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Interactive comment on “Structural analysis of three global land models on carbon cycle simulations using a traceability framework” by R. Rafique et al.

R. Rafique et al.

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Anonymous Referee #1 Received and published: 18 July 2014 The manuscript presents a detailed breakdown of the transfer of carbon between model pools within 3 global ecosystem models. The paper could benefit from a revision which draws out the key messages more clearly, i.e. the overall differences. Furthermore and perhaps more importantly, the authors should make more effort to consider the "why" the models are different, rather than just the "fact" that they are different. Are the differences, just parameterization or are they more fundamental to the models. Is this paper likely to be relevant to future versions of the model or just these versions? I have also listed

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Interactive Discussion

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a few other concerns below.

Response: The manuscript has been revised substantially according to suggestions given by reviewers. We hope that the key message is more clear now.

- Section 2.4, it is unclear why the models would use different forcing data? Or be run at different resolutions? Given that the input forcing will dictate the steady state reached this seems a strange approach? Particularly as the authors then go on to compare across models. I think unless a good justification can be provided the models should be re-run with the same input forcing and simulate on the same grids. As it stands the reader cannot be sure of the impacts this has on any comparisons.

Response: To satisfy reviewer's concern we analyzed both climate forcing data to see if any difference exists between them. We found that both climate forcing data are comparable and not significantly different from each other at global level. The quantitative analysis of both climate forcings has been presented in the revised manuscript (RM). Secondly, we believe that for global level analysis, different resolutions don't make a difference. Other researchers have also used different resolutions to study model behavior in various modeling studies (Friedlingstein et al., 2006).

- The paper would benefit from a table which draws out the key model differences which are relevant to the paper.

Response: In order to present the models' allocations, transfer, residence times and storage capacity, we assumed the flow diagrams are more suitable than tables. There too many numbers with different level of complexities and table(s) may not be a suitable option to present them to convey the whole picture. All the numbers for three models have been given in the flow diagrams (Fig 3-5). However, there is also a table which gives the very basic fundamental differences among models used in this study.

- Unless I missed it, the different allocation schemes in the models aren't discussed in detail? Perhaps this could be part of the above suggested table. The paper is

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particularly detailed in described what is different between the models, but short on details of why these differences take place. Much of this must relate to the different assumptions with regards to allocation for example. Much of the allocation text is kept until the discussion. I think it would aid the reader if this was described in the methods instead. Further, when the authors make statements about transfer percentage to various pools, are these values average values? Do they vary with time? Can this be clarified in the text please.

Response: We have moved some of the NPP allocation description to the method section of RM. We also clarify that the transfer percentages to various pools are the average values. They are constant values as the whole model analysis was carried out at stationary stage and not time in a variant mode. We have also clarified this information in the RM.

- Finally, throughout the manuscript the English requires a final check, particularly when it comes to tenses (e.g. pg. 9988, line 19).

Response: The whole manuscript has been checked for spelling, grammar, and overall clarity/consistency of language.

Minor things: - pg. 9982, line 16: "insufficiently attributed" - I think this sentence needs rewording as I'm not following the intended meaning. –

Response: The correction has been incorporated in the RM.

pg. 9984, line 17: CASACNP not defined. –

Response: The CASACNP has been defined in the RM.

pg. 9988, line 16: "for many years" is vague. Given that you go on to define "how long" in the next sentence, perhaps the sentence would be better concluded by saying "until a steady state has been reached".

Response: The suggested correction has been incorporated in RM to better explain

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the time frame of model simulations.

- pg. 9988, line 4, doesn't make sense, I assume the authors mean to say that disturbance effects were switched off. -

Response: Yes, we agree with reviewer. The confusion in the sentence has been corrected in RM.

pg. 9989, line 10, "elaborate" is the wrong word.

Response: The word "elaborate" has been replaced with "examine" in RM.

- Fig 1. m^2 should be superscripted.

Response: The superscription of unit has been corrected in RM.

- Fig 2. What are the measured data here? This needs to be included in the captions - Section 3.2 and

Response: The measure data has been properly described in the caption of Fig 2 in RM.

Fig 6. - there are some noticeable "blobs" of long C residence time on the CABLE panel. What is the explanation here?

Response: The noticeable blobs in panel of CABLE have been described in the Fig caption.

- page 9995, can the authors check that this statement about nitrogen is true. It is my understanding that in the standard cable model nitrogen plays no role in the allocation scheme, instead there is a proxy for nitrogen which is used instead.

Response: We verified this finding that nitrogen plays a role in determining the NPP partitioning. This is also consistent with the results published by Xia et al. The reference is:

Xia, J., Luo, Y., Wang, Y.-P., and Hararuk, O.: Traceable components of terrestrial
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Discussion Paper



carbon storage capacity in biogeochemical models, *Global Change Biology*, 19, 2104–2116, 2013.

- page 9998, "Markove"

Response: The spelling mistake has been corrected in RM.

Interactive comment on *Biogeosciences Discuss.*, 11, 9979, 2014.

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11, C7027–C7031, 2014

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