

RV MARIA S. MERIAN - MSM114
Las Palmas - Mindelo, 15th - 21st January 2023
“MOSES Eddy Study IV”

1st Weekly Report (14. - 15.01.2023)

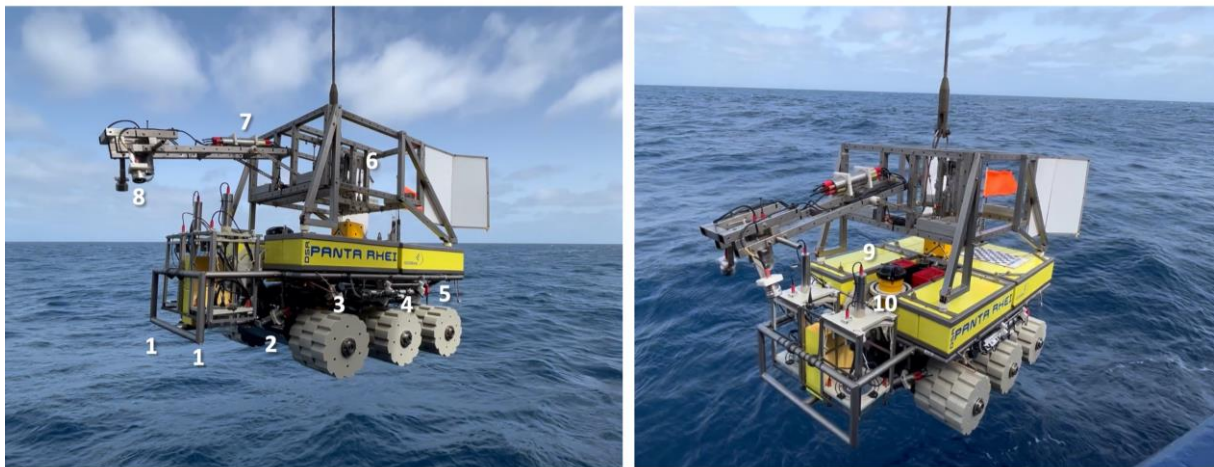
On the morning of January 14, 2023, we embarked in Las Palmas (Gran Canaria) onboard the German research vessel MARIA S. MERIAN for the expedition MSM114. Our small team consists of technicians, biogeochemists and a data management team from GEOMAR, three meteorologists, one of them formerly at the Max-Planck Institute for Meteorology (MPI-M) in Hamburg and the Koninklijk Nederlands Meteorologisch Instituut (KNMI). The major aim of the short cruise is the recovery of the Deep-Sea Rover (DSR) Panta Rhei and an observation lander, which have been deployed off the Cape Verde islands in a water depth of about 3300 m during the previous RV METEOR cruise M182 in June/July 2022. The research cruise MSM114 concludes a measurement campaign of 4 research cruises (M156 in July/Aug. 2019, M160 in Nov./Dec. 2019, M182 in June/July 2021), which were conducted within the projects REEBUS and MOSES funded by the Helmholtz Society and the German Ministry for Education and Research.



Abb. 1: Scientific team on MSM114.

The motivation for the research cruise MSM114 to the Cape Verde islands is to obtain a better understanding of the effects of mesoscale eddies (diameter ca. 120 km) on the source and sink mechanisms of CO₂ of the biological carbon pump in upwelling areas. Transporting nutrient rich upwelling waters to the open ocean, eddies are important for lateral mixing, whereby they can potentially enhance primary productivity and carbon export to the deep-sea floor.

To measure a timeseries of the benthic oxygen consumption under conditions of elevated deposition of organic carbon during the passage of a productive eddy at the sea surface, we deployed the DSR *Panta Rhei* during the RV *Meteor* expedition M182 on the 3rd July 2022. The DSR *Panta Rhei* is a six-wheeled underwater vehicle (weight in air 1200 kg, weight in water 70 kg, dimensions 3 x 2 x 1.7 m (L, W, H)) that is specifically designed for repeated benthic oxygen consumption measurements, Fig. 2. The respiration, i.e. the aerobic organic matter degradation of the entire sediment community (microbiota, protozoa, meio- and macrofauna) is measured using two flux chambers at the front of the vehicle. After each flux measurement, which last for 16 hours, the vehicle moves forward 70 cm to continue with a new flux measurement in an undisturbed pristine sediment area. Photographs of the sediment surface are taken prior to, during and after each flux measurement.



*Fig. 2: Long-term deployment of the DSR *Panta Rhei* on 03.07.2022 in working area E2 north of the Cape Verde, (1) two chambers for benthic oxygen flux measurements, (2) camera to survey the sediment surface, (3) Wetlab turbidity sensor, (4) Seabird CTD SBE 19plus (5) rear camera, (6) launching unit from which the Rover is uncoupled using an electric releaser when the seafloor is reached (7) telemetry for signal and energy transfer (8) camera and lights of the launching unit, (9) profiling current meter, (10) pump module for volume determination. Photos Gabriel Nolte.*

Simultaneous to the DSR deployment, a lander was moored on the seafloor at a distance of about 300 m to the DSR to measure the depositional flux of particulate organic material at the seabed using a sediment trap. In addition, the lander harbors sensors to measure physical parameters in the bottom water, the current regime as well as the turbidity. A camera system is used to survey the sediment surface. After in situ measurements of about 6 months, both platforms will now be recovered in the following days (17/18 Jan. 2023). We very much hope that the DSR has successfully conducted about 100 oxygen consumption measurements whilst covering a distance of 85 m. In addition to the recovery of these gears, a towed camera system (OFOS, Ocean Floor Observation System) will be used for the visual mapping of the Rover area.

An additional aim of the cruise is taking air and reference samples for remote sensing using satellites – with particular focus on clouds, aerosols and water vapor. These activities will be continued in the next cruise MSM114/2. The measurements during this cruise are especially interesting as high amounts of Saharan sand can be expected, which will be blown over the West-African coast to the Atlantic.

For the data management colleagues, this cruise offers an excellent opportunity to further develop the management of the various scientific devices in cooperation with the crew of RV

Maria S. Merian. The main task is to comprehensively inventorise all permanently installed devices on board, to include them in a digital data base and to actualize their metadata. In case of exchanging onboard instruments for calibration or failure, all information needs to be entered into the device databank. Furthermore, the integration of user specific maps into the internal ship data management system will be tested, in order to support scientists with regard to their cruise planning.

All on board are well, and we look forward to a successful cruise.

Best regards on behalf of the MSM114 team,

Stefan Sommer
(GEOMAR Helmholtz Centre for Ocean Research Kiel)