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An experimental investigation of microplastic transport in fluvial systems

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Although a major part of marine microplastic (MP) pollution originates from rivers and streams, the mechanistic behavior of MP in fluvial systems is only poorly understood. MP enter fluvial systems from e.g. waste water treatment plant (WWTP) effluents, sewer overflows during heavy rain events, agricultural runoff, aerial input/atmospheric fallout, road runoff or via fragmentation of plastic litter. As part of this project we want to investigate the hydrodynamic transport mechanisms that control the behavior and re-distribution of MP in open channel flow and the streambed sediments. Hydrodynamic conditions in open channel flow are represented in an experimental flume environment. Different porous media materials (e.g. aqua beads, glass beads and sand) are used in the flume experiments to shape typical bed form structures such as riffle-pool sequences, ripples and dunes. The aim of this experimental setup is to create hydrodynamic flow conditions such as hydraulic jumps, low and high flow velocity environments for which the transport and sedimentation behavior of MP can be investigated under realistic conditions. Hydrodynamic flow conditions in the flume are characterized using a Laser-Doppler-Anemometry (LDA) and Particle Image Velocimetry (PIV). Detection and tracking of fluorescent MP-particles in open channel flow and in porous media will be achieved with a fluorescence-camera-system.