

Atmos. Chem. Phys. Discuss., referee comment RC2
<https://doi.org/10.5194/acp-2022-481-RC2>, 2023
© Author(s) 2023. This work is distributed under
the Creative Commons Attribution 4.0 License.

Comment on acp-2022-481

Anonymous Referee #2

Referee comment on "Measurement Report: Observed Increase in Southern Hemisphere Reflected Energy from Clouds During December 2020 and 2021" by Jay Herman et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2022-481-RC2>, 2023

Dear authors,
Wishes for a happy New Year,

In this study by Herman et al. EPIC backscattered UV radiances at 388nm analyzed and they concluded that the observed increases in reflected solar radiation were attributed to increase in cloud cover and not to the decrease of the small satellite viewing angle from the Sun-Earth line (SEV). This argument is also supported by analyzing data from an independent platform (OMPS-NM). Changes in cloudiness is of great importance for climate change and for solar power generation, so a paper giving evidence of such changes it would be interesting. But, regarding the present manuscript there are many things to improved. Apart from the fact that the manuscript is hard to follow and needs improvements, there are parts in the analysis that are unclear.

I recommend this paper for publication. I think it will be improved if the authors can address the following major comments:

- 1) Make the scientific questions clear. The goals of the study that are stated in the introduction are not related with the final conclusions. An apparent increased in back reflection observed by EPIC was anticipated in 2020 and 2021 as it is stated in the introduction and a correction for the changing orbit in 2020-2021 has been applied as it is stated in the last sentence of the introduction and in section 2. So, the performance of the correction is tested compare to previous years? And the changes of the corrected values of 2020-2021 compared to previous years are explained by changes in cloud cover?
- 2) Try to clarify and put the scientific questions and the related conclusions into perspective and discuss the importance of the results for the community. Studies dealing with changes in cloudiness are of great importance for climate and for the solar energy sector too.

3) From my point of view, the main dataset was EPIC measurements, and the OMPS-NM were used additionally for supporting the EPIC results and only for SH. So, make also clear the scientific question being addressed using the OMPS-NM data.

4) The manuscript is hard to follow and essential parts of the analysis are unclear due to this. I suggest the following changes:

- use different sections for data and methods

- in methods, it was hard to follow the equations presented. I suggest to explain step by step the equations, by explaining every symbol (not all symbols were explained e.g. L_{ER} or G_i) when they first appear. A figure illustrating the problem geometry it would be also helpful.

2) Specific comments

Lines 24: My opinion is that it is missing from the abstract a link explain why enhanced backscatter effects are anticipated for backscatter angles ~ 178 for 2020 and 2021 and this "problem" first appears in line 31. The relevant discussion is provided by the authors in the introduction (lines 45-51), but I think that it would be helpful to better understand the concluded remarks if a relevant sentence included in the abstract too.

Lines 52-59: If I understand correctly the goal of the study wasn't to compare (line 55) EPIC and OMPS-NM data, but to use OMPS-NM data to support EPIC results. Please clarify better and also in this paragraph only 388nm are given, while OMPS data correspond to different wavelengths.

Lines 82-83: In previous paragraph (lines 78-80) it is stated that the observed UV reflectivity comes mostly from clouds. Please, try not to repeat and be consistent with previous statements.

Lines 115-116: I strongly recommend here to explain in more detail the correction applied and move equation given in lines 167-168 and 174 here.

Lines 117-119: I miss here the connection to the EPIC measurements. The EPIC measured backscatter UV radiances at 388nm are converted to LER as mentioned in the abstract, but nowhere up to now in the main text this description is given and for the first time appeared in eq (5) with a different symbol L_{ER} without explanation.

Lines 123-129: I cannot see an obvious increase in P_{SE} in Fig 1. Also, is there any comment for the gap for the last ~6months of 2019?

Lines 125-126: see 3rd specific comment

Lines 151-157: This description is for Fig 4 and not 3

Lines 158-164: This paragraph fits better after the description of fig 4

Line 174: R_A or A_C the correction? And 2019 and not 2018?

Line 180: Is Fig4 smoothed like Fig 1B?

Line 234: There is no blue curve at fig 11.

3) Technical corrections

Line 19: R_{SE} corresponds to reflected energy for different wavelengths, so please change the sentence accordingly.

Line 78: TOA acronym is introduced here, please put it inside parenthesis and in general check acronym throughout the manuscript.

Line 85: OMPS-NM instead of OMPS

Line 86: B_A first appears in main text, please explain symbol

Line 99: OMPS-NM instead of NPP-NM

Figure 1: The y-axis doesn't have P_{SE} label

Figure 2: Please correct y-axis, $P(t)$, $\Delta\theta$

Figure 3: Remove the second "The ratio" from the beginning of the legend. Additionally, it is 2019 and not 2019? The same for fig 9.

Figure 4: please replace "energy in the P_{SE} " with energy PSE in the and correct y-axis, the same in fig 8.

Figure 5: Please correct y-axis, red line is for 2016-2017?

Figure 6: Please use the same color for lines and legends, here make Dec 2020 the same color with line. Additionally, is it 2018 or 2019?

Figure 7: Please correct y-axis.

Table 2: 2018 or 2019? Also Latitude in degrees.

Line 249: in Fig 10 instead of 11.

Line 259: OMPS-NM instead of OMI-NM