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Interactive comment on "Effects of SO_2 oxidation on ambient aerosol growth in water and ethanol vapours" *by* T. Petäjä et al.

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The authors would like to thank the anonumous referee for very constructive comments.

Specific comments:

The referee commented that the size dependency of hygroscopicity between different cases is not presented clearly enough. Differences between the cases in a selected dry size are presented in the last three lines in the table 1 for time periods before, during and after the nucleation burst. The size dependency is most apparent in Case 3, 7 April 2003, when 50 nm particles exhibited growth factor (GF) of 1.73 during nucleation event, the ten nm particles, on the other hand, had average GF of 1.28. The other

cases the differences are much more masked, but still observable. Also one has to bear in mind that the observed growth factor is bound to have a value between 1 and 2.5 in the atmospheric aerosol particles, and in a continental site the highest growth factors hardly ever reach 2.

It is true that calculation of apparent growth rates of nucleation modes and partitioning of observed growth rate to different processes (intermodal and extramodal and condensation of different compounds) linked with observed growth factors in water and ethanol vapours could release additional information on the condensing species. This would strengthen the argument of the effect of backtrajectories ie. amount of hydrophilic compounds condensing on the way to the measurement site. However, there are few points, which have also to be taken into account. Firstly, the nature of condensing vapours, which lead to growth of the nucleation mode particles, is unknown. Most probably it is a mixture of compounds, some of which are hydrophobic and some which are hygroscopic. If their ratio in different case studies remained the same, then examination of growth rates and changes in the water and ethanol uptake of nucleation mode particles would be informative or some of the vapours were measured. Secondly, the water and ethanol uptakes were measured for fixed dry sizes. This limits the application of solubility measurements since it gives information on the properties of nucleation mode particles at the instant when the nucleation mode coincides with the fixed TDMA dry-sizes. This could be changed by either measuring with more dry sizes or targetting the solubility measurements based on the observed nucleation mode peak diameter. The former deteriorates the time resolution of the TDMA measurement cycle and the latter would require improvements of the both aerosol size distribution and solubility measurement devices.

As suggested by the referee, a table is added to the article and the text in the experimental setup section is amended starting from pp. 7730, line 20.

"As a summary, hygroscopicity and ethanol solubility of several types of atmospheric aerosol particles are presented in Table 1.

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Category	HTDMA	OTDMA
inorganic salts (eg. ammonium sulphate)	soluble	insoluble
sulphuric acid	soluble	soluble
water-soluble organics (eg. oxidation producs of alpha-pinene)	soluble	soluble
water-insoluble organics (eg. adipic acid)	insoluble	soluble
crustal material and elemental carbon	insoluble	insoluble

Table 1: Differences in the water and ethanol solubilities of several categories of ambient aerosol particles (adapted from Joutsensaari et al. 2001). HTDMA and OTDMA refers to Hygroscopic and Organic Tandem Differential Mobility Analyzer, respectively.

The manuscript was carefully proof-read and corrected accordingly.

References

Joutsensaari, J. Vaattovaara, P., Vesterinen, M., Hämeri, K., and Laaksonen, A. A novel tandem differential mobility analyzer with organic vapor treatment of aerosol particles, Atmos. Chem. Phys., 1, 51-60, 2001.

Interactive comment on Atmos. Chem. Phys. Discuss., 4, 7725, 2004.