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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 #1

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This paper presents measurements of particulate organic compounds made during the FIREX lab campaign with a novel multi-stage measurement technique. The compounds are identified or assigned to functional groups where possible. The dependence of the emission factors of OC, EC, and the different compound classes and individual compounds with modified combustion efficiency and fuel type are analyzed.

This is an important piece of work that will further our efforts to understand the chemistry of organic aerosols from biomass burning smoke. The work appears to have been carefully done and important uncertainties and caveats are made clear. The conclu-

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Discussion paper

sions are generally justified by the results presented. The paper, tables, and figures are also generally clear and well presented.

I have no major concerns about the manuscript. Below I discuss a few minor issues that I would like the authors to address, and a few typos that need to be fixed.

Minor Comments:

P5, L31 and elsewhere: The numbers presented for the linear fits in this paragraph (including on page 6) do not match the numbers in Figure 1. Which set are correct? Please double-check all the numbers in the text to confirm they are consistent with the latest analysis of the data.

P7, L9-18 and Figure 2: This may be outside the scope of this paper, but would it be possible to map the two axes of Figure 2 to the saturation vapor concentration, O/C ratio, or the hygroscopicity "kappa" parameter? If so, that would help modelers use this data more directly.

P8, L1-3: You mention the uncertainty in the organic nitrogen compounds, but what about the uncertainty in the other EFs? How should those be treated?

P8, L10-14: The "shrub" class has the most variation in EFs, and I'm wondering if that's because the plants also have the most biological diversity in that class? I could see where all pines are basically the same but shrubs can be very different from one another.

P8, L17 and elsewhere: I agree that much of the variability in the EFs is due to MCE, but I think you understate the role of fuel type. It looks like the regression line is always low for conifers and always high for peat. I'd be curious what the effect of including fuel type as a factor variable in the linear regression would be (https://stats.idre.ucla.edu/r/modules/coding-for-categorical-variables-in-regression-models/) and if it would improve the fit.

P9, L15: I don't understand the statement that "the predicted total I/SVOC EFs are on

average higher than the measured EFs by a factor of 2." Isn't the point of a regression fit that "on average" the predicted value is the same as the measured value? How should I interpret this statement and the statements about the different fuel types?

P11, L17: I think this is the first time you discuss that the fuel structure of peat may be responsible for the difference, and I'm not sure you have any evidence for that statement, so I'd remove it from the conclusions.

Figure 2 caption: "Size of a point approximately scales with its emission factor" – is this a quantitative mapping from a function of some sort? It's be nice if the supplemental data explained how the size of the point relate to EF, or if you added a point size scale to the legend.

Table S6: That is a lot of significant figures given the error. Is there a reason you reported so many digits?

Typos:

P3, L10: Consider changing to "Therefore, a better representation"?

P5, L7: "laser transmittance laser"?

Section 3.2 heading and elsewhere: You don't need a colon at the end of headings

Figure 4f: The other panels listed the R2 and equation below the chemical family name, but it is listed at the bottom here. Please make consistent.

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