**PROJECT TITLE: Understanding Magma-Driven Faulting in Active Volcanic Systems Using Satellite InSAR**

**Project Science Theme:** Earth Science and Hazards
**Project keywords:** Volcanoes, Faults, Satellites, InSAR

**Lead Institution:** University Bristol
**Lead Supervisor:** Professor Juliet Biggs, Bristol, Earth Sciences
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**Project description:**

Active volcanic systems are dynamic environments in which rising magma and evolving topography drive rapid changes in the crustal stress field. The resulting fault motion can generate damaging earthquakes, surface ruptures, landslides and tsunamis, yet the role of faulting in magmatic systems has received far less attention than eruptive processes. Recent events in Iceland and Ethiopia highlight how magma-driven earthquakes and fractures can cause substantial damage, even without eruption (Lewi et al, 2025), while the rapid fault motion that preceded the catastrophic flank collapse of Anak Krakatau in 2018 was only recognised retrospectively (Kim et al, 2024).

This project aims to develop a new understanding of how faults behave in volcanic environments and how their activity is influenced by magma intrusion, fluid flow and changing stresses within the crust. The student will use state-of-the-art satellite observations to investigate patterns of magma-driven faulting, initially focusing on recent dyke intrusions in Iceland and Ethiopia, where preliminary studies have revealed intriguing and previously unrecognised patterns of fault motion (Ducrocq et al., 2024).

Using advanced geodetic techniques, including InSAR time-series analysis and kinematic inversions, the student will identify and quantify the full spectrum of fault behaviour, from earthquakes and steady fault creep to aseismic transients and fault-zone dilation. The project will provide training in satellite geodesy, geospatial analysis, programming and quantitative data analysis.

As the project develops, the research direction can be tailored to the student's interests. Opportunities include fieldwork, AI and machine-learning approaches to large satellite datasets, numerical modelling of fault processes, and applications to volcanic monitoring and hazard assessment. The student will join a vibrant research team and collaborate with researchers in the UK and internationally, including potential collaborations with the University of Iceland, fieldwork in Ethiopia, and AI development with Bristol's Visual Information Laboratory.

**Useful recruitment links:**

For information relating to the research project please contact the lead Supervisor via: juliet.biggs@bristol.ac.uk

**Bristol NERC GW4+ DTP Prospectus:**
https://www.bristol.ac.uk/study/postgraduate/research/great-western-four-doctoral-training-partnership-nerc/

**How to apply to the University of Bristol:**
http://www.bristol.ac.uk/study/postgraduate/apply/

**The application deadline is Thursday 7 January 2027 at 2359 GMT**