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Miocene tectonics along the Mid-Hungarian fault zone - implications from northern Romania

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The Tertiary emplacement of the continental Alcapa and Tisza–Dacia blocks into the Carpathian “embayment” is a key issue for understanding the evolution of the Carpathian orogen (Csontos & Vörös, 2004). The Mid Hungarian fault zone, separating these two blocks (Csontos & Nagymarosy 1998), is for the most part covered by sediments of the Pannonian basin, and can only be studied by geophysical data in most places. Alcapa has been thrusted over Tisza – Dacia during Late Oligocene to Early Miocene times along an individual fault named "Mid Hungarian line" (Csontos & Nagymarosy 1998), a part the broader deformation belt of the Mid-Hungarian fault zone. Our field-studies in northern Romania provide kinematic, sedimentological and fission track data for northern Romania, where parts of the Mid Hungarian fault zone are outcropping.

The non-metamorphic flysch units of the Pienides represent the easternmost parts of the outer west Carpathians (Plasienka 1997), and were emplaced onto the Paleocene to lower Miocene post-tectonic cover of the Bucovinian nappes in Burdigalian times. During Oligocene to Aquitanian times flysch sedimentation prevails in the autochtononous domain, exhibiting an overall coarsening-up trend, finally resulting in the deposition of Burdigalian-age molasses deposits. These deposits show a wedge-shaped geometry, as imaged by seismic sections from the northern Transylvanian basin. (Ciulavu et al 2002 and references therein). Later left-lateral movements along the Bogdan-Dragos Voda fault, which is part of the eastern Mid Hungarian fault zone, offset these early Miocene thrust contacts.

The Burdigalian-age emplacement of the Pienides is dominated by consistently SE-directed thrusting under brittle conditions while folding is of subordinate importance. The curved map appearance of the thrust contact is due to lateral ramps and tear faults,

accentuated by later folding.

Sinistral transpression along the Bogdan–Dragos Voda fault started during the middle Miocene and led to the formation of open NW-SE trending folds in the sedimentary units, while transtension characterises middle to late Miocene kinematics along the Bogdan-Dragos Voda fault. Towards the east the sinstral offset along the main fault is continuously reduced by coevally active SW-NE trending normal faults, thus terminating the Bogdan-Dragos Voda fault in an extensional horsetail splay. The main activity along the Bogdan Voda fault ended at about 10Ma, as indicated by almost unaffected Neogene volcanics.

The Oligocene to lower Miocene clastic wedge from the northern Transylvanian basin probably represents a clastic wedge derived from the SE-directed thrusting of the Pienides, the eastern tip of Alcapa, over the Transylvanian basin i.e. Tisza-Dacia. This interpretation implies that the foredeep in the NE part of the Transylvanian Basin (Ciulavu et al 2002) formed owing to direct flexural response to loading by the overthrusted units.

The deduced tectonic history is in good agreement with the exhumation history deduced by fission track analysis (see Gröger et al. this volume). The kinematic data from outcrops in northern Romania can be well correlated with borehole and seismic data from the Mid Hungarian fault zone. Late Oligocene to Early Miocene thrusting observed at the Mid Hungarian Line coincides with the Pienide nappe emplacement. At least since the middle Miocene the Mid Hungarian fault zone is most likely kinematically connected to the Bogdan-Dragos Voda fault. Similar stress data from the more southerly located Preluca fault suggest that this fault also took up some of the movements along the Mid-Hungarian fault zone. Hence, our data indicate that strain is distributed along the eastward continuation of the Mid Hungarian fault zone, and that the notion of movement along a single fault (such as the so-called "Mid-Hungarian line" might be misleading.

0.1 References

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