

Interactive comment on “Overview of the field measurement campaign in Hyyti’ by M. Boy et al.

M. Boy et al.

Received and published: 16 October 2003

Thanks Referee 1 for your critical comments. In the following I will go in detail through your single comments of the manuscript and try to make different things clear or add needed informations:

3776, line 11. It is mentioned that the OTDMA was used in two different configurations. The other configuration was first humidifying the aerosol close to $S = 1$, and then bringing it down to the final saturation ratio. But these were only preliminary tests, and we shouldn't have mentioned them in the first place. We removed the sentence from the new text for the MS. See new text (A) in the end of this comments!! What differences were observed? Only a few experiments were carried out with an external treatment unit and results of those measurements were removed when final hour average and time series results were calculated.

3778, line 5. What was the coating of the denuders used for acid and carbonyl sampling? For gaseous carbonyls (aldehydes and ketones) we used DNPH-coated car-

Full Screen / Esc

Print Version

Interactive Discussion

Discussion Paper

tridges available commercially from Waters. Is the efficiency of the denuder system known? The efficiency of denuders is around 97%.

Section 2.6- 2.8. Samples for chemical analysis were extracted for GC-MS with water, and CH₂Cl₂, and for LC-MS in pure CH₃OH or 10% CH₃OH in water. This very different extraction media should be acknowledged in the later results section and may explain some of the observed differences. The authors believe that it is already mentioned in detail in the instrumentation part and pointed out to different references. A discussion about the effects of the different extraction ways will go above the goal of this MS and belongs more in a exclusive MS about various chemical analyse methods.

3782ff, section 3.1.3. I suggest that the authors give some more detailed information how the OTDMA measurements could be interpreted, e.g., for the chemical aerosol composition (it is only indirectly mentioned in the top lines of p.3784). High ethanol GF => Particles are composed of well ethanol soluble material(s), very probably organic. Low ethanol GF => Particles are composed of material(s) that do not have a very high ethanol solubility (could be organic) or parts of ethanol insoluble and parts of ethanol soluble material(s). Ethanol insoluble materials include elementary carbon, minerals, most inorganic salts and also different organics. We include description like above in the MS, see new text (A) in the end of this comments!! Why was ethanol chosen as organic vapor? Ethanol was chosen because - it dissolves a wide range of organic compounds, and does not dissolve most inorganic salts - there's a lot of data of the ethanol solubility of different materials in the literature - it is fairly convenient to use in practice, i.e. there's no danger of explosion, it is not toxic and its vapour pressure is manageable. The information about the OTDMA data interpretation and why ethanol was chosen as organic vapour are described in more detailed in Joutsensaari et al., 2001.

3783, line 4ff/Fig3. How high is the variability of GFs between different event days and non-event days, respectively? Please add standard deviations to Figure 3. Standard deviations for event and non-event days are added in the Figures 3 and 4 in the new

Full Screen / Esc

Print Version

Interactive Discussion

Discussion Paper

MS.

3783, line 18. There was only one event day that could be measured with the OTDMA. Considering this I suggest to weaken the statement that GFs are similar for event and non-event days. This is a misunderstanding: There were just 3 night-time measurement series, and only one of those was after an event day. There were many daytime event measurements. We will add the numbers in the text. OTDMA day-time measurements: - 6 event days (1, 2, 3, 7, 10 and 14) - 10 non-event days (4, 5, 6, 8, 9, 12, 13, 15, 16 and 17)

3784, line 1. Could the slightly higher hygroscopic GFs of 100nm particles also be explained by their longer atmospheric residence time, i.e., by higher oxidized and therefore more water soluble organics ? Possibly, we'll have to check what happens to ethanol solubility with increasing oxidation state. The text concerning the interpretation of Figure 5 is changed, see new text (B) in the end of this comments!!

3784, line 27. Pflux: Please give same units as in Figure 7. The text will be changed into: (Pflux: 30-70 106 particles m⁻² s⁻¹)

3785, section 3.1.5. Data in figure 8 are only described, however no data interpretation is given. I recommend adding some comments. The authors believe that such small trend between 90 and 110 % and concerning the fact that an OPC was used with a lower cut-off at 300 nm and only one event day was measured gives to less information of interpretation. However, the authors still want to keep the figure inside the MS, because very low vertical measured of particles exist in the literature.

3786, line 2/ Fig 9. Figure 9 shows data from Aug.9, a non-event day. However, conclusions about nucleation events are given. This seems not adequate. This is maybe misleading in the text, but it do not give conclusion about nucleation event days it is only said, that S_particles of the sizes most interesting for nucleation eventsŠ. And in this point we talk about particles in the size range 10-1000 nm, see Fig. 9.

Full Screen / Esc

Print Version

Interactive Discussion

Discussion Paper

3787, line 27/Fig 11b. From Figure 11b it is visible that the terpene concentrations are decreasing with increasing height, however isoprene seems to be constant, if not increasing. Please differentiate this in the text and add an explanation if possible. We will change line 27 into: Average VOC profiles (especially from monoterpenes) within the PBL.

3789, line 9/Fig 13. I suggest to change the legend in Figure 13b to particle phase instead of PAL/P and gas phase instead of PAL/G and correspondingly for Fig 13c-f for easier reading. Fig 13a shows gas phase components only, please state that in the figure captions. Will be done in the final version of the MS.

3789. Measurement results from one group showing higher formic acid than acetic acid concentration are discussed in detail. At the bottom of the page, however, measurements from another group giving opposite results are reported. This significant discrepancy should be discussed. This is already answered in detail under referee 2.

3790-3794. Three groups (ECPLUC, ISAS, MPI) measured oxidation products of α -pinene and the results are presented separately in Fig 13 and 14 and over several pages in the text. I suggest presenting the data in a consistent way for all three measurements (e.g. time series for all three in one figure) and discuss them together. We do not agree with the referee in this point. Chapter 3.3 only handles chemical characterization in the gas- and particle-phase whereas chapter 3.4 handles only characterizations in the particle phase. So to mix these to chapters would not decrease the clearness of the MS.

New text A to page 3776 (OTDMA paragraph):

The main features of the OTDMA are similar to those of the HTDMA with the exception that the humidification unit is used to generate a constant ethanol saturation ratio inside the second DMA. The details of the instrument and interpretation of the OTDMA data are described in Joutsensaari et al. (2001). Ethanol was chosen as organic solvent because 1) it dissolves a wide range of organic compounds, and does not dissolve most

[Full Screen / Esc](#)[Print Version](#)[Interactive Discussion](#)[Discussion Paper](#)

inorganic salts, 2) there's a lot of data of the ethanol solubility of different materials in the literature and 3) it is fairly convenient to use in practice, i.e. there's no danger of explosion, it is not toxic, and its vapour pressure is manageable. Growth of aerosol particles in ethanol vapour depends on composition of the particles. Particles can be roughly classified based on their growth in ethanol vapour: a high GF indicates that particles are composed of well ethanol soluble material(s), very probably organic, whereas a low GF indicates that particles are composed of material(s) that do not have a very high ethanol solubility (could be organic) or partly of ethanol insoluble and partly of ethanol soluble material(s). Ethanol insoluble materials include elementary carbon, minerals, most inorganic salts and also different organics.

In most of the experiments, aerosol particles were only treated inside DMA-2 by ethanol-rich sheath air and no aerosol treatment was used before DMA-2. In this paper, only results without aerosol treatment before DMA-2 are presented. Growth in ethanol vapour was mainly determined for particles of 20, 30, 50, 80 and 100 nm in diameter. Saturation ratio (S) of ethanol vapour was kept at 0.90 ± 0.02 during the experiments. The OTDMA measurements were mainly carried out during daytime (9 a.m. - 8 p.m.) because the system is not fully automatized and supervision is needed during measurements. During daytime of the campaign, OTDMA results were obtained for 6 event (1, 2, 3, 7, 10 and 14 August) and 10 non-event days. Only a few nighttime experiments (15, 16 and 17 August) were carried out.

New text B to page 3784 (OTDMA paragraph):

A possible explanation for the data shown in Fig. 5 is that the 100 nm particles contain a somewhat higher fraction of inorganic salts and a somewhat lower fraction of organic materials than do the 50 nm particles. Furthermore, chemical composition of the organic matter can vary in different size ranges. For instance, organic compounds in larger particles (100 nm) can be more aged (longer residence time in the atmosphere) than smaller particles and thus they can be, e.g., higher oxidized and thus can be more water soluble and possibly also less ethanol soluble. However, this interpretation

Full Screen / Esc

Print Version

Interactive Discussion

Discussion Paper

cannot be considered conclusive without a chemical analysis of the particles.

Interactive comment on Atmos. Chem. Phys. Discuss., 3, 3769, 2003.

ACPD

3, S1721–S1726, 2003

Interactive
Comment

Full Screen / Esc

Print Version

Interactive Discussion

Discussion Paper