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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Vertical profiles of urban aerosol complex refractive index in the frame of ESQUIF airborne measurements" *by* J.-C. Raut and P. Chazette

Anonymous Referee #2

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The paper Vertical profiles of urban aerosol complex refractive index in the frame of ESQUIF airborne measurements deals with the retrieval of range-resolved aerosol complex refractive indexes from airborne in situ measurements, lidar and sunphotometer. The paper is an improvement to the former paper from the same authors (ACP 2007) since now it is made use of height-resolved in situ measurements (from an airplane) of the aerosol size distribution and scattering coefficients. It has interesting aspects worth to be published in ACP, but the paper in its present version is not acceptable. So I recommend to reject the paper by Raut and Chazette.

General comments It is not clear to me what the authors called Part 1 and Part 2. Do

they refer to height ranges or coordinates in latitude and longitude or flight legs? Can it be described more clearly?

How the correction factor is used? Do the authors simply multiply the resulting total scattering between 7 and 170 degree by this correction factor? It seems quite a small value given that the phase function in the first 10 degree can be quite different (and higher) than in the rest of the 180 degree.

The authors give in Section 2.2 values of the AOT +/- 0.03 and +/- 0.05 (probably from the AERONET stations of Creil and Palaiseau, it is not said in the text), whereas they stated in Section 2.1 that AERONET errorbars for the AOT was +/- 0.02, independently from the aerosol loading (which I doubt). What is the correct errorbar?

The ACRI retrieval method is not well described, not in a clear manner. A diagram would help a lot (like in Raut and Chazette, 2007).

Lots of the hypothesis (a priori dispersion of nr and range of ni) made in the application of the method presented are based on results obtained in Raut and Chazette (2007) with data from May 2005. In the submitted paper, the data are from July 2000 and no discussion is given about this difference.

An underlying argument (not explicitly given as is) to the previous comment is that Paris and its surroundings are loaded with anthropogenic aerosols from automobile traffic. But is there really no other aerosols present on the specific dates of the study? Reference it!

I have a hard time to believe that a constant BER profile of 0.014 sr-1 can be used for the Paris ABL at all season of the year. Can the authors add some errorbars to this value? Is there any Raman measurement available in the Paris area?

Furthermore an important work of cross comparison is needed between the retrieved and measured optical and microphysical parameters. In other words, the loop is not closed. The authors have taken as reference the size distribution from the PCASP

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and CPC measurements, the scattering coefficients from the nephelometer and the AOT from AERONET. A check if the recalculation of all optical measurements (AOT and sky brightness) still leads to values within the error bars of the measurements would validate the method. A comparison between the measured size distributions and AERONET is also necessary (as mentioned also by Rev. #1). What about the comparison of the BER from lidar and that calculated using a Mie model and the measured microphysical parameters?

I have a hard time to believe the backtrajectories arriving at 500 m with so many deposition on their way. Therefore I agree with the first minor comments from Rev. #1 about performing a sensitivity study of the backtrajectories.

Some parts of the sections Comparison to AERONET measurements and Comparison with lidar profiles are not at the right place. Both AERONET and the lidar measurements take part completely to the retrieval of the ACRI and should come earlier in the paper.

I think a table is necessary in the Section Comparison to previous studies. Furthermore an identification of cases similar to the study presented here should be emphasized. My sensation is that, as it is presented here, that section could perfectly fit in the introduction, qualitatively speaking, as it browses the different techniques used to retrieved range-resolved ACRI.

Specific comments

All comments on Fig. 1 are unreadable. Please use a larger font.

p. 10801, line 8: been should read be.

p. 10801, line 9: in extensively should read by intensively.

p. 10801, line 25: regarding at should read by looking at.

p. 10806, line 20: been should read be.

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Revise the English thoroughly!

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