

Response of the Atlantic Ocean Circulation to Greenland Ice Sheet Melting in a Global, Strongly-Eddying Ocean Model

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The sensitivity of the Atlantic Meridional Overturning Circulation (AMOC) to freshwater input from the Greenland Ice Sheet (GrIS) is considered one of the Achilles' heels in climate change. Considering the importance of the AMOC for the climate system, and the vulnerability of the GrIS to global warming, assessing this sensitivity is critical for climate change projections.

Here we present a unique set of numerical experiments to investigate the adjustment of the North Atlantic Ocean circulation to enhanced freshwater fluxes from Greenland. In particular we compare the response in a global, strongly-eddy ocean model and an ocean model typical of the current generation of climate models. We find that the short term response to freshwater input is stronger in the low-resolution model, due to an almost immediate and complete shut-down of deep convection in the Nordic and Labrador Seas. On decadal time scales, however, the AMOC in the strongly-eddy model is more sensitive than in the non-eddy model. This result suggests that the ocean circulation may be more sensitive to freshwater anomalies than previously thought.