

Atmos. Chem. Phys. Discuss., referee comment RC2
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Comment on acp-2021-765

Anonymous Referee #2

Referee comment on "Occurrence and growth of sub-50 nm aerosol particles in the Amazonian boundary layer" by Marco A. Franco et al., Atmos. Chem. Phys. Discuss.,
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This manuscript investigates the origin and growth of sub-50 nm particles over Amazonia. The presented analysis relies on several years of measurements in the boundary layer, extending earlier more campaign-based results on this topic. The paper is scientifically sound and, in most parts, very well written. I have a few, mostly minor issues to be considered further. After addressing these issues, the paper is, in my opinion, acceptable for publication in ACP.

The authors should provide some reasoning for selecting the periods G1 to G2 when looking at different times of the day. At first site, it seems like this choice only covers 4 roughly equally long periods covering both nighttime (G1 and G4) and daytime (G2, G3). Furthermore, it seems evident that many of the differences observed between these 4 groups are simply the results of typical diurnal development of the boundary layer and its interactions with the rest of the troposphere. This feature should be explicitly brought up when discussing the results. As a final note, was there some reason for having one hour (00:00-01:00) that was not included in any of the groups G1-G4?

Minor comments

While NPF may occur in both local and regional scales, occurrence of NPF leading to observable growth requires usually NPF taking place over relatively large spatial scales. Therefore, it is somewhat misleading to claim that occurrence of NPF depends strongly on local conditions of individual sites (page 3, lines 3-4). Therefore, rather than emphasizing just local conditions, it should be noted that conditions (both emissions and meteorological conditions) over regional/synoptic scales are important in this respect.

Page 26, line 9: "early afternoon" does not match with the time period 06:00-11:00.

Page 26, lines 11-12: The author mention coagulation as an explanation for the observed decrease in $N < 50$ and state that coagulation results in the growth of these particles. It is a relatively simple procedure to estimate the approximate growth rate of a mode of particles due to self-coagulation when knowing the particle number concentration in this mode. I recommend the authors to make this exercise. To me, it seems that for the typical values of $N > 50$, coagulation can explain only a minor fraction of the observed growth of sub-50 nm particles, suggesting that this growth is mainly due to condensation or other gas-to-particle conversion processes.