

Decadal-scale Changes in the Seasonal Transition Patterns of the Asian Summer Monsoon and the South China Sea Tropical Cyclone Frequency During May

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Abstract

The decadal-scale variations of the Asian summer monsoon and the tropical cyclone (TC) activity over the western North Pacific (WNP) and the South China Sea (SCS) are of great scientific and societal importance. The period of 2010-2019 was identified as the most inactive decade since 1961 in terms of TC genesis over the SCS and the Philippine Sea during May (Cho et al., 2022). In this paper we extended the analysis by using 40-yr (1981-2020) data to illustrate the relationship between the SCS TC frequency in May and the spring-to-summer transition of Asian monsoon systems. The results show clear decadal-scale variations of TC frequency with two active decades during the 1980s and 2000s and two inactive decades during the 1990s and 2010s. The circulation and surface air temperature contrast during the earlier two decades is drastically different from the contrast during later two decades. The difference can be understood as decadal-scale variations of two leading modes of the 40-yr March-June precipitation in Asian-Australian-Pacific monsoon region. For the two earlier decades, the contrast of active and inactive SCS TC frequency in May can be explained by the difference in EOF2. The positive EOF2 corresponds to a wet and dry dipole pattern of the concurrent anomalies with enhanced convection over the eastern Indian Ocean and suppressed convection over the western Pacific warm pool. For the two later decades, the contrast can be explained by the difference in EOF1, which shows a meridional dipole pattern over eastern Indian Ocean reflecting the northward movement of the ITCZ. Among four decades, the decade of 2001-2010 shows the earliest northward transition of the ITCZ and the most active SCS TC frequency in May. Although the decades of 1981-1990 and 1991-2000 show strong difference in TC frequency, no discernable difference in monsoon seasonal transition is detected.

Key words: tropical cyclone, decadal variability, monsoon transition season