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Roughness and discharge uncertainty propagation in water level calculations :

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In hydraulics, water level simulations are necessary for variety of purposes, such as flood, hydraulic structures design etc. Knowledge of the uncertainty in flow depth estimation is crucial for risk assessment and hydraulic structures design. In hydraulics models, the sources of uncertainty are manifold : roughness coefficient, boundary conditions (discharge – geometry – data for calibration etc) .
In the present study, we will investigate the effect of two key uncertainty sources on water level simulations in 1D - 2D hydraulic models : the roughness coefficient and the discharge quantile, i.e. the flow rate corresponding to a given return period. A Monte-Carlo method is used to propagate the input uncertainty through the model in case of a real case study on a 50 km reach of the Garonne river. The difficulty with the crude Monte-Carlo method is due to the convergence, for instance the approximation of quantile could be time consuming. It will be illustrated on a real case of river that we propose for a benchmark.