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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Optical-microphysical properties of Saharan dust aerosols and composition relationship using a multi-wavelength Raman lidar, in situ sensors and modelling: a case study analysis" *by* A. Papayannis et al.

Anonymous Referee #3

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General Comments The paper present sound results and calculations of an important event - Saharan Dust - collected and compiled by many plataforms, both experimental and numerical. It is an important contribution to understand this phenomenon and after some corrections suggested in style and rephrasing of some sentences should be published.

Specific Comments
ABSTRACT
LINE 3 - The model would evaluate or simulate the vertical profiles of aerosol not

PROVIDE
LINE 7 - cloud free instead of UNCLOUDED

INTRODUCTION
LINE 26 - spatio-temporal
PAGE 25746
LINE 9 - originated
LINE 11 - Western and Eastern Sahara
LINE 11 - large instead of PRONOUNCED
LINE 29 - REPHRASE: The lidar measurement can provide many aerosol optical and physico-chemical properties largely found in the literature (REFERENCES) both from space and ground based plataforms (REFS)

PAGE 25477
LINE 13 - CONCLUDE with FINAL REMARKS is a little bit redundant - We provid final remarks and a summary of the work carried on this paper in Section 4.

PAGE 25478
LINE 21 - from the nighttime period in the same date as the event (Saharan Dust) occurred

PAGE 25480
LINE 1 - that that - repeated
LINE 22 - IN the last years

PAGE 25481
LINE 4 - based on viscous...and ON soil moisture content

LINE 5 - From an BSC-DREAM8b outsider point of view is hard to understand what is meant by description and bins - Is it possible to clarify this in a concise phrase ?
LINE 12 - $1/3^o$ is that right ?
LINE 12 - within 24 layers
LINE 13 - long-range dust transport studies might sound better
LINE 22 - **weaker** is not a good term to describe a scattering

PAGE 25482
LINE 5 - What are real differences ?
LINE 16 - Which coefficients a_{aer},b$_{aer}$ are retrieved by the Raman and which are retrieved by the elastic channels ?
LINE 17 - The INVERTED aerosol microphysical properties **take into account** or **provide**.
LINE 18 - real and imaginary PARTS
LINE 19 - within different layers
LINE 21 - dependence of the refractive index WITH size ?
LINE 23 - Which MEANS (averages) are you referring to ?
LINE 25-28 - Despite the fact you mention the reference how are these uncertainties reached ?

PAGE 25485
LINE 20 - What does EDXFR stand for ?

PAGE 25486
LINE 21 - left-side and right-side figures
LINE 21 - In which sense do the trajectories suggest the time of the event outbreak ? From my knowledge the user setup the simulation starting time.

PAGE 25487
LINE 19 - How come it is inferred the dust layers descended and that not a new layer is present ? Besides from a ground based system the lower layers could mask the higher ones.
LINE 24 - 27 - This increase can originate from other effects such as marine aerosols present and humidity.

PAGE 25488
LINE 2-5 - I am a little bit confused here if the aerosol load decrease wouldn't the LIDAR SIGNAL as well. This brings me idea that perhaps the use of the Aerosol Scattering Ratio might be more useful in these instances.
LINE 21-25 - The reasoning here might have some pitfalls as comparing water vapor mixing ratio and relative humidity is meaningless with further information reagarding the WV saturation. Perhaps extra data might be available to give more background to the discussion raised in this part of the paper.
LINE 28 - Perhaps a section describing these quantities would be handy as they firs appear in this section in the paper.

PAGE 25489
LINE 1-9 - Here a table or even a figure comparing all the previous and present results should be presented or inserted in FIGURE 6 (those which relate ngström exponents)
LINE 21 - GREATER area of Athens
LINE 26 - 0.70 or 0.700 would be in the right number of significant digits.

PAGE 25490
LINE 6 - Thick layers instead of STRONG
LINE 14 - PERCENTUAL LINE 14 - 21 - From the source point of view how can explain the presence of these two distinct species of aerosols ? Dust and Sulfates.

PAGE 25492
LINE 19 - FIG. 7a and 7b LINE 24 - IN the order of FOR layers 1 and 2
LINE 27 - while FOR layers 3 and 4

PAGE 25493
LINE 1 - I had the impression the dust layers were somehow absorbing but this results shows the opposite. Is that right ?
LINE 23 - SLIGHTLY instead of slide

PAGE 25494
LINE 1 - *Reflects the tendency of organic carbon to partition to the aerosols phase*. Can this further explained ? Just extracting this conclusion from a single value of the refractive index is not too much rely on a bold assumption ?

PAGE 25495
LINE 16 - 0.33 ± 0.10

PAGE 25507
In table title please refer where these data were taken from.

PAGE 25508
Overall please pay attention to the right amount of significant digits provided in the table. For example 0.007 ± 0.0035 is not the correct form.

PAGE 25509

FIG 1. Aren't the font too small ?

PAGE 25510
FIG 2. Same comment as FIG 1.

PAGE 25513
FIG 5. Definitely these plots are very hard to read. Perhaps merging them would be a good idea.

PAGE 25514
Fig 6. The time gap in the figure can be omitted and provide more room for the data.

PAGE 25515
FIG 7a. In the legend the layers height could be mentioned (Suggestion).

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 25473, 2011.