

Recumbent folding in a Late Cretaceous low-angle shear zone between Austroalpine nappes west of the Tauern Window (Brenner Pass area, Austria/Italy)

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The Austroalpine nappes west of the Tauern window comprise the Obernberg Nappe and the Gschnitz Nappe (summarized as Steinach Nappes of the Drauzug-Gurktal Nappe System) tectonically above the Permomesozoic cover (Brenner Mesozoic) of the Ötztal-Nappe (Ötztal-Bundschuh Nappe System) in the footwall of an Eoalpine thrust contact. NW-directed thrusting of the Obernberg Nappe led to a metamorphic overprint of the Ötztal Nappe that attained approximately 500°C in the study area. ⁴⁰Ar/³⁹Ar muscovite ages around 300 Ma indicate that the Obernberg Nappe in the hanging wall of the tectonic contact largely escaped an Alpine overprint. Estimated thermal conditions of up to about 520°C from the Obernberg Nappe (using Raman spectroscopy on carbonaceous material) are attributed to the Variscan overprint. Mixed ages around 260 Ma from the central part of the nappe show an incomplete thermal resetting. Exclusively Late Cretaceous ⁴⁰Ar/³⁹Ar muscovite ages (80 - 90 Ma) were obtained from the southern part of the Obernberg Nappe, indicating a gradually increasing thermal overprint of approximately 450 to 500°C towards the underlying metasedimentary cover of the Ötztal Nappe. Top southeast-directed ductile and ductile-brittle shear sense indicators from the shear zone and a progressively increasing tectonic omission of the Mesozoic sequence towards the southeast evidence a low-angle extensional reactivation of the tectonic contact. Small- and large-scale recumbent folds of the calcitic top of the otherwise predominantly dolomitic metasedimentary succession are seen in the field. ⁴⁰Ar/³⁹Ar muscovite ages (86 - 93 Ma) and a ⁸⁷Rb/⁸⁷Sr cooling age from synkinematic biotite from the Brenner Mesozoic constrain cooling below 300°C to early Late Cretaceous times. Lenses of highly deformed calcite and dolomite marble within the quartzphyllite of the Obernberg Nappe show lithological similarities with calcite marble from the underlying Brenner Mesozoic. From a reconstruction of the fold geometries, they are interpreted as boudinaged lenses along the axial plane of large-scale recumbent folds that formed during Late Cretaceous low-angle extension.