

EGU21-14426

<https://doi.org/10.5194/egusphere-egu21-14426>

EGU General Assembly 2021

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Hydraulic roughness estimation in vegetated floodplains

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The continuous interaction between riparian vegetation and water has important effects on the hydraulics of a river, mainly onto the flood events propagation. Vegetation is a fundamental part of the river ecosystem, but its stage and growth need to be monitored and controlled, especially when the river passes through a densely urbanized area. In fact, vegetation obstructs the streamflow by reducing the hydraulic cross-section area and increasing the roughness of the floodplains and the relative flood risk.

In this study, experiments have been performed at the Fantoli Hydraulic Laboratory at Politecnico di Milano, to validate the methodologies that estimate the hydraulic roughness of vegetated river floodplains, starting from the vegetation properties such as size, density and elastic modulus of a case study. A model based on the mechanical properties of vegetation was used to identify the most suitable material to reproduce the dynamic behaviour of real vegetation on a laboratory scale. The tests were carried out for different spatial configurations of trees, densities and submerged conditions.

The analysis, in addition to relying on experimental work, involves the installation of six piezoresistive pressure sensors located both in the floodplains and in the main channel, to monitor head losses in a representative reach of the river under study. The field measurements allow validation of the approach used in laboratory tests.