

Interactive comment on “Tropospheric column amount of ozone retrieved from SCIAMACHY limb-nadir-matching observations” by F. Ebojie et al.

Anonymous Referee #2

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This study presents a residual method of subtracting stratospheric column ozone from total column ozone to derive tropospheric column ozone. What makes this particular residual method unique is that these two measurements are made by the same satellite instrument. Residual ozone is derived by subtracting nadir total column minus limb viewing stratospheric column. To my knowledge this single instrument method is currently only possible with SCIAMACHY measurements; however, the new NPP OMPS instrument can also do this using a nadir scan instrument measurement minus limb slit instrument measurement, but the OMPS data are not yet publically available. Time lag between the SCIAMACHY total and limb measurements as noted by the authors is

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about 7 minutes which is as good as can be obtained with current instruments. I like this paper and suggest publication subject to relatively small improvement changes to the current version. Below are listed some comments which the authors may want to implement:

Page 7822, Section 3.1: Just to clarify in the text regarding the original ozone retrieval by SCIAMACHY – by “ozone profile” you are referring to SCIAMACHY measuring ozone number density on fixed altitude surfaces at 1 km vertical sampling? In comparison, ozone profiles from the Aura MLS instrument are ozone volume mixing ratios measured on constant pressure surfaces. Equation (5) suggests that it is number density on fixed altitude surfaces unless some conversion was made from mixing ratios on fixed pressure surfaces. Also, with your optimization method employed for retrieving stratospheric ozone profiles, aren't the ozone profiles in the lower (upper) stratosphere below some altitude originating from the visible (UV) wavelengths? About what would this altitude be and is it much different between the tropics and extra-tropics?

Figures 6-13: It is likely that the differences between the tropospheric column ozone measurements in these figures come largely from differences in the tropopause pressures that they each employ. Differences in column ozone between them would be larger in the extra-tropics compared to tropics and sensitive to the highly localized nature of the sonde station locations depending on tropopause definition.

The basic spatial features with season in Figure 15 look to be generally consistent between the three different tropospheric ozone products but there are some inconsistencies that stand out. One puzzling feature is smaller zonal variation in the tropics for SCIAMACHY including almost no evidence of an Atlantic relative maximum during DJF and MAM. Also, the tropical Pacific ozone for SCIAMACHY appears much larger than both TES and OMI/MLS during DJF. On a different subject, Lelieveld et al. [2002, Science] discuss a pollution “crossroads” in the Mediterranean during northern summer months (JJA) which TES and OMI/MLS ozone seem to show but not SCIAMACHY.

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It is clear from Figure 15 that OMI/MLS is smaller overall relative to either SCIAMACHY or TES, but there is also indication that spatial variability may be most similar between TES and OMI/MLS despite their offset differences. The problem with color plots is that small changes in color scale can either hide or amplify certain features. It would be very useful for directly comparing the spatial variability of these three tropospheric ozone products by including some simple longitude line plots of the three ozone measurements averaged within different latitude bands (e.g., perhaps 20S-20N, 40S-60S, 40N-60N, etc.?).

It could be that the major differences between the tropospheric ozone products from SCIAMACHY and OMI/MLS originate largely from differences in their total column ozone measurements (independent of tropopause pressure). If space permits, it would be useful to say or show something in the paper about their total column ozone differences.

Some small comments:

> Page 7825, line 13: "...from ozonesonde climatological..."

> Page 7830, line 3 "...ozonesonde..."

> Page 7834, line 2: "...TES are slightly..."

> Page 7834, line 6: "...in these regions..."

> Page 7835, line 29: "...no ozonesonde stations..."

> I had some other comments regarding sectional content and improving the clarity of figures (such as currently small text/numbers in some of them), but these are only very small subjective comments and not really worth bringing up.

Interactive comment on Atmos. Meas. Tech. Discuss., 6, 7811, 2013.

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