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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.

Anonymous Referee #1

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The manuscript presents a detailed break down 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 considers the "why" the models are different, rather than just the "fact" that they are different. Are the differences, just parameterisation 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 a few other concerns below.

- 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

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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.

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

- 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 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.

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

Minor things: - pg. 9982, line 16: "insufficiently attributed" - I think this sentence needs rewording as I'm not following the intended meaning. - pg. 9984, line 17: CASACNP not defined. - 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". - pg. 9988, line 4, doesn't make sense, I assume the authors mean to say that disturbance effects were switched off. - pg. 9989, line 10, "elaborate" is the wrong word. - Fig 1. m2 should be superscripted. - Fig 2. What are the measured data here? This needs to be included in the captions - Section 3.2 and Fig 6. - there are some noticeable "blobs" of long C residence time on the CABLE panel. What is the explanation here? - 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. - page 9998, "Markove"

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