Atmospheric Measurement Techniques Discussions

Atmos. Meas. Tech. Discuss., referee comment RC2
https://doi.org/10.5194/amt-2022-313-RC2, 2023

Comment on amt-2022-313

Anonymous Referee #2

Referee comment on "Updated merged SAGE-CCI-OMPS+ dataset for the evaluation of ozone trends in the stratosphere" by Viktoria F. Sofieva et al., Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2022-313-RC2, 2023

Review of manuscript amt-2022-313, "Updated merged SAGE - CCI- OMPS+ dataset for evaluation of ozone" by V. Sofieva et al.

This manuscript describes an updated version of the merged profile ozone data set SAGE-CCI-OMPS, which is one of several merged ozone records used widely within the ozone science and trends community. The updated merged record includes several new data versions of data used in the current record as well as new data sources. The authors provide a thorough summary of the version changes for the relevant instruments, and an analysis of the impact of each change on the final trend estimates. The manuscript is well written (some copy-editing suggestions included below), logically organized and easy to follow. I recommend publication after some very minor comments are addressed.

Minor Comments:

When comparing the versions of the data for MIPAS and especially for ACE-FTS, I suggest cutting the figures off at 55km, or at least no higher than 60km. The ACE-FTS plots go up to 90km, which is far above the range of the merged record and thus not relevant to these results. Expanding the vertical scale will allow the authors to better highlight the regions that matter most to the merged product. In particular in ACE-FTS, there appears to be a seasonal component in the differences, with the mid-stratospheric increase from the old to new version over a broader vertical range in summer compared to winter.

There also seems to be a bit of a trend relative to MLS in the new ACE-FTS version compared to MLS (Figure 4 bottom panel, also Fig. S1 but not as clear) starting in mid-2019 that might be worth noting as this would also contribute to a more positive trend.

Page 18, Lines 15-20: For the details of reconstructing the merged record in absolute units (adding a seasonal cycle back in) and the error analysis, the readers are referred to Section 3.1 and the description of the original merged SAGE-CCI-OMPS. There is no discussion that I see concerning the error estimates, do the authors mean to refer to the 2017 paper? Did the inclusion of the new data lead to any notable changes in estimated uncertainties in the merged record? While the trend analysis including each instrument is very informative, a comment about any changes (or no changes) in uncertainty would be useful.

As for the seasonal cycle, section 3.1 says "For the SAGE-CCI-OMPS, the amplitude of the seasonal cycle is estimated using MIPAS measurements because they provide all season pole-to-pole measurements with dense sampling. The absolute values of the seasonal cycle are estimated from SAGE II and OSIRIS in the overlapping period (which are very close to each other and to GOMOS measurements), thus preserving the consistency in the dataset through the whole observation period." I'm not sure I follow the use of SAGE II and OSIRIS here, are SAGE II and OSIRIS seasonal cycles checked against the MIPAS seasonal cycle in their respective overlap periods with MIPAS, thus verifying using the MIPAS seasonal cycle over the full record is valid, or is the seasonal cycle from SAGE II and OSIRIS used directly? In any case, it appears there may be seasonal changes in some of the new data versions, an update to the seasonal cycles in Figure 4 of the 2017 paper would be useful as a supplemental figure that can be referred to in the text to support the representativeness of MIPAS to establish the seasonal cycle in the new version.

When discussing trend results I assume all results are for the second portion of the piecewise linear fit (since 1997) as opposed to a linear fit over the full 'hockey-stick' proxy, but this should be specified in the text.

Typos/Editorial Suggestions

Page 2

L2 The importance of monitoring stratospheric ozone and its vertical structure is well recognized …

L8 The main advantages of satellite …

L10 … instruments is limited, data from several instruments …

Page 3

L4 … ozone profiles are retrieved on a geometric altitude grid …

L5 presented on an altitude grid from 10 to 50 km.

L6 (upper troposphere and lower stratosphere)

L11 … we used ozone profile datasets …

L14 … we used altitude gridded datasets (HARMOZ_ALT), available …

L18 Add space before “Below”

Page 4

L9 described in Boone et al. (2020),

L14: “Sheese et al. (2022) showed that v4.1 ozone data bias with respect to data sets” do the authors mean with respect to independent data sets?

L23-24: This leads to less instrument drift in the retrieved ozone values.

Page 5

L6: OSIRIS measurements are used to produce three long term data records: vertically …

L7: … upper troposphere; recently these processing chains …

L21: authors of Brion et al. (1993), Daumont et al. (1992) and Malicet et al. (1995),

L23-24: described by Rieger et al. (2019).

L25: https://arg.usask.ca/docs/osiris_v7/index.html (last access: 09 October 2022).

Page 6

L24: the “AO3” ozone product used here is derived from measurements

Page 7

L6-7: within 5% in the stratosphere, increasing …

L9: “which results in random errors of more than about 10%” do the authors mean ‘less than’ 10% here, or is ‘more than’ correct? It reads as though the less than 10% of ozone profiles suffer from sunspot-related artifacts should lead to lower random errors, if the more than 10% is correct, this should be re-worded.

Page 8

L30: “retrieval grid width” consider adding vertical for clarity… retrieval vertical grid width

Page 9

L2: “(~10 %)” suggest changing to (~ +/- 10%) to clarify positive and negative range

L6: ACE-FTC -> ACE-FTS

L15: ozone profiles cover a larger altitude range

Page 14

Fig. 7 Caption: typo - Panel B is OMPS UBr.

Page 16

L5: within the ~60°S–60°N latitude range or within~60°S–60°N latitude (remove range)

L6: POAM III and SAGE III/ISS

Page 18

L3: How is good agreement defined? Consider re-wording as We use only the data that do not exhibit significant offset or drift with respect to …

L6: consider (illustrations and discussion of these data exclusions are presented in Sofieva et al. (2017)).

Page 21

L5 and L8: Figures S7-S12 should be Figures S8-S13

L10: (consistent with …)

Page 22

Fig. 15 caption: at the 95% confidence level

Page 23

L16: do not change the overall morphology of trends in ozone profiles: statistically significant trends …

L19: The profiles of ozone concentrations and deseasonalized anomalies are presented on an altitude grid …

Page 24

L4: framework of the ESA ALGOM project

Figure S3 caption: NLS -> MLS

Figure S5 and S6: specify this is OMPS UBr in the figure or caption