

## ***Interactive comment on “Measurement, growth types and shrinkage of newly formed aerosol particles at an urban research platform” by I. Salma et al.***

**Anonymous Referee #2**

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The manuscript describes and characterizes the aerosol measurement site in central Budapest. A detailed analysis of the measurement systems and the large-scale representativeness of the measurements is given.

Observations of new particle formation (NPF) events are presented, and analysis of several growth and shrinkage episodes is performed. The manuscript provides several hypothesis for the observed particle growth and shrinkage events.

Meteorological conditions and precursor species concentrations are reported as average values calculated over all the observed NPF growth and shrinkage events. It would be interesting to see also comparisons of the precursor and NPF parameters (particle formation and growth/shrinkage rates) on an event-by-event basis. For example, can

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the observed shrinkage of the nucleation mode particles be linked to changes in the concentration of precursor vapours? There are not many reports in the literature of particle shrinkage in relation to NPF, so these type of detailed analysis would provide valuable information. I understand if the authors feel that this type of analysis is outside the scope of this paper, but are there any plans for a possible follow-up paper that would focus more on the detailed NPF analysis?

I recommend accepting the manuscript for publication in Atmospheric Chemistry and Physics, after the authors have addressed the comments below.

General comments:

Page 3, lines 38–40: How representative are these gas-phase measurements for BpART (has there been intercomparison measurements between BpART and the air-quality site 1.6 km away)? Could there be larger differences in the concentrations between the two sites when the airmasses do not pass both sites?

Page 7, lines 8–10: What are these properties related to NPF events that varied substantially?

Page 7, lines 37–39: There seems to be a growing nucleation mode present after 9 p.m (Fig 11b). Could this growing NPF also be related to the grass cutting?

Page 8, line 12: “varied” would be a better term than “changed”

Page 8, lines 27–29: What is the typical time that particles were in high-vacuum conditions in the TEM, without evaporating?

Page 8, lines 34–36: What does it mean that the growth and shrinkage phases “were selected by linear approximation”?

Page 9, lines 35–37: In the conclusions the decreasing global radiation and H<sub>2</sub>SO<sub>4</sub>-proxy concentration are highlighted as the main reasons for the observed particle shrinkage events. However, the shrinkage episodes seem to be quite rare (8 out of

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178 NPF events), whereas the global radiation and the proxy typically decrease in the afternoons of every day. Could the authors clarify their conclusion? Are the change rates of global radiation and proxy during the shrinkage episodes (reported in Table 3) much higher than on a typical afternoon of an NPF-day without particle shrinkage (for example on the day shown in Fig 8a)?

Page 15, Table 3: What is the reason for using both mean and median values in Table 3? The numbers in the last column are the mean G/S ratios of medians over growth and shrinkage phases, and as such are somewhat different from the ratios of the reported mean values over the growth and shrinkage phases.

Page 15, Table 3: Reporting the  $\text{H}_2\text{SO}_4$  proxy in the units  $\text{molec}/\text{cm}^3$  instead of  $\mu\text{g m}^{-3}$  would make it easier to compare the proxy values to those from other sites. I know that the scaling coefficient in Petäjä et al. (2009) is based only on measurements in Hyytiälä, Finland, but it is still widely used in the literature, and would thus enable at least a semi-quantitative comparison of the Budapest proxy values with other sites.

Technical comments:

Page 2, line 9: "systematic" should be "systematically"

Page 2, line 18: "surface based" and "satellite born" should be "surface-based" and "satellite-born"

Page 3, line 20: "ordinary" should be "ordinarily"

Page 3, line 29: "Non-nucleated time intervals" sounds strange. The sentence could be rephrased, e.g. "Only time intervals outside NPF were considered .."

Page 7, line 15: "no" should be "none"

Page 8, lines 5–6: "non-unambiguous" should be "ambiguous"

Page 8, line 31: "pot" should be "plot"

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Page 9, line 25: "Chemical and physics situations" sounds strange. Something like "Conditions related to chemical and physical processes in urban atmospheric environments .."

Page 15: The units of  $\text{SO}_2$  and  $\text{O}_3$  concentrations should be  $\mu\text{g m}^{-3}$

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