

**TECTONIC EVOLUTION OF THE WESTERN MARGIN OF THE  
GURKTAL NAPPE COMPLEX, EASTERN ALPS:  
CONSTRAINTS FROM STRUCTURAL STUDIES AND <sup>40</sup>Ar/<sup>39</sup>Ar WHITE MICA AGES**

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New structural data and <sup>40</sup>Ar/<sup>39</sup>Ar white mica ages constrain aspects of the pre-Alpine and Cretaceous structural and metamorphic relationships as well as the tectonic evolution of Middle and Upper Austroalpine nappe units along the western margin of the Gurktal nappe complex (Upper Austroalpine units) in the Eastern Alps. There, a strong contrast of metamorphic pressure-temperature conditions of the penetrative Cretaceous overprint exists between the Middle Austroalpine nappe and the Murau and Stolzalpe nappes of the Gurktal nappe complex.

(1) An outcrop displaying the basal angular unconformity between Variscan Bundschuh basement and Triassic Stangalm Mesozoic cover, which are part of the uppermost Middle Austroalpine nappe, has been examined, both overprinted by Cretaceous age upper greenschist facies metamorphic conditions. The outcrop exposes the primary contact between the basement (micaschist) and the transgressively overlying Quartzite (Skythian). The basement micaschist displays ca. E-trending, upright open folds, which are discordantly overlain by quartzites of suggested Skythian age. Hangingwall sectors of the quartzite are well foliated and display an E-dipping foliation. New sericite is grown on the foliation plane. An <sup>40</sup>Ar/<sup>39</sup>Ar age of a concentrate of a few white mica grains yielded a plateau age of ca.  $89.0 \pm 0.6$  Ma. This age is interpreted to date cooling after throughout recrystallization of the Middle Austroalpine unit, demonstrating the Cretaceous metamorphic overprint in the footwall of the east-directed detachment fault at the western margin of the Gurktal nappe complex. This age is supported by further similar, more variable integrated <sup>40</sup>Ar/<sup>39</sup>Ar ages from the same level.

(2) The overlying Murau nappe is pervasively overprinted in upper greenschist facies metamorphic conditions, including garnet-bearing siliciclastic rocks. A plateau age of  $85.78 \pm 0.33$  Ma from white mica at Aigen (near Bad Kleinkirchheim) demonstrates for the first time the pervasive Late Cretaceous metamorphic overprint on the Murau nappe in the footwall of regional, ESE-directed detachment fault.

(3) The classical area of the basal tectonic boundaries along the western margin of the Gurktal nappe complex has been examined (Eisentalhöhe – Pfannockscharte/Karlwand). This shows the juxtaposition of Stangalm Mesozoic cover with extremely thinned Murau nappe, as e. g. along the Nockalpen road. The dolomite marbles of the Stangalm Mesozoic sequence are in part strongly foliated and lineated, the lineation plunges E and ESE.

The marbles are overlain by a several tens of metres thick phyllonite, which exhibits a clearly visible extensional crenulation cleavage fabric. The sense of displacement is top to the E/ESE. The phyllonite was interpreted as Carnian Raibl Formation. The inclusion of chlorite phyllite excludes this stratigraphic interpretation and argues rather for an Early Paleozoic age. This level is now interpreted as part of the Murau Nappe of the Gurktal Nappe Complex because lithological composition and continuous exposure to true Murau Nappe along the structural base of the Gurktal Nappe Complex. In the hangingwall, nearly unmetamorphic dark Late Triassic fossil-rich limestones, which belong to the cover of the Pfannock Nappe of the Gurktal Nappe Complex are exposed. In many places along the upper margin of the phyllonite zone, a dense network of east-dipping low-angle normal faults is preserved. These faults were active under pervasive circulation of hydrothermal fluids as the common presence of chlorite along fault surfaces as well as quartz fibres indicate. Fault and striae data collected in these outcrops and their assessment with palaeostress methods proof the ESE-WNW extension, which overprints rare faults of an earlier stage of NW- and N-directed thrusting.

The new age data give for the first time exact time constraints on the age of low angle normal faulting in the Murau nappe complex. The data also proof that the Murau nappe was fully overprinted by Cretaceous metamorphism and the main branch of the normal fault is between the Murau and Stolzalpe nappes. Together, these ages proof that the cooling occurred at the same time as the Krappfeld Gosau basin had their strongest phase of tectonic subsidence during the same time interval.

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