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Hydrology and Earth System Sciences Discussions

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

Anonymous Referee #3

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This study attempts to synthesize the contribution of hydrologic initial conditions and climate forecast skill to the overall skill of seasonal hydrologic predictions over CONUS at all seasons, based on ESP and revESP experiments with VIC model. Similar work was done over other regions by other researchers, so there is no significant contribution in research methodology, but the more comprehensive results are still of great values. There several issues that the authors need to address before the paper can be published.

Major issues 1)The reverse ESP approach to study the impact of hydrologic initial condition on seasonal hydrologic prediction skill of soil moisture and runoff is a bit flawed, although it has been used in several studies. The current forecast approaches to estimate the hydrologic initial conditions won't necessarily create errors as large as that represented by the interannual variability. So using initial conditions from 31 years as the ensemble initial conditions will overestimate the uncertainties associated with hydrologic initial conditions, which means that contribution of hydrologic initial condition to the overall forecast skill will likely be overestimated. The conclusion that improving hydrologic initial condition will significantly improve the forecast skill of runoff and soil moisture months in advance is unintentionally inflated. The authors need to address this issue in the study.

2) Equations 1 and 2 need to be redefined for soil moisture since soil moisture forecast is evaluated for individual month and runoff is evaluated as the accumulation during the forecast period, so the summation over lead time does not apply to soil moisture. The current form only works for accumulative runoff. This also leads to another issue on page 6576 and several other places in the discussion. Since soil moisture and runoff are evaluated differently, a direct comparison between how hydrologic initial condition and climate forecast skill contribute to soil moisture and accumulative runoff forecast are inappropriate. Statement like "Overall, the relative contributions of IHCs are greater for forecasts of SM than for forecasts of CR (page 6576 line 18)" should be avoided because the authors are comparing apples and oranges.

Minor Issues 1) The use of abbreviation is the manuscript makes it difficult to read sometimes. There are already too many acronyms in this field, so one should not introduce new abbreviations/acronyms unless it is necessary. Is it really necessary to use PU for Princeton University, SWM for surface water monitor, USDM for US drought monitor ? In fact many of these abbreviations are only used once or twice in the manuscript, and these are not widely accepted abbreviations, unlike terms such as NCEP, USGS, GEWEX, etc. So I strongly recommend removing the abbreviations as

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much as possible so that Table A1 won't be necessary.

2) The use of CFS (climate forecast skill) can be confusing for many in the field because this normally stands for Climate Forecast System at NCEP. Although this term is not reserved for the modeling system, it'd be better to avoid confusions. Please consider using the whole phrase.

3) Page 6567 line 2 and Page 6570 line 23: multiple references for one particular work should be cited in chronicle order. This comment applies to other places in the manuscript.

4)Page 6572 line 5-8: VIC in water balance mode does not require input of radiation, but rather internally generate them, correct?

5)Page 6572 line 9-11: The baseline simulation over the entire period should have produced all the initial conditions. If so, this sentence is misleading.

6)Page 6572 line 12, 6570 line 26 and several other places hereafter: The use of "region" and "sub-region" is inconsistent throughout the manuscript. Please modify accordingly.

7)Page 6573 line 14: A better and more clear way to say this can be ""Let O be the observed CR and SM obtained from the baseline run as the synthetic truth..."

8)Table 1 is mentioned only once in the manuscript, but the content in this table is actually not used in the manuscript. The authors mentioned 221 USGS regions, and then aggregated to 18 regions. Nowhere in the manuscript had the authors mentioned 18 USGS water resources regions. This table should be eliminated.

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