

The emplacement and deformation of rheomorphic ignimbrites

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Ignimbrite-forming pyroclastic eruptions were traditionally thought to involve the generation of large Plinian eruption columns where pyroclasts mixed with ambient air, before the column collapsed and generated pyroclastic density currents from which ignimbrites were deposited. We now understand that some ignimbrites are the products of much lower eruption columns or fountains. In these eruptions the pyroclasts retain their heat, and as they are deposited begin to agglutinate and coalesce to form a hot ductile mass that undergoes complex deformation. These ignimbrites display a variety of structures, including folds, which are often refolded, and elongation lineations. They are typically referred to as rheomorphic or lava-like ignimbrites. These ignimbrites are formed during particularly devastating eruptions and examples up to 200 m thick and $\sim 1000 \text{ km}^3$ in volume have been recognised.

Very little is known of the emplacement of rheomorphic ignimbrites, in particular the nature and duration of deposition from the pyroclastic density current, and the deformation they undergo, both during and shortly after eruption. This project aims to compare and contrast rheomorphic ignimbrites from a variety of settings to address the following key questions:

- 1) Are rheomorphic ignimbrites deposited incrementally or during single sustained eruptions?
- 2) What does deposit architecture tell us about the nature of the density current?
- 3) What do the observed structures tell us about the deformation of the agglutinated pyroclasts?
- 4) What do the observed structures tell us about the location of the vent and the effects of topography and bounding structures (e.g. faults)?
- 5) What do the observed structures tell us about the cooling of the ignimbrite (e.g. is there a transition from ductile to brittle deformation)?

The fieldwork localities are flexible but you will examine ignimbrites from a variety of tectonic settings with initial work on Glencoe, the Lake District and Gran Canaria. Detailed field mapping, logging and structural analysis will be undertaken in order to examine and document the physical volcanology and structural geology of the rheomorphic ignimbrites. Petrographic and chemical analyses using optical and scanning electron microscopy will be undertaken to further describe and interpret key lithologies, and interrogate micro-structures.

The student will receive training in:

- 1) mapping and logging of ignimbrites using a rigorous lithofacies approach

- 2) detailed structural analysis of the ignimbrites
- 3) optical microscopy and the SEM

The successful candidate will have a strong, demonstrable interest in physical volcanology and structural geology. The student must be able to drive, have a good level of physical fitness, and experience of camping and working in mountainous terrain.

About us: In Glasgow, the student will join the Graduate Schools of the School of Geographical and Earth Sciences (up to 20 new PhD students starting in autumn 2011) and the broader College of Science and Engineering; both of these have thriving post-graduate research communities. The Glasgow Earth Systems Research Group (ESRG) is a vibrant research group that has weekly meetings and one or two research 'away-days' annually. ESRG is supported by state-of-the-art laboratories on the Glasgow campus and at the Scottish Universities Environmental Research Centre in Glasgow's southern suburbs.

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).