ONE Planet
Doctoral Training Partnership

Natural Environment Research Council

Project title: A slippery situation? Modelling the impact of surface melt on Antarctic Ice Shelf stability

Ref: OP2430

Keywords: Ice shelves, Modelling, Antarctica

One Planet Research Theme:
Climate & Climate Change ☒ | Earth System Processes ☒ | Anthropocene ☐ | Environmental Informatics ☐

Lead Supervisor:
Sammie Buzzard, Northumbria University

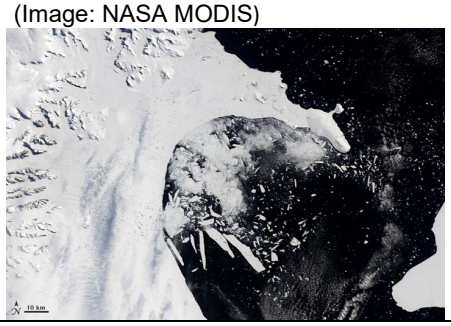
Key Research Gaps and Questions:

How do ice shelf surfaces evolve in response to surface melt over multiple years?

Which ice shelves are showing vulnerability to meltwater induced damage and/or collapse?

How does ice shelf flow impact surface melt features?

(Image: NASA MODIS)



Project Description:
The formation of surface meltwater on Antarctica's floating ice shelves has been linked with the disintegration of several ice shelves including the Larsen B, the collapse of which resulted in the loss of an area of ice over twice the size of Greater London over a period of just a few weeks.The loss of ice shelves removes their buttressing effect on the grounded ice sheet, influencing the contribution of Antarctica to global sea level as well as affecting ocean circulation and temperature, and causing a loss of habitat. Understanding the surface hydrology of ice shelves is thus an essential first step to reliably project future sea level rise from ice sheet melt.
The project will use a high-fidelity model of Antarctic ice shelf surface hydrology, developed by Dr Sammie Buzzard, to carry out case studies of surface melt on Antarctic ice shelves. Possible areas of investigation include the evolution of the ice shelf's upper layer of snow through the inclusion of meltwater, and the development of the locations of surface lakes over multiple seasons. In collaboration with Dr Jan De Rydt (Northumbria), the surface hydrology model will be used alongside Úa, a finite-element ice-flow model, to investigate the long term impact of surface melt under a variety of future climate scenarios.

References: Bell, RE., et al. 2017. Antarctic surface hydrology and impacts on ice-sheet mass balance Nature Climate Change 8 (12), 1044-1052
Buzzard, S., et al. 2018. Modelling the fate of surface melt on the Larsen C Ice Shelf. Cryosphere 12(11), pp. 3565-3575. (10.5194/tc-12-3565-2018)

Prerequisites:
A strong numerical background (e.g. a degree in mathematics, physics or earth sciences with a substantial numerical component) is preferred. Coding ability would be beneficial but is not essential as long as the candidate has the enthusiasm to learn these skills. For more information, please contact Sammie Buzzard (Sammie.buzzard@northumbria.ac.uk)

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