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# Overview of the microlitter pollution in the coastal area of the north-eastern Tyrrhenian Sea (Italy): knowledge, innovative monitoring solutions and future perspectives

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Anthropogenic litter (AL) is globally recognized as a major challenge due to its multiple environmental, economic, social, political, and cultural implications. It is composed of various materials the most abundant being the plastic. AL is a threat especially in areas with high population densities; with this respect, coastal areas are considered main hotspots of AL pollution. The most abundant and potentially harmful fraction of AL is the microlitter (items < 5 mm) component.

In the last three years, several studies concerning microlitter pollution have been conducted in the coastal area of northern Latium (Northern Tyrrhenian Sea, Italy). These studies have provided important information on the quality and quantity of microlitter in different environmental matrices.

Microlitter components were classified according to the different shapes (fragments, films, filaments, and microspheres), sizes, colors, and types by visual sorting, optical and scanning electron (SEM) microscopy, while their typology was mainly addressed via spectroscopic (Raman and FTIR) and XRF (X-ray fluorescence) microanalysis.

Overall, microplastics (MPs) were found to be abundant in all analyzed samples. MPs abundances were comparable with data from the literature related to the same environmental matrices in the Mediterranean Sea and elsewhere. Coastal sediments showed the presence of particles produced by transport and industrial activities (aluminium silicate microspheres) which contributed 32% of the total microlitter content. Furthermore, coastal waters showed a higher concentration of microlitter items in the water column compared to surface waters.

To better investigate the microlitter distribution and fate in the coastal zone, the use of numerical models capable of simulating marine hydrodynamic conditions and predicting the pathways of AL

is of particular importance to properly evaluate the litter items trajectories and the presence of potential contamination hotspots. In this context the reliability of predictive models could be enhanced in the next future thanks to the use of new low cost-effective devices and autonomous survey technologies for the acquisition of real-time data with a greater spatial and temporal coverage. To better understand qualitative and quantitative variations of microlitter in coastal areas as well as their distribution, transport, and fate, environmental factors such as rainfall and flood events, which strongly influence the contributions from the continent to the sea and consequently the pollutants load, must be considered. Repeated long-term investigations and seasonal surveys of microlitter pollution could give important information to confirm the obtained results