

Interactive comment on “Does the weighting of climate simulations result in a more reasonable quantification of hydrological impacts?” by Hui-Min Wang et al.

Anonymous Referee #1

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This is a well written paper that studies the added value of weighting GCMs within an ensemble as a function of hydrological performance rather than as a function of climatological performance as usually done. The paper discusses some interesting aspects (e.g. the difference in outcome if weighting according to precipitation or temperature under different hydrological regimes) and comes to the conclusion that if raw GCM data is to be used, ensembles should be weighted based on streamflow rather than temperature or precipitation. In exchange, there is not much added value with streamflow-based weighting if the underlying GCMs are duly bias corrected. This outcome is not entirely surprising (see detailed comments) but I think it is nevertheless interesting for the readers of HESS and thus worth publishing.

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Detailed comments In this paper, the GCM weighing is tested for large catchments (> 10'000 km²) that are simulated with a lumped model (GR4J) at a daily time step. With such a lumped model, it can a priori be assumed that the most important aspect of climate inputs for hydrological model performance and for future simulations is the actual precipitation and temperature bias. In fact, there is a whole body of hydrological literature on the importance of correct area-average precipitation estimates, which should perhaps be linked to this study. A starting point is the work of Lebel et al. 1987. Since the model is lumped, spatial differences between meteorological inputs derived from GCMs cannot show up in the simulation results otherwise than affecting the catchment-scale average values (i.e. the bias). Differences between GCM outputs in temporal variability do most likely not show up because they are dampened by the model. The authors argue that the response of a catchment to climate input is nonlinear. This holds in general but if such a simple model is used, no surprising outcomes can be expected (not much difference between climate-based weighting and hydrological weighting in absence of major meteorological biases). This is a limitation of the study: major differences between climate-based weighting and hydrological weighting can a priori not be expected in the bias corrected set-up with such a simple model. This has to be discussed in sufficient detail in the paper and highlighted also in the perspectives. Finally: I am not an expert on bias correction methods. Accordingly I can only assume that this part of the work is state-of-the-art.

References Lebel, T., Bastin, G., Obled, C., and Creutin, J. D.: On the accuracy of areal rainfall estimation - a case study, *Water Resources Research*, 23, 2123-2134, 10.1029/WR023i011p02123, 1987.

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