Halogen heterogeneity in the Icelandic mantle source

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The chemical and lithological heterogeneity of the Icelandic mantle cannot be explained by simple mixing between shallow MORB and deep OIB sources, and likely involves recycled crustal material the distribution of which is poorly spatially constrained [1, 2]. During subduction, halogens concentrated in the slab are fractionated and released into the mantle, making them promising tracers of this recycled material [3]. This study aims to quantify the concentration of halogens in Iceland's heterogeneous mantle domains and hence quantify the contribution of recycled material to Icelandic melts.

To determine the halogen content of Iceland's different mantle domains we have selected olivine- and plagioclase-hosted melt inclusions from glassy sub-glacial pillow lavas from two field areas. Miðfell, in Iceland's Western Volcanic Zone, has noble gas isotopic ratios indicating that it was fed by melts derived from a relatively undegassed, near-primordial mantle component [4]. In contrast Snæfellsjökull, far from the plume centre, erupts incompatible element-enriched melts possibly sampling recycled material. Melt inclusion analyses from these two contrasting localities constrain both short-wavelength heterogeneity, as well as long-wavelength 'plume-' and 'non-plume-like' sources in the Icelandic mantle.

Miðfell melt inclusions are hosted in Fo>85 olivines and are therefore likely to represent near-primary melts. Preliminary results show that the Miðfell inclusions have F/Nd=20.2±11.4 (1σ) and Cl/K=0.175±0.10 (1σ), indicating a degree of heterogeneity in their mantle source. We also observe an obvious long-wavelength heterogenity in F and Cl concentrations, which increase by around an order of magnitude from Miðfell (~5-142 ppm F, ~7-92 ppm Cl) to Snæfellsjökull (~583-1259 ppm F, ~509-704 ppm Cl).

[1] Halldórsson *et al* (2016) *Geology* **44,** 679-682. [2] Shorttle *et al.* (2014). *EPSL* **395,** 24-40. [3] Kendrick *et al.* (2012) *Geology* **48,** 1075-1078. [4] Mukhopadhyay (2012) *Nature* **486,** 101-106.