RV METEOR - M181 - "TRATLEQ2"

17.04. - 28.05.2022, Cape Town - Mindelo

3rd Weekly Report (25.4. - 1.5.2022)

With the beginning of the third week, only 8 days after leaving Cape Town, the work at our 11°S section off Angola ended. After the successful service of our long-term moored observatory, we finished the work off Angola with the deployment of three Argo floats as part of the German Argo program. These floats contribute to the almost 4000 floats currently measuring temperature and salinity in the upper 2000 m of the global ocean thus providing the required database for estimating the global energy budget under climate warming. A few of these Argo floats can do even more. For example, they can reach larger depth up to 6000m or are equipped with additional sensors for measuring biological and biogeochemical properties. One of these special floats was deployed during SONNE cruise SO283 in May 2021 and drifted for almost one year off Angola. It was equipped with several additional instruments, including a camera system for the detection of particles and plankton, similar to an instrument used in our CTD system. With some minor deviation from our planned cruise track, we were able to reach the float position and recover it without problems using the working boat of METEOR.

On the way toward the equator, we passed the Congo River mouth. This region is of particular interest for climate and ecosystem studies because of its huge amount of freshwater that is transported into the open ocean together with nutrients and biological material. We measured changes in the water mass distribution along the cruise track using our moving vessel profiler, a system that almost automatically run while METEOR is at full speed. The system nicely captured the Congo plume at about 6°S with salinities as low as 28 PSU more than 100 nm away from the coast. Unfortunately, we had to stop measuring within the exclusive economic zone of the Democratic Republic of the Congo where we were not given allowance for sampling that region (Fig. 1).

Biological underway measurements were carried out for example using the CLASS. This is a dual laser spectrofluorometer that excites fluorescence of various substances like chlorophyll, phycoerythrin and dissolved organic matter using a blue and a green laser. Chlorophyll fluorescence is a measure of phytoplankton abundance while fluorescence of phycoerythrin, a pigment found mostly in cyanobacteria, can be used to estimate the amount of cyanobacteria in the water. Dissolved organic matter concentrations are higher in river plumes or in deeper waters and so high fluorescence of dissolved organic matter can be used to detect the influence of river plumes or upwelling in the surface ocean. When this instrument is plumbed into the ship's flowthrough system, we can make timeseries of these various substances along the ship's path (Fig. 1).

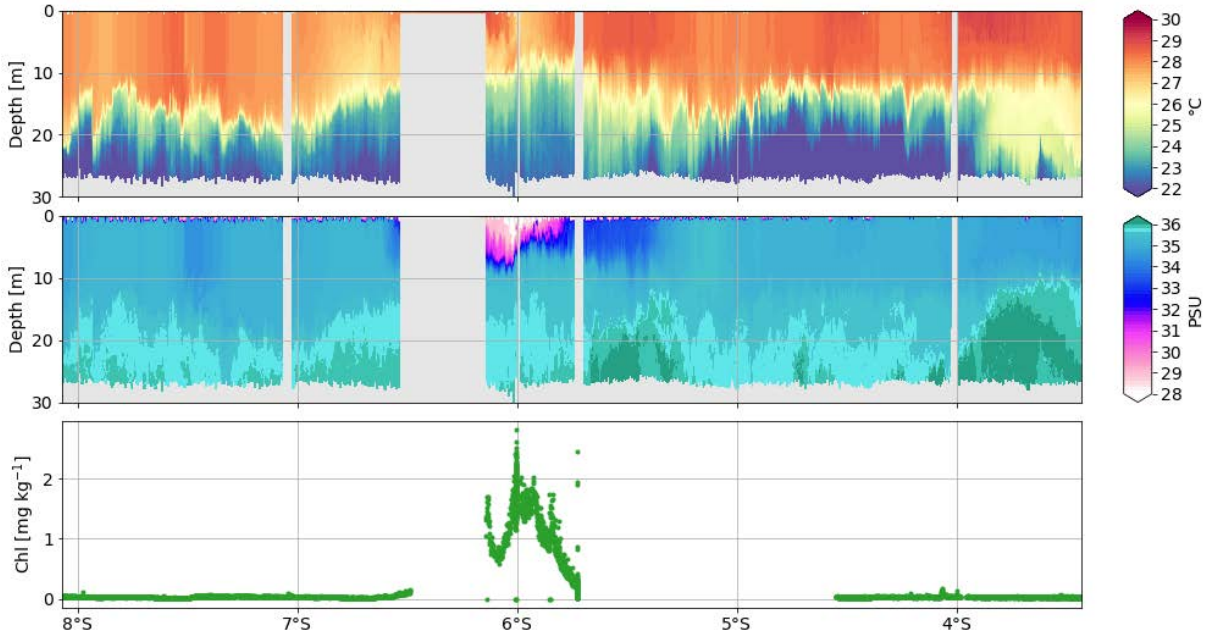

Fig. 1: *Section of temperature and salinity passing the Congo plume at about 6°S together with the underway measurements of Chlorophyll by the CLASS (Figure: Mareike Körner, Ajit Subramaniam).*

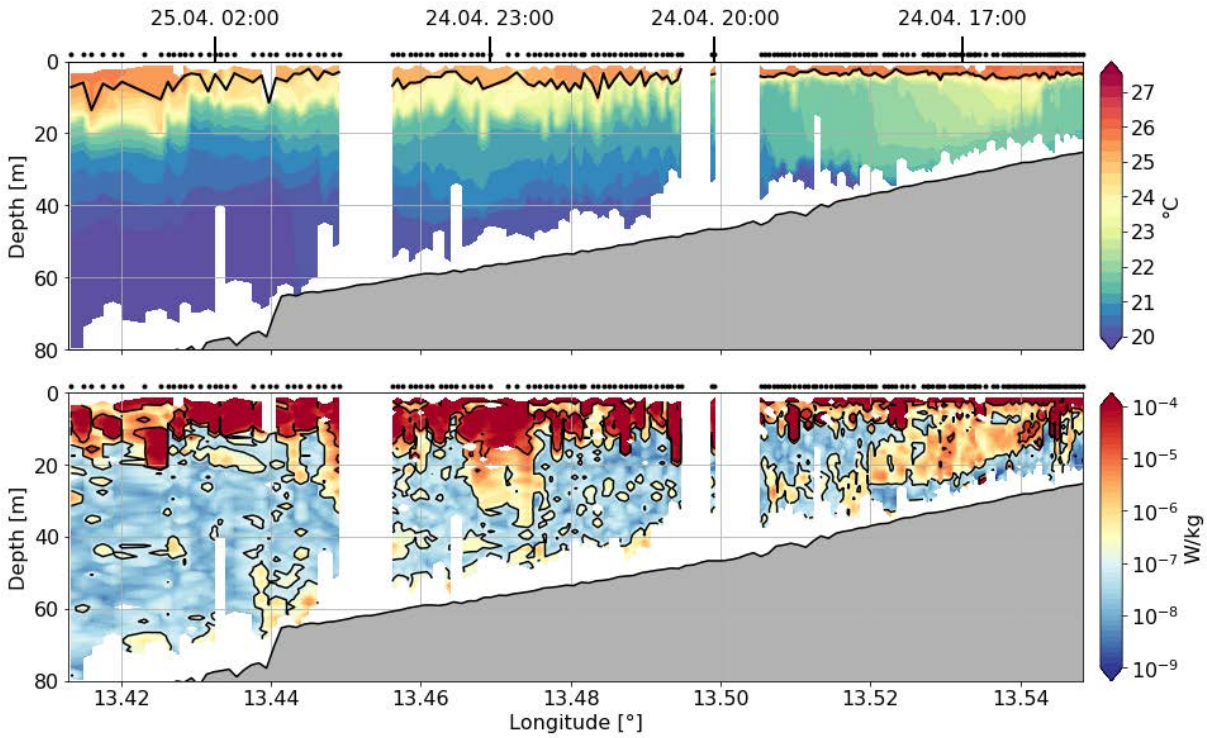

Fig. 2: *Section of temperature and mixing rate as measured with the microstructure profiler on the shelf at 11°S showing high mixing rates and well mixed waters close to the coast (Figure: Mareike Körner).*

While on the way to the equator, the analysis of the acquired data off Angola continued and first results show an exceptional mixing dataset from the near-coastal waters of Angola. Here, the interaction of tides with the continental slope leads to the generation

of internal waves propagating toward the coast and resulting, while breaking, in enhanced mixing in shallow waters. Probably due to the enhanced mixing, the surface temperatures at water depth shallower than 50m were found to be about 4°C cooler than further offshore. Among the topics, we want study here are the mixed layer temperature and salinity budgets as well as the supply of nutrients to the euphotic zone that seasonally enhance the biological productivity.
With the end of the CORONA measures, we restarted the social life onboard with an Icebreaker during the passage from the Angolan working area toward the equator. The ice was particularly helpful taken into account the extremely hot and humid air in the eastern equatorial Atlantic during this season. Low wind speeds and water temperatures close to 30°C make working on deck challenging for crew and science team.

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