聖嬰變化對於颱風十至十一月侵襲菲律賓之影響機制

Impact of various El Niño–Southern Oscillation to tropical cyclone activity during October-December in the Philippines

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摘　要

此研究工作為探討10-12月侵襲菲律賓颱風活動與ENSO之相關性與調節機制。研究結果發現侵(近)菲律賓之秋季颱風活躍度與ENSO存在著非對稱對應關係。對於颱風活躍度與聖嬰或反聖嬰年海表面溫度相關性中，颱風活躍(非活躍)型態之暖海水距平主要分布在西北太平洋120º-150º E 區域。在聖嬰颱風活躍年，此暖海溫距平驅動大氣在東太平洋赤道海域產生一個輻合中心及西太平洋赤道附近120º-130ºE產生輻散中心。此輻散中心透Matsuno-Gill 類型機制反應，於菲律賓東側產生異常的氣旋距平環流場，提供一個有利於颱風移入的環境場。對於聖嬰-颱風不活躍型態類別中，反氣旋環流距平往東偏移並覆蓋在菲律賓海域上，抑制了颱風生成並提供不利於颱風往此進入的條件。在反聖嬰年-颱風活躍型態，冷海溫距平出現在赤道東太平洋與東印度洋、南中國海域，微弱的暖海水距平則呈現在西太平洋赤道洋面，引發大尺度環流產生輻合中心距平位於130º-140º E，以及氣旋式環流距平由印度洋往東延伸至菲律賓海。位於菲律賓海域上的氣旋環流距平提供一個有利於颱風生成的環境場，隨後伴隨著東南風駛流場而侵近菲律賓。對於反聖嬰-颱風不活躍型態，主要的冷海溫距平出現在東太平洋赤道地區、暖海溫距平呈現在西太平洋赤道地區。此海溫配置在120º-130º E引發大尺度輻合中心，使反氣旋環流距平往西偏移到菲律賓上方附近，抑制了西太平洋赤道海域的颱風生成、及不利颱風往菲律賓移動，因此減少了颱風活躍度。

關鍵字：ENSO，颱風，菲律賓

Abstract

This study demonstrates asymmetric relationships between El Niño–Southern Oscillation (ENSO) and tropical cyclones (TCs) affecting the Philippines during October–December. In El Niño or La Niña years, the number of TCs impacting the Philippines may increase or decrease. These variations result in four ENSO–TC variability types all of which exhibit strong sea surface temperature (SST) anomalies across the equatorial eastern Pacific. The major difference between the active and inactive types in terms of El Niño or La Niña years is related to the magnitude of SST anomalies in the tropical western Pacific (TWP) over the 120º–150º E region. During El Niño years, moderate cold SST anomalies in this TWP region cause an anomalous divergent centre around the 120º–130º E zone to evoke an anomalous cyclone east of the Philippines. In the western North Pacific (WNP), this anomalous cyclone causes more TCs to form and move toward the Philippines, resulting in active TC activity. For the inactive TC type during El Niño years, very weak cold SST anomalies in the aforementioned TWP region correspond with a northeastward-extended anomalous divergent centre over the 120º–140º E, 10º S–20º N zone and an anomalous anticyclone across the Philippines and its eastern side. Decreases in the formation of the WNP TC and movement

toward the Philippines lead to inactive TC activity. The large-scale anomalies and regulating processes are mainly opposite between the active TC type during El Niño years and the inactive TC type during La Niña years. These two types are influenced by interdecadal variability of the Pacific decadal oscillation. Opposite anomalies and regulating processes also occur between the inactive TC type during El Niño years and the active TC type during La Niña years. The former type is jointly modulated by the positive Indian Ocean Dipole mode and central-Pacific El Niño..

Key words : El Niño–Southern Oscillation, October–December, the Philippines, tropical cyclone activity