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The Vertical Structure of the water masses at the Western South Atlantic Based on Two Different Resolutions of the Ocean Circulation and Climate Advanced Modelling Project (OCCAM)

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The thermohaline structure at the western South Atlantic is classified by: the Tropical Water (TW), the warm high-salinity surface water in the upper 200 m; the South Atlantic Central Water (SACW), that appears between 200 and 600 m; the Antarctic Intermediate Water (AAIW) flowing northward and the North Atlantic Deep Water (NADW) flowing southward beneath the AAIW. The western boundary current of the South Atlantic flows south along the eastern continental margin of the South America, and its origin is when the South Equatorial Current (SEC) reaches the coast. The SEC bifurcation occurs at the surface and sub-surface levels with a latitudinal dependence. Here we present two runs of the OCCAM model, one with a horizontal resolution of 1/4° and the other one with 1/12°, but both with 66 vertical levels. The two different OCCAM runs were used for characterize the vertical structure of the water masses at the western South Atlantic and to describe the high and course resolution effect in the circulation source features by calculating the volume transport on isopycnal levels. The horizontal map of volume transport calculated between surface and 25.7 kg.m-3 , where TW occupies the density range, shows the SEC bifurcation in OCCAM 1/4° near 14°S and at 13°S in OCCAM 1/12° resolution. The Brazil Current (BC), southward limb of the SEC bifurcation, over 30°S transports from 2-2.5 Sv in both OCCAM resolution for these layers. However, the main characteristic for the high resolution run is the BC recirculation cell signature at 23°S and 38°W. Below TW, the northward flowing carries part of the SACW with the density range of 25.7 kg.m-3 and 26.8 kg.m-3 . It occurs due to the shift of the SEC bifurcation with depth, which for this level the 1/12° resolution run presents the latitude of bifurcation around 22°S, in contrast with 1/4° the SEC reaches the coast at 26°S. The Intermediate Western Boundary Current (IWBC), here represented by 26.8 kg.m-3 and 27.53 kg.m-3 layers, is associated with AAIW northward flow. The transport map for AAIW shows the SEC bifurcation at sub-surface around 30°S for both OCCAM resolution. The NADW map transport shows a continuous flow southward, at the Brazilian continental margin as Deep Western Boundary Current (DWBC). From 27.53 kg.m-3 to the bottom, the calculated NADW transport for the WOCE section at 19°S (A9) found here is 17 Sv and 13 Sv for OCCAM 1/14° and 1/12°, respectively. Examining these results is an important process to provide confidence in the water masses vertical structure and the Western Boundary Current System in the South Atlantic represented by the two model runs, one with high and other with course resolution, even in the case of OCCAM 1/4°, which has a lower horizontal resolution, the water masses signature and the circulation source features are well represented with the 66 vertical levels.