The Climate Regime Shift in Pacific Basin in Middle-Late 1990s: Mechanisms and Impacts

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Abstract

A climate regime shift (CRS) in the Pacific sea surface temperature (SST) pattern was identified in 1996/1997. This decadal SST change is characterized by a warming over the equatorial western Pacific (EWP) and mid-latitude North and South Pacific and a cooling in the equatorial central Pacific (ECP). The large-scale atmospheric circulation change associated with this CRS exhibits a pair of low-level anticyclonic (cyclonic) gyres off the EWP (ECP) and a zonal-vertical overturning circulation anomaly along the equator.

A mixed layer heat budget analysis suggests that the abrupt change of SST in the EWP and ECP is attributed to different physical processes. The abrupt warming over the EWP was initiated by a short wave radiation anomaly in association with a preceding warming in the ECP. The cooling in the ECP happened about 6 months later than that of the EWP and was primarily attributed to anomalous oceanic zonal and vertical temperature advections.

The possible influences of CRS on the TC-activity in the Pacific basin, including the western North Pacific, western South Pacific and eastern North Pacific, and the weakening and east-shift of Aleutian Low after the late 1990s were addressed.