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Biogenic polymers aggregation drives the export and vertical dynamics of small microplastics in the North Atlantic Gyre

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One of the major knowledge gaps in the study of plastic pollution is the understanding of residence times of these anthropogenic particles once they reach our oceans. Observations report a mismatch between estimates of plastic loads from worldwide plastic production and mismanaged plastic waste and actual plastic concentration seen floating at the sea-surface. Surveys of the water column -from the surface to the deep sea- are rare. Most of the recent efforts have thus addressed this question with modeling approaches or laboratory experiments that individuate in biofouling an important factor for the removal efficiency of plastics at sea and a likely explanation for the “missing plastic”. For the first time, we provide *in-situ* measured fluxes and removal rates of microplastics using deployments of drifting sediment traps in the North Atlantic Gyre from 50 m down to 600 m depth. We identified and quantified plastic contents with two different analytical approaches, FTIR and Py-GC/MS to determine polymer mass and particle distribution over depth. From derived data, interaction with biogenic polymers and thus particles transfer from the surface to the deep ocean are reconstructed. These findings shed a light on important pathways that regulate microplastics fate in marine ecosystems, from possible harmful repercussions on marine biota to impacts on fundamentals elements cycles.