Iron isotope and $Fe^{3+}/\Sigma Fe$ heterogeneity preserved on inter-eruption lengthscales in Iceland

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Previous studies have demonstrated that the Icelandic plume is heterogenous at a range of lengthscales and have attributed this heterogeneity to both variations in mantle lithology and source region enrichment and the presence of both recycled and primordial components. It is expected that variations in source lithology will directly track source history and in turn source lithology will exert a control on melt oxidation state and chemistry. Distinguishing between variations in mantle lithology and chemical enrichment is however challenging. Iron isotopes may provide a solution to this problem as a number of studies have shown that Fe isotopes respond to variations in partial melting processes and melt $Fe^{3+}/\Sigma Fe$ and also show mineral-specific partitioning effects. Here we present Fe isotope and XANES $Fe^{3+}/\Sigma Fe$ data for well-characterised sub-glacial and sub-aerial basaltic glasses from the neovolcanic rift zones of Iceland. Our new data reveal a striking degree of short-wavelength heterogeneity in Fe stable isotope compositions. This isotopic heterogeniety does not appear to be coupled to glass $Fe^{3+}/\Sigma Fe$ in a straightforward manner but rather reflects the complex interplay of source composition and lithological control on partial melting and melt transport processes.