

**SHADOZ ozone variability: Interannual variations of ozone in the tropical troposphere and tropopause region from the SHADOZ and other ozonesonde data sets**

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Ozonesonde data from 10 Southern Hemisphere Additional Ozonesondes (SHADOZ) tropical stations up to 2008 are analyzed to investigate interannual variations of ozone in the troposphere and around the tropopause region. Data from five of the stations during the pre-SHADOZ period (1993-1997) are also incorporated in this study. Interannual variations of tropospheric column ozone are found to be largely controlled by the El Niño-Southern Oscillation (ENSO) and the Indian Ocean Dipole (IOD) in Southeast Asia and the central Pacific in the 1990s. In the 2000s, high ozone events are observed in this region at least in 2002, 2006, and 2008 when El Niño events (and IOD events in 2006 and 2008) occurred. The interannual variability during 1998-2008 is generally greater in Southeast Asia and the central Pacific (Kuala Lumpur, Watukosek, Fiji, and American Samoa) than in the Atlantic and South America (Ascension, Natal, Paramaribo, and San Cristobal) in a relative sense with respect to the local climatology. Around the tropopause region, at 16-20 km, significant decadal-scale variations with a maximum around 1999-2000 and increases in 2006-2008 are observed at most stations. This is largely consistent with the tropopause temperature changes and the lower stratospheric water vapor changes recently reported in the literature. A decadal linear trend analysis is made for tropospheric ozone for ~11 years between 1998 and 2008. The tropospheric column ozone shows increasing trends of ~1% per year (0.2-0.3 DU per year) at most stations. Increasing trends in ozone mixing ratio, though mostly statistically insignificant, are found in the planetary boundary layer at Kuala Lumpur and Watukosek at 2-3% per year (~1 ppbv per year) and in the upper troposphere at most stations at 0-5% per year (0-1.5 ppbv per year) depending on station.