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A physical model of driftwood-rich braided rivers

M. Welber, W. Bertoldi, and M. Tubino
Department of Civil and Environmental Engineering, University of Trento, Trento, Italy

In riverine systems, strong links and feedbacks between driftwood dynamics and river morphodynamics and ecology have been observed. Wood influences fluvial dynamics by interacting with water flow, sediment transport and standing vegetation; conversely, its dispersal is governed by river morphology and flow regime. These interactions are especially intense in braided systems characterized by a high level of connectivity between the riparian forest and the active tract which may include vegetated islands. This study focuses on wood dispersal and sediment transport in braided systems and aims to investigate their governing factors and mutual feedback processes.
Physical modelling was performed in a 3x25 m laboratory facility located at the University of Trento, Italy. The flume was set up to reproduce typical discharges and slopes of natural gravel-bed braided rivers. To investigate the effect of log properties on wood dispersal, cylindrical wooden dowels of various sizes were used as surrogate logs. Cross-shaped bases were added to reproduce the effect of root boles. Wood input to the network under constant flow conditions produces consistent patterns of accumulations that highlight typical retentive sites. Moreover, floods were investigated as the main driver of wood and sediment transport. Rapid discharge pulses were simulated and both bed topography and wood deposits were surveyed before and after each event using digital imagery and laser profiler. Map analysis in a GIS framework shows clear links between scour and deposition areas and wood deposition and remobilization patterns.