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The studies of crystalline substratum in mountain area based on electrical imaging (Eastern Sudetes, Czech Republic).

Dominika Stan

Faculty of Earth Sciences, University of Silesia, Będzińska St. 60, 41-200 Sosnowiec, Poland. (standominika@go2.pl)

The Eastern Sudetes mountain area has become a subject of subsurface studies because of its paleogeographic past, the occurrence of geomorphological forms and the structural conditions. The research was performed directly within the three massifs: Ztracené kameny (1250m), Medvědi vrch (1216m) and Osikový vrch (656m), both on the ridges and on the slopes. The stands were located in the eastern and southern parts of mid-mountain range of the High Jesenik. The rock complexes occurring there are folded Lower Devonian deposits and eroded Lower Carboniferous series with strongly metamorphosed Proterozoic rocks. They consist of crystalline rocks such as Devonian quartzites, gneisses and amphibolites surrounded by strongly metamorphosed intrusions, phyllites and schists. Highly diversified geological structure with numerous dissections, that secondarily were subjected to deformation and regional metamorphism processes, determined to use two geophysical methods to identify subsurface layers, imaging their structure and thickness.

The electrical resistivity tomography (ERT) was performed using the P.A.S.I. (Mod.16S24-N) with 32 electrodes. The system applied the Dipole-Dipole, the Wenner and the Wenner-Schlumberger arrays, where the length of the profiles amounted appropriately 69, 93 and 150 m. The distance between the electrodes was 2, 3 and 5 m. Interpretation was made using the RES2DINV program from Geotomo Software. Whereas the seismic refraction tomography was performed using 24-channel P.A.S.I. 16GS24N seismograph. This method was used to determine the boundary between unconsolidated weathered cover and solid rock. The seismic data were digitally recorded with up to 24 geophones at a 3-meter spacing, so the profiles were 69-meters long. The data allowed the seismic imaging tomography to be obtained using the SeisImager software. The physical properties of the studied rocks were defined by fracture density measurements and orientation of crack systems.

The results of the two-dimensional (2D) electrical resistivity imaging confirmed the usefulness of these methods, hence emphasizing their complementary nature. The measurements of particular stands were compared to each other. The interpretation of the results specified three and four- layered rock mass. The obtained resistance values of quartzite rocks ranges from 6000 to 20 000 ohm m and gneisses ranges from 1500 to 5000 ohm m. The appearance of these intervals is directly connected with the presence of numerous intrusions, usually as a quartz veins, as well as diversified degree of metamorphism processes and varying fracturing – what affects the electrical conductivity. The measurements of seismic tomography allow the determination of the boundary between quartzite and phyllite, and gneiss and phyllite. The different conditions for each of the stands indicated that the use of this method seems to be justified in the case of low thickness of weathered layers and vertical diversification of the particular rock types.