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Decadal variability in a high-resolution model of the North Atlantic ocean

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The climate in the Atlantic region is essentially influenced by the Atlantic meridional overturning circulation (AMOC) which carries warm waters into northern latitudes and returns cold deep water southward across the equator. An important aspect in driving the AMOC is the deep-water mass formation at northern latitudes, but climate scenarios for the future indicate that deep-water formation rate in the North Atlantic could weaken during the 21st century due to global warming. Geological records already indicate that the ocean circulation had almost ceased several times in the geological past due to abrupt changes in the climate. We aim to determine the processes that are responsible for the fluctuations in the deep-water mass formation rates, on interannual to decadal timescales, by using a coupled finite-element sea-ice ocean model. This model has a special focus on the deep-water mass formation areas in the Atlantic (eg., Greenland Sea and Labrador Sea) as well as on areas in the Southern Ocean (eg., Weddell Sea and Ross Sea). Furthermore, we test the importance of the equatorial and coastal upwelling regions, which also play a major role in driving the large-scale ocean circulation.