**Atmospheric
Measurement
Techniques
Discussions**

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.

Anonymous Referee #3

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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 Liar 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.

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. 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 ω and the mean complex refractive index.

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

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.

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4 Case study 20–21 July 2009

I propose here to extend the information and output on the airborne activity. In the present form this part of the campaign play for he 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 complete, 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...

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?

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.

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.

Minor comments:

In the legend of Figure 5 is the time period is missing

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