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Comment

## ***Interactive comment on “Vertically resolved aerosol properties by multi wavelengths lidar measurements” by M. R. Perrone et al.***

**Anonymous Referee #1**

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The authors make an interesting attempt to apply technique previously developed by Gobbi et al for sun photometers to lidar measurements. The main issues in their approach are: 1. Necessity to assume well mixed PBL to extrapolate the particle extinction to the ground. 2. Necessity to assume the lidar ratio to get particle extinction. The authors understand these issues and try to estimate uncertainties due to height variation of lidar ratio. Thus they make calculations assuming that above certain height all lidar ratios (LR) are 10% increased and show that it doesn't affect the results significantly. For this I should mention that 10% is not too much, variation of LR can be significantly stronger. Besides, for ratio of extinctions (for Angstrom exponent) this LR enhancement is partly compensated. Probably the situation will be more severe when LR at different wavelengths are changed differently. The uncertainty of estimation of

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the fine mode radius and relative contribution looks to be too high at this stage, but the approach is interesting and may be this technique applied to Raman lidars will provide results with better accuracy.

#### Additional comments

Table 1. The real part of ref. index  $n=1.483$  for dust looks to be quite low. In principle AERONET may underestimate  $n$  for dust. What happens if more typical value like 1.55 is considered?

Fig.1 It is not clear what the coarse mode radius was used in calculations? How does choice of the coarse mode parameters influence the analysis presented?

Complex refractive index can be also height dependent, especially for dust layers. Probably it will not affect results to much, but still it should be commented.

p.18552 In.13 “So, resuspended soil and/or desert dust particles have likely been responsible for the volume depolarization ratios revealed by Fig. 5a” Volume depolarization of 2% is too low to be an indicator of dust particles presence. It would definitely be more informative if authors show particle depolarization on the figures.

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