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Post-collisional cooling trends in the Eastern Alps: Indications for spatial and temporal varying exhumation phases throughout the Miocene

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The Tertiary post-collisional cooling history of the Eastern Alps is characterized by strong lateral gradients of which the origin is structurally controlled. These structures include the Brenner- and Katschberg normal shear zones and the DAV and Salzachtal Line with strike-slip components. This research aims at working out cooling patterns and cooling rates to gain insight in the underlying processes steering rock exhumation and cooling in the Eastern Alps. The presented cooling maps are based on published cooling age data derived from $^{87}Rb/^{86}Sr$, $^{40}K/^{39}Ar$ *(biotite)* and *fission track (apatite, zircon)* datings. The data is displayed on georeferenced time-contoured *temperature maps* portraying cooling down from upper greenschist / amphibolite facies metamorphism (500-600 ˚C) to 110 ˚C, and on temperature-contoured *time maps* starting at 25 Ma.

The compilation of available cooling-age data shows that the bulk of the Austroalipine units already cooled below 230 ˚C before the Tertiary. The onset of cooling of the Tauern Window (TW) was in the Oligocene-Early Miocene and was confined to the Penninic units, while in the Middle- to Late Miocene the surrounding Austroalpine units cooled together with the TW towards near surface temperature conditions.

High cooling rates (50˚C/Ma) within the TW's are recorded for the temperature interval 375-230 ˚C and occurred from Early Miocene in the east to Middle Miocene in the west and is coeval with the climax of lateral extrusion tectonics. Further cooling below the closure temperature for the zircon fission track isotope system happened around

18 Ma in the easternmost TW, while in the westernmost TW cooling is recorded until 10 Ma ago.

Cooling in the western TW was controlled by activity along the Brenner normal fault as shown by gradually decreasing ages towards the Brenner Line. Cooling ages decreases also towards the TW's central E-W striking structural axe indicating a thermal dome geometry. Both cooling trends and the timing of the highest cooling rates reveal a strong interplay between E-W extension and N-S orientated shortening during exhumation of the TW.