

Halogens and noble gases through the subduction zone

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The recycling of volatiles back to the Earth's mantle at subduction zones has a significant, yet poorly constrained impact to the volatile budget in the mantle. Halogen and noble gases provide powerful tracers of volatile recycling given that they are concentrated within the exosphere and exhibit large variations in relative abundance and isotopic signature between different geochemical reservoirs. Noble gas analysis of mantle derived samples has shown that the mantle's heavy noble gas budget is dominated by non-radiogenic heavy noble gas signatures attributed to the transport of marine-derived atmospheric noble gases back to the mantle within subducting slabs^{1,2}. Likewise, halogens measured within mantle wedge peridotites have been shown to preserve marine pore-fluid signatures suggesting that marine volatiles can survive the subduction cycle to at least subarc depths³.

In this presentation we will outline recent advancements made on determining the halogen and noble gas composition in a wide variety of mantle-derived samples. Data presented will encompass a host of different mantle reservoirs including the subcontinental lithospheric mantle^{4,5}, the convecting upper MORB mantle and the deep plume mantle source⁶. This tour through the subduction zone will enable us to gain a better understanding on the behaviour of volatiles throughout the process of subduction.

[1] Holland, G. and Ballentine, C., 2006. *Nature*, 441 [2] Parai, R. and Mukhopadhyay S., 2015. *G-cubed*, 15 [3] Sumino et al., 2010. *EPSL* 533. [4] Broadley et al., 2018, *Nature Geoscience*, 11 [5] Broadley et al., 2016 *GCA*. 176 [6] Broadley et al., 2019 *G-cubed*, 20.