

Interactive comment on “Long-term Brown Carbon and Smoke Tracer Observations in Bogotá, Colombia: Association to Medium-Range Transport of Biomass Burning Plumes” by Juan Manuel Rincón-Riveros et al.

Anonymous Referee #3

Received and published: 5 February 2020

This manuscript presents 3-year measurements of aerosol light absorption at multiple wavelengths over a site in the Northern South America (NSA) region. These measurements are combined with campaign-based biomass burning tracer measurements, MODIS fire counts and back-trajectory analysis to examine seasonal variations and source attributions of black carbon and brown carbon. It is one of the few observational studies over NSA, and clearly demonstrates the influences of nearby biomass burning on the local air quality in densely populated areas. The long-term observations of biomass burning aerosol properties are also useful in revealing the regional

C1

and temporal variability in light absorbing aerosols. The sample collection and data postprocessing parts are well described.

My major concern is about the inference of brown carbon concentration in section 2.2. First, the assumptions of FF AAE (=1) and BB AAE (=2) are subject to large uncertainty. How sensitive are the derived BC and BrC concentrations to these assumed AAEs? It would be helpful to include some sensitivity analysis by varying the AAE values. Furthermore, lines 156-157 indicate that BrC concentration is computed as the product of eBC (equivalent BC concentration) and f_{BB} (fractional contribution of biomass burning to absorption). This is confusing: isn't the product equal to BC concentrations from the BB sources? How is it related to the BrC concentration? Presumably, BB aerosols should include both BC and BrC. But the inference method of BrC in section 2.2 seems to imply that absorption in BB aerosols is due to BrC. The calculation of BrC concentrations needs clarification.

Another suggestion is since there are previous studies of BrC from the Amazon BB region, it'd be interesting to compare the derived BrC loadings and absorption properties over NSA with those in discussions. That would help extend the findings in this study to a larger regional context.

Minor comments:

1. Line 38: the source of BrC is not limited to BB. They could also come from bio-fuel and biogenic sources. Suggest to revise the definition of BrC, i.e., Andreae and Gelencser, 2006
2. Lines 39-40: This sentence is inaccurate. The referred paper Bond et al., 2013 suggests that BC is the second largest contributors to anthropogenic radiative forcing, not BB particles.
3. Line 65: missing a comma after “. . .their work”
4. line 66: replace “finding” with “indicating”

C2

5. Line 83: “Levoglucosan” doesn’t need an initial capital letter
6. Line 92: brown carbon and black carbon do not need initial letter capitalized. This needs to be corrected in other places as well.
7. Line 123: W doesn’t need capitalization
8. Line 126: what is Davis Advantage Pro II?
9. Figure 1 (b): suggest to add a color scale for the background map. Is it for terrain height?
10. Section 2.4: why not make the observatory site directly as the starting point of the back-trajectories, instead of Bogota? Since they are located at different altitudes.
11. Line 209: what is the spatial resolution of GDAS1 meteorology?

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2019-1124>, 2020.