

Supraglacial ice characteristics retrieved from remote sensing techniques

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Background

The characteristics of the glacier ice-atmosphere interface are critical in determining the relative proportions of the energy balance involved in ice-melt. Moreover, these characteristics have implications on the data and backscatter retrieved by remote sensors mounted on various satellite platforms. Recent research has demonstrated that dust and biological consortia can influence glacier surface albedo at the plot-scale, and both glaciers and ice-sheets may experience systematic changes in ice reflectivity. However, the absence of a clear relationship between supraglacial characteristics and potential driving forces highlights this as a research necessity to improve models used to forecast glacier and ice-sheet melt rates. Consequently, the principal aim of the project will be to interrogate the parameters describing glacier surface properties and relate dynamics in these properties to physical processes. The PhD programme, therefore, provides an excellent chance to engage in research that covers a range of investigative avenues; more specifically, the project allows applicants the opportunity to examine glaciological processes and data sets bridging from the plot- to satellite- scales. The research will deliver a significant number of transferable skills in remote sensing and ground-truthing.

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

- (i) Ice surface albedo: the temporal dynamics of glacier ice surface reflectivity remains poorly constrained, despite evidence of longer-term trends and processes behind systematic change, and this remains poorly studied.
- (ii) Ice surface topography: as has been shown for sea ice, it is possible to retrieve measures of ice surface geometry from C-band radar, and exploring temporal variations in surface topography at the glacier-scale has remained under-explored.
- (iii) Ice surface content: in Arctic settings, analysis of remotely sensed data products has facilitated quantification of black carbon content or the geological make-up of surface debris, but a similar assessment of biological particulates is yet to be achieved.
- (iv) Ice surface dynamics: C-band radar has also been widely used to assess surface-melt characteristics of ice caps and glaciers, yet spatio-temporal patterns and processes remain poorly investigated or described.

Aberystwyth offers a number of existing data sets, and access to sources of remote sensing data products that are highly suited to this project. The project, based within the Centre for Glaciology, would be also aligned with the Earth Observation group's expertise, and include intellectual support from the Institute of Biological, Environmental and Rural Sciences. Opportunities exist to complement these data with ground truth data collected from glacier sites within Europe.



Figure 1: A typical supraglacial environment, Austre Brøggerbreen, Svalbard, highlighting spatial variations in supraglacial dust and topography – both key components to the

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 Physics.
- Strong quantitative, remote-sensing, GIS 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) or Dr. Tom Holt (toh08@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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