

Variations of Summertime Tropical Cyclones in the Western North Pacific in Background of Global Warming

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Occurrences of tropical cyclones(TCs) in background of global warming have been drawn more and more attention in our climate community. Using the TC observations of 58-yr from China Meteorological Administration and the ERA-40、NCEP-NCAR、HadISST reanalysis datasets, the variations of TC activity in the western north Pacific(WNP) in the summertime are investigated. The total of 1247 summertime TCs in 58 years are classified into four types according to their paths, of which there are 427 cases for the westward-bound type, 502 for the northeastward-bound type, 200 for SCS-bound type and 118 other cases. The statistics showed that the frequencies of the TC formation and the super typhoons, the westward-bound type and the South China Sea TCs all experienced a decreasing climate trend over the past six decades in boreal summer over the WNP. The composite sea surface temperature(SST) and atmospheric climate background of the anomalous TC activity years in summertime is performed to further explore the reasons of the variation of TC activities. The composite analysis shows that the warm and cold SST events in the equatorial central and eastern Pacific are significantly correlated with abnormal TC activities:the negative sea surface temperature anomalies (SSTA) in the equatorial central and eastern Pacific are associated with more TCs genesis, and vice versa, which relates to the La Nina or El Niño events. The low-level circulation anomalies over the cyclogenesis area display cyclonic (anticyclonic) in the greater (fewer)-TC years. The atmospheric circulation and SST in background of climatic warming show the climate trends: the subtropical high becomes more intense and expands more westward in the WNP, with the SSTA showing an increasing trend in the central and eastern equatorial Pacific. Such climatic trends of atmosphere and SST anomalies facilitate less forming of the total, the SCS and the moving westward TCs in the WNP in the summertime.

Key words: tropical cyclone, frequency, track, global warming