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# Effect of patchy vegetation canopies on turbidity currents: Hydrodynamics and sediment deposition

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### Abstract

Interactions between turbidity currents and aquatic vegetation canopies have landscape-scale consequences. It has been carried out a study focussed on comparing hydrodynamics and sediment deposition in continuous canopies with those in vegetation patches besides on the effects of varying water depth.

Twenty-five runs were carried out in a lock-exchange flume fully vegetated, and with shorter vegetation patches. Varying canopy frontal densities, a, and five water depths, H, were used. The currents' particulate load was characterised as a mix of fine and coarse fractions.

In all runs, the currents evolved through inertial (i.e. its frontal position, $x_c$, varies as $t^1$), drag-dominated (i.e. $x_c$ varies as $t^{1/2}$) and viscous regimes (i.e. $x_c$ varies as $t^{1/5}$). The transition position between the regimes in the fully-vegetated experiments varied linearly with aH for aH < 0.8, and were constant when aH > 0.8. Results suggest that variation at lower values of aH is caused by non-canopy drag forces becoming non-negligible compared to the canopy drag. It has been modelled, as a function of a and H, the size a vegetation patch needs to be for its effect on turbidity currents to be the same as that of a continuous canopy.

Sediment depositional flux rate for fine particles from the currents within the vegetation was found to be greater than that for coarse particles, by a factor of 1.57. This suggests that bed sediment deposited within canopy patches will be on average finer than that in gaps between patches, as has been found previously for currents and waves. Distances, over which the phenomena we document occur in typical inter-tidal and shallow sub-tidal contexts, are found to be of the same order of magnitude as sizes of patches of saltmarsh plants and seagrasses. Then the reported patch length effects are highly relevant to understanding eco-hydrological interactions in these contexts.

### Keywords

Turbidity current , Vegetation canopy , Patch length, Sedimentation