Bioavailability and remineralization of sediment-derived dissolved organic carbon from the Baltic Sea depositional area

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The coastal and marginal seas, such as the Baltic Sea, act like a link between land, open ocean and the atmosphere, thus play an important role in the global carbon cycling. Eutrophication of the Baltic Sea and high loads of terrestrial organic matter lead to high sedimentation rates, especially in the depositional areas. The organic matter-rich sediments in the Baltic Sea have been recognized as an important source of dissolved organic carbon (DOC). The high loads of DOC released from sediments may influence the microbial loop and thus alter processes occurring in the water column, which consequently may lead to extension of anoxic zones. However, still little is known about the fate of sediment-derived DOC.

Our study aim at assessing bioavailability, remineralization rate constans and half-life times of DOC released from the Baltic Sea sediments. Although, the study was performed in the Gdańsk Deep, it has a universal character with the ability to be conducted for other depositional areas in the shelf seas and coastal regions, while the obtained data could be of use for the biogeochemical models.

To quantify the DOC remineralization the incubation experiment and the first order kinetics were used. During the incubation period pore water DOC concentration decreased from 1408 to 850 μmol l^{-1}, which corresponds to almost 40% loss. Three different DOC fractions were defined: labile (DOC_L), semi-labile (DOC_{SL}) and refractory (DOC_R). DOC_L and DOC_{SL} are considered to be the bioavailable pool of DOC (DOC_B) and in this study, it amounted to 54%. DOC_L remineralization rate constant equaled 0.0958 d^{-1}, while half-life time was 7.24 d. DOC_{SL} remineralization rate constant amounted to 0.0082 d^{-1}, while half-life time was 84.53 d.

The obtained results indicated that about half of sediment-derived DOC is bioavailable. This gives a new insight on the Baltic Sea carbon cycle and other shelf regions.

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