
Microplastic "Bathtub Ring" Effect on Beach

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Abstract

Plastics are one of the most widely used materials due to their versatility and great performance at low cost. The majority of plastic wastes end in landfills and our oceans, where they go through an array of weathering processes and eventually form microplastics i.e., small plastic particles with size < 5 mm. These microplastics (MPs) are detrimental to both land and marine ecosystems. To study MP type and concentration in beaches, this summer six high school students enrolled in Columbia Lamont-Doherty Earth Observatory's Secondary School Field Research Program collected high-tide and low-tide samples from 5 locations (3 in New York City and 2 in Puerto Rico) and various analytical approaches (e.g., Nile Red, Dissection Microscope, SEM, and XRF) were used. The goals of this study are to compare MP type and level between high tide and low tide locations and examine the possible impact of nearby pollution sources (e.g., sewage treatment plants and CSO). Our results showed a consistently higher level of MPs in the high tide samples than that in low tide samples. This phenomenon is presumably due to the deposition of resuspended MP from low-tide locations at high-tide locations during high-tide conditions, a "bathtub ring" effect. Based on this finding, future cleanup efforts could be prioritized in those high-tide zones. Other research is undergoing to determine the MP sources and the level of nanoplastics ($< 1 \mu\text{m}$).

Keywords: beach, microplastics, high tide, low tide, distribution

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