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SEA-ICE THICKNESS FOR THE SOUTHERN OCEAN DERIVED FROM ICE CHARTS

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We evaluated the weekly NIC (National Ice Center) ice chart dataset with in situ sea-ice thickness observations from the ASPeCt (Antarctic Sea Ice Processes and Climate) program during the 1995 to 2000 time period. Five ship voyages from May/June 1995, August 1995, May/June 1998, December 1998/January 1999, and December 1999/January 2000 were compared with weekly ice charts. Sea-ice thickness calculations from both datasets are temporally joined with spatially averaged in situ observations matching their respective NIC ice chart using a Geographic Information System (GIS). The uncertainties of total ice thickness for both in situ observations and NIC ice charts are obtained through individual calculations and the GIS processing. Overall, the NIC ice chart thickness estimates correlate reasonably well with *in* situ observations. However, since discrepancies do exist, a temporal comparison of the NIC ice chart data along an individual ship track reveals insight into their differences, such as operational biases, thin ice not seen by satellites, and snow and ridge contributions to mass balance.

Using the NIC charts, the sea-ice extent, seasonal and interannual thickness distribution and the mass balance are derived for the Ross Sea. Analysis of the NIC sea-ice extent, for example, in June 1995 and 1998 reveals differences in spatial extent with an increase northward towards the maximum extent in September. The interannual and spatial variability is evident between years, with thinner sea-ice conditions in June 1998 as compared to June 1995, primarily because first-year thick and multi-year sea ice show a larger extent in June 1995 as compared to June 1998. Regional monthly thickness distributions are calculated. In 1998, during the annual cycle, the growth and melt seasons are resolved in percentages of open water and thin and thicker ice types. In the decay season, the sea-ice pack is largely distributed between open water and the thickest ice that has survived the melt season (1st year medium/thick and multi-year ice), while in July through September the pack is distributed into the thinner ice categories as the growth season is reaching its maximum in September. Using these analyses, we found that comparisons of sea ice extent and mass balance were not linearly correlated due to differences in the thickness distributions. A summer (December) comparison showed for example less mass with more areal extent because of thinner ice composition of the year with greater extent. We conclude that both ice extent and ice thickness information will be necessary to compute accurately the oceanic and atmospheric fluxes associated with sea ice growth and decay.