

Hydrol. Earth Syst. Sci. Discuss., referee comment RC2  
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## Comment on hess-2021-270

Anonymous Referee #2

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Referee comment on "A space-time Bayesian hierarchical modeling framework for projection of seasonal maximum streamflow" by Álvaro Ossandón et al., Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2021-270-RC2>, 2021

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The topic of the manuscript is certainly within the scope of the journal and the use of a Bayesian Bayesian hierarchical framework for modeling seasonal extremes is groundbreaking; there are no other papers that I am aware of that utilize this approach for this purpose.

My few comments are mainly related to terminology, the underlying dataset, and a question about the title and future application of the framework (which, of course, would be beyond the scope of this study).

(1) L54 and L58: Use of the word "nonstationarity"

In L54, it appears that the term "nonstationarity" is meant in terms of things such as climate change, more akin to what we might think of as long term changes to the system as what non-statisticians think of as only nonstationarity; however, nonstationarity also refers simply to the seasonal signal in the streamflow time series. In L58, the study is asking whether the "representation of nonstationarity through suitable covariates improves season predictions..." Here it appears that you are referring to nonstationarity in the more precise statistical term of nonstationarity. It may be helpful to add a sentence or phrase in the introduction to define nonstationarity in the strict statistical terms so non-statisticians reading the text will not be confused. (I hope I did not confuse things!)

(2) The study uses 7 streamgages to complete the testing of this framework. Looking at Table 1, UCRB7 is an outlier in drainage area, mean streamflow, and mean seasonal streamflow from the other streamgages. It is also located substantially further away from the other streamgages.

(a) How does the framework account for streamgages that are outliers. In Figure A4, the model certainly has a different behavior for CHRB7 for the cross-validation in only high flow years. Does this affect the

(b) How robust is your understanding of the spatial dependencies on performance skill when only these 7 streamgages are used? This is a key question you had planned to examine (L59)?

(c) Could you comment on why a much larger study area or set of streamgages was not used? If a limitation of this framework is that it cannot be applied to large streamgage networks, I wonder what implications this has for its practical applicability.

### (3) Title and future applications

(a) Of particular interest to the Upper Colorado is also the situation of drought prediction. Could this approach be useful for that situation as well? This is beyond the scope of this study but what would be some of the difference in applying the framework to low-flow extremes.

(b) Along these lines, the title implies that "seasonal streamflow extremes" would mean both tails of the distribution (high and low streamflows); however, flooding is only examined here. Consider changing the title to reflect this.