國立中央大學大氣物理研究所書報討論

An Impact Study of GNSS RO Data on the Prediction of Typhoon Nepartak (2016) Using a Multiresolution Global Model with 3D-Hybrid Data Assimilation

Abstract

Conventional soundings are rather limited over the western North Pacific and can be largely compensated by GNSS radio occultation (RO) data. The authors utilize the GSI hybrid assimilation system to assimilate RO data and the multi-resolution global model (MPAS) to investigate the RO data impact on prediction of Typhoon Nepartak that passed over southern Taiwan in 2016.

In this study, the performances of assimilation with local RO refractivity and bending angle operators are compared for the assimilation analysis and typhoon forecast. Assimilations with both RO data have shown similar and comparable temperature and moisture increments after cycling assimilation and largely reduce the RMSEs of the forecast without RO data assimilation at later times. The forecast results at 60–15-km resolution show that RO data assimilation largely improves the typhoon track prediction compared to that without RO data assimilation, and assimilation with bending angle has better performances than assimilation with refractivity, in particular for wind forecast.

The improvement in the forecasted track is mainly due to the improved simulation for the translation of the typhoon. Diagnostics of wavenumber-1 potential vorticity (PV) tendency budget indicates that the northwestward typhoon translation dominated by PV horizontal advection is slowed down by the southward tendency induced by the stronger differential diabatic heating south of the typhoon center for bending-angle assimilation. Simulations with the enhanced resolution of 3 km in the region of the storm track show further improvements in both typhoon track and intensity prediction with RO data assimilation. Positive RO impacts on track prediction are also illustrated for two other typhoons using the MPAS-GSI system.

Keyword

Hybrid data assimilation

Reference

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