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THE WEST INDIAN HURRICANE OF SEPTEMBER 14–22, 1926

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By CHARLES L. MITCHELL

[With the collaboration of the Editor]

The tropical cyclone of September 14–22 was first observed on the morning of the 14th northeast of St. Kitts. On this date two other tropical cyclones were centered over the southern part of the North Atlantic, the first and more intense of the two being about 300 miles southwest of Bermuda, and the second, of little intensity, was slowly moving northeastward between Cuba and the Bahamas. This last-named soon lost whatever intensity it possessed at the time and could not be charted after the 17th.

The geographic position of these 3 disturbances at 8 a. m. 75th meridian time is shown in Figure 1 which also presents the 8 a. m. positions of the respective disturbances on the 15th, 16th, 17th and 18th; the 8 p. m. chart of the 17th is inserted in the series, as showing the barometric conditions immediately before the storm struck the Florida coast.

The third storm of the series with which this article is chiefly concerned was one of the most severe tropical cyclones or hurricanes that ever reached coastal United States, entailing a loss of life of 242 souls and an estimated property loss, in round numbers, of one hundred million dollars.

The course of this storm, on the average, was about 30 to 35° north of west; it passed almost directly over Grand Turk Island, very close to Nassau and struck the Florida coast at Miami after crossing the Gulf Stream at about its narrowest point. See Chart 14a, Figure 1. Its speed of movement varied somewhat. In the first 3 days subsequent to its appearance northeast of St. Kitts its center moved about 1,000 miles, or at the rate of about 14 m. p. h.; during the 24 hours previous to its arrival at the Florida coast it covered 450 miles at the rate of 18.75 m. p. h., an unusually rapid speed. During the next 2 days, when it was crossing southern Florida and northeastern Gulf of Mexico, a distance of about 550 miles, it traveled at the rate of only 11.5 m. p. h., while between 8 a. m. of the 20th and 8 a. m. of the 21st the center advanced only about 150 miles or at the rate of 6.25 m. p. h. These figures may be in error to a slight degree because of lack of meteorological reports from oceanic areas and the resulting uncertainty of the location of the center of the storm.

I present in the table below the data of the storm within a radius of 500 miles of its center as received from land and sea stations by radio and cable and available to the forecaster in predicting the future movement of this storm. The notable feature of this table is the small number of reports from oceanic areas and this is strikingly manifest for the 17th—the critical date. It may be that the advance notice of the presence of the storm deterred vessel masters from entering the storm area; in any event the absence of reports from oceanic areas at critical times must be a serious handicap to any organization that attempts to forecast the coming of these destructive storms.

TABLE 1.—*Synoptic data for the West Indian hurricane of September 14–22, 1926*

Date	Stations	Sea-level pressure	Temperature	Wind		State of weather
				Direction	Force (Beaufort)	
		in.	*F.*			
Sept. 14, 8 a. m.	St. Kitts	29.78	74	NW.	1	Cloudy.
	St. Thomas	29.82	82	N.	4	Partly cloudy.
14, 8 p. m.	St. Kitts	29.70	80	W.	2	Rain.
	St. Thomas	29.74	------	N.	5	Cloudy.
15, 8 a. m.	St. Kitts	29.84	74	SW.	5	Cloudy.
	St. Martins	29.76	------	S.	7	Rain.
	St. Thomas	29.66	74	SW.	8	Rain.
	San Juan	29.74	82	W.	5	Cloudy.
15, 8 p. m.	St. Thomas	29.80	82	SW.	7	Cloudy.
	San Juan	29.72	78	S.	3	Rain.
	Santo Domingo	29.76	92	NW.	1	Cloudy.
	Turks Island	29.90	90	NE.	3	Clear.
16, 8 a. m.	St. Thomas	29.92	72	SE.	4	Cloudy.
	Santo Domingo	29.76	72	SW.	3	Cloudy.
	Puerto Plata	29.72	74	W.	3	Rain.
	Turks Island	29.74	70	NW.	4	Cloudy.
11.20 a. m.	Turks Island	29.62	72	NW.	7	Cloudy.
1 p. m.	Turks Island	29.26	68	NW.	12	Cloudy.
16, 8 p. m.	Santo Domingo	29.78	92	S.	3	Cloudy.
	Puerto Plata	29.62	82	S.	3	Cloudy.
	Inagua	29.64	82	NW.	7	Cloudy.
	U. S. S. Kittery (20°.1 N. 72°.3 W).	29.64	88	SW.	6	Cloudy.
	S. S. Gulf Trade (24°.3 N. 74°.3 W).	29.82	82	NE.	5	Rain.
17, 8 a. m.	Puerto Plata	29.78	76	SE.	4	Partly cloudy.
	Baracoa	29.72	80	S.	2	Cloudy.
	Gibara	29.76	76	SW.	2	Rain.
	Camaguey	29.74	76	NW.	2	Clear.
	Nassau	29.72	84	NE.	5	Partly cloudy.
	S. S. Scantic (26°.3 N. 74°.2 W.).	29.90	84	E.	7	Partly cloudy.
10 a. m.	Nassau	29.64	86	NE.	7	Partly cloudy.
12 noon.	Gibara	29.68	86	SSW.	3	Cloudy.
1 p. m.	Nassau	29.56	86	N.	9	Cloudy.
17, 8 p. m.	Gibara	29.76	86	S.	2	Cloudy.
	Camaguey	29.68	84	SW.	4	Rain.
	Tunas	29.70	------	W.	6	Cloudy.
	Cienfuegos	29.66	90	W.	3	Rain.
	Havana	29.72	90	NW.	4	Partly cloudy.
	Key West	29.68	84	NE.	3	Cloudy.
	Miami	29.68	82	NE.	4	Cloudy.
	S. S. La Playa (26°.4 N. 79°.7 W.).	29.74	82	NE.	6	Cloudy.
18, 8 a. m.	Key West	29.50	82	NW.	7	Cloudy.
	Fort Myers	29.46	82	NE.	6	Cloudy.
	Havana	29.64	80	SW.	4	Cloudy.
	Tampa	29.68	80	NE.	5	Cloudy.
	S. S. El Oceana (29°.3 N. 79°.5 W.).	29.66	86	NE.	9	Rain.
	S. S. Scantic (25°.7 N. 76°.6 W.).	29.88	82	SE.	7	Cloudy.
	Miami (received next day).	27.94	------	SE.	9	Rain.
12 noon.	Fort Myers	29.04	76	N.	9	Rain.
4 p. m.	Tampa	29.42	78	NE.	7	Rain.

THE HURRICANE APPROACHES THE FLORIDA COAST

A special observation made at Nassau at 1 p. m. on the 17th was the last and only observation received from the region east of Miami and Key West on that date. At the 8 p. m. observation of the 17th both of these stations reported a barometer reading of 29.68 inches, with northeast wind, 18 m. p. h. at Miami and 12 at Key West; furthermore, both stations reported no material change in pressure within the last 2 hours. The lack of information from the region to the eastward of Florida and the rather disconcerting reports of little pressure

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change at the two stations named placed the forecaster in a very difficult position. With night already on and no chance of awaiting special reports from Miami, he had to rely on his previous deductions made Friday morning, which placed the hurricane center near Miami at 8 a. m. Saturday morning; therefore, with no indications whatever of a recurve in the path of the hurricane, the storm warnings were changed to hurricane warnings at 11 p. m. of the 17th from Key West to Jupiter Inlet, and northeast storm warnings were ordered north of Jupiter to Titusville and on the west Florida coast from Key West to Punta Gorda.

A chronological list of the most important warnings issued in connection with this storm is given in a later section of this report.

The center of the hurricane reached the Florida coast at Miami about 6 a. m. September 18. That the "eye" of the storm passed directly over the Weather Bureau office in Miami is clearly shown in Figure 2, the latter being a reproduction of the record of wind direction and speed as automatically recorded in that office for the hours 5 to 8 a. m. September 18, within which time the "eye" of the storm passed the station.

It is shown thereon that the strong northeast winds diminished and at 6:10 a. m. became variable, at first shifting to the southeast and for the next 35 minutes momentary winds from all directions were recorded but in the main they were from the southeast at velocities of 10 to 12 miles per hour. At this time the people of Miami, thinking the storm was over, ventured into the streets, as told herein later by Mr. Gray, some of whom doubtless lost their lives by so doing.

After the lull the wind went to the southeast and increased in speed and at 9 a. m. of the 18th it became southwest and continued in that direction until well after the storm had passed.

At the end of this report is given a short account of an extraordinary wind experienced at Jupiter Inlet, about 80 miles north of Miami, as late as 8 p. m. of the 18th.

At the time of the passage of the "eye" of the storm, Miami was doubtless in or near the northern edge thereof since at Homestead 28 miles to the south, the lull was of but 5 minutes duration.

The record of rainfall and temperature during the passage of the "eye" was lost due to the recording instruments being blown away. Below is the narrative of R. W. Gray, the official in charge of the station.

Miami, Fla.—The first information concerning the storm was received from the central office at 11:30 a. m. of the 14th. No vessels bound for the Bahamas left Miami after that date. Advisory messages relative to the intensity and progress of the storm were received at regular intervals from the 15th to the 17th, inclusive, and these advices were given such wide distribution that it can be safely said that the entire population of the lower east coast of Florida was informed of the approach of the storm.

Northeast storm warnings were displayed, by order of the central office, at noon of the 17th. The afternoon newspapers published the warning, and it was otherwise disseminated by telephone and telegraph. From the early afternoon of the 17th until the wires were blown down, telephone calls at the Weather Bureau office were answered at the rate of two to three per minute. In addition to the telephone service from the Weather Bureau, the Miami Daily News kept a special telephone operator on duty to give information to those who did not succeed in getting telephone connection with the Weather Bureau. A representative of the News remained at the Weather Bureau office throughout the night of the 17th–18th and kept his paper informed of all available information until telephone connection was severed.

The message ordering hurricane warnings at 11 p. m. of the 17th was received at 11:16 p. m. The warning was displayed from the roof of the Federal Building at 11:25 p. m., and from the storm warning tower at the city docks, one and one-half miles from the Weather Bureau office, at midnight.

Before leaving for the storm-warning tower, I gave the hurricane warning to the long distance telephone operator, who repeated it to the telephone exchanges at Homestead, Dania, Hollywood, and Fort Lauderdale. The warning was also telephoned to the chief dispatcher of the Florida East Coast Railroad, and several efforts were made to get telephone connection with Fowey Rock Lighthouse and the Coast Guard base at Fort Lauderdale. Telephone communication had not been interrupted, but the operator reported that repeated calls failed to get any response from Fowey Rock or the Coast Guard station. Shortly after 10 p. m. I began to give out the information that the rapid fall of the barometer and the direction and increasing velocity of the wind indicated that the storm was rapidly approaching this coast, and that, unless it recurved to the east of Miami, winds of hurricane force might be expected. This information continued to be given by telephone until the receipt of the hurricane warnings at 11:16 p. m. After that time all persons calling by telephone or in person were informed of the display of hurricane warnings. Telephone communication with Hollywood and Miami Beach was severed between 1 a. m. and 2 a. m., and in Miami between 2 a. m. and 3 a. m.

The hurricane came with great suddenness. Except for a moderate but steady fall of the barometer after 10 a. m. of the 17th, there were no unusual meteorological conditions to herald the approach of the storm. The wind velocity as late as 8 p. m. of the 17th was only 19 miles per hour, and the usual heavy rain that precedes a tropical storm did not set in until after midnight, by which time the wind was blowing a fresh gale. At 10 p. m. of the 17th the barometer began to fall rapidly, and by midnight it had fallen 0.11 inch. From midnight to 6:45 a. m., at which time the center of the storm passed over Miami, there was a precipitate fall at the rate of 0.28 inch per hour. * * * From about 5:30 to 6:10 a. m. the barometer fell 0.40 inch and then remained stationary for 15 or 20 minutes. This was at the beginning of the lull in the wind that attended the arrival of the center of the storm. After the short stationary period there was another rapid fall of 0.06 inch, and at 6:45 a. m. a reading of the mercurial barometer showed a pressure of 27.61 inches. * * * After the passage of the center of the storm, the barometer rose even more rapidly than it had fallen, and by noon it had reached 29.30 inches.

The center of the storm passed over the central and southern parts of Miami. Over the extreme northern part of the city and over the northern part of Miami Beach the wind shifted from northeast to south, but there was no pronounced lull. At the Weather Bureau office the wind fell to 10 miles per hour at 6:30 a. m. At the same time the velocity at the Allison Hospital, 6¼ miles northeast of the Weather Bureau office in the northern part of Miami Beach, was 80 miles per hour. Ten minutes before, the velocity had been 108 miles.[1]

The wind increased steadily from the northeast after 10 p. m.

At 1:50 a. m. the anemometer recorded a velocity of 41 miles, indicating a true velocity of about 57 miles per hour. Telephone communication with Miami Beach ceased shortly before this time. By 2:35 a. m. the true velocity had increased to 60 miles per hour, and by 3 a. m. telephone service in Miami had ended. There was a steady increase in wind velocity from that time to 5 a. m. when the anemometer recorded a maximum velocity of 80 miles, indicating a true velocity of at least 115 miles per hour. The top of the raingage blew off at 3:42 a. m., and was recovered and replaced by the assistant at this station. It was again blown off a few minutes later and lost. A part of it was found the next day on the roof of a nearby building. The electric light wires were blown down at 4 a. m., and the observations during the remainder of the night were made with a flashlight, supplied by one of the visitors who spent the night at the Weather Bureau office. Frequent flashes of electricity from fallen wires added to the fearful aspect of the elements. The instrument shelter blew away between 4 a. m. and 5 a. m., landing in the street below and crashing into the automobile of a *Miami Daily News* staff writer who was on duty at the Weather Bureau office. There was an abrupt decrease in the wind velocity between 6:10 a. m. and 6:15 a. m., when the center of the storm reached Miami (see Fig. 2). Many persons who had spent the night in down-town buildings rushed out to

[1] Mr. B. C. Kadel, Chief of the Instrument Division, informs the editor that the anemometer here mentioned was supplied by Friez of Baltimore and that it is one of the new three-cup pattern anemometer developed by J. Patterson of the Canadian Meteorological service in collaboration with U. S. Weather Bureau officials, and, further, that this form of anemometer at the speeds named registers very close to the true velocity and that the maximum of 128 m. p. h. is equivalent to a velocity of 160 m. p. h. as registered by the 4-cup Robinson anemometer.

The disparity between the wind velocities at the two exposures mentioned is therefore greater than the figures would indicate; this is due to the blanketing effect of recently erected high buildings which almost completely surround the three-story Federal office building in which the Weather Bureau office is housed. These buildings rise to 8 and, in one case, 18-stories; one 15-story building stands not more than 100 feet east-northeast of the Weather Bureau exposure. It so happens that plans for a change in location were under consideration at the time the disaster occurred. See Mr. Kadel's analysis of the Allison Hospital wind record following this article.—Ed.

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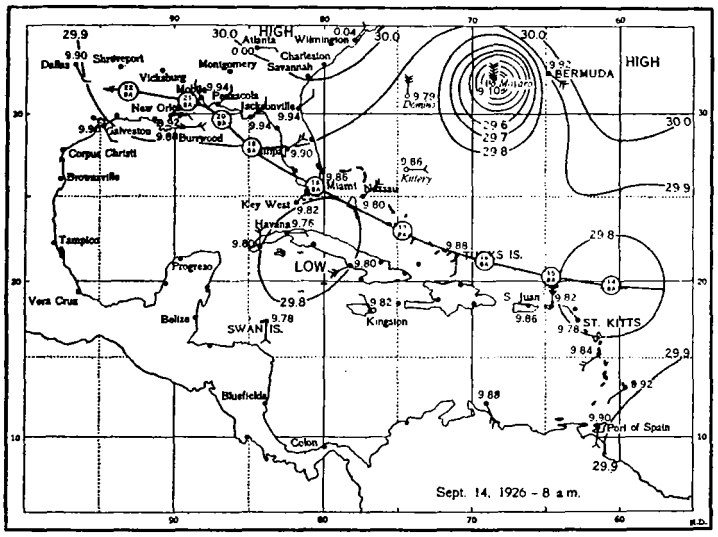

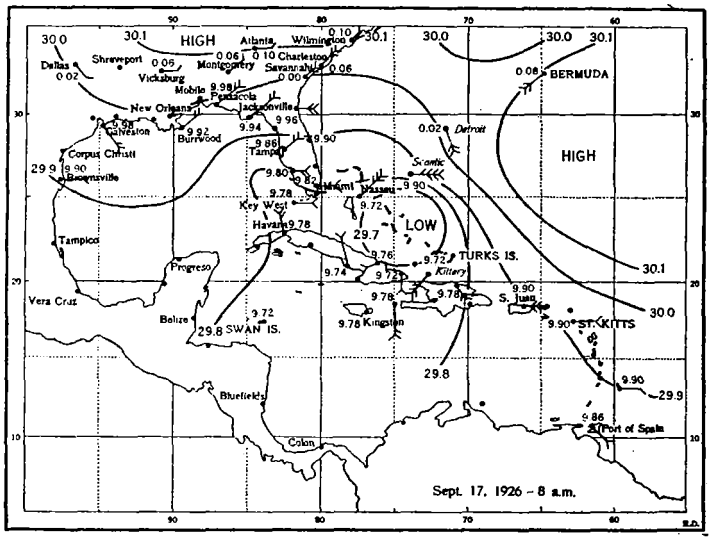

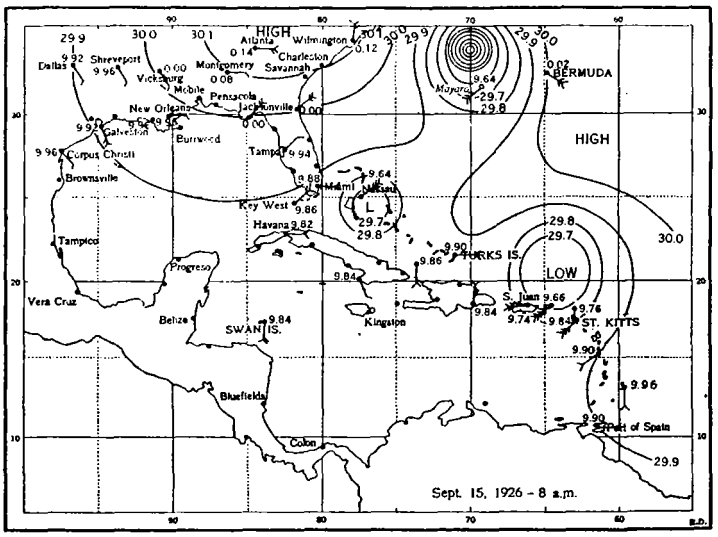

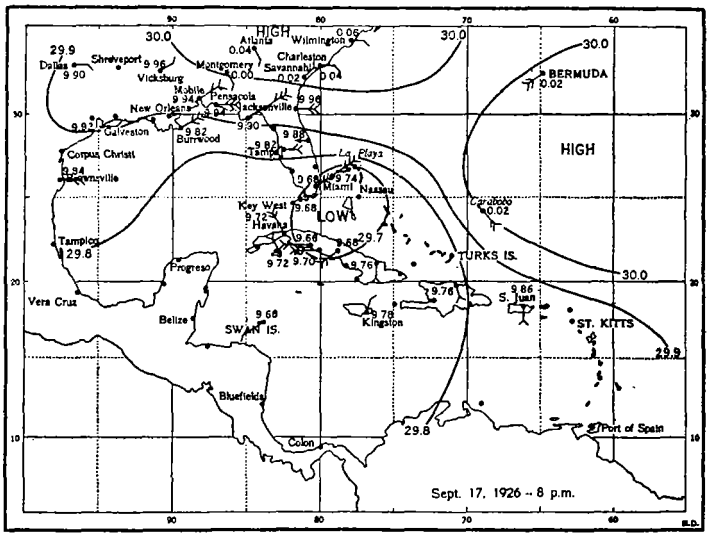

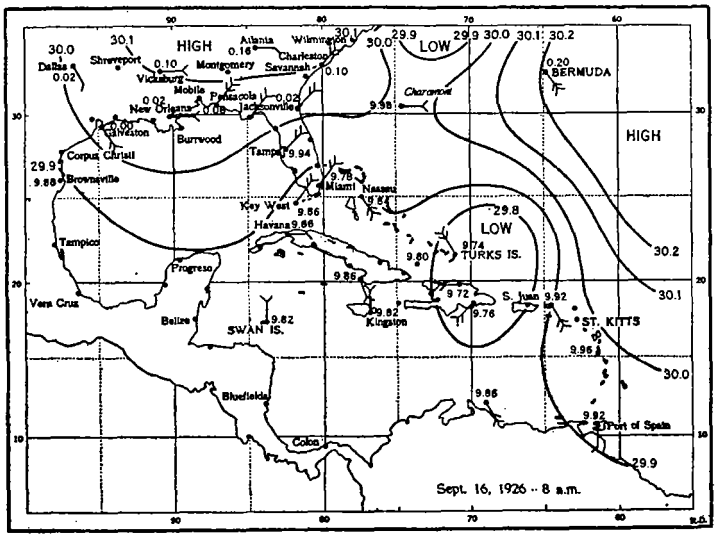

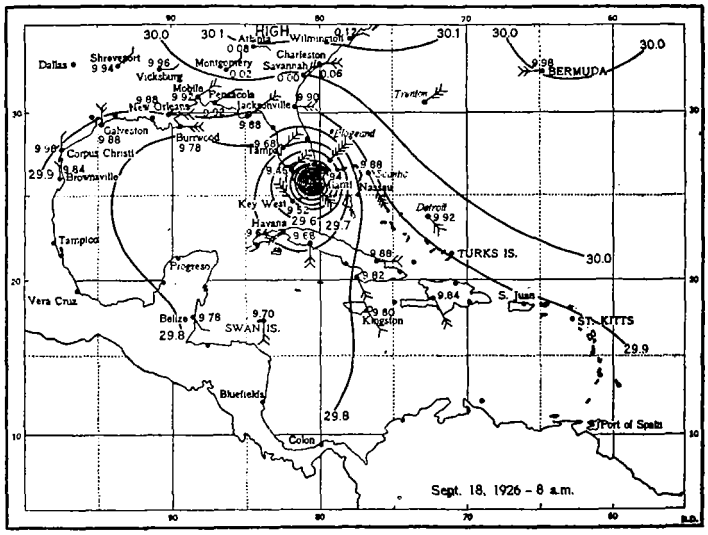

FIG. 1.—Synoptic charts of the Miami hurricane

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view the wreckage that filled the streets. I warned those in the vicinity of the Federal Building that the storm was not over and that it would be dangerous to remain in the open. The lull lasted 35 minutes, and during that time the streets of the city became crowded with people. As a result, many lives were lost during the second phase of the storm. With the passage of the center of the storm, the wind shifted to southeast at 6:47 a. m., and immediately increased to gale force. A velocity of 50 miles was recorded at 7:55 a. m. and a velocity of 60 miles at 8:55 a. m. These recorded velocities are nearly 50 per cent less than the actual velocities. The wind shifted to southwest at 9 a. m. and continued from that direction until 6 p. m., with steadily diminishing force.

A Robinson anemometer on the roof of the Allison Hospital,[1] Miami Beach, connected with a Weather Bureau type triple register, recorded a velocity of 128 miles per hour at 7:30 a. m. The anemometer blew away at 8:12 a. m., at which time it was recording 120 miles per hour.

The storm tide on the Miami side of Biscayne Bay was approximately eight feet, and reports indicate a similar tide at Miami Beach. The water front of Miami was flooded for two to three blocks back from the bay, and low parts of the city near the Miami River were also flooded. After the storm, the entire bay front section of Miami was strewn with boats ranging in size from small pleasure craft to large schooners. Some of the boats had been carried more than two blocks from the bay. Water rose in hotels and residences near the bay to a depth of three to five feet. Miami Beach was entirely inundated, and, at the height of the tide, the ocean extended to Miami, three and one-half miles across Biscayne Bay. All streets near the ocean at Miami Beach were covered

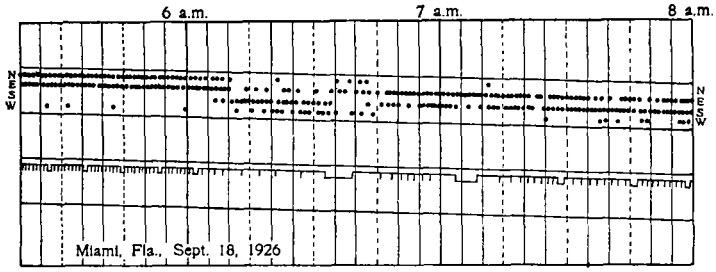

FIG. 2.—Record of wind direction and velocity, Miami hurricane (Weather Bureau Office, Miami, during passage of "eye" of storm. Each space between pairs of vertical marks on velocity graph equals one mile of wind)

with sand to a depth of several feet, and in some places automobiles were entirely covered. The foundations of some buildings were washed out, allowing the buildings to collapse. The storm tide occurred with the shift of the wind to the east and southeast, following the arrival of the center of the storm. In the Miami River, the tide came in the form of a bore that left a mass of wreckage from the boats that had sought safe anchorage.

The intensity of the storm and the wreckage that it left can not be adequately described. The continuous roar of the wind; the crash of falling buildings, flying débris, and plate glass; the shriek of fire apparatus and ambulances that rendered assistance until the streets became impassable; the terrifically driven rain that came in sheets as dense as fog; the electric flashes from live wires have left the memory of a fearful night in the minds of the many thousands that were in the storm area.

The known loss of life in the Miami district is 114. Many more are missing. Several thousand persons were injured, and 25,000 were without shelter after the storm.

The property loss in the greater Miami area has been estimated at $76,000,000. This does not include damage to house, office, and store furnishings. Approximately 4,725 homes were destroyed and 9,100 damaged in the area extending from Fort Lauderdale to Miami.

THE HURRICANE AFTER PASSING MIAMI

Nearing the west coast of extreme southern Florida, the center passed over Bonita Springs, about 20 miles south of Fort Myers, shortly after noon. It passed into the Gulf of Mexico during the afternoon, the displayman at Punta Rasa, Fla., reporting a calm at 3:15 p. m. and lowest pressure 28.05 inches at 3:30 p. m. After crossing the northeastern portion of the Gulf, the center closely approached, but did not reach Pensacola, September 20,

[1] See footnote 1.

where the pressure fell to 28.56 inches. Shortly afterward the center was definitely located as passing over Perdido Beach, Baldwin Co., Ala., where a minimum reading of 28.20 inches was observed between 3 and 4 p. m. with a lull in the wind and a shift from northeast to southwest. It moved thence toward the west passing a short distance south of Mobile at 9:30 p. m. when the barometer at that station reached its minimum of 28.76

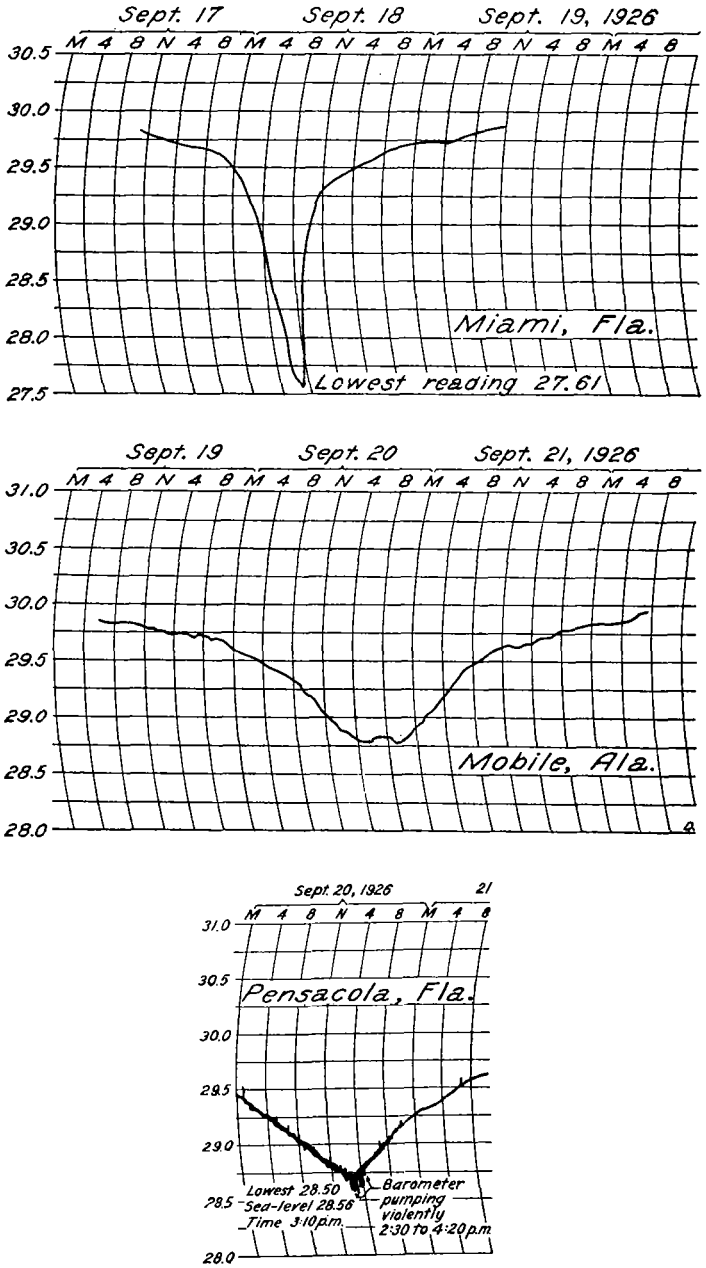

FIG. 3.—Barograms at three cities, Miami hurricane

inches; continuing thence westward the center passed a very short distance south of Pascagoula, Miss., at 5:25 a. m. of the 21st with lowest pressure 28.99 inches. The northern edge of the "eye" of the storm passed over Biloxi about 8 a. m., with a pressure of 29.03 inches at that time; at 9 a. m., the center reached Gulfport and there was a calm of about 10 minutes during which the barometer read 29.08 inches. The center passed over Pass Christian about 9:30 a. m., and there was a calm of about 30 minutes. The lowest pressure was about the

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same as at Gulfport. Beginning about 9:30 a. m., there was calm for an hour at Bay St. Louis. The hurricane center moved over land after leaving Pass Christian and Bay St. Louis. By this time it had greatly diminished in intensity. At 8 p. m. the center was some distance northwest of New Orleans and during the ensuing 24 hours it moved more rapidly westward over Louisiana and dissipated in eastern Texas.

As showing the changed character of the pressure distribution in the storm, three barograph curves are reproduced in Figure 3, viz, Miami, and Pensacola, Fla., and Mobile, Ala.

Thus far no evidence has been received as to the place of origin of the storm, but it may be inferred that it developed to the southwest of the Cape Verde Islands 6 or 7 days before its appearance northeast of St. Kitts.

This storm was the sixth tropical cyclone in the last 40 years to pass inland over the southeast Florida coast and cross the pensinsula into the Gulf of Mexico. It was also by far the most severe of the six.

Below is given data of lowest sea-level pressure and maximum wind velocity at the various observing stations in or near the path of the storm. These data clearly show that the maximum intensity was reached on the Florida coast when the storm passed from the Gulf Stream to a land surface, that the pressure in or near the center did not thereafter descend to so low a level as where it first impinged on the coast, there being 0.59 inch difference between the low pressure at Miami and at Perdido Beach, Ala., near where the storm made its second entry upon a land surface, see Table 2.

TABLE 2.—*Pressure and wind data for stations along the path of the hurricane, stations arranged in accordance with their respective distances from the center*

Stations	Date	Lowest pressure	Time	Wind	
				Maximum velocity	Direction
		Inches		*M. p. h.*	
Miami, Fla	Sept. 18	27.61	6:45 a.	115	NE.
Miami Beach, Fla	do			128	SE. or E.
Punta Rasa, Fla	do	28.05	3:30 p.		
Fort Myers, Fla	do	28.14		[1] 80	
Perdido Beach, Ala	Sept. 20	28.20	3:30 p.		
Pensacola, Fla	do	28.56	3:10 p.	116	E.-SE.
Mobile, Ala	do	28.76	9:30 p.	94	N.
Gulfport, Miss	Sept. 21	29.08	8:30 a.	[1] 55	S.-SE.
Tampa, Fla	Sept. 18	29.36	5:30 a.	50	NE.
Apalachicola, Fla	Sept. 19	29.57	5:00 a.	64	NE.
Jacksonville, Fla	Sept. 18	29.77	4:00 p.	50	E.
New Orleans, La	Sept. 21	29.47	2:00 p.	27	NW.

[1] Estimated.

STORM TIDES

(Excerpts from reports of Weather Bureau officials)

Miami and Miami Beach.—The tide ranged from 7.5 feet along the northern part of the Miami water-front to 11.7 feet along the lower water-front south of Miami River. The highest tide occurred in the lower and wider part of Biscayne Bay. (All heights given are above mean low water.)

At Miami Beach, the tide was highest over the southern part of the city, ranging from 10.6 feet on the ocean side to 6.4 feet on the bay side.

All measurements at Miami and Miami Beach were carefully made, most of them being taken from water marks inside of buildings, where the action of the waves was not shown.

Tampa.—The tide was very low, being driven out of the bay and river by the strong northeast winds, as was the case in 1910. At 3 p. m. of the 18th it was 0.8 feet below mean low water, at 6 p. m., 4.0 feet below, and at 9 p. m. 6 feet below (lowest point). High tide on September 19 about 2 p. m. reached 4.5 feet above mean low tide, making the extreme range 10.5 feet. It was high again on the 20th, being 3.9 feet above mean low tide. In 1910 the tide went 8 feet below mean low tide, and in 1921 it went 10.5 feet above.

Fort Myers.—High water accompanied the storm, according to newspaper reports, reaching 4 to 6 feet above normal and flooding certain sections of the city.

Apalachicola.—The tide was down to −0.4 foot at 6:30 a. m.; it rose during the day, 20th, reaching 3.4 feet at 6:30 p. m. and continued to rise during the night. On the 21st the tide was estimated at 4.2 feet at 6:30 a. m.; it was then overflowing low ground along the water front with highest waves running possibly to 5.0 feet, portions of Water Street being then from 6 to 8 inches under water.

Pensacola.—Tides were but little above normal until after midnight of the 19th–20th, and at 2 a. m. of the 20th the stage was only 1.3 feet above normal, but thereafter the water rose rapidly and reached its highest stage about noon of the 20th. At 7 a. m. of the 20th the tide was 5 feet above normal, at which time the U. S. Coast and Geodetic tide gage ceased recording. The water remained high until after 2 p. m. when it receded considerably. The water rose steadily in the face of northeast winds of hurricane force, indicating that the storm center was preceded by a moderate tidal wave, as the highest water occurred before the winds became true southeast, or off the Gulf. The high stage of 9.4 feet above mean sea level has been accurately determined since the storm. This stage is 0.6 foot below the high water recorded in 1906, but reliable persons who experienced the 1906 storm assert that the water was higher this year than in 1906, probably by two feet. The United States Coast and Geodetic tide gage was not in operation, of course, in 1906, and probably an inaccurate base level was used in computing the level of the storm tide of that year. Reports indicate that the tide did not reach as high a level at the Naval Air Station as at Pensacola, while proceeding eastward in Pensacola Bay much higher levels were reported. The Bagdad Land and Lumber Company at Bagdad, Fla., reports a tide of 14 feet. Valparaiso reports a tide of about 4 feet above normal; St. Andrews, 6 feet; and Port St. Joe about 4½ feet. Reports from the Gulf Beach, about 20 miles southwest of Pensacola indicate that no high water was experienced there.

Mobile, The tide in Mobile River.—There was a steadily decreasing tide with the northerly winds until an unprecedented low stage occurred at 2 p. m., September 21. The water was 0.5 foot above mean low tide on the harbormaster's gage at 11:30 p. m., September 19. Measurements by the observer of the depths of the water at points of the river bottom reported by different parties as having been above water level indicate a minimum stage of 9.7 feet below mean low tide. This unusual condition became troublesome and caused slight damage to boats that had sought shelter at Twelve Mile Island, upriver from Mobile, as it increased the height of the river bank above water, and the swaying of the trees caused large sections of ground with timber to slide into the river. The tide was reported to be rising at 1 a. m., September 21, and a maximum stage of 5.3 feet was reached at 11 a. m. It fluctuated slightly and remained within a foot of the highest stage until about nightfall.

Gulfport.—* * * At 9:30 a. m., after a lull of 10 minutes, the wind shifted to east-southeast and was about 15 m. p. h. It did not change much until 11:15 a. m., when it began to veer and increase in velocity. It was from the southwest by 6:15 p. m., having reached a velocity of about 55 miles p. h. from the SSE at 2:30 p. m. The tide fell and it was 3.8 feet below mean low tide at 10 a. m. September 20. It rose on September 21 and reached a maximum of 6.0 feet at 1:15 p. m.

Bay St. Louis.—* * * The tide was very low from September 17 to 9:15 a. m. September 21, when it began to rise, and it reached about 3 feet above normal.

New Orleans.—* * * The storm having moved across the Florida Peninsula, the length of fetch over the Gulf needed to develop swells that would produce tides preceding the storm was short. The rise in the tide on the Mississippi coast and at Burrwood up to Sunday morning, the 19th, indicated that the center of the storm was moving toward the mouth of the Mississippi; however, on Sunday afternoon, September 19, reports from along the Mississippi coast and Burrwood, La. showed the tide falling at all points. From these and attendant weather conditions, we concluded that the whole coast eastward to Mobile was in that part of the storm to the left of the line of advance of the center. Our judgment on this matter was therefore embodied in a telegram to the Central Office which was forwarded shortly after 4 p. m. September 19.

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DISTRIBUTION OF WARNINGS OF SEVERE STORMS

General distribution.—Hurricane and other warnings of severe storms are telegraphed or cabled from the Central Office of the Weather Bureau in Washington direct to officials in charge of principal and substations of the Bureau in the districts affected; also to the radio broadcast stations at Brownsville, Tex., New Orleans, La., and Key West, Fla., for radio broadcast at those points.

The Navy Department (Communications Office for Arlington) also receives a copy of warnings of all severe storms. The weather bulletin broadcast daily by the Arlington station (NAA) includes in addition to the weather data warnings of severe storms as issued by the Weather Bureau.

Press associations are also supplied with telegraphic advices of storm warnings.

Advices of the coming of the hurricane, in the present case, were perhaps as widely, if not more widely distributed than ever before due to the multiplication of radio broadcasting stations. The radio service at New Orleans, in particular, was especially effective, one station broadcasting hourly bulletins.

Space does not permit mention of the valuable services of individuals and organizations in spreading the warnings and the subsequent advices as issued.

Below is given copies of the more important warnings issued; the arrangement is chronological.

September 15, 10:02 a. m.—Tropical disturbance reported northeast of St. Kitts Tuesday morning has moved directly westward. Now centered short distance north St. Thomas, Virgin Islands. This storm has already attained considerable intensity.

September 16, 3 p. m.—Center of hurricane of great intensity passing near Turks Island which reports wind one hundred miles from northwest. Hurricane center will pass near or slightly north of Crooked Island, Bahama group, Friday forenoon. Greatest caution advised vessels bound for Bahama group and adjacent waters.

September 16, 9:30 p. m.—Third tropical storm has passed Turks Island moving west-northwestward attended by dangerous shifting gales. Caution advised vessels bound for Florida Straits, Bahamas and adjacent waters.

September 17, 10:20 a. m.—Hoist northeast storm warning twelve noon Jupiter Inlet to Key West. Hurricane central about twenty-three north seventy-four west moving west-northwestward attended by winds hurricane force near center. This is a very severe storm. Its center will likely pass near Nassau early to-night. Great caution advised all vessels bound Florida Straits, Bahama Islands, and east Florida coast. Every precaution should be taken for destructive winds Saturday morning especially Jupiter to Miami.

To the Governor General, Nassau, Bahamas, the following message was sent:

September 17, 10:02 a. m.—Please send special observations every two hours to-day. Hurricane central near and north Crooked Island and its center will likely pass near Nassau early to-night. This is a destructive storm.

September 18, 1:30 p. m.—Hoist northeast storm warning 4 p. m. north of Jacksonville to Charleston and west of Mobile to mouth of Mississippi River. Hurricane center noon over extreme southern Florida, Fort Myers reporting barometer 29.04, wind fifty-two miles north. Hurricane will pass into Gulf of Mexico this afternoon and continue to move west-northwestward for the present. This is a very severe storm. Greatest caution advised vessels in its path.

September 18, 9:45 p. m.—Change to hurricane warning 11 p. m. Apalachicola, Fla., to Burrwood, La. Hurricane central between twenty-six and twenty-seven north and about eighty-three west moving west-northwestward attended by winds of hurricane force. This is a very severe storm. Unless course changes hurricane center will move inland, most likely between Pensacola and mouth of Mississippi River Sunday night. Emergency. Every precaution should be taken against destructive winds.

September 19, 10 a. m.—Advisory 10 a. m. Hurricane apparently central between twenty-seven and twenty-eight north and about eighty-five west moving west-northwestward attended by dangerous shifting gales. Unless course changes hurricane center will move inland late to-night between Pensacola and mouth of Mississippi River, probably nearer the latter. Further advices this afternoon. Meanwhile every precaution should be taken against destructive east and northeast winds beginning to-night all points where hurricane warnings are displayed.

September 19, 2.30 p. m.—At 2:30 p. m. of the 19th the following advisory warning was sent to all stations from Apalachicola to Burrwood, inclusive, and hurricane warnings were ordered continued at 11 p. m. at all display stations within this area:

Noon specials indicate hurricane center near twenty-eight north eighty-six west moving west-northwestward. This is a hurricane of great intensity and magnitude and emphasis should be placed on need of every possible preparation for destructive winds, especially Pensacola to mouth of Mississippi River. Hurricane center will likely pass inland late to-night or Monday morning.

Then the final advisory before the hurricane center approached the coast was as follows:

September 19, 9:30 p. m.—Advisory 9:30 p. m. Hurricane central about twenty-nine north eighty-seven west apparently moving northwestward. Hurricane center will pass inland early Monday morning, probably not far from the Pensacola-Mobile section.

The local distribution.—Each local Weather Bureau station in the storm area distributes the warnings by telephone directly to all persons and organizations that have vital interests to be served. In urgent cases such other means of quick personal distribution as are available are utilized. In the present case the Tampa official enlisted the services of the local Boy Scout organization. Other officials took advantage of such means as were at hand, but in the main chief reliance is placed on the telephone, the radio, and the daily local press.

Special acknowledgement is made to the *Mobile Register* for issuing a special edition on Sunday, September 19, giving the latest information respecting the hurricane. Space does not permit a recital of the details of the local distribution at the various Weather Bureau stations in the storm-stricken area; suffice it to say that each and every employee was faithful to the trust imposed in him, and made the widest distribution humanly possible.

AN INTERPRETATION OF THE WIND VELOCITY RECORD AT MIAMI BEACH, FLA., SEPTEMBER 17–18, 1926

551.55 (759)

By BENJAMIN C. KADEL, in charge of Instrument Division

[U. S. Weather Bureau, Washington, D. C.]

Dr. Scott R. Edwards, superintendent of Allison Hospital, Miami Beach, Fla., has kindly furnished to the Weather Bureau, through R. W. Gray of the Miami office of the Weather Bureau, a record of the wind movement at Miami Beach about 4 miles east of the city of Miami during the hurricane of September 17 and 18, 1926. The hospital is three-fourths of a mile north of the northern limit of the center of the hurricane. The anemometer, a 3-cup Robinson anemometer, cups 5 inches in diameter on arms 6.29 inches long, factor 2.50, was exposed 19 feet above the roof and 40 feet above the ground, the ground being 5 feet above mean sea level. It was on the eastern or ocean side of the hospital roof, about 1,200 feet from the ocean, and freely exposed to wind from all directions. The anemometer was equipped to close an electrical circuit for each mile of travel of the wind, the 9th and 10th miles being connected together to aid in identification of the record.

The record was made on a standard Weather Bureau pattern meteorograph, variously called triple register or

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