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Atmospheric Chemistry and Physics
Discussions

Interactive comment on "Emissions from village cookstoves in Haryana, India and their potential impacts on air quality" *by* Lauren T. Fleming et al.

Anonymous Referee #2

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Fleming et al. report on gas-phase emissions from combinations of two cookstoves (angithi and chulha) and two fuel types (dung and brushwood) in a real world environment. They find that use of dung fuel and angithi cookstove results in higher gas-phase emissions, which is in line with lower observed modified combustion efficiencies. They use the gas-phase speciation to reflect on the potential of those emissions on ozone (O3) and secondary organic (SOA) production.

The experimental and analysis methods of this study are robust and well executed and the findings reported agree very well with the data. The technical communication is of high quality and very easy to follow. I do not have any reservations with publication of this work in ACP subject to the authors responding to my comments below.

1. There is a wide diversity of stove and fuel types globally and the stove and fuel

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types explored here are but a small fraction of those used in real world. So while the gas-phase speciation offers a detailed view of the emissions from these stove-fuel sources, how are the stove-fuel sources in this work representative of the stove-fuel combinations in India and globally? More specifically, what fraction of the gas-phase emissions from cookstoves come from the stove-fuels described in this work? And depending on the answers to the previous question, how can this speciation, if at all, be used to inform the gas-phase emissions speciation in large-scale atmospheric models?

2. Since multiple tests were done with each stove-fuel combination, were other important variables recorded and/or controlled during the test? For example, fuel moisture content, environmental conditions (e.g., temperature, relative humidity), fuel size and burn rate, cooking pots, meals cooked. According to the authors, are any of these variables important in explaining the variability? Citing relevant literature on the factors affecting cookstove emissions variability would be helpful.

3. Some more detail on the fuels and stoves for the less informed reader would be helpful. What animals was the dung from? Presumably cow? What is an Angithi stove? What is a chulha? How are these different? What is brushwood? Is the brushwood from a particular plant? The use of pictures could help.

4. In equations 1-3, how are mT and mT,c estimated/calculated?

5. Page 4, line 11: What is the limit of detection and limit of quantification for the filter measurement? The 0.75 μg blank seems quite low.

6. Page 5, line 1: I am not sure what the point is of normalizing the SOA production from a species to that of toluene? Why not report the SOA production in absolute values of g/kg-fuel when the presentation of results in Figure 2(c) is done in relative format anyways?

7. Why was the maximum incremental reactivity approach used to determine the ozone potential? If an alternative method was used (e.g., MOIR, EBIR), do the findings

change?

8. Can more details about the SOA formation be added? Were the SOA yields for low or high NOx conditions? What OA mass concentration as the absorbing mass was used to determine the SOA yield? Were they corrected for vapor wall losses? NOx and vapor wall loss corrections are species dependent (see Zhang et al., 2014) and may change the apportionment shown in Figure 2(c).

9. Page 7, lines 3-21: Are the brushwood results in this study comparable to the hardwood results from Stockwell et al. (2016)? If yes, why? It is unclear what the point of the comparison to the Stockwell study is since the manuscript only has a few sentences on this comparison. Is it just to show that the emissions in this study were lower than those in Stockwell et al. (2016). The explanations offered for the lower emissions was not satisfactory. Did the authors try to compare the emissions on a normalized basis with each other? Do they correlate?

10. Section 3.3 for SOA: Was there an estimate for emissions of total non-methane organic gases (NMOG)? What fraction did the speciated compounds account for of the total NMOG? Were any intermediate volatility and semi-volatile organic compounds targeted? What fraction of the NMOG was unspeciated? What implications does this unspeciated fraction that may include lower-volatility vapors have for SOA formation?

11. Section 4: Could atmospheric implications for SOA formation also be determined for this village similar to those for O3? How would the SOA formation compare to the primary PM2.5 emissions?

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