

Interactive comment on “Long-term observations of atmospheric aerosol, cloud condensation nuclei concentration and hygroscopicity in the Amazon rain forest – Part 1: Size-resolved characterization and new model parameterizations for CCN prediction” by Mira L. Pöhlker et al.

Anonymous Referee #2

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Long-term observations of atmospheric aerosol, cloud condensation nuclei concentration and hygroscopicity in the Amazon rain forest – Part 1: Size-resolved characterization and new model parameterizations for CCN prediction By Mira L. Pöhlker et al.

General comments This paper presents Size-resolved long-term measurements of atmospheric aerosol and cloud condensation nuclei (CCN) concentrations performed at the remote Amazon Tall Tower Observatory (ATTO). The study evaluates the evolution

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of the aerosol hygroscopicity parameter during 10 months and 11 days, which can be said to cover a full seasonal cycle. The work presents the properties of aerosol hygroscopicities during four different period of interest, which represents contrasting aerosol conditions and sources, according to previous baseline works to the study. Furthermore, the authors evaluate the performance of parameterizations on the determination of CCN concentration considering the present database. New parameterization is also presented and compared to observations.

This work is interesting, well written and with an important subject. But I would recommend some small modifications before it goes for publication on ACP.

Specific comments:

I suggest that the period be referred as “full seasonal cycle” instead of “almost one year”.

On page 11. section 3.2, line 21, we can read: “A close look reveals a gap between the activation curves for $S = 0.47\%$ and $S = 0.29\%$, which corresponds to a jump in $\kappa(S, Da)$ (discussed below).” I could not see this gap! If we look closer the picture, we also can see that the intervals level used in supersaturation inside the CCNC jumps from $\sim 0.05\%$ to $\sim 0.15\%$, which can explain the gap on the featured curves. So, what authors claim to correspond to a jump in hygroscopicities is, in fact, a result from the measurement. Is that right?

Page 14:

“Comparing the seasonal $\kappa(S, Da)$ size distributions in Fig. 6, it is obvious that the (seasonally averaged) κ_{Ait} values in the Aitken mode size range are surprisingly stable between 0.13 and 0.14 throughout the whole year.” This was already said at beginning of page 12 and also at page 10 (line 15). It was said three times in the text (and presented on table 1 too) that there is not an appreciable variation of hygroscopicity. Please, verify it. So, is Figure 7 really needed?

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The parameterization of CCN spectra with constants (Twomey parameterization) has been used in many studies, most of them for short term observations. Though simple to carry out, it does not take into account any variation in the CCN loading, as was said in the text. It seems obvious to me, that the use of annual average for the constant used on the CCN spectra would result in overestimation of CCN concentration during the wet season, and in underestimation during the dry season. I would be more interesting if you could provide the constants for each season, instead of that for the whole year. Then the current section 3.5.3, as it is now, more weakens rather than strengthens the present work. Consider removing Figure 11.

Technical corrections: The text begins expressing supersaturation by “supersaturation S”. Then it changes to “S”, then to “S levels”. Is it correct? Please check it.

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