Anonymous Referee #2
The paper contains original material and is worthwhile to be published in AMT.
Minor changes are required.
The so-called linear estimation (LE) procedure is applied to pure spectral particle extinction data, no sky radiance information (phase function) is available in contrast to the AERONET inversion method. So, AERONET inversion retrieval products clearly represent the quality standard. That should be mentioned in the paper.

The reviewer is right, we have add this sentence in the new manuscript.

Page 14, line 7: Why does AERONET inversion overestimates the volume concentration V-c? I believe the other methods underestimate V-c, and AERONET is correct. But what is true? At least the classical AERONET approach is more reliable.

We have rephrased the sentence to that LE underestimates

I was expecting a discussion on the reasons of the discrepancies (in this section 3.2.3), but that is not given!

A paragraph was added in the end of section 3.2.3
Comparing the volume retrieved from direct sun measurements, we should remember that PFR provides only four input data, while CIMEL - seven, so retrieval from CIMEL data should be more accurate. Besides, as will be shown in section 3.3, the retrieval is quite sensitive to the noise in input data, so difference in error distribution through channels in both instruments may also case the difference in retrieved parameters.

Section 3.3. uncertainties in the retrievals: I expected an explanation why the uncertainties in the LE retrieval products are so systematic (a clear pronounced bias is visble). But an explanation is missing. Please provide! Clarify why there is this bias, what causes this.

The following text has been added:

As was mentioned, the uncertainties of inversion obtained for $\varepsilon=0$ include the errors arising from existence of the null-space and incorrect choice of the refractive index. To estimate influence of this second factor we performed retrievals assuming m_R=1.35 and 1.55, while the model value was m_R=1.45. For Type II aerosol the variation of retrieved parameters was below 10%. Small particles (Type I) are more sensitive to the choice of m_R and corresponding variations are up to ~30% for effective radius and up to 15% for volume. However sensitivity of data to the real part of refractive index allows estimation of m_R from the measurements, so finally retrieval uncertainty is below 20% for radius and below 10% for the volume, as it follows from Table 2. Influence of the imaginary part was even less significant: choice of mI=0.01 instead 0.005 didn't increase errors of retrieval for more than 5%.
The values presented in Table 2 represent the absolute errors of the retrieval, while relative changes of parameters can be obtained, with lower uncertainty. For example, if the particle effective radius and refractive index don't vary much the uncertainties due to null-space are small and the choice of the inversion interval is quite stable, thus a relative change of the particle volume can be retrieved with significantly lower uncertainty than given in Table 2.
The numerical simulations in our paper were performed just for two extreme cases, when either fine or coarse mode dominates the PSDs, to illustrate the main tendency: the increase of retrieval uncertainty when the coarse mode becomes predominant. For a more complete analysis wider range of the mode parameters

together with refractive index variation should be considered. Such simulations are in progress, but several notions should be made:

- As the problem is underdetermined, the uncertainties can be decreased by narrowing the “search space” for inversion interval. The spectral dependence of Angstrom parameter allows to separate the contributions of the fine and coarse modes to AOD (O'Neill et al., 2003) and this information can be used to constrain rmin and rmax ranges in retrieval. So including the spectral dependence of Angstrom in analysis should improve retrieval and will provide basis for characterization of retrieval uncertainties.
- Considering AERONET retrievals as a “true” and accumulating sufficient statistics for different types of aerosol it is possible to introduce correction to LE retrieval to decrease uncertainty, especially for big particles. Both of these studies are in a progress and the results will be presented as a separate publication.

A table with all the instrument parameters, wavelengths, capabilities would be nice as an introductory table - Fig 11, a picture of instrumentation and Athens in the background is attractive, but a Table with instrumental information is also useful

This was introduced in the new manuscript

Fig.4, please explain in more detail what does air mass of 1.5, 3, or 5 mean, many readers may not know what a sun photometer exactly measures.

More explanation was provided in the new manuscript as the reviewer suggests.

Fig 6.: AERONET inversion is the reference, and the LE solution partly considerably deviate from the AERONET inversion results (30% or so..). Please provide the reasons for the visible systematic deviations of the blue and open circles from the red ones (the best solutions).

The AOD measurement kernels are less sensitive to the coarse mode particles and significant part of the coarse mode is in null-space. Thus results in systematic underestimation of particle volume comparing to AERONET operational retrieval. Corresponding comments are added to section 3.3. (see comment above)

Fig 7: good figure, may be draw (horizontal) zero lines
Figure 9: again good figure, may be draw a zero line in the right plot.

Zero lines were drawn

Fig 8: AERONET inversion results (the quality standard) are a factor of 2 higher than the LE products. Why are the LE results so poor? This systematic bias needs to be explained! The explanations for the uncertainties and biases must be one of the goals of such a paper.

Just as mentioned above such deviation is the result of low sensitivity of measurement kernels to the coarse mode. This systematic deviation can be strongly decreased by applying corresponding correction. Corresponding comment is added to the section 3.3.