Probing heterogeneity in the mantle with boron isotopes in OIB

*LINDA KIRSTEIN[1]; KRISTINA WALOWSKI[1]; CEES-JAN DE HOOG[1]; TIM ELLIOTT[2]; IVAN SAVOV[3]

[1]School of Geosciences, University of Edinburgh, UK (*corresponding author:linda.kirstein@ed.ac.uk)
[2]School of Earth Sciences, University of Bristol, UK
[3]School of Earth and Environment, University of Leeds, UK

Recycling of oceanic lithosphere drives the chemical evolution of the Earth's mantle supplying both solids and volatiles to the Earth's interior. Yet, how subducted material influences mantle composition remains unclear. Ocean island basalts (OIB) tap different parts of the Earth's mantle and allow us to probe the deep interior of the planet. OIBs are divided into different geochemical types that reflect primitive and recycled components in the mantle. We will present the trace element, volatile and the B isotope composition of basaltic glasses and melt inclusions in olivine from distinct end-member ocean island basalts to track the fate of recycled lithosphere and ultimately document how recycling contributes to mantle heterogeneity. The samples represent the different end member OIB compositions and include: EMI (Pitcairn); EMII (MacDonald); HIMU (St. Helena) and FOZO (Cape Verde & Reunion). The data is derived from both submarine and subaerial deposits, with B isotope determination of both basaltic glass and melt inclusions from each locality. The B concentrations of the entire sample suite range from ~1.5-4 ppm and H_2O concentrations range from 0.6-1.6 wt%, extending the typical range of B in OIBs relative to existing bulk rock data. The Cl concentrations are highly variable, ranging from 250-2500 ppm. However, the variability in H_2O, Cl, and B concentrations dominantly represent differences in source enrichments and fractionation, and are unlikely the result of seawater contamination as evidenced by relationships in Cl/Nb and Cl/K_2O, making these samples suitable for B isotope work. Ultimately this work contributes to our understanding of the volatile budget of the deep mantle.