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Using ISSM to simulate the LIA to present ice margin change at Upernavik Glacier, Greenland

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The possibility for rapid melting of the Greenland ice sheet ranks among the most serious societal climate threats. To improve predictions it is useful to know more about past ice volume changes.
This project puts the rate of contemporary climate change-driven Greenland ice mass change in a temporal context, by simulating the Greenland ice sheet margin throughout the Holocene. The modelled results can be compared with historical ice positions and with records of past glacier activity (i.e. calving) based on studies of sediment cores from the fjord (Andresen et al. 2012). Another data source of ice margins derives from aerial photography and ice trimline positions (Kjær et al. 2012).
Here we present a simulation using the Ice Sheet System Model (ISSM) (Larour et. al 2012) of the Upernavik Isstrøm, a set of NW Greenland marine-terminating glaciers. The simulation runs from year 1840 in the Little Ice Age (LIA) to year 2012, forced by an updated surface mass balance reconstruction after Box (2013). The work establishes a base from which we can model the entire Greenland Ice Sheet. To resolve where model development is needed most, using observations that are iteratively excluded from the simulation, we evaluate the relative importance of each data set on the total uncertainty. We discuss the challenges associated with the general model boundary conditions such as the ice-ocean interaction representation in the model and lacking bathymetrical data. Finally, we address the need for further observations and the perspective of applying the model to other glaciers.

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