Southwest Atlantic MOC Project (SAM)

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The Southwest Atlantic MOC ("SAM") project is designed to measure both the warm-upper and cold-deeper flows associated with the Meridional Overturning Circulation (MOC) with an array of four pressure-equipped inverted echo sounder (PIES) moorings deployed near the western boundary at 34.5°S in the Atlantic. The SAM program began in March 2009 and it is designed to be a first building block, coupled with Brazilian, French, South African, and Argentine efforts, towards a future complete trans-basin MOC observing array in the South Atlantic. The SAM array also augments an existing NOAA long-term program that estimates meridional volume and temperature transports using quarterly trans-basin high-density expendable bathythermograph sections along nominally 35°S. The SAM data is also useful to the researchers involved in the international Shelf-Deep Ocean Interaction program (funded by the Inter-American Institute For Global Change Research), wherein scientists periodically conduct CTD/O2 sections from the coast to the location of the near shore instruments and along the PIES array during joint cruises. The NOAA SAM array has now collected more than four years of PIES data, and the array has been completely recovered and redeployed (in December 2012) with batteries that will last through 2016. In December 2012, our Brazilian partners essentially doubled the number of moored instruments with new deployments, and our French partners then doubled the number of moored instruments again when they deployed a comparable moored array on the eastern boundary in September 2013. Finally, our South African partners will be further augmenting the eastern array in late 2014 – so a trans-basin MOC array at 34.5°S is taking shape (e.g. Ansorge et al. 2013).

A publication based on the first two years of SAM data, together with contemporaneous data from a pilot French array on the eastern boundary, was published in December 2013 in the *Journal of Geophysical Research* (Meinen et al. 2013). This article was highlighted in both the journal and *EOS*. The 20-months of data used in this study shows that the variability of the basin-wide MOC at 34.5°S is roughly comparable in magnitude to (or perhaps slightly larger than) that observed in the longer 26.5°N and 16°N moored array records, and this variability is driven roughly equally by changes on the western and eastern boundaries at time scales ranging from days to a few months.

Another publication related to the goals of SAM, funded by NOAA, was published in July 2014 (Dong et al., 2014). This article diagnoses the possible causes for differences in how models and data reproduce the seasonal variations of the MOC at 34.5°S. The results indicate that the weak seasonal cycle in the model geostrophic transport can primarily be attributed to excessively strong baroclinicity below the surface mixed layer, whereas the observations show a strong vertical coherence in the velocity down to 1200 m. This study was motivated primarily by results from trans-basin expendable bathythermograph sections along 34.5°S, however it also provides very useful information for analyzing SAM data and observations from the related international projects.