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Biogeosciences Discussions

Interactive comment on "Improving vegetation phenological parameterization of a land surface model" *by* B. Chen and M. Che

Anonymous Referee #2

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Chen et al. "Improving vegetation phenological parameterization of a land surface model"

Recommendation: reject

GENERAL

This study evaluates two phenological schemes implemented into a land surface model (LSM). The comparisons show that simulations with GSI scheme perform better than those with GDD scheme. The authors further estimate that simulated GPP with the former scheme shows smaller biases than the latter. Evaluation of phenological schemes for LSM is important. However, this specific study does not commit such purpose due to the lack of scientific contributions and flaws in the analyses.

First, missing of the scientific merits. The main purpose of the study is to compare two phenological schemes. Such inter-comparison has been widely performed (Chuine et al., 1999; Morin et al., 2009; Migliavacca et al., 2012). This study does not add anything new to the scientific community.

Second, flaws in the analyses. There are at least three flaws.

(1) Biased selections of phenological parameters. The authors explained that parameters were adopted from the literature. However, those parameters are appropriate for specific models and/or tree species, but may not be fit for the current study. Without reasonable calibrations, we do not know whether improper parameters contribute to the biases in the schemes. For example, the parameters of GSI scheme were further optimized based on GPP data (Lines 383-384) but those for GDD scheme were adopted directly from CLM model (Lines 388-389). This may explain why the former has better performance.

(2) Improper usage of meteorological forcings. As described in the text (Line 210), the GDD scheme relies on soil temperature while the GSI scheme does not. However, soil variables are adopted from a model instead of observations (Lines 367-369). This also contributes to the biases in GDD approach.

(3) Unnecessary repetition in the comparisons. The authors investigated the impacts of phenological biases on carbon uptake. They found that, relative to GDD scheme, GSI scheme has smaller biases in both phenology and GPP. However, the observations of phenology are derived based on GPP (Line 302). As a result, it is not a surprise that one scheme with better performance for GPP-derived phenology (Figure 6) also has better performance for GPP simulations.

Third, the writing of the paper needs further improvements. I found many redundancies in the text. For example, the last paragraph of section 3 (Lines 557-563) can be replaced with the last sentence, because the whole paragraph is repeating the same conclusion. In addition, most of discussion section lists only problems and uncertain-

ties for current schemes, with limited explorations of the causes, consequences, and/or implications.

SPECIFIC

Line 44-45: Sequence of references should be chronological. Similar problems exist for other citations.

Line 62: How to define “explicit”, “implicit”, and “both”?

Line 75: Format of the citation should be “(Arora and Boer, 2005)”. Similar problems should be corrected.

Line 103: “researched” should be “researches”.

Lines 183-188: This paragraph is almost identical to that for spring phenology (Lines 165-170).

Lines 334-346: Most of this paragraph is more appropriate for the discussion section.

Reference

Chuine, I., Cour, P., and Rousseau, D. D.: Selecting models to predict the timing of flowering of temperate trees: implications for tree phenology modelling, Plant Cell Environ, 22, 1-13, doi:10.1046/J.1365-3040.1999.00395.X, 1999.

Migliavacca, M., Sonnentag, O., Keenan, T. F., Cescatti, A., O'Keefe, J., and Richardson, A. D.: On the uncertainty of phenological responses to climate change, and implications for a terrestrial biosphere model, Biogeosciences, 9, 2063-2083, doi:10.5194/Bg-9-2063-2012, 2012.

Morin, X., Lechowicz, M. J., Augspurger, C., O' Keefe, J., Viner, D., and Chuine, I.: Leaf phenology in 22 North American tree species during the 21st century, Global Change Biol, 15, 961-975, doi:10.1111/J.1365-2486.2008.01735.X, 2009.

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