Forecast simulation of rapidly-intensified typhoon in the Eddy-Rich Northwest Pacific region

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The real-time typhoon predictions in the Northwest Pacific (NWP) are being distributed by various agencies (for example, KMA, JMA, JTWC, NMC, CWB, HKO and PAGASA). Currently the movement of the typhoon can be predicted with an error of less than 100 km in 48 hours, however it is difficult to the predict of the intensity of the typhoon especially the Rapidly Intensified (RI) Typhoons. The mean occurrence of RI typhoon amounts to 5.4 times a year during 39 years (1977-2015), occupying 21% of typhoons in NWP. Especially the RI typhoon in the Eddy-Rich Northwest Pacific (ER-NWP) occurred 1.8 times a year, covering 29% of typhoons in ER-NWP.

A RI typhoon, NEPARTAK (T201601), occurred in July 2016. It was formed in Caroline Islands and moved northwest, straightly heading for Taiwan. However, at the beginning stage many forecasting agencies predicts as move to the Yellow Sea. The accuracy of prediction data of the Typhoon NEPARTAK (T201601) from KMA, JMA and JTWC was compared with the adjusted best-track data from Digital-Typhoon (JMA-RSMC). The sequential prediction data are summarized with 6-hour interval from 3th to 10th July 2016.The JMA prediction of the typhoon track and the JTWC predictions of the maximum wind speed were found to be best.

The numerical simulations using WRF model forced with NCEP GFS prediction data and microwave SST is compared. The simulations using one domain (D1), two domains (D2) using a moving nest scheme, and with or without the spectral nudging (-SN) are compared. Comparison of the errors on the track shows the differences of 100 km in 48-hour prediction and200 km in 72-hour prediction on average. The best results on the track prediction are shown in the D2 case of WRF model. However, underestimation of the maximum wind speed of WRF prediction still exists, obviously requiring better understanding of RI-related processes to improve the model prediction.