Comment on acp-2022-297

Anonymous Referee #1

Referee comment on "Emissions of Organic Compounds from Western US Wildfires and Their Near Fire Transformations" by Yutong Liang et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2022-297-RC1, 2022

Summary:

The work submitted by Liang and Stamatis et al., addresses gas and particle phase organic species, and investigates the composition of PM from largely coniferous fuel wildfires sampled by the Aerodyne Mobile Lab as part of the FIREX-AQ study. The results presented here ultimately aim to address unknowns associated with the composition of wildfire PM, and the formation of secondary species such as SOA. Overall the manuscript is well written with minimal grammatical errors and the work is clearly presented. It is appropriate for ACP and should be considered for publication, but some minor caveats need to be considered first. Though the overall study is clear, the manuscript would benefit from increased specificity, especially in qualifying comparative statements or defining the importance of contributions from single species (see below in more detail). This would help provide additional context to some of the comparisons with other studies and to which compounds are most important in this context of wildfire PM. Additionally, though the importance of this work is implied throughout the text, more clearly defined statements regarding broader impacts would help strengthen the significance of the results presented here. For instance, estimates on SOA formation or potential yields from the most abundant compounds could help contextualize the importance of these species, though a detailed analysis may be outside the scope of this work. Additionally, in the conclusion, the authors mention that the emission profiles can benefit future source apportionment and exposure assessments for public health and impacts. Though this is true, specificity on how that could be done is lacking. The authors should not underestimate the importance of the work they have done--they even mention that non-targeted molecular level measurements of biomass burning particles in the literature are scarce. Thus, the work is unique and the authors should reiterate that and the implications moving forward. Below are specific comments and suggestions relevant to each section:

Abstract: Could benefit from more specificity. E.g, "MCE was a good predictor of particle phase EFs..." is there an R^2 value or correlation coefficient range that can be listed to strengthen this statement?

Introduction:

L39, 58 & throughout: references within text should be in some chronological order, descending or ascending based on year

L83-84: consider rewording "traveled very close to three wildfires" to "sampled ground-based near-source emissions from wildfires"

L87: "sampling very close" quantify w/ distance (i.e <1 km)

L90: End of this paragraph would benefit from expected outcomes of tasks 1 &2. What do you expect these objectives to bring to the broader community/current knowledge? Reiterate points from intro. 1-2 sentences is fine.

Materials & Methods:

L99-100: As samples were taken when the AML was stationary and mobile, was any process considered to remove potential cross-contamination from the AML? Was this a concern? If not, express why.

L105: 'Very short section' – any quantifiable length?

L110: Wouldn't necessarily call $PM_{2.5}$ large. The $PM_{2.5}$ cyclone was there to remove particles below $PM_{2.5}$.

L111: Mention of samples excluded from analysis. What % is this compared to rest of data?

L112: suggest rewording "analyzed 33 $PM_{2.5}$ 3.5-hour samples" to "analyzed 33 3.5 hour $PM_{2.5}$...", less awkward

L156: Is 285C enough to desorb all species? Any fraction expected to be lost?

L204: 'Eleven filter out of 27 samples met all the thresholds for EF calculation' – awkward wording, consider rewriting

Results & Discussion:

L215-217: Seems like you can condense this into "MCE is useful for predicting emissions among similar fuel types?"

L270-275: Earlier authors mentioned that resin acids and diterpenoid species are abundant in the conifer stems and needles, but also note that abundance can come from heat-induced evaporative emissions from "non-burned forest components in wildfires". In this line, authors mention that these compounds can be used as tracers for BB. Given the earlier statement, with what certainty/accuracy can these species be used as tracers if there is still some fraction of them emitted in the presence of non BB (heat induced)? Perhaps I am misinterpreting the results, but clarification on these two statements/stipulation in regards to previous statement would be beneficial.

L282: "…are higher than those" how much higher? Quantify w/ percentage or fraction/factor.

L296-299: quantify comparative statements. (e.g values were within X% of one another, these ratios are Y of Z from _____ study).

L304: "significantly higher" again quantify/qualify

L314-315: awkward wording, consider rewrite

L316: 'still much smaller' – how much?

L324: Do you have a sense/proxy for how aged the samples in this study were by comparison? What fraction of what was sampled do you suspect had already formed SOA? Maybe hard to determine

L328: how much higher? Define statistically significant

L356-357: rewrite, can't follow

L362: remove "though"

L386: Isn't EC separate from OC? So should say "… phase organic compound EFs, but not for EC"

L386: "Dominated" – list fractional contribution

L388: how much higher?

L389: How much of a decrease?

L391-392: Broad statement, specify how it can contribute to health impacts. E.g formation of PM downwind a big point

Tables & Figures:

Figure 1: How was a "sample" defined? From the figure it looks like a sample refers to an emission pass near the fire for X amount of minutes? Please clarify in figure/text. Was number of minutes (e.g "n") accounted for in samples? Useful to list date samples were taken if all from the same day w/in figure.

Table 1:

Include date(s) that fire was sampled

Table 2: Include measurement uncertainty or detection limit if appropriate