

Interactive comment on “Impacts of the Manaus pollution plume on the microphysical properties of Amazonian warm-phase clouds in the wet season” by Micael A. Cecchini et al.

Anonymous Referee #1

Received and published: 9 March 2016

The study under review applied in-situ instrumental data from an aircraft campaign with the aim to separate cloud microphysical properties for conditions of clean/background air and for air polluted from anthropogenic aerosol. Therefore the aircraft measurements were taken inside and outside of a plume created from the city Manaus during the wet season over the Amazon regions. While studies for the dry period exist, the study seems to be one of the first to investigate the wet season, which has the advantage that background conditions are comparable to oceanic conditions, i.e. thermodynamic variables do not vary much with distance from the city.

The study clearly outlines and justifies the methods that are applied. The results are presented in a clear way and the discussion is conclusive and supports the current

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understanding of aerosol-cloud interactions. The data is unique and the results should definitely be of interest for the scientific community.

Therefore I would suggest to publish the manuscript after some minor corrections, which are listed in the following.

Minor revisions:

1. You could consider to separate the results section into topic related subsections, as the section is quite long in general (E.g. differences in LWC for background and polluted clouds, effect of updraft speed, vertical development of clouds). This would make it easier for the reader to find the relevant information in the results.

2. The summary and conclusions section ends quite abrupt. Consider to add a short outlook. What are the remaining open questions? Are further field studies planned? You already mention that the effects on ice-clouds is one focus for future endeavors in the motivation.

p.4, l.13: Can you tell more about the uncertainties of the instruments? E.g. what is the accuracy of the particle concentrations from the CPC?

p.6, l.27: You name one factor is commonly cited in literature but do not add any references. I suggest to add some references at this point.

p.7, l.18: Calculations show that . . . → It would be nice if you shortly can present how you did this estimation.

p.8.,l. 21: While your statement seems to be true for the background clouds, especially for the polluted clouds there seems to be an increase in the last LWC bin. Also the spread is increased. Can the latter be explained by a larger LWC bin size?

Table 2: Add the definition of bottom, mid and top layer to the Table caption.

Figure 2: This figure looks a bit clumsy. My suggestion would be to create a plot with subfigures with the individual flight plans and add the estimated plume area and the

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average wind direction for each flight.

Phrasing / spelling corrections:

p.1, l.11: in terms *of* aerosol conditions

p.1, l.17: split the sentence after the brackets → The cloud droplets observed are in the range . . .

p.1, l.24: correct superscript of km⁻¹

p.1, l.25: Why you use *e.g.* for the definition of larger droplets? In my opinion, you can just omit this.

p.1, l.25: to *the* cloud base

p.1., l.26: change sentence structure to: The overall shape of the droplet size distribution (DSD) does not appear to be . . .

p.1, l.31: initiation of *the* collision-coalescence

p.2, l.4: maintains

p.2, l.8: for the Amazon *by* Martin et al.

p.2, l.11: that a city like Manaus *has* on atmospheric conditions

p.2, l.22: Amazonian cloud properties

p.3, l.7: suggests → suggest

p.3, l.8: over *the* Manaus area

p.3, l.9: stronger wind component → dominant wind component

p.3, l.20: clouds microphysical properties → cloud microphysical properties

p.3, l.25: add comma after background air reference

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- p.4, l.1: consider to change pollution-aerosols to anthropogenic aerosols
- p.4, l.2: are almost only urban, while biomass-burning contribution is very exceptional
- p.4, l.6: omit numbered before chronologically
- p.4, l.29: what is meant by true airspeed? I guess you mean the speed of the aircraft?
- p.6, l.22: by effective size you refer to effective diameter D_e ?
- p.7, l.29: omit *profiles*
- p.7, l.30: updraft speeds levels → updraft speed levels
- p.8, l.18: relationships $D_e \times LWC$ and $DNC \times LWC$ → relationships of D_e and LWC, and of DNC and LWC
- p.8, l.20: omit *e.g.*
- p. 9, l.4: omit brackets. Instead write: for each layer, as there are more measurements for lower levels.
- p.9, l.14: its mass → their mass
- p.9, l.19: omit *e.g.*
- p.9, l.32: and l.33: once you write plume and once polluted. Try to be consistent.
- p.10, l.10: justifies → explains
- p.10, l.11: vertical velocities region → vertical velocity region
- p.10, l.25: the updraft regions DSD → DSDs in the updraft region
- p.11, l.6: Polluted clouds had 10
- p.11, l.16: omit *e.g.*
- p.11, l.17: bi-modality *favors* the efficiency

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p.11, l.20: aerosols conditions → aerosol conditions

Figure 5 caption: affected or not → affected and unaffected

Figure 5 caption: units of LWC should be gm^{-3}

Figure 6 caption: add the information that this is for clouds lower than 1000 m only

Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2015-1049, 2016.

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