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Atmospheric Measurement Techniques Discussions

Interactive comment on "Global tropospheric ozone column retrievals from OMI data by means of neural networks" *by* A. Di Noia et al.

Anonymous Referee #1

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This paper presented a new NN-based algorithm to retrieve tropospheric column ozone (TCO) over the globe from OMI level 1b data. The authors have made several significant improvements over previous work by Sellitto et al. (2011): (a) extending training dataset to cover tropics, middle and high latitudes, (b) using tropopause in defining output TCO, (c) use principal components of reflectance spectra rather than selected wavelengths based on extended pruning technique, (d) adding the use of VZA and excluding the use of OMTO3 total ozone, (e) combining OMI spectral information with ancillary information (e.g., tropopause pressure, temperature profiles, monthly mean TCO climatology) to constrain the retrievals. The retrievals were extensively validated with ozonesonde dataset (independent from training datasets) and it was found that TCO can be retrieved with a RMSE of ∼5-6 DU at all latitude bands and non-climatological

features of TCO can be well retrieved. Daily global maps of TCO are presented and compare well with CTM simulations. This paper is generally well written and organized and is suitable for publication on ACPD. I recommend this paper to be published after addressing the following minor comments:

Specific comments

1. In abstract, it is good to add what ancillary data are used, i.e., adding "(NCEP tropopause pressure and temperature profiles, monthly mean TCO climatology)" after "ancillary data"

2. P7676, L19, remove "upper" as this is not limited to the upper troposphere

3. P7677, L9, add "and its precursors" before "also affects"

4. P7677, L16, I do not think Eskes and Boersma is the correct reference of this as it talks about averaging kernels for DOAS retrievals, maybe you can refer it to Natraj et al., 2011 and references therein and modify the sentence to "current passive ultraviolet or thermal Infrared measurements usually have a reduced vertical sensitivity to lower tropospheric ozone"

5. P7677, L24-25, you may want to add a few recent references to derive TCO from OMI and MLS: Ziemke et al., 2006, Schoeberl et al., 2007, Yang et al., 2007

6. P7679, I think that another improvement might be worthy of mentioning is: the inclusion of viewing zenith angle (as radiances depend strongly on VZA, not used in OMI-TOC NN) and the exclusion of TOMS total ozone (not dependent on other ozone products).

7. P7686, L21, is the spectral range of "310-315 nm" correct? It seems to be inconsistent with "351 wavelengths" on L7 of P7691 as 310-315 nm range only has ∼30 wavelengths.

8. P7687, first paragraph, in addition to better characterize ozone absorption, the use

of temperature profiles might help constrain the retrievals through ozone and potential temperature correlation (Teitelbaum et al., 1996).

9. P7688, L16, it is good to add the spatial resolution of the climatology.

10. P7695, L25, since it is just based on correlation, it could also be due to the smaller range of anomalies (e.g., variations) in the tropics.

11. P7696, Section 6.1, it might be useful to briefly discuss how these retrievals compared to other TCO retrievals? Liu et al. (2010) also shows the OMI TCO map on 26 Aug. 2006.

12. P7696, L14, it is mainly due to the radiometric calibration of OMI radiances, using solar composite only slightly reduces the stripes. In the OMI TOMS total ozone algorithm, empirical radiometric calibration has been done to reduce the cross-track dependent biases. In the ozone profile algorithm by Liu et al. (2010), striping still exists with the use of multi-year mean solar irradiance.

13. P7698, L17, it is not clear about the meaning of "being more abrupt" according to the figure. The asymmetry with respect to the equator might be due to the motion of Inter-tropical Convergence Zone with season and August is in late summer.

14. In Figs. 5 and 6 labels, top panel uses Pearson coeff.: 0.75, lower panel uses Pearson: 75.22%. Are they the same? If so, it is good to be consistent.

15. P7677, L29, change "from the scan angle" to "on the scan angle"

16. P7678, line 21, change ";" to ","

17. In Table 1, it might be good to provide the full words for PC, SZA, VZA, TCO directly or in table footnote as some of these abbreviations have not occurred in the text before.

18. P7702, L14, the doi number does not look right, probably due to software issues, There are 5-6 similar other occurrences in the reference section.

References

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