**Atmospheric
Measurement
Techniques
Discussions**

Interactive comment on "Columnar aerosol size distribution function obtained by inversion of spectral optical depth measurements for the Zanjan, Iran" *by* A. Masoumi et al.

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The authors would like to express their gratitude to the referee for the valuable comments and questions. We have tried to answer all the questions and apply all the comments into the manuscript.

In this new version we made some general changes that are listed in the following. All the changes have been addressed by the page number, P, the column (C1 for left and C2 for right), and the line number, L. We also worked on the English writing of the manuscript.

General scientific revisions in the current version

1. We applied the Langley plot calibration method in the most appropriate possible conditions and used the cloud screening algorithm that suggested by AERONET. Also the ozone optical depths are subtracted from the measured optical depths to retrieve more exact AODs. Therefore, the AOD and Angstrom exponent values are changed slightly without basic effects on the conclusions of the manuscript.

2. As it appeared in P2C1L4-7, the separation point of the fine and coarse mode aerosols is shifted from r = 1 μm in the previous version to r = 0.75 μm in the current version, in agreement with the Version 2 AERONET inversion products that supposed a variable boundary between $\sim$ 0.5 μm to 1.0 μm for this parameter (http://aeronet.gsfc.nasa.gov/new_web/Documents/Inversion_products_V2.pdf).

3. We changed Eq. 8 in a manner that equal coarse radius intervals (Δr) are substituted by equal coarse logarithmic radius intervals (Δlogr) (P2C2L32). Also we supposed aerosols are spheres with radii between $\sim$0.15 μm and 3 μm (King et al., 1978) (P2C2L4). Therefore, the radii of 0.25, 0.5, 1, and 2 μm are the midpoints of four coarse logarithm radius intervals in the revised manuscript (P3C1L39).

4. We applied the complex refractive index values suggested by Dubovik et al., 2002 for dust and urban-industrial aerosols at four different wavelength channels for the coarse and fine mode aerosols, respectively. These changes are appeared in Table 1.

Applying all above changes, Figures 1, 2, 3, 4, 6, 7, and 9 and Table 2 have been changed respect to the previous version but the main conclusions of the work concerning the observation of the aerosols in different seasons of the year are almost remained unchanged.

Answer to the questions and comments:

1) Some explanations are required about the choice of constant refractive index of 1.45. Conduct the sensitivity study and evaluate uncertainties of derived results using

other reported values of refractive index with non-zero imaginary part. It is commonly recognized that aerosol and dust particle in the region under investigation may have a non-zero imaginary part of the refractive index.

Please refer to general revisions No. 4. We have to add that the considered values for aerosol refractive indices in Table 1 also are in agreement with reported AERONET values for our station during 2010 but we do not believe this should be referred in the current manuscript when all the measurements have been done during 2006-2008.

2) Provide better review of standard methods for aerosol retrievals from the ground sun-photometer observations and available results for the regions with similar atmospheric conditions and climatology.

We have to emphasize that this paper does not present a new technique for calculation of columnar aerosol size distribution and we used exactly the same technique presented by King et al., 1978. But for the first time we are reporting the result of such calculations for an area in Northwest Iran not so far from the border with Iraq. The CASD techniques have been mentioned very shortly in P1C2L27-34, and the reason that we used this old technique is presented in P1C2L34-37, and P2 C1L1-3.

3) It would be beneficial to compare results of this work with available satellite retrievals from MODIS, MISR and SEVIRI (Meteosat).

As an example, Deep Blue AOD of Aqua/MODIS for July 2-4, 2008, and HYSPLIT back-trajectories model for July 3, 2008, are presented in Figures 8a-8c and 7. In P5C1L1-23, we discussed that how the results shown in these figures are in agreement with our recorded data and calculated CASD that are shown in Figure 6.

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