



Hydraulic 1D modelling: a cost-and-benefit analysis for optimising topographical surveys

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1D hydraulic models are widely used in river engineering. Several reasons can explain the diffusion of 1D models (such as Mike 11, Hec-Ras), among these: (1) 1D models are simpler to use than higher dimensional models, (2) they require a minimum quantity of input data and (3) they are computationally efficient. Furthermore, in some cases a 1D approach may be very appropriate in predicting flood extent (see e.g. Horritt and Bates, *Journal of Hydrology*, 2002). Our study performs a cost-and-benefit analysis for evaluating the optimal number of cross sections to survey for inclusion in a 1D model. In particular, we evaluate the effect of varying the minimum distance between cross section on the accuracy of 1D models. We test the 1D model code HEC-RAS (U.S. Army Corps of Hydraulic Engineering) in a variety of river reaches (located in Italy and England) with different geomorphologic characteristics. The 1D model is calibrated for each selected survey resolution by using inundation data or downstream level observations and a preliminary parameterisation analysis is performed. Then, for each river reach and for each survey resolution we compare the efficiency of simulation results in terms of inundated area, velocity and water depth, assessing the detriment of model performance caused by a decrease of the survey resolution (i.e., survey costs).