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# New large-scale lithospheric model of the Western Carpathian-Pannonian Basin region based on the 3-D gravity modelling.

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A 3-D forward modelling of the Bouguer gravity field was performed for the Western Carpathian-Pannonian Basin region. The gravity model extends to depth of 220 km and includes also the surrounding units (the Eastern Alps, Bohemian Massif, Trans-European Suture Zone and East European Craton). It is constrained by seismic models, mainly from the CELEBRATION 2000 seismic experiment, and other geophysical data. Additionally, the density distribution and thermal structure in the shallow upper mantle were estimated using a combination of petrological, geophysical, and mineral physics information (LitMod). This approach is necessary in order to better constrain the more complicated structure of the Pannonian Basin. As a result, we present the first 3-D gravity model of the region that combines various geophysical datasets and is consistent with petrological data.

Realistic density values within the uppermost mantle provide a better control on the regional gravity signal. In turn, this generates a model with refined and enhanced crustal structure. This means that deeper parts of the model are better accounted for, which helps to better constrain the nature of shallower crustal layers. Although not commonly applied in potential field modelling, we find that this approach is advantageous when modelling large areas with insufficient near-surface constraints. Also, a density distribution within the crust and uppermost mantle that is consistent with petrological data allows better estimates of the depth to the Moho (where it is not constrained by seismic data) and to the lithosphere-asthenosphere boundary. Hence, our model provides improved estimates of both the density distribution within the crust and uppermost mantle and the depth to major density discontinuities (sediments, Moho, lithosphere-asthenosphere boundary).

The results of the modelling reveal a markedly different nature of the Western Carpathian-Pannonian region (ALACAPA and Tisza-Dacia microplates) from the European Platform lithosphere. While Pannonian Basin region has an extremely thin lithosphere of low densities, the Western Carpathians are characterized by moderate densities and a minor crustal root. In contrast, the European Platform and Eastern Alps are characterized by lithosphere that is considerably thicker and denser.

This conclusion is well supported also by results of gravity stripping, which was applied in order to analyze the gravity field. Since major structures associated with the basin (i.e. the deep sedimentary basin and shallow crust) have opposing gravity effects that tend to cancel each other, the gravity stripping in the Pannonian Basin region is essential. The complete residual anomalies, from which the gravity effects of the sediments, Moho and the asthenospheric upwelling in the Pannonian Basin have been removed, are characteristically low in the Western Carpathian-Pannonian Basin region. These low residual anomalies partly reflect crust that is, with respect to the surrounding units, unconsolidated. Hence, both the ALCAPA and Tisza-Dacia microplates are exotic terranes, which significantly differ from the more consolidated crust and denser lithospheric mantle of the European Platform and Eastern Alps.