

## Does mantle heterogeneity control the distribution of volcanic systems?

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### Background

The Earth's crust is unique in our Solar System. The young (180 Ma), dense oceanic crust has low elevation compared to the less dense and significantly older (2–4 Ga) continental crust. Throughout its lifetime, continental crust becomes more heterogeneous, inheriting compositional, structural, thermal and mechanical properties from previous stages of the Wilson cycle in a process called tectonic inheritance. This heterogeneity has been shown to control the behaviour of continental crust during extensional rifting (e.g. Papua New Guinea) and has also been linked to the distribution of volcanic systems within continental regions (e.g. Australia). This project will use a multidisciplinary approach to assess the impact of crustal heterogeneity on the distribution of volcanic systems in a young continental collision zone in Armenia.

### Research methodology

The Gegham Highlands, 1 of the 4 neovolcanic zones in Armenia, displays both rhyolitic centres and monogenetic basaltic cones. Using remote sensing, the student will undertake a detailed spatial analysis of the relationship between these volcanic systems and indicators of crustal heterogeneity such as structures and lithological changes. Using geochemical and textural analysis of the volcanic products the student will also gain insight into the evolution of the volcanic systems to better understand the possible relationships between the processes controlling magma supply and those controlling its distribution and storage in the crust. These 2 data sets will be combined to investigate the role that crustal heterogeneity plays in controlling the type and distribution of volcanism occurring in an area and to identify whether certain crustal conditions are preferential for long lived magma storage.

### Training

You will be trained in:

1. Analytical techniques using remotely sensed data such as radar and multispectral.
2. Geochemical analysis of whole rock for major and trace elements and radiogenic isotope ratios.
3. Quantitative textural analysis of the volcanic rocks in thin section and in situ element mapping of both minerals and glass.

### Person specification

We are looking for an enthusiastic applicant with a degree in Earth Sciences, Geography or something similar to undertake this exciting project. No previous analytical experience is required but we are looking for an applicant who is keen to learn these skills.

### References

- 1) Blockley, S. P. E., Gasparyan, B., Manning, C. J., Mark, D., Nahapetyan, S., & Preece, K. J. (2022). Middle Pleistocene environments, landscapes and tephrostratigraphy of the Armenian Highlands: evidence from Bird Farm 1, Hrazdan Valley. *Journal of Quaternary Science*, 37(1), 6-27. Advance online publication. <https://doi.org/10.1002/jqs.3370>

- 2) Sherriff, J., Wilkinson, K., Adler, D., Arakelyan, D., Beverly, E., Blockley, S., Gasparyan, B., Mark, D., Meliksetyan, K., Nahapetyan, S., Preece, K., & Timms, R. (2019). Pleistocene volcanism and the geomorphological record of the Hrazdan valley, central Armenia linking landscape dynamics and the Palaeolithic record. *Quaternary Science Reviews*, 226, 105994
- 3) Weber, G., Simpson, G. & Caricchi, L. Magma diversity reflects recharge regime and thermal structure of the crust. *Sci Rep* 10, 11867 (2020). <https://doi.org/10.1038/s41598-020-68610-1>
- 4) Davies, D. R., Rawlinson, N., Iaffaldano, G., & Campbell, I. H. (2015). Lithospheric controls on magma composition along Earth's longest continental hotspot track. *Nature*, 525(7570), 511–514
- 5) Bischoff, C., Mason, P. J., Ghail, R. C. & Davis, J., 2020. Revealing mm-scale ground movements in London using SqueeSAR™, QJEGH, 53(3).

## Key Information

- This project has been shortlisted for funding by the ARIES NERC DTP and will start on 1st October 2024. The closing date for applications is 23:59 on 10th January 2024.
- Successful candidates who meet UKRI's eligibility criteria will be awarded a NERC studentship, which covers fees, stipend (£18,622 p.a. plus London Weighting for 2023–24) and research funding. International applicants are eligible for fully-funded ARIES studentships including fees. Please note however that ARIES funding does not cover additional costs associated with relocation to, and living in, the UK. We expect to award between 4 and 6 studentships to international candidates in 2024.
- ARIES students benefit from bespoke graduate training and ARIES provides £2,500 to every student for access to external training, travel and conferences, on top of all Research Costs associated with the project. Excellent applicants from quantitative disciplines with limited experience in environmental sciences may be considered for an additional 3-month stipend to take advanced-level courses.
- ARIES is committed to equality, diversity, widening participation and inclusion in all areas of its operation. We encourage enquiries and applications from all sections of the community regardless of gender, ethnicity, disability, age, sexual orientation and transgender status. Academic qualifications are considered alongside non-academic experience, and our recruitment process considers potential with the same weighting as past experience.
- All ARIES studentships may be undertaken on a part-time or full-time basis, visa requirements notwithstanding.
- For further information, please contact the supervisor. To apply for this Studentship follow the instructions at the bottom of the page or click the 'apply now' link.
- ARIES is required by our funders to collect Equality and Diversity Information from all of our applicants. The information you provide will be used solely for monitoring and statistical purposes; it will remain confidential and will be stored on the UEA sharepoint server. Data will not be shared with those involved in making decisions on the award of Studentships, and will have no influence on the success of your application. It will only be shared outside of this group in an anonymised and aggregated form. You will be asked to complete the form by the University to which you apply.
- ARIES funding is subject to UKRI terms and conditions. Postgraduate Researchers are expected to live within reasonable distance of their host organisation for the duration of

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their studentship. See <https://www.ukri.org/publications/terms-and-conditions-for-training-funding/> for more information.