

Interactive comment on “CALIPSO Lidar Calibration at 532 nm: Version 4 Nighttime Algorithm” by Jayanta Kar et al.

Anonymous Referee #1

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The paper “CALIPSO Lidar Calibration at 532 nm: Version 4 Nighttime Algorithm” presents and discusses the improvements of the CALIOP detectability (especially of stratospheric aerosol layers) due to the implementation of the version 4.1 calibration algorithm and the change of the normalization altitude from 30-34 km to 36-39 km. This technical issue is critical since it propagates into the 532 nm daytime and 1064 nm calibrations. The paper is not only limited to addressing the issue. The paper discusses the effect of the new normalization altitude to biases in earlier versions and is extended to compare the effects of the two versions against LaRC airborne HSRL.

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. I recommend publica-

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tion in AMT, however I recommend the following revisions before it can proceed to be published.

Comments:

1) As indicated in the very first lines of the manuscript, in the abstract, the author's intention in this work is to provide the motivation of the new algorithm implementation for CALIPSO 4.1 calibration. The motivation is highly related with the problems identified due to the V3 normalization altitude between 30 and 34 km, which led to the idea of the new normalization altitude between 36 and 39 km. Therefore I would expect a more extended literature survey studies related to CALIPSO validation. In this way the motivation of the new algorithm would be more clearly introduced in the beginning of the manuscript, for the entire study to follow presenting how the problems-biases were dealt with.

2) Signal-to-Noise ratio and Noise-to-Signal ratio. Both are used, sometime in the same sentence. In the first part of the manuscript, the "Signal-to-Noise" ratio is presented and discussed, while in the second half the ratio is switched to "Noise-to-Signal", not only in the manuscript but also in the figures and the discussion. I suggest the authors to keep one throughout the entire manuscript.

3) Page 5, lines 8,9 and for Figure 2: For GOMOS, the aerosol extinctions at 500 nm were converted to R at 532 nm using a stratospheric aerosol lidar ratio of 50 sr and an Angstrom exponent of 1.5. Why a LR of 50 sr was used and an Angstrom exponent of 1.5? Please provide related reference. Furthermore the justification of selecting SAGE II and not GOMOS as a reference standard is missing. References are needed also.

4) Figure 7: The rate of the V3 and V4 are characterized indeed by similar PDAC calibration success rates, although V4 seems somewhat more noise. I suggest the authors to include along with Fig.7a and Fig.7b a third figure showing the Relative (or Absolute) Difference between the two (V3 and V4) in order for the features of the changes in the success rate to be shown more clearly.

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5) Figure 8: Fig. 8 shows the time series of the granule averaged V4 532 nm CALIOP nighttime channel calibration coefficient. I would suggest the authors to include the similar V3 calibration coefficient (on the same figure), since the paper is highly related to the change from V3 to V4 normalization altitude.

6) Validation of V4 calibration: Comparisons with HSRL measurements (Figure 17): I would suggest the use of (CALIOP-HSRL)/HSRL and not the (HSRL-CALIOP)/HSRL, hence subtracting the reference (HSRL) from the measurement-to-be-validated (CALIOP). The use of (CALIOP-HSRL)/HSRL would in addition provide consistency with other CALIPSO validating studies (Pappalardo et al., 2009).

7) Reference: Getzewich, B., Vaughan, M., Hunt, W., Avery, M., Tackett, J., Kar, J., Lee, K.-P.: CALIPSO Lidar Calibration at 532 nm: Version 4 Daytime Algorithm, in preparation, 2017. To be submitted in the present Special Issue?

8) The reference list of related work is highly biased towards US groups. I suggest to consider acknowledging the work of European groups that have devoted time and effort on CALIPSO, including cal/val studies, mostly published on AMT or ACP Copernicus journals.

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