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Tectonostratigraphic evolution of the Danube Basin: inferences from gravity, magnetic and seismic data

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The 220-290 km of Miocene extension observed in the Pannonian basin system of Central Europe was driven by the rapid roll-back of the Carpathian slab. Basin formation was coupled with the extrusion of the Eastern Alps with large amounts of translation and vertical axis rotations. In the hanging wall of low-angle normal faults and detachments few kilometers thick syn-rift sediments deposited during the Early to Middle Miocene (Karpatian, Badenian and Sarmatian). Following a spectacular unconformity they are overlain by the gently folded thick Pannonian to Quaternary deposits.
A novel tectono-stratigraphic interpretation was carried out in the Csapod and Győr-Kenyeri sub-basins using a dense network of reflection seismic data supported by gravity and magnetic anomaly maps. Incorporating new biostratigraphical data from deep wells the spatial and temporal patterns of the Miocene deformation was analyzed. 3D geological model was constructed using the gravity and magnetic forward modeling software (IGMAS+, e.g., Götze & Lahmeyer, 1988) based on the potential field anomalies (). Dz magnetic anomalies imply the location of buried volcanic bodies while the gravity anomalies indicate the buried basement highs.
Our seismic interpretation revealed that asymmetric extension (Tari et al. 1992) was diachronous in the basin system. Oldest half-grabens closer to the basin margins were characterized by Karpatian (ca. 17.2-16.3 Ma) extension with limited amount of Badenian post-kinematic sedimentation. Toward the basin centre, in the Csapod Through the culmination of extension is Badenian (16-13 Ma) in age. Further to the deepest depocenters, in the Győr-Kenyeri depression, half-graben formation was still active during late Badenian - Sarmatian (14-11.6 Ma). Uplift and exhumation of the footwalls of the half-grabens are shown by the interpretation of depth-converted seismic data. Our estimations on this uplift of the footwalls are in the order of a few hundreds of meters, up to 1 km, based on the lateral correlation of the seismic profiles. The depth of the Neogene basement and crustal thickness was refined by the seismic interpretations coupled with gravity and magnetic forward modelling.
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