

**EVIDENCE OF MULTI-STAGE METASOMATISM OF CHLORITE-AMPHIBOLE
PERIDOTITES FROM TRACE ELEMENT COMPOSITIONS OF HYDROUS
PHASES (ULTEN ZONE, ALPS)**

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Peridotites from the Ulten Zone (Upper Austroalpine Domain, Central-Eastern Alps, Italy) outcrop as small lens-shaped bodies within high grade Grt-Ky gneisses and migmatites basement rocks belonging to the Tonale Nappe. Several lenses record a complex metamorphic history and display progressive transformation of spinel peridotites to garnet-amphibole peridotites. Previous trace element studies have shown that the garnet-amphibole peridotites have a geochemical signature compatible with the influx of crustal-derived fluid. These features have been interpreted by entrapment of mantle wedge peridotites by subducted continental crust.

We have investigated in detail the evolution of chlorite-amphibole peridotite lenses. Chlorite is generally closely intergrown with Cr-spinel, indicating that it grew at the expense of former Al-spinel. No garnet relics or chlorite pseudomorphs after garnet have been found. This suggests that the investigated lenses never equilibrated in the garnet-peridotite stability field. On the basis of textures, major and trace elements, three generations of amphibole can be distinguished. The youngest amphibole is a tremolite in equilibrium with chlorite and displays LREE and incompatible element enrichment, with positive anomalies in Cs, Ba, Pb and U, and strong LREE-HREE fractionation. Relics of pargasitic hornblende display a less pronounced enrichment of incompatible elements and a flat HREE pattern indicating that it did not coexist with garnet. We suggest that this amphibole formed in equilibrium with Al-rich spinel, prior to the formation of chlorite. Some of the amphibole and orthopyroxene relics display a positive Eu-anomaly and LREE enrichment. This feature is also present in the bulk rock composition and suggests that the rocks experienced a previous metasomatic event in the plagioclase peridotite field. A probably even older type of relic pargasite is characterised by flat Th/U and Rb/Ba ratios and by negative Sr and Pb anomalies and might be related to this earliest metasomatic event.

The new results indicate that there have been three stages of metasomatism of the mantle rocks. We propose that the earliest stage represents melt impregnation of plagioclase peridotites and is unrelated to subduction. The metasomatism leading to spinel and chlorite-amphibole peridotites is related to the progressive influx of a fluid with crustal signature derived from neighbouring subducted continental crust as the mantle wedge peridotites approach the slab. The observation that garnet and chlorite peridotites, which never passed through the garnet stability field, are hosted within the same gneisses, suggests that slices of mantle wedge peridotite with different P-T trajectories can be sampled by subducted crust.