

Interactive comment on “Regional effect on urban atmospheric nucleation” by Imre Salma et al.

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The authors thank Referee #2 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 critique here concerns why only the condensation sink is taken into consideration. What about all the other conventional air pollution parameters usually considered in the atmospheric chemistry to be involved in the NPF. Like VOCs, NO_x or ammonia? ELVOCs and mentioned but there is no data. There are some values such as O₃ and SO₂ given in Table 4 but I don't seem to get a clear complete picture on O₃, SO₂ from it. It is stated that SO₂ does not count, or that NPF is not sensitive on SO₂.

Response to Comment 1 We were measuring several criteria air pollutant concentrations for the urban and rural sites over 2-year time interval. VOCs, NO_x and NH₃ were

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unfortunately not involved because of several reasons. Continuous measurements of monoterpenes – as one of the most important groups of VOCs – are usually not available or they are scarce so far. Their proximity value has been just elaborated and introduced very-very recently. We plan to adopt it in the future work. The measured variables made it feasible to arrive at the conclusions on the urban-regional similarities and/or differences. The parts dealing with the role and importance of O₃ and SO₂ were reformulated to clarify our conclusions better. See the corresponding highlighted part of the marked-up MS.

Comment 2 It is finally concluded that CS and H₂SO₄ are the relevant parameters. And H₂SO₄ being a relevant parameter requires explaining part of the H₂SO₄ by introducing Criegee intermediate. But that, to my understanding, is not however explained by at least the O₃ levels. The O₃ levels seem to be, on the whole, apparently systematically higher in K-pusztá. Please comment on this.

Response to Comment 2 The main oxidation process of SO₂ by OH radical could not completely explain the NPF occurrence through the formation of H₂SO₄ in the forested site of K-pusztá, and the missing contribution was related to the effect of stabilized Criegee intermediates (CIs) as the likely oxidising agent. Stabilized CIs are formed by ozonolysis of unsaturated organics including terpenoid compounds (Mauldin III et al., 2012). These are emitted in large amounts by plants. In this sense, O₃ plays a mediation role in the process. The text was modified accordingly to express our intention more clearly. See the highlighted part of the marked-up MS.

Comment 3 Also, according to Table 4, when there is NPF in Budapest but not in K-Pusztá, still on the average/median the CS seems to be lower on K-pusztá (6.8) than in Budapest (8.8). Please comment also on this.

Response to Comment 3 The basic preconditions of NPF events are realised by competing source and sink terms, which can largely vary in different atmospheric environments. As a consequence, NPF can occur even in polluted environments (with

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large condensation and scavenging sinks) if the sources for condensable chemical species are even larger, and the other conditions are also favourable (Salma et al., Measurement, growth types and shrinkage of newly formed aerosol particles at an urban research platform. *Atmos. Chem. Phys.*, doi:10.5194/acp-2016-239, in production, 2016). Furthermore, it is worth mentioning here that NPF occurrence depends on a complex set of multiple variables at a time. All of them contain relevant information while it cannot be expected that any standalone property or paired relationship can explain or even directly be linked to the NPF occurrence. The text was extended to include this point as well. See the highlighted part of the marked-up MS.

Comment 4 To my opinion this is a good study, and the paper could be published, but prior to that the whole text within Chapters 3.2. and 3.3. should be clarified in what is actually claimed here.

Response to Comment 4 Sections 3.3 and 3.4 (according to the new numbering) were revised to emphasize our arguments and conclusions in a more explicit and precise way. See the highlighted parts of the marked-up MS.

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