



Tropical tropospheric ozone morphology and seasonality seen in satellite, model, and in-situ measurements.

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An important issue in satellite remote sensing techniques for retrieving tropical tropospheric ozone is understanding the cause of the disagreement between ozone derived from satellite residual-based methods and the precursor distributions seen in both the fire-count distribution and the Measurements Of Pollution In The Troposphere (MOPITT) CO distribution over northern tropical Atlantic and Africa in boreal winter and spring, which is called the Northern Atlantic Paradox. We have developed a new algorithm, the Scan Angle Method (SAM), to probe the Paradox. This algorithm takes advantage of the difference in the Total Ozone Mapping Spectrometer (TOMS) retrieval information between nadir and high viewing angles. The averaging kernel for this difference exhibits a broad maximum centered at ~5 km in the troposphere and thereby can be used to estimate tropospheric ozone information. The seasonal distribution of tropospheric ozone derived from the SAM algorithm shows a remarkably good agreement with fire counts from Along Track Scanning Radiometer (ATSR) and CO from MOPITT; TOMS Aerosol Index; ozone distribution from the GEOS-CHEM model in four seasons over the tropics. In meridional distribution, all products except the Convective Cloud Differential (CCD) method clearly reveal the seasonal oscillation between the maximum over northern tropical Africa in boreal winter and over southern tropical Africa in boreal summer. The CCD products always show the ozone maximum over the southern Atlantic off the coast of southwest Africa. A further comparison has been made between various measurements and the *in-situ* measurements from the Measurement of Ozone and Water Vapor by Airbus In-Service Aircraft

(MOZAIC) campaign at three locations over the northern tropics; Abidjan (5°N, 4°W), Madras (13°N, 80°E), and Bangkok (14°N, 101°E). The seasonality of the SAM and the model ozone, which shows the ozone maximum in boreal summer and the minimum in boreal winter, are in accordance with the MOZAIC measurements. However, the seasonality of the CCD does not agree with that of *in-situ* measurements. We have not observed the Paradox between the seasonality of the SAM tropospheric ozone and the biomass burning activity distribution as of between the CCD and the burning activity.