The impact of North-Western Pacific tropical cyclones on the excitation of Rossby Wave Trains: a climatological perspective

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Recent studies have highlighted the importance of tropical cyclones (TCs) that undergo extratropical transition (ET) in modifying the synoptic-scale mid-latitude flow. Several case studies and numerical experiments identified various physical processes that have a significant impact on the mid-latitude flow pattern both in the vicinity of the ET event as well as in far downstream regions.

This study investigates the role of North-Western Pacific TCs in tropical-extratropical interactions from a climatological point of view. We have identified Rossby Wave Trains (RWTs) of planetary- and synoptic-scale wavelength in the period 1980-2010, that occur downstream of a TCs undergoing ET. This identification is based on a Hilbert-Transform of the meridional wind at upper levels and a zonal wavenumber filter. A composite of the envelope of the meridional wind for in total 318 recurving TCs indicates a statistically significant increase in amplitude and occurence frequency of RWTs downstream of TCs. Statistically robust signals concerning the amplitude and occurence frequency extend from the North-Western Pacific toward the Central United States; in some cases even toward the North-Atlantic basin and Western Europe.

Favorable synoptic conditions at recurvature time for either a planetary-scale or a synoptic-scale RWT development are identified. A composite analysis of eddy-kinetic energy (EKE) budgets suggests that the production of EKE due to the interaction of the TC's outflow with an approaching mid-latitude trough has a significant impact on the further downstream development.

With this study we would like to highlight the role of TCs in tropical-extratropical interactions from a climatological point of view.