

Proposed Studentship

Investigating the interaction of magma plumbing systems beneath Icelandic volcanoes: How close are they really to their neighbors?

Supervisor (s): Dr Christina Manning and Dr Dave Waltham

Project Description:

The generation of melt in the mantle requires particular conditions as such it is no surprise that volcanoes are clustered in specific locations. Studies have shown that once melt reaches the crust it can be stored in complex magma plumbing systems where batches of magma move laterally as well as vertically. Given these complexities it appears likely that in areas where there are several volcanic centres that there must be a certain amount of interaction between the magma plumbing systems supplying these edifices. The 2010 eruption of Eyjafjallajökull saw much publicity of historic links between eruptions at Eyjafjallajökull and those at the larger Katla volcano (Iceland) and the suggestion that eruptions at Eyjafjallajökull can trigger eruptions at Katla. Current investigations into the mechanics of Icelandic volcanic systems suggest that magma is typically intruded along sills at shallow levels in the crust and suggest that stress changes at one centre can impact on the stability of closely located volcanoes. This project will look for geochemical evidence of magma interaction between lavas from Eyjafjallajökull and Katla. Focusing on lavas erupted during historic dual eruptions of Eyjafjallajökull and Katla this study will:

- Use micro-sampling techniques to build up detailed petrogenetic histories for individual populations of mineral grains and use this to suggest possible magma plumbing configurations.
- Use diffusion profiling to assess timescales of magma ascent and storage in the crust.
- To try and ascertain whether decompression and melt extraction at one centre can destabilize the magmatic system sufficiently to trigger eruptions at other edifices and if so can it be identified in the geochemical record.
- If this trigger event is recorded in zoned phenocrysts diffusion profiling will be used to determine the time lapse between trigger and eruption.

The successful student will undertake field work in Iceland and be trained in a range of analytical techniques specifically analysis of small aliquots from zoned minerals for isotope analyses, major and trace element analyses of mineral grains and diffusion profiling of zoned minerals using Laser Ablation ICPMS.

References:

- Davidson, J.P., Morgan, D.J., Charlier, B.L.A., Harlou, R. & Hora, J.M. (2007). Microsampling and Isotopic Analysis of Igneous Rocks: Implications for the Study of Magmatic Systems. *Annual Review of Earth and Planetary Sciences* 35: 273–311.
- Davidson, J, Tepley, F, Hora, J & Knesel, K (2002). Magma system processes constrained by mineral-scale isotope variations. *Geochimica Et Cosmochimica Acta* 66(15A): A170-A170.

Morgan DJ; Costa F (2010) Timescales of Magmatic Processes, In: Dosseto A; Turner S; Van-Orman J (Ed) *Timescales of Magmatic Processes*, Wiley-Blackwell.

Morgan DJ; Blake S; Rogers NW; De Vivo B; Rolandi G; Macdonald R; Hawkesworth CJ (2004) Time scales of crystal residence and magma chamber volume from modelling of diffusion profiles in phenocrysts: Vesuvius 1944, *Earth and Planetary Science Letters*, 222, pp.933-946.

Gudmundsson, A & Andrew, REB 2007, 'Mechanical interaction between active volcanoes in Iceland' *Geophysical Research Letters*, vol 34,

Albino, F.; Sigmundsson, F. Modelling the mechanical interactions between volcanoes: the example of the Eyjafjallajökull and Katla magmatic systems, Iceland. American Geophysical Union, Fall Meeting 2011, abstract

Potential funding:

We currently have a vacant NERC studentship available for the **2013 academic session** following a withdrawal of a previous student, which has a maximum funding of 3 years. The NERC studentship will be awarded to the best candidate over a range of PhD topics on offer.

Eligibility:

Eligibility for this studentship is restricted to UK citizens and applicants who have been ordinarily resident in the UK throughout the 3-year period preceding the date of application for an award, and has settled status in the UK within the meaning of the Immigration Act 1971 (i.e. is not subject to any restriction on the period for which he/she may stay). Further information can be found from the National Environmental Research council website <http://www.nerc.ac.uk/funding/eligibility.asp>.

How to Apply:

Please use the **online application system**

(<http://www.rhul.ac.uk/studyhere/postgraduate/applying/home.aspx>) to submit an application for this project. Applications should include 2 letters of reference, a cover letter and CV- applicants are also requested to email a copy of their CV directly to the lead supervisor of this project. Please ensure you complete your application **by Friday 23rd August 2013**.

Interviews will be in the week commencing 2nd September (most likely the 2nd or 3rd) and offers will be made soon after.

For administrative queries please email info@es.rhul.ac.uk and for project queries, contact the Lead Supervisor- staff contact details will be on the website:

<http://www.rhul.ac.uk/earthsciences/staffdirectory/home.aspx>