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Contrasting trends in North Atlantic deep-water formation in the Labrador Sea and Nordic Seas during the Holocene

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The Holocene North Atlantic deep-water formation is studied in a 9,000-year long simulation with a coupled climate model of intermediate complexity, forced by changes in orbital forcing and atmospheric trace gas concentrations. During the experiment, deep-water formation in the Nordic Seas is reduced due to an enhanced influx of sea ice from the Central Arctic, decreasing both surface salinity and density, whereas deep-water formation in the Labrador Sea increases due to surface cooling. This leads to changes in the distribution of oceanic heat transported northwards by the Atlantic Ocean, with less heat released (-120 Wm^{-2}in February) in the Nordic Seas, amplifying the surface cooling and increasing the sea-ice cover. In the Labrador Sea, the oceanic heat release increases slightly (+14 Wm^{-2}), thus dampening locally the cooling trend. The overall Atlantic overturning strength remains constant throughout the experiment. Over the Nordic Seas, reduced evaporation contributes to the surface freshening.

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