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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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There are at least 2 things going on as it relates to DJF at Natal.

1. Biomass Burning from West Africa. In the lower troposphere (at pressure levels 850-600 hPa) we believe that this station is under the influence of some biomass burning from Western Africa. Hence during January the ozone levels are enhanced. Please refer to the Tropoz I &II papers of Jonquieres et al. 1998. We have also suggested in Jenkins and Ryu (2003) that ozone at pressure levels less than 800 hPa may reach South America via strong easterly winds. It is also possible that subsidence after lightning events could enhance the tropospheric column ozone.

2. Lightning during DJF and SON in South America. While it is true that there are more flashes in South America during SON relative to DJF, lightning is equally distributed

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between Africa and South America (More flashes in S. America) in the latitude zone of 15S-5S (Figure 9c Ű Jenkins and Ryu) in DJF. Hence there are two potential sources of ozone via NOx in this latitude zone . There are also a considerable number of flashes in the latitude zone of (5S-5N) but most of these flashes are coming from Central Africa. If you examine Figure 5 (Jenkins and Ryu, 2003), you will note that the highest values are in the 300-500 hPa layer during January at Natal. This would suggest that Central Africa is important for enhancement of ozone. In the 300-150 hPa levels both Central Africa and South America are likely contributors at Natal during January. While the mean winds are westerly during DJF, we have found that there can be consider variability in wind speed/direction associated with upper-level anticyclones (Jenkins et al. 2003). Edwards et al. (2003) and Martin et al (2002) have also suggested South America as potential sources of ozone during DJF over the South Tropical Atlantic. Finally you have 3 potential sources of ozone via lightning and NOx production during SON (South America, Central Africa and West Africa)-

Other Issues

3. Biomass Burning at Natal DJF/SON. Again, we believe that the enhancement of lower troposphere ozone at Natal is associated with Biomass burning from West Africa. However, subsidence after thunderstorms could also be important. The mean winds are from the east in the lower troposphere, which is downstream of fires in Central Africa during JJA-SON. The TRACE-A measurements clearly show that there is enhancement from the east, which is likely increasing ozone in the lower troposphere (Kirchoff et al. 1996). Kirchoff et al. 1996 identifies Central Africa as the source. While it is true that biomass burning is coming to an end on both continents (especially in October) there may still be significant emissions leaving Africa (See Plate 1 Anderson et al. 1996).

4. Ozone at the other stations. If you examine Figure 6 in Jenkins and Ryu, (2003)you will see that ozone is higher at Ascension Island than Natal because it is under the direct influence of biomass burning from Central Africa. Paramaribo is too far north to

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be directly impacted by biomass burning from Central Africa during JJA/SON.

I have not included several figures because of the nature of the short comments but will send them you via email.

Gregory Jenkins

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