



Exhumation history of the eastern Periadriatic fault – linkage to the Tauern metamorphic core complex

Bianca Heberer (1), Franz Neubauer (1), István Dunkl (2), and Johann Genser (1)

(1) Department of Geography and Geology, University of Salzburg, Salzburg, Austria (bianca.heberer@sbg.ac.at), (2) Geoscience Center, University of Göttingen, Göttingen, Germany (istvan.dunkl@geo.uni-goettingen.de)

Indentation of rigid blocks into rheologically weak orogens is generally associated with lateral and vertical extrusion of rocks. In this study, we report an example from the Eastern Alps, in which subvertical extrusion of crustal blocks associated with exhumation in distant areas is connected by a transfer fault, which likely corresponds to a block boundary in the deeper crust or even lithosphere.

We applied apatite (U-Th)/He (AHe) dating to Triassic granites and Oligocene tonalites from the Karawanken plutonic belts located in the immediate vicinity of the eastern Periadriatic fault near the Austrian-Slovenian border. The eastern Periadriatic fault is segmented into three portions: a straight segment west of the Hochstuhl-Möll Valley (HVM) fault system, a central segment between the NW-trending HVM and Lavant Valley faults with a Neogene positive flower structure separating the north-vergent North Karawanken from the south-vergent South Karawanken unit, and an eastern segment largely buried underneath Neogene Pannonian basin sediments. In the central segment, the Periadriatic fault is dextrally displaced by the HVM and Lavant Valley faults and the North Karawanken unit is thrust over the Neogene flexural, intra-orogenic Klagenfurt basin, which contains sediments ranging from Sarmatian (ca. 11 Ma) to Pliocene or possibly even Quaternary. In the central segment, we find AHe ages mostly ranging from 6 to 9 Ma. This is in contrast to older ages west of the HVM directly at the PAF, where an age of 20 ± 1 Ma has been found. The basement north of the Klagenfurt basin yields also older AHe and apatite fission track ages ranging from c. 25 to 30 Ma. This age pattern confirms and constrains the positive flower structure as an area of young exhumation.

Young AHe ages similar to the central segment of the eastern Periadriatic fault were reported from the Tauern window (Foeken et al., 2007; Wölfler et al., 2012). We suggest that the HVM fault system acts as a transfer fault and connects shortening of an apparent positive flower structure and associated exhumation with coeval updoming in the eastern Tauern window, particularly within the strongly shortened Sonnblick dome. Interestingly, the HVM fault corresponds roughly with the western boundary of a lower crustal Pannonian fragment.

These new findings indicate a hitherto undetected late Neogene deformation event within the Eastern Alpine system, possibly triggered by revived indentation of the Adriatic indenter. Further evidence for such a Late Neogene shortening phase comes from the widespread inversion in the entire Alpine-Carpathian-Pannonian system as well as the ca. coeval development of the Sava folds in Slovenia.

References

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