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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Sub-micron atmospheric aerosols in the surroundings of Marseille and Athens: physical characterization and new particle formation" *by* T. Petäjä et al.

T. Petäjä et al.

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The authors would like to thank Ref 3 for comments and suggestions.

The referee points out that not enough background is given for the variety of the methods used in this publication. This is a conscious decision made by the authors. The aim of this paper is two-fold, firstly, it presents average properties of ambient sub-micron particles in the Mediterranean area and secondly, it examines formation and growth in more detail in Mediterranean region. To meet both of these goals, the paper is lengthy as it is. Thus, the methods are described as shortly as possibly and citing to relevant literature, when possible.

According to the referee, some of the conclusions are weak since there is no direct

measurements of possible condensing species and yet some indications of their chemical nature are discussed in the paper. When reporting results for a given field campaign, one has to present what is available. If direct observations are lacking, one has to rely on indirect measurements as was done in this paper.

The field campaign data was used to examine the differences between urban, freshly polluted air masses and clean background air masses. Since there was no precursor measurements (except SO2 in Plan d'Aups, Marseille), we had to rely on indirect information on the chemical composition of atmospheric particles, namely hygroscopicity. Average hygroscopicity was used to determine mean contribution of water soluble and water insoluble components to nucleation mode growth.

The referee pointed out the representativeness problem in TDMA measurement during Athens field campaign, i.e. can we say that a selected size can be interpreted as presenting properties in the nucleation mode as a whole. The lowest sizes examined with the Hygroscopic TDMA in Athens field campaign corresponded to 10 and 20 nm in mobility equivalent diameter. Thus we can only study relative contribution of different components in this size range. Based on aerosol number size distribution measurements, typically the nucleation mode reached 10 nm in size at noon. The modal diameter increased to 20 nm during the afternoon hours. Thus the indications of the condensing species was extracted from day-time hygroscopicity data, when 10 nm data measured at noon was compared to that of 20 nm detected in the afternoon hours. Reasoning is clarified in the text:

(subsection:hygroscopicity during events) "During growth the geometric mean diameter of the nucleation mode coincides with different HTDMA dry sizes at different times. Thus, one is able to interpret the measured GF changes as differences in the mass fluxes to the nucleation mode particles."

Focusing only on nucleation mode, as suggested by the referee, would leave out the average characteristics completely. The mean quantities can be useful when com-

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paring experimental results with models and thus it is worth publishing. To make the division between the two aims more apparent, result section was re-organized and the mean properties are discussed in a separate section. There is a separate section for formation and growth issues.

As pointed out by the referee, several figures were redrawn. Figure 2 now only represents hourly minimum and maximum number concentrations for clarity. Figure 3 now represents media and quartiles instead of 95% confidence levels. This brings out the high variation from day to day. Also the lines were removed. Figure 4 was modified according to referee suggestions. Figure 9 was removed from the manuscript, now the issue is only speculated in more condensed manner in the text.

Less hygroscopic mode is not anymore directly addressed to certain GF, which clarifies the text.

Calculation of J3 from data is clarified.

Editorial comments were taken into account accordingly.

Interactive comment on Atmos. Chem. Phys. Discuss., 6, 8605, 2006.