Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2019-775-RC2, 2019

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Influx of African biomass burning aerosol during the Amazonian dry season through layered transatlantic transport of black carbon-rich smoke" *by* Bruna A. Holanda et al.

Anonymous Referee #2

Received and published: 1 November 2019

General:

This paper describes the influx of African smoke to the Amazon during the dry season and discusses the implications of this transport for the Amazon. This work is novel and of interest to the aerosol community. I do recommend this paper for publication; however, I suggest that the authors revise the current manuscript, which is too long and detailed in its current form.

Major Comments:

1. In its current form, this paper is well-written but has so many details, that I found myself losing the main point of a paragraph or an entire section. I also found that a lot

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Discussion paper

of the major findings were either buried in the middle of a section or at the end of a very long discussion that could have been cut in half. I list below a few suggested areas to tighten up this paper but encourage the authors to re-evaluate their paper as a whole and determine areas that could go into the supporting information.

2. This paper has too many acronyms to keep track of. I found myself having to go back to the acronym table a lot, which made the paper difficult to read. I suggest that the authors try to reduce the number of terms and instruments discussed to focus only on the most important ones for this story and to place the rest of the measurements in the supporting information.

3. I felt that the abstract and introduction promise that the focus of the paper will be on radiative impacts but those impacts weren't as well-emphasized in the results. I suggest restructuring the conclusions section to include a brief overview of the findings then focus on the radiative impacts as an extension of their findings.

Specific Comments:

Abstract:

1. Lines 36-40: This sentence is far too long and dense. I suggest breaking it up.

2. The abstract should include a very brief clause or sentence describing the most relevant instruments used.

3. Lines 46-47: I had a hard time understanding this part of your sentence.

Introduction:

1. I suggest condensing the first two paragraphs down to half a paragraph. There is a lot of detail that is not necessary.

2. I also suggest adding a sentence or two regarding the impact of aging on the direct effect. It has been shown in several studies that coatings can greatly alter the radiative properties of black carbon [Moffet and Prather, 2009].

3. Lines 114-118 can be cut as they do not add much to the introduction.

4. The sentence on lines 121-122 is not clear to me.

Methods:

1. I strongly suggest reducing the text in this section. For example, the gas phase data does not play a major role compared to the aerosol data. I suggest mentioning what was measured in the gas phase then directing the reader to the SI for more details on the instrumentation. This will also reduce the number of acronyms that the reader must memorize.

2. I also suggest placing details about AIRS data and AERONET in the SI. The AIRS and AERONET data were not as integral to the study as other methods.

Results:

1. I suggest placing Figure 2 in the SI.

2. Sections 3 and 3.1 are too long and detailed. This information dilutes the major findings regarding the transport of biomass burning and its impact on the optical and cloud nucleating properties of Amazonian aerosol. I suggest condensing the material from 330-394 down to a paragraph if possible and placing much of this information in the SI.

3. Lines 442-443: It is not necessary to explain that O3 is a secondary pollutant produced photochemically in BB plumes.

4. Lines 447-467: This paragraph could go in a discussion section.

5. Lines 470-473 belong in the introduction.

6. The authors should note that the methodology shown in Figure 7 is similar to the methods used in [Barkley et al., 2019] to identify similar plumes.

7. Lines 591-606 are really important for understanding the implications of your work. I

strongly suggest either giving this paragraph its own section or placing it in a discussion section.

References:

Barkley, A. E., J. M. Prospero, N. Mahowald, D. S. Hamilton, N. Mahowald, K. J. Popendorf, A. M. Oehlert, A. Pourmand, A. Gatineau, K. Panechou-Pulcherie, P. Blackwelder, and C. J. Gaston (2019), African biomass burning is a substantial source of phosphorus deposition to the Amazon, Tropical Atlantic Ocean, and Southern Ocean, Proceedings of the National Academy of Sciences of the United States of America, DOI: 10.1073/pnas.1906091116.

Moffet, R. C., and K. A. Prather (2009), In-situ measurements of the mixing state and optical properties of soot with implications for radiative forcing estimates, Proceedings of the National Academy of Sciences of the United States of America, 106(29), 11872-11877.

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