Warming in the tropical tropopause layer estimated from GPS radio occultation data during 2001-2010

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The trends and interannual variations of the temperature of tropical tropopause layer (TTL), cold point tropopause (CPT) temperature, altitude and pressure are studied using GPS Radio Occultation (RO) data during 2001-2010 within ±15° tropical latitudes, and radiosonde data from 5 tropical stations during 1980-2010 within ±15° latitudes. Two homogenized radiosonde datasets, HadAT, RICH and ERA Interim datasets are also used during 1980-2010 in ±15° latitude. Linear regression analysis are applied to detect the trend in deseasonalized annual mean and monthly mean TTL temperatures, respectively. The linear regression analysis includes the components representing quasi-biennial oscillation (QBO), El Nino Sothern Oscillation (ENSO) and stratospheric aerosol optical depth (AOD) for the period of 1980-2010. It is shown that the TTL temperatures trend change from cooling in past decades (1980-2000) to warming in present decade (2001-2010). The QBO and ENSO play important roles in interannual variability of the TTL. The role of AOD in the interannual variability of the TTL can be seen in the present decade although there are no major volcanic eruptions. The CPT temperature trend shows similar changes as TTL temperatures whereas trends in its altitude and pressure do not show similar changes. The QBO and AOD play important role in interannual variability of the CPT temperature while QBO and ENSO for the CPT altitude and pressure for the period 2001-2010.