Response to Editor's comments

Dear Editor,

Many thanks for reviewing our manuscript and ensuring our work reaches the highest possible standard. We have updated the manuscript in response to your comments, and have made the data and code available in appropriate repositories. Further details are provided in the text below.

We hope that our work will be considered suitable for publication in HESS, and we look forward to hearing from you soon.

Best wishes,

Jess Baker

Dear authors,

Thank you for your detailed responses to the referee comments, which were very supportive, but also suggested a few improvements and pointed out potential deficiencies that needed to be addressed. I think that you addressed most of the points very well and that your proposed revisions will make the paper a very valuable addition to the scientific literature. In addition to your proposed edits, I would also like you to consider the following points:

- Referee #3 was missing a clear statement "in what ways the current paper adds up to the currently reported literature on uncertainties in ET products (e.g. Mueller et al 2014) or in other words what is new here that we didn't know before?". In your response to the referee's comment about Line 555-560, you do highlight the novel aspects of your analysis, but I believe that it would be good to discuss more systematically in the introduction already what has been done to date (e.g. Mueller and Seneviratne 2014 and citations therein) and what gaps the present study intends to fill, which, as I understand it, goes beyond the application of old methods for bias detection to the new CMIP6 data, as mentioned in Line 130. In particular, the comparison with the catchment water balance and the associated uncertainty bounds are an important addition in my opinion. The paragraph starting in Line 123 could be a good place for this.

Thanks for raising this point. We had indeed not fully emphasised that the novelty of our approach comes from benchmarking the CMIP model output and remote sensing datasets against our catchment-balance estimates of ET and its associated uncertainty. As suggested, we have expanded the introduction to highlight this point.

"Finally, representation of Amazon ET in coupled climate models is still underdeveloped, in part due to limited high-quality reference observations. To overcome uncertainties in benchmarking data, Mueller and Seneviratne (2014) utilised a synthesis of 40 observational, reanalysis and land-surface model datasets (Mueller et al., 2013) to evaluate 14 models from the fifth Coupled Model Inter-comparison Project (CMIP5). Their analysis showed that Amazon ET tended to be overestimated at the annual scale, but underestimated from June to August. More recently it was observed that 28 out of 40 CMIP5 models misrepresented the controls on Amazon ET, with implications for future precipitation projections in the region (Baker et al., in review). Other assessments of CMIP5 models over the Amazon have found that choice of reference ET dataset can have a large impact on model performance metrics (Schwalm et al., 2013, Baker et al., 2021). Catchment-balance analysis accounting for changes in groundwater storage, offers an alternative approach for directly quantifying Amazon ET and its associated uncertainty at the monthly timescale, but to our knowledge has not previously been applied to evaluate climate models. With output from the sixth generation of CMIP models now available (Eyring et al., 2016), there is an opportunity to extend earlier evaluation studies by comparing simulated Amazon ET against catchment-balance estimates, and thus provide a first assessment of model performance over the Amazon."

- Data and code availability: Thank you for providing links to the datasets used, a summary of the

extracted data on zenodo and the scripts for raw data processing on github. Could you provide the full link to the zenodo repository, instead of just the doi? This would make it easier to find: https://doi.org/10.5281/zenodo.4271331

Good idea – we have now provided the link to the repository.

Since github.com is not a suitable permanent repository as outlined in the HESS data policy, would you be able to publish the relevant version of your github repo on zenodo as well? Zenodo offers a very convenient way to link up to a github repo.

We have created a 'release' of the github repository, which can now be obtained from Zenodo (https://zenodo.org/record/4580447#.YEC_wi2l1hE).

The data provided in zenodo only contains basin-mean monthly estimates, but Fig. 3 and Fig. 6 show sub-basins. The uncertainty bounds in Fig. 6 are also not included in the zenodo file and it is not clear how the numbers in zenodo actually connect to the original datasets. Would you be able to describe how this table can be recreated from the original datasets using the scripts provided, and similarly, how the sub-basin data and error bounds can be recreated? This would help tremendously, should a reader wish to do a similar analysis for different datasets, as they would be able to verify that they are actually doing the same thing. You stated that the python scripts used for data analysis are available from the authors upon request. Is there a reason not to add them to the scripts used for raw data processing? I thank you already for your additional efforts to make your data analysis FAIR, as described in the HESS data policy (https://www.hydrology-and-earth-system-sciences.net/policies/data_policy.html).

We have now uploaded all of the data analysis scripts, including the script to calculate catchment balance ET for the Amazon and its sub-basins, and scripts to extract basin-mean values from gridded netcdf files, in addition to the data processing scripts previously uploaded to github. The readme explains what each script does, and how to generate the table of catchment-scale estimates of Amazon evapotranspiration.

We also provide a script to estimate the errors in the catchment-balance ET for the Amazon. These errors are included as a separate table, accessible here: https://zenodo.org/record/4580292#.YECz-i2l23c.

For the sub-basins, we only used climatological mean ET. These values can be obtained using the provided script 'get_catchment_balance_ET_all_basins.py'.