

Advances in Science, Technology & Innovation  
IEREK Interdisciplinary Series for Sustainable Development

Attila Çiner · Santanu Banerjee · Federico Lucci ·  
Ahmed E. Radwan · Afroz Ahmad Shah · Domenico M. Doronzo ·  
Zakaria Hamimi · Wilfried Bauer *Editors*

# Recent Research on Sedimentology, Stratigraphy, Paleontology, Tectonics, Geochemistry, Volcanology and Petroleum Geology

Proceedings of the 1st MedGU, Istanbul 2021  
(Volume 2)

---

# Advances in Science, Technology & Innovation

## IEREK Interdisciplinary Series for Sustainable Development

### Editorial Board

Anna Laura Pisello, Department of Engineering, University of Perugia, Italy

Dean Hawkes, University of Cambridge, Cambridge, UK

Hocine Bougdah, University for the Creative Arts, Farnham, UK

Federica Rosso, Sapienza University of Rome, Rome, Italy

Hassan Abdalla, University of East London, London, UK

Sofia-Natalia Boemi, Aristotle University of Thessaloniki, Greece

Nabil Mohareb, Faculty of Architecture—Design and Built Environment,  
Beirut Arab University, Beirut, Lebanon

Saleh Mesbah Elkaffas, Arab Academy for Science, Technology and Maritime Transport,  
Cairo, Egypt

Emmanuel Bozonnet, University of La Rochelle, La Rochelle, France

Gloria Pignatta, University of Perugia, Italy

Yasser Mahgoub, Qatar University, Qatar

Luciano De Bonis, University of Molise, Italy

Stella Kostopoulou, Regional and Tourism Development, University of Thessaloniki,  
Thessaloniki, Greece

Biswajeet Pradhan, Faculty of Engineering and IT, University of Technology Sydney,  
Sydney, Australia

Md. Abdul Mannan, Universiti Malaysia Sarawak, Malaysia

Chaham Alalouch, Sultan Qaboos University, Muscat, Oman

Iman O. Gawad, Helwan University, Cairo, Egypt

Anand Nayyar , Graduate School, Duy Tan University, Da Nang, Vietnam

### Series Editor

Mourad Amer, International Experts for Research Enrichment and Knowledge Exchange  
(IEREK), Cairo, Egypt

**Advances in Science, Technology & Innovation (ASTI)** is a series of peer-reviewed books based on important emerging research that redefines the current disciplinary boundaries in science, technology and innovation (STI) in order to develop integrated concepts for sustainable development. It not only discusses the progress made towards securing more resources, allocating smarter solutions, and rebalancing the relationship between nature and people, but also provides in-depth insights from comprehensive research that addresses the **17 sustainable development goals (SDGs)** as set out by the UN for 2030.

The series draws on the best research papers from various IEREK and other international conferences to promote the creation and development of viable solutions for a **sustainable future and a positive societal** transformation with the help of integrated and innovative science-based approaches. Including interdisciplinary contributions, it presents innovative approaches and highlights how they can best support both economic and sustainable development, through better use of data, more effective institutions, and global, local and individual action, for the welfare of all societies.

The series particularly features conceptual and empirical contributions from various interrelated fields of science, technology and innovation, with an emphasis on digital transformation, that focus on providing practical solutions to **ensure food, water and energy security to achieve the SDGs**. It also presents new case studies offering concrete examples of how to resolve sustainable urbanization and environmental issues in different regions of the world.

The series is intended for professionals in research and teaching, consultancies and industry, and government and international organizations. Published in collaboration with IEREK, the Springer ASTI series will acquaint readers with essential new studies in STI for sustainable development.

**ASTI series has now been accepted for Scopus (September 2020). All content published in this series will start appearing on the Scopus site in early 2021.**

---

Attila Çiner • Santanu Banerjee •  
Federico Lucci • Ahmed E. Radwan •  
Afroz Ahmad Shah •  
Domenico M. Doronzo •  
Zakaria Hamimi • Wilfried Bauer  
Editors

Recent Research  
on Sedimentology,  
Stratigraphy, Paleontology,  
Tectonics, Geochemistry,  
Volcanology and Petroleum  
Geology

Proceedings of the 1st MedGU, Istanbul 2021  
(Volume 2)

*Editors*

Attila Çiner  
Eurasia Institute of Earth Sciences  
Istanbul Technical University  
Istanbul, Türkiye

Federico Lucci  
Dipartimento di Scienze della Terra e  
Geoambientali  
Università degli Studi di Bari “Aldo Moro”  
Bari, Italy

Afroz Ahmad Shah  
Universiti of Brunei Darussalam  
Gadong, Brunei Darussalam

Zakaria Hamimi  
Geology Department  
Faculty of Science  
Benha University  
Benha, Egypt

Santanu Banerjee  
Indian Institute of Technology Bombay  
Mumbai, India

Ahmed E. Radwan  
Faculty of Geography and Geology  
Institute of Geological Sciences  
Jagiellonian University  
Kraków, Poland

Domenico M. Doronzo  
Istituto Nazionale di Geofisica e Vulcanologia  
Napoli, Italy

Wilfried Bauer  
German University of Technology  
Athaibah, Oman

ISSN 2522-8714 ISSN 2522-8722 (electronic)  
Advances in Science, Technology & Innovation  
IEREK Interdisciplinary Series for Sustainable Development  
ISBN 978-3-031-43221-7 ISBN 978-3-031-43222-4 (eBook)  
<https://doi.org/10.1007/978-3-031-43222-4>

© The Editor(s) (if applicable) and The Author(s), under exclusive license to Springer Nature Switzerland AG 2023

This work is subject to copyright. All rights are solely and exclusively licensed by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors, and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Switzerland AG  
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Paper in this product is recyclable.

---

## About the Conference

---

### About MedGU



---

### Steps toward the creation of a Mediterranean Geosciences Union (MedGU)

[Mediterranean Geosciences Union](#) (MedGU) aims to create a unique federation that brings together and represents the Mediterranean geoscience community specializing in the areas of Earth, planetary and space sciences.

MedGU will be structured along the lines of American Geophysical Union (AGU) and European Geosciences Union (EGU).

The plan is to establish a large organization for the Mediterranean region that is more influential than any one local geoscience society with the objective of fostering fundamental geoscience research, as well as applied research that addresses key societal and environmental challenges.

MedGU's overarching vision is to contribute to the realization of a sustainable future for humanity and for the planet.

The creation of this union will give the Earth sciences more influence in policy-making and in the implementation of solutions to preserve the natural environment and to create more sustainable societies for the people living in the Mediterranean region. It is hoped that the union will also provide opportunities to Mediterranean geoscientists to undertake interdisciplinary collaborative research. MedGU plans to recognize the work of the most active geoscientists with a number of awards and medals.

Although MedGU has not yet been officially inaugurated, its first annual meeting is planned for November 2021 in Istanbul. This will provide a forum to achieve a consensus for the formation of this non-profit international union of geoscientists. Membership will be open to individuals who have a professional engagement with the Earth, planetary and space sciences, and related studies, including students and retired seniors.

Nabil Khelifi and Attila Çiner have taken an ambitious approach to the launch of the first [MedGU Annual Meeting 2021](#) and hope to develop it in the near future into the largest international geoscience event in the Mediterranean and the broader MENA region. Its mission is to support geoscientists based in this region by establishing a Global Geoscience Congress.

It is expected that hundreds of participants from all over the world will attend this first MedGU Annual Meeting 2021, making it one of the largest and most prominent geosciences

events in the region. So far, over 1300 abstracts have been submitted from 95 countries. The meeting's sessions will cover a wide range of topics with more details available on the [conference tracks](#).

This first 2021 Annual Meeting will have a “hybrid” format, with both in-person and virtual participation. Springer, its official partner, will publish the proceedings in a book series (indexed in Scopus) as well as a number of special issues in diverse scientific journals (for more details, see [Publications](#)). The official journal of MedGU is [Mediterranean Geoscience Reviews](#) (Springer).

---

## Conference Tracks

The scientific committee of the MedGU invites research papers on all cross-cutting themes of Earth sciences, with a main focus on the following 16 conference tracks:

- Track 1. Atmospheric Sciences, Meteorology, Climatology, Oceanography
- Track 2. Biogeochemistry, Geobiology, Geoecology, Geoagronomy
- Track 3. Earthquake Seismology and Geodesy
- Track 4. Environmental Earth Sciences
- Track 5. Applied and Theoretical Geophysics
- Track 6. Geo-Informatics and Remote Sensing
- Track 7. Geochemistry, Mineralogy, Petrology, Volcanology
- Track 8. Geological Engineering, Geotechnical Engineering
- Track 9. Geomorphology, Geography, Soil Science, Glaciology, Geoarchaeology, Geoheritage
- Track 10. Hydrology, Hydrogeology, Hydrochemistry
- Track 11. Marine Geosciences, Historical Geology, Paleoceanography, Paleoclimatology
- Track 12. Numerical and Analytical Methods in Mining Sciences and Geomechanics
- Track 13. Petroleum and Energy Engineering, Petroleum Geochemistry
- Track 14. Sedimentology, Stratigraphy, Paleontology, Geochronology
- Track 15. Structural Geology, Tectonics and Geodynamics, Petroleum Geology
- Track 16. Caves and Karst, a special session on the occasion of International Year of Caves and Karst

---

## About the Conference Steering Committee

### Executive Committee

#### Honorary Chair



A. M. Celâl Sengör  
Associate Editor, *Mediterranean Geosciences Reviews* (Springer)  
Eurasia Institute of Earth Sciences,  
Istanbul Technical University, Istanbul, Turkey

#### Organizing Chair



Attila Çiner  
MedGU (Interim) President,  
Founding Editor-in-Chief, *Mediterranean Geosciences Reviews* (Springer),  
Chief Editor—Tracks 11 and 14, *Arabian Journal of Geosciences* (Springer),  
Eurasia Institute of Earth Sciences,  
Istanbul Technical University, Turkey



## Conference Manager



Mohamed Sahbi Moalla  
Performer—The Leading Conference Organizer, Tunisia,  
Journal Coordinator, *Euro-Mediterranean Journal  
for Environmental Integration* (Springer),  
ISET, University of Sfax, Tunisia

## Conference Support



Mourad Amer  
Founder and CEO of IEREK,  
Editor of ASTI Series (Springer/IEREK),  
IEREK, Alexandria, Egypt

## Conference Supervisor



Nabil Khelifi  
Senior Publishing Editor, MENA Program,  
MedGU-21 Supervisor,  
Springer, a part of Springer Nature, Germany

## Local Organizing Team

Attila Çiner, Eurasia Institute of Earth Sciences, Istanbul Technical University, Turkey  
Cengiz Yildirim, Eurasia Institute of Earth Sciences, Istanbul Technical University, Turkey  
M. Akif Sarikaya, Eurasia Institute of Earth Sciences, Istanbul Technical University, Turkey  
Tolga Gorum, Eurasia Institute of Earth Sciences, Istanbul Technical University, Turkey  
Ömer Yetemen, Eurasia Institute of Earth Sciences, Istanbul Technical University, Turkey  
Mustafa Üstüner, Artvin Çoruh University, Artvin, Turkey

## Online Organizing Team

M. Sahbi Moalla, Performer—The Leading Conference Organizer, Tunisia  
Melek Rebai, Performer—The Leading Conference Organizer, Tunisia  
M. Bassem Abdelhedi, Performer—The Leading Conference Organizer, Tunisia  
Oumayma Abidi, Performer—The Leading Conference Organizer, Tunisia  
Toka M. Amer, IEREK—International Experts for Research Enrichment and Knowledge Exchange, Egypt

## Advisory Committee



Hans Thybo  
President of International Lithosphere Program (ILP),  
Editor-in-Chief of *Earth and Planetary Science Letters* (EPSL),

Professor at:

- Eurasia Institute of Earth Sciences, Istanbul Technical University Turkey
- Center for Earth Evolution and Dynamics, University of Oslo, Norway



A. M. Celâl Sengör  
Associate Editor, *Mediterranean Geosciences Reviews* (Springer),  
Eurasia Institute of Earth Sciences, Istanbul Technical University, Istanbul, Turkey



François Roure  
Chief Editor—Track 15,  
*Arabian Journal of Geosciences* (Springer),  
IFP—Energies Nouvelles, France



Giovanni Bertotti  
Associate Editor, *Mediterranean Geosciences Reviews*  
(Springer),  
Geoscience and Engineering, Delft University of Technology,  
The Netherlands



Abdullah Al-Amri  
Founder and Editor-in-Chief,  
*Arabian Journal of Geosciences* (Springer),  
King Saud University, Saudi Arabia



Akiça Bahri  
Director for Africa at the International Water Management  
Institute (IWMI), Ghana (2005–2010),  
Coordinator of the African Water Facility (AWF) at the Afri-  
can Development Bank (2010–2015),  
Director of Research at the National Research Institute for  
Agricultural Engineering, Water, and Forestry (INRGREF),  
Tunisia (since 2016),  
Professor at the National Agricultural Institute of Tunisia  
(INAT), Tunisia (since 2017),  
Awardee of the International Water Association (IWA)  
Women in Water Prize (2018),  
Associate Editor, *Euro-Mediterranean Journal for Environ-  
mental Integration* (Springer) (since 2019),  
Minister of Agriculture, Water Resources and Fisheries in  
Tunisia (2019–2020)

## Program Committee



Mustapha Meghraoui  
Editorial Board Member, *Mediterranean Geosciences Reviews* (Springer),  
Editor of *Arabian Journal of Geosciences* (Springer),  
IPG Strasbourg, France



Sami Khomsi  
University Tunis El-Manar, Tunis, Tunisia, and King Abdulaziz University, Jeddah, Saudi Arabia

## Scientific Committee



François Roure  
Chief Editor—Track 15,  
*Arabian Journal of Geosciences* (Springer),  
IFP—Energies Nouvelles, France



Anastasia Kiratzi  
Professor of Seismology,  
Faculty of Sciences, Aristotle University of Thessaloniki,  
Greece



Broder Merkel  
Chief Editor—Track 10,  
*Arabian Journal of Geosciences* (Springer),  
Associate Editor of *Environmental Earth Science* (Springer),  
Publisher of *Freiberg Online Geoscience* (FOG),  
Institute of Geology, Technische Universität Bergakademie,  
Freiberg, Germany



Elena Xoplaki  
Chief Editor, *Euro-Mediterranean Journal for Environmental  
Integration* (Springer),  
Justus-Liebig-University Giessen, Germany

## Publications Committee

### Chair



Attila Çiner  
MedGU (Interim) President,  
Founding Editor-in-Chief, *Mediterranean Geosciences Reviews* (Springer),  
Chief Editor—Tracks 11 and 14, *Arabian Journal of Geosciences* (Springer),  
Eurasia Institute of Earth Sciences, Istanbul Technical University, Turkey



Zeynal Abiddin Erguler  
Chief Editor—Track 8,  
*Arabian Journal of Geosciences* (Springer),  
Dumlupinar University, Kutahya, Turkey



Alina Polonia  
The National Research Council (CNR),  
Institute of Marine Sciences (ISMAR),  
Bologna, Italy



Amjad Kallel  
Chief Editor—Track 4,  
*Arabian Journal of Geosciences* (Springer),  
Managing and Development Editor, *Euro-Mediterranean  
Journal for Environmental Integration* (Springer),  
ENIS, University of Sfax, Tunisia



Mourad Bezzeghoud  
School of Sciences and Technology (ECT),  
Institute of Earth Sciences (IIFA),  
University of Évora, Portugal



Hesham El-Askary  
Professor of Remote Sensing and Earth Systems Science,  
Editor of *Arabian Journal of Geosciences* (Springer),  
Director Computational and Data Sciences Graduate Programs,  
Center of Excellence in Earth Systems Modeling and  
Observations,  
Schmid College of Science and Technology, Chapman  
University, USA



Zakaria Hamimi  
President of ArabGU,  
IAGETH VP for Africa and IAGETH National Chapter for  
Egypt,  
Editor of *Arabian Journal of Geosciences* (Springer),  
Professor, Benha University, Benha, Egypt

## Outreach Committee



Hasnaa Chennaoui Aoudjehane  
Member of the Nomenclature Committee of the Meteoritical Society,  
Laureate, “Prix Paul Doistau–Émile Blutet” from the French Academy of Sciences,  
Editor of *Arabian Journal of Geosciences* (Springer),  
Professor, Hassan II University of Casablanca, Morocco



Catherine Kuzucuoglu  
Associate Editor, *Mediterranean Geosciences Reviews* (Springer),  
Research Director Emeritus,  
CNRS, Laboratoire de Géographie Physique,  
UMR 8591, Meudon, France



---

## Preface

This proceedings volume consists of 57 papers accepted and presented during the 1st Mediterranean Geosciences Union (MedGU-21) Conference organized in Istanbul, Turkey, in 2021 under the auspices of Springer Nature. Here, we assembled a set of contributions investigating, through multidisciplinary and advanced methodologies, the most recent advances in the comprehension of geodynamic scenarios, geological processes and linkage with the anthropic environment.

The first part is related to Sedimentology, Stratigraphy and Paleontology. It contains 15 studies dealing with depositional environments, chronostratigraphy, chemostratigraphy, fossil records, paleoecology and paleoenvironment reconstruction.

Under the Geochemistry, Mineralogy, Petrology and Volcanology part, 19 papers address petrogenetic studies, geochronological investigations, ore geology works, mineralogical characterizations, hydrothermal and geothermal contributions and volcanological findings. Additionally, this section also contains contributions investigating volcanological hazards and environmental recovery.

The third part includes five articles focused on Structural Geology, Tectonics and Geodynamics, exploring the Meso-Cenozoic scenario from the western Mediterranean to the Iranian Makran, passing through the Balkans and Turkey.

Finally, the fourth part, with 18 contributions, is fully dedicated to the advancements in Petroleum and Energy Engineering and Petroleum Geology.

Although more than half of the inputs come from the Mediterranean region, many other countries around the globe also actively participated in contributing to this volume. This collection of studies is related to disciplines spanning from sedimentology and paleontology to structural geology and geodynamics, from petrology and mineralogy to volcanology, from geochemistry to ore geology and petroleum geology. Therefore, it could represent a privileged point of view for a better understanding of the Earth System.

The book is of interest to all researchers, practitioners and students in the abovementioned fields, presenting an updated complementary view on field studies, laboratory analyses and modeling aimed at better quantifying process-product binomials in geosciences.

Istanbul, Türkiye  
Mumbai, India  
Bari, Italy  
Kraków, Poland  
Gadong, Brunei  
Rome, Italy  
Benha, Egypt  
Halban, Oman  
July 2022

Attila Çiner  
Santanu Banerjee  
Federico Lucci  
Ahmed E. Radwan  
Afroz Ahmad Shah  
Domenico M. Doronzo  
Zakaria Hamimi  
Wilfried Bauer

---

## Contents

### **Sedimentology, Stratigraphy, Paleontology**

- Sedimentology and Depositional Facies Architecture of the Cenomanian Ain Tobi Formation, Nafusah Escarpment, NW Libya** ..... 3  
Mohamed Hamruni and Ibrahim Mriheel
- Distribution of Surface Sediments at the Bottom of Lake Ladoga** ..... 7  
Vladimir Anokhin, Dina Dudakova, Aleksey Aksenov, Mikhail Dudakov, and Anna Revunova
- Upper Pleistocene-Holocene Coastal Depositional Sediments of the Farwah Spit, NW Libya** ..... 11  
Ibrahim Mriheel and Mohamed Hamruni
- Study of the Oligocene Sediments in the SW Boundary of Les Avellanes Diapir (NE Spain)** ..... 15  
Gabriel Cofrade, Irene Cantarero, Òscar Gratacós, Anna Travé, Eduard Roca, and Oriol Ferrer
- Facies, Sedimentology, and Characterization of the Depositional Environments of the Lower Liassic (Lower Jurassic) Deposits from the Mohammedia–Benslimane–ElGara–Berrechid Basin (Moroccan Meseta)** ..... 19  
Ahmed Belqadi, Rachid Essamoud, Abdelkrim Afenzar, and Touria Hssaida
- Paleoecology, Paleoenvironment, and Petroleum Potential of middle-upper Cretaceous Calabar Flank Sediments, Southeastern Nigeria** ..... 25  
Moshood Olayiwola, Ernest Durugbo, Olugbenga Fajemila, Olaonipekun Oyebanjo, Adedotun Aderogba, Olufemi Olaleye-Otunla, and Adebayo Aderanti
- Post-oligocene Tectono-Eustatic Fluctuations and Their Influence on the Stratigraphy of Eastern Arabia: The Fars Group of the Batina Coast, Oman** ..... 31  
Osman Salad Hersi, Iftikhar Ahmed Abbasi, Abdulrazak Al-Sayigh, Musaab Al-Sarmi, Mohamed El-Ghali, and Tariq Al-Raisi
- New Time-Expanded Chronostratigraphic Column of Northern Iraq During Cretaceous and Tertiary** ..... 35  
Kamal Haji Karim
- Establishment of Geological Age Under the Constraints of Astronomical Cycles in Dongying Sag** ..... 41  
Xuwei Luan and Jinliang Zhang
- Well Log Sequence Stratigraphic Analysis of the Upper Carboniferous-Early Permian Haushi Group in South Oman** ..... 45  
Ibtisam Nasser Al-Kharusi, Mohamed A. K. El-Ghali, Iftikhar Ahmed Abbasi, and Aleksandar Ilic

<b>Sequence Stratigraphy and Chemostratigraphy Interpretations Based on Stable Isotope and Gamma Ray: An Example from the Early Triassic Lower Mahil Formation [Upper Khuff Outcrop Equivalent (KS1)], al Jabal Al-Akhdar, North Oman, Sultanate of Oman</b> . . . . .	49
Mohamed S. H. Moustafa, Mohamed A. K. El-Ghali, Rasha Al Raqaishi, Iftikhar Ahmed Abbasi, Hezam Al-Awah, Mohammed Farfour, Nada Al Ghafri, and Aaraf Al Humaidi	
<b>Spectral Gamma-Ray Variability Within Carbonate Lithofacies: An Example from the Early Triassic Lower Mahil Formation (Upper Khuff-Equivalent) of Al Jabal Al-Akhdar, North Oman</b> . . . . .	53
Mohamed S. H. Moustafa, Mohamed A. K. El-Ghali, Iftikhar Ahmed Abbasi, Hezam AL-Awah, Musaab Shakir Al Sarmi, Abdulrazak Al-Sayigh, Arshad Ali, Nada Al Ghafri, Araf Al Humaidi, and Rasha Al Raqaishi	
<b>Chemostratigraphy of a Mixed Upper Cretaceous Carbonate-Siliciclastic Succession (Southern Pyrenees): Geochemical Proxies for Sedimentological Interpretations</b> . . . . .	57
David Cruset, Mar Moragas, Enric Pascual-Cebrian, Ramon Mercedes-Martín, Anna Travé, and Jaume Vergés	
<b>Stratigraphy and Age of the Sahabi Formation, Libya</b> . . . . .	61
Moftah El Shawaihi, Ahmed Muftah, Raymond Bernor, and Noel Boaz	
<b>Early Pliocene Benthic Foraminifera of the Southeastern Coast of Cap Bon Peninsula (Northern Tunisia)</b> . . . . .	65
Syrine Ben Ali and Nadia Gaaloul	
<b>Geochemistry, Mineralogy, Petrology, Volcanology</b>	
<b>The Geochemistry of Biotite from TTG Batholiths and A-type Complexes (Silet Region, Hoggar, Algeria): A Marker of Geodynamic Evolution</b> . . . . .	73
Sarrah Mokaddem, Fatene Bechiri-Benmerzoug, Hamid Bechiri, Nicolas Rividi, and Bernard Bonin	
<b>U–Pb Age Dating for Carbonate Sequences: An Example from Late Neoproterozoic Kharus Formation, Al Jabal Al-Akhdar, Northern Oman</b> . . . . .	79
Mohamed A. K. El-Ghali, Osman Salad Hersi, Iftikhar Abbasi, Hezam Al-Awah, and Mohamed S. H. Moustafa	
<b>Diagenetic Alterations of the Outcropped Lower Triassic Mahil Formation (KS-1 Khuff-Equivalent) in the Oman Mountains, North Oman</b> . . . . .	83
Mohamed A. K. El-Ghali, Mohamed S. H. Moustafa, Iftikhar Ahmed Abbasi, Hezam Al-Awah, Musaab Shakir Al Sarmi, Arshad Ali, Abdulrazak Al-Sayigh, Rana Al Rab'ani, Basma Al Kindi, Najiya Al Subhi, and Sankaran Rajendran	
<b>Geochronologic Constraints on the Rubidium Deposit of Guiren Peak, Guangdong, China</b> . . . . .	87
Su Zhou, Ruizhao Qiu, Bingjing Xie, Lei Qiu, Cui Liu, and Dan Lin	
<b>Sandstone Petrography and Geochemistry of the Pre-albian Awi Formation, Calabar Flank, Southeast Nigeria</b> . . . . .	91
Emmanuel Etim Okon, Nse Udo Essien, Oluwaseye Peter Oyetade, Ebenezer Agayina Kudamnya, Ama Otele, and Betty Ikporukpo	

<b>Trace Element Geochemical Analysis and Depositional Environment of Lokoja-Basange Sandstone at Imiegba Area, Southwestern Nigeria</b> . . . . .	95
S. O. Obaje and B. Alli	
<b>Gold in Silicified Structures Related to the Quartz Diorite-Serpentinite Contact of Taghouni Prospect in the Bou Azzer Mining District (Central Anti-Atlas, Morocco)</b> . . . . .	101
Hamid Dani, Abdelhafid El Fels El Alaoui, Mustapha El Ghorfi, and Lhou Maacha	
<b>Geology and Geodynamic Setting of the Chadak Epithermal Au–Ag Deposit in Middle Tien Shan (Uzbekistan)</b> . . . . .	105
Bakhtiar Nurtaev and Svetlana Kirezidi	
<b>Fluid Evolution of the Fe-Zn Skarn Deposits in the Çiftahan (Ulukışla-Niğde) Area, South-Central Turkey</b> . . . . .	109
Emmanuel Daanoba Sunkari, Abdurrahman Lermi, and Yılmaz Demir	
<b>Effect of Different Basis Sets on the Theoretical Calculation of Zinc Isotope Fractionation of Zn Complexes</b> . . . . .	113
Yang Zhao and Yongbing Li	
<b>Lead Mineralization in Carbonate Rocks Jamrud, District Khyber, Pakistan</b> . . . . .	117
Asghar Ali, Sajid Ali, Salman Akbar, Aamir Azad, Aasim Danish, Rafique Ahmad, and Liaqat Ali	
<b>Microfaciological Characterization of Calcareous Crusts of Pleistocene Moghrebian Strata in the Coastal Basin of Tarfaya (Morocco): Paleoclimatic Implications</b> . . . . .	123
Fatima Jira and Abdallah Lakhouili	
<b>Chlorides' Concentration Assessment in the Waters of the Sila Massif (Calabria, Southern Italy)</b> . . . . .	129
Ilaria Guagliardi, Tommaso Caloiero, Ernesto Infusino, Simona Gaglioti, and Nicola Ricca	
<b>Geothermal Supply System for a Winery on a Volcanic Island (Lanzarote, Canary Islands)</b> . . . . .	133
Juan C. Santamarta, Giovanni Lemes Pacheco, Jesica Rodríguez-Martín, M <sup>a</sup> del Cristo Expósito, Alejandro García-Gil, and Noelia Cruz-Pérez	
<b>Origin of Çardak Tephra, SW Turkey</b> . . . . .	137
Rengin Özsoy, Erkan Aydar, and Orkun Ersoy	
<b>Distal Pyroclastic Current Deposits of the 79 AD Vesuvius Eruption on the Mountains Adjacent to the Campanian Plain</b> . . . . .	141
Ileana Santangelo, Claudio Scarpati, Annamaria Perrotta, Lorenzo Fedele, and Giulia Chiominto	
<b>Fallout Events During the Post-plinian Phase of the AD 79 Vesuvius Eruption</b> . . . . .	145
Giulia Chiominto, Claudio Scarpati, Annamaria Perrotta, Lorenzo Fedele, and Ileana Santangelo	
<b>The Composition of Fly Ash and Bottom Ash (FABA) from Indonesian Coal Power Plant: A Case Study from Batam</b> . . . . .	149
Iqbal Iqbal, Ferian Anggara, and Himawan Tri Bayu Murti Petrus	

<b>Forensic Fingerprinting of Biomarkers for the Geochemical Characterization of Oil Spills and Soil Contamination in the Coastal Area of Bizerte, Tunisia . . . .</b>	<b>155</b>
Cyrine Belhadj, Anis Belhaj Mohamed, and Noamen Rebai	
<b>Structural Geology, Tectonics, Geodynamics</b>	
<b>New Geochemical and Age Data on the Bajgan Complex (Makran Accretionary Prism, SE Iran): Implications for the Redefinition of Its Tectonic Setting of Formation from a Paleozoic Continental Basement to a Cretaceous Oceanic Domain . . . . .</b>	<b>163</b>
Eduardo Barbero, Morteza Delavari, Asghar Dolati, Antonio Langone, Luca Pandolfi, Michele Marroni, and Emilio Saccani	
<b>Tectonic-Diagenesis Interaction from Carbonate Veins Studies in Guelma Basin (Eastern Constantine Unit-Algeria) . . . . .</b>	<b>167</b>
Amira Ouddah, Abdelkader Khiari, and Badreddine Saadali	
<b>Possible Causes of the Late Cenozoic Global Activation of the Earth's Tectonomagmatic Processes . . . . .</b>	<b>171</b>
Evgenii Sharkov	
<b>New Tectonic and Topometric Evidence of Modern Transtensional Tectonics in the Low Nekor Basin (NE Morocco) . . . . .</b>	<b>175</b>
Morad Taher, Taoufik Mourabit, Ali Errahmouni, and Abdelhak Bourjila	
<b>The Mila 2020 Seismic Sequence in North-East Algeria: Seismotectonic Context and Geohazard Consequences . . . . .</b>	<b>179</b>
Yahia Mohammedi, Abdelkarim Yelles-Chaouche, and Seifeddine Adjiri	
<b>Petroleum and Energy Engineering, Petroleum Geology</b>	
<b>Overcoming the Crude Oil Emulsion Problem Through the Utilization of Organic Additive De-emulsifier from Olea Europaea: Effect of Additive Volume, Temperature, and Composition . . . . .</b>	<b>185</b>
Novrianti Novrianti, Idham Khalid, Sri Setia Ningsih, and Adi Novriansyah	
<b>A Practical Recipe to Reconstruct Fluid Composition from Limited Sample or Data . . . . .</b>	<b>189</b>
Abhijit Dandekar	
<b>Numerical Investigation of Wettability Alteration and Well Configuration Effects on Oil Recovery in Waterflooding Operations . . . . .</b>	<b>193</b>
Palang Moronke Guful and Serhat Canbolat	
<b>Well Deliverability Assessment of Libyan Near-Critical Gas Condensate Field . . . . .</b>	<b>197</b>
Raghd Gadrboh and Mohsen Khazam	
<b>Experimental and Visual Assessments of Artificially/Naturally Fractured Cores During Improved Oil Recovery . . . . .</b>	<b>201</b>
Serhat Canbolat	
<b>Optimization of Multi-stage Fracturing Cluster Space and Perforation Parameters of Deep Shale Horizontal Well . . . . .</b>	<b>205</b>
Jinbo Li, Suling Wang, and Kangxing Dong	

<b>Fracture Initiation Mechanism Study of Circulating Pump Injection Hydraulic Fracturing</b> . . . . .	209
Kangxing Dong, Annan Zhao, Suling Wang, Jinbo Li, and Wei Liu	
<b>Pseudopotential Method of Hydrocarbon Contacts Resolution in Reservoirs with Poor and Insufficient Pressure Data. Case Study of Feji Offshore Field, Eastern Niger Delta Basin (Nigeria)</b> . . . . .	217
Godwin Oboh, Eliseus Akpunonu, Solomon Okeke, Onochie Okafor, and Daniel Okolo	
<b>Thermodynamic and Kinetic Characterization of the Formation Process for Improving the CO<sub>2</sub> Capture Efficiency into Hydrates</b> . . . . .	223
Alberto Maria Gambelli and Federico Rossi	
<b>Numerical Assessment of CO<sub>2</sub>-Circulated Geothermal Production from a Closed Reservoir System</b> . . . . .	227
Mingjie Chen, Mohammad Mahdi Rajabi, Ali Al-Maktoumi, and Azizallah Izady	
<b>Efficiency Analysis of the European Oil Pipeline Systems Between 2007 and 2017</b> . . . . .	231
Corrado Io Storto	
<b>Assessment of Geological Risks in the Search for Oil and Gas Fields in the Eastern Arctic</b> . . . . .	235
Rustam Mamedov, Yulia Scherbina, and Maria Frolova	
<b>Geochemical Evidence of Deep Source Rocks—Adamantanes in Oils from the Absheron Archipelago, South Caspian Basin, Azerbaijan</b> . . . . .	239
Arzu Javadova and Galina Martinova	
<b>Geological Resources and Prospects of Oil- and Gas-Bearing Capacity of Low-Permeability Shale Strata of the Tersko-Caspian Basin</b> . . . . .	243
Vagif Kerimov, Rustam Mustaeiev, and Uliana Serikova	
<b>Results of Modeling the Hydrocarbon Systems of the Bering Sea</b> . . . . .	247
Elena Lavrenova, Sanan Guryanov, Vadim Kosyanov, and Vagif Kerimov	
<b>Integrated Technique on Static and Dynamic Properties Estimation: An Application of Probabilistic Neural Network and Seismic Inversion</b> . . . . .	251
Chukwuemeka Abbey, Chukwudi Meludu, Adetola Sunday Oniku, Abraham Sebastian, and Mohammed Aminu	
<b>Assessment of Geological Risks and the Probability of Discovering Oil and Gas Fields in the Bering Sea</b> . . . . .	255
Sanan Guryanov, Vagif Kerimov, and Vadim Kosyanov	
<b>Influence of Trap Magmatism on the Oil and Gas Potential of Sedimentary Deposits</b> . . . . .	259
Andrei Shilovskii	

---

## About the Editors



**Attila Çiner** is a sedimentology and Quaternary geology professor at the Eurasia Institute of Earth Sciences at Istanbul Technical University, Turkey. After graduating from the Middle East Technical University in Ankara (1985), he obtained his M.Sc. degree at the University of Toledo, USA (1988), and his Ph.D. at the University of Strasbourg, France (1992). He works on the tectono-sedimentary evolution of basins and Quaternary depositional systems such as moraines, fluvial terraces, alluvial fans, and deltas. He uses cosmogenic nuclides to date these deposits. He primarily focuses on the glacial deposits and landscapes and tries to understand paleoclimatic and paleoenvironmental changes since the Last Glacial Maximum. Lastly, he was part of the Turkish Antarctic Expedition. He spent two months working on the site recognition and decision of the future Turkish scientific research station to be implemented on the continent. He is the editor-in-chief of *Mediterranean Geoscience Reviews* and the chief editor of *Arabian Journal of Geosciences*, both published by Springer. He has published more than 100 peer-reviewed articles and chapters.



**Santanu Banerjee** currently works as a professor at the Department of Earth Sciences, Indian Institute of Technology Bombay. He does research in sedimentology and petroleum geology. His research areas include authigenic iron silicates, microbially induced sedimentary structures, basin analysis, provenance interpretations and alternate potash fertilizer. He is on the editorial board of *Journal of Palaeogeography*, *Minerals*, *Arabian Journal of Geosciences* and *Journal of Earth Systems Science*. He has published more than 150 papers in SCI-indexed journals, which have received more than 5000 citations.



**Federico Lucci** holds a B.Sc. in Earth Sciences (2004), an M.Sc. in Earth Sciences (2006) and a Ph.D. degree in Earth Sciences (2010) from Università degli Studi Roma Tre (Italy). Since February 2022, He is a researcher (RTDb) of petrography and petrology at the University of Bari, where he is dealing with the teaching course petrography of metamorphic rocks. His research is focused on modeling and timing of magmatic complexes as key constraint for understanding regional tectonics and geodynamic scenarios, through a multidisciplinary approach that integrates field survey, rock fabric characterization, mineral chemistry, geochemistry, geochronology, inverse and forward thermobarometry and FC-AFC-mixing modeling.



**Dr. Ahmed E. Radwan** is an adjunct professor at the Institute of Geological Sciences of the Jagiellonian University (Poland). He has academic and industrial experience, since he obtained his Ph.D. in geophysics at Sohag University, Egypt, besides his proficient work in the oil and gas industry as the department head at the exploration department of the Gulf of Suez petroleum company (Gupco), Egypt. As a postdoctoral research scientist, he attended Innsbruck University in Austria in 2019. In 2020, he joined the Jagiellonian University in Poland. Despite his youth, he has received numerous awards from international organizations such as the International Union of Geological Sciences (IUGS), the Geochemical Society (GS), the Clay Minerals Society (CMS), the Austrian Forschungsgemeinschaft (FG), the Narodowa Agencja Wymiany Akademickiej (NAWA), the Austrian Federal Ministry of Education, Science, and Research (BMBWF) and petroleum companies. He has authored more than 90 papers in highly indexed international peer-reviewed journals, published four chapters and presented at numerous international conferences. He is an associate editor in *Asian Earth Sciences*, *Marine and Petroleum Geology*, *Geoenergy Sciences and Engineering*, *Petroleum Exploration and Production Technology*, the *Geological Journal*, *Energy Geosciences and Petroleum Research*, in addition to being an editorial board member of *Unconventional Resources*. He is a book reviewer and a research article reviewer for several publishers and journals, and he organizes many special issues in different journals with the leading publishers. His research interests focused on multidisciplinary research integrating geosciences (geophysics, geochemistry and geology), petroleum engineering and reservoir engineering, as follows: (1) Geology areas include petroleum geology, reservoir characterization, sedimentology, facies analysis, depositional environment, diagenesis, paleoenvironment interpretations, subsurface analysis, basin analysis, reservoir quality, fluid flow, fractures, formation evaluation and unconventional and conventional resources; (2) petroleum engineering (petroleum geomechanics, drilling, fluids and casing design); (3) reservoir engineering (reservoir geology and geophysics, reservoir damage, production optimization, water



flooding, stimulations, fluid flow and enhanced recovery); (4) the geophysics fields of study (ex. formation evaluation, petrophysics, borehole geophysics and rock typing); (5) geochemistry fields of study include geochemical characterization, basin modeling, petroleum systems and isotope analysis; (6) petroleum geomechanics (pore pressure, wellbore stability, in situ stress orientation and magnitudes); (7) machine learning applications in the energy industry; (8) energy storage.



**Afroz Ahmad Shah** is an assistant professor of Structural Geology at the Department of Geosciences, Universiti of Brunei Darussalam (UBD). He completed Ph.D. at James Cook University, Australia, in 2010, a postdoctorate at Earth Observatory of Singapore in 2013 and joined his first academic job as a senior lecturer of Structural Geology at Curtin Sarawak, Miri, Malaysia, before joining UBD. His research mainly involves the brittle deformation of lithospheric plates, focusing on earthquake-causing faults in South and Southeast Asia. It also includes floods, landslides and land subsidence hazards. He works on earthquake science education and outreach and frequently writes in newspapers, magazines and blogs.



**Dr. Domenico M. Doronzo** holds a B.Sc., a M.Sc. and a Ph.D. degrees in Earth Sciences from Università degli Studi di Bari Aldo Moro, Italy. Investigation specialties related to those degrees are physical volcanology, experimental and computational fluid dynamics, petrology and natural hazards. Then, he has worked in volcanology and sedimentology, fluid dynamics and combustion, environmental sciences and rock physics in the USA, Mexico, Spain and Italy. Currently, he is a contract researcher at Istituto Nazionale di Geofisica e Vulcanologia, Italy. Particularly, he has received the Rittmann Medal from Associazione Italiana di Vulcanologia and Istituto Nazionale di Geofisica e Vulcanologia, which is assigned to the best young Italian volcanologist. His research interests focus on integrating theory, field measurements, numerical modeling, laboratory and outdoor experiments to study geological processes and products in volcanic areas (Vesuvio, Campi Flegrei, Etna, Vulcano, Colli Albani, Tenerife, Altiplano Puna, Colima) from fluid dynamic and natural hazard perspectives. He studies specifically pyroclastic energy currents, pre-eruption conditions, ground deformations, eruption forecasting, lahars and debris flows, flow-building interactions, sand and dust storms, turbidity currents, man-made environmental phenomena and geo-resources. Recently, he has published the first comprehensive review on the famous 79 CE “Pompeii” Plinian eruption of Vesuvius by means of a multidisciplinary approach in volcanology. He is a chief editor of the *Arabian Journal of Geosciences* responsible for evaluating submissions in the fields of Geochemistry, Mineralogy, Petrology and Volcanology.