



EGUsphere, referee comment RC1
<https://doi.org/10.5194/egusphere-2022-742-RC1>, 2022
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Comment on egusphere-2022-742

Anonymous Referee #1

Referee comment on "Estimating the effects of meteorology and land cover on fire growth in Peru using a novel difference equation model" by Harry Podschwit et al., EGU sphere, <https://doi.org/10.5194/egusphere-2022-742-RC1>, 2022

Review of the article **Effects of fire danger indexes and land cover on fire growth in Peru** by Podschwit et al.

General comments

This article by Podschwit et al. introduces a novel and simple method to model wildfire growth. Specifically, a difference equation model estimating a spread and an extinguish parameter was described and generalized linear models were fit for each parameter which use fire danger indexes and land cover predictors. The method was tested using fire perimeter data from recent wildfires in four ecoregions in Peru. The approach is certainly interesting and the methodology is mostly comprehensible, with a few key points needing to be further clarified. The overall presentation of the results is sound and the common thread can be followed throughout the paper while language and readability are almost flawless. Here and there, rework is needed to clarify certain points which currently might confuse readers. Therefore I propose that the article can be accepted for publication in this journal after addressing some minor revisions.

Specific comments

While I understand the intention and the setup of the study, I think the methodology

currently lacks some clarity. Firstly, Figure 1 makes it seem like direction matters to the approach but if I understood correctly, the extinguish parameter merely decreases the perimeter as a whole and not on a specific side of the circle. Speaking of the sector arc makes this further confusing but I understand that it needs to be calculated for solving the difference equation. I think the best way to avoid this confusion is to adjust Figure 1 and have the "fire" spread in all directions instead of just one. Overall, I think it would still be good if there is some information about the direction of spread (e.g. that you are not modeling it here and why).

At the end of the model description, it would be nice to also show the final difference equation (after Line 116). This might of course be trivial to some but I think others would appreciate to see the final equation directly and it would serve as a good end point of section 2.

The data selection and description is okay. Maybe it is a good idea to state which year the Nature Conservancy data for the ecoregion definition is from. Besides that, I wonder if it is possible to consider land cover changes throughout the study period. Linking a land cover map from 2009 to a fire event from 2019 could be problematic. I understand that the latest GlobCover dataset is only available for 2009 but other global datasets with higher spatial and temporal resolution might increase the validity of the analysis. I was also asking myself why the land cover data was only reclassified into two categorical values. I understand that it is a simple approach but this again raises the question why GlobCover was chosen specifically. At the very least, some more information about the land cover data should be provided (around Line 130).

One more parameter which can potentially also influence fire spread is forest structure (or forest composition). This seems to not be considered here. Is there a specific reason for that?

I would also suggest giving some more information as to how the elements of the GLM were chosen. It seems like an inverse-link and a Gamma density function work here and make sense but when reading the text, this assumption comes out of nowhere and it would increase the understanding of the modeling approach if this part was a bit more elaborated on.

To give the article a better structure, I suggest moving the results section into a separate chapter (e.g. a new chapter 4). Currently, the results are announced in chapter 3.4 but then the actual results follow in chapters 3.5-3.7. It would make much more sense to put them into a new chapter to separate them from the data and modeling section.

On a similar note, I suggest getting rid of chapter 3.7 and work the contents into chapter 3.6 where the same relationships are already discussed. Figure 7 should be kept and the growth curves should be discussed more thoroughly.

I think the discussion part is okay and covers the interpretation of results, potential flaws of the approach and possible future work. However, what I'm most concerned with is the explanation for the counterintuitive results of the relationships between the extinguish rates and the environmental variables. Your explanation sounds like this comes solely from the correlation with the spread rates. This sounds correct but it would mean that the extinguish parameter is not independently modeled and is therefore flawed. It would be great to get some more insights as to why the analysis was still carried through with this approach.

Finally, I'd like to make a general remark about the title and the contents of the article. The title made me expect an application of known methods to a specific study region. However, while reading it felt more like a methodological article which describes and evaluates a novel and simple approach for modeling fire growth. Maybe the title can be adjusted to accurately state what the key aim of this study was.

Technical comments

Line 24: The subordinate clause after the comma sounds a bit strange.

Line 72: The word "areal" should be changed as it can be easily confused with "radial".

Lines 120/127/130: It's always better to include a citation to datasets. Posting links is okay but if possible, add a citation to fully acknowledge the source.

Line 148: Maybe include a reference to the appendix already here.

Lines 149/154: There is no author called "Computing". The author in this case is "R Core Team" – this should also be adjusted in the References section in Line 342.

Figure 6: While I understand how to interpret this figure, it can be confusing to other readers to have the ascending probability values on the y-axis (may seem like ERC for example always has a probability of below 0.1 while Intercept-only always has a probability close to 1.0). Additionally, the colors, especially the shades of blue, are very hard to distinguish. Consider choosing other colors or at least bigger "gaps" between the different shades.

Line 204: Remove the comma before the citation.

Line 213: I think it's better to change "area burned" to "burned area".

Figure 7: I had a hard time understanding the legend. Does the dashed line stand for 10% forest cover or for 10% anthropogenic cover? Or even for both scenarios together? Please make it clearer which land cover extreme corresponds to which line style.

Lines 289/290: This sounds like extreme fire events often occur in the conditions that are typical for other normal fires. So are the conditions now unique or not? Please rephrase this sentence.

Appendix A: The structure and syntax of the appendix is confusing. The subchapters are named A0.1 and A0.2 while the figures are then named A1 and B1. Please name the chapters and figures consistently.

Figures 1/3/4/6/A1/B1: It should be considered to add labels to every subplot instead of just one for all. This was already done in Figures 5 and 7 and improves readability as the reader doesn't have to look at the whole figure to understand a subplot (e.g. if only looking at the lower left plot in Figure 3, it's hard to infer that frequency is displayed on the y-axis).

Several occasions: It often seems that spaces between words in parenthesis are too big (see e.g. Lines 125/159/168/175/181/207). Please check the whole article for this.