Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2018-840-RC2, 2018

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Speciated and total emission factors of particulate organics from burning western U.S. wildland fuels and their dependence on combustion efficiency" *by* Coty N. Jen et al.

Anonymous Referee #2

Received and published: 30 October 2018

Jen et al. have speciated particles and vapors from emissions of laboratory fires representative of those found in the Western US, as conducted at the Fire Sciences Lab in Missoula, MT. They performed 2D gas-chromatography/mass spectrometry to speciate a significant fraction of compounds from a whole range of organic families. Additionally, they were also able to develop log-linear regressions of the emission factors for these compounds with modified combustion efficiency (MCE) to aid development of fuel- and phase-specific emissions from fires in the Western US.

The study is well motivated, the methods are appropriate, and the manuscript is well

Printer-friendly version

Discussion paper

written. I had a few major comments surrounding the methods and data analysis. Regardless of my comments, I believe the speciation data from this study should help with modeling efforts to supplement the multi-agency ground, aircraft, and satellite-based studies involving fires in the United States (e.g., WE-CAN, FIREX-AQ). I would like to recommend publication of this study in Atmospheric Chemistry and Physics after the authors have responded to the following major and minor comments.

Major comments:

1. Identification, Page 6, Section 3.2: Of the 3000 compounds measured across the 29 fires, 149 seem to be positively identified. These probably have the highest certainty amongst the speciated compounds. What fraction of the total speciated and total mass do these represent? I am sure they probably change with fuel type but it would still be nice to know the range and some basic statistics (mean, standard deviation). For the remaining (3000-149) compounds, the authors refer to the SI for a more complete description of the methodology used to identify these compounds. It seems like Section 5 in the SI is what the authors are referring to. I found this description to be unsatisfactory and I am not sure this is a useful guide for readers if there were to replicate your methodology for their own work. What fraction of the total speciated and total mass do these remaining compounds account for, resolved by identified and unidentified? Finally, are the methods described herein common to analysis of GC/MS data and those of this research group? If they are, it would be beneficial to cite the group's earlier work in Section 3.2.

2. Calibration, Page 5, lines 13-18: Has the calibration technique described here been validated to work? If yes, can you cite the most recent literature? If not, would it be possible to split the dataset to validate this technique? How well would it work? Also, what are typical uncertainties in using a projected calibration (e.g., nearest sugar standard or nearest eluting standard) to calculate masses?

3. Fuel type as covariate, Sections 3.3-3.5: Despite the authors repeatedly saying

that fuel type was an important covariate, they failed to account for it in the regression models and limited their modeling to one with just a single covariate (i.e., MCE). The regression models in Figures 4 and 5 clearly show that the model when blanket-ly applied to any fuel can over/underestimate the emissions for certain types of fuels. Please consider using fuel type as a covariate to see if the regression model can be improved.

4. OC for mass closure, Page 7, lines 9-10: How did the final observed mass on the filters compare to the OC measurements? Wouldn't the OC be the gold standard to test for mass closure? If it is, shouldn't Figure 3 be done by normalizing with OC? Further, can the mass distribution from OC1 through OC4 be another useful constraint on the identification and calibration techniques since the 1 through 4 OC types are crude approximations for decreasing vapor pressure species?

5. Gas/particle partitioning: Were C* identified/developed for these species? What phase are these species expected to be in inside a fire plume or near background concentrations of organic aerosol? The C* for the species could be provided in the SI.

Minor comments:

1. Page 4, lines 10-11: If the quartz filters were the only ones analyzed in this study, I would state that after this sentence.

2. Page 4, line 18: Of the 75 fires, were only 29 sampled? Was there a reason the others were not?

3. Page 5, line 11: Why is a data inversion needed and what is it? Mention briefly in the main text.

4. Page 7, lines 3-5: Does this library also contain the emission factors for all the species measured in this study? This would be a useful resource to share with the community. It would also be beneficial to list the emission factors for species by fire that contribute a significant amount of the total observed mass in the SI (e.g., levoglucosan).

5. Page 8, lines 13-14: Can this final point about similarity within fuels be made statistically?

6. Page 9, line 14: Is ‘accuracy’ the right word here? Since you are testing the fit to the data, you are looking at the ‘goodness-of-fit’.

7. Figures 4 and 5: Consider adding a factor of 2, 5, or 10 envelope on here to bound the deviation of the data from the fit.

8. SI: The Selimovic et al. citation seems to have shown up as both the ACPD and ACP paper. Please correct.

9. SI, page 12: A sentence in this section says ‘see SI for more details’. Self-referencing?

Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2018-840, 2018.