

## Research Experience Placement (REP) Scheme Project

**Project Supervisors:**

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**Host Organization and Department (if applicable):**

Geography Department, Durham University

**Project Title:**

Ice sheet dynamics and landscape evolution

**Project Description:**

Ice sheets shape their own future by altering the topography beneath them. Over a single glacial cycle (~100,000 years) the growth and decay of an ice sheet leads to the subsidence and rebound of the land beneath the ice. Over multiple glacial cycles the flow of ice preferentially erodes giant glacial troughs, 10's of km wide, and millions of tons of sediment are transported from the continent to the ocean. This redistribution of material reshapes the land and triggers an isostatic response that continues for tens of thousands of years. These topography-altering processes affect the behaviour of the overlying ice sheet but are not incorporated into numerical models of long-term ice sheet evolution.

The aim of this project is to investigate feedbacks between glacial erosion, sea-level change, and earth deformation in the context of past Antarctic Ice Sheet (AIS) change.

Much of Antarctica is *marine-grounded*: ice flows directly into the ocean and sea-level change plays an important role in controlling the rate of ice flow. A suite of numerical experiments has recently been carried out by Whitehouse using a new model that represents feedbacks between AIS dynamics and sea-level change. The student will interrogate the model output to identify the strength of feedbacks between ice dynamics, sea-level change, and land deformation. They will also implement a simple erosion model, drawing on previous work by Jamieson into the relationship between ice velocity and glacial erosion. The project will suit a numerate student familiar with programming languages such as python or MATLAB. There will also be opportunities to experiment with developing new visualisations of the model output.

**Skills and Career-Development Opportunities:**

The student will learn about the processes controlling the evolution of the Antarctic Ice Sheet, gain direct experience in working with cutting edge numerical model output, and have the opportunity to apply their expertise in programming to an environmental science problem.

The student will receive tuition from the supervisors in relation to developing a research career, including discussion of preparation for a PhD project and guidance in producing a short report on the research findings of this study.

Finally, the student will be introduced to the activities of the Scientific Committee for Antarctic Research (SCAR). They will have the opportunity to contribute to one of SCAR's working groups (led by Whitehouse and Jamieson) and interact with the wider international Antarctic research community.

**Wider context of research:**

The student will join the lively research meetings hosted by Durham's 'Antarctic Group'. This group of ~15 researchers meet monthly via Zoom (hopefully in person over the summer) and is made up of a 50:50 mix of research students and academic staff. The meetings provide an informal setting in which to discuss emerging research in the field, hear about new research taking place within the department, and present and receive feedback on preliminary research findings. The student will be able to interact with current research students and gain direct insight into how Antarctic research is carried out.

**Project Timeframe:**

The project work is expected to take ~8 weeks but the timeframe over which the research is carried out is flexible, with joint supervision provided by Whitehouse and Jamieson.