Goldschmidt 2022 Abstract
https://doi.org/10.46427/gold2022.10176

Diverse mantle components with invariant oxygen isotopes; the 2021 Fagradalsfjall eruption, Iceland

ILYA N. BINDEMAN[1], FRANCES DEEGAN[2], VALENTIN R TROLL[2], **THOR THORDARSON**[3], ÁRMANN HÖSKULDSSON[4], WILLIAM MORELAND[4], EDGAR ZORN[5], ALINA SHEVCHENKO[5] AND THOMAS R. WALTER[5]

[1]University of Oregon
[2]Uppsala University
[3]Faculty of Earth Sciences, University of Iceland
[4]University of Iceland
[5]GFZ Potsdam

Presenting Author: torvth@hi.is

Continuous and densely sampling of ongoing eruptions provides unprecedented insight into volcanic activity and processes in the mantle conduits that are impossible to unravel when studying ancient deposits or pre-historical eruptions where younger and more voluminous products cover first erupted deposits.

The Reykjanes Peninsula in Western Iceland is not only a volcanically active subaerial plate boundary functioning as the onshore extension of the Reykjanes Ridge, but also hosts about 70% of Iceland's population, including the Greater Reykjavík area, the Reykjanes geothermal power plant, and Keflavík international airport. The basalts of the 2021 Fagradalsfjall eruption are the first to be erupted on the Reykjanes Peninsula in 781 years and offer unique insights into the composition of the mantle underlying Iceland, in particular its oxygen isotope composition ($\delta^{18}O$ values) and trace elemental ratios. The basalts show compositional variations in Zr/Y, Nb/Zr and Nb/Y values that span half of the previously described range for Icelandic basalt magmas and thus signal involvement of Icelandic plume (OIB) and Enriched Mid-Ocean Ridge Basalt (EMORB) in magma genesis. Remarkably, Fagradalsfjall δ18O values are invariable (mean $\delta^{18}O$ =5.4 ±0.3‰ 2SD, N=42) and indistinguishable from “normal” upper mantle, in contrast to significantly lower $\delta^{18}O$ values reported for erupted materials from Central Iceland. Thus, despite differing trace element characteristics, the melts that supplied the Fagradalsfjall eruption show no evidence for ^{18}O-depleted mantle or interaction with low-$\delta^{18}O$ crust, and may thus represent a useful mantle reference value in this part of the Iceland plume system.