Geophysical Research Abstracts
Vol. 19, EGU2017-6112, 2017
EGU General Assembly 2017

Long term numerical investigations of measures to increase the structural variability and the fish passability of the river Iller

Lydia Seitz, Stefan Haun, and Silke Wieprecht
University of Stuttgart, Institute for Modelling Hydraulic and Environmental Systems, Stuttgart, Germany

The river Iller origins at Oberstdorf in the Allgäu Alps and drains after 147 km into the river Danube. During the past decades the river Iller was considerable modified due to hydropower development and due to the construction of weirs and ramps to avoid ongoing river bed deepening. As consequence between km 52.9 - 39.3 almost equilibrium conditions of the river bed were reached. The aim of this study is to investigate with a 1D - 2D coupled numerical sediment transport model the long term effects (50 years) of different measures, which will be implemented to improve structural variability of the river Iller and to improve the passability for fishes. In a first step long term morphological trends will be investigated for replacing weirs by ramps. This will enable and improve the passability for fishes and sediments. In a second step the remobilization of already deposited sediments is investigated. Therefore the weir downstream of a gravel bar will be lowered stepwise (between 1.0 and 2.5 m) to see under which conditions the sediments can be remobilized. In a third step artificial sediment feeding will be simulated to find adequate spots for the sediment supply and to investigate the amount of sediments which have to be added to the river to improve structural variability of the river Iller.
The numerical model framework BASEMENT, developed at the ETH Zürich, is used for the investigations. In the model fractional sediment transport is implemented with 9 grain sizes between 0.5 mm and 128 mm. Two layers are implemented to simulate the armouring of the river bed. Due to absence of very fine sediments and the fact that bed load transport is the governing sediment transport mode the Meyer-Peter and Müller bed load transport formula, with an extension by Hunziker for multiple grain classes, is used for the simulations. The critical Shields parameter, used to obtain the critical shear stress in BASEMENT, is evaluated as a function of the dimensionless grain diameter accordingly to van Rijn.
The results show that the passability can be increased by replacing weirs by ramps (three in total) without negative morphological effects on this section. Furthermore, the simulated results show that the deposited sediments can be remobilized by lowering the weir, resulting in ongoing dynamic morphological bed changes and so a structural variability of the river. However, it can be seen that this dynamic processes fade away over time due to the large number of hydraulic structures along the river. The results of the artificial sediment supply (one time supply with an amount between 5,000 to 12,500 m^3) shows a similar trend as the lowering of the weir over time, where right at the beginning morphological bed changes can be seen, these processes decrease and even stop within a couple of years.