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Numerical modelling of the buoyant marine microplastics in the South-Eastern Baltic Sea

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Microplastics is a burning issue in the marine pollution science. Its sources, ways of propagation and final destiny pose a lot of questions to the modern oceanographers. Hence, a numerical model is an optimal tool for reconstruction of microplastics pathways and fate.
Within the MARBLE project (lamp.ocean.ru), a model of Lagrangian particles transport was developed. It was tested coupled with oceanographic transport fields from the operational oceanography product of Copernicus Marine Monitoring Environment Service. Our model deals with two major types of microplastics such as microfibres and buoyant spheroidal particles. We are currently working to increase the grid resolution by means of the NEMO regional configuration for the south-eastern Baltic Sea.
Several expeditions were organised to the three regions of the Baltic Sea (the Gotland, the Bornholm, and the Gdansk basins). Water samples from the surface and different water layers were collected, processed, and analysed by our team. A set of laboratory experiments was specifically designed to establish the settling velocity of particles of various shapes and densities.
The analysis in question provided us with the understanding necessary for the model to reproduce the large-scale dynamics of microfibres. In the simulation, particles were spreading from the shore to the deep sea, slowly sinking to the bottom, while decreasing in quantity due to conditional sedimentation.
Our model is expected to map out the microplastics life cycle and to account for its distribution patterns under the impact of wind and currents. For this purpose, we have already included the parameterization for the wind drag force applied to a particle. Initial results of numerical experiments seem to indicate the importance of proper implicit parameterization of the particle dynamics at the vertical solid boundary. Our suggested solutions to that problem will be presented at the EGU-2017.
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