Anonymous Referee #3: Anonymous

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

This paper covers the extension of the recovery of data during the pre-satellite period of stratospheric aerosol observations particularly in the time frame of the 1963 Agung eruptions. These data sets are extremely valuable and the dedication of the authors to this mostly thankless task is a true service to the community. The paper describes the process of data recovery well and I support publication of this paper with some minor revisions enumerated below.

(The reviewer's comments has been numbered to facilitate crossed references)

1. The primary concern I have is that, since I am not terribly familiar with search light measurements, I don't appreciate the measurement process or the uncertainties associated with these measurements. A brief discussion of how the measurements are made (a paragraph) would be helpful. Also, the paper describes digitization differences between the historical tabulated data and the digitized data record produced in this paper but does nothing to provide the reader with any idea how this data could be used in practice.

Answer: We agree with your suggestion: The sentences below were added to the paragraph mentioning the searchlight by first time in the Introduction:

"*The searchlight was a predecessor of the lidar, with the main difference been that, instead of a laser, it used a powerful light projector (like the ones used for civilian and military aircraft surveillance and control) and a narrow wavelength band optical filter was installed in the receptor. The earlier article reporting the rescue and recalibration of the searchlight AEP from tables in an AFCRL report describes the searchlight design, measurement and data processing, which are almost the same that a contemporary bi-static lidar (Antuña-Marrero et al., 2024)*".

A new paragraph has been added in the Introduction **on line 62** describing two applications of rescued lidar aerosol extinction profiles, one for filling gaps in GloSSAC (Thomason et al., 2018) and the other for validating volcanic modeled SA extinction profiles (Dhomse et al., 2020). In addition, the recognition of the potential contributions of historical unexploited datasets in Thomason et al., (2028). Also, a recent article from CMIP7, mention the five Stratospheric Aerosol Activity rescued datasets cited above to contribute to the existing aerosol optical properties dataset (Aubry et al., 2026).

2. For instance, I find the profiles in Figure 1 look unrealistic at higher altitudes and wonder how good the profiles are at those altitudes and by extension throughout. In addition, the scatter shown in Figure 3 is so large after the eruption of Agung that I wonder about how robust the original measurements are.

Answer:

Both profiles in Figure 1 are perturbed by the October 14 – 17, 1974 eruption of Fuego volcano. 2.76 km (the lower altitude of the measurement) to around 20 km, the aerosol extinction is in the order of 10^{-2} km^{-1}, decreasing one order of magnitude above. In the left (Oct-Nov 1974 averaged profile) between 30 and 35 km the aerosol extinction is another order of magnitude lower. Those are typical values for volcanic SA from eruptions of medium magnitude. If you compare with figure 8 (Antuña-Marrero et al., 2024) show the average profile of all the searchlight profiles between Dec-1963 and Dec-1964, you see that those magnitudes are not atypical.

In figure 3 (Antuña-Marrero et al., 2024) the variable plotted is the sAOD. calculated between 12 and 25 km, using the original AEP rescued from Tables in an AFCRL report. A comparison of the searchlight monthly mean sAOD between Dec-1963 and Dec 1964 with the lidar sAOD from Lexington, MA, sAOD from Sato (1993) and Stothers (2001), both for northern and southern hemisphere. In addition, the sAOD from two lunar eclipses are shown.

3. How much of the scatter is related to the difficulty of making the measurements and how much represents real geophysical variability? I recognize that the authors do not have access to the raw data but, at this point in time, they may have more insight into the difficulties of making these measurements than anyone else and it would be extremely helpful to elucidate these issues to their potential users.

Answer: We already answered this comment in the Answer to Comment 1.

4. I worry a bit about using a fixed 12 km tropopause altitude in the sAOD calculations since that altitude can be quite variable and, particularly in the Summer, it can be quite a bit higher than 12 km so some tropospheric aerosol would be included in a stratospheric value. I recognize that part of those

calculations is meant to produce comparable values to those reported but some clarity on that would be welcome.

Answer: We agree. We also worried about 25 km top altitude. However, the very scarce reports of sAOD magnitudes available in the literature about this dataset used as bottom and top limits 12 and 25 km. For the purposes to verify the uncertainties in the digitization and resulting AEP integration we had no option, but to use it.

5. In general, the extinction referred to in the manuscript would be more correctly referred to as extinction coefficient.

Answer: In practice when the term "aerosol extinction" is used it is implicit that it refers to the "aerosol extinction coefficient".

6. The grammar is stilted at times throughout the paper.

Line 42, I think SSiRC has been renamed recently though it is well known by the former name.

Answer:

7. Line 55 It might be worthwhile to mention the recovery of the post El Chichón NASA aircraft lidar data as a part of GloSSAC and available at the NASA Atmospheric Sciences Data Center.

Answer: That mention has been included in the new paragraph added in the introduction, already cited in the Answer to Comment 1.

8. Line 75 You could probably eliminate equation 1 and just refer to *ATP(z) at 0.55 microns is determined as the ratio of the original published extinction coefficient profiles and the Rayleigh (molecular) extinction profiles found in Elterman (1964).*

Answer: We prefer to keep it to facilitate the understanding of the calculation procedure.

9. Line 118-123 I don't understand the discussion of estimated errors. Is this just the difference between tabulated errors versus the digitized values? If so, the discussion should be clearly referred to as digitization uncertainty. (later on this becomes clearer)

Answer: We agree, we introduced several corrections, including the sections names, to make easier to understand.

10. Line 159 Focused with one s is much more usual.

Answer: The paragraph was modified to explain what make those features relavant.