

## ***Interactive comment on “Characterization of Odin-OSIRIS ozone profiles with the SAGE II dataset” by C. Adams et al.***

**C. Adams et al.**

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Thank you for your comments, which have helped to improve our manuscript. Below we address the recommended changes point-by-point.

*1. P1034; L9: Can this information really help to merge other data sets than OSIRIS SaskMART v5.0x ozone to SAGE II? This probably should refer to the discussion in the paper, that other data sets should be included because OSIRIS does not cover all latitudes during all seasons? Since no additional data set is included in this work, I would rather omit “and other satellite ozone measurements” here.*

This sentence was poorly constructed. I've changed it to the following to make it clear that other datasets are required for a full merged data product:

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“This information can be used toward merging OSIRIS with SAGE II into a single ozone record from 1984 to the present. Note that for full global and seasonal coverage, ozone measurements from at least one other satellite instruments would be required to fill gaps in the OSIRIS dataset in the winter hemisphere.”

*2. Dynamical coincidence criteria are presented and their influence on the results is discussed by the authors, but it is not shown in any figure. I would suggest to show Fig. 5 (only 5a or both panels), for both broad coincidence criteria alone and including dynamical coincidence criteria.*

As suggested, we have added two panels to Fig. 5 corresponding to the dynamical coincidence criteria.

*3. There are difficult dependencies of the latitudinal, diurnal, and seasonal sampling of Odin-OSIRIS. Although the seasonal dependence of the differences to SAGE II is probably dominated by the dependence to the optics temperature there could be additional information in a comparison for different seasons. Figures showing the seasonal dependence (Fig. 5 for different seasons or a figure similar to Fig. 5 for all seasons) could be included, e.g. as additional figure, additional panel for Fig. 7, or in an electronic supplement. This would also underline, why seasons are mentioned in Table 2.*

In order to address this, we have added a new figure to Sect. 4.1 (Fig. 6), which shows the seasonal dependence in the agreement between OSIRIS and SAGE II. With this figure, we have added the following paragraph:

“The seasonal variation of the mean relative differences between OSIRIS and SAGE II is given in Fig. 6. Larger 20° latitude bins were used due to the limited number of coincidences. For 20.5–40.5 km, OSIRIS agrees with SAGE II within 5% at most latitudes during most seasons. In May–June–July, OSIRIS measures less ozone than SAGE II, due to biases associated with low OSIRIS optics temperatures during the summer (see Sect. 4.3). At higher altitudes, there is a seasonal dependence in the

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agreement, which may be caused in part by the diurnal variation of ozone (see Sect. 4.2) and the systematic variation of the OSIRIS measurement SZA with the season (see Fig. 4a of McLinden et al., 2012). The low bias in OSIRIS data above the tropical tropopause also has a seasonal variability, with a weaker bias observed in the summer hemisphere. This seasonality may be related to the ascending and descending node biases in the OSIRIS dataset (see Sect. 4.4)."

*4. Is it not relevant for the merging to estimate drifts between SAGE II and OSIRIS? Are there any significant drifts between these instruments despite the short over-lap time period?*

The goal of this paper is to assess biases between OSIRIS and SAGE II. Due to the short period of overlap (only three years with full seasonal coverage) and the limited number of coincidences, we cannot say much about drifts between the datasets. In order to clarify this, we have removed the reference to trend studies using OSIRIS measurements on P.1036, L.9.

*5. Section 4.2: P1043, L9–10: A reference should be given where the diurnal variation of ozone is described, if possible including an estimate for its magnitude.*

We added the following to the text:

"Schneider et al. (2005) observed relative increases in ozone from day to night of ~20% and ~30% within 5 km layers centered at 47.5 km 52.5 km, respectively."

*6. Section 4.4, P1046; L22: Could the bias be related to not detected polar stratospheric clouds instead of or additional to aerosols?*

To make this clear, we have added "... or undetected polar stratospheric clouds" to the text.

*7. P1049; L25–26: is there a fixed threshold for this selection, e.g. 5sigma*

This was clarified with the following text:

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"For most altitudes, scans with ozone or aerosol values that deviate from the mean by more than  $5\sigma$  or from the median by more than 10-MAD are rejected. These criteria are loosened at the top and bottom of the profiles to account for larger natural variability."

#### TECHNICAL AND TYPOGRAPHICAL CORRECTIONS

*P1034, L18: "exceed 5% under several cases" - "for" instead of "under"?*

This was changed, as recommended.

*P1035, L14: "spanning 21 years" instead of "span 21 yr"?*

"Span" was changed to "spanning". AMT abbreviates years to yr.

*P1035, L 21ff: try to clarify which letters are used for the SI2N acronym, e.g. use underlined or bold letters.*

This was changed, as recommended.

*P1037, L1 and L28: "are" instead of "were"?*

This was changed, as recommended.

*P1037, L29: here, and at several other places in the text is a "-" before "km"?*

This was changed throughout the text, as recommended.

*P1038, L11: "measurements"?*

This was changed, as recommended.

*P1038, L12: "during which both instruments measured."?*

Changed "measured" to "were operational"

*P1039, L1 and P1043, L17: The term "twilight" seems misleading when discussing solar occultation measurements?*

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Removed the word “twilight” from the text, so that it now reads “... allow morning and evening measurements to be compared against one another.”

*P1040, L2–3: the information in this sentence was already given on P1039, L25. Therefore, it should be omitted.*

The sentence “The two datasets were then compared on the OSIRIS altitude grid.” was deleted.

*P1040, L16–18: this sentence is rather long and complicated, maybe split it into two shorter ones?*

This was split into two sentences as recommended. The text now reads: “OSIRIS does not measure ozone in the winter hemisphere. Therefore, to produce a merged long-term time series with global coverage, other current satellite datasets would be required to complement the OSIRIS measurements.”

*P1041; L9: refer to Eq. 1?*

A reference to Eq. 1 has been added.

*P1042, L3: “seasonal and spatial variability”?*

This was changed, as recommended.

*P1044; L2: “viewing geometry”?*

This was changed, as recommended.

*P1048, L9: “should” or “must”, probably not both?*

“Should” was deleted.

*Figure 2: something is wrong with the label on the y-axis (“10<sup>12</sup>” instead of “10<sup>12</sup>”).*

This was corrected to 10<sup>12</sup>

*Figure 3 and 4: try to sort the panels differently to display them larger.*

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The panels were rearranged to improve readability of the figure.

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