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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Optical and geometrical aerosol particle properties over the United Arab Emirates" *by* Maria Filioglou et al.

Anonymous Referee #1

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The paper of Filioglou et al., presents the geometrical and optical properties of the Arabian dust particles based on ground-based observations from a multi-wavelength Raman lidar instrument. The manuscript is well written and structured and the main results of the study are very interesting. I recommend the publication of the manuscript after some revisions, considering the following comments.

1) The measuring period covers an almost one year of observations (from March 2018 to February 2019), with two measuring gaps during May to August and September to November, due to instrumental problems. Thus, the term "long-term observations" used by the authors, should be replaced through the manuscript with the "one year observations".

2) In the introduction part, the authors should discuss about the threshold values of

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the intensive optical properties (lidar ratio, depolarization ratio) used in existing typing schemes for dust particles within EARLINET for example. Stations within EARLINET, are affected mostly from the African dust, so the references clusters are attributed to properties connected with these particles. But, what about stations e.g. Cyprus, affected by both the African mineral dust and the Arabian dust. This discussion would strengthen the claim of the authors that "a universal lidar ratio for dust aerosol particles will lead to biased results".

3) In the processing part, the authors should discuss more the automatic detection of the aerosol particle layers. Do they use a minimum layer thickness threshold (Figure 3 indicates that they did not). How do they define the first detected layer. Is this the PBL top? Please explain. In the manuscript you state that " there is a very persistent and stable night-time BL at 1 km or so throughout the measurement year". Is this the first layer presented in Fig. 2.

4) Figure 4 and Figure 5, present inconsistent retrievals for June 2018. Figure 4 presents geometrical properties for June 2018, while Figure 5 presents missing data. Please correct the figures accordingly.

5) Figure 4b, is a bit misleading. As it is shown it gives the impression that the FT has a certain depth equal to the PBL depth. Please modify.

6) Figure 7. Maybe the authors can provide a different approach for these plots. The division of the atmosphere into 5 altitude ranges (0-1,1-2,2-3,3-4 and >5) is a bit supressed. Maybe you could provide the information, based on the division of the atmosphere in regions, PBL, FT.

7) Figure 8. Authors should discuss more about the correlation of the presented properties of the Arabian dust. Can they conclude about the correlation between LR and δ? Or between the other properties?

8) Last paragraph of 3.3. The authors discuss about the possible differences between

African dust and the Arabian dust, analyzing two dust samples. However, they provide limited information about these two samples. Why are they interesting? They are linked to particular transported aerosol load? What about the lidar properties obtained during these periods of sampling? These are issues that the authors should address, so as the reader to understand the connection with the current analysis.

9) Line 295. Please provide a reference to strengthen the statement.

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