ABSTRACT

DEVELOPMENT OF A PERFORMANCE-WEIGHTED ENSEMBLE MODEL TO FORECAST TROPICAL CYCLONE TRACKS IN THE PHILIPPINES

Joel C. Jesusa
University of the Philippines, 2011

Adviser: Gerry Bagtasa, PhD
Reader: Leoncio A. Amadore, PhD

An evaluation of the performance of three tropical cyclone forecast models currently used by PAGASA, i.e., the Global Spectral Model (GSM), Mesoscale Model Version 5 (MM5) and the Analog model (ANALOG) showed that the GSM bested the other 2 models for storm and typhoon categories and for all tropical cyclones movement characteristics (land-falling, recurving and moving in straight path); MMS did best in forecasting the tracks of tropical depression; and ANALOG was the least efficient of the three models. An equally weighted ensemble average (ENSAV) model derived from the result of the three models' evaluation, excelled its ensemble member in the long-term forecast (72-hr) category. The dynamical models, specifically, GSM showed its superior skill in medium-term (48-hr) forecast. The simple 24-hr persistence (PERS) technique outperformed all of the above models in the short-term (24-hr) forecast category. A Performance-Weighted Ensemble Model (PWEN) was derived with GSM, MM5, ANALOG and PERS (24-hr persistence, where applicable) as ensemble members. The results showed that, outside of the 24-hour persistence forecast, the new forecast model (PWEN) outperformed its ensemble members in terms of all aspects for two data sets (non-random and independent, random). On tropical cyclone intensity forecasting, on the average, GSM and MM5 intensity forecasts are lower than the observed cyclone intensity, i.e., both models are under-forecast especially for the typhoon category. However, GSM with the lower Mean Absolute Error (MAE) and Root Mean Square Error (RMSE) values of 6.0 kph and 17.1 kph respectively, compared to MM5's MAE and RMSE of -15.5 kph and 20.8 kph respectively, appeared to be the better model in the tropical cyclone intensity forecasting. Other results consistent with observations, showed that the accuracy of the forecast decreases as the forecast time validity increases and the stronger the intensity of the tropical cyclone, the larger is the error in forecast intensity, and vice-versa.