



Diurnal, seasonal, and interannual variability of the surface scattering layer in Drake Passage

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Mean volume backscatter (MVBS) estimated from 106 shipboard ADCP surveys made over a 5-year period is used to examine variability in the scattering layer in the upper 150 m of Drake Passage. MVBS at 150 kHz is highly correlated to biomass. It is used here as a means to remotely sense the characteristics of the scattering layer, which in Drake Passage is dominated by Antarctic krill. The surveys were made by the ARSV Laurence M. Gould, which crosses Drake Passage 2-4 times per month as the principal supply vessel for Palmer Station, Antarctica. Because the ADCP transducer is uncalibrated, the MVBS is relative to an unknown constant. However, since all cruises used the same transducer, operating under uniform conditions, the relative changes in backscatter over time and space are well-resolved even if the absolute level cannot be determined. Ocean currents are measured simultaneously.

Diel vertical migration in the upper 150 m was the dominant variability observed in any single transect. To minimize bias, calculations were made using daytime data, and MVBS was averaged over the upper 150 m. There was a well defined annual cycle, with depth-averaged MVBS increasing by a factor of four from a late winter minimum to a spring-summer maximum over a period of four months, followed by a more gentle decline during late spring and summer. In addition, there were significant differences in scattering levels north and south of the Polar Front. The average summer maximum MVBS level north of the Polar Front was more than twice the maximum level south of the Polar Front, but the winter minima were about the same. Interannual variability was also observed, with a trend toward lower MVBS, especially south of the Polar Front. Over the four full years sampled (2000-2003), mean MVBS in the upper 150 m was significantly lower in 2003, by about a factor of two south of the Polar Front.