

FS MARIA S. MERIAN, cruise MSM04/1  
03.12. – 21.12.2006  
Fort de France – Fort de France



## Short Cruise Report

### Scientific objectives

The general scientific goal is to measure the fluctuations of North Atlantic Deep Water (NADW) transport across roughly 16°N in the deep western North Atlantic. The southward transported NADW is the most important cold water branch of the world's oceanic thermohaline circulation, and it is expected from numerical modelling that fluctuations or, in the worst, a break-down would have significant impact on climate. It is well known that the strongest signal of associated currents within NADW transports can be observed in the deep western boundary current off the Americas. However, within the large deep basins, recirculation cells can induce large transport fluctuations even when currents are weak. The *Leibniz-Institut für Meereswissenschaften* in Kiel, Germany (IFM-GEOMAR) in 2000 initially set up an instrumental array along 16°N in the western basin within the *Meridional Overturning Experiment (MOVE)* to measure such fluctuations using cross-basin integral methods, namely geostrophic moorings with a number of self recording Conductivity-Temperature-Depth (CTD) instruments (MicroCat, MC) and acoustic tomography. Surface elevations are measured using inverted echosounders in combination with high precision pressure sensors (PIES) which data are to be compared with gravity data from the GRACE satellite mission. Within the deep boundary current, self recording current meters were moored to estimate directly transports. For the geographical distribution of moored instrumentation see the map in Figure 1. These had been launched during the last of so far 5 cruises within MOVE from the French R/V l'ATALANTE in May 2005.

The main aim during cruise MSM04/1 was to recover or directly read out the moored instruments, supplemented by a final high resolution CTD section along 16°N. The moored component will from now on be continued in the western basin by the *Scripps Institution of Oceanography* (SIO, La Jolla, CA, U.S.A.) and complemented in the eastern basin by IFM-GEOMAR through its new time series station off the Cape Verde Islands.

### Embarked Scientists and Technicians

1. Müller, Dr. Thomas J.	principal scientist	IFM-GEOMAR
2. Böke, Wolfgang	technician	IUPUHB
3. Begler, Christian	oceanography	SIO
4. Denker, Claudia	student	IFM-GEOMAR
5. Karbe, Fritz	student	IFM-GEOMAR
6. Karstensen, Dr. Johannes	oceanography	IFM-GEOMAR
7. Krahnemann, Dr. Gerd	oceanography	IFM-GEOMAR
8. Link, Rudolf	technician	IFM-GEOMAR
9. Niehus, Gerd	technician	IFM-GEOMAR
10. Nielsen, Martina	technician	IFM-GEOMAR
11. Pinck, Andreas	technician	IFM-GEOMAR
12. Neumann, Uta	student	IFM-GEOMAR
13. Neves-Silva, Pericles	student	INDP
14. Semingson, Taylor	TA / technician	SIO
15. Chavez, Gabriela	student	SIO

The scientific party during MSM04/1 consisted of 10 scientists and technicians from IFM-GEOMAR, three from SIO, one participant from the University of Bremen (IUPHB), and a guest from the Fishery Research Institute of the Cape Verde Islands (INDP). No observer had joined the cruise.

## **Cruise Narrative**

The ship sailed on 03<sup>rd</sup> December 2006 at 09:00 l.t. from Fort de France, Martinique for cruise MSM04/1. Outside territorial waters, scientific work started with underway meteorological and physical surface data recording. After a CTD test station later the same day, we reached on 4<sup>th</sup> December shortly after midnight the site of PIES 123 the western mooring arrays M3 and M4. The instrument was still in site, however data could not be read out acoustically. Before deciding whether to pick up this instrument when returning to Fort de France at the end of the cruise or to leave it in site, we wanted to check the other four instruments for possible systematic malfunction in the *read-out* mode.

On the 4<sup>th</sup> and the 5<sup>th</sup> December both, the combined current meter and tomography mooring arrays at M4 and the geostrophic mooring at M3 at the western edge of the deep basin were recovered successfully besides two of three transponders. The current meters and all but one MC show good data. The tomograph transceiver in M4 had transmitted all the time. Moorings M4 and M3 were re-launched on 5<sup>th</sup> and 6<sup>th</sup> December with less instruments. Several CTD casts were taken in between the mooring work for calibration purposes.

When leaving sites M3 and M4 towards the site of PIES 128 in the north, multibeam sounding and ship mounted ADCP were switched on. The site of PIES 128 was reached on 9<sup>th</sup> December. As we faced the same problems in *data read out mode* as before, PIES 128 was released and recovered. Technical inspection showed that the main batteries had ceased 18 months after deployment in 2004. As turned out later during the cruise and was confirmed by the manufacturer, this was a general instrumental problem.

On 11<sup>th</sup> December, we reached the eastern array M1 where the geostrophic mooring with tomography receiver, all three transponders and PIES 127 were recovered. The telemetry on top of the mooring had transmitted deep sea data *via* satellite ashore for all the time. With less instrumentation, the geostrophic mooring M1 was launched on 12<sup>th</sup> December.

After having finished the mooring work, the CTD section along ca. 16°N started on 13<sup>th</sup> December. Most casts were down to 5000 m. Many casts (locations see map) also were used to calibrate *in-situ* some instruments recovered from moorings. On the way, the remaining PIES 012, 165, 005 and 123 were recovered. Scientific work was finished after completion of the section off Guadeloupe on 19<sup>th</sup> December.

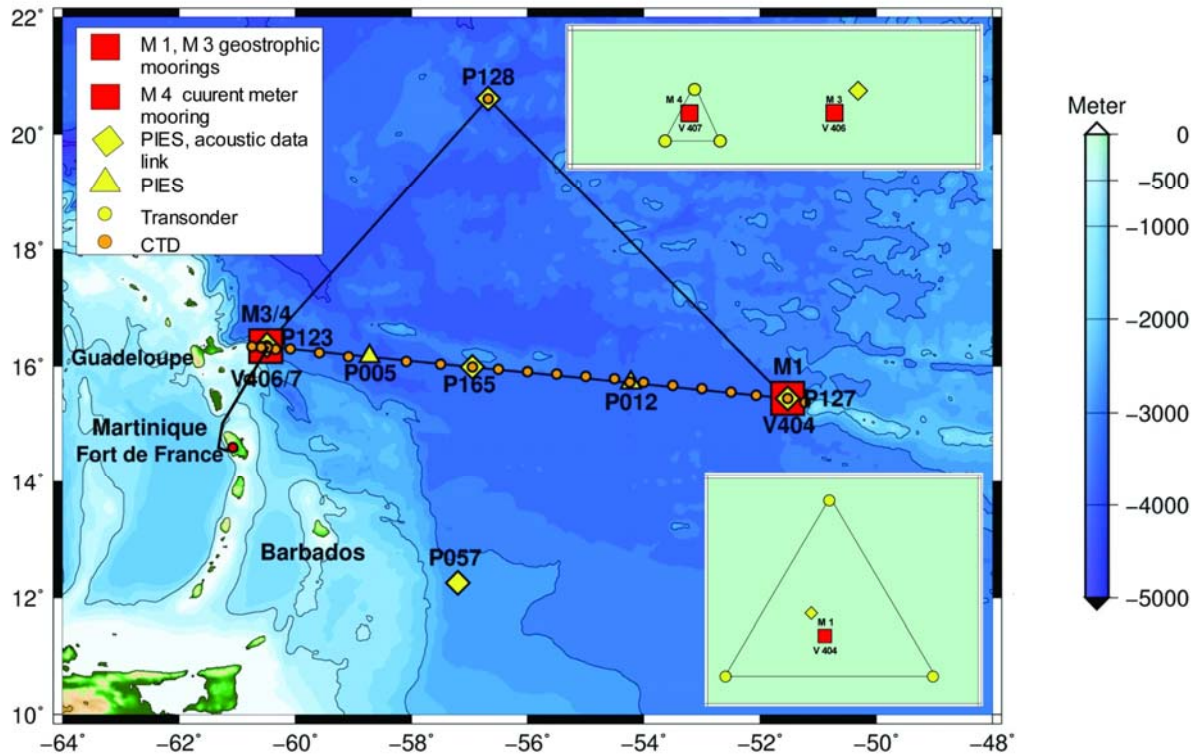
Overall data are complete and of high quality with the following exceptions: two MCs showed malfunction; all PIES records are incomplete (ca. 18 of 33 months); data in the tomography receiver are of bad quality.

For logistic reasons, PIES 057 off Barbados in the south was not recovered. Work at this site will be performed later in spring 2007 with a different ship.

## **Acknowledgements**

The MOVE project has been funded by the German government and the German Research Foundation (DFG). We thank the coastal states governments for their support, both with clearance and logistics. Last not least the new ship with its master and helpful crew let us feel well and look forward optimistically for the scientific evaluation in the future.

## MOVE 2006, cruise track



**Fig. 1 :** Track of R/V MARIA S. MERIAN, cruise MSM04/1, 03 - 21 December 2006, Fort de France – Fort de France, Martinique, France. Track clockwise along the triangle. Moorings at sites M1, M3 and M4 including 4 transponders recovered; 2 transponders at M4 lost; moorings at M1, M3 and M4 redeployed with less instrumentation. All PIES along the cruise track recovered. PIES 057 was not recovered for logistical reasons.