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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Evaluating residual error approaches for post-processing monthly and seasonal streamflow forecasts" *by* Fitsum Woldemeskel et al.

Anonymous Referee #2

Received and published: 31 May 2018

This paper presents a comparison of three variants of a post-processing approach for long-range (here monthly to seasonal) streamflow forecasts in Australia. The paper is well-written and easy to read. The research is interesting for several reasons. First, the topic of long-range forecasting and especially how the skill of such forecasts can be improved is currently raising a lot of attention from hydrologists. There are many practical applications for which seasonal forecasts are required for decision-making. Second, Australia is a vast country which includes a broad range of hydro-climatic conditions, and the authors efficiently gathered a data base of 300 catchments, to ensure that their findings are as generalizable as possible. The authors explicitly address the specific case of dry catchments and low-flow periods, which is of great practical interest in sev-

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eral areas on the planet. Indirectly, the research has implications for socio-economic issues, as the management of water-scarce catchments could benefit from better seasonal forecasts. The paper also fits well within the scope of HESS.

This paper is definitely suitable for publication in HESS. However, I do have a few specific comments and suggestions for the authors to improve it prior to publication. In my opinion, all comments are minor.

Specific comments/suggestions/questions:

1. Data assimilation/link with short-term forecasts

From the paper, I am not entirely sure how GR4J's state variables are managed (see also my next comment). From what I understand, there is no data assimilation at all. Perhaps this can be justified in the context of long-range forecasts as the effect of data assimilation would fade out quickly (probably before the one month horizon).

I was also wondering if there is a link (operationaly at BoM) between short- and long-range forecasts. Surely the hydrological model is the same, but what about the meteorological forecasts? Are the short- and long-ranges connected in some way? Surely, in operations, there must be a certain form of data assimilation for short lead times.

Considering the above interrogations, I would very much appreciate short comment regarding data assimilation in the paper.

2. Simulation and Forecast steps vs model calibration and warm-up

Section 2.2 and 2.3: I am slightly puzzled by that division into "simulation step", which includes model calibration, and "forecast step". Reading the description of the "simulation step", one could thing that you re-calibrate the model several times, once before each forecasting step. Is that so? If so, why? You want the model parameters to be dynamic?

I would tend to think that what the steps would rather be (1) calibrate the model (40

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times using the MCMC-based method you mention) once and for all, (2) simulate streamflow over the entire period and save the state variables (I assume no data assimilation) and (3) launch GR4J in "forecast mode", by fetching the appropriate state variables for a specific date and feeding the model with meteorological forecasts.

I would very much appreciate if you could clarify those issues in the paper. In particular, think that calibration should be separated from simulation.

3. Discussing the choice of model for dry catchments

Section 5, lines 535-536, you mention that "This finding can be attributed to the challenge of capturing key physical processes in modeling dry and ephemeral catchments (. . .)". In my opinion, this sentence leads to questioning whether of not GR4J is an appropriate model for very dry catchments. I know this model very well and I can appreciate its many qualities. GR4J works well for a very wide variety of hydro-climatic conditions. In addition, I do understand the practicality of having only one (very simple) model for all catchments on the entire country. However, there is no soil per se in GR4J. It is a very simple conceptual model which cannot, for instance, model soil sealing phenomena for dry catchments. I don't see how this model could ever capture the physical processes, as mentioned in your sentence.

In my opinion, this issue (the choice of a very simple conceptual model) should be briefly discussed following lines 535-536.

4. Citing papers from HESS Discussion

In my opinion, citing papers from HESS Discussion should be discouraged. After all, there is no real filtering of the papers before they can be published in discussion. The revision process takes place around the Discussion paper. To me, a paper that never makes it to HESS (after the Discussion) should be considered as rejected, even though it remains publicly accessible on the web. You wouldn't cite a paper that was rejected from other "more traditional" journals for which the revision is not as public as for HESS.

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Of course you could argue that if a paper in Discussion receives excellent comments but never makes it to HESS, it could be a case where the authors purposefully decided not to spend time editing it according to the reviewer's comments and re-submitting it. In my opinion, this practice, if it exists, should not be encouraged. Again, it wouldn't be possible with the majority of other journals.

Therefore, I would very strongly recommend that you remove all references to HESS Discussion. Set (2006) should therefore not be cited.

The citation for Mendoza et al (2017) should be updated as it is now published. Same for Turner et al (2017). The titles have also changed in the published version.

5. Forecasts' value

Section 5.3 lines 584-587, you briefly touch on the issue of forecasts value. I personally don't think measures of skill could ever be linked to the socio-economic value of forecasts. Most studies focussing on forecast values in the current literature largely over-simplify the problem. For the issue of forecasts value to be tackles in a more realistic way, researchers from humanities and social sciences would inevitably have to be involved. Forecasts value involves complex issues related to human psychology, economic theory, communication, social studies, etc. See for instance Morss et al. (2010), Matte et al. (2017), Toon et al. (2017) and Solin et al (2018)

In my opinion, forecasts skill is a pre-requisite for forecast value but in no way a guaranty. I don't see how metrics related strictly to the skill of a forecast (as in comparing the forecast to observation) could be a predictor of forecasts value on their own.

Morss et al (2017) Examining the use of weather forecasts in decision scenarios: results from a US survey with implications for uncertainty communication, METEOROLOGICAL APPLICATIONS, 17(2), 149-162

Matte et al (2017) Moving beyond the cost-loss ratio: economic assessment of streamflow forecasts for a risk-averse decision maker, HYDROLOGY AND EARTH SYSTEM

SCIENCES, 21 (6), 2967-2986.

Toon et al (2017) Integrating Household Risk Mitigation Behavior in Flood Risk Analysis: An Agent-Based Model Approach, RISK ANALYSIS, 37 (10), 1977-1992

Solin et al (2018) Vulnerability assessment of households and its possible reflection in flood risk management: The case of the upper Myjava basin, Slovakia, INTERNATIONAL JOURNAL OF DISASTER RISK REDUCTION, 28, 640-652

6. Typos/spelling/format/figures

- Page 10 line 255: I think the word " trial" should be replaced by "tried".

- Page 13 equation 11: The CRPS is usually computed by averaging the values over a large sample of forecasts-observation groups. Therefore, I think it is important that equation (11) be modified to be more explicit about this averaging.

- Page 14 line 388: "lead to misleading" is a bit strange to read. I would advise rephrasing

- Page 15 lines 413-414: there seem to be an awkward space between those two lines. Please verify.

- Page 16 lines 443-444: Is "from in excess of 150%" the correct phrasing? Also, there is a typo in the parenthesis "(Figure 45i)".

- Page 18 line 493: remove comma after "scheme"

- Page 37, figure 8: please include the units for streamflow (y axis) on this figure. In addition, I am not entirely sure I understand the time step (x axis). Counting the points, I understand that the time step is one month, which would be coherent with the text, but not explicitly specified for this figure. In my opinion the x axis label could also be clearer.

- Page 38 figure 9: An "S" is missing for the y axis label of the top row. It should be

CRPSS and not CRPS.

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