The 9th International Electronic Conference on Water Sciences

11–14 November 2025 | Online

MDPI

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ECWS-9 2025 Conference

11–14 November 2025
Online

The 9th International Electronic Conference on Water Sciences

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Co-Organised by

The Department of Rural and Surveying Engineering
Aristotle University of Thessaloniki

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Welcome from the Chair

We are delighted to welcome you to **the 9th International Electronic Conference on Water Sciences (ECWS-9),** which will be held online and promoted by the open access MDPI journal *Water* (ISSN 2073-4441; IF 3.0).

In recent years, a series of eight (8) International Electronic Conferences on Water Sciences (ECWS-1, ECWS-2, ECW-3, ECWS-4, ECWS-5, ECWS-6, ECWS-7, and ECWS-8) have delved into a wide array of crucial water-related matters. The eighth conference zeroed in on innovative trends that are reshaping water science, technology, and engineering. Now, ECWS-9 aims to explore and deliberate on the latest advancements in water sciences within a variable and evolving environment.

ECWS-9 cordially invites researchers from academic institutions, as well as water industry practitioners, to share their original research findings, novel ideas, scientific concepts, and new technologies and experiences. The contributions should be relevant to the following topics:

S1. Hydrological Processes and Modelling;
S2. Urban Water Modelling and Management;
S3. River, Lake and Groundwater Hydraulics, Quality and Vulnerability;
S4. Water Resources Management, Policy and Governance;
S5. Extreme Hydro-meteorological Events: Sources, Mitigation and Adaptation;
S6. Ecohydrological Approaches and Ecosystems Conservancy;
S7. Remote Sensing, Artificial Intelligence and New Technologies in Water Sciences;
S8. Wastewater Treatment and Reuse;
S9. Agricultural Water Systems;
S10. Glacier Hydrology and Climate Change.

This conference will be conducted entirely online so as to eliminate concerns about travel and associated costs for participants from across the globe. An online format provides a platform that enables rapid and direct exchange of the latest research achievements and innovative concepts.

We greatly appreciate the support and enthusiasm of the water scientific community. Your active participation is pivotal in ensuring the success of this edition of the ECWS. Your contributions will not only enhance the current event but also lay a solid foundation for the future success of subsequent editions.

Prof. Dr. Athanasios Loukas
Conference Chair
Department of Rural and Surveying Engineering, Aristotle University of Thessaloniki, Thessaloniki, Greece

water

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Full methodical and/or experimental details must be provided for research articles. We encourage scientists to publish their research in as much detail as possible. Computed data or files regarding the full details of the experimental procedure or model set-up, if unable to be published as part of the main manuscript, can be deposited as supplementary material.

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Prof. Dr. Yanfang Sang
Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences, Beijing, China

Invited Speakers

Dr. Alban Kuriqi

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Dr. Dina Pirone

Department of Civil, Architectural and Environmental Engineering, University of Naples Federico II, Naples, Italy

Dr. Isa Ebtehaj

Department of Soils and Agri-Food Engineering, Laval University, Québec, QC, Canada

Dr. Wangbao Gong

Pearl River Fisheries Research Institute, Chinese Academy of Fishery Sciences (CAFS), Guangzhou, China

Dr. Yale Deng

Department of Veterinary Population Medicine, University of Minnesota, Minneapolis, MN, USA

Prof. Dr. Davide Danilo Chiarelli

Department of Civil and Environmental Engineering, Polytechnic University of Milan, Milan, Italy

Prof. Dr. Florica Manea

Research Centre in Environmental Science and Engineering, Politehnica University of Timisoara, Timișoara, Romania

Prof. Dr. Franz Tscheikner-Gratl

Department of Civil and Environmental Engineering Faculty of Engineering, Norwegian University of Science and Technology, Trondheim, Norway

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Department of Geology, Aristotle University of Thessaloniki, Thessaloniki, Greece

Prof. Dr. Manousos Valyrakis
Department of Civil Engineering, Aristotle University of Thessaloniki, Thessaloniki, Greece

Prof. Dr. Nikolaos Tziolas
Department of Soil, Water, and Ecosystem Sciences, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, FL, USA

Prof. Dr. Sabino De Gisi
Department of Industrial Engineering (DIIN), University of Salerno, Fisciano, Italy

Prof. Dr. Xiaofeng Xu
Ecological Modeling and Integration Lab, San Diego State University, San Diego, CA, USA

Program at a Glance

	Day 1	Day 2	Day 3	Day 4
Morning	**Session 5.** Extreme Hydro-meteorological Events: Sources, Mitigation and Adaptation	**Session 3.** River, Lake and Groundwater Hydraulics, Quality and Vulnerability	**Session 4.** Water Resources Management, Policy and Governance	**Parallel Sessions ①** **Session 6.** Ecohydrological Approaches and Ecosystems Conservancy **Parallel Sessions ②** **Session 9.** Agricultural Water Systems
Afternoon	**Session 8.** Wastewater Treatment and Reuse	**Session 2.** Urban Water Modelling and Management	**Session 1.** Hydrological Processes and Modelling	**Session 7.** Remote Sensing, Artificial Intelligence and New Technologies in Water Sciences

ECWS-9 Program

11th November 2025 (Tuesday)

Session 5. Extreme Hydro-meteorological Events: Sources, Mitigation and Adaptation

Time: 9:00 (CEST, Basel) | 03:00 (EST, New York) | 15:00 (CST Asia, Beijing)

Time in CET	Speaker	Title
9:00–9:05	Prof. Dr. Athanasios Loukas Opening Remark from Conference Chair	
9:05–9:10	Prof. Dr. Lampros Vasiliades Prof. Dr. Yanfang Sang Welcome from the Session Chairs	
9:10–9:30	**Prof. Dr. Giuseppe Del Giudice** **Dr. Dina Pirone** Invited Speakers	Advancing the Understanding and Management of Hydro-Meteorological Extremes: Challenges and Prospects Across Spatial and Temporal Scales
9:30–9:45	**Christos V. Makris** Selected Speaker	The impact of sea-level rise on coastal flooding due to extreme storm tides under climate change projections in the 21st century: Application to the Kalamaria littoral zone (N. Aegean Sea, Greece)
9:45–10:00	**Adrian Chummac** Selected Speaker	Probabilistic Modeling of Drought Effects on Maize Yield in Basilicata, Italy: Impacts of Shifting Planting Dates and Irrigation Regimes as Adaptation Strategies
10:00–10:15	**Reza Arefi** Selected Speaker	Numerical Study of the effectiveness of Water-Filled Canals for Reducing Tsunami-Induced Forces on a Nearshore Structure
10:15–10:30	**Marios Billios** Selected Speaker	Optimizing Pooling Regions for Rainfall Frequency Analysis Using Genetic Algorithms in Complex Networks
10:30–10:45	**Carla Larissa Fonseca da Silva** Selected Speaker	Characterisation of Recent Climate Extremes in Mainland Portugal Using ETCCDI Indices and Validated ERA5-Land Data
10:45–11:00	**Luis Angel Espinosa** Selected Speaker	A Spatiotemporal Analysis of Extreme Minimum Temperatures in Portugal (1980–2024) Using Severity Heatmaps
11:00–11:15	**Evangelos Leivadiotis** Selected Speaker	Spatio-Temporal Dynamics of Rapid Drought-to-Wet Transitions in Thessaly, Greece (1990–2024)
11:15–11:30	**Salvador Garcia-Ayllon** Selected Speaker	Flooding risk in the context of climate change crisis: new urban and land use planning approaches vs traditional hydrological ones

Session 8. Wastewater Treatment and Reuse

Time: 14:00 (CET, Basel) | 08:00 (EST, New York) | 21:00 (CST Asia, Beijing)

Time in CET	Speaker	Title
14:00–14:10	Prof. Dr. Carmen Teodosiu Welcome from the Session Chair	
14:10–14:30	**Prof. Dr. Sabino De Gisi** Invited Speaker	Emerging Materials from Municipal Wastewater Treatment: Current Status and Challenges
14:30–14:50	**Prof. Dr. Florica Manea** Invited Speaker	Innovative electrochemical approaches for sustainable wastewater treatment and reuse
14:50–15:05	**Diana Hanganu** Selected Speaker	REMOVAL OF PHARMACEUTICAL COMPOUNDS ONTO ACTIVATED CARBON: INSIGHTS INTO THE ADSORPTION MECHANISM
15:05–15:20	**Patricia Cardoso** Selected Speaker	Integrating Hybrid Nature-Based Solutions for Pollutant Reduction and Biodiversity Promotion
15:20–15:35	**Joana Dele** Selected Speaker	Three-Dimensional-Alumina-Supported Activated Carbon for Water Treatment and In Situ Regeneration Through Catalytic Wet Peroxide Oxidatio

15:35–15:50	**Hayley Elizabeth Corbett** Selected Speaker	Shifting sands: the pH-dependent removal of emerging contaminants using sustainable materials
15:50–16:05	**Catarina Miranda** Selected Speaker	Wastewater Stressors Shape the Microbiome of Aerobic Granular Sludge
16:05–16:20	**Isabella Tonial Tomasi** Selected Speaker	Turning Vegetable Residues into Coagulants: Sustainable Solutions for Agri-Food Wastewater
16:20–16:35	**Bhautik Dave** Selected Speaker	Evaluating Sand-Based Clay for Adsorption of Caffeine, Methyl 4-Paraben, and Triclocarbanilide Across Aqueous Media
16:35–16:50	**Fabiano Castrogiovanni** Selected Speaker	Innovative Synergies: How SFDMBR, Electrochemical Processes, and Algae Transform Wastewater into a Resource
16:50–17:05	**Seid Mingizem Gashaw** Selected Speaker	Enhanced Removal of Micropollutants from Secondary Effluents Using UV/Sulfite and Biochar-Coupled Advanced Oxidation Processes

12th November 2025 (Wednesday)

Session 3. River, Lake and Groundwater Hydraulics, Quality and Vulnerability

Time: 09:00 (CET, Basel) | 03:00 (EST, New York) | 16:00 (CST Asia, Beijing)

Time in CET	Speaker	Title
9:00–9:10	Prof. Dr. Nicolò Colombani Welcome from the Session Chair	
9:10–9:30	**Prof. Dr. Manousos Valyrakis** Invited Speaker	Low altitude technologies as a tool for safeguarding the resilience of hydraulic infrastructure and cultural heritage
9:30–9:50	**Prof. Dr. Konstantinos S. Voudouris** Invited Speaker	Groundwater: Pressures, Challenges, Best Practices
9:50–10:05	**Africa De La Hera Portillo** Selected Speaker	Reconstruction of Flooding Patterns in Endorheic Lagoons of Semi-Arid Zones Using Satellite Imagery, Historical Data, and Water Balance Models: A Case Study from the LIFE IP Duero Project
10:05–10:20	**José Carlos Moreira Teixeira** Selected Speaker	Impact of selected parabens and related disinfection by-products in biofilms formed by bacteria isolated from drinking water
10:20–10:35	**Vikas Sonkar** Selected Speaker	Antimicrobial Resistance Pollution Dynamics and Ecotoxicological Impacts on Zebrafish from Untreated Wastewater in Urban Rivers
10:35–10:50	**Ruinan Liu** Selected Speaker	A novel method for identifying groundwater nitrate natural background levels in an urbanized delta in China
10:50–11:05	**Shihuan Wang** Selected Speaker	Multi-scale Partitioning of DOM and Microbial Community Response Mechanisms in Ice-Covered Lakes of Cold-Arid Regions during the Frozen Period
11:05–11:20	**Barbara Jean Nicolai** Selected Speaker	Developing a Data Warehouse Tool for Analyzing the Water Quality in the Great Lakes
11:20–11:35	**Sibianka Lepuri** Selected Speaker	Nitrate Vulnerability of the Almyros Aquifer (Thessaly, Greece) under Climate Change Using DRASTIC and a Bias-Corrected Med-CORDEX-Driven Integrated Modeling System
11:35–11:50	**Jinda Zhang** Selected Speaker	Morphological Characteristics and Influencing Factors of Mercury Occurrence and in Typical Lakes in Cold and Arid Areas
11:50–12:05	**Hui Zhang** Selected Speaker	The impact of green algae blooms on methylmercury production in shallow lakes in cold and arid regions

Session 2. Urban Water Modelling and Management

Time: 14:00 (CET, Basel) | 08:00 (EST, New York) | 21:00 (CST Asia, Beijing)

Time in CET	Speaker	Title
14:00–14:10	Prof. Dr. Abbas Roozbahani Welcome from the Session Chair	
14:10–14:30	**Prof. Dr. Franz Tscheikner-Gratl** Invited Speaker	Only strings in the urban fabric? Integrated multi-infrastructure asset management from a water perspective
14:30–14:45	**Satyaki Chatterjee** Selected Speaker	Unsupervised Timely Detection of Leaks in Water Network DMAs using a Robust Regression Ensemble Method
14:45–15:00	**Iolanda Borzì** Selected Speaker	Integrating Vulnerability Assessment and Urban Water Modelling for Resilient Management of Aqueduct Failures
15:00–15:15	**Aikaterini Lyra** Selected Speaker	Integrated Hydraulic Modeling of the Lamia Water Distribution Network for Enhanced Resilience

15:15–15:30	**Luisa Martínez-Acosta** Selected Speaker	Analysis of Sustainable Solutions for Stormwater Management in Vulnerable Urban Areas: Case Study in Monteverde, Montería, Colombia
15:30–15:45	**Alex Javier Garzón-Orduña** Selected Speaker	Non-Revenue Water (NRW) and Leakage Management: Global KPIs and Modelling Challenges
15:45–16:00	**Ana Cristina Oliveira Afonso** Selected Speaker	Bacterial coaggregation enhances disinfection tolerance in drinking-water biofilms
16:00–16:15	**Óscar Javier Burgos** Selected Speaker	Historical Evolution and Software Selection Criteria for Transient Hydraulic Analysis with Hydro-Pneumatic Protection
16:15–16:30	**Thiago Masaharu Osawa** Selected Speaker	Hydrological and Pollutant Response of a Ceramic Roof: Implications for Stormwater Reuse

13th November 2025 (Thursday)

Session 4. Water Resources Management, Policy and Governance

Time: 09:00 (CET, Basel) | 03:00 (EST, New York) | 16:00 (CST Asia, Beijing)

Time in CET	Speaker	Title
9:00–9:10	Prof. Dr. Luis Garrote Welcome from the Session Chair	
9:10–9:40	**Dr. Alban Kuriqi** Keynote Speaker	When Saving Water Sinks the Land: The Hidden Side of Modern Irrigation in the Nile Delta
9:40–10:00	**Prof. Dr. Davide Chiarelli** Invited Speaker	Hydrological modeling to support sustainable agricultural management
10:00–10:15	**Nikolaos Nagkoulis** Selected Speaker	Using the Shapley Value to Promote Water Consumption Reduction in Water Distribution Networks
10:15–10:30	**Mosammat Mustari Khanaum** Selected Speaker	Assessment of Pollutant Bioaccumulation in Fish Communities from Human-Induced Water Pollution: A Machine Learning and Statistical Approach
10:30–10:45	**Christy Mathew Damascene** Selected Speaker	Impact of Rainfall Variability on Rainwater Harvesting potential
10:45–11:00	**Aías Santino de Lima** Selected Speaker	Evaluating phosphorus fluxes in Portugal: opportunities and limitations for the implementation of regional synergies between the wastewater and agricultural sectors
11:00–11:15	**Yang Zhang** Selected Speaker	Dual-Risk Management of Water–Energy–Environment Nexus through Stochastic Programming: Regional Industrial Structure Adjustment
11:15–11:30	**Alena Voznakova** Selected Speaker	Assessment of the bioaccumulation potential of pharmaceuticals in periphyton in river systems of northeastern Portugal: methodological design and environmental perspectives
11:30–11:45	**Rimma Abdrashitova** Selected Speaker	Technogenic impact on groundwater of deep aquifers and oil bearing complexes of the West Siberian megabasin
11:45–12:00	**Ana Rita Fernandes Sousa Pereira** Selected Speaker	Unveiling the Effects of Methylparaben with Drinking Water Biofilms: A Realism-Based Study

Session 1. Hydrological Processes and Modelling

14:00 (CET, Basel) | 08:00 (EST, New York) | 21:00 (CST Asia, Beijing)

Time in CET	Speaker	Title
14:00–14:10	Dr. Hossein Bonakdari Prof. Dr. Giuseppe Tito Aronica Welcome from the Session Chairs	
14:10–14:40	**Dr. Isa Ebtehaj** Keynote Speaker	Artificial Intelligence for Flood Resilience: Bridging Models, Data, and Forecasting
14:40–14:55	**Yixuan Gao** Selected Speaker	Accuracy Assessment of ERA5-LAND, TPMFD, and CDMet Meteorological Datasets in the Yarlung Zangbo River Basin
14:55–15:10	**Jiaqi Ma** Selected Speaker	Global Ground Validation of β in the Radiative-Convective Equilibrium Energy Budget Theory for Land Relative Humidity
15:10–15:25	**Charalampos Skoulikaris** Selected Speaker	Multicriteria analysis supported by geographic information systems and hydraulic modelling for flood protection in riparian regions
15:25–15:40	**Angelos Alamanos** Selected Speaker	A national-scale IDF-based design storm hyetograph inventory: Applying the Catchment2Storm tool in Greece
15:40–15:55	**Danielle Rainville** Selected Speaker	Integration of Geological and Hydrological Parameters through a Bayesian Framework to Estimate Flood

		Likelihood: Case Study of the Ottawa River Basin, Canada
15:55–16:10	**Angelos Kokkinos** Selected Speaker	Towards an Operational Forecast Model Suite for Compound Inundation due to Flash Floods and Storm Tides in Coastal Areas with Non-Perennial Rivers
16:10–16:25	**Ilia Popstoyanov Dimitrov** Selected Speaker	Developing a Coupled Surface–Subsurface Flow Model for High-Mountain Watersheds Using the Finite Element Method: Preliminary Results
16:25–16:40	**Marco Callado** Selected Speaker	Numerical Modeling and Hydrodynamic Characterization of an Eastern Amazon Estuary under Macrotidal Forcing
16:40–16:55	**Alice Carlotta Tani** Selected Speaker	Modelling Climate Change Impacts on Hydrological Processes and Water Balance in the Cervaro River Basin (Italy) Using SWAT+

14th November 2025 (Friday)

Session 6. Ecohydrological Approaches and Ecosystems Conservancy
Morning Parallel Session ①

09:00 (CET, Basel) | 03:00 (EST, New York) | 16:00 (CST Asia, Beijing)

Time in CET	Speaker	Title
9:00–9:10	Prof. Dr. Pingping Luo Prof. Dr. Qiang Liu Welcome from the Session Chair	
9:10–9:40	**Prof. Dr. Xiaofeng Xu** Keynote Speaker	Hydrological Feedback of Methane Cycling Under Climate Warming
9:40–9:55	**Yang Zhao** Selected Speaker	Integrating Multidimensional Frameworks and Management Strategies for Sustainable Water Security: Insights from Assessment, Indicators, and Policy Approaches
9:55–10:10	**Eugeniusz Pronin** Selected Speaker	Macrophyte depth distribution in relation to carbon and nitrogen isotope signatures (δ13C and δ15N) of bulk organic matter in lakes of northern Poland
10:10–10:25	**Fan Zhang** Selected Speaker	Evaluating Trophic State of Lakes in Cold and Arid Zones: An Integrated Approach Based on Neural Networks and Genetic Algorithms
10:25–10:40	**Dionissis Latinopoulos** Selected Speaker	Water transparency boundaries assisting the ecohydrological management of Greek natural lakes
10:40–10:55	**Jingyi Wang** Selected Speaker	Dynamic Succession Patterns, Functional Metabolic Differentiation, and Multi-Scale Assembly Mechanisms of Multi-Media Bacterial Communities in Lakes Driven by Ice-Covered Conditions
10:55–11:10	**Abdul Rashid Issifu** Selected Speaker	Assessing the Potential of Biomass Hydrothermal Liquefaction Hydrochar for Soil Amendment: Chemical/Physical Characterization and Water Holding Capacity and Retention
11:10–11:25	**Elena Núñez Prieto** Selected Speaker	Evaluation of Microplastics Content in Mediterranean Wetlands
11:25–11:40	**Larissa Santos** Selected Speaker	Immobilization of Bacteriophages in a Calcium Alginate Biopolymeric Matrix for Biosorption of Hg(II) in Aqueous Medi

Session 9. Agricultural Water Systems
Morning Parallel Session ②

09:00 (CET, Basel) | 03:00 (EST, New York) | 16:00 (CST Asia, Beijing)

Time in CET	Speaker	Title
9:00–9:10	Prof. Dr. Dapeng Li Welcome from the Session Chair	
9:10–9:30	**Dr. Wangbao Gong** Invited Speaker	Effects of Hydraulic Retention Time on Performance, Mechanisms, and Microbial Communities in a Multi-stage Constructed Wetland for Treating Aquaculture Tailwater
9:30–9:50	**Dr. Yale Deng** Invited Speaker	Microbial ecology in aquaculture wastewater treatment systems
9:50–10:05	**Lamprini Kokkinaki** Selected Speaker	Assessing the trade-offs between nitrate water pollution and water conservation for cost-efficient river basin management
10:05–10:20	**Unius Arinaitwe** Selected Speaker	Evaluating the Influence of dripline spacing on corn grain Yield in the Sandy Soil of Southeast Costal Plains
10:20–10:35	**Nikiforos Samarinas** Selected Speaker	Subsurface Drain Spacing Estimation at the Watershed Level by using the SWAT Model and the Donnan–Hooghoudt Equation

10:35–10:50	**Abdu Yimer Yimam** Selected Speaker	Impact of Deficit Irrigation on Major Irrigated Crop Yield and Water Productivity: A Meta Analysis
10:50–11:05	**Luigi Alessandrino** Selected Speaker	Photosynthesis-driven capillary rise and daily salinity dynamics in an agricultural system of the Po River Lowland
11:05–11:20	**Valentina Carrillo** Selected Speaker	Productive Potential of Floating Wetland Islands for Sustainable Agriculture
11:20–11:35	**Rafael Olmos Ruiz** Selcted Speaker	Optimizing irrigation in lemon trees: Balancing water savings and yield under climate change

Session 7. Remote Sensing, Artificial Intelligence and New Technologies in Water Sciences

14:00 (CET, Basel) | 08:00 (EST, New York) | 21:00 (CST Asia, Beijing)

Time in CET	Speaker	Title
14:00–14:10	Prof. Dr. Nikiforos Samarinas Welcome from the Session Chair	
14:10–14:30	**Prof Dr. Nikolaos Tziolas** Invited Speaker	Conversational AI and Remote Sensing for Agro-Environmental Monitoring
14:30–14:45	**Nikolaos Alpanakis** Selected Speaker	Spatio-Temporal Drought Assessment in the Pinios River Basin Using Ground Observations and Satellite Data
14:45–15:00	**Indishe P Senanayake** Selected Speaker	A Rapid Method for Generating Long-Term Wetland Inundation Time Series Using the Landsat Archive on Google Earth Engine
15:00–15:15	**Anastasia I. Triantafyllou** Selected Speaker	Leveraging Lightweight Large Language Models for Hydrological Interpretation of Precipitation Time Series in Greece
15:15–15:30	**Suyi Liu** Selected Speaker	A Global Terrestrial Evapotranspiration Dataset (2001–2019) Based on the Nonparametric Approach
15:30–15:45	**Waruth POJSILAPACHAI** Selected Speaker	Optimized UAV-LiDAR Workflows for Fine-Scale Stream Network Mapping in Low-Gradient Wetlands: A Kushiro Wetland, Japan Case Study
15:45–16:00	**Konstantinos Ioannou** Selected Speaker	Low-Cost IoT sensor for real-time streamflow measurements
16:00–16:15	**Tymoteusz Igor Miller** Selected Speaker	Artificial Intelligence for Modeling Multi-Phase $BOD_{(20)}$ Kinetics in Urban Lakes under Anthropogenic and Climatic Pressure
16:15–16:30	**Dimitrios Koulouris** Selected Speaker	Soil Moisture Time Series Gap-Filling Using Random Forest Machine Learning Models: A Case Study in the Arta Plain
16:30–16:35	**Prof. Dr. Athanasios Loukas**	Closing Remark from Conference Chair

sciforum-137185: Assessment of the bioaccumulation potential of pharmaceuticals in periphyton in river systems of northeastern Portugal: methodological design and environmental perspectives

Alena Voznakova [1,*], Ana Maria Antao-Geraldes [2], Moisés Canle [1]

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Periphyton is a complex biological matrix that plays a key role in aquatic ecosystems, not only as the basis of the food web, but also as a potential bioindicator of pollution. In the context of monitoring emerging pollutants, the study of periphyton provides complementary information to that obtained from water and sediment, especially regarding bioaccumulation processes and associated ecological risks. Its ability to retain and accumulate contaminants over time makes it a valuable tool for assessing long-term exposure and environmental quality.

This study was carried out in the Douro river basin, in the region of Bragança (northeastern Portugal), where periphyton samples were collected from 14 sites during three seasonal campaigns throughout 2024. Samples were obtained by scraping hard substrates in river and reservoir systems, then preserved under cold conditions and freeze-dried for laboratory analysis. In addition to the development of a specific solid-phase extraction (SPE) and cleanup protocol for the detection of pharmaceutical compounds using high-performance liquid chromatography coupled to mass spectrometry (HPLC-MS/MS), periphyton samples were characterized to better understand their structure and composition as an environmental matrix.

Periphyton characterization revealed consistent patterns, with dry weight generally between ~4 and 90 g/m^2 and chlorophyll content ranging from ~0.02% to 5%. The assessment of pharmaceutical contamination is still in progress, as methodological improvements are being applied due to the lack of reliable results with existing approaches.

The methodological approach adopted will be presented, along with reflections on technical challenges and its potential contribution to integrated environmental assessment. Preliminary findings may also be included.

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