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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Single-particle characterization of aerosols collected at a remote site in the Amazonian rainforest and an urban site in Manaus, Brazil" *by* Li Wu et al.

Anonymous Referee #1

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General comment: the manuscript reports single-particle analysis from size-selected aerosol samples collected at two sites in the Amazon basin, ATTO forest site and Manaus city center, in the wet season of 2012. Results from the forest site samples confirm previous observations reported in the literature, with a predominance of SOA particles in the smaller size ranges. Results from the Manaus samples attest the influence of local urban emissions, as well as the influence of regional biogenic emissions and sea salt. In my opinion, the discussion of the results from Manaus, which is the novelty brought by this manuscript, could be improved. The manuscript is reasonably well written, but there are some redundancies that could be omitted.

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Discussion paper

Comments to the text:

1) General comment on the introduction: I suggest restructuring the order of the contents. First, present general characteristics of the Amazon region and its importance, mentioning the ATTO site and the Manaus city. Then, focus on aerosol sources in the wet season, and previous studies on single-particle characterization in Amazonia.

2) Line 65: interaction with? Maybe it would be better to replace “interaction” with “dynamical processes”.

3) Line 65: aerosols are airborne by definition, so I suggest omitting “airborne” here.

4) Lines 182-188: These sentences, near the beginning of the results section, refer to a previous study, right? It might create a confusion between your current results and previous studies. Please reformulate, to make clear what your contribution is.

5) Line 351: Replace “nascent airborne” by “fresh”.

6) Line 377: Replace “size” by “diameter”.

7) Line 394: there is a typo here (90%).

8) Lines 439-445: It is not necessary to describe the figure and its numbers in words, like here. I suggest that you go straight to the interpretation of the figure results.

9) Section 3.2: I recommend that you omit redundancies in this section. You already discussed the particle formation processes and its contribution to CCN and IN, there is no need to repeat it. For example, in lines 450-453 and 474-480.

Specific comments:

1) Lines 77-78: There is not a unique pathway to produce SOA in Amazonia. Condensation of low volatility organic species can also occur at the surface of PBA, for example.

2) Lines 84-87: This is true for biomass burning aerosols in Amazonia. This sen-

tence does not fit well into this paragraph, since you are talking mostly about biogenic aerosols.

3) Lines 97-98: This sentence is unclear. First, you might say that Fraund et al. (2017) used cluster analysis to identity particle types. Second, what do you mean by "anthropogenic elements"?

4) Lines 107-108: One third of what? Mass? Number? PM or OOA (oxygenated organic aerosols)? Please clarify.

5) Lines 109-116: Compared to previous works, I would say that the main novelty of this study is the analysis of aerosol samples from the Manaus city center. Emphasize that.

6) Line 127: Please provide more details about the city sampling site. Was it located in the southern on northern part of the city? What was the approximate distance to busy roads/avenues/streets? Do you know if vehicular types were mostly light duty, heavy duty, or both? Is there potential influence of industrial or power plant emissions? The Manaus urban plume is very heterogeneous. You can find more information at de Sá et al., 2018 and Medeiros et al., 2017.

7) Line 132: information on sampling dates and sample names would be better suited in a table.

8) Line 135: How were the samples conserved during transport and storage? Semivolatile organic compounds can volatilize when subjected to temperature variations. Do you think that this is an important issue in your measurements?

9) Line 141: You must provide more information about the backtrajectories calculation. What was the input meteorological database that you used? In which spatial resolution? How many trajectories were calculated for each aerosol sample?

10) Lines 263-264: Is this true (ammonium sulfate dominant over ammonium bisulfate) both for Manaus and ATTO? Is it possible to provide a percentage of the relative am-

mounts of sulfate in each form (ammonium sulfate, ammonium bisulfate, sulfuric acid)? How does it compare to other metropolis in the world?

11) Line 274: I recommend citing Saturno et al. (2018), about the influence of African volcanic emissions on sulfate concentrations at the ATTO site.

12) Lines 287-209: You discussed the potential sources of SO4 and NH4 in the Amazon forest, based on previous studies. How about the potential sources in Manaus city? You may refer to Medeiros et al., 2017 and de Sá et al., 2018. Also, you may refer to the literature produced on this subject for other metropolis in the world.

13) Lines 343-345: Here you could hypothetize on the potential sources of nitrate in Manaus.

14) Line 364-366: Yes, biomass burning emissions reduce significantly in the Amazonian wet season. However, advection from Africa brings biomass burning aerosols, besides Saharan dust, to the Amazon region in March-April. See, for example, Baars et al., 2011. So, part of the observed K-salts could be associated with biomass burning aerosols from Africa.

15) Line 405: You may cite a reference for the term "brown carbon". It could be either Andreae et al., 2006 or Laskin et al., 2010.

16) Lines 467-469: A single backtrajectory is unsufficient to prove the occurrence of African aerosol advection. You may add a sentence recognizing that.

17) Lines 497-499: The reasoning is not strong. Part of the SOA observed at Manaus can be locally produced. You would need a biogenic tracer to make this point. A better indication of the influence of forest emissions in Manaus is the 20% of PBA in sample SM3, stage 4, provided that the sampling site was not in a city park. The influence of the forest over the city is an interesting question, and I suggest that you include a sentence about it in the abstract.

18) In general, I recommend that you improve the discussion on Manaus results. It is

a metropolis in the middle of a tropical forest, a very unique situation. How does your findings compare to other metropolis in the world? What is the proportion of SOA, PBA and soot in other cities?

19) Lines 502-503: Was there anything special during the sampling SM3? Did you notice increased traffic activity compared to the other days?

20) Line 650: Please update the reference, since it moved from ACPD to ACP.

21) Figure 9: I suggest that you group the columns by size range, for a better comprehension of the plots. Also, you might include information on particle size ranges, either in the x-axis label, or in the figure caption.

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