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Uncertainties in the Prediction of Typhoon Neptartak (2016) and Typhoon Talim (2017) as Revealed with ECMWF Ensemble Forecast and Their Association with Initial Fields

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In recent years, typhoon track has been predicted more and more accurately by the ensemble forecast of the European Centre for Medium-Range Weather Forecasts (ECMWF), which has become the most important reference model for forecasters all over the world. However, some seemingly easily predicted typhoons, such as No. 1 Typhoon Nepartak in 2016 and No. 18 Typhoon Talim in 2017, failed to be predicted 3 days ahead, showing great uncertainties. Forecasters deeply suffer from this kind of uncertainties, further affecting decision service and the ability of local government to defense typhoon. Through selecting ECMWF ensemble forecast products initialized at two pivotal times of 12Z 04 July 2016 and 00Z 11 September 2017 (UTC), the relationships between track predictions of the two tropical cyclones at 72 forecast hours and the fields at initial time and different forecast hours were analyzed It is found that the average track of 10 good members of ECMWF ensemble forecast is in good accordance with the observation, while the average track of 10 bad members deviates substantially from the observation. The area around tropical cyclone center, Northeast China and the Sea of Japan are the target areas responsible for big error of track forecast of this kind of typhoons. In addition, the dipole mode-like distribution of initial field disturbances is found. Meanwhile, the area of dipole mode is becoming larger and larger, and much more obvious with forecast time. For Typhoon Nepartak, higher geopotential height (GPH) in Northeast China and the Sea of Japan indicates a smaller error of track forecast. By contrast, the situation is just opposite for Typhoon Talim. However, different from Nepartak, the dipole mode around the center of Talim gradually changes to tripole mode distribution under the influence of No.19 Typhoon Doksuri to the southwest of Talim, with the added pole being located in the northeast quadrant of Doksuri. This indicates under the background of monsoonal circulation, Rossby wave dispersion plays an important role in the spread of typhoon track forecast. Therefore, special attention should be paid to the comparison between the predicted GPH and the observed GPH in the aforementioned target areas, and then good members can be screened out from all ensemble members, which is conducive to predicting the most possible moving direction of typhoon.