

The Weddell Sea is one of the few places in the World Ocean where deep and bottom water masses are formed to participate in the global thermohaline circulation. The characteristics of exported water masses are the result of complex interactions between surface forcing, represented mainly by the wind stress and, to some extent, by buoyancy. These forces happen to be significantly modified by sea ice processes, ocean dynamics at the continental shelf break, as well as by slope and sub-ice shelf water mass transformations. Recent studies have suggested that the variability in Antarctic Bottom Water (AABW) properties within the Scotia Sea, on time scales up to decadal, may be linked to changes in the baroclinicity of the Weddell gyre. This is the reason why the necessity to quantify the interannual and intrannual correlation between the AABW export rate and the wind stress curl over the area of the Weddell Gyre has become a priority in order to better understand the existing teleconnections between the Weddell Sea and the global ocean. For this purpose, the outputs of the most up-to-date Southern Ocean State Estimate model have been analysed in this work. Through the use of a meridionally integrated stream function, the volume transports of the whole gyre's depth and of AABW have been computed and compared with the intensities and trends of the wind stress and sea ice cover. Validation of the model results against in situ data was based on two German sections of hydrographic measurements and, considering the scarce amount of observations available in the study area, indicated an overall satisfying performance of the state estimate in describing the gyre system. The results obtained in terms of transports and wind stress are consistent with previous studies and with the notion of the AABW export from the Weddell Sea being controlled by the gyre's baroclinic adjustment to wind forcing on time scales of several months. These actually confirm how the wind stress variability over the Weddell gyre leads changes in AABW properties by approximately a lag of few months, even though no significant correlation was observed between the two parameters. In fact, wind stress results were mostly characterised by a semi-annual cycle, while a seasonal one prevailed in the zonal transport time series, which seemed to strongly project onto the pattern of sea ice concentration. Nevertheless, these preliminary findings suggest that wind forcing, sea ice cover and, possibly, buoyancy, can be considered the key factors in driving the Weddell gyre's variability and that further investigation should focus on the complex interactions between them, rather than exclusively on one of these drivers, as their synergy could be ultimately constitute the responsible of the variations of AABW export rate throughout the global ocean.