# Comprehensive geological and geophysical interpretation of the Polish Outer Carpathians basement in the area between Jasło and Rzeszów

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Integrated geophysical and geological investigation of the basement of the flysch Carpathians in the area between cities of Rzeszów, Pilzno, Jasło and Krosno was conducted in 1992–1995 by a team of experts from the University of Mining and Metallurgy and Polish Oil and Gas Company. The project was commissioned by the Polish Oil and Gas Company — Section of Oil and Gas Prospecting in Jasło. The general objective of the investigation was to identify the Mesozoic, Palaeozoic and Precambrian basement of the Carpathian orogen. Available magnetotelluric, seismic and gravity data as well as surface and borehole geological data were employed. A series of new magnetotelluric data was also recorded. The basement roof was interpreted along six magnetotelluric profiles. Maps of the sub-Miocene basement roof were also constructed for a part of the study area.

Based on surface and borehole geological data and seismic data, cross-sections of the flysch cover were made along the MT profiles. The cross-sections and well-logging data were used to construct initial models for geoelectric interpretation and the models of seismic wave velocity distribution. The models were then used in geophysical data interpretation. The initial models of resistivity distribution were verified by 1D magnetotelluric inversion and 2D magnetotelluric modelling. The effect of the morphology of the deep basement on magnetotelluric field measured on the Earths surface is attenuated by a complex resistivity distribution in flysch formations. Hence, a proper choice of initial interpretation models is essential. A 2D model of magnetotelluric data interpretation can be assumed for a major part of the study area. However, a 3D geoelectric model of the flysch cover is evident for some areas.

As a result of the geological and geophysical interpretation integrated cross-sections illustrating the orogen basement together with structural and facies units of the flysch were obtained. The sub-Miocene basement is dipping progressively with increasing distance to the Carpathian edge. However, some elevations and depressions can be observed on the cross-sections. Except for some local discrepancies, results of magnetotelluric, seismic and gravity data interpretation are concordant in general. The origin of the discrepancies may be connected with different initial models assumed for bulk density, resistivity and seismic wave velocity distribution in the flysch cover and/or with different location of physical parameter contrast boundaries. Well-log analysis and parameter sounding interpretation results show that the high-resistivity horizon is connected with the roof of the sub-Miocene basement. Locally, it may be located deep below the basement roof or shallow in the high-resistivity sandstones in the flysch cover.