Modeling Effects of Greenland Ice Sheet Melting on AMOC Variability and Predictability

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The goals of this project are to quantify impacts of enhanced future melting of the Greenland Ice Sheet (GrIS) on Atlantic Meridional Overturning Circulation (AMOC) variability and predictability. The approach is to construct detailed projections of future GrIS meltwater fluxes and runoff, to incorporate those as an additional forcing in multiple state-of-the-science global climate models (GCMs) and to run those models for 100-300 years into the future.

2013-2014 activities:

- In close collaboration with researchers from Utrecht University (The Netherlands) a parametrization of future GrIS melt as a function of local temperature changes has been developed based on high-resolution regional climate modeling and observational data.
- Several Greenland Ice Sheet melt scenarios have been developed based on this parameterization. The scenarios consider high-end and intermediate greenhouse gas scenarios RCP4.5 and RCP8.5, CMIP5 multimodel-mean local temperature change projections, observed runoff and iceberg calving rates to correct for biases in the amount and seasonality of Greenland Ice Sheet runoff simulated by the individual GCMs, and feedbacks between enhanced GrIS melt and climate change by interactively calculating the amount of melt based on the simulated local temperature change using the developed parameterization.
- A range of GrIS melt scenarios has been distributed to the modeling centers around the world that are involved in the project.
- Currently researchers in five different countries are using seven to nine different GCMs to perform the different experiments.