



Paradox in Tropical storm genesis frequency decreasing and Genesis Potential index increasing after late 1990's over the western North Pacific

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Tropical storm (TS) genesis frequency in summer (June-August) and autumn (September–November) over the western North Pacific (WNP) experienced an abrupt change in late 1990s. After the late 1990s, TC genesis frequency decreased significantly over the WNP. To investigate the mechanisms responsible for the decadal change of TS numbers, two Genesis Potential indexes (GPI) and a newly proposed synoptic-scale eddy (SSE) kinetic energy (KE) equation that separates the contributions of seasonal-mean circulation and intraseasonal oscillation (ISO) to the SSE are adopted in this study. The results show that, during the inactive TC decade, GPI estimated from observational data and 6 CMIP5 models increased after the late 1990's. GPI failed to capture the decrease of TS number during the inactive TC decade was primarily contributed by the increase of relative humidity in GPI calculation.

The variation of SSEs was closely related to the decadal change of TS formation numbers over the WNP. SSE obtained less KE from both mean flow and ISO through eddy barotropic energy conversion associated with the weakened monsoon trough and ISO cyclonic anomaly over the WNP, during the inactive TC decade. The dynamic interaction between mean flow, ISO, and SSE play an important role in the decadal change of TS genesis frequency.