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Simulations of deep-draft icebergs and freshwater surges formed during a Barents Ice Sheet collapse

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Observations of iceberg plowmarks on the Lomonosov Ridge imply that bergs with drafts exceeding 800 m existed in the central Arctic during MIS 6 (140 ka B.P). It has been suggested that these deep-draft icebergs originated from the collapse of an ice sheet over the Barents Sea. Similar erosion patterns observed on the Yermak Plateau imply that the icebergs exited the Arctic through the Fram Strait into the Nordic Seas, where the northern arm of the thermohaline circulation currently forms. A coupled ocean-climate-iceberg model has been used to investigate the climatic impact of large-scale freshwater surges and melting icebergs during a 500 year collapse of the Barents Ice Sheet, and to simulate the drift tracks of deep-draft icebergs formed during the event. Results show that the ice sheet collapse has a significant impact on ocean and climate in the N. Atlantic and Arctic regions when the freshwater forcing is larger than 0.1 Sv. The form of freshwater input from ice sheet collapse is shown to be important, with freshwater fluxes having more of an impact during the actual release period compared to icebergs, but the bergs induce effects over longer time scales. The model indicates that a proportion of deep-keeled icebergs were carried to the central Arctic and eventually traversed the Fram Strait, supporting observational findings reported elsewhere. Similar simulations conducted using MIS 2 (18 ka B.P) parameters indicate different iceberg drift tracks, with icebergs remaining closer to the European coastline.