SO 262: Expedition MANGAN 2018 with RV SONNE

Weekly report No. 4 (23rd to 29th of April 2018)

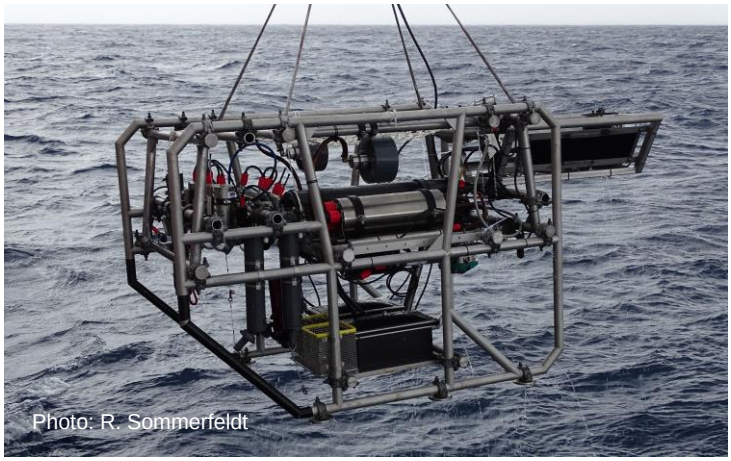
On Saturday afternoon we terminated our work in the first study area and sailed 40 nautical miles eastward to our second working area where we are currently sampling a manganese nodule field with the box corer at three kilometer sampling distance. At the beginning of last week we deployed the video sledge on a short transect in the "Impact Reference Zone" in order to obtain information on potential resuspension of sediments. During RV SONNE expedition SO-239 in spring 2015, colleagues from the Geomar institute mapped the same location with a camera mounted on an autonomous underwater vehicle (AUV). On the resulting photo mosaic, the scientists recognized that sediments that had been resuspended shortly before by an epibenthic sledge (EBS) had settled within 40 meters north and 100 meters south of the track and covered the manganese nodules on the seafloor. Subsequently, investigations on particle aggregation in the laboratory of the Jacobs University Bremen have shown that such newly formed aggregates are resuspended at bottom current velocities of around 8 cm/s and may then be transported away to further sites. Naturally settled sediments on the other hand are not resuspended in this area at current speeds up to 15 cm/s.

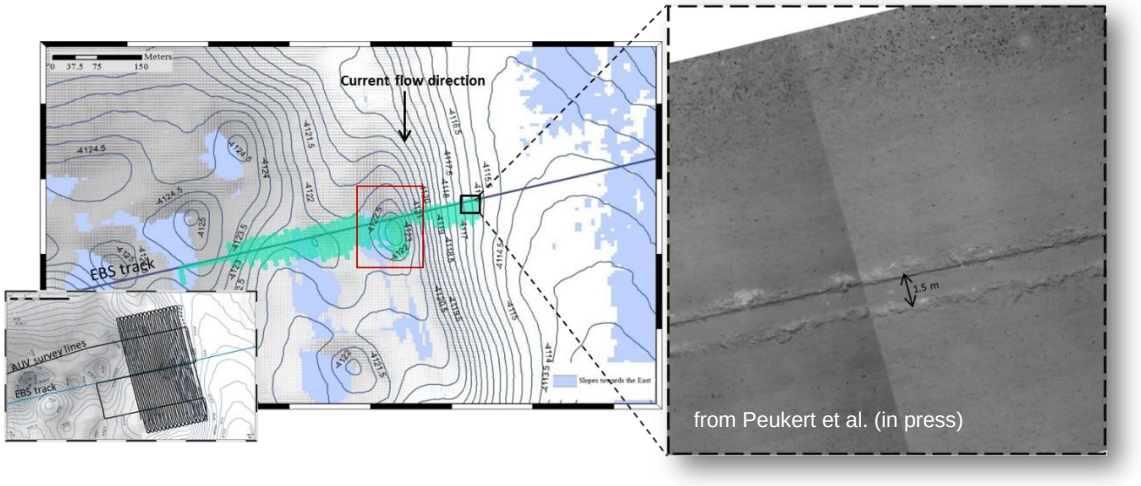
To verify these empirical results we deployed our video sledge and mapped the area of the 2015 EBS track again. Resettled sediments on nodules were only found in the immediate vicinity of the track (see photo mosaic), whereas the nodules were free of such sediment “blanketing” a few decimeters away from the track. This observation suggests that a sediment layer of a few millimeters to centimeters thickness, such as that potentially produced by a future deep-sea mining activity, may resuspend and be transported away in due time. Such resuspension could be caused by oceanic eddies with diameters of about 100 kilometers, that form several times a year at the coast of Mexico and slowly move westward to eventually pass over the German license area. For a few days to weeks, the current velocities in the bottom waters increase from 3 cm/s on average to up to 12 cm/s and once again whirl up the resettled sediments.

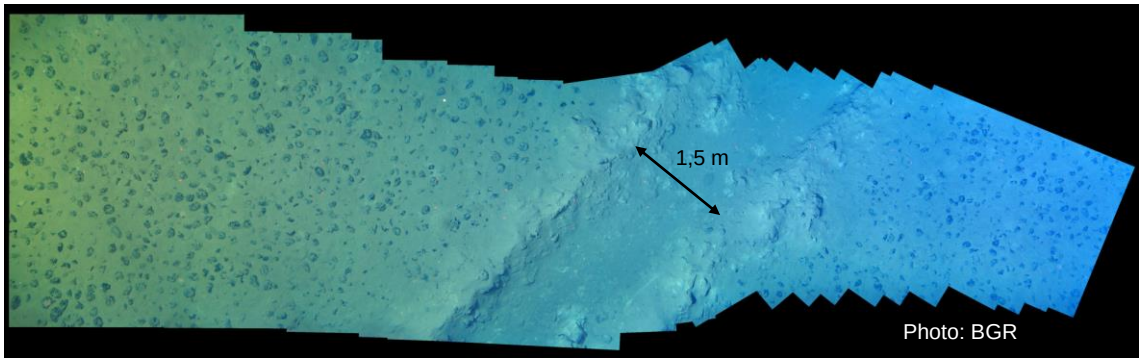
The biological sampling in the "Impact Reference Zone" with an epibenthic sledge and a multicorer that followed the video sledge deployment was also very successful. With these samples we were able to continue a biodiversity time series that has been carried out on a yearly basis between 2013 and 2016. We now have a unique data set within the manganese nodule belt covering five years in total. Furthermore, our efforts to recover a manganese nodule mass sample have finally been successful. After the modest quantities that we had initially retrieved, we equipped the dredge with a second net to reduce the mesh size and in addition adapted our dredging technique. That way we could recover another ten tons of nodules in

nine dredge hauls between Wednesday and Saturday. In total, we could store away 11.5 tons for future metallurgical experiments at pilot plant scale. With these nodules, the zero-waste approach for the recovery of metals from nodules will be advanced to a higher level in 2019.

With best regard from the RV SONNE,
Carsten Rühlemann







Upper left: Recovery of video sledge after deployment in 4100 meters of water depth. Upper right: "Mission accomplished", Annemiek Vink standing on 1.1 tons of nodules from the last dredge haul. Middle, left: EBS tow (blue line) carried out in 2015; the nodule area covered by resettled sediment is shown in green. Middle, right: Photo mosaic of the EBS track (Peukert et al., in press). Below: Recent photo mosaic of the same EBS track compiled by H. Wedemeyer. Nodules close to the track of the sledge were covered by a thin sediment layer three years ago but are free of sediment today.