“COOL-DUNES - Factors controlling spatial pattern of periglacial dune fields in the central part of the European Sand Belt”

Dunes are present in almost all climatic zones, covering areas from equator to both poles. Occurrence of most of them is linked to hot climatic zones, but aridity needed for development of dunes can be found as well in cold areas, where dunes appear in several places on Iceland, Alaska and Antarctica. The scientific problem is, that due to limited extent of cold-dunes in present times we are not able to fully recognize processes leading to their development and evolution. However, such processes are known from extensively studied hot-climate dune fields, e.g. Sahara and Namib desert. Our idea is to use this knowledge to find differences between dunes currently existing in hot areas and cold-dunes from the past, trying to reconstruct factors affecting their development in cold areas. Currently dunes in cold regions are rare, but during Last Glacial Maximum (about 21 000 years ago), when global temperature was a few degrees lower, such dunes had been developing widely in Europe and North America. Now they are covered by dense forest, but still can be studied as environmental marker of last cold episodes in Europe.

Our project will be focused on detailed geomorphological study of ten fixed dune fields in Poland. We are going to study spatial distribution of dunes, which is strongly connected to local environmental properties. For example, high wetness should lead to development of parabolic dunes, while high sand supply will result in development of large transverse dunes. Study will be based mainly on GIS analyses, including measurements of all dune fields and selected dunes. Obtained results will be verified and supplemented using methods commonly used in studies of aeolian systems (ground-penetrating radar, granulometry, morphoscopy of grains). GPR will be used to identify internal structure of dunes, indicating simple or complex forms. GPR profiles will additionally allow us to compare orientation of dune shape (delivered from GIS analysis) to orientation of internal structures (stratifications). Granulometry will provide informations about grain-size distribution in individual dunes. Mean grain size, skewness and sorting of material will be used to define duration of aeolian transport and to identify possible alimentation areas. Last two issues will be additionally supported by morphoscopy of quartz grains, which will allow us to determinate eolization of transported sediment.

On the base of results obtained during realization of COOL-DUNES project we are expecting to recognize and quantify impact of permafrost, limited and periodical sand supply, niveo-aolian processes and vegetation on development and evolution of dune fields during last glaciation, referring results to present polar dune fields. This study will extend our knowledge about aeolian processes in polar regions, showing complexity of interactions between climate and surface of Earth in these areas.