EVOLUTION AND CONTROLS OF VALLEY NETWORK IN SANDSTONE AREAS OF THE SUDETES AND ADJACENT REGIONS – COMBINED FIELD-BASED AND GEOMORPHOMETRIC APPROACH

The forms of relief created in sandstones are one of the most spectacular on Earth. Therefore, it is not surprising that sandstone terrains are often protected areas (such as national parks) and are frequently visited by tourists, photographers and researchers. The well-known landscape of the Grand Canyon of the Colorado River is an iconic example of the diversity of sandstone forms – such as deep, winding canyons, high, steep cliffs and extensive plateaus. Those forms mirror the specific features of the rocks in which they have evolved. Despite the large public interest in sandstone areas, the processes which are responsible for the evolution of valley network in sandstone rocks are still poorly known. The project aims to fill this gap and provide a method to decipher information about history of the area by analyzing its valley network. It is possible more than ever before due to modern technologies of GIS (Geographic Information Systems), accessibility of high-resolution digital elevation models (DEM) and portable devices for measurements. Measurements and calculations are automatic and far more precise than those carried out in the past. Using these tools we want to characterize in detail the valley network in sandstone areas of the Sudetes and adjacent regions.

We choose the following test areas, recognized as representative, for field work (1) Stołowe Mountains (Poland); (2) Broumovská vrchovina (Czechia); (3) Kokořín Area (Czechia); (4) Elbe Sandstone Mountains (Germany). Our approach includes qualitative (mapping) and quantitative component (geomorphometry). In geomorphometry we intend to measure landforms in order to characterize topography as objectively as possible, expressing various features of topography using specific parameters and indices, which allow to compare results between different areas. We want to focus on small valleys, such as gorges and canyons, often dry and without any permanent stream, but nevertheless deeply incised. The key scientific problem is to determine whether the development of these valleys is related entirely to the fluvial processes or other processes such as mass movements and subsurface erosion played a role and how important this role was/is. Our project has two components: desk work (part A) and field work (part B), complementary to one another. Works in both parts of the project will be conducted in parallel, and the results combined in the final phase of implementation. Part A aims to analyse the spatial occurrence, distribution and major geomorphic features of valley forms, including delimitation of valleys, geomorphometric analysis of individual valleys, analysis of spatial distribution of valley forms and development of statistics of various features of valleys which aim to identify specific groups of valley segments. Part B will include geomorphological mapping of valley forms and their surroundings, morphometry, description and classification of these forms, description of lithology, structural and strength measurements.

It is assumed that valley forms developed in sandstones are an important carrier of information on the long-term morphological development of region. Complex analysis of valley network of the Czech Cretaceous Basin sandstone areas will significantly contribute to the knowledge about the development of sandstone relief in general.