Impact of shelf-basin interaction on deep convection in the Western Labrador Sea.

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Freshwater exiting the Arctic Ocean through the Canadian Arctic Archipelago (CAA) has been shown to affect meridional overturning circulation and thereby the global climate system. However, due to constraints of spatial resolution in most global ocean models neither the flow of low salinity water through the CAA to the Labrador Sea nor the eddy activity that may transport freshwater from the shelf to areas of open ocean convection can be directly simulated. To address these issues this study uses a high-resolution ice-ocean model of the pan-Arctic region with a realistic CAA and forced with realistic atmospheric data. This model resolves conditions in the Arctic Ocean upstream of the Labrador Sea and is coupled to a thermodynamic-dynamic sea ice model that responds to the atmospheric forcing. The major shelf-basin exchange of liquid freshwater occurs south of Hamilton Bank, while the largest ice flux occurs in the northwest of the basin. Freshwater flux anomalies entering the Labrador Sea through Davis Strait do not immediately affect deep convection. Instead, eddies acting on shorter time scales can move freshwater to locations of active convection and halt the process. Convection is modulated by the position of the ice edge, highlighting the critical need for a coupled ice-ocean model. Finally, the size of eddies and the short duration of events demonstrate the need for high resolution, both spatial and temporal.