Mantle metasomatism in subduction zone and intraplate settings based on halogen and noble gas systematics

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Halogens and noble gases are among the most important geochemical tracers of subducted water in the mantle. Fluid inclusions within mantle peridotites provide the best medium to investigate slab-derived fluids. Here, in order to investigate how far the metasomatism driven by slab-derived fluids extends, we analyzed the halogens and noble gases within mantle peridotites from the Western-Pacific subduction zones (Avacha, Pinatubo, and Ichinomegata) and intraplate settings (Eifel, San Carlos and Kilbourne Hole). Noble gases in the fluid inclusions were extracted by *in vacuo* crushing and subsequently analyzed through mass spectrometry. Halogens were also analyzed by noble gas mass spectrometry after conversion to noble gas proxy isotopes by neutron irradiation [1]. The halogen composition of the whole rock was determined by melting extraction.

The mantle xenoliths from the volcanic fronts of subduction zones show similar halogen and noble gas signatures to those of marine sedimentary pore fluids [2], which were found in exhumed mantle wedge peridotites [3] and serpentinites in the subducting oceanic lithosphere [4]. This indicates that the mantle beneath the volcanic front has been metasomatised by the interaction with slab-derived fluids. The lower halogen and noble gas concentrations and higher $^{40}Ar/^{36}Ar$ ratios in rear-arc region demonstrates that the influence of slab-derived fluids is smaller than volcanic front. However, involvement of pore fluid-like halogens in some xenoliths from the rear-arc regions suggests that subduction driven metasomatism can extend to rear-arc regions. The Cl/Br/I ratios of xenoliths from intraplate settings are explainable by a halogen fractionation from a MORB-like composition, rather than by the influence of subducted pore fluid-like halogens.

[1] Johnson et al. (2000) *GCA* **64**, 717. [2] Kobayashi et al. (2013) *Mineral. Mag.* **77**, 1484. [3] Sumino et al. (2010) *EPSL* **294**, 163. [4] e.g. Kendrick et al. (2013) *EPSL* **365**, 86.