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Discussions

Interactive comment on "Local and regional smoke impacts from prescribed fires" *by* Owen F. Price et al.

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Thank you for your helpful review. We have made some changes to the manuscript to take account of your points, and address each one below.

The authors have identified an issue in prescribed burning that has not been sufficiently examined and use the example of both a large and small prescribed burn to illustrate that these burns can have unintended health consequences, the likes of which these burns are designed to prevent. The manuscript is well-written and the authors acknowledge the points where data is either insufficient or direct relationships between the fires cannot be exploited, but the results are sufficient to illustrate the problem and warrant publication. However, I would ask the authors to address the following minor comments/questions prior to publication:

P. 3, Lines, 9-11: The authors state that most if not all models are designed for large-scale dispersion. This seems a very broad statement to make and Pearce et al. (2012) referenced in that statement only suggests HYSPLIT and CALPUFF (wellknown, but hardly "most" or "all") are designed for long-distance transport, while sug- gesting VSMOKE is developed with the idea of simulating short-range dispersion. I would like to see either additional references or a re-writing of that portion to more accurately reflect the comments of Pearce et al.

Response: We have changed these two sentences to: However, the use of dispersion models for predicting fire smoke is problematic because they are mostly, designed to predict large-scale movements of pollutants (Pearce et al., 2012), with the exception of the V-SMOKE model for line-of-sight modelling (Lavdas, 1996). Also the models are not well validated against observational data (Price et al., 2012). "

P. 3, Lines 25-29: You mention anecdotal evidence; are there any references you can add here to strengthen these statements?

P. 4, Lines 23-26: I'm confused why you assumed a value of 4 microgram/m3 for pe- riods between observations. This seems significant, but I'm not sure what this means or how exactly it plays into your calculation. Also, assuming a background value does not strike me as a conservative estimate. Perhaps I'm misunderstanding what you're trying to say here, but could this be written to more explicitly state your intentions with this?

Response: This is quite straightforward. We assumed that the level was the same as it was before the fire started. This is conservative since it is very unlikely that the level would be any less than this once the fire was lit. We have changed the sentence slightly to be more clear: "In the case of the handheld monitor, only locations with three or more PM2.5 observations were used. The periods between observations were assumed to have the same value as that recorded before the fire commenced (a mean value of 4 μg/m3)."

P. 10, Lines 15-17: You mention earlier in this paragraph that additional incendieries were used at 4pm to ensure the completion of the burn. This seems like a probable cause for the sudden spike in plume height if you suddenly expanded the size of the fire and intensity of heat. I would like you to consider this possibility and address it in your manuscript.

Response: We did mention that the incendiaries having a link to the pulse in plume height. We have now changed this to be more explicit: (probably resulting from the aerial incendiaries) (probably resulting from the aerial incendiaries)". We also added a sentence in the second paragraph of the discussion: "The aerial incendiaries which rapidly increased the size of the larger fire were probably partly responsible for the higher plumes in that fire."

P. 11: In multiple places on this page, you reference Table 1. Do you mean Table 2?
Response: No, Table 1 is correct.

P. 11, Figure 5: What are the red shadings on these figures? I assume this is the radar signature of the plume, but would like you to explicitly state this in the figure caption and/or text.

Response: We have added a sentence to the legend for Figure 5: "The pink shading is the outline recorded from the rain radar."

P. 12, Line 14: You mention the statistical comparisons you performed (I assume this relates to #4 in your Methods section?). Would it be possible to show some graphical representation of these measurements with the spikes in question identified? I think this would help the reader to see at least an example or two of this data.

Response: Have added a new figure (Figure 6) showing the time traces for all of these monitors.

P. 15, Line 18: You state that locations up to 500m had very high levels of PM2.5 recorded. Can you be more specific and give an indication of what the values were as

you did for the locations at 100m?

Response: Have quoted values for two sites: "(e.g. Gate, peak 531, 24 mean 78.1 μg/m;, Pole 16, peak 863, mean 51.5 μg/m3)".

P. 16, Line 12-15: Here again, I would like to see some discussion of how the additional incendiaries used in the 700 ha burn may have impacted plume height.

Response: We have added a sentence at this point: The rapid increase in plume height at the time of the aerial incendiaries confirms this interpretation."

I also caught a few technical issues that I have listed for sentence clarity: P. 4, Line 6: "August 2015, *and* targeted patches..." P. 15, Line 15: "similar to those found *by* Pearce et al...." P. 16, Line 4: "but this may simply *be* because..."

Response: All fixed

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