Geophysical Research Abstracts
Vol. 21, EGU2019-5429, 2019
EGU General Assembly 2019

Role of the sediments in functioning of the Baltic Sea ecosystem

Monika Lengier (1), Beata Szymczycha (1), Karol Kuliński (1), Aleksandra Brodecka-Goluch (2), Żaneta Kłostowska (1,2)

(1) Institute of Oceanology Polish Academy of Sciences, Marine Chemistry and Biochemistry Department, Sopot, Poland , (2) Institute of Oceanography, Division of Marine Chemistry and Environmental Protection, University of Gdańsk, Poland

The main sources of organic matter in the Baltic Sea are river run-off and primary production induced by high input of nutrients from anthropogenic sources. Organic matter is gradually transported towards deeper parts of the sea, where it is finally deposited to the bottom sediments. Due to high amounts of organic matter and relatively small depths of the Baltic Sea, its remineralisation and hydrolysis occur to large extent in the sediments. The dissolved products of these processes namely: dissolved carbon (DIC + DOC), nitrogen and phosphorus (nutrients) can be released to the water column. Thus, as a result these compounds can intensify primary production and influence quality of the seawater. Studies concerning return fluxes of carbon and nutrients have been intensively performed in many places worldwide, including the region of the Baltic Sea. Nevertheless, obtained results mostly describe single sites. Moreover, there are many different, not unified methods of collecting sediments and interstitial water samples and also different mathematical approaches used in quantification return fluxes.
The aim of this study was assessment of return fluxes of dissolved organic and inorganic carbon (DOC, DIC) and nutrients (NH4+ and PO43-). Physicochemical conditions (temperature, O_2 concentration) and sediments properties were taken into consideration as parameters impacting the diffusive fluxes. The study area encompassed the Baltic Proper and the Bothnian Bay, including important depositional areas: the Gdańsk, Bornholm and Gotland Deeps. The calculations were conducted by means of the First Fick's Law of Diffusion. Part of the study was dedicated for a discussion on sensitivity of different methods applied for determination of a concentration gradient between sediments and overlaying waters (dc/dx).
DIC, DOC, NH4+ and PO43- fluxes, being a direct consequence of organic matter remineralisation, hydrolysis and solute mobilization to the interstitial water, were in general directed from the sediment to the overlying water. Within the whole investigated area DIC fluxes ranged from 0.06 to 0.57 mmol·m-2·d-1, DOC from -0.04 to 0.47 mmol·m-2·d-1, NH4+ from -28.9 to 241.52 μmol·m-2·d-1 and PO43- from -4.2 to 40.1 μmol·m-2·d-1.
Obtained data indicate that sediments are an important source of carbon, nitrogen and phosphorus within most of the investigated regions in the Baltic Sea. This fact together with the limited exchange of water with the open ocean cause that the Baltic Sea responses slowly to the nutrient loads reduction observed in the recent years. Hence, an appropriate quantification of fluxes of major chemical constituents from sediments is crucial for understanding the functioning of the Baltic Sea ecosystem.