Hydrology and Earth System Sciences Discussions

Hydrol. Earth Syst. Sci. Discuss., referee comment RC2
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Comment on hess-2022-102

Anonymous Referee #2

Referee comment on "Assessing runoff sensitivity of North American Prairie Pothole Region basins to wetland drainage using a basin classification-based virtual modelling approach" by Christopher Spence et al., Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2022-102-RC2, 2022

Overall, the subject matter, methodological approach, and results of this paper address relevant scientific questions within the scope of this journal. The authors present an interesting modeling application towards better understanding complex landscape hydrological processes.

It is unclear the actual spatial extent of the modeling study. I suggest including more maps in text and in supplemental material to orient the reader through the complex methods. It is clear the Cold Regions Hydrological Modelling platform (CRHM) has been developed and published in many different publications, but it would be helpful to include a spatial visualization of routing pathways of surface water, spatial orientation, and size of wetlands relative to stream networks and how these watershed characteristics change under different drainage scenarios. These details are currently lacking or hard to find, despite the major conclusions of the paper directly relating to these aspects.

Another point of clarity is to standardize use of stream discharge, streamflow depth, and runoff. These different terms are used throughout interchangeably and makes the findings hard to follow.

Overall, interesting conclusions are made but more effort could be made to distill the major findings and move some method and results information into supplemental material.

Below are specific editorial suggestions regarding text, tables, and figures.

L63 this half of the sentence does not say anything. Consider removing or re-writing

L71 replace “numerous depressions” with an order of magnitude (i.e., millions) estimate of number of basins

L80-109 this paragraph can be distilled and shortened to focus on how this information describes the system and problems

L110 This sentence is confusing and repetitive, consider re-writing

L143 These objectives are a perfect spot to set the tone on standardizing language in regards to stream response variables of interest (streamflow, runoff, discharge) and then keep consistent after that

L195-210 this section would be much easier to follow and would allow for better interpretation of results if there were at least one map showing the distribution of wetlands and runoff preferential flowpaths under different drainage scenarios. I find it hard to visualize what this looks like in virtual model space.

L293 More details about the drainage scenarios are needed to better understand what is being manipulated in the model relative to the hydrologic responses.

L307-315 This text would be easier to understand with a visual figure as well. Could be in the supplemental material

Fig 1. The weather station sites are very hard to see. Make bigger and more contrasting to the background

Fig 2. Include slope and intercept of regression model in caption. Also, make sure it is noted why the simulated depression storage is an order of magnitude larger than the observed pond depth. Consider changing units on one y-axis so you are comparing mm to mm or cm to cm

Fig 3. This figure does not say that much and could be moved to the supplemental material

Table 4. in L416-418 you show that there is low deviation between drainage scenarios. To simplify this information consider moving this whole table to the supplemental material and only present the average and sd for each site

Figure 4. similar to Table 4 suggested edits. Take average of all 4 scenarios and only visualize that in the main text. Move whole figure to supplemental. This figure is hard to pull details out of. Also, in the caption include the time period that is modeled and the units of discharge depth. Discharge depth is mentioned in the caption, but the figure shows Annual streamflow (mm).

Figure 5. add “median” “wet” and “dry” labels above the top panel next to each corresponding black vertical line.

Table 5. This information is confusing. Maybe because I do not think about 1:42 as a flood size very often.

Figure 6. This could be consolidated into one panel with the bottom panel’s y-axis range. Right now the y-axis labels seem to be wrong and missing median and max labels.

Figure 8. Different y-axis labels. Standardize runoff or streamflow and be consistent

L548 needs a new section title since this analysis and Fig. 9 talk about a different topic.