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In situ Sr isotope analysis of mantle carbonates: constraints on the evolution and sources of metasomatic carbon-bearing fluids in a collisional setting

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Orogenic peridotites associated with high-grade felsic rocks occasionally occur in HP-UHP orogenic systems and offer the opportunity to provide quantitative constraints on slab-to-mantle mass transfer in these collisional settings. Ascending fluids and/or hydrous melts originating from the subducting continental lithosphere are assumed to enrich the overhanging mantle wedge with respect to its incompatible element budget. *In situ* approaches on hydrous and carbonaceous phases forming in ultramafic rocks above the subducted channel may offer the spatial resolution to determine isotopic variations of mineral grains and better constrain the behaviour of fluid-mobile elements between converging plates.

In this study we present a detailed microstructural and *in situ* Sr isotope analyses of carbonates, which occur in the Ulten Zone garnet-bearing peridotites and demonstrate that the evolution of metasomatic fluids prompting carbonates precipitation is linked to different sources. *In situ* Sr isotopes were measured in dolomite and calcite from both coarse (less deformed) and mylonitic fine grained garnet-bearing peridotites, using a laser ablation system coupled to a Neptune MC-ICP-MS. Results indicate a large isotopic variation that seems correlated with the different microstructural positions of carbonates: interstitial matrix dolomite exhibits relatively unradiogenic $^{87}Sr/^{86}Sr$ present day values of about 0.7049 whereas vein dolomite, which is a late-stage feature related to the final stages of mantle exhumation, yields a more radiogenic $^{87}Sr/^{86}Sr$ ratio of about 0.7112. We suggest that this isotopic heterogeneity reflects open-system processes involving several interactions with fluids over time and we will discuss how the crustal signature of these carbon-bearing fluids increases during the metasomatic evolution of peridotites, from their initial residence in a supra-subduction mantle-wedge setting to their incorporation into an orogenic crust-mantle mélange.