

Tracing fluids in subducted oceanic crust using in-situ $\delta^{18}\text{O}$ and $\delta^{11}\text{B}$ by SHRIMP

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The geochemical character of arc magmatic rocks requires the integration of geochemical signatures across multiple reservoirs (i.e. altered oceanic crust, serpentinites, oceanic metasediments and subarc mantle). Here we investigate the extent of chemical interaction between oceanic crustal lithologies to sub-arc depths. A transect of metasedimentary and metabasaltic samples were collected from the well-preserved oceanic sequence of the ultra-high pressure locality of Lago di Cignana (NW Italian Alps); in-situ oxygen and boron isotope data from zoned garnets and tourmalines, respectively were obtained with the SHRIMP ion microprobe. Both minerals are part of the subduction assemblage and preserve geochemical information regarding episodes of prograde fluid percolation, with variation from core to rim and between samples. Petrological and geochemical information is used to relate the growth sequence of the two minerals along the prograde path. Tourmaline boron isotope compositions extend from -13 to 5‰ ($\pm 0.4\text{-}0.8\%$), with up to 10‰ systematic intra-grain variation without significant correlation to major element composition. Garnet also exhibits significant and systematic intra-grain oxygen isotopic variation correlating with major element composition (particularly Mg/Fe), consistently towards lighter values ($\delta^{18}\text{O}$ from 17 down to 3‰). Light oxygen isotope compositions of garnet rims are likely caused by infiltration of ultramafic-derived fluids, while light $\delta^{11}\text{B}$ of tourmaline rims were likely generated by a different process. Significant isotopic heterogeneity is preserved throughout the Lago di Cignana transect, particularly for boron (up to 10‰ over <1m).