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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Statistics of vertical backscatter profile of cirrus clouds" *by* P. Veglio and T. Maestri

Anonymous Referee #1

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General Comments:

This work presents a very useful study of the statistics of the vertical distribution of backscatter, and, by implication, IWC, in thin cirrus clouds as measured by the CALIOP lidar on board the CALIPSO satellite. It should find considerable use by those researchers wanting to perform radiative transfer calculations on cirrus clouds.

The work is systematically and logically structured and the analysis thorough and well supported by clear and relevant figures and tables. Once a few remaining, minor, technical errors are fixed, I would recommend that this work be accepted for publication.

Specific Comments:

p. 25820, lines 3-5. It might help their readers and avoid the potential for confusion

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if the authors were to point out that the symbols used in this present work represent quite different quantities from those they represent in the CALIPSO documentation. (e.g. beta_primed here represents total backscatter while it represents attenuated backscatter in the CALIPSO documents. Similarly, beta_a here represents attenuated backscatter, but aerosol backscatter in the CALIPSO documents.)

p. 25823, lines 8 – 15. The authors should probably add a note of caution here regarding the effects on CALIPSO's layer detection algorithms of the reduced the SNR during daytime. With the higher levels of daytime noise, where backscatter signals near cloud top and base are below the noise level, the cloud boundaries detected by the algorithm will be closer to the center of the cloud than is actually the case. i.e. Detected cloud tops will be lower and bases higher than is actually the case. This effect may account for some, if not all, of the difference reported here. This could also explain some of the reported reduction in detected cloud thickness by day.

p. 25846, lines18 – 21. (Possible attenuation correction errors) Did the authors use the CALIPSO extinction retrieval QC flags to filter their selection of data in this work? For example, some researchers only use results with QC = 0 or 1 to indicate the highest quality retrievals. Higher values do not necessarily indicate problems, but they may exist.

Minor Technical Points:

p. 25813. Could change title to " . . . backscatter profiles . . . "

p. 25814, line 5: "distribution"

" line 11: "relationship"

" line 15: "located near cloud top "

" line 18: "have smaller effects"

p. 25815, line 1: "which normally cover"

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" line 4: Do you mean that their coverage of the region is about 40%?

" lines 11,12: “crucial for determining . . . of the Earth’s atmosphere”

" line 20: “high cloud microphysical properties”

p. 25816, line 25: “to derive ice particle effective sizes at cloud top”

p. 25817, line 3: “suitable for observing”?

" line 11: “possibility of sensing”?

" line 14: “launched into orbit”

p. 25818, line 18: “for determining”?

p. 25820, lines 14,15: “The uncertainties. . .data lead to estimated percentage errors” ?

p. 25821, line 16: “80 million FOVs”

p. 25822, lines 23,24: “Some basic statistics . . . are given”

p. 25823, line 2: “match those found by other authors”

" line 5: “with respect to what was found”

" lines 10,11: “These values are in good agreement with those found by . . .”

p. 25824, line 16: “to avoid the possibility that”

p. 25828, line 1: “with respect to what was found”

p. 25834, line 8: “are superimposed on the frequency of occurrence”

" lines 13,14: “relationship”

p. 25835, line 11: “are larger (by a factor of between 1.5 and 2)”

p. 25836, line 14: “values that are mostly below 10%”

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p. 25839, line 2: “thus providing a more realistic description”

p. 25840, line 1: “span various” (“over” is redundant.)

" line 9: “is of second-order importance with respect to variations”

" lines 19,20: “total particle number concentration”

p. 25843, line 17: “Simulation results are weighted by the spectral response functions”

p. 25844, lines 19,20 “cirrus cloud IWC profiles”

" line 26: Do you mean “have a detectable (or measurable) impact”?

" line 27: “cirrus cloud properties”

p. 25845, line 15: “total attenuation effects. . .”

" lines 15,16: “Cirrus cloud covered fields of view”

p. 25846, line16: “relationship”

p. 25847, line1: “Similarly to what was found”

" line 11: “compared to that found”

p. 25848, lines 12,13: “The problem arises when”

p. 25849, line 9: “cirrus cloud data set”

" lines 10,11: “minimum number of profiles . . . that is required”

p. 25850 List of Acronyms: The full instrument, mission or facility names are usually written with initial capitals, e.g. Geoscience Laser Altimeter System.

p. 25851 line 4: “their valuable suggestions”

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