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 cycle1,2. 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 signature (~-8), whereas ⁸⁷Sr/⁸⁶Sr values are more dispersed (0.708<⁸⁷Sr/⁸⁶Sr<0.709) and plot along a mixing curve between serpentinite/metasediments/continental crust. Previous δ¹⁸O and δ¹³C analyses on metasomatic marbles1 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.