ONE Planet Doctoral Training Partnership

Natural Environment Research Council

Project title: Exploring ocean mechanisms driving melting of Antarctica's ice shelves in a warming world

Ref: OP2457

Keywords: Climate Change, Antarctica, ocean modelling

One Planet Research Theme:

Climate & Climate Change ☒ | Earth System Processes ☒ | Anthropocene ☐ | Environmental Informatics ☐

Lead Supervisor: Christopher Bull, Northumbria University

Key Research Gaps and Questions:

1. How sensitive are Antarctica's ice shelves to projected changes in the large-scale climate forcing?
2. How do feedbacks between the ocean and Antarctic ice sheet influence sea level projections?

Project Description:

Global sea-level rise is one of the most severe impacts of climate change which threatens large coastal cities and ecosystems. Sea-level rise originates from several sources, including melting of glaciers and ice sheets. Around the Antarctic ice sheet's edges, there are thinner areas of ice that float on the ocean, called 'ice shelves'. These ice shelves are melted underneath by the ocean, and slow the the flow of the ice sheet into the ocean. Ocean models then, are a critical tool that enables us to model and predict Antarctica's future contribution to sea level rise. Present ocean models used for melt-rate projections are currently limited in that they poorly represent processes near and inside the ice shelves. This project will look to generate new understanding of the mechanisms that connect the large-scale climate drivers to changing melt rates inside Antarctica's ice shelf cavities. As an extension, the project could also use a state-of-the-art ocean ice-sheet model to understand feedbacks between the ocean and ice sheet. This project has natural partnerships with the University of Reading, for model configuration support and evaluation. The project is closely linked to the NERC project "Re-thinking Antarctic Sea Level Rise Projections", which focuses on improving the protocol for ice sheet projections.

The student will join a growing, vibrant modelling group at Northumbria University who are interested in improving our physical understanding of the ocean, ice-shelf and ice-sheet-climate system. The student will gain real-world experience in solving geophysical equations using complex numerical codes on the UK's national high-performance supercomputer. The results could underpin a step change in the community's confidence and understanding of future sea level rise projections. Quantative, industry-sought, big data skills will be developed and fascinating geophysical phenomena studied.

Prerequisites: A physical science or quantitative background (first degree in maths/physics or similar) is essential. Candidates with previous experience in computational fluid dynamics and/or scientific programming (e.g. Fortran/Python) are encouraged to apply. Applicants from a minority group are strongly encouraged to apply. For more information, please contact Christopher Bull (christopher.bull@northumbria.ac.uk).

Newcastle University

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