

Track Evolution of Typhoon Chanthu (2021) near Taiwan as Investigated Using a High-Resolution Global Model

Ya-Hsin Chi¹, Ching-Yuang Huang^{1@}, and William C. Skamarock²

¹Department of Atmospheric Sciences, National Central University, Jhong-Li, Taiwan

²National Center for Atmospheric Research, Boulder, Colorado, USA

Abstract

The global model MPAS with multiple resolutions (60-15-1 km) is used to investigate the evolution of Typhoon Chanthu (2021) near Taiwan. Chanthu exhibited a rightward track deflection near south Taiwan, and subsequently underwent a leftward deflection after moving northward along the east coast of Taiwan. Numerical experiments are conducted to identify the physical processes for the track changes. The rightward track deflection of the northward typhoon is primarily induced by the recirculating flow resulting from the effect of Taiwan topography, which is completely changed to a westward track in the absence of the MJO flow component. The wavenumber-one potential vorticity (PV) budget analysis indicates that horizontal PV advection dominates the earlier rightward deflection, while more affected by vertical PV advection and diabatic heating to move inland toward north Taiwan in the presence of Taiwan terrain. The idealized WRF is also used to aid an interpretation of the track deflection under varying steering conditions. Idealized simulations confirm the track deflection mechanism in the real case with similar PV dynamics and further illustrate the sensitivity of the track deflection to the steering flow direction in this study. The magnitude of the rightward deflection is essentially determined by the ratio of R/LE where R is the vortex size and LE is the effective terrain length.

Key word: MPAS, typhoon track deflection