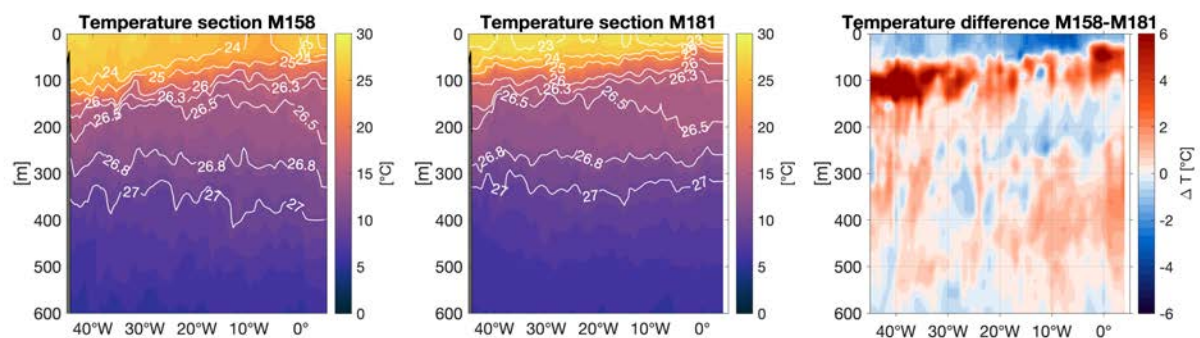


## RV METEOR - M181 - "TRATLEQ2"

17.04. - 28.05.2022, Cape Town - Mindelo

### 6<sup>th</sup> Weekly Report (16. - 22.5.2022)

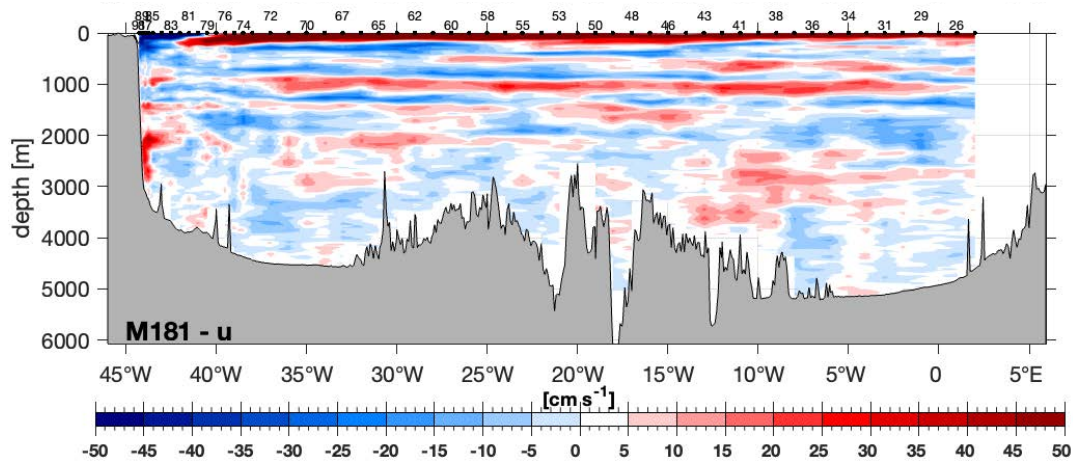
During the sixth week of METEOR cruise M181, the station work program ended. The last CTD station took place on the continental slope off Brazil on Friday afternoon. With this station a very successful physical, biogeochemical and biological program along the equator consisting of two trans-Atlantic equatorial cruises (TRATLEQ I and II) was completed. While the first cruise, TRATLEQ I, could be carried out just before the Corona pandemic in September/October 2019, TRATLEQ II – originally planned for 2021 – had to be shifted by one year. TRATLEQ I was planned during the cold season with surface temperatures below 25°C in the centre of the equatorial cold tongue at about 10°W. During the second cruise in April/May 2022 water temperatures at the surface was always close to or above 28°C (Fig. 1). Besides the seasonal temperature changes at the sea surface (that we feel during our work on board), there are similar strong temperature changes in the subsurface ocean, but of different sign, marking a shallower thermocline during TRATLEQ II compared to TRATLEQ I. These changes are due to seasonal differences in the physical forcing, e.g., wind speed and direction, atmospheric heat and freshwater fluxes, and have strong consequences for the biological productivity at the equator, the community structure of phyto- and zooplankton, their behaviour or associated rates and fluxes of carbon, nitrogen, oxygen and trace elements.



**Fig. 1:** Temperature along the equator as measured during M158 in September/October 2019 (left) and during M181 (centre). White lines mark density surfaces. Both cruises were aimed to cover the cold (M158) and warm (M181) seasons at the equator, which can be seen in the temperature difference (right) showing up to 4°C difference at the sea surface (Figure: Marisa Roch).

Another topic of our cruise was the intermediate and deep circulation consisting of east- and westward equatorial deep jets. These jets have vertical scales of only few 100 metres and can transport water masses from one side of the Atlantic to the other side thereby for example contributing to the ventilation of the low-oxygen regions in the eastern basin (Fig. 2). The equatorial deep jets are a very intriguing phenomenon

of the equatorial oceans, which are generated in the deep ocean. In the Atlantic, they get their energy from downward propagating intraseasonal waves (with about monthly period) that is transformed into an interannual variability of the equatorial deep jets oscillating at a period of about 4.5 years. As the equatorial deep jets propagate their energy upward again, they have the potential to influence surface conditions and climate on those time scales.



**Fig. 2:** Zonal velocity along the equator as measured by the ADCPs attached to the CTD rosette during M181. Nicely seen are the eastward (red) and westward (blue) jets extending along the whole equator exchanging water masses, oxygen and other biogeochemical tracers between the western and eastern boundary regions (Figure: Rena Czeschel & Gerd Krahnmann).

On the way from our last station at the equator to our final destination, the port of Mindelo, Cape Verde, more than 1600 nm away we will recover some instrumentation from our colleagues at GEOMAR. Sunday evening, we started with the recovery of a surface buoy that was detached from its anchor in early April and freely drifted since then with the currents and the wind (Fig. 3). Later, on Monday, the recovery of a wave glider is planned and, hopefully, the day before we arrive at Mindelo, the remaining subsurface elements of the surface buoy mooring west of the Cape Verdean Island of Santo Antão will be collected. The remaining time will be used for seminars, further analysis of the acquired data, packing of the containers and preparing instruments for the upcoming cruise of our GEOMAR colleagues.



**Fig. 3:** Recovery of the surface buoy (Photo: Peter Brandt).

On Saturday, at the end of the sixth week, we celebrated the end of the station work. Having an excellently prepared barbeque on deck of METEOR during the sunset slightly north of the equator is surely one of the highlights during the cruise. A special thanks to all helping to prepare this great event. At this point we would also like to thank 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 all scientists and technicians. Thanks for the great time we had onboard!

Greetings from the tropics and the cruise participants of M181,  
Peter Brandt  
(GEOMAR Helmholtz Centre for Ocean Research Kiel)