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Microplastics in two contrasted rivers discharging into the Northwestern Mediterranean Sea

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Freshwater environments are exposed to microplastic (MP) pollution due to the use and discard of plastics on adjacent lands. Rivers are suspected to be a major transport pathway of MPs from terrestrial to marine ecosystems. Monitoring MP concentrations within rivers is therefore critical to assess hazards on freshwater ecosystems, but also to estimate MP fluxes from watersheds to coastal waters. However, only a few studies have investigated MP concentrations in rivers. To fill this gap, MPs (size < 5 mm) were collected on several occasions during a complete yearly cycle using a manta trawl (> 300 µm) at the surface of two contrasted rivers: the Rhône River, the largest source of freshwater and sediments into the Mediterranean Sea and a typical small Mediterranean coastal river, the Têt River. MP concentrations varied by two orders of magnitude for both rivers: from 0.01 to 0.66 mg.m⁻³ (mean = 0.13 ± 0.17 mg.m⁻³) for the Rhône River and from 0.02 to 3.41 mg.m⁻³ (mean = 0.87 ± 0.86 mg.m⁻³) for the Têt River, which was significantly more polluted (Wilcoxon test; p.value < 0.001). Fibers were the most abundant shape (95-85%), followed by fragments (10-2%). Foams, films and beads were less represented (< 2%). FTIR analysis indicates that fibers were mainly made of polyester (PES), fragments and films were mostly polyethylene (PE) and polypropylene (PP), while foams were essentially made of polystyrene (PS). Replicate sampling was performed on the Têt River that showed that the short-term temporal variability (hours) was as important as the seasonal variability (months). No clear trends were found for both rivers between MPs concentration and external factors such as local precipitations, water flow rates and total suspended matters, indicating complex or chaotic patterns of MP distribution within river waters and subsequent transport.

Keywords: microplastics, anthropogenic litter, rivers.

*Speaker