

4th Weekly Report M145, Mindelo-Recife

05.03.-11.03.2018

The fourth week of the METEOR cruise M145 from Mindelo to Recife concentrated on measuring the western boundary circulation off Brazil. Here at the western boundary of the Atlantic Ocean, warm water is transported from south to north and cold deep water flows beneath in the opposite direction. These transports are part of the Atlantic-wide meridional overturning circulation, which also includes the Gulf Stream in the North Atlantic. The flow variability, which is observed with moorings and shipboard measurements, is a core topic of the BMBF joint project RACE II. Our measurements, which were resumed in 2013, build on previous measurements (from 2000 to 2004). By now, a nearly 20-year data set of the circulation variability is available. A decrease in the strength of the overturning circulation, which is predicted for a future warmer climate and would consequently result in a weakening of the Gulf Stream, could so far not be detected off Brazil. Water mass properties such as temperature, salinity and oxygen have, however, changed quite a bit over the last decades, mainly due to increased inflow of waters from the Indian into the Atlantic Ocean south of Africa.

The mooring work off Brazil was very successful: we were able to recover all four moorings as well as two separate instruments for measuring bottom pressure; all instruments worked as planned. The redeployment of the moorings ran smoothly and we hope for a successful recovery in fall 2019 allowing important statements on the influence of natural and anthropogenic climate fluctuations on the circulation of the Atlantic Ocean.

Our measurements off Brazil are conducted in close cooperation with the Federal University of Pernambuco in Recife. This time we again have two participants from Recife on board, who actively support us in our work. In December 2017, a Brazilian research cruise to service the PIRATA buoys in the western tropical Atlantic performed for the first time shipboard measurements along the exact same cruise tracks we are doing now. These data were analyzed on board in comparison to our own data (Fig. 1). Together, they provide important information about the short-term variability of the structure of the western boundary current.

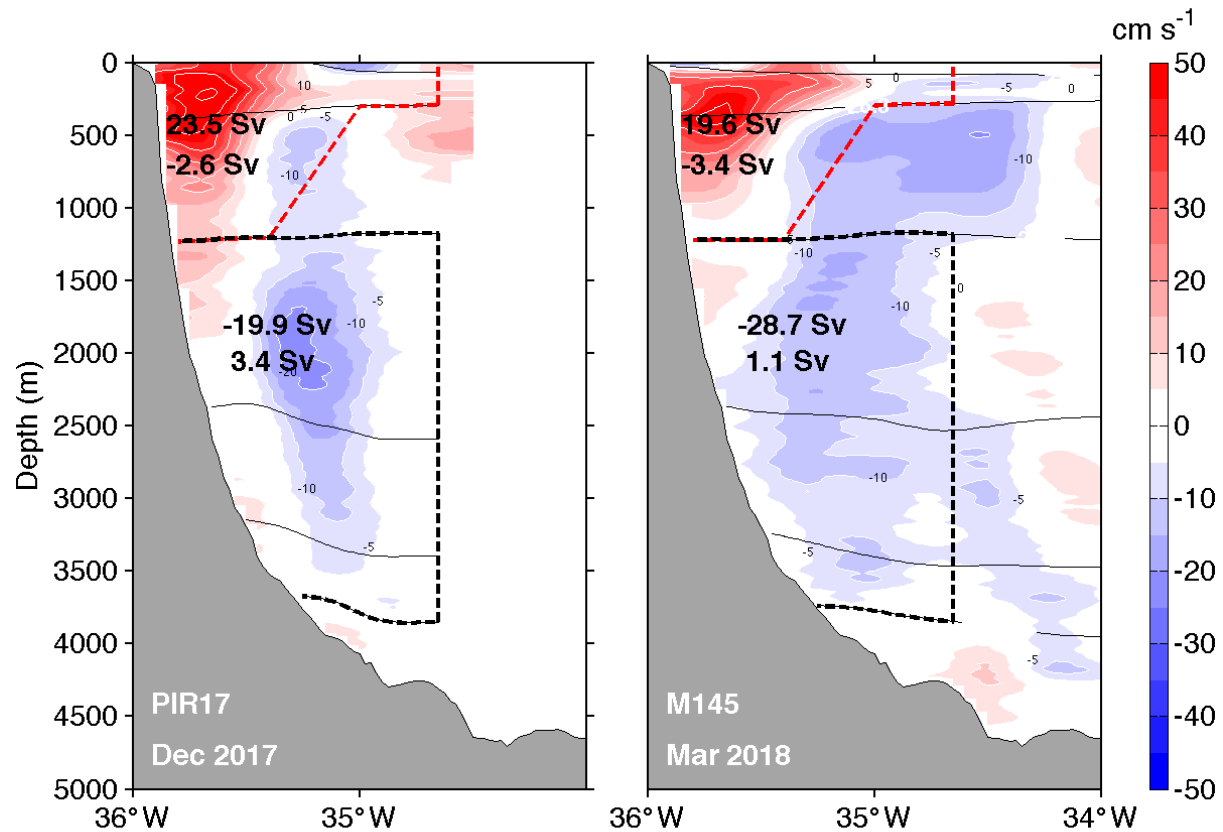


Fig. 1: Along-shore velocity along 11°S near the western boundary as measured during M145 (right panel) shows strong positive (northward) flow within the North Brazil Undercurrent and southward flow of North Atlantic Deep Water below. In comparison, analogous western boundary current measurements performed during a Brazilian PIRATA cruise in December 2017 are presented (left panel). The numbers indicate volume transports for the marked areas in Sv ($10^6 \text{ m}^3/\text{s}$) (Fig.: RH and LB).

Research cruise M145 is now coming to an end. On Monday, the last CTD measurements along 5°S following an eastward path to about 29°W will be done before METEOR heads to the port of Recife, where it will arrive on Wednesday morning. For some of us, there will be a scientific seminar at the Federal University of Pernambuco where, together with our Brazilian colleagues from Recife, we will present and discuss the latest research results. This seminar is already the sixth in a series of bilateral cooperation seminars initiated in 2002 with the first seminar following METEOR cruise M53/2.



Fig. 2: Group picture of the scientific cruise participants of M145 (Photo: HD).

This completes an intense research cruise that allowed us to gather a wealth of exciting data on the physical, chemical, and biological state of the tropical ocean that will surely find its way into future undergraduate, graduate, and doctoral theses, as well as scientific publications. At this point a very special thank you to captain Detlef Korte and his crew for the great support in all areas and their important contribution to the success of the cruise, which was of course only possible due to the great commitment of the scientists and technicians. From us also a special thank you to all cruise participants for the great time on board that we had together.

Greetings from the tropics,
Rebecca Hummels and Peter Brandt and the cruise participants of M145