

Interactive comment on “Ozone Profile Climatology for Remote Sensing Retrieval Algorithms” by Kai Yang and Xiong Liu

Anonymous Referee #1

Received and published: 3 June 2019

This manuscript presents new ozone climatology's constructed based on MERRA-2 analyses with assimilation of AURA MLS and OMI observations during the period 2005-2016. Two types of climatology's have been constructed: one classified as a function of the tropopause height more suited for profile retrievals and the other classified as a function of the total ozone column, which should be used by total ozone retrievals. This work is perfectly suited for AMT and is comprehensively described and illustrated. The general context and past studies are appropriately referred to and discussed. I recommend publication of this work in AMT once the few small comments below have been considered.

Comments:

- What is the lower altitude limit of the ozone profiles provided in the climatology's? Do

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they extend down to sea level or down to a mean surface altitude? If the latter, how is this lower altitude defined? As the spatial resolution of the climatology is quite coarse compared to current spatial observations, could you provide recommendations on how to adjust the climatological profiles to be used in the retrievals to the actual satellite scene?

- In figure 2, focus is on the diurnal variation of ozone in the upper stratosphere. There must be some diurnal variation in the lowermost troposphere as well, at least in some regions of the world. Can such a diurnal variation be seen in the climatology's? Could you add a comment on this?

- Figures 4-5: It is not fully clear to me what represent the altitudes given in the line legends. As the climatology is binned in 1-km tropopause altitude steps, I would have expected numbers changing regularly (e.g 7.5, 8.5, 9.5 . . .), which is not the case here.

- Figures 6-7: same question as for Figs 4-5, but this time relating to the O₃ column binning. I'd expect a regular grid, like for the TOMS-V8 database. Also could you discuss the O₃ column range covered by your climatology? It seems to be significantly smaller for some of the latitude bins compared to TOMSv8, which might be an issue when using it as an a priori source of information in satellite retrievals. Do you have any recommendation to extend this column range if necessary?

- Figure 15: There is a general bias of 2-4% between the two climatologies, in agreement with Wargan et al. (2017), as mentioned at page 11, line 24. Shouldn't this bias be corrected for before constructing the climatology's or does it have no impact? The mentioned regions in NH where differences would be larger than 4% are not really visible. So this comment is perhaps not necessary.

Minor/Technical comments:

- Page 1 – line 18: covrariance → covariance

- Page 5 – line 24: attitude → altitude

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- Page 5 – Line 32: MEERA-2 → MERRA-2
- Page 11 – Line 14: tropopuase → tropopause
- Page 11 – Line 23: a small and high bias? Not clear?
- Page 11 – Line 31: capture → capturing.
- Page 12 – Line 6: MEERA-2 → MERRA-2
- Page 15 – Line 10: add “of” → accuracy of O3 profile retrieval; have → has.
- Page 19 – Line 19: remove one “the”
- Page 19 – Line 29: The number of 4DU for the TCO differences appears a bit low. There are clearly differences up to 6DU, even at low latitudes. I also see in Fig. 12 that the coverage in latitudes for the maps of the differences is smaller than what the Ziemke2011 database provides. Why is it so? Is it related to the fact that the differences at high latitudes appear to be much higher (a belt of red is visible in Northern hemisphere for the period May-Sept). It seems to come from the Ziemke2011 data and would worth to be mentioned.
- Page 24 – Line 2-3: delete “the tropopause-based O3(TpO3) climatology and the ML in Sofieva et al. (2014),”
- Page 26 – line 2: add a “and” → “over a broader range and at higher resolution”.
- Page 26 – Line 11: ‘resolutions’ -> “resolution”
- Page 26 – Line 14: add “on” → “based on total column abundance”

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2019-116, 2019.

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