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Tracing recycled volatiles in a heterogeneous mantle with boron isotopes

Kristina Walowski (1), Linda Kirstein (1), Cees-Jan de Hoog (1), Tim Elliot (2), Ivan Savov (3), and Colin Devey (4)

(1) University of Edinburgh, School of Geosciences, United Kingdom (k.walowski@ed.ac.uk), (2) University of Bristol, School of Earth Sciences, United Kingdom, (3) University of Leeds, School of Earth and Environment, United Kingdom, (4) GEOMAR - Helmholtz Centre for Ocean Research Kiel, Germany

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. A perfect tracer for slab recycling should be only fractionated at the Earth's surface, have a strong influence on mantle compositions but be resistant to perturbations en route back to the surface. Current understanding suggests that boron concentrations linked to B isotope determinations fulfil all these requirements and should be an excellent tracer of heterogeneity in the deep mantle. Here, we 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 (OIB) to track the fate of recycled lithosphere and ultimately document how recycling contributes to mantle heterogeneity. The chosen 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. Preliminary results suggest OIB have B isotopic compositions that overlap the MORB array (-7.5‰$±0.7; Marschall et al., 2015) but extend to both lighter and heavier values. These results suggest that B isotopes will be useful for resolving mantle source heterogeneity at different ocean islands and contribute to our understanding of the volatile budget of the deep mantle.