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# WEDDELL SEA DEEP WATER MASSES IN THE SIMPLE OCEAN DATA ASSIMILATION REANALYSIS OF OCEAN CLIMATE VARIABILITY (SODA)

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The Southern Ocean is one of the most important regions of the world for the understanding of climate changes and variability because of the combined interaction between ocean, atmosphere and sea ice. However, the sub sampling of this remote area makes it difficult to understand the coupled nature of those processes. Furthermore, due to the lack of observations in the area, many aspects of its circulation remain unknown. The SODA (Carton & Giese, 2005) product is a viable alternative to understanding the behaviour of the southern oceans. It represents a considerable improvement when compared to the existing hydrographic observations or even available numerical simulations in the analysis and diagnostic of ocean processes, in particular those related to water mass changes and variability. Water masses are excellent indicators of climatic conditions alterations and very often ill represented in numerical models. Our results show how well the Weddell Sea dense waters are captured with SODA when compared to the WOCE data. SODA product has significant advantages comparing with WOCE hydrographic data. SODA has a 3-D representation of the oceanic process and the spatial and temporal cover is more adequate than WOCE pattern. Another advantage is the elimination of the seasonal bias in the SODA product. Optimum Multiparameter water mass analysis (OMP; Tomczak & Large, 1989) was used to quantify the main deep water masses along three longitudinal sections (20, 30, 40$^{o}$W) extracted by SODA output in the Weddell Sea – Antarctica, and compared to the WOCE data. Three water masses were separated to run OMP (i.e. WDW – Warm Deep Water, WSDW – Weddell Sea Deep Water and WSBW – Weddell Sea Bottom Water). This number was limited by the number of input parameters available to perform the OMP. The salinity distribution profile showed some differences between the WOCE observations and the output by SODA particularly at deep levels. The source water types for deep waters are obtained with respect to the SODA output. The results show similar water masses distribution with that obtained by WOCE hydrographic data in another sections inside the Weddell Sea. The observed distribution showed WDW down to approximately 1500m inside the Weddell basin. The source water type definition to WDW also marked the Circumpolar Deep Water (CDW) in the Scotia Sea and Weddell-Scotia confluence (i.e. the region driven by Antarctic Circumpolar Current (ACC)). CDW is the source water mass for WDW, and is warmer and saltier than WDW. In the Scotia Sea, the CDW distribution occupies the same level as the WDW; however this layer was deeper in the region of the ocean ridges system influenced by the ACC. A displacement of the CDW core in direction of the Weddell Sea was observed which is consistent with the temperature profile. The most important result considering the WSDW is its outflow through the gaps along the ocean ridges system in the northern part of Weddell Sea. When this water leaves the Weddell Sea it interacts and mixes with other water masses to form the Antarctic Bottom Water. The WSBW remains topographically confined inside the Weddell basin due to its density characteristics.