Geophysical Research Abstracts
Vol. 14, EGU2012-1837, 2012
EGU General Assembly 2012

Investigating basalt genesis, evolution and magmatic residence times in the Taupo Volcanic Zone, New Zealand.

A. Allen (1), K. Saunders (1), G. Kilgour (1,2), C. Manning (3), and J. Blundy (1)

(1) Department of Earth Sciences, University of Bristol, Bristol, United Kingdom (aa7385@bristol.ac.uk), (2) GNS Science, Wairakei Research Centre, Taupo, New Zealand, (3) Department of Earth Sciences, Royal Holloway University of London, Egham, Surrey

Basalts are rare in the Taupo Volcanic Zone (TVZ), representing <0.1% of outcrop by volume. In comparison, rhyolites that are largely considered to be a product of later differentiation from parental basalt magmas are dominant. Thus, apart from several bulk rock studies, little work has focussed on the basalts due to their apparent insignificance at the surface and as a consequence, the genesis and evolution of TVZ basalts is poorly understood.

Bulk rock analyses combine and mix the chemical signals from all the components of the rock (phenocrysts, antecrysts, xenocrysts, groundmass, glass, xenoliths and lithics). This will therefore blur the primary chemical signal and mask evidence for changes in magmatic conditions through time. However, analysis of the individual crystals in the basalts reveal a much more detailed history of the basalts evolution. Processes that impact the chemical composition of a body of magma are recorded by discrete zoning in the crystal lattice of a crystal prior to its eruption. These changes in composition through time can be used to fingerprint the magmatic processes and changes that were on-going at the time of crystallisation of that zone.

There is the potential for the basalts to have experienced varying amounts of partial melting and/or significant crustal assimilation throughout the basalts' history. However, the degree to which these processes are taking place is not well constrained. Here, we will present the preliminary results of additional data, in particular in-situ micro-analytical studies of five basalts, (Kakuki, Rotowarau, Waimarino, K-trig & Okahune), chosen for their relative primitive composition and geographical spread along the TVZ. Using a combination of geochemical techniques (scanning electron microscopy (SEM), electron probe microanalyser (EPMA), laser ablation inductively coupled plasma mass spectrometry (LA-ICPMS), mineral specific Sr isotopes), we aim to determine the origin and evolution of primary crystals and their residence times within the host magma prior to eruption. With these results we hope to gain a better understanding of why basalts are so rare in the TVZ and how basaltic magmas behave in back arc regimes in general.