

## ***Interactive comment on “A methodology for estimating seasonal cycles of atmospheric CO<sub>2</sub> resulting from terrestrial net ecosystem exchange (NEE) fluxes using the Transcom T3L2 pulse-response functions” by C. D. Nevison et al.***

**Anonymous Referee #2**

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General comments.

The manuscript presents a work on application of the Transcom-3 pre-calculated responses of the atmospheric CO<sub>2</sub> concentrations to monthly emission pulses from 22 regions covering the globe. The pre-calculated responses are used to simulate the atmospheric CO<sub>2</sub> variability driven by CLM model fluxes of CO<sub>2</sub> bypassing the need for application of the atmospheric transport model. Instead, the region-mean monthly terrestrial biosphere fluxes are used in combination with pre-calculated responses to provide forward simulation of atmospheric CO<sub>2</sub>. The study presents valuable result

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indicating applicability of the climatological response functions for simulation of the seasonal cycle of the atmospheric CO<sub>2</sub> with given terrestrial biosphere fluxes. As an implication of the successful application of the approach one can see an opportunity for using the multi-model simulated pulse functions in validation and optimization of the terrestrial biosphere models against observed seasonal cycles of the atmospheric CO<sub>2</sub>. The manuscript is well written; however some details are missing, and have to be added in the final version. Thus minor revision is recommended.

Comments:

Page 2790 Line 25, suggest to add recent reference to (Sitch et al, 2008)

Page 2792 Line 11, Authors mention 253 simulated locations. Actually, 228 were provided by modelers as part of standard submission set that included 4-hourly output, time series for remaining locations are constructed from 3-D monthly mean output.

Page 2793 Line 22, A cyclo-stationary response is being derived, however, it appears as if contributions from years 4 and longer are not considered, while accumulated contribution of the remaining years can match the amplitude of year 3 contribution. More accurate analytical extension of the pulse functions with diagnosed signal decay rate would be desirable.

Page 2796 Line 1, Statement: “involves a relatively small sacrifice in accuracy” should be complemented with numerical data on errors.

Page 2797 Line 11, The reason that “CASA NEE reproduces the observed CO<sub>2</sub> cycle relatively well” authors assign mainly to scaling the NPP to satellite observations. On the contrary it is important to check if a larger effect was introduced by fitting Q10 of the respiration to match observed seasonal cycle (Randerson et al, 1997).

References:

Randerson et al, Global Biogeochem. Cy., 11, 535–560, 1997

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Sitch et al, *Global Change Biology*, 14, 2015–2039, 2008

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Interactive comment on *Geosci. Model Dev. Discuss.*, 5, 2789, 2012.

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