MORPHOSTRUCTURE AND MORPHOTECTONICS OF THE ORLICKIE-BYSTRZYCKIE MTS BLOCK (MIDDLE SUDETES) IN THE LIGHT OF QUANTITATIVE ANALYSIS OF LANDFORMS AND CHARACTERISTICS OF FLUVIAL SYSTEMS

Vertical tectonic movements, that is upward and downward displacements of specific parts of the Earth's crust known as tectonic blocks, have played very important part in landscape evolution of the Sudetes – one of Central European mountain ranges. The entire range is considered as a mosaic of such blocks, which moved in different ways and at different rates. The area of Orlickie and Bystrzyckie Mts in the Middle Sudetes is one such large block, but its structure is insufficiently known. Its topography suggests that it actually consists of a number of smaller blocks subject to tectonic deformations of different types, including uplift, subsidence and tilting. However, we do not know their boundaries, nor the exact nature of vertical movements responsible for the present-day appearance of the landscape. The project aims to fill this gap and we will show how the Orlickie – Bystrzyckie Mts Blocks is divided into minor units (so-called morphostructures) and how have these units behaved.

One way of reasoning about tectonic trends in the Earth's crust is through analysis of current topography. This geomorphological approach focuses on landscape elements such as spatial pattern of landforms of different kind, their appearance and size, as well as on features on fluvial systems which are the most sensitive indicators of tectonic disturbances. Morphotectonics (or tectonic geomorphology) is a branch of geoscience that looks at interactions between tectonics and landscape. It is an important and rapidly growing research avenue and there many projects of this kind run in different parts of the world.

Our approach in the project is quantitative and represents research field known as geomorphometry. In geomorphometry we intend to measure landforms in order to characterize topography as objectively as possible, through numbers, expressing various features of topography using specific parameters and indices. In this project we will use high resolution digital elevation model which shows topography with extremely high degree of accuracy. Having such excellent data, we will focus on mountain fronts and other escarpments, on valleys which cross the escarpments, drainage basins – their shapes and altitude relationships, spatial patterns of river networks, and stream longitudinal profiles. There are certain features of these landscape elements which may indicate the role of tectonic movement. For example, the more straight are the escarpments, the more steep are river profiles, and the more elongated are drainage basins, the more intense tectonic movements have occurred. Of course, we are aware that tectonics is not the sole factor responsible for the origin of landscape and this why we will pay special attention to adequately consider the role of other factors, mainly rock types which occur in the study area.

The work on digital elevation models will be supplemented by field work. In the field we will verify some of the results of model analysis. We also intend to look closely at various landforms whose characteristics cannot be fully revealed by models, and yet they may have developed in close association with tectonic movements. River gorges and landslides are among such landforms. If required, we will also use shallow geophysical surveys, capable of identifying suspect tectonic structures, e.g. faults.

There are several reasons why this project is undertaken. Geomorphology of the study area remains insufficiently known and we know little about factors which have controlled landform evolution in the Orlickie – Bystrzyckie Mts Block, at least in comparison with other parts of the Sudetes. There are very few published geomorphological studies from this area. Since the origin of the Sudetes as a whole is not yet fully understood and the spatial pattern of uplift and subsidence is rather vaguely known, we hope to make significant contribution to regional geomorphology. Another reason is that we have gained access to topographic data of unprecedented accuracy, higher than ever before. They have been collected through laser scanning of the Earth's surface from planes. Specialist computer programmes within Geographic Information Systems allow now fast and efficient handling of these data. Measurements and calculations are automatic and far more precise than measurements carried out by our predecessors on topographic maps.