

## **Examples of Deep Seated Gravitational Slope Deformations in the central part of the Lower Beskids, (the Polish Flysch Carpathians)**

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The Lower Beskids are located between the western and eastern parts of the Carpathian flysch belt, whereas the low altitudes of passes and ridges in this region have until now been identified mainly with the differences in bedrock resistance. In the light of contemporary information regarding the geology of this area, the hypothesis of the gravitational placement of large tectonic elements has become topical again.

A particularly interesting area is the ridge and foreland of the Magura Wątkowska, bordering in the north with the Sanok-Jasło Pits (a denudation valley). This edge zone of the Lower Beskids has a complicated geological structure, i.e. it constitutes a tectonic contact of the Magura Unit and the Central Carpathian Depression (the depressed part of the Silesian nappe). During the field research and analyses regarding the identification of morphostructural elements, the important role of various kinds of lineaments was observed. Some of the inventoried lineaments were, e.g. large size faults or effects of the impact of tectonic processes on bedrock. Structures in the rock (cracks, faults) accompanying them are important in determining the type of macro scale gravitational movements. The outer part of fold structures in the foreland of the Magura Wątkowska shows the rotation around the longitudinal syncline axis, and is an excellent research field for a comprehensive analysis of gravitational movements, both of the basin type and the DSGSD (Deep Seated Gravitational Slope Deformations) type.

Determining the types of tectonic lineaments was based on a review of selected directions in the context of the course of tectonic structures in the study area. On that basis, lineaments were classified into two morphogenetic groups, i.e. structures that do not result in visible movements relative to the analyzed rock massif (cracks), and those causing the displacement of the rock massif (faults, overthrust). Using the directional and contour diagrams generated by measuring the spatial orientation of joint planes, gravitational macrocomplexes with a characteristic joint system were singled out. Next, by correlating them with fault zones, a morphogenetic analysis was performed the result of which was a precise characterization of the type of gravitational morphogenetic processes in the meso scale (e.g. large rock landslides) as well as in the macro scale (the basin type or DSGSD). Ultimately, the research results were used to classify lineaments in the context of the structural control of the Carpathian Mountains (gravity development of macro scale landforms) and to reinterpret the spatial interdependence of landforms (e.g. ridge, ridge-top trenches and rifts) with the geological structure.

The research conducted so far indicates a variety of macro scale movements in the edge zone of the research area. Based on the morphotectonic analysis performed so far, the following examples of displacement have been found: lateral spreading, toppling, and rotation movement. The effects of these movements are associated with both the basin phases and the DSGSD, so they play an important morphogenetic role, leading to the fragmentation of the morphological threshold of the Lower Beskids, and to the development of characteristic structural landforms.