



Holocene glacier fluctuations in Iceland: tephrochronology, glacier response, and climatic forcing

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We present a well-dated Holocene glacier chronology for a key mid-oceanic, sub-polar location. We date forelands spanning the last 5,000 years at glaciers across Iceland using tephrochronology to present a more complete and extended picture of how glaciers have responded to Holocene climate variability. The pattern is consistent with a Neoglacial sequence of four “Little Ice Age”-type periods in which the preserved suite of landforms reflects (1) glacier type and their sensitivity to forcing (extremes being ice cap outlet lobes and cirque glaciers); (2) preservation potential, especially limited by meltwater and outburst floods at some sites; and (3) availability of dateable material. Thus, recovery of the regional climate signal from the landform record is conditioned by local factors. When these factors are considered, a coherent regional-scale chronology is apparent, which maps onto higher resolution climate proxies (temperature reconstructions, sea ice indices, NAO, Greenland ice cores). These demonstrate that “glacier-friendly” periods correspond to negative NAO excursions in recent centuries and to negative $\delta^{18}\text{O}$ anomalies in the GISP2 ice core. By inference, climates under which glaciers might have been smaller than at present have occurred within the last two millennia and before.