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Melt- versus fluid-induced metasomatism in mantle wedge alpine peridotites (Ulten zone, Eastern Italian Alps)

M. Scambelluri (1), J. Hermann (2), L. Morten (3), E. Rampone (1)

(1) Dipartimento per lo Studio del Territorio e delle sue Risorse, University of Genova, Italy (2) Research School of Earth Sciences, The Australian National University, Canberra, Australia (3) Dipartimento di Scienze della Terra e Geologico Ambientali, Bologna, Italy

We present a trace element study of orogenic peridotites which record the transformation of spinel peridotites to garnet - amphibole peridotites. This change occurred in response to corner-flow inside a mantle wedge, causing the tectonic slicing of lithospheric mantle into a subducted continental slab. All samples show similar trace element signatures with LREE, LILE and light element enrichments with respect to HREE and HFSE. These characteristics imply the recycling of subduction-related crustal components in various wedge domains. A change from melt to fluid as metasomatic agent occurred at the transition from spinel to amphibole $\pm$ garnet peridotites. This is suggested by the lack of amphibole in the spinel peridotites, by their high temperatures of equilibration, and by several trace element characteristics. The spinel-facies clinopyroxene has low LILE/HFSE (Pb/Nb from 10 to 51) and high Li/Be; moreover the spinel-facies pyroxenes are Li-enriched compared with the coexisting olivine (up to 25 ppm Li in cpx; about 3 ppm Li in opx). These features suggest interaction of spinel peridotites with melt enriched in slab components. The amphibole + garnet peridotites display high LILE-HFSE fractionation (cpx Pb/Nb from 391 to 443), low Li/Be and variable LILE and LREE enrichments. Relevant features of the amphibole + garnet peridotites are bulk-rock positive anomalies in Cs, Ba, Pb and U. Bulk Li and Be in these rocks are twice the Primitive Mantle (PM), thus reflecting addition of a crustal component to the mantle rocks. The coupled increase of water and incompatible elements in these rocks indicate that metasomatism was caused by the infiltration in the mantle wedge domains above the subducting slab of an aqueous fluid sourced from the crustal rocks. The trace element signature acquired at eclogite-facies

remains essentially unchanged during retrogression and further hydration. All these features concur to the conclusion that during their entire history the Ulten peridotites were percolated first by melts and then by aqueous fluids adding recycled components sourced by the same subducting crustal reservoir to the mantle wedge.