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Interactive comment on "The impacts of recent drought and fire in lowland Bolivia on forest loss and regional smoke emissions" *by* Joshua P. Heyer et al.

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The comments and concerns made by referee 1 are greatly appreciated and will be taken into consideration in the updated manuscript. Below is a summary list of referee 1 main comments and concerns, and how they will be addressed in the updated manuscript draft.

REFEREE SPECIFIC COMMENTS 1-4:

REFEREE COMMENT 1. Lack of clarity between mean-monthly correlations and mean-fire season correlations.

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REFEREE COMMENT 2. Pearson's correlations do not validate that Bext visibility data can be used as a proxy of fire activity for lowland Bolivia

AUTHORS RESPONSE TO COMMENTS 1 & 2:

- In consideration of both concerns, we have made the following changes:

- We describe in greater detail the correlations that were performed in the Methods section "2.5 Statistical Analysis". The Method section now clearly states which correlations are mean-monthly, and which are mean-fire season. In addition, in the Results and Discussion sections we make clear which correlations are mean-monthly and which are mean-fire season. Further, the referee's comment that mean-monthly correlations are representative of seasonal variability and the mean-fire season correlations are representative of interannual variability were taken into consideration and included in our Results and Discussion sections.

- We changed 3.6 and 4.3 subsection titles. The titles were changed to more clearly present statistical relationships in section 3.6, and save any discussion of the statistical relationships for section 4.3. We maintain that our results are consistent with Marle et al. (2017), as well as other studies that have used horizontal visibility data to extend regional fire records (Field et al., 2009; Field et al., 2016). Thus, with caution we suggest Bext is related to fire activity prior to the MODIS record. Further, a strong correlation is established between lowland Bolivia MODIS active fire and Bext seasonality in Figure 2 in our paper (2001 - 2015), indicating lowland Bolivia fire and Bext seasonal variability are highly correlated. Given our data is consistent with others, reproducible, and the strong statistical relationships are established, we suggest past Bext variability is related to past fire activity in lowland Bolivia prior to the MODIS record.

REFEREE COMMENT 3.

Page 9, line 233-234: What are exactly the 'normal's mean in 'lower-than-normal' and 'higher-than-normal'? A logical guess is that the 'normal' refers to the monthly clima-

tology, and this sentence is about explaining the interannual variability. But this will be contrary to Table 1 cited the later part of the sentence, which is all about seasonal variability.

AUTHORS RESPONSE TO COMMENT 4:

- Because our study is an investigation of how relationships between fire, climate, and visiblity (i.e., smoke) vary interannually and seasonally, we have removed any 'lower-than or higher-than-normal' interpretations. Instead, we discuss fire, climate and visibility data values as high or low relative to other values during that year, or between years (e.g., 2004 and 2010 were high fire years compared to the other 13 years).

REFEREE COMMENT 4.

There's something wrong in Figure 5. In several places of the text, you talked about Fig. 5a and Fig. 5b (e.g., in Page 8, line 200-201). But I only see one panel in Figure 5. Since I couldn't locate the positions for forest loss (white color pixels?) in Figure 5, I am basically unable to review the whole section of 3.5, as well as the first paragraph in section 4.1.

AUTHORS RESPONSE TO COMMENT 4:

- Figure 5a was not included in this updated manuscript version. I forgot to change all of the Fig. 5a and 5b to Fig. 5. The updated manuscript refers to Fig. 5 throughout. We thank the referee for making us aware of this mistake.

- As for the forest loss "white pixels", because Figure 5 is a high-resolution figure, if you zoom in you can see the white color pixels (i.e., positions of forest loss). A sentence was added to make this is made clear in the Methods section.

REFEREE TECHNICAL CORRECTIONS AND AUTHORS RESPONSE:

We thank the referee for taking their time in making technical corrections on our manuscript. These corrections have improved our manuscript, and are much appreci-

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ated. Thank you.

Page 2, line 48-50: This sentence is difficult to understand. Page 3, line 66-69: Again, I don't quite understand this sentence. Please rephrase it. - This sentence will be rephrased for clarity in the updated manuscript.

Page 3, line 76: The spatial resolution of MODIS active fire product should be 1km, not 500 meters. - Resolution changed to 1km

Page 5, line 121: Better to change '13âŮęS x 15.3âŮęS, 62.2âŮęW x 59.5âŮęW' to '13âŮęS - 15.3âŮęS, 62.2âŮęW - 59.5âŮęW'. - Changed to recommended text

Page 7, line 175: 'Fig. 3f' is about MERRA2 data, not MODIS data. - The Fig. 3 labels that were incorrectly referenced in the text were corrected in the updated manuscript.

Page 8, line 208: Where did you show this: "the positive relationship between lowland Bolivia MODIS C6 active fire data and mean-September Bext"? - Relationship should be for the fire season (August - October). The text was changed to "mean-fire season (i.e., August – October). The relationship is shown in Figure 2.

Page 20, Figure 1: You combined these biomes into several groups "cerrado, SDTF, METF and seasonally inundated wetland biomes" in the text, and discussed your results mainly based on the group classifications. Why didn't you the grouped vegetation types in Figures 1 and 4? - This was done for simplicity when discussing in-text the fire-biome spatial analyses. The land classification could have been further simplified visually, but the details between the many different biomes would be lost to readers interested in higher level of detail. - I made this clearer in the methods section 2.1

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