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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Regional water-balance modelling using flow-duration curves with observational uncertainties" *by* I. K. Westerberg et al.

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This paper presents an approach to constrain prediction uncertainty in water-balance modelling for ungauged catchments by means of regionalized flow duration curves. Specifically, the authors investigated parametric uncertainty of a simple hydrological model, uncertainty in observational data and in the regionalization method. The analysis is based on the comprehensive dataset of 36 basins in Central America with the area ranging from 132 to 8579 km^2 and with long term discharge records from 1965-1994 years.

Generally, the paper is well organized and constitutes a significant contribution to hydrological studies because across the world a significant portion of catchments remains ungauged. However, I have a few specific comments to the authors that, I believe, will help improving the manuscript.

1) The approach is tested with a water-balance model, WASMOD. The parametric uncertainty of this model was estimated by sampling randomly parameter values from the defined ranges (Sect. 3). The choice of sampling ranges, however, is not well justified neither in this paper nor in the previous one (Westerberg et al., 2011). The selection of sampling ranges can play an important role in the estimation of prediction uncertainty. Furthermore, model parameters for all catchments are always sampled from the same ranges. Should you include any weighting factor for model parameter priors depending on some catchment characteristics such as a catchment area?

2) In the discussion (line 11 p. 15704) the authors state that the precipitation-data quality was probably the most limiting factor in uncertainty estimation. This is an important statement because most of catchments suffer from the lack of sufficient rainfall information. Recent studies have showed that the uncertainty in precipitation data strongly influences simulation results (e.g. McMillan et al., 2011). Although, the authors are aware of that, this needs some more emphasis and some recommendations in this respect could be given.

3) Based on the results and Fig. 7, using information from more catchments in the regionalization method leads to the increase in prediction reliability and to the decrease in prediction precision. In this regards, a choice and a number of selected catchments and cross sections may be of the essential relevance. This is an important issue when translating the method into another study and should be discussed.

4) Although, generally the paper is well written, I share the first Reviewer's concern that the Sect. 6, i.e. Discussion and concluding remarks, is too long and slightly repetitive. This makes it difficult to follow and decreases the overall strength of the take home

message. I would recommend to rewrite this section by splitting it into two separate subsections. I would also expect summarising recommendations for using the method and its usefulness for other studies.

5) My last comment relates to the chosen method of uncertainty estimation, namely the Generalized Likelihood Uncertainty Estimation (GLUE). Although, the methodology of uncertainty estimation is not the focus of this paper, more promising and rigours methods would be more adequate such as Bayesian methods with a realistic likelihood function (e.g. Mantovan and Todini, 2006; Reichert and Mieleitner, 2009; Del Giudice et al., 2013; Evin et al., 2013). I would like the authors to elaborate on that especially when discussing the limitations of their study.

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