Transport in the upper branch of the South Atlantic Meridional Overturning Circulation.

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Abstract

Studies based on climate models have shown that changes in the Atlantic MOC may relate to rain- fall patterns and decadal changes in hurricane genesis and intensity. Because climate models have limitations, for example due to their vertical and horizontal resolution, it is important to analyze observations and provide the results to the modeling community for assessment of their models. Estimates of the transports in the upper branch of the Atlantic Meridional Overturning Circulation (AMOC) at different latitudes will provide indicators for the monitoring of the AMOC itself as well as information that can be used for assessments of past, current and future states of the climate sys- tem. The estimated transports will also improve scientific understanding of this system, for example, through process studies and joint analyses of the variability of the transports in conjunction with other indexes (e.g. the North Atlantic Oscillation index). This, in turn, can help with identifying potential impacts on society and thus provide input for service, planning, and management decisions.

This proposal is focused on computing transport indexes for monitoring the Meridional Overturning Circulation in the South Atlantic Ocean at selected latitudes from Argo observations complemented with satellite observations and model fields. To accomplish this, a method for deriving three- dimensional fields of absolute velocity in the upper 2000 m of the ocean developed by the PI for the estimation of the climatological flow field (Schmid, 2013, submitted) will be employed to calculate seasonal estimates of the flow field during the Argo period. The method is based on situ observations from Argo, a project funded by NOAA/CPO, that are complemented with sea surface height from satellite altimetry. The plan is to use these fields in conjunction with fields of the Ekman trans- port to derive seasonal estimates of the volume transport in the upper branch of the MOC across selected latitudes, starting in 2000. The methodology will be evaluated by comparing the estimated transports with transport estimates from independent observations: (1) the estimates based on the XBT transects along 35S that were derived four to five times a year since 2002; (2) transports across 34.5S that are estimated from data collected by the South Atlantic Meridional Overturning Circu- lation (SAMOC) project; (3) transports across 26.5N that are estimated from data collected by the Rapid Climate Change-Meridional Overturning Circulation and Heatflux Array (RAPID/MOCHA). Two ocean model products produced by other groups will be analyzed to validate the realism of, and also to augment the scientific analysis of, the observation-based products.