Geophysical Research Abstracts
Vol. 21, EGU2019-13739, 2019
EGU General Assembly 2019

Tracing microplastics in the Atlantic Ocean

Katsiaryna Pabortsava and Richard Lampitt
National Oceanography Centre, European Way, Southampton, UK (katsia@noc.ac.uk)

Understanding the risks posed by the presence of microplastics in the marine environment requires fundamental and robust knowledge of the exposure levels to this contaminant and the associated harms. However, these terms are poorly constrained for the open ocean which is largely undersampled for microplastics, especially for those in a smaller size range. The mass balance between plastic entering the ocean from land and the amounts found within remains open. With large uncertainties, we can account for at most 10% the total global plastic waste discarded into the ocean every year with <1% constituted by small plastic debris down to 300 μm in size floating in the surface waters. Answering the basic questions of what and where microplastics in the ocean are, how long they persist in this environment and where they go is critical to define the scale and impacts of microplastic pollution.

We quantified and characterised the abundance and, for the first time, the vertical distribution of microplastics down to 25 μm in size in the Atlantic Ocean on a passage of the Atlantic Meridional Transect cruise from the UK to the Falklands in 2016. Depth-resolved particle samples were collected in the top 300 m via in situ filtration following a strict contamination prevention control. Microplastics in the bulk particle mixture were identified and characterised for polymer type and size using the state-of-the-art Fourier Transform infrared imaging system.

Microplastics were present at all sampled stations and depths as polymer resins, synthetic fibres and additives. Our study is focused on polyethylene, polypropylene and polystyrene which were the most dominant non-fibre polymer groups in terms of numerical abundance and mass concentration, consistent with the trends in the global polymer-specific waste generation and disposal. All three polymer groups showed elevated abundance in the North Atlantic subtropical gyre (45°N-25°N) and in the Southern Subtropical Convergence Zone (40°S-55°S). Polyethylene microplastics were the most abundant and ubiquitously dispersed over the examined area and depth layer. The mass concentrations of polypropylene and polystyrene microplastics were up to several orders of magnitude lower compared to polyethylene. Their distribution with depth was also patchier suggesting different residence times of these polymers in the water column. The polymer-specific particle sizes also varied latitudinally and with depth. They were mostly in a range between 70 and 120 μm and rarely exceeded 600 μm.

Our depth-resolved data thus provide new insights on abundance and distribution of marine plastic debris in a lower micro-size range, which is unprecedented for marine microplastics studies. Our findings now also allow for more accurate estimates of the inventory of microplastics in the ocean, their source-to-sink budgets and environmental persistence, resolving to a degree the issue of ‘missing plastics’ in the ocean.