

U.S. Atlantic Meridional Overturning Circulation (AMOC) Update **May 2010**

Under the guidance and support of relevant federal agencies (NASA [lead], NOAA, and NSF), the US AMOC Program is coordinating research focused on the 4th near-term priority of the Ocean Research Priorities Plan, the Atlantic Meridional Overturning Circulation (AMOC). Here we report significant events resulting from that effort since the last update:

Leadership

As of 4/1/2010 Bill Johns, University of Miami, has taken over as chair of the US AMOC Science Team, replacing Susan Lozier, Duke University, who has served as chair since spring of 2008. Thank you Susan!

Susan Lozier will take on Bill Johns' role as co-chair of the Observations Task Team.

US AMOC Activities

- A workshop for the design of a subpolar North Atlantic observing system was held on April 14-16, 2010, at Duke University, Durham, NC, hosted by Susan Lozier. A total of 23 scientists participated, including 7 invited international colleagues and 3 program/agency representatives. The workshop focused on both the design of a physical observing system for the AMOC and potential biogeochemical linkages to AMOC variability in the subpolar region (e.g. CO₂ uptake, primary productivity, biological/species responses). Significant progress was made toward a consensus plan for the observing system. A workshop report is in preparation.
- The 3rd South Atlantic MOC workshop (SAMOC 3) will be held on May 11-13, 2010 in Niteroi/Rio de Janeiro, Brazil (http://www.aoml.noaa.gov/phod/SAMOC/index_SAMOC3.html). The organizing committee consists of Silvia Garzoli (U.S), Alberto Piola (Argentina), Sabrina Speich (France), and Edmo Campos (Brazil). The workshop will bring together international experts to design and plan the South Atlantic and inter-ocean exchanges element of an MOC observing system.
- This year's AMOC Annual Science Team meeting will be held in Miami, Florida from June 7-9, 2010 (<http://www.atlanticmoc.org/AMOC2010.php>). Tony Lee and George Halliwell are serving as co-organizers of the meeting, in consultation with the AMOC Science Team and the US CLIVAR Project Office. The meeting will highlight recent progress in observing the AMOC, development and evaluation of state estimation models, mechanisms of AMOC variability, and AMOC predictability.
- Peter Rhines (UW) and Sirpa Hakkinen (NASA), in collaboration with Charlie Eriksen/Nick Beird at UW and with the Faroe Islands (Hjalmar Hatun and Bogi Hansen), recently completed a 3-year NSF sponsored Seaglider campaign that netted more than 17,000 ctd/bio-optics profiles in the dense overflows between Iceland and Scotland. The program includes an active graduate exchange program between Seattle and Bergen, Norway.

- The U.K. moorings on the western boundary of the 26.5°N RAPID/MOCHA/WBTS array were successfully recovered and redeployed in March-April 2010 on a joint NOAA-U.Miami-NOCS cruise on the R/V Oceanus, led by Chris Meinen of NOAA/AOML.
- Craig Lee (UW/APL), Brian Petire (BIO), and colleagues have obtained a 4-year (2004-2008) time series of fluxes through Davis Strait, including new success with sea-gliders operating in extended under-ice conditions. A 5-year continuation of this effort has been proposed and is currently under review.
- The MOVE array (PI: Uwe Send, SIO) will begin servicing moorings at 2-year intervals this summer, with an acoustic modem and controller that is able to telemeter all the T/S sensor and current meter data on the moorings.
- Tim Liu (NASA/JPL) has provided public access to the space-based estimation surface fresh water flux over global ocean between 75 degree latitudes at monthly, half degree resolutions, in form of the divergence of atmospheric integrated moisture transport, for a nine year period starting July 1999, at "<http://airsea.jpl.nasa.gov/DATA/water-transport>". The data is being used to compute the time-mean Atlantic meridional water transport and, in conjunction with GRACE data, the time dependent transport.
- To evaluate requirements and predictive capabilities of the ocean observing system, the MIT group (PI's: Carl Wunsch and Patrick Heimbach) has recently implemented Lagrange multiplier solutions to study the space/time sensitivity of various important elements of the ocean circulation (AMOC variability, sea ice cover in the North Atlantic, sea level change on the eastern and western sides of the oceans) to controlling elements such as temperature, salinity, and atmospheric forcing.

New Science Results

- Jim Carton and Sirpa Hakkinen are guest editors for a Special issue of Deep-Sea Research II: Climate and the Atlantic Meridional Overturning Circulation. Currently ~18 papers are in review. Contributions to this special issue include:

"Transport of the North Atlantic Deep Western Boundary Current about 39° N, 70° W: 2004-2008", J.M. Toole, R.G. Curry, T.M. Joyce, M. McCartney and B. Peña-Molino

"Export of Labrador Sea Water from the Subpolar North Atlantic: A Lagrangian Perspective", A. Bower, S. Lozier and S. Gary

"Effect of Climate Model Bias on Abrupt Climate Change Simulations in Atlantic Sector", X. Wan, P. Chang, C. S. Jackson, L. Ji and M. Li

- Sirpa Hakkinen and Peter Rhines have submitted a new manuscript: Häkkinen, S. and P.B.Rhines, 2010: Episodes of warm, saline events embedded in the meridional circulation of the northern North Atlantic, J.Geophys. Res. submitted; NASA sponsored

- Christopher Meinen, Molly Baringer and Rigoberto Garcia have a manuscript in press in Deep Sea Research I looking at long-term variability of a key component of the AMOC: "Florida Current Transport Variability: An Analysis of Annual and Longer-Period Signals"
- Josh Willis has recently published a paper in Geophysical Research Letters: Can In-Situ Floats and Satellite Altimeters Detect Long-Term Changes in Atlantic Ocean Overturning? (<http://www.agu.org/journals/gl/gl1006/2010GL042372/>). JPL has posted a press release on the paper: <http://www.jpl.nasa.gov/news/news.cfm?release=2010-101>
- Boyin Huang and Vikram Mehta recently published an article on global riverine influences on the ocean circulation: "Influences of freshwater from major rivers on global ocean circulation and temperatures in the MIT Ocean General Circulation Model", Advances in Atmospheric Sciences, Vol. 27(3), 2010, 455-468.

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