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

**Pls:** A. Schmitzner¹, A. Hu², S. H. Mernhild³

**International Collaborators:** D. Bi⁴, S. Marsland⁵, K. Dommerget⁶, S. Phipps⁷, J. Li⁸, T. Zhou⁹, P. Lin⁹, R. Stouffer⁷, J. Yin⁹, L. Jackson⁹, M. Menary⁹, D. Swingedouw¹⁰, S. Drijfhout¹¹, A. Abe-Ouchi¹², M. Yoshimori¹², U. Mikolajewicz¹³, K. Taylor¹⁴, M. van den Broeke¹⁵, J. Lenaerts¹⁵

¹Oregon State University, Corvallis, OR
²National Center for Atmospheric Research, Boulder, CO
³Los Alamos National Laboratory, Los Alamos, NM
⁴Center for Scientific Studies, Santiago, Chile
⁵Commonwealth Scientific and Industrial Research Organization, Australia
⁶Laboratory of Numerical Modeling for Atmospheric Sciences & Geophysical Fluid Dynamics, Beijing, China
⁷NOAA Geophysical Fluid Dynamics Laboratory, Princeton, NJ
⁸University of Arizona, Tucson, AZ
⁹Hadley Center, Exeter, UK
¹⁰Institu Pierre Simon Laplace, France
¹¹Royal Netherlands Meteorological Institute, Netherlands
¹²University of Tokyo, Japan
¹³Max Planck Institute, Hamburg, Germany
¹⁴Lawrrence Livermore National Laboratory, Livermore, CA
¹⁵Utrecht University, Netherlands

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.