Constraints on petrogenesis of silicic magmas in the Afro-Arabian flood basalt province using oxygen isotopes

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Several mechanisms have been proposed to explain silicic melt generation associated with large igenous provinces and rifted margins (e.g. extreme fractional crystallization from a basaltic melt ± crustal assimilation; melting of lower crustal rocks by mafic intrusions). Silicic magmatism is an important component of the Oligocene Afro-Arabian province. Trace element isotope data indicate a close genetic relationship between the basalts and most silicic units, but a small group of silicic units have distinct features (high Zr/Nb, low $^{143}Nd/^{144}Nd$) that are interpreted as crustal melts (e.g. Ukstins Peate *et al*. 2005).

Oxygen isotopes are a powerful tool to constrain contributions from crustal materials. Baker *et al*. (2000) presented extensive mineral $\delta^{18}O$ data on Yemen basalts, but only included a few cpx $\delta^{18}O$ analyses on silicic units. We mainly analysed $\delta^{18}O$ in feldspar, as quartz is only found in a few silicic units. Most silicic units temporally associated with the flood basalts have a limited range in $\delta^{18}O_{feldspar}$ of +5.9-6.8‰, consistent with the extensive fractional crystallization model proposed by Baker *et al*. (2000). However, our preliminary data on the rare high Zr/Nb silicic units show significantly higher $\delta^{18}O_{feldspar}$ of +7.5-8.1‰.

The Ethiopia rifted margin preserves a record of pre- to syn-rift silicic melt generation spanning from 31 Ma to < 3 Ma. Analysis of ^{40}Ar-^{39}Ar-dated silicic samples (Ukstins Peate *et al*. 2002) show two distinct groups: (i) samples from 3.2 Ma to 10.3 Ma have $\delta^{18}O_{feldspar}$ of +6.0-6.8‰ similar to the 28-31 Ma silicic units associated with voluminous flood basalts; (ii) in contrast, samples from 11.7 Ma to 25 Ma have lower $\delta^{18}O_{feldspar}$ of +5.1-5.6‰.

These new oxygen isotope data will be integrated with elemental and radiogenic isotope data to improve models for silicic melt generation in the Afro-Arabian province.

[1] Baker *et al* (2000). *J. Petrol*. **41**, 1805-1820 [2] Ukstins Peate *et al* (2002). *EarthPlanetSciLett* **198**, 289-306 [3] Ukstins Peate *et al* (2005). *Bull. Volc*. **28**, 135-156