



## Meteor cruise

# 97: Oxygen Supply Tracer Release Experiment SFB754

## 4<sup>th</sup> Weekly report for the Meteor cruise M97, 17-23 June

Mindelo (Cape Verde) – Fortaleza (Brazil), May 25 – June 28, 2013

This Meteor cruise is one component of the collaborative research project SFB754; Climate – Biogeochemistry interactions in the tropical ocean, funded by the German Science Foundation (DFG). This project is particularly interested in the areas of low oxygen concentrations that are found in the eastern part of the tropical oceans. Relevant for this project are, for instance: How does subsurface dissolved oxygen in the tropical ocean respond to variability in ocean circulation and ventilation? What is the role of zooplankton in the biogeochemical cycles, and, in particular, how important is the diurnal migration of zooplankton for transport of organic matter? With cruise M97 we attempt to provide more data to be able to answer these and other questions relevant for the dynamics of the Oxygen Minimum Zone in the Tropical North Atlantic.

A primary focus of this cruise was to map out the horizontal and vertical distribution of an artificial tracer in the area. This tracer was injected by us in December on a cruise on the RV Maria S. Merian on the approximate position of 11°N 021°W, and on the potential density of 27.03  $\sigma_\theta$ . The location where the tracer has been injected was carefully selected to be right in the middle of the Oxygen Minimum Zone, both in the horizontal and vertical. The depth of the “target density” (i.e. where we injected the tracer) varied during the cruise but was mostly around 400 meters depth. The tracer we injected is an inert gas; that means a gas that does not react chemically to pretty much anything it can encounter in the ocean. It is thus harmless, and we can detect this gas at exceedingly low concentrations on a gas chromatograph.



*Photo of the instrument used to detect and quantify even minute concentrations of the artificial tracer.*

The cruise-track of this cruise was planned in a way that we would be able to map the distribution of the tracer as accurately as possible. We are interested in knowing how fast the tracer gets distributed in the horizontal by currents, eddies or other processes. The so called horizontal diffusivity (in a way a term that includes the combined effect of all of those processes) is very difficult to measure by direct means. But by mapping out the tracer distribution at various times after release we are able to make realistic estimates of this, important, ocean constant.



*Photo of the integrated tracer sampler mounted of the CTD. This is a new invention for this cruise. The syringes are slowly filled during the time the CTD is raised up through the density layer where the tracer is, normally a 100 meter thick layer. The content of the syringes is thus an average of the tracer concentration in this interval, and a good measure of the integrated tracer content at a certain position; just the quantity we want to know. The photo shows the syringes full of water from a cast, ready to analyze in the gas-chromatograph.*

*The experience with this new device was very good and we mostly got reliable results.*

At this time, on Sunday afternoon, we have just conducted our last scientific station during this cruise. The last samples are being measured in the laboratories and some equipment is already finding its way into boxes for transport in a container back to Kiel. We can now start to carefully analyze the data that we have collected during the cruise. The tracer data seem to be of high quality and it will be interesting to take a closer look at the tracer distribution 6 months after we injected the tracer.

In the name of all the participants, best regards from the Meteor,

Toste Tanhua

Meteor, Sunday June 23, 2013