Fluids in the mantle wedge beneath a volcanic front: an example from Avacha peridotite xenoliths, Kamchatka arc

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Avacha peridotite xenoliths are characterized by various amounts of secondary orthopyroxenes with/without hornblendes, replacing olivine. One type of the orthopyroxene shows irregular shapes and frequently forms radial aggregates. The formation of the secondary orthopyroxenes resulted from the reaction between olivines and SiO_2-oversaturated hydrous melts and/or aqueous fluids (Ishimaru et al., J. Petrol. 2007). The metasomatism observed in Avacha peridotite xenoliths is quite peculiar and variable: for example, formation of Ni-rich domain, represented by high-NiO content (up to 5.2 wt%) of olivine (Ishimaru and Arai, Contrib. Mineral. Petrol. 2008), as well as formation of high-Mg# pyroxenite (up to 0.98).

We found H_2O fluid (with or without gas) inclusions in olivines and orthopyroxenes in the metasomatized harzburgite xenoliths. Some of the H_2O inclusions in olivine coexist with orthopyroxene and without brucite. This means the H_2O fluid was primarily SiO_2 rich. Here is another example of H_2O fluids in a peridotite xenolith from a frontal volcano of the Luzon arc (Schiano et al., Nature 1995). Petrographical features of the Iraya peridotites are similar to those of Avacha peridotites.

We will discuss about the metasomatic processes through H_2O-rich fluids in the mantle wedge beneath the volcanic front.