

## **Pressure, temperature and time constraints for the Wildkogel Nappe (Steinkogelschiefer, Oberpinzgau, Salzburg, Austria)**

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The Wildkogel Nappe (Oberpinzgau, Salzburg, Austria) is a tectonic unit of the Upper Austroalpine Unit in the Eastern Alps. It corresponds to the previously defined “Steinkogelschiefer” lithological unit and is considered as part of the vaguely defined “Innsbruck Quartzphyllite Zone.” However, the Wildkogel Nappe can be differentiated from the “Innsbruck Quartzphyllite Zone” by its lithological assemblage (micaschist, para- and orthogneiss, dolomitic- and calcitic-marble, amphibolite) and upper greenschist facies metamorphic grade (parageneses with garnet and/or biotite in micaschist, paragneiss and orthogneiss). Historically the metamorphism is attributed to the Variscan orogeny, whereas the Alpine signature is thought to be restricted to limited overprinting in the lower greenschist facies. We present new pressure, temperature and time data in order to precisely constrain the Pre-variscan, Variscan, Eo-alpine and Neo-Alpine story of the rocks belonging to the Wildkogel Nappe.

Two representative samples of garnet-micaschists were selected for petrographic characterization, mineral analyses, garnet elemental mapping and calculation of pseudosections. One sample is characterized by two-phased garnet with healed cracks. The Ca-poor garnet core is part of a primary assemblage with An-rich plagioclase, biotite, muscovite and ilmenite. The Ca-rich rim and the healed cracks are part of a secondary assemblage with An-poor plagioclase, biotite, muscovite, epidote and titanite. The second sample possesses fine-grained chloritoid aggregates and one-phased garnet. The chloritoid aggregates are prismatic and interpreted as pseudomorphs after staurolite, belonging to an undetermined primary assemblage without garnet. The garnet is in equilibrium with chloritoid, paragonite, muscovite, chlorite and ilmenite. Pseudosections indicate that the primary assemblages of both samples were stable at ~530°C and 5 kbar whereas the secondary assemblages were stable at ~530°C and 10 kbar. These conditions are consistent with maximum temperatures determined with Raman microspectroscopy on carbonaceous material on separate rocks from the Wildkogel Nappe.

Zircon U-Pb ages in orthogneiss pin the intrusion age of the protolith to the Lower-Middle Ordovician. In addition initial Sr isotopic ratio of a marble sample and an apatite U-Pb age on grains interpreted as detrital and not reset in a chlorite-carbonate schist are consistent with sedimentation in the Silurian to Devonian. An apatite U-Pb age at  $309 \pm 28$  Ma of a garnet micaschist indicates Variscan metamorphism, in marked contrast to Cretaceous Eo-Alpine metamorphism documented by a garnet Sm-Nd age in a garnet micaschist, an apatite U-Pb age in an orthogneiss and a muscovite Rb-Sr age in a marble ranging between 135 Ma and 100 Ma. Multiple single-grain fusion  $^{40}\text{Ar}/^{39}\text{Ar}$  dating indicates that the nappe boundaries were active between 120 and 90 Ma. Biotite Rb-Sr ages at c. 80 Ma, zircon (U-Th)/He ages from 80-35 Ma and apatite (U-Th)/He ages from 55-2 Ma indicate protracted cooling through the middle and shallow crust during Eo-Alpine exhumation and, likely, thermal resetting during exhumation in the Tauern Window.

This dataset documents the complex history of the rocks belonging to the Eo-Alpine Wildkogel Nappe. It indicates that the Alpine imprint was much more significant than previously recognized.