University of Glasgow | School of Geographical & Earth Sciences

Antarctic glaciers and rock weathering: Exploring chemical and mineralogy processes within the blue ice fields

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Antarctica is our most important source of meteorites. These extraterrestrial rocks accumulate within glaciers, and can be recovered in large numbers from 'blue ice fields', which are regions where they are concentrated by ablation of glacial ice. Almost all of the meteorites that have been found by US teams working in the Transantarctic Mountains have been significantly altered by reaction with glacial meltwater and the Earth's atmosphere. The resulting decay of primary minerals, and precipitation of weathering products (e.g. magnesium carbonates and iron oxyhydroxides, or 'rust'), is highly detrimental to the scientific value of these rocks. However, in this project we aim to turn this problem into a virtue by using weathering products to unlock the information that contain regarding the mechanisms and rates of ice melting, and even the climatic evolution of the interior of Antarctica.



Using the world-class analytical facilities of the Imaging, Spectroscopy and Analysis Center (ISACC) in the Department of Geographical and Earth Sciences, we will determine the mineralogy and chemical composition of a suite of Antarctic ordinary chondrites that have undergone different degrees of weathering. Questions to be asked will include:

- Which factors intrinsic to the meteorites given their rate of decay (e.g. crystal size, primary mineralogy, porosity & permeability)?
- Does the volume of weathering products and their mineralogy and chemical composition differ between samples and so potentially encode information on local environments and/or their change with time?
- Do meteorite weathering products record multiple episodes of burial in the ice and exhumation ?

These observations will be complemented by weathering experiments undertaken on fresh meteorite samples at the University of Reading. The experiments will attempt to duplicate conditions within the Antarctic ice, and meltwater pools, so that weathering rates can be determined.

The student will work closely with supervisors at Glasgow, Reading and Imperial College, where they will receive training in mineralogy, geochemistry and meteorite research. He/she will also be a part of a vibrant international meteorite research community and so have the opportunity to travel widely in order to undertake research and present results.

Application procedure and deadlines
To be considered for PhD studentships to be held in the School of Geographical and Earth Sciences (GES), suitably qualified candidates should apply via the website of the College of Science and Engineering (http://www.gla.ac.uk/colleges/scienceengineering/graduateschool/prospectivestudents/essentialinformation/). Closing dates for University and research council funded studentships will be in early in the new year, as stated on the GES studentships page: http://www.gla.ac.uk/schools/ges/research/postgraduate/.

Non- English speakers must meet the University's English language requirements. Candidates for NERC studentships should also meet the NERC's requirements for both academic qualifications and residential eligibility. For more information go to http://www.nerc.ac.uk/funding/application/studentships and please note that *non-UK European Union citizens will be awarded fees only by NERC.*

For informal enquiries about the research projects please contact the relevant supervisors. Information on the GES graduate school and the application process can be obtained from Mrs Jean McPartland, the assistant to head of the School (Jean.McPartland@glasgow.ac.uk).