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The effects of tides on dense water formation in Arctic shelf seas

C. F. Postlethwaite, G. R. Tattersall, M. A. Morales Maqueda, J. Holt, and A. J. Willmott

Proudman Oceanographic Laboratory, Sea Level Group, Liverpool, United Kingdom (mamm@pol.ac.uk, 44 (0)151 7954918)

The Arctic shelf seas are key regions of dense water formation contributing to the global thermohaline circulation. Reports of decreased Arctic summer sea-ice extent highlight the importance of ensuring all relevant Arctic processes are sufficiently represented in climate prediction models. We investigate whether the interaction between tides and sea-ice significantly alters model results of dense water formation. Tidal currents can cause divergence of sea-ice, bringing about the opening of leads within the ice pack. Although these areas of open water are small and short lived, they can lead to large heat fluxes from the ocean to atmosphere and increased salt fluxes to the surface ocean as new ice forms. We present results from a dynamic/thermodynamic sea ice model coupled to a baroclinic coastal ocean model for the Barents and Kara Seas. Comparing results from the model run both with and without tidal forcing indicates differences in the ice distribution for the two scenarios. Results show that including tidal forcing in a coupled coastal ocean/ice model can increase the salt flux to the ocean by 25% and hence have a significant effect on dense water formation in the region.