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# MICROPLASTICS SPATIOTEMPORAL DISTRIBUTION AND ABUNDANCE IN WATER AND SEDIMENTS FROM THE BAY OF MARSEILLE

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## Abstract

The Bay of Marseille (North-western Mediterranean Sea, France) is bordered by an over urbanised coastline and faces high anthropogenic pressure. We studied the spatiotemporal concentration of microplastics (MP) in surface waters and sediments during spring and autumn 2020 and 2021, at seven stations in the Bay. The locations are representative of contrasted environments regarding hydrodynamics and proximity with the urbanized areas. Microplastics were extracted and counted with an improved, ecological protocol from 27 surface water samples and 16 sediments samples.

We observed MP contamination with an average concentration of  $5.83 \pm 1.97$  MP.m<sup>-3</sup> in surface water and of  $865 \pm 63$  MP.kg dry sediment<sup>-1</sup> in sediments. Water concentration ranged from  $0.47 \pm 0.09$  MP.m<sup>-3</sup> to  $72.66 \pm 18.16$  MP.m<sup>-3</sup> and sediment concentration ranged from  $405 \pm 106$  MP.kg dry sediment<sup>-1</sup> to  $1490 \pm 127$  MP.kg dry sediment<sup>-1</sup>. The characterization of MP in water and sediment demonstrate the dominance of 1mm size elements, belonging mostly to fibre type.

Concentrations in water and sediments do not exhibit any spatial trend. Likewise, seasonal and interannual temporal variation is absent, except in spring 2020 with an abnormal high water microplastic concentration (in average  $22.47 \pm 8.85$  MP.m<sup>-3</sup>). We suggest that accumulation and transport of MP are mainly linked to meteorologic and hydrodynamic features of the Bay of Marseille (i.e., precipitations, wind regimes, intrusion of the Northern Current and Rhône’s plume,

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west swell). The hydrodynamical model MARS3D-RHOMA-ECO-3M was used to test the influence of these forcing on the MP concentration during the study period. While the Northern Current and the precipitations (and therefore runoff) seem to have no influence on the MP distribution, our study shows the influence of the north wind regime to favour MP dispersion outside the Bay and the influence of the Rhône plume's intrusion into the Bay and the south-east wind regime to promote MP accumulation.

**Keywords:** Microplastic, surface water, sediment, hydrodynamic