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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Size-segregated mass distributions of aerosols over Eastern Mediterranean: seasonal variability and comparison with AERONET columnar size-distributions" *by* E. Gerasopoulos et al.

E. Gerasopoulos et al.

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Response to Anonymous Referee #1

We would like to thank the reviewer for his insightful comments that have really helped us improve this final version. His suggestions have been taken into account and all raised issues are answered one by one.

1. Manuscript was checked for spelling and grammar. Rondriquez has been changed to Rodriguez throughout the text.

2. There is no intermediate heating process of the sampled air so the diameter refers

to ambient conditions.

3. The reviewer has correctly understood, however, for clarity reasons the sentence has been rephrased as follows. “The retrieval errors in the particle volume size distributions, at an intermediate size range (from 0.1 to 7.0 μm), remain below 10% in the maxima of the distribution, and rise to about 35% in the minima of the distribution. The errors, however, exceed 80% for particles smaller than 0.1 μm or larger than 7.0 μm (Dubovik et al., 2000, 2002a).”

4. Changed accordingly

5. We have added in section 2.1 the following description of the station and its proximity to anthropogenic aerosol sources as indicated by the reviewer: “The Finokalia station is situated 70 km east of Heraklion, the biggest city of the island with a population of about 140000. The major urban agglomeration of the extended area is Athens (about 4500000 inhabitants) which is located 350 km northwest of the station. Athens and other urban centers of the continental Europe (e.g. Istanbul) are the main sources of pollution transported over eastern Mediterranean, mainly in summer when N-NW winds prevail (Gerasopoulos et al., 2005). A description of the site and the prevailing meteorology has been previously reported by Mihalopoulos et al., (1997).”

6. In Fig. 5 triangles represent the measured masses from each impactor stage and no fitting process is applied on this data. Our inversion procedure is the following: First we apply the inversion code and produce the blue continuous line (this actually introduces the inter-calibration between the different stages) and then we fit numerous log-normal distributions. When the pattern from the inversion is completely inconsistent with raw data then this sampling was excluded from analysis. However, the difference we see in the raw and inverted data e.g. in autumn is the result of the collection efficiencies of these adjacent stages as correctly mentioned by the reviewer that does not detract the statistical perspective of the modes occurrence in the paper.

7. Our first attempt to create this image was indeed with Dp instead of log(Dp). As

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fine particles are $<$ 1 micrometers while coarse are in the range 1-10 micrometers no details could be identified for the fine fraction of aerosols unless logarithmic scale is used. Moreover, Israelevich et al. (2003) has applied the same procedure which allows comparisons between different studies easier.

8. Changed to: “Overall, a very good agreement is revealed between the AERONET volume size distributions and the mass size distributions derived from the impactor denoting that the latter . . . "

9. Reduction in density due to water absorption is expected mainly for the fine mode as ammonium sulfate accounting for about 50% of this mode can absorb significant amount of water. We performed the calculations suggested by the reviewer and we found that inclusion of water will decrease the density by about 7% which has no major influence on the calculated mean diameter. For the coarse mode such calculation is very difficult as the chemical composition is more complex and highly variable. However as the main component of this mode is dust (ranging from 40-7-0%) which is not hydroscopic also no major influence on the calculated diameter is expected

10. The reviewer is correct that using the peak values of the modes for the comparison between impactors and AERONET could include increased uncertainty. Thus we have followed his very positive suggestion to integrate the mass and volume size distributions for the fine and coarse fractions (separating them at the size cutoff of 1 micrometers). Actually, AERONET provides also the integral for each fraction directly as a product. Fig. 10 has been replaced with a new one representing the total mass and the total volume of the two size fractions and the discussion in 4.3.2 has been changed accordingly.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 469, 2007.