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Impact of Greenland orography on the Atlantic Meridional Overturning Circulation

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We show that the absence of the Greenland Ice Sheet would have important consequences on the North Atlantic Ocean circulation, even without taking into account the effect of the freshwater input from ice melting. These effects are investigated in a 200-year long coupled ocean-atmosphere simulation with the high-resolution global climate model EC-Earth 3.0.1. Once a new equilibrium is established, cooling of Eurasia and of the North Atlantic and poleward shift of the subtropical jet are observed. These hemispheric changes are ascribed to a weakening of the Atlantic Meridional Overturning Circulation (AMOC) by about 20%. Such slowdown is associated to the freshening of the Arctic basin and to the related reduction in the freshwater export through the Fram Strait, as a result of the new wind pattern generated by the lower orography. This idealized experiment reveals the possibility of decreasing the AMOC by locally changing the surface winds.