Geosci. Model Dev. Discuss.,
https://doi.org/10.5194/gmd-2017-146-RC1, 2017

Geoscientific Model Development Discussions

Interactive comment on "LPJmL4 – a dynamic global vegetation model with managed land: Part II – Model evaluation" *by* Sibyll Schaphoff et al.

Anonymous Referee #1

Received and published: 14 September 2017

General comments: This paper presents a comprehensive evaluation of the new model version, LPJmL4, which shows the strengths and shortcomings of the model and identifies the need of further model improvement. This evaluation mainly focuses on stocks and flows of carbon and water in natural and managed ecosystems at various temporal and spatial scales, providing an elegant example of DGVM assessment.

Specific comments: I have two concerns on the manuscript.

1. The increasing crop production trend as mainly driven by the agricultural Green Revolution did not seem to simulate well, for wheat, e.g., China, India, France, Pakistan and Germany in Fig.12a, and for maize, most countries in Fig.12b, and for rice, most countries in SI-Fig.72. Are there any representations of the Green Revolution in the model like other models (Gray et al., 2014; Zeng et al., 2014)? And/or do the driv-

ing datasets include management practices (high-yield variety selection, irrigation and fertilizer and pesticide application)? Please provide more details in Section 2.1 and/or discuss this in Section 3.8.

2. The scale mismatch problem between site observed data and model simulated results as mentioned in Line 122-132 makes the comparison of vegetation carbon and aboveground biomass in Fig.4a-b much more difficult. One possible method to avoid such mismatch may be to calibrate and validate the model using site specific climate, edaphic, vegetation and management datasets. With site and/or regional calibrated parameters, the comparison between observed and simulated results would make more sense.

Technical corrections and some minor comments:

1. Please introduce each abbreviation in the manuscript text after it is first used. For example, FAPAR was firstly used in Line 29, not Line 106; GPP firstly in Line 117, not in 163;NEE in Line 108 is better after net ecosystem exchange and could avoid in Line 181. Please also check other abbreviations.

2. FAOstat in Line 110 may be better for FAOSTAT;

3. In Line 189 "a empirical model" should be an empirical model;

4. The citation for HWSD data (Line 189) is better for: FAO/IIASA/ISRIC/ISSCAS/JRC, 2012. Harmonized World Soil Database (version 1.2). FAO, Rome, Italy and IIASA, Laxenburg, Austria;

5. There is double "a" in Line 201, double "in" in Line 313, delete one;

6. CALM and IPA are firstly used in Line 219; GFED and CCI in 226;

7. A period should be at the end of Line 309;

8. "soil organic carbon" in Line 188 can be short for SOC;

9. Soil carbon pool can also compare to (Tian et al., 2015);

10. Line 391 SI-Fig.86 might be SI-Fig.66a for biomass? Also check other SI-Figs.

11. Add linear regression coefficients of slope, intercept, R square (R2), P value and root mean square error (RMSE) for Fig. 4; For Fig.4c, to provide a side by side sub-plot of GPP from MTE against observed data (in SI) can be beneficial.

12. Line 501 MENA is better separated for ME and NA.

13. Section 3.5 may be too short. Add more details on permafrost area and active-layer depth dynamics.

14. Line 546-547 used PgC p.a., and Line 551 PgC yr-1, please keep consistency.

15. Please provide full name for “FM” in Fig.12 caption and “resp.” in Line 614.

References:

Gray, J. M., Frolking, S., Kort, E. A., Ray, D. K., Kucharik, C. J., Ramankutty, N., and Friedl, M. A.: Direct human influence on atmospheric CO2 seasonality from increased cropland productivity, Nature, 515, 398-401, 2014.

Tian, H., Lu, C., Yang, J., Kamaljit, B., Huntzinger, D. N., Schwalm, C. R., Michalak, A. M., Robert, C., Philippe, C., and Daniel, H.: Global patterns and controls of soil organic carbon dynamics as simulated by multiple terrestrial biosphere models: Current status and future directions, Global Biogeochemical Cycles, 29, 775, 2015.

Zeng, N., Zhao, F., Collatz, G. J., Kalnay, E., Salawitch, R. J., West, T. O., and Guanter, L.: Agricultural Green Revolution as a driver of increasing atmospheric CO2 seasonal amplitude, Nature, 515, 394-397, 2014.

Interactive comment on Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2017-146, 2017.