

Interactive comment on “Quantification of terrestrial ecosystem carbon dynamics in the conterminous United States combining a process-based biogeochemical model and MODIS and AmeriFlux data” by M. Chen et al.

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General comments The authors present a comprehensive study on the coupling of the biogeochemical terrestrial ecosystem model TEM with MODIS data and its evaluation at eddy-flux tower sites. They present results of the regional application of the modified model of carbon fluxes over the conterminous US. The manuscript is overall carefully prepared, well structured and well written. Results are presented concisely and are

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well explained and discussed. They are embedded into a thorough literature study.

Specific comments Pg. 2728, In. 3: Please clarify which previous similar effect you are referring to when stating “having the similar effect on”.

In TEM, $f(\text{FOLIAGE})$ represents the relative degree of allocation of canopy leaf biomass comparing to a theoretical maximum possible leaf biomass. It is used as a scalar with similar effect of $f(\text{PHENOLOGY})$ presented in the previous text. We clarify this in the revised manuscript at Line 146.

Pg. 2728, In. 16.: Please add further references to models which use satellite vegetation indices as the sentence states that they are “widely” used in satellite-based carbon models.

We added further references after that point in the revised manuscript from Lines 157-158.

Pg. 2729, In. 18: Please explain how/when the maximum LSWI is estimated! Is it an input parameter which is calculated in the data pre-processing?

The maximum LSWIs are processed for each grid cell. They are calculated as the maximum growing-season LSWI occurred at each grid cell during our study period. We clarified this in the revised manuscript from Lines 184-186.

Pg. 2731, In. 8: Shouldn't it be “7” major vegetation types instead of 6? Table 2 lists 7 types.

In Table 2, Mixed Forest is not an independent vegetation type, but a combination of Deciduous Forest and Evergreen Forest.

Pg. 2732, In. 7: I assume that 50 sets of parameters are sampled, each set from another error level? If yes, please change to “:sampled 50 sets of parameters, one for each level”. Otherwise clarify.

Yes. The sentence has been changed as suggestion in the revised manuscript in Line

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248.

Pg. 2732, In. 18-28: Please explain more explicitly which (climate) data are used for the equilibrium run and the spin-up run.

We presented more explanation of the equilibrium and spin-up run from Lines 260-264. "We then spin-up the model for 120 years to account for the influence of climate inter-annual variability on the initial conditions of the ecosystems. Since historic climate and CO₂ concentration data are not available before 1948, we repeat the data from 1948 to 1987 for three times for the spin-up."

Pg. 2738/2739: Please elaborate why TEM (not SAT-TEM) shows the different temporal pattern of GPP and NPP, because it is lacking which information specifically in these years?

We added a sentence for elaborating potential reason of why TEM shows different temporal patterns of GPP and NPP as "During these years, TEM might over- or underestimate the water stress and PAR absorption of the vegetation and therefore provided different carbon sequestration estimations, while SAT-TEM used the satellite information of vegetation index and land surface water index, which constrained the carbon flux estimates." from Lines 419-422 in the revised manuscript.

Technical corrections Pg. 2727, In.1: better "the" (instead of "a") process-based biogeochemistry model TEM" Pg. 2728, In.8: "." Instead of ";" at end of sentence. Pg. 2729, In.12: "while maintaining" instead of "while maintain" Pg. 2729, In.14: the expression of the CO₂ effect (f(CA, GA)) on GPP is missing in equation 4. Pg. 2730, In.11/12: Change reference to Papale and Valentini, 2003, from capital to lower case. Pg. 2732, In.20: Please change to "spatial resolution with a total of 322287 grid cells." Pg. 2733, In.23. Add "." After "Xiao et al. (2008)" Pg. 2735, In.17: Please correct sentence: "with of" instead of "and". Pg. 2735, In. 26: Better " but our estimation of " than " but the estimation of" Pg. 2736, In. 2: Please complete sentence. Maybe just add ", and the land-based analyses" Pg. 2736, In.22: delete "the" Pg. 2737, In.1:

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better "have passed the range of optimums temperature" Pg. 2737, In.11: add "to" at the end of the line. Pg. 2740, In.24: Please add "and" after "August 2005" Pg. 2741, In.3: Add "." after "temperature". Pg. 2759, Table 7: Column "Comments": change to passive form of "release" in "the carbon assimilated by crops would be released back" Pg. 2779, Fig. 6: Please make legend colors of graph (a) the same as for the other graphs.

All of these have been corrected following the comments in the revised manuscript.

Pg. 2768, Fig. 4: blue regression lines should be drawn solid or caption needs to be changed.

We changed the caption to make it consistent with the figure.

Please also note the supplement to this comment:

<http://www.biogeosciences-discuss.net/8/C2393/2011/bgd-8-C2393-2011-supplement.pdf>

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