Earth Syst. Sci. Data Discuss.,
https://doi.org/10.5194/essd-2020-56-RC3, 2020

Open Access Earth System Science Data Discussions

Interactive comment on "A Global Space-based Stratospheric Aerosol Climatology (Version 2.0): 1979–2018" *by* Mahesh Kovilakam et al.

Anonymous Referee #3

Received and published: 7 July 2020

General comments: The paper describe the development of the stratospheric aerosol data set GloSSAC V2.0 and changes made since the last release of V1.1. The methodology of the data set construction and rational is clearly described. The paper is well written, and the results are presented and discussed with sufficent details. I recommend for publication subject to the following changes.

Major comment:

I find the authors choice of conforming rather than excluding data that exhibit very large biases (>50%) somewhat concerning. Mainly because some of these data may be affected by clouds. Kar et al. (2019) reported large differences with SAGE III/ISS below 20 km, which can be explained in part by subvisible cirrus cloud scattering artifacts that may appear to within several kilometers above the tropopause. In addition, the authors

Printer-friendly version

Discussion paper

failed to explain the advantage of using the newly released CALIOP standard products instead of version 4.0 Level 1 data used in GloSSAC V1.0. Do they believe that their approach produces better product than what was used in V1.0 and V1.1?

General comments:

Table 1: Some of the volcanic eruptions listed in table 1 did not reach the stratosphere and thus are not relevant to this dataset. The table should be modified to include only volcanic eruption that are evident in GloSSAC dataset.

Figure 1: the figure is identical to figure 1 published earlier by (Thomason et al., 2018), which shows SAGE III/ISS as a future instrument. I suggest either updating the figure or simply just cite the figure in (Thomason et al., 2018).

Page 3, first paragraph: The authors need to add a brief statement justifying the change and summarizing the differences between the new CALIOP products and the one used in V1.1.

Page 8 L6: "OSIRIS extinction is also routinely produced at 525 nm, . . ." should be replaced by "OSIRIS extinction can be produced at 525 nm, . . ." or something like that. The original text implies that it is part of the official V7.0 release.

Page 8 L10: "Since the SAGE III/ISS instruments operates in a manner virtually identical to SAGE II" "virtually identical" should be replaced by "similar" since the two instruments have different designs and age. Toward the end of its life, SAGE II was an aging instrument that operated on reduced duty cycle as compared to the newly refurbished SAGE III/ISS instrument.

Page 8, L15: "SAGE II and SAGE III/ISS are relatively unbiased with each other" this not accurate since both (Thomason et al., 2010) and (Damadeo et al., 2013) reported 10% bias between SAGE II and SAGE III Meteor, which is supposed to be identical to SAGE III/ISS. The differences between SAGE II and III should be acknowledged and discussed in this section.

Page 8, footnote 1: “While the OSIRIS instrument performance has remained unchanged over time,” This not exactly accurate. According to Bourassa et al. (2018) and Rieger et al. (2019), OSIRIS had a small drift that resulted in a pointing error and a correction was applied to V7.0. Please modify the text accordingly.

Page 9, L23: I suggest changing “Angstrom exponent” (where appropriate) to something like “pseudo Angstrom exponent” to eliminate any confusion regarding its physical meaning.

Figure 7: Can you add the year to the volcanic eruption label?

Section 3.1: The paragraph describing the choice between using the standard CALIOP stratospheric backscatter or the alternative product is confusing and difficult to follow, especially when the authors conclude that “it ultimately does not matter a great deal whether we use the standard CALIOP stratospheric backscatter product or the alternative product described above”. If that is the case, why not use the standard product and eliminate the confusion? Also, the CALIPSO section in supplementary materials implies that the standard products were used.

Page 11, L29-30: “except at higher altitude at polar latitudes where it is possible that the impact of the polar vortex plays a role in producing SFs less than 10 sr” I find it difficult to believe that the effect of PSC can cause this small ratio at altitudes between 25 – 30 km, and the statement is pure speculation. Unless the authors can show that this low ratio takes place during the winter season and low temperature, which are ideal for PSCs formation, I suggest deleting it.

Page 12, L11: The authors claim that the difference between CALIOP and SAGE III/ISS is now below 20%, when in fact figure 8d clearly shows the differences are mostly 30 and 40%. Please revise the text accordingly.

Figure 10 and 12: Can you change the y-axis to linear scale instead of log. The log scale makes it difficult to see the differences between different measurements.

Printer-friendly version

Discussion paper

Figure 6 and 11: Can you modify the color scale to -1 to 5.

Page 13 second paragraph: The authors use angstrom exponents to infer 1020 nm, similar to the method used to derive 520 nm. Can they comment on any potential use the two wavelengths in climate models, which will most likely use it to infer particle size information?

Figure 13, 14 and 15: Can you modify the color scale to properly show the volcanic enhancements. Also, can you remove the labels as they are distracting and interfere with the figure.

Section 5: It's difficult to follow the arguments regarding figure 15 because of the color scale, which doesn't show the author's argument. Please modify the color scale accordingly.

Figure 16: Again, can you adjust the color scale to show the smaller volcanic eruptions? In addition, remove the labels and add a symbol or a label denoting the location and time of each volcano.

Figure 17: Can you comment on the lack of seasonality in CALIOP data in the southern and northern hemisphere compared to other data set?

Section 6 Conclusions and future work: There is no mention of any addition of new data sets when figure 1 implies that SCIAMACHY and OMPS will be added in the future.

Supplementary materials, Figure 1: The figure needs further explanation, what year, SAGE II or III/ISS? The text implies both datasets without explaining the methodology to combine it. What wavelength? 750 nm converted to 525? How?

Interactive comment on Earth Syst. Sci. Data Discuss., https://doi.org/10.5194/essd-2020-56, 2020.