



A novel and fast application of SWIR imaging spectroscopy enables multi-temporal surveys for microplastic particles in an urban watercourse traversing Berlin

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An increasing number of recent studies identify rivers as important pathways for microplastic particles (MPP) to the oceans and thereby confirm the widespread assumption that a majority of marine MPP originate from land-based sources. Yet since the existing methods for MPP identification are accurate but very time-consuming, a detailed understanding of the underlying processes and dominant sources is difficult to obtain.

In this study, we tested a novel approach for the quick and semi-automated identification of MPP based on short-wave infrared (SWIR) imaging spectroscopy for environmental samples taken with a multitemporal survey concept. For this, we took volume-reduced surface water samples from transects at ten points along a major watercourse running through the South of Berlin, Germany, on six dates. After laboratory treatment, we filtered the samples onto glass-fiber filters, scanned them with an imaging spectrometer and analyzed them by image processing.

The presented novel method allows to count MPP, classify the plastic types and determine particle sizes. Particles larger than 450 μm can be identified at the present stage of development and a visual validation showed that the results are reliable after a correction of certain typical error types. Therefore, the method has the potential to accelerate microplastic identification by complementing FTIR and Raman microspectroscopy. Furthermore, we expect that technical advancements will allow lower detection limits and a higher grade of automatization in the near future.

The resulting MPP concentrations showed to be higher downstream of the urban area than upstream and after precipitation as compared to dry periods. We also assessed changes in MPP concentrations with respect to effluents of three major Berlin wastewater treatment plants discharging into the canal: an increase was only discernible for the wastewater treatment plant located furthest upstream though not for the other two.