Atmos. Meas. Tech. Discuss.,
doi:10.5194/amt-2017-340-RC3, 2017

Atmospheric Measurement Techniques Discussions

Interactive comment on "Minimum Aerosol Layer Detection Sensitivities and their Subsequent Impacts on Aerosol Optical Thickness Retrievals in CALIPSO Level 2 Data Products" *by* Travis D. Toth et al.

Anonymous Referee #3

Received and published: 25 October 2017

The paper presents and discusses the CALIOP detectability problem of tenuous aerosol layers with backscatter below the algorithm noise floor. This technical issue is critical since it propagates into CALIOP climatological AOT studies and based on the selected approach introduces artificial underestimations or overestimations to detected AOT features. The paper is not only limited to addressing the issue. The paper quantifies the related AOT of retrieval fill values (RFV) over ocean (daytime), through comparison with MODIS Aqua DT AOD and AERONET coastal sites, performs a proof-of-concept exercise to correct the artificial effect of RFV values, introduces the night-

time problem and refers to the CALIPSO improved V4.

The study falls within the scope of AMT. The authors have done a thorough job and have a rigorous approach. The manuscript is well-written/structured, the presentation clear, the language fluent and the quality of the figures high. Furthermore, the authors give credit to related work and the results support the conclusions. I recommend publication following minor revisions.

1) CALIOP methodology: The description of the methodology is not sufficient. In the Datasets section the authors state that "prior to analysis, advanced QA procedures are performed on the L2_05kmAProf product. This QA scheme is similar to that employed in Campbell et al. (2012) and Winker et al. (2013), detailed descriptions of which are also outlined in our most recent CALIOP-based study (Toth et al., 2016)". This section is of high importance since the scientific methods, assumptions, the validity of the conclusions are based on the preprocessing of the CALIOP data. Although proper reference is given, a short summary of the methodology would help the reader to follow.

2) In page 11, lines 256-258 and for Figure 2c the authors state that "... L2 CALIOP profiles collocated with MODIS AOT between 0.03 and 0.07." The reason of the selected boundaries 0.03/0.07 is not clear.

3) I would suggest the authors to provide similar histograms of all over ocean Aqua MODIS AOT (#) for the same domains (used in figure 4) and of AERONET-number of AOT (presented in figure 8), in order for a reader to be able to visualize the differences between the different sensors, apart from just MODIS and AERONET statistical values (mean/median-table 2). This would strengthen the scientific question through the simple visual comparison of the different histograms. The figures could be added either in comparison with the already existing figures or as supplementary files in the end of the paper.

4) Figure 4. The exhibited distributions between the three domains are not similar in terms of the first MODIS AOT bin, between 0 and 0.01. Figures 4a and 4c are

characterized by large number of CALIOP profiles, both all-RFV and all, larger than the following bin between 0.01 and 0.02. This characteristic reverses for the 30S to 30N domain. This feature is interesting and may deserve some justification.

5) Figure 6. The exhibited distributions between the three domains are not similar in terms of the last AOT Aqua MODIS bins in the 60S-30S domain. Figures 6a and 6b are characterized by a decreasing percentage with increasing Aqua MODIS AOT values (0.2-0.3). This characteristic reverses in Figure 6c. This feature is interesting and may deserve more attention.

6) Although the paper's purpose is the description of the RFV problem, the quantification of the RFV problem in CALIPSO V4 may be more interesting than for the outdated CALIPSO V3.

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2017-340, 2017.