

Interactive comment on “Evaluating the potential of large scale simulations to predict carbon fluxes of terrestrial ecosystems over a European Eddy Covariance network” by M. Balzarolo et al.

M. Balzarolo et al.

manuela.balzarolo@uantwerpen.be

Received and published: 30 October 2013

The authors thank the anonymous reviewer #1 for his/her review of the manuscript and for the helpful comments.

[General comments: Balzarolo and colleagues used measured carbon fluxes from 32 eddy covariance sites as reference to compare the performances of three land surface models (LSMs) at these locations, when forced with the same meteorology. Most of the paper is well written, and the analysis manages to keep together the description of biome-specific trends and the model intercomparison. It is completed by a substantial conclusion that interestingly discuss the identified model pitfalls and possible future

C6288

strategies, notably regarding the modeling of water limitations in summer-dry ecosystems and the incorporation of human management effects. In my opinion this article is suitable for publication in Biogeosciences, although it sometimes lacks clarity when exposing the methodology and some results. I therefore suggest the authors to consider a few improvements that would make this scientific contribution more reader-friendly.]

RESPONSE

Thanks for the positive comments and the helpful suggestions to improve clarity and readability of the paper. We will revise the manuscript accordingly and please see the following responses.

[Specific comments]

[p. 11860/3: Given the substantial literature existing on LSM optimization with FLUXNET data, I suggest to simply complete the reference by adding “...(e.g., (Kuppel et al. 2012) and references therein)...”]

RESPONSE

This change will be included in the revised manuscript.

[p. 11860/sect. 2.1.1 and 2.1.2: What are the time resolutions of ISBA-A-gs and CTESSEL models?]

RESPONSE

For most prognostic variables, the time step of ISBA-A-gs model is 5 minutes. LAI and biomass values are calculated on a daily basis. The time-step used in the CTESSEL model runs is 30 minutes. All these details will be added to the revised manuscript in Sect. 2.1.1 describing the ISBA-A-gs model, and in Sect. 2.1.2 for CTESSEL.

[p. 11865/2-5: It not clear to me why the time selection is a compromise between spin-up effects and forecast errors. Also, the temporal windows listed leads to assume that only daytime fluxes where used, in which case an explanation would be desirable,

C6289

especially given the mention of daily averages in the metrics introduced later in sect. 2.4. Finally, is the end of the sentence an involuntary copy-taste from the previous sentence?]

RESPONSE

We agree with this comment. This sentence could be reworded as: "Systematic increments in the data assimilation cause a slight imbalance in the model and therefore the first 9 hours of the forecasts are avoided for the fluxes. Instead, the forecast intervals 9-12, 12-15, 15-18 and 18-21 hours starting from the daily analyses at 00 and 12 UTC are selected for the fluxes. Twice daily forecast of fluxes and instantaneous fields are matched by verification time and concatenated, which results in an uninterrupted time series with a full diurnal cycle and a time resolution of 3 hours.". We agree that the following final sentence of the Sect. 2.4. "They are from the 3-, 6-, 9- and 12-hour forecasts starting from the daily analyses at 00 and 12 UTC." is a copy of the previous sentence and it will be removed from the revised manuscript.

[11865/16-19: I am not sure to understand how this sentence connects with the previous one. Do the authors imply that the fact that the small benefit from bias correction only happens sometimes is a warning against "general statements" ?]

RESPONSE

In extra-tropical mid-latitudes the quality of precipitation forcing can be evaluated with independent ground-based precipitation observations (rain-gauges and meteorological radars composites) and the GPCP bias correction method used in Balsamo et al. 2012, is shown to address relatively small errors in the original ERA-Interim precipitation forcing. A further study is added in the references to support the verification of ERA-Interim precipitation forcing (Balsamo et al. 2010).

REFERENCE

Balsamo, G., Boussetta, S., Lopez, P., and Ferranti, L.: Evaluation of ERA-Interim and

C6290

ERA-Interim-GPCP-rescaled precipitation over the U.S.A., ERA Report Series, n. 5, pp10, 2010.

[p. 11869/11-18: I not sure to grasp the logic of this paragraph. After pointing out that the variability of climate (Cfb-Cfa) explains the variability of performance among DBF sites, what do the authors exactly want to state ? In my opinion the link between sentences and the overall logic should be made clearer.]

RESPONSE

We would like to say that under different climatic conditions the carbon flux dynamics is controlled by various environmental factors (e.g. soil moisture, rain pulse). This paragraph could be reworded as: "This high variability of the statistical metrics and the negative values of CORR for DBF forests can be explained by climatic variability in this PFT class (Tab. 1). In fact DBF forests are located in both Oceanic/European (Cfb) and Sub-tropical (Cfa) climate regions without and with dry summer periods, respectively. In these areas, different factors control carbon dynamics and ecosystem ecological responses (Migliavacca et al., 2011)."

[p. 11870/6: Here should be added the abbreviation SWC after "soil water content", as it used in the subsequent paragraph.]

RESPONSE

It will be done in the revised manuscript.

[p. 11873/1-2: Since the measured NEE1998 is positive, DK-Sor is not even a lower carbon sink that year, but a source.]

RESPONSE

We agree with your comment, the NEE1998 = 103.95 gC m⁻² yr⁻¹ means that this forest is a source of carbon for that year. We will correct this in the revised manuscript.

[p. 11873/9-12: The sentence is not clear, and the second occurrence of "lower and

C6291

higher" seems to be erroneous. I propose to rephrase as follows: "Moreover, CTESSEL respectively presents marked negative and positive values of IAV in 2002 and 2003 for DE-Tha evergreen needleleaf forest, respectively indicating a higher and lower carbon uptake with respect to the measured data."

RESPONSE

Thanks. We will correct this in the revised manuscript.

[p. 11873/1-2: ORCHIDEE also significantly overestimates Ta-Reco at FR-Fon.]

RESPONSE

Thanks. We will correct this in the revised manuscript.

[Technical corrections]

[p. 11859/8: "With the aim to improve the simulation of biophysical fluxes..." would be more accurate.]

RESPONSE:

Thanks. We will correct this in the revised manuscript.

[p. 11860/19: I think it is "(Zhao et al., 2006)"]

RESPONSE

The reference "(Zhao et al., 2012)" is correct. Sorry for not including it in the reference list. Here the right reference:

Zhao, Y., Ciais, P., Peylin, P., Viovy, N., Longdoz, B., Bonnefond, J. M., Rambal, S., Klumpp, K., Olioso, A., Cellier, P., Maignan, F., Eglin, T., and Calvet, J. C: How errors on meteorological variables impact simulated ecosystem fluxes: a case study for six French sites, *Biogeosciences*, 9, 2537–2564, doi:10.5194/bg-9-2537-2012, 2012.

The following reference will be updated:

C6292

Kuppel, S., Peylin, P., Chevallier, F., Bacour, C., Maignan, F., and Richardson, A.D.: Constraining a global ecosystem model with multi-site eddy-covariance data, *Biogeosciences*, 9, 3757–3776, 2012.

Thanks for the following corrections. These will be included in the revised manuscript.

[p. 11862/8: "Interactively calculated".]

[p. 11864/17-21: The two sentences should avoid beginning both with "so".]

[p. 11864/28: "3-hourly". Also applies to p. 11865/6 and 8.]

[p. 11865/1: "...in time to match the model time step..."]

[p. 11867/5: equation]

[p. 11868/14: add a comma after "average" ?]

[p. 11869/23: DE-Tha instead of DETha]

[p. 11871/20: DE-Gri instead of De-Gri]

[p. 11871/22: DK-Lva instead of DKLva]

[p. 11872/18: "shown" instead of "showed"]

[p. 11872/26: DE-Tha, DK-Sor, FR-Pue and IT-Ren, instead of DETha, DKSor, FRPue and ITRen. The same corrections go all over the paragraph.]

[p. 11873/8: "Lower negative values" is somewhat confusing.]

[p. 11873/9: "lower" and "higher" should be switched]

[p. 11873/14: VPD has already been defined earlier]

[p. 11873/20-21: I suggest to start the second paragraph of sect. 3.4 before this sentence, not after.]

[p. 11873/21: "DE-Tha in 2006" instead of "DETha2006"]

C6293

[p. 11873/24: "...ecological function of GPP at IT-Ren in 2006..."]

[p. 11873/25: "Ta-Reco" instead of "Reco-Ta"]

[p. 11873/26: "VPD-GPP and Ta-Reco" instead of "VPD and GPP-Ta"]

[p. 11875/24: I do not understand the use of "entity" here]

[p. 11876/1: "...both croplands and grasslands."]

[p. 11876/20: "remains"]

[p. 11877/19: "types"]

Interactive comment on Biogeosciences Discuss., 10, 11857, 2013.