# 2nd Weekly Report M145, Mindelo-Recife

19.02.-25.02.2018

The second week of METEOR cruise M145 from Mindelo to Recife focused on the southern part of the oxygen minimum zone of the tropical North Atlantic. Oxygen minimum zones are formed in regions with weak currents, i.e. low oxygen supply by currents and mixing, and relatively high oxygen consumption associated with high biological production and the associated remineralization of the sinking biological material. We find lowest oxygen levels at a depth of about 400 meters, well below the surface mixed layer, which is almost always saturated with oxygen, and above the deep ocean, that is only reached by small amounts of sinking biological material and where accordingly the oxygen consumption decreases rapidly. The work concentrates on measurements with the CTD rosette, which is lowered into the ocean down to depths of up to 5000 m. The CTD Rosette is equipped with a variety of instruments, some of which deliver their data online via the wire to the deck unit aboard METEOR, others record data internally, and with water bottles that take water samples from different depths for biogeochemical analyzes and experiments in METEOR's laboratories or on deck.

Our participants from the MPI for Marine Microbiology sample water from the euphotic zone in order to measure biological nitrogen fixation and primary production rates. Nitrogen is an essential nutrient to all living organisms. However, only certain nitrogen species can be taken up and made use of by most organisms. Dinitrogen gas, which is the most dominant nitrogen species in the atmosphere, cannot be used by the majority of all organisms. Nevertheless, there are certain prokaryotic microorganisms that are able to "fix" dinitrogen gas, meaning that they are able to react it to more favorable nitrogen species. This process called nitrogen fixation is a major source of nitrogen for photosynthetic primary producers. Primary producers, e.g. microalgae, have the ability to fix the greenhouse gas carbon dioxide into biomass. Therewith they build the basis of the overall foodweb. In order to investigate and quantify these two important biogeochemical processes water samples from different depths along the 23°W section are incubated with stable nitrogen and carbon isotopes. Eventually the incoorporation of these isotopes into biomass can be measured and analyzed using mass spectrometry.

**Fig. 1:** Anchor drop at the end of the mooring deployment of our equatorial mooring at 23°W (Photo: TF).

The second week of the METEOR M145 trip ended with the mooring work at the equator, 23°W. Since December 2001 a current meter mooring has been serviced to measure the equatorial velocity field. This mooring was first deployed in the framework of French research projects and then continued in cooperation between the international PIRATA program and various German projects (BMBF RACE, SFB754). Since 2006, this mooring, which is globally the only deep sea mooring at the equator measuring the velocity field from the surface to the seabed, has been recovered and redeployed approximately every one and a half years during our voyages. Many publications result from this dataset, which initially document strong currents with multi-year fluctuations, as well as in combination with other data and models discussed the importance of the currents for the distribution of oxygen and tracers in the ocean or the climate in the tropic al Atlantic sector. After each recovery, the first view on the data of the deep-profiling instrument is eagerly awaited. This time, it has returned an almost complete dataset of deep equatorial circulation. The mooring work on the equator and the previously recovered moorings in the center (at 11°N) and at the southern edge (at 5°N) of the oxygen minimum zone of the tropical North Atlantic ends the mooring work of the SFB754. Almost all instruments of our SFB754 moorings have provided complete datasets and will thus make a significant contribution to the synthesis of the results in the last phase of the SFB754.

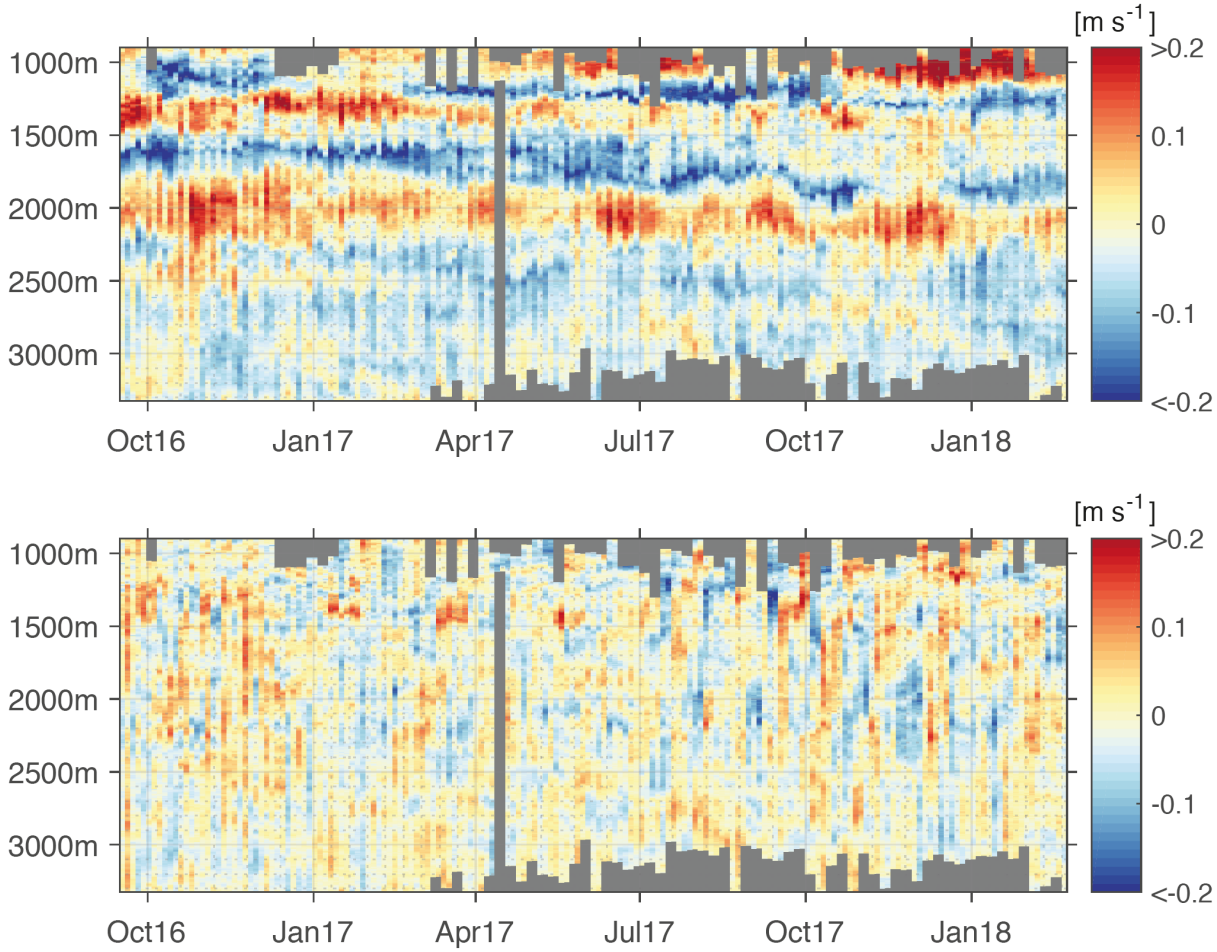


**Fig. 2:** Zonal (upper panel) and meridional velocity (lower panel) measured at the equator, 23°W with an MacLane profiler profiling up and down the mooring wire every six days. Note east- and westward current bands marked by red and blue colors, respectively, in the upper panel. The phase of these current bands slowly propagate downward, which is associated with upward energy propagation. The meridional velocity is dominated by monthly fluctuations most clearly visible at the end of 2017 (Fig. FPT).

From the equator we continue south, before turning west towards Brazil in the middle of next week. Meanwhile, we are almost back on track with our research program thanks to the above-average speed of METEOR, but also due to the very smooth and professional work on board. Minor technical issues were solved immediately, and in particular the excellent cooperation between the captain, crew and science team allows for very effective recovery and redeployment of our deep-sea moorings. Here we would like to thank especially the crew for the professional work and the consistently very positive working atmosphere on board.

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