DESCRIPTION FOR THE GENERAL PUBLIC

Soil erosion destroys soil surface and disintegrates soil structure by mechanical translocation of soil particles with water (water erosion) or wind (wind erosion). Soil erosion rates are not only dependent on basic soil characteristics like soil texture, organic content, soil structure and root density that enhance soil strength, but also are linked to land use and vegetation cover. It is considered that the type of land use such as grassland and forest decrease soil erosion hazards, and that arable lands accelerate soil erosion. Soils in the loess landscape of Trzebnickie Hills, usually are used agriculturally and are shaped mainly by water erosion.

Effects of soil erosion on soil environment have multidirectional character, don't only cause losses of soil material from topsoil, but also modify the rate and direction of pedogenesis, as well as leads to soil formation of colluvium materials in toes slopes which is a new soil substrate for soil formation.

So far, empirical studies about soil erosion rates were carried out mostly using the sediment traps (runoff collection system), which collected the eroded material in the toe slope. However, erosion phenomena are periodic and are not regular. This fact causes that reliable data with sediment traps have to be carried out over many years which is problematic because the same surface coverage with plants should be maintained on the experimental plots. Therefore, many scientists resign on the independent estimation of soil erosion rates using sediment traps and focus on the experience of other researchers, which is summarized in the soil loss model RUSLE (Revised Universal Soil Los Equation). However, the RUSLE is mathematical/statistical modeling which only replaces research. It is, therefore, necessary to look for and apply new tools/methods to study soil erosion in such erosion-forced landscapes.

The proposed project intends to use isotopic methods (^{10}Be, $^{239+240}Pu$) and OSL dating. Meteoric beryllium (^{10}Be) gives a signal over the entire period of soil evolution. The use of this isotope gives possibility to investigate long-term erosion which might occur since soil was developed. Moreover, knowing concentration of meteoritic ^{10}Be it is possible to determine the age of testing material. The second time-proxy – plutonium ($^{239+240}Pu$) allows to identify short-term erosion that occurred over last 50 years. Additionally, using plutonium as a soil erosion tracer can indicate a huge dynamic and high heterogeneity of erosion processes and provide possibility for cross checking achieved results. Complementary to the erosion studies using isotopes is the application of OSL dating which is a tool to verify the age of the eroded materials and the formed colluvium soils. This will help to reconstruct the history of erosional events and establish the beginning of prehistoric agricultural activities in a particular area as well as to determine the extent of areas used for agriculture in the past.

The aim of this project is, therefore, a detailed investigation of erosional processes in a loess landscape, with a particular emphasis on: 1) determination of soil erosion rates on loess that are used for agriculture, 2) evaluation of time-intervals of erosional processes and the age of the colluvium materials, 3) development of a spatial model of soil transformation under erosional conditions in a loess landscape, 4) clarification of criteria for systematic position of colluvium soils in Polish classification system.