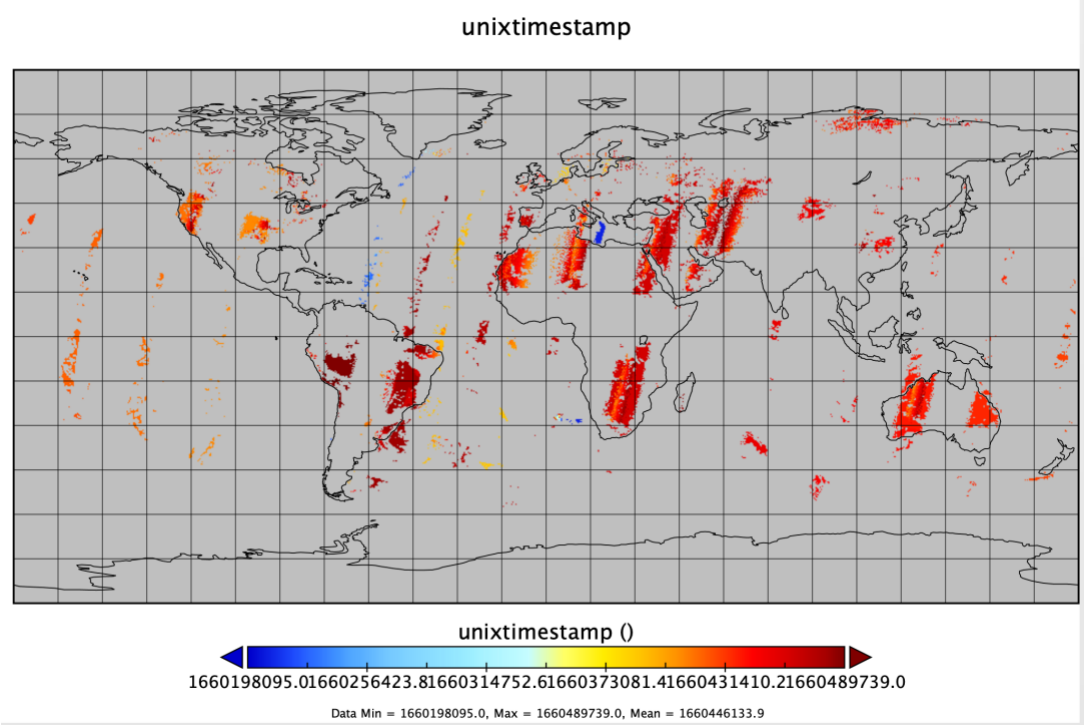
This is a nice study which introduces and does some evaluation from a new aerosol data set derived from the POSP instrument on the GF-2 satellite. It is in scope to the journal and of interest to the readership. The contents are mostly what I would expect to find in a paper of this type.

The provided DOI works and the data are freely downloadable, which is great. I appreciate the “lessons learned” aspects of the discussion, both in terms of the GRASP algorithm and also issues related to e.g. ground segment and things like coast identification which are not always discussed.

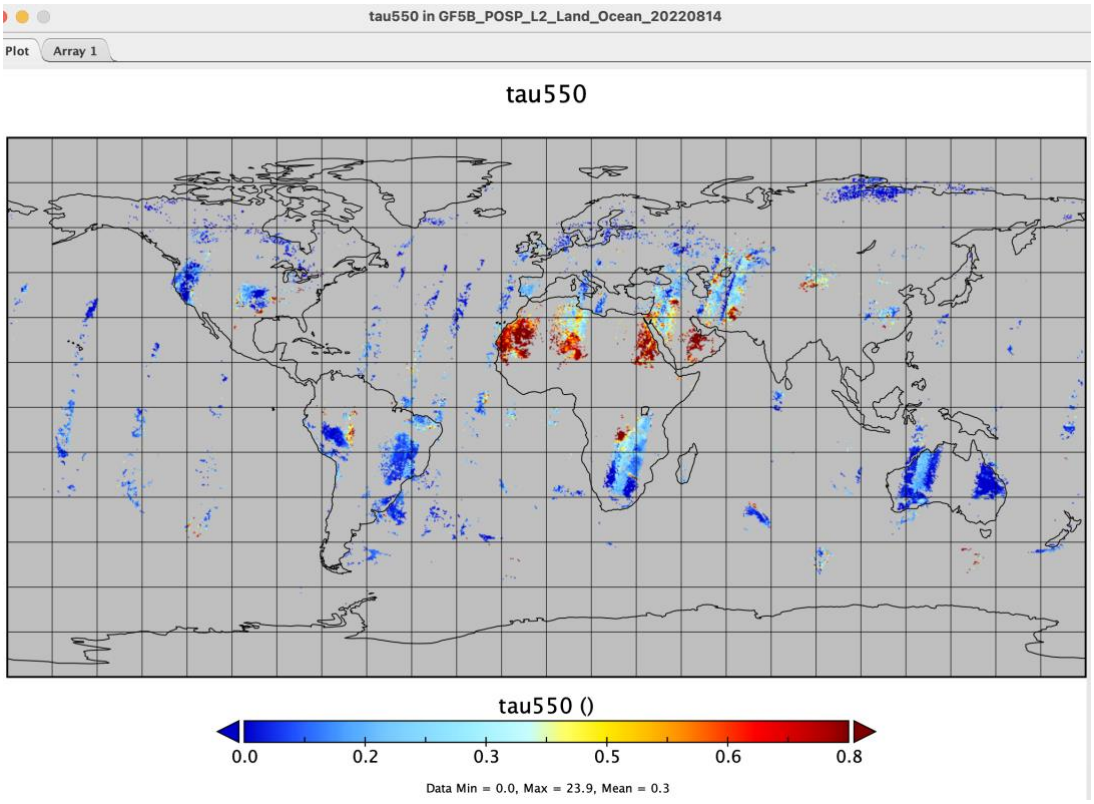
That said, I have some questions about the work presented and the files themselves (which I opened in the Panoply tool to look at), and there are some important aspects of the data which are glossed over in the manuscript. I recommend revisions and would like to review the revised version. This in my view falls on the gap between minor and major revisions. My reasons for this recommendation are as follows:

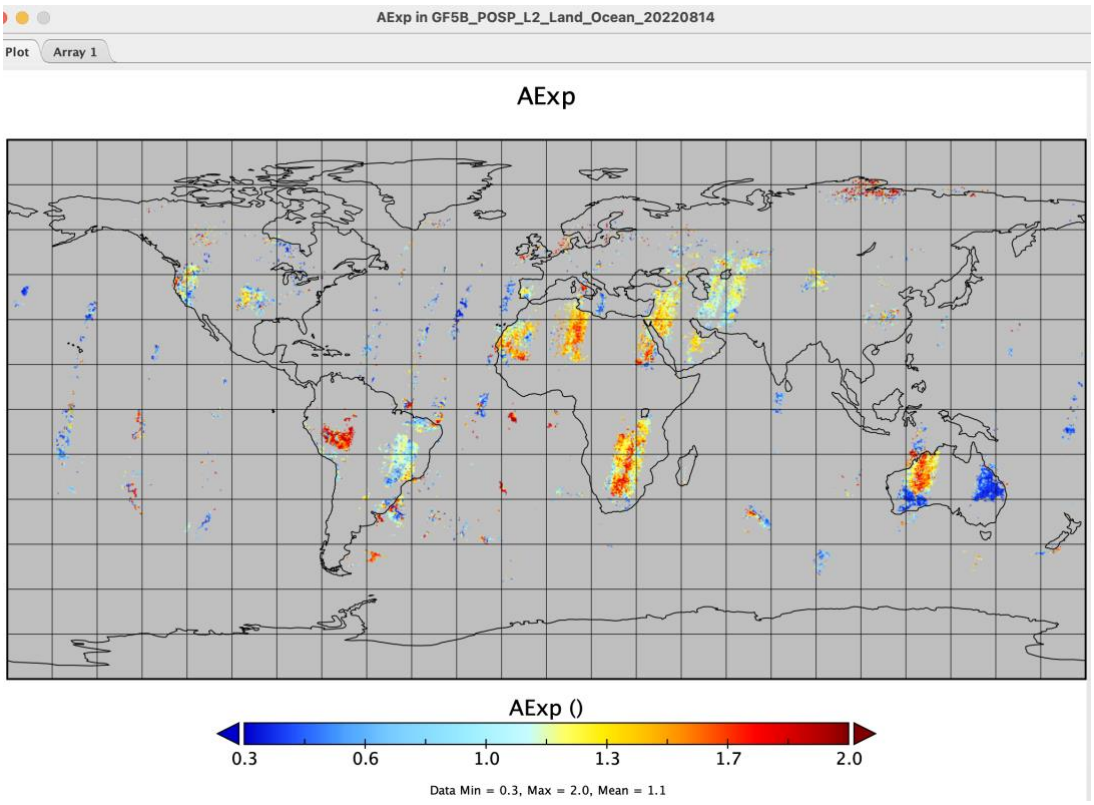
1. The files are missing a lot of the important metadata which is commonly provided within satellite products from major agencies and institutions. For example there is no global metadata (e.g. originating institute, processing version info, contact etc). Variables have fill values, chunking, and coordinate systems specified but are missing a bunch of the other standard metadata e.g. long_name, valid_min, and valid_max. I strongly advise that these are added to the files for usability and operability issues. It should be possible via command line tools and scripts to add this metadata without having to reprocess the whole archive.

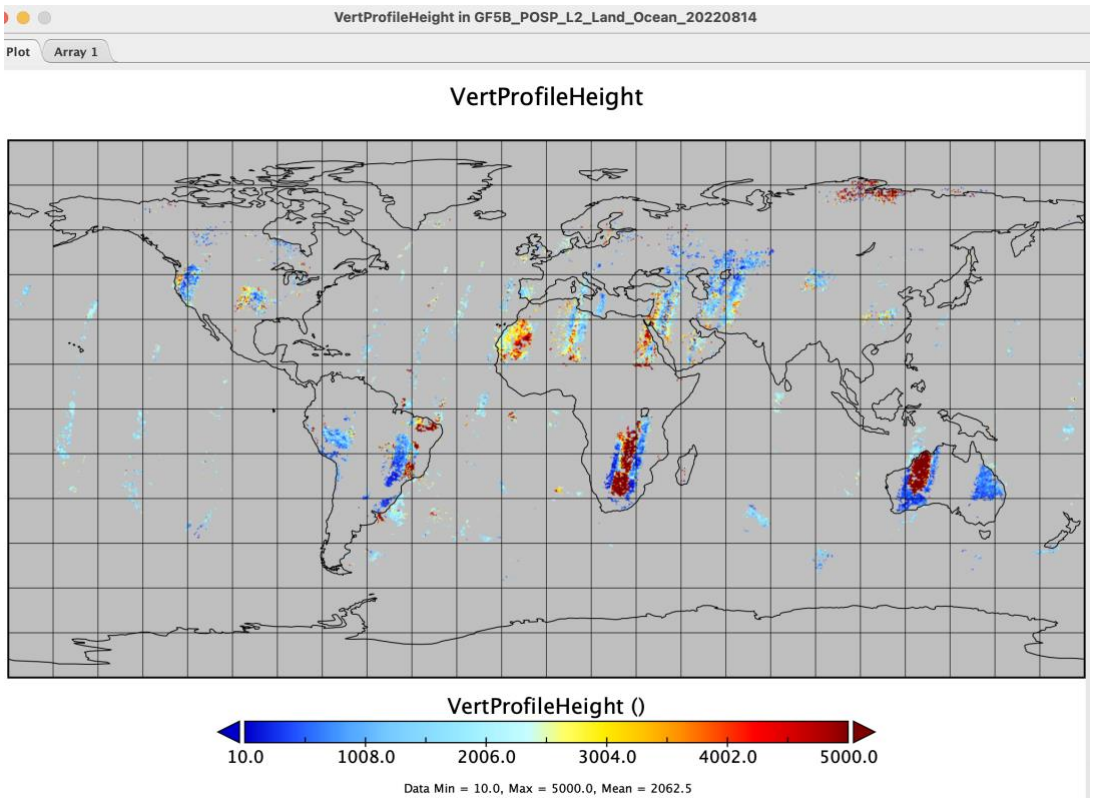
2. The unix time stamp looks strange and I am not sure how to interpret it. Could you check these values? I would expect it to increase monotonically during an orbit (from north to south or south to north dependent on direction), and between orbits (e.g. from east to west). Instead it jumps around a lot with artefacts near the middle of the orbit and some which seem out of place. If these patterns are correct then the orbit needs to be explained in more detail as I am not sure how a single satellite in a Sun-synchronous orbit could have overpass features like this on a single day. I have attached a screenshot below to show this.



3. The analysis is focused on validation at single locations (AERONET sites) and then global mapped time-composites of the year 2022. However, if you look at the data for an individual day, you notice a lot of strange things (see attached screenshots). For example, there are artefacts near the middle of the swaths in a lot of the variables which are clearly not physical. And the coverage of the different variables does not match exactly (some have fewer pixels than others). This is not documented in the files or discussed in the paper. Many users will be using the data on a daily basis so understanding these features is important to give an honest assessment of the data – particularly as there are no quality flags or uncertainty estimates provided in the files. This needs to be documented and discussed openly.


tau550 in GF5B_POSP_L2_Land_Ocean_20220814
Plot
Array 1
tau550
tau550 ()
0.0
0.2
0.3
0.5
0.6
0.8
Data Min = 0.0, Max = 23.9, Mean = 0.3


AExp in GF5B_POSP_L2_Land_Ocean_20220814
Plot
Array 1
AExp
AExp ()
0.3
0.6
1.0
1.3
1.7
2.0
Data Min = 0.3, Max = 2.0, Mean = 1.1



4. As a general comment Copernicus prefers not to use the rainbow color bar (because of the green in the middle) and suggests others such as viridis instead.

5. If I understand correctly, POSP is like APS but rotated so instead of collecting multiangle images along-track, it sees a wide across-track view (1850 km although the 10 outer pixels are stated to be skipped so I am not sure what the effective width is – could this be added?), but each location on the Earth is only seen from a single angle (so it's in effect a single-view, multi-spectral polarimeter). Is this right? If so I suggest expanding the text to write something like this as well, as otherwise people might see the text about APS and assume it is multi-angle too (because most polarimeters to now have been multiangle as well due to the added information content).

6. Lines 232-239: I am trying to figure out the multi-pixel configuration uses here as I know GRASP is flexible. I understand this is spatially, 3x3 pixels. Does the wording about NT also mean that all pixels from a given month are inverted simultaneously (i.e. the time period is 1 month)? What are the space/time

smoothness constraints for the retrieval as run? The paper should say what was used for this case.

7. Lines 293-301: This section describes the quality filtering applied for the validation analysis. The authors state that they did not put quality flags in the file. I suggest this is done, as it is not so practical for users to e.g. compute the 3x3 moving averages and counts everywhere and be confident about applying the residual threshold correctly. For example, there are two "*residual_relative_noise*" variables in the file and it is not clear which should be used for this test. Otherwise, the data as presented will not be consistent with the data filtering used for the analyses in the paper.

8. Figure 6: Almost all the points are below AOD of 0.2 which is buried in one corner of the plot because AOD data are highly skewed. I suggest showing this on a log scale (maybe truncate at 0.01 on the lower end) as this would show the magnitude and direction of any biases more directly. I also think the fit line would make more sense shown on log scale for this same reason about distribution shape.

9. Figures 6-10: Could you explain the color shading here? I initially thought it was density of points (i.e. a heat map aka scatter density plot). But, looking more closely the data are shown as a scatter plot instead of a heat map. And there is no color bar on the figures. If this is a heat map, then it should be shown with solid boxes and a color bar. If it is a scatter plot, then showing colors is just confusing. It implies the data are clustered in a certain way by drawing the eye, but it is not documented in the paper as far as I can tell what it means. My preference would be for a heat map because the meaning is clear and more informative than just a scatter plot.

10. Figure 11: is this (1) a difference in the mean (i.e. top panel minus bottom panel) or (2) the mean of the differences calculated on a daily basis? This is not clear and should be stated. In my opinion option (2) is better because it decreases sampling-related differences by ensuring both instruments saw the same location on the same day. And if there is a concern (e.g. line 395) about overpass times causing a difference due to e.g. aerosol transport, this would also be a smaller uncertainty source if the comparison were done at a coarser spatial scale (e.g. 0.5 or 1 degree instead of 0.2). (Note, I did not see the GF satellite orbit times listed in the paper, from the swath patterns I guess it is descending during the daytime node, what is the Equatorial crossing time?)

11. Figures 12, 14, 16: Should be “Probability” density function not “Possibility” in the caption.

12. Figures 13,15: same question/suggestion as Figure 11.