Boron recycling across the Subduction Factory: Insights from SIMS measurements of metasomatized mantle xenoliths from Kamchatka arc

Lubomira Tomanikova (1), Ivan Savov (1), Jason Harvey (1), and Cees-Jan De Hoog (2)

(1) University of Leeds, Institute of Geophysics and Tectonics, School of Earth and Environment, United Kingdom (gy11lt@leeds.ac.uk), (2) University of Edinburgh, Grant Institute, School of Geosciences, United Kingdom

There is no direct observation of element transfer through the subarc mantle. A novel approach to constrain element mobility in the mantle wedge is by studying metasomatized mantle xenoliths erupted by arc volcanoes. Here, we present boron contents and $\delta^{11}$B of hydrous vein minerals, phlogopite and amphibole, in ultramafic mantle xenoliths from the Avachinsky and Shiveluch volcanoes in Kamchatka. They provide evidence of fluid/melt flow originating from dehydration/melting of the subducting plate.

New SIMS measurements reveal that B in phlogopite and amphibole is extremely low and range from 0.3 to 3.1 $\mu$g g$^{-1}$ and from 0.2 to 6.4 $\mu$g g$^{-1}$, respectively. The $\delta^{11}$B of phlogopite and amphibole are highly variable and range from -16.6 to -0.5‰ ($\pm$ 1.4‰), and from -12.1 to +0.9‰ ($\pm$ 1.6‰), respectively. The unexpectedly low B contents and highly variable but isotopically light $\delta^{11}$B ratios of the metasomatic minerals may reflect sluggish slab dehydration under the arc front volcanoes. The well-documented and very large B outfluxes in the shallow parts of subduction zones seem to be in stark contrast with the deep (100-150km) slab derived fluids as recorded in the hydrous minerals we studied.

References: