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Hydrology and Earth System Sciences Discussions

Interactive comment on "Performance and reliability of multimodel hydrological ensemble simulations based on seventeen lumped models and a thousand catchments" *by* J. A. Velázquez et al.

Anonymous Referee #2

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Ensemble simulations are seen increasingly as an option to overcome the shortcomings of deterministic simulations that can only provide a single solution and do not account for errors in input data, process realization and model calibration. Instead, multi model solutions allow extracting more valuable information and to quantify the overall uncertainty in a system. This paper addresses a number of important question how to deal best with ensembles once generated – should they be aggregated to single predictors, should all the components be retained, is there an optimum number of

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ensemble members or is the more the better?

This paper is very well written in every aspect and a great pleasure to read. Although targeted for hydrological applications, I am sure that the findings are valuable also for other applications such as meteorology, where similar discussions on how to best create and explore ensembles take place.

The methodology and results are well presented. I have a few comments only that the authors may wish to consider.

The CRPS described by Gneiting and Raftery (2007) is very good in the case the cdf (Ft) is known and has the advantage that it can be calculated very quickly for the optimization purposes. However, in the case of small ensemble numbers, a potentially large variance of this ensemble could attenuate the CRPS of Gneiting and Raftery (2007). The authors may want to consider using the formulation of Hersbach (2000) instead. (Hersbach, H., 2000. Decomposition of the continuous ranked probability score for ensemble prediction systems. Weather and forecasting, 15: 559-570.)

There might be misunderstanding how the mean of the CRPS has been calculated – the stations or the simulations. The authors may want to specify more clearly.

According to table 1 the ranges in catchment size are quite large. Obviously the hydrological responses are very different between small size, flashflood type, catchments and the larger catchments. Did the authors look at their results also aggregated to catchment size? This could yield interesting results in particular with regards to the extremes of the distributions.

In their analysis the authors considered 10 years time series which will have been dominated largely by average flows. In section 3.2 the authors state that over all flow quantiles the probabilistic system performs better than the deterministic system and "that the system is better at detecting larger events such as quantiles 50 or higher, than low flow events such as quantile 10". What is their explanation for this?

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