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Atmospheric Measurement Techniques Discussions

Interactive comment on "Analysis of co-located MODIS and CALIPSO observations near clouds" *by* T. Várnai and A. Marshak

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General Comments

This paper describes synergistic use of CALIOP and MODIS data to quantify the distance between clouds over global oceans and to thereby establish a sphere of influence that clouds have on surrounding aerosol properties. Using a statistical relationship based on MODIS observations to correct CALIOP observations of aerosol changes in the vicinity of clouds as the authors have reported is a novel idea and is critically important at interpreting satellite retrievals of this behavior.

Given the importance of the scientific issue discussed (reconciling the influence of

clouds on aerosol optical properties) and the novel, synergistic techniques employed using satellite data, I concur that this paper addresses scientific questions within the scope of AMT. The contribution that this paper makes to this topic is clearly evident and attribution is given appropriately to related studies.

I believe that the assumptions employed in analyses of the two satellite datasets are valid though I ask for some elaboration on one assumption in specific comment 1 below. The description of analyses is thorough enough to be reproduced by fellow scientists, though I ask the authors to please expand on their description in specific comment 3 for enhanced clarity. I believe that the main conclusions follow logically from the authors' arguments. All content within the manuscript is relevant – I see no need to reorganize or remove any portions.

Based on the strength of the manuscript and the scientific importance of the topic discussed, it is my recommendation that this article be published within the AMT journal, provided the authors please respond to my comments below which I hope will help enhance the clarity of an already solid article.

Specific Comments

1. P. 6864 line 14: Please provide a justification as to why only the 1 km resolution CALIOP cloud mask was used and why the 5 km resolution CALIOP cloud mask was not used.

2. It would be informative to show the number of samples that went into Figure 3 and Figure 5 either in the manuscript or in an online supplement. If most clouds are separated by 4-5 km, then it seems that there would be relatively few 'clear air' regions 20 km away from clouds. Perhaps just stating that "x samples were included at 1 km from clouds and this number reduced by y% to z samples at 20 km from clouds" would be sufficient.

3. P. 6866 line 24 -27: Please elaborate on how CALIOP data was averaged with

varying distance from cloud edge and used to create Figure 3 and Figure 5. Based on how this analysis was conducted in the three papers cited, attenuated backscatter and color ratio were recorded from cloud top to cloud base with varying distance from cloud for each individual cloud and then medians were computed from samples recorded at identical altitudes. Finally, the median backscatters are integrated from a higher to a lower altitude. Taking the words of the manuscript literally, this is not so clear because these details are in the cited works. It would be tremendously helpful to give more details of how this calculation was accomplished here – even if in just a sentence or two – so the procedure is clear based on this paper alone.

Technical Corrections

1. Throughout the manuscript, the word "backscatter" is used for the quantity "attenuated backscatter". This may cause some confusion because there are both "backscatter" and "attenuated backscatter" products reported from CALIOP data. So that readers understand exactly which CALIOP product is used, please call the quantity "attenuated backscatter" everywhere it is mentioned as "backscatter", or (perhaps the better option) add something like this to P. 6864, line 16: "(called "backscatter" throughout this paper for brevity)".

2. P. 6867 line 14: For clarity, please change, "(and hence lidar backscatter)" to "(and hence high lidar backscatter)".

3. P. 6870 line 9: It may be clearer to say "grow closer together" instead of "grow closer". Just a suggestion.

4. P. 6872 line 15: If I understand correctly, please replace "We plan to report on a such follow-up study. . ." with "We plan to report on such a follow-up study. . .".

5. Figure 3 vertical axis label: It would be more accurate to label this axis as "Integrated Median 532 nm CALIOP backscatter (/sr)" At first look I thought the units were wrong because backscatter has units of /km/sr, but because this is actually integrated

backscatter with units of /sr, the units are correct. Modifying the label would alleviate this confusion for other readers.

6. Figure 4 (a): Please state that the data going into this figure is for the entire year dataset in the caption.

7. Figure 5 caption: Replace "Median CALIOP backscatter. . ." with "Median CALIOP color ratio. . .". Also, please clarify, were the 1064 nm and 532 nm median backscatters integrated and then the ratio was taken of the two integrated quantities to obtain the color ratio in the figure?

Interactive comment on Atmos. Meas. Tech. Discuss., 4, 6861, 2011.