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Tertiary structural evolution and exhumation history of the Rodna horst and the Preluca massif in Northern Romania

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This study addresses the exhumation history of basement units (the Rodna horst and the Preluca massif) in the Maramures area (northern Romania) by combining field observations and fission-track analyses. Located internally from the main East Carpathian chain, the Rodna horst and the Preluca massif underwent a polyphase tectonometamorphic history under lowgrade metamorphic conditions during the Cretaceous. Post-collisional exhumation was followed by Eocene/Oligocene burial. Final exhumation during the Miocene was largely goverened by brittle faulting and fragmentation.

According to our paleostress analyses of meso-scale faults, middle Miocene transpression was followed by middle to late Miocene transtension with a consistently NE-SW oriented compression axis. The Miocene evolution of the Rodna horst, governed by the sinistral Dragos Voda fault, is related to open folding and erosion-controlled exhumation followed by apparently dominant normal faulting during transtension. NE-SW trending normal faults led to fragmentation of the Rodna horst into blocks and allowed for exhumation in the normal-fault bounded Maramures mountains to the north. While the same kinematic succession can be observed at the Preluca massif as well, transpression is more dominant at the Preluca fault (cf. Tischler et al., this volume).

For estimates on the rate and timing of exhumation, the Rodna horst, the Maramures mountains and the Preluca massif were sampled for fission-track (FT) anaylses.

Burial by Eocene to Oligocene sediments led to annealing of apatites in the Rodna

Horst and the Maramures mountains while no sign of annealing could be observed for zircon samples. In tectonostratigraphically higher positions only partial annealing of apatites is observed, while samples from deeper levels have been fully annealed and yield middle Miocene cooling ages (10-13 Ma, see also Sanders 1998). Thermal modelling points to maximum paleotemperatures of 115˚C related to burial. Late Cretaceous apparent zircon FT cooling ages (60-95 Ma) reflect late Cretaceous cooling after mid Cretaceous nappestacking.

In contrast apatite FT ages from the presently exposed Preluca massif (57-63 Ma) were only very slightly disturbed during Eocene to Oligocene burial. Thermal modelling of samples from this area points to maximum paleotemperatures of 75˚C only!

Considering recent heat flow data (Demetrescu & Veliciu 1991), these temperatures correspond to 5-6 km and 2-3 km of Paleogene burial for the Rodna horst and the Preluca massif respectively. The suggested onset of exhumation at 15-12.5 Ma b.p., as deduced from thermal modelling, is in agreement with stratigraphic arguments and field observations again pointing to fault activity in the interval between 15-10 Ma. Based on our data, we estimated average exhumation rates of about 0.4 mm/a for the Rodna horst and 0.2 mm/a for the Preluca massif for the time interval 15 Ma.

0.1 References

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