
Wet and dry deposition of airborne microplastics in urban background site in Helsinki

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Abstract

Urban environments are increasingly affected by microplastic and tire wear rubber pollution, which pose ecological and human health risks. Since the production of plastics is annually increasing and their applications are broadening, there are potentially myriad types of microplastics sources. Microplastics have been shown to spread in the environment via rivers, wastewater treatment plants, stormwaters, soils and atmosphere. Even though these pathways have been recognized and explored, the results are often not comparable partly due to the unharmonized methodology. In this study, the influence of sampling height and the repeatability of sampling are investigated.

Wet and dry deposition samples were collected as three parallel samplings at a height of 4 m (60.20288, 24.96125) and 15 m (60.20342, 24.96088) from ground level in Kumpula campus of University of Helsinki (N60.20, 24.96) that represents an urban background site. The 14-day samples were collected with in-house, plastic-free samplers (sampling area 20 cm in diameter) between April 8 and May 20, 2024. Air quality data and meteorological data including temperature, wind speed and direction, relative humidity and precipitation were continuously collected at the SMEAR III sampling station (60.20288, 24.96125). Samples were analyzed with a gas chromatography-mass spectrometer (GC-MS; Shimadzu QP2020NX) coupled with a microfurnace pyrolyzer (Py; Frontier Laboratories EGA-PY-3030D).

The vertical distribution of the mass concentrations of four plastics (polyethene, polypropene, polystyrene and polyethene terephthalate) and tire rubbers (styrene butadiene and natural rubber) will be presented. In addition, the deviations between the parallel samplings during different events (snowing, raining and dry period as well as varying pollen contents) will be discussed.

Keywords: Atmospheric fallout, microplastics, sampling, PyGCMS

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