

This work presents a comparison of ozone profiles retrieved from GOME-2A nadir observations with limb ozone profiles from GOMOS, OSIRIS and MLS. In general, the manuscript reads well and the presented work is relevant. I do have some questions though and would like to see the authors clarify various issues before the article is published. Please go through the detailed comments below.

General

Abstract: please specify version numbers of the used algorithms.

Relative differences: have you looked at the median relative differences besides the mean relative differences (more sensitive to outliers)? Please describe the rationale of having different collocation criteria for the three reference instruments. I suppose that you tried to be as strict as possible whilst keeping sufficient statistics, but it has to be explained and you should say something about the sensitivity of the results to the two criteria. Also, how do you deal with measurements on two sides of the polar vortex?

Data selection: do you apply any further data filtering based on quality (e.g. data flags/uncertainties/unrealistic ozone concentrations)?

Figures and table

Fig. 1: Please change “Nof” in the titles of the lower row to “N of” or “# of” or similar – with the current font size it looks like it says ‘Not’. Also, can you assure the figures retain the same size (for each top and bottom pair, so that the latitude bins are aligned)?

Figs. 2-4: Is the number of collocations valid for all altitudes (i.e. only full profiles are considered)?

Fig. 8: Is this figure the same for all latitudes? Please label the indicated local solar times and include also MLS and OSIRIS. Can you extend the figure down to 15 km to match with your other figures?

Fig. 9 and 10: please make clear in the figure captions that the SZA refers to the GOME-2 observations. Add the unit (°) to the x-labels.

Fig. 9: I do not understand the grey marking of the “outliers” at 30 km as they overlap with the other data.

Fig. 10: there is no need to mention ‘at four altitude layers’ as they are the same altitudes as in Fig. 9 (it suggests that the altitudes would be different). There is a group of outliers (>40% difference) for solar zenith angles between about 65 and 80° visible at all four altitudes which has not been coloured grey to indicate them being outliers, but they are described in the text. Please mark them for consistency with the description.

Fig. 11: Please add also the outside-inside polar vortex plot for the smoothed OSIRIS data for reference. Secondly, it looks like outside the polar vortex below 25 km, the a priori actually agrees better with OSIRIS than the GOME-2 retrieval. Please comment.

Table 1: Please add used algorithm versions. It might be useful to add the altitude ranges covered by the instruments. Since you mention “ozone unit”, you might as well add which vertical grid is the native one.

Text

Page 7664 Line 25: space born -> spaceborne

Page 7665 line 8: specify version number for “earlier”

Page 7665 line 23 target value + ‘of’

Page 7665 lines 24 – 27 “apart from certain altitude regions”. You mention only one? Perhaps rephrase to: In the stratosphere the 15% target value is met below 37 km, above which the differences are increasing... or clarify otherwise

Page 7665 line 28: “after November 2008”. Are the >15% differences with reference datasets above 37 km also present for GOME-2 on Metop-B directly since its launch in 2012 (or is it a GOME-2A degradation issue)? Please clarify the text (since in line 17 you mention the validation to have been done for both 2A and 2B).

Page 7667 line 2 “1.14-1.24” how many versions does that cover?

Page 7667 lines 28-29 “the vertical resolution... is between 8 and 11 km at its best”. I read this as that for some parts of the profile, you will have a lower resolution, yet in Table 1 you specify the vertical resolution to be 8-11 km. Please clarify. Also, can you add a graph specifying the information content from the observation as a function of altitude for a typical observation?

Page 7668 line 26 “nighttime”. Please clarify its definition (e.g. product flag ‘dark’, SZA limit)?

Page 7669 lines 1-4. How do you consider differences in space between the GOMOS ground coordinates and those at the studied altitude range 15-60 km? I guess that for more oblique observations it does matter whether you collocate at ground level or at, say, 40 km? Also clarify how you deal with this for the other limb sensors where your spatial collocation criteria are tighter (see also comments in the related sections).

Page 7669 line 8 “OSIRIS also has <> infrared imager”. Insert “an”.

Page 7669 line 13 “latest OSIRIS Level 1 data”. Specify version number.

Page 7669 line 15 FMI has been used in the abbreviated form before you define here.

Page 7669 line 17 Provide a reference for “OSIRIS SaskMART”.

Page 7669 lines 18-21 What about performance outside the tropics?

Page 7669 line 23 “.. GOME-2 pixel maximum 6 h in time”. Change to “.. GOME-2 pixel and a maximum difference of 6 h in time”.

Page 7669 line 23. Is the maximum distance of 200 km considered for all altitudes?

Page 7670 line 11 “gave the overall 5-10% agreement” → “resulted in an overall agreement of 5-10%”

Page 7670 lines 12-14. Change to “The collocation criteria used here allow the maximum distance between the GOME-2 pixel center and MLS to be 100 km and the maximum time difference between the sensing times to be 6 h”.

Page 7670 lines 12-14. The maximum distance of 100 km is considered for all altitudes or do you only check the collocation criteria at the ground level?

Section 3.3 is quite brief in length in comparison to 3.1. Perhaps add some more details on the ozone retrieval method.

Page 7670 lines 17-18. Please add details on the procedure and (when applicable) which external information (e.g. ECMWF pressure?) has been used to do the conversion. Do you also do this for the reported uncertainties?

Page 7671 lines 23-24 “at lower altitudes below ~20 km” change to “at altitudes lower than ~20 km” or skip ‘lower’.

Page 7672 line 10 “... there was also detected overestimation ...” change to “... overestimation was also detected ...”

Page 7672 line 16 “MLS data in summer”. It is hard to verify the statement about the 55-65 °S results from Fig. 1 in Figs. 3-4 where 60° is at the edge of two classes and the covered time period is not the same. Also, please indicate that the summer is the southern hemispheric (local) one or specify the months to avoid confusion.

Page 7672 line 16 “the positive bias” change to “a positive bias”

Page 7672 lines 17-18 ‘this bias’. Clarify that this refers to the OSIRIS comparison as clearly for MLS it persists.

Page 7672 lines 24-25. Clarify why you have decided to reduce the time frame to two years.

Page 7672 from 26 – page 7673 line 1. What does the low seasonal variation in relative differences have to do with the larger relative differences in DJF? What is the cause of the increased bias?

Page 7673 lines 13-14 “These differences in the results are due to temporal sampling...”. I guess this is also true in other months, for instance in MAM for the northern high latitudes? To what part can the observed differences be attributed to two sensors sampling different air masses as there are larger spatial variations in polar springs? Are the GOMOS data taken in full dark (no straylight/twilight contamination)? If not, do you think this could play a role (besides the temporal sampling) in the different relative difference shape observed?

Page 7673 lines 17 and 18. Please also discuss the deviations at the bottom of the profiles (rapid increase in the 1 σ deviation), as well as differences for GOMOS around 30 km in the 30-90 °S region

in the SON period and differences for MLS between 20 and 25 km in the 60-90 °N region in the period MAM-SON.

Page 7673 line 25 "In <> tropics ..." insert "the"

Page 7673 line 27 – page 7674 line 2. Why haven't you reprocessed the full timeseries with the same version if you notice differences between versions? If not possible, you should at least mention the version numbers and indicate in the figures (5-7) where you switch with a vertical line (with labels).

Page 7674 lines 13-20. It is not clear to me if the "implemented additive offset" has been implemented here or only in other studies. On page 7671 discussing Fig. 1 you state "which are not corrected for instrument degradation". Please clarify (in the conclusions it is clearly stated, but that is quite late!). Also, "data has become noisier due to the instrument degradation", is that valid for all altitudes or is that altitude dependent? Otherwise, how does that relate to the difference between Van Peet et al. and your results?

Page 7674 line 25. Detail why you chose the southern high latitudes to illustrate the SZA dependence and why the dataset is now limited to 2010.

Page 7674 line 28 (and onward). "The similar dependence" → "A similar dependence". This sentence and the rest of the paragraph are not supported by figures (mention that).

Page 7676 line 13 "... the very useful information" remove "the"

Page 7676 line 13 ".. to note, that .." remove the comma.

Section 5.5. Does this correction go on top of the previously used algorithms or is it another algorithm version? Please state in the text!

Page 7676 line 22 ".. some comparison .." either change to plural ("some comparisons") or "comparison of some GOME-2 .."

Page 7676 line 23 "using <> newly developed ..." add "the" or "a".

Given that the comparison for March 2008 was done for the uncorrected data (dotted lines) with the oldest algorithm version, would it show such substantial improvements if applied to the latest OPERA version (for instance, for comparisons in March 2011)? I mean, can you quantify to what extent the improvement comes from the degradation correction and to which extent it comes from the algorithm changes?

Page 7676 line 28. "original offline ozone product" Please state which version this is.

Page 7677 line 1 "new", again state which version number.

Page 7677 line 4 "under the continuous" remove "the"

Page 7677 line 5 "developement" → development

Page 7677 last paragraph: Please provide a better introduction to the study case than "the special case ..."