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Calibration of numerical hydraulic model: effects of rating-curve uncertainty

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This study proposes a framework for analysing the uncertainty of rating curves and its effects on the calibration of numerical hydraulic models. The uncertainty associated with rating curves is often neglected, generally considered to be less important with respect to other approximations affecting hydraulic studies. Considering the importance of rating curves, that are traditionally used for describing boundary conditions, a series of synthetic simulation were applied in order to assess the uncertainty of the curves and how this uncertainty affects the calibration of Manning's coefficient. The study case is the middle-lower reach of the Po River for which a quasi- twodimensional (quasi-2D) hydraulic model was implemented. Ten different historical flood events were simulated along the Po River and 50 measurement campaigns were mimicked (5 campaigns per event) at the hydrometric river cross-section of Cremona. Synthetic discharge data values measured during each campaign were corrupted according to the indications on measurement errors reported in the literature. For each synthetic campaign, we applied different procedures for rating curve estimation, and we quantified the 90% confidence interval of the estimated curves. To investigate how the uncertainty of rating curves affects the evaluation of Manning's coefficients during the calibration phase further model simulations were run downstream the Cremona's cross-section. Uncertainty on estimate roughness coefficient is analysed and discussed relative to the variability of Manning's coefficient reported in the literature for large natural reaches.