

Age and structure of the Stubai Alps (Ötztal-Nappe, Tyrol/Austria)

Martin Reiser¹, Christoph Iglseder¹, Ralf Schuster¹, David Schneider² and Daniela Gallhofer³

¹Department of Hard-Rock Geology, Geological Survey of Austria, Vienna, Austria (martin.reiser@geologie.ac.at)

²Department of Earth and Environmental Sciences, University of Ottawa, Ottawa, Canada

³Institute of Earth Sciences, University of Graz, Graz, Austria

The Ötztal-Nappe in the central Eastern Alps represents a classical area of polyphase deformation and metamorphism. The pre-Mesozoic basement (Ötztal-Stubai Complex; OSC) comprises metasediments (paragneiss and mica schist), metaigneous rocks and metabasites that experienced a polymetamorphic overprint during Ordovician, Variscan (Devonian to Carboniferous) and Eo-Alpine (Early/Late Cretaceous) events. In the Stubai Alps, basement rocks are unconformably overlain by a monometamorphic Permo-Triassic cover sequence (i.e. “Brenner-Mesozoic”), which truncates pre-Mesozoic structures and allows discriminating pre-Alpine and (Eo-)Alpine structures.

Ordovician metagranites (analysed using LA-ICP-MS U-Pb dating of zircon), deformed together with their metasedimentary host rock, highlight the large-scale structure of the OSC. During the Variscan event, metabasitic rocks of the central OSC underwent eclogite-facies metamorphism followed by an amphibolite-facies overprint. Two pre-Alpine fold generations can be distinguished: i) NE-dipping fold axes of isoclinal folds overprinted by ii) subhorizontal NW-SE trending fold axes that are

associated with a pervasive axial plane foliation. Shearbands dissecting the foliation indicate a top-NE directed shear sense, which probably correlates with post-Variscan exhumation. Locally, the shearbands show a SE-directed overprint, which is attributed to Late Cretaceous extension in the course of the Eo-Alpine event.

(Eo-)Alpine metamorphism of the Ötztal-Nappe, represented by a southward increasing gradient from greenschist-facies conditions in the northwest to epidote-amphibolite-facies conditions in the southeast, led to a differential structural overprint. Ar-Ar white mica ages from the Stubai Alps yielding Middle to Upper Pennsylvanian ages (post-Variscan cooling) and “mixed” Variscan-to-Alpine ages reflect the metamorphic gradient. Late Cretaceous ages from Rb-Sr analyses on biotite and (UTh)/He zircon thermochronology provide time constraints on large detachment faults that created several tectonic klippen of Mesozoic rocks in the study area. These detachments formed in a general SE-directed extensional regime, which is widely reported from Upper Austroalpine units.