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NW directed normal faulting in the hanging wall of the eo-alpine high-pressure rocks: the W termination of the Schneeberg Zug (Southern Tyrol, Italy)

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The Austroalpine microplate traces the Alpine collision event between the Africa-related southern Alpine realm and the European continent. The southern margin of this microplate, the basement to the north of Meran (including Texel unit and Schneeberg Zug) is characterized by regional eo-Alpine high-pressure metamorphism. PT conditions decrease from SE (Texel unit) to the pre-Alpine basement in the NW.

The HP rocks were exhumed within a c. 15 km broad SW-NE-striking, NW-dipping high strain zone. The high-pressure Texel crystalline is tectonically underlain by the Campo unit in the south and overlain by the Ötztal-Stubai Basement in the north-west. The “Schneeberg Zug” forms an up to 5 km thick shear zone at its base.

The study area exposes the termination of this normal sense shear zone, separating pre-Alpine basement rocks in the hanging wall and a high strain zone with reverse kinematics, supposed to represent the basal thrust exhuming the high-pressure rocks.

Lithologically the western termination of the Schneeberg Zug comprises garnet micaschists, marble layers, amphibolites, quartzites, hornblende-garben-schists and calc-schists, called “Bunte Serie” and differ from the polyphase adjacent Texel unit and the polymetamorphic basement rocks in the hanging wall due to their lithological content and their monometamorphic evolution.

Petrologic and geochronologic investigations on the eastern continuation of these characteristic metapelitic rocks evidence the time of garnet growth during D1 close to the Cretaceous pressure peak. Sm-Nd dating of these continuously zoned garnets yielded crystallization ages between 90 and 95 Ma, whereas Rb-Sr ages on synkine-

matic biotite range between 73 and 78 Ma.

Structural investigations yielded four major deformation events:

D1 produced a compositional layering and a mylonitic foliation; generally this ductile deformation in the northwestern portion of the Schneeberg Zug is characterized by contemporaneous shearing and folding with subhorizontal rootless isoclinal folds and axes oriented parallel to the reconstructed NW-SE plunging stretching lineation. The main deformation in the basal NE plunging shear zone with reverse top to SE kinematics is thought to belong to this stage.

Deformation stage D2 formed tight folds with steep NW to WSW plunging axes and NW to W dipping axial planes, which refold D1 related structures.

Deformation stage D3 is present only in the “Schneeberger Zug” and is characterized by open folding with NW plunging axes and weakly developed NW dipping axial planes.

Lower greenschist facies normal shear zones dipping at 40-50˚ to the W with shear sense top to W-WNW represent the last ductile event. These shear zones crosscut the earlier fabrics.

Brittle deformation records normal faulting, reactivating the roughly NW dipping main foliation. Dextral, north plunging strike-slip faults crosscut and partly reactivate these zones. These faults and the younger sinistral north-south striking strike-slip faults probably are related to deformation along of the Tertiary Passeiertal Fault.

Geochronological data and structural investigations indicate a continuous eo-Alpine tectono-metamorphic evolution, showing simultaneous shearing in high strain zones and folding with axes sub-parallel to the stretching lineation in the adjacent zones. At decreasing temperature conditions the normal sense deformation progressively partitioned into distinct shear zones transecting the former structural inventory.

.Sölva H, Grasemann B, Thöni M, Thiede RC, Habler G; (2005); The Schneeberg Normal Fault Zone: Normal faulting associated with Cretaceous SE-directed extrusion in the Eastern Alps (Italy/Austria). Tectonophysics; 401; 143-166