

## ***Interactive comment on “Assessment of aerosol’s mass concentrations from measured linear particle depolarization ratio (vertically resolved) and simulations” by A. Nemuc et al.***

**Anonymous Referee #2**

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The authors evaluated mass concentrations of smoke and mineral dust aerosols using multi-wavelength Raman lidar data observed at Magurele, Romania in 2012 and discussed the features of the vertical profiles and seasonal variation for the derived smoke and dust concentrations. They assumed depolarization ratio of 3% for smoke aerosols and 35% for mineral dust aerosols and estimated their extinction coefficients from the Raman lidar measurements. They calculated mean mass-extinction efficiencies for smoke and mineral dust using the OPAC data at relative humidity of 70% and used them to convert the derived smoke and mineral dust extinction coefficients to their mass concentrations. The authors demonstrated to be able to calculate vertical profile

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of mass concentration for each aerosol component using Raman lidar data, and the derived data are useful for validation and assimilation of numerical models such as aerosol transport model. The retrieval methods are logically constructed based on the concepts (ideas) of previous studies. On the other hand, this paper has needs some revisions as follows:

1)1. Introduction The introduction does not match the gist of this paper. You should describe why mass concentration data, especially their vertical profiles, for each aerosol component are needed and should review mass-extinction efficiency (e.g., see Shimizu et al. SOLA, 2011, vol. 7A, 001-004, doi:10.2151/sola.7A-001).

2)2.2 Assessment of mass concentration It seems that the retrieval method to evaluate extinctions for smoke and dust needs only two channels of the multi-wavelength Raman lidar data that are extinction coefficient and depolarization ratio at one wavelength. You should describe this point clearly.

3) P5933, L18: You should describe cause for using the OPAC results at relative humidity of 70%.

4) P5394 L11 “The error bars represents the uncertainties ~~~ the algorithm.” How did you evaluate the uncertainties? You should describe the method.

5)P5937 Figure 10, 11, and related discussion. You should add the figure for the monthly variation of the mean mass concentration of the dust and smoke and discuss the seasonal (temporal) variation of mass concentration of dust and smoke as well as the ratio.

6) 5938 L25, “This study shows ~~~ with sufficient accuracy.” This paper does not show sufficient cause for this conclusion. This study has no validation study and does not show the methods and results of sensitivity studies, especially related to assumptions such as use of fixed values for depolarization ratio of 3% for smoke and 35% for dust and use of fixed values for mass-extinction efficiency evaluated from OPAC data.

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If you suggest the agreement with LIRIC as the cause for this conclusion, you should describe the accuracy (and performance) of the LIRIC.

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