Research project objectives

The proposed project is designed to solve two primary research problems:

- create a sedimentologic classification system for land slope deposits,
- provide a stratigraphic interpretation of slope cover in mountain and upland areas of southern Poland.

The project is designed to study areas in Poland, but **its results will have significance abroad.** The broad study area will make it possible to analyze the significance of the determinants of hill slope processes as well as their record in the lithologic characteristics of sediments resulting key processes documented in the international research literature. This will make it possible to draw conclusions that may be applied in a universal sense. The fundamental argument in favor of this proposed project is the fact that **currently there does not exist a classification system for land slope deposits based on unambiguous lithologic characteristics.** The land slope environment is a poorly recognized sedimentation environment. Sedimentologic research was not performed in this area for decades. Research on slope processes focused on geomorphologic aspects and the relationship between geomorphology and slope relief as well as forms of accumulation at the foot of the slope. The identification of contemporary slope processes usually does not yield any controversy. On the other hand, the identification of the mechanism responsible for relict sediment deposition on hillslopes is often problematic due to the fact that different slope processes may yield macroscopically similar lithofacies. Hence, the basis of the proposed research study will consist of a detailed sedimentologic analysis designed to accurately establish the workings of the depositional mechanism. **The micromorphologic method will be used** to yield a complete textural and structural picture of deposit characteristics – in addition to macroscopic observations. **The use of this method is an innovative aspect of the proposed project,** as few research studies on slope deposits have employed this method in the past. However, research has shown that this method is an important tool facilitating the identification of depositional slope processes in cases where the identification of deposits is not possible based on macroscopic data alone. A certain amount of research has already been performed in southern Poland producing detailed lithologic characteristics of deposits: (i) scree, (ii) landslides, (iii) solifluction, (iv) debris flows, (v) overland flow. The proposed research will make it possible to expand the data set and verify existing data. Comparative analysis based on available characteristics of slope sediments as well as research results available in the literature will provide a basis for drawing universal conclusions and the creation of a detailed sedimentologic classification system for slope sediments.

Stratigraphic interpretation of slope cover remains an open question in many mountain and upland areas in southern Poland. This problem is particularly significant, as **periglacial slope cover in these areas is often the only available record of the Pleistocene.** The basic research tools in the proposed study are C14 dating and OSL-type absolute dating of deposits as well as lithostratigraphic analysis. The foothills and uplands of southern Poland lie within the range of Pleistocene loess cover. This creates an opportunity to connect research results generated in this study with stratigraphic loess schemes as well as to use the lithostratigraphic method based on the analysis of succession of loess horizons, slope deposits, fossil soils, and frost structure horizons. The proposed research will deliver new data for the purpose of regional stratigraphic interpretation as well as for the purpose of a discussion of slope cover stratigraphy encompassing slopes in central European mountain ranges. Finally, the research will allow for a discussion of stratigraphy in loess areas throughout Europe.

Research project methodology

Fieldwork. The project will include a substantial amount of fieldwork designed to analyze the impact of local conditions on the emergence of selected slope processes in the flysch Carpathians, Sudeten Mountains, Holy Cross Mountains, and Southern Polish Uplands. The fieldwork will include the following tasks: (i) geologic and geomorphologic surveys, (ii) detailed description of lithologic profiles, (iii) morphologic analysis of fossil soils, (iv) collection of samples for laboratory analysis.

Micromorphologic analysis. This part of the project will involve the use of a polarizing microscope designed to: (i) help compare the petrographic/mineral composition of slope cover and bedrock, (ii) help identify vital characteristics that serve as a record of depositional processes, (iii) help identify vital characteristics that serve as a record of post-sedimentation soil processes and cryogenic processes. A scanning microscope will be used to analyze selected samples in detail.

Absolute dating of deposits using the OSL luminescence method and the carbon 14 dating method.