

Reconstruction of a stage-discharge relation for a damaged weir on the Cavaillon river, Haïti

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ABSTRACT

Haiti is probably one of the most exposed countries to dramatic floods and inundations due, among other, to intense deforestation. Haiti is also extremely poor in hydrologic and hydrographic data, as this is not considered as a priority in a context of frequent disasters. The ambition of the program sustained by the Belgian Cooperation Administration (ARES-CCD) is to create, through an exemplary watershed and river reach along the Cavaillon River, a simple and repeatable methodology for enhancing hydrologic data and designing flood protection procedures.

One of the required data is the discharge of the river. As a weir, located near the village Dory, represents the upstream limit of the studied reach, we have the opportunity to evaluate the Cavaillon discharge from a continuous water level measurement located 50 m upriver. Unfortunately this infrastructure is in very bad condition as time and recurrent floods have done their work and considerably degraded the initial weir profile (Figure 1).



Figure 1: Illustrations of the Dory weir

The aim of the presented work is to build a stage-discharge relation, considering that no data are available about the design and the construction of this weir and that the damages have the consequence that it is certainly not working in standard conditions. In situ survey, laboratory scale model and numerical modelling using the free Open Foam software are used to address the problem from complementary approaches.

To validate the numerical approach, a flow over a scaled model of a normal weir, 4 cm wide and 7.5 cm high (crest level) has been studied. Laboratory

measurements have been conducted by image analysis, allowing similar representations of the experimental observations and of the results obtained numerical modelling (Figure 2).

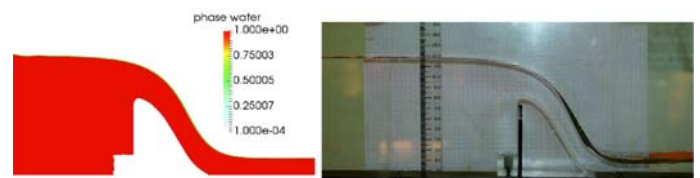


Figure 2: Scaled-model flow (right) and Open Foam simulation (left) related

In 2015, a dense geometrical survey was conducted in Dory (Joseph A., 2015), leading to the bathymetric data illustrated in Figure 3. The calibrated numerical model has been used to generate several flow scenarios on the spillway, considering its exact damaged geometry, in order to rebuild the local stage-discharge that could then be used as upstream boundary condition for the flow model.

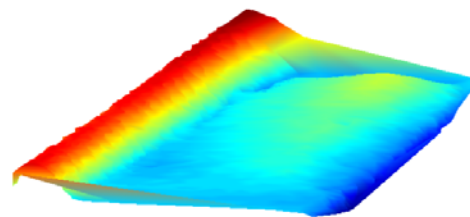


Figure 3: Dory weir model generated from in-situ survey

Discussions about the results and the developed methodologies, based on field measurements, scaled model work and Open Foam software simulations will be detailed in the presentation.

REFERENCES

- Bureau of Reclamation (1960). Design of small dams. A Water Resources Technical Publication. First Edition, 1960. Second Edition, 1973. Revised Reprint 1974
- Joseph A., Carlier d'Odeigne O., Zech Y., Gonomy N., Soares-Frazão S. (2015). Construction of one-dimensional model for the Cavaillon River, Haiti, from an in-situ survey of the bathymetry, e-proceedings of the 36th IAHR World Congress 28 June – 3 July, 2015, The Hague, the Netherlands