Comment on essd-2022-272
Anonymous Referee #2

Referee comment on "The recovery and re-calibration of a 13-month aerosol extinction profiles dataset from searchlight observations from New Mexico, after the 1963 Agung eruption" by Juan-Carlos Antuña-Marrero et al., Earth Syst. Sci. Data Discuss., https://doi.org/10.5194/essd-2022-272-RC2, 2022

This study shows the recovery and recalibration of an extensive dataset of stratospheric aerosol vertical profiles originally measured during 1963/64 by two searchlight measurement sites in New Mexico, US. A description of the original retrieval process and discussion of the source of its sources of uncertainty are provided. The different steps, including assumptions and additional processing of the recovery and recalibration processes are described. The goddess of the new vertical products is shown through comparison against independent stratospheric and column integrated AOD of different sites.

The complex methodological structure, with lots of references to specific tables, figures and data in the literature, makes it difficult to follow some parts of the manuscript. Inputs, outputs and assumptions have to be clearly indicated in the description of each step of the recalibration, recovery or retrieval.

Use of English needs to be deeply revised. Lots of typos and poorly constructed sentences can be found along the text, making some paragraphs hardly understandable.

Some specific comments can be found below:

- section 2 needs to be revisited, it is not clear for me what is being described, the original method of the measurements or the new methodology applied after re-digitalization or both are the same. A better explanation is required of how the iterative process is made. Please, state clearly which are the inputs, outputs and assumed parameters. A table or an explanatory box chart will be very useful.
- line 184: Table 1 is referred but further details are needed. Some column names are
not totally clear (ToD (LST) and DD).
- line 207: $T_p(z)_{init}$ first mentioned here. Clarification of its meaning is necessary.
- In line 242 is stated that only aerosol profiles are going to be considered in this work. And in the same paragraph some lines after it is said that a two component atmosphere is assumed. Thus, I do not understand the need of refilling the aerosol profile with Rayleigh values. If Rayleigh is already accounted for in the molecular profile, these points corresponding to aerosol should be zero according to my understanding. Unless the authors are referring to total extinction, in this case it should be clearly indicated.
- line 366: It is not clear what is the second molecular phase function that was applied to the top part of the profile.
- line 460: It is difficult to understand what is represented in figure 4. This sentence needs to be revised.
- What is the wavelength corresponding to AERONET AOD represented in figure 7?
- What is the meaning of the whiskers in figure 7? Standard deviation?
- It is surprising the spiky behaviour of the monthly averages of AOD of the recalibrated and original datasets in the months of October, November and December. Some clarification is needed in the text.
- To my understanding the objective of section 5.5.1 is not clear. From the figure and the explanations in the text it seems that the original AOD is more adequate than the recalibrated values. If the message is that the reference stratospheric AOD and sAODorig do not retain information of stratospheric aerosol load because of different reasons, it should be clearly stated.
- line 569: “A second study reported the climatology of the mixing height (MH)” What is the reference for this study?