

# Radiocarbon age of the Zero-Varve of the Swedish Time Scale

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Here we present radiocarbon ages of the drainage of a series of lakes in Jämtland that were dammed by the retreating Scandinavian Ice Sheet, one of which led to the deposition of the zero-varve of the Swedish Time Scale (cf. De Geer 1940).

The varve-based Swedish Time Scale is an unparalleled tool for documenting the retreat pattern of the Scandinavian Ice Sheet, along with associated palaeo-environmental changes, at an annual time scale. Its early construction was due to the enormous body of work by Gerard De Geer and collaborators and, while initially a relative chronology “floating” in absolute time, the time scale has since been linked to the present through Holocene and modern estuary varves. However, later works have revealed that ~900 varves are missing from the chronology, and it cannot be considered a true absolute time scale. To anchor his chronology, De Geer chose an exceptionally thick (~1 m) and coarse-grained “varve” in Dövikén, eastern Jämtland, as a marker bed and zero-point of his time scale. De Geer interpreted this “zero-varve” as resulting from catastrophic drainage of the Central Jämtland Ice Lake, following a partitioning of the ice sheet around Storsjön. However, this correspondence was only assumed and, at the time, no geomorphological features from such a large drainage event had been found.

We present a reconstruction of not one but a series of connected and evolving ice-dammed lakes in Central Jämtland, and find independent evidence for catastrophic lake drainage event(s), including that which corresponds to the deposition of De Geer’s zero-varve. Using the isolation basin-method, we have dated the lake drainage that deposited the zero-varve to  $10\,003 \pm 76$  cal. a BP. We hereby tie the varve-based Swedish Time Scale to the radiocarbon timescale with unprecedented precision, independent of intercontinental teleconnections, and show that  $765 \pm 76$  varves are missing in the part of the Swedish Time Scale younger than the zero-varve. We demonstrate that the zero-varve drainage, and other such lake drainage events, were rapid and the interpretation of the thick marker bed as a single varve is appropriate. Based on our new age, we discuss the implications for the timing of other deglacial events (e.g. final drainage of the Baltic Ice Lake) and palaeo-environmental shifts (e.g. Younger Dryas/Preboreal transition) previously observed in the Swedish varve chronology.

## References

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