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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Derived flood frequency analysis using different model calibration strategies based on various types of rainfall–runoff data – a comparison" *by* U. Haberlandt and I. Radtke

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General remarks (to both referees):

We want to thank both referees for their positive evaluation, for the time they spent on our manuscript and for their valuable comments and suggestions. We will respond to all comments in the following.

Response to comments of referee #1:

1. (Page 10387, lines 15-16, page 10389, lines 19-21) We thank the reviewer for this suggestion. We added some text to section 2.2.3 and included the two recommended references to justify the choice regarding the use of average initial conditions for the prediction of the design floods.

2. (Page 10387, line 27) For this comparison study, we have assumed unique parameter sets for each calibration strategy. Given this and the stochastic character of the precipitation input from the different realizations, some kind of average simulation result is required for calibration. We have chosen to use the simulated median of daily flows accepting a loss of variance, which implies of course a certain underestimation of extreme peak flows. We added an explanation to section 2.2.2.

3. (Page 10395, line 10) Yes, the 90% confidence limits exclude only the single highest and the lowest flood frequency curves. Of course, it would have been better to use 100 realisations or more, but due to computationally constraints, we had to restrict the number of realisations, considering hourly simulations and the demanding re-calibration requirements for each strategy. Since we focus in this paper on relative comparisons and not on absolute design values, we think this is still an acceptable approach.

4. (Page 10395, line 26) The smaller range of the simulated flows using parameter set E instead of parameter set B for exactly the same realisations shows the reduction in uncertainty. The central location of the observed flood frequency curve within the grey range for parameter set E indicates a better model performance for this parameter set. We clarified this in section 4.2.

5. (Page 10397, point 3) The results indicate that the best calibration strategy is to use stochastic rainfall and the observed flood frequency curve as seen e.g. from Fig. 13. The most likely reason is to focus the calibration of the model to the target input and output variables for derived flood frequency analysis.

6. (Page 10398, line 18) We have removed the comment about the possible bias

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correction of climate models.

Response to comments of referee #2:

1. We thank the reviewer for this suggestion. We have changed the title as follows: "Hydrological model calibration for derived flood frequency analysis using stochastic rainfall and probability distributions of peak flows"

2. We think the proposed strategy has the following three main advantages compared to a pure statistical design based on historical peak flow records:

a) Using hydrological modelling for design it is possible to consider planned alterations in land use and management, future changes in climate or the introduction of new flood protection measures, whose effect is not contained in observed historical flood records.

b) Of course, hydrological modelling allows obtaining the full hydrograph for design, which is usually not available from peak flow records. This is most important for the design of reservoirs or for flood mapping where the flood volume is essential.

c) Third, the estimation of design flows can be carried out for completely ungauged basins if the parameters of the hydrological model are regionalized and the rainfall model can be applied for unobserved regions.

We have modified the first paragraph of the introduction to make the possible benefits of the proposed strategy more clear.

3. The reference has been corrected.

4. We have now included some more information about the calibration parameters in section 2.2.2.

5. Yes, the models are well known. However, we think the figures will refresh the concept of the approaches briefly, which might be useful for some of the readers. We also referred to the figures in explanations (e.g. reference to Fig. 3 about the calibration parameters).

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 10379, 2013.