**Improve Tropical Cyclone Prediction of TWRF with the Application of Advanced Observation Data**

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With violent wind and severe rainfall, the tropical cyclone is one of the most disastrous weather systems over ocean and the coastal area. To provide accurate tropical cyclone (TC) track and intensity forecasts is one of the most important tasks of the national weather service of countries affected. Taiwan is one of the areas frequently influenced by tropical cyclones. Improving the tropical cyclone forecast is the highest priority task of Taiwan's Central Weather Bureau (CWB).

Recent improvement of the TC forecast is due to the improvement of the numerical weather prediction. A version of the Advanced Research Weather Research and Forecasting Model (WRF), named TWRF (Typhoon WRF), was developed and implemented in CWB for operational TC forecasting from 2011. During the years, partial update cycling, cyclone bogus scheme, relocation scheme, 3DVAR with outer loop, analysis blending scheme, new trigger Kain–Fritsch cumulus scheme, and so on have been studied and applied in TWRF (Hsiao et al. 2010, 2012, 2015) to improve the model. We also improved the model by changing the TWRF configuration from a triple nested to a double nested grid and increasing the model resolution from 45/15/5 km 45-levels to 15/3 km 52-levels from 2016. Results showed increasing the model resolution improving the track, intensity and rainfall forecast. However, The averaged 24/48/72 hours TC track forecast errors of TWRF are 91/147/223, 84/133/197, 74/127/215, 64/122/202, 70/120/194 and 70/122/180 km in year 2014, 2015, 2016, 2017, 2018 and 2019 respectively.

In this study, WRF Four-dimensional data assimilation (FDDA) is adopted to assimilate the temperature, pressure, water vapor content which processed from the FORMOSAT-7 constellation, high-temporal frequency atmospheric motion vector (AMV) retrieved from Himawari-8 satellite images and radar data to generate a model balanced TC structure and thermodynamic state at the initial time. The specific goal is to improve the track, structure and intensity prediction of TCs and their associated rainfall distribution in Taiwan. The detail will be presented in the conference.

Keywords: tropical cyclone, Himawari-8 AMV, Four-dimensional data assimilation, FORMOSAT-7, radar data.

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