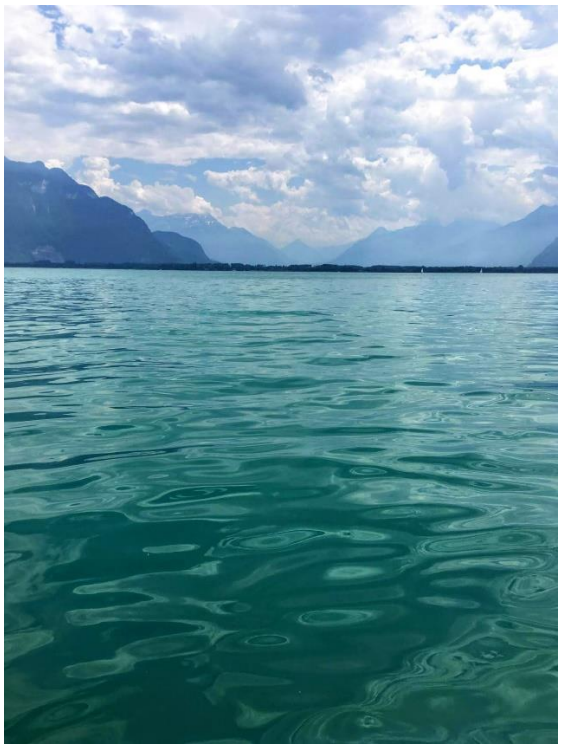
3-years fully funded PhD position, University of Barcelona, Spain

Unravelling the role of calcite on the carbon budget of inland waters

Disciplines: Limnology, Biogeochemistry, Geosciences, Remote sensing



Context: Inland waters are a net source of carbon (C) to the atmosphere. Carbon dioxide (CO_2) supersaturation in inland waters is caused by organic matter respiration, carbonate weathering, and calcium carbonates (calcite) precipitation. Approximately 60% of the global lakes and reservoirs show moderate to high alkalinity levels where $CaCO_3$ precipitation is likely to occur. Yet, the role of calcite cycling has been so far largely overlooked.

The pelagic calcite precipitation-dissolution cycle is tightly linked to the organic C loop: precipitation coincides with primary production when photosynthesis shifts the carbonate equilibrium, and dissolution occurs when aerobic and anaerobic respiration releases CO_2 and produces favourable conditions for calcite dissolution. Although the overall calcite precipitation/dissolution mechanisms have been documented from *in situ* or lab incubation experiments, the large-scale impact of calcite precipitation and dissolution on the C sink/source balance in inland waters remains largely unknown.

Pelagic calcite precipitation likely takes place seasonally at low background levels during the warm season. But sometimes, it produces spectacular whiting events, turning the surface waters into a milky-blue colour, detectable with satellite imagery. Despite convincing evidence of whiting events in multiple waterbodies of diverse geographical locations, there is currently no large-scale assessment of their spatial and temporal occurrence, impeding the possibility to evaluate the importance of calcite precipitation events on the global C cycle. Moreover, as a result of climate change and human water use, an increasing number of water bodies are becoming shallower and seasonally or totally dry, contracting their water volume and exposing large quantities of lake sediments to the atmosphere. The fate of the sedimentary inorganic C stock exposed to hydrological contraction or recurrent dry/wet conditions remains largely unknown.

Keywords: lakes, carbon cycle, calcite, whiting, water scarcity

Objectives: i) Determine how calcite precipitation/dissolution impact the overall C cycle in inland waters; ii) Identify the key drivers for the occurrence of whiting events in lakes and reservoirs; iii) Evaluate the effect of water scarcity on inorganic C processes.

Methodological approach: Depending on the candidate's interest, several approaches can be followed, including the analysis of existing databases of lake biogeochemistry for a large number of lakes and reservoirs, multi-spectral optical satellite data, in situ measurements campaigns, experiments in the lab, and process-based numerical modelling.

Scientific environment: the successful candidate will become core member of the Carbon and Nutrient Biogeochemistry in Aquatic Systems team at the Department of Ecology of the University of Barcelona, Spain. The candidate will benefit from strong interactions with other researchers working on this topic at the national and international level. The candidate will join the Doctoral program in Ecology, Environmental Sciences and Plant Physiology.

Supervisors: Biel Obrador, Camille Minaudo

Profile: Master in environmental sciences, limnology, ecology, remote sensing of the environment. Eager to learn and acquire new skills, the candidate must demonstrate a strong interest for the ecology of aquatic ecosystems. We seek outstanding candidates with a strong academic background, willingness to work in an interdisciplinary vibrant environment, and a strong commitment to collaborative, supportive, inclusive and equity-based work ethics. Prior experience in conducting research, preferably in a related field, is desirable. Candidates should demonstrate critical thinking skills, problem-solving abilities, and the capacity to contribute to innovative research projects.

Prior participation in fieldwork activities in aquatic ecosystems will be appreciated. Proficiency with GIS data analysis, programming skills (e.g. R, Python) and a commitment to open science principles will be highly valued.

Starting date: 01/10/2024 and for 3 years. **Gross annual salary:** 21,560 EUR.

Find more information and how to apply on the EURAXESS job portal and the Electronic Office of University of Barcelona.

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