

**THE INFLUENCE OF SEA ICE COVER AND ICEBERGS ON CIRCULATION AND WATER MASS FORMATION IN A NUMERICAL CIRCULATION MODEL OF THE ROSS SEA, ANTARCTICA**

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Satellites show that there was substantial variability in the sea ice extent in the Ross Sea during 2001-2003. Much of this variability is thought to be due to several large icebergs (including C-19 and B-15) that calved off the Ross Ice Shelf and moved through the area. It would be difficult to accurately simulate the sea ice concentrations from 2001-2003 with just a dynamic sea ice model since much of the variability was due to the effects from the floating icebergs. Here, a model is used where the sea ice and icebergs are imposed as boundary conditions. The circulation and water mass distributions are investigated with a high resolution (5 km) three-dimensional general circulation numerical model, which includes the cavity underneath the Ross Ice Shelf. After a several year spin up period, the circulation model is forced with daily winds for the period Sep. 2001 – Sep. 2003, as well as heat and salt fluxes calculated from atmospheric data by bulk formulae. Instead of a dynamic sea ice model, sea ice concentration is specified from satellite observations which then modify heat and salt fluxes through the melting and freezing cycle. To examine the effects of the extra sea ice during austral summer 2002-2003 (though to be due to C-19), simulations were performed using either the climatological ice concentrations or the observed ice for 9/01 – 9/03. Another simulation was performed where a fixed iceberg (representing B-15A which was nearly stationary during this period) was placed in the model. The annual basal melt rate beneath the Ross Ice Shelf in the simulation with the climatological ice cover (12 cm/yr) is within the range of estimates (12 - 22 cm/yr) from observations. The simulation with the observed sea ice reduces the annual mean melting by about 1 cm/yr. The simulation with the observed sea ice creates more High Salinity Shelf Water on the continental shelf than the climatological sea ice case. There is reduced advection of warm surface water during austral summer from the Ross Sea polynya into McMurdo Sound in the B-15A simulation, but this effect is small in the austral summer of 2002-2003 since the surface water in the polynya was much cooler than typical because of the extra sea ice due to C-19.