

Long-term observations of MLT zonal wind variations in relation to stratospheric zonal winds over low-latitudes

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Long-term observations from medium-frequency and meteor radars (1993-2012) and rocket soundings (1979-1990 and 2002-2007) are used to study mesosphere lower thermosphere (MLT) zonal wind variations in relation to the stratospheric winds over Northern low-latitudes. The combined dataset provide a complete height profile of amplitude of semiannual oscillation (SAO) up to 100 km, with an exception around 75-80 km. The SAO signal has maxima around 50 km and 82 km and a minimum around 65 km. The MLT zonal winds show remarkable inter-annual variability during spring equinox and much less during fall equinox. Zonal wind mesospheric spring equinox enhancements (MSEE) appear with a periodicity of 2-3 years suggesting a modulation by the quasi-biennial oscillation, which we identified with the strength of stratospheric westward winds. Out of 20 years of observations, the stratospheric westward winds are strong during 11 years (non-MSEE) and weak during 9 years. Six of these years show large MLT winds (MSEE) and 3 years (1999, 2004 and 2006) show small MLT winds (missing-MSEEs). These unexpected small winds occur in years with global circulation anomalies as identified with strong sudden stratospheric warmings and an early spring transition of zonal winds, along with a minor enhancement in the tidal amplitudes.

Keywords: MLT winds, MSAO, Meteor radar, MF radar, QBO