Hydrology and Earth System Sciences Discussions

Hydrol. Earth Syst. Sci. Discuss., referee comment RC3
https://doi.org/10.5194/hess-2021-49-RC3, 2021

Comment on hess-2021-49

Anonymous Referee #3

Referee comment on "Identifying sensitivities in flood frequency analyses using a stochastic hydrologic modeling system" by Andrew J. Newman et al., Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2021-49-RC3, 2021

General comments :

This paper presents a comprehensive study of the uncertainties of a Flood Frequency analysis method based on stochastic simulation. The different sources of uncertainty are distributed between the structure of the model, the estimation of the parameters, the initial conditions and the inputs (rainfall). Overall, this paper is well written and presents significant and comprehensive scientific results. As the other reviewers I will recommend minor corrections, mainly to clarify some points about the tools used, described only by publications. Clarifications on the methodology would allow a better understanding of certain points detailed below.

Specific comments :

Section 3.1: As the other reviewers, I think that a diagram presenting the workflow would help in understanding the different steps and tools used.

L134: specify if the modeling is lumped or distributed, knowing that the input data for the calibration looks distributed (in Newman et al, 2015). Clarify how you calibrate the hydrological models from an ensemble of historical meteorology (is the ensemble related to ground data interpolation uncertainties?). If the modeling is global, are the ensemble really very different sets (spatial mean)?

L137: Clarify if "two event sequence possibilities" are in fact two periods/seasons? And which ones?

L141: We ask ourselves the question of 11 parameters sets: how are they obtained ? This is not from the sets of historical meteorology since there are 100 used. (ok, the answer is in line 328... but only 10 sets for the Altus basin)

L220: why not take the whole distribution of initial conditions (IC) and only the strongest initial conditions. This does not allow to associate dry CI with heavy rainfall, and it reduces the impact of the uncertainties related to IC (for the current frequencies at least).

L250: Rainfall events are in fact total rainfall generated from a regional probability law. Is it a limitation of the method, to simulate two-day events to generate extreme flood flows? As the time step of the hydrological modeling is daily, how are the rains distributed over the two days simulated? Moreover, can you explain how the problem of changing from a point rainfall to a basin rainfall is solved (how the areal-reduction factor is taken into account).

L250-252 and 260-262: it should be better explained how you use historical precipitation events that are equal to the basin-average magnitudes sampled from the frequency curve, especially for extremes events.

L309: How is the calibration performance assessed. There do not appear to be any validation procedures to verify this (as LOO procedure for instance). The graphs in Figure 4 presented calibration results. It is therefore difficult to judge the performance of the different models, which also depends on their robustness. It is better to show validation results.

Specific comments : Figure 1: as it is a theoretical explanation diagram, put theoretical curves (straight lines for example ?) because we have the impression that it is a result.