Geophysical Research Abstracts
Vol. 20, EGU2018-9855, 2018
EGU General Assembly 2018

Impacts of Meltwater Distribution Along the Coast of the Greenland Ice Sheet

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The Greenland Ice Sheet stores the largest amount of freshwater in the Northern Hemisphere. Marine terminating glaciers are one of most influential components of the ice sheet for releasing freshwater into the ocean. How glacial meltwater is distributed when it is discharged into fjords along Greenland's coastline may play a role in the maintenance or eradication of these marine terminating glaciers, and may also determine the fate and impact of the freshwater downstream. We use a regional eddy-permitting coupled ocean-sea-ice general circulation model to determine the impacts of how exactly Greenland meltwater is delivered into the ocean. We set up a suite of experiments in a 1/4 degree Arctic and Northern Hemisphere Atlantic configuration of NEMO v3.6, forced with realistic estimates of Greenland's meltwater. We use these to explore the effect of a range of observationally-motivated vertical distributions of freshwater input to the ocean at the mouth of each fjord, along with the impact of a range of assumptions about iceberg melt. We examine how these different ways of injecting freshwater affect water mass properties and circulation around the coast of Greenland and the North Atlantic Subpolar Gyre. For example, we assess whether the details of the meltwater distribution are important for the renewal of warm water back onto the Greenland Shelf.