P1.28   **A VERIFICATION OF NATIONAL HURRICANE CENTER FORECASTS OF SURFACE WIND SPEED RADII IN HURRICANES**

Sam Houston[1][*], Miles Lawrence[2], Summer Spisak[1], and Shirley Murillo[1]

[1] Hurricane Research Division, AOML/NOAA, Miami, FL

[2] National Hurricane Center, TPC/NOAA, Miami, FL

1. INTRODUCTION

The National Hurricane Center (NHC) issues a position and intensity forecast every 6 h for all tropical cyclones in the Atlantic and eastern Pacific basins. This prediction is contained in the *Forecast / Advisory Product* and includes the initial and forecast horizontal distribution of the surface wind field (OFCM 1997). This distribution is given as radii in four quadrants from the center of the tropical cyclone to three threshold wind speed values: 17.5, 25.7, and 32.9 m s^{-1} (i.e., 34, 50, and 64 kt, respectively). The forecast 17.5 m s^{-1} wind radii are valid for 0, 12, 24, and 36 h. The forecasts of the 25.7 and 32.9 m s^{-1} wind radii are available for the above times and for 48 and 72 h.

A set of opportunistic marine observations was obtained for a number of cases when hurricanes made close approaches to observation platforms such that the observed wind speeds reached one or more of the threshold wind speeds given above. The distance from the center of the hurricane to the platform at the time the threshold wind speed was reached is used to verify the forecast radius. This is the first time that such a data set has been prepared and that forecasts of tropical cyclone intensity in terms of wind speed radii have been verified. Results for the verification of the 17.5 m s^{-1} wind radii are presented.

2. DATA AND METHODOLOGY

The wind observations at National Data Buoy Center (NDBC) marine platforms are used to determine when each tropical cyclone's wind field affected a measurement platform with the required wind speed(s). These observations were originally collected for composites of surface marine observations in the vicinity of hurricanes for an air-sea interaction study (Murillo et al. 1997) and were adjusted to maximum sustained 1-min values and 10 m heights using the methods of Powell et al. (1996). The wind speed radii based on the marine platform data are used to verify the official NHC radii forecasts.

* *Corresponding author address:* Sam Houston, HRD/AOML/NOAA, 4301 Rickenbacker Cswy., Miami, FL 33149, e-mail: *houston@aoml.noaa.gov*

The tracks used for the composites of these wind observations in storm-relative coordinates were based on "best track" positions which are available at 6 h intervals. "Best track" sometimes significantly filters short-term movements of the hurricane along its path. In these cases, the platform observations in combination with any available research or reconnaissance aircraft "fixes" were used to refine the storm's track at more frequent intervals. Figure 1 shows an example of the use of observations from a platform to determine the wind radii in Hurricane Fran (1996).
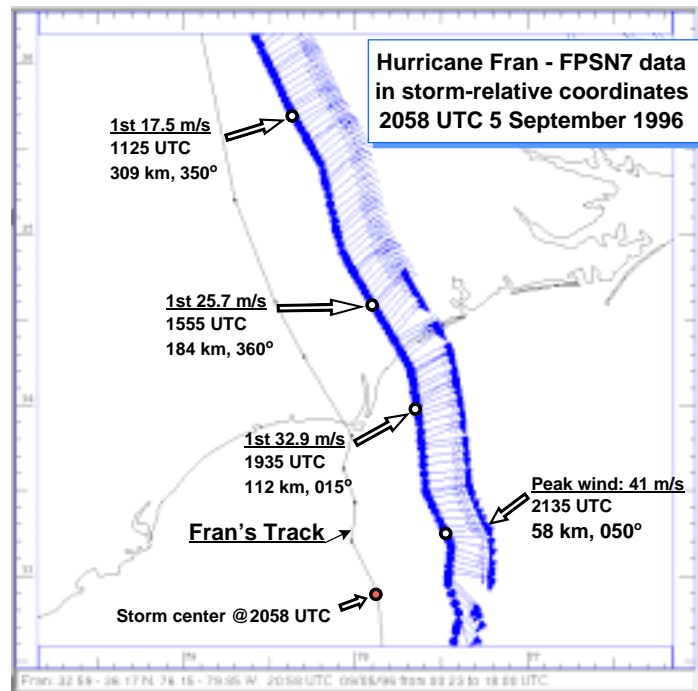

Figure 1: Frying Pan Shoals (FPSN7) Coastal-Marine Automated Network winds shown as wind barbs in storm-relative coordinates for Hurricane Fran centered at 2058 UTC 5 September 1996. Wind speeds are adjusted to maximum sustained 1-min, 10 m values valid for marine exposure only. The time, distance and azimuth from the center are shown for the first 17.5, 25.7, and 32.9 m s^{-1} wind radii.

3. DISCUSSION

Figure 2 shows that the locations of the observed 17.5 m s⁻¹ wind radii about the storm center are approximately evenly distributed. The preliminary results for 17.5 m s⁻¹ wind radii are based on 53 cases. Table 1 shows the mean absolute errors and the mean algebraic errors of wind radii for each forecast. The mean absolute errors for the 0 and 12 h forecasts are somewhat larger than the errors at 24 and 36 h. The algebraic mean error (forecast radii minus observed radii) indicates that there is a mean positive bias at all forecast periods (i.e., the forecast wind radii were larger than observed wind radii). The bias decreases for longer forecast periods. Future work will involve finalizing the error analysis of these forecast wind speed radii.

4. REFERENCES

Murillo, S. T., S. H. Houston, and M. D. Powell, 1997: Composites of surface marine observations for hurricanes during 1975-1996. *Proc.: 22nd Conf. on Hur. and Trop. Met.*, 19-23 May 1997, Ft. Collins, CO, 78-79.

Office of the Federal Coordinator of Meteorology (OFCM), 1997: National Hurricane Operations Plan. FCM-12-1997. OFCM, Silver Spring, MD 20910, 134 pp.

Powell, M.D., S. H. Houston, and T. Reinhold, 1996: Hurricane Andrew's landfall in south Florida. Part I: Standardizing measurements for documentation of surface wind fields. *Wea. Forecasting*, **11**, 304-328.
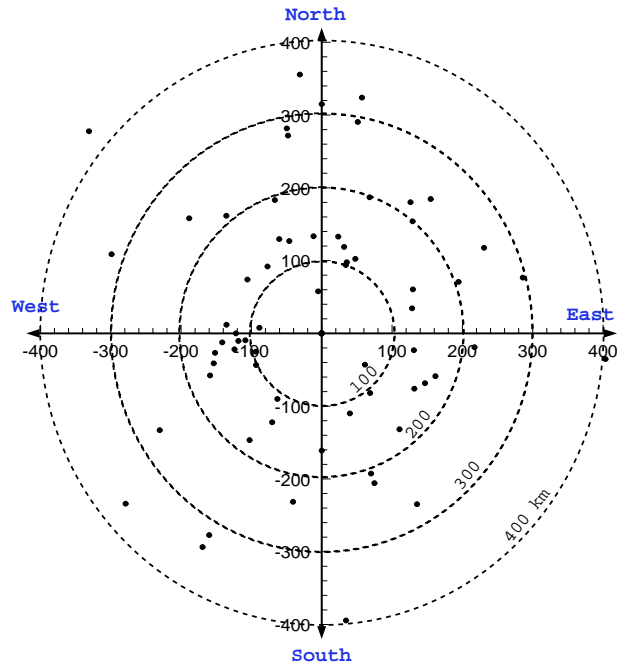
Figure 2: The dots represent locations of the first and last 17.5 m s⁻¹ winds measured at each of the NDBC platforms affected by each hurricanes relative to its center; range rings indicate the radii at 100 km intervals.

Table 1: Mean errors and standard deviations for official forecasts of 17.5 m s⁻¹ wind speed radii.

Forecast	number of cases	mean absolute error [km]	stand. dev. abs. error [km]	mean algebraic error (bias) [km]	stand. dev. alg. error [km]
0 h (Initial)	53	78	65	45	90
12 h	44	87	84	48	112
24 h	47	71	69	27	93
36 h	35	73	59	15	92