



Exhumation structures in the Tauern Window and their relation to present-day crust-mantle structure in the Eastern Alps

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The Alps east of the Giudicarie and Brenner Lines comprise a Late Cretaceous, NE-vergent nappe stack that overlies a Cenozoic N-vergent duplex in the Tauern Window (Scharf et al., this session). The Tauern Window exposes exhumed oceanic (Alpine Tethys) and basement units of the distal European margin. The MOHO attains a maximum depth of 50-52 km at the W end of the Tauern Window, where it appears to be sinistrally offset by the Giudicarie Line. To the E, this thickness gradually decreases to about 44 km at the E end of the Tauern Window, and to as little as 38-40 km towards the Pannonian Basin. The Tauern Window also coincides broadly with a positive Vp mantle anomaly, which in tomographic studies is variously interpreted as a lithospheric slab dipping steeply to the N (Lippitsch et al. 2003) or to the S (Mitterbauer et al. 2011). Our goal is to relate the kinematics of crustal thickening and exhumation in the Tauern Window to these first-order geophysical anomalies.

Accretion of units exposed in the Tauern Window began with Late Cretaceous thrusting of the Adriatic margin onto oceanic units of Alpine Tethys. This continued throughout the early Cenozoic with the subduction (D1) and early exhumation (D2) of imbricated oceanic and distal European units, as recorded by Eocene high-pressure metamorphic assemblages (e.g., Kurz et al. 2008 and refs.). The onset of collision at ca. 35 Ma is marked by nappes and duplex formation (D3, Venediger nappe complex) in the European basement units forming the core of the Tauern Window. Rapid exhumation began no later than 20-23 Ma and lasted until about 17 Ma in the E Tauern Window, and 11 Ma in the W Tauern Window. This exhumation was accommodated by a combination of km-scale upright-folding, doming and low-angle normal faulting (D4) at both ends of the Tauern Window. Continued N-S shortening was accommodated increasingly by eastward lateral escape along a conjugate system of strike-slip faults that affected progressively more E parts of the Eastern Alps (Wölfler et al. 2011).

We attribute the formation of the MOHO root beneath the Tauern Window to a combination of Oligocene nappe stacking and Miocene late-orogenic doming. Doming coincided broadly with two kinematically related events: (1) sinistral Giudicarie faulting which reaches down to the base of the thickened crust and deforms the MOHO; (2) E-W stretching of the orogenic crust in the footwall of the normal faults bounding the Tauern Window. This supports the notion that pronounced exhumation and lateral escape were triggered by indentation of the eastern part of the rigid Adriatic microplate. This indentation may be related to the high Vp mantle anomaly beneath the Eastern Alps.