

Transition from subduction to strike-slip deformation at the tail of orogens: the relation between the Carpathians and the Moesian plate during the Tertiary, Romania

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The Carpathians is a tightly curved orogen formed by the Cretaceous to Tertiary collision of tectonic blocks to the distal parts of the East European margin to the NE of the Black Sea region. Our study focuses on the Getic Depression, foreland of the Southern Carpathians during the Middle Miocene.

This foreland basin is dominated by a complex network of Middle Miocene thrust faults. However, kinematic analysis of faults by structural balancing reveals the presence of an older deformation phase, which differs from west to east as follows. In the west, a thick-skinned transtensional network of Paleogene(?) to Early Miocene age has been reconstructed. By that time (i.e. “intra-Burdigalian”) thin-skinned thrusting is observed in the east. There, the transtensional faults are locally developed by the late Burdigalian (e.g. Tutana area), and seem to detach on earlier (?) thin-skinned thrust faults.

Our study suggests the western Getic Basin is a Paleogene (?) to Early Miocene transtensional basin inverted and locally detached from its basement during the Mid Miocene. In turn, the eastern Getic Basin is the continuation – albeit on a smaller scale – of the Eastern Carpathians. The transition between the two different structural styles may be placed somewhere in the central part of the basin (Olt valley area).

The “intra-Burdigalian” thrusting was coeval with the northeastward movement of the Inner Carpathians into the “Magura Ocean” which was very similar to the present-day Black Sea Basin. The shortening was laterally accommodated by a major extensional wrench corridor developed at the contact zone of the Inner Carpathians and Moesia. This wrench corridor starts in the Timok zone in Serbia and continues northward into Romania and it encompasses the strike-slip basins on top of the Inner Carpathians (e.g. Petro  ani Basin, Ha  eg Basin) and also the sheared northern (distal) margin of Moesia. This later forms the basement of the Getic Basin during the Paleogene to Early Miocene.

The basins developed on the Inner Carpathians illustrate progressive break-up of the Carpathians due to the orogen-parallel extension and related core-complex formation. In turn, transtension on distal Moesia was controlled by the position in time of the backstop of the Carpathians.