

## ***Interactive comment on “Influence of climate variability, fire and phosphorus limitation on the vegetation structure and dynamics in the Amazon-Cerrado border” by Emily Ane Dionizio da Silva et al.***

### **Anonymous Referee #2**

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This work uses the vegetation model INLAND to evaluate the individual and combined effects of the climate variability, the fire and the Phosphorus (P) limitation on the Brazilian ecosystem. The changes on the NPP,  $J$  and AGB were evaluated in relation to 12 climate simulations. The AGB was also evaluated in function of observed data. In addition to climate variability, this work shows the importance of considering the soil nutrient limitation as well as the disturbances caused by the biomass burning in the study of vegetation dynamics. It is also presented some deficiencies of the DGVMs and the databases used to feed the INLAND model. Understanding the mechanisms

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that affect the vegetation and the efforts to improve numerical models in order to simulate such effects is of paramount important to the scientific progress. Therefore, this study is of great relevance and, in my opinion, it is suitable for publication in the BG. However, I have some recommendations and doubts that I would like to see being clarified before publication.

### **Specific comments**

1. L55-L60: observing the Figure 6d (CV+PC), all the Amazon region became “very robust”, so we can assume that the simulation that considers only the climatic effect didn’t indicate the “savannization of the Amazon”, in other words, the results obtained in this study don’t agree with the mentioned works. Can you comment on this?
2. L140: “values smaller than  $0.8 \text{ m}^2\text{m}^{-2}$  characterize a grassland vegetation type” – Grassland can have LAI values much higher than  $0.8 \text{ m}^2\text{m}^{-2}$ . Darvishzadeh et al., 2008 found out grassland’s average values of  $2.76 \text{ m}^2\text{m}^{-2}$  and maximum value of  $7.34 \text{ m}^2\text{m}^{-2}$ . Please check if the INLAND really utilizes this threshold of LAI to define grassland.
3. L85-L87: According to Oliveira et al. (*in press*), the weather also has influence in the nutrients. Then, the climate change’s effect cannot be higher due to the indirect effects in the nutrients? Can you comment on this?
4. L157-L158: How are the other PFTs affected by the availability of P?
5. L262: I didn’t understand where the 8.7% came from. Could you make it clearer?
6. L339-L344: It can be seen in Figure 6 large differences between  $CA + F$  (Line 3) and  $CV + F$  (Line 4). However, the differences between  $CA$  (Line 1) and

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$CA + F$  (Line 3) and the ones between  $PC$  (Column 1),  $PR$  (Column 2) and  $PG$  (Column 3) are not very significant. Thus, the climatic variability is dominant when considering the three effects. Probably, if a fifth map showing  $CA + PG + F - CA + PG$  is constructed in Figure 4, it will be quite distinct from Figure 4d. Therefore, it should be exposed more clearly how it came up to the conclusion described in L513-515.

7. L342: I think it is unlikely that an area with “deciduous forest” will turn into “ever-green forest” after being consumed by fire. Please comment if this is possible or if it is a model deficiency.

### Technical corrections

1. L22: “1960 – 1990” → “1961 – 1990”, as described in L204.
2. L23: “two regional datasets” → “two datasets”.
3. L62: “particularly the P limitation.” → “particularly the Phosphorus (P) limitation.”
4. L72: “Phosphorus (P) is a” → “P is a” or “Phosphorus is a”.
5. L103: Transects 1 and 2 are more related to “Cerrado” than “Amazon”, as shown in Figures 1, 2 and 5. Please rewrite this sentence.
6. L105: “Transect 1 (T1, 43°-49°W; 5°-7°S)” → “Transect 1 (T1, 44°-50°W; 5°-7°S)”.
7. L107: “Transect 5 (T5, 53°-61° W; 13°-15° S)” → “Transect 5 (T5, 52°-60° W; 13°-15° S)”.
8. L138: “annual mean  $LAI_{upper}$  above” → “annual mean  $LAI_{upper}$  below”

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9. L173: “We used the P-mehlich-1” → “We used the Pmehlich-1”
10. L176: “resulting in 12 additional pixels” – Wouldn’t it be 6?
11. L176: “pixels with observed total P content” → “pixels without observed total P content”
12. L186: “Above-Ground AGB (AGB) database” → “Above-Ground Biomass (AGB) database”
13. L194-L196: There are two pixels for each longitude in each transects. Do the Figures 3 and 5 show the mean of the two pixels, or only the upper or the lower one?
14. L212: Remove the phrase: “The model simulations were run for the time period 1582-2008, a total of 427 years.” – The boundary condition begins in 1948, so it can’t be said that the model began in 1582. This was only an artifice used to simulate the same period for seven times.
15. L224: “the simulations  $(CV + PC) - (CA + PC) = (CV - CA)|_{PC}$ ” → “the simulations  $(CV + PC)$  and  $(CA + PC)$ ” - The notation “ $(CV - CA)|_{PC}$ ” is interesting, but it wasn’t used. Then it can be removed.
16. L228: “and  $CA + PC$ , so that  $(CA + PC + F) - (CA + PC) = F|_{CA,PC}$ . Similarly,” → “and  $CA + PC$ . Similarly,”.
17. L230: “between  $CV + PC + F$  and  $CV + PC$ , so that  $(CV + PC + F) - (CV + PC) = F|_{CV,PC}$ . The different” → “between  $CV + PC + F$  and  $CV + PC$ . The different”.
18. L273: “TB declined by 2% for PR”, - In Figure 4b it looks positive, so it would be an increase instead of a decrease. Please check it.
19. L393: “compared to  $CV + PC$ ” → “compared to  $CV + PC - CA + PC$ ”.

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20. Figure 4d: " $CV + PG + F - CV + PC$ "  $\rightarrow$  " $CV + PG + F - CV + PG$ ".

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