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Preliminary investigation of the transport of small plastic litter along a vegetated riverbank

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Plastics are widely used in consumer products, due to its low cost, low weight and high durability compared to other types of materials. Contamination of marine ecosystems due to plastics (including microplastics) is a challenge that has received a lot of attention due to the significant risks it poses for the environment and human health. Plastics find their way to the ocean from land via the river system. Studying and obtaining a better understanding of the mechanisms contributing to the fate of plastic litter is therefore important in proactively devising methods to reduce their quantity or produce designs to trap plastic pollutants and prevent them from entering the ocean through estuaries.
In this context, it is a common observation of hydraulic practitioners and field geomorphologists, that plastic litter can be trapped within riparian vegetation patches along streams or canals, which can be washed away in periods of high flows.
To this goal this study aims to use a series of purpose specific physical experiments to examine the mechanisms of dispersion of plastic litter along the water surface of a channel with simulated riparian vegetation. The set of experiments are conducted in a recirculating flume with rigid riverbank and riparian vegetation modeled by a large number of acrylic rods, placed on the top of the riverbank section. Six different sizes of pieces of Styrofoam are used to simulate plastic litter. These are released from different locations upstream and in the vicinity of the riparian vegetation for various configurations (linear, staggered and random) of characteristic solid density. The trajectory of the plastic litter is recorded with a camera offering a top view of the arrangement. From the analysis of this a variety of results are obtained including transport metrics (including transport velocity and time to trapping) and litter-trapping location. The relation between the size of the litter, the vegetation configuration and the traveling distance is summarized.