EGU24-19544, updated on 27 Nov 2024
https://doi.org/10.5194/egusphere-egu24-19544
EGU General Assembly 2024

Plastics Affect the Ocean's Uptake of Atmospheric CO□ across the Marine Boundary Layer

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Microplastics can support biomass production by acting as substrates for microbial activity. This may imply potentially relevant effects for the sea-surface microlayer, the interface mediating air-sea gas exchange and where biological organic compounds can accumulate.

We tested this hypothesis by using six large scale mesocosms to simulate a future “high plastic ocean”. During the course of a 12-days experiment, we explored microbial organic matter dynamics in the sea-surface microlayer in the presence and absence of microplastics in the underlying water. We used as a reference a known number of polystyrene beads of 30 µm diameter and compared the three treatment mesocosms to an equal number of plastic-free control mesocosms.

The presence of microplastics represented a spur for microbial activity, and in the treated mesocosms biomass production was enhanced, leading to an increased concentration of organic compounds accumulating in the sea-surface microlayer. This initial boost in biological productivity led to a □3 % reduction of dissolved CO□ in the underlying water, which we could imagine potentially reversed once the degradation phase took off. Based on our results and on other recent studies, we will discuss potential interference of plastic with the composition of the sea-surface microlayer, with direct and indirect impacts on the uptake of CO□ and the marine carbon cycle.