

Application of cosmogenic isotope ^{36}Cl method for dating of age exposure of carbonate rocks in order to reconstruct lateglacial morphological evolution of Miętusia and Małej Łąki valleys in the Western Tatras in the background of climate changes

Modern climate changes are being studied in different climatic zones and under different angles, but study of the climatic conditions in the geological past is the key to solving the mystery of how the climate will behave in the future. The climate is very dynamic structure that responds to changes in input factors, such as the amount of radiation reaching Earth. Cool mountain ecosystems are good markers of climate changes, because the pace of their reaction to these changes is fast. Mountain areas can tell us a lot about the changes in climatic conditions, especially when they were glaciated in the past. Landforms, which today can be found in these valleys, indicate what was the extent of glaciers that no longer exist. Extent of the glacier determines what were the conditions in the past (amount of rainfall during the year, the average temperature etc.) in which the glacier could be formed.

The aim of the project is comprehensive reconstruction of the lateglacial morphological evolution of two valleys: Miętusia and Małej Łąki in the Western Tatra Mountains as well as climate conditions of the region during last glacial maximum. The reconstruction of these climatic conditions will be based on the paleoglaciological reconstruction of selected glaciers that filled the valleys of Tatra Mountains during the last glaciation.

The study area will include two valleys in the Polish Western Tatra Mountains: Miętusia and Małej Łąki. Both valleys are formed over 90% of sedimentary rocks, which affects the selection of test methods.

In the initial part of the study on the basis of charted forms found in the valleys Miętusiej and Małej Łąki ranges of paleoglaciers, glaciers that existed in the valleys in the past, will be reconstructed. With the knowledge of horizontal and vertical range of the paleoglaciers we will be able to determine the average summer temperature, average annual temperature and total annual precipitation.

In order to determine the age of stationing glaciers (estimated age is between 26,000 to 11,700 years ago, last glacial maximum) and temporal changes in the morphology of both studied valleys modern method of absolute dating by cosmogenic isotope will be used. This isotope is formed under the influence of cosmic rays bombarding the elements of the surface layer of the studied rocks. To investigate the carbonate rocks isotope of chlorine-36 can be used.

Additionally, in order to supplement the knowledge about the evolution of morphology of valleys Miętusiej and Małej Łąki will be examined by non-invasive geophysical method: electrical resistivity tomography. This study will allow to check the thickness of sediment lingering in the valley bottoms and their type, whether they are of coarse or fine granulation. And thus infers how the bottom of the valley was remodeled by the glacier and indicates the depth of the forms that it left behind.

The last stage of the study, a summary of the entire project, will be a reconstruction of the evolution of morphology of the study area based on the deglaciation process, i.e. the retreat of the ice. The main tool used in this analysis is GIS software, which will be used to create a series of maps and diagrams based on previous calculations.

In summary, by knowing the age of landforms, its' evolution will be reconstructed not only in space but also in time.