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Controls on microplastic flux mechanisms in a large river

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The majority of marine plastic pollution originates from land-based sources with the dominant transport agent being riverine. Despite many of the potential ecotoxicological consequences of plastics being well known, research has only just recently begun to explore the source to sink dynamics of plastics in the environment. Despite the widespread recognition that rivers dominate the global flux of plastics to the ocean, there is a key knowledge gap regarding the nature of the flux, the behaviour of microplastics (<5mm) in transport and its pathways from rivers into the ocean. Additionally, little is presently known about the role of biota in the transport of microplastics through processes such as biofilm formation and how this influences microplastic fate. This prevents progress in understanding microplastic fate and hotspot formation, as well as curtailing the evolution of effective mitigation and policy measures.

As part of the National Geographic Rivers of Plastic project, a combined-laboratory and field investigation was conducted. Fieldwork was undertaken in the Mekong River, one of the top global contributors to marine plastic pollution with an estimated 37,000 tonnes of plastic being discharged from the Mekong Delta each year. This flux is set to grow significantly in accordance with the projected population increase in the basin. The results presented herein outline a suite of laboratory experiments that explore the role of biofilms on the generation of microplastic flocs and the impact on buoyancy and settling velocities. Aligned fieldwork details the particulate flux and transport of microplastic, throughout the vertical velocity profile, across the river-delta-coast system, including the Tonle Sap Lake. The results also highlight potential areas of highest ecological risk related to the dispersal and distribution of microplastics. Finally, pilot data on the levels of microplastics within fish from the Mekong system are also quantified to explore the potential impact of biological uptake on the fate and sinks of plastics within the system.