



## **THE ULTRAMAFIC COMPLEX OF NAUDERS (LOWER ENGADINE WINDOW, EASTERN ALPS, AUSTRIA): MORB MANTLE VS. UNROOFED SUB-CONTINENTAL MANTLE?**

Bertle, R.J. (1), **Koller, F.** (1), Melcher, F. (2)

(1) Inst. of geological sciences, Univ. of Vienna, rufus.bertle@univie.ac.at (2) Federal Inst. for Geoscience and Natural Resources, Hannover

Ultramafic complexes of Mesozoic age are widespread within Penninic Windows of the Eastern Alps and commonly related to ophiolites representing former oceanic crust. All these mantle fragments are highly serpentized and represent harzburgitic precursor composition. Only few exceptions are composed of rather undepleted lherzolitic rocks. They occur in the zone of Matrei (a tectonic *mélange* zone between Penninic and Austroalpine nappes), and in the Lower Austroalpine Reckner complex, both parts of the Tauern Window. An additional lherzolite complex occur close to Nauders in the Lower Engadine Window. Most of them contain preserved magmatic clinopyroxene, but the complex of Nauders is the only example where all primary minerals are still well preserved.

At the southern margin of the Lower Engadine Window, SW of the village of Nauders, weakly serpentized lherzolites are exposed. They are sandwiched between pumpellyite-bearing greenschist and sediments to the north, both related to the North Penninic zone of Pfunds, and granitic to gabbroic rocks of the Middle Penninic Tasna nappe to the south. The ultramafic body of Nauders is situated in a north to middle Penninic position as is demonstrated by recent geological mapping. Locally, small gabbroic intrusions and rare cross-cutting dikes with rarely preserved volcanic texture are connected to the ultramafic rocks.

The coarse-grained ultramafic rocks of Nauders carry a well-preserved magmatic assemblage of olivine ( $Fo \sim 90$ ), clinopyroxene ( $Mg = 90-91$  with 2 wt%  $Na_2O$  and 6-7

wt%  $\text{Al}_2\text{O}_3$ ) and orthopyroxene (En 89-90 with 0.4-0.6 wt% CaO and 4-5 wt%  $\text{Al}_2\text{O}_3$ ) and green spinel (Cr = 3-7). This assemblage is partly replaced by diopside (rimming clinopyroxene), minor amphibole (Na- and Ti-rich pargasite), serpentine and carbonate. Melcher et al. (2002) have shown, that most of the lherzolites have rather similar chemical composition. However,  $\text{Na}_2\text{O}$  concentrations are considerable higher (up to 0.23 wt.%) than in the other Penninic lherzolitic complexes. Chondrite-normalized REE patterns of the UM rock of Nauders are rather flat with slightly depleted LREE (Melcher et al., 2002), similar to other lherzolitic samples of the Mesozoic units. Small gabbroic bodies and rare cross-cutting basaltic dikes are associated with the ultramafic rocks. Based on their less mobile trace element (REE, HFSE) geochemistry, they more likely represent within-plate magmas than typical mid ocean ridge basalts.

Based on the differences in preservation and geological setting, and in the geochemical composition of associated mafic rocks the ultramafic complex of Nauders might better correspond to tectonic setting such as, e.g. the Valmalenco complex (Müntener et al., 2000), which is currently interpreted as a fragment of a pre-oceanic subcontinental mantle of the Briançonnais microplate, emplaced and denuded during late Jurassic to early Cretaceous times.