

Atmos. Chem. Phys. Discuss., referee comment RC3
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Comment on acp-2021-49

Anonymous Referee #3

Referee comment on "Rapid transformation of ambient absorbing aerosols from West African biomass burning" by Huihui Wu et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-49-RC3>, 2021

This paper describes aircraft measurements from three flights in west Africa that sampled biomass burning. The authors examine the aerosol optical properties as a function of transport age over 0 - 12 hours. The paper is well-written and well-organized.

Major comments:

- Section 2: It would be useful to provide a basic overview of the campaign and the fires sampled in a few sentences. Specifically: What were the dates of the study? How many total flights were made? What was the aircraft duration? What were the criteria for selecting these three flights for this study?
- Section 2.2: What is the minimum detectable fire size for MODIS? Were most of the fires in the region detected?
- Section 3.1: What was the fuel for the agricultural fires? What was the burn area? How long did the fires persist? How similar were the fuels and burn conditions for the different fires? These are important questions because the analysis of different smoke ages represent different fires sampled during different flights. If the fire conditions differed between the flights, that will affect the trends.
- Figure 1 shows that transects for each flight were all sampled at the same distance downwind. Why not make multiple downwind transects at increasing distance from the source?
- Section 3.3: What was the uncertainty of the SMPS scans? Due to the slow time response, it is more typical to use an optical particle counter for aircraft measurements. Was there a reason that the SMPS was used?

Minor comments:

- Line 35-37: The aerosol aren't evolving in the fires, they are evolving downwind. This sentence might be clearer as "Different treatments of absorbing aerosol properties from smoldering and flaming combustion and their downwind evolution should be considered..."

- Lines 56-57: Consider including earlier references.

- Line 64: "The initial relative contribution of OA and BC varies...." It is unclear if you mean the mass contribution or the absorption contribution.

- Line 75: Consider including older Lack and Langridge references?

- Line 97: Could the acronym "MR" be eliminated and replaced with MnonBC/MBC? By the time it appeared here, I had to search for the definition again.

- Lines 396-397: What RI is assumed for BC?

- Figure 1: Color the MODIS-detected fires according to the three flights (blue, green, pink).

- Figure 1 Caption: Change "1-day back trajectory of selected sampled smoke over the Atlantic Ocean during flight C006 (c) and C007 (d)" to "1-day back trajectory of sampled smoke from flight C006 (c) and C007 (d)" because it sounds like the back trajectory is over the Atlantic Ocean but its actually the flight that was over the Atlantic Ocean.

- Figure 2: Upper whiskers are hidden on the bar chart.

- Figure 4: It is unclear which traces are assigned to the left and right axes.