**Atmospheric
Chemistry
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Discussions

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comment

Interactive comment on "Chemical composition and light absorption of carbonaceous aerosols emitted from crop residue burning: Influence of combustion efficiency" *by* Yujue Wang et al.

Anonymous Referee #2

Received and published: 7 September 2020

The paper by Wang et al. summarizes results on aerosol emission factors and optical properties in burning of agricultural residues (wheat and corn straw) under different burn conditions. They determine the emission factors of PM2.5, EC, OC, and different components of OC (water soluble, including HULIS and low-molecular weight oxygenated molecules, and the insoluble fraction) and also determine the wavelength-dependent absorbance, mass absorption efficiency, and Angstrom Exponent of Absorption. They highlight that the EFs of all species except EC was higher at the lower combustion efficiency values (estimated by measurements of CO and CO_2) and that the WISOC had the largest contribution to the measured absorbance; however, wavelength dependence of absorption was strongest for the WSOC and HULIS. The results

are interesting to the community and the paper fits the scope of ACP. The paper is overall well written although some parts benefit from some editing (I suggest below). I'd like the authors to clarify the points I highlight below before the paper is accepted for publication:

Technical points: L76-77: I think this statement underestimates all the studies that have been carried out in the Fire lab in Missoula, that characterize influence of combustion efficiency on aerosol optical properties. I can imagine that for agricultural residue burning, the studies are limited, so a more accurate statement should be included here.

L110-111: Do authors mean that fuels were weighed before and after drying? If so please add this detail.

Table S1: There doesn't seem to be a consistent picture between MCE and the moisture content. For example, MCE $\sim$0.77 was observed at all different moisture content values of the wheat. Please explain the reason for this variability. Because of this lack of obvious trend, I would not mention this in the conclusions either (L318-319)

Eqn of Abs(l): why is absorbance at 700 nm subtracted from the absorbance at the wavelength of interest? Why should this be a relative absorbance? Shouldn't the absorbance at a specific wavelength be corrected for the background absorbance at the same wavelength while sampling only pure water?

L178-180: The average EFs of corn are higher, but still considering the variabilities that were observed for both fuels, the difference isn't significant and beyond the observed variabilities.

Fig. 3g: why not showing all the fits as in the other panels? Also, are the fits a double-sided regression line, considering the uncertainties in the x and y values?

L233: what precluded the possibility of having burns with MCE>0.9 that's more representative of flaming conditions? I think some discussion should be provided. Also it would be valuable to mention what the expected MCE in real world burns of agricultural

residues are so readers get an idea of how applicable the results are and what values are most meaningful to be used in models.

Figure 4. There are some wheat burns for which the $K+/OC$ and $Cl-/OC$ ratios are highly variable; are all the burns from the same batch of fuel? Could this variability be explained by variable K and Cl content of the fuel itself?

L290-291: Since this paper has reported on MAE as well as EF of the different components of OC, it will be very valuable to combine the two results and present the EF of absorption to be able to more directly compare radiative impacts of WISOC, WSOC, and HULIS.

L297-298, 338-339: I disagree; there are really two points that might be considered as outliers and without those, the MAE(365) vs MCE looks pretty flat. I suggest removing this statement.

Suggested Edits: L 33: remove observed in "..were also observed higher under..." L39 and 334: remove if in "if without considering the burning conditions..." L 61: Add "...was reported to be higher for more ..."

L112: consider changing "weighted" to "weighed"

L118: include the volumetric unit for both 10 and 5 units of water and methanol, respectively.

L121: why did you use a smaller size filter for the WISOC fraction?

L129-L130: consider changing "minus..." to "difference between total OC and WSOC." Eqns. Consider adding equation numbers

L174-175: I think I know what the authors try to say (in higher moisture fuel burns, some energy is first used to dry up the fuel and so the temperature is lower); however, as written the sentence is confusing. Consider rephrasing it.

L186 and 191: change negligible to "neglected"

C3

L200, 315: change "dominated" to "dominant"

L234-235: rephrase the beginning of the sentence; the structure is not correct

L237: data "are"...

L247: remove "that"

L272: consider changing "occupy" to "contribute to"

L271-273: the % contributions are for 300 nm and 400 nm, respectively? It's unclear when a range of 300-400nm is mentioned. Please clarify.

L296, 338: change "as the decreasing of MCE" to "... as MCE decreases..."