

A synoptic palaeogeography of older Saalian ice-sheet extents and related proglacial lakes in northern central Europe: integrating ice-flow directions, till provenance and numerical ages

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We present a palaeogeographic reconstruction of ice-sheet advances and related proglacial lake systems for the older Saalian glaciation in northern central Europe. Data on palaeo-ice flow directions, till provenance, facies analysis, geomorphology and new luminescence ages of ice-marginal deposits are integrated into a synoptic model.

Three major ice advances with different ice-advance directions and source areas are indicated by palaeo-ice flow directions and till provenance. The first ice advance was characterised by southwards directed ice flow and a dominance of clasts derived from southern Sweden. Numerical ages for the first ice advance are sparse, but may indicate a correlation with MIS 8 or early MIS 6. The second ice advance was initially characterised by ice flow towards the southwest. Clasts are mainly derived from southern and central Sweden. New pIRIR290 luminescence ages of ice-marginal deposits attributed to the second ice advance range from 175 ± 10 to 156 ± 24 ka (Lang et al., 2018) and correlate with MIS 6. The latest ice advance in the study area was characterised by ice streaming (Hondsrug ice stream) in the west and a re-advance in the east. Clasts of this stage are mainly derived from eastern Fennoscandia.

The ice sheets repeatedly blocked the main river-drainage pathways and led to the formation of extensive ice-dammed lakes. Lake formation was mainly controlled by ice-damming of river valleys and major bedrock spillways; therefore, the lake levels and extends were very similar throughout the repeated ice advances. During deglaciation the lakes commonly increased in size and eventually drained successively towards the west and northwest into the Lower Rhine Embayment and the North Sea. Catastrophic lake-drainage events occurred when large overspill channels were suddenly opened. Ice-streaming at the end of the older Saalian glaciation was probably triggered by major lake-drainage events (Meinsen et al., 2011).

References:

Lang, J., Lauer, T., Winsemann, J., 2018. New age constraints for the Saalian glaciation in northern central Europe: implications for the extent of ice sheets and related proglacial lake systems. *Quaternary Science Reviews* 180, 240-259.

Meinsen, J., Winsemann, J., Weitkamp, A., Landmeyer, N., Lenz, A., Dölling, A., 2011. Middle Pleistocene (Saalian) lake outburst floods in the Münsterland Embayment (NW Germany): impacts and magnitudes. *Quaternary Science Reviews* 30, 2597-2625.