Geophysical Research Abstracts
Vol. 19, EGU2017-13622, 2017
EGU General Assembly 2017

Effects of the 2014 Major Baltic Inflow on methane dynamics in the water column of the Central Baltic Sea

Jukka-Pekka Myllykangas (1), Tom Jilbert (1), Gunnar Jakobs (2), Gregor Rehder (3), and Susanna Hietanen (1)

(1) Department of Environmental Sciences, University of Helsinki, Helsinki, Finland, (2) Technical University of Denmark, Roskilde, Denmark, (3) Leibniz Institute for Baltic Sea Research Warnemünde (IOW), Rostock, Germany

The Baltic Sea is a brackish water body which exhibits strong salinity stratification between its almost fresh surface and the comparatively high salinity deep waters. Due to this stratification, the sub-halocline deep waters are insulated from the surface and are typically anoxic and contain large amounts of methane. Deep water renewal occurs predominantly by irregular inflow phenomena, during which specific meteorological conditions cause large amounts of oxic and highly saline North Sea water to enter the Baltic via the Danish straits. In late 2014, the third largest inflow ever recorded entered the Baltic Sea and caused considerable changes in the southern and central Baltic water column oxygen conditions and consequently also in the deep-water methane pool. We studied these changes during 2015 on six cruises spanning between March and December.

Following the inflow, methane that had previously accumulated in the stagnant deep waters was largely removed over a period of several months. Based on methane oxidation rate measurements, stable isotope data and comparisons to changes in corresponding phosphate inventories, we show strong evidence that most of the methane removal observed was due microbial oxidation. The intruding water masses interacted with the old stagnant water masses, creating complex redox environments, which seemed ideal for microbial oxidation of methane. However, a considerable amount of methane was also removed by physical displacement to other parts of the Baltic Sea, the relative importance of these two process changing over time. By the end of 2015, the deep waters were turning anoxic again and methane started accumulating, indicating that the ability of the inflow to ventilate the Baltic Sea was relatively short-lived.