

Weekly Report 1: 21.-24.11.2019: Great Start into Exciting Eddy Study

Mindelo, São Vicente, Republic of Cape Verde: The scientists of the voyage M159 have hardly left, when a colourful hustle and bustle and quite a mess of equipment unfolds again on the METEOR deck. After a smooth journey and in eager anticipation, the scientific participants in the M160 voyage arrive on board the METEOR and begin to receive five containers, various air freight consignments and two truckloads of scientific cargo from the "Ocean Science Centre Mindelo". The extensive assembly of the equipment in the laboratories and on deck is largely completed by the time the METEOR leaves the port of Mindelo at 9:00 a.m. on 23 November.

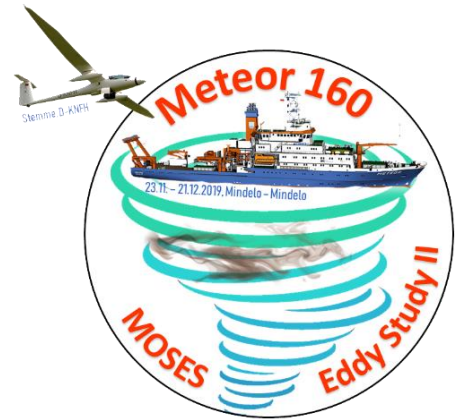


Photo: Burkard Baschek/HZG



Photo: Arne Körtzinger/GEOMAR

During the assembly work, many participants can already experience up close how much a competent and extremely helpful ship's crew can be worth when it comes to solving the usual minor problems and starting difficulties.

Our expedition M160 uses the new observation system MOSES (Modular Observation Solutions for Earth Systems) of the Helmholtz Association, developed by the Helmholtz Centres in the research field "Earth and Environment". This comprises highly flexible and mobile observation modules that have been specially developed to investigate the interactions between short-term events and long-term trends in the various Earth compartments. One of MOSES' four observation priorities is dedicated to the role of marine eddies in the Earth system. These are also the focus of the multidisciplinary BMBF-funded collaborative

project REEBUS (Role of Eddies in the Carbon Pump of Eastern Boundary Upwelling Systems, coordinator Prof. Arne Körtzinger/GEOMAR), which investigates the role of eddies in the West African upwelling region using an innovative and diverse observation approach with linked modelling. The aim of the research is to gain a better understanding of the processes, particularly with regard to the CO₂ source and sink function and the biological carbon pump of the various eddy types.

On board the METEOR are 29 researchers from working groups of the GEOMAR Helmholtz Centre for Ocean Research (Kiel), the Helmholtz Centre for Materials and Coastal Research (Geesthacht), the MARUM (Bremen), the University of Kaiserslautern and the University of Hamburg. We also receive major support from the air. The Aachen University of Applied Sciences has stationed its research motorglider plane Stemme S-10 VTX on the Cape Verde island of Sal in order to let experts from the HZG study the eddies from above and thereby support the expedition programme on METEOR.

Satellite images (sea surface temperature, sea level anomaly, ocean color) have been evaluated for months to identify and track suitable eddy candidates so that the limited ship and aircraft time can be used most efficiently. The eddies in the working area around the Cape Verde Islands form off the West African coast due to the interaction of wind, currents and coastal topography. From there they migrate west into the open Atlantic, where they usually survive for several months and thus also pass Cape Verde. From the "Ocean Science Centre Mindelo" we have therefore also launched a swarm of autonomous devices to investigate these eddy candidates in more detail in prior to the cruise. In addition to our own equipment – so-called ocean gliders and wave gliders – two new "Saildrones" are also used. These are 4 metre high sailing drones, which are remote-controlled at 2-5 knots and have already covered more than 4000 kilometres each to study the eddies in the region. All these robotic vehicles are stuffed with physical and biogeochemical sensors, providing valuable information from the surface and interior of the ocean.



Since yesterday, we are now on our way and have started to study a cyclonic eddy southeast of the 3000 meter high volcano Fogo. At first, mostly underway measurements were carried out from the moving ship. These were followed by deployment of further autonomous instruments (2 gliders, 1 wave glider, 2 Argo floats, 1 surface drifter). This increases the number of autonomous platforms in the water to 11, to be controlled or monitored by us. In the next 2 weeks their number will increase to 3-4 dozen. To keep this bag of fleas in view and under control, we have brought along a special system that allows us to send out a virtual AIS signal for each of these platforms, which can be intercepted by other ships in the region and also appears on the METEOR navigation screens. In this way, METEOR bridge officers are always in the picture of where our equipment is romping around. Tonight we also have started to use equipment for sampling of water and particles – including a CTD rosette system, drifting sediment traps and special device to catch "marine snow", fine flakes of organic material that play an important role in the biological carbon pump of the sea.

We will report more on these and other measurements in the coming week, by when we will certainly have experienced the first glider plane missions over the METEOR.

With warm greetings from the tropical Atlantic Ocean on behalf of the Cruise Participants,

Arne Körtzinger

GEOMAR Helmholtz Centre for Ocean Research Kiel