

R/V MARIA S. MERIAN

MSM98 (GPF 20-3_092):
08. - 23.01.2021, Emden – Emden

2nd Weekly Report:
11. - 17.01.2021



At the beginning of the week we had three days of stormy seas. Due to the weather, we were limited to water sampling with the water rosette and hydroacoustic surveys. On Monday morning the sea was still calm enough to record a known flare location in high resolution with an echo sounder that we brought along and installed in the moon pool, which will allow us to estimate fluxes of escaping methane. In a flare area near a salt dome discovered on Heincke cruise HE537, we were able to conduct systematic CTD sampling, using ADCP profiles to look for flow directions. First results of CTD measurements directly above a flare show a 5-fold increase in methane concentrations compared to the surrounding area. Using hydroacoustic surveys conducted at night, we were able to detect more flares and even two wrecks lying on the seabed, which are, however, marked on the nautical charts. We were also able to observe three flare locations over an entire tidal cycle, which allowed us to gain very valuable insights into their activity and intensity. This was only possible because the ship could be kept in position with an accuracy of less than 10 metres, despite the sometimes very stormy sea with waves up to 5 m high and a wind force of up to Beaufort 9.



Figure 1: Sediment sampling with the Multicorer in calm seas and a beautiful sunrise (@ Miriam Römer).

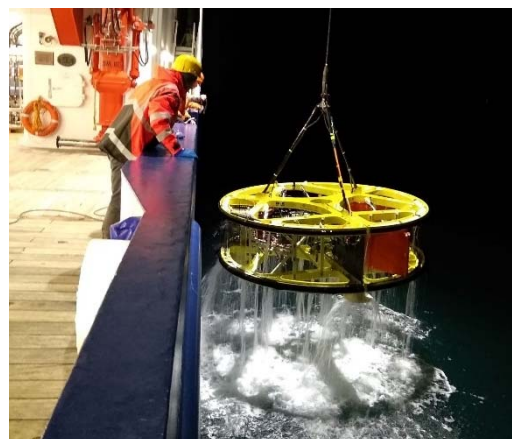


Figure 2: The Golden Eye is brought on deck after what is now its third successful deployment of the expedition (@ Katrin Schwalenberg).

During the night of Thursday, 14 January 2021, the sea calmed down so that we again had ideal conditions for all instrument deployments. First, we recovered the sonar lander on Thursday morning. We were very relieved when the crew sighted our buoy and brought the lander on board without any problems. The data were immediately reviewed and backed up, giving a great time series showing activity from multiple gas bubble releases over five days.

The day continued to be very rewarding. After obtaining sediment samples in the area of the gas bubble seeps with the multicorer in beautiful sunrise weather (Fig. 1), we deployed the BlueROV (remotely operated vehicle, Figs. 3 and 4) to sample the now well-known gas bubble seeps. The ROV team also succeeded

wonderfully, giving the geochemists three gas samples for isotopic analysis. At the end of the day, the Golden Eye was used again with the electric dipole-dipole system for a 7-hour survey over the known seep area with the aim of detecting shallow gas in the sediment (Fig. 2).

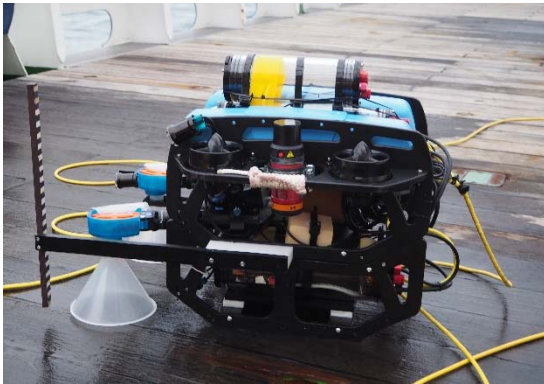


Figure 3: Launching the BlueROV, which is equipped with camera, sonar and gas bubble catcher (© Miriam Römer).



Figure 4: Operations of the BlueROV are tracked and documented live (@Szymon Krupinski).

On the following Friday, 15 January 2021, everything also went perfectly. After more sediment samples were taken with the multicorer, the sonar lander was deployed a second time. This deployment is not far from the first position, but at gas seeps that probably correlate with a fault system in the subsurface above a salt dome. Again, the instrument will remain on the seafloor for about five days. Friday afternoon we moved to our second working area where we discovered some depressions on the seafloor in 2019. Here we started with electromagnetic surveys with Golden Eye, which we were able to navigate directly over the depressions thanks to MERIAN's excellent Dynamic Positioning precision. These turned out to be areas of firmer substrate, densely populated by sponges and other filter-feeding organisms, as we flew over them in the video image. The first successful gravity core deployment on Saturday 16 January 2021 ultimately showed us that this firmer substrate consisted of peat. An ROV dive on Saturday afternoon completed our impressions of the peats, their colonisation and the extent of these areas on the seabed. Late Saturday afternoon we sampled the water column of a nearby old borehole with a CTD and mapped the area around the old borehole with hydroacoustics during the night to check whether methane migrates through the sediments at these locations and escapes into the water column. Today, Sunday 17.02.2021, we will finish our investigations in the area of the depressions with another Golden Eye mission and an ROV dive to search for gas bubbles.

In the coming days until Friday, 22 January 2021, the last outstanding samples will be taken, the sonar lander recovered and further hydroacoustic mapping undertaken before we return to Emden next Saturday. We can already state that we have more than achieved the goals of the trip and would like to thank Captain Björn Maaß and his entire crew for their great support.

All participants are healthy and very satisfied with the results so far.

Greetings on behalf of all participants
Miriam Römer (MARUM)

FS MARIA S. MERIAN, Sonntag, den 17. Januar 2021