Western Boundary Time Series

PIs: M. Baringer[1], C. Meinen[1], and S. Garzoli[2,1]
National Collaborators: B. Johns[2]
International Collaborators: D. Smeed[3], H. Bryden[3], E. Frajka-Williams[3], and S. Cunningham[4]
[1]NOAA Atlantic Oceanographic Meteorological Laboratory, Miami FL
[2]University of Miami, Miami FL
[3]National Oceanography Centre, Southampton, UK
[4]Scottish Marine Institute Oban, Argyll, UK

This project continuously monitors two important components of the thermohaline circulation in the Subtropical North Atlantic with the ultimate goal of determining the state of the overturning circulation and providing a monitoring system for rapid climate change and hence addresses the program deliverable on "ocean heat content and transport". The components include the northward flowing Florida Current and the southward flowing Deep Western Boundary Current.

Recent results

While this program only funds data collection this fiscal year the lead PIs published five papers on this data (Baringer et al. 2014a; Baringer et al. 2014b, Meinen and Garzoli 2014, Garcia and Meinen 2014, Smeed et al. 2014), and four data reports were published (Hooper and Baringer 2013b, Hooper and Baringer 2014a, Hooper and Baringer 2014c, Hooper and Baringer 2014d). The published papers included the following highlights:

- Baringer et al. (2014a) released the State of the Meridional Overturning Circulation report, which appeared in the State of the Climate Report and expanded the report to include 41°N, 26°N, and 16°N MOC transports as well as the Florida Current time series.
- Baringer et al. (2014b) released the State of the Meridional Heat Transport report, which appeared in the State of the Climate Report and included updated heat transport estimates from 41°N, 26°N and 35°S.
- Meinen and Garzoli (2014) published "Attribution of Deep Western Boundary Current variability at 26.5°N," which explores the mechanisms that cause large transport changes in the Deep Western Boundary Current (DWBC) east of the Bahamas and argues that the strongest variations are associated with Rossby wave-like features propagating westward from the interior that overwhelm the DWBC transport signal.
- Garcia and Meinen (2014) published "Accuracy of Florida Current volume transport measurements at 27°N using multiple observational techniques" that uses observations from a submarine cable, free-falling dropsonde floats, and lowered acoustic Doppler current profilers to quantify the precise accuracy of the Florida Current volume transport estimated and served to the public.
- Smeed et al. (2014) examined the first eight and a half years of the data from the 26°N MOC array to show a small but statistically significant downward trend in the MOC from the 26°N array, which is primarily resulting from changes in the ocean density structure within the basin interior. This change is likely to be associated with interannual and/or decadal variability, and it is superimposed on top of much stronger subannual variations that make extracting trends difficult. This illustrates the imperative need for making continuous daily estimates over long time scales in order to tease out these very important long-period signals.

Online data

NOAA Florida Current and cruise data: http://www.aoml.noaa.gov/phod/wbts/data.php
Merged with MOC data: http://www.noc.soton.ac.uk/rapidmoc/
Merged with Heat transport data: http://www.rsmas.miami.edu/users/mocha/

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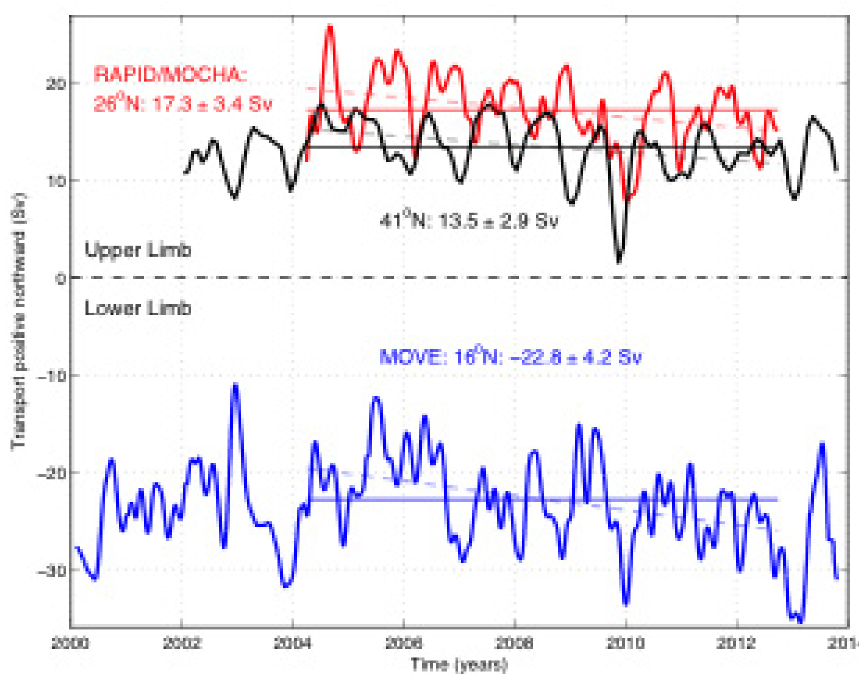

Figure 1: Baringer et al. (2014) show estimates of the MOC in the Atlantic Ocean from the Argo/Altimetry estimate at 41°N (black; Willis 2010), the RAPID-WATCH/MOCHA/WBTS 26°N array (red; Cunningham et al. 2007), and the German/NOAA MOVE array at 16°N (blue; Send et al. 2011) are shown versus year. All time series have a three-month second-order butterworth low pass filter applied. Horizontal lines are the mean transport during similar time periods as listed in the corresponding text. Dashed lines are the trends for each series over the same time period. For the MOVE data the net zonal and vertical integral of the deep circulation represents the lower limb of the MOC (with a negative sign for the southward flow) and hence a stronger negative southward flow represents an increase in the MOC.