
Lateral distribution of (micro)plastic particles in surface waters across the North Pacific Ocean

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Abstract

Plastic particles are emerging, ubiquitous contaminants and the pollution of the environment with plastic debris is considered a planetary boundary threat. Since the annually produced mass of plastic constantly grows and the increase in plastic waste in the environment exceeds mitigation measures, the amount of plastic particles in the environment is expected to rise further. There they may cause a variety of adverse ecological, economic and social effects. In the marine environment, plastic particles are impacted by mechanical, photochemical and biological weathering processes, which lead to the formation of smaller plastic particles. Floating plastic particles are transported by ocean currents and winds, leading to the formation of accumulation zones like the North Pacific Garbage Patch (NPGP) between California and Hawaii. So far, most studies have focused on these areas of concern or on coastal regions, whereas remote regions are challenging to access and less well studied. The aim of this study was to evaluate the lateral distribution of surface-floating plastic items, identify accumulation zones of plastic pollution and fill data gaps for plastic debris in less explored remote areas of the North Pacific Ocean. Samples were collected during research cruise SO268/3 on the German research Vessel Sonne between Vancouver and Singapore from May to July 2019. After a gentle, complex cleanup procedure, all potential plastic particles > 330 μm were analyzed using ATR-FT-IR or FT-IR imaging. We found a total number of 1,036 plastic particles along the cruise track. Their concentrations ranged from 12,000 to

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285,000 #/km². After correction for wind-induced vertical mixing these values increased to a range of 41,000 to 452,000 #/km². The lowest concentration of plastic litter was found in the most remote area and the highest concentrations in the area of the NPGP. A second hotspot of plastic pollution was identified in a marine protected area.

Keywords: microplastic, surface waters, Pacific Ocean, distribution, FT, IR