magnus Group

19-20 SEPT 2022

VIRTUAL EVENT

Global Conference on

GEOLOGY AND EARTH SCIENCE

Contact us:
Ph: +1 (702) 988-2320
Email: geology@magnusconference.com
Website: https://geology.magnusconferences.com/

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BOOK OF ABSTRACTS

GLOBAL CONFERENCE ON

GEOLOGY AND EARTH SCIENCE

19-20 SEPT

INDEX

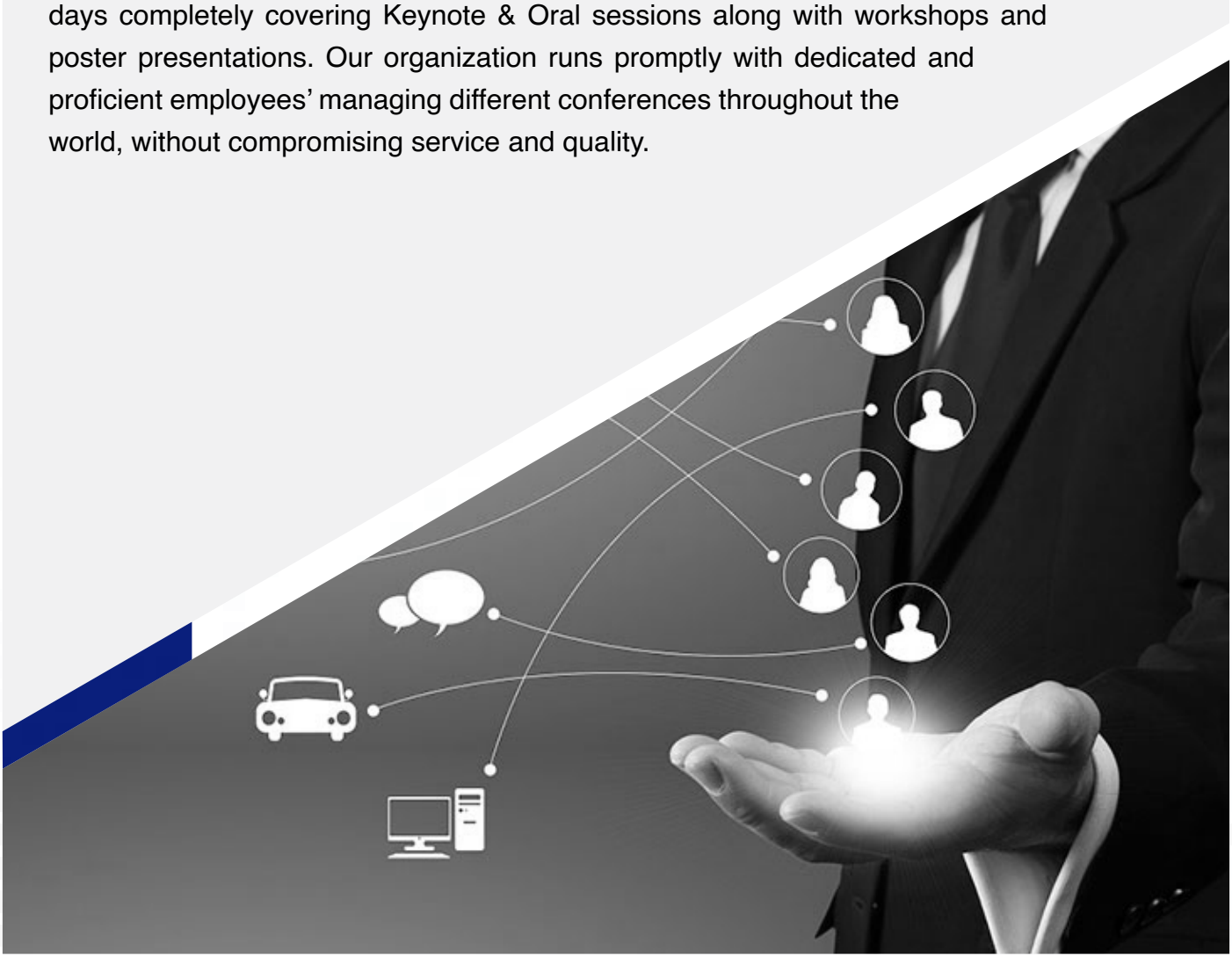
Contents

About Host	4
Keynote Presentations - Day 1	6
Oral Presentations - Day 1	10
Poster Presentation - Day 1	33
Keynote Presentations - Day 2	36
Oral Presentations - Day 2	41
Participants List	64

ABOUT MAGNUS GROUP

Magnus Group (MG) is initiated to meet a need and to pursue collective goals of the scientific community specifically focusing in the field of Sciences, Engineering and technology to endorse exchanging of the ideas & knowledge which facilitate the collaboration between the scientists, academicians and researchers of same field or interdisciplinary research. Magnus group is proficient in organizing conferences, meetings, seminars and workshops with the ingenious and peerless speakers throughout the world providing you and your organization with broad range of networking opportunities to globalize your research and create your own identity. Our conference and workshops can be well titled as 'ocean of knowledge' where you can sail your boat and pick the pearls, leading the way for innovative research and strategies empowering the strength by overwhelming the complications associated with in the respective fields.

Participation from 90 different countries and 1090 different Universities have contributed to the success of our conferences. Our first International Conference was organized on Oncology and Radiology (ICOR) in Dubai, UAE. Our conferences usually run for 2-3 days completely covering Keynote & Oral sessions along with workshops and poster presentations. Our organization runs promptly with dedicated and proficient employees' managing different conferences throughout the world, without compromising service and quality.



ABOUT GEOLOGY 2022

Magnus Group welcomes you to our Online Event entitled "**Global Conference on Geology and Earth Science**" **(GEOLOGY 2022)** scheduled on **September 19-20, 2022** with the theme "*Global View of Down-To-Earth Geological Advancements for Reaching Sustainable Goals*."

GEOLOGY 2022 is an international platform that amalgamates world renowned experts of both academics and industries within the discipline of Geology and Earth Science from all over of the world. This event brings together all the Earth scientists and to exchange and innovates new theories and practices of Geology and Earth Science.

KEYNOTE FORUM

DAY 01

GLOBAL CONFERENCE ON

GEOLOGY AND EARTH SCIENCE

19-20 SEPT

Shozo Yanagida

M3 Labo. Inc., Osaka University, ISIR, Ibaraki, Osaka, Japan

Carbon dioxide is by no means the cause of climate change, and solar radio radiation causes climate change. Forecast / verification by quantum chemistry molecular modeling

Atmospheric components hydrated carbon dioxide [CO_2 $(H_2O)_2$], hydrated Argon [$Ar(H_2O)_2$], hydrated triplet Oxygen [$^3O_2(H_2O)_2$], hydrated Nitrogen [$N_2(H_2O)_2$], and water vapor [$fs(H_2O)_3$] was analyzed based on the density functional theory. All of the associated molecules give comparable absorption spectra in the infrared and far-infrared regions. This means that carbon dioxide is by no means the cause of climate change. On the other hand, water in the liquid state [$ts(H_2O)_3$] and silicic acid (SiO_2) were verified to give strong infrared and far-infrared spectra. Solar radio emission from solar flares includes strong far-infrared ray. This theory fact will verify that infrared energy, that is, thermal energy, is generated on the earth by solar radio emission. Solar flare occurrence will cause global climate change.

Audience Take Away:

- Densisty functional theory means molecular modeling for equilibrium geometry of van der Waals force aggregates of molecules.Molecular modeling using PC is a kind of experiments for chemsits of all genres
- Yes, this research that other faculty could use to expand their research or teaching
- Yes, Does this provide a practical solution to a problem that could simplify or make a designer's job more efficient
- Yes, it improve the accuracy of a design, or provide new information to assist in a design problem

Biography:

Shozo Yanagida (Emeritus Professor of Osaka University since 2004) is a pioneer of molecular-structured solar cells, and now stay at the forefront with regards to quantum chemsigtry molecular modeling of vander Waals force-alighned molecular aggregats. Now, he may be regarded as a molecular modeling chemist. Five years ago, he founded "M3 Laboratory Inc." in Osaka Universit, ISIR. "M3" stands density-functional theory based molecular modeling of materials.

Takaji Kokusho

Professor Emeritus, Department Of Civil & Environmental Engineering, Chuo University, Tokyo, Japan

Energy demand in surface soils for earthquake engineering based on vertical array strong motion records

In earthquake engineering, acceleration has been playing a major role while wave energy has rarely been considered as a demand in design. In order to understand earthquake damage in terms of energy, the demand of wave energy in surface soils is studied here assuming one-dimensional SH-wave propagation, by using a number of vertical array records during 9 strong earthquakes in Japan in the last two decades. A drastic decreasing trend of the energy demand has been found in general with decreasing ground depth to be almost 1/10 from the bottom to the surface. A simple formula has also been developed to evaluate upward energy at a given soil from the bedrock using the corresponding S-wave impedance ratio. Incident energies extrapolated at seismological bedrocks using the depth-dependent variations have been found roughly compatible with a well-known empirical formula despite that individual fault mechanisms are utterly neglected. Also indicated quite unexpectedly is that the softer the surface soil is, the more the energy demand tends to decrease. However, it may not be contradictory with a widely accepted perception that softer soil sites tend to suffer heavier damage as far as geotechnical influence is concerned, because induced soil strain tends to be larger due to decreasing soil stiffness despite the decreasing trend of energy demand there.

Audience Take Away:

- Energy demand rarely interested in earthquake engineering is focused to draw designers' attention
- Unlike the current acceleration-based design, energy-based design using cumulative energy of upcoming earthquake wave can determine the extent of damage without giving acceleration time histories such as in liquefaction evaluation
- Depth-dependent energy demand has been evaluated using a number of vertical array strong motion records all over Japan, compared with a well-known empirical formula and formulated to be used in design
- Thus, the demand energy-based design will pave the way to a simpler yet more reasonable design method

Biography:

Professor, Chuo University, Tokyo, Japan, until 2015, and Professor emeritus thereafter.PhD in 1982, MS & BS in 1969 &1967 from the University of Tokyo, and MS from Duke University USA in 1975. Major academic society activities; 5th Ishihara Lecturer on Earthquake Geotechnical Engineering, Christchurch (2015), Chairman of TC4 (Earthquake Geotechnical Engineering), ISSMGE (2005-2009), Chairman of Organizing Committee of IS-2009 Tokyo by TC4, ISSMGE (2009) .Publications in English (all CRC Press, London); Innovative Earthquake Soil Dynamics (2017): Performance-Based Design in Earthquake Geotechnical Engineering - from Case History to Practice- (2009). Earthquake Geotechnical Case Histories for Performance-Based Design: (2009). More than 100 reviewed English papers.

Myint Win Bo

Bo & Associate Inc., Mississauga, Ontario, canada

Advancement of geotechnical engineering

The history of geotechnical engineering is not very old and it was initiated by an understanding of soil mechanics in the early 19th century. The term "Geotechnology" which is now referred to as "geotechnical Engineering" first appeared in 1945. However significant applications of geotechnical engineering can be traced back to as early as the 11th century. Despite this fact, the subject is relatively young with many progresses and developments made at an extraordinary rate in the last few decades. Geotechnical engineering involves ground investigation, geotechnical laboratory testing, geotechnical instrumentation, geotechnical design and analysis, ground improvement and ground engineering. Progressive developments in these areas are discussed and documented in this keynote lecture. These engineering principles are not only applied in the construction industry but also have been applied in rescuing valuable heritage structures, transporting extra heavy equipment, investigating new planets, demolition and reconstruction of famous structures, warship engineering etc. This keynote lecture describes services provided by the geotechnical engineering discipline and presents some well-known case studies of geotechnical engineering services provided during history and demonstrates how geotechnical engineers have been involved around the world in well-known construction projects, case studies and protecting the environment we are living in.

Audience Take Away:

- The case studies presented will be useful to apply in the industry as those are proven to be working
- Learning from these developments, engineers can directly apply or further innovate to solve the construction issues. Expansion of these research and use for teaching is possible. These case studies provide a practical solution to a problem that could simplify or make a designer's job more efficient. Methods presented will improve the accuracy of a design, or provide new information to assist in a design problem

Biography:

Myint Win Bo is President and CEO at Bo & Associates Inc., Canada. He graduated with a B.Sc from Rangoon University and received a Postgraduate Diploma from UCL, UK, and an M.Sc from the University of London, UK. He obtained his Ph.D. from the Nanyang Technological University, Singapore, and obtained a Certificate of Executive Management and Leadership from MIT, USA. He has given more than 40 special/keynote lectures. Dr. Bo is also an Adjunct Professor at York University and Toronto Metropolitan University, Canada has published five textbooks, five book chapters, and 200 papers. Bo is an Editor for five journals.

SPEAKERS

DAY 01

GLOBAL CONFERENCE ON

GEOLOGY AND EARTH SCIENCE

19-20 SEPT

Saeed Aligholi
Institute of Innovation, Science and Sustainability, Federation University Australia, Ballarat, VIC, Australia

Automated mineral identification and its applications in rock mechanics

Microstructural features of a material is determining its mechanical properties. Mechanical properties of rock materials are very important in a wide range of engineering disciplines including mining, civil and petroleum. In order to reliably model mechanical properties of rock materials quantifying their microstructural features is the first step. Rocks are formed from different minerals with different textural features. Optical microscopy is the main method in order to quantify both mineralogical and textural (size, shape, interlocking,) features of rock materials. However, manual microscopy is a time-consuming process, and a successful rock quantification requires an experienced operator. Therefore, an automated mineral identification (AMI) scheme is highly demanded. For the sake of a successful AMI both colour and textural patterns of the rock forming minerals must be taken into account. Minerals regarding their crystallographic systems are showing different colours under planned and crossed polarized lights as a function of the orientation of their optical axes with the polarizers. These colour variations are the most important colour features for the task of mineral identification. The major rock forming minerals including quartz and feldspars, however, cannot be recognised just by their colour features. These minerals are showing distinct textural features including twinning and undulatory extinction. It will be explained how developed AMI schemes can recognise and classify minerals based on colour and textural features. Moreover, it will be shown that the mechanical properties of rack materials are closely related to their petrographic features, and it is possible to successfully estimate engineering properties of rock materials by means of quantitative analysis of their photomicrographs.

Audience Take Away:

- The importance of quantitative rock microstructural analysis in rock mechanics
- Automation of optical microscopy
- Application of novel image processing methods in mineral identification

Biography:

Dr. Aligholi obtained a B.Sc. in Applied Geology from Shahrood University of Technology, and an M.Sc. in Engineering Geology from Ferdowsi University of Mashhad. His PhD awarded recently by the department of Civil Engineering, Monash University. Dr. Aligholi is currently a sessional lecturer at institute of Innovation, Science and Technology, Federation University Australia. He has worked in the field of automatic microstructural quantification of rock materials by means of image processing and machine learning techniques, and understanding the relationship between physical, mechanical and dynamical properties of rock materials, and has published his findings and contributions in high ranked journals.

Kamilla Pawłowska
Department of Palaeo environmental Research, Institute of Geology, Adam Mickiewicz University in Poznan, Poznan, Poland

Animals embedded in quaternary environments

The Quaternary is marked in geological history as a time of dynamic change in climate, environment, hominid evolution, and populations of large terrestrial mammals (megafauna) across most of the globe. Mammal bone assemblages recovered from paleontological sites allow reconstruction of the biogeography of individual components of the Pleistocene and Holocene worlds, including woolly mammoths, woolly rhinoceri, horses, giant deer, red deer, fallow deer, reindeer, steppe bison, aurochs, bears, and cave lions. Much of Europe's megafauna underwent extinction in response to changing climate or human impact, or a combination of both factors. The pattern of extinction is not uniform for all taxa, as studies for Eurasia show, indicating the complexity of the process and the ecological flexibility of taxa. This highlights the strong links between animals in the Pleistocene and Holocene and the environment.

This paper is intended to embed various species of Pleistocene and Holocene mammals in environmental perspective using evidence from paleontological sites, with reference to Poland. Understanding the environmental conditions and rates of changes is crucial to understanding the impact on fauna, including the extent, development, and extinction of populations. Human–animal relations and human impact on the extinction of Quaternary fauna will be also discussed using taphonomic evidence across time in Europe. Special attention will be given to the woolly rhinoceros (grant no. 2021/43/B/ST10/00362 awarded to Kamilla Pawłowska from the National Science Center, Poland) as the dominant species in the Pleistocene faunal community.

Audience Take Away:

- How to perform multiproxy studies of faunal remains to gain chronological, ecological, and social insights
- How animals operated in the past in various environments through individual adaptations
- How links can be drawn between human and animals and how we can assess hominids' impact on megafauna population

Biography:

Kamilla Pawłowska is currently an associate professor at the University of Adam Mickiewicz, Poland, where she cocreates paleoenvironmental research. Her research interests include Paleolithic Europe, Neolithic Near East, human–animal relations, the relationship between climate and cultural change, the study of disease in past animal populations, worked bone study, and taphonomic studies, including depositional practices. Pawłowska is an enthusiastic advocate of contextual zooarchaeology and paleontology, which she uses in her research. She has just begun research on unraveling the chronological, geographical, and taphonomic complexities of the occurrence of the woolly rhinoceros in the Pleistocene contexts of Poland (WOOLRHINOPOLI) and Europe.

Mokhamad Nur Cahyadi[1*], Arizal Bawasir[1], Syachrul Arief[2], Amien Widodo[1], DeniKusumawardani[3], Meifal Rusli[4]

[1]Geomatics Engineering Department, Institut Teknologi Sepuluh Nopember, Surabaya, East Java, Indonesia

[2]Geospatial Training Center, Geospatial Information Authority of Indonesia, Bogor, West Java, Indonesia

[3]Faculty of Economics and Business, Airlangga University, Surabaya, East Java, Indonesia

[4]Mechanical Engineering Department, Andalas University, Padang, West Sumatra, Indonesia

Monitoring of deformation, space observation, and socio-economic impacts due to the 2021 eruption of mount semeru by using geospatial analysis for multi aspects early warning system

The high accuracy of positioning using the Global Navigation Satellite System (GNSS) has been widely used in geodynamics and deformation studies. To mitigate volcanic disasters, GNSS is not only limited to the role of measuring deformation of the area, GNSS also plays a role in mitigation through space observation, especially in the ionosphere and troposphere layers of the earth. In the troposphere, GNSS has an important role in observing the impact after an eruption. The GNSS signal propagation delay can be used to determine the Zenith Tropospheric Delay (ZTD) and Precipitable Water Vapor (PWV) variables. On December 4, 2021, Mount Semeru (East Java, Indonesia) experienced an eruption caused by fallen lava dome. Therefore, the value of water vapor content will be associated with rainfall data at several points. The aim is to analyse whether there is a possibility of the influence of heavy rainfall on volcanism activity on Mount Semeru in the period of November 2021 - January 2022. These two variables will be processed together with remote sensing satellite data to analyse the dominant particle and gaseous content in the eruption.

Observations of ground deformation, analysis of the content of particles and gases in the troposphere will be integrated in a comprehensive analysis to observe the impact of the volcanic activity of the eruption of Mount Semeru from 2006 to 2021, especially the largest eruption in 2021. The data used for the three. These observations come from observations using a low-cost GNSS receiver that is being developed by the Institut Teknologi Sepuluh Nopember (ITS). To get the calculated value of the impact caused by the eruption of Mount Semeru, a spatial economic analysis of the impact of losses caused by the eruption needs to be carried out. This spatial economic analysis effort is important to be carried out as input for policy makers in restoring economic activity in the environment around Mount Semeru quickly and efficiently. The integration of several comprehensive analyses in the engineering and socio-economic fields is expected to be a supporting variable in developing an early warning system, especially for volcanic phenomena that often occur in Indonesia. This research also supports the achievement of the Sustainable Development Goals (SDGs) program on the 13th goal which intends to take immediate action in combating climate change and its impacts, especially the disaster aspect in the field of volcanic eruptions.

Audience Take Away:

- Audiences will know the tropospheric variations before, during, and after the eruption through analysing the time-series PWV graphs from the 4 closest CORS GNSS stations from Mount Semeru. Audiences can also identify the

rainfall time-series variations before, during, and after the eruption. Extreme rainfall may have a correlation with the eruption event as a pre-eruptive rain because the eruption of Mount Semeru is included in the avalanches type caused by fallen lava dome and hot cloud avalanches. Moreover, the audience will also know the spatial and temporal variations of SO2 content in several locations around Mount Semeru

- Water vapor monitoring using GNSS technology has advantages in temporal resolution which allows up to 1-second data availability with sufficient accuracy when compared to radiosonde which has a resolution of 6 hours. In the case of an avalanche-type eruption such as the 2021 Mount Semeru eruption, water vapor data from GNSS can be compared with rainfall data using satellite technology by JAXA (GSMaP) which allows the availability of hourly rainfall data with a grid resolution of 11x11 km at the equator. In addition, the Sentinel-5P remote sensing technology with the TROPOMI sensor can also be used for daily monitoring of the dominant SO2 particles during eruptions. This SO2 content data can be integrated with water vapor content and rainfall data to identify the possibility of acid rain, cold lava, or other phenomena that cause adverse impacts on the environment and communities around the mountain. The integration of these data is expected to be an additional variable in the early warning system, especially in the case of eruptions with an avalanche type

Biography:

Mokhamad Nur Cahyadi completed his undergraduate education in 2004 at Geomatics Engineering Department, Sepuluh Nopember Institute of Technology (ITS) Indonesia. He continued his master's degree at Universitat Stuttgart Germany and graduated as MS in 2010. He then joined the research at Natural History Laboratory, Hokkaido University Japan. He received his PhD degree in 2014 at the same institution. His research fields are the development of Low-cost GNSS, analysis of ionospheric disturbances (TEC), atmospheric monitoring, UAV mapping, and hydrographic survey.

Irina Shtangeeva
St. Petersburg state University, Russian Federation

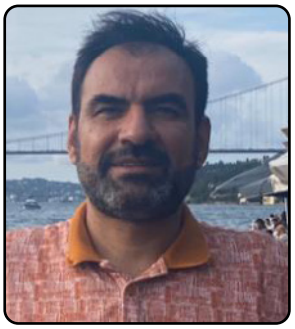
Biogeochemistry of new potential toxic trace elements

Up to now, information about biogeochemistry of many trace elements is scarce. It is commonly accepted that only a small part of the so-called biologically essential elements are needed for normal plant development. Since the last century, another group of elements (they are called heavy metals) has attracted considerable interest. Over the past decades, a great body of experimental material on environmental chemistry of the elements has been collected. On the other hand, the biogeochemistry of many other elements has not yet attracted much attention. Meanwhile, all elements known to date are always present in soil and plants. It can be assumed that those trace elements that have so far received little attention of researchers also play a certain role in biogeochemical processes. Contrary to the generally recognized opinion, it may be assumed that all elements are involved in the biogeochemical processes. It can be stated that our knowledge of biological role of one or another element is still in its infancy. This especially concerns trace elements that usually present in the environment at low concentrations. An insufficient quality of analytical techniques that are applied for elemental analysis is probably one of the reasons why information about significance or toxicity of the elements is still limited. With development of new methods of analysis, the information on biogeochemistry of previously poorly-studied ultratrace elements will undoubtedly grow.

For our research, several trace elements that are not so widely present in scientific reports were selected. In the experiments, widely grown crops as well as wild plants were studied. The plants were grown in the soils that differed in the main parameters (texture, pH, concentrations of exchangeable cations) and also in the level of contamination. The main aim of the research was to study the ability of the plants to accumulate both well-known toxic elements and also the trace elements that are poorly-studied yet.

The experimental results showed that the plants were capable of accumulating various elements. The uptake of the elements depended on type of soil, level of soil contamination and was often different for different plant species. The plants were capable of uptaking different amounts of one or another element even though they grew under the same conditions. It can be concluded that many trace elements that occur in the environment at low concentrations and have not got yet a proper examination should also be considered as potentially toxic elements. The improvement of accuracy and sensitivity of analytical techniques used for elemental analysis of plant and soil material can help to get a new insight into the significance and/or potential toxicity of many new trace and ultratrace elements.

Biography:
Irina Shtangeeva is senior researcher at St. Petersburg State University, Russia. Her scientific interests are biogeochemistry of trace and ultratrace elements, phytoremediation of contaminated soils and multivariate statistical analysis. Recently Dr. Shtangeeva paid main attention to short-term variations in concentrations of macro- and trace elements in plants and rhizosphere soil that are due to circadian rhythmic changes and effects of interrelations between root exudates of different plant species on uptake of elements. She published more than 50 indexed publications, three (3) books, two chapters book (Nova Science Publishers and Elsevier).



Recep Celik
Dicle University Eng. Faculty, Diyarbakir, Turkey

Assignation of groundwater vulnerability by GIS-based drastic method, a case study; Determination of diyarbakir's basalts aquifer pollution risk in Turkey

There are various causes for their being polluted aquifer over time, such as agricultural activities and the rapid growth of population, more industrial and domestic sewer water are discharged in shallow aquifers causing serious groundwater contamination. Therefore, in places where groundwater is used as an alternative source, regular monitoring of groundwater quality and determination of its contamination, especially in shallow aquifers, are required. Preparing aquifer vulnerability maps with references to taking measures may be among the primary issue.

Aquifer vulnerability maps represent both the prominent sources of drinking water and the potential for pollution arise from agricultural, industrial and other human activities. These properties made the aquifer vulnerability contamination maps claimed to be used in analyses of aquifers. The DRASTIC model can be used to prevent further contamination in sensitive areas. For this purpose, it is applied a GIS-based DRASTIC model on a basalt aquifer and aimed to detect pollution by groundwater mapping in the Diyarbakir basin. This study demonstrates that 52 % of the basalt aquifer of Diyarbakir basin has a senior grade of pollution risk. This area additionally remains the prominent place where the residential areas and industrialized districts are intense. It also 28% part of the study area has rated as "medium" vulnerability and these points show that it was receptive to contamination. The only 20% of the distinct region has low-risk pollution vulnerability.

Audience Take Away:

- The audiences will see about how groundwater risk maps are prepared
- This study will enable the DRASTIC method, which is a common method, to determine groundwater vulnerability as a practical solution. It presents a mapping method that local administrators should consider in industry and urbanization in next projections

Biography :

Dr Celik studied Civil Engineer Dpt. At the Dicle University, Turkey and graduated as MS in 1995 Istanbul Technical University graduated as Engineer in 1999, and in 2000 Master degree at the same university. Then he received PhD degree from Fırat University at Civil Engineering Hydrology department. He is still Associate Professor at the Dicle University civil engineering Water Resources and Hydraulic department in Turkey. He has published more than 20 research articles in İnternational journals.

Mabrouk Sami
Geology Department, Faculty of Science, Minia University, El-Minia, Egypt

Using the monazite U-Th-Pb geochronology for dating the highly fractionated rare metal granites

Determining the absolute or relative age of the highly fractionated rare metal granites is one of the main challenges that face the petrochronologist, due to the significant effect of post-magmatic hydrothermal fluids during the evolution of these rocks. For example, most rare metal granites from different orogenic belts worldwide have anomalously high $^{87}Rb/^{86}Sr$ and $^{87}Sr/^{86}Sr$ due to the isotopic alteration during post-magmatic stage. Moreover, the reported zircons from these granites have extremely high U-concentration and intense metamictization, resulting in significant radiogenic Pb-loss, as well as common Pb contamination, along fractures and other imperfections, yielding imprecise to meaningless dates. Therefore, the accessory minerals such as monazite, thorite, titanite, columbite-tantalite and cassiterite were recently used as geochronometers to date and track the magmatic-hydrothermal process. CHIME (chemical Th–U-total Pb isochron method) dating method is used to date monazite in rare metal granites. This method required the precise measurement of Th, U and Pb in monazite by electron microprobe analyses (EMPA). The highly fractionated rare metal granites are widely distributed in the Eastern Desert of Egypt, which occupy the northmost tip of the Arabian Nubian Shield. Numerous methods have been applied to rare metal deposits on bulk-rocks (Rb-Sr and Sm-Nd) and minerals (Pb-Pb and U-Pb) such as zircon, columbite, tantalite, and cassiterite, However, ages obtained using these methods are inconsistent because post- to late-magmatic hydrothermal solutions and tectono-thermal events following magma emplacement have partially to completely reset the original mineral-rock isotopic system. Therefore, chemical dating" of monazite was used to constrain the timing of rare metal granitic magmatism and understand bulk-rock alteration associated with these highly evolved rare metal granites in the Arabian Nubian Shield. The results provide comparable ages agree with the timing of rare metal-rich intrusions (~ 600 Ma) related to the Pan-African orogeny.

Audience Take Away:

- The audience will know wealth information about rare metal granites and difficulties of dating these rocks
- Knowing more information about CHIME monazite (chemical Th–U-total Pb isochron method) dating method
- Applying CHIME monazite dating method and interpretation of data

Biography:

Dr. Mabrouk Sami studied Geohemistry at Minia University, Egypt and graduated as MS in 2011. He then joined the research group of Prof. Theodoros Ntaflos at Department of Lithospheric Research, University of Vienna (Austria). He received his PhD degree in 2018 at the same institution. After one-year postdoctoral fellowship supervised by Prof. Dr. Rainer Abart at the University of Vienna, (Austria) he obtained the position of an Assistant Professor at the Geology Department, Minia University. He has published several research articles in Peer-reviewed international journals.

Tugbanur Ozen Balaban*[1], Ozlem Oztekin Okan[2]

[1] Technoloy Transfer Office, University of Izmir Katip Celebi, Izmir, Turkey

[2] Deparment of Geological Engineering, Faculty of Engineering, Fırat University, Elazıg, Turkey

Water-rock interaction and hydrothermal equilibria in the Pertek (Tunceli, Turkey) geothermal system

The study area is located in Eastern Anatolia. The geology of the studied area is very important for the geodynamic evolution of the Eastern Taurus. Hydrogeological units were divided into the three units in accordance with lithological, structural and hydrogeological properties. First, the basement of the study area, marbles and dolomitic marbles within the Keban metamorphic rocks are highly fractured and karstified as main aquifer in particular thermal waters on the location. Kırkgecit and Karabakir formations occur as impermeable barrier rocks. Some parts of the limestone units act as aquifers of fresh waters. In addition, basalt and limestone of Karabakir formations having fractured also act as an aquifer for cold waters. Moreover, alluvium is the most important and favorable unit for cold groundwater production. There are most of thermal springs with low temperatures (35–37°C) with a discharge of 3 L/s in the geothermal system. The distribution of the geothermal potential appears to be controlled by the neotectonic features such that the highest potential is associated with the tensional tectonics in the Eastern Anatolia, being driven by the supply of heat from a deep-seated source and deep circulation of waters along the fracture zones.

The purpose of this study is to determine hydrochemical modelling of the Pertek geothermal system. Groundwater-rock and groundwater-clay/alteration mineral interaction processes are the predominant factors controlling the trace element hydrogeochemistry of thermal and cold waters. Low tritium values of thermal waters are indicated long groundwater circulation. Trace element composition of thermal waters occurs as the result of the groundwater-rock and groundwater-clay/alteration mineral interaction processes through long and deep circulation along the faults and fractures in the study area.

Audience Take Away:

- Recognize how hydrogeochemical changes occur with water-rock interaction
- A new study will be announced
- Will have information about low temperature geothermal systems of Turkey
- You will have the opportunity to compare different studies
- Will be aware of similar studies in other countries
- It will have the opportunity to cooperate with researchers from different countries

Biography:

Dr. Ozen Balaban graduated from Dokuz Eylul University, Engineering Faculty, and Department of Geological Engineering. Then she received her MSc and PhD degrees. Then she had a one-year postdoctoral fellowship supervised by Prof. Dr. Gultekin Tarcan hydrogeological studies at the same university. She worked as an Assistant Professor at Ataturk University, Department of Geological Engineering from 2013 to 2016. She has worked at Izmir Katip Celebi University since 2016. She has published research articles in SCI(E) journals and presentations. She has also completed coordinator many projects.

Ranjan Ramasamy*, Noble S. Surendran
Department of Zoology, University of Jaffna, Jaffna, Sri Lanka

Increasing salinisation and pollution of groundwater resources in a tropical peninsula – Causes and implications for human well-being

Sea level rise and unsustainable groundwater extraction causes sea water intrusion into fresh water aquifers in coastal zones. Extensive use of agrochemicals and poor waste drainage practices pollute groundwater. The impact of such changes on human well-being in the 1025 km^2 Jaffna peninsula in northern Sri Lanka are analysed. The peninsula has a mean elevation of 5 m, an estimated population of 650,000, and a distance from coast of < 10 km at any location, and is thus considered a coastal zone. Freshwater aquifers are the source of water in Jaffna. The Jaffna peninsula and nearby islands have an underlying Miocene limestone formation inland and unconsolidated formations e.g., lagoonal and estuarine deposits, and coastal and dune sands near the sea The limestone bedrock, is primarily calcite, and extends below sea level to function as an aquifer. There are four main limestone aquifers in the peninsula and the adjacent islands. Human well-being in Jaffna is increasingly affected by, (i) freshwater mosquito vectors of human disease adapting to develop in brackish and polluted water habitats making vector control more difficult, and (ii) deterioration of ground water quality.

Biography:
Ranjan Ramasamy graduated from the University of Cambridge, UK and then obtained a PhD also from the University of Cambridge. He has since held academic appointments in the UK and abroad including Australia, Sri Lanka and the USA. He was the Chairman of the National Science Foundation of Sri Lanka, Professor of Life Sciences at the Institute of Fundamental Studies in Kandy in Sri Lanka, Professor of Biochemistry in the University of Jaffna in Jaffna Sri Lanka, Professor of Immunology in the University Brunei Darussalam Medical School and held institute appointments at the Babraham Institute in Cambridge in the UK & Scripps Clinic and Research Foundation in La Jolla in the USA. He has more 250 publications in fields pertaining to Biological Sciences and an interest in Global Environmental Change and International Science. He was on the Committee on Scientific Planning and Review of the International Council for Science and the Board of Governors of the International Centre for Genetic Engineering and Biotechnology.

Ahmed Hosny*[1,2], Wael Alraddadi[2], Yahya Tarabulsi[2]

[1]Department of seismology, National Research Institute of Astronomy and Geophysisc (NRIAG), Cairo, Egypt

[2] Saudi Geological Survey (SGS), Jeddah, Saudi Arabia

Moho undulations and high poisson's ratio beneath volcanic areas, west of Saudi Arabia: Indication of asymmetric lithospheric uplift

By utilizing teleseismic data, the P-wave receiver functions (RFs) have been computed for 20 broadband seismic station deployed in Harrat Khaybar and Ithnayn, in the Arabian Shield area, western of Saudi Arabia. The RFs are modeled to investigate the crustal structure, represented by determining of crustal thickness, mean crustal Vp/Vs ratio, and the Poisson's ratio. No previous studies have provided information on crustal structure using seismological data for several parts of Harrat Khyber, and therefore this study provides new information about the crustal structure for those parts. Results revealed that the crustal thicknesses range from 30 to 37 km, verifying an indication of undulated Moho interface and asymmetric mantle uplift beneath the study area.

The asymmetry could relate to a simple shear extension under the study area, or due to the pre-existing lateral variations of crustal thickness. The observed Vp/Vs values that range from 1.71 to 1.82 seem to have a direct relationship with the crustal thickness (i.e., crust of smaller depth corresponds to high Vp/Vs). The high Poisson's ratios throughout some areas beneath Khayber and Ithnayn area (~ 0.30) indicate that the crust is more mafic in composition than a typical continental crust, probably referring to intrusion of mafic dikes into the lower crust. In contrast to previous studies, results of this study revealed that some areas of Harrat Khaybar and Ithnayn have high Vp/Vs ratios with respect to the rest of the Arabian shield; however, it is consistent with the results of other previous studies.

Audience Take Away:

- It will be an opportunity to learn how to exploit earthquake data to obtain the structural structures of the earth's crust as well as the tectonic status of any region. Perhaps it represents an opportunity to work in the field of seismology in local and international Institutions. Other faculty could use and apply the same methodology to expand their research or teaching. Ahmed Hosny think it will provide a practical solution to get understanding the tectonics of the lithosphere, at least geodynamically.

Biography:

Dr. Ahmed Hosny, is currently Prof. of seismology at National Research Institute of Astronomy and Geophysics (NRIAG), Cairo, Egypt. He was Past Vice President of the African Seismological commission (AFSC), 2014-2018. He is Technical Advisor at Saudi Geological Survey (SGS), Geohazard center, National center for earthquakes and volcanoes.

Dmytro Rudakov*, Oleksandr INKIN
Department of Hydrogeology and Engineering Geology, Dnipro University of Technology, Dnipro, Ukraine

Evaluation of the potential and efficiency of geothermal system performance in closed mines

The study focuses on evaluating the potential of geothermal system in closed mines. The designs of existing open-loop and closed-loop geothermal systems in different countries, their thermal capacities and efficiency criteria are analyzed. The study encompasses preliminary assessment and ranking of closed mines in Ukraine and Germany as well as the detailed modeling of individual cases. 27 mines in the Donetsk coal basin of Ukraine (Donbas) and 28 mines in the Ruhr coalmining area (Germany) were selected for analysis, with the depth of mining from 300 to 1200 m in Donbas and from 400 to 1600 m in the Ruhr area. The geothermal gradient was evaluated based on the measurements of the deep heat flux in the Donbas area and the rock temperature at a depth of 5 km in the Ruhr area.

To rank the selected mines according to the efficiency of mine water and rock heat recovery, five critical parameters were evaluated; they include the conversion factor of heat pumps COP, the energy balance relation, thermal capacity, profit from operation, and the CO_2 emission reduction. The energy balance relation was introduced by the authors earlier; it is defined as the ratio of the generated thermal energy to the thermal equivalent of the electrical energy spent for running the system.

Closed mines in Donbas as potential sites for heat recovery were ranked both according to the five parameters individually and according to the relative complex criterium that include all ranks in equal shares. The theoretically achievable thermal capacity of potential open irreversible geothermal systems in the Donbas mines is estimated from 1.56 MW to 24.41 MW, the COP for heat pump from 4.73 to 9.74, and the energy criterion from 2.10 to 4.33 with average the values of these parameters of 11.09 MW, 6.08 and 3.02, respectively. The same parameters in the Ruhr area refer to the ranges 0.98-111.2 MW, 3.80-6.30, and 2.73-3.98, respectively, with average the values of 29.8 MW, 4.80 and 3.04.

To calculate the performance parameters of individual geothermal systems, the authors have developed mathematical models using different approaches. The first approach includes analytical calculations of the hydraulic flow in a system of several connected workings and the temperature of water pumped out by water hoisting from the shaft. The second approach is based on finite-difference modeling of the flow of underground and mine waters and heat transfer in a mined-out rocks around the geothermal system, which is appropriate to analyze in detail the impact of technology features and natural conditions on heat recovery. The third approach is proposed for closed-loop geothermal systems and includes numerical solution of 1D heat transfer equations in tubes of a borehole heat exchanger with boundary conditions of heat exchange with surrounding soils and mine water and a detailed consideration of thermal resistances in the exchanger regarding the internal geometry.

Audience Take Away:

- The presented methodology for ranking closed mines according to the heat recovery efficiency includes the set of basic geological and technological parameters and allows select the most promising sites; the similar approach is helpful for practitioners in geothermal applications and can be used in other research fields of geology when facing the challenge of ranking numerous objects/sites and selection of those most promising
- The data obtained can be used to select the most promising mining sites for heat recovery; the presentation considers closed mines not only as unprofitable objects requiring permanent spends to maintain hydrodynamic safety, but also as the constant source of geothermal energy to nearby settlements
- Teachers can use the presentation in lectures on alternative energy, particularly, geothermal applications
- The methodology for preliminary calculation of the geothermal system performance is useful at the pre-design stage when forming a priority list in terms of mine water/rock heat recovery at closed mines; this will simplify the designer's work and allows to focus on potentially most profitable sites
- The approach being presented enables analyzing and preliminarily quantifying the feasibility of open-loop and closed loop geothermal systems under various conditions

Biography:

Prof. Dmytro Rudakov studied Mathematics at the Dnipropetrovsk University, Ukraine and graduated as MS in 1992. He received his PhD degree in 1996 and the Doctoral degree in 2007 in the field of environmental and mining hydrogeology focusing on groundwater flow and mass transport in aquifers and mining sites. He had post-doctoral research studies in Germany and the USA and participated in 16 international and national research and educational projects. Since 2011 he works as the Professor and the Department Head in Dnipro University of Technology. He has published more than 140 research articles in SCI(E) journals.

Sudip Basack*[1] , Ghritartha Goswami[2]

[1]Professor and Principal, Elitte College of Engineering, MAKA University of Technology, Kolkata, India

[2]Research Associate, Department of Civil Engineering, North Eastern Regional Institute of Science and Technology, Nirjuli, Arunachal Pradesh, India

Soft ground improvement techniques: Theoretical, laboratory and field based investigations

Reducing long-term settlement of infrastructure and providing cost-effective foundations with sufficient load-bearing capacities are national priorities for infrastructure development in most countries. In particular, transport infrastructure built on soft soil can cause excessive settlement initiating undrained failure of super-structure if proper ground improvement is not carried out. Adequate ground improvement techniques can be adopted to prevent unacceptable excessive and differential settlement and increase the bearing capacity of the foundations at much lower cost. Over several decades, various ground improvement techniques have been developed, which include use of admixtures, chemical stabilization, dynamic compaction, preloading with vertical drains and stone column, piling, among others. Each of these techniques has different mechanisms to improve the soft ground. The authors have conducted extensive theoretical and experimental (laboratory and field) investigations on various ground improvement techniques. The theoretical analysis included rigorous numerical studies based on finite difference and finite element modelling. The laboratory model studies involved extensive experimentations using sophisticated test set-ups with reliable control mechanisms. The field-based investigations were conducted in adequate site comprising of soft, compressible soils. In this paper, brief overview of the various investigations conducted has been briefly described. Also, comparative studies on different methodologies have been described and their suitability in different ground conditions have been analysed. A set of case studies has been conducted at selected site locations. Adequate quantifications of the efficiency of the methodology are incorporated and relevant conclusions are drawn.

Audience Take Away:

- Detailed analysis of the various ground improvement techniques followed worldwide and its necessity
- Step-by-step analysis of the problem and the research methodology adopted
- Description of the state-of-the-art experimental and modeling techniques to improve the soft ground

Biography:

Prof. Sudip Basack, PhD, FIE, M.ASCE is a civil engineering professional with significant experience and expertise in geotechnical and geoenvironmental engineering. He held several responsible senior academic positions in India and abroad. He published more than 125 technical papers in reputed journals and conferences and is recipient of several research awards at national and international levels. He is an active reviewer of numerous top-class international journals. He has supervised more than 10 research students at postgraduate (Masters and PhD) levels and executed sponsored research projects in different Universities. He has undertaken several academic visits in many countries including USA, UK, Germany, Australia, New Zealand, Singapore, China, etc.

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Ghritartha Goswami[1*], Sudip Basack[2]

[1]Research Associate, Department of Civil Engineering, North Eastern Regional Institute of Science and Technology, Nirjuli, Arunachal Pradesh, India

[2]Professor and Principal, Elitte College of Engineering, MAKA University of Technology, Kolkata, India

Soft ground improvement techniques: Theoretical, laboratory and field based investigations

Reducing long-term settlement of infrastructure and providing cost-effective foundations with sufficient load-bearing capacities are national priorities for infrastructure development in most countries. In particular, transport infrastructure built on soft soil can cause excessive settlement initiating undrained failure of super-structure if proper ground improvement is not carried out. Adequate ground improvement techniques can be adopted to prevent unacceptable excessive and differential settlement and increase the bearing capacity of the foundations at much lower cost. Over several decades, various ground improvement techniques have been developed, which include use of admixtures, chemical stabilization, dynamic compaction, preloading with vertical drains and stone column, piling, among others. Each of these techniques has different mechanisms to improve the soft ground. The authors have conducted extensive theoretical and experimental (laboratory and field) investigations on various ground improvement techniques. The theoretical analysis included rigorous numerical studies based on finite difference and finite element modelling. The laboratory model studies involved extensive experimentations using sophisticated test set-ups with reliable control mechanisms. The field-based investigations were conducted in adequate site comprising of soft, compressible soils. In this paper, brief overview of the various investigations conducted has been briefly described. Also, comparative studies on different methodologies have been described and their suitability in different ground conditions have been analysed. A set of case studies has been conducted at selected site locations. Adequate quantifications of the efficiency of the methodology are incorporated and relevant conclusions are drawn.

Audience Take Away:

- Detailed analysis of the various ground improvement techniques followed worldwide and its necessity
- Step-by-step analysis of the problem and the research methodology adopted
- Description of the state-of-the-art experimental and modeling techniques to improve the soft ground

Biography:

Ghritartha Goswami, BE, M.Tech., AMIE, CEng is a professional civil and water resources engineer, currently a Research Associate at North Eastern Regional Institute of Science and Technology, Arunachal Pradesh, India. Formerly an Assistant Professor & Head at Scholars Institute of Technology & Management, Assam, India. He has published more than 30 papers in different international journals and conferences of repute in civil engineering fields. For his remarkable accomplishment in his profession, he was recently named a Young Scientist by the International Scientist Awards.

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Sustainability of groundwater resources in the Nile delta under the impact of climatic changes: Challenges and future directions

Khaled Said Gemail*, Ahmed M. Nosair
Environmental Geophysics Lab, (ZEGL), Zagazig University, Faculty of Science, Department of Geology, Zagazig, Egypt

Sustainable development in the Nile Delta region, Egypt is retarded by serious environmental problems, where the land use and land cover of the region is changing over the present time. The groundwater quality in the Nile Delta area is controlled mainly by saltwater intrusion from the north due to Sea Level Rise (SLR), in addition to surface contaminants from the common wastewater networks in heterogeneous clay and silt soils. Due to the excessive pumping over the last few decades, the groundwater salinity in the northern and middle parts of the delta has considerably increased and the salty water migrated to the south. Thus, the delta faces a lot of environmental problems and challenges now and in the future due to the unplanned water resources and wastewater pollution. To elaborate on these challenges and the future development of the groundwater aquifer, in-depth analyses of vulnerability conditions related to water quality and soil salinization are suggested in the present work. Therefore, an integrated management plan for freshwater conservation in the Nile Delta is presented where the area is one of the most vulnerable deltas in the world due to SLR and freshwater scarcity. Reasonably, geological, hydrochemical, groundwater recharge system and flow regime, and hydro-geophysical datasets were integrated into a GIS environment to fully understand these threats and challenges such as groundwater salinization, wastewater (domestic and agricultural drainages) penetration into the shallow freshwater aquifer, and cultivated land salinization. In addition, the socio-economics information and governance are addressed to make future conservation scenarios to improve water allocation as an economic good. Accordingly, the results are provided all stakeholders with reliable and affordable drinking water, sustainable irrigation water resources, and enhancement of soil productivity.

The ongoing works will comprise the following outcomes,

1. Providing in cooperation with National Authority for Potable Water and Sewage a reliable roadmap for water quality conservation (changes in water quality in time and space) using advanced machine learning techniques and statistical modeling in order to evaluate long-term changes in water quality for domestic and irrigation supplies, and
2. Water quantity and quality monitoring improvement and assessment by establishing an internet-based monitoring system based on harnessing the cloud computing power along with the artificial intelligence techniques

Audience Take Away:

- In the present work, we applied a multidisciplinary approach including hydrochemical, hydrogeological, microbiological, and geophysical data to assess and monitor the groundwater quality which is considered a critical environmental problem in the Nile Delta, Egypt. This is significant because we employed numerical and geophysical modeling as a monitoring tool to locate potential preferential flow paths and horizons of lateral flow of pollutants in the upper aquifer zone. Additionally, it may guide to understand the surface-groundwater links in order to supply the growing population with safe water in arid and semi-arid regions elsewhere. The work should be of interest to readers in the areas of aquifer vulnerability and pollution assessment under the impact of SLR and wastewater percolation in the Nile Delta region. The present work was considered as a case study in some teaching courses at Zagazig University for mapping saltwater intrusion, water resources management, and hydrogeochemical modeling in the Nile Delta as one of the most vulnerable deltas in the world due to the population growth and impact of SLR

- As a global research problem, the problem of sea-level rise (SLR) and wastewater pollution led to a reduction of freshwater resources for quantity and quality and may have effects on coastal regions in the short and long term such as an increase in coastal erosion, population migration, and seawater intrusion (SWI). Water quality degradation problems are widespread and shortage of water resources has become a global problem and/or the issue that requires integrated efforts to minimize the negative impact of the climatic changes. Also, the exchange of national and international experiences could help to initiate relevant solutions for these critical challenges. Therefore, the applied research approach in the present work can be considered an interesting case study for the mitigation of water quality degradation in the coastal aquifer all over the world

Biography:

Dr. Khaled Gemail studied Environmental Geophysics and Hydro-geophysical modeling at Zagazig University, Egypt, and TU Freiberg, Germany, and graduated as Ph.D. in 2003. He has rewarded a two years postdoctoral fellowship at the Department of Geosciences at Saskatchewan University, Canada, and then he returned back to his home university at Zagazig as a full-time professor in Environmental Geophysics. During his time at Zagazig University, he established a research group and Environmental Geophysics Lab (ZEGL) in accordance with ISO 17025 accreditation standers. He has rewarded several research projects funded by STDF, HEEP, and ARST and published more than 40 research articles in the field of groundwater and soil salinization.

Angue Minto o C M*, Lombo Tombo S, Megneng M, Massengo J, Assembe Mba F
Department of Life and Earth Sciences, Ecole Normale Superieure, Libreville, Gabon

Retreat of the mangrove and risk of marine submersion: The case of Libreville

The urbanization of coastal cities is a process that is often linked to significant urban growth, resulting in intensive coastal development. This often results in continued strong anthropogenic pressure on the coastal zone. The coastal city of Libreville (situated at the north west of Gabon, a central African country) is characterized by a significant increase in its population over the past 50 years (from 7% to 52% of the total Gabonese population, Poitier et al., 2017). In addition to this demographic explosion, there followed an anarchic land occupation described as the "galloping" urbanization of Libreville (Poitier et al., 2017) which leads to the destruction of coastal ecosystems such as mangroves constituting a natural barrier against the risks of erosion and marine submersion. The destruction of mangrove areas exposes the environment to floods and other disasters, often endangering the populations that continue to settle in these areas.

In order to characterize the impact of climate change and human activity on the mangrove, four sites in the Libreville region were the subject of our study. Concerning the first two sites (Malibé and Diba-Diba areas), the processing of aerial photographs associated with field observations and field surveys made it possible to highlight the following results: 1/ in Malibé, the space of the mangrove has receded by about 90m since 1995, that is a retreat rate of 3.5m/year; 2/ in the Diba-Diba area, for an area of 100ha, the mangrove still occupies a relatively large space (70%) with an anthropization of around 15%. This observed decline of the mangrove in these two areas suggests a strong anthropogenic influence on which is added the effects of the sea level rise. The use of micro-organisms (benthic foraminifera and ostracods) as bioindicators of a marine influence on the continent in the two other sites (Akournam and Kouango) has made it possible to show that their presence in the samples analyzed, would translate a marine signal indicating a phase of progressive marine transgression. The two sites could therefore, in the long term, be covered by the waters of the South Atlantic.

In conclusion, the studied areas (Malibé, Diba-Diba, Akournam and Kouango) would constitute areas at risk for populations that are constantly settling there, destroying the ecosystem.

Audience Take Away:

- The audience will be able to use what they learn in the field of teaching. When the "climate change" aspect addressed in a course, this presentation can be used to show that the effects of climate change associated with human activities can lead to and accelerate environmental degradation. This would be more visible when we are in a context of uncontrolled urbanization

Biography:

Dr. Angue Minto'o studied Environmental geological at the Perpignan University, France and graduated as MS in 2010. She then joined the Centre of Education and Research on Mediterranean laboratory at the Perpignan University. She received her PhD degree in 2014 at the same institution. After one year postdoctoral fellowship supervised by Dr Maria-Angela Bassetti. She awarded of the Academy of Sciences for her research results in 2017. She has published more than 6 research articles in SCI(E) journals.

Ali Akbar Daya
Associate professor at University of Sistan and Baluchestan

Application of fractal methods for separating geochemical anomalies from background

Separation of geochemical anomalies from background is a fundamental topic in the field of geochemical exploration. Fractal and multifractal modeling of geochemical data are among these methods and have been used by many geoscientists for more than two decades. In this study, fractal methods, consisting of concentration–area (C–A), concentration–perimeter (C–P), number–size (N–S), Spectrum-Area (S-A), and Concentration-distance (C-D) methods were applied to identify geochemical anomalies in 317 stream sediment samples from Kamoshgaran region, Kurdestan province, north- west of Iran. Implementation of fractal methods showed that southwestern, eastern, and central parts of Kamoshgaran region were the most important parts and future detailed exploration .Also, a good relationship was found between alteration units and anomalous areas using fractal methods. Maps of the anomalies revealed that As, Cu, and Mo anomalies were simultaneously located in the eastern part of the studied area and corresponded to Au anomalies. From this point of view, it can be said that the studied area could be very important for Au mineralization and its eastern part can be the target of future exploration.

Biography:

Ali Akbar Daya currently is associate professor at the Department of Mining Engineering, Faculty of Technology and Engineering, University of Sistan and Baluchestan. Ali Akbar does research in Economic Geology, Geochemistry, Geostatistics and fractal modeling in earth sciences.

Abolfazl Rezaei
Associate Professor in Hydrogeology, Department of Earth Sciences, Institute for Advanced Studies in Basic Sciences (IASBS), Zanjan, Iran

Reactive contaminant transport modeling in a filled-fractured system with intervening rock matrices: Case examples of Tritium and Uranium

While fractures are commonly filled in the subsurface, they have received little attention in terms of flow and solute transport. This study presents a semi-analytical solution for a reactive contaminant in a five-layer fracture matrix groundwater system characterized by a thin rock matrix separating the fractures, which are taken to be filled with sediments. Under conditions of steady groundwater flow using the Laplace transform for two scenarios of two-dimensional unilateral and three-dimensional radial flows, the solutions have obtained that account for longitudinal advective transport in the mobile portion of fractures and transverse diffusion in the adjacent matrices. The mathematical models in the real-time domain are derived by numerically inverting the solutions from the Laplace domain and validated against both the numerical and existing semi-analytical solutions. Examples of the solution behavior are presented, which demonstrate an increase in the fracture-mobile/fracture immobile porosity ratio tends to increase the solute concentration in the adjacent matrices, particularly under unilateral flow rate, because in addition to the groundwater velocity, Peclet number, and hydrodynamic dispersion coefficient, the ratio of retardation factor to hydrodynamic dispersion coefficient also plays a significant role in solute transport. Compared to the fracture, the solute behavior in the matrices, particularly under the unilateral flow case, is more sensitive to changes in the parameters. The porosity of the rock matrix has a twofold effect since as porosity is increased, the retardation factor decreases while storage capacity increases. A thinner middle matrix in addition to a lower peak in tritium and uranium concentrations inside the whole system over long-time periods is further accompanied by a quick overlapping the concentration penetration depth of adjacent fractures. The diffusion process in the rock matrix has been further identified as important as advection in the fracture for those repositories that are planned to safely dispose wastes for a long-time. The idea of combining multiple fractures as a single one with a double aperture is found to be only reasonable for the conservative solute under the steady-state or long-time conditions while it is not to be useful for the cases of sorptive solutes under the unsteady-state solute transport. The findings of this study can assist for simulating tracer tests as well as fate, transport, and remediation of groundwater contaminants in fractured rocks to better evaluate the safety degree of deep reservoirs in regard to disposal of nuclear and chemical wastes.

Biography:

Abolfazl Rezaei received a PhD degree in Hydrogeology from Shiraz University, Shiraz, Iran in 2014. He is currently an Assistant Professor in the Department of Earth Sciences, Institute for Advanced Studies in Basic Sciences (IASBS), Zanjan, Iran. He has authored more than 20 peer-reviewed articles in international journals. His research interests include the study of physical characteristics of groundwater systems, large-scale climate variability impacts on water resources, and hydrogeology of karstic aquifers.

Zainab Naeem
Department of Environmental Sciences, Fatima Jinnah Women University, Islamabad, Pakistan

Correlation of earthquake precursors with soil physico-chemical parameters

The presentation will focus upon the soil gas radon and soil electrical conductivity as the earthquake precursors. The correlation between these two precursors will be discussed. Furthermore, how these precursors react to the air temperature difference will also be highlighted. Moreover, it will be discussed how other physico-chemical parameters of soil affect the activity of these two precursors. The study will focus on the main boundary thrust fault zone are of Pakistan which is one of the most complex and seismically active thrust fault system in the world. Technical aspects of methodologies will also be discussed. The presentation will focus on how these precursors can help in reducing the loss and damage that occurs due to the earthquakes in Pakistan and any other country where it could be replicated. Moreover, Sendai Framework for disaster risk resilience will be discussed as a strategy to improve preparedness in earthquake active zones.

Audience Take Away:

- The audience will be able to analyze the importance of soil medium and the complexities which hinder the earthquake prediction process
- The presentation will give an insight to the geo-physical precursory phenomena associated with earthquakes.
- It can be replicated in other developing countries as well where community-based disaster resilience planning is missing
- Based on these parameters and the correlation, it will be easy to discuss earthquake precursors and assess how we can bring improvement in the field

Biography:

Zainab Naeem is a Ph.D. Scholar in Environmental Sciences at Fatima Jinnah Women University and is working on seismic hazard risk assessment as part of her Ph.D. Project. Moreover, she is also working as a research associate at Sustainable Development Policy Institute in Pakistan.

Khalid S. Essa*[1], Yves Geraud[2], Marc Diraison[2]

[1]Department of Geophysics, Cairo University, Giza

[2]Universite de Lorraine, GeoRessources Laboratory, Nancy, France

Global particle swarm optimization method for gravity data interpretation

Gravity data measured along a profile for a 2D fault-like geologic structure were interpreted to calculate the fault parameters (upthrown depth, downthrown depth, amplitude coefficient, fault angle, and location of the fault trace) applying the particle swarm method. Faults have prime-concerns for solving many problem-related engineering and environmental applications, describing the accompanying mineralized or ore zones with faults, describing geological deformation events, monitoring active shear zones in the subsurface, delineating the hazards of faulting before any investment planning, and visualizing subsurface faults for more scientific investigations. The proposed method is done through the following steps: First, it utilizes the residual moving average anomalies that estimated from the Bouguer gravity anomalies by using several window lengths. Second, each residual anomaly is interpreted using the particle swarm. Third, calculate the average value for all interpreted anomalies. Fourth, the average values for the fault parameters are utilized to build the forward gravity model that compared with the true-ones. The efficiency of this method has been studied by applying it to a synthetic and a field data from France. It was found that the obtained results are in good agreement with the previously published studies.

Audience Take Away:

- Global particle swarm optimization for interpreting gravity data for fault-model
- The proposed method is depends on second moving average operator to remove the regional effect
- This method is tested on synthetic and fields data
- This method is powerful and robust

Biography:

Dr. Essa joined Geophysics Department staff at Cairo University after graduated in 1997. He received his Ph.D. in Geophysics in 2004 and was appointed a research Professor of potential field methods in 2014. He has affiliated to several post-doctoral visits and conferences to France, Czech, Australia, and USA. Also, he is a member of the Petroleum and Mineral Resources Research Council and a member of the member of the National committee for Geodesy and Geophysics, Academy of Scientific Research and Technology, Egypt. He has given Award of the Prof. Nasry Matari Shokry and Award of Cairo University for Scientific Excellence in Interdisciplinary, Multidisciplinary and Future Sciences in 2017).

Ashraf Adly
National Research Institute of Astronomy and Geophysisc (NRIAG), Egypt

Site specific probabilistic seismic hazard for New Mallawy, Egypt

The common practice of conducting seismic hazard analysis for already built cities can be considered of sub-optimal value. The best practice is the hazard evaluation before the urban planning of the cities. The hazard model used in the current study is based on up-to-date database of historical and recent earthquakes. The site response is accounted for through the use of average 30-m shear-wave velocity (Vs30). A set of Ground motion prediction models is selected to characterize the expected ground motion and associated uncertainty. Epistemic uncertainty in earthquake recurrence, maximum expected earthquake size, ground motion prediction models is considered in the hazard calculations.

Observed variability of earthquake shaking is mainly related to lateral changes in soil properties. The expected earthquake loads are rather low compared to the Egyptian code. The obtained seismic hazard results can be used for urban planning and risk mitigation at the New Mallawy city.

Audience Take Away:

- The audience will have a general idea about how probabilistic seismic hazard is conducted
- They will also see how the results of probabilistic seismic hazard are used in designing earthquake resistant buildings
- This research can provide an insight for people interested in seismic hazard and risk reduction

Biography:

Dr. Ashraf Adly got his MSc in seismology at Al-Azhar University (Egypt) in 2011. He also obtained a specialization certificate in geological and climate related risk, University of Geneva (Switzerland) in 2012. He then did his PhD through a joint program between Swiss Federal Institute of Technology (ETH), Zurich (Switzerland) and Assiut University (Egypt) in 2017. His main interest is in field of site seismic characterization and probabilistic seismic hazard.

POSTERS

DAY 01

GLOBAL CONFERENCE ON

GEOLOGY AND EARTH SCIENCE

19-20 SEPT

Veronica lutri[1,2]*, Monica blarasin[1], Edel matteoda[1], miguel pascuini[1], daniela giacobone[1],santiago pramparo[1],[2], fatima becher quinodoz[1,2], adriana cabrera[1], german schroeter [1]

[1]Geology Department, National University of Rio Cuarto,Cordoba, Argentina

[2] National Council of Scientific and Technical Research (CONICET), Buenos Aires, Argentina

Groundwater pollution by herbicides in the Pampean plain, hydrogeological features related and seasonal variations. Cordoba, Argentina

A large part of the territory of Argentina is dedicated to agricultural and livestock production, and is located mainly in the Humid Pampas, an area approximately of 600 000 km2. The predominant crops are soybean, maize, wheat, peanuts and alfalfa among others, with no-tillage farming and intensive use of agrochemicals like fertilizers and pesticides. Regard the seconds, herbicides lead the volume of total consumption, being the most important Glyphosate (N-phosphono-methylglycine) in soybean crops (which suffers microbial biodegradation giving aminomethylphosphonic acid-AMPA, its main metabolite) and Atrazine in maize crops. These compounds are considered as pollutants in surface water and groundwater, arriving by runoff and vertical transport towards the aquifer.

In the study carried out in the province of Cordoba, it was determined that the hydrogeological characteristics influenced the herbicide distribution in the unconfined aquifer. In general, areas with a thin vadose zone and shallow groundwater depth, low hydraulic conductivity and low hydraulic gradient, added to the anthropic factors of herbicide application, allow to define spatially and temporally the increase in the leaching processes of these compounds towards the unconfined aquifer. Also, the lithology of the vadose zone was also critical for atrazine mostly, where in areas with a predominance of coarse-textured sediments (sands and gravels), low clay percentages and lower atrazine Koc, this herbicide exhibits high mobility, which makes possible its transport to the unconfined aquifer at sites with a deep water table (≈25 m below surface).

In addition, the distribution of rainfall in a climate with marked seasonality also defines the concentration of herbicides in the unconfined aquifer and surface water (higher in wet seasons) due the coexistence of the season with the highest rainfall, the time spray period and the recharge of the aquifer system.

The detection of herbicides in the unconfined aquifer shows that the application for decades under the prevailing agricultural model exceeds the degradation potential of the soil and the unsaturated zone, causing groundwater pollution.

Audience Take Away:

- The importance of the basic geological study to be able to define a conceptual geo-hydrological model linked to seasonality variations related to groundwater pollution
- To be able to correlate characteristics of the natural system with the corresponding anthropic alterations in a highly modified agricultural system, obtaining management guidelines to respond to water pollution problems
- How to minimize the risk of environmental deterioration and at the same time enhance the benefits of using natural and modified environments

Biography:

Dr. Veronica Lutri studied Geology at the National University of Río Cuarto, Argentina, and graduated as Geologist bachelor in 2013. She then joined for a PhD study with the research group of Prof. Monica Blarasi at the Geology Department of the National University of Rio Cuarto with a fellowship of the National Council of Scientific and Technical Research of Argentina (CONICET), obtaining the title of PhD in Geological Sciences in 2020, focused in geohydrology. She has published approximately 20 research articles in SCI(E) journals, and have participated in 25 scientific events such as national and international conferences and conventions.

KEYNOTE FORUM

DAY 02

GLOBAL CONFERENCE ON

GEOLOGY AND EARTH SCIENCE

19-20 SEPT

Jillian Huntley*[1,2]

[1]Griffith Centre for Social and Cultural Research, Brisbane, Queensland, Australia

[2]Australian Research Centre for Human Evolution,Brisbane, Queensland, Australia

Salt in the wound: Rock art degradation and climate change in the Australasian monsoon domain

To date research, planning, mitigation strategies, and adaptation policies regarding the effects of climate change on cultural heritage have focused on primary impacts like inundation from sea level rise. Drawing on work in Island Southeast Asia and Northern Australia, I will discuss multiscalar, secondary impacts and the unique challenges faced managing accelerating rock art degradation in the most climatically dynamic region on Earth – the Australasian Monsoon Domain. Using salt weathering/haloclasty as an example, I will discuss the mechanisms of art loss at panel, site, and regional scales. I will illustrate the complex issues faced, highlighting social justice inequities for communities with cultural responsibilities for their heritage. I argue that while interagency cooperation and strategic planning are vital for local governance], even the best interventions will have limited outcomes without serious, urgent reduction in global carbon emissions to net zero as soon as possible.

Audience Take Away:

- This presentation highlights the complex, compound impacts of climate change on cultural heritage sites. It draws on recent field observation in the context of recent IPCC reporting to foreground accelerating rock art degradation in the Tropics
- This presentation will be of particular interest to those engaged in the management and preservation of cultural heritage in government, the museum sector and for cultural groups who hold custodial responsibilities. Here I advocate for a coordinated, strategic management approach across the region and call for more resourcing to help on the ground conservation programs
- In raising awareness of the challenges faced for long term preservation of cultural heritage it is hoped that better mitigation and management strategies can be designed at local levels, fostering regional and global initiatives

Biography :

Dr Jillian Huntley specializes in the physicochemical characterization of ochres (mineral pigments), rock art and shelter/cave environments. She uses cutting-edge methods to investigate how past peoples interacted with each other, and their landscapes. Jillian has made a significant contribution to climate change sustainability and adaptation research agendas in the Equatorial Tropics through her work on the effects of climate change on the Pleistocene rock art of Sulawesi (published in *Scientific Reports*). She is one of the experts currently overseeing the design and implementation of the Murujuga Rock Art Monitoring Program (2020-2024) for the Western Australian government.

Giorgio S. Senesi

CNR - Istituto per la Scienza e Tecnologia dei Plasmi (ISTP), Sede di Bari, Bari, Italy

A powerful analytical tool for geosciences, environmental systems and their potential contaminants: Laser-Induced breakdown spectroscopy

The comment by Winefordner et al. (2004) that Laser-Induced Breakdown Spectroscopy (LIBS) would be the next superstar in analytical atomic spectrometry appears prescient, as LIBS has been investigated and found very performant for elemental analysis in many different applications. Since the turn of the century, LIBS technology has rapidly progressed from bespoke laboratory apparatus to commercial laboratory instruments, to systems appropriate for industrial analysis, to portable and then handheld analyzers to achieve in-situ, real-time chemical analysis in the field, even deployed on extraterrestrial Mars rovers. LIBS is a simple, straightforward, and highly versatile analytical technique that focuses a rapidly pulsed laser beam onto a sample to yield a plasma containing its constituent elements and then uses spectral analysis of emitted light to determine the material chemical composition. LIBS can be used for the rapid and simultaneous multi-element analysis of different types of geological media – solid (rocks, minerals, soils), liquid (natural waters, brines, hydrothermal fluids), or gas (e.g. ambient atmosphere, geogenic emissions, etc.). In principle, LIBS is capable of qualitative, semi-quantitative, and quantitative analysis of all elements in the periodic table both in the laboratory and outside for in situ analysis, being able also to perform rapid microscale compositional imaging. In this presentation the LIBS technique will be described, and LIBS applications to the analysis of minerals, rocks, soils and meteorites discussed and illustrated on the basis of personal work and literature review. Given the persistent need of analytical instrumentation for the rapid chemical analysis of geologic materials in the field, and the capability of LIBS to analyze any type of sample in real time with little to no preparation, there is a promising potential for routinary application of LIBS across a broad spectrum of geosciences which is as yet only minimally explored.

Audience Take Away:

- The presentation will describe LIBS in terms appropriate to an audience unfamiliar with the technique by discussing and illustrating how LIBS has been and can be applied across the broad spectrum of geosciences

Biography:

Dr. Giorgio S. Senesi holds a BA/MS in geology and is PhD in Earth Sciences from University of Bari. He is senior researcher at the National Council Research (CNR), Institute for Plasma Science and Technology (ISTP), Bari seat. His research interests are: Laser-Induced Breakdown Spectroscopy applied to minerals, gems, rocks, meteorites, soils, fertilizers, plants and cultural heritage, laser-matter interaction, laser spectroscopy, morphological characterization techniques (AFM, SEM, TEM) and nanocrystalline diamond films.

R. Alvarez*[1], M. Camacho[2]

[1]Instituto de Investigaciones en Matematicas Aplicadas y en Sistemas (IIMAS), Universidad Nacional Autonoma de Mexico, CDMX

[2]Posgrado en Ciencias de la Tierra, Universidad Nacional Autonoma de Mexico

Visualizing the plumbing system of Hunga Tonga Hunga Ha'apai volcano, Tonga

The largest underwater volcano chain in the globe is generated by the Kermadec-Tonga Subduction Zone, with over 2000 km in length; additionally, the Tonga trench is one of the fastest subduction zones, with rates going up to 24 cm/yr. In January 15, 2022 a violent explosion occurred in one of the members of the volcanic chain: the Hunga Tonga Hunga Ha'apai (HTHH) volcano, it induced worldwide atmospheric perturbations and tsunamis that affected portions of the North, Central and South American littorals. The recent eruption released energy equivalent to an earthquake of M 5.8. HTHH volcano has had repeated eruptions in 1998, 2009, 2015, and 2022; yet its internal structure is poorly known. Local measurements on the volcano are rare given its remote, isolated, and submarine location. Triggering mechanisms postulated for highly explosive mafic eruptions frequently include water–magma interaction or basaltic intrusions into a storage chamber. Ensuing eruption progression and dynamics depend on the mechanism and rate of caldera collapse and resulting modification of the geometry of the plumbing system. Here we use a high-resolution gravity data set, to perform an inversion of the complete Bouguer anomaly of the HTHH volcanic area that yields the density distribution in the volcano's interior. This distribution unveils the characteristics of the plumbing system.

In general, they are the conduits that store and transport magmatic products to the surface. The possibility to map those conduits relies in their low-density characteristics, arising from either gas-filled, semi-hollow paths, or low-density, high-temperature magma chambers. The high-resolution data sets play a definitive roll unveiling the characteristics of volcanic interiors. We perform two 3D inversions using the high-resolution Bouguer Anomaly, obtained for the HTHH area. The models have resolutions of 500 and 250 m, respectively. The former reaches depths of 6 km, whilst the latter reaches 5 km; they complement each other. Major low-density anomalies are unveiled in both models. Strategic slices of the 3D models expose low-density regions that evolve from the bottom of the models to the surface; we associate them with the plumbing system. No low-density distribution within 6 km depth can be identified with a magma chamber, as observed in other surveyed volcanoes. Both models show an important negative anomaly in the NW portion of the inverted area; the system shows at least two feeding conduits at the bottom of the model and in the intermediate to upper levels we identify four trajectories along which the motion of magmatic material could take place to the surface. Groups of horizontal cross-sections show that the near-surface volume concentrates many low-density materials that appear to be associated with circular faulting. These results constitute a baseline to compare with in future explosive modifications of the volcanic structure of HTHH, as well as other members of the volcanic chain.

Audience Take Away:

- The internal structure of HTHH volcano has not been described previously. Colleagues in the Earth Sciences can incorporate these results to expand in their own fields, characteristics of this volcanic structure
- The traits of the plumbing system of HTHH volcano can be used to compare with many other explosive volcanic structures generated by the Tonga-Kermadec subduction zone
- Two observations are considered of value to distinguish this volcano from other structures: We cannot locate a magma chamber within 6 km depth, and we find an unusual concentration of low-density regions close to the surface. These observations require additional investigations
- Knowing the potentially devastating effects of explosive volcanism, this study may help systematize observations on groups of volcanos in the Tonga-Kermadec region

Biography:

Dr Alvarez obtained MsC and PhD degrees from University of California at Berkeley in 1970 and 1972, respectively. He has spent 48 years at the National Autonomous University of Mexico (UNAM) as a Professor and Researcher at the Institute of Applied Mathematics (IIMAS) and the Institute of Geophysics. In the 1989-1977 period he was director of the Institute of Geography. Between 1975-1977 he was Principal Investigator in NASA's Lunar Sample Program. He has done research in electrical properties of rocks, Tectonics, and volcanic structures.

SPEAKERS

DAY 02

GLOBAL CONFERENCE ON

GEOLOGY AND EARTH SCIENCE

19-20 SEPT

Yetong Wang [1,2*], Guoqiang Sun [2,3], Shuncun Zhang [2,3,] Guojun Chen [2], David Cruset [4], Juan Diego Martin-Martin [5], Hui Guo [2,3], Shangshang Bo [1,2], Irene Cantarero [5], Vinyet Baques [5] , Anna Trave [5]

[1]University of Chinese Academy of Sciences, Beijing China

[2] Northwest Institute of Eco-Environment and Resources, Chinese Academy of Sciences, Lanzhou

[3] National Engineering Research Center of Offshore Oil and Gas Exploration, Beijing, China

[4] Group of Dynamics of the Lithosphere, Geo3BCN–CSIC, Lluis Sole i Sabaris s/n, Barcelona, Spain

[5]Departament de Mineralogia, Petrologia I Geologia Aplicada, Facultat de Ciències de la Terra, Universitat de Barcelona (UB), c/ Marti i Franques Barcelona, Spain

Detrital zircon U-Pb dating and geochemistry of the paleogene-neogene sediments in the qaidam basin (China): Implications for provenance and tectonics

Different sediment routing systems merge in the Qaidam Basin, providing an example of the interaction of several source areas with distinct petrographic signatures, recording several stages of exhumation of the surrounding orogenic belts. However, despite decades of studies dealing with the provenance of the Cenozoic sediments in the northern margin of the Qaidam Basin, the source to sink model is still under debate. Published thermochronology data revealed an obvious tectonic-thermal event between 200-300Ma in mountain belts surrounding the Qaidam Basin, which provided the main source composition for Cenozoic sediments. Most Paleozoic and early Mesozoic magmatism bodies are distributed in small sub-basins along the Altyn Tagh and the southern flank of the Qilian Shan in the NE Qaidam Basin. There is still no convincing model with reliable evidence for the sediment sources and migration channels that hinders our understanding of the basin-mountain coupling mechanism.

In this paper, the Cenozoic Paleogene-Neogene sediments of the Qaidam Basin are studied by using the methods of petrological observations, geochemical analysis, and zircon U-Pb dating. The results show that the Paleogene-Neogene sediments mainly derived from felsic parent rocks, and after the Paleogene, they experienced obvious sedimentary recycling. The Chemical Index of Alteration (CIA) is in the range of moderate weathering. The parent rock is in the tectonic setting of the active continental margin and continental island arc. The provenance analysis of the Lulehe Formation indicates that it is mainly derived from the southern Qilian Mountains and the Mesozoic crystallization basement. The direct provenance areas of the Xiaganchaigou Formation and the Shangganchaigou Formation are the Saishiteng, Lvliang, and Aolao Mountains, and the indirect provenances are from the South Qilian Mountains, the Mesozoic crystallization basement, and the underlying Lulehe Formation sediments. In addition, it is concluded that the deformation response of the uplift process of the Qinghai Tibet Plateau in the northern margin of Qaidam Basin develops from west to east and has the characteristics of diachronic.

Audience Take Away:

- Provenance of Cenozoic Qaidam Basin is mainly in the tectonic setting of the active continental margin and continental island arc. From Paleogene to Neogene, direct and indirect provenances had obvious changes from west to east
- Established the Cenozoic tectonic evolution of the Qaidam Basin
- The results confirm the phased uplift model of Qinghai Tibet Plateau

- The results provide additional data regarding the tectonic evolution of peripheral mountain belts and the intracontinental basins in response to subduction or collisional processes along the northeast margin of the Qinghai Tibet Plateau

Biography:

Dr. Wang studies Geology at the University of Chinese Academy of Sciences as MS and PhD, and will graduate in 2023. She is a visiting PhD student in the group of Prof. Anna at the University of Barcelona now.

Naser Golsanami[1,2]*, Madusanka N. Jayasuriya[2] , Shanilka G. Fernando[2]

[1]State Key Laboratory of Mining Disaster Prevention and Control, Shandong University of Science and Technology, Qingdao, China

[2]College of Energy and Mining Engineering, Shandong University of Science and Technology, Qingdao, China

Investigating the impact of clay minerals on the fluid flow of sandstone hydrocarbon reservoirs based on LBM simulation and SEM imaging

The presence of clays in hydrocarbon reservoirs challenges the producible amount of oil and gas significantly. Therefore, this study reports a detailed quantitative characterization of clays' specific properties from two fundamental aspects which include clays' type and amount, and their impact on reservoir's fluid flow. We used Scanning Electron Microscopy (SEM) images and respectively adopted deep learning for typing and quantifying clays, and the Lattice-Boltzmann Method (LBM) for flow simulations with and without the presence of clays. The trained deep learning model of the present study was translated into a MATLAB application that is a convenient tool for clay characterization by the future user. This model was trained using 2160 images of different clay minerals based on transfer learning using AlexNet and resulted in more than 95.4% accuracy while applied on the unforeseen images. Moreover, we established the technique of depth-slicing of 2D SEM images, which provides the possibility of 3D processing of the routine SEM images. The results from this technique proved that clays could reduce reservoir porosity and permeability by more than 30% and 400 mD, respectively. The introduced approach of the present study provides new insights into the detailed impacts of clay minerals on the reservoir's quality.

Audience Take Away:

- Developing an App for deep learning-based quantification of clay minerals
- Developing the depth-slicing technique to address the issue of the "depth of field"
- 3D processing of 2D SEM images
- Applying LBM techniques to 2D SEM images
- 3D quantitative analysis of various clays' impact on the pore space

Biography:

Naser Golsanami is an associate professor in the College of Energy and Mining Engineering of Shandong University of Science and Technology. Naser received his Ph.D. from China University of Petroleum (East China) (UPC) in July 2018. He is the establisher of the "Scientific Research and Publication Center" of UPC. Naser is the winner of the "Talented Young Scientists Program" of the Ministry of Science and Technology of the People's Republic of China. He has taken an active role in Geological and Petroleum Engineering projects funded by both governmental and private sectors of the industry, for which the total founding reaches up to $0.5M.

Simon P. Michaux
Circular Economy Solutions KTR, Geological Survey of Finland, Espoo, Finland

Minerals are the new oil

Energy is the master resource. It allows and facilitates all physical work done, the development of technology and allows human population to live in such high-density settlements like modern cities. The current industrial ecosystem is dependent on fossil fuels, with petroleum (oil) fueled Internal Combustion Engine (ICE) technology being particularly relevant. The task to phase out fossil fuels is now at hand. Most studies and publications to date focus on why fossil fuels should be phased out. Very few have examined the practicalities of doing so. Technologies to phase out fossil fuels and substitute ICE vehicle systems have been developed and are viable. The estimated sum total of extra annual capacity of non-fossil fuel power generation to phase out fossil fuels completely, and maintain the existing industrial ecosystem, at a global scale was 37 670.6 TWh.

There are practical bottlenecks when scaling up these non-fossil vehicle systems like Electric Vehicles (EV's) and hydrogen fuel cell vehicles to completely replace what ICE vehicles do now. As this system has not been yet constructed, it cannot be recycled. Thus, the source of metals will have to come from the mining of minerals.

The quantity of metals to manufacture just one generation of EV batteries and stationary power storage batteries is so large that both annual mining production and stated global reserves of the relevant metals was not sufficient. Fossil fuels, oil in particular provide a high calorifically dense source of energy. To replace this energy source, non-fossil fuel systems will have to be constructed, requiring an unprecedented quantity of metals. In the past 200 years, oil was the most strategically significant raw material. A case can be made for the next industrial era, minerals will take oil's place as the master resource.

Audience Take Away:

- Oil was the master resource
- The task to phase out fossil fuels is much larger than current thinking allows for
- Mining of minerals will be required at an unprecedented scale
- This will help the audience understand why the industrial ecosystem will have to evolve in a way that will facilitate mining on an unprecedented scale. This was something previously not accepted
- It will assist in future planning around known bottlenecks

Biography:

Associate Professor of geometallurgy at the Geological Survey of Finland (GTK) in KTR, the Circular Economy Solutions Unit. Basic degree Bach App. Sc in Physics and Geology, Phd in Mining Engineering from JKMRC University of Queensland. Work experience 18 years in the Australian mining industry in research and development, 12 months at Ausenco in the private sector, 3 years in Belgium at the University of Liege researching Circular Economy and industrial recycling. Work experience in Finland has been at GTK has been in the Minerals Intelligence in the MTR unit, before joining the KTR. Mineral processing and geometallurgy being developed.

Saikat Sengupta*[1], SS Nimya[1], Anant Parekh[1], S.K. Bhattacharya[2]

[1]Indian Institute of Tropical Meteorology, Pune, Maharashtra, India

[2]Department of Geology and Geophysics, Indian Institute of Technology, Kharagpur, Kharagpur, West Bengal, India

Understanding daily/monthly scale variation in hydro-meteorological processes during Indian summer monsoon through observed and model water isotope data

Stable isotopic ratio ($^{2}H/^{1}H$ and $^{18}O/^{16}O$) of atmospheric vapour and rain change during various hydro-meteorological processes viz, evaporation, advection, condensation, moisture recycling, etc. The relationships between isotope ratio and various local meteorological parameters have long been used for climate reconstruction on different time scales. Several recent studies have further documented that the regional-scale atmospheric circulation primarily controls water isotope variability. Therefore, efforts have been made to simulate water isotope ratios constraining atmospheric circulation in various general circulation models (GCM). The historical simulations of these models are often compared with the isotope ratios of various natural archives to reconstruct past atmospheric circulation. These isotope-enabled GCMs depend on the parameterization of the processes mentioned earlier, which are often formulated with several simplifications. These simplifications may incorporate considerable biases and errors. Indian summer monsoon (ISM) is a prototype of complex monsoon dynamics involving considerable heterogeneity in moisture sources and rainout mechanisms. The talk will cover how this heterogeneity is reflected in observed and model water isotope values of ISM on a daily/monthly scale. The talk will further elucidate how quantitatively one can assess the role of various processes in region-specific water isotope biases. Hence, both users and modelers will be benefitted from the talk. While the users will get a scope to evaluate the models for ISM critically, the modelers may get a guideline on how to improve their models by incorporating the complexities of monsoon dynamics.

Audience Take Away:

- Rainfall during Indian Summer Monsoon controls the agro-economy of south-east Asia. The dynamics of monsoonal rainfall involve multiple moisture sources and various rainout mechanisms
- The talk will demonstrate how various hydro-meteorological processes' daily/monthly scale variability is captured in the observed rain and vapour isotope ratios during the Indian summer monsoon
- A region-specific comparison of the observed and model isotope data will be presented, and a quantitative assessment of the controlling factors critical for isotope biases will be provided in the talk
- The talk will be helpful for paleoclimate and hydroclimate observation and modeling fraternities. The users of various climate models will critically assess the performances of different isotope-enabled general circulation models for the Indian Summer Monsoon. They can decide which historical simulations would be useful for paleoclimate modeling
- The modelers will get a glimpse of how to improve the models by further incorporating the meteorological complexities associated with the South Asian Monsoon

Biography:

Dr. Saikat Sengupta is currently a senior scientist at the Centre for Climate Change Research at the Indian Institute of Tropical Meteorology (IITM). An expert in isotope geochemistry and hydrogeology, he is currently working on the application of stable isotopes in modern and past hydrology. Dr. Sengupta actively participated in setting up the Laser isotope laboratory at IITM and the stable isotope laboratory at IIT Kharagpur, the first national stable isotope facility for Geosciences research in India. He graduated from Presidency College, Kolkata, in Geology and did his masters (M.Sc and M.Tech) from IIT Bombay. After Ph.D. from IIT Kharagpur, he received various prestigious post-doctoral fellowships (Golda Meir, Brain Korea, etc) and continued his post-doctoral work at Hebrew University Jerusalem, Israel, and NCKU, Taiwan. He has participated in various geological and dendroclimatological fieldworks and published papers in several reputed international and national journals, including Earth and Planetary Science Letters, Environmental Science and Technology, JGR-Oceans, Quaternary Science Reviews, Journal of Hazardous Materials, Water Research, etc. He is currently guiding several masters and Ph.D. students.

Elena Ivanova*, Dmitrii Borisov, Ivar Murdmaa, Ekaterina Ovsepyan
Shirshov Institute of Oceanolgy, Russian Academy of Sciences, Moscow, Russia

The deep-sea terrigenous and biogenic calcareous contourites as records of the Neogene-Quaternary bottom water circulation in the Western South Atlantic

During the last ~ 30 - 40 years, it appeared clear that pelagic and lateral (gravity-driven) sedimentation in the oceans and seas is strongly supplemented by the sediment erosion, transport and accumulation due to the bottom currents activity, so-called contourite sedimentation. In this context, the oceanic gateways like the Vema Channel attract an increasing interest of paleoceanographers. The present study is aimed to address past variations in the contourite sedimentation and notably the impact of Lower Circumpolar Deep Water (LCDW)/Antarctic Bottom Water (AABW) passing through the Vema gateway on erosion and accumulation of deep-sea sediments in the SW Atlantic. A high-resolution sub-bottom (seismoacoustic) profiling and a multidisciplinary study are applied to investigate several contourite drifts of different types and sizes identified to the west and northeast of the Vema Channel. We examined lithology, grain-size (including sortable silt) distribution, biostratigraphy, magnetic susceptibility (MS), color reflectance, X-ray fluorescence (XRF) from fourteen sediment cores with biogenic calcareous and terrigenous contourites, and carried out AMS-14C dating. Our data show that the temporary intensification of the LCDW/AABW flow, likely due to an increased production in the Weddell Sea, led to deep erosion ultimately resulting in long-term hiatuses and hence contributing to the enormously compressed Upper Pliocene–Middle Pleistocene section of the Ioffe Drift, a large calcareous contourite body discovered to the northeast of the Vema Channel. To the west of the channel, the contourite origin of generally silty terrigenous sediments in the Santa Catarina Plateau – São Paulo Plateau area is ascertained by both morpho-seismic (occurrence of sediment waves) and sedimentary characteristics. Therefore, our new findings shed light on the bottom current contribution to the Pliocene-Pleistocene sedimentation in the large pelagic realm of the Western South Atlantic. This presentation is supported the Russian Science Foundation grant 22-27-00421.

Audience Take Away:

- One of the first examples of deep-sea calcareous contourites and the approach of their investigation are provided in comparison with those for terrigenous ones
- Our findings can be used by the other research teams during the cruises and as well in on-land multiproxy studies of contourites, lateral sedimentation and deep-sea circulation

Biography:

Prof. Elena Ivanova studied Paleogeography at the Moscow State University, Moscow, received her PhD degree (1984) and Dr. Sc. degree (Habilitation, 2003) in Oceanography/Marine geology at the Shirshov Institute of Oceanology, Russian Academy of Sciences. In 2005-2017 she was a head of the Paleoceanographic team, and since 2018 –Head of the Laboratory of Paleoceanology at the same institute. She participated in 23 scientific cruises, and have been a Chief Scientist in seven of them. EI collaborated as a visiting scientist with several laboratories in France, UK, USA and Germany. She has published 4 monographs and more than 80 research articles.

Debashish Sengupta[1]*, Samikshya Mohanty[1] and Rahat Khan[2]

[1]Department of Geology and Geophysics, Indian Institute of technology, Kharagpur, India

[2]Institute of Nuclear Science and Technology, Bangladesh Atomic Energy Commission, Dhaka, Bangladesh

Potential rare earth resource estimation based on thorium exploration in the eastern coastal part of India using thermal imagery and instrumental neutron activation analysis

The present study delves into the exploration of Heavy minerals in the coastal sands of Podampata area, using thermal imagery followed by ground trothing based on in-situ studies. The coast of Odisha is replete with placer deposits of beach origin. With the advent and evolution of green technology and miniaturization of electronics, the use of REEs is increasing day by day. It becomes increasingly important to utilize our indigenous resources and without any untoward effect to the ambient eco-system. Unsustainable exploitation is highly detrimental not only to the beach system but also to the ecological balance of the area. In the present study, we have tried to pin down the specific aspects of concern, in the study area, in Odisha, where REE- bearing minerals are present extensively. Remote Sensing data available in public domain was used to carry out the present research work. For thermal imagery study, we have used Landsat-8 data. Subsequently field studies involved, sample collection for laboratory studies and radiometric reconnaissance survey with Gamma Surveyor 2 instrument along with Micro R survey meter. The abundance of trace elements, REEs, and radioactive elements was analyzed using instrumental neutron activation analysis (INAA) in the core sediments. The Th/U ratio is nearly nine times higher in each core sample and has a positive correlation with the total rare earth elements in the study area. A depth of 2–2.5 m in the respective core samples is an economically viable zone for exploration and possible extraction of REEs and other critical metals enriched in the heavy minerals. Finally, an attempt was made to integrate the results obtained from remote sensing, field data and geochemical data, to obtain a robust surface as well as subsurface manifestation of the heavy mineral placers. Successful implementation of the current methodology can be replicated for the entire Eastern coast of India, for sustainable exploration and extraction of REE bearing minerals.

Audience Take Away:

- Thermal map can be used for distinguish between the presence radioactive heavy mineral from lighter one, which can be used as preliminary reconnaissance survey
- Exploration of REEs from heavy minerals could be done which has significant application in modern technology
- Surface as well as subsurface mining of heavy minerals will be helpful in economic growth

Biography:

Dr. Debashish Sengupta is currently Professor (H.A.G) at the Department of Geology and Geophysics in Indian Institute of Technology, Kharagpur. After completing the PhD in Physical Research laboratory, Ahmedabad, he joined in the department as faculty member in 1990. He has been involved in various research applications of nuclear geophysics, geochemistry, Environmental Science, Radiation detection, Radiation dosimetry in earth science more than thirty years. He has associated with various international research groups from University of Rome Tre, Italy and USGS. He has received awards for his extensive contribution by national as well as international agencies. He has published more than 140 research articles and 30 book chapters.

Prijitha R. G
CORAL, Indian Institute of Technology Kharagpur, Kharagpur, West Bengal, India

The Indian monsoon rainfall and associated climate drivers

Indian rainfall is influenced by various climate drivers and climate forcings, and its frequency and occurrence is also affected by global warming. The changes in Indian rainfall affect the agriculture and livelihood of billions of people and hence the economy of India. Therefore accurate prediction of Indian rainfall is necessary which requires a clear understanding of various climate drivers and climate forcings responsible for the Indian rainfall and the physical mechanisms underlying it. In addition to the commonly used proxies like ENSO, IOD, AMO, etc., new parameters based on the sea surface temperature over the Arabian Sea and Bay of Bengal and atmospheric moisture are introduced and analysed their influence on the Indian rainfall. The analysis is carried out using a multiple linear regression (MLR) model. This model helps to assess contributions of different remote and local climate drivers to seasonal and regional inhomogeneity in rainfall. It is found that the Indian Summer Monsoon Rainfall (ISMR) variability is governed by Eastern and Central Pacific El Nino Southern Oscillation, equatorial zonal winds, Atlantic zonal mode and surface temperatures of the Arabian Sea and Bay of Bengal. The North East Monsoon Rainfall variability is controlled by sea surface temperature of the North Atlantic and extratropical oceans. The ISMR shows statistically significant positive trends (0.43 mm/day/dec) in North West India. The influence of warming over the Indian Ocean on the Indian rainfall is studied using parameters created from the atmospheric moisture content, its transport and its divergence over the Arabian Sea, Bay of Bengal, central Indian Ocean and Ganga river basin using the MLR model. The study reveals that the ISMR is largely controlled by the Arabian Sea moisture flux and Ganga river basin moisture content, and these parameters exhibit statistically significant high correlations in most regions. The model reproduces rainfall variability of about 12–50%. Also, moisture indices could clearly identify the majority of wet and dry years.

This study demonstrates the significance of various climate drivers and atmospheric moisture on regional rainfall distribution and suggests that these parameters can be used in both statistical and dynamical models to better predict monsoon and global precipitation.

Audience Take Away:

- The newly developed parameters can be used for improving the prediction model
- The prediction model needs to be different for forecasting precipitation in each region
- The wet and dry years could be clearly identified

Biography:

Dr. Prijitha R. G. is working at CORAL, IIT Kharagpur availing Women Scientist–A fellowship by Department of Science and Technology, Government of India. She holds master's degree in Physics from CUSAT, India and Ph.D. in Atmospheric Physics from UPMC/LATMOS/CNRS, France. She has participated in various international programmes and contributed to World Meteorological Organisation 2010 report on Scientific Assessment on Ozone Depletion. She is an editorial board member of national and International Journals. She has done research on cosmology, stratospheric ozone and Indian rainfall. Her works include identification of ozone recovery and studies on the drivers of Indian rainfall using statistical models with 12 publications in highly reputed journals.

Nesrine frifita
University of Gabes, Tunisia

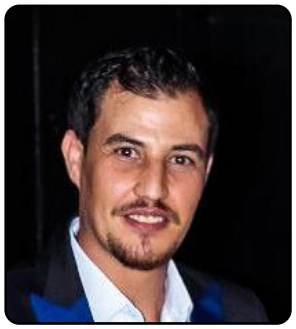
Applied geophysics using gravity and electrical resistivity method to study deep and shallow structures related to aquifers system

The aquifer system under the Jeffara plain, southeastern zone of Tunisia, was never studied by the geophysical approach, the present study provides a detailed geophysical analysis using gravity and 2D electrical resistivity tomography. The wavelength filtering produced the residual gravity anomaly map, and the gravity interpretation based on 3D Euler deconvolution and the radially averaged power spectrum technique in order to identify the subsurface faults and to decipher the relationship between the groundwater aquifers and the near-surface faults. The electrical resistivity survey was carrying out to characterize the geometry and the depth of deep and shallow aquifers under the studied sites. The identified faults were classified in three sets according to their depth; the deepest faults (? 2.5 km depth) are these associated to Medenine fault and having NW-SE as major direction. The shallow and the near-surface faults detected in multidirectional trend have a primordial role in sedimentation and affect the deep and shallow aquifers under the studied region.

The geo-electrical sections indicate that the shallow aquifers are detected at 20 m as averaged depth and the deep aquifers are detected at 50 and 80 m depth. The geophysical findings linking to aquifer characterization and the hydrogeological previous studies deduce an approximate limit for the studied aquifers; however, based on the present study, the recognized limit of Smar catchment can be lightly adjusted. Also, this work discusses the role of deduced faults in the communication between the different aquifer levels.

The present work can serve as a reference for groundwater exploration that applied the ERT geo-electric techniques never used in this area before.

Biography:
"**Nesrine FRIFITA** received her bachelor's degree in Experimental Sciences (2008), master's degree in Geology (2013), and doctorate degree in Geosciences (2018) from Tunis El Manar University in Tunisia. She was an academic visitor at the Missouri State University_ USA in 2015. She is now doing postdoctoral research at Institute of Arid Regions (IRA) of Medenine, Gabes University, Tunisia. Her research interests include 2D geophysical modeling and applied geophysics in structural and hydrogeological studies".



Youssef TAIB*[1], Ahmed TOUIL[1], Mohamed AISSA[2], Brahim OUARGAGA[1], Ilyasse LOUDAOUED[2] Mohamed ZOUHAIR[3], Abdelmalek OUADJOU[3]

[1]Georessources Geoenvironment and Civil Engineering Laboratory, Faculty of Science and Technics, Cadi Ayyad University, Marrakech, Morocco

[2]Department of geology, faculty of sciences, Moulay Ismail University, Meknes, Morocco

[3]Managem Holding, Twin center, Tower A, Zerktouni Boulevard, Casablanca, Morocco

The Taourirte Cu, Pb, Zn (±Ag-Au) and Ba (Western High Atlas, Morocco): Example of carbonates hosted polymetallic mineralization in a polyphase magmatic context

Taourirte area is located on the eastern flank (ENE) of the Western High Atlas massif (WHA) in north of the South Atlas fault. It belongs to the Amezmiz mining district which includes several deposits and showing of polymetallic mineralization (Azegour, Tighardine, Amensif, Erdouz…).

The geological investigations carried out on the Taourirte zone, allowed us to distinguish three lithostratigraphic units dominated by volcanic and volcano-sedimentary rocks with intercalation of dolomitic beds and lenses. The Taourirte formation is correlated with the neighboring Tighardine area where an Early Ediacaran age has been proposed (1).

The geochemical and petrological studies carried out on the volcanic rocks of the Taourirte Formation, shows that these metavolcanites are basalts, basalt-andesites and andesites with some felsic derivatives. The parent magma of these rocks is similar to that of intracontinental tholeiites derived from an enriched mantle source compatible with a continental extensional regime (2).

The main mineralized body is hosted in the basal dolomitic bar of the median unit at the contact of a shear zone that shows a quartz ± barite fill associated with sulphides. An important network of veins and slits develops in the hosted dolomites.

Four paragenetic stages generating the Taourirte mineralization are distinguished. The early stage consists of a thermal episode marked by tremolite-actinolite and talc, followed by the dissemination stage with pyrite and chalcopyrite which is accompanied by cryptocrystalline silicification of the dolomite and filling of cracks and fractures with microcrystalline quartz and dolomite (quartz I and dolomite I) in all facies. The third stage is related to a tectonic-hydrothermal event, lead to a quartz I and dolomite I brecciating. It corresponds to the main mineralizing stage during which quartz II, dolomite II, barite and the main sulphide mineralization (chalcopyrite, galena, sphalerite, pyrite, arsenopyrite, bornite and stibnite) are deposited. The late supergene stage corresponds to a filling of late developed cracks and fractures by quartz III and dolomite III. It also produces a generalized oxidation which of the mineralization.

Audience Take Away:

- Importance of polyphase magmatic events in the genesis of the polymetallic mineralization
- Relationship between magmatic and tectonics and ore genesis
- Importance of geodynamic setting characterization in the mining exploration
- Sedimentary rocks especially carbonates as a potential target for Cu-AuAg

Biography:

Dr. Youssef TAIB received his Bachelor in applied geosciences in Sciences and technics college, a Master's degree in applied geosciences for mineral and energy resources and a PhD degree in petro- geochemistry and metallogeny from Cadi Ayyad University (Morocco). His academic and professional experience is on Base and precious metal deposits. Worked as visiting professor in the geology department in cadi Ayyad University from 2017 to 2020, now, working as an independent geologist consultant in the mining sector, with a huge interest in mineral exploration (base and precious metals, industrial minerals, critical metals/minerals), geochemistry and energy transition.

Lala Behari Sukla*, Archana Pattanaik, Debabrata Pradhan
Biofuels and Bioprocessing Research Center, Institute of Technical Education and Research, Siksha 'O' Anusandhan (Deemed to be University), Odisha, India

Recovery of nickel and cobalt from low-grade Ni-laterite ore of sukinda, Odisha using microorganisms

Nickel principally occurs in two types of deposits i.e. sulfide and laterite ores. About 60% of nickel reserves are in the form of lateritic ores and 40% are in the form of sulfidic ores. However, the high-grade sulfidic ores have been the major source of nickel till date. Interest in low-grade Ni-laterite ores has increased in recent years as high-grade Ni-sulfide deposits are being quickly depleted. The nickel resources in India are estimated at 189 million tonnes of metal content of which Odisha accounts for maximum of 175 million tonnes. The only significant deposit of lateritic nickel ore in India is in the ultra-basic belt of Sukinda, Odisha with a nickel content of 0.15-1.2% along with trace amount of cobalt and manganese which is yet to be commercially exploited. The major occurrence of nickel is in the form of nickeliferous limonite in the overburden of chromite mines in Sukinda valley, Jajpur. A huge amount of overburden (nearly 8 to 10 times that of the ore) is generated during chromite mining in Sukinda chromite deposits of Odisha contains nickel and cobalt as minor constituents (Ni: 0.4%-0.9% and Co: 0.02%-0.05%). These overburdens are dumped nearby and have found a very little use so far. The mineralogical studies indicated that there was no separate nickel bearing mineral phase in the lateritic nickel ore. Goethite is the main iron bearing phase or host, which contains most of the nickel in the raw lateritic ore. However, processing of Ni laterites has proven technically difficult and costly through the conventional methods. Hence, the development of alternative low-cost biotechnologies for Ni solubilization has been encouraged. Bioleaching involves the utilization of microorganisms and their metabolic products to dissolve metals from low grade ores. Both autotrophic and heterotrophic microorganisms possess the potential to recover nickel from its ores. The use of heterotrophic fungi (strains of *Aspergillus* and *Penicillium*) and bacteria (strains of *Bacillus* and *Pseudomonas*) for metal recovery have been extensively studied. However, in case of nickel recovery from lateritic ores, strains of *Aspergillus* and *Penicillium* are the most preferred microorganisms. These microbes produce organic acids such as gluconic, oxalic, citric etc. by their cellular metabolism, which are responsible for metal solubilisation from lateritic ores. Several studies suggest that citric acid and oxalic acid are the two major fungal metabolites to have major role in nickel bioleaching. *Acidithiobacillus ferrooxidans* a chemolithotrophic bacterium has been reported to solubilize nickel from lateritic ore by microbial reductive method. This bacterium reduces ferric iron (Fe^{3+}) in the goethite to ferrous iron (Fe^{2+}) in anoxic condition with elemental sulfur as electron donor, thereby producing sulfuric acid which generates acidity in the medium and is responsible for dissolution of nickel. Recent study reported about the use of DIRB (Dissimilatory Iron Reducing Bacteria) in bio-reduction of lateritic chromite overburden (COB) and enhancement in nickel and cobalt recovery. DIRB have the ability to utilize Fe (III) as terminal electron acceptor during bio-reduction of lateritic mineral. In this process DIRB consortium reduces the goethite phase to hematite and magnetite with the exposure of nickel oxide. Subsequent leaching of DIRB pre-treated ore by H_2SO_4 results in enhanced recovery of nickel and cobalt. However, bioleaching of nickel and cobalt from lateritic ore are in laboratory scale only. Further work is required to better understand the bioleaching process and identification of more efficient microbial strains.

Audience Take Away:

- From this presentation the audience will learn to make use of low grade and secondary resources for the recovery of valuable metals
- They will be able to make use of different microorganisms for various purposes
- They will be able to develop an environmentally sustainable process of metal recovery from low grade deposits and different wastes
- As the environmental safety is an important global concern, the audiences can choose this process of metal recovery from secondary resources for further research and development.
- Yes, this area of research is gaining more attention by the researchers
- The high grade mineral deposits are being depleted very fast along with the rise in demand for various metals
- In the near future these low grade mineral deposits and secondary resources will be the source to meet the growing metal demand

Biography:

Prof. Sukla is at present Director in Biofuels and Bioprocessing Research Center (BBRC), Siksha 'O' Anusandhan (Deemed to be University), Bhubaneswar. He has worked as Chief Scientist and was heading the Bioresources Engineering Department in CSIR-IMMT, Bhubaneswar, India. He has more than 45 years of R&D experience in the area of Bio-mineral Processing, Hydrometallurgy and contributed over 240 papers in International & National Journals. He has published 5 books and 10 patents and seven students have been awarded Ph.D. degrees under his guidance He is a Fellow Institution of Engineers INDIA. Prof. Sukla is the recipient of several prestigious awards.

Vahed Ghiasi
Department of Civil Engineering, Civil and Architecture Faculty, Malayer Professor, Malayer, Hamedan, Iran

Tunnel squeezing potential classification based on rock mechanics properties

Purpose: This study aims to evaluate the methods employed for classifying and quantifying the potential of squeezing in tunnels. Along with the empirical and semi-empirical approaches to anticipate the possible squeezing tunnel problems, the squeezing potential of the Karaj water transfer tunnel and North West Tunnel Convey (NWTC) tunnels (Lot 2), located in Iran, are evaluated and presented. Those two case studies have an interesting geology profile and parameters to identify and evaluate the squeezing potential.

Design/methodology/approach: In recent years, there has been an increasing interest in tunnel construction. This paper describes the squeezing behavior of poor rock mass associated with deformability and strength properties. The Karaj water transfer tunnel has eight lithological rock types; the NWTC tunnel (Lot2) has 21 Lithological rock types. The parameters for rock classification, such as Rock Quality Designation (RQD), Rock Mass Rating (RMR), modified RMR, Q-system, Geological Strength Index (GSI), Rock Mass Index (RMi), and Rock Structure Rating (RSR), are evaluated and presented here. The above parameters are the input parameters for the squeezing study in Karaj and NWTC tunnels. According to different methods of squeezing evaluation of tunnel presented in tables, the results of two case studies are presented in this paper.

Findings: One of the more significant findings from this study showed that about 3 km of the second part of the NWTC tunnel and 2 km of the Karaj tunnel have high squeezing potential. This research deals with not only an overview of the methods used for the identifying and quantifying of squeezing along with the empirical and semi-empirical approaches presently available to anticipate the potential of squeezing tunnel problem, but also the case studies of NWTC and Karaj tunnels to evaluate and compare the potential of squeezing by different methods. These two tunnel case studies have a high possibility of squeezing; therefore, the lining of those two tunnels must be strong enough to overcome this issue.

Originality/value: This study is a precise and concise comparison of the evaluation of tunnels under squeezing rock conditions. The present study confirms the previous findings and contributes additional evidence suggesting that many studies are conducted using empirical and analytical methods to determine the squeezing phenomenon in tunnels. This paper responds to various questions like, what is the squeezing phenomenon? How can we quantify the potential of squeezing in weak rock? What are the different approaches to understanding the squeezing phenomenon?

Audience Take Away:

- Introduction
- Definition of squeezing ground
- I identification of squeezing behavior
- Empirical approaches
- Semi-empirical approaches
- Numerical methods in squeezing condition
- Mechanized excavation in squeezing condition
- Monitoring of a tunnel excavation

Biography:

Dr. Vahed Ghiasi studied Civil Engineering, Geotechnical Engineering at the University Putra Malaysia (UPM) in 2012 Malaysia and graduated with MS in 2007. He obtained the position of Assistant Professor at the Malayer University in 2012. He has published more than 70 research articles in SCI(E) journals.

Parisa Imani[1]*, Gang Tian[2]
[1]Department of geophysics and mining, Shahrood University, Semnan, Iran
[2]School of earth sciences, Zhejiang University, Hangzhou, Zhejiang, China

Investigating the ability of delay-Time method to illustrate accurate uneven horizons on post-sliding sites

Near surface geophysical methods have been extensively used as non-invasive and cost-effective methods to characterize subsurface geological properties over the past two decades. Since these approaches are able to illustrate the temporal and spatial changes of geological conditions, they are applied for the characterization of landslide zones. Landslide events are one of many natural disasters that cause losses of life and property. Landslide mechanisms are affected by topsoil materials, bedrock geometry, and subsurface water content.

Seismic refraction tomography (SRT) has so far been used as the most powerful geophysical methods for landslide investigation. In this research, this technique is used to study spatial and temporal variations of geophysical parameters of sliding site. The landslide incident occurred in Yanshan village placed in Xiaoshan district, Hangzhou City, China. This project focuses on the capability of delay-time method in processing SRT data. This technique employs traveltime curves to determine the time and thickness beneath each receiver. Since the study area is inclined and included undulating surface, the processing technique can provide a better image of the underground features corresponding to inversion models. In this technique, the true velocity can be computed by recording signal from two ends of line (forward and revers shots). It leads to have the actual depth beneath recorders with more details. The values calculated by Matlab have been synthesized in the form of schematic of geological sections of each profile by GEO5 2020 software (slope stability). These models have verified and quantified the geophysical parameters of inversion models mapped by ZondST2D software which incorporates a tomographic inversion method. This processing technique is applied in which a strong horizontal velocity is shown in rugged topography. The good agreement between the inversion models and the synthesized images proves the reliability of the applied processing methods.

Audience Take Away:

- No need to try different processing methods to find the best answer, this study shows the best one
- It is the most accurate method in post-event cases
- They can be sure to use the applied method leading to the accurate results
- No it couldn't simplify the problem. But high efficiency is the goal of this research that has been accomplished
- Since the method uses pure data, they can have the most reliable and accurate results

Biography :

Dr. Parisa studied Geophysics at Zhejiang University, China and graduated as Ph.D. in Aug. 2020. She then joined the research group at department of Geophysics and Mining of Shahrood University, Iran as a postdoc researcher. After one year and half, she joined a research group investigating submarine landslides. She has been awarded as an excellent presenter in various international geophysical conferences.

Aida H. Baghanam*, Mohammad Bejani
Faculty of Civil Engineering, University of Tabriz, Tabriz, Iran

Deep (CNN) or shallow (FFNN) learning for statistical downscaling of climate data?

Encountering with stochastic inherent climate parameters, get cumbersome in computational phase. Precipitation and temperature are also the most-known climate parameters that affects local climate formation. Simulating the variability of these two parameters from past era till present, allow managers to manage effectively and make policies accurately. The simulation of precipitation which formed based on bunch of interactions, led it "hard-to-gain" trustable results. Thus, studying the characteristics of such stochastic parameters has been the subject of high priority for researchers. Using the AI-based models led to gain accurate results. On the other hand, deep-based models have successfully applied in climate issues and the superiority of these methods are proofed. In this research, local precipitation and temperature are projected based on state-of-the-art method named Convolutional Neural Network (CNN) for the end of century using General Circulation Model (GCM) dataset obtained from coupled Model Inter-comparison Project 6 (CMIP6). Also shallow-layered Feed Forward Neural Network (FFNN) was used as evaluation of the performance of CNN model. Ultimately, the performance of models evaluated based on Root Mean Squared Error (RMSE) and Coefficient of Determination (DC) criteria and results denoted that the CNN standalone outperformed over shallow-layered FFNN coupled with pre-processing techniques.

Audience Take Away:

- The audiences will be aware from the efficiency of state-of-the-art techniques
- Being aware of novel feature extraction technique over climate data
- The audiences could decide if they want to use deep or shallow-layered models

Biography:

Dr. Aida H. Baghanam started to serve as an assistant professor in the Civil and Environmental Engineering Department at the University of Tabriz, Iran, since August 2019. She gained invaluable experience in computer modeling, atmospheric science, soil physics, hydrology, and solute transport in the subsurface as well as various other numerical modeling techniques during her academic life. During recent years she focused on the impact of climate change on the water resources, where she delved into applying Artificial Intelligence models to improve the performance of climate change impact models. She went over on various bias correction and predictor screening models to enhance precipitation and temperature downscaling models' precision. She published over 20 refereed journal papers since 2012, as well as 6 book chapters and several conference papers. Her citation indices in Google Scholar are H-index of 130 and i-index of 15 and total citations of 1181.

Aklilu Assefa[1*], Alemseged Tamiru Haile[2], C.T. Dhanya[3], David W Walker[4,6], John Gowing[5], Geoff Parkin[6]

[1]Arba Minch Water Technology Institute (AWTI), Arba Minch University, Arba Minch, Ethiopia
[2]International Water Management Institute, Addis Ababa, Ethiopia
[3]Department of Civil Engineering, Indian Institute of Technology Delhi, New Delhi, India
[4]JSPS International Research Fellow, Faculty of Design, Kyushu University, Fukuoka, Japan
[5]School of Natural and Environmental Science, Newcastle University, Newcastle upon Tyne, United Kingdom
[6]School of Engineering, Newcastle University, Newcastle upon Tyne, United Kingdom

Impact of watershed management on vegetation cover and LULC dynamics using remote sensing in wonba micro-watershed, omo gibe basin, Ethiopia

The impact of watershed interventions on vegetation cover and LULC dynamics is one the responsible factor for changing the hydrological process of watershed by altering the magnitude of aquifer recharge, surface runoff and river flow. Thus, effective information regarding the LULC and vegetation cover responses of watershed management impact are important for hydrologists, water resources engineers and land use planner for sustainable water resource planning and management. Consequently, this study was aimed at evaluating the changes in LULC and vegetation cover due to watershed interventions in Wonba micro watershed for the period of 30 years from 1990 to 2020 which encompasses the period before and after watershed interventions. To address this concern, multi-temporal Landsat images of thematic mapper (TM), Enhanced thematic mapper plus (ETM+) and Operational land imager (OLI) with the aid of recent ground based data and historical trends were used for estimating the Normalized Difference Vegetation Index (NDVI) for detecting the vegetation cover change and to generate LULC map for assessing the land cover changes. Long-term daily rainfall data from 1982 was aggregated to derive average annual precipitation (AAP) into three sections to correspond with the processed image data. The rainfall data then converted into raster format using the inverse distance weight interpolation (IDW) method. Furthermore, the LULC maps were generated with the Maximum Likelihood Algorithm of Supervised classification. The accuracy of classified maps was also assessed using confusion matrix. The analysis was performed using ERDAS Imagine 16 software and results were mapped in ArcGIS 10.5 package. The result indicates that significant modification and conversion of LULC and vegetation cover classes of the watershed over the last three decades (1990-2020).

The area under dense vegetation cover increased from 1.44 km^2 (6.87%) to km^2 (17.54%) post intervention. The area under bare land decreased from 0.26 km^2 (1.03%) to 0.01 km^2 (0.05%). Even though, the Average Annual Precipitation (AAP) distribution shows a declining trend over the 30 years of study period, the vegetation cover shows an increasing trend. The LULC maps of the year 1990, 2005 and 2020 were generated. The integration of NDVI with supervised classification has improved the classification of LULC maps by 89.73%, 90.91% and 97% for the year 1990, 2005 and 2020 respectively. The change detection analysis showed that the bare land was continuously decreased from 12% in 1990 to 2.27% in 2020 in the expenses of the other classes. The expansion of forest land by 3.5% in the

watershed had an impact on the decrease of bare land for the past 30 years. The study indicates that watershed management implemented in the study area is successfully achieved. Therefore, this study concludes by providing an indicator data support and theoretical bases for further research on land cover change and vegetation restoration for other regions of Ethiopia.

Audience Take Away:

- The importance of watershed management intervention in increasing vegetation cover, surface and groundwater availability and deceasing soil erosion, sediment yield and land degradation
- The application of satellite remote sensing for watershed management impact evaluation
- The hydrological impacts of watershed interventions were rarely evaluated because of lack of data gaps and scientific knowledge. Therefore, results from this research output recommends the potential of satellite remote sensing in evaluating watershed interventions and new scientific insights about how watershed management interventions on hydrological impacts such as vegetation cover and LULC dynamics using remote sensing and field measurements are evaluated
- The awareness of watershed management intervention importance for Land use planners and hydrologist

Biography:

Aklilu Assefa completed Bachelor degree in Hydraulic and Water Resources Engineering from Jimma University, Ethiopia and also Masters in Hydrology and water resources management from Africa Center excellence for water management Addis Ababa University, Ethiopia with an excellent grade of academic research. Aklilu Assefa published research article in high indexed journal. Aklilu Assefa have then joined Arba Minch University as Lecturer and Researcher. Aklilu Assefa now working on many water resources management researches and also have 6 years teaching experience in water resources and hydrology courses. Aklilu Assefa have been worked in Indian Institute of Technology Delhi as a postgraduate scholar for 6 months from July 2019 to January 2020 in Civil Engineering department.

Lucia Helena Xavier
CETEM, Brazil

The urban mining challenge in recovering value from secondary material in anthropogenic stocks

The scarcity of mineral resources and the prices fluctuation of demanded materials represent some of the aspects that most concern producers around the world. The pandemic and wars condition brought the need to guarantee the supply of raw materials. Internationally, the establishing criteria for defining critical materials consider the supply risk and economic value of materials from natural sources. The use of secondary materials from residual sources has been prioritized in different countries and motivated the elaboration of legal and normative instruments and encouraging the development and consolidation of recovery techniques. The technologies and processes available today for environmentally sound management of waste and tailings seek to include the principles of the circular economy which, in turn, comprise the recovery of value from the extension of the useful life of products. The recovery of secondary materials can be considered as a process of mineral transformation from residual sources using basic metallurgy techniques. Unlike conventional mining, urban mining has a greater potential for mineral concentration since the products have a known mass balance and more efficient recovery channels by eliminating some of the processes. It is estimated that the growth of world e-waste generation is between 3 and 5%, representing an increasing source of secondary material from anthropogenic stocks, demanding efficient reverse logistics and traceability potential.

Biography:
Dr. Lucia Helena Xavier has published relevant papers along the last ten years regarding electronic waste (e-waste) management, circular economy and urban mining. She joined the Centre for Mineral Technology (CETEM), a research institute from Ministry of Science, Technology and Innovation in Brazil, in 2017 as Senior Researcher after contributing as consultant and researcher on reverse logistics and waste management for 12 years. She published the first books on e-waste management (2014) on urban mining (2021) in Brazil, with specific approaches on the potential of e-waste as an anthropogenic stock of secondary material.

S.M. Mahdi Niktabar
Department of Laboratory research on geomaterials, Institute of Geonics Czech Academy of Sciences, Ostrava-Poruba, Czech Republic

Behavior of rock joints under cyclic loads

The presence of the discontinuity in the form of joints is one of the most significant factors causing instability in the rock mass. On the other hand, dynamic loads, including earthquake and blasting induce cyclic shear loads along the joints in rock masses; therefore, failure of rock mass exacerbates along the joints due to changing shear resistance. Hence, it is important to evaluate the shear behavior of rock joint under cyclic condition. In the present study, synthetic rock joints with regular and irregular asperity were prepared by plaster of Paris. Regular joints were simulated by keeping regular asperity angles of 15^0 -15^0 and 30^0-30^0, and irregular rock joint which is closer to natural joints were replicated by keeping the asperity angles of 15^0-30^0. The sample size and amplitude of roughness were kept the same for the both regular and irregular joints respectively. Shear test was conducted on these joints using a large-scale direct shear testing machine by keeping the frequency and amplitude of shear load constant. This experiment examined with different normal stress values. Shear strength and its envelope of irregular joint were found to be higher than regular joint at different cycles of shearing. The shear strength envelope of irregular joint (15^0-30^0) was very close to that of regular joint (30^0-30^0) at low normal stress (slope condition), and large difference was observed at higher normal stress (underground structure condition). With the increase of the number of shear cycles, the shear strength decreased for all the asperity angles but the rate of reduction was more in case of high asperity angles. In addition, results indicated that peak shear stress increases with increasing normal stiffness at the first cycle, but the influence of normal stiffness decreases with an increase in the number of shear cycles. The mechanism of shearing for regular and irregular joints was different under cyclic condition at low normal stress. The shear strength and degradation of asperities on regular joints between loading and unloading were the same, whereas for irregular joints, they were different. Joint degradation was predominant on the slope of asperity with higher angles on irregular joints until two angles of asperities became equal under shear cycles, and then they started behaving as regular joints for subsequent cycles. This process of shearing was not observed at high normal stress.

Audience Take Away:

- Audience will learn about behaviour of rock joints in rock slopes (foundations) and underground structures when rock mass subjected to dynamic loads such as such as earthquake, blasting and vibrations
- Showing development of large scale shear apparatus under dynamic loads (ASTM accepted)
- Changing or decreasing in shear strength of rock joints under cyclic loads by showing the experimental results
- The results could provide useful insight in practical studies such as the stability of rock slopes and underground structures, where the shear strength of rock joint could play an important role, especially when the rock structure is likely to be subjected to cyclic loads, e.g. due to seismic loading
- There is several suggestions for design of rock foundations or support of rock slopes (rock mass) based on experimental results

Biography:

Dr. Niktabar studied mining engineering at the Yazd University, Iran and graduated as MS in 2006. He then joined as lecturer in Mining group at the Ardakan University (IAU). He received her PhD degree in 2016 from Indian Institute of Technology Delhi (IITD). After postdoctoral In Chungnam National University (CNU) in South Korea and Institute of Geonics (UGN) Czech Academy of Sciences, he obtained the position of an Assistant Professor at the UGN. He has published many research articles in journals and international conferences.

Participants List

Abolfazl Rezaei Institute for Advanced Studies in Basic Sciences (IASBS), Iran (Islamic Republic of)	**29**
Ahmed Hosny National Research Institute of Astronomy and Geophysisc (NRIAG), Egypt	**20**
Aida H Baghanam University of Tabriz, Iran (Islamic Republic of)	**58**
Aklilu Assefa Tilahun Arba Minch University, Ethiopia	**59-60**
Ali Akbar Daya University of Sistan and Baluchestan, Iran (Islamic Republic of)	**28**
Angue Mintoo Charlie Morelle Ecole Normale Supérieure, Gabon	**27**
Ashraf Adly National Research Institute of Astronomy and Geophysisc (NRIAG), Egypt	**32**
Debashish Sengupta Indian Institute of technology Kharagpur, India	**49**
Dmytro Rudakov Dnipro University of Technology, Ukraine	**21-22**
Elena Ivanova Shirshov Institute of Oceanolgy, Russian Federation	**48**
Ghritartha Goswami North eastern Regional Institute of Science and Technology, India	**24**
Giorgio S Senesi CNR - Istituto per la Scienza e Tecnologia dei Plasmi (ISTP), Italy	**38**
Irina Shtangeeva St. Petersburg state University, Russian Federation	**15**

Jillian Huntley GCSCR and ARCHE, Griffith University, Australia	**37**
Kamilla Pawlowska Adam Mickiewicz University in Poznan, Poland	**12**
Khaled Said Gemail Zagazig University, Egypt	**25-26**
Khalid S Essa Cairo University, Egypt	**31**
Lala Behari Sukla Siksha 'O' Anusandhan, India	**54-55**
Lucia Helena Xavier CETEM, Brazil	**61**
Mabrouk Sami Minia University, Egypt	**17**
Mokhamad Nur Cahyadi Institut Teknologi Sepuluh Nopember (ITS), Indonesia	**14**
Myint Win Bo Bo & Associates Inc., Canada	**9**
Naser Golsanami Shandong University of Science and Technology, China	**44**
Nesrine Frifita University of Gabes, Tunisia	**51**
Parisa Imani Shahrood University, Iran (Islamic Republic of)	**57**
Prijitha R G CORAL, Indian Institute of Technology Kharagpur, India	**50**
Ranjan Ramasamy University of Jaffna, Sri Lanka	**19**
Recep Celik Dicle University, Turkey	**16**

Roman Alvarez National Autonomous University of Mexico (UNAM), Mexico	**39-40**
S M Mahdi Niktabar Institute of Geonics Czech Academy of Sciences, Czech Republic	**62-63**
Saeed Aligholi Federation University Australia, Australia	**11**
Saikat Sengupta Indian Institute of Tropical Meteorology, India	**46-47**
Shozo Yanagida Osaka University, Japan	**7**
Simon Peter Michaux Geological Survey of Finland, Finland	**45**
Sudip Basack Elitte College of Engineering, India	**23**
Takaji Kokusho Chuo University, Japan	**8**
Tugbanur Ozen Balaban University of Izmir Katip Celebi, Turkey	**18**
Vahed Ghiasi Malayer University, Iran (Islamic Republic of)	**56**
Veronica Florencia Lutri National University of Río Cuarto and National Council of Scientific and Technical Research (CONICET), Argentina	**34-35**
Yetong Wang University of Chinese Academy of Sciences, China	**42-43**
Youssef Taib Cadi Ayyad University, Morocco	**52-53**
Zainab Naeem Fatima Jinnah Women University, Pakistan	**30**

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