



Deglacial climate modulated by the storage and release of Arctic sea ice

Alan Condron (1), Anthony Joyce (2), and Raymond Bradley (2)

(1) Woods Hole Oceanographic Institution, Woods Hole, United States (acondron@whoi.edu), (2) Department of Geosciences, University of Massachusetts, Amherst, United States

Many of the diaries and journals kept by 19th and early 20th century Arctic explorers make reference to regions of exceptionally thick ice in the Arctic Ocean. We consider that these historical accounts provide a glimpse of what conditions may have been like during the much colder conditions, when vast areas of the Arctic Ocean were likely covered by even thicker and more persistent ice. Here, we use a climate model to show that during the Last Glacial Maximum, the Arctic ocean was permanently covered by sea ice tens-of-meters thick. The episodic break-up and mobilization of this ice during deglaciation would have released considerable volumes of freshwater directly to the Nordic Seas, where processes regulating large-scale climate occur. Massive sea ice export events to the North Atlantic are generated in our model whenever the transport of ice is enhanced, either by changes in atmospheric circulation, rising sea level submerging the Bering land bridge, or glacial outburst floods draining into the Arctic Ocean from the Mackenzie River. We find that the volumes of freshwater released to the Nordic Seas are similar to, or larger than, those estimated to have come from terrestrial outburst floods, including the discharge at the onset of the Younger Dryas. Our results provide evidence that the storage and release of Arctic sea ice played a role in driving deglacial climate change.