



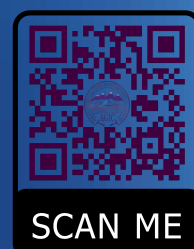
# AGIC 5

## “Conference Program Book 5th Atlas Georesources International Congress”

### **Geosciences and Water Security Challenges under Climate Change**

**November 8-10, 2024**


**Hammamet, Tunisia**




SCAN ME



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# WELCOME MESSAGE

**Dear Esteemed Guests, Colleagues and friends,**

On behalf of the **AGIC5** Organizing committee, I am delighted to welcome you to the 5th Atlas Georesources International Congress (AGIC5) which held from 8th November to 10th November 2024 in Hammamet, Tunisia. This 5th Edition of AGIC focuses on serious water challenges facing Tunisia and Mediterrean region. It will cover a wide range of research fields of research from the resource exploration to the application of innovative technologies for monitoring and treatment.

Since its first edition in 2017, AGIC has become an important scientific event. This symposium provided an opportunity for water stakeholders including researchers, experts, Industrials, policymakers to exchange knowledge, share best practices and present the latest results related to water resources.

This edition of the conference has the overall theme "Geosciences and Water Security Challenges under Climate Change" and its main sub-themes of :

- Groundwater management and Surface water monitoring and Groundwater recharge
- Climate change and water
- Water treatment and reuse of non-conventional water
- Pollutant control and Water quality assessment
- GIS, Remote sensing, and IA applied to water resource
- Hydro-Hazards and Early warning system
- Geological Modeling and Resources Exploration

**AGIC5** program included plenary sessions, followed by parallel sessions focused on the main sub-themes of congress. Special sessions will also bring together experts to discuss and find solutions to key water challenges facing society and the environment.

In addition, the poster sessions will offer students and young researchers the opportunity to present their latest findings. A student poster award will also be given to recognize outstanding research contributions.

Last but not least, I would like to express my gratitude to the four co-chairs for their excellent coordination. I also want to thank the volunteers from the organizing committee, the scientific coordinators and reviewers for their valuable work to select outstanding presentations. Finally, I would like also to thank all partners for their support.

**Enjoy the AGIC5**  
**Prof. Ammar MLAYAH**  
**Water Research and Technologies Center (CERTE)**  
**Chairman AGIC5**

**AGIC5**

5th Atlas Georesources International Congress  
Hammamet, Tunisia, November 8-10, 2024



**Water Research and Technologies Center, Borj Cedria (CERTE)**



**Laboratory of Georesources (LGR)**



**Tunisian Association of Georesources (ATGr)**



**Ministry of Higher Education and Scientific Research (MHESR)**



**General Directorate of Scientific Research (DG-RS)**

وزارة التعليم العالي  
والبحوث العلمية

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**Ecole de l'Aviation de Borj EL Amri (EABA)**



**Sustainable water reuse practices improving safety in agriculture, food and environment – SAFE, PRIMA**



**Euro-Mediterranean Journal for Environmental Integration Journal (EMJEI), Springer Nature**



**Tunis International Center for Digital Cultural Economy**



**Geophysics and Geosciences Network (GGN)**



**Centre de Biotechnologie de Borj-Cédria**



**Société Tunisienne d'Electricité et de Gaz (STEG)**



**AGIC5**

5th Atlas Georesources International Congress  
Hammamet, Tunisia, November 8-10, 2024

**Société Tunisienne de l'Electricité et du Gaz (STEG)**

**Centre National de la Cartographie et de la Télédétection (CNCT)**

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Prof. Ammar Mlayah, CERTE

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Dr. Mohamed Dhaoui, CERTE  
Dr. Mohamed Kefi, CERTE  
Dr. Mourad El Koundi, EABA

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## Members

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Prof. Hakim Gabtni, CERTE  
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Dr. Fethi Lachaal, CERTE  
Dr. Ahlem Amri, CERTE  
Dr. Nesrine Ouchir, CERTE  
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Mrs Kaouther Bargaoui, UIDS-CERTE  
Dr. Imen Oueslati, CBBC  
Dr. Mouez Gouasmia, FSGf

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# AGIC5 Sessions Coordinators

Groundwater management and surface water monitoring and Groundwater recharge		
Dr. Faten Jarraya- Horriche CERTE/IAH	Dr. Fayrouz Slama ENIT / IAH	Prof. Joanna Doummar American University of Beirut, Lebanon / IAH
Climate change and water		
Dr. Haykel Sallemi CERTE		
Water treatment and reuse of non-conventional water		
Prof. Marc Heran University of Montpellier, France	Dr. Feyda Srarfi FST, University El Manar	
Pollutant control and Water quality assessment		
Dr. Taissire Ben Amor CERTE	Dr. Kawther Ben Mabrouk CERTE	
GIS, Remote sensing, and IA applied to water resource		
Prof. Imed Riadh Farah MSE, University of Manouba	Dr. Mourad EL Koundi EABA	Dr. Ahmed Ezzine CNCT
Hydro-Hazards and Early warning system		
Mrs Thouraya Sahli Chahed CNCT		
Geological Modeling and Resources Exploration		
Prof. Hayet Chihi CERTE		

## Special Sessions Coordinators

Treasure Network Event : REUSE opportunities through Treasure Network		
Prof. Jérôme Harmand, INRAE		
Geophysics and Geosciences Network (GGN) Event : 1 <sup>st</sup> Geosciences and Environment Interdisciplinary Meetings		
Dr. Mohamed Dhaoui CERTE	Dr. Mourad El Koundi EABA	
SAFE Event : Bridging the gap between science and society : Towards a sustainable water resources management in Cap Bon region, NE Tunisia		
Dr. Samia Khadhar CERTE	Dr. Anis Chkirbene INAT	Eng. Ali Ben Ammar CRDA Nabeul

# Members / Reviewers

	Reviewer Name	Affiliation
Prof	Abdelaziz Mridekh	Université Ibn Tofail, Morocco
Dr	Abdelaziz Sbaai	FST, Université Tunis El Manar
Dr	Abdelhamid Ben Salem	ETAP
Dr	Adel Kharroubi	ISSTEGb, University of Gabes
Prof	Amina Mabrouk	FST, University Tunis El Manar
Dr	Asma Abdedayem	CERTE
Dr	Badra El Abed	CERTE
Dr	Belgacem Akoubi	ISSTEGb, University of Gabes
Dr	Chafai Azri	FSS, University of Sfax
Dr	Dat Pham	Macquarie University, Australia
Dr	Fadoua Hamzaoui	FST, Université Tunis El Manar
Dr	Fairouz Slama	ENIT
Dr	Faten Jarraya-Horriche	CERTE
Dr	Fatma Trabelsi	ESIM
Dr	Feyda Srarfi	FST, University of Tunis El Manar
Dr	Habib Abida	FSS, University of Sfax
Prof	Hayet Chihi	CERTE
Dr	Haykel Sellami	CERTE
Dr	Houda Zendah	CERTE
Dr	Imen Dridi	FST, Université Tunis El Manar
Dr	Kawther Ben Mabrouk	CERTE
Dr	Lamine Hamai	CRAAG Alegria
Prof	Mabrouk Boughdiri	FSB, University of Carthage
Prof	Marc Heran	Montpellier University, France
Dr	Maroua Bouteffeha	LMHE - ENIT
Dr	Mohamed El Bouhaddioui	ENIM Morocco
Prof	Mohamed Gasmi	FSB, University of Carthage
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Dr	Narjess Eleuch	FST, Université Tunis El Manar
Dr	Nesrine Ghouili	LGR CERTE/UGPO
Dr	Nesrine Kalboussi	CERTE
Dr	Nesrine Kamoun	CERTE
Dr	Nesrine Nasri	ISTEUB/LMHE
Dr	Noureddien Hamdi	ISSTEGb, University of Gabes
Dr	Rachid Boukhchina	ISSTEGb, University of Gabes
Dr	Riahi Sami	FST, University of Tunis El Manar
Dr	Rim Ben Amor	FST, Université Tunis El Manar
Prof	Salem Bouri	FSS, University of Sfax
Dr	Samira Melki	CERTE
Dr	Sonia Gannouni	CERTE
Dr	Soumaya Hajji	FST, Université Tunis El Manar
Dr	Taissire Ben Amor	CERTE
Prof	Jérôme Harmand	INRAE, France
Dr	Yudi Setiawan	Center for Environmental Research, IPB University, Indonesia

Day 1 : Friday 8 November 2024				
13 : 00 – 14 : 00	Registration desk Open			
14:00 – 14 :30	Opening Ceremony Welcome Address by Conference Chairs Official Opening of AGIC5			
14:30 – 16:00	Plenary Lectures			
16:00 – 16:30	Break			
Parallel Sessions I				
16:30 – 18:00	Room 1	Room 2		
	SubS1 : Groundwater management and surface water monitoring and Groundwater Recharge	SubS1 : GIS, Remote sensing, and IA applied to water resource		
18:00-19:00	Workshop : How to write a Scientific paper ?			
Day 2 : Saturday 9 November 2024				
8:30 – 12:00	Registration desk Open			
8:30 – 9:30	Plenary Lectures			
Parallel Sessions II				
Time	Room 1	Room 2	Room 3	Room 4
9:30 – 11:00	SubS1 : Geological modeling for resources exploration	SubS1 : Pollutant control and Water quality assessment	GGN Event (I) 1 <sup>st</sup> Geosciences and Environment Interdisciplinary Meetings	SAFE Event (I) Bridging the gap between science and society
Parallel Sessions III				
Time	Room 1	Room 2	Room 3	Room 4
11:30 – 13:00	Climate change and water	Treasure Network Event REUSE opportunities through Treasure Network	GGN Event (II) 1 <sup>st</sup> Geosciences and Environment Interdisciplinary Meetings	SAFE Event (II) Bridging the gap between science and society
13:00- 14:00	Lunch			
Parallel Sessions IV				
Time	Room 1	Room 2	Room 3	
14:00 – 15:45	SubS2 : Geological modeling for resources exploration	Water treatment and reuse of non-conventional water	GGN Event (III) 1 <sup>st</sup> Geosciences and Environment Interdisciplinary Meetings	
15:45 – 16:15	Break + Poster viewing			
	Room 1& Room 2			Room 3
16:15 – 18:00	Poster Contest / Lighting talk			GGN Event (IV) 1 <sup>st</sup> Geosciences and Environment Interdisciplinary Meetings
Day 3 : Sunday 10 November 2024				
8:30 – 10:00	Registration desk Open			
8:30 – 9:30	Plenary Lectures			
Parallel Sessions V				
Time	Room 1	Room 2	Room 3	
9:30 – 11:00	SubS2 : Groundwater management and surface water monitoring and Groundwater Recharge	SubS2 : GIS, Remote sensing, and IA applied to water resource	SubS2 : Pollutant control and Water quality assessment	
11:00 – 11:30	Break			
11:30 – 13:00	Closing Ceremony Session reports by coordinators / Global Discussion / Poster Awards / Closing remarks			
13:00 – 14:30	Lunch			

# CONFERENCE PROGRAM DAY 1

Day 1 : Friday, November 8 <sup>th</sup> , 2024		
13:00 – 14:00	AGIC5 Registration Opening	
OPENING CEREMONY		
Masters of Ceremony : Dr. Mohamed Kefi & Dr. Samia Khadhar		
Venue : Room 1		
14:00 – 14:30	<p>Welcome Address</p> <ul style="list-style-type: none"><li>- <b>Prof. Ammar Mlayah</b>, Chairman AGIC5, CERTE</li></ul> <p>Official Opening of AGIC5</p> <ul style="list-style-type: none"><li>- <b>Prof. Hakim Gabtni</b>, General Director, CERTE</li><li>- Representative from Ministry of Higher Education and Scientific Research (MHESR)</li><li>- Representative from Ministry of Agriculture, Hydraulic Resources and Fisheries</li></ul>	
PLENARY LECTURES		
14:30 – 16:00	<p>Water Scarcity: Current situation and Prospects <b>Ing. Ridha Gabouj, Water Expert and former Secretary of State in charge of water resources, MARHP</b></p> <p>Strategic priorities of the water risk in the mediterranean region <b>Dr. Raoudha Gafrej, Water Expert, Univers de l'Eau, IME</b></p> <p>Groundwater exploitation in the Anthropocene, Day Zero and scientific pathways to water security for Tunisia <b>Prof. Hakim Gabtni, CERTE, Tunisia</b></p>	
Group Photo		
16:00 – 16:30	Break	
Parallel Sessions I		
	Room 1	Room 2
16:30 – 18:00	<p><b>SubS1</b> : Groundwater management and surface water monitoring and Groundwater Recharge</p> <p><b>Chairs : Prof. Mlayah &amp; Dr. Jarraya-Horriche</b></p>	<p><b>SubS1</b> : GIS, Remote sensing, and IA applied to water resource</p> <p><b>Chairs : Prof. Riadh Farah &amp; Prof. Ben Abdallah</b></p>
18:00-19:00	Room 3	
	<p><b>Workshop</b> : How to write a Scientific paper ?</p> <p><b>Prof. Mohamed Ksibi ISBS / Editor-in-Chief</b></p> <p><b>Euro-Mediterranean Journal for Environmental Integration (EMJEI)</b></p>	



## SubS1 : Groundwater management and surface water monitoring and Groundwater Recharge

Chairs : Prof. Ammar Mlayah & Dr. Feten Jarraya-Horriche

Venue : Room 1

- |               |   |
|---------------|---|
| 16:30 – 16:45 | Fractures analysis in the Takelsa basin (Northeastern Tunisia) using field data and automatic extraction for groundwater investigation<br><b>Sabra Dhouioui</b> |
| 16:45 – 17:00 | Recharge Mapping and water availability analysis for the Zaghouan Karst aquifer (Northeastern Tunisia)<br><b>Fairouz Slama</b>                                  |
| 17:00 – 17:15 | Groundwater recharge estimation for Mornag aquifer using SWB code<br><b>Nesrine Ghouili</b>   |
| 17:15 – 17:30 | Precise delimitation of the 'SASS' reservoirs (Southern Tunisia). Well logging contributions<br><b>Rafika Ben Lasmar</b>  |
| 17:30 – 17:45 | Hydrochemical and geophysical study of the spatial extent of marine intrusion in the Oualidia coastal aquifer, Morocco<br><b>Sadik Youssef</b>                  |
| 17:45 – 18:00 | Analyzing the Hydrodynamic Patterns of Zaghouan's Karst Springs: A Comparative Evaluation of ANN Models Using Historical Data<br><b>Emna Gargouri-Ellouze</b>   |

## SubS1 : GIS, Remote sensing, and IA applied to water resource

Chairs: Prof. Imed Riadh Farah & Prof. Siham Ben Abdallah

Venue : Room 2

- |               |   |
|---------------|---|
| 16:30 – 16:45 | Big Data and Deep Learning for Water Loss Detection Using Multiple Sensors<br><b>Yassine Gacha</b>  |
| 16:45 – 17:00 | Enhancing Satellite and Aerial Images: Advances in Spatial and Spectral Super Resolution Techniques<br><b>Mohamed Aymen Ben Khalifa</b>   |
| 17:00 – 17:15 | Digital Twins for Africa: Exploring Foundational Concepts, Modern Technologies Integration, Application Landscape, Development Challenges, and Strategies<br><b>Mohamed Chahine Bouaziz</b> |
| 17:15 – 17:30 | Mapping of storage sites for olive mill wastewaters: A combined approach using AHP and machine learning<br><b>Bilel Soussi</b>  |
| 17:30 – 17:45 | Advancements in Lithological Mapping: A Review of Machine Learning Algorithms and Remote Sensing Data<br><b>Ilyes Salhi</b>   |
| 17:45 – 18:00 | Big geospatial data in favour of smart and sustainable cities :Use case: Real-Time Road Monitoring and Accident Detection Platform for Smart Cities<br><b>Hazem Ben Abderrahmen</b>         |

Day 2 : Saturday, November 9 <sup>th</sup> , 2024				
8:30 –12:00	Registration of Participants			
Plenary Lectures				
Moderator :Prof. Ammar Mlayah, CERTE				
Venue : Room 1				
8:30 – 9:30	Contaminants risks assessment for a safe expansion of reclaimed wastewater reuse and paths for mitigation Prof. Serge Chiron, IRD, France Raman Spectroscopy for environmental analysis and monitoring Prof. Jean-Francois Bardeau, CNRS, France			
Parallel Session II				
	Room 1	Room 2	Room 3	Room 4
9:30 – 11:00	SubS1 : Geological modeling for Resources exploration Chairs : Prof. Chihi & Dr. Jrad	SubS1 : Pollutant control and Water quality assessment Chairs : Prof. Bardeau &Dr. Ben Mabrouk	GGN Event (I) 1 <sup>st</sup> Geosciences and Environment Interdisciplinary Meetings	SAFE Event (I) Bridging the gap between science and society Chairs : Dr. Khadhar & Ing. Ammar
11:00 – 11:30	Break			
Parallel Session III				
	Room 1	Room 2	Room 3	Room 4
11:30 – 13:00	Climate change and water Chairs : Dr. Sallemi & Dr. Chargui	Treasure Network Event REUSE opportunities through Treasure Chair : Prof. Harmand	GGN Event (II) 1 <sup>st</sup> Geosciences and Environment Interdisciplinary Meetings	SAFE Event (II) Bridging the gap between science and society Chairs : Dr. Khadhar & Dr. Chkirbene
13:00 – 14:00	Lunch			

Scientific Program / Parallel Sessions II

SubS1 : Geological modeling for Resources exploration  
Chairs : Prof. Hayet Chihi & Dr. Abir Jrad      Venue : Room 1

Geological modeling and conceptual thinking

- 9:30 – 9:45      3D Geological modeling of multilayered Aquifer Systems  
Mohamed Amin Hammami
- 9:45 – 10:00      Comparative Hydrogeological Assessment of Late Cretaceous and Early Eocene Carbonate Aquifers in the Mateur-Hedil region  
Sourour El Gattoussi
- 10:00 – 10:15      Geodynamic Study and Petroleum Interest of the Lower Cretaceous in the EL Kef Region (NW Tunisia)  
Mohamed Hassen Jebabli

Georesources Characterization and Geophysical Analysis

- 10:15 – 10:30      Advancing Mineral Resource Characterization through Geomodeling and Gravimetry  
Selim Braham
- 10:30 – 10:45      Gravity analysis of the Northeastern Atlas of Tunisia  
Nouri Ons
- 10:45 – 11:00      Decoding the Soliman Coastal subsurface geometry structure (Tunisia, Mediterranean area): Gravity VS Seismic Data Analysis  
Sana Ayari

SubS1 : Pollutant control and Water quality assessment  
Chairs: Prof. Jean-Francois Bardeau & Dr. Kawther Ben Mabrouk      Venue : Room 2

Water Pollution Monitoring

- 9:30 – 9:45      Monitoring, evaluation and improvement of tap water quality  
Emna Melliti
- 9:45 – 10:00      Assessment of Microplastics in Tap Water: Insights from the Ben Arous Governorate, Tunisia  
Tesnim Ben Mbarek
- 10:00 – 10:15      Emerging Contaminants in Surface Waters of the Monastir Coast: Implications for Aquatic Ecosystems and Human Health  
Nouha Khiari

Soil contamination (sources and effects)

- 10:15 – 10:30      CO2 Emissions from Soils Fertilized with Arable Crop Wastes Pre-treated by Anaerobic Digestion and Pyrolysis  
Zeineb Louati
- 10:30 – 10:45      Effect of sewage sludge and municipal solid waste biochars on the physicochemical and biological properties of a sandy soil  
Amani Haddouk
- 10:45 – 11:00      Sediment Contamination Patterns in Tabarka's Coastal Ecosystem, Northwestern Tunisia: An Integrative Analysis of Trace Metals and Nutrient Loading Dynamics  
Maissa Naouar

# CONFERENCE PROGRAM DAY 2

## GGN Event (I) : 1<sup>st</sup> Geosciences and Environment Interdisciplinary Meetings 1<sup>st</sup> Session : GIS, Remote sensing, and IA for Geosciences (CNCT)

**Chairs : Pr. Ahmed Siala & Dr. Thouraya Sahli**

**Venue: Room 3**

- |               |   |
|---------------|---|
| 9:30 – 9:40   | Les contrats programmes de recherche au CNCT: Etat et perspectives<br><b>Thouraya Sahli</b> |
| 9:40 – 10:00  | The Smart City project<br><b>Haythem Smail</b>  |
| 10:00 – 10:20 | The REMINT project<br><b>Ahmed Ezzine</b>   |
| 10:20 – 10:40 | The Sol project<br><b>Hosni Trabelsi</b>  |
| 10:40 – 11:00 | Projet REMINT<br><b>Wafa Talhaoui</b>   |

## SAFE Event (I) : Bridging the gap between science and society

**Chairs : Dr. Samia Khadhar & Ing. Ali Ammar**

**Venue: Room 4**

- |               |  |
|---------------|--|
| 9:30 – 10:00  | Water resources in Cap Bon: diagnostic, challenges and needs for research support<br><b>Ali Ammar, CRDA Nabeul</b>   |
| 10:00 – 10:30 | Advancing Managed Aquifer Recharge (MAR) through agreements: key insights from the AGREEMAR project implementation in Cap Bon, NE Tunisia<br><b>Anis Chkirbene, INAT</b> |
| 10:30 – 11:00 | Impact of Irrigation with Treated Wastewater on Agricultural Soils: Challenges and Perspectives<br><b>Nouha Khiari, CERTE</b>  |

**AGIC5**

5th Atlas Georesources International Congress  
Hammamet, Tunisia, November 8-10, 2024

## Day 2 : Saturday, November 9<sup>th</sup>, 2024

### Scientific Program / Parallel Sessions III

#### Climate Change and Water

**Chairs : Dr. Haykel Sallemi & Dr. Sameh Chargui & Dr. Samira Melki**

**Venue : Room 1**

- |               |   |
|---------------|---|
| 11:30 – 11:45 | Time propagation from meteorological to hydrological drought<br><b>Majdi Chargui</b>  |
| 11:45 – 12:00 | Hydrological and meteorological drought characterization in Lebna and Oued el Bey Basins, Cap Bon, Tunisia<br><b>Malek Drissi</b>                             |
| 12:00 – 12:15 | Comparison of High-Resolution Satellite Precipitation Products and a Reanalysis in a Semi-Arid Region<br><b>Ines Gharnouki</b>                                |
| 12:15 – 12:30 | Impact of Land Use Change on the Hydrological Response: Two Cases Study in Tunisia<br><b>Sihem Ben Abdallah</b>   |
| 12:30 – 12:45 | Projections of cereal production in Tunisia under climate change<br><b>Firas Tibaoui</b>  |
| 12:45 – 13:00 | COMSOL Multiphysics Model Applied to Simulate Soil Water and Salt Content in the El Haouareb Irrigated Area - Central Tunisia<br><b>Emna Abdenmour</b>        |
| 13:00 – 13:15 | Impact of climate change on areas vulnerable to water erosion (case of the boulajraf watershed, Morocco)<br><b>Houda Ousbouane Bakioui &amp; Jamal Naoura</b> |

#### Treasure Network Event : REUSE opportunities through Treasure

**Chairs : Prof. Jérôme Harmand**

**Venue : Room 2**

- |               |  |
|---------------|--|
| 11:30 – 11:45 | The Euromed TREASURE research network and its extensions<br><b>Jérôme Harmand</b>  |
| 11:45 – 12:00 | UNESCO Chair project DEF - Waste, Water, Energy<br><b>Nihel Ben Amar</b>   |
| 12:00 – 12:15 | On some Anaerobic Digestion models: Mathematical Approaches, and Applications<br><b>Nahla Abdellatif</b>                   |
| 12:15 – 12:30 | Model-Based Optimization of Fertirrigation with Treated Wastewater for Sustainable Agriculture<br><b>Nesrine Kalboussi</b> |
| 12:30 – 12:45 | Modeling and parameter identification of bioprocesses in bioreactors<br><b>Radhouane Fekih-Salem</b>                       |
| 12:45 – 13:00 | Modelisation and optimal control of membrane filtration system<br><b>Fatma Ellouze</b>                                     |

## GGN Event (II) : 1<sup>st</sup> Geosciences and Environment Interdisciplinary Meetings 2<sup>nd</sup> session : Geosciences Projects

**Chairs : Pr. Noamen Rebai & Pr. Olfa Hentati**

**Venue: Room 3**

11:30 – 11:50	Overview of the Horizon Europe Programme: Focus on Marie Skłodowska-Curie Actions (MSCA) <b>Mohamed Kefi</b>
11:50 – 12:15	A Decade of the Euro-Mediterranean Journal for Environmental Integration (EMJEI): Achievements, Stability, and Future Horizons <b>Mohamed Ksibi</b>
12:15 – 12:30	Geographical information system of soil resources in Tunisia (SIGREST 2020-2023) <b>Amal Matoussi</b>
12:30 – 12:45	SmartSDGTunisia: Leveraging AI and Machine Learning for Sustainable Development and Environmental Monitoring in Tunisia <b>Hanen Balti</b>
12:45 – 13:00	Presentation of an Innovative Project: Soil Health and Agriculture Resilience through an Integrated Geographical information systems of Mediterranean Drylands (SHARInG-MeD) <b>Asma Yahyaoui</b>

## SAFE Event (II) : Bridging the gap between science and society

**Chairs : Dr. Samia Khadhar & Dr. Anis Chkirbene**

**Venue: Room 4**

11:30 – 12:00	Towards a sustainable groundwater resources management in Grombalia region (Cap Bon) through hydrogeological modeling <b>Jalel Rebhi &amp; Ali Taabouri, CRDA Nabeul</b>
12:00 – 12:30	Characterization of anthropogenic impacts in Mediterranean intermittent rivers with chemical, ecological and hydrological indicators <b>Samia Khadhar, CERTE</b>
12:30 – 13:00	AGREEMed: Innovative Aquifers Governance for Resilient Water Management and Sustainable Ecosystems in Stressed Mediterranean Agricultural Areas <b>Khawla Masmoudi Jabri</b>

**Day 2 : Saturday, November 9<sup>th</sup>, 2024**

**Scientific Program / Parallel Sessions IV**

Parallel Sessions IV			
Time	Room 1	Room 2	Room 3
14:00 – 15:45	SubS2 : Geological modeling for resources exploration Chairs : Prof. Boughdiri & Dr. Mzali	Water treatment and reuse of non-conventional water Chairs : Dr. Srarfi & Dr. Khadhar	<b>GGN Event (III)</b> 1 <sup>st</sup> Geosciences and Environment Interdisciplinary Meetings
15:45 – 16:15	Break + Poster viewing		
	Room 1	Room 2	Room 3
16:15 – 18:00	Poster Contest/Lighting talk		<b>GGN Event (IV)</b> 1 <sup>st</sup> Geosciences and Environment Interdisciplinary Meetings
	Chairs : Dr. Khadhar Dr. Lachaal and Dr. Kalboussi "GR, WTR,PC, Geo"	Chairs : Prof Rebai, Dr. Azaiez and Cln Smail. "GRS, CC, HH, GEIM"	

**Scientific Program / Parallel Sessions IV**

<b>SubS2 : Geological modeling for resources exploration</b>		
Chairs : Prof. Mabrouk Boughdiri & Dr. Housseem Mzali	Venue : Room 1	

**Stratigraphy, Biozonation, and Geodynamics**

14:00 – 14:15	Mathematical modeling of Upper Tithonian Calpionellids (Protozoa, incertae sedis): the genus Crassicollaria as a key marker for updated stratigraphy and phyletic reconstructions <b>Ichrak Cherif</b>
14:15 – 14:30	Updated biozonation and correlations of Upper Barremian-Middle Albian successions from NE Tunisia (Zaghouan area): regional geodynamic implications <b>Abdallah El Khazri</b>

**Environmental and Soil Impact Studies**

14:30 – 14:45	Sedimentological assessment of the Water Table Vulnerability to Pollution by Olive Oil Mill Wastewater, Oued Laya, Sousse area, Eastern Tunisia <b>Mouna Frigui</b>
14:45 – 15:00	Modeling Soil Water Retention in Plastic Clays under Cyclic Wetting and Drying <b>Samia Rafraf</b>
15:00 – 15:15	Storage of phosphogypsum in clayey soils: geotechnical and mechanical impact <b>Ines Benaoun</b>

**Geological Applications and Conservation**

15:15 – 15:30	Characterization and assessment of stone deterioration on Antonin's baths ruins in CARTHAGE <b>Aroua Mannai</b>
15:30 – 15:45	Use of Tunisian Clay and Spent Bleaching Earth in the Manufacture of Lightweight Aggregates <b>Amira Cherif</b>

## Scientific Program / Parallel Sessions IV

Water Treatment and Reuse of Non-conventional Water	
Chairs : Dr. Feyda Srarfi & Dr. Samia Khadhar	
Venue: Room 2	
14:00 – 14:15	Synthetic and textile wastewater based cationic dye treatment using local iron tailing waste <b>Oumaima Grine</b>
14:15 – 14:30	Phosphate sludge-metakaolin foamed geopolymers and their application in dye removal <b>Oumaima Karoui</b>
14:30 – 14:45	Green synthesis of zinc oxide nanoparticles using Albizia procera leaf extract: Degradation of methylene blue dye via Advanced Oxidation Process and Box–Behnken Design <b>Hajer Chemingui</b>
14:45 – 15:00	Enhanced Water Reuse for Irrigation: Synergy of Macrophytes and AOP in Urban Wastewater Treatment <b>Feriel Araibi</b>
15:00 – 15:15	Enhanced Photocatalytic Degradation Activity of Amido Black Dye by Electrodeposition of BiVO4 nanostructures on TiO2 nanotubes <b>Kawther Ben Mabrouk</b>
15:15 – 15:30	Exploring microplastics in wastewater reuse for irrigation <b>Amal Ayari</b>
15:30 – 15:45	Electrochemical treatment of the actual waste from the industrial landfills of Lindane <b>Najia Hamrouni</b>



**GGN Event (III) : 1<sup>st</sup> Geosciences and Environment Interdisciplinary Meetings**  
**3<sup>rd</sup> Session: Renewable Energy and Climate change**  
**Chairs : Pr.Abdelaziz Mridekh & Dr. Ghaleb Ennine** **Venue: Room 3**

- 14:00 – 14:25 Latest countries energy transition statistics, and the case of Tunisia  
**Mongi Marzoug**
- 14:25 – 14:45 Exploring Tunisia's Deep Geology: Unveiling the Hidden Potential for Natural Hydrogen  
**Hakim Gabtni**
- 14:45 – 15:00 Advanced Utilization of High-Resolution Aerial Imagery and GAN-Based Super-Resolution Techniques for Solar Deployment Analysis in Tunisia  
**Mourad El Koundi**
- 15:00 – 15:15 The Democratic Republic of Congo's strategic metals in the face of climate change  
**François Onya Shongo**
- 15:15 – 15:30 Intelligent Optimization of Photovoltaic Solar Panel Placement for Enhanced Energy Efficiency  
**Fares Zaalouni**
- 15:30 – 15:45 General discussion

**GGN Event (IV) : 1<sup>st</sup> Geosciences and Environment Interdisciplinary Meetings**  
**4<sup>th</sup> Session: Water Security and agriculture**  
**Chairs : Pr. Taoufik Hermassi & Dr. Ahmed Ezzine** **Venue: Room 3**

- 16:15 – 16:45 The OSS Geoportals  
**OSS team**
- 16:45 – 17:00 Modelling and Mapping of water erosion hazard using EO-data and geospatial techniques: Case of Medjerda Watershed  
**Ahmed Ezzine**
- 17:00 – 17:15 Modelling flood risks due to climate change in Bousselem  
**Saida ben alaya**
- 17:15 – 17:30 Integrated Assessment of Phosphogypsum Contamination and Its Environmental Consequences in the Gabes Coastal Ecosystem  
**Abir Jrad**
- 17:30 – 17:45 The Role of Geospatial Data in the Disaster Cycle: A Focus on Hydro-Hazards within the UN-Spider Framework  
**Wafa Talhaoui**
- 17:45 – 18:00 Development of an Advanced System for Monitoring Cereal Crop Campaigns in Tunisia Using Remote Sensing Technologies  
**Arij Ahmed**

**Chairs : Dr. Samia Khadhar, Dr. Fathi Lachaal, Dr Nesrine Kalboussi**

**Venue : Room 1**

## Groundwater Management and Surface Water Monitoring and Groundwater Recharge

- |                 |   |
|-----------------|---|
| <b>GR-Po-01</b> | Hydrogeophysical study of the relationship between the Sfax and Regueb aquifers in the Tunisian Sahel (Mediterranean arid region)<br><b>Mohamed Lemine Babou</b>                                    |
| <b>GR-Po-02</b> | Geophysical Characterization of Karst Aquifers in a Semi-Arid Environment: A Case Study of the El Houdh Basin (Northwestern Tunisia)<br><b>Mohamed Hamrouni</b>                                     |
| <b>GR-Po-03</b> | Modelling Dam - aquifer exchanges under climate change: Impact of Dam construction on groundwater recharge of Lebna plain downstream (Cap Bon, Tunisia)<br><b>Mohamed Neji</b>                      |
| <b>GR-Po-04</b> | Mapping regional discontinuities and identification of their role in underground fluid flow in reservoir: case study of the of Sidi Jdidi region (North-Eastern Tunisia)<br><b>Yosri Khadhraoui</b> |
| <b>GR-Po-05</b> | Deep structure of the Mesozoic series in Southern Tunisia. Hydrogeological Implications<br><b>Rafika Ben Lasmar</b>   |
| <b>GR-Po-06</b> | Integrated Hydrogeological and Geophysical Approaches for Characterizing the Sahel Aquifer System<br><b>Nermine Ghazouani</b>   |
| <b>GR-Po-07</b> | Reconstitution of the geometry of the Mio-Plio-Quaternary aquifer system in the Sousse region<br><b>Sahar Ben Skander</b>   |

## Water Treatment and Reuse of Non-Conventional Water

- |                  |   |
|------------------|---|
| <b>WTR-Po-01</b> | The use of central composite design (CCD) to optimize the coagulation-flocculation process: Application in jar test and industrial scale<br><b>Takwa Lazher</b>   |
| <b>WTR-Po-02</b> | Etiological survey on contaminations of thermal waters and disinfectant tests and purely natural flavorings<br><b>Mohamed Ali Dridi</b>                           |
| <b>WTR-Po-03</b> | Reduction of total dissolved solids in industrial water storage tanks while maximizing water resource recovery through reverse osmosis<br><b>Aicha Lamali</b>     |
| <b>WTR-Po-04</b> | Impact of Wastewater Irrigation on Antioxidant Levels in Tomato Plants (Var. BOBCAT) Grown in Oued Souhil, Nabeul<br><b>Wided Ben Ammar</b>                       |
| <b>WTR-Po-05</b> | Impact of Wastewater Irrigation on Tomato Plants (Var. BOBCAT) Productivity, Water Content, and Certain Primary Metabolite Production<br><b>Sarah Ben Hassine</b> |
| <b>WTR-Po-06</b> | Development of eco-friendly biochar from agricultural residues for the removal of Bisphenol A<br><b>Hajer Ennouri</b>   |
| <b>WTR-Po-07</b> | Investigating substrates to enhance constructed wetland performance for wastewater treatment<br><b>Marwa Ben Saad</b>   |

## Pollutant Control and Water Quality Assessment

- PC-Po-01** Anthropogenic impacts on a wetland within the Tunis Gulf; wadi Méliane estuary: identification and investigation  
**Raja Chairi**
- PC-Po-02** Calcined phosphate sludges and metakaolin for alkali-activated geopolymers  
**Walid Hajjaji**
- PC-Po-03** Impact of urbanization on the Tazarka lagoon: sedimentological and geochemical characterization  
**Abir Marzougui**
- PC-Po-04** The effect of some chemical parameters of drinking water in the municipality of Qasr Al-Akhyar- Libya  
**Dukali Almabruk Abujnah**
- PC-Po-05** Tackling Water Security Challenges through Pollution Control: A Unified Framework for Microplastic Extraction and Analysis  
**Sarra Hechmi**
- PC-Po-06** Enhancing Olive Oil composition and Water Conservation: The Impact of Buried Clay Pot Irrigation on the Chétoui Variety in Tunisia  
**Imen Oueslati**
- PC-Po-07** Electrical properties analysis of  $\text{La}_{1-x}\text{Sr}_x\text{FeO}_3$  ( $0 \leq x \leq 0.5$ ) solid solutions  
**Rania Lataoui**

## Geological Modeling for Resources Exploration

- Geo-Po-01** "ED" method to detect the edges of the subsurface structures in the Enfidha plain (Tunisian Sahel) Hydrogeological implications  
**Maissa Zouaidi**
- Geo-Po-02** Late Cretaceous-Paleocene Ostracods and foraminifera assemblages from the Fguira Salah section (Fahs Region, Northern Tunisia): Biostratigraphy and Palaeogeography  
**Ahlem Amri**
- Geo-Po-03** New insights into the subsurface structure of Mornag plain using geophysical data  
**Mouna Ouerfelli**
- Geo-Po-04** Geological and geophysical applied for prospecting the surface and subsurface structure in the Ghar el Melh region (North of Tunisia): Investigations for Prospecting Potential Deep Groundwater Resources  
**Sofien Alyahyaoui**
- Geo-Po-05** Dynamic modeling in the El Borma Field: Petroleum Implications  
**Mohamed Hassen Jebabli**
- Geo-Po-06** Events associated with Cretaceous-Paleocene transition in North Africa (Tunisia, Algeria, Morocco and Libya). Synsedimentary and tectonic record; evidence of a margin activity  
**Ahlem Amri**

## GIS, Remote Sensing, and IA applied to water resource

- |                  |  |
|------------------|--|
| <b>GRS-Po-01</b> | Soil salinization investigation in the Mejerda lower valley by remote sensing (El Habibia - Mansoura land) Tunisia<br><b>Feyda Srarfi</b>                            |
| <b>GRS-Po-02</b> | Groundwater human health risks assessment using GIS technique: A case study of Mornag aquifer<br><b>Omeyma Gasmî</b>   |
| <b>GRS-Po-03</b> | Analysis of Land Cover Changes and Stream Network Evolution in Chaffar Region (Eastern Tunisia) Using High-Resolution Remote Sensing Data<br><b>Rouaida Trabelsi</b> |
| <b>GRS-Po-04</b> | Hydrology modeling of El Bey Wadi: A Case Study in Tunisia<br><b>Farah Khezami</b>   |
| <b>GRS-Po-05</b> | Extraction of geological lineaments using convolutional neural networks in the Hairech Massif<br><b>Sonia Gannouni</b>   |
| <b>GRS-Po-06</b> | Advanced machine learning techniques for modelling reservoir management with irregular data<br><b>Bilal Lefoula</b>  |
| <b>GRS-Po-07</b> | Geospatial Insights into Carthage's Defensive Strategies: Unveiling Visibility Patterns in Northeastern Tunisia<br><b>Oumaima EL Ghali</b>                           |

## Climate Change and Water

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|-----------------|--|
| <b>CC-Po-01</b> | Changes in Extreme events in a semi-arid context: Drought and Annual Maximum Daily Rainfall over the past decades (Merguellil basin)<br><b>Sameh Chargui</b> |
|-----------------|--|

## Hydro-Hazards and Early Warning System

- |                 |   |
|-----------------|---|
| <b>HH-Po-01</b> | Development of the white plan of the district hospital of Bousalem; governorate of Jendouba – Tunisia: year 2022<br><b>Faten Khemaissia</b> |
|-----------------|---|

## 1<sup>st</sup> Geosciences and Environment Interdisciplinary Meetings

- |                   |   |
|-------------------|---|
| <b>GEIM-Po-01</b> | ARIMA algorithm and WCM to retrieve soil moisture based on Sentinel-1 and Sentinel-2 images over a semi-arid region<br><b>Raja Inoubli</b>  |
| <b>GEIM-Po-02</b> | Spectral-spatial Gabor feature-based deep multi-view learning for blind hyperspectral image unmixing<br><b>Refka Hanachi</b>  |
| <b>GEIM-Po-03</b> | Assessment of Infiltration Dynamics in Oued El Hema Using Remote Sensing Techniques: Implications for Water Resource Management<br><b>Mohamed Dhaoui</b>                              |
| <b>GEIM-Po-04</b> | Agro-Geophysical Study of Olive Groves in the Sned Region: Optimizing Irrigation through Electrical Resistivity Tomography and Electromagnetic Surveys<br><b>Mohamed Dhaoui</b>       |
| <b>GEIM-Po-05</b> | Morphometric Analysis of the Maknassy Plain: Insights into Tectonic Structures and Geological Characteristics<br><b>Nesrine Bouguerra</b>   |
| <b>GEIM-Po-06</b> | Geophysical Characterization for deep structuring mapping and Groundwater Resources in a Semi-Arid Environment (Northeastern, Tunisia)<br><b>Oussama Kortas</b>                       |
| <b>GEIM-Po-07</b> | Petrophysical analysis of Miocene reservoirs in the Rharrb Basin (Northwest Morocco) from borehole log data: Application of principal component analysis (PCA).<br><b>Ahlam Bouri</b> |

Day 3 : Sunday, November 10 <sup>th</sup> , 2024			
8:00 –10:00	Registration of Participants		
Keynote Presentations			
Moderator: Prof. Hakim Gabtni Venue : Room 1			
8:30 – 9:30	Energy Transition: Nord African Perspectives and Challenges Prof Abdelaziz Mridekh, Université Ibn Tofail, Morocco Data and modeling in karst systems: potential application to groundwater management and policy in semi-arid regions (Online) Prof. Joanna Doummar, American University of Beirut/ IAH, Lebanon		
Parallel Sessions V			
Time	Room 1	Room 2	Room 3
9 : 30– 11:00	SubS2 : Groundwater management and surface water monitoring and groundwater recharge Chairs : Dr. Slama & Dr. Azaiez	SubS2 : GIS, Remote sensing, and IA applied to water resource Chairs : Prof. Riadh Farah & Dr. El Koundi	SubS2 : Pollutant control and Water quality assessment Chairs : Dr. Ben Amor & Dr. Hajjaji
11:00 – 11:30	Break		
CLOSING CEREMONY			
Masters of Ceremony : Dr. Mohamed Dhaoui & Dr. Mourad El Koundi Venue : Room 1			
11:30 – 13:00	Summary of Session from Coordinators  Global Discussion  Poster Awards <ul style="list-style-type: none"><li>- Dr. Samia Khadhar</li><li>- Dr. Hajer Azaiez</li></ul> Closing remarks <ul style="list-style-type: none"><li>- Prof. Ammar Mlayah</li><li>- Prof. Hakim Gabtni</li></ul>		

Day 3: Sunday, November 10<sup>th</sup>, 2024

Scientific Programme / Parallel SessionsV

SubS1 : Groundwater management and surface water monitoring and Groundwater Recharge

Chairs: Dr. Fairouz Slama & Dr. Hajer Azaiez

Venue : Room 1

9:30 – 9:45	Surface water quality for irrigation and dominant hydrogeochemical mechanisms in a Mediterranean wetland ecosystem, North-East Algeria <b>Faouzi Zahi</b>
9:45 – 10:00	Hydrogeological Significance of Mediterranean Geoparks In the Framework of the UNESCO IGCP-730 Project <b>Badiaa Chulli</b>
10:00 – 10:15	Multi-tracer and isotopic investigation of seawater intrusion in the Lebna plain (Cap-Bon, Tunisia) <b>Fethi Lachaal</b>
10:15 – 10:30	Optimization of the strategy for exploiting underground water resources at the University of Bondoukou site (north-east of Côte d'Ivoire) <b>Coulibaly Issouf</b>
10:30 – 10:45	Application of multiple approaches to investigate the hydrochemistry evolution of salt in an arid region, sabkha En Noual, Southern Tunisia <b>Nesrine Nasri</b>
10:45 – 11:00	Modeling Approach to Groundwater Processes and Pollution: A Hydrogeochemical Assessment of the Grombalia Aquifer in Northeast Tunisia <b>Farah Khezami</b>

SubS2 : GIS, Remote sensing, and IA applied to water resource

Chairs : Prof. Imed Riadh Farah & Dr. Mourad El Koundi

Venue: Room 2

9:30 – 9:45	A Machine Learning-Enhanced SWAT Model for Dynamic Assessment of Natural Groundwater Recharge <b>Khaoula Khemiri</b>
9:45 – 10:00	Applying Machine Learning Techniques with Earth Observation Data to Forecast Groundwater Levels: A Case Study of the Lower Medjerda Valley (Tunisia) <b>Khouloud Neili</b>
10:00 – 10:15	Geospatial Technologies for Monitoring Water Resources in Supporting life <b>Osward Mwakifumbwa</b>
10:15 – 10:30	Spatialization and mapping of water erosion hazard based on multi-decisional AHP approach: case of Medjerda watershed in the North of Tunisia <b>Dhouha Ben Othman</b>
10:30 – 10:45	Flood susceptibility mapping using machine learning models: case of the Wadi El Bey Watershed, North-eastern Tunisia <b>Intissar Barhoumi</b>
10:45 – 11:00	Groundwater & LCLU monitoring of the Aousja-Ghar El Melh Coastal Aquifer, Gulf of Tunis, Tunisia, Mediterranean <b>Nadia Khazri</b>

9:30 – 9:45	Anthropogenic effects and contamination of Gabes Gulf coastline: geochemical and numerical approaches <b>Adel Kharroubi</b>
9:45 – 10:00	Extent of anthropogenic influence on surface water quality in the wadi Nil watershed (northeastern Algeria): an integrated assessment based on selected characteristic indices <b>Abdelmalek Drouiche</b>
10:00 – 10:15	Assessment of water quality status using heavy metal pollution indices :A case study from Sidi Driss mine, (North West of Tunisia) <b>Nesrine Ouchir</b>
10:15 – 10:30	Conductometric study of struvite prenucleation stage <b>Sami Ben Moussa</b>
10:30 – 10:45	Long-term evolution of water quality and interactions with climate change: Case of the Bab Louta (Taza, Morocco) <b>Abdelaziz Zouhir&amp; Jamal Naoura</b>
10:45 – 11:00	Assessment of Aquifer Pollution Risk Incorporating Characterization of Vadose and Saturated Zones in Mareth, Southern Tunisia <b>Mounir Atoui</b>



Mr Ridha GABOUJ

Water Expert

Former Secretary of State in charge  
of water resources, MARHP,  
Tunisia

Biography: Gabouj Ridha is a water management expert who graduated from AgroParisTech and has dedicated his career to the water sector within the Ministry of Agriculture, Hydraulic Resources, and Fisheries (MARHP). From February 2023 to August 2024, he served as Secretary of State for Water Resources after leading the Water Program. His career includes key roles such as General Director of the General Directorate of Rural Engineering and Water Exploitation and Director of Drinking Water.

Mr. Gabouj has played a crucial role in developing legislation and policies for the water sector, implementing reforms to enhance governance while addressing various challenges, including climate change. He has coordinated significant infrastructure projects in drinking water supply, sanitation, and irrigation, linked to value chain development, and funded by various donors such as the World Bank, KfW, AfDB, JICA, AFD, and others.

He has represented the Tunisian government in numerous international forums and official committees dealing with water and agriculture. Additionally, he has organized international events, including the 5th Mediterranean Water Forum in Tunis, and is an active member of several associations promoting water and environmental conservation.





Dr. Raoudha Gafrej,  
Water Expert, L'Univers de l'EAU  
Tunisia

**Biography:** Dr Ing. Raoudha GAFREJ is a hydraulic engineer graduated from the National Engineering School of Tunis (1988), PhD in Earth Sciences graduated from the Pierre and Marie Curie University Paris VI (1993), specialized in Environmental economics graduated from the Federal Polytechnic School of Lausanne (2006) and in Leadership of public policies, graduate of South Mediterranean University (2019). Dr Gafrej is an international expert in the field of integrated water resources management and adaptation to climate change and a certified trainer in these fields. She was for 18 years a university lecturer and researcher at the University of Tunis El Manar. She participated in the development of various national and regional strategies in the field of water, the green economy, the adaptation of agriculture and ecosystems to climate change, and sustainable development. As a certified trainer, Ms. Gafrej has trained more than 1,500 directors and executives in water, climate change adaptation and other areas. Ms. Gafrej is author and contributor of different publications of World Bank Giz, International Alert, etc. : "Adaptation to a Changing Climate in the Arab Countries" , "Water governance in issues in the media and brings a real advocacy for a sustainable management of water resources under climate change threads.



Prof. Hakim Gabtni,  
General Director  
Water Research and Technologies  
Center CERTE,  
Tunisia

**Biography:** Professor Hakim Gabtni is a senior geoscientist and full professor at the Georesources Laboratory, currently serving as the General Director of the Centre of Water Research and Technologies (CERTE) in Tunisia. He holds a B.S. degree in geology/geophysics (2000), a master's degree (2002), a Ph.D. (2006), and an HDR (2012), all from Tunis El Manar University.

Professor Gabtni specializes in geophysical methods for understanding sedimentary basins and complex geological formations. His work addresses critical areas like groundwater, water resources, energy, geological hydrogen, georesources, and environmental sustainability. His research focuses on gravity and aeromagnetic investigations, three-dimensional seismic modeling, Deep Electromagnetic survey, and near-surface geophysical techniques, including microgravity, seismic refraction/MASW, and electrical resistivity tomography.

With an extensive background in research, development programs, and consulting, Professor Gabtni is also an active editor, reviewer, and author, contributing numerous publications to international scientific journals.



Prof. Serge CHIRON  
IRD, France

**Biography:** Serge Chiron is a senior scientist at IRD. He has more than 25 years of experience in environmental chemistry with a particular focus on emerging contaminants. Their analysis and transformation in the environment as well as their remediation at source by applying nature-based solutions are his main research skills. He has been partner in several national and international projects including two projects funded by PRIMA.

## **Contaminants risks assessment for a safe expansion of reclaimed wastewater reuse and paths for mitigation** **Serge CHIRON, IRD France**

Escalating food demands driven by population growth have intensified agricultural practices, placing extraordinary strain on natural resources. The Food and Agriculture Organization predicts a 70% surge in food demand by 2050, paralleling a projected population increase of over 30%. Consequently, strengthening our food systems is becoming essential. Addressing this challenge requires a paradigm shift towards circular economy principles, in which waste becomes a valuable resource. Wastewater emerges as a promising alternative water source for agriculture, provided its characteristics are suitably enhanced. While this approach offers many benefits, this is not without potential risks to human and environmental health that largely stem from the presence of contaminants in the recycled resources (e.g., organic micropollutants, pathogens, antibiotic resistant genes). In this context, different issues and solutions will be discussed including i) contaminants monitoring strategy, ii) regulation and policy as well as iii) water management practices to allow for a safe resource reuse in an effective and replicable way. If needed, contaminants risks must also be mitigated. In rural area, where the capacity of wastewater collection facilities are often underdeveloped, decentralized treatment systems should be prioritized.



Prof. Jean-François BARDEAU  
Director of Research  
CNRS, France

**Biography:** Jean-François BARDEAU, Director of Research at CNRS, obtained his PhD in Materials Science at the University of Le Mans in 1997. He specialized in the study of the structural and dynamic properties of different classes of materials such as organic-inorganic hybrid compounds, biomaterials and functional surfaces to focus more recently on the phenomena of electromagnetic exaltation induced on multi-nanostructured metallic surfaces to develop SERS (surface enhanced Raman scattering) sensors. Member of the office of the French Group of Vibrational Spectroscopies (GFSV) since 2015, he is the author of more than 150 publications, 5 patents and has received several distinctions for his work. In march 2024, Jean-François BARDEAU became the new director of the ICMN laboratory (Interfaces, Confinement, Materials and Nanostructures) which is a Mixed Research Unit (UMR n°7374) of the University of Orléans and the French National Center for Scientific Research (CNRS).



## Raman Spectroscopy for environmental analysis and monitoring

Jean François Bardeau<sup>1\*</sup>,

*P. Taugeron<sup>1</sup>, M. Rahmani<sup>1</sup>, Ludovic Douillard<sup>2</sup>*

<sup>1</sup>*Institut des Molécules et Matériaux du Mans – CNRS UMR 6283, Univ. Le Mans, Le Mans, France*

<sup>1\*</sup>*Interfaces, Confinement, Matériaux et Nanostructures – CNRS UMR 7374, Univ. Orléans, Orléans, France*

<sup>2</sup>*CEA, IRAMIS SPEC - CNRS UMR 380, Université Paris-Saclay, Gif-sur-Yvette, France*

*\*[Jean-Francois.Bardeau@cnrs.fr](mailto:Jean-Francois.Bardeau@cnrs.fr)*

Surface-Enhanced Raman Spectroscopy (SERS) is an exceptionally powerful and non-invasive optical technique, increasingly used for the detection and identification of trace-level molecular analytes. Despite its immense potential, one of the key obstacles to the widespread quantitative application of SERS lies in the reproducible fabrication of substrates that exhibit consistent, high enhancement factors. These factors are intimately linked to the formation on the surface of "hot spots", regions of intense electromagnetic field enhancement. In response to this challenge, we successfully developed an efficient and inexpensive approach for fabricating metallic SERS substrates through thermal evaporation. In our recent work, we developed a bilayer gold substrate based on a primary layer approximately 100 nm thick, overlaid with an additional evaporated gold layer. During the deposition process, the metal clusters gradually coalesce, initially forming irregular nanoscale structures with small asperities before merging into a continuous film. This controlled evolution allows for fine-tuning of the interparticle spacing, creating an extended percolation network — ideal conditions for the generation of abundant hot spots.

However, a critical question remains: how does the surface quality of the primary layer influence the spatial distribution and density of hot spots, and consequently, the overall SERS enhancement factor of the substrate? To address this, we conducted numerical simulations, creating model surfaces and by using the Finite Element Method (COMSOL Multiphysics®), we mapped the distribution of hot spots, elucidating thus the influence of the base layer's topographical irregularities on the substrate's plasmonic behavior. Our findings were further validated by experimental results obtained using PhotoEmission Electron Microscopy (PEEM), which confirmed the critical influence of the primary gold layer's morphology on the plasmonic properties and overall SERS performance.

Our optimized nanorough Au substrates enabled the detection of crystal violet (CV), a chemical dye and antifungal agent classified as a biohazard and potent carcinogen, at a concentration of  $5 \cdot 10^{-9}$  M, highlighting the potential of such substrates for applications in environmental monitoring.



Prof. Abdelaziz MRIDEKH  
Ibn Tofail university,  
Faculty of sciences,  
Natural ressources and  
Sustainable laboratory  
Maroc

**Biography:** Abdelaziz Mridekh is a professor of Applied Geophysics at Ibn tofail university, "Géosciences des ressources naturelle". He is head of research unit "Géophysique et hydrosystèmes". He earned his DEA in 1994 (at the university of Tunis El Manar) and Doctorat national at Ibn Tofail University in 2002. He worked for 3 years in water exploration for GéoAtlas, one of leader in hydrogeophysics in Africa. He specializes in hydrogeophysics and petroleum basin exploration, sequence and seismic stratigraphy, wire-line logging and GIS. He is currently conducting many research programs, consulting and is the author of several international publications and a reviewer in international journals.

## Energy Transition: Nord African Perspectives and Challenges

Abdelaziz MRIDEKH<sup>a</sup>

Rachidi Samir<sup>b</sup>, Nouhail Nabil<sup>b</sup>, Achraf Essalih<sup>c</sup>, Ibtihal El Aichouni<sup>a</sup>

*a) Ibn Tofail university, Faculty of sciences, Natural ressources and Sustainable laboratory*

*b) Institut de recherche en energie solaire et energies nouvelles*

*c) Société Marocaine de Stockage Souterrain*

The energy transition is a crucial issue of the 21st century, driven by the need to reduce carbon emissions and promote sustainable energy sources. Globally, this transition significantly influences the economy, redefining investments and energy policies. In Africa, the energy transition presents considerable opportunities for sustainable development but also faces unique challenges, such as limited access to technology and financing.

Morocco possesses significant fossil energy potential, with production zones in the Gharb region and numerous offshore projects. These resources offer an opportunity to balance the energy mix while transitioning towards more sustainable sources. In parallel, Morocco stands out as a regional leader in adopting renewable energies, with ambitious initiatives like the Noor solar complex in Ouarzazate, one of the largest in the world. The country has implemented an energy strategy aiming to increase the share of renewables to 52% of its energy mix by 2030. Additionally, Morocco is actively developing its green hydrogen policy, recognizing its potential to decarbonize industry and transport.

In this context, Morocco is exploring underground storage sites, with ongoing projects like MELHY, which aim to enhance energy security and stability by addressing the intermittency challenges of renewable energies. This underground storage presents numerous technical challenges, requiring the integration of diverse scientific disciplines such as geomechanics, geophysics, and reservoir modeling to ensure effective and safe implementation.

We examine the role of the energy transition in the global economy and its impact in Africa, emphasizing the importance of an energy mix tailored to the specificities of each country. In conclusion, it highlights the necessity of a personalized and collaborative approach to ensure a successful energy transition, beneficial for both Africa and the rest of the world.





Prof. Joanna Doummar  
American University of Beirut  
IAH Vice President MENA  
Lebanon

**Biography:** Joanna Doummar is the Chair of the Department of Earth Sciences and an associate professor of groundwater hydrology at the American University of Beirut. Joanna's research focuses on water quality and quantity assessments in Mediterranean, semi-arid, and snow governed karst and fractured aquifers. Her research projects include the high-resolution monitoring and collection of time series data, subsurface characterization, and development of numerical groundwater flow. This approach is essential to drive, using science-supported evidence, policy and infrastructural interventions for GW protection and sustainability on pilot scale.

She has supervised many undergraduate and graduate students in research topics in hydrogeology that culminated in various publications. She is the Vice president (MENA Region) of the International Association of Hydrogeologists and an elected member of the IAH Karst Commission. She has been also been elected in the World Economic Forum Young Scientists Community- Class of 2020."

## **Data and modeling in karst systems: potential application to groundwater management and policy in semi-arid regions**

**Prof. Joanna DOUMMAR**

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The presentation will present work undertaken in an experimental poorly studied semi-arid region in Lebanon: the Nahr El Kalb surface water/ aquifer system composed of limestone and dolostones of Jurassic to Cenomanian age. A high-resolution monitoring is taking place since 2014 to characterize the subsurface, understand spring responses, conceptualize flow and transport in complex systems, and simulate flow in variably heterogeneous systems of Mount-Lebanon. Different methods have been applied for the characterization of flow and transport in different types of karst systems with variable heterogeneities, hydrodynamic conditions, and climatic input: 1) snow-governed versus rain governed springs, 2) fissured karst aquifers, 3) highly complex heterogeneous karst with little knowledge of the subsurface, and 4) highly complex karst with a cave access. Such utilized methods include times series analysis, tracer experiments, micropollutants sampling campaigns, stable isotope studies etc.

The presentation will present briefly selected models such as distributed integrated hydrological, lumped linear reservoir, 2-D dual continuum, discrete fractured network models, and recently machine learning applications that have been tailored to simulate flow in the investigated spring catchments to account for the degree of karstification and varying hydrodynamic responses.

In sum, the talk will illustrate a long-term methodology that allows to assess water quality and quantity in Lebanon in particular. This approach can be upscaled to the region for a better sustainable karst groundwater management, testing of alternative methods for enhanced recharge, and policy development and implementation in poorly studied catchment areas.







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