WHP Ref. No.: AR15 Deep Basin Experiment
Last updated: 5 April 1993

EXPOCODE: 06MT22_4
Chief Scientist: W. Zenk, IfM Kiel
Ship: F.S. METEOR cruise 22, leg4
Ports of call: Santos (Brazil) to Rio de Janeiro
Cruise dates: Dec. 2 - Dec. 22, 1992

Summarized cruise report

The investigations were aimed at physical studies of the large-scale oceanic transports in the western South Atlantic subtropical gyre. The circulation measurements are part of WOCE and its subprogram Deep Basin Experiment (DBE). In the South Atlantic the heat and water mass transports near the surface are dominated by the anticyclonic gyre. At lower layers Antarctic Intermediate Water and Circumpolar Deep Water have northward components and the North Atlantic Deep Water has a southward flow direction. At the lowest level Antarctic Bottom Water passes through the western South Atlantic on its way to the North Atlantic.

It was the aim of this leg to investigate the exchange of water masses across the Rio Grande Rise, a natural obstacle for the meridional water flow in the deep ocean. Studies of the near surface waters were performed by drogued drifters, and those of the Intermediate Water by neutrally buoyant RAFOS floats. Numerous long-term current observations were obtained by moored current meters with special emphasis on the Deep and Bottom Waters. The latter follows the western boundary of the Argentine Basin to two connecting passages, the Vema and the Hunter Channel. Both these deep gaps permit entry of Antarctic Bottom Water into the Brazil Basin. Supplementary hydrographic and bathymetric surveys had to be performed when spare time was available between the extended mooring program and when weather conditions allowed it.

METEOR left Santos on December 2, 1992 at 8:00 A.M. We sailed directly towards mooring position 906/DB1 near 28S, 44W. In addition to 33 crew members, 19 scientists were on hoard the ship. This number included team members from Kiel, Sao Paulo, Rio de Janeiro, and Woods Hole. The official observer from Brazil, Capt. J.M. Ramos, stayed on board the METEOR. He had previously joined the ship in Recife (22/2).

The main work was concerned with mooring activities which had begun during the previous leg in the Brazil Current region and continued during most of leg 3. Initially we recovered the Woods Hole moorings 906/DB1 - 909/DB4 without any difficulties. Unfortunately the acoustic release of 910/DB5 failed, and after numerous attempts to release we had to give up on this mooring west of the Vema Channel. On December 2, the sound source mooring 350/K2 was deployed on the western Vema terrace. Next we recovered moorings 337/VW and 338/VE from the western shoulder and the Vema sill. A second mooring was lost when we were unable to communicate or release 337/VM. We had better luck with 343/DBK and 912/DB6, both situated on the eastern Vema terrace. To

summarize, by December 7 we had recovered 8 moorings that had been deployed in early January, 1991 from the METEOR (M 15) Further logistical details can be found in the attached mooring inventory.

In the inner Vema district we repeated the narrowly-spaced CTD section from the 1991 expedition although with a smaller number of stations. Further stations were occupied on the way to the Hunter Channel. Besides CTD observations we deployed surface drifters and RAFOS floats.

Slowed down by strong easterly winds we approached the Hunter region on December 11. Hours earlier METEOR had occupied the deepest station of the cruise at a depth of 5146 m. Due to poor weather conditions we were unable to perform the intended bathymetric survey with HYDROSWEEP, the shipborne multibeam echosounder. By December 15 we managed to launch seven moorings across the Hunter Channel. They consist of a zonal row of six current meter moorings (353/H1 - 358/H6) and one sound source (352/K0) mooring. The deployment of mooring 355/H3 could not be finished properly because of a severe storm. The problem was solved by a brave zodiac maneuver. On December 13,all work had to be terminated until the storm weakened the next day. After the completion of the mooring work we left the Hunter region heading due NW. On December 16, an additional mooring was installed close to the bottom on the eastern flank of the Rio Grande Rise.

A final mooring deployment (349/K3) was performed on the return leg to Rio de Janeiro. In this case we combined near-bottom current meters with a sound source at about 1000 m depth. At the end of these activities METEOR sailed on a northwesterly course towards the Brazilian shelf. Underway we launched all remaining RAFOS floats and the satellite-tracked surface drifting buoys. Further observations of the upper-ocean thermal structure were done by two-hourly spaced XBT-drops on the return leg. These data were transmitted by the Global Observing System (GTS) in a near-real time. Approaching the shelf we dropped 9 XCP probes that will help to analyze the vertical structure of the Brazil Current.

METEOR called port at Rio de Janeiro in the morning of December 22,1992.