Halogens in subcontinental lithospheric mantle beneath Southern Patagonia

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Volatile recycling back to the Earth's mantle at subduction zones has a significant, yet poorly constrained impact to the volatile budget in the mantle. Halogens with marine pore-fluid signatures have previously been discovered in mantle wedge peridotites, suggesting that marine volatiles can survive the subduction cycle to subarc depths and modify the subcontinental lithospheric mantle (SCLM) beneath subduction zones [1,2]. In order to better constrain how such subduction fluids may modify the halogen composition of SCLM, we have analyzed halogens in mantle-derived xenoliths from Southern Patagonia, where two metasomatic noble gas components have been observed previously: a degassed SCLM component with a radiogenic/nucleogenic composition; and a MORB-like component, the latter may result from the presence of a slab-window [3].

In addition to a MORB-like halogen component observed in most of the samples, three other distinct components were identified: (A) a marine-pore-fluid-like component with high Br/Cl and I/Cl ratios similar to mantle wedge peridotites [1,2], (B) a Cl-enriched component relative to MORB, similar to bulk altered oceanic crust [4]; and (C) a component enriched in Br and moderately in I compared to MORB, which resembles to fluid components in altered oceanic crust and diamonds [4,5]. Considering that the latter two components are observed in samples having radiogenic/nucleogenic noble gases, they could be remnants of metasomatic agents derived from subducted altered oceanic crust. The pore-fluid-like component could be derived from a fluid that was released from serpentinized mantle lithosphere beneath a subducted plate which migrated upward through the slab window.

[1] Sumino *et al.*, *EPSL* 2010. [2] Kobayashi *et al.*, *EPSL* 2017. [3] Jalowizki *et al.*, *EPSL* 2016. [4] Chavrit *et al.*, *GCA* 2016. [5] Burgess *et al.*, *GCA* 2009.