

Interactive comment on “A comparison of light backscattering and particle size distribution measurements in tropical cirrus clouds” by F. Cairo et al.

Anonymous Referee #1

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The authors present comparison of backscattering coefficient of from cirrus clouds measured by backscattersonde on a board of the aircraft with particle parameters retrieved from size distribution measured with Particle Counter. As a result the linear relationship between particle number density and backscattering coefficient is established. This is a useful result to be exploited in ground based lidar data analysis. The paper is clearly written and can be published after minor revision.

The weak point in this paper is the use of Mie calculations for the modeling of cirrus clouds backscatter. The authors understand this issue and mention it. It is good also

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that the authors realistically estimate the uncertainties of their analysis.

Specific comments

p.4067, ln.2. “. . . the discrepancy remaining on average within a factor of 2”. Can it be seen on panel F of Fig.2? What does the linear fit on that panel mean? Is it “perfect” case?

p.4067, ln.5. “This result is likely due to the fact that in the present study the scattering is dominated by particles whose diameters are above 4 μm , and allows us to rule out any appreciable dependency from the particular binning used, on our optical computations.” This sentence is not clear for me.

p.4067, ln.20. Just want to mention that for the real part of refractive index 1.35 and particle radius of several μm the backscattering by spheres is about 2.5 times higher than backscattering by randomly oriented spheroids of the same volume (Veselovskii, I., O. Dubovik, A. Kolgotin, T. Lapyonok, P. Di Girolamo, D. Summa, D. N. Whiteman, M. Mishchenko, and D. Tanré (2010), Application of randomly oriented spheroids for retrieval of dust particle parameters from multiwavelength lidar measurements, J. Geophys. Res., 115, doi:10.1029/2010JD014139, to be published).

p.4070, ln.2. “This correspondence suggests that the portion of size distribution sampled by the FSSP is sufficient to account for the overall optical properties of tropical high cirrus clouds at 532 nm.” Mie calculations overestimate backscattering, but if part of the particles stay undetected by FSSP, these effects may be partly compensated. . .

Fig.6-Fig.9 “. . . measured by the backscattersonde (vertical). . .” Vertical or horizontal? Because surface, volume etc are shown for vertical. I don’t understand also the capture on the lower panel : “aerosol backscattering coefficient –FSSP”. Does it mean that backscattering is calculated from FSSP data?

The authors mention possibility depolarization measurements, but no depolarization data are given.

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