

## ***Interactive comment on “Differentiating between particle formation and growth events in an urban environment” by Buddhi Pushpawela et al.***

**Anonymous Referee #3**

Received and published: 28 June 2018

The manuscript presents data from new particle formation (NPF) events in an urban environment in Brisbane, Australia. The main finding is that some NPF events could be misidentified growth of aerosol particles. The main issue is that this interpretation relies solely on the NAIS size distributions measured with the particle mode. The presented size distribution (Fig. 3) has no charger ion signal, which is an indication that the detection of the smallest size fraction was faulty. When the NAIS is adjusted to filter all the corona charger ions, it will also filter the newly formed particles measured within the particle mode. Nevertheless, I would not recommend to plot the corona ions a part of the particle spectra as it is not a real signal from ambient sample.

I would recommend that the authors check the diagnostic values for these days and contact the instrument vendor to determine the quality of the measurements. The

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comparison of these results to the NAIS ion mode measurements is also extremely important, especially, to understand the performance of their instrument. Authors mention on Page 7, Line 153 that also the ion mode measurements were recorded.

The manuscript also does not reveal the source of the freshly formed 20 nm size particles that grow. It is visible in Figure 5 that the 2 growth only events correlate (at least the 2nd is clearly visible by eye) with an increase in particle number concentration. How well does your SMPS and NAIS agree in particle mode? Show a comparison figure as they overlapping size range.

Please find below a few line by line comments as the missing charger ions are clearly the largest issue at the moment (see comment to Fig. 3 below):

L360: Hard to see a growth until the early morning. Was the time series smoothed? The mean diameter seems to plateau.

L362-365: The description of the what is presented in Fig 5 is a bit limited. Also: what happened on the 5th June midday.

L367-374: Seems out of place in the result part, move this to the discussion or introduction?

L367-381: “Time” is the time of day?

L376-381: How does this look for NPF events?

L398: Factor of 2 not 1.

Comments to Figures:

Fig. 1: To see seasonality or the lack of it, the NPF frequency for each month should be shown.

Fig. 2: Data below 2 nm is from charger ions, so it's not a signal but an artifact.

Fig. 3: Why are there almost no charger ions (the signal below about ~2nm) in this

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figure? This could indicate a problem with the detection of small aerosol particles in the NAIS. Compare charger ions in Figure 3 to those in Figure 2.

Fig. 4 & 5: Was the time series smoothed? It looks rather noisy.

Fig. 6 & 7: The effect shown in Fig 7 is not visible in Fig 6. Plotting diameter vs RH in Figure 6 would allow immediate comparison with Fig 7.

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Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2018-189>, 2018.