

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

Anonymous Referee #2

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This manuscript presents an analysis on new particle formation (NPF) and growth events based on extensive ambient measurements at an urban location. This is a valuable data set that should be published. However, in its current form the manuscript requires revisions, some of which can be considered substantial. My detailed comments in this regard are given below.

The last two paragraphs in section 3.4 give an impression that sub-10 nm particles might grow faster in this environment than larger particles. This is an interesting observation, if true. In most sites where ion spectrometers have been used for reported NPF studies, the particle growth rate was observed to increase from sub- 3 nm sizes up to 10-20 nm. I would like to see a bit more discussion on this topic in this paper, including comparison to earlier studies.

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I am surprised how the authors ended up in selecting the few short-term campaigns when discussing particle growth following NPF in section 3.6 (lines 322-328). Growth to larger sizes occurs very frequently in so-called regional NPF events and in many locations, newly-formed particles have been observed to grow up to sizes where they may act as cloud condensation nuclei (50-150 nm in diameter). So growth following NPF is a very common phenomenon. The authors should bring this up more clearly in that paragraph, now the reader easily get a wrong impression that growth to larger sizes is kind of a rare phenomenon.

I am not comfortable with the last paragraph of section 3.6 (lines 343-358). By reading it, one easily gets an impression that water uptake alone might explain the observed particle growth at increasing RH. This is very unlikely to be the case. Firstly, comparison of the growing particles water uptake to that by NaCl is unfair, since the latter is perhaps the most hygroscopic material present in the ambient atmosphere, while ultra-fine particles in an urban environment are (based on measurements in several sites) much less hygroscopic. However, high RH might favor particle growth due to other reasons: 1) heterogenous reactions taking place in the liquid phase of the growing particles, or 2) simply due to the fact that an increase in RH is often accompanied by a decrease in ambient temperature, which would favor the transport of any semi-volatile compounds from the gas phase to these particles. I would recommend rewriting this paragraph and removing Figure 7 altogether.

In addition to the paragraphs mentioned above, there are many places in the text that lack references, either totally or proper/fresh ones: 1: line 42: the particle growth varies with particle size, 2) lines 57-58: Oxides of . . ., 3) lines 64-65: Numerous studies. . ., 4) the paragraph on lines 48-55: there are plenty of fresher papers on this, even reviews, that could be mentioned here.

Figure 1a seems unnecessary to me, as all the required information can be obtained from figure 1b. I recommend removing figure 1a from the paper.

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

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