
Large-scale transport of Microplastics from the European waters to the Arctic

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Abstract

High concentrations of microplastic (MP) particles have been reported in the Arctic Ocean, but studies on the high-resolution lateral and vertical transport of MPs from the European waters to the Arctic are still scarce. The European-wide project FACTS (Fluxes and Fate of Microplastics in Northern European Waters), funded by JPI Oceans, aims to address the geographical transport of MP from temperate waters of the southern North Sea to the Arctic waters of the Barents Sea. Here, samples from different water compartments, including samples from the surface, subsurface, above and below the pycnocline, were successfully collected at 23 stations in the area of interest using an improved Neuston Catamaran, the COntinuos MicroPlastic Automatic Sampling System (COMPASS) and in situ pumps, respectively. Different types of FTIR microscopy and spectroscopy were applied to obtain information on MP abundance, polymer composition and size distribution. Preliminary results indicate that the abundance of small microplastics (SMPs, $< 300 \mu\text{m}$) varies considerably within the water column, with significantly higher abundances in the surface water compared to water collected above and below the pycnocline. Furthermore, the average abundance of SMPs in surface water samples was four orders of magnitude higher than the abundance of large microplastics ($> 300 \mu\text{m}$), and overall, SMPs $< 50 \mu\text{m}$ account for $> 80\%$ of all detected MPs. A total of 19 different polymers were detected in all samples, and no significant differences in polymer diversity were found in the water compartments, implying a relatively homogeneous distribution of MP particles in the water column. However, the predominant polymer differs among different sampling transects and water compartments. Further statistical analyses and modelling stimulations are still needed to help better explain the sources, transport, occurrence, and fate of SMPs in the northern marine waters.

Keywords: Microplastics, Large scale transport, FTIR spectroscopy

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