

Multi-proxy investigations and advanced methods of determining numerical time scales in the reconstruction of the evolution of inland dunes in Poland during the end of the last glaciation

The European Sand Belt in Central Europe is a remarkably interesting remnant of the Late Glacial aeolian accumulation. Due to its geographical location, Poland is characterized by very extensive dune areas, which occur both in the form of large dune fields and individual dunes scattered throughout the country. Over the last several dozen years, a large volume of scientific and research works has been devoted to the stratigraphy of inland dunes. From the very beginning of the stratigraphic research, some researchers posed a purely hypothetical theory of the earlier formation of aeolian covers in the southern part of Poland (Older Dryas), and only later in the northern part (Younger Dryas). The assumptions of the hypothesis seem to be justified, since the width of the European Sand Belt in Poland exceeds 400 km in the north-south direction. Such a significant spread should allow the detection of the temporal and spatial gradient of the formation of the aeolian units. Silty and sandy material in ice-free area in the southern part of Poland was earlier released than in the glaciated, northern part. This theory could not, however, have been reliably confirmed in the past, as there were no suitable research methods to accurately determine the time of creation of the dune covers in a given area. These problems have not been addressed earlier due to some limitations in the research methods necessary to give a reliable answer. Luminescence methods were at that time not yet known, or if at a later time these methods required intensive development (they were burdened with many limitations).

In the current research literature dedicated to stratigraphy of inland dunes in Poland we did not find a single work aimed at a deeper study on luminescence and gamma spectrometry explaining some problems, which the current literature only rarely mentioned. Our earlier preliminary research on dune covers from the southern and northern part of the dune belt has shown that using standard techniques and procedures we are unable to obtain an appropriate chronology based on the radiocarbon and OSL methods for the period of the last glaciation. The main reason for this situation is the overestimation of the OSL results in relation to radiocarbon results, which perfectly positioned investigated sediments to the period of Bølling - Allerød. Such a situation is not isolated, and despite the fact that dune sediments are considered to be a perfect material for the OSL dating, we can notice similar discrepancies in literature.

As part of this project, we would like to use all current knowledge and the latest luminescence equipment to explain the differences and answer the question whether the observed age differences are caused by local conditions or whether they relate globally to the entire European Sand Belt located in Poland. Only in this way we will be able to reliably determine the spatial variability of the palaeoclimatic and environmental conditions in which the dune covers were formed in the northern and southern areas of the European Sand Belt with the best chronology possible to be found on the absolute time scale. Only obtaining a very accurate absolute time scale will allow us to provide a reliable answer in relation to the assumed research hypothesis.

Our advantage is a good field recognition of inland dune covers as well as the possibility of using new research methods and techniques of much greater precision in determining the age and conditions of formation of the examined objects.

The results of extensive, interdisciplinary field and laboratory tests (sedimentological, geochemical and isotopic research, age determination by means of the latest OSL techniques and parallel ^{14}C dating) will be the basis for achieving the objectives of our research and verification of research hypotheses. The participation in the project of renowned experts dealing with those problems in Europe will be a guarantee of conducting objective and comparable research and will contribute to the wide dissemination of the obtained results.