

Numerical modeling of the river revitalization measures within the framework of the Third Rhone correction in Martigny

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The third Rhone correction aims to increase flood protection while ensuring sustainable conditions for the Rhone river upstream the Geneva lake and its floodplain. Due to the high potential damages, the "Martigny Bend" was defined as a priority measure in securing Riddes-Martigny floodplain. A preliminary project suggests to significantly lower the water line of the Rhone river in order to reduce the risk of flooding in the Martigny area and to facilitate the return of water from the Riddes-Martigny floodplain to the main channel. The solution also consists of widening the bed of the Rhone and resumption of the existing confluences into the main channel.

The hydraulic study of the project at its first phase was carried out using a 1D model, without considering the sediment transport. If this method allowed to estimate the water lines and to choose the most appropriate for the Rhone correction, it is inadequate to understand and evaluate precisely the hydro-morphological dynamics on the entire project area. A hybrid study on physical model accompanied by a 2D numerical model integrating the whole area of the priority measure therefore appeared as a necessity (Fig. 1).

The physical model study was carried out by PL-LCH between 2017 and 2020 for which several scenarios with different return periods and characteristics were tested over the bend and the confluence region. The main objectives were the determination of water lines, estimation of the variety and dynamics of confluences and widenings from a morphological point of view and verification of the conservation of sediment transit. The 2D numerical model study was carried out using BASEMENT v2.8 software. The numerical model was first calibrated based on the obtained results from the physical model for a certain benchmark scenario. A whole series of scenarios were then tested on the numerical model, in order to verify and assess its capability to accurately predict the events, both from hydraulic and morphological points of view. Subsequently, the numerical model will be extended downstream over the entire priority measure in order to serve as a substitute for the physical model for the next steps of the "Martigny Bend Priority Measure" once the physical model has been decommissioned.

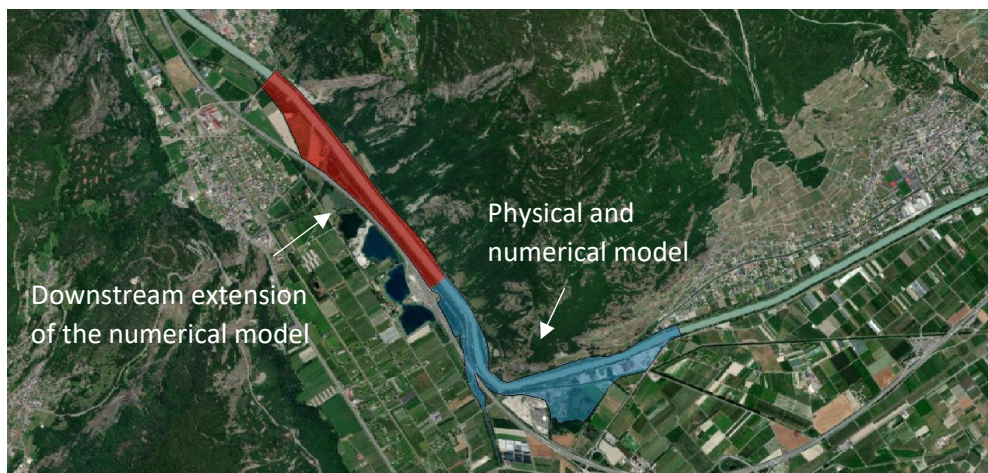


Fig.1 Physical and numerical model extension of the Martigny Bend Priority Measure