

Distribution of Late Palaeozoic metamorphism in the Eastern Alps: Variscan continental collision and Permian extension

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In this contribution an overview on petrological and geochronological data concerning the Variscan collisional event and the Permian extensional event in the Austroalpine unit of the Eastern Alps is given. Additionally, new geochronological data are presented, providing further information on the related metamorphic imprints and magmatic activity.

A low to medium/high grade Variscan metamorphism characterises all those Austroalpine basement units which carry transgressive Permomesozoic cover series. Within the cover series, frequently Permian quartzporphyric volcanic rocks are present and in the structural lowermost parts of some of the basement units a Permian low-pressure metamorphic overprint can be recognised. These units comprise the Lower Austroalpine unit, the Silvretta-Seckau nappe system, the Greywacky zone and the Drauzug-Gurktal nappe system (nomenclature based on Schmid et al., 2004). A medium- to high-grade Permian imprint can be found in most units of the Koralpe-Wölz nappe system. In its western part the Permian imprint is overprinting Variscan assemblages, whereas in the eastern part it affects units which have not experienced an upper greenschist facies, or higher grade, metamorphism before. The latter units cover a large area and comprise the Wölz, Rappold, Saualpe-Koralpe, Grobgneis and Plankogel complexes. From none of these complexes pre-Permian magmatic or metamorphic relics are known until now, except cores of zircons from Permian granites. These complexes were mainly deposited during Early Palaeozoic times and some parts might be Carboniferous in age.

Our compilations show that in previous maps the extension of the Variscan metamorphic imprint was overestimated. Furthermore the question arises in which tectonic position within the Variscan orogen those units were located which show no Carboniferous metamorphic and magmatic activity. They may have been situated in the foreland, in an external part of the orogen, or alternatively, in a tectonically high position in the internal part. In some recent publications the Permian metamorphism has been interpreted as a direct result of the collapse of the Variscan orogen. However, there are arguments against this interpretation: According to Kroner et al. (2008) units affected by the collapse (e.g. the Saxothuringian and Moldanubian units) show P-T-t paths with a pressure-dominated, medium to high-grade metamorphic imprint and a low-pressure overprint as the result of decompression during exhumation. The collapse occurred between 345 and 290 Ma and its structures are variable and heterogeneously dispersed. In contrast, the Permian metamorphism is characteristic for units which experienced their first prograde heating during this low-pressure event. Age data reflecting the Permian event are in the range of c. 290 to 245/230 Ma, and therefore clearly younger than the collapse of the Variscan orogen.

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