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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Considering rating curve uncertainty in water level predictions" *by* A. E. Sikorska et al.

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First of all, we wish to thank the Editor (Prof. Todini) for his comments, which improve the presentation of the manuscript. We reply to his remarks directly below. To make our reply clearer, we report in italic the original Editor's comments. To avoid any misunderstanding we refer to passages in the Discussion Paper (DP) instead of referring to the revised manuscript, which has a different line numbering.

Editor (Ezio Todini): *"I took the decision of publishing your manuscript "as is" although there is a number of issues that are not well clarified in the text. You mention a rainfall-runoff (RR) model and a water level-runoff (LR) model. What you call LR*

model is a typical rating curve expression but there are many cases where a routing model is also used between RR and LR."

The aim of our work is to propose a general approach to systematically incorporate the uncertainty of the calibration data to quantify the total uncertainty in water level predictions. As rightly noticed by the Editor, we demonstrated our approach with a typical rating curve expression as LR model. As clearly stated in the manuscript, other models than a rating curve could be implemented, e.g. numerical hydraulic models (DP l. 2 p. 2958). Therefore, instead of referring only to a rating curve, we prefer LR as a label for a more general framework.

Our approach relies on converting predicted streamflow, modelled by a rainfall-runoff model (RR), into water level. As RR we understand every model that predicts the runoff at a spatial point given rainfall data (see Sect. 2.2 in DP). We agree with the Editor that our RR model is arguably simplistic. However, altering the hydrological model structure, e.g. by stream routing or storage elements does not change the theoretical considerations regarding the systematic assessment of the contributions from the LR model to prediction uncertainties.

"Moreover while LR is needed for the RR calibration, it is not necessarily needed for the derivation of the water levels prediction uncertainty, which can be defined as the probability of future water levels conditional upon the runoff forecast. I hope that the discussion will cover these and other issues."

Here, unfortunately, we do not understand how RR forecasts can be related to water levels without any relationship between runoff and water levels, in other words, a LR model. As it is often the case for rainfall-runoff predictions in small catchments, we assume that continuous discharge data are not available and only few discharge data obtained by the area-velocity method are available from past events. Therefore, we have to convert the predicted discharge to water level which is done by the inverse function of LR (see Eq. 7, p. 2966, DP). Alternatively, if water level (or discharge) is known as in real-time forecasting methods, water level forecast could be relied on this information. In regards to the point above, we modified the introduction in the revised manuscript by including the following paragraph (p. 2959, l. 21, DP):

["As it is often the case for rainfall-runoff predictions in small catchments, we assume that continuous streamflow data are not available. Thus, water levels must be predicted upon the streamflow which is modelled by the RR model. Other methods that rely water level forecast on the known water level or discharge (e.g. Todini and Coccia, 2011) are dedicated for operational forecasting and are not considered in this paper. "]

Reference:

Coccia, G. and Todini, E.: Recent developments in predictive uncertainty assessment based on the model conditional processor approach, Hydrol. Earth Syst. Sci., 15, 3253-3274, doi:10.5194/hess-15-3253-2011, 2011.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 2955, 2013.