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THE SEA ICE THICKNESS DISTRIBUTION IN THE WESTERN WEDDELL SEA

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Sea ice thickness is an important parameter in the air-ice-ocean system, and an indicator of climate change. However, ice thicknesses in the Southern Ocean and their spatial and temporal variability are largely unknown. Extensive helicopter-borne electromagnetic measurements of total (ice plus snow) thickness have been performed in November and December 2004 in the western Weddell Sea during the international research cruise ISPOL of German icebreaker RV Polarstern. These were supplemented by ground-based ruler-stick snow thickness sounding. In addition, the study region has been mapped by means of satellite radar data. At a latitude of 67°S, a large regional variability has been observed. Along the Antarctic Peninsula, modal thicknesses of the heavily deformed ice ranged between 3.0 and 5.0 m. East of 57°W, a narrow band of first-year ice had modal thicknesses of 2.0 m, including 0.3 m of snow. The radar images indicate that the ice had formed in the Ronne Polynya since March 2004. East of 55°W, the region was mainly covered by thick second-year ice, with modal thicknesses around 3.0 m. This was composed of 1.6 to 2.0 m of ice and 0.6 to 1.0 mm of snow. Our results provide important and unique information on the spatial variability of sea ice thickness in the region, and can optimally be used to validate ice and snow thickness retrievals from other sensors like satellite laser altimeters and radiometers. Together with the radar imagery, different ice types can be well classified. The observed first-year ice thickness provides a rough estimate for ice production in the Ronne Polynya. The data will be used as a comparison for earlier and future thickness measurements in the region to observe longer term thickness changes.