

Interactive comment on “Comparison of different multi-objective calibration criteria of a conceptual rainfall-runoff model of flood events” by N. Chahinian and R. Moussa

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General comments

This study focuses on the multiple objective calibration of an event based conceptual hydrologic model for Gardon catchment located in France. The main aim was to evaluate different single and multiple objective constraints used in parameter estimation. Based on 29 flood events (15 in calibration and 14 in verification period) the authors report that two non-redundant criteria are sufficient for a robust calibration of their event based hydrologic model.

Although the methodology applied for the multiple objective calibration is not new, the

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contribution may be of interest for hydrologists and water resources managers who are dealing with the simulation or forecasting of flood events. However for the reproduction of such modeling exercise in other regions or with another model, three points should be clarified or extended. The first question is the methodology applied for the model calibration. It is not clear what the authors mean with the grid-based calibration procedure (p. 1041)? How this optimization technique is sensitive to selected parameter ranges, and how are these ranges selected? There is also a contradiction in author's statement (p.1041) "... no automatic calibration procedure was undertaken" and e.g. Table 1 caption: "Parameter ranges applied for the different automatic calibration ...".

The second point is that authors applied an event based model. For such type of hydrologic model, the setting of initial conditions is always of interest. I would suggest discussing in more detail the setting of initial conditions and their effects on final model performance. A justification for using a 5-day antecedent rainfall index is needed.

The third point is the presentation of results. The authors state that the emphasis will be given on impact of the selected objective functions on the hydrograph shapes (and this is really an interesting issue), however the figures do not demonstrate that. I would suggest to add and discuss (e.g. to existing Figures 3, 4 and 5) a typical shape of hydrograph coming from different optimization constraints. The question is how the shape is changing when different constraints are applied. (I expect that just minimizing the volume error resulted in a different shape of hydrograph, then using e.g. root mean square error). In the discussion section I would suggest to link the results to existing studies.

Overall this is a relevant contribution to every study focusing on the flood event modeling. The title of the manuscript adequately represents the main objectives of the paper. The manuscript in present form is generally well structured, only some clarifications and changes are requested (see general and specific comments). English proof will help to improve the clarity of some phrases or sentences. Taking my comments into consideration, I propose to accept this manuscript for the publication.

Specific comments

The root mean square error is first considered (p.1033) as tending to emphasize the high flows, second (p.1034) it is considered as a measure of the global agreement between observation and simulation. Please consider to clarify this.

P. 1036. Does the term S/S_m characterize the soil moisture or relative soil moisture?

P. 1037. Please change the units to SI units.

P. 1042. The description of construction of aggregated objective function (Eq. 18) is not clear. Please add some explanation how the transformation constants are estimated.

P.1043. The justification for the selection of mean catchment precipitation is needed. I'm not sure if the arithmetic mean is applicable for such estimation. Especially the results for volume constraints indicate, that there may be a bias (underestimation of mean catchment precipitation).

P. 1044 How are the upper and lower bounds estimated? Please add some explanations.

P. 1062. The meaning and interpretation of dotted plots (in Figures 3, 4 and 5) is not clear.

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