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Linking varve-formation processes to climate and lake conditions at Tiefer See (NE Germany)

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Annually laminated (varved) lake sediments represent unique archives in continental areas providing both, precise chronologies and seasonally resolving proxy data. Monitoring of physical, chemical and biological processes influencing lake sediment formation are a suitable approach for detailed proxy understanding of varved sediment records. Lake Tiefer See (NE Germany) indicates deposition of varved sediments today as well as millennia ago (Dräger et al., 2016; Kienel et al., 2013). Therefore, the lake provides the possibility to trace current seasonal layer formation in the lake and to pair these data to climate and lake conditions (Kienel et al., 2016). Lake Tiefer See was formed during the last glaciation and is part of the Klocksin Lake Chain, a subglacial channel system that crosses the Pomeranian terminal moraine. The lake is a mesotrophic hard water lake with a maximum depth of 63 m and a surface area of 0.75 km^2.

During four consecutive years (2012-2015) the particulate matter deposition was trapped at bi-weekly to monthly resolution at three different water depths (5, 12 and 50 m). The sediment trap material was analysed for sediment flux and organic matter and calcite content. In addition, we monitored limnological parameters (e.g. temperature, pH, conductivity, oxygen content) as well as the meteorological conditions (e.g. temperature, wind speed and direction, precipitation) with a monitoring and climate station installed on the lake. These data describe strength and duration of lake mixing and lake stagnation phases.

Our results show distinct seasonal peaks in sediment formation, which correspond to the spring and summer productivity phases comprising of diatom blooms and calcite precipitation. This observation is in line with microfacies results from surface sediment cores. The content of biogenic calcite content decreases in the trapped material with increasing water depth indicating dissolution processes. However, the strength of calcite dissolution varies between seasons and years. We will discuss the depositional processes in relation to conditions in the water column and to meteorological data.

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