

# 5. Weekly Report (18.11.2024 - 24.11.2024)



Figure 1. Sampling areas SA5 and SAX of the 205th voyage of the research vessel METEOR. Bathymetric relief map of a section of the eastern Vema Fracture Zone. Map: Dr Torben Riehl, SENCKENBERG, chief scientist M205.

## Short Summary Sampling Areas SA5 and SAX

In SA5, 8 BC deployments, 1 MUC deployment and 2 EBS deployments were completed. Remarkably, all BC deployments were successful for the first time on 18 November. The SAX stations focussed on potential manganese nodule fields, with 3 OFOS surveys, 4 BC, 3 MUC and 2 EBS deployments. The first BC attempts were hampered by positioning problems. Despite the difficulties, manganese nodules, crusts and volcanic glass were successfully sampled. The last OFOS survey ended on 22 November at 11:55 ship time, completing the station work. This was followed by a 24-hour deep-water calibration of the EM122 echo sounder with additional transit bathymetry before heading to Fortaleza, Brazil, on 23 November.



### Narrative SA5

On the night of 18 November 2024, all 5 BC deployments were successful - this was the first time on this expedition that all BC deployments in a sampling site were successful. After 10 hours of transit bathymetry (MB survey) - again with failures - a nine-hour OFOS survey followed. The repeat station SA5-B7 (MUC) was then sampled from around 23:00 shipboard time.

In the early hours of 19 November 2024, the repeat stations SA5-A1 and SA5-A2 were sampled. Both BCs were successful. The station work was completed in the SA5 area at around 10 a.m. and was followed by an approx. 2-hour transit to the SAX area, where the OFOS was deployed at SAX-1.

#### Narrative SAX

Although SAX-1 was specifically designed to find another type of hard substrate: Manganese nodules. Based on the habitat characterisation, the track was chosen to intersect areas where the potential for the occurrence of hard substrates was as high as possible despite the flat relief.

The SAX-1 OFOS deployment began in a relatively uneven hilly area with high rock potential, but focussed on an abyssal plain whose backscatter signal indicated the possible presence of manganese nodules. However, the analysis of the live stream showed that although there were no hard substrates exposed in the abyssal plain, there were some in sediment pockets in the hill country instead. As manganese nodules had not yet been encountered as a habitat type during this expedition, they were given special consideration in the subsequent station planning.

Since an approximate location of the OFOS on the sea floor can be reconstructed from the USBL signals of the OFOS pinger, an attempt was made to align the deployment planning of BC, EBS and MUC accordingly. However, the manganese nodule fields discovered during SAX-1 were so small in size that the relatively large error of the USBL signal hardly allowed for precise positioning of BC and MUC. It was impossible to use the EBS on the manganese nodule fields, as these fields were too small in area and surrounded by bedrock.

Initially, 2 BC and 1 MUC deployment followed. The first BC SAX-2 came back on deck in the early morning of 20 November 2024 at around 2:15. The box was empty and it was possible to reconstruct from its condition that it must have touched down on the edge of a rock and tipped over. The central spar had slipped so far through the suspension that the release lever for the BC wire had slipped under the suspension and jammed there. Sediment could be seen on one side of the BC up to the release mechanism and there were marks (bends) on the box from touching down on rock.





Figure 2. Manganese nodules exposed deep in the sediment at M205 station SAX-3.

However, a second BC (SAX-3) was successful and brought manganese nodules embedded in the sediment on board (Figure 2). The subsequent MUC (SAX-4) was triggered and penetrated slightly into the sediment, but the tubes contained only a few centimetres of sediment, which was also very disturbed (agitated). It was decided not to repeat any of the equipment, but to continue with the OFOS according to yesterday's plan.

In the late morning of 20 November 2024, the OFOS was launched a second time. At this station, SAX-5, with a planned bottom time of 4.5 hours, the main area mapped was classified as hard substrate according to echo sounder data. This assessment was confirmed during the OFOS dive. In addition to the rocky outcrops and manganese crusts, sediment plains and manganese nodule fields were also identified. As a result, the next stations were planned in such a way that two further BC were deployed in manganese nodule fields and one MUC and one EBS each in sediment areas of the uplands and the abyssal plain.

On the evening of 20 November and the night of 21 November, 2 BC were successfully deployed, bringing numerous manganese nodules on deck. Unfortunately, the sediment surface of the second GKG (SAX-7) was disturbed, as the overlying water leaked out during the recovery of the sample. The MUC SAX-8 deployed in the abyssal plain and the EBS (SAX-9) deployed thereafter were also successful.



This was followed by an exciting EBS deployment SAX-10 on a "high plateau" of the abyssal hill south of the abyssal plain. For reasons of safety for the EBS, the plan had actually been to follow the track of the OFOS survey, in order to match the flat terrain and avoid any upcoming rock formation that the EBS could get stuck on. At the time of the EBS deployment, however, there was a strong surface current from the east, which made the planned deployment to the NNE impossible. Without further ado, plans were changed and an alternative track in an easterly direction was determined using the available bathymetry data. For this deployment, all eventualities were discussed with the ship's command in order to pull the EBS free as safely as possible in the event of a hang-up.

While the EBS was being pulled along the seabed, the tensile stress on the wire was monitored closely so that a rapid response could be made if necessary. Based on the deflections on the load recorder, it became clear that the EBS slipped regularly over the seabed for the majority of the pulling distance. However, there were also two brief increases in the tensile force to over 80 kN, which prompted the winch operator to stop the winch, whereupon the tensile force suddenly normalised again on both occasions. These increases indicated a hanger or sediment or debris that the EBS was pushing in front of it. In the end, the EBS came back on deck intact at around 6 p.m. ship time and brought a clean sample with it. The epinet contained manganese nodules, manganese crusts and volcanic glass. The sampling of the seabed was concluded with a final MUC deployment (SAX-11), which ran smoothly and was completed at around 23:40 ship's time.

The last planned large-scale deployment was the OFOS, which was launched at 01:26 ship's time on 22 November 2024. After approx. 8 hours of profiling, the OFOS was back on deck of the METEOR at 11:55 and the programme of sampling and data acquisition of the 205th research cruise of the METEOR was thus completed.

Last but not least, an MB profiling cruise for deep water calibration of the EM122 echo sounder followed, which lasted more than 24 hours with the approach to the suitable area, approx. 80 nm east of SAX, and the subsequent transit profile (M205\_117). At midday on 23 November 2024, we completed the research work and set course for the destination port of Fortaleza in Brazil.

The results of the expedition will contribute to a better understanding of deep-sea ecosystems and biodiversity, while promoting public engagement through outreach activities.

ABBREVIATION (ENGL)	TERM (ENGL)	ABBREVIATION (GER)	TERM (GER)
EBS	Epibenhic Sledge	EBS	Epibenthosschlitten
BC	Box Corer	GKG	Großkastengreifer
MB	EM122 Multibeam	MB	EM122 Fächerecholot
MUC	Multicorer	MUC	Multicorer
OFOS	Ocean-Floor Observation System	OFOS	Tiefsee-Kamerasystem
SA	Sampling Area	SA	Probenahmegebiet
ST	Station	St	Station
VFZ	Vema Fracture Zone	VFZ	Vema-Bruchzone

#### Abbreviations



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