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A Numerical Study of the Sensitivity of Typhoon Track and Convection Structure to Cloud Microphysics

Abstract

Typhoon track deflections often occurred in the northern part of Taiwan's east coast before making landfall. The WRF Model is utilized to simulate the looping track of Typhoon Saloa (2012), which exhibited a cyclonic deflection as it approached Taiwan. The simulated track of Typhoon Saloa (2012) is divided into three stages: move northwestward, deflect cyclonically, made cyclonic looping and then moved northward. Additionally, potential vorticity (PV) tendency diagnosis is utilized to analyze the contributions of horizontal advection (HA), vertical advection (VA), and diabatic heating (DH) terms on typhoon tracks. The potential vorticity tendency diagnosis confirms that diabatic heating and vertical advection are the primary factors contributing to the southwestward deflection of the tropical cyclone.

Because the looping track near the terrain is influenced by convection, sensitivity experiments with different cloud microphysics schemes are performed. The experiments show that TC's looping track simulation is sensitive to the selection of model cloud microphysics schemes. Six different cloud microphysics schemes were utilized for sensitivity testing. The experimental results from the CTRL, THOM, LIN, and WSM6 microphysics schemes indicated track deflection, while the MORR and WDM6 schemes displayed straight tracks.

Keyword

Potential vorticity tendency diagnosis

Reference

Hsu, L.-H., S.-H. Su, and H.-C. Kuo, 2021: A numerical study of the sensitivity of typhoon track and convection structure to cloud microphysics. *J. Geophys. Res. Atmos.*, **126**, e2020JD034390. https://doi.org/10.1029/2020JD034390.