**Geoscientific
Model Development
Discussions**

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# *Interactive comment on* "Global sensitivity analysis, probabilistic calibration, and predictive assessment for the Data Assimilation Linked Ecosystem Carbon model" *by* C. Safta et al.

**Anonymous Referee #2**

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General comments:

This paper describes a sequence of steps, or workflow, behind a sensitivity analysis, parameter optimization and assessment of the predictive skill of a simple ecosystem model, the Data Assimilation Linked Ecosystem Carbon Model (DALEC).

This workflow incorporates a number of steps novel to the ecosystem modeling literature, and which potentially have considerable value to the community.

It is not clear if the goal of the authors is to document the workflow tools used for uncertainty quantification, or provide insights into DALEC, improving our understanding of modeling ecosystem processes. Unfortunately, in its current form the manuscript

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fails to achieve either.

There is little in the way of discussion, or interpretation of results, that might of interest to the ecosystem modeler trying to learn about DALEC but at the same time details behind the selection, value and benefits of using particular methodologies and indices in the UQ framework are not articulated.

The use of uninformed priors greatly reduces the utility of the study as a number of studies have demonstrated that this fundamentally impacts uncertainty analysis and optimization results, and at a site like Harvard forest with a model like DALEC a lot of information is available to inform the priors. See for example the work of LeBauer et al., 2013 for workflows that include the assignment of informative priors and variance decomposition.

Overall the paper is too long, with too many figures – especially given the lack of any meaningful discussion about much of the results.

Specific comments:

Page 6895-6896: Much of the background section could be replaced by reference to a number of recent reviews of data assimilation techniques used with ecosystem models and UQ workflow tools. Instead more emphasize should be placed on the context of this particular study.

Page 6897, line 27: The impacts of steady state/non-steady state assumption on SA and UQ are pretty interesting and deserve more discussion at this point. In this case this is spin-up v. initial conditions estimation (although you don't explain that here), but could mean other things.

Page 6898, line 9: Don't say "modified version" without immediately describing the changes – which is done in the following section

Page 6899, line 12: What is UQTk v3.0? OM – you follow the link and its software. This looks great, but how was this actually used? How could what you've done be

reproduced? I think it would be of great interest to have considerable more details of this tool, and how ecosystem modelers can use it.

Page 6901, line 9: What you describe is an uncertainty analysis, not a sensititivity analysis (which is what you then do)

Page 6902, line 19: See my overall comment – there is considerable prior information that could be/should be used to inform priors in this study to give a meaningful and informative analysis.

Page 6903, line 27: Right, monthly timescales are not appropriate for analysis of controls over these large carbon pools. Why was a monthly timescale selected in the first place?

Page 6906, line 6: How was "steady-state" defined in this case?

Page 6906, line 6: "30-50 cycles" Why is there is variability? You're cycling the same climate files, in the same order? And have a definition of steady state, why isn't it a single, repeatable value?

Page 6906, line 14: Do you mean 1991 or should it be 1992 to correspond with the start of the met data?

Page 6909, line 13: Why is this done sequentially like this?

Page 6913, line 8: "paramaters" typo

Page 6916, line 1: What is KDE here?

Page 6918, line 3: This requires further elaboration/explanation.

Page 6919, line 27: Actually, it seems like these "robust statistical methodologies" that are sampling based can't be used with model like CLM – that's why you're developing emulators!

Interactive comment on Geosci. Model Dev. Discuss., 7, 6893, 2014.