

## **Geomorphic records and palaeogeographic implications of Late Weichselian glacial megafloods and surges at the southern sector of the Scandinavian ice sheet (MEASSIS)**

The principal aim of research project is to identify and analysis of landforms which unambiguously prove the existence of extreme glacial events – specifically, sudden discharges of large quantities of meltwaters and surges in the south-eastern periphery of the ice sheet during the last glaciation. It will investigate the morphological characteristics of the landforms which indicate such events having taken place, as well as the processes which formed such land relief features – processes which in the case of the Scandinavian ice sheet currently remain an enigma. In terms of the glacial landforms, the planned research objective is to reconstruct both the processes which shaped them, and the deposition of sediments under the ice sheet during surge phases (rapid advance of the ice sheet head) in which the ice sheet slid along the bedrock. Meanwhile, identifying the morphology, geological structure and origins of landforms created by catastrophic glacial floods in north-eastern Poland will help us understand the processes by which such floods transport and deposit sediments, and their energy and flow regimes, as well as their flow parameters (depth, speed, hydraulic gradient, etc.). Initial estimations of the scale of glacial megaflood waters in north-eastern Poland (1.5m–2.0m m<sup>3</sup>/s) have placed these floods among the five largest events of this type globally during the Quaternary. This, and the fact that landforms similar to these exist only in North America and Asia make the planned research significant on a global scale. Additionally, the existence of megascale glacial phenomena during the Weichselian glaciation also had a fundamental impact on the evolution of Europe's system of valleys – an impact which has never been fully understood. The research results will subsequently allow us to determine the possible influence of a sudden massive supply of meltwaters to the Atlantic ocean, which may have caused changes in the circulation of its waters and on the course of global climate changes.

A geomorphological and geological database will be created with information about the ice-sheet marginal zones in north-eastern Poland where there are landforms indicative of ice sheet surges and cataclysmic glacial megafloods. High-resolution analyses of the morphometry of these diagnostic landforms will also be performed using specialised software. The main stage of the project will consist of field analyses (geological, geomorphological and geophysical) to identify the geological structure of the landforms in question, as well as sampling of sediments for further laboratory analyses. These analyses will identify the structural and textural features of the sediments – and the processes – associated with extreme glacial events.

Planned research will allow us to detect previously unidentified processes related to extreme and catastrophic glacial events in the last European glaciation. The results will allow us to identify where and when these events occurred, and then correlate that information against changes in the extent of the last ice sheet. Dating these glacial megafloods (by OSL dating of floodwater sediments) will allow the main development stages of landforms in the European Lowland to be correlated against the phases of ice-sheet retreat at the regional level. These results will also let us identify the effects of the glacial megafloods' erosional and accumulative processes, and the scale and duration of their discharge in north-eastern Poland. They will also pinpoint the outlets from which the floods originated. The development of the database of field and laboratory research results will be of no small importance, and will be used in creating qualitative and semi-quantitative models using the modern computational methods. These models will show the relationships between the landforms (and their constituent deposits) and the geological processes brought on by the extreme glacial events. The results will make it possible to determine the impact that glacial megafloods had on the formation of Europe's valley system taking into account the influence of extreme glacial processes on global climate changes in the Late Weichselian during the last glaciation.