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Fluid-assisted remobilization of lithophile and highly siderophile elements upon subduction and dehydration of serpentinite (Cerro del Almirez, southern Spain)

Claudio Marchesi (1,2), Carlos J. Garrido (2), José Alberto Padrón-Navarta (3), Vicente López Sánchez-Vizcaíno (4), María Teresa Gómez-Pugnaire (1,2), Martin Rosner (5), and Casto Laborda López (4)

(1) Departamento de Mineralogía y Petrología, Universidad de Granada, Granada, Spain (claudio@ugr.es), (2) Instituto Andaluz de Ciencias de la Tierra, CSIC-Universidad de Granada, Armilla (Granada), Spain, (3) Géosciences Montpellier, UMR 5243, CNRS-Université Montpellier II, Montpellier, France, (4) Departamento de Geología, Universidad de Jaén, Linares (Jaén), Spain, (5) IsoAnalysis UG, Berlin, Germany

The Cerro del Almirez massif is composed of antigorite serpentinite and chlorite harzburgite separated by a transitional zone that constitutes the front of prograde serpentinite-dehydration in a paleo-subduction setting. Precursor peridotites underwent intense seafloor serpentinization in a fluid-dominated system, causing the remobilization of Ca and REE (especially LREE and Eu) and the enrichment of Cs, Rb, Ba, U and Pb. Upon subduction, transformation from low-P chrysotile/lizardite assemblages to antigorite serpentinite led to Sr depletion, and Ti and HREE were remobilized at the sample scale during fluid-assisted crystallization of titanian clinohumite. High-pressure breakdown of antigorite to chlorite harzburgite preserved the REE fractionations and the characteristic negative Eu anomaly of serpentinite. On the other hand, concentrations of Th, U, Nb, Ta, Pb and Sr increase across the front, indicating that dehydration involved external fluids equilibrated with subducted rodingites and/or metasediments. This process results in the recycling into the deep convective asthenospheric mantle of prograde harzburgite enriched in Th, U, HFSE and Pb relatively to oceanic depleted peridotite. Serpentinite dehydration seems to have not affected highly siderophile elements (Ir, Ru, Rh, Pt and Pd) except gold, whose decreasing concentrations across the dehydration front indicate that fluids in equilibrium with chlorite harzburgite partitioned and remobilized Au possibly in sulphur-complexes.