VARVE STRUCTURE, CHRONOLOGY AND XRF SCANNING RESULTS OF THE SEDIMENT RECORD FROM LAKE ŻABIŃSKIE, NORTHEASTERN POLAND: INSIGHT INTO THE CLIMATE OF THE LAST MILLENNIUM

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The project CLIMPOL (Climate of northern Poland during the last 1000 years: Constraining the future with the past) aims at a quantitative reconstruction of climate change based on varved sediments from Lake Żabińskie in northeastern Poland. The lake is located in the Masurian Lakeland (54°07'54."N; 21°59'01.1"E) and presents features typical for kettle-hole lakes, i.e. small surface area (41.6 ha) and considerable depth (44.4 m). Measurements of physical and chemical properties of the lake water indicate a thermally stratified, hardwater and eutrophic lake with seasonal anoxia in the hypolimnion.

A set of undisturbed sediment cores was collected from the deepest part of the lake using a coring platform and UWITEC gravity and piston corers. Core sections were split, photographed and scanned with Itrax XRF Core Scanner at the University of Bremen. Based on macroscopic correlation of overlapping core sections, a composite sediment profile was constructed for the last 1000 years being represented in the uppermost ca. 4 m of the sediment record. The structure of lamination in Lake Żabińskie sediments can be defined as biogenic (calcite) varves produced by a seasonal biological and sedimentological succession with pale spring/summer layers composed of autochthonous carbonates (calcite) and dark fall/winter layers made of detritic components. This is confirmed by results of high-resolution XRF scanning which show excellent agreement of calcium peaks with the position of pale layers. Microscopic analyses of thin sections proved annual nature of laminations but also showed complex structure of varves, including multiple calcite laminae within one-year-deposition, which caused problems with defining varve boundaries in some sections. To verify reliability of the varve counting in recent sediments we used two well defined peaks in ^{137}Cs activity that are in perfect agreement with varve chronology. Calendar time scale for older sediments was validated by AMS ^{14}C dating of terrestrial macrofossils.

Varve thickness in the range of 2-18 mm allowed sub-sampling for biologic and biogeochemical multi-proxy analyses with annual resolution, which provided very detailed picture of the sediment composition changes over time and should improve substantially the quality of calibration of proxy data against instrumental records.