Geoscientific
Model Development
Discussions

Interactive comment on "**A new version of the CABLE land surface model (Subversion revision r4546), incorporating land use and land cover change, woody vegetation demography and a novel optimisation-based approach to plant coordination of electron transport and carboxylation capacity-limited photosynthesis**" *by* **Vanessa Haverd et al.**

Anonymous Referee #2

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Haverd and collaborators present and evaluate the latest developments for the land surface model CABLE. The manuscript contains the information that is expected in such a study and the structure of the manuscript is good. The figures and tables

support the text but the text itself is often too concise which hampers the readability of the manuscript. I made several specific comments to underpin my opinion but I would like to encourage the authors to carefully go through the manuscript and check every paragraph, even those not mentioned in my comments.

Contrary to the text itself, the title is too wordy. A shorter alternative could be "Incorporating gross land cover change, tree-demography and a novel optimization-based photosynthesis in CABLE land surface model (revision 4546)". The words that will no longer be in the title could be moved to the keywords. Words already in the title should not be repeated as keywords as they will result in new hits from search engines.

P4, L16. "is inconsistent with the Co-ordination Hypothesis". Rephrase or better explain. The logic of this sentence appears twisted. As I read this sentence it says that the co-ordination hypothesis differs from the hypothesis that the ratio between Vmax and Jmax is constant, which seems trivial given that the Co-ordination hypothesis was established as an alternative for the fixed-hypothesis. It is more relevant for the reader to be informed whether the co-ordination hypothesis is or isn't at odds with the data.

P4, Section 2. The explanation of the structure of the model would likely benefit from a adding a simplified flowchart-type of figure showing the main dependencies. The actual approaches are often missing and should be added to the text. How is, for example, the radiation transfer through the canopy simulated? Describe the approach in a few words (i.e. "Lambert-Beer extinction relationship"), try to add some of the key assumptions (i.e. "single-layer energy budget combining the energy budget of the soil and vegetation" to help other land surface modelers to get a rough idea of the core of CABLE.

P5, Section 3.1. A schematic of POP (along the lines of fig 2 in doi:10.1002/grl.50972) could help the reader to better understanding of what this module does without having to consult the original publication in Biogeosciences.

P7, L 16, e.f. Acronyms for the PFTs are introduced here. These acronyms are only

used a couple of times throughout the text but not enough to accommodate the reader to their meaning. Omit the acronyms and write in full (also in Table 1) for the sake of readability.

P8, L21. Reword. Despite being familiar with modeling land cover changes I don't understand which process is described here.

P9, Section 3.4. The style and information content of this section is very different from the previous paragraphs under section 3. Sections 3.1 to 3.3 are descriptive and do not present any of the equations. Section 3.4 lists the equations with little description. If sections 3.1 to 3.3 are a summary of model developments that have already been published and section 3.4 is a complete new model approach the change in style may be justified. This should be made explicit. I read section 3.4 twice but I could not figure out how this new approach was implemented (in other words, the description would be of little help to write a working code). Another schematic combined with more explanations may help.

P11, L37-38. I read this sentence as if it is impossible for a natural grassland to become a forest. I agree this is probably not the most common land cover change but I was a bit surprised to see this transition being excluded.

P13, Section 5 e.f. Most of the results are descriptive. The authors often claim that the match between simulations and observations is "good" or "acceptable". I still need to meet the first modeler who would claim otherwise. All subjective statements should be removed unless the authors can establish an objective scale of "poor", "acceptable", "good", "very well". It is worth to have a look at the method proposed by Murphy et al 2004 (doi:10.1038/nature02771). Have a look at the performance index outlined in their supplementary material. Murphy et al claim that the method gives the chance that the simulations and the observations come from the same population. Isn't that what we want to know?

P13, L18. Many of the sections start with a single sentence paragraph. This hampers

the readability of the text. This sentence often simply rephrased the caption. It would improve the text flow to use the first paragraph to explain/remind the reader to the significance of the analysis. Why are we, for example, looking at evapotranspiration rather than sensible heat? If the model does a good job in simulating evapotranspiration, which applications could the model be used for?

P13, L28. Write EBL in full. This kind of acronyms hamper readability.

P16, Section 5.3. This section is in the validation section. It is not a validation as the result is not compared to observational products or other simulations. The title is correct in stating it is an illustrative example. Add a single sentence explaining why you show these examples. How do they help to understand the next analysis?

P16, L28. Write PNG in full. I assumed it is Papua New Guinea.

P18, Figure. The coordinates of the sites could go into the text.

P19, L20. It looks like the number preceding 106 km2 is missing. If not, please, write 1.0 x 106 km2 for consistency.

P19, L38. It is stated that the FccxL is large. Is this confirmed by observations? I assume the evidence to look for would be observations showing increasingly faster regrowth of secondary forest.

P23, L18. See comment for P13, L18.

P24, L1. Delete "a" from "a simulates".

P26, L8-9. Please, expand your thoughts and be more specific. Which variable should be benchmarked, which data streams do you intent to use for model-data fusion?