Atmospheric
Chemistry
and Physics
Discussions

Interactive comment on "Molecular Composition of Particulate Matter Emissions from Dung and Brushwood Burning Household Cookstoves in Haryana, India" *by* Lauren T. Fleming et al.

Anonymous Referee #2

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The Fleming et al. manuscript reports on chemical speciation of fine particulate matter (PM2.5) emitted from cookstoves. Two types of stoves were evaluated, as well as two types of fuel (dung and brushwood). The stoves were operated under realistic conditions (e.g., traditional meals, local cook). Samples were collected onto PTFE filters and were analyzed off-line using advanced high-resolution mass spectrometry techniques. In addition to expanding the list of reported compounds in biomass burning PM2.5 samples, brown carbon (BrC) chromophores were identified and mass absorption coefficients (MAC) were estimated. There are many strengths of this manuscript, including the effort to represent real world conditions, the application of advanced instrumentation, and the novelty of the reported results. This study likely represents the

most comprehensive analysis of the chemical composition of brushwood- and dung-generated primary PM2.5. The manuscript is well written and should be of interest to biomass burning, air quality and climate communities. It is thus appropriate for publication in ACP. Minor technical and editorial comments are provided below.

Technical:

Sample collection: have particle losses through the aluminum tubing been characterized? Would any size dependent losses bias the results?

MAC estimation: Can some uncertainty bounds be given for, 1. use of a separate filter for total mass and 2. range of estimated extraction efficiencies? Fig. 8 should include some uncertainty bounds/shading.

EF approximation: Is it reasonable to assume the peak abundances are proportional to mass concentrations? It would be useful to provide support for this assumption in either the manuscript or the supporting information. Given the uncertainties and required caveats, is there adequate justification for reporting emissions factors? Relative peak abundance may be more appropriate.

Nano-desi results (p. 7): The fractions of CxHyOzNw are relatively similar within and across fuel and stove types, with the exception of the brushwood sample RE007. That sample also appears to have a higher moisture content. Can any linkages between moisture content and PM2.5 chemical composition be made? Does this also influence the presence of BrC chromophores and can the differences between the values reported in this paper and in prior work be attributed in part to difference in fuel moisture (e.g., p. 11, line 17-20)?

Levoglucosan: The suggestion that levoglucosan may be a "good" tracer for the two fuel types may be misleading in the context given (i.e., present in less than half of the dung and brushwood/chulha samples). It is suggested to revise this statement.

Editorial:

The motivation for this work, as articulated in the introduction, is a bit unclear. There is quite a bit of discussion on the health implications of solid fuel use in cookstoves, and it is noted that the work was done as part of a larger study documenting the contribution of household combustion to ambient pollution (p. 4, line 4); however, the focus on MAC and BrC chromophores implies a greater relevance to climate. There is little to no discussion on the health implications of the identified compounds and no discussion of the local to regional implications of the findings (e.g., whether or not the MAC values and emissions factors are significant to suggest regional climatic influence).

p. 2, line 9-10: The clause "of pregnant women" after infants is a bit strange as written. Does this mean that exposure is through the mother? If so, one possible revision could be: "infants of women exposed while pregnant".

p. 2, lines 25-28: The discussion of estimated EFs from the Stockwell et al. manuscript is awkward as written. Revision is recommended.

p. 3, line 33: "prescribed" instead of "prescribing" ?

p. 5, line 50: "O"/oxygen does not need to be defined for DBE equation

p. 6, line 20: Remove "the" after "Since"

p. 13, line 3: SIC is undefined

Fig. 3: is confusing and provides little to no additional information beyond other figures and tables. Authors should consider removing it.

Fig. 5: "terpenes" is misspelled in figure legend