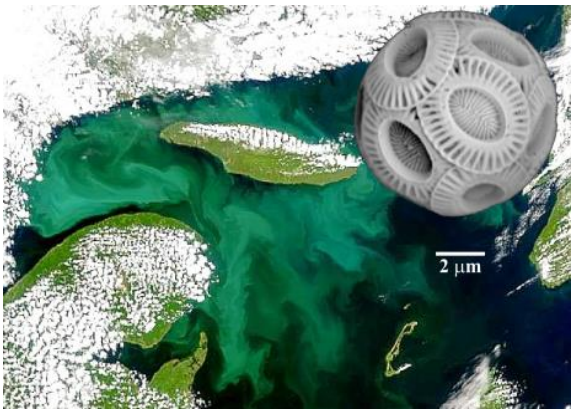
Master in Oceanography at ISMER

How alkalinity and viruses shape long-chain lipid production in marine microalgae



Coccolithophores, particularly *Gephyrocapsa huxleyi*, are among the most influential microalgae for global carbon cycling. Through photosynthesis and intracellular calcification, they form vast seasonal blooms that export both organic and inorganic carbon to depth. Their contribution to climate regulation depends on the balance between particulate inorganic and particulate organic carbon.

In the ocean, viral infections have a very important role in regulating phytoplankton bloom dynamics, including *G. huxleyi* and its associated virus *Ehv*. At the cellular scale, viral infection triggers metabolic shifts in *G. huxleyi*, including a marked overproduction of long-chain lipids such as highly refractory alkenones. Alkenones (C37–C39) enhance long-term carbon storage. They are also robust palaeotemperature proxies through the UK'37 index and increasingly recognised for biotechnological potential.

The goals of this project include (1) characterising alkenone production during viral infection; (2) determining the influence of alkalinity on resilience against viral infection; (3) measuring virus infection-induced changes in cellular carbon quota; (4) assessing the alkenone metabolic pathway during viral infection.

Methodologically, this project will be based on culture experiments of *G. huxleyi* strains under environmentally diverse conditions (alkalinity, viruses). Geochemical analyses include gas chromatograph-mass spectrometry, elemental analysis, titration and photospectrometry, and biological analyses include flow cytometry, PAM and transcriptomics.

This MSc project will be carried out at the Institut des sciences de la mer (ISMER) at the Université du Québec à Rimouski (UQAR). The student will be part of a dynamic, multidisciplinary research environment, and will have the opportunity to develop knowledge and practical skills in marine microbiology, bioinformatics, and biogeochemistry. A fully funded two-year scholarship is available for the successful candidate. Research costs are fully covered by the project.

Qualifications:

- Bachelor's degree in biology, ecology, chemistry, geosciences or other related disciplines.
- Demonstrate a strong interest for research in oceanography.
- Experience in computer science or molecular biology would be an asset.
- Candidates with atypical academic backgrounds are encouraged to apply and should detail what they learned from their experience in their cover letter.

If you are interested, please send your CV, transcripts and a letter of motivation including the contact details of two referees to Prof. El Mahdi Bendif, elmahdi_bendif@uqar.ca. This position will stay open until filled.

Please note that ISMER offers assistance during the recruitment process. We invite you to share your needs with us if necessary. ISMER places great importance on the diversity of its student community where individual differences are recognized, appreciated, respected and valued, with the aim of fostering the full potential of each person and building on their unique talents and strengths.