

# Tectonics of the northern Carpathians basement in the light of electromagnetic and gravity data analysis

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The northern part of the Carpathians covers the north-eastern area of the Western and north-western of the Eastern Carpathians. The basement of the Carpathians in this zone is of a transitional nature and is relatively poorly explored, which results from its deep burial, in particular under the so-called Outer Carpathians. The interpretation of the tectonics and geodynamics of the basement depends to a large extent on the analysis of large scale geophysical data. In this area, regional seismic surveys were carried out mainly using the so-called deep refraction and numerous geophysical works using gravity, magnetic, geomagnetic and magnetotelluric methods. The subject of the presented work is a review of the regional image of electromagnetic and gravity studies carried out in this area, with particular emphasis on the territory of Poland, within which the authors carried out numerous research works. Electromagnetic research allows for the construction of a regional model of basement resistivity distributions and the determination of general outlines of its geometry as well as the formulation or testing of the concept of its geodynamical interpretations. An auxiliary role in this aspect is played by gravity data allowing to recognize the density distribution of the basement and constituting a set of additional data for integrated interpretation. The area outside the territory of Poland was presented on the basis of literature data, creating an extensive regional background for the results of research related with the participation of the authors in Poland. Within the Polish Carpathians, there is a structural reconstruction of the Carpathian overthrust and its basement, as well as a clear change in the nature of geophysical

fields, e.g. the system of gravity field anomalies. Due to the deep burial of the Carpathian overthrust in this area and the complex structure of the orogen, which hinder effective drilling penetration, its fragmentary and uncertain recognition is based mainly on geophysical surface studies. The complex structure of the orogen reduces the effectiveness of the use of the seismic reflection method, the participation of which is limited in practice to the recognition of the basement in the marginal zone of the Carpathian overthrust. In the remaining area, alternative methods of surface geophysics are used, i.e. the magnetotelluric and gravity method. An important role in recognizing the basement of the Eastern part of the Polish Carpathians was played by magnetotelluric soundings that cover the above mentioned area with a relatively dense network of several generations of measurement points. The results of the interpretation of the MT soundings were used to construct a resistivity model, which was verified by new results of regional processing of seismic data and magnetotelluric and gravity modelling. The visualization of resistivity distributions was presented through maps interpreted at selected depth levels and in the resistivity cross-sections form. Resistivity distributions are the basis for interpreting tectonic zones marked as resistivity contrasts. Forward modelling and inversion of gravity data were used to verify resistivity structural models.

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