This review is by Owen Cooper, TOAR Scientific Coordinator of the TOAR-II Community Special Issue. I, or a member of the TOAR-II Steering Committee, will post comments on all papers submitted to the TOAR-II Community Special Issue, which is an inter-journal special issue accommodating submissions to six Copernicus journals: ACP (lead journal), AMT, GMD, ESSD, ASCMO and BG. The primary purpose of these reviews is to identify any discrepancies across the TOAR-II submissions, and to allow the author teams time to address the discrepancies. Additional comments may be included with the reviews.

General comments:

This is the first paper submitted to the TOAR-II Community Special Issue, and therefore there are no other papers to compare it to at this time. The OMPS-LNM satellite product and its analysis and interpretation are similar to the discussion and analysis of several tropospheric ozone satellite products presented in the TOAR-Climate paper (Gaudel et al., 2018) published during the first phase of TOAR.

Specific comments:

Line 14

IPCC now uses "short-lived climate forcer" rather than "near-term climate forcer" (Szopa et al., 2021)

A: It is now corrected in the revised version of the manuscript.

Line 20

Regarding the lifetime of ozone in the free troposphere, the paper by Kourtidis et al. (2002) is not a good reference as they only mention a lifetime of 40 days in the Introduction, and they don't provide a reference. A better reference is Young et al. (2013) who give a global average lifetime of 22-23 days (this includes the boundary layer and the free troposphere).

A: The text is modified as suggested: "The global average lifetime of tropospheric O3 was estimated to be 22-23 days (Young et al., 2013). " (Line 19)

Line 39

It's worth pointing out that the nadir-limb approach gives tropospheric ozone values back to 1979, which is the earliest tropospheric ozone observations from satellites (Ziemke et al., 2019). See also Figure 22 in Gaudel et al. (2018), which shows clear ozone hotspots in summer 1979.

A: It is now included in the manuscript (Line 39)

Line 58

Here you mention merging the OMPS data with SCIAMACHY to produce long-term trends since 2002. But on line 124 you say that the OMPS-LP data can only be trusted until 2018. Does this mean the combined SCIAMACHY-OMPS trend will only span 2002-2018, and that additional data after 2018 will not be possible?

A: A new version of IUP OMPS-LP profiles is being processed based on the improved L1 (V2.6) data that counts for the observed drift after 2018. Using the improved stratospheric data, the OMPS-LNM TrOC dataset will be reprocessed, extended to the present and will be subject of a later paper. (Lines 466-468)

Line 103

Here and throughout the manuscript, “data was” should be “data were”

A: Corrected (Line 108)

Line 114

This is the first mention of IUP and it needs to be defined

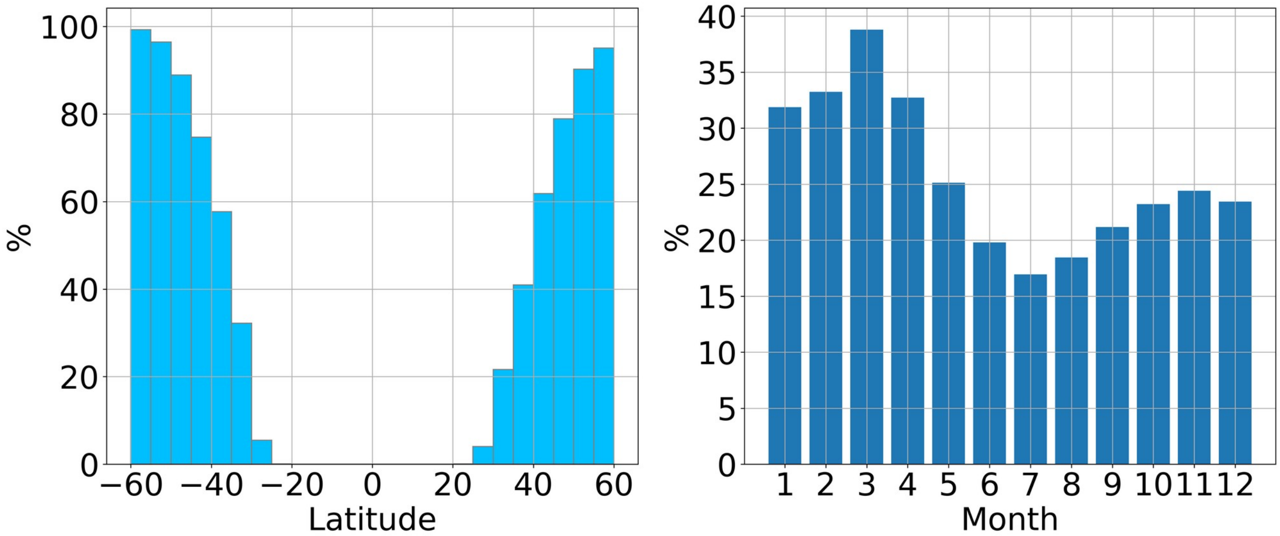
A: Now defined in Line 87.

Line 160

An ozone profile climatology (year 2018) has to be used to fill the gap between the lowest level of OMPS-LP (12.5 km) and the tropopause, if the tropopause is below 12 km. It would be helpful to indicate the frequency that the climatology has to be used. For example, it seems that it would only be necessary in the extra-tropics and during the cold months when the tropopause is often below 12.5 km.

A table or simple plot indicating the percent of the profiles requiring the use of the climatology by season and latitude band would be informative.

A: For one example year (2016), 27% of the processed profiles used climatology. The latitude dependence and the seasonal distribution for the northern hemisphere can be seen in the following figure.



How much uncertainty is introduced by using the climatology? This topic does not seem to be included in Section 4.

A: Indeed, the usage of the climatology was not included in the error budget. It is, however, unclear how it can be done.

Line 291

Logan (1985) is a landmark paper, but in terms of describing the current global distribution of ozone, and its origins, it is now out of date. Recent TOAR papers, or IPCC AR6, or the Monks et al. 2015 paper would be good choices as additional references.

A: Included (Line 306)

Figure 4

Thank you for using the same color table as the plots of satellite ozone products in Gaudel et al. (2018), it really helps to compare features between the different products.

Line 335

This is some excellent detective work to identify the likely origin of the tropical Pacific artefact.

References:

Szopa, S., V. Naik, B. Adhikary, P. Artaxo, T. Berntsen, W.D. Collins, S. Fuzzi, L. Gallardo, A. Kiendler-Scharr, Z. Klimont, H. Liao, N. Unger, and P. Zanis, 2021: Short-Lived Climate Forcers. In Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 817–922, doi:10.1017/9781009157896.008.

Young, P. J., Archibald, A. T., Bowman, K. W., Lamarque, J.-F., Naik, V., Stevenson, D. S., Tilmes, S., Voulgarakis, A., Wild, O., Bergmann, D., Cameron-Smith, P., Cionni, I., Collins, W. J., Dalsøren, S. B., Doherty, R. M., Eyring, V., Faluvegi, G., Horowitz, L. W., Josse, B., Lee, Y. H., MacKenzie, I. A., Nagashima, T., Plummer, D. A., Righi, M., Rumbold, S. T., Skeie, R. B., Shindell, D. T., Strode, S. A., Sudo, K., Szopa, S., and Zeng, G.: Pre-industrial to end 21st century projections of tropospheric ozone from the Atmospheric Chemistry and Climate Model Intercomparison Project (ACCMIP), Atmos. Chem. Phys., 13, 2063–2090, https://doi.org/10.5194/acp-13-2063-2013, 2013.