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Recurving tropical cyclone-jet stream interactions over the Western North Pacific and their influence on the midlatitude circulation

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The interaction between recurving TCs and the midlatitude jet stream represents a class of tropical-extratropical interactions occurring on time scales that span the weather-climate interface. While some recurving TCs excite or amplify Rossby wave trains along the jet stream that produce persistent midlatitude circulation anomalies and high-impact weather downstream, others exert little influence on the midlatitude circulation. The combination of factors governing this difference in behavior is not well understood, although characteristics of the large-scale flow pattern, the TC, and the phasing between the TC and the midlatitude flow are believed to be important. Thus, the aim of this research is to investigate the factors modulating the influence of recurving western North Pacific (WNP) TCs on the midlatitude circulation on synoptic to intraseasonal time scales. A 31-yr climatology (1979-2009) and composite analysis of TC-jet stream interactions associated with recurving WNP TCs are conducted. Recurving WNP TC episodes are objectively ranked by the strength of the TC-jet stream interaction (i.e., the magnitude of negative upper-level PV advection by the divergent TC outflow). The top and bottom quintiles of the ranked cases are categorized as strong and weak TC-jet stream interaction cases, respectively. Climatologies for these two categories are constructed to assess factors that are hypothesized to modulate the strength of TC-jet stream interaction during WNP TC recurvature (e.g., time of year, characteristics of the large-scale flow pattern, TC strength, extent of TC wind field). Interaction-relative composite analyses are created for each category to allow for a comparison of the flow response to recurving WNP TCs associated with strong and weak TC-jet stream interactions. Results indicate that relative to the weak TC-jet stream interaction cases, the strong TC-jet stream interaction cases feature stronger midtropospheric ascent and broader divergent outflow associated with the TC, a more amplified trough-ridge-trough flow pattern, and a more distinct downstream jet streak embedded within a stronger waveguide. A comparison of the downstream large-scale flow evolution for the two categories suggests that the strong interaction cases are associated with the development of higher-amplitude, longer-lived Rossby wave trains over the eastern Pacific and North America.