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Interactive comment on "Joint Measurements of $PM_{2.5}$ and light-absorptive PM in woodsmoke-dominated ambient and plume environments" *by* K. Max Zhang et al.

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We greatly appreciate the valuable comments from Anonymous Referee #2. In addition to the replies below, revised manuscript with marked changes are also enclosed as a supplement.

1. "I found the analyses focused on the three fixed site data collection straightforward and the conclusions well-supported. I think Figure 7, DC/BC vs Heating Days is particularly compelling. Why is it only shown for Rutland site? It would be interesting to understand how this stable this relationship is."

Among the sites included in our study, only Rutland had DC data over a year. We will search for more data in other locations, and likely report the findings in a separate publication. For long-term continuous light-absorption measurement in a woodsmoke-dominated environment, Rutland is probably one of very few in the U.S.

2. "How was the CO2 data used?"

We did not use the CO2 data in the current manuscript. The data did not pass our quality assurance (QA) check. We are still trying to figure out the possible causes.

3. "There are two parts of this paper that are weak and I would recommend removal. The mobile monitoring in Ithaca is not well integrated and it does not add significant value to the paper. Likewise the PAH comparison is very lightly discussed and basically dismissed by the authors themselves. I recommend that these sections be removed so that the main point of the paper, the DC/BC analysis, is clear. "

We have removed the section discussing PAH measurement. We'd like to explain why we think the Ithaca plume analysis is inherent part of the paper. The main goal of our manuscript is to address the concerns whether DC (aka Delta-C) is a useful woodsmoke marker for air quality management, in both qualitative and semi-quantitative sense. By studying woodsmoke plume data, we showed linear relationships between PM2.5 and DC can be used to distinguish different combustion conditions. The fundemental principle is that different combustion conditions lead to different PM composition, which in turns lead to different absorption cross sections. The high time resolution AE-33 we deployed can capture the changes in absorption cross sections, which can potentially allows us to track combustion conditions. We added the following sentence near the end of the second paragraph of Section 3.3.2, "In other words, the different combustion conditions lead to different chemical compositions and absorption cross sections, which can be potentially captured by high time resolution light absorption measurements."

Please also note the supplement to this comment:
http://www.atmos-chem-phys-discuss.net/acp-2017-213/acp-2017-213-AC2-supplement.pdf

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