EGU24-2635, updated on 20 May 2024
https://doi.org/10.5194/egusphere-egu24-2635
EGU General Assembly 2024

Intraseasonal Variability of Anticyclonic Rossby Wave Breaking and Its Impact on Tropical Cyclone Activity over the Western North Pacific

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The intraseasonal variations in anticyclonic Rossby wave breaking (AWB) events, which are characterized by synoptic-scale irreversible meridional overturning of potential vorticity over the North Pacific, and their modulations on tropical cyclone (TC) activity over the western North Pacific (WNP), were investigated in this study. Spectral analysis of the AWB frequency shows significant variability within a period of 7–40 days, closely linked to the subseasonal variability of the jet stream intensity. When the jet stream weakens at its exit region over the North Pacific, the AWB occurs along with an equatorward Rossby wave flux. This AWB is preceded by an intensified Rossby wave train across Eurasia 12 days earlier. Simultaneously, a high potential vorticity intrusion is advected in the upper troposphere from the North Pacific toward the WNP, and suppressed TC activities are observed over the WNP open ocean where decreased moisture and temperature, subsidence, and increased vertical wind shear prevail. In contrast, anomalously enhanced convection, positive relative vorticity, and ascending motion are found in the southwestern quadrant of the AWB, facilitating enhanced TC activities over the South China Sea (SCS). Further analysis indicates that the impact of the AWB on TC activities over the WNP is robust and independent of the tropical intraseasonal convection over the tropical Indian Ocean and SCS, even though it accompanies the increased AWB frequency.