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Modeling the influence of biogeochemical and ecosystem processes on microplastic transport in the Arctic seas on the example of Oslofjord

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Currently, all natural environments, including the Arctic seas, are contaminated by microplastics (MP, plastic fragments less than 5 mm). Biogeochemical processes significantly affect the physical properties of MP, primarily its density due to biofouling.

The aim of this work is to develop a numerical model for assessing the fate of MP in the marine environment under the influence of natural biogeochemical cycles in the Arctic seas on the example of Oslofjord.

The biogeochemical model OxyDep (E. V. Yakushev et al., 2011) was used to reproduce the temporal variability of the phyto- and zooplankton, dissolved and particulate organic matter. The two-dimensional 2D benthic-pelagic transport model (2DBP), which considers the processes in the water column and bottom sediments together, is used as a hydrophysical model.

The separate module which describes the transformation of the MP under biogeochemical processes was developed. The biogeochemical and MP modules were coupled with the transport model using the Framework for Aquatic Biogeochemical Modeling (FABM) (Bruggeman & Bolding, 2014).

The results show, that there would be a decrease in the MP content in the surface layer in summer period due to the ingestion by zooplankton and its transfer to the sediments. Based on the obtained patterns, it is possible to predict zones of accumulation of MP for a specific water area, depending on the local ecosystem.

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