

Interactive comment on “Optical properties of different aerosol types: seven years of combined Raman- elastic backscatter lidar measurements in Thessaloniki, Greece” by E. Giannakaki et al.

Anonymous Referee #1

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General comment:

The paper analyses the profiles of optical properties of atmospheric aerosols over Thessaloniki, Greece. In this sense the authors use seven years of combined Raman and elastic backscatter lidar measurements. These measurements represent a worthy database obtained with an advanced Raman lidar system. The experimental and processing procedures are described appropriately and very valuable results are obtained. The authors gave the appropriate credit to previous works on the topic. The title reflects the content of the paper and the abstract provides a concise and complete

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summary of the paper's content. The paper is well structured and the language is used appropriately. The reference section is appropriate. In this sense the manuscript only requires minor corrections that are detailed below. Starting on section 3.2 the authors approach an analysis of the aerosol optical profiles in terms of air mass origin. For this purpose they start with a cluster analysis of backward trajectories that is complemented with additional pieces of information to improve the classification of the aerosol in different types. The authors justify the need of this combined approach appropriately. The analyses of lidar ratio dependence on backscatter related Ångström exponents represent a very relevant contribution of this paper. The paper is well on the scope of AMT and deserves to be published. In the next lines some comments and minor corrections are detailed.

Particular comments:

In lines 21-29 of page 3031 the authors described the ranges of uncertainties of their retrievals. In view of the figures presented it seems that the mentioned uncertainties of Klett method do not include the effects associated to the choice of the lidar ratio. This point must be clarified.

Page 3034, line 22, substitute "that" for "those".

The authors analyzed the data base using different criteria for the cases classification. In a first step they present a section on mean aerosol properties, section 3.1. The results presented in this section are relevant. The lidar ratios obtained by Raman retrieval are in the range encountered by other authors. Nevertheless, the Ångström coefficient derived from backscatter coefficient reaches rather large values (up to 3.4) that seem unphysical. Are these large values representatives of a large number of cases? It would be worthy that the authors revise these cases.

In section 3.2 the values of optical depth are expressed with an excessive number of significant figures considering the associated standard deviations. (e.g. 0.83 ± 0.29 must read $0.8 \pm 0.3, \dots$).

In section 3.3 the authors discuss about the vertical profiles for each of the aerosol types considered. Interesting results concerning the vertical distribution of the aerosol optical properties are presented in this section. Nevertheless, the authors must clarify the criteria employed to determine the separation between the Boundary Layer and the Free Troposphere.

Figure 2 requires larger and clearer symbols.

Table 1 requires revision of the number of significant figures used.

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