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# Slab-derived metasomatism in chlorite-amphibole-peridotites from the Ulten Zone (northern Italian Alps): constraints on the nature of the fluids

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Fluid released from subducting slabs at sub-arc depths are responsible for one of the Earth's main differentiation mechanisms. Mantle-wedge peridotites represent the least-known piece of the subduction factory and are clues to an understanding of metasomatism of mantle domains percolated by fluids arising from subducting slabs. Nevertheless, the nature (aqueous fluid, hydrous melt or transitional "supercritical fluid") and composition of such fluids remain poorly constrained.

At this purpose, relevant information can be gained by the study of orogenic garnet peridotites, which in several occurrences correspond to slices of mantle wedge tectonically emplaced within subducted continental slabs, as in the case of peridotites from the Ulten Zone (Upper Austroalpine Domain, Eastern Alps) (Nimis & Morten, 2000). The investigation of chlorite-amphibole-peridotites from the Ulten Zone has documented that mantle wedge peridotites suffered multi-episode metasomatism by agents arising from the subducting slab (Marocchi et al., 2005). Evident metasomatic features are formation of amphibole (pargasite and tremolite) and chlorite and progressive bulk-rock enrichment in LILE and LREE, documenting interaction with aqueous fluids.

Both chlorite and amphibole are characterised by strong LREE-enrichments; on the basis of trace-element compositions three amphibole generations have been identified and employed as important tracers of different metasomatic imprints (Marocchi et al.,

2005). Amphiboles display variable degrees of enrichment in LILE, LREE, Ba, Rb, Th and U and very low contents in HFSE (Nb, Ta, Zr, Hf). The nature of the fluid as an hydrous fluid is consistent with calculated equilibrium temperatures for chlorite peridotites in the range 680-780˚C, with $H_2O$ activity varying from 0.4 to 0.7. In addition to the slab-derived, fluid-induced metasomatism, on the basis of the trace element composition of relic pargasite, we recognise a pristine metasomatic event which has more likely been ascribed to a "supercritical fluid". Particularly useful elements that monitor the metasomatic processes are Li, Be, LILE and LREE. Li and Be abundances in amphiboles of chlorite peridotites give information on the nature of the fluids that were involved in the metasomatic process. These elements have been used to compare results on chlorite-amphibole-peridotites with previous studies carried out on spinel- and garnet-peridotites from the Ulten Zone (Scambelluri et al., 2005), in order to better constrain the metasomatic evolution of the Nonsberg peridotites from the wedge to the slab.

References:

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