

## **The subduction recycling of halogens: insights from the shallow and deep mantle**

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Volatile elements, such as the halogens, have been shown to play fundamental roles in governing petrological and geophysical processes in the mantle (e.g., melting temperatures, oxidation states, mechanical strength properties). Due to their volatile and incompatible behaviour, the halogens (F, Cl, Br, and I) are concentrated at the Earth's surface (oceans, crust, altered crust) where they tend to have distinctive elemental compositions. Abundances of halogens in the mantle are low (ppm-ppt) and subduction of once-surficial material into the mantle may significantly perturb the halogen composition. Understanding the spatial distribution of mantle halogen abundances, therefore provides important constraints on exchanges between different Earth system reservoirs.

To assess the extent of volatile recycling to the shallow and deep mantle, halogen abundances were determined (via NI-NGMS) for rocks thought to sample different mantle reservoirs. The analysed samples include mantle xenoliths and volcanic scoria collected from six, hot-spot derived, ocean islands (e.g., La Réunion, Cape Verde and the Canary Islands), and across-arc transects from two convergent margins (Kamchatka and Chile).

Despite representing distinct mantle-endmembers (e.g., HIMU, EM1) thought to be influenced by different, deeply subducted components, the Br/Cl and I/Cl obtained for the OIBs are remarkably uniform, with the majority overlapping MORB-like compositions. The notable exception is the Canary Islands, which have higher I/Cl ratios, indicative of a distinct fluid component. Halogen compositions derived from arc-related volcanic rocks are also rather uniform, and do not reflect the compositions observed in the associated mantle xenoliths. The xenoliths from Kamchatka have higher Br/Cl and I/Cl ratios, indicative of interaction with marine pore fluids and serpentinite, and variations are observed across-arc. This new halogen data will be discussed alongside boron isotope and trace element data collected from the same sample suites (e.g., Walowski et al., 2019, Tomanikova et al., 2019).