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Polymetamorphism and deformation in the hanging wall of a Cretaceous extrusion zone (Austroalpine Ötztal-Stubai basement, Eastern Alps)

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The southern portion of the Ötztal-Stubai Complex (ÖSC), an Austroalpine crystalline basement unit west of the Tauern Window, provides key information on the Variscan, Permian and Cretaceous tectonometamorphic events in the Eastern Alps. New (micro)structural, mineral compositional and geochronological data were obtained from the hanging wall of the Cretaceous SE-directed extrusion zone in the Texel Complex (Sölva et al., 2005) situated SE of the ÖSC. The results allow confining the age and intensity of pre-Cretaceous metamorphism, the timing of Permian pegmatite emplacement, as well as the extent of Cretaceous metamorphism and deformation supposedly related with the extrusion of the eclogite facies metamorphic Texel Complex. New data were obtained from A) the Timmelsjoch and Obergurgl area, where maximum Cretaceous normal displacement related with the exhumation of the eclogites is expected, and B) the Matsch Unit west of the extrusion zone, which has a key tectonic position for deciphering the lateral extension and 3D-structure of the extrusion zone.

From the Matsch Unit Sm-Nd data yielded Grt crystallization in metapelites at 325 $\pm$ 4 Ma (Grt HCl residue – leachate), or 311 $\pm$ 10 Ma (three Grt fractions + WR) respectively, and thus point to a Variscan age of the first and predominant metamorphic imprint reflected by medium-pressure amphibolite facies metapelitic mineral assemblages containing Grt, St and Ky, which were followed by Sil, then And and again Sil formation. Intercalated pegmatites gave Grt Sm–Nd results of 266 $\pm$ 3 Ma (Grt HCl residue – leachate), 270 $\pm$ 3 (Grt-WR), and 276 $\pm$ 4 Ma (Grt-WR) reflecting magmatic crystallization. The major deformation in the Matsch Unit largely predated pegmatite

emplacement, whereas localized deformation zones of presumed Cretaceous age occur at the base and the top of the Matsch Unit as well as within internal shear zones. Their kinematics are consistently west-directed continuing from lower amphibolite to lower greenschist facies metamorphic conditions. Shear deformation is correlated with folding by subhorizontally E-W trending fold axes. Further large scale folding by NNE-SSW trending axes with SE dipping axial planes still rotated the greenschist facies shear zones.

From the Obergurgl-Timmelsjoch area preliminary field, micro(structural) and mineral compositional data were obtained. Adjacent to the Schneeberg Normal Fault Zone (Sölva et al., 2005) interpreted as the hanging wall boundary of the extrusion zone, the amphibolite facies major foliation in the ÖSC is subparallel to the mylonitic foliation of the Cretaceous HP rocks, but was transected by strongly partitioned lower grade shear zones. The major foliation reflected by a compositional layering of coarse-grained Qtz and fine-grained dynamically recrystallized plagioclase, displays strongly fragmented pre-Cretaceous garnet, which is continuously zoned and contains inclusions of chloritoid, staurolite, margarite, paragonite and muscovite. The generation of the major foliation is interpreted to predate the crystallization of the presumably Cretaceous idiomorphic second garnet generation, which has overgrown garnet fragments with significantly higher Ca-content and lower Mg#. Localized deformation zones with WNW directed stretching lineations and presumably related with the extrusion of the high pressure rocks from the Texel Complex may be traced in the ÖSC at least 2 km above the Schneeberg Normal Fault Zone.

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