

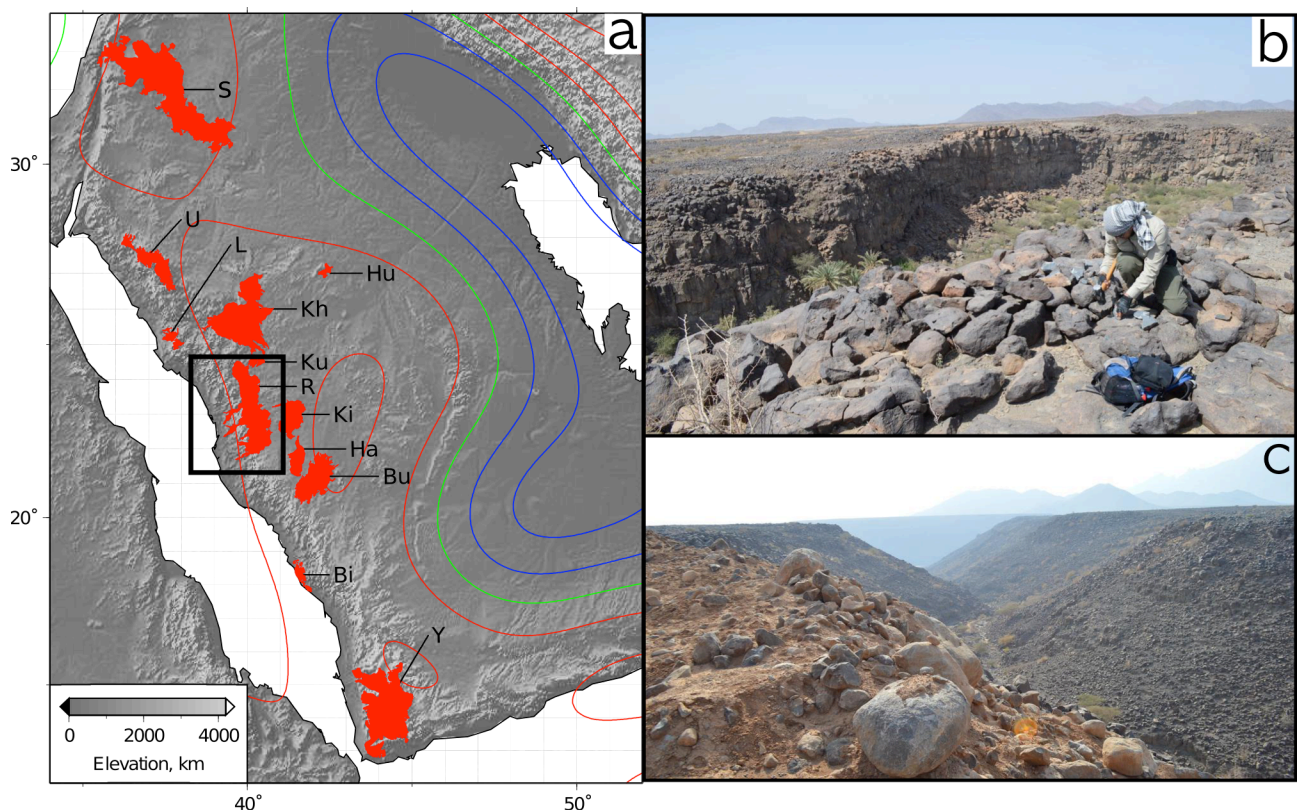
## Histories of mantle convection: Constraints from Arabia's landscape

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**Summary** We will measure the incision history of large rivers in western Saudi Arabia to calculate Neogene erosion and uplift rate histories. Results will be used to constrain evolution of mantle convection through space and time. Basalt samples will be collected and drainage patterns mapped during fieldwork. These data will be used to determine incision rates and pressures and temperature of melting. This project will appeal to geologists/geophysicists interested in combining fieldwork, laboratory analyses and computational methods.

**Project** The distribution and evolution of thermochemical anomalies in the mantle play an important role in generating vertical motions at Earth's surface. Understanding how dynamic support varies through space and time has implications for understanding a range of geological processes (e.g. landscape evolution, magmatism, glacio-eustasy, oceanic and atmospheric circulation). An important corollary is that magmatic, uplift and erosion histories in dynamically supported regions contain important information about mantle convection. Unfortunately the database of reliable constraints on dynamic support is sparse. This project will measure incision rate histories of large rivers that drain dynamically supported topography. The student will undertake fieldwork to collect samples and map flows, perform laboratory analyses for exposure dating and develop inverse algorithms for analysis of landscapes. We will focus on the West Arabian swell where a combination of geophysical, geomorphological and geochemical data indicates that sub-crust processes maintain its km-scale topography (e.g. Wilson et al., 2014). The PhD candidate will join a team of academics and PhD students who work on a range of geomorphological, geochemical and geophysical problems. The student will build on an ongoing project dating Arabian basalts with colleagues in SUERC. We will work closely with our colleagues in the Saudi Geological Survey and KAUST. Please contact [gareth.roberts@imperial.ac.uk](mailto:gareth.roberts@imperial.ac.uk) for more information.

*Wilson, Roberts, Hoggard, and White, 2014. Cenozoic epeirogeny of the Arabian Peninsula from drainage modeling. C-Cubed, 15, doi:10.1002/2014GC005283.*



(a) Arabian Peninsula. Red/green/blue contours = positive/0/negative long wavelength free-air gravity anomalies; contour interval = 15 mGal. Positive anomalies are centered on the West Arabian Swell, Yemen and Syria. Red polygons = Neogene magmatism. Box = study area centred on Harat Rahat (R). (b) Wadi Rabigh, which incises 150 m into Neogene Harat Rahat before draining into the Red Sea. (c) Tributary of Wadi Rabigh showing low relief regional surface.