



A Timeseries of Surface Geostrophic Currents across the Antarctic Circumpolar Current in Drake Passage

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Since 1992 the UK has regularly occupied WOCE hydrographic section SR1b across the Antarctic Circumpolar Current in Drake Passage. Here we combine seven hydrographic sections, current measurements and satellite altimeter velocity anomalies to determine a timeseries of surface geostrophic currents from 1992 to 2004. By connecting the in situ measurements in time using the satellite altimeter we are able to estimate the bias in the average surface current due to bias in the direct current measurements. The average area weighted surface geostrophic current through Drake Passage from 1992 to 2004 is 16.7 ± 0.2 cm/s with a standard deviation of 0.69 cm/s. Between 1995 and 2004 the average surface current increased by 1.6 cm/s (equivalent to a SSH change of 14.5 cm). Surface currents can be scaled to estimate barotropic transport variability and the corresponding transport increase is 40 Sv. As there is no evidence of such changes in the baroclinic transport, then it is plausible that this increase in transport is barotropic. We compare an index of surface currents to the Southern Annular Mode index. These timeseries have a significant but low cross-correlation of $R^2=0.05$ at zero lag. Spectra of the two timeseries are flat with no dominant frequencies and the cospectra are coherent and in phase for periods longer than one year, at five months and for periods shorter than three months. The low cross correlation and absence of a dominant frequency response suggest that it is unlikely that the Southern Annular Mode can be used to estimate transport variability of the Antarctic Circumpolar Current.