

Interactive comment on “On the sources of global land surface hydrologic predictability” by S. Shukla et al.

Anonymous Referee #4

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This paper assesses the sources of hydrologic predictability on a global scale. Essentially they are comparing the contributions of the initial (soil moisture and snow) conditions versus the atmospheric forcing.

I like the paper, it is very well written and the message is very clear. Also, the topic the authors address is highly relevant and currently an active field of research.

I have some minor remarks regarding the methodology, which should be addressed before the paper is ready for submission:

- with the ESP and rESP methodology you test the importance of the initial conditions versus a *perfect* forcing forecast because you use observed forcings; however you should be aware of the fact that seasonal climate forecasts are far from perfect in many

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regions of the world. I think, in comparison with these non-perfect forecasts the initial conditions would be even more important.

- the importance of the initial soil moisture depends strongly on the soil moisture variability which in turn depends on the water holding capacity. Given that the underlying water holding capacities used in the VIC model are probably poorly validated in many regions of the world, you should include a sensitivity experiment to assess the impact of the water holding capacities on your results.

- you validate your forecasts against a control run, the necessarily imperfect representation of hydrology in the VIC model will therefore inevitably impact your results. At least for runoff in in some place(s) in the world you should try to validate your findings with observations

- the ratio between kappa(SM) and kappa(SWE) could be replaced by the ratio of SWE variability and SM variability, that would be more straightforward

- Whereas the initial conditions are more important for soil moisture forecasts than for runoff forecasts at a lag of 1 month (which makes intuitive sense), they seem to contribute less skill at longer lags. Why is that?

- sections 3.1-3.3 are a bit lengthy, maybe you could define regions and summarize all information (different start dates, different lag times) as regional means in a table

Minor comments:

page 1991, line 11: references are not in chronologic order line 13 & 17: change 'up to the time of forecast ...' to 'up to forecast initialization' line 26: change '... as in (...' to '(e.g. ...)'

page 1997, line 27: southern instead of eastern Europe, I think

page 1999, line 11: change 'half of US' to 'half of the US'

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