

Anonymous Referee #2: Anonymous

Citation: <https://doi.org/10.5194/essd-2026-114-RC2>

Antuña-Marrero et al., : "Extending the late 1963 to 1964 Mt Agung rescued searchlight aerosol profiles dataset at 32N, from early 1963 to 1976."

General comments:

This paper describes rescued and digitized data sets of stratospheric aerosol extinction (and turbidity) based on searchlight measurements carried out in the U.S. in the 1960s and 1970s. The data sets are important for the atmospheric science community and I think the paper should eventually be published. I ask the authors to consider the comments below.

I have two general comments:

1. Although the complexity of the study is not very high, the description of the different profiles is not easy to follow and I suggest restructuring the introduction of the different profile types (introduce AEP_c and AEP_d in two subsequent sentences). At some point AEP_s appears and it is unclear to me, whether this is a typo; I assume that.

Answer: We agree.

- The definitions of ATPd and AEPd were integrated in the same sentence, The sentence beginning at the end of the former line 83 was modified to define ATPd and AEPd. It is now: *"The plot digitization was conducted using the WebPlotDigitizer software (Rohatgi, 2024), at the 0.5 km resolution, producing the ATPd and AEPd from the plotted ATP and AEP respectively"*.
- The definition of AEPc is two sentences after the sentence cited above, following the logical consecutive description of the digitization, calculation and interpolation procedures applied.

The 1st paragraph in section 2.1 was restructured in part, to facilitate an easy reading.

Thank you for pointing AEP_s. It was a typo, also present in some cases for the different acronyms. We identified and corrected all them.

2. Is it possible to provide an error estimate for the extinction coefficients and the sAODs? The background values (before the arrival of the volcanic plume in spring 1963) are already quite high, both for the extinction coefficient and sAOD. This data set is of course only useful for climate modelling, if it is accurate and/or an error estimate exists.

Answer: The error estimate of the extinction coefficients has been included at the beginning of section 2.2, as part of the changes made in this section (see the answer to your comment "Equation (2):...").

The explanation for the high background sAOD values before the arrival of the volcanic plume is explained in the answer to your comment "Line 173:...".

It is not possible to provide an estimate for the sAOD error. The extinction coefficients error provided are already a gross estimate in absolute values. The integral of those absolute values will produce an unrealistic result, because in the reality there are contributing uncertainties with different signs.

The most recent evidence of what I explained below is a CLAIPSO AOD validation. Applying the theoretically algorithm the results showed the RMSE of 93% and BIAS of -20% (determined using all the information about the instrument and the atmospheric conditions with modern technology, information that we do not have for the dataset in our study). The validation with AERONET AOD (the recognized standard because of its uncertainty of ± 0.01) showed RMSE of 60% and no BIAS (Thorsen et al., 2025).

Thorsen, T. J., Ryan, R. A., and Vaughan, M. A. (2025). Validation of aerosol optical depth retrieved from CALIPSO lidar ocean surface backscatter. *Journal of Geophysical Research: Atmospheres*, 130, e2024JD042416. <https://doi.org/10.1029/2024JD042416>

Specific comments:

Line 15: "digitization's errors" -> "digitization errors"

Answer: Corrected

Line 20: "This fact"

In the previous sentence you write "what could be", now it is suddenly a fact?

Same line: "the arrival .. arrived"

Please adjust/correct.

Answer: Replaced *“fact”* by *“would”*. Erased *“...the arrival of...”*

Line 28: space missing in Fontijn reference.

Answer: Corrected

Line 29: Delete “the” in “Before the 1979”

Answer: Corrected

Line 40: “the datasets have not been available at any data repository/archive for more than half a century.”

The data set probably has never been available, right? The sentence allows the possibility that they were available at the beginning and then not any more.

Answer: We agree. The sentence was changed to: *“...the datasets have not been available so far.”*

Line 52: “consists on” -> “consists of”

Answer: Corrected

Line 55: “has been” -> “have been”? I think the sentence is incomplete or misleading. Please check, whether intended meaning and actual meaning match.

Answer: Corrected. Replaced *“...has...”* by *“ have...”*. The sentence was rewritten: *“The original and the recalibrated tropospheric and stratospheric searchlight AEP have been stored at PANGAEA (Antuña-Marrero et al., 2023) like the other four stratospheric lidar AEP datasets cited above.”*

Line 70: “at the same night” -> “in the same night”

Answer: Corrected

Line 82 and lines 90, 125: “on Table” -> “in Table”

Same line: “the others” -> “the other”

Same sentence: “have been digitized”

By whom? Probably by you as part of the current study. From the way this is expressed it is not clear, whether this was done in past study or within the current study. Please state it explicitly.

Answer: All the corrections were made. The sentence beginning on former line 81 *“Three of the ATPs have not been digitized, ...”* was changed to *“Within the current study three of the ATPs have not been digitized, ...”*

Line 84: “The plots digitization” -> “The plot’s digitization” or probably better “The plot digitization”

Answer: Corrected

Line 86: “The 11 ATPs and 2 AEPs plots” -> “The 11 ATP and 2 AEP plots”

Answer: Corrected

Line 91: “The second column reportS”

Answer: Corrected

Equation (2): I wonder, why the digitization is necessary, if the values are published in papers? Perhaps values are only published for a subset of the profiles (I'm getting confused with all the different profile abbreviations). If yes, I suggest stating this here explicitly. Thanks.

Answer: You misunderstood what we were talking about, very likely because of the very short title of section 2.2 and the text after it and before subsection 2.2.1.

We are referring in this section to the errors from the digitization (ATPd and AEPd) and from the calculus of AEPc using Eq. (2) and the ATPd.

The text in section 2.2, before subsection 2.2.1 was erased and a new paragraph reporting the errors magnitudes for the original dataset and for the rescued and recalibrated. Also, subsection 2.2.1 title and text were rewritten. Also, de subsection title was rewritten. See the new version of the manuscript.

Lines 128 and 129: “RME”

Above you define “MRE”, not “RME”

Answer: Corrected

Line 146: “respect to” -> “with respect to”?

Answer: Corrected

Paragraph starting line 147 and also definition of the different profiles above: I read the corresponding section several times and I think the overall description of the different profiles and the difference between AEP_c and AEP_d can be and should be improved. "AEP_d" appears first in line 114. I suggest explaining in subsequent sentences, what "AEP_c" and "AEP_d" mean. Currently, the text is not really easy to follow.

Answer: AEPd is now defined in the current line 87 of the subsection 2.1 1st paragraph, when the digitization is explained.

The paragraph beginning on the former line 147 has been modified and a mention of figure 1 has been introduced.

Line 152: “currently missed”

I don't really understand what this refers to? Please explain in text.

Answer: The very original profiles (tabulated) for the daily AEP for November 11th 1974 at 22:17 MST and for the average AEP from October-November 1970 are not available. That is why they are “currently missed”. We have in this case no one for the daily and the bi-monthly averaged profiles, but two plots: the ATPs and the AEPs. The AEPs are the better approximation we have to the tabulated AEPs and we are using them as the “proxies” to the tabulated AEPs.

Lines 164, 171: “on figure/s” -> “in figure/s”

Answer: Corrected

Line 165: 3 occurrences of “AEP_s” (with subscript “s”): What are these profiles now? Something new? Or a typo and it should be “AEPs”?

Answer: It was a typo. Corrected

Line 173: the sAOD before the arrival of 0.019 is already quite high and significantly higher than typical background sAODs, right? It would be good to discuss that and also, how reliable these sAOD values are in general.

Answer: We added a text, in the last paragraph of section 3, discussing the high background sAOD in the early sixties, just before the 1963 Mt Pinatubo eruption.

Line 177: 2 occurrences of “AEPc” -> “AEP_c”

Answer: It was a typo. Corrected

Line 188: “which length” -> “whose length”

Answer: Corrected

Line 190: “that the last sAOD value”

Meaning unclear, the last sAOD value shown in the Figure is in 74/75, but you mean daily values in 1964 here, right? Please correct.

Answer: There was a mistake to initiate a paragraph with the sentence *“It should be emphasized that the last sAOD value, ...”*. It has been corrected and that sentence is now part of the 1st paragraph of this section.

Also, the text *“...that the last sAOD value, and its associated increase ...”* has been replaced by *“...that the cited sAOD value in June 12th, together with the increase ”*