

## ***Interactive comment on “Seasonal hydrologic prediction in the United States: understanding the role of initial hydrologic conditions and seasonal climate forecast skill” by S. Shukla and D. P. Lettenmaier***

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Received and published: 27 September 2011

This paper attempts to enhance seasonal hydrologic forecast skill by reducing uncertainties in the initial hydrologic conditions and improving climate forecast skill. The authors synthesized and utilized some state-of-the-art prediction models/methods. The findings could be important for the improvement of seasonal hydrologic and drought prediction in the Conterminous United States and for other countries as well. Therefore the paper is qualified for publication in this journal. However the draft could be

C4217

improved by addressing the following comments.

We thank reviewer 1 for the valuable comments.

1. It's not very clear that why the authors adopted the methods by Wood and Lettenmaier (2008). Some summarizing comparisons of different methods reviewed should be provided to the last paragraph of Section 1.

Response: The ESP-based framework developed by Wood and Lettenmaier (2008) partitions hydrologic prediction skill into components derived from the initial hydrologic conditions and climate forecast skill, which is essentially what we want to do. The framework is applicable over large spatial scales (e.g. continental) and leverages from ESP forecast approaches used operationally. These are the primary reasons we've made use of the framework. We now so state in a few sentences in section 1.

2. Variable Infiltration Capacity (VIC) with more background info. and its applications have not been reviewed in the Introduction.

Response: We don't explicitly discuss past uses of VIC or its details, primarily because our focus is on prediction skill, and could have easily used any other large scale model. The VIC model in this study is merely a medium for conducting the experiments. Nonetheless, we do now mention in section 2.1 a few previous studies that have made use of the VIC model.

3. There are no discussions or comparisons of results with other researchers. I couldn't locate a direct reference in the Results section.

Response: We cited results of previous studies that have quantified the contribution of initial hydrologic conditions and climate forecast skill in the introduction. Our results for the common spatial domain and forecast periods are consistent with other studies. We now include some references to the most relevant studies in terms of spatial domain and the forecast period.

4. The Conclusion part could be improved by providing more details or discussions

C4218

about the weakness/limitation of the methods adopted in the research.

Response: We agree, and now include a paragraph in the conclusions section discussing potential weakness and strengths of our approach.

5. P6567 line 1, and many other similar places: the order should be switched. The earliest published article should be put at the very beginning.

Response: Corrected.

6. P6568 line 24, JJA is not referenced.

Response: Although the full form of JJA was mentioned in the Appendix A 1, we now include it on the page 6568 as well.

7. P6568 line 26, PCA only appeared here once. So better to just use Principal Component Analysis. Too many acronyms were used throughout the paper. Try to reduce some. It's better to list the full names for some important texts in the conclusion part.

Response: Agreed. Other reviewers had similar comments, so we have removed abbreviations that are used less than 3 times.

8. P6578, The key findings should be numbered differently from the major sections, like (1), (2), etc.

Response: We have revised the number style for the key findings.

9. Section 3.3, should some texts (i.e. those for Eq. 4) be put in the Method part?

Response: We have moved the part of section 3.3 that describes the  $\kappa$  parameter to the section 2 (i.e. Approach) and included it as section 2.5.

10. I don't think it's necessary to list Table 1, since it's publically available at USGS. reference should be sufficient.

Response: The names of USGS water resources regions are indeed publicly available however we think that it is appropriate to include a table as a quick reference for the

C4219

readers. It also lists the acronyms we used in the manuscript for the USGS water resources regions, which would need to be listed elsewhere if the table was deleted.

11. Table A1, usually MI is short for Michigan (unless USGS designated it differently).

Response: We have revised the acronym for Missouri to MO. The abbreviations we used to address USGS water resources regions do not necessarily come from the USGS, we have used our own abbreviations for the regions for which there are no popular abbreviations (for example RG for Rio-Grande, and LC for Lower Colorado) however for other regions we used the abbreviations which are commonly used (e.g. PNW, CA, TX etc)

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 6565, 2011.