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Comment on hess-2021-109

Anonymous Referee #2

Referee comment on "Inundation prediction in tropical wetlands from JULES-CaMa-Flood global land surface simulations" by Toby R. Marthews et al., Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2021-109-RC2, 2021

General comments:

This is a potentially interesting study comparing JULES-CaMa-Flood simulation output with a global dataset of inundation extent for different selected wetland regions.

Specific comments:

- There are 10 case study wetland regions, but the study spends insufficient time on most, if not all of them.
- The results section needs improving. The results within and between the regions studied should be compared in quantitative terms. The main/most important findings should be identified and highlighted.
- There are insufficient insights presented in the discussion. Can the errors and biases (based on the NGE, KGE, alphas and beta) at different locations be better attributed to the quality of JULES versus JULES-CaMa-Flood simulation? Are they predominantly a result of model structure, parameter or forcing errors? To what degree is uncertainty in the remote sensing data responsible? How do climate, season, and hydrotopograhy factor in? The authors must relate their results/findings with existing knowledge of earth system/hydrological processes of the different wetland regions studied.
- The authors propose the alpha and beta parameters as indicators of model bias in the simulation of evapotranspiration and infiltration. However, these cannot be expected to be constant over time. Additionally, the NSE and KGE were calculated over the full temporal domain. Can the authors be confident that the high performing parameters remain valid at a different time? Additional analysis is warranted to investigate this.

Technical comments:

- Abstract: the final sentence of the abstract claims "This study provides timely data". However, it is unclear from the manuscript what part of the results/findings this "data" is referring to. The alpha and beta parameters are possibly only useful for JULES-CaMa-Flood-GIEMS users.
- Abstract: in line with the earlier recommendation to investigate all the different regions more thoroughly "(including the Sudd, Pantanal, Congo and Amazon)" should be removed.
- Line 35: what is being referenced to in the cited reference Saunois et al 2020 is unclear.
- Line 100: "Most hydrological models are run uncoupled from the atmosphere and are therefore reliant on the availability of good precipitation and other atmospheric driving data." – the first part of this statement is inconsequential. Even if hydrological models were run coupled with atmospheric models, a high level of error from the simulated precipitation is still expected.
- Include a study area figure at the global scale to adequately introduce the wetland regions and discuss their differences in major processes/controls. This will remove the need to refer to a few of these regions as "the three tropical zones", which can be confusing for the reader.
- Lines 201, 215: references to figures from the results section within the methods section should be removed.
- Line 222: "We therefore calculate spatial matching statistics across all case study areas" - it is unclear what is being meant here by spatial matching statistics.
- Lines 228-229: The evaluation metrics nRMSE, r, RMSE were not introduced in the methods, nor were their results presented.
- Line 238: "However, these statistics are not capable of measuring some aspects of the flow regime that are important from the point of view of allowing us to divide out the different sources of inundation in our study wetlands" is unclear.
- Figure 1, 4: the results for regions with a larger spatial domain are difficult to see.
- Figure 5 is blurry
- Line 237: "within the borders of the wetland itself" – at/near the wetland boundaries?
- The authors' conclusion in lines 284-288 is poorly supported.
- Line 302: "If overbank flooding is underestimated in our simulation then the water within the river course (the Niger or White Nile, respectively, in these cases) will remain in the river and be taken downstream further than expected, producing a downstream wetland 'extension' that exists in the simulation results but not the observed (as we see in our JULES-CaMa-Flood outputs). – this needs to be better linked better to the study results, with examples.
- The manuscript is informal in tone and unfocussed at some parts, with longwinded sentences that make it hard to read. Additionally, there are:
  - acronyms undefined at first use e.g. CaMA, GIEMS, GLWD, WRR1, WRR2
  - use of biased/subjective words, e.g. "surprisingly", "sophisticated"
  - overstatements, e.g. "widely used" (relative to the few references cited)
  - excessive use of brackets and italicized phrases that highly disrupt the flow
  - generic/blanket statements such as: "We found that our simulated inundation extents (from the CaMa-Flood model, driven by JULES runoff data at 0.25° resolution) sometimes compared very closely to our observed data (from GIEMS satellite-based data), but at many points there were divergences", and "The spatial displacement of inundation prediction downstream from observed inundation visible especially in our results for the Inner Niger Delta and the Sudd (Fig. 1) is a result of over- or under-estimation of overbank flooding upstream." There are multiple occurrences throughout the manuscript including in the abstract.

The overall readability must be improved.