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Global emission, atmospheric transport and deposition trends of microplastics originating from road traffic

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Since the first reports on the presence of plastic debris in the marine environment in the early 70s (1), plastics have been steadily accumulating in the environment. The global production of plastics in 2019 reached 368 Mt (from 311 Mt in 2014 and 225 Mt in 2004), with the largest portion produced in Asia (51%) (2), whereas 10% is believed to end into the sea every year (3). As a result, plastics have been confirmed today in several freshwater (4), and terrestrial (5) ecosystems; they fragment into microplastics (MPs, 1 μm to 5 mm) (6) and nanoplastics (<1μm) (7) via physical processes (8). MP present has been now confirmed from the Alps (9) and the Pyrenees (10), as far as Antarctica (11) and the high Arctic (9). Consequently, MPs have been found to affect coral reefs (12), marine (13) and terrestrial animals (14). Schwabl et al. (15) detected them in human stool, while a recent study by Ragusa et al. (16) reported that MPs were even found in all placental portions.

A smaller fraction of MPs originates from road traffic emissions (17). Kole et al. (18) reported global average emissions of tire wear particles (TWPs) of 0.81 kg year-1 per capita, about 6.1 million tonnes (~1.8% of total plastic production). Emissions of brake wear particles (BWPs) add another 0.5 million tonnes. TWPs and BWPs are produced via mechanical abrasion and corrosion (19). Here, we present global trends in emissions, transport and deposition of road MPs.

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