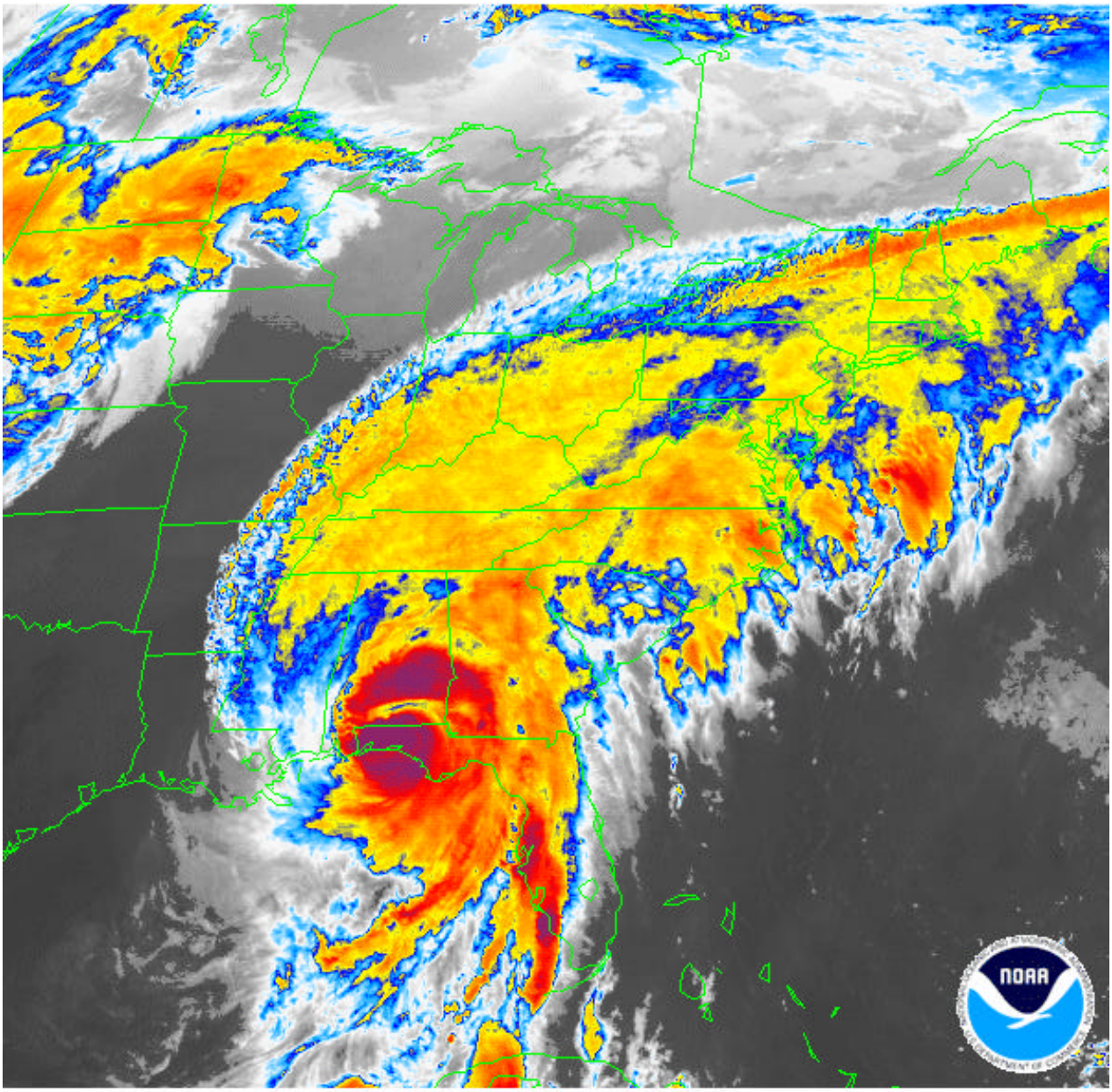
Technical Report 95-02

November 1995

Hurricane Opal

Preliminary Report



National Climatic Data Center

Research Customer Service Group

INTRODUCTION

This report deals with the U.S. landfall of Hurricane Opal, the 15th named storm in an amazingly active Atlantic tropical storm season. The authors of and contributors to this report were:

National Climatic Data Center: Axel Graumann
John Kobar
Neal Lott
Doug Ross
Karen Ross
Tom Ross
Matthew Sittel

National Weather Service
National Hurricane Center
Federal Emergency Management Agency

At the time of this report, 19 named storms had occurred this season with 11 of those reaching hurricane strength. We have included a short narrative with some of the details of Opal and its aftermath, rainfall/wind tables and maps, satellite images, and NEXRAD radar images. Please note that storm surge, rainfall amounts, peak wind gusts, and other information are based on preliminary data. Therefore, some statistics shown in this report may change later on. Also, a National Hurricane Center (NHC) preliminary report on Hurricane Opal is available from NHC upon request (phone 305-229-4470).

DISCUSSION

Following is a brief account of the storm:

-- Opal made landfall in the Florida panhandle along the Okaloosa-Santa Rosa county line about 6 PM CDT October 4, 1995 with maximum sustained winds of 125 miles per hour (mph). This location is near the area where Hurricane Erin made landfall on August 3, producing approximately $350 million in insured losses. Hurricane Allison also affected the Florida panhandle (farther to the east) in June with less severe damages.

-- Due to Opal weakening somewhat during the hours just before landfall, the destruction was somewhat less severe

than it otherwise would have been. As a category 4 storm with sustained winds of 150 mph, Opal encountered less favorable conditions including slightly cooler sea surface temperatures. Therefore, it weakened to category 3 intensity.

-- Opal's overall damages are now estimated at $2.1 billion in insured losses, with overall losses (insured + uninsured) expected to reach or exceed $3 billion. This makes Opal the third most costly hurricane to strike the U.S., behind Andrew in 1992 and Hugo in 1989.

-- Over 100,000 people were evacuated before the storm made landfall, and about 40,000 were housed temporarily in Red Cross shelters.

-- On U.S. 98, a length of approximately one-half mile between Leeside Park and the Eglin AFB Officer's Club was destroyed and actually became an 'inlet' of Choctawhatchee Bay.

-- The storm surge was estimated to be as high as 15-20 feet just east of Miramar Beach. Coastal flooding occurred along the Gulf Coast from Gulf Shores, Alabama to Tampa, Florida.

-- Approximately 3300 structures were destroyed, and over 18,000 were damaged.

-- 3 to 5 feet of sand was deposited in some beachfront homes and businesses, and 20-foot sand dunes were laid flat by the surge.

-- Florida counties hardest hit were: Escambia, Santa Rosa, Okaloosa, Walton, and Bay.

-- Florida cities/towns hardest hit included: Navarre, Fort Walton Beach, Destin, Niceville, Miramar Beach, and Mexico Beach.

-- Hundreds of boats were destroyed in marinas, and motels/hotels sustained severe damage.

-- Tremendous damage to infrastructure occurred--water and sewer systems damaged; roads buckled, eroded, or covered in sand; phone and electric utilities damaged.

-- Hurricane force winds impacted portions of Florida, Alabama, and Georgia, with tropical storm force winds affecting western North Carolina and eastern Tennessee.

-- 400,000 customers were left without power in the Atlanta area, and well over a half-million in Georgia overall. Over 500,000 were without power in the Florida panhandle, with 95% without power at one time in Okaloosa County. Over 1 million customers in the Southeast area were still without power 2 days after the storm.

-- Counties eligible for disaster aid: Florida--14
Georgia--49
Alabama--38
North Carolina--13

-- Death toll from direct and indirect causes based on reports from individual state emergency management agencies:

Florida--5
Georgia--14
Alabama--6
North Carolina--2
Total--27

FIGURES AND TABLES

All satellite images in this report are from GOES-8. The cover page image (a 4 km resolution, enhanced infrared image) is from October 4 at 2259Z. The storm was at category 3 strength with 125 mph sustained winds and a 940 mb central pressure at the time. Figures 1-4 show Opal at peak strength as a category 4 storm (approaching category 5 strength). Figures 5-8 show Opal at landfall, and Figures 9-10 are about 10 hours after landfall. Full size images of Opal are available from NCDC's Satellite Services Group (704-271-4850, satorder@ncdc.noaa.gov). Following are descriptions of these figures (Vis = Visible image, IR = infrared image, WV = water vapor image):

Fig	Date & Time	Image	Storm Class.	Sust. Wind	Min. Pres.
1	10/04 1246Z	1 km Vis.	Cat-4 Hurr.	150 mph	921 mb
2	10/04 1246Z	2 km Vis.	Cat-4 Hurr.	150 mph	921 mb

3	10/04 1246Z	4 km Vis.	Cat-4 Hurr.	150 mph	921 mb
4	10/04 1345Z	4 km IR	Cat-4 Hurr.	150 mph	921 mb
5	10/04 2205Z	1 km Vis.	Cat-3 Hurr.	125 mph	940 mb
6	10/04 2159Z	4 km Vis.	Cat-3 Hurr.	125 mph	940 mb
7	10/04 2259Z	4 km WV	Cat-3 Hurr.	125 mph	940 mb
8	10/04 2159Z	4 km IR	Cat-3 Hurr.	125 mph	940 mb
9	10/05 0815Z	4 km IR	Trop. Storm	40-75 mph	975 mb
10	10/05 0832Z	4 km WV	Trop. Storm	40-75 mph	975 mb

Figures 11 and 12 are NEXRAD images from the Birmingham, Alabama site. (Note: This was the best available site with level III data received at NCDC in time for this report.) Figure 11 shows the base reflectivity of the storm circulation at 0016Z on October 5. Figure 12 is the NEXRAD estimated storm total precipitation amount for the entire event, beginning at 2155Z on the 2nd, and ending at 1341Z on the 5th. No attempt is made in this report to correlate this image with the actual reported amounts in Table 2. A separate NCDC study is underway to compare NEXRAD estimates with rain gauge reports from a number of heavy rain events.

Figure 13 shows the track of the storm before, during, and after landfall. Figures 14 and 15 illustrate the rainfall amounts reported for the event, which includes some interaction with a frontal system in the area. Figure 16 presents the highest reported wind gusts during the passage of the storm.

Finally, the three tables below show the track of the hurricane/tropical storm (Table 1); the rainfall amounts as obtained from National Weather Service (NWS) bulletins (Table 2); and the peak wind gusts as obtained from NWS bulletins (Table 3). Anyone desiring further information or data can contact NCDC at phone 704-271-4800, fax 704-271-4876, or email 'orders@ncdc.noaa.gov'.

TABLE 1

Track of Hurricane Opal by National
Hurricane Center Advisories.
ADV#: National Hurricane Center advisory number.
DATE/TIME: The date and Greenwich Time (Z-time).
PRES: The minimum central pressure.
WIND: The maximum sustained wind speed.

ADV#	DATE/TIME	LAT	LON	PRES	WIND	
1.	SEP27/21UTC	19.3N	87.3W	1005MB	30MPH	Depression
2.	SEP28/03UTC	19.5N	87.6W	1005MB	30MPH	
3.	SEP28/09UTC	19.7N	88.2W	1005MB	30MPH	
4.	SEP28/15UTC	20.3N	88.5W	1005MB	30MPH	
5.	SEP28/21UTC	19.5N	88.5W	1004MB	30MPH	
6.	SEP29/03UTC	19.5N	88.5W	1004MB	30MPH	
7.	SEP29/09UTC	19.7N	88.7W	1002MB	30MPH	
8.	SEP29/15UTC	19.5N	88.5W	1002MB	30MPH	
9.	SEP29/21UTC	20.2N	88.0W	1000MB	35MPH	
10.	SEP30/03UTC	20.5N	88.1W	1000MB	35MPH	
11.	SEP30/09UTC	21.1N	88.3W	1000MB	35MPH	
12.	SEP30/15UTC	21.8N	88.5W	999MB	45MPH	Trop Storm
12a.	SEP30/18UTC	21.8N	89.2W	999MB	45MPH	
13.	SEP30/21UTC	21.8N	89.6W	997MB	50MPH	
13a.	OCT01/00UTC	21.4N	89.8W	997MB	50MPH	
14.	OCT01/03UTC	21.4N	90.0W	997MB	50MPH	
14a.	OCT01/06UTC	21.3N	90.6W	996MB	50MPH	
15.	OCT01/09UTC	21.2N	91.1W	987MB	60MPH	
15a.	OCT01/12UTC	21.0N	91.4W	986MB	60MPH	
16.	OCT01/15UTC	20.9N	91.6W	986MB	50MPH	
16a	OCT01/18UTC	20.8N	91.7W	993MB	50MPH	
17.	OCT01/21UTC	20.7N	91.7W	989MB	50MPH	
17a.	OCT02/00UTC	20.7N	91.9W	984MB	65MPH	
18.	OCT02/03UTC	20.8N	92.1W	984MB	65MPH	
18a.	OCT02/06UTC	20.9N	92.0W	980MB	65MPH	
19.	OCT02/09UTC	20.9N	92.4W	982MB	65MPH	
19a.	OCT02/12UTC	21.1N	92.5W	973MB	75MPH	Hurricane
20.	OCT02/15UTC	21.0N	92.5W	973MB	75MPH	
20a.	OCT02/18UTC	21.1N	92.4W	973MB	75MPH	
21.	OCT02/21UTC	21.3N	92.3W	971MB	80MPH	
21a.	OCT03/00UTC	21.7N	92.2W	970MB	80MPH	
22.	OCT03/03UTC	22.0N	92.2W	970MB	80MPH	
22a.	OCT03/06UTC	22.2N	92.2W	972MB	80MPH	
23.	OCT03/09UTC	22.5N	92.1W	968MB	80MPH	

23a.	OCT03/12UTC	22.7N	91.8W	969MB	80MPH	
24.	OCT03/15UTC	23.1N	91.4W	969MB	90MPH	
24a.	OCT03/18UTC	23.4N	91.0W	967MB	90MPH	
25.	OCT03/21UTC	23.9N	90.6W	963MB	100MPH	
25a.	OCT04/00UTC	24.5N	90.1W	957MB	100MPH	
26.	OCT04/03UTC	25.3N	89.5W	948MB	115MPH	
26a.	OCT04/06UTC	25.8N	89.5W	939MB	115MPH	
27.	OCT04/09UTC	26.4N	89.2W	933MB	120MPH	
27a.	OCT04/11UTC	27.0N	88.7W	916MB	135MPH	
27b.	OCT04/13UTC	27.6N	88.4W	921MB	150MPH	
28.	OCT04/15UTC	28.1N	88.2W	927MB	150MPH	
28a.	OCT04/17UTC	28.6N	87.9W	934MB	135MPH	
28b.	OCT04/19UTC	29.2N	87.8W	940MB	125MPH	
29.	OCT04/21UTC	29.8N	87.3W	940MB	125MPH	
29a.	OCT04/23UTC	30.6N	87.0W	940MB	125MPH	Landfall
29b.	OCT05/01UTC	31.3N	86.7W	960MB	100MPH	
30.	OCT05/03UTC	31.9N	86.2W	970MB	85MPH	
30a.	OCT05/05UTC	32.5N	86.5W	970MB	75MPH	
31.	OCT05/09UTC	34.7N	85.8W	975MB	40MPH	Trop Storm
32.	OCT05/15UTC	36.7N	84.6W	982MB	35MPH	Depression

TABLE 2

Southeast U.S. rainfall (inches)
attributed to Opal, October 3-6, 1995.
Includes some interaction with frontal system.
Amounts obtained from National Weather Service
bulletins via internet/world wide web, and
then summarized for the event.

HENDERSONVILLE, NC	10.48	DILLON, SC	2.08
MT. MITCHELL, NC	10.43	GREENWOOD, SC	1.96
BIRMINGHAM, AL	9.80	ALBANY, GA	1.95
BOONE, NC	8.87	LORIS, SC	1.81
GRANDFATHER MTN., NC	8.74	TAMPA, FL	1.77
MARIETTA, GA	8.66	GOLDSBORO, NC	1.69
PINSON, AL	8.54	HATTIESBURG, MS	1.68
PEACHTREE CITY, GA	8.08	CLEWISTON, FL	1.60
MOBILE, AL	7.89	MCCOMB, MS	1.56
PISGAH FOREST, NC	7.82	KNOXVILLE, TN	1.53
WALHALLA, SC	7.61	AUGUSTA, GA	1.52
SELMA, AL	7.41	ORLANDO, FL	1.48
ANNISTON, AL	7.21	CADES, SC	1.45
WEST ATLANTA, GA	7.17	KEY WEST, FL	1.41

MORGANTON, NC	7.14	YAZOO CITY, MS	1.38
ALABASTER, AL	7.11	BRISTOL, TN	1.35
ATLANTA, GA	7.11	COLUMBIA, SC	1.35
BOONE 2W, NC	6.94	TALLAHASSEE, FL	1.35
SPRUCE PINE, NC	6.35	COLUMBIA, MS	1.29
LENOIR, NC	6.21	WILMINGTON, NC	1.29
MT. LECONTE, TN	5.80	SUMMERVILLE, SC	1.28
ASHEVILLE, NC	5.77	CHARLESTON CITY, SC	1.21
PENSACOLA, FL	5.64	KINGSTREE, SC	1.15
WEST JEFFERSON, NC	5.57	JOHNSTON, SC	1.10
MONTGOMERY, AL	5.55	MORRISTOWN, TN	1.08
CHATTANOOGA, TN	5.45	WILLIAMS, SC	1.02
BILOXI, MS	5.40	MYRTLE BEACH, SC	1.00
PASCAGOULA, MS	5.39	CAPE HATTERAS, NC	0.87
RALEIGH/DURHAM, NC	5.38	IUKA, MS	0.85
ATHENS, GA	5.15	MACON, GA	0.85
RUSKIN, FL	4.81	CARTHAGE, MS	0.80
FORT BRAGG, NC	4.75	JACKSONVILLE, NC	0.66
MERIDIAN, MS	4.69	HOLLYWOOD, FL	0.65
MURPHY, NC	4.61	VICKSBURG, MS	0.62
HUNTSVILLE, AL	4.59	ALLENDALE, SC	0.60
TUSCALOOSA, AL	4.58	EUTAWVILLE, SC	0.59
PICKENS, SC	4.34	JACKSON, MS	0.56
CHESTER, SC	4.16	VALDOSTA, GA	0.55
CHERAW, SC	4.09	DAYTONA BEACH, FL	0.53
CROSSVILLE, TN	4.07	TUPELO, MS	0.52
COLUMBUS, GA	3.84	VERO BEACH, FL	0.49
CHARLOTTE, NC	3.64	CHARLESTON, SC	0.47
NASHVILLE, TN	3.50	WINONA, MS	0.41
SANDHILL, SC	3.50	CHERRY POINT, NC	0.39
FLORENCE, SC	3.47	WEST PALM BEACH, FL	0.29
GREER, SC	3.29	ALMA, GA	0.28
SARASOTA, FL	3.11	HOMESTEAD, FL	0.27
CALHOUN FALLS, SC	3.03	JACKSONVILLE, FL	0.24
LAUREL, MS	2.91	CORINTH, MS	0.17
YORK, SC	2.84	MIAMI BEACH, FL	0.16
MUSCLE SHOALS, AL	2.82	SAVANNAH, GA	0.16
UNION, SC	2.77	TAVERNIER, FL	0.14
WIGGINS, MS	2.71	GREENWOOD, MS	0.12
PEE DEE, SC	2.66	BEAUFORT, SC	0.11
CADES COVE, TN	2.64	MEMPHIS, TN	0.08
CLINTON, SC	2.54	DYERSBURG, TN	0.07
GREENSBORO, NC	2.31	JACKSON, TN	0.05
N. DADE COUNTY, FL	2.29	BRUNSWICK, GA	0.03
COLUMBUS, MS	2.13	CLEVELAND, MS	0.02

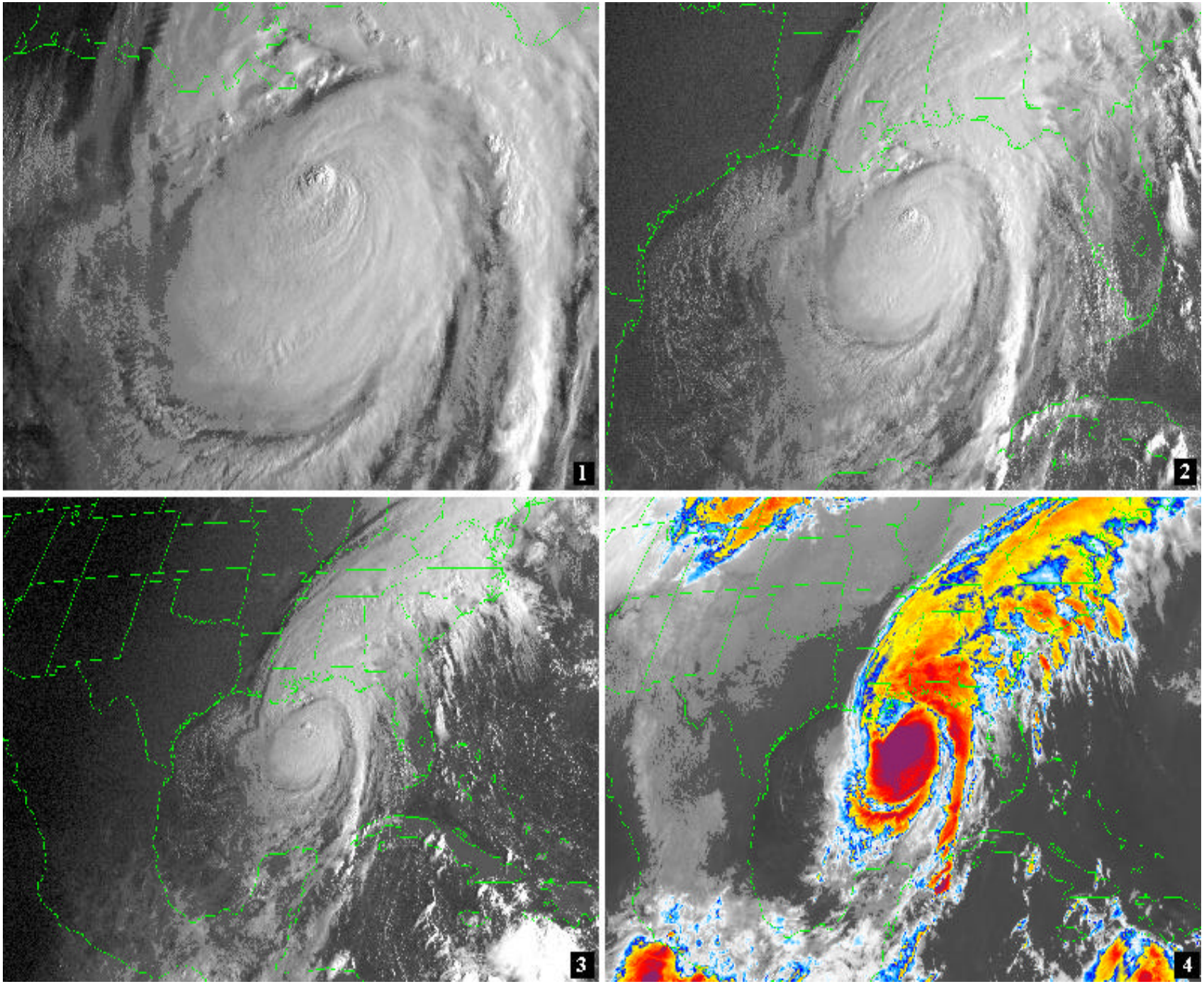
CONWAY, SC	2.10	GREENVILLE, MS	0.00

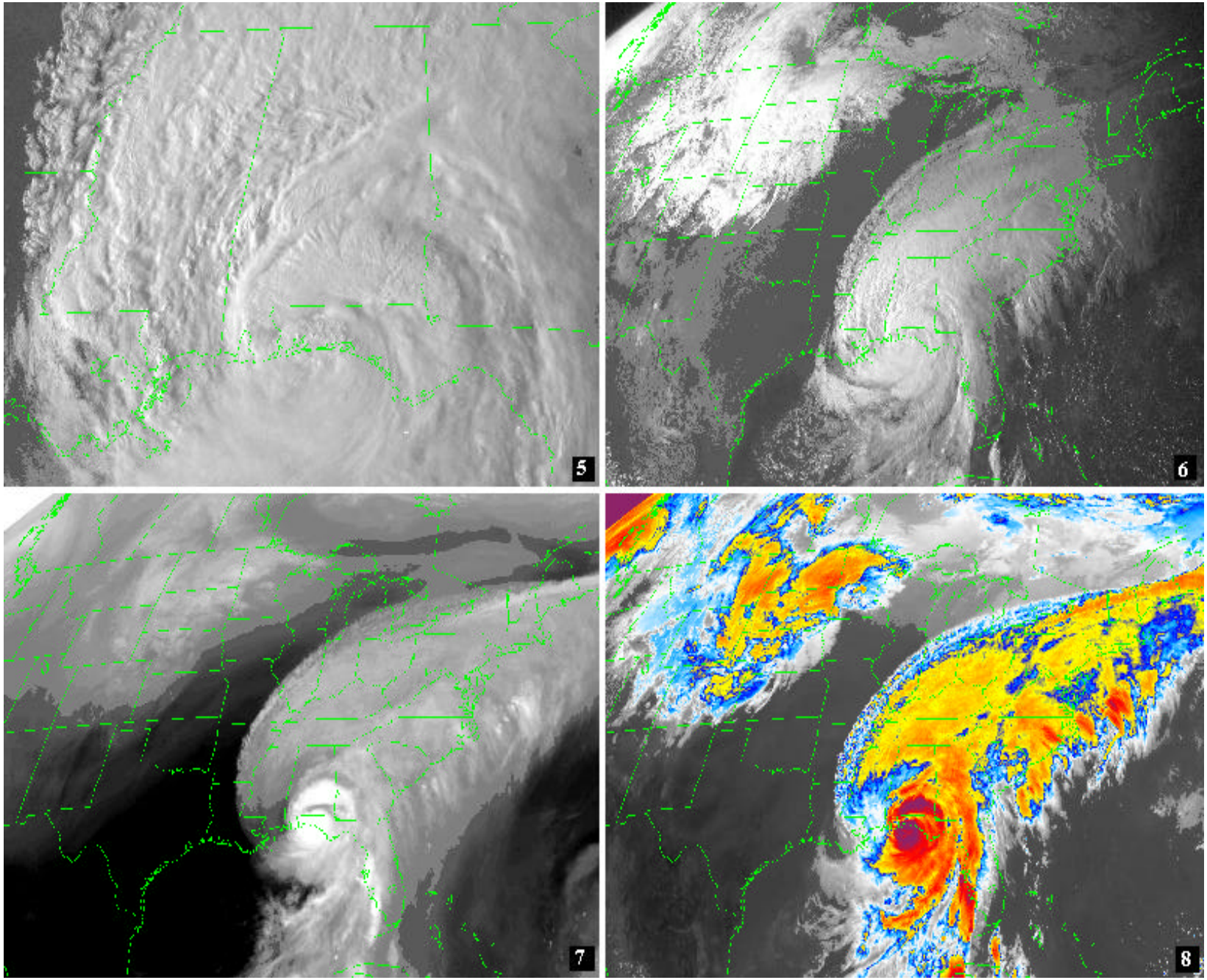
TABLE 3

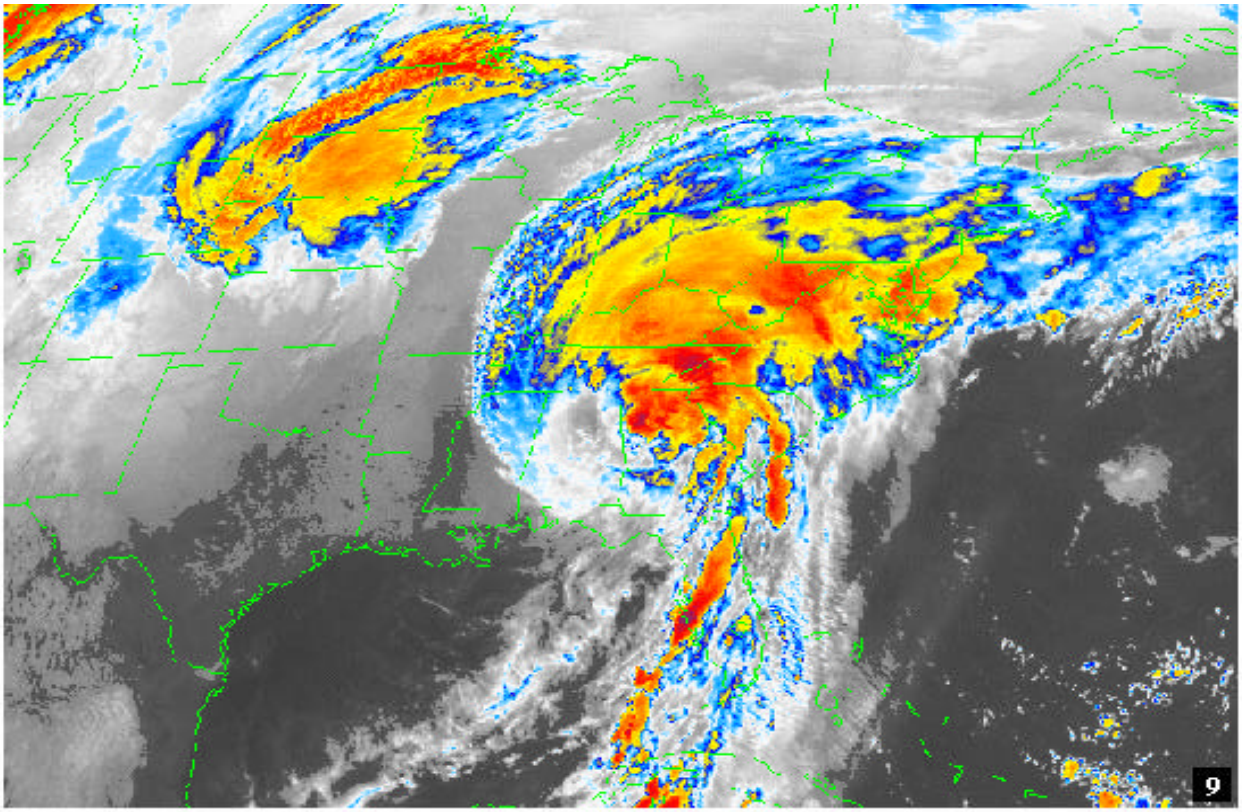
Peak wind gust (mph), October 4-5, 1995.
Southeast area, for speeds exceeding 30 mph.
Values obtained from NWS bulletins.

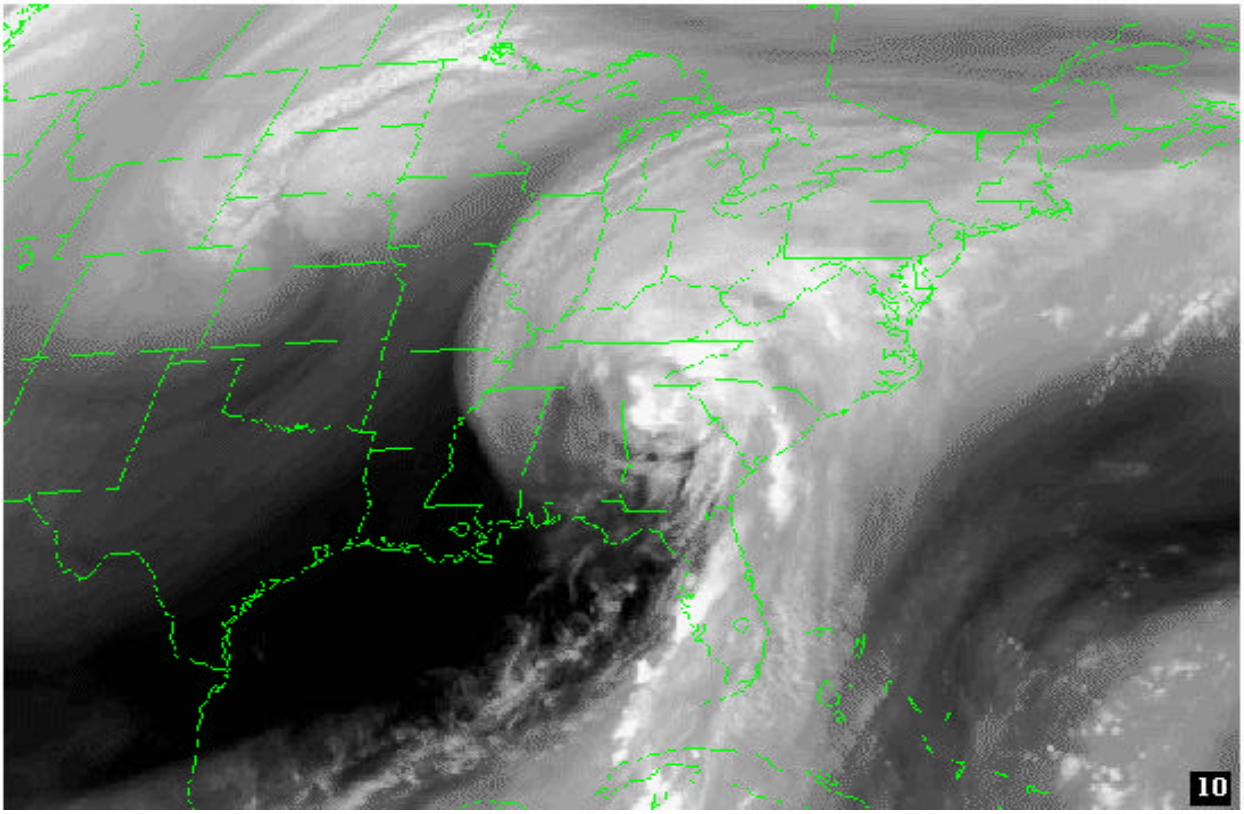
MARY ESTHER, FL (HURLBURT)	144	GRAND BAY, AL	42
VALPARAISO, FL (AFB)	115	BRISTOL, TN	41
OZARK, AL (AAF)	98	CHARLESTON, SC	41
MONTGOMERY, AL (AFB)	90	HEADLAND, AL	41
FLATTOP MTN., NC	83	KEY WEST, FL (NAS)	41
MARIETTA, GA (AFB)	69	SARASOTA, FL	41
PENSACOLA, FL (NAS)	66	WINTER HAVEN, FL	41
BILOXI, MS (AFB)	63	ANNISTON, AL	40
MONTGOMERY, AL (ARPT)	63	FT. LAUDERDALE, FL (ARPT)	40
COLUMBUS, GA (FT. BENNING)	61	JACKSONVILLE, NC (MCAS)	40
MOBILE, AL (ARPT)	59	TAMPA, FL (AFB)	40
PEACHTREE CITY, GA	59	FT. MYERS, FL	39
ASHEVILLE, NC	58	MERIDIAN, MS	39
FLORENCE, SC	58	SAVANNAH, GA (AAF)	39
AUBURN, AL	57	SAVANNAH, GA (ARPT)	39
MILTON, FL (NAS)	56	THORSBY, AL	39
BELLE MINA, AL	55	TITUSVILLE, FL	39
HUNTSVILLE, AL	55	VALDOSTA, GA	39
ATLANTA-DEKALB, GA	52	CHATTANOOGA, TN	38
AUBURN/OPELIKA, AL (ARPT)	52	MELBOURNE, FL	38
BEAUFORT, SC	52	KEY WEST, FL (ARPT)	38
TALLAHASSEE, FL	52	MCCOMB, MS	38
FAIRHOPE, AL	51	NECTAR/ONEONTA, AL	38
KNOXVILLE, TN	51	WEST PALM BEACH, FL	38
ATLANTA-HARTSFIELD, GA	49	MELBOURNE, FL	37
ALBANY, GA	48	MYRTLE BEACH, SC	37
ATLANTA-FULTON, GA	48	SMYRNA, TN	37
COLUMBUS, GA (ARPT)	48	CHARLOTTE, NC	36
ATHENS, GA	47	CHERRY POINT, NC (MCAS)	36
GREER, SC	47	NEW PORT RICHEY, FL	36
BIRMINGHAM, AL	46	BARTOW, FL	35
NASHVILLE, TN	46	COLUMBIA, SC	35
TUSCALOOSA, AL	46	FT. LAUDERDALE, FL	35
UNION SPRINGS, AL	46	GREENVILLE, SC	35
WILMINGTON, NC	46	JACKSONVILLE, FL (ARPT)	35
GREENSBORO, NC	45	JACKSONVILLE, FL (NAS)	35

MACON, GA	45	LAKELAND, FL	35
SEMMES, AL	45	MIAMI, FL	35
TAMPA, FL (ARPT)	45	MOBILE, AL (DOWNTOWN ARPT)	35
WARNER ROBINS, GA (AFB)	45	NORTH MYRTLE BEACH, SC	35
AUGUSTA, GA	44	ORLANDO, FL (EXEC ARPT)	35
GULFPORT, MS	44	IDER, AL	34
MERIDIANVILLE, AL	44	ORLANDO, FL (INTL ARPT)	33
ST. PETERSBURG, FL	44	HICKORY, NC	32
MILSTEAD, AL	43	HINESVILLE, GA	32
NAPLES, FL	43	CROSS CITY, FL	31


1
2
3
4


5
6
7
8


9


10

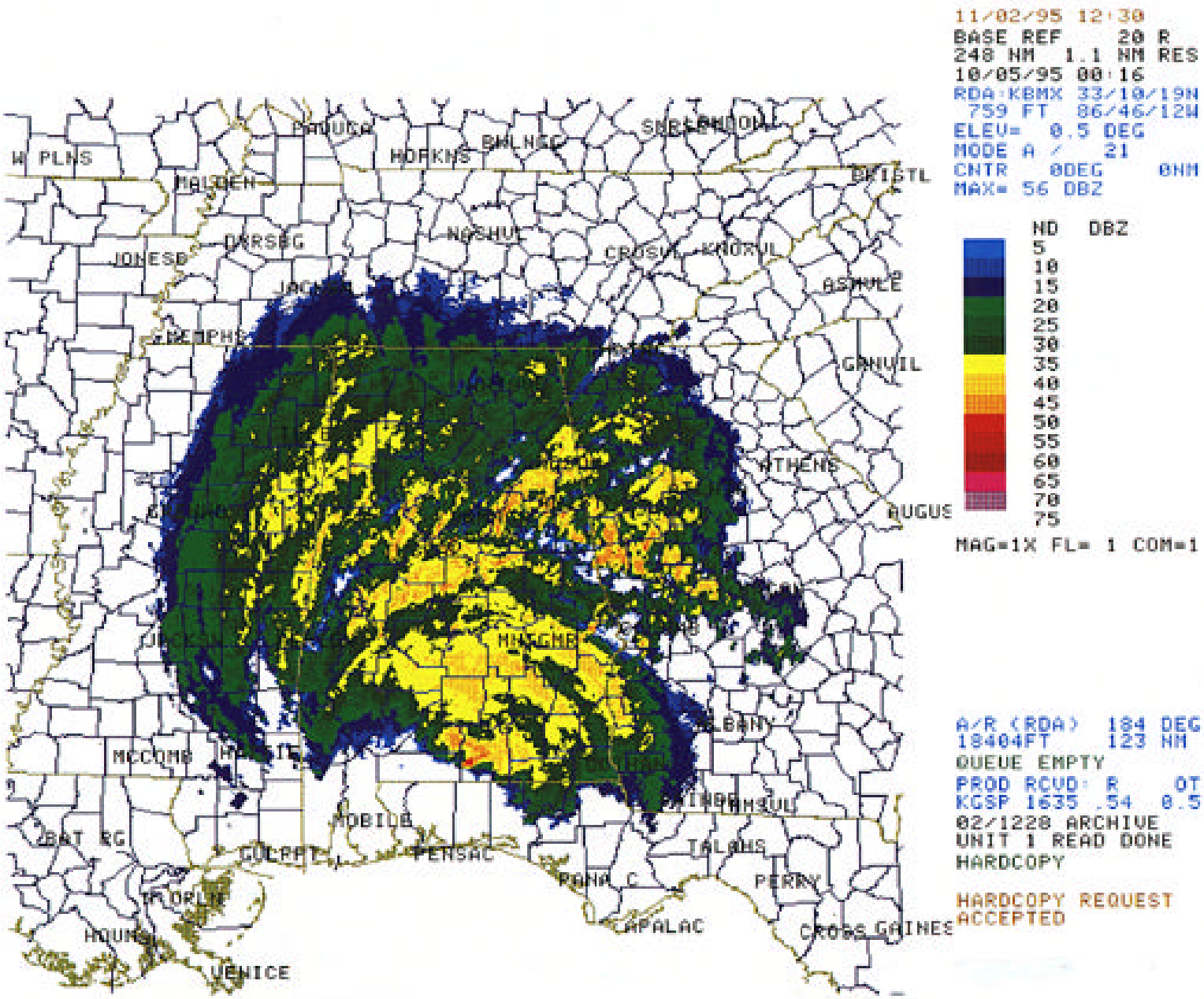


Figure 11. NEXRAD Base Reflectivity

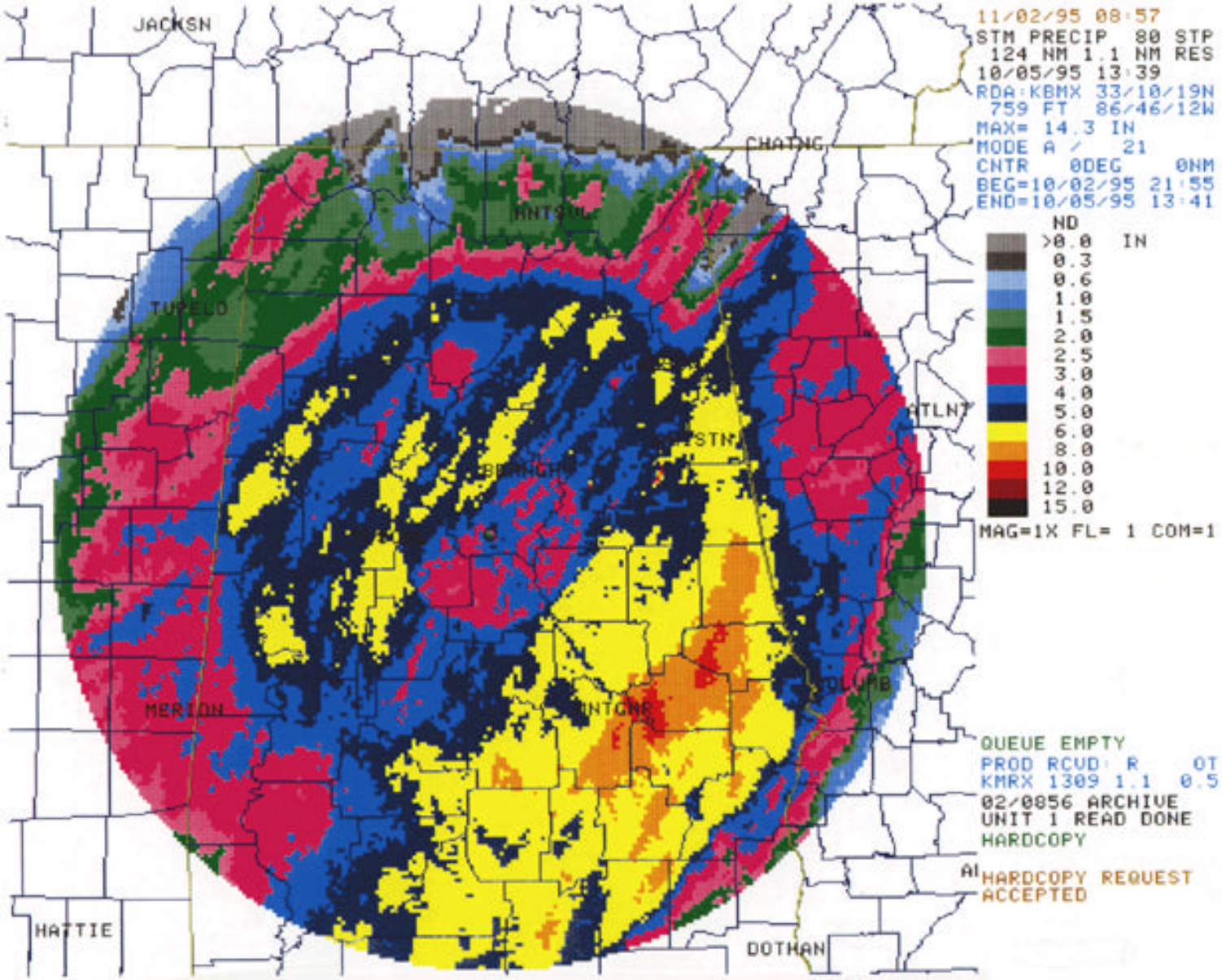


Figure 12. NEXRAD Storm Total Precipitation

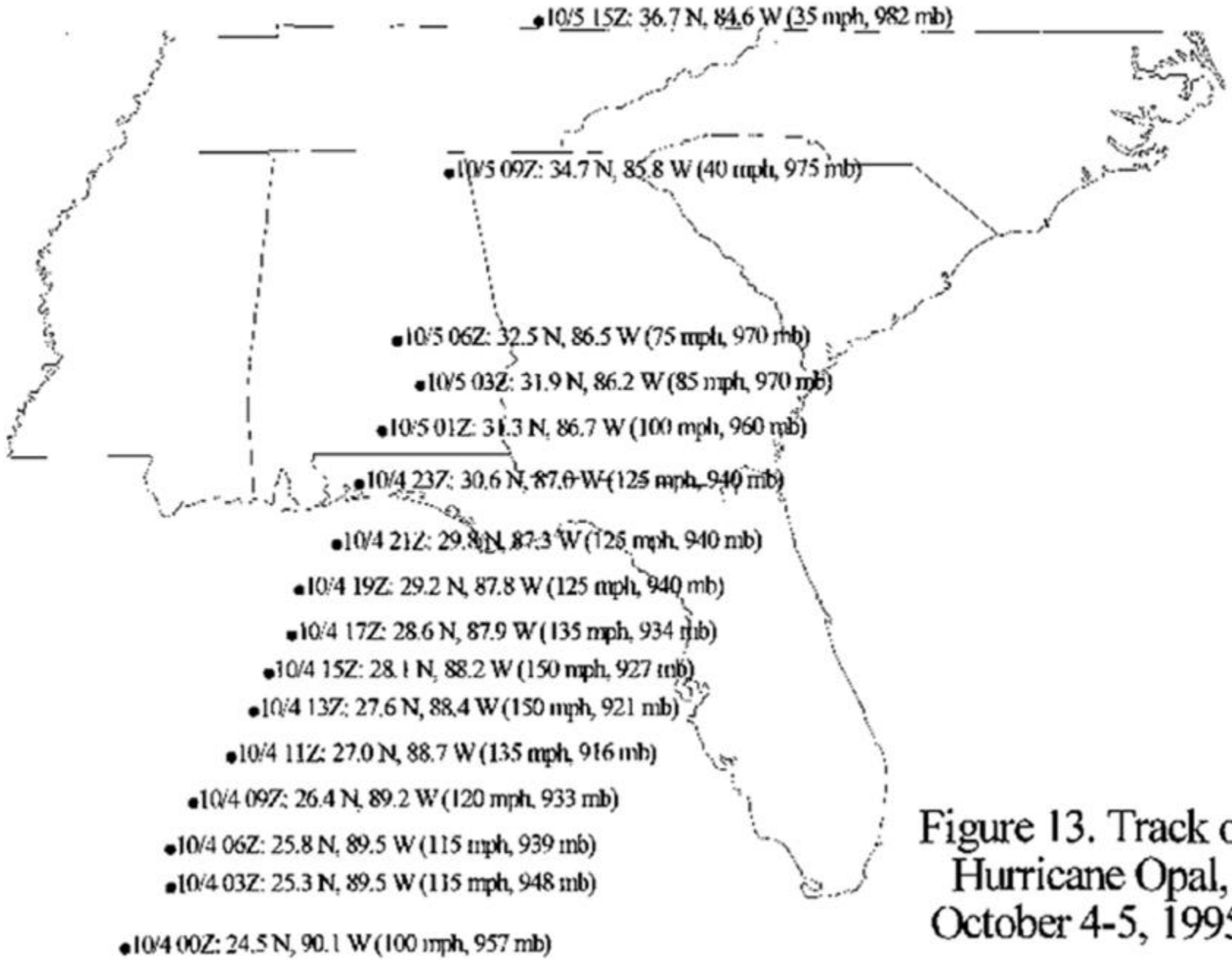


Figure 13. Track of Hurricane Opal, October 4-5, 1995

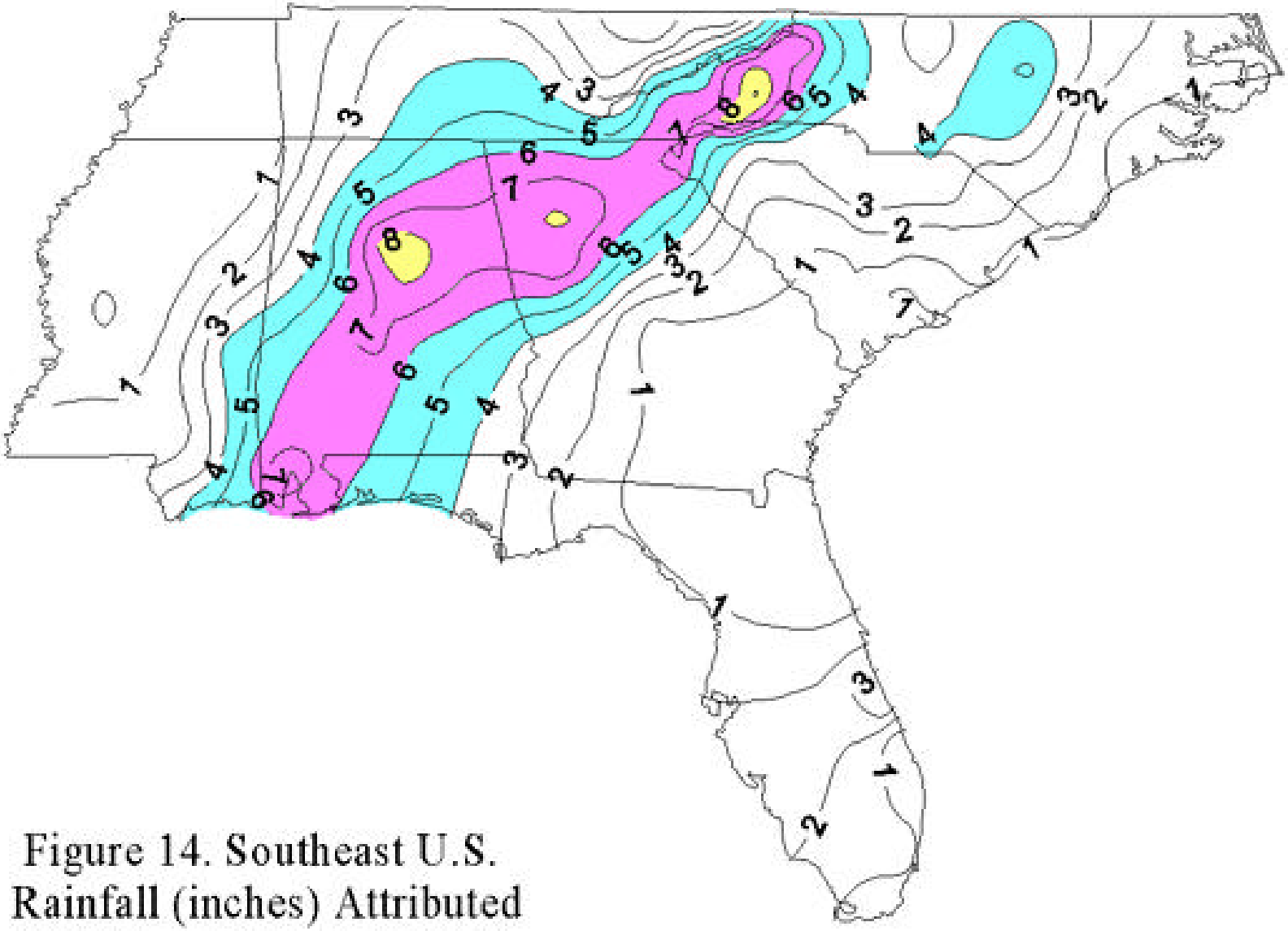


Figure 14. Southeast U.S. Rainfall (inches) Attributed to Opal, October 3-6, 1995

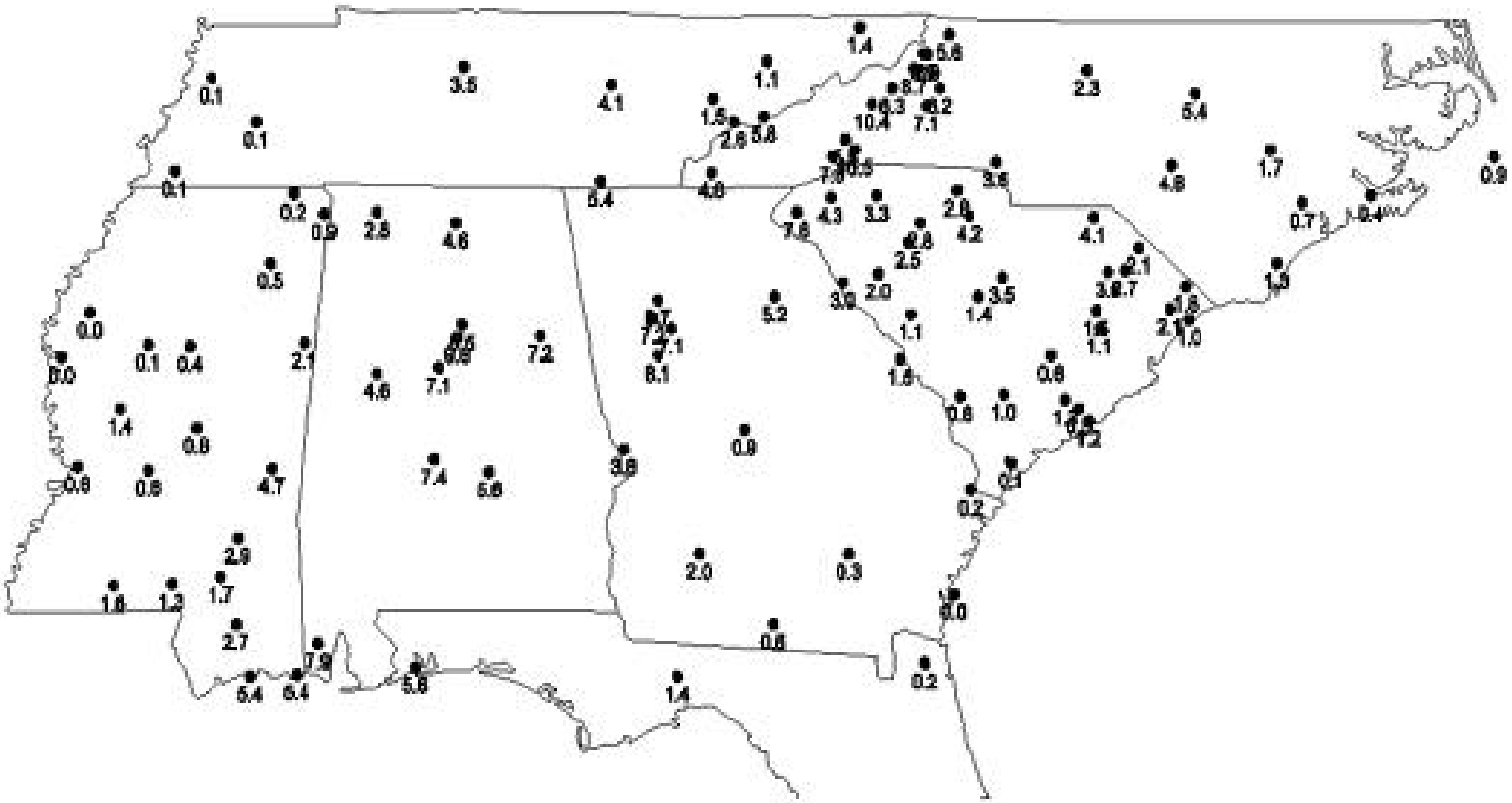


Figure 15. Southeast U.S. Rainfall (inches) Attributed to Opal, October 3-6, 1995

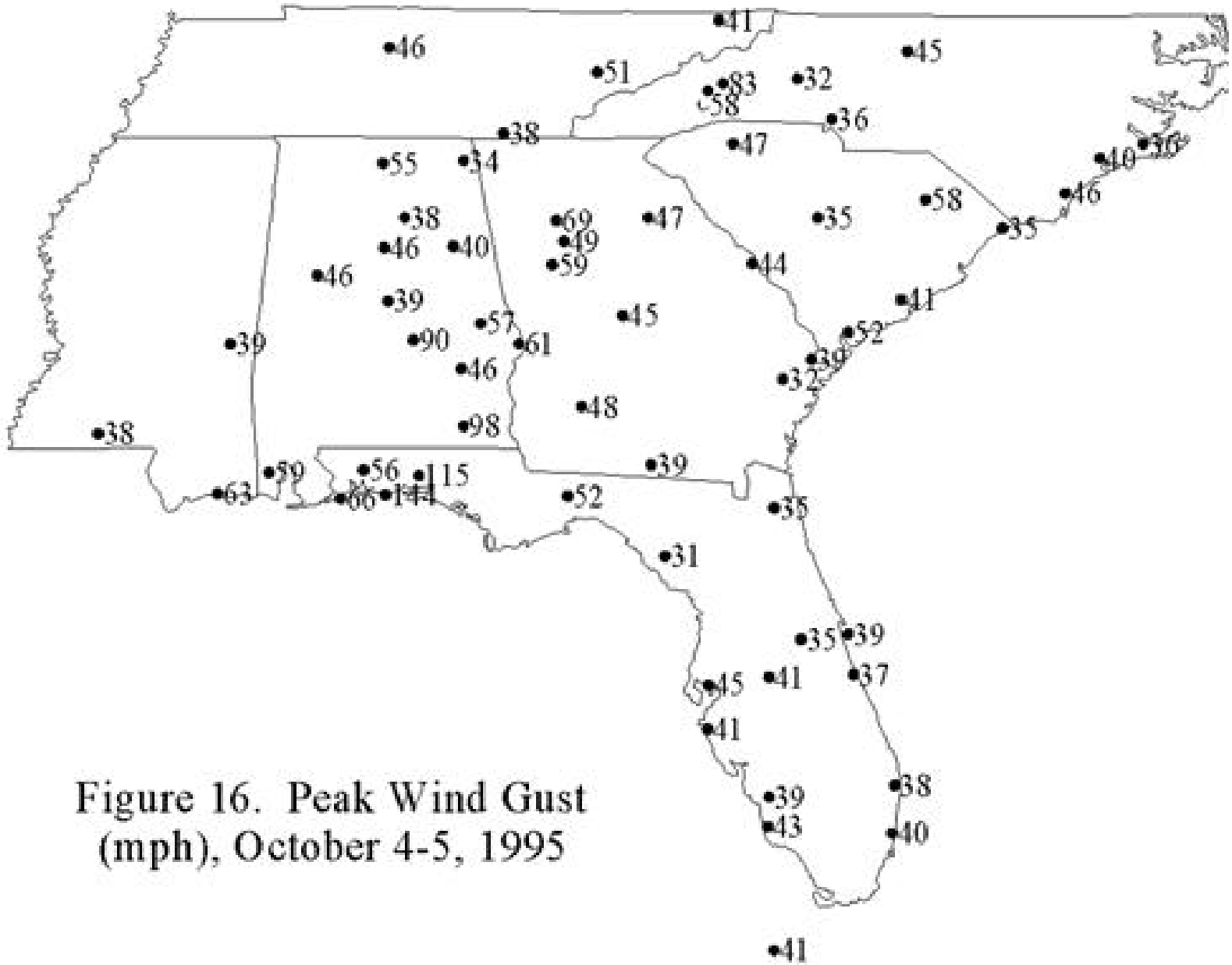


Figure 16. Peak Wind Gust (mph), October 4-5, 1995