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Extent and significance of sinistral shear along the southwestern border of the Tauern Window, Eastern Alps (Italy/Austria)

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Five major fault systems join at the SW termination of the Tauern Window: The dextral Pustertal Line, the Brenner normal fault, the sinistral DAV Line, the sininstral Ahrntal Fault and the sinistral Giudicarie fault system. This study focuses on the extent and tectonic significance of the Ahrntal Fault. This Structure is shown as a sinistral strike-slip fault in numerous tectonic maps of the Eastern Alps, although no data exist yet in the literature concerning its precise geographic location, its kinematics, its structural relationship to the neighbouring folds, and its microstructural characteristics. We present new structural and microstructural data from this shear zone and discuss its relationship to the Brenner fault.

The internal architecture of the western Tauern Window consists of three upright, ENE striking gneiss antiforms, which fold the dominant, early Alpine S1 foliation. The fold limbs of these folds and the associated synforms are overprinted by sinistral shear zones, which form a new S2 foliation sub-parallel to the axial planes of the upright folds. We mapped the southernmost of these shear zones along the southern margin of the Tauern Window, from Sterzing to upper end of the Ahrntal Valley, at the Italian Austrian border. The thickness of the shear zone attains a maximum of 1.5km in the Valser Valley. The large number of consistent sinistral kinematic indicators observed in the carbonate schists of the western half of this structure between Sterzing and Speikboden, makes its mapping and interpretation as a sinistral shear zone straightforward. In contrast the eastern continuation of this steep, ENE-striking structure in the Zentral Gneiss of the Ahrntal Valley shows contrary kinematic indicators, and a more distributed type of deformation. These contrary shear sense indicators may result from a larger component of pure shear in this area. In spite of poor outcropping conditions in the area south of Sterzing, the sinistral shear zone described above does not seem to be interrupted by dextral strike-slip faults, which are expected to transform part of the extensional displacement of the Brenner Fault into the dextral Pustertal Fault. Hence the Brenner Fault probably terminates into a sinistral structure.

A section from N to S across this shear zone and its wall rocks shows the following fabrics. North of the shear zone N-vergent tight folds pass into upright isoclinal folds southwards. Dextral shear bands were rarely observed. Further south the folds are refolded and develop an axial plane foliation (S2) associated with sinistral shear bands. Still further south a steep shear zone with rootless folds and a well developed sinistral C-C'-fabric follows. This structural sequence points to the coeval occurrence of upright folding and sinistral shearing, as previously described for the northern margin of the Zentral Gneiss.