Low-$\delta^{18}O_{ol}$ controlled by entrainment of oceanic lithosphere into the Iceland plume source

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$\delta^{18}O$ values of Icelandic basalts are notably lower than the majority of other ocean island basalt (OIB) localities. The origin of this low-$\delta^{18}O$ signature has been largely attributed to crustal processes, such as assimilation of hydrothermally altered low-$\delta^{18}O$ crust and this process is well documented in several large-volume and evolved fissure basalts from central and south Iceland[1].

We present new *in-situ* $\delta^{18}O_{ol}$ analysis of a set of well-characterised high-forsterite olivine (Fo_{82-91}) from the neovolcanic rift- and flank zones as well as older Tertiary units of Iceland which span the age of the Iceland crust (n=51)[2]. We supplement this dataset with a set of laser fluorination $\delta^{18}O_{ol}$ analysis of high $^3He/^4He$-basalts from NW Iceland (n=8).

The $\delta^{18}O_{ol}$ variation by SIMS spans ~ 3 ‰ across the island with mean $\delta^{18}O_{ol}$ values clustering around 4-4.5 ‰, in agreement with bulk LF data, well below the typical mantle value (~5.19 ±0.2‰). We show that for the studied examples, assimilation processes are unlikely to be significant. This moderately low-$\delta^{18}O$ component occurs in primary mantle-derived basalts with high $^3He/^4He_{Ol}$[2] and thus are characteristic for the upwelling plume. The low-$\delta^{18}O$ mantle component is absent in Baffin Island picrites (60 Ma) but has become increasingly more apparent in the Iceland hotspot over at least the last 16 Ma and is best explained by a continuous incorporation of deeply stored oceanic lithosphere.

[1] Bindeman *et al*. (2008), *GCA* **72** pp. 4397-4420; [2] Rasmussen *et al*. (2020), *EPSL* **531** article 116008