

A44D-08 - Global emissions of atmospheric microplastics revealed from inverse modelling

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Abstract

Since the first reports on the presence of plastic debris in the marine environment plastics have been steadily accumulating in the environment. The global production of plastics in 2019 reached 368 Mt, whereas 10% is believed to end into the sea every year. Although most plastics exist in the form of macroplastics (>5 mm), they have also appeared to fragment into microplastics (MPs, 1 μm to 5 mm) and nanoplastics (<1 μm). These forms become easily airborne, not only from the continents, but also from the surface of the ocean, and travel over long distances. Lately, they have been determined in remote regions such as the Alps and the Pyrenees, and from Antarctica to the high Arctic. Although the presence of MPs as a pollution source has started to be discussed extensively, the lack of a concrete determination methodology has prevented the exact identification of their sources. Recently, consistent fallout measurements of primary and secondary MPs from protected areas of the Western USA were made available. We make use of these measurements and combine them with atmospheric transport and Bayesian inverse modelling to calculate emissions of MPs and MFs (microfibers). We extrapolate these emissions at a global scale and discuss the first reported global emission dataset for MPs and MFs. We calculate a total annual emitted mass of MPs and MFs of 6.8 kt y^{-1} and 49 t y^{-1} in the Western USA, respectively.

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