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Serpentinite slices within a tectonic zone at the base of the Juvavic nappe system in the Northern Calcareous Alps (Austria): characterization and origin

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The investigated serpentinites are present in an ENE-WSW orientated tectonic zone at the base of Juvavic nappes (Northern Calcareous Alps), situated at the eastern margin of the Eastern Alps (Lower Austria). They form small tectonically squeezed slices, which are embedded in Permotriassic schists and Middle to Upper Triassic limestones. These serpentinites play an important, but not yet understood role in reconstructing Neotethys evolution, Alpine Orogeny and the correlation of Dinarides and Alps.

The largest serpentinite body near to Unterhöflein is 400 to 100 meters in size and was investigated by mineralogical (XRD) and petrological/geochemical (XRF) methods. The primary mineral composition is olivine + orthopyroxene + clinopyroxene + chrome spinel. Pseudomorphs of pyroxenes are visible macroscopically, but almost all primary minerals are replaced by serpentine minerals. Former olivine is converted to chrysotile minerals, which show typical reticulate textures, orthopyroxene turned into lizardite pseudomorphs and chrome spinel is almost completely altered to magnetite. Major contents of chrysotile-α, chrysotile-γ and lizardite and minor antigorite, as well as secondary minerals like talc, chlorite and hydrogrossular were identified with XRD. Results from whole rock geochemistry indicate harzburgitic precursor rocks for the serpentinites.

According to the low antigorite content, the rocks have only a weak metamorphic imprint and therefore an obduction rather than a subduction history is likely. This leads to the assumption that these serpentinites possibly originate from the Neotethys and not from the Penninic oceanic realm. Further, the tectonic position of the serpentinite slices is in close vicinity to sediments of the Meliata unit which also occur between Juvavic and underlying Tirolic nappe system (Mandl & Ondrejickova, 1993). Additionally, remnants from ophiolite nappes are found reworked into the surrounding Upper Cretaceous Gosau Group. In the latter also chrome spinel detritus is present. In contrast to the altered chrome spinels in the investigated serpentinites, the spinels from Gosau Group are well preserved and they show similarities to those of Dinaric Cretaceous basins, concerning their harzburgitic and lherzolitic sources (Stern & Wagreich, 2013).
If the investigated serpentinites belong to obducted material from Neothetys oceanic realm, a tectonic model of a slab-tearing induced sinistral strike-slip zone could explain the position in the Eastern Alps. However, the relationship to other basic magmatic rocks from several other localities in similar positions, mostly occurring within evaporitic sediments of Permian Haselgebirge (Schorn et al., 2013), has to be clarified.