



PhD opportunity - Graduate School ED585

Cellular processes of biogeochemical matter transformation in planktonic rhizarians

Université du Littoral Côte d'Opale
Laboratoire d'Océanologie et Géosciences (LOG) - Wimereux
Centre de Recherche et d'enseignement multidisciplinaire
international (CEREGE) - Aix-en-Provence
France

36 months

Call description: This PhD position is part of the 4-years ChoRhiSO project (Characterisation of Rhizaria in the Southern Ocean) led by Tristan Biard. ChoRhiSO aims to characterize the contribution of siliceous Rhizaria, to marine biogeochemical cycles (in particular the carbon biological pump and silica cycle) of the Southern Ocean.

The team involved in ChoRhiSO has already published a number of pioneering studies about the importance of the elusive Rhizaria in modern oceans. These studies highlight that Rhizaria represent a substantial fraction of living biomass in the ocean (Biard et al., 2016, Laget et al., 2024). Such biomass eventually fuels large fluxes of particulate organic carbon (Stukel et al., 2019) and biogenic silica (Biard et al., 2018) exported to the deep ocean. Nevertheless, rhizarians encompass a large diversity of species, spanning a wide size range (0.04 - > 4 mm) and inhabiting diverse ecological niches. Therefore, the role and significance of Rhizaria to biogeochemical cycles cannot be reduced to the study of a few taxa, which was the case for the studies mentioned above. Moreover, our previous work mostly focused on quantifying elemental biomass, rather than the rates of biogeochemical matter transformation at the cellular level.

This PhD project will be a cornerstone of ChoRhiSO's second objective: "Quantify the different pathways (i.e., gravitational, dissolution, and minipellets) by which Rhizaria contribute to the biogeochemical cycles of C and Si". Specifically, we will aim to quantify two cellular processes affecting the transformation of C at the cellular level :

- The production of C-rich fecal matter through *minipellet* (MP).
- Respiration.

Minipellet production will be investigated using various approaches/methods, starting with traditional microscopy observations to determine whether or not all Rhizaria can produce minipellets. Then, we will use the experimental devices [SNOWMAN](#) and "[Gravity machine](#)" to investigate the interaction of Rhizaria with marine snow and the subsequent production of minipellets. Ultimately, to quantify the impact of minipellet in gravitational fluxes, we will explore the elemental contents of minipellets using electron microscopy, Micro-Fourier Transformed Infrared spectrometry (~FTIR) and chemical analyses.



Rhizaria from the SO, excreting a MP (arrow). © K. Leblanc.

Respiration will also be investigated using various approaches/methods. We will first focus on oxygen respiration. Oxygen consumption rates are used to define zooplankton food demand and growth. Such information is lacking for silicified Rhizaria but has been acquired for other planktonic Rhizaria (including work from J. Meilland). We will measure oxygen respiration under various conditions (e.g., light, food availability, pressure, temperature, etc.) to acquire an exhaustive dataset. As many Rhizaria thrive under low oxygen concentrations, we will also investigate Rhizaria's putative ability to respire nitrogen under specific conditions. So far, only benthic Rhizaria have proved capable of such unique respiration.

Designed to complement regional field studies (in particular in the French Riviera) and oceanographic cruises in the Southern Ocean, these laboratory experiments will generate information needed to interpret large-scale studies in different major oceanic basins (the final objective of this PhD project).

PhD applicants- Required skills: We are looking for a bright, curious, and highly motivated PhD candidate holding a MSc in a relevant topic (e.g., marine biology-ecology, biological oceanography, biochemistry, cellular biology). The candidate should be interested in laboratory work and be able to perform data analysis (R, or Python) at an intermediate level. A willingness to spend extended periods of time during field trips, including a ~50-day cruise in the Southern Ocean (Year 2), is necessary, such as proficiency in written and spoken English. We expect the candidate to have a high degree of independence, experience in conducting field and laboratory experiments, and the ability to work in an interdisciplinary, international research group.

The PhD candidate will have the opportunity to join (at least one) an international expedition onboard the R.V. Marion Dufresnes (January-March 2028), allowing them to acquire a unique field work experience and meet foreign researchers. The candidate will be part of the ChoRhiSO consortium and will interact with multiple researchers (including several PhD students and postdoctoral researchers) in the host laboratory, creating a dynamic environment for personal development. The candidate will learn from interdisciplinary discussion with a strong emphasis on critical thinking and will receive a multidisciplinary training, ranging from biological oceanography, biogeochemistry, ecology, and big-data analysis.

Duration: The PhD position is for 3 years. **Start date:** October 1, 2026.

Supervision: The PhD candidate will be supervised by Dr. Tristan Biard (LOG, Wimereux) and Dr. Julie Meilland (CEREGE, Aix-en-Provence). Dr. Tristan Biard is the PI of the ChoRhiSO project and a recent recipient of an ERC-Consolidator grant (also on Rhizaria). He is a world-leading expert on Rhizaria. J. Meilland is a renowned expert on planktonic Foraminifera and has unlocked the long-thought-unbreakable mystery of Foraminifera cultivation.

Location: The position will be based at the Laboratoire d'Océanologie et Géosciences (LOG), Wimereux, France. It is a joint research unit of the University of the Litoral Opal Coast, the University of Lille, and the Centre National de la Recherche Scientifique. It is renowned in the fields of zoo- and phytoplankton ecology/physiology, microbial ecology, biogeochemistry, marine optics, physical oceanography, and geosciences. The position will include numerous visits (sometimes for extended periods) to Aix-en-Provence (France) as well as several field-trips (at least 5) on the French Riviera (Nice, Marseille, etc.).

Hours and Compensation: The PhD candidate will be given a fully equipped workstation at the LOG, and will be expected to work full-time for a duration of 36 months, starting in October 2026. The minimum monthly remuneration under the contract shall be ~€1,800 (after taxes).

Application Requirements: Interested candidates should send an email to both supervisors (tristan.biard@univ-littoral.fr and meilland@cerege.fr) by 1st June 2026 with the subject line: PhD-ChoRhiSO, and include the following:

- Cover letter of 1 or 2 pages (with a brief summary of the candidate's academic and research experiences and goals).
- CV (including several references).