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A MODELING STUDY OF THE SEASONAL CHANGES OF SEA ICE IN THE ROSS SEA

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A high-resolution (5 km), dynamic/thermodynamic sea ice-ocean model is implemented to simulate the seasonal sea ice cycle and analyze the influence of sea ice-related surface fluxes and vertical processes on the water column structure in the Ross Sea. Freezing initiates on the eastern shelf by late February and most of the model domain is sea ice-covered by early April. Melting begins by mid-November and the model domain is virtually sea ice-free by early January. Annual mean sea ice concentration and thickness distribution closely follow bathymetric features, especially on the western half of the domain, showing the influence of ocean surface flow on the sea ice cover. Ross Sea polynya area and coastal areas on the eastern shelf have lower sea ice concentrations than other areas throughout the sea ice cycle, mainly due to oceanic supply of heat to the surface layers. Sensible heat creates the polynya over the Pennell Bank by early December. Ross Sea polynya starts to open by early December and is maintained by a combined effect of sensible and latent heat fluxes. Terra Nova Bay polynya is strictly wind-driven and fails to open when not forced with westerly katabatic surges. Preliminary analysis indicates formation and modification of High Salinity Shelf Water (HSSW) driven by the ice shelf and polynya processes. Simulated onshore intrusion events of Circumpolar Deep Water (CDW) are in agreement with observations.