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Interocean exchanges and spreading of the Antarctic Intermediate Water south of Africa

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Argo hydrographic profiles from different projects collected between 2004-2008 in the South Atlantic south of Africa in combination with hydrographic transects are used to describe the characteristic and the flow of the Antarctic Intermediate Water (AAIW). The study area was divided in 9 subregions on the base of the front patterns that have shown to be relevant to the AAIW dynamics, the Subtropical Front (STF) and the Subantarctic Front (SAF). The fronts mean position have been computed from Argo floats as function of the calculated surface dynamic height. We present here estimates of the relative importance of the different regional varieties of AAIW (south-west Atlantic, characterized by S$\leq$34.2, Indian, with S$\geq$34.3, and a new intermediate water found north of the SSTF between 10°W and 12°E and south of the SSTF between 12°E and 40°E with 34.2<S<34.3) and their origins. The collected Argo salinity profiles show a zonal distribution of the salinity minimum values computed within AAIW in the isoneutral surfaces (γn = 27.3) on a grid 1°$\times$1°. The zonal AAIW matches fairly well the Southern Ocean fronts location. The Indian and Atlantic varieties of AAIW are separated by the SSTF in the west domain; the area north to the SSTF is largely dominated by AAIW of Indian origin with volume values, west to 23°E, of about 5,14*10$\hat{2}$ m$\hat{3}$/m$\hat{2}$. Two eddies, one anticyclonic and the other cyclonic intercepted in the Subantarctic zone south of Africa were described on the base of the signature of the AAIW. By making use of recently developed ANDRO velocity dataset (Ollitrault and Rannou, 2011) we estimates for the regional AAIW absolute geostrophic velocity and transport within the isoneutral layer. The AAIW moves with speeds between 0.1 - 0.3 m/s in the Agulhas Current and 0.1 - 0.23 m/s in the Agulhas Return Current. AAIW flows in the subtropical region have approximately 0.03 m/s speed. A net increase of the eastward transport is evident from 40°S to 60°S, in particular at the SSTF and SAF location. The AAIW cross frontal transport shows an evident variability between the three front lines, with a maximum northward transport of 15 about Sv across the SAF between 12°E and 23°E.