

Holocene glacier extent and ELA reconstructions of paleoglaciers in Sarek National Park, northern Sweden

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In this study recently published high resolution LiDAR data is used for the first time to reconstruct equilibrium line altitudes (ELAs) of Holocene paleoglaciers in Sarek National Park, northern Sweden. Trimlines, marginal meltwater channels, end moraines and lateral moraines were mapped to define past extent of the paleoglaciers. The glaciers are often fronted by several imbricated, closely spaced end moraines, most of which are thought to be formed during the Little Ice Age (LIA) but some moraines might be of early- and mid Holocene age (Karlén & Denton, 1976).

ELAs were calculated using the Accumulation Area Ratio (AAR), Area Altitude (AA) and the Area Altitude Balance Ratio (AABR) methods. Calculated ELAs for the paleo glaciers ranges between 1340-1460 m.a.s.l. when applying an AAR of 0.6, 1350-1490 m.a.s.l. with the AA-method and 1280-1490 m.a.s.l. for AABRs of 0.8-3.0. These paleo-ELAs are approximately 100-200 m lower than measured 21th century ELAs in the adjacent Kebnekaise area.

The results in this study identify periods when glacier extent cannot be explained by reconstructed summer temperatures alone and therefore indicate high winter precipitation at the time. These findings are potentially of major importance for paleoglaciological reconstructions in Sweden as summer balance have previously been assumed to be more important than winter balance on net mass balance of Swedish glaciers. Resulting in discrepancies between glacier reconstructions and the moraine-based glacier chronologies. The existing glacier chronologies in northern Sweden are, however, mainly based on highly extended lichen growth curves. The maps produced in this study are hence needed to pinpoint locations for future exposure dating as a revision of the glacier chronologies will enable correlations with possible climate forcings.

References:

Karlén, W., and Denton, G. H., 1976. Holocene glacial variations in Sarek National Park, northern Sweden. *Boreas*, 5(1), 25-56.