

Interactive comment on “Improved estimate of global gross primary production for reproducing its long-term variation, 1982–2017” by Yi Zheng et al.

Anonymous Referee #2

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This paper reported some improvements of global gross primary production using the revised EC-LUE model. Overall, it lacks in detailed explanation and thorough validation to show the novelty of the proposed model if any. English must be significantly improved. Thus, I recommend rejecting the paper. Please see several major comments below.

1. Details are missing in many parts. Justification should follow when a decision or selection is done. For example, what is the rationale of dividing data into calibration and validation, and how was it done? How was the parameter optimization conducted? How was the collocation of different input data done? These are just a few of them.

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Readers don't know what and how the authors exactly did, which limit the understanding of the proposed model and its evaluation.

2. Calibration vs. validation. As empirical models are dependent on data, a more robust approach should be adopted. Calibration sites were randomly selected? What if different calibration sites are used? A bootstrapping method might be adopted to see if consistent results can be achieved using different calibration data. Or n-fold cross validation would work. If consistent results were not obtained, the proposed model would be inherently unstable.

3. Seasonal analysis using time-series data should be conducted. Figs 2 and 3 are not sufficient to say that the proposed model showed a good performance in reproducing the seasonal variations in GPP as they don't contain any seasonal information. You may conduct statistical analysis by season, not simply based on stations.

4. More supporting references should follow in lines 250-251 if you want to say the decreased GPP was due to excessive precipitation and hot temp. In other words, both precipitation and temperature in Amazon significantly increased from 1982 to 2017? Seasonal factors might affect?

5. Scale issues should be carefully examined. Input data have different scales and the ground GPP measurements don't have the same scale with input data. What kinds of approaches were conducted when matching input data on the same spatial domain? How did the authors mitigate or consider the different scale issues between site GPP data and input variables?

6. Lines 282-285. Needs more uncertainty analysis by factor (e.g., radiation) to support this. Line 325. throughout the seasons? or different results by season? Again, seasonal analysis should be conducted.

7. Figure 8. Comparison by region (or continent) would make the paper robust. Are there any merits of using the proposed model in terms of the spatial domain?

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8. Lines 371-372. Don't see any conclusive results to say that the model has a unique superiority in reproducing the inter annual variations in GPP at both site level and global scales. Superiority to what? Any comparison with other models (e.g., machine learning or physical models) to show the inter annual variations?

9. English needs to be carefully revised.

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