Accurate prediction of the tropical cyclone wind field after landfall is one of the greatest challenges for operational forecasters. Many past studies have examined the evolution of the tropical cyclone wind field after landfall (Wong et al. 2008; Bhowmik et al. 2005; and Kaplan and DeMaria 2001). The results of these studies have not been routinely incorporated into the techniques used by NWS forecasters in operational prediction.

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Introduction

NWS Forecast Process

A survey of local WFOs was conducted to develop a better understanding of the process of developing a wind speed and gust forecast for a tropical cyclone. There was a consensus among forecasters on the following points:

• Forecasters use a Smart Tool in the Graphical Forecast Editor called TCMWindTool that takes the four quadrant NHC highest wind forecast and interpolates it to a 5 km x 5 km grid.
• Forecasters then make adjustments to the output from TCMWindTool through a largely subjective process.
• Land reduction factors range from 10-40%, depending on distance from coast and tropical cyclone characteristics.
• Gust factors range from 15-40% above sustained wind speeds, depending on forecasted degree of mixing and tropical cyclone characteristics.
• The choice of a background wind field for the TCMWindTool is highly subjective, interpolating the 12-hour TCM wind forecast onto hourly grids is another significant source for error.

Future Work

The NDFD forecasts will be compared to the observed sustained wind speeds and gusts for each storm in each track type. A statistical calculation of bias will be computed. A gust factor will be calculated for each track type. Common synoptic and mesoscale features will be identified among the various identified cases that will help explain land reduction and gust factors. A statistical and dynamical model will be built to model winds and wind gusts associated with these landfalling tropical cyclones. This will be accomplished by combining the above climatological observations-based analysis with specific high-resolution numerical simulations of select cases.

References


Acknowledgements

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Purpose

The overall goal of this study is to thus to improve the currently used methodology for operational forecasts of wind speed and wind gusts associated with tropical cyclones.

Hannah (2006) Forecast

• Generally weaker observed winds in coastal regions than forecasted. In far inland areas, some areas where forecasted winds were weaker than observed.
• Combination of subjective nature of forecasts, low-resolution initial condition for model, and complex synoptic conditions lead to forecast errors

Tropical Cyclone Tracks

• Tropical cyclones affecting North Carolina 1990-2008 broke down by track. Five major tracks identified:

Future Work

• Hypothesized that "type 2" and "type 3" storms most poorly forecasted

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