On the Archean vs. Proterozoic age of the HIMU mantle component : New $^{33}S/^{32}S$, $^{34}S/^{32}S$, $^{36}S/^{32}S$-data from Saint-Helena glasses

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In order to better address mantle sulfur isotope variability, we report on the only two available HIMU basalt glasses dredged on Josephine seamount, in the close vicinity of Saint-Helena. Together with several HIMU localities in the south Pacific (including Mangaia), St. Helena exhibits a HIMU signature.

The two lavas show similar Sr-, Nd- and Pb-isotope compositions and trace element patterns compositions compared with previous data. Both are enriched in $\delta^{34}S > 0.5‰$ vs CDT and do not display any significant mass-independent signature, with $\Delta^{33}S \sim 0.014 \pm 0.010$ and $\Delta^{36}S \sim 0.040 \pm 130‰$. Importantly $\Delta^{33}S$ and $\Delta^{36}S$ values are within error of the MORB mantle, at $+0.010 \pm 0.005‰$ and $-0.071 \pm 0.047‰$ respectively.

Trace elements ratios (e.g. $Cl/K \sim 0.045$) show that assimilation of either altered oceanic crust or seawater played a negligible role in accounting for the S-isotope characteristics of these lavas. Despite their large variations in S-contents and major element compositions, the samples show similar S-isotope compositions suggesting a minimal role for either degassing or sulfide segregation.

These results contrasts with those obtained on Mangaia sulfide inclusions in olivine phenocrysts (with $\Delta^{33}S$ and $\delta^{34}S$ as low as $-0.35‰$ and $-11‰$ respectively) and suggests that the HIMU component is likely isotopically heterogeneous for sulfur and Pb-isotopes. The $\Delta^{33}S$ and $\Delta^{36}S$ rather support a Proterozoic recycled component for the source of Saint-Helena melts.