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Atmospheric Measurement Techniques Discussions

Interactive comment on "Profiling of fine- and coarse-mode particles with LIRIC (LIdar/Radiometer Inversion Code)" *by* M. R. Perrone et al.

Anonymous Referee #1

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The authors try to retrieve the vertical dependence of aerosol properties from multi-wavelength lidar measurements using previously developed graphical aerosol classification framework and compare results with LIRIC code outputs. Vertical profiling of particle properties is definitely important, and the authors present interesting results of comparison with LIRIC inversion. However I need to mention that: 1. Authors assume constant lidar ratio when calculate extinction coefficient with CII approach, which is the source of possible errors. No sensitivity studies allowing realistically estimate these errors are presented. 2. LIRIC code assumes that the fine and the coarse mode radii are height independent. Such assumption may lead to the errors in the retrieved

profiles of volume concentration. Corresponding sensitivity studies are not presented. 3. Authors provide uncertainty of extinction calculation (and particle volume retrieval as well) as standard deviation from mean value, which is not correct. The uncertainty of retrieval and deviation from obtained mean value is not the same. 4. Because of possible biases in extinction calculation the presented graphical aerosol classification framework may be characterized by high uncertainty so it can't be used for verification of LIRIC retrieval. Neither of these techniques can be considered as etalon, hence we can talk only about comparison. 5. Authors retrieve vertical variation of the fine mode radius assuming that lidar ratio doesn't change. I think this way they put restriction on the class of considered solutions.

Specific comments

Abstract is too long, looks more like Conclusion.

p.3, ln21 "Aerosol effects on climate depend on the vertical distribution of the aerosol optical and microphysical properties (e.g. Perrone et al., 2012)." This problem is discussed for the long time, earlier references are needed.

p.13, ln.6. "...since the efficiency of scattering by small particles is more pronounced at the short wavelengths (Lopatin et al., 2013)..." The reference for earlier classical work should be given

p.16, ln 9. " the particle fine modal radius varies with z spanning the ïĄ¿ïĂă0.02-0.17 ïĄm range" How can authors distinguish 0.02 mcm radius when shortest wavelength is 355 nm?

p.16, ln.11 " CII-procedure does not make any constrain on the dependence on altitude of the particle size". Isn't constant lidar ratio a constraint?

Fig.1 "...the coarse modal radius equal to 0.75, 0.9, 0.105, and 0.12 μm..." It is misprint

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