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Variability of volume transport of the Antarctic Slope Current in the Southeast Weddell Sea

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A moored array of current meters, conductivity/temperature sensors and upward-looking acoustic Doppler current profilers was deployed across the Antarctic continental shelf and slope in the southeast Weddell Sea from February 2009 until March 2010 as part of the international SASSI project. The array allows the first direct measurement of the seasonal variability of the volume transport associated with the Antarctic Slope Current in a key region for preconditioning the water for dense water formation on the continental shelf around the Filchner-Ronne Ice Shelf.

The annual mean transport measured by the array is $\sim$7 Sv. We discuss the dominant timescales for variability in the transport time series from tidal to annual. There is a pronounced seasonal cycle with a maximum transport of $\sim$15 Sv in May - June. The maximum is consistent with an April 1995 snapshot value of volume transport of $\sim$14 Sv at the same location, and the seasonality agrees with the seasonal cycle in moored velocities further east on the continental slope at the Greenwich Meridian observed by Nunez-Riboni and Fahrbach. The local wind is indeed strongest in May, but the transport starts to increase long before the wind does, and there is no strong correlation. We discuss mechanisms for the seasonal cycle in volume transport including the influence of the large-scale wind stress curl across the Weddell Gyre. Points of interest include changes in the isopycnal slopes across the moored array, movement of the front onshore/offshore and narrowing/broadening of the frontal jet. Finally we discuss the variability of temperature and freshwater anomaly fluxes deduced from the temperature, salinity and velocity fields from the moored array and the implications for the water mass transformation region downstream.