JHT Mid-term Report
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Estimating tropical cyclone wind radii utilizing an empirical inland wind decay model

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Mid-term progress report:

Accomplishments:

Software routines were developed to extract the storm track, intensity, and wind radii information that are required to run the decay model from the ATCF database. These routines were successfully employed to generate the necessary model input files for several landfalling storms including Hurricanes Isabel (2003), and Dennis (2005). Many of the modifications required to convert the decay model from an interactive to real-time model were implemented. Specifically, the model was modified so that it could be run off of the input files that are generated using the ATCF software extractions routines described above. The model was also modified so that the decay model coefficients are determined as a function of storm latitude along the forecast track following the methodology of DeMaria et al. (2005). Furthermore, the model was modified to account for changes in storm speed along the forecast track when estimating the left to right storm motion induced asymmetry. Finally, code was added to compute the 34,50, and 64 kt wind radii in each of the four quadrants at all forecast times out to 120 h.

The decay model described above was utilized to obtain wind radii estimates for Hurricanes Isabel (2003) and Dennis (2005). These tests revealed some difficulties fitting the initial wind field of Hurricane Dennis (2005) which was a relatively small storm. To ameliorate this problem a new vortex fitting algorithm developed by Knaff et al. (2005) was tested. Sensitivity tests showed that this algorithm provided a superior fit for the initial wind field of Hurricane Dennis (2005) when compared to that employed in Kaplan and DeMaria (1995). However, the formulation of the parametric model employed in the latter study provided a superior fit for the much larger Hurricane Isabel (2003) suggesting that the parametric model formulations from both studies will be needed to fit the spectrum of storm shapes that are observed. Thus, the decay model will need to be modified to determine which of two parametric models provides a superior fit for any given storm. Additionally, the decay model will also need to be modified to handle storms with more than one landfall (such as Dennis (2005)) as this problem was not previously encountered when the model was run interactively.

Future Work:

The model will continue to be modified in preparation for real-time testing on suitable landfalling storms and the results of these tests will be presented at the upcoming 2006 Interdepartmental Hurricane Conference (IHC).

References:

DeMaria, M., M. Mainelli, L,K. Shay, J.A. Knaff, and J. Kaplan, 2005: Further improvements to the Statistical Hurricane Intensity Prediction Scheme (SHIPS). Wea.. Forecasting, **20**, 531-543.

Kaplan, J., and M. DeMaria, 1995: A simple empirical model for predicting the decay of tropical cyclone winds after landfall. J. Appl. Meteor., **34**, 2499-2512.

Knaff, J. C.R. Sampon, C.J. Mcadie, M. DeMaria, T. P. Marchok, and J. M. Gross, 2005: Statistical tropical cyclone wind radii prediction using climatology and persistence. To be submitted to Wea. Forecasting.