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Interactive
comment

Interactive comment on "Assessing the performance of global hydrological models for capturing peak river flows in the Amazon Basin" *by* Jamie Towner et al.

Gemma Coxon (Referee)

gemma.coxon@bristol.ac.uk

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This manuscript assesses the performance of eight different global hydrological models for 75 gauging stations across the Amazon basin. It assesses the ability of the model to reproduce daily and peak river flows and finds interesting regional differences in model performance. It concludes that the rainfall product is the dominant control on model performance.

Overall, I enjoyed reading the paper. It is well-written and logically structured, with excellently formatted plots. While the analysis and results (as Reviewer 1 also pointed out) are not ground-breaking, the work represents a potentially useful contribution to

the application of GHMs and their use for flood risk assessment and forecasting. For the results to have wider applicability, I think the authors should consider adding some additional analyses to strengthen their conclusions. Many reasons for good/bad model performance are postulated in the results section but the analysis isn't in-depth enough to draw strong conclusions (other than rainfall is a dominant control on model performance). The wider applicability of the results also needs to be better highlighted in the conclusions.

My main comments are detailed below.

Comments

1. The authors conclude that rainfall is (unsurprisingly) the dominant control on model performance. If the choice of precipitation dataset is the most influential on model performance then I would have expected a little more analysis on the precipitation datasets themselves. I appreciate that more involved analysis looking at the seasonal characteristics of the rainfall patterns is probably beyond this paper, however a figure of mean annual rainfall across all the catchments for each rainfall product would be useful for the reader to better understand how and why model performance may vary between the different models across the Amazon basin.

2. P10 L23 "An average of 81% of stations are considered skillful (i.e. > 0) for the KGE metric". I would not consider a KGE score just greater than 0 as 'skillful'. You should be more specific here about what a KGE score greater than zero represents if you are using it as a benchmark to define whether a model is skilful or not. Unlike NSE, a KGE score of zero does not represent the mean streamflow response.

3. P10 L27 (and elsewhere). Your 'average' station scores could be skewed here by particularly low values of KGE – it may be better to report the median station scores here instead.

4. Section 3.1. I liked your analysis of the relationship between model performance

and dams and Figure 1b. However, as you note, this doesn't fully explain regional differences in model performance. Are there any other catchment characteristics that may also explain good/poor model performance? I would calculate and add some additional catchment characteristics such as mean rainfall, mean pet, elevation, geology (as you also focus on groundwater parameterisation) to Figure 1 to better analyse these regional differences in model performance and strengthen the conclusions of the paper.

5. Section 3.1. In addition to comment 4 – do any of the GHMs include schemes to represent dams/reservoirs? Do you see any differences in model performance for models that do include these human influences over models that do not?

6. Conclusions L28-29. You state that "The implications of these results suggest that the choice of precipitation dataset is the most influential component of the GHM set-up in terms of our ability to recreate annual maximum river flows in the Amazon basin". Can you say anything more about what type or spatial resolution of precipitation dataset should be used to better reproduce annual maximum flows? This would help to guide future studies on modelling peak flows in the Amazon basin.

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