

Hydroacoustic exploration of submarine subglacial landforms: towards reconstruction of palaeo-ice streams in the Baltic Sea Basin (STREAMBAL)

Research in regions covered by continental ice sheets (Antarctica, Greenland) indicate that movement of ice and glacial debris significantly accelerate within so called “ice streams”. They are zones of confluence and rapid flow of ice masses, similarly to swift current within river channels, however in the case of ice flow the term “rapid” means hundreds of meters per year. Ice streams cause formation of extraordinary regular landforms, i.e. hummocks and hills highly elongated according to the direction of ice flow: drumlins, flutings, glacial lineations, or mega-grooves. This type of landforms occurring in the area of past glaciations are an excellent geomorphological indicator of palaeo-ice streams, which occurred within past ice sheets.

The main goal of this project is to reconstruct palaeo-ice streams which most likely occurred in central and southern Baltic Sea. Several thousand years ago, during the last glaciation, the Baltic Basin was filled with Scandinavian Ice Sheet, which was flowing from the Scandinavian Mountains southward across the basin and intensively shaped its bottom. One of the results of this activity are elongated glacial landforms, which are clearly visible within some areas of the Baltic Sea`s floor. The four-years project which we plan will concern detailed analysis of these landforms within selected research polygons and with application of the most up-to-date geophysical and geological methods. This research will be conducted using the research vessel *R/V Oceanograf* which is available at the University of Gdańsk and specialistic instruments dedicated to hydroacoustic measurements of the seafloor relief and structure, and coring seafloor sediments. We plan our investigations in the area of central and southern Baltic Sea Basin (the Baltic Proper), where submarine landforms indicative for fast ice flow and occurrence of palaeo-ice streams have not been studied so far. Motivation for this type of research were the following research questions:

1. What is the potential to extract subglacial bedforms generated by palaeo-ice streams from multibeam echosounder images using object-based image analysis (OBIA) supported by 2D spectral characteristics of high-resolution digital bathymetric models?
2. Does roughness and relief regularity of palaeo-ice stream beds quantified with 2D spectral methods differs from other areas of the seafloor surface and how does it change along the flowlines of the palaeo-ice streams?
3. Were subglacial streamlined bedforms of research polygons formed rapidly and synchronously or time-transgressively during ice margin retreat and what was the extent, directions and distributions of the reconstructed palaeo-ice streams?

Answers for above questions will contribute to broadening our knowledge about the last glaciation in the Baltic Sea region and also about possibilities of the modern methods of the seafloor detection and analysis in the context of palaeo-ice streams reconstruction.