

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

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The authors thank Referee #1 for his/her valuable comments to further improve and clarify the MS. We have considered all recommendations, and made the appropriate alterations. Our specific responses to the comments are as follows.

Comment 1 My main problem with this paper is that it deals with several topics, all of which are not very tightly related to each other. More specifically, the authors define 6 objectives (O1: : O6) for this paper at the end of section 1. I am not saying that some of this material should be left out, but it might help the reader if the authors would organize the list of their objectives somehow. For example, O1 is not really an objective but rather a description of a platform. O2 is a real objective, but closely

connected with O1, so O1 and O2 could somehow be tied together. Of the rest, O3 is a method-related objective, while the purely scientific O4-O6 are all related to NPF.

Response to Comment 1 We decreased the number and modified the formulation of the objectives of the study. The objective 1 was largely removed from the list, while the rest of it was included into the objective 2, and more emphasis was put on the objectives 4–6, which are considered scientifically more relevant. They were finally reordered as well. See page 2, line 12–16.

Comment 2 There are a couple of minor issues related to the logic how things are expressed in the paper. For example, it is a real gas-phase H₂SO₄ concentration, not its proxy, that causes an atmospheric phenomenon. The fact that the real concentration was not available, but was estimated using a proxy, is OK but should not be mixed with the true cause-effect relationship. This should be corrected in both abstract and conclusions section. The same problem concerns size distribution surface plots discussed in section 3.5: phenomena like blizzard or emissions from various sources cause changes in size distributions, which are then seen in the surface plots, but these phenomena do not affect the surface plots by themselves. Please modify.

Response to Comment 2 The gas-phase H₂SO₄ proxy value was found to be proportional to atmospheric H₂SO₄ concentration (Petäjä et al., Sulfuric acid and OH concentrations in a boreal forest site, *Atmos. Chem. Phys.* 9, 7435–7448, 2009; Mikkonen et al., A statistical proxy for sulphuric acid concentration, *Atmos. Chem. Phys.* 11, 11319–11334, 2011). We utilized the H₂SO₄ proxy in the evaluations in a relative way to assess the influence of H₂SO₄ concentration change on atmospheric properties or processes. The particle number size distribution surface plots express jointly the variation in particle diameter and particle number concentration density in time. The time series of size distributions can be modified by transformation processes (e.g. changes in sink, coagulation or deposition of particles, which often depend on local meteorological and chemical conditions) in the atmosphere as well. Some of these processes can affect the size distributions in general, while some others cause alteration in specific

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particle diameter ranges or in certain time intervals. Some sentences in the body, abstract and conclusions of the MS were modified to express our intention more clearly and specifically. See page 1, line 21 and page 10, lines 1–2.

Comment 3 The first sentence of the introduction " : : :NPF: : :relevant in urban environments as well" contains information not mentioned in the paper: "as well" gives the impression that NPF may be more important in non-urban environments, but there is nothing in the paper to back up this.

Response to Comment 3 We modified somewhat the sentence to make it clearer that we are just to refer to historical timeline. NPF and consecutive particle growth processes in the atmosphere were first identified in clean environments. They were shown to be important processes in the global troposphere. NPF has been proved to be common and substantial in polluted environments including large cities as well at a later stage. In addition to its climate effects, NPF in cities can have relevance for public health issues. A reference was also added to back this idea. See page 1, lines 25–26.

Comment 4 I do not fully understand what is meant in lines 4-5 on page 9. Is limiting the shrinkage something the prevents to shrinkage to take place actively? And how is SO₂ exactly related to this, i.e. when one would expect changes in SO₂ concentration to affect this process?

Response to Comment 4 The sentence was largely reformulated as: "The concentration of SO₂ precursor gas was also rather constant during both the growth and shrinkage phases, which suggests that SO₂ is usually available in excess in the city (Salma et al., 2011a), and that the processes do not seem to be sensitive to SO₂." A reference on ordinary SO₂ concentration in Budapest was also added.

Comment 5 I do not understand what "wide variety" refers to in line 4 on page 2.

Response to Comment 5 The expression under question was exchange by "larger number of relevant emission sources of UF particles".

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Response to Comment on language issues The whole MS was checked for language and typing errors. The specific examples mentioned by the Referee were, naturally, all corrected.

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