



Constructing a precise and robust chronology for the varved sediment record of Lake Czechowskie (Poland)

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Annually laminated (varved) sediment records are essential for detailed investigations of past climate and environmental changes as they function as a natural memory far beyond instrumental datasets. However, reliable reconstructions of past changes need a robust chronology. In order to determine Holocene inter-annual and decadal-scale variability and to establish a precise time scale we investigated varved sediments of Lake Czechowskie (53°52' N/ 18°14' E, 108 m a.s.l.), northern Poland. During two coring campaigns in 2009 and 2012 we recovered several long and short cores with the longest core reaching 14.25 m.

Here we present a multiple dating approach for the Lake Czechowskie sediments. The chronology comprises varve counting for the Holocene time period and AMS 14C dating (19 plant macro remains and two bulk samples) for the entire sediment record reaching back to 14.0 cal ka BP. Varve counting between 14C dated samples and Bayesian age modeling helped to identify and omit samples either too old or too young caused by redeposition or too low C contents, respectively. The good agreement between varve chronology and modeled age based on radiocarbon dates proves the robust age control for the sediment profile. Additionally, independent chronological anchor points derived from (i) 137Cs activity concentration measurements for the last ca. 50 years and (ii) newly detected tephra layers of the Askja AD 1875 eruption and the Laacher See Tephra (12880 varve yrs BP) are used as precise dated isochrones. These volcanic ash layers can be further used as tie points to synchronize and correlate different lake records and to investigate local and regional differences to climatic and environmental changes over a wider geographic region on a common age scale.

This study is a contribution to the Virtual Institute of Integrated Climate and Landscape Evolution Analysis –ICLEA– of the Helmholtz Association and the Helmholtz Association climate initiative REKLIM topic 8 “Rapid climate change derived from proxy data“.