



## **Refining the time span between the early Holocene Askja-S and Hässeldalen tephtras through differential dating based on varve counting from Lake Czechowskie (N Poland)**

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Robust chronological framework is a crucial necessity for palaeoclimate reconstructions and especially for synchronizing records to decipher climatic teleconnections. Volcanic ash deposits (tephra) provide isochronous time marker that can be utilized as tie-lines to synchronize sedimentary archives. Advances in the detection and identification of non-visible (crypto-) tephra, often transported over thousands of kilometers, also allows identifying ash deposits even in distal records. We report the first findings of co-existing early Holocene Hässeldalen and Askja-S cryptotephtras in a varved sediment record in Lake Czechowskie (JC, northern Poland). Annual layer counting was used to establish a varve chronology and micro-facies analyses, relative calcium (Ca) and titanium (Ti) concentrations were used to decipher between lake productivity and detrital flux. Here we focus (i) on the determination of the time span between both tephtras, (ii) revised age estimates for the Askja-S tephtra and (iii) the sedimentological response of the JC record to the Preboreal Oscillation (PBO), a short lived cold episode during the early Holocene.

A differential dating approach revealed a time span of  $152 \pm 11/-8$  varve years counted in the JC sediment record between both tephtras. Since the varved interval of the JC sediment record comprising the tephtras is floating, we anchored the floating varve chronology to an absolute timescale by using the radiocarbon-dated Hässeldalen Tephtra ( $11,380 \pm 216$  cal a BP, Wohlfarth et al, 2006). The resulting age for the Askja-S of 11,454-11,002 cal a BP is, even considering the rather large uncertainties, a few decades to several hundred years older than most radiocarbon based age models, but it supports the original age model from Hässeldala port. The sediment response to the PBO cold period is seen only in a slight decrease in titanium, a proxy for detrital matter flux. Varve micro-facies did not change during this interval confirming a weak impact of the PBO on the sedimentation regime in Lake Czechowskie.

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Wohlfarth, B., Blaauw, M., Davies, S.M., Andersson, M., Wastegård, S., Hormes, A., Possnert, G., 2006. Constraining the age of Lateglacial and early Holocene pollen zones and tephra horizons in southern Sweden with Bayesian probability methods. *J. Quat. Sci.* 21, 321–334. doi:10.1002/jqs.996