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Characterisation of rock samples collected in the first week of the eruption- trace elements and Pb-isotopes

The trace element concentrations in the lavas varied little throughout the first week of the Geldingadalir eruption, similar to the major elements (Fig. 1, see previous petrology report). The lavas have lower LREE/HREE ratios, and lower abundances of trace elements than historical Reykjanes lavas. This is consistent with the previously reported low TiO_2 content of the lavas.

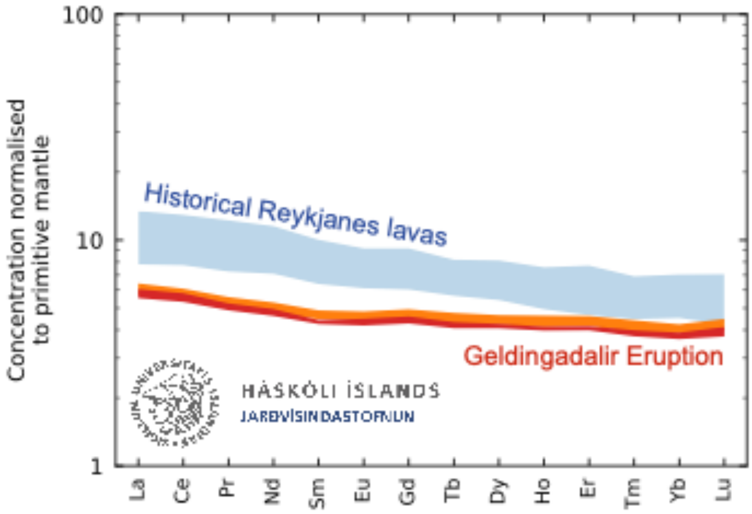

Fig. 1: *Rare earth element concentrations in the Geldingadalir eruption's bulk rock (red) and matrix glass (orange), compared with historical lavas on Reykjanes (light blue). Data is normalised to the primitive mantle composition of Palme & O'Neill (2014) and is shown on a logarithmic scale. The comparison data is taken from Kokfelt et al. (2006), Peate et al. (2009), and Koorneef et al. (2012).*

We also report preliminary radiogenic Pb-isotope ratios for material collected on the first day of the eruption (Fig. 2). The Geldingadalir eruption's Pb-isotope ratio values are lower (less radiogenic) than the historical Reykjanes lavas, but sit within the Icelandic array.

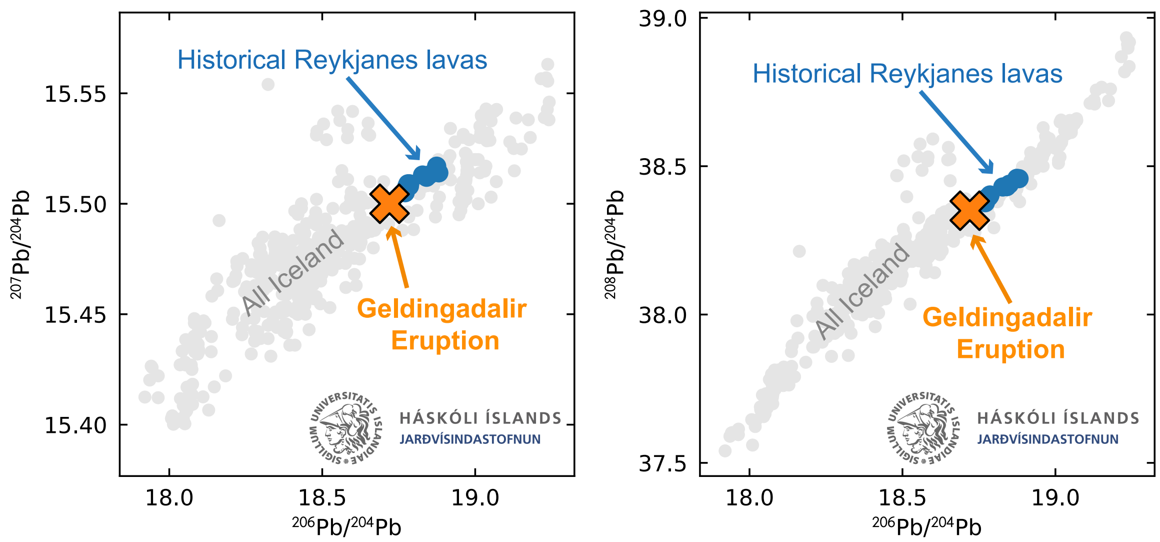

Fig. 2: *Radiogenic Pb-isotope ratios for glass from Geldingadalir lava sample 20210320-005, collected on the first day of the eruption (orange cross). Historical Reykjanes lavas (Peate et al., 2009) shown as blue circles for comparison. The whole Iceland array is shown in light grey (see references below).*

The magmas that are contributing to the Geldingadalir eruption are compositionally distinct from those associated with historical Reykjanes eruptions, in their major element composition (see previous report), their trace element concentrations, and their Pb-isotope ratios. However, the geochemistry of the lavas is within the range of older magmatism on Reykjanes. Therefore, the shift in the geochemistry identified in lava from the new eruption potentially reflects a new and distinct batch of magma arriving from the mantle beneath Reykjanes.

The Geldingadalir lava trace element concentrations and radiogenic isotopes allow us to identify the mantle sources and mantle melting processes occurring beneath Iceland. The lower concentrations of incompatible trace elements potentially show a larger contribution from higher degree partial mantle melts, sampling more depleted/refractory mantle components. This is further supported by the less-radiogenic Pb-isotope ratios, which indicate a greater contribution from a 'depleted' mantle component, more likely to be sampled by higher degree partial melting.

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