

Interactive comment on “Chemical composition of ultrafine aerosol particles in central Amazonia during the wet season” by Hayley S. Glicker et al.

Anonymous Referee #1

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Glicker et al. presents the chemical composition of ultrafine particles (<100 nm) during two distinct periods of the GoAmazon campaigns. The first period was characterized by air masses passing through a large, urban area and the second by air from the forest (i.e. background). The authors used a thermal desorption chemical ionization spectrometer (TDCIMS) to measure the chemical composition of particles found in and/or produced from these two distinct air masses. Their results indicate that ultrafine particles during the anthropogenic period contained more bisulfate and ammonium+trimethyl ammonium. During the background times, the particles contained isoprene-derived organic compounds. Organic nitrogen compounds were found to be important in both time periods, indicating their importance in particle formation and growth of ultrafine particles. Comparison of the TDCIMS results with the AMS indicates key

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differences in ultrafine composition (and consequently, chemistry) compared to larger particles (>100 nm). Overall, this study helps address the clear gap in knowledge of ultrafine particle composition. In addition, their results show that isoprene chemistry plays a role in new particle formation in the Amazon Rainforest and likely preindustrial times.

This study is easy to follow and the topic is appropriate for ACP. I have a few minor comments the authors should address but recommend this manuscript be published.

Page 2, line 49: “impacts of particle physical and. . .” awkward phrasing

Page 2, line 50: “Uncertainty would be aided. . .” awkward phrasing

Page 2, line 65: What do the authors mean by “large area sources”?

Page 3 line 80: larger should be higher

Page 3, line 93: “in only 3% of the days”

Page 5. Line 172: It is not clear how the authors used collection efficiency of the sampling line to determine mass of each sample. Is size dependent charge fraction from the unipolar charger taken into account? Please expand on this description a bit more to make it clearer.

Page 7 line 218: “air masses often also passed over”

Page 7 line 221: might be better to clearly state that air masses from the northeast to northwest are from the forest.

Page 8 line 226: ~100 ng/sample (and figure S2) From this sentence and the SI figure, it seems like the collection time was 2 hours and was the same for each sample. If the sampling times for the TDCIMS varied (as the TDCIMS description suggested on Page 5 line 149 and several of the other figures), how is the reader suppose to compare mass loadings per sample between the background and anthropogenic periods? Ultimately, the units of ng/sample are difficult to compare to other studies if sampling times and

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volumetric flow rates are not known. It would be worth converting ng/sample to mass concentration.

Page 8 line 247: were measured in order to understand

Page 8 line 247 and line 268: The TDCIMS measured potassium since it is a tracer for primary biological fragments. However, potassium is also a well-known (albeit imperfect) tracer for biomass burning. Figure 3 shows elevated potassium during the anthropogenic period and the tail end of the background period where sulfate fraction increased. Could this be from biomass burning?

Page 10 line 279: Super interesting that 42 m/z was the most abundant ion. The authors attribute this to C₂H₄N⁻. Do the authors know what compounds would lead to this ion fragment? Is it possible that 42 m/z showing up in both the anthropogenic and background period could be explained by two compounds or types of compounds? Maybe cyanate contributed to the 42 m/z signal during the anthropogenic period and other organic nitrogen during the background period?

Page 10 line 294: It is a bit strange the authors used PM_{2.5} observations of organic nitrogen to justify 42 m/z being organic nitrogen in sub 100 nm particles as they later state that ultrafine particles have unique composition compared to larger particles.

Figure 1: It is nearly impossible to read the numbers on the color scale for the particle size distribution color map. Also units of dN/dlogD_p should be (cm⁻³) and not molecules/cm³. Is there a reason the rainfall scale is wide when the amount of rain does not exceed ~4 mm? Also, the left-hand axes for wind direction and windspeed look like continuations of the observations (i.e. large spike in wind speed and 360 degrees for wind direction). Please make this a bit clearer (and larger so everything is easier to read).

Figure 2: Would be helpful to label Manus on this map. Could be a patch of rocks to the unsuspecting reader. Also please add that pink and red traces are from anthropogenic

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period in the caption.

Figure 3: The text in the legend is too small to read. Would be helpful if something was drawn on (a) to indicate when the anthropogenic and background periods were. For (b), consider putting in the m/z for each panel because the reds, greens, blues, and yellows (orange?) look the same.

Figure 4: label for the color scale would be useful, especially since there are no -1 correlations (red) but only light oranges that are harder see.

Figure S1: bisulfate is a clearer marker for anthropogenic influences compared to what?

Figure S3: A legend is needed for each panel/color. Is this negative ion? Or positive?

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