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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 2: Generalization in time and space" *by* D. Brochero et al.

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General remarks: I was asked to make a review on "Part 2" of this suite of two companion papers focused on strategies for reducing the size of "grand ensemble" hydrological prediction systems. Such efforts are particularly needed in order to be able to transfer the outcomes of research experiments to operational services, which, as correctly

stated by the authors, would have large problems in using Hydrological Ensemble Prediction System (HEPS) delivering hundreds of members in their daily business. The introduction is well organized and covers an adequate spectrum of current literature on the thematic areas related to the paper. Sections 2 and 3 are to great part redundant, as most of the information presented is already presented in more detail in "Part 1: Optimization criteria". Section 4 is a summary of the methodology presented in "Part 1". The "Pseudocode Algorithm 1" and Figure 2 would fit and help in "Part 1". The really novel aspects of the paper begin then in Section 5, where an interesting proof-of-concept for extending the methodology to different lead times and sort-of regionalization to similar catchments is well described. The use of a "publication set" is a well chosen benchmark. The results are a clear support to "Part 1" and surely an interesting contribution to HESS.

Major Issues

1) As already indicated by the reviewer G. Thirel, there is some obvious redundancy with the companion paper "Part 1: Optimization criteria". As a reviewer allocated only for Part 2, this results in a well organized paper, which could be read without often switches to Part 1. If "Part 1" will be accepted, then I agree with G. Thirel concerning shortening section 2 and dropping Table 1 from the "Part 2". Your answer to G. Thirel goes in the right direction.

2) I have a general concern on the selection methodology. I agree here with the comments of the reviewers on "Part 1". ECMWF EPS members are independent, so it is useless to have a "a-posteriori" statistic of the ECMWF member contributions (Your Fig 4 in Part 2) to the member selection. In operational mode you would need to propagate all 50 members through the hydrological model. According to Table 5 (Bold criterion) and depending on the test area you can reduce a priori only the number of hydrological models you consider (e.g. for basin "K7312610" you can disregard in operational mode 6 of 16 models). You should find a technique in order to decide "a priori" how to reduce the numbers of EPS members to propagate through your suite of hydrological models,

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and this is exactly what the procedure of Molteni et al. (2001) is doing previous to make a limited-area downscaling of ECMWF EPS.

Minor comments: Page (line):

2787 (20) The reference on a EGU presentation (Velazquez, 2010) for the description of the setup is rather inadequate. Change to Velazquez et al. (2011, Adgeo)

2788 (3-5) Do you have any reference on how the "distributed models" have been downgraded to "lumped" and how their performance is affected by such structural change?

2815 Please declare also in the caption that symbols refer to the clustering evaluated in Table 4. It would be also useful to highlight in the Map which areas were used for selection and which only served to verify the methodology.

Final considerations: The capability of the methodology to reduce computational need in operational mode (paramount goal of the study) apply only to the selection of hydrological models. The authors reply to Reviewer G. Thirel answers already the few technical flaws of the paper. I suggest the editors and the authors to explore the possibility to transfer Figure 2 to "Part 1" and re-arrange "Part 2" in order to obtain a compact paper, that could be labelled as "Technical-note".

References:

Molteni, F., Buizza, R., Marsigli, C., Montani, A., Nerozzi, F., and Paccagnella, T.: A strategy 20 for high-resolution ensemble prediction. I: Definition of representative members and globalmodel experiments, Q. J. R. Meteorol. Soc., 127, 2069–2094, doi:10.1002/qj.49712757612, 2001. 2787

Velázquez, J. A., Anctil, F., Ramos, M. H. and Perrin C.: Can a multi-model approach improve hydrological ensemble forecasting? A study on 29 French catchments using 16 hydrological model structures, Advances in Geosciences, 29, 33–42, 2011.

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