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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Assessment of an ensemble seasonal streamflow forecasting system for Australia" *by* James C. Bennett et al.

Anonymous Referee #1

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Summary

This paper investigates a recently developed forecasting framework called FoGSS (forecast guided stochastic scenario) for long-range streamflow forecasts (up to 12 month ahead) in Australia. FoGSS has been developed to replace stochastic scenarios (resampled historical flows) still used by many Australian water agencies. Two aspects are examined in this study: i) FoGSS's capability to act as a continent-wide forecasting system is assessed by evaluating its performance for 63 different catchments representing a wide range of Australia's climates. ii) Although FoGSS in the current set-up already performs well in general, skill / reliability is limited in ephemeral rivers with zero flows several months per year. Three different experiments are conducted in order to evaluate, which component of FoGSS (rainfall forcing, rainfall-runoff model, statistical

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error model) could be further improved especially with regard to ephemeral rivers.

General comment

I found the paper very well written and it is well-arranged. In my opinion, the manuscript fits pretty well into this special issue and its content is relevant for publication in HESS. The extensive experiment of the continent-wide forecasting system is described in-depth regarding the underlying methodology (including the statistical and rainfall-runoff models), the verification procedure as well as the numerous results. This work is a consistent step to continue previous work reported e.g. by Bennett et al. (2016) and Turner et al. (2017). Below I listed my comments and questions about the paper:

Major comment

I suggest trying to condense section 2.2 (especially its subsections) in order to strengthen the role of the Bayesian prior, which is assessed in experiment 3 and which seems to be most promising / sensitive to improve FoGSS output. The error model approach is very interesting, but as a reader, I slightly lost the focus on the relevant aspect (the prior) for your study.

Minor / Technical comments

Page 2, line 18: I suggest adding a short explanation, why BJP is not (or even may be cannot be) suitable for those long-range forecasts in order to assist readers, who aren't familiar with the BJP approach.

Page 2, line 25: It might be beyond the scope of this paper, but did you experience that the preference of some water agencies to use stochastic scenarios (instead of seasonal forecasts) might be based on the fact that they still have to gain confidence to this "new" source of information (they are used to the scenaros, they comprehend it, ..)? So the "practical" advantages you mentioned might also contain such more psychological aspects instead of purely technical ones?

Page 3, line 8: I recommend mentioning how the three variants of the POAMA model

are generated (variation of model parameter)?

Page 3, line 29: I suggest to split section 2.2 and to add a separate chapter “Hydrological model” (or something similar). Even this chapter might be relatively short, I suggest to have a separate section for each of the main FoGSS components, which correspond to the three experiments descripted in section 3of this paper.

Page 3, line 35: Have you thought about / tested using data assimilation techniques to reduce hydrological model errors?

Page 4, line 5: Shouldn’t it be “homoscedastic” in this context?

Page 4, line 24: I suggest to insert a comma before “. . . a and b are parameters.”

Page 5, line 1: I think “takes” should be deleted.

Page 5, line 3: The word-wrap slipped (comma at the beginning of line 4 should be in line 3).

Page 5, line 8: As you state that the upper limit of d is arbitrary, it would be interesting to know, if you have tested other thresholds before (and you ended up with 2)?

Page 11, line 1: I guess that “perennial” and “ephemeral” have to be switched?

Page 12, line 4-6: Could you please explain, why you are planning to improve Wapaba instead of using the GR2M model, as the latter one seems to perform better, especially in drier catchments? I think you give some kind of explanation on page 13 (line 13-18), but I suggest to add a link or to explain your decision to the reader already at the end of section 4.3.

Appendix A: As the state is a relevant information in your list, I suggest to explain the acronyms used, as several reader might not be familiar with the different Australian states.

Figure 1: Why does the arrow linking “rainfall-runoff model” and “Climatology PE” point

in the direction of the climatology? Isn't climatology potential evaporation an input to the rainfall-runoff model?

Figure 3 + 13: I suggest to explicitly mentioning the CRPSS as "skill measure". Figure 5, 6, 7, 8, 9, 10, 11, and 12: I suggest adding the total number of catchments in each panel (e.g. in brackets behind the title).

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