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Monitoring climate signal transfer into the varved lake sediments of Lake Czechowskie, Poland

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In 2012 we started a monitoring program at Lake Czechowskie, Poland, because the lake comprises a long Holocene time series of calcite varves until recent times. The aim of the program is to understand how environmental and climatic conditions influence the hydrological conditions and, ultimately, the sediment deposition processes of the lake. Lake Czechowskie is located in the north of Poland in the Pomeranian Lake District and is part of the national park Tuchola Forest. The landscape and the lake is formed by the glacier retreat after the last glaciation (Weichselian). Lake Czechowskie is a typical hardwater lake and has a length of 1.4 km, an average width of 600 m and a lake surface area of ca 4 km. The maximum depth of 32 m is reached in a rather small hollow in the eastern part of the lake. Two different types of sediment traps provide sediment samples with monthly resolution from different water depths (12m, 26m). In addition, hydrological data including water temperature in different depths, water inflow, throughflow and outflow and the depth of visibility are measured. These data allow to describe strength and duration of lake mixing in spring and autumn and its influence on sedimentation. The sediment samples were analyzed with respect to their dry weight (used to calculate mean daily sediment flux), their inorganic and organic carbon contents, the stable C- and O-isotopes of organic matter and calcite as well as N-isotopes of organic matter. For selected samples dominant diatom taxa are determined. Our first results demonstrate the strong influence of the long winter with ice cover until April in 2013 on the sedimentation. A rapid warming in only 9 days starting on April 9th from -0,3 C° to 15,2 C° resulted in fast ice break-up and a short but intensive lake mixing. In consequence of this short mixing period a strong algal bloom especially of Fragilaria and Crysophycea commenced in April and had its maximum in May. This bloom further induced biogenic calcite precipitation in May leading to the monthly maximum in calcite deposition of 1.18 [g/m^{2}d] (66.31