Northwestern Pacific Typhoon Prediction Trends in Track and Intensity Errors in Straight and Recurving Storms

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1. Introduction

The purpose of this study was to determine the potential effect that the type of track of a typhoon in the northwest Pacific (e.g. straight or recurving) has upon the errors involved in predicting the storm. Specifically examined was the absolute track error (in kilometers) and the intensity error with respect to wind speed (knots).

2. Methodology

The sample was comprised of storms from both 2015 and 2016 seasons. The storms selected for the sample needed to both maintain typhoon strength for three days, as well as fit into one of two classifications (straight runner or recurving storm). Two different Global Forecasting System deterministic models (GFS) were used for each storm, one starting at the day before the storm reached typhoon strength (GFS 1) and one starting the next day (GFS 2). Each storm's errors were calculated daily (at the 24-hour mark) for both models. Track error was found by:

$$\sqrt{((long_p - long_a) * 111 * cos((lat_p + lat_a)/2))^2 + ((lat_p - lat_a) * 111)^2}$$

In addition, using the same data, a correlation analysis on the wind speed and pressure was performed for the best track, GFS 1 and GFS 2.

3. Results and Discussion

The results indicate both a wider range and a higher average error for the tracks of recurving storms. The intensity error was nearly equal for storms, with recurving storms averaging again with a higher error, but with a lower spread.

In all forms, the wind speed and pressure were highly correlated, however, both models showed a potential curve in the data. Above the 90-knot line, as well as below the 40-knot line, there was a "break" away from the line of best fit.

4. Summary

The basic conclusion of this study was that straight storms have less error in their track prediction. Additionally, there has a reduction in average in both track and intensity (since 2007). Future work in the field could be done in studying the "breaks", particularly above 90 knots, as this could point to a need for modification of the models used. Additionally, a longer term study with parameters could provide more concrete conclusions.

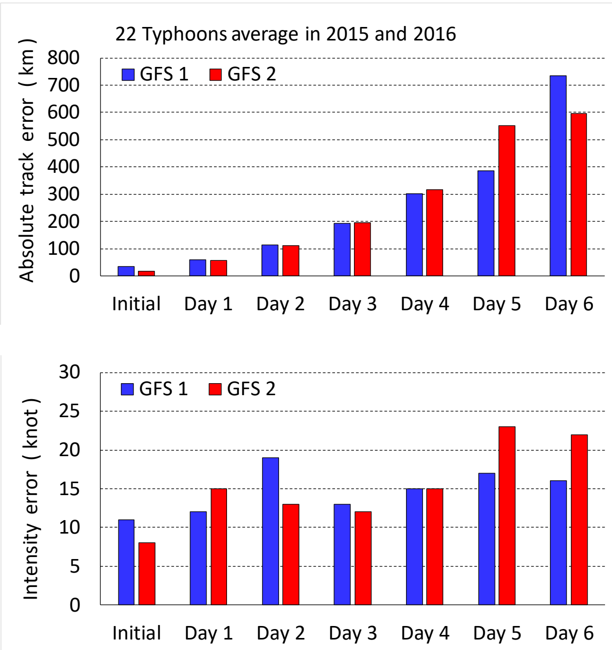

Fig. 1. The comparison for GFS 1 versus GFS 2.

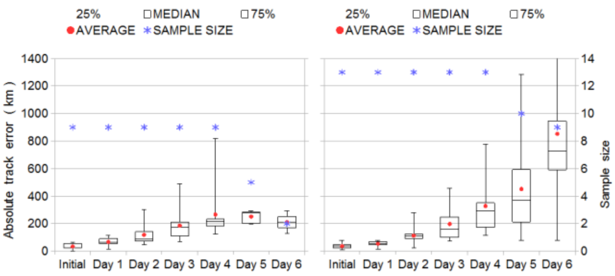

Fig. 2. The box plot graphs showing average track error for straight (left) and recurving (right) storms, respectively.

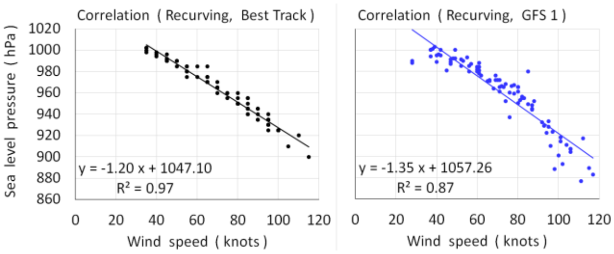

Fig. 3. The wind-pressure correlation graphs for best track (left) and GFS 1 (right).