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Comment on hess-2021-552

Anonymous Referee #1

Referee comment on "Evaluation of a new observationally based channel parameterization for the National Water Model" by Aaron Heldmyer et al., Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2021-552-RC1, 2022

Review for paper: "Evaluation of a New Observationally Based Channel Parameterization for the National Water Model"

In this paper, the authors explored the effects of modifying channel routing parameters in the National Water Model (NWM) streamflow simulations using a regionalized channel geometry and Manning's roughness dataset.

The study is an important contribution to the possibility of improving the NWM in order to provide a better quality of the results, focusing especially on those areas where significant differences were found.

This reviewer considers the paper is suitable for publication in Hydrology and Earth System Sciences" Journal, after the authors address the following suggestions and comments.

Line 22. An increase in mean R2 by just over one hundredth (from 0.479 to 0.494) is not a significant variation. I suggest changing the word "significant" for "modest" as you do in the Conclusions (Line 454).

Line 40. Here you must define the abbreviation "LSM" (Land Surface Model), since is the first time in the document that you are using it.

Line 130. I suggest including a brief discussion on the dependence and variation of the parameter n_{cc} as a function of the extension of the floodplain (dx_{cc} variation). Same for the dependence and variation of n as a function of the channel depth (d variation).

Line 171. Explain more details about the criteria that you considered to define the 12 basins of study. It could be summarized in a table that list the climate, land cover and terrain characteristics for each basin.

Line 201. One of my main concerns is that the authors didn't explore the uncertainty of the longitudinal slope (S) in Equation 10 to obtain Manning's n. The authors made two strong assumptions that should to be better discussed and justified: 1) Authors used the terrain slope instead of the hydraulic grade line in the Manning equation, and 2) the slope was not measured but obtained from a terrain model that could include errors of the DEM and those errors propagate in the obtained Manning's n.

Line 206. I suggest renaming the parameter "b" in the linear regression Equation 11, as it might be confusing with the exponent "b" in Equation 6.

Line 235. Explain more details of the reasons you considered for choosing the 99th and

99.9th percentile flows to calculate TW.

Line 277. In this line you mentioned Figure S1 but in the Appendix A the Figure is called Figure A1. This figure also has a poor resolution and is difficult to read it. Improve the quality of the figure.

Line 287 - 289. The analysis written in these lines does not correspond to what is shown in Figure 6. The caption of Figure 6 says "…and boxes with text indicate the combination that resulted in the lowest error, which is shown within the box". However, you mention "For example, the regression determined from 90th percentile flow yielded the smallest Manning's n error in the California region (18), whereas the smallest error in the Tennessee region (06) was achieved at the full CONUS-wide regionalization scale" but according to Figure 6 for region 18 the smallest Manning's n error is in the 75th percentile and for region 6 the smallest error is for the HU4 scale.

Review both the figure and the discussion for consistency.

Line 302. In this line you mentioned Figure S2 but in the Appendix A the Figure is called Figure A2. Improve the quality of the figure.

Line 344. In this line you mentioned Figure S3 but in the Appendix A the Figure is called Figure A3.

Line 345. Improve the quality of Figure 9

Line 380. Improve the quality of Figure 10

Line 405. How can you ensure that a smaller scale typically results in the lowest error, if according to Figure 6, only 9 out 18 regions show the smallest Manning's error for HUC4 which is equivalent to 50% of the study regions, and 8 regions show the smallest error for HUC2 which is around 45%? I do not see much of difference here to affirm that sentence.

Line 410. In your analysis you mention "Furthermore, the strong performance of the HUC4 regionalization scale relative to HUC2 in the Missouri Region (10) speaks to the diversity of terrain conditions…" However, according to Figure 6, in region 10 the smaller Manning's error was found in HUC2 which means the strong performance here is not for HUC4 regionalization scale.