

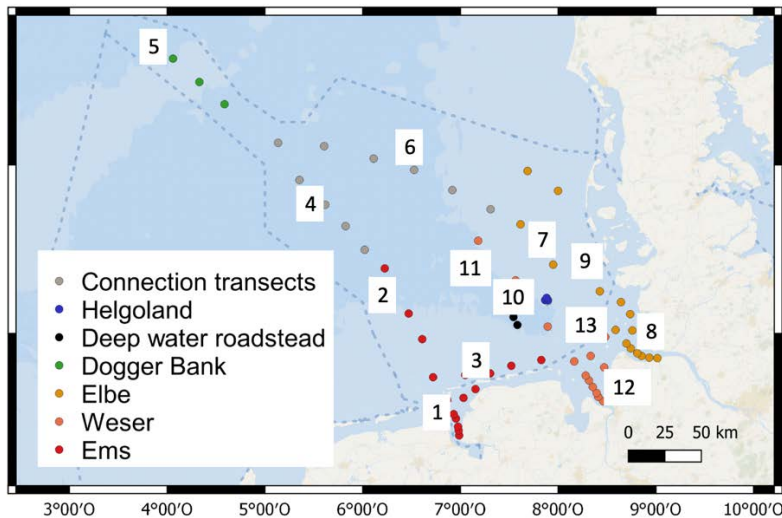


FS Meteor
Expedition M169
(GPF 20-3_091)
11.12.2020 (Emden)
– 29.12.2020 Emden



M169, 1. Weekly Report 11.12.-13.12.2020

Research cruise M169 with RV will cover the river estuaries of Ems, Weser and Elbe and the North Sea to study anthropogenic inputs of emerging, critical metal contaminants such as rare earths, scandium, gallium, germanium, platinum, zirconium, titanium, molybdenum, and vanadium from the rivers into the ocean. These metals are largely introduced into the environment from modern technologies such as renewable energies as well as medicinal applications. However, up to now only very few studies on these processes and potential consequences are available. Via the rivers these substances reach the coastal areas and finally the sea, with significant modifications of the elemental fluxes by physical and chemical processes taking place during mixing of freshwater and seawater in the estuaries. Additionally, the microbial communities of the water bodies interact with the introduced substances, e.g. by accumulating the trace metals, and some can even develop resistances against certain metals. Using the hundreds of water samples collected from the rivers, estuaries and the southern North Sea we will conduct geochemical and microbiological analyses and experiments that will deliver a good data base for the assessment of the potential impact that these emerging metal compounds may have.



Overview map of the working areas of cruise M169 showing the different sampling areas in the rivers, estuaries and the German EEZ of the North Sea. The colored dots mark the tentatively planned sampling stations for CTD and water sampler deployments, and the numbers indicate the planned order of the working areas.

(Map made by Sophie Paul)

Our team consists of 14 members of the trace element geochemistry and microbiology research areas of Jacobs University Bremen and two colleagues of the Federal Institute for Geosciences and Natural Resources BGR in Hanover. After three days in a corona camp during which we were well served in a hotel in Leer, we were looking forward to finally reach the port of Emden on 10.12.2020, together with the newly boarding crew members. Here the crew that had remained onboard after the last cruise was already expecting us. As we had less than 24 hours time until sailing and the first sampling in the Ems River was planned already shortly afterwards, all aluminum boxes with our equipment had to be distributed into the labs and the sampling and filtration tools had to be set up immediately. The next morning after the safety drill we continued the preparations. Sailing began at noon on the 11th under good weather conditions which allowed us to have a short break on deck before the sampling program that started shortly afterwards.

We had to learn rather quickly, however, that the selection of the sampling locations in the rivers had to meet many boundary conditions, and so it took us, with the help of the river pilot, a while to find an appropriate site where the vessel could remain in place for the first CTD station. Luckily, we also have a land-bound team that sampled the pure river endmembers from land, as our first sample from the Ems River had already significantly more than 50% of seawater in it. Several more stations on our way towards the North Sea followed. Small problems, typical at the beginning of most research cruises, could be solved quickly and in a cooperative and competent manner by the energetic science team and especially the crew members from the different sections.



Photo left: CTD-rosette water sampler, our main working tool; center: David Ernst and Dennis Krämer prepare the CTD for the next deployment; right: The trace-metal clean GoFlo bottles in the lab for extraction of the water samples. (Photos by Adrienne Hollister (left, right) and Franziska Klimpel (center))

In addition to the ship-owned CTD-rosette sampler with standard Niskin bottles we also use special trace-metal clean GoFlo bottles on a Kevlar wire to guarantee contamination-free sampling for trace metal analysis. As soon as the device is on deck, the sample bottles are brought to the ship's labs and the samples extracted and filtered with different filtrations steps before they are preserved for later analysis in the home lab. The microbiological work largely focuses on the solid material collected on filters.

So far, we have completed the Ems River and estuary profile (profile 1 in the map), part of the northern extension (profile 2), as well as the river plume being pushed towards the East along the coast (profile 3), although the coordinates of our sampling tracks and points continue to be influenced by the restricted access in areas with seafloor cables, offshore windparks, shipping lanes and other regulations in the North Sea. As the North Sea is a rather unusual cruise area for RV Meteor, all onboard collect new experiences every day. Nevertheless, a certain routine has already arisen after three days, due to the high professionalism of all participants.

We are documenting our cruise by daily entries in a blog and look forward to interested readers following our trip:

<https://www.jacobs-university.de/blog-forschungsfahrt-m169> (German)

<https://www.jacobs-university.de/blog-post-m169> (English)

Everyone onboard feels comfortable and sends best wishes!

Andrea Koschinsky (chief scientist M169, Jacobs University Bremen) and the team of M169