

Interactive comment on “Assessing impacts of selective logging on water, energy, and carbon budgets and ecosystem dynamics in Amazon forests using the Functionally Assembled Terrestrial Ecosystem Simulator” by Maoyi Huang et al.

Anonymous Referee #2

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The authors parameterized two PFTs in FATES for a tropical forest site and embedded a selective logging module. As a model description paper, the manuscript appears fairly complete and informative for others interested in understanding the model design better. The authors present results of a calibration exercise at the two sites by comparing simulated and observed responses to logging at one site, and comparing it to undisturbed dynamics at the second site. The results show that the model is modestly successful in capturing some facets of the forest/ecosystem dynamics, but performs

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poorly at others. As a biogeoscience paper, we think the manuscript falls disappointingly short of reaching some interesting potential for insight.

Specifically, there is a substantial mismatch between data and the model for some very basic forest/ecosystem characteristics. There are large errors in LAI, GPP, RH, and age structure, as conceded by the authors. Even for the control site, GPP shows an almost opposite seasonality between model and data. The errors caused by calibration are much greater than the variation due to disturbance levels (Table 5). While it would have been preferable to have a more successful calibration, falling short of that, the authors should present a coherent and robust explanation of what the fundamental structural problems were, with figures specifically illustrating the insights. That would elevate the significance of the paper, and increase its utility for those seeking to do similar work.

Comments for each section Introduction: The authors lay out pertinent background information but the text does not explicitly articulate a cogent and compelling argument for why this study is needed. I think the introduction would be more effective if text were added to make the connection between the background information and the aims of the paper.

Methods: They report that FATES is very sensitive to parameter values, to a point that with some combinations the two PFTs cannot coexist. That is somewhat worrisome. There is a fair amount of detail given on how a logging activity is applied to a patch, but it's a bit unclear which patches are selected for logging.

Results: Given that SH mismatch happens at the seasonal scale it would be useful to have some analysis results at that time scale. For example, the results in Fig 4 could be replotted at the seasonal scale (average across years). Low SH is attributed to attributed to low LAI, but what's causing LAI? It seems a fairly straight forward question to answer (or at least speculate). It appears they did not go far enough with the most interesting/instructive part of the exploration. Similarly with soil moisture, the authors present a cursory analysis of soil water uptake. What about SWC of the deeper

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layer(s)? What is their relation to simulated ET?

Line-by-line comments

56: "suggested a net tropical forest land-use source of 1.3 ..." is grammatically incorrect. I suggest something like, "suggested tropical forests can be a net source of 1.3 ... from land-use change."

63: The authors defined degradation as widespread damage to remaining trees, sub-canopy vegetation and soils, and that it could cause as much as 40% carbon loss of clearcut deforestation. In your simulation, how did you define the effect of degradation?

66: delete "as".

67: hyphenate one-eighth.

70: Extraneous parenthesis.

78: couple terrestrial and atmospheric...

78-80: Perhaps list some examples of those models?

79: comma after "change"

81: representation of wood harvest...

83: Is that in LM3V? It's unclear.

86-89: It would be better to define selective logging earlier, since it is referred to many times prior to this point in the text.

90: Not just simplified but absent

91: did not

98: "tremendous" is overly dramatic

108: "assess the simulated recovery of Tapajos National Forest..."

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109: summary of

113: simulated forest trajectory

120: The authors describe FATES model as a further developed model based on CLM (ED), which can be viewed as an early version of FATES. Then, which version is what you used in this study? Is there any paper that formerly published FATES model?

152: Specific should be lowercase. But lines 150-155 is a run-on sentence. They need to at least insert a conjunction.

162: Delete hyphen in co-existence

164: Delete hyphen in co-existence

176-7: "transports off-site by adding..." should be "transports off-site by reducing site carbon pools. Remaining necromass ... are added to coarse woody debris and litter pools."

181: "are represented" should be "are conceptually represented." Because this paragraph just talks about the various concepts, and not specific implementation of logging regimes & effects.

189: It's unclear if FATES implements these two types of logging practices.

221-4: Parentheses seem unnecessary.

227: "...whose..." is grammatically incorrect.

250: Delete respectively.

273: Awkward phrasing. I recommend, "To ... conservation, we calculate.". And then say how del-B is used to ensure mass conservation. (Just calculating del-B doesn't ensure mass conservation).

315: Equation should be plural. Or, if singular, use an article.

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327: ... this forest comprised 399 ...

328: Replace semicolon with a period.

339: This is the first use of the name "CLM(FATES)". I think authors should explain this means running FATES as a module inside CLM, then use the name "CLM(FATES)".

341: "km 67" -> "km67"

342: "km 83" -> "km83"

344: "be covered by bare soil" -> "be bare soil."

346: "even with the" -> "even within the"

362: "specified" -> applied, prescribed or implemented

363: "following" doesn't work here, since authors describe an RIL in the sentence.

447: "Table 5" should be "Table 6."

455: Could it also be related to how crowns are represented (leaf area exists at a single height), and how light is allowed to penetrate downward?

Tbl 2: In caption, m2 should have 2 as a superscript. Also, it would make more sense to have subtotals below numbers for DBH-based classes. There is an asterisk and a footnote but I don't see the corresponding asterisk in the caption text. I think the whole footnote could just go in the caption.

Tbl 5: This is a difficult way to compare values. It would be much better to present as a graph. The caption should spell out all the abbreviations used.

Fig 1: Legend of panel C is too small and fuzzy and therefore nearly illegible.

Fig 2: In panel (c), having mortality symbols line up at the top was a little confusing to me, visually. Recommend positioning them at the canopy level. The caption for (e) should read, "calculating..." The caption for (f) is mislabeled as "(d)".

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Fig 4: In the PDF version I got, the font used in the figure is too small, and appears with jagged edges, even when magnified. The phrase "based on" is repeated, and should be deleted. The legend for the panels on right are confusing. I think the caption should clearly say four types of logging effects are plotted. The caption should also state that there are no observation values for panels I, k, l, and m.

Fig 5: Above ground biomass and coarse woody debris should not be capitalized. I recommend coloring the observation bars differently, to make them stand out. AGB_early and AGB_late should be explained in the caption.

Fig 6: In the caption, "derived based on" should be "derived from". Do the red dashed horizontal lines represent period averages?

Fig 8, 9: In most of the panels, the intact curve is hard to see, and hard to distinguish from RIL-low. I suggest using a solid black line, and draw it on top of other lines.

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