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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Secondary new particle formation in Northern Finland Pallas site between the years 2000 and 2010" *by* E. Asmi et al.

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We are thankful for Referee #2 for their comments and remarks, truly helping us to improve the manuscript. Our detailed responses along with the explanations on the changes made are presented below.

It should be mentioned that the analysis assumes a constant air mass-wide process of NPF and growth and that advection is of secondary importance. Ie, not a Lagrangian study.

Answer: Yes, this is a common first assumption done when new particle formation and growth rates are studied using single point measurements. We now wrote this explicitly in section methods/ analysis: "To calculate the particle formation and growth

rates, we assumed the new particle formation occurred simultaneously and equally in a wide area of the air mass. For class I events, showing well-defined continuous particle growth, this assumption is well justified."

Given some of the weak relationships observed in sections 3 and 4, could factor analysis be of value to future analysis of this data set?

Answer: Yes, it could. Actually, we already made some cluster analysis with the dataset. The problem here is that the results depend largely on the method of clustering. And without knowing the exact functional forms of dependencies between different variables, and their mutual dependencies, the results can be almost anything. Non-linear multivariate analysis could be the next step.

Section 1. . . scale between the first and second power of . . . Answer: corrected

2.1 The inlet has an upper size cut of . . . Answer: corrected

2.2 . . . non-NPF. . . Answer: we have used the term no-NPF (non-NPF) systematically in the manuscript

2.2 . . .rates (nm hr-1) Answer: added

2.2 The weighting procedure is not clear here and as referred to later in section 3.2

Answer: We tried to be more specific in explaining the weighting procedure in the text: "For dividing the air masses into characteristic types, distance weighted fractions were used. It has been shown that NPF observed in northern Finland typically occurs in the proximity of the station (Hussein et al., 2009) and thus it is justified to give more weight to the nearest trajectory points. Here the weigh was set to be a linear function of time such that the weight decreased from 1 to 0.0769 (10/130) during the 120 hours. This way, the sum of the weights given for the trajectory points at nearest 24 hours is 34 %, while the weights for the points at four following days are 27, 20, 13, and 6 %. Therefore, even if the trajectory path is over the ocean during the first three days (hours 48–120 backwards), the air mass can be classified as 61 % continental based on the

most recent trajectory path. The division to characteristic types (marine, continental and mixed) is explained in detail in following section "air mass properties".”

3.1 . . . a pronounced seasonal cycle . . . Answer: corrected

3.1 . . . to the seasonal cycle of NPF and undefined days. Answer: corrected

3.1 “A partial explanation for the undiscovered seasonal trend could be related to the used relatively large lowest detection limit of the particle diameter.” Rearrange to: A partial explanation for the undiscovered seasonal trend could be related to the relatively large lower detection limit of the particle diameter that was used.

Answer: thank you, rephrased

3.1 . . . observed formation rates ... Answer: added

3.1 . . . of the start of the event with . . . Answer: corrected

3.1 . . . The points being made about the time of day of the start of the events is evident in figure 3 but not very clear in the scatter plot. A histogram of events vs. time of day for the dominant eight months might show the result better than the scatter plot in figure 3.

Answer: True it would be clearer, but then someone might start wondering of the possible intra-annual variability. One of the points in figure is also the month-to-month variability presented together with solar cycle (which is quite strong at this latitude).

3.2.4 Do you mean with increasing gas emissions or with increasing aerosol concentration resulting from emissions and time over land?

Answer: We mean rather the latter one, i.e., it seems, with increasing time over land, the CS increases. Whether this is due to increasing cumulative monoterpene emissions in air mass, or other (secondary or primary) aerosol emissions over land, is of course not clear. We rephrased the sentence slightly by removing “increasing emission”, since it is not clear what this refers to.

3.4 For lack of ... Answer: corrected

3.4 Give the average value of water vapor supersaturation for this assumption and the standard deviation as found by Komppula.

Answer: The activation diameter measured by Komppula et al., 2005 varied from 50 to 128 nm, with an average value of 80 nm. This diameter was measured by comparing interstitial and whole aerosol size distributions, so it included variable supersaturations, depending on the LWC and the aerosol and cloud properties. The limits and explanation were added in the manuscript.

Fig 9 Define the box and whisker parameters.

Answer: The boxes show upper and lower quartiles, and median with red line. The whiskers extend from minimum to maximum. This explanation is now added in figure caption.

Fig 12 Define the box and whisker parameters. Are they the same as in fig. 9? Plotting format is different.

Answer: Explanation added in figure caption. And yes, the parameters in figs 9 and 12 are the same. We hadn’t noticed the difference in plotting format, so thank you for the remark. Now, the format of fig 12 is modified and is similar as in fig 9.

Please also note the supplement to this comment:
http://www.atmos-chem-phys-discuss.net/11/C12535/2011/acpd-11-C12535-2011-supplement.pdf

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