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Deglaciation of the Greenland and Laurentide ice sheets interrupted by glacier advance during abrupt coolings

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The early Holocene (11.7 ka to 8.2 ka) represents the most recent period when the Laurentide and Greenland ice sheets underwent large-scale recession. Moreover, this ice-sheet recession occurred under the backdrop of regional temperatures that were similar to or warmer than today, and comparable to those projected for the upcoming centuries. Reconstructing Laurentide and Greenland ice sheet behavior during the early Holocene, and elucidating the mechanisms dictating this behavior may serve as a partial analog for future Greenland ice-sheet change in a warming world. Here, we use 123 new ^{10}Be surface exposure ages from two sites on Baffin Island and southwestern Greenland that constrain the behavior of the Laurentide and Greenland ice sheets, and an independent alpine glacier during the early Holocene. On Baffin Island, sixty-one ^{10}Be ages reveal that advances and/or stillstands of the Laurentide Ice Sheet and an alpine glacier occurred in unison around 11.8 ka, 10.3 ka, and 9.2 ka. Sixty-two ^{10}Be ages from southwestern Greenland indicate that the GrIS margin experienced re-advances or stillstands around 11.6 ka, 10.4 ka, 9.1 ka, 8.1 ka, and 7.3 ka. Our results reveal that alpine glaciers and the Laurentide and Greenland ice sheets responded in unison to abrupt early Holocene climate perturbations in the Baffin Bay region. We suggest that during the warming climate of the early Holocene, freshening of the North Atlantic Ocean induced by a melting Laurentide Ice Sheet resulted in regional abrupt cooling and brief periods of ice-sheet stabilization superimposed on net glacier recession. These observations point to a negative feedback mechanism inherent to melting ice sheets in the Baffin Bay region that slows ice-sheet recession during intervals of otherwise rapid deglaciation.