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Linking flow, vegetation and sediment deposition in low Reynolds number environments: laboratory experiments

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Low Reynolds number flows are typically of importance in wetlands (natural and constructed) and vegetated riparian zones of slowly moving water, where suspended particles are trapped and sediment deposition, affected by the presence of vegetation, takes place. The research reported here addresses the interaction between flow, transport, sediment deposition and emergent vegetation.

A series of laboratory flume experiments was conducted to study the governing processes under well defined conditions. Controls for sediment deposition were varied *ceteris paribus*, which included flow velocity, TSS inflow concentration and stem density. Artificial vegetation (cylindrical plastic rods of diameter 32 mm) was modelled after cattail (*Typha latifolia)*, a type of emergent vegetation frequent in (northern) European wetlands. In addition to baseline runs without vegetation, two different stem densities (13 and 49 m^{-2}) were studied. Flume width amounted to 1.50 m, with water depths of 0.20 m and 0.50 m resp. The model sediment was kaolin, with a known particle size distribution and a mean diameter of approximately 8 μm. Deposited sediment mass was determined at a number of predefined measuring points within the 'vegetation zone' of some 40 m length.

Distributions of flow velocities were found to be close to uniform both in vertical and transverse directions. In the experimental setup used the presence of plants did not typically increase settling rates, and higher plant densities tended to be associated with a decrease in deposited mass, which can be attributed to enhanced mixing by wake flow processes.

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