5B.6 RE-ANALYSIS OF HURRICANES CONNIE AUGUST 12, 1955 AND IONE SEPTEMBER 19, 1955

Hugh D. Cobb, III
NOAA/NWS/Tropical Prediction Center

1. INTRODUCTION

The 1950s were a particularly active decade for hurricane landfalls along the east coast of the United States. The years 1954 and 1955 were especially active with six hurricanes making landfall in the area from North Carolina to New England with five of the hurricanes considered major (Category 3 or higher) landfalls (Figure 1). Hurricanes Connie and Ione were the two storms in the 1955 season that were considered major landfalls. This active period of hurricane activity provided the motivation to create the National Hurricane Research Project, which evolved into the Hurricane Research Division.

The National Hurricane Center's (NHC's) North Atlantic hurricane database (HURDAT) of six-hourly positions and intensities was created in the 1960s in support of the Apollo space program to help provide statistical track forecast guidance for tropical storms and hurricanes (Jarvinen et al., 1984). This database is kept current and represents the official record for tropical cyclone positions and intensities in the Atlantic basin.

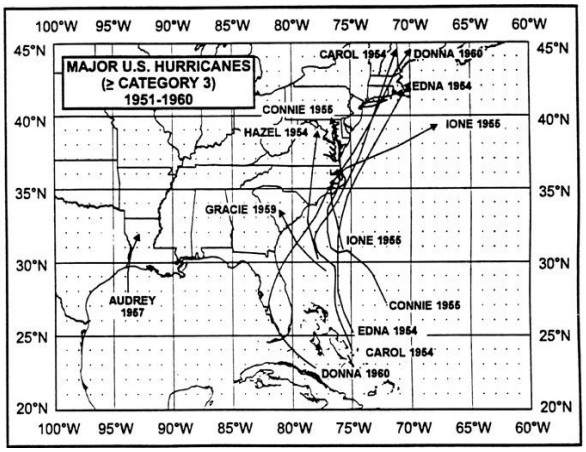

Figure 1. Tracks of land falling major hurricanes In the period 1951-1960 from NWS Technical Memoranda NWS/TPC-4, 2005

* *Corresponding Author Address*: Hugh D. Cobb, III, Tropical Prediction Center, NOAA/NWS, 11691 SW 17th St., Miami, FL 33165.
E-mail: Hugh.Cobb@noaa.gov

Even though the HURDAT database indicates that Connie was considered a Category Three hurricane for North Carolina, the six-hourly data in HURDAT indicates Hurricane Connie was a Category One hurricane at 1200 UTC 12 August, several hours before the time of landfall in North Carolina. HURDAT also indicates Hurricane Ione was a Category Two hurricane at 0600 UTC 19 September, five hours before landfall in North Carolina. Thus a discrepancy exists within the HURDAT database. NOAA Technical Memoranda NWS TPC-4 also indicates Hurricanes Connie and Ione were Category Three hurricanes in North Carolina.

The re-analysis of both Hurricanes Connie and Ione supports the findings in the six hourly data in the HURDAT database.

2. DATA SOURCES AND METHODOLOGY

Sources of information for this re-analysis include monthly and daily airways surface observations, ship reports from the NCDC Comprehensive Ocean-Atmosphere Data Set (COADS), archived radar and reconnaissance data from the NCDC and the Atlantic Oceanographic Meteorological Laboratory (AOML). Surface wind data were converted from five-minute averaged winds to one-minute sustained winds (Powell et. al, 1996) and were adjusted to the 10-m level using a process which equates mean boundary layer (MBL) winds to surface winds (Dunion et al., 2003). One-minute sustained winds at the 10-m level are used in the NHC Best Track database.

Synoptic surface maps were created from the available surface airways observations in six hour increments from 0600 UTC 12 August through 1800 UTC 12 August for Hurricane Connie and from 0600 UTC through 1800 UTC 19 September for Hurricane Ione. The surface analyses provided a more concise track of the hurricanes near the time of landfall.

3. HURRICANE CONNIE

Hurricane Connie was responsible for 25 deaths and extensive damages throughout eastern North Carolina. The sinking of the Levin J. Marvel in the northern Chesapeake Bay resulted in fourteen of the deaths. This was considered one of the worst marine disasters in the Chesapeake Bay (Bauer, 1993).

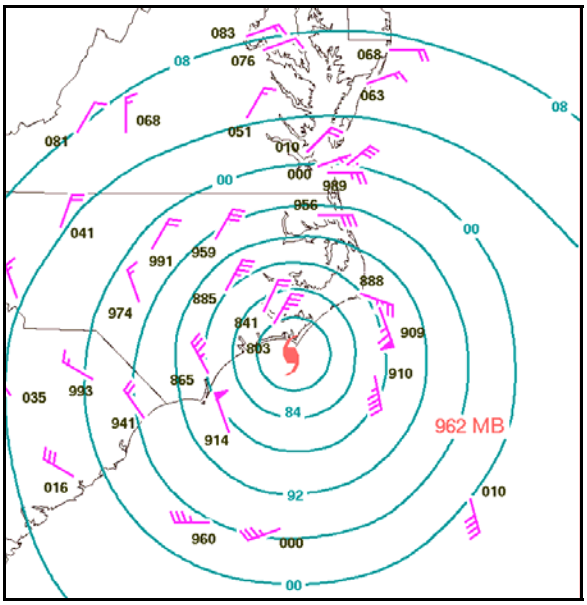

Figure 2. Surface Analysis valid 1200 UTC 12 August 1955 approximately three hours before the landfall for hurricane Connie

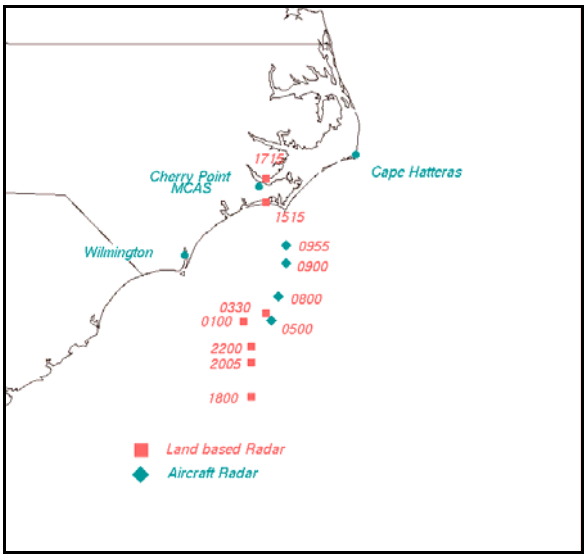

Figure 3. Positions of Hurricane Connie as determined from land based and aircraft radar from 1800 UTC 11 August through 1715 UTC 12 August 1955.

Figure 2 is a surface analysis valid at 1200 UTC 12 August 1955 depicting the locations of land based observing stations and ships located in the coastal waters of the Carolinas and Virginia used in the re-analysis of Hurricane Connie. Station pressures are in millibars and surface winds are adjusted for exposure at 10-m for one minute.

Surface observations and radar data (Figure 3) from both land based (Cape Hatteras) and aircraft radar indicated hurricane Connie made landfall near 1500 UTC 12 August 1955 near Beaufort, NC just to the west of Cape Lookout with an estimated central pressure of 962 millibars. Beaufort reported east-southeast winds of 15 kt at 1530 UTC with a pressure of 969.6 millibars. The winds shifted to the southwest just before 1630 UTC. Connie then continued slowly northward and passed very close to Cherry Point, NC where the lowest pressure of 968.3 millibars was observed at 1645 UTC. Maximum sustained surface winds reached 43 kt at 1305 UTC and again near 1530 UTC and ranged between 29 and 32 kt while the center of the hurricane passed just to the east of the station between 1630 and 1730 UTC.

Utilizing regionally-based wind-pressure relationships for the Atlantic basin, (Landsea et al, 2003) Hurricane Connie's central pressure at landfall, 962 millibars, corresponds to maximum sustained winds of 90 kt for a system near latitude 35^{o}N. However, Connie was moving erratically off the southeast United States from 9 August up until landfall in North Carolina. Such slow motion would normally result in significant upwelling and cooler sea surface temperatures and less efficient vertical momentum transport by convection in a more stable environment. The Frying Pan Shoals Lightship reported a drop in SSTs from 27C to 24.5C between 0600 UTC and 1200 UTC 12 August. In addition, the analysis in Figure 2 indicates a weakening pressure gradient associated with Connie and an expansion of the wind field with the radius of maximum winds estimated to be 38 nm (Ho et al., 1987). Based on these factors, a landfall intensity of 80 kt is proposed. Table 1 lists proposed changes to the best track data based on this re-analysis. The intensity after landfall was derived using regionally based empirical models for predicting the decay of tropical cyclone winds after landfall (Kaplan and DeMaria, 1995). This model yielded an intensity estimate of 65 kt for 1800 UTC 12 August (Table 1).

Date/Time	Position	Intensity	Central Pressure
12/1200	34.5 76.6 (34.8 76.2)	80 (70)	962
12/1500 (Landfall)	34.7 76.7	80 (70)	962
12/1800	35.0 76.6 (35.6 76.0)	65 (65)	966

Table 1. Proposed best track locations and intensities for Hurricane Connie 1200-1800 UTC 12 August 1955. Current best track values are in parenthesis.

4. HURRICANE IONE

Hurricane Ione was the third storm to strike the North Carolina coast in the 1955 season. Ione was responsible for 13 deaths and damages in the hundreds of millions of dollars mainly due to freshwater flooding.

Reconnaissance aircraft data were available prior to Ione's landfall in eastern North Carolina. A 0723 UTC 19 September reconnaissance dropsonde reported a central pressure of 963 millibars with 500 millibar winds of 85 kt near the core of the circulation of Ione.

Figure 4 is a surface analysis valid at 1200 UTC 19 September 1955 depicting the locations of land based observing stations and ships located in the coastal waters of the Carolinas and Virginia used in the re-analysis of Hurricane Ione. As stated earlier, station pressures are in millibars and surface winds are adjusted for exposure at 10-m for one minute.

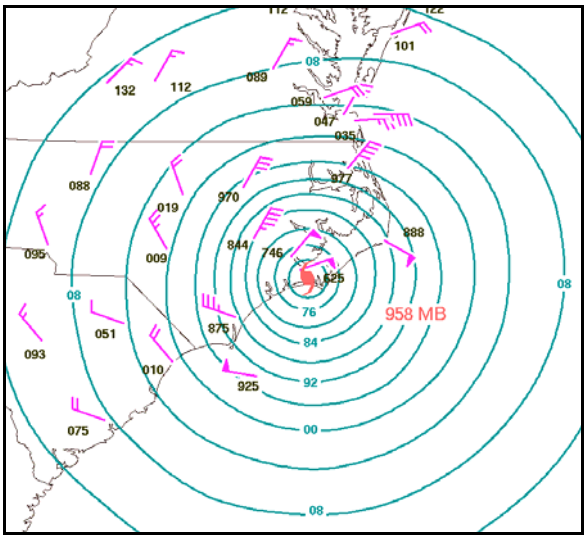

Figure 4. Surface Analysis valid 1200 UTC 19 September 1955 near the time of landfall for hurricane Ione.

Surface observations and radar data (Figure 5) from both land based radar (Cape Hatteras) and aircraft radar indicated hurricane Ione made landfall near 1100 UTC 19 September 1955 very close to the point where Connie came ashore five weeks earlier just west of Cape Lookout, with an estimated central pressure of 958 millibars. No surface observations were available from Beaufort, N.C. during Ione. A complete record of surface observations were available from Cherry Point. The lowest pressure of 962.5 millibars occurred at 1125 UTC and the maximum observed sustained surface winds were 47 kt with a gust to 80 kt. Ione moved erratically across coastal North Carolina for several hours after landfall as indicated by two subsequent barometric pressure minima of 963.0 millibars at 1330 UTC and 963.7-964.0 millibars between 1510 and 1630 UTC at Cherry Point. Surface winds there were out of the east at speeds between 33 and 43 kt. Winds shifted to the southwest at 1630 UTC and pressures rose thereafter signaling the passage of the center of Ione to the north of the station.

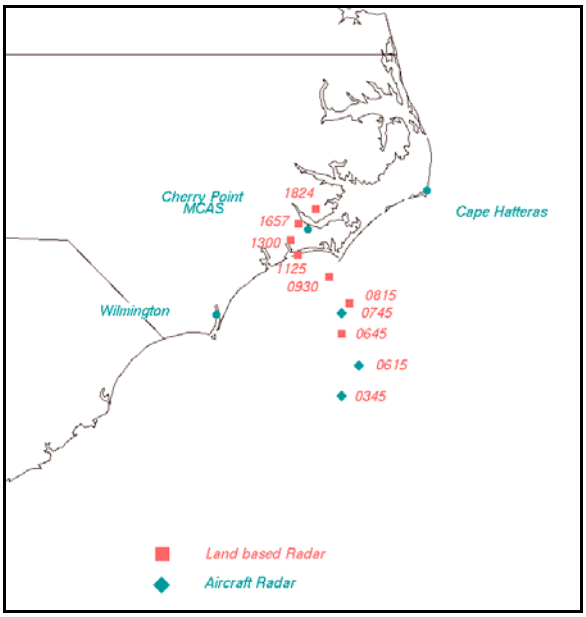

Figure 5. Positions of Hurricane Ione as determined from land based and aircraft radar from 0345 UTC through 1824 UTC 19 September 1955.

Date/Time	Position	Intensity	Central Pressure
19/0600	34.2 76.5 (33.9 76.6)	90 (90)	963
19/1100 (Landfall)	34.7 76.8	90 (90)	958
19/1200	34.8 76.8 (34.8 76.7)	80 (65)	958
19/1800	35.0 76.7 (35.6 76.5)	60 (60)	962

Table 2. Proposed best track locations and intensities for Hurricane Ione 0600-1800 UTC 19 September 1955. Current best track values are in parenthesis.

Storm	Best Track Intensity	Central Pressure
Bonnie 1998	95	964
Floyd 1999	90	956
Isabel 2003	90	957

Table 3. Landfall intensities of more recent hurricanes in North Carolina similar to Ione.

Regionally based wind-pressure relationships for the Atlantic basin indicate Ione's 958 millibar central pressure at landfall corresponds to maximum sustained winds of 91 kt for a storm near latitude 35^{o}N. The analysis in Figure 4 indicates that although Hurricane Ione possessed a rather large circulation, the tight pressure gradient associated with intense hurricanes at landfall was still present with the radius of maximum winds was estimated to be 22 nm (Ho et al, 1987). Based on this information, a landfall intensity of 90 kt is proposed. Table 2 lists proposed changes to the best track data based on this re-analysis. The 90 kt intensity for Ione is similar to the best track intensity for more recent hurricanes of similar central pressures at landfall in North Carolina. These storms are listed in Table 3.

The intensity after landfall was derived using regionally based empirical models for predicting the decay of tropical cyclone winds after landfall (Kaplan and DeMaria, 1995). This model yielded an intensity estimate of 80 kt and 60 kt for 1200 UTC and 1800 UTC 19 September (Table 2).

6. REFERENCES

Bauer, B.A., 1993: The Sinking of the Levin J. Marvel 1800. *Bay Weekly* **1 Issue 9**, 5-7.

Blake, Eric., Edward N. Rappaport **,** Jerry D. Jarrell, and Christopher W. Landsea, 2005: The Deadliest, Costliest, and Most Intense United States Tropical Cyclones From 1851 to 2004 and other Frequently Requested Hurricane Facts. NOAA NWS Technical Memoranda TPC 4.

Dunion, Jason P., Christopher W. Landsea, Samuel H. Houston and Mark D. Powell, 2003: A Re-Analysis of the Surface Winds for Hurricane Donna of 1960. *Monthly Weather Review* **131**, 1992-2011.

Dunn, Gordon E., Walter Davis and Paul Moore, 1955: Hurricanes of 1955. Monthly Weather Review Vol. 83 pp 315-326. . U.S. Dept of Agriculture Government Printing Office. Washington, D.C.

Ho, Francis P., R.W. Schwerdt and H.V. Goodyear, 1987: Some Climatological Characteristics of Hurricanes and Tropical Storms, Gulf and East Coasts of the United States. NOAA Technical Report, NWS 15, Washington, D.C.,87 pp.

Jarvinen, B. R., C. J. Neumann, and M. A. S. Davis, 1984: A tropical cyclone data tape for the North Atlantic Basin, 1886-1983: Contents, limitations, and uses. NOAA Technical Memorandum, NWS NHC 22, Coral Gables, Florida, 21 pp.

Jordan Harold M., and David J. Stowell, 1955: Some Small Scale Features of the track of Hurricane Ione. *Monthly Weather Review* **83**, 210-215. U.S. Dept of Agriculture Government Printing Office. Washington, D.C.

Kaplan, John and Mark DeMaria, 1995: A Simple Empirical Model for Predicting the Decay of Tropical Cyclone Winds after Landfall. *Journal of Applied Meteorology* **34**, 2499-2512.

Landsea, Christopher W., C. Anderson, G. Clark, M. Zimmer, C. Neumann and J. Partegas, 2003: The Atlantic Hurricane Database Re-analysis Project Documentation for 1851-1910 Alterations and Addition to the HURDAT Database.

Powell, M.D., S.H. Houston, and T.A. Reinhold, 1996: Hurricane Andrew's Landfall in South Florida. Part I: Standardizing Measurements For Documentation Of Surface Wind Fields*. Weather and Forecasting*., **11**, 304-328.

U.S. Department of Energy, 1978: National wind data index final report. Rep. HEO-T1041-01, 198 pp.