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Chalcophile, highly siderophile elements (HSEs) and in-situ isotope systematics in subducted serpentinites and metaperidotites

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Geochemical exchanges occurring along subduction zones regulate the mobility and long-term cycling of elements between the exospheres and the deep Earth. Following the journey of hydrous mantle (i.e., serpentinites) from the seafloor to subduction and then to high-pressure metamorphic dehydration is of significant interest, as these processes govern the release of volatiles and trace metals back to the mantle wedge and/or the surface, as well as their delivery down to the deep mantle, contributing to the evolution of the Earth's mantle composition. However, the specific systematics and relative contribution of hydrous mantle dehydration in the global geochemical cycle remain to be fully understood. In this study, we aim to assess these processes through the geochemistry of sulfides in serpentinites and meta peridotites, which record unique subduction histories and provide further insights on questions that remain highly debated in the literature, such as: Is sulphur significantly extracted from the slab and if so, at which stage or depth does this occur? Are the chalcophile and highly siderophile elements (HSEs) mobilised as subduction progresses? (Alt et al., 2012; González-Jiménez et al., 2021; Crossley et al., 2018).

Co-located *in-situ* trace element and sulfur isotope analyses reveal trends and variations in $\delta^{34}S$ (+3 to +11 ‰ in serpentinites; +2 to +7 ‰ in chlorite-harzburgites; and <4 ‰ in garnet-peridotites), S_{PM}/Se_{PM} ratios (6.7-16.3 in serpentinites vs. 5.8-77.0 in chlorite-harzburgites), and PGE compositions (e.g., 1150 $<Pd_{PM}/Ir_{PM}<$ 10,000 in serpentinites vs. 82 $<Pd_{PM}/Ir_{PM}<$ 6,600 in chlorite-harzburgites) that serve as valuable tracers of subduction and slab dehydration processes, offering insights into the trace element budgets and sulfur isotope systematics of the liberated fluids and remnant phases within the secondary peridotites.

References: [1] Alt, JC et al. (2012) *Earth and Planetary Science Letters* 327:50-60; [2] González-Jiménez, JM et al. (2021) *Lithos 400*:106432; [3] Crossley RJ et al. (2018) *Chemical Geology 493*:359-378