

Exploring the eco-hydrology of glacier surfaces

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Background

The low nutrient environment that is the glacier ice-atmosphere interface has recently been described as an “ice cold hot spot” for microbiological diversity and activity. Indeed, first order estimates suggest there may be a comparable number of microbes thriving in the shallow photic zone of the Earth’s glaciers as there are in the top 200m of Earth’s oceans. Crucially, the presence of microbial life on glacier surfaces has the potential to “biologically darken” the ice augmenting melt rates and supraglacial runoff volumes. However, to date, these processes remain poorly documented or understood. Consequently, the principal aim of the project will be to develop a better understanding of the hydrological, biogeochemical and microbial processes and characteristics associated with the ice surface habitat. The PhD programme, therefore, provides an excellent opportunity to engage in truly interdisciplinary research that covers a range of investigative avenues, all exploring a variety of glaciological issues and yielding a significant breadth of transferable skills.

The research areas that the PhD programme could expand into, dependent on the applicant’s skill set and interests, would include:

- (i) Ice surface hydrology, with particular focus on using hillslope hydrology as an analogy to examine the changing hydraulic conditions and their influence on runoff volumes and organic and mineral particle fluxes.
- (ii) Ice surface microbiology, examining the microbes and products that enter, reside in and leave the glacier surface habitat and specifically considering the temporal dynamics of microbe communities flourishing on or washed from the supraglacial environment.
- (iii) Ice surface biogeochemistry, centred on better-characterising mineral-microbe interactions at the ice surface to understand their relative importance on key nutrient cycling within the low nutrient environment.

There is a wealth of samples and data currently available in Aberystwyth that are highly suited to initiate the project; these samples were collected as part of Natural Environment Research Council project examining glacier surfaces as refuges for distinct microbes. Further opportunities exist to complement these data with new samples collected from Arctic and Alpine glacier sites within Europe.



Figure 1: The supraglacial habitat on Austre Brøggerbreen, Svalbard, illustrating cryoconite, algae, supraglacial dust and meltwater channels – all key components of a glacier’s ecological character.

Projects may develop with focus on a singular area, or look to incorporate two or three elements. Applicants should work from these outlines to construct a specific project proposal, typically a few sides of A4, as part of their application.

Personal specification

Essential:

- An undergraduate degree (2.i class, or higher) in a relevant Earth or Environmental Science subject, or in Biology / Ecology.
- Strong quantitative, laboratory and/or analytical skills.

Desirable:

- Some glaciological training, education and/or experience.
- The desire and ability to undertake glaciological fieldwork in remote locations.

Further information

For further information relating to this project, please email Dr. Tris Irvine-Fynn (tdi@aber.ac.uk).

For application forms and procedures, please go to the Department's relevant web-page (<http://www.aber.ac.uk/en/iges/prospective/postgraduate/>) and the University's information on postgraduate applications (<http://www.aber.ac.uk/en/postgrad/howtoapply/> and <http://www.aber.ac.uk/en/postgrad/funding-fees/uk-eu/research-competition/>)

Useful references

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