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Hydrology and Earth System Sciences Discussions

Interactive comment on "Inferring the flood frequency distribution for an ungauged basin using a spatially distributed rainfall-runoff model" *by* G. Moretti and A. Montanari

Anonymous Referee #2

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General comments:

The topic is significant and of high international relevance. There is an increasing utilisation of continuous rainfall-runoff models for derived flood frequency analysis. Existing problems are the availability of appropriate long continuous space-time precipitation series as input for hydrological modelling, the calibration of the rainfall-runoff models in absence of sufficient data for ungauged basins and the assessment of uncertainty of those procedures. This paper focuses on the latter two issues with some novel investigations about the simulation reliability over a range of spatial scales. The authors calibrate a rainfall-runoff model for a larger scale basin (1214 km2). They validate the

approach for this basin and a subcatchment (337 km2) using stochastic rainfall data by comparing observed and simulated precipitation and flood frequency distributions. Considering that only 1 year of continuous river discharge and only 2 years of continuous climate data could be used for model calibration the validation performance is surprisingly good. Then they apply the model to an ungauged small basin with an area of only 12 km2 and estimate design floods with uncertainty using the GLUE method. They conclude that the proposed method provides reliable results for sizing erosion control works for that small target basin.

This conclusion seems somewhat speculative, because there are no data available for the target basin to do a strict validation of the method and a simple scaling approach gives completely different results. Besides, a rigorous evaluation of this method as regionalisation approach would require testing the results for several target catchments with different properties. To increase the confidence in their simulation results, the authors may apply additional methods to estimate the design flood for the target basin (e.g. the GRADEX method or a regional frequency analysis) or they might select another target basin with available observed data.

Detailed Comments:

1. The abstract is not a concise and complete summary of the manuscript: the different rainfall input to the hydrological model is not specified; the stepwise calibration, validation and application to three different basins is not mentioned; what kind of hydrological similarity principle is used is missing; the results are not summarised, etc.

2. In the introduction one of the main problems for derived flood frequency analysis is not discussed at all: the missing long time series of rainfall and possible solutions using stochastic data.

3. Section 2 "Description of the case study"; might better named "Study region and data"

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4. Please provide a figure of the study region showing river network, streamflow gauges (cross sections), climate stations, etc.

5. Figure 2: The model performance is very difficult to judge from this plot. Please add a diagram comparing flow hydrographs.

6. Page 12, lines 10-15: How is the mean areal DDF for rainfall over the basin calculated from point DDF's? Usually long simultaneous time series of rainfall for all gauges are required to infer a frequency distribution of mean areal rainfall.

7. Page 13, line 21: Figure of the study region with rainfall stations is required here again.

8. Page 15, lines 1-10: The explanation of this procedure could be made clearer to the reader. To me, the core of the approach seems, that observed and simulated frequency distributions are compared by calculating Nash-Sutcliff-Efficiencies.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 5, 1, 2008.