

RV MARIA S. MERIAN

Cruise MSM105

11.01. - 23.02.2022

Walvis Bay - Mindelo

BUSUC II

The Benguela System
under climate change –

Effects of variability in physical forcing
on carbon and oxygen budgets

6. Weekly Report

14. - 20.02.2022



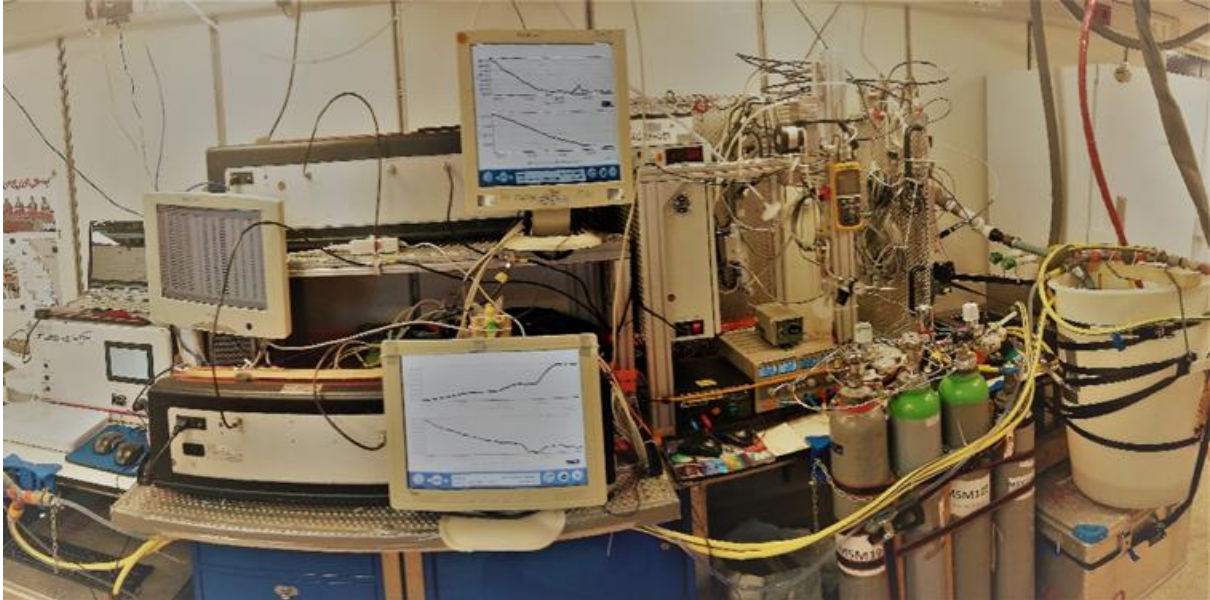
On our way to Mindelo we crossed the equator on Friday and now we are back in the northern hemisphere. Two days earlier we had our last hydrographic station in the Angola Basin, that serve as reference station for the water masses observed off Namibia. Of course, this was not the end of our measurements. On the transit to Mindelo we carry out so-called en route measurements. These are observations of the currents, the surface properties of the water, and trace gas measurements.

Coastal upwelling regions are known to be hot spots of release of the three major green house gases carbon dioxide, methane, and nitrous oxide from the ocean to the atmosphere. The greenhouse gases are produced during the decay of organic material, either in the water column or in the sediment. The upward movement of water from the subsurface shuttles the gases towards the uppermost water layers, which exchange with the atmosphere. For carbon dioxide, the ocean can also become a sink, when the nutrients which are also surfacing with the upwelled waters trigger phytoplankton growth, for which carbon is removed from the water. The upwelling signature was well captured closer to the coast with an increase in methane and nitrous oxide partial pressure at surface waters, while the pattern of the partial pressure of carbon dioxide shows both enrichment due to upwelling and depletion, triggered onset of phytoplankton growth.

With the precise gas measurements in the surface waters, we will be able to compute the gas fluxes in the Benguela upwelling system in order to quantify the source strength of the gases to the atmosphere. Looking at the variability might enable us to estimate how these source and sink pattern might alter in a changing climate.

The total carbonate also known as Dissolved Inorganic Carbon, is one of the four parameters to determine the marine carbonate system, and a direct measure of the build-up or decay of biomass like phytoplankton. The maxima total carbonate in the Namibian waters, mostly overlaying the shelf, nicely shows the remineralization of organic carbon, leading to the release of total carbonate.

While the ship is now in transit from Namibia to the Cape Verde Islands, the still ongoing surface trace gas measurements just witness the imprint of another type of deep water upwelling, induced by a divergence of the surface waters at the sea surface driven by the trade winds far from the coast.



Set up of the Mobile Equilibrator Sensor System for trace gas measurements on board of MARIA S. MERIAN.

We now have three more days to travel to Mindelo. We will use this time to dismount our equipment and pack it back into the containers, process the last samples and clean up the laboratories. The weather continues to be kind to us, so that we will be able to complete this work as well. The expedition is slowly coming to an end and we are looking forward to our journey home to Germany.

Best regards on behalf of all participants,

Bitá Sabbaghzadeh, Gregor Rehder and Volker Mohrholtz
(Leibniz Institute for Baltic Sea Research Warnemuende)