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Atmospheric Measurement Techniques Discussions



# *Interactive comment on* "A methodology for investigating dust model performance using synergistic EARLINET/AERONET dust concentration retrievals" *by* I. Binietoglou et al.

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General

The paper deals with an interesting topic: Comparison of desert dust profiles from dust transport modelling versus EARLINET lidar observations of dust profiles by applying the LIRIC algorithm to lidar/photometer data sets. The paper is well written, but my minor recommendations may be helpful to further improve the article.

Details

First of all I have a minor problem with the co-author list: There are, e.g., 5 co-authors

from Athens, but only 3 LIRIC profiles (probably produced by one person), and then there is Evora (co-author V. Carrasco, new EARLINET scientist?) with 18 profiles (contributing 30% to the 61 considered LIRIC profiles), but Evora has only one co-author.

Furthermore: What about the quality of the Evora data, when obviously analysed by a scientist of which the LIRIC expertise is at least unknown?

As mentioned this is a minor issue, but I did not understand on which rules the co-author list is based.....

Introduction:

General remark: Except for the abstract, all acronyms or short names should be explained (give full explanation!) at their first appearance.... DREAM, BSC, NMME, MAAC, POLIPHON,

Page 3609: The first EARLINET network paper on a Saharan dust outbreak was presented by Ansmann et al. (JGR, 2003). Should be cited.

Algorithms and Models:

Page 3612, lines 14-17: One could also mention one of the important Chinese photometer networks:

Ground-based aerosol climatology of China: aerosol optical depths from the China Aerosol Remote Sensing Network (CARSNET) 2002–2013 H. Che, X. Zhang, X. Xia, P. Goloub, B. Holben, H. Zhao, Y. Wang, X. Zhang, H. Wang, L. Blarel, B. Damiri, R. Zhang, X. Deng, Y. Ma, T. Wang, F. Geng, B. Qi, J. Zhu, J. Yu, Q. Chen, and G. Shi Atmos. Chem. Phys. Discuss., 15, 12715-12776, 2015

Page 3615, line 10: OPAC: How can OPAC be used to separate dust and nondust! The original OPAC data base only deals with spherical particles.

Page 3615, lines 14-22: I would like to see a more balanced discussion on the two methods, POLIPHON versus LIRIC. LIRIC is not just of advantage in many situations,



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it needs clear skies, three wavelengths, it needs assumptions on particle optical properties for the overlap region (from the lidar up to 500-1000m above the lidar), and also not too complicated vertical aerosol layering with mixtures of dust, urban haze, smoke, and marine particles. POLIPHON seems to be more robust, needs only one wavelength, has no overlap effect when looking at lofted dust layers, and does obviously not need cloudless conditions.

The need for clear skies (cloudless conditions) for the application of the LIRIC method may bias the model-observation comparison because the probability is high that wet removal effects are underestimated.

Page 3615, line 23: How was the data set of 61 profiles produced? All groups delivered their signals, and the LIRIC products were analysed by one group, or all the groups analysed their own signals. Should be clearly mentioned. Even this will certainly introduce some variability in all the observed data and the data comparisons.

Page 3616, lines 16-25: If I read these papers of Wagner et al. (2013) and Granados-Munoz et al. (2014) I do not have the impression that LIRIC is robust. . ., and the errors are always below 20%. A very careful preparation of the signal profiles and all the input parameters seems to be necessary before using LIRIC.

Page 3622, lines 11-12: I think this is speculation that the hydrophobic dust particles change their microphysical (size, shape) and optical properties (including depolarization features) as a function of coating and water uptake. Yes, that may be true, but how large are these effects. Is there any reference for the hypothesis?

Page 3625, lines 2-5: As mentioned, LIRIC needs cloud-free conditions during the lidar observations. This means that the dust cases considered here are (in the majority) not affected by any wet deposition which can remove significant amounts of dust. This point should be mentioned.

Figure 8: Is it possible to put variability bars (standard deviations) to the observational



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profile and also to the modelled ones?

Figures 9 and 15: standard deviation bars?

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