

Integrated modelling of the structure and rheology of the lithosphere in the Carpathian-Pannonian region

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Abstract: We apply two dimensional (cages) integrated modeling of the lithosphere which combines the interpretation of surface heat flow, geoid, gravity, and topography data in the Carpathian–Pannonian Basin region and surrounding areas. This approach is able to constrain the complicated lithospheric structures of the studied region better than interpreting each data set on its own. The calculation is performed using a finite element technique that links the different physical equations. The program optionally calculates the temperature at any material boundary and with given rheological parameters, the strength distribution and the total lithospheric strength in selected columns (Zeyen and Fernandez, 1994). We present in this paper three two dimensional integrated models of the lithosphere in the Carpathian–Pannonian Basin region and surrounding areas. The models provide improved estimates of both the density distribution within the lithosphere and the depth to major density discontinuities such as the Moho discontinuity and the lithosphere–

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asthenosphere boundary. The lithospheric thickness varies from a maximum depth of 240 km under the Eastern Carpathians to 180 km under the Southern Carpathians and Dinarides, 150 km under the Moesian platform and Adriatic Sea, 110 km under the Transylvanian basin, 100 km under the Aegean Sea and 60 km (Profile B1) or 130 km (Profile B2) under the Pannonian Basin. In our best-fitting model, the Moesian platform is characterized by higher densities than the surrounding units which is typical for cratonic crust, the surrounding units being much younger than the Moesian platform. Moreover we find a thickening of the lithosphere under the Southern Carpathians which we interpret as due to underplating of the Moesian platform beneath the Southern Carpathian towards the north. This underplating, although proposed by some authors, has never been imaged before with geophysical data. Also near the southern limit of the Moesian platform, crustal and lithospheric thickening has been modelled, indicating an underplating of the Moesian platform also to the South. The lithospheric thickness of the Pannonian Basin may have two solutions. One of them is the lithospheric thickness of 60 km which is in accordance with the most common estimation and the second solution estimates the lithospheric thickness about 130 km. This estimation is the result of our best-fitting model.

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