Biogeosciences
Discussions

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Interactive comment on "Using satellite data to improve the leaf phenology of a global Terrestrial Biosphere Model" *by* N. MacBean et al.

Anonymous Referee #1

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MacBean et al. "Using satellite data to improve the leaf phenology of a global Terrestrial Biosphere Model"

GENERAL

This study presents a framework to improve phenological parameters of a terrestrial biosphere model and the impacts on the simulated global phenology and carbon fluxes. The most significant change is the bias correction of delayed end of season in the original model. The results are interesting and the impacts are significant. I recommend some minor changes before the publication.

First, the optimization procedure was not explained clearly. The authors estimated global minimum of the cost function by starting at 20 different random "first guest"

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points. It was not clear which model outputs were used in the calculation, fAPAR, SOS, EOS, or GSL? Did the 20 points mean 20 sets of parameters that change at the same time, or 20 different values for each individual parameter while fixing other parameters? Was the ORCHIDEE model required to re-run for each different set of x (parameters), that is to say 20 times?

Second, the impacts of phenological change on carbon fluxes might not be quantified properly. The optimized parameters did shorten growing season length (Fig. 4). Moreover, I found that the peak of LAI also decreased significantly (Fig. 3c), which definitely contributed to the lower GPP ($\sim$10 Pg yr-1) in the updated simulations. It was unclear whether such reduction in LAI was related to the optimization of phenological parameters or the feedback of lower carbon uptake, which affects carbon allocation and tree growth. In addition, it was unclear how much reduction in GPP was related to the shortened growing season and how much was related to the decreased LAI in peak season.

SPECIFIC

Abstract: Abbreviations (GPP, GSL, and fAPAR) are not defined.

Page 13315, Line 9: fAPAR and GSL are not defined.

Page 13318, Line 6: BRDF is not defined.

Page 13322, Line 11: "Fifteen of . . ., and the other fifteen . . ." How to determine which sites are used for optimization or validation?

Page 13324, Line 25: "multiple growing seasons" How to determine SOS and EOS for grids with multiple growing seasons?

Page 13329, Line 10: "a negatively biased" Might be "positively" instead?

Page 13333, Lines 13-14: "changes in the amplitude are the results of . . ." Is that possibly contributed by the changes in the simulated carbon flux and tree growth as

well?

Appendix A2: How does the model consider the impact of photoperiod on autumn phenology?

Table 2: Is it possible to quantify the sensitivity of SOS/EOS to the changes of model parameters?

Table 3: The 1st, 2nd, and 3rd columns should be 2nd, 3rd, and 4th columns instead.

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