



Seasonal sub-layer variations of a varved record from the Czechowskie Lake, Poland

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Most evidences for Late Holocene climate changes in Poland are provided from historical data and model based reconstructions (Luterbacher et al. 2010). In order to determine inter-annual and decadal-scale variability of climate and environmental change on larger timescales we investigated a new varved lake sediment record from Lake Czechowskie, Northern Poland. Analytical procedures included micro-facies analyses together with X-ray fluorescence element scanning (μ -XRF) at sub-mm resolution and carbon and nitrogen analyses (TOC, TC, TN) at five year resolution.

The floating chronology comprises 1.500 varve years where abrupt changes in seasonal layer thickness indicate distinct short-term climatic and environmental variability. Detailed microscopic analyses show that biogenic calcite varves are formed by five different sub-layers. A thin layer of chrysophyte cysts deposited in early spring is followed by two calcite layers. A lower coarser-grained (10-20 μ m) and an upper fine-grained (2-5 μ m) layer. The calcite sub-layers are followed by a distinct diatom layer. The end of annual cycle is marked by a mixed sub-layer consisting of epiphytic diatoms and organic remains.

The diatom sub-layer is predominantly responsible for a threefold increase in total varve thickness (approx. 1.4 to 5.0 mm/year) during three distinct periods each with a length of 100 to 200 years. We assume that diatom layer thickness is controlled by lake productivity and thus can be applied as a proxy for water column mixing and nutrient supply.

The Lake Czechowskie sediment record and especially variations in diatom layer thickness indicate a high sensitivity of the lake towards changes in wind activity. The aim of the on-going investigations is to disentangle both natural and climate variations and human impact in the lake and its catchment. The Czechowskie varved sediment record extends back at least in to the early Holocene and this has the potential to extend historical climate and environmental records in Poland further back in time.

Luterbacher J, Xoplaki E, Küttel M, Zorita E, González-Rouco JF, Jones PD, Stössel M, Rutishauser T, Wanner H, Wibig J, Przybylak R (2010): Climate Change in Poland in the Past Centuries and its Relationship to European Climate: Evidence from Reconstructions and Coupled Climate Models.
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