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Deformation in the hanging wall of Cretaceous HP rocks (Austroalpine Ötztal-Stubai Complex, European Eastern Alps): constraints on timing, conditions and kinematics

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The position and nature of the tectonic boundary between the Cretaceous eclogite facies metamorphic Texel Complex (Sölva et al. 2005, TC) and the Ötztal-Stubai Complex sensu stricto (OSC) with predominantly pre-Cretaceous tectonometamorphic imprint remained a matter of discussion (Fügenschuh et al. 2009). Sölva et al (2005) described the Cretaceous Schneeberg Normal Fault Zone (SNFZ) as the major tectonic boundary between the exhuming TC and the OSC, where the major portion of ductile deformation was partitioned into the rheologically weak Schneeberg/Monteneve Unit (SMU). In contrast, other authors proposed a model of a coherent vertical crustal section in the southern OSC (Schmid and Haas 1989), which was rotated and exhumed by erosion due to Oligocene large scale refolding (Fügenschuh et al. 2009).

Here, new Rb-Sr data of muscovite and biotite from para- and orthogneisses from the Ferwalltal and Timmelsjoch areas (Austria/Italy) were correlated with mineral chemical and structural data in order to constrain the age and kinematics of the predominant deformational imprint in the OSC representing the hanging wall of the SNFZ.

In the Ferwalltal the undisturbed OSC/SMU boundary is exposed. Above that boundary an amphibolite facies mylonitic foliation (Sc1) represented by the compositional layering of coarse grained Qtz, Bt and dynamically recrystallized Pl interferes with an overprinting mylonitic foliation (Sc2) with spatially heterogeneous intensity. Sc1-planes were syn-tectonically overgrown by euhedral Grt with single phase continuous prograde chemical zoning and Bt-porphyroblasts. Dc2 postdated garnet growth and caused the formation of SCC' fabrics in Bt-Pl gneisses. Still Qtz recrystallized dynamically, whereas Ms and Bt newly crystallized during Dc2. In the study area, the lithological boundaries in the OSC mainly are subparallel to the predominant foliation Sc1. These planes dip with 45-50° to the NW-NNW and show a WNW-plunging stretching lineation (LSc1) of dynamically recrystallized plagioclase and quartz. Shear kinematics of Dc1 alternate between Top to WNW or ESE. Sc2 foliation planes and the lithological-tectonic OSC/SMU boundary dip with intermediate angles towards N - NNW but also bear a W-plunging stretching lineation (LSc2). Dc2 structures consistently indicate W-directed shear kinematics. Due to the angular relationship of Sc1 and Sc2 the lithological boundaries of the OSC are truncated at the boundary with the SMU.

Cretaceous Rb-Sr isochrons were obtained from Bt-granite-gneiss about 400m structurally above the OSC/SMU boundary. Fine-grained muscovite forming part of the major foliation Sc1 yielded a Rb-Sr Ms-WR age of 86.1 ± 0.9 Ma interpreted as a crystallization age constraining the timing of Dc1. The evidence of isotopic equilibration was supported by the homogeneous major element Ms composition. Rb-Sr Bt-WR data from the same material yielded 80.8±0.8 Ma interpreted to reflect cooling below c. 300°C. Several Rb-Sr Bt-WR data obtained from the Ferwalltal area gave age-results between 80.0 and 84.7 Ma and thus range among numerous Bt-WR Rb-Sr ages available from the wider study area (Thöni and Hoinkes 1987). Both deformation stages Dc1 and Dc2 predate this cooling period, as the Qtz-mica-fabrics demand significantly higher T-conditions.

Subsequent deformation covers strongly partitioned brittle-ductile shear zones dipping with 50 – 60° to NW, as well as ultra-cataclasites bearing pseudotachylites, which reactivated Sc1- or Sc2 planes about 50 – 70 meters above the OSC/SMU boundary. Both brittle-ductile and brittle structures showed W-directed kinematics of normal faulting. The continuation of consistent shear kinematics to the brittle regime, as well as the extensive database of mica ages indicating cooling to below c. 300°C in the OSC adjacent to the SMU between 85 - 80 Ma (Thöni and Hoinkes 1987, with references) contradict a model of Oligocene ductile refolding.

References:
Fügenschuh B, Flöss D, Speckbacher R (2009) In Alpine Workshop Cogne.
Schmid SM, Haas R (1989) Tectonics 8: 697-718.
Sölva H, Grasemann B, Thöni M, Thiede RC, Habler G (2005) Tectonophysics 401: 143-166.
Thöni M, Hoinkes G (1987) In Geodynamics of the Eastern Alps, pp. 200-213. Edited by Flügel HW and Faupl P. Vienna: Deuticke.