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Comment

Interactive comment on “Forest response to increased disturbance in the Central Amazon and comparison to Western Amazonian forests” by J. A. Holm et al.

Anonymous Referee #1

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This paper presents modeling study of the effects of disturbance rates on the carbon dynamics of lowland Amazonian forests. The authors integrate available field observations with their individual-based model to estimate carbon dynamics under currently known disturbance regimes, and then simulate changes in disturbance and their effect on carbon cycling. They also compare their model to a widely-used, general model CLM-CN.

Overall, the paper provides some new insight on the interactions of various disturbance issues and carbon stocks and fluxes in central vs. western Amazonian forests. The study also seems to highlight the important finding that the CLM-CN model does not simulate the carbon dynamics of Amazonian forests well, either under current or

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projected disturbance regimes.

My comments are intended to improve the presentation of the paper, as I found several aspects of the story to be difficult to follow. With an improved delivery of the information, the take-home messages may become more clear.

- The introduction is long and repetitive. Each paragraph seems to make similar or close-to-similar types of statements, several of them ending in the need for individual-based modeling of disturbance regimes. I strongly feel that the paper would be more clear if the authors would reduce the overall length and repetitiveness of the introduction. They can easily state the current knowledge in a first paragraph, then the need and current situation with models (including CLM), and then the need for the study they have undertaken. In addition, the questions posed at the end of the introduction are long and are never clearly returned to in the discussion. I suggest that the authors simplify the set of questions, and directly answer them in the discussion.

- In the discussion, it is stated in the second paragraph that the modeled decrease in biomass was considered as a false-positive because the empirical data found that wood density drives decreases in biomass in the western Amazon. First, I think that the field data from RAINFOR is not representative of wood density from east to west. There is plenty of emerging literature showing the wood density can and often is quite high in the western Amazon, especially in central and northern Peru and southern Colombia. So, while I agree that wood density is a real contributor to spatial patterns in biomass, it is not a simple east-west gradient. More importantly, the literature agrees with the authors that neither basal area nor LAI are drivers of patterns of biomass in lowland Amazonia. But canopy height is a very strong driver, and just as strong or more strong than wood density. There are several papers on this for lowland Amazonia. The authors should reconcile their findings and their interpretation with these issues.

- Section 4.1.1 discussed CO₂ fertilization as if it is fact or a known. They even go as far as to say that there is “causal evidence”. This is incorrect, and there is no data

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to show that CO₂ fertilization is really happening in the Amazon basin. Neither the field plots nor models have provided causal evidence. Overall, I feel that this section is overly speculative, and could be deleted or reduced.

- Section 4.2.2: Much of the discussion here seems to be skewed by the idea that wood density is varying geographically based on species. This is only true at a micro-scale (e.g. scales of a few hundred hectares; also known as within-community variation). Cross-community or regional-scale variation in wood density, when viewed as plot-aggregate, basal-area weighted wood density, is much less variable – from about 0.62 in the western Amazon to 0.68 in the eastern Amazon. This needs to be reconciled with the literature on large-scale, plot-aggregated gradients in wood density, not small-scale species-specific variation in wood density. Perhaps this is more of a communication issue than an analytical one. The authors are advised to assess and recommunicate.

- The discussion would benefit from a final paragraph that succinctly communicates the key findings of the entire study, perhaps as a series of bulleted points. Perhaps each section of the discussion can be used to generate one or two key points for use in a synthesis/final paragraph. This may also help to fine-tune the abstract.

- I found several typographical errors and instances where the grammar can be easily improved for clarity. The authors are encouraged to find those and to make corrections.

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