Geophysical Research Abstracts
Vol. 19, EGU2017-14291, 2017
EGU General Assembly 2017

Effect of hydrograph in the morphology of a channel with lateral cavities

Carmelo Juez, Matthias Thalmann, Anton J. Schleiss, and Mário J. Franca

École Polytechnique Fédérale de Lausanne, Laboratoire de Constructions Hydrauliques, EPFL-ENAC-IIC-LCH, Lausanne, Switzerland (carmelo.juez@epfl.ch)

Local widening or river bank revitalization in a channelized river is a common practice in restoration projects. The lateral embayments built for this purpose in the river banks can be partially filled up by fine sediments that are conveyed in suspension within the main reach. The embayments areas may present a suitable combination for riparian habitats if they have a limited amount of fine sediments trapped providing morphology diversity and areas with low and high velocities. However, the design of these lateral cavities may be compromised by fluctuations in the water discharge: an increase in the flow discharge may re-mobilize the sediments destroying the shelters for the aquatic biota and causing effects that may hamper the ecology of the main channel and downstream reaches (sudden increase of the sediment concentration and turbidity for instance). Aiming at a better design of lateral embayments with the purpose of restoration projects, systematic experimental investigations were carried out with five hydrographs with different unsteadiness, for five different normalized geometries of the cavities installed in the banks of a laboratory open channel. Water depth, sediment samples, sediment concentration and area covered by the settled sediments are analyzed in each experiment. Sediments patterns evolution within the cavities prior, during and after the increase in discharge were correlated with the unsteadiness character of each hydrograph. It is shown that cavities with larger aspect ratios (defined as the width of the cavity over the length of the cavity) provides a sustainable shelter for aquatic biota. Quantified analysis reveal that the recovery of the sediments patterns before the flushing is different depending on the geometry and unsteadiness. Finally, total mass trapped inside the cavities at the end of the experiments is analyzed. It is shown that the trapping efficiency of the macro-roughness elements with variable discharge is a clear function of the geometry of the lateral cavities and of the shallowness of the flow.

This work was funded by the ITN-Programme (Marie Curie Actions) of the European Union's Seventh Framework Programme FP7-PEOPLE-2013-ITN under REA grant agreement 607394-SEDITRANS. The experiments were funded by FOEN (Federal Office for the Environment, Switzerland).