

Biogeosciences Discuss., referee comment RC3
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Comment on bg-2022-46

Anonymous Referee #3

Referee comment on "Variability and Uncertainty in Flux-Site Scale Net Ecosystem Exchange Simulations Based on Machine Learning and Remote Sensing: A Systematic Evaluation" by Haiyang Shi et al., Biogeosciences Discuss.,
<https://doi.org/10.5194/bg-2022-46-RC3>, 2022

This manuscript conducts a meta-analysis to explore the uncertainty of simulating NEE using comparing machine learning techniques, time-scale and spatial-scale changes, and input variables. This is an important topic to solve the difference between observed and predicted NEE. However, this manuscript doesn't clarify the objectives and detail of data processing. Oversimple descriptions in the Methods section makes readers confusing. Additionally, the usage of too many speculative explanations in the discussion section is hard to draw universal conclusions. This manuscript doesn't clarify the motivation of the work, especially in the advantages and potential of ML. In summary, the paper needs to be substantially revised, and some parts need further elaboration.

L32, This sentence hardly reflects the scientific value of this paper.

L40-L43, The advantages and the current situation applied to ML need to be further reviewed, which is beneficial for readers to understand the purpose of introducing ML in this paper.

L45, The sentence, "a synthesis evaluation is ...limited", needs to be further explained otherwise it is hardly understood.

L49-50, need references, preferably with 2 examples

L52-54, There is a logical gap between this sentence and the previous statements.

L88-93, The uncertainty caused by spatio-temporal heterogeneity cannot be confused with the volume of data sets. Because large-data volume does not equate to higher heterogeneity. Big data provides more opportunities to build balanced-training data. This section may need to be rewritten.

L107-108, need references

L116, "Other Features" needs to be clarified. The purpose of this manuscript may be to explore: the uncertainty of NEE evaluation results caused by ML techniques, spatio-temporal resolution remote sensing data, and verification methods according to the introduction?

L144, An oversimplified description of the workflow, please give an overview and detailed sub-steps of data processing and simulation. It is hard to know the objectives of each analysis for readers.

L150, Abbreviations in the figure need to be clarified

L178, Need scale bar and north arrow in figure 3

L198, It is difficult to find the differences among algorithms using simple comparisons in figure 5a, and needs more statistically testing. Additionally, this figure confuses me. Why are MLR, RF, SVM, and ANN separately compared? Please provide explanations. Why is PLSR with high R² removed? Finally, there are also some problems with the image. The caption does not explain the details of the box. Does the line in the box represent the mean or the median?

L205, Avoid using the word "significant" without statistically testing

L206-210, It is hard to read the trend in Figure 6. Recommend adding a line chart to demonstrate the decreasing trend.

L212, There are no details of the boxplot. Are all models incorporated into the time-scales comparison, or only RF, SVM, and ANN? Please add the details of data processing.

L223, Also, use these words carefully without statistically testing.

L263, Need to reorder the y-axis text in figure 8. Furthermore, a serious question is whether the comparison analysis of these variables keeps other variables constant? If not, conclusions based on comparisons of R² may not hold water.

L299, Lacking the in-depth discussion of the uncertainty of NEE prediction resulting from time-scale change.

L308, There are too many speculative parts and insufficient supporting materials in section 4.1 of discussed.

L321-323, The discussion of model accuracy difference caused by satellites needs careful. This sentence needs further support. Are you implying that the time scale compensates for the uncertainty caused by the spatial scale?

L326-330, This sentence is too long

L330-332, The time-scale discussion containing spatial-scale matching will confuse readers.

L349, Does "coarse-resolution" here note spatial resolution or temporal resolution?