

Atmos. Chem. Phys. Discuss., referee comment RC2  
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## **Comment on acp-2022-459**

Anonymous Referee #2

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Referee comment on "Examination of brown carbon absorption from wildfires in the western US during the WE-CAN study" by Amy P. Sullivan et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2022-459-RC2>, 2022

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The manuscript by Sullivan et al. describes aerosol absorption in aircraft-collected samples collected from aircraft of biomass burning plumes. The authors describe particle-into-liquid (PiLS) samples and photoacoustic spectroscopy measurements of brown carbon. They assess the comparability of the data from the two instruments, the relationship between brown carbon and biomass burning tracers, as well as evolution of brown carbon with plume age. This is an interesting and valuable analysis that adds to our understanding of absorbing aerosol. After addressing the comments below, I believe the work will be suitable for publication in Atmospheric Chemistry and Physics.

### **General comments**

There are other studies that have not been mentioned that examined relationships between organics and biomass burning tracers (e.g., Lee et al., (2016) and Di Lorenzo et al., (2018)). The discussion in this work would be stronger if it related these observations to those in these previous works. It would also be interesting to know more about the relationship (or lack thereof) between ammonium and brown carbon and/or other biomass burning trackers. Di Lorenzo et al. (2018) saw a relationship between reduced nitrogen and brown carbon in aged samples.

The discussion of brown carbon absorption with plume age should include discussion of these results in the context of previously published results from the same aircraft campaign (Palm et al., 2020). The section should also discuss recent aircraft PiLS work that has examined similar trends (Washenfelder et al., 2022).

### **Specific comments**

Line 178: I think both PiLS sampled from the same inlet—"each" implies they have their own separate inlets. It would improve clarity to say "both PILS systems sampled from..."

Line 230: Other anhydrosugars being below detection is mentioned later on in the manuscript. Suggest giving the more general term at this point in the methods, before later saying that you focused on levoglucosan.

Line 230: Suggest not mentioning anions/organic acids since none of the data or methods are presented.

Line 246: What detector was used here? I assume conductivity.

Line 389: What fraction of the samples was not affected by biomass burning? That will affect the robustness of this claim. Somewhere in the discussion of tracers, it might be worth explicitly stating why you might expect to see differences in correlations with CO versus the other tracers that are discussed.

Lines 397-399: This sentence seems out of place. It is not clear how it connects to the preceding discussion.

Figure 8: I think parts (a) and (b) of this figure could be removed.

Line 444: Could you be more specific about the other types of burning you mean here?

Line 470: There is field data that describes this phenomenon as well that may be of interest for comparison (though the aging times may be too long to be relevant, Di Lorenzo et al. (2017)).

## References

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