

Late Holocene Expansion of the Greenland Ice Sheet and Implications for Its Current Decay

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An understanding of the present-day widespread retreat of Greenland outlet glaciers requires that this recession be placed in a long-term context. Processes controlling the dynamic evolution of the ice sheet likely operate over several different time scales. Thus, finding a base line for temporal comparisons is problematic, but one possibility is the maximum extent in the Holocene.

Here, we present preliminary work indicating the most recent, and probable Holocene maximum, extent of an outlet glacier, the Vendue, in the Scoresby Sund region. We obtained sediment cores from glacially fed lakes that receive silt only when the glacier margin reaches a critical thickness. The lake sediments record only one major silt unit in the last 4700 years. This silt indicates that outlet-glacier expansion was underway by 500 yr BP. Subsequent retreat has not yet been sufficient to stop silt deposition at this site, implying that the outlet glacier has not yet thinned to the level occupied ~500 years ago. Other thinner, silt layers indicate the outlet glacier may have been at similar positions at 1330, 1700, 2300, and 3500 yr BP.

If the patterns recorded by the lake sediments near Vendue Glacier have a wider spatial representation, it implies that the ice sheet has been in similar positions over the last few millennium but that the largest expansion was in the last half millennium. The dynamic processes that are currently causing ice-sheet recession have reduced the ice sheet only a limited amount, compared to its late Holocene extent.