Press Release

SFB 754

GEOMAR
Helmholtz Centre for Ocean Research Kiel

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Rare Traces of a Volatile Gas

New measurement technology helps to determine NO concentrations in the ocean

24 January 2018 / Kiel. **The gas nitrogen monoxide (NO) belongs to the group of nitrogen oxides which are infamous as toxic emissions in urban agglomerations. But NO is also produced in nature and plays a role in the nitrogen cycle, which is essential for most organisms. However, from earth's largest ecosystem, the ocean, we have hardly any NO measurements so far. Researchers from the GEOMAR Helmholtz Centre for Ocean Research Kiel and the Collaborative Research Center (SFB) 754 now have published new NO concentration data from the eastern tropical South Pacific Ocean in the international journal *Deep-Sea Research Part II*, for which a newly developed measuring method was used for the first time.**

Nitrogen oxides — i.e. nitrogen compounds with varying amounts of oxygen — have a very bad reputation. They are produced among other things by burning fossil fuels. In regions with heavy traffic and a lot of industry, they occur in high concentrations and are made responsible for a large number of diseases of the respiratory system. However, nitrogen oxides also occur in nature. There they play an important role in the nitrogen cycle, which ensures that nitrogen, essential for life, is available in forms that the organisms can process.

One of these nitrogen oxides is nitrogen monoxide (NO). Where it is produced in nature and in which quantities is hardly known. It is very volatile and reacts quickly with other substances. Therefore, NO is difficult to measure, especially in the world's largest ecosystem, the ocean. In the past few years, researchers at the GEOMAR Helmholtz Centre for Ocean Research Kiel have developed a new measurement method and used them during an expedition of the Collaborative Research Center (SFB) 754 "Climate-Biogeochemical Interactions in the Tropical Ocean" in the eastern tropical South Pacific Ocean. Now, they have published the first results in the international journal *Deep-Sea Research Part II*. "We have been able to demonstrate a clear link between low oxygen concentrations and the production of NO," says Hannah Lutterbeck, first author of the study.

The new NO-data set is the first since 30 years. "There have been some attempts to measure oceanic NO in the 1980s, but the procedure was extremely complex and resulted in comparatively few data points," explains co-author Prof. Dr. Hermann Bange from GEOMAR. Since then, research has hardly dealt with the topic of NO in seawater — until Hannah Lutterbeck has taken up the topic again for her PhD thesis.

The special trick of the new method: Water samples are pumped from the depth directly on board and analyzed immediately. "Only by means of quick processing directly on board the research vessel, we have obtained good results. If the water samples are stored for only a few minutes before analysis, the results can already be distorted," explains Hannah Lutterbeck, who now works at the State Office for Agriculture, Environment and Rural Areas of Schleswig-Holstein.

The expedition, in which the new method has proven itself, was conducted in February and March 2013 in a region off the coast of Peru, where very low oxygen concentrations already occur at 30-50 meters depth. The SFB 754 funded by the German Science Foundation and hosted by Kiel

University and the GEOMAR investigates these oxygen minimum zones and their development. “It's not just a question of whether oxygen depletion in the ocean is increasing, but also how it affects other processes, such as nitrogen and nutrient supply in the ocean,” explains Professor Bange.

The new method of measurement allows marine researchers to add another piece to the puzzle of the many chemical, physical and biological processes in the oxygen minimum zones. “The more details we know, the sooner we understand the phenomenon in its entirety,” says Hermann Bange.

Background information: The SFB 754
The Collaborative Research Center 754 (SFB 754) “Climate and Biogeochemical Interactions in the Tropical Ocean" was established in January 2008 as a cooperation between the Kiel University, the GEOMAR Helmholtz Center for Ocean Research Kiel and the Max Planck Institute for Marine Microbiology (Bremen). The SFB 754 investigates the changes in ocean oxygen content, their potential impact on the oxygen minimum zones and the consequences on the global interaction of climate and biogeochemistry of the tropical ocean. The SFB 754 is funded by the German Research Foundation (DFG) and is in third phase (2016-2019).

Links:
www.geomar.de GEOMAR Helmholtz Centre for Ocean Research Kiel

Images:
At www.geomar.de/n5700-e images are available for download.

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