Modeling of Ocean Dynamics and Variability of Relevance to Greenland's Marine Terminating Glaciers

W. Maslowski, R. Osinski, J. Clement Kinney, Saffia Hossainzadeh, A.F. Roberts, S. Tulaczyk

Results from a hierarchy of numerical models based on the Regional Arctic System Model (RASM) are analyzed to evaluate their representation of potentially critical oceanic physical processes, circulation and variability, as well as air - sea ice - ocean interactions around the Greenland shelves and slopes. In particular, we examine multi-decadal output from RASM where the ocean and sea ice components are configured at 1/12-degree grid and the atmospheric model and river / Greenland runoff are replaced by prescribed forcing from the Coordinated Ocean-ice Reference Experiments version 2 (CORE2) reanalysis, for 1948 – present. Additionally, preliminary results from a similar model configuration, but with the ocean and sea ice models configured at 1/48-degree, are evaluated for improvements at eddy-resolving resolution. Finally, results from the fully-coupled RASM are included for comparison.

Goals of this study include better understanding of: (i) the role of eddies, coastal buoyancy currents and shelf-basin interactions, (ii) the importance of large scale circulation, its upstream forcing and seasonal to multi-decadal variability and (iii) the impact of limited spatial resolution in global models on the simulated oceanographic conditions and variability around Greenland, especially in the Labrador and Irminger seas. We argue that a better understanding and modeling of the regional ocean dynamics are needed to advance knowledge and improve simulation and prediction of ice-sheet/ocean interaction in the past, present and future arctic climate.