Differences in calcite varve formation discerned by a dual lake monitoring approach in the southern Baltic lowlands

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Varved lake sediments are valuable archives for reconstructing climate and environmental change in the human habitat at seasonal resolution. However, it is still not fully understood which factors control varve thickness and, consequently, varve proxy records are differently interpreted with respect to their climatic significance. Here we present, for the first time, a dual lake monitoring in two lakes forming calcite varves to provide new insights into the seasonal depositional processes forming these varves. The study lakes, Tiefer See (TSK) in NE Germany and Czechowskie (JC) in N Poland, are located a few hundred km away from each other in the southern Baltic lowlands. This is an ideal test region for this investigation because it holds the major known geographical cluster of calcite varve producing lakes. The lake basins are different in morphology and bathymetry and, therefore, are ideal to investigate common processes and local differences of seasonal deposition. The monitoring setup in both lakes is largely identical and included instrumental observation of (1) meteorological parameters, (2) chemical profiling of the lake water column including water sampling and analyses, and (3) sediment trapping at both bi-weekly and monthly intervals. Finally, we compared our six-year monitoring time series with varve micro-facies of sediments deposited during this time at the lake bottom. Based on this robust data-set, we present and discuss new findings with respect to the seasonal deposition of endogenic calcite varves, as well as their limnologic control factors.