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AMTD

5, C1369–C1373, 2012

Interactive
Comment

Interactive comment on “Multi-wavelength Raman lidar, sunphotometric and aircraft measurements in combination with inversion models for the estimation of the aerosol optical and physico-chemical properties over Athens, Greece” by R. E. Mamouri et al.

R. E. Mamouri et al.

apdlidar@central.ntua.gr

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The authors would like to thank the reviewers for the helpful comments and technical corrections:

General Comments

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Interactive Discussion

Discussion Paper



1) The authors present aerosol data sets based on Lidar, sun photometer, aircraft measurements which the aim to estimate the chemical composition by combined analysis of measured and model (ISORROPIA-II) output. This is very interesting for the science community to get much more robust information on aerosol due to linkage of measurements and modeling. But the manuscript shows only more or less a combined analysis of Raman Lidar and AOD ground-based measurements during a special time period. The original idea, with is announced is only partly realized within this manuscript and therefore a revision is highly welcome. In general the manuscript is interesting for AMT readers.

Reply: The paper has been substantially revised according to reviewer's #3 comments.

Major comments:

2) Methodology and experimental set up

The description of the Raman LIDAR is sufficient, but the description of the AOD measurements with CIMEL and the airborne systems are very limited, especially the information on the uncertainty of these data sets are totally missing.

Reply: The CIMEL part has been totally revised according to the reviewer's comments. The description of the airborne systems has been revised, as well. Details concerning the methodology of the in situ measurements and the uncertainties have been added in the revised version of the manuscript.

The description of ISORROPIA-II is not sufficient. I don't see based on the description of the hybrid regularization technique as well as the ISORROPIA II, that airborne data will be used to derive the parameter reff , as well as and the mean complex refractive index.

Reply: The description of ISORROPIA-II has been completely revised. A new Plate (Plate 1) illustrating the use of ISORROPIA in conjunction with lidar, sun photometer and radiosonde data has been added.

The chapter 2 isn't really strongly focused enough for the originally aim of the Manuscript

Reply: Chapter 2 has now been revised in the new version of the manuscript.

3) The THERMOPOLIS campaign

One of the interesting points would be to know how many research flights have been performed during the campaign and how many matches exist with the Raman Lidar and AOD measurements, respectively, Raman Lidar measurements exist between 17th and 25th of July.

Reply: Additionally information has been added in the revised version of the manuscript.

Figure 1 and Figure 2 are completely focused on the ground-based measurements. No information on the variability of aerosol parameter from the airborne measurements is mentioned.

Reply: The variability of aerosol parameter from the airborne measurements.

Figure 1 shows the AOD at 532 nm, measured with the CIMEL and derived from Raman Lidar. I see partly big differences in the AOD, especially 23rd of July. It would be good to have here an explanation, why the AOD derived from LIDAR (separated in AOD below 2 km and above 2 km) is much higher like the AOD measured with CIMEL. I thrust here much more the CIMEL output. What is the reason for the higher AOD values, derived from the Raman Lidar measurements?

Reply: In the new version of the manuscript the figures are revised. Now the figure shows comparisons only during daytime (sunphotometer and lidar data). The procedure for the direct comparison of the retrieval of the two instruments is given in the section 3.

4) Case study 20–21 July 2009 I propose here to extend the information and output on

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the airborne activity. In the present form this part of the campaign play for the entire discussion a secondary role. All figures (1-8) show presently only outputs from the Raman Lidar and CIMEL photometer, respectively. It would be helpful to compare the both mentioned flights activity during the case study (11 – 13 UTC, 1 – 3 UTC, next morning) to see the change of aerosol burden in the height, similar to the Raman Lidar output, like Figure 3. It is better to delete it completely; because of presently will be used only airborne data from one layer during one time period (2nd flight during the case study period) is used in table 1, not really substantially...

Reply: a) No further in situ data are available due to some power failures during flights. Flight's data at two heights and all available data are given in the revised version of Table 1.

b) Figure 3 will not be deleted since it is used to show the variability of the aerosol burden over our site and also to provide the temporal periods where the measured aerosol parameters are provided.

5) Inversion columnar comparisons with sun photometer data (18–21 July 2009)

The Raman Lidar and CIMEL Photometer data set is from 17th to 25th of July. Why the authors compare only few days (18th, 20th and 21st of July) and present in Figure 8 the size distribution for all days, derived from CIMEL data set. What is the reason for the different handling of the output?

Reply: The complete dataset from lidar measurements used by the inversion algorithm is available only during night time measurements, so night time lidar observations are needed for the application of the methodology. Additionally, the inversion algorithm can be used only in case of low polarized (spherical) aerosols such as smoke and anthropogenic aerosols. For our study we excluded the cases with Saharan dust presence above the Greater Athens Area (GAA) from 23 to 25 July. The complete CIMEL data set is given in order to draw the aerosol distribution and variability during the campaign time period.

6) Summary: The statement: good coincidence between airborne and ground-based data due to comparison of one layer at one day is not really robust information. It should be compare also the second flight on this day and other potential matches during the entire time period.

Reply: All the available data from the coincidence airborne and ground based measurements are given in the revised version of Table 1 for a more significant comparison some discussion has been added.

The second part of the summary is more or less a general statement and should be moved to the Introduction. Finally could be say that the presented results are in accordance with the literature, which was discussed/mentioned before.

Reply: The second paragraph was removed from the conclusions and added in the Introduction section, as requested by the reviewer.

Minor comments: In the legend of Figure 5 is the time period is missing

Reply: This has been corrected. Figure 5 revised in the new version of the manuscript.

Please also note the supplement to this comment:

<http://www.atmos-meas-tech-discuss.net/5/C1369/2012/amtd-5-C1369-2012-supplement.pdf>

Interactive comment on Atmos. Meas. Tech. Discuss., 5, 589, 2012.

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