

Modelling Antarctic zooplankton and their response to climate change



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Scientific background

Zooplankton are important organisms in the ocean providing most of the food to the fish and other large predators. They are also key actors of the ocean uptake of atmospheric CO₂, hence climate, where they export carbon from the surface of the ocean to the vast carbon reservoir of the deep ocean. This ocean carbon pump is particularly important in the Southern Ocean, but is highly uncertain due to the complex interactions between ocean physics, biology and chemistry of the region. Even less is known about how this system will respond with climate change. This PhD project aims to develop a model of the Southern Ocean to examine the factors determining the distribution and abundance of zooplankton and explore aspects of their role in regulating the biological pump in this region, in sustaining populations of fishes and whales and how this is likely to change with global warming.

Project Aims and Methods

The goal of the project is to design a zooplankton module based on Antarctic krill (a key zooplankton species in this region) that can be used in an ocean model in order to explore the impact of climate change on krill. To this effect the student will start the project by working with an existing zero-dimensional (0D) biogeochemical model (GOTM-FABM-ERSEM) to implement a krill module, and then progress to a 3D modelling platform applying the krill module developed in the 0D model to explore circumpolar distribution, variability and impacts of climate change on krill and subsequent impacts on ocean production and climate.

This PhD project will be linked to the ongoing NERC-funded project PICCOLO (roses.ac.uk/piccolo/), enabling the student to interact with the UK Antarctic research community. Additionally, we will encourage the student to take part in one of the Antarctic cruises organised either via the PICCOLO project or on one of the BAS annual survey cruises near South Georgia. While not critical to the PhD project, the cruise will provide an opportunity to collect more data to validate or explore aspects of the model.

Training

The student will receive training in how to develop and run biogeochemical models. In addition to the modelling, the student will receive training in Python and Matlab, software used to analyse model outputs.

This will be complemented with training on aspects of zooplankton biology and ecology (as organisms and their representation in models) and Antarctic ecosystem dynamics. Through BAS, the student will be exposed to a range of scientists involved in studying Antarctic krill and Southern Ocean ecosystems,

Candidate Requirements

We seek a highly motivated and independent candidate with good computer programming and mathematical skills, and strong interest in marine biology, chemistry and/or climate change. Experience in biogeochemical modelling is desirable but not essential.



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