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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Biomass burning emissions and potential air quality impacts of volatile organic compounds and other trace gases from temperate fuels common in the United States" *by* J. B. Gilman et al.

Anonymous Referee #2

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This manuscript describes a biomass burning emissions dataset containing hundreds of compounds based on a comprehensive suite of observations (FTIR, GCMS, CIMS, PTRMS) and considers the potential atmospheric impacts of different fuel types by assigning OH reactivity and SOA yields to these compounds. There is also a section on ambient observations during a biomass burning event in Colorado which provides some additional information on potential biomass burning markers but has relatively little connection with the rest of the paper. This is a topic of interest to readers of ACP and the paper could provide a valuable contribution to the scientific literature after

addressing the following comments:

1) The observations have already been reported in a series of papers. While the manuscript does mention these papers in the introduction, it initially appeared to me that they were just referencing previous studies that they would compare with some new observations. I had read through most of the paper before I realized these were all the same data. The authors should make it clear that ALL of the fire lab observations in the paper have previously been described.

2) Since emissions are given as a ratio to CO, it is important that the CO emission is relevant to "real" fires. Is there any indication that this is the case? How does the CO emitted per fuel mass burned relate to what is observed in the field for fires from these different regions?

3) What fraction of Table 2 was quantified by each of the instruments? How did you choose which instrument to use when there was more than one choice? What would be lost if you did not have all 5 systems? For example, I see "+" listed on only 3 compounds and all of them can be analyzed by GCMS. Does this suggest that there is no need for PTRMS and PITMS for determining emission factors?

4) on P21721, line 5: I would expect it would be difficult to get these compounds through an unheated sample line? Have there been any tests to look at this?

5) Section 3.2: Why not collect a sample for the GC that includes the whole burn? The way the GC sampling is presented in the manuscript gives the impression that the GC can only capture a discrete sample and so cannot characterize the fire integrated value. But this was the case for this study only because you didn't sample for the entire burn. It should be made clear in the text that it is possible to characterize the fire integrated value with GC if you integrated the sample over the entire burn.

6) section 3.2: How common is this bias (discrete sampling that did not characterize the entire burn) in past studies? Would it change any of the emission factors used in

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models if this was accounted for? Could the biased values be adjusted and still useful?

7) Page 21730 line 24-26: How do you know there are differences are due to region? If you had samples for different ecosystems within each region then you could investigate this. With the data presented here it can be shown that there are differences between fuels from some different landscapes but I don't see evidence that these are characteristic of the whole region.

8) Page 21730: The text makes it clear that emissions from these fuels are different but not why. Any ideas on why they are different?

9) Page 21734, line 15: It is impressive that OH reactivity was found for all of these compounds. One of the most important contributions that this paper can make is to list the OH reaction rate of each compound and include this in Table 2. That would be a valuable resource for readers of this paper.

10) Section 3.3.3: Was a SOAP calculated for each compound in Table 2? How does this compare to other reported SOAP for the most important contributors to total SOAP? As above for OH reactivity, the SOAP should be included in Table 2 for each compound. This would be a valuable addition to the manuscript.

11) Table 2: Provide the units for the "SW" columns. It is presumably mmol(mol CO)-1) but it would help the reader to make this clear in the table.

12) Figure 2: When it states "GC-MS vs OP-FTIR", I assume it means the ratio of GC-MS value to the OP-FTIR value but it is not clear. If they are ratios then state this.

13) Fig 7: what is the line? It is not described. Is it needed?

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 21713, 2015.