ONE Planet Doctoral Training Partnership

Natural Environment Research Council

Project title: Autonomous Observations and Modelling of Antarctic Ice Shelf Melting to Reduce Uncertainty in Sea Level Projections

Ref: OP2402

Keywords: Antarctica, ice shelf, ocean circulation, Autononmous Underwater Vehicle (AUV)

One Planet Research Theme:

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

Lead Supervisor:
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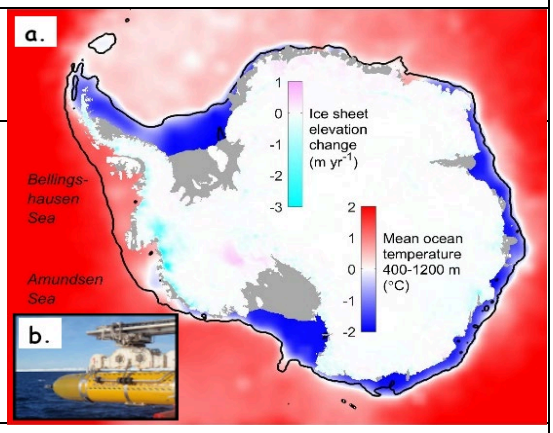

Key Research Gaps and Questions:

What controls the melt rate of Antarctica's floating ice shelves?

Can we relate changing conditions beneath the ice shelves to climate change?

How can we improve the representation of the key processes in climate models?

Project Description:

Estimates of Antarctica's contribution to sea level rise by 2100 range from -5 to +200 cm, dwarfing all other sources of uncertainty. The key to reducing that uncertainty lies in improving our understanding of the ocean circulation beneath the floating ice shelves (shaded grey in figure a). Enhanced melting of the small ice shelves in the Amundsen and Bellingshausen seas, caused by warm ocean waters (red shading in figure a), is currently driving the ice sheet thinning observed in that region (cyan shading in figure a).

The project will exploit some unique datasets that have been, and will be, collected by Autonomous Underwater Vehicles (AUVs, figure b) sent beneath the ice shelves of the Amundsen Sea[1]. Those data will be combined with ship-based measurements[2] and ocean models of reduced complexity to advance our understanding of the sub-ice circulation. The overall goal is to improve the representation of the key processes in the ocean general circulation models that are used for climate and sea level projection.

The project is a collaboration with the British Antarctic Survey and a broader international team. The student will gain experience in the analysis of oceanographic data collected with AUVs, and in the use of inverse and forward models. There should be an opportunity to participate in Antarctic fieldwork to collect under-ice data with the UK's new Autosub5.

[1]Jenkins, A., et al. (2010): *Nat. Geosci.*, **3**, 468–472 (doi: 10.1038/ngeo890).
[2]Jenkins, A., et al. (2018): *Nat. Geosci.*, **11**, 733–738 (doi: 10.1038/s41561-018-0207-4).

Prerequisites:

A numerate background (first degree in maths/physics/earth sciences or similar) is essential. Previous experience with the analysis of data and some knowledge of computer programming (Python/Matlab/Fortran), although not essential, is desirable.

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