

Geosci. Model Dev. Discuss., referee comment RC1
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Comment on gmd-2021-236

Anonymous Referee #1

Referee comment on "Development of an open-source regional data assimilation system in PEcAn v. 1.7.2: application to carbon cycle reanalysis across the contiguous US using SIPNET" by Hamze Dokoohaki et al., Geosci. Model Dev. Discuss.,
<https://doi.org/10.5194/gmd-2021-236-RC1>, 2021

The manuscript by Dokoohaki et al. is an excellent example of data assimilation exercise concerning terrestrial carbon dynamics. This is a valuable contribution to this subject, as the C cycle is a particularly important topic to study to understand and ameliorate global climate change.

Major comments

Please refer and evaluate previous studies. There are several articles you might want to consider.

The target temporal range (1986-2019) is relatively long. You may need to consider effects of succession and/or landuse change in this timescale. Please explain why you can say that the very simple model SIPNET (a "big-leaf" model) was able to reproduce the terrestrial ecosystem dynamics in this range.

Arakida et al. (2017) is an example of data assimilation of hard-core individual-based model, with explicit representation of vegetation dynamics such as competition and succession. Please explain strengths and weaknesses of your approach against this preceding work. You may need to rewrite the Future Directions according to this information.

Ise et al. (2018) optimized a simple TBM using particle filter, a primitive approach of DA. They used a brutal power of supercomputer to optimize the model on big spatiotemporal data. It might be beneficial to read and compare.

Please summarize the computational environment of this study. What was the computational burden (number of sites x number of timesteps)? How long did the computation take? Your approach using an improved TWEnF was really needed for this exercise?

Please summarize the parameters optimized by the SDA.

Minor comments

p.2 l.47 I think there are a few terrestrial ecosystem models that explicitly consider the uncertainties in model parameters. Please try to find them.

p.13 l.333 You just found tendencies that was already described by a previous work. Please explain why this fact strengthens your study.