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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Size-segregated aerosol chemical composition at a boreal site in southern Finland, during the QUEST project" *by* F. Cavalli et al.

Anonymous Referee #2

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The manuscript presents an interesting analysis of aerosol chemical composition and air mass origins during the QUEST campaign. From the analysis differences are found for time periods in which nucleation events occurred at the site compared to non-event situations. The manuscript is well focussed and clear. It is well written. The data is interesting and it presents a useful study to elucidate nucleation characteristics. It can be published after the two points raised below have been clarified/discussed.

1) p 8854, l 21-25: Please explain the sampling strategy in more detail. It is difficult to understand at first reading how the sampling strategy worked. Furthermore it would be

important to know how many hours of sampling each of the samples experienced (e.g. add a column in Table 1 including the total hours of sampling for each sample). Did you sample during night time, too? When was the sampling shifted between event and non-event? As soon as nucleation mode particles turned up in the smallest channels? When was it switched to non-event again after a nucleation even? Reword the sentence starting "As result...".

2) Some of the conclusions on the observed differences in the aerosol should be put forward more carefully or at least be explained in more detail. I agree, there are some distinct differences, e.g. more than a factor 2 higher total aerosol load on the non-event days, but other differences are not as obvious in the data as stated in the text: a) p 8864 l 5-15. The biggest change between clean and modified conditions (Table 2) for the H-C-C= functional group at 2.5-3.2ppm is only changing from 15.8+-1.8% to 20.0+-2.6%. Is this difference really significant? These slight shifts in composition are probably not as relevant for the occurrence of nucleation as the changes in aerosol surface area, temperature, relative humidity, ozone, terpene emission strength and the efficiency of the oxidation processes. How were the stated uncertainties determined? Also, the shift in H-C from 48.7+-0.5% to 44.3+-1.5% does not seem very large. Please discuss. b) Please explain in more detail what is meant by the "background" signal (e.g. p 8863, l 8 and p 8862 l 27). c) It is stated that 72% of the H-NMR spectra of the event-aerosol and only 32% of the non-event aerosol can be accounted for by a-pinene oxidation products. But can it be excluded that the oxidation products of other organics, especially those of anthropogenic origin (e.g. 1,3,5-TMB) produce similar spectra? It is also not clear why the non-event spectrum of Figure 3 could not be produced mainly from terpene oxidation products as well, maybe terpenes other than a-pinene. These points should be considered and put into perspective in the Results and the Conclusions sections.

technical corrections:

p 8858, l 6: "...transported polluted air from the Kola peninsula in Russia to the mea-

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surement site ...".

p 8858, l 7:"...supermicron mode is measured..." (no comma)

p 8858, l 16: correct to "n-e310303" and clarify the sentence "the n-e310303 collects, however, the only non-event day in that week".

p 8858, l 18: "precipitation"

p 8859, l 8: "as it typically occurs"

p 8859, l 28: "In contrast, "

p 8860, l 4: "occurred when air masses, ..."

p 8860, l 5: "coming from an east to south-east direction"

p 8860, l 23: please reword/clarify: "as the northerly air flow increasingly arrives from the west"

p 8861, l 2: explain, in how far the NO3- could also be influenced by temperature effects, changing the gas-particle partitioning of nitrate.

p 8862, l 5: "resemble any other H-NMR spectra collected so far"

p 8863, l 8: clarify what is meant by "background signals"

p 8863, l 8: "in contrast" and "n-e070403"

p 8863, l 29: "n-e070403"

p 8864, l 12: "in contrast"

p 8864, l 12: "Hyytiälä"

p 8865, l 21: "never" – never within the one month of measurements

Figure 7: green bar should be yellow

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Interactive comment on Atmos. Chem. Phys. Discuss., 5, 8851, 2005.

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Interactive Comment