The Lifetime and Longitudinal variation of the Kelvin waves around the Tropical Tropopause Region

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Many studies of the tropical atmosphere have led to detailed analyses of waves and oscillations. Among them, the Kelvin waves in the tropical tropopause layer (TTL) have been focused from the view point of stratosphere-troposphere exchange (STE) in tropics, because the Kelvin wave is one of the largest amplitude disturbances in the temperature field around the TTL [*Suzuki and Shiotani*, 2008].

Using the ECMWF 40-year reanalysis data for zonal wind field we have investigated the characteristic variability and the mean lifecycle of the Kelvin waves around the tropical tropopause layer (TTL).The vertical distributions of the passing case numbers and the mean squared amplitude compared to the activity are examined: the Kelvin wave total case numbers are most contributable to the Kelvin wave activity. The Kelvin wave disappearance locations concerning to the appearance longitude are also investigated at 200 and 100 hPa.At 200 hPa the Kelvin waves are most concentrated in the region named the case W in the western hemisphere. At 100 hPa the most frequency region named the case E is centered on the eastern hemisphere. On the average, propagating eastward about 80 degrees distance in longitude is common to the cases W and E.

The mean lifecycle and its relation to the background conditions for the Kelvin waves are analyzed with a composite method. In the case W for the typical example in the upper troposphere, the convections over the Indian Ocean and the western Pacific might be main energy source for the Kelvin waves. The Kelvin wave propagates eastward through the westerly basic wind, decreases over South America, and then goes faster to the east. The vertical structure has the divergence in the upper and middle troposphere and the weak convergence in the lower troposphere tilting toward the east following the time.

In the case E for the typical example in the TTL, the Kelvin wave propagates eastward through the easterly basic wind and then decreases over the region between the Indian Ocean and the western Pacific. The Kelvin waves signal continuously from the region over the South America suggested that some of Kelvin waves firstly recognized as the case W in the western hemisphere at 200 hPa propagate upward and eastward over near the South America, and then they reach as the case E at 100 hPa in the eastern hemisphere. The Kelvin waves included in the case W and E might be convectively coupled for a few days after they appear at 200 and 100 hPa, respectively. The temperature anomalies show the boomerang-like vertical structure during associated with the convection.