High-Pressure rock carbonation: a Sr-Nd isotopes perspective

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HP rock carbonation is a newly discovered fluid-mediated process that may represent an important part of C cycle in subduction zones with implication on the long-term global C cycle[1,2]. This study focuses on HP carbonate bearing metasomatic system located along lithological boundaries juxtaposing the serpentinite basement and the cover units (both metasediments and continental crust) in the lawsonite-eclogite unit of Alpine Corsica (France). In the metasomatic rind fluid-rock interactions lead to massive carbonate precipitation and omphacite (±garnet) crystallization. In order to constrain the source of fluids responsible for rock carbonation, we performed a petrological and geochemical study of metasomatic marbles and their protolith rocks. All study samples of metasomatic marbles display very homogenous εNd_i signature (~ -8), whereas $^{87}Sr/^{86}Sr_i$ values are more dispersed ($0.708<^{87}Sr/^{86}Sr_i<0.709$) and plot along a mixing curve between serpentinite/metasediments/continental crust. Previous $\delta^{18}O$ and $\delta^{13}C$ analyses on metasomatic marbles[1] show that the fluid oxygen composition was equilibrated with an ultramafic rock, but C derives from metasediments. Altogether, these constrains allow us to propose both metasediments and serpentinite contribute as fluid source. These results involve complex evolution of mixed metamorphic fluids channelized along lithological boundaries.

1. Piccoli *et al.* Carbonation by fluid–rock interactions at high-pressure conditions: Implications for carbon cycling in subduction zones. *Earth and Planetary Science Letters* **445,** 146–159 (2016).
2. Scambelluri *et al.* Carbonation of subduction-zone serpentinite (high-pressure ophicarbonate; Ligurian Western Alps) and implications for the deep carbon cycling. *Earth and Planetary Science Letters* **441,** 155–166 (2016).