

INVITATION

New Developments in Environmental Sciences: Assessing Natural Resources and the Anthropogenic Impact

We are pleased to invite you to our upcoming two-day training workshop on “**New Developments in Environmental Sciences: Assessing Natural Resources and the Anthropogenic Impact**”. The training workshop will take place on **29 and 30 January 2024 at the University of Rennes, France**.

This event is organised by EDUC-SHARE, the research and innovation part of EDUC. **Your EDUC partner university covers travel and accommodation costs** (the number of participants is limited). Your local EDUC-SHARE project manager is your contact person for this.

The event is open to any colleague, researcher, doctoral or post-doctoral student in the EDUC network interested in these themes and techniques.

DAY 1: 29 January 2024 (Geosciences Rennes)

Venue: Geosciences Rennes, Beaulieu campus, 263 Av. Général Leclerc, 35042 Rennes

Morning

- ***Study of nanoparticle/metal interaction under flow conditions: the innovative coupling of microfluidics and spectroscopy.***

By Imane Khatib, PhD student in water sciences and geochemistry

Abstract: Metals, integral to Earth's lithosphere, exist naturally in water and soil. Yet, the surge in metal contamination, primarily of human origin, stems from technological advancements, medical progress, and widespread metal usage in various products. These metals, concentrated at high levels, exhibit a spectrum of toxic properties, from harmful effects to lethal concentrations. Understanding their impact on the environment hinges on their speciation, governing mobility, bioavailability, and toxicity—a delicate balance shaped by specific physicochemical parameters. Traditional studies on metal adsorption to natural surfaces have largely occurred under static conditions, spanning hours to days. However, metals swiftly associate with nanoparticles in real-world scenarios where water flows, traversing extensive distances and facilitating environmental dispersion. The pivotal role of nanoparticles intensifies with climate change, contributing to their increased formation through phenomena like soil erosion and permafrost melting.

Despite the paramount significance of metal contamination and nanoparticles, a surprising gap exists—there is no available data on their interactions under flow conditions, a potential game-changer in understanding metal flow through the environment.

Enter our ground-breaking research, where we unveil a novel approach to studying the interplay between nanoparticles and metals within the dynamic flow conditions found at the pore scale in soil. Leveraging recent advancements in microfluidics and the synergistic potential of coupling with spectroscopy, we introduce:

- **Development of an Innovative Device:** A pioneering coupling of microfluidic systems with spectroscopy (ICP-MS QQQ).



- **Real-time Monitoring:** In-situ tracking of nanoparticle/metal adsorption processes and the identification of formed complexes.

- **Quantitative Insights:** Quantification of sorption processes through ICP-MS QQQ.

Join us as we embark on a journey to unravel the intricate dynamics of nanoparticle-metal interactions in flow conditions, pushing the boundaries of knowledge and reshaping our understanding of metal behaviour in the environment.

- ***Dating of unconventional minerals by Laser ablation ICP-MS and more particularly of supergene copper mineralisation***

By Bastien Lesage, PhD - Genesis of oxidised copper deposits in sedimentary domains. Application to the Moroccan Anti-Atlas. Geosciences Rennes / BRGM

Abstract: In the last decades, the instrumentations used for geochronological research have improved drastically. Consequently, we can date more precisely and accurately than ever before. One of the main achievements consisted of the development of in-situ dating either by SIMS (early 80s) or by LA-ICP-MS (mid-90s). These progresses allowed the researchers to tackle the analysis of objects that could not be dated previously. Either because they are small (a few microns), polyphased, rare, etc. This is particularly true in the field of economic geology where geochronological studies helped to improve our understanding of the rates and durations of the natural processes that lead to the emplacement of mineral deposits.

In-situ dating in general and Laser ablation ICP-MS, in particular, require the use of a reference material (or standard) to correct for the instrument drift and mass bias during the analyses. Ideally, this standard should be a “matrix-matching” one, as it is well known that this technique is highly affected by matrix effects. During this presentation, we will present the recent developments of in-situ and in-context (i.e. directly in thin or thick sections) U-Th-Pb geochronology. We will also discuss how we can accurately date minerals without a proper matrix-matching standard, with a special focus on the dating of ore deposits (including oxidized copper mineralization).

Lunch break

Afternoon

- **EDUC Workshop: Trace element analysis by ICP-MS**

Training will take place on the GeOHeLiS platform which includes analytical facilities (i.e., ICP-MS) for measuring elements present in low concentrations in natural samples. The practical training will introduce the basics of the ICP-MS elemental analysis technique and will take place on a Q-ICP-MS Agilent 7700. An example of the analysis of tap water samples will be proposed.

The training includes the description of the sample introduction system parts, the description of the instrument tuning before measurement, the ways to monitor instrumental drift during acquisition, the typical sequence of analyses (calibration standards, blanks, samples, certified reference materials, ...), the possible ways for assessing matrix effects (e.g., using an internal standard and running two dilutions). The course will also cover the preparation of the calibration standards used for calculating concentrations in the samples and the data reduction steps.



DAY 2: 30 January 2024 (ECOBIO)

Venue: ECOBIO, Beaulieu campus, 263 Av. Général Leclerc, 35042 Rennes

Molecular biology / environmental genetics

The importance of microbes in biogeochemical cycling: abundance and diversity

Biogeochemical cycling regulates the flow of elements and compounds through the Earth's ecosystems. Microbes play a crucial role in these biogeochemical cycles, their abundance and diversity can be determined using molecular biology.

Microbial densities influence the rates and efficiency of various nutrient transformations in ecosystems. Microorganisms, including bacteria, archaea, fungi, and protists, are key players in biogeochemical cycles as they drive processes such as nutrient mineralization, immobilization, nitrification, denitrification, and organic matter decomposition. Furthermore, molecular biology techniques, such as DNA sequencing and metagenomics, help identify and characterize the microbial communities involved in biogeochemical cycles.

We will give an overview of the techniques that can be used to determine microbial densities by qPCR and diversity via metabarcoding and provide examples of ongoing research applying these techniques.

Morning

- ***The importance of microbes in biogeochemical cycling: numbers and diversity***
By Dr Annet Laverman, CNRS Research Director
- ***The impact of nitrate and organic carbon on bacterial diversity in intertidal sediments***
By PhD student Floriane Turrel, PhD on ,Impacts of environmental variables on microbial diversity, associated functions and biogeochemical cycles

Lunch Break

Afternoon

- ***Nucleic acids extraction from complex matrices and estimation of microbial abundance by Quantitative PCR***
By Dr Céline Roose Amsaleg, CNRS Research engineer
- ***Impact of prebiotics and probiotics on the taxonomic and functional diversity of microbial communities of degraded soils in a reforestation context***
By Dr Romain Darriaut, CNRS Post-doctoral researcher

Confirmation of participation

Please complete the following **REGISTRATION FORM** to participate.

Participation is free upon registration. If you have any questions, email Julie Newton, EDUC-SHARE Project Manager julie-anne.newton@univ-rennes.fr.

About the host institutes

Geosciences Rennes and GeOHeLiS platform:

Geosciences Rennes is a multidisciplinary laboratory for Earth Sciences and Environment. The lab



focuses on geological processes and the evolution of continental surfaces at long time scales, as well as the functioning and dynamics of our natural environment (the critical zone) on human time scales. The GeOHeLiS platform is a university-certified platform for improving the readability of the institution's technical resources.

Geosciences website: <https://geosciences.univ-rennes.fr/en/geosciences-rennes>

GeOHeLiS platform website: <https://geosciences.univ-rennes.fr/en/geohelis>

ECOBIO:

UMR ECOBIO (160 members) brings together teacher-researchers (lecturers and professors), CNRS researchers (research officers and research directors), BIATSS staff from the University of Rennes and IT staff from the CNRS. It welcomes many students (doctoral students, interns), but also visits foreign researchers and researchers associated with partners (IPEV). By covering all areas of ecology: evolutionary ecology, behavioural ecology, community ecology, functional ecology and landscape ecology it analyzes the dynamics of biodiversity and the functioning of continental ecosystems in the face of ongoing global changes (population growth, climate change, land use) with a view to sustainable development (restrained management of natural resources, conservation, etc.).

ECOBIO: <https://ecobio.univ-rennes.fr/en/ecobio-umr6553-ur1-cnrs-research-laboratory>

Molecular Ecology Platform: <https://ecobio.univ-rennes.fr/en/pem-plateform>

Environmental Microbiology Platform: <https://ecobio.univ-rennes.fr/en/technical-platform-micro>

EDUC-SHARE

This event is organised by EDUC-SHARE, the research and innovation part of EDUC. The project "EDUC-SHARE" received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101017526.

If you wish to learn more about EDUC-SHARE and the EDUC Alliance, note that a dedicated event is taking place in Rennes that same week that you are most welcome to attend: The event is called: "EDUCation meets Research: The EDUC European University Adventure" and will take place at the University of Rennes, on Beaulieu Campus Thursday 1 February 2024. You can learn more about the event [here](#).

