# Amundsen Sea simulation with optimized ocean, sea ice, and thermodynamic ice shelf model parameters

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The ice shelves and glaciers of the West Antarctic Ice Sheet (WAIS) are melting and thinning rapidly in the Amundsen Sea (AS) and Bellingshausen Sea (BS), with consequences for global sea level rise and ocean circulation. First, approximately 10% of the observed sea level rise has been attributed to the thinning of WAIS between 2005 and 2010. Second, the melting of ice shelves in the AS and BS will freshen the shelf water locally as well as downstream in the Ross Sea (RS), which may lead to a change in the characteristics of Antarctic Bottom Water formed in the RS and thus influence the global thermohaline circulation.

Agreement between model results and observations are crucial for understanding and projecting these impacts on the current and future climate. Thus, we aim to conduct model optimization for a regional Amundsen and Bellingshausen Seas configuration of the MITgcm. Currently, we have adjusted a small number of model parameters to better fit the available observations during the 2007-2010 period using trial-and-error adjustment and a Green’ s function approach. As a result of adjustments, our model shows significantly better match with observations than previous modeling studies, especially for Winter Water (WW). Since density of sea water depends largely on salinity at low temperature, this is important for assessing the impact of WW on Pine Island Glacier melt rate. We also conduct several sensitivity studies, showing the impact of surface heat loss on the thickness and properties of WW.

Our work is a first step toward improved representation of ice-shelf ocean interactions in the ECCO (Estimating the Circulation and Climate of the Ocean) global ocean retrospective analysis. In this presentation, we briefly explain our overall project and present some preliminary results pertaining to sensitivity simulations using high resolution (2 km) configuration and adjoint sensitivity simulations.

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