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Coeval folding, extensional and strike-slip faulting at the eastern end of an axial culmination in the Tauern Window (Eastern Alps)

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We seek to understand how folding and extensional faulting accommodated lateral motion of orogenic crust at the eastern end of the Tauern Window in the Eastern Alps. This is key to determining how the Tauern Window evolved during Miocene indentation of the Adriatic microplate.

The Katschberg normal fault zone (KNFZ) at the eastern end of the Tauern Window (Genser & Neubauer 1989) comprises a thick (1-2 km) belt of retrograde, amphibolite-to-greenschist facies mylonites (the Katschberg shear zone, KSZ) capped along its central part by a narrow (10-100 m) zone of cataclasites (the Katschberg Brittle Normal Fault, KBF). The KNFZ accommodated top-E to -SE motion of the hangingwall, indicative of normal faulting. This is consistent with the observation from a newly compiled tectonic map that the Katschberg normal fault zone thinned and locally excised the folded Early Tertiary nappe stack of the eastern TW. The KBF capping the moderately (30°) SE-dipping central part of the KSZ coincides with the greatest amount of tectonic omission of the Early Tertiary nappe stack. New measurements of the main foliation (S2) and stretching lineation (Ls2) associated with the KSZ indicate that the northern and southern continuations of the KSZ are curved and affect primarily Mesozoic calc-schists (Bündnerschiefer) around the perimeter of the eastern TW. The northern continuation of the KSZ reveals dextral shear sense along moderately N- to NE-dipping S2 surfaces, whereas its southern continuation shows sinistral shear sense on subvertical, NE-SW striking S2 surfaces. These S2 surfaces accommodate sinistral strike-slip movement and bend into an orientation subparallel to the Mölltal fault, a major fault that has been interpreted as a stretching fault (Kurz & Neubauer 1996) that produced both dextral displacement and NE-side up vertical displacement.

The relative ages of the KSZ and Mölltal Fault are not yet known, but we tentatively explain the opposite shear senses along the southern KSZ and Mölltal Fault in the following way: Sinistral shear sense along the S2 foliation of the southern KSZ accommodated exhumation of the Tauern Window axial zone combined with east-directed extrusion of the hangingwall of the KNFZ during N-S shortening and induced by northward motion of the Adriatic indenter. The dextral shear sense of the brittle and ductile parts of the Mölltal fault indicates E-directed lateral extrusion of the entire core of the Eastern Alps, i.e. the Tauern Window including the Austroalpine nappes in the immediate hangingwall of the KNFZ. These units underwent coeval shortening and lateral extrusion with respect to the Southern Alps (Adriatic indenter) and other non- or less-extended Austroalpine units adjacent to the Periadriatic Line.

We conclude that the KNFZ accommodated a large, as yet unconstrained amount of orogen-parallel extension at the eastern end of the Tauern axial culmination during N-S shortening and Adriatic indentation. This extension is interpreted to have been broadly coeval with post-nappe folding because maximum tectonic omission across the KNFZ coincides with the hinge of the Tauern axial culmination. Continued Adriatic indentation and N-S shortening lead to dextral transpression and stretching along the Mölltal fault; this accommodated east-directed extrusion and exhumation of the still shortening and extending axial zone of the Alps.

References:
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