

The influence of asymmetric convection on typhoon motion near Taiwan

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This study focus on the influence of asymmetric convection on typhoon motion near the east coast of Taiwan. Eighty-four typhoons that made landfall on the east coast of Taiwan are analyzed. There are 49 cases which experience deflection tracks turning to the left-hand side relative to the typhoon moving direction before landfall. Eighteen of them are with very large deflection angles (DA) ($> 20^\circ$) and another 7 cases are with looping tracks (LTs). We found most of the large DA and LT cases are occurred north of 23°N near Taiwan and has significant stronger convection in the north of the storm. The Weather Research and Forecasting (WRF) Model was used to simulate the typhoon motion approaching Taiwan. We use the potential vorticity (PV) tendency diagnosis to analyze the mechanisms which affect the storm movements. The wave number one component (WN1) of PV tendencies are decomposed into horizontal advection (HA), vertical advection (VA) and diabatic heating (DH) terms. The northern landfall typhoons have significant heating asymmetries for the storm structure before landfall, and thus modify the storm track through the DH PV tendency. The vorticity stretching effect also occurred to south of the storm. This vorticity stretching (VA effect) and diabatic heating asymmetries (DH effect) lead to the track deflections before landfall. Our results highlight the importance of asymmetric convection and its impact to typhoon track deflections which occurred north of 23°N near the east coast of Taiwan.

Keywords: Typhoon track, Potential vorticity tendency diagnosis, Diabatic heating asymmetries