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Atmospheric Measurement Techniques Discussions

Interactive comment on "TROPOMI/S5ptotal ozone column data: global ground-based validation & consistency with other satellite missions" *by* Katerina Garane et al.

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1 General comment

This paper is the first validation of S5P/TROPOMI total ozone data derived using two different ESA operational processors, one for near-real-time applications (NRTI) and the other offline (OFFL), both are based upon two different algorithms. S5P is in orbit since October 2017 and data validated covers roughly one year of data. Comparisons are made with data from several groundbased instruments which are part of several networks. The comparisons with the goundbased data is quite thorough and the results

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clearly presented. The comparisons with other satellites that have used the same algorithms as for S5P is limited only to overpass data and provides thus rather little additional information on the quality of the S5P ozone data. Here the global extent of the satellite data should be exploited in the comparisons.

There are some major issues which I think need to be addressed before final publication. These issues are in the sense major that they are of high importance and require attention, but they are not extensive in terms of additional work required to address them.

2 Major issues

- Abstract (p.1, l. 34 and p. 2., l. 8) (and elsewhere in the manuscript): Differences and biases are usually signed quantities. Do you mean here that the differences ranges from 0% to +1.5% or do you mean they agree to within $\pm$1.5%. This should be more clearly indicated by adding signs to those numbers (e.g. +1.5%). This should be done also at other places in the manuscript where appropriate.

- p. 4, l3 ff (destriping): Here the destriping procedure is described. I think this aspect is very important and some more details should be given. The destriping correction can lead to maximum change of 1.5% from the original data which is of the same magnitude as the maximum percent difference reported (s. above). This means the validation results applies in a strict sense only to the destriped version of the total ozone data, which is not available to the public. For traceability the destriping correction factors should be made available as supplementary data (url link) to the readers (users). I also suggest to put the description of the destriping in a separate subsection, as destriping may be also relevant to the offline data (not mentioned here). For a more detailed description, a plot showing the correction factors as a function of the ground pixel (both data products)

should be added, the ground pixel identified which was used as reference value (and why), and which part of the tropics were used to determine the correction factors (exact latitude range).

- Sections 4.1 and 4.2 (satellite-satellite comparisons): I agree with the other reviewer that a more extensive comparison with other satellites should be presented here. The global extent of the satellite datasets needs to be exploited and would clearly bring in additional insights into the consistency of the S5P. It would be nice to show differences as 2D plots as a function of latitude and time. This would nicely reveal the subtle differences between the datasets. As the GOME-2 instruments are the predecessors of TROPOMI (European data record), the offline total ozone data product need also to be compared with GOME-2.

3 Minor issues

- abstract (p. 1, l.22): What are the "new components", please specify. This could be possibly discussed better in the Introduction. One could simply state here that the spatial resolution of TROPOMI is "unprecedented."
- p.3, l. 9: the period covered by S5P here is too short to check for "long-term stability". One may mention in the conclusion that more data is needed to check the long-term stability.
- p. 4, l. 12ff: In the description of the two different algorithm version, I am missing some discussions on why different algorithms are used. As I understand the GODFIT algorithm as used for S5P uses now look-up-tables for speed up (should be mentioned in the paper as this is new here). Is the offline LUT algorithm still slower than the near-real-time? Another point to discuss (maybe better in the

conclusion) is which data (NRTI, OFFL) should be recommended to the user based upon the validation results if the near-real-time aspect is irrelevant.

- p.3., l. 16: a brief explanation what commissioning phase means and what that means, e.g. less data are available.
- p. 3, l. 21: Not clear what "using the daily solar reference spectrum" means here. One could say that DOAS is applied to sun-normaliized radiances.
- p. 5, l. 3: Is the retrieval meaningful, if you have retrieved albedos of -0.49 and 1.49?
- p. 6, l. 8: "... the Laboratoire ATmosphères Milieu Observations Spatiales (LATMOS) RT (Real Time) facility provides a first processing of the SAOZ measurements within a week of the actual observation at the most. The data used here are such LATMOS_RT data"

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  "... the Laboratoire ATmosphères Milieu Observations Spatiales Real Time facility provides a first processing of the SAOZ measurements within a week of the actual observation. This data are called LATMOS_RT."
- p. 6, l. 12 SAOZ "allows measurements of the column above cloudy scenes". Brewer and Dobsons also provide zenith sky measurements. Please discuss.
- p. 7., l. 26: remove "to the fact"
- p. 8, l. 15: Here one should mention that Band 3 is used for the ozone retrievals, but cloud information comes from Band 6.
- Figure 5: color legend for ozone values should be added.
- p. 14, l. 9: "Suffice it to note that" sounds awkward, please correct.

- Figure 8: I do not see a green line in this figure. The surface albedo is not retrieved but comes from a climatology? Why are they different between near-real time and offline?
- p. 20, l. 1: "as is well known" –> "as described in"
- Figure 11: Where is the green line? OMI? Do you mean the red line for "orange line"?
- p. 23, l. 7: "Figure 14 andFigure 15" –> "Figures 14 and 15"

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