Global microplastic emission and deposition fluxes at the ocean-atmosphere interface

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Abstract

While microplastic (MP) has recently been identified and recognized as a pollutant for the atmospheric environment, little is known about its actual emissions and concentrations in the atmosphere. In this work we follow a bottom-up approach to estimate the fluxes of MP at the ocean-atmosphere interface. We start with the ocean surface MP concentrations simulated by the the NEMO-PISCES (Nucleus for European Modelling of the Ocean, Pelagic Interaction Scheme for Carbon and Ecosystem Studies) general circulation model (Richon et al. 2022). Based on Grythe et al. 2014, we estimate the global sea spray MP emissions at 6-hourly resolution over a one-year period. The MP emission fluxes are then fed into the Lagrangian atmospheric dispersion model FLEXPART (Stohl et al., 2005, Pisso et al., 2019), driven with hourly ERA5 data at 0.5∘ horizontal resolution, to provide a global picture of the atmospheric cycle of the MP of marine origin. We discuss the main emission areas and their seasonal variability, the resulting atmospheric concentrations across the globe and the deposition fluxes on both land and ocean surfaces. Finally, we compare simulated fluxes and concentrations with existing observations of MP in the marine atmosphere.
References:

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