Review of Andrea Orfanoz-Cheuquelaf et al., Tropospheric ozone column dataset from OMPS-LP/OMPS-NM limb-nadir matching

The manuscript Tropospheric ozone column dataset from OMPS-LP/OMPS-NM limb-nadir matching by Andrea Orfanoz-Cheuquelaf et al. descripes the adaption of the LNM algorithm for SCIAMACHY (Ebojie et al., 2014) to the OMPS instrument. The errors are estimated and moreover the retrieved tropospheric ozone columns are compared to ozone soundings as well as comparable satellite data sets i.e. OMI-MLS and S5P CCD.

General Remarks / Questions

The total column is retrieved using a WFDOAS approach (or similar) here a view more details on the algorithm might be given e.g. is a stratospheric ozone profile necessary if so which one is used? As a reader we don't know all the details that might be obvious to the authors and have been presented in previous publications.

Concerning the tropospheric ozone retrieval, are the total and stratospheric columns retrieved independent from each other, or are the retrievals linked? For example one might think of using the stratospheric profile retrieved from the limb observations in the total column retrieval, or constrain the stratospheric column by the total column as upper limit.

Only cloud free pixels (cloud fraction less than 0.1) is used. Which cloud data are used here? If only the cloud fraction is used the VIIRS cloud fraction might be an option?

The authors discuss a very interesting issue in the OMPS profile retrieval over the Pacific Ocean around 10° N and attribute it to a possible cloud effect on the profile along the Line-of-Sight (p 16 l 335). I fully agree that clarifying this issue in detail might be worth a detailed study. On the other hand as a first check it might be worth to skip the profiles being affected by clouds some hundreds of km north or south (along the Line-of-Sight) of the tangent point. This might give a first indication whether your hypothesis is correct, provided you have enough data.
This effect is only observed over the oceans but not over the continents, even though or because the convection is stronger over the continents. Is this in agreement to the current hypothesis? Unfortunately there are no ozone soundings available in the most affected regions.

The tropospheric columns agree more or less with the data from OMI-MLS or S5P_CCD. All three retrieval approaches make use of the residual technique: TrOC=TOC - SOC. Can the observed difference to OMPS-LNM be attributes to the total column or the stratospheric column. For the drift relative to OMI-MLS (p 19 l 412) this might be of interest.

Data from 2012 to 2018 are presented, however no reason is given why the following 4 years (2018- 2022) are not included, yet.

Detailed remarks

Figure 1 is it possible to add a mean tropopause height to the mean profile deviations. Perhaps you can add an individual profile for both MLS and OMPS (V3-3) and the difference. Because, later on you are using individual measurements.

p 6 l 145 -150: For long term time series based on SCIAMACHY and OMPS it is important to use the same definition of tropopause as in Ebojie et al.. However, this is not yet the focus of the study. Is the definition of the tropopause also consistent with the datasets used in the comparison section i.e. OMI-MLS?

p 6 l 152: Here some more details might given on the calculation of the tropopause. How are the data interpolated to the OMPS profiles / total columns.

p7 l 184: "For the calculation .. (..below 0.1) are used." this is not fully clear. Assuming one of the three pixels has a higher cloud fraction, will all three be rejected or only the cloud contaminated one. How is the spatial resolution adapted in this case.

Figure 2 Unless the data are too cloudy the tropospheric columns are retrieved along the three central columns, right?

Figure 3 One of the largest uncertainties in many satellite based trace gas retrievals are caused by the uncertainties related to the cloud fraction and altitude. Therefor the small error bars on the stratospheric ozone column with respect to the cloud data is a bit surprising. Even taken into account that only cloud fractions less than 10% are investigated the range shown here seems too optimistic.

Table 4: please add the percentile range as well. For some regions (over the tropical Pacific Ocean) the tropospheric column is as low as 20 DU (figure 4) so in this case 12 DU random uncertainty means ~60%. This is comparable to other tropospheric ozone products.

Figure 4 The figure contains some orbital structures (over the Pacific Ocean), which is a bit strange for a 6 years mean. Is this caused by the sparse spatial sampling. How many data have been averaged for the specific regions?

p 14 l 302 According to Cooper et al., 2009 Lighting NOx is an important ozone precursor over the southern US in summer and there fore contributes to the outflow over the Atlantic.

Table 5: as for table 4 add percentile deviations.

p 19 l 392 OMPS-LNM has sparse spatial coverage, has this been considered in the comparison? Comparing S5P-CCD/OMI_MLS with OMPS only where and when both datasets are available.

Refrences:

For your colleague Eichmann, Kai-Uwe the hyphen is missing in some references (e.g. Leventidou et al., 2018)

Cooper, O. R., S. Eckhardt, J. H. Crawford, C. C. Brown, R. C. Cohen, T. H. Bertram, P. Wooldridge, A. Perring, W. H. Brune, X. Ren, D. Brunner, and S. L. Baughcum (2009), Summertime buildup and decay of lightning NOx and aged thunderstorm outflow above North America, J. Geophys Res., 114, D01101, doi:10.1029/2008JD010293