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WMESS 2016

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WORLD MULTIDISCIPLINARY EARTH SCIENCES SYMPOSIUM

ABSTRACT COLLECTION BOOK

Eco-friendly Symposium - WMESS

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Preface

This Abstract Collection consists of the abstracts of papers presented in the “World Multidisciplinary Earth Sciences Symposium” in the city of romance Prague (Czech Republic) during 5-9 September 2016. The World Multidisciplinary Earth Sciences Symposium (WMESS) aims to provide a forum for discussion of the latest findings and technologies in different fields of Earth Sciences, to give opportunities for future collaborations. WMESS wants to be a platform for sharing knowledge and experiences in the fields of Earth Sciences, to lead for providing a forum for early career researchers for presentation of their work and discussion of their ideas with experts in different fields of Earth Sciences such as; Tectonics & Structural Geology; Engineering Geology; Geotechnics; Hydro-Hydrogeological Sciences; Natural Hazards; Geomorphology; Geochemistry, Mineralogy, Petrology & Volcanology; Stratigraphy, Sedimentology & Palaeontology; Geophysics & Seismology; Geodesy, Photogrammetry & Cartography; Informatics, Geoinformatics & Remote Sensing; Mining Engineering; Mineral Processing; Blasting & New Technologies; Natural Resources; Environmental Sciences; Energy, Resources & Pollution & the Environment; Environmental Legislation; Biogeosciences; Geological Heritage & Geoparks; Urban Planning; Atmospheric Sciences – Climate; Modelling and Soft Computing Techniques in Earth Sciences; Medical Geology; Occupational Health and Safety.

WMESS 2016 will be the 2nd of the Annual series and the main mission of the "World Multidisciplinary Earth Sciences Symposium - WMESS" is to lead to contribute in multidisciplinary studies related with atmosphere, biosphere, hydrosphere, lithosphere and pedosphere of the Earth and interaction of the human with them. As another mission, it provides a forum for this diverse range of studies, which report very latest results and document emerging understanding of the Earth's system and our place in it. The Scientific Committee and Institutional Scientific Partners of WMESS was completed by paying strict attention, and all members were selected from well-known, very much appreciated, productive and representatives of the different countries. We are deeply grateful to the members of the scientific committee and institutional scientific partners (International Association for Engineering Geology & the Environment – **IAEG**, International Union of Soil Sciences – **IUSS**, International Geographical Union – **IGU**, The International Association of Hydrogeologists **– IAH**, Geological Sciences of Italy – **SGI**, Czech Soil Science Society – **CSSS**, Arabian Geosciences Union – **ArabGU**, The Society of Economic Geology of Romania – **SEGR**, World Meteorological Organization – **WMO**, International Medical Geology Association – **IMGA**, Russian Mineralogical Society – **RMS**, University of Petrosani) of WMESS.

We would like to express our sincere gratitude to all participants of WMESS 2016 from 50+ different countries all over the world for their interests and contributions in WMESS 2016. We wish you enjoy the World Multidisciplinary Earth Sciences Symposium – WMESS 2016 and have a pleasant stay in the city of romance Prague. We hope to see you again during next event WMESS 2017 which will be held in Prague (Czech Republic) approximately in the similar period.

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Quaternary stress states along the North Anatolian Fault, Turkey

Suha Ozden *

Canakkale Onsekiz Mart University, Department of Geological Engineering, 17020, Çanakkale, Turkey

ABSTRACT

The Alpine-Himalayan orogenic system incorporates many structural lineaments including plate boundaries such as along the border of the Anatolian block where three major plates – the Eurasian, African and Arabian – are juxtaposed. The collision of the Arabian plate with the Eurasian plate in eastern Turkey during the late Miocene time induced two major strike-slip faults: the North Anatolian Fault (NAF) and the East Anatolian Fault (EAF), bounding the Anatolian block in the north and in the east of Turkey, respectively. Both the NAF and EAF have been ascribed to the westward extrusion of the Anatolian block from the Eurasian-Arabian continental collision zone and also contribute to the geodynamic evolution of the Aegean region to the west-southwest of Anatolia. This study defines the Quaternary stress states along the North Anatolian Fault has a 1400 km long. The inferred regional stress regime, obtained from the inversion of measured fault-slip vectors as well as focal mechanism solutions from earthquakes, is significant and induces the right-lateral displacement of the North Anatolian Fault. Approximately east to west lineament along the main three segments (east, middle and west) on the fault zone, there are many pull-apart and wrench basins such as namely Erzincan, Reşadiye, Koyulhisar, Niksar, Erbaa, Bolu, Gönen and Ganos from east to west which were collected data to fault kinematic analysis from in and around the basins. Fault kinematic inversion results show a Quaternary aged two distinct strike-slip stress regimes with consistent N to NW-trending (sigma 1) and E to NE-trending (sigma 3) axes. In addition to regimes, it has been observed consistent pre-Quaternary reverse faulting by a N to NW-trending (sigma 1) and Quaternary aged local normal faulting regime with a E to NE-trending (sigma 3) along the NAF. The strike-slip regime characterized by the older transpressional and the younger transtensional stress regimes, respectively. A change in stress regime defined from transpressional to transtensional, having a consistent N to NW- and E to NE-trending (sigma 1) and (sigma 3) axes, respectively with field observations, cross-cutting relationships and significantly different mean stress-ratio (Rm) values. Transtensional stress regime is still active along the NAF. The temporal change, probably in Quaternary time, within the regional stress regime, from transpressional to transtensional, resulted from the coeval influences of slab-pull and/or roll-back process in the southwest (i.e., along the Cyprus and Hellenic arc), continental collision in the east (Eurasian-Arabian continental collision) and westward escape of the Anatolian block.

Key words: Stress state; kinematics; inversion; fault; earthquak; North Anatolian Fault, Turkey.

* Corresponding Author

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The structure and metamorphism of rocks as a criterion of dissection and correlation of polymetamorphic complexes: an example of the Subpolar Urals

Alexandr M. Pystin *, Ju. I. Pystina, I. L. Potapov, P. A. Markova, A.V. Panfilov

Ural Branch of RAS, Komi Science Centre, Institute of Geology, Syktyvkar, Russia

ABSTRACT

The aim of this work is substantiation of the structural position and stratigraphic sequence of polymetamorphic formations in the Subpolar Urals, basing on the study of rock structural features and metamorphism. In the Subpolar Urals, polymetamorphic formations constitute the Upper pre-Riphean part of the section. According to the officially accepted stratigraphic schemes, they are divided (bottom-up) into the Nyartin metamorphic complex (PR1), Manhobeyu (RF1), Schekurya (RF1), and Puiva (RF2) suites. Biostratigraphic verification of rock ages is available only for the Middle Riphean Puiva suite. The Early Proterozoic age of the Nyartin rocks (2.2-2.1 Ga) is accepted according to isotope-geochronological data on the early stages of metamorphic manifestations in them. The sediment ages of the Manhobeyu and Schekurya suites are not reliably known and supposedly defined as Early Riphean. Studying the structure and metamorphism of the above-mentioned structural-material units, it was found that intensively and repeatedly deformed and metamorphosed formations of the Nyartin complex, Manhobeyu and Schekurya suites can be assigned to the same structural stage. Considering the available isotopic data on the early stages of metamorphic manifestations in rocks of the Nyartin complex, it can be stated that all of these stratigraphic units are attributed to the Lower Proterozoic, with a high degree of probability. At the same time, the rock association, known as the Manhobeyu suite, should be attributed to the Nyartin complex; this has no independent stratigraphic significance and was wrongly distinguished as a suite in the zones of evolution of medium-low temperature diaphthorites. The Schekurya suite differs from the Nyartin complex (and the Manhobeyu suite) by the predominance of carbonate rocks in the section, and this can be regarded as an independent structural-material unit, i.e. a metamorphic complex. Basing on the conducted research, it can be stated that the Upper Proterozoic section in the Subpolar Urals begins with sediments of the Middle Riphean Puiva suite. In contrast to the southern regions of the Urals, there are no Lower Riphean formations there.

Key words: Subpolar Urals; Proterozoic; polymetamorphic complexes; structure.

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Structural characteristics of the rocks of the Nyarovey series (Polar Urals)

Natalia Ulyasheva, Oksana Grakova, Aleksandr Pystin *, Yulia Pystina

Ural Branch of RAS, Komi Science Centre, Institute of Geology, Syktyvkar, Russia

ABSTRACT

Nyarovey series is represented by formations of Upper Precambrian of the Central Zone of the Polar Urals north-eastern part of Europe, metamorphosed in conditions of greenschist and epidote-amphibolite facies. It stretches in the form of bands of the northern and north-eastern directions and frames of deeply Early Proterozoic complexes. In the Nyarovey series it stands out from the bottom up Upperharbey (quartzites, mica-albite-quartz, mica-quartz graphitiferous schist) (R2 vh) and Miniseyshor (fillitovidnye, epidote-chlorite-amphibole, albite-chlorite schists carbon) (R2 mn) series. Age series conditionally accepted as the Middle Riphean. Many questions geology of Nyarovey series still unresolved, including the problem of the structural transformation of the rocks. The aim of this work is to establish structural changes rocks Nyarovey series, which is very important for understanding the geological history of the prospective for minerals Riphean formations of the Polar Urals. To establish the structural and material characteristics of the rocks Nyarovey series of expeditions to the release of her formations areas measured dip and strike of rock and folds of bedding were conducted. It was found that for species Nyarovey series linear structures, according to the Early Proterozoic complexes framing is conformable. At the same time, they are characterized by lateral changes in the meridional direction. Field observations have shown that in the Riphean formations widely developed processes of structural and material transformations of rocks, associated with the formation of Uralides (Hercynian orogeny), in particular with the development thrusts. The folds and planar structures associated with thrust, formed in the third stage of deformation. Earlier structural elements in monotone section occur as relics. The sections composed contrasting composition of rocks, and especially in sections, including lodes and dykes of granites mapped asymmetric plications with heavy pitches apical plane and steeply plunging apexes. They precede the folds of moderate to severe degree of to appress with hollow plunging apexes. The predominant orientation of earlier structural elements has a north-west direction, similar to the orientations of planar elements neighboring Early Proterozoic complexes. Thus, the study of the structural features of the Polar Urals for Middle Riphean formations have shown that they have undergone at least three stages of deformation. The most manifest changes associated with Hercynian orogeny. The study was financially supported by RFBR in the framework of a research project № 16-35-00146 mol_a, as well as with the support of the Programme of Fundamental Research RAS № 15-18-5-17.

Key words: Middle Riphean; Polar Urals; deformation; Hercynian orogeny.

* Corresponding Author

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Morphotectonic active faults in relation to hydrothermal activity in Guelma basin in eastern Algeria

Baya Nait Amara *[1], Massinissa Braham [1], Rabah Bensalem [1], El Hadi Obaiche [1], Djamel Machane [1], Djamel Aissa Eddin [2]

[1] National Centre of Applied Research in Earthquake Engineering, CGS, Rue kaddour Rahim BP 252 H.day, 16040, Algeria

[2] University of Science and Technology of Algeria (USTHB), FSTGAT, El Alia, Algeria

ABSTRACT

The reliefs of existing landscapes are most often the result of complex tectonic activity such as playing active faults. The Nineties saw the development of a new relief visualization technique and its application in the recognition and geological studies. Indeed, in recent years, alongside the methods of classical geology, the use of morphotectonic approach and geomorphology are increasingly sought in the identification and characterization of active faults and knowledge of traces of strong earthquakes in the morphology of the active areas. Identifying these seismogenic structures requires morphological analysis focused on the search criteria attesting tectonic activity. The search for this signature is on the field but also by observing flaws in the development of satellite technology (Google Earth, digital topography and satellite imagery). The study of aerial photographs, satellite imagery and digital terrain models (DTMs) of Guelma basin allowed us to highlight an important lineament network and identify some lineaments known at the regional scale 1/500 000 (villa, 1980) in particular North Fault Guelma (confirmed by the profile "P2") and the South Fault Guelma (found on the cup profile "P1"). Following the analysis of the historical seismicity, it turned out that earthquakes of magnitude less than 3 can be attributed to hydrothermal activity. This relationship between faults and hydrothermal activity in Hammam Meskhoutine area (west of the city of Guelma) has been demonstrated by many authors as Vila (1980), Dib (1985) and Maouche (2013) it results in alignments of warm water emergences following directions faults.

Key words: Morphotectonic; hydrothermal; active fault; historical seismicity, hot springs.

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Magmatic complexes of the Urals as suspect parts of Large Igneous Provinces

Victor Puchkov *

Ufimian Scientific Centre, Institute of Geology, K.Marx st., 450077 Ufa, Russia

ABSTRACT

Petrogenetic, geochemical studies and isotope age determinations of flood basalts, dolerites, trachybasalts, picrite-basalts, rapakiwi granites, layered mafic-ultramafic intrusions and also alkaline and carbonatite magmatic complexes of the Urals, along with coeval magmatic complexes of adjacent and faraway territories permits to put forward a preliminary list of objects – “candidates” at attribution to Large Igneous Provinces (LIPs). Their petro-geochemical properties distinguish them from spreading and subduction types; they are characterized by wide areas of development and very short periods of activity. In the Southern Urals near the base of the Lower Riphean (Uppermost Paleoproterozoic and Lower Mesoproterozoic), covering crystalline Taratash complex dated as Archean and Lower Paleoproterozoic, there are volcanic deposits of the Navysh Subformation, represented by trachybasalts. The age of the unit was determined as 1752±11Ma (SHRIMP, zircons). Volcanic rocks of the age level of 1750−1780 Ma are developed not only in some other places of Baltica, but also in the Northern Africa, Siberia, Laurentia and North China (parts of Nuna supercontinent). Therefore they may belong to a LIP. Higher up the section of the Riphean, at the base of the Middle Riphean (Mid−Mesoproterozoic), rhyolites of the Mashak Formation were dated by SHRIMP and CA-IDTIMS U−Pb methods in three isotopic laboratories as 1380−1385 Ma. The same ages have also rapakiwi granites, layered gabbro, carbonatites and dolerite dykes widely developed in the Southern Urals and encountered in boreholes of East European platform; magmatic rocks of the same age are traced to Greenland, Laurentia and Siberian cratons and date the beginning of Nuna supercontinent break-up. Less confidently we may speak of the younger Neoproterozoic magmatic complexes complexes of the Southern Urals as LIPs, dated as ca. 720 Ma and 680 Ma (Arshinian and Kiryabinka complexes); they need a further study. The study of dykes in the western slope of the Urals has revealed three main Paleozoic volcanic events. The first one, represented by subalkaline volcanics is connected with rift process started at ca. 490 Ma, the beginning of the Ordovician that has led to oceanic spreading and formation of the Paleouralian Ocean. The second Paleozoic episode was marked by an eruption of trachytes, and was dated (SHRIMP, zircons) between 435 and 455 Ma. It can be correlated with the early stage of development of Vishnevogorsk plume-related carbonatite complex. The younger complex is Devonian in age and is traced along the western slope of the Urals to Pay−Khoy. They match excellently with the Mid-Upper Devonian volcano-intrusive complexes of the East European platform including traps, dolerite dykes, alkaline and carbonatite intrusions and kimberlites, and belong to the marginal part of the LIP called Kola−Dnieper. The last but not the least are the Lower Triassic flood basalts and dykes traced from the easternmost parts of the Southern and Middle Urals to the western margin of the Polar Urals. It became evident that they belong to the Uralo-Siberian LIP and “African” super swell.

Key words: Urals; plumes; superplumes; supercontinents; LIPs.

* Corresponding Author

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Tectono-sedimentary evolution of the NE Tunisian Atlas (Bouficha-Enfidha area) and the role of the Cretaceous extension during the orogeny period

Haithem Briki [1]*, Mohsen Rabhi [2], Ahmed Nasri [3], Fyacel Ferhi [3], Abd Errahman Ouahchi [3]

[1] University of Sfax, Laboratory 3E, Sfax National School of Engineers, Tunisia
[2] University of Tunis El Manar, Faculty of Sciences of Tunis, Tunisia
[3] Entreprise Tunisienne d'Activité Pétrolières -ETAP, Tunisia

ABSTRACT

The Bouficha-Enfidha area belongs in the eastern Tunisian Atlas. It is characterized by a major NW-SE trending faults and a NE-SW and N-S folds direction. Using detailed geological mapping, field cross section, and structural analysis; we note that this region records many sedimentary and tectonic events since the Mesozoic age accompanied by a volcanic eruption at the lower Senonian. In fact, during the lower cretaceous, our study area fossilized a NE-SW contraction stress created a horst and graben structure. This architecture leads to the accumulation on the high land a condensed carbonates Aptian series (30 to 50cm of the serdj formation) at Jebel Garci, Jebel Mdhaker, and Hammem Jedidi area, however; in the sidi Jedidi Area this series shows a deep argillaceous facies. NE-SW extensional event was still active until the upper cretaceous accompanied with a volcanic eruption during Coniacian-Santonian time. The tectonic inversion started at the early Maestrichtian age (top of the Abiod Formation) which demonstrated by the absent of the Palecone series (El Haria formation) in the Sidi Abid area which was a subsidence basin during the Senonian age. Consequently we can attribute this period to the first stage of the Bouficha Graben structuring. The tectonic inversion enhanced during the Eocene by a light NW-SE compression regime. The important thickness variation observed in the Oligo-Miocene series (mainly in the Aquitanian series) testifies a NE-SW extensional event during the Oligocene-Miocene age. Furthermore, the Langhian carbonate bar (Ain Ghrab Formation) overlays the previous series with angular unconformities within a general transgressive context. At the base, this series shows many different origins pebbles. As a consequence of The African Eurasian plate collision, during the upper Miocene a regional NW-SE compression event took place and generated the Tunisian Atlasic domain. This compression was responsible to the folding of the Bouficha-Enfidha area (NE-SW and N-S trending folds) and the reactivation of pre-existing normal faults to reverse or strike slip movement. This event still actives until today.

Key words: Eastern Tunisian atlas; extension; tectonic inversion; Bouficha Graben; fault reactivation.

* Corresponding Author

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Emplacement of granitoids in dextral transpressional regime: inference from magnetic fabric combined with electron backscatter diffraction analysis (EBSD) of the Mbakop Pluton, Western Cameroon Domain

B.E. Bella Nke [1,2,3]*, T. Njankoa [4], M.A. Mamtanic, P. Rochettee [5], E. Njonfang [6]

[1] University of Dschang, Department of Earth Sciences, Laboratory of Environmental Geology, P.O. Box 67, Dschang, Cameroon

[2] Department of Earth Sciences, Faculty of Sciences, University of Maroua, P.O. Box 46, Maroua, Cameroon

[3] Department of Geology & Geophysics, Indian Institute of Technology, Kharagpur, 721302, India

[4] Ministry of Scientific Research and Innovation, DPSP/CCAR, P.O. Box 1457, Yaoundé, Cameroon

[5] CEREGE UMR7330 Aix-Marseille Université CNRS, 13545 Aix-en-provence, France

[6] Laboratory of Geology, High Teacher Training School, University of Yaoundé I, P.O. Box 47, Yaoundé, Cameroon

ABSTRACT

Granitoids are excellent recorders of the deformation which affects the earth's crust as far as their fabrics reflect the last stage of the deformation. Thus, fabric patterns of a pluton, usually studied using the anisotropy of magnetic susceptibility (AMS) technique, give more constrains concerning the tectonic settings that prevailed at the time of their emplacement. The ongoing classical study (petrography and microstructure) combined with AMS and EBSD methods of the Mbakop granitic pluton (MGP), situated at the transitional zone between the N30°E and the N70°E branches of the Central Cameroon Shear Zone (CCSZ) in the Tikar Plain (West-Cameroon), gave the following results: 1) The MGP consists of deformed biotite granite and hornblende biotite granite emplaced in a deformed amphibolo-gneissic basement; 2) The deformation markers include i) kinematic indicators such as hornblende fish-shape, σ- and δ-types feldspar and hornblende porphyroclasts; they indicate sinistral and dextral (top to the S and top to the N respectively) senses of shear movement sometimes in the same thin section; ii) two types of microstructures: - feldspar microfractures filled with quartz, bended plagioclases twins, dynamic recrystallization of quartz grains and biotite flakes around feldspar porphyroclasts; as indicators of moderate to high temperature submagmatic to solid–state microstructures; - crystal transformations, quartz aggregates displaying bulging grain boundaries and broken feldspar porphyroclasts; characteristic of low temperature solid-state microstructures and iii) quartz C-axis measurements showing patterns corresponding to the dominant activity of prism <c> slip system typical of high temperature and hydrous conditions of deformation. The shape of the quartz C- axis fabrics suggests a rotational component with a dextral sense of shear movement. For the ASM method, 204 samples from 51 stations were collected. The following results are obtained: Magnetic susceptibility magnitudes of the MGP show ferromagnetic behavior (Km ≥ 500μSI for 85% of the stations) likely due to the presence of multidomain magnetite grains as shown in K-T curves and hysteresis diagram. Based on the Flinn diagram and the Pj and T-shape parameters, AMS ellipsoids are mostly prolate (64% of the stations), suggesting that constriction with less component of flattening may have been the main deformation mechanism that affected the MGP. Magnetic lineation trends NNW-SSE, N-S and NE-SW with mostly low to moderate plunges (best lines at 196/0 in MGP and 197/13 in the basement rocks) towards South. Field and magnetic foliations trend: N-S, NNE-SSW, ENE-WSW and E-W, with moderate to steep dips in the granitic and the basement rocks (best poles at 103/66 and 95/24 respectively). This directional organization draws a sigmoidal shape of the magnetic foliation and lineation trajectories in the study area. The present study reveals that the high temperature solid-state

microstructure deformation fabrics indicates syntectonic emplacement of the MGP. Pj and T-shape parameters and kinematics markers are consistent with a non-coaxial deformation. Sub-vertical magnetic foliation and sub-horizontal magnetic lineation imply transcurrent deformation. Their sigmoidal trajectories are indicative of a dextral sense of shear. The observed structures and distribution of fabric elements suggest for the MGP emplacement, a transpressional regime controlled by the functioning of the CCSZ.

Key words: Microstructures; AMS; shear zone; transpression; Cameroon.

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Consideration of relationship between Nickel variations in crude oil and structural features in Bangestan reservoirs, Mansuri oil field, SW Iran

Mohammad Hossein Heidarifard [1]*, Negin Valinezhad [2]

[1] National Iranian South Oil Company, Head of Geochemistry Division, Naft Street, Po Box: 61735-1333, Iran
[2] Tabriz University, Tabriz, Iran

ABSTRACT

The aim of this study is consideration of Nickel variations in the Bangestan reservoir crude oils of the Mansuri oilfield and determining their responsible factors and applications. For this purpose, Nickel values of crude oils have been measured in 14 selected wells. The concentration of Nickel in these oils varies between 9.58 to 26.6 ppm that lowest value is referred to well no.45 and highest one is related to well no.79. The Nickel values of wells 45,19,40,39,82 mark lower concentrations of Nickel rather than average values and all of them highlight the which are located in particular parts of the oilfield. The wells no. 40,39 are located in the East, 45 in the Middle and 19,82 in the West of oilfield. These parts associated with gravitating of asphaltenic wells and temperature anomalous. Further considerations show the decreased Nickel concentrate zones are affected by structural features such as basement faults and paleohigh borders. These features would have increased local geothermal gradient and lead to differentiation of crude oil into heavier and lighter parts. The heavier part is precipitated as asphalten and incorporates heavy elements such as Nickel. Therefore Nickel is depleted in produced oils of asphaltenic wells. This study shows that; 1. Depletion of Nickel in the Bangestan crude oils occurred in three parts of oilfield, wells 39, 40 in the eastern part (on Paleohigh border), well 45 in the middle part and wells 19, 82 in the western part of oilfield (in the vicinity of Basement fault). 2. Locally increasing of temperature as resulted of structural features is lead to differentiation of oils into heavier and lighter parts that heavier part is precipitated as asphalten which absorb large amount of Nickel; therefore it will be depleted in the produced oils of asphaltenic wells. 3. So based on all the above mentioned points, Nickel values of crude oil is strong and reliable indicator of structural features in reservoirs with a resolution that could detect even minor fault displacements.

Key words: Dezful Embayment; Mansuri oilfield; Paleohigh; nickel; asphaltenic wells.

* Corresponding Author

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Subsidence in the Sept Iles layered intrusion (Canada) revealed by anisotropy of magnetic susceptibility

Olivier Bolle [1]*, Hervé Diot [2], William Fransen [1], Michael Higgins [3]

[1] Département de Géologie, Université de Liège, Allée du Six Août 12, 4000 Sart Tilman, Belgium
[2] UMR-CNRS 6112, Laboratoire de Planétologie et Géodynamique, Université de Nantes, Nantes, France
[3] Sciences de la Terre, Université du Québec à Chicoutimi, Chicoutimi, Québec G7H 2B1, Canada

ABSTRACT

The Sept Iles layered intrusion (Quebec, Canada) is an Ediacaran (564 Ma), dinner-plate shaped plutonic body with a diameter of 80 km and a maximum thickness of 7 km. It is the third largest layered intrusion in the world, after the Bushveld complex and the Dufek intrusion. From base to top, the Sept Iles intrusion is made up of a Layered Series (at least 4800 m thick) dominated by troctolite and gabbro, an anorthositic Upper Border Series and a broadly granitic Upper Series. About 90% of the intrusion is covered by the St. Lawrence River and only its northwesternmost portion is partly visible on the mainland and on islands. We have conducted a structural study of the outcropping part of the Layered Series, using the technique of low-field anisotropy of magnetic susceptibility. The bulk magnetic susceptibility (values from 5 to 280×10^{-3} SI, excluding one strongly altered sample) is largely ferromagnetic and dominated by magnetite. The magnetic fabrics can be divided into three categories (Type 1 to 3), according to the orientation of magnetic foliation (K_1-K_2 plane) and magnetic lineation (K_1 axis). In Type 1 (67% of the samples), the magnetic foliation is at low angle to the igneous layering (that consistently shows centripetal, relatively low dips) and the magnetic lineation is gently plunging, towards the SE in average. Type 2 (25% of the samples) is also characterized by a magnetic foliation that approximates layering and a lineation that is gently-plunging, however the latter is inclined to the NE in average. In type 3 (9% of the samples), the magnetic foliation is steeply-dipping and the magnetic lineation is of variable orientation. Type 1 is interpreted as a “normal” magnetic fabric, controlled by the shape anisotropy of large (i.e. multidomain) magnetite grains. Type 2 would be an “intermediate” magnetic fabric, with a switching of the K_1 and K_2 axes due to some interference between the normal magnetic fabric and an “inverse” fabric linked to numerous, very small (i.e. single-domain) magnetite inclusions identified in silicates. Type 3 would be either an intermediate magnetic fabric reflecting a stronger influence of the minute inclusions of magnetite or a secondary fabric. The average magnetic lineation of Type 1 (orientation of 141SE10) is inclined inwards, toward the deepest part of the Sept Iles intrusion coinciding with a maximum of the gravity anomaly that delimits the plutonic body. This is interpreted as an evidence of stretching of the cumulate rocks recorded during foundering of the Fe-Ti-oxide-rich, high-density Layered Series into lower-density country-rocks (quartz-feldspath-rich Grenvillian gneisses). Such a “central subsidence” has been evidenced in other mafic to ultramafic layered intrusions (e.g. the Skaergaard intrusion, the Bjerkreim-Sokndal intrusion and the Rum layered suite). It was possibly triggered here by very high thermal conditions, since it has been suggested elsewhere that the Sept Iles intrusion might be related to an important mantle plume.

Key words: Cumulate; magnetite; normal magnetic fabric; intermediate magnetic fabric; inverse magnetic fabric; density contrast.

* Corresponding Author

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Late Proterozoic - Early Palaeozoic rocks of the NW Anatolia-Turkey; a remnant of an active continental margin of the Pan-African oceanic realm

İsmail Onur Tunç 1*, Erdinç Yiğitbaş 2

1 Ardahan University, Faculty of Social Sciences and Humanities, Department of Geography, Ardahan, Turkey
2 Çanakkale Onsekiz Mart University, Department of Geological Engineering, Çanakkale, Turkey

ABSTRACT

In northwest Anatolia, three E–W-trending tectonic units can be distinguished; İstanbul Zone (IZ) in the north, Sakarya Zone (SZ) in the south, and the Armutlu-Ovacık Zone (AOZ) between them which is dominated by strike-slip systems and a tectonic mixture of the IZ and the SZ. The Biga Peninsula (NW Anatolia), which is located in the westernmost part of the SZ, was affected by late Mesozoic-early Tertiary strike-slip tectonics. Metamorphic assemblages crop out as two NE-SW trending belts in the Biga Peninsula, which were described and evaluated by different names, ages, geological and tectonic meanings. Previous studies suggest a suture zone between these two metamorphic belts, beneath a thick Tertiary-Quaternary volcanic and sedimentary cover. This suture was evaluated as Paleo- or Neo-Tethyan. The metamorphic assemblages in the south of this suture were evaluated as the continuation of the SZ and the northern ones were assigned to the Rhodope and Serbo-Macedonian massifs. The northern metamorphic assemblages are represented by a calc-alkaline metavolcanic dominated sequence at the bottom and a metasedimentary sequence at the top, which are tectonically imbricated with metaophiolites and eclogitic rocks in various sizes from centimeters to meters. Geochoronological studies on the northern metamorphic massifs yielded the following data: maximum sedimentation ages of the protoliths of metasedimentary rocks in the range of 559 ±17 to 582 ± 30 Ma; crystallization age of the protolith of metavolcanic rock is of 577 ± 20 Ma, and crystallization age of the protolith of eclogitic rocks is of 565 ± 9Ma. On the other hand, a metamorphic unit called as Torasan formation, which crops out in the southern belt on the Kazdağ antiform, is cut by early Devonian metagranitoids and having 566 ± 7 Ma maximum sedimentation age according to U-Pd zircon dating. In addition to the similar U-Pb zircon ages and the patterns of the concordia diagrams of the northern and the southern belt metamorphic units, there is also a very strong correlation between these metamorphic units, in terms of their lithological, stratigraphical, structural and metamorphic features. When we consider this correlation and the data together, as a conclusion, the remnants of a late Ediacaran – early Paleozoic active continental margin juxtaposed to the Pan-African oceanic realm in the basement of northwestern Anatolia.

Key words: Late Proterozoic-Early Paleozoic; Pan-African; active continental margin; Northwest Anatolia; U-Pb zircon.

* Corresponding Author

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Relationship between faults oriented parallel and oblique to bedding in Neogene massive siliceous mudstones at the Horonobe Underground Research Laboratory, Japan

Akira Hayano *, Eiichi Ishii

Japan Atomic Energy Agency, Horonobe Underground Research Center, Hokushin 432-2, Horonobe-cho, Hokkaido 098-3224, Japan

ABSTRACT

Neogene massive siliceous mudstones at the site of the Horonobe Underground Research Laboratory (URL) in Hokkaido, Japan, are cut by faults parallel to bedding (bedding-parallel faults) and faults obliquely intersecting bedding (bedding-oblique faults). Core logging of pilot boreholes and fracture mapping on shafts and gallery walls enabled observations of the relationship between these bedding-parallel and bedding-oblique faults. Previous studies have shown that the bedding-oblique faults formed after the bedding-parallel faults, based on crosscutting relationships. Thus, there is a possibility that bedding-parallel faults mechanically affect the propagation of bedding-oblique faults. To discuss this effect of bedding-parallel faults on the propagation of bedding-oblique faults, this study investigates the relationship between bedding-parallel and bedding-oblique faults in the Wakkanai Formation at the Horonobe URL using drill-hole logging and fracture mapping on gallery walls. Four bedding-parallel faults that contain visible fault gouge are present in the two pilot drill-holes PB-V01 and SAB-1 and are herein named (occurring stratigraphically from top to bottom) the MM Fault, the Last MM Fault, the S1 Fault, and the S2 Fault. These bedding-parallel faults are characterised by fault rock that consists mainly of fault gouge with a thickness of 1 to 2 cm and occur at 350 m depth in the Horonobe URL, spread over at least several tens of metres in parallel along a bedding plane. In contrast, bedding-oblique faults are characterised by fault rock that consists mainly of fault breccia with a thickness of 8 to 25 cm. A bedding-oblique fault displaces the bedding-parallel Last MM fault, but not the MM and S2 faults, which is consistent with observations in previous studies. The discontinuation of the bedding-oblique faults at the vicinity of the MM and S1 faults suggests that the presence of fault gouge at the bedding-parallel faults acts as a mechanical barrier to the propagation of the later-stage bedding-oblique faults. In particular, the MM and S1 faults, which have a relatively thick fault gouge, appear to have had a stronger control on the propagation of bedding-oblique faults than did the Last MM fault, which has a relatively thin fault gouge.

Key words: Massive siliceous mudstone; bedding-parallel faults; bedding-oblique faults; mechanical barrier; fracture mapping; Underground Research Laboratory (URL).

* Corresponding Author

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The geothermal fields that formed along tectonically active detachment faults: An example from the Ortakçı geothermal field (Büyük Menderes Graben, SW Turkey)

Ali Kaya *

Pamukkale University, Faculty of Engineering, Department of Geological Engineering, 20017 Kınıklı, Denizli, Turkey

ABSTRACT

The Ortakçı geothermal field is part of the Büyük Menderes graben that forms southern boundary of the central Menderes massif, in western Turkey. The field is situated in a relay ramp between two active normal fault segments having the same dip direction. One of the active hot springs are formed at the intersection of the E–W and N–S-oriented faults in the geothermal field. A major south-dipping normal fault system bounds the northern margin of the E–W striking Büyük Menderes graben. The normal faults juxtapose Neogene and Quaternary sedimentary units against the metamorphics. These faults and fractures throughout the hanging wall are connected to the main detachment fault in which distributed high stresses are present. The central Menderes massif core-complex which has exhumated on the footwalls of south facing of Büyük Menderes detachment and north facing of Gediz detachment in the south and in the north respectively. Approximately E–W directed Büyük Menderes detachment fault is commonly S-dipping with a small right-lateral strike-slip component, dip values vary from 40° to 65°. The existence of thick and widespread scree deposits in front of the faults on the northern margin of the Büyük Menderes graben indicates that these faults are experienced larger displacement rates and are more active than those to the south. Geothermal fields are positioned on the tectonically active high-angle normal faults along the northern and southern margins of the Büyük Menderes and Gediz grabens, respectively. The springs occurred on the relay ramp were permitted by high permeability fluid-flow conduits formed from the high fracture density and dynamically continuous fracture systems. Thermal fluids prefer to flow in highly fractured zones, occurred at the intersection between these fault segments, along shear zones of detachment faults and active normal faults. Field observations prove that all hot water outflows are related to the high-angle normal faults on the hanging wall of the detachment faults. The lack of significant actual magmatic activity indicates that the upper levels of the crust are not a direct heat source for geothermal activity in western Turkey. Therefore, the heat source seems to be associated with crustal faulting. The heat source is the shallow mantle of a thinned lithosphere due to large extension rates, resulting in increased heat flow. The tectonic effects are on the heat transport mechanism, and the heat transport is controlled by faults in a convection dominated systems. The result is a high geothermal gradient because water can circulate deep and transports the heat upwards to the surface. The high heat flow values have been observed at the margins of the northern Büyük Menderes and the southern Gediz grabens. The high heat flow corresponds to places where tectonically active current. The highest heat flow values in the region, compared with other active normal faults are remarkably perfect harmony with detachment faults. This situation indicates that detachment faults are highly effective for the circulating of fluids flow and heat transport.

Key words: Active Extensional tectonics; detachment faults; structural controls; Büyük Menderes graben; heat transport mechanism.

* Corresponding Author

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Paleoseismic investigation of 1943 Tosya-Ladik Earthquake Fault rupture on the Northern Part of Ladik (Turkey)

T. Fikret Sezen *

Cumhuriyet University, Department of Geological Engineering, Sivas, Turkey

ABSTRACT

The main purpose of this study is to obtain of related data connecting with the old earthquake fault segment of NAFZ which producing earthquake in 1943; is to demonstrate of neotectonics and active tectonic features and is to make prediction on potential of creating major earthquake of this active fault. In this study, trenches were dug at the designated locations on the Tosya-Ladik fault segment that torn with earthquake in 1943 year. The seismic behaviours and generated earthquake time intervals of this fault segment are aimed to achieve with the findings obtained from these trenches. In addition, geological mapping has been made on the fault corridor that included the relevant studying area. One of the many fault segments in the NAFZ is also Ladik-Tosya segment. This fault segment has been broken again at the one (Ms=7.6) of the earthquakes which occurred at "the instrumental recording period"; between Tosya and Ladik of this segment was torn about 280 km along during this earthquake in 1943 year. There have been numerous studies for paleoseismic aimed on the NAFZ in the last 30 years. However, the majority of these studies were realised between Bolu-Gerede and Istanbul at the concerned fault zone. The paleoseismic studies is very inadequate in central and eastern parts of the NAFZ. This paleoseismic study were carried out on Ladik-Tosya fault segment in order to resolve this deficiency studies. For this purpose, trenches were dug in designated locations on Ladik-Tosya fault segment (between Tatlıcak and Arslantaş). Taken six samples associated with fault segment from three excavated trenches were made analysis for radiocarbon dating.

Key words: North Anatolian Fault Zone; Tosya-Ladik Earthquake in 1943; active tectonics; paleoseismic; trech.

* Corresponding Author

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Structural architecture and Hydrocarbon potential of the carbonate of Turonian-Coniacian target in the Gulf of Gabes (Offshore Tunisia)

Imen Chalwati *, Noureddine Boukadi

University Tunisia El Manar, Faculty of sciences of Tunisia, Department of Geology, UR11 ES15, Tunisia

ABSTRACT

The Pelagian Province generally coincides with the offshore shelf area of east-central Tunisia and northern Libya. The Gulf of Gabes lies in the pellagian province. It is a wide Ceno-Mesoizoic basin developed at the expense of a stable platform and separated from it by the NW-SE platform. During late Cretaceous, extensive shallow water carbonate platforms were developed over a large part of Gulf of Gabes. The development of this carbonate platform was especially controlled by the inherited substratum structuration. The present study is based on subsurface data and it was initiated with the aim to reconstitute the tectono-sedimentary evolution of Turonian-Coniacian series, to bring out the major structural elements that have dislocated the sedimentary substratum and to highlight the remaining hydrocarbon potential of the Ashtart sub-basin to guide the future exploration activities. The overview of the lithostratigraphic succession of the study area using mud logging data and wireline log lead to homogenize all the stratigraphic formations as well as the Turonian-Coniacian target. Thus, the drilled wells used, crossed a lithostratigraphic series ranging from the Plio-quaternary to the upper Cretaceous. Several Lateral thickness and facies changes were highlighted through different directions of regional correlation well lines. Moreover, several digraphic correlations lines of cretaceous intervals flattened with the Santonian discordance (Datum) and facies map allowed us to follow the special distribution of facies and thickness of Douleb and Bireno objective. Indeed, the Turonian-Coniacian lithostratigraphic sequences show a main lateral facies evolution from the SW to the NE seen at different scales. The interpretation of 2D seismic reflection lines are used to determine the structural configuration of the basin. Isochron and Isobath maps drawn for both tops of Douleb and Bireno carbonates horizons show that during the Turonian-Coniacian time, the structure of study area was especially controlled by NW-SE extensional faults network development, strike slip and NE-SW minor normal faults system. The structural pattern resulting from the NW-SE compartmentation is governed mainly by tilted blocks, horsts, grabens and puzzling structures. Thus, this study allowed us to bring out the best area of interest where all favourable conditions to the generation and hydrocarbons accumulation are met in Tunisia.

Key words: Tunisia; tectonic evolution; Turonian-Coniacian; 2D seismic; hydrocarbon potential.

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On the hydraulic behaviour of large strike-slip fault: Thénia active fault zone (north-central Algeria) as a case study

Hakim Moulouel *, Rabah Bensalem, Djamel Machane

Centre de Recherche Appliquée en Génie Parasismique, CGS, Algiers. Algeria

ABSTRACT

Fault zones control a wide range of crustal processes. Although fault zones occupy only a small volume of the crust, they have a controlling influence on the crust's mechanical and hydraulic behavior. In this study we focus on the fluid flow patterns in ground water aquifers impacted by Thénia Fault Zone (TFZ) which is the most prominent "strike-slip" active fault passing nearby the cities of Algiers and Boumerdes. The study concentrates first on two primary aspects of TFZ; its internal structure and its hydraulic behavior. We emphasize that these two aspects are inextricably coupled. Second, we discuss the hydrogeological characteristics of the fault derived from a number of indirect data sources such as, springs, aquifers, piezometric levels and electrical resistivity tomography.

Key words: Thénia fault; strike-slip active fault; Algeria; fluid flow; aquifer; lectrical resestivity tomography.

* Corresponding Author

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Tidal strain variations recorded by a quartz-tube extensometer in the Sopronbánfalva Geodynamic Observatory, Hungary

Gyula Mentes *

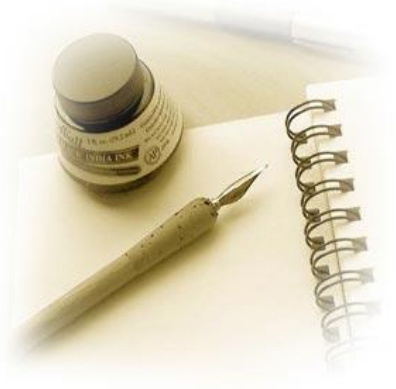
Hungarian Academy of Sciences, Research Centre for Astronomy and Earth Sciences, Geodetic and Geophysical Institute, Csatkai E. u. 6-8., H-9400 Sopron, Hungary

ABSTRACT

In 1990 a quartz-tube extensometer was installed in the Sopronbánfalva Geodynamic Observatory (SGO) for monitoring local tectonic movements and rock strain variations due to Earth tides. The scale factor of the highly sensitive extensometer is 2.093 ± 0.032 nm/mV. We have a continuous extensometric, temperature and barometric pressure data series since 1991, but for our investigations the data series recorded between 2000 and 2015 were used. The stability of extensometers is strongly influenced by the geological structure and properties of the rocks in the vicinity of the observation site and the measured data are strongly influenced by local effects, namely by the barometric pressure and temperature variations. The effect of the rock properties was investigated by coherence analysis between the theoretical and measured tide. In the semidiurnal tidal frequency band the coherence is better than 0.95, while in the diurnal band it is about 0.8. Probably this is due to the fact that the noise is higher in the diurnal band (0.4-0.5 nstr) than in the semidiurnal band (0.19-0.22 nstr). The measured data series were corrected for barometric pressure and temperature and were subjected to tidal analysis. The obtained amplitude factors (measured/theoretical amplitudes) in the semidiurnal band are near one and in the diurnal tidal band near 0.7-0.8. The effect of the ocean loading was also investigated and the results show that this effect can be disregarded in the SGO. The resonance effect of the Free Core Nutation (FCN) was also investigated, but it was only detected in the case of the K1 Luni-Solar diurnal tidal wave. The long-term strain record shows a contraction with a strain rate of 105 μstr/year (1 μstr is 10-6 relative change of length) which is probably due to the uplift of the Alp.

Key words: Extensometer; Earth tides; local effects; free core nutation; ocean load; rock strain.

* Corresponding Author



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Investigation of mechanical properties of natural building stone

Mustafa Ozgur Yayli *[1], Suheyla Yerel Kandemir [2], Ali Erdem Cercevik [2]

[1] Uludag University, Bursa, Turkey
[2] Bilecik Seyh Edebali University, Bilecik, Turkey

ABSTRACT

The estimation of mechanical properties of natural building stones can be carried out by several methods such as destructive and non-destructive. Destructive testing involves the physical destruction of the stone in order to evaluate its characteristics. The method of testing is used for a number of applications. The crushing of natural stone is the usual destructive test to determine the mechanic properties. The aim of the study is presentation of some destructive test methods for investigation of mechanical properties of natural building stones.

Key words: Natural building stone; mechanical properties; destructive testing.

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Role of organic carbon in controlling the spatial variations of soil water content in varied fields

Jili Qu *, Zhongming Sun

University of Shanghai for Science and Technology, Department of Environmental and Architectural College, 20093 Shanghai, China

ABSTRACT

Refined information of agricultural field scale is needed in estimating the soil water content (SWC) from remote sensing observations. This field investigation offered key information about SWC and soil physical constitution from 52 agricultural lands to evaluate the impact of soil organic carbon (SOC) and other physical properties such as soil textural class on soil water content over a 12 week period. Cropland averaging SWC over the period of the investigation was projected in an optimum way by integration of soil texture class and SOC in every field moisture status. In spite of that both %Clay and SOC explained approximately 80% of variance in SWC over all cropland, respectively, soil organic carbon explained larger variation in soil water content than its other physical properties in desiccation situation. The strong association of SWC with SOC shows soil organic carbon may be a good parameter in downscaling the estimate of SWC from satellite data in particular where SWC information are unavailable or unreliable.

Key words: Soil water content; soil organic carbon; clay content; sand content.

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Long-term measurement of subcritical crack growth in rock

Yoshitaka Nara *[1], Tomoki Harui [2]

[1] Kyoto University, Kyoto-Daigaku-Katsura, Nishikyo-ku, Kyoto 615-8540, Japan
[2] Tottori University, 4-101 Koyama-Minami, Tottori 680-8552, Japan

ABSTRACT

Granite rock masses have been used for various geomechanical and engineering purposes such as the construction of caverns to store liquid natural gas or liquid petroleum gas, extraction of geothermal energy from hot dry rock and underground repositories for radioactive waste. Subcritical crack growth is one of the main causes of time-dependent fracturing in rock. Therefore, for the long-term integrity of the structures in a granite rock mass, it is essential to investigate subcritical crack growth in granite. The measurement of the subcritical crack growth rate has been conducted within the range of 10-2 ~ 10-8 m/s. However, it is necessary to measure the lower crack growth rate to understand the time-dependent phenomena of rock. For this purpose, the measurement should be done for a long-term. In this study, the long-term measurement of subcritical crack growth in granite was conducted by using the load-relaxation method of the double-torsion test. All measurements have been conducted under controlled temperature and relative humidity. Since numerous cementitious materials will be used for the construction of structures in a rock mass, the concentration of calcium ion in ground water can be high. Therefore, we have conducted measurements in calcium hydroaide solution and in distilled water. From the measurement for 2 weeks, we could measure the crack growth rate lower than 10-9 m/s both in air and in water. It was also found that the crack velocity in calcium hydroxide solution was lower than that in distilled water. It is considered that the precipitation of calcium compound on the crack surface decreased the crack growth rate. Therefore, the concentration of calcium ion in water is considered to have a significant effect on subcritical crack growth in rock. The subcritical crack growth limit was not detected even from the long-term measurements in the calcium hydroxide solution. It is concluded that the water environment with high calcium ion concentration is suitable for the long-term integrity of granite rock mass.

Key words: Subcritical crack growth; granite; double-torsion test; water; calcium.

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Investigation of the stability of slopes in continuum and discontinuum media using shear strength reduction Finite Element Method (FEM)

Ayberk Kaya *

Recep Tayyip Erdogan University, Department of Geological Engineering, Rize, Turkey

ABSTRACT

Due to the rapid advances in computer systems, many numerical stability analysis methods used in the stability investigations of soil/rock slopes have been developed such as analytic element method (AEM), boundary element method (BEM), finite difference method (FDM), discrete element method (DEM), and finite element method (FEM). The most commonly used one by designers is finite element based shear strength reduction method (FEM-SSR) that considers elastic parameters and forces acting on a slope forming material. Two failed soil and rock slopes located in eastern Black Sea region of Turkey were selected as the application sites of this study. In order to determine the geotechnical properties of the slope materials, the engineering geological studies were conducted in two stages as field investigation and laboratory studies. The field studies comprised geological mapping, in-situ tests, scan-line surveys, geophysical and borehole investigations. Laboratory studies were carried out in order to determine the physico-mechanical and elastic properties of undisturbed/disturbed soil and rock samples. Based on the gathered data from field and laboratory studies, the soil slope was modelled as continuum and fractured rock slope as discontinuum media in the analyses. In order to investigate the occurrence mechanism of the failed slopes and to determine the feasible remedial measures, the FEM-SSR method was used by the help of Phase2 v8.0 software and its performance was controlled. It was concluded that results of the FEM-SSR analyses completely coincide with the actual situation observed in the field. Consequently, it is proposed an approach to use FEM-SSR method for slope stability analyses in practical design.

Key words: Slope stability; FEM-SSR method; rock and soil slopes; remediation.

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Bearing capacity assessment of rock masses at the Subasi viaduct site, NE Turkey

Ayberk Kaya *

Recep Tayyip Erdogan University, Department of Geological Engineering, Rize, Turkey

ABSTRACT

The Subasi viaduct that connects the portals of the Cankurtaran and T2 tunnels (Artvin, NE Turkey), was planned to be constructed on a pier by balanced cantilever method. Therefore, the bearing capacity of the andesitic tuffs crop out at the Subasi viaduct site was investigated using the empirical and numerical methods. The detailed engineering geological investigations include geological mapping, drillings, scan-line surveys, seismic investigations, pressuremeter tests, geotechnical descriptions and laboratory studies have been carried out. The data obtained from the investigation boreholes indicated that the andesitic tuffs are composed of two different weathering zones and classified as highly and moderately weathered, respectively. It was also concluded that the moderately weathered andesitic tuffs have three major joint sets described as open, closely spaced with medium persistence, undulating, dry, moderately weathered and filled with thin clay staining. Laboratory studies were carried out in order to determine the physico-mechanical and elastic properties of undisturbed rock samples collected from borehole. To determine the deformation modulus within opened boreholes and Poisson's ratio values, the pressuremeter tests and geophysical studies were performed. Rock mass parameters were calculated using the Hoek–Brown empirical strength criterion. The footings of the viaduct will be constructed at the moderately weathered andesitic tuffs. In order to estimate the bearing capacity of the moderately weathered andesitic tuffs, different empirical equations were used and compared. According to empirical approaches, the allowable bearing capacity value varies between 3.33 and 19.53 MPa when a factor of safety value of three was considered. In addition to this, the finite element method (FEM) based numerical analyses were also undertaken in order to define the stress distributions and deformations developed around the viaduct footings. The numerical analyses showed that the largest effective stress at excavation level ranges between 0 and 0.6 MPa, which indicates that the Subasi viaduct can be safely constructed at the proposed site.

Key words: Subasi viaduct; bearing capacity; finite element method; andesitic tuffs.

* Corresponding Author

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Rockfall analysis in UNESCO World Heritage City Safranbolu (Karabuk/Turkey)

Inan Keskin *,

Karabuk University, Faculty of Engineering, Department of Civil Engineering, Karabuk, Turkey

ABSTRACT

Rock fall is one of the important natural disasters affecting the human life. Preparing and triggering factors of rock falls caused by geological conditions in general are mainly earthquakes, precipitation, freeze-thaw, physical and chemical weathering, joints in the rock mass, penetration of tree roots etc. Initial velocity, weight, type and shape of the falling rock and the type of the slope forming material chiefly control the characteristics of rock fall. This paper considers the rockfall problems at the UNESCO World Heritage city in Turkey (Safranbolu). Safranbolu, in which to be quite high slope-induced disasters settlement is very important for our country, its historical and cultural heritage with the world is also a valuable city. For these reasons, reveal potential the wealth of this world heritage city affected by a possible natural disasters is very important. In this context, it was analysed in terms of slope instabilities Safranbolu surrounding rock slopes with the performed study. Affected rockfall maps were prepared using Geographical Information System (GIS) software ArcGIS 10.2.

Key words: Safranbolu; rockfall; UNESCO World Heritage; rockfall path analysis; rock slope stability.

* Corresponding Author

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Evaluation of the support systems obtained from RMi classification system using numerical analyses: Macka Tunnel (Northern Turkey)

Mustafa Kanik *, Zulfu Gurocak

Fırat University, Department of Geological Engineering, Elazig/Turkey

ABSTRACT

In this study, the support systems obtained from RMi rock mass classification for the Macka tunnel (Trabzon/Northern Turkey) route, where Turonien aged Catak Formation, Turonien-Santonien aged Macka Formation, Turonien-Santoniyen aged Esiroglu Formation and Early Campanien aged Kackar Ryhodacites are outcropped, were analysed using numerical analyses to determine the optimum support systems. For this purpose, Scan-line surveys, boreholes and the related in-situ tests were conducted and the laboratory tests were carried out to determine index, strength and deformation characteristics. Firstly, all data obtained from field and laboratory studies were used to characterize rock masses along the tunnel route. The rock masses were classified using RMi system and support systems are determined. For the second step, the support elements obtained from RMi system were evaluated by numerical analyses using Finite Elements Method (FEM). Additionally, to the name of defining the optimum support systems for the tunnel route numerical analyses carried out separately. According to the numerical analyses considering the minimization of the thickness of the plastic zone and the maximum total displacement values, RMi system suggests more close spaced and longer rock bolts when compared to the optimum support system while shotcrete thickness values offered by RMi system are almost similar with shotcrete thickness obtained from the optimum support system. However, RMi system offers reinforced shotcrete except for Esiroglu Formation. Shotcrete reinforcement is not required for the optimum support systems obtained by numerical analysing. The numerical analyses results showed that the thickness of the plastic zone and the maximum total displacement values can be minimized without using more close spaced and longer rock bolts with reinforced shotcrete.

Key words: RMi Classification System; numerical analysis; Macka Tunnel; support system.

* Corresponding Author

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Study on high accuracy topographic mapping via UAV-based Images

Yun-Yao Chi [1], Ya-Fen Lee [2]*, Shang-En Tsai [1]

[1] Toko University, No.1,Changda Rd.,Gueiren District, Tainan City 71101, Taiwan
[2] Toko University, No.51, Sec. 2, Xuefu Rd., Puzi City, Chiayi County 61363, Taiwan

ABSTRACT

Unmanned aerial vehicle (UAV) provides a promising tool for the acquisition of such multi-temporal aerial stereo photos and high-resolution digital surface models. Recently, the flight of UAVs operates with high degrees of autonomy by the global position system and on-board digit camera and computer. The UAV-based mapping can be obtained faster and cheaper, but its accuracy is anxious. This paper aims to identify the integration ability of high accuracy topographic map via the image of quadr-rotors UAV and ground control points (GCPs). The living survey data is collected in the Errn river basins area in Tainan, Taiwan. The high accuracy UAV-based topographic in the study area is calibrated by the local coordinate of GCPs using the total station with the accuracy less than 1/2000. The comparison results show the accuracy of UAV-based topographic is accepted by overlapping. The results can be a reference for the practice works of mapping survey in earth.

Key words: UAV; image; topographic; survey; mapping.

* Corresponding Author

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A feasibility study on magnetic induction (MI) based monitoring method for underground environment

Dong Woo Ryu [1,2]*, E.H. Kim [1], K. Lee [3], B.W. Yum [1,2], C. Sunwoo [2], I.H. Lee [1]

[1] UGS Convergence Resarch Group, Electronics and Telecommunications Research Institute (ETRI), 218 Gajeong-ro, Yuseong-gu, Daejeon, 34129, Korea

[2] Korea Institute of Geoscience and Mineral Resources (KIGAM), 124 Gwahak-ro, Yuseong-gu, Daejeon 34129, Korea

[3] Kunsan National University, 558 Daehak-ro, Gunsan-si, 54150, Korea

ABSTRACT

As urban infrastructure is aging, the possibility of accidents due to the failures or breakdowns of infrastructure increases. Especially, improper construction and aging underground infrastructures like sewer pipes, waterworks, and subway have a potential to cause an urban sinkhole. Urban sinkhole is defined just as a local and erratic collapse occurred by underground cavity due to soil erosion or soil loss, which is separated from a sinkhole in soluble bedrock such as limestone. The conventional measurements such as differential settlement gauge, inclinometer or earth pressure gauge have a shortcoming just to provide point measurements with short coverage. Therefore, these methods are not adequate for erratic subsidence caused by soil erosion or ground loosening which occurring at unspecified time and location. As an alternative method, magnetic induction (MI)-based monitoring method is suggested. In this study, the feasibility of a novel MI-based method is investigated through laboratory tests, where the changes of path loss (S21) were measured under various testing conditions: media including air, water, and soil, resonant frequency, impedance, and distances between transmitter (TX) and receiver (RX). Theoretically, the transfer characteristic of magnetic field is known to be independent of the density of the medium. However, the results of the test show the meaningful differences in the path loss (S21) under the different conditions of medium. We found the dominant factors, which have an effect on the S21 in the same medium condition, through the comparison of the path loss under various testing conditions. For example, the S21 is found to become smaller at the longer distance and lower frequency and be also influenced by the density of the medium. Therefore, this method is expected to detect the change of medium condition by underground event through observing the change of the path loss. In addition, this method shows possibility to be a viable and economic monitoring for easy installation and broad coverage and also has versatile applications in agricultural, environmental, and military sector.

Key words: Urban sinkhole; magnetic induction; monitoring; path loss.

* Corresponding Author

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Geomechanical characterisation of peaty soils at an industrial free trade zone (Turkey)

Nazlı Tunar Özcan [1]*, Reşat Ulusay [1], Nihat Sinan Işık [2]

[1] Hacettepe University, Department of Geological Engineering, 06800 Beytepe, Ankara, Turkey
[2] Gazi University, Faculty of Technology, Civil Engineering Department, Beşevler, Ankara, Turkey

ABSTRACT

Peat is a soil type which is formed by deposition of the residual plants in anaerobic wetlands under warm and humid or cold climate conditions. Their geomechanical characteristics differ from other soil types with their high organic matter, high water content and extremely compressible behavior. Due to these, they mainly cause settlement, slope instability and soil amplification problems. By considering the rapid development of industrial zones on peaty soils in the city of Kayseri located in central Turkey, in this study, physical, index and geomechanical properties of the peats in the Kayseri Free Trade Zone were investigated and compared with those of some peats from other countries. For this purpose, a series of site investigations, which consisted of borings and geophysical surveys, in the study area and geomechanical laboratory tests were conducted. In the study area the peat takes place near the surface and its thickness varies between 5 and 8 m. The laboratory test results indicated that in terms of their geomechanical properties, the peats are generally consistent with those reported in the literature. However, they are closer to the lower bounds of the reported ranges due to their mineral content. It was determined that the peats, which include thick fibres and locate near to the ground surface, have high shear strength parameters due to the resistance of the fibres against shearing force, while the peats including thinly fibres and amorphous peats have lower shear strength. The consolidation test results show that the compression process of the investigated peats occurs in three stages: primary and secondary consolidation and tertiary compression. These peats complete their primary consolidation shorter than one minute under normal stresses smaller than 54 kPa and their secondary compression indices increase in a non-linear trend and confirm some previous studies conducted on peats.

Key words: Peat; geomechanical properties; shear strength; consolidation.

* Corresponding Author

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The effect of specimen size on uniaxial compressive strength of carbonate dimension stones from Western Turkey

Sefer Beran Çelik *

Pamukkale University, Faculty of Engineering, Department of Geological Engineering, 20017 Kınıklı, Denizli, Turkey

ABSTRACT

Uniaxial compressive strength (UCS) of rock materials is very important design parameter in engineering practice. In construction and building stone sector, UCS value of a rock material is one of the important parameter which controls its lifetime after used as; cladding, coverings etc. In rock mechanics and rock engineering it is suggested that UCS tests are performed on core specimens. However, Determination of UCS values of rock materials on cubic specimens is suggested in the construction and building stone sector. In this study, the effect of cubic specimen size on UCS values of some carbonate rocks from Western Turkey were investigated. A total of 299 cubic specimens at five different edge sizes (3, 5, 7, 9 and 11 cm) were prepared. Marble and travertine specimens were supplied from the stone quarries in Mustafa Kemal Paşa (Bursa) and Kaklık (Denizli) respectively. Four groups of limestone specimens were collected from Isparta, Senirkent (Isparta), Yeşilova (Burdur) and Finike (Antalya). Chemical, petrographic analyses and basic physical properties of specimens were determined and after that UCS tests were carried out. Averages of UCS values of tested samples are ranging from 51.54 MPa to 119.51 MPa for travertine and Isparta limestone respectively. When all test results are taken in to consideration it is observed that with increasing specimen size from 3 to 11 cm cubic specimen sizes, averages of UCS values decreased about 7 % for tested carbonate rocks. In the light of this finding, results of UCS tests could be interpreted considering cubic specimen sizes for same rock types in related fields.

Key words: Uniaxial compressive strength; cubic specimen; carbonate rocks.

* Corresponding Author

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Investigation of usability as aggregate of different originated rocks

Ebru Başpınar Tuncay [1]*, Şemsettin Kılınçarslan [2], Fuzuli Yağmurlu [1]

[1] Süleyman Demirel University, Faculty of Engineering, Department of Geology Engineering, Isparta, Turkey
[2] Süleyman Demirel University, Faculty of Engineering, Department of Civil Engineering, Isparta, Turkey

ABSTRACT

The general properties of aggregate can be determined the performance and durability of the concrete. It is to be known the technical characteristics of the aggregates. In this study, mineralogical, petrographical, mechanical, physical and chemical properties of the rock samples of different origin (limestone, recrystallized limestone, dolomite, sand and gravel, tephra–phonolite, trachybasalt) were determined. Samples were obtained from different origin rocks units has been classified in three different sizes aggregate with crushing and screening method. Grading, classification of particle, loose bulk density, particle density, water absorption ratio, fineness modulus, fine matter content, flakiness index, coefficient of Los Angeles, resistance to freeze-loosening and alkali-silica reaction of aggregates and organic matter determination has determined. The rocks have been investigated that compliance with the relevant standards. Trachybasalt and dolomite have higher partical density than other rocks. In addition, strength and flexural strength of these rocks higher than other rocks. Tephra–phonolite has the lowest water absorption rate. At the same time resistance to freeze loosening of phonolite is lower than the other rocks. Resistance to fragmentation and the resistance to ware of all of rocks are quite high. Sand and gravel, tephra–phonolite and trachybasalt are evaluated ın terms of alkali-silica reaction. Sand and gravel are more reactive than the other aggregates. Organic matter content of the aggregates is low for the quality of aggregate. Also there were high correlations between some properties of aggregates was observed. For example, high correlation between compressive strength and flexural strength, water absorption and porosity, resistance to fragmentation and the resistance to ware (Micro-Deval).

Key words: Aggregate; different orgin rocks, standard; correlation.

* Corresponding Author

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Stability analyses for Zirli (Gumushane-Turkey) tailings dam

Selcuk Alemdag *

Gumushane University, Department of Geological Engineering, 29100, Gumushane, Turkey

ABSTRACT

Chemicals used for ore beneficiation in metallic mines cause pollutions and threaten human health. Therefore, design of the dams which will be constructed to deposit the chemical wastes that show up after ore beneficiation is important both for the human health and the economy. One of the most important studies carried out for this kind of engineering constructions is stability analyses. Also, these analyses should be carried out for both body of the dam and the reservoir. In this study, stability of the reservoir and the body of the Zirli Tailings Dam (Gumushane/Turkey), that is planned to deposit the chemical wastes, is evaluated. At the first stage, stability analyses carried out for before excavation conditions. According to the result of the analyses, right slope is unstable (SRF: 0.83) and left slope is stable (SRF: 1.83). At the second stage, stability analyses carried out considering all the excavation works were assumed to be completed as maximum waste level was to be reached for the reservoir. SRF value obtained from the results of the stability analyses regarding the dynamic loads emerged from both the seismic activity of the zone and the static load of the stored waste material is 1.49. The stability of the body of the dam was evaluated by Bishop Method. The analyses are carried out considering the dynamic and static loads. First of all, body of the dam was designed and stability analyses were evaluated for both downstream and upstream sides. Obtained results from the analyses showed, safety factors for the upstream and the downstream slope is 1.36 and 1.80, respectively and both slopes are stable under the efficiency of both static and dynamic loads.

Key words: Bishop Method; limit equilibrium; numerical analysis; stability; waste storage.

* Corresponding Author

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Optimum slope design and stability analyses for spoil piles: a case study from Turkey

Selcuk Alemdag [1]*, Zulfu Gurocak [2], Mustafa Kanik [2]

[1] Gumushane University, Department of Geological Engineering, 29100, Gumushane, Turkey
[2] Firat University, Department of Geological Engineering, 23119 Elazig, Turkey

ABSTRACT

In this study, it is aimed to design optimum slope for the spoil piles of a copper mine located in Gümüşhane (Turkey). For this purpose, field studies at the “storage area” and laboratory studies were carried out. Vane shear test and pocket penetrometers were used to determine the “shear strength” of the spoil piles, along three scan lines seismic refraction and MASW measurements were fulfilled to determine dynamic properties. Besides, disturbed and undisturbed samples of spoil pile were collected for the laboratory studies. According to the results obtained from both field and laboratory studies, spoil was classified as clayey sand (SC) with 13.9 kN/m^3 unit weight, 12.60 kPa cohesion and 24^o friction angle. For the first stage, limit equilibrium method and numerical analyses were carried out to evaluate the stability of the spoil piles. Slide v5.0 software was used for the limit equilibrium analyses and for the numerical analyses Phase 2 6.0 (Rocscience, 2007) software was used. Limit equilibrium analyses were carried out separately by Janbu and Bishop Methods. Finite Elements Method based on shear strength reduction (SSR) was preferred for the numerical analyses. Stability analyses, using the data obtained from both the field and the laboratory studies as input parameters for the numerical analyses, were carried out for three different scan lines (Line A-A’, Line B-B’ and Line C-C’). Results of the stability analyses showed, Factor of safety values representing Line C-C’ were between 0.78 and 1.03, so the spoil pile was defined as unstable, nevertheless Line A-A’ and B-B’ were defined as stable. While designing the geometrically stable slope for the Line C-C’, numerical analyses were carried out for unfavourable conditions and factor of safety was retrieved 1,5. Result of the design showed, the optimum slope should have 20 m slope height, 10 m slope length and 34^o inclination.

Key words: Bishop Method; Janbu method; limit equilibrium; mine waste; numerical analysis; stability.

* Corresponding Author

mess@mess-earth.org

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The importance of the anisotropy on defining the in-situ deformation modulus of rock masses

Selcuk Alemdag [1]* Zulfu Gurocak [2]

[1] Gumushane University, Department of Geological Engineering, 29100, Gumushane, Turkey
[2] Firat University, Department of Geological Engineering, 23119 Elazig, Turkey

ABSTRACT

Rock masses show anisotropic behaviour by influence rock material and discontinuities. Anisotropy especially has an important effect on deformation and strength properties of the rock masses. Researchers improved several methods including laboratory and in-situ tests to explain the effect of the anisotropy on deformation and strength properties. Modelling studies carried out using various rock materials at the laboratory and in-situ experiments showed deformation modulus (Em), one of the most important parameter on geotechnical studies, is considerably affected by anisotropy. Maestrichtian-Late Paleocene aged siltstones outcropped at the southeast of Elazig were chosen for this study to understand the influence level of the anisotropy on deformational properties of siltstones. Pressuremeter tests were fulfilled for each meter of the boreholes to determine the in-situ deformation modulus (Em) of siltstones. For this purpose, geotechnical boreholes varying of 10 degree intervals (angle □) to bedding surface were drilled and pressuremeter tests were performed at every meter of the boreholes to determine Em. Laboratory studies are carried out to determine the modulus of elasticity (Ei) of the rock material. The relationships between angle □ with Em and Elasticity modulus ratio (Em/Ei) were evaluated by regression analysis. The regression analysis indicated that the siltstones have U-type anisotropic behaviours. It is determined that there is a strong correlation between □ and Em (r=0.73) and a very strong correlation between □ and Em/Ei. Highest Em values were obtained as the □ angle is 0o and 90o nevertheless, in the range of 450-550 lowest Em values were obtained. The regression analysis indicated Em is significantly affected by anisotropy and the Em values should be adjusted while studying on anisotropic rock masses like subjected siltstones.

Key words: Anisotropy; deformation modulus; rock mass; bedded siltstone.

* Corresponding Author

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The tectonic and paleogeographic evolution of Ulukisla (Nigde, Turkey)

Mahmut Ziya Gorucu *

Istanbul University, Department of Geological Engineering, Istanbul, Turkey

ABSTRACT

This study includes the research of Tertiary aged and mostly evaporitic sedimentary basin which is located in the district Ulukışla (Niğde) and Nourthern of Mount Bolkar of Middle Taurus (Toros) Mountains. This region, is an inner marinal basin which begins to be formed after Paleocene in the North of collision zone of an old ocean in the southern branch of the Neo-Tethys which is closed between Upper Cretaceous and Lower Paleocene. In the south of the region, the Upper Cretaceous units were thrust with reverse faults on Paleocene units towards south. Within the borders of our study field, there are deformations indirectly caused by these over thrusts. In this study, we did try to explain the tectonics and paleogeograpgic evolution of the region with environmental conditions. The tectonic of the working area was controlled by three factors. 1-The movement of Toros Platform toward to south causing the closure of the Neo-Tetis ocean, 2-Forming an inner sea in Paleocene in the region, 3- Closure of this inner sea because of local stressing in the region. The region became a higher continental area because of the closure of Neo-Tethys Ocean and forming some island arc. Because of this stress it became an inland sea and sediments deposited in Ulukışla basin. The basin was a deep marinal region in Cretaceous. The basin did continue to closuring in Paleocene as well. At the end of Paleocene the basin still was closuring. In Eocene is relax term. In the new inland sea was formed because of a sudden transgression or current shallow sea was deepened. This inner sea which had closed until the end of Miocene turned into a continental basin with lacustrine sediments in Pliocene.

Key words: Ulukışla; Cretaceous; marinal; basin; evolution; paleogeography; Nigde; tectonics; Tertiary; Taurus.

* Corresponding Author

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Coastal dynamics driven by physical and chemical processes: Costa Merlata near Brindisi (Southern Italy)

Giuseppe Spilotro [1]*, Ilenia Argentiero [1], M. Dolores Fidelibus [2], Roberta Pellicani [1]

[1] Dipartimento delle Culture Europee e del Mediterraneo, Università della Basilicata, Matera, Italy
[2] Dipartimento di Ingegneria Civile, Ambientale, del Territorio, Edile e di Chimica, Politecnico di Bari, Bari, Italy

ABSTRACT

In the stretch of Southern coast of Torre Canne (Brindisi, South Italy), calcareous stone and calcarenites, which are the prevalent lithologies on the coast line, are replaced by sandy sediments. The degree of their cementation varies rhythmically in correspondence of the surface drainage channels (known as “lame”), which come with almost regular spacing from the hills of the hinterland and canalize also groundwater. This configuration of the surface and underground drainage lines determines the following conditions: (i) predominately saturated coastal sands in correspondence of the riverbeds and surroundings, (ii) a capillarity condition in the intermediate sections, (iii) evolving to unsaturated condition, with precipitation of carbonates and cementation of the coastal sand due to the evaporation and drying processes. The action of the sea in the area is constantly lifting in accordance with the known values of the post Würmian upward, and produces, in the previously configured situation, differential erosion of the coastline. As a result, the coastline is marked by rhythmic sequences of pocket beaches, interspersed with headlands of cemented and more resistant soils. The complete geomorphic process is well described in the various sections of the coast. In fact, the sea action continues in the narrow inlets and, as a further evolution, shapes the strips of land between the various “lame” initially into a hammer, while the last erosive attack phase of the sea is the complete separation of the hammer head by its handle, a process that takes place in a very long time and that leaves on the ancient coast line an array of small islets. The discovery of archaeological traces dating back to the Iron Age on one of these islets (the Apani reef) allow to estimate the time taken for the current coastal evolution, from Costa Merlata to the residual islets of the ancient coastline. The erosion process in place can be considered at present as a continuation of natural processes in the long period, controlled by both relative sea lift and particular hydrogeological and geochemical associated conditions. The differential erosion condition will presumably be subject to further acceleration as a result of the underway climate changes.

Key words: Coastal dynamics; lame; erosion; ancient coastline; Brindisi.

* Corresponding Author

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The problem of the foundation of the laboratory building faculty of civil engineering of the University Warmia and Mazury in Olsztyn (Poland)

Marek Zagroba *

University of Warmia and Mazury, PL 10-724 Olsztyn, Heweliusza str. 4, Poland

ABSTRACT

The subject of this paper is to present conditions and problems of the foundation of specialized laboratory building built in the university campus in Olsztyn. Topography and furnishing of laboratories building had a great influence on the mass of the building and therefore the project's foundations, whose size is the result of ground conditions and statements of various loads, including equipment in which the object was equipped. The article raises issues of constructing contemporary architectural structures in cultural heritage protection zones, using the case study of a building located within the campus of the University of Warmia and Mazury in Olsztyn. Questions revolving around the construction of this building arise from the need to preserve the surrounding historic heritage, and deal with landscaping, architectural and construction solutions as well as interior design. Many of the heritage protection zones are spoilt with inappropriate buildings and structures. The historic part of the university campus in Olsztyn, in the town's suburb called Kortowo, is an example. Some of the architecture in this area present features characteristics for socialist realism, which causes disharmony with the remaining late-19th century buildings. This paper is dedicated to the question of how to harmonise new buildings with historic ones, and how to strive towards maintaining spatial order. The case discussed in this article proves that such efforts, even when drastic solutions like demolition are needed, can be successful.

Key words: Foundation; new buildings; historical buildings.

* Corresponding Author

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Stress related fracturing in dimension stone quarries

Ahmet Hamdi Deliormanlı [1,2]* , Norbert H. Maerz [1]

[1] Missouri University of Science and Technology, Geological Engineering Department, USA
[2] Dokuz Eylul University, Mining Engineering Department, Turkey

ABSTRACT

In Missouri, the horizontal stresses (pressures) in the near surface rock are uncommonly high. While the vertical stresses in rock are simply a function of the weight of the overlying rock, near surface stresses can be many times higher. The near surface horizontal stresses can be in excess of 5 times greater than the vertical stresses. In this research, Flatjack method was used to measure horizontal stress in Red Granite Quarry in Missouri. The flatjack method is an approved method of measuring ground stresses. A saw cut is used to "relax" the stress in the ground by allowing the rock to deform inwards the cut. A hydraulic flat jack is used to inflate the slot; to push the rock back to its stressed position, as measured by a strain gauge on either side of the slot. The pressure in the jack, when the rock is exactly back to its original position, is equal to the ground stress before the saw cut was made. According to the results, present production direction for each pit is not good because the maximum stress direction is perpendicular with production direction. This case causes unintentional breakage results in the loss rock. The results show that production direction should be changed.

Key words: Stress measurements; flatjack; granite.

* Corresponding Author

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Analysis of the loess geological environment in terms of engineering-geological and geotechnical purposes and application in geotourism

Marian Marschalko [1]*, Jan Durďák [1], Dominik Niemiec [1], Petra Zástěrová [1], Miloš Duraj [1], Işik Yilmaz [2], Marian Drusa [3]

[1] VŠB-Technical University of Ostrava, Faculty of Mining and Geology, Institute of Geological Engineering, 17 listopadu 15, 708 33, Ostrava, Czech Republic

[2] Cumhuriyet University - Faculty of Engineering - Department of Geological Engineering - 58140 Sivas, Turkey

[3] Faculty of Civil Engineering, University of Žilina, Univerzitná 8215/1, Žilina 010 26, Slovakia

ABSTRACT

Loess sediments, formed via wind action, are important geological environments both for the engineering geology as well as for the newly developing field in the geosciences, i.e. geotourism. The paper aims to give the basic characteristics of loess sediments and point at two localities in the Czech Republic, where significant archaeological localities are situated on loess. The first locality is Mikulčice in the Hodonín district in the South-Moravian Region. The second locality is Chtěbuz in the Karviná district in the Moravian-Silesian Region. The two localities are important examples for tourists and scientists searching for the sights related to their geological environment. Loess sediments have specific characteristics that arise from their genesis.

Key words: Loess sediments; wind action; engineering geology; geotourism; Mikulčice, Chotěbuz.

* Corresponding Author

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Analysis the purposes of land use planning on the hard coal tailing dumps

Petra Zástěrová [1], Dominik Niemiec [1], Marian Marschalko [1]*, Jan Durďák [1], Miloš Duraj [1], Işik Yilmaz [2], Marian Drusa [3]

[1] VŠB-Technical University of Ostrava, Faculty of Mining and Geology, Institute of Geological Engineering, 17 listopadu 15, 708 33, Ostrava, Czech Republic

[2] Cumhuriyet University - Faculty of Engineering - Department of Geological Engineering - 58140 Sivas, Turkey

[3] Faculty of Civil Engineering, University of Žilina, Univerzitná 8215/1, Žilina 010 26, Slovakia

ABSTRACT

The aim of this publication is to analyse the purposes of land use planning on hard coal tailing dumps. This issue is very topical because there are 46 tailing dumps and 281 reservoirs in the Ostrava-Karvina Mining District. They significantly affect the landscape of this region. A major problem is solving problems of reclamation of these geological environment. This means that it is necessary to think about it and start to solve it. It is clear that such reclamation is not simple both economic as well as environmental point of view. It is necessary to think carefully about what purpose would be tailing dump or reservoirs to utilize in a given location.

Key words: Land use planning; coal tailing dumps; Ostrava-Karvina Mining District; landscape character; reclamation.

* Corresponding Author

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Assessing the geological environment constituents of the Neogene sediments related to various geotechnical applications

Dominik Niemiec [1], Marian Marschalko [1]*, Jan Durďák [1], Petra Zástěrová [1], Miloš Duraj [1], Işik Yilmaz [2], Marian Drusa [3]

[1] VŠB-Technical University of Ostrava, Faculty of Mining and Geology, Institute of Geological Engineering, 17 listopadu 15, 708 33, Ostrava, Czech Republic

[2] Cumhuriyet University - Faculty of Engineering - Department of Geological Engineering - 58140 Sivas, Turkey

[3] Faculty of Civil Engineering, University of Žilina, Univerzitná 8215/1, Žilina 010 26, Slovakia

ABSTRACT

The paper aims to assess the geological environment constituents of the Neogene sediments related to different geotechnical applications. The environment of Neogene sediments is a very important geological environment for the Czech Republic as it may be found, for example, below the Quaternary geological structure of the Ostrava Basin. This environment appears as unfavourable from many points of view, but there are also interactions with engineering structures that may also have a positive character.

Key words: Neogene sediments; geotechnical applications; geological environment; regional geological units, freezing, insulator.

* Corresponding Author

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Determination of Slake Durability Index (SDI) values on different shape of laminated marl samples

Hüseyin ANKARA *[1], Fatma Çiçek [1], İsmail Talha Deniz [1], Emre Uçak [1], Süheyla Yerel Kandemir [2]

[1] Eskişehir Osmangazi University, Department of Mining Engineering, Eskişehir, Turkey
[2] Bilecik Şeyh Edebali University, Department of Civil Engineering, Bilecik, Turkey

ABSTRACT

The slake durability index (SDI) test is widely used to determine the disintegration characteristics of the weak and clay-bearing rocks in geo-engineering problems. This characteristic of a rock is described through a durability parameter called the slake durability index. However, due to the different shapes of sample pieces, in particular irregular shapes in slaking process occurring mechanical breakages, the SDI test has some limitations effecting on the index values. In addition, shape and surface roughness of laminated marl samples have the severe influence on the slake durability index. In this study, a new sample preparation method called as Pasha Method was used to prepare sphere-specimens for the laminated marl collected from Seyitomer collar (Turkey), and also the SDI tests were performed on the equal size and weight specimen consisting of three sets which have different shapes. Three sets were prepared to be the sphere-specimen shapes, to be parallel to the layers in irregular shape and to be vertical to the layers in irregular shape, respectively. Index values were determined according to the three sets subjected to the SDI test up to 4 cycles. As given following figure, the index values at the end of fourth cycles were found to be 98.43, 98.39 and 97.20 %, respectively.

Key words: Slake durability index; disintegration; weak and clay-bearing rocks; laminated marl.

* Corresponding Author

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Post-earthquake fire tests – Part 1: Report

Tudor Petrina *

Technical University of Cluj-Napoca, 15 Daicoviciu Str., Cluj-Napoca, jud. Cluj, Romania

ABSTRACT

Immediately after an earthquake, fire is the most probable accidental action on buildings. Beam-to-column steel connections are parts of the structure that need to have sufficient fire resistance in order for occupants to exit the building and firemen to intervene. Fire and post-earthquake fire tests on steel connections were made at the Technical University of Cluj-Napoca, Romania. Real scale specimens were created and some of them were subjected to cyclic action following a special procedure. After the cyclic action, the deteriorated specimens were immediately subjected to fire. New connections were also tested for fire action in order to find differences to the deteriorated case. In this paper, a short description of the specimen, test stand and equipment, the reports of all tests and immediate conclusions of each test are presented. The original aspects of the experimental testing programme were: design of the sub-ensemble, design of the test stand for the prior computed internal forces, the mode to test the specimen and the entire programme management, cyclic action on the specimen by using only monotonic pressure devices, the design of a removable furnace around the node having reduced costs and using traditional material, which gives possibility of immediate fire test after cyclic action. All experimental test results and behaviour were in accordance with similar tests realized worldwide. In a similar study, post-earthquake fire tests on steel connections that were performed at University of Trento (Italy) were presented. The cyclic actions on the specimen were made in Italy and they were followed by fire tests at BRE (UK). In our case, after cyclic action, fire action was immediately applied on the specimen. The results were also in accordance with initial numerical simulations and initial computation, following prescriptions of the European design code EN1993.

Key words: End-plate connections; post-earthquake fire; bolts; fire tests; high temperature.

* Corresponding Author

mess@mess-earth.org

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Post-earthquake fire tests – Part 2: Failure modes

Tudor Petrina *

Technical University of Cluj-Napoca, 15 Daicoviciu Str., Cluj-Napoca, jud. Cluj, Romania

ABSTRACT

During seismic motions, the steel connections are parts of structure that may have permanent damage, changing their strength and stiffness. For this reason during a post seismic fire, they will work in a different manner, having a different fire resistance. With the help of tests, we want to find the effect of the seismic damage on the fire behaviour of the structure. Fire and post-earthquake fire tests were done, together with room temperature tests, for comparison and scale. The main goal was to find the effect of the deterioration due to cyclic action, on the fire behaviour of specimens. During earthquake, steel connections may develop permanent damage, that is a deterioration of strength and stiffness that will lead to a different behaviour under fire. Immediately after an earthquake, fire is the most probable accidental action on buildings. In this paper, parallels between different tests are presented. The conclusions are in terms of maximum reached forces and modes of failure in the case of prior deteriorated or new connections subjected to fire. From the experimental testing programme, the author deduce that separate seismic design or fire design is not enough for steel structures. The structure should be analysed under the combined action. That is why the author considers that the post-earthquake fire scenario should be explicitly mentioned in the design codes. The post-earthquake fire action may be considered having a low probability, but it may be characterized by having major consequences. To find the response of a steel structure under a post-earthquake fire, more steps should be done: model the structure by taking into account the material and geometry non-linearity, choose of seismic scenario, a push-over or time-history analysis, evaluation of all fire scenarios, thermal analysis to see the response of each element under fire, structural computation to find stresses and strains. The structural elements and connections are weakened by the inelastic cyclic deformation causing them deterioration of stiffness and strength. Other data from tests is available and the author wants to collaborate with researchers worldwide for further conclusions and studies.

Key words: Steel connections; post-earthquake fire; fire tests; fire resistance; cyclic action.

* Corresponding Author

mess@mess-earth.org

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Fire behaviour of structural steel – code vs. tests

Tudor Petrina *

Technical University of Cluj-Napoca, 15 Daicoviciu Str., Cluj-Napoca, jud. Cluj, Romania

ABSTRACT

This article shows part of the results of a complex research on the behaviour of steel beam-to-column end-plate connections under the fire action. In the paper, a parallel between a computation made with the help of a computer model, based on the prescriptions of the EN 1993 design code, and experimental tests conducted on real scale substructures is presented. The main goal of this work is to find the difference, in terms of strength and mode of failure, between the European design code and the real situation in the testing facility. Before designing and executing the real scale specimens, multiple simulations were performed by help of computer programs. Firstly we designed a structure having 4 stories and made up of steel frames. The nodes were realized by end-plate bolted connections. Such a connection was then designed by applying the prescriptions according the European design code EN 1993. The second stage consisted in verification of the connection at surrounding temperature and also at high temperature – by modifying the properties of the material and bolts according to the design code. The force at which the connection failed and the failure mode was computed at 20 ^{o}C, 200 ^{o}C, 400 ^{o}C, 600 ^{o}C, 800 ^{o}C by applying code prescriptions. After that, nonlinear fire simulations on the entire sub-structure were performed and we passed to the execution and experimental test of the specimens. A very good correlation between verifications according design code and behaviour in experimental situation was obtained. The design of these types of connections according to the code offers a plus of resistance: around 52% of the designed value, at room temperature. For example, in the theoretical case the maximum attained applied force at 20 degrees Celsius was 125 kN, but during experimental test it was around 180-200 kN.

Key words: Steel connections; fire action; high temperature; steel structure; failure mode; bolt strength.

* Corresponding Author

mess@mess-earth.org

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Rock joint asperities and mechanical strength of concrete foundations

Tomáš Ficker *

Brno University of Technology, Faculty of Civil Engineering, Physics Department, Veveří 95, 602 00 Brno, Czech Republic

ABSTRACT

The mechanical stability of bedrocks is primary information when designs of large civil-engineering structures (tunnels, bridges or dams) are developed. This information comprises many important data concerning the shear strength of rock discontinuities, the degree of rock weathering or the susceptibility to weathering, the compressive strength of intact rock, the level of ground water, the degree of infilling of rock joints, etc. If all these factors show favourable conditions, nothing from the geotechnical point of view prevents to start with building these new large structures. However, there are some aspects that are usually ignored or neglected. For example, the interaction between freshly placed concrete and rocky surfaces, often covered by large peaked asperities, is one of these aspects that are usually considered to be unimportant. In fact, only little is known about mechanical interactions when the huge pressure of the whole structure is exerted on the interface between the concrete foundation and the asperity surface. This contribution deals with influences of sharp asperities on the mechanical stability of hydrated cement materials. A large set of samples made of hydrated Portland cement paste was used. Sharp steel pins were imbedded into each sample to resemble acting of asperities. The samples were divided into several groups according to the length of the imbedded needles and then they were subjected to compressive tests. It was found that there was a critical relative length (related to the length of the sample) whose overgrowing leads to weakening of the compressive strength of the samples whereas the needles shorter than this critical relative length acts favourably like reinforcement.

Key words: Rock joints; asperities; concrete foundations; interfaces concrete-asperity; compressive strength of interfaces; laboratory experiments.

* Corresponding Author

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Landslides inventory maps in the region of Tizi-Ouzou (Algeria)

Nacira Bouaziz *, Bachir Melbouci

University of Mouloud Mammeri of Tizi-Ouzou, Laboratory of Geomaterials Environnement and developing (LGEA), BP N° 17, 15000, Tizi-Ouzou, Algeria

ABSTRACT

Landslides are a complex natural phenomenon that constitutes a worldwide serious natural hazard. Northern Algeria, as all Mediterranean countries, suffers by this hazard in many towns (JIJEL, Bejaia, Algiers, Constantine, Mila, Media...). Landslides constitute a significant problem for development and urban planning particularly in the city of Tizi-Ouzou, where after each pluvial season, landslides causes many damages for constructions, soils and human lives. The region of Tizi-Ouzou is situated in an area with a variable geology characterised by the presence of different loose formations, where the landslides are widespread. The inventory map of landslides was constructed by field surveys and historical phenomenon, the number of major and significant landslides considered exceeds 25, scattered all about this region. Our paper aims to present the first inventory map of the major landslides induced by different parameters as lithology, geology, slopes, precipitations, urbanization and seismic activities in this region since 1950. Each landslide will be presented and characterized with different geotechnical and geophysical parameters. The results of this study show the importance of landslides inventory in the region of Tizi-Ouzou, to preserve and reduce the hazard to build in risked region, to save human lives and provide useful tools to take decisions.

Key words: Landslides; inventory; maps; hazard; Kabylia.

* Corresponding Author

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Assessment of the vibrations effects caused by technical seismicity due to the railway traffic on a hightsensitive machinery

Daniel Papán, Veronika Valašková *, Katarína Demeterová

University of Zilina, Faculty of Civil Engineering, Department of Structural Mechanics and Applied Mathematics, Univerzitna 8215/1, 010 26 Zilina, Slovak Republic

ABSTRACT

The numerical and experimental approach in structural dynamics problems is more and more actual nowadays. This approach is applied and solved in many research and developing institutions of the all the world. Vibrations effect caused by passing trains used in manufacturing facilities can affect the quality of the production activity. This effects is possible to solve by numerical or experimental way. Numerical solution is not so financially and time demanding. The main aim of this article is focus on just experimental measurement of this problem. In this paper is presented the case study with measurement due to cramped conditions realized in situ. Our case study is located close to railway and we observe the vibration effect caused by passing trains on the higthsensitive machinery contained in this object. The structure were hightsensitive machine is placed was in construction process. For the measurements the higthsensitivity standard vibrations equipment were used. The measurements results assessments were performed for the technological conditions and Slovak Standard Criteria. Both of this assessments were divided to amplitude and frequency domain. The amplitude criteria is also divided to peak particle velocity and RMS (Root Mean Square). Frequency domain assessment were realised using the frequency response curves obtained from hightsensitive machinery manufacturer. The frequency limits are established for each axis of triaxle system. The measurement results can be predicted to be or not to be done vibration reduction. Measurement implemented in the production hall will should obtain materials to determine the seismic loading and response of production machinery, caused by technical seismicity.

Key words: Railway traffic; vibration; frequency spectrum; vibration velocity; vibration acceleration.

* Corresponding Author

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The blasting works effect in numerical and experimental case study

Daniel Papán [1], Veronika Valašková [1]*, Marián Drusa [2]

[1] University of Zilina, Faculty of Civil Engineering, Department of Structural Mechanics and Applied Mathematics, Univerzitna 8215/1, 010 26 Zilina, Slovak Republic

[2] University of Zilina, Faculty of Civil Engineering, Department of Geotechnics, Univerzitna 8215/1, 010 26 Zilina, Slovak Republic

ABSTRACT

The experimental measurement of the civil and traffic structures dynamic response is actual topic. It is one of the most effective tools for safety, stability and healthy structure conditions. The blasting works using for tunnels construction are common. This article contains the theoretical and experimental case study of dynamic monitoring of the geological area above constructed road tunnel. The length of the road tunnel is about 800 meters and it is part of the new built highway D3 from Žilina to Čadca direction. The basic dynamic parameters monitored during blasting works are compared to the FEM (Finite Element Method) calculations and to the Slovak standard limits. The FEM simulation is based on planar linear viscoelastic approach modelled in numerical software VisualFea. The dynamic calculation was processed at time domain as time iteration linearized simulation. The results from experimental measurement are presented as parametric dependence of explosive mas and distance blasting works from pipe line. However, this data from experimental measurement were recorded during road tunnel construction from November 2014 till May 2016. The data evaluation was performed amplitude and spectral analysis software. As an example of the structure the pipeline were used for the case study. Drilling and blasting still remain the only possible ways of tunnelling in very adverse geological conditions. The geological locality of this structure is mainly bedrock. The locality of the case study is near Žilina and it will be connecting Považský Chlmec and Vranie vilages. All this analyses results can be used for further evaluation of structures during its lifetime.

Key words: Vibration; blasting works; FEM simulation; vibration velocity; experimental measurement.

* Corresponding Author

mess@mess-earth.org

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The road and railway traffic seismicity effect comparison on historical building in Slovakia

Daniel Papán, Veronika Valašková *

University of Zilina, Faculty of Civil Engineering, Department of Structural Mechanics and Applied Mathematics, Univerzitna 8215/1, 010 26 Zilina, Slovak Republic

ABSTRACT

The road and the railway traffic generate material and immaterial emissions. The immaterial emission produced by traffic is divided to the noise and the vibrations. All these aspects attacking the environment should to be assessed. For the assessment the national and international standards can be used. This paper contains only the vibration assessment and the comparison of the dynamic parameters influence in this process. The heritage buildings have more conservative criteria as another buildings. This approach is performed via experimental and numerical study and identification of the basic dynamic parameters. It is presented on two case studies of important historic buildings in Modra and Žilina (Slovakia). For both case studies buildings the FEM (Finite Element Method) numerical models were created. The modes of the natural vibration and natural frequencies were obtained as the relevant results from numerical models. These parameters are very important for this type of assessment. For the FEM models the Scia Engineer were used as the numerical software system. The experimental measurements were realised for FEM model verification. Also these measurements were used for the assessment according Slovak standards. These models can be tuned based on the experimental measurements. The tuned FEM models can be used for the further extrapolations. The main part of the investigation was to compare traffic seismicity effect on the historical buildings. Both buildings were assed in the frequency and time domain. The comparison of the traffic seismicity effects were realised also in frequency and the time domain. It is necessary to taking to account this assessment for the heritage buildings.

Key words: Railway traffic; vibration; frequency spectrum; vibration velocity; vibration acceleration.

* Corresponding Author

mess@mess-earth.org

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Cyclic response of footing with embedment depth on multi-layered geocell-reinforced bed

S. Davarifard [1], S.N. Moghaddas Tafreshi [1], Omid Khalaj [2]*, B. Mašek [2]

[1] Toosi University of Technology, Department of Civil Engineering, K.N. Valiasr St., Mirdamad Cr., Tehran, Iran
[2] University of West Bohemia, the Research Centre of Forming Technology, Plzen, Czech Republic

ABSTRACT

Comprehensive results from cyclic plate loading at a diameter of 300 mm supported by layers of geocell are presented. The plate load tests were performed in a test pit measuring 2000*2000 mm in plane and 700 mm in depth, in order to investigate the effect of embedment depth on settlement of footing supported by geocell-reinforced bed. The geocell used in the tests was non-perforated with pocket size 110*110 mm2 and height 100 mm, fabricated from continuous polypropylene filaments as a nonwoven geotextile. The results show that installation of the geocell layers in the foundation bed toward embedded footing supported by one layer geocell has more effect on increasing the resilient behavior in addition to reduction of accumulated plastic and total settlement of system. Efficiency of geocell reinforcement was decreased by increasing the number of the geocell layers and with increase in the embedment depth ratio for all applied cyclic pressure levels. The study also compares the embedment depth ratio of one layer geocell reinforcement with two and three layer geocell reinforcement bed with no embedment depth.

Key words: Cyclic loading; embedment depth; multiple geocell layers; residual and resilient deformations.

* Corresponding Author

mess@mess-earth.org

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Ground improvement method of an earth embankment within a highly seismic zone

Altay Acar, Berna Güntel *

Çukurova University, Engineering and Architecture Faculty, Geological Engineering Department, Balcalı, 01330, Adana, Turkey

ABSTRACT

An embankment of coal stock area was constructed on alluvial soft-stiff clay of a depression area created by an active faulting at a power plant on East Mediterranean coast of Turkey. A ground improvement application was applied to solve the excessive settlement problems in the Stacker Reclaimer foundations and coal storage area by applying preloading with vertical drains. Coal Storage site consist of Late Miocene clastic rocks, alluvium with plastic clays and man-made ground. Vertical wick drains which shorten the drainage path within the clay were used to accelerating of slow rate of consolidation in saturated unconsolidated clays of low permeability. The maximum clay thickness is more than 30.00 m with various consolidation properties (normally consolidated clays and overconsolidated clays). It was obvious that the calculated rough calculation of the settlement was not acceptable and the ground improvement was carried out before the site has been activated. The excavated claystone and sandstone rock materials were used as structural permanent rock fill at over the wick drain applications area and other part of the Coal Storage Area using standard compaction methods. During the application of the preloading with vertical drains settlements, Magnet Extensometer Monitoring Method was carried out on the centre lines of Stacker Reclaimer axes at 4 locations with Multipoint Settlement Monitoring System, and total settlement under the surcharge was measured as 0.93m at the end of monitoring. As a result, %93 of calculated total settlements was completed using the vertical wick drain in a short period of three months.

Key words: Ground ımprovement; highly seismic zone; rock fill; surcharge; wick drain.

* Corresponding Author

mess@mess-earth.org

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Rockall modelling with remedial design and measures along part of a mountainous settlement area, Southern Turkey

Berna Güntel *, Altay Acar

Çukurova University, Engineering and Architecture Faculty, Geological Engineering Department, Balcalı, 01330, Adana, Turkey

ABSTRACT

In June 2011, a heavy rainfall triggered a number of rockfalls from steep slopes and on slopes made of soft to loose soils capped by inhomogeneous hard rock blocks and masses. Rainfall took place a few days day before rockfalls followed by an earth slump occurred on the Haruniye Hot Springs Facilities of Düziçi Town of Osmaniye Province in Turkey. Large rock blocks had damaged 15 prefabricated hotel rooms whereas the slope movement blocked the major road between Düziçi and hot spring facilities at numerous locations along 280 m. The slope was about 300 m high and had been cut about 70□ in moderately weathered fractured recrystallized limestone and colluvium type materials at the toe of the slope along a fault zone. In some weak rocks tensile fractures apparently formed due to interaction of considerable water flow along out-wash discontinuity surfaces with the free face of the steep valley slopes. Rock mass generally had close spacing and was characterised as medium strong and weak rock. During the rainfall, a number of boulders, some as large as 100 tonnes in mass, broke loose and fell, rolled, or bounced down the ridge flank. Some of them came to rest on the prefabricated houses and roadway to the Düziçi town. Field inspection of slope material failed indicated that the slope had high water content at the time of movement because of rainy periods and hot spring supplies. This paper describes remedial measures and design recommended according to the modelling process based on the collection of data and simulation of rockfall with Rocscience RockFall 5.0 software.

Key words: Rockfall; slump; Düziçi-Haruniye; remedial; rocscience.

* Corresponding Author

mess@mess-earth.org

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The use non-destructive methods for measurement of structural characteristics and simulation of dependence

Katarina Zgutova, Juraj Sramek, Matej Blasko *

University of Zilina, Faculty of Civil Engineering, Univerzitna 8215/1, SK-010 26 Zilina, Slovakia

ABSTRACT

The technical condition of many existing pavements, does not correspond to nowadays requirements in terms of operational performance. The causes are various: overloading of construction, incorrectly determined design elements, the causes associated with the subgrade – with bearing capacity, improperly designed modulus of elasticity, inadequately assurance of earth quality control. One of the most important input information for the construction of the pavement, and for the design is the state of the subgrade and the state of each construction layer. The correct determination of the module of deformation can avoid the collapse of the construction, expensive reconstruction or the overall increasing in the pavement construction cost. The module is normally determined by the static load test or with non-destructive method such as dynamic load test. Over time are implemented modern, in practice not ordinarily used non-destructive test methods for quality assurance. The main advantages are in relatively undemanding process, which does not restrict the functionality of the construction and the possibility of immediately repeating. Lightweight and portable apparatus is resistant to shock, dust, mechanical damage and the measuring process is cost-effective from the point of view of the investor. This paper presents the numerical simulation of the suitability of non-destructive methods for the particular structural component and numerical modelling for specifying relevance of non-destructive method for considered construction element.

Key words: Non-destructive methods; structural characteristics; diagnostic methods; simulation of defence; correlations; subgrade.

* Corresponding Author

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Effect of surface void percentage (SVP) on the unconfined compressive strength (UCS) of porous rocks and performance of Core Strangle Test (CST)

Işık YILMAZ *

Cumhuriyet University, Faculty of Engineering, Department of Geological Engineering, 58140 Sivas, Turkey

ABSTRACT

In this paper, the effect of areal void size on unconfined compressive strength (UCS) depending on the core diameter is researched and discussed in terms of obtaining the most accurate and reliable strength value. The Core Strangle Test (CST) is an index test and mainly UCS is indirectly determined. The second objective of this study is to test the performance and the usefulness of CST in determination of UCS of porous rocks and to compare its accuracy with UCS tests. According to results obtained from UCS tests, overall trends were observed to be significant losses in UCS by increasing of surface void percent, while loss in UCS was found to be approximately 10 times smaller in CST. It can be concluded that areal size of voids on loading surfaces to be an important property of rocks should be taken into account particularly in rock engineering in order to determine the most accurate and reliable strength values for a rock. CST shown a high performance for determination of UCS of porous rocks and can be used as an alternative testing method for determination of UCS of porous rocks.

Key words: Porous rocks; void dimension; core diameter; unconfined compressive strength (UCS); core strangle test (CST).

* Corresponding Author

mess@mess-earth.org

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Horizontal displacement control in course of lateral loading of a pile in a slope

Jaroslaw Rybak *, Zbigniew Muszynski

Wroclaw University of Science and Technology, Wyb. Wyspianskiego 27, 50-370 Wroclaw, Poland

ABSTRACT

Standard procedures concerning axial and lateral capacity testing of foundation piles usually consist of a single loading cycle. Constant load steps or constant settlement increments may be applied in the test. Such a procedure significantly differs from in-situ conditions of pile loading, which can be cyclic – especially in the case of the constructions, which are subject to wind load. Several tests were performed to observe the behaviour of the driven piles subject to fast cyclic loading in horizontal direction (lateral load). The manner in which the load tests were performed made it possible to determine the displacement of the 40×40 cm pile in the least favourable loading scheme, i.e. the lateral load capacity of the pile oriented towards the embankment slope. The piles were originally designed for the foundation of noise barriers along the highway. Some of the piles were broken in course of driving and a cautious check of their behaviour under load was requested before the assembling of the entire structure. 8 load tests were carried out altogether. While selecting the piles for further load tests, the representativeness of the random sample was taken into account. The piles with diverse length were chosen, on the basis of the previous tests of their length and integrity. The subsoil around the piles consisted of medium and coarse sands with the density index ID>0.67. The pile heads were free. The points of support of the “base” to which the sensors were fastened were located at the distance of 0.6 m from the side surface of the pile loaded laterally. In order to assure the independence of measurement, additional control (verifying) geodetic survey of the displacements of the piles subject to the load tests was carried out (by means of the alignment method). The research conducted at Wroclaw University of Technology made it possible to collect and summarize the results of displacement measurements in course of static load testing of driven piles in a slope. Some selected case studies of cyclic loading in horizontal (lateral) pile load tests are presented in the paper.

Key words: Driven pile; slope; lateral load; alignment method.

* Corresponding Author

mess@mess-earth.org

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Some remarks on foundation pile testing procedures

Jaroslaw Rybak *

Wroclaw University of Science and Technology, Wyb. Wyspianskiego 27, 50-370 Wroclaw, Poland

ABSTRACT

This work presents the examples of piling contract execution which were preceded by insufficient or improper soil investigation. In an overview, the key points in pile designing are: determination of the appropriate computational schemes, reliable data on loads and the properties of structural materials (in particular, of the soil mass, which is marked by the greatest variability). The procedure of constructing a pile foundation should include: • carrying out soil tests in the scope that ensures safe designing, • selecting a piling technology that is relevant both to geotechnical conditions and expected loads, • drafting a piling design together with the design of load tests, • setting up a testing station for further load tests, • static and/or dynamic tests of pile load capacity, preceded by supplementary soil tests when the conditions of test pile installation fail to comply with the design assumptions or when the pile length exceeds the depth of the previously investigated soil, • making documentation of load capacity tests (with an additional correction of the piling design), • the actual piling (on-going analysis of pile driving logs and, if necessary, testing the piles' integrity), • drawing up the as-built documentation. Unfortunately, the design is corrected after the load test have been conducted only if the piles fail to show the designed bearing capacity. The designer is then obliged to revise the design assumptions on the basis of tests results. If the test results account for the a greater bearing capacity than necessary and it would be recommendable to limit the extent of the planned (i.e. set out in the contract) piling works, usually neither the contractor nor the designer, nor even the Construction Site Supervisor, acting for the benefit of the investor, are willing to take on the responsibility for reducing the scope of the piling works. The necessity of conducting additional control tests before and during the implementation of the construction project is often treated by the investors as an attempt at extorting extra financial resources or at delaying the project implementation. The designer, however, has no other possibility (and often – he/she does not have required qualifications) to verify the obtained test results.

Key words: Foundation pile; driven pile; static load test; dynamic testing.

* Corresponding Author

mess@mess-earth.org

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Numerical modelling of Rayleigh Wave Propagation in course of rapid impulse compaction

Jaroslaw Rybak *, Aneta Herbut

Wroclaw University of Science and Technology, Wyb. Wyspianskiego 27, 50-370 Wroclaw

ABSTRACT

As the soil improvement technologies are the area of a rapid development, they require designing and implementing novel methods of control and calibration in order to ensure the safety of geotechnical works. At Wroclaw University of Science and Technology (Poland), these new methods are continually developed with the aim to provide the appropriate tools for the preliminary design of work process, as well as for the further ongoing on-site control of geotechnical works (steel sheet piling, pile driving or soil improvement technologies). The studies include preliminary numerical simulations and field tests concerning measurements and continuous histogram recording of shocks and vibrations and its ground-born dynamic impact on engineering structures. The impact of vibrations on reinforced concrete and masonry structures in the close proximity of the construction site may be destroying in both architectural and structural meaning. Those limits are juxtaposed in codes of practice, but always need an individual judgment. The results and observations make it possible to delineate specific modifications to the parameters of technology applied (e.g. hammer drop height). On the basis of numerous case studies of practical applications, already summarized and published, we were able to formulate the guidelines for work on the aforementioned sites. This work presents specific aspects of the active design (calibration of building site numerical model) by means of technology calibration, using the investigation of the impact of vibrations that occur during the Rapid Impulse Compaction on this adjacent structures. A case study entails the impact of construction works on Rayleigh wave propagation in the zone of 100 m (radius) around the Compactor.

Key words: Rapid impulse compaction; vibrations; numerical modelling; safety.

* Corresponding Author

mess@mess-earth.org

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Analysis petrophysical parameters zone 4 field of Hassi Messaoud (Algeria)

Khaled Loumi *, S. Kenane, A. Asses

Université de Boumerdes Faculté des hydrocarbures et de la Chimie, Algérie

ABSTRACT

The field of Hassi Messaoud divided into 24 zones, is located 850 km southeast of Algiers and 300 km from the Algerian-Tunisian border. It represents the largest deposit of the Triassic province (Boudjemaa 1987). Zone 4 is a part of the Hassi Messaoud field that has undergone an intense polyphase tectonics (Kenane, 2015) has developed a set of faults and fractures. They affected the various reservoirs levels and changed their geometries (compartmentalization) and their petrophysical parameters. From the analysis of maps contours in isoporosité and isoperméabilité and different histograms lineaments and fractures that we have established, we demonstrated that in Zone 4 and throughout the Hassi Messaoud field directions mainly: NE-SW, NW-SE, EW and NS. Moreover the work of Beicip (2004) showed that the dynamic point of view the lineaments drivers have a direction E-W. The analysis of imaging data allowed us to identify fractures whose directions are: NNE-SSW, NE-SW, NW-SE, N-S and E-W. We find that remained open fractures are oriented NE-SW. Permeability measurements (fracture permeability) and porosity incidentally reveal the presence of indicia of the influence of the fractures on the flow of hydrocarbons. We can see that, although the correlation diagrams between porosity and permeability show that we are in the presence of cement tanks. They behave as compact tanks because these diagrams reveal the existence of points outside the cloud corresponding to small values of permeability and porosity (less than 6% porosity) .This is also demonstrated by the test wells which shows a flow pattern dual porosity, at least in a well (Bour, 1997). In conclusion we can summarize our analysis that the fracture network in the field of Hassi Messaoud plays a positive role in the flow of oil can be by area or can be per well. We must not also hide the negative role of these accidents (Louifi, 2006) that create permeability barriers and compartmentalize the field.

Key words: Hassi Messaoud; fracturing; porosity; permeability; model flow.

* Corresponding Author

mess@mess-earth.org

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The determination of lime migration in lime stabilization of clay soils

Derya Toksoz *, Isik Yilmaz

Cumhuriyet University, Department of Geological Engineering, 58140 Sivas, Turkey

ABSTRACT

The basic purpose in using the lime piles on the soft clayey soils including is to improve the surrounding soil with time by diffusion after adding slaked or unslaked lime into the holes opened inside the soils. Lime piles have been successfully used in practice in several countries worldwide but their mechanism of operation has not been adequately explained. For this reason the literature on the subject has tended to be inconsistent at best, and in some cases directly contradictory. Thus, there is an apparent lack of understanding of how lime piles work. This paper aims to produce some clarity by interpreting the literature in the light of recent research and to report the results of some laboratory experiments performed to determine the distance of migration from lime piles.

Key words: Lime pile; clay; diffusion; migration; improve.

* Corresponding Author

mess@mess-earth.org

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Diversity of characteristics of sandy soils in relation to foundation engineering

Josef Musílek [1]*, Petr Hrubý [2], Ondrej Stopka [3]

[1] VŠTE-Institute of Technology and Business in České Budějovice, Faculty Technology, Department of Civil Engineering, Okružní 517/10, 370 01 České Budějovice, Czech Republic
[2] VŠTE-Institute of Technology and Business in České Budějovice, Faculty Technology, The Department of Mechanical Engineering, Okružní 517/10, 370 01 České Budějovice, Czech Republic
[3] VŠTE-Institute of Technology and Business in České Budějovice, Faculty Technology, Department of Transport and Logistics, Okružní 517/10, 370 01 České Budějovice, Czech Republic

ABSTRACT

Subsoil sandy soils is very variable environment. This environment is dependent on many factors. The bearing capacity and settlement are important and critical parameters in the case of assessing soil as foundation soil. The publication focuses on the bearing capacity value of the table bearing capacity which the assessment of foundation soil without expensive field testing and their evaluation possible. However, this only applies to buildings in the 1st geotechnical category. The nature of the various classes of sandy soils is defined on the basis of the indicative value of bearing capacity. Values of bearing capacity within individual classes are mainly influenced by grain size.

Key words: Bearing capacity; sand; fine-grained soils; foundation engineering.

* Corresponding Author

mess@mess-earth.org

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Problems with approximate bearing capacity of gravel soils

Jan Plachy [1]*, Viktorie Weiss [2], Ladislav Bartuška [3]

[1] VŠTE-Institute of Technology and Business in České Budějovice, Faculty Technology, Department of Civil Engineering, Okružní 517/10, 370 01 České Budějovice, Czech Republic
[2] VŠTE-Institute of Technology and Business in České Budějovice, Faculty Technology, the Department of Mechanical Engineering, Okružní 517/10, 370 01 České Budějovice, Czech Republic
[3] VŠTE-Institute of Technology and Business in České Budějovice, Faculty Technology, Department of Transport and Logistics, Okružní 517/10, 370 01 České Budějovice, Czech Republic

ABSTRACT

The publication aims to bring undoubted importance approximate table bearing capacity of gravel soils, which are used in the new constructions. Tabulated values enable to determine the estimated bearing capacity of foundation soil for a simple and inexpensive construction to a depth of 1 meter. In the publication there are compares particular class of gravel soils in depending on the width of the base and ingredients of fine-grained soil. Gravelly soils are the best foundation soil in terms of bearing capacity, but the amount of fine-grained soils or poorly grained gravel, or gravel with a low value of compactness can greatly reduce this value.

Key words: Gravel; bearing capacity; relative density; fine-grained soil; foundation soil.

* Corresponding Author

mess@mess-earth.org

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Evaluation an indicative modulus of deformation for fine-grained, sandy and gravelly soils

Luboš Podolka [1]*, Monika Karková [2], Rudolf Kampf [3]

[1] VŠTE-Institute of Technology and Business in České Budějovice, Faculty Technology, Department of Civil Engineering, Okružní 517/10, 370 01 České Budějovice, Czech Republic
[2] VŠTE-Institute of Technology and Business in České Budějovice, Faculty Technology, the Department of Mechanical Engineering, Okružní 517/10, 370 01 České Budějovice, Czech Republic
[3] VŠTE-Institute of Technology and Business in České Budějovice, Faculty Technology, Department of Transport and Logistics, Okružní 517/10, 370 01 České Budějovice, Czech Republic

ABSTRACT

The aim of the publication is to evaluate the indicative modules of the deformation of fine-grained, sandy and gravelly soils. Deformation modulus is one of the most important geotechnical properties in terms of geotechnics. The reason is that it is most important from the point of assessing subsidence of buildings and expresses the characteristics that we call compressibility. It is evident that differences in the modulus of deformation are very important, among the classes of fine-grained, sandy and gravelly soils. Maximum indicative value of deformation modules is 30 MPa for fine-grained soils. It is 100 MPa for sandy soil and 500 MPa for a gravelly soil. From this trend it is apparent that the geological conditions have different characteristics in terms of impact on the subsidence of buildings in these important groups of sediments.

Key words: Deformation modulus; fine-grained soils; sandy soil; gravelly soils; compressibility; settlement.

* Corresponding Author

mess@mess-earth.org

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Relationship orientation bearing capacity of fine-grained soils with respect to the classes of foundation soils

Terezie Vondráčkova [1]*, František Němec [2], Miroslav Gombár [3], Jiří Čejka [2], Ján Ližbetin [4]

[1] VŠTE-Institute of Technology and Business in České Budějovice, Faculty Technology, Department of Civil Engineering, Okružní 517/10, 370 01 České Budějovice, Czech Republic
[2] VŠTE-Institute of Technology and Business in České Budějovice, Faculty Technology, Department of Informatics and Natural Sciences, Okružní 517/10, 370 01 České Budějovice, Czech Republic
[3] VŠTE-Institute of Technology and Business in České Budějovice, Faculty Technology, the Department of Mechanical Engineering, Okružní 517/10, 370 01 České Budějovice, Czech Republic
[4] VŠTE-Institute of Technology and Business in České Budějovice, Faculty Technology, Department of Transport and Logistics, Okružní 517/10, 370 01 České Budějovice, Czech Republic

ABSTRACT

Its aim is to elucidate the relationship orientation bearing capacity fine-grained soils and classes of the foundation soils. Quantification and understanding of the nature of bearing capacity in fine-grained soils is one of the basic senses of a geotechnical survey. We can know the orientation suitability of the site for the foundation. This is possible based on the knowledge of the approximate bearing capacity of field surveys. We can also assume certain complications due to demanding building foundations. Approximate estimate of the percentage of each type classes of fine-grained soil is another reason to the knowledge an indicative bearing capacity. It interests us because of its suitability or unsuitability of view the most important characteristics of foundations represented by the bearing capacity.

Key words: Bearing capacity; fine-grained soils; building foundations; soil consistency.

* Corresponding Author

mess@mess-earth.org

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Evaluation of the parameters affecting the cohesion of fine grained soil

Terezie Vondráčkova [1]*, Ján Kmec [2], Jiří Čejka [3], Ladislav Bartuška [4], Ondrej Stopka [4]

[1] VŠTE-Institute of Technology and Business in České Budějovice, Faculty Technology, Department of Civil Engineering, Okružní 517/10, 370 01 České Budějovice, Czech Republic

[2] VŠTE-Institute of Technology and Business in České Budějovice, Faculty Technology, The Department of Mechanical Engineering, Okružní 517/10, 370 01 České Budějovice, Czech Republic

[3] VŠTE-Institute of Technology and Business in České Budějovice, Faculty Technology, Department of Informatics and Natural Sciences, Okružní 517/10, 370 01 České Budějovice, Czech Republic

[4] VŠTE-Institute of Technology and Business in České Budějovice, Faculty Technology, Department of Transport and Logistics, Okružní 517/10, 370 01 České Budějovice, Czech Republic

ABSTRACT

Cohesion of the soils is one of the most important parameters which soil is evaluated in terms of its suitability for building foundations. Safety of construction is in fact dependent on the strength of soil, respectively shear strength. Fine-grained soil represents very specific group, in which is distinguished an effective and total cohesion of soils. The water in the soil thus drastically affects its cohesion contrary to gravel and sandy soils. The publication compares the tabular values of the effective and total cohesion and define the influence of water, grain size and consistency of her behaviour.

Key words: Total cohesion; effective cohesion; fine-grained soil; subsoil.

* Corresponding Author

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Comparison of angles of internal friction of soil for foundation engineering

Vladimír Nývlt [1]*, Jiří Míka [2], Ján Ližbetin [3], Daniel Kučerka [2]

[1] VŠTE-Institute of Technology and Business in České Budějovice, Faculty Technology, Department of Civil Engineering, Okružní 517/10, 370 01 České Budějovice, Czech Republic
[b] VŠTE-Institute of Technology and Business in České Budějovice, Faculty Technology, The Department of Mechanical Engineering, Okružní 517/10, 370 01 České Budějovice, Czech Republic
[3] VŠTE-Institute of Technology and Business in České Budějovice, Faculty Technology, Department of Transport and Logistics, Okružní 517/10, 370 01 České Budějovice, Czech Republic

ABSTRACT

Study of orientation geotechnical properties of the foundation soil is a very important scientific issues in the study of the foundation conditions of different foundation soils. Its aim is to provide a comparison of the angle of internal friction in fine-grained, sandy and gravelly soils. This is a fundamental feature for determining the shear parameters of soils. The differences between these groups, it is possible to understand by the comparison of the angle of internal friction of soil in the same publication. Effect representation of fine soil on the behaviour of the classes of the mentioned soils is possible to demonstrate by comparing of these parameters.

Key words: Effective angle of internal friction; foundation soil; soils; foundation construction.

* Corresponding Author

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Experimental evaluation of cement replacement fillers on the performance of slurry seal

Mansour Fakhri [1]*, Hossein Ali Alrezaei [2], Soroush Naji Almasi [2]

[1] Faculty Member of Civil Engineering, K.N Toosi University of Technology, Iran
[2] Masters of Road and Transportation, K.N Toosi University of Technology, Iran

ABSTRACT

Reducing the level of roads service is a process that started from the first day of the operation of road and the slope of this decrease becomes faster with the passage of time. After building the road, adopting an economic approach in order to maintain the road is very important. Slurry seal as one type of protective asphalts by sealing inactive cracks of the road and increasing skid resistance is the most effective types of restoration with environmentally friendly behaviour. Fillers are responsible for adjusting set time in Slurry seal. Cement is the most common filler used in slurry seal. Cement unlike having suitable properties as a filler, has a very energetic manufacturing process and a notable amount of energy is used for manufacturing cement in the country annually. On the other hand, manufacturing process and application of cement have increased pollutant gases and have followed by much environmental pollution. So in this study other options as a filler such as hydrated lime, stone powder and the slag of iron melting furnace were compared with two common types of cement (Portland and type-v cement) in the mixtures of slurry seal by wet abrasion and cohesion tests. Results indicated that, in both tests, lime and slag fillers had behaviours close to the cement filler. Furthermore, skid resistance of slurry seal samples with different size of aggregate and different amount of emulsion were studied. Result of this test showed that types III aggregate created more friction and with increasing bitumen content the friction decreased.

Key words: Slurry seal; cohesion test; abrasion loss; different fillers.

* Corresponding Author

mess@mess-earth.org

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Design of road pavement using recycled aggregate

Eva Remišova *, Martin Decký, Matúš Kováč, Matej Hájek

Department of Highway Engineering, Faculty of Civil Engineering, University of Žilina, Univerzitná 8215/1, 01026 Zilina, Slovakia

ABSTRACT

The presented article gives special attention to codified clauses of the road construction law, the relevant clauses of the standards and technical regulations to design and control the quality of recycled aggregate constructions. The article also presents the authors' suggestions to design of earth constructions and pavements of roads according to the Slovak technical standards, technical regulations and objectively determined results of research and development of road infrastructure. The article presents a comparison of the mechanical characteristics measurements of the structural layers of road pavements built from the recycled and natural aggregate. It also presents correlation functions of results obtained from in situ and in labo CBR (Californian Bearing Ratio) measuring, representing the world's most widely used control method of bearing capacity of mentioned construction layers.

Key words: Engineering construction; recycled aggregate; static bearing plate test; CBR (Californian Bearing Ratio).

* Corresponding Author

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Objectification of elasticity modulus and flexural strength of foam concrete poroflow 17-5

Matej Hajek [1]*, Martin Decky [2], Marian Drusa [3], Walter Scherfel [4]

[a] Department of Highway Engineering, Faculty of Civil Engineering, University of Žilina, Univerzitná 8215/1, 010 26 Žilina, Slovakia

[b] Department of Geotechnics, Faculty of Civil Engineering, University of Žilina, Univerzitná 8215/1, 010 26 Žilina, Slovakia

[c] Department of Highway Engineering, Faculty of Geotechnic, University of Žilina, Univerzitná 8215/1, 010 26 Žilina, Slovakia

[d] Iwtech s.r.o., Mateja Bela 2504/17, 911 08 Trenčín, Slovakia

ABSTRACT

In these days it is necessary to develop new building materials, which are in accordance to the principles ofthe following provisions of the Roads Act: The design of road is subject that follows Slovak technical standards, technical regulations and objectively established results of research and development for road infrastructure. Foam concrete, as kind of lightweight concrete, has advantages like low bulk density, thermal insulation and disadvantages that will be reduced with development of it. The contribution focuses to identify the major material characteristics of foam concrete Poroflow 17-5, in order to replace a cement bound granular mixtures. The experimental measurements provided on test specimens were subject of diploma thesis in 2015 and continuously of the dissertation thesis. At the beginning of contribution was elaborated overview of the current use of foam concrete abroad. Moreover, it aims to determine flexural strength on test specimens Poroflow 17-5 in combination with various basis weights of the underlying geotextile. Another part of article is devoted to back-casting indicative quantified modulus range Poroflow based on the results of static load tests conducted to test experimental equipment. Test experimental equipment University of Žilina, Faculty of Civil Engineering has been created to solve problems of research on selected highway construction. In purpose of SEZ FCE UNIZA there were built engineering structures. Concerned building construction presents a physical homomorphic model that is identical with the corresponding theory in all structural features. Based on the achieved material characteristics we compared the tensile strength in bending of previously used road construction materials with innovative alternative of foam concrete and determined the suitability for the base layers of pavement roads.

Key words: Foam concrete; modulus of elasticity; flexural strength; static load test, test experimental equipment.

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Computational simulation of dynamic response of vehicle tatra T815 and ground

Jozef Vlcek [1]*, Veronika Valaskova [2]

[1] Department of Geotechnics, Faculty of Civil Engineering, University of Žilina, Univerzitná 8215/1, Žilina 010 26, Slovakia

[2] Department of Structural Mechanics and Applied Mathematics, University of Žilina, Univerzitná 8215/1, Žilina 010 26, Slovakia

ABSTRACT

The effect of moving load represents the actual problem which is analysed in engineering practice. The response of the vehicle and its dynamic effect on the pavement can be analysed by the experimental or computational way. The aim of this paper was to perform computer simulations of vehicle-ground interaction. For this purpose, a half-part model of heavy lorry Tatra 815 and ground was modelled in computational programmes ADINA and PLAXIS based on FEM methods and with using of the analytical approaches. Two procedures were then selected for further calculations. The first one is based on the simplification of the stiffer pavement layers to the beam element supported by the springs simulating the subgrade layers using Winkler-Pasternak theory of elastic half-space. Modulus of subgrade reaction was determined in the programme LAYMED trough the simulation of plate load test. Second approach considers multi-layered ground system with layers of different thicknesses and material properties. For comparison of outputs of both approaches the same input values were used for every calculation procedure. Crucial parameter for the simulations was the velocity of the passing vehicle with regard to the ground response to the impulse of the pass. Lower velocities result in almost static response of the pavement, but higher velocities induce response that can be better described by the dynamic theory. For small deformations, an elastic material model seems to be sufficient to define the ground response to the moving load but for larger deformations advanced material models for the ground environment would be more reliable.

Key words: FEM; moving load; pavement; response; vehicle-ground interaction.

* Corresponding Author

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Assessment of the vibrations effects caused by technical seismicity due to the railway traffic on a hightsensitive machinery

Daniel Papán, Veronika Valaškova *, Katarína Demeterová

University of Zilina, Faculty of Civil Engineering, Department of Structural Mechanics and Applied Mathematics, Univerzitna 8215/1, 010 26 Zilina, Slovak Republic

ABSTRACT

The numerical and experimental approach in structural dynamics problems is more and more actual nowadays. This approach is applied and solved in many research and developing institutions of the all the world. Vibrations effect caused by passing trains used in manufacturing facilities can affect the quality of the production activity. This effects is possible to solve by numerical or experimental way. Numerical solution is not so financially and time demanding. The main aim of this article is focus on just experimental measurement of this problem. In this paper is presented the case study with measurement due to cramped conditions realized in situ. Our case study is located close to railway and we observe the vibration effect caused by passing trains on the higthsensitive machinery contained in this object. The structure were hightsensitive machine is placed was in construction process. For the measurements the higthsensitivity standard vibrations equipment were used. The measurements results assessments were performed for the technological conditions and Slovak Standard Criteria. Both of this assessments were divided to amplitude and frequency domain. The amplitude criteria is also divided to peak particle velocity and RMS (Root Mean Square). Frequency domain assessment were realised using the frequency response curves obtained from hightsensitive machinery manufacturer. The frequency limits are established for each axis of triaxle system. The measurement results can be predicted to be or not to be done vibration reduction. Measurement implemented in the production hall will should obtain materials to determine the seismic loading and response of production machinery, caused by technical seismicity.

Key words: Railway traffic; vibration; frequency spectrum; vibration velocity; vibration acceleration.

* Corresponding Author

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The road and railway traffic seismicity effect comparison on historical building in Slovakia

Daniel Papán, Veronika Valaškova *,

University of Zilina, Faculty of Civil Engineering, Department of Structural Mechanics and Applied Mathematics, Univerzitna 8215/1, 010 26 Zilina, Slovak Republic

ABSTRACT

The road and the railway traffic generate material and immaterial emissions. The immaterial emission produced by traffic is divided to the noise and the vibrations. All these aspects attacking the environment should to be assessed. For the assessment the national and international standards can be used. This paper contains only the vibration assessment and the comparison of the dynamic parameters influence in this process. The heritage buildings have more conservative criteria as another building. This approach is performed via experimental and numerical study and identification of the basic dynamic parameters. It is presented on two case studies of important historic buildings in Modra and Žilina (Slovakia). For both case studies buildings, the FEM (Finite Element Method) numerical models were created. The modes of the natural vibration and natural frequencies were obtained as the relevant results from numerical models. These parameters are very important for this type of assessment. For the FEM models the Scia Engineer were used as the numerical software system. The experimental measurements were realised for FEM model verification. Also these measurements were used for the assessment according Slovak standards. These models can be tuned based on the experimental measurements. The tuned FEM models can be used for the further extrapolations. The main part of the investigation was to compare traffic seismicity effect on the historical buildings. Both buildings were assed in the frequency and time domain. The comparison of the traffic seismicity effects were realised also in frequency and the time domain. It is necessary to taking to account this assessment for the heritage buildings.

Key words: Railway traffic; vibration; frequency spectrum; vibration velocity; vibration acceleration.

* Corresponding Author

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The blasting works effect in numerical and experimental case study

Daniel Papán [1], Veronika Valašková [1]*, Marián Drusa [2]

[1] University of Zilina, Faculty of Civil Engineering, Department of Structural Mechanics and Applied Mathematics, Univerzitna 8215/1, 010 26 Zilina, Slovak Republic
[2] University of Zilina, Faculty of Civil Engineering, Department of Geotechnics, Univerzitna 8215/1, 010 26 Zilina, Slovak Republic

ABSTRACT

This article contains the theoretical and experimental case study of dynamic monitoring of the geological area above constructed highway tunnel. The monitored structure is high diameter steel water supply pipeline crossing the tunnel. The basic dynamic parameters monitored during blasting works are compared to the FEM (Finite Element Method) calculations and to the Slovak standard limits. It is possible to use the tune the FEM model using the experimental measurement data results. This realistic numerical model can be used for further time and space extrapolations.

Key words: Blasting works; tunnel construction; pipeline; dynamic excitation; vibration velocity.

* Corresponding Author

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Case study of difficult geotechnical conditions under the palace complex in Cianowice (Krakow, Poland)

Joanna Gil-Mastalerczyk [1]*, Regina Gil [2]

[1] Kielce University of Technology, Faculty of Civil Engineering and Architecture, Department of Architecture and Town Planning, al. Tysiąclecia Państwa Polskiego 7, 25-314 Kielce, Poland
[2] Andrzej Frycz Modrzewski Krakow University in Krakow, ul. Herlinga Grudzińskiego 1, 30-705 Krakow, Poland

ABSTRACT

The palace complex in Cianowice near Krakow (Lesser Poland, Poland) built around 1890, after 1945 ceased to function as a residential, so the whole building underwent successive devastation. Military activities, ad hoc repairs and long-term shortage of funds in Poland, led to the destruction of the magnificent assumptions. Since 2006. Palace remained completely unsecured and unattended. Performed in 2012-2015 modernization of the historic palace with the expansion of the basement (for residential building multigenerational) has become the occasion for a thorough diagnosis of the prevailing geotechnical conditions and the state of preservation of threads stone and brick walls and vaults chambers basement. Difficult ground conditions, water penetration, lack of insulation of horizontal and vertical has become one of the main causes of the destruction of the foundations and walls of basements. Moisture from the ground, rising damp in the walls (with dissolved salts in it), evaporate causing erosion of the walls. The result it led to the weakening of the structural and breakout layers of walls. The phenomenon has become particularly clear after the geotechnical surveys, excavations and complete discovery of the basement walls. The conducted works related to general technical renovation and restoration, included foundations (lining and insulation), walls, floors and roof. The assumption palace in Cianowice, through appropriate interference with the use of modern and introduction of a new substance, in any manner that emphasizes value and historical monument became possible to restore the important significance of the object and place.

Key words: Difficult geotechnical conditions; architecture; modern modernization; monument; Cianowice.

* Corresponding Author

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Evaluation of ground bearing capacity estimation methods based on plate loading tests

Yavuz Gul *, Atilla Ceylanoglu

Cumhuriyet University, Department of Mining Engineering, Sivas, Turkey

ABSTRACT

Within the scope of this study, bearing capacities were calculated based on 11 different estimation methods in literature, using some mass and material properties for different rock units, such as; magnetite, syenite, serpentinite, limestone, clayey limestone and gypsum, encountered in three different open-pit mines (Sivas-Ulaş Open-Pit Celestite Mine, Divriği Open-Pit Iron Mine and Kangal Open-Pit Coal Mine) around Sivas in Turkey. Through regression analyses between estimated bearing capacity values and those that had been determined as a result of plate loading tests, bearing capacity estimation methods specified in the literature were assessed. Moreover, 4 different equations to be used in bearing capacity estimation were also proposed.

Key words: Bearing capacity; estimation methods of bearing capacity; rock mass and material properties.

* Corresponding Author

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Evaluation and cartography of the vulnerability of the aquifers to pollution: methodological approach of the intrinsic vulnerability

Abida Haddouche *[1,2], Ahmed Cherif Toubal [2]

[1] National Centre of Applied Research in Earthquake Engineering (CGS), Rue Kadour Rahim Prolongée B.P. 252 H-Dey, Alger

[2] University of Sciences and Technology Houari Boumedienne (USTHB), BP 32 El Alia, Bab Ezzouar – Alger

ABSTRACT

Pollution is a permanent risk to surface water resources and groundwater. It can degrade their quality and reduce their quantity. The protection and preservation of these resources are a necessity of the first order. Thus the approach of vulnerability to pollution of water resources is presented as an effective tool to limit and control the risks of degradation of water quality, thus allowing to take appropriate protective measures. The identification and mapping of the intrinsic vulnerability requires consideration of soil characteristics, geological, hydrological and hydrogeological environment. These parameters vary depending on the evaluation methods. Intrinsic vulnerability maps do not take into account the physico-chemical characteristics specific to a contaminant. Neogene basin of the Eastern Mitidja conceals water potentials of origin mainly underground. This water is an important economic resource and heritage sensitive ecological importance of managing and preserving. The study methodology is required, involving three different methods of approach to vulnerability (DRASTIC, DRIST, GOD). The methods are based on a numerical scoring system, integrating a GIS, which allows the use of databases or entered directly digitized graphics. The appropriateness of the methods is assessed in relation to the state hydrochemical groundwater (nitrates and heavy metals). The application of the three methods for assessing aquifer vulnerability to pollution (DRASTIC, DRIST and GOD) highlighted the vulnerability maps differ from one method to another. The results shows that the DRASTIC method (with the classification of Engel et al., 1996) is the most representative and most secure especially for the study area.

Key words: Vulnerability; GIS; Mitidja East; pollution and protection of aquifers.

* Corresponding Author

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An interpolation method for flood water prediction along Mekong rivers base on geographical impact factor of dyke measurement in the Mekong Delta

Hoang Thai Duong Vu *[1], Franz Nestmann [1], Van Trinh Cong [2], Peter Oberle [1]

[1] Karlsruhe Institute of Technology, Kaiserstraße 12, 76131, Karlsruhe, Germany
[2] Mekong Water Technology Innovation Institute, 72 Tran Van Danh, Ward 13, Tan Binh dist., HCMC, Vietnam

ABSTRACT

The Mekong River Delta (MRD) is one of the largest river deltas in the world, it is located in the lower Mekong River, which originates at the Tibetan plateau and crosses China, Myanmar, Laos, Thailand, and Cambodia before entering the territory of Vietnam. The MRD is considered as a rice bowl of the whole country with a contribution approximately 52% of the national rice production, and 70% of national rice exportation, putting Vietnam at the second place in the world rice market. With an area of only about 5% of the total catchment area of the Mekong River and low natural ground (mostly below +2m a.s.l.), and annually the MRD is impacted by flooding from upstream Mekong river. Due to the strategy of intensive rice harvesting development issued by the Government of Vietnam, a mass of poldering system including semi-dyke (to protect rice fields from flood water until middle August) and the full-dyke system (to protect the rice fields fully from flood water) has been built rapidly in the flooded areas. As a result, it causes consequences to downstream areas. In this line, the present study is aimed at developing an interpolation method of flood water along Mekong Rivers based on Geographical Impact Factor of Dyke Measurements and satellite products.

Key words: Mekong River Delta; dyke system; geographical impact factor (GIF), Satellite products.

* Corresponding Author

mess@mess-earth.org

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Long term groundwater level changes in Demre coastal aquifer (SW, Turkey) as a measure of sustainable use of the aquifer

Pinar Avci *, C. Serdar Bayari, N. Nur Ozyurt

Hacettepe University, Geological Engineering Department, 06800 Beytepe Ankara, Turkey

ABSTRACT

Long term monitoring of the groundwater level fluctuations is instrumental in assessing the sustainable use of aquifers. Like many others in the Mediterranean Sea basin, groundwater is the sole source of irrigation water demand in 24 sq. km large Demre coastal plain of SW Turkey where local economy is based on greenhousing and orcharding. The security of long term food production in the plain depends on sustainable use of the alluvium aquifer. The aquifer is recharged by infiltration from precipitation and by lateral seepage from the karstic carbonates that surround the plain from north. The groundwater level in the plain has been monitored over the years to determine the interplay between temporal irrigation water demand and precipitation regime. In this study, we present groundwater level measurements at 9 observation wells through the years 1983 and 1999 and, 2014 and 2015. In general, depending on the intensifying irrigation water demand the groundwater level reaches its minimum in September and October and then, it starts to rise due to the recharge during the wet season (November to April). A comparison of long term water level (1983-2011) with concurrent precipitation data reveals that the groundwater level reaches its lows after droughts and increases to its highs at the end of rainy periods. However, the magnitude of annual groundwater level fluctuations in the plain over the years stays within 2 m. While long term seasonal groundwater level observations are useful in assessing the response of aquifer to recharge and discharge events, high temporal resolution observations are essential to better understand the aquifer dynamics. Comparison of daily precipitation observations with hourly groundwater level data of several monitoring wells in 2014 and 2015 revealed important clues on the functioning of the aquifer. As expected, the groundwater level declines during the irrigation season and rises during the wet season. The response of the aquifer to precipitation events is remarkably fast but, regardless of the magnitude of seasonal recharge by precipitation annual fluctuation of groundwater level stays around 2 m. This indicates that the lateral recharge from karstic carbonates that underlay the alluvium has a vital role in keeping the groundwater level in a quasi-steady state over the years. In general, the long term groundwater level change seems to be in agreement with the cumulative deviation from the mean annual precipitation.

Key words: Groundwater level; Demre Coastal aquifer; precipitation regime.

* Corresponding Author

mess@mess-earth.org

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Watershed prioritization from the flooding viewpoint using the HEC - HMS model: a case study from Eskandari watershed, Iran

Ali Talebi *, Abdolhossein Abbasi, Samaneh Pourmohamadi

Yazd University, Faculty of Natural Resources, Watershed Management Engineering Department, University Blvd. - Safayieh PO Box 89195 - 741 Yazd, Iran

ABSTRACT

One of the basic solution for the preventing and containment of flood is identifying risk areas and flood in watersheds. The preventing and containment of flood must be considered in the origin, means in Sub-basin watershed. This study aimed to prioritize the Eskandari's watershed from flooding viewpoint by application the HEC-HMS model and using the point plan rain and hydrometric data. The results of calibration and validation of HEC-HMS model shows good correlation with measured flow rate data in output of Eskandari watershed. Performance indices of model amounts in this research is consist of: Nash – Sutcliffe Index, coefficient of variance of the simulation, the bias of the model Estimating flow volume, the percentage of peak flow error, coefficient of determination, the determination coefficients and weighted least square mean error. Based on the obtained results, there is a good estimate between the components of the maximum flow rate and time to peak. It cannot be seen a huge difference in estimated time to peak and observed peak discharge for various scenarios in different return periods. By omitting the sub- basin watersheds in flood cycle, the annual flood hydrograph corresponding to its rainfall hyetograph was computed for each sub watershed. Then, the effect of each one of them in manufacturing output flood was obtained. The effective sub watersheds were ranked in order of their role in the flood creation. The results showed that the rate of contribution of sub watersheds for flood creation is not proportional to output peak flow. This means that the high precipitation does not essentially leads to high peak flow.

Key words: Rainfall-runoff; watershed prioritization; flooding; HEC-HMS model; Eskandari watershed.

* Corresponding Author

mess@mess-earth.org

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Impact of climate change on the flow in five watershed of the Northwest of Algeria

Mohamed Meddi *[1], Gil Mahe [2], Aicah Attaf [1], Hayate Saidi [1]

[1] Ecole Nationale Supérieure d'Hydraulique de Blida, BP. 31, Blida, Algeria
[2] IRD, Laboratoire HydroSciences Montpellier, France

ABSTRACT

The climate change matter set in at the forefront of the news and public opinions' concerns for a long time. These climate changes have negatively affected the water reserves which necessary for any social and economic development. In Algeria, the deficit of this blue gold becomes worrying, confirming various expertise starting from assumptions and using different methodologies which all have concluded that our country will be confronted to this shortage in the next coming years. To better work out the importance of those impacts, we have analysed the average water flows of five basins of Algerian northwest, in the Central Maghreb, over the reference period (1970-200) and we have compared them to those that could result from the changes in the main climatic stress (temperature and rains). The methodology used rests on the model GR2M in order to make simulations on the flows of five basins of the Central and West of Algeria in view of the climate changes by the years 2025 and 2050. The results obtained show a coming decrease in the flows, of the order of 15%, from January to April for the basins of the Central and Chéliff, and which will exceed 25% for the basins of the West. For the first months of the warm season, the aforementioned decrease, for 2050 and for the pessimistic scenario, will be more than 40%. The decrease in surface water resources will be significant within the context of climate changes, despite uncertainties we can quantify with accuracy on the degree of those changes. The aforementioned changes and their impacts are already visible and quantifiable as regards water resources for instance. This situation combined with the population increase will generate important social, economic and environmental problems. The inflows drop will directly impact dams' filling, which was already recorded for instance during 2006 and 2007 years. The natural recharge of water tables for the region will suffer from this drop, which will give rise to a lowering of piezometric levels. This established fact will favour surface and ground water pollution. We must act now to limit the damage whilst obviously considering the uncertainty range on the climatic forecasts.

Key words: Climate change; flows; model; five watershed; Northwest of Algeria.

* Corresponding Author

mess@mess-earth.org

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Transfer of water in the soil-plant- atmosphere system at plot level in the High Cheliff Plain - Algeria

Mohamed Meddi *, Mohamed Maddi

Ecole Nationale Supérieure d'Hydraulique de Blida, BP. 31, Blida, Algeria

ABSTRACT

The alluvial plain of Upper Cheliff plain called El-Khemis is situated at 120 km in the south west of Algiers. It has an area of 21,035 km^2. It is bounded to the north by the mountains of Zaccar, to the south by the foothills of the Ouarsenis, to the west by massive Doui and eastern Jebel Gountas. It has a relatively low slope (15%) (M Hattab., 1998). It is bordered to the north by cones droppings which constitute the transition zone between the valley and mountains. In the zone of High Chelif, the annual average rainfall varies from 250 to 470 mm. Knowing that the lack of sufficient available water is a major obstacle for the development of the agricultural production, its economy and its good management require the comprehension of its distribution in the soil-plant-atmosphere system. In this context and to better optimize the management of the contribution of the water of the rainy season by improving its maximum use and reserve by the plants, it is necessary to make a study on the distribution of water in the soil-plant-atmosphere system. The goal of this work is to analyse the dynamics of water in the soil, the evolution of water stocks according to the contribution, consumption of the plants and the evaluation of losses. It is important to understand the morphology, water and physico-chemical characteristics of the soil profile where the storage is carried out, the amount that can be stored and be available to the plant, and that lost by drainage and evapotranspiration. This soil has adverse physical properties, a water reserve that can be significant but not very extractable by the roots (PF 4,2 quickly reached) and a compactness and significant variations of volume preventing the good development of the roots.

Key words: Water stocks; hydraulic conductivity; plant; High Chelif; Algeria.

* Corresponding Author

mess@mess-earth.org

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Evaluation of the ability of some artificial intelligence models for rainfall-runoff simulations in hill slope scale

Mohammad Taghi Dastorani *, M.M. Zaree, M. Mesdaghi

Ferdowsi University of Mashhad, Faculty of Natural Resources and Environment, Mashhad, Iran

ABSTRACT

There are several ways to simulate watersheds hydrological processes but since the measuring of all parameters needed to assess the reaction of the basin is not possible due to the cost and time therefore, the selection of a model with simple structure, using minimal input data, and ability to provide accurate forecasts is important. In order to achieve the best results, modelling and identification of factors affecting the output of the model is carried out. In this regard, in present study, it has been tried to identify the factors and estimating the amount of runoff using a variety of methods of artificial intelligence and multiple regression. Then, to evaluate the efficiency of the implemented models and choose the best model, some performance criteria including the correlation coefficient (R), Nash-Sutcliffe coefficient (NSE), the root mean square error (RMSE) and the mean absolute error (MAE) were used . The data used in this study were 9 rainfall events data measured in time period of 2011- 2015 taken from the Khakh watershed of Gonabad. Artificial intelligence models used in this study were: normal feed forward neural networks, feed forward Cascade neural networks, feed backward Elman neural networks, Adaptive Neuro-Fuzzy Inference System (ANFIS) and regression decision tree model (Regression Tree) that were implemented in MATLAB software environment and also step multiple regression as statistical methods which was implemented in Minitab software. The results showed that the statistical as well as artificial intelligence methods considered in this research are sensitive to the different number of input parameters. Also inartificial intelligence models, in addition to the number of input parameters, the number of hidden layers and the number of neurons in hidden layer can lead to different estimates. Overall, the findings show that the performance of the models is acceptable, as often all of them are able to estimate the amount of runoff with reasonable accuracy, and relatively low error.

Key words: Propagation; feedback; feed forward; decision trees; Neural Networks; modelling, ANFIS.

* Corresponding Author

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Fluoride mobilization mechanism and its influence on groundwater quality parameters for deltaic plain district of lower Indus basin

Muhammad Sanaullah *[1], Noor Zaman [2], Sajid Rashid Ahmad [3], Abdul Jabbar Khan [4]

[1] University of the Punjab, Institute of Geology, Lahore-54590, Pakistan
[2] Pakistan Council of Research in Water Resources, Jamshoro, Pakistan
[3] University of the Punjab, College of Earth and Environmental Sciences, Lahore-54590, Pakistan
[4] National University of Science and Technology , Islamabad, Pakistan

ABSTRACT

Ground water contamination is one of the major concerns of deltaic plain areas of lower Indus basin. Forty (40) ground water samples from hand pumps were geochemically evaluated and investigated to ascertain the quality of water in three union councils of Sanghar district, Sindh. Studies are focused to identify the mobilization mechanism of Fluoride and its impact on the concentration trends of ground water quality parameters. Water quality is assessed for pH, TDS, Ca, Mg, Na, K, HCO_3,CO_3, F, Cl, SO_4, SAR and Nitrate (NO_3-N). Groundwater chemistry results indicate a safe drinking water quality of Fluoride (3.1-9.2 mg/l) and Nitrate (0.2-0.8 mg/l) as per WHO permissible limits. The concentration of pH (6.7-8.3) shows a dominancy of alkaline concentrations in ground water. Chemical analysis revealed that Na-Cl is accompanied by the ion pair of Ca-HCO_3 (Stiff Diagram). Hydrogeochemical classification specifies Mixed-Type concentration inclining Na-K-Type ionic concentrations (Piper Diagram) in majority of the samples collected. Analytical studies exhibited cations are in abundance following Na^{+}> Ca^{++}> Mg^{++} pattern and that the areas rich in Ca^{++} display a comparatively low concentrations of dissolved Fluoride. It is found that alkaline environment and the lithlogical composition of alluvial sediments may favour the F- dissolution in gorund water of the study area.

Key words: Fluoride mobilization mechanism; Indus basin; hydrogeochemical classification; alkaline environment; Sanghar District; groundwater quality.

* Corresponding Author

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Livelihood strategies of wetland community in the face of changing climatic condition in Southwest Bangladesh

Mohsina Aktar [1]*, Bishawjit Mallick [2]

[1] Khulna University, Environmental Science Discipline, Khulna-9208, Bangladesh
[2] Karlsruhe Institute of Technology (KIT), Institute of Regional Science (IfR), Karlsruhe, Germany

ABSTRACT

Bangladesh faces the multidimensional manifestations of climate change e.g. flood, cyclone, sea level rise, drainage congestion, salinity etc. This study aimed at to find out the community's perception about the perceived impact of climate change on their wetland resource based livelihood, to analyse their present livelihood scenario and to find out required institutional setup to strengthen present livelihood scenario. Therefore, this study required both quantitative analysis like quantification of wetland resources, occupation, etc. and also exploratory information like policy and institutional reform. For quantitative information 200 questionnaire survey and in some cases observation survey and for socially shareable qualitative and quantitative issues case study and focus group discussion were conducted. In-Depth interview was conducted for socially non-shareable qualitative issues. The overall findings of this study have been presented maintaining a sequence- perception about climate change effect, livelihood scenario and required institutional support of the wetland community. Flood has been ranked where cyclone effect is comparatively less disastrous in this area. Heavy rainfall comes after the cyclone. Female members responded almost same about the ranking and effects of frequently occurred and devastating effects of climate change. People are much more aware about the impact of climate change. Training of Care in RVCC project helps increasing their knowledge level. If the level of education can be increased, people can fight against calamity and poverty with more confidence. People seem to overcome the problems of water logging and thus besides involving in Hydroponics (33.3%) as prime occupation in monsoon, they are also engaged in other business related activities. January to May are the low income season for the farmers. But some people don't want to change their traditional occupation and their age is above 45. The young earning member wants to utilize their lean income period by alternative occupation. People who do not have own land and performing water transportation or other types of occupation are now interested about Hydroponics. People who give their land on rent are now thinking about renting their land in monsoon as through that they can earn a sound amount rather than get nothing. What they require is just seed, training, and capital. Present marketing system faces the problem of communication. So this sector needed to be developed. Involvement of women in income earning activity is very low (5.1%) and 100% women are housewives. They became inferior due to their educational level and dominance of their husband. Only one NGO named BCAS (Bangladesh Centre for Advanced Studies) has been found engage training facilities and advocacy in this purpose. Upazilla agricultural extension office like other GO remains inactive to give support the community for extension and improvement of Hydroponics agriculture. If the community gets proper support and inspiration they can fight against crisis of low income and climate change, with the Hydroponics cultivation system successfully.

Key words: Livelihood; hydroponics; climate change adaptation; wetland community; Bangladesh.
* Corresponding Author

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Zonal features of bog and lake water chemistry along a transect from boreal to arid landscapes in the South of Western Siberia, Russia

Marina N. Kolpakova [1,3], Olga S. Naymushina [1,2]*

[1] Siberian Branch of the Russian Academy of Sciences, V.S. Sobolev Institute of Geology and Mineralogy, Koptyuga av., 3, 630090, Novosibirsk, Russia

[2] National Research Tomsk Polytechnic University, Lenin av., 30, 634050, Tomsk, Russia

[3] Siberian Branch of the Russian Academy of Sciences, Tomsk Department of the Trofimuk Institute of Petroleum-Gas Geology and Geophysics, Academichesky av., 4, 634021, Tomsk, Russia

ABSTRACT

The south of Western Siberia is a unique territory where more than 12000 water reservoirs are located. Moreover, this region is characterized by high bogginess that can reach 90% in the north. Such bog and lake systems are able to accumulate different natural and technogenic resources, including trace elements and organic matter. This article presents the results of chemical composition of surface water in this area along a 5-year monitoring. The obtained data allow us to conclude that dynamics of bog and lake water chemistry is predetermined by their location in various landscape zones and subordinated to zonal distribution of such major landscape elements as moistening, evaporation, rate of underground water flow, etc.

Key words: Water chemistry; bogs, lakes; landscape zones.

* Corresponding Author

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Assessment of groundwater hydrochemistry and hydrodynamics in the Djérid multilayer aquifer system, southern Tunisia

Lassaad Dassi *, Meriem Tarki

University of Sfax, National School of Engineers of Sfax, Research Laboratory "Eau, Energie et Environnement" (LR3E), code : LR99ES35, Sfax 3038, Tunisia

ABSTRACT

Major and trace element geochemistry was used in conjunction with stable and radiogenic isotopes in a Saharan multilayer aquifer system from south-western Tunisia to identify the mineralization processes of groundwater, their possible origins, their flow patterns and their changes caused by the impact of human activities. The groundwater mineralization is controlled primarily by the water-rock interaction along the lines of flow and secondarily by the flushing of fertilizers in oases regions. The deep aquifer contains mainly paleowater, approximately 25 ka, and was recharged in a late Pleistocene colder and wetter climate environment. The shallow aquifer is mainly recharged by return flow of irrigation water originating from the underlying aquifers. The intermediate aquifer contains old waters recharged during early Holocene humid period sand receives an extensive upward and downward mass transfer from deep and shallow aquifers. Human activity, in particular large-scale water resources development in the last 50 years associated with long-term flood irrigation practice, has enhanced the mixing by vertical leakage and led to tremendous changes in the groundwater flow regime. The established conceptual model describes the main groundwater flow features in study area with emphasis on vertical leakage process which is previously considered to be minor component of the water balance, relative to lateral flow in aquifers.

Key words: Hydrochemistry; environmental isotopes; water-rock interaction; return flow; mixing; conceptual model.

* Corresponding Author

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Development of IoT-based urban underground monitoring system and prediction of land subsidence risk area in a metropolitan city of South Korea

Byeongju Jung [1,2]*, Hong-Jin Lee [1,2], Eunseok Bang [1,2], Sueng Won Jeong [1,2], Dongwoo Ryu [1,2], Sung Woung Kim [1,2] , Byoung-Woo Yum [1,2], In-Hwan Lee [1]

[1] UGS Convergence Research Group, Electronics and Telecommunications Research Institute, 218 Gajeong-ro, Yuseong-gu, Daejeon 305-500, South Korea

[2] Korea Institute of Geoscience and Mineral Resources (KIGAM), 124 Gwahang-ro, Yuseong-gu, Daejeon 305-350, South Korea

ABSTRACT

As population of cities grow, the demands of underground developments (e.g. sewer/ water supply lines, subway tunnelling, high-rise building foundation, and etc.) increase accordingly. However, without careful consideration of urban hydrogeology and soil characteristics, those subsurface constructions could alter urban hydrogeology and consequently induce land deformation on the ground, which are potentially hazardous to local communities. We are developing IoT- (Internet of things) based underground safety monitoring network system to collect real-time groundwater and soil condition data to assess potential subsidence risk arisen from hydrogeological changes in metropolitan cities in South Korea. The monitoring system includes four functional parts, which are subsurface monitoring sensors sending data directly through the internet, central servers capable of collecting and processing big data, computational sub-modules for predicting high-risk areas, and geologic information service platforms visualizing underground safety maps for the public. The purpose of this study are (1) to explore the feasible mechanism of land subsidence and road collapse in the urban areas, (2) to develop a regional hydrogeological model that estimates current status of groundwater dynamics and land subsidence based on real-time data collected in the monitoring sites located near in subway tunnels, and (3) to predict the potential subsidence-vulnerable area by the impacts of future underground developments and climate change. A fully coupled groundwater flow - deformation equation is used for solving a land subsidence problem corresponding to transient pore pressure changes by natural and anthropogenic factors. Preliminary numerical results show that the subsidence pattern is closely related to the local groundwater flow affected by underground structure/ facilities and hydromechanical properties of the aquifer.

Key words: Urban area; underground development; land subsidence; road collapse, IoT-based monitoring; fully coupled hydromechanical modelling.

* Corresponding Author

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Geolithological and anthropogenic controls on the hydrochemistry of the Calore River (IT)

Nicolò Colombani [1]*, Emilio Cuoco [2], Gianluigi Busico [2], Thomas Darrah [3], Micòl Mastrocicco [2], Dario Tedesco [2]

[1] National Research Council, Research Institute for Hydrogeological Protection, Department of Bari, Bari, Italy
[2] Second University of Naples, Dept. of Environmental, Biological & Pharmaceutical Sci. & Technologies, Caserta, Italy
[3] Ohio State University, School of Earth Sciences, 275 Mendenhall Laboratory, Columbus (OH), USA

ABSTRACT

The present work aims to study the main chemical and physical water parameters in the upper and middle Calore River catchment (southern Italy), between the headwater catchment and the confluence with the Volturno River. In this work, we employed data on: morphology, lithology, tectonic, land use and physico-chemical parameters (pH, EC, Temperature, major ions and reactive nitrogen species). The physico-chemical parameters data were distinguished into two main categories, the base flow and peak flow conditions. The spatial analyses were performed in a GIS environment. This dataset was useful to recognise the main sources of surface and ground waters mineralization in the Calore catchment and of their geochemical evolution and/or mixing during base flow and peak flow conditions. The study was also accomplished to evaluate the water quality variations due to potential sources of anthropogenic contamination, which could mask the geochemical signature of natural sources of surface waters in the highly settled and cultivated plains. During base flow conditions, the identification of different ambient background mineralization due to different lithological units for both surface and ground waters was straightforwardly accomplished. During base flow conditions, it was relatively simple to follow the geochemical evolution and mixing of the previously cited lithological units in pristine environments (highlands), while this division was hardly possible in human-impacted environments. During peak flow conditions, the influence of run-off and through-flow from uphills modified the Calore River geochemistry, even if the differentiation of the end member waters and their mixing was still feasible in pristine environments. This study shows that using standard geochemical tools, based on cost effective methods, sampling stream networks and springs at selected strategic key points, can provide insights into river catchment geochemistry helping to separate between different sources of surface and ground waters, but also helping to identify areas impacted by anthropogenic activities. The proposed approach resulted to be a suitable screening tool to obtain reliable information on upland catchment hydrology characterized by complex geologic and structural setting. The proposed approach could also help to assess how the run-off flow alter the overall river chemistry, allowing a preliminary evaluation of the relative importance of run-off flow compared to groundwater and springs contributions to river flow. Finally, the results show that major ions in headwater catchment originate from natural processes due to water/rock interactions, which can be used as reference baseline for future water quality monitoring in the upper and middle Calore catchment. Although this study gave insights on the nature of the geochemical processes arising in the upper and middle Calore catchment, it does not deliver a comprehensive outline of geochemical functioning over a hydrological year. Therefore, the time-based variability of geochemical fluxes related to single pulse hydrological variations must be measured in details in future studies.

Key words: Lithology; ionic ratios; river catchment; radon; anthropogenic impact.
* Corresponding Author

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Heavy metal pollution in the surrounding Pb-Zn-Cu deposits: a case study from Kastamonu (Turkey)

Tülay Ekemen Keskin [1]*, Emre Özler [2], İnan Keskin [1]

[1] Karabük University Civil Engineering Department 78050 Karabuk, Turkey
[2] Karabük University Environmental Engineering Department 78050 Karabuk, Turkey

ABSTRACT

The study area has active Pb-Zn-Cu mining. The study area has a surface area of approximately 2990 km^2. Küre River which drain Küre Pb-Zn-Cu mine area and its vicinity has also a surface area of about 440 km^2. The basement rocks of the study area consist of Paleosoic shale and Ballıdağ Formations consisting of quartzites; Karadon Formation consisting of clastics with coal vein; Mesozoic ophiolite and Daday Group composed of formations which have transitive with each other. Triassic Ballıdağ Formation is overlain unconformably by Akgöl Formation consisting of sandstone-shale alternations, andesite, basalt lavas and limestone. Dogger Kastamonu Granitoid cut all these old units. The mean annual precipitation of the study area (between 1960-2014) is calculated as 896 mm. Discharges of the springs in the investigation area in the dry period range between 0.1-25 l/s, whereas in the rainy period range between 0.1-93 l/s. Most of the spring with high flows discharge from karstic limestone and coarse grained clastic levels. 28 springs, 6 wells, 4 river measurement points located in the study area were mapped after their locations and altitudes were determined and the measurements were carry out in situ. Electrical conductivity (EC), pH, oxidation–reduction potential (Eh) values of groundwater in the dry period range between 305-2785 µS/cm, 6.12-8.26 and 217-854 mV respectively. EC, pH, Eh values of groundwater in the rainy period range between 276-2836 µS/cm, 6.31-8.24 and 237-401 mV respectively. Sulphide minerals in the region generally contribute acidification and groundwater contain high SO_4. Al, As, Ba, Mn, Ni, Se, Sb and Pb concentrations in the KS-10 and KS-27 wells exceed the limits Turkish Standards for Water Intended For Human Consumption (TS-266-2005) and World Health Organization regulations (WHO-2006). KS-10 well is a well drilled in the volcanic parts consisting of ore vein on the Akgöl Formation. The well is drilled on the edge of mine liquid waste pool. KS-27 well is a well drilled in the alluvium which located outside (in the south) of the study area and it has 95 m depth and pressure feature. While the well is drilled in alluvium, it's thought that it cuts clastic layer and Mesozoic Ofiyolites. In addition, as pollution, which exceed the standards in several times, is determined in the groundwater discharging from sandstone of Akgöl Formation (KS-20, KS-21) and ophiolitic rocks (KS-28, KS-29, KS-30). Many trace element and major ion concentrations in the rainy season decreases depending on dilution with the effect of rain and snow water which causing the increase of discharge. However, in general Ba, Co, Ni, Pb and Sr elements and Al, As, Fe, Mn, Sb, Se, Zn concentrations in several springs increase probably due to acidic rain water because of the increasing solution rate in rocks due to Eh- pH balance.

Key words: Hydrogeology; water chemistry; water contamination; Küre (Kastamonu).

* Corresponding Author

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Underground lakes of Insuyu Cave (Burdur, Turkey)

Suat Taşdelen [1]*, Mahmut Güngör [2], Ali Aydın [3]

[1] Pamukkale University, Faculty of Engineering, Department of Geological Engineering, 20017 Kınıklı, Denizli, Turkey
[2] Denizli Municipality, Denizli Turkey
[3] Pamukkale University, Faculty of Engineering, Department of Geophysical Engineering, 20017 Kınıklı, Denizli, Turkey

ABSTRACT

Insuyu Cave is located in the western part of the Taurus Mountains and besides Cine Plain of Burdur Province. The study area, under the influence of Alpine Orogeny, shows a complex structure formed by overlapping tectonic structures. Cine Plain is surrounded by high mountains of the eastern and northern side, the altitude is 1175 meters. Great fractures and faults are generally northeast-southwest direction. Insuyu Cave is a karst cave formed in Mesozoic (Cretaceous) limestone in a horizontal position and strong tectonic influence. Insuyu Cave is a karst cave formed in Mesozoic (Cretaceous) limestone in a horizontal position and strong tectonic influence. In cave has nine different sizes underground lake in connect to each other. Groundwater in the cave, flows out from the source called with own name from a melting channel. Precipitation on Cretaceous limestone, before the lake inside the cave; then feeds the aquifer under Cine Plain in the lateral direction of the underground. This is due to the hydrodynamic relationship, the level drops, and the underground lake in the cave in the dry season, directly affect the flow of underground water level in the cave resources and the plains. In the region, since the dry period entered into in 1984, due to intense demand for water, the number of the growing number of water drilling has reached 680 in 2014. By local people and various institutions, with drilling for years, recharge-discharge balance of the consideration were performed uncontrolled pumping. In this case, the underground aquifers and lakes in the cave indirectly, have created extreme stress, groundwater reserves are decreased a significant amount of time. Therefore, before the underground water level, after the Insuyu Cave Source of its average flow rate of 50 liters / sec (average 195 days a year) it started to fall rapidly and completely dried up since 1986. Extreme pumping of groundwater in the plain, because it continued to increase with each passing day, at the end of the dry season, even when it reaches the average value of precipitation, the amount of recharge aquifers have become unable to meet the amount discharged. Consequently underground lakes, they lose their natural level of seasonal oscillations are dried after a short time. The number of wells identified in the plains, in 1991 220, about 680 in 2014. In the plains, a maximum amount of water with to be pumped safely each year should be between 10,25x10^6 m^3 and 10,93x106 m^3. The groundwater budget accounts of the period October 1990-October 1991, the amount of groundwater use has been 17,79x10^6 m^3. This amount is about the same as every year. So about 7x10^6 m^3 more pumping is performed every year in CinePlain. This extreme groundwater use unless restricted, Insuyu to reach former levels of cave lake is not possible.

Key words: Insuyu cave; hydrogeology; Çine plain.

* Corresponding Author

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Assessment of the relation between design floods based on daily maxima and daily means: use of the POT approach in the Upper Nysa Kłodzka Basin (SW Poland)

Agnieszka Rutkowska [1]*, Patrick Willems [2], Tomasz Niedzielski [3]

[1] University of Agriculture in Kraków, Faculty of Environmental Engineering and Land Surveying, Department of Applied Mathematics, Balicka 253C, 30-198 Kraków, Poland

[2] KU Leuven, Department of Civil Engineering, Hydraulics Section, Kasteelpark Arenberg 40, 3001 Leuven, Belgium

[3] University of Wrocław, Institute of Geography and Regional Development, Department of Geoinformatics and Cartography, pl. Uniwersytecki 1, 50-137 Wrocław, Poland

ABSTRACT

The proper assessment of flood quintiles is crucial in Flood Frequency Analysis. A comparative analysis of design discharges estimated from daily maximum flows and daily mean flows for four mountainous catchments located in the Upper Nysa Kłodzka river basin (SW Poland) was carried out. The parameters of the Generalized Pareto distribution were estimated from the POT sample using the Hill statistic and bias correction. To assess the uncertainty of the predicted flood quintiles, the jack-knife approach was used. Results show that the difference between logs of maxima-based and means-based design discharges and between the rates of change of flood magnitude stabilises with increasing return period, decreases downstream and is high for catchments susceptible to flooding. Results can be used in practice when daily maximum discharges are not routinely recorded.

Key words: Flood frequency analysis; peak over threshold; hill statistic; bias correction, design discharge.

* Corresponding Author

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Comparison of 2D sediment transport models for assessing hydrodynamic and morphological conditions in Ucayali River and Pucallpa Port

Julio I. Montenegro Gambini *[1,2]

[1] University of Engineering, Lima, Peru
[2] Yacucamayoc Consultants Ltd. Lima, Peru

ABSTRACT

This research aims to evaluate the hydraulic properties and processes of erosion and sedimentation using two 2D hydrodynamic-sediment transport modes to study the Ucayali River in the Peruvian Amazon in a meandering zone close to Pucallpa port. We have used remote sensing techniques to assess plain morphodynamics and geomorphology implications, recognizing features that affects flow leading to a tendency to riverbank erosion and sedimentation processes. However with this time analysis and modelling, some changes will be denoted in the bed and we will be are able to note concentration of velocity patterns that could be a cause of future affections for Pucallpa port. During this work are denoted changes in the bed and the concentration of erosive velocities and shear stresses that affects a short and its effect on the bed and suspended load transport extending us a couple of kilometers upstream and downstream from the port to see potential impacts. To assess these processes, we applied CCHE2D model based on equilibrium bed load transport of uniform and no-uniform materials and TELEMAC making use of its the state of the art sediment transport and bed evolution module SISYPHE in order to study non-uniform cohesive sediments . Those models was calibrated using daily measurement campaigns for water levels and discharges carried out in the studied site as well as ADCP measurements. Size distribution of sediments was obtained by laboratory tests of field cohesive and non-cohesive samples getting settling velocities to set the model parameters. CCHE2D and TELEMAC were studied by the evaluation of model parameters sensibility in this study case, recognizing their capabilities and difficulties modelling this domain of a river meander. Once we had obtained qualitatively consistent results, it is necessary to propose infrastructure solutions or port operation measures and planning to set a fluvial equilibrium and get the best hydrodynamic and navigation conditions in Pucallpa port.

Key words: Meander; hydrodynamic; sediment transport; cohesive; morhpological.

* Corresponding Author

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Comparison of digital elevation models based on Radiometric and Synthetic Aperture Radar (SAR) products for hydrological evaluation purposes in flat to mountainous catchment range

Julio I. Montenegro Gambini *[1,2]

[1] University of Engineering, Lima, Peru
[2] Yacucamayoc Consultants Ltd. Lima, Peru

ABSTRACT

This research aims to evaluate the accuracy and quality of the DEM's generated by remote sensing ALOS-PALSAR (recientemente, SRTM (1 arc second) and Gdem ASTER versus the DEM obtained from contour lines digitized and measurements LIDAR taken as a baseline for hydromorphological extraction parameters. Thus it will be seen what the performance with radar information according to the study area to be used in the hydrological basin analysis. The information ALOS PALSAR has recently been released to the Peruvian territory and has chosen to evaluate it in the valley of Olmos for being a varied topography with areas of alluvial low slope dedicated to agriculture and other parties with prominent rugged terrain, where there are some villages in the lower parts prone to landslides or rockfalls. The digital elevation models, SRTM and Gdem ASTER have high correlation coefficients but some difficulties were encountered since some areas are out of the theoretical ranges of accuracy, due to the existence of various landforms such as mountains high slope. With the respective analysis will be what source DEM can be used to determine and estimate parameters at small scales and topographic features differences. Hydrologic estimation of peak values in both models presents similar values without much variability, DEM SRTM is the one that has much more confidence in the results time of concentration and considering high topographic variability.

Key words: ALOS-PALSAR; LIDAR; SRTM; ASTER; landforms.

* Corresponding Author

mess@mess-earth.org

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Stochastic management of open large water reservoir with storage function using genetic algorithm

Tomas Kozel *, Milos Stary

Brno University of Technology, Faculty of Civil Engineering, Institute of Landscape Water Management, Veveří 331/95 Brno, Czech Republic

ABSTRACT

Described models are used random forecasting period of flow line with different length. The length is shorter than 1 year. Forecasting period of flow line is transformed to line of managing discharges with same length as forecast. Adaptive managing is used only first value of line of discharges. Stochastic management is worked with dispersion of controlling discharge value. Main advantage stochastic management is fun of possibilities. In article is described construction and evaluation of adaptive stochastic model base on genetic algorithm (classic optimization method). Model was used for stochastic management of open large water reservoir with storage function. Genetic algorithm is used as optimization algorithm. Forecasted inflow is given to model and controlling discharge value is computed by model for chosen probability of controlling discharge value. Model was tested and validated on made up large open water reservoir. Results of stochastic model were evaluated for given probability and were compared to results of same model for 100% forecast (forecasted values are real values). The management of the large open water reservoir with storage function was done logically and with increased sum number of forecast from 300 to 500 the results given by model were better, but another increased from 500 to 750 and 1000 did not get expected improvement. Influence on course of management was tested for different length forecasted inflow and their sum number. Classical optimization model is needed too much time for calculation, therefore stochastic model base on genetic algorithm was used parallel calculation on cluster.

Key words: Stochastic; storage function; open water reservoir; genetic algorithm.

* Corresponding Author

mess@mess-earth.org

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Groundwater as main geomorphological factor: the Taranto area (South of Italy)

M. Dolores Fidelibus [1]*, Giuseppe Spilotro [2], Ilenia Argentiero [2], Roberta Pellicani [2]

[1] Dipartimento di Ingegneria Civile, Ambientale, del Territorio, Edile e di Chimica, Politecnico di Bari, Bari, Italy
[2] Università della Basilicata,Dipartimento delle Culture Europee e del Mediterraneo, Matera, Italy

ABSTRACT

The area of Taranto (Apulia region, Italy) has an extraordinary environmental and landscape value, which derives from its specific geological, geomorphological and hydrogeological conditions and represents the product of a complex mechanism of interaction with the sea, its variations and its stationing levels. The geological and stratigraphical setting is represented by terraced marine deposits, which cover the filling sediment of Bradanic Trough at S-SW and the western border of the Apulian carbonate platform at SE. The latter is an important hydro-structure, fed by rainfall, which borders on the NE side the Adriatic Sea and, therefore, freely spills in that direction according with the coastal aquifer model. While, on the W-NW side, the continued presence of an impermeable containment forces the underground drainage of the aquifer towards the Ionian Sea. The overall flow rate of the groundwater through submarine and subaerial coastal springs is significant and currently estimated in about 18 cm/sec. The sea level changes and stationing have been well placed, at the regional level, in correspondence of well-defined levels on the basis of the effects produced by the corresponding levels of karst in the inland areas and the coastal terraces. In the area of Taranto these changes in sea level resulted in active or fossil aquifer discharge points; the spill areas of the aquifer into the sea are associated with specific morphologies distributed at various altitudes. Several geological studies, accompanied by a significant number of stratigraphic and hydrogeological data and some datations, allowed an excellent reconstruction of such processes in the long term. While historical investigations allowed a significant recognition of such events in more recent ages (during the Little Ice Age), reported by different levels of hydrological activities in these areas. More generally, it is possible to recognize the conditioning morphogenetic power of groundwater in the study area, which shapes in a very characteristic terms the most widespread marine terraced morphologies.

Key words: Geomorphology; groundwater; sea level; karst; history; Taranto.

* Corresponding Author

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Temporal dissagregation for additive weather gage stations in Peru

Juan Walter Cabrera Cabrera *

Universidad Nacional de Ingeniería, Facultad de Ingeniería Civil, Lima25, Peru

ABSTRACT

For many years, "additive weather gage stations" existed in Peru; these were located in inaccessible places and only weekly or monthly records were taken, insufficient for certain hydrological analysis. This information deficit suggests the necessity for estimation of daily precipitation values based on the monthly record known. In this research characteristics of daily precipitation time series is analysed and based on them two possible methods for disaggregating data from monthly to daily scale are analysed. The objective of the methodology is to estimate the maximum daily precipitation per year, for this reason only the wettest months were studied. Data from 40 years of daily precipitation to January was used in this study. The first method divides the data of daily precipitation of the month in 31 daily series (one per day) and each one is analysed independently. These series showed a good fit to the incomplete Gamma distribution, regardless records with no precipitation. After estimate the probability of occurrence of zeros, generating random numbers permit to define the occurrence of precipitation or not for each day: in case of precipitation, the most probable value of the Gamma distribution determines the value of the precipitation that day. Finally, knowing the full month unbundled precipitation, accumulated precipitation is scaled with the value of historical rainfall for that month. The second approach assumes a one incomplete gamma distribution and adjusts historical data of the month, generating daily data randomly. Since both methodologies are based on random number generation can't describe the daily behaviour but seeks to estimate the maximum rainfall of it. This article presents the first results of its application in Peru.

Key words: Dissagregation; maximum rainfall; gamma distribution.

* Corresponding Author

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Relationship between drought occurrence and El Niño phenomenon in southern Peru: a copulas analysis

Juan Walter Cabrera Cabrera *

Universidad Nacional de Ingeniería, Facultad de Ingeniería Civil, Lima25, Peru

ABSTRACT

Southern Peru is a semiarid area with frequent occurrence of drought events. Causes are often attributed to the occurrence of El Niño Phenomenon however, this relationship has not been fully confirmed. This article analyses the possible relationship between the occurrences of drought with the occurrence of El Niño in southern Peru under a copulas analysis. For this purpose, the Standardized Precipitation Index is used for a period of three months (SPI3) as an indicator of drought and ONI3-4, ONI 1-2, ICEN and anomalies of surface temperature of the sea as indicators of El NIño Phenomenon occurrence. Copulas analysis will establish whether or not there relationship between the variables in analysis and can be used as a basis for the development of mitigation plans against the occurrence of droughts. The results show little relationship between the occurrence of droughts and the occurrence of El Niño; however, the methodology is shown robust enough to analyse other meteorological variables and seek to establish another indicator to forecast future occurrences of drought.

Key words: Droughts; copulas analysis; ENSO.

* Corresponding Author

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Evaluation of the quality of water harvested from roof catchments in different climate conditions

P. Pahlevani [1], Mohammad Taghi Dastorani [1]*, J. Tabatabaei Yazdi [2], M. Vafakhah [3]

[1] Ferdowsi University of Mashhad, Faculty of Natural Resources and Environment, Mashhad, Iran
[2] Iranian Rainwater Catchment Systems Association, Mashhad, Iran
[3] Tarbiat Modares University, Faculty of Natural Resources and Marine Sciences, Iran

ABSTRACT

Rainfall in urbanized areas dissolves suspended particles of the air and also washes out soluble contents of the roofs generally causing lower quality of run off. This contamination limits suitability of harvested water in different uses, and also increases water as well as soil resources pollution during a longer time period. Present research conducted to evaluate the quality of water harvested from residential roof catchments in two different urbanized areas located in different climate conditions and also with different resident population. The first place is located in metropolitan city of Mashhad in northeast of Iran with about 3.5 million population and arid and semi-arid climate condition, where the second place is located in the small town of Noor in north humid region of Iran with less than 30000 population. In both places required equipment were established and the run off resulted from rainfall events was diverted to the provided storages and totally 34 water samples (17 from each place) were collected just after occurrence of each rainfall event. Collected samples were analysed in laboratory to determine the most common heavy metals including Hg, Ni, Mn, Fe, Cu, Cr, Cd, Ba, B, As, Zn and Pb. Results showed that the amount of Ni, Cr, Cd, As and Pb in samples of Noor and the amount of Zn, Cr, Pb and As in samples of Mashhad are near zero and negligible. However, the concentration Hg in all samples of Noor and also in some samples of Mashhad is over the standard level. Concentration of Fe only in one of the samples collected in Mashhad is over the standard level.

Key words: Water harvesting; water quality; roof catchments; heavy metals; Mashhad; Noor.

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Artificial ground water recharge with surface water

Silvie Heviánkova [1]*, Marian Marschalko [2], Jitka Chromíková [1], Miroslav Kyncl [1], Michal Korabík [3]

[1] VŠB - Technical University of Ostrava, Faculty of Mining and Geology, Institute of Environmental Engineering, 17 listopadu 15, 708 33, Ostrava Poruba, Czech Republic
[2] VŠB - Technical University of Ostrava, Faculty of Mining and Geology, Institute of Geological Engineering, 17 listopadu 15, 708 33 Ostrava Poruba, Czech Republic
[3] Vodovody a kanalizace Vsetín, a.s., Jesenická 1106,75501 Vsetín, Czech Republic

ABSTRACT

With regard to the adverse manifestations of the recent climatic conditions, Europe as well as the world have been facing the problem of dry periods that reduce the possibility of drawing drinking water from the underground sources. The paper aims to describe artificial ground water recharge that may be used to dope underground sources with surface water from natural streams. Among many conditions, it aims to specify the boundary and operational conditions of the individual aspects of the artificial ground water recharge technology. The principle of artificial infiltration lies in the design of a technical system, by means of which it is possible to conduct surplus water from one place (in this case a natural stream) into another place (an infiltration basin in this case). This way, the water begins to infiltrate into the drinking water resources underground, while the mixed water composition corresponds to the water parameters required for drinking water.

Key words: Artificial ground water recharge; underground sources of drinking water; natural stream; drought; infiltration basin; water quality monitoring; pre-treatment.

* Corresponding Author

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Spatial analysis of water infrastructure development on the example of the Eastern Europe rural regions

Katarzyna Pietrucha-Urbanik *[1], Justyna Stecko [2], Agnieszka Pękala [3]

[1] Rzeszow University of Technology, 35-959 Rzeszów, al. Powstańców Warszawy 6, Poland
[2] Rzeszow University of Technology, 35-082 Rzeszów, ul. Podkarpacka 1, Poland
[3] Rzeszow University of Technology, 35-084 Rzeszów, ul. Poznańska 2, Poland

ABSTRACT

In the paper the assessment of water supply in rural areas in Poland was performed in aspect of future problems and the necessity of investments. The analysis proposed in this work is a helpful tool in making the ranking of the level of infrastructure development in different regions of the country. The assessment of the water supply network functioning is a very important issue that requires the use of operational experience with the practice of water supply. The analysis was based on data associated with the exploitation of water supply systems. Among others, to illustrate this diversity, the multidimensional comparative analysis was used. The developed analysis will enable decision support in the process of evaluating the economic efficiency of the operation of water supply infrastructure, through established indicators including the water network length development.

Key words: Water supply system; water infrastructure development; water supply condition assessment; rural areas.

* Corresponding Author

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A new methodology for the determination of the ecological flow with hydrometric data

Washington Sandoval-Erazo, David Carrera-Villacrés *, Marco Masabanda-Caisaguano, Evelyn Arce

Universidad de las Fuerzas Armadas-ESPE, Departamento de Ciencias de la Tierra y la Construcción Grupo de Investigación en Contaminación Ambiental (GICA), Av. Gral. Rumiñahui S/N, Sangolquí, Ecuador

ABSTRACT

Although there are several methods to calculate the ecological flow, however in Ecuador did not develop yet a technique that suits the reality of the national water systems. Therefore we proposed a new methodology to determine the ecological flow through hydrometric data such as minimum flows, average flow and monthly peak flows in a specific basin. The values obtained with the applied methodology are unique for the studied basin and do not correspond to a percentage flow. This is fundamental since engineers use a variety of methods and need to choose at its discretion the best fitting one.

Key words: Hydrological data; ecological flows; mass integral curve.

* Corresponding Author

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Hydrogeochemistry characterization of hot springs located in the Andes from Ecuador

David Carrera-Villacrés *, Alexander Hidalgo-Hidalgo, Paulina Guevara-García, María Vivero-Balarezo, Vicente Delgado-Rodríguez

Universidty of Fuerzas Armadas ESPE, a Universidad de las Fuerzas Armadas-ESPE, Departamento de Ciencias de la Tierra y la Construcción Grupo de Investigación en Contaminación Ambiental (GICA), Av. Gral. Rumiñahui S/N, Sangolquí, Ecuador

ABSTRACT

The formation of several sources of hot springs in the Andes from Ecuador is the result of intense volcanic activity due to the subduction of the Nazca oceanic plate under the South American continental plate. The aims of this study were to describe the hidrogeochemistry water geothermal origin, their chemical classification and their relationship with the complex geology of Ecuador, using different hydro chemical diagrams (Stiff, Piper and Schoeller-Berkaloff). Geothermal waters can be divided into two groups, the first group were associated with an extinct volcanic activity produced in the Cenozoic, these were qualified to the type of water Na^{+}-Cl^{-} , the second group were associated with a young activity Quaternary volcanic, the kind of water were Mg^{2+}-HCO_3^{-}, Na^{+}-HCO_3^{-}, Na^{+}-SO_4^{2-},Mg^{2+}-SO_4^{2-}.

Key words: Hydrogeochemistry; thermal waters; Stiff &Piper diagrams; Schoeller plot.

* Corresponding Author

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Artificial ground water recharge with surface water

Silvie Heviánková [1]*, Marian Marschalko [2], Jitka Chromíková [1], Miroslav Kyncl [1], Michal Korabík [3]

[1] VŠB-Technical University of Ostrava, Faculty of Mining and Geology, Institute of Environmental Engineering, 17 listopadu 15, 708 33, Ostrava, Czech Republic

[2] VŠB-Technical University of Ostrava, Faculty of Mining and Geology, Institute of Geological Engineering, 17 listopadu 15, 708 33, Ostrava, Czech Republic

[3] Vodovody a kanalizace Vsetín, a.s., Jesenická 1106, 75501 Vsetín

ABSTRACT

With regard to the adverse manifestations of the recent climatic conditions, Europe as well as the world have been facing the problem of dry periods that reduce the possibility of drawing drinking water from the underground sources. The paper aims to describe artificial ground water recharge (infiltration) that may be used to restock underground sources with surface water from natural streams. Among many conditions, it aims to specify the boundary and operational conditions of the individual aspects of the artificial ground water recharge technology. The principle of artificial infiltration lies in the design of a technical system, by means of which it is possible to conduct surplus water from one place (in this case a natural stream) into another place (an infiltration basin in this case). This way, the water begins to infiltrate into the underground resources of drinking water, while the mixed water composition corresponds to the water parameters required for drinking water.

Key words: Artificial ground water recharge; underground sources of drinking water; natural stream; drought; infiltration basin; water quality monitoring; pre-treatment.

* Corresponding Author

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Distribution and pollution characteristics analysis of heavy metals in surface sediment in Bi River

Qianrui Huang [1]*, Tomas Danek [2], Xianfeng Cheng [1], Tao Dong [3], Wufu Qi [1], Liling Zou [1], Xueqiong Zhao [1], Xinliang Zhao [1], Yungang Xiang [1]

[1] Yunnan Land and Resources Vocational College, Yunnan Kunming 652501, China
[2] VSB-Technical University of Ostrava, 17. listopadu 15,OSTRAVA, Czech Republic
[3] Ministry of Land and resources Kunming mineral resource supervision inspecting centre, Yunnan Kunming 652501, China

ABSTRACT

The author analyzes distribution characteristics of heavy metals' content in surface sediments of Bi River (Cu, Zn, As and Cd) and evaluates the potential ecological harm of heavy metal pollution in surface sediment by index method of potential ecological harm. Results show that heavy metals, such as Cu, Zn, As, Pb and Cd in surface sediments of Bi River are badly out of limitation. Especially, the heavy metals' content in Jinding mining area is far higher than the national first class standard. The content of heavy metal is still high in the intersection of Bi River and Lancang River, which have certain influence on the Lancang River sediment and its water system. And, Pb and Cd, as the main pollutants, should be regarded as a key research subject.

Key words: Pollution; heavy metals; surface sediment; Bi River; China.

* Corresponding Author

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Distributing characteristics of heavy metal elements in a tributary of Zhedong River in Laowangzhai gold deposit, Yunnan (China): an implication to environmentology from sediments

Shuran Yang [1]*, Tomáš Daněk [2], Xiaofeng Yang [1,3], Xianfeng Cheng [1,3]

[1] Yunnan Land and Resources Vocational College, 652501, Yangzonghai Scenic Area, Kunming, Yunnan Province, P. R. of China

[2] VŠB-Technical University of Ostrava, Faculty of Mining and Geology, Department of Geological Engineering, 17. listopadu 15, 708 33, Ostrava-Poruba, Czech Republic

[3] China University of Geosciences, 100083 Beijing, P. R. of China

ABSTRACT

Five heavy metal contents from five sediments and seven sediment profiles in an upstream reach of Zhedong river in Laowangzhai gold deposit were investigated in this research, along with analysis of the horizontal distribution, the surface distribution, the vertical distribution and the interlayer distribution of five heavy metal contents: arsenic (As), mercury (Hg), copper (Cu), lead (Pb) and zinc (Zn). The potential ecological risk of five heavy metals was evaluated to help understanding pollution control of Laowangzhai deposit.

Key words: Pollution; heavy metals; surface sediment; gold deposit; Zhedong River; China.

* Corresponding Author

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LIDAR data analysis with Digital Image Correlation (DIC) in obtaining landslide displacement fields: a case of Gschliefgraben Landslide-Austria

Remzi Eker *, Abdurrahim Aydın

Düzce University, Faculty of Forestry, Konuralp Campus, 81620 Düzce, Turkey

ABSTRACT

Comparison of LIDAR datasets were shown as useful in obtaining information about displacement fields of active landslides. Iterative closest point (ICP) and digital image correlation (DIC) are two main approaches used for this aim. Whereas ICP is based on precisely matching point-clouds, DIC is based on cross-correlation of remotely sensed digital imageries. Although DIC is a popular application in fluid mechanics for quantifying flow velocity, its successful applications in estimating displacements resulted from landslides are available. Studies indicate that DIC is more suitable than ICP when computing displacements in the order of magnitude of several meters. DIC is applied to any raster dataset representing a surface property considering the specific advantages and disadvantages of these techniques. In the present study, DIC was applied for an active landslide (named Gschliefgraben) located in Upper Austria. Two time series of LIDAR data obtained in 11th February 2008 and 28th April 2008 was used. The precision of DEMs with 1*1m raster cell size is 20 cm (horizontal) and 15 cm (vertical). Because Gschliefgraben is a big landslide system, DIC analysis was only made for small part of landslide area located close to the crown (head). This part was selected because more activation was observed between two series with visual inspection. Within the study area two separate active parts were observed. According to results, between two time series, the mean displacement rates in these more active parts within study area were obtained 0.66 m (max. 1.9 m) with sub-pixel precision image matching.

Key words: Digital image correlation; displacement field; landslide; LIDAR.

* Corresponding Author

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Contribution of the hydrogeological study in mapping the susceptibility of soil to liquefaction

Abida Haddouche *[1,2], Ouahiba Barca

[1] National Centre of Applied Research in Earthquake Engineering (CGS), Rue Kadour Rahim Prolongée B.P. 252 H-Dey, Alger

[2] University of Sciences and Technology Houari Boumedienne (USTHB), BP 32 El Alia, Bab Ezzouar – Alger

ABSTRACT

The phenomenon of soil liquefaction during an earthquake may cause considerable damage which can be devastating in some cases. The geotechnical literature describes soil liquefaction as a geological phenomenon generally brutal and temporary, in which a water-saturated soil loses some or all of its lift. This soil appears suddenly lose much of its resistance to shearing and flows in a similar manner to a viscous fluid, hence the term of liquefaction. When such phenomenon occurs, buildings or structures based on liquefied soil will be destabilized (lateral movement and tilting buildings, dam failure). This phenomenon is generally observed in the case of sandy soils in the presence of groundwater rising to the surface, subjected to a fast solicitation, such as earthquakes, tidal waves, explosions, etc. The presence of water at a certain depth is one of trigger-elements of the liquefaction phenomenon. Thus, the hydrogeological study focuses on the estimation of the thickness of the emerged land between the topographic surface and the groundwater existing in the region. An example of application was realized in the same region of Algiers (Algiers - Algeria). The map of soil susceptibility to liquefaction, developed using GIS, shows that the sands of beach, dunes and recent alluvial deposits, with a shallow water level is the most disposed area to the liquefaction phenomenon.

Key words: Hydrogeology; liquefaction; GIS.

* Corresponding Author

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Evaluation of seismicity using density analysis of 2000-2015 earthquakes in the west coastal zone of Anatolia (Turkey) and its correlation with geothermal areas

Ozde Bakak *

Dokuz Eylül University, Graduate School of Natural and Applied Science, Geothermal Energy Department, Turkey

ABSTRACT

The purpose of this study is to evaluate the earthquake activity using the density analysis methods for 2000-2015 earthquake catalogue in Western Anatolia (Turkey), to apply for its correlation with geothermal regions. Study area is surrounded by Çanakkaleto thenorth, Fethiye to the south and Denizli (Buharkent) to the east. There are important provinces as Edremit,İzmir, Aydın, Manisa, Muğla, Bodrum etc., and also in Edremit, Aliağa, Gülbahçe, Balçova, Seferihisar and Muğla geothermal areas. The earthquake catalogue, which consists of 6.675 earthquakes and3<M magnitudes were obtained from Prime Ministry Disaster & Emergency Management Authority (AFAD) website. In this paper, all analysis and maps was prepared using ArcGIS_10.1 program. Records were converted to this program which based on Geographic Information System (GIS). The earthquake depths are classified as the shallow earthquakes for ranging from 1 km to 140 km. The most depth earthquakes were determined in outside of Gökova Gulf.Data was applied to the density analysis (point density and Kernel density). However, to investigate of relationship between fault and seismicity, firstly fault lines, which are classified active faults and inactive faults were obtained from Emre et al., (2013), were digitized, after then these digitized faults were applied to buffer analysis for specific distance. In looking at the historical earthquakes distribution maps an earthquake clusters is shown to dominate in between Midilli Island and Karaburun Peninsula, Samos Island and Gulfs of Sığacık and Gökova, Kuşadası and Edremit. But the most important clusters are in Sığacık and Gökova Gulfs. The point density analysis shows that the direction of earthquakes distribution generally related with the direction of faults in region. Some clusters located in near of geothermal areas as Aliağa, Gülbahçe, Seferihisar, Bodrum fields. It is thought that this earthquake series triggered by the active/inactive faults, not by the geothermal procces (enjection and re-enjection of hydrothermal water). Furthermore, 2015 population map of study area was prepared using the Inverse Distance Weigted (IDW) method, which is be one of the interpolation methods in program tools, for more clearly demonstrate of both importance and impact of the earthquakes in this region. Seferihisar, Urla, Güzelbahçe, Gülbahçe and Demircili, whose population are changing from 64.000 to 140.000, and the eastern coastal zone of Sığacık Gulf and Bodrum, whose population is 155.815, are also identified as areas having high seismic activity for the last 15 years.

Key words: West Anatolia; earthquakes; geographic information system; geothermal areas; seismicity; density analysis.

* Corresponding Author

mess@mess-earth.org

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Hydrological approach to the typhoon flood disaster by the 4th grade students, Kawatanaka primary school, Yoshinogawa, Tokushima, Japan

Sanae Kawamata [1]*, Mamotu Murata [2]

[1] Hyogo University of Teacher Education, The Joint Graduate School (Ph.D.Program) in Science of School Education, Japan

[2] Naruto University of Education, Department of Geosciences, Japan

ABSTRACT

The typhoon No. 18 attacked the Yoshinogawa city, middle Tokushima prefecture on 15th, September, 2013. Totally 228 mm of rain fell in a day and caused heavy flood damage, although the Kawata River, raised bed river, did not overflow its banks. The underflow channel of Kawata River flowed forcefully on the playground of the Kawatanaka primary school. On the next day, current marks from 625 holes, 30 cm to 1 mm in diameter, on the ground were observed. The flow current showed direction from SE to NW. When the 4th grade students observed the current, they considered the ground tilted based on the knowledge that water runs from high to low. They made three kinds of levels as their homework to make their hypothesis sure; plastic bottle with water, plastic bottle with marble, and corrugated carton track for marble. The homemade levels showed that the ground had a tilt to NW with 1 to 2 degrees. The students expected the flood disaster would occur in the lower altitude above sea level and confirmed the direction of water flow with their levels and topographical map. The Kawata River is a raised bed river and its river bed is 36.7 m with banks to 40.5 m above sea level. The heavy rain did not destroy the banks but made the river level 39.4 m high and then pressed the underflow channel. As the Kawatanaka primary school is situated on 36.2 m high, it was not submerged although the underflow channel overbanked on the ground. However the area below 31.7 m high was submerged. The students also examined the transition of village by the comparison between older and the latest topographical maps, and revealed that people shifted their houses to lower land which were often submerged. They briefed their parents and neighbours about the prevention and reduction of the flood disaster. They were impressed by the presentation of their children, and requested the Tokushima prefectural office for the prevention of flood disaster and clearance of the river from debris. Finally, the Tokushima prefectural office dredged out sludge from the river.

Key words: Hydrological approach; typhoon; flood; disaster; primary school.

* Corresponding Author

mess@mess-earth.org

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Landslide susceptibility mapping by using Logistic Regression (LR) and Artificial Neural Networks (ANN): the eastern part of the Gallipoli Peninsula (Turkey)

Gulseren Dağdelenler [1]*, Hakan A. Nefeslioğlu [2], Candan Gökçeoğlu [1]

[1] Hacettepe University, Department of Geological Engineering, 06800 Beytepe, Ankara, Turkey
[2] Akdeniz University, Faculty of Engineering, Department of Geological Engineering, 07058, Antalya, Turkey

ABSTRACT

Recently, the most important phase of the studies to minimize the losses and damages sourced from landslides is the production of landslide inventory and landslide susceptibility map of the area to be studied. The purpose of this study is to produce landslide susceptibility map of the Eastern part of the Gallipoli Peninsula by using Logistic Regression (LR) and Artificial Neural Networks (ANN) methods based on Geographic Information System (GIS). For this purpose, landslide inventory map of the study area was first prepared by using the detailed field studies, the aerial photos and the Google Earth satellite images, and a total of 211 landslides were mapped. Based on the results of the detailed field studies, preliminary parameters causing landslides were considered in three stages as topographic parameters, lithology and land-cover. In order to obtain landslide database, landslide mass sampling model, commonly used in the literature, was used by forming three different randomly selected sampling data sets. Then, logistic regression (LR) and artificial neural network analyses (ANN) were used for susceptibility mapping of the model. Performances of the maps produced for 3 different random sampling sets (Rnd1, Rnd2 and Rnd3) using LR and ANN were evaluated by determining the area under ROC curve (AUC) values. For verification of the models' performance for 3 different random sampling sets, the areas under curve (AUC) values were calculated as 0.801, 0.802 and 0.781 for LR model, and 0.852, 0.851 and 0.849 for ANN model respectively. Accordingly, it was observed that the AUC values of the randomly selected sampling sets of both models gave the satisfactory results and based on the results the prediction capacity of the ANN model used for the landslide susceptibility of the study area was considered higher than LR model.

Key words: Landslide inventory, susceptibility; Gallipoli Peninsula; Logistic Regression (LR); Artificial Neural Network (ANN); Area Under ROC Curve (AUC).

* Corresponding Author

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Flood risk analysis and mapping using GIS: Fethiye-Cerci River (Turkey)

Guzin Akin [1], Oznur Karaca [2]*, Mustafa Bozcu [2]

[1] Cumhuriyet Dist. Cile St. No:4/3 Kartal, İstanbul, Turkey.

[2] Canakkale Onsekiz Mart University, Department of Geological Engineering, Terzioglu Campus, 17020, Turkey

ABSTRACT

Floods are one of the most damaging natural hazards due to its devastating effects. Floods damage to environment and effect socio-economic life of people around the world. Parallel to the growth of population the unplanned urban growth also increases the risk of floods. One of the ways of protection from flood damage is to know the flooding area and its risk. For this purpose one of the best methods is the preparation of flood risk maps. There are many methods for the preparation of flood analysis and risk maps. Since there are several different factors that can cause flooding, Multi-criteria Decision Analysis (MCDA) makes it easy to evaluate all the criteria together and mutually for decision makers. MCDA is based on the assessment of different data regarding their risk status. Spatial distribution of various risks for a region can be showed on a map prepared using MCDA. In this study the flood potential of Cerci River located in the north of Fethiye was investigated. Fethiye is situated in the southwest of Turkey. GIS-based multi-criteria risk analysis applied to the study area in order to decide more accurate decision to define the flood potential of Cerci River. The causative factors taken into account to evaluate the flood risk of the region are geological, geomorphological and hydrological properties of the study area. Processes were performed using the Spatial Analysis module of the ArcGIS 10. The flood risk map was carried out using six parameters such as geology, elevation, slope, aspect, land use and proximity to the river. Sub-criteria were defined for each main parameter and weight values of sub-criteria of the criterions were calculated. Then, susceptibility analysis was performed using weighted overlay method. Based on the results, vulnerable areas for the flood were determined on the risk map. The region was divided into 5 categories from very low risky (1) to very high risky (5). Risk categories classified in this map include useful data for urban planning.

Key words: Fethiye; flood risk; GIS; multi-criteria; weighted overlay method.

* Corresponding Author

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Seismotectonic analysis of the Olekma-Stanovoy region, South Yakutia (paleoseismogeological aspects)

A.N. Ovsyuchenko [1], Valery S. Imaev [2,3]*, E.A. Rogozhin [1], A.S.Larkov [1], S.S.Novikov [1], L.P. Imaeva [2], N.N.Grib [4]

[1] Schmidt Institute of the Earth's Physics RAS, Building 1, 10 Bolshaya Gruzinskaya street, Moscow, Russia
[2] Institute of the Earth's Crust, Siberian Branch of RAS, 128 Lermontov street, Irkutsk, Russia
[3] Diamond and Precious Metals Geology Institute, Siberian Branch of RAS, 39 Lenin prospect, Yakutsk, Russia
[4] Technical Institute (Branch) of the North Eastern Federal University, 16 Kravchenko, Neryungri, Russia

ABSTRACT

Geological, tectonical and seismological studies carried out in South Yakutia for more than 50 years revealed seismogenerating structures in the interaction zone of the Eurasian and Amur lithospheric plates (Imaev et.al, 2000). The structures traceable within the Lena-Amur interfluve, between 50°and 60°N, extendi ngeastwestward as a wide (up to 400 km) seismic band over a distance of 3000 km from Lake Baikal, through Transbaikalia, South Yakutia and Priamuria, to the Sea of Okhotsk. The zone of plate interaction is bordered on the north by the Baikal-Stanovoy seismic belt (BSB) extending eastwestterly from Lake Baikal along the southern margin of the Siberian platform, through the Stanovoy highlands in Transbaikalia, the Stanovoy Range and the Aldan-Uchur plateau in South Yakutia, to the Sea of Okhotsk. The BSB combines the events of the Baikal rift zone (BRZ) in the west and the Olekma-Stanovoy zone (OSZ) in the east. During nearly the 50-year period of instrumental observations, more than 150 thousand events with M ≥2 were reported from the BRZ and over 40 thousand from the OSZ. The southern boundary of the plate interaction zone is marked by an epicentral cluster extending eastwestward from Northern Mongolia, through East Transbaikalia along the Tukuringra-Soktakhan-DzhagdyRanges in Priamuria to the Sea of Okhotsk. Most active within this boundary, the Tukuringra-Dzhagdy seismic zone (TDZ) is most active. It is located 200 km to the south of the OSZ and extends parallel to it between 54°and 55°N to the east of 120°E. Some eight thousand seismic events were detected in the zone over the 40-year period. According to the focal mechanism solutions, motions in the earthquake foci within the OSZ and TDZ are of left-lateral strike-slip, thrust and reverse fault nature (Imaev et al., 2000; Imaeva et al., 2007; 2008; Mackey et al., 2003). The NS-trending Temulyakite-Dzheltula seismic band (almost 3,000 events) crosscuts the study area between 120°and 125°E from the Lena River along the left bank of the Olekma River and its right-side tributary Nyukzha, through the Amur River valley, into the Lesser Khingan Range in China. The band divides the zone of interaction of the Eurasian and Amur lithospheric plates into two blocks – Transbaikalian – from LakeBaikal up to the OlekmaRiver and the Aldan-Stanovoy – from Olekma to the Sea of Okhotsk (Imaeva et al., 2007; 2008). In the described seismotectonic setting, the relationship between the regional faults and the foci of associated strong seismic events, as well as the present-day tectonic stress fields are be studied in detail based on the focal mechanism solutions of earthquakes and geological and structural observation data, as well as the data on the system of plates and blocks in Pribaikalia, Priamuria and South Yakutia.

Key words: Seismotectonic; focal mechanism solutions; geological and structural observation; Olekma-Stanovoy region; South Yakutia.

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Spatial analysis of 2000 – 2016 earthquake catalogue in SW Anatolia

Ozde Bakak *

Dokuz Eylul University, Graduate School of Natural and Applied Science, Geothermal Energy Department, Izmir, Turkey

ABSTRACT

South-western Anatolia is one of the most tectonically active areas of Mediterranean. Region experienced a transition from crustal shortening to extension, and its evidence was recorded in four distinct basin types in the Muğla-Gökova Gulf regions. Based on the focal depth and fault plane solutions of the earthquakes (Ms≥4) occurred in the region from 2000 to 2006, it is observed that shallow earthquakes associate with W-E trending normal fault planes, whereas the deep earthquakes associate with the oblique to strike-slip fault planes. After 2015 Gökova earthquakes, region has become the focus of attention of many researchers. The aim of this study is to is evaluated earthquakes and seismicity with spatial and density analysis (point and Kernel) using ArcGIS (version 10.1) software program. Study area consist Bodrum, Datça, and Marmaris cities and Gökova Gulf which is one of the greatest graben systems in Western. The geographic boundaries of this area are longtitude: 26.6737 - 28.8713 and latitude: 36.4002 - 37.3731. The earthquake catalogue, which consists of 1.740 earthquake data occurred from 01.01.2000 to 23.05.2016 and 5.3 > M > 3 magnitudes, were taken from the DDA Catalogue of Prime Ministry Disaster & Emergency Management Authority (AFAD) official website. Earthquakes were occurred in 0–140 km depth, but dominated in 0–40 km depth, and also the deepest earthquakes were dispersed towards out of the Gökova Gulf. To spatial analysis, earthquake points were transferred to program and applied to the mean centre, the weighted mean centre, the standard distance, the weighted standard (added magnitude values as weight field) distance, and the standard deviation ellipse analysis. Earthquake values were grouped two categories as little earthquakes (4,99> M > 3) and middle earthquakes (5.3 > M). Middle earthquakes were obtained in Gökova Gulf. At the same time, as density analysis; Point and Kernel density analysis was made for earthquake catalogue. To investigation of relationship between fault and seismicity, digitized fault lines such as land or submarine faults transferred to using program (geographic coordinates of onland faults were obtained from Emre et al., 2013 and submarine faults from İşcan et al., 2013), after then buffer analysis was applied for specific distance. In the light of all analysis results; 1) mean center with median center points are very closely to each other, 2) standard distance and weighted standard distance is similar because of earthquake points and magnitude values are situated in nearly to each other, 3) standard deviation ellipse direction is NE-SW, and this direction is showed similarity with the directions of Gökova and Datça Faults in region, 4) Point analysis reveals earthquakes were dominated in Gökova Gulf, Gökova and Bodrum provinces, and as a latest analysis; 5) Kernel analysis map (added magnitude values as population field) has been grouped as low, middle, and high density values. The highest values symbolized the Gökova Gulf, the coastal zones of Bodrum and Gökova. Consequently these regions have been interpreted as a region having high seismic activity according to the results of spatial analysis for latest 16 years.

Key words: Southwestern Turkey; Gokova Gulf; seismicity; earthquakes; geographical information system (GIS); spatial analysis.

* Corresponding Author

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Testing the performance of Earthquake Early Warning System in India

Himanshu Mittal [1]*, Yih-Min Wu [1,2], Benjamin Ming Yang [1] , Cédric P. Legendre [1]

[1] National Taiwan University, Department of Geosciences, Taipei-106, Taiwan

[2] National Center for Research on Earthquake Engineering, National Applied Research Laboratories, Taipei-106, Taiwan

ABSTRACT

The main goal of present study is to test the functionality of earthquake early warning (EEW) system in India using the recorded earthquake data from Taiwan. In recent time, India set up an EEW system in central seismic gap (CSG) along Himalayan belt, consisting of 100 low-cost P-alert instruments. The area, where these instruments are installed is highly sensitive to seismic risk with possible occurrence of higher magnitude earthquake. Some higher magnitude earthquakes occurred along this belt in past 200 years, but few recorded waveforms are available from these historical earthquakes. In absence of data, we take advantage of recorded waveforms from Taiwan, to test EEW system. We took advantage of a well-established EEW system in Taiwan using similar instrumentation to test the EEW system in India. We selected the Taiwanese stations in well accordance with the Indian sensor network, to have a good match in term of distance between the stations. This selected grid of Taiwan instruments is transferred into Indian coordinates. Finally the recorded waveforms are passed through Earthworm software using tankplayer module. The performance of EEW system is judged according to time taken by system in issuing warning after the confirmation of occurrence of damaging earthquake and the lead time (time interval between the issuing of warning and arrival of damaging earthquake at a particular location). This lead time varies from couple of seconds to tens of second at different locations according to distance from epicentre. The system performs very well in terms of earthquake detection, P-wave picking, earthquake magnitude and location (using previously estimated regressions). Finally the performance of system is checked in terms of EEW warning. High lead times are obtained for the plainer regions, which are the main target of EEW system.

Key words: EEW; P-alert; Himalayan belt; Taiwan; earthworm; lead time.

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Analysis of long term radon time series data for earthquake precursory studies in Taiwan

Vivek Walia [1]*, Arvind Kumar [1], Ching-Chou Fu [2], Shih-Jung Lin [1], Tsung-Han Jimmy Yang [1], C-H Chen [3], Kuo-Liang Wen [1,4]

[1] National Center for Research on Earthquake Engineering, NARL, Taipei-106, Taiwan
[2] Academia Sinica, Institute of Earth Sciences, Taipei-115, Taiwan
[3] National Taiwan University, Department of Geosciences, Taipei-106, Taiwan
[4] National Central University, Department of Earth Sciences and Institute of Geophysics, Jhongli-320, Taiwan

ABSTRACT

The present investigations aim at developing an effective earthquake precursory system from the long term radon data soil-gas data obtained from a network of soil-gas monitoring stations covering NW, SW and eastern Taiwan. Over the last few years, we have established geochemical observatories along the Hsincheng fault in the Hsinchu area, Hsinhua fault in the Tainan areas, and at Jaosi in the Ilan areas of Taiwan. An automated real-time database operating system has been developed to improve the data processing for earthquake precursory studies. We have applied a number of statistical approaches to quantify the influence of single or all meteorological parameters either on time-series soil-gas radon or other precursor's parameters. The present study is also aimed at the appraisal and filtrations of these environmental/meteorological parameters and to create an automated real-time database for earthquake precursory study. During the observation period of 2015, about 34 earthquakes of magnitude ≥ 5 were recorded and out of these, 16 earthquakes fell under the defined selection criteria and were tested in the proposed model. From all the monitoring station data it has been found that Jaosi monitoring station has recorded the maximum number of earthquakes whereas Hsincheng monitoring station has the highest efficiency. It has also been found that 3 earthquakes lie in the common influence area of all the monitoring stations. Out of these, 2 earthquakes happened to have precursory signals which can be correlated with the occurred earthquake whereas one earthquake has shown precursory signals at Hsincheng and Hsinhua monitoring stations.

Key words: Radon; soil-gas; earthquakes; real-time; data base.

* Corresponding Author

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The earthquake of Boumerdes (Algeria) May 21, 2003 (Mw = 6.8): The field observations and preliminary microzonation map based to liquefaction potential susceptibility in the city of Isser (Northern Algeria)

Hamid Bourenane [1,2]*

[1] CGS, Centre National de Recherche Appliquée en Génie Parasismique, 1 Rue Kadour Rahim, H. Dey, Algiers, Algeria
[2] FSTGAT, Université des Sciences et de la Technologie Houari Boumediene Bab Ezzouar (USTHB), Algiers Algeria

ABSTRACT

The Isser city is located on Northern Algeria at a region that is characterized as high seismicity zone due to the fact that moderate to high events occurred during the last century. During the main shock of the 21 May 2003 earthquake (Mw=6.8), liquefaction was widely observed in the area of Boumerdès where the geological, geotechnical and hydrogeological conditions are most favourable. The present work is a part of a microzoning study of the city of Isser based on liquefaction susceptibility mapping under GIS witch aim to identify potential areas for liquefaction susceptibility in the case of strong earthquake on the basis of geologic, geotechnical and seismicity data. Results will be presented as maps showing the hazard levels for geological effects. The results of the study show that the city of Isser should be considered as a moderate to high liquefaction area. Liquefaction hazard maps are useful tool for slope disaster management and planning development activities in the Boumerdès region.

Key words: Isser; liquefaction; susceptibility; mapping; microzonation; GIS; Algeria.

* Corresponding Author

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Mapping surface features produced by an active landslide

Mario Parise [1]*, Erwan Gueguen [2], Carmela Vennari [1,3]

[1] CNR-IRPI, Via Amendola 122-I, 70126, Bari, Italy
[2] CNR-IMAA, Tito Scalo, Potenza, Italy
[3] University of “Federico II”, Napoli, Italy

ABSTRACT

A large landslide (affecting a total area of about 3.0×105 m2) occurred on December 3, 2013, SW of Montescaglioso, a town located in the Matera Province of southern Italy. The slope movement was registered in a setting characterized by widespread development of landslides of different typologies, and showing different states and styles of activity. In particular, the slope affected by the new landslide is characterized by several morphologies related to ancient gravitational movements, as also reported in previous works and maps, including the official geological map produced during the 1950’s. The re-activation occurred after 56 hours of continuous rainfall, from 30 November to 2 December, with a cumulated rainfall measured at a rain gauge located 8 km from Montescaglioso of 151.6 mm, and mean rainfall intensity equal to 2.7 mm□h-1. It has to be noted that two months before the landslide event, between 5 and 8 October 2013, the general area between Apulia and Basilicata, including the town of Montescaglioso, was struck by a heavy rainfall event (cumulated rainfall = 246 mm, mean rainfall intensity = 3.6 mm□h-1), that caused widespread flooding, numerous shallow landslides, severe economic losses, and four fatalities. The December 2013 landslide damaged the freeway connecting the town of Montescaglioso to the Province road SP175, disrupting more than 500 m of the road; further, it involved a few warehouses, a supermarket, and private homes. Immediately after the landslide event, we performed field surveys to evaluate the main consequences of the landslide, and to compile a map of the surface deformation in the landslide area, following a methodology already used in several other cases in the past. The field surveys were aided by the visual analysis of post-event terrestrial photographs, and photographs taken during helicopter flights. The geomorphological features mapped in the field and through the inspection of the terrestrial and the helicopter photographs included single fractures, sets of fractures, tension cracks, trenches up to 6 m in depth/width, and pressure ridges. Many of the geomorphological features mapped immediately after the landslide event were later destroyed by the construction of temporary roads. In this paper we present the methodology used, the map obtained through the intensive field work, and discuss the main features of deformation produced by the landslide at the surface.

Key words: Landslide; mapping; surface deformation; cracks; trenches.

* Corresponding Author

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Implementation of a Web-based Geo-visualization System for Meteorological Disaster using Numerical Weather Prediction Data

In-Hak Kong [1], Hong-Joong Kim [2], Jae-Ho Oh [2], Yang-Won Lee [1]*

[1] Pukyong National University, Department of Spatial Information Engineering, Busan, South Korea
[2] Pukyong National University, Department of Environmental Atmospheric Sciences, Busan, South Korea

ABSTRACT

Meteorological disasters caused by localized heavy rain, heat wave, strong wind, cold wave or fog result in socioeconomic damage and human casualty. To prevent this beforehand, we need a standardized visualization system of meteorological disaster based on effective weather prediction data that can be used by local government. Currently, we can produce forecasts data with various numerical models or climate models, but we still lack development on visualization of meteorological disasters. Therefore, we need to implement multi-platform software system that can run on many different computer platforms. In addition, we can implement a new form of web application through mash-up using open source based map API and Javascript library. The objective of this study is to implement a multi-platform environment in which the forecasts produced by climate model can run on various platforms and a system which can immediately process the meaning of the data and make decision through data visualization. We implement the cross-browsing using HTML5, the data visualization to display charts using D3.js Javascript library and the web application through the mash-up using the map API and other visualization library. The basic functions are composed of today's weather situation, current situation of meteorological disaster, change of meteorological disaster risk. Today's weather situation will provide general weather warning for each region. Current situation of meteorological disaster will show detailed degree of the disasters. Change of meteorological disaster risk will be consisted of a diagram that shows the change of risk by time in one sight. We will implement the Meteorological disaster prediction system that can minimize the damage by meteorological disasters and prepare to the disasters through the visualization of weather forecasts. Furthermore, the standard web application on meteorological disaster is required. We expect it will contribute to preparing for meteorological disasters through forecast

Key words: Meteorological disaster prevention; visualization; numerical forecast.

* Corresponding Author

mess@mess-earth.org

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Documentation of the landslide distribution based on field investigation in Neelum Valley area, Lesser Himalayas, Pakistan

Muhammad Basharat *, Sohail Ahmad Khan

University of Azad Jammu and Kashmir, Institute of Geology, Muzaffarabad, Pakistan

ABSTRACT

The presented study deals with the documentations and landslide distribution analysis in Neelum Valley area, Lesser Himalayas, Pakistan. The main focus of this work was to document the landslides occurred in the study area and analyse the relationships between landslide distribution and various factors such as lithology, slope angle, vegetation, stability and triggering factor. In addition, landslide inventory map of the study area was produced. For this purpose, ground based field investigations was used to map these landslides. In total, 83 landslides were documented and classified into five types such as “rock slide, rock falls, debris falls, debris slide and earth flow. The analysis suggests that the diverse geological, tectonic and morphological conditions control the extent and distribution of these landslides. The distribution analysis indicates that mostly landslides triggered due to human activity. The results show that the occurrence of landslides was high in Precambrian Tanol Formation as compared to the other geological units. Moreover, the maximum landslides occurred at slope angle between 30-45 degrees.

Key words: Lesser Himalaya; Neelum Valley; landslide distribution; lithology.

* Corresponding Author

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Use of solid state nuclear track detector for integrated radon –thoron monitoring in Tatun Volcanic Areas of Northern Taiwan for seismic and volcanic study

Arvind Kumar [1]*, Vivek Walia [1], Tsanyao Frank Yang [2], Shih-Jung Lin [1], Cheng-Hong Chen [2], Kuo-Liang Wen [1,3]

[1] National Center for Research on Earthquake Engineering, National Applied Research Laboratories, Taipei, Taiwan
[2] National Taiwan University, Department of Geosciences, Taipei-106, Taiwan
[3] National Central University, Department of Earth Sciences and Institute of Geophysics, Jhongli, Taiwan

ABSTRACT

In the present solid state nuclear track detectors (SSNTDs) technique has been used for the measurement of radon-thoron concentrations in soil gas for volcanic and seismic study in Taiwan. Before deploying the SSNTDs set ups in actual field measurements of radon-thoron concentrations in soil gas for volcanic and seismic study, these SSNTDs set ups had been calibrated in the laboratory.
In order to study radon-thoron in volcanic areas, radon-thoron discriminators along with LR films has been installed in Hsiaoyoukeng (SYK), Dayoukeng (DYK), Bayen (BY) and Gungtzeping (GTP) of Tatun Volcanic areas in a hole (about 50 cm depths) having different temperatures for a defined period (bi-weekly to monthly). Radon behavior observed is different at above said sites in the volcanic areas of northern Taiwan. The thoron concentration recorded in the study area is very low, so we have stopped the thoron monitoring. The observations have shown potential precursory signals for some earthquakes that occurred during the observation period having an epicenter in and around the TVG. We are also monitoring radon using SSNTDs along with active detectors (RAD 7) in Bayen (BY) area of Tatun for comparative study. This paper presents the possible fluctuations and radon behavior due to seismic events and volcanic eruptions at selected suitable sites for integrated radon monitoring in details.

Key words: Radon; thoron; LR-115 films; discriminative cup; tatun volcanic areas.

* Corresponding Author

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Updating landslide inventory maps in Turkey using Satellite SAR Interferometry

Milan Lazecky [1]*, Fatma Canaslan Comut [2], Sule Gurboga [3]

[1] IT4Innovations, 17. listopadu 15, 708 33 Ostrava-Poruba, Czech Republic
[2] AFAD Denizli, Turkey
[3] MTA Ankara, Turkey

ABSTRACT

There are different types of slope deformations existing in the world. They can be classified based on the velocity of their movement. After a fast landslide takes place on a site, the affected slope may keep its unstable behaviour. It would be called an „active landslide“. National landslide inventories very often recognize between non-active and active landslides. However it is not a straightforward task to recognize the slope activity in practice. Satellite SAR interferometry is a modern technology offering a high sensitivity for identifying terrain movements. The SAR signal is affected by too many sources in natural terrain, very often causing the estimated amounts of a movement unreliable. However, characteristics of the technology offer a qualitative information, that is – is the observed slope moving or not? The sensitivity for movement can reach a millimetre (in favourable conditions). Using Sentinel-1 satellite data, the task to detect slowly moving slopes in regional or even a national scale is possible, economically available and reliable, with limitations based on slope orientation towards the satellite track, landslide size and amount of dense vegetation over the observed slope. The landslide activity detection results can be a useful source of information for risk management and geology facilities interested in updated landslide inventory maps. This work shows results from semi-automatic processing of Sentinel-1 data over selected landslide areas in Turkey and demonstrates its potential for updating landslide activity and potentially an identification of unknown creeping landslides.

Key words: SAR Interferometry; landslide inventory; landslide detection.

* Corresponding Author

mess@mess-earth.org

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Lessons from a M=7.2 seismic event and how to preserve awareness forty years later: the case of the Vrancea, Romania, March 4, 1977 earthquake

Iolanda-Gabriela Craifaleanu [1,2]*, Emil-Sever Georgescu [1], Claudiu-Sorin Dragomir [1,3], Daniela Dobre [1,2]

[1] National Institute for Research and Development in Construction, Urban Planning and Sustainable Spatial Development, "URBAN-INCERC" and European Centre for Buildings Rehabilitation, ECBR, 266 Pantelimon St., Sector 2, Bucharest, Romania

[2] Technical University of Civil Engineering Bucharest, 124 Lacul Tei Blvd., Sector 2, Bucharest, Romania

[3] University of Agronomic Science and Veterinary Medicine Bucharest, Romania, 59 Marasti Blvd., Sector 1, Bucharest, Romania

ABSTRACT

Almost forty years ago, on March 4, 1977, a MG-R=7.2 (Mw=7.4) earthquake hit Romania, producing over 1,578 victims (of which 1424 in the capital city, Bucharest), more than 11,300 wounded and damage to about 32,900 of buildings. Losses were evaluated to around two billion US dollars and significant perturbations were induced to the entire socio-economic and industrial system of the country. In the following years, in 1986 and 1990, three other seismic events with magnitudes larger than 6 occurred, these being generated, like the 1977 earthquake, by the Vrancea source, located at the Carpathian arc bent. Today, even though the population fears a new strong earthquake, awareness on preparedness and mitigation measures is rather low. After each strong seismic event, the National Institute for Building Research, INCERC, played an important role in data collection and organization, damage and loss assessment, data processing and interpretation, as well as in the elaboration of new seismic codes, incorporating lessons learnt following the earthquakes. Besides the ground motion records from its seismic network, distributed all over the country, INCERC collected a considerable amount of information about earthquake effects on built environment and on lifelines, geological effects etc. This information is invaluable today, as a basis for the assessment of potential urban and geological vulnerabilities in future earthquakes, and for evaluating the implications for the present and future seismic risk of the country. Nonetheless, it will represent an educational resource for university students and young professionals in the field of civil engineering, seismology, geology, economy, sociology etc. Deposited today in the archives of the National Institute for Research and Development in Construction, Urban Planning and Sustainable Spatial Development, "URBAN INCERC", that incorporated INCERC in 2009, the above resources are planned to be reconsidered and made accessible to specialists and the interested public. The paper presents the types of available resources and proposes a plan for their organization for dissemination.

Key words: Vrancea earthquakes; public awareness; building damage; earthquake preparedness..

* Corresponding Author

mess@mess-earth.org

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Rock-fall monitoring in the National Park Bohemian Switzerland

Jakub Šafránek *

The National park Bohemian Switzerland Administration, Pražská 52, Krásnáá Lípa 40746, Czech republic

ABSTRACT

Bohemian Switzerland is a part of Bohemian Cretaceous basin and is formed primarily by sandstones. During its existence were these sandstones influenced by tectonic episodes called Saxonian tectonics. And what is the mechanics of rock falling? Bohemian Switzerland is formed by few hundred meters thick sandstone layers that differ in thickness, roughness or durability to erosion etc. and on top of that is this huge sandstone body cut by dense joint system and is also influenced by water. Unstable rock block fall down to lower position to gained stability. Combination of varieties of sandstones, dense system of joints and water and erosional influence leads to the creation of beautiful landscape, but also to danger of rock-falls. In the National Park Bohemian Switzerland there was established de facto the last rock squad in the Czech Republic. Its duties are monitoring of unstable rock blocks and slopes in the National park area and securing most unstable block up to 20 cubic meters. Basic monitoring that is kept in the National park is handheld monitoring that is done using adapted industrial dilatometers. Another type is automatic monitoring with remote data transfer that is operated in municipality Hřensko on four localities, and next on Pravčická brána rock arch with near rock block called Přílepek and on rock slope above road from Hřensko to Janov. On top of that the Department of Geology have had number of explorations realized, such as geological radar exploration on Pravcicka brána arch, etc.

Key words: Rack-fall; monitoring; Bohemian Switzerland; sandstone.

* Corresponding Author

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Typical geo-hazards and countermeasures of mines in Yunnan Province, Southwest China

Xianfeng Cheng [1,,2]*, Wufu Qi [2], Qianrui Huang [2], Xueqiong Zhao [2], Rong Fang[b], Jun Xu [2]

[1] China University of Geosciences, 100083 Beijing, China
[2] Yunnan Land and Resources Vocational College, 652501, Yangzonghai Scenic Area, Kunming, Yunnan Province, P.R. China

ABSTRACT

Mining-induced geo-hazards have caused enormous destruction and threat to mines. Known as the "kingdom of nonferrous metals" and located in Southwest China, Yunnan Province developed mining-induced geo-hazards well with characteristics of multiple types, widespread distribution and serious damage. Landslides and debris flows are two common sub-types of geo-hazards causing most serious damage in Yunnan, and some of them were very representative in the world. Two landslides and two debris flows were chosen to analyze deeply. Both Laojinshan Landslide and Sunjiaqing Landslide possess the characteristic of rock avalanches. The high sliding speed and long distance made the landslides translate into clastic flows with impact force and caused enormous destruction. Rainstorm and mining waste rock were two main factors to induce debris flows in Yunnan mines. Heishan valley debris flow of Dongchuan copper mine was a super large rainstorm type viscose debris flow with very low frequency, which brought a good caution to utilize valleys which looked an unlikely debris flow. Nandagou Valley of Jinding lead-zinc mine in Lanping County was a rainstorm stimulating, gully-type, high frequency and large scale debris flow, which was induced by mining activities. Many countermeasures have been used for Yunnan mines, including engineering treatment technology and ecological remediation, monitoring and forecasting, relocation and public administration.

Key words: Geo-hazard; countermeasures; mine; Yunnan Province; Southwest China.

* Corresponding Author

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Landslide susceptibility mapping based on GIS model in Suichuan County, Jiangxi Province, China

Wufu Qi [1], Xianfeng Cheng [1,2], Yu Chen [3], Jun Xu [1], Xinliang Zhao [1]

[1] Yunnan Land and Resources Vocational College, 652501, Yangzonghai Scenic Area, Kunming, Yunnan Province, P.R. China

[2] China University of Geosciences, 100083 Beijing, China

[3] Key Laboratory of Digital Earth Sciences, Institute of Remote Sensing and Digital Earth, Chinese Academy of Sciences, Beijing 100094, China

ABSTRACT

The case study presents an information index model for landslide susceptibility mapping in Suichuan County, Jiangxi Province, China. More than 100 landslides were identified from the 2.1-m fused ZY-3 imagery (China), and about 83 percent of them were verified in field investigation. It is proved that the landslides are more likely to occur in areas nearby the road, lower vegetation coverage and the areas close to faults. The high elevation accuracy of 74.2% was reached using a receiver operating characteristic (ROC). The result indicates that the south and parts of the southeast of Suichuan County are highly susceptible to damages from landslides.

Key words: Landslide susceptibility mapping; GIS; Information Index Model; Suichuan County; Jiangxi Province; China.

* Corresponding Author

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Interpretation and research on Landuse based on Landsat 7 ETM + remote sensing data

Haoyuan Hong [1,2]*, Chong Xu [1], Wei Chen [3]

[1] Key Laboratory of Active Tectonics and Volcano, Institute of Geology, China Earthquake Administration, #1 Huayanli, Chaoyang District, PO Box 9803, Beijing 100029, P.R. China

[2] Jiangxi Provincial Meteorological Observatory, Jiangxi Meteorological Bureau, No.109 ShengfuBeier Road, Nanchang, 330046, China

[3] School of Geology and Environment, Xi'an University of Science and Technology, Xi'an 710054, China

ABSTRACT

The change of landuse is very important factor in environmental. For example, it has significant relationship with the natural disaster such as landslide. With the development of technology about GIS and RS, the interpretation of landuse become easy and accuracy. This paper based on Landsat 7 ETM + data, combined Xiushui County, Jiangxi Province of geographic information base data using maximum likelihood classification method however, the minimum distance, secession law, ISODATA so on Xiushui county land use remote sensing interpretation. The results show that the maximum likelihood classification accuracy of the overall evaluation of the maximum likelihood method is to examine the method best suited to the region. The result of this study was the use of land may be provided to decision makers and land-use planning.

Key words: Land use; classification; maximum likelihood; minimum distance; mixing distance; ıterative selforganizing data.

* Corresponding Author

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An integrated approach to morph structural mapping of Jerba Island using remote sensing and GIS

Youssef Akrout *, Mahmoud Dlala

Physics and Naturals of Tunis, Faculty of Sciences, Department of Geology, Mathematics, 2092, El Manar, Tunisia

ABSTRACT

This paper presents an improved geomorphological methodology that uses DEM data, a Geographical Information System and a brief field campaign to allow rapid, yet, precise mapping as well as Interpretation and analysis of lineaments. DEMs SRTM and ASTER were compared in our study in order to validate results of each one from GPS measurements. Shaded relief images created from valid Digital Elevation Models (DEMs) are helpful in identifying lineaments in different distinct relief and topography. Our method can enhance lineaments at different orientations by simulating topographic illumination under varied light directions .Our objective was extracting eight lineament maps from eight shaded relief images using PCI Geomatica 2013 software. Tow lineament maps into a final image leads to enhancing lineaments within the four lineament maps extracted from four sun azimuth directions. The lineaments of the first image show that the most automatic lineaments represent positive lineaments; and the automatic lineaments of second image represent negative lineaments of the study area. Results verify the similarity in the directional behaviour of the lineaments, the fault lines and the structures measured in the field. The main trends of the extracted lineaments of both images are NW-SE, N-S, E-W and NE-SW.

Key words: GIS; GPS; morpho-structural; shaded relief; Digital Elevation Model (DEM).

* Corresponding Author

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Physically based modelling of debris flow events and protection measures in mountain areas of northern Peru

Julio I. Montenegro Gambini *[1,2]

[1] University of Engineering, Lima, Peru
[2] Yacucamayoc Consultants Ltd. Lima, Peru

ABSTRACT

In the study of torrential hydraulics today must take into account many important factors judiciously tools in computational fluid dynamics (CFD). It is no longer acceptable to solve an engineering problem of rivers by using empirical formulas in general cases, therefore it has to be carried out a detailed study of morphological processes in mountain streams taking into account the hydrodynamics of rapid mass movements. This research aims to the use of RAMMS and FLO2D physically based models to simulate extreme events in Hualapampa creek and its tributaries in the vicinity of New Hualapampa city and Federico Belaunde Terry highway to debris and mud flows generated by heavy rainstorms, as well as to evaluate the capabilities and ways of help of each model. Grain size distribution of sediment in each tributary and the main creek were studied in laboratory and determined main properties. Rainfall and dischargue were assessed by hydrological modelling and daily-hourly information obtained by governmental institutions. The proposed protection elements to be included in the study area are riverbank defences on unstable slopes serving as protection in the vicinity, as well as the piles and abutments belonging to a bridge of the highway. Finally one can predict in the study site possible areas of erosion as a warning for riverbank protection and deposition zones or fans in order to determine adequate hydraulic capacity or imply riverbed-cleaning works, as well as hazard maps with different intensities. Hazard mapping criteria is based on the inclusion of the two physically based models with empirical-parametric formulations.

Key words: Debris flow; hazard mapping; torrential; riverbank.

* Corresponding Author

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New occurrence of mineralized alteration zones using multispectral remote sensing data, Eastern Desert, Egypt

Safaa Mohamed Hassan [1] *, Sultan A. Sultan [2]

[1] National Authority for Remote Sensing and Space Sciences (NARSS), Cairo, Egypt
[2] National Research Institute of Astronomy and Geophysics, 11722 Cairo, Egypt

ABSTRACT

Massive supplied are highly altered ultramafic rocks that are possibly associated with economic mineralization. The present work deals with the utilization of ASTER imagery, combined with geological and aeromagnetic data for the identification of sulphide-mineralized zones at Wadi Allaqi area, in South Eastern Desert of Egypt. The study area is underlain by Neoproterozoic island arc metavolcanic rocks and their equivalent gabbro-diorite rocks and intruded by granodiorites. The developed band ratioing, Principal Component Analysis (PCA) and the Spectral Angle Mapper (SAM) supervised classification and image processing techniques applied on the ASTER data set have proved their capability for better interpretation and identification of hydrothermally altered rocks and associated mineralization. The hyperspectral tools (Minimum Noise Fraction (MNF), Pixel Purity Index (PPI) and nD-visualizer) extracted endmember spectra and SAM classification clearly show the occurrence of minerals and their spatial distributions. The spatial data analyses of the lineaments and lithology map derived from ASTER data and field work revealed the presence of a number of effective Cu-Au mineralization in the NW-SE trending lineaments, including the well-known Um Garayat and Marahiq gold mines. Aeromagnetic map (total intensity reduced to the pole) of the study area was digitized and replotted using Geosoft program to produce a total intensity magnetic map reduced to the pole. Low and high pass filtering as well as the Eulier deconvolution technique were used to determine the fault elements occurred at different depths and have NW-SE, NNE-SSW and NE-SW trends The depths and widths of magnetic bodies were detected by using (Magmap-Geosoft program) where, the depths of the magnetized bodies are at shallow depths and ranged from 33.9 to 139 m. The interpretation of aeromagnetic map correlated with the geological map and Landsat TM image of the study area, revealed the occurrence of magnetic anomalies coinciding with subsurface massive sulphide bodies. The geochemical analysis for some representative samples from the alteration zones capping these sulphide zones indicates that the copper content reaches up to 4.5% and the gold content reaches up to 3.2 g/t. This promising results indicates that Wadi Um Rican El Ashen massive sulphide deposits is the most promising area and need more detailed geological and geophysical studies. The hyperspectral tools applied on ASTER satellite data show that these can be used as a powerful tool to explore the massive sulphide and the potential associated mineralization in other arid geographical regions worldwide.

Key words: Hydrothermal mineralized zone; ASTER Spectral Angle Mapper; Allaqi–Heiani belt.

* Corresponding Author

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Geochemical investigation of dolomites in the Kızılören Formation (Upper Triassic-Lower Jurassic) at the west of Ardıçlı-Konya (Turkey)

Ali Mujdat Ozkan *, Levent Kenan Kibar

Selcuk University, Faculty of Engineering, Department of Geological Engineering, Konya, Turkey

ABSTRACT

The Sr content in the Kızılören formation (96 to 236 ppm in the early dolomites, and 48 to 90 ppm in the late dolomites, respectively) is compatible with the Sr concentration mixing-zone, and burial dolomites, respectively. The Na content in the Kızılören formation (117 to 292 ppm in the early dolomites, and 58 to 117 ppm in the late dolomites, respectively) is compatible with the Na concentration mixing-zone, and burial dolomites, respectively. The investigated dolomites exhibit between -0,17 with -3,70 PDB in δO18 values relative to their δC13 values (between +1,56 with +2,99 PDB) in the early diagenetic dolomites. The late diagenetic dolomites display between -4,13 with -5,83 PDB in δ O18 values relative to their δC13 values (between -0,37 with -1,63 PDB). Most of the Kızılören formation dolomite samples show similar characteristics to the original limestone in terms of rare earth elements. However, an example shows enrichment, and a few examples shows reducing. The negative Ce anomalies observed in most of the examples are suggested to dolomitization in oxidized conditions, but a few examples showing the positive anomalies indicate to dolomitization in reduced circumstances. In addition, all samples of Kızılören Formation dolomites are showed positive Eu anomalies that this is suggested reducing conditions and/or hydrothermal effect. Observed Mo/U, Ni/Co, V/Cr and U/Th ratios in the Kızılören Formation carbonates are showed from the oxic to anoxic conditions. As a result, features of the Kızılören Formation dolomites have been formed as early diagenetic at marine-meteoric mixing environment with shallow burial, and as the late diagenetic at the medium-deep burial depths.

Key words: Dolomite; geochemistry; isotope; Kızılören; Ardıçlı; Konya (Turkey).

* Corresponding Author

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Petrographical features of limestones and dolomites in the late Triassic-early Jurassic Kizilören Formation at the west Konya (Turkey)

Ali Müjdat Özkan *, Levent Kenan Kibar

Selcuk University, Faculty of Engineering, Department of Geological Engineering, Konya, Turkey

ABSTRACT

The aim of this study is to determine the sedimentary features of limestones and dolomites (Late Triassic-Early Jurassic) in terms of petrography, which belong to the Kızılören Formation existing at the west of Konya City (Turkey). The Kızılören Formation is occurred dolomite, calcitic dolomite, dolomitic limestone and limestone. While some of the Kızılören Formation limestones are crystalline features, some of which featured micritic. Also, in some levels of the Kızılören Formation limestone and dolomite are preserved primary texture and fossils. Additionally, in the Kızılören Formation limestones and dolomites were observed micro-stylolites. Various dolomite types of the Kızılören Formation include: type 1) unimodal, fine to very fine crystalline planar-s (subhedral) mozaic dolomite, type 2) medium to coarse crystalline planar-e (euhedral) mozaic dolomite, type 3) medium crystalline planar-e (euhedral) replasive dolomite, type 4) unimodal, medium to coarse crystalline non-planar-s-a (subhedral-anhedral) mozaic dolomite, type 5) fine crystalline planar-e-s (euhedral-subhedral) mozaic dolomite, type 6) polymodal planar-e-s (euhedral-subhedral) mosaic dolomite, and type 7) coarse to very coarse crystalline non-planar-c (cement) saddle dolomite, and type 8) micro-breccia dolomite. While the Kızılören Formation limestones have been formed as in a stable carbonate shelf environment, the Kızılören Formation dolomites have been formed as early diagenetic at marine-meteoric mixing environment with shallow burial, and as the late diagenetic at the medium-deep burial depths.

Key words: Limestone; dolomite; petrography; Kızılören Formation; Konya.

* Corresponding Author

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Application of the titanium-in-quartz thermobarometer to eclogites from the Biga Peninsula, NW Turkey

Firat Sengun *[1], Thomas Zack [2]

[1] Canakkale Onsekiz Mart University, Terzioglu Campus, Faculty of Engineering, Department of Geological Engineering, 17100, Çanakkale, Turkey

[2] University of Gothenburg, Department of Earth Sciences, Box 460, 40530, Gothenburg, Sweden

ABSTRACT

Eclogites crop out in the Çamlıca metamorphics and beneath the Çetmi melange as a tectonic slice in the Biga Peninsula in northwest Turkey. The Çamlıca metamorphics occur in the westernmost part of the Biga Peninsula and are tectonically separated from the Denizgören ophiolite in the west by the Ovacık fault. The Çetmi melange found on the southern part of the Biga Peninsula is mainly composed of various types of blocks within a detritic matrix. The high-P assemblages in eclogite consist of omphacite + garnet + epidote + glaucophane + quartz + phengite. Typical accessory minerals are rutile, zircon and sphene. Ti-in-quartz thermobarometer (TitaniQ) was applied on eclogites from the Biga Peninsula. The P–T dependencies of Ti-in-quartz solubility can be combined with P–T dependencies of Zr-in-rutile solubility to estimate pressure and temperature of crystallization. Titanium concentrations in quartz from the Çamlıca metamorphics range from 0.26 to 0.91 ppm. Zirconium concentrations in rutile range from 26 to 64 ppm. However, Ti contents in quartz from the Çetmi melange vary from 0.47 to 2.19 ppm. Zr contents in rutile range between 50 and 150 ppm. Regional high-P metamorphism with peak conditions of 551 ± 5 oC and 21.5 ± 0.3 kbar in eclogite from the Çamlıca region and 624 ± 17 oC and 22.6 ± 1.6 kbar in eclogite from the Çetmi region. Ti-in-quartz thermobarometer gives precise and comprehensible pressure and temperature values when using the Zr-in-rutile thermobarometer, which could be an advantage over classical methods.

Key words: I-in-quartz; Zr-in-rutile; eclogite; Biga Peninsula; NW Turkey.

* Corresponding Author

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Uralian eclogites as potential diamond-bearing objects

Alexandr M. Pystin *, Ju. I. Pystina

Ural Branch of RAS, Komi Science Centre, Institute of Geology, Syktyvkar, Russia

ABSTRACT

In the Urals, eclogites are mainly confined to the so-called high-pressure belt, which is traced along the Main Ural Deep Fault (MUDF) from the river Tschuch'ya in the North to the river Ural in the South at a distance of 2000 km. However, within the limits of the belt, eclogites are distributed locally. They only occur in four polymetamorphic complexes: Maksyutov in the South Urals, East Ufaley in the Middle Urals, Marunkeu and Nerkayu in the North and South parts of the Polar Urals, correspondingly. Questions on an age, tectonic position, and thermodynamic conditions of formation of eclogite-bearing complexes in the Urals are discussed (Pystin et.all. 2014, Pystin, Pystina 2015). The conclusion of metamorphic origin of the Uralian eclogites and their formation at subduction stage of the early Precambrian cycle of geodynamic development of the region (2.1-1.7 Ga) has been made. Younger ages determined on eclogites, including predominant dates falling within the interval 400-350 Ma, are associated with eclogite transformation and exhumation. The data show that the Uralian eclogite-bearing complexes are related to the early Precambrian formations. Eclogites were formed under the conditions of the Earth's crust and are of the metamorphic origin. The established by means of calculation temperatures (600-900oC) can be realized at the pressure over 20 kbar only in the subduction zones. The metastable conditions (at pressures less than 35-40 kbar), which are necessary for crystallization of diamonds over graphite, could occur at the collision stage of the geodynamic development of the region at manifestation of strong shift and fracture deformations ca. 1.9 Ga. Direct finds of diamonds in the eclogite-bearing metamorphic complexes in the Urals as well as similarity of their tectonic position and age with those of diamondiferous eclogites of the Kokchetav and Dabeshan' massifs propose wide possibility for searching of the deposits of diamonds of metamorphic genesis in the Urals.

Key words: The Urals; eclogites; deposits of diamonds.

* Corresponding Author

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Distribution of platinum-group elements in chromite ores of the Sorkhband ultramafic complex, Kerman, Southeastern Iran

Ali Reza Najafzadeh [1]*, Mohsen Arvin [2,3], Hamid Ahmadipour [2], Yuanming Pan [3]

[1] Payame Noor University, Department of Geology, Tehran, Iran
[2] Shahid Bahonar University of Kerman, Department of Geology, Kerman, Iran
[3] University of Saskatchewan, Department of Geological Sciences, Saskatoon, Canada

ABSTRACT

The Ordovician Sorkhband ultramafic complex lies in southern Kerman Province of Iran. The wedge shape complex covers an area of more than 100 km2 and is divided into: lower part comprises of dunites, largest podiform chromitite deposits in Iran (Faryab mine), olivine clinopyroxenite dykes and massive's, wehrlite and olivine websterite dykes; and upper part comprises of clinopyroxene bearing harzburgites, with subordinate lenses and dykes of dunite, massive and dyke like olivine clinopyroxenite and minor orthopyroxenite dykes with no significant chromitite mineralization. Chromitite orebodies exhibit variable sizes and shapes, forming pods, lenses, bands, vein-like bodies and rich dissemination. Podiform chromitites in dunite form tabular to lenticular bodies although may occur also as pencil-like masses. The chromitites occur in four distinct textural modes. Massive, disseminated, banded and nodular chromitites are the most common textural types and commonly grade into one other. Massive chromitites have sharp contacts with the enclosing dunite whereas disseminated bodies grade outward into dunite and occasionally pass into interbanded chromitite and dunite. A detailed electron microprobe study reveals very high Cr#, Mg# and very low TiO2 contents for chromian spinels in chromitites. The Sorkhband chromitites contain up to 440 ppb total PGE, and display a systematic enrichment in IPGE relative to PPGE, with a steep negative slope in the PGE spidergrams and very low PPGE/IPGE ratios, a feature typical of ophiolitic podiform chromitites worldwide. The mineral chemistry data and PGE geochemistry of the chromitites indicates that the Sorkhband ultramafic complex was generated from an arc-related magma with boninitic affinity in a supra-subduction zone setting.

Key words: Podiform chromitites; Platinum-group elements; supra-subduction zone setting; boninitic magma; Sorkhband ultramafic complex; Iran.

* Corresponding Author

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Trace and rare earth element geochemistry of black shales in Triassic Kasımlar Formation, Anamas - Akseki Platform, Western Taurids, Turkey

Mustafa Kuscu [1]*, Rifat Ozsoy [1], Orhan Ozcelik [2], Mehmet Altunsoy [2]

[1] Suleyman Demirel University, Department of Geological Engineering, Isparta, Turkey
[2] Akdeniz University, Department of Geological Engineering, Antalya, Turkey

ABSTRACT

The study area is located in its surrounding and Kasımlar village, Sütçüler-Isparta, Turkey. The purpose of this study is to investigate relations with contents of trace elements and total organic carbon value and paleoredox conditions of depositional environment in the Triassic Kasımlar shale. The Triassic black shale sequence of Kasımlar formation in the Anamas - Akseki Platform of Western Taurids does not show any trace element enrichment. But trace elements values of black shale from the Kasımlar formation are broadly comparable with those of the average upper continental crust. Among the exception are marked slightly enrichments in Zn, As, Nb and V. Organic carbon content of the black shales is between 0.02 and 0.96 % but reach 3.78 % (averaging as 0.51 %). The black shales do not show metal/TOC correlation. The content of ∑REE varies between 64.54 and 230.76 ppm, with the average of 158.07 ppm. Most of the samples from Kasımlar shales have higher ∑REE contents than those of upper crust (UC). The concentration of the light REE is higher than that of the heavy REE. The ratio of LREE/HREE varies between 3.40 and 16.75 ppm with the average of 7.86 ppm. Compared to the black shale values of Kasımlar formation and upper continental crust; the black shale values show a significant increase in HREE and LREE. Our data show slightly negative Ce anomalies (Ce/Ce* as low as 0.94 ppm) and positive Eu anomalies (Eu/Eu* as high as 3.88 ppm). Ce/Ce* and Eu/Eu* values recorded in the depositional environment indicate low oxygenated and anaerobic (reducing) conditions.

Key words: Western Taurids; Kasımlar formation; black shale; trace elements; organic carbon; deposition environment.

* Corresponding Author

mess@mess-earth.org

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Fluid inclusion studies on North Narbaghi intermediate sulphidation epithermal Ag-Cu deposit, Urumieh-Dokhtar magmatic arc, Iran

Majid Ghaderi *[1], Negin Fazli [1], Shuang Yan [2], David R. Lentz [3], Jian-Wei Li [4]

[1] Tarbiat Modares University, Department of Economic Geology, Tehran 14115-175, Iran
[2] Chinese Academy of Sciences, Guangzhou Institute of Geochemistry, Key Laboratory of Mineralogy and Metallogeny, Guangzhou, China
[3] University of New Brunswick, Department of Earth Sciences, Fredericton, New Brunswick, Canada
[4] China University of Geosciences, School of Earth Resources, Wuhan, China

ABSTRACT

The North Narbaghi epithermal Ag-Cu deposit is located in the central part of the Urumieh-Dokhtar Magmatic Arc (UDMA) of Iran. Regional tectonic reconstruction for late Mesozoic-Tertiary indicates that the North Narbaghi epithermal deposit formed as a result of subduction of Neotethyan oceanic crust beneath central Iranian block. Ag-Cu mineralization is associated with middle to late Eocene volcanic and Oligo-Miocene intrusive rocks with chemical compositions characteristic of continental arc magmas. Mineralization at the deposit occurs as vein and breccia associated with a quartz-carbonate-sulphide (pyrite-chalcopyrite-sphalerite)-sericite-chlorite mineral assemblage. The hydrothermal alteration assemblages consist of extensive propylitic, argillic, silicification, sulphidation and phyllic from rims to the core zone. The deposit is considered of intermediate sulfidation type because of the argillic alteration consisting of kaolinite-illite-smectite as well as ore-forming fluid containing high base metal and low Au contents. Different textures of mineralization have been distinguished in the North Narbaghi deposit consisting of dissemination, vein-veinlet, brecciated and open space filling. The main hypogene mineralization includes tetrahedrite, tennantite, chalcopyrite, pyrite, sphalerite and bornite, while other minerals such as azurite, malachite, and chalcocite formed at the supergene stage. Mineralogical and geochemical studies show that silver mineralization is associated with sulfosalts. In order to carry out fluid inclusion (FI) micro thermometric studies, 14 thin sections were made from quartz veins within the andesite, diorite and monzodiorite units from the area. Four types of primary inclusions are common at North Narbaghi based upon their phase content pure liquid FIs, vapour-rich FIs and daughter-mineral-bearing FIs are identified based on the petrographic observation of FIs, in the daughter-mineral-bearing FIs, halite is the principal daughter mineral. Micro thermometric measurements on quartz hosted FIs indicate that the mineralization may have taken place between 176 and 365 °C. First ice-melting temperatures between −52 and -73°C indicate that the aqueous fluids contained NaCl and $CaCl_2$ ± $MgCl_2$. The North Narbaghi ore deposit developed from high salinity fluids (10-28% NaCl equiv.), therefore the ore-forming fluids are favourable for transportation of base metals and have high Ag/Au ratios. The high temperature and high salinity hydrothermal fluids as well as coexisting liquid-rich and vapour-rich fluid inclusions, assemblages of vapour-rich only inclusions and based on the presence of breccia and carbonate as well imply boiling in the ore-forming hydrothermal fluids of the North Narbaghi epithermal deposit.

Key words: Epithermal; silver; copper; fluid inclusion, North Narbaghi; Iran.

* Corresponding Author

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Raman spectroscopy of mineral inclusions in diamonds from Yakutia

Sargylana S. Ugap'eva [1]*, Sergey V. Goryainov [2], Valentin P. Afanasiev [2]

[1] Siberian Branch of the Russian Academy of Sciences (DPMGI SB RAS), Diamond and Precious Metal Geology Institute, prosp. Lenina, 39 Yakutsk 677007, Russia

[2] The V.S. Sobolev Institute of Geology and Mineralogy of the Russian Academy of Sciences (IGM SB RAS), prosp. ak. Koptuga, 3 Novosibirsk 630090, Russia

ABSTRACT

New data on the study of residual pressure in mineral inclusions in diamonds from Yakutia are presented. Analysis of stressed inclusions in diamonds using Raman spectroscopy was carried out, taking into account that, chemical composition of inclusions of one mineral in the volume of host mineral is the same. The most intensive bands of stretching vibrations SiO4-groups in olivine spectrum were observed as a doublet with maximums about 825 and 857 cm 1, which has significant shift rate on pressure 2.81±0.09 and 2.69±0.12 cm 1/GPa, that is presented as increased values of band frequencies in stress inclusions stressed inclusions. Analysis of Raman spectra showed that, these bands had maximum shift on frequency for inclusion in sample from pipe Aikhal: 826.14 and 857.17 cm 1. This doublet was used for determination of residual pressure Pi in olivine inclusion, and frequencies for zero pressure were identified experimentally on Raman spectra of inclusion, brought to the surface: ~823.47 and 855.71 cm 1. Raman spectra, obtained from the inclusion in the sample, gave maximum shift to each doublet band for value Δv=2.67±0.2 and 1.46±0.2 cm 1, that corresponds to inner residual pressure in inclusion Pi=0.41±0.05 GPa calculated from formulas (Izraeli et al., 1999; Yasuzuka, 2009). According to (Izraeli et al., 1999) this residual pressure in inclusion helps in evaluating pressure of diamond crystallization, which, according to our calculations, is at least Pf =4.8±0.5 GPa at model temperature of its growth 1200 °C. Comparative analysis of Raman spectra of olivine inclusions in diamonds from placers of Ebelyakh river on inclusions, contained in diamond and then brought to the surface, showed that, frequency shifts are insignificant for any band of the doublet Δv=±0.3 cm 1 (~822.9 -823.5 cm-1 and 855.4-855.7 cm-1) and it is impossible to calculate pressure of diamond crystallization in this case.

In diamond from pipe Mir with couple inclusions of coesite, small inclusion (60 μm – maximum diameter) contained higher internal pressure and was used for microanalysis. Note that, two microfractures were found around this small inclusion in the diamond, which can slightly reduce internal pressure, preserved in inclusion. Elastic tangential stresses were observed in diamond around this inclusion that indicates high degree of preservation of the tense inclusion. The most intensive band of coesite with 521 cm–1, has a significant shear velocity 2.9±0.1 cm–1/GPa (Hemley et al., 1987). This band is used to measure internal pressure in Pi inclusion. Raman spectra of coesite gave maximum band shear 521 cm–1 for value Δv=9.53±0.5 cm–1, which corresponds to residual pressure in inclusion Pi=3.29±0.2 GPa, calculated by the formula inverse to the ratio: v=521.0+2.9 Pi (GPa). Using model of mechanic stress calculation in coesite-diamond system, described in the work (Sobolev et al., 2000), we calculated pressure of diamond crystallization from pipe Mir Pf = 5.0±0.5 GPa at temperature of its growth 12000C.

Key words: Diamond; inclusion; Raman spectroscopy; Yakutia; olivine; coesite.

* Corresponding Author

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Srilankite inclusions in garnet from kimberlite deposits of Yakutia

Anastasia Biller *, Svetlana Babushkina, Oleg Oleinikov

Diamond and Precious Metal Geology Institute, Lenina 39, Yakutsk, Russia

ABSTRACT

The article describes srilankite inclusions in garnets from Yubileynaya (Alakit), Zapretnaya (Orto-Yargin field), Malokuonapskaya (Kuranakh field) kimberlite pipes and from diamondiferous volcanogenic-sedimentary deposits of the North-eastern Yakutia, Bulkur anticline area. Garnets with srilankite inclusions are characterized by pyrope-almandine composition, content of grossular components is up to 18-20 mol %, in general, they show monotypic composition, and with high FeO and low Cr_2O_3 content that is why they belong to garnets of eclogites (bimineral eclogites at ternary diagrams of composition in CaO-MgO-FeO coordinates). The studied garnets are saturated with mineral inclusions, which record rutile, quartz, ilmenite, rarely apatite and zircon, pyroxene is found in one grain of garnet from the Orto-Yargin field. Rutile and ilmenite inclusions are oriented in structure of the host garnet. Quartz usually form growths with rutile or occur as individual inclusions. Polymineral inclusions are also occur, the following associations of minerals are the most typical: quartz-rutile, quartz-rutile-ilmenite, rutile-ilmenite-srilankite, quartz-rutile-srilankite. Srilankite occurs as inclusions of irregular shape in rutile or ilmenite, rarely it forms own inclusions, sometimes it occurs in intergrowths with apatite. Srilankite inclusion dimensions is usually 5-10 micron (up to 15 micron). Srilankite in the studied paper, except basic oxides TiO_2 and ZrO_2, contains constant admixture FeO from 1,24 to 3,86 wt. %, rarely Al_2O_3 up to 3 wt. %, CaO up to 1,29 wt. %, MgO up to 0,47 wt. %. Srilankite formation in natural conditions is interpreted by scientists differently. Experimentally, it has been synthesized in hydrothermal conditions (128-635°C, 0.15-3 kbar) (Willgallis et al., 1983). However, discovery of srilankite in inclusions in garnets from kimberlites suggests much higher parameters of its formation. Wang et al. studied garnet with inclusions (including srilankite) and estimated parameters of its formation of 1,5-3 GPa and 600-800°C. Some researchers (Bingen et al., 2001) suggest that srilankite is formed during the reaction between baddeleytte and ilmenite in conditions of granulite facies of metamorphism. Note that, in some cases, rutile is enriched with zircon (up to 5 wt.% ZrO), and zircon inclusions occur in some cases as well. Researchers have two opinions on srilankite formation in deep-seated minerals – mantle metasomatism or magmatic crystallization from the melt, enriched with Zr. Due to absence of any contacts or fractures between rutile (ilmenite) and zircon, which could result in srilankite formation, the studied samples most likely were crystallized from the melt, simultaneously or at a final stage together with rutile and ilmenite. Occurrence of srilankite as inclusions in garnets from different kimberlite and kimberlite-like rocks of the Yakutian kimberlite province allows considering it typomorphic mineral of inclusions in eclogitic garnets for this region.

Key words: Srilankite; inclusions in garnet; oriented rutile; garnet from eclogite.

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Investigation of helium isotope variations of alkaline volcanic rocks In Osmaniye Region (Turkey)

Duru Aral [1]*, Halim Mutlu [2], Ercan Aldanmaz [3], Nilgün Güleç [4], Fin Stuart [5]

[1] Eskişehir Osmangazi University, Department of Geological Engineering, Eskişehir, Turkey
[2] Ankara University, Department of Geological Engineering, Ankara, Turkey
[3] Kocaeli University, Department of Geological Engineering, Kocaeli, Turkey
[4] Middle East Technical Teknik University, Department of Geological Engineering, Ankara, Turkey
[5] Scottish Universities, Environmental Research Centre (SUERC), Scotland

ABSTRACT

The noble gases, in particular helium isotopes, provide valuable information on the mantle source of recent basaltic volcanism, especially when linked to trace elements and radiogenic isotopes. Although the alkaline volcanics in the Osmaniye region have been studied in detail by several works by means of element variations, radiogenic dating and isotope systematics, noble gas isotope compositions that could significantly contribute to dynamics of volcanism have not been investigated yet. In this study which aims to fill the defiency of such data, helium isotope compositions of olivine-basalts in Osmaniye region are measured. The Quaternary Alkaline volcanism of Osmaniye is located in a south of Turkey. Olivine minerals from Osmaniye alkaline volcanics were separated with heavy-liquid method. Helium isotope analysis of olivines was carried out at Scottish Universities Environmental Research Centre (SUERC) laboratories. R/Ra ((3He/4He) sample/(3He/4He)atm) values of gas inclusions in olivines separated from alkaline basalt lavas in the Osmaniye region are in the range of 7.6 to 7.9. Such high helium isotope values, which are close to mean MORB ratios, are most probably indicative of an asthenospheric mantle source.

Key words: Alkaline rock; olivine; helium isotope.

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Petrography and mineralogy of the Dogankuzu Karst Bauxite Deposit, SW Turkey: implications for depositional mechanism

Mehmet Muzaffer Karadağ, Şuayip Küpeli

Selcuk University, Engineering Faculty, Department of Geological Engineering, Konya, Turkey

ABSTRACT

The Dogankuzu bauxite deposit, southwestern part of Turkey, is the largest deposit in Turkey. The deposit is located along the simple unconformity surface between the Cenomanian Katrangediği and the Senonian Doğankuzu formations. Bauxite ores were deposited in fault controlled huge paleokarstic cavities developed on the Katrangediği limestone by karstification processes under humid-tropical climate conditions during the Turonian period. In ascending order, four distinct bauxite horizones, Earthy bauxite (EB), Brecciatic buxite (BB), oolithic bauxite (OB), and massive bauxite (MB) were described based on their textural properties. The EB horizone with approximately 40–70 cm thick is mainly composed of clayey bauxite ores consisting of boehmite, kaolinite, hematite and small amounts of hematite, diaspore, rutile, calcite, gibbsite and pyrite that sharply overlies the carbonate footwall of the Katrangediği Formation. The BB horizone containing large amounts of breccias of limestone approximately 8–10 m thick that consists mainly of calcite, boehmite, hematite, kaolinite, diaspore, rutile and anatase and small amounts of dolomite, saponite and pyrite. The OB horizone with aproximately 5–8 m thickness and showing widely oolitic, partially pisolitic and in some places, thin-banded macro-textures that consists of essentially boehmite, hematite–goethite–lepidocrocite and kaolinite and lesser amounts of pyrite and manganese dendrites. The MB horizon about 10–15 m thick and composed of mainly boehmite, hematite and kaolinite with small amounts of gibbsite, quartz and diaspore, and overlain by the Doğankuzu Formation. Detailed petrographic studies show that diagenetic alteration effects on the bauxite ores. The most important bauxite textures are massive, oolitic, pisolitic, brecciatic and earth and microclastic. Microgranular and microclastic textures associated with the residual fractured and corroded quartz grains, as well as feldspar grains are almost completely replaced by platy diaspore. All data show that the Dogankuzu bauxites have been rapidly deposited in karstic cavities next to the shore-line under the turbulent fluvial evidenced by fresh woter fossil of Microcodium Sp. to very shallow marine environmental conditions.

Key words: Karst bauxite; oolitic-pisolitic bauxite; Dogankuzu-Turkey; gibbsite; boehmite; diaspore.

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Major and trace element concentrations and Sr-Nd isotopes of Kutahya (Turkey) volcanics and investigation of source composition

Duru Cesur [1]*, Halim Mutlu [2], Ercan Aldanmaz [3], Nilgün Güleç [4]

[1] Eskişehir Osmangazi University, Department of Geological Engineering, Eskişehir, Turkey
[2] Ankara University, Department of Geological Engineering, Ankara, Turkey
[3] Kocaeli University, Department of Geological Engineering, Kocaeli, Turkey
[4] Middle East Technical University, Department of Geological Engineering, Ankara, Turkey

ABSTRACT

Kütahya alkaline volcanics are located in western Anatolia E-W graben system that was resulted from the Aegean extensional regime. The Kütahya lavas compositions are basaltic trachyandesite and trachybasalt. Kütahya lavas are normalized with PM (primitive mantle) normalized diagram. Lavas with high LILE and light REE patterns show enrichment in incompatible elements. This indicates that small degrees of partial melting or partly contamination by continental crust contributed to generation of Kütahya volcanics. However primitive mantle normalized trace element concentration patterns of Kütahya volcanics show prominent negative Ti, Nd and Ta anomalies, and this indicate that Kütahya alkaline lavas were significantly affected by crustal contamination. 87Sr/86Sr and 143Nd/144Nd isotopic compositions range between 0.707315-0.707456 and 0.512506-0.512516, respectively. High Sr and low Nd isotope ratious and chemical compositions imply contribution of a lithospheric mantle source and contamination of continental crust in the genesis of the Kütahya alkaline lavas.

Key words: Kütahya alkaline volcanics; major-trace element concentrations; Sr-Nd isotopes.

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Geochemistry of Late Cambrian-Early Ordovician metaclastic sediments from the Bağbaşı-Hadim area, Southern Turkey: implications for source area weathering, provenance and tectonic setting

Şuayip Küpeli *, M.Yavuz Hüseyinca, Ahmet Turan

Selcuk University, Engineering Faculty, Department of Geological Engineering, Konya, Turkey

ABSTRACT

The major, trace and rare earth element (REE) contents of total 43 of Shale (Sh), Fe-shale (Fe-Sh), Litarenit (Lar), wacke (Wa) and Fe-sandstone (Fe-Sst) samples were analyzed to investigate their source area weathering, provenance and tectonic setting. Average chemical index of alteration (CIA), chemical index of weathering (CIW), and plagioclase index of alteration (PIA) values of the Sh, Fe-Sh, Lar, Wa, Fe-Sst are (80, 95, 93); (84, 93, 92); (78, 87, 86); (77, 89, 87); and (79, 84, 83), respectively that indicate modarate to high degree of alteration (weathering) of plagioclase to illite/kaolinite in the samples' provenance. The sample groups were slightly enriched in Si, Na, P, Cr, Pb, Hf, MREE, HREE and depleted in Al, Fe, Mg, Ca, K, Ti, Mn, LREE, HFSE, LILE, and TRE concentrations in comparison with the Post Archean Australian Shale (PAAS). The Sh, Fe-Sh, Lar, Wa, Fe-Sst samples show variable SiO_2 contents, with average values of 59.9, 61.1, 78.1, 69.3 and 76.9%; modarate to high SiO_2/Al_2O_3 (mean 3, 4, 9, 5, 9 wt%); generaly high Fe2O3+MgO contents (mean 9, 11, 5, 8, 7 wt%), and low K_2O/Na_2O ratios (mean 3.5, 1.9, 0.9, 1.5, and 0.4, respectively). In general, the concentrations of the high field strength elements (HFSE), large ion litophile elements (LILE) and transition elements (TRE) are low in the sample groups compared with those of the PAAS, suggesting that the Seydişehir metasediments were derived from the recycled upper continental crust material. The chondrite-normalized REE patterns of the sample groups show very similar LREE enriched, but HREE depleted and nearly flatt patterns with pronounced negative Eu anomalies (mean ratio of 0.71) and moderate fractionation [average (La/Yb)CN=7]. Plots of the metasediments in ternary diagrams of La, Th, Sc and elemental ratios (La/Sc, Th/Sc, Cr/Th, Eu/Eu*, La/Lu, Co/Th, La/Sc and Sc/Th), which are critical for determining provenance, and REE patterns indicate that the Seydişehir metasediments in the Bağbaşı area were sourced from a felsic to intermediate magmatic rock. The La–Sc–Th and Th–Sc–Zr/10 ternary diagrams of the sample groups suggest that the the metasediments were deposited in an Andean-type retroarc foreland basin as well as elsewhere in the western Taurus Belt in southern Turkey. The Neoproterozoic Cadomian crystaline basement rocks described as Sandıklı–Afyon Basement Complex (SBC) in an intermediate to felsic composition may be mainly source of the studied metasediments of the Seydişehir Formation in the Bağbaşı-Hadim area.

Key words: Provenance; tectonic setting; geochemistry; REE; weathering; Bağbaşı-Hadim-Turkey.

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Investigation of δ18O variations of alkaline volcanic rocks in Kula region (Turkey)

Duru Aral [1]*, Halim Mutlu [2], Ercan Aldanmaz [3], Nilgün Güleç [4], Fin Stuart [5]

[1] Eskişehir Osmangazi University, Department of Geological Engineering, Eskişehir, Turkey
[2] Ankara University, Department of Geological Engineering, Ankara, Turkey
[3] Kocaeli University, Department of Geological Engineering, Kocaeli, Turkey
[4] Middle East Technical Teknik University, Department of Geological Engineering, Ankara, Turkey
[5] Scottish Universities, Environmental Research Centre (SUERC), Scotland

ABSTRACT

Oxygen isotopes are represented by various compositions in different reservoirs in the earth and they provide information about genesis of lavas. The Quaternary alkaline volcanism of Kula is located in a western Anatolian E-W trending graben system that resulted from an Aegean extensional regime. In this study δ18O isotopes of olivine-basalts in western Anatolia (Kula) are measured. Olivine minerals from alkaline volcanic rocks in Kula region was separated with heavy-liquid method. Oxygen isotope analysis of olivines was carried out at Scottish Universities Environmental Research Centre (SUERC) laboratories. δ18O values of olivines separated from Kula basalts are in the range of 4,7 - 5,2 ‰. δ18O values which was obtained from basalts were compared with δ18O values of mantle reservoirs (EMI, EMII, HIMU, MORB, OIB) and δ18O values of Kula lavas exhibit very similar values with δ18O of OIB (4.9 - 5.4 ‰; Eiler vd., 1997). δ18O values were evaluated with trace element compositions and R/Ra ((3He/4He)sample/(3He/4He)atm) values of Kula lavas. Chemical compositions, He and δ18O isotopes indicate that derivation from OIB-like asthenospheric mantle.

Key words: Kula alkaline rocks; olivine; oxygen isotope.

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Geochemical study of the Albian source rock (Fahdene Formation) and the role of structural architecture in the maturity evolution in the western central part of the Tunisian Atlas (Kef-Kasserine area, Tunisia)

Haithem Briki 1*, Riadh Ahmadi 1, Rabiaa Smida 2 and Farhat Rekhiss 1

[1] University of Sfax, Laboratory 3E, Sfax National School of Engineers, Tunisia
[2] Global Oil and Gas Services (GOGS), Tunis, Tunisia

ABSTRACT

The Kef-Kasserine area lies to western central part of the Tunisian Atlas. This area is located between the Tunisian trough to the north and a shallow plate form to the South. During the Albian, Fahdene Formation was deposited and it consists of a thick series of both Black shales and carbonates. Geochemical analysis, on a different structure and petroleum wells (using Rock eval), reveals that this series has a relatively important TOC (0.2% to 2%) and a good hydrocarbon potential (9Kg/T of rocks to 17.1 Kg/T). The organic matter provided by Fahdene Formation is essentially planktonic marine “type II” and “oil and gas prone” quality. Burial history, timing of petroleum generation and thermal maturity have been modeled from outcropping (Henchir Gara: HG) and boreholes (OBL, Semda, and DL101) show a wide variability. In fact, the el HG reveals a mature to overmature organic matter; however, OBL and Semda wells indicate an immature to early mature stage of organic matter. In addition, the Tmax ranges between 433°c to 444°c, but at the HG, the previous work reported a 550°c. So, we conclude that we have a growth maturity gradient to northward. Moreover, the start of oil generation occurred from the Campanian with a maximum at Maestrichtian age in the north (HG). Although, In the OBL and Semda wells, the maximum of oil generation started at the Eocene age. These results lead us to suggest that the north part of our study area characterized by an active subsidence during the upper Cretaceous. This period corresponds to an extensional NE-SW tectonic regime leads to an installation of a deep basin to the north of Tunisia (HG) as a result of a normal movement of NW-SE, E-W, and N-S faults.

Key words: Tunisian Atlas; Fahdene Formation; geochimacal analysis; subsidence; extensional tectonic.

* Corresponding Author

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Factors controlling the metal levels in a headwater stream draining an agroforestry catchment (Galicia, NW Spain)

Laura Palleiro, M. Luz Rodríguez-Blanco, M. MercedesTaboada-Castro, M. TeresaTaboada-Castro *

University of A Coruna, Faculty of Sciences, Centre for Advanced Scientific Research (CICA), 15071 A Coruña, Spain

ABSTRACT

Relationships between metals and other parameters may be used to infer potential mechanisms controlling trace metal fluxes. Concentrations of Al, Fe, Mn, Cu and Zn (dissolved and particulates), suspended sediment, dissolved organic carbon, and pH and discharge were determined during a 3-year period in stream water of an agroforestry catchment (65 km2) under humid temperate climate in Galicia (NW Spain). The objective of this study is to investigate the role of these variables in controlling dissolved and particulate concentrations of each metal in the stream water. The soils in the catchment are developed on metamorphic schist. The surface soil layer has silt or silt-loam texture, acidic pH and it is well provided with organic matter (4.1 to 14.3%). Stream water samples were collected at the catchment outlet every 15 days and more frequently with increased stream flows. A total of 1100 water samples were analyzed in this study. Metal concentrations were measured by ICP-MS. Pearson correlation coefficients were calculated to examine the possible associations between metals and the four variables under consideration. Stepwise multiple regressions were applied to determine which predictor variables have the strongest influences in controlling concentrations of each metal in the stream. The results showed that metal concentrations were relatively low (Fe > Al > Mn > Zn > Cu), but particulate metals predominate over those dissolved. Stepwise multiple regression analysis reveals that the most important variable to explain dissolved concentrations for Al, Fe and Cu is the dissolved organic carbon, whereas for dissolved Zn is the suspended sediment and for dissolved Mn is the discharge. The suspended sediment was also a good predictor of particulate metal levels.

Key words: metals; headwater; agroforestry catchment; dissolved organic carbon; suspended sediment.

* Corresponding Author

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Main environmental results of geochemical mapping low density in soils and stream sediments of Pernambuco State, Brazil

Enjolras de Albuquerque Medeiros Lima [1]*, Melissa Franzen [1], Fernanda Soares de Miranda Torres [1], Fernanda Gonçalves da Cunha [2]

[1] Geological Survey of Brazil, CPRM, Av. Sul, 2291, Recife, Pernambuco, Brazil

[2] Geological Survey of Brazil, CPRM, Av. Pasteur, 404, 1º, Praia Vermelha 22290-240, Rio de Janeiro, Brazil

ABSTRACT

The geochemical survey work carried out by the Geological Survey of Brazil–CPRM within the Project Geochemical Mapping of Low Density conducted in the Pernambuco State (Brazil) managed to collect 1,170 samples of bottom sediments from streams, representing drainage basins with areas less than 100 km2. In addition, 142 soil samples were collected, approximately in the central part of the cartography sheet 1:50.000 scale, seeking to sample the type most representative soil on each sheet in the B horizon, spread over an area of 98,311 km2. The samples were brought to dryness at 40°C in the sieved fraction (<80 mesh -0.177 mm), and the chemical analyses for 53 elements was carried out by ICP-EAS/MS after digestion with aqua regia. For each chemical element, toxicological patterns Brazilian law was used or omissions were considered international standards. Several anomalous points of As (11 mg kg-1) associated with high levels of Pb, Cd, Sb, Sn and Ag occur near from Belo Jardim, due to the existence of an environmental liability caused by an industry of automotive batteries and several rudimentary factories of hunting pellet, where Pb is used. For Hg in stream sediments, occurred points above the threshold patterns NOAA (TEL = 0.174 mg kg-1), which corresponds to N1 = 0,17 mg kg-1 of CONAMA, located in Igarassu (0.19 mg kg-1) and Olinda (0.26 mg kg-1) and are due to a previous paper factory and the existence of a soda-chlorine plant in Igarassu, yet having been previously recorded contents exceeding 9 mg kg-1 of Hg in estuarine sediments and represent an environmental liability. For Pb, the auriferous region Serrita - Itapetim, are found scattered values ranging from 68 mg kg-1 to 215 mg kg-1, that set targets for environmental care, because they far outweigh the CONAMA thresholds (N1 = 35 mg kg-1 and N2 = 91.3 mg kg-1) and these anomalies are also associated with As, Ni and Sb. The Pb also stands out in the Suape Industrial Port Complex (558 mg kg-1) and in Belo Jardim (2,479 mg kg-1). For U, several prominent values exceed the threshold of toxicity for NOAA soils (5 mg kg-1), being worthy of a better appreciation of the possibility of contamination. Is necessary an effective environmental monitoring in some areas, especially for the portion of poor population, which has essentially telluric survival habits, practicing agriculture and livestock subsistence, feeding on local production and drinking water of the scarce resources of water available, especially in semi-arid region.

Key words: Geochemical mapping; environmental contamination; soils; stream sediments.

* Corresponding Author

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Geochemistry, provenance, and tectonic setting of Devonian-Lower Permian metasedimentary rocks, Kadınhanı area, Central Anatolia, Turkey

Muzaffer Karadağ *, Şuayip Küpeli, M. Yavuz Hüseyinca, Gürsel Kansun

Selcuk University, Engineering Faculty, Department of Geological Engineering, Konya, Turkey

ABSTRACT

Major, trace and rare earth element (REE) contents of the Wacke (W), Fe-shale (FeSh), shale (Sh), and Fe-sandstone (FeSst) sample groups from the Devonian-Lower Permian metasediments of the Bağrıkurt formation were determined to examine their tectonic setting, provenance and source area weathering conditions. The metasediments represented by phyllite, metaconglomerate, tremolite-albite chlorite schist show pofiroblastic or granoblastic textures. They are enriched in CaO and Na_2O and depleted in Al_2O_3, MgO, K_2O, TiO_2, P_2O_5, and Cr_2O_3 relative to Post Archean Australian Shale (PAAS). SiO_2 concentrations are similar to PAAS but Fe_2O_3 and MnO contents are generally lower than in the PAAS. Average ∑REE contents of the samples from the W, FeSh, Sh, and FeSst members are 116, 128, 162, and 97, respectively. They show MREE enriched, LREE and HREE depleted and very slightly fractionated nearly flatt REE patterns, with (La/Yb)SN values ranging from 0.7 to 1. The REE, High field strength element (HFSE), large ion litophile element (LILE) and transition element (TRE) concentrations are lower than those of the PAAS. Europium anomalies are completely positive and very less variable that average Eu/Eu* ratios of the sample suites are 1.27, 1.31, 1.29, and 1.31, respectively, with an overall average of Eu/Eu* is 1.3). Cerium anomalies show less variable almost completely slightly negative values changing from 0.83 to 1.007 with an overall average of 0.95. The W, FeSh, Sh, FeSst sample groups from the Bağrıkurt Formation show high values for the Chemical Index of Alteration (73, 83, 76, 80), Chemical Index of Weathering (80, 87, 84, 84) and Plagioclase Index of Alteration (78, 86, 82, 83) that indicate moderate to intense source area weathering processes. Plots of sediments in ternary diagrams of La, Th, Sc and elemental ratios (La/Sc, Th/Sc, Cr/Th, Eu/Eu*, La/Lu, Co/Th, La/Sc and Sc/Th), which are critical for determining provenance, and REE patterns indicate that the metaclastic units of the Bağrıkurt Formation were derived dominantly from felsic to intermediate magmatic rocks. The K_2O/Na_2O-SiO_2, La–Sc–Th and Th–Sc–Zr/10 diagrams of the Bağrıkurt Formation are typical of continental island arc/active continental margin tectonic settings.

Key words: Geochemistry; provenance; tectonic setting; Kadınhanı-Konya; Turkey; source area weathering.

* Corresponding Author

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Siberian Traps, Norilsk area: corrected scheme of magmatism evolution

Nadezhda Krivolutskaya [1]*, Bronislav Gongalsky [2], Alexander Dolgal [3], Natalia Svirskaya [1], Tamara Vekshina [2]

[1] Vernadsky Institute of Geochemistry and Analytical Chemistry, 19 Kosygin st., Moscow, 119991, Russia
[2] Institute Geology of Ore deposits, Petrography, Mineralogy and Geochemistry, Moscow, 117109, Russia
[3] Perm State University, 15 Bukireva st., Perm, 614990, Russia

ABSTRACT

This study aims to understand the origin of Large Igneous Provinces (LIP) and history of magmatism evolution in space and time. Siberian Traps represent the most important object for such study due to their huge volume and presence of PGE-Cu-Ni unique deposits in the Norilsk area. The structure and geochemistry of rocks give information of magmatism evolution in this region. Volcanic rocks were described in the western part of the Siberian platform (Lightfoot et al., 1990; 1993) and were subdivided into oceanic islands (OIB), «transit series" (intermediate between OIB and WPB) and intraplate (WPB) basalts. The so-called "transit series of rocks" are comprised of volcanic rocks with different geochemical parameters (Hakanchansky, Tuklonsky, Nadezhdinsky and Lower Morongovsky Formations). In particular, the gradual change of geochemical features (spectra distribution of trace elements, isotopic characteristics) from the Upper Nadezhdinsky to the Lower Morongovsky has been established (Wooden et al., 1993). Regarding to beginning of the actual trap stage was referred to the middle of Morongovsky time. The difference between the first three Formations was shown earlier (Krivolutskaya, 2011). Here we present new geological and geochemical data on the Upper Nadezhdinsky and Lower Morongovsky Formations demonstrating the absence of “transit series”. We have studied the geology and chemical composition of basalts in the eastern part of the Norilsk area that have not been studied earlier. This area is located at the junction of the Norilsk-Kharayelakh trough and the Tunguska syncline formed on different crystalline basement (Dolgal, 2012). This tectonic position provides data on the structure and history of development of a large area. 56 samples were taken from the outcrops near Lake Glubokoe. Nadezhdinsky Formation consists of aphyric, porphyric and glomeroporphyric basalts. The latest ones are typomorphic rocks of the Upper Nadezhdinsky Formation. Morongovsky Formation contains aphyric, porphyric basalts and tuffs. The diagram SiO_2 - MgO shows significant differences in the silica and magnesium content between Nadezhdinsky and Morongovsky formations: elevated concentrations above 52 wt.% and <1 wt% TiO_2 for the first one and at least 50 wt.% SiO_2 and higher 1.1 wt% for the second one consequentially. Nadezhdinsky Formation differs substantially by enrichment of incompatible elements (the (La / Sm) n = 2.59 - 2.88) and clearly manifested by the presence of negative Ta-Nb and positive Sr anomalies. Morongovsky Formation is characterized by less enrichment of rare elements ((La / Sm) n = 1,62-1,70) and flat spectra. No intermediate compositions between upper Nadezhdinsky and Lower Morongovsky rocks were detected. The periodicity in the development of trap magmatism in the north of the Siberian platform was described by many geologists. The most common scheme of formation of volcanic rocks includes three stages (oceanic islands, transit series and intraplate basalts). Our data shows big difference in rocks compositions and the spread between Nadehdinsky and Lower Morongovsky basalts. Thus, trap phase began in Tuklonsky time, rather than from the middle Morongovsky time, as previously though.

Key words: Magmatism; Cu-Ni deposits; REE; Siberian platform.

* Corresponding Author

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Types of primary sources of placer gold of the East Siberian platform (Lena-Viluy interfluve)

Anisya G. Kazhenkina *, Z.S.Nikiforova

Russian Academy of Sciences (DPMGI SB RAS), Siberian Branch, Diamond and Precious Metal Geology Institute, 677980, Yakutsk, Lenin Prospect, 39, Russia

ABSTRACT

Goal of the study is to sole fundamental problem – to forecast primary sources of gold and identification of their formation belonging, based on generalization of materials on mineral-geochemical characters of placer gold and nature of its distribution in platform areas, overlain by thick layers of sedimentary deposits. Actuality of this project is related to identification of primary gold deposits in the eastern part of the Siberian platform (Lena-Viluy interfluve), where range of placer gold scattering is widely distributed, with unidentified primary sources. Detailed study of mineralogical-geochemical features of placer gold, which can preserve “genetic memory” of its primary sources, greatly helps to determine relation of gold-bearing placers with primary sources. Large set of the known mineralogical and geochemical methods of studying features of placer gold is used to solve these problems. Obtained data will allow to identify formation type of primary sources, and hereby, will increase accuracy of forecast and purposefulness of prospecting primary sources of gold in certain areas. Detailed mineralogical study of placer gold from channel fill and Quaternary deposits of numerous water courses of the Lena-Viluy interfluve (East Siberian platform) is carried out. More than 300 objects were analysed in all, herewith, morphologic features of gold, particle-size distribution, fineness, composition of trace elements, internal structure and presence of microinclusions are studied. Obtained results suggest the following conclusions. Determined indicator signs of placer gold, specifically high fineness (950-999 ‰), increased Cu content (up to 1,47%), micromineral inclusions of pyrite, arsenopyrite, quartz and carbonates, existence of recrystallization structures, lines of plastic deformation are typical for primary sources of low-sulfide gold-quartz formation. Discovery in placer gold (Kempenday dislocation zone) of such indicator signs as high Ag content up to 47,7%, increased Hg content up to 1,46%, presence of wide range of trace elements Pb, Zn, As, Sb, Te, and microinclusions – strontium barite, native silver, adularia, calcite, cerebriform, porous internal structure and two-phase gold indicate generation, in this area, of shallow low-temperature primary sources of gold-silver formation, paragenetically related to acid volcanism of andesite-dacite composition. Complex of indicator signs, identified in placer gold – increased Cu content (up to 2,22%), permanent existence of trace elements Pt, Pd and Ni, as well as inclusions of exotic mineral phase of platinum group gives basis to forecast the presence of primary sources of gold-platinoid formation within the Suntar arched uplift. Thus, primary sources – gold-quartz-lowsulfide, gold-silver and gold-platinoid formations are predicted within the Lena-Viluy interfluve (East Siberian platform) for the first time.

Key words: Placer gold; mineralogical-geochemical features; formation types; primary sources; East Siberian platform.

* Corresponding Author

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Trace including rare earth element geochemistry of the Lower Paleozoic carbonates in the Bağbaşı-Hadim-Konya, Southern Turkey

Şuayip Küpeli *, Ahmet Turan, Müjdat Özkan

Selcuk University, Engineering Faculty, Department of Geological Engineering, Konya, Turkey

ABSTRACT

Large variations in ΣREE content are observed among the different members of the Early-Middle Cambrian Çaltepe Formation (LD=3,71ppm, BL=3,98ppm, UD=25,65ppm, NL=74,57ppm) that are increased from bottom to top of the sequence. This may be related to gradually increasing terrigenous materials in the sample groups in the same direction. The most carbonate samples exhibit slightly fractionated and, more or less flat PAAS-normalized REE+Y patterns that can be resulted from deglacial input and possibly related to metal-oxyhydroxide scavenging in the shallow marine near-shore environment. The Çaltepe carbonates could partially be influenced by hydrothermal exhalation that is evidenced by positive Eu anomalies. Some carbonate samples, however, yielded seawater-like trace element distribution. The negative Ce anomaly reflects the incorporation of REE directly from seawater or from the pore water under oxic condition, and also reveals the mixing of two component systems with terrigenous clay (detrital) in the marine sediments. The members (LD, BL, UD and NL) of the Çaltepe Formation show small and very similar negative Ce anomaly (Ce/Ce*=0,87, 0,84, 0,82 and 0,87). The non-seawater-like REE patterns, relatively high ΣREE contents, low magnitude of LREE depletion (La/Yb)N and low Y/Ho ratios, indicate that the variations in ΣREE contents are principaly resulted from the changing amounts of terrigenous materials in the Çaltepe carbonates. The detrital input controls REE distribution in the carbonate members that is evidenced by positive correlation of ΣREE with Al2O3, Fe2O3, Ni, Cr, Sc, and Y as well as V, Cr, and Sc are positively correlated with Ti; negative correlation with (CaO+MgO) and changing Y/Ho ratios. The Post-Archean Australian Shale (PAAS)-normalized trace element patterns of the members (LD, BL, UD and NL) of the ÇF are depleted in almost all of the trace elements, except for Sr that is high in especially NL and also BL. The LD, BL, UD and NL members of the Çaltepe Formation show highly positive Mn* values (0,444 to 1,700) combined with high V/(V+Ni) ratios (>0.50), except S43 (0,43) suggesting that the carbonates have been deposited under the oxic conditions. Most of the carbonates show positive Eu anomalies, but some ones show negative Eu anomalies (Eu/Eu*: 0.42 to 2.62).

Key words: Paleozoic carbonates; REE; geochemistry; Çaltepe Formation; Bağbaşı-Hadim-Turkey.

* Corresponding Author

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Carbon and oxygen isotope record of the Lower-Middle Cambrian carbonates in the Seydişehir Region, Central Taurus Belt, Southern Turkey: implication for Diagenetic Alteration Processes

Şuayip Küpeli *, Müjdat Özkan, Gürsel Kansun

Selcuk University, Engineering Faculty, Department of Geological Engineering, Konya, Turkey

ABSTRACT

The Lower Paleozoic shallow marine succession is one of the oldest units exposed at the base of the Geyikdağı unit, Central Taurus Belt. This succession in the study area consists of Early-Middle Cambrian metacarbonates of the Çaltepe Formation (ÇF) and Late Cambrian-Early Ordovician metasediments of the Seydişehir Formation. This study focussed on the Çaltepe carbonates composed of peloosparitic, oopelintrasparitic, and biomicritic dolomite (D); intraoosparitic and oointrasparitic black limestone (BL); peloointrasparitic and recrystallized light grey limestone (LGL); and biomicritic red nodular limestone (RNL). Stable isotope values and some major and trace element concentrations of the sample groups from the members of the ÇF have been determined to identify of the C and O isotope variations and implications for diagenetic and/or metamorphic alteration processes. All dolomite samples from the D and RNL(only one sample) show lower CaO/MgO weight ratio < 8 and higher Fe/Sr and Mn/Sr values than the coeval BL, LGL, and RNL limestones suggesting that they are in dolostone composition. The δ13C values of the Çaltepe carbonate members vary from -0.07 to +0.72; +0.60 to +0.90; -0.40 to +0.11; and +0.26 to 1.40‰ (PDB), respectively. Similarly, the δ18O isotope values range from -8.62 to -7.87;-12.76 to -10.67; -9.32 to -8.07‰ and-10.88 to -8.13‰ (PDB). The positive δ13C values might be originated from the higher burial rate of organic matter. The relatively depleted δ18O values (-7.87 to -12.76‰) in most of the samples are most likely responsible of diagenetic and/or metamorphic alteration processes. The least-altered samples yield values of -7.87 to -8.20 ‰ that are similar to the Phanerozoic δ18O trend that is still in primary nature. The average Mn/Sr and Mg/Ca ratios of the sample groups are 1,9 and 0.11 that are higher than the 1.5 and 0.01values that the original nature of the Çaltepe carbonates were more or less modified by the effect of diagenetic and/or metamorphic events. The effect of the secondary processes is also supported by the microscophic observations of the Çaltepe carbonates with prominent orientation among their components and the presence of calcite intraclast replaced by secondary dolomite.

Key words: Çaltepe; limestone; dolomite; carbonate; isotope; geochemistry; Seydişehir-Konya;Turkey.

* Corresponding Author

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Trace and REE+Y geochemistry of the Lower Paleozoic carbonates in the Seydişehir region, Konya, Turkey

Muzaffer Karadağ *, Şuayip Küpeli, Gürsel Kansun, Müjdat Özkan

Selcuk University, Engineering Faculty, Department of Geological Engineering, Konya, Turkey

ABSTRACT

The Lower-Middle Cambrian Çaltepe Formation (ÇF) of the Geyikdağı major tectonic unit in the Çaltepe area (Seydişehir-Konya), southwestern part of Turkey, consists of dolomite (D), black limestone (BL), light grey limestone (LGL), and red nodular limestone (RNL) members. The RNL pass grade into metaclastic rocks of the Seydişehir Formation (SF). In this study, major, trace, and rare earth element (REE) geochemistry of the D, BL, LGL, and RNL rock groups were firstly studied in order to investigate the depositional environment and source for the REEs. The Post Archaean Australian Shale (PAAS) normalized REE+Y values of the studied sample suites show mostly consistent seawater-like patterns i.e., i) LREE depletion, average (Dy/Sm)SN ratio of the D(1.90), BL(1.43), LGL (2.42, and RNL (1,18); ii) negative Ce anomaly (average CeSN/Ce* value of the D(0,95), BL(0,76); LGL(0,78), and RNL (0,73); iii) positive Gd anomaly (average GdSN/Gd*ratio for the D(1.27); BL(1,42), LGL(1,29), and RNL(1,11), and iv) Chondritic average Y/Ho ratios of the D(28.44), BL(21,39), LGL(33,44), and NL(36,63). The depletion of LREE and enrichment of HREE in the D and BL members determined by (Dy/Sm)SN and negative Ce anomaly (CeSN/Ce*) ratios of the all sample groups are clearly suggest the retention of seawater characteristics in these carbonate rock groups of the ÇF. Average Mn anomaly values of the D(0,11), BL(0,66), LGL(0,49), and RNL(0,05) and negative Ce anomaly and Y/Ho values of them show that the presence of REE in the Çaltepe Formation was directly linked to the seawater or porewater under oxic condition, and also suggest that the mixing of two-component systems with terrigenous (detrital) materials in the marine chemical sediments. The detrital input in the D, BL, LGL, and RNL is confirmed by positive correlation between ΣREE and Al_2O_3, K_2O, SiO_2, TiO_2, Zr, negative or no correlation with CaO and also MgO and lower Y/Ho ratios than 45 value. Moderate to strong positive correlation among ΣREE, Fe_2O_3, Ba, Sr, Rb and Y also indicate the presence of terrigenous materials in the carbonate members of the ÇF.

Key words: Rare earth elements; geochemistry; Cambrian limestone; Paleo-redox conditions; Çaltepe Formation; South Turkey.

* Corresponding Author

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Investigation by CI (Kathodölüminesans) and Raman Spectroscopy of zircon

Ayşe Didem Kılıç *

Fırat University, Department of Geological Engineering, Elazığ, Turkey

ABSTRACT

Pütürge metamorphites are made up of pelite/semi-pelite, psammite, metagranite gneisse, schist, amphibolite, marble and quartzite type rocks. Mineralogical studies (rock named, zircon separate), geochemical analysis (LA-ICPMS), raman spectroskopy and cathodoluminescence (CL) image were applied to samples of the Pütürge metamorphites representing different facies such as amphibolites and greenschiste. The cathodoluminescence images of zircon minerals show that indicates a zircon type with different textural and chemical components which might be called metamictte has developed. The luminescence feature in partially radiated zircon particles rich in radiogenetic minerals is rather high in comparison with other zircon particles. High temperature during the metamorphism of the Pütürge metamorphite and the ratio of the radiogenetic elements like U, Pb and Th in the mineral are effective in the textural and chemical difference between the core and rims of zircons. Mineralogic evidence and chemical data at ambient conditions suggest that complexing of Zr with hydroxyl ions at high pH enhances the solubility of zircon. The solubility of zirconium at high pH increases. Alkaline fluids will dissolve zircon and mobilize Zr. Our results show that Pb loss in zircons can be generated from metamict zircon through volume diffusion at low temperatures or by an external fluid (H_2O). Loss of lead in zircon signify that the fluids approaching the crystal lattice can be effective in the radiation damage processes50 to 500 words concise and factual abstract is required. The abstract should include the purpose of research, principal results and major conclusions. References should be avoided, if it is essential, only cite the author(s) and year(s) without giving reference list. Prepare your abstract in this file and then copy it into the registration web field.

Key words: Zircon; Raman spectroscopy; kathodölüminesans method; actinides; metamphic fluids; zoning.

* Corresponding Author

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Petrography, mineral chemistry and petrochemistry of the Eocene aged mafic dikes in the Eastern Pontides Orogenic Belt, NE Turkey

Cem Yücel [1]*, Emre Aydınçakır [2], Mehmet Ali Gücer [2], Enver Akaryalı [2]

[1] Gümüşhane University, Department of Mining Engineering, TR-29000, Gümüşhane, Turkey
[2] Gümüşhane University, Department of Geological Engineering, TR-29000, Gümüşhane, Turkey

ABSTRACT

In this study, we have determined mineral chemistry and geochemical characteristics of the Eocene aged mafic dikes that crop out at Gümüşhane and surrounding in the south of the Eastern Pontides. Eocene mafic dikes were made of two groups: (1) anhydrous group represented by pl +cpx ± ol + opq with microloitic porphyritic, hyalo-microlitic porphyritic, glomeroporphyritic textures and (2) hydrous group represented pl + hbl ± sa + opq mineral associations with flow, microloitic porphyritic, glomeroporphyritic, poikilitic textures. The anhydrous group contains plagioclase (An42-97), pyroxene (Wo4-41En42-63Fs3-17) phenocrysts, magnetite and titanomagnetite microphenocrysts, whereas the hydrous group includes plagioclase (An8-22), hornblende (Mg#=0.45-0.78) phenocrysts and magnetite microphenocrysts. Based on whole-rock chemical classification diagram, Mafic dikes were made of two groups that the anhydrous volcanic rocks are mainly basalt and basaltic andesite, whereas the hydrous volcanic rocks are generally basaltic trachyandesite. The volcanic rocks show alkali-calc-alkaline affinities and have low-medium K contents. They are enriched in large ion lithophile (LILE) and light rare earth elements (LREE), with pronounced depleted of high field strength elements (HFSE). The chondrite-normalized REE patterns (LaN/LuN=2-5) show low enrichment with no significant Eu anomalies, indicating similar sources for the rock suite. The main solidification processes involved in the evolution of the volcanics consist of fractional crystallization with minor amounts of crustal contamination ± magma mixing. All evidence supports the conclusion that the parental magma(s) of the rocks probably derived from an enriched mantle, previously metasomatized by fluids derived from subducted slab in a post-collisional extension-related geodynamic setting.

Key words: Mineral chemistry; petrochemistry; Eastern Pontides; Turkey.

* Corresponding Author

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Petrographical and whole-rock geochemical characteristics of Late Cretaceous aged syenitic intrusions in the Ordu area (NE Turkey)

İrfan Temizel [1]*, Mehmet Arslan [1], Emel Abdioğlu [1], Abdullah Kaygusuz [2], Zafer Aslan [3]

[1] Karadeniz Technical University, Department of Geological Engineering, 61080-Trabzon, Turkey
[2] Gümüşhane University, Department of Geological Engineering, 29000-Gümüşhane, Turkey
[3] Balıkesir University, Department of Geological Engineering, 10145-Balıkesir, Turkey

ABSTRACT

Late Cretaceous intrusions in Eastern Pontides (NE Turkey) are common in varying ages, sizes and compositions. Of these, the studied syenitic bodies (namely Direkli and Yeniköy Tepe plutons in the Ordu area) intruded into Late Cretaceous aged volcanics and volcanoclastics, and compositionally consist of syenite and less quartz-syenite with mainly granular and rarely porphyric, poikilitic and perthitic textures. The Direkli pluton contain K-feldspar, plagioclase, quartz, clinopyroxene, and less hornblende, biotite and Fe-Ti oxide, apatite, and zircon, whereas the Yeniköy Tepe pluton include K-feldspar, plagioclase, quartz, biotite, and less hornblende, Fe-Ti oxide, apatite, and zircon. Based on whole-rock geochemistry, the studied syenitic plutons show I-type, metaluminous (A/CNK=1.04-1.15) and shoshonitic features. Increasing K_2O, Na_2O, Rb, Hf, and Ta, and decreasing TiO_2, Al_2O_3, Fe_2O_3(t), MgO, MnO, CaO, P_2O_5, Sr, Zr, Nb, Ba, Sc, Y and Th with increasing SiO2 contents suggest fractionation of plagioclase ± K-feldspar ± clinopyroxene ± hornblende ± Fe-Ti oxide ± apatite in the Direkli pluton whereas plagioclase ± K-feldspar ± biotite ± Fe-Ti oxide ± apatite in the Yeniköy Tepe pluton. Primitive mantle-normalized trace element patterns of the studied plutons exhibit enrichment in LILE, Th and Ce and negative Nb and TiO_2 anomalies. Besides, the chondrite-normalized rare earth element (REE) plots of the studied plutons show slightly two different moderately enriched patterns with LaN/LuN=10.3-10.7 for the Direkli pluton and LaN/LuN= 6.8-11.7.6 for the Yeniköy Tepe pluton. Additionally, the REE distributions have characteristic concave patterns, suggesting a significant role of clinopyroxene ± hornblende fractionation in the evolution of the syenitic plutons. The syenitic intrusions have also negative Eu anomalies, probably associated with K-feldspar ± plagioclase fractionations. Trace element data also indicate that parental magmas of the studied plutons were derived from melts of lower crustal and enriched lithospheric mantle sources, and evolved differently within crustal levels.

Key words: Late Cretaceous intrusions; syenite; whole-rock geochemistry; Eastern Pontides; Ordu; Turkey.

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* Corresponding Author

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Mineral chemistry and whole-rock geochemical characteristics of Late Cretaceous aged gabbroic pluton in the Giresun area (NE Turkey)

İrfan Temizel [1]*, Tuğba Baki-Eraydın [1], Mehmet Arslan [1], Emel Abdioğlu [1], Abdullah Kaygusuz[2], Zafer Aslan[3]

[1] Karadeniz Technical University, Department of Geological Engineering, 61080-Trabzon, Turkey
[2] Gümüşhane University, Department of Geological Engineering, 29000-Gümüşhane, Turkey
[3] Balıkesir University, Department of Geological Engineering, 10145-Balıkesir, Turkey

ABSTRACT

Late Cretaceous-aged intrusions are common in varying ages, sizes and compositions but mafic ones are very limited in Eastern Pontides (NE Turkey). One of these, the Kovanlık Pluton around Giresun area cut Late Cretaceous-aged volcanic and volcaniclastics. The emplacement of the Kovanlık Pluton has been controlled approximately by N-S and/or NW-SE directed fractures. It is petrographically predominantly gabbro and lesser diorite in composition with phaneritic, ophitic and rarely poikilitic and porphyritic textures. Gabbroic rocks are dark-grey and black in color and contain plagioclase, clino-, ortho-pyroxene and Fe-Ti oxides, whereas dioritic rocks are grey and dark-grey in color and contain plagioclase, hornblende, and lesser biotite and Fe-Ti oxides. Poikilitic texture is characteristic in the gabbroic rocks containing large euhedral-subhedral clino-pyroxenes up to 3.0 mm in size, with the inclusion of subhedral plagioclase, ortho-pyroxene, Fe-Ti oxides, and apatite. In the gabbroic samples, the plagioclase occurs both as large euhedral crystals and as small subhedral crystals, usually with resorption features. The plagioclase composition varies from An54-61 as labradorite, An80-89 as bytownite, and An90-92 as anorthite. Clino- and ortho-pyroxenes as large crysts are the most abundant mafic phase in the gabbroic samples. Clino-pyroxene large crysts are euhedral to subhedral, unzoned and broken, whereas ortho-pyroxene large-medium crysts are subhedral to unhedral, rounded and broken. The clino-pyroxene compositions range from Wo31-49En41-60Fs1-5 and are classified as diopside and augite. The ortho-pyroxenes are fairly homogeneous with compositions of Wo1-4En66-74Fs24-31 and are classified as enstatite. The plagioclase crystals in dioritic samples are relatively smaller than those in the gabbroic samples. The plagioclase composition of the dioritic samples is distinct from that of the gabbroic samples, which varies from An57-69 as labradorite and An71-87 as bytownite. All euhedral-subhedral hornblendes in the diorites are classified as magnesio-hornblende. Based on whole-rock geochemistry, the studied pluton shows tholeiitic to calc-alkaline characteristics. Differences in the major and trace element variations can be explained by the fractionation of clinopyroxene ± orthopyroxene ± Fe-Ti oxide in gabbroic samples and that of hornblende ± plagioclase ± Fe-Ti oxide ± apatite in dioritic samples. Primitive mantle-normalized multi-element variations exhibit slight enrichment in large ion lithophile elements (e.g., Sr, K2O, Rb, Ba), as well as depletion of Th, Zr, Nb, La, and Ce, thus revealing that gabbroic and dioritic samples evolved from a parental magma derived from an enriched mantle source. These enrichments and depletions of gabbroic and dioritic samples suggest subduction-related fluid±melt enrichment during the generation of parental magma(s) as well as fractionation ± crustal assimilation in the evolution of the pluton. Chondrite-normalized rare earth element diagrams of the studied rocks are characterized by low-to-medium enriched patterns (LaN/LuN=0.91-1.41 in gabbroic sample and LaN/LuN=1.44-2.48 in dioritic sample), indicating spinel lherzolitic mantle source(s).

Key words: Mineral chemistry; gabbro; diorite; geochemistry; Eastern Pontides; Giresun; Turkey.

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Petrography, mineral chemistry and geochemical characteristics of the calc-alkaline Eocene (?) andesites in the Altınpınar area (Torul-Gümüşhane) NE Turkey

Mehmet Ali Gücer [1]*, Emre Aydinçakir [1], Cem Yücel [2], Enver Akaryali [1]

[1] Gumushane University, Department of Geological Engineering, Gumushane, Turkey
[2] Gumushane University, Department of Mining Engineering, Gumushane, Turkey

ABSTRACT

In the eastern Pontides orogenic belt (NE Turkey) there are different volcanic rocks exposed that formed under different types of magma. Eocene volcanism consists of acidic, notr and basic volcanic and pyroclastic rocks in Gümüşhane and surrounding area. In this study, mineralogical, petrographical and geochemical properties of the Altınpınar andesites in the Eocene volcanics were investigated. These rocks, northwest of Gümüşhane, are characterized by the calc-alkaline series with high alumina contents, containing moderate to abundant amounts of amphibole megacrysts. The texture of the rock shows microlitic-porphyry and vitrophyric-porphyry with euhedral to subhedral amphibole and plagioclase crystals. These andesites are consisting of amphibole, plagioclase (An22-61), opaque minerals (generally magnetite and pyrite), lesser K-feldspar (An2-31Ab19-39Or50-69) and pyroxene with secondary clay, sericite, calcite, chlorite, and devitrified glass. The amphiboles are exclusively Ca-type with CaB ≥ 1.5, Ti < 0.5 and (Na+K)A ≥ 0.5 apfu, and edenite in composition with Mg/Mg+Fe^{2+} = 0.59-0.71. Some of the hornblende aggregates, occurring in large plates, are often weathered and contain inclusions of plagioclase, accessory and opaque minerals. All plagioclases show albite twinning and/or oscillatory zoning. Geochemically, these volcanics are of andesite and basaltic trachy-andesite composition. They have a composition of 55-62 % SiO_2, 15-17 % Al_2O_3, 4-8 % Fe_2O_3T, 2-4 % K_2O and 4-7 % CaO with low content of TiO_2 (0.3-0.6 %). Andesites are medium to high potassic calc-alkaline characters, and show enrichment in large-ion lithophile elements (LILEs) such as Sr, K, Rb, Ba and Th, comparing to HFSE elements. All samples are characterised by significant negative Nb and Ti anomaly. Besides, the high field strength elements (HFSEs) such as Ti, Y and Yb are depleted. Chondrite-normalized REE patterns of the samples are concave upwards that indicating fractional crystallization during evolution of the magma. In general, REE content are moderately enriched in LREEs relative to HREEs (LaN/LuN = 8.26-13.50), indicating calc-alkaline suites. The most of the samples also show slightly negative Eu anomalies (EuN/Eu* = 0.80–1.02), implying a plagioclase fractionation and/or crustal contribution in the evolution of magma. Petrochemical data suggests that andesites were derived from calc-alkaline island arc basalts. The Altınpınar andesites differ from the Eocene volcanics in the Gümüşhane area by their field, petrographical and geochemical characteristics.

Key words: Altınpınar; Gümüşhane; eastern Pontides; Eocene volcanism; amphibole megacrysts; calc-alkaline andesites.

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The zeolite deposit of Hekimhan in the Malatya Basin

Mehmet Onal *, Tolga Depci, Cigdem Ceylan, Nilgun Kizilkaya

Department of Mining Engineering, Inonu University, Malatya, Turkey

ABSTRACT

Zeolite deposits in the Malatya Basin which is formed of the Yüksekova Group were investigated in the present study. The zeolites was occurred in the two layers: the lower zeolite layer and the upper zeolite layer of the Sarıkız Formation of Campanian-Maastrichtian age within the flysch like sediments at Hekimhan in the northern part of the Malatya Basin. Characterization studies of the zeolite samples were done by XRF, XRD and SEM images and the results showed that the main structures of the zeolites were clinoptilolite-(Cs), heulandite and calcite and the geological occurrences of zeolite is in marine environments.

Key words: Marine zeolite; Upper Cretaceous; Malatya Basin

* Corresponding Author

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Characterization and traditional ceramic application of clays from the Baskarcı region in Denizli (Western Anatolia)

Barış Semiz *

Pamukkale University, Department of Geological Engineering, TR-20070 Denizli, Turkey

ABSTRACT

Clay samples collected from the Baskarcı region in Denizli have been studied for their possible use in the ceramic industry. The chemical and mineralogical composition and thermal analyses of clays were determined by X-ray fluorescence (XRF), powder X-ray diffraction (XRD) and thermogravimetric–Differential Thermal Analysis (TG-DTA) techniques. Consistency limits of the samples were also determined. Test samples were prepared by pressing and firing at different temperatures. In terms of mineralogy, they can be considered illitic clays. However, other clay minerals, such as kaolinite and C-S mixed-layer quartz, and hematite, are present in small quantities. The chemical analysis indicates that the average amounts of silica and potassium are 37.5% and 2.1% respectively. The amount of alumina (23.6%) and iron (11.4%) oxide is very high. The tests show that these clays have high plasticity values (PI = 31%) and red colour. The samples were classified as Loam. The mineralogical changes during the firing process were recorded via the X-ray diffraction of the raw clays and subsequent firing at 700, 800, 900, 1000, 1100 and 1200 °C. The main transformations were observed at 1000 °C with the appearance of new crystalline phases. The variations in bulk density, water absorption, and unconfined compression strength (UCS) and colour were also determined and showed sensitivity to the chemical and mineralogical compositions. The density and unconfined compression strength of clay increased significantly at 900 ^{o}C and this is probably due to the formation of substantial glassy phase and reducing porosity. Technical tests show that ceramics prepared from these clayey materials have adequate characteristics for the production of structural ceramics without defects.

Key words: Ceramics; clay; loam; Denizli; Turkey.

* Corresponding Author

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Using p-XRF analysis for the petro-chemical properties of ancient stones used in Aphrodisias (Aydın, Turkey)

Ramazan Hacımustafaoğlu [1]*, Fuzuli Yağmurlu [2], İhsan Murat Kuşoğlu [3], Hakan Elçi [4]

[1] Dokuz Eylül University, Torbalı Vocational School, Department of Natural Building Stone Technology, 35860 İzmir, Turkey

[2] Süleyman Demirel University, Engineering Faculty, Department of Geological Engineering, 32200 Isparta, Turkey

[3] Dokuz Eylül University, Torbalı Vocational School, Archaeometry Application & Research Center, TR-35860 İzmir, Turkey

[4] Dokuz Eylül University, Torbalı Vocational School, Department of Geotechnic, 35860 İzmir, Turkey

ABSTRACT

Geology is one of the discipline in the multi-disciplinary field of archaeometry and important for determining petro-chemical properties and provenance analysis of natural stones used in the construction of ancient cities. These geological researches focus on lithologic, petrographic, chemical and isotope analyses. There are several disadvantages using conventional techniques during analyses such as time-consuming, high cost, high amount of sampling mass and damaging the ancient object. In this point, p-XRF is geting popular to avoid these disadvantages. Portable X-Ray Fluorescence (p-XRF) analysis is fast and non-destructive analysis technique to obtain elemental compositions of materials. In this study, a comparative investigation is carried out for p-XRF versus ICP and p-XRF versus petrographic techniques for the natural Stones used in Aphrodisias (Aydin, Turkey). p-XRF is used to determine elemental ratios in % and ppm levels; minerological ratios (%) and marble types are determined by petrographic analysis; major and minor oxide ratios and trace element ratios are determined by Inductively Coupled Plasma Emission - Mass Spectrometry (ICP-MS). It is found that p-XRF results are matching with petrographic results with 95 % and ICP-MS results with 91 %. p-XRF technique can be used in ancient cities to analysis natural stones and it is faster, economic and non-destructive according to other techniques used to determine Petro-chemical properties. Further studies can be focused on statistical mapping of natural Stones used in ancient cities and ancient quarries in Turkey for the provenance analyses.

Key words: Portable-XRF; marble; archaeometry; ancient city; Afrodisias; natural building stone.

* Corresponding Author

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Geochemistry of Lamprophyres in Karakaya (İscehisar, Afyon), Western Anatolia, Turkey

Deniz Dedeoglu *, Kamil Yilmaz

Süleyman Demirel University, Engineering Faculty, Department of Geological Engineering, Isparta, Turkey

ABSTRACT

The geochemical characteristics of the volcanism, occurred in the Western Anatolia, display calc-alkaline (Oligocene-Lower Miocene) and alkaline (Upper Miocene-Pliocene) affinities. These two different volcanism have an important role to understand the geodynamic evolution of the Western Anatolia during the Neogene time. The Karakaya lamprophyres, one of the products of these volcanism lying in the Western Anatolia, comprises alkaline basaltic rocks extruded into the ignimbrites. Petrographically, they have mostly hyalopilitic, trachytic, intersertal, vitrophyric porphyritic, pilotaxitic and glomeroporphyritic texture. Olivine (mostly altered to iddingisite and resorbed by carbonate), clinopyroxene (diopside, augite) and phlogopite (partly transformed into Fe-Ti oxide) as phenocyrst phase, and apatite, quartz, garnet and opaque minerals as accessory phase defined. In some thin sections, quartz phenocrysts are surrounded by clinopyroxene needles that evulated as evidence of magma mixing. These lamprophyres are characterized by low concentrations of SiO_2, TiO_2 and total Fe_2O_3, high concentrations of Mg#, enriched in LREE and LILE but variably depleted in HFSE. In the total alkali silica diagram, Karakaya lamprophyres mainly plot in the fields of trachyandesite, basaltic trachyandesite. According to mineral chemistry results, olivines show normal zoning by increasing of CaO and decreasing of Fo contents from core to the rim. Pyroxenes are classified as diopside and augite compositions. The mica minerals are generally phlogopite. The overall data about the petrograhy and mineral chemistry exhibit that these lamprophyres appear to derived by fractional crystallization of a magma mixing which formed by melting of the continental crust with effect of the uprising lithospheric mantle during in a extensional tectonic regime after the Middle Miocene.

Key words: Karakaya lamprophyres; mineral chemistry; petrography; geochemistry.

* Corresponding Author

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The dichotomy of the Messada pluton, Serbo-Macedonian massif, Greece: From rifting to subduction

Charalampos Vasilatos *

National & Kapodistrian University of Athens, Department of Geology & Geoenvironment, Section of Economic Geology and Geochemistry, Zografou 15784 Athens, Greece

ABSTRACT

The Messada pluton is a mafic magmatic intrusion that is located about 12km SW of Serres town, Macedonia Greece and has intruded the two mica, the biotitic and the augen gneisses of the Vertiskos formation (Serbo-Macedonian massif). The aim of this study is to investigate, define and evaluate the geochemical characteristics of the pluton in order to determine the geotectonic environment in which the parental magma has been formed. Sampling was carried out during fieldwork, taking care to include fresh rock samples from any different petrographic types of its pluton. Optical microscopy and Electron Probe Micro-Analysis have been used for the mineralogical and petrographical study of the samples in thin sections. The bulk rock chemical analyses for major and trace elements were implemented by the X-ray Fluorescence analytical technique, while the analyses, of selected samples, for the REE, U, Ta, Hf and Cs were performed by the instrumental neutron activation method. The Mesada pluton is a mid to coarse grained intrusion that presents a petrographic variety from diorite and quartz diorite to tonalite and granodiorite. Furthermore, the evaluation of the chemical analytical results has proved the geochemical inhomogeneity of the pluton. It is suggested that parts of pluton have been formed by distinctly different types of magmas originated in diverse geotectonic settings. The parts of quartz diorite and tonalite composition, present similar geochemical characteristics, LILE/HFSE ratios and negative Nb but no Ti anomalies in their primitive mantle normalized trace elements spidergrams. They exhibit higher HFS values than those of granodioritic composition. Moreover, their ocean ridge granite (ORG) normalized spidergrams not only suggest that they have been evolved from a common parental magma, but also present the typical characteristics of a “crust dominated within plate pluton” that may have been formed in an early stage during rifting, prior to a subsequent subduction episode. This interpretation may be in accordance with the suggestion of other authors, for a Gondwanian origin of the more acidic Triassic rift related, meta-granites (e.g. Arnea plutonic complex) of the Serbo-Macedonian massif. In contrary, the parts of Mesada pluton of granodioritic composition, exhibit a calc-alkaline to high K calc-alkaline magmatic suite and present higher LILE/HFSE and LREE/HREE ratios, related to a higher crustal component contribution for the magma genesis. Furthermore, their primitive mantle normalized spidergrams present negative anomalies at Nb and Ti. These characteristics indicate that those granodioritic parts have been formed by the crystallization of a calk-alkaline magma, produced by the partial melting of lower crust, lithospheric mantle and asthenospheric mantle components, in a volcanic arc geotectonic setting. Their geochemical characteristics have close similarities to those of the collision related granitoids that have intruded the Serbo-Macedonian during Tertiary.

Key words: Geochemistry; petrogenesis; magmatism; geotectonic setting; Serbo-Macedonian Massif.

* Corresponding Author

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The Peschanka porphyry copper deposit (Chukotka, Russia): Distribution of rare earth elements in wallrock and ores

Ildar Kalko [1]*, Yulia Sidorina [1], Yury Nikolaev [1], Vsevolod Prokof'ev [2], Yana Bychkova [2], Andrey Chitalin [3], Irina Nikolaeva [1], Rustam Garipov [1]

[1] Lomonosov Moscow State University, Geology Department, 1, Leninskie Gory, GSP-1, Moscow, Russia
[2] Russian Academy of Science (RAS), Institute of Geology of Ore Deposits, Mineralogy, Petrography and Geochemistry (IGEM) 35, Staromonetny lane, Moscow, Russia, 109017
[3] LLC INGEOTECH, Nauchny Park MGU,1, vlad. 77, Leninskie Gory, Moscow, Russia

ABSTRACT

The Peschanka deposit is considered to be the largest porphyry copper deposit in Russia containing over 6 Mt Cu @ 0.53%, 165 kt Mo @ 140 g/t, and 350 t Au @ 0.29 g/t average. Despite several decades of exploration precise research on distribution of trace elements in rocks was not carried out until presented work. The host rocks are gabbro, monzodiorite and syenite of egdygkich complex which are significantly altered in the central part of the deposit. Unaltered rocks belong to potassium-rich type. Its felsic varieties show high alumina content and the mafic ones have high concentrations of CaO, MgO, Fe_2O_3. Nb/Ta ratio varies from 2 to 13. Distribution of rare earth elements (REE) was studied along the drill hole cutting subepithermal base metal mineralization at its shallow level and porphyry copper at depth. Unaltered rock samples were collected at the surface to be used for evaluating elemental gain/loss comparative to them. Total REE concentrations obtained by ICP-MS range from 55 to 187 ppm in unaltered rocks and from 74 to 116 ppm in altered ones. It is revealed that concentrations of REE decrease with depth. All the samples display enrichment of light REE with respect to heavy REE (LaN/LuN ratio is 5–17 in unaltered rocks and 8–10 in altered). EuN/Eu* varies between 0.7 and 1.2 and increases with depth. In unaltered rocks no correlation between ore components and total REE is obtained. Strong positive correlation (Pearson coefficient 0.36–0.8) is assessed between concentrations of total REE and porphyry-stage metals (Cu, Ag, Co, Fe, Ni, Mn, Zn). Negative correlation is found between total REE and metals of subepithermal polymetallic stage. Intervals of base metal mineralization represent slighter enrichment of light REE than intervals of porphyry copper stockwork which are depleted in heavy REE. The rocks of egdygkich complex seem to be formed in island arc settings with contamination by the material of slab partial melting. During formation of porphyry deposit REE distribution in rocks has changed but some indicators remain unchanged.

Key words: Peschanka; Far-East Russia; porphyry copper deposit; rare earth elements.

* Corresponding Author

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Mineral chemistry and stable isotope (O, H and C) constraints of the Dağbaşı skarn occurrences (Trabzon, NE-Turkey)

Yıllmaz Demir *, Ali Dişli

Recep Tayyip Erdoğan University, Department of Geological Engineering, 53100, Rize, Turkey

ABSTRACT

The Dağbaşı skarn occurrences in the Northeastern Metallogenic Belt of Turkey, located about 30 km southeast of Trabzon. Mineralization characteristics and condition of contact metasomatic process have been determined at this study. The area around the skarn zone is dominated by Jurassic-Lower Cretaceous andesite, basalt, syphilitic basalt and their pyroclastites, including interbeded dolomitic limestone lenses and blocks. Intrusion of the Upper Cretaceous Dağbaşı Granitoide in the volcano-sedimentary unit resulted skarn type occurrences along the granitoid-dolomitic limestone contact and nearby. The ore is associated with exoskarns and skarnization in the area is characterized by intensive epidotization, chloritization, sericitization and silicification along the granite border of volcano-sedimentary units, including pyroxene, garnet epidote, tremolite, actinolite, biotite, amphibole, chlorite, quartz and calcite minerals. The primary ore minerals are composed mainly of magnetite, specularite, pyrhotite, pyrite, chalcopyrite and sphalerite with minor amount of galena around the contact. Pyrite, marcasite, hematite, goethite, lepidocrozite are the secondary ore minerals. Both prograde and retrograde stages have been recognized along the skarn zone. Prograde stage were characterized by grossular dominated garnet (And0-8.81Grs55.67-78.65Prs21.35-38.11) and diopside dominated pyroxene (Hed22.44-31.81Diy67.3-76.99Joh0.52-0.88) whereas retrograde stages were characterized by increasing andradite (And74.67-100Grs0-22.81Prs0-4.41) and johansenite composition (Hed22.17-62.63Diy0-36.2Joh31.86-76.69). Prograde stage garnet with grossular types represent reduced conditions. On the other hand Mn/Fe ratios of pyroxene and higher andradite, lower spersartine and almandine composition of garnet minerals represent increasing oxidation degrees during the retrograde stage. Such an increase in oxidation state are indicative of relatively shallow depth and mixture of meteoric water. Oxygen isotope composition of quartz and plagioclase, from center of granitoide, measured in the range of 12.4‰ and 11.8‰ respectively. On the other hand δ18O ratios from the skarn zone, including quartz, pyroxene, garnet, tremolite and epidote measured in the range of 10.3‰ and -1.9‰. In addition δD ratios measured on epidote, tremolite and actinolite minerals of the skarn zone are also range between -52‰ and -84‰. δ18O and δD ratios clearly linked to magmatic source. Besides, depletion of δ18O ratios, till -1.95‰ are also indicative of meteoric dilution. The δ13C ratios of limestone and skarn calcite are -1.93‰ and 2.88‰ (VPDB) that conformable marine origin. On the other hand δ18O ratios of these limestone and skarn calcite are highly depleted with a ratios ranging between 7.33‰ and 16.18‰(SMOW). These δ18O values much closer to the magmatic source than the marine limestones. Such a highly depleted δ18O values revealed that continuous interaction between carbonates and magmatic source, δ18O values of skarn calcite systematically decreased.

Key words: Skarn deposits; mineral chemistry; stable isotopes; Dağbaşı (Araklı-Trabzon); NE Turkey.

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* Corresponding Author

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Microthermometric and Raman spectroscopic properties of fluid inclusions of the Sivrikaya Fe-skarn deposit (İkizdere, NE-Turkey)

Yılmaz Demir [1]*, Raif Kandemir [1], Andrea Jauss [2]

[1] Recep Tayyip Erdogan University, Department of Geological Engineering, 53100, Rize, Turkey
[2] WITec GmbH, Lise Meitner Strasse 6, 89081, Ulm, Germany

ABSTRACT

The Sivrikaya Fe-skarn deposit, located about 15 km southwest of İkizdere, is hosted in Jurassic-Lower Cretaceous andesite, basalt and their pyroclastites, including interbeded tuff, sandstone, shale and dolomitic limestone lenses. Intrusion of the Upper Cretaceous İkizdere Granitoide in the volcano-sedimentary unit resulted Fe-skarn occurrences along the granitoid-dolomitic limestone contact and nearby. The ore is associated with exoskarns and skarnization in the area is characterised by garnet, pyroxene, biotite, amphibole, epidote, quartz, calcite and chlorite. The primary ore minerals in the skarns are composed mainly of magnetite and specularite with minor amount of pyrite and chalcopyrite inclusions. Pyrite, marcasite, hematite, goethite and lepidocrozite are also observed as a secondary origin. Three different types of fluid inclusions have been recognized in garnet, epidote, quartz and calcite minerals. All the fluid inclusions are liquid-rich two phases and no solid phases and aqueous-carbonic inclusions were observed in the studied minerals. Homogenization temperatures of these fluid inclusions are in the range of 166 - 462 °C. Early stage fluid inclusions are characterized by higher homogenisation temperature, lower eutectic and ice melting temperatures. Calculated salinity content, in all fluid inclusions are in the range of 0,35 – 14.3 %NaCl equ. Well defined positive correlation between Th and salinity data indicate that meteoric water were involved in the hydrothermal solution. Eutectic temperatures between -49.8 to -55 °C correspond to the presence of CaCl2 in the early stage fluid inclusions. On the other hand eutectic temperature of later stage fluid inclusions are correspond the presence of MgCl2, FeCl2 and NaCl with a temperature range of -38 °C and -21.2 °C. Liquid-rich two phase fluid inclusions from different stages were measured by Laser Raman Spectroscopy on the fluid inclusions in representative garnet, epidote and quartz minerals. The spectral data indicate that first stage fluid inclusions contain CH_4 with a characteristic peak at around 2915 cm-1. On the other hand later stage fluid inclusions never contain CH_4 and other carbonic phases. Carbon and oxygen isotope composition of limestone and skarn calcite were found to be extremely depleted, ranging between 0.7 -6.5‰ and 7.6 and 12.5‰ respectively. The extreme decreases in δ18O isotopes are indication of meteoric dilution, besides isotopic interaction between granite and carbonates. On the other hand highly depleted δ13C isotopes, lower than marine limestones are most likely point out the addiction of organic materials. Therefore it is concluded that during the metasomatic interaction between carbonates and granitic intrusion, some hydrocarbon were involved in the hydrothermal solutions at the early stage of mineralization. But, due to increasing meteoric addiction, this type of hydrocarbon was restricted in the hydrothermal solutions, through the later stage of ore formation process.

Key words: Skarn deposits; Sivrikaya (İkizdere-Rize); fluid inclusion; Raman spectroscopy; NE Turkey.

* Corresponding Author

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Sulphur, carbon and oxygen isotopes in Fe mineralization systems at Torud magmatic arc, North-eastern Iran

Nader Taghipour *

Damghan University, School of Earth Sciences, P.O. Box: 36715– 364, Damghan, Iran

ABSTRACT

Torud magmatic arc is part of Alborz magmatic belt that is situated in the Semnan province, North-eastern Iran. Based on mineralization, iron deposits in Torud magmatic arc classified into magnetite and hematite type. Nukeh, Panjkoh and Lajaneh deposits are magnetite type and Hamyard and Chaloo deposits are hematite types. Iron deposits in this area have different country rocks of mineralization. Tuff and volcanic rocks are main country rocks in Nukeh, Hamyard and Panjkoh deposits and limestone is the main host of mineralization in Lajaneh and Chaloo deposits. All of iron deposits in Torud magmatic arc associated with diorite and monzonite intrusions of Eocene age. The sulphur isotope values (δ34S) of pyrite vary from -1.5 to +6.7‰ (CDT) in iron deposits in Torud belt. Calcite occurs as a paragenetic mineral with magnetite and hematite in these iron deposits. δ18O and δ13C values of calcite are within the range of -5.2 to -1.5 ‰ (VPDB) and +9.98 to +19.16‰ (SMOW), respectively. The δ34S, δ18O and δ13C of iron deposits in Torud magmatic arc demonstrate that Fe mineralization systems are formed by mixing of magmatic and meteoric waters.

Key words: Stable isotope; Fe Mineralization system; Torud magmatic arc; Iran.

* Corresponding Author

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Chemical elements distribution in peat deposits of the Kokchetav mountain group, North Kazakhstan by the sequential extraction procedure

Anna A. Bogush [1], Olga S. Naymushina [1,2]*, Marina N. Kolpakova [1,3]

[1] Siberian Branch Russian Academy of Sciences, Sobolev Institute of Geology and Mineralogy, Koptyuga av., 3, 630090, Novosibirsk, Russia

[2] National research Tomsk Polytechnic University ,Lenin av., 30, 634050, Tomsk, Russia

[3] Siberian Branch of the Russian Academy of Sciences, Department of the Trofimuk Institute of Petroleum-Gas Geology and Geophysics, cademichesky av., 4, 634021, Tomsk, Russia

ABSTRACT

The understanding the patterns of the chemical elements mobilization and migration in natural objects and the reasons for the increase of their concentrations at the regional and global level is one of the most imperative problems of modern hydrogeochemistry. Currently, much attention is paid to the factors that determine the extent and environmental behaviour of chemical elements distribution and, in particular, heavy metals. The definition of forms of heavy metal compounds in natural objects is a basic tool for the study of geochemical cycles of elements, to identify mechanisms for the negative influence of anthropogenic factors, an assessment of resistance to environmental protection and the choice of methods of their effective inactivation. On this point, of particular interest is the study of bog systems that typically are indicative of any significant regional environmental and climate changes. The distribution of elements in bog soils affects their mobility and availability and thus their potential beneficial or harmful impact on ecosystems, biota and humans. On the other side, the properties of the soil influence elemental distribution. In the present study, chemical speciation of macro and trace elements in peat deposits, collected from the territory of the Kokchetav mountain group, North Kazakhstan, by sequential extraction procedure were analysed. The impact of the chemical peat properties on the content, distribution, mobility and availability of elements was investigated. Principal component analysis was employed for the evaluation and characterization of the experimental data, understanding of the relationships between peat properties and the distribution, affiliation and connection of the elements.

Key words: Peat deposits; distribution of elements; sequential extraction procedure.

* Corresponding Author

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Landmark orientation and map design for pedestrians: prototype of Selcuk University campus area (Turkey) pedestrian navigation system

Huseyin Zahit Selvi [1]*, I. Oztug Bildirici [2], Necla Ulugtekin [3]

[1] Necmettin Erbakan University Geomatic Engineering Department Division of Cartography, Konya, Turkey
[2] Selçuk University Geomatic Engineering Department Division of Cartography, Konya, Turkey
[3] Istanbul Technical University Geomatic Engineering Department Division of Cartography, Istanbul, Turkey

ABSTRACT

Orientation software produced today is generally designed for the navigation of cars. However, the navigation needs of pedestrians are different from those of drivers. Recently, the number of studies on orientation services for pedestrians has rapidly increased. However, the most important issue is the usability of these applications. The aim of this study is the design of a cartographic interface that supports the navigation of pedestrians in unfamiliar areas using landmarks and evaluation of this geo-mobile application by usability testing. In this study, an approach to landmark orientation based on the Voronoi diagram is proposed. Furthermore, the developed mobile application that uses this approach is explained in detail. The results of user tests are also given.

Key words: Landmark orientation; map design; pedestrians; navigation system.

* Corresponding Author

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The study of geobarometers in pelitic schists from the Pütürge metamorphites (Turkey)

Filiz Gungor *

Fırat University, Department of Geological Engineering, Elazig, Turkey

ABSTRACT

Pelitic schists from The Pütürge metamorphites have important minerals garnet, biotite, chlorite, kyanite, and staurolite as a used in the determination of degree of metamorphism. Kyanite from these commonly found in metapelites such as staurolite mica schist, stavrolite garnet mica schist, biotite schist and amphibole schist. Kyanite is one from $A_{12}SiO_5$ polymorphs (andalusite, sillimanite and kyanite). Kyanite is approximately ten percent more dense than the other two, and hence formation of kyanite is favoured by high pressures. The metamorphic petrolgy is to estimated pressure-temperature conditions during metamorphic events and fluids in metamorphic environment. The geobarometers were used to estimate metamorphic conditions of pelitic schistes in metamorphites. The study of garnet–aluminium silicate–plagioclase–quartz (GASP) barometry has a long history. Compositions of staurolite and garnet in the assemblage in samples was calculated from temperature and pressure changes. The calculated temperatures could be due to conditions of PH_2O < Ptotal during metamorphism. The equilibrium among staurolite, garnet, quartz and aluminium silicate is only approximately located in pressure-temperature space.

Key words: Turkey; kyanite; pelites; geobarometry; Ar-Ar isotope.

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Au-Ag minerals in pyrites at Tikhoe epithermal deposit

Galina Palyanova [1,2]*, T. Zhuravkova [1,2], N. Savva [3], E. Kolova [3]

[1] Siberian Branch of Russian Academy of Sciences, Sobolev Institute of Geology and Mineralogy, Russia
[2] Novosibirsk State University, Russia
[3] Far East Branch of the Russian Academy of Sciences, Northeastern Complex Research Institute, 685000, Magadan, ul. Portovaya, 16, Russia

ABSTRACT

Tikhoe epithermal deposit represents a new promising industrial facility of Engterinsky ore block (Magadan region, Russia). The content of gold in some samples of ore varies from the first of up to 700 g/t and silver - up to 2200 g/t (Kolova et al., 2015). Pyrite and galena dominates among the ore minerals, arsenopyrite, sphalerite, silver sulphosalts, fahlore and electrum are less developed. Since pyrite attributed to minerals - concentrators of gold and silver, the identification of the forms of precious metals in the sulfides of iron is of great fundamental and practical importance. The optical and scanning electron microscopy and electron microprobe analysis were used to study gold- and silver-bearing pyrites of Tikhoe deposit. One- or two-phase round microinclusions consisting of electrum (450-680 ‰) and (or) galena, petrovskaite and (or) uytenbogaardtite, galena, sphalerite were found in the early productive pyrites. Later arsenical pyrites (with As up to 2.6 wt.%) contain multiphase xenomorphic microinclusions of acanthite, uytenbogaardtite, freibergite, argentotetraedrite-tennantite, naumannite, petzite, selenopolybasite-selenostephanite, tellurocanfieldite and other ore minerals, located in the porous, cracks and intergranular space. Pyrite, which underwent hypergene changes, comprises rims and intersecting veins of acanthite, goethite, anglesite, plattnerite and native silver. Thermobarogeochemical studies of primary and primary-secondary fluid inclusions in quartz were carried out. Diagrams lg fS2 (Se2) - T, lg fO2 - pH, lg fS2 - lg fSe2 were calculated for detected parageneses. The presence of rounded microinclusions of ore minerals and large pores in the early pyrites suggest both the participation of volatile components in the mineral-forming processes, as well as the capture of large amounts of pyrite impurities in sharply graded crystallization conditions. The thermobarogeochemical data testify that the formation of the studied ore zone occurred during the boiling of fluid in stages at temperatures from 230 to 105°C. Thermodynamic calculations showed that Ag-Au-S-Se minerals were formed from the weak-acid - neutral solutions at high fugacity of sulphur (lg fS2 = –22 ÷ –9) and selenium (lg fSe2 = –27 ÷ –14) with a temperature decrease and change of reducing to oxidizing conditions.

Key words: Pyrites; Au-Ag minerals; genesis.

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* Corresponding Author

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Physicochemical models of formation of gold-silver ore mineralization at the Rogovik deposit (north-eastern Russia)

Tatiana V. Zhuravkova [1,2]*, G.A. Palyanova [1,2], I.R. Prokopyev [1,2], A.S. Borisenko [1,2], K.V. Chudnenko [3], R.G. Kravtsova [3]

[1] Siberian Branch Russian Academy of Sciences, Sobolev Institute of Geology and Mineralogy, Novosibirsk, Russia
[2] Novosibirsk State University, ul. Pirogova 2, Novosibirsk, 630090, Russia
[3] Siberian Branch of the RAS, Vinogradov Institute of Geochemistry, ul. Favorskogo 1a, Irkutsk, 664033, Russia

ABSTRACT

The Rogovik epithermal gold-silver deposit is located in the Omsukchan ore district (Magadan Region), one of the known Au- and Ag-rich ore districts. Specialty of multiple composition of ore mineralization and polygenic character of formation are typical of the deposit. Previously, three ore types were found at the deposit: 1) Au-Ag (volcanogenic Au-Ag formation); 2) Ag (volcanoplutonic Ag-Pb formation); 3) «Polyassociation» (Au-Ag-Pb) ores formed when two ore-bearing systems were combined. Goals of this work were to conduct comprehensive studies to identify the characteristics of chemical composition of gold-silver minerals (acanthite, naumannite, native gold and other) and their relationships in various types of ores, to establish conditions of ore formation, and develop possible physicochemical models of formation of Au-Ag mineralization at the Rogovik deposit. Mineralogical researches have shown that the main gold-silver minerals in Au-Ag ores are electrum, kustelite, acanthite ($Ag_{2.3-2.5}S_{0.89-0.87}Se_{0.11-0.13}$), silver sulfosalts, naumannite ($Ag_{2.8}S_{0.36-0.11}Se_{0.64-0.89}$); in Ag ores - kustelite, native silver, naumannite ($Ag_{2.10-2.31}S_{0.20-0.13}Se_{0.80-0.87}$), silver sulfosalts, acanthite; in «polyassociation» ores - Hg-bearing kustelite, electrum, naumannite ($Ag_2S_{0.27-0}Se_{0.73-1}$), acanthite ($Ag_2S_{1-0.75}Se_{0-0.25}$), argyrodite, silver sulfosalts. The thermobarogeochemical studies of fluid inclusions in quartz have shown that Au-Ag mineralization was formed during the first volcanogenic stage at 300-50ºC. Apparently, there was heterogenization of deep fluid and this boiling-up fluid formed a gas mixture (CO_2, CH_4 and H_2) and an aqueous solution of Mg, Ca and K chlorides with a salinity of 4.8-4.9 wt.% NaCl equiv.. Hydrothermal solution mixed with meteoric waters near the surface. The second stage was characterized by relatively high temperature (195-220ºC) and aqueous solutions of K and Na chlorides with salinity below 10.5 wt.% NaCl equiv., which were cooled to 120°C. Thermodynamic calculations were performed with the use of obtained mineralogical and thermobarogeochemical data. We used universal software complex «Selektor-C» to develop physicochemical models of ore formation at the Rogovik deposit. The simulations were carried out for chemical system K-Na-Ca-Mg-Mn-Al-Si-Ti-Fe-Zn-Cu-Pb-Au-Ag-Hg-C-S-Se-As-Sb-Cl-H-O at temperatures of 25-300ºC and pressures of 1-100 bars. Forming solid solutions $Ag_2(S,Se)$ and Ag-Au-Hg were taken into account in simulation. We have calculated several models of Au-Ag mineralization formation: boiling-up of hydrothermal solution, mixing of ore-bearing gas phase with meteoric waters, interaction of ore-forming fluids, host rocks/the Au-Ag ores. Based on mineralogical data and simulation results, we suggest the scenario for the formation of ore associations at the Rogovik deposit.

Key words: P-T-X conditions of ore formation; thermodynamic modeling.

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* Corresponding Author

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Geochronology and geochemistry of Kuhe Zar granitoid, NE Iran

Ghasem Ghorbani *

Damghan University, School of Earth Sciences, Damghan 36716-41167, Iran

ABSTRACT

The Torud-Chahe-shirin magmatic belt is located at the northeast edge of the central Iran structural zone, NE Iran. In this magmatic belt some granitoid bodies as stocks or bosses that intruded into the Cretaceous carbonate and Eocene volcanic and volcanoclastic deposits. The Kuhe Zar granitoid body is located in the north of this belt and is mainly composed of granite and granodiorite rocks. Their mineralogical (For example, the presence of magnetite, calcic amphibole, pyroxene and the lack of muscovite, aluminosilicates) and geochemical characteristics suggest that this body has composition similar to metaluminous calc-alkaline I type granitoids. The rocks show medium to fine grained and have mainly porphyritic textures. This body were emplaced at shallow depth as evidenced by the occurrence of microgranites and microgranoriorites and granophyric, perthitic and porphyritic textures. They are enriched in large-ion lithophile elements (LILE) and have negative anomalies of Nb, Ti, Ta and P, similar to subduction zone environments. Their chondrite-normalized REE patterns are characterized by LREE enrichment and show slight negative Eu anomalies. This paper reports LA U-Pb dating and LA-ICPMS Hf isotopic composition of zircons from this rocks. The U-Pb Concordia diagrams for granite and granodiorite show that the magma crystallization ages of 42.23±0.92 Ma, and 41.2±1.2 Ma, respectively. Zircons in granite and granodiorite are characterized by clearly positive initial εHf values. Sixteen spots were analysed on zircon from granite and granodiorite rocks and their εHf values ranging from +8.89 to +11.36 and +7.08 to +9.93, respectively, indicating that depleted mantle contributed to their origin.

Key words: Age dating; granite; granodiorite; geochemistry; Damghan; NE Iran.

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Zeolitization of Eocene aged felsic tuffs in the Bayburt area, NE Turkey

Derya Cicerali [1]*, Mehmet Arslan [1], Emel Abdioğlu [1], Sohyun Park [2]

[1] Karadeniz Technical University, Department of Geology, TR-61080, Trabzon, Turkey
[2] Ludwig-Maximilians-Universität München, Sektion Kristallographie, 80333, München, Germany

ABSTRACT

The zeolitization in the Eocene aged dacitic-rhyodacitic tuffs from the Bayburt area were investigated by means of optical microscopy, XRD, DTA-TGA, SEM-EDX and mineral chemistry. Based on petrographic observations, zeolitization generally affected on glassy constituents of the tuffs, made of mainly V- and Y- shaped glass shards, compacted fibrous pumice fragments and pirogenic minerals as plagioclase, quartz, biotite and sanidine in a lesser extent, and zeolitization in the tuffs increases with increasing amount of glassy components. Whole-rock powder X-ray diffractions of samples collected from the measured sections in the field were used to determine vertical and horizontal variations in abundances of pirogenic, zeolite and accompanied minerals. Based on the secondary minerals, clinoptilolite-bearing vitric tuff, clinoptilolite-bearing vitric-crystal tuff, clay-bearing tuff and analcime-bearing tuff were separated. According to XRD analysis, tuff samples contain commonly clinoptilolite type zeolite. Other phases are quartz, plagioclase, analcime, opal-CT, calcite, biotite and clay minerals. Clay minerals are mainly smectite and rarely kaolinite. Rietweld refinement method revealed that main phase is K-clinoptilolite and other phases are albite, smectite and alpha-quartz, respectively. The main phase, K-clinoptilolite, was crystallized in monoclinic system and C2/m space group. In DTA curves, clinoplilolite-rich tuffs show endothermic reactions related to loss of absorbed water at ~55 ºC and collapse of crystal structure at ~700 ºC, however, do not exhibit endothermic reaction at ~230 ºC. This observation is consistent with clinoptilolites which are rich in univalent cations (K^+). SEM studies revealed that corn flake textured smectites and platy clinoptilolites were formed by dissolution of glass, respectively. The opal-CT spheres on the clinoptilolite crystals indicate crystallization from excess silica. The fibrous mordenites (?) were developed on the clinoptilolites. The clinoptilolites have Rr value from 0.81 to 0.82, Si/Al ratio between 4.20-4.70 and contain K+ as a major exchangeable cation (0.39-3.30) in addition to Ca^{2+} (0.39-2.25) and Na^+ (0.02-2.16). Conclusively, nearly homogeneous zeolite mineral type in the studied tuffs indicates that the composition of sea water and/or fluid at the time of zeolitization changed lesser in a closed system. In the studied tuffs, smectite formed firstly by devitrification of the glassy constitutes, followed by development of clinoptilolite and other accompanying minerals with increasing ($Na^{++}K^{++}Ca^{2+}$)/H+ activity and pH (9-10) in a closed saline-alkaline environment at low temperatures. Mineral paragenesis developed from glassy components is as smectite → clinoptilolite → mordenite (?) → analcime → opal-CT.

Key words: Clinoptilolite; zeolitization; tuff; Bayburt; Eastern Pontides; Turkey.

* Corresponding Author

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Geochemistry of the orthogneisses in the Koprubasi (Manisa) area: northern part of the Menderes Massif (Western Turkey)

Hulya Kacmaz *

Dokuz Eylul University, Facult of Engineering, Department of Geological Engineering, Tinaztepe Campus, 35160, Buca, Izmır, Turkey

ABSTRACT

Geochemical investigations were carried out on orthogneiss samples collected from the Koprubasi area, in the northern part of the Menderes Massif. The orthogneiss are composed primarily of quartz, plagioclase, k-feldspar, muscovite and biotite. Zircon, ilmenite and apatite are the main accessory minerals. Clay minerals (chlorite/kaolinite) and jarosite occurs as the secondary minerals in some of samples. Geochemical data show that the studied orthogneisses are silica-rich (more than 70 wt % SiO_2), and calc-alkaline. They show a peraluminous character, with A/CNK ratio (molar $Al_2O_3/(CaO+Na_2O+K_2O)$ greater than 1.1. Their normative corundum values (>1%) display characteristics of S-type granite. Also, peraluminous nature, high A/CNK value and abundant mica content support a sedimentary origin for them. The samples show similar chondrite-normalized rare earth element (REE) patterns. These patterns are characterized by light REE (LREE) enrichment, prominent negative Eu anomalies and relatively flat heavy REE (HREE), resembling to the upper continental crust. Negative Eu anomaly indicates the fractional crystallization of plagioclase. In primitive mantle-normalized multi-element diagram, all samples display parallel patterns characterized by sharp negative anomalies of Ba, Nb, Sr and Ti. Their high incompatible element contents (Cs, Rb, K, Th) and negative Nb and Ti anomalies is a characteristic feature of continental crust rocks. Also, significant negative Nb anomaly point out a subduction-related setting. On tectonic discrimination diagrams, the orthogneisses mostly fall in the field of volcanic arc and late/post-collision granites. This is compatible with Ocean Ridge Granite (ORG)-normalized spider diagram showing enrichment of LILE (like K, Rb, Ba) and depletion of HFSE (Hf, Zr, Y, Yb). Obtained data suggest that the protolith of orthogneises are peraluminous, calc-alkaline, S-type granite formed in subduction-related environment.

Key words: Orthogneisses; geochemistry; Koprubasi; Menderes Massif; Western Anatolia.

* Corresponding Author

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Geochemical and isotopic evolution of Pliocene basaltic volcanism in the Eastern Anatolia, Turkey

Vural Oyan [1]*, Yavuz Özdemir [2], Mehmet Keskin [3], Nilgün Güleç [4]

[1] Yüzüncü Yıl University, Department of Mining Engineering, 65080 Van, Turkey
[2] Yüzüncü Yıl University, Department of Geological Engineering, 65080 Van, Turkey
[3] İstanbul University, Department of Geological Engineering, 65080 Avcılar, İstanbul, Turkey
[4] Middle East Technical University, Department of Geological Engineering, Ankara, Turkey

ABSTRACT

Pliocene basaltic volcanism in the East Anatolia (Turkey) erupted form both extensional fractures and volcanic centers in the East Anatolia High Plateau created by collision of the Arabian with Eurasian plate. Our recent studies and literature studies on the Eastern Anatolian volcanism suggest that volcanic activity peaked in the Pliocene and continued in the same productivity throughout Quaternary. In order to better understand the spatial and temporal variations in Pliocene basaltic volcanism, we have started to study basaltic volcanism in the East Anatolia within the framework of a TUBITAK project (project number:113Y406). Geochronological dating results (Ar-Ar and K-Ar) indicate that age of this magmatic activity range between 6-3.5 Ma. Volcanic products contain alkaline and subalkaline lavas, ranging in compositions from basalts to andesite and trachyandesite. EC-AFC model calculations suggest that basaltic samples were unaffected from combined processes of the fractional crystallization and crustal contamination but evolved lavas includes to 2-7 % assimilation rates. Enrichment of large ion lithophile elements (LILE) and light rare earth elements (LREE) relative to high strength filed elements (HFSE) and higher 87Sr/86Sr, Pb isotopic ratios and lower 144Nd/143Nd of the basaltic samples indicates that are derived from mantle source region enriched by melts derived from subducted sediment rather than AOC melts and fluids. Results of the melting model indicate that there was a marked variation both in the source mineralogy (from ~70% to 10% garnet) and the degree of melting (i.e. F from 0.8 % to 6 %) during the formation of Pliocene basaltic lavas. The percentage of spinel seems to have increased in the lerzolitic mantle source of the basaltic lavas. Accordingly, chemical character of the lavas turned from alkaline to subalkaline in time. We argue that the temporal increase of spinel contribution and the melting degree in the mantle source region was responsible for transition from alkaline to subalkaline character in the lava chemistry. This can be explained by the variations in the depth of and degree of melting in the mantle source region, possibly related to the lithospheric extensional nature and partial delamination of lithospheric mantle of Eastern Anatolia during the Pliocene.

Key words: East Anatolia; Pliocene; basaltic volcanism; lithospheric mantle.

* Corresponding Author

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Petrogenesis of Solhan (Bingöl) volcanics in the East Anatolian, Turkey

Vural Oyan [1]*, Yavuz Özdemir [2], Mehmet Keskin [3], Nilgün Güleç [4]

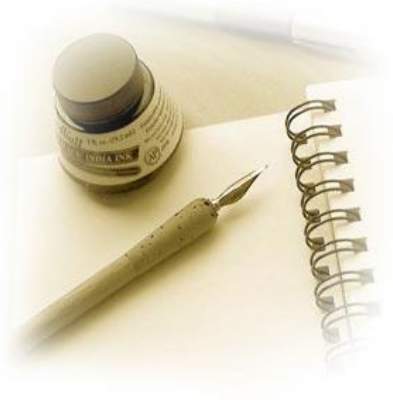
[1] Yüzüncü Yıl University, Department of Mining Engineering, 65080 Van, Turkey
[2] Yüzüncü Yıl University, Department of Geological Engineering, 65080 Van, Turkey
[3] İstanbul University, Department of Geological Engineering, 65080 Avcılar, İstanbul, Turkey
[4] Middle East Technical University, Department of Geological Engineering, Ankara, Turkey

ABSTRACT

Solhan volcanics located in the eastern of Bingöl covers an area of approximately 1000 km2. Our K-Ar dating results indicate that age of this magmatic activity range between 6-3.3 Ma. Schists and metacarbonates in upper unit of the Bitlis Massif and metagranites which observed in around Kızılağaç and Genç takes place on the basis of Solhan volcanics and extensive volcanic activity observed in this area. They consist of olivine, plagioclase, pyroxene phenocrysts and exhibits porphyrtic and crystalline as well as massif textures. The groundmass in these lavas contains the microcrystals of the same mineral assemblage and volcanic glasses. Solhan volcanics have broad compositional range from basalt to andesite and trachyandesite, displaying both alkaline and subalkaline characteristics. Enrichment of large ion lithophile elements (LILE) and light rare earth elements (LREE) relative to high strength filed elements (HFSE) indicate that mantle source of the Solhan volcanics had been enriched by a clear subduction component. Petrologic models obtained by using Isotopic data (Sr, Nd, Pb and □O) and incompatible trace elements reveal that evaluation of magma chamber of the lavas is important of the AFC processes, suggesting evolved lavas includes to 2-6 % assimilation rates. Our melting model calculations show that basaltic melts in this part of the East Anatolia Region (Turkey) would be produced by mixture of the melts obtained by melting of the mantle sources including both of the amphibole bearing garnet lherzolite and spinel lherzolite with 1 % partial melting degree.

Key words: East Anatolia; Solhan volcanics; AFC; melting.

* Corresponding Author



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Turkey: Another country of the Oligocene Giant Rhinoceros Paraceratherium

Neşe Oyal [1]*, Şevket Şen [2], Levent Karadenizli [3], Pierre-Olivier Antoine [4], Gerçek Saraç [1], Cemal Tunoğlu [5]

[1] General Directorate of Mineral Research and Exploration, Natural History Museum 06520 Ankara, Turkey
[2] Laboratoire de Paléontologie du Muséum, CR2P-CNRS, 8 rue Buffon, 75005 Paris, France
[3] General Directorate of Mineral Research and Exploration, Department of Geological Research Ankara, Turkey
[4] Institut des Sciences de l'Évolution, Université Montpellier 2 Place Eugène Bataillon F-34095 Montpellier, Cedex, France
[5] Hacettepe University Faculty of Engineering Department of Geological Engineering General Geology Division Beytepe, Ankara,Turkey

ABSTRACT

Paraceratherium is an extinct genus of gigantic hornless rhinoceroses grouped in the family Hyracodontidae. The representatives of this family dispersed in large areas from eastern Asia to the Balkans during Eocene and Oligocene times. The genus Paraceratherium includes the largest species of this family; adult males are estimated to have been taller than 5 m at the shoulder and 10 m long from head to tail. They had a long neck, like giraffes. Their skull was nearly 1.5 m long. Weight estimates vary greatly, but most realistic and reliable weight estimates are more than 10 tonnes. Giant rhinos were the largest land mammals that have ever existed. Paracerathere fossils were widespread in Mongolia, China, Central Asia and Indian Subcontinent. A few specimens were also mentioned from Georgia and Balkans. First Paraceratherium specimens in Turkey were recovered in 2002 from the Oligocene deposits (Kızılırmak Formation) in the Çankırı-Çorum Tertiary Basin of North-Central Anatolia. Later fieldworks in this formation led to the discovery of several localities with abundant cranial and postcranial remains of this gigantic rhinocerotoid. It is associated to several other mammalian taxa such as small rhinocerotoids, ruminants and rodents, which strongly suggest a Late Oligocene age for the Kızılırmak Formation. In addition, some postcranial remains of Paraceratherium were also recently reported from northeastern Anatolia, also dated to the Late Oligocene. The Paraceratherium fossils from Turkey referred a new Paraceratherium species (Paraceratherium. sp. nov) after detailed systematic definitions and comparisons with the giant rhino specimens from other Asian and European localities. The Oligocene Paracerathere fossils from Asian localities are known as inhabitants of open woodlands and also they were browsers that fed on leaves, fruits, branches, twigs and shrubs. The morphological similarities of Turkish Paracerathere fossils suggest that they lived in similar paleoenvironments and climate as in South and Central Asia. Terrestrial connections and similar palaeoenvironment probably facilitated the dispersal of giant rhinocerotoids from East Asia to the Balkans, across the Anatolian land.

Key words: Kızılırmak Formation; Çankırı-Çorum Tertiary Basin; North-Central Anatolia; Turkey; Oligocene; Paraceratherium.

* Corresponding Author

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Systematics of Middle Eocene Molluscan Fauna from Kavak Village (Delice, Kirikkale) and paleoecological approaches

Müjde Gürsoy [1]*, İbrahim K. Ertekin [1], Levent Karadenizli [2], Neşe Oyal [1]

[1] General Directorate of Mineral Research and Exploration, Natural History Museum 06520 Ankara, Turkey
[2] Hacettepe University, Department of Geological Research, Ankara, Turkey

ABSTRACT

In 2015, field researchs were performed under the project of MTA Natural History Museum called “Oligocene Stratigraphy and Paleogeography of Turkey“. In these researchs, Kocaçay Formation with the middle Eocene age in the Kavak village, Delice, Kırıkkale was examined and important datas about invertebrate fauna and the paleoecology were held out. Çankırı-Çorum Basin was one of the most important basins in Central Anatolia, which takes place among the Tauride, Anatolide and Sakarya continents during the Tertiary era. It is known as an impact basin and was developed at the north branch of Neo-tethys (İzmir-Ankara-Erzincan Ocean) and it was formed during closure under the control of compression regime. During closure on the ophiolitic basement a sequence from Paleocene to Pliocene with continuous sediment accumulation occurs in the basin. This sequence shows oceanic basin feature until Middle Eocene. After the Middle Eocene, sedimentation continues in the form of continental facies. Kocaçay formation in the Kavak village, Delice, Kırıkkale consist of sandstone, claystone and limestone at the top. Formation shows unconformity with ophiolites at the basement and İncik Formation with the early Oligocene age at the top. From the Kocaçay Formation plenty of foraminifera, echinoids, corals and mollusca faunas were held out. Samples from various levels contain 13 species (six from the class Bivalvia: Pycnodonte (Gigantostrea) gigantica (Solender, 1766), Crassatella (C.) gigantica (Koch, 1894), Spondylus eocenus (Leymerie, 1878), Chlamys sp., Venericardia sp., Lima sp., and nine from the class Gastrapoda: Megalocypraea gigantea (Münster, 1828), Terebellum (Seraphs) sopitum (Solander, 1766), Graphis eocenica (de Boury, 1887), Syrnola conulus (Cossmann, 1888), Odostomia lignitarum (Deshayes, 1861), Cepatia cepacea (Lamarck, 1804), Trochus (Tectus) aulacophorus (Cossmann&Pissarro, 1903), Velates perversus (Gmelin, 1791), Campanile leymeriei (d’Archiac,1822,), Opalia sp. After these definitions it was found that the fauna belongs to Lutetian; paleoecological features show a shallow and warm environment with evolved shore facies of detrital-carbonate mixture.

Key words: Turkey; Çankırı-Çorum Basin; Middle Eocene; Bivalvia; Gastropoda.

* Corresponding Author

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Utilization of open source imagery data in delineating active faults, SE Western Desert, Egypt

Mamdouh M. Abdeen *, Hossam M. Gaballah

National Authority for Remote Sensing and Space Sciences (NARSS), El-Nozha El-Gedida, Cairo, Egypt

ABSTRACT

The southeastern part of the Egyptian Western Desert is dominated by nearly E-W and N-S striking fault sets that are associated with parallel to sub-parallel folds. The ca. 300 km long Kalabsha and the ca. 100 km long Seiyal are the most significant and famous faults representing the E-W fault set, while the Kurkur and Gazelle faults are the most significant and famous faults representing the N-S fault set. Parts of these four faults and their associated structures have been investigated in the present study. The epicenter of the November 14, 1981 earthquake (5.6 M), which was felt in Aswan and in the neighboring areas, was located at Gebel Marawa at the intersection between the E-W striking Kalabsha and N-S striking Kurkur faults. In the present study, we test the potential of the satellite imagery data freely available through the USGS website (http://earthexplorer.usgs.gov/) for mapping these geological structures. Resolution merge (pan-sharpen) between the 1m-spatial resolution, panchromatic Orbview-3 image and the 30 m-spatial resolution Landsat 7 ETM+ multi-spectral image gives 6 multi-spectral bands in VNIR and SWIR channels with 1 m spatial resolution. Principal component analysis and high-pass filtering further enhanced rock units' discrimination and hence structural interpretation. Observations indicate that each of these faults is composed of several segments having en echelon arrangement, producing releasing and constraining bends with synclines and anticlines, respectively. The four faults affect Cretaceous, Paleocene and Lower Eocene rocks. Hence they are younger than Early Eocene. Open fractures filled with windblown sand in the Quaternary terraces were observed along and parallel to the fault traces indicating recent seismic activity due to reactivation of these faults. Kinematic indicators (e.g. slickensides, minor folds, faults) indicate a major dextral strike-slip movement and a subordinate dip-slip movement associated with the E-W striking Kalabsha and Seiyal faults and a major sinistral strike-slip movement and a subordinate eastward dip-slip movement associated with the N-S striking Kurkur and Gazelle faults. Paleo-stress analysis of fault plane striae of the four faults indicates sub-horizontal NNE-SSW extension comparable to the present day stress field. Several N-S to NNW-SSE and E-W to ENE-WSW-trending fractures have been observed affecting the Cretaceous sandstone near the Kalabsha and Kurkur faults. These two fracture sets are parallel to the nearly E-W and N-S striking faults, and are believed here to be synchronous. This conclusion is in agreement with the trends of the nodal planes obtained from fault plane solution of the November 14, 1981 earthquake and the events recorded afterwards. The seismicity of the area could be related to the present day plate configuration and stress distribution related to the Red Sea opening.

Key words: Neotectonic; Kalabsha; Seiyal; Kurkur; Gazelle; active faults; Aswan, Egypt.
* Corresponding Author

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Palynostartigraphy and dispersed organic matter studies in Permian succession of Lingala-Koyagudem coalbelt, Godavari Graben, South India

Neha Aggarwal *, Neerja Jha

Birbal Sahni Institute of Palaeosciences, 53-University Road, Lucknow-226007, India

ABSTRACT

The purpose of present investigation is to reconstruct the palaeoenvironment of fresh water sequences with the help of dispersed organic matter studies in order to achieve this objective i.e. to reconstruct the palaeoenvironment during the deposition of sediment in Lingala-Koyagudem Coalbelt of Godavari Graben, palynofacies analyses were conducted on 33 samples from the 380.00 m deep core, MMK-19 and 24 samples from 319.00m deep core, MLG-23. Six categories of Dispersed Organic Matter (DOM) were observed and on the basis of dominance and sub-dominance of the different categories four (I—IV) palynofacies has been identified, representing the different palaeoenvironments. Palynofacies (I-IV) are dominated by structured terrestrial, degraded terrestrial, charcoal and terrestrial palynomorphs respectively. The allocation of palynofacies reflects a combination of lacustrine and deltaic depositional environments. Palynofacies-I has been interpreted as an oxic environmental conditions; Palynofacies-II reflects low energy fresh water swamps; Palynofacies-III, indicates redeposition of organic matter from fluvio-deltaic sources; Palynofacies-IV has been attributed to fresh water peat environment in lower energy setting. Palynological studies have also been carried for the dating of the sediments. Six different palynozones have been identified on the basis of the dominance and the subdominance of the palynomorphs. These palynozones are comparable to Talchir, Lower Karharbari, Upper Karharbari, Barakar and Raniganj palynoflora of Indian Lower Gondwana. Palynozone-1 identified in MLG-23 is equivalent to Parasaccites Assemblage of Talchir Palynoflora; Palynozone-2 identified in MLG-23 and MMK-19 is correlatable with Callumispora + Parasaccites Assemblage of Lower Karharbari palynoflora; Palynozone-3 identified in MMK-19 corresponds well with Parasaccites + Scheuringipollenites Assemblage of Upper Karharbari palynoflora; Palynozone-4 identified in MLG-23 and MMK-19 is comparable to Scheuringipollenites Assemblage of Barakar palynoflora; Palynozone-5 identified in MMK-19 is correlatable with Faunipollenites+ Striatopodocarpites Assemblage of Raniganj palynoflora and Palynozone-6 identified in MMK-19 corresponds well with the Crescentipollenites Assemblage of Raniganj palynoflora.

Key words: Palynostratigraphy; Dispersed Organic Matter (DOM); palynofacies; palaeoenvironment; Permian; Godavari Graben; India.

* Corresponding Author

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Permian and Triassic Palynology of Chintalapudi sub-basin, its stratigraphic and phytogeographic implications

Neerja Jha *, Neha Aggarwal

Birbal Sahni Institute of Palaeosciences, 53-University Road, Lucknow-226007, India

ABSTRACT

Sub surface palynological investigations carried out in different parts of Chintalapudi sub-basin have led to recognise 11 distinct palynoassemblages belonging to Talchir, Karharbari, Barakar, Raniganj and Panchet palynoflora. Late Permian Raniganj palynoflora has been identified in Ayyanapalli Gompana, Sattupalli, Chintalapudi, Gattugudem, Amavaram and Bottapagudem areas and Early Triassic palynoflora has been recognised in Sattupalli and Chintalapudi areas indicating presence of Raniganj and Panchet equivalent sediments in Chintalapudi sub-basin. On the basis of these palynological studies existence of two coal bearing horizons, one belonging to Early Permian (Karharbari and Barakar Formation) and other belonging to Late Permian (Raniganj Formation) has been indicated in Chintalapudi sub-basin as well. Absence of Upper Barakar and Barren Measures palynoflora indicates apparent discordance in stratigraphic sequence in Chintalapudi sub-basin. Early Triassic palynoflora recorded in Sattupalli and Chintalapudi areas of Chintalapudi sub-basin again support the findings of (Jha and Srivastava, 1996) that Kamthi Formation represents Early Triassic sequence equivalent to Panchet Formation. Permian Triassic transition in Chintalapudi sub-basin is gradational similar to Budharam area of Godavari sub basin and qualitatively it is similar to that of Salt Range, Madagascar and South Africa. The present palynological studies supports Guttulapollenites Palaeophytogeographic province, in Glossopteris dominated megafloral province in Gondwana during Late Permian time, extending from Salt Range in north to Amery basin in south, Mid Zambesi-Luangawa basin in west to Satpura- Wardha-Godavari basin in east. It is possible that reworked palynomorphs of Dulhuntiyispora, an endemic stratigraphically significant Permian taxa of Australia, recorded in Tertiary sediments of Assam, might have come from Late Permian sediments of Australia by long distance turbidity currents or the waves caused by some palaeomegatsunami.

Key words: Palynostratigraphy; phytogeographic province; palaeomegatsunami; Chintalapudi sub-basin; India.

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Species longevity in marine invertebrates; biotic versus abiotic traits

Ahmed Awad Abdelhady *

Minia University, Faculty of Science, Geology Department, 61519 El-Minia, Egypt

ABSTRACT

Predicting biotic responses to current global change can be acquired through understanding how biological and environmental traits shaped the past origination, dispersion, and extinction patterns using the paleontological data. Species duration (longevity) varies greatly, but the reasons for this are unclear. Based on regression modelling and quantitative analysis of fossil marine invertebrates, ecological factors influencing longevity were assessed. Occurrence and range data of bivalve through the Phanerozoic as a whole were downloaded from the Paleobiology Database. The final occurrence matrix include 161357 record belonging to 2378 genera. The data were compiled into two tables, the range table and the occurrence table. The genus level was chosen to be the unit of analysis as it quite enough for macroecological processes. In addition it have more complete fossil record and robustness against sampling artifacts. Raw occurrence data was standardized using randomized subsampling and square-root transformation to downplay the effect of sampling bias. The results indicated that geographic range size, longevity, and diversity have a cyclic pattern, in which each variable affect and is affected by the others. In addition, a significant variation on species duration was found among taxa exhibiting different biotic traits such as life habit (i.e., infaunal vs. epifaunal), diet (suspension vs. deposit feeders), composition (aragonite vs. calcite), larval type (planktotrophic vs. non-planktotrophic), and locomotion (stationary vs. mobile). Testing whether a wide geographical distribution provide potentially to survive mass extinctions, revealed a significant variation among average duration of narrow and wide range sizes (66 and 230 MY). Moreover, taxa originated at crises intervals have a wider range size, higher abundance, and lower extinction rates. Hence, geographic range size play a major role in determining extinction risk.

Key words: Longevity; geographic range-size; biodiversity; ecological traits; ınvertebrates; fossil record.

* Corresponding Author

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The stratigraphy of the Taşova (Amasya, Turkey) region

Mehmet Akyazi [1]*, Filiz Koçak [1], E. Meral Unsal [1], Yeşim Yildirim [2], T. Fikret Sezen [1]

[1] Cumhuriyet University, Department of Geological Engineering, 58140 Sivas, Turkey
[2] Garanti Bank Call Centre, Cumhuriyet University Campus, 58140 Sivas, Turkey

ABSTRACT

This study includes paleontological and stratigraphy in the Taşova (Amasya) region. In this study, geological and stratigraphical characteristic of these units will be investigate as detail and will be contribute to previous studies. Middle Black Sea region has to rather complex and interesting structure as a stratigraphical. The study area is located in the Pontid Tectonic Belt. It is known that continental and marine cover deposits in the study area included various and abundant fossil. In this study, these deposits will be aged as detail. According to these ages, Tertiary stratigraphy of region will be realize. As result of, geological and stratigraphical situation of central Pontid region will be investigate with these data.

Key words: Taşova; geology; stratigraphy; chronostratigraphy; stratigraphic correlation.

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The geology of Akincilar and vicinity (Sivas, Turkey)

T. Fikret Sezen *, Mehmet Akyazi

Cumhuriyet University, Department of Geological Engineering, 58140 Sivas, Turkey

ABSTRACT

This geological study includes Akıncılar (Sivas) region. In this investigation, geological characteristics of lithostratigraphical units will be investigated as detail and will be contributed to previous studies. Northern of Central Anatolia is a significant region with stratigraphical and geological features. In addition to this, the investigation area has an interesting and complex structure as tectonically because of this area located on the North Anatolian Fault Zone. Meanwhile, the studying area is located on the northern of Anatolides tectonic belt and on the southern margin of Pontides orogenic belt. This area contains a wide variety of abundant marine fossiliferous sedimentary units. Editing of stratigraphic units, investigation of tectonic evidences and review of the geological features of the investigation area were planned with this proposed study at the related scope area.

Key words: Stratigraphy; geology; Akıncılar.

* Corresponding Author

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Early Cretaceous shallow-water platform carbonates of the Bolkar Mountains (Central Taurides, S Turkey): facies analysis and depositional environments

Cemile Solak *, Kemal Taslı, Hayati Koç

Mersin University, Department of Geological Engineering, Mersin, Turkey

ABSTRACT

Bolkar Mountains are situated in southern Turkey, eastern part of the Central Taurides. The study area comprises southern non-metamorphic part of the Bolkar Mountains. The studied five outcrops form geologically parts of the tectonostratigraphic units called as allochthonous Aladağ Unit and autochthonous Geyikdağı Unit. The aim of this study is to describe microfacies and depositional environments recorded from the Bolkar Mountains Early Cretaceous shallow-water platform carbonates. The Lower Cretaceous in the Bolkar Mountains is represented by continuous thick-massive bedded dolomite sequence ranging from 100 to 150 meters thick, which only contains locally laminated limestone intercalations in the Yüğlük section and thick-very thick bedded uniform limestones ranging from approximately 50 to 120 meters, consist of mainly laminated-fenestral mudstone, peloidal-intraclastic grainstone-packstone, bioclastic packstone-wackestone, benthic foraminiferal-intraclastic grainstone-packstone, ostracod-fenestral wackestone-mudstone, dasycladacean algal packstone-wackestone and ooidal grainstone microfacies. Based on a combination sedimantological data, facies/microfacies and micropaleontological (predominantly dasycladacean algae and diverse benthic foraminifera) analysis, it is concluded that Early Cretaceous platform carbonates of the Bolkar Mountains reflect a tidally affected tidal-flat and restricted lagoon settings. During the Berriasian-Valanginian unfavourable facies for benthic foraminifera and dolomitization were predominate. In the Hauterivian-early Aptian, the effect of dolomitization largely disappeared and inner platform conditions still prevailed showing alternations of peritidal and lagoon facies, going from peritidal plains (representing various subenvironments including supratidal, intertidal area, tidal-intertidal ponds and ooidbars) dominated by ostracod and miliolids, to dasycladacean algae-rich restricted lagoons-subtidal. These environments show a transition in the vertical and lateral directions in all studied stratigraphic sections.

Key words: Early Cretaceous; platform carbonates; facies analysis; depositional environments; Central Taurides.

* Corresponding Author

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Statistical analysis of facies using probability of density method of the late Ordovician reservoir (unite IV), Sbaa basin, Saharan Platform, Algeria

Rabah Chaouchi *, Kadri Imededdine, Soumya Benayad

University M'hamed Bougara (UMBB) Boumerdes, Faculty of Hydrocarbons and Chemistry (FHC), Laboratory of mineral resources and energy, 2 Avenue de l'independence, Boumerdes, Algeria

ABSTRACT

The late Ordovician reservoir (unite IV) is one of the most important reservoir in the Sbaa basin. Parameters controlling the quality of this reservoir vary and have a direct relation with the depositional environment. The studied reservoir is interpreted to be deposited in a glacial environment (paleo-valley) where various problems regarding lithology as well as petrophysical parameters were highlighted. Therefore, the aim of this study is to characterize the reservoir facies by applying the probability of density method using geostatistical software named "Easy Trace". For that; two wells were used (GNF-1 and OTRA-2) in order to characterize facies changes within the northern and southern perimeter; respectively. The well GNF-1 shows a facies diversification with shale abundance, whereas the well OTRA-1 shows that facies in the southern perimeter of the study area has a coarse granulometry with a low volume of shale. Reservoir facies changes from the north to the south is explained by the presence of two different source areas. Indeed; the Azzene Vout is interpreted to be the source area of the northern perimeter of the study reservoir; whereas, the source area of the southern perimeter is interpreted to be located toward the south eastern part of the paleo-valley.

Key words: Sbaa basin; Late Ordovician reservoir; unit IV; probability of density method; easy trace.

* Corresponding Author

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Impact of the fracturation and the diagenesis on the petrophysic qualities of the TAGS and Quartzites of Hamra Reservoirs in the field of Rhoud Nouss - Algeria

Khemissi Zellouf *, N. Gaci

University of Boumerdes, F.H.C, 35000 Boumerdes, Algeria

ABSTRACT

The choice of the best process to stimulate a reservoir in order to improve the production requires an accurate data about its petrographic and petrophysics characteristics. The field of Rhoud Nouss is a dood case study. The upper Triassic argillaceous sandstone (TAGS) and Quartzite Hamra (Ordovician) reservoirs are considered among the main reservoirs of the Rhoud Nouss field. The two reservoirs are different because they belong to two geologic units, each one having its own history and evolution (deposition and tectonic events); however the diagenetic effect as well as the fracturation have improved or destroyed their primary petrophysic qualities and, as a result, the two reservoirs underwent a same transformation but in different amount. The TAGS is the best reservoir in this region the facies association of the TAGS reservoir, gotten from the drill cores analysis shows a typical sedimentation of breaded stream net in the lower part of the reservoir and becoming meandering fluvial net in the upper part. The good petrophysic characteristic of this reservoir is due to the primary porosity that is sometime sealed off by different cements. The petrographic and the radiocristallographic analysis able us to identify an illite matrix filling the intragranular space between the grains. The “pore bridging” damaged the petrophysic qualities. The primary porosity is very good, but it was often sealed off by different phases of cementation (siliceous, dolomitic anhydritic and argillaceous cementation). The dissolution of the secondary silica as well as the fragments of rocks with a high silica content brought a secondary porosity and a good permeability. The fractures observed on the drill cores are subvertical, open and sometime field with anhydrite or carbonates (dolomite), they improved, partially, the total porosity but they boosted the permeability by connecting the net of fractures. The Quartzites of Hamra reservoir tops the TAGS upon the Hercynian unconformity. This reservoir has poor petrophysic properties because it is highly damaged by a strong compaction due to an overburden diagenesis (the stylolites in the drill cores are marks of the pressure – dissolution resulting from the compaction). The chemical compaction has generated a low rate of secondary porosity (2 to 4%) on the total porosity; however the drill cores, the bore hole images and the microscopic observations able us to highlight the effect of the microfissures on the petrophysic properties of this reservoir. In fact, only the natural fracturation, linked with the complex fracturation of all the region of Rhoud Nouss is the main cause of the improvement of the petrophysic qualities, even though the compaction produced cracks and dissolution. The natural fracturation and the diagenesis are the main causes that improved or demaged the petrophysic qualities of the TAGS and Quartzites of Hamra reservoirs. This is illustrated by a set of photo and a diagenesis sequences flowchart. The fracturation is the main cause for the improvement of the primary petrophysic properties of the Quartzites of Hamra reservoir, while the dissolution due to diagenesis has generated a good secondary porosity in the TAGS reservoir. To boost the production it is recommended to do an hydrolic fracturation in the Quartzites of Hamra reservoir and a chlorine acidification to dissolve the carbonates cement that fill the fractures and the inter granular space between the grains.

Key words: TAGS; quartzites of Hamra; diagenesis; fracturation; acidification; Rhoud – Nouss.

* Corresponding Author

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Facies association and sequence Stratigraphy of the Late Ordovician Glaciation: Impact on the hydrocarbon Prospect of the Ahnet Basin (Sahara Platform)

Khemissi Zellouf *, Hdj Fedlaoui

University of Boumerdes, F.H.C, 35000 Boumerdes, Algeria

ABSTRACT

The upper Ordovician is characterized by important glaciations that left numerous marks in the North of Sahara platform. These glaciations contributed to build up hydrocarbon Prospects, particularly the reservoir rocks, and the morphology of traps and, after their melting during the Silurian, the source rocks. A comprehensive approach to the study of the sedimentary cover of this event, including analysis of the drilling logs, the seismic profiles and out-crops data, enable us a better understanding about the extensive glacial sediments, of this period. Sequence stratigraphy has been a valuable tool in analysing and modelling the Ahnet basin. In the upper Ordovician, important cycles of glaciations have left numerous evidences in the sahara platform. Some of them (striations on the floors, eskers, glaciomarine deposits and incisions of valley) are present through all the Sahara, from Libya to Mauretania. In Algeria, the late Ordovician formations are named unit IV. The bottom of this unit is made of micro-conglomeratic shale with almond of quartz. The deposits suggest a periglacial environment and are found at the periphery of the upper Ordovician inland. The proximal deposits are located in a wide fluvial-coastal plain and the shore environment are characterized by the presence of delta fans. In the coastal domain the periglacial deposits are reworked by tidal processes. On the north at the distal position, there are melted sediments coming from the peripheric zone of the Inlandis, carried by gravity toward the deeper environment. In the Ahnet basin, the sequence stratigraphy shows two 3rd order cycles corresponding to EL Golea and M'kratta formations. At the base of each cycle there is an unconformity (S B). The overall shows a transgressive tendency which has reached the maximum (M F S) during the Landovery. The sedimentary analysis from the out- crops, the drill cores, and the electrofacies able we to individualize 08 facies associations linked with their environments. The seismic profiles through the principal axe of Bahar Ahmar (Ahnet basin) show that the deposits of unit IV have a fan shaped geometry, more or less stratified, cut laterally by zones of incision filled with Silurian deposits. The origin of these incisions seems to be linked with the isostatic rebound at the end of the Ordovician. The late Ordovician glaciation in the Sahara platform gave birth too many reservoir rocks and traps. A sequence stratigraphy approach has been used to predict reservoir rocks distribution; a modelling, using diver's data from the Ahnet basin, is proposed.

Key words: Glaciation; Ordivician; Sahara-platform; Ahnet basin; reservoir rocks.

* Corresponding Author

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A geo-archaeological approach to reconstruct Arno plain landscapes (NW Tuscany, Italy) from fluvial to coastal contexts since Etruscan times

Arianna Commodari [1]*, Monica Bini [2], Valeria Mariani [2], Veronica Rossi [3], Giovanni Sarti [2]

[1] University of Nice Sophia Antipolis, CNRS UMR 7264 - CEPAM (Cultures et Environnements Préhistoire, Antiquité, Moyen Âge) Campus Saint Jean d'Angély 3, 24, avenue des Diables Bleus - 06357 Nice Cedex 4, France
[2] Pisa University, Dipartimento di Scienze della Terra, Via Santa Maria 53, 56126 Pisa, Italy
[3] Bologna University, Dipartimento di Scienze Biologiche, Geologiche e Ambientali, 40126 Bologna, Italy

ABSTRACT

The study of recent past landscapes, understood as the result of the interaction between natural environment and human society, needs an interdisciplinary approach able to reconstruct the evolution of both paleo-environments and landforms at a chronological resolution comparable to that marking the succession of historical periods. In the Arno Plain (NW Tuscany, Italy), a fully integrated geo-archaeological approach allowed the reconstruction of paleo-environments, paleo-topography and urban growth patterns of the Pisa city area during the Etruscan and Roman period (first half of the 5th century BC-2nd century AD; Bini et al., 2015), whereas a detailed reconstruction of extra-urban landscapes from fluvial to coastal areas is still lacking. In order to fill this gap of knowledge, we applied the geo-archaeological approach on two different extra-urban areas subject to long-lasting human frequentation since Etruscan times and located at distal and proximal locations, respectively. The first site, located ca. 18.5 km south of the Pisa city and 5 km inland respect to the modern coastline, is supposed to host the ancient harbour of Pisa (Portus Pisanus; Pasquinucci, 2013; Morhange et al., 2015; Rossi et al., 2015). Stratigraphic cross-sections, supported by cores facies analysis and radiocarbon dating, document the establishment of a wide lagoonal basin since the marine transgression peak (ca. 8000 cal yr BP). This basin persisted for several millennia providing a naturally protected landing-place for boats (Portus Pisanus basin?). The integration of stratigraphic and historical data suggests a progressive closing of the lagoon since Roman times, inducing the westward transferring of the middle Ages harbour in the area now occupied by Leghorn port. The other site is located ca. 15 km far from the modern coastline between Pisa and Cascina urban areas, within a fully alluvial context still showing evident traces of Roman Centuriation that was an orthogonal system of axis created to measure, divide and reclaim the territory but also to manage the water resources. However, the paleo-hydrographic network of this portion of the Pisa plain is still unknown. Preliminary core facies analyses, integrated with geomorphological and toponomastic studies, allowed the identification of a paleo-Arno river branch located in a southern position respect the modern course and the identification of a marked change in alluvial plain drainage conditions (from poorly drained to well drained), attributable to Roman reclamation landworks. In both sites the employed geo-archaeological approach, including sedimentological, paleontological, geomorphological, radiocarbon, toponomastic and historical data, enabled a reliable, although preliminary, reconstruction of past landscapes, furnishing new insights into the transformation processes that affected the Pisa plain during the last ca.3000 years.

Key words: Pisa plain; paleo-environment; geo-archaeology; facies analysis; Etruscan and Roman times.

* Corresponding Author

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Alluvial megafan evolution in strike-slip tectonic settings: examples from Dehaghan-Abadeh basin, centre of Iran

Nasser Arzani 1*, Alireza Nadimi 2

1 Payame Noor University, Geology Department, P.O.Box: 19395-469, Tehran, Iran
2 University of Isfahan, Department of GeologyIsfahan, Iran

ABSTRACT

Quaternary alluvial megafans are developed and evolved in response to active strike-slip tectonic settings in Dehaghan-Abadeh basin, where the fans are emplaced in a fault-bounded, NW-SE trending narrow depression in the west of Sanandaj-Sirjan zone in center of Iran.The studied basin is 10-40 km wide, more than 160 km long and is bounded by two right-lateral strike-slip faults known as Dehaghan and Shahreza-Abadeh faults. The Zagros Orogen and its fold-thrust belts is in west of this basin and provide the highland source and the catchments of the studied megafans. The geomorphic response of an active transtensional stretch in Dehaghan-Abadeh basin was studied using satellite images integrated with geomorphic mappings combined with sedimentological studies of two representative alluvial megafans. The Kahroyeh and Esferjan megafans were selected to study the landscape evolution in this basin. They were formed in a tectonically active basin and under arid to semiarid climate conditions. Geomorphic indices including stream length-gradient index, mountain front sinuosity, valley floor width to valley height ratios, and entrenchment of recent alluvial megafan deposits were used to define the lateral growth and direction of propagation of the fault systems. Right-lateral displacement along Dehaghan and Shahreza faults and uplift along the Dehaghan fault was defined using topographic analysis of the ridges and geomorphic mapping of these fans. The succeeding strike-slip movements brought about a shingling arrangement of successive fan lobes. Deformed landforms, such as alluvial megafans, which were rotated and geomorphologically evolved under active tectonics of the basin-boundary fault systems, provide an excellent record for understanding actively evolving intra-continental strike-slip faults. Structural controls are dominant drivers behind the development and evolution of alluvial megafans and the characteristic suite of deformations seem to define useful criteria in distinguishing alluvial fans developed in strike-slip regimes.

Key words: Alluvial megafans; climate; tectonism; upstream catchment; lithological and structural controls.

* Corresponding Author

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Tectonic controls on carbonate-evaporite successions of the Triassic platforms: a comparison between Khaneh Kat, Kangan and Dashtak formations in Zagros Mountains, SW Iran

Ali Hossein Jalilian *

Payame Noor University, Geology Department, Iran

ABSTRACT

Tectonics and climate are two primary controls which determine sedimentary facies and the nature of carbonate successions. The widespread dolomite and evaporite compositions of the middle to upper Triassic carbonate platforms have been attributed to the climatic conditions. However, tectonics have been a major constrain on facies distribution as it is the case for the Triassic carbonate depositional system developed on the Zagros Basin in southwest Iran. High Zagros Fault (HZF), which separates the thrust belt of the High Zagros (in the northeast) from the Simple Fold belt (in the southwest) divides the study area into two distinct time equivalent carbonate (Khaneh Kat Formation) and carbonate/evaporite (Kangan and Dashtak formations) platforms in northern and southern parts of the HZF respectively. Detailed field and laboratory investigations of the Khaneh Kat Formation, which crops out in the High Zagros Belt, showed this sedimentary succession consists mainly of limestones and dolomites deposited in tidal flat setting and shallow, relatively quiet portion of a carbonate platform. These deposits are mainly results of shallowing-upward cycles consisting of intertidal-supratidal facies repeated over and over in a tidal system under dry climate. In some horizons, the presence of laterally extensive carbonate storm beds has terminated the normal succession of peritidal facies. The carbonate-dominated Khaneh Kat Formation was deposited in inner part of an open, storm-dominated platform. Comparison of this situation with the sedimentary environment of equivalent Kangan and Dashtak formations confirms significant increase of evaporites and siliciclastics in the southern areas of HZF. This reveals the tectonic controls on sedimentation and paramount role of this bounding fault activity in controlling basin geometry and facies variations of the Triassic carbonate platforms. In other words, displacement of the Zagros basin floor due to HZF movements resulted in basin fragmentation and restriction of sea water circulation in the Simple Fold belt that is dominated by shallow-water restricted facies (lagoons and sabkhas) of Kangan and Dashtak formations. In contrast, carbonate tidalites and storm induced sediments of the Khaneh Kat Formation have been developed under more open-marine conditions in the High Zagros belt.

Key words: Tectonic controls; Zagros Mountains; Trias.

* Corresponding Author

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A new operculate pollen from the Late Permian and Early Triassic deposits of Chintalapudi Sub-Basin, Andhra Pradesh, South India

Neerja Jha *, Shreya Mishra

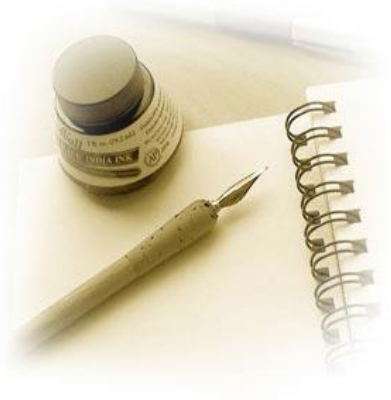
Birbal Sahni Institute of Palaeosciences, 53 University Road, Lucknow-226007, (U.P.), India

ABSTRACT

A new pollen has been recovered from the Late Permian and Early Triassic sediments of Chintalapudi area of the Chintalapudi sub-basin, Godavari Graben, South India. The pollen grains are circular to sub-circular in shape with variously folded pollen surface and are characterised by the presence of opercula. The shape of opercula may be circular, with or without marginal rim and with or witout radiating arms or may be polygonal with acute margins and radiating arms. The micromorphography and fine structure of specimens revealed that exine is psilate to faintly scabrate. Scanning Electron Microscopy of the present specimens have also been carried out. Pollen of different genera in family Taxodiaceae and Cupressaceae resemble in the exine structure with the present specimens. The pollen morphology of the present specimens show resemblance with the pollen of extant genus Cunninghamia. The pollen appears to be endemic to Chintalapudi area of the Chintalapudi sub-basin as it has been never reported from other parts of India and other Gondwana continents. The fossil record of conifers suggests that the family Taxodiaceae originated during the Triassic and was well established by the Jurassic and the evidence for the origin of Cupressaceae is from Middle Jurassic. Hence, Occurrence of these operculate pollen in Late Permian and Early Triassic is significant, as this record will play a significant role in evolution of Mesozoic and modern conifers. Further work is in progress.

Key words: Permian; Triassic; operculate pollen; scanning electron microscopy.

* Corresponding Author



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Petrophysical properties of clastic reservoirs using NMR Relaxometry and Mercury Injection Data: Bahariya Formation, Egypt

Abdel Moktader A. El Sayed [1]*, Nahla A. El Sayed [2]

[1] Department of Geophysics, Ain Shams University, Cairo, Egypt
[2] Egyptian Petroleum Institute, Nasr City, Cairo, Egypt

ABSTRACT

The Bahariya Formation is a sedimentary sequence which was deposited under fluvial to shallow marine conditions at the beginning of the Upper Cretaceous (Cenomanian) transgression in the Western Desert of Egypt. 30 sandstone core samples, obtained from the Bahariya Formation, are conducted to NMR measurements and the relaxation time T2 = 100 μs and 600 μs were estimated. Application of a model related core-porosity and transverse relaxation time (T2) measured from NMR spectrum; the cementation exponent of Wyllie's type is outlined with high accuracy. Consequently, the water saturation and hydrocarbon saturation will be significantly improved. The irreducible water saturation (Swirr) calculated from the mercury injection capillary pressure (MICP) measurements is related to the normalized area under < 4 μs of transverse relaxation time (T2) and a regression model is calculated with a reliable coefficient of correlation permitting calculation of (Swirr) with high accuracy. Lithologic laminations presented in some intervals of the Bahariya Formation have great consequences on both the Mercury injection capillary pressure (MICP) measurements and nuclear magnetic Relaxometry (T2) as well. Thin sections and SEM-micrographs were made for some selected core samples in order to recognize petrography and mineralogy of the Bahariya sandstones. Glauconite, mica, zircon, rutile and pyrite minerals are predominant in the laminated sandstones intervals.

Keywords: NMR; capillarity; irreducible water; Egypt.

* Corresponding Author

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Topography of the Moho undulation in Cameroon from gravity data: Preliminary insights into the origin, the age and the structure of the crust and the upper mantle across Cameroon and adjacent areas

Albert Eyike *[1], Jorg Ebbing [2]

[1] University of Douala, Faculty of Science, Department of Physics, PO Box 24157, Douala, Cameroon

[2] Christian-Albrechts-Universität, Department of Geosciences, Kiel, Otto-Hahn-Platz 1. D-24118 Kiel, Germany

ABSTRACT

The complete gravity data from Cameroon and part of the neighbouring countries has been analysed to compute the topography of the Moho undulations. This work is based on an improved filtering technique and an appropriate assumed density contrast between the crust and the upper mantle. Comparison with deep seismic refraction data reveals that this relief map expresses the continuity and geometry of the Moho undulations better than the sparsely distributed seismic data in Cameroon. This gravity Moho map, though may not give absolute depths at places, provides a far better correlation with surface geology than the result from other geophysical techniques. Four domains have been recognized: (a) the Cameroon Volcanic Line (CVL) domain where all the Moho undulations are parallel with volcanic line; (b) the Central African Shear Zone (CASZ) domain in which all the undulations ENE-WSW oriented; (c) the Congo craton domain, in which the undulations are concentric with the craton; and (d) the Chad basin domain which does not show clear structural orientation. Study of the topography and of the superficial structures associated with these undulations reveals that the undulations delineated in the CVL Domain result from the Tertiary uplift which shaped the Line. Comparison between the Moho undulations map and the topography shows that the Moho in the Central African Shear Zone (CASZ) must be link with different dextral movements during the opening of the south Atlantic in the Cretaceous time. In the Chad basin, the Moho is associated to the opening of the central and south Atlantic~130 Ma. In the case of the Congo basin, the Moho undulations are related to the post rift subsidence. However, it is argued that the Congo basin is still subsiding today, and that this subsidence must have an influence the Moho geometry in this area, even though the significance of this influence is yet to be determined. A comparison with the surface geology suggests that the Moho undulations in Cameroon can be related to the development of the Early Cretaceous to Palaeogene West and Central African rift system, where the build-up of interpolate tensional stresses caused reactivation of pre-existing zones of lithospheric weakness during the break up of Gondwana.

Key words: Gravity anomaly; Moho undulations; long wavelength undulations; Cameroon.

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Deep and shallow geothermal anomalies inferred from electrically high conductive zones found by resistivity and magnetotelluric surveys in Western Anatolia

İlyas Çağlar [1]*, Ümit Avşar [2]

[1] Istanbul Technical University, Faculty of Mines, Department of Geophysical Engineering, 34469 Maslak, Istanbul, Turkey

[2] Tubitak Marmara Research Center, Earth and Marine Science Institute, Kocaeli, Turkey

ABSTRACT

The use of electrical resistivity methods in geothermal exploration is based on the fact that the resistivity of thermal ground water in the rocks decreases significantly at high temperatures and that activity can produce conductive alteration minerals. The magnetotelluric and resistivity methods were used primarily to locate anomalous regions of low resistivity associated with geothermal activity, and to define the resistivity distribution at different depths beneath the survey area. As a result of the major neotectonic structures that shapes Turkey many host and graben systems are located within the Western Anatolia. These systems have several hot springs with various temperatures. The Tauride zone within southwestern Anatolia accommodates the Isparta Angle area that is an important segment of the eastern Mediterranean region. A magnetotelluric line crossing Isparta Angle with north – east direction was taken to define geoelectrical structure along this line in the region between Afyon and Antalya. The study area where was not far from the well – known geothermal field around northwest Anatolia has several potentially valuable mineral and hot springs. The magnetotelluric results in the view of the two –dimensional geoelectric structures, with true resistivity values, obtained from inversion was interpreted. The electrical structures modelled by magnetotelluric data was clearly displayed the existence of an electrically conductive zone beneath Sandikli graben where is the popularly known as a geothermal region. The geoelectric structure was indicated two conductive (□5-10 □m) zones S (shallow) and D (deep). The origins of the remarkably good conductivity within the large zone D from the depth about 13 km down to the levels deeper than 20 km and smaller zone S at depth between 6 – 10 km were explained by the circulation of hydrothermal fluids with low resistivity values (0.2-0.4 □m) and by the effects of a strong hydrothermal alteration in the geothermal reservoir. As a second survey, the Wenner electrical resistivity soundings were carried out in the Kestanbol area, within Biga peninsula at northern Aegean in order to investigate the conductive zones that might be associated with shallow geothermal anomaly. The two – dimensional geoelectric models indicated a good conductive region (<10 ohm – m) in the southwest part of Kestanbol. This conductive region was highly permeable due to alteration. Considering Archie's law it's remarkably good conductivity is caused by geothermal fluid, with a low resistivity of 0.35ohm-m, and alteration minerals in the rocks.

Key words: Geothermal; magnetotelluric; resistivity; Turkey.

* Corresponding Author

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Lithosphere thickness, heat flow and Moho depth in the south of Portugal

Maria Rosa Duque *

Universidade de Évora, Departamento de Física, ECT, Rua Romão Ramalho 59, Évora, Portugal

ABSTRACT

In the last years, several models were presented trying to obtain lithosphere and Moho thickness in the Iberian Peninsula, using data related to geoid elevation and topography, gravity, seismicity and thermal analysis. The results obtained show a decrease in the thickness of the crust and the lithosphere in the SW part of the Iberian Peninsula. Density anomalies in the crust are also referred. The work I intend to present is related with the south of the Ossa Morena Zone, the South Portuguese Zone and the Algarve, in the south of Portugal. Data obtained in the region was collected and deviations from average values used were detected. Models were made taking into account the specific characteristics of the region. Heat flow, thermal conductivity, heat production, topography, gravity, seismic and geological data available for the region, are used to adapt the models. A special attention will be given to the spatial variation of heat flow values and to Moho depth in the region. The results show that this region is different from other parts of the Iberian Peninsula and a special attention must be given to it. The different values obtained using seismic, gravity, and geoid height data, and the results obtained with models using thermal data shows the importance of trying to know and understand the thermal structure of the regions. Problems related with the use of average values will be focused.

Key words: Lithosphere thickness; heat flow data; thermal models; seismic data; crustal depth; average values.

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The bridges dynamic parameters identification based on experimental and numerical method comparison in regard with traffic seismicity

Katarína Demeterová *, Daniel Papán, Daniela Kuchárová

University of Zilina, Univerzitná 8215/1, 01001 Žilina, Slovakia

ABSTRACT

The technical seismicity negatively affects the environment, buildings and structures. Technical seismicity means seismic shakes caused by force impulse, random process and unnatural origin [1]. The vibration influence on buildings is evaluated in the Eurocode NO. 8 in Slovak Republic, however, the Slovak Technical Norm NO. 73 0036 (STN 73 0036 - [2]) includes solution of the technical seismicity. This standard also classes bridges into the group of structures that are significant in light of the technical seismicity – the group “U”. Using the case studies analysis by FEM simulation and comparison is necessary because of brief norm evaluation of this issue. In this article, the dynamic parameters, determinated by experimental measuring and numerical method on two real bridges, are compared. First bridge (D201 – 00) is Scaffold Bridge on the road I/11 leading to the city of Čadca and is situated in the city of Žilina. It is eleven – span concrete road bridge. The railway is the obstacle that this bridge spans. Second bridge (M5973 Brodno) is situated in the part of Žilina city on the road of I/11. It is concrete three – span road bridge built as box girder. The computing part includes 3D computational models of the bridges. First bridge (D201 – 00) was modelled in the software of IDA Nexis as the slab – wall model. The model outputs are natural frequencies and natural vibration modes. Second bridge (M5973 Brodno) was modelled in the software of VisualFEA. The technical seismicity corresponds with the force impulse, which was put into this model. The model outputs are vibration displacements, velocities and accelerations. The aim of the experiments was measuring of the vibration acceleration time record of bridges, and there was need to systematic placement of accelerometers. The vibration acceleration time record is important during the under – bridge train crossing, about the first bridge (D201 – 00) and the vibration acceleration time domain is important during deducing the force impulse under the bridge, about second bridge (M5973 Brodno). The analysis was done in the software of Sigview. About the first bridge (D201 – 00), the analysis output were values of power spectral density adherent to the frequencies values. These frequencies were compared with the natural frequencies values from the computational model whereby the technical seismicity influence on bridge natural frequencies was found out. About the second bridge (M5973 Brodno), the Sigview display of recorded vibration acceleration time response was compared with the final vibration acceleration time response from the computational model, whereby the results were incidental.

Key words: Natural frequency; computational model; vibration acceleration; experimental measuring.

* Corresponding Author

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Investigation of hydrodynamic and tectonical properties using the geophysical methods Gokpinar and Derindere (Denizli) springs

Ali Aydin [1]*, Mahmud Güngör [2], Suat Taşdelen [3], Erdal Akyol [3]

[1] Pamukkale University, Engineering Faculty, Dept. of Geophysical Engineering, 20070 Denizli, Turkey
[2] Pamukkale University, Engineering Faculty, Dept. of Civil Engineering, 20070 Denizli, Turkey
[3] Pamukkale University, Engineering Faculty, Dept. of Geological Engineering, 20070 Denizli, Turkey

ABSTRACT

Very important water sources of Denizli city which are Gökpınar and Derindere springs where take place about 10 km from Denizli city center, near of the Antalya road. Those springs are the East part of the Aegean horst and graben systems. In the drainage systems of Gökpınar dams, those springs altitude of topography is high and the Sothern site and along the North Slope of the Cukurkoy village, they take place on the top of the slope debris and some deposited cones. Geoelectric and electromagnetic methods have been used to investigate the affect of drainage and urban area on the fresh water in the county of Denizli. Vertical electrical sounding has been performed on 30 points and GPR method was carried out about 4 km horizontally using georadar. Also, in this study has been presented which is a detailed works of geoelectrical profile sections on this area. As a result of hydro-geological and geophysical studies, affective feeding area of the springs is investigated in the area. We could show the lineations of the techtonisma of this study area by using the seismic and resistivity methods. This study may be the good example to investigate the feeding direction and the location of the springs for similar type of projects.

Key words: Gokpinar; Denizli; resistivity sections; GPR.

* Corresponding Author

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Seismic hazard assessment of the site for Diamer Basha dam, Northern Pakistan

Perveiz Khalid *, Shahzada Khurram, Zia Ud Din

University of the Punjab, Institute of Geology, 54590, Lahore,Pakistan

ABSTRACT

The site for the construction of Diamer Basha Dam (35.518 N and 73.785 E), one of the largest dams of Pakistan is situated in, Gilgit Biltastan northern Pakistan. This dam will be constructed on the Indus River, about 315 km up stream of Tarbela dam, 165 km downstream of Gilgit (the capital of Gilgit-Baltistan) and 40 km downstream of Chilas in Gilgit Baltistan Pakistan. The region is bounded by three high mountain ranges, which are tectonically active, thus prone for high seismic events and selected for seismic hazard analysis. The seismological data collected from history and instruments infers the presence of active fault systems in the vicinity of the dam site. Based on the seismic analysis and tectonic setting, four active faults are considered as major seismogenic features with their maximum potential magnitude. Seismic analysis was performed using probabilistic approach. Main Karakoram Thrust (MKT), Raikot-Sassi Fault (RKSF), Main Mantle Thrust (MMT) and Kohistan Fault (KF) with peak ground acceleration (PGA) 0.11, 0.13 0.07 and 0.05 respectively and maximum potential magnitude 7.7, 7.6, 7.8 and 7.1 respectively are considered as active seismic sources in the dam site. The value of peak ground acceleration is 0.38 g proposed for the maximum design earthquake. The peak horizontal ground acceleration at 50% probability of exceedance in 100 years with 144 years of return period is 0.18g. According to the building codes of Pakistan, areas with peak ground acceleration values 0.16 to 0.24 g are considered in seismic zone 2B, thus probabilistic hazard analysis place the dam site in seismic zone 2B.

Key words: Seismic hazard analysis; peak ground acceleration; Diamer Basha dam; return period.

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Electrical structure of the Isparta Angle using 2 - D, 3 - D magnetotelluric imaging and its tectonic interpretation

Umit Avsar [1], Tulay Kaya [2], Gokhan Karcioglu [3], İlyas Çaglar [4]*, Yasuo Ogawa [2]

[1] Tubitak Marmara Research Center, Earth and Marine Science Institute, Kocaeli, Turkey
[2] Tokyo Institute of Technology, Volcanic Fluid Research Center, Tokyo, Japan
[3] Istanbul University, Department of Geophysical Engineering, Istanbul, Turkey 3 ITU Department of Geophysical Engineering, Istanbul, Turkey

ABSTRACT

The Isparta Angle is an inverse-triangle region bordered by the Aksehir Fault Zone (AFZ) and the Fethiye Burdur Fault Zone (FBFZ) in the east and west respectively. The region is located in the south-western Anatolia where a tearing and rising of asthenosphere occurs between the Hellenic and Cyprus arcs. It is an obstacle to the rising and S-SW moving central Anatolia plate as well as a transition zone between the expanding west Anatolia and the central Anatolia. Magnetotelluric method is sensitive to the resistivity variations beneath the Earth and employed frequently to reveal the tectonic structures of the region from shallow crust to the deep mantle. In this research, 47 magnetotelluric data were acquired along 4 profiles, two of which cross the FBFZ and the rest cross the AFZ. The geo-electric structure of the region was revealed by both 2D and 3D analysis. The prominent result of this study is that the electrical structure beneath the first profile, which crosses FBFZ in the west, differs from the rest of the modelled area according to conductivity values and distribution of these anomalies in the western and eastern regions. In the west there is a lower crustal conductor (1-10 □m), which is located S-SW of the Isparta Angle and could be related to partial melting. Furthermore, there is a shallow conductor zone, which becomes shallower in fault regions in upper crust toward the north-western FBFZ and could be an indication of fluids in fracture zones. On the other hand, toward the east of the region the lower crustal conductor becomes deeper and less conductive. The basement geological units are imaged as ~1000 Ωm resistive zones. Sultandagi methamorphics and AFZ are also imaged in the electrical resistivity models. Consequently, a conductive zone imaged at upper crustal level in the west of the FBFZ but not imaged in the east may imply that the FBFZ and its surroundings could be a border between the rising and moving central Anatolia's thick crust and the expanding west Anatolia's thin crust.

Key words: Fethiye Burdur Fault Zone, Aksehir Fault Zone, Isparta Angle, Magnetotelluric.

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Seismotectonic analysis of the Olekma-Stanovoy region, South Yakutia: paleo-seismogeological aspects

A.N. Ovsyuchenko [1], V.S. Imaev [2,3], E.A. Rogozhin [1], A.S.Larkov [1], S.S.Novikov [1], L.P. Imaeva [2], Nikolay N.Grib [4]*

[1] Schmidt Institute of the Earth's Physics RAS, Building 1, 10 Bolshaya Gruzinskaya street, Moscow 123242, Russia

[2] Institute of the Earth's Crust, Siberian Branch of RAS. 128 Lermontov street, Irkutsk 664033, Russia

[3] Diamond and Precious Metals Geology Institute, Siberian Branch of RAS, 39 Lenin prospect, Yakutsk, Russia

[4] North Eastern Federal University,Technical Institute (Branch), 16 Kravchenko, Neryungri, Russia

ABSTRACT

Geological, tectonical and seismological studies carried out in South Yakutia for than 50 years revealed seismogenerating structures in the interaction zone of the Eurasian and Amur lithospheric plates (Imaev et.al.,2000). The structures traceable within the Lena-Amur interfluve, between 50°and 60°N, extend east westward as a wide (up to 400 km) seismic band over a distance of 3000 km from Lake Baikal, through Transbaikalia, South Yakutia and Priamuria, to the Sea of Okhotsk. The zone of plate interaction is borderedn the north by the Baikal-Stanovoy seismic belt (BSB) extending east westterly from Lake Baikal along the southern margin of the Siberian platform, through the Stanovoy highlands in Transbaikalia, the Stanovoy Range and the Aldan-Uchur plateau in South Yakutia, to the Sea of Okhotsk. The BSB combines the events of the Baikal rift zone (BRZ) in the west and the Olekma-Stanovoy zone (OSZ) in the east. During nearly the 50-year period of instrumental observations, more than 150 thousand events with M ≥2 were reported from the BRZ and over 40 thousand from the OSZ. The southern boundary of the plate interaction zone is marked by an epicentral cluster extending east westward from Northern Mongolia, through East Transbaikalia along the Tukuringra-Soktakhan-DzhagdyRanges in Priamuria to the Sea of Okhotsk. Within this boundary, the Tukuringra-Dzhagdy seismic zone (TDZ) is most active. It is located 200 km to the south of the OSZ and extends parallel to it between 54°and 55°N to the east of 120°E. Some eight thousand seismic events were detected in the zone over the 40-year period. According to the focal mechanism solutions, motions in the earthquake foci within the OSZ and TDZ are of left-lateral strike-slip, thrust and reverse fault nature (Imaev et al., 2000; Imaeva et al., 2007; 2008; Mackey et al., 2003). The NS-trending Temulyakite-Dzheltula seismic band (almost 3,000 events) crosscuts the study area between 120°and 125°E from the Lena River along the left bank of the Olekma River and its right-side tributary Nyukzha, through the Amur River valley, into the Lesser Khingan Range in China. The band divides the zone of interaction of the Eurasian and Amur lithospheric plates into two blocks – Transbaikalian – from LakeBaikal up to the OlekmaRiver and the Aldan-Stanovoy – from Olekma to the Sea of Okhotsk (Imaeva et al., 2007; 2008). In the described seismotectonic setting, the relationship between the regional faults and the foci of associated strong seismic events, as well as the present-day tectonic stress fields are be studied in detail based on the focal mechanism solutions of earthquakes and geological and structural observation data, as well as the data on the system of plates and blocks in Pribaikalia, Priamuria and South Yakutia.

Key words: Seismotectonic analysis; paleo-seismogeological aspect; Olekma-Stanovoy region; South Yakutia.

* Corresponding Author

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Site effects evaluation by soil and sediments microzonation in Karaj, Iran

Khalil Rezaei *

Kharazmi University, Department of Geology, Tehran, Iran

ABSTRACT

As an important step in effectively reducing seismic risk and the vulnerability of the city of Karaj to earthquakes, a site effect microzonation Study was conducted. Seismic hazard analysis for a return period of 475 years was carried out. Data from 20 borings was collected and analyzed, geophysical surveys were conducted and seismology and geoelectric measurements taken in more than 50 stations throughout the city. The study area was divided into a grid of 500 × 500 m2 elements and the sub-surface ground conditions were classified into 5 representative geotechnical profiles. Electric resistivity was measured in close to 50 geotechnical boreholes and surface and sub-surface sediments were collected and analyzed. Site response analyses were carried out on each representative profile using 30 different base rock input motions. Distribution maps of site periods and peak ground acceleration and old and new texture buildings throughout the city were developed, providing a useful basis for land-use planning in the city.

Key words: Soil; sediment; site effect; microzonation; earthquake.

* Corresponding Author

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Seismic image processing and interpretation

Sunjay Sunjay *, Manas Banerjee

Banaras Hindu University, Department of Geophysics, Varanasi-221005, India

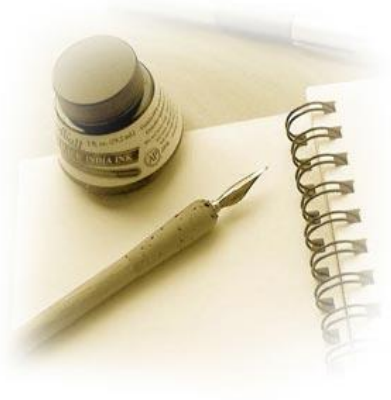
ABSTRACT

Geophysical interpretation is closely related to geologic interpretation, i.e., the task of inferring from a description of a region the sequence of events which formed that region. The description of the region can be a diagram representing a cross-section of the region, which comes e.g. from the geophysical interpretation of a seismic cross-section, together with an identification of the rock types. Geologic interpretation is not static. It attempts to reconstruct the sequence of events which occurred, i.e., it converts the signal data from a spatial domain to the temporal domain of geologic processes. Seismic interpretation is a difficult task, because the seismic data are usually fuzzy and noisy. Furthermore, it is heavily based on the available geological and geophysical knowledge of the region and on the expertise of the interpreter. The most common approaches are the following:1. Seismic pattern recognition;2. Seismic image processing; 3.Graphics; 4.Geophysical and geologic expert systems. Seismic Pattern Recognition:Pattern recognition has been perhaps, the first approach to automate certain tasks of geophysical interpretation (e.g. horizon picking, remote correlation, recognition of the nature and boundaries of an oil or gas reservoir). Horizon picking is the first task of geophysical interpretation which took advantage of pattern recognition techniques. The reason is that horizon picking is the first and fairly simple step in geophysical interpretation. A model of seismic reflections is usually needed for horizon picking. Seismic reflections are ideally quite similar to Ricker wavelets. Therefore, they can be modelled by a set of parameters which take into account their spectrum and their character that may exist in their arches. Syntactic methods can also be used for reflection modelling. A syntactic pattern recognition approach that uses structural information of the wavelet to classify Ricker wavelets and syntactic pattern recognition employing Hough transform. Pattern recognition with wavelet transform: It contains analysis and detection of singularities with wavelets; wavelet descriptors for shapes of the objects; invariant representation of patterns; texture analysis and classification; image indexing and retrieval; classification and clustering; face recognition using wavelet transform and wavelet-based image fusion, etc. Seismic Image Processing:Digital image processing techniques can be used for the processing of seismic images . There are two tasks of geophysical interpretation where digital image processing techniques can be employed: 1. horizon picking; 2. texture analysis of seismic images. Horizon Picking: The simplest approach to horizon picking is to consider horizons as sequences of local extreme of reflection intensity in the seismic image. By this way, horizon picking can be made by contour following techniques based on local decisions, or by the use of edge detector operators (e.g., the Laplacian operator or edge detectors based on nonlinear filters. More complicated techniques for horizon picking are performed by using neighbourhood information based on Markovian image models and dynamic programming. An edge detector is applied to the seismic image. The local image edges (edge elements) are considered to be parts of seismic horizons. Kuwahara filter is an adaptive, edge preserving smoothing filter. The Kuwahara filter is a non-linear smoothing filter used in image processing for adaptive noise reduction. Most filters that are used for image smoothing are linear low pass filter that effectively reduce noise but also blur out the edges. However the Kuwahara filter is able to apply smoothing on the image

while preserving the edges. Sobel filter is used for edge detection.Texture Analysis of Seismic Images:Texture information of the seismic images is directly related to the stratigraphic information. Chaotic or reflection-free or stratified patterns are simple texture patterns. Some techniques that have been proposed for seismic texture analysis will be presented briefly. Template matching assumes that a seismic pattern can be represented by a set of matrices called templates. Each seismic region corresponds to a seismic pattern, which is described by a set of templates. These templates can be selected by an expert from an already interpreted seismic section. Another matrix (having equal dimensions with the template), contains the reflection coefficients around a pixel of the seismic image. Directional filtering is a technique for the decomposition of an image to regions having similar texture directionality. Directional information about texture is contained in the power spectrum of a seismic image. Power concentrations on lines in the power spectrum of an image correspond to texture having perpendicular orientation to the spectral lines. Therefore, directional filters can be used for seismic texture segmentation.

Key words: Seismic interpretation; seismic pattern recognition; seismic image processing; wavelet transform.

* Corresponding Author



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Determining consistency of tillage direction with soil erosion protection requirements as the element of decision-making process in planning and applying land consolidation

Piotr Bozek *, Jaroslaw Janus, Jaroslaw Taszakowski, Agnieszka Glowacka

University of Agriculture in Cracow, Department of Agricultural Land Surveying, Cadaster and Photogrammetry, Cracow, Poland

ABSTRACT

Water erosion is one of the factors which have negative effect on soil productivity. It often leads to irreversible soil degradation, making soil worthless for agricultural activities. One way of preventing water erosion is making the direction of cultivation perpendicular to the direction of rainwater run-off. Matching the direction with the shape of parcels boundaries in small and extended ones is often possible only through changes in the configuration of property boundaries, which is possible only in the process of land consolidation. The article presents methodology of qualifying the areas for changes in boundaries configuration and cultivation direction in view of existing erosion risk. A computation process was suggested that uses, among others, LIDAR data to model the terrain shape precisely as well as cadastral data that defines the geometry of parcels and, resulting from it, the direction of cultivation and form of use. The suggested process includes also the information on the texture of soil upper horizons from soil agricultural maps. The RUSLE erosion model was applied and the computation process took place in ArcGIS environment with the use of dedicated algorithms suggested and implemented to solve the formulated problem. Computations were conducted for test area of several hundred hectares which was characterized by vast diversity of soil types and landforms. The results prove the usefulness of the suggested method as an element of systems that support decision-making processes used in the stage of determining objects chosen for the realization of consolidating processes (including local consolidation, which covers only chosen fragment of a village). They can also be used in the stage of completing detailed plans of parcels distribution in land consolidation process. The importance of the method is particularly seen in the analysis of areas where land fragmentation indices are unfavourable. Especially in these cases, without the reorganization of boundaries, it is impossible to adapt the direction of cultivation to the requirements of protection against erosion.

Key words: Soil erosion; decision making; planning; land consolidation.

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Comparison of photogrammetric techniques to rockfall monitoring

Felipe Buill, María Amparo Nuñez-Andrés *, Nieves Lantada, Albert Prades

Politechnic University of Catalunya, Division of Geotechnical Engineering and Geosciences, Dr. Marañón 44-50, 08028 Barcelona, Spain

ABSTRACT

The use of Unmanned Aerial Vehicles, UAVs to image capture for monitoring natural hazards has had a major boost for its wide possibilities in the last decade. From example the study and monitoring of unstable slopes, glaciers and rocky escarpments, to damage assessment after the event, they can be displaced material, blocks or buildings and infrastructure affected. But the use of these devices requires a specific treatment regarding the case studied and geomatics techniques suitable to get the adequate precision to the movement, size of items or events to study. For each application it is necessary determine what kind of capture is the most appropriate to obtain an optimal benefit - cost ratio. With this aim, a photogrammetric survey of a rock wall has made taken images from ground and from air with UAV. In this last case photography's and video 4k have been captured. Ground points were natural details, such as corner of poles and rocks. Their coordinates were known by topography. In the photogrammetric process the calibration of the camera was performed for each case and the 3D model were obtained. Independent models were generated for each case: terrestrial photogrammetry, aerial photogrammetry with photo and video, moreover the combination of the terrestrial images with the two captures from UAV, i.e. six models have been obtained, all of them with appropriate resolution and quality. When no targets but natural details are used as ground points it is more difficult to identify them in the images, being easier this task in the terrestrial photogrammetry case since the point of view is similar to the topographic one. Therefore the combined models aerial - terrestrial are easier to adjust in the photogrammetric block than the aerial models independently since the terrestrial orientation is an important support.

Key words: Digital photogrammetry; UAV; video; 3D model; rockfall; natural hazards.

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3D model of Hittite Yalburt Monument

İbrahim Kalaycı [1], Sermet Öğütcü [1]*, Güngör Karauguz [2]

[1] Necmettin Erbakan University, Department of Geomatic Engineering, Konya, Turkey
[2] Necmettin Erbakan University, Department of Primary Education, Konya, Turkey

ABSTRACT

The objective of this paper is Yalburt plateau which is located 16km north of Ilgın. Height of this plateau is 1300m. There are hieroglyph stone blocks located in the foot of mountain constitutes a pool. This pool was first discovered in 1970 and archaeological dig has been carried out during 1970, 1972, 1973 and 1975 (Temizer 1984). As a result of these archaeological studies, there is a rectangular pool surrounded by the hieroglyph stone blocks with its three sides was discovered. There is no Hittites' remnants were found inside and outside of the pool but there are plenty of ceramics were found from Rome, Byzantine and early Hellenistic era (Özgüç, 1988). The total length of hieroglyph stone blocks of the pool is 12.70 meters, theirs' thickness is 1.20 meters and the width of the pool is 8.30 meters. The condition of 18 hieroglyph stone blocks are quite well except a few of them. One tablet describes the family tree of Tuthaliya IV and also describes the king of Hittite's campaign to Lukka lands which consist of Wiianawanta and Pinali countries.

Key words: Cultural heritage; documentation; 3D reconstruction.

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3D modelling of Kizildag Monument

Güngör Karauguz [1]*, İbrahim Kalaycı [2], Sermet Öğütcü [2]

[1] Necmettin Erbakan University, Department of Primary Education, Konya, Turkey
[2] Necmettin Erbakan University, Department of Geomatic Engineering, Konya, Turkey

ABSTRACT

The most important cultural property nations possess is their historical accumulation, and bringing these to light, taking measures to preserve them or at least maintain the continuity of transferring them to next generations by means of recent technic and technology ought to be the business of present generations. Although, nowadays, intensive documentation and archiving studies are done by means of classical techniques, besides studies towards preserving historical objects, modelling one-to-one or scaled modelling were not possible until recently. Computing devices and the on-going reflection of this, which is acknowledged as digital technology, is widely used in many areas and makes it possible to document and archive historical works. Even virtual forms in quantitative environments can be transferred to next generations in a scaled and one-to-one modelled way. Within this scope, every single artefact categorization belonging to any era or civilization present in our country can be considered in separate study areas. Furthermore, any work or likewise can be evaluated in separate categories. Also, it is possible to construct travelable virtual 3D museums that make it possible to visit these artefacts. Under the auspices of these technologies, it is quite possible to construct single virtual indoor museums or also, at the final stage, a 3D travelable open-air museum, a platform or more precisely, to establish a data system that spreads all over the country on a broad spectrum. With a long-termed, significant and extensive study and a substantial organization, such a data system can be established which also serves as a serious infrastructure for alternative tourism possibilities (Çelik., 2005). Located beside a stepped altar and right above the Kızıldag IV inscription, the offering pot is destructed and rolled away a few metres to the south slope of the mold. Every time visiting these artefacts with our undergraduate students, unfortunately, we observe more demolishment. This case study aims to construct the extensive data system mentioned above, and in the context of historical artefacts it aims-which is the lowest stage of such a study gathering information about the Kızıldag findings using the previously mentioned technologies. This paper will explain how the geometry and texture of historical objects can be automatically constructed, modelled and visualized from digital image processing software. In this context, the second research (Karauguz et all. 2009) we conducted, aimed to obtain the visuals of the Hittite hieroglyph inscriptions located in Kızıldag by using digital photogrammetry technique. After obtaining the visuals, they will be evaluated in a photogrammetric software which endues the finally constructed 3D virtual product with its original texture. In this way, the current destructed artefacts mentioned above can be handed down to the next generations in form of scaled, virtual models. We consider this of particular importance.

Key words: Cultural heritage; documentation; 3D reconstruction.

* Corresponding Author

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Automatic extraction of building oblique roof from dense image matching point clouds with high resolution colour-infrared images

Hayrettin Acar [1]*, Mehmet Öztürk [2], Fevzi Karslı [2], Mustafa Dihkan [2]

[1] Karadeniz Technical University, Geomatics Engineering, Turkey
[2] Karadeniz Technical University, Electrical and Electronics Engineering, Turkey

ABSTRACT

Automatic creation of the 3D city models and keeping up to date are important topics in many disciplines. Generating the 3D city models quickly and automatically depends on producing some of models' details (buildings, vegetation, roads etc.) and digital elevation model. Nowadays, the aerial laser scanner system and the aerial imaging technologies are preferred for collection of the digital elevation models and 3D city model details. This paper presents an automatic detection technique for extraction of building oblique roof and vegetation from dense image matching point clouds by Semi Global Matching (SGM) algorithm applied on high resolution colour-infrared (CIR) digital aerial images. The high resolution (GSD 8 cm) colour-infrared images from Vaihingen-Data Set (ISPRS benchmark Project, consisting of historic buildings with roads and trees) were used for producing the coloured 3D point clouds by SGM. The study consists of three steps; firstly, the vegetation points were detected by using NDVI mask from the infrared-coloured 3D point clouds. Then, the bare-earth points were extracted by Progressive TIN densification algorithm from the 3D point clouds that have been eliminated the vegetation points. As a final step, the oblique roof planes were obtained by Random Sample Consensus (RANSAC) from the latest point cloud without the vegetation and the bare-earth points. The results show that the algorithm is successful for automatic extraction of oblique roof planes.

Key words: Building extraction; oblique roof points; dense image matching.

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Analysis of the variability of the motorway impact on agricultural land on example of A1 motorway section

Stanisław Bacior *

University of Agriculture in Krakow, Faculty of Environmental Engineering and Land Surveying,
Balicka 253a, 30-198 Kraków, Poland

ABSTRACT

The innovative method developed for estimating the motorway impact on agricultural land allows determining all the losses associated with the directions of this interaction. The basis for the determination of losses is the analysis of the variability of land use and quality classes and location of access roads to the land along the axis of the planned motorway. Adopted measure of the multi-direction motorway impact on agricultural land is specified change in the value of land, at which determination only the diversity of the land suitability for agricultural production is taken into account. The developed method for determining the motorway impact on agricultural land is shown on the example of the planned motorway section. The construction of one kilometre of the motorway section will reduce the value of agricultural land amounting to an average of 1,350 cereal units. Taking over the land for the motorway construction and its negative impact covers about 85% of the total loss of value of agricultural land. The remaining 15% loss of the land value is associated with increase in transport and deterioration of land configuration plots.

Key words: The value of agricultural land; the impact of the motorway; farm land layout.

* Corresponding Author

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TLS and UAV as support techniques in deformation inquiry of the dam

Vladimír Sedlák *, Ján Kaňuk

Pavol Jozef Šafárik University in Kosice, Faculty of Science, Institute of Geography, Jesenná 5, 04001 Košice, Slovakia

ABSTRACT

Deformations and movements of buildings, civil engineering works and other associated buildings and structures are generally the result of expressions of volume changes inside them due to their own weight, water pressure, fluctuations in indoor temperature and pressure, as well as fluctuations in atmospheric temperature and pressure, settling subsoil and expressions and due to a number of other internal and external earth endogenous and anthropogenic factors. In particular, it is necessary to deal with observing and analysing deformations and movements of large water structures such as dams and other breakwaters. In such water structures in the event of their destruction can expect catastrophic manifestations and consequences on the surrounding environment. From the subsequent analysis of the observed dam deformations there is possible the acquired knowledge in the future to applied in the design of such water works, as well as at the protection of human lives, their property and at the entire surrounding environment. Dams belong to the dominant object in the interest of monitoring deformations in terms of geomechanic processes. Deformation survey of dams and their subsequent analysis of results must never be underestimated in terms of safety of human lives and protection of their proprieties as well as the environment protection. Deprecation of the outcome of investigations from deformation of dams and embankments for water projects in the past has led to many disasters and the environmental accidents that could have been prevented. Deformation survey of dams and their subsequent analysis of the results must never be underestimated in terms of safety. The paper gives the results of the deformation investigation and subsequent deformation analytical and graphical analysis of the earth-fill dam - Pod Bukovcom nearby the city of Košice in the East Slovakia Region. Results and analysis of the geodetic terrestrial and satellite measurements on the body of the earth-fill dam are assumed by the test statistic and mathematical model of stability and further movement of the embankment with a time prediction. Terrestrial Laser Scanning (TLS) and Unmanned Aerial Vehicle (UAV) were applied in deformation inquiry of the dam pod Bukovcom as the supported tools to the geodetic measurements. The outputs of deformation surveys of the earth-fill dam Pod Bukovcom are incorporated into GIS of the metallurgical enterprise U.S. Steel Košice, the owner of the dam.

Key words: Dam; geodesy; deformation; analyses; TLS; UAV.

* Corresponding Author

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Analysis of the accuracy and reliability of the real time kinematic measurements using different combinations of the Multi-GNSS Positioning

Zbigniew Siejka *

University of Agriculture in Krakow, Department of Land Surveying, Poland

ABSTRACT

The rapid development of the Global Navigation Satellite System GNSS such as GPS, GLONASS, and recently also BeiDou and Galileo creates new and better opportunities for determining the real time position. It's known that, in the precise satellite positioning, the number of available GNSS signals and the effectiveness of the reduction of the signals error propagation in the atmosphere are key factors, which constitute the ability of accurate and reliable determination of the position. The article presents results of research on the first of these factors. Research on the use in RTK (Real Time Kinematic) a combination of GPS navigation system with the remaining other GNSS was carried out to assess the actual usefulness of currently available observations. All measurements were performed on the basis of the same reference station. During the experiment multiple daily RTK measurements were made on a special test base, the points of which had coordinates determined using the static method and has been adopted as a reference. Results of the study showed a significant advantages resulting from the multi-system GNSS solution in relation to the positioning based only on a single GPS. This is particularly important for geodetic applications with respect to the reliability and accuracy of obtained solutions, especially in difficult measuring conditions. The analysis of the results of the measurement experiment showed, that the combined use of GPS measurements plus other systems is the most desirable. This applies both to the improvement of the horizontal and vertical position accuracy.

Key words: BDS; Galileo; GLONASS; GPS; ASG-EUPOS; real time; dual/triple-frequency observations.

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Using hyperspectral frame images from UAV for DSM generation

Raquel A. de Oliveira [1]*, Antonio M. G. Tommaselli [1], Eija Honkavaara [2]

[1] University Estadual Paulista, Department of Cartography, Roberto Simonsen, 305, 19060-900 - Presidente Prudente, SP Brazil

[2] Finnish Geospatial Research Institute FGI, Geodeetinrinne 2 FI-02430 Masala, Finland

ABSTRACT

Digital Surface Models (DSM) of forest areas are being increasingly used as a complementary data for several forestry applications, such as estimation of forest biomass, volume, disturbance and change. DSM can be derived from LiDAR, aerial or orbital digital images and the resulting accuracy and completeness will depend on the image resolution and quality. Low-cost tools for photogrammetric surveys and remote sensing by unmanned airborne vehicles (UAVs) have been amongst the remote sensing community at the moment. Hyperspectral images give detailed spectral information for each pixel in an image, which aids the segmentation and classification process in forest areas. The objective of this paper was to investigate the feasibility of DSM generation using image matching and information extracted from image classification to improve matching strategies. The algorithm uses a multi-image matching approach with a geometric constraint in the search space, starting from the object space to the image space. Image data sets were collected by a lightweight Fabry-Pérot interferometer (FPI) based hyperspectral frame camera on-board an UAV in boreal forest area. The proposed matching algorithm is analysed and compared with a commercial software and LiDAR data. The experiments showed that the generated DSM was compatible with the commercial software, but with less smoothing. Besides, the results of the proposed algorithm better fitted with the LiDAR data at the ground level, which is favourable for digital terrain model (DTM) extraction. A highly interesting feature is also that our approach allow assignment of the hyperspectral reflectance signature for all matched points, i.e. capturing of hyperspectral reflectance point clouds.

Key words: Image matching; forest DSM; point cloud; hyperspectral frame image; hyperspectral point cloud.

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Comparison of computer vision and photogrammetric space intersection for calculating 3D coordinates in digital aerial images

Samed Ozdemir [1]*, Fevzi Karsli [2], Hayrettin Acar [2], Mustafa Dihkan [2]

[1] Gümüşhane University, Gümüşhane, Turkey
[2] Karadeniz Technical University, Trabzon, Turkey

ABSTRACT

In photogrammetry, acquiring object coordinates from stereo pairs accomplished by two methods. First method is space intersection in which object coordinates calculated by known interior and exterior parameters. Second method to solve this problem is epipolar geometry. Essentially epipolar geometry is intersection of two image planes centres and having the baseline as axis between planes. Epipolar geometry can be algebraically explained by fundamental matrix. Fundamental matrix contains all available information regarding relative orientation of uncalibrated two image planes. Due to developments in computer vision epipolar geometry widely used in applications ranging from 3D modelling to robotics. In this study, automatically matched object points coordinates calculated with space intersection and epipolar geometry methods and results from these methods compared. To verify the results Lidar point cloud will be used. The aim of this study is to determine space intersection and epipolar geometric methods performance, accuracy and suitable conditions to acquire satisfactory results.

Key words: Computer vision; photogrammetry; space intersection; accuracy; comparison.

* Corresponding Author

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Reconstructing architectural environment from a panoramic image

Jolanta Dzwierzynska *

Rzeszow University of Technology, Department of Architectural Design and Engineering Graphics, Poznanska 2 35-084 Rzeszow, Poland

ABSTRACT

The use of panoramic images for retrieving information about presented architectural environment is a fast developing field recently. The aim of the herby paper was developing an effective method of reconstruction of the architectural forms from their single panoramic image as well as establishing requirements which panoramic presentation should meet for the restitution purpose. The reconstruction attempt presented in the paper is the conjunction of the descriptive method and computer aid. The starting point in reconstruction process was determination of the base elements of panoramic projection as a horizon line and a base circle, which can be establish in a descriptive way. Next, the simple formulas were proposed for calculation of 3D coordinates of the characteristic points of the objects given in their 2D unfolded panoramic image. The points established by their spatial coordinates defined lines which in term determined edge models of the presented forms. Presented method of reconstruction seems to be universal and can be useful for restitution of different forms of the panoramic presentation; paintings and photographs. The study shows that reconstructing architectural environment from the single panoramic image mostly depends on the image's content and an initial assumptions. It is not always an easy process but possible in some cases however.

Key words: Cylindrical perspective; panoramic projection; reconstruction; CAD.

* Corresponding Author

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Environmental protection tools in agricultural management works

Agnieszka Glowacka *, Jaroslaw Taszakowski, Jaroslaw Janus, Piotr Bozek

University of Agriculture in Krakow, Krakow, Poland

ABSTRACT

Land consolidation is a fundamental instrument for agricultural management. It facilitates comprehensive changes in the agricultural, social, and ecological domains. Consolidation and post-consolidation development-related investments are an opportunity to improve living conditions in rural areas, and simultaneously ensure its positive impact on the environment. One of the primary goals of consolidation, directly specified in the Act on land consolidation, is to improve farming conditions. In Poland, consolidation is possible owing to EU funds: RDP 2007–2013 and RDP 2014–2020. In order for individual villages to be granted EU funds for consolidation and post-consolidation development under the Rural Development Programme 2014–2020, their consolidation has to implement actions with positive impact on the environment and the landscape. According to the Act on disclosure of environmental information and its protection, public participation in environment protection, and on environmental impact assessment, land consolidation has been classified as an undertaking with potential significant impact on the environment. Environmental impact assessment is carried out as part of proceedings to obtain environmental permits. The starost of the district where the consolidation is to take place decides whether an environmental impact assessment is necessary. The goal of this paper is to analyse documentation in the form of assumptions for a land consolidation project enclosed to an RDP 2014–2020 grant application and project information sheets as the basis for environmental impact assessment in the context of detailed presentation of environmental protection solutions that ensure a positive impact of the project on the environment and landscape. The detailed study involved 9 villages in the Małopolskie Voivodeship, which applied for EU grants for land consolidation in the current financial perspective. The paper specifies the existing state of the analysed villages as regards the natural environment, lists agricultural management instruments that have a positive impact on the environment, and demonstrates that planning of actions aimed at environmental protection is an indispensable element of assumptions for land consolidation projects.

Key words: Land consolidation; agricultural management; environmental protection; landscape.

* Corresponding Author

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An evaluation of educational atlas maps in terms of cartographic design

Ilkay Bugdayci [1]*, I. Oztug Bildirici [2]

[1] Necmettin Erbakan University, Engineering and Architecture Faculty, Geomatic Engineering, Turkey
[2] Selcuk University, Engineering Faculty, Geomatic Engineering, Turkey

ABSTRACT

Atlases and maps are very essential tools that effectively used for geographic research, social science, and geography and history education. For this reason, it is clear that the intensive use of atlases in education will influence the use of maps in a positive or negative way. Cartographers have important responsibilities in the field of map use in education. One of the most important part of map use is cartographic design. Cartographic design is a process which the cartographer conceptualizes and creates maps according to the needs of the intended map user. Cartographic design has two main goals. To create map that appropriately serves the map user based on the map's intended use, and the other is to create a map that communicates the maps information in the most efficient manner, simply and clearly. Many aspects of cartographic design have been guided by the results of map design research. Determining the map reproducing method, selecting appropriate scale and projection for map's theme, determining most appropriate methods for data classification and symbolization, selecting which map elements to employ, and deciding how each will be implemented and etc. are more important points in cartographic design. If the map user is in the childhood, cartographic design is gaining more significance. In this context, the design of sign, font, color, graphical representation, legend must be appropriate for the child's age depends on the perception and level of education. Consequently with depending level of perception, maps must be redesign both in terms of aspects of subjects and geographical information. Cartographers or map maker must promote the use and enjoyment of maps by children and young people, must increase understanding of children and young people's engagement with maps and must raise the standard of maps and atlases produced for children and young people. Nowadays many specialists in geography recommend the usage of electronic maps and atlases. But traditional cartography based on paper version maps is used more than the electronics, in education system especially in Turkey. This report considers the deficiencies of current atlas maps that are used in the education of geography and social studies in terms of cartographic design. About 22 atlas has investigated for the study. Several examples are given from these school atlases and some proposals are introduced about designing children maps.

Key words: Atlas map; cartographic design; children map.

* Corresponding Author

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Impact of baseline distance and interstation height difference on the accuracy of GPS-derived station coordinates

İbrahim Kalaycı [1], Bekir Yüksel [2]*, Sermet Öğütcü [1]

[1] Necmettin Erbakan University, Department of Geomatic Engineering, Konya, Turkey
[2] Republic of Turkey Ministry of Food, Agriculture and Livestock, Ankara, Turkey

ABSTRACT

This paper investigates the accuracy comparison of scientific and commercial GPS processing software for varying length of baselines and interstation height differences. European Reference (EUREF) Permanent Network Stations were used for the processing. GAMIT/GLOBK research GPS processing software (version 10.6) and Leica Geo Office (version 8.4) commercial GPS processing software were chosen for the experiment. TUBO EUREF GPS station was taken as a known station whose three-dimensional (3D) published coordinates are precisely known and the other stations were taken as unknown points whose 3D coordinates are calculated after the processing. In this way, minimally constrained adjustment was performed for each unknown station within the EUREF network and their coordinates were calculated w.r.t. TUBO station with using each software. Only independent (non-trivial) baselines are processed between known station and unknown stations. Processing was conducted for 10 different days with 24 hours rinex data of the stations. When choosing the GPS stations, we consider the interstation height difference and baseline distance between the chosen GPS stations. Baseline distances varying from 131 km to 495 km. Interstation height differences varying from 4m to 1620m. After the processing, differences between the calculated 3D Cartesian coordinates of the stations whose coordinates assumed unknown and the published true coordinates of these stations were transformed to topocentric coordinates (north, east, up) to observe the error component in 3D space. Results show that vertical accuracy obtained from commercial software is significantly low and not consistent comparing with the scientific software. There is no significant difference observed for horizontal accuracy between the software but the horizontal accuracy obtained from the scientific software is slightly better than commercial one. There is no strong correlation is found between the baseline distance and the accuracy for each software but this is not the issue for interstation height differences. Regarding the interstation height differences, it is observed that height difference between station pairs effect the accuracy in up component. As height difference between baseline points grow vertical error become larger especially for commercial software.

Key words: Adjustment; baseline; GAMIT; GLOBK; GPS.

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Application of terrestrial laser scanning to study the geometry of slender objects

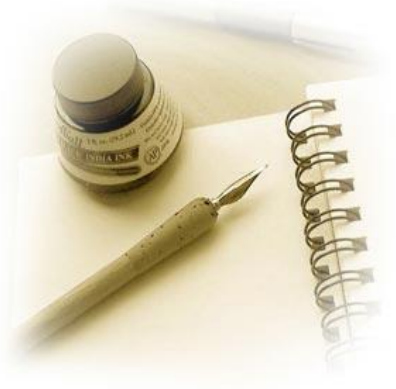
Zbigniew Muszyński *, Wojciech Milczarek

Wrocław University of Science and Technology, Faculty of Geoengineering, Mining and Geology, Geodesy and Geoinformatics Unit, ul. Na Grobli 15, 50-421 Wrocław, Poland

ABSTRACT

Slender objects are a special group among the many types of industrial structures. These objects are characterized by a considerable height which is at least several times bigger than the diameter of the base. Mainly various types of industrial chimneys, as well as truss masts, towers, radio and television towers and also windmill columns belong to this group. During their operation slender objects are exposed to a number of unfavourable factors. The most important of these is variable wind load which causes vibrations and deformation of the structure. The second major factor is the thermal load caused by varying direction of incidence and intensity of sunlight. In the case of industrial chimneys the thermal load is also connected with a difference of temperatures between the hot exhaust gases inside the chimney and the low ambient temperature (especially in winter). Not without significance is also the stability of the foundation of the object as well as the corrosion of its structural elements. Simultaneously the environmental requirements necessitate the construction of increasingly higher and higher industrial chimneys. In order to ensure operational safety, the slender objects require regular technical inspections, including regular geodetic measurements. Standard range of geodetic work includes the determination of vertical displacements of the foundation of the chimney and determination of deflections of the main vertical axis of the chimney. Apart from the classical methods of measurement, such as precise levelling, photogrammetry and motorized precise tacheometry, the terrestrial laser scanning is increasingly applied. It is undoubtedly a modern and fast measurement technique, but has also some limitations. The most important of these are: very steep sight lines (especially for high chimneys localised among dense infrastructures of industrial plant), the vibrations or changes of the object's shape during the measurement period and also a large amount of noise in the point cloud caused by precipitation. The comparison of measurement results from the scanner (quasi-continuous data) with the archival data (based on classical techniques which describe the geometry of the chimney in selected measurement levels) also provides an additional problems. In the paper the results of geodetic control of geometry of industrial chimney with a height of 120 m has been presented. The measurements were made by means of terrestrial laser scanning technique under rather unfavourable conditions (at night, during snowfall, with low air temperature) which allowed to verify the real usefulness and accuracy of this technique in engineering practice. On the basis of point cloud the values of deviations from the vertical for main axis of the chimney have been calculated using two methods. In the first method the spatial model of whole chimney was developed (which describes the actual geometry) and was compared with the theoretical model. In the second method the so-called local approach was used. Using point cloud the selected horizontal cross sections of chimney were analysed and were compared with the archival geodetic documentation. On this basis the final conclusions about the advantages and limitations of the using of terrestrial laser scanning technique for the control of geometry of high industrial chimneys have been formulated.

Key words: Vertical slender objects; geodetic measurements; terrestrial laser scanning; vertical deviation.
* Corresponding Author



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Lithological discrimination and detection of Talc-Cu mineralization along the eastern part of Barnis-Aswan Road, south eastern desert of Egypt using Landsat-8 and ASTER images

Mohamed Fouad Sadek [1]*, Safaa Mohamed Hassan [1], Mohamed W. Ali-Bik [2]

[1] National Authority for Remote Sensing and Space Sciences (NARSS), Cairo, Egypt
[2] Geol. Sci. Dept., National Research Centre, Cairo, Egypt

ABSTRACT

The study area is located at the eastern part of Barnis-Aswan Road, it comprises Precambrian basement rocks including calc-alkaline metavolcanics intruding by magmatic assemblages of syn- to late-tectonic intrusions of gabbro-diorite, tonalite-granodiorite and late tectonic gabbro. The metavolcanics are basic to intermediate of andesite to basaltic andesite in composition. They form the NE-SW Abu Gurdi-Darhib mountainous belt which encloses talc-sulphide mineralization. This belt is extending towards west to Abu Hamamid-Um Samuki Cu occurrence. The spectral signatures of the exposed rock units with their spectral profiles have been determined. The processed data extracted from Landsat-8 and ASTER images have been used to differentiate the exposed rock units as well as to detect the talc-Cu mineralized alteration zones hosted within the calc-alkaline metavolcanic belt. This study proved that the processed data of Landsat-8 and ASTER images including the principal component analysis and band ratio images in addition to the spectral characterizations and field study are very helpful tools for accurate lithological discrimination and detection of talc-Cu mineralization zones within the Abu Gurdi-Darhib metavolcanic belt.

Key words: Eastern desert; Barnis-Aswan; Egypt; Landsat-8; Aster; Talc-Cu.

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Mapping soil conservation service hotspots of terrestrial ecosystems at regional scale: a comparison of two methods

Liwei Zhang [1], Yihe Lv *[2], Bojie Fu [2]

[1] Shaanxi Normal University, Department of Geography, Tourism and Environment College, Xi'an, Shaanxi 710119, China.

[2] Chinese Academy of Sciences, State Key Laboratory of Urban and Regional Ecology, Research Center for Eco-Environmental Sciences, Beijing 100085, China

ABSTRACT

Soil conservation (SC) is an important regulating service of terrestrial ecosystems. At present, methods for spatially explicit mapping of the hotspots of SC are primarily based on empirical soil erosion models, such as the Revised Universal Soil Loss Equation (RUSLE), by which the SC can be quantified through determining the difference between the actual soil loss estimation of the landscape and the potential soil loss estimation. Subsequently, no vegetation cover is assumed as an extremely degraded form of the targeted landscape. However, this hypothesis may yield a considerable overestimation of SC. More importantly, the parameters of the empirical soil conservation model are based on long-term observations of field experiments at small spatial scales, which are very difficult to obtain and must be simplified when implementing these models at large spatial scales. Such simplification of model parameters may lead to uncertainty in quantifying SC at large spatial scales. In this paper, we present a newly formulated composite-indicator-based method to map the SC which can be used at regional scales. After comparing the spatial-temporal changes of SC from the RUSLE based model and those from the composite-indicator-based method in Jiangxi province of China, the similarities and differences of these methods were revealed. Firstly, the result showed that the two methods were similar to represent the effects of vegetation coverage and land cover types on SC, however, they were significantly different in representing the spatial pattern of SC and its temporal change. Based on the comparisons, the advantages and drawbacks for both of the methods were made clear and suggestions were made for the suitable use of the two methods, which may benefit the research and application concerning the planning and assessment with SC as key criteria.

Key words: Ecosystem services mapping; soil conservation; composite biophysical indicator; RUSLE; Jiangxi province of China.

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Discrimination and geological mapping of basement rocks at Gabal Korbai Area, South Eastern Desert of Egypt using Landsat-8 and ASTER Data

Safaa Mohamed Hassan *, Mohamed Fouad Sadek

Natural Authority for Remote Sensing & Space Sciences, Cairo, Egypt

ABSTRACT

Gabal Korbai area in the extreme South Eastern Desert of Egypt is covered mainly by a wide variety of basement rock units association pertaining to the Pan-African Arabian-Nubian Shield. These exposed basement sequence includes ophiolitic and calc-alkaline assemblages. The ophiolitic assemblage comprises serpentinite-talc carbonate rocks and basic metavolcanics forming N-S trending Korbai-Gerf mass. These rocks are tectonically thrusted over the island-arc schistose metavolcanics. The whole sequence is intruded by syn-late orogenic intrusions comprising gabbro-diorite, tonalite-granodiorite, Korab Kansi ultramafic-mafic association (peridotite and gabbro) and monzogranite. All basement varieties are dissected by post orogenic dykes and veins. The exposed basement assemblages have been successfully discriminated on the Landsat-8 images using the Minimum Noise Fraction (MNF), Principal Component Analysis (PCA, PC6, PC2, and PC7) and different band ratios. On the other hand, ASTER clay index (5×7/6) and silica index (10/13) successfully discriminated the granitoid varieties, while the Korbai-Gerf ophiolitic serpentinite-talc carbonate rocks are discriminated on ASTER carbonate index (6+9/7+8). ASTER amphibole index (6/8) distinguished gabbro and basic metavolcanics. The field study has been done to verify the interpreted remotely sensed data. The exposed basement rock units with accurate boundaries are well discriminated in the produced modified geological map comparing with the previously geological mapping covering the study area.

Key words: Gabal Korbai; Eastern Desert, Egypt; ASTER; Landsat-8.

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Spatiotemporal change of UHI using Landsat Imagery in a Metropolitan City

Farhad Nejadkoorki *, Mahsa Bozorgi

Yazd University, Department of Environmental Engineering, Yazd, Iran

ABSTRACT

Nowadays, urban areas suffer from climate change and warmer environment worldwide. Furthermore, urban Heat Island (UHI) is regarded as one of the most prominent problems caused by unsustainable urban development. Urban areas have a higher temperature than the surrounding rural areas, which is referred to as UHI. Urban heat island phenomenon has significant effects on air quality and energy consumption of urban buildings. The current study aims to analyse and evaluate the spatiotemporal changes of UHI in Isfahan during 1998-2014. A nono-window algorithm was applied to extract Land Surface Temperature (LST). Temporal and spatial change in heat islands was analysed using statistical methods, Mann-Kendall and URI index. Results revealed that LST had an increasing trend and the intensity of this trend is mainly in northwest and northeast of the city and around Zayande- Rood River. This is primarily due to the development of the city and the destruction of green cover. Finally it was concluded that the temporal change of UHI witnessed an increasing trend (UHI index of 0.25 in 1998 and 0.312 in 2014) which is in line with the spatial trend. Evaluation of temporal change UHI shows The URI index has been an increasing trend and its value from 0.25 for 1998 to 0.312 for 2014.

Key words: Urban heat island; spatiotemporal; remote sensing, change detection.

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Analysis of the productivity and the optimization of converting point clouds in spatial databases

Aleksandra Chrószcz *, Piotr Łukasik, Michał Lupa

AGH University, Aleja Adama Mickiewicza 30, 30-059 Kraków

ABSTRACT

This article compares popular systems for relational database management system and one non-relational database in the context of cloud storage points from LIDAR. The authors examine the issues of efficient storage cloud points in the database and optimization of execution time of the queries. In addition, there is also a comparison of SSD technology to a traditional HDD, time differences operations will be shown on examples using point cloud.

Key words: LIDAR; point cloud; spatial database.

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Classifications assessment of high spatial resolution data for land use land cover mapping in Mediterranean landscape

Mohamed Elhag [1], Silvena Boteva [2]*

[1] King Abdulaziz University, Faculty of Meteorology, Environment & Arid Land Agriculture, Department of Hydrology and Water Resources Management, Jeddah, 21589. Kingdom of Saudi Arabia

[2] Sofia University, Faculty of Biology, Department of Ecology and Environmental Protection, Sofia, 1164, Bulgaria

ABSTRACT

Landscape fragmentation is noticeably practiced in Mediterranean regions and imposes substantial complications in several satellite image classification methods. To some extent, high spatial resolution data were able to overcome such complications. For better classification performances in Land Use Land Cover (LULC) mapping, the current research adopts twofold work schemes: (1) Different classification methods comparison for LULC mapping using Sentinel-2 satellite as a source of high spatial resolution. Both of pixel-based and an object-based classification algorithms were assessed; the pixel-based approach employs the Support Vector Machine (SVM), Maximum Likelihood (ML), and Artificial Neural Network (ANN) algorithms, and the object-based classification uses the Nearest Neighbour (NN) classifier. Stratified Masking Process (SMP) that integrates a ranking process within the classes based on spectral fluctuation of the sum of the training and testing sites was implemented. An analysis of the overall and individual accuracy of the classification results of all four methods reveals that the SVM classifier was the most efficient overall by distinguishing most of the classes with the highest accuracy. NN succeeded to deal with artificial surface classes in general while agriculture area classes, and forest and semi-natural area classes were segregated successfully with SVM. Moreover, adding the Normalized Difference Vegetation Index (NDVI) and Leaf Area Index (LAI) features to the Sentinel-2 image increased dramatically the classification accuracy especially with the SVM classifier. Furthermore, a comparative analysis indicates that the conventional classification method yielded better accuracy results than the SMP method overall with both classifiers used, ML and SVM.

Key words: Classifications assessment; Land Use Land Cover; Mediterranean landscape remote sensing; Sentinel-2.

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A heterogeneous Wireless Sensor Network for real time remote monitoring of sand dynamics on coastal dunes

Alessandro Pozzebon [1]*, Carmine Bove [1], Irene Cappelli [1], Fernanda Alquini [2], Duccio Bertoni [2], Giovanni Sarti [2]

[1] University of Siena, Department of Information Engineering and Mathematical Sciences, Via Roma 56, Siena, Italy
[2] University of Pisa, Department of Earth Sciences, Via Santa Maria 53, Pisa, Italy

ABSTRACT

In this paper the authors describe the architecture of a heterogeneous Wireless Sensor Network (WSN) to be deployed on coastal sand dunes: the aim is to provide real time measurements of physical parameters to better define sediment transport in connection with aeolian processes. The WSN integrates different typologies of sensors and is provided with both local and remote connection. In particular, three different typologies of sensors are integrated in the network: a multilayer anemometric station, a sensor developed ad-hoc to measure the sand dune level and a sand collector capable of measuring the weight of trapped sand and its quantity. Each sensor node is composed at least by an XBee Series 2 transmission module that is able to transmit the data collected by the sensor at a distance of about 100 meters: while the sand level sensor and the sand collector are provided only with this transmission module, the anemometric station also integrates an Arduino Uno board in charge of data processing. A Gateway node composed by an Arduino Uno Board integrated with a GMS Shield for remote data transmission and an XBee transmission module for Local Area communication has also been developed: this node is in charge of collecting all the data packets sent by the Sensor Nodes and transmit them to a remote server through GPRS connection. A Glassfish server has been set up to collect these packets and store them in a MySQL database. The anemometric station is composed by three anemometer/anemoscope couples positioned 40cm, 120cm and 200cm from the ground. During the tests, the station data were sampled every 20 minutes, wind speed and direction was calculated directly on the Arduino Uno Board and then a packet composed by the six data (three speeds and three directions) was sent to the Gateway. The sand level sensor is composed by an array of 24 photo resistors (LDRs) mounted on a plastic tube 5cm apart from each other (reaching a total length of 120cm). Sunk LDRs do not sense sun light and send a 0 value. Surfacing LDRs detect sunlight and send a higher value. By counting sunk LDRs it is possible to measure the current level of the dune. During the tests, the sensor was sampled once per hour, three data packets were sent every time, each packet with the reading of 8 LDRs; the level value was calculated on the Gateway before being transmitted to the remote server. The sand collector is mainly a plastic cylinder about one meter high, able to orientate according to the wind direction. The wind-blown sand flows inside the cylinder and is collected on its bottom, where the load cell can measure weight variations. During the tests, the sensor was sampled once per hour, the value of the Load Cell was transmitted to the Gateway that calculated the sand weight before transmitting this value to the remote server. The proposed WSN can provide both a static and a dynamic framework of sand transport processes acting on coastal dunes.

Key words: Wireless Sensor Network; coastal sand dunes; sediment transport; Aeolian processes.

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Groundwater quality assessment using averaged water quality index: a case study of Lahore City, Punjab, Pakistan

Syed Umair Shahid *, Javed Iqbal

National University of Sciences and Technology (NUST), Institute of Geographical Information Systems, H-12, Islamabad, Pakistan

ABSTRACT

Water quality is considered as a major issue in mega cities of developing countries. The city of Lahore has over 10 million population with the highest population density in the Punjab Province, Pakistan. Groundwater is the main source of drinking water in Lahore. The groundwater quality should be regularly monitored to cope up with drinking water quality issues. The water quality index (WQI), previously used in many studies was usually based on one year data to analyse the water quality situation of the study area. However, the results obtained from the data, based on single observation from different points may have distortion. This might have occurred due to the inclusion of multiple types of errors induced in the data as a result of improper sampling design, lack of expertise in terms of both sampling method and sample testing, instrumental and human errors, etc. Therefore, the study evaluated the groundwater physicochemical parameters (turbidity, pH, total dissolved solids, hardness, chlorides, alkalinity and calcium) for three years. The averaged water quality index (AWQI) was computed using ArcGIS 10.3 model builder. The AWQI map indicated that the water quality in the study area was generally good except in few places like Anarkali, Baghbanpura, Allama Iqbal Town, Mughalpura and Mozang due to relatively higher turbidity levels. The results of this study can be used for decision making regarding provision of clean drinking water to the city of Lahore. Moreover, the methodology adopted in this study can be implemented in other mega cities as well to monitor groundwater quality.

Key words: Water quality; spatial interpolation; Turbidity; inverse distance weighting; water quality index.

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Monitoring coastline change using remote sensing and GIS technology: a case study of Acıgöl Lake, Turkey

Fatih Temiz, S.Savaş Durduran *

Necmettin Erbakan University, Department of Geomatics Engineering, Konya, Turkey

ABSTRACT

Acıgöl is a lake in Turkey's inner Aegean Region, in an endorheic basin at the junction between Denizli Province, Afyonkarahisar Province and Burdur Province. The lake is notable for its sodium sulfate reserves extensively used in the industry and Turkey's largest commercial sodium sulfate production operations are based here. Shoreline changes caused by sediment erosion and accretion have important consequences for coastal ecosystems and coastal communities. Coastlines are the natural borders which separates the water and land. Change of coastlines has great importance, therefore it is needed to detect this change and take precautions. In this study, with the purpose of detecting the coastline change of Acıgöl, multispectral Landsat images from the years of 1985, 2000, 2015 based on landsat images, coastline belonging to these years is drawn numerically and shoreline change belonging to these years in Acıgöl is provided with the help of Geographic Information Systems and Remote Sensing method and software. When these changes are analyzed, it is determined that there is a significant decline in Acıgöl. At the end of the study, significant coastline movements (in some parts more than 200 m) were detected for a 30-year period.

Key words: GIS; remote sensing; coastline; Acıgöl Lake; Landsat; geomatics.

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Applied of the analytic hierarchy process for landslide susceptibility mapping in Taşkent (Konya), Turkey

Adnan Ozdemir *

Necmettin Erbakan University, Department of Civil Engineering, Konya, Turkey

ABSTRACT

In this study, landslide susceptibility of Taşkent creek subbasin (Konya, Turkey) has been investigated. The study area is located approximately between latitudes 36.88 N to 36.95 N and longitudes 32.35 E to 32.53 E, covering area of about 80 km2 in the vicinity of Taşkent in Konya Provinces. The analytical hierarchy process (AHP) is applied to produce susceptibility map. Fourteen layers including landslide inventory, elevation, slope, slope aspect, plan curvature, profile curvature, sediment loading factor, stream power index, wetness index, drainage density, distance to drainage, geological units, fault density, distance to fault and land use-land cover are selected for preparing the susceptibility map. Using AHP method each layers are weighted based on their importance, and finally the last prepared layers are assembled and the final map is generated. Produced landslide susceptibility map is classified susceptibility into four categories: low, moderate, high, and very high. The area under curve value of relative operating characteristics curve for analysis was found to be 0.899, with an estimated standard error of 0.029. Validation of the model used in this study was also performed by comparing the known landslide location data. The results obtained from overlaying the predicted landslide susceptibility map produced by the AHP method with the analysis, test, and all landslides indicated that 87%, 74% and 93% of the observed landslides were concentrated in the high and very high landslide class, respectively. These results are indicated that AHP analysis is a good estimator of landslide susceptibility in the study area.

Key words: Landslide; AHP; Taşkent; susceptibility; geology.

* Corresponding Author

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Subsidence potential of Eastern Konya (Turkey)

Adnan Ozdemir *

Necmettin Erbakan University, Department of Civil Engineering, Konya, Turkey

ABSTRACT

In this study, the subsidence potential of the geological units located in the eastern Konya (Turkey) was investigated considering the decline in groundwater level. The investigation was carried out on a 1730 km2 area. Investigation area where major agricultural activities performed is located in the near east of Konya Metropolitan city. In order to fulfil the agricultural needs of the fast growing Konya city and Turkey, there is a significant demand for drinking, irrigation, domestic and industrial water in the region. A great portion of this water supply is derived from groundwater. In recent years, with the observed lack of precipitation, the tendency to use excessive amounts of groundwater has caused a substantial decline in the groundwater level in the region. The decline in the groundwater level increases the effective stress, as a result, the compression of geological units creates subsidence. In this research, the subsidence caused by the groundwater decline in the eastern Konya was investigated using geographic information system. In the study, initially, old (1965, 2006, 2009) and new (2010) groundwater level maps of the region were generated based on GIS. Afterward, groundwater level decline maps for the years 2006-2009 and 1965-2010 were produced using a grid size 100 m * 100 m. On the other hand, numerous geotechnical assessment reports and bore-hole logs prepared for the region were compiled and evaluated. As a conclusion of these investigations, the thicknesses of the geological units and geo-mechanical values (unit weight, specific unit weight, porosity and coefficients of volume compressibility corresponding to 25-50, 50-100, 100-200, 200-400 and 400-800 kN/m2 stress increments) were determined. The maps of the distribution of the interpolated values of the factors such as thickness of geological unit, unit weight, porosity, groundwater level and groundwater level decline, compression index and coefficient of volume compressibility etc. that are required for the subsidence calculations were produced using the “Inverse Distance Weight” function of the ArcGIS software. The subsidence was calculated as the multiplication of the thickness of the geological units (the thickness of the clay layer with compression potential) by compression index and height of water level decline. During calculations, it was determined that the subsidence values ranges between 10 cm and 120 cm. The calculated subsidence values were compared with those determined geodetically at 10 points by other researchers. The distribution of the subsidence values was found to be in accordance with the ones obtained geodetically. Obtaining the subsidence values of the region will be very beneficial for the planning and evaluation of transportation, irrigation, residential areas and military activities in the region to engineers, local governors and military personnel.

Key words: Subsidence; Konya; GIS; settlement; groundwater.

* Corresponding Author

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Characterization and modelling of the Cambro-Ordovician reservoir in the Tinrhert region, Illizi basin, Algeria

Rabah Chaouchi *, Kahina Dabiane, Soumya Benayad

University M'hamed Bougara (UMBB) Boumerdes, Faculty of Hydrocarbons and Chemistry (FHC), Laboratory of mineral resources and energy, 2 Avenue de l'independence, Boumerdes, Algeria

ABSTRACT

Tinrhert region located in the north eastern part of the Illizi basin contains 17 gas fields producing mainly from the Devonian, Silurian and Cambro-Ordovician reservoir which are the subject of this study. The study reservoir is located in the Alrar south, Alrar centre, In Amenas north and In Amenas northern horst covering an area of about 1350 km2. This area has anticlinal structure oriented NNE-SSE. The Cambro-Ordovician sandstone reservoir is composed from bottom to top by 5 units. These reservoir units are described as tight and are not well studied. Therefore, geological and statistical models are required in order to develop these reservoir units and optimize hydrocarbon recovering. For that, different type of geophysical, petrophysical and petrographical data were used. 3D geological model is the result of all data integration. Result obtained from pertophysical interpretation and electrofacies are determined from log and core interpretation.

Key words: Illizi basin; Tinrhert; Cambro-Ordovician reservoir uints; characterization; modelling.

* Corresponding Author

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Remote Sensing image analysis without expert knowledge - a web-based classification tool on top of Taverna workflow management system

Peter Selsam [1], Christian Schwartze [2]*

[1] Friedrich-Schiller-University of Jena, Hydrology and Modelling, School of Chemical and Earth Sciences, Department of Geoinformatics, Germany

[2] Codematix GmbH, Jena, Germany

ABSTRACT

Providing software solutions via internet has been known for quite some time and is now an increasing trend marketed as "software as a service". A lot of business units accept the new methods and streamlined IT strategies by offering web-based infrastructures for external software usage - but geospatial applications featuring very specialized services or functionalities on demand are still rare. Originally applied in desktop environments, the ILMSimage tool for remote sensing image analysis and classification was modified in its communicating structures and enabled for running on a high-power server. Each single processing step (task) in ILMSimage is therefore encapsulated in a workflow initialized and fully controlled by Taverna Server as part of a powerful workflow management system. In order to execute parameterized ILMSimage commands within Taverna workflows, so-called tool services are used and particularly connected to required input data ports, status check services and output ports. This approach also profits from temporary workspaces and user management provided by the Taverna workflow engine. On top, a GIS-like and web-based user interface guides the user through the different steps in ILMSimage. For this purpose the client development is based on a set of current script libraries which provide technologies for implementing modern and rich web mapping applications. ILMSimage combines object oriented image segmentation with pattern recognition features. Basic image elements form a construction set to model for large image objects with diverse and complex appearance. After an image selection and image pre-processing step basic image elements (segments) are delineated and registered concerning size, form and spectral features. Larger image objects are defined as specific (rule based) combinations of the basic elements. The resulting image objects share all properties of the basic elements and enlarge them by spatial connections and frequency of the basic elements. Different objects can share the same basic elements if the combination differs. There is no need for the user to set up detailed object definitions. Training is done by delineating one or more typical examples (templates) of the desired object using a simple vector polygon. The template can be large and does not need to be homogeneous. The template is completely independent from the segmentation. The object definition is done completely by the software. Type of connections, frequency and size of the basic image elements provide the information necessary for the classification process. Complex (patterned) reference sites will increase the specificity of the object definition rather than reducing the quality. As a result all regions that share the object building rules of the templates are classified.

Key words: Remote sensing; classification; object oriented; workflow system; web gis; service.

* Corresponding Author

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Analysis of land surface temperature changes at the Palas Basin (Turkey) using remote sensing techniques

Gulhan Ozdogan [1], Filiz Dadaser-Celik [2]*, Semih Ekercin [3]

[1] Amasya University, Suluova Vocational School, Department of Environmental Protection Technologies, Amasya, Turkey
[2] Erciyes University, Department of Environmental Engineering, Kayseri, Turkey
[3] Aksaray University, Department of Geomatics Engineering, Aksaray, Turkey

ABSTRACT

This study aims to determine the land surface temperature changes at the Palas Basin in Turkey for the 2001-2011 period using remote sensing techniques and examine the relationships of these changes with meteorological factors and land-use changes. Palas Basin is a semi-arid closed basin in Turkey, which hosts a saline playa lake called Tuzla Lake. Four Landsat 5 TM images acquired in 2001, 2003, 2007, and 2011 were used in the analysis. The raw images were corrected for geometric and radiometric errors. Land surface temperature and normalized difference vegetation index (NDVI) maps were prepared for the Palas Basin. Analysis revealed that significant changes in land surface temperatures occured at the Palas Basin. Average land surface temperature for the basin was 44 ^{o}C, 46 ^{o}C, 45 ^{o}C, 41 ^{o}C in 2001, 2003, 2007, and 2011, respectively. Land surface temperatures showed a rising trend from 2001 to 2007 and showed a decrease from 2007 to 2011. The decrease was about 2^{o}C between 2001-2011. This result is supported by the meteorological data. Average NDVI values were -0.24, 0.05, 0.07 and 0.12 for 2001, 2003, 2007 and 2011, respectively. Changes in land surface temperatures values were related to NDVI values both in the temporal and spatial dimension. This study showed that satellite remote sensing techniques can be used to determine land surface temperatures and changes in these values over time. Land surface temperature changes reflect both the changes in meteorological and land use conditions.

Key words: Palas Basin; remote sensing; land surface temperature; normalized difference vegetation index.

* Corresponding Author

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Using and customizing open-source GIS software (QGIS) for vertical electrical sounding (VES) surveys: creation of an add-on from beginning to end

Halil Bölük *, M.Erkan Karaman

Akdeniz University, Institute of Natural and Applied Sciences, Konyaaltı, Antalya, 07058, Turkey

ABSTRACT

Quantum GIS (QGIS) is most widely using open-source - whose source code is available for modification – GIS software and therefore it is preferred by variable academic disciplines, governmental agency also private sector. As known VES studies are ground based survey and it is so important to calculate results regard to location with a high precision. There are a lot of inversion software to interpret raw VES data. Commonly researchers are using these softwares to interpret and GIS softwares to visualise and correlate. GIS or similar softwares are also using to preapeare resisitivity sections and co-resistivity maps based on depth. In author's book, at least basic programming with easy-codable language like python, java, VB.NET or MATLAB must be known by geoscientist because a simple api or add-on can solve a lot of problems and save time. This paper is aimed to create an add-on step by step to collect VES data directly on GIS, interpret and visualise them and also to use GIS capabilities like querying, creating maps etc. QGIS Add-ons can be written with Python and interfaces can be designed with QT Designer which is imported in every QGIS installation file. There is also a lot of sample and source on web to start or develop an add-on.

Key words: GIS; geothermal research; geophysics; vertical electrical sounding; qgis.

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Multi-temporal satellite images in the study of environmental changes in the Baltic Sea coastal zone

Krystyna Michalowska [1]*, Ewa Glowienka [2], Beata Hejmanowska [3]

[1] University of Agriculture in Krakow, Faculty of Environmental Engineering and Land Surveying, Poland
[2] Kielce University of Technology, Faculty of Environmental, Geomatics and Energy Engineering, Poland
[3] AGH University of Science and Technology, Department of Geoinformation, Photogrammetry and Environmental Remote Sensing, Krakow, Poland

ABSTRACT

Research works involved the analysis of changes in coastal zone of the southern Baltic Sea, and, in particular, the migration of dunes and the resultant transformations of land coverage. The goal of the research was to perform tests aimed at assessing possibilities of utilising multi-temporal Landsat satellite images, and selected vegetation indexes computed based on them, e.g. NDVI (Normalised Difference Vegetation Index), for the analysis of variability of the selected environment elements. The research database was composed of Landsat satellite images, and standardized NDVI vegetation indexes from the years 1975, 1985, 1994, 2005, 2010, and 2015, as well as multi-temporal orthophotomaps made of aerial images, and a vector map of water resources. The differential NDVI maps that have been generated made it possible to locate areas, in which diametrical changes in land coverage took place, and to determine the nature of processes causing those transformations. Aerial orthophotomaps reflecting the condition of the examined area in five consecutive decades enabled outlining coastal lines of the lakes, and then determining the rate and extent of transformations of surfaces of examined water bodies, and also made it possible to trace the migration of dunes. Moreover, orthophotomaps from the periods of 1975, 1995 and 2004 and vector maps of coastal lines of lakes obtained on the basis of them made it possible to verify the results of the NDVI differential map analysis. A process of gradual decreasing of surfaces of lacustrine bodies as a result of continuous shallowing and covering with plants was noticed in the examined area. As a result of research, following the processing of satellite and aerial images, a very close correspondence between those types of data was obtained. The correspondence between shore outlines on the NDVI map, and vector data obtained on the basis of aerial orthophotomaps demonstrates that the method of computing differences in multi-temporal vegetation indexes is correct, and may be used for determining the extent of transformation of shorelines of water bodies, as well as changes in dune areas. The quantitative analysis also proved correspondence between the shoreline locations set out on the basis of both types of data. One can therefore come to a general conclusion that when using differential NDVI values, one can easily identify areas, in which essential land coverage changes took place.

Key words: NDVI; multi-temporal analysis; Remote Sensing; orthophotomaps; environmental changes.

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Point clouds in BIM

Gergana Antova *

University of Architecture, Civil Engineering and Geodesy, Sofia, Bulgaria

ABSTRACT

The representation of physical buildings in building information models (BIM) has been a subject of research since four decades in the fields of Construction Informatics and GeoInformation science. The early digital representations of buildings mainly appeared as 3D drawings constructed by CAD software, and the 3D representation of the buildings was only geometric, while semantics and topology were out of modelling focus. On the other hand less detailed building representations, with often focus on 'outside' representations, and were also found in form of 2D /2,5D GeoInformation models. Point clouds from 3D laser scanning data give a full and exact representation of the building geometry. The article presents different aspects of implementing point clouds in BIM.

Key words: BIM; building information modelling; laser scanning; point clouds.

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An assessment of Turkish cadastral web services in terms of NSDI user requirements

Hasan Tahsin Bostancı [1]*, Çetin Cömert [2]

[1] Gümüşhane University, Engineering Faculty, Geomatics Engineering, Gümüşhane, Turkey
[2] Karadeniz Technical University, Engineering Faculty, Geomatics Engineering, Trabzon, Turkey

ABSTRACT

Besides its rather large physical cover, Turkish Land Title and Cadaster (LTC) has to collect, register, manage, and present a great variety of data related to land and ownership. Thus LTC is the provider of one of the most fundamental spatial components needed for many applications. However, due to several traditional problems in the Turkish Cadastral System, LTC has been unable to fulfil her role to its full extent. On the other hand, such problems are not specific to cadastral services only; many other Government agencies have similar problems in sharing their data or services with the others. Turkish National Spatial Data Infrastructure (NSDI) has been proposed as a remedy for sharing spatial data and services among stakeholders. NSDI, would cover Government agencies, municipalities, private sector, universities, and many others who work with spatial data somehow. It would enable interoperability among the participants and ensure rapid access to spatial data and services for any requester including citizens. Setting up an NSDI is a tedious undertaking. In addition to this, Turkey's efforts for it has not been well coordinated. Let alone the coordination, there is no single agency that has prepared herself for NSDI. Recently there are several projects related to NSDI. One such effort has been the web services by LTC. Since LTC would be one the main providers in NSDI, as pointed out above, the successful implementation of such services will be of utmost importance. These services have been used by a number of municipalities currently and they have been rated "valuable" for the users. Nevertheless, there are some shortcomings. In this study, LTC Web services will be assessed in terms of both the services LTC is responsible for and her role in NSDI. For this, a "requirements analysis" has to be carried out first. In addition, traditional LTC services have to be taken into account. Moving from this point on, LTC services of several LTC offices have been examined on a yearly basis concerning a number of factors. Forty thousand operations of thirty LTC offices have been collected and examined rigorously with respect to their request frequency, the requesting parties, and the data they need to operate. As a result of this examination, a number of Web services that are to be offered by LTC have been determined and compared with the currently offered Web services of LTC. In result, a number of shortcomings have been discovered. One of these is the number of current services seem to be limited with respect to the responsibilities of LTC. That is, there need to be some more services to be offered for the proper functioning within NSDI. Another shortcoming is that official document offering web services is missing. Finally current services are just for "viewing" purposes; one cannot employ them within a workflow that would produce a "legal" result. Therefore, many LTC transactions have still been carried out in the traditional fashion. Consequently, it can be said that the current LTC Web services are far from meeting the requirements of Turkish NSDI.

Key words: National Spatial Data Infrastructure (NSDI); land title and cadaster; ınteroperability; web services.

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Long time series built-up area extraction from Landsat remote sensing images based on incremental information mining

Guizhou Wang [1], Guojin He [1]*, Jianbo Liu [1], Mengmeng Wang [1,2], Zhaoming Zhang [1]

[1] Chinese Academy of Sciences, Institute Of Remote Sensing and Digital Earth, Beijing China
[2] University of Chinese Academy of Sciences, Beijing, China

ABSTRACT

Mapping the dynamic expansion of built-up area in both temporal and spatial is very critical to understand the process and degree of urbanization. In order to effectively obtain long time series built-up area information, this paper proposed a method of long time series built-up area extraction based on incremental information mining from Landsat remote sensing images. First, the build-up area information of the first temporal was extracted by decision fusion combining the pixel-based thematic indexes method and object-oriented method. Second, the build-up area of the next temporal was obtained by increment information mining form the previous temporal. The presented method was tested in Ningbo, one of the fastest urban growth cities in China. The three decades Landsat remote sensing data was collected at interval for five years from 1986 to 2016 and the built-up area was obtained and analysed. Experimental results show that the framework based on incremental information mining for built-up area extraction from Landsat remote sensing data can make full use of the irreversible characteristic of built-up area, integrate the pixel- and object-based build-up area extraction methods, and finally obtain the higher overall accuracy.

Key words: Long time series; Landsat remote sensing images; built-up area; decision fusion; increment information mining.

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Vegetation coverage dynamic monitoring for East Rennell Island world heritage site based on remote sensing

Mengmeng Wang [1,2], Guojin He [1]*, Guizhou Wang [1], Jianbo Liu [1], Zhaoming Zhang [1]

[1] Chinese Academy of Sciences, Institute Of Remote Sensing and Digital Earth, Beijing China
[2] University of Chinese Academy of Sciences, Beijing, China

ABSTRACT

East Rennell island world heritage site (ERIWHS) is unique in being the first natural heritage site inscribed on the World Heritage List based purely on customary regulation and management. Unfortunately, the World Heritage Committee declared ERIWHS a World Heritage site in Danger in 2013. Forest cover changes is one of key monitoring parameters to measure whether ERIWHS could be removed from the List of World Heritage in Danger. The main objective of this study is that the use of satellite images to understand the nature and extent of forest cover changes in and outside of the ERIWHS since its inscription on the World Heritage List in 1998 and establish a classification system for future monitoring which is vital for the future conservation of ERIWHS. The high resolution remote sensing images (Worldview) was used to generate land cover classification at present (2015) for establishing a base line for future monitoring. The Worldview mosaic image was used to develop the land classification system of 10 categories, including Unspoiled forest, Un-reclaimed forest, Reclaimed forest, Road, Building, Farmland, Airport, Coast, Bare land and Grass land. The Landsat, Hensen and MODIS images were used to analyze the changes in vegetation coverage during 2000-2015. Base on the analyses of satellite data, the main conclusions can be drawn: 1) Undisturbed or unspoiled forest cover in the whole of the East Rennell Island is still contiguous. The area of coverage of forests within ERIWHS is over 95% of the land area (i.e. not counting the area covered by Lake Tegano which is nearly 45% of the ERIWHS); 2) Forest cover on East Rennell island remains higher than West Rennell, and the disturbance to forest cover in East Rennell ERWHS is four times less than in West Rennell; 3) There are some of the larger clearances during 2000 to 2015; for example, the large, but dispersed patches of clearing in the middle of the Island in 2001, in 2003 there was significant damage and so on; and 4) The MODIS time series of NDVI and Hansen data set correlate a trend of forest loss over last 15 years. The large forest losing year is 2008 and 2009. These results summarized in this study can facilitate the efforts of the Government of Solomon Island to conserve the outstanding universal value (OUV) of its East Rennell Island World Heritage Site.

Key words: East Rennell Island world heritage site; dynamic monitoring; vegetation coverage; multi-sources remote sensing data; forest loss.

* Corresponding Author

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Large scale urban area extracted from Landsat remote sensing images driven by night-time light data

Guizhou Wang [1]*, Jianbo Liu [1], Guojin He [1], Mengmeng Wang [1,2], Zhaoming Zhang [1], Wei Jiang [1,2]

[1] Chinese Academy of Sciences, Institute Of Remote Sensing and Digital Earth, Beijing China
[2] University of Chinese Academy of Sciences, Beijing, China

ABSTRACT

With the development of human society and economy, a large number of people moves from rural to urban areas and the urbanization of cities is very fast in the past few decades. Mapping the dynamic expansion of cities in both temporal and spatial at regional or global scales is very critical to understand the process and degree of urbanization. Night-time Light (NTL) data from the Defense Meteorological Satellite Program / Operational Line-scan System can be used for mapping urban area in low spatial resolution at regional or global scale. And Landsat series satellites provide the necessary spatial, spectral and temporal details for mapping urban area in the medium spatial resolution. In order to more efficient use Landsat remote sensing images for mapping urban area at larger scale, an urban area extraction method was proposed integrating Landsat series remote sensing images and NTL data. This method included two main steps. Firstly, the NTL data was used to extract urban area by threshold segmentation. Secondly, the urban area from NTL data was mapped to the Landsat remote sensing image and considered as prior knowledge to extract urban area information accurately. To test the efficiency of presented method, China was selected as the study area and the NTL and TM images were collected in 2013. Experimental results show that high quality urban area information can be automatically and efficiently extracted from Landsat remote sensing images driven by NTL data in large scale.

Key words: Urban area; Landsat remote sensing images; night-time light data.

* Corresponding Author

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Determining the most appropriate classification methods for water quality

Onder Gursoy *

Cumhuriyet University, Faculty of Engineering, Department of Geomatics, 58140 Sivas, Turkey

ABSTRACT

Assessing water resources' quality and also monitoring them have attracted lots of attention in the recent years. Remote sensing has been growing widely in the last decade and its resources are very usable when it comes to water resources management. In this study, by using remote sensing technology, satellite images that have 350 to 1050 nanometres wavelength band sensors (e.g. CHRIS Proba) are used to determine the quality of the Kizilirmak River's water. Through the river's resources, ground based spectral measurements are made to identify the quality differences of the water at the test spots that have been determined before. In this context at Imranli, where the river contacts civilization for the first time, which is located in Sivas city of Turkey, samples are gathered in order to do ground based spectroradiometer measurements. These samples are gathered simultaneously with the image acquiring time of CHRIS Proba satellite. Spectral signatures that are obtained from ground measurements are used as reference data in order to classify CHRIS Proba satellite's hyperspectral images over the study area. Satellite images are classified based on Chemical Oxygen Demand (COD), Turbidity and Electrical Conductivity (EC) attributes. As a result, interpretations obtained from classified CHRIS Proba satellite hyperspectral images of the study area are presented. Spectras are readied for Spectral Information Divergence and Spectral Angle Mapper methods for determining the best classification method.

Key words: Remote sensing; spectral classification; water quality.

* Corresponding Author

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Utilization of remote sensing in detection of pesticides

Evren Gölge [1]*, Önder Gürsoy [2]

[1] Cumhuriyet University, Engineering Faculty, Department of Food Engineering, 58140 Sivas, Turkey
[2] Cumhuriyet University, Engineering Faculty, Department of Geomatics, 58140 Sivas, Turkey

ABSTRACT

Pesticides are defined as chemicals designed for preventing, destroying, repelling, or mitigating any pest or weed. In the last century, the use of pesticides has greatly increased. In result, with increasing amounts used, concern about non-target pesticide poisoning, identified as the cause of fish kills, reproductive failure in birds, and illness in humans, has also grown. Residential proximity to agricultural pesticide applications may impact human health. Applied pesticides may drift through the air and the ground and through post-application volatilization. Exposure to agricultural pesticides has been linked with a variety of public health problems i.e. cancers. Remote sensing has been widely used to map farmlands, analyse and monitor agricultural changes, and estimate production yield. In this study certain type pesticide was applied to various parts of different fruit trees and spectral measurements were taken in the pesticide applied and non-applied tree-parts. In result of these measurements, the spectral differences of pesticide applied tree-parts were determined in the bandwidth of the high resolution satellite images. Finally, the detectable wavelength ranges in the IR region for the pesticide applied trees that could not be differed in visible region were determined. By this way the variation of the pesticide applied trees could be defined in the satellite images.

Key words: Remote sensing; pesticide detection; farming.

* Corresponding Author

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Review and evaluation of soil moisture estimation method using satellite data

Shabnam Mohajerani *

AZAD University Central, Department of Applied Physics, Tehran, Iran

ABSTRACT

Estimating soil properties, including soil moisture, is important for many water-budgeting processes, and for meteorological and agricultural applications. Soil-moisture information can also be used as an indicator for the prediction of natural disasters, such as flooding and droughts, and for environment changing, such as dust storms and erosions. Technological advances in satellite remote sensing have offered a variety of techniques for measuring soil moisture across a wide area continuously over time. Thus direct observations of soil moisture are currently restricted to discrete measurements at specific locations, because soil moisture is highly variable both spatially and temporally and are therefore inadequate to carry out regional and global studies. Different soil-moisture evaluation methods have been introduced by different authors for different applications. The purpose of this study is to review, compare, and summarize existing methods to identify their effectiveness and weaknesses. Toward this end a group of Combined Active and Passive Remote Sensing Methods was studied. The result show at present, remote sensing methods have not been successful in estimating soil moisture from deep soil layers, such as at the root-zone soil layers. On the basis of the active remote sensing methods, estimating soil moisture on bare soil or soil with less vegetation gives more accurate results, as compared to using the methods on a mixture of land-cover soil. Moreover, the estimation process becomes more challenging when the vegetation cover is dense.

Key words: Soil moisture; remote sensing; active method; passive method; Radar.

* Corresponding Author

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Assessment of plate losses in natural stone industry

Suheyla Yerel Kandemir [1], Hüseyin Ankara [2]*

[1] Bilecik Seyh Edebali University, Engineering Faculty, Gulumbe, Bilecik, Turkey
[2] Eskisehir Osmangazi University, Engineering Faculty, Eskisehir, Turkey

ABSTRACT

Turkey has one of the world's largest stone reserves with over 80 types and 400 different colours. Turkey is also among the important natural stone producers. Circular saw block cutter machines have been widely used in stone industry. In this paper, the costs occurring in plate losses cut from different natural stone blocks have been investigated by using the multivariate statistical techniques. One of multivariate statistical techniques is cluster analysis. Cluster analysis results are showed dendrogram. Dendrogram have been efficiently determining the plate losses. Finally, this study presents the necessity cluster analysis in assessment of natural stone industry.

Key words: Plate losses; natural stone; multivariate statistical techniques; cluster analysis.

* Corresponding Author

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Investigation of morphology of polished marble surface by Atomic-Force Microscopy (AFM)

Huseyin Ankara [1], Haydar Aras [2], Ibrahim Celikyurek *[3], Suat Pat [4], Suheyla Yerel Kandemir [5]

[1] Eskişehir Osmangazi University, Department of Mining Engineering, Eskişehir, Turkey
[2] Eskişehir Osmangazi University, Department of Mechanical Engineering, Eskişehir, Turkey
[3] Eskişehir Osmangazi University, Department of Metallurgical and Materials Engineering, Eskişehir, Turkey
[4] Eskişehir Osmangazi University, Department of Physics, Eskişehir, Turkey
[5] Bilecik Şeyh Edebali University, Department of Civil Engineering, Bilecik, Turkey

ABSTRACT

In this study, the effect of morphology on quality of polished marble surface was investigated by using Atomic-Force Microscopy (AFM). For this purpose, the three dimensional images of surface morphology were achieved by scanning the eight different positions for twelve kinds of marble samples. The quality of surfaces was assessed by measuring the surface roughness and friction. Then, similarities and differences between roughness and friction coefficient on the marble surfaces were determined using single linkage method which is one of the cluster analyses. It is observed that 2 marble types according to other 10 marble types had low similarity as 39.72 %. After this analysis, the relationship between the surface roughness and the surface morphology with image analysis was examined. Consequently, it has been concluded the occurrences of ductile morphology with increasing in polished surface roughness in all marble samples has been appeared to have an effect on marble surface quality. The occurrences of semi-spherical morphology with decrease in the polished surface roughness have been determined in the improvement of the marble surface quality.

Key words: Marble quality; AFM; cluster analysis; morphology.

* Corresponding Author

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Hercynian granite and related mineralisation (Beni Snouss, Western Algeria)

Hadj Mohamed Nacera [1]*, Abdelhak Boutaleb [2]

[1] University Djillali Bounaama, Khemis Miliana, Algeria
[2] Algeria USTHB, Laboratory of Metallogeny and Magmatism, Algiers, Algeria

ABSTRACT

The Hercynian granite in western Algeria, has a typical high-K calc-alkaline evolution, with peraluminous trend U-Pb zircon geochronology yielded the minimum emplacement age of 297 ± 1 Ma. It shows dark microgranular enclaves, veins of pegmatite, aplite, tourmaline and quartz. The granite plutons selected for this study are formed during the late Variscian phase and intrudes the Lower Silurian metasediments which were affected by the major Hercynian folding phases. An important Quartz vein field cross-cutting granitic rocks, several quartz occurrences are observed: grey and microcrystalline; white macroc-rystalline and translucent with palissadic textures; or locally pyramidal .The ore minerals are mainly arsenopyrite and rare gold. Veins of tourmaline are N65 with sub vertical dip; thickness varies from a few centimetres up to 0.5 meter. They are associated with pink barite. The purpose of this study is to highlight the relationship between the mineralisation and the intrusion by combining petrographic and geochemical studies.

Key words: Algeria; Hercynian; Granite; Mineralisation.

* Corresponding Author

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Research on goaf water features and disaster formation mechanism in China coalmines

Herong Gui [1,2]*, Linhua Sun [1,2], Song Chen[1,2], Xianghong Liu[1,2]

[1] Suzhou University, Suzhou, School of Earth Science and Engineering, Anhui, China

[2] National Engineering Research Center of Coal Mine Water Hazard Controlling, Suzhou, Anhui,China

ABSTRACT

Goaf water is one of the major water hazards in China coalmines. In statistics, over 80% of the accidents recorded in recent years were caused by goaf water burst. This article classifies goaf water into 11 types in the light of mine shut-down time and a variety of categorizing principles. It analyses the features of goaf water based on past goaf water disasters in China coalmines and studies the mechanisms inducing goaf water disasters, including goaf water exposed by tunnel excavation, channelled by water-conductive faults and post-mining caving fissures in overlying strata, and bursting through damaged water-resistant coal pillar. All achievements can be of reference to other coal-producing countries confronted with karst water hazards.

Key words: Goaf water; types of goaf water; features of goaf water hazards; mechanisms inducing goaf water disasters; China.

* Corresponding Author

mess@mess-earth.org

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Equipment selection by using fuzzy TOPSIS method

Mahmut Yavuz *

Eskisehir Osmangazi University, Department of Mining Engineering, Eskisehir, Turkey

ABSTRACT

Multiple Criteria Decision Making (MCDM) is one of the most considerable branches of Decision Making (DM). MCDM refers to making decisions in the presence of multiple, usually conflicting, criteria. The problems in MCDM are classified into two categories: Multiple Attribute Decision Making (MADM) and Multiple Objective Decision Making (MODM). However, very often the terms MADM and MCDM are used to mean the same class of models and mostly confused in practice. Usually, MADM is used when the model cannot be stated in mathematical equations and otherwise MODM is used. One of the challenging DM problems in mining operations is to choose the best equipment among the alternatives. Equipment selection is an important task for mine management due to its operational cost, and also an integral part of mine planning and design. Equipment selection is not a well-defined process because it involves the interaction of several subjective factors or criteria. Besides, decisions are often complicated and may even embody contradictions. Therefore; equipment selection is considered as a MCDM process, and suitable decision making methods should be employed in this process. In this study, Fuzzy TOPSIS method was performed for the selection of open pit truck and the optimal solution of the problem was investigated. Data from Turkish Coal Enterprises was used in the application of the method. As a result, the advantages and disadvantages encountered during the application of the method were presented. It was found that Fuzzy TOPSIS is a method that may help decision-makers in solving different decision-making problems in mining.

Key words: Decision making; Fuzzy TOPSIS; equipment selection; open pit truck.

* Corresponding Author

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A new partial derivatives model to optimize mining capacities

Ali Abbasi *, Morteza Osanloo

Amirkabir University of Technology, Department of Mining and Metallurgical Engineering, Tehran, Iran

ABSTRACT

Mining capacities are one the main factor in mine design. Other parameters such as equipment capacity, infrastructure, manpower, income, initial investment, operating costs, cut-off grade, stripping ratio, dilution, recovery, ultimate pit limit, push backs, production planning and life of mine depend on mining capacities. Miss estimation of mining capacities causes wrong allocation of financial resources and it could make the project infeasible. Among the proposed method for capacity calculation, Taylor's equation is the most used one, but this relation is an empirical method and it just considers ore reserve. As mining of low grade ore continues in deep, the mining capacities and consequently the capital costs encountered with should increase. In this paper, a new partial derivatives approach is used to estimate the mining capacities and results are compared with Taylor's. The results show a significant increase in the net present value of the project.

Key words: Mining capacities optimization; extraction capacity; concentration capacity; refinery capacity; partial derivatives approach.

* Corresponding Author

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The impact of selected parameters on the fatigue strength of splices of multi-ply textile conveyor belts

Mirosław Bajda *, Ryszard Błażej

Wroclaw University of Technology, Machinery System Department, Na Grobli 15, 50-421 Wrocław, Poland

ABSTRACT

Splices are the weakest points in the conveyor belt loop. The strength of these joints, and thus their design and the method and quality of splicing, determine the strength of the whole conveyor belt loop. There is a special zone in a splice where the stresses in the adjacent plies or cables differ considerably from each other. This results in differences in the elongation of these elements and in additional shearing stresses in the rubber layer. The strength of the joints depends on several factors such as the parameters of the joined belt, on the connecting layer and the technology of joining, as well as on the materials used to make the joint. The strength of the joint constitutes a criterion for the selection of a belt suitable for the operating conditions, therefore methods of testing such joints are of great importance. This paper presents the method of testing fatigue strength of splices of multi-ply textile conveyor belts and the results of these studies.

Key words: Mine transport; textile conveyor belts; conveyor belt splices; belt splices testing.

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* Corresponding Author

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Production scheduling of iron ore mines considering multiple destinations

Mohsen Jamshidi *, Morteza Osanloo

Amirkabir University of Technology, Department of Mining and Metallurgical Engineering, Tehran, Iran

ABSTRACT

In direct shipping iron ore mines, different ore blocks blend together in a manner that satisfies the customer requirements in quantity and quality. In this kind of minerals, the quality of mine product depends on the different elements that exist in the ore body and the aim of production planning is to produce and blend mine product in a manner that not only the required specifications are met but also the profitability of the project is optimized. In this paper, a mixed integer programming model with the objective of maximizing the net present value of the project is developed to optimize the production planning of an iron ore mine, considering three different destinations for ore blocks. Considering more destinations for mine products is a complex problem and proportional to the number of destinations, different blending plans are required in each case to satisfy the destinations' requirements. In this model, the acceptable limit of the elements such as iron, sulphur and phosphorous for each destination are taken into account. The model checks the characteristics of blocks in the block model to determine appropriate ore blocks for each blending plan in order to achieve the most possible net present value. The proposed methodology has been implemented in Gol-e-Gohar No.2 iron ore mine in Iran. The results of the model show that having various blending plans help to have more alternatives in production scheduling and it is possible to blend more suitable blocks to meet the destination or customers' requirements and consequently extending pit limits and mine life.

Key words: Iron ore mine; production scheduling; blending; direct shipping ore; open pit.

* Corresponding Author

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Effect of waste brick as mineral admixture on the mechanical performance of cemented paste backfill

Gökhan Külekçi *, Bayram Erçikdi, Şener Aliyazıcıoğlu

Karadeniz Technical University, Department of Mining Engineering, 61080 Trabzon, Turkey

ABSTRACT

In recent years, the utilization of mineral admixtures as pozzolanic material for the partial replacement of Portland cement has gained importance since i) it reduces the porosity and permeability of cementitious mixtures (i.e. concrete, backfill), ii) alleviate the loss of stability due to alkali-silica and acid/sulphate attack and, iii) decreases the binder consumption and operating costs. The most important parameters that affect the usability of pozzolanic materials are the availability of these materials at low cost and sufficient amount. Cemented paste backfill (CPB) is a mixture composed of dewatered process tailings, a hydraulic binder and mix water. Binder is added to the mixture to provide strength development by 3-9 wt% dry weight. Ordinary Portland cement is often used as the binder and binder costs represent 50-75% of the operating costs in a CPB plant. Calcium rich binders such as ordinary Portland cement are particularly susceptible to sulphate attack when the CPB is prepared from sulphide rich mill tailings and hence, the preventive solutions have been seek. In concrete industry, the use of pozzolanic additives (e.g. waste brick, metakaolin, diatomite, blast furnace slag etc) has been reported to be one of the most effective solutions to the acid and sulphate attack. Considering that binder costs represents 50-75% of the backfill's operating cost, the addition of pozzolanic materials with binding properties probably would not only reduce the problems associated with the sulphate attack, but also the consumption and, hence, cost of binder in a CPB plant. Although brick wastes are exploited as pozzolanic material in concrete, there is no detailed study on the utilization of brick wastes in cemented paste backfill. In this study, the effects of brick wastes as additive and replacement to ordinary Portland cement (up to 45 % by weight) on the short- and long-term strength and stability of CPB were investigated. CPB samples were subjected to the uniaxial compressive strength tests at 7-180 days and the most suitable pozzolan type and dosage were determined. The UCSs of CPB samples increased with increasing additive rates and decreased with increasing replacement ratios. All CPB samples produced the desired strength and stability when WB were used as an additive to OPC. However, a binder dosage of >7 wt% was required to produce the desired 28–day strength of ≥0.7 MPa when the OPC was replaced by 15-45 wt% WB samples. The stability (i.e. no loss of strength) of CPB samples is closely inter-related with the calcination temperatures and glass phase content of WB.

Key words: Waste brick; cemented paste backfill; waste management; compressive strength.

* Corresponding Author

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Continuous rating for diggability assessment in surface mines

Melih Iphar *

Eskisehir Osmangazi University, Faculty of Engineering and Architecture Mining Engineering Department, Meselik Campus Eskisehir-Turkey

ABSTRACT

The rocks can be loosened either by drilling-blasting or direct excavation using powerful machines in opencast mining operations. The economics of rock excavation is considered for each method to be applied. If blasting operation is not preferred and also the geological structures and rock mass properties in site are convenient (favourable ground conditions) for ripping or direct excavation method by mining machines, the next step is to determine which machine or excavator should be selected for the excavation purposes. Many researches have been proposed several diggability or excavatability assessment methods for deciding on excavator type to be used in the field. Most of these systems are generally based on assigning a rating for the parameters having importance in rock excavation process. The final rating obtained from this type of classification systems can enable the engineers or decision makers to determine excavator or ripper type to be used for the considered site. However, the sharp transitions between the two adjacent classes for a given parameter can lead to some uncertainties. Owing to this abrupt transition, the assigning rating for a given parameter has been dramatically increased or decreased if the numerical value of the parameter is very near to the upper or lower boundary of the classes. This increase or decrease directly affects the final rating and the determined machine type for the evaluated site by employing diggability classification systems. The above mentioned uncertainties or fuzziness encountered in the practical application of conventional rock excavation classification systems can be handled by employing “continuous rating” which enables a soft and gradual transition between the classes. In this paper, it has been proposed that varying rating should be assigned for a given parameter called as “continuous rating” instead of giving constant rating for a given class.

Key words: Diggability assessment; classification rating system; uncertainty; continuous rating.

* Corresponding Author

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Monitoring of landslide at Tuncbilek (Turkey) open pit stripping area with terrestrial laser scanner and optical images

Mehmet Volkan Ozdogan *, Ahmet Hamdi Deliormanli

Dokuz Eylul University, Mining Engineering Department, Izmir, Turkey

ABSTRACT

Evaluation of the risk induced by landslide need an appropriate phenomenon investigation. Monitoring of landslides has vital importance for determining the future development of sliding mass. Traditional methods for monitoring the slopes are generally point based measurements and represents the measurement environment also most of them need extensive field study. The other critical disadvantage of traditional methods are they do not provide data about past movement of the landslides. So the development of landslide cannot be exposed clearly. Remote sensing techniques used for providing data on earth sciences have rapidly developed in recent years. Usage of remote sensing for monitoring of slopes have made a lot of progress in the last decade, especially in the field of ground-based remote sensing platforms. The most important benefit of remote sensing applications on slope monitoring is safe working conditions with high accurate results. Terrestrial laser scanners are one of the ground-based remote sensing equipment which provide detailed and highly accurate 3D data rapidly and efficiently. In this study terrestrial laser scanner method was carried out for monitoring the landslide at Tuncbilek Open pit stripping area and also optical images were evaluated for determining the development of landslide. The head part of landslide was measured with Leica Scanstation II terrestrial laser scanner at three various dates and the point cloud of head part of landslide were created. Then the three point cloud created at various date were compared. The measurements were carried out with 5cm x 5cm point density for 300m distance. Also six optical satellite image with resolution 1m and below were examined for determining the development of landslide between 2001 and 2013.

Key words: Landslide; slope monitoring; remote sensing; terrestrial laser scanning.

* Corresponding Author

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Heat regime of mines of the North

Alexander Galkin *

21-liniya 2, Saint Petersburg, Russia

ABSTRACT

The results of theoretical research of heat regime in modern mechanized gold mines of the North are presented. The main regularities of the formation of the heat regime in mine workings during the warm and cold periods of the year have been established. Assessment of influence of microclimate at exploitation of the mine without additional air heating during the winter period of the year has been conducted. The mine workings in which parameters of the microclimate do not comply with the occupational safety and health requirements have been determined. Risk significance of occurrence of cold-like occupational diseases of the mine workers have been determined. It was established that the risk significance for the mine worker exceeds the mean maximum permitted values several times. In addition, it has been established that a part of the mine workings, when exploited in conditions of an unregulated heat regime, does not correspond to the criteria of safety requirements in case of occurrence of emergency events. An assessment has been made of the degree of influence of heat release of the diesel-powered scooptrams on the heat regime in various workings of the mine – main (capital), preparatory and cleaning. It was demonstrated that the largest increase in air temperature occurs in mine faces of the cleaning and preparatory workings of the mine. It necessarily needs to be considered when determining the depth of thawing of the rocks around the workings and when selecting the parameters of anchor mounting. The changes in temperature in main (capital) workings caused by such sources are not as significant and can be considered as being evenly spread sources along the length of the working.

Key words: Construction design; mine; heat regime; ventilation; safety; regulation; North.

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Monte Carlo simulations of proficiency testing for geometric distributed test results

Marius Darie *, Sorin Burian, Tiberiu Csaszar, Leonard Lupu, Lucian Moldovan, Cosmin Colda, Adriana Andriș

National Institute for Research and Development in Mine Safety and Protection to Explosion – INSEMEX, 32-34 G-ral Vasile Milea street, Petrosani, Romania

ABSTRACT

The scope of the paper is the investigation of the effect of probability value variations on the dispersion of extreme values of geometric random process results. The practical background of the investigation is the study of values obtained in the process of low currents tests using explosive gas mixtures. In the first part of the paper it was briefly shown the process of testing using spark test apparatus and explosive test gas mixtures. In the second part of the paper has been emphasized the geometric type of distribution process associated to tests results. In third part were introduced the simulation method used together with Monte Carlo simulation process. The simulation results and discussions were presented in the last part.

Key words: Monte Carlo simulations; geometric probability distribution; explosive gas test mixture.

* Corresponding Author

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Modern monitoring with preventive role for a production capacity

Cristian Tomescu *, Constantin Lupu, Andrei Szollosi-Mota, Florin Radoi, Emeric Chiuzan

National Institute for Research and Development in Mine Safety and Protection to Explosion – INSEMEX Petroşani, Romania

ABSTRACT

In the process of exploitation of coal, the appearance of the phenomenon of spontaneous combustion represents a risk factor identified by the subjective and objective the causes, which requires the development of appropriate prevention methods. In order to control the risk, shall be drawn up incipient intervention solutions with preventive function, which consist in the direct and indirect measurement of the working environment, of the temperature of the coal massif and of the concentrations of gases, O_2, CO_2, CO. Monitoring instruments which fall within the modern concept for proactively anticipation is represented by thermography and thermograma applied in the exploitation of coal and by the gas chromatograph for the analysis of the air collected. The drawing up of thermal maps on the basis of the thermograms and analysis of the chromatograms resulted represents the binome for assessing and treatments of the spontaneous combustion risk, which will be discussed in this work.

Key words: Coal; spontaneous combustion; the chromatogram; thermography.

* Corresponding Author

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Determination of the mechanical power in belt conveyor's drive system in industrial conditions

Robert Król, Damian Kaszuba *, Waldemar Kisielewski

Wroclaw University of Technology, Faculty of Geoengineering, Mining and Geology, ul. Na Grobli 15, 50-421 Wroclaw, Poland

ABSTRACT

Mechanical power is a value which carries a significant amount of information on the properties of the operating status of the machine analysed. The value of mechanical power reflects the degree of load of the drive system and of the entire machine. It is essential to determine the actual efficiency of the drive system η [%], which is the key parameter of the energy efficiency of the drive system. In the case of a single drive of a belt conveyor the actual efficiency is expressed as the ratio of mechanical output power PM [W] at the drive pulley shaft to active electrical power drawn by the motor PE [W]. Furthermore, the knowledge about the mechanical power from all drives of the multiple driven belt conveyor allows for the analysis of load distribution between the drives. In case of belt conveyor the mechanical power PM [W] generated by the drive at the drive pulley shaft is equal to its angular velocity ω [rad / s] multiplied by the torque T [Nm]. The measurement of angular velocity is relatively easy and can be realized with use of a tachometer or can be determined on the basis of linear velocity of the conveyor belt during belt conveyor's steady state operation. Significantly more difficult to perform in industrial conditions is the measurement of the torque. This is due to the operational conditions of belt conveyors (e.g. dustiness, high humidity, and high temperature) and tight assembly of the drive components without the possibility of their disassembly. It makes it difficult or even impossible to measure the torque using a number of the techniques available, causing an individual approach to each object of research. The paper proposes a measurement methodology allowing to determine the mechanical power in belt conveyors drives which are commonly used in underground and surface mining. The paper presents results of research into mechanical power in belt conveyor's drive carried out in underground mine conditions.

Key words: Belt conveyor; measurement; torque; mechanical power, efficiency; energy efficiency.

* Corresponding Author

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An idea of identification of copper ore with the use of Process Analyser Technology sensors

Leszek Jurdziak, Damian Kaszuba *, Witold Kawalec, Robert Król

Wroclaw University of Technology, Faculty of Geoengineering, Mining and Geology, ul. Na Grobli 15, 50-421 Wroclaw, Poland

ABSTRACT

The Polish resources of the copper ore exploited by the KGHM S.A. underground mines are considered as one of the most complex in the world and – consequently - the most difficult to be processed. The ore consists of three lithology forms: dolomites, shales and sandstones but in different proportions which has a significant impact on the effectiveness of the grinding and flotation processes. The lithological composition of the ore is generally recognised in-situ but after being mined it is blended on its long way from various mining fields to the processing plant by the complex transportation system consisting of belt conveyors with numerous switching points, ore bunkers and shafts. Identification of the lithological composition of the ore being supplied to the processing plant should improve the adjustments of the ore processing machinery equipment aiming to decrease the specific processing (mainly grinding) energy consumption as well as increase the metal recovery. The novel idea of Process Analyser Technology (PAT) sensors – – information carrying pellets, dropped into the transported or processed bulk material which can read directly when needed - is investigated for various applications within the DISIRE project (a part of the SPIRE initiative, acting under the Horizon2020 framework program) and is adopted for implementing the annotation the transported copper ore for the needs of ore processing plants control. The identification of the lithological composition of ore blended on its way to the processing plant can be achieved by an information system consisting of pellets that keep the information about the original location of the portions of conveyed ore, the digital, geological database keeping the data of in-situ lithology and the simulation models of the transportation system, necessary to evaluate the composition of the blended ore. The assumptions of the proposed solution and the plan of necessary in-situ tests (with the special respect to harsh environment of conveying in underground mines in order to formulate the requirements of necessary robustness of pellets) and analytical investigations are presented.

Key words: Copper ore lithology; KGHM underground mines; belt conveyor systems; process analyser technology; orebody modelling; simulation methods.

* Corresponding Author

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Rock cutting tests on selected volcanic rocks with a simple shaped chisel tool and theoretical implications

Serdar Yasar *, Ali Osman Yimaz

Karadeniz Technical University, Mining Engineering Department, Trabzon, Turkey

ABSTRACT

Chisel shaped hand tools are the mankind's first hand crafts for different purposes. Early rock cutting machines were utilized with these type of tools and early rock cutting mechanics studies focused on these tools, too. For the sake of geometrical simplifications, simple shaped chisel tools were preferred in theoretical rock cutting mechanics studies. Evans and Nishimatsu were suggested the most significant rock cutting theories about these tools. However, despite to the significance of these theories, some experimental results have showed that these theories, in some conditions, were not in a good agreement with field and experimental results. In this study, five different volcanic rock samples were conducted to the rock cutting tests with vertical rock cutting rig (VRCR) by using a simple shaped chisel tool. Cutting tests were performed from 1 mm to 6 mm. Cutting force data were recorded during cutting tests. Results obtained from cutting tests were compared with the cutting forces which were found by the formula suggested by Evans. Results showed that experimental cutting forces were seen approximately as double as theoretical forces. It was clearly seen that rock cutting tests have an extreme importance in rock cuttability assessment since theoretical models is not in a good agreement with experimental results in some conditions.

Key words: Rock cutting mechanics; mechanical excavation; rock cutting theories; vertical rock cutting rig (VRCR).

* Corresponding Author

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Non-Smooth Contact Dynamics (NSCD) method applied to rockfall simulation with a stochastic approach

Nguyễn Anh Tuấn [1,2]*, Véronique Merrien-Soukatchoff [3], Marc Vinches [4]

[1] Hanoi University of Mining and Geology, Vietnam
[2] Université de Lorraine, GeoRessources, Ecole des Mines de Nancy, France.
[3] Geodesy, Geomatics, Geosciences, Planning and Land Law Laboratory (GeF), Cnam, Paris, France.
[4] Laboratoire LGEI, Ecole des Mines d'Alès, France

ABSTRACT

The mechanical properties of rock mass are dependent on the presence of the discontinuities network. This paper is to apply the geostatistical method and to study the spatial correlation between discontinuity systems measured by the scanline method. The results of application to produce a numerical model of 3D blocks of the Non-Smooth Contact Dynamics (NSCD) method. The stochastic model of fractured rock masses on the quarry Clues, France to investigate the stability conditions of jointed rock slopes are presented in this paper.

Key words: Grouping of discontinuities; discrete fracture network (DFN); modelling; stochastic; stability analysis; Rockfall hazard.

* Corresponding Author

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Evaluation of occupational accidents in mining sectors

Suheyla Yerel Kandemir *

Bilecik Seyh Edebali University, Bilecik, Turkey

ABSTRACT

Today, due to technological developments, the increasing importance given to occupational health and safety in the works. However, despite the importance attached to occupational health and safety are still a large number of job related accidents. The mining sectors is one of them. Mines workers can suffer a wide variety of accident and injuries. Thus, sustainable management of mining sectors requires careful of accidents. In this paper, the number of mining accidents in Turkey are evaluated by using the statistical analysis method.

Key words: Occupational accidents; mining; sustainable management; Turkey.

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* Corresponding Author

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Triboelectrostatic separator

Özcan Y. Gülsoy *, T. Onur Dizdar, Gizem Kocausta

Hacettepe University, Department of Mining Engineering, Beytepe, 06800, Ankara Turkey

ABSTRACT

Electrostatic separation known as enrichment method which has a highly operational cost because of required high voltage. But, this method is main separation system for some mineral concentration and for recycling. Because of the high voltage requirement and problems on the handling of this voltage, the usage of this system is very limited in the industry. Particles can be charged by friction and this method is defined as tribo-charging. Tribo-charging is generally used to charge the particle in order to increase the separation performance of electrostatic separation. On the other hand, high voltage which is necessary for separation can be produced by tribo-charging. The high voltage produced by friction can be collected on an electrode and this electrode can be used in an electrostatic separator. This is the most important advantage in comparison with conventional electrostatic separators. Friction produces high voltage up to ten thousand of volts. Specific materials are chosen from triboelectric series to produce the required high potential in an electrostatic separator. In this study, different material from different sides of the triboelectric series were selected and used to produce triboelectric effect in specially designed test system. This system is also collected to an electrostatic separator which is designed according to the conventional electrostatic separators in the laboratory. Artificially prepared feed samples including quartz and magnetite (-212+106 μm) are used in this electrostatic separator. Test results showed that magnetite and quartz could be separated successfully. In the test, a magnetite concentrate including 96% magnetite with 77% recovery was obtained from a feed including 20% magnetite. The results revealed that tribo-charging could be used as an alternative high voltage production method in electrostatic separators.

Key words: Tribo-charging; electrostatic separator; triboelectrostatic separator.

* Corresponding Author

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Effect of dry ultra-fine grinding conditions on the particle size distribution and specific surface area of talc

Oner Yusuf Toraman *

Nigde University, Faculty of Engineering, Department of Mining Engineering, 51240 Nigde, Turkey

ABSTRACT

The demand for ultra-fine talc in the range of micron and sub-micron is emerging which drives the mineral industry to produce value added products. In this study, the effects of various operating parameters, such as grinding time (10-20 min), rotational speed of stirrer (300-600 r/min), feed rate (5-10% of ball weight) and ball filling ratio (50-70% of mill volume) on ultra-fine grinding of talc powder (d50=5 μm) were studied using a laboratory scale vertical stirred mill (750 cm^3 capacity) under dry conditions. A series of laboratory experiments using 24 full factorial designs was conducted to determine the optimum grinding parameters. The main and interaction effects on the particle size and volume specific surface area (SV, m2/cm3) of the ground product were evaluated using Yates technique with ANOVA (analysis of variance). Under the optimal conditions at the stirrer speed of 600 r/min, grinding time of 20 min, sample mass of 5% and ball ratio of 70%, the resulting talc powder had larger volume specific surface area (i.e., 3.23 m^2/cm^3) than the starting material (i.e., 1.81 m^2/cm^3).

Key words: Surface area; ultra fine grinding; vertical stirred mill; talc; operational parameters; statistical design.

* Corresponding Author

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Complex processing of a titanium magnetite concentrate with receiving the products containing iron, the titan and vanadium

Madali A. Naimanbayev *, Zhantore Dzurkanov, Nina Lokhova, Galymjan Maldybayev

Joint Stock Company, Center of Earth Sciences, Metallurgy and Ore Benefication, Almaty, Republic of Kazakhstan

ABSTRACT

Present study determines conditions for titanium magnetite concentrate processing with fairly complete titanium conversion to the slag and iron and vanadium separation in the hot metal. It is quite difficult to process titanium magnetite concentrate in the blast furnaces due to low fusibility of charge and direct electrical melting causes process instability. Present work is devoted to development of concentrate double stage smelting process with little soda additions, including solid-phase recovery at the first stage using specific coke as a reductant, avoiding concentrate oxidation and including its preliminary thermooxidation. Mix charge made of concentrate, soda and specific coke was granulated in water, dried at 130°C, pellets were placed in graphite crucible, and later on it was set up in the centre of the furnace in alundum crucible. Temperature regimen was fixed under following parameters: temperature at the first stage is 1250 °C; soaking time is 50 minutes; temperature at the second stage is 1500 – 1650 °C; soaking time is 35 min. It is established that little soda additive (estimated 3-4% Na_2O) to the charge of titanium magnetite concentrate recovery smelting performs as coagulant during briquetting, as catalyst in course of solid-phase recovery, as inhibitor of DRI briquettes secondary oxidation as slag thinner during smelting. In course of titanium magnetite concentrate reduction smelting process soda interacts to SiO_2, Al_2O_3, TiO_2 oxides forming sodium silicates and titanates. Double-stage technology of titanium magnetite concentrate reduction smelting both with soda addition and without oxidation and preliminary iron oxidation of titanium magnetite concentrates till hematite was developed. Optimal process parameters were determined. Following parameters were obtained: hot metal yield was ~55% out of concentrate weight, slag yield - 23.3-25.8%, carbon-free slag content, wt%: Fe=1,0-1,6; TiO_2=62,7-61,9. TiO_2 yield in the slag is 89,6-94,1%. Hot metal contains, %: 5,51 C; 0,36 Ti; 0,35 Mn; 0,04 Si; 0,23 V. Vanadium yield in iron was 53.0%.

Key words: Titanium magnetite concentrate; reduction smelting; calcinated soda; spec coke; charge.

* Corresponding Author

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Production of synthetic carnallite from the wastes of titanium and magnesium production with the extraction of niobium-containing middlings

Almagul Ultarakova *, Madali Naimanbayev, Onayev Murat, Alzhanbaeva Nadira, Barkytova Botakoz

Joint Stock Company, Center of Earth Sciences, Metallurgy and Ore Benefication, Almaty
Republic of Kazakhstan

ABSTRACT

Analysis of the current state of the titanium and magnesium production in the Republic of Kazakhstan shows the availability of significant amounts of chloride wastes containing valuable components. Magnesium and potassium with an average content of 50-60% potassium chlorides, 25-30% magnesium chlorides are lost among other metals in the wastes of the titanium and magnesium production. Kazakhstan has not mastered the field of magnesium raw materials, so it has to import it in the form of carnallite. Ust-Kamenogorsk Titanium Magnesium Plant JSC (UTMK) currently imports carnallite that is a KCl□MgCl2□6H2O binary salt at quite high prices. In this regard, the task of extracting these metals from chloride wastes is relevant. Chloride wastes of titanium production, sublimates of dust chambers of a titanium chlorinator, sludge of a magnesium electrolytic unit and sludge of a carnallite chlorinator has been chosen as the targets of our research. The analysis of niobium distribution within any solid waste of a titanium sludge chlorination process in UTMK JSC showed that the highest content of niobium is in the sublimates of dust chambers of a titanium chlorinator in the ranges from 0.26 to 1.0%. Among the niobium extraction technologies considered, the known method of its extraction from the chloride waste is leaching with weak solutions of mineral acids or bases in order to convert the chloride salts into the solution to be used for synthetic carnallite extraction. Besides niobium, other impurity components are transferred to the cake and shall be separated from the base metals. The effective method for this is the chlorination process enabling niobium transfer into the sublimates in the form of chlorides and thus separating it from the majority of the impurities. The condensed niobium chlorides are hydrolyzed transferring it into sediments in the form of oxide. The paper shows the way of synthetic carnallite production suitable for use in the main flow diagram of titanium and magnesium production with a by-product in the form of middlings enriched with niobium.

Key words: Leaching of chloride wastes; carnallite; synthesis; niobium; chlorination.

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Characterization and processing of francs sterile mine Ouenza

Dirar Baala *, Abel Aziz Idres, Mohamed Bounouala

BADJI Mokhtar University, Mining Department, Laboratory of Mining Resources Processing and Environment, PB 12, 23000, Annaba, Algeria

ABSTRACT

Mine Ouenza operates iron ore by open pit method and produces about 2 million ton. However, to reach the mineralized zone, it is necessary to remove the rocks stripping. The Ouenza the mine produces annually 1.8 Million ton francs sterile, they are stored on the surface in the form of stacks. Because of their in situ properties (heterogeneous releases to spread the meter size ranging micrometre, hydro-geotechnical properties vary, angular particles, etc.), Management of waste rock can be an environmental challenge, especially when they contain sulphide outcrops of sulphide minerals (called iron caps or gossan in English) are naturally subject to oxidation by contact with air and water. This slow phenomenon leads sulphuric acid and solubilisation of the metals present. The objective of this research work is to characterize these sterile francs from the Ouenza the mine by physical methods. Representative samples are taken from different levels of discharge. The results of the mineralogical analysis and by X-ray diffraction of these samples, the same characterization will be applied for the samples by x ray fluorescence and thin blades. This analysis enables us to distinguish three categories sterile francs on all landfills namely hematite representing 15%, 35% marl and limestone50 %. For the processing of these sterile francs we propose to apply the radiometric method for sorting fragmented rock and century after sorting the percentage of iron ore that remains will return to the magnetic separation process to bring each of these categories in their sterile fashion usage.

Key words: Ouenza deposit; radiometric; sample; sterile francs; XRD.

* Corresponding Author

mess@mess-earth.org

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Dephosphorisation of oolitic iron ore by HIMS, case study; Gara djebilet deposit-Tindouf (Algeria)

Salem Badjoudj *, Abdelaziz Idres, Issam Rouaiguia

Badji Mokhtar University, Earth Sciences Faculty, Mining Department, Mineral Processing and Environment Laboratory, Annaba, 23000, Algeria

ABSTRACT

Most metals and other inorganic elements exploited are found combined in the form of minerals that make up the earth's crust. The forces and processes that have shaped the surface of the Earth concentrated these minerals in widely varying amounts. When the concentration is high enough to be exploited profitably, we talk of an ore deposit. However, even at these concentrations, minerals seldom have sufficient purity to be processed directly into finished products. Gara djebilet iron ore deposit, with 3 billion tons of reserves, has not been the subject of mineral processing studies, showing the delicacy of finding a suitable method for treating and recycling to lessen the levels of harmful elements namely phosphorus. To this end we opted for the high intensity magnetic separation (HIMS) using the wet method to lessen the phosphorus concentration as the ore is always used in the steel field sometimes to increase its content, sometimes to market according to the requirements of steel companies. The interest of this research is to reduce the levels of impurities specifically phosphorus which has proved that, based on research conducted by caterers in field, it generates micro-cracks at the crystal lattice of iron after metallurgical fusion which makes the steel brittle and reach the stage of plasticity than elasticity.

Key words: Content; Gara djebilet; oolithic iron; phosphorus; HIMS.

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Production quality, value and revenue in Polish copper mines

Jerzy Malewski

Wroclaw University of Technology, Faculty of Geoengineering, Mining and Geology, ul. Na Grobli 15, 50-421 Wroclaw, Poland

ABSTRACT

Polish copper ore deposits, located in the Legnica-Głogów Copper District (LGOM) documented an area of over 200 km^2, at a depth of 600-1400 meters. The estimated resources equal to 22.7 million tonnes of copper (proven and probable), or 44.4 million t (measured and Indicated), or 8.7 million t (infered), at the criterion of profitability at a cost less than 50 cents per ton of ore (KGHM Raport Zasobowy, 2015). Organization of production takes place in the combine of mining and metallurgy (KGHM). Ore is extracted in three mines: Lubin, Polkowice-Sieroszowice and Rudna. The total production of these mines is about 31 million tones / year of ore, from which it receives a 550000 t/y of copper, 1152 t/y of silver, 1066 kg/y of gold, and certain amounts of Pb, Zn, Se, Re, Ni, SO4, H2SO4. The quality (grading) of the ore in exploited deposits is varied, affecting the quality and quantity of produced concentrates, what influence on its market value. The paper presents a brief description of ore deposit and estimates mines revenues and production profit. Calculations show that at today's (June 2016) metal prices each of the mine can expect the following net smelter revenue: Lubin ~41, P-S ~70, Rudna ~75 $/t of ore. But estimated cost production differs less, i.e.: 45, 56 and 65$/t of ore respectively, because of mining depth.

Key words: Copper; mining; performance; revenue.

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Processing of phosphorus slag with recovery of rare earth metals and obtaining silicon containing cake

Zaure Karshigina [1]*, Zinesh Abisheva [1], Yelena Bochevskaya [1], Ata Akcil [2], Aynash Sharipova [1], Elmira Sargelova [1]

[1] Centre of Earth Sciences, Metallurgy and Ore Beneficiation (CESMOB), Shevchenko st. 29/133, Almaty, Kazakhstan
[2] Mineral-Metal Recovery and Recycling (MMR&R) Research Group, Mineral Processing Division, Department of Mining Engineering, Suleyman Demirel University, TR32260, Isparta, Turkey

ABSTRACT

The present research is devoted to the processing of slag generating during the yellow phosphorus production. In this paper are presented studies on leaching of phosphorus production slag by nitric acid with recovery of rare earth metals (REMs) into solution. REMs recovery into the solution achieved 98 % during the leaching process with using 7.5 mol/L of HNO3, liquid-to-solid ratio is 2.6 :1, temperature is 60 °C, process duration is 1 hour and stirrer speed is 500 rpm. Behaviour during the leaching of associated components such as calcium, aluminium, and iron was studied. After the leaching cake contains ~75-85 % of SiO_2 and it might be useful for obtaining of precipitated silicon dioxide. With the purpose of separation from the impurities, recovery and concentrating of REMs, the obtained solution after leaching was subjected to extraction processing methods. As the extractant was used tributyl phosphate (TBP), as the diluent - purified kerosene. The influence of ratio of organic and aqueous phases (O:A) on the extraction of rare earth metals by TBP with concentrations from 20 up to 100 % was studied. The REMs extraction with increasing TBP concentration under changes O:A ratio from 1:20 down to 1:1 into the organic phase from the solutions after nitric acid leaching increased from 22.2 up to 99.3 %. The duration effect of REMs extraction process was studied by tributyl phosphate. It is revealed that with increasing of duration of the extraction process from 10 to 30 minutes REMs recovery into the organic phase almost did not changed. The behaviour of iron in the extraction process by TBP was studied. It was found that such accompanying components as calcium and aluminium by tributyl phosphate didn't extracted. To construct isotherm of REMs extraction of by tributyl phosphate was used variable volume method. It was calculated three-step extraction is needed for REMs recovery from the solutions after nitric acid leaching of phosphorus production slag. The process of the three-steps counter current extraction of rare earth metals was modelled from the solutions after slag leaching with using 50 % of TBP in kerosene at the ratios O:A = 1:6 and 1:20. So, REMs recovery into the extract achieved 97.0 and 76.5 %, respectively. It was offered flow sheet of processing of phosphorus slag production with extraction of rare earth metals and obtaining silicon containing cake.

Key words: Leaching; phosphorus slag; rare earth metals; extraction, recovery.

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Influence of microwave heating and thermal auxiliary on decomposition of siderite

Mehmet Celikdemir *, Musa Sarikaya, Tolga Depci, Ramazan Aydogmus

Department of Mining Engineering, Inonu University, Malatya, Turkey

ABSTRACT

In the present study, microwave radiation was used to decrease power inputs and roasting duration time for thermal decomposition of Deveci, Hekimhan siderite ore. The siderite was not enough to absorb adequate microwave radiation to start the decomposition or roasting reaction. Therefore, sucrose as thermal auxiliary was added to the raw siderite ore before microwave irradiation. The effect of amount of sucrose (10 to 30 % by weight) against the duration of heating and roasting temperature of the thermal decomposition of siderite was investigated in the present study. On the contrary of the literature, the experimental results showed that the siderite was decomposed in a 3 minutes with addition of 30 wt % sucrose and transformed to Fe_3O_4. The temperature, the weight loss and the magnetic susceptibility of the roasted final product were recorded as 1100 °C, 32.14 wt % and 15410.03 $m^3/kg * 10^{-8}$, respectively.

Key words: Microwave irradiation; roasting; magnetic susceptibility.

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The usability of Malatya pyrophyllite in the traditional ceramic industry

Nilgun Kizilkaya [1]*, Mehmet Onal [1], Tolga Depci [1], Yunus Onal [2]

[1] Department of Mining Engineering, Inonu University, Malatya, Turkey
[2] Department of Chemical Engineering, Inonu University, Malatya, Turkey

ABSTRACT

In the present study, the usability of the pyrophyllite in the traditional ceramic industry was investigated. The raw pyrophyllite was obtained in Malatya, Turkey. The characterization of the raw pyrophyllite and the prepared ceramics which were heated at the different temperatures in oven (800, 900, 1000 and 1100 °C) were done by XRF, XRD, FTIR, SEM and the main physical properties, like total shrinkage, water absorption capacity and compression strength were determined. As a result of experimental studies; the raw pyrophyllite had to be mixed with the feldspar and another clay (Unye clay) with having high plasticity in order to shape easily and a high water resistance. The optimum receipt was found as 70 wt % pyrophyllite, 20 wt % Unye clay and 10 wt % feldspar. The main properties of the obtained ceramics was specific white baking colour and high temperature resistance properties.

Key words: Pyrophyllite; ceramic; white baking colour.

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Production of nano amorphous SiO_2 from Malatya pyrophyllite

Musa Sarikaya *, Tolga Depci, Ramazan Aydogmus, Aysegul Yucel, Nilgun Kizilkaya

Department of Mining Engineering, Inonu University, Malatya, Turkey

ABSTRACT

Pyrophyllite ($Al_4Si_8O_{20}(OH)_4$) is an important industrial clay mineral. In this paper, highly pure nano silica powder was synthesized by alkaline treatment method from the local pyrophyllite deposit which is in Malatya, Turkey. The morphologies, structures and properties of the raw pyrophyllite and the obtained nano amorphous SiO_2 were determined by XRF, XRD, ATR, SEM and EDX. The results showed that the nano silica can be produced with a high purity (98 %) and nano size (< 50 nm).

Key words: Nano silica; pyrophyllite; amorphous material.

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A preliminary study on the investigation of the influence of $CaCl_3$ salt on the oil agglomeration of waste coal

Ozum Yasar *, Tuncay Uslu

Karadeniz Technical University, Mining Engineering Department, Trabzon, Turkey

ABSTRACT

Coal is a significant energy resource for Turkey. A part of produced coal is being conducted cleaning in washing plants based upon their high ash and sulphur content. In these washing plants, approximately one million tonnes of recoverable fine coal called slam are produced annually. Cleaning of these fine coals have a great importance with regard to environmental and economic issues. In this study, coal tailings from Tunçbilek Coal Washing Plant of West Lignite Enterprises Establishment Directorate were tried to be recovered with the aid of oil agglomeration method with waste oil and effect of the $CaCl_3$ on this process was investigated. During execution of the experimental study, waste coal having ash content of 52.6 % was agglomerated with waste oil and 48 % of combustible matter efficiency were achieved with producing coal with 32 % ash content. Under identical conditions, agglomeration tests were carried out with using $CaCl_3$ salt additive and 59 % of combustible matter efficiency were achieved with producing coal with 30 % ash content. Results showed that $CaCl_3$ additive played and efficient role in regard to recovery of coal tailings.

Key words: $CaCl_3$; additive; coal tailings.

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West lignite enterprise establishment directorate's washing plant (wp) performance

Gozde Coskun [1]*, Ozum Yasar [2], Halim Yagar [3]

[1] General Directorate of Turkish Coal Enterprises, Ankara, Turkey
[2] Karadeniz Technical University, Mining Engineering Department, Trabzon, Turkey
[3] West Lignite Enterprises Establishment Directorate, Kütahya, Turkey

ABSTRACT

The importance of a coal preparation and enrichment plant is to be dressed process to put desired quality product. Raw coal which is come from underground and open pits in hard conditions, must be regarded maximum benefit. In this study, Tunçbilek washing plants and their performance between 2010 and 2015 were investigated. This washing plant was committed to West Lignite Enterprises Establishment Directorate with in General Directorate of Turkish Coal Enterprise. West Lignite Enterprises Establishment Directorate is located in Tavşanlı, Kütahya. Tavşanlı keeps on developing as a lignite town and its economy depends on coal mining and for the town most important producer is West Lignite Enterprises Establishment Directorate. From establishment to present, Tunçbilek washing plant has showed very huge development with respect to technological progress and market demands. The importance of this subject is that all of saleable coal must be separated and enriched from raw coal with maximum efficiency. In this study, firstly the amount of raw coal, wastes, schist and, sized clean coal calculated and compared with the data which takes place in relevant literature. Finally, data was examined with the help of the correlations obtained between 2010 and 2015 and results were presented.

Key words: Lignite enterprise; establishment; washing plant; performance.

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Evaluation of slip potentials on Bilecik beige marble with pendulum method

Ali Erdem Çerçevik [1]*, S. Yerel Kandemir [1], M. Özgür Yaylı [2]

[1] Bilecik Şeyh Edebali University, Gülümbe, Bilecik, Turkey
[2] Uludağ University, Nilüfer, Bursa, Turkey

ABSTRACT

This study deals with the determining of slip resistance and classification of slip potential for 5 different type of Bilecik Beige Marble were applied tumbling. TS EN 14231 Standard “Determination of Slip Resistance with Pendulum Friction Test Equipment” was basically utilized in determining the slip resistances of Bilecik Beige Marble with wet and dry surfaces. After tumbling process, by depending on the Bilecik Beige Marble type reduce slip potential, especially wet conditions. Slip resistance values on marble sample plates were specified to be considerably change by depending on both the applied surface processing techniques and dry/wet of surface characteristics. Finally, marbles used in this research have been classified according to safety applications by taking into account their slip resistance values.

Key words: Bilecik; marble, surface treatment, slip resistance, pendulum test.

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Low temperature oxidation of GaAs by UV stimulated plasma anodizing

Amiran Bibilashvili, Zurab Kushitashvili *

Micro and Nanoelectronics Institute, Chavchavadze ave.13, Georgia

ABSTRACT

In the current researches it is actual to increase the switching speed of integral circuits. For this purpose the GaAs is a perfect material, which has good electrical and physical properties. Such as high electron mobility and their saturation high speed. But the silicon technology is not useful for GaAs based integral circuit technology, because more than 5000C temperatures take place destroying of GaAs structure. In this study we offer low temperature technology receiving GaAs oxide. For this purpose we use plasma anodizing [3] with ultraviolet irradiation. It is well known that achieve native oxide of GaAs is a problem [4]. Solving this problem is a low temperature technology. The scientific essence of the plasma anodizing is as following: in the general case plasma anodizing is performed under positive voltage applied to the material to be oxidized, which leads to oxidize samples with negatively charged oxygen ions extracted from the plasma. In this process, oxidation current contains many electrons, compared to negatively charged oxygen ions and therefore the process efficiency becomes low [5]. For this reason and for increasing process efficiency in the process of anodizing simultaneously is switched on UV irradiation. UV irradiation acts as a stimulation of plasma anodizing process. Irradiation by UV spectra creates in the oxide-semiconductor interface small energetic levels and small positive charge. Beside of this effect the oxide layer thickness is more uniform. Also we suggest the mechanism of oxidizing semiconductors by stimulated plasma anodizing, which is based on UV irradiation. It causes electron transfer from bonding to antibonding zone, which increases diffusion coefficient. Uniformity of the thickness is caused by UV ionizing on the surface of the sample. We have studied electrical, optical and structural properties of GaAs oxide. Electric properties were characterized by Capacitance-Voltage measurement, for structural - XRD diffractometer, Auger spectroscopy, SEM measurements.

Key words: Anodization; ion; catalytic; plasma.

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Synthesis and explosive consolidation of titanium, aluminium, boron and carbon containing powders

Mikheil Chikhradze *[1,2,4], George Oniashvili [1], Nikoloz Chikhradze [2,4], Fernand D.S Marquis [3]

[1] F. Tavadze Institute of Metallurgy and Materials Science,10 E.Mindeli str,Tbilisi 0111, Georgia
[2] G.Tsulukidze Mining Institute, 7 E. Mindeli Str., Tbilisi 0186, Georgia
[3] San Diego State University, 5500 Campanile Drive San Diego, CA 92182-8010,USA
[4] Georgian Technical University, 75 Kostava Str., Tbilisi 0175, Georgia

ABSTRACT

The development of modern technologies in field of materials science has increased the interest towards the bulk materials with improved physical, chemical and mechanical properties. Composites, fabricated in Ti-Al-B-C systems are characterized by unique physical and mechanical properties. They are attractive for aerospace, power engineering, machine and chemical applications. The technologies to fabricate ultrafine grained powder and bulk materials in Ti-Al-B-C system are described in the paper. It includes results of theoretical and experimental investigation for selection of powders composition and determination of thermodynamic conditions for bland preparation, as well as optimal technological parameters for mechanical alloying and adiabatic compaction. The crystalline coarse Ti, Al, C powders and amorphous B were used as precursors and blends with different compositions of Ti-Al, Ti-Al-C, Ti-B-C and Ti-Al-B were prepared. Preliminary determination/selection of blend compositions was made on the base of phase diagrams. The powders were mixed according the selected ratios of components to produce the blend. Blends were proceed in high energetic “Fritsch” Planetary premium line ball mill for mechanical alloying, syntheses of new phases, amorphization and ultrafine powder production. The blends processing time was variable and change between: 1 to 20 hours. The optimal technological regimes of nanoblend preparation were determined experimentally. Ball milled nano blends were placed in metallic tube and loaded by shock waves for realization of consolidation in adiabatic regime. The structure and properties of the obtained ultrafine grained materials depending on the processing parameters are investigated and discussed. For consolidation of the mixture explosive compaction technology is applied at room temperatures. The prepared mixtures were located in low carbon steel tube and blast energies were used for explosive consolidation compositions. The relationship of ball milling technological parameters and explosive consolidation conditions on the structure/properties of the obtained samples are described in the paper.

Key words: Synthesis; mechanical alloying; explosive compaction, shock waves.

* Corresponding Author

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Physical modelling of mine blast impact on armoured vehicles

Nika Bochorishvili *, I. Akhvlediani, Nikoloz Chikhradze, E. Mataradze

G.Tsulukidze Mining Institute, 7, Mindeli str, 1086 Tbilisi, Georgia

ABSTRACT

Studies relating to the impact of mine blast on armored vehicle focus on aspects such as i) dynamic loads acting on the armoured vehicle at the moment of mine blast; ii) armoured vehicle response under the impact of dynamic load; iii) dynamic loads acting on the crew and the assessment of potential human traumas. They are conducted by means of experimental methods and computer modelling. An experimental method envisages real vehicle testing under real blast conditions and requires a large amount of expensive polygonal work. However, the study of vehicle response under real explosions is not always feasible in the circumstances of a wide-range change of dynamic loads. Advantages of computer modelling over experimental testing include the lack of necessity of physical components and an ability to study the response of a vehicle under blast conditions. Apart from advantages, however, computer modelling is characterized by certain limitations, e.g. in the cases when dynamic loads on armoured vehicle are critical or near critical. The method of physical modelling has certain advantages over full-scale testing and computer modelling for certain circumstances, for example, behaviour of vehicles for critical and near-critical dynamic loads. The paper presents similarity criteria for physical modelling of the mine blast under the armoured vehicle and the results of modelling of dynamic behaviour of vehicles. Similarity criteria, established as a result of the analysis of the governing parameters and similarity theory, are adequate to the processes of blast impact on the vehicle. Modelling experiments were conducted in the underground experimental base of the Mining Institute especially designed for the study of explosion processes. Physical modelling can be used for preliminary studies with the purpose of the evaluation of the protective level of armoured vehicles as well as for pre-testing experiments in accordance with STANAG 4569 requirements.

Key words: Mine blast; armored vehicle; impact; physical modelling.

* Corresponding Author

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New design shock tube for the study of vapour cloud explosion

Irakli Akhvlediani *[1], Nikoloz Chikhradze [1,2], E. Mataradze [1], Nika Bochorishvili [1], T. Krauthammer [3]

[1] Mining Institute, 7, Mindeli St., 0186 Tbilisi, Georgia

[2] Georgian Technical University, 77, Kostava St., 0175, Tbilisi, Georgia

[3] University of Florida, Center for Infrastructure Protection and Physical Security (CIPPS), 365 Weil Hall, PO Box 116580, Gainesville, FL 32611-6580, USA

ABSTRACT

Development of new protective techniques requires the establishment of characteristics of blast energy suppression barrier that would ensure high damping capacity on one hand and enable the creation of such a barrier by means of contemporary protective systems, on the other. The Mining Institute of Georgia and CIPPS, University of Florida has designed a new type of a shock tube for investigating the processes of suppression of vapour cloud explosion in water mist barrier. The shock tube consists of a blast chamber and ten separate cylindrical sections/pipes (diameter - 50 cm, wall thickness – 8mm, total length – 10m) connected to each other. Pressure sensors and flame sensors are fixed in the blast chamber and pipes. A high speed video camera also records blast in the chamber. The shock tube has systems for dosed supply of fuel and water, which contain pumps, pipelines and nozzles for creating fuel cloud and water mist. The pipes are also provided with spray nozzles of three different models which allow the droplet size change in mist up to 60μm, 240 μm and 1000 μm at different stages of experiment. The vapour cloud blast in the blast chamber is synchronized with the dispersed water supply system by the process control block. The process control block has the following functions: a. provide information regarding the current state of the experiment; b. in accordance with the pre-defined objective of the experiment, give commands regarding the amount of water to be supplied to the chamber and pipes as well as the time intervals for the supply; c. give command regarding the moment of blast initiation in the chamber; d. memory management information. The control block operates it two modes: testing and experimental. Testing mode enables to check the performance of the system before the start of the experiment. This paper describes the technical characteristics of the new shock tube as well as the results of the preliminary experiment. The blast wave generated by vapour cloud explosion is investigated in terms of pressure and impulse.

These tasks were performed with the financial support of the NATO SPS Programme.

Key words: Shock tube; vapour cloud; explosion; water mist; shock attenuation.

* Corresponding Author

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The effects of explosive loading and neutron irradiation on mechanical properties of Titanium and Copper

Nikoloz Chikhradze *

Georgian Technical University, LEPL G. Tsulukidze Mining Institute, E. Mindeli Str. #7, Tbilisi, 0108, Georgia

ABSTRACT

It is known that a properties of materials is sufficiently depends on their initial defect structure. One of the methods of mechanical treatment of materials is explosive working (strengthening, welding and etc). High strain rate deformation of materials under explosive loading caused significant changes of defect structure of crystals and as a result appropriate variations of their physical and mechanical properties. Radiation effects in crystals with non-equilibrium defect structure represents great interest for scientific as well as from applied points of view. The paper describes the results of experimental investigations of strengthening processes of Titanium (purity-99.5%) and Copper (purity-99.98%) using axial-symmetric explosive loading. Shock loading of materials was carried out by axis-symmetric cylindrical scheme. For shock wave generation the industrial explosive substances ANFO, Ammonite and Hexogen were used. The experiments shows that the intensive shift deformations caused by the explosive pressure of intensity 10-20Gpa increase the strength and flow limits approximately 2.0-2.5 times above-mentioned materials. The samples strengthened by shock waves were subjected to the neutron irradiation. Results of the interaction of structural defects induced by shock waves followed by fast neutron irradiation (exposure of irradiation 8x1021 m-2; E=0.5 Mev) and its influence on strength characteristics are discusses. Samples for mechanical testing as well as for investigation of thermal stability of explosive strengthening in combination with shock and neutron action, were annealed in vacuum furnace (10-6 torr). The temperature during annealing of samples was controlled by the thermal-regulator. Accuracy of temperature fluctuation during the sample annealing for mechanical testing was 30C. It is shown that: a) shock loading of titanium and copper significantly increases strength characteristics with a simultaneous decrease of plasticity; b) Neutron irradiation tends to partial relaxation of strength and plastic characteristics of titanium whereas in the case of copper in contrast its further strengthening is observed without an appearance of plasticity.

Key words: Explosive; shock wave; neutron irradiation; strengthening; stress; deformation.

* Corresponding Author

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Development of technology for beneficiation of silver containing ores

Asmati Shekiladze *, O.Kavtelashvili, M. Bagnashvili

G.Tsulukidze Mining Institute, 7, Mindeli str, 1086 Tbilisi, Georgia

ABSTRACT

A research has been conducted on the ore, in which, together with barite, silver is of economic interest. The initial average content of barium sulphate is 27-29% and silver - 79-88 g/t. The silver is present either as simple sulphide or as chloride or in the native state. Take into account ore complexity, silver and barite are considered in one technological view. Therefore, for ore beneficiation, selective flotation flowchart and reagent treatment with obtaining at first silver and then barite concentrate have been developed. The first contains 650 g/t silver, with extraction of 92.21%; and the second - 92.11% $BaSO_4$, with extraction of 92.11%. For silver flotation potassium butyl xanthate and pine oil are recommended as reagents and for barite flotation – liquid glass, calcined soda, alkyl sulphate group collectors.

Key words: Silver containing ores; barite; barium sulphate; flotation.

* Corresponding Author

mess@mess-earth.org

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C-V measurement of HfO_2 dielectric layer received by stimulated plasma anodizing

Amiran Bibilashvili *, Zurab Kushitashvili

Ivane Javakhishvili Tbilisi State University, LEPL Micro and Nanoelectronics Institute, Chavchavadze ave. 13, 0179 Tbilisi, Georgia

ABSTRACT

Transaction metals oxides are technologically important metal oxides, which are characterized by excellent electrical and optical properties. They are attractive for applications in the field of electronics and opto-electronics due to their high dielectric constants and wide band gaps. Recently, high dielectric constant (high K) oxides, such as HfO_2 replaces SiO_2 as the gate dielectric in metal-oxide-semiconductor field effect transistors (MOSFETs). One of the main electrical characterizations for MOS structures is C-V characterization, because this methodical gives many electric parameters, which define the quality of dielectric layers. The present work is focused towards C-V characterization of HfO_2 films received by UV stimulated plasma anodizing. In this report we consider HfO2 dielectric layer received by UV stimulated plasma anodizing. This dielectric is distinguished by good electric parameters. For this purpose we used C-V characterization technic and calculate dielectric constant, flatband voltage, threshold voltage, bulk potential, work function, oxide effective charge, charge concentration, doping profile, deflation depth. The C-V measurement was carried out on Keithley Instrument – Semiconductor Parameter Analyser 4200, oxide thickness was measured by reflectometer – MprobeVis System. The experiment was carried out in the tree modes: 1 mA/cm^2, 0.5 mA/cm^2 and 2 mA/cm^2 anodizing currents densities in order to define the optimal experimental mode for creating gate dielectric. In the process of formation of dielectric at 1mA/cm^2 anodizing current, the structure of the dielectric is better in quality. It means that created dipoles in the anodizing process are less and surface charge also is small (twice less than other modes). Calculated dielectric constant is about 30.5 F/cm, which is intermediate value between I and III anodizing modes.

Key words: Charge; dielectric; anodizing; plasma.

* Corresponding Author

mess@mess-earth.org

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Effect of tunnel blasting operation on the surface penstock pipe

Tekin Yilmaz *, Kadir Karaman, Ferdi Cihangir, Bayram Ercikdi, Ayhan Kesimal

Karadeniz Technical University, Mining Engineering Department, Trabzon, Turkey

ABSTRACT

This paper presents the investigation of the effect of ground vibration components induced blasting events in Ordu-Mesudiye (Turkey) Highway Topçam tunnel on the penstock pipe (PP) having 35-400 slopping of Topçam Hydro-Electrical Power Plant (HEPP). Until the tunnel excavation passed under the penstock pipe of Hydro-Electrical Power Plant, a total of 37 shots (26 upper half and 11 lower half) were monitored and the ground vibration components (peak particle velocity, acceleration, displacement and frequency) were measured in two different stations. It was also examined whether the concrete platform under this penstock pipe had a crack, damage or etc. As a result of these workings, a maximum of 220 kg total charge was used and the charge weight per delay varied between 1.0-18 kg in the shots. The distance of shots to measurement station was between 78.04 and 170.16 m. 6 PPVs, 11 accelerations and a displacement value exceeded the threshold values determined. However, the vibration values were taken under control with changing the blasting parameters and it was provided that the tunnel excavation passed under the penstock pipe of Topçam Hydro-Electrical Power Plant.

Key words: Blasting; penstock pipe; tunnel excavation; peak particle velocity; acceleration; displacement; frequency.

* Corresponding Author

mess@mess-earth.org

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Modelling and testing of blast effect on the structures

Lucia Figuli [1]*, Daniel Papán [2]

[1] University of Žilina, Faculty of Security Engineering, Univerzitná 8215/1, 01026 Žilina, Slovakia
[2] University of Žilina, Faculty of Civil Engineering, Univerzitná 8215/1, 01026 Žilina, Slovakia

ABSTRACT

As a blasting agent in the blasting and mining engineering, has been using one of so called new generation of explosives which offer greater flexibility in their range and application, and such explosive is ANFO. It is type of explosive consists of an oxidiser and a fuel (ammonium nitrate and fuel oil). One of such ANFO explosives which are industrially made in Slovakia is POLONIT. The explosive is a mixture of ammonium nitrate, methyl esters of higher fatty acids, vegetable oil and red dye. The paper deals with the analysis of structure subjected to the blast load created by the explosion of POLONIT charge. First part of paper is describing behaviour and characteristic of blast wave generated from the blast (detonation characteristics, physical characteristics, time-history diagram etc.) and the second part presents the behaviour of such loaded structures, because for the analysis of such dynamical loaded structure is required knowing the parameters of blast wave, its effect on structure and the tools for the solution of dynamic analysis. The real field tests of three different weight of charges and two different structures were done. The explosive POLONIT was used together with 25 g of ignition explosive PLNp10. Analytical and numerical model of blast loaded structure is compared with the results obtained from the field tests (is compared with the corresponding experimental accelerations and strain time-histories). For the modelling structures were approximated as a one degree system of freedom (SDOF), where the blast wave was estimated with linear decay and exponential decay using positive and negative phase of blast wave. Numerical solution of the steel beam dynamic response was performed via FEM (Finite Element Method) using standard software Visual FEA.

Key words: Blasting; ANFO explosive; mining engineering; dynamical loading; numerical simulation.

* Corresponding Author

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The rock directed breaking under the impulse load

Sergo Khomeriki *, Edgar Mataradze, Nikoloz Chikhradze, Marine Losaberidze, Davit Khomeriki, Grigol Shatberashvili

Georgian Technical University, E.Mindeli str.#7, 0186; Tbilisi, Georgia

ABSTRACT

In the work the problem of directed chipping of facing stone material by means of managing of explosion process is considered. The technology of the mining of decorative stone by the use of explosion energy means the very rapid transfer of potential energy of elastic deformations to kinetic energy. As a result the explosion impulse, in the expanse of the inertia of rock massive, does not cause the increase of existing cracks. In the course of explosion the shock wave is propagated by ultrasonic velocity and in this case the medium parameters (pressure, density, temperature, velocity) increase in spurts. In spite of this fact the all three conservation laws of mechanics remain valid on basis of three laws the equations are derived by which the parameters of shock wave may be defined by means of the rock physical-mechanical properties. The load on the body volume at breaking under explosion acts over very small period of the time. Therefore stressed-deformed state of the rock was studied when the impulse load acts on the boundary. It was considered that the mining of the blocks of facing stone is performed from the hard rocks. This means that the breaking proceeds in the zone of elastic deformation. In the conditions of mentioned assumptions the expression of the stress tensor and displacement of vector components initiated by stressed-deformed state in the rock are written. The numerical analysis of obtained results on the Mat lab language was carried out and the graphs of normal and tangential stressed were constructed. On the basic of all above mentioned it was concluded that by means of the energy of controlled explosion at the mining of the blocks of facing stoned the use of the detonators of small delay (60-75ms) is reasonable. Its advantage involves the fact that the explosion energy of the explosive is concentrated, explosion waves are nearly combined which enhances the explosion effect and causes the increase of local stress in the rock and its additional breaking.

Key words: Stone; block: explosive; blasting; energy.

* Corresponding Author

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The purification of the sewage, contaminated by the oil products, at the mesoporous coal filter

Elene Gvazava *, Nino Maisuradze, Irma Samkharadze

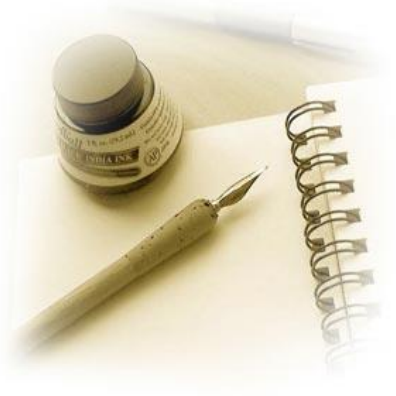
G.Tsulukidze Mining Institute, 7, Mindeli str, 1086 Tbilisi, Georgia

ABSTRACT

The percolating filtration in the adsorbent layer is the most common and efficient method for purification of the sewage, contaminated by the oil products. Any porous material, including coals, may be used as an adsorbent. In the course of the study of Tkibuli- Shaori deposit coal (Georgia), as a gas collector, it has been established that they are characterized by developed system of the mesopores (transient, capillary) and by high adsorptivity regarding to the gases. These properties have stimulated the presented investigations, in particular, the study of their sorption ability regarding to the oil products and for preparation of low-price adsorbent for sewage purification. The sample was taken from that layer of the deposit which is formed by the following coals: semiglittering Clarain and Durain-Clarain, with a middle layers of semidull Clarain-Durain. The structure of these coals is a Clarain tape, the main mass is uniform. Individual elements keep quite well. Their ash content comprises 24.65%, the mass volume of volatile substances – 35.09%, the mean sizes of the pores – 5nm, specific surface – 50-150 m^2/g. The study of the sorption properties of the coal, crushed and classified by coarseness (-5+3;-3+2mm) regarding to the oil products has shown that the class of (-3+2) mm is more active, which have a larger specific surface. The degree of the purification of oil emulsion containing water is twofold greater at the material of (-3+2) mm size than in the case of the coal of (-5+3) mm coalescence. The following factors effect on the purification degree: height of coal layer, filtration rate, initial concentration of the products and medium temperature. Acceleration of the process of sewage purification from the oil products may be performed by the use of two- or three-stage filters: at first, water passes through the first column, in which the coal layer of 50 cm height is loaded, furthermore – through the second and third columns, the thickness of coal layer is 25 cm in each case. Multistage purification was found as more efficient-at passing to the second stage the purification degree increases by 10% at the initial oil concentration – 200 mg/l and by 30% at lower concentrations. At the third stage the purification efficiency increases by 8-15%. The adsorbent, obtained from Tkibuli Coals, is a low-price, there is no need in the destruction of oil products; it may be utilized as a fuel and does not form the source of secondary contamination in contrast to the filters of other inert materials. Its use will be profitable for such small and medium industrial entities as automobile service centres, transport agencies, petrol filling stations, and petroleum storage depots of small volume, in which the daily flow rate of sewage is low, but they are characterized by the sewage, contaminated by the oil products in large quantities.

Key words: Oil products; adsorbent; adsorption; coals; water; mesoporous.

* Corresponding Author



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Diagenesis of sedimentary phosphorite deposits in Djebel Onk basin, Algeria

Hacène Redjehimi *[1], Henrik Friis [2], Abdelhak Boutaleb [3]

[1] Université Badji Mokhtar, Faculté des Sciences de la Terre, Département de Géologie, B.P.12, Sidi Amar, 23000 Annaba, Algeria

[2] Aarhus University, Department of Earth Sciences, DK-8000 Aarhus C., Denmark

[3] Université des Sciences et de la Technologie, Houari Boumediene, Département de Géologie. B.P.32, El Alia, 16111-Algeria

ABSTRACT

Phosphate rocks are important economic resources. The sedimentary succession of Djebel Onk, which is characterised by the deposition of phosphatic formations of Late Palaeocene - Early Eocene age (Upper Thanetian-Lower Ypresian), range in age from Upper Cretaceous (Maastrichtian) to the Eocene (Lutetian); this marine sequence of approximately 500m thick is overlain in discordance by a thick continental sequence of sand and clays of Miocene age, then by the Quaternary deposits. The Thanetian sequence starts with dark grey marls and passes up section to thick economic phosphorite layer of about 30m at Djebel Onk and which thins until it disappears northwards, the West and the South of this economic phosphorite layer generally ends by a lumachellic level. The economic phosphorite layer crops out as a NE-SW lenticular body of friable gray-brown phosphorites and consists of two phosphate horizons, bright (friable brown), at the upper part, and dark (gray-black), at the lower part. These two horizons evolve laterally, either in a single layer of brown phosphorite or in a layer of black phosphorite. Petrographic analysis of thin sections and scanning electron microscope observations of the studied phosphate samples indicate that the phosphate ore mainly consists of structureless peloids, the most common phosphate grains, and other minor phosphatic grains like bone fragments, fish teeth and coprolites, that were c authigenically by dolomite and microcrystalline Si-rich phase, which have been formed by diagenetic processes. Based upon on the environment of deposition for the phosphate grains, the detailed Petrographic analysis using back scattered electron (BSE) imaging, and taking into account the paleogeography of Djebel Onk basin. The following main diagenetic processes affecting the Upper Paleocene phosphorites of the Djebel Onk include: (1) accumulation of phosphate grains, (2) compaction, (3) dolomite cementation, (3) minor amount of other diagenetic mineral cements: opal-CT, K-feldspar overgrowth, clinoptinolite and pyrite, (4) dissolution of dolomite crystals and calcite cementation.

Key words: Phosphorite; diagenesis; phosphate peloids; carbonate-fluorapatite; compaction; dolomite cement; porosity.

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Investigation of the effective factors on beneficiaries' participation in the integrated natural resources management project: case study Abadeh County, Fars Province, Iran

Ali Akbar Karimian *

Yazd University, Faculty of Natural Resources, Yazd, Iran

ABSTRACT

This research was done with the aim of review effective factors on beneficiary's participation in comprehensive management project of natural resources of some part of Molasadra dam basin, in central part of Abadeh. Possession about 12000 hectares of national resources by people in this area and annual plowing in natural lands, lead to increase of soil erosion. Inefficient non irrigation farming conversion scheme to non-irrigation gardens began of 2007 with the participation of beneficiaries, meanwhile protecting soil resources, Legal way to use people make of this lands. Research method was survey and using a questionnaire from 129 people out of 138 project operator. The questionnaire validity by experts and its reliability by using Cronbach's alpha were confirmed. Results showed that there is positive and significant connection between some economic factors (annual income, source of income, main job, household spending), individual factors (literacy level, number of family members, individual knowledge, interest rate, rate of enjoyment of educational services) with the participation in complementation of plan, and there is a negative correlation between some economic factors (land ownership, initial capital, banking facilities and second job), environmental factors (irrigation quality, land position) and individual factors (age) with the participation in the plan.

Key words: Participation; comprehensive management; natural resources; Abadeh County.

* Corresponding Author

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Existing road network assessment using lookout technique

Seyed Ata ollah Hosseini, Mohsen Gorgandi Pour *

University of Tehran, Faculty of Natural Resources, Forestry and Forest Economics, Tehran, Iran

ABSTRACT

The forests have a lot of ecosystem services such as preparation of nutrient, conservation of soil, production of wood and etc. Thus, recently multiple management of forests is growing instead viewpoint of dominant based on production of wood. This method of management is including ecotourism, Socio-economic issues of forest dwellers and several goals consider in addition production of wood. Road is a necessity for attaining ideas, principles and management plan in forestry unit (district). Forest road network design must be in a way that estimated plan executive goals and if possible, report other forest functions such as landscaping and tourism. Nowadays, ecotourism management is necessary for community grow and development due to population growing and decreasing of natural resources. In recent decades, planners, managers and executives of jobs have doing investments of hug around the world according to because of poverty of income sources. This study was in Namkhaneh section of Kheyrud forest from 10 km of east Nowshahr. First, provided map of factors affecting the routing of the road including parrotia type, afforestation and etc. by GIS and determined parts of lookout on topographic map of area study. Then designed a new variant as the secondary roads and turnoff from the existing road that try to pass from more parts of lookout in it designing. Finally, compared existing and completive road network in terms of opening up and parts of lookout. The results showed that completive road network had more forest openness and more parts of lookout compared to existing road network.

Key words: Forest road design; lookout; GIS; Kheyrud forest.

* Corresponding Author

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Mapping and assessment of heathland and shrub ecosystems distributed on the territory of Bulgaria and located outside the boundaries of NATURA 2000 network

Silvena Boteva [1]*, Rossen Tzonev [1], Marian Nikolov [2], Valentin Bogoev [1], Krastio Dimitrov [1], Anelia Kenarova [1], Daniela Simeonovska-Nikolova [1], Kalina Pachedjieva [1], Ivan Traykov [1], Ralitsa Tsekova [1], Nelia Parleva [1], Vladimir Stefanov [1], Georgi Nachev [2]

[1] Sofia University "St. Kliment Ohridski", Department of Ecology and Environmental Protection, Sofia, Bulgaria
[2] CARTGEO LTD, 1000,"Vranya" str. 32, floor 3, Sofia, Bulgaria

ABSTRACT

This presentation proposes a synthesis of the ecological conditions of the mapped heathland and shrub ecosystems in Bulgaria (outside NATURA 2000). The research was carried out during the implementation of the project "Mapping and assessment of heathland and shrub ecosystem services in Bulgaria (outside NATURA 2000)". The project is performed by experts from SU "St. Kliment Ohridski", Epsilon Bulgaria LTD and Kartgeo LTD. It was realized with the financial support of Program BG03 "Biodiversity and Ecosystem Services" in Bulgaria under the Financial mechanism of the European Economic Area 2009-2014. For a period of 9 months, 39 000 plots occupied by heathland and shrub ecosystems were evaluated in an attempt to assess their potential to support ecosystem services. This activity is relevant to the EU initiative for mapping of the ecosystem services (MAES). The MAES initiative is conducted under action 5 of the EU Biodiversity Strategy, which calls Member States to map and assess the state of ecosystems and their services in their national territory. The ecosystems' mapping and assessment follow the methodology of MAES adapted by the Bulgarian Ministry of Environment and Water (http://bg03.moew.government.bg/bg). This methodology requires gathering data about a set of indicators concerning the status of the ecosystems such as biodiversity, heterogeneity of soil environment, and risk of pollution. The data were collected from the national and international databases and fieldwork. The mapping was based on the maps from the Physical blocks, which is the most up-to-date, complete and consistent land use and land cover maps. The study has distinguished three subtypes of the shrub ecosystems – (501) Arctic, alpine and subalpine shrubs, (502) Temperate and Mediterranean-mountain shrubs, and (503) Riverine and fen shrubs. Majority (98%) of the shrub ecosystems belong to the subtype 502. The ecosystem soils vary, and shrub ecosystems occupy great areas of Chromic Cambisols, Distric Cambisols & Luvisols. Communities belonging to 502 subtype are dominated by Juniperus communis, J. oxycedrus, Paliurus spina-christi, Jasminum friticans, Cotinus coggygria, Corylus avellana, Carpinus orientalis, Cornus mas, Astragalus angustifolius, Cornus sanguinea, Rosa canina, Prunus spinosa, and the dominant shrub species vary depending on local soil and climatic conditions. The range of ecosystem areas is from 1 ha to more than 100 ha, and prevailing vegetation cover is between 10 % and 25 %, but could be close to 100% as well. Diversity of plants and animals, including endangered species is high, but increasing of the distribution of alien and invasive species appears as a negative trend. The status of many ecosystems deteriorated due to the impact both of soil erosion and pollution. The already gathered data are sufficient for mapping and assessment of ecosystem services provided by the respective heathland and shrub ecosystems.

Key words: Heathland & shrubs ecosystems; vegetation cover; MAES; EU Biodiversity Strategy.
* Corresponding Author

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Investigation of usability as industrial raw material of olivine occurrences: A case study from Gelendost-Isparta, south-western Turkey

Oya Cengiz *, Mustafa Kursunluoglu

Suleyman Demirel University, Department of Geological Engineering, Çünür, Isparta, Turkey

ABSTRACT

Olivine occurrences are located in the northwest of Madenli and Egirler villages in Gelendost-Isparta, South-western Turkey. The aim of this study is to investigate usability as an industrial raw material of olivine formations in peridotite. For this purpose, geological, mineralogical and geochemical properties of olivine-rich rocks outcropping in the field were examined. Allochthonous units belonging to Beysehir-Hoyran Nappes in the field are formed in the Upper Eocene settlement aged Sarkikaraagac Ophiolites, the Upper Cretaceous Egirler Formation that contains wild flysch, and the Upper Triassic Deliktas Formation that consists of recrystallized massive limestone. The units belong to Anamas-Akseki Autochthonous are the Jurassic Hacialabaz formation, which consists of dolomite and limestone, the Cretaceous-Lower Eocene Anamasdag formation, which is composed of dolomitic limestone and limestone, the Middle Eocene Golgeli formation, which consists of sandstone, claystone and siltstone, the Upper Eocene Bagkonak formation, the Upper Miocene-Pliocene Goksogut formation, and the Quaternary alluvium. Harzburgite and dunite that are observed in peridotite at the bottom of Sarkikaraagaç Ophiolite belong to the Beysehir-Hoyran Nappe. They are dominant rocks of olivine occurrences in the field. They include mainly olivine, enstatite, stockwork and vein magnesite, and locally chromite occurrences. The concentrations of major oxides for fifteen harzburgite samples vary between 41.98 and 44.59% SiO2, between 41.32 to 45.74% MgO, and between 8.75 and 9.82% Fe2O3. The samples ranged from 0,1-4.50% loss on ignition of significance for their usability. Except for some samples, major oxide contents and loss on ignition values of olivine-rich harzburgite samples in the study area do comply with the standards and the values that have been determined to be suitable for usage in industry.

Key words: Southwestern Turkey; Sarkikaraagaç Ophiolites; harzburgite; olivine; element contents; usage.

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Evaluation of the effects of rainwater harvesting techniques on soil moisture balance in semi-arid climatic conditions

Mohammad Taghi Dastorani *, B. Kouhzad, A. Sepehr

Ferdowsi University of Mashhad, Faculty of Natural Resources and Environment, Mashhad, Iran

ABSTRACT

Water harvesting Knowledge has an ancient history. From old times, people, specially, occupants of arid lands whose access to water was limited, invent different ways to collect and conserve water. Today, many of these methods are reclaimed and introduced as Indigenous Knowledge. There are many case studies in different branches of water harvesting and new methods based on Indigenous Knowledge have been presented. These studies especially in our country, which is situated in the desert belt, are of importance. This study is based and inspired by one of these methods. Given that Mashhad city is situated in a semi-arid zone in Khorasan Razavi, therefore, is in a good situation for this study. Accordingly, an area was chosen which is situated in a 4.2 % slope and a 22 % slope of overlooking hillsides of Mayan-Payeen, Dehbar district, south of Mashhad. Basic meteorology data were collected and essential soil data were calculated in soil lab. Inspired by Martinez et al. field study, their designated software model, Modipe, was used in choosing the best structures for the area. Negarim microcatchment and absorbing banquet was chosen for both of slopes. During six months, after each precipitation, soil sampling was done with six time repeating process. Soil moisture was calculated after each time. Using basic data and soil information, Changing Procedure of soil moisture was studied. Graph analysis showed that in total both structures performance were 20 % better than testifiers. And at the end of precipitation period, loosing moisture in testifiers is two times more than the structures, an average of 30 %. The acquired results confirms the success of Modipe's suggested structures.

Key words: Water harvesting; arid lands; indigenous knowledge; Modipe model; Negarim Micro-catchment; absorbing banquet; soil moisture process analysis.

* Corresponding Author

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Determination of shale volume and distribution patterns and effective porosity from well log data based on cross-plot approach for a shaly carbonate gas reservoir

Siyamak Moradi [1]*, Mohammad Moeini [1], Mohammad Kamal Ghassem al-Askari [2], Elaheh Hamed Mahvelati [1]

[1] Petroleum University of Technology, Abadan Faculty of Petroleum Engineering, Abadan, Iran
[2] Petroleum University of Technology, Ahwaz Faculty of Petroleum Engineering, Ahwaz, Iran

ABSTRACT

Determination of shale volume and its distribution is one of the most important factors that has to be considered in formation evaluation, since existence of shale reduces effective porosity and permeability of the reservoir. Distribution of clay minerals is categorized into three basic forms of dispersed, laminar and structural or combination of these types which affect porosity and permeability in different ways. In this paper, distribution types and volume of shale and effective porosity of formation are determined from well log data and cross-plots of neutron and density logs in one of central Iranian carbonate gas fields. Five depth intervals of the reservoir are selected with different shale volumes in order to extend the working criteria to a wide range of shaliness. Integration of neutron-density cross-plot analysis for the studied field shows that shale distribution is mainly dispersed with few of laminar ones and the main reason of low productivity of wells is pore throat plugging by dispersed clay minerals. Based on effective porosity values estimated, it is also observed that the reservoir quality decreases with increasing depth and the majority of gas production is from upper zones. Estimated shale volumes and effective porosities are compared to the values determined from gamma ray log (CGR) and core analysis, respectively; good agreement of results demonstrates the accuracy of neutron-density cross-plots to determine important petrophysical parameters from conventional log data. This approach is can be used for other formation types; However, the properties of shale layers (i.e. φ_{NSh} and φ_{DSh}) should be determined throughout the study area and be recalibrated as more wells are drilled.

Key words: Shale type; shale volume; effective porosity; cross-plot method; well log.

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Environmentally hazardous trace and major element content and distribution in Tertiary coal from the Malatya Basin, Eastern Anatolia, Turkey

Nazan Yalcin Erik *[1], Faruk Ay [2]

[1] Cumhuriyet University, Department of Geological Engineering, 58140, Sivas, Turkey
[2] Cumhuriyet University, Department of Anthropology, 58140, Sivas, Turkey

ABSTRACT

Fossil fuels, particularly coal is one of the main energy sources throughout the world and it is likely to maintain its significance in the near future. Although it is known that coal mining and coal consumption cause important environmental and human health problems, coal will continue to be a very considerable energy source all over the the world and also in Turkey. The environmental, economic, technological, and human-health impacts of trace elements within coals are included among coal-quality parameters. This study focuses on the geochemistry of environmentally hazardous trace elements of Miocene coal bearing units from Arguvan (Parçikan coal mine) area in Malatya Basin. The mineralogy, elemental composition, and distribution of elements in these samples were studied by optical microscopy, X-ray diffraction, inductively coupled-plasma mass spectrometry analyses. Common minerals in this coals include clay minerals, pyrite, quartz, calcite and siderite. The Parçikan coal consist mainly of SiO_2 and Al_2O_3, with secondary Fe_2O_3, CaO, and minor proportions of TiO_2, P_2O_5 and other oxides. The environmental impacts of trace elements are generally related to their concentrations, toxicities, and mode(s) of formation. Elements, such as Sb, As, Ba, Be, B, Cd, Cl, Cr, Co, Cu, F, Pb, Hg, Mn, Ni, Mo, P, Se, Ag, Tl, Th, Sn, V, U, and Zn, were reported to pose environmental threats. Several trace elements of environmental concern namely As, Ni, Co, Pb, Zn, Se, U and Be in Parçikan coal are above the world averages, while Th, U, V, Mo, Cu, Sb, Hg and Pb concentrations are less than the world average. On the basis of analytical data, there is no possibility that the Parçikan coals could be used for residential heating or industrial applications; when used, they cause significant of air pollution and healt problems.

Key words: Trace element; Tertiary coal; major oxide; Malatya Basin; Southeast Anatolia; Arguvan.

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Oil recovery potential from miscible gas injection in a Middle Eastern Reservoir

Ridha Gharbi *

Kuwait Oil Company, Research & Development Group, Kuwait

ABSTRACT

Several reservoirs in the Middle East are approaching maturity from primary depletion methods and therefore new management and production strategies must be determined in order to meet the global market demand for oil. Therefore, the need to optimize oil production from current resources through Enhanced Oil Recovery (EOR) techniques is a main strategy to address reservoir management challenges for many oil producers. In Kuwait, one very promising EOR method that could be applied is based on injecting solvents that will mix with the oil under reservoir conditions to dissolve and displace more oil. Examples of these solvents include carbon dioxide and light hydrocarbons gases. Therefore, the objective of this work was to develop and evaluate a compositional simulation model of a candidate carbonate reservoir in order to define the new management and production strategies under which miscible gas injection process will yield better recovery. In order to develop the compositional simulation model, a detailed investigation was initially performed to examine the validity of the PVT report and evaluate the accuracy of the data. The selected experimental data were then used for compositional model studies and tuning Equation-of-State (EOS) parameters to characterize the reservoir fluid. The tuned model based on the matched lab data was then used for compositional studies and for predicting the other thermodynamic data such as phase envelope, quality lines, two-phase flow conditions and physical properties of each phase. The tuned compositional PVT model was then incorporated into the full-field black oil model and consequently a fully compositional model of the candidate reservoir was developed. An optimization process for the WAG injection was then developed in order to find at what conditions CO_2 flood may produce better recovery. Optimum values of WAG ratio, CO_2 slug size per WAG cycle, total slug size and solvent injection rate were obtained for the WAG process. The paper will address the various investigated scenarios and production strategies and the performance of miscible flood when applied in this reservoir.

Key words: Enhanced oil recovery; miscible gas injection; equation-of-state; Middle Eastern reservoir.

* Corresponding Author

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Mineralogical and chemical characterization of acidic pumices outcrop north of Lake Van

Aysegul Yucel [1]*, Tugba Efe [2], Mehmet Onal [1], Tolga Depci [1], Harun Aydın [1]

[1] Department of Mining Engineering, Inonu University, Malatya, Turkey
[2] Department of Geological Engineering, Yuzuncu Yil University, Malatya, Turkey

ABSTRACT

In the present study, mineralogical, physical and chemical characteristics of the pumice located in North of Lake Van locations were investigated to find an applicability of them for cement and textile industry. Characterization studies of the pumice samples were carried out by thin section, SEM, XRF, XRD and FTIR analysis. In addition, the bulk density, Hard Grove Index (HGI), pozzolanic activity and reactive silica of the pumice samples were determined. The overall results showed that the pumice samples, which might be an eruption product of Süphan, had an amorphous structure and rhyolite composition in high calc-alkaline series. The chemical compositions and physical properties indicated that the pumice samples could be used in cement and textile industry.

Key words: Acidic pumice; Lake Van; cement industry; textile industry.

* Corresponding Author

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Two endemic plant species from south-western Anatolia and an evaluation of their conservation status

Gürkan Semiz *

Pamukkale University, Department of Biology, Denizli, Turkey

ABSTRACT

This study presents the distribution and conservation status of the following endemic species from Denizli in Southwestern Anatolia: Nepeta nuda L. subsp. lydiae P. H. Davis and Salvia pisidica Boiss. & Heldr. ex Benth. The N. nuda subsp. lydiae is called as “babaküncü” and S. pisidica is called as “benli şalba” by local people and S. pisidica is one of the most commonly plant as herbal tea aganist to cold and cough in the region. The threat categories for these species are proposed according to the IUCN Red List Criteria. Taxonomic notes and habitat preferences of these endemic plants are given, and environmental impacts on their habitats and population sizes are described. The current situation of these two endemic plants has been threatened by gathering these aromatic plants by native people for their health and healing needs, habitat destruction through heavy grazing, expansion of mining quarries.

Key words: Nepeta nuda L. subsp. lydiae; Salvia pisidica; endemic; conservation status; Turkey.

* Corresponding Author

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Sensitivity study of acid-fracturing in carbonate oil reservoir by using a two-dimensional model

Khaled Benyounes *, Mohamed Kerrouche, Abderrahmane Mellak

University M'Hamed Bougara of Boumerdes, Faculty of Hydrocarbon and Chemistry, DGMP, Avenue de l'independence, Boumerdes, Algeria

ABSTRACT

Many oil and gas low permeable reservoirs have been stimulated to enhance productivity. Acid fracturing is one of the commonly used well stimulation treatment in carbonate formations, such as limestone, dolomite, and chalk. Carbonate reservoirs are good candidates for acid fracturing since strong acids such as hydrochloric acid react easily with carbonate. The acid reacts within the fracture to create a differentially etched surface that will maintain a conductive pathway. Habitually, a pad fluid is injected ahead of the acid to initiate the fracture, and then an ordinary acid or fluid containing acid is injected. During the injection of pad, several models of fracture geometry have been used, which define the development of fracture geometry with time and treatment pressure. The dimension of a fracture affects the hydrocarbon production from the reservoir. Among the models used in the classic hydraulic fracturing are 2D models, where the KGD and the PKN models are most popular. In this wok, we have used the KGD model to simulate the geometry of fracture. We have showed that the half-length and width of fracture are affected by the injected time of PAD and flow index of fluid frac. An important half-length has been found for a low flow index with a maximal injection time. The increase in flow index leads to the growth of width. The half-length of the fracture increases gradually as the increase of the pumping rate of the fluid. The initial rate of fractured wells increases with the injection time by fixing the injection rate and for the same injection time, the production presents an optimum point. It is noted that the penetration of the acid increases with increase in flow index. The effect acid contact time on the initial oil flow rate and productivity index ratio were also investigated successfully. According to the results of this simulation, it was noticed that the fracture is not damaged, it is marked by a negative skin for different values of power law exponent. Nierode and Kruk correlation is applied to estimate the conductivity; it increases with the increase of flow index. This can be explained from the fact that the conductivity is directly related to the etched width by the acid.

Key words: Carbonate; oil; acid fracturing; stimulation, productivity index.

* Corresponding Author

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The effect of Bryophytes on archaeological ruins in Carian region (Turkey)

Mesut Kirmaci [1], Murat Çekilmez [2]*

[1] Adnan Menderes University, Faculty of Arts & Sciences, Biology Department, Branch of Botany, 09100 Aydin, Turkey
[2] Adnan Menderes University, Faculty of Arts & Sciences, Archaeology Department, Branch of Classical Archaeology, 09100 Aydin, Turkey

ABSTRACT

This study was planned to carry out of bryophytes of Carian historical place and its effect to archaeological ruins. Approximately 450 bryophyte taxa were collected from the study area. Totally 130 moss taxa (belonging to 18 families and 47 genera) and 16 liverwort taxa (belonging to 10 families and 13 genera) were identified. Among them, Grimmia pulvinata, Didymodon vinealis, Pseudocrossidium hornschuchianum, Tortula muralis, Bryum argenteum, B. capillare, B. dichotomum, Homalothecium sericeum and Pterogonium gracile were found the most common mosses living and spreading on gneiss rocks in our study area. It is well known that lichens and bryophytes, as pioneer organisms, have an essential role in plant succession. Also, these pioneer organisms might damage historical places (Lisci et al. 2003). In the research area, it was observed that two types of rock, marble and gneiss, had been typically used for constructing of ancient buildings in Carian Region. Our observation shown that gneiss (metamorphic rock) is more sensitive to corrosion which caused by bryophytes than marble (sedimentary rock) because of its physical structure and wavy surface.

Key words: Bryophytes; damage; Carian Region, Turkey.

* Corresponding Author

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Minerals from halite caves in the Atacama Desert (Chile)

Jo De Waele [1], Cristina Carbone [2]*, Laura Sanna [3], Marco Vattano [4], Ermanno Galli [5], Paolo Forti [1]

[1] Università di Bologna, BiGeA, Dipartimento di Scienze Biologiche, Geologiche e Ambientali, Alma Mater Studiorum, Bologna, Italy

[2] Università di Genova, DISTAV, Dipartimento di Scienze della Terra, dell'Ambiente e della Vita, Corso Europa 26, Genova, Italy

[3] Institute for Biometeorology, CNR, Traversa La Crucca 3, Località Baldinca - Li Punti, 07100 Sassari, Italy

[4] University of Palermo, Dipartimento di Scienze della Terra e del Mare, Via Archirafi 22, 90123 Palermo, Italy. E-mail: marco.vattano@unipa.it

[5] Università di Modena e Reggio Emilia, Dipartimento di Scienze Chimiche e Geologiche - Largo S.Eufemia 19, I-41121, Modena, Italy

ABSTRACT

In the past 15 years several expeditions by French, American and especially Italian cavers have unveiled over 50 caves in the Cordillera de la Sal, close to San Pedro de Atacama village (Atacama Desert). Four caves are longer than 2 km, while total explored underground development has exceeded 20 km. These caves cross an anticline composed of an Oligo-Miocene evaporite sequence, containing 20-60 m thick interbedded salt beds, sandwiched between clastic and gypsiferous Cretaceous-Eocene sediments and a succession of Miocene to Pleistocene volcanics, and continental, mostly alluvial, deposits. Despite the hyperarid climate, with annual rainfall of only a couple of mm/a, and often several years without any rain, short Niño-driven precipitation events are enough to trigger the dissolution of salt and the formation of underground meandering river passages. Caves are mostly through-passages, with large entrances both upstream and downstream, and often some skylights in between, creating a constant airflow through their entire length. In-cave temperature ranges between 15-18° C, depending on altitude, cave depth below the surface, and size/number of their openings. These caves contain a variety of speleothems and minerals, two of which (atacamite and antacticite) new for the cavern environment. Samples have been taken in six caves, at altitudes ranging between 2,348 m asl (the base of the Cordillera) and 2,550 m asl (the top of the anticline). Most secondary deposits are composed of halite, but also other halides, carbonates, sulphates, nitrates, phosphates, and silicates have been discovered. Among the seventeen observed minerals, beside the two new for the cavern environment, darapskite, blodite and anhydrite are worth mentioning. The peculiar climate (extremely arid) and the very special environment, which is dominated by NaCl and $CaSO_4$, allow local enrichment in Cu (of hydrothermal origin), Al and Mg (by volcanic source such as olivine, plagioclase, pyroxenes, and amphiboles) and nitrates (by bird guano), thus giving rise to the formation of the different observed mineral species.

Key words: Speleothems; cave minerals; salt caves; hyperaridity; minerogenesis.

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Investigation of environmental effects in Bilecik (Turkey) natural stone quarries

Ali Erdem Çerçevik *[1], Suheyla Yerel Kandemir [1], Mustafa Özgür Yaylı [2]

[1] Bilecik Şeyh Edebali University, Bilecik, Turkey
[2] Uludağ University, Bursa, Turkey

ABSTRACT

Natural stones are one of the oldest construction materials. The use of natural stone as a building sector in Turkey has been increasing. Because of the rich resources of natural stone reserves in our country, it is used extensively as a building material. Bilecik is located at the northwest part of Turkey. The city is one of the important natural stone industry regions in Turkey. Bilecik region also has rich deposits in terms of natural stone resources and more than 400 natural stone quarries is operated. However, these quarries negatively affects topographical features and vegetation of region. In this study, the negative effects they cause to the environment of the quarries is investigated.

Key words: Natural stone; environmental effect; quarries; Bilecik; Turkey.

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Flammability and mechanical properties of wood plastic composites produced with pumice treated wood flour

Menderes Koyuncu *

Yuzuncu Yil University, Van Vocational School, Department of Textile, Van, Turkey

ABSTRACT

This study evaluated, mechanical and flammability properties of the wood plastic composite panels made from pumice powder formulations using a conventional hand lay-up method under laboratory conditions. Wood flour was stirred with pumice in order to improve in the mechanical properties of the wood flour - epoxy composites Five levels of pumice powder 5%, 10%, 20% ,30% and 50%, based on the composition by weight, were mixed with the wood flour. The mechanical properties of the composites prepared with pumice stirred wood flour are found to increase substantially compared to those of unstirred ones. The tensile strength, the flexural strength and the impact strength of the composites improved with increasing the pumice powed content up to 50wt%. The flame retardancy of the composites improved with increasing with pumice powed content. Both wood flour and pumice stirred wood flour- epoxy composites showed a decreasing trend with increasing filler content. However, the values for the pumice stirred wood flour-epoxy composites at all mixing rations are found to be higher than that of unstirred composites.

Key words: Epoxy- matrix composites; hand lay up; mechanical properties; wood flour.

* Corresponding Author

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Investigation of geomorphic and coastal geology of the Malaysian bays frequented with HABs occurrence using remote sensing data

Amin Beiranvand Pour *, Mazlan Hashim

University Technology Malaysia, Geoscience and Digital Earth Centre (Geo-DEC), Research Institute for Sustainability and Environment (RISE), 81310 UTM JB, Malaysia

ABSTRACT

Malaysian bays are considered vulnerable to the impacts of climate change and frequented with Harmful algal blooms (HABs). Rising in sea level, shoreline erosion, stresses on fisheries, population pressure, interference of land-use and lack of institutional capabilities for integrated management make major challenges. Increasing frequency, intensity, and geographic distribution of HABs poses a serious threat to the coastal fish/shellfish aquaculture and fisheries in Malaysian bays. Recent investigations and satellite observations indicate HABs originated from specific coast that have favourable geographic, geomorphic and coastal geology conditions to bring the green macroalgae from the coast offshore. Therefore, the identification of high HABs frequented bays using remote sensing and geology investigations in Malaysian waters is required to reduce future challenges in this unique case. This research implemented comprehensive geomorphic and coastal geology investigations combined with remote sensing digital image processing approach to identify Malaysian bays frequented with HABs occurrence in Malaysian waters territory and the impacts of climate change on coastal shoreline. The landscape and geomorphological features of the Malaysian bays were constructed from remote sensing satellite data such as the Moderate-resolution Imaging Spectroradiometer (MODIS), Landsat Enhanced Thematic Mapper, the Advanced Spaceborne Thermal Emission and Reflectance Radiometer (ASTER) data and the Phased Array type L-band Synthetic Aperture Radar (PALSAR) and aerial photographs combined with field observations and surveying. The samples for laboratory analysis were collected from the sediment stations with 10 meter distance across shorelines features of the Malaysian bays. This research identified the Malaysian bays that have high potential to be frequented with HABs occurrence, which will assist to reduce future challenges in this unique case in Malaysian waters territory.

Key words: Coastal geology; Malaysian bays; HABs; remote sensing.

* Corresponding Author

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Application of satellite remote sensing data for geological mapping in Antarctic Peninsula

Amin Beiranvand Pour *, Mazlan Hashim

University Technology Malaysia, Geoscience and Digital Earth Centre (Geo-DEC), Research Institute for Sustainability and Environment (RISE), 81310 UTM JB, Malaysia

ABSTRACT

Remote sensing imagery is capable to provide a solution to overcome the difficulties associated with field mapping in the Antarctic. Recent generation of high resolution multi-platform satellite sensors with various spectra-spatial imagery in shortwave infrared to long wavelength thermal and radar regions of the electromagnetic spectrum could be investigated to extract geological information for Antarctic environments. The Antarctic Peninsula (AP) contains a variety of well-exposed lithologies and areas that have not been mapped. The different geological history and environmental conditions suggest that Antarctic Peninsula (AP) is one of the more likely places in Antarctica for significant base-metal deposits and possible associated gold and silver due to analogy with the Andes Mountain Range of South America. In this scientific research, the Antarctic Peninsula (AP) was selected to conduct satellite remote sensing investigations. Landsat-8 Thematic Mapper (TM), the Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) and the Phased Array type L-band Synthetic Aperture Radar (PALSAR) data were used to extract the information in different regions of the electromagnetic spectrum. The improvised image processing algorithms and systematic GIS techniques were implemented to detect structural elements and geological features for producing detailed geological maps of the Antarctic Peninsula. The outcomes of the investigation demonstrated that new revisions of geological maps with high accuracy of the Antarctic Peninsula could be produced using recent remote sensing satellite data. The results could be extended to map coverage of non-investigated regions further east and validated previously inferred geological observations concerning other rocks and mineral deposits throughout the Antarctica.

Key words: Antarctic Peninsula (AP); satellite remote sensing data; geological mapping.

* Corresponding Author

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Ozonation of common textile auxiliaries

Gulen Iskender *, Idil Arslan-Alaton, Sebnem Koyunluoğlu, Zeynep Yilmaz, Fatos Germirli Babuna

Istanbul Technical University, Faculty of Civil Engineering, Environmental Engineering Department, 34469 Maslak, Istanbul, Turkey

ABSTRACT

The variety and complex structural features of auxiliary chemicals (scouring and mercerizing agents, antistatic, surfactants, sequestering agents, complexing agents, carriers, tannins, softeners, wetting agents, lubricants, levelling agents, emulsifiers, etc.) being used at different stages of textile preparation, dyeing and finishing processes render the effective treatment of dye house effluents a rather challenging task. In some cases chemical oxidation processes are required as a pre-treatment to enhance the subsequent conventional biological (activated sludge) treatment. Considering the above mentioned tasks, in this study textile bath discharges containing four different commonly applied textile auxiliary chemicals, namely two biocidal finishing agents (Biocide 1: A 2,4,4'-trichloro-2'-hydroxydiphenyl ether; Biocide 2: A nonionic diphenyl alkane derivative) and two tannin formulations (Tannin 1: A condensation product of aryl sulphonate; Tannin 2: Natural tannic acid) were subjected to treatment with ozone. The major purpose of ozonation was to pretreat and partially oxidize the above mentioned textile auxiliaries for biodegradability improvement. Both of the biocide and synthetic tannin bearing segregated textile effluents had negligible BOD5 contents (< 10 mg/L). Tannin containing segregated textile baths were ozonated at pH 3.5 and 7.0 in phosphate buffers to stabilize the reaction pH and mimic the pH conditions of the actual segregated textile bath effluents. Due to similar reasons biocide carrying bath discharges were ozonated at pH 7.0 and 12.0 in phosphate buffers. For Tannin 1 containing segregated wastewater discharge having a COD of 465 mg/l, up to 64 % COD removal was obtained after 1 hour ozonation (applied ozone dose = 890 mg; 0.9 mg O3/mg CODo) at a pH of 7. On the other hand for Tannin 2 carrying effluent with a COD of 1100 mg/l, one hour ozone application yielded up to 28 % (applied ozone dose = 900 mg; 1.4 mg O3/mg CODo) at pH 7. Biocide containing segregated effluents had rather low COD concentrations of 240 mg/l (Biocide 1) and 200 mg/l (Biocide 2). For both examined biocides, the highest COD removal was obtained in the range of 67 - 72 % after 1 h ozonation (applied ozone dose = 900 mg; 4.2 mg O3/mg CODo) at a pH of 12. The COD removal efficiencies were observed to increase with increasing pH and ozone doses. The AOX content of Biocide 1 originally being 45 mg/L was completely eliminated after 20 min ozonation at a rate of 900 mg/h (applied ozone dose = 300 mg; 1.4 mg O3/mg CODo) at both of the studied pH levels of 7 and 12. The BOD5/COD ratio was observed to increase with 40 min ozone application (applied ozone dose = 667 mg) for both of the biocide bath discharges (from 0.03 to 0.13 for Biocide 1 and from 0.009 to 0.155 for Biocide 2) and Tannin 1 (from 0.0130 to 0.529) containing segregated effluent, whereas a decrease in the aforementioned ratio was obtained for natural tannin (Tannin 2) bearing effluents.

Key words: Ozonation; tannins; biocides; textile wastewaters; auxiliary chemicals.

* Corresponding Author

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Environmental pollution in river and marine sediments: the case of Gromolo Torrent (Liguria, Italy)

Cristina Carbone [1], Marco Capello [1], Sirio Consani [1], Laura Cutroneo [1], Enrico Dinelli [2], Gabriella Lucchetti [1]*

[1] Università di Genova, DISTAV, Dipartimento di Scienze della Terra, dell'Ambiente e della Vita, Corso Europa 26, Genova, Italy

[2] Università di Bologna, BiGeA, Dipartimento di Scienze Biologiche, Geologiche e Ambientali, Alma Mater Studiorum, Bologna, Italy

ABSTRACT

The Gromolo Torrent is a metal-polluted Apennine stream flow located near Sestri Levante (Liguria, Italy). It springs from the Monte Rocca Grande (850 m a.s.l.), and flows for 11.5 km through the Gromolo Valley before flowing into the Ligurian Sea. Inside Gromolo basin is located the abandoned Fe-Cu mine of Libiola, which was the most important sulfide deposit of the Ligurian Apennines. In this mining site, extensive Acid Mine Drainage (AMD) processes are active, both inside the mine tunnels and in the sulfide rich waste-rock dumps: the solutions generated are characterised by low pH values and high amounts (EC >6000 µS) of dissolved SO42-, Fe, and other PTE elements such as Cu, Zn, Pb, Al, Co, and Ni. Moreover, extensively precipitation of Fe- and Cu-rich secondary minerals occurs both as soft crusts inside the mine adits and as loose suspensions associated with overland flow of mine drainage. AMD waters flowed into the uncontaminated (pH=8,33 EC=344 µS) Gromolo Torrent where abundant precipitation of amorphous Fe(III)-oxy-hydroxides occurred. The aims of this work are: 1) to evaluate the PTE mobility of colloidal stream precipitates for about 7 km up to its mouth in the Ligurian Sea, 2) to verify the presence of colloidal precipitates into the marine sediments, and 3) to determine the colloidal capacity to retain in the solid fraction some PTE (Fe, Al, Cu, Zn, Mn, Ni, Pb, Co, Cd, and Cr) using bulk leaching test experiments. Eleven stream and twelve marine bottom sediments were sampled and analysed using XRPD and ICP-MS. Moreover, in order to verify the possible interaction with rain and sea waters, bulk leaching experiments were performed. The results showed that colloidal nanoparticles are characterised by amorphous Fe(III)-oxy-hydroxides with a strong environmental impact, as they act as sinks for chemical elements scavenging almost the entire amounts of dissolved metals from the solutions. These Fe amorphous phases evidenced a major enrichment of all chemical elements, with the exception of Fe and SO42-, compared to AMD precipitates such as ferrihydrite and schwertmannite. The bulk leaching test results, performed with deionized water, showed that the colloidal nanoparticles are an efficient sink for metals, with the exception of Pb which reaches high concentrations in the leachates (up to the 86% of the amounts of the solid fraction). Alongside Pb, sea water remobilized high amounts of Mn and Cd (up to 42% and 30% of the amounts of the solid fraction, respectively) and remarkable amounts of Co and Ni (up to 16% and 6% of the amounts of the solid fraction, respectively).

Key words: Environmental pollution; Gromolo Torrent; mine drainage; river and sea sediments.

* Corresponding Author

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Comparative study of SEA system between China and Germany – Based upon legal requirements

Zhilin Li [1]*, Ulrike Weiland [1], Cunkuan Bao [2], Jane Duthie Tristan [1]

[1] Universität Leipzig, Institut für Geographie,Johannisallee 19a,04103, Leipzig,Germany

[2] Fudan University, Department of Environmental Sciences and Engineering, Room 204 of the 11th Building,220 Handan Road, Shanghai, 200433, China.

ABSTRACT

Viewed as a family of instruments or a family of approaches, Strategic Environmental Assessment (SEA) has already been applied in an increasing number of developed and developing countries worldwide. Various SEA legislations, guidelines and methodologies have been established and developed in different countries, which interpret the differences in terms of policy making processes and social and cultural background, and moreover, which can also make SEA systems more mature. Based upon a comparative study focusing on certain issues in Chinese and German SEA systems, this paper aims to provide comprehensive perspectives of the states of the institutional structures and legal frameworks in both countries. The results show some distinctions, such as: 1) the Chinese SEA system pays more attention to mitigation measures while Germany focuses more on the development and assessment of alternatives; 2) without any real screening procedure in the Chinese SEA system, some plans with potential negative environmental impacts will not be subject to SEA, whereas the German SEA system adopts a more complicated screening procedure to ensure plans or programmes be subjected to SEA within the legal regulation; 3) by employing a self – assessment mode, the German SEA system can be easier to integrate into the plan making process, while an external assessment mode employed in China can bring the environmental authorities more responsibilities to review the quality of the SEA processes and the environmental reports; 4) at the same time, these different assessment modes can lead to different understandings and regulations in terms of the tiering; 5) in addition, issues of the expert consultation and the public participation etc. also show some degrees of differences.

Key words: Comparative study; SEA (Strategic Environmental Assessment); legal requirements; China; Germany.

* Corresponding Author

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Ancient structures for collecting and storing water in karst settings

Mario Parise *

CNR-IRPI, Via Amendola 122-I, 70126, Bari, Italy

ABSTRACT

Among the peculiarities of karst settings, the scarce presence, or the lack, of water at the surface stands as one of the most typical. Water generally infiltrates underground very rapidly, or after a short path at the surface, taking advantage of the fissures and joints in the soluble rock mass, and starting to create the underground network of karst conduits and caves. As a consequence, at the surface there is typically shortage of water resources, which may become very severe during the dry season, or in conditions of low rainfall recharge. People settling in karst lands had therefore to face this problem since their first establishment. The only way to solve the issue of water availability was to acquire a very good knowledge of the landscape, not only limited to its geological and morphological features, but also including data and observations about the hydrogeological functionality of the land. For instance, the different behaviour of the same site, in response to rainfall events of different intensity and/or duration, as well as the time of withdrawal of water from flooded areas after heavy rainstorms, had in some way to be checked and controlled, in a sort of ancient monitoring technique, aimed at identifying those sites where the surface water could be kept for longer times close to the surface. Starting from these careful observations, and by the need not to waste any single drop of water in arid and semi-arid lands, ancient populations were able to develop several techniques to collect, transport, and distribute water, even at long distances. Still today, ancient hydraulic works, developing underground for long stretches, are preserved in good conditions, with many of them still in function. Since we are nowadays dealing with the search for sustainable use of the natural resources, we should look with great care to such ancient hydraulic works, in order to learn from the ability of ancient populations to use water resources, and possibly to re-evaluate the use of some of these structures.

Key words: Water resources; karst; sustainability; hydraulic works; semi-arid areas.

* Corresponding Author

mess@mess-earth.org

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RIGED-RA project – Restoration and management of coastal dunes in the Norther Adriatic coast (Ravenna province, Italy)

Beatrice M.S. Giambastiani *, Nicolas Greggio, Flavia Sistilli, Stefano Fabbri, Frederico Scarelli, Sebastian Candiago, Luigi Cantelli, Giovanni Gabbianelli

University of Bologna, Geological and Environmental Sciences Department, BiGeA – Biological, UOS Ravenna Campus, Via S. Alberto 163, 48123 Ravenna, Italy

ABSTRACT

It is well known that coastal dunes play an important role in protecting the coastline: they act as a sand reservoir and sediment supply against coast erosion; they protect the inland during extreme events (winter storm, inundation, etc.); and they act as freshwater reservoir and coastal aquifer recharge area against saltwater intrusion. Moreover dunes are places of sensitive and complex ecosystems. Unfortunately in the last decades dunes have been removed, replaced, or damaged by human activities. The dune system instability remains a serious problem along many parts of the European coasts and the few remaining dunes are recognized areas of priority protection and conservation (Dir 92/43/EEC). Along the Mediterranean coast, 71% of the total dune system have disappeared over the last century, and nowadays, only 9000 ha of the initial extension (45000 ha) of coastal dunes remain in along the Italian coast, with a total loss of 80%. In the Emilia- Romagna region significant residual dune systems are found only along Ravenna and Ferrara coasts. In this context, the RIGED-RA project (2013-2016) has been launched with the aim to develop sustainable and integrated coastal zone management by identifying dynamics, erosion and vulnerability of Northern Adriatic coast and associated residual dunes, for a total length of about 40 km. It is a complex territory characterized by high environmental value (dunes, pine forest, wetlands, etc.) and where different socio-economic interests coexist (tourism, industry, agriculture, port activities, etc.). Project objectives are to define intervention strategies for dune protection and restoration, and to develop guidelines for local authorities involved in coastal management and planning. The methodology is based on a multidisciplinary approach that integrates the expertise of several researchers and investigates all aspects (biotic and abiotic) that drive the dune-beach system. The project includes: topographic and bathymetric surveys to study the coastline evolution and sea floor; application of TLS technology and SfM photogrammetry (UAV-based and ground-based) to characterize geomorphologic evolution of the area; seismic and GPR surveys to study the subsurface structures; characterization of climatic and meteo-marine conditions; dune vegetation classification and mapping; hydrogeology investigations to explore the water quality and availability underneath the dunes; and stratigraphic and sedimentological surveys. All datasets have been integrated to define coastal management guidelines, as well as to identify test sites for applying dune restoration or reconstruction. In particular, two dune restoration interventions have been planned and have got the final approval by the local management authority. The first intervention started in April 2016. Results of these two interventions will be monitored and the restoration efficiency will be assessed.

Key words: Coastal dune; Adriatic coast, dune restoration, coastal management, dune geomorphology.

* Corresponding Author

mess@mess-earth.org

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Challenges of Chinese river water security

Zheng Zheng *

Guanghua Building 1207, 220 Handan Rd., Yangpu District, Shanghai,China

ABSTRACT

China is one of the most abundant in river water resources around the world. It has more than 1500 rivers whose upstream contribution area is more than 1000 square kilometres. Among them, the Yangtz River and Yellow River are the two longest rivers in the world. These rivers have bred the birth and prosperity of ancient Chinese civilization. However, with its fast economic development, industrialization, and urbanization in the recent decades, the water security of Chinese rivers are faced with increasingly severe challenges. First, there has been increasing shortage in river water resources, with many rivers drying up or even disappearing. For example, the Yellow River has ever stayed dry for more than 200 days in a single year. The drying and disappearance of rivers have brought a series of ecological, environmental, and social issues. Secondly, rivers in China have been seriously polluted. According to the annual report of Chinese Environment in 2014, water quality at 28.8% of the national monitored river sections belong to Class IV or worse. At the minimum, surface water needs to meet the Class III standard to serve as the drinking water source. The water quality deterioration of many rivers due to pollution has caused their loss of various ecological functions, and sometimes they have become completely useless and even caused the destruction of landscape. Finally, China lacks the implementation of necessary river protection measures during its urbanization process. The practices of filling, occupying, and cutting off of river courses are widespread. For example, in Shanghai, a coastal city, its average river length per square kilometre land area has decreased by half in less than 30 years. In its city center, rivers have almost vanished completely. The significant decrease in urban rivers has led to the fragmentation of urban river networks, which in turn causes a high possibility of urban flooding during heavy rainfall events.

Key words: Chinese rivers; water security; river protection; challenges.

* Corresponding Author

mess@mess-earth.org

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Influence of anthropogenic sources on water chemistry and isotopic compositions of nitrate in the Geum River, South Korea

Seunghyun Choi [1], Woo-Jin Shin [1]*, Youngyun Park [2], Kwang-Sik Lee [1]

[1] Korea Basic Science institute, Ochang Center, Division of Earth and Environmental Science, 162 Yeongudanji-ro, Ochang-eup, Cheongju 28119, Republic of Korea
[2] Kangwon National University, Department of Geology, 1 Kangwondaehak-gil, Chuncheon 24341, Republic of Korea

ABSTRACT

The major elements and isotopic compositions of nitrate were determined for water samples collected along the main channel of the Geum River, South Korea to identify anthropogenic and natural sources on water chemistry. The catchment characteristics vary along the river encompassing relatively undisturbed forest areas in its upper reach, agricultural and populated urban areas in the middle, and dominantly agricultural areas in the lower reach. Compared to the undisturbed upper reach, the dissolved ion concentrations (Ca^{2+}, Mg^{2+}, Na^{+}, K^{+}, Cl^{-}, SO_4^{2-} and NO^{3-}) slightly increased in agricultural areas. Abrupt increases in Na^{+}, Cl^{-} and SO_4^{2-} concentrations were observed in the river water after mixing with stream derived from populated Daejeon metropolitan city. The effects of anthropogenic inputs were clearly explained from ionic balance and from correlation between cations and anions. Ca^{2+} and Mg^{2+} of water samples represented relatively far better ionic balance with HCO^{3-} and NO^{3-}. In binary plot of cations and anions, data from the upper reach were plotted close to the rainwater but those from the agricultural/urban areas were either plotted close to the sewage end-member or scattered. $\delta 15N\text{-}NO_3$ and $\delta 18O\text{-}NO_3$ indicated that the dominant nitrate sources in the river were manure/sewage derived from agricultural and residential areas, except the dam discharge and water upstream that contains a large proportion of soil nitrates. The statistical analysis precisely verified this suggestion. Notably, the anthropogenic disturbances in water chemistry were moderated in the lower reaches and dam discharges possibly due to the dilution effects. Our results suggest that water chemistry in the Geum River was closely related to the land use patterns in the catchment and therefore the management efforts for water quality should be devised according to the catchment characteristics.

Key words: Geum River; soil weathering; isotopic composition of nitrate; fertilizers; sewage.

* Corresponding Author

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Identification of social and environmental conflicts resulting from open-cast mining

Justyna Gorniak-Zimroz *, Katarzyna Pactwa

Wroclaw University of Technology, Wybrzeze Wyspianskiego 27, 50-370 Wroclaw, Poland

ABSTRACT

Open-cast mining is related to interference in the natural environment. It also affects human health and quality of life. This influence is, among others, dependent on: type of extracted materials, size of deposit, methods of mining and mineral processing, as well as, equally important, sensitivity of the environment within which mining is planned. The negative effects of mining include deformations of land surface or contamination of soils, air and water. What is more, in many cases, mining for minerals leads to clearing of housing and transport infrastructures located within the mining area, a decrease in values of the properties in the immediate vicinity of a deposit, and an increase in stress level in local residents exposed to noise. The awareness of negative consequences of taking up open-cast mining activity leads to conflicts between a mining entrepreneur and self-government authorities, society or non-government organisations. The article attempts to identify potential social and environmental conflicts that may occur in relation to a planned mining activity. The results of the analyses were interpreted with respect to the deposits which were or have been mined. That enabled one to determine which facilities exclude mineral mining and which allow it. The research took the non-energy mineral resources into consideration which are included in the group of solid minerals located in one of the districts of Lower Silesian Province (SW Poland). The spatial analyses used the tools available in the geographical information systems.

Key words: Environmental protection; solid minerals; database; GIS.

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Phosphorus mobility among sediments, water and cyanobacteria in eutrophic Lake Dianchi

Xin Cao *

Fudan University, Department of Environmental Science and Engineering, Shanghai 200433, People's Republic of China

ABSTRACT

This study was focused on the phosphorus mobility among sediments, water and cyanobacteria in eutrophic Lake Dianchi. Four experiments were conducted to investigate the effects of cyanobacteria growth on the migration and transformation of phosphorus. Results showed a persistent correlation between the development of cyanobacterial blooms and the increase of soluble reactive phosphorus (SRP) in the lake water. Time-course assays measuring different forms of phosphorus in sediments indicated that inorganic phosphorus (IP) and NaOH-P were relatively easier to migrate out of sediment to the water and cyanobacteria. Further studies on phosphorus mobility showed that up to 70.2% of the released phosphorus could be absorbed by cyanobacteria, indicating that sediment is a major source of phosphorus when external loading is reduced. Time-course assays also showed that the development of cyanobacterial blooms promoted an increase in pH and a decrease in the redox potential of the lake water. The structure of the microbial communities in sediments was also significantly changed, revealed a great impaction of cyanobacterial blooms on the microbial communities in sediments, which may contribute to phosphorus release. Our study simulated the cyanobacterial blooms of Lake Dianchi and revealed that the cyanobacterial blooms is a driving force for phosphorus mobility among sediments, water and cyanobacteria. The outbreak of algal blooms caused deterioration in water quality. The P in the sediments represented a significant supply for the growth of cyanobacteria.

Key words: Cyanobacterial blooms; phosphorus mobility; sediments release; pH; microbes.

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Irrigation return flow as a controlling factor on stream and groundwater chemistry in rice paddy fields in a small watershed, South Korea

Woo-Jin Shin [1]*, Youngyun Park [2], Yongje Kim [3], Kwang-Sik Lee [1]

[1] Korea Basic Science institute, Division of Earth and Environmental Science, Ochang center, 162 Yeongudanji-ro, Ochang-eup, Cheongju 28119, Republic of Korea

[2] Kangwon National University, Department of Geology, 1 Kangwondaehak-gil, Chuncheon 24341, Republic of Korea

[3] Korea Institute of Geoscience and Mineral Resources, Environmental Geology Division, 124, Gwahak-ro, Yuseong-gu, Daejeon 34132, Republic of Korea

ABSTRACT

Water samples were collected, November 2004 to December 2005, from stream, shallow groundwater and deep groundwater in a small watershed that contains extensive rice paddy fields. Chemical and isotopic compositions for water samples were determined to evaluate contribution of irrigation return flow to stream and groundwater. Water temperature, EC and DO content in shallow groundwater (SG-1 and SG-2) were similar to those in the lower reaches (MS-2), which showed clear seasonality. Oxygen and hydrogen isotopic compositions varied with seasonality, in particular in MS-2 and water sample taken from tributary (TS). Of MS-2 and TS samples, those in April and May were not explained by the three-component (soil water, groundwater and rainfall) hydrograph separation models (THSM) produced from relationship between oxygen isotopic composition and Si concentration. This occurrence suggested possibility that MS-2 and TS samples during the period were affected by extremely high evaporation. Based on a plot of Cl/NO_3 and NO_3/HCO_3, water chemistry of most water samples was regulated overall by soil water and groundwater. In addition, except for the upstream samples (MS-1), water chemistry in MS-2 was affected by water derived from rice paddy (WR), whereas manure impacted on water chemistry in TS, SG-1 and DG-2. Relationship between $\delta 15NNO_3$ and $\delta 18ONO_3$ values in the water samples verified that in other samples besides MS-1 and DG-1, manure is the dominant source. MS-2 was characterized by denitrification processes, implying that irrigation return flow was involved in determining the water chemistry. This study suggests that the THSM and dual isotope approach for nitrate are useful to decipher the sources and processes controlling water chemistry in a small stream associated with rice paddy fields in a watershed.

Key words: Rice paddy field; three-component hydrograph separation model; irrigation return flow; denitrification.

* Corresponding Author

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Vulnerability assessment of a coastal dune system at São Francisco do Sul Island (Santa Catarina, Brazil)

Fernanda Alquini [1], Duccio Bertoni [1]*, Giovanni Sarti [1], Daniela Ciccarelli [2], Alessandro Pozzebon [3], João Carlos Ferreira de Melo Júnior [4], Celso Voos Vieira [4]

[1] University of Pisa, Department of Earth Sciences, Via S. Maria 53, 56126 Pisa, Italy

[2] University of Pisa, Department of Biology, Via Ghini 13, 56126 Pisa, Italy

[3] University of Siena, Department of Information Engineering and Mathematical Science, Via Roma 56, 53100 Siena, Italy

[4] University of the Region of Joinville, Department of Biology, Rua Paulo Malschitzki 10, 89219-710 Joinville, Brazil

ABSTRACT

Beach dunes are geomorphological forms that are frequent in the coastal environment. They represent a vital factor in the evolution of these systems because they affect coastal areas from several standpoints: economy, culture, tourism and nature are aspects that are tightly connected to the conservation of coastal dunes. Excessive exploitation and mismanagement of dune systems lead to their degradation, erosion and eventual disappearance: extreme use of natural resources and uncontrolled population growth are among the human-related factors that often put the existence of coastal dunes in jeopardy. Based on the necessity to preserve these systems, the aim of this study is to apply a Coastal Dune Vulnerability Index (CDVI) on a beach at São Francisco do Sul Island (southern Brazil) in order to identify the areas that result most sensitive to environmental changes. The CDVI has been applied along six transects traced out on two sectors of Grande beach. The sectors have been selected based on dune characteristics: Zone A (northern sector) is characterized by well-developed parabolic dunes up to 15 m high, often interrupted by wide blowouts; Zone B (central sector) is characterized by transverse dunes. The analysis involved 51 quantitative and qualitative variables, divided into five groups: geomorphological dune system condition (GCD), marine influence (MI), aeolian effect (AE), vegetation condition (VC) and human effect (HE). Data were collected through fieldwork (sediment sampling, topographic survey, vegetation coverage, human impact), laboratory analyses (grain-size), digital processing (photo-interpretation); marine and wind database were provided by local authorities and literature data. The index was calculated associating each variable to a five point scale, ranging from 0 (no vulnerability) to 4 (very high vulnerability). For each group, the sum of the variables was divided by the sum of the maximum achievable rating within each group, thus generating a partial index expressed as a percentage. The total CDVI was computed as the unweighted average of the partial vulnerability indices with the algorithm: CDVI = (GCD+MI+AE+VC+HE)/5. ANOVA was used to test if there were any significant differences between transects. Partial CDVI values do not show significant differences between transects, ranging from 0.37 to 0.48. The parameter showing higher partial CDVI for both areas was GCD (maximum value 0.78 – T2), then MI (maximum value 0.55 – T1). AE had lower values in Zone A (0.33 to 0.16) rather than in Zone B (0.50 to 0.53). VC values were similar in both areas. The HE was higher in Zone A (0.35) relative to Zone B (0.14). The CDVI evaluation needs to be repeated periodically, but presently the total vulnerability can be classified as medium: summarizing, the geomorphological factor must be monitored at Grande beach, in particular the blowouts in Zone A and the frontal dune retreat in Zone B. The results of the study further suggest that assessing the vulnerability of coastal dune systems with an easy to use instrument

as the CDVI might be a valuable support to improve the management of coastal areas, in particular those subjected to erosion issues.

Key words: Coastal dunes; vulnerability index; erosion; coastal management; São Francisco do Sul Island.

* Corresponding Author

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Study of degradation kinetics of parathion methyl on mixed nanocrystalline titania-zirconium and titania-cerium oxides

Pavel Kuráň [1]*, Martin Pšenička [1], Martin Šťastný [1], Monika Benkocká [2], Pavel Janoš [1]

[1] University of Jan Evangelista Purkyne, Faculty of the Environment, Kralova Vysina 7, 400 96 Usti nad Labem, Czech Republic

[2] University of Jan Evangelista Purkyne, Faculty of Science, Ceske Mladeze 8, 400 96 Usti nad Labem, Czech Republic

ABSTRACT

The unique surface properties of some nanocrystalline metal oxides and their application for removal of variuos toxic compounds were reported elsewhere (Klabunde 1996, 2001). Recently, we have published a reliable method for the preparation of reactive cerium dioxide sorbent and its application for degradation of the organophosphate pesticides parathion methyl, chlorpyrifos, dichlofenthion, fenchlorphos, and prothiofos, as well as of some chemical warfare agents—nerve gases soman and O-ethyl S-[2-(diisopropylamino) ethyl] methylphosphonothioate (VX) (Janoš 2014, 2015). Here, we report on the kinetics study of degradation of parathion methyl as a representative organophosphate on nanocrystalline metal oxides TiO_2, ZrO_2, CeO_2 and their mixtures in different molar ratios of particular elements (2Ti.8Ce, 1Ti.1Ce, 0Ti.1Ce, 1Ti.1Zr, 8Ti.2Ce, 8Ti.2Zr, 2Ti.8Zr where the numbers indicate molar ratios of particular elements e.g. 2Ti.8Ce stands for molar ratio 2:8 of Ti:Ce). The tested sorbents except of CeO2 were prepared by different methods (e.g.sol-gel, precipitation) in cooperation with Institute of Inorganic Chemistry (Řež, Czech Republic). The degradation kinetics of parathion methyl on tested sorbents was followed by HPLC equipped with diode array detector. The basic kinetics parameters (half-lives of parathion methyl degradation, rate constants of degradation product formation) were calculated for each sorbent from Weber-Morris equation of 1st order diffusion kinetic model. The results proved the ability of prepared sorbents to degrade parathion methyl under formation of 4-nitrophenol as the main degradation product. The most efficient sorbents were 2Ti.8Ce, 1Ti.1Ce, 0Ti.1Ce (50-70 %) follow by 1Ti.1Zr, 8Ti.2Ce, 8Ti.2Zr, 2Ti.8Zr (20-30%) and TiO_2, ZrO_2, 1Ti.0Ce (less than 5 %).

Key words: Reactive sorbents; organophosphates; parathion methyl; HPLC.

* Corresponding Author

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Ecological risk assessment of sediment through direct toxicity assessment in Dhaka Export Processing Zone (DEPZ) area, Bangladesh

M. Safiur Rahman [1]*, Narottam Saha [2,3], A. Hossain Molla [3]

[1] Atomic Energy Centre, Atmospheric and Environmental Chemistry Laboratory, Dhaka-1000, Bangladesh
[2] University of Rajshahi, Department of Applied Chemistry, Bangladesh
[3] University of East Anglia, School of Environmental Sciences, Norwich, UK

ABSTRACT

Due to industrial development, everyday a huge amounts of industrial wastages discharge into water bodies without proper treatment. As a consequence, it is assumed that the equilibrium balance between the metals in sediment and surface or ground water is disturbed. Depending on hydrodynamics and environmental conditions, heavy metals tend to adsorb from water column onto surfaces of fine particles. Throughout the hydrological cycle, far less than 1% of pollutants remain dissolved in water, whereas over 99% are stored in sediment. Therefore, the present work attempts to determine the status of eight heavy metals distribution in sediments and water samples, and their ecological risks assessment in the studied area. The concentration of heavy metals in water and sediment samples were determined by atomic absorption spectrophotometer (AAS) following standard methods. The distribution pattern of heavy metals in the water and sediment follows the sequences: Zn > Cu > Pb > Cr > Mn > Ni > As > Cd and Mn > Zn > Cr > Pb > Cu > Ni > As > Cd respectively. Water pollution is observed at different sampling points of Dhalaibeel and Bangshi River. The comparison of sedimentary metal concentrations with several environmental contamination monitoring parameters, viz, threshold effect level (TEL), probable effect level (PEL), and severe effect level (SEL) indicates that the metal levels are less than PEL except Cr. Moreover, the level of contamination degree (Cd) and modified degree of contamination (mCd) indicates 'low' and 'nil to low' degree of contamination respectively. Pollution load indices (PLI) of the studied area are lower than unity, indicates no pollution. Furthermore, a toxic-response factor is applied to assess the potential ecological risk of these heavy metals into the water bodies. The order of potential ecological risk factor of heavy metal in sediments of Bangshi River was Cd > Pb > Cu > Cr > Ni > As > Zn > Mn respectively. The potential ecological risk factors (Eri) of Pb, Cd, Ni, Cr, Cu, Zn, Mn and As were all lower than 40, which belong to low ecological risk. All the sampling sites were at low risk level, where the risk index (RI) values were much lower than 150. The results indicated that there was low potential ecological risk for the heavy metals in the study area. The cluster analysis is used for source identification of heavy metals in the study area. It is expected that the study will provide insights to policy/decision makers for the assessment of ecological risk in any study area.

Key words: Water, sediment, heavy metals, ecological risk.

* Corresponding Author

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Butterflies as ambassadors for biodiversity knowledge transfer

Karin Ulbrich *, Elisabeth Kühn, Oliver Schweiger, Stefan Klotz, Josef Settele

Helmholtz Centre for Environmental Research-UFZ, Theodor-Lieser-Straße 4, D-06120 Halle, Germany

ABSTRACT

Loss of biodiversity under changes in climate and land use is essential subject for research. However, there is still a huge gap which has to be bridged in order to make results available for school education. Surveys show that many students care for the findings of environmental science and think that scientists have the responsibility to share their insights. Though biodiversity knowledge, including the knowledge of butterfly species, is extremely poor, many students want to learn more about butterflies and their habitats. The real challenge was to establish learning resources that leverage what we now know about climate change and risks for biodiversity, in particular for butterflies, to augment understanding of ecological processes in students and to motivate them to individual activities. We developed the “Butterfly tool” - educational software which allows simulating climatic niches of 15 popular European species for different climatic futures within the next decades. The tool provides interactive quizzes and informative texts where the target groups are students from 12 to 19. We found that digital media developed by environmental scientists to convey research results to school students, may inspire students to initiate own research. Examples for such research activities are butterfly monitoring activities as well as analyses of monitoring data sets.

Key words: Biodiversity; butterfly; climate change; climatic niche; educational software.

* Corresponding Author

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Evaluation of habitat provision on the basis of Carabidae diversity in Slovak permanent grasslands

Jana Jaďuďová [1]*, Radoslava Kanianska [1], Miriam Kizeková [2], Jarmila Makovníková [3]

[1] Matej Bel University Banská Bystrica, Faculty of Natural Sciences, Tajovského 40, 974 01 Banská Bystrica, Slovakia
[2] National Agricultural and Food Centre - Grassland and Mountain Agriculture Research Institute, Mládežnícka 36, 974 21 Banská Bystrica, Slovakia
[3] National Agricultural and Food Centre – Soil Science and Conservation Research Institute Bratislava, Regional Station Banská Bystrica, Mládežnícka 36, 974 21 Banská Bystrica, Slovakia

ABSTRACT

Biodiversity has an important role in creating and regulating ecosystem processes, functions, and services. Carabidae are considered to be suitable bio-indicator of environment. The aim of this study is to analyse the relationship between Carabidae and the ability of study site to fulfil habitat provision. Research was conducted on permanent grasslands (PG) with different management at 2 study sites (Tajov - TA, Liptovská Teplička - LT) located in different climatic and natural conditions of Slovakia. At each study site, seven plastic traps were placed in line with 3 m distance site in spring 2014 and 2015 for 1 month. Habitat provision was identified by Biotope Valuation Method (BVM). The calculated values of both study sites were same (BVM = 41.67). One of the reason can be the same type of habitat. According to Catalogue of habitats in Slovakia both study sites belong to mesophilic pastures and grazed grassland. Biodiversity was evaluated with Shannon-Weaver index. The calculated values were similar (H´= 1,208 in TA, H´= 1,225 in LT). In Tajov, a total of 328 individuals of Coleoptera were captured and in Liptovská Teplička 342 individuals. In Tajov, three eurytopic species of Carabidae and one adaptable species (Abax Parallelepipedus) were captured. Two orders belong to eudominant species: Pseudophonus rufipex (49.39%) and Poecilus cupreus (38.72%). In Liptovská Teplička, five eurytopic species of Carabidae and three adaptable species (Abax parallelepipedus, Carabus Cancellatus, Carabus violaceus) were captured. Two species belong to eudominat species: Poecilus cupreus (22.81%), Phyllopertha horticola (59.65%) and one species to dominant: Carabus cancellatus (9.65%). The relationship between diversity of Carabidae and the ability of study site to fulfil habitat provision has not beenconfirmed. Carabidae are not closely linked to structure of the vegetation cover, but their occurrence is influenced by habitat microclimate conditions. The authors acknowledge the Slovak Research and Development Agency for the financial support via contract No. APVV-0098-12 Analysis, modelling and evaluation of agroecosystem services.

Key words: Carabidae; permanent grasslands; habitat provision; Biotope Valuation Method; biodiversity.

* Corresponding Author

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Computational chemistry approach to interpret the crystal violet adsorption on Golbası lignite activated carbon

Tolga Depci [1]*, Musa Sarikaya [1], Keith A. Prisbrey [2]

[1] Department of Mining Engineering, Inonu University, Malatya, Turkey
[2] Department of Metallurgical Engineering, University of Utah, Salt Lake City, UT, USA

ABSTRACT

In this paper, adsorption mechanism of Crystal Violet (CV) dye from the aqueous solution on the activated carbon prepared from Golbasi lignite was explained and interpreted by a computational chemistry approach and experimental studies. Molecular dynamic simulations and *Ab initio* frontier orbital analysis indicated relatively high energy and electron transfer processes during adsorption, and molecular dynamics simulations showed CV dye molecules moving around on the activated carbon surface after adsorption, facilitating penetration into cracks and pores. The experimental results supported to molecular dynamic simulation and showed that the monolayer coverage occurred on the activated carbon surface and each CV dye ion had equal sorption activation energy.

Key words: Molecular dynamic simulation; Ab initio; Golbasi lignite; activated carbon.

* Corresponding Author

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Adsorption of crystal violet on activated carbon prepared from coal flotation concentrate

Ramazan Aydogmus [1]*, Tolga Depci [1], Musa Sarikaya [1], Ali Rıza Kul [2], Yunus Onal [3]

[1] Department of Mining Engineering, Inonu University, Malatya, Turkey
[2] Department of Chemistry, Yuzuncu Yil University, Van, Turkey
[3] Department of Chemical Engineering, Inonu University, Malatya, Turkey

ABSTRACT

The objective of this study was firstly to investigate the floatability properties of Zilan-Van coal after microwave irradiation and secondly to produce activated carbon from flotation concentrate in order to remove Crystal Violet (CV) from waste waters. The flotation experiments showed that microwave heating at 0.9 kW power level for 60 sec exposure time enhanced the hydrophobicity and increased the flotation yield. The activated carbon with remarkable surface area (696 m^2/g) was produced from the flotation concentrate and used to adsorb CV from aqueous solution in a batch reactor at different temperature. The adsorption properties of CV onto the activated carbon are discussed in terms of the adsorption isotherms (Langmuir and Freundlich) and found that the experimental results best fitted by the Langmuir model.

Key words: Microwave; lignite; activated carbon; dye adsorption; flotation.

* Corresponding Author

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Terrestrial ecotoxicological tests as screening tool to assess soil contamination in Krompachy area

Oľga Šestinová *, Lenka Findoráková, Jozef Hančuľák, Erika Fedorová, Tomislav Špaldon

Slovak Academy of Sciences, Institute of Geotechnics, Department of Environment and Hygiene in Mining , Watsonova 45, Kosice 04 001, Slovak Republic

ABSTRACT

In this study, we present screening tool of heavy metal inputs to agricultural and permanent grass vegetation of the soils in Krompachy. This study is devoted to Ecotoxicity tests, Terrestrial Plant Test (modification of OECD 208, Phytotoxkit microbiotest on Sinapis Alba) and chronic tests of Earthworm (Eisenia Veneta, modification of OECD Guidelines for the testing of chemicals 317, Bioaccumulation in Terrestrial Oligochaetes) as practical and sensitive screening method for assessing the effects of heavy metals in Krompachy soils. The total Cu, Zn, As, Pb and Hg concentrations and ecotoxicological tests of soils from the Krompachy area were determined of 4 sampling sites in 2014-2015. An influence of the sampling sites distance from the copper smeltery on the absolutely concentrations of metals were recorded for copper lead, zinc, arsenic and mercury. The highest concentrations of these metals were detected on the sampling sites up to 3 km from the copper smeltery. The samples of soil were used to assess of the potential phytotoxic effect. Total mortality was established at earthworms using chronic toxicity test after 7 exposure days. The results of our study confirmed that no mortality was observed in any of the study soils. The metal contents of the soils after 72 hour bioassay with plant were ranged identical values. Based on the results of the phytotoxicity testing on Sinapis alba, no potential phytotoxic effect of the metals on contamination soils from the Krompachy was observed.

Key words: Soil; heavy metals; phototoxic effect; test of earthworm.

* Corresponding Author

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Qualitative and quantitative estimation of heavy metals in bottom sediments using screening methods (XRF, TGA/MS, XRPD)

Lenka Findoráková *, Oľga Šestinová, Erika Fedorová, Jozef Hančuľák, Tomislav Špaldon

Slovak Academy of Sciences, Institute of Geotechnics, Department of Environment and Hygiene in Mining, Watsonova 45, 040 01 Košice, Slovak Republic

ABSTRACT

Thermal analysis coupled with mass spectrometry, X-ray fluorescence spectrometry was used to investigate the pollution on bottom sediments. In April 2016 the sediments were collected from water reservoir in the town Krompachy, the central part of historical region Spiš, which is situated near the plant Kovohuty a.s., Eastern Slovakia. X-ray fluorescence (XRF) analysis indicated a high contamination of studied sediments by trace elements. X-ray diffraction studies (XRPD) showed that quartz, barite, siderite, illite, chalcopyrite, muscovite and vermiculite were found in studied sediments before thermal study. It was found that sediments were characterized by large silt and clay fractions and, in general low organic matter contents. In our study also the correlations between weight losses from TG curves and the metals concentration were found.

Key words: TG/DTG-MS; XRF spectrometry; contaminated sediments; particle size.

* Corresponding Author

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Development of soil characteristics and plant communities on reclaimed and unreclaimed spoil heaps after coal mining

Ondřej Cudlín *[1], Zdeněk Řehák [2], Pavel Cudlín [1]

[1] Global Change Research Institute CAS, Lipová 9, 370 05 České Budějovice, Czech Republic
[2] Faculty of Environmental Science, Czech University of Life Science Prague, Kamýcká 129, Praha 6- Suchdol, Czech Republic

ABSTRACT

The aim of our study was to compare soil characteristics, plant communities and the rate of selected ecosystem function performance on reclaimed and unreclaimed plots (left for spontaneous succession) of different age on spoil heaps. Twelve spoil heaps near the town Kladno in north-west direction from Prague on spoil heaps created after deep coal mining were compared. We established three circle plots of radius 12,5 m in each spoil heap. The mixed soil samples from five soil samples from organo-mineral layer in each plot were analysed for total content of carbon nitrogen and phosphorus. In addition, pH - active soil reaction was determinated. Plant diversity was determined by vegetation relevés. The biodiversity value of the habitat according to the Habitat Valuation Method (Seják et al., 2003) was assessed and the evapotranspiration function by the Method of Valuation Functions and Services of Ecosystems in the Czech Republic (Seják et al., 2010) was determined. The higher organo-mineral layers and higher amount of total nitrogen content were found on the older reclaimed and unreclaimed plots than in younger reclaimed and unreclaimed plots. The number of plant species and the total content of carbon and nitrogen were significantly higher at the unreclaimed plots compared to reclaimed plots. The biodiversity values and evapotranspiration function rate were also higher on unreclaimed plots. From this perspective, it is possible to recommend using of spontaneous succession, together with routine reclamation methods, to restore habitats after coal mining. Despite the relatively high age of vegetation in some of our plots (90 years), both the reclaimed and unreclaimed plots have not reached the stage of potential vegetation near the natural climax. Slow development of vegetation was probably due to unsuitable substrate of spoil heaps and a lack of plant and tree species from natural forest habitats in this area. However, it is probable that vegetation communities on our observed spoil heaps in both type of management (reclaimed and unreclaimed) will achieve the stage of natural climax and they will provide more effectively ecosystem functions in the future.

Key words: Soil formation; potential natural vegetation; ecosystem functions; spoil heaps; spontaneous succession.

* Corresponding Author

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Incidence of the Almadén historical mining district on the hydrochemical characteristics of Valdeazogues basin (Spain)

Efren García-Ordiales 1*, Jorge Loredo [1], Pablo L. Higueras [2], Jose M. Esbrí [2], Pablo Cienfuegos [1], Nieves Roqueñí [1]

[1] University of Oviedo, Department of Mineral Exploration, ISYMA Research Group,13 Independencia St. 33004 Oviedo, Spain

[2] University of Castilla-La Mancha Institute for Applied Geology, 1 Manuel Meca Sq.13400 Almadén, Spain

ABSTRACT

The distribution of dissolved potentially harmful elements (PHEs), major ions and physico-chemical parameters in the Valdeazogues river basin has been studied during 9 surveys, carried out between 2010 and 2013. The observe physico-chemical parameters depend on the season, the major ions to the lithological materials and the PHEs to the mine inputs. The Principal Component Analysis performed on the analysed dataset, distinguished the sources of contaminants introduced into waters and that nowadays mine runoffs play a major role than natural inputs in the hydrochemistry of waters.

Key words: Dissolved potentially toxic elements; surface waters; environmental impact; hydrochemistry; Almadén; Spain.

* Corresponding Author

mess@mess-earth.org

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Sulphates removal from acid mine drainage

Alena Luptáková *, Eva Mačingová, Ingrida Kotuličová, Dominika Rudzanová

Slovak Academy of Sciences, Institute of Geotechnics, Watsonova 45, 040 01 Košice, Slovak Republic

ABSTRACT

Acid mine drainage (AMD) are a worldwide problem leading to ecological destruction in river basins and the contamination of water sources. AMD are characterized by low pH and high content of heavy metals and sulphates. In order to minimize negative impacts of AMD appropriate treatment techniques has to be chosen. These processes are focused on neutralizing, stabilizing and removing pollutants. From this reason efficient and environmental friendly methods are needed to be developed in order to reduce heavy metals as well as sulphates. Various methods are used for remediation of acid mine drainage, but any of them have been applied under commercial-scale conditions. Their application depends on geochemical, technical, natural, financial, and other factors. The aim of the present work was to interpret the study of biological methods for sulphates removal from AMD out-flowing from the shaft Pech of the deposit Smolník in Slovak Republic. In the experimental works AMD were used after removal of heavy metals by sorption using the synthetic sorbent Slovakite. The base of the studied method for the sulphates elimination was the anaerobic bacterial sulphate reduction using sulphate-reducing bacteria (SRB) genera Desulfovibrio. SRB represent a group of bacteria that uses sulphates as a terminal electron acceptor for their metabolism. These bacteria realize the conversion of sulphate to hydrogen sulphide under anaerobic conditions. For the purposes of experiments a few variants of the selective medium DSM-63 culture media were used in term of the sulphates and sodium lactate contents in the selective medium as well as sulphates in the studied AMD.

Key words: AMD; sulphate; sulfate removal methods; bioremediation; SRB.

* Corresponding Author

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Biodeterioration of the cement composites

Alena Luptáková *, Adriana Eštoková, Eva Mačingová, Martina Kovalčíková, Dominika Rudzanová

Slovak Academy of Sciences, Institute of Geotechnics, Watsonova 45, 040 01 Košice, Slovak Republic

ABSTRACT

The destruction of natural and synthetic materials is the spontaneous and irreversible process of the elements cycling in nature. It can by accelerated or decelerated by physical, chemical and biological influences. Biological influences are represented by the influence of the vegetation and microorganisms (MO). The destruction of cement composites by different MO through the diverse mechanisms is entitled as the concrete biodeterioration. Several sulphur compounds and species of MO are involved in this complex process. Heterotrophic and chemolithotrophic bacteria together with fungi have all been found in samples of corroding cement composites. The MO involved in the process metabolise the presented sulphur compounds (hydrogen sulphide, elemental sulphur etc.) to sulphuric acid reacting with concrete. When sulphuric acid reacts with a concrete matrix, the first step involves a reaction between the acid and the calcium hydroxide forming calcium sulphate. This is subsequently hydrated to form gypsum, the appearance of which on the surface of concrete pipes takes the form of a white, mushy substance which has no cohesive properties. In the continuing attack, the gypsum would react with the calcium aluminate hydrate to form ettringite, an expansive product. The use supplementary cementing composite materials have been reported to improve the resistance of concrete to biodeterioration. The aim of this work was the study of the cement composites biodeterioration by the bacteria Acidithiobacillus thiooxidans. Experimental works were focused on the comparison of special cement composites and its resistance affected by the activities of used sulphur-oxidising bacteria. Cement composites contain partial replacement of binder by selected wastes (silica fume as a secondary raw material, zeolite as a natural raw material). All experiments were realised under the model laboratory conditions. The pH values and concentrations of Ca, Si, and Al in liquid phases were observed. From achieved experimental results it can be concluded, that concrete composites with partial binder replacement by silica waste and zeolite are of the higher resistance against the biogenic sulphuric acid.

Key words: Cement composites; biodeterioration; Acidithiobacillus thiooxidans.

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The effect of forest management of Picea abies and Fagus sylvaticus with different type of felling on carbon and economic balances in the Czech Republic

Radek Plch [1]*, Karel Pulkrab [2], Jan Bukáček [2], Roman Sloup [2], Pavel Cudlín [1]

[1] Global Change Research Institute CAS, Belidla 986/4a, 603 00 Brno, Czech Republic
[2] Czech University of Life Sciences Prague, Faculty of Forestry and Wood Science, Kamycka 1176, 165 21 Prague 6 – Suchdol, Czech Republic

ABSTRACT

The selection of most sustainable forest management under given site conditions needs suitable criteria and indicators. To this purpose we propose to use carbon and economic balance assessment, completed with environmental load computation using the Life Cycle Assessment (LCA). The aim of this study was to compare forestry operations and wood production of selected forest stands with different i) tree species composition (main forest tree species - Norway spruce - Picea abies and European beech - Fagus sylvaticus) and ii) type of felling (chain-saw and harvester). Carbon and economic balance methods consist in the comparison of quantified inputs (fossil fuels, electricity, used machinery, fertilizers, etc., converted into emission units of carbon in t of C-CO2–eq. or EUR) with quantified outputs (biomass production in t of carbon or EUR). In this contribution, forest stands in the 4th forest altitudinal zone (in the Czech Republic approximately 400-700 m above sea-level) were selected. Forestry operations were divided into 5 main stages: i) seedling production, ii) stand establishment, iii) thinning and final cutting, iv) skidding, and v) secondary timber transport and modelled for one rotation period of timber production (ca 100 years). The differences between Norway spruce and European beech forest stands in the carbon efficiency were relatively small while higher differences were achieved in the economic efficiency (forest stands with Norway spruce had higher economic efficiency). Concerning the comparison of different types of felling in Norway spruce forest stands, the harvester use proved to provide significantly higher environmental impacts. The comparison of forestry operation stages showed that the main part of carbon emissions, originating from fuel production and combustion, is connected with a final cutting and secondary timber transport.

Key words: Norway spruce (Picea abies; European beech (Fagus sylvaticus); forestry operations; harvester; Life Cycle Assessment (LCA); economic balance.

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Agricultural non-point pollution sources in 3rd water management plans cycle in the Czech Republic – from ideas to proposals

Zbyněk Kulhavý [1], Tomáš Dostál [2], Antonín Zajíček [1], Petr Fučík [1]*, Pavel Novák [1], Josef Krása [2], Pavel Rosendorf [3], Igor Pelíšek [1], Martin Pavel [4], Tomáš Kvítek [5]

[1] Research Institute for Soil and Water Conservation, Prague, Czech Republic
[2] Czech Technical Universtity Prague, Faculty of Civil Engineering, Department of Irrigation, Drainage and Landscape Engineering, Prague, Czech Republic
[3] T. G. Masaryk Water Research Institute, Prague, Czech Republic
4 Sweco Hydroprojekt, Czech Republic
[5] Povodí Vltavy, State Enterprise (Vltava River Basin Management Authority), Czech Republic

ABSTRACT

Water management planning in the European Union Countries originates from the EU Water Framework Directive (WFD), which defines the fundamental base for EU water policy concept and action. The purpose of WFD is to prevent further deterioration of surface and groundwater quality, to improve the general status of waters as well as of water-related ecosystems. The third planning period takes place from 2016 to 2021, and the realization of measures, proposed within this cycle, is anticipated to be performed between 2022 and 2027. In the two previous water management planning cycles, agricultural non-point pollution sources were neither analysed nor evaluated in CR. Hence, measures for diminishing this type of pollution (s.c. A-type measures, related to a particular land block, land owner, certain management, budget, etc.) were not designed. In general, agricultural non-point pollution sources in CR are linked on one hand with soil erosion, accompanied by transport of sediment and other substances to waters and on the other hand with water from tile drainage, discharging pesticides, nitrates and other, especially soluble materials applied on farmland, being weakly sorbed to soil particles. Despite different release / transport mechanisms, both soil erosion as well as leaching of substances from land drainage are governed by hydrology, esp. runoff. This paper brings a methodological introduction of a study aimed at identification of critical areas of agricultural non-point pollution sources by the help of critical points network. In these points, delivery of sediments and substances transported by soil erosion (total phosphorus) as well as of pollution from tile drainage (nitrates, pesticides) will be quantified using GIS-related models (e.g. WaTEM/SEDEM) as well as newly derived empirical relationships based on catchment geomorphological and agricultural characteristics. Critical points will be delineated hierarchically within four categories, based on hydrologically related contribution area and connectivity; the network will spread from a small subcatchment (tens of hectars) to water body level (hundreds of square km). In these areas, point pollution sources will be assessed too. The goal of this approach is to address water pollution sources by the most precise way, to classify water pollution risk related to different critical point type and category and to propose a set of targeted measures. The novelty of presented approach lies in options and tools for mutual assessment and evaluation of non-point pollution sources of different origin as well as for the design of feasible, most effective measures.

Key words: Non-point pollution sources; water management planning; mitigation measures; sediment; phosphorus; nitrates; pesticides.

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Degradation of PVC/PLA thick films in soil burial experiment

Bożena Nowak [1]*, Szymon Rusinowski [2], Grażyna Płaza [2], Błażej Chmielnicki [3], Grażyna Kamińska-Bach [3], Krzysztof Bortel [3]

[1] University of Silesia Jagiellońska, Faculty of Biology and Environmental Protection, Department of Biochemistry, 28, 40-032 Katowice, Poland

[2] Institute for Ecology of Industrial Areas, Kossutha 6, 40-844 Katowice, Poland

[3] Institute for Engineering of Polymer Materials and Dyes, The Branch House for Paints and Plastics in Gliwice, Chorzowska 50A, 44-100 Gliwice, Poland

ABSTRACT

It is known that recycled polylactide shows a decrease in some parameters resulting from e.g. reduction of molar mass due to repeated reprocessing cycles or/and from introduction of some impurities. That is why the number of applications of such polymer is very limited. Some of the biodegradable polymers can be blended with a synthetic polymer to facilitate their biodegradation in the environment. The objective of the study was to investigate the biodegradation of thick films of poly(vinyl chloride)/recycled polylactide (PVC/rPLA). The experiments were carried out in the garden soil or in the mixture of garden soil and hydrocarbon-contaminated soil under laboratory conditions. Since it is widely accepted that the biosurfactants secreted by microorganisms enable biotransformation of various hydrophobic substances in the environment, we assumed that the use of contaminated soil, rich in biosurfactant producing bacteria, may accelerate biodegradation of plastics. After the experimental period the more noticeable weight loss of polymer films was observed after incubation in the garden soil. However, more pronounced changes in the film surface morphology and chemical structure as well as decrease of tensile strength were observed after incubation of films in the mixture of garden and contaminated soil. It turned out that as a result of competition between two distinct group of microorganisms present in the mixture of garden and hydrocarbon-contaminated soils the number of microorganisms and their activity were lower than the activity of indigenous microflora of garden soil as well as the amount of secreted biosurfactants towards plastics. It was concluded that the amount of biosurfactants present in soils, significantly affected the degree of biodegradation of films.

Key words: Poly(vinyl chloride); polylactide; microorganisms; soil, biosurfactants.

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Degradation of modified poly(vinyl chloride) under controlled composting conditions

Bożena Nowak [1]*, Maciej Ociepski [1], Błażej Chmielnicki [2], Grażyna Kamińska-Bach [2], Krzysztof Bortel [2]

[1] University of Silesia Jagiellońska, Faculty of Biology and Environmental Protection, Department of Biochemistry, 28, 40-032 Katowice, Poland

[2] Institute for Engineering of Polymer Materials and Dyes, The Branch House for Paints and Plastics in Gliwice, Chorzowska 50A, 44-100 Gliwice, Poland

ABSTRACT

Poly(vinyl chloride) (PVC), because of its excellent performance, is commonly used synthetic polymer with many applications. The main ecological drawback is that after disposal it slowly degrades by natural processes in the environment. Polylactide (PLA) is one of the best known substitutes for petropolymers with good properties and quick degradability in the environments with high temperature and humidity. Unlike the pure PLA, recycled polylactide (rPLA) possesses some shortcomings limiting its stand-alone usability. In this research recycled polylactide (PLA) was incorporated into poly(vinyl chloride) (PVC). To check the resistance of obtained material to various chemical substances thick films were pretreated in the sulphuric acid, ethanol and mineral oil for three months. In order to assess biodegradability of compositions films, after abiotic degradation, were incubated in the compost under laboratory conditions. Apart from properties of films, numerous parameters of the compost were monitored during the next 90 days of the experiment. It was shown that the presence of films did not influence on physio-chemical parameters of the compost in comparison to the reference compost. Degradation of films proceeded via rather indirect action of microorganisms (extracellular enzymes) since there were no significant growth of compost microorganisms on the surface of films. The course of changes of tensile properties of films during abiotic treatment resulted in different mechanisms of their biodecomposition. Greater activity of proteases and peroxidases in compost as well as extensive oxidation of films with greater tensile strength were observed during decomposition of films preincubated in alcohol. More pronounced activities of compost esterases and ureases together with prevailed hydrolysis were observed after composting of films pretreated in mineral oil.

Key words: Poly(vinyl chloride); polylactide; microorganisms; enzymes; compost.

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The participation of compost microorganisms in the biodegradation of PE/PLA/PEoxo composition

Bożena Nowak [1]*, Ewelina Antosiewicz [1], Błażej Chmielnicki [2], Sebastian Jurczyk [2], Grażyna Kamińska-Bach [2], Krzysztof Bortel [2]

[1] University of Silesia Jagiellońska, Faculty of Biology and Environmental Protection, Department of Biochemistry, 28, 40-032 Katowice, Poland

[2] Institute for Engineering of Polymer Materials and Dyes, The Branch House for Paints and Plastics in Gliwice, Chorzowska 50A, 44-100 Gliwice, Poland

ABSTRACT

It is well known that there are many physical, chemical and biological factors affecting the rate of decomposition of organic matter during composting process. It has been also proven that degradation of some plastics in compost, due to high temperature and humidity, proceeds exclusively via non-enzymatic route. Previous studies demonstrated that although examined polymers were degraded in compost there was no visible growth of microorganisms on the surface of PE/PLA/PEoxo compositions.

The purpose of the research was to determine the participation of compost microorganisms in the degradation of films. Since oxo-degradable polyethylene was one of the component of the compositions, films, before biological treatment were subjected to 7-day thermodegradation or 60-day environmental degradation. For the biodegradation experiments the mixture of microorganisms in the form of “compost tea” was used for inoculation of films in the synthetic medium. After 90-day biodegradation in the synthetic medium it was confirmed that microorganisms were able to colonise the films as confirmed by SEM observations. The degree of microbial growth depended on the amount of PLA in the films. Abiotic degradation, especially thermodegradation, increased the rate of degradation of the films containing oxo-degradable polyethylene. Contrary to compost environment, in the synthetic medium, where films were the sole source of carbon and energy to compost microorganisms, we observed up to 9-times more effective process of degradation of films. Probably, in the compost environment enzymes secreted in the presence of high amount of plant debris were not active towards synthetic polymers or their concentration near film’s surface was too low to induce pronounced degradation.

Key words: Polyethylene; polylactide; abiotic degradation; microorganisms; biodegradation.

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Geochemical characterization of surface and ground waters in South Tyrol and its application to trace the geographical origin of agricultural products

Zakaria Bouchaaba [1]*, Francesco Comiti [1], Tanja Mimmo [1], Werner Tirler [2]

[1] Free University of Bolzano, Piazza Università 1, 39100 Bolzano, Italy
[2] Eco-Research, Via Negrelli 13, 39100 Bolzano, Italy

ABSTRACT

In developed countries, the demand of consumers for high-quality food products with precise regional identification is growing regularly. This stimulated the scientific research in this field including multi-tracers along with isotope methods of analysis to identify the provenance of foods. Indeed, combining different parameters has proved to be a promising strategy for food provenance studies. However, the direct measure of elemental and isotopic food composition is most of the time relatively expensive, time-consuming and even infeasible if authentic food samples to compare with are absent or not representative of the production area. In this way, Investigating the link between trace elements and isotopes found in the food, to those of the surrounding environment is an easy way to get a clear idea about the specific characteristics a food should have when produced in a definite location. In South Tyrol (Eastern Italian Alps), no studies have been conducted at the regional scale to investigate the effect of local geology on surface and ground waters geochemistry, to characterize their elemental and isotopes content, and to test the applicability of water characteristics to predict the origin of agricultural products. Hence, this research project will focus on the spatial variability of geochemical and isotopic composition of surface and ground waters in South Tyrol, with the objective to determine the environmental factors affecting its pattern. This analysis will be of use not only to identity the origin of food products from this region, but also to set up a baseline hydrogeochemical knowledge still missing at present for this area. The main research hypothesis of this research is that the chemical characteristics of agricultural products is closely related to the geochemistry of the local water sources used by the plants from which the products are derived. This implies that a detailed knowledge of the spatial variability at the regional scale of water geochemistry will enable to trace the origin of food products based on their elemental and isotopic composition.

Key words: Multi-element composition; isotopes; strontium; food authenticity; hydro-geochemistry.

* Corresponding Author

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Isotope geochemistry survey in Ierissos Gulf basin, north Greece

Paraskevi Chantzi [1]*, Elissavet Dotsika [1,2], Brunella Raco [2]

[1] Institute of Nanoscience & Nanotechnology, Laboratory of Stable Isotopes and Radiocarbon, NCSR "Demokritos", 153 10, Greece

[2] Institute of Geosciences and Earth Resources, Via G. Moruzzi 1, 56124 Pisa, Italy

ABSTRACT

Thirty-six samples from the wider area of Ierissos Gulf basin were collected in three different sampling periods and subjected to chemical and isotopic analysis. All sampled waters (groundwater and surface water) presented neutral to alkaline pH (7.2-8.5) values. Major element chemistry of water samples in Ierissos gulf basin is dominated by Ca^{2+}, Mg^{2+} and HCO^{3-}. Water rock interaction and contribution of sea sprays/aerosols seems to control the mineralization of groundwater. A linked between Skouries and Gomati samples (Mg-HCO_3) was detected reflecting the well documented M. Panagia-Gomati fault. A different origin fluid identified to Neochori and M. Panagia samples participating in their heavy metal load. Regarding surface waters, at the upper part of Kokkinolakas basin a surface run-off with high As and Sb values was detected originating by groundwater circulation. Extended bicarbonates action of meteoric waters suggesting to gather As concentration in surface waters for winter sampling period with intense precipitation.

Key words: Isotopes; Chalkidiki; Kokkinolakas; heavy metals; Ierissos; geochemistry.

* Corresponding Author

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The environmental impact on fossil record for palaecological reconstruction studies

Paraskevi Chantzi [1]*, A. E. Poutouki [1], E. Dotsika [1,2], B. Raco [2], K. Albanakis [3], E. Samarztidou [1]

[1] Institute of Nanoscience & Nanotechnology, Laboratory of Stable Isotopes and Radiocarbon, NCSR "Demokritos", 153 10, Greece

[2] Institute of Geosciences and Earth Resources, Via G. Moruzzi 1, 56124 Pisa, Italy

[3] Aristotle University, School of Geology, Department of Physical and Environmental Geography, GR-54124 Thessaloniki, Greece

ABSTRACT

Paleoecological studies have an important role in understanding past environmental, dietary and/or societal changes however require the authentic signature of fossil materials. Therefore, a significant part of these studies is the isolation of the material authentic matrix. Bone hydroxyapatite from different animal species from the archaeological site of Dispilio in Kastoria Lake basin in northern Greece has been subjected to mineral analysis in order to detect if there are suitable for palaoecological studies. Calcium, phosphorus, oxygen and hydrogen are the main components of bones resulting rigidity, hardness and compressive strength of their structure. However different bone structure resulting different calcium-phosphate phases and different compositions, including Ca/P ratios. These disparities may be attributable to different physiological characteristic, conditions under which the bones were formed or burial environment. Trace element analysis (Ca/P, Sr/P, Fe/Mn) concluded that treated fossil bones retained their biochemical signal without any strong influence by soil remains however without suggesting that no chemical alteration have been occurred.

Key words: SEM; palaeoenvironment; palaecology; Dispilio; diagenesis; Kastoria.

* Corresponding Author

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Isotope geochemistry study on thermal waters of Evros area, NE Greece

Elissavet Dotsika [1,2], Paraskevi Chantzi [1]*

[1] Institute of Nanoscience & Nanotechnology, Laboratory of Stable Isotopes and Radiocarbon, NCSR "Demokritos", 153 10, Greece

[2] Institute of Geosciences and Earth Resources, Via G. Moruzzi 1, 56124 Pisa, Italy

ABSTRACT

Thermal waters from Evros area were collected and subjected to chemical and isotopic analysis in order to understand all the physicochemical mechanisms (mixing, dilution, precipitating) that contribute to the shallow and deep geothermal water tables and determine the origin of these fluids as well as their mineralization. Physicochemical characteristics EC, ToC, pH was determined at the field. The ionic concentrations of samples indicate solutions with high salinity. Two chemical water types were arisen: Na-SO_4 concerning low temperatures and shallow aquifers and Na-Cl concerning high temperatures and deeper geothermal circulation. The ratio Br/Cl definitely considered marine origin indicator is the same as the sea confirming the involvement of the seawater in the geothermal system. The marine component and water-rock interaction process under high temperatures seem to contribute to the mineralization of thermal waters. Moreover, water-rock interaction process is also responsible for the alternation of δ18O values. Geothermometers concluded to a middle enthalpy geothermal field.

Key words: Chalkidiki; Kokkinolakas; heavy metals; Ierissos; geochemistry.

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The use of GIS and remote sensing techniques in multi-temporal analyses of the Carpathian foredeep soil properties

Ewa Glowienka [1], Krystyna Michalowska [2]*, Agnieszka Pekala [3]

[1] Kielce University of Technology, Faculty of Environmental, Geomatics and Energy Engineering, Poland
[2] University of Agriculture in Krakow, Faculty of Environmental Engineering and Land Surveying, Poland
[3] Rzeszow University of Technology, Department of Geodesy and Geotechnics, Poland

ABSTRACT

The paper presents spatial and temporal analyses of the distribution of the salinity level and pH reaction in soils of south-east Poland depending on selected environmental factors. The area under examination (Carpathian Foredeep, the flysh Carpathians) is distinguished by its specific hydrological and geological conditions (the Vistula and the San valley). Research took into account the type of geological structure, land slope, soil type and reaction, as well as the contents of potassium and sodium. The research works were performed in relation to parameters that had been measured in-situ in 1995, 2000, 2005, and 2010. The said data were gathered by the Institute of Soil Science and Plant Cultivation in Puławy, Poland (IUNG) in the form of an attribute database within the framework of the programme of "Monitoring the Chemism of Arable Soils in Poland" financed from resources granted by the National Fund for Environmental Protection and Water Management (online access – see the website of the Inspection for Environmental Protection). Using specialist GIS software, proper interpolation procedures were performed, which enabled visualization in the form of raster and vector maps for the spatial distribution of the examined soil properties. Moreover, an analysis of remote sensing data was completed. To that purpose, Landsat satellite images were used (available online on USGS servers), recorded in those years, in which the in-situ samples were collected. On the basis of spectral channels of the obtained satellite images, colour compositions were created, as well as vegetation indexes (e.g. Normalized Difference Vegetation Index - NDVI). For calculation and analysis purposes, channels recorded in visible and in near infrared ranges were selected. Based on the analysis of the obtained maps of spatial and temporal distribution and on the processed satellite images, the paper authors found out that the biggest changes in all examined soil parameters took place in 2010. The analysis results prove extensive changes in the levels of potassium (K) and sodium (Na), as well as in the pH reaction and soil salinity. Those changes occurred mainly in the north and south parts of the examined area. The underlying reason for those changes might have been the flood, which hit the region in June 2010. The use of GIS spatial analyses and remote sensing images made it possible to examine correlation between the levels of soil salinity and reaction, and factors affecting soil properties (the contents of Na and K elements, land slope) within a period of 15 years.

Key words: Soil properties; salinity; multi-temporal analysis; GIS; Remote Sensing; NDVI.

* Corresponding Author

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Assessment of the carbon storage in the small and middle watersheds (Czech Republic): effects of grain size

Jan Purkyt [1,2]*, V. Pechanec [3], L. Štěrbová [1], R. Plch [1], P. Cudlín [1]

[1] Global Change Research Institute CAS, Lipová 9, 370 05 České Budějovice, Czech Republic
[2] University of South Bohemia in České Budějovice, Department of Plant Production and Agroecology, Branišovská 1645, 370 05 České Budějovice, Czech Republic
[3] Palacký University Olomouc, Department of Geoinformatics, 17. listopadu 50, 77146 Olomouc, Czech Republic

ABSTRACT

Selection of the appropriate map grain size depends on the size of the watershed and the related plotting accuracy of land cover/land use categories in the landscape. The aim of our contribution is to describe the influence of different map grain size of land cover/land use categories in small and medium watersheds on the assessment of carbon storage. Carbon storage of land cover/land use categories was assessed for watershed Dřevnice (434.60 km2) and Všeminka (21.64 km2). CORINE Land Cover mapping from 2012 at the scale of 1: 100 000 was used for both studied watersheds. In addition, Všeminka watershed was mapped using the combined mapping Natura 2000 – BVM (Biotope Valuation Method) (Seják et al. 2003) on the base of Base Map of the Czech Republic (1:10 000), maps of Natura 2000, aerial ortophotos and field mapping. To determine the existing carbon stocks the worldwide used model InVEST 3.0 - carbon was applied. Values of carbon storage were calculated from four carbon pools: above-ground biomass, below-ground biomass, necromass and soil organic carbon. The original model InVEST was modified to vector space for a better identification of land heterogeneity. The values of four carbon pools for individual land cover/land use categories were derived from literature and experimental investigations. Middle size watershed Dřevnice has about 10% less carbon storage, calculated per km2, compared to small watershed Všeminka. A bit greater values of stored carbon (less 10 %) were computed in the watershed Všeminka based on the CORINE Land Cover categories compared to Natura 2000 – BVM. From these results it is possible to hypothesize that the computation of carbon storage based on the CORINE Land Cover mapping could be used also for a small watershed.

Key words: Carbon stocks; biomass; Natura 2000; CORINE Land Cover; scaling.

* Corresponding Author

mess@mess-earth.org

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Indicator algae species of Adrasan Stream (Antalya, Turkey)

Tahir Atici [1]*, Cengiz Akköz [2]

[1] Gazi University, Gazi Education Faculty, Biology Department Beşevler, Ankara, Turkey
[2] Selçuk University, Science Faculty, Biology Department, Konya, Turkey

ABSTRACT

Economic importance of the pollution indicator species of algae will be investigated in this study of Adrasan Stream. Adrasan Creek; nature of Tahtali Mountains in Beydağları National Park and poured into the Adrasan bay. Aim is; to determine of indicator algae in Adrasan creek and to make comparisons between them, from the source region of Adrasan creeks and estuary region was chosen to be 2 different stations. Samples from different habitats (Epilithic, Epiphytic and Epipelic (also from Station 2) Plankton) were collected. Determined from stations belonging to four different habitats were studied samples. A total of 118 of algal taxa were identified in the four habitats on Adrasan creek. In a study conducted in Adrasan Creek Bacillariophyta division with 50.8% of the group was the most represented the other division Chlorphyta 27.9% Cyanobacteria 15.2% Euglenophyta 3.38% and Dinophyta was found to be 2.5% respectively. Fonded as an indicator alg species is Cladophora fracta, Pediastrum boryanum, Pediastrum dubium, Scenedesmus accuminatus, Scenedesmus sp., Ulotrix sp., Oscilatoria princeps, Oscilatoria splendida, Oscilatoria sp., Phormidium tenium and Euglena sp. Relating different characteristic indicators algae in water quality is divided into zones as follows; a. In the zone Polysabrobic Euglena, Oscillatoria, Phormidium, b. In the zone α -Mesosabrobic Ulothrix, Oscillatoria, Stigeoclonium, c. In the zone β-Mesosabrobic Cladophora, Phormidium, Scenedesmus, Pediastrum, Ulothrix, Voucheria, d. In the zone Oligosabrobic genera of Meridion, Lemanea, Batrachospermum.
In this study found zones which is similar zones Polysabrobic, α and β-Mesosabrobic but different species include also. Some genera detected in algal species are more frequent in number.

Key words: Indicator algae; epilithic; epiphytic; epipelic; pollution; Adrasan (Turkey).

* Corresponding Author

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Concentrations and soil-to-plant transfer factor of selenium in soil and plant species from an arid area

Mohamad Sakizadeh [1]*, Fatemeh Mehrabi Sharafabadi [2], Eshagh Shayegan [1], Hadi Ghorbani [3]

[1] Shahid Rajaee Teacher Training University, Department of Environmental Sciences, Iran
[2] Jundishapour University of Medical Sciences, Department of Pharmacology, Iran
[3] University of Shahrood, Iran

ABSTRACT

The concentration of selenium in 97 plants related to seven different species and the associated soil samples was considered in an arid area in the central part of Iran. The mean of Se in the soil samples varied from 0.17 to 0.43mgkg-1 which is within the worldwide range. There was a highly significant correlation ($r=0.688$, $p<0.01$) between selenium concentration in the two soil depths (e.g. 0-5cm and 5-25cm) indicating that the selenium in deeper parts of the soil(5-25cm) has most probably originated from the surface part (0-5cm).The highest accumulation of Se was recorded in the chives with the average value of 0.35mgkg-1. Except for apricot, the concentrations of selenium in top parts of the plants (e.g. leaf, grain, and fruit) were higher than stem/stalk implying the facile translocation of this element in the considered plant species. The higher than one bioconcentration factors (BCFs) of selenium for the chives, spindle tree and wheat is indicative of high phytoremediation potential for these plants.

Key words: Agricultural activity, Selenium, Soil-to-plant transfer factor.

* Corresponding Author

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Evaluation of vegetation drought index for monitoring drought based on remote sensing data in central Iran

Ali Talebi [1]*, Yaghoub Niazi [2], Mohammad Hossein Mokhtari [3], Majid Vazifedoust [4]

[1] Yazd University, Faculty of Natural Resources, Yazd, Iran
[2] Yazd University, Faculty of Natural Resources, Watershed Management Sciences and Engineering, Yazd, Iran
[3] Yazd University, Faculty of Natural Resources, Remote Sensing, Yazd, Iran
[4] University of Guilan, Faculty of Agriculture Science, Rasht, Iran

ABSTRACT

Drought is a major environmental disaster in many parts of the world. Knowledge about the timing, severity and extent of drought can aid planning and decision-making. Drought indices derived from in-situ meteorological data have coarse spatial and temporal resolutions, thus, obtaining a real-time drought condition over a large area is difficult. The vegetation drought index (VDI), which is derived from remote-sensing data, has been widely used for drought monitoring. In this study, spatial and temporal variability of a new vegetation drought index based on remote sensing (VDI) is evaluated based on precipitation. The standard precipitation index (SPI) is used to evaluate the spatial and temporal characteristics of vegetative drought in Central Iran. Central Iran is a steppe-like plateau characterized by extremely wet climate in the Northern regions, arid and semiarid conditions surrounded by desert with no recorded rainfall for years, and mountains (Zagros on the west and Alborz on the north). The study area is located between 27N-37N latitudes and 48E-61E longitudes and has an area of about 837,184 km2. The data included the MODIS sensor images from Terra satellite for the 2001-2004 and the rainfalls from synoptic stations of the range of Central Iran. To gain the vegetation drought index (VDI) values, the normalized vegetation index (NDVI) values were used. Precipitation data from 50 synoptic meteorological stations was collected to calculate the standardized precipitation index (SPI) as a meteorological drought index. Accuracy of the new vegetation drought index based on satellite data carried out using the evaluation criteria of R and RMSE compared with drought spatial distribution map of the SPI based on monthly data of synoptic stations. The results indicate significant correlation between VDI index with SPI index in 95% confidence levels. Thus, a VDI index could well use in drought early warning systems.

Key words: Drought monitoring; remote sensing; satellite data; VDI; SPI; Central Iran.

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Assessment of Drought monitoring from the remotely sensed temperature index in Central Iran

Ali Talebi [1]*, Yaghoub Niazi [2], Mohammad Hossein Mokhtari [3], Majid Vazifedoust [4]

[1] Yazd University, Faculty of Natural Resources, Yazd, Iran
[2] Yazd University, Faculty of Natural Resources, Watershed Management Sciences and Engineering, Yazd, Iran
[3] Yazd University, Faculty of Natural Resources, Remote Sensing, Yazd, Iran
[4] University of Guilan, Faculty of Agriculture Science, Rasht, Iran

ABSTRACT

Increasing temperature and altered precipitation patterns, leads to the extreme weather events like Drought which drastically impact on agricultural, ecological and socio-economic spheres. Knowledge about the timing, severity and extent of drought can aid planning and decision-making. Drought indices derived from in-situ meteorological data have coarse spatial and temporal resolutions, thus, obtaining a real-time drought condition over a large area is difficult. The temperature drought index (TDI), which is derived from remote-sensing data, has been widely used for drought monitoring. In this study, spatial and temporal variability of a new temperature drought index based on remote sensing (TDI) is evaluated based on precipitation. The standard precipitation index (SPI) is used to evaluate the spatial and temporal characteristics of temperature drought in Central Iran. Central Iran is a steppe-like plateau characterized by extremely wet climate in the Northern regions, arid and semiarid conditions surrounded by desert with no recorded rainfall for years, and mountains (Zagros on the west and Alborz on the north). The study area is located between 27N-37N latitudes and 48E-61E longitudes and has an area of about 837,184 km2. The data included the MODIS sensor images from Terra satellite for the 2001-2004 and the rainfalls from synoptic stations of the range of Central Iran. To gain the temperature drought index (TDI) values, the land surface temperature (LST) values were used. Precipitation data from 50 synoptic meteorological stations was collected to calculate the standardized precipitation index (SPI) as a meteorological drought index. Accuracy of the new vegetation drought index based on satellite data carried out using the evaluation criteria of R and RMSE compared with drought spatial distribution map of the SPI based on monthly data of synoptic stations. The results indicate significant correlation between TDI index with SPI index in 95% confidence levels. Thus, a TDI index could well use in drought early warning systems.

Key words: Drought Monitoring; remote sensing; satellite data; TDI; SPI; Central Iran.

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The archaeological survey project of Myrina and Gryneion in Aiolis Region (Turkey)

Murat Çekilmez *

Adnan Menderes University, Faculty of Arts & Sciences, Archaeology Department, Branch of Classical Archaeology, 09100 Aydin, Turkey

ABSTRACT

A new archaeological survey project was started by the Adnan Menderes University at Myrina and Gryneion in 2015. Myrina and Gryneion are archaeological resources: a well-preserved and almost completely unexplored ancient city, lying on the seaside in Aiolis region/Western Turkey. The Myrina and Gryneion Archaeological Surveys are an interdisciplinary research project aiming to understand how populations adapt to local conditions dictated by environmental constraints. Major objectives of survey researches at Myrina and Gryneion are to clarify the long-term history of the site. Our primary fieldwork goals were to conduct intensive survey at ancient city of Myrina and Gryneion. Field work surveys were started in 2015. On the other hand laboratory work focused on refining the ceramic typology; efforts concentrated also on establishing a centralized database system to manage and eventually make public all project files. 2015 program yielded significant quantities of pottery including a representative sample of the typical Hellenistic and Roman wares. One interesting result about Myrina and Gryneion are the lack of monumental architectural remains. Preliminary results suggest that the large architectural blocks remain underground. Examination of nearby villages suggests that they were not extensively reused in modern buildings.

Key words: Myrina; Gryneion; Aiolis region; Turkey.

* Corresponding Author

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Influence of ppGpp and DksA on tRNA promoters transcription activation

Klaudia Milewska *, Robert Łyżeń

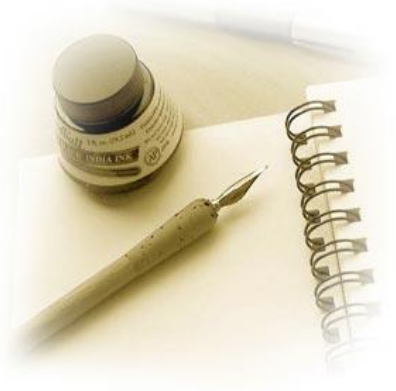
University of Gdansk, Department of Molecular Biology, Wita Stwosza 59, 80-308 Gdansk, Poland

ABSTRACT

One of the global mechanisms involved in regulation of gene expression in E. coli is stringent response. It affects mainly the first step of gene expression – transcription initiation. It happens via specific nucleotides – guanosine tetraphosphate and pentaphosphate (ppGpp and pppGpp) which are commonly called stringent alarmons. Level of this special nucleotides increases during stress conditions, such like nutrient limitation and various physical and chemical stresses. This level is also increased during late growth phase of the bacterial culture, and reaches highest level in stationary phase. This is caused due to ppGpp is necessary in normal growth conditions in stationary phase to control cellular processes. The most spectacular effect of the stringent response is down-regulation of the energy-consuming processes such as ribosomal promoter activity. Several tRNA promoters are also under negative control of ppGpp. In addition to ppGpp, DksA protein (belonged to group of proteins that can bind to RNA polymerase (RNAP)) can also regulate gene expression during negative environmental conditions. It destabilizes open complex formed by RNAP and promoter region and shortens time of promoter escape by interaction with newly synthesized RNA. Previous data showed that binding of ppGpp and DksA to RNAP can have an impact on promoter activity. Very important role in transcription regulation is also played by the discriminator. A specific sequence located in a promoter region between -10 box and +1. Any nucleotide changes in this region, AT to GC and inversely, can influence the promoter activity and open promoter stability. It is suggested that GC-rich promoters are repressed by ppGpp and DksA, whereas AT-rich promoters are activated. The regulation of transcription from tRNA promoters during stringent response can be modulated by ppGpp. Our RT-PCR analysis indicates that the regulation by ppGpp and DksA molecules can differ for each of the promoters. The main aim of this work is to investigate the mechanism of regulation of transcription from tRNA promoters by this three factors: discriminator sequence, ppGpp and DksA. Here, we report differences in transcription efficiency from tRNA promoters with different sequence of discriminator, in presence of increasing concentrations of ppGpp and DksA in vitro and in vivo. Research methods included: i) RNA extraction and RT-PCR analysis ii) tRNA promoter sequence cloning into pTE plasmid, iii) radioactive transcription in vitro. It is known that ppGpp has negative influence on transcription from several tRNA promoters. Our results from RT-PCR analysis confirmed this also for the rest of them. These results indicated, that the most important place in discriminator sequence, for ppGpp and DksA regulation, is -5 position. It is known, that tRNA promoters are inhibited by ppGpp in stationary phase. DksA also influences tRNA transcription initiation. Depending on the tRNA promoter, the effect of ppGpp and DksA, can differ, from synergistic to antagonistic. Using transcription in vitro analysis, we confirmed that both ppGpp and DksA can activate or inhibit transcription from tRNA promoters.

Key words: ppGpp; DksA; stringent response; tRNA promoters.

* Corresponding Author



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Assessment of energy consumption in Turkey

Suheyla Yerel Kandemir [1]*, Huseyin Ankara [2], M. Ozgur Yayli [3], A. Erdem Cercevik [1]

[1] Bilecik Seyh Edebali University, Bilecik, Turkey
[2] Eskisehir Osmangazi University, Eskisehir, Turkey
[3] Uludag University, Bursa, Turkey

ABSTRACT

Energy is one of the important fundamental parts in the world. Energy consumption in Turkey has increased rapidly over the past decades. In this study, Turkey's energy consumption investigated by using the multivariate statistical analysis techniques including cluster analyses and multidimensional scaling analyses. The consumption was evaluated from 1998 to 2004. Multivariate statistical analysis techniques results showed that the variations in the energy consumption were significantly increasing by years. Finally, this study presented that the usefulness of multivariate statistical analyses techniques in assessed in the energy issues.

Key words: Multivariate statistical analysis techniques; cluster analyses; multidimensional scaling analyses; energy; Turkey.

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Assessment of renewable energy sources in Turkey

Suheyla Yerel Kandemir [1] and Hüseyin Ankara [2]*

[1] Bilecik Seyh Edebali University, Engineering Faculty, Gulumbe, Bilecik, Turkey
[2] Eskisehir Osmangazi University, Engineering Faculty, Eskisehir, Turkey

ABSTRACT

The development level of world is related to social and economic level. One of the important factors that take a role is energy. Turkey has economic development and rapid population increased. The net effect of the factors is that Turkey's energy needs has increased rapidly. Since 1990, Turkey becomes more dependent on foreign countries for fulfilling its energy needs. The energy needs of Turkey was doubled between 2000–2010 and will be fivefold between 2000-2025. In this regard, renewable energy resources appear to be one of the most effective solutions for clean and sustainable energy in Turkey. Thus, in this paper, renewable energy sources in Turkey were studied.

Key words: Energy; renewable energy sources; Turkey.

* Corresponding Author

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Nuclear power as a basis for future electricity generation

Sergei K. Buruchenko *[1], Igor L. Pioro [2]

[1] South Ural State University, Snezhinsk, Russia
[2] University of Ontario Institute of Technology, Oshawa, Ontario,Canada

ABSTRACT

It is well known that electrical power generation is the key factor for advances in industry, agriculture, technology, and standards of living. Also, a strong power industry with diverse energy sources is very important for a nation's independence. In general, electrical energy can be generated from (1) burning mined and refined energy sources such as coal, natural gas, oil, and nuclear; and (2) harnessing energy sources such as hydro, biomass, wind, geothermal, solar, and wave power. Today, the main sources for electrical energy generation are (1) thermal power, primarily using coal and secondarily natural gas; (2) "large" hydraulic power from dams and rivers; and (3) nuclear power from various reactor designs. The balance of the energy sources is from using oil, biomass, wind, geothermal, and solar, which have a visible impact just in some countries. This paper presents the current status and role of the nuclear-power industry in the world with a comparison of nuclear-energy systems to other energy systems.

Key words: Nuclear power industry; electricity generation; current status; thermal power plants; modern nuclear power plants; 4-th generation nuclear reactors.

* Corresponding Author

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Assessment of heavy metal pollution in topsoil around Beijing Metropolis

Ranhao Sun *, Liding Chen

Chinese Academy of Sciences, Research Center for Eco-Environmental Sciences, People's Republic of China

ABSTRACT

The topsoil around Beijing metropolis, China, is experiencing impacts of rapid urbanization, intensive farming, and extensive industrial emissions. We analysed the concentrations of Cu, Ni, Pb, Zn, Cd, and Cr from 87 topsoil samples in the pre-rainy season and 115 samples in the post-rainy season. These samples were attributed to nine land use types: forest, grass, shrub, orchard, wheat, cotton, spring maize, summer maize, and mixed farmland. The pollution index (PI) of heavy metals was calculated from the measured and background concentrations. The ecological risk index (RI) was assessed based on the PI values and toxic-response parameters. The results showed that the mean PI values of Pb, Cr, and Cd were > 1 while those of Cu, Ni, and Zn were < 1. All the samples had low ecological risk for Cu, Ni, Pb, Zn, and Cr while only 15.35 % of samples had low ecological risk for Cd. Atmospheric transport rather than land use factors best explained the seasonal variations in heavy metal concentrations and the impact of atmospheric transport on heavy metal concentrations varied according to the heavy metal types. The concentrations of Cu, Cd, and Cr decreased from the pre- to post-rainy season, while those of Ni, Pb, and Zn increased during this period. Future research should be focused on the underlying atmospheric processes that lead to these spatial and seasonal variations in heavy metals. The policymaking on environmental management should pay close attention to potential ecological risks of Cd as well as identifying the transport pathways of different heavy metals.

Key words: Heavy metal; pollution; ecological risk; topsoil, China.

* Corresponding Author

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A statistical method approach for wind energy potential estimation

Hasan D. Yildizay [1], Nil Aras [2], Veysel Yilmaz [3], Haydar Aras [4]*

[1] Dumlupınar University, Engineering Faculty, Mechanical Engineering Department, Kütahya, Turkey
[2] Anadolu University, Engineering Faculty, Industrial Engineering Department, 2 Eylul Campus, Eskisehir, Turkey
[3] Eskisehir Osmangazi University, Science and Letters Faculty, Statistic Department, Meselik Campus, Eskisehir, Turkey
[4] Eskisehir Osmangazi University, Engineering- Architecture Faculty, Mechanical Engineering Department, Meselik Campus, Eskisehir, Turkey

ABSTRACT

In recent years, Weibull distribution has been commonly used, accepted and recommended distribution in literature to express the wind speed frequency distribution. In this study, wind energy potential of Eskisehir is analysed statistically. Data acquired from the measurement station, which is established in Meselik Campus of Eskisehir Osmangazi University (Turkey), are used for the analyses. Wind speed and direction, temperature, relative humidity and pressure values can be taken instantaneously from the mentioned station. In this investigation, the 10 minute average values of wind speed taken every 2 seconds for a period between November 2010 and January 2013 are considered. Statistical analyses are performed using meteorological data obtained from sensors mounted on the station at various heights. Thus, the energy generation capacity of a probable renewable energy power plant located in campus area is determined. Windographer software was used in the assessment of wind energy potential of the area. Chi-Square, Kolmogorov-Simirnov and Anderson-Darling fitness tests are applied in order to determine the probability model which wind speed values fit to. The study shows a statistical view to the suitability of wind data to Weibull distribution. Data acquisition will be carried on and the scope of the study will be enlarged in order to have approximate information about the wind energy potential of Eskisehir region.

Key words: Parameter estimation; Chi-Square; Kolmogorov-Simirnov; Anderson-Darling; wind energy potential.

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Electrochemical dehydrogenation of Liquid Organic Hydrogen Carriers (LOHC)

Frederic Buttler *, Chinmoy Ranjan, Robert Schlögl

Max Planck institute for Chemical Energy Conversion, Stifstr.34-36 45468 Mülheim an der Ruhr, Germany

ABSTRACT

Hydrogen is high in energy, can be found everywhere and when combined with oxygen in a fuel cell produces energy and water as the major products. The major drawback is the fact that hydrogen is a gas that needs big tanks or high pressure to be stored. One of the possible solutions is the idea of a Liquid Organic Hydrogen Carrier (LOHC). Hydrogen is stored on a liquid molecule and gets released upon heating when needed. An advantage over the other hydrogen storage methods, like compressed hydrogen, cryogenics and metal hydrides is that the LOHC has the features of a diesel like fuel. Furthermore big molecules like ethylcarbazole, tribenzyltoluol or other cyclic molecules can carry a lot of hydrogens (> 6 wt %). Until now these molecules get heated up over a catalyst to release the hydrogen. Most of the possible LOHC molecules need high temperatures (> 300°C) and show unwanted side products upon thermal dehydrogenation. Until now unexplored pathway for the dehydrogenation process is the electrochemical way. The hydrogenated molecules are electro oxidized on a metal catalyst and the products get analysed by different spectroscopic means like NMR or IR spectroscopy. As it is known from other fields of chemistry the use of electrochemistry can lead to a variety of reactions which can be controlled by potential. In other words the reaction can be driven into the desired direction. Besides the right LOHC and potential, the catalyst and the electrolyte are an important factor for a successful dehydrogenation. In addition to the dehydrogenation the chosen catalyst should be able to oxidize the released hydrogen. Therefore most of the tests were done on Pt, known as a good hydrogen oxidation catalyst. Most of the tested molecules were N-heterocycles which showed dimerization or polymerization reactions upon dehydrogenation. Other hydrocarbons will be tested.

Key words: Energy storage; hydrogen; fuel cell; electrochemistry.

* Corresponding Author

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Spontaneous combustion of Can Basin (Canakkale-Turkey) coals and its controlling factors: assessment of the environmental impact

Gulbin Gurdal [1], Hakan Hosgormez [2]

[1] Onsekiz Mart University, Engineering Faculty, Deparment of Geological Engineering, Canakkale, Turkey
[2] Istanbul, University, Engineering Faculty, Department of Geological Engineering, İstanbul, Turkey

ABSTRACT

In this study, we investigated intrinsic factors that impact spontaneous combustion susceptibility of Can Basin coals and the composition of gas formed by combustion. Additionally, the changes in the organic and inorganic constituents of coal due to spontaneous heating were examined in order to identify their possible health and environmental effects. A total of 38 Can coal samples (burned and partly burned coal samples) have been investigated by multidisciplinar approaches to be proximate, forms of sulphur, petrographical, mineralogical, and geochemical analyses. Furthermore, gas samples obtained from smoke outlets were analysed for their composition using a gas chromatograph (GC) and GC-MS methods. The investigated Can coals are humic and classified as lignite to sub-bituminous coals as a result of random huminite reflectance (0,38 and 0,54 %Rr), volatile matter (45,50 and 62,25 wt.%,daf), and upper calorific values (3419 and 6479 kcal/kg,maf). Our results indicated that high pyrite content of Çan coals is a significant factor promoting combustion in addition to rank and moisture. In general, major mineral contents of fired coal samples are made up of pyrite, quartz, cristobalite, tridymite, kaolinite, amorphous matter, and gypsum. Fumarolic minerals (sulphur blooming and ammonium chloride) forming on the surface of coal seams were monitored. Elements including beryllium, fluorine, scandium, vanadium, cobalt, nickel, copper, zinc, arsenic, selenium, zirconium, molybdenum, tungsten, mercury, tantalum, lead, and uranium were found to be higher in Can coal samples than the world average. The concentration of arsenic (max. 3319.7 µg/g) was relatively high and is the major hazardous element in the region. Coal combustion can be considered as one of the main sources of trace elements emissions to the atmosphere and from these elements arsenic, mercury, fluorine and selenium can also be emitted to the air via coal spontaneous combustion. Gases determined in the coal fire vents of the Can coalfields consisted of a complex mixture of hydrocarbons, greenhouse gases, and toxic concentration of CO, H_2S and benzene. Hydrocarbon concentrations ranged from 77 to 92%, and the dominant hydrocarbon gas was methane. Ethane (0.3 to 2.1%) and propane (0.2 to 1.4%) were also detected. Hazardous compounds such as 5-methyl-3-propyl-1,2-oxazole ($C_7H_{11}NO$), ethanediimidic acid, 1,2-dihydrazide ($C_2H_8N_6$), and 2,3-dihydrofuran (C_4H_6O); high concentrations of nitrogen (N_2) (max. 6.8%) and carbon dioxide (CO_2) (max. 18.2%); and low concentrations of carbon monoxide were also determined. Based on results, Can coal is reactive and susceptible to self-heating. Low rank and high pyrite content of Can coals enhances the process of spontaneous combustion. Atmospheric emissions of toxic gases result from coal combustion process, and the volatization of coal and mineral matter during spontaneous combustion may result in atmospheric pollution. Locally, due to toxic smoke, coal fires pose a serious health and safety risk. On a global scale, greenhouse gases (CO_2 and CH_4) from burning coal beds may contribute to climate change and alter ecosystems. As well as, fire, the results of spontaneous combustion, threatens safety and production in coal mines.

Key words: Coal; spontaneous combustion; environmental impact; Can Basin (Turkey).
* Corresponding Author

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Phase transition of high-purity $CaCO_3$ from yellowish FGD gypsum by a direct mineral carbonation method

Kyungsun Song *, Wonbaek Kim, Sangwon Park, Chi Wan Jeon

Korea Institute of Geoscience & Mineral Resources (KIGAM), Gwahang-no 124, Yuseong-gu, Daejeon, 305- 350, Republic of Korea

ABSTRACT

Mineral carbonation, one of the methods for CO_2 sequestration, is based on the weathering process of silicate minerals. Feedstocks for mineral carbonation have been extended to industrial wastes to bind CO_2 and produce carbonate minerals such as $CaCO_3$ or $MgCO_3$. We recently carried out an aqueous direct mineral carbonation using yellowish flue gas desulfurization (FGD) gypsum, a by-product at coal-fired power plants. The process showed high reactivity at ambient temperature and atmospheric pressure and can be described as follows:

$CaSO_4 \cdot 2H_2O + CO_2(g) + 2NH_4OH(aq) \rightarrow CaCO_3(s) + (NH_4)2SO_4(aq)$

In the process, we investigated the possibility of preparing high-purity $CaCO_3(s)$ by exploiting the induction period for $CaCO_3$ precipitation. $CaCO_3$ was found to exist in the dissolved state during the early stage of reaction, and could be separated from the yellowish impurities included in FGD gypsum by a simple filtering process. Carbamate species (NH_2CH^{2-}) existing in the early stage of reaction was likely to enable both Ca^{2+} and CO_3^{2-} ions to remain in the dissolved state beyond the saturation concentration for $CaCO_3(s)$. The amount of high-purity $CaCO_3$ proportionally increased with the ammonia concentration while the induction time was shortened as the CO_2 flow rate increases. The phase and morphology of $CaCO_3(s)$ were dependent on the amount of ammonia added. FE-SEM (field-emission scanning electron microscopy) and XRD (X-ray diffraction) were employed to identify the shape and morphology of the precipitated $CaCO_3$. Rhombohedral calcite was dominant when using a stoichiometric amount of ammonia and was replaced by round vaterite in an ammonia-excess condition. This study suggests a simple method for the production of high-purity $CaCO_3(s)$ using industrial by-products by mineral carbonation. It also demonstrates the morphology transition of $CaCO_3(s)$ depending on the stoichiometric condition of carbonation reaction.

Key words: Mineral carbonation; FGD gypsum; high-purity $CaCO_3(s)$; Induction time; Ammonia.

* Corresponding Author

mess@mess-earth.org

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Quinone-mediated biological and chemical reductions of carbon tetrachloride under iron- and sulphate-reducing environments

Ruey-an Doong [1]*, Huai-chih Chiang [2], Chia-min Lien [2]

[1] National Chiao Tung University, Institute of Environmental Engineering, Hsinchu, Taiwan
[2] National Tsing Hua University, Department of Biomedical Engineering and Environmental Sciences, Hsinchu, Taiwan

ABSTRACT

Quinone compounds such as humic substances, semi Quinone, hydroquinone, and mercaptoquinone are ubiquitously present in trace amounts in natural organic matter. These compounds have been reported to effectively transfer electrons from the bulk reductants to the organic pollutants. The addition of thiol compounds to quinones produces reactive electron transfer species that may be important for the transformation of chlorinated hydrocarbons in natural environments. In addition, the microbial reduction of iron oxides by Geobacter sulfurreducens has recently been recognized as an important process for the generation of Fe(II) as well as the degradation of organic contaminants under anaerobic conditions. However, the elucidation of the effect of quinone moiety on the biological and chemical reductions of chlorinated hydrocarbon is still a challenge. In this study, the effect of quinone moieties including lawsone (LQ), ubiquinone (UQ), juglone (JQ), 1,4-naphthoquinone (NQ) and AQDS on the biological and chemical reductions of carbon tetrachloride (CT) was investigated. For biological reduction of CT, the reductive dissolution of ferrihydrite by G. sulphurreducens can be enhanced by AQDS, NQ, and LQ. The bioreduction efficiency and rate of ferrihydrite was highly dependent on the natural property and concentration of quinone compounds. The addition of low concentrations of AQDS, LQ and NQ significantly accelerated the biotransformation rate of CT, presumably attributed to the fact that the produced ferrous ions would be crystalized into secondary iron oxides such as magnetite and goethite to accelerate the chemical dechlorination efficiency and rate of CT. The pseudo-first-order rate constant for (kobs) CT dechlorination in AQDS-, LQ- and NQ-amended batches were 5.4–5.8, 4.6–7.4 and 2.4–5.8 times, respectively, higher than those in the absence of quinone. The relationship between kobs for CT dechlorination and bioreduction ratio of ferrihydrite indicates that the biological reaction enhanced the bio-production of ferrous ions, while the formation of crystalline ferric oxide accelerated the chemical reduction of CT. For chemical reduction of CT, the use of thiol compounds as bulk reductant can effectively dechlorinate CT. The dechlorination of CT followed pseudo first-order kinetics and kobs was 0.051 d-1 for NaHS and 0.009 d-1 for cysteine. Addition of quinone compounds including AQDS, NQ and LQ significantly increased the rate and efficiency of CT dechlorination and the kobs for CT reduction was 2 orders of magnitude higher than those under biological conditions. Environmental factors such as pH and thiol concentration also significantly influenced the kobs for CT reduction. Results obtained in this study clearly indicate that both biological and chemical reactions would influence the fate and transport of chlorinated compounds in the contaminated environment, and the co-existence of thiol and quione compounds can accelerate the synergistic effect of biological and chemical reductions on the transformation of chlorinated hydrocarbons in the contaminated soils and groundwater.

Key words: Quinone moiety; iron-reducing conditions; Geobacter sulphurreducens; thiol compounds; carbon tetrachloride.

* Corresponding Author

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Key scientific problems faced in enhanced coal bed methane recovery with CO_2 sequestration in deep coal seams

Jiang Renxia, Yu Hongguan *, Wang Li

Shandong University of Science and Technology, School of Chemical and Environmental Engineering, 579 Qianwangang Road , Qingdao Economic & Technical Development Zone, Qingdao, Shandong Province, China

ABSTRACT

The injection of CO_2 into deep coal seems can enhance the recovery of coal bed methane (ECBM) and at the same time it is a very attractive option for geologic CO_2 sequestration as CO_2 is strongly absorbed onto the coal. Based on CO_2-ECBM/sequestration and O_2/CO_2 combustion technique, this paper presents the scientific problems, and a novel concept of "Zero Carbon Emission" for coal-fired power plant near coal mine. The paper gives some scientific problems concerning CO_2 sequestration and ECBM operations of deep coal seams, including CO_2 adsorption on coal, the interaction between supercritical CO_2 (Sc-CO_2) and coal, solubility of mineral matters in aqueous Sc-CO_2 solution, the thermodynamic parameters of CO_2 concerning with CO_2-ECBM/sequestration, the effect of CO_2-coal interaction on fluid flow and so on. The determination techniques of CO_2 adsorption, Equation of State, experimental conditions and coal swelling, may result in uni-modal, bimodal, negative isotherms and less reproducibility and repeatability of Sc-CO_2 adsorption on coal. Sc-CO_2 will extract small molecules trapped within the macromolecular network of coal, and will plasticize coal. Some of mineral matters in coal will dissolve in the acidic carbonated water formed solubility of CO_2 in water. The swelling and plasticization of coal, extracted small molecules and dissolved mineral matters caused by Sc-CO_2, will affect the flow of fluid in deep coal seams, which will be limited by the free space in the seams. These scientific problems concern the chemical, physical, and thermodynamic process when CO_2 is injected into a deep coal seam, and will require further research and development.

Key words: Deep coal bed methane; supercritical CO_2; enhanced recovery; sequestration; problems; O_2/CO_2 combustion.

* Corresponding Author

mess@mess-earth.org

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Primary study on mechanisms of coal extraction of supercritical CO_2 based on CO_2 sequestration in coal seam

Yu Hongguan *, Jiang Renxia, Wang Li

Shandong University of Science and Technology, School of Chemical and Environmental Engineering, 579 Qianwangang Road , Qingdao Economic & Technical Development Zone, Qingdao, Shandong Province, China

ABSTRACT

The investigation on mechanisms of coal extraction of supercritical CO_2 (Sc-CO_2) is important for understanding the main controlling factors of the coal extraction of Sc-CO_2 and the effect of the soluble organic matter of Sc-CO_2 on the CO_2 sequestration into coal seams. The process of Sc-CO_2 extraction of small organic compounds in coal involves: (1)the CO_2 diffusion and adsorption in coal matrix microspores, (2) the contact and solubilization of small organic compounds in coal matrix micropores with CO_2, and (3) CO_2 desorption and its extracts diffusion and sweeping out of the pores. The results show that CO_2 migration through the matrix micropores is mainly controlled by Knudsen diffusion, and the main controlling factor of Sc-CO_2 extraction is the matrix micropores structure which might be changed as CO_2 adsorption and desorption. The matrix swelling with CO_2 adsorption might induces the micropore diameter become smaller or even blocked, ultimately, it is difficult that the CO_2 diffuses to the matrix micropores and the extracts diffuse away from the pores. As the CO_2 pressure decreases to a low value (<6 MPa), the distinct shrinkage of coal matrix is favorable for extracts diffusion away from the pores and into free phase. After Sc-CO_2 extraction at high pressure, the extract recovery is higher at the low pressure with the equal amount of CO_2, especially for low rank coal. This indicates that the small organic compounds in coal might be migrated and enriched in low pressure region of coal seam for CO_2 sequestration.

Key words: Supercritical CO_2; extraction; coal; mechanism; matrix micropore; sequestration.

* Corresponding Author

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Supercritical CO_2 extraction of organic matter from coal based on CO_2 sequestration in coal seam

Jiang Renxia, Yu Hongguan *, Wang Li

Shandong University of Science and Technology, School of Chemical and Environmental Engineering, 579 Qianwangang Road , Qingdao Economic & Technical Development Zone, Qingdao, Shandong Province, China

ABSTRACT

To evaluate the potential for mobilizing organic matters in coal during CO_2 sequestration and enhanced coal bed methane recovery from deep coal beds, coal samples of different rank were extracted with supercritical CO_2 (Sc-CO_2) using an experimental device self-assembled. The results show that the extract yields decrease with the increase of coal rank, extraction temperature or coal particle size, and the extract yield of brown, bituminous and anthracite coal sample with the size <0.2 mm is 749, 218 and 201 mg/kg on a dry, ash-free basis at 40 ℃, respectively. The main small molecular organics in coal could be extracted at 40 ℃ with Sc-CO_2, especially for low-rank lignite and high-rank anthracite. The extract yield of coal with non-supercritical CO_2 is very low, but the highest quality of Sc-CO_2 extracts was collected at a low pressure (<7 MPa). The main control factors in Sc-CO_2 extraction of different rank coals may be different, being the dissolved-organics quality for lignite, the extraction temperature for bituminous coal, and the pore structure of coal for anthracite. These results demonstrate that the dissolved organics trapped within coal will mobilize with CO_2, and the effect of coal rank on this process, are important to consider when evaluating CO_2 sequestration into deep coal seams.

Key words: Supercritical CO_2; extraction; coal; organic matter; sequestration.

* Corresponding Author

mess@mess-earth.org

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Application of microwave energy at treatment of asbestos cement (eternit)

Ingrid Znamenáčková [1]*, Michal Lovás [1], Silvia Dolinská [1], Slavomír Hredzák [1], Vladimír Čablík [2], Milota Kováčová [1]

[1] Institute of Geotechnics of SAS, Watsonova 45, 040 01 Košice, Slovak Republic
[2] VŠB - Technical University of Ostrava, Faculty of Mining and Geology, 17. listopadu 15, 708 00 Ostrava - Poruba, Czech Republic

ABSTRACT

Microwave energy represents the perspective method for the intensification of different ways of treatment and processing of minerals, ores, rocks, wastes as well as coal and biomass. The interaction of microwaves with materials is mainly dependent on their dielectric properties, conductivity loss, and intensity of the electric field, specific heat, density and thermal conductivity. In asbestos cement materials, mainly the eternit roof ceiling, being widely applied in the past, represent a serious environmental load. The solar radiation, rain and frost cause the deliberation of cement from the eternit roofing and consequently the wind contaminates the surrounding area by the asbestos (chrysotile) fibres. The material known as asbestos in our country occurs mainly chrysotile mineral $Mg_3Si_2O_5(OH)_4$. The studied material was crushed and milled. Microwave heating was realized at power 2500 W in various times. We have focused on confirmation the presence respectively the absence of chrysotile in microwave irradiated in the asbestos cement sample (eternit).

Key words: Asbestos cement; microwave energy; heating.

* Corresponding Author

mess@mess-earth.org

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3D mineral potential mapping using a data-driven method in the southern Taebaek mineralized belt of Korea

Hyun-Joo Oh *, Seong-Jun Cho, You Hong Kihm

Korea Institute of Geoscience & Mineral Resources (KIGAM), Gwahang-no 124, Yuseong-gu, Daejeon, 305- 350, Republic of Korea

ABSTRACT

Three-dimensional (3D) regional-scale skarn-type mineral potential mapping was conducted in the southern Taebaek mineralized belt of Korea using a weight of evidence approach. A 1:50,000 geologic map was used to construct a 3D geological model using GOCAD software. Exploration criteria maps used as input parameters for the 3D geological model were also constructed based on 3D geological and mineral system models. The primary geological criteria for skarn mineralization in the study area included the distance from igneous bodies, the distance to faults, the distance to a mineral layer surface, key regions of strata, and magnetic susceptibility. To generate the binary pattern of the five criteria maps, the exploration criteria were reclassified as ‘‘favourable’’, and the other information as ‘‘non-favourable’’. The optimum cut-off for the binary pattern was determined by calculating the studentized value of contrast, C/S(C). The W+ and W- values were subsequently used as ratings for each criterion. The skarn-type mineral potential map was assembled from the exploration criteria maps with W+ and W- values. The result of the analysis was validated by comparison with previous mine locations in the study area. The high potential mineral area includes all known mines. Therefore, this map can be used to find new areas of high mineral potential, at depth, for future deposit-scale mineral exploration.

Key words: 3D; mineral potential map; exploration criteria; weight of evidence.

* Corresponding Author

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A study of the carbonate formation to reduce CO_2 within alkaline solutions

Sangwon Park *, Kyungsun Song, Chi Wan Jeon

Korea Institute of Geoscience & Mineral Resources (KIGAM), Gwahang-no 124, Yuseong-gu, Daejeon, 305- 350, Republic of Korea

ABSTRACT

We propose a novel CO_2 conversion technology based on use of an alkaline solution. In this investigation, alkaline solutions were used to fix CO_2 in the presence of metal ions. Generally, CO_2 gas was known to the weak acid gases. Like these weak acid gases could react (or absorb) with alkaline solution. In this point of view, our previous study used amine solution to convert the CO_2 gas into aqueous CO_2 such as H_2CO_3, HCO_3^- and CO_3^{2-}. These aqueous CO_2 make a metal carbonate when the metal ions were supplied in CO_2 saturated solution. However, the amine solution is little bit expensive to make a large scale plant. Therefore, it needs to replace the cheaper solution or chemical. In these reasons, NaOH and KOH were selected for this study and used at a concentration of 30 wt% in H_2O. Replacement of the selected alkaline solution was evaluated under normal temperature and pressure conditions. We also used a 30 wt% mono-ethanolamine solution to evaluate carbonate formation. Metal ions were supplied by Ca^{2+} from a $CaCl_2$ solution. We then monitored CO_2 fixation within the selected NaOH and KOH solutions. We confirmed that a precipitate formed within the selected alkaline solutions in the presence of CO_2 and metal ions. The product precipitate was then analysed by X-ray diffraction (XRD). Unexpectedly, no metal carbonate compounds formed except NaOH solution. The NaOH could make a little bit of calcium carbonate. However, its reproducibility is falling when we compared the 1st precipitates with 2nd precipitates. We hypothesize that the alkaline solutions reacted directly with CO_2 via neutralization. Alkaline solutions could be used to control various carbonate properties such as particle size and composition. Additionally, the precipitate could also be used in industrial processes that utilize K_2CO_3 and $NaHCO_3$. Our results contribute not only to basic research regarding the controlled formation of metal carbonates, but may also be applicable to CO_2 reduction technologies.

Key words: CO_2 separation; CO_2 conversion; CO_2 utilization; alkaline solution.

* Corresponding Author

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Feasibility study for the setting up of a safety system for monitoring CO_2 storage at Prinos field (Greece)

Panagiotis Lymperopoulos [1], Nikolaos Koukouzas [1], Seyed Shariatipour [2], Alexandros Tasianas [1]*

[1] Centre for Research & Technology Hellas, Chemical Process and Energy Resources Institute (CERTH/CPERI), 15125, Athens, Greece

[2] Coventry University, Faculty of Business, Environment and Society, Priory Street, Coventry, CV1 5FB, UK

ABSTRACT

Geological storage of CO_2 in subsurface geological structures can mitigate global warming. A comprehensive safety and monitoring system for CO_2 storage has been undertaken for the Prinos hydrocarbon field, offshore northern Greece; a system which can prevent any possible leakage of CO_2. This paper presents various monitoring strategies of CO_2 subsurface movement in the Prinos reservoir, the results of a simulation of a CO_2 leak through a well, an environmental risk assessment study related to the potential leakage of CO_2 or oil from the seafloor and an overall economic insight of the system. The results of the simulation of the CO_2 leak have shown that CO_2 reaches the seabed in the form of gas approximately 13.7 years, from the beginning of injection. From that point onwards the amount of CO_2 reaching the seabed increases until it reaches a peak at around 32.9 years. During the injection period, the CO_2 plume develops only within the reservoir. During the post-injection period, the CO_2 reaches the seabed and develops side branches. These correspond to preferential lateral flow pathways of the CO_2 and are more extensive for the dissolved CO_2 than for the saturated CO_2 gas. For the environmental risk assessment we set up a model, using ArcGIS software, based on the use of data regarding the speeds of the winds and currents encountered in the region. We also made assumptions related to the flow rate of CO_2. Results show that it only takes a period of 10 days from the start of oil leakage until the “Natura” protected areas start to be affected. CO_2 leakage modelling results show CO_2 to be initially flowing along a preferential flow direction, which is towards the NE. However, 5 days after the start of leakage of CO_2, the CO_2 is also flowing towards the ENE. The consequences of a potential CO_2 leak are considered spatially limited and the ecosystem is itself capable of recovering. We also tried to determine the costs necessary for the creation of such an integrated CO_2 monitoring program both during the CO_2 injection phase as well as during permanent storage. The most prevalent solution consists of purchasing both seismic equipment and Echosounder systems as well as privileging a monitoring system, which uses selected boreholes. The necessary period required for monitoring the study area is at least 20 years after the end of the CO_2 storage period at Prinos. To the overall monitoring time, we should also add a further 20 years that are required for the injection phase as well as 12 years for the storage phase. The operating costs for monitoring the CO_2 amount to 0,38per \$/ton CO_2 and the total cost for EOR at Prinos amounts to 0,45 \$/ton CO_2. With a relatively low cost, we are thus able to accommodate a major portion of the CO_2 captured in various industrial facilities across Greece. Furthermore, the revenues (or cost reduction) from sale of CO_2 to EOR helps CCS economics by producing oil with a lower CO_2 emissions “footprint.”

Key words: Safety system; monitoring; CO_2 storage; Prinos field; Greece.

* Corresponding Author

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Hydrophobic modification of calcite obtained by gypsum mineral carbonation process in the media of organic solvent

Chi Wan Jeon *, Soochun Choi, Sungwoo Lee, Kyungsun Song, Junhwan Bang, Sangwon Park

Korea Institute of Geoscience & Mineral Resources (KIGAM), Gwahang-no 124, Yuseong-gu, Daejeon, 305- 350, Republic of Korea

ABSTRACT

The gypsum powder produced in the process of flue gas desulfurization process was treated with ammonia water in the flow of carbon dioxide, after then obtained calcium carbonate in the form of calcite and ammonium sulphate. The calcium carbonate used as filler in the industrial fields such as plastics, rubber, paint should be required well-refined and dispersed form, especially. For this purpose, the surface properties of the calcite were modified from hydrophilic to hydrophobic nature by the direct blending and mechano-chemical methods in the media of organic solvent. Several materials were used as modifiers for the purpose of positively increased hydrophobicity and advanced functionality of calcium carbonate surface. The surface characteristic parameters of modified calcium carbonate showed better enhanced functionality demand for as fillers of raw polymer materials. To increase the specific surface area of calcium carbonate, the sample was initially pulverized and then heat treated at the range of 50 ~ 250 ℃ temperature. To perform the chemical surface treatment, the modifiers, such as aliphatic acids, aliphatic acetate salt and silane coupling agents, were dissolved in organic solvents and then mixed with calcium carbonate in the condition of direct blending with mechanical stirring and mechano-chemical stirred mill. The reaction process was preceded at room temperature and several experimental parameters; modifier concentration, aging time, etc., were varied in the different organic solvents. To evaluate the surface modification effect employed active ratio represents conversion ratio of surface polarity of modified calcium carbonate from hydrophilic to hydrophobic. The best results were obtained in the condition of high concentration of stearic acid (8%) and short aging time (1 hr.) with chloroform solvent and low concentration of stearic acid (0.2 %) and long aging time (24 hrs.) with 2-propanol solvent.

Key words: Gypsum process; mineral carbonation; calcite; hydrophobic modification.

* Corresponding Author

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Detoxification of chrysotile by the carbonation methods at low temperature

Kyoung Won Ryu [1]*, Sang Hoon Choi [1], Young Nam Jang [2], Hwan Ju Jo [2]

[1] Chungbuk National University, College of Natural Science, Department of Earth and Environmental Sciences, Chungbuk 28644, Korea

[2] Korea Institute of Geoscience and Mineral Resources, Geological and Environmental Research Department, Daejeon 305-350, Korea

ABSTRACT

Asbestos and asbestos-containing materials have been widely used in many applications such as insulators, asbestos cement and fireproof construction materials, because of their low thermal conductivity and high mechanical strength. However, asbestos is known to be extremely carcinogenic, especially in causing a severe asbestosis, lung cancer and pleural mesothelioma when the respiratory system is exposed to it. As a result, nowadays, in the most countries the mining, refinement and use of asbestos have been banned, apart from some exceptional applications. Chrysotile, a fibrous variety of serpentine with chemical formula $2[Mg_3Si_2O_5(OH)_4)]$ is the most important source of commercial asbestos. And chrysotile has long been the subject of mineral carbonation because it has a high Mg content and it is distributed abundantly worldwide. Most importantly, the aims of this study were to investigate significant changes in the surface morphologies of fibrous chrysotile to a non-hazardous material under economically viable and safe conditions through the thermo-chemical treatments and the direct mineral carbonation. A novel pretreatment method for the mineral chrysotile was proposed to develop an effective carbonation process for CO_2 sequestration. Basically, the method involved preheating a mixture of ammonium bisulfate(NH_4HSO_4), sodium hydrogen sulfate monohydrate ($NaHSO_4.H_2O$) and chrysotile and the subsequent aqueous carbonation. The addition of ammonium bisulfate and sodium hydrogen sulfate mono hydrate was found to stimulate the decomposition of chrysotile during chemical and heat treatment. X-ray diffraction analysis revealed that the starting material was pure chrysotile and it transformed into effremovite $[(NH_4)2Mg2(SO_4)3]$ or boussingaultite $[(NH_4)2Mg(SO_4)2{\cdot}6(H_2O)]$ by pre-treatments with NH4HSO4 in reaction tempetature 100°C~200°C for 2hr and trisodium hydrogen sulfate $[Na_3H(SO_4)2]$ and ferrinatrite, $[Na_3Fe^{3+}(SO_4)^3{\cdot}3H_2O]$ with 3M $NaHSO_4.H_2O$ in the range of 60°C~200°C for 30min. After thermochemical treatments of chrysotile with 3M $NaHSO_4.H_2O$, FT-IR spectrum of the special chrysotie were not observed except the band of 952cm-1 according to Si-O-Si streching vibration and this peak became considerably weak and exhibited broadening.

Key words: Asbestos; CO_2 sequestration; chrysotile; non-hazardous; thermos-chemical treatment.

* Corresponding Author

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Review of gas emissions to air related to shale gas operations

Paula Costa *, Ana Picado, Filomena Pinto, Justina Catarino

LNEG, Estrada do Paço do Lumiar, 22, 1649-038 Lisboa, Portugal

ABSTRACT

Environmental impact associated with large scale shale gas development is of major concern to the public, policy makers and other stakeholders. The major knowledge on the effects and consequences of shale gas exploration and exploitation comes, mostly, from shale gas practices in the United States. It is important to address differences in geological settings and societal environment between European countries and the US and the impact of these differences for the potential future development of shale gas in Europe. It is also important to evaluate whether or not the existing EU Directives and regulations appropriately apply to unconventional hydrocarbon extraction. This paper aims at assessing the impact of gas emissions related to shale gas exploration and exploitation and comparing emissions from shale gas with those of conventional fuel exploitation. The different sources and types of emissions (e.g., CH_4, NMVOC, NO_x, SO_x, PM, benzene, HPA, O_3) associated with the various phases of shale gas production were identified and reviewed. Other air pollutants were also assessed, but the information available was much lesser. The main concern, present in the many studies consulted is the GHG emissions. However more attention should be given to the other types of emissions. The evaluation of the different pollutants balance of shale gas takes into account all air emissions related to the (1) pre-production, (2) production, transportation, distribution and end-use of shale gas, (4) end of exploration and well closure. The most significant sources of GHG and other air pollutants emissions, during the pre-production phase, are well completion and gas treatment, but emissions from combustion sources (particulate matter, nitrogen oxides and hazardous air pollutants, and CO_2) are also present. The main emissions during production phase derive from the use of conventional equipment and leakage from gas distribution pipes. Regarding the end of exploration and closure phases, the main risk is leakage to the surface of hydrocarbon and other fluids from the well, or their migration between different formations. Some potential emission reduction techniques are also discussed and knowledge gaps are identified e.g. well and borehole integrity. The well and its integrity remains the weak spot in the system being the primary concern in environmental protection issues.

Key words: Emissions; air pollutants; shale gas; green house gases; environmental impact.

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* Corresponding Author

mess@mess-earth.org

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Hydrothermal liquefaction of macro algae to produce liquid biofuels

Filomena Pinto [1]*, Paula Costa [1], Patricia Magalhães [2]

[1] LNEG, Estrada do Paço do Lumiar, 22, 1649-038 Lisboa, Portugal
[2] FCUL, Campo Grande, 1749-016 Lisboa, Portugal

ABSTRACT

Macro algae are one of the most abundant natural resources on earth with low utilisation scales. Due to macro algae high photosynthetic capacity in relation to terrestrial plants, huge productivity is achieved, which allows high continuously productivity on a large scale. Macro algae can grow in different types of environments not competing with food industry for water or arable land. Besides, macro algae that exist in littoral areas, they may be grown in integration with agricultural, animal farming, aquaculture and mineral processing systems. Macro algae may grow in association with aquaculture using the nutrients that still remain in the aquaculture discarded waters, contributing to bioremediation of these wastewaters. Similar process integration may be applied for cleaning the waste waters produced by animal farming. In Portugal high volumes of such waste waters are produced, especially by poultry and pig Intensive animal farming. These waste waters have a very negative environmental bearing and they need to be treated before they could be discharged, but the nutrients that they contain may be used in a productive in macro algae growth. Besides the very good nutrient absorption of macro algae, promoting bioremediation of wastewaters, they may also have an important role in helping carbon capture and sequestration (CCS). Macro algae may be used in different utilisations for instance in food, pharmaceuticals and cosmetics industries. But the huge amounts that will be produced in association with food production chains encourage the development of different end-uses, such as the production of liquid biofuels to be used in the transportation sector. Due to the high moisture content of macro algae, hydrothermal liquefaction is a promising process for their conversion into liquid biofuels. Hydrothermal liquefaction occurs in subcritical conditions and allows conversing biomass with high moisture contents into bio-oil with high yield, as water is used as a solvent and a catalyst. The main advantage in relation to conventional thermochemical processes are the possibility of using wet biomass with water contents higher than 70 to 80%, thus the high cost drying process is not needed. Another advantage is the higher conversion rates, as not only lipids, but also carbohydrates and proteins are converted into liquid biofuels. Hydrothermal liquefaction is dependent on experimental conditions, namely temperature, pressure, reaction time and macro algae/water ratio. The macro algae fucus vesiculosus was selected for this work, because it exists in high quantities in Portuguese sea cost. The results obtained showed that reaction temperatures is one of the most important parameters. Reaction temperatures from 275º to 350°C and reaction times in the range of 15 and 60 minutes were studied. The results obtained led to the selection of the following conditions: temperature of 325ºC, reaction time of 30 minutes and macro algae/water ratio of 1/20. At these conditions it was possible to produce around 65% of liquid biofuels in dry basis. This paper will analyse the effect of operation conditions on macro algae conversion into liquid biofuels and will fully discuss the results obtained.

Key words: Macro algae growth; hydrothermal liquefaction; bio-oils; wastewaters cleaning; CCS.

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Automated mineral analysis to characterize metalliferous mine waste

Ana-Sophie Hensler *, Bernd G. Lottermoser, Peter Vossen, Lukas C. Langenberg

RWTH Aachen University, Institute of Mineral Resources Engineering, Wüllnerstr.2, 52062 Aachen, Germany

ABSTRACT

At metal mine sites, a solid understanding of the properties of mine wastes is needed to evaluate the nature and extent of metal contamination and to assess the potential threats to human health and the environment. Today's mine waste characterization exclusively relies on geochemical static tests to classify materials based on their propensity to generate acid mine drainage. Unfortunately, such risk assessment does not consider mineralogical properties of wastes nor the fact that environmentally significant elements such as Cd and Zn may be mobile at near-neutral to alkaline pH values, leading to neutral metalliferous drainage. The objective of this study was to investigate the applicability of automated QEMSCAN® mineral analysis combined with bulk geochemical analysis to evaluate the environmental risk of non-acid producing mine waste present at the historic Albertsgrube Pb-Zn mine site, Hastenrath, North Rhine-Westphalia, Germany. At this site, there is ca. 4500 m2 large mine dump, which is erodible and largely unvegetated and contains ca. 100000 m3 of unconsolidated, oxidizing, generally sulfidic waste, with particle sizes ranging from clay to sand. Geochemical analyses of bulk samples demonstrated elevated average abundances of As (127 ppm), Cd (397 ppm), Cu (151 ppm), Mn (3641 ppm), Pb (>1 wt%), Sb (61 ppm) and Zn (>1 wt%) and near neutral to slightly alkaline paste pH values. Mineralogical analyses on representative samples, using the QEMSCAN® automated mineral/phase analysis system, revealed diverse mono- and polymineralic particles across all samples, with grain sizes ranging from a few µm up to 2000 µm. Calcite and dolomite (up to 78 %), smithsonite (up to 24 %) and Ca sulfate (up to 11.5 %) are dominant minerals in the coarse-grained fraction. By contrast, significant amounts of quartz, muscovite/illite, sphalerite (up to 10.8 %), galena (up to 1 %), pyrite (up to 3.4 %) and cerussite/anglesite (up to 4.3 %) are present as fine-grained particles (<500 µm). QEMSCAN® analysis also identified accessory sauconite, coronadite/chalcophanite, chalcopyrite, jarosite, apatite, rutile, K-feldspar, biotite, Fe (hydr) oxides/CO3 and unknown Zn Pb(Fe) and Zn Pb Ca(Fe Ti) phases. The mineralogical hosts of As, Cd and Sb could not be identified using QEMSCAN® analysis, yet it appears likely that these elements are included as trace elements in sulfides (e.g. sphalerite, galena). Many of the metal-bearing sulfide grains occur as separate particles that are not or not fully enclosed by other phases. Thus, the abundance of reactive sulfide grains with exposed surface areas is of environmental concern because such mineralogical hosts will continue to release metals and metalloids (As, Cd, Sb, Zn) at near neutral pH into ground and surface waters. In conclusion, automated QEMSCAN® mineral analysis allows acquisition of fully quantitative data on the mineralogical composition of mine wastes and their textures and grain sizes. The technique also permits the recognition of mine waste as "high-risk" material that would have otherwise been classified by traditional geochemical tests as benign. Thus, automated mineral analysis represents a valuable tool for the environmental risk assessment of mine waste.

Key words: Mine waste; metals; QEMSCAN®.

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Indoor air quality monitoring in retrofitted apartment buildings

Robert Wawerka *, Vojtěch Hrůza, Petr Komínek

Brno University of Technology, Faculty of Civil Engineering, AdMaS Centre, Purkyňova 139, 612 00 Brno, Czech Republic

ABSTRACT

The demand for energy consumption reduction and overall energy efficiency in buildings (Directive 2010/31/EU) in recent years led to an improvement in buildings envelope quality in terms of thermal properties and airtightness of newly constructed buildings as well as of those of an older age. And while this is certainly a good progress, there are also some not so positive effects. As we focus on energy consumption reduction and energy efficiency, we often neglect other equally important parameters such as indoor environment quality, mainly indoor air quality (temperature, relative humidity or CO_2). And while this isn't much of an issue for modern office, commercial and other mechanically ventilated buildings, it becomes an increasing problem of the naturally ventilated ones, especially for the newly renovated buildings such as schools, apartment buildings etc. CO_2 concentrations in these buildings oftentimes get alarmingly high. The paper describes long term indoor air quality monitoring (temperature, relative humidity, CO_2) in the existing housing estate, within the pilot project in the city district of Brno - Nový Lískovec in the Czech Republic. The indoor air quality monitoring was performed in selected concrete block of flats in retrofitted buildings from communist era. The IAQ monitoring results present inadequately ventilated areas within the apartments in refurbished buildings. The appropriate measures and principles related to IAQ improvement are discussed and presented.

Key words: Indoor air quality; CO_2; apartment; retrofitting.

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Co-liquefaction behaviour of Elbistan lignite and olive bagasse

Mesut Karta [1]*, Tolga Depci [1], Huseyin Karaca [2], Mehmet Onal [1], M. Ali Coskun [2]

[1] Department of Mining Engineering, Inonu University, Malatya, Turkey
[2] Department of Chemical Engineering, Inonu University, Malatya, Turkey

ABSTRACT

In the present study, co-liquefaction potential of Elbistan lignite and Balikesir olive bagasse were investigated by direct coal liquefaction process. The olive bagasse is a cheap and abundant biomass, so it is used to decrease the cost of oil production from the lignite. The effect of blending ratio of the lignite and the olive bagasse on liquefaction conversion and oil yield were investigated. Characterization studies of the starting materials were done using XRD, FTIR, DTA/TG and elemental analysis. Elemental compositions of liquefaction products were also determined and the composition of the obtained oil was identified by GC/MS. DTA and TG results indicated the synergistic effect of the lignite and the olive bagasse and maximum oil conversion (36 %) was obtained from 1:3 blending ratio of the lignite:the olive bagasse. The results showed that the obtained oil was paraffinic-low waxy oil with 22.5 MJ/kg of calorific value and 0.95 gr/cm^3 density.

Key words: Elbistan lignite; olive bagasse; co-liquefaction; biomass

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Liquefaction potential of Adiyaman peat

Huseyin Karaca [1]*, Tolga Depci [2], Mesut Karta [2], M. Ali Coskun [1]

[1] Department of Chemical Engineering, Inonu University, Malatya, Turkey
[2] Department of Mining Engineering, Inonu University, Malatya, Turkey

ABSTRACT

Adiyaman has a huge peat reserve and peat has been used for agricultural purposes in this region. High carbon and hydrogen content and low sulphur ratio indicate that it is a cheap, abundant and renewable energy source. In addition, on the contrary of pyrolysis and gasification process of peat studies, liquefaction properties of peat have not been fully researched, so it is a promising study. In the present study, liquefaction potential of Adiyaman peat was searched by direct liquefaction technique to obtain oil as a fuel purposes. The peat and liquefaction products, named char, asphaltene, preasphaltene and oil, were characterized by XRD, FTIR, SEM, DTA/TG and elemental analysis. The compositions of the obtained oil were also identified by GC/MS. The results indicated that the obtained oil was paraffinic-low waxy oil with 21.73 MJ/kg of calorific value and 0.93 gr/cm3 density and it composed of naphthalene and phenolic groups. The oil conversion ratio was found as 29 %.

Key words: Adiyaman peat; liquefaction; waxy oil; particle size.

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Utilization of polyethylene waste and polypropylene wastes for formation of fine copper ore concentrates

Danuta Szyszka *, Jadwiga Więckowska

Wroclaw University of Technology (WUT), Faculty of Geoengineering, Mining and Geology, Wybrzeze Wyspianskiego 27, 50-370 Wroclaw, Poland

ABSTRACT

The possibilities for utilization of polyethylene waste and polypropylene waste as binding material for formation fine grain of copper ore concentrate in Hake Rheomix were examined. The optimum parameters of the formation processes were established. Strength, thermal and microscopic properties device apparatus of the products were determined.

Key words: Formation copper ore concentrate; polyethylene waste; polypropylene waste.

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Evaluation of coupling nitrogen removal and growth of microalgae using domestic wastewater

Melike Gürel [1]*, Didem Okutman Taş [1], Güçlü İnsel [1], Elif Pehlivanoğlu-Mantaş [1], Emine Çokgör [1], Tuba İça [2], Elif Banu Gençsoy [3], Faezeh Movahedpour [4], Eyüp Görgün [3], Murad Özbaşaran [3]

[1] Istanbul Technical University, Faculty of Civil Engineering, Environmental Engineering Department, 34469 Maslak, Istanbul, Turkey

[2] Dumlupınar University, Faculty of Science and Letters, Department of Biology, Evliya Çelebi Yerleşkesi Tavşanlı Yolu 10. km, Kütahya, Turkey

[3] Crop Ecology, Department of Plant Eco-Physiology, Faculty of Agriculture, University of Tabriz, Iran

[4] Norm Çevre Teknolojileri Sanayi ve Ticaret A.Ş., ITU Arı Teknokent Teknoloji Geliştirme Bölge Şubesi, ITU Ayazağa Kampüsü, Arı 6 Binası No:203 34469 Maslak Sarıyer, Istanbul, Turkey

ABSTRACT

Microalgae-based wastewater treatment is an economical alternative for nutrient removal if it is integrated in the existing conventional wastewater treatment plants. This process becomes very attractive for the treatment of secondary effluent because of the lack of carbon requirement for nitrogen and phosphorus removal. The aim of this paper is to evaluate and compare the performance of Chlamydomonas Reinhardtii (CR) and Botryococcus Braunii (BB) when domestic wastewater effluent after UV disinfection together with p49 and Bold Basal's Growth Synthetic Medium (BBM) are used as media for CR and BB, respectively. The trials were carried out in an effective volume of 0.4 L erlenmeyer flasks, operated at constant aeration with filtered air at a temperature of 25 ± 1 ^{o}C, photoperiod of 16:8 light:dark cycles, and 35-40 µmol photon $m^2.s^{-1}$ light density. Runs were started approximately with an optical density (OD) of 0.4 at 10 and 40 mg NO^{3-}N/L concentration for the synthetic media and wastewater effluent. The growth of algae was assessed daily by means of optical density (680 nm), Chlorophyll-a, and dry weight of algal biomass. Nitrate nitrogen, nitrite nitrogen, phosphate and pH were also analysed. The results of algal growth are provided. The effect of using effluent wastewater instead of synthetic media will be evaluated in detail in the full manuscript. The nitrogen removal achieved in wastewater were determined as 46% and 69% for Chlamydomonas Reinhardtii and Botryococcus Braunii, respectively, at the end of experiments.

Key words: Chlamydomonas Reinhardtii; Botryococcus Braunii; wastewater; autotrophic growth.

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Evaluation of ultrasonication effect on the anaerobic digestion of domestic sludge

Didem Okutman Tas, Gülsüm Emel Zengin Balci, Gülten Yüksek, Irmak Bati Onay, Emine Cokgor *

Istanbul Technical University, Department of Environmental Engineering, 34469 Maslak, İstanbul, Turkey

ABSTRACT

A large amount of waste activated sludge is generated in wastewater treatment plants and the cost of sludge management increases tremendously due to the expansion of population and industry. Anaerobic digestion is known to be a conventional and economical method as it reduces the sludge volume, generates energy-rich biogas in the form of methane and produces a stabilized sludge. Anaerobic stabilization has often been limited due to the longer retention time and low degradation efficiency of WAS. The remaining non-digestible material in WAS is known to be inorganically bound carbon or slowly digestible organics that needs to be converted to biodegradable material for an effective stabilization. The increase in the biodegradability potential in WAS after the ultrasonication will improve the anaerobic digestion performance of the sludge. This study investigates the characterization and anaerobic treatability of domestic waste activated sludge using ultrasonication as a pre-treatment technique. Sludge samples were obtained from a nutrient removing biological wastewater treatment plant. The ultrasonic disintegration was performed with an ultrasonic homogenizer (Bandelin Sonopuls HD 2200, Berlin, Germany) equipped with a VS 70T probe. The ultrasonic unit has an operating frequency of 20 kHz and a power supply of 200 W. The amplitude of 100% was applied for a 200 mL of WAS sample which resulted in a sonication density of 1 W/mL. Ultrasonic specific energy of 2000 to 50000 kJ/kg TS was studied with variable sonication time to obtain the optimum value for anaerobic stabilization. Specific energy input of 3700 and 9500 kJ/kg TS were selected for further anaerobic digestion experiments regarding on the soluble COD (SCOD) release, sludge dewaterability characteristics, subsequent anaerobic stabilization performance. Methane production increased 3 and 30% according to control when the specific energy increased from 3500 kJ/kgTS to 9000 kJ/kgTS, respectively.

Key words: Sludge stabilization; minimization, ultrasonication, anaerobic digestion.

* Corresponding Author

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New estimation of unconventional gas resources in the Cantabrian Palaeozoic Basin (NW Spain)

Pablo Cienfuegos *, Efrén García-Ordiales, Rocío García-Menéndez, Rodrigo Álvarez, Jorge Loredo

University of Oviedo, Department of Mineral Exploration, ISYMA Research Group,13 Independencia St. 33004 Oviedo, Spain

ABSTRACT

Main “shale gas” projects in the USA are located in areas corresponding to ancient deep sea environments of upper Paleozoic basins, in the contact areas of foreland basins with the front thrusts of the "Ouachita Mountains" and the Appalachian Trail. In Europe, studied potential “shale gas” resources are mainly storaged in Palaeozoic materials, where the Cantabrian Palaeozoic Basin, in northern Spain, is well known as a potential reservoir of fossil conventional resources. The shale gas resources evaluation included in the current Spanish national inventory can be considered underestimated because of the lack of a deep knowledge in these geological formations. In this context, the recent construction of two tunnels (25 km long each) through the Cantabrian Mountains for railway uses, allowed measurements in gas content which confirm the presence of important unconventional gas resources in different geological units. Gas concentrations (mainly methane) were detected from Carboniferous to Cambrian shales of the San Emiliano, Huergas, Valporquero and Formigoso Formations. Quantified gas resources in sandstones and shales were in the order of 25 m3/t and the average gas flow in tunnels was about 25.000 m3/day. Continuous measurements made during the construction works showed that gas shale is mainly associated to the San Emiliano Formation, which can be considered as the most interesting shale gas target in the area. Laboratory studies performed on the San Emiliano shales, showed mean values for Thermal Maturity (Ro) and Total Organic Content (TOC) in the order of 0.6% and 1% respectively, which can be considered as favourable values for preliminary studies in order to evaluate the potential of shale gas resources. A preliminary shale gas assessment accomplished on the San Emiliano Formation, with a minimum gas content estimated from 8 to 12 m^3/t, shows that potential shale gas in this geological formation ranges between 50 to 100 Tcf (1 Tcf = 30×109 m^3) making this formation as one of the most important potential gas reservoir in Spain.

Key words: Shale gas; unconventional resources; Spain.

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Determination of the surface energy of natural zeolite by inverse gas chromatography

Ceyda Bilgiç [1]*, Naile Karakehya [2]

[1] Eskişehir Osmangazi University, Faculty of Engineering and Architecture, Department of Chemical Engineering, 26480 Eskişehir, Turkey

[2] Eskişehir Osmangazi University, Eskişehir Vocational School, Environmental Control and Protection Programme, Eskişehir, Turkey

ABSTRACT

Natural zeolites form where volcanic rocks and ash layers react with alkaline groundwater. Zeolites also crystallize in post-depositional environments over periods ranging from thousands to millions of years in shallow marine basins. Naturally occurring zeolites are rarely pure and are contaminated to varying degrees by other minerals, metals, quartz, or other zeolites. Gas–solid chromatography (GSC), when applied to the investigation of solid surface properties, is usually called inverse gas chromatography (IGC). This method is based on the study of physical adsorption of appropriate molecular probes by means of chromatographic (dynamic) experiments. In contrast to static methods, dynamic systems utilize a flowing gas system. The most common flow methods are IGC, gravimetric instruments, and permeability measurement systems. The principle of dynamic gravimetric systems is the measurement of the amount of solute adsorbed from a flowing gas stream using a microbalance. Dynamic measurements give less accurate results when compared with static methods because they rely on measuring a small difference between quantities at different temperatures. However, for heats at zero coverage, infinite dilution gas chromatography is a more reliable method because it requires no extrapolation of data over a region where the heat can be very sensitive to small changes in coverage. In this study, purified zeolite was prepared by decantation and centrifugation process was applied. The structural and morphological characteristics of the zeolites produced were studied with BET analysis, and surface properties were investigated by IGC. We showed that inverse gas chromatography is a powerful analytical technique very useful for studying the surface properties of zeolite and for monitoring adsorption processes. Thermodynamic information on adsorption was obtained from the temperature variation of the partition coefficients for probes at zero coverage. The high value of the dispersive component of free energy of adsorption probably was related to structural heterogeneities on the lateral surfaces, as well as to the channels and pores present at 210–240 °C.

Key words: Surface energy; inverse gas chromatography.

* Corresponding Author

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Thermal decomposition of copper ore concentrate and polyethylene composites

Danuta Szyszka *, Jadwiga Więckowska

Wroclaw University of Technology (WUT), Faculty of Geoengineering, Mining and Geology, Wybrzeze Wyspianskiego 27, 50-370 Wroclaw, Poland

ABSTRACT

Thermal analyses (TG and DTA) of the composite, comprised of 10% polyethylene (PE) scrap and 90% copper ore concentrate, enabled determination of the temperature range and decomposition degree of the organic matters in argon atmosphere. Products of pyrolysis were qualitatively and quantitatively determined. The results were compared to those obtained for products of pyrolysis of the composite in air. Products of pyrolysis were identified by means of the gas chromatography (GC) method alone or supported with results of mass spectrometry analyses (GC-MS).

Key words: Polyethylene; copper ore concentrate; composite; pyrolysis.

* Corresponding Author

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Assessment of acute toxicity of diclofenac on anaerobic biotransformation

Didem Okutman Tas *, Sevgi Sarı, Emel Topuz, Egemen Aydin, Elif Pehlivanoglu Mantas

Istanbul Technical University, Department of Environmental Engineering, 34469 Maslak, İstanbul, Turkey

ABSTRACT

According to the recent studies, Diclofenac has been implied as a potential concern due to its increasing occurrence in the environmental compartments as a result of rising global consumption. Diclofenac has been identified as a problem for the water cycle because of its low removal rate during wastewater treatment processes. Removal of diclofenac in wastewater treatment plants is often incomplete. Besides, potential toxic effects have been previously observed at environmentally relevant concentrations on aquatic organisms. The potential for biomagnification of diclofenac in the food chain ultimately in human requires the investigation of diclofenac treatment methods in wastewater treatment plants in addition to its toxicity survey. In order to investigate both the biodegradation as well as toxicity potential of diclofenac under anaerobic conditions, an enrichment culture was developed from sediment sample taken from Alibeykoy Creek (Sediment A) in Istanbul, Turkey. The culture was initiated by diluting 80 g of the sediment in 2 L of mineral media in a N2-flushed, 3 L glass flask reactor, capped with a Teflon-lined stopper. After 2-months incubation period a second generation culture was started. During the 7-day feeding cycle, glucose, yeast extract, and diclofenac in methanol were added resulting in initial concentrations of 300 mg/L, 17 mg/L, and 1 µg/L, respectively. The effect of initial diclofenac concentration on the biotransformation potential was investigated with this second generation enrichment culture. Five culture series were prepared with initial diclofenac concentration of 0, 10, 50, 200 and 1000 µg/L. The cultures were monitored for 45 days incubation period. In the culture amended with 1000 µg/L diclofenac, 10% decrease in methane production was observed. A decrease in the Volatile Suspended Solids (VSS) concentration was observed at the end of 30 days incubation period with increasing initial diclofenac concentration. Diclofenac removal at different initial concentrations ranged between 18 and 54%. Higher removal efficiencies have been observed at higher concentrations of diclofenac.

Key words: Methanogenesis; pharmaceutical; micro-pollutant; anaerobic degradation.

* Corresponding Author

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Coal heating value estimation using genetic programming based symbolic regression method

Ali Volkan Akkaya *

Yildiz Technical University, Department of Mechanical Engineering, 34349 Besiktas, Istanbul, Turkey

ABSTRACT

Higher heating value (HHV) is important parameter for coals because of its influence on the quality, cost and design of coal based technologies. Generally, sophisticated experimental devices are used to measure higher heating value by an expertise. However, the experimental methods are time-consuming and comparatively expensive. In addition to this, the estimation models can be developed and used easily to determine higher heating value. Therefore, in the literature, it can be found a number of empirical HHV estimation models with using proximate or ultimate analysis components as input variables. It should be emphasized that there is nonlinearity between some the proximate or ultimate analysis components and HHV. In spite of the nonlinear relationship, most of the proposed estimation models are based on linear regression method. The fundamental reason of this is that linear equation is simple and easy to use in real problems. However, these linear models may failure when they are tested with the different coal samples. Recently, computing intelligence based HHV estimation models (e.g. artificial neural network and fuzzy logic) were developed. These methods can provide generally higher estimation performance and generalization ability due to their nonlinear features. On the other hand, the main disadvantage of these models is that its utilization is not practical and they need experts to use. Consequently, it is required to develop HHV estimation model not only giving high estimation performance but also provides relatively simple model equation. In this context, symbolic regression based on genetic programming can be promising method to solve this problem. This method explores the forms of nonlinear equation and optimize its parameters at the same time in order to derive a mathematical equation describing the relationship between input and output variables for a specified modelling problem. Accordingly, in this study, a symbolic regression based genetic programming is utilized to obtain estimation model equation for coal higher heating value. In this modelling process, 143 coal samples representing entire geographic regions of Turkey are used. Proximate analysis components such as moisture, ash, volatile matter and fixed carbon are considered as model input variables. The coal data is divided to two groups as modelling and test parts. The estimation performance of the developed model equation are evaluated by some statistical criteria such as squared correlation coefficient, average relative error and root mean squared error. Finally, the developed model results are compared to those of models given literature. The results indicate that GP based symbolic regression model not only gives high estimation performance but also provide practical usage in terms of engineering applications.

Key words: Higher heating value; coal; symbolic regression; genetic programming; estimation model.

* Corresponding Author

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An investigation of volatile fatty acids in UASB reactor treating landfill leachate

Ebru Akkaya *, Ahmet Demir, M. Sinan Bilgili, Bestamin Özkaya

Yildiz Technical University, Department of Environmental Engineering, Esenler, Istanbul, Turkey

ABSTRACT

Increasing waste generation results in considerably quantity of leachate involving organic and inorganic pollutants in landfill sites. Therefore, it is obvious that this complex wastewater must be treated by convenient methods. In the past decades, the laboratory, pilot and full-scale treatment applications of landfill leachate have been carried out with physical, chemical, biological processes and their combinations. In addition to this, the fact that the characteristics of municipal solid wastes are different from a city to a city affects considerably the quality of leachate and the applied treatment method. In this context, understanding both the characteristic parameters of leachate and their relationship with treatment process is crucial to obtain efficient anaerobic treatment. For instance; pH, COD, BOD and alkalinity can be considered as some of main leachate parameters. The other important parameter is volatile fatty acid (VFA). VFA generally are present in leachate as the form of acetic, propionic and butyric acid. They are released in landfill for the period of anaerobic phase and they are readily biodegradable. During anaerobic treatment, VFAs together with other important parameters should be monitored because of influencing on biogas production and treatment efficiency. In this study, the removal of VFAs (acetic, propionic, butyric, iso-butyric, n-valeric, iso-valeric, n-kaproic, iso-kaproic, heptonic) in an UASB (upflow sludge blanket reactor) treating landfill leachate was investigated. In addition, the effect of VFAs on biogas production and treatment efficiency of UASB was evaluated. Leachate used in this study was obtained from Odayeri Sanitary Landfill Site located in the European side of Istanbul, Turkey. The performance of the UASB reactor was evaluated in terms of COD, CH4 to COD ratio, VFAs. As a conclusion, it was observed that acetic, butyric and propionic acids were a significant part of VFAs in raw leachate, and almost all were removed in UASB. Furthermore, VFA affected biogas production and treatment efficiency, which depending on other parameters such as alkalinity value.

Key words: Anaerobic treatment; leachate; VFA; biogas.

* Corresponding Author

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Drag-out recovery in surface coating industry by membrane filtration system

Tarık Kotan [1]*, Gülfem Bakan [2]

[1] 19 Mayıs University, Yeşilyurt Demir Çelik Vocational School of Higher Education, 55300 Tekkeköy, Samsun, Turkey
[2] 19 Mayıs University, Department of Environmental Engineering, 55215 Atakum, Samsun, Turkey

ABSTRACT

In this study, It is aimed that production steps be evaluated within the scope of Sustainable Production approach and Best Available Techniques and Technologies to reduce the amount of water, chemicals, energy and the pollution load in the current waste water treatment plant be determined in a manner in which eco-efficiency of a metal coating company would be increased. Drag-out is an important pollutant source for the metal finishing (coating) industry. This study focuses on improvements in process and drag-out recovery through use of nano filtration system in metal plating industry. Administrative and technological measures to minimize the losses resulting from drag -out in system have been reviewed. Water and chemical recovery can be provided by setup eco tank and recovery technologies. As a result of the laboratory scaled applications, Recovery experiments of rinsing waters in coating line were made by membrane filtration (NF) technique and 70-85% of drag-out recovery was obtained. Chemicals and water recovery can be made in all acidic coating system (after determination of rinsing ratio and load) by membrane filtration and these technique is feasible for evaluation of environmental, technical and economic. By this means, it was noted that pollutant concentration to wastewater treatment plant has been reduced by 80%. With regard to this study, it was determined that evaluation of recovery chances would be more economic and the investment would pay for itself in a shorter period. Besides, waste production may be prevented substantially by first taking administrative measures in best technique practices.

Key words: Sustainable production; drag-out recovery; membrane filtration; surface coating industry.

* Corresponding Author

mess@mess-earth.org

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Investigation the effect of additives on well cement's exothermic heat development throughout setting period

Mustafa Hakan Ozyurtkan *, Azimjan Dovletyarov, Sulayman Matkuliyev, Sardar Asadov

Istanbul Technical University, Faculty of Mines, Petroleum and Natural Gas Engineering Department, Maslak, 34469 Istanbul, Turkey

ABSTRACT

Sustained Casing Pressure (SCP) described as pressure accumulation between and/or behind the casing annulus due to flow through cement matrix. One of the main reason of SCP is the development of fractures on cement matrix exposed to the exothermic reaction heat during setting by creating pathways for any undesired formation fluid flow through surface and/or other formation(s). The aim of this study is to investigate the effect of additives on exothermic heat generation. This study is an experimental work carried out to observe the cement setting heat. The impact of commonly used cement additives such as friction reducer and fluid loss controller on exothermic setting reaction of cement had been investigated at ambient condition. The thermal alteration of the cement slurries having various different compositions had been observed after pouring them in a thermally isolated cell by using a high resolution thermocouple for a period of 24 hours. The effect of cement friction reducer on heat generation was more considerable than those of fluid loss controller. The highest temperature observed by only cement friction reducer added cement samples was 155 0F. For only fluid loss controller added samples, the observed highest temperature was 130 0F. When both additives coupled in the cement composition together, the maximum temperature escalation was 120 0F. The results pointed out that the additives considerably increased the heat generated on setting period. Additionally, the effect of additives on setting reaction time was also investigated. The additives shifted the setting reaction time of well cement more than 6 hours in some compositions. Such situation may be one of the reasons of SCP evolution mechanism by creating pathways like micro and/or macro fractures on cement matrix. Consequences of permeable oil well cement could be catastrophic and result in economic loss of hydrocarbon production, environmental pollution, and the most importantly the loss of lives. The obtained results might create an awareness on the importance of consideration the effect of heat while designing the well cement slurries.

Key words: Well cement; setting; additives; exothermic heat.

* Corresponding Author

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Sap flow measurements integrating tree foliage and rootage help to better specify the radiant energy load and cooling efficiency of forest stands

Jan Čermák [1]*, N. Nadezhdina [1], J. Kučera [2]

[1] Mendel University, Institute of Forest Botany, Dendrology and Geobiocenology, Zemědělská 3, 61300 Brno, Czech Republic

[2] Environmental Measuring Systems, 62100 Brno, Czech Republic

ABSTRACT

Precise estimation of energy load needed in studies of transpiration or photosynthesis is rather a difficult task, because of very complicated structure of tree crowns and particularly geometrical distribution of individual leaves creating foliage. In fact the same or even more complicated structures we can find when determining similar distribution of root systems down to individual absorptive roots. However, we must not be always fixed on detail geometry, when considering complicated structures, if we can use natural integrators, such as sap flow (Q_w). It gradually summarizes behavior of all absorptive roots when supplying water to all transpiring leaves through the main stem and allows estimations of impact of stresses by drought or hypoxia. It is enough to know only roughly position of rootage say in vertical soil layers around stems (as estimated through analysis of radial patterns of sap flow in different sapwood depths (Čermák et al. 2004, 2008 Nadezhdina et al. 2006) and similarly rough position of foliage: upper crown – exposed (sunlit) and lower crown (shaded). This can be estimated through classical biometric analysis of leaf distribution (Čermák 1998) and derived from corresponding allometric relationships) or from diurnal courses of sap flow (Čermák and Kučera 1990). This fits when we compare diurnal courses of Q_w with PET, but change artificially the form of a body on which the solar radiation (as a term in Penman´s PET) is absorbed. Iterative calculation finds the best fit of Q_w and PET of which the effective crown form and sunlit leaf area can be derived. These parameters can be easily applied for trees of any species and DBH or social classes and up scaled per stand area, therefore better estimates of the energy load and temporal changes of cooling effectivity of forests can be achieved.

Key words: Flow measurement; tree foliage; rootage; radiant energy load; cooling efficiency; forest stands.

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The investigation of benthic algae and pollution of Meke Lake (Karapinar, Konya) in Turkey

Cengiz Akkoz [1]*, Baran Asikkutlu [1], Tahir Atici [2]

[1] Selcuk University, Faculty of Science, Biology Department, Konya, Turkey
[2] Gazi University, Gazi Education Faculty, Biology Department, Besevler, Ankara, Turkey

ABSTRACT

The aim of this study is to determine benthic algae, lake water contamination and quality 5 different stations conducted on the Meke Lake where is unique volcanic lake on the Ramsar area in the Konya distinct, and samples were collected periodically monthly from stations between April 2011 and May 2012. Physical and chemical characteristics of surface water were investigated in order to determination of the level of water pollutants and water quality. The levels of pH, soluble oxygen, turbidity, conductivity, temperature, chlorine, COD, BOD, organic material, sulphate, nitrate and ammoniac were measured for the evaluation of water quality. The results of this study were evaluated depending on station and season. In the first aspect, water pollution and high salt concentration were observed. It is said that the unavailability of the lake water to use for humanitarian purposes as a result of the water quality measurement in the Make Lake. Also, dense water salinity, sulphate and excessive evaporation that increase the concentration of salt is the major of the factors. Higher levels of soluble minerals, salts and ions in the lake water may be depend on geologic characteristic of geographic area. In addition, organic materials contribute the lake pollution. Soluble oxygen levels were determined <0.8 mg/L all sampling time. This situation effects water quality and causes anoxic conditions. Low soluble oxygen levels and higher organic material concentrations confirm the existence of organic pollution. In the lake water highly more concentration of KOD was observed according to BOD concentration. BOI/KOI rates were found far away from domestic ones. This result indicates that organic materials different from biologic fissionable materials. Meke Lake, an important habitat, has poor algaelogic level. Due to high salt concentrations only salt tolerate fauna and flora can survive in this lake. Totally, 49 species of algae have been identified in the Meke Lake. According to the distribution of the ordo this algae, 22 of this algeae is belonging to Orchrophyta, 13 of them belonging to Cyanobacteria, 11 of them belonging to Chlorophyta and 3 of them belonging to Euglenozoa. In a conclusion the members of Orchrophyta have been found dominant on the lake. Make lake, possesses the characteristic features of a volcanic lake, is an important water reserve. Nevertheless, it is crucial to control the entrance of high organic matter from outside.

Key words: Meke Lake; benthic algae; water quality; pollution.

* Corresponding Author

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Drag-out recovery in surface coating industry by membrane filtration system

Tarık Kotan [1], Gülfem Bakan [2*]

[1] 19 Mayıs University, Yeşilyurt Demir Çelik Vocational School of Higher Education, 55300 Tekkeköy, Samsun, Turkey
[2] Ondokuz Mayıs University, Engineering Faculty, Environmental Engineering Department, 55139 Samsun, Turkey

ABSTRACT

In this study, It is aimed that production steps be evaluated within the scope of Sustainable Production approach and Best Available Techniques and Technologies to reduce the amount of water, chemicals, energy and the pollution load in the current waste water treatment plant be determined in a manner in which eco-efficiency of a metal coating company would be increased. Drag-out is an important pollutant source for the metal finishing (coating) industry. This study focuses on improvements in process and drag-out recovery through use of nano filtration system in metal plating industry. Administrative and technological measures to minimize the losses resulting from drag -out in system have been reviewed. Water and chemical recovery can be provided by setup eco tank and recovery technologies. As a result of the laboratory scaled applications, Recovery experiments of rinsing waters in coating line were made by membrane filtration (NF) technique and 70-85% of drag-out recovery was obtained. Chemicals and water recovery can be made in all acidic coating system (after determination of rinsing ratio and load) by membrane filtration and these technique is feasible for evaluation of environmental, technical and economic. By this means, it was noted that pollutant concentration to wastewater treatment plant has been reduced by 80%. With regard to this study, it was determined that evaluation of recovery chances would be more economic and the investment would pay for itself in a shorter period. Besides, waste production may be prevented substantially by first taking administrative measures in best technique practices.

Key words: Sustainable production; drag-out recovery; membrane filtration; surface coating industry.

* Corresponding Author

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Assessment of housing energy consumption in Turkey

Suheyla Yerel Kandemir [1]*, Ali Erdem Çerçevik [1], Huseyin Ankara [2], M. Ozgur Yayli [3]

[1] Bilecik Seyh Edebali University, Bilecik, Turkey
[2] Eskisehir Osmangazi University, Eskişehir, Turkey
[3] Uludag University, Bursa, Turkey

ABSTRACT

In this study, we analyse housing energy consumption in Turkey. The energy consumption is evaluated by using the multivariate techniques such as cluster analysis and multidimensional scaling (MDS) analysis. The number of clusters for housing energy consumption was selected as five years. Finally, cluster and MDS analysis results show that the 2009 and 2010 was the most similar consumption years in housing energy consumption. Finally, this paper present that the usefulness of cluster and MDS analysis for assessment in the energy consumption.

Key words: Energy; housing energy consumption; cluster analysis; MDS analysis; Turkey.

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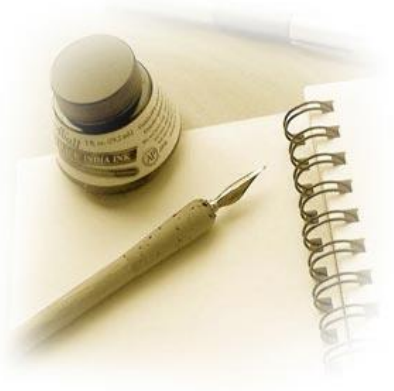

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Protecting the environment through public procurement law - the case of Poland

Renata Kozik *, Izabela Karasińska - Jaśkowiec

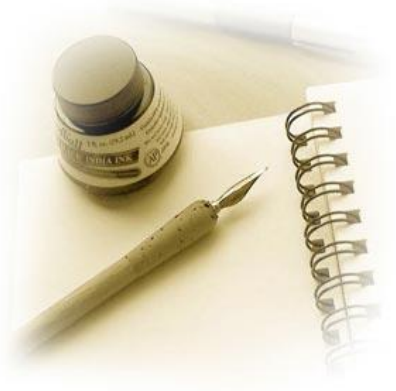
Cracow University of Technology, ul. Warszawska 24; 31-155 Kraków, Poland

ABSTRACT

The article presents the results of studies which aim was to analyse public procurement procedures in the context of environmental protection, especially wastewater infrastructure, performed in the selected Polish municipalities. The criterion of the respondents' selection was: the time of public procurement procedure - from 2009 until 2015 and, in addition, that the contract was co-financed by the European Union funds. The contracting authorities responsible for awarding specific contracts, were asked series of detailed questions about the environmental criteria and requirements contained in the tender documents for the construction contacts related to the wastewater infrastructure. The following factors were analysed: 1. Consideration by the authorities, awarding contracts, issues related to sustainable development (e.g. the use of so-called. "green public procurement", "sustainable procurement") 2. Consultation, by the authorities, design solutions at the design stage with a specialist in the field of environmental protection, 3. The requirements for energy consumption, energy efficiency of wastewater infrastructure, 4. Indication that the contractor has implemented appropriate measures to protect the environment during the execution of works, 5. Indication of the environmental management measures that the economic operator will be applied during the execution of a works contract or services, 6. Contractors' declaration that during the construction hazardous materials/substances harmful to environment e.g. such as products containing sulphur hexafluoride (SF6) will not be used 7. An indication of the environmental management measures that will be applied by the economic operator during the execution of a works or a services, 8. Experience of contractors for construction of wastewater infrastructure, with particular emphasis on reducing impacts on the environment, 9. Commitment contractors to submit an environmental management plan in relation to the construction or management of wastewater infrastructure, focusing on the reduction of environmental impact, 10. Taking into account the efficiency requirements of wastewater infrastructure 11. Taking into account the requirements for water consumption 12. Taking into account the efficiency requirements for flue gas treatment, the aim of the study was to determine whether the actions taken by the contracting authorities in a tender procedure for the construction or operation of wastewater infrastructure include environmental issues. Authors examine also the applicable public procurement law regulation in Poland and Europe in the context of sustainable development and environmental protection. The aim of studies was to check whether the law regulation fully takes into account the environmental aspects of the planned investments. On this basis, conclusions have been made that laws are consistent and do not constitute an obstacle to awarding a contract positively affecting the environment. The analysis of green public procurements shows that they are still untapped potential in the field of environmental protection. Environmental clauses are marginally used by public authorities in Poland. The scale of their application in the tender procedures in relation to the existing possibilities, is far too low.

Key words: Green public procurement; wastewater infrastructure; sustainable development; environmental protection.

* Corresponding Author



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Microbial degradation of nickel and vanadium porphyrins by Pseudomonas sp. LM8 – laboratory studies

Robert Stasiuk, Aleksandra Skłodowska, Renata Matlakowska *

University of Warsaw, Faculty of Biology, Laboratory of Environmental Pollution Analysis, Miecznikowa 1, 02-096 Warsaw, Poland

ABSTRACT

Geoporhyrins are an important component of the fossil organic matter deposited in Lopingian Kupferschiefer black shale (Fore-Sudetic Monocline, Poland). It was showed that indigenous, lithobiontic, heterotrophic, neutrophilic microorganisms inhabited this rock are responsible for oxidative bioweathering of fossil organic matter however their role in biotransformation of hardly-degradable organic compounds such as geoporhyrins remains still unknown. The aim of present study was to demonstrate the biodegradation of nickel and vanadyl porphyrins by Pseudomonas sp. LM8 isolated from black shale (Lubin mine). The 256-million-year-old Kupferschiefer black shale and four synthetic metalloporphyrins (vanadyl octaethylporphyrin [$C_{36}H_{44}N_4OV$]; vanadyl meso-tetraphenylporphyrin [$C_{44}H_{28}N_4OV$]; nickel octaethylporphyrin [$C_{36}H_{44}N_4Ni$] and nickel meso-tetraphenylporphyrin [$C_{44}H_{28}N_4Ni$]) were exposed to the activity of strain LM8 for 30 days under aerobic conditions. The biodegradation of metalloporphyrins was monitored by analysis of absorbance spectra of porphyrins (high-performance liquid chromatography with photodiode array detection) as well as by identification of organic compounds being products of this process (gas chromatography with mass spectrometer detector and atomic emission detector; nuclear magnetic resonance spectroscopy; graphite furnace atomic absorption spectrometry). The role of LM8 in degradation of pyrrole rings as well as aliphatic and aromatic substituents of porphyrins was showed. The analysis of Soret and Q bands of absorbance spectra revealed the biodegradation of studied porphyrins at the level of 7-99%. The numerous products of biodegradation was identified. Among them the organic acids (e.g. 4-aminobutanoic acid; benzeneacetic acid) and alcohols (e.g. 1,4-dioxan-2,3-diol; pentane-1,2,3,4,5-pentol) were the dominant classes. Moreover the number of aliphatic hydrocarbons (e.g. heptacosane; heptylcyclohexane), aldehydes (e.g. benzaldehyde; butanal) and esters (e.g. 1,2-benzenedicarboxylic acid, bis(2-methylpropyl) ester; benzoic acid, 3-methyl ester) were detected. Furthermore, bicyclo[4.4.1]undeca-1,3,5,7,9-pentaene-2-carboxamide; 2-chloro-N-[2-(2,5-dimethyl-1H-indol-3-yl)ethyl]-4,5-difluorobenzamide; n,n-diethyl - cyanonickel, bis (trifluoromethyl) and pyrazol [1,5-a] pyrimidine, 2,5-bis (methylthio)-3-phenyl-7-(6-phenyl-1,3,5-hexatrienyl) were identified. Each of these compounds are potential products of breakdown of porphyrins. The mobilization of nickel and vanadium from porphyrins was also confirmed. The obtained results of laboratory studies showed the contribution of indigenous bacterium inhabiting the black shale in biodegradation of porphyrins and indicate the potential role of microbiom in transformation of persistent organic compounds deposited in Lopingian Kupferschiefer black shale.

Key words: Bioweathering; organic compounds; porphyrin; geoporphyrin; Pseudomonas.

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Adsorption of copper from aqueous solution using moss Polytrichum, lichen Cladonia stellaris, potamogeton, and roots of water hyacinth

Natalya Abrosimova *, Alexey Edelev, Ekaterina Rybkina

Trofimuk Institute of Petroleum Geology and Geophysics, SB RAS, 630090, Novosibirsk, Russia

ABSTRACT

At present study, we investigate the adsorption of copper from aqueous solution using moss Polytrichum, lichen Cladonia stellaris, potamogeton, and roots of water hyacinth collected in Siberia. FTIR, ISP-MS, and electronic scanning microscope were used to characterise the biosorbents. Results concluded the following sequences of the biosorbents for Cu removal in the order of sorption properties improvement: lichen< roots of water hyacinth <moss< potamogeton. The composition of the samples after sorption experiments carried out by IR spectroscopy showed slightly changed in the structure of biosorbents. Redistribution of certain functional groups, which showed displacement and changes in the intensity and shape of the bands shown on the interaction of sorbents with experimental solution. The biosorbents have different functional groups, which include carboxyl (-COOH), alkane (- CH2), amide (-NH2), amine (-NH) and hydroxide (-OH) groups. These functional groups are able to react with Cu ion in aqueous solution.

Key words: Pphytoremediation; adsorption of copper; FTIR.

* Corresponding Author

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Biomass plants site selection using multi criteria spatial analysis

Luís Quinta-Nova *, Nuno Pedro

Polytechnic Institute of Castelo Branco, School of Agriculture, Department of Natural Resources and Sustainable Development, Quinta da Senhora de Mércules, 6001-909 Castelo Branco; Portugal

ABSTRACT

In this study we developed a decision support system based on multi criteria spatial analysis in order to select sites suitable to locate biomass plants. A set of environmental, economic and social criteria was defined, evaluated and weighted in the context of Saaty's analytic hierarchies. The best alternatives were obtained after applying Analytic Hierarchy Process (AHP). The model was applied to the central region of Portugal where forest and agriculture are the most representative land uses. Finally, sensitivity analysis of the set of factors and their associated weights was performed to test the robustness of the model. The sensitivity analysis provided insight into the most influent factors on the model, such as geomorphology, crop types, vegetation cover, potential demand and transport cost. The proposed evaluation model provides a valuable reference for decision makers in establishing a standardized means of selecting the optimal location for new biomass plants.

Key words: Biomass; multi criteria analysis; GIS; optimal location; AHP; sensitivity analysis.

* Corresponding Author

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Some convincing evidences of a deep root system within an interfluve aquifer of Northeast Thailand

Jean-Pierre Montorol [1]*, Alain Pierret [1], Jean-Luc Maeght [1], Worraphan Chintachao [2], Somjai Chenyapanich [2], Kriengsak Srisuk [3]

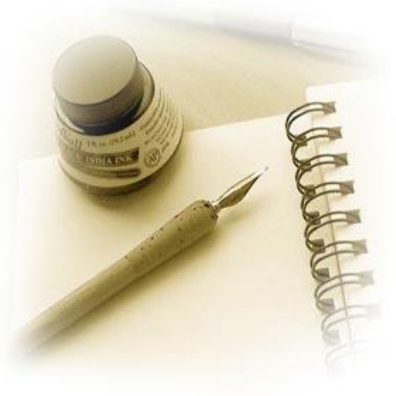
[1] IRD, JRU "IESS Paris", 32 avenue Henri Varagnat, 93143 Bondy, France
[2] Land Development Department, Phahonyothin Road, Chatuchak, 10900 Bangkok, Thaïland
[3] Khon Kaen University, Ground Water Research Center, 40002 Khon Kaen, Thailand

ABSTRACT

The northeast of Thailand (NT) is dominated by a landscape of low hills with elevations ranging from 170 m (lowlands) to 240 m (highlands). Dipterocarpus forest originally occupied the highlands, but was heavily destroyed during the last half of the twentieth century. Intensive deforestation has favored the development of cash crops such as cassava, sugarcane, kenaf and maize. It is widely accepted that the change in land use has led to a radical change in the hydrological balance within the NT, namely a rise in groundwater due to the increase in deep aquifer recharge, an evapotranspiration decrease of seasonal crops and an extension of the saline contamination in the bottom of slopes and in lowlands. Studies on the deep roots of tree species are relatively limited because the investigative tools access to limited information. The purpose of this study is to (i) characterize the mineralogy of the deep surface formations along an interfluve toposequence; (ii) detect traces of root biomass in the geological substrate; (iii) if possible, interpret the origin of the deep roots. Located near the village of Ban Nong Tun and about 20 km southwest of the city of Khon Kaen, in the district of Phra Yun, the studied watershed has an area of 2 km2. The soil profile includes a clay layer of varying thickness over bedrock (sandstone-siltstone) and below a sandy surface layer. The depth of the clayey layer is less than one meter at the top of the slope and increases along the slope up to a few meters. The sandy layer has iron oxide stains which reflect the mobility of iron under reducing conditions. Three boreholes (worm screw) were implemented for deep piezometry (PB1K, PB2K and PB5K). Disturbed materials were sampled every meter for a mineralogical analysis by X-ray diffractometry. On each sample the root biomass was weighed. Isotopic measurements (13C and 14C) and scanning electron microscopy observations were performed on some root samples. The main results show that quartz, kaolinite and smectite are the predominant minerals in the clay fraction with some illite. Quartz is the major component of the non-clay fraction with a small amount of feldspar and traces of goethite. The distribution of root biomass as a function of depth indicates a high amount of root biomass (from 0.1 to 1.8 g 1000g-1) at a depth ranged from 20 m to 30 m. The root biomass occurs below the actual groundwater level. The deep roots are in a good state of preservation and assigned to trees. The current presence of a water table suggests that the roots of the past trees had to reach a water-saturated zone, probably deeper, to meet the water and nutrient requirements with minimal energy. In conclusion, root biomass was observed and quantified at several tens of meters in depth. The proximity of a groundwater body is a favourable environment for the development of a deep root system which is probably widespread throughout the deforested environment insofar textural discontinuities do not prevent the root progression in depth.

Key words: Root biomass; mineralogy; groundwater; watershed; rubber tree; Northeast Thailand.

* Corresponding Author



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A sustainable geopark design with views of landscape architecture

Nurhan Kocan *, Tugba Akyuz, Nuket Ankarali

Bartin University, Faculty of Forestry, Department of Landscape Architecture, Office 418, PK.74100 Bartin, Turkey

ABSTRACT

Today people prefer more natural environment for their leisure activities. For this purpose people have entered into a search of natural areas with rare features. Geological and geomorphologic structure of the unique elements is important for scientists and nature lovers because of their scientific, educational and interesting features. In this context the evaluation of natural and cultural resources via of geoparks and geotourism is a current and valid approach. In this study Kizilcahamam-Camlıdere geoparks and surroundings have been examined in terms of important geological-geomorphologic elements, natural, cultural and historical values of area. In the study the area has been dealt with the landscape architecture discipline and proposal geopark design has been developed for area. Also suggestions were made order to ensure sustainable development and to effective use of the tourism potential in the region through geotourism. The method of study began with fieldwork studies, identification of available data, sketches of the ideas and suggestions for the area. AutoCAD 2014, SketchUp and Lumion softwares used for drawing of geopark design. As a result of the study it is seen that developed geoparks design for area will ensure sustainability of area with regard to spatial and ecological significance.

Key words: Geotourism; geopark; landscape design; sustainable development; Kizilcahamam-Camlidere Geoparks.

* Corresponding Author

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A natural oil seep in Korňa – significant locality for geotourism

Marian Marschalko [1]*, Miloš Duraj [1], Dominik Niemiec [1], Işik Yilmaz [2]

[1] VŠB-Technical University of Ostrava, Faculty of Mining and Geology, Institute of Geological Engineering, 17 listopadu 15, 708 33, Ostrava, Czech Republic

[2] Cumhuriyet University - Faculty of Engineering - Department of Geological Engineering - 58140 Sivas, Turkey

ABSTRACT

From the geological point of view, Kysuce does not have such a varied structure as other parts of Slovakia as flysch dominates in the region. Still, there are a number of geological formations, and were included among protected natural monuments in the past. Very frequent are the manifestations of landslides, typical for this type of geological structure, and their impact on the landscape. There are also specimens of large sandstone concretions in several localities, the occurrences of which are unique world-wide. Next, there are several mineralised springs that contain various concentrations of hydrogen sulphide or methane. Such springs demonstrate the abundance of caustobioliths in the deep bedrock. A possibility of natural oil is confirmed by a protected natural monument of a natural oil seepage in Korňa. This world unique seepage of slightly paraffinic oil has been protected since 1984.

Key words: Natural oil; seepage; protected monument; geotourism; Kysuce.

* Corresponding Author

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Listing a geological rarity of 'Stone Balls' in Kysuce among world geotourism destinations

Miloš Duraj [1], Dominik Niemiec [1], Marian Marschalko [1]*, Işik Yilmaz [2]

[1] VŠB-Technical University of Ostrava, Faculty of Mining and Geology, Institute of Geological Engineering, 17 listopadu 15, 708 33, Ostrava, Czech Republic

[2] Cumhuriyet University - Faculty of Engineering - Department of Geological Engineering - 58140 Sivas, Turkey

ABSTRACT

Kysuce, situated on the border with the Czech Republic and Poland, belongs among distinctive regions in the Slovak Republic. This region offers tourism many interesting sites. Few decades ago, Kysuce offered tourists and visitors well-preserved national architecture, which is nowadays concentrated in an open-air museum Vychylovka. Thanks to the rich afforestation and a sophisticated network of signs for hikers, hiking has been very popular. The ground relief and climatic conditions also encourage winter sports. The world-wide development of geotourism has also concerned this region. Despite a low-varied geological structure, there are unique geological formations that have attracted attention for years. For example, tourists visit the interesting mineralized springs and a remarkable crude oil seep in Korňa. Geologically unique are also the occurrences of 'stone balls' from sandstone and conglomerates. This phenomenon has attracted attention of both geologists and esotericism supporters.

Key words: Rock jointing; geology; natural monument; geotourism; Kysuce.

* Corresponding Author

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Occurrences of mineralized waters and mineral springs in Kysuce and their meaning for geotourism

Dominik Niemiec [1], Marian Marschalko [1]*, Miloš Duraj [1], Işik Yilmaz [2]

[1] VŠB-Technical University of Ostrava, Faculty of Mining and Geology, Institute of Geological Engineering, 17 listopadu 15, 708 33, Ostrava, Czech Republic

[2] Cumhuriyet University - Faculty of Engineering - Department of Geological Engineering - 58140 Sivas, Turkey

ABSTRACT

Kysuce is a region situated in north-western Slovakia and it borders the Czech Republic on the west and Poland on the north. From the geological point of view, the locality is mainly formed by Tertiary flysch formation. This composition together with the relief of this location created very suitable conditions for occurrences of numerous mineral springs which can be found in this region. The increased concentration of mineral contents in the waters which find their expression not only through taste but also through their typical odour held the interest of local inhabitants already in the past centuries. Currently, they are frequently visited not only by inhabitants of the region but also by visitors to Kysuce. From the geotourism point of view, this region offers more interesting geological phenomena. Some of them, such as a crude oil seep in Korňa or occurrences of sandstone and agglomerate stone balls, rank among world uniques.

Key words: Kysuce; Slovak Republic; mineral water; medicinal water; flysch formation; geotourism.

* Corresponding Author

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Improvement of the integrated coastal zone management in the Black Sea region of Turkey

Gulfem Bakan *

Ondokuz Mayıs University, Engineering Faculty, Environmental Engineering Department, 55139 Samsun, TURKEY

ABSTRACT

Turkey is a country well-endowed with a wealth of coastal areas and an abundance of their coastal resources. The Turkish land borders the Black Sea in the North, the Aegean in the west and the Mediterranean in the south. In addition to these areas, Turkish land encloses an extremely important inland sea, the Sea of Marmara. Turkey has very important coastal areas along the inland Sea of Marmara and the Black Sea, and is a partner of the Black Sea Strategic Plan (BSAP). The total length of the Turkish coastline including the islands is 8,333 kilometres, of which 1,067 kilometres are island shores. Turkey has a Coastal Law, but no integrated legislation covering multiple aspects of coastal zone management. Despite a coastal law, there is neither legislation nor an institution that covers all aspects of coastal zone management. The National Committee on Turkish Coastal Zone Management has been established since 1993. The Black Sea, a nearly enclosed and isolated environment, has suffered from severe ecological changes during the last decades. In the face of likely serious environmental changes occurring in the Black Sea region the littoral countries are attempting to find solutions by seeking international assistance from well-known international organizations and some leading states interested in settlement of environmental issues at the regional or global level. Major ICZM problems of Black Sea coast of Turkey are urban sprawl, tourism development and near-shore illegal construction, coastal waters polluted by municipal, industrial, agricultural and ship waste, biodiversity protection required for extremely rich biodiversity and last natural habitat for monk seal, green turtles and other rare species, widespread urban sprawl and illegal construction in coastal areas. In fact, integrated coastal zone management in Turkey is becoming an increasingly important issue due to the ever-growing developmental pressures on coastal areas.

Key words: ICZM; Black Sea; Black Sea Strategic Plan (BSAP).

* Corresponding Author

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Urban planning and sustainable development in the 21st century: conceptual and management issues

Arturo Azpeitia Santander *[1], Agustín Azkarate Garai-Olaun [2]

[1] Built Heritage Research Group (GPAC, UPV/EHU), CIEA Lucio Lascaray, Avd. Miguel de Unamuno,3, 01006 Vitoria-Gasteiz, Spain

[2] UNESCO Chair on Cultural Landscapes and Heritage (UPV /EHU), CIEA Lucio Lascaray, Avd. Miguel de Unamuno, 3, 01006 Vitoria-Gasteiz, Spain

ABSTRACT

Urban areas in historic cities resemble a living organism that evolves in parallel to social transformation processes, shaping the material substrate that expresses identity and collective memory. In the twenty-first century, exponential population growth, globalization and the information society have resulted in many of these socio-economic processes accelerating, with consequences that we are not yet able to discern in their entirety. In this context, cities need to adapt to the general dynamics of urban development by incorporating the environmental, economic and social aspects of the "sustainability paradigm". With good planning, urban heritage is a key sustainable resource that needs promoting as part of the existing territorial competitiveness in a scenario marked by an increase in rivalry between cities. This requires the development of a conceptual framework that, based on a global, holistic and integrative approach, covers equity and social justice, respect for human rights, the gender perspective, public health and environmental quality, among other aspects. In this sense, the purpose of this paper is to study the concept of landscape applied to urban planning in greater depth, paying special attention to the analysis of the notion of Historic Urban Landscapes from a critical point of view, since the economic pressures arising from the reality of today's globalized world pose a serious threat that hinders their custody and protection, complicating this new comprehensive approach: how to bring this new systemic and transversal concept to the current regulatory framework in order to achieve real legal protection and effective governance models in urban areas? What should be the acceptable limits to ensure that "managing this change" does not result in public spaces being at the service of the interests of financial capitalism? These, along with many other questions, make the work of the professionals in charge of urban conservation more challenging in their aim to establish a sustainable dialogue to clear the complex equation between historical city and development. With a view to tackling this challenge, this paper sets out proposals regarding the development of acceptable change limitation methods and indicators applied to the conservation of urban heritage that can become the basis for urban management policies and models.

Key words: Urban evolution; sustainable development; globalization; historic urban landscapes; ındicator systems, buffers zone.

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A GIS based decision support system for prioritizing urban road infrastructure excavations: Istanbul - Fatih district (Turkey) example

Halil Ibrahim Yumrutas [1]*, Sukuriye Iyinam [2]

[1] Karabuk University, Demircelik Campus, Civil Engineering Department, 78000 Karabuk, Turkey
[2] Istanbul Technical University, Maslak Campus, Civil Engineering Faculty, 34000 Istanbul, Turkey

ABSTRACT

Infrastructure facilities, indicating development and life standards in urban areas, have important connections with each other similar to the nerves in human body. It is quite common that infrastructure organizations in charge of these facilities encounter some coordination problems since these constructions are built by different organizations in especially developing countries such as Turkey. In this study, a geographic information system (GIS) based urban infrastructure management system software (KENTSIS) has been developed, which must be used by all related infrastructure organizations in order to provide coordination of excavations, to prevent repeated excavations, to prevent time and economic loss due to traffic congestion during excavations, to minimize probable deformations in pavements and also a decision support system using fuzzy logic was proposed. The proposed model was aimed to make “intelligent schedule” for prioritizing urban road infrastructure excavations integrated with infrastructure management system software. Fuzzy logic model data are updatable depending on the local differences, decision makers’ policies and changing conditions. With the application of the model infrastructure organizations and local public authorities carried out the excavations in accordance with each other and traffic congestion, pavement deformations, waste of public resources, noise/visual pollution, working and traffic accidents due to repeated works were diminished.

Key words: GIS; infrastructure; excavation; urban; road; fuzzy model.

* Corresponding Author

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Green spaces benefits in contemporary city

Ana Lidia Virtudes *

University of Beira Interior, Department of Civil Engineering and Architecture, Covilhã, Portugal

ABSTRACT

The need for green spaces has been present at city level since ancient times. However, the description of the evolutionary process of form and function of urban green infrastructures as it has developed from antiquity is complicated and depends greatly upon the different roles played by these places throughout history. There are several types of green spaces in the contemporary city and all of them have their own role in the urban context. These different types of greenery are designed in different urban scales with different functions in the city. Green spaces elements (i.e. trees, small gardens, green parks or green surfaces on buildings) are all identifiable components in the city structure, making part of the composition of urban context and also organizing, defining and containing spaces. In this sense, it can be said that the priority given to green infrastructures has not changed much in city policy. The provision and the localization of green spaces have particular importance in the configuration of the city. The presence of green areas in the urban context can contribute to the quality of life of citizens in many ways. The integration of plants affects positively the urban environment, because vegetation is a climate moderator, helping to reduce the imperviousness of soil and contributing to storm water management, improving the air quality through the production of oxygen, absorption of pollution like CO_2 and heavy metals and trapping dust particles. On the one hand, green spaces can have a positive effect on urban environmental conditions and consequently in the health of citizens. When applied in a significant scale they can be beneficial to the thermal comfort of cities, providing shade, promoting the evapo-transpiration, inducing a cooling effect and contributing to the mitigation of urban heat island effect. On the other hand, they have a social and emotional importance in the citizen's quality of life and well-being. In fact, the presence of nature in cities encourages the use of outdoor spaces, increasing the interaction and social integration among citizens. Given that the main part of the world population is living in cities, it can be said that the green infrastructures have a strategic importance in the contemporary urban context. This particular talk concerns the impact on health and attempts to identify links between green urban infrastructures and how they affect positively health whether physical, mental or indeed socially. The literature found in sources notedly in Australia and New Zealand are particularly relevant and are compared in this work. Thus, the analysis is based on a literature review, the sources of which are growing in this scientific research domain, studies in these two countries being particularly relevant. It is focused on the influence of urban green infrastructures for the health of city dwellers. The main approach is the identification of links between urban green infrastructures, their characteristics and health benefits, and their enhancement of physical, mental and social welfare.

Key words: Green spaces; contemporary cities; health benefits for dwellers.

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Urban planning teaching methodologies for integration of international students

Ana Lidia Virtudes *

University of Beira Interior, Department of Civil Engineering and Architecture, Calçada Fonte do Lameiro Ed.II das Engenharias, 6201-001 Covilhã, Portugal

ABSTRACT

Nowadays, the spread of international exchanges is growing among university students, across European countries. In general, during their academic degrees, the high education students are looking for international experiences abroad. This goal has its justification not only in the reason of pursuing their studies, but also in the desire of knowing another city, a different culture, a diverse way of teaching, and at the same time having the opportunity of improving their skills speaking another language. Therefore, the scholars at the high level of educational systems have to rethink their traditional approaches in terms of teaching methodologies in order to be able to integrate these students, that every academic year are coming from abroad. Portugal is not an exception on this matter, neither the scientific domain of urban planning. Actually, during the last years, the number of foreign students choosing to study in this country is rapidly increasing. Even though some years ago, most of the international students were originated from Portuguese speaking countries, comprising its former colonies such as Brazil, Angola, Cape Verde or Mozambique, recently the number of students from other countries is increasing, including from Syria. Characterized by a mild climate, a beautiful seashore and cities packed with historical and cultural interests, this country is a very attractive destination for international students. In this sense, this study explores the beliefs about teaching methodologies that scholars in urban planning domain can use to guide their practice within Architecture and Civil Engineering degrees, in order to promote de integration of international students. It is focused on the experiences of Urban Design and Spatial Planning subjects, in the Master Degree in Architecture and in the Master Degree in Civil Engineering at the University of Beira Interior, in Covilhã, Portugal. These methodologies are based on the notion that effective teaching is student-centred rather than teacher-centred, in order to achieve a knowledge-centred learning environment framework in terms of urban planning skills. This research main conclusion is the need of promoting a shift from lecture-based and teacher-centred practices to student-centred approach.

Key words: Urban planning; teaching methodologies; international students; integration; knowledge-centred learning.

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Effects for elderly people of urban open spaces

Ana Virtudes *

University of Beira Interior, Department of Civil Engineering and Architecture, Calçada Fonte do Lameiro Ed.II das Engenharias, 6201-001 Covilhã, Portugal

ABSTRACT

The cities are their dwellers. Therefore, the health risks are sensitive issues in the ongoing debate about cities, due the growing quantity of people living on a small amount of land, requiring massive public investments, whether in collective facilities or public spaces. Globally the average life expectancy has been increasing. A more careful diet and an unprecedented advance in access to health care has contributed to this. On the other hand, the population concentrated in cities also records an increasing trend. In summary there are increasingly older people and more and more people concentrated in urban areas. In this context, this article explores the importance of local public spaces i.e. those observed at neighbourhood scale in the health of dwellers in general and elderly people in particular. The first part of the analysis describes some crucial aspects, which have shaped the evolution of public spaces in cities. Consequently, the main approach that is going to be explored in this part is the identification of links between local public spaces, whether their characteristics and health benefits, or their enhancement of physical, mental and social welfare. This analysis is based on a literature review, using as a researching method the existing academic writing on the particular topics of local public spaces, collective places, health benefits, and elderly people requirements in urban context, the sources of which are growing in this scientific research domain. The literature has revealed that the needs and activities of people could be expressed in urban design approaches, in order to promote more health benefits due the use of collective places. This analysis has discovered evidences that public spaces at neighbourhood scale help to promote healthy lifestyles in urban settings. Consequently, the provision of local public spaces should be defined according to the urban fabric, considering aspects such as the density of buildings and inhabitants, being a key factor of health whether in particular/individual (to each person) or in general/collective (at neighbourhood scale). The article concludes with some guidelines for the creation at neighbourhood scale of new or reshaping local public spaces, which should be considered as landmarks by urban designers, town planners and policy makers in order to achieve more health benefits in particular for elderly people.

Key words: Urban open spaces; health benefits; neighbourhood scale; elderly people.

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Green urbanism for the new greener future of metropolitan areas

Anna Zaręba *, Alicja Krzemińska, Krzysztof Widawski

University of Wrocław, pl. Uniwersytecki 1, 50-137 Wrocław, Poland

ABSTRACT

Natural environmental qualities are significant value in spatial management. Their preservation is the underlying principle of global eco-development. Intensive urbanization is swallowing municipal green areas which causes intensification of erosion, decrease in biodiversity and permanent fragmentation of habitats. In the face of this changes a risk of irreversible damages of urban ecosystems is growing. That is why planning solutions within the framework of Green Urbanism in metropolitan areas inhabited by over 55% of the global population are of extraordinary importance. The task of the paper is to present patterns of the Green Urbanism using selected examples of metropolitan areas as case studies. The main goal of the research is to make comparison between GU practices in different countries, in various spatial settings. Green, sustainable cities designed following the nature and its needs, using good planning practices as green infrastructure, public transport, pattern of compact city, have a beneficial effect on general health of inhabitants and vitality of urban ecosystems in the form of clean air, better quality water, flood and drought protection, and wider accessibility of recreational grounds. The principles of triple zero framework: zero fossil-fuel energy use, zero waste, zero emissions (from low-to-no-carbon emissions) introduce not only the contemporary trends in theoretical urban planning but are dictated by practical considerations to create healthy environment for healthy society with minimized environmental footprint. The research results help to identify Green Urbanism technics used for multiple functions: including ecological, recreational, cultural, aesthetic and other uses and present opportunities for implementation of Green Urbanism solutions in metropolitan areas. To achieve healthier society and environment we have to recreate highly congested and polluted cities through working with the existing landscape, topography and natural resources particular to the site.

Key words: Green Urbanism; metropolitan areas; healthy environment.

* Corresponding Author

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Traffic perception in Eskişehir province (Turkey)

Murat Karacasu *, Arzu Altin Yavuz, Barış Ergül

Eskişehir Osmangazi University, Department of Civil Engineering, Eskisehir, Turkey

ABSTRACT

With the rapid growth of the world population that is becoming increasingly common use of motor vehicles. Also, thanks to technological advances that have become more accessible to a case having a motor vehicle. However, these developments have led to the emergence of some problems. Especially, highways of serious accidents occurred in Turkey in transportation, the precautions to be taken to investigate and the detection of this problem is an important issue. Identification of individual traffic perception is important to identify gaps in the application. This study was planned and carried out in order to measure of traffic perceptions of living in Eskisehir Province (Turkey). For this purpose, a questionnaire aimed at determining demographic and socio-economic characteristics and attitudes of the individuals' perception of traffic was prepared. Data were analysed by factor analysis known as one of the multivariate statistical analysis techniques. The result of analysis obtained over the dimensions, traffic perceptions of individuals in Eskisehir Province aimed to model. Looking for solutions for the traffic problem in institutions of the Eskişehir Province has obtained a series of results that could benefit in creating attitudes and behaviours about traffic.

Key words: Traffic perceptions; multivariate statistical analysis; Eskisehir province; Turkey.

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Evaluation of park and ride scenarios for Eskisehir (Turkey) with AHP

Polat Yaliniz [1], Ozden Ustun [2], Safak Bilgic [3]*, Yasar Vitosoglu [1]

[1] Dumlupinar University, Faculty of Engineering, Department of Civil Engineering, Kutahya, Turkey
[2] Dumlupinar University, Faculty of Engineering, Department of Industrial Engineering, Kutahya, Turkey
[3] Eskisehir Osmangazi University, Faculty of Engineering and Architecture, Department of Civil Engineering, Eskisehir, Turkey

ABSTRACT

Nowadays, limiting individual transportation and increasing share of mass transit occupy an important place in planning a sustainable urban transportation system. In order to attract private automobile users into public transportation, a number of applications can be employed. Among these applications, “park and ride” system comes in first. Therefore, in this study, by taking expert views, park and ride system as well as the other applicable scenarios have been evaluated with Analytical Hierarchy Process (AHP) method. The alternatives evaluated include the Protection of the Current Situation, the Introduction of Only Restrictive Factors and the Park and Ride Implementation. As a result, the overall relative priority values of alternatives were calculated as 0.195 in the case of the Protection of Current Situation, as 0.268 in the case of Introduction of Only Restrictive Factors and as 0.537 in the case of Park and Ride Application, respectively. Consequently, the overall relative priority values of alternatives were calculated and found to be the highest in the case of Park and Ride Implementation. Within the scope of the study, the 18 criteria have been determined, and these 18 criteria have been grouped under the main criteria of Benefit, Cost, Opportunity and Risk. Alternative scenarios were evaluated for each criterion. Thus, the importance ratios of alternatives were calculated for every sub-criterion. The consistency ratios of comparison matrices were found to be within acceptable limits. Hence, it was determined that the "park and ride" application provided a clear superiority compared to other alternatives. However, when the significance of the main criterion of cost was greater than the sum of significances of other main criteria, the Protection of the Current Situation emerged as the result. On the other hand, just by considering cost, it is not possible to provide sustainable transportation. In many major cities, the public transportation systems and the "park and ride" application are considered together. That is, when new public transport systems are constructed, the "park and ride" parking areas are also built. Integrating the "park and ride" system into the newly opened public transport system will increase the efficiency of new system. Thus, when the social dimensions of “park and ride” application and its benefits are taken into consideration, the necessity of realizing the application comes out.

Key words: Sustainable transportation; urban transport policies; park and ride; Multi-criteria Decision Making; Analytical Hierarchy Process.

* Corresponding Author

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Curve estimation of number of killed people in traffic accidents in Turkey

Kadir Berkhan Akalin *, Murat Karacasu, Arzu Altin Yavuz

Eskişehir Osmangazi University, Department of Civil Engineering, Eskisehir, Turkey

ABSTRACT

One or more than one vehicle in motion on the highway involving death, injury and loss events which have resulted are called accidents. As a result of increasing population and traffic density, traffic accidents continues to increase and this leads to both human losses and harm to the economy. In addition also leads to social problems. As a result of increasing population and traffic density, traffic accidents continues to increase and this leads to both human losses and harm to the economy. In addition to this, it also leads to social problems. As a result of traffic accidents, millions of people die every year in the year. A great majority of these accidents occur in developing countries, the vast majority. One of the most important tasks of transportation engineers is to reduce traffic accidents by creating a specific system. For that reason, statistical information about traffic accidents which occur in the past years should be organized by versed people. Factors affecting the traffic accidents are analyzed in various ways. In this study, modelling of number of people killed in traffic accidents in Turkey is determined. The dead people were modelled using curve fitting method with the number of people killed in traffic accidents in Turkey dataset between 1990 and 2014. Number of dead people predicted by using various models for the future. It is decided that cubic model is suitable for the estimates.

Key words: Traffic accidents; curve estimation, killed people.

* Corresponding Author

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Coarse aerosol distribution in planetary boundary layer aloft a coal strip mine

Jan Hovorka [1]*, Veronika Docekalova [1], Jan Brejcha [2]

[1] Charles University in Prague, Faculty of Science, Institute for Environmental Studies, Benátská 2, 128 01 Prague 2, Czech Republic

[2] Brown Coal Research Institute, Jsc., Most, Czech Republic

ABSTRACT

Distribution of atmospheric aerosol particles within planetary boundary layer – PBL, the lowest part of the troposphere, reflects dominancy of aerosol emission sources at the Earth surface. Open-pit coal mining produce predominantly aerosol particles larger than 1um in aerodynamic diameter, i.e. coarse aerosol. The aim of presented study was to measure and construct vertical/horizontal mass concentration profiles of coarse aerosol particles aloft a large coal strip mine and in proximity to different mining technologies. The profiles were acquired by land-based and airborne measurements. While land-based measurements were conducted using a set of laser nefelometers positioned on the surface near the mining technologies, airborne measurements were conducted by nefelometer attached to an unmanned airship. The airship was remotely controlled with GPS 10 Hz position tracking, electrically powered with propulsion vectoring allowing average cruising speed of 6 ms^{-1} at heights of 50-200m above ground. The monitors at the airship acquired 1Hz data on coarse aerosol concentrations, air temperature and humidity. Total number of 50 flights above a large coal strip mine Vrsany, Czech Republic (GPS: 50.49010N, 13.54624E) were conducted within the period of 11-22.11. 2012. Coarse aerosol mass concentrations gradually decreased from 220 ugm^{-3} near the excavator at the coal seam to less than 5 ugm^{-3} at height about 150m. In contrast to a Gaussian aerosol dispersion model, horizontal dispersion of coarse aerosol was limited to a narrow, columnar plume. The plume, about 60m in diameter, was centred at the excavator and formed at heights from 50m and up to 120m. Mass concentration of coarse aerosol within the plume was about 200 ugm^{-3} and suddenly dropped to less than 10 ugm^{-3} near the plume boundary. Also, during fly scans aloft the mining area, there were recorded higher coarse aerosol concentration above of the coal seam or mine edges than above reclamation areas. But those indicative differences disappeared at heights about 100m. Also, an entrainment of significant coarse particle mass into the airshed of coal mining area from distant sources was recorded. Our findings revealed very limited dispersion of coarse aerosol produced by coal mining out of the mining area.

Key words: Atmospheric aerosol, coarse particles, airship, coal mining, dust, reclamation site.

* Corresponding Author

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Aerosol distribution in the planetary boundary layer aloft a residential area

Jan Hovorka [1], Cecilia Leoni [1]*, Veronika Docekalova [1], Jakub Ondráček [2], Naděžda Zíková [1]

[1] Charles University in Prague, Faculty of Science, Institute for Environmental Studies, Benátská 2, 128 01 Prague, Czech Republic

[2] Laboratory of Aerosol Chemistry and Physics, Institute of Chemical Process Fundamentals of the CAS, v. v. i., Rozvojová 2/135, 165 02 Prague 6, Czech Republic

ABSTRACT

The atmosphere contains significant concentration of aerosol particles that influence air quality and human health. The size of these particles spans over five orders of magnitude, from 1nm to about 100μm. Ultrafine (diameter below 100nm), fine (100nm – 1μm) and coarse (>1μm) particles concentration in the air is usually measured at the ground level and aerosol dispersal is only estimated based on modelling. The aims of this study are: to obtain vertical and horizontal size-segregated aerosol dispersal from the source; to assess the aerosol particle contribution to the air pollution in the area. The vertical and horizontal profiles of coarse, fine and ultrafine atmospheric aerosol particles were obtained with airborne measurements. An unmanned airship, remotely controlled with GPS 10Hz position tracking, electrically powered with propulsion vectoring which allows average cruising speed of 6ms-1, was used. The airship was equipped with specially designed gondola carrying three aerosol monitors and a temperature sensor. The monitors acquired 1Hz data on mass concentration of coarse particles, and number concentration of fine and ultrafine particles. Flights were conducted on the 2nd March 2014 above a residential area of village Plesna, situated up-wind of the Ostrava city at the Moravian-Silesian region of the Czech Republic. The region is considered as a European air pollution hot-spot. Repeated flights were carried out in several height levels up to 200m above the ground level (AGL). There were early morning flights conducted to record expected morning air boundary layer temperature inversion. Temperature inversion up to height 120m AGL was recorded to persist during the measurements. Coarse aerosol mass concentrations were in a range of 20-50ugm^{-3} near the ground up to 120m AGL, than dropped to less than 10ugm^{-3} with increasing height. On the contrary, enrichment of layers at heights 120-140m AGL with ultrafine particle number concentrations up to 2.5*104cm^{-3} were recorded which may indicate a fanning plume from a distant emission source with high emission height.

Key words: Atmospheric aerosol; nanoparticles; vertical/horizontal profile; airship.

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* Corresponding Author

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Impact of mining activities on the air quality in the village nearby a coal strip mine

Petra Pokorná *[1], Jan Hovorka [1], Jan Brejcha [2]

[1] Charles University, Institute for Environmental Studies, Benátská 2, Prague 2, 128 01, Czech Republic
[2] The Brown Coal Research Institute, Jsc., Budovatelů 2830/3, Most, 434 01, Czech Republic

ABSTRACT

Atmospheric aerosol residence times differ from seconds to weeks depending on the particle aerodynamic diameter. The residence time for the fraction of coarse particles (particles with aerodynamic diameter >1 μm) ranges from hours to a few days and is given by equilibrium between sedimentation and turbulent mixing in the atmospheric boundary layer. Thus, coarse particle sources significantly influence local air quality. The objective of the presented study was to estimate share of atmospheric aerosol emitted by mining activities on PM_{10} in the village situated in proximity to a coal strip mine. Parallel measurements were conducted from the 15th to 27th November 2012 in the coal strip mine Vršany and village Čepirohy in the northern part of the Czech Republic. Three size fractions were sampled by a Davis Rotating-drum Uniform-size-cut Monitor (3 DRUM) and analysed for 27 elements by Synchrotron-XRF with 1-h time resolution. The three fractions sampled by 3 DRUM (particles of aerodynamic diameter of˙1.15–10 μm, 0.34–1.15 μm and 0.15–0.34 μm) were summed to provide size fraction of PM_{10}. Currently 1-h PM_{10} mass concentrations were measured by a Beta attenuation monitor (FH 62 I-R, Thermo ESM Andersen) in the village and 5 minute mass concentrations of PM_{10} determined by a DustTrak DRX 8533 (TSI) in the open pit mine. Also five size ranges, <0.25, 0.25–0.5, 0.5–1.0, 1.0–2.5, and 2.5–10μm of aerodynamic diameter, by a personal cascade impactor sampler (PCIS; SKC, Inc., PA, USA) were sampled and analysed by scanning electron microscopy (SEM, TESCAN-Vega). Meteorological parameters were also concurrently recorded. The coarse aerosol fraction PM_{1-10} formed in average 70% (119□59 μgm^{-3}) of PM_{10} in the coal strip mine and 20% (12□10 μgm^{-3}) in the village. The SEM analysis of filter samples from mine revealed soil particles only while bioaerosol, ash and aggregates of fine particles were found in the village samples. Databases of hourly elemental and mass concentrations from the two localities were analysed separately by EPA PMF 5.0. For each data set, the optimum number of factors was chosen based on an adequate fit of the model to the data and the physically interpretable results. The optimal factor number was 5 for the village dataset and 4 for the mine dataset. Based on factor chemical profiles and time series a common factor of coarse aerosol was identified. The factor contributed to the PM_{10} concentration in the village by about 30%. Nevertheless, this factor includes re-suspended aerosol with similar chemical fingerprint as the one produced by the mining activities. Based on different time course of the factor contribution and meteorological condition especially wind speed and direction the contribution of mining activities in the village to PM_{1-10} and PM_{10} concentration is estimated to be 6% and 20%, respectively.

Key words: PM10; source apportionment; receptor modelling; highly time resolved elemental composition; rotating drum impactor; S-XRF.

* Corresponding Author

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Asbestos fibre disintegration to nanosize range

Miroslav Klán [1]*, Jan Hovorka [1], David Havlíček [2]

[1] Charles University in Prague, Faculty of Science, Institute for Environmental Studies, Albertov 6, 12843 Prague 2, Czech Republic

[2] Charles University in Prague, Faculty of Science, Department of Inorganic Chemistry, Albertov 6, 12843 Prague 2, Czech Republic

ABSTRACT

Asbestos fibre occurrence and emissions into the ambient air is well documented problem and there seems to be nothing new. Despite the conformity in the mining and manipulation with this dangerous carcinogenic material, there are high concentrations of asbestos fibre in the ambient air at several sites, even in highly economically advanced countries. One example is the city of Pilsen and its surrounding. The first valid asbestos fibre actinolite limit exceedances were observed there in 2002. Thereafter, five-year long research followed and it was proven that respirable actinolite fibers are emitted to ambient air during mining and aggregate processing with high content of the asbestos mineral actinolite during construction works, winter road gravel strewing, pavement dusting. Actinolite $Ca_2(Mg,Fe^{2+})5Si_8O_{22}(OH)_2$ is classified in the group of calcium amphibols which forms part of asbestos minerals. In the Pilsen area is occurred in Proterozoic metamorphosed altered basalts called spilite. Spilite mining in the Pilsen area represents, according to inquiry, more than 1million tons of aggregate per year. Fine fraction is a significant part which are often used in the mixtures. Asbestos fibres are formed by the mechanical abrasion of the rock, from the material which are not in the fibre form. Actinolite is most often crumbled in the ratio 1/7-8 (width/length). In the Pilsen area there are often fibres 1-2 μm wide and around 7-14 μm long. Actinolite asbestos fibre distribution and its number concentration in the Pilsen ambient air is not yet sufficiently explained. According to previous single measurements of asbestos fibre number concentration there are around 1000m-3 fibres depending on the dustiness and source proximity. Fibres long or longer than 5μm and about 3μm in diameter and of the ratio 1/3 are considered as an asbestos fibre for number concentration evaluation. Additionally, those fibres are disintegrated by the mechanical abrasion to nanofibres of 10nm width and 100nm length with the ratio 1/7-10 as found by transmission electron microscopy. Unlike spherical nanoparticles emitted by high temperature processes, asbestos actinolite nanofibres generally do not form aggregates or chains. Particles of 35nm exhibit the highest pulmonary alveolar deposition efficiency amongst fine aerosol particles. Therefore, high appearance of asbestos nanofibres in the ambient air poses a serious potential human health threat at the site.

Key words: Asbestos; actinolite; gravel; urban aerosol A.

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* Corresponding Author

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Temperature, relative humidity, O_3 and NO_x vertical profiles within planetary boundary layer in winter urban air shed

Jan Bendl [1]*, Jan Hovorka [1], Vlasta Svecova [2]

[1] Charles University in Prague, Faculty of Science, Institute for Environmental Studies, Benátská 2, 128 01 Prague 2, Czech Republic

[2] Acad. Sci., Institute of Experimental Medicine, Department of Genetic Ecotoxicology, Vídeňská 1083, Prague 4, 142 20, Czech Republic

ABSTRACT

The planetary boundary layer is a dynamic system with turbulent flow where horizontal and vertical air mixing depends mainly on the weather conditions and geomorphology. Normally, air temperature from the Earth surface decreases with height but inversion situation may occur, mainly during winter-time. Pollutant dispersion is poor during inversions so air pollutant concentration can quickly rise, especially in urban closed valleys. Air pollution was evaluated by WHO as a human carcinogen (by polycyclic aromatic hydrocarbons etc.) and health effects are obvious. Knowledge about inversion layer height is important for estimation of the pollution impact and it can give us also information about the air pollution sources. NO_x and O_3 vertical profiles complement ground measurements. Comprehensive characterization of urban aerosol was conducted in residential district of the city of Kladno Svermov, about 30 km NW of Prague, from the 2nd Feb. to the 3rd of March 2016. The Svermov is an air pollution hot-spot for long time benzo[a]pyrene B[a]P limit exceedances, reaching the highest B[a]P annual concentration in Bohemia – west part of the Czech Republic. The city Kladno residential district - Svermov is situated in a shallow valley. Five minute integrates of aerosol number size distributions in the range of 14 nm – 10 000 nm, CO, NO_x, SO_2, O_3, CH_4, NMHC, meteorology parameters were measured at the station placed at the sports field in Svermov. Simultaneously, measurements with tethered balloon were conducted in the immediate vicinity to the station. Total number of 53 series of vertical profiles for temperature, humidity, pressure and NO, NO_2 and O_3 up to the height of 300 m within the atmospheric boundary layer were conducted by tethered, helium-filled balloon. While meteorology parameters were acquired with 4 Hz frequency, trace atmospheric gaseous components were measured with 1min integration time by an ATEKNEA Little Environmental Observatory. Gaseous components data were corrected by the Horiba automatic analysers in the station. The measurements confirmed frequent formation of temperature inversion within boundary layer up to the height of 50m. Gaseous component vertical profiling is in progress.

Key words: Tethered balloon; NO_x; O_3; vertical profiles; urban air.

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* Corresponding Author

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Statistical properties of magnetic field fluctuations in the Earth's magnetosphere

Liudmyla Kozak [1,2]*, Anthony Tat Yin Lui [3], Elena Grigorenko [4], Elena Kronberg [5], Andrew Prokhorenkov [1]

[1] Kyiv Taras Shevchenko University, Ave. Glushkov 4, Kyiv 03189, Ukraine

[2] Space Research Institute National Academy of Sciences of Ukraine and State Space Agency of Ukraine, Glushkov Ave 40, 4/1, 03680, Kyiv 187, Ukraine

[3] Applied Physics Laboratory, Laurel, Maryland, United States

[4] Space Research Institute, Russian Academy of Sciences, Str. Profsoyuznaya 84/32, Moscow 117997, Russia

[5] Max Planck Institute for Solar System Research, Justus-von-Liebig-Weg 3 37077, Göttingen, Germany

ABSTRACT

The statistical features of the magnetic field fluctuations in the boundary regions of the Earth's magnetosphere and the Earth's magnetosheet have been studied on different timescales based on the Cluster-2 measurements. As a characteristic of the fluctuations on various time scales, changes in the shape and parameters of the probability density function and wave analysis were studied. In order for investigations of features of the probability density functions of magnetic field fluctuations we analysed the statistical properties of the absolute value of magnetic field variations in the different regions of near earth space. Amplitude of fluctuations in the magnetosheath just after crossing bow shock exceeds in a few time amplitude of fluctuations for non-perturbed solar wind or the foreshock. The analysis of the height of maximum of the probability density functions and of the kurtosis values have shown the presence of different asymptotic modes which are characterized by different power laws. The use of the technique of probability density function for magnetic fluctuations has shown that at high frequencies the structure of turbulence differs from that in the low-frequency region. The critical scale corresponds to the scales of the Larmor radius of ions. The research of the statistical properties of boundary layers allows to determine the role of turbulent processes in the interaction of plasma flows with the magnetic obstacles, whether these are fields of planets, stars, or laboratory traps, and to reveal the actual mechanisms of the energy transformation in collisionless plasma.

Key words: Earth's magnetosphere; Earth's magnetosheet; probability density function; magnetic field fluctuations; boundary regions of the Earth's magnetosphere; Cluster-2 measurements.

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* Corresponding Author

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Satellite-based analyses of the relationship between atmospheric CO_2 and arctic sea ice

Jiwon Kim *, Yang-won Lee

Pukyong National University,Department of Spatial Information Engineering, South Korea

ABSTRACT

The global warming is caused by greenhouse gases which absorb infrared radiation that the earth release. According to the Kyoto Protocol, the carbon dioxide (CO_2) is one of the six greenhouse gas (CO_2, CH_4, N_2O, HFC, PFC, SF_6). And CO_2 is accounted for about 60 percent of all greenhouse gas emission from human activities. The ocean is a significant repository absorbing CO_2 of the atmosphere. Especially, in case of the Arctic Ocean, about 5 to 14 percent of this gas is known to be preserved in this area. Hence, Sea ice emits CO_2 into the atmosphere. Although studies about CO_2 and Sea ice have separately been underway, but a study about relationship between CO_2 and sea ice haven't been activated. The objective of this study is to identify the correlation between arctic sea ice and CO_2 of the atmosphere using the observation source. As satellite data is used in this study, AIRS (Atmospheric Infrared Sounder) on board Aqua satellite launched in May of 2002 has observed carbon dioxide level and SMMR (Scanning Multi-channel Microwave Radiometer) has observed sea ice concentration. Through monthly data from September of 2002 to December of 2014, we could recognize correlation between CO_2 and sea ice concentration. Consequently, we could identify the more decrease sea ice concentration, the more increase CO_2. And we also know that correlation between CO_2 and sea ice concentration is different for every areas of ocean. This study's result is expected to be used as a decision supporting materials on climate response policy.

Key words: Carbon dioxide; sea ice; sea ice concentration; climate change; relationship analysis.

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Setting up a network of agrometeorological stations in East Timor

José Andrade [1]*, Tiago Silva [2], Hugo Trindade [2]

[1] University of Evora, Department of Geosciences, Institute of Mediterranean Agricultural and Environmental Sciences (ICAAM), Rua Romão Ramalho, 59, 7000-671 Évora, Portugal

[2] Camões Mission – Institute for Cooperation and Language, Global Climate Change alliance programme in East-Timor, MAP of East-Timor, Comoro, Dili, East-Timor

ABSTRACT

A developed and sustainable agriculture requires a permanent and reliable monitoring of climatic/ meteorological elements in (agro) meteorological stations which should be located close to agricultural, silvicultural or pastoral activities. An adequate network of meteorological stations is then a necessary condition to support innovation and development in any country. Developing countries, mainly those with a history of frequent conflicts, presents deficient number of weather stations, often poorly composed and improperly distributed within their territories, and without a regular operation that allows continuity of records for a sufficiently long period of time. The objective of this work was to build a network of meteorological and agro-meteorological stations in East Timor. To achieve this goal, the number and location of pre-existing stations, their structure and composition (number and type of sensors, communication system,…), the administrative division of the country and the available agro-ecological zoning, the agricultural and forestry practices in the country, the existing centres for the agricultural research and the history of the weathers records were taken into account. Several troubles were found (some of the automatic stations were assembled incorrectly, others stations duplicated information regarding the same agricultural area, vast areas with relevant agro-ecological representativeness were not monitored …). It was proposed the elimination of 11 existing stations, the relocation of 7 new stations in places not covered until then, the automation of 3 manual meteorological stations. Two networks were then purposed, a major with 15 agro-meteorological stations (all automatized) and one other secondary composed by 32 weather stations (only two were manual). The set of the 47 stations corresponded to a density of 329 km^2/station. The flexibility in the composition of each of the networks was safeguarded and intends to respond effectively to any substantive change in the conditions in a country in constant change. It was also discussed the national coverage by these networks under a “management concept for weather stations”.

Key words: Network; agrometeorological station; set up; East Timor.

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Physiographical study on the extent of effects contributed by soil temperature and humidity on ground heat flux rates

Vahid Ikani [1], Karem Chokmani [2], Richard Fournier [1], Loghman Fathollahi [3]

[1] Université de Sherbrooke, Centre d'applications et de recherche en télédétection(CARTEL), Département de Géomatique appliquée, Québec, Canada

[2] Institut National de la Recherche Scientifique (INRS) ¬ Eau Terre Environnement Research Centre, Québec, Canada

[3] Boukan Meteorological Station, West Azerbaijan, Iran

ABSTRACT

In a variety of problems involving micrometeorology, it is often necessary to evaluate as precisely as possible the variation terms in the ground heat flux mechanism. While many models employ surface soil physic to predict the ground heat flux, in general the treatment of soil moisture remains very crude. In fact, additional work is needed to investigate and refine the relationship between ground heat flux and soil temperature and humidity. Consequently, the main objective of this research was to assess the contribution of soil temperature and soil moisture on ground heat flux over an agricultural zone. To achieve this end, the specific objective was to determine soil heat flux using a temperature gradient method. To address these objectives, a field measurement experiment was conducted in a commercial vineyard located in Quebec (Canada) during the spring of 2015. For this study, two different zones were selected for experimental measurements. Each individual zone represented a distinct microclimate condition, and a measurement station was installed at each site. One of these stations was installed in a clear-cut area, and the second station was placed at a distance of 110 m from the centre of the clear-cut area; this second station was situated in a shelter-wood region. Detailed measurements of both soil moisture and temperature were collected at the surface of the ground as well as at a depth of 30 cm below the surface within each of the two zones. The results show that soil temperature is a key factor that affects the ground heat flux range. The change in soil temperature is also of greater importance than soil humidity in the ground heat flux variation range. On the other hand, physiographical analyses have illustrated the importance of the role of soil humidity as a stabilizer of ground heat flux variation against meteorological condition influence. A spatial analysis has shown that the contribution of ground heat flux is less important in a sheltered or shadowed area, in comparison to a more open area. Finally, the measurement of ground heat flux can be a difficult task yet; based on the results shown in this research, namely that soil temperature is the most significant factor in these types of analyses, the utilization of a simpler model based solely on soil temperature is recommended.

Key words: Ground heat flux; soil humidity; soil temperature; clear cut area; shelter-wood.

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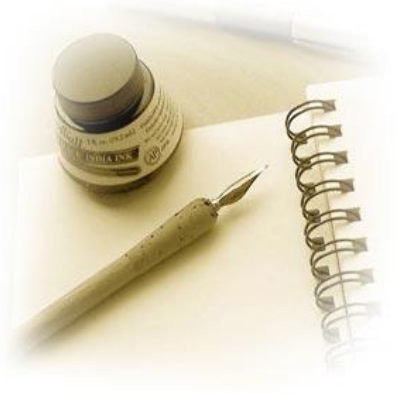

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Geographical impacts on flood water in the Mekong River Delta

Hoang Thai Duong Vu *[1] , Franz Nestmann [1] , Van Trinh Cong [2] , Peter Oberle [1]

[1] Karlsruhe Institute of Technology, Kaiserstraße 12, 76131, Karlsruhe, Germany
[2] Mekong Water Technology Innovation Institute, 72 Tran Van Danh, Ward 13, Tan Binh dist., HCMC, Vietnam

ABSTRACT

The Mekong River Delta (MRD) is one of the largest river deltas in the world, it is located in the lower Mekong River, which originates at the Tibetan plateau and crosses China, Myanmar, Laos, Thailand, and Cambodia before entering the territory of Vietnam. The MRD is considered as a rice bowl of the whole country with a contribution approximately 52% of the national rice production, and 70% of national rice exportation, putting Vietnam at the second place in the world rice market. With an area of only about 5% of the total catchment area of the Mekong River and low natural ground (mostly below +2m a.s.l.), and annually the MRD is impacted by flooding from upstream Mekong river. Due to the strategy of intensive rice harvesting development issued by the Government of Vietnam, a mass of poldering system including semi-dyke (to protect rice fields from flood water until middle August) and the full-dyke system (to protect the rice fields fully from flood water) has been built rapidly in the flooded areas. As a result, it causes consequences to downstream areas. In this line, the present study is aimed at analysing the geographical impact factor of poldering system (in flooded areas) on flood water level along the main rivers in the Mekong delta based on hydraulic modelling.

Key words: Mekong River Delta; dyke system; geographical impact factor (GIF).

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Three-dimensional simulation of tsunami run-up around conical island using smoothed particle hydrodynamics

Sergei K. Buruchenko *

South Ural State University, Snezhinsk, Russia

ABSTRACT

The large-scale laboratory experiments were performed in a 30 m-wide, 25 m-long, and 60 cm-deep wave basin. Waves were realistically created in the tank by a horizontal wave generator with 60 different paddles each 46 cm-wide and moving independently. These experiments provided run-up observations for validating numerical models and supplemented comparisons with analytical results. Smoothed particle hydrodynamics (SPH) is a popular meshfree, Lagrangian method with attractive features in modelling fluid dynamics. The SPH method is capable of dealing with problems with free surface, deformable boundary, moving interface, wave propagation and solid simulation. A weakly incompressible fluid flow SPH model was employed in this paper to investigate the run-up heights of near shore tsunamis in the vicinity of a circular island. The predicted numerical results have been verified by comparing to available laboratory measurements. A good agreement has been observed.

Key words: Computer; modelling; earth; tsunami.

* Corresponding Author

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Numerical simulating three dimensional wave run-up over breakwater

Sergei K. Buruchenko *

South Ural State University, Snezhinsk, Russia

ABSTRACT

The application of smoothed particle hydrodynamics (SPH) to model the three-dimensional fluid-structure interaction for waves approaching a rubble mound breakwater is presented. The main aim is to investigate the influence of the forms of block sea breakwater on its overtopping. Using novel computer architecture solutions such as graphics processing units (GPUs), the fluid-structure interaction is modelled with SPH particles between armour blocks that are representative of the real structure. The open-source GPU code, DualSPHysics, enables the simulation of millions of particles required for the accurate simulation of the run-up on an armoured structure. SPH has been proven to be a suitable method for practical applications in coastal engineering. The aim is to investigate the reliability of this approach as a design tool.

Key words: Wave run-up; block sea breakwater; numerical simulation; smoothed particle hydro-dynamics.

* Corresponding Author

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Daily reservoir inflow forecasting using data mining methods

Mohammad Taghi Sattari *, Saeed Samadianfard

Water Engineering Department, Faculty of Agriculture, University of Tabriz, Tabriz, Iran

ABSTRACT

In this research, artificial neural networks (ANNs) and M5 tree model as a data mining methods used for estimation of the Sattarkhan Reservoir inflows in North East of Iran. Different combinations of precipitation, evaporation and discharge time series data at reservoir upstream stations considered as the inputs and the next day discharge as the output of two models. Results of the various scenarios in both models showed that the scenario in which the model input consisted of the precipitation, last and current day discharge could easily estimate the next day discharge with high accuracy. Moreover, results indicated that the ANNs model with an Root Mean Squared Error (RMSE) value of 1.026 m3/s and Correlation Coefficient (CC) with 0.922 presents relatively high accuracy, but M5 tree model with an RMSE value of 0.88 m^3/s and CC with 0.917 could be estimates reservoir inflow via 2 simple linear equations especially regarding low-level flows. Comparison of methods showed that the M5 tree model as an accurate and simple method could be preferred in reservoir inflow forecasting.

Key words: Reservoir inflow; forecasting; Artificial Neural Networks; M5 Model Tree.

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Trends and seasonal variations in global sea level revealed by singular spectrum analysis and wavelet multi-resolution analysis

Sofiane Khelifa *

Centre of Space Techniques, PO Box 13, 31200, Arzew, Algeria

ABSTRACT

The main purpose of this paper is to apply the Singular Spectrum Analysis (SSA), based on the phase space, and the Wavelet Multi-resolution Analysis (WMA), based on the frequency space, to the weekly time series of Global Sea Level Anomaly (GSLA) derived from satellite altimetry data over 1993-2013, in order to assess its nonlinear trends and its seasonal signals. The SSA results show that the GSLA time series is mainly dominated by a nonlinear trend explaining 89.89% of the total GSLA variability, followed by annual and semi-annual signals with an explained variance of 9.15% and 0.32%, respectively. For the annual signal, both methods give similar results. Its amplitude is less than 14 mm with an average of about 11 mm, and its minimum and maximum occur in April and October, respectively. The calculation of sea level trend, by both methods, is direct without removing the seasonal signals from the original GSLA time series as the most commonly used in the literature. The global sea level trend obtained from the WMA is about 2.52 ± 0.01 mm/yr which is in good agreement with 2.94 ± 0.05 mm/yr estimated from the SSA. Furthermore, the SSA method is most suitable for seasonal adjustment, and the WMA method is more useful for providing the different rates of sea level rise. Indeed, the WMA reveals that the global sea level has risen with the rate of 3.43 ± 0.01 mm/yr from January/1993 to January/1998, 0.66 ± 0.01 mm/yr from February/1998 to May/2000, 5.71 ± 0.03 mm/yr from June/2000 to October/2003, and 1.57 ± 0.01 mm/yr since January/2004.

Key words: Time series analysis; sea level anomaly; singular spectrum analysis; wavelet multi-resolution analysis; nonlinear trends; seasonal signals.

* Corresponding Author

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Contributions to load efficiency in a computer cluster environment for an oblique subduction tentative modelling

Mihai Pomeran *, Lucian Beșuțiu, Luminița Zlăgnean

Institute of Geodynamics of the Romanian Academy, 19-21 Jean-Louis Calderon St., Bucharest-37, Romania

ABSTRACT

Despite the increasing power of computer clusters employed for numerical modelling of Earth's interior dynamics, reducing the computing time therefore optimizing the operation costs still represents a challenge. The paper aims to improve the knowledge about the role of the mapping process that shares the computing load among the individual processors of a computer cluster. We base our work on the idea that the mapping stencil should take into account the peculiarities of the simulation (e.g. the gradient of the studied physical quantity). To run our computations, we use the CitcomS finite element software package, installed at the CYBERDYN cybernetic infrastructure (CCI) owned by the Solid Earth Dynamics Department in the Institute of Geodynamics of the Romanian Academy. CCI is a modern Beowulf-type high performance computer cluster, combined with a high performance visualization cluster and a 3D stereoscopic projection system. CCI's architecture is structured around 1344 central processing unit (CPU) cores and 3 TB of random access memory (RAM). The high speed interconnect is provided by a Qlogic InfiniBand switch, able to transfer up to 40 Gbps. The CCI storage component is a 40 TB Panasas network attached storage (NAS). The considered scenario has been an oblique subduction. Two identical tectonic plates converge towards each other on the longitude direction, for a period of 30 Myr (model time). Then, an assumed pole jump of one plate changes the velocity vector field and as a result the tectonic plate increases its speed along the trench. When computation time ended (1000 numerical steps) 55 Myr of model time had passed, the structure of the subduction zone revealed a slab that appeared flat on one side of the model and steep on the other side, similar to that described by the CitcomS tutorial. The 3D model spanned within a spherical domain of 1274.2 × 3185.5Km lat×long or 11.46 ◦ × 28.65 ◦ lat×long, reaching 1900Km in depth. To solve the equations we employed a irregular numerical grid with higher resolution towards the middle and the top of the of the computing domain. To test our assumptions, we equally shared the 32768 finite elements of the model among CPUs, but in different ways. By analysing the execution and model time of each simulation, we have succeeded to find the optimum direction for the mapping stencil to distribute the CPU cores on. This way, the computing time is significantly smaller. The shortest execution time was less than half: 40% from the average execution time and 12.5% from the longest.

Key words: Computational geodynamics; HPCC; computing time; subduction.

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* Corresponding Author

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Numerical simulation on production efficiency and leakage risk of brine production only and enhanced by CO_2 storage under different permeability conditions of mudstone interlayers

Qi Fang [1], Guojian Peng [2]*, Junwen Lv [1], Yingfeng Luo [1]

[1] University of South China, School of Environmental Protection and Safety Engineering, Hengyang 421001, China
[2] University of South China, School of Computer Science and Technology, Hengyang 421001, China

ABSTRACT

Highly mineralized potassium-rich brine production enhanced by supercritical CO_2 injection and storage is proposed to be a win-win method for the enhancement of deep brine production and CO_2 geological storage. In this work, a multi-layered structural aquifer system separated by mudstone interlayers is built up to estimate the brine production efficiency and leakage risk as well regional pressure control of brine production only and enhanced by CO_2 storage under different permeability conditions of mudstone interlayers. The purpose of this work is to further verify the significant advantages of brine production enhanced by supercritical CO_2 storage compared to brine production only and provide more powerful persuasion for the decision-makers of deep highly mineralized potassium-rich brine resources development strategy. Numerical simulation results show that there is big difference on brine production efficiency, leakage risk and regional pressure regulation under both schemes of brine production only and enhanced by supercritical CO_2 under different permeability conditions of mudstone interlayers. However, the extent effect of the permeability conditions of mudstone interlayers to brine production efficiency, leakage risk and regional pressure change is much less obvious for brine production enhanced by CO_2 storage than that for brine production only. The results further confirm that brine production combined with CO_2 geological storage could be more attractive to enhance brine production efficiency and regional pressure regulation and CO_2 geological storage in a safe way, thereby achieving the economic and environmental benefits.

Key words: Brine production only; brine production enhanced by CO_2 storage; brine production efficiency; leakage risk; pressure regulation; CO_2 geological storage.

* Corresponding Author

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Design and implementation of a web service for satellite-based global meteorological information on the smartphone

Yeong-Ho Kim *, Yang-Won Lee

Pukyong National University, Department of Spatial Information Engineering, South Korea

ABSTRACT

In recent years, interest in the weather information in the abnormal weather due to global warming is increasing rapidly every day. In particular, meteorological information is important in order to cope with disasters such as localized heavy rain, flooding, typhoon and predict a little more in advance. Then meteorological information is provided to the user to be able to quickly determine the various severe weathers and disaster situations by using the processed finely information in daily life and industrial activities. The whole countries are also using fast supercomputer for the production of quick and accurate weather information. Data processing is in progress by using advanced information technologies such as grid computing. In this study, our visualization system for meteorological variables deal with various things. And our system can use everyone who have a smart phone or a computer. This system is used not only JAVA, but also JSON (JavaScript Object Notation) basically to make this system. In order to provide weather information more effectively, we build a Web Service that predict the current weather based on historical weather data. We also provide a comfortable environment for users to use by be equipped with a database of data in the computers, smart phones. DBMS (Database Management System) manage various meteorological information such as global temperature, air barometric pressure, precipitation, sky coverage, and wind including wind speed, wind direction calculated from the satellite data, we have developed a service to be provided through the Android and iOS smart phones. In the future, if Big data mining techniques based on SNS (Social Network Service) is cooperated with our visualization system, usability will be more better than before.

Key words: Web service; smartphone apps; visualization system; meteorological data.

* Corresponding Author

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Coupled hydro-mechanical model of bentonite hydration and swelling

Ilona Hancilova [1]*, Milan Hokr [2]

[1] Technical University of Liberec, Faculty of Mechatronics, Informatics and Interdisciplinary Studies, Czech Republic

[2] Technical University of Liberec,Institute for Nanomaterials, Advanced Technology and Innovation, Czech Republic

ABSTRACT

We deal with a modelling of bentonite hydration coupled with mechanical processes at the buffer and host rock interface (bentonite and granite) in the context of the safe disposal of spent nuclear fuel. Research of the processes in the deep geological repository barriers and characterization and prediction of thermo-hydro-mechanical behaviour belong to an important safety issue. Granite, as one of the considered repository barrier, includes fractures which cause the increase of total permeability value. This causes bentonite hydration and its subsequent swelling which affects mechanical behaviour and the stability of the whole system. Numerical modelling of so-defined problem involves a large number of difficulties (e.g. non-linearities in bentonite behaviour and its mathematical description and solution of coupled problem). We developed a non-linear solution of stress-deformation problem with swelling in a solution-dependent computational domain and boundary condition (either continuous material or a contact problem with a free surface allowing only compression). This solution is coupled with the non-linear diffusion problem, which is equivalent expression of Richards' equation controlling the hydration in the unsaturated state. The swelling of bentonite is defined with a coefficient dependent on water content according to literature data. The effective Young's modulus is also dependent on water content, with the decrease close to zero corresponding to the plastic state in high water content. Water flow and elasticity is considered for granite (fully saturated medium at the beginning of the process with no volume changes with the change of water content). The contribution shows the alternative method for solution of complicated hydro-mechanical problems in bentonite. Model concept is applied to a 3D model with bentonite, granite and fracture, which is solved in the universal multiphysics simulation system ANSYS.

Key words: Modelling; coupled processes; rock-bentonite interaction, granite; bentonite.

* Corresponding Author

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A dynamic time warping based approach for mining periodic patterns in hydroclimatic time series

Mete Celik [1]*, Nuh Azginoglu [2], Filiz Dadaser-Celik [3]

[1] Erciyes University, Department of Computer Engineering, Kayseri, Turkey
[2] Nevşehir University, Department of Computer Engineering, Nevşehir, Turkey
[3] Erciyes University, Department of Environmental Engineering, Kayseri, Turkey

ABSTRACT

Periodicity is defined as the behaviour that repeats itself in specific time periods. Periodicity is a common behaviour in real world applications (i.e., the world's movement, web site hits, and heartbeats) and discovering periodic patterns is important for several application domains, including hydrologic and climatic sciences. In this study, we propose a new method that bases on dynamic time warping (DTW) approach for detecting periodic patterns in hydroclimatic time series. The main idea of periodicity detection with DTW is to compare the original signal with its shifted copies. If the periodicity similarity ratio is higher than the given threshold then the time series are called periodic. In this study, we define the problem of mining periodic patterns in hydroclimatic time series, propose a novel periodicity mining algorithm and apply the method to a hydrologic and climatic dataset of Turkey. The dataset used includes data for stream flow, precipitation and air temperature parameters for a 26-year period. The analysis showed that periodicities in time series can be successfully detected with the proposed algorithm.

Key words: Periodicity; periodic patterns; data mining; hydroclimatic time series.

* Corresponding Author

mess@mess-earth.org

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Engineering-geological data model – the first step to build national Polish standard for multilevel information management

Grzegorz Ryżyński *, Tomasz Nałęcz

Polish Geological Institute, National Research Institute, 4 Rakowiecka St., 00-975 Warsaw, Poland

ABSTRACT

The efficient geological data management in Poland is necessary to support multilevel decision processes for government and local authorities in case of spatial planning, mineral resources and groundwater supply and the rational use of subsurface. Vast amount of geological information gathered in the digital archives and databases of Polish Geological Survey (PGS) is a basic resource for multiscale national subsurface management. Data integration is the key factor to allow development of GIS and web tools for decision makers, however the main barrier for efficient geological information management is the heterogeneity of data in Polish Geological Survey resources. Engineering-geological database is the first PSG thematic domain applied in the whole data integration plan. The solutions developed on this area will facilitate the creation of procedures and standards for multilevel data management in Polish Geological Survey. 20 years of experience in delivering digital engineering-geological mapping in 1:10 000 scale and archival geotechnical reports acquisition and digitisation allowed to gather a database consisting of more than 300 thousands engineering-geological boreholes as well as set of 10 thematic spatial layers (including foundation conditions map, depth to first groundwater level, bedrock level, geohazards etc…). Historically the desktop approach was used for the geological-engineering data storage, resulting in multiple non-correlated interbase datasets. The need for creation of domain data model emerged and an object-oriented modelling (UML) scheme was developed. The aim was to merge all datasets in one centralised Oracle server and prepare the unified spatial data structure for efficient web presentation and applications development. The presented approach will be the milestone toward creation of the Polish national standard for engineering-geological information management. The paper presents the approach and methodology of data unification, thematic vocabularies harmonisation, assumptions and results of data modelling as well as process of the integration of domain model with enterprise architecture implemented in PSG. Currently there is no geological data standard in Poland. Lack of guidelines for borehole and spatial data management results in an increasing data dispersion, the growing barrier for multilevel data management and implementation of efficient decision support tools. Building the national geological data standard makes geotechnical information accessible to multiple institutions, universities, and administration and research organisations and gather their data in the same, unified digital form according to presented data model. Such approach is compliant with current digital trends and the idea of Spatial Data Infrastructure. Efficient geological data management is essential to support the sustainable development and economic growth, as it allows implementation of geological information to assist the idea of Smart Cites, deliver information for Building Information Management (BIM) and support modern spatial planning. The engineering-geological domain data model, presented in the paper, is a scalable solution. The future implementation of developed procedures on other domains of PGS geological data is possible.

Key words: Data model; data standard; engineering-geology; mapping; Spatial Data Infrastructure.
* Corresponding Author

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Stand to identify damage and defects in an induction motor under operating

Ivan Suvorov, Olga Khanzhina *, Alexander Sidorov

South Ural State University, Lenin prospekt, 76, Chelyabinsk, Russia

ABSTRACT

Induction motor is widely used in many sectors of the economy, due to the simplicity of production and operation. This is confirmed by the fact that the asynchronous electric drive consumes up to 40 % of the electricity produced in the world. However, the optimal use of induction motors prevent their high damage (damaged annually 20-25 % of the total number of installed motors). It leads to disruption of continuity of technological processes, resulting in the defective products, costs for recovery and repair of electric motors, as well as for the restoration of normal technological processes of production. To reduce the costs of maintenance and preventive maintenance of electric drives, to reduce the likelihood of electrocution, it is necessary to periodically monitor their condition. The test facility includes: a circuit breaker, current transformer, starter, three-phase auto-transformer, a device converting current / voltage connection switch motor windings - star/delta and the position of the current transformers - phase / line, digital oscilloscope, specialized software. The functionality of the stand allows to apply the motor required voltage level, and also to make his adjustment (to adapt to the rated value), remove the waveform phase and line currents without additional attachments, save to the experimental data the hard disk to hold the spectral current analysis using discrete Fourier transform. The maximum capacity of the diagnosed motor is 2.2 kW. The principle of operation is the transformation of the electric current consumption, followed by conversion to a certain voltage level, which is supplied to the input of a digital oscilloscope. The software part of the stand is receiving data from the digital oscilloscope and makes their processing (selection period, signal averaging). The processed data is loaded into the application for the spectral analysis of the signal. At the final stage of the analysis, the user can see a graphical interpretation of the amplitude-frequency spectrum of the signal under study, where you can see the distortion corresponding to specific damage, so, for example, was considered insulation damage on the body of the asynchronous motor brand AIR71A6U3. Designed stand allows you to use different methods of control the technical condition of electric motors based on the input current study, and is a good basis for creating an automated complex diagnosis and assessment of the residual life of the drives. Technical characteristics of the diagnostic stand are; maximum power diagnosed induction motor is 2,2 kW, power Supply is 380 W and weight is 150 kg. In conclusion, developed by induction motors diagnostic technology can detect damage and defects in the insulation of induction motors, and in the future - the residual life of the insulation. The proposed technology is different from analogues that allows you to: adjust the supply voltage, lower capital investment, analyse the state of the induction motor on the discrete Fourier transform. The laboratory setup used in the departments of BC of SUSU and power and electrical Transbaikal State University.

Key words: Stand; defects; induction motor; frequency; converter.

* Corresponding Author

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Application of occupational safety for the marble quarries used image processing techniques

Ali Erdem Çerçevik *[1], Suheyla Yerel Kandemir [1], Mustafa Özgür Yaylı [2]

[1] Bilecik Şeyh Edebali University, Bilecik, Turkey
[2] Uludağ University, Bursa, Turkey

ABSTRACT

Occupational accidents occur every year in the marble quarries. Deaths and injuries each year in the mining sector occupational accidents occur. Marble quarries are areas where many dangers. For example, falls from heights, injuries from cutting and drilling tools. Dangers to avoid these risks should be reduced to a minimum and full training of workers. However, the preventions taken for occupational safety must not be adequate, should benefit from the new technology. Image processing is one such technology. Today, image processing technologies have been used in the mining industry. In this study, the characteristics of the camera will be examined for risky parts of the marble quarries.

Key words: Occupational safety; marble quarries; image processing; camera.

* Corresponding Author

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Economical methods of the safety management of labour

Alexander Sidorov *, Irina Beregovaya, Olga Khanzhina

South Ural State University, Lenin prospekt, 76, Chelyabinsk, Russia

ABSTRACT

The article discusses the issues of the economic methods of the safety management. Powered author's definition of safety management, which is represented as a purposeful process to identify, installation, establish and maintain such a state of working conditions in which there is no possible effects of dangerous and harmful factors, or the extent of their influence does not go beyond certain limits. The paper noted that the economic methods, along with the administrative, organizational and administrative, social and psychological methods of management are part of the safety management. In turn, the authors of economic methods of the safety management proposed to classify a number of respects, in particular according to: a. Management of the subject: on methods coming from the top management, middle management, line management; b. Management of the object: in the methods, process-oriented, result, condition, staff; c. In relation to the enterprise environment: on the methods used by internal and external environment; d. The content of the control action as economic methods highlighted feasibility study, feasibility study, planning, financial incentives, preferential crediting of enterprises, pricing, profit sharing and equity, preferential tax treatment for enterprises, the establishment of economic norms and specifications, benefits under compulsory social insurance against industrial accidents and occupational diseases, and others. The article discusses the mechanism of safety management using economic methods, based on the process approach. This approach takes into account the initial state ("input"), character (content) of control actions, the subject of management, feedback economic methods ("exit"). It is stressed control the impact of economic methods must be such that the parameters of the "exit" shall comply with "the consumer". A model for evaluating the effectiveness of the use of economic methods of safety management, based on the application of the system of indicators, taking into account the results of management before and after the application of these methods correlated with the costs of their (methods) implementation.

Key words: Labour safety; working conditions; management of occupational safety.

* Corresponding Author

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Definition of the regular intervals of the certification electricians

Alexander Sidorov *, Olga Khanzhina

South Ural State University, Lenin prospekt, 76, Chelyabinsk, Russia

ABSTRACT

In the modern production worker's safety is largely determined by the level of his skill and depends on the quality and content of training. Safety training is conducted throughout the entire production activity of the worker: the passage of industrial training directly in the process, with retraining and advanced training. For electricians business training system is regulated by the rules of technical operation of electrical consumers. Despite the considerable attention paid to safety issues identified in the analysis of the causes of electrical shocks prevalence of organizational factors (70%), including the instructions and safety regulations (20%), casts doubt on the effectiveness of the existing training system. In addition, up to 50% of electrical shocks with organizational reasons take place before the expiration of two months from the date of the last instruction, which also speaks of the low efficiency of the latter. Experimental studies carried out at a number of the main electric networks, metallurgy, machine building industry, led to the conclusion that the level of residual knowledge electricians OSH depends on the following personal characteristics: education (the correlation coefficient was 0.58), the group of electrical safety (coefficient the correlation is 0.89), sex (the average level of knowledge of women was higher than men). The effect of the age and length of service at the level of residual knowledge in general is practically absent (correlation coefficients were, respectively, 0.049 and 0.028). It is observed only personnel with higher education. It is proposed to characterize the rate of forgetting the information by a factor L represented by a fuzzy number with a triangular membership function assignment: L= (0.0129, 0.018, 0.023). An analysis of the experimental results allowed to distinguish four groups of people with similar individual characteristics of forgetting information rate: a. Electro-male staff from the 5th group of electrical safety (L= 0.0129); b. Operational female staff with the 3rd, 4th and 5th group of electrical safety (L= 0.0129); c. Operational, operational and maintenance, administrative and technical staff of the male with the 3rd and 4th group of electrical safety (L= 0.023). A method for determining the date of the subsequent certification of electrical safety, taking into account the results of the current evaluation and the individual characteristics of workers (a group of electrical safety, education, gender) and held its approbation. The introduction of the proposed system of certification will reduce the risk of electrical danger situations caused by violations of the rules and regulations of labour protection, from 2.4 to 17 times while also improving power supply reliability by eliminating emergency situations.

Key words: Electric personnel; electrical safety group; validation.

* Corresponding Author

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Calculation settings for the insulation monitoring systems in the distribution networks with the voltage 6 or 10 kV in conductions of uncertainty

Alexander Sidorov *, Yulia Medvedeva, Olga Khanzhina

South Ural State University, Lenin prospekt, 76, Chelyabinsk, Russia

ABSTRACT

The effectiveness of the insulation monitoring systems based on the measurement of regime parameters of electric network is largely determined by your goal setting, that is, that network isolation resistance value relative to the ground, at which should be carried out off a particular part of the network, which further decrease the insulation resistance is unacceptable. It is common knowledge that the network insulation resistance to ground changes continuously and depends not only on the qualifications of personnel operating the network, the quality of its construction, but also on the sectorial network accessories, it's execution. Distribution networks specified voltage can be urban, career, or be used for agricultural purposes in the industry. By design, they are divided into the air, cable, and mixed, containing both cable and air stations. From the performance of the network depends on the expected current single-phase ground fault, as well as its calming factor d, defined as the ratio of active and reactive impedance network isolation components relative to the ground. On the basis of these parameters are determined by the calculated values of capacitance and conductance network isolation phase relative to the ground. Calculated expected total conductivity isolation phases network with respect to earth is a point estimate and cannot be used as the setting because of the continuous change of the parameters of network isolation phases over ground we have already said. To determine the setting to present the resulting estimated expected value of admittance as a fuzzy number with a triangular membership function assignment μX: [0.1]→[1.0]. To define a fuzzy number X lower X' and upper X'' boundaries of satisfying the conditions found in the report. X' and X'' is calculated as follows: X' = X - β(X); X'' = X + β(X). Where in β(X) is determined depending on the discharge number of least significant digits X. The report shows the method of determining β(X). As the conductivity set-point Y accepted upper limit of fuzzy number, and if the setting is determined by the insulation resistance of the network with respect to earth - the lower boundary of the fuzzy number.

Key words: Isolation; monitoring; operating parameters; fuzzy number.

* Corresponding Author

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A systematic approach to ensure electrical safety in voltage networks up to 1000 V with earthed neutral

Rustam Valeev *, Olga Hanzhina, Alexsandr Sidorov, Alexsandr Ershov

South Ural State University, Lenin prospekt 76, Chelyabinsk, Russia

ABSTRACT

Electric network voltage up to 1000 V with dead-earthed neutral are the most extended, the total length of which reaches approximately one third of the total length of electric networks with voltage from 1 kV up to 220. Most of them are running air lines. Considerable length, maximum proximity of the considered electric network to the power consumer, a high degree of wear and accessibility to the exploitation of people without technical electrical education are the reasons for high level of electrical injuries among humans and animals, as well as the appearance of fire. The aim of this work is the creation of a systematic approach to improve electrical safety in electrical networks with voltage up to 1000 V overhead lines and balance on the power grid companies. The report briefly analyses the causes of the high level of damage and electrical injuries of low-voltage electrical networks. It is shown that the level of electrical injuries in these networks remains very high despite the advent of modern low-voltage protection devices and automation, with a broad functionality. The main protection devices are still fuses and circuit breakers on the basis of the thermomagnetic breakers. Studies carried out in South Ural state University, with the support of JSC "IDGC of Urals" has shown that the main causes of high level of electrical injuries are errors in the calculation of set points protection, low level single-phase currents earth fault and neutral conductor, a high degree of deterioration of electrical networks and the lack of protection that detects wire breaks. There is the description of the experiments in existing electric networks, the physical model and experienced in electric network with voltage of 380 V. It is the most important results of experiments and theoretical studies. Consider ways of improving electrical safety in electrical networks with voltage up to 1000 V with dead-earthed neutral, made of non-insulated wires. Evaluate the effectiveness of existing methods of selection of low voltage fuses. Special attention is paid to the partitioning overhead lines with voltage of 380 V fuse, as a means to improve the effectiveness of current protections. The proposed method of disposition section Group fuses, allowing to provide the response time of fuse less than 5 seconds. Theoretically and experimentally proved the effectiveness of the proposed method of constructing protection of overhead lines with voltage of 380 V from single-phase short circuits with fuses section area. We consider one of the solutions to the problems in the timely determination of the breakage of the phase and neutral wires with the help of microprocessor electricity meters. Carried out theoretical and experimental research South Ural state University and the branch of "IDGC of Urals"–"Chelyabenergo" showed the ineffectiveness of the existing protection at single-phase short circuits and breakages of the phase and neutral wires. These types of injuries are among the most dangerous, due to the fact that these types are difficult to identify. The conducted research allowed to develop a method to improve the effectiveness of current protections for single-phase short circuits and a method of detecting breakages of the phase and neutral wires. The developed method and device that can detect the broken wire were successfully tested in experimental electric network with voltage of 380 V.

Key words: Overhead lines voltage 380 V; single-phase short-circuit; electrical safety; breaks of zero and phase conductors; protective system.

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Assessment of occupational health and safety for a gas meter manufacturing plant

Ece Korkmaz, Gulen Iskender *, Fatos Germirli Babuna

Istanbul Technical University, Faculty of Civil Engineering, Environmental Engineering Department, 34469 Maslak, Istanbul, Turkey

ABSTRACT

Providing employees' health and safety at workplaces by taking necessary precautions are of importance especially when dealing with the industrial facilities. Various risk assessment methodologies are developed to assess occupational health and safety. Fine Kinney method based on probability, consequences and frequency is used as a tool to rank and prioritize the risks in workplaces. On the other hand 5S is a systematic approach to workplace organization. Apart from reducing the wastes and optimizing the productivity, application of 5S methodology also improves safety. In this context the objective of this study is to investigate the occupational health and safety for a gas meter manufacturing plant. The risk assessment and management study is applied to plastic injection and mounting departments of the factory through quantitative Fine Kinney method. Furthermore the effect of applying 5S workplace organization method on risk assessment is examined. The risk assessment reveals among 9 very high risks, 3 can be reduced by 83 % when 5S is applied. In other words, out of 9 very high risks (risk level is > 400 that leads activity cessation as required action); it is possible to reduce 6 to 70<R<200 level (significant risk score that leads measures to be taken as required action) and lower the rest 3 to 20<R<70 (possible risk score that leads to monitoring as required action) with the application of 5S.

Key words: Occupational health and safety; risk assessment; industry; Fine Kinney.

* Corresponding Author

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Implementing the requirements of the European rules named "REACH" specific of the safety activity with fireworks

Ciprian Jitea *, Attila Kovacs, Daniela Rus, Edward Gheorghiosu, Gabriel Dragoș Vasilescu

National Institute for Research and Development in Mine Safety and Protection to Explosion – INSEMEX, 32-34 G-ral Vasile Milea street, Petrosani, Romania

ABSTRACT

"REACH" is the European regulation (CE) no.1907/2006 for the mandatory Registration, Evaluation, Authorisation and Restriction of Chemicals. It entered into force on June 1st, 2007. "REACH" is a regulation and not a directive. Therefore it is not directly transposed into the national laws of the Member States of the European Union. However, these Member States may need to amend their regulatory system to integrate the corresponding new measures and requirements. "REACH" applies to chemical substances that are marketed, manufactured or imported in quantities of more than one tonne per year in the European Union (EU) territory extended to the European Economic Area. Articles which include such substances may also be submitted to it when their chemical composition determines their function to a greater degree than or the same degree as the special shape, surface or design they are given during production. The main aims of "REACH" are to ensure a high level of protection of human health and the environment from the risks that can be posed by chemicals, the promotion of alternative test methods, the free circulation of substances on the internal market and the enhancement of competitiveness and innovation. Consequently it makes industry responsible for assessing and managing the risks posed by chemicals and providing appropriate safety information to their users. The downstream manufacturers, importers and users have then an obligation to manufacture, market and use substances whose hazardous effects for human health or the environment are correctly controlled. These measures are based on the precautionary principle. "REACH" introduces an unprecedented change in the way information on the substances is exchanged throughout the supply chain. Each economic actor must now reinforce the traceability of the substances it uses and ensure that such uses fall within the Exposure Scenarios taken into account by the suppliers. So "REACH" results not only in imposing requirements but also in generating responsible behaviours of European manufacturers, importers and users of chemical substances. Its main consequence in legal terms is that it shifts the burden of proof of harmfulness of the chemical substances not to the States but to the economic actors. There are 3 different types of objects: • the object which is a chemical substance or a mixture of chemical substances, • the object which is a combination of an article (acting as container or carrier material) and of a substance or a mixture (cf. page 9 of the ECHA Guidance, Version 2), • the object which is an article with an integral substance/mixture (i.e. the substance or the mixture is an integral part of the article - cf. page 10 of ECHA Guidance, Version 2) Among these articles, it is necessary to differentiate those which intentionally release the contained chemical substances into the environment without any chemical transformation from those which don't release the contained substances or release them with chemical transformation. This point has a peculiar importance for fireworks.

Key words: Fireworks; REACH; industrial manufactures; requirement; chemical substances.

* Corresponding Author

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Assessment of workers occupational exposure in the context of industrial toxicology

Călămar Angelica *, George Artur Găman, Toth Lorand, Daniel Pupăzan, Simion Sorin

National Institute for Research and Development in Mine Safety and Protection to Explosion – INSEMEX, 32-34 G-ral Vasile Milea street, Petrosani, Romania

ABSTRACT

Knowledge and assessment of occupational risks in every workplace is the main objective of preventing occupational illnesses. The ultimate goal of safety and health at work is to protect life, integrity and health of workers against the risks of accidents and professional diseases that may occur in the workplace. This paper approaches the measurement of workplace respirable dust and microclimate parameters at a Romanian branch of a multinational company, in order to analyse the results in terms of safety and health of workers. The means of investigating the studied objective involved knowledge of the working environment, choice of pollutants, sampling, analysis and interpretation of sampled materials, as well as equipment and working methods. The research started as a result of an employee complaining of headache, respiratory discomfort and nasal congestion. The most frequent noxae measuring take place in places where are developed industrial activities that generate physical and chemical agents. This paper investigated the presence of noxae in workplaces located in Open Space offices where the main activity is IT. These spaces are ventilated by an air conditioning system, windows are fixed and the floor is carpeted on the entire surface. Research has led to the fact that the measured noxae (dusts, microclimate) have exceeded the maximum permissible concentration required by national legislation, this being an unexpected out coming for the company manager. These concentrations may be due to staff traffic, high number of employees and lack of natural ventilation. Following the evaluation results, a number of technical and organizational measures to correct the workplace atmosphere were recommended.

Key words: Health; security; dusts; microclimate, exposure of workers.

* Corresponding Author

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Computational study of scenarios regarding explosion risk mitigation

Nicolae-Ioan Vlasin *, Vlad Mihai Păsculescu, Gheorghe-Daniel Florea, Marius Cornel Şuvar

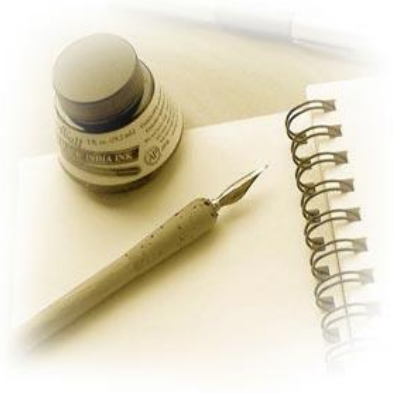
National Institute for Research and Development in Mine Safety and Protection to Explosion – INSEMEX, 32-34 G-ral Vasile Milea street, Petrosani, Romania

ABSTRACT

Exploration in order to discover new deposits of natural gas, upgrading techniques to exploit these resources and new ways, more efficient, to convert the heat capacity of these gases into industrial usable energy is the research areas of great interest around the globe. But all activities involving the handling of natural gas (exploitation, transport, combustion) are subjected to the same type of risk: the risk to explosion. Experiments carried out physical scenarios to determine ways to reduce this risk can be extremely costly, requiring suitable premises, equipment and apparatus, manpower, time and, not least, presenting the risk of personnel injury. Taking in account the above, the present paper deals with the possibility of studying the scenarios of gas explosion type events in virtual domain, exemplifying by performing a computer simulation of a stoichiometric air - methane explosion (methane is the main component of natural gas). The advantages of computer-assisted imply, inter alia, the possibility of using complex virtual geometries of any form as the area of deployment phenomenon, the use of the same geometry for an infinite number of settings of initial parameters as input, total elimination the risk of personnel injury, decrease the execution time etc. Although computer simulations are hardware resources consuming and require specialized personnel to use the CFD (Computational Fluid Dynamics) techniques, the costs and risks associated with these methods are greatly diminished, presenting, in the same time, a major benefit in terms of execution time.

Key words: Computational simulation; gas explosion; methane; explosion risk; coal mine.

* Corresponding Author



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Simultaneous biogas upgrading and biogas slurry nutrient reduction by using of microalgae photobioreactor

Cheng Yan *

China University of Geosciences (Wuhan), School of Environmental Studies, Department of Environmental Science and Engineering, Wuhan 430074, China

ABSTRACT

Biogas is a promising renewable energy which has to be upgraded to meet the efficient combustion standard. The microalgae biogas upgrading system used in this study could effectively upgrade biogas and simultaneously reduce biogas slurry nutrient. Red light was the optimum light wavelength for microalgae growth, biogas upgrading, and biogas slurry nutrient reduction. Only moderate light intensities (i.e., 400, 600, 800, and 1000 μmol m^{-2} s^{-1}) were suitable for microalgae growth. The optimal lighting strategy should be incremental light intensity strategy since it could avoid photoinhibition at the initial culture phase and insufficient light intensity at the latter culture phase. Under this lighting strategy, the microalgae dry weight was 446.98 ± 25.32 mg L^{-1}; the methane concentration in the upgraded biogas was 92.87±4.10%; the chemical oxygen demand, total nitrogen, and total phosphorus removal efficiency was 92.67± 5.14%, 80.87 ± 6.25%, and 79.33 ± 6.18%, respectively.

Key words: Biogas upgrading; microalgae; light wavelength; light intensity.

* Corresponding Author

mess@mess-earth.org

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The mechanism of degradation of tetracycline by lignin peroxidase

Jianguo Bao *, Yifei Leng, Xingxing Li

China University of Geosciences, School of Environment Studies, Wuhan 430074, PR China

ABSTRACT

Tetracycline has been attracting increasing attention as an emerging contaminant in recent years, which detected in the environment frequently. Lignin peroxidase (LiP) prepared from rot fungi (Phanerochaete chrysosporium) was selected for studying the induction condition of lignin peroxidase and the degradation mechanism of tetracycline. The results indicated that the limitation of carbon, nitrogen and low concertation of Mn^{2+} were important factors for enzyme production. The degradation reaction of tetracycline terminated when the concentration of H_2O_2 decreased to 0.045mmol·L- 1, the degradation rate reached about 80% within 10min and the enzyme activity of LiP was not changed at the same time. LiP was still effective by adding TC and H_2O_2 when degradation reaction reached balance, and the secondary degradation rate was 65%. Lignin peroxidase also had a strong ability to degradation tetracycline with both high (100mg·L^{-1}) and low (10mg·L^{-1}) initial concentrations. The antibacterial activities of tetracycline and its transformation products were measured using the disk diffusion method. It showed that the transformation products of tetracycline had lower antimicrobial potencies than parent compound, unlike photo degradation. Six possible transformation products were identified by LC/MS, and a potential degradation pathway was proposed that included hydroxylation, dehydration, and decarboxylation. Results from this study can has the potential to be utilized in designing engineering processes to remove tetracycline from water and soil.

Key words: Tetracycline; lignin peroxidase; degradation; degradation products.

* Corresponding Author

mess@mess-earth.org

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Effects of various LED light qualities and light intensity supply strategies on purification of slurry

Ying Wang *

Central Southern Geotechnical Design Institute Co., Ltd. No. 18 Zhongnan Road. Wuhan 430074, Hubei Province, PR China

ABSTRACT

The slurry from anaerobic digestion process (biogas slurry) is now well known to potentially cause water eutrophication and even large-scale algal blooms. The Chlorella vulgaris utilized in this research is able to purify the biogas slurry effectively under optimum light quality and light intensity supply strategy. The descending order of dry cell weight for C. vulgaris reproduction and nutrient removal efficiency of biogas slurry both are red > white > yellow > purple > blue > green, indicating that the red light is the optimum light quality. Furthermore, this study was among the first attempt to analysed the economic efficiency for nutrient removal under various light intensity supply strategies, and found out that the optimal light intensity supply strategy used for microalgae culture should be incremental intensity strategy, rather than constant intensity strategy, to avoid light energy wastage and photoinhibition.

Key words: Microalgae; dry cell weight; nutrient removal efficiency.

* Corresponding Author

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Purifying anaerobic fermentation slurry using microalgae in response to various LED light wavelengths and intensities

Ying Wang *

China University of Geosciences (Wuhan), School of Environmental Studies, Department of Environmental Science and Engineering, No. 388 Lumo Road, Hongshan District, Wuhan 430074, Hubei Province, PR China

ABSTRACT

Anaerobic fermentation slurry (AFS) is a type of high-pollution load wastewater that can cause water eutrophication and algal blooms. The current study focused on the response of microalgae nutrient removal efficiency to various light-emitting diode light wavelengths and intensities. Results showed that the microalgae Chlorella vulgaris was able to remove nutrients from AFS effectively. Furthermore, only moderate light intensities (800, 1300, 1800, and 2300 μmol m−2 s−1) were required to culture C. vulgaris and induce nutrient removal. Exposure to higher light intensities produced greater dry weight (DW) biomass and achieved higher nutrient removal efficiencies. The order of light wavelengths based on the DW biomass yield of C. vulgaris was red > white > yellow > blue. The order of light wavelengths, according to the nutrient removal efficiencies reached by C. vulgaris, was red > white > yellow > blue. Red light was also the light wavelength with the best economic efficiency for nutrient removal. Therefore, in this study, red light was used as the optimum light wavelength. Furthermore, the optimum light intensity range was from 1300 to 1800 μmol m−2 s−1 when both nutrient removal and economic efficiencies were considered. Moreover, the optimum treatment time was determined to be 120 h.

Key words: COD removal; TN removal; TP removal; dry weight.

* Corresponding Author

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Occurrence of antibiotics and antibiotic resistance genes in the environmental water of Honghu Lake

Lei Tong, Hui Liu *, Liting Qin, Chuan Guan

China University of Geosciences, School of Environmental Studies, Lumo road, Hongshan district, Wuhan city, Hubei Province, China

ABSTRACT

The widespread use of antibiotics in humans and animals has raised several environmental issues in recent years. Not only antibiotics but antibiotic resistance genes are being found at elevated levels in aquatic compartments. Here we examined the fate of eighteen antibiotics and four metabolite compounds in surface water and groundwater in aquaculture environment of Honghu Lake, central China. The abundance of relative resistance genes were also studied in different samples. The results showed that sulphamethazine, doxycline, chlorotetracycline and N4-acetyl-sulfadiazine were most frequently detected, and the highest concentration was found in sulfamethoxazole at concentration of 507 μg/L in fish pond. It is noteworthy that the average concentrations of sulfonamides and metabolites exceeded other types of antibiotics, such as tetracyclines, fluoroquinolones and microlides. The abundance of twenty seven antibiotics resistance genes and one integrase gene were detected and found in more than half of sampling sites. Additionally, the sum of all sul genes correlated with the abundance of class I integron. It is speculated that antibiotic resistance genes were integrated by class I integron and spread in the environment. Our results suggest that sulfonamide compounds could be degraded into metabolites in the environment, and long-term residue of antibiotics resulted in widespread of antibiotic resistance genes.

Key words: Antibiotics; antibiotic resistance genes; Honghu Lake; aquaculture; groundwater; surface water.

* Corresponding Author

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The transport of persistent organic pollutants by fugacity multimedia model-case study in Quanzhou Bay, Fujian Province, China

Xinli Xing *[1], Tianpeng Hu [1], Mengyun Jin [1], Jiaquan Zhang [2], Shihua Qi [3]

[1] China University of Geosciences, School of Environmental Studies, Wuhan, 430074, China
[2] Hubei Polytechnic University, School of Environmental Science and Engineering, Huangshi 435003, China
[3] China University of Geosciences, State Key Laboratory of Biogeology and Environmental Geology, Wuhan, 430074, China

ABSTRACT

Fugacity model is an effective and powerful measure to study persistent organic matters in multimedia environment. In this paper, Level III fugacity model was used to model and forecast the interface transport and fate behaviours of HCH and DDT in multimedia environment, Quanzhou Bay, Fujian Province. The corroboration by field actual analysis proved that Level III fugacity model can reflect HCH and DDT environmental geochemical behaviour reasonably. The parameter sensitivity calculation shows physicochemical parameter Octanol-water partition coefficient (LogKow) has a great impact on the modelling result. Secondly, the water parameters also have obvious effect on the result. The environmental geochemical behavioural characteristics of HCH and DDT are as follows: (1) The main sources of HCH and DDT in Quanzhou Bay are advection input from Jinjiang River and Luoyangjiang River, atmospheric wet and dry deposition and remove of surface soil; the concentration in soil and sediment were higher than in air. (2) There are higher HCH and DDT storages in soils and sediment than in other media. Moreover, storage capacity Z values in soil and sediment are higher than those from water and air. Soil and sediment have strong residual capability, and they are the main reservoirs for organochloride pesticides. (3) The main decreased route of HCH in environment was ocean circulation, atmospheric advection and degradation in soils; because of the poor transport ability of DDTs, main decreased of DDTs was degradation and transport in sediment, the next was ocean circulation. (4) For intermedia transport, the transport from water to air and water to sediment was main process for HCHs, while the transport from water to sediment was primary one for DDT and its metabolites. The probity reason is low vapour pressure and volatility of DDT and its metabolites. In result, the high concentration of HCH in air and water and high concentration of DDT in sediment.

Key words: Transport; persistent organic pollutants; fugacity model; multimedia environment; Quanzhou Bay.

* Corresponding Author

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Dawsonite synthesis through geochemical processes for fracture self-sealing at CO2 storage conditions

Ying Yu 1, Yilian Li *, Guodong Yang

China University of Geosciences, School of Environmental Studies, Wuhan 430074, China

ABSTRACT

Dawsonite-bearing veins are abundantly found during field investigation in formations that invaded by CO^2-bearing fluid. Meanwhile, dawsonite can be produced in quantity in the reaction among Al-bearing silicates, groundwater, and injected CO^2 at CO^2 geological storage conditions according to the thermodynamic calculations and the research of demonstration projects. The purpose of this study is to explore the synthesis of dawsonite in geochemical processes for fracture self-sealing in caprock. We reconstruct the CO^2 storage conditions during the geochemical modelling, including the temperature, pressure and the characteristics of water chemistry. The Al-bearing silicates selected are common in sedimentary basins, which are determined in part by the availability of their kinetic properties. In addition, the supply of sodium is also important based on the chemical formula of dawsonite ($NaAlCO^3(OH)^2$), which is carefully considered in the selection of Al-bearing silicates. In order to improve the synthesis of dawsonite, batches of simulations are conducted to obtain the best reactants composition. The simulation results show that chlorite is the most active and effective mineral providing aluminum among the selected Al-bearing silicates to promote the production of dawsonite. Besides chlorite, oligoclase can supply aluminium and sodium simultaneously. On the contrary, albite, illite, kaolinite and sodium-montmorillonite mainly precipitate and consume the aluminium during the reactions, which is not beneficial for the synthesis of dawsonite. The initial presence of kaolinite even could thoroughly inhibit the dawsonite synthesis. The results above suggest that fracture self-sealing at CO2 storage conditions is possible with appropriate mineral composition of filler.

Key words: CO_2 storage; dawsonite synthesis; geochemical modelling; fracture; self-sealing.

* Corresponding Author

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Numerical investigation into salt precipitation during CO_2 injection in low-permeability saline aquifers at the Shenhua CCS project

Guodong Yang [1], Yilian Li *[1], Yanxin Wang [1], Ying Yu [1], Xin Ma [2]

[1] China University of Geosciences, School of Environmental Studies, Wuhan 430074, China
[2] China Geological Survey, Center for Hydrogeology and Environmental geology Survey, Baoding 071051, China

ABSTRACT

Geologic carbon sequestration (GCS) in deep saline formations has been widely considered as a significant means for reducing CO_2 emissions to the atmosphere. China has successfully finished the first demonstration project of injecting 100,000 tons/year CO_2 into an onshore low-permeability saline aquifer for sequestration in Ordos Basin by Shenhua Group. The injection of CO_2 into saline aquifers may cause dry-out of saline formation waters and the associated salt precipitation near the injection well, which can have severe impacts on formation porosity, permeability and CO_2 injectivity. This study applies a two-dimensional (2-D) radial injection model using TOUGH2/ECO2N code to simulate injection of CO_2 into the target formations at the Shenhua CCS demonstration cite. Different simulation scenarios are developed to investigate the salt precipitation and associated pressure build-up induced by continuous injection of CO_2 and to examine the role of different parameters in the salt precipitation. The results show that the amount of salt precipitation is different for different formations. The salt precipitation amount is in the order of Liujiagou formation > Shiqianfeng formation > Shihezi formation due to the different initial salinity. Salt precipitation is observed to reduce the formation permeability in the near-well zone, and the permeability decreases with the increase of salt precipitation. Furthermore, analyses of the effects of different parameters on salt precipitation indicate that salinity affects the amount of salt precipitation without changing its distribution, while porosity, buried depth of reservoir and injection rate affect the distribution of salt precipitation and CO_2 mitigation. In addition, the initial permeability and residual water saturation affect not only the amount of salt precipitation but also its distribution. Results from this study could provide useful insights into assess salt precipitation and CO_2 injectivity for CO_2 injection in low-permeability formations at other pilots or target sites.

Key words: CO_2 sequestration; salt precipitation; ınjectivity; saline aquifers; pressure buildup; numerical simulation.

* Corresponding Author

mess@mess-earth.org

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Geochemical modelling of long-term CO_2-water-rock interactions for the main injection formations of the Shenhua CCS demonstration project in Ordos Basin

Yilian Li *, Ying Yu, Guodong Yang, Fengcheng Jiang, Sen Yang

China University of Geosciences, School of Environmental Studies, Wuhan 430074, China

ABSTRACT

China is actively conducting research and pilot project demonstrations of the CO_2 emissions reduction technologies accordingly to address global climate change. The Shenhua CCS demonstration project is the first field scale project in China, which has successfully finished its goal of injecting CO_2 at rates of 100,000 tons/year into the onshore saline aquifer in Ordos Basin. Injection of CO_2 into deep saline aquifers results in a variety of strongly coupled physical and chemical processes. This study presents analyses of geochemical interactions between CO_2, formation fluid and rock of the three main reservoirs (Liujiagou, Shiqianfeng and Shihezi formation) using geochemical modelling in order to assess the long-term impact of CO_2 sequestration. Specifically, we predict the changes in brine pH, the mineral precipitation and dissolution, and the trapping forms of injected CO_2 in response to the CO_2 injection. Carbon dioxide was injected at a constant rate of 0.1 Mt/year for 30 years, and the fluid flow and geochemical transport simulation was run for a period of 10,000 years by the TOUGHREACT code according to the underground conditions of the three main reservoirs. Results of the simulations performed show that the controlled trapping phase of CO_2 varies with time. 80% of the injected CO_2 remains as a free supercritical phase during the injection period, then gradually decreases due to dissolution and the formation of carbonates. The mineral precipitation and dissolution after CO_2 injection are different for the three reservoirs due to the difference in initial mineral composition and the content. The oligoclase and chlorite are mainly dissolved minerals for Liujiagou formation, oligoclase and illite for Shiqianfeng formation. While in Shihezi formation, oligoclase and dolomite mainly dissolves, slight Ca-smectite dissolution is also observed after 3000 years. The injected CO_2 can be permanently immobilized by precipitation of calcite and dawsonite for the three main reservoirs. Besides, CO_2 can also be trapped by siderite for Liujiagou formation, and magnesite for Shihezi formation. These results are useful for the evaluation of long-term CO_2 geological storage and estimation of geochemical process for practical implementations of CCS.

Key words: CO_2 sequestration; CO_2-water-rock interactions; CO_2 trapping; geochemical modelling; Shenhua CCS demonstration project.

* Corresponding Author

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