Response to referee comments.

Referee comments in black and author responses are in blue.

Interactive comment on "Post processing rainfall forecasts from numerical weather prediction models for short term streamflow forecasting" by D. E. Robertson et al.

Anonymous Referee #3

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Post-processing methods are most important for removing bias and to improve the reliability of rainfall forecasts. In this paper the Bayesian joint probability (BJP) modelling approach is applied to generate forecast probability distributions and ensembles are produced using the Shaake shuffle. Different verification methods have been applied to the post-processed NWP rainfall predictions and the results are discussed. In general the paper is very well written and its worth to be published after some minor changes. There are just a few comments:

(1) The BJP modelling approach has been explained already in detail in several other papers by the authors (e.g. Wang, 2009), so this part could be short and removed in the Appendix, since there is no new information.

There are several features of the BJP modelling approach used in this paper that are different to previously published papers. We therefore have included the mathematical details of these differences in an appendix with material to provide the reader with the sufficient context. The major differences include:

- The transformation used to normalise the data
- The bivariate formulation of the BJP modelling approach is given
- The parameter inference method here uses maximum a posterior solution rather than a full Bayesian solution using Markov chain Monte Carlo
- Reparameterisations used to ease parameter inference and their effect on the prior parameter distributions.

(2) What is really important is a thoroughly description how you keep the temporal and spatial correlations applying the Shaake shuffle, because these correlation structures are essential and are most often destroyed by the application of post-processing methods. Unfortunately it is not discussed in detail and from the results shown, it is difficult to see how the temporal correlation is reproduced. Furthermore it will be very interesting to see how the spatial correlation is reproduced, when the method is applied to more stations.

A new plot (Figure 13) is included to illustrate the effect of using the Schaake shuffle to reproduce temporal correlations in now included. Comments regarding the spatial correlation have been removed as analysis is only of temporal correlation.

(3) Regarding the forecast verification: If you have forecasts with lead-time up to 10 days available, why do you show only reliability diagrams for day 1 and day 2? At least you should mention the results for the other lead-times! Furthermore the sample size of the rainfall

events exceeding the 5 mm threshold seems to be far too small to make some meaningful interpretations.

The NWP model post-processed in this study only produces forecasts of lead times up to 60 hours and we show results for all these lead times. The sample size of rainfall events exceeding 5mm is small, and now we quantify the uncertainty of several of the relevant verification measures.

(4) In Fig. 10 you say on the one hand that for day 1 the forecast probability of a rainfall event of greater than 5 mm appears to be reliable. On the other hand for day 2 you say that the forecast is unreliable, because there are just a few forecasts falling into the two upper bins. When I look at the inserted histograms, I cannot see forecasts falling into the third bin at day 1 also.

The relevant paragraph has been revised and the reliability diagrams updated. See response to similar comment (comment 13) by reviewer 2.

References