Comment on hess-2021-52

Anonymous Referee #1

Referee comment on "Assessing interannual variability in nitrogen sourcing and retention through hybrid Bayesian watershed modeling" by Jonathan W. Miller et al., Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2021-52-RC1, 2021

General comments:

This is a well-written paper, presenting an interesting model of nitrogen loading across river basins, accounting for temporal variability. In general, the methods appear to be appropriate, with assumptions and potential biases considered and appropriately accounted for, while the results are well interpreted and implications for policy are discussed.

I suggest below some specific comments, most of which are very minor in nature.

Specific comments:

Equation 1 (line 160). I am not sure I completely understand this formulation. It seems like there are only 2 upstream LMSs considered (k and l), while line 161 mentions "n". I do not have access to the original reference, but I wonder if some minor clarification would be helpful here.

Section 2.9 (lines 216 to 232). Has a sensitivity analysis been carried out to investigate the effects of changing the informative priors? If not, I think this would be useful in understanding the robustness of the model. In any case, I think that some discussion of this is required.

Section 3.3 (lines 260 to 275). Can the CI endpoints be reproduced here? Currently, I feel that the point estimates without this context suggest greater certainty in these values

than is the reality.

Technical corrections:

Line 46. A comma between "reservoirs" and "using" might be useful.

Line 144. I think "plant" is unnecessary, being effectively a repetition here.

Line 172. Is 10^5 definitely correct here? (It seems very large for an offset for a log transformation.)

Line 261. "ECs" need to be defined here. The acronym is only defined in the captions for Tables 2 and 3, but not in the main text.

Line 620. "CI" needs to be defined as "credible interval" in the caption of Table 2.

Supplementary material: Can the figure captions be checked to ensure that the captions contain all required information? E.g. It would be helpful for Figure S3 to define the dashed line in the caption, while dots and lines could be defined in the caption of Figure S4 (so that this is self-contained without relying on the caption of Figure 3).