Atmospheric
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Techniques

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Discussions

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Interactive comment on "The CALIPSO Version 4 Automated Aerosol Classification and Lidar Ratio Selection Algorithm" *by* Man-Hae Kim et al.

Anonymous Referee #1

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Review: The CALIPSO Version 4 Automated Aerosol Classification and Lidar Ratio Selection Algorithm

Authors: Man-Hae Kim, Ali H. Omar, Jason L. Tackett, Mark A. Vaughan, David M. Winker, Charles R. Trepte, Yongxiang Hu, Zhaoyan Liu, Lamont R. Poole, Michael C. Pitts, Jayanta Kar, and Brian E. Magill

General comments:

The document clearly describes the steps taken in the algorithm and the changes made between the different versions, in that sense it is a very readable version of the ATBD and will be important for the users of the data to read. The paper is very lengthy but that is by no means a bad thing for this type of article which has to describe all the

changes and the impacts of each.

I was very lucky to have a pro-active editor who made a large number of substantial comments resulting in a revised version before I had to go through the paper, making the task a lot easier. I will not add comments from my side which touches those discussions, knowing that some of the specific details have been looked at in detail. For the remainder the authors only need to look at some minor comments from my side.

I personally very much like the change in the concept in V4 of retrieving the subclasses for stratospheric aerosols and allowing the more general aerosols over polar regions. The main part which I am still wondering about is why the 1064nm channel provides you with no additional information in the troposphere. It is mentioned that within the PBL the color ratio does not help with the classification, however I did not notice a similar remark for the remainder of the troposphere. Please include a small discussion on why the color ratio has no impact on the classification in the troposphere since now only 2 of the three signals are used in this regime.

In a lot of places within the document the effects of the new Earth's Surface detection scheme (Vaughan 2018b) is discussed. Sadly enough I do not have a draft version available of this paper, making it impossible to understand the why's of any changes. There is enough information provided to 'trust' the results, so I will do without for this review.

Minor comments:

Page 2, Line 25: compare –> compared Line 26: Even though it is obvious please add V3 to CALIOP AOD

Page 6, Line 12: AOD differences

Page 10, Figure 5: would it be possible to overplot the Arctic PSC season (winter that year) to show that the -70 is consistent for both absolute high latitude regions.

Page 14, Line 7: two releases. Also add a bit more information/origin on the 20 and

80km resolution

Page 20, Line 4: demonstrates an

Page 21, Line 20: Can you explain the 31% quoted there. My guess is that it is the normalized values of 1.18 and 0.13 combined, but a bit more explanation here would make it a lot easier to comprehend

Page 22, Line 7: Add what the averaging boxes are 1 deg x 1deg ?

Page 24, Line 2 : anan Line 13: give full name of AVD (maybe I missed it earlier) Line 18: WhileWhile

Page 24 Line19 & Page 30 line 15 : Remove correctly from 'correctly classified & correctly detected'. The word correct should not appear in a this text as the absolute truth is not available. You can maybe use 'more realistically' or something like that if you would like to add an adverb. I agree that for surface detection one could consider it, however in the previous version the surface was also thought to be correct.

Page 24 Line24: Rewrite sentence 'Similarly . . ..in V3'.

Page 25,Table 5. Most of the work is a comparison between the two versions where we now have absolute values in this table. What is clearly noticeable is not only the change in mean value but also the larger standard deviations for the V4. Since we are looking at the 0, 1, 16 and 18 QC flags only, I would like to see the subdivision of the mean and std deviations for these four individual flagged pixels and see where the std deviation has increased most and a small discussion why. Please add the values for the four QC flags individually to the table.

Page 30 Line 21: a decrease in the mean AOD

Page 32 Lines 27-29: The discussion is hard to follow, mostly due to the word smaller (I think). I guess you mean smaller in absolute value here or not. In any case please rephrase this sentence to make it crystal clear what you mean

C3

Page 34, Line 13: are now correctly classified as → are more realistically classified as Line 19 : have been updated Figure 17: By eye it looks like there are two distributions combined (heart shaped distribution) with one above and the other below the 1-1 line. Is there a reason for this, one day and the other night?

Figures: The axes font-sizes of Figures 2, 3, 7, 8, 9, 11, 15 are extremely small, I think it would improve reading/glancing of the figures enormously if these would be increased.