

Retaining macroplastic in riverbanks using air curtains and interaction with floating vegetation

Summary

Plastic waste and its management have recently become an environmental problem due to its fragmentation into macroplastic particles (MAP), particularly its irruption into aquatic environments, negatively affecting all organisms involved.

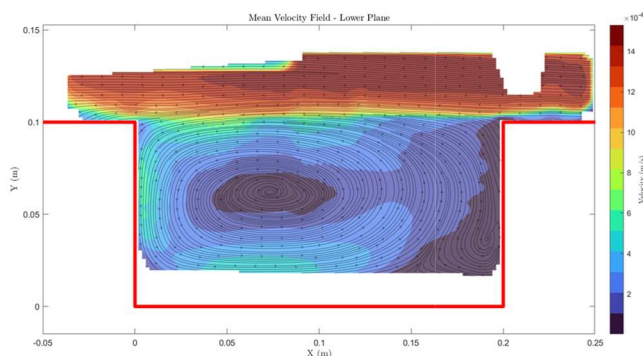
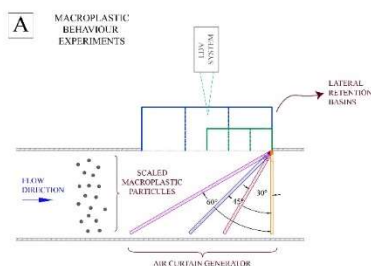
This study aimed to assess the potential for secondary currents induced by air curtains (AC) introduced transversally to the flow to drive MAP to lateral retention areas and to consider whether permanent retention is more likely. Experiments will be conducted in a 12.5m long, 0.40m wide, and 0.50m high flume. Lateral retention basins were made using a lateral opening on the flume, and W/L ratios of 0.3, 0.5, and 1 were tested, to determine the most appropriate conditions for the retention of MAP in the retention basins; brass pipes were used with 1/4" diameters and 0.50mm perforations spaced at 5mm intervals to produce the AC; in order to evaluate the AC driving potential, they will be arranged at angles of 0°, 30°, 45°, and 60°, transverse to the direction of water flow within the flume; to quantify the amount of MP retained in lateral retention areas, efficiency will be determined by comparing the amount of MAP collected in the lateral retention areas. Polystyrene pellets will be used as MAP; PIV, PTV, and LDV measurements will be performed to characterize the flow behavior.

The specific objectives are:

- I. Establish the state of the art of the subject of study.
- II. Identify and parameterize the relevant processes involved in the transport and retention of MAPs in rivers.
- III. Map the efficiency of retention to flow, air curtain, and basin parameters to provide recommendations for prototype scale basins.
- IV. Identify the proper nozzle vs. air discharge relationship that will allow for the most effective retention.
- V. Understand the interaction of MAP with floating vegetation.

Keywords

Plastic waste, air curtains, macroplastic, environmental impact, flow behaviour.



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