NERC-funded Research Experience Placement (REPs) Summer 2025

Project title

Ice Crystal Structure of Antarctic Ice

Lead supervisor

Emma Pearce

Project description

As glaciers flow from the Antarctic continent toward the ocean, they transition from ice on land to floating ice, forming vast ice shelves. Over time, the accumulation of internal stresses within these ice shelves leads to the formation of large fractures, leading to iceberg calving. Despite its critical role in Antarctic ice mass loss, the precise mechanisms controlling ice fracturing and calving remain poorly constrained, representing a major uncertainty in projecting Antarctica's future contribution to global sea level rise.

This project aims to improve our understanding of ice fracture dynamics by analysing ice core samples from the Brunt Ice Shelf, Antarctica. A key factor influencing fracture behaviour is the microstructural properties of the ice, particularly ice crystal fabric—the orientation and distribution of individual ice grains which evolve in response to stress. By examining the microstructure, we can assess how ice flow history and stress regimes influence fracture susceptibility.

The project will involve hands-on laboratory work, preparing thin sections of Antarctic ice cores collected during field expeditions in 2023–2025. These thin sections will then be analysed using polarized light microscopy, a technique that reveals variations in crystal orientation, grain size, and grain shape. The primary goal is to quantify how ice crystal fabric changes with depth, providing insight into deformation processes at different stratigraphic levels within the ice shelf. These data will then be compared to our fracture analysis data of these same ice cores. Allowing links to be made between the ice fabric and ice strength.

Project restrictions

The project requires the individual to work inside the cold labs at the British Antarctic Survey.

Working arrangements

the project could not be carried out remotely as the student would need to be at BAS to prepare and work on thin sections. The student will join our twice monthly ice core meetings, and aim to present their findings to all at the end of their project in one of these meetings. Other members of the research group (myself included) will also be working in the lab during this time, and will be present to work with the student and integrate them further into the research culture at BAS.