Quantifying subducted volatiles from the Leka Ophiolite, Norway

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Until recently it has been widely assumed that there is a "subduction barrier" preventing the passage of many volatile elements into the deep Earth. This view is now coming under renewed scrutiny as a consequence of new studies of the halogens and noble gases in mid-ocean ridge basalts, altered oceanic crust and exhumed mantle wedge peridotites. If such a barrier does not exist or is only partly effective, global subduction could potentially dominate the mantle budget of volatiles. Useful insight into these questions can be gained by dredging and drilling of the modern seafloor, but such sampling techniques are not currently able to penetrate deeper than ~2 km into present-day oceanic crust. Hence, estimates of elemental fluxes currently require significant extrapolations from the available data. Ophiolites, by contrast, contain complete oceanic crustal sections and are a cornerstone in our understanding of the structure and composition of oceanic lithosphere. In this study we aim to measure the halogen and noble gas abundances through the lower crustal and mantle sections of the Leka Ophiolite Complex, Norway. We discuss the application of these systems to spatially and chemically resolve "normal" oceanic lithosphere from its slab-derived supra-subduction zone overprint. This will allow quantification of the supply of volatiles into the subduction zone and the fluxes of volatiles lost from the dehydrating slab. In turn, this will help to develop a more accurate volatile budget for the subduction cycle as a whole.