No. 101 December 2020

# IAMG Newsletter

Official Newsletter of the International Association for Mathematical Geosciences

## Contents



## Submit nominations for 2021 Georges Matheron Lecturer and 2022 IAMG Distinguished Lecturer

For details about prerequisites for nominations please see the IAMG web site http://www.iamg.org/ and click on Awards

Proposals should include a curriculum vitae and a short statement summarizing the relevant qualifications of the nominee.

Deadline 31 December 2020, email nominations to christien.thiart@uct.ac.za

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## Distinguished Lecturer Updates

The IAMG 2020 Distinguished Lecturer, Professor Peter Atkinson, will continue his lectures into 2021 due to Covid-19. His presentations for 2020 were:

IAMG Student Chapter Freiberg, 12th November. Title: Implications of the PSF for downscaling and data fusion in remote sensing

International Geospatial Week, Colombia, 26th November. Title: Trends in geospatial data science and remote sensing

The IAMG 2021 Distinguished Lecturer is Jaime Gómez-Hernández. Please contact Jaime or Peter if you are interested in arranging a lecture.

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Wow, what a strange year! Yet with international travel stopped, conferences postponed, and campuses closed we've adapted. As can be expected, we're a little light on news. Hopefully 2021 is a much better year worldwide! In the meantime, hopefully you enjoy the cartoons below.

I'd like to welcome Peter Dowd and our new IAMG council and thank Jenny McKinley and a our outgoing council for all their hard work over the last four years.

*Katie Silversides*

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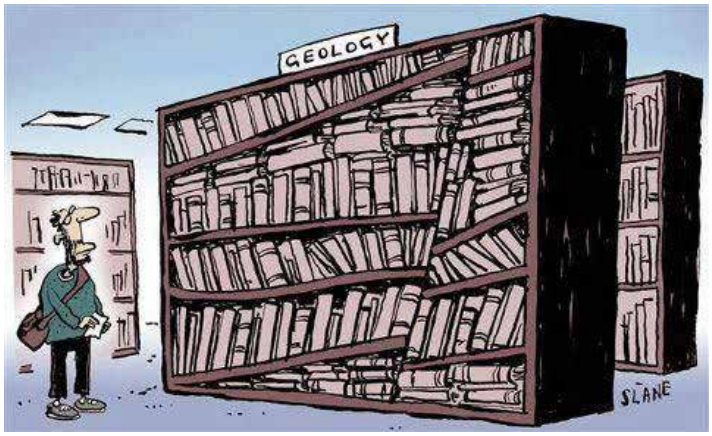
**The First Geology Conference**

From Himelblog fun classroom biology (2020)




From https://the-earth-story.com/post/87286624757/amp

**IAMG is on LinkedIn, Twitter and Facebook!**

# International Association for Mathematical Geosciences

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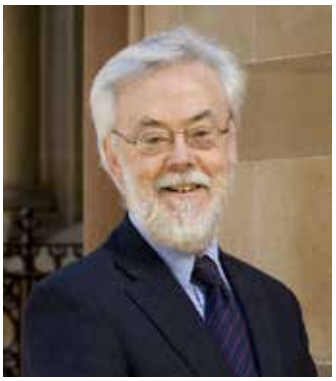
# PRESIDENT'S FORUM

Dear IAMG Members,

This is my first letter as President of IAMG and, on behalf of the new Council, my first duty is to thank Jennifer McKinley and the members of the previous Council for the work they have done over the past four years and for the very strong and healthy state in which they have left the IAMG. My second duty is to thank the chairs and members of the various Council committees for their significant contributions to the operation of the IAMG during the tenure of the previous Council.



Your new Council was formally installed on 1st September 2020. Some of us, including me, are new to the Council and its committees and we are in the process of familiarising ourselves with the structure and operation of the IAMG.

As a priority, I want to ensure as wide a participation as possible in IAMG activities in terms of regions/countries, gender, diversity and disciplines and I would welcome suggestions from members on how we could promote and achieve this aim. As a start, we called for expressions of interest in chairing the various IAMG committees for the tenure of the new Council. Thank you to those members who responded to this call. We are now in the process of confirming the chair positions. There will be other opportunities for members to take an active part in the IAMG and I encourage you to respond to them when they arise.

The mission of the IAMG is to promote, worldwide, the advancement of mathematics, statistics and informatics in the Geosciences. We are also committed to promoting diversity, inclusion, fairness, impartiality and democracy. A full statement of our mission and commitments can be found on the IAMG website.

In addition to our mission, values and commitments, it is useful to consider the wider role of the IAMG as a scientific association. A recent study[1] identified five main roles of scientific associations: communication among peers, promotion of research, science dissemination, representation of professional interests and policy advice. In my view we cover the first four of these reasonably well. The fifth role is a means of contributing knowledge and reason to decision-making and to the formulation of policy. Science should be a major source of knowledge for society and, in particular, should inform policy in relevant areas. A 2019 study[2] by the European Commission Joint Research Centre, concluded that the principle that policy should be informed by evidence is under attack. It is not difficult to find examples of the lack of science-informed policy and the lack of effective dissemination of relevant science to the wider population to enable informed opinions about matters that affect their daily lives.

I have a particular interest in informing political policy with relevant science. For the past few years I have been a member of the *Science meets Parliament* group for the Government of the state in which I live. We have four meetings a year to which we invite a scientist to make a presentation to politicians on a specific policy-related topic with the expectation that it might inform policy. Some of these meetings have focussed on matters directly relevant to the mathematical geosciences. There are similar initiatives in other states in Australia and in other counties. It is somewhat more difficult to do this on the global scale of IAMG, but perhaps we could exchange views and strategies on how this might be fostered at the local or regional area. It would be particularly useful to hear from IAMG members who have been involved in successfully informing policy and/or in successfully contributing to the public understanding of science relevant to policy.

Through the IAMG Council we could consider ways to increase collaboration with various agencies and to advance the mathematical geosciences as a resource that can inform policy decisions on natural resources and the environment as well as promoting the individual disciplines that comprise the mathematical geosciences. There are several industry areas relevant to the mathematical geosciences that could also be involved.

Turning to our own dissemination of research, the COVID pandemic continues to impede the traditional forms of conferences and meetings and it is likely to continue to do so throughout 2021.

Several members have made suggestions for virtual conferences and other forms of communication and dissemination. In my own field, I have found short (up to two hours) webinars to be a useful means. A speaker presents a topic for 45 minutes or so, followed by a panel discussion of 30 minutes and then an open question and answer session for all participants. These events can be recorded and made available as a resource for others. We welcome suggestions from members on how we can continue to communicate and disseminate our research effectively in the current environment.

I look forward to the next four years as your President and, together with your Council, I welcome your input during this period.

*Yours sincerely,*

*Professor Peter Dowd, FREng, FTSE*

*President, International Association for Mathematical Geosciences*

[1] Delicado, A., Rego, R., Conceição¸ C.P., Pereira, I. and Junqueira, L. (2014) What roles for scientific associations in contemporary science? *Minerva*, 52:439–465. DOI: 10.1007/s11024-014-9260-3.

[2] Understanding our Political Nature: how to put knowledge and reason at the heart of political decision-making. European Commission, Joint Research Centre, Brussels – Belgium. ISBN 978-92-76-08621-5. doi:10.2760/374191.

# Member News

## Past President Prof Jenny McKinley Election to the IUGS Executive Council

IAMG Past President Jenny McKinley has been elected as a Councillor (2020-2024) to the International Union of Geological Sciences (IUGS) Executive Council

https://www.iugs.org/

The International Union of Geological Sciences (IUGS) has 121 national members, represents over a million geoscientists, and is one of the World's largest scientific organizations. The IUGS in partnership with UNESCO encourages international co-operation and participation in the Earth sciences in relation to human welfare and is a member of the International Science Council (ISC).

As an affiliated organisation, the IAMG has a long history of successful collaboration with the IUGS. Most recently past IAMG president Prof Qiuming Chang was the IUGS president 2016-2020 and remains on the new IUGS Council as Past President.

The new IUGS President is Prof John Ludden (UK) and the new Vice President is Prof Hassina Mouri (South Africa).

Jenny says ' I'm delighted and honoured to be elected as a Councillor 2020-2024 to the IUGS Executive Council. I'm pleased to continue the work of IAMG colleagues in establishing productive links with the IUGS to serve the international geoscience community.'

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## Springer Encyclopedia of Mathematical Geosciences

Springer's "Encyclopedia of Mathematical Geosciences" is being edited by B. S. Daya Sagar, Qiuming Cheng, Jennifer McKinley, and Frits Agterberg with the support of nine Section Editors. This Encyclopedia that is scheduled for completion at the end of 2021 would be a complete and authoritative reference work. We expect that it will provide a concise explanation of each relevant term related to the Mathematical Geosciences.

In total, the Encyclopedia of Mathematical Geosciences is expected to consist of ~430 entries. There are 39 Category-A chapters, 341 Category-B Chapters (each 1000-3000 words long), and around 50 Category-C chapters (each 500 words long, and these Category-C chapters are brief biographies of eminent Mathematical Geoscientists). We have authors for most Category-A and Category-C Chapters, and for 225 Category-B-Chapters. In view of this, we are appealing to all Mathematical Geoscientists to contribute Chapters of Category B. Each Category-B chapter is keyword-specific. As of 24th October 2020, the pending 116 keyword-specific chapters that still need authors are listed on the Google-Sheet available at the following link:

https://docs.google.com/spreadsheets/d/1J44xz44bseRc3Ibiqb9ojFgGXSux3rhW53i0PYbGaqY/edit#gid=937016950

Mathematical geoscientists who can contribute chapters for the keywords specified on the Google sheet available at the above link, kindly contact any Editor to get the details on how to contribute the chapters for this Encyclopedia. More details about the Springer's Encyclopedia of Mathematical Geosciences can be seen at https://meteor.springer.com/math_geosciences.

*B. S. Daya Sagar, Qiuming Cheng, Jennifer McKinley and Frits Agterberg*

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## Prince Sultan bin Abdulaziz International Water Prize

The Prince Sultan bin Abdulaziz International Water Prize, probably the most important prize, worldwide, in the area of water resources, has been awarded to Jaime Gómez-Hernández.

The award was presented in recognition for his work in proposing that natural heterogeneity is not well represented by multiGaussian fields, and developing the 'self-calibrating method' using pilot points for the stochastic inversion of natural heterogeneity, which yields an estimate of the parameters, but also an estimate about their uncertainty. Details at https://psipw.org/index.php?option=com_content&view=article&id=209&Itemid=129&lang=en

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## IEEE Geoscience and Remote Sensing Society (GRSS) Distinguished Lecturer (DL)

Prof. B. S. Daya Sagar of the Systems Science and Informatics Unit (SSIU) at the Indian Statistical Institute-Bangalore Centre has been appointed as the "IEEE Geoscience and Remote Sensing Society (GRSS) Distinguished Lecturer (DL)" for the period between 2020-2022. It is worth mentioning that he is the first-ever Indian Geoscience and Remote Sensing scientist to get this honor. The GRSS Distinguished Lecturer Program (DLP) is a service of the IEEE Geoscience and Remote Sensing Society and its members across the globe to support GRSS chapter activities. IEEE GRSS DLP's goal is to provide chapters with access to leading professionals in geoscience and remote sensing and discuss novel topics in current research. This is an opportunity for the GRSS membership across the globe to hear interesting talks about work being done in the fields of interest and to meet some of the prominent members of our Society. More details about this can be seen at http://www.grss-ieee.org/education/distinguished-lecturers.

*B. S. Daya Sagar*

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## Diversity and Inclusion in Geoscience

Dario Grana an associate professor in the Department of Geology and Geophysics at the University of Wyoming is currently offering a new class for undergraduate and graduate students on Diversity and Inclusion in Geoscience.

The dramatic events of the last months in the United States challenged us to confront the racial injustices that have long undermined the world. Few STEM fields are less diverse than geosciences. Even worse, this lack of diversity itself poses challenges to overcoming it, limiting recruitment of diverse young geoscientists and allowing systemic racism, sexism, and discrimination to persist. Indeed, we constantly witness how the careers of young scientists are hindered based on race, ethnicity, gender, geographical origin, sexual orientation, and social prejudice all over the world. Systemic racism and arbitrary discrimination are a big loss for science and humanity.

The purpose of this course is to educate and promote the value of diversity and inclusion and to discuss how our scientific community is affected by racial injustice. In this class, students learn how to support equality, diversity, and inclusivity in academia and in the scientific community.

The class includes lectures on implicit bias, inclusive teaching, inclusive geoscience coursework, challenges in achieving diversity, and diversifying geosciences through mentoring. The class also includes four discussion panels on inclusivity in geosciences from underrepresented minority groups, such as Afro-Americans, Latinos and Hispanics, Women, and LGBTQ2S+. Invited lectures on the integration of diversity, equity, and inclusion (DEI) initiatives in geosciences are given by DEI experts and renowned geoscientists, including Dr. Catherine Riihimaki (Princeton University), Prof. Jef Caers (Stanford University), Prof. Mark Clementz (University of Wyoming), Prof. Kira Lawrence (Lafayette College), Dr. Lorena Medina Luna (UCAR), Prof. Aradhna Tripati (UCLA), Prof. Ellen Currano (University of Wyoming), Prof. Estella Atekwana (University of Delaware), Prof. Kamini Singha (Colorado School of Mines), and Prof. Jerry Harris (Stanford University).

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# Student News

## Nancy Student Chapter

1. In October 2019, the board of the IAMG student Chapter has been renewed: Capucine Legentil is president, Paul Baville as treasurer, and Zoe Renat as secretary.

2. In January 2020, we presented the IAMG and the Student Chapter of Nancy to our MCs students.

3. Nicolas Clausolles had defended his thesis in March 2020 about stochastic seismic interpretation of salt bodies, and Nicolas Mastio in April 2020 worked on improving the global coherency of shared earth model using static, dynamic, and geomechanics data. They are Drs now!

4. During the lockdown, we maintained the weekly seminar with presentations done by IAMG student Chapter members and also with outside speakers such as Marcus Apel from Equinor (you can find the news on our website: here).

5. Paul Baville (treasurer) has presented his works at the online AAPG in October 2020 while Corentin Gouache presented at the online EGU.

6. Melchior Schuh-Senlis published an article in Solid Earth about restoration. Corentin Gouache and Yves Frantz are waiting for final reviews on their articles.

7. All Ph.D. students of the Student Chapter presented their works at the RING meeting 2020.

Capucine Legentil

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## Abstracts from 2019 Research Grant Reports

**CG-2019-6:** Thibaud Chassin (EPFL) - Title: Shaping 3D virtual environments in accordance with the user's background and preferences

The representation of urban projects in 3D is a powerful concept that can help local communities to have an accurate idea of the future development of their district or city. However, the public's understanding of 3D models significantly varies from one person to another, leading to misjudgments or inadequate feedback. To reduce this bias, the use of customized 3D portrayals could improve individual 3D understanding. This study aims at making a first step allowing a semi-automated 3D portrayal personalization. Following the COVID-19 regulations regarding onsite experiments, an online survey has been conducted. Despite the challenging context, more than a hundred participants have completed the study. Several parameters were collected (response times, success rates, camera positions, inputs, etc.) to assess the user's perception and, by extension, their understanding and preferences. The results suggest that an increase of complexity in the operated task (memorization, lack of interaction) or the portrayal (such as photo-realism) weakens the user's perception of morphological structures in 3D scenes. However, the contrary does not appear to be always true, even though the user's perception could be enhanced by visual elements (saliency).

**CG-2019-8:** Teeratorn Kadeethum (Technical Univ. of Denmark) - Title: A Locally Conservative Mixed Finite Element Framework for Coupled Hydro-Mechanical-Chemical Processes in Heterogeneous Porous Media

This paper presents a mixed finite element framework for coupled hydro-mechanical-chemical processes in heterogeneous porous media. The framework combines two types of locally conservative discretization schemes: (1) an enriched Galerkin method for reactive flow, and (2) a three-field mixed finite element method for coupled fluid flow and solid deformation. This combination ensures local mass conservation, which is critical to flow and transport in heterogeneous porous media, with a relatively affordable computational cost. A particular class of the framework is constructed for calcite precipitation/dissolution reactions, incorporating their nonlinear effects on the fluid viscosity and solid deformation. Linearization schemes and algorithms for solving the nonlinear algebraic system are also presented. Through numerical examples of various complexity, we demonstrate that the proposed framework is a robust and efficient computational method for simulation of reactive flow and transport in deformable porous media, even when the material properties are strongly heterogeneous and anisotropic.

**CG-2019-12:** Ben R. Mather (Univ. of Sydney) - Title: High performance computing framework to solve the adjoint to the inverse problem of heat conduction at unprecedented resolution

A common obstacle in Bayesian inversion is the large number of simulations required to adequately sample the posterior density function. For models of thermal structure, this involves solving temperature with prescribed boundary conditions across a mesh populated with constitutive properties, such as thermal diffusivity and heat production, and finding the optimal fit with geophysical data. We constructed the adjoint to the inverse problem of heat conduction to provide an efficient framework for simulating Earth-realistic models at very fine resolution and that optimally reproduce the available data. We found a linear scaling between the number of inversion variables and evaluations of the adjoint model to converge to a model with an optimal trade-off between Curie depth, surface heat flow data, and prior information on the thermal properties of the lithosphere. This is a significant improvement in computational efficiency than traditional MCMC approaches. In Ireland, where we have applied this code, we have significantly improved estimates of geothermal resource potential and quantified the uncertainty of subsurface thermal structure. An open-source Python package, "Conduction" is freely available to reproduce these results and infer the thermal regime of the lithosphere in other geological contexts.

**CG-2019-14:** Siavash Ghelichkhan (Australian National Univ.) - Title: Revealing the Structure and Evolution of Earth's Engine in Space and Time

A long-standing challenge in fluid dynamical mantle simulations is integration of the ever-growing disparate datasets in various disciplines of Solid Earth Sciences. For this reason, geodynamicists have turned to large scale optimization methods where models are optimized with regards to various observational datasets. An example is reconstructions of past mantle flow that involve the solution of a geodynamic inverse problem through the adjoint method. This inverse problem aims at finding the (unknown) state of the mantle in the past that naturally evolves into its (known) present-day state by iteratively minimizing the difference between the observed present-day mantle structure and the prediction of a geodynamic model. The adjoint method is a powerful technique to compute sensitivities (Fréchet derivatives) with respect to model parameters, allowing one to solve inverse problems where analytical solutions are not available or the cost to determine many times the associated forward problem is prohibitive. In geodynamics, it has been applied to the restoration problem of mantle convection so that poorly known mantle flow parameters can be tested against observations gleaned from the geological record. By enabling us to construct time dependent Earth models the adjoint method has the potential to link observations from seismology, geology, mineral physics and palaeomagnetism in a dynamically consistent way, greatly enhancing our understanding of the solid Earth system.

**NRR-2019-7:** Shubin Zhou (China Univ. of Geosciences) - Title:Rapid assessment of ecological risks in mining/tailing sites via portable XRF

Heavy metals created by mining and smelting activities may pose a threat to human beings through food chain. It becomes crucial to monitor the biological effects of heavy metal pollution. The present study invegestigated the application of pXRF in elemental assessment of organic matrices. Ordinary least square (OLS) regression calibration models were established for correcting the matrix effect, and the validation results were quite good for all studied elements. Other factors which may affect pXRF readings, such as moisture content and compaction (density) effect, were experimentally determined. The pXRF reported concentrations of heavy metals decreased with increased mass per unit area in sample cups in a power function with a negative exponent, enabling a mass correction for samples with intermediate thickness (insufficient sample mass). The calibration models established in this resarch have subtancially improved the predictive accuracy of pXRF reported concentrations in organic samples, providing insights into heavy metal accumulation in plants in Bailing Cu-Zn deposit, Harbin, China.

**NRR-2019-5:** Yong Peng (China Univ. of Geosciences) - Title: Mining and intergration of deep-level prospecting information using convolutional neural network

Mining and integration of geological prospecting information using deep learning algorithms (DL) has become a frontier field of mathematical geoscience. DL, which is a machine learning algorithm with multiple hidden layers, starts to be used in mining the geological prospecting big data in recent years, and there are a series of issues to be solved in this field. In this study, we took the convolutional neural network (CNN) as an example to discuss two challenges of DL on mining geological prospecting big data, which include insufficient training samples and how to construct deep learning network structure. In this study, data augmentation and transfer learning methods were applied to generate training dataset, and a number of number of experiments were carried out for determining the optimal parameters of the hyper-parameters of a CNN model for mining and integrating geological prospecting big data. A case study from Southwest Fujian Province, China was carried out to mine and integrate the geological, geophysical and geochemical multi-source prospecting information. The results obtained by CNN can provide clues for mineral exploration in this area.



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# Upcoming Meetings

**Due to Covid-19 many meetings are being postponed! Please check the relevant websites for updated details.**

## 2020

82nd EAGE Conference & Exhibition 2020, December, Amsterdam, Netherlands. https://eage.eventsair.com/eageannual2020/

## 2021

EGU 2021 General Assembly, 19-30 April, online. https://www.egu21.eu/

Geostats2020, 12-16 Jul, Toronto, Canada. http://www.geostats2020.com/home.html

**36th International Geological Congress (IGC), 16-21 Aug, Dehli, India. http://www.36igc.org/**

ISEH 2020, ICEPH 2020 & G16 2020, Aug, Galway, Ireland. http://www.nuigalway.ie/iseh2020/

APCOM 2021, Sept, Johannesburg, South Africa. https://apcom.info/apcom-2021/

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### EGU 2021 General Assembly

The IAMG is co-organizing the geostatistics session within the EGU 2021 General Assembly.

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### Online-conference "Marginal Seas – Past and Future" Dec 16/17, 2020

During the annual conference of the International Association for Mathematical Geosciences "IAMG 2019", held at State College, Pennsylvania, USA, August 10-16, 2019, an international and interdisciplinary group of scientists launched an initiative "Eurasian Marginal Seas – Past and Future (EMS)". The initiative's objective is to develop a generally accessible methodology, based on big data analyses and numerical modeling, to answer questions related to environmental changes in marginal seas during the Last Glacial Cycle in order to generate future scenarios for this century. Modeling should help to work out strategies for balancing the protection of the environment and the economic use of marginal sea resources. The initiative resulted in an international Marginal Seas network, supported by IAMG and the DDE Big Science Program of the IUGS. However, communication within the network slowed down after the 36th IGC had been postponed due to the pandemic which dramatically hampers face-to-face meetings. Having learned from these lessons, we are continuing our work via electronic communication means. When discussing the possibilities of modeling the processes in marginal seas, we realized that we still have to close gaps in our basic knowledge by conducting baseline studies before - or in parallel – numerical models describing processes in marginal seas can be generally used. The on-line conference organized by the Institute of Marine and Environmental Sciences, University of Szczecin, Poland, together with partners of the Marginal Seas network will serve as a contribution to these baseline studies. For details, please visit the conference website https://baltic.earth/EMS2/ and be cordially invited to attend the event and contribute to the discussion. A total of 25 invited lectures will be presented and discussed in three topical sessions. The first is devoted to the interdisciplinary description of the interrelation between climate and geo-, eco- and anthroposphere. The second covers the interaction between marginal seas and the society. Presentations in the third session dealing with data management and visualization (mapping) should build a bridge to the next step on our roadmap: generating scenarios of geological past and future developments by applying numerical models. The technical program for the online-conference was published in November 2020.

*Breakwaters at southwestern Baltic Sea coast*

Jan Harff

### News about CoDaWork: save the date!

The CoDaWork 2021 conference has been postponed to 2022 due to the world pandemic. However the local organizers in Toulouse and the scientific committee invite you to participate in an online event (CoDaDay) on June 17th 2021. There will be five invited talks, and the conference is free of charge. The detailed program will be announced shortly on the CoDa Association website https://www.coda-association.org.

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36TH INTERNATIONAL GEOLOGICAL CONGRESS
2 - 8 MARCH 2020, DELHI, INDIA

The 36th IGC has been postponed until August 16-21, 2021

The IAMG is collaborating in symposiums 35.1 (Mathematical Geosciences and Mineral Resource Evaluation) and 45.10 (Advances in Global Geological Data Sharing and Processing).

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# IAMG Journal Reports


# IAMG Journal Contents

## Natural Resources Research

**NRR - Volume 29, Issue 3, June 2020**

Growth Drivers of Bakken Oil Well Productivity — E. D. Attanasi, P. A. Freeman

Dynamics Behind Cycles and Co-movements in Metal Prices: An Empirical Study Using Band-Pass Filters — Matias Marañon, Mustafa Kumral

Digital Economy as a Factor in the Technological Development of the Mineral Sector — V. S. Litvinenko

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Updated Characterization of Dorowa Phosphate Rock Mined in Zimbabwe — Akinson Tumbure, Mike R. Bretherton, Peter Bishop, Mike J. Hedley

Study on Characteristics of Airflow Spatial Distribution in Abandoned Mine Gob and Its Application in Methane Drainage — Shengyong Hu, Guocai Hao, Guorui Feng, Ao Zhang, Lanqing Hu, Siyuan Li

Evaluation of Soil Re-mineralizer from By-Product of Volcanic Rock Mining: Experimental Proof Using Black Oats and Maize Crops — Claudete Gindri Ramos, Diego dos Santos de Medeiros, Leandro Gomez, Luis Felipe Silva Oliveira, Ivo André Homrich Schneider, Rubens Muller Kautzmann

Analysis of Spatial–Temporal Evolution of Mining-Induced Fracture Field: A Case Study Using Image Processing in the Shaqu Coal Mine, China — Zhiheng Cheng, Biao Liu, Quanle Zou, Xin Wang, Jicheng Feng, Zhiyan Zhao, Fulong Sun

Experimental Analysis of the Dynamic Effects of Coal–Gas Outburst and a Protean Contraction and Expansion Flow Model — Bin Zhou, Jiang Xu, Shoujian Peng, Fazhi Yan, Wei Yang, Liang Cheng, Guanhua Ni

Non-uniform Distributions of Gas Pressure and Coal Permeability in Coalbed Methane Reservoirs Induced by the Loess Plateau Geomorphology: A Case Study in Ordos Basin, China — Qingquan Liu, Peng Chu, Congmeng Hao, Yuanping Cheng, Haifeng Wang, Liang Wang

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Coal Cleat/Fracture Segmentation Using Convolutional Neural Networks — Sadegh Karimpouli, Pejman Tahmasebi, Erik H. Saenger

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Effect of Slot Inclination Angle and Borehole-Slot Ratio on Mechanical Property of Pre-cracked Coal: Implications for ECBM Recovery Using Hydraulic Slotting — Quanle Zou, Han Liu, Zhiheng Cheng, Tiancheng Zhang, Baiquan Lin

Geochemical Evaluation of Enrichment of Rare-Earth and Critical Elements in Coal Wastes from Jurassic and Permo-Carboniferous Coals in Ordos Basin, China — Rahib Hussain, Kunli Luo

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Predicting Total Dissolved Gas Concentration on a Daily Scale Using Kriging Interpolation, Response Surface Method and Artificial Neural Network: Case Study of Columbia River Basin Dams, USA — Salim Heddam, Behrooz Keshtegar, Ozgur Kisi

Study of Effects of Hard Thick Roof on Gas Migration and Field Experiment of Roof Artificially Guided Pre-splitting for Efficient Gas Control — Tong Liu, Baiquan Lin, Wei Yang, Ting Liu, Wu Xiao, Wei Zha

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A Thermo–Hydro–Mechanical Model: Capturing the Effects of Initial Permeability and Gas Pressure on Outburst-Prone Indicators — Cai Shu, Hongtu Wang, Xuelong Li, Jinyang Fan, Xu Ye

Water Resources Management Through Flood Spreading Project Suitability Mapping Using Frequency Ratio, k-nearest Neighbours, and Random Forest Algorithms — Seyed Amir Naghibi, Mehdi Vafakhah, Hossein Hashemi, Biswajeet Pradhan, Seyed Jalil Alavi

Detecting Land Subsidence Due to Groundwater Withdrawal in Aliabad Plain, Iran, Using ESA Sentinel-1 Satellite Data — Ali Edalat, Mahdi Khodaparast, Ali M. Rajabi

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Can One-Run-Fixed-Arrhenius Kerogen Analysis Provide Comparable Organofacies Results to Detailed Palynological Analysis? A Case Study from a Prospective Mississippian Source Rock Reservoir (Bowland Shale, UK) — Sarah M. Newport, Jan A. I. Hennissen, James P. Armstrong, Kevin G. Taylor, Leo P. Newport, Edward Hough

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A Study on the Surface Wettability of Clastic Rocks with Potential Application for CO2 Storage Sites — Bappah Adamu Umar, Raoof Gholami, Arshad Raza, William Samuel Downey, Mohammad Sarmadivaleh, Afroz A. Shah, Prasanta Nayak

Chemometric Differentiation of Oil Families and Their Potential Source Rocks in the Gulf of Suez — W. Sh. El Diasty, S. Y. El Beialy, A. R. Mostafa, A. A. Abo Ghonaim, K. E. Peters

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Anthraxolite Evolution and Vanadium Enrichment Mechanism in the Tanjianshan Group, Upper Ordovician in the Northern Qaidam Basin — Chenglin Liu, Hongwei Gong, Chao Dun, Xiaohu Wang, Yuanyuan Yang, Chao Tong, Zhihui Zhang

Technical and Non-technical Challenges of Development of Offshore Petroleum Reservoirs: Characterization and Production — Masoud Seyyedattar, Sohrab Zendehboudi, Stephen Butt

Feasibility of Re-injecting the Production Effluent from Alkali–Surfactant–Polymer Flooding Systems Back into a Reservoir to Further Improve Oil Recovery — Chengli Zhang, Bozhou Hu, Peng Wang, Xiaofei Fu, Guoliang Song, Haoliang Liu

Experimental Investigations of Single Bubble Rising in Static Newtonian Fluids as a Function of Temperature Using a Modified Drag Coefficient — Nannan Liu, Yong Yang, Jian Wang, Binshan Ju, Eric Thompson Brantson, Yapeng Tian, Yintao Dong, B. M. Mahlalela

Effects of Artefacts on Natural Gradient Single-Borehole Tracer Dilution Tests — M. Gomo

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Constrained Kriging: An Alternative to Predict Global Recoverable Resources — Nadia Mery, Denis Marcotte, Raphael Dutaut

The Availability of Critical Minerals for China's Renewable Energy Development: An Analysis of Physical Supply — Jianliang Wang, Lifang Yang, Jingli Lin, Yongmei Bentley

Curie Point Depth Estimations for Northwest Iran Through Spectral Analysis of Aeromagnetic Data for Geothermal Resources Exploration — Sina Shirani, Ali Nejati Kalateh, Younes Noorollahi

Prediction of Reservoir Temperatures Using Hydrogeochemical Data, Western Anatolia Geothermal Systems (Turkey): A Machine Learning Approach — Fusun S. Tut Haklidir, Mehmet Haklidir

Multi-objective Freshwater Management in Coastal Aquifers Under Uncertainty in Hydraulic Parameters — Ali RanjbarNajmeh Mahjouri

Risk of Fluoride-Rich Groundwater on Human Health: Remediation Through Managed Aquifer Recharge in a Hard Rock Terrain, South India — D. Karunanidhi, P. Aravinthasamy, T. Subramani, Priyadarsi D. Roy, K. Srinivasamoorthy

The Driving Effect of Spatial Differences of Water Intensity in China — Zhen Shi, Huinan Huang, Fengping Wu, Yung-ho Chiu, Chenjun Zhang

Nagmati River Sub-watershed Prioritization Using PCA, Integrated PCWS, and AHP: A Case Study — Rabab Siddiqui, Saif Said, Mohammad Shakeel

Mineralogical Study of Beneficiated and Carbonized Indian Coking Coal for Better Utilization: A Case Study — K. Chakravarty, Vivek Mishra, S. Chakravarty, S. Chakladar, V. K. Saxena, S. Bhattacharya

Coal Permeability Evolution Under Different Water-Bearing Conditions — Jianhua Li, Bobo Li, Zhejun Pan, Zhihe Wang, Kang Yang, Chonghong Ren, Jiang Xu

Characterization and Quantification of Mining-Induced Fractures in Overlying Strata: Implications for Coalbed Methane Drainage — Bichuan Zhang, Haitao Sun, Yunpei Liang, Kequan Wang, Quanle Zou

Experimental Study of Coal–Gas Outburst: Insights from Coal–Rock Structure, Gas Pressure and Adsorptivity — Feng Du, Kai Wang, Xiang Zhang, Chengpeng Xin, Longyong Shu, Gongda Wang

Numerical Simulation of Broken Coal Strength Influence on Compaction Characteristics in Goaf — Cun Zhang, Jinbao Liu, Yixin Zhao, Penghua Han, Lei Zhang

Failure Mechanism and Deformation Characteristics of Gob-Side Entry Retaining in Solid Backfill Mining: A Case Study — Qiang Sun, Jixiong Zhang, Yanli Huang, Wei Yin

Improving Coal Quality Estimations with Geostatistics and Geophysical Logs — Rick Jeuken, Chaoshui Xu, Peter Dowd

Analysis of Petrophysical Characteristics and Water Movability of Tight Sandstone Using Low-Field Nuclear Magnetic Resonance — Chaozheng LiGuangdi Liu, Zhe Cao, Wei Yuan, Peng Wang, Yuan You

3D Structural, Facies and Petrophysical Modeling of C Member of Six Hills Formation, Komombo Basin, Upper Egypt — Moamen Ali, Ahmed Abdelmaksoud, M. A. Essa, A. Abdelhady, M. Darwish

Improved Estimation of Shear-Wave Velocity by Ordered Weighted Averaging of Rock Physics Models in a Carbonate Reservoir — Hamid Seifi, Behzad Tokhmechi, Ali Moradzadeh

A Novel Method to Obtain Permeability in a Dual-Pore System Using Geophysical Logs: A Case Study of an Upper Triassic Formation, Southwest Ordos Basin, China — Zhen Qin, Dong Wu, Shaocheng Luo, Xiugang Ma, Ke Huang, Fei Tian, Kun Xiao, Xiao Chen, Min Hou, Heping Pan

Empirical Relations Between Aquifer Geohydraulic–Geoelectric Properties Derived from Surficial Resistivity Measurements in Parts of Akwa Ibom State, Southern Nigeria — Aniekan M. Ekanem, Nyakno J. George, Jewel E. Thomas, Ekong U. Nathaniel

Geochemical Characteristics and Hydrocarbon Expulsion of Lacustrine Marlstones in the Shulu Sag, Bohai Bay Basin, Eastern China: Assessment of Tight Oil Resources — Zhipeng Huo, Xuan Tang, Qingkuan Meng, Jinchuan Zhang, Changrong Li, Xiaofei Yu, Xue Yang

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# Journal Statistics

**Mathematical Geosciences:**

2019 ISI Impact factor: 2.471

5-Year Impact Factor: 2.183

Ave. review time: 57 days (submission to first decision 2019)

260 days (submission to final decision 2019)

**Computers & Geosciences:**

2019 ISI Impact Factor: 2.991

5-Year Impact Factor: 3.339

Ave. review time: 8.2 weeks (submission to first decision 2019)

12.7 weeks (submission to final decision 2019)

**Natural Resources Research:**

2018 ISI Impact Factor: 3.708

Ave. review time: 40 days (submission to first decision 2018)

133 days (submission to final decision 2019)

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Algorithm Using Genetic Algorithm to Forecast Crude Oil Price — Mohamed Abd Elaziz, Ahmed A. Ewees, Zakaria Alameer

Hydrocarbon Generation Potential of the Organic-Rich Naifa Formation, Say'un–Masila Rift Basin, Yemen: Insights from Geochemical and Palynofacies Analyses — Mohammed Hail Hakimi, Wan Hasiah Abdullah, Aref A. Lashin, El-Khedr H. Ibrahim, Yousif M. Makeen

Modeling Pore Pressure, Fracture Pressure and Collapse Pressure Gradients in Offshore Panna, Western India: Implications for Drilling and Wellbore Stability — Souvik Sen, Ashani Kundan, Mithilesh Kumar

Impact of Reservoir Permeability, Permeability Anisotropy and Designed Injection Rate on CO2 Gas Behavior in the Shallow Saline Aquifer at the CaMI Field Research Station, Brooks, Alberta — Xinran Yu, Masoud Ahmadinia, Seyed M. Shariatipour, Don Lawton, Kirk Osadetz, Amin Saeedfar

Carbon Sequestration Potential of the Forest Ecosystems in the Western Ghats, a Global Biodiversity Hotspot — T. V. Ramachandra, Setturu Bharath

Assessment of Geogenic and Anthropogenic Pollution Sources Using an Aquatic Plant Along the Sonora River Basin: Insights from Elemental Concentrations and Pb Isotope Signatures — Diana Romo-Morales, Verónica Moreno-Rodríguez, Francisco Molina-Freaner, Martín Valencia-Moreno, Joaquín Ruiz, Christian Minjárez-Osorio, Ernesto Hernández-Mendiola, Rafael del Rio-Salas

Modeling of Persistence and Seasonality in Sectoral Energy Consumption in the USA Using Fractionally Integrated Processes: Implications for Economic Policy — Oluwasegun B. Adekoya

Another Look at the Nexus Among Energy Consumption, Natural Resources, and Gross Capital Formation: Evidence from Pakistan — Syed Tauseef Hassan, Enjun Xia, Enjun Xia, Khalid Latif, Jieping Huang, Nazakat Ali

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Point and Interval Solar Power Forecasting Using Hybrid Empirical Wavelet Transform and Robust Wavelet Kernel Ridge Regression — P. K. Dash, Irani Majumder, Niranjan Nayak, Ranjeeta Bisoi

Evolution Mechanisms of Carbonate Reservoirs Based on Dissolution Rates and Multifractal Analysis of Microscopic Morphology — Jiayi Ma, Shuyun Xie, Huayun Tang, Ming Ma, Emmanuel John M. Carranza, Jun Han, Zhiliang He, Cunli Jiao, Hai Zhang

Ideal Element Distribution Pattern and Characteristics of Primary Halo in the Fault-Controlled Ore Zone of the Yidinan Gold Deposit, Gansu Province, China — Wentong An, Jianping Chen, Xuewei Chen, Jiang Wei, Zixin Wei

Weighted Photolineaments Factor (WPF): An Enhanced Method to Generate a Predictive Structural Evidential Map with Low Uncertainty, a Case Study in Chahargonbad Area, Iran — Gholam-Reza Elyasi, Abbas Bahroudi, Maysam Abedi, Hossain Rahimi

Analysis of Aeromagnetic Data of Ikwo and Environs, Southeastern Nigeria: A Mineral and Hydrocarbon Exploration Guide — Charles Chibueze Ugbor, Innocent John Arinze, Chidubem Okwudiri Emedo

Sub-pixel Mapping of Copper- and Iron-Bearing Metamorphic Rocks Using ASTER Data: A Case Study of Toutak and Surian Complexes, NE Shiraz, Iran — Soheyla Esmaeili, Majid H. Tangestani, Mohammad H. Tayebi

A New Band Ratio Approach for Discriminating Calcite and Dolomite by ASTER Imagery in Arid and Semiarid Regions — Meisam Rasouli Beirami, Majid H. Tangestani

Investigating the Irregular Localization of Skarn Orebodies by Computational Modeling in the Fenghuangshan Ore Field, Tongling District, Anhui Province, China — Wei Cao, Liangming Liu, Hongsheng Liu, Feng Lai

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A Fuzzy Techno-Financial Methodology for Selecting an Optimal Mining Method — Webby Banda

A Copula–Hubbert Model for Co(By)-Product Minerals — Deyi Xu, Yongguang Zhu

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A Multi-objective Zoning Framework for Mineral Resources Development and Management: A Case Study in Henan Province, China — Yali Zhang, Xiaoyang Li, Song Wang, Jialiang Guo, Guofang Lv

Characterization of Chemical Structure with Relative Density of Three Different Ranks of Coal from India — Sanchita Chakravarty, K. Chakravarty, Vivek Mishra, Saswati Chakladar, Ashok Mohanty, Mamta Sharma

Gas Permeability Characteristics and Energy Evolution Laws of Gas-Bearing Coal under Multi-Level Stress Paths — Kang Peng, Shaowei Shi, Quanle Zou, Yongjiang Zhang, Guowen Tan

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Dynamic Mechanical Properties and Fragment Fractal Characteristics of Fractured Coal–Rock-Like Combined Bodies in Split Hopkinson Pressure Bar Tests — Chengjie Li, Ying Xu, Peiyuan Chen, Hailong Li, Peijie Lou

Tree-Type Boreholes in Coal Mines for Enhancing Permeability and Methane Drainage: Theory and an Industrial-Scale Field Trial — Liang Zhang, Zhaolong Ge, Yiyu Lu, Zhe Zhou, Songqiang Xiao, Kai Deng

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Enhancement of Groundwater-Level Prediction Using an Integrated Machine Learning Model Optimized by Whale Algorithm — Fatemeh Barzegari Banadkooki, Mohammad Ehteram, Ali Najah Ahmed, Fang Yenn Teo, Chow Ming Fai, Haitham Abdulmohsin Afan, Michelle Sapitang, Ahmed El-Shafie

Enhanced Characterization of Water Resource Potential in Zaghouan Region, Northeast Tunisia — A. Hamed Ferjani, R. Guellala, S. Gannouni, M. H. Inoubli

Evaluation of Potential for Salt Cavern Gas Storage and Integration of Brine Extraction: Cavern Utilization, Yangtze River Delta Region — Wei Liu, Xiong Zhang, Jinyan Fan, Yinping Li, Lu Wang

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An Anisotropic Permeability Model for Shale Gas Recovery Considering Slippage Effect and Embedded Proppants — Jianhua Li, Bobo Li, Zhihe Wang, Chonghong Ren, Kang Yang, Shuai Chen

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Hydraulic Fracturing in Southern Florida: A Critical Analysis of Potential Environmental Impacts — Thomas M. Missimer, Robert G. Maliva

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Effects of Random Negative Training Samples on Mineral Prospectivity Mapping — Renguang Zuo, Ziye Wang

GIS-Based Spatial Analysis of Regional-Scale Structural Controls on Gold Mineralization Along the Bétaré-Oya Shear Zone, Eastern Cameroon — Salomon César Nguemhe Fils, Mumbfu Ernestine Mimba, Brunot Nyeck, Melvin Tamnta Nforba, Boniface Kankeu, Philippe Njandjock Nouck, Joseph Victor Hell

Evaluation of WorldView-3 VNIR and SWIR Data for Hydrothermal Alteration Mapping for Mineral Exploration: Case Study from Northeastern Isfahan, Iran — Touba Salehi, Majid H. Tangestani

Logistic-Based Translation of Orogenic Gold Forming Processes into Mappable Exploration Criteria for Fuzzy Logic Mineral Exploration Targeting in the Kushaka Schist Belt, North-Central Nigeria — Sherif Olumide Sanusi, John Olurotimi Amigun

Simulation of Synthetic Exploration and Geometallurgical Database of Porphyry Copper Deposits for Educational Purposes — Mauricio Garrido, Exequiel Sepúlveda, Julián Ortiz, Brian Townley

Textural Quantification and Classification of Drill Cores for Geometallurgy: Moving Toward 3D with X-ray Microcomputed Tomography (μCT) — Pratama Istiadi Guntoro, Yousef Ghorbani, Alan R. Butcher, Jukka Kuva, Jan Rosenkranz

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Synergetic Network Evolution of Mineral Exploitation on the Water Environment in the Yangtze River Economic Belt — Han Sun, Hai Wang, Xueyuan Hu

A New Semi-greedy Approach to Enhance Drillhole Planning — Raphaël Dutaut, Denis Marcotte

Geochemistry of Famennian to Visean Metapelites from the Iberian Pyrite Belt: Implications for Provenance, Paleo-Redox Conditions and Vectoring to Massive Sulfide Deposits — Filipa Luz, António Mateus, Carlos Rosa, Jorge Figueiras

Waveform Characteristics of Earthquakes Induced by Hydraulic Fracturing and Mining Activities: Comparison with Those of Natural Earthquakes — Nan Li, Baolin Li, Dong Chen, Enyuan Wang, Yuyang Tan, Jiawei Qian, Haishan Jia

A High Thermal Conductivity Cement for Geothermal Exploitation Application — Sheng Wang, Liming Jian, Zhihong Shu, Shaohua Chen, Liyi Chen

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The Effects of Industrial Wastewater on Groundwater Quality of the Boroujen Aquifer, Southwest Iran — Milad Khodabakhshi Sureshjani, Hakimeh Amanipoor, Sedigheh Battaleb-Looie

Assessment of Red Bed Groundwater in the Jinqu Basin, Southeastern China: Its Enrichment Regularity and Emergency Exploitation Potential — Yu Zhao, Yongfa Zhang, Haiqing Yang, Xin Tian, Haque Md. Emdadul, Faouziatou Mouhamadou

Appraisal of Hydraulic Flow Units and Factors of the Dynamics and Contamination of Hydrogeological Units in the Littoral Zones: A Case Study of Akwa Ibom State University and Its Environs, Mkpat Enin L.G.A, Nigeria — Nyakno J. George

Impact of Lithofacies and Structures on the Hydrogeochemistry of the Lower Miocene Aquifer at Moghra Oasis, North Western Desert, Egypt — Maha Abdelazeem, Zenhom E. Salem, Mohamed S. Fathy, Maha Saleh

Improved Water Quality Prediction with Hybrid Wavelet-Genetic Programming Model and Shannon Entropy — Hamideh Jafari, Taher Rajaee, Ozgur Kisi

Evaluation of the Presence of Methane in Złoczew Lignite: Comparison with Other Lignite Deposits in Poland — Jan Macuda, Paweł Baran, Marian Wagner

Fracture Development at Laminated Floor Layers Under Longwall Face in Deep Coal Mining — Chunyuan Li, Jianping Zuo, Chunchen Wei, Xiang Xu, Ziqi Zhou, Yang Li, Yong Zhang

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Influence of Local Frequent Dynamic Disturbance on Micro-structure Evolution of Coal-Rock and Localization Effect — Huan Zhang, Hongbao Zhao, Wenpu Li, Xuelin Yang, Tao Wang

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Dual-Porosity Coupled Borehole Gas Flow Model: A New Method for Inversion of Coal Seam Permeability — Jia Liu, Yueping Qin, Tianbai Zhou, Yu Gao

Gas Emission and Soil Chemical Properties Associated with Underground Coal Fires, Wuda Coalfield, Inner Mongolia, China — Haiyan Wang, Junpeng Zhang, Lei Zhang, Jiali Wang, Zuohui Xu

Experimental Investigation of Anisotropic Thermal Deformation of Oil Shale Under High Temperature and Triaxial Stress Based on Mineral and Micro-fracture Characteristics — Dong Yang, Guoying Wang, Zhiqin Kang, Jing Zhao, Yiqing Lv

Synergic Impacts of Two Non-ionic Natural Surfactants and Low Salinity Water on Interfacial Tension Reduction, Wettability Alteration and Oil Recovery: Experimental Study on Oil Wet Carbonate Core Samples — Abdolreza Dabiri, Bizhan Honarvar

Application of Artificial Intelligence to Estimate Oil Flow Rate in Gas-Lift Wells — Mohammad Rasheed Khan, Zeeshan Tariq, Abdulazeez Abdulraheem

A Trapezoidal Three-Dimensional Model for Gas Extraction Based on Shapes of Caved Overlying Strata and Numerical Calculation — Pan Wei, Xuelong Li, Qianting Hu, Shoujian Peng, Shu Liu

Differential Enrichment of Organic Matter in Saline Lacustrine Source Rocks in a Rift Basin: A Case Study of Paleogene Source Rocks, Dongpu Depression, Bohai Bay Basin — Qifeng Wang, Fujie Jiang, Hancheng Ji, Shu Jiang, Fangxin Guo, Shuangyi Gong, Ze Wang, Xiaohan Liu, Boshi Li, Yuanyuan Chen, Qian Deng

Changes in Shale Rock Properties and Wave Velocity Anisotropy Induced by Increasing Temperature — Yu Suo, Zhixi Chen, Sheikh S. Rahman

Rockburst Risk Analysis During High-Hard Roof Breaking in Deep Mines — Qiming Zhang, Enyuan Wang, Xiaojun Feng, Yue Niu, Muhammad Ali, Song Lin, Hao Wang

A Novel Intelligent ELM-BBO Technique for Predicting Distance of Mine Blasting-Induced Flyrock — Bhatawdekar Ramesh Murlidhar, Deepak Kumar, Xiaojun Feng, Yue Niu, Muhammad Ali, Song Lin, Binh Thai Pham

Artificial Neural Network and Firefly Algorithm for Estimation and Minimization of Ground Vibration Induced by Blasting in a Mine — Parichehr Bayat, Masoud Monjezi, Mojtaba Rezakhah, Danial Jahed Armaghani

A Coupling Method for Eco-Geological Environmental Safety Assessment in Mining Areas Using PCA and Catastrophe Theory — Xiaofei Sun, Huaiyong Shao, Xiaoyu Xiang, Linguo Yuan, Yingzhi Zhou, Wei Xian

Rare Earth Elements Around the Barakah Nuclear Power Plant, UAE — Mouza Rashid Al Rashdi, Mohamed El Tokhi, Sulaiman Alaabed, Walid El Mowafi, Alya A. Arabi

Ecological Security Assessment of the G20 and its Drivers: EF-Path-STIRPAT Modeling — Zhili Zuo, Haixiang Guo, Jinhua Cheng, Shicheng Li

Optimization of Flue Gas Composition to Maximize Base Gas Replacement During UGS Process — Hamed Namdar, Elnaz Khodapanah, Seyyed Alireza Tabatabaei-Nejad

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## Mathematical Geosciences

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