YEAR 1905

Five storms were found to have occurred in 1905. Tracks for this storms are presented in Fig. 1.

Storm 1, 1905 (Sept. 6-8), T. S.

The following information was found in relation to this storm: 1) Data extracted from 8 A.M. (E.S.T.) Historical Weather Maps: Sept. 6, Barbados, N.E. f. 2, 29.92; ship near 11 N., 58 W., S.S.W. f. 4, rain; Martinique, N., f. 2, 29.97; Trinidad, data could not be read off the map. Sept. 7, Barbados, S.S.E. f. 6, 30.01; Trinidad, E. f. 2, 29.99; Martinique, S.E. f. 3, 30.00. Sept. 8, San Juan, S.E. f. 3, 29.95; Santo Domingo, N. f. 2. 29.99; Port-au- Prince, E. f. 4, 29.89, Curacao, E. f. 4, 29.88, rain. Sept. 9, ship near 15 N., 74 W., E.N.E. f. 5, 29.92; Port-au-Prince, E.N.E. f. 3, 29.92; Kingston, E. f. 3, 29.93. Sept. 10, ship near 15 N., 76 W., E.S.E. f. 4, 30.03 (too high), showers (Historical Weather Maps, Sept. 1905). Author's note: Wind forces (f) are on Beaufort scale and pressures are in inches. 2) On the morning of Sept. 6 a disturbance of apparent small diameter appeared to the eastward of Barbados; during the afternoon of that day it passed to the westward of Barbados and by the morning of Sept. 7 had advanced into the eastern Caribbean Sea. The severity of the storm is indicated in the experience of a schooner that sailed from Bridgetown (Barbados) on the morning of Sept. 6, bound for Surinam. When 40 to 50 miles from port the voyage was abandoned on account of heavy seas and high squally winds and the vessel returned to Bridgetown where it was thrown by heavy seas on the pierhead and totally wrecked, with the loss by drowning of the captain and one of the crew. Advices were issued to West Indian ports regarding the character and probably course of the disturbance on Sept. 6-7. After Sept. 7, it appears to drift slowly westward over the Caribbean Sea as a shallow depression of considerable area in which no evidence of high winds has been furnished (Monthly Weather Review, Sept. 1905). 3) Washington, Sept. 6. A tropical disturbance appears to be approaching Barbados from the S.E. (The New York Times, Sept. 7, 1905, p. 7, col. 5). 4) Belen College Observatory, Sept. 6, 2 P.M. We have just received observations from our station at Barbados from which the existence of a cyclone of good intensity is inferred to the S.W. of that island, in the vicinity of St. Vincent. Nothing can be said about the direction of the tempest, but according to the general motion for this time of the year and its position, it should move towards the W.N.W. M. Gutierrez-Lanza, S.J. (Diario de la Marina, Havana, Sept. 7, 1905, morning edition, p.2. col.5). Author's note: Father Mariano Gutierrez-Lanza was the assistant director of the observatory. 5) Washington, Sept. 8. The tropical disturbance has not yet appeared at any of the land stations in the West Indies. It is apparently of small diameter and it is apparently S. of Santo Domingo (The New York Times, Sept. 9, 1905, p.9, col.6). 6) Belen College Observatory, Sept. 8. The cyclone which we announced to the W.S.W. of Barbados, was located this morning over the Caribbean Sea to the S. of the island of Santo Domingo, where it has begun to feel its influence. It is moving at a good forward speed in the direction (W.N.W.) we indicated as probable in our first advisory. It is likely that some effects of it will start to be felt over eastern Cuba tomorrow, and ships sailing S. of Cuba should remain on alert. M. Gutierrez-Lanza, S.J. (Diario de la Marina, Sept. 8, 1905, evening edition, p.2, col. 2). 7) Central Meteorological Station, Sept. 7 (it should read Sept. 8), 3 P.M. Based on observations received from our official station at Santiago de Cuba, it is inferred that there is a cyclonic perturbation over the Caribbean Sea to the S. of the island of Santo Domingo. In case it

were moving normally to the W.N.W,. its influence could start to be felt over eastern Cuba between tonight and tomorrow Saturday (Sept. 9). Enrique del Monte (Diario de la Marina, Havana, Sept. 9, 1905, morning edition, p.5, col. 4). Author's note: Mr. del Monte was the director of the station. 8) A storm was first observed near 13 N., 59 W. on Sept. 6, 1905, and lasted for 1 day; it was last observed near 14 N., 64 W. (Mitchell, 1924). Author's note: The track in Mitchell (1924) did not correspond with in information given above. It showed 5 positions, the first one near 14 N., 55 W. and the last one near 15 N., 65 W. This track is similar to the one Tannehill (1938) showed and that it extended from Sept. 6 to Sept. 10; that track passed the storm center N. of Barbados early Sept. 8, which is in error. However, the starting position (13 N., 59 W.) on Sept. 6 and the ending position (14 N., 64 W.) on Sept. 7 as tabulated in Mitchell (1924) were not found to differ very much from the positions for those days in Neumann et al. (1993). This latter publication showed a two-day track over the period Sept. 6-7.

On the basis of information in the above items, the author of this study introduced some modifications along the track in Neumann et al. (1993) and extended it to Sept. 8. The author's 7 A.M. Sept. 6 position was estimated near 12.0 degrees N., 58.5 degrees W. on the basis of information in items 1) through 4); this position was found to be about 120 miles to the S.S.E. of the corresponding one in Neumann et al. (1993). The author's 7 A.M. Sept. 7 position was estimated near 13.5 degrees N., 64.3 degrees W., primarily on the basis of information in item 2) and on space-time continuity to his estimated 7 A.M. position for Sept. 8; the author's 7 A.M. Sept. 7 position was found to be about 100 miles to the W.S.W. of the corresponding one in Neumann et al. (1993). In spite of that and E. f. 4 wind was reported from Curacao on Sept. 8, the author decided to take into account the information given in items 5) through 7) and estimated the storm, most likely in dissipating stages, near 15.3 degrees N., 70.3 degrees W. at 7 A.M. Sept. 8. The author's track for Storm 1, 1905 is displayed in Fig. 1.

Although, according to the nomenclature normally used in reference to Cuban cyclones, items 4) and 6) suggested hurricane intensity, the author of this study decided to keep this system as a tropical storm on Sept. 6-7 as indicated in Neumann et al. (1993) and to introduce a dissipating depression stage along his track on Sept. 8.

Storm 2, 1905 (Sept. 11-16), T. S.

The following information was found in relation to this storm: 1) Data extracted from 8 A.M. (E.S.T.) Historical Weather Maps: Sept. 11, ship near 17.7 N., 51 W. S.W. f. 9, rain; ship near 22 N., 52 W., E.N.E. f. 5; low 1005 millibars (29.68) placed 19.5 N., 51.5 W. Sept. 12, ship near 19 N., 50 W., E. f. 6 (not clearly read off the map); ship near 15 N., 49 W., E.S.E. f. 4; low 1005 millibars (29.68) placed near 17.5 N., 51.5 W. (probably too far S. and E.). Sept. 13, ship near 23 N., 56.7 W., E.S.E. f. 9, 29.65; low 9995 millibars (29.38) placed 22 N., 58 W. Sept. 14, ship near 23 N., 55.7 W., S.S.E. f. 7, 29.94; low 995 millibars (29.38) placed 22.7 N., 58.5 W. Sept. 15, ship near 25 N., 59 W., S.W. f. 4, 29.77; low 1005 millibars (29.68) placed 25.5 N., 60 W. Sept. 16, ship near 29 N., 61 W., S.S.E. f. 5, 30.09 (probably too high); low 1010 millibars (29.83) placed 27 N., 62 W. Sept. 17, low apparently opened to a trough in the westerlies which continued W. for about 2 days (Historical Weather Maps, Sept. 1905). Author's note: Wind forces (f) are on Beaufort scale ; pressures are in inches.

The content of the above item was found to support the track for Storm 2, 1905 in Neumann et al (1993), which is the only one the author of this study has found for this storm. Therefore, the above track is reproduced in Fig. 1.

The force 9 winds reported by ships in item 1) on Sept. 11 and 13 were found to corroborate the tropical storm status that Neumann et al. (1993) gave to this storm. As in this latter publication, that status was denoted along the track over the period Sept. 11-15 and changed to a depression in a dissipating stage on Sept. 16.

Storm 3, 1905 (Sept. 24-30), T. S.

The following information was found in relation to this storm: 1) Report from the New Orleans Forecast Office: Weather conditions were moderate until Sept. 26 when a general pressure area appeared in the Gulf of Mexico. From Sept. 26 to the evening of Sept. 28 the disturbance was apparently moving from the central Gulf to the N.W. and on the morning of Sept. 29 the storm center moved into Louisiana. Although the storm did not exhibit specially severe features, high winds and high tides prevailed along the central Gulf coast and shipping remained at port until advised by the Weather Bureau that danger had passed. I.M. Cline, Forecaster (Monthly Weather Review, Sept. 1905). 2) Data extracted from 8 A.M. (E.S.T.) Historical Weather Maps: Sept. 24, ship just N. of Cape Catoche (Yucatan), N.N.E. f. 5; Merida, E. f. 2, 29.83. Sept. 25, Merida, calm, 29.76; low 1007.5 millibars (29.75) placed just E. of Belize (too far S., it should have been farther N.). Sept. 26, Merida, S. f. 2, 29.58 (maybe somewhat low); ship near 27.3 N., 89 W., N.E. f. 5, 29.88; Port Eads, E. f. 4. 29. 88; low not drawn on the map but inferred to be near 22 N., 91 W. Sept. 27, New Orleans, N.E. f. 2, 29.85, showers; Port Eads, E.S.E. f. 4, 29.85; ship near 27.5 N., 93 W., N.E. f. 7; Merida, S. f. 2, 29. 76; low 1005 millibars (29.68) placed 25.5 N., 93 W., apparently associated with a warm front. Sept. 28, Galveston, N.E. f. 5, 29.74; impossible to read other stations around the storm; low inferred near 28 N., 93 W., apparently incorporated to a warm front. Sept. 29, Galveston, N.N.W. f. 3. 29.74; ship near 27 N., 90 W., S.S.W. f. 5; ship near 23 N., 90 W., S.W. f. 5, 29.80; other data could not be read off the map; low below 1005 millibars (29.68) placed over central Louisiana coast. Sept. 30, weak cyclonic circulation inferred over S. Arkansas (Historical Weather Maps, Sept. 1905). Author's note: Wind forces (f) are on Beaufort scale; pressures are in inches. 3) Washington, Sept. 26. There is some evidence of a disturbance in the Gulf of Mexico S. of the Louisiana coast. The intensity of the storm and probable direction are as yet unknown (The New York Times, Sept. 27. 1905, p.9, col. 6). Author's note: This and other statements published in the New York Times were probably issued the evening before their publication date. 4) Washington, Sept. 27. The Gulf disturbance is apparently central off the mouth of the Mississippi. Pressures are falling slowly along the Middle and West Gulf coasts. A wireless message from the mouth of the Mississippi at 2 P.M. reports the Gulf as being very rough with swells from the N.E. Pensacola reports at 8 o'clock an E. wind of 28 mph. Storm warnings are displayed from Key West to Corpus Christi (The New York Times, Sept. 28, 1905, p.9, col.6). 5) Washington, Sept. 28. The barometer along the Gulf coast continues to fall. The center of the disturbance is still apparently off the Louisiana coast. The wind has abated somewhat, although a maximum velocity of 34 mph is reported from New Orleans. Present indications are for a continuation of the storm in very nearly its present position during the next 24 hours (The New York Times, Sept. 29, 1905, p.9, col.6). 6) Some maximum velocities were as follows: Pensacola, 41 mph on Sept. 29; Mobile, E. 24 mph on Sept. 28; Meridian, E. 27 mph on Sept. 28; New Orleans, N.E. 34 mph on Sept. 28; Galveston, N.E. 28 mph on Sept. 27 (Monthly Weather Review, Sept. 1905). 7) Minimum pressure at New Orleans was 29.53 inches (Weather Bureau, 1907). Author's note: The barometer was at a height of 51 ft. and apparently

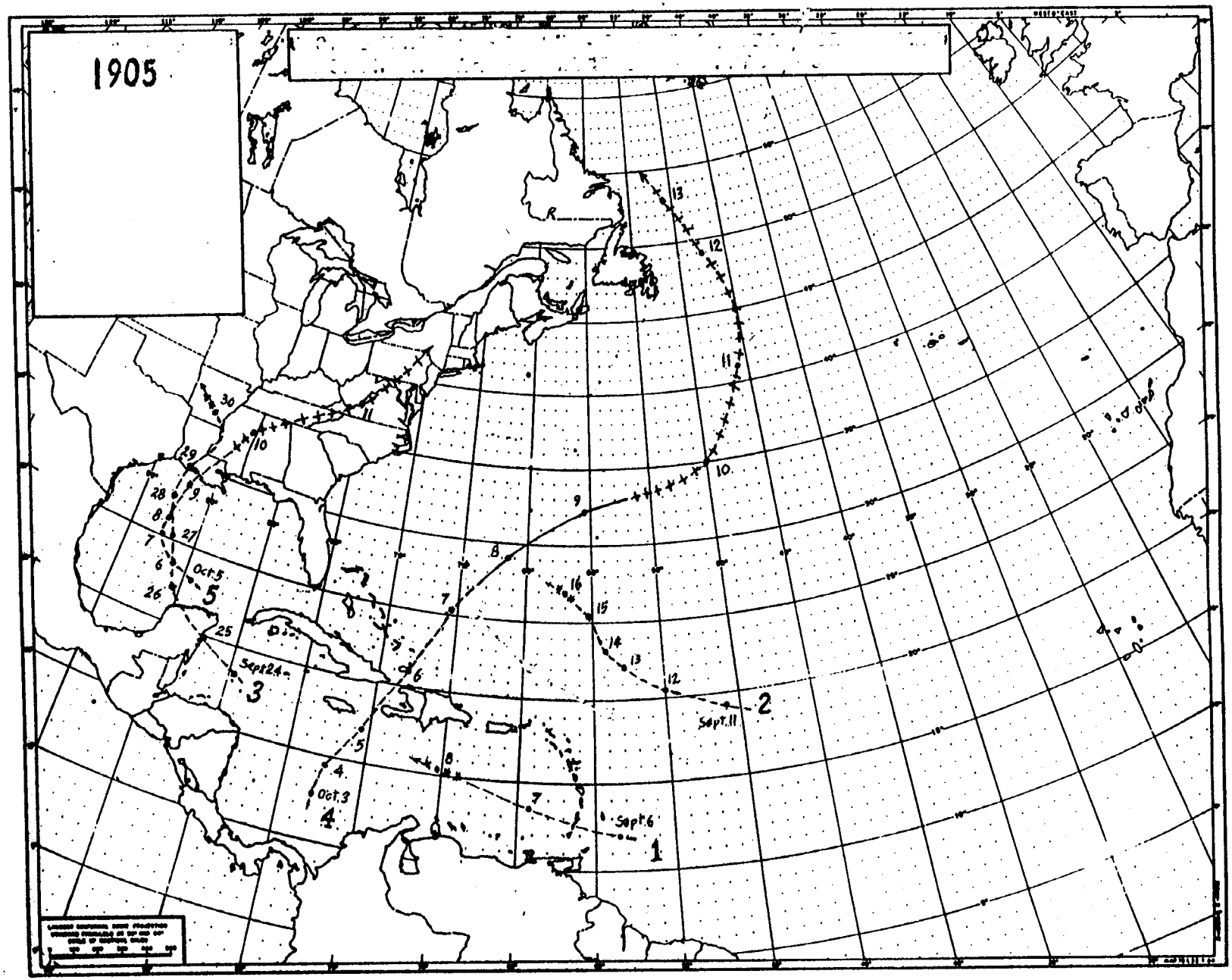

Fig. 1

no reduction was made to sea level. 8) Observations from New Orleans: Sept. 29, 8 A.M., S.E. 8 mph, 29.55 inches; 8 P.M., S.W. 8 mph, 29.63 inches (Weather Bureau, 1907). Author's note: Pressure readings apparently were not reduced to sea level. 9) Storm of Sep. 29, 1905. Louisiana. Minor (Dunn and Miller, 1960). 10) Map showing a track for the storm. The center was placed on the Louisiana coast near longitude 91.3 W. at 8 A.M. Sept. 29; it was near 32 N., 91.3 W. at 8 P.M. Sept. 29 and over southern Arkansas at 8 A.M. Sept. 30 (Monthly Weather Review, Sept. 1905). 11) A storm was first observed near 18 N., 85 W. on Sept. 24 and lasted 6 days; it recurved near 27 N., 92 W. and it was last observed near 34 N., 92 W. (Mitchell, 1924). Author's note: A track shown in Tannehill (1938) was found to be very similar to the corresponding track shown in the above publication. However, the track in Mitchell (1924) does not show the eastward inflection on Sept. 29 which is denoted along the track in Neumman et al. (1993); otherwise, both tracks are also similar.

Information contained in the above items was found to support, in general, the track for Storm 3, 1905 in Neumann et al. (1993). In particular, information in item 2) served to check the track over the period Sept. 26-30 and, although 7 A.M. positions for Sept. 24-25 could not be rigorously checked, such positions were also accepted. Therefore, the entire track in the above publication was reproduced in Fig. 1.

The tropical storm status which Neumann et al. (1993) gave to this storm was found to be rigorously supported only by the S. 41 mph maximum wind velocity reported at Pensacola (item 6), but pressure values at New Orleans reported in items 7) and 8) were low enough to provide additional support to the occurrence of tropical storm intensity. As in Neumann et al. (1993), such intensity was shown along the track over the period Sept. 24-29 and changed to a depression in a dissipating stage on Sept. 30.

Storm 4, 1905 (Oct. 3-13), H.

The following information was found in relation to this storm: 1) The only West Indian disturbance of mark intensity appeared over the Caribbean Sea S. of Santo Domingo on Oct. 3-4, recurved N. over the Windward Passage on Oct. 5 and passed on a northerly course to the westward of Turks Is. on Oct. 6. From the eastern Bahamas this disturbance moved northeastward and passed to the S. and E. of Bermuda during the afternoon of Oct. 8. A fresh E. to N.E. gale prevailed during the day and night of Oct. 8 at Bermuda and the lowest barometer at Hamilton at 8 P.M. was 29.66 inches. To de E. and S.E. of Bermuda gales of hurricane force were reported. From the vicinity of Bermuda the center of the storm moved northeastward to the Banks of Newfoundland. The action of the storm was not severe until after recurving northeastward from the Bahamas, when the barometric pressure began to decline rapidly, with a corresponding increase in wind force. In about 45 N., 45 W. the steamship "La Savoie" at 4 P.M. Oct. 11 reported a barometric reading of 27.92 inches; and a disastrous storm wave, within its area, was encountered on the same day by the "Campania". Advices to West Indian, Gulf and Atlantic coast interests were begun on Oct. 3 and continued daily until it recurved northeastward over the Atlantic. On Oct. 6 advices to Bermuda and Halifax regarding its movement were begun and were continued until it passed Bermuda and on the morning of Oct. 9 Lloyds, London, was advised by cable that a tropical disturbance was moving northeastward from Bermuda (Monthly Weather Review, Oct. 1905). Author's note: Shorter descriptions of this storm were published in Tannehill (1938) and Weather Bureau (1907). 2) Data extracted from 8 A.M. (E.S.T.) Historical Weather Maps: Oct. 1, Colon, S.E. f. 3, 29.83. Oct. 2, Colon, S. f. 2, 29.83. Oct. 3, Colon, S.

f. 2, 29.77; Kingston, E. f. 3, 29.81, rain; ship near 14 N., 76 W., S.E. f. 3, 29.80; ship near 12 N., 75 W., S. f. 4, 29.86, rain; low placed 12.5 N., 81.5 W. but another center was probably developing some 200 miles to the E. Oct. 4, ship near 15 N., 78 W., E.N.E. f. 5, 29.65; ship near 16 N., 75 W, N. f. 4 (wind direction probably in error), 29.74; ship near 14 N., 73 W., S. f. 5, rain; Port-au-Prince, E. f. 3, 29.73; Kingston, N. f. 1, 29.73; low placed 15 N., 75 W. (probably too far E.). Oct. 5, Kingston, N. f. 2, 29.68; Santiago de Cuba, E. f. 4, 29.80; ship near 20 N., 74 W., E. f. 5, rain; Port-au- Prince, E. f. 4, 29.70; Santo Domingo, S.S.E. f. 2, 29.77; Turks Is. E. f. 3, 29.77; Camaguey, N.E. f. 2, 29.77; low placed 16.5 N., 75.5 W. Oct. 6, Camaguey, N. f. 2, 29.71; Kingston, N.N.W. f. 3, 29.70; Turks Is., S.S.E. f. 6, 29.66; ship near 19.7 N., 74 W., W.S.W. f. 5; low placed 22 N, 72 W. (probably too far N. and E.). Oct. 7, Camaguey, N.N.E. f. 1, 29.80; ship near 19.7 N., 73.7, W.S.W. f. 3; Turks Is., S.W. f. 5, 29.75; ship near 24 N., 74 W., W.N.W. f. 2, pressure could not be read; low placed 24.5 N., 72.5 W. (probably too far S. and W.). Oct. 8, low placed as extratropical near 30 N., 66 W., but probably not yet as such; Bermuda E.N.E. (wind speed and pressure could not be read), but temperature in the low 70's Fahrenheit. Oct. 9, Bermuda, N.E. f. 2, 29.69, temperature 74 degrees Fahrenheit; low placed 32 N., 58 W. as extratropical, but probably not yet as such (probably too far E.). Oct. 10, extratropical low placed 35 N., 50 W., although there may be more than one center. Oct. 11, center of extratropical low placed 40.5 N. 45.5 W., 985 millibars (29.09) or lower. Oct. 12, center of extratropical low placed 46.5 N., 46.5 W.; however, according to ship data 49 N, 47.5 W. should be a much better location. Oct. 13, center of extratropical low placed 52.5 N., 49 W., probably a bit far S. and E. (Historical Weather Maps, Oct. 1905). Author's note: Wind forces (f) are on Beaufort scale; pressures are in inches. 3) Belen College Observatory, Oct. 2, 5 P.M. On the basis of observations received from various places in Cuba and Jamaica it is inferred that a moderate tempest is developing to the W. of Jamaica and to the S. of the Cayman Islands. Early this afternoon its effects were being felt with some force over the extreme western Jamaica and with less intensity on the southern coast of Puerto Principe (Camaguey), where there were rough seas and strong winds this afternoon. M. Gutierrez-Lanza, S.J. (Diario de la Marina, Havana, Oct. 3, 1905, morning edition, p.2, col.6). 4) Belen College Observatory, Oct. 3, 6 P.M. The tempest center remains almost stationary about the position indicated previously, but it can be affirmed that the tempest is gaining strength and expanding its spirals; its influence is more noticeable over the island (of Cuba) today. Its organization is poor and its ascending and outward currents are showing very little activity. M. Gutierrez- Lanza, S.J. (Diario de la Marina, Havana, Oct. 4, 1905, morning edition, p.4, col.2). 5) Belen College Observatory, Oct. 4, 10:30 A.M. The indecision of the tempest which has been stationary for over 3 days still continues. The tempest has produced torrential rains in Jamaica since last Saturday (Sept. 30). Some activity in the upper air currents is now noticed and shows that the tempest is getting better organized. M. Gutierrez-Lanza, S.J. (Diario de la Marina, Havana, Oct. 4, 1905, evening edition, p.2, col.1) 6) Belen College Observatory, Oct. 5, 5 P.M. The complex set of data concerning the upper air currents today makes one to believe that a portion of the extensive perturbation which has been affecting this island for over 4 days has moved to the W. and that a new center appears to be forming to the E.S.E. of Kingston and S.S.E. of Santiago de Cuba, within the general depression. M. Gutierrez-Lanza, S.J. (Diario de la Marina, Havana, Oct. 6, 1905, morning edition, p.2, col.3). 7) Belen College Observatory. Oct. 6, 10:30 A.M. Our hypothesis expressed yesterday that a new center was forming to the E.S.E. of Kingston and S.S.E. of Santiago de Cuba has been confirmed. We can state today that such a depression is moving northward to pass through the Windward Passage between Cuba and

Haiti. M. Gutierrez-Lanza, S.J. (Diario de la Marina, Havana, Oct. 6, 1905, evening edition, p.2, col.1). 8) Oct. 1-4, 1905. Cyclone in the Caribbean (Sea) which effects were felt on the southern coast of eastern Cuba with some force but without causing serious damage (Sarasola, 1928). Author's note: Actually taken from the catalog of Cuban cyclones by M. Gutierrez-Lanza which is included in Sarasola (1928). The influence of the weather system over eastern Cuba should have extended to Oct. 5-6. 9) Washington, Oct. 8. The West Indian disturbance changed its course more to the N. as was indicated on Saturday night (Oct. 7) and was this afternoon affecting the island of Bermuda where a N.E. gale prevailed with rapidly falling pressure (The New York Times, Oct. 9, 1905, p.9, col.5). 10) Map showing a track for the storm. Morning positions along the track were as follows: Oct. 6, near the N.E. tip of Great Inagua (Southeastern Bahamas); Oct. 7, near 27.5 N., 68.5 W., with a question mark shown (Monthly Weather Review. Oct. 1905). 11) A storm was first observed near 13 N., 80 W. on Oct. 3, 1905 and lasted for 13 days; it was last observed near 56 N., 58 W. (Mitchell, 1924). Author's note: The corresponding track in the above publication was found to be very similar to the one in Tannehill (1938). However, Neumann et al. (1993) started their track near 11 N., 80 W. on Oct. 1, or two days earlier. In general, this latter track was also similar to the one in Mitchell (1924). On the basis of information in the above items, primarily in item 2),the author of this study introduced a number of modifications along the track for this storm shown in Neumann et al. (1993). The author's track was started on Oct. 3 in lieu of on Oct. 1 as in the above publication and the reason for so doing was that that was the first day that the center which was going to become the prominent one within the general and extensive depression could be identified based on ship data (item 2). The author's 7 A.M. Oct. 3 position was estimated near 12.7 degrees N., 78.0 degrees W., which is about 60 miles to the E. of the corresponding one in Neumann et al. !1993). The author's 7 A.M. Oct. 4 position was near 14.5 degrees N., 77.5 degrees W. and was based on a nearby ship observation showing the lowest pressure (29.65 inches) in the depression area and an E.N.E. force 5 wind (item 2); the author's position was found to be about 45 miles to the S.E. of the corresponding one in Neumann et al. (1993). The author's 7 A.M. Oct. 5 position was near 17.0 degrees N., 75.5 degrees W. and was based on information in items 2) and 6); this position was found to be about 70 miles to the S.S.E. of the one in the above publication. The author's 7 A.M. Oct. 6 position was based on information for that day in items 2) and 10); such a position was estimated near 21.0 degrees N., 73.0 degrees W. and was about 80 miles to the N.E. of the one in the above publication. The 7 A.M. Oct. 7 position in Neumann et al. (1993) was adjusted to the N.N.W. by about 90 miles to near 25.3 N., 70.5 degrees W. in order to fit better information in item 2) and space-time continuity along the track. The author's 7 A.M. Oct. 8 position was based on information for that day in items 1) and 2) and was estimated near 29.0 degrees N., 66.5 degrees W.; this position was found to be about 150 miles to the N.N.E. of the corresponding one in Neumann et al. (1993). Author's 7 A.M. positions for Oct. 9 and Oct. 10 were near 32.3 degrees N., 60.5 degrees W. and 35.0 degrees N., 50.0 degrees W., respectively, and were based on information in item 2); these positions were about 150 miles to the E.N.E. and about 240 miles to the E. of the respective positions in the above publication. The 7 A.M. Oct. 11 position in Neumann et al. (1993) was kept unchanged because it was found to agree with information for that day in item 2). However, their 7 A.M. Oct. 12 position was adjusted to the N.N.W. by about 240 miles to near 49.0 degrees N., 47.5 W. in order to satisfy information for that day in item 2) and to achieve space-time continuity with the location along the track (near 45 N., 45 W.) in which the steamship "La Savoie" met the storm at 4 P.M. Oct. 11 (item 1). Finally, the 7 A.M. Oct. 13 position in Neumann et al. (1993) was adjusted to the

N.N.W. by about 130 miles to near 53.0 degrees N, 51.0 degrees W. in order to satisfy information in item 2). The author's track for Storm 4, 1905 is shown in Fig. 1.

Information contained in item 1) was found to justify the hurricane status that Neumann et al. (1993) gave to this storm. The above authors showed that status to have begun as early as Oct. 3; however, information in item 1) did not confirm that status until Oct. 8 when the storm reached the vicinity of Bermuda. Therefore, on the basis of information in item 1), the author of this study decided to introduce the hurricane status along his tracks as the storm passed the 27 degrees N. parallel late on Oct. 7. Tropical storm intensity was denoted along the track prior to late Oct. 7. On the basis of information in item 2) for the period Oct. 8-10, the hurricane status was changed to the extratropical stage as the storm crossed the 57 degrees W. meridian late on Oct. 9. This transition differed significantly from the one shown in Neumann et al. (1993) in which the extratropical stage was introduced when the storm crossed the 67 degrees W. meridian in the morning of Oct. 8.

Storm 5, 1905 (Oct. 5-11), T. S.

The following information was found in relation to this storm: 1) Data extracted from 8 A.M. (E.S.T.) Historical Weather Maps: Oct. 5, ship near 26 N., 88 W. E. f. 4, rain; ship near 22.7 N., 89 W., S. f. 2, rain; Merida, W. f. 8, 29.63; center placed 23 N., 89.5 W. Oct. 6, Merida, S.W. f. 2, 29.91; no other data in vicinity; center placed 23.5 N., 91.5 W. Oct. 7, Galveston, N.E. f. 4, 29.93; Corpus Christi, N. f. 3, 29.92; Brownsville, N.E. f. 8 (probably too high speed), 29.74; ship near 26.7 N., 90.7 W., S.E. f. 5; ship near 27.5 N., 90.7 W., N.E. f. 5; New Orleans, N.E. f. 3, 29.89; center placed 25 N., 92.5 W. Oct. 8, Galveston, N.N.E. f. 4, 29.83; ship near 27.7 N., 92 W., E. f 4 (or 6); ship near 26.5 N., 89 W., E. f. 4, 29.71; ship near 26.7 N., 86 W., E. f. 7, 29.86; New Orleans, N.E. f. 5, 29.84; center placed 26 N., 92 W. (maybe a bit far E.). Oct. 9, New Orleans, S.E. f. 4, 29.72, rain; ship near 28 N., 92 W., S.W. f. 9, 29.68; ship near 27 N., 87 W., S.E. f. 9, 29.91, thunderstorm; center placed 28.5 N., 92 W. Oct. 10, extratropical low placed near 33 N., 88.5 W. Oct. 11, extratropical low placed near 37.5 N., 80 W. Oct. 12, low united with another extratropical system in the evening of Oct. 11 over the State of New York (Historical Weather Maps, Oct. 1905). Author's note: Wind forces (f) are on Beaufort scale; pressures are in inches. 2) Storm warnings were issued for the central Gulf coast on Oct. 8-9 and were fully justified. The New Orleans Item, in speaking of the storm of Oct. 8-9 says: "The Weather Bureau sent out storm warnings Sunday morning (Oct. 8) in advance of the high winds, advising shipping and public interests fully regarding anticipated conditions". I.M. Cline, District Forecaster, New Orleans Forecast District ((Monthly Weather Review, Oct. 1905). 3) Washington, Oct. 8. Evidence of a disturbance in the West Gulf were observed Sunday morning and storm warnings were ordered at once. Tonight the storm center is approaching the Louisiana coast , from which section some high winds have already been reported (The New York Times, Oct. 9, 1905, p.9, col.5). 4) Washington, Oct. 9. The Gulf storm is centered tonight over southern Mississippi (The New York Times, Oct. 10, 1905, p.9, col.10). 5) The Gulf storm has moved N.E. to east Tennessee with somewhat diminishing intensity (The New York Times, Oct. 11, 1905, p.11, col. 5). 6) The following wind velocities were associated with the storm: New Orleans, N.E. 37 mph on Oct. 8; Pensacola, E. 36 mph on Oct. 9; Birmingham, S.E. 29 mph on Oct. 10; Norfolk, S. 33 mph on Oct. 11; Lynchburg, N.W. 24 mph on Oct. 11; Atlantic City, S.E. 36 mph on Oct. 11; Cape May, S.E. 36 mph on Oct. 11; Albany, S.E. 40 mph on Oct. 11 (Monthly Weather Review, Oct. 1905). 7) Minimum

pressure at New Orleans was 29.63 inches (Weather Bureau, 1907). Author's note: Apparently no correction to sea level was applied to this reading. 8) Some observations taken at New Orleans on Oct. 9: 8 A.M., wind S.E. 18 mph, pressure 29.67 inches; 8 P.M., wind S. 4 mph, pressure 29.67 inches (Weather Bureau, 1907). Author's note: Apparently no correction to sea level was applied to these readings. 9) Map showing a track for this storm. The following positions were noted along the track: Oct. 9, morning, near 29 N., 92.5 W.; evening, near 30.5 N., 92.5 W. Oct. 10, morning, near 33 N., 88.5 W.; evening, near 36.3 N., 83.5 W. Oct. 11, morning, near 37.5 N., 79.5 W.; evening, near 42.5 N., 73.7 W., having merged with another low pressure center coming from the lake region. Oct. 12, merged center located just N.W. of Portland, Me. (Monthly Weather Review, Oct. 1905).

On the basis of information in the above items, the author of this study introduced a very minor modification and an extension of the track for this storm which is shown in Neumann et al. (1993). The 7 A.M. Oct. 8 position along such a track was adjusted to the east by about 25 miles to near 26.3 degrees N., 92.5 degrees W. in order to fit better information for that day in item 1). All other 7 A.M. positions along the above mentioned track were kept unchanged because they reasonably agree with information in item 1) and, in some cases, with additional information in item 9). The storm track in Neumann et al. (1993) was extended to Oct. 11 on the basis of information in items 1) and 9), resulting in an author's estimated position near 37.3 degrees N., 80.0 degrees W. for 7 A.M. Oct. 11. Because of the merge of the original storm center with another mid-latitude center over eastern New York in the evening of Oct. 11, the author's track was terminated at that time. The author's track for Storm 5, 1905 is displayed in Fig. 1.

Winds of force 8-9 on the Beaufort scale reported on Oct. 5 and Oct. 9 (item 1) were found to fully justify the tropical storm status which Neumann et al. (1993) gave to this storm. Such tropical storm intensity was denoted along the author's track over the period Sept. 5-9, and the extratropical stage was introduced early on Oct. 10 in accordance with information in item 1).

Special statement.

In addition to the five storms which were fully discussed above, four possible cases were found for 1905. Available information was insufficient to document these cases as tropical ones or to determine that they indeed reached storm intensity.

A) Case of Aug. 18-20, 1905.

The Monthly Weather Review, Aug. 1905, stated that about Aug. 20 there was evidence of a storm to the S.E. of the Windward Islands. Data published in Historical Weather Maps, Aug. 1905, showed a ship observation with a N.N.W. f. 2 wind and showers near 8 N., 53 W. in the morning of Aug. 18, a ship with a W.N.W. f. 3 wind near 9 N., 54 W. and a second one with as N.N.E. f. 4 wind near 10.5 N., 57 W. in the morning of Aug. 19, and a S.E. f. 4 wind at Barbados, two nearby ships with a very light S.E. wind and a minimum pressure of 29.85 inches at Trinidad in the morning of Aug. 20. The above information suggested a weak low pressure system moving westward and entering the extreme southeastern Caribbean Sea on Aug. 20. The system could not be traced across the Caribbean after Aug. 20. Indications are that this weather system did not reach tropical storm status but, at any rate, available data were not enough to entirely rule out the statement that "about Aug. 20 there was evidence of a storm to the S.E. of the Windward Islands". This is why this case is being maintained as a possible one.

B) Case of Aug. 27-30, 1905.

This case involves a frontal system along which two separate low pressure areas were identified. One of these areas was over the Atlantic to the east of Florida and the other one evolved over the Gulf of Mexico and indications are that it acquired some tropical characteristics. In connection with the low pressure area in the Atlantic a ship reported a N.E. f. 8 wind near 31.5 N, 75 W. in the morning of Aug. 27, a short distance to the N. of a cold front which extended across central Florida (Historical Weather Maps, Aug. 1905). In addition, the Monthly Weather Review , Aug. 1905, indicated that the threatening character of the weather was telegraphed to all Florida ports at noon Aug. 27, and that a steamship foundered off the extreme North Atlantic coast of Florida during the night of Aug. 27-28 and a number of vessels put into port in distress. By publishing a dispatch dated at Fernandina, Fl., on Aug. 28, The New York Times, Aug,. 29, 1905, p.1, col.2, stated that the steamship "Pecanic" was the one which foundered off the Florida coast. Twenty men constituting all but 2 men of the officers and crew were drowned by the sinking of the vessel and the disaster was the result of a fierce gale which raged during the night and early morning of Aug. 28. An immense wave struck the vessel and the impact, coming just as the vessel was making a turn, caused a shift in the cargo and the vessel went over and sank immediately. At the time of the disaster the vessel was about 20 miles N.E. of Fernandina, heading S. and in the teeth of the gale. Historical Weather Maps, Aug. 1905, placed a weak low pressure area over the Gulf of Mexico near 25 N., 89 W., just at the end of the above mentioned cold front, in the morning of Aug. 27. Morning weather maps for Aug. 28-30 showed this low pressure area to have moved to the W. and then to the N.W. to just N. of Galveston over such a period. Maximum wind velocities associated with this low pressure area were force 5 on the Beaufort scale. Although there are indications that the low pressure area in the Atlantic remained embedded in a front while gales (force 8 or higher) were reported on Aug. 27-28 and that the low pressure area in the Gulf of Maxico probably attained tropical characteristics but it did not likely reach tropical storm intensity, the author of this study decided to keep this complex weather situation as a possible case, mostly because it occurred late in Aug. and not far from the peak of the hurricane season.

C) Case of Sept. 27, 1905.

This case was described in Diario de la Marina, Havana, Oct. 4, 1905, morning edition, p.4, cols. 2-3, as a hurricane encountered by the Spanish steamship "Reina Maria Cristina" on Sept. 27 during a voyage from Coruna (Spain) to Havana. According to officer Pablo Ferrer, after having observed cirrus clouds and cirrus veils for a good number of hours, by midnight (presumably of Sept. 26-27) the cirrus deck had thickened, heavy rain was falling, the barometer has significantly dropped and lightning was observed at the third quadrant. At 4 A.M. (Sept. 27), wind became strong and gusty, barometer at 30.10 inches (probably too hugh), heavy seas and strong showers, ship located at 34 15 N., 42 20 W. of San Fernando (48 32 W. of Greenwich). At 5 A.M., the wind reached hurricane force, with gusts of incredible violence. At 5:45 A.M. the ship's crew checked the hurricane course, and maneuvers were undertaken to get out of the dangerous area. At daybreak the hurricane was moving away from the vessel and the ship's previous course was resumed. Examination of Historical Weather Maps (Sept. 1905) revealed an extratropical low near 45 N., 48 W. at 8 A.M. (E.S.T.) Sept. 27, with a front to the S. and

S.W. passing through 35 N., 50 W. No cyclone was drawn in the vicinity of the position in which the ship "Reina Maria Cristina" allegedly met the hurricane in the early morning of Sept. 27. The closest ship report plotted on the map was near 37 N., 45.5 W. and showed a S. f. 6 wind with rain and a barometer reading of 29.80 inches, a set of data which seemed to be responding to the extratropical low drawn on the map and not to the alleged hurricane. The author of this study believes that the severe weather encountered by the "Reina Maria Cristina" was associated rather with the approaching front than with a hurricane; however, it is still possible that a small tropical cyclone could have existed, moving ahead of the front and finally incorporating to it. This is why the author decided to keep this case as a possible one.

D) Case of Nov. 28- Dec. 3, 1905.

This case was shown as a tropical storm by Ortiz-Hector (1975). He stated that the storm showed its first signs of great intensity on the northern coast of Jamaica on Nov, 28-29, that it moved almost to the west over the seas S. of Cuba , that on Dec. 1-2 passed over or near the western end of that island and that it recurved in the Gulf of Mexico to the N.W. of Havana on Dec. 3. The recurvature to the N.E. caused high pressures to invade the southeastern Gulf and a moderate cold front to move over western Cuba. In addition to the above description, Ortiz-Hector (1975) showed a track for the alleged storm. Ortiz-Hector (1975) stated that it is probable that the perturbation had originated to the east of Jamaica and mentioned that reports from Kingston tended to confirm that hypothesis. According to those reports, the steamer "Bodo", which had encountered strong winds and rough seas, arrived at Port Maria at 8 P.M. Nov. 28 and came ashore when attempting to anchor. The "Miami" arrived a few hours later and was also wrecked at Port Maria, and the storm was also felt by the "San Juan", according to her captain. As a dispatch dated at Kingston on Nov. 28 referred to the wreckage of the "Bodo" and the "Miami" at Port Maria, indicating the latter vessel was soon refloated, the wreckage of both vessels should have occurred during the night of Nov. 27-28, or about 24 hours earlier than indicated by Ortiz-Hector (1975); the date of the Kingston dispatch was undoubtedly correct because it was published in The Times, London, Nov. 29, p.11, col.4). Examination of Historical Weather Maps (Nov. 1905) suggested the existence of a weak cyclonic circulation on the N.E. coast of the Dominican Republic in the morning of Nov. 27; the existence of this weather system was based on a ship report showing a S. f. 3 wind off the E. tip of Hispaniola, a S.E. f. 3 wind at San Juan, an E.N.E. f. 3 wind at Turks Is. and a N.E. f. 3 wind, with rain, reported by a ship near 21 N., 68 W.; in addition, three ships reported N. f. 3 winds along the 74 W. meridian and between latitudes 24 N. and 26 N., and Port-au-Prince reported an E.N.E. f. 3 wind, with no report being available from Jamaica. On the morning of Nov. 28, the corresponding weather map showed that the pressure had dropped from 29.95 to 29.85 inches in 24 hours at Port-au-Prince, accompanied by a wind change from E.N.E. f. 3 to E.S.E. f. 3; Turks Is. and Cap Haitien showed N.N.E. f. 4 winds and no report was available from Jamaica. The set of data above suggested that the weak weather system had moved westward with a slight intensification and was then located near the Haitian capital. The weather map corresponding to the morning of Nov. 29 showed the following data: Port-au-Prince, S.E. f. 4, 29.81 inches; Turks Is., S.E. f. 4, 29.92 inches; Puerto Plata, E. f. 5; ship near 22 N., 74 W., E.N.E. f. 6; ship near 21 N., 76 W., N.N.E. to N.E. f. 6; ship near 22 N., 77 W., N.N.E. to N.E. f. 5; ship near 16 N., 69 W., S.S.E. f. 3, 29.80 inches; ship near 15 N., 78 W., N.N.E. f.5, 29.83 inches. This set of data suggested the existence of a N.N.E.- S.S.W. trough in the vicinity of the 75 W.

meridian, with the lowest pressure being located to the southwestern tip of Haiti. Although judging from the continuing pressure drop in Port-au-Prince, some intensification had probably occurred from the previous days, maximum reported winds did not exceed force 6 on the Beaufort scale and tropical storm intensity could not be supported by the data. Ortiz-Hector (1975) indicated that fresh N.E. winds and rough seas from the S.E. occurred at Cape Cruz (southeastern Cuban coast) on Nov. 29, this information being probably taken from an article by M. Gutierrez-Lanza, S.J. published in Diario de la Marina, Havana, Dec. 5, 1905, morning edition, p.5, col.1. The following data were plotted on the weather map for the morning of Nov. 30: ship near 21 N., 75 W., E. f. 3, 29.94 inches; Turks Is., S.E. f. 3, 29.97 inches; Port-au-Prince, E. f. 5, 29.89 inches, having risen from 29.81 inches the previous day; ship near 19 N., 74 W. N.N.E. f. 6, 29.94 inches; ship near 17 N., 73 W., E. f. 3, 29.88 inches; ship near 16 N., 75 W., E. f. 2; ship near 12 N., 77 W., N. to N.N.E. f. 1, 28.88 inches. The above set of observations suggested that the trough of the previous day in the vicinity of the 75 W. meridian had apparently moved very little and weakened. However, the weather map for Nov. 30 showed a significant intensification of an extratropical low pressure center which was near the Great Lakes the day before and had reached Newfoundland, with a cold front extending southwestward to near the southern tip of Florida. N.E. winds were reported at Key West and Havana and by three ships in the Florida Straits, being the maximum wind force 6 on the Beaufort scale at Havana. South of Cuba, near 20 N., 79 W., there was, however, a ship reporting a S.E. f. 3 wind, with partly cloudy sky, the wind direction being attributed to the frontal trough which was approaching from the N.W. According to M. Gutierrez-Lanza, S.J. (Diario de la Marina, Havana, Dec. 5, 1905, morning edition, p.5, col.1), 86 millimeters (3.39 inches) of rainfall fell at the Belen College Observatory from 7:30 P.M. Nov. 30 to 7:30 A.M. Dec. 1. He was of the opinion that the rainfall and that the strong N. to N.E. wind were in response to a depression of rotatory, cyclonic character which had been passing to the S. of Cuba, and which produced at Havana a slowly descending barometer that started in the evening of Nov. 28 and reached its minimum in the afternoon of Dec. 3, with a strong southerly wind. Data in Historical Weather Maps (Dec. 1905) do not seem to favor Gutierrez-Lanza's interpretation. Data on the map corresponding to Dec. 1 showed a huge and very strong anticyclone over the eastern Great Lakes region, with E.N.E. to E. winds f. 6 in the Florida Straits and Central Bahamas and a temperature of 73 degrees Fahrenheit at Havana. Although not drawn on the map, a dissipating front with an E.-W. orientation should have still been present to the S. of Havana. By the morning of Dec. 2, the anticyclone had moved to a position S. of Nova Scotia and a good convergence zone was shown over the Straits of Florida, with S.E. f. 5 wind at Havana and rain reported at Key West, the Dry Tortugas Lighthouse and a ship near 25 N., 85 W. These observations suggested that the front had moved northward as a warm front and that a wave was about to start forming in the S.E. Gulf of Mexico. Dy the morning of Dec. 3, the corresponding map showed an extratropical low pressure center just W. of Jacksonville, with a cold front extending to the extreme western Cuba. The minimum pressure which occurred at Havana in the afternoon of Dec. 3 was evidently associated with the frontal trough and not with a cyclonic center of imperfect organization which had presumably moved from the Caribbean S. of Cuba into the Gulf of Mexico as indicated in Diario de la Marina, Havana, Dec. 5, 1905, morning edition, p.5, col.1. Ortiz-Hector)1975) apparently followed the line of thought expressed by Father Gutierrez-Lanza when he prepared his track for the alleged Nov. 28- Dec. 3 storm of tropical character. But not only Ortiz-Hector (1975) did follow the priest's thought: Martinez-Fortun (1942) also stated that the heavy rains that fell over central Cuba by the end of Nov. 1905

were due to the cyclone to the S. In regard to the rainy and windy conditions in Cuba, L.G. Carbonell, Chief of the Meteorological Service, seems to have produced explanations which were closer to reality. In a note published in Diario de la Marina, Havana, Dec. 1, 1905, morning edition, p.5, col.1, he said that several persons had visited the Central Station to inquire about the prevailing weather and that, for the sake of public knowledge, he was stating that the "brisote sucio" (strong wind accompanied by rain) was related to a tempest to the north (apparently referring to the winter storm which had moved from the Great Lakes on Nov. 29 to Newfoundland on Nov. 30). Another note from the Central Station appeared in Diario de la Marina, Havana, Dec. 3, 1905, morning edition, p.4. col.3, and indicated that the temperature dropped to 18 degrees Fahrenheit at New York and to 24 degrees Fahrenheit at St. Louis on Nov. 30 and that on Dec. 1 readings were somewhat higher than the previous day as the cold wave which produced the temperature drop and the strong winds and rain (at Havana) had moved towards the first quadrant (N.E.). Finally, L.G. Carbonell issued a note on Nov. 4 which was published in Diario de la Marina, Havana, Dec. 5, 1905, morning edition, p.2, col.5. This note stated that the prevailing weather was related to the first norther of the season and that the rains that fell on Dec. 4, as well as those during the last days of the previous week, fell more heavily on the western portion and northern coast of the Republic than on the rest of Cuba, where cloudy skies and drizzle precipitation were more general. In spite of that the analysis which the author of this study has just presented does not support the alleged tropical storm described in Ortiz-Hector (1975) as having occurred over the period Nov. 28- Dec. 3, the author of this study decided to keep this storm as a possible case. The reason for the author's decision is that he feels that, although data in Historical Weather Maps (Nov. 1905) did not support tropical storm intensity while the weather system was near Jamaica on Nov. 28-29, there is still a low probability that the weather system had briefly reached tropical storm intensity.