Geophysical Research Abstracts
Vol. 19, EGU2017-14261, 2017
EGU General Assembly 2017

Hydrologic control on the root growth of *Salix* cuttings at the laboratory scale

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Riparian plant roots contribute to the ecosystem functioning and, to a certain extent, also directly affect fluvial morphodynamics, e.g. by influencing sediment transport via mechanical stabilization and trapping. There is much both scientific and engineering interest in understanding the complex interactions among riparian vegetation and river processes. For example, to investigate plant resilience to uprooting by flow, one should quantify the probability that riparian plants may be uprooted during specific flooding event. Laboratory flume experiments are of some help to this regard, but are often limited to use grass (e.g., *Avena* and *Medicago sativa*) as vegetation replicate with a number of limitations due to fundamental scaling problems. Hence, the use of small-scale real plants grown undisturbed in the actual sediment and within a reasonable time frame would be particularly helpful to obtain more realistic flume experiments. The aim of this work is to develop and tune an experimental technique to control the growth of the root vertical density distribution of small-scale Salix cuttings of different sizes and lengths. This is obtained by controlling the position of the saturated water table in the sedimentary bed according to the sediment size distribution and the cutting length. Measurements in the rhizosphere are performed by scanning and analysing the whole below-ground biomass by means of the root analysis software WinRhizo, from which root morphology statistics and the empirical vertical density distribution are obtained. The model of Tron et al. (2015) for the vertical density distribution of the below-ground biomass is used to show that experimental conditions that allow to develop the desired root density distribution can be fairly well predicted. This augments enormously the flexibility and the applicability of the proposed methodology in view of using such plants for novel flow erosion experiments.

Tron, S., Perona, P., Gorla, L., Schwarz, M., Laio, F., and L. Ridolfi (2015). The signature of randomness in riparian plant root distributions. *Geophys. Res. Letts.*, **42**, 7098-7106