



Differential uplift on the Periadriatic fault system: thermochronological constraints from the Brenner Base Tunnel

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The Alpine orogenic system is characterised by a highly variable lithospheric structure, e.g. a change in slab polarity along strike and spatially limited subduction zones. The structures do not only change in space but also in time, adding a fourth dimension to this puzzle. The ongoing north-directed indentation of Adria into Europe is a key feature of the Alpine orogenesis. Internal deformation and deformation along the rim of the indenter are documented by important fault zones, e.g. the Periadriatic fault system, the Giudicarie belt, the Valsugana fault, and the Fella-Sava fault. The very tip of the Dolomites Indenter is a particularly interesting area and is right now even more in the spotlight due to the construction of the Brenner Base Tunnel. The three tubes of the tunnel already pierced the boundary between the Eastern and Southern Alps, i.e. the Periadriatic fault system, and provide the unique opportunity to sample a horizontal transect across this first order fault zone. Until now Apatite He, Apatite Fission Track and Zircon Fission Track analysis have been performed on 20 samples along a 2 km long section of the Brenner Base Tunnel allowing for the following conclusions:

- (i) Along the Pustertal fault (part of the Periadriatic fault system), described as dextral strike-slip fault in the literature, a Miocene to (at least) Pliocene N-side up movement can be observed
- (ii) The until now unknown location of the SAM (Southern border of Alpine metamorphism) within the narrow, overtilted Austroalpine nappe stack SW of the Tauern Window could be identified
- (iii) Alpine metamorphic and Alpine non-metamorphic Austroalpine units S of the Tauern Window show a clearly decoupled exhumation history during the Miocene Giudicarie phase between 17 and 8 Ma
- (iv) The Alpine non-metamorphic Austroalpine units West and East of Maultal and the Eisack Valley show different exhumation rates from 17 Ma onwards during the Giudicarie phase. They are probably decoupled along a fault hidden in the Eisack Valley
- (v) The Alpine metamorphic Austroalpine units S of the Tauern Window show a significant pre-Miocene W-E trend to more recent cooling ages in the West (Maultal area)