THE STRATIGRAPHICAL AND SPATIAL VARIABILITY OF THE CHEMICAL COMPOSITION OF THE POLISH LATE PLEISTOCENE LOESS-PALEOSOL SEQUENCES IN PALEOENVIRONMENTAL AND PALEOCLIMATIC CONTEXT

The Polish loess is located in the central part of an extensive latitudinal North European Loess Belt, which is one of the most extensive loess areas in the world. Due to its characteristic, transitional location, the loess of eastern Poland shares many similarities with the East European loess covers, whilst the west part is similar to the western ones. This differentiation was found on the basis of various proxy data, such as the characteristics of fossil soils, granulometric composition, magnetic properties, palynological analyzes or the content of carbonates and humus. In combination with the use of age dating methods (e.g. TL, OSL, ^{14}C), this enabled the reconstruction of climate and environmental features specified in geological time. It is considered, in the most general sense, that in the east the climate was continental and more oceanic in the west.

The aim of this project is to supplement the existing palaeoenvironmental and paleoclimatic interpretations with geochemical data, in terms of major and trace elements. Four representative profiles will be analyzed, located on the east-west line, at considerable distances from each other (about 150-200 km). Only fully developed loess-paleosol sequences will be considered, consisting of five main stratigraphic units: two fossil soils, two loess units and a recent soil at the top. Three of them, i.e. Tyszowce, Złota and Biały Kościół, are available for direct research after refreshing, which does not require large financial outlays. Only within the Cracow loess area, between Kraków and Częstochowa, the research profile will be prepared from the beginning, which will require more advanced fieldwork.

Research conducted within this project will be based mainly on the analysis of the chemical composition of the major and trace elements. These analysis will be done in an external laboratory, due to their specialized nature it requires advanced testing equipment. The results of the chemical determinations will be supported by the analysis of the lithological features commonly studied in Poland (i.e granulometric composition, color and content of humus and carbonates), made in the laboratory of the Host Institution. At the stage of desk work, the results of laboratory tests will be analyzed, taking into account the macroscopic description of the variability of litho- and pedostratigraphic units made during the fieldwork.

The first part of the interpretation will be focused on the entirety of the processes that shape the loess-paleosol sequence, which can be expressed in the simplest way as an alternating intensification of material deposition and weathering/soil-forming transformations. At this stage, the variety of the chemical composition will be analyzed in all soil and loess units of the discussed profiles. This will allow us to verify stratigraphic subdivisions and to deduce about the variety of the Late Pleistocene climate. For this purpose, fossil soils are particularly useful, which on the basis of comparative analysis with contemporary soil often allow for the quantitative determination of selected palaeoclimatic and palaeoenvironmental parameters.

The second part of the interpretation will be based on the chemical composition of "fresh" loess, not significantly changed by weathering and soil-forming processes. This should allow us for a reliable inference about selected features of the source areas, omitting secondary processes modifying the original chemical composition. The selection of samples will be based on the data obtained in the previous step of interpretation (average proportion of mobile and non-mobile elements and the degree of chemical weathering) and the color of the material. Of course, it is not possible to select only chemically unchanged material, because even "fresh" loess are often weakly weathered after deposition and can be also partly constructed of older material from eroded loess covers. Nevertheless, a precise analysis of the variability of the chemical composition of the different loess units within one profile, and the same units between different profiles, should provide valuable information on the source areas of loess dust.

The subject is chosen for several reasons. Polish loess-paleosol sequences are still poorly recognized in terms of chemical composition, in relation to other world loess areas. This is proven by a small number of scientific publications, among others, dealing with this issue, furthermore not including the spatial differentiation. This project, based on high resolution analysis, will provide the first accurate data on the chemical composition of such a significant fragment of the European loess belt, obtained by means of a widely accepted and comparable analytical method.