

Evaluation of the GFDL Hurricane Prediction System in the Western North Pacific in 1995 and 1996

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ABSTRACT

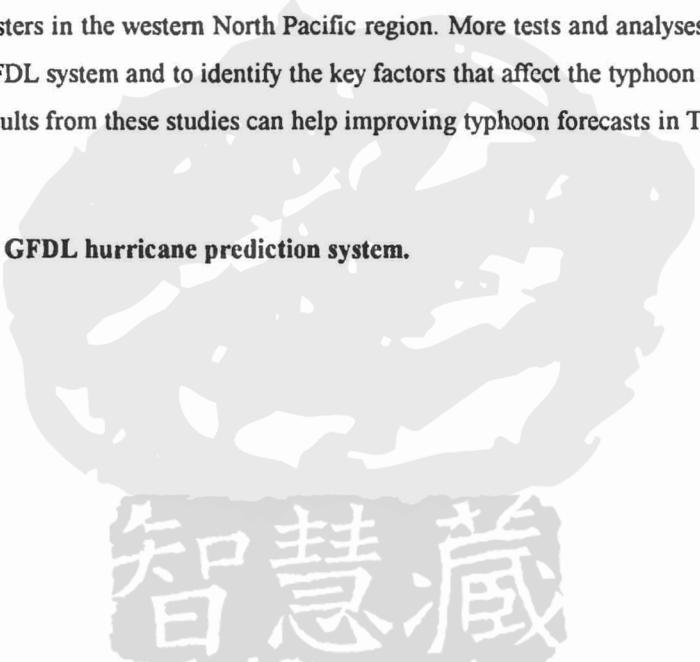
The Geophysical Fluid Dynamics Laboratory (GFDL) hurricane prediction system was tested at the National Centers for Environmental Prediction in experimental mode and in near real time for western North Pacific storms during 1995 and 1996.

Altogether, 125 (171) forecasts were run for 16 (23) storms in 1995 (1996). The forecast tracks in 1995 were compared with the official JTWC (Joint Typhoon Warning Center) and CWB (Central Weather Bureau) forecast available just after the initial synoptic time, as well as forecasts from other operational models, such as CLIPER (CLImatology and PERsistence), TFS (Typhoon Forecasting System) of CWB, NOGAPS (Navy Operational Global Prediction System) and AVN (AViation model). Results in 1995 indicate that the GFDL system exhibited considerable skill in the forecast of the storm track for the cases run. The average improvement of the GFDL track forecasts over other models is roughly 35%. In addition, the improvement of the GFDL forecasts over the official forecasts from JTWC and CWB is about 30%. The forecasts from 1996 also show comparable performance, with mean track errors of 108, 174, 220, 274, 352 and 436 km for 12, 24, 36, 48, 60 and 72h, individually.

Despite the demonstrated skill of the GFDL forecast system, some biases were revealed in the storm track and intensity. In general, a northward and a rightward (relative to the storm's heading direction) bias is found (especially in 1995). As to the intensity forecasts, an over-prediction of the intensity of weak storms and an under-prediction of the intensity of strong storms by the GFDL system is found, thus suggesting a need for some improvement both in the prediction model and its initialization.

The case studies of Typhoon Ryan (1995) and Typhoon Herb (1996) are also discussed. The sensibility of the GFDL system to its initial condition is identified. Certain capability, in forecasting the distribution of precipitation and wind is also demonstrated. Overall, results from this study clearly indicate that the GFDL hurricane prediction system can serve as a useful dynamical model guidance for tropical cyclone forecasters in the western North Pacific region. More tests and analyses are still needed to improve the current GFDL system and to identify the key factors that affect the typhoon forecasting system. It is also hoped that results from these studies can help improving typhoon forecasts in Taiwan.

Key words: Typhoon, GFDL hurricane prediction system.



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