Response to Dr. P. Kiedron

The authors gratefully acknowledge Dr. P. Kiedron for carefully reading the manuscript and providing constructive comment. This document contains the authors' responses to Dr. Kiedron comment.

*****Reviewer's comment

Author's response

* All you have is AOD as function of wavelength. And you seem to claim that you can retrieve some parameters of particle size distribution PSD as well as real and imaginary parts of index of refraction m=n+ik by solving the integral equation which kernel is not known to you. Isn't it too much to ask? It does not seem mathematically sound nor sane. Did you perform studies concerning the uniqueness of the procedure? Can it be that two different PSD's and different values of m may produce the same AOD? I think this is a rhetorical question. Obviously the problem as posed in the paper has multiple solutions. Could you please comment on the issue.

Yes, the problem is under-determined, so we don't achieve a single unique solution. Instead we have a family of solutions, obtained with specific assumptions about the refractive index and the permitted inversion ranges. The algorithm performs a search for a family of solutions determined by use of the discrepancy(ρ) defined as the difference between the input data AOD(λ) and the data calculated from the solutions obtained. This approach is described in detail in our previous publications (e.g. Veselovskii et al., 2002 2012).

To exclude the possibility of getting very different solutions the "search space" is limited by constraining the inversions, both for the refractive index and the inversion radius, as shown in the manuscript. The simulations performed in section 2 and 3 demonstrated the capabilities of the Linear Estimation technique to obtain effective radius and particle volume concentration with uncertainties below 40%. Also, please note that the approach presented does not provide particle refractive index because the associated uncertainties are too high. Furthermore, we calculate only integral quantities and not the size distribution. Finally, the agreement between LE and the operational AERONET retrievals for the same set of data shows the potential for Linear Estimation to obtain high temporal resolution values of the studied aerosol microphysical parameters.

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