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The Wallner Normal Fault: A new major tectonic structure within the Austroalpine Units south of the Tauern Window (Kreuzeck, Eastern Alps, Austria)

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The polymetamorphic Austroalpine Units of the Eastern Alps were derived from the northern Adriatic continental margin and have been significantly reworked during the Eoalpine intracontinental subduction. Several major basement/cover nappe systems, which experienced a markedly different tectono-metamorphic history, characterize the complex internal structure of the Austroalpine Units. This work describes a new major tectonic structure in the Kreuzeck Mountains, south of the famous Tauern Window – the Wallner Normal Fault. It separates the so called Koralpe-Wölz Nappe System in the footwall from the Drauzug-Gurktal Nappe System in the hanging wall.

The Koralpe-Wölz Nappe System below the Wallner Normal Fault is dominated by monotonous paragneisses and minor mica schists, which are locally garnet bearing. Subordinated amphibolite bodies can be observed. The schistosity is homogeneously dipping steeply to the S and the partly mylonitic stretching lineation is typically moderately dipping to the ESE. The Alpine metamorphic peak reached eclogite facies further in the north and amphibolite facies in the study area. The metamorphic peak occurred in the Late Cretaceous followed by rapid cooling.

The Drauzug-Gurktal Nappe System above the Wallner Normal Fault consists of various subunits. (i) Paragneisses and micaschists subunit (Gaugen Complex) with numerous quartz mobilisates are locally intercalated with amphibolites. Several millimeter large garnets together with staurolite and kyanite have been identified in thin sections. Even though the main striking direction is E-W, polyphase refolding resulted in strong local variations of the orientation of the main foliation. (ii) Garnet micaschists subunit (Strieden Complex) with garnets up to 15 mm are intercalated with up to tens of meters thick amphibolites. The lithologies are intensely folded with folding axes dipping moderately to the SSW and axial planes dipping steeply to the NW. (iii) A phyllites-marble subunit (Goldeck Complex) localized deformation and records mylonitic to phyllonitic microstructures. In all subunits of the Drauzug-Gurktal Nappe System, the Alpine overprint did not exceed greenschist facies conditions. The Variscan peak assemblages indicate amphibolite facies to lowermost greenschist facies in the various subunits.

The newly described Waller Normal Fault can be mapped over a structural thickness of up to several hundred of meters and consistently dips towards the south. The structural record suggests a significant strain gradient from the footwall to the normal fault showing isolated shear bands at some distance to the fault grading into intensely mylonitized and phyllonitized rocks in the core of the fault zone. The shear sense is unequivocally top to the S. The hanging wall is hardly affected by a top-to-the S overprint but is dissected by several more than 100 m wide subvertical internal phyllonite zones which strike roughly W-E. The almost vertical stretching lineation is associated with N-side up shear sense criteria. Locally the shear zones contain pseudotachylites, which are partly overprinted by the phyllonitic deformation. Because these phyllonitic zones record similar deformation mechanisms compared with the phyllonites in the Wallner Normal Fault, we suggest that the subvertical phyllonites are mechanically linked to movements along the Wallner Normal Fault.