

Laminated lake sediments as an indicator of recently induced anoxia in lakes of northern Poland

Research project objectives / Research hypothesis

The aim of this project is a verification of opposing hypotheses of climatic or local causes leading to the sedimentation of laminated sediments as a result of worsening oxygen conditions in lakes. We are going to analyse carefully selected lakes with topmost laminations in the sediment cores to identify climatic, catchment-related and limnological conditions responsible for a change in the sediment structure from homogenous to laminated. At the same time, processes and mechanisms leading to those changes will be defined as well as chronology and dynamics of observed changes will be determined.

With implementation of this project we address the following research questions:

- (1) Can the appearance of laminated sediments be associated with the changes in trophic state and worsening of oxygen conditions in the investigated lakes? What factors led to this?
- (2) What was the timing and dynamics of those changes? Should these processes be considered at decadal time scales or they could occur within several years or even one year?

Research project methodology

Three lakes were selected for detailed analysis (Dubie, Wąsoskie, Salno), from which recent sediment cores (1 m long) were collected. In each core, a distinct change in the sediment structure from homogenous to laminated was observed. With this material we plan multiproxy research including sediment dating, geochemical analyses, diatom analyses and Cladocera analyses. Sediment chronology will be established using varve chronology, Cs-137 and Pb-210 dating. Geochemical analyses will be used to determine major sediment components: total organic carbon, total inorganic carbon, total nitrogen, total sulphur and biogenic silica. Diatom and Cladocera analyses will allow determining changes in limnological conditions in lakes. Data obtained within each analyses will be confronted with already performed XRF (X-Ray Fluorescence) scanning, that was used to determine variability of major and trace elements in the sediments, and also with meteorological, cartographic and documentary data. Using statistical methods we will be able to find the correlations between sediment components and demonstrate different stages of changes in lacustrine environment.