

Interactive comment on “The challenge of forecasting high streamflows in medium sized catchments 1–3 months in advance” by J. C. Bennett et al.

J. C. Bennett et al.

james.bennett@csiro.au

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Response to Anonymous Reviewer 2

Review comments are in double quotation marks. Line numbers (e.g. lines xxx-yyy) refer to the manuscript attached as the supplement.

General:

Comment: "The authors present a paper on forecasting high streamflows in medium sized catchments in southeastern Australia 1-3 months in advance. Overall the manuscript is well written and well organized. However, I feel there is room for some
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improvement."

Response: Thanks for the positive feedback, and we have tried to improve the manuscript by addressing your suggestions.

1. Comment: "The title needs to reflect that the forecasting of streamflow was performed in medium sized catchments in which snow-melt is an irrelevant factor. As the authors mention in their study, this is one of the aspects that set this study apart from other research. It is up to the authors to decide whether they would like to use terms such as "predominantly pluvial runoff regimes" or "mostly subtropical climate" or to simply name the study region."

Response: Thanks for this suggestion –we agree that this would help to focus our paper. We have changed the title to: "The challenge of forecasting high streamflows 1-3 months in advance using lagged climate indices in south-east Australia" in order to be more specific about both our method and the study area.

2. Comment: "In addition to streamflow, the authors also predict total rainfall; however, they only mention this in section 2.2.2, not in the abstract and not under results. In the discussion, the authors briefly mention that the relationship between heavier rainfall events and lagged climate indices in general is weak. I think it will improve and broaden the manuscript, if the authors show some of these results. In general forecasting rainfall based on climate indices and subsequent modeling of runoff sounds like a convincing approach. If the authors show that this approach is not successful, their approach of using catchment wetness in addition becomes even more meaningful."

Response: Thanks for this interesting suggestion. We have used seasonal total rainfall as a co-predictand because it is expected to broadly influence catchment wetness during the forecast period, which in turns influence extreme flows. We agree with the reviewer that ideally we should try to forecast short-event extreme rainfalls, which are more directly related to extreme flows. However, it is extremely difficult to forecast short-event extreme rainfalls that may occur in the next month or three months. For

this reason, we have not included this approach in this study. However, as dynamical seasonal climate models improve, this approach will become more attractive. Further, rainfall is only an auxiliary variable, not the focus, of this study. For this reason, we have not included results on seasonal rainfall forecasts in this paper. Members of our research group have published several papers on the predictability of seasonal rainfall total using lagged and forecast climate indices (e.g. Hawthorne et al., 2013; Schepen et al., 2012b; Wang et al., 2012; Schepen et al., 2012a). To address this comment, we have added additional discussion of the usefulness of lagged climate indices for predicting rainfall in SE Aus, with reference to these papers (lines 198-204; lines 503-571). Finally, we agree that using a rainfall-runoff model could be a useful approach. We have added considerable discussion of possible alternative approaches, notably the use of NWP/GCM forecasts to force rainfall-runoff models (lines 553-571).

3. Comment: "In Chapter 3.1 the reference to Fig. 4 is missing."

Response: Thanks for picking this up - we've added the reference to figure 4.

4. Comment: "Fig. 6: The size of the black points needs to be increased."

Response: Done – thanks for the suggestion.

5. Comment: "Page 3146, row 23: (Figs. 9 and 10) should be changed to (Figs. 11 and 12)."

Response: Changed – thanks for reading the paper so closely.

References

Hawthorne, S., Wang, Q. J., Schepen, A., and Robertson, D. E.: Effective use of GCM outputs for forecasting monthly rainfalls to long lead times, *Water Resources Research*, 49, 5427–5436, 10.1002/wrcr.20453, 2013.

Schepen, A., Wang, Q. J., and Robertson, D.: Evidence for using lagged climate indices to forecast Australian seasonal rainfall, *Journal of Climate*, 25, 1230–1246,

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10.1175/JCLI-D-11-00156.1, 2012a.

Schepen, A., Wang, Q. J., and Robertson, D. E.: Combining the strengths of statistical and dynamical modeling approaches for forecasting Australian seasonal rainfall, *Journal of Geophysical Research*, 117, D20107, 10.1029/2012JD018011, 2012b.

Wang, Q. J., Schepen, A., and Robertson, D. E.: Merging seasonal rainfall forecasts from multiple statistical models through Bayesian model averaging, *Journal of Climate*, 25, 5524-5537, 10.1175/JCLI-D-11-00386.1, 2012.

Please also note the supplement to this comment:

<http://www.nat-hazards-earth-syst-sci-discuss.net/1/C2018/2013/nhessd-1-C2018-2013-supplement.pdf>

Interactive comment on *Nat. Hazards Earth Syst. Sci. Discuss.*, 1, 3129, 2013.

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