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Interactive comment on "Identification and quantification of gaseous organic compounds emitted from biomass burning using two-dimensional gas chromatography/time-of-flight mass spectrometry" *by* L. E. Hatch et al.

Anonymous Referee #2

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This paper presents results of highly detailed analyses of sorbent tube samples collected during laboratory test burns of 6 biomass fuels during the FLAME-IV study. Thermal-Desorption 2D-GC-TOF-MS analysis was conducted on gaseous non-methane organic compounds (NMOC; ranging from 'volatile' to 'intermediate volatility') extracted from Tenax/Carbon sorbent tubes collected from well mixed smoke collected during the FLAME studies. A large number of compounds were identified and quan-

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tified based on instrument response to either authentic standards of identified compounds or chemically similar compounds. The analysis described in the paper appears to be carefully done, with sources of uncertainty identified and the results placed in context with prior investigation in this area. The data and analysis will be of great interest to a wide swath of researchers investigating atmospheric impacts of biomass burning (BB) emissions. These results and discussion will be of particular interest atmospheric modelers and those studying the potential precursors for the secondary organic aerosol (SOA) production observed in biomass burning emissions (which are, as noted, substantially under-predicted by current models and a large source of uncertainty in models). Therefore, the paper is highly suitable for publication in ACP. I concur with most of the questions raised by the other referee, so look forward to these points being addressed. Here I highlight some (mostly) minor points, mostly with the aim of improving the clarity of the manuscript.

P23239, L8-9: This example is not the best way to demonstrate the health and environmental impacts of long range transport of BB emissions – not so many folks in the Arctic.

P23243, L7-8: Considering the extensive testing conducted to look at sorbent breakthrough and volatilization from the filters, it is surprising that so little attention is paid here. Some effort to quantify the extent of this effect and identify compounds that might be under-estimated because of this potential source of compound loss would be very helpful.

P23244, L1-2: This sentence doesn't make sense to me. How would you know if mass was loss from the background filter during PM collection? Perhaps 'PM collection' should be 'filter desorption'? In any case, this description should be clarified.

P23245, L10: GC Column types are not listed, though are referred to later. It would be helpful to list them here.

P23245, L21-22: I found this description of background correction in general unclear.

What statistical method was applied to test whether peaks were 'statistically different from zero'?

P23246, L1-7: How was the most chemically similar compound determined? Are there cases where this selection would have a large effect on the quantification of the compound, and if so is this accounted-for in the uncertainty calculation? Also, I found the distinction between the use of the calibration line and the response factor unclear.

P23246, L25: What is meant by 'lower volatility compounds' and 'not well characterized'? Some attempt at quantifying the range of volatility identified (e.g. vapor pressures, RT, C*), and the uncertainty in quantification should be included (also relates to discussion of sampling losses above).

P23247, L4-7: What effect does this 'wrap around' have on the quantification of these and neighboring compounds? Can this be specified and is it reflected in uncertainties for these compounds?

P23247, L24-27: Given that values with which to compare are available, this comparison should be made and the extent by which these values are 'lower bounds' reflected in the discussion and the table.

P23249, L23: Presumably 'compounds emitted during smoldering combustion'?

P23250, L14: This would suggest that it cannot be at all explained by differences in MCE?

P23255, L27: Disproportionately relative to what?

P23256, L6-9: It is not clear why NO2/NO ratio is discussed here and whether high- or low-NOx yields should be applied? Should this be VOC/NOx?

P23256, L23: 'Largest category' is ambiguous. Referring to the figure I presume it is largest mass emission factor, but this could be interpreted to mean the largest number of identified compounds. This kind of ambiguity is found in several other places and

I suggest that the revised manuscript be edited with an eye towards removing such ambiguity.

P23257, L25: ‘Visual observations’ of the mass of fuel burned? This seems fairly untrustworthy? Can this be quantified in any way?

P23258, L14: No correlations are presented here.

P23259, L5-11: This is the first mention of PTRMS data in the manuscript, and there’s little reasoning behind this sudden comparison (nor is the acronym defined) or references to works that rely on these values, and what the issues with that might be. Some context should be provided. Further, while the suggestions in this paragraph are likely quite welcome, it would help if a bit further guidance is provided. For example, if ratios from essential oil samples are used, how might these be normalized for use in as emission factors for modeling purposes? This discussion might be transferred to the conclusions section.

P23260, L28: Should be section 3.3.2

P23265, L8-10: The references listed include OA enhancement ratios for some of these same fuels under similar conditions. Why not do a direct comparison, where possible?

Figures 1-6: The chromatograms don’t add much to the presentation, so can be moved to the supplement and the additional real-estate potentially used to selectively point out some noteworthy features of the bar charts.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 23237, 2014.

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