



## **Analysis of the varved clay accumulation in the Pärnu Bay area, Estonia**

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Varved clays are commonly found glaciolacustrine sediments representing high-resolution environmental archives of the deglaciation events. We examine varve formation in the Baltic Ice Lake at the Pärnu Bay area, Estonia, during the deglaciation of the last Scandinavian glaciation from the region. The data set of Hang and Kohv (2013) spanning 584 years is used. Analysis of the spatial variation of the seasonal layer thickness distribution based on 26 sediment cores and sub-varve resolution grain size analysis from a single section was performed. The Baltic Ice Lake water level reconstruction indicates that the water depth at the study region was up to 80 m (Rosentau et al., 2009).

It is found that during the first ~130 years after the ice retreat the summer sedimentation was dominated by sediment loaded underflows emanating from the ice margin: summer layer thickness is strongly positively correlated with water depth. The winter layer thickness during this period does not demonstrate significant correlation with water depth suggesting that the simple raining-out of the suspended material from a water column was complicated by water circulation.

Ice retreat from the Pandivere-Neva line of the marginal formations just north from study area took place during the interval from 96 to 130 local varve years. During the transition marked shift from proglacial to distal sedimentary environment is observed: the summer layer thickness decreased dramatically and its thickness is markedly higher in the area close to the ice margin. The winter layer thickness becomes strongly correlated to the water depth, suggesting that the simple sedimentation model with no water circulation and addition of no new sediments is valid.

The grain size data is used to estimate the “terminal grain size” – the size of the largest particles sedimented at the top of the winter layer. Provided that no significant water circulation took place during the winter, the terminal grain size will be controlled solely by the basin depth and duration of the ice cover period. A normal grading is observed in most of the studied winter layers of individual varves. Relatively large errors in the estimated terminal grain size permits only to conclude that it is in line with previously reconstructed water depth constrained by the maximum possible duration of the lake ice cover.

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### References

- Hang, T., Kohv, M. 2013. Glacial varves at Pärnu, south-western Estonia: a local varve chronology and proglacial sedimentary environment. *GFF*, June, 37–41. doi:10.1080/11035897.2013.775598
- Rosentau, A., Vassiljev, J., Hang, T., Saarse, L., Kalm, V. 2009. Development of the Baltic Ice Lake in the eastern Baltic. *Quaternary International*, 206(1-2), 16–23. doi:10.1016/j.quaint.2008.10.005