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# Low-Ti basalts from the Faroe Islands constrain the early Iceland depleted plume component

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New Sr, Nd, Hf and high precision Pb isotope analyses of 46 Faroese low-Ti lavas erupted at the rifting of the proto-North Atlantic 5̃6-55 Ma ago are presented. The low-Ti lavas are depleted, MORB-like basalts erupted close to the riftzone at the same time as enriched high-Ti basalts were erupted away from the rift . The low-Ti samples include a large proportion of high-MgO basalts and can be related by a common model of low-pressure fractionation. Fractionation correction to 13 % MgO shows only little variation in their primitive major element contents, suggesting very similar origins of the magmas. However, 5 of the samples show signs of mixing with high-Ti melts. Although highly sensitive to crustal contamination, only little is detected in the low-Ti basalts.

Isotopically the low-Ti basalts can be explained by mixing of the two end-members DM (the local depleted mantle as defined by the sample array) and NAEM (North Atlantic End-Member) (Ellam & Stuart 2000). The NAEM component is very similar to the Icelandic depleted plume component ID1 (Thirlwall et al. 2004) and both have negative delta207Pb, low 206Pb/204Pb and epsilonNd and high 87Sr/86Sr compared to MORB. Therefore the NAEM component could be an early version of the ID1 component but it could also be explained as a product of crustal contamination of the ID1 or DM components. The fact that NAEM seems to be a common component in lavas from all of the early NAIP (North Atlantic Igneous Province) and that it is also a mixing end-member for low-Ti basalts mixing with high-Ti melts is an argument for a depleted plume component and not crustal contamination. The NAEM component, or the similar e-component of Hanan et al. (2000), has been interpreted as subcontinental lithospheric mantle by Hanan et al (2000) and Blichert-Toft et al. (2005) but the depleted, MgO-rich melts with high (Dy/Yb)N of 1.13 to 1.33, indicate deep seated melting, and they must have been formed at temperatures higher than MORB mantle. Therefore a plume origin for the NAEM component is more likely.

In contrast to present day Icelandic lavas, very little mixing is detected between the high-Ti and low-Ti basalts and they form separate fields in most plots. This means they must have been generated and evolved separately, but if the NAEM component and the enriched components are all contained in the plume then why do they not mix? The low-Ti basalts are much more abundant on the Faroe Islands compared to the East Greenland side of the rift. This indicates some asymmetri in the plume or melting regime.

References

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