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Hydrology and Earth System Sciences Discussions

Interactive comment on "

Simplifying a hydrological ensemble prediction system with a backward greedy selection of members – Part 1: Optimization criteria" *by* D. Brochero et al.

Anonymous Referee #2

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General comments

This manuscript describes a methodology to reduce the number of members of an ensemble consisting of 16 lumped hydrological models coupled with the 50-members ECMWF EPS. This method has been applied on a set of 10 catchments. This work relies on the extensive analysis of the ensembles with the means of 5 verification scores

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and their combination in one summary score. These scores have been chosen because they quantify different aspects of ensemble prediction's quality. The selection works by removing one member at a time and the dividing of the dataset in three subsets as well as a resampling procedure aimed at avoiding overfitting and at obtaining an optimal subset.

I didn't find the manuscript easy to read. Some changes might facilitate the reading. But there is one point with which I don't agree. This is about the participation of the members of the ECMWF EPS in the selected 30-member ensemble (p.2757, l.18-24). I don't see the relevance of using the member's numbering as criteria since at each new forecast, the 50 initial states are assumed to be equally likely (as written p2749, l.11 & p.2757, 21-24!). The authors (p.2756, l.7-10) compare the results with the ensemble of 16 hydrological models driven by the deterministic forecasts. Maybe analysing the results without using the "mean rank of elimination" but taking advantage of the resampling procedure (Section 5) could explain the apparent difference. This major criticism might be withdrawn if multi-model meteorological ensembles could be used or – possible to achieve with the same material – if a reduced number of ECMWF EPS members were drawn randomly.

The choice of the scores should be presented more carefully. In the introduction, four aspects of ensemble predictions' qualities are listed (resolution, reliability, consistency and diversity). Then in Section 2, the five scores are introduced. CRPS is said to combine reliability and "potential CRPS" but this distinction is not used afterwards. IGNS is not associated with any aspect. RD explicitly refers to reliability and calibration. The delta ratio of the rank histogram also refers to reliability. MDCV is said to measure the reliability of the "central value". In Section 6, the scores are systematically linked with aspects of forecasts quality: MDCV with diversity, RD and delta with reliability, CRPS and IGNS with resolution, and delta with consistency and reliability. These aspects should be clearly defined in Section 2 (with appropriate references) and the choice of the scores should be shown to cover all of them.

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Specific comments

p.2744, l.1 Add the reference to Appendix A.

p.2744, l.2 Herbasch (2000) shows how to the compute CRPS of an ensemble without the need to assume normality.

p.2748, l.19 Explain SAFRAN. l.20 from.

p.2750, l.2 Daily data are probably observed around 6 UTC and if the 0 UTC forecasts are used, rainfall predictions are accumulated from 6 to 30, etc. Please clarify.

p.2751, l.4 I don't understand the end of the first sentence of this paragraph.

p.2752, l.12 Explain "consistency" and tell why a minimum of 30 members has been chosen.

p.2751, l.21 & p.2752, l.2-4. Isn't it a contradiction?

p.2753, l.12-15 An easier link with the subdivision of the dataset in three subsets explained in Section 4 should be provided.

p.2754, l.1-2& l.14-17. Could be also enhanced by the independence between the EPS members.

p.2755, l.4 This should be already announced in Section 3,3 (Fig. 2).

p.2757, l.27 NS should be defined in Section 2 and justified regarding CC.

p.2761, Eq.10 & p.2762, Eq. 11 should be defined earlier

Table 3. The distinction between "deterministic" and "probabilistic" HEPS seems inappropriate since both are probabilistic.

Fig. 2. The hydrograms are difficult to read. Select one. Refer to which forecast day these graphs correspond.

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