Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2020-137-RC2, 2020

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Biomass-burning-derived particles from a wide variety of fuels: Part 2: Effects of photochemical aging on particle optical and chemical properties" *by* Christopher D. Cappa et al.

Anonymous Referee #2

Received and published: 1 April 2020

Summary: This paper describes measurements of aerosol optical properties of black and brown carbon for representative western U.S. wildfires. The particle/gas mixtures were aged in a reaction chamber with OH, and the authors report the optical properties as a function of estimated OH exposure. They use these results to construct a model of aerosol aging downwind of wildfires.

There are very few measurements of the atmospheric lifetime of BrC from biomass burning, and this manuscript is a useful contribution.

Printer-friendly version

Discussion paper

Comments: 1. Clarification is needed in Section 2.3 about the instrumentation. Specifically:

The description of the CRD-PAS instrument with measurements of light absorption is missing (already mentioned in a note from the authors).

How was BrC absorption derived from the CRD-PAS measurement of total absorption? By comparison of denuded and undenuded absorption, or by wavelength-dependence of absorption at three wavelengths?

In Eqn 1, what are the uncertainties in b_abs and [BC]? How do these uncertainties propogate through Eqns 2 and 3, and the determination of b_abs_BrC?

2. Line 168: How was the [OH] concentration calculated?

3. Lines 224-243: E_abs is reported to be close to 1. Does this affect prior published conclusions about lensing?

4. Lines 248-249: This sentence is unclear.

5. Section 3.1.2 Comparison with Literature. A large list of comparisons are given in the text, and only partially summarized in Table S4. The paper would be stronger if the literature comparison were more completely and quantitatively summarized in a table.

6. Section 3.2: It would be useful to give an overview of the model here. What is the time step? How frequently is the model constrained to the measurements, and which measurements provide constraints?

7. Conclusions: Which conclusions are derived directly from the measurements, and which are from the model?

8. Uncertainties and error bars are missing in the paper. These are important in Tables 1 and 2. The range of values measured could be shown as a shaded background for the lines in Figures 1, 2, 3, and 5. This would show the variability of the repeated measurements, and the uniqueness (or not) of the six classes.

Minor Comments:

Line 86: "...absorptivity dependent upon on..."

Line 149: "An instruments suite..."

Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2020-137, 2020.