Prehistoric lavas from Valle del Bove (Etna): I. MELTS modelling results

P. D. KEMPTON[1]*, H. DOWNES[2], A. SPENCE[2], J. BLICHERT-TOFT[3], J. BRYCE[4], E. HEGNER[5], P.Z. VROON[6]

[1]Department of Geology, Kansas State Univ., Manhattan, KS 66506, USA (*correspondence: pkempton@ksu.edu)
[2]Dept. of Earth & Planetary Sciences, Birkbeck, Univ. London, WC1E 7HX, UK
[3]Ecole Normale Superieure de Lyon, Lyon, France
[4]Univ. New Hampshire, Durham, NH 03824, USA
[5]Ludwig-Maximilians Universität, Munich, Germany
[6]Vrije University Amsterdam, Amsterdam, Netherlands

Geochemical investigations of Mt Etna (NE Sicily) have largely focused on historic (>125 yrs old) or recent (<125 yrs old) eruptions, or on ancient basal lavas (~500 - 200 ka). This study targets alkalic lavas from the southern wall of Valle del Bove (VdB), which covers a little known time period of prehistoric magmatic activity from >85.6 ka to <15 ka.

Most VdB lavas are more evolved (basaltic trachyandesites to trachyandesites) than recent and historic Etna (trachybasalts) and overlap fields for prehistoric and ancient Etna lavas in major element plots. The least evolved VdB rocks, however, have MgO contents similar to recent/historic Etna, suggesting similar degrees of magmatic evolution, despite their significantly higher SiO_2 contents.

To better understand the magmatic evolution of the VdB lavas, we have modelled isobaric fractionation and isentropic melting (20-8kb) using MELTS [1, 2]. Results suggest that the VdB has a 'plum pudding' style mantle source consisting of a mix of lherzolite and pyroxenite. The proportion of pyroxenite appears to be less in VdB lavas than in historic / recent Etna. Fractionation occurred in a magma chamber at moderate depths (~10-12 km) and is dominated by ol + cpx. The degree of fraction of VdB lavas is similar to that of recent/historic Etna, but with distinctive parental magmas, i.e. recent Etna lavas are more silica undersaturated. Differences may be a function of degree of partial melting but are more likely due to different source composition and particularly different proportions of pyroxenite in the source.

[1] Ghiorso & Sack (1995) *Contrib. Mineral. Petrol.* **119**, 197-212. [2] Smith & Asimow (2005) *Geochem. Geophys. Geosyst.* **6**, doi:10.1029/2004GC000816.