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THE USE OF TOMS DATA FOR TROPOSPHERIC OZONE STUDIES

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Since 1984, we have been funded by NASA's Tropospheric Chemistry Program to identify potential uses of various satellite data sets to investigate tropospheric chemical processes. At the cornerstone of this research has been the archived gridded data set of TOMS total ozone measurements. In conjunction with other conventional satellite data sets available from NOAA, such as GOES and AVHRR, we have identified numerous instances whereby enhancements of total ozone in the Tropics are clearly associated with sporadic occurrences of widespread biomass burning events. The measured increase in total ozone from TOMS (10 to 20 Dobson Units) is consistent with in situ aircraft measurements taken during biomass burning episodes.

Our studies also indicate that a very strong positive correlation exists between total ozone and the distribution of carbon monoxide (CO) in the Tropics. The CO data we used were taken from the MAPS (Measurement of Air Pollution from Satellites) data set which was flown on a 1981 Space Shuttle mission. Because CO has only tropospheric sources, its strong in-phase relationship with total ozone likewise supports the hypothesis that total ozone data can be used for tropospheric ozone studies at low latitudes.

The feasibility of extracting a tropospheric ozone amount by subtracting the integrated stratospheric ozone component from the TOMS total ozone measurement is currently being explored. Using ozone profiles derived from SAGE (Stratospheric Aerosol and Gas Experiment), our preliminary findings show enhanced tropospheric ozone concentrations over Africa and the eastern Atlantic Ocean at tropical latitudes. Other preliminary studies also suggest that TOMS data may provide a means of identifying widespread air pollution episodes over the United States during the summer when the jet stream is located north of the region of interest.

One of the future studies we plan to conduct is to compare TOMS data with tropospheric ozone cross sections (distance versus altitude) obtained from UV-DIAL (Ultraviolet Differential Absorption Lidar) which was flown over the Amazon Basin in the summer of 1985. Enhancements of ozone concentrations throughout the lowest 4 km of the atmosphere were observed by the UV-DIAL in regions that had been polluted by biomass burning. Hopefully, the gradients of tropospheric ozone measured by UV-DIAL will be captured by TOMS.