YEAR 1906

Eleven storms were found to have occurred in 1906. Tracks for these storms are presented in Fig. 2.

Storm 1, 1906 (Jun. 8-14), T. S.

The following information was found about this storm: 1) Data extracted from 8 A.M. (E.S.T.) Historical Weather Maps: Jun. 8, no data in the vicinity of the storm. Jun. 9, ship near 24.3 N., 83 W., S.E. f. 6, 29.74; ship near 23.7 N., 81 W., S.E. f. 8. Jun. 10, ship near 24.5 N, 83.2 W., S. f. 5, 29.64; ship near 23.5 N., 84 W., W. f. 7. Jun. 11, ship near 26.7 N., 85.7 W., N.N.E. f. 9, 29.56; ship near 24.5 N., 83 W., S. f. 6, 29.66. Jun. 12, ship near 26 N., 84 WE, S.W. f. 9, 29.56; ship near 25.7 N., 85.7 W., W. f. 6, 29.65; Tampa, S.E. f. 4, 29.65; Pensacola, N.E. f. 4, 29.64. Jun. 13, center below 1005 millibars (29.68) placed over N.E. Alabama; data difficult to read off the map. Jun. 14, weak low pressure (extratropical) over central Illinois; system difficult to follow after this day (Historical Weather Maps, Jun. 1906). Author's note: Wind forces (f) are on Beaufort scale; pressures are in inches. 2) Central Meteorological Station, Jun. 9. The center of the perturbation which we talked about yesterday is still to the third quadrant and continues producing rains over the western portion of the Republic. At midnight (Jun. 8-9) the wind at Havana reached a maximum of 21.5 meters per second (48 mph). Ships sailing to the N., today and tomorrow, should exercise caution (Diario de la Marina, Havana, Jun. 10, 1906, morning edition, p.10, col.1). 3) Havana, Jun. 10. The Meteorological Station of the Republic has informed that at 10 A.M. yesterday (Jun. 9) the barometer read 752.76 millimeters (29.64 inches) and at 4 P.M. 751.48 millimeters (29.59 inches). The predominant wind was S.E. 5 meters per second or 11.2 mph (Diario de la Marina, Havana, Jun. 11, 1906, evening edition, p.2, col.1). 4) Belen College Observatory, Jun. 9, 11:30 A.M. At 7 A.M. we sent to the Weather Bureau of Washington the following cablegram: "Center of perturbation about 250 miles W. of Habana". In response to the telegram we received the following: "Storm advisory, 10 A.M. Perturbation at this time W. of Cuba will probably move N.E. causing strong winds on the Florida coast this afternoon or tonight, particularly at Key West, Miami, Jupiter and Jacksonville". There is no danger for us. L. Gangoiti, S.J. (Diario de la Marina, Havana, Jun. 9, 1906, evening edition, p.2, col.4). Author's note: The storm position given by Father Gangoiti was too far W. 5) Washington, Jun. 9. A tropical disturbance appeared Saturday morning W. of Cuba and is apparently central tonight off the S.W. Florida coast. It has thus far been attended by rain in Florida and the E. Gulf, with some high winds over the southern portion (The New York Times, Jun. 10, 1906, p.9, col.5). 6) The southern storm is still central off the western coast of Florida and some high winds have been reported from S. Florida stations (The New York Times, Jun. 11, 1906, p.7, col.6). Author's note: The above statement was probably issued in the evening of Jun. 10. 7) The southern storm appears to be still central in the eastern Gulf, with a slight diminution in intensity. Abnormally high tides were reported at Tampa and reports from southern Florida stations are missing (The New York Times, Jun. 12, 1906, p.9, col.7). Author's note: The above statement was probably issued in the evening of Jun. 11. 8) A ship from Galveston was wrecked at (Cayo) Buena Vista, Pinar del Rio, on Saturday (Jun. 9). Guardia Rural forces are helping the crew (Diario de la Marina, Havana, Jun. 11, 1906, evening edition, p.2, col.2). 9) The steamer "Conde de Wifredo", which arrived from New Orleans today, experienced much high wind and rough sea during the voyage (Diario de la Marina,

Havana, Jun. 12, 1906, evening edition, p.2, col.2). 10) Tampa, Jun. 14. The schooner "Emma J. Cottingham" developed a leak during the Saturday's storm (Jun. 9) and sank near Egmont Key on Sunday. The crew was picked up by the schooner "Thomas Denninson" (Diario de la Marina, Havana, Jun. 14, 1906, evening edition, p.2, col.4). 11) Of the June storms, one passed inland near Apalachicola on Jun. 12, attended by heavy rains but no winds of extraordinary force (Tannehill, 1938). 12) Storm of Jun. 12, 1906. Apalachicola. Minor (Dunn and Miller, 1960). 13) Some maximum velocities apparently associated with the storm were: Charleston, E. 47 mph; Savannah, S.E. 36 mph; Atlanta, N.E. 42 mph; Tampa, S.W. 39 mph; all of the velocities above were recorded on Jun. 12 (Monthly Weather Review, Jun. 1906). 14) Map showing a track for the storm: The track was started near 23 N., 85 W.in the morning of Jun. 9 and showed the storm moving N. until reaching N.E. Alabama in the morning of Jun. 13. It turned then to the N.N.W. and it was located over central Illinois in the morning of Jun. 14. By the morning of Jun. 15, the center was shown near 44 N., 88 W. and by the morning of Jun. 16 was shown near 43.5 N, 80 W., moving then to the S.E. (Monthly Weather Review, Jun. 1906). 15) A storm was first observed near 18 N., 82 W. on Jun. 8, 1906 and lasted 8 days; it recurved near 38 N., 90 W. and it was last observed near 44 N., 80 W. (Mitchell, 1924). Author's note: A track shown in Tannehill (1939) was found to be very similar to the corresponding track shown in Mitchell (1924). The track in Neumann et al. (1993) was also similar to the one in the publication just mentioned; however, the track in Mitchell (1924) was extended until Jun. 16 whereas the one in Neumann et al. (1993) was ended on Jun. 13.

On the basis of information in the above items, particularly in item 1), the author introduced some modifications along the track for Storm 1, 1906 which is displayed in Neumann et al. (1993). The 7 A.M. Jun. 8 position in the above publication was kept unchanged because such a position could not be checked due to lacking information for that day in item 1). Author's 7 A.M. positions for the period Jun. 9-12 were estimated as follows: Jun. 9, near 23.0 degrees N., 84.0 degrees W.; Jun. 10, near 25.0 degrees N., 84.3 degrees W.; Jun. 11, near 26.5 degrees N., 85.0 degrees W.; Jun. 12, near 28.5 degrees N., 85.5 degrees W. These new positions were about 30 miles to the E. of the ones in Neumann et al. (1993) for Jun. 9-10, about 60 miles to the S.S.E. of the 7 A.M. Jun. 11 position in the above publication and about 40 miles to the S. of the 7 A.M. Jun. 12 position in Neumann et al. (1993). Their 7 A.M. Jun. 13 position was kept unchanged but their track was extended to Jun. 14 by introducing a 7 A.M. position near 40.0 degrees N., 89.5 degrees W. for that day, in accordance with information in items 1) and 14). The author's track is displayed in Fig. 2.

The tropical storm status which Neumann et al. (1993) gave to Storm 1, 1906 was supported by information contained in items 1), 2) and 13). Tropical storm intensity was denoted along the author's track for the period Jun. 8-13 and the extratropical stage was introduced during the latter day in order to comply with information for Jun. 14 in item 1).

Storm 2, 1906 (Jun. 14-23), H.

The following information was found about this storm: 1) Data extracted from 8 A.M. (E.S.T.) Historical Weather Maps: Jun. 14, ship near 22 N., 78 W., W. f. 5, 29.91; ship near 22 N., 74 W., S.E. f. 4, 29.94; ship near 24 N., 79 W., E. f. 2. 29.91. Jun. 15, no data in vicinity of center, low placed just E. of Isle of Pines (wrong position). Jun. 16, Key West, E. f. 5, 29.77; ship or lighthouse near 24.5 N., 83 W., E. f. 6, 29.76, rain; center of low placed between Havana and Isle of Pines (wrong position). Jun. 17, Jupiter, E. f. 7, 29.70, rain; Key West, W.

f. 6, 29.75; ship near 24 N., 79 W., W.S.W. f. 6, 29.77, rain. Jun. 18, ship near 29 N., 76 W., N.W. f. 6; ship near 27 N., 74 W., S.S.W. f. 6, 29.88; ship near 33 N., 73 W., S.S.E. f. 7, 29.83; ship near 32 N., 77 W., E. f. 5, 29.77 ((wind direction seems wrong, pressure too high); low below 1005 millibars (29.68) placed 32 N., 76 W. (probably too far N. and W., near 30.7 N., 74.7 W. looks more seasonable). Jun. 19, ship near 37 N., 68.0 W., S.S.E. f. 9, 29.62; ship near 37 N., 72 W., N.E. f. 6, pressure could not be read, rain; low placed 36.5 N., 69.5 W. Jun. 20; low placed 36 N., 65 W., circulation defined by several ships along the periphery of the low. Jun. 21, ship near 35 N., 61.5 W., S.S.E. f. 6 (not clearly read), 29.74; ship near 34 N, 64.5 W. N.N.W. f. 5, 29.74. Jun. 22, center near 36 N., 60 W., defined by several ships along the periphery of the storm. Jun. 23, low below 1010 millibars (29.83) near 37 N., 55 W., a ship with S. f. 4 wind east of the low and a second ship with N. f. 5 wind to the W.N.W. of the low. Jun. 24, low having been absorbed in a frontal trough (Historical Weather Maps, Jun. 1906). Author's note: Wind forces (f) are on Beaufort scale; pressures are in inches. 2) Observations taken at Santa Clara (central Cuba) by Mr. Jover: In the afternoon of Jun. 14 the first clouds which were coming from the N.W. were observed, accompanied with torrential rain and gusty winds; by sunset the wind was N.W. with rain. By daybreak Jun. 15 the wind had backed to the S.S.W. and the barometer had dropped significantly. Obviously the center had moved towards the Florida Straits, "getting ready for its recurvature to the N.N.E." (Diario de la Marina, Havana, Jun. 21, 1906, morning edition, p.6, col.4-5). 3) Belen College Observatory, Jun. 15. We have sent today the following cablegram to the Weather Bureau of Washington: "Jun. 15, the center of the perturbation is near Cay Sal moving towards the Florida Straits". L. Gangoiti, S.J. (Diario de la Marina. Havana, Jun. 16, 1906, morning edition, p.8, col.1). 4) Havana, Jun. 15. According to observations of the Department of Meteorology of the Republic and telegrams received, there is a center of minimum pressure approximately to the E.S.E. of this capital (Diario de la Marina, Havana, Jun. 16, 1906, morning edition, p.8, col.1). Author's note: The position to the E.S.E. of Havana would have implied that the center was over land which, in reality, was not found to be the case. 5) Havana, Jun. 16. Observations taken at the Central Meteorological Station on Jun. 15: Barometer, 10 A.M. 756.61 millimeters (29.79 inches); 4 P.M., 753.20 millimeters (29.65 inches). Variable wind, average speed 5.6 meters per second or 12.5 mph (Diario de la Marina, Havana, Jun. 16, 1906, evening edition, p.2, col.2). 6) Central Meteorological Station, Jun. 16, 8 A.M. "The center of the perturbation continues to the E.S.E. of Havana, with N.E. wind since yesterday afternoon which has not exceeded 16 meters per second (36 mph). Observations from Havana and Pinar del Rio indicate that the motion is towards the fourth quadrant. Luis G. Carbonell (Diario de la Marina, Jun. 16, 1906, evening edition, p.2, col.1). 7) Central Meteorological Station, Jun. 16. The center of the perturbation is moving towards the fourth quadrant and is to the N. of the capital, where the lowest pressure occurred at noon (Jun. 16) when the wind reached 21.5 meters per second (48 mph) in gusts (Diario de la Marina, Havana, Jun. 17, 1906, morning edition, p.2, col.5-6). 8) Belen College Observatory, Jun. 16, 7 P.M. At noon we sent the following cablegram to the Weather Bureau of Washington: "The center of the perturbation is to the N. and not far from Matanzas, moving towards the W.N.W.". We received from Washington: "Storm warnings have been ordered at Tampa, Punta Gorda, Punta Rassa, Key West, Miami and Jupiter at 4 P.M. The storm appears to be moving W., but inclining to the N. Strong easterly winds on the Florida coasts tonight and Sunday". (Diario de la Marina, Havana, Jun. 18, 1906, evening edition, p.2, col.5). 9) Sagua la Grande, Jun. 15, 4:15 P.M. As a result of the rain storm the Sagua River has overflowed (Diario de la Marina, Havana, Jun. 16, 1906, morning edition, p.8, col.1). 10) Santo Domingo (central

Cuba).Jun. 15, 5 P.M. The Sagua River is overflowing due to the rain storm (Diario de la Marina, Jun. 26, 1906, morning edition, p.8, col.1). 11) Matanzas, Jun. 15, 7 P.M. A strong rain and wind storm prevails since this morning. Reports from Union de Reyes, Jovellanos and Colon indicate that the weather has the aspect of a tempest (Diario de la Marina, Havana, Jun. 16, 1906, morning edition, p.8, col.1). 12) Pedro Betancourt, Jun. 16. Since 2 A.M. yesterday rain has not stopped and has been accompanied by gusts from the S. and S.W. At 9:40 A.M. today there is no improvement (Diario de la Marina, Jun. 20, 1906, evening edition, p.6, col.6). Author's note: Pedro Betancourt is located near the center of Matanzas province. 13) There were abundant rains and the wind blew from the S. at Moron (on the northern coast of Camaguey province). The wind force at Matanzas reached 12.5 meters per second or 28 mph (Diario de la Marina, Havana, Jun. 19, 1906, evening edition, p.1, col.2). 14) The sloop "Siglo XX" brought here the crew of the schooner "Hidie Feroe" which was wrecked at Punta India (Rincon de Guanabao) and sunk at 12:30 hours on Saturday, Jun. 16 (Diario de la Marina, Havana, Jun. 20, 1906, morning edition, .8, col.1). 15) A moderate cyclone near the northern coast of the Santa Clara and Matanzas provinces. Some vessels were lost and there was extensive flooding (Sarasola, 1928). Author's note: Actually taken from the catalog of Cuban cyclones by M. Gutierrez- Lanza which is included in Sarasola (1928). 16) A cyclone to the north of the central provinces of Cuba on Jun. 15-16 caused heavy rains at Remedios (Martinez-Fortun, 1942). Author's note: Remedios is located near the northern coast of central Cuba. 17) At Key West, wind was N.E. 38 mph and pressure was 29.60 inches at station level (29.62 inches corrected to sea level) at 8 P.M. Jun. 16. The maximum wind velocity was 42 mph (Weather Bureau, 1908). 18) Other maximum velocities were: N.E. 70 mph at Sand Key on Jun. 16 and N.E. 49 mph at Jupiter on Jun. 17 (Monthly Weather Review, Jun. 1906). Author's note: Tannehill (1938 also published these maximum winds. 19) The minimum pressure at Jupiter was 29.64 inches (Weather Bureau, 1908). Author's note: Probably this value was not corrected to sea level. 20) The rain began to fall and the wind to blow (at Miami) in the early part of Saturday night (Jun. 16) and with an occasional let-up continued all night until 6 A.M. Sunday. At this time the wind calmed down and the sun tried hard to come out but was again covered by the gathering storm and about 8 A.M. the wind and rain again reigned supreme and kept up until 11:45 A.M. (The Daily Miami Metropolis, Jun. 18, 1906, p.1, col.1). 21) Metropolis Bureau, Key West, Jun. 21. The steamer "Olivette" arrived Sunday morning (Jun. 17) from Havana, having been out 18 hours. The sea was very rough but the steamer made good headway. She left Havana at 3 o'clock Saturday afternoon (Jun. 16). As night approached the storm increased and on account of the torrents of rain Sand Light was not discernable. Not daring to venture along the reefs under such conditions, the captain lay to until daylight. The storm when blew over the city (Key West) Saturday was very severe and had it lasted longer serious damage would have resulted. For a time the wind blew at 42 mph and rain fell in torrents. About 8 P.M. the storm began to abate and by daylight the storm has passed (The Daily Miami Metropolis, Jun. 22, 1906, p.6, col.3). 22) During the storm a big boat was dashed through the Peacock (Coconut Grove) stove wharf and both were badly damaged. Just before day (Jun. 17) the big sloop "Springwell" came ashore at Mr. Kirk Monroe's place. Capt. Sweeting said that he had drifted from Cape Florida where he was anchored Saturday night (The Miami Metropolis, Jun. 22, 1906, p.7, col.3). 23) Storm of Jun. 17, 1906. Extreme South Florida. Minimal (Dunn and Miller, 1960). 24) The tropical disturbance is apparently still off the eastern Florida coast and diminishing in energy (The New York Times, Jun. 18, 1906, p.7, col.6). Author's note: The above statement was probably issued in the evening of Jun. 17. 25) Map showing a track for this storm. The track was started near

Cienfuegos in the morning of Jun. 16. The center was placed near 23.5 N., 81 W. by the evening of that day and near 26 N., 80.5 W. in the morning of Jun. 17. It was near 29 N., 79.5 W. by the evening of Jun. 17 and near 33 N., 76 W. in the morning of Hun. 18 (Monthly Weather Review, Jun. 1906). Author's note: With the exception of the Jun. 17 morning position given above, all other positions proved to be in significant error. 26) A storm was first observed near 22 N., 76 W. on Jun. 12, 1906 and lasted 14 days; it recurved near 23 N., 82 W. and it was last observed near 46 N., 24 W. (Mitchell, 1924). Author's note: The corresponding track in the above publication suggested that Jun. 12 was not the starting date for this storm and that the correct day should be Jun. 14; this track brought the storm center over central Cuba on Jun. 15-16, which proved to be wrong. The track in Tannehill (1938) was found to be very similar to the one in Mitchell (1924). The track for this storm in Neumann et al. (1993), although showing some similarities with the above tracks, did not bring the storm center over Cuba but it made to pass a short distance off the northern Cuban coast.

On the basis of information in the above items, the author of this study introduced a number of modifications along the track in Neumann et al. (1993). The author's track was started with a 7 A.M Jun. 14 position which was estimated near 23.0 degrees N., 77.5 degrees W. on the basis of information for that day in items 1) and 2); this position was found to be about 90 miles to the W.N.W. of the corresponding one in Neumann et al. (1993). The author's 7 A.M. Jun. 15 position was near 23.3 degrees N., 80.5 degrees W. and was based on information in items 2) and 3); this position was found to be about 150 miles to the W.N.W. of the one in the above publication. The author's 7 A.M. Jun. 16 position was estimated near 23.5 degrees N., 81.5 degrees W., primarily on the basis of information in item 8) and to a lesser extent on information in item 12); this position was about 80 miles to the W.N.W. of the corresponding one in Neumann et al. (1993). The author's 7 A.M. Jun. 17 position was based on information in item 20) which showed the storm center to have been over Miami at that time; this position was near 25.7 degrees N., 80.3 degrees W. and was found to be about 70 miles to the S. of the corresponding position in the above publication. On the basis of information in item 1), the author estimated 7 A.M. positions for the period Jun. 18-23 as follows: Jun. 18, near 31.0 degrees N., 74.7 degrees W; Jun. 19, near 36.3 degrees N., 69.5 degrees W.; Jun. 20, near 36.0 degrees N., 65.0 degrees W.; Jun. 21, near 35.0 degrees N., 63.0 degrees W.; Jun. 22, near 36.0 degrees N., 60.0 degrees W.; Jun. 23, near 37.0 degrees N., 55.0 degrees W. Differences between author's positions for the period Jun. 18-23 and the corresponding ones in Neumann et al. (1993) were found to range from about 120 miles on Jun. 20 to just a few miles on Jun. 21-22. The author's track for Storm 2, 1906 is shown in Fig. 2.

The author of this study accepted the hurricane status which Neumann et al. (1993) gave to this storm; his acceptance was based on the fact that a wind velocity of 70 mph from the N.E. was recorded at Sand Key (item 18), indicating that the 1-minute averaged wind at that station probably reached hurricane intensity (74 mph) but, even if this were not the case, hurricane winds should have blown at any rate to the east of the N. and N.E. moving storm center, which obviously passed to the E. of Sand Key. Therefore, hurricane intensity was denoted along the author's track starting as the storm crossed the 24 N. parallel in the afternoon of Jun. 16. Prior to that time, tropical storm intensity was denoted along the author's track. As in Neumann et al. (1993), weakening to tropical storm status was introduced along the author's track early on Jun. 21 and the extratropical stage was introduced on Jun. 23.

Storm 3, 1906 (Aug. 22-25), T. S.

This is a new case which has been recently documented by the author of this study; the case, of course, is not included in Neumann et al. (1993).

Documentation of this case was based on the following information: 1) Data extracted from 8 A.M. (E.S.T.) Historical Weather Maps: Aug. 22, low placed 29 N., 53 W. (probably a bit E.); ship near 28 N., 51 W., S. f. 6, 29.97; ship near 30 N., 61 W., N. f. 3, 30.06. Aug. 23, low placed 32 N., 59 W. (too far N. and W., 31.7 N., 56.7 W. appears to be a much better location); ship near 32 N., 55.3 W., S.E. f. 8, pressure could not be clearly read but probably 30.12 inches (too high). Aug. 24, low below 1005 millibars (29.68) placed 33.5 N., 56 W. (too far W., near 33.5 N., 54.5 W. appears to be much better); ship near 33 N., 55 W., W. f. 10, 29.62. Aug. 25, frontal wave near 39 N., 48 W.; ship near 39 N., 46 W., S.S.E. f. 5, 29.65, temperature 76 degrees Fahrenheit; ship near 38.5 N., 51 W., N. f. 7, 29.94 (probably too high), temperature 67 degrees Fahrenheit. Aug. 26, system could not be identified (Historical Weather Maps, Aug. 1906). Author's note: Wind forces (f) are on Beaufort scale, pressures are in inches.

Based on information in item 1), the author of this study prepared a track for Storm 3, 1906. Author's 7 A.M. positions were estimated as follows: Aug. 22, near 29.0 degrees N., 54.0 degrees W.; Aug. 23, near 31.3 degrees N., 56.7 degrees W.; Aug. 24, near 33.5 degrees N., 54.5 degrees W.; Aug. 25, near 39.0 degrees N., 48.0 degrees W. The author's track is displayed in Fig. 2.

As a maximum wind reported in connection with this storm was W. f. 10 on Aug. 24, the author of this study decided to assign tropical storm intensity to this weather system; however, he admits that there is a chance that stronger winds had occurred and, if this were the case, hurricane intensity could have been reached. Tropical storm status was denoted along the author's track over the period Aug. 22-24 and the extratropical stage was introduced on Aug. 25.

Storm 4, 1906 (Aug. 25- Sept. 12), H.

This storm corresponds to Storm 3, 1906 in Neumann et al. (1993).

The following information was found in relation to this storm: 1) Data extracted from 8 A.M. (E.S.T.) Historical Weather Maps: Aug. 25-26, data do not clearly fit the existence of a cyclonic circulation in the eastern Atlantic. Aug. 27, ship near 17 N., 34 W., E. f. 5, 29.91; ship near 14 N., 28 W., S.S.E. f. 1. Aug. 28, ship near 17 N., 49 W., E.N.E. f. 4. Aug. 29, center of low placed 10 N., 47.5 W. (too far S.). Aug. 30, ship near 15 N., 53 W., E. f. 6, 29.83, rain; ship near 12 N., 51 W, S.W. f. 4, 29.94; ship near 12 N., 57 W., N.W. f. 1, 29.97; Barbados, N.E. f. 1, 29.95; center of low placed 13 N., 53.5 W. Aug. 31, center of low placed near 18 N., 56 W. (too far N.); ship near 19 N., 59 W., N.E. f. 4, 29.80 (Historical Weather Maps, Aug. 1906). Author's note: Wind forces (f) are on Beaufort scale; pressures are in inches. 2) Data extracted from 8 A.M. (E.S.T.) Historical Weather Maps: Sept. 1, ship near 17.5 N., 60 W., E. f. 9, 29.62; Dominica, W. f. 3, 29.82; St Kitts, N.E. f. 3, 29.77; ship near 17.7 N., 61.7 W., E.N.E. f. 6, 29.80; Martinique, S.W. force could not be read, 29.85; Barbados, S.W. f. 4, 29.92; center placed 17 N., 60 W. Sept. 2, St Kitts, S. f. 7, 29.79; ship near 19 N., 64 W., E.S.E. f. 3, pressure could not be read, ship was apparently in the vicinity of the storm center as suggested by the weak wind; San Juan, N.W. f. 4, 29.74, center placed near 17 N., 64.7 W. (too

far S.). Sept. 3, ship near 23 N., 65 W., E.N.E. f. 10; ship near 22 N., 68.7 W., N.E. f. 4, pressure could not be read, rain; San Juan, S.W. f. 4, 29.70; center placed 21.3 N., 64.7 W. (too far N. and E.). Sept. 4, San Juan, S. f. 4, 29.78; Santo Domingo, S.S.W. f. 3, 29.75; Turks Is., N. f. 5, pressure could not be clearly read but probably around 29.74; ship near 22 N., 64 W., S.E. f. 7, 29.80; center placed 21.5 N., 67.5 W. (too far E.). Sept. 5, ship near 26 N., 68.7 W., E. speed could not be read, 29.80; Turk Is., S.W. f. 6, 29.88; ship near 23 N., 73.7 W., N. f. 3, 29.80 (probably too high); center placed 24.3 N., 69.5 W. (too far E. and probably a bit N.). Sept. 6, no data in the vicinity; center placed 28 N., 75 W. (too far N.). Sept.7, ship near 31 N., 78 W., N.N.W. f. 7 (wind direction probably in error), 29.77; Jupiter, N.W. f. 3, 29.78; ship near 25 N., 74 W., S.W. f. 5, 29.77, showers; Charleston, N. f. 4, 29.90; Wilmington, N. f. 3, 29.89; Hatteras, N.N.E. f. 4, 29.92; center placed 29 N., 75 W. (it seems too far E. and perhaps a bit S.). Sept. 8, ship near 29 N., 75 W., W.N.W. f. 7, 29.62; ship near 29 N., 68.8 W., S.S.W. f. 10, 29.44; ship near 34.7 N., 71 W., N.E. f. 6, 29.71; ship near 32.8 N., 72.8 W., N.E. f. 6. 29.71; center placed 30.5 N., 69.5 W (probably a little far E.). Sept. 9, ship near 35.7 N., 65 W., N.E. f. 8; ship near 31 N., 63 W., S. f. 7, 29.68; ship near 30 N., 63 W., S.W. f. 9, 29.59; center placed 34 N., 64 W. (too far N. and E.). Sept. 10, ship near 39 N., 57 W., S.S.E. to S. f. 8, 29.35; ship near 40 N., 62 W., E.N.E. f. 6, 29.56; ship near 41 N., 64 W., N.N.E. f. 6, 29.68; center placed 38.7 N., 60 W. (probably a bit N.). Sept. 11, extratropical low placed 45 N., 45 W. Sept. 12, extratropical low placed 53 N., 25 W. (Historical Weather Maps, Sept. 1906). Author's note: Wind forces (f) are on Beaufort scale; pressures are in inches. 3) Taken from a storm report by E.B. Garriott: According to Mr D. Hope Ross, official in charge of the Weather Bureau office at St. Kitts, the barometer there read 29.76 inches at 6 A.M. Sept. 1, it rose slowly to 29.77 at time of observation, and then fell steadily to 29.64 inches at 5 P.M. Sept. 1, the lowest point reached, and rose slowly afterwards. The wind steadily decreased from midnight Aug. 31 and at 12:30 P.M. Sept. 1 it was less than 3 mph. Shortly after, it increased slowly, shifted from N.N.E. and N. to S.W. and S.S.W.. It blew steadily from that quarter with increased force and reached a maximum velocity of 60 mph between 3:35 and 3:40 A.M. Sept. 2, with an extreme velocity for 1 minute at 70 mph at 3:36 A.M. Rainfalls were heavy and varied from about 6 to 13 inches at different points of the island. The weather observer at San Juan reported that the maximum velocity there was 35 mph from the W. on Sept. 3 and that no material damage was caused on the island although 8.48 inches of rain fell on Sept. 4. During Sept. 4-5 the center of disturbance moved N.W. and passed N. of Turks Island on Sept. 4. During Sept. 6-7 it gradually recurved E. of the northern Bahamas and was severely felt by vessels navigating that region. At 3 A.M. Sept. 7, the schooner "John Rose", in lat. 28 37 N., long. 77 04 W., had a barometer
reading of 29.01 inches. The vessel was held before the wind on a S.W. course, and the wind shift encountered was from N.E., back to N. and N.W., but there was no cross seas until the center passed. By the morning of Sept. 8 the storm has completed its recurvature to the N.E. By the morning of Sept. 9, the center had past to the W. and N. of Bermuda and the reading of the barometer at Hamilton was 29.18 inches. The storm was exceptionally severe in the trans-Atlantic steamer tracks on Sep. 10-11. The experience of the steamship "Koenigin Luise" indicates the intensity of the storm in the region of the Grand Banks. The steamer encountered the hurricane Sept. 10 in lat. 39 N., long. 55 W., and at 8 P.M. the barometer read 28.06 inches. The vessel was unable to resume full speed until 5 A.M. Sept. 11, 14 hours after the storm began (Monthly Weather Review, Sept. 1906). Author's note: Tannehill (1938) also offered a brief description of this storm, adding that the storm originated near the Cape Verde Islands. 4) Taken

from the Royal Gazette, Sept. 11: "A severe and prolonged gale visited Bermuda on Saturday and Sunday (Sept. 8-9) but fortunately no great destruction of property has been recorded. For 2 or 3 days previously the barometer gave indications of a change and on Friday afternoon at half past 5 o'clock the reading was 30.03 inches and from that time the glass continued to fall until Sunday morning (Sept. 9) at 9 o'clock it reached its minimum when it recorded 28.90 inches. On Saturday afternoon a breeze sprang up from the southwest and steadily increased in violence until at the height of the gale early Sunday the wind attained a rate of 70 miles an hour..." (Tucker, 1982). 5) Washington, Sept. 1. A tropical disturbance central this morning S.E. of St. Kitts is moving N.W. and is now apparently E.S.E. of Puerto Rico. Thus far on its course it has not, so far as known, developed dangerously high winds (The New York Times, Sept. 2, 1906, p.9, col.6). 6) Belen College Observatory, Sept. 1, 11 A.M. The disturbance E. of Barbados that we indicated yesterday it has moved away somewhat from that island, being now towards the N.N.W. of Bridgetown; it is now moving to the N.W., probably towards Puerto Rico or vicinity. L. Gangoiti, S.J. (Diario de la Marina, Havana, Sept. 1, 1906, evening edition, p.8, col.1). 7) Sept. 1, noon. The Meteorological Service of the Republic has received the following cablegram from the Weather Bureau of Washington: "Perturbation to the E. of the Windward Islands. Center at 8 A.M. to the S.E. of St. Kitts, where the barometer read 29.76 and the wind was N.E. 12 mph, with a maximum velocity of 24 mph. Before we received the above cablegram, we had requested information from Barbados and the reply was: "At 11 A.M., barometer 29.92 inches, wind S. 30 mph, cloudy sky and drizzle. Heavy rough sea and some swell from N.W." (Diario de la Marina, Havana, Sept. 2, 1906, morning edition, p.5, col.1). 8) Washington, Sept. 2. The tropical disturbance was apparently E. of Puerto Rico this morning, moving a little W. of N. (it should probably read N. of W.). High swells were reported from St. Kitts but no destructive winds have occurred elsewhere, so far as is known (The New York Times, Sept. 3, 1906, p.7, col.6). 9) Washington, Sept. 3. The tropical disturbance has not yet passed Turks Island at 3 P.M. Monday (Sept. 3). Its future course is yet uncertain (The New York Times, Sept. 4, 1906, p.9, col.7) 10) The following cablegram was received at the National Meteorological Service from the Weather Bureau of Washington: Advisory issued at 10:45 A.M. (Sept. 3). The tropical perturbation passed to the E. and near Puerto Rico and continues its N.W. course and it will pass near the eastern Bahamas with increased intensity (Diario de la Marina, Havana, Sept. 4, 1906, morning edition, p.6, col.1). Author's note: The same advisory was published by L. Gangoiti of the Belen College Observatory, who added "that it will be felt with some force tonight on the coast of Santo Domingo". 11) Washington, Sept. 4. The tropical disturbance passed Turks Island today on the course N.W. towards the Bahamas. It should manifest itself over the eastern islands of the group in 24 to 36 hours (The New York Times, Sept. 5, 1906, p.9, col.6). 12) This morning (Sept. 4), we have received (at the National Meteorological Service) the following telegrams (from Washington): "Advisory at 10:30 A.M. The center of the perturbation appears to be approaching the E. Bahamas on a course towards the W. one quarter to the N.W. Shipping is considered dangerous for vessels off the southern coast of the United States in the next few days". A second cablegram stated: "Turks Is., 11 A.M., barometer 29.72 inches, wind N.W. 24 mph., cloudy sky" (Diario de la Marina, Havana, Sept. 5, 1906, morning edition, p.8, col.3). 13) Havana, Sept. 5. The following cablegrams were received by the Meteorological Service of Cuba from the Weather Bureau of Washington: "Sept. 4, Turks Is, 1 P.M., barometer 29.70 inches, wind N.W. 28 mph with a maximum of 30 mph, cloudy sky". "Sept. 5 (it should read Sept. 4), 10 P.M. The tropical storm center has passed N. of Turks Is. on a W. one quarter to the N.W. course, posing a danger to shipping off the S.E. coast of U.S. during the next few

days". "Advisory at 4 P.M. Sept. 5. Key West, Miami, Jupiter and Jacksonville are being notified that the tropical perturbation is approaching Nassau and it is likely that will reach the Florida coast Thursday or Thursday night, Sept. 6" (Diario de la Marina, Sept. 6, 1906, morning edition, p.4, col.6). 14) Washington, Sept. 5. The tropical disturbance was apparently central this morning over the eastern Bahamas (The New York Times, Sept. 6, 1906, p.9, col.6). 15) Sept. 6, 6 P.M. The following cablegrams were received at the Central Meteorological Station from the Weather Bureau of Washington: "Advisory at 10:15 A.M. The center of the perturbation is passing near and to the N. of Nassau on a course some to the N. of W. Danger for shipping off the Atlantic coast of the U.S. during the next few days". "Hurricane warnings continue at 4:30 P.M. (Sept. 6) at Jupiter and Jacksonville. The center of the perturbation is over the extreme northern Bahamas, moving some N. of W" (Diario de la Marina, Sept. 7, 1906, p.4, col.5). 16) Washington, Sept. 6. The center of the disturbance has not yet reached the South Atlantic coast, although there were some signs of it this afternoon. Hurricane warnings are displayed on the East Florida coast (The New York Times, Sept. 7, 1906, p.9, col.6). 17) Washington, Sept. 7. The tropical disturbance is probably at sea E. of the Carolinas (The New York Times, Sept. 8, 1906, p.9, col.7). 18) Two maps showing storm tracks, one of them over the period Sept. 1-9 and the second one over the period Sept. 4-9. The first track was shown to extend from the vicinity of the Lesser Antilles to near Bermuda and the second track was started just N. of Puerto Rico. Both tracks showed the storm to have recurved near 28 N., 76.5 W. on Sept. 7 (Monthly Weather Review, Sept. 1906). 19) A storm was first observed near 14 N., 29 W. on Aug. 25, 1906 and lasted 19 days; it recurved near 27 N., 75 W. and it was last observed near 65 N., 21 W. (Mitchell, 1924). Author's note: The track for this storm in Mitchell (1924) was found to be very similar to the one published in Tannehill (1938) and also was quite similar to that in Neumann et al. (1993). On the basis of information in the above items, the author of this study introduced a series of modifications along the track for this storm which Neumann et al. (1993) show as for Storm 3, 1906. No modifications were introduced over the period Aug. 25-27 because the track for those days could not be checked against data (item 1). On the basis of data in item 1) and space-time continuity, the author's 7 A.M. positions for Aug. 28-31 were estimated as follows: Aug. 28, near 14.0 degrees N., 43.0 degrees W.; Aug. 29, near 13.7 degrees N., 47.7 degrees W., Aug. 30, near 13.3 degrees N., 53.5 degrees W.; Aug. 31, near 15.0 degrees N., 57.5 degrees W. Author's 7 A.M positions for Sept. 1-3 were estimated on the basis of information in items 2) and 3); these positions were as follows: Sept. 1, near 17.0 degrees N., 60.7 degrees W.; Sept. 2, near 19.0 degrees N., 64.0 degrees W.; Sept. 3, near 20.0 degrees N., 66.7 degrees W.. The author's 7 A.M. Sept. 4 position was estimated near 21.3 degrees N., 69.7 degrees W. on the basis of information in items 2), 3), 12) and 13). 7 A.M. positions for Sept. 5-6 in Neumann et al. (1993) were found to be reasonable and, therefore, were kept unchanged; however, their positions for 7 A.M. Sept. 7-8 were modified on the basis of information in items 2) and 3), resulting in author's estimated positions near 29.0 degrees N., 76.0 degrees W. and near 30.3 degrees N., 70.5 degrees W. for 7 A.M. Sept. 7 and 7 A.M. Sept. 8. The author's 7 A.M. Sept. 9 position was based on information in items 2) and 4) and was near 32.5 degrees N., 65.7 degrees W. Author's 7 A.M. positions for the period Sept. 10-12 were based on information for those days in item 2), the weather description provided by the "Koenigin Luise" (item 3) and space-time continuity; these positions were as follows: Sept. 10, near 37.0 degrees N., 60.0 degrees W.; Sept. 11, near 45.0 degrees N., 45.0 degrees W.; Sept. 12, near 23.0 degrees N., 25.0 degrees W. The difference between the author's new positions and the ones for corresponding days in Neumann et al. (1993) was found to range from about 200 miles on Aug.

30, Sept. 11 and Sept. 12 to a few miles on Sept. 4 and Sept. 8. The author's track for Storm 4, 1906 is shown in Fig. 2.

The hurricane status that Neumann et al. (1993) gave to this storm as for Storm 3, 1906 was found to be supported by the content of several of the items above. In fact, the barometer reading of 28.06 inches reported by the "Koenigin Luise" at 8 P.M. Sept. 10 (item 3) clearly indicated that Storm 4, 1906 became a major hurricane in the northern Atlantic. As in the storm track shown in Neumann et al. (1993), hurricane status was denoted along the author's track over the period Aug. 25- Sept. 10; however, the author believes that, in reality, hurricane intensity probably was not reached until the end of Aug. The extratropical stage was introduced along the author's track on Sept. 11.

Storm 5, 1906 (Sept. 3-18), H.

This is the same storm which Neumann et al. (1993) identify as Storm 4, 1906.

The following information was found about this storm: 1) Data extracted from 8 A.M. (E.S.T.) Historical Weather Maps: Sept. 3, ship near 12 N., 35 W., N.E. f. 5, 29.80; center placed 10 N., 35 W., probably too far W. Sept. 4, ship near 10 N., 37 W., N. f. 6, 29.71; center placed 9 N., 35.5 W. Sept. 5, ship near 8 N., 39 W., S.W. f. 4, 29.77; ship near 8 N., 42 W., S.W. f. 4, 29.94; center placed 11 N., 39.5 W. Sept. 6, ship near 7 N., 40.7 W., S.W. f. 4, 29.80; center placed 11.5 N., 42.5 W. Sept. 7, ship near 17.7 N., 45 W., E.S.E. f. 6, 29.88; center placed 14 N., 46.5 W. (probably a bit S.). Sept. 8, ship near 15.7 N., 56 W., N. f. 3, 29.91; ship near 16.7 N., 46 W., S.S.E. f. 3; center placed 15 N., 48.5 W. (probably a bit S.). Sept. 9, ship near 14 N., 48 W., W. f. 1; 29.97 (probably too high); ship near 16.8 N., 57 W., N. f. 3, 29.94; center placed 17 N., 51.3 W. (probably a bit S. and too far W.). Sept. 10, ship near 18 N., 57 W., N. f. 3; center not drawn that day; however, it could have been near 19.5 N., 50.5 W. based on space-time continuity; three ships near lat. 10 N. and between 50 W. and 55 W. had W. winds force 2-3. Sept. 11, ship near 22 N., 53 W., E. f. 6, 29.83; ship near 18 N., 56 W., W. f. 3, 29.94; center placed 19.7 N., 51 W., but near 21 N., 54 W. seems to be a much better location. Sept. 12, ship near 27 N., 67 W., N.E. f. 8 (probably too high); ship near 29 N., 60 W., E. f. 4, 29.97; ship near 20 N., 57 W., S. f. 5, 29.97; center placed 24 N., 62 W. (probably a bit N., and too far W.). Sept. 13, ship near 31 N., 62 W., E.S.E. f. 9; ship near 28 N., 63 W., S.E. to S.S.E. f. 8; ship near 23 N., 64.8 W., N. force could not be read, pressure could not be read, showers; ship near 29 N., 69 W., E.S.E. f. 5 (wind direction was probably wrong); ship near 26.7 N., 73.7 W., N.N.E. f. 4, 29.97; center placed 24 N., 63.5 W. Sept. 14, ship near 30 N., 66 W., E. f. 8; ship near 28 N., 65 W, S.S.W. speed not clear but high; center placed 26 N., 66.5 W. Sept. 15, ship near 31 N., 65 W., S.S.E. f. 6, 29.77; ship near 26 N., 69 W., S.W. f. 5, 29.86; ship near 29.8 N., 71 W., N. f. 6; center placed 30 N., 67 W. Sept. 16, ship near 32 N., 71 W., N. f. 10; center placed 31.7 N., 70 W. Sept. 17, data difficult to read off the map; ship near 33 N., 74 W, E.S.E. speed could not be read; ship near 32 N, 77.7 W., N. or N.N.W. wind (speed could not be read); center placed 32 N., 76.5 W. Sept. 18, station near the convergence point of the borders of S.C., N.C. and Ga., N.E. f. 4, 29.83 (lowest barometer in the area); weak low placed in that vicinity (Historical Weather Maps, Sept. 1906). Author's note: Wind forces (f) are on Beaufort scale; pressures are in inches. 2) Taken from a report prepared by E.B. Garriott: On Sept. 12 there was evidence of a slight depression near Puerto Rico. From this position it moved to the neighborhood of the Windward Channel, where there were indications of its presence on Sept. 14, after which it appeared to pass northward over

the ocean. During Sept. 16 falling barometer and increasing N. winds over the South Atlantic coast showed the presence of a barometric disturbance off the coast, but the absence of reports from the ocean area rendered impossible to determine its future course. On the morning of Sept. 17 its close to the Carolina coast was shown and by 1 P.M. it had reached the coast line N. of Charleston, where the barometer at that hour read 29.44 inches and the wind had reached a velocity of 46 mph from the W. The observer at Charleston indicated that the barometer began to fall at 11 P.M. Sept. 16. The wind shifted to N.W. at 5 A.M. Sept. 17 and backed to S. at 5 P.M., from which quadrant it continued until midnight (Sept. 17-18). From 11 A.M. to 9 P.M. it blew a moderate and at times fresh gale, the highest velocity, 48 mph, occurring at 3:30 P.M. The damage to shipping along the coast between Charleston and Wilmington was, however, considerable and crops were destroyed near Georgetown where the center moved inland. At Wilmington the maximum velocity had been 52 mph from the N.E. After crossing the coast line the storm lost strength rapidly and during its subsequent course to the lower Ohio Valley and then northward its energy was expended in heavy rains (Monthly Weather Review, Sept. 1906). Author's note: The above description of the early stages of the storm near Puerto Rico and the Windward Channel proved to be in error. Tannehill (1938) also published a shorter description of the storm in which he added that "no reports were received from the immediate storm center as it moved over land". 3) Washington, Sept. 17. The disturbance reported this morning off Wilmington N.C. has moved W.S.W. and is central tonight over eastern Georgia. The storm is one of a very small diameter but nevertheless of destructive character in the center of the whirl. Winds of 52 mph occurred this afternoon on the Carolina coasts. It now seems that the storm will move inland towards the Mississippi Valley and not N.E. along the Atlantic coast. Storm warnings are displayed from Cape Cod to Jacksonville (The New York Times, Sept. 18, 1906, p.9, col.7). 4) Washington, Sept. 18. The storm that appeared on the South Atlantic coast Monday morning (Sept. 17) has moved N.W. to the western portions of Kentucky and Tennessee with a rapid decrease in intensity (The New York Times, Sept. 19, 1906, p.9, col.2). 5) The steamship "Verona", in yesterday from Port Antonio (Jamaica), was caught in the hurricane which raged off Cape Hatteras on Sunday and Monday (Sept. 16-17). The hurricane came out of the N.E. and, according to the skipper, while it lasted was about as stiff an affair he has encountered in many years. The "Uller" and the "Jamaica" reported encountering the same hurricane. So did the liner "Katahdin" which got in from Jacksonville and Charleston (The New York Times, Sept. 19, 1906, p.16, col.4). 6) Norfolk, Va., Sept. 19. The chart house of the tramp steamer "Laura" was swept into the sea during the hurricane off Hatteras on Sunday night and Monday morning, carrying with it Capt. Charles T. Adams, John Brenaan, the man at the wheel and W. Elliott, a fireman (The New York Times, Sept. 20, 1906, p.1, col.2). 7) Norfolk, Va., Sept. 22. Two seamen were rescued from the wreck of the schooner "Nelson E. Newbury" and landed here by the steamer "Egda". The "Newbury" sailed from Port Royal, S.C. to New York on Sept. 8 and last Monday (Sept. 17) when they were off Charleston a hurricane struck them (The New York Times, Sept. 23, 1906, p.9, col.5). 8) The following maximum wind velocities were associated with this storm: Columbia, S.C., N.E. 44 mph; Charleston, S.W. 48 mph; Wilmington, N.E. 50 mph; Raleigh, N.E. 24 mph; Charlotte, N.E. 32 mph; all of the above velocities were recorded on Sept. 17; Hatteras, N.E. 39 mph on Sept. 16; Asheville, E. 18 mph on Sept. 18 (Monthly Weather Review, Sept. 1906). 9) Minimum pressure at Wilmington was 29.54 inches and at Charleston 29.39 inches, apparently without applying the reduction to sea level (Weather Bureau, 1908). 10) Storm of Sept. 17, 1906. Myrtle Beach, S.C. Major. Barometer 27.90 at Cape Fear (Dunn and Miller, 1960). Author's note: As Cape Fear is only 25

miles from Wilmington and the maximum velocity at the latter place was only 50 mph (item 8) with a minimum pressure of 29.54 inches (item 9), the barometer reading of 27.90 inches is highly suspected to be in error, implying that the storm probably was not a major hurricane. 11) Two maps showing tracks for this storm. Both tracks were started in the vicinity of Hispaniola-Puerto Rico, brought the alleged storm to the Windward Passage on Sept. 13 and then to the N.N.E. until Sept. 15. By Sept. 16 the tracks showed a turn to the N.W. and W.N.W. and on the morning of Sept. 17 the center was placed off the South Carolina coast to the E. of Charleston. One of the tracks showed the center over extreme S.E. Tennessee in the morning of Sept. 18 and then moving northward later that day. The center was placed near Evansville in the morning of Sept. 19, to the W. of Detroit in the morning of Sept. 20 and to the E. of Yarmouth (Nova Scotia) in the morning of Sept. 21 (Monthly Weather Review, Sept. 1906). Author's note: Positions shown along the tracks prior to landfall on the South Carolina coast on Sept. 17 were found to be in error. 12) A storm was first observed near 22 N., 54 W. on Sept. 11, 1906 and lasted 6 days; it was last observed near 34 N., 82 W. (Mitchell, 1924). Author's note: The corresponding track in the above publication was found to be very similar to the track for this storm in Tannehill (1938). However, the track in Mitchell (1924) was started 8 days later than the track in Neumann et al. (1993) which, in turn, was begun about 500 miles to the S.W. of the Cape Verde Islands on Sept. 3.

Primarily on the basis of information in item 1), the author of this study introduced a series of modifications along the track that Neumann et al. (1993) showed as for Storm 4, 1906. No modifications were made over the period Sept. 3-8 because the morning positions along the above mentioned track were found to reasonably agree with information for those days in item 1). 7 A.M. positions in Neumann et al. (1993) for the period Sept. 9-17 were modified on the basis of information in item 1), resulting in the following positions as estimated by the author of this study: Sept. 9, near 18.0 degrees N., 49.3 degrees W.; Sept. 10, near 19.7 degrees N., 50.7 W.; Sept. 11, near 21.0 degrees N., 54.0 degrees W; Sept. 12, near 22.7 degrees N., 59.0 degrees W.; Sept. 13, near 24.3 degrees N., 63.3 degrees W; Sept. 14, near 29.0 degrees N., 66.3 degrees W.; Sept. 15, near 30.5 degrees N., 68.0 degrees W.; Sept. 16, near 31.7 degrees N., 70.3 degrees W.; Sept. 17, near 32.3 degrees N., 76.7 degrees W.; differences between the author's positions above and the respective ones in Neumann et al. (1993) were found to range from about 180 miles on Sept. 11 to approximately 40 miles on Sept. 15-16. The author's track allowed for the storm to have made landfall on the South Carolina coast near Georgetown around 1 P.M. Sept. 17 (item 2), and the 7 A.M. Sept. 18 position in Neumann et al. (1993) was adjusted by some 40 miles to the W.N.W. to near 35.0 degrees N., 83.0 degrees W. in accordance with information in item 1). The author's track for Storm 5, 1906 is displayed in Fig. 2.

The hurricane status which Neumann et al. (1993) gave to this storm as for Storm 4, 1906 was found to be supported by information contained in several items, particularly in item 2). Pressure information in item 10) supported major hurricane intensity, but the barometer reading of 27.90 inches at Cape Fear is suspected to be in error. On the basis of significant intensification of the winds around the storm from Sept. 11 to Sept. 13 which can be inferred from information in item 1), the author of this study decided to introduce hurricane intensity along his track on Sept. 12 instead of on Sept. 9 as indicated in Neumann et al. (1993). Prior to Sept. 12, tropical storm intensity was denoted along the author's track. In accordance with information in item 2) indicating rapid weakening after landfall, hurricane intensity along the track was changed back to tropical storm intensity late on Sept. 17. Finally, a depression (dissipation) stage was introduced

on Sept. 18.

Storm 6, 1906 (Sept. 20-29), H.

This is the same storm which Neumann et al. (1993) identify as Storm 5, 1906.

The following information was found about this storm: 1) Data extracted from 8 A.M. (E.S.T.) Historical Weather Maps: Sept. 20, ship near 17 N., 78 W., E. f. 2, 29.88, showers; Kingston, N.E. f. 2, 29.89, rain; ship near 10 N., 77 W., S. f. 3, 29.88; ship near 10 N., 78 W., S.W. f. 2, rain; low placed 15.5 N., 72.5 W (very much too far N. and E.). Sept. 21, Kingston, N.N.W. f. 1, 29.90; ship near 18 N., 75 W., S.S.E. f. 4, 29.91; ship near 16.3 N, 76.3 W., E.S.E. f.3, 29.91; ship near 10 N., 82 W., W. f.2, 29.80; ship near 18 N., 82 W., E. f. 2, 29.91, showers; low placed 13 N., 79 W. (probably a bit S. and E.). Sept. 22, no data, but low placed 16.5 N., 82.5 W. Sept. 23, no data, but low placed 19.5 N., 84.5 W. Sept. 24, ship or station near 24.7 N., 83 W., S.E. f. 8, 29.83; Key West, E. f. 5, 29.84; ship near 23 N., 86 W., N. f. 4, pressure could not be read; center placed 22.7 N., 84 W. (probably too far N. and E.). Sept. 25, ship near 23 N., 85 W., S.S.E. f. 10, 29.62; ship near 26 N., 86 W., E.N.E. f. 8, 29.77 (not clearly read); center placed 23 N., 86 W. Sept. 26, center placed 26.3 N., 87 W.; ship in that vicinity, N. f. 10 (or 12), 28.64; another ship in practically the same position, calm, rain, 28.14 (obviously in the eye of the storm); central pressure of 955 millibars (28.20) written on the map. Sept. 27, center on the coast near the Mississippi-Alabama border; Pensacola, S.S.E. at least f. 8 (maybe higher); New Orleans, N.N.W. f. 6, pressure could not be read. Sept. 28, Memphis, S.E. f. 4, 29.52 (could not be clearly read). Sept. 29, St. Louis, E. f. 3, 29.69; extratropical low placed just S. of the station. Sept. 30, low no longer identified, but its remnants were probably embedded in a cold front over northern Mississippi-Alabama area (Historical Weather Maps, Sept. 1906). Author's note: Wind forces (f) are on Beaufort scale; pressures are in inches. 2) This Sept. 1906 storm was first definitively observed over the western portion of the Caribbean Sea on Sept. 22 and crossed the Gulf coast line W. of Mobile. After leaving the Yucatan Channnel on Sept. 24, the storm moved almost due N. over the Gulf of Mexico (Monthly Weather Review, Sept. 1906). Author's note: The above information was taken from a storm report prepared by E.B. Garriott. 3) Washington, Sept. 22. A tropical disturbance was reported Saturday afternoon (Sept. 22) as developing S. of Grand Cayman, probable direction N.W. to the Yucatan Channel (The New York Times, Sept. 23, 1906, p.9, col.7). Author's note: A similar statement was issued by the Belen College Observatory at 4 P.M. Sept. 22 and published in Diario de la Marina, Havana, Sept. 23, 1906, morning edition, p.4, col.5). 4) Belen College Observatory, Sept. 23, 4 P.M. At 7 A.M. we sent a cablegram to the Weather Bureau of Washington announcing that the cyclone was intensifying and approaching the Yucatan Channel. From Washington we received the following cablegram at 11:40 A.M. "Storm warnings issued for Key West at 10:30 A.M. The perturbation is approaching the Yucatan Channel and gaining in intensity. Strong E. and S.E. winds are expected along the Florida coast and vicinity. Henry". L. Gangoiti, S.J. (Diario de la Marina, Havana, Sept. 23, 1906, evening edition, p.1, col.6). Author's note: The whole advisory issued by the Weather Bureau near noon Sept. 23 was also published in The New York Times, Sept. 24, 1906, p.7, col.6). 5) Belen College Observatory, Sept. 24. At 7 A.M. today the center of the cyclone is about 200 miles to the W. one quarter to the S.W. of Havana, probably moving towards the central Gulf. We have just sent this note to the Central Observatory of Mexico and the Weather Bureau of Washington. L. Gangoiti, S.J. (Diario de la Marina, Havana, Sept. 24, 1906, evening edition, p.1, col.6). 6) National Meteorological

Observatory, Sept. 24, 4 P.M. At noon we received the following cablegram from the Weather Bureau of Washington: "Cyclonic perturbation to the W. of extreme western Cuba, moving northward. Danger for ships sailing from or towards the Gulf ports during the next two days" (Diario de la Marina, Havana, Sept. 25, 1906, morning edition, p.4, col.4). 7) Washington, Sept. 24. The tropical disturbance has passed into the Gulf of Mexico from the Yucatan Channel. Its influence on the Gulf coast has not been felt as yet, except on the southern Florida coast where high S.E. winds are blowing (The New York Times, Sept. 25, 1906, p.9, col.6). 8) Batabano, Sept. 24, 9:40 A.M. Since yesterday we are under the influence of a heavy rain storm. The streets of this town are flooded, reaching a depth of a yard at several places, specially at Pueblo Nuevo (Diario de la Marina, Sept. 24, 1906, evening edition, p.1, col.6). Author's note: Batabano is located on the southern coast of Havana province. 9) Sept. 23-24, 1906. A cyclone of moderate intensity passed through the Yucatan Channel. Heavy rains and floods occurred at Pinar del Rio and Havana provinces (Sarasola, 1928). Author's note: Actually taken from the catalog of Cuban cyclones by M. Gutierrez-Lanza which is included in Sarasola (1928). 10) Belen College Observatory, Sept. 25, 7 A.M. The center of the cyclone was off Cuba yesterday as indicated in our note to Washington published this morning. Now the vortex of the cyclone is about 300 miles to the N.W. one quarter to W. of Havana, moving away from our island and getting ready for recurvature. L. Gangoiti, S.J. (Diario de la Marina, Sept. 15, 1906, evening edition, p.2, col.2). Author's note: A similar note issued by the National Meteorological Observatory at 8 A.M. Sept. 25 was published in the same edition. 11) Washington, Sept. 25. The tropical disturbance is probably central over the eastern portion of the Gulf of Mexico. It seems from observations at shore stations that the storm should be felt somewhere between the mouth of the Mississippi and the western Florida coast within 36 hours (The New York Times, Sept. 26, 1906, p.9, col.5). 12) Washington, Sept. 26. The tropical disturbance has reached the W. Florida coast in the vicinity of Pensacola where at 8 P.M. Wednesday the wind was blowing at a rate of 48 mph (The New York Times, Sept. 27, 1906, p.9, col.6). 13) Washington, Sept. 27. Delayed reports from Pensacola show that the Gulf storm passed inland at some distance W. of that station with winds of hurricane strength, the maximum velocity there being 88 mph (The New York Times, Sept. 28, 1906, p.9, col.6). 14) Some observations taken at New Orleans: Sept 26, 8 P.M., N. 28 mph, 29.68.; midnight Sept. 26-27, N. 32 mph, 29.59; 4 A.M. Sept. 27, N. 37 mph, 29.49; 8 A.M., N.W. 40 mph, 29.22; 8:15
A.M., 29.15; noon, W. 27 mph, 29.20; 4 P.M. S.W. 23 mph, 29.34; 8 P.M., S.W. 22 mph, 29.47 (Cline, 1926). Author's note: Pressures (sea level) are in inches and times are 90 W. meridian. 1) Some observations taken at Mobile: Sept. 26, 8 P.M., N.E. 26 mph, 29.62; midnight Sept. 26-27, N.E. 31 mph, 29.48; 2 A.M. Sept. 27, N.E. 33 mph, 29.32; 4 A.M. N.E. 34 mph, 29.19; 6 A.M., N.E. 46 mph, 29.00; 7 A.M., E 42 mph, 28.84; 8 A.M. E. 43 mph, 28.90; 9 A.M., S.E. 39 mph, 29.00; 10 A.M., S.E. 28 mph, 29.12; noon, S.E. 21 mph, 29.25; 4 P.M., S.E. 14 mph, 29.35; 8 P.M., S.E. 10 mph, 29.47 (Cline, 1926),. Author's note: Pressures (sea level) are in inches and times are 90 W meridian. 16) Some observations taken at Pensacola: Sept. 26, 8 P.M., N.E. 40 mph, 29.52; midnight Sept. 26-27, N.E. 44 mph, 29.35; 2 A.M. Sept. 27, E. 64 mph, 29.29; 4 A.M., E. 74 mph, 29.18; 5 A.M., S.E. 68 mph, 29.17; 6 A.M., S.E. 67 mph, 29.19; 7 A.M., S.E. 72 mph, 29.24; 8 A.M., S.E. 62 mph, 29.31; 9 A.M., S.E. 58 mph, 29.35; 10 A.M., S.E. 55 mph, 29.39; noon, S.E. 53 mph, 29.45; 4 P.M., S. 44 mph, 29.49; 8 P.M., S. 39 mph, 29.59 (Cline, 1926). Author's note: Pressures (sea level) are in inches and times are 90 W. meridian. 17 At Pensacola trees were uprooted, houses unroofed and vessels dragged their anchors. Wind velocities at Pensacola were extremely high;

the maximum was 83 mph from the E. Thirty-two lives were lost at Pensacola and damage in that vicinity amounted to $ 2 millon. Damage to property at Mobile was severe and the tide was 9.9 feet above normal (Tannehill, 1938). 18) Some pressure observations taken on board the U.S. Revenue steamer "Winona" which was at Scranton, Mississippi, during the storm: Sept. 26, 8 P.M., 29.64; midnight Sept. 26-27, 29.45; 4 A.M. Sept. 27, 29.07; 4:30 A.M., 29.02; 5 A.M.. 28.96; 5:10 A.M., 28.90; 5:30 A.M. 28.75; 6 A.M., 28.68; 6:30 A.M., 28.55; 7 A.M., 28.50; 7:45, 28.50; noon, 28.70; midnight Sept. 27-28, 29.00. From the beginning of the blow till 7 A.M. Sept. 27 the wind was N.N.E. For 15 minutes after 7 A.M. there was a lull in the wind; then it shifted to the S.W. and blew with terrific force (Monthly Weather Review, Sept. 1906). Author's note: Taken from a report prepared by E.B. Garriott. Pressures are in inches. The noon Sept. 27 and the midnight Sept. 27-28 pressures seem to be in error. 19) At Fort Morgan an anemometer, which owing to its worn condition registers velocities 5 percent too low, was in temporary use during the storm. Several times after midnight (Sept. 26-27) a maximum velocity of 85 mph was recorded for a period of 5 minutes; 3 miles were recorded in 2 minutes, which is at a rate of 90 mph; this, with a 5 percent correction added, is more than 94 mph (Monthly Weather Review, Sept. 1906). Author's note: Also taken from the report by E.B. Garriott. Ft. Morgan is located at the entrance to the Mobile Bay. 20) At Mobile, the rainfall amount from 12:05 P.M. Sept. 26 to 7:20 P.M. Sept. 27 was 6.40 inches (Monthly Weather Review, Sept. 1906). Author's note: Also taken from the report by E.B. Garriott. 21) Louisville, Ky., Sept. 27. Damage to railroads is heavy, the tracks between Flomanton, Al. and Pensacola, Fl. are obstructed. The waters of Lake Pontchartrain, which for the past 24 hours have been 5 feet above normal causing a serious overflow in parts of New Orleans, have receded apparently (The New York Times, Sept. 28, 1906, p.1, col.5). 22) Pensacola, Sept. 27. It is reported that many lives between the city and the Navy Yard have been lost in the hurricane that began last night and is still raging this afternoon. Every home in Pensacola has suffered damage and many roofs are blown off. The water front is strewn with wreckage for miles on either side of the city and vessels are piled on the wharves or ashore (The New York Times, Sept. 28, 1906, p.1, col.5). 23) New Orleans, Sept. 28. The wireless station at the mouth of the (Mississippi) river was abandoned, the last report that there was about 8 feet of water over the floor of the operator's room (The New York Times, Sept. 28, 1906, p.1, col.5). 24) Washington, Sept. 28. The Gulf storm is now central near the lower Ohio Valley, moving N.N.E. (The New York Times, Sept. 29, 1906, p.7, col.6). 25) Washington, Sept. 29. The Gulf storm continues to diminish in intensity and is now crowded southeastward by a strong area of high pressure that is moving E. across the lake region (The New York Times, Sept. 30, 1906, p.9, col.6). Author's note: The above statement was probably issued in the evening of Sept. 29. 26) Some maximum velocities were as follows: Sand Key, S.E. 54 mph on Sept. 24; Key West, S.E. 35 mph on Sept. 24; Jupiter, S.E. 37 mph on Sept. 26; New Orleans, N.W. 49 mph on Sept. 27; Meridian, N.E. 44 mph on Sept. 27; Montgomery, E. 36 mph on Sept. 27; Mobile, E. 55 mph on Sept. 27; Birmingham, S.E. 50 mph on Sept. 27; Pensacola, E. 83 mph on Sept. 27; Atlanta, E. 42 mph on Sept. 27; Chattanooga, S.E. 38 mph on Sept. 28 (Monthly Weather Review, Sept. 1906). 27) Storm of Sept. 27, 1906. Mississippi Delta eastward. Major. Barometer 28.30 inches, estimated (Dunn and Miller, 1960). 28) Two naps showing tracks for this storm. The track shown on the first map was started S. of Hispaniola on Sept. 18 and ended over the eastern Mississippi coast on Sept. 27; however, daily positions were shown with question marks over the period Sept. 18-23. The track displayed on the second map made the storm to have emerged from the Yucatan Channel on Sept. 24 and to have continued on a N.N.W. course, reaching the eastern Mississippi

coast. The last position along the track was near St. Louis in the morning of Sept. 29, from where the storm was shown to have continued to the Chicago area later that day (Monthly Weather Review, Sept. 1906). Author's note: According to information in item 25), the weakening storm apparently moved to the S.E. and not to the N.E. during late Sept. 29. 29) A storm was first observed near 14 N., 32 W. on Sept. 10, 1906 and lasted 20 days; it recurved near 35 N., 91 W. and it was last observed near 52 N., 60 W. (Mitchell, 1924). Author's note: The corresponding track in Mitchell (1924) was very similar to the one shown in Tannehill (1938). Both tracks show the alleged storm to have moved westward, reaching the Lesser Antilles by Sept. 17; however, data in Historical Weather Maps (Sept. 1906) were not sufficient to ascertain that evolution with a reasonable space-time continuity and no closed circulation was drawn on the Sept. 17 map or documented by data as the alleged storm passed into the eastern Caribbean Sea; only a rather weak wave disturbance was apparent on that day. The track in Neumann et al. (1993) was not started until Sept. 19 near 15 N., 72 W., which is a position S. of Hispaniola. This latter track brought the storm center well S. of Jamaica and into the Gulf of Mexico through the Yucatan Channel and not over western Jamaica and western Cuba as in Mitchell (1924) and Tannehill (1938).

By primarily using information in item 1), the author of this study introduced a number of modifications along the track which Neumann et al. (1993) show as for Storm 5, 1906. The author's track was started on Sept. 20, which is one day later than in the above publication, by estimating a 7 A.M. position for that day near 12.5 degrees N., 78.7 degrees W.; this location was found to be about 270 miles to the S.W. of the corresponding one in Neumann et al. (1993); the author's new position was based on two ship reports showing S. and S.W. winds N. of eastern Panama on Sept. 20 (item 1). Author's positions for the period Sept 21-26 were as follows: Sept. 21, near 14.0 degrees N., 80.5 degrees W.; Sept. 22, near 16.3 degrees N., 82.3 degrees W.; Sept. 23, near 18.7 degrees N., 84.0 degrees W.; Sept. 24, near 21.4 degrees N., 85.0 degrees W.; Sept. 25, near 23.3 degrees N., 86.0 degrees W.; Sept. 26, near 26.3 degrees N., 87.0 degrees W.; differences between these positions and the corresponding ones in Neumann et al. (1993) ranged from about 100 miles on Sep. 21 and Sept. 25 to about 30 miles on Sept. 23. Morning positions for Sept. 27-28 in Neumann et al. (1993) were kept unmodified because they were found to agree with information in item 1); however, their 7 A.M. Sept. 29 position was adjusted to the W. by about 50 miles to 38.3 degrees N., 90.3 degrees W. in compliance with information for that day in item 1). The author's track for Storm 6, 1906 is shown in Fig. 2.

The hurricane status which Neumann et al. (1993) gave to this storm as for Storm 5, 1906 was found to be supported by the content of several of the items above. In fact, information in item 1) showing a ship at the vortex of the storm and a central pressure of 28.14 inches in the morning of Sept. 26, together with a minimum pressure reading of 28.50 inches at Scranton, Mi., reported by the "Winona" (item 18) and the estimated pressure of 28.30 inches stated in item 27), showed that, indeed, the storm was a major hurricane. Although the time Storm 6, 1906 reached hurricane intensity could not be ascertained with any degree of confidence, the author decided to introduce that status along his track as the storm crossed the 20 N. parallel late on Sept. 23; his decision was based on the intensification announced in item 4), on the use of the word "cyclone" for first time by the Belen College Observatory on Sept. 24 (item 5), which, in accordance with the usual nomenclature regarding Cuban storms, carried the implication that the cyclonic perturbation had reached hurricane intensity, and on the words "moderate cyclone" which were used as the storm passed through the Yucatan Channel (item 9). Prior to late Sept.