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Geoscientific Model Development Discussions
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Interactive comment on "Are vegetation-specific model parameters required for estimating gross primary production?" *by* W. Yuan et al.

Anonymous Referee #1

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General Comments

This study tested the robustness of globally constant vegetation specific parameters to simulate GPP based on light use efficiency (LUE) GPP models; how globally constant parameter works for GPP simulation for different vegetation types. The authors conducted two simulations, one is to use globally constant model parameter, and the other is plant functional type specific parameters using 7 LUE GPP models. By optimizing model parameters using eddy-covariance based GPP, the authors analyzed the differences in model performances of the parameter setting based on globally constant or PFT-specific parameters.

The scientific question of this study, "Are vegetation specific model parameters required for estimating GPP?" is an interesting and important question. I agree that satellite

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based land cover map might be one of the causes of model uncertainties. Therefore, as the authors stated, it will be nice if we don't need to rely on the vegetation-specific parameter, which requires accurate land cover data.

I read this paper interestingly. However, I found that some potentially important information is missing at this stage. To try to answer such an important scientific question, this paper requires more clarification and proof. For example, the method section does not express the procedure of the experiment well (see below). In addition, the results section were not also described properly (see below).

Thus, my suggestion is major revision is required before acceptance. This paper can be significantly improved after the authors rewrite it more precisely.

Details are:

1. I could not get clear idea how model parameters were optimized. I guess the model parameters were optimized using the eddy-flux based GPP, but I have no idea how the model were optimized with what (for example, to minimize RMSE of monthly GPP ? yearly GPP ? or something else? Or to maximize R2? Or something else?).

2. There are many parameters in each models. Please describe how many parameters out of model parameters were used for model optimization and why the authors chose them.

3. I am sure that description of each model in supplement materials are very important to understand the contents. Therefore, please move model descriptions in supplement materials into main text or appendix. Adding one table which describes model overview will be helpful.

4. Some major vegetation types were not covered in this study (e.g. cropland, shrubland, deciduous needleleaf). Please add if any data exist.

5. As far as I know, at least two earlier studies (e.g. Still et al. 2004; Yang et al. 2007) inversely estimated epsilon-0, and found that epsilon-0 varies in different vegetation

GMDD

6, C2289–C2291, 2013

types. Please mention the differences and their potential causes with previous studies.

6. Figure 1 is not clear. (1) very hard to identify each vegetation type in GPP mean figures. (2) No information on the temporal resolution of RMSE calculation (e.g. RMSE of annual? monthly? daily? GPP?) were given. (3) how the authors calculated R2. using annual mean, monthly mean, or daily mean etc.

7. Differences in model performance were given, however, no direct evaluation of the model was given. It will be helpful to add one Table which shows RMSE and R2 in each vegetation type for the two experiments.

8. In some models (e.g. CASA, CFlux, MODIS), I see clear systematic differences in model performance between vegetation-invariant parameter simulation and vegetation-dependent parameter simulation. Any comments?

9. It looks like models work poorly in some sites (e.g. sites with low R2 and high RMSE values). Any comments?

References:

Still et al. (2004) Large-scale plant light use efficiency inferred from seasonal cycle of atmospheric CO2. Global Change Biology, 10, 1240-1252.

Yang et al. (2007) Developing a continental scale measure of gross primary production by combining MODIS and AmeriFlux data through Support Vector Machine approach. Remote Sensing of Environment, 110, 109-122.

Interactive comment on Geosci. Model Dev. Discuss., 6, 5475, 2013.