

# South Atlantic Meridional Fluxes

by

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<sup>15</sup> Silvia L. Garzoli Order of Authors: Silvia L. Garzoli; Molly O Baringer, PhD; Shenfu Dong, PhD; Renellys C Perez, PhD; Qi Yao, MD Abstract: The properties of the meridional overturning circulation (MOC) and associated meridional heat transport (MHT) and salt fluxes are analyzed in the South Atlantic. The oceanographic data used for the study consist on Expendable bathythermograph (XBT) data collected along 27 sections at nominally 35°S for the period of time 2002 to 2011 and Argo profiles data collected in the region. Previous estimates obtained with a shorter record are improved and extended, using new oceanographic sections and wind fields. Different wind products are analyzed to determine the uncertainty in the Ekman component of the MHT due to the use of different products. Results of the analysis provide a nine-year time series of MHT, and volume transport of the upper layer of the MOC. Salinity fluxes at 35°S are estimated using a parameter introduced by numerical studies, the Mov that represents the salinity flux and helps determine the basin scale salt feedback associated with the MOC. Volume transports by the boundary currents are estimated, and their relations to the heat transport carried within each current are analyzed. Analysis of the data shows that the South Atlantic is responsible for a northward MHT with a mean value of  $0.54 \pm 0.14$  PW. The MHT exhibits no significant trend from 2002 to 2011. The MOC varies from 14.4 to 22.7 Sv with a mean value of  $18.1 \pm 2.3$  Sv and the maximum overturning transport is found at a mean depth of 1250 m, which is deeper than that in the North Atlantic. Statistical analysis suggests that an increase of 1 Sv in the MOC leads to an increase of the MHT of  $0.04 \pm 0.02$  PW. Contrary to model results that yields positive values for the Mov, the analysis conducted in this paper indicates that the MOC has a net transport of salt to the northern hemisphere (mean Mov of  $-0.16$  Sv). Observations indicate that the mean value of the Brazil Current is  $-8.6 \pm 4.1$  Sv at 24°S and  $-19.4 \pm 4.4$  Sv at 35°S, increasing towards the south. East of 3°E, the northward flowing Benguela Current and Agulhas rings have a net northward transport of  $22.5 \text{ Sv} \pm 4.7 \text{ Sv}$ . Products from the Ocean general circulation model For the Earth Simulator (OFES) are used to validate methodology used to extend the XBT record, and to aid in the interpretation of the observed findings.