The impact of melting of metasomatized subarc mantle on the B isotope systematics of arc volcanics

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Subarc mantle is generally considered to be extensively metasomatized by slab-derived fluids and melts. One such aspect of the geochemical signature of arcs is elevated B and positive $\delta^{11}B$[1]. While boron is an often cited tracer of slab fluids and melts in subduction zones, its cycling through the subarc mantle has not previously been investigated in detail. Here, we present boron contents and $\delta^{11}B$ of the hydrous minerals phlogopite and amphibole, preserved in veins within ultramafic mantle xenoliths from two volcanoes on the Kamchatkan peninsula - Avachinsky and Shiveluch.

Boron contents in phlogopite and amphibole are extremely low and range from 0.3 to 3.1 µg g^{-1} and from 0.2 to 6.4 µg g^{-1}, respectively. The $\delta^{11}B$ of phlogopite and amphibole are highly variable and range from -16.6 to - 0.5‰ (± 1.4‰) and from -12.1 to + 0.9‰ (± 1.6‰), respectively. The implication of our new B elemental and isotopic measurements is that melting of the metasomatized subarc mantle, specifically the metasomatic veins of this study, is not capable of generating arc volcanics enriched in heavy B ($\delta^{11}B$ = + 17‰)[1]. This signature can only be sourced by forearc-modified serpentinite. Boron-rich fluids and melts must percolate through the mantle to enrich the sources of arc magmas without B being fractionated in the transfer process from the slab to the mantle melting regions. This requires an effective flow network connecting the subducting slabs with the magma generation sites most likely in the form of rising mélange diapirs[2].

[1] De Hoog & Savov (2018), In: Marschall, Foster (eds), *Boron isotopes*, Advances in isotope geochemistry, 217-247.
[2] Marschall & Schumacher (2012), *Nature Geoscience* 5, 862-867.