

Interactive comment on “Potential of polarization/Raman lidar to separate fine dust, coarse dust, maritime, and anthropogenic aerosol profiles” by Rodanthi-Elisavet Mamouri and Albert Ansmann

Anonymous Referee #1

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The study presents an extended POLIPHON technique that allows the derivation of the mass concentration profiles from lidar measurements at three wavelengths and separating of the fine dust fraction, coarse dust fraction and non-dust contribution. The developed methodology is applied to SALTRACE observations and the results are presented. Also, the conclusions drawn from the analysis are clearly discussed: the use of the 532nm wavelength leads to more robust results, the analysis is better applied to conditions with height-independent ratio of fine to coarse dust backscattering. The paper is well conducted. The methodology part is clearly structured and explained. It is also well-stressed by the authors that the comparison of the results with in-situ

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observations would greatly strengthen the retrievals of the proposed method.

Therefore, this is a great paper providing new paths for the retrieval of higher level lidar products (also applicable on space lidars) and I would therefore recommend publication with the following minor revisions:

For the estimation of extinction-to-volume conversion factors from AERONET, it is clearly stated that for the cases of continental and dust aerosol types (Germany and Cyprus sites), a filter has been applied based on the Angström exponent (i.e. $AE > 1.6$ for continental and $AE < 0.5$ for dust). Can you please be such specific also for the Barbados dataset concerning the marine type? Did you apply any filtering? Moreover, I wonder if the dataset obtained from AERONET in Cyprus contains also the relevant information regarding marine aerosol. In that case it would be beneficial for the manuscript to have a comparison with the corresponding values from Barbados.

Please provide some more details on Figure 10, I am confused. Especially in Figure 10b. You may want to consider adding more legends to adequately explain the method.

In Figure 2 you could use different colors for the different modes and different shapes for the different campaigns. Then you could plot with different colors also the corresponding correlation lines so that it would be more visible to the viewer

In Figures 3 and 4 I would recommend that you use lines with the corresponding colors for different wavelengths

In Figures 7, 9 and 11 the distinction between thick and thin lines is not at all visible to the reader. Try to make the difference between the lines greater or use dashed or dotted lines for the separation.

p.1, line 22: avoid 'and here' p.3, line 3: use 'except' instead of 'accept' p.3, line 24: add 'for the first time' p.5, line 32: "influenced" instead of "influences" p.9, line 3: add according 'to' p.16, line 9: 'article' instead of 'arricle' p.17, line 33: omit 'of' in the sentence 'a FMF of close to 0.2' p.18, line 7: reverse 'than the ones shown' p.19, line

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3: write 'as described' p19, line 15: 'the depolarization increase' Fig.8 legend: 'also' instead of 'aslo' Fig. 12, legend: 'Comparison' instead of 'Comparsion'

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