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Restored river corridors: first results on the effects of flow variability on vegetation cuttings survival rate and related root architecture

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Understanding and predicting the evolution of river alluvial bed forms toward a vegetated or a non-vegetated morphology have important implications for restored river corridors and the related ecosystem functioning (see also Schäppi et al, this session). Vegetation recruitment and growth on non-cohesive material of river corridors, such as gravel bars and islands of braided river, depend on the ability of roots to develop and anchor efficiently such to resist against flow erosion.
In this work, we study the interannual morphological evolution of a gravel bar island, the survival rate and the growth of a number of plots with different density and orientation of transplanted cuttings (Salix Alba), the space and time dynamics of which depend on erosion and deposition processes due to floods. Our purpose is to identify island locations where the hydrodynamic conditions are more suitable for plants germination, growth and survival in relation to the river hydrograph statistics. This information is a first step to build a stochastic model able to predict the future evolution and progress of the restoration action of the investigated river reach.
We focus at the main island of River Thur at Niederneunforn (Canton Thurgau, Switzerland), the restoration success of which is investigated from a mechanistic viewpoint in the research project "REstored CORridor Dynamics" (www.record.ethz.ch). Accordingly, we analyze two recent Digital Elevation Models (1 year difference), which were first corrected to account for the river bathymetry, and then we compare them in order to extract relevant interannual morphological changes. Using a two dimensional numerical hydrodynamic model we simulate several flow conditions ranging from the minimum recorded flow up to the one that completely inundates the island. Hence, we build inundation maps of the island that we associate to the frequency and the submergence duration of every area. We then correlate such results to the observed survival rate and the root characteristics of a sample of 1-year old transplanted cuttings.
Despite limited in number, the investigated sample suggests that roots are shot from different points of the cuttings, which seem to reflect their location on the island and the direction of major resistance to flow erosion, also in agreement with the inundation maps.