

IOW Press Release of May 29, 2012

Research vessel METEOR is in the Baltic Sea

The 87th expedition of the METEOR, under scientific leadership of the IOW, is heading to one of the largest brackish water seas on Earth. The two-month crossing of the Baltic Sea will include three calls at the Hanseatic city of Rostock. The study carried out by the IOW's scientists will focus on a summer bloom of blue-green algae and the effects of the thawing permafrost on microbial life in the Baltic Sea.

In its 26 years in the service of the Federal Republic of Germany, the METEOR has ferried its passengers across the Atlantic Ocean, from Cape Town to Tromsø, and over the Mediterranean, the Black Sea, and the Indian Ocean. Now the 97.5-meter-long research vessel is returning to its home waters of the Baltic, where its career began a quarter century ago, with the launch in Travemünde.

When on 29 May the METEOR departs from the Norwegian town of Stavanger towards Skagerrak, two legs of its 87th voyage will have been completed: beginning with its departure in Lisbon to its first docking in the city of Reykjavik, and then on to Stavanger. In Norway, the METEOR will meet the IOW researchers who will take over the scientific helm, making full use of the 20 on-board labs for the next two months.

Under the guidance of Dr. Matthias Labrenz, the ship will first sail almost the entire length of the Baltic Sea, from Skagerrak to the Gulf of Bothnia. "On this route, we want to document the shifts in bacterial communities along the rapidly decreasing salinity gradient," says Matthias Labrenz. In general, bacteria play a central role in the nutrient cycle of the Baltic Sea. Knowledge of their distribution and activity is therefore of fundamental importance in understanding the system as a whole. During the excursion, the scientists will regularly collect water samples, analyzing them for microbial life. "Among the various tools, we will use our in-house developed pumping system, the AFIS," said Labrenz. Unlike a conventional CTD rosette, the AFIS automatically allows the water samples to be fixed inside the sample bottle already at the sampling depth. This preserves the sampled organisms' pattern of gene activity, preventing further alterations when they are hauled on board.

"As a result of global warming, thawing of the permafrost has increased in the polar regions and tundra," said Labrenz. "This, in turn, has caused the release of large amounts of largely non-biodegradable organic compounds, which, for example, are transported to the Baltic Sea from as far as the northern Swedish river Kalixälven." Bacterial activity then determines the fate of these compounds: If they are targets of bacterial degradation, their carbon ends up in the atmosphere and can thus influence the climate. If the compounds are ignored by the bacteria, they are either deposited in the



sediments of the Baltic Sea or washed into the North Sea. To test how the bacteria handle the compounds, the IOW scientists will mix frozen, stored river water from northern Sweden with water from the Baltic Sea and then analyze the microbial response.

On 11 June, the METEOR will dock in Rostock, exchanging some of its crew before setting off on the next leg. Professor Dr. Klaus Jürgens will take over as the chief scientist, overseeing the journey into the Gotland Basin, in the central Baltic Sea. At greater depths, this inland sea is often deficient in oxygen. The result is the buildup of poisonous sulfide, which kills fish eggs, larvae, and other multicellular life. Only bacteria are able to survive under these toxic conditions and degrade the sulfide. In an interdisciplinary collaboration, physicists and microbiologists will investigate, for the first time, the extent to which microbially driven processes are stimulated in the water column by influxes and mixing. In addition to the free water column, surface sediments will be sampled using so-called multicorers and boxcorers in order to analyze their microbial communities.

The METEOR returns to Rostock on 26 June, in order to prepare for the final leg of the journey. Under scientific leadership of Professor Dr. Gregor Rehder, the ship will set off again to the central Baltic Sea, to investigate the course of a summer bloom of blue-green algae. The bloom significantly contributes to the oxygen deficiency in the central Baltic Sea, as the algae fall in large quantities to great depths, where they are degraded by oxygen-dependent microbial processes. In addition, dense carpets of blue-green algae are regularly driven to the coasts of Sweden, where, for example, they negatively impact regional tourism. Despite extensive research, the exact conditions that determine the start, end, and intensity of such blooms, the factors that limit their growth, and the change in the budgets of the involved nutrients remain unclear.

"The last part of this expedition will include a two-ship experiment," explains Gregor Rehder. "The IOW research vessel Elisabeth Mann Borgese will accompany the METEOR and in the same study area will examine the turbulent mixing processes that take place in the water." The IOW ship will circle the METEOR, casting out a sensor network, called a CTD chain, that provides a 3-dimensional picture of the flow structure within the water column. The focus is on the question whether nutrients in the surface vicinity eventually mix with the blue-green algae blooms and thus affect the growth of these unicellular organisms. On board the METEOR, at a fixed station, the nutrient concentrations at different water depths, the composition of the biological communities, and their carbon and nitrogen turnover will be determined. In addition, a previously released sediment trap will be retrieved for later analysis. "In the end, accurate records of the nutrient balance of the bloom will be obtained. What was the concentration of nutrients before the bloom? How are they transported through the system as part of the biomass? What percentage of these nutrients will, through degradation processes, be released back into the water?" asks Gregor Rehder. These data are extremely important for Baltic Sea ecosystem models, as they provide the only approach to reliably predict the future development of the Baltic Sea.



Finally, on 23 July, the METEOR will return to Rostock for the last time this year, thus ending its 87th expedition.

Contact address:

Barbara Hentzsch, 0381 / 5197 102, Public Relation, IOW

Nils Ehrenberg, 0381 / 5197 106, Public Relation, IOW

The IOW is a member of the Leibniz Association, which currently includes 87 research institutes and a scientific infrastructure for research. The Leibniz Institutes' fields range from the natural sciences, engineering and environmental sciences, business, social sciences and space sciences to the humanities. Federal and state governments together support the Institute. In total, the Leibniz Institute has 16 800 employees, of which approximately are 7,800 scientists, and of those 3300 young scientists. The total budget of the Institute is more than 1.4 billion Euros. Third-party funds amount to approximately € 330 million per year. (www.leibniz-gemeinschaft.de)

