

Tropospheric Ozone at Tropical and Middle Latitudes Derived from TOMS/MLS Residual: Comparison with a Global Model

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Abstract

The tropospheric ozone residual method is used to derive zonal maps of tropospheric column ozone using concurrent measurements of total column ozone from Nimbus 7 Earth Probe (EP) Total Ozone Mapping Spectrometer (TOMS) and stratospheric column ozone from the Microwave Limb Sounder (MLS) instrument on the Upper Atmosphere Research Satellite (UARS). Our study shows that the zonal variability in TOMS total column ozone at tropical and sub-tropical latitudes is mostly of tropospheric origin. The seasonal and zonal variability in tropospheric column ozone (TCO), derived from the TOMS/MLS residual, are consistent with that derived from the convective cloud differential (CCD) method and ozonesonde measurements in regions where these data overlap. A comparison of TCO derived from the TOMS/MLS residual and a global 3D model of tropospheric chemistry (GEOS-CHEM) for 1996-1997 shows good agreement in the tropics south of the equator. Both the model and observations show similar zonal and seasonal characteristics including an enhancement of TCO in the Indonesian region associated with the 1997 El Niño. Both show the decline of the wave-1 pattern from the tropics to the extratropics as lightning activity and the Walker circulation decline. Both show enhanced ozone in the downwelling branches of the Hadley Circulation near $\pm 30^\circ$. Model and observational differences increase with latitude during winter and spring.

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