

Progressive growth of the Scandinavian Ice Sheet across the south-western Baltic Sea Basin during Marine Isotope Stage 2

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To understand the dynamic of waxing and waning of the Scandinavian Ice Sheet (SIS) and its response to climate signals, an accurate age constraining of the different ice extents during Marine Isotope Stage 3 and 2 (MIS 3 and 2) is required. Age data for the south-western Baltic Sea area are available mainly for Denmark and Sweden [1], while for northern Germany, only sparse ages are published, and some of them are conflicting with each other, often linked to the use of different dating techniques [2]. Recently optically stimulated luminescence (OSL), infrared stimulated luminescence (IRSL) and terrestrial cosmogenic nuclide (TCN) dating methods create new opportunities to refine the chronology of progressive ice advance of the SIS during MIS 3 and 2.

We present new sedimentological and dating results from coastal cliff outcrops on the Jasmund peninsula (Rügen Island, south-western Baltic Sea, Germany). The investigated sites display up to 15m thick sequences of glacial tills with intercalated fluvial to glaciolacustrine sediments. Our study relies on an integrated approach of sedimentological investigations (lithofacies analysis, micromorphology and palaeontology) combined with the dating of sand-sized quartz grains by OSL.

Based on our results, we can summarise the palaeoenvironmental changes as follows: After a first advance and retreat of the SIS before 60 ka (MIS 4 or MIS 6?), a periglacial landscape under arctic to subarctic climate conditions with small lakes was formed. Between 47 and 42 ka, a braided river system supplied well-sorted sands and shaped a steppe-like landscape. A climate warming accompanied this phase with short warm summers and cool winters. Through a climate-cooling phase between 42 and 30 ka, a periglacial landscape with the resulting formation of permafrost and ice-wedges was characterized

by non-deposition or even erosional processes. During the transition of MIS 3 and 2, a terminoglacial lake was formed. This lake was increasingly influenced and supplied by the subsequent advance of the SIS. Arctic to subarctic climate conditions predominated. The ice-contact lake was glaciotectonically deformed and subsequently overridden by the progressively advancing SIS after 23 ka. The entirely distorted sequence is truncated by a glaciotectonic unconformity and the overlying uppermost till unit.

For the first time, we can benchmark the point in time when the SIS reached the onshore area in the south-west of the Baltic Sea. This age of 23 ka is consistent with the interpretation in Hughes et al. [1] for this area.

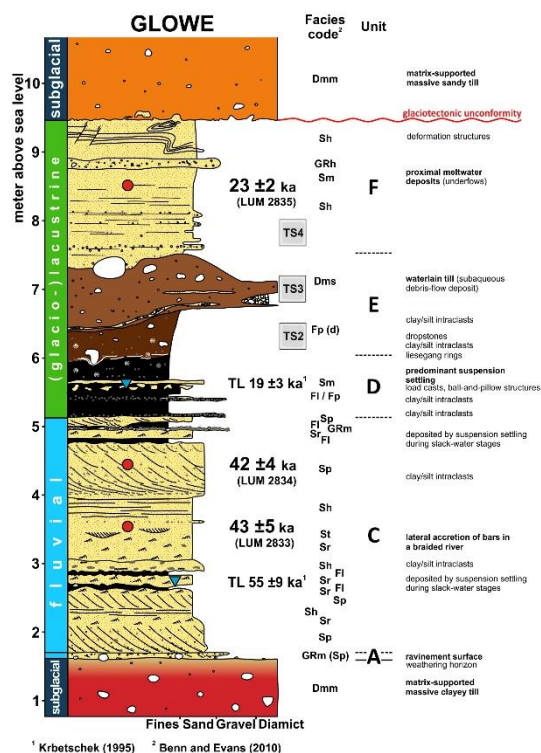


Figure 1: Stratigraphic log from Glowe site indicating lithofacies, depositional environments and OSL sample positions with ages (modified after Kenzler et al. [4]).

References:

- [1] Hughes et al. (2016) *Boreas* 45: 1-45
- [2] Lüthgens et al. (2011) *Boreas* 40: 598-615
- [3] Kenzler M (2015) *Quaternary Geochronology* 30: 251-256
- [4] Kenzler M et al. (submitted) *Boreas*

