



Variation of the Tropical Upper-tropospheric Trough and Its Linkage to the Asian-Pacific-North American Summer Climate

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The tropical upper-tropospheric trough (TUTT) is one of the most prominent features in Northern Hemisphere (NH) summer, which peaks at 200-150 hPa in July and August. It is found that the TUTT varies largely from year to year, which indicates that the TUTT may exert great effects on the NH summer climate. In order to explore the causes that lead to the interannual variations of the TUTT, an area-weighted empirical orthogonal function decomposition analysis was applied to.

The first mode reflects the northeastward-southwestward displacement of the TUTT, which is significantly related to the planetary wave originating from the Indo-western Pacific during a developing La Niña. The second mode presents the intensity change of the TUTT, which is attributed to the enhanced convection over the central Pacific where the anomalous warming sea surface temperature is appearing. The third mode shows the northwestward-southeastward displacement of the TUTT, which is correlated well with the north-south direction shift of east Asian westerly jet. Anomalous warming over the midlatitudes and cooling over the subtropics suggests a decreased meridional temperature gradient, which results in the northward displacement of westerly jet. The variations of TUTT's location and strength have distinct effects on the variation of South Asian high, the northwestern Pacific subtropical high, and the Mexican high, which subsequently modulate the climate anomalies in different regions.