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Understanding the physical and biological controls on microplastic transport in lakes.

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Microplastics (MPs) have been found ubiquitously in oceanic and terrestrial environments. As the production and consumption of plastic polymers increases the amount of plastic evading accepted disposal pathways and entering natural systems is also expected to increase. To date the focus of plastic and MP research in particular has been on the ocean, there has recently been a rapid increase in interest in MP levels and distribution in terrestrial systems. However, the focus of existing studies has mostly been on the quantification and distribution of MP contamination in the sediment or on the water column of rivers and lakes. The aim of this project is to investigate the fundamental physical and biological influences on the transport of microplastics (MPs) in lake systems. In particular, we will focus on an understanding of the migration and distribution of MPs, and a systematic investigation on transport and sedimentation of MP in the lake water column. Lab and field experiments are planned to investigate the behavior of different MPs polymers, shapes and sizes under different conditions and determine how this influence the MP transport.

The settling velocity of MPs in stationary water was measured in the laboratory using particle image velocimetry (PIV) which was then compared to manual timing of the sinking velocity. The trajectories of the settling MPs have also been tracked during weak turbulences. In addition, the results were compared with theoretical calculations.

To investigate microbial colonization and biofilm formation on the surface of MPs, samples were exposed on a natural lake environment for varying time periods. The colonization of MP surfaces by microorganisms and their excretion of extracellular polymeric substances (EPS) were examined by laser microscopic techniques and subsequently the effect of the microbiological colonization of settling velocity was determined. In this work we show that the transport of MP is complex, as it is influenced by plastic type, shape, and biological colonization as well as the hydrodynamic conditions in the lake water column.