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Oceanic evolution of Spl-peridotites of the Frido Unit ophiolites (Southern Apennine-Italy)

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The southern Apennine chain is a fold-and thrust belt formed between the upper Oligocene and Quaternary as a result of the convergence between the African and European plates and a simultaneous SE-directed rollback of the Ionian subducting lithospere. The ophiolitic sequences, which are part of the Southern Apennines, are remnants of the Ligurian oceanic lithosphere pertaining to the Jurassic western Tethys. The Liguride Units of the Southern Apennines include sequences characterized by an HP/LT metamorphic overprint in the Frido Unit and sequences lacking orogenic metamorphism North-Calabria Unit. The ophiolitic rocks occurring in the Frido Unit include serpentinite derived from a lherzolitic to harzburgitic mantle, as suggested by microstructural and petrographical features. The serpentinites are frequently associated to tectonic slices and dykes composed of diabase and medium to high-grade metamorphic rocks such as amphibolites, gneiss, granofels as well as gabbros and basalts with a pillow structure. The studied serpentinites of the Frido Unit show mesh, xenomorphic and mylonitic texture. Primary mantle minerals are represented by olivine, orthopyroxene, clinopyroxene and spinel. Pseudomorphic minerals are serpentine, magnetite and tremolite. Olivine is replaced by serpentine forming a mesh texture; orthopyroxene is mostly altered to bastite and in some cases shows exsolution lamellae of clinopyroxene and kink bands. Clinopyroxene is armoured by a tremolite rim. Spinel shows a holly-leaf habit and is often armoured by a corona of Cr-chlorite. The core of the analysed spinel has a Cr-Al spinel composition corresponding to chromite (Al2O3=29-31 wt %; Cr2O3= 28-37 wt%), whereas the rim has a Fe-Cr spinel composition corresponding to ferritchromite (Al2O3= 1-2% wt; Cr2O3=28-30 wt %). The Cr-Al spinel/ferritchromite ratio may be various in different spinel porphyroclasts. Serpentine has a fibrous stretched subidiomorphic habit, it is colourless or pale green. Tremolite is present as nematoblasts associated with orthopyroxene. Magnetite replaces spinel or occurs within the mesh textured serpentine. The metamorphic assemblages in the Frido Unit serpentinites allowed to infer the physical conditions operating during serpentinization. The mineralogical assemblages found are typical of the amphibolite facies, greenschist-amphibolite transition and greenschist facies conditions. Serpentinites are cut by veins filled with mineralogical assemblages typical of prehnite-pumpellyite facies likely related to the later orogenic Apennine evolution. The geochemical features of serpentinites show differences in compositions with respect to the Primitive Upper Mantle (PUM). These are likely related to serpentinization processes, since elements normalised to PUM show different trends, comparable to Residual MORB Mantle and to Primitive Upper Mantle respectively. HP/LT metamorphic conditions can be documented in mafic dykes enclosed in serpentinites, but similar conditions are not recorded in serpentinites. This suggests that P-T conditions during the orogenic event were not able to produce a HP/LT mineral assemblage in serpentinites.