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Impact of Assimilating Himawari-8-Derived Layered Precipitable Water With Varying Cumulus and Microphysics Parameterization Schemes on the Simulation of Typhoon Hato

Abstract

Tropical Cyclones (TCs) are often accompanied by strong winds and heavy rains that can cause loss of life and damage. This study aims to improve TC prediction accuracy. We assimilate the layered precipitable water (LPW) data retrieved from Himawari-8, enhancing Numerical Weather Prediction (NWP) model performance. This leads to more precise TC track, intensity, and precipitation predictions. Additionally, the importance of parameterization schemes in TC simulations is also considered. Our research shows that selecting these schemes can significantly impact forecasting accuracy.

The results show that LPW assimilation enhances the Equitable Threat Score (ETS) and Probability of Detection (POD) for heavy rainfall (>50 mm), crucial for TC forecasting. We find that LPW assimilation weakens the sensitivity of the TC intensity to the MP scheme more than to the CP scheme, and group statistics indicate the KF scheme with LPW assimilation reveals the most improvement.

Keywords

Layered precipitation water (LPW)

Reference

Lu, J., Feng, T., Li, J., Cai, Z., Xu, X., Li,L., & Li, J. (2019). Impact of assimilating Himawari-8-derivedlayered precipitable water with varying cumulus and microphysics parameterization schemes on the simulation of Typhoon Hato. *Journal of Geophysical Research: Atmospheres*,124, 3050–3071. https://doi.org/10.1029/2018JD029364