5.2.P07

Multi-isotopic constraints on magma sources in central Iceland

B. SETH[1], J. DAY[2], M. THIRLWALL[1], D. HILTON[3], K. GRONVOLD[4] AND C. MACPHERSON[2]

[1] Dept. Geology, Royal Holloway of London, Egham, UK (b.seth@gl.rhul.ac.uk)
[2] Dept. Earth Sciences, University of Durham, UK
[3] Scripps Inst. Oceanography, La Jolla, USA
[4] Nordic Volcanological Institute, Iceland

New double spike Pb isotope data and high-precision Sr-Nd data of basaltic glasses from central Iceland are combined with He and O isotope data [Day *et al.,* in prep.] in order to assess the effects of crustal contamination and the input of mantle components to Icelandic basalts. $^{206}Pb/^{204}Pb$ shows limited variation (18.35-18.50) and lie within the range of Eastern Rift Zone (ERZ) basalts [1]. Samples overlap and extend the ERZ array [1] in Pb-Nd and Pb-Sr space confirming that the observed ERZ array is restricted to $^{206}Pb/^{204}Pb$ ratios <18.5. This array points to depleted component ID1 and requires an enriched component intermediate between those of Theistareykir (further N, lower $^{206}Pb/^{204}Pb$, IE2) and Reykjanes Peninsula (further SW, higher $^{206}Pb/^{204}Pb$, IE1) volcanic fields [1]. $\Delta^{207}Pb$ and $\Delta^{208}Pb$ of most of the newly obtained data are slightly higher than ERZ basalts analysed by Thirlwall *et al.* [1], which suggests that the fourth mantle component ID2 (a depleted component with affinities to EM1 [1]) might have been involved in the generation of our northernmost samples. This is supported by higher $^{87}Sr/^{86}Sr$ for given $^{143}Nd/^{144}Nd$ than most Reykjanes Peninsula or Theistareykir samples. The samples of this study exhibit a large range in $^{3}He/^{4}He$ ratios from ~1 to 35R_A [Day *et al.,* in prep.]. Elevated $^{3}He/^{4}He$ is present in samples with both low (0.51299) and high (0.51308) $^{143}Nd/^{144}Nd$, and with $^{87}Sr/^{86}Sr$ up to 0.70346. Oxygen isotope ratios of central Iceland glasses [Day *et al.*, in prep.] are, after estimating equivalent $\delta^{18}O_{Ol}$ (+2.8 to +4.1), similar to $\delta^{18}O_{Ol}$ in basalts from the ERZ (+2.6 to +4 [Thirlwall *et al.*, in prep.]), and much lower than most lavas from the Reykjanes Peninsula (+4 to +5.1 [Thirlwall *et al.*, in prep.]). This could suggest either greater crustal contamination in central Iceland, or that mantle $\delta^{18}O_{Ol}$ in central Iceland is appreciably lower than the +4.2 suggested for the Reykjanes area on the basis of Rejkjanes Ridge submarine lavas [Thirlwall *et al.,* in prep.]. The presence of elevated $^{3}He/^{4}He$ in some of these samples, and the association of high $^{3}He/^{4}He$ with both low and high $^{143}Nd/^{144}Nd$, suggest that a low $\delta^{18}O$ (<+4.0) mantle component is required.

References

[1] Thirlwall *et al.* (2004) *GCA* **68,** 361-386.

5.2.P08

Convection models of the heterogeneous Iceland plume

T. RUEDAS

Danish Lithosphere Centre, Øster Voldgade 10, 1350 Copenhagen, Denmark (tr@dlc.ku.dk)

Several studies have demonstrated that the Iceland plume is compositionally heterogeneous, but the number, character, and depth of origin of the different chemical sources has not yet been clarified unambiguously. Among the results which seem to be well established, however, are an elevated water content in plume lavas (as compared to N-MORB) and the presence of the signature of recycled oceanic lithosphere; the latter feature suggests that an eclogitic component exists somewhere in the plume source. In this study, numerical models of convection and melt generation for a ridge-centered plume are calculated in model boxes comprising the upper mantle and the upper part of the lower mantle, whereby different chemical source regions are defined as initial conditions and tracked through the model as marker fields in order to compare the patterns of erupted melts from the different reservoirs with observations of chemical anomalies in the Iceland region. Special consideration will be given to the notion of a chemically distinct "sheath" picked up by the plume at the 660 km discontinuity (e.g. [1]).

Reference

[1] Thirlwall M.F. (1995) *J.Geol.Soc.Lond.* **152,** 991-996.