

Interactive comment on “Verification of ECMWF System4 for seasonal hydrological forecasting in a northern climate” by Rachel Bazile et al.

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General comments

The paper is well written, and technically and scientifically sound. Applied methods and data used are well described, and results are presented in a concise and clear way. The paper uses methodologies and results from previous research. The main contribution is the verification of bias-corrected ECMWF System 4 forecasts for hydrological forecasting in Quebec, Canada. This supplements, and to a large degree confirms, previous verification studies in other regions.

Response : We would like to thank you for your review and comments. Answers and clarifications for the detailed comments are detailed below.

C1

Detailed comments

1. Page 7, line 28-30. The procedure for deriving catchment average precipitation and temperature is not that clear. Why is it necessary to first downscale ECMWF forecasts and then aggregate over a catchment?

Response : The original resolution of ECMWF System4 forecast grid is 0.7 degrees. This is too coarse to used at watershed scale, as some watersheds have no point or only 1-2 grid points inside their boundaries. In order to have more points inside the watershed boundaries and ensure that the average precipitation is not biased by a local storm, the original grid was interpolated on a 0.1° grid.

2. Page 9, line 18-20. Repetition. Described earlier.

Response : Although we agree that the information is repeated, it was made on purpose and we would prefer to leave the sentence there. Indeed, the denominations 'DSP' and 'HSP' are not conventional and we wanted to remind the reader about their meaning at this point in the manuscript. Reviewer 1's 21st specific comment (about Page 17, line 11) also indicates that the denominations used in the manuscript can perhaps be confusing, so we would really prefer to keep this repetition.

3. Page 10, line 12-13. Both precipitation and temperature are bias-corrected.

Response : Yes, they are both bias-corrected. Indeed, the way the sentence is formulated in the present version of the manuscript does not include temperature. This will be specified in the improved version of the manuscript.

4. Page 13, line 16. General performance of watersheds 5 and 7 described is not clear

Response : This issue was also raised by Reviewer 2 (his or her 3rd specific comment).

C2

This is a mistake, which we will correct. In fact, we clearly see that watershed 5 is not a good example in this sentence. The sentence "*in general, corr-DSP outperforms ESP for the 1-month lead-time for watershed 5 and 7.*" will be replaced by "*In general, corr-DSP outperforms ESP for the 1-month lead-time, with some exceptions such as watershed number 5 in winter or watersheds number 3 and 9 during the spring.*"

6. Page 15, Figure 7. PIT histograms and not rank histograms, I expect.

Response : Thank you for highlighting this mistake, which was also pointed out by Reviewer 1. This has already been corrected in the revised version of the manuscript currently in preparation.

7. Page 16, line 1-2. The problem of underdispersion of the bias-corrected ensemble could be elaborated. There is a general overestimation of precipitation cf. Fig. 2. In this case, linear scaling will produce a bias-corrected ensemble with smaller dispersion than the raw ensemble.

Response : We agree. The linear scaling method modifies the dispersion of precipitation forecasts and can influence the dispersion of streamflow forecasts. This will be further discussed in the revised version of the manuscript and the elements you mention will be specifically mentioned.

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