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Vegetation roots and fluvial ecomorphodynamics: processes and related timescales

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The biological dynamics of riparian and riverbed vegetation has been recognized to play a fundamental role in fluvial ecomorphodynamics. Contrarily to terrain slopes, the role of vegetation roots in alluvial (non-cohesive) sediment is quite unexplored both at the field and laboratory scales. Hydrologic and biologic growth processes can interact at certain timescales and be determinant to the colonization and successive stabilization of alluvial bedforms. This influences the reworking return period (i.e. the magnitude of impacting floods) of islands and bars in the absence of vegetation and may lead to specific riverbed morphological features.

In this paper we first discuss how river hydrology may influence root tropisms and the related growing architecture at the field scale (Pasquale et al., 2012). Different root density vertical distributions can thus be determinant to uprooting and transport processes (Edmaier et al., 2011). Results from a number of laboratory experiments aimed at relating floods intertime and root growth timescales to uprooting statistics are then presented (Perona et al., 2012). We show the biomass selection mechanism operated by flow disturbances on riverbed vegetation, and discuss :i) the related impact that this process may have to select young vegetation in and among species (Crouzy and Perona, 2012; ii) two exemplary vegetation patterns that have been observed in rivers with converging boundaries and ephemeral streams. This study is a first step to better understand and model the sediment stabilization mechanism by vegetation roots in the equations of morphodynamics.

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