**Dynamic ecosystem assembly and escaping the "fire-trap" in the tropics: Insights from FATES_15.0.0**

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**Response to Review**

We thank the editor and reviewer for the careful reading and opportunity to further respond to comments. We appreciate the thorough and attentive evaluation of the manuscript, and the ability to address and clarify our response to the reviewer and within the manuscript. Specific comments are addressed in the manuscript and below with text shown in blue. Line numbers are shown for the track changes version of the manuscript.

On behalf of the authors,
Jacquelyn Shuman

Submitted on 24 Mar 2024
Referee #2:

I appreciate the author's extensive revisions on the paper. The paper could be published as is after addressing my remaining minor comments as below:

Table 2: perhaps better to make distinctions where parameters are the same between fire-vulnerable and fire-tolerant trees to make the table being easier to read. Do you really need that many digits (e.g., eaf_slatop = 0.01995827, is it really precise up to 10^-8?). Please clean a bit the digits. I hope the authors can expand their revisions to really let the readers understand Table 2. Their revisions are still too much brief for me.

Author response: We have updated the table as suggested and expanded the text explanation in methods section 2.1.3 (lines 370-372) to identify the difference between the fire-vulnerable and fire-tolerant trees more clearly. "Specifically, the fire-vulnerable and fire-tolerant trees are distinct for five parameters: leaf fire vulnerability, bark thickness, crown depth, crown mortality probability, and wood density (Table 2)."
We have added more explanation of how these parameters create a distinction between the fire-vulnerable and fire-tolerant trees in this same section preceding table 2 (lines 386-390).
"The fire-vulnerable tree has lower wood density, and from this less costly resource allocation than the fire-tolerant tree resulting in higher growth and biomass accumulation but is more likely to experience damage and mortality due to fire. The fire-vulnerable tree has higher leaf fire vulnerability, a thicker crown creating more exposure to flame scorch, a

lower accumulation of protective bark and higher probability of crown mortality than the fire-tolerant tree."

Fig. 2: are these results (panels a, b, c) averaged only for days with fire occurrence? How should I understand panel d? for the green line, if I accumulate the values across all months, does it mean that all grid cells have been almost twice (with accumulative value is about 2 judging by eyes)?: The response to this comment is rather an important detail which warrants explanation in the manuscript.

Author response: We have added detail to the manuscript results section 3.1 (lines 460-462) to explicitly identify that it was calculated for all fires and that the recurrent burning shown in Figure 2d is shown as values greater than 1.

Line 284-285: was fire module switched on from the very beginning of the simulation? I don't know if there is a risk that trees are too small at the very beginning and they get repeatedly and easily killed by fire. Do you have this issue? : The response to this comment is rather an important detail which warrants explanation in the manuscript

Author response: Thank you for this note. We have added to the manuscript that fire was active from the beginning of the simulation in both the methods in section 2.1.3 (line 365) and in the discussion section 4.1.1 (lines 756-761). As the reviewer notes, small trees are vulnerable to repeat fire. Text has been added to the discussion to further highlight that fire is present at the beginning of simulation, but that the variation in distribution across fuel drying scenarios demonstrates the importance of associated frequency of burning and fire intensity. Further study using initialization with potential stand structure would be valuable to further evaluate the 149 kW m-1 fire intensity mortality threshold derived by De Faria et al (2021) from Staver et al (2020) data and its connection to fuel moisture, fire frequency and fire intensity.
"Though fire is active from the beginning of the simulations, variation of tree distribution and biomass accumulation among the fuel drying scenarios (Figure 7) demonstrate that less frequent burning (Figure 1) and lower annual fire intensity (Figure S15) associated with wetter fuels and less fuel drying is a consideration for tree survival and distribution. Initialization with a potential tree stand structure would need to be evaluated for survival and resilience under similar fuel drying conditions and the associated fire frequency and intensity, as small stature establishing trees would be expected to show more vulnerability to fire than existing tree stands."