

Quasi-biennial Variation of Equatorial Waves

Zeyu Chen

*Institute of Atmospheric Physics, Chinese Academy of Sciences, P.O. Box 9804 Beijing, China
100029*

The quasi-biennial oscillation (QBO) in zonal winds in the lower stratosphere at the Equator is the most prominent inter-annual variation signal in the middle atmosphere. Theoretically, it is driven by the drag from the damping of equatorial waves including the equatorially trapped planetary scale waves, such as Kelvin waves propagating eastward and Rossby-gravity waves propagating westward, inertio-gravity waves and gravity waves. In current research, the temperature data collected by the SABER/TIMED mission in 2002-2009 are used to investigate the equatorial waves activities. The Fast Fourier Synoptic Mapping (FFSM) method is applied to delineate planetary wave components with the zonal wavenumber spanning over -6 to +6, hereby, positive (negative) wavenumber is assigned to westward (eastward) propagating waves.

Focusing on the height region 70-10 hPa where the QBO signal is most significant, it is clearly observed that the composite activity of all the eastward waves exhibit QBO like variation. Specifically, for each QBO cycle, the activity at ~50 hPa level is characterized by the occurrence of a substantially clear minimum that coincides to the fast downward propagation of the westerly phase, the typical pattern of the QBO phenomenon. Phase speed spectra are derived by using the FFSM analysis results. And vertical shear of the zonal wind is derived by using the rawinsonde data at Singapore. Comparison of the phase speed spectra and the wind shear indicates that the minimum is due to the westerly shear below 30 hPa. Between the minimum, significant wave activities emerge. Results show that in height range 70-10 hPa, both wave 1 to wave 3 are prominent during the inter-minimum period for each QBO cycle. Moreover, results also show that although with small amplitude, wave 4 and wave 5 with shorter periods of 4-7 days are discernable in particular in the inter-minimum period. Further details will be presented in the talk.