

# ***Interactive comment on “Microphysical particle properties derived from inversion algorithms developed in the framework of EARLINET” by D. Müller et al.***

**D. Müller et al.**

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General comments: The paper tries to consolidate the results obtained with TROPOS and UP, still reading the manuscript I had feeling, that these are two independent papers, which were glued together. The results for TROPOS and UP are presented in a different ways, so the reader can't really compare the operation of these two algorithms. And when two algorithms are presented together, reader usually hopes to find out what are advantages and disadvantages of approaches considered. So I would prefer to see the results for both algorithms presented in similar manner.

We point out at the end of the introduction that the purpose of this paper is NOT to show

a 1 to 1 comparison of results between the two algorithms. It was not the intention of this paper. Thus, the reviewer is right that a direct comparison is not possible.

We agree that the two text portions look a bit glued together. We tried to rephrase some text portions in the paper such that the structure becomes more coherent. We think it is not helpful to do a direct comparison at the moment as we are constantly trying to improve our two algorithms. The reviewer may understand that we want to avoid to show pros and cons of the two algorithms until we think we have arrived at the point where we feel that we have developed our algorithms to the maximum possible point. We moved section 3.2.2 and now present it in section 4 (summary) as new section 4.3 (comparison of results). We added some text where we try to put the results from the two algorithms into a better context.

I would recommend strongly to decrease the number of plots, describing the main results in the text, and to increase the plots size.

Following this suggestion the subfigures in Figures 3 and 4 were reduced each figure has now only 4 columns instead of 6. The main results were included into the text. The text was fitted to the new labelling.

Fig.1 goes after Fig.2 in the text.

Fig. 1 is already mentioned in the Introduction (p. 12830, line16) before Fig. 2.

I am not sure also that it is a good idea to show the screen shot of program window in the paper. Letters are very small and it is difficult to read. Why not to make this figure in traditional way?

We would like to let Fig. 1 as it is.

Caption to Fig.2. “different constraints on the real part and error free data, i.e. 0.05” What does it mean? The search space is limited?

Yes. We rephrased that part of the figure captions: “Row (a–c) represents the results

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from using the constraint that the real part is known to 0.05 in the data inversion and that the optical data are error free. Row (d–f) shows the results for error-free data and that the real part is known to 0.1. Row (g–i) shows the results if the real part is known to 0.05 and that the optical data have an extreme error of 15%. Row (j–l) shows the results if the real part is known to 0.1 and that the optical data have an extreme error of 15%.”

Section 2.3 contains nothing

It is an error in the section numbering. We corrected for it.

Section 2.4.1. Are these results for TROPOS and UP algorithm?

Only for UP. Therefore, we added: Identification of the Solution Space for UP algorithm  
The results for the TROPOS/UH algorithm are described in sections 2.1.1 – 2.1.3

p.12844/20 “: : : which in most cases correspond to 10 to 20 PSD’s: : :” Unclear

We rearranged the sentence and hope that it is now clear: The mean retrieved PSD solution, Figs.~\ref{fig:fig3}, \ref{fig:fig4}(red solid line), is the average of 10 to 20 PSD’s (grey solid lines) corresponding to the selected 10 to 20 CRI grid points as described in the last section (initial PSD: black solid line).

p.12844/27 “: : : The exception are weakly absorbing (0.005i , 0.01i ) particles with real part 1.4.” Probably it should be for some range of the real parts. For example, what will happen for 1.42?

Yes, of course, we changed to: The exception are weakly absorbing (0.005i, 0.01i) particles with real parts in a range around 1.4.

Fig.4. 24 examples of retrieval - too many. It would be better to decrease the number of plots.

We decreased the number of plots to 16.

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p.12846/6 " Table 1 shows the parameters: : :". Authors have already mentioned it in section 2.2.2

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Yes, but we would like to repeat it once more.

p.12846 /10 " Effective radii of 0.28 and 0.4 \_m describe particle size distributions that have a significant share of particles in the coarse-mode fraction and the fine-mode fraction." Authors consider monomodal PSD. How can they compare it with bimodal?

We assume the reviewer objects calling large particles coarse-mode particles if the PSD is not bimodal? We provide some explanation at the beginning of this section regarding our choice of using monomodal particle size distributions only.

p.12848/3 " : : the particle size distribution also influences the value of SSA. A small change of the imaginary part may have a large impact on SSA if the particles are in a specific radius range. A small change of the imaginary part may not have a significant impact on SSA if the particles are in another part of the radius range of atmospheric particles." Can authors specify these radii range?

No, we cannot at the current stage of our work. In order to come up with robust numbers that can be used in future research we would need to carry out a separate study in which we would need to cover as many aerosol particle size distributions scenarios of CRIs as large as possible. This goes beyond the scope of the current study. We mention this fact in our text.

p.12848 ln. 15-25. I have difficulty in understanding this paragraph and Table 2. For example, in Table 2 the first line is "ext-A(355/532) 1.45–1.78" What does this range mean? Is it arising from different imaginary parts used?

We added text to the figure caption. We use five different imaginary parts for each real part (1.4, 1.5, and 1.6) and each effective radius (e.g., 0.15 micrometer). Accordingly, we obtain 5 different Angstrom exponents for each real part and effective radius. Instead of writing these five different Angstrom exponents we decided to provide the

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range of Angstrom exponents from minimum to maximum value.

Fig.5. The plots are too small, it is very difficult to read anything.

The plot in the final paper will have the size of one full page (portrait orientation, A4 paper format). The figure caption will appear on a separate page. In that way we can make maximum use of the available space on the page that will show the plot. We already take account of this in the current manuscript, i.e. the plots are shown with their maximum possible size. We checked the plot, and the symbols and numbers and lines are clearly visible in that case.

The reason why details on the plot are barely visible in the AMTD is that AMTD uses landscape format which naturally squeezes the length of a plot and makes it nearly impossible to see anything.

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Interactive comment on *Atmos. Meas. Tech. Discuss.*, 8, 12823, 2015.

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