Unusual growth in intense typhoon occurrences over the Philippine Sea in September after the mid-2000s

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During the global warming hiatus period (1998–present), a pronounced increase in the number of intense typhoon occurrences was identified over the Philippine Sea (PS: 5°–25°N, 125°–140°E) in September after the mid-2000s. Comparing two periods before and after the mid-2000s indicates that intense typhoons rarely occurred over the PS in September before the mid-2000s, with a frequency of fewer than 0.4 per year, but reached up to nearly 1.5 per year after the mid-2000s. The abrupt increase in intense typhoon occurrences over the PS was primarily attributed to increased tropical cyclone (TC) genesis and favorable large-scale conditions for TC intensification. The increase in TC genesis number over the PS was caused by contributory dynamical conditions, including positive low-level relative vorticity anomalies and anomalous ascents, which corresponded to a southwestward shift and strengthening of the monsoon trough. In addition, among the favorable large-scale conditions, the increased relative humidity that resulted from intensified moisture flux convergence exerted essential effect on the TC intensification.

These changes in atmospheric environmental conditions favoring intense typhoon occurrences over the PS were primarily associated with the change in the tropical Indo-Pacific sea surface temperature (SST) around the mid-2000s. Besides that, the positive feedback TCs exerted on the circulation was also conducive to the unusual growth in intense typhoon occurrences over the PS. And note that the role of SST anomalies in the air–sea interaction is the key to interpret why the unique phenomenon only occurred in September

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