Reply to Anonymous Referee #1

We are grateful to the Referee #1 for the consideration he/she has chosen to give to our work, and for his/her suggestions. Here are our detailed replies to his/her comments.

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"

We have included this clarification in the abstract of our revised manuscript.

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

We have applied this correction.

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

Done.

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"

We haved changed the reference and modified the sentence as suggested by the Referee.

P677, 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

We have added these references in the revised version of our manuscript.

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).

We have pointed this out in the revised version of the manuscript.

P686, 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.

It is indeed a misprint. The upper wavelength should have been 345 nm. We thank the Referee for noticing this. We have applied the correction.

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).

This is true, but we would prefer to say that the correlation between ozone and temperature has been used, without mentioning the potential temperature. In fact, no potential temperature data are used in our algorithm. Therefore we have cited the paper by Müller et al. (2003), whose authors mention this point.

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

We have added this information in the text.

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.

We have added a sentence that mentions also this aspect.

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.

Actually, the choice of 26 Aug 2006 as a date was not random, and same holds for the choice of the colour scale in our maps. Our initial idea was to perform a comparison with Liu et al. (2010). Then we decided to postpone this to a later work, where we might compare our retrieval not only with Liu et al. (2010), but also to other algorithms like Schoeberl et al. (2007), or retrievals from other satellites (e.g. IASI). Our main goal in the current paper was to describe the new design setup of the algorithm.
A quantitative comparison with other satellite products deserves a study of its own, as it would require much additional work which cannot be performed within the given time frame for this paper. Instead, in the revised version of our manuscript we provide a qualitative discussion of the main similarities and differences that can be seen between the TCO map shown in Fig. 9 of our paper and that shown in Fig. 8c of the paper by Liu et al. (2010).

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.

We have discussed this in the revised version of the paper.

P698, 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.

The Referee is probably right. We have changed the text according to his/her observation.

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.

They are the same, but two different conventions are adopted in reporting the Pearson coeffs. We have homogenized the conventions in the revised version of the paper.

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

Done.

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.

We have added the explanations of the acronyms in the caption, because we do not know if footnotes are editorially accepted. In case they are, we will consider including them in the version for typesetting.

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

Is the Referee referring to Chevallier et al. (2008)? We have tested that doi (by clicking on it) and it seems to point to the right link. Probably it is the presence of <> signs that makes the doi (as well as the doi's of other cited papers) look unusual, but to our awareness these signs are routinely used in the doi's of some journals published by the American Meteorological Society.

References

Liu, X. et al. (2010), "Ozone profile retrievals from the Ozone Monitoring Instrument", Atmos. Chem. Phys. 10, 2521-2537, doi: 10.5194/acp-10-2521-2010

Müller, M. D. et al. (2003), "Ozone profile retrieval from Global Ozone Monitoring Experiment (GOME) data using a neural network approach (neural network ozone retrieval system (NNORSY))", J. Geophys. Res. 108, 4497, doi: 10.1029/2002JD002784

Schoeberl, M. R. et al. (2007), "A trajectory-based estimate of the tropospheric ozone column using the residual method", J. Geophys. Res. 112, D24S49, doi: 10.1029/2007JD008773