Cascading off Davis Strait as seen from a NEMO simulation

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Cascading occurs when dense waters form and accumulate on the continental shelf, eventually sliding down the slope and reaching intermediate and deep layers of the ocean. It is an important process for ventilating the deep ocean and capturing carbon from the atmosphere. Although observed in several different locations, especially at high latitudes, cascading has never been reported for the western Greenland shelf. We use the results from a 2002-2014 NEMO ocean model simulation to show that cascading could happen sporadically at Davis Strait. Over the time span of the model run, cascading occurred during five winters with each event starting around February and persisting until the end of May. The occurrence of those events seems to be dependent on (1) the balance between sea ice formation and melting in the region; (2) the amount of freshwater coming from the Arctic through Fram Strait; (3) the presence of West Greenland Irminger Water on the shelf. The cascading water primarily flows into deep Baffin Bay, although not at a sufficient rate to be a primary source of Baffin Bay Deep Water. The simulation's temperature and salinity interannual variability in Davis Strait agrees reasonably with observations (CTD profiles and moorings) but overestimates the peak salinity and density and consequently the strength of the cascade process. Nonetheless, the model simulation indicates that this phenomenon has the potential to occur in this location.