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Hydrology and Earth System Sciences Discussions

Interactive comment on "Assessing rating-curve uncertainty and its effects on hydraulic model calibration" *by* A. Domeneghetti et al.

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In my opinion, the present paper gives a significant contribution to important research questions, that is, how to assess and possibly reduce the uncertainty related to steady flow rating curves. In particular, the authors propose an interesting method to improve the estimation of steady flow rating curves. The paper is well written and the analyses are adequate to support the conclusions of the authors. I just have some suggestions:

1) Introduction: among the already mentioned uncertainty sources, the authors should also include the presence of unsteady flow conditions.

2) Section 2.2: Di Baldassarre and Claps (2011) stated that hydraulic calibration is

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generally affected by uncertainty, given that roughness can vary according to flow conditions. Therefore, the use of low and medium discharge values to calibrate the 1D model for maximum discharge estimation could introduce a further relevant source of uncertainty in the rating curve. I think the authors should include such general consideration when presenting the constrained approach, although in this case the method indeed reduced overall uncertainty.

3) Discussion: as mentioned at point 2, the results in Figure 5 suggest that the uncertainty associated to the calibration of the 1D model is not so marked. Could the authors provide some explanation about this overall reduction of uncertainty? A possible reason could be that the use of hydraulic simulation data allows to take into account the cross section geometry at higher flows; on the contrary, such information is not retained when a standard extrapolation of the low flow rating curve is performed, thus increasing uncertainty. Similar considerations can be also found in Dottori et al. (2009, page 15).

4) Conclusions: Despite the good results provided by the constrained approach, I think that the authors should clearly point out that the method is still relying on the steady state assumption. In particular, in Figures 6 and 7 both the standard and constrained approaches are evaluated referring to the optimal steady flow rating curve; a comparison against the "real" meaurements originated by unsteady flow simulation could be useful. Altohugh in this case the optimal rating curve seems to fit well the "observations" (that is, results coming from the 2D model), in other cases the error deriving from steady state assumptiom could be significant (Di Baldassarre and Montanari, 2009). As a result, the proposed method can reduce some, but not all, sources of errors related to the use of steady flow rating curves.

Typo: p.10511 line 22 (Pontelagoscuro).

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HESSD

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Interactive Comment

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