

Near-Term Research Priorities of U.S. AMOC

Observing system implementation and evaluation

- Assessing the meridional coherence of AMOC changes should be a continued focus of prognostic models, state estimation models, and enhancement of the AMOC observing system. The design of monitoring systems for the time varying strength of the AMOC in the subpolar North Atlantic and subtropical South Atlantic should be completed this year and implemented during 2012. The importance of deep temperature and salinity measurements (i.e., deep Argo) in monitoring AMOC variability should also be assessed.

AMOC State, variability, and change

- Assimilation modeling efforts should focus on reaching a consensus on the variability of the AMOC over the past few decades, and on placing realistic uncertainty bounds on these estimates. It is important that we understand the uncertainties of existing estimates and the accuracies required to detect climatically important AMOC-related changes.
- Studies aiming to develop fingerprinting techniques to better characterize AMOC variability by combining model simulations with observations should be further encouraged and supported. Particular focus should be on understanding the linkage between AMOC variability and SST variability, both from a diagnostic and mechanistic viewpoint.
- The meridional heat transport (MHT) carried by the AMOC provides the main connection to the climate system. Therefore it is important to explore AMOC and MHT relationships in various models (forward, assimilation, non-eddy-resolving, eddy-resolving) in comparison with observational data being generated by the program, to understand the reasons for differences, or biases, in the relationship between model AMOC intensity and MHT in available models.

AMOC mechanisms and predictability

- Further effort needs to be directed toward understanding AMOC variability mechanisms and the model dependencies of these variability mechanisms. To address this issue, a detailed comparison study for the AMOC mechanisms should be coordinated among modeling groups. A focused effort is also needed to develop a synthesis of existing observations, including synthesis of proxy data, to discriminate various model-based proposed mechanisms against the observational data.
- In coordination with the near-term prediction experiments being conducted by modeling centers for the IPCC AR5, an inter-comparison study should be performed to investigate the robustness of AMOC predictions among simulations using various models. These efforts should seek collaboration with the U.S. CLIVAR Decadal Predictability Working Group as well as the International CLIVAR Working Group on Ocean Model Development and Global Synthesis and Observational Panel.

Climate sensitivity to AMOC: climate/ecosystem impacts

- Further study is required to understand the teleconnections between AMOC/North Atlantic SST and climate variability elsewhere, and the physical mechanisms of these teleconnections. Targeted studies of the impact of AMOC variability on sea ice, ocean ecosystems, sea level changes around the Atlantic Basin, and the exchange of carbon between the atmosphere and ocean are also needed.