

**PROJECT TITLE: Quantifying magmatic processes of pantellerites from Mayor Island (Tuhua), Taupo Volcanic Zone, New Zealand**

DTP Research Theme(s): Dynamic Earth, Living World, Changing Planet – delete as appropriate

Lead Institution: University of Bristol

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Project keywords: pantellerite; petrology; volcano monitoring; magma



Aerial view of Mayor Island looking westwards to the North Island of New Zealand. Note the central caldera which occurred as a response to the Tuhua eruption ~ 6.3 ka. Image from GNS Science photo archive.

### Project Background

Mayor Island (Tuhua in Māori) is New Zealand's only Quaternary pantellerite and is located ~ 80 km westwards of the Taupo Volcanic Zone (TVZ). The ~ 4 km wide island exhibits a wide geological variety of eruption emplacement mechanisms from a range of eruption styles and sizes. These include caldera forming events, Strombolian cones, and lava flows. The most recent Plinian eruption was ~ 6300 years ago and deposited ash and lapilli onto the North Island. Since that event, small volume lava domes and flows were emplaced, perhaps as recently as 500-1000 years ago (Houghton et al 1992). Mayor Island's unusual composition and location make this anomalous volcano an outlier in the TVZ. Further work to understand its origin and controlling magmatic processes are vital in case of future unrest.

### Project Aims and Methods

The project aims to quantify the pressure-temperature conditions of pantellerite magma genesis and ascent beneath Mayor Island. We will combine a range of methods including field observations, laboratory studies and modelling. Field work on the island will be within a recently updated geological map that is being completed in collaboration with NZ-based colleagues. Laboratory work will involve petrological and textural analysis, both static and dynamic high P-T experiments, and rheological experiments. We will then use these data to model the flow properties of the magma and explore the underlying controls on the transition between explosive and effusive phases. The results of this work will provide vital information for developing a model of the volcano, which will help constrain future monitoring efforts in case of future volcanic unrest. To integrate with volcano research and monitoring staff at GNS Science, the student will spend at least two periods of time (totaling a minimum of 3 months) at the GNS Science base in Taupo, New Zealand, and on Mayor Island to conduct the field observations and some of the associated analyses.

### Candidate Requirements

The project would suit a student with a first degree in the physical sciences and a desire to develop a range of different skills (field, lab and modelling). Basic petrological knowledge would be an advantage. The balance between field, laboratory and numerical modelling can be adjusted to some extent to suit the background and interests of the candidate.

### CASE or Collaborative Partner

This is a CASE award. The student will spend a minimum of 3 months at the CASE Partner, GNS Science (New Zealand). Previous CASE PhD Students have spent considerably longer at GNS Science than this. Dr Kilgour visits Bristol periodically and we maintain contact via a monthly skype with him that usually includes the whole team (i.e. the PhD student and Bristol supervisors).

### Training

The student will receive training in volcanology and advanced field skills, based at GNS Science (<http://www.gns.cri.nz/>), New Zealand. Petrology, geochemistry, textural studies, rheological experiments and modelling will be completed at Bristol. Candidates will emerge with a strong background in the physical Earth sciences including advanced field, laboratory and modelling skills and highly marketable transferable skills including: numeracy, written and spoken presentational skills and an ability to work in a multidisciplinary team. Previous PhD graduates have gone on to successful careers in academia, environmental organisations (such as the Met Office or British Antarctic Survey), commercial consultancies, volcano monitoring, and teaching.

### References / Background reading list

Houghton BF, Weaver SD, Wilson CJN, Lanphere MA (1992) Evolution of a Quaternary peralkaline volcano: Mayor Island, New Zealand. *Journal of Volcanology and Geothermal Research* 51(3):217-236

### Useful links

Links:

School URL – <http://www.bristol.ac.uk/earthsciences/courses/postgraduate/>

#### NERC GW4+ DTP Website:

For more information about the NERC GW4+ DTP, please visit

<http://nercgw4plus.ac.uk/>

#### Bristol NERC GW4+ DTP Prospectus:

<http://www.bristol.ac.uk/study/postgraduate/2020/doctoral/phd-great-western-four-dtp/>

#### How to apply to the University of Bristol:

<http://www.bristol.ac.uk/study/postgraduate/apply/>

The application deadline is 1600 hours GMT Monday 6 January 2020 and interviews will take place between 10 and 21 February 2020

#### General Enquiries:

Bristol NERC GW4+ DTP Administrator

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