

50 Years Ago

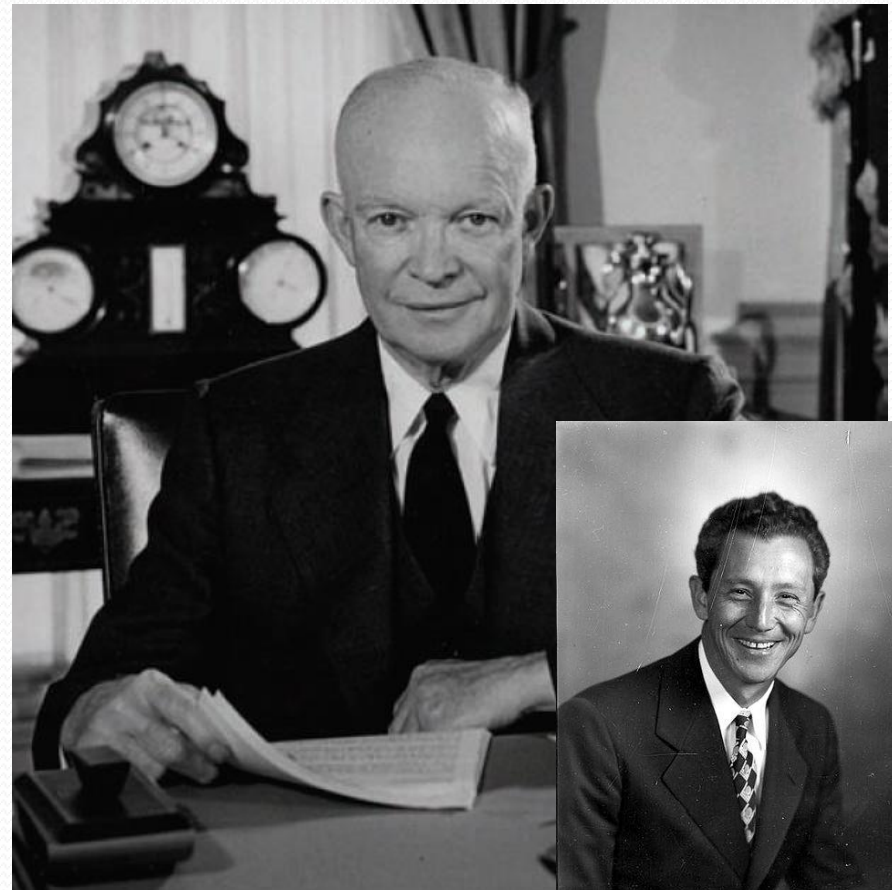
HURRICANE DONNA

Rusty Pfost (former Meteorologist-in-Charge at WFO
Miami)

September 2010

1960

- Dwight D. Eisenhower is President
- Cold War
- LeRoy Collins is Governor
- US sends 3500 soldiers to Vietnam
- Soviet missile shoots down U2
- Castro nationalizes US interests in Cuba
- “The Flintstones” premieres
- Tiros I weather satellite
- Kennedy/Johnson elected



Weather Bureau in 1960

- WBAS at the airport
 - W.L. “Tommy” Thompson is CAM
- WBO/NHC at the Aviation Bldg
 - Gordon Dunn is MIC
- WSR-57 installed in 1959



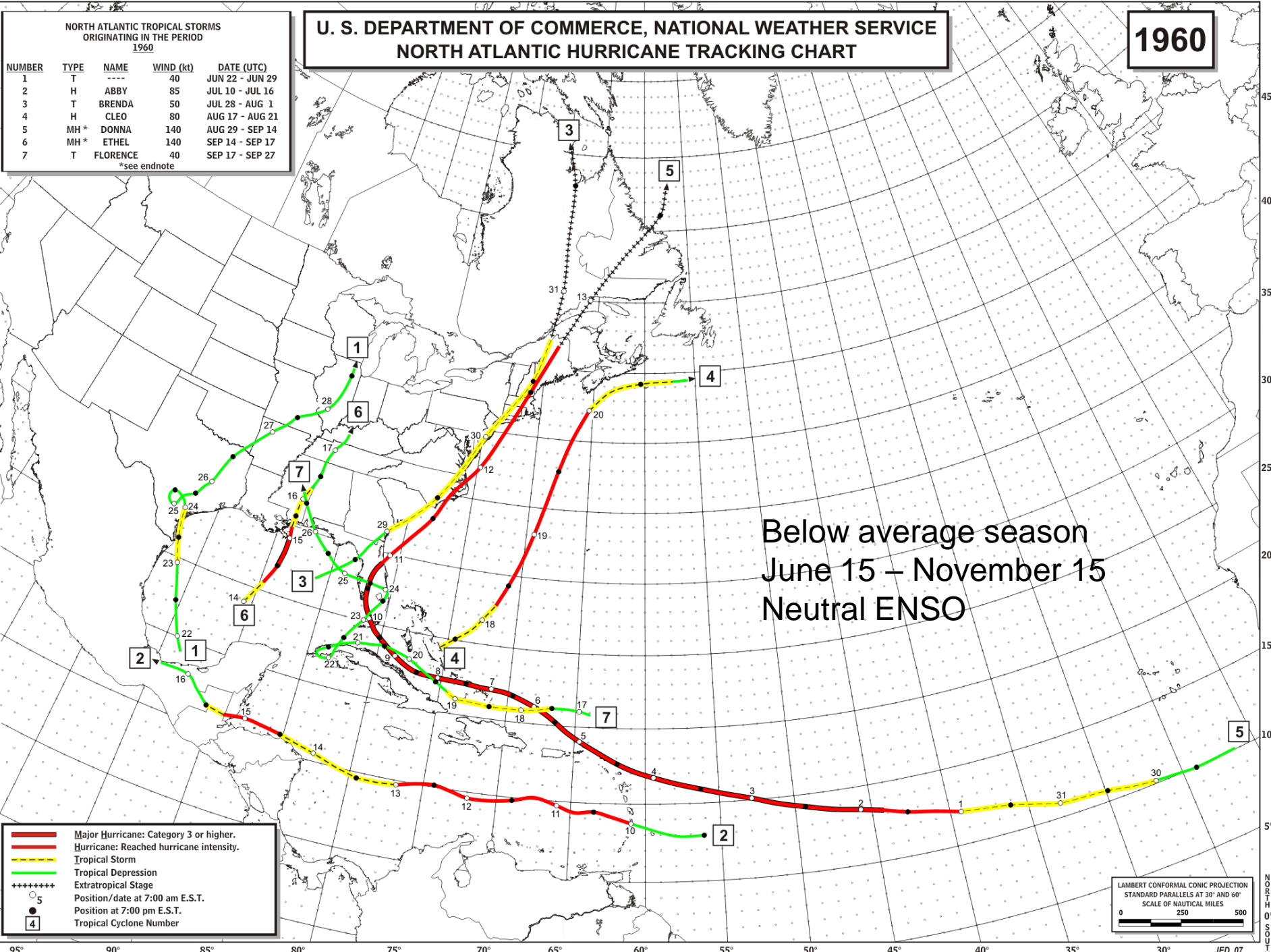
U. S. DEPARTMENT OF COMMERCE, NATIONAL WEATHER SERVICE NORTH ATLANTIC HURRICANE TRACKING CHART

1960

**NORTH ATLANTIC TROPICAL STORMS
ORIGINATING IN THE PERIOD
1960**

NUMBER	TYPE	NAME	WIND (kt)	DATE (UTC)
1	T	----	40	JUN 22 - JUN 29
2	H	ABBY	85	JUL 10 - JUL 16
3	T	BRENDA	50	JUL 28 - AUG 1
4	H	CLEO	80	AUG 17 - AUG 21
5	MH*	DONNA	140	AUG 29 - SEP 14
6	MH*	ETHEL	140	SEP 14 - SEP 17
7	T	FLORENCE	40	SEP 17 - SEP 27

*see endnote



Below average season
June 15 – November 15
Neutral ENSO

—	Major Hurricane: Category 3 or higher.
—	Hurricane: Reached hurricane intensity.
—	Tropical Storm
—	Tropical Depression
-----	Extratropical Stage
○	Position/date at 7:00 am E.S.T.
●	Position at 7:00 pm E.S.T.
4	Tropical Cyclone Number

LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES

0 250 500

NORTH
0°
30°
60°
90°
120°
150°
180°
210°
240°
270°
300°
330°
360°

JED_07

Hurricane Donna

- August 29 – September 17
- Record for maintaining major hurricane (Cat 3) status
 - 9 days, September 2-11
- Briefly category 5 on September 4 over Atlantic Ocean
- Direct hits
 - Florida Keys, FL (Marathon, Vaca Key) category 4
 - Fort Myers/Naples, FL category 4
 - Cape Hatteras, NC
 - Long Island, NY and New England

Tropical disturbance Aug 28-29

French airliner crashed in a “blinding rainstorm” on Aug. 29 attempting to land at Dakar, Senegal

55 passengers and crew of 8 all killed

On Aug. 30, an Air Force plane reported a tropical disturbance near the Cape Verde Islands

No satellite pictures because Tiros I ceased operations in mid June 1960, electrical failure

63 Killed In Crash Of French Airliner

DAKAR, Senegal (UPI) — An Air France Super Constellation circling for a third attempt to land at Dakar Airport in a blinding rainstorm crashed into the Atlantic today, apparently killing all 63 persons aboard.

The plane had 55 passengers and eight crew members aboard on a scheduled flight from Paris to Dakar, Monrovia, Liberia, and Abidjan, Ivory Coast.

Three helicopters, two French Navy seaplanes, a dispatch boat and several freighters took part in the search for survivors or bodies.

BOATS EMPTY

Dinghies spotted near the place where the plane lay on a sandy bottom in 80 feet of water turned out to be empty. They apparently were released automatically when the plane hit the water as it was turning to make the third attempt to land.

Rescue officials said the condition of the bodies made it appear that the plane exploded when it hit the water.

The Singer Sewing Machine Co. said one of the passengers was James McKinnon, a Singer sales executive. A Canadian, McKinnon had offices in New York City, and resided at Riverside, Conn.

OTHER YANKS

An American official at Dakar said earlier that, so far as information then available was concerned, no Americans were aboard.

The plane's pilot was Lucien Boirre, a veteran of 20,000 flying hours.

It was the third accident in four years on the Paris-Abidjan route. On Sept. 25, 1949, a DC-7 belonging to the French TAI Line



ROUTE OF AIRLINER

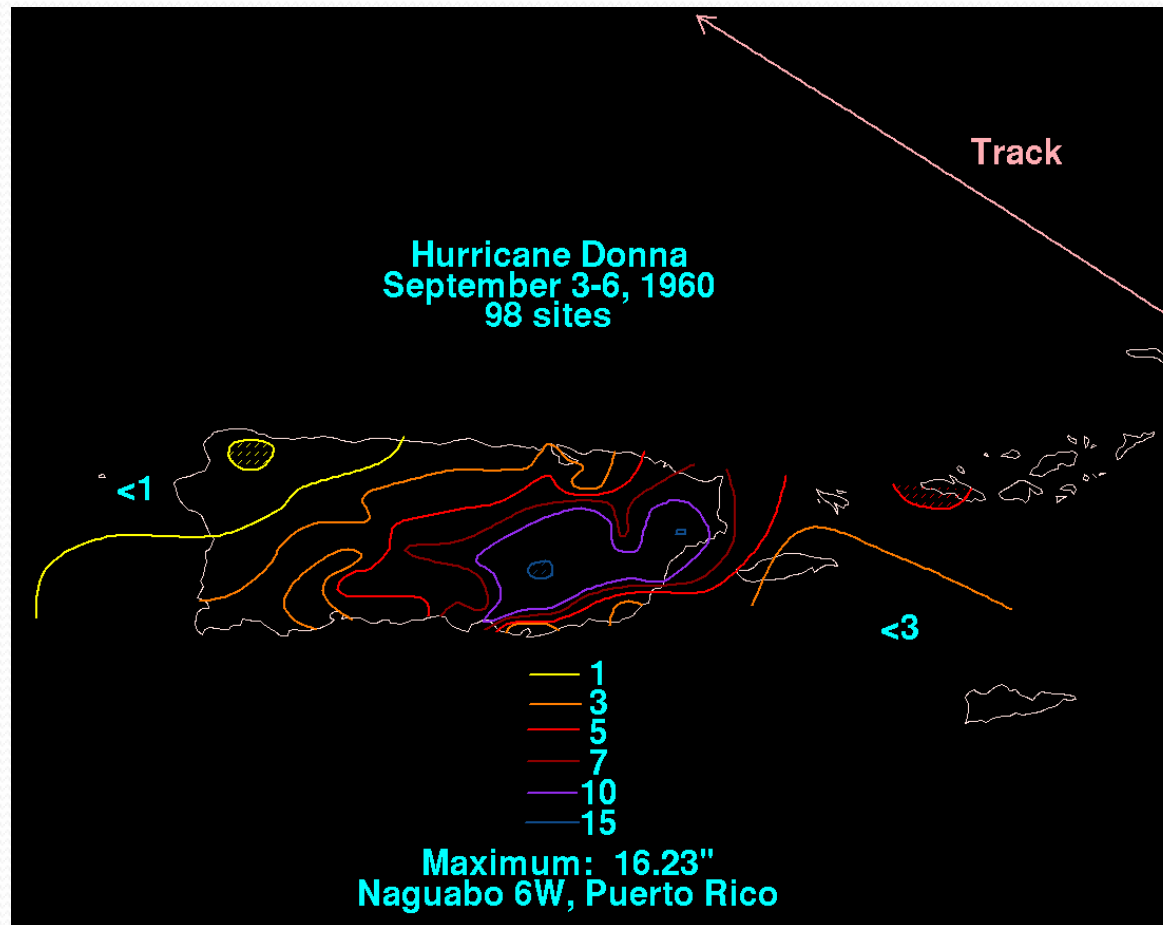
The S

LONDON (AP) — Lovely Veronica Wise lay in her strange dark world for the 828th day today, unaware that her romance had come to a tragic end.

First advisory – Sep 2

- Located by Navy reconnaissance invest flight
- First advisory 6 PM AST Sep 2 by Hurricane Warning Center, San Juan, PR
- 12 noon AST Sep 3 - Hurricane Watch for Leeward Islands
- 6 PM AST Sep 3 - Hurricane Warning for Leeward Islands, Hurricane Watch for Puerto Rico
- 6 AM AST Sep 4 - Hurricane Warning for Puerto Rico and Virgin Islands
- 9 AM and 12 Noon AST Sep 5 – Hurricane Warnings changed to Gale Warnings for PR and VI

Torrential rains, floods in Puerto Rico



Donna's effect on the islands

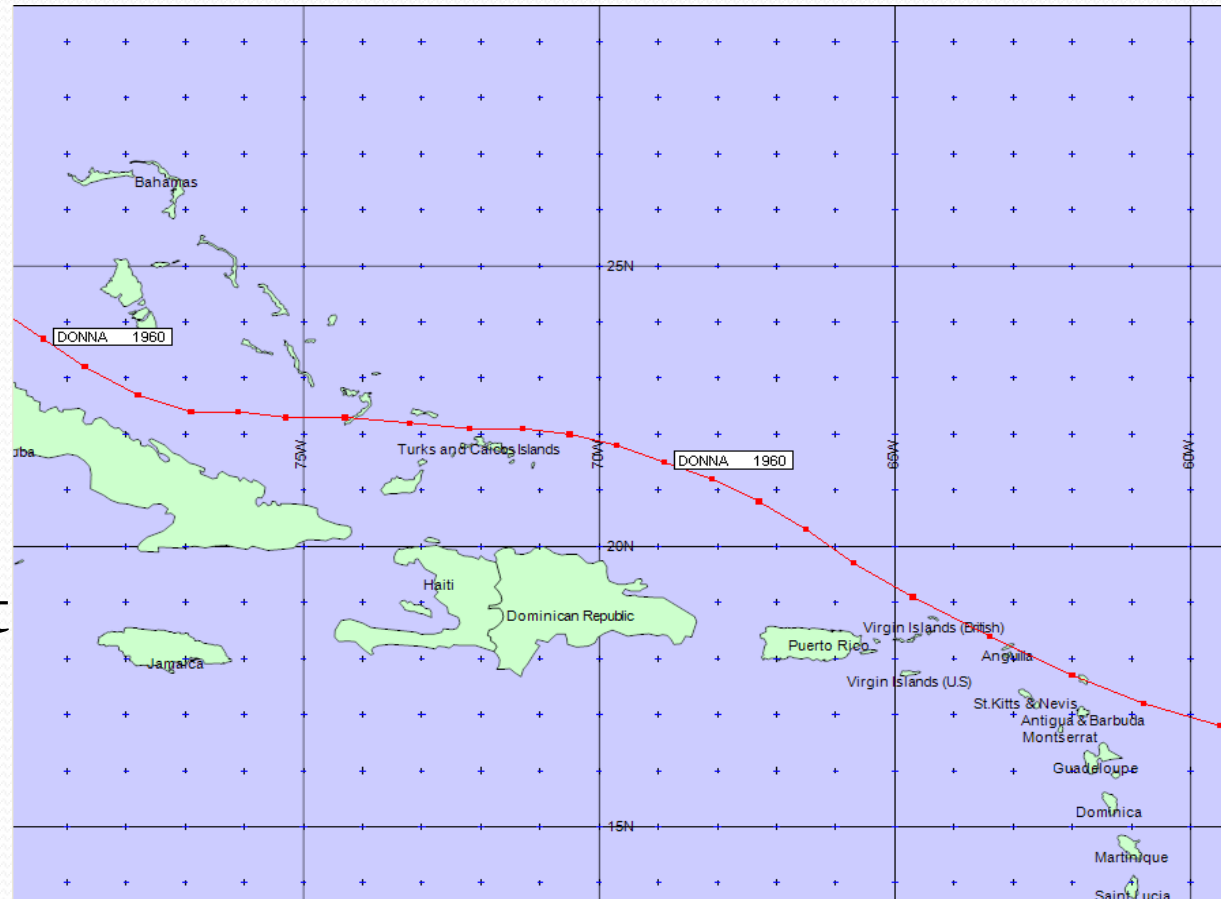
- Category 5 storm for a short time on Sep 4
- St. Maarten reported 120 mph sustained wind
- St. Maarten – 7 dead, extensive damage, 25% homeless
- Anguilla – 1 dead
- Virgin Islands – 7 dead
- Puerto Rico – over 10 inches of rain produced flash floods, killing 107 people
- By noon on Sep 5, apparent that the center of Donna will miss Puerto Rico to the north

Watches and warnings

- 5 AM EST, Sep 7 - (70 mi north of Grand Turc)
Interests on Turks and Caicos Islands and Mayaguana Island advised to prepare for hurricane force winds immediately
- 130 PM EST, Sep 7 - (short distance south of Mayaguana Isl) HURRICANE WATCH issued for Florida from Melbourne to Key West
- 8 PM EST, Sep 7 - (midway between Mayaguana and Crooked Islands, Bahamas)

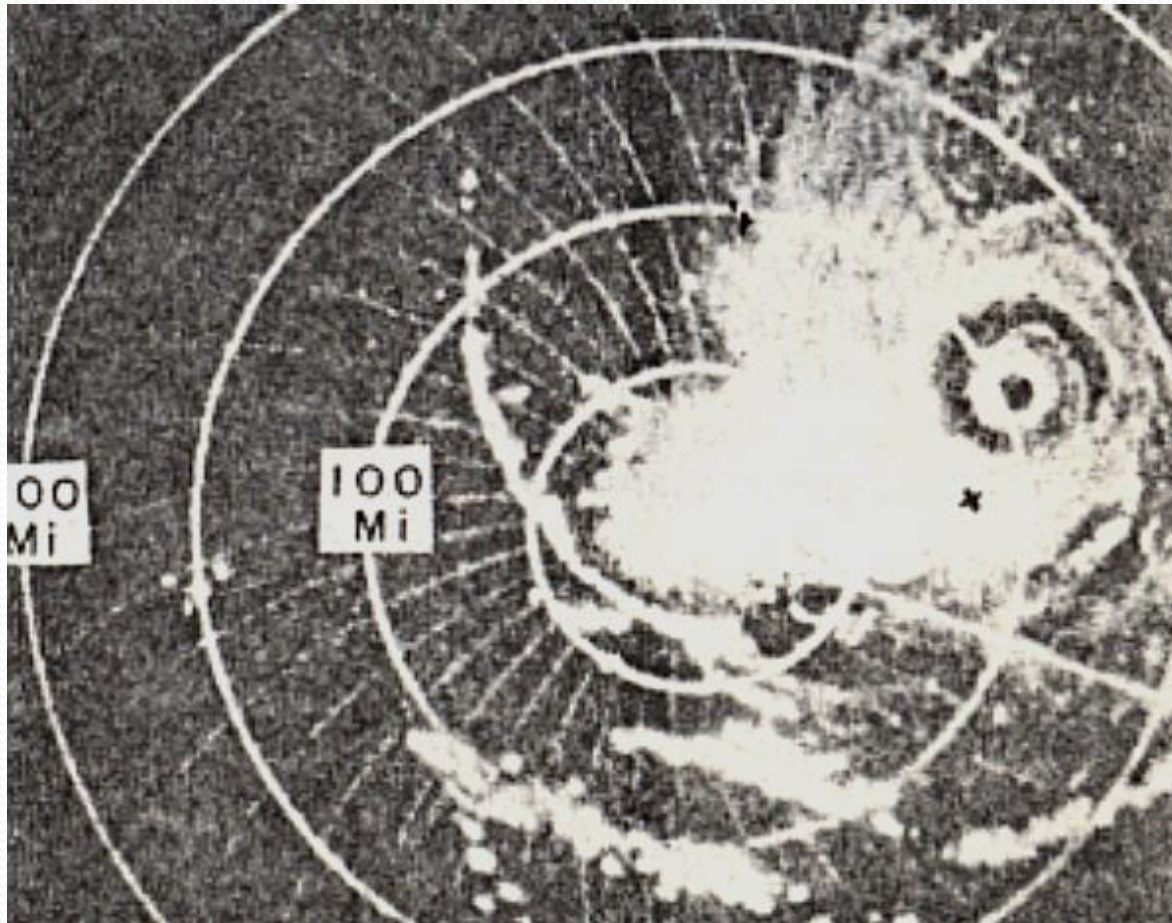
Donna moves through Bahamas

- 20 inches of rainfall at North Caicos
- Hurricane force for 13 hours at Mayaguana
- Eye passed across Crooked Island
- 150 mph wind gust at Ragged Island, anemometer blew away



Sep 7-8, 1960

Double eyewall structure, SE Bahamas



400 PM EST Sep 6 1960, aircraft radar 10 mi S Turks Isl.

Mayaguana devastation

<http://www.hurricanes-blizzards-noreasters.com/>



TOWN CRUSHED—This aerial view of Abraham's Bay, Mayaguana, in the Bahamas, shows how the small town was laid waste by the 150-

mile-an-hour winds of Hurricane Donna.

(AP Wirephoto)

Well behaved hurricane?

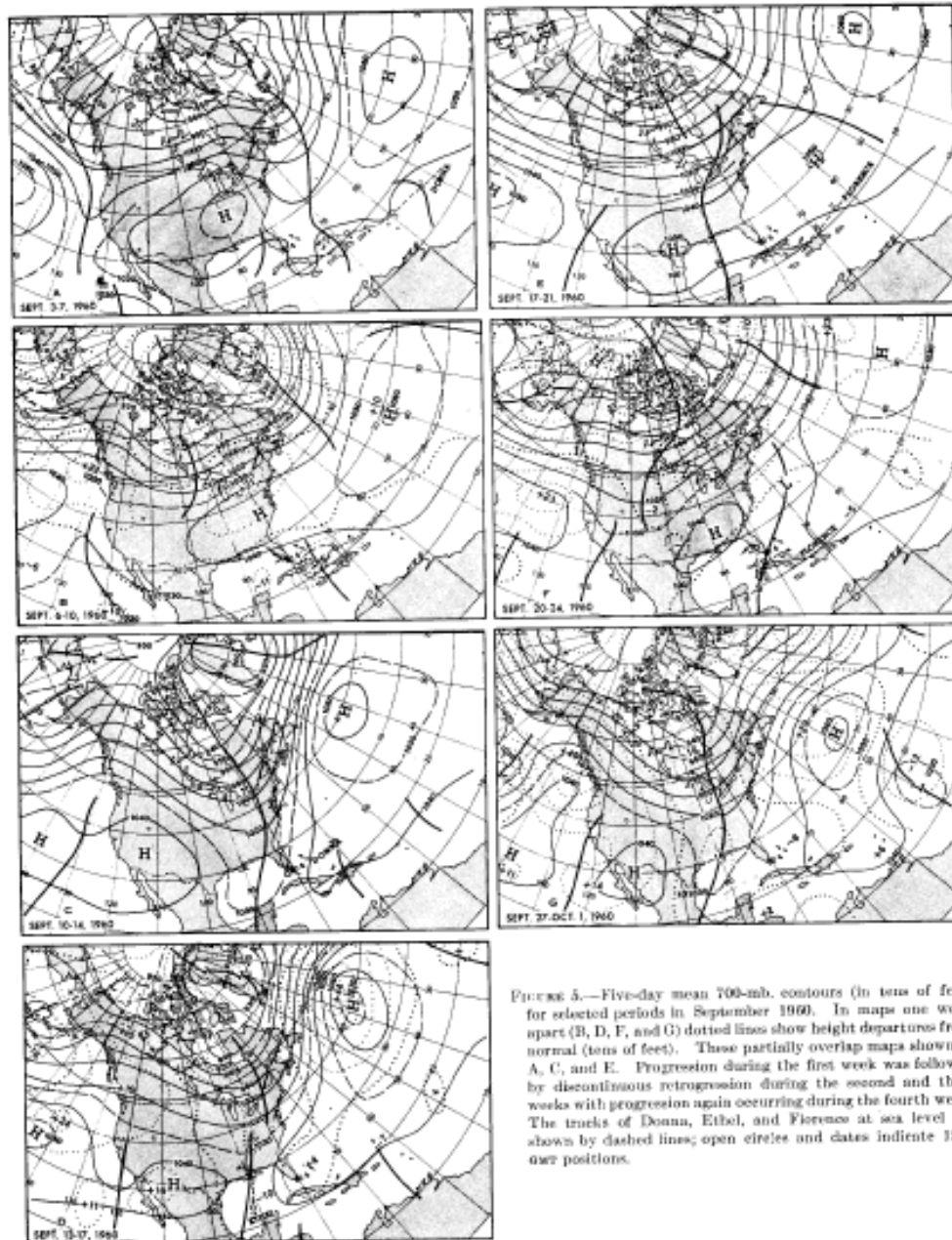
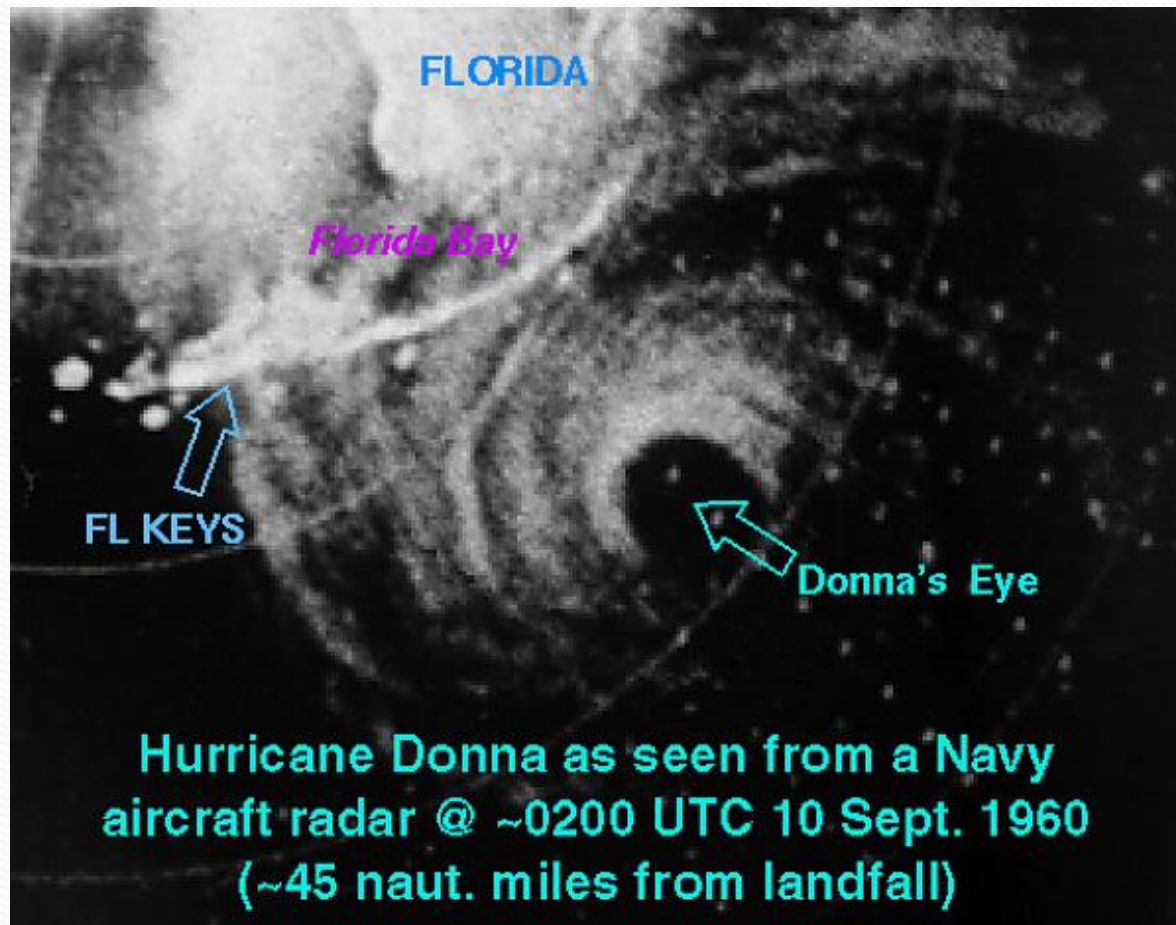


FIGURE 5.—Five-day mean 700-mb. contours (in tens of feet) for selected periods in September 1960. In maps one week apart (B, D, F, and G) dotted lines show height departures from normal (tens of feet). These partially overlap maps shown in A, C, and E. Progression during the first week was followed by discontinuous retrogression during the second and third weeks with progression again occurring during the fourth week. The tracks of Donna, Ethel, and Florence at sea level are shown by dashed lines; open circles and dates indicate 1200 GMT positions.

Hurricane Warning for Florida

- 11 AM EST, Sep 8 - (20 mi W of Ragged Island) Hurricane Warning for Florida Keys from Key Largo to Dry Tortugas, Hurricane Watch Melbourne to Fort Myers
- 8 AM EST, Sep 9 - term EMERGENCY inserted
- 11 AM EST, Sep 9 - (154 mi SSE of Miami) Hurricane Warning extended, Fort Lauderdale to Punta Gorda, Hurricane Watch Melbourne to Cedar Keys
- 5 PM EST, Sep 9 - Carysfort Reef Light 90 mph, Miami 55 mph
- 11 PM EST, Sep 9 - (35 mi E of middle keys) Hurricane Warning extended, Melbourne to Clearwater including Lake Okeechobee

Donna approaching Fla Keys

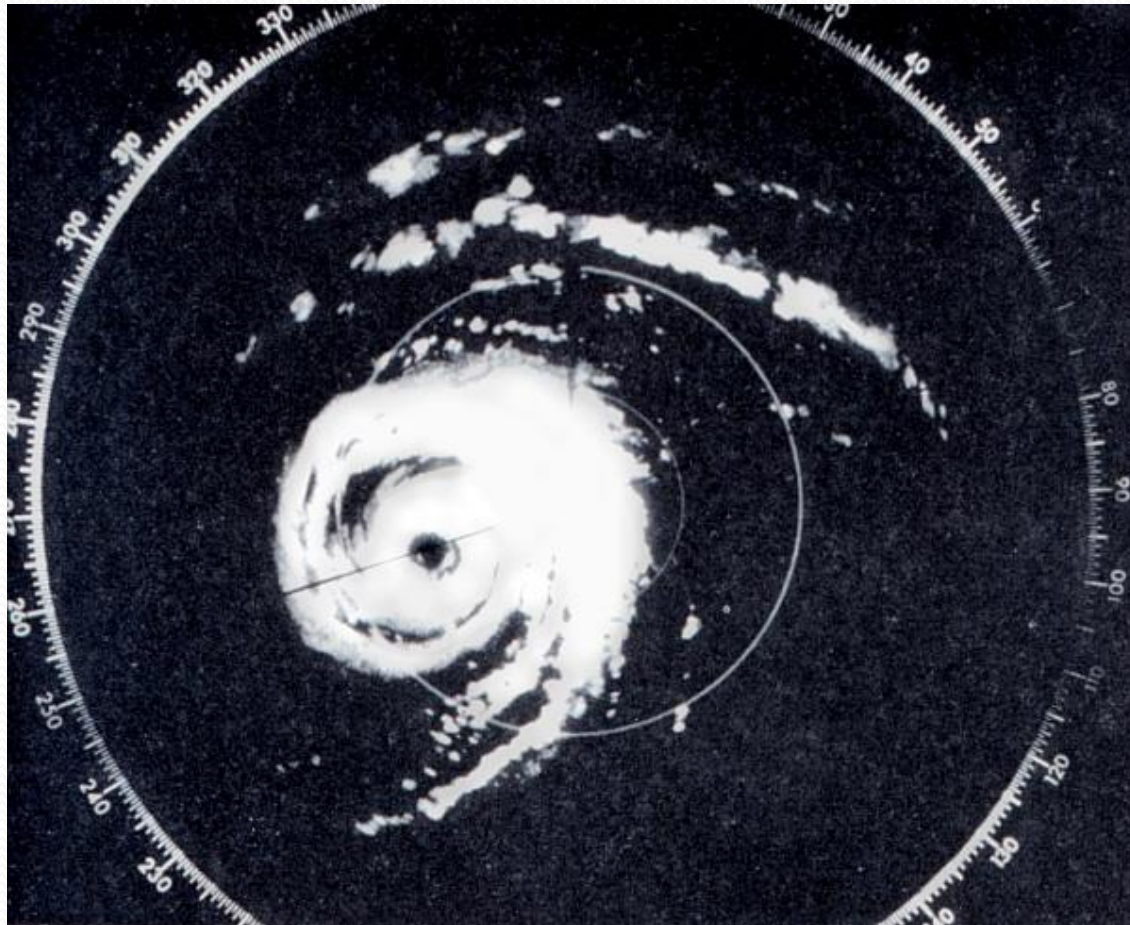


900 PM EST Sep 10 1960, aircraft radar

Devastation in the Keys

- 1 AM EST, Sep 10 - 135 mph wind at Tavernier
- 3 AM EST, Sep 10 - eye moving onto Long Key
- 5 AM EST, Sep 10 - eye over Cape Sable, Hurricane Warning extended Daytona Beach to Cedar Keys
- 7 AM EST, Sep 10 - about 25 mi south of Everglades City
- 9 AM EST, Sep 10 - 97 mph gust at MIA
- 1 PM EST, Sep 10 - near Naples
- 3 PM EST, Sep 10 - near Fort Myers
- 7 PM EST, Sep 10 - 30 mi east of Sarasota

Donna in extreme SE Gulf



730 AM EST Sep 10 1960, Miami radar

Islamorada, Sep 10, 1960



Marathon



MARK ON DOOR. TIDE GAGE
FROM BLACKWATER SOUND IN
SECOND PHASE FROM WESTERLY
WINDS.

6.9
7.3
6.7
6.7

6-6.5

3.6

MARK ON POLE.

SAN PEDRO CATHOLIC CHURCH:
6.3 IN ALCOVE ON EASTSIDE.
4.8 IN BACK OF CHURCH

MARK ON PALM TREE NE
CORNER OF BUILDING

PEAK TIDE LASTED ABOUT
30 MINUTES.

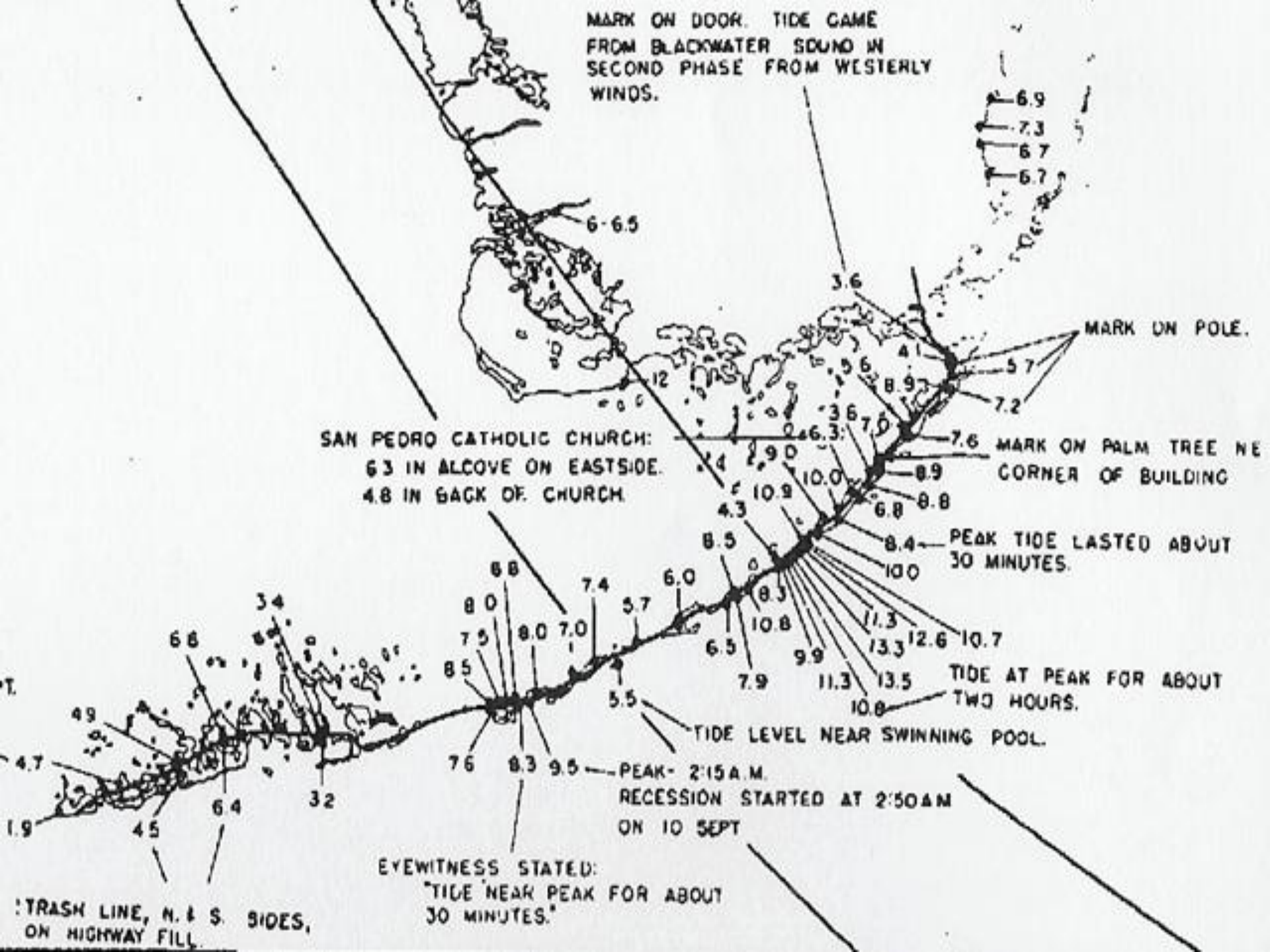
TIDE AT PEAK FOR ABOUT
TWO HOURS.

TIDE LEVEL NEAR SWINNING POOL.

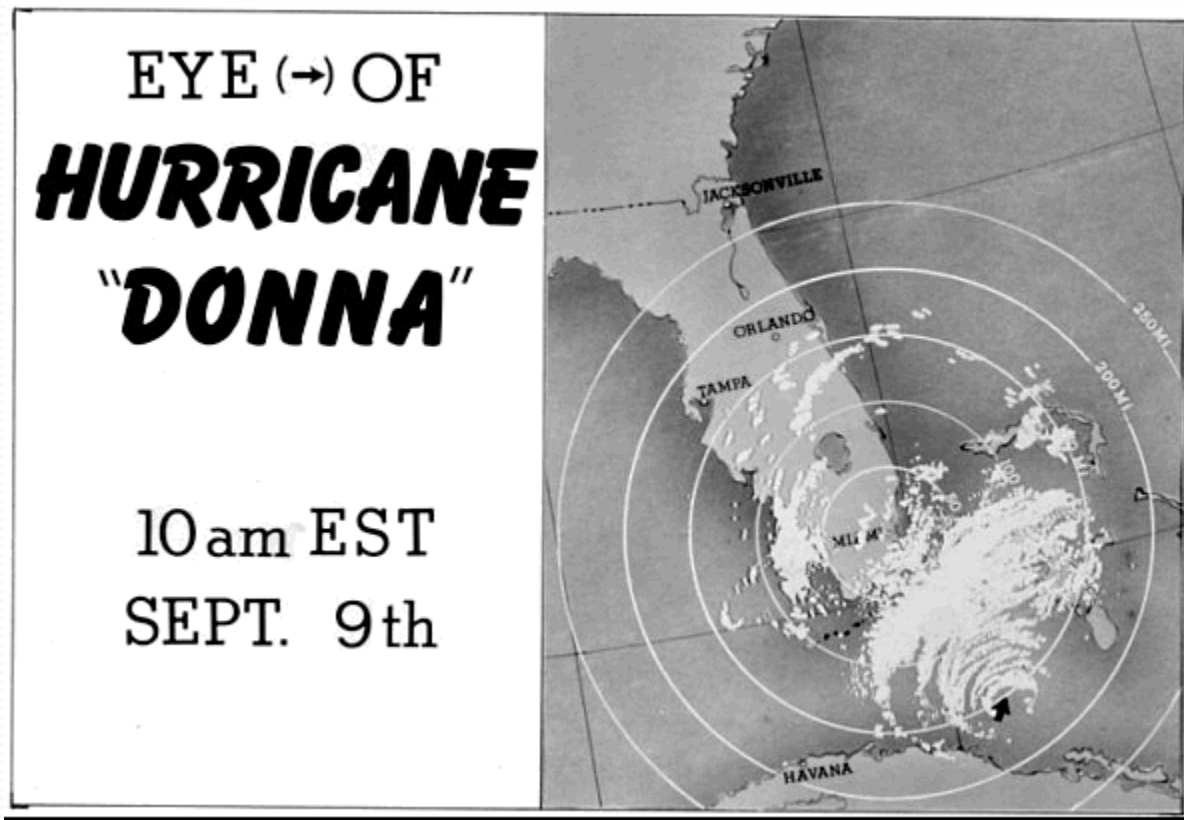
PEAK- 2:15 A.M.
RECESSION STARTED AT 2:50 A.M.
ON 10 SEPT

EYEWITNESS STATED:
"TIDE NEAR PEAK FOR ABOUT
30 MINUTES."

TRASH LINE, N. & S. SIDES,
ON HIGHWAY FILL.



Donna radar animation



Donna track

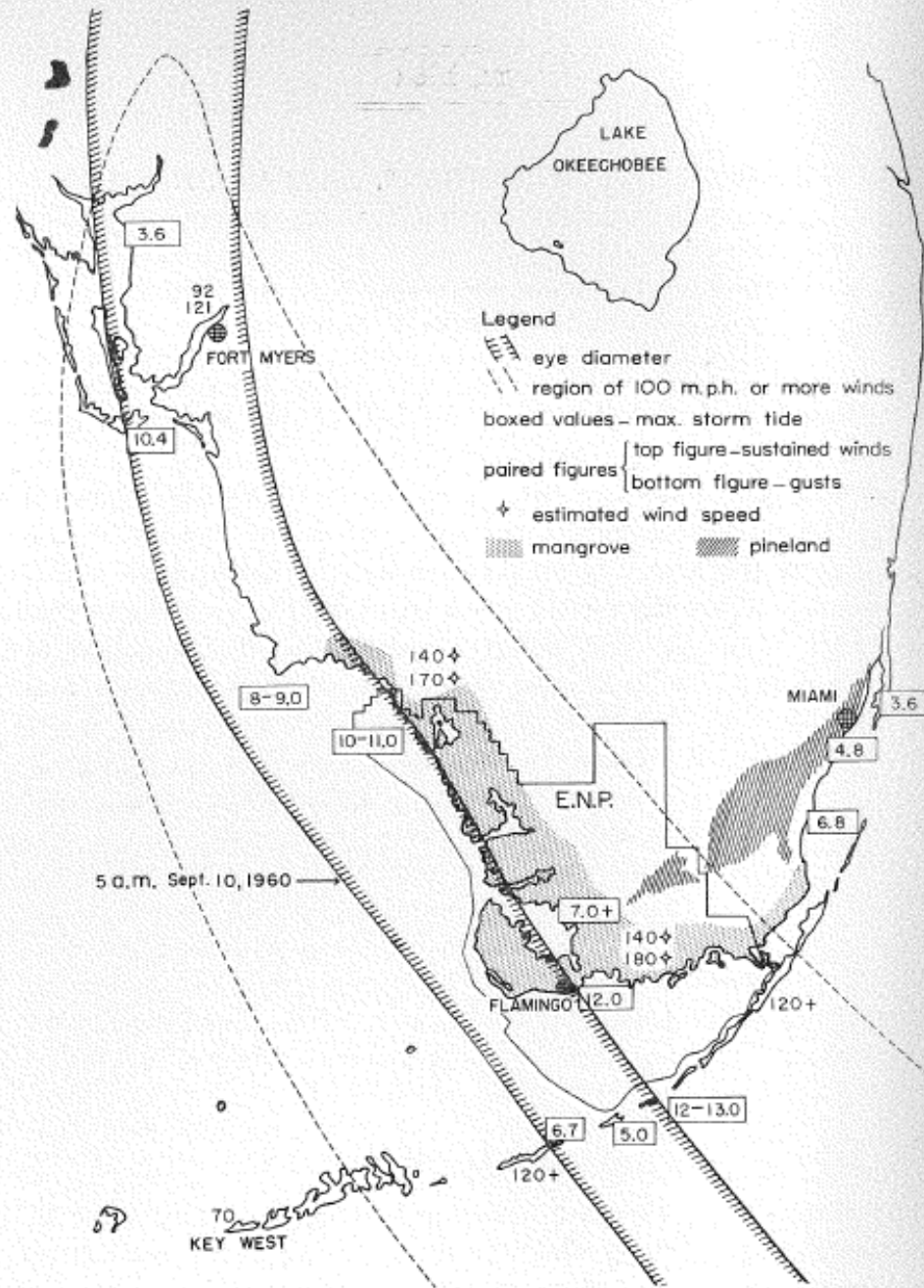
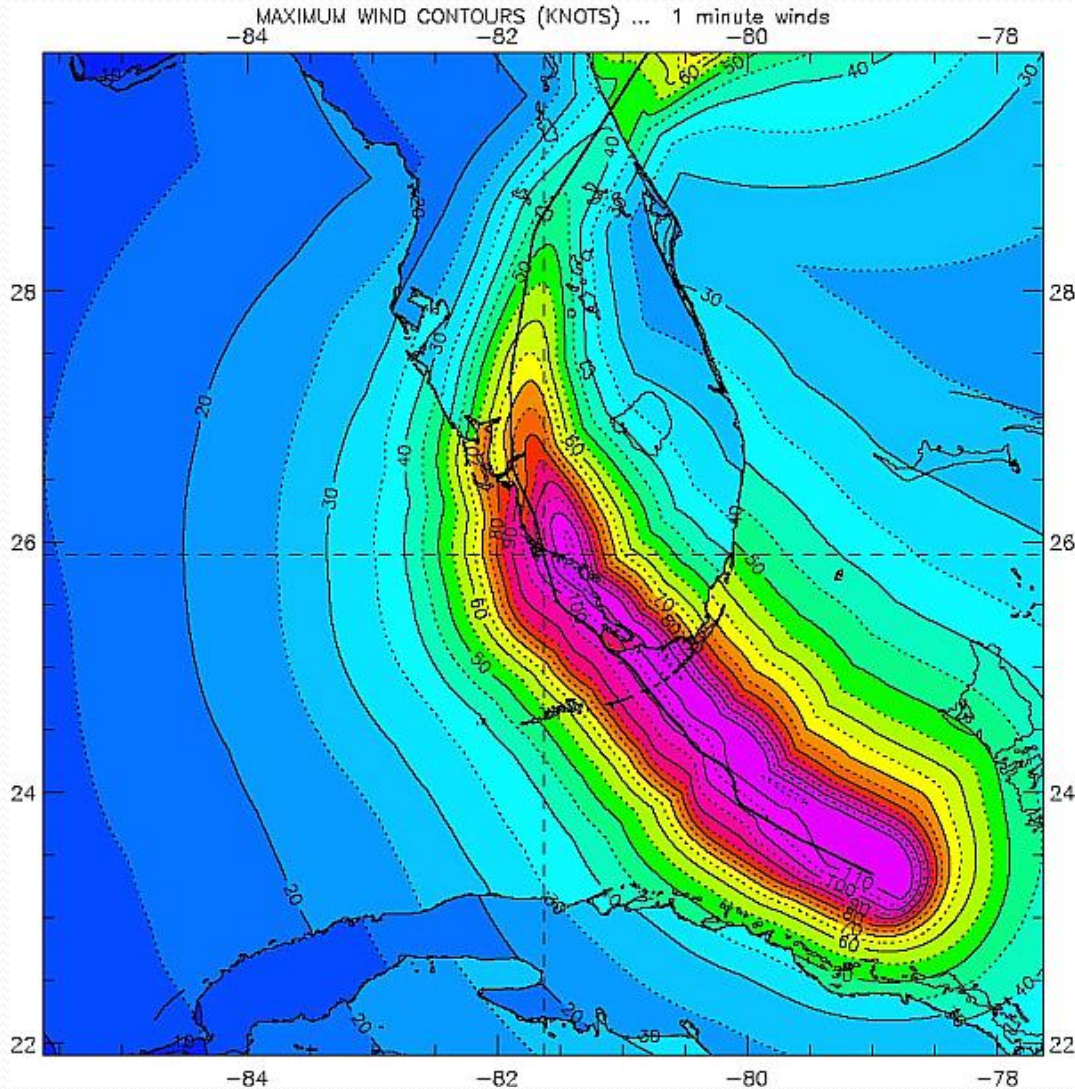


Figure 1. Track of Hurricane Donna in Southern Florida.

Wind swath of Donna



Everglades damage

- Pineland and mangrove forests sustained extensive damage
 - Labor Day Hurricane – 1935
 - Hurricane Donna – 1960
 - [Hurricane Andrew – 1992]



Figure 2. Remnants of the "Black Forest" trees that survived the 1935 storm and second growth understory, 20-25 years of age, recently destroyed by Donna. Flamingo, Monroe County.



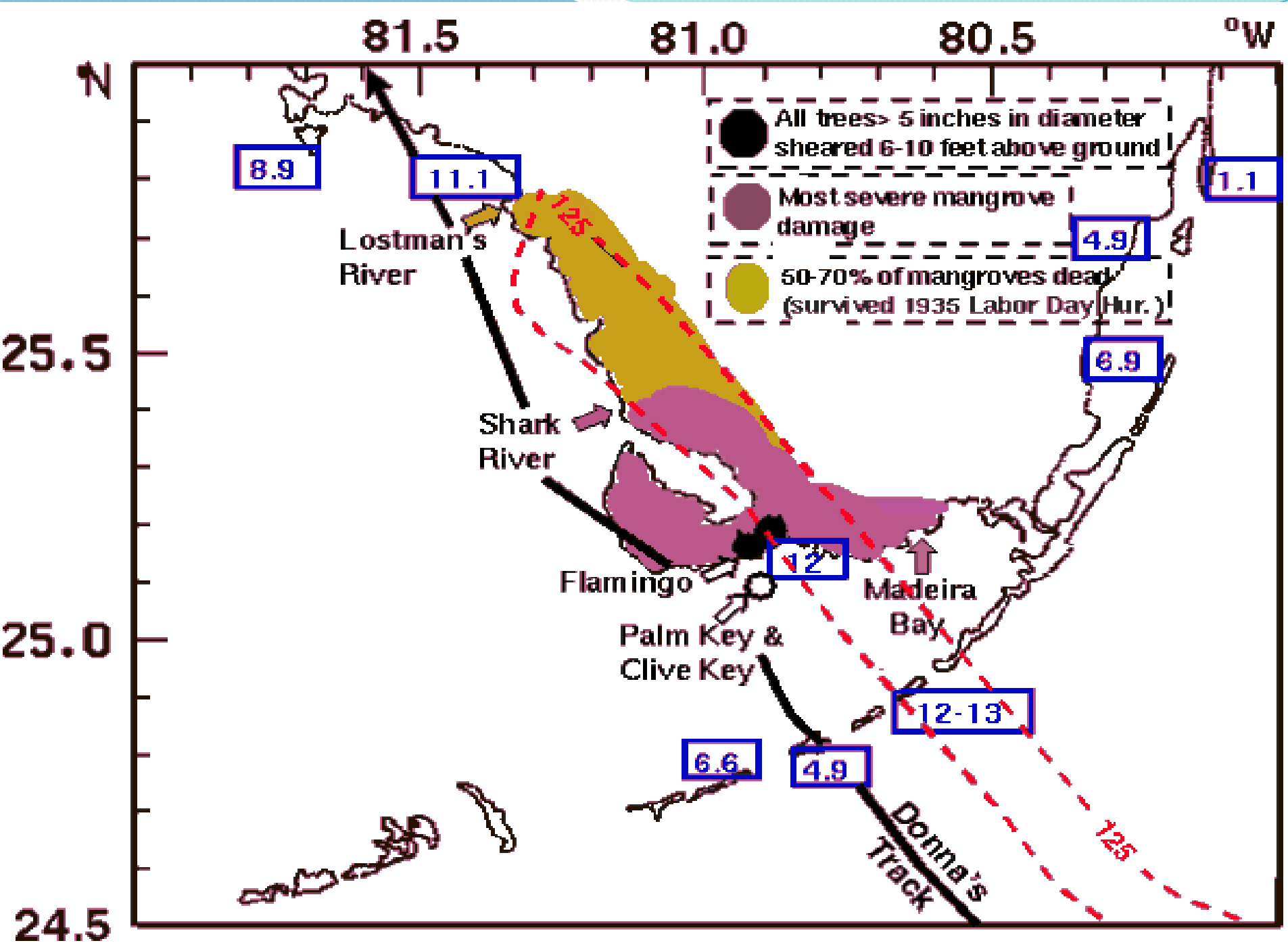
Figure 7. Mahogany Hammock before Donna.



Figure 8. Mahogany Hammock a month after Donna.

Everglades damage

- Slow movement (approx 14 mph) subjected Everglades areas to damaging winds for 36 hours
- Flamingo est'd 140 mph gusting to 180 mph
- Max storm tide at Flamingo 12 ft above msl
- Most severe mangrove damage from Madeira Bay to Shark River including Whitewater Bay
- Many trees 2 inches or more in diameter sheared off 6 to 10 ft above ground
- Shark River north to Lostmans River 50-75% killed
- Lostmans River to Everglades City 10-25% killed



Everglades National Park

- 50-90% of foliage torn off
- Winterlike appearance for 1-2 weeks after Donna
- By Sept. 24, springlike appearance, new leaves coming out, pastel shades of green
- Some plants flowered
- 1-5 inches of silt deposited across much of the flooded area

Everglades City



Hurricane Donna 1600 UTC 10 September 1960

Max. 1-min sustained surface winds (kt)

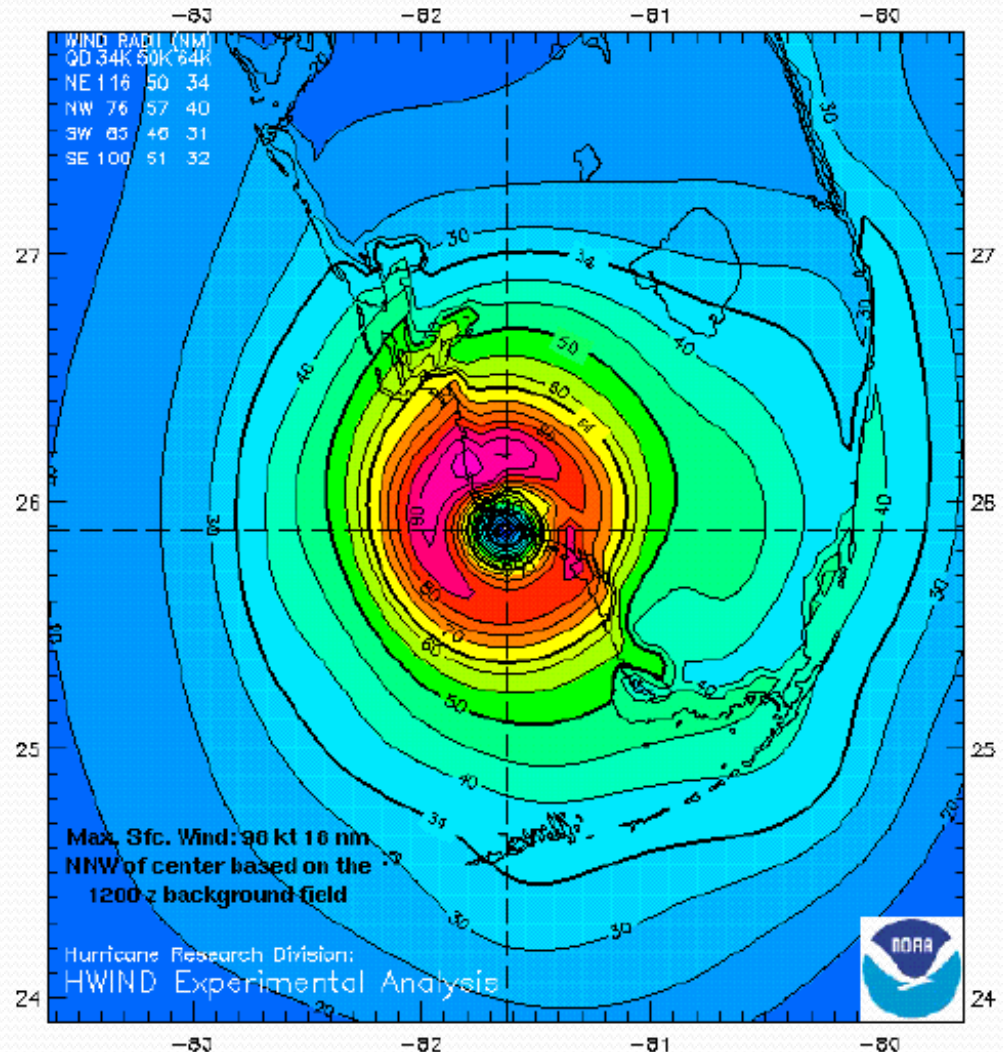
Analysis based on background field from the previous 1200 z analysis;

Navy data adj. to the surface from 700 mb: 1930 z;

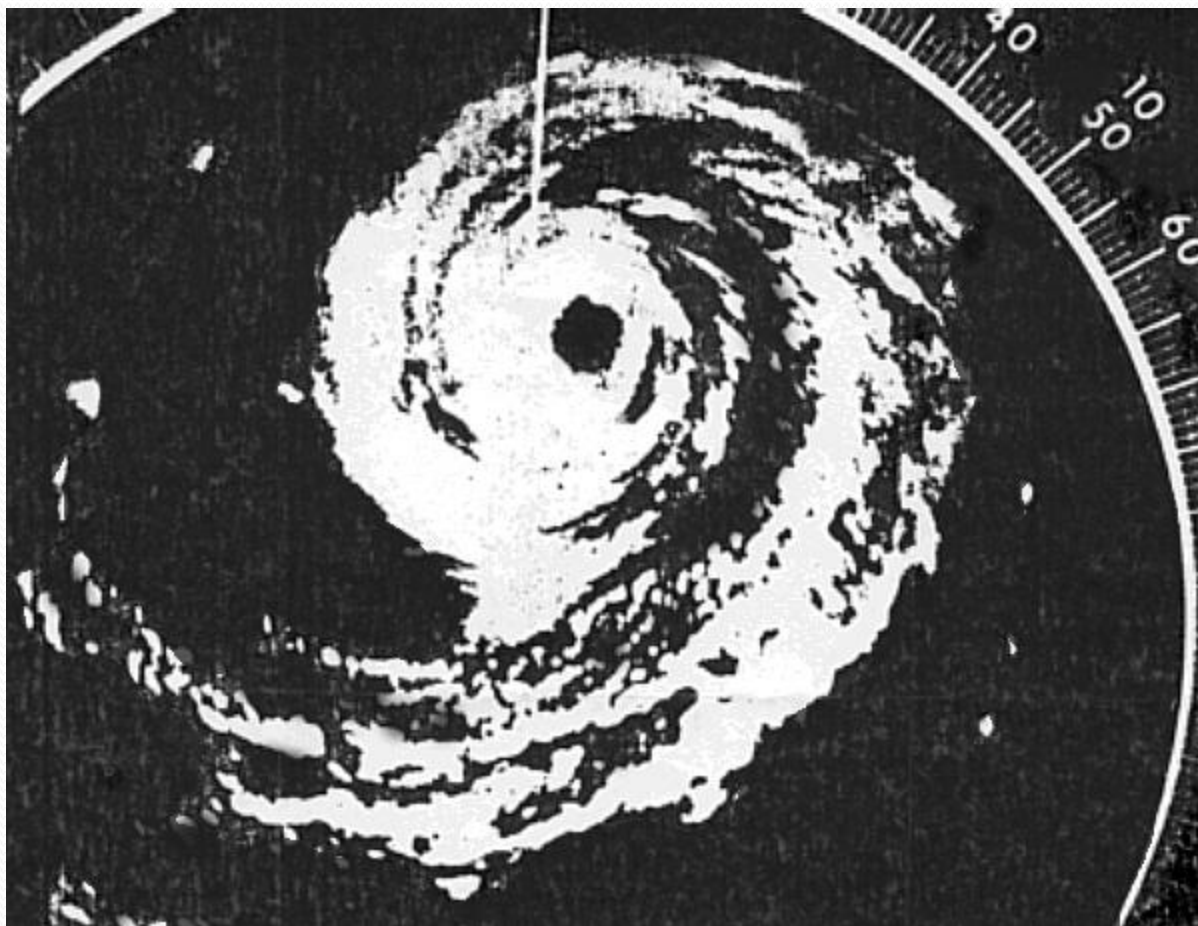
Ship, lighthouse, and METAR reports: 1200 - 1800 z;

1600 z centered analysis utilizing a +/- 4 hour storm relative time window

Southwest Gulf coast



Donna near Fort Myers



200 PM EST Sep 10 1960, Key West radar

Naples and Fort Myers

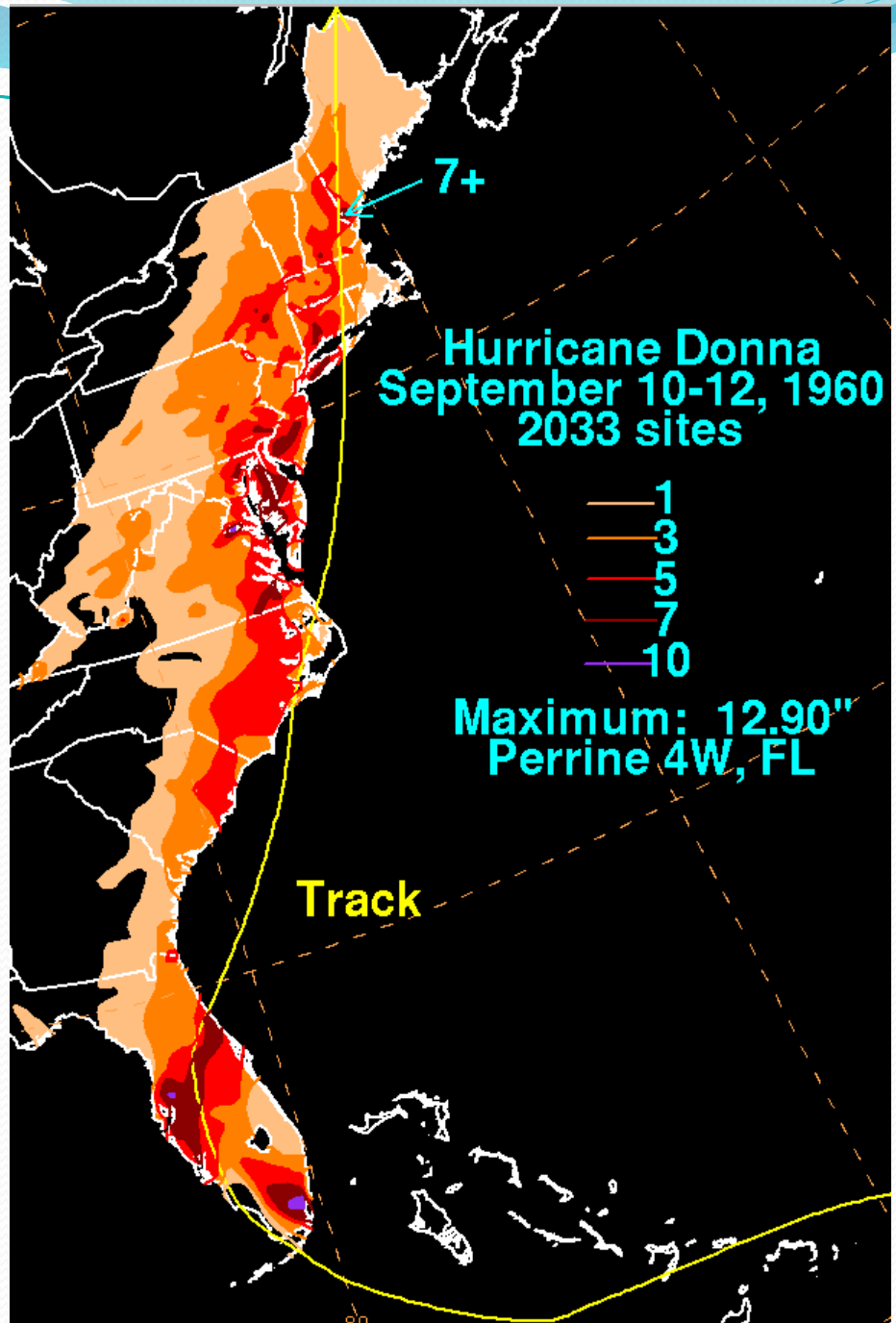
- Storm tide 4 to 7 feet above msl
- Storm tide pushed to center of Naples
- Fort Myers max wind 92 mph gusts to 121 mph
- Gusts to 100 mph as far north as Sarasota



Fort Myers



Torrential Rainfall!

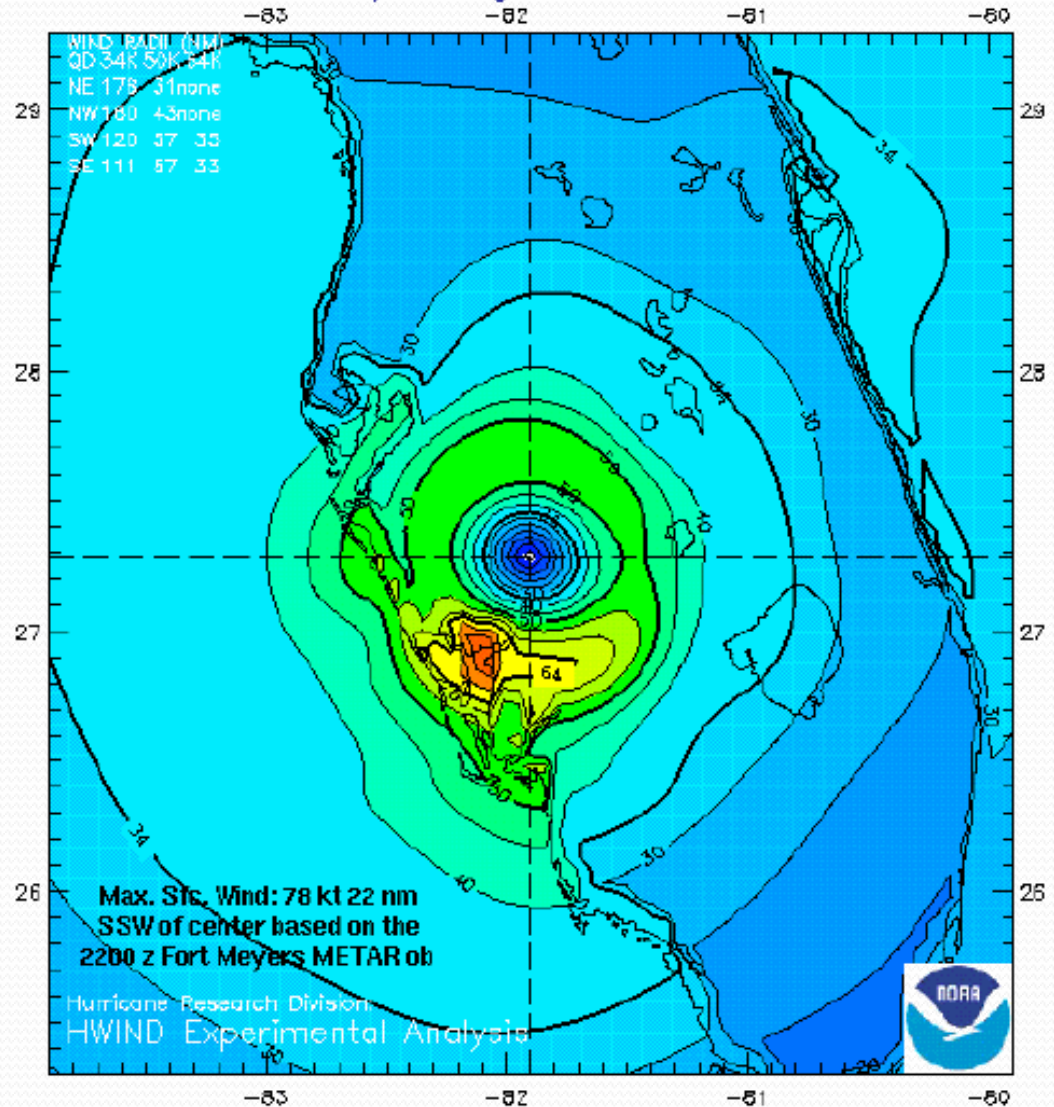


Hurricane Donna 0000 UTC 11 September 1960

Max. 1-min sustained surface winds (kt)

Analysis based on background field from the previous 1600 z analysis using the Kaplan-DeMaria Inland Decay Model;
Navy data adj. to the surface from 700 mb; z 130 z;
Ship, lighthouse, and METAR reports: 2000 - 0359 z;
0000 z centered analysis utilizing a +/- 4 hour storm relative time window

Weakening
over
central
Florida



Donna races north

- 11 PM EST, Sep 10 - 20 mi south of Lakeland, Hurricane Warning extended north to Savannah, GA
- 3 AM EST, Sep 11 - near Orlando
- 5 AM EST, Sep 11 - just northwest of DeLand, Hurricane Warning Vero Beach to Myrtle Beach SC
- 7 AM EST, Sep 11 - Flagler Beach into the Atlantic
- 11 AM EST, Sep 11 - 90 mi northeast of Jacksonville, Hurricane Warning Fernandina Beach to Cape Hatteras
- 8 PM EST, Sep 11 - Cape Fear, NC moving NE 35 mph

North Carolina to New England

- 9 PM EST, Sep 11 - 40 mi east of Wilmington, NC
Hurricane Warning Beaufort SC to Portsmouth, NH
- 7 AM EST, Sep 12 - 60 mi southeast of Ocean City, MD, Hurricane Warning to Eastport, ME
 - Expected to come ashore on Long Island NY
- 11 AM EST, Sep 12 - 80 mi east of Atlantic City, NJ
- 2 PM EST, Sep 12 - center of Donna passes over Long Island NY
- 5 PM EST, Sep 12 - 40 mi northwest of Boston
- 11 PM EST, Sep 12 - 40 mi northwest of Bangor ME



Effects - Middle Atlantic to New England

- North Carolina - gusts to 103 mph at New Bern NC, rainfall 6.26 inches at Wilmington, NC, Sep 12
- Virginia - gusts to 75 mph at Norfolk Sep 12, tides 7 feet above normal
- Delaware/New Jersey - gusts to 100 mph at Wildwood, 83 mph at Atlantic City, Sep 12, rainfall 3-5 inches
- New York - gust to 82 mph at the WBO Sep 12, tides 6 feet above normal
- Rhode Island - gust to 130 mph at Block Island Sep 12, tides 8-9 feet above normal in Providence
- Massachusetts - gust to 79 at Boston, tides 7-9 feet above normal Sep 12



Summary

- Hurricane Donna 9th costliest storm, damages estimated 6.6 billion (in 2010 dollars)
- 364 direct deaths (over 100 in Puerto Rico, 50 in the United States, 63 in the jet crash)
- Category 5 over the Atlantic, category 4 at landfall
- 35 percent of Florida grapefruit crop lost, 10-15% of the orange crop lost