Reply to Comments from Anonymous Referees

Comments from Anonymous Referee #2

General comments

I enjoyed reading this paper, as harmonization of datasets is an important aspect in intercomparison of measurements and the interpretation of trends in timeseries, for example related to climate aspects. More specific, the paper focuses on a softcalibration technique to harmonize the total ozone measurements of the S-NPP and N20 OMPS sensors.

Overall, the paper is well written, although also some questions arose while reading, as indicated below.

I agree to publication of this paper, if the authors attend to the specifics below.

Specific comments:

Throughout the manuscript

I have the impression that the included imagery suffers from insufficient resolution, something that should be easily remedied.

All figures were updated with higher resolution.

1 Introduction

Overall a clearly written introduction, providing sufficient justification and background for the use of the V8TOZ algorithm and sufficient references to relevant literature. I would like to read a little more here, though, on the motivation of the study. Why is the development of a new soft-calibration scheme required? What is missing in existing schemes (NASA) or why can't those be applied? Little by little the answers are given elsewhere in the paper, but the motivation should already be clear here.

We added the following in the middle of Line 75 as a new paragraph:
The results in this paper use soft calibration adjustments to force agreement between V8TOz retrievals for S-NPP and NOAA-20 with plans to continue using the method for NOAA-21 OMPS and other instruments. The adjustment method uses statistical comparisons over a latitude / longitude box over the equatorial Pacific. This region is selected for a variety of reasons including the following: 1) The total column ozone amounts are modest and the solar zenith angles are low; 2) The ozone profiles are relatively stable and consistent over the region (with some intra- and inter-annual and quasi-biennial

changes); 3) The atmospheric aerosol and SO_2 loading are usually close to background levels; and 4) The ocean surface presents a target with little intra-annual variability.

2. V8TOZ with a broader bandpass approach

The broadband approach is described convincingly and is later shown to reduce retrieval noise and product biases. In section 2.4, the broadband approach is tested on one month of V8TOZ runs. Any reason to specifically choose this month and year? Same question for data selection further on in the paper.

No, the range of ozone, reflectivity and aerosol loading over any month for the whole globe would have served as a good test of the wider channel method. The broadband approach has been implemented in the NOAA operations since July, 2022.

Line 204: see Fig. 3, left panel --> see Fig. 3, right panel.

Agreed. Corrected.

3. Soft-calibration for both OMPS S-NPP and N20.

In Section 3.1, it becomes clear that OMPS S-NPP V8TOZ retrieval results from NASA are used as reference data set. At the same time, it appears that the existing soft-calibration method developed at NASA cannot be applied to the NOAA datasets, because of different treatment of the measurement data. This should be made clear earlier in the paper.

The NASA soft calibration using ice radiances could have been applied. That calibration is primarily for the reflectivity channels and requires seasonal observations. The equatorial Pacific is available year round with good viewing conditions. Both methods use the cross-track reflectivity over dark vegetative scenes as a check on the performance. The soft calibration for ozone for the NASA S-NPP used comparisons to the ozone amounts from the NOAA-19 SBUV/2 retrievals. The equatorial Pacific presents a low variability ozone field for inter-instrument result comparisons to estimate ozone channel adjustments to force agreement.

Line 287: "The reflectivity from **the** broadband approach is generally **slightly** lower with less variation than **the** narrowband approach."

Corrected.

Line 294: agree --> agreement

Corrected.

Line 417: 0.3 --> 0.3%.

Corrected.

4 Errors and uncertainties versus latitude.

In chapter 4, the authors show extensive tests and comparisons. I appreciate that they don't shy away from mentioning remaining uncertainties or lack of explanation of the origin of observed remaining biases.

Thanks.

5 Comparison with other products

In the comparison of OMPS aerosol index and ozone column with those from other satellite sensors, it appears that ozone columns from NOAA OMPS show differences when compared to TROPOMI and EPIC. although suggestions are given to explain these differences, some uncertainty remains in these explanations (different factors contribute) and comparison with ground measurements for specific scenes would smaybe be useful. I do not ask to ask the authors to add a full section on comparison with ground data, but literature may also provide some sources that may help explain the observed offsets. After all, NASA OMPS S-Npp data is taken as reference. is this data known to agree better with validation data than TROPOMI and EPIC?

For the Aerosol Indices, we plan to conduct a simple study creating retrievals using a range of short and long wavelength channel pairs with V8TOz partial cloud approach to quantify the effects of channel choices on those values and establish their functional relationship. We agree that the results in Figure 12 show a need for additional validation studies and analysis for the ozone estimates.