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A Numerical Investigation of Track and Intensity Evolution of Typhoon Doksuri (2023)

Abstract

This study uses WRF model to simulate Typhoon Doksuri (2023). First, a series of sensitivity tests are conducted to select optimal parameterization schemes. The results suggest that a combination of the Grell–Freitas Ensemble cumulus scheme and the NSSL 2-moment microphysics scheme is the best choice for reproducing both the track and intensity of Doksuri. Subsequently, further analysis will be conducted to better understand the mechanism of typhoon track and intensity.

Typhoon Doksuri mainly moves northwestward, however as it approaches the northern Philippines, it changes direction and moves towards the west. Diagnostic of potential vorticity (PV) tendency budget is applied to explain the dynamic mechanism of typhoon track. The results show that the westward motion is dominanted by horizontal advection of PV tendency.

For typhoon intensity, Doksruri undergo the rapid intensity (RI). Examining this process reveals that the increasing percentage of convective cloud indicates formation of deep convection in the inner core, result in strong diabatic heating, lead to enhancing the heating efficiency and supporting stronger intensity. In addition, the Sawyer–Eliassen (SE) equation is used to determine the primary factors contributing typhoon intensity. The results indicate that the role of diabatic heating in intense secondary circulation is significant.