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

First Weekly Report, period 01.12.-07.12.2006

After embarking and and setting up most scientific systems, the ship sailed on 01st December 2006 at 09:00 l.t. from Fort de France, Martinique for cruise MSM04/1. 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 Artlantic. 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. IFM-GEOMAR in 2000 initially set up an instrumental array along 16°N in the western basin within the experiment MOVE to measure such fluctuations using cross-basin integral methods, namely geostrophic moorings with a number 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. The geographical distribution can be looked at on the web (www.ifm-geomar.de, keywords *epeditions* and *MOVE*).

The main aim during cruise MSM04/1 is to recover or directly read out the moored instruments, supplemented by a final high resolution CTD section along16°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 . The scientific party during MSM04/1 consists of 11 scientists and technicians from IFM-GEOMAR, three from SIO, one participant from the University of Bremen, and a guest from the Fishery Research Institute of the Cape Verde Islands (INDP).

Shortly after sailing, we reached the western moorings which were recovered successfully besides two of three transponders. The tomograph recorded a complete data set. All but one MC show good data. According to **Johannes Karstensen**, the mooring dived at least three times by up to 700 m, the third time at the end of the recording period. Such divings probably are caused by rings which had spun off from the North Brazil Current. This hypothesis is supported by the structure of CTD data which were mainly taken for *in-situ* calibration purpose, and which show intensive fine structure as a signature of water mass mixing.

Data from the moored western PIES, although still in site, could not be read out acoustically. Before deciding whether to pick up this instrument when returning to Fort de France or to leave it in site, we want to check the other four instruments for possible systematic malfunction in the *read-out* mode. The current meter mooring and the geostrophic mooring at the western edge of the deep basin were launched without problems, and since today noon we are heading to the northern PIES, located at ca. 20.5°N, 56.5°W. The ship's track maybe followed in the web using the meteological station data that are transmitted into the World Meteorlogical Organization's data net (www.sailwx.org , then use the ship's call sign DBBT).

Embarking in a Caribbean port, usually let people expect fair and sunny wheather. During this winter season, a picture shot during our mooring work on deck two days ago, let us believe the navigator had mixed up latitude and longitude (16°N, 60°W) to sail with wap speed to the Irminger Sea (60°N, 16°W). However, temperatutes are high, the wheather slowly gets better, and all participants are in good mood.

Last not least the new ship with its master and helpful crew let us feel well and look forward optimistically for the next mooring array.

At sea, 07-Dec-2006

Thomas J. Müller
Principal Scientist MSM04/1

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Second Weekly Report, period 08.12.-14.12.2006

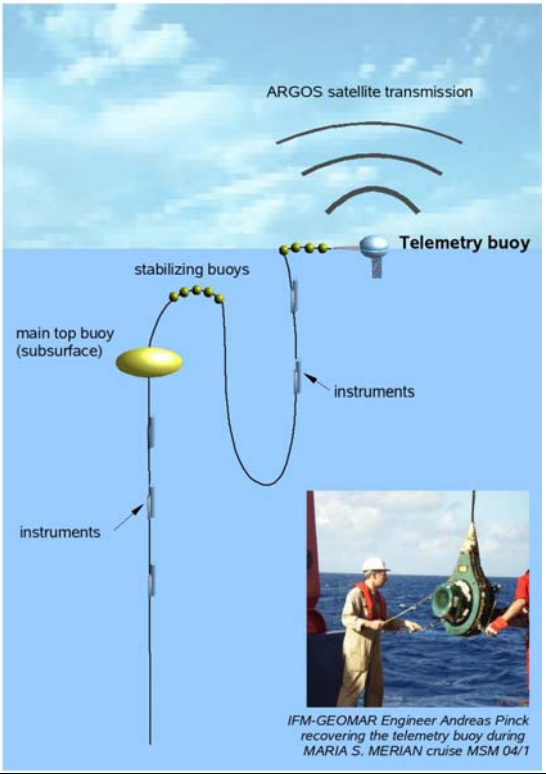
On 8th December we reached the northernmost position at 20.5°N, 056.5°W where we tried to read out acoustically the data of the second PIES. Like the first one, also this one did not transfer any data. Therefore, we decided to recover the instrument. During inspection in the laboratory, it quickly became clear that the battery package for the measurement circuit had broken down after only 6 months. As the manufacturer confirmed, this is now known to happen with instruments from this series after several months of measurements due to a systematic malfunction in the battery power circuit.

On 11th December we reached the eastern work area around M1 on the western flank of deep basin at the Mid Atlantic Ridge. At M1, the geostophic mooring was recovered. IFM-GEOMAR engeneer **Andreas Pinck**, electronician **Rudolf Link** and mooring technician **Gerd Niehus** are proud that all instruments and mooring components had worked continuously for 19 months until recovery. This includes for such a long time the telemetry and the tomography receiver. The PIES after recovery showed the now known problems; it was recovered, also all three transponders. On 12th December, the geostrophic mooring for the SIO was launched. We are now on the almost zonal CTD section towards Guadeloupe, and just have recovered the PIES at 15.75°N, 054.21°W.

The ship's track can be followed in the internet (www.sailwx.info, call sign DBBT).

At sea, 14-Dec-2006

Thomas J. Müller
Principal Scientist MSM04/1



Telemetry Buoy Principle

In this type of telemetry mooring, data from instruments moored in the deep sea are transferred inductively using the steel mooring wire. The telemetry buoy stores transferred data and transfers a reduced set in regular intervals via satellite to IFM-GEOMAR where scientists in charge check and process them. The inlet photo shows IFM-GEOMAR engeneer Andreas Pinck taking care of his telemetry 'baby' on mooring M1 after 19 months continuous data transmission.

FS MARIA S. MERIAN, Fahrt MSM04/1
03.12. – 21.12.2006
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Third Weekly Report, period 15.12.-21.12.2006

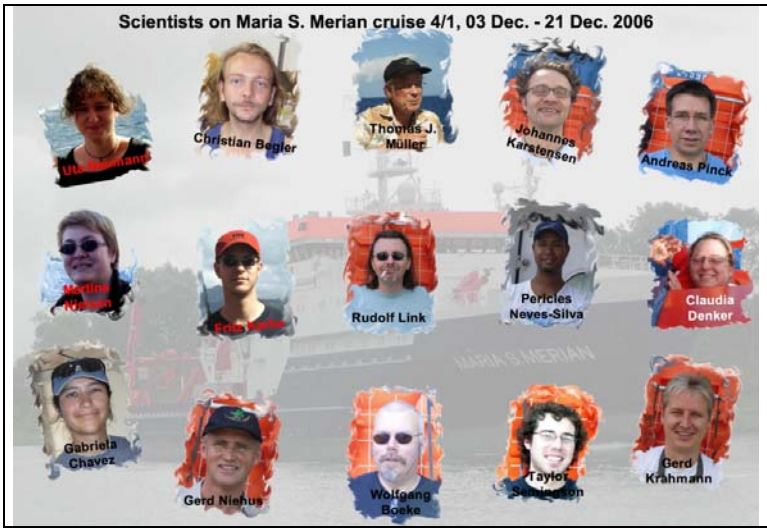
This is the final weekly report for cruise MSM04/1: We have completed yesterday evening station work off Guadeloupe with picking up PIES 123 and a final CTD station on the continental slope. Since then, MERIAN has been on transit and, while writing this report, the ship already has arrived on the roads of Fort de France where we will pack our containers and clear up for disembarking tomorrow morning, 21st December.

The major goals of this cruise were achieved: (i) all three full depth IFM-GEOMAR moorings recovered and (ii) with reduced equipment as SIO moorings relaunched; (ii) four of six transponders to acoustically monitor mooring motion of tomographic equipment recovered; (iiii) all seven PIES located, two of them recovered as scheduled, and five recovered before schedule after identifying technical problems within the power circuit of the measuring mode (iv) hydrographic high resolution (< 30 nm) CTD/lADCP section accomplished along 16° N.

First inspection of the data shows: (i) high quality data from the geostrophic (MicroCats, MTDs) and direct current measuring (RCM8/9) components with a single bad record only, and one MicroCat flooded; (ii) tomographic data transmitted and received for 19 months, however with a low signal to noise ratio, probably due to the large distance; (iv) PIES data overall have not the high quality as expected, and five of the new instruments failed recording after a couple of months due the now known failure in the power pack circuit; (v) high CTD data quality, meeting WOCE satndards as expected.

The highlight certainly was the 19 months continuously telemetered subset of deep sea data from mooring M1 on the western flank of the Mid Atlantic Ridge.

Thank's go to the scientists, technicians and students who as cruise participants and ashore with all their experience and enthusiasm for new technologies significantly contributed to the scientific success of all six MOVE cruises since 2000, and in particular to this final one under IFM-GEOMAR flag.



The scientific crew during MSM04/1

1st row: Uta Neumann, Christian Begler, Tomas J. Müller, Johannes Karstensen, Andreas Pinck

2nd row: Martina Nielsen, Fritz Karbe, Rudolf Link, Pericles Neves-Silva, Claudia Denker

3rd row: Gabriela Chavez, Gerd Niehus, Wolgang Böke, Taylor Semingson, Gerd Krahmann

The new ship conceptionally is an excellent platform. The large deck space and a huge variety of special winches and cranes provide modern technical facilities for all fields of academic research. For certain components, however improvements are necessary and possible, and they need to be performed, in particular with respect to reliability of their function.

As always with new highly specialized research vessels, the crew and the inspection ashore has to struggle with initial problems, in particular technical ones. Despite all these, the master and the crew always have been in a good and friendly mood, always supporting our work. Special thanks for this!

Mit den besten Wünschen für ein frohes Weihnachtsfest und ein gutes Jahr 2007!

auf Reede, Fort de France, 20-Dec-2006

Thomas J. Müller
principal scientist, MSM04/1