

## 2012 Project Summary

### Decadal and Multidecadal Variability of the AMOC in Observational Records and Numerical Models

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The purpose of this project is to identify and investigate variables and processes that have been relatively better observed and can be associated with decadal-to-multidecadal changes of AMOC, and to examine these processes in climate model simulations.

#### *Recent Results*

(1) The North Brazil Current (NBC) transport, calculated from 5 decades of historical hydrographic data, exhibited a multidecadal variability. It is shown to be an useful indicator for AMOC low frequency variations. As a major pathway for surface return flow of AMOC, the NBC transport variability lags the Labrador Sea deep convection by a few years and is coherent with the Atlantic Multidecadal Oscillation (AMO) in sea surface temperature. The study suggests a need of western boundary current measurements off the coast of Brazil as a complementary component of AMOC observing system, so that the multidecadal historical record can be extended further into the future. (Zhang et al. 2011, an AGU Journal highlight)

(2) While decadal variability of NBC and AMOC at various latitudes (e.g. 6°S, 26°N and 40°N) are highly coherent in coupled models, they are less so in data assimilation products. GECCO and SODA show that the AMOC at 6°S is more coherent with the AMO than the AMOC at other latitudes of North Atlantic. In both products, the AMOC at 40°N connects better to the Labrador Sea deep convection, but of less connection with the dominant pattern of subpolar subsurface temperature contrary to the relationship suggested in some coupled models. Large differences found between the two data assimilations and between data assimilation and coupled models have implications in decadal predictions when ocean data assimilations are used to initialize the coupled models. (WCRP 2011 poster)

(3) The usefulness of NBC to track low frequency variability of AMOC is further examined in newly available IPCC AR5 models. All models suggest excellent correlation (above 0.8) between the NBC and AMOC in the tropical Atlantic and that the NBC can be used to detect future AMOC trends. (WCRP 2011 poster)

#### *Bibliography*

Zhang, D., R. Msadek, M.J. McPhaden, and T. Delworth, 2011: Multidecadal variability of the North Brazil Current and its connection to the Atlantic Meridional Overturning Circulation. *J. Geophys. Res.*, 116, C04012, doi:10.1029/2010JC006812. (Editor's Highlight)

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