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The Ulten unit: Hypothesis on the origin of the garnet peridotites.

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The Ulten unit (Upper Austroalpine, North-East Italy) belongs to a pre-Alpine accretionary wedge of the Eastern Alps subducted during Paleozoic. This is composed of ky-grt schists, retrogressed eclogites, metagabbros and metagranitoids, migmatitic gneisses, spinel/garnet peridotites and eclogites injected by trondhjemitic leucosomes. Garnet peridotites occur at the boundary between stromatic migmatites (below) and lecosomatic ones (or nebulites; above) and form a discontinuous layer. The peridotites occur as hectometric cigar-shaped lenses or minor bodies. The texture of the garnet peridotites changes from coarse-grained to fine-grained (mylonitic) (Obata and Morten, 1987). The mineral paragenesis indicates occurrence of garnet-lherzolites, garnet-dunites and spinel-amphibole harzburgites to serpentinites. The smallest lenses and marginal bands are composed of tremolite-rich rocks due to metasomatism of peridotites. Their mineralogical parageneses (ol, cpx, opx) and deformation microstructures (porphyroclasts, kink-bands) confirm an origin for these rocks from a strongly deformed portion of the mantle wedge close to the underlying the Paleozoic subducted slab (Tumiati et al., 2003).

The geochemical characters of these rocks, as LREE and LILE and Zr contents, detected in rocks and minerals by Rampone and Morten (2001), Tumiati et al. (2003), Tumiati et al. (2005), suggest a pervasive crustal metasomatism in peridotites. Besides, the observed porphyroblastic texture amphibole and garnet in fine-grained metasomatic peridotites, exceptionally preserved at the Hochwart outcrop (Ultental), indicates recrystallization of the mantle peridotites under high-P conditions inside crustal material. The age of the high-T and high-P peak of the garnet peridotites is based

on U-Pb zircon dating of garnet-pyroxenites and Sm-Nd garnet-clinopyroxene dating of coarse-grained peridotites (∼330Ma), fine-grained peridotites (∼340Ma) and eclogites (∼336Ma) (Tumiati et al. 2003 and refs. therein). The very high-P peak (P∼2.7GPa, T∼850˚C) was attained by garnet-peridotites after their emplacement in the subducted continental crust, at a minimum depth of about 80-100km. This age also corresponds to the time of the migmatization of the felsic rocks (stromatic migmatites) associated to the garnet peridotites in the subducted crust.

The exhumation and cooling of the garnet peridotites is interpreted as due to an extrusion of the Ulten slice along the subduction channel during continuing subduction according to the Chemenda model as recently modelized by Ranalli et al. (2005). Successively, this slice cooled down slowly and the slow portion of the exhumation path could correspond to the time of break off of the deepest part (oceanic) of the slab. The break off may be related to the production of trondhjemitic melts which intruded the stromatic migmatites and cut across the peridotites. The age of trondhjemitic-melt formation is uncertain, but available data point to about 330-300Ma. The Nd and Sr isotopic nature of the melts confirms melting of the slab crustal rocks in contact with astenospheric material. Slab break off may have generated cessation of subduction, slowing down of exhumation observed in the upper Ulten slice, and may have been related to the lithospheric extension and Permo-Triassic magmatism of the Eastern Alps.

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