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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Transferability of climate simulation uncertainty to hydrological climate change impacts" *by* Hui-Min Wang et al.

Anonymous Referee #2

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The authors do a good job in their attempt to shed light on the important problem that impact modelers face in efficiently and effectively capturing the range of uncertainty in climate model simulations. Furthermore, they investigate whether covering this range in climate model output variables translates to capturing the uncertainty range of hydrological variables. The paper is well written and clearly presented. Though, in the end, I was not convinced that impact modelers can actually save much time and effort using this methodology. I would recommend that the manuscript needs minor revisions. Importantly, the authors need to make it clearer how an end user can avoid downloading all 50 simulations in order to prove which subset of 10 are most appropriate to cover the uncertainty range in their study.

I would begin by asking this. What do end users or impact modelers gain by this pa-

per? You have shown that for your two different watersheds, a subset of approximately 10 model simulations are needed to reasonably capture the spread of the model uncertainty for both climate and hydrological variables. Additionally, you point out that not using the temperature variables to obtain the subset affects the hydrology of the two watersheds differently. As a result, you illustrate that the selection of the 10 climate models is unique to each impact assessment study. Furthermore, you needed all 50 simulations to test which subset was optimal for your two cases. I do not see how an impact modeler would not need to repeat precisely what you have done. In order to replicate your method, but specific to their study interest or area, they would need to "extract, store, and compute" (page 2, line 14) all 50 model simulations themselves. Then, couldn't they just as easily implement the entire set of simulations instead of a smaller subset? To ask it more directly: How can an impact modeler know which 10 model simulations to use, for their unique case, without testing the ensemble ranges of each possible subset with respect to the entire set of simulations? And to do this, would they not need to run all 50 model simulations?

Some more specific comments and questions are as follows:

In section "2.2.1 Climate Simulations": Does it make sense to lump the uncertainty ranges of both RCP4.5 and RCP8.5? These are two different concentration pathways that represent very different conditions. It is true that we currently can't know which is more likely. I would recommend either treating each pathway independently with different ranges of uncertainty, or I would recommend also including simulations from pathways RCP2.6 and RCP6.

Page 7, line 17: What was the reason to use 100 quantiles instead of the total number of days in the periods (e.g., 1975-2004 for January = 30 years times 31 days = 930 days or quantiles)?

Page 9, line 5: I do not anticipate for it to change your results that much, but perhaps it is better to use something like standard deviation as a measure of the uncertainty

coverage. The Percentage of Spread Coverage (PSC) is only sensitive to the range of the minimum and maximum values. You could end up having many of the models grouped close together, and as a result, your measure would overestimate your actual uncertainty coverage.

Figure 2: Are you showing the observed and simulated values for the calibration and validation for 1 year? Or is each day the average of that day across the years (e.g., for Xiangjiang: all January 1 values are averaged over the time period 1975-1987, then January 2 values are averaged over the same years, . . .)?

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