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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Space-borne observations link the tropical Atlantic ozone maximum and paradox to lightning" *by* G. S. Jenkins and J.-H. Ryu

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This paper tried to show the possible causes of the tropical ozone paradox, which shows about 10-15 DU higher ozone over southern Africa than northern Africa during northern biomass burning season (Dec-Feb). The authors concluded that ozone precursors from biomass burning activity in northern Africa was transported to southern Africa with elevated amounts of NOx from lightning activity, and then ozone was photochemically produced.

(1) Overall, I can not find any noticeable difference between this paper and Edwards et al paper(2003) in the approach and the method to resolve the paradox.

(2) This paper used fire count distribution and meteorological wind flow to show how ozone precursors over northern Africa can be transported to southern Africa and photochemically produce ozone with enhanced lightning. Even though this paper showed only ATSR fire counts, however, MOZART (Edwards et al, 2003), GEOS-CHEM (Martin et al, 200)'s chemical-transport model always showed high ozone over northern Africa during northern burning season even with enhanced lightning activity. They show that the distribution of fire counts is well correlated with MOPITT CO and model-simulated tropospheric ozone distribution. Therefore, the authors' conclusion is contradicted to chemical-transport model results.

(3) If tropopsheric ozone was located near boundary over northern Africa in northern burning season, while transported ozone from northern Africa was located in the higher altitude over southern Africa, the TOMS algorithm could underestimated tropospheric portion of TOMS total ozone over northern Africa compared with that over southern Africa due to low retrieval efficiency for tropopsheric portion by the TOMS algorithm (Hudson et al (1995), Kim et al (1996)). However, even though this vertical tropospheric ozone distribution is true, the amounts of the error due to the efficiency is about less than 5 Dobson Unit between northern and southern Africa. This amount is still too small to make up 10-15 DU difference between southern than northern Africa during the northern burning season.

All of research papers tried to resolve the paradox have started with based on that the outcome from the residual based measurements are the truth, and then tried to tune the analysis to fit to the satellite measurements. I would like to remind that Kim et al (2001) developed a new algorithm based on the concept of the TOMS retrieval efficiency using the TOMS scan angle geometry and found tropospheric ozone distribution consistent with Fire counts and MOPITT CO. Therefore, because there is a new satellite measurements that does not show the paradox, it is time to think about whether there is any mistake in the satellite measurements or not.

Reference 1. Edwards et al. Tropospheric ozone over the tropical Atlantic: A satellite

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perspective, JGR, D8, 4237, 2003.

2. Hudson et al. On the derivation of tropospheric column ozone from radiances measured by the TOMS, JGR, 100, D6, 11137-11146, 1995.

3. Kim et al. A new method of deriving time-averaged tropospheric column ozone over the tropics using TOMS, JGR, 101, D19, 24317-24330, 1996.

4. Kim et al. Distribution of tropcal troopsheric ozone determined by the SAM method applied to TOMS measurements. JAS, 58, 18, 2699-2708, 2001.

5. Martin et al. Interpretation of TOMS observations of tropical tropospheric ozone with a global model and in situ observations, JGR, 107, D18, 4351, 2002.

Interactive comment on Atmos. Chem. Phys. Discuss., 3, 5725, 2003.