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Interactive Comment

Interactive comment on "Global distribution of tropospheric ozone from satellite measurements using the empirically corrected tropospheric ozone residual technique: Identification of the regional aspects of air pollution" *by* J. Fishman et al.

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The authors present a new method for determining tropospheric column ozone climatology by subtracting SBUV-derived stratospheric ozone climatology from TOMS total ozone climatology. This is different from the previous tropospheric ozone residual(TOR) method that used SAGE data from determining stratosopheric column ozone. I am submitting this to ask about the results from Figure 2 and Figure 5.

Figure 2 shows the comparison between SAGE/TOMS TOR and SBUV/TOMS TOR.

There are three locations significantly different each other; northern India, California, and the west coast of northern equatorial Africa. Both SAGE/TOMS TOR and SBUV/TOMS TOR have used the same TOMS total ozone, which contains information about both stratospheric and tropospheric ozone. The only difference between two methods is the first used SAGE data and the second used SBUV data for determining stratospheric column ozone. Therefore, if tropospheric ozone distribution, which is determined by subtraction between TOMS total ozone and SAGE (or SBUV) stratospheric ozone, is different each other, the difference must be originated from difference between SAGE-derived and SBUV-derived stratospheric ozone. On this ground, the difference in tropospheric ozone distribution over the three locations must be explained by what have caused the difference between SAGE-derived and SBUV-derived stratospheric ozone over these locations. The authors appear to explain that the detection of enhanced ozone over northern India is the advantage of SBUV/TOMS TOR over SAGE/TOMS TOR. However, there is no clear explanation about why SAGE/TOMS TOR did not see the northern Indian pollution with the size of about 30 degree longitude by 5 degree latitude. Does this mean that the spatial resolution for SAGE/TOMS TOR is about 30-degree longitude by 5-degree latitude? The authors explain the difference of tropospheric ozone over California is due to GHOST (Global Hidden Ozone Strutures in TOMS) effect. As I mentioned above, if there is GHOST effect, both SAGE/TOMS TOR and SBUV/TOMS TOR must be affected because two methods used the same TOMS data. Therefore, the GHOST effect can not explain the elevated ozone observed by SBUV/TOMS TOR.

The additional question comes from enhanced tropospheric ozone over the west coast of northern equatorial Africa. This ozone shows the highest value over Africa for June-July-August period. It is well known that elevated ozone from South America across the Atlantic to Africa is due to production from ozone precursors released from biomass burning activity. June-July-August period is biomass-burning season over southern Africa and the south of South America. TOMS Aerosol Index and ATST fire counts shows the burning activity over these regions for this period. Therefore, it is surprising to see more ozone over northern equatorial Atlantic and Africa than southern equatorial Atlantic and Africa in Figure 2. In addition, there are several methods for determining tropospheric ozone such as Convective Cloud Differential method by Ziemke and Chandra (1998, JGR), Modified Residual method by Hudson and Thompson (1998, JGR), Scan Angle Geometry method by Kim et al. (2001), and Convective Cloud Pair method by Newchurch et al. (2003). None of these methods shows more ozone over northern equatorial Atlantic and Africa than southern Atlantic and Africa. These raised questions about the results from Figure 2 must be explained

Figure 5 shows tropospheric ozone distribution between February and June-August period. The amounts of ozone over northern Indian is about 45-50 DU for June-August, while the amounts is about 20-25 DU for February 1991 and 35-40 for February 1992. Generally, India is under the influence of southerly flow during summer and so continental air becomes clean due to the transport from clean environment, the Indian Ocean. This pattern is well observed over tropospheric column ozone climatology over Madras (13N, 80E) from MOZAIC campaign, which shows low ozone in July and August and high ozone in December-May shown by Martine et al (2002). Oltman et al (2003) analyzed ozonesoundings over Asia have also shown minimum tropospheric column ozone during July-August as well. Therefore, in order to prove that the feature of enhanced tropospheric ozone, especially over northern India, is real, the authors should show that the ozone seasonality from Figure 5 is consistent with other measurements from ground-based measurements such as ozonesoundings and the ozone distribution agrees with at least either ozone distribution from model or MOPITT CO distribution.

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