

Nineteen storms were identified as having occurred in 1887. Tracks for these storms are presented in Fig. 1.

Storm 1, 1887 (May 15-19), T. S.

This is a new storm case in the sense that it is not included in Neumann et al. (1993). However, the Monthly Weather Review, May 1887, referred to this system without attaching any tropical characteristics to it.

Documentation of this storm was based on the following information: 1) On May 15 the depression was central to the S.E. of Bermuda, with fresh to strong gales and rain over a considerable area to the northward. By May 16 the center had moved N.W. of Bermuda. Passing slowly northward, the storm disappeared N. of Newfoundland on May 20, with an area of high barometer over the ocean opposing an eastward course (Monthly Weather Review, May 1887). 2) Steamship "Orinoco", at Bermuda. May 15, in the morning very heavy rain, falling barometer, fresh gale; 8 P.M., barometer 29.57 inches, fresh S.E. gale, heavy rain and thunder. May 16, 6 A.M., barometer 29.55 inches, fresh S. gale, heavy rain; 10 A.M., wind S.S.E., rain; noon, barometer 29.45 inches, heavy S. gale; midnight (May 16-17). barometer 29.55 inches, fresh S.W. gale. May 17, in the morning fresh S.W. wind, rising barometer; in the afternoon, fine weather (Monthly Weather Review, May 1887). 3) Map showing a track for this system. Daily positions are as follows: May 15, 30.3 degrees N., 64.7 degrees W.; May 16, 32.3 degrees N., 66.0 degrees W.; May 17, 34.3 degrees N., 66.7 degrees W.; May 18, 36.5 degrees N., 66.7 degrees W.; May 19, 42.3 degrees N., 66.7 degrees W. (Monthly Weather Review, May 1887).

The author of this study has accepted the positions in item 3) as his 7 A.M. positions in preparing the track shown in Fig. 1. The 7 A.M. May 16 position was found to be in fairly good agreement with information given by the "Orinoco" (item 2); however, no information was available to verify the positions given in item 3) for the other days. The track was ended just N. of Newfoundland before 7 A.M. May 20 (item 1).

Although this system was classified as a tropical storm by the author of this study, it is possible that some subtropical characteristics might have been present. It is also very likely that the system gradually became extratropical as it advanced towards high latitudes.

Storm 2, 1887 (May 17-21), T. S.

This is the same storm which Neumann et al. (1993) identify as Storm 1, 1887.

The following information was found in relation to this storm: 1) Steamship "Athos". May 17., off the S.E. end of Jamaica, weather very dark and thick, with torrents of rain, vivid lightning and strong gusts of wind from S.E.; continued very squally and unsettled, with heavy rain until May 18 (Monthly Weather Review, May 1887). 2) Steamship "Pomona". May 17-18, in Montego Bay,

Jamaica; very heavy rain, wind from S.W., in heavy, short squalls, making a hard sea at times; at night very dark; lowest barometer 29.71 inches on May 18. This was an unusually heavy wind for Jamaica, for this time of the year (Monthly Weather Review, May 1887). 3) Steamship "Alvena". May 17, from Kingston to Lucea, Jamaica, experienced very rough weather after leaving Port Royal at 10 A.M. Greenwich mean time. May 18, the wind commenced to blow from the southward with heavy rain squalls and increased up to 4 P.M., during which time the wind hauled to the westward and a heavy sea was running from S.W.; barometer (mercurial) 29.60 inches at the last-mentioned hour. After 4 P.M. the wind and squalls decreased in strength, but wind continued to blow strong from the westward (Monthly Weather Review, May 1887). 4) May 18-19, 1887. 4) Cyclonic perturbation crossed the eastern portion of Cuba on a N.E. course. It only produced heavy rain and squally showers which reached Caibarien on the W. (Sarasola, 1928). Author's note: Actually taken from the catalog of Cuban cyclones by M. Gutierrez-Lanza, which is included in Sarasola (1928). 5) Steamship "Athos". May 20, lat. 26 13 N., long. 74 12 W., encountered an E. gale, accompanied by heavy rain squalls lasting 12 hours; lowest barometer 29.85 inches (Monthly Weather Review, May 1887). 6) Map showing a track for this storm as follows: May 17, 19 degrees N., 78.7 degrees W.; May 18, 21.2 degrees N., 79 degrees W.; May 19, 23.2 degrees N., 78.7 degrees W.; May 20, 23.8 degrees N., 74.7 degrees W.; May 21, 27.2 degrees N., 70.7 degrees W. (Monthly Weather Review, May 1887).

Based on the content of the items above, some modifications along the track which Neumann et al. (1993) showed as for Storm 1, 1887) were proposed by the author of this study. He estimated new 7 A.M. positions for the period May 17-19 and decided to keep unchanged the positions displayed in Neumann et al. (1993) for May 20 and 21 because they were found to be supported by information in items 5) and 6) and in item 6), respectively. The author's estimates were as follows: May 17, near 16.5 degrees N., 77.5 degrees W, based on information in items 1) and 3); May 18, near 18.7 degrees N., 78.7 degrees W., based on information in items 2) and 3) and, to a lesser extent, in item 4); May 19, 22.0 degrees N., 77.5 degrees W., based on information in item 4). The author's track for Storm 2, 1887 is shown in Fig. 1.

The tropical storm status which Neumann et al. (1993) assigned to this storm was found to be supported by the content of the items above.

#### Storm 3, 1887 (Jun. 11-13), T. S.

This is a new storm case that the author of this study has recently documented. However, this case is not entirely new because it had been previously mentioned in some catalogs of Cuban cyclones (Sarasola, 1928; Martinez-Fortun, 1942).

Documentation of this case was based on the following information: 1) Jun. 11-15, 1887. Vast cyclonic perturbation passed over the South Sea (the Caribbean) and over Vuelta Abajo towards the Gulf of Mexico. Its effects reached Havana, Matanzas and Santa Clara. There were torrential rains and moderate winds. It caused

extensive flooding, with the loss of crops and some lives (Sarasola, 1928). Author's note: Actually taken from the catalog of Cuban cyclones by M. Gutierrez-Lanza which is included in Sarasola (1928). 2) Jun. 11-15. 1887. Cyclonic weather from Santa Clara to Pinar del Rio due to a cyclone in the Gulf of Mexico (Martinez-Fortun, 1942). 3) Havana, Jun. 13. Excessive rain has fallen here and will continue for some time. Several districts have been flooded. The barometer is falling (The New York Times, Jun. 14, 1887, p.1, col.6). 4) New Orleans, Jun. 28. The steamer "Faxhall", from Puerto Limon (Costa Rica), reported: The steamer sailed Jun. 11 from the Passes (heading for Puerto Limon). The weather was cloudy and strong S. winds and high seas made the captain unable to take ship's positions. On the afternoon of Jun. 13 (Monday), the steamer ran ashore off Colorados Reef, 21 miles E. of Cape San Antonio (western tip of Cuba) and remained fast for 40 hours (The New York Times, Jun. 29, 1887, p.5, col.1). 5) Pensacola, Jun. 16. On the afternoon of Jun. 13, 90 miles E. of Sand Island Light, the steamship "Vidette", from New York for Mobile, sprung a leak. She labored heavily and at 7:30 P.M. was abandoned. The crew was taken from 2 boats by a tug about 12 miles off Pensacola Light and arrived here this afternoon (The New York Times, Jun. 17, 1887, p.1, col.6). 6) Mobile, Jun. 16. The vessel "Vidette" was heavy laden and made water freely during the storm of Jun. 13. She was down by the stern and filling rapidly when abandoned (The New York Times, Jun. 17, 1887, p.1, col.6).

In spite of information in item 1), this system does not seem to have been a tropical storm when crossing over the westernmost portion of Cuba. Item 2) and items 4) through 6) provided, however, strong clues that it reached, at least, the intensity of a weak tropical storm in the Gulf of Mexico. Consequently, the author of this study decided to add this case as a tropical storm to the cyclones of 1887 which are covered in Neumann et al. (1993).

The author's 7 A.M. positions for Storm 3, 1887 are as follows: Jun. 11, 20.5 degrees N., 84.0 degrees W., primarily based on information in item 1); Jun. 12, near 23.5 degrees N., 86.5 degrees W., based on items 1), 2) and 4); Jun. 13, near 27.0 degrees N., 88.0 degrees W., primarily based on information in items 4) through 6). Due to the limited data available, the confidence the author has in the above positions is rather low but, nevertheless, such positions enabled him to produce the storm track shown in Fig. 1, which is believed to still depict quite well the general motion of the storm. Although items 1) and 2) suggest that the storm life-span extended to Jun. 15, the author was unable to find any information beyond Jun. 13 and, therefore, ended his track on this latter day.

Storm 4, 1887 (Jul. 28-28), H.

This is the same storm which Neumann et al. (1993) identify as Storm 2, 1887.

The following information was found about this storm: 1) Bark "Florence", at Barbados, Jul. 20. During the last two days we have had light squally weather with rain storms, sultry weather and falling barometer. At 4 A.M. (Greenwich time) the weather commenced

to threaten, the glass having fallen to 29.64 inches. We put out extra ropes and lines and made all secure for a blow; 6 A.M., blowing heavily, with squalls and sea running from E.S.E.; 7:30 A.M., wind increasing in the squalls; 8:30 A.M., in a terrific squall we parted all our lines and drove over the other side of the Creek, doing considerable damage; about the same time we saw distress signals out of the Roads and when daylight broke it was something terrific to look at, there being no less two barks, one barkentine, one brigantine, one no-masted schooner, one small steamer and two condemned vessels on the shore; one bark and brigantine broken up; the sea was like a mountain on the shore (Monthly Weather Review, Jul. 1887). 2) The path pursued by the cyclone was determined by a number of vessel's logs, reports and observations. It appears to have been a little S. of Barbados on Jul. 20, then to have moved westward over the central portion of the Caribbean Sea to just N. of lat. 15 N., long. 85 W. and then N.W. over the extreme eastern portion of Yucatan to about lat. 25 N. About the latter point. the path seemed to have been northerly and then changed to N.E. (Monthly Weather Review, Jul. 1887). 3) Jul. 24-26, 1887. A strong hurricane which came from Barbados passed far to the south of Cuba, with gusty winds of moderate intensity from Trinidad westward. At Batabano, several schooners were sunk. The hurricane caused heavy rains and flooding in the interior of the island. It passed over Yucatan into the Gulf of Mexico and then it recurved towards the N.E. (Sarasola, 1928). Author's note: Actually taken from the catalog of Cuban cyclones, which is included in Sarasola (1928). Trinidad is located practically on the coast of south-central Cuba and Batabano is a port on the southern coast of Havana province. 4) Through the kindness of Padre Benito Vines, S.J., Director of the Magnetic and Meteorological Observatory, Belen College, Havana, the Chief Signal Officer was kept informed by telegraph of the progress of the cyclone before it reached the coast of the United States, and timely warning was given to shipping on the Gulf and South Atlantic coasts, both by cautionary wind signals and special storm messages (Monthly Weather Review, Jul. 1887). 5) The cyclone arrived on the coast of western Florida on the morning of Jul. 27, with a central pressure of 29.60 inches and a wind velocity of 54 mph. After reaching Florida, the cyclone continued northeastward to the vicinity of Augusta, Ga. (Monthly Weather Review, Jul. 1887). Author's note: At landfall on the Gulf coast, the central pressure should have been much lower than the one of 29.60 inches which was indicated. That value was probably the one reported at a Signal Service station, either at Pensacola or at Cedar Keys. 6) Maximum wind velocities: Cedar Keys, 54 mph; Pensacola, 36 mph; Jacksonville, 36 mph; Savannah, 36 mph; Augusta, 20 mph; Atlanta, 30 mph; Mobile, 26 mph (Monthly Weather Review, Jul. 1887). 7) Total rainfall associated with the cyclone: Jacksonville, 3.50 inches; Titusville, 4.54 inches; Cedar Keys, 8.00 inches; Pensacola, 1.34 inches; Montgomery, 3.57 inches; Atlanta, 3.93 inches; Augusta, 6.02 inches (Monthly Weather Review, Jul. 1887). 8) Montgomery, Al., Jul. 27. The wind blew a gale here all day and the rain has fallen constantly. Reports from the surrounding country indicated immense damage to crops. Opelikea had 5.5 inches

of rain (The New York Times, Jul. 28, 1887, p.1, col.4). 9) Columbus, Ga. Jul. 30. This city is about the center of the district damaged by the rains which set in 4 days ago. The cotton crop is entirely ruined. Many cattle were swept away. Cabins were swept away like toy houses (The New York Times, Jul. 31, 1887, p.3, col.6). 10) Map showing a track for this storm. Daily positions along that track are as follows: Jul. 20, 15 degrees N., 61.5 degrees W.; Jul. 21, 15 degrees N., 67 degrees W.; Jul. 22, 15 degrees N., 72.2 degrees W.; Jul. 23, 16 degrees N. 76.5 degrees W.; Jul. 24, 18 degrees N., 82 degrees W.; Jul. 25, 20.5 degrees N., 87.5 degrees W.; Jul. 26, 25.7 degrees N., 91.2 degrees W.; Jul. 27, 30 degrees N., 86 degrees W. (Monthly Weather Review, Jul. 1887).

With the exception of a minor adjustment introduced for the 7 A.M. Jul. 20 position, the track in Neumann et al. (1993) as for Storm 2, 1887 was accepted as reasonable for Storm 4, 1887 in the light of most information contained in the above items. Therefore, after adjusting westward the 7 A.M. Jul. 20 position in Neumann et al (1993) by about 90 miles, to near 12.3 degrees N., 61.0 degrees W., to satisfy information in item 1), the track shown in the above publication was reproduced in Fig. 1.

The content of several of the items above allowed the author of this study to verify the hurricane status given in Neumann et al. (1993). In fact, the terms "strong hurricane" used in item 3) suggested the possibility that Storm 4, 1887 could have been a major hurricane.

Storm 5, 1887 (Jul. 30- Aug. 7), T. S.

This is the same storm that Neumann et al. (1993) identify as Storm 3, 1887.

The following information was found about this storm: 1) A track for this storm starting near 10 degrees N., 51 degrees W. towards the end of Jul. (it should be on Jul. 30) and ending to the south of central Cuba (Mitchell, 1924). Author's note: A much shorter track which is partially similar to the one described above is shown in the Monthly Weather Review, Aug. 1887. This shorter track extends from about 17 degrees N., 70.5 degrees W. on Aug. 5 to about 20.5 degrees N., 80.8 degrees W. on Aug. 7. 2) Storm of Jul. 30- Aug. 7, 1887. Windward Islands, Caribbean Sea (Tannehill, 1938). 3) The presence of this system was indicated by vessel reports to the south of Santo Domingo on Aug. 5, whence it apparently moved eastward (it should read westward) over the Caribbean Sea into the Gulf of Mexico on Aug. 8, accompanied by rain and fresh gales. Its course after Aug. 7 cannot be determined, owing to an absence of reports (Monthly Weather Review, Aug. 1887). 4) Bark "Florence", at East Harbor, Caicos Islands. Aug. 5, 4:30 A.M. (Greenwich time), threatening weather, barometer 29.61 inches and falling; 7:30 A.M., wind and sea rising rapidly; 8:30 A.M. barometer 29.57 inches, wind a hard gale, with heavy squalls and rain and high sea from S.E.; 10 A.M., barometer 29.55 inches, a very heavy S.E. squall of wind and rain, gale at its height; 11:30 A.M., barometer rising and gale moderating (Monthly Weather Review, Aug. 1887). 5) Aug. 6-8, 1887. Diminutive cyclone, owing its

extension and every, came from S. of Santo Domingo and Santiago de Cuba and passed to the S. and near Havana on Aug. 7, moving towards the Gulf of Mexico on a W.N.W. course. There was no important damage (Sarasola, 1928). Author's note: Actually taken from the catalog of Cuban cyclones by M. Gutierrez-Lanza, which is included in Sarasola (1928).

Although item 4) strongly suggests the possibility of a tendency for the cyclone to have reformed just N. of Hispaniola, such a happening was discarded because it would have been against information contained in the remaining items. The content of the latter items, however, was found to support the track shown in Neumann et al. (1993) as for Storm 3, 1887 and, consequently, that track was reproduced as for Storm 5, 1887 in Fig. 1.

As no evidence of hurricane intensity was shown in the above items, the tropical storm status which Neumann et al. (1993) attributed to this system was accepted by the author of this study.

Storm 6, 1887 (Aug. 15-23), H.

This is the same storm that Neumann et al. (1993) identify as Storm 4, 1887.

The following information was found in relation to this storm:

- 1) The depression apparently originated to the eastward of the Windward Islands and moved N.W. to about 22 degrees N., 63 degrees W. on Aug. 16 (Monthly Weather Review, Aug. 1887). Author's note: This position appears to be too far east.
- 2) Schr. "Mary A. Douglas" was towed to New York by the steamer "Pomona". The schooner left New York on Aug. 6 and on the evening of Aug. 16, at lat. 26 26 N., long. 71 18 W. was struck by a hurricane and thrown on her beam ends while the sea made a clean breach over her. At 9 P.M. a heavy sea struck the vessel and carried away the jibboom mast about 25 feet from the deck. At 1 A.M. Aug. 17, the wind moderated somewhat (The New York Times, Aug. 27, 1887, p.8, col.5).
- 3) Nassau, Aug. 24. Schr. "Mabel F. Staples" (from New York to Caibarien, Cuba). Aug. 18, lat. 24 43 N., long. 73 18 W., experienced a hurricane during which she sprung her foremast badly and lost foretopmast, bowsprit, some sails and rigging. She arrived in Nassau in distress on Aug. 21 (The New York Times, Aug. 30, 1887, p.5, col.6).
- 4) Storm of Aug. 16-20, 1887. Atlantic E. of Florida. Hurricane winds of exceptional violence along the coast (Tannehill, 1938). Author's note: The storm extended beyond Aug. 20.
- 5) Steamship "City of San Antonio" reported a hurricane on Aug. 19-20; wind veered from E.S.E. to S.W.; lowest barometer 28.56 inches at 1:45 A.M. Aug. 20 in lat. 33 48 N., long. 76 36 W. (Monthly Weather Review, Aug. 1887).
- 6) Savannah, Ga., Aug. 21. The "City of Savannah", which arrived here 12 hours late from New York, reported passing through a violent hurricane on Friday night (Aug. 19-20). The ship was then off Hatteras with the light in sight. She was headed out to sea and ran into the storm (The New York Times, Aug. 22, 1887, p.1, col.3).
- 7) Steamship "Manhattan". Aug. 20, 9 A.M., off S.E. point of Hatteras Shoal, weather very threatening, barometer falling fast from 29.94 inches, wind E.; 11 A.M., hove to on starboard track, head to E.; 1 to 3:30 P.M., storm very severe, the wind at times estimated 90 to 100 mph, barometer 29.13 inches

at 1 P.M.; 3:30 P.M., barometer commenced to rise and wind veered to S. and S.W. and commenced to moderate when it hauled to N.W. and cleared off (Monthly Weather Review, Aug. 1887). 8) Bark "Walter S. Massy" arrived here from Brunswick, Ga. in a dilapidated condition. Weather was fine until meeting a hurricane at 4:20 A.M. Aug. 20 when off Hatteras. At 8 A.M. the foremast was carried away. At about 1 hour later the wind moderated but the vessel was then scuding under bare poles with about 4 feet of water in her hold (The New York Times, Aug. 28, 1887, p.9, col.7). 9) Schr. "Louis Bucki". Had a hurricane on Aug. 19-20; lowest barometer 29.00 inches at 3 A.M. Aug. 20 in lat. 34 25 N., long. 76 50 W. Wind set in from S.E. to E. and steadily increased from 11 P.M. Aug 19 to 3 A.M. Aug. 20; after a lull of 15 minutes, the wind suddenly shifted to W.N.W., blowing squally and hard, then moderated gradually (Monthly Weather Review, Aug. 1887). 10) Steamship "Wyoming". Noon Aug. 21 (Greenwich time), lat. 43 32 N., long. 59 08 W., barometer 29.79 inches, light variable winds, mostly southerly with rain, wind backing to E.; 4 P.M., lat. 43 17 N., long. 60 16 W., barometer 29.70 inches, strong E.S.E. wind, with heavy rain, wind veering to S.W.; 6:10 P.M., wind fell light and veered around by W. to N.W. and N.E., and increased to hurricane force with a very heavy sea; 7:30 P.M., lat. 43 02 N., long. 60 50 W., barometer 29.05 inches, still blowing the same with very heavy rain and very confused sea; 8 P.M., wind moderating and backing to N.W.. barometer 29.16 inches; midnight, lat. 42 46 N, long. 61 36 W., barometer 29.72 inches, strong N.W. breeze and clearing (Monthly Weather Review, Aug. 1887). 11) Bark "Bassano" reported a whole gale on Aug. 20 and 21, wind backed from S.W. to S.E. to N.; lowest barometer 29.35 inches at 1:30 A.M. Aug. 21 in lat. 40 35 N., long. 68 04 W. The gale was accompanied by very heavy rain, terrific thunder and lightning and confused sea (Monthly Weather Review, Aug. 1887). 12) Steamship "State of Nebraska" reported a hurricane of short duration on Aug. 21; wind backed from S.E. to N.N.E.; lowest barometer 29.21 inches at noon Aug. 21 in lat. 42 33 N., long. 62 04 W. (Monthly Weather Review, Aug. 1887). 13) Steamship "British Prince", had a hurricane on Aug. 20 and 21; wind backed from S. by E. to S.E. by S. and shifted suddenly to N.W. by N.; lowest barometer 29.09 inches at 11:30 P.M. (Aug. 20) in lat. 39 54 N., long. 69 20 W. (Monthly Weather Review, Aug. 1887). 14) Steamship "Rhein" reported a S.S.W. to W.N.W. storm on Aug. 21; lowest barometer in lat. 40 05 N., long. 66 20 W. (Monthly Weather Review, Aug. 1887). 15) Ship "Charles S. Whitney" reported a hurricane on Aug. 21 and 22; wind veered from S.E. to N.W.; lowest barometer 29.29 inches at 4 A.M. Aug. 22 in lat. 42 15 N., long. 52 50 W. (Monthly Weather Review, Aug. 1887). 16) Steamship "Galileo". Aug. 22, noon, lat. 42 22 N., long. 51 19 W.; 3 A.M., a strong gale from S.W., with high rough sea; 7:30 A.M., shifted to W., barometer 29.44 inches; 11 A.M., shifted to N.W., barometer 29.58 inches; wind gradually decreased into a strong breeze (Monthly Weather Review, Aug. 1887). 17) Steamship "Ohio". Aug. 22, 10 A.M., in lat. 45 N., long. 41 30 W., wind S., increasing and hauling to W.; 4 P.M., wind falling light; 6 P.M., wind increasing from N.W., barometer 29.57 inches; 7 P.M., blowing a hurricane, barometer 29.08 inches; 7:30 P.M., moderating, strong gale (Monthly Weather

Review, Aug. 1887). 18) Steamship "Holland" reported a fresh gale on Aug. 22; wind backed from S.E. to N.; lowest barometer 29.12 inches at 11:44 A.M. in lat. 47 10 N., long. 41 30 W. (Monthly Weather Review, Aug. 1887). Author's note: 11:44 P.M. would fit better the space-time continuity along the track. 19) Steamship "Europa" reported a fresh gale on Aug. 22 and 23; lowest barometer 29.20 inches at 11:09 A.M. (probably on Aug. 22) in lat. 48 23 N., long. 38 09 W.; wind backed from N.E. to N.W. (Monthly Weather Review, Aug. 1887). Author's note: 11:09 P.M. would fit better the space-time continuity along the track. 20) Steamship "Umbria" reported a hurricane on Aug. 23-24; wind backed from S.E. to E. and N.W.; lowest barometer 28.85 inches at 1 P.M. Aug. 23 (Monthly Weather Review, Aug. 1887). 21) Steamship "Arizona". Aug. 23, noon (Greenwich time), lat. 50 51 N., long. 26 W., barometer 29.34 inches, wind S., moderate gale, barometer falling very rapidly and wind backing to S.E.; 9 P.M., lat. 50 30 N., long. 30 W., barometer 28.73 inches, wind had backed to N.W. round by E., N.E. and N.; barometer began to rise and a furious N.W. gale prevailed until after midnight Aug. 23-24 (Monthly Weather Review, Aug. 1887). 22) Steamship "Mineola" reported a hurricane on Aug. 23 and 24; wind veered from S.E. to W. and N.N.E., lowest barometer 29.00 inches at 8 P.M. Aug. 23 in lat. 51 10 N., long. 30 30 W. (Monthly Weather Review, Aug. 1887). 23) Steamship "Marengo" reported a whole gale on Aug. 23 and 24; wind veered from S.W. to W.N.W., lowest barometer 28.74 inches at 6 P.M. Aug. 23 in lat. 49 18 N., long. 26 33 W. (Monthly Weather Review, Aug. 1887). 24) Steamship "Oxford" reported a whole gale from Aug. 23 to Aug. 27, wind veered from S.E. to N.W.; lowest barometer 28.69 inches at 2:30 P.M. Aug. 23 in lat. 51 21 N., long. 30 39 W. (Monthly Weather Review, Aug. 1887). 25) Steamship "Britannic" reported a gale on Aug. 27, wind veered from S.E. to N.W.; lowest barometer 29.09 inches in lat. 51 06 N., long. 23 58 W. (Monthly Weather Review, Aug. 1887). 26) Steamship "Gellert" reported a whole W. to N.W. gale from Aug. 27 to Aug. 29; lowest barometer 29.26 inches at 5 A.M. Aug. 27 in lat. 49 20 N., long. 23 20 W. (Monthly Weather Review, Aug. 1887). 27) Steamship "Island" reported a fresh gale on Aug. 26 and 27; wind backed from S.E. to E. and N.W.; lowest barometer 28.84 inches at 9 A.M. Aug. 25 (it should probably read Aug. 26 or 27) in lat. 56 06 N., long. 26 35 W. (Monthly Weather Review, Aug. 1887). 28) Steamship "Indiana" reported a strong gale on Aug. 26 and 27; wind veered from S.W. to N.W.; lowest barometer 29.13 inches at noon Aug. 26 in lat. 50 52 N., long. 21 05 W. (Monthly Weather Review, Aug. 1887).

Information in the above items suggested the need for a number of modifications along the storm track presented in Neumann et al. (1993) as for Storm 4, 1887. For the period Aug. 15-16 such a track was accepted because, due to the lack of data, the author of this study was unable to verify their 7 A.M. Aug. 15 position and, on the other hand, their 7 A.M. Aug. 16 position appeared to be reasonable in the light of information in item 2). The author estimated new positions as follows: Aug. 17, 25.0 degrees N., 72.5 degrees W., based on item 2); Aug. 18, 27.0 degrees N., 76.7 degrees W., primarily based on item 3) and on space-time continuity along a smooth curve; Aug. 19, 29.5 degrees N., 79.0 degrees W., based on space-time continuity with some deceleration near the

recurving point and also on information in item 4); Aug. 20, 35.0 degrees N., 75.0 degrees W., based on the analysis of the content of items 5) through 9); Aug. 21, 41.0 degrees N., 66.0 degrees W., based on the analysis of the content of items 10) through 14); Aug. 22, 44.0 degrees N., 49.5 degrees W., primarily based on information in items 15) and 16); Aug. 23, 48.5 degrees N., 35.0 degrees W., primarily based on information in items 21) through 24). The author decided to end his track on Aug. 23 because he found that information in items 25) through 28) carried too much uncertainty for track purposes and, in addition, he suspects that much of such information might pertain to another low pressure area which could have absorbed the storm. The author's track for Storm 6, 1887 is displayed in Fig. 1.

Information in many of the above items allowed one to verify the hurricane status that Neumann et al. (1993) attributed to this storm (Storm 4 in their publication). If the wind information in item 4) were correct, the storm would appear to have been a major hurricane.

Storm 7, 1887 (Aug. 18-27), H.

This is the same storm which Neumann et al. (1993) identify as Storm 5, 1887.

The following information was found about this storm: 1) The presence of this weather system to the eastward of the Windward Islands (it should probably read the Leeward Islands) was indicated by vessel reports on Aug. 19; by Aug. 20 the center of the depression had moved W.N.W. to about 22 degrees N., 66 degrees W. then it was traced to 26 degrees N., 76 degrees W. by Aug. 21 (Monthly Weather Review, Aug. 1887). 2) Steamship "City of Para". Aug. 20, noon, lat. 23 40 N., long. 74 16 W., wind fresh from W.N.W., cloudy and threatening weather, heavy N.E. swell, barometer 29.75 inches. Supposed we were in the S.W. quadrant of a cyclone, then steered N. by E. 1/2 E. forty-four miles until 4 P.M. when barometer 29.60 inches with a W.N.W. gale; slowed engine lowest possible speed heading N.N.E., took in all sails; 8 P.M., barometer 29.51 inches, hard W.S.W. gale with squalls and rain, increased speed to 6 mph making N.N.E. course; midnight (Aug. 20-21) barometer 29.41 inches, increasing S.W. wind, steering N. 11 mph; Aug. 21, 4 A.M., barometer 29.35 inches, hard S. gale, squally with blinding rain; 8 A.M., barometer 29.51 inches, very hard S.S.E. gale, terrific squalls, blinding rain, heavy sea, ship running before it; noon, barometer 29.67 inches, wind S.E., moderate, weather clearing in N.E.; wind continued S.E. and barometer rose rapidly (Monthly Weather Review, Aug. 1887). 3) Steamship "Earnmoor". Aug. 19, 11 P.M., left Santiago de Cuba with a light N.W. breeze and hazy weather, barometer falling slowly and sky having the appearance of an approaching hurricane. Aug. 20, weather fine with light to fresh N.W. and W. to W.S.W. breeze and falling barometer. Aug. 21, in lat. 23 35 N., long. 74 16 W. at noon, heavy squall of wind and rain from S.W., lasting 1 hour and a heavy northerly sea, falling barometer; 2:40 P.M. passed Watling Island (San Salvador) with a fresh and increasing S. gale and a heavy sea, also a short N. sea and terrific squalls accompanied by rain. Aug.

22, in lat. 27 06 N., long. 74 20 W., a heavy gale and tremendous sea running, with torrents of rain, brought ship to the wind which was S.S.E. at 4 A.M, with slowly rising barometer; 5 A.M., barometer again falling, S.E. gale and S.W. sea, with very unstable barometer continuing throughout the day. Aug. 23, in lat 30 44 N., long. 74 36 W. at noon, fresh gale continued until 4 P.M., then moderated; midnight (Aug. 23-24), fresh gale again from E.S.E. with falling barometer. Aug. 24, in lat. 33 51 N., long. 74 40 W., at noon, fresh gale, falling barometer, heavy sea; towards noon it blew a heavy gale from E. to S.S.W. with terrific squalls and rain; 4 P.M., hard gale and high sea, falling barometer, fresh gale continued until midnight (Aug. 24-25). Aug. 25, in lat. 36 56 N., long. 74 49 W., at noon; at 4 A.M., wind hauled to N.E. with fresh gale and tremendous sea; noon, strong N. gale and rising barometer; wind moderated in the afternoon (Monthly Weather Review, Aug. 1887). 4) Steamship "Pamona". Aug. 20, after leaving Cape Maysi, Cuba, wind came into the N.W., moderate; wind refreshed at night and sky looked very red; during night wind hauled to W. and refreshed, with squalls and heavy rain. Aug. 21, at Watling Island (San Salvador), weather looked very dirty and barometer continued falling; wind hauled to S. with terrific squalls and heavy rain; ship running before the rain (it should probably read the wind) and sea; at 5:30 P.M., hove the ship's head to the sea, barometer still falling; between 10 and 11 P.M. it blew very hard, afterwards moderating. Aug. 22, in lat. 26 44 N., long. 74 11 W. took off the crew of the wrecked schooner "Mary A. Douglas", which had been caught in two hurricanes. Aug. 23, lat. 30 56 N., long. 74 20 W. at noon, strong gale from S.E. and high sea with rain. Aug. 24, in lat. 34 24 N., long. 74 20 W. at noon, very squally, with rain and high seas. Aug. 25, lat 38 04 N. long. 72 00 W., at noon; at 5 A.M., wind changed to N. and blew a gale with very heavy sea (Monthly Weather Review, Aug. 1887). 5) Schr. "Mary A. Douglas". After having had a hurricane in the evening of Aug. 16, on Aug. 20 another hurricane sprung from N. and lasted about 2 hours (The New York Times, Aug. 27, 1887, p.8, col.5). Author's note: The time of 2 hours appears too short for the hurricane duration. 6) Schr. "Mabel S. Staples" (from New York for Caibarien, Cuba) arrived in Nassau in distress on Aug. 21. She made Nassau in a heavy gale and on the same day dragged ashore in the harbor, suffering damages and causing to leak badly (The New York Times, Aug. 30, 1887, p.5, col.6). 7) New Orleans, Aug. 29. The "El Dorado" arrived here from New York and struck the tornado (it means the hurricane), having left New York at midday Aug. 20. The hurricane was encountered at the latitude of Jacksonville (The New York Times, Aug. 30, 1887, p.1, col.5). 8) Nassau, N.P., Sept. 5. On Aug. 21 and 22, a severe hurricane passed over the islands of Grand Bahama and Abaco. The wind commenced blowing from N. and worked around to the S.E. The barometer reading at the lowest 28.80 inches. Nassau being just on the southern edge escaped with trifling damage (The New York Times, Sept. 19, 1887, p.1, col.6). 9) New Orleans, Sept. 1. The "Knickenbocker" left New York at 5 P.M. Aug. 20. The steamer passed Hatteras at midnight Aug. 21-22. At 7 A.M. Aug. 23, the wind was blowing a gale. At 1 P.M. the ship headed to open sea and at 4 P.M. the wind blew a heavy gale. At 9 P.M. the vessel shipped a heavy

sea. When in lat. 30 N., the wind blew with great fury and gradually hauled to N. At 9 A.M. Aug. 24, the port wheel ropes parted, leaving the vessel at the mercy of the sea. At noon the wind moderated slightly. Still there was a terrific swell but the barometer, which had fallen as low as 28.20 inches, was now rising. By midnight (Aug. 24-25), the weather had moderated. The wind at one time blew a velocity of at least 100 mph (The New York Times, Sept. 2, 1887, p.8, col.1). 10) The "Chalmette", which left New York for New Orleans on Aug. 23, was struck by a gale off Hatteras, which lasted 12 hours (The New York Times, Aug. 30, 1887, p.1, col.5). 11) Aug. 21-23, 1887. Cyclone of a large diameter, but slight energy, which moved over the Bahamas. It was felt in central Cuba, producing heavy showers and cyclonic winds which even reached places on the southern coast like Cienfuegos and Jucaro (Sarasola, 1928). Author's note: Actually taken from the catalog of Cuban hurricanes by M. Gutierrez-Lanza, which is included in Sarasola (1928). The statement that this was a storm of slight energy in the Bahamas seriously underestimated the storm intensity as inferred from information in item 8). 12) Steamship "Manhattan". Aug 22, 11 P.M., in lat. 30 N., long. 80 40 W., very bad looking weather and barometer falling rapidly, strong E.N.E. gale and very heavy S.W. sea, hove to head to the northward. Aug. 23, 9:30 A.M., turned around and ran to the southward, barometer 29.63 inches, wind inclined to back to N.; 11 P.M., hove to head to eastward, hard W.N.W. gale, barometer 29.43 inches, very heavy N.E. sea. Aug. 24, 9 A.M., rising barometer, hard N.W. gale. On Aug. 23 at sunset the sky was full of "mare-fails" moving in all directions, the lower clouds from N., the ones next above then from S.W., then some from S.E. and some from N.E. (Monthly Weather Review, Aug. 1887). 13) The "Bermuda" left St. Kitts on Aug. 19. On the morning of Aug. 22 Capt. Fraser did not like the weather because the horizon looked "greasy" and rain fell with sudden squalls; the wind had refreshed significantly and changed from N.E. to S. On Aug. 24, the barometer began to fall and by 4 P.M. the wind changed to S.E. by S.; at 8 P.M., the barometer read 29.50 inches. At 8 A.M. Aug. 25, the wind tried a new dodge and went to the E. By 8:30 A.M., the hurricane had left itself loose and in half an hour (9 A.M.) the barometer had reached 28.47 inches. Capt. Fraser kept the vessel off and ran with the wind, and a tremendous sea struck the ship. By noon the center of the storm had gone by. The barometer began to rise and the wind had backed to N.W. In two hours (2 P.M.), the barometer was at 29.10 inches and the weather much clearer. In the morning of Aug. 26 the sea was calmer and the barometer back to 30.00 inches (The New York Times, Aug. 30, 1887, p.1, col.3). 14) Baltimore, Aug. 30. A fleet of 4 British steamships arrived here coming from ports of Spain: the "Orpington", the "Triumph", the "Ashfield" and the "Kathleen". They encountered a hurricane, the "Orpington" having had the roughest experience and greatest damage. The vessels had ordinary weather until just after midnight Aug. 25 (Thursday), then began the hurricane which lasted 24 hours, swept away boats, etc. The atmosphere was so thick that the sky could not be seen. On Aug. 27, at lat. 36 22 N., long. 71 W., the "Orpington" passed a sailing vessel painted in black with masts gone and apparently nobody on board. The other three vessels also had

exciting experiences and the "Triumph" lost 2 boats (The New York Times, Aug. 31, 1887, p.5, col.4). 15) Barkentine "Josephine". Aug. 24, barometer continued falling until 19 30 hours in lat. 38 13 N., long. 74 40 W., to 29.65 inches, with light rain, and the wind gradually backed from S.E. to N.E. with increasing sea. Aug. 25, at 3 hours 15 minutes, sky commenced to clear but the wind increased until 4 hours 58 minutes when it blew heavily from N. by W. force 10, with sea heavy from N. by W., after which it moderated gradually (Monthly Weather Review, Aug. 1887). 16) Steamship "Yemassee". Aug. 24, noon, lat. 37 28 N., long. 74 50 W., barometer 29.75 inches and falling steadily, sea swell fast, long and heavy, heavy clouds in E. and S.; 4 P.M., wind backed to E., blowing in heavy gusts, with rain-squalls; 8 P.M., barometer 29.48 inches, wind N.E. a hard gale; 11 P.M. barometer 29.27 inches, lowest, wind a hurricane. Aug. 25, 2:40 A.M., Hatteras west, immense sea; during the day, the barometer rose and wind backed to N. and N.N.W. (Monthly Weather Review, Aug. 1887). 17) Ship "Hudson", which left Philadelphia for Antwerp on Aug. 22, put into this harbor (New York) in distress. The hurricane which caused so much havoc to shipping struck her on Aug. 25. The bowsprit was sprung and several sails were split (The New York Times, Sept. 11, 1887, p.9, col.7). 18) Steamship "Catalonia". Aug. 25-26, between long. 58 W. and 68 W., had a very unsettled weather; wind attained force of a fresh gale, accompanied by a heavy electrical storm, balls of flame being on all extremities aloft, wind backed gradually from S. to E. and W. by N. (Monthly Weather Review, Aug. 1887). 19) Steamship "Umbria". Aug. 26, noon, lat. 42 27 N., long. 59 20 W.; 2 P.M. (Greenwich time), barometer 29.80 inches, wind S., overcast and much rain, barometer falling rapidly and wind increasing, with a high, confused sea; 3 P.M., wind S.E. and a tremendous sea running; wind fell very light; to all appearances in the center of the cyclone; engine slowed; 5:30 P.M., barometer 28.65 inches; during a heavy squall of wind and rain, the wind went to N.N.W. and blew with hurricane force for 2 hours and then gradually moderated to a strong gale from N.W. with high sea (Monthly Weather Review, Aug. 1887). 20) Steamship "Rhaetia" reported a whole gale on Aug. 26, wind backed from N.N.E. to W.; lowest barometer 29.30 inches at 7 A.M., in lat. 41 55 N., long. 65 00 W. (Monthly Weather Review, Aug. 1887). 21) Steamship "La Gascogne" reported a hurricane on Aug. 26 and 27; wind backed from E.S.E. to N.W.; lowest barometer 28.58 inches at 1:30 P.M. Aug. 26 in lat. 42 29 N., long. 62 00 W. (Monthly Weather Review, Aug. 1887). 22) Steamship "Ohio". Aug. 26, 8 A.M., in lat. 41 28 N., long. 62 02 W., encountered a hurricane from S.S.E., barometer 29.51 inches; noon, barometer 28.20 inches, wind hauled to N.W. and storm continued for 4 hours with very high seas (Monthly Weather Review, Aug. 1887). 23) Steamship "Peconia" reported a hurricane on Aug. 26; wind backed from S.S.W. to E. and N.W.; lowest barometer 28.11 inches at 7 A.M. in lat. 39 19 N., long. 64 14 W. (Monthly Weather Review, Aug. 1887). 24) Steamship "Holland" reported a hurricane on Aug. 26; wind backed from S. to N.; lowest barometer 28.52 inches at 9:53 A.M. in lat. 42 41 N., long. 61 47 W. (Monthly Weather Review, Aug. 1887). 25) Steamship "Devonia" reported a storm on Aug. 26; wind veered from S.S.E. to N.W.; lowest barometer 28.44 inches at 7 P.M. in lat. 43 37 N.,

long. 56 22 W. (Monthly Weather Review, Aug. 1887). 26) Steamship "Crystal" had a whole gale on Aug. 26; wind backed from N.E. to N.W.; lowest barometer 29.24 inches at 11 A.M. in lat. 42 N., long. 64 12 W. (Monthly Weather Review, Aug. 1887). 27) Steamship "British Princess" reported a hurricane on Aug. 26; wind veered from S.E. to W.; lowest barometer 28.67 inches at 1 P.M. in lat. 43 12 N., long. 60 09 W. (Monthly Weather Review, Aug. 1887). 28) Steamship "Arizona". Aug. 26, 8 P.M. (Greenwich time) in lat. 45 06 N., long. 53 10 W., strong breeze from S. and fog; barometer 29.67 inches and falling rapidly; 10 P.M., barometer 28.70 inches, wind a hurricane from S.E., ship completely enveloped in spray; midnight (Aug. 26-27) in lat. 44 50 N., long. 54 00 W., lowest barometer 28.50 inches, wind began hauling to W. and barometer commenced to rise; wind settled down to hard W.S.W. gale, with tremendous high-breaking sea and barometer continued to rise rapidly (Monthly Weather Review, Aug. 1887). 29) Steamship "Europa" reported a hurricane on Aug. 26; wind veered from S.S.E. to W., lowest barometer 28.80 inches at midnight (Aug. 26-27) in lat. 44 10 N., long. 54 40 W. (Monthly Weather Review, Aug. 1887). 30) Steamship "Charles S. Whitney" reported a hurricane on Aug. 26; wind backed from S.S.E. to N.W., lowest barometer 28.40 inches at 7 P.M. in lat. 42 30 W., long. 60 30 W. (Monthly Weather Review, Aug. 1887). 31) Steamer "Italy" reported a heavy S.W. to W. gale on Aug. 27; lowest barometer 29.01 inches at 1 A.M. in lat. 45 N., long. 50 30 W. (Monthly Weather Review, Aug. 1887). 32) Steamship "Britannic" reported a strong gale from Aug. 28 to Aug. 30; lowest barometer 29.44 inches at lat. 48 40 N., long. 38 30 W. on Aug. 29 (Monthly Weather Review, Aug. 1887). 33) Steamship "La Normandie" reported a whole W.S.W. to N.W. gale from Aug. 29 to Aug. 31; lowest barometer 29.22 inches at 6 A.M. Aug. 30 in lat. 50 15 N., long. 24 W. (Monthly Weather Review, Aug. 1887). 34) Steamship "Leerdam" reported a whole W.S.W. to W.N.W. gale on Aug. 29 and 30; lowest barometer 29.50 inches at 10 A.M. Aug. 29 in lat. 48 05 N., long. 36 03 W. (Monthly Weather Review, Aug. 1887). 35) Steamship "Aller" reported a whole S.W. to W.N.W. gale on Aug. 28 through Aug. 30; lowest barometer 29.33 inches at 4 P.M. Aug. 29 in lat. 49 13 N., long. 35 29 W. (Monthly Weather Review, Aug. 1887). 36) Steamship "Island" reported a whole gale on Aug. 28 and 29; wind veered from S. to N.W.; lowest barometer 29.09 inches at 7 A.M. Aug. 28 in lat. 52 06 N., long. 41 20 W. (Monthly Weather Review, Aug. 1887). 37) Cyclone of Aug. 19-30. Recurved E. of Florida (Tannehill, 1938). 38) Map showing a track for the storm. Daily positions along the track are: Aug. 19, 16.8 degrees N., 58 degrees W.; Aug. 20, 21.8 degrees N., 65.8 degrees W.; Aug. 21, 25.5 degrees N., 75.5 degrees W.; Aug. 22, 26.5 degrees N., 76.8 degrees W.; Aug. 23, 29 degrees N., 77 degrees W.; Aug. 24, 32 degrees N., 76.2 degrees W.; Aug. 25, 36.8 degrees N., 69.7 degrees W.; Aug. 26, 41 degrees N., 60.8 degrees W. (Monthly Weather Review, Aug. 1887).

Many of the items above suggested some modifications to be applied to the track shown in Neumann et al. (1993) as for Storm 5, 1887. The author of this study estimated 7 A.M. positions for the days in the period Aug. 18-27 which allowed him to produce a track somewhat different from the one mentioned above, primarily in regard to the timing along the track. The author's 7 A.M.

positions for the period Aug. 18-20 were obtained from backwards extrapolation in time along practically the same curve in Neumann et al. (1993), starting from the author's 7 A.M. Aug. 21 position (which was the first one the author could estimate with some degree of accuracy on the basis of the available data) and after assuming a constant motion of about 18 mph. These positions were as follows: Aug. 18, near 16.0 degrees N., 55.0 degrees W., which is about 200 miles to the E.S.E. of the corresponding position in Neumann et al. (1993); Aug. 19, near 19.5 degrees N., 62.0 degrees W., which is roughly the same position given in the above publication; Aug. 20, 24.0 degrees N., 68.3 degrees W., which is about 150 miles to the N.W. of the position given in Neumann et al. (1993). Obviously, the confidence the author has concerning the trajectory for this early period is fairly low, but much more accurate estimates were obtained by him from Aug. 21 on. The author's 7 A.M. position for Aug. 21 was near 26.3 degrees N., 76.0 degrees W. and was based on the content of items 2), 3), 4), 6), 8) and 11). The author's 7 A.M. Aug. 22 position was near 27.0 degrees N., 78.3 degrees W. and was based on information in items 8) and 11). It should be mentioned that the positions for Aug. 21 and 22 are about 75 and 100 miles to the S.W. of the corresponding ones in Neumann et al. (1993); these new positions brought the center of the storm over the N.W. Bahamas as suggested in item 8). The author's 7 A.M. Aug. 23 position was estimated near 30.0 degrees N., 78.5 degrees W. on the basis of information in items 7), 9) and 12). The author's 7 A.M. Aug. 24 position was near 32.3 degrees N., 77.7 degrees W., allowing from a smooth turn to the N.N.E. at a slightly slower forward speed prior to a northeastward acceleration which started during the next 24 hours. The author's 7 A.M. Aug. 25 position was estimated near 35.7 degrees N., 73.3 degrees W. on the basis of information in items 15) and 16) and, to a lesser extent, in item 13). The author's 7 A.M. position was near 40.0 degrees N., 64.0 degrees W. and was primarily based on a careful analysis of all data for that day and, in particular, on items 20) and 23). The author's 7 A.M. Aug. 27 position was near 48.0 degrees N., 47.0 degrees W. and was primarily based on space-time continuity using information in items 28) and 29) and, particularly, in item 31). The author's track was terminated on Aug. 27 because information in items 32) through 36) for the next few days was found to be insufficient for track purposes and, furthermore, the author believes that merging of the storm with a vast low pressure area at high latitudes in the eastern Atlantic might have occurred after Aug. 27. The author's track for Storm 7, 1887 is shown in Fig. 1.

The hurricane status which Neumann et al. (1993) attributed to this storm (Storm 5, 1887 in their publication) was fully verified by the content of many of the items above. Furthermore, barometer readings equal or below 28.50 inches reported by several vessels, the lowest being 28.11 inches by the "Peconia" (item 23), indicated that Storm 7, 1887 was a major hurricane.

Storm 8, 1887 (Sept. 1-6), H.

This is the same storm that Neumann et al. (1993) identify as Storm 6, 1887.

The following information was found about this storm: 1) The system was central on Sept. 1 about lat. 29 N., long. 55 W., whence it had apparently advanced from the tropics. By Sept. 2, the center had moved to about lat. 33 N., long. 58 W. and then circled northwards to the Banks of Newfoundland by Sept. 3; the center passed rapidly northeastward and reached the vicinity of lat. 56 N., long. 23 W. by Sept. 5; during the next 24 hours it pursued an E.S.E. course to the Irish coast and by Sept. 7 had advanced eastward beyond the region of observation (Monthly Weather Review, Sept. 1887). 2) Storm of Sept. 1-7, 1887. Far out in the Atlantic (Tannehill, 1938). 3) Ship "Inflexible". Sept. 1, noon, lat. 33 34 N., long. 56 W.; wind refreshed and barometer falling; wind backing to E.S.E. and E. blowing a stiff breeze, heavy S.E. seas; 10 P.M., barometer falling rapidly, sea E.S.E. with long roll; Sept. 2, 1 A.M., barometer falling, wind increased to a gale and backing to N.E.; 4 A.M., wind backing, barometer falling; rain and terrific squalls; the sea one mass of foam; 10 A.M., moderating, wind N.W.; position at noon Sept. 2: lat. 32 21 N., long. 60 10 W. (Monthly Weather Review, Sept. 1887). 4) Bark "Hermon". Sept. 2, noon, lat. 43 56 N., long. 51 29 W., S. and S.S.E. wind and rapidly falling barometer; Sept. 3, noon, lat. 42 02 N., long. 53 48 W., wind drawing to N.E. with heavy rain; 4 A.M., wind N. force 10; very heavy S.W. sea; barometer commenced to rise and wind moderated and drew to W.N.W. (Monthly Weather Review, Sept. 1887). Author's note: The N.E. wind at noon Sept. 3 and the 4 A.M. observation and remarks which follow show some inconsistencies and look suspicious. 5) Steamship "Geiser". Sept. 1, 7 A.M., lat. 43 26 N., long. 59 22 W., entered a fog bank which continued without clearing until Sept. 3, when it was dispersed by a cyclone which passed to the southward of the vessel. Sept. 3, 8 A.M., lat. 45 50 N., long. 49 45 W., barometer 29.53 inches wind S. by E. force 5; 10 A.M., barometer 29.39 inches, wind S.S.E. force 6, dense fog; noon, lat. 46 20 N., long. 48 58 W., barometer 29.29 inches, wind S.E. force 6, heavy rain; 1 P.M., wind E.S.E. force 7, heavy rain; 2 P.M., wind N.E. by E. force 7, heavy rain; 3 P.M., wind N.E. force 9, heavy rain; 4 P.M. lat. 46 46 N., long. 48 14 W., barometer 28.86 inches, wind N.E. by N. force 9, heavy rain; 4:30 P.M., barometer 28.86 inches, wind N.N.E. force 10, rain moderating; 5 P.M., barometer 28.92 inches, wind N.N.E. force 10; 6 P.M., barometer 28.96 inches, wind N. by E., hurricane; 7 P.M., barometer 29.06 inches. wind N. by W. force 10. After this the clouds broke and the barometer rose rapidly and the wind settled into an ordinary gale from N.W. by N. that continued 2 days with a heavy sea (Monthly Weather Review, Sept. 1887). 6) Bark "Seudesnaes", from Trieste, met a terrific hurricane from S.S.W. on Sept. 3 at lat. 42 54 N., long. 54 45 W. The jibboom, topmast, rigging and bulwarks were carried away and other damage sustained (The New York Times, Dec. 2, 1887, p.3, col.4). Author's note: If the position given were correct, the "hurricane from S.S.W." statement would likely be in error. 7) Steamship "De Ruyter" reported a hurricane on Sept. 3; wind backed from S.E. to E., N.E. and N.W.; lowest barometer 29.10 inches at 7:40 A.M. in lat. 41 16 N., long. 54 54 W. (Monthly Weather Review, Sept. 1887). 8) Steamship "Pieter de Conick" reported a storm on Sept. 3, wind veered from S.S.E. to S.W.; lowest barometer 28.48

inches at 3 P.M. in lat. 44 48 N., long. 48 08 W. (Monthly Weather Review, Sept. 1887). 9) Steamship "Taormina" reported a hurricane on Sept. 3; wind veered from S.E. to N.W.; lowest barometer 28.44 inches at 5:15 P.M. in lat. 43 48 N., long. 48 17 W. (Monthly Weather Review, Sept. 1887). 10) Steamship "City of Rome" encountered a whole W. to N.W. gale on Sept. 4, lowest barometer 29.08 inches at noon in lat. 50 37 N., long. 55 11 W. (Monthly Weather Review, Sept. 1887). 11) On Sept. 5 and 6 the depression was accompanied by heavy gales E. of the 35 degrees W. meridian (Monthly Weather Review, Sept. 1887).

The content of the above items supported the introduction of some modifications along the track in Neumann et al. (1993) for the period Sept. 1-4 and as for Storm 6, 1887 in their publication. Therefore, the author of this study estimated new 7 A.M. positions as follows: Sept. 1, near 29.0 degrees N., 55.0 degrees W., based on item 1) and on a better space-time continuity with the author's estimated position for the next day; Sept. 2, near 32.0 degrees N., 58.5 degrees W., based on information in item 3); Sept. 3, near 41.0 degrees N., 54.0 degrees W., based on the entire analysis of the information in items 4) through 9), in general, and on item 7), in particular; Sept. 4, near 52.0 degrees N., 35.0 degrees W., based on information in item 10). The positions shown in Neumann et al. (1993) for the period Sept. 5-6 (Storm 6, 1887 in their publication) were kept unchanged on the ground that they seemed to be reasonable in the light of information in items 1) and 11). The author's track for Storm 8, 1887 is displayed in Fig. 1.

Barometer readings reported by several vessels, particularly on Sept. 3, fully supported the hurricane status that Neumann et al. (1993) attributed to this storm (Storm 6, 1887 in their publication. Barometer readings below 28.50 inches reported by the "Pieter de Conick" (item 8) and the "Taormina" (item 9) suggest the possibility that the storm might have even reached major hurricane status.

#### Storm 9, 1887 (Sept. 11-22), H.

This is the same storm which Neumann et al. (1993) identify as Storm 7, 1887.

The following information was found about this storm: 1) This cyclone was first reported in a telegram to the Chief Signal Officer on the morning of Sept. 16 as a cyclonic disturbance to the S.W. of Cuba. By the courtesy of Padre Benito Vines, S.J., director of the Belen College Observatory of Havana, the Chief Signal Officer was notified of the presence of the cyclone and its subsequent progress through the Gulf (Monthly Weather Review, Sept. 1887). Author's note: The New York Times, Sept. 17, 1887, p.5, col.2, also published the statement from Havana, dated on Sept. 16, saying that there were indications of a cyclone S.W. of that city. 2) Reports received from marine observers by mail showed, however, that the storm was first observed in lat. 13 N., long. 57 W. Cwing to the limited number of reports received from the region traversed by the storm, its chartered track over the Caribbean is only approximately correct and no accurate data about its intensity could be given (Monthly Weather Review, Sept. 1887). 3) Storm of

Sept. 11-21, 1887. Dominica, Yucatan, Brownsville. Moving very slowly on passing inland at Brownsville on Sept. 21-22. Barometer 28.93 inches, was below 29 inches for several hours. Wind N. 78 mph (Tannehill, 1938). 4) Steamer "Colorado" left Galveston on Sept. 17. E. gales were encountered up to the Tortugas. The day after leaving Galveston she was caught in a tremendous squall and waves broke over the deck. The squall was of short duration (The New York Times, Sept. 26, 1887, p.8, col.2). 5) New Orleans, Sept. 20. The wind still blows from the E. and harder since 6 P.M.. Tonight the rise of the basins has been 4.51 inches in the past 24 hours. Below the city, half of the parish of Plaquemines and all of the rear of St. Bernard are under water (The New York Times, Sept. 21, 1887, p.4, col.6). 6) Report by the Signal Service observer at Corpus Christi, Tx.: Brisk to high N. wind prevailed on Sept. 19 until 5 P.M. when the wind veered to N.E.; it backed to N. at 8:15 P.M. and attained a maximum velocity of 33 mph from N. at 9:17 P.M. High N. winds prevailed on Sept. 20, attaining a maximum velocity of 36 mph. Heavy rain fell during the early morning of Sept. 21, and light to heavy rain continued until 9 P.M. The wind veered to N.E. and attained a velocity of 40 mph at 1:10 A.M., backing to N. at 6:30 A.M. and then veering to N.E., its reached its maximum velocity of 45 mph at 12:25 P.M.; brisk to high winds continued during the remainder of the day. The water in Corpus Christi Bay rose about 2.5 feet from Sept. 19 to Sept. 21 (Monthly Weather Review, Sept. 1887). 7) Record of observations taken at Point Isabel, Tx. by Mr. Egan and furnished through the observer at Brownsville: Sept. 20, 7:10 P.M. barometer 29.73 inches, N.W. wind, water high, drizzling rain; Sept. 21, 7:30 A.M., barometer 29.12 inches, N.W. wind, hurricane since 4 A.M; 9:50 A.M., barometer 28.76 inches, N. wind, hurricane; 10:45 A.M., barometer 28.74 inches, N.E. wind, weakening; 11 A.M., barometer 28.74, N.E. wind, very light; 11:45 A.M., barometer 28.77 inches, N.E. by E. wind, very light; 12:30 P.M., barometer 28.79 inches, E. by S. wind; 12:40 P.M., barometer 28.82 inches, S.E. wind, fresh, water falling fast; 1:45 P.M., barometer 28.98 inches, S.E. wind, fresh; 2:30 P.M., barometer 28.98 inches, S.E. wind, fresh; 3:10 P.M., barometer 29.00 inches, S.E. wind, fresh; 4:30 P.M., barometer 29.12 inches, wind S.E., fresh; 6:40 P.M., S.E. wind, fresh; 8:10 P.M., barometer 29.40 inches, S.E. wind, fresh; 8:55 P.M., barometer 29.44 inches, wind S.E., fresh; 11:40 P.M., barometer 29.56 inches, fresh S.E. wind, stronger; Sept. 22, 7:30 A.M., barometer 29.76 inches, S. wind, moderate; very heavy rain; 8:30 A.M., barometer 29.83 inches, S. wind, moderate; 11 A.M., barometer 29.88, S. wind, moderate (Monthly Weather Review, Sept. 1887). Author's note: Point Isabel is located 23 miles N.E. of Brownsville. Times are expressed in Eastern Standard Time (75 degrees W. meridian). The wind intensity reported during the afternoon and evening of Sept. 21 appears to be underestimated, the persistent "fresh" wind being suspicious. 8) Record of observations taken at Brownsville as reported by Sergeant A.B. Crane, Signal Corps: Sept. 20, 10 P.M., barometer 29.92 inches, wind N.W. 15 mph; Sept. 21, 7 A.M., barometrer 29.45 inches, wind N.E. 25 mph; 1 P.M., barometer 29.08 inches, wind N. 78 mph; 1:15 P.M., barometer 28.97 inches, wind N. 50 mph; 1:30 P.M., barometer 28.94 inches,

wind N.W. 40 mph; 1:45 P.M., barometer 28.93 inches, wind N.W. 53 mph; 2 P.M., barometer 28.95 inches, wind N.W. 43 mph; 2:15 P.M., barometer 28.96 inches, wind N.W. 40 mph; 2:30 P.M., barometer 28.95 inches, wind N.W. 37 mph; 2:45 P.M., barometer 28.95 inches, wind N.W. 45 mph; 3 P.M., barometer 28.95 inches, wind N.W. 38 mph; 3:15 P.M., barometer 28.96 inches, wind N.W. 36 mph; 3:30 P.M., barometer 28.94 inches, wind N.W. 36 mph; 4 P.M., barometer 28.93 inches, wind N.W. 18 mph; 4:30 P.M., barometer 28.94 inches, wind N.W. 12 mph; 5 P.M., barometer 28.96 inches, wind N.W. 11 mph; 5:30 P.M., barometer 28.98 inches, wind W. 9 mph; 6 P.M., barometer 29.03 inches, wind W. 12 mph; records showed that the wind decreased in force until 4:10 P.M. when a lull occurred and all appearances of the storm seemed to be over; between 4:10 and 5 P.M., the wind became variable, swinging in all directions and by 6:45 P.M. it had backed to the S.W. and began blowing at a high rate, increasing in force to 60 mph; 10 P.M., barometer 29.37 inches, wind S.E. 24 mph; Sept. 22, 2 A.M., no barometer reading, wind S. and S.E. 60 mph; 7 A.M., barometer 29.74 inches, wind S.E. 17 mph. Rainfall at Brownsville was 0.02 inches on Sept. 20, 8.50 inches on Sept. 21 and 2.26 inches on Sept. 22 (Monthly Weather Review, Sept. 1887). Author's note: Times are expressed in Eastern Standard Time (75 degrees W. meridian). 9) Description of the storm at Matamoros, Mexico, extracted from the Chicago Times, Sept. 24. The great storm of Wednesday night (Sept. 21) and the morning of Sept. 22 did extensive damage in Matamoros and for 20 miles S. of here and 40 miles W. along the Rio Grande. The hurricane drove the sea into the mouth of the Rio Grande, causing it to overflow its bank on the Mexican side for a distance of about 100 miles from its mouth. The principal streets of the city were submerged to a depth of 3 feet. The hurricane was so powerful that not a single metal roof remains here. All fences in the city and for miles surrounding have disappeared. It is thought that every frame house was moved more or less from its foundation or otherwise damaged. The rain poured down in blinding sheets for several hours, adding terror to the hurricane and the raging river (Monthly Weather Review, Sept. 1887). 10) Map showing a track for this storm. Daily positions along such a track are: Sept. 11, lat. 13 N., long. 57 W.; Sept. 12, lat. 14.8 N., long. 62 W.; Sept. 13, lat. 15 N., long. 65 W.; Sept. 14, lat. 14.7 N., long. 74 W.; Sept. 15, lat. 15 N., long. 80 W.; Sept. 16, lat. 18.8 N., long. 84.2 W.; Sept. 17, lat. 20 N., long. 87.2 W.; Sept. 18, lat. 22.2 N., long. 89 W.; Sept. 19, lat. 25 N., long. 91 W.; Sept. 20, lat. 26 N., long. 94 W.; Sept. 21, lat. 26.2 N., long. 96.8 W.; Sept. 22, lat. 25.5 N., long. 98.5 W. (Monthly Weather Review, Sept. 1887).

With the exception of a slight adjustment made for Sept. 21, the track in Neumann et al. (1993) as for Storm 7, 1887 was accepted as satisfactory in the light of the information contained in the above items. For Sept. 21, a slight adjustment of the track by a few miles to the north was introduced and a new 7 A.M. position near 26.2 degrees N., 96.8 degrees W. was estimated by the author of this study on the basis of information in items 7), 8) and 10). All other positions along the track shown by the above mentioned authors were kept unchanged in the process of preparing the track for Storm 9, 1887 which is displayed in Fig. 1.

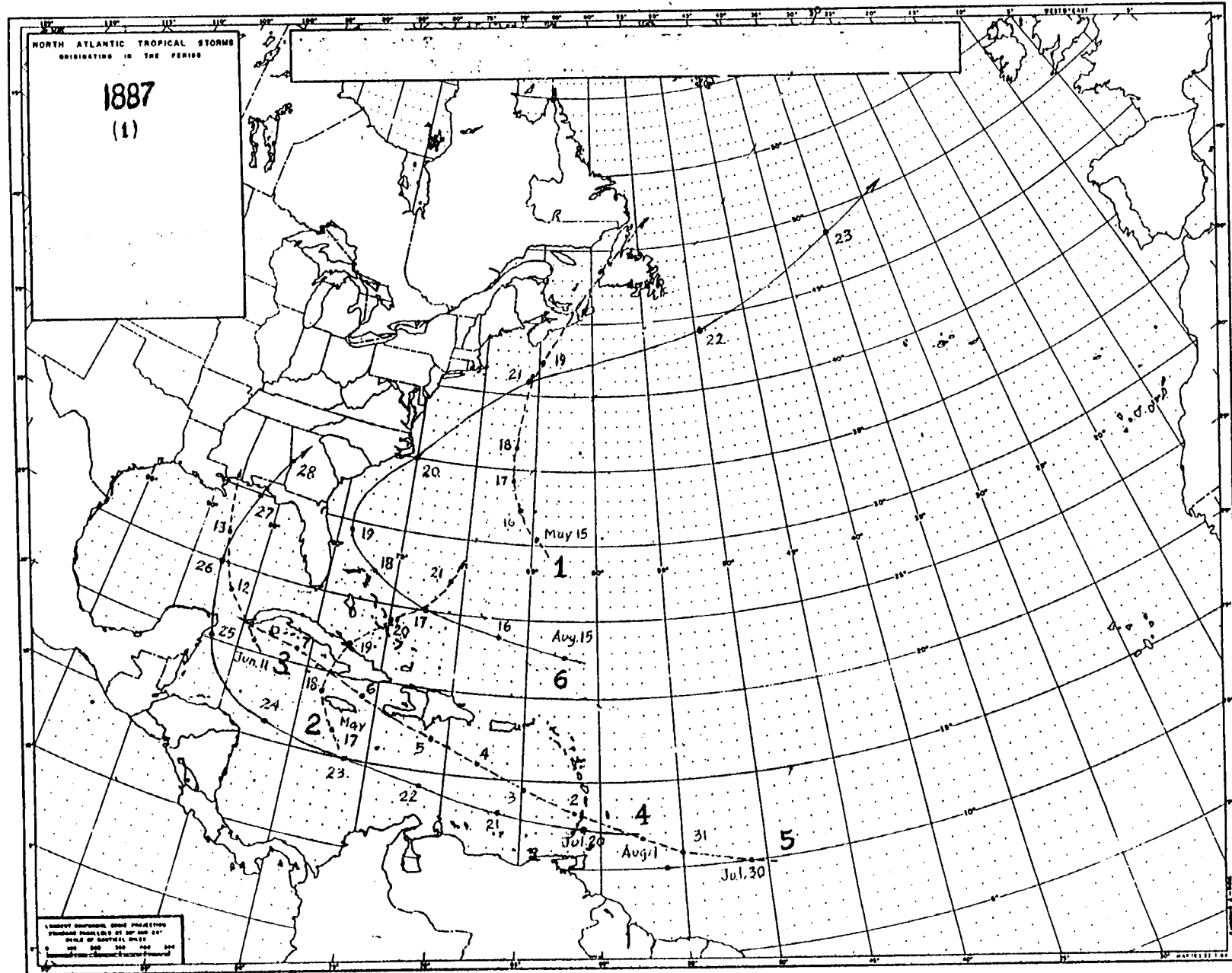


Fig. 1.

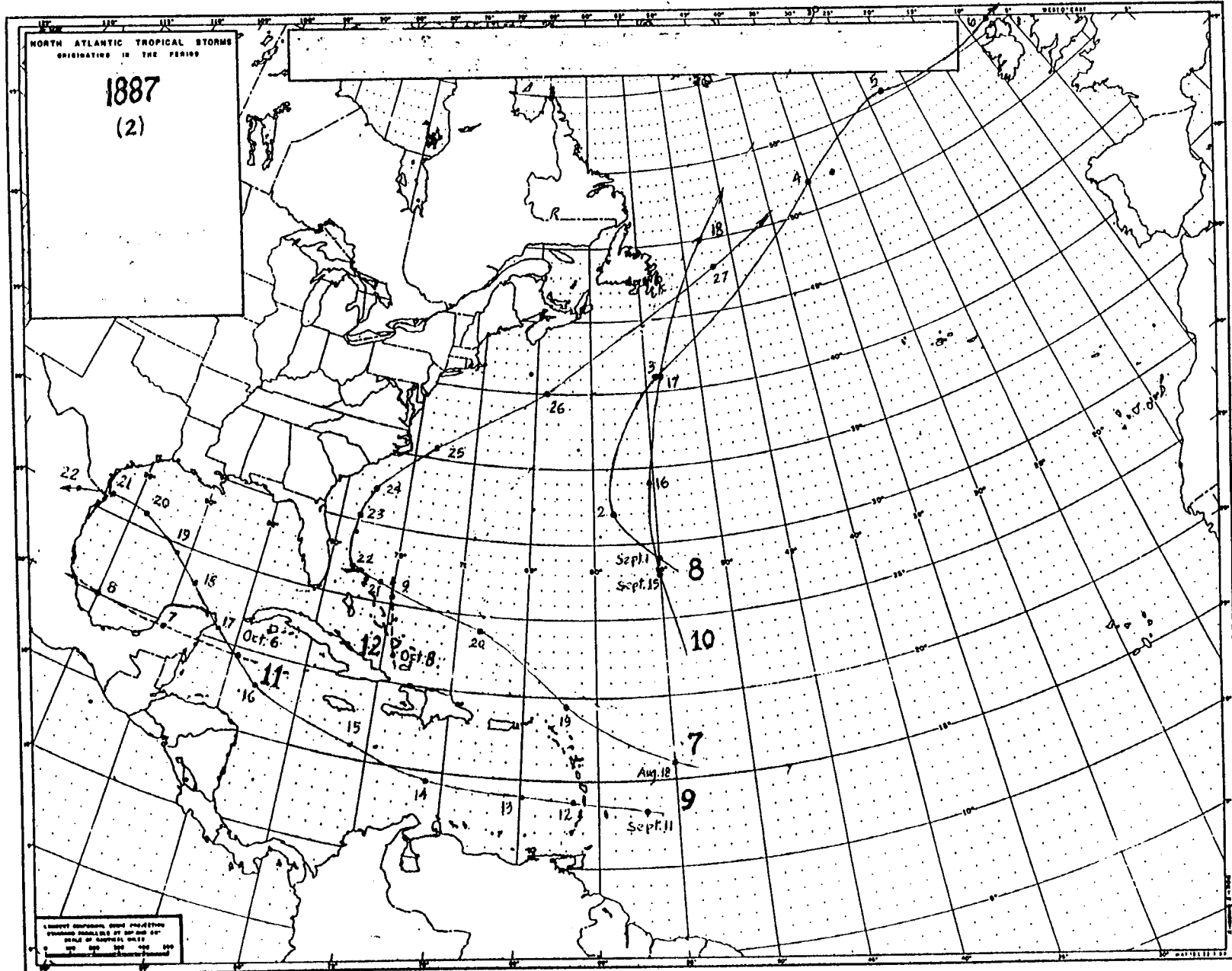


Fig. 1 (cont'd).

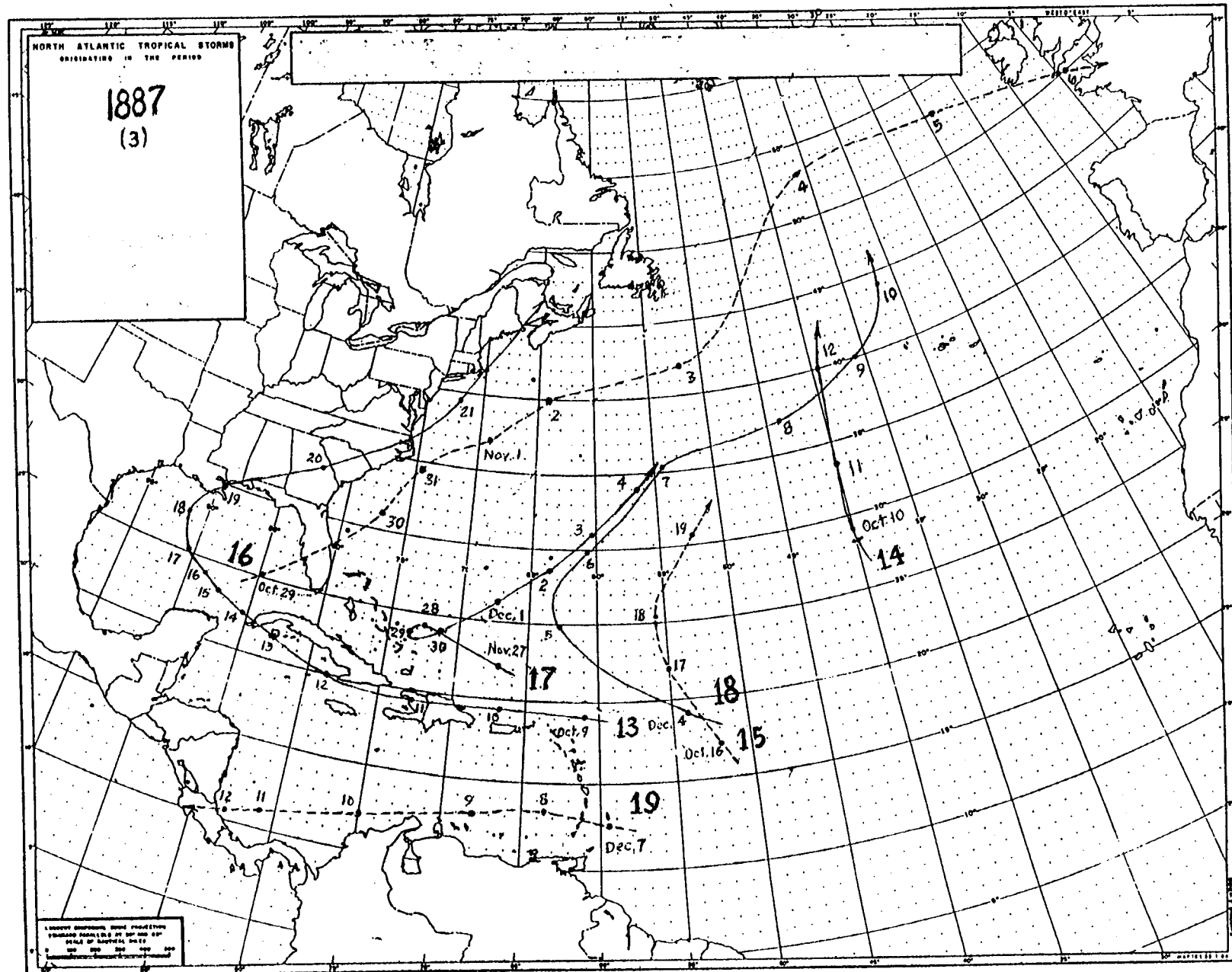


Fig. 1 (cont'd).

Lowest barometer readings of 28.74 inches at Point Isabel (item 7) and 28.93 inches at Brownsville (item 8) were found to justify the hurricane status given to the storm in Neumann et al. (1993) under the label of Storm 7, 1887.

Storm 10, 1887 (Sept. 15-18), H.

This storm corresponds to Storm 8, 1887 in Neumann et al. (1993).

The following information was found about this storm: 1) Storm of Sept. 15-18, 1887. Far out in the Atlantic (Tannehill, 1938). 2) This system was of tropical origin and moved northward in the vicinity of the 55 degrees W. meridian during Sept. 15 and 16, attained by storms of hurricane force. During Sept. 17 the center passed E. of N. over the Banks of Newfoundland and during Sept. 18 moved N. of the 50 degrees N. parallel and beyond the area of observations (Monthly Weather Review, Sept. 1887). 3) Steamship "Marsala" reported a strong gale on Sept. 16 and 17; wind veered from S.E. to N.W.; lowest barometer 29.02 inches at 9 P.M. Sept. 17 in lat. 45 26 N., long. 50 54 W. (Monthly Weather Review, Sept. 1887). 4) Mr. J. Higgins, the observer at Saint John's, Newfoundland, stated that a strong N.E. gale, with heavy rain, commenced there in the afternoon of Sept. 17; at 11 P.M. barometer fell to 29.31 inches; gale increased and continued till the morning of Sept. 18, when it veered to N.W. and moderated (Monthly Weather Review, Sept. 1887). 5) St. John's, Newfoundland, Sept. 19. A gale from the N.E. Saturday night (Sept. 17) caused much damage at Portugal Cove. Many vessels were driven ashore and others were driven against the cliffs and smashed. At Placentia, several craft were driven seaward and have not since been heard from. Bonavista presents a dreadful scene (The New York Times, Sept. 20, 1887, p.1, col.5). 6) Map showing a track for this storm. Positions along the track are: Sept. 15, lat. 28 N., long. 55.3 W.; Sept. 16, lat. 33 N., long. 58 W.; Sept. 17, lat. 43 N., long. 52.7 W.; Sept. 18, lat. 50 N., long. 50 W. (Monthly Weather Review, Sept. 1887). Author's note: A similar track is included in Mitchell (1924).

The above items suggested some modifications to be introduced along the track shown in Neumann et al. (1993) as for Storm 8, 1887. The author of this study kept unchanged the 7 A.M. Sept. 15 position in the just mentioned publication, and produced new 7 A.M. position estimates as follows: Sept. 16, near 34.0 degrees N., 55.3 degrees W., primarily based on interpolation, along a smooth curve, between positions on the previous day and the next day; Sept. 17, near 41.0 degrees N., 53.5 degrees W., using space-time continuity as applied backwards on the basis of items 3) and 4); Sept. 18, near 50.0 degrees N., 48.0 degrees W., based on splitting the difference between positions in item 6) and in Neumann et al. (1993), after having taken into account the wind information given in item 3). The author's track for Storm 10, 1887 is displayed in Fig. 1.

General information in item 2) and the barometer reading of 29.02 inches reported by the "Marsala" (item 3) were found to support the hurricane status that Neumann et al. (1993) attributed to this storm (Storm 8, 1887 in their publication).

Storm 11, 1887 (Oct. 6-8), T. S.

This storm corresponds to Storm 9, 1887 in Neumann et al. (1993).

Information about this storm was found to be rather limited: 1) This system is traced from the Caribbean westward along the 20 degrees N. parallel over Yucatan and the southern portion of the Gulf of Mexico during Oct. 6-8, its path being determined, approximately, by a limited number of vessel reports. While the cyclonic nature of this storm is well defined by chartered reports, its course was too far southward to accurately determine its strength (Monthly Weather Review, Oct. 1887). 2) Storm of Oct. 6-8, 1887. Yucatan (Tannehill, 1938). 3) Map showing a storm track with the following daily positions: Oct. 6, lat. 19.5 N., long. 85.5 W.; Oct. 7, lat. 19.5 N., long. 89.7 W.; Oct. 8, lat. 19.7 N., long. 95.0 W. (Monthly Weather Review, Oct. 1887). Author's note: A similar track for this storm is included in Mitchell (1924).

The information in the above items was found to support, in general, the track in Neumann et al. (1993) as for Storm 9, 1887. Therefore, such a track is reproduced in Fig. 1 as for Storm 11, 1887.

Because of the uncertainties about the storm strength discussed in item 1), the author of this study believes that the classification of the system as a tropical storm given in Neumann et al. (1993) is appropriate and, therefore, it was kept unchanged.

Storm 12, 1887 (Oct. 8-9), T. S.

This storm seems to be somewhat related to Storm 10, 1887 in Neumann et al. (1993) in the sense that some information allegedly connected to this system appeared to have been used in preparing the track for such a storm.

The following information was found to be allegedly related to the storm: 1) The presence of this depression over the Caribbean Sea was shown on reports on Oct. 8; by Oct. 9 the storm center had apparently moved westward to about 19 degrees N., 71 degrees W. (it should read 81 degrees W.) and on the morning of Oct. 10 it had moved N.W., over the western extremity of Cuba, whence it passed slowly westward over the Gulf of Mexico. The path subsequent to Oct. 11 could not be determined, owing to absent reports E. of the position it occupied on that date (Monthly Weather Review, Oct. 1887). 2) Steamship "Alvena". Oct. 8, between Maysi (Cuba) and Castle Island, at 4:57 A.M., Greenwich time; 8:12 A.M., barometer 29.63 inches and falling rapidly; 9:37 A.M., barometer lowest 29.36 inches after which it commenced to rise. The weather during this time was heavy and threatening, with wild-looking clouds from N. to S. and around to W.; at the last-mentioned hour clouds parted in E. to N. and the greater portion remained in the S., but no rain fell. Oct. 9, between lat. 25 10 N., long. 74 08 W. and lat. 28 N., long. 74 15 W.; at 4:50 A.M., Greenwich time, a fresh gale commenced, with heavy rain and a rough sea from E.; gale continued until 7 P.M., when it moderated; lowest barometer 29.59 inches at 9 A.M. (Monthly Weather Review, Oct. 1887). Author's note: Castle Island is located in the southeastern Bahamas. 3) Havana, Oct. 10,

barometer 29.89 inches, wind S.E. 11 mph; cloudy weather, 4 tenths of cirrostratus clouds moving from the S.W.; storm center west of station (Monthly Weather Review, Oct. 1887). Author's note: In the author's opinion, the above mentioned weather conditions at Havana do not seem to imply the presence of the storm center which was stated to have been to the west of that city. 4) Storm of Oct. 9-10, 1887. Western Cuba (Tannehill, 1938). 5) Brownsville, Tx., Oct. 11. Reports of another hurricane in the Gulf moving westward create great uneasiness here. Seven inches of rain fell last night and the Rio Grande River is higher than ever. In Matamoros the flood has spread greatly. The steamer "Aransas" has been 2 days on the bar, unable to communicate with the town on account of the rough weather (The New York Times, Oct. 12, 1887, p.5, col.4). Author's note: The bad weather in the Brownsville area was probably linked in some way to Storm 11, 1887. 6) Storm track showing the following positions: Oct. 9, 19 degrees N., 80.5 degrees W.; Oct. 10, 22.7 degrees N., 85.0 degrees W.; Oct. 11, 23.3 degrees N., 87 degrees W. (Monthly Weather Review, Oct. 1887). Author's note: A similar track is included in Mitchell (1924) and it should be indicated that the track in Neumann et al. (1993) as for Storm 10, 1887 does not differ significantly from the above mentioned tracks.

The author of this study believes that the track displayed in Neumann et al. (1993) is primarily based on the tracks discussed in item 6) and its corresponding author's note. In turn, these latter tracks appeared to have been based, primarily, on information in item 3) which, in the author's opinion, looks to have been erroneous as far as to justify the presence of a storm to the W. of Havana on Oct. 10. In support of the author's opinion is the fact that in neither the catalog of Cuban cyclones by M. Gutierrez-Lanza (Sarasola, 1928) nor the Cuban cyclone chronology by Martinez-Fortun (1942) there is an indication of any storm to have affected Cuba on Oct. 9-10, 1887. However, information in item 2) was found to support, indeed, a storm over the southeastern Bahamas and adjacent waters on Oct. 8 and 9 which, according to the above mentioned publications on Cuban cyclones, it did spare the island of Cuba. Therefore, the author of this study decided to discard the storm track in Neumann et al. (1993) as for Storm 10, 1887 and to introduce a new track for the storm over and near the Bahamas by making use of information in item 2). Author's 7 A.M. estimated positions were as follows: Oct. 8, 21.7 degrees N., 74.3 degrees W.; Oct. 9, 25.5 degrees N., 75.0 degrees W. After the "Alvena" was near the center of the storm at 9:27 A.M. Oct. 8 (Greenwich time), both the ship and the storm progressed northward, resulting in the E. gale reported by the "Alvena" for about 14 hours on Oct. 9 (item 2). The author's track for this weather system over and near the Bahamas is introduced as for Storm 12, 1887 in Fig. 1. The author was unable to track the storm beyond Oct. 9. However, it seems possible, and even likely, that this storm might have turned northeastward, being the same depression that the Monthly Weather Review, Oct. 1887, mentioned to have been to the E. of Bermuda on Oct. 12.

As there is no evidence of hurricane winds associated with Storm 12, 1887, a tropical storm status was given to this weather system.

Storm 13, 1887 (Oct, 9-21), H.

This is the same storm that Neumann et al. (1993) identify as Storm 11, 1887.

The following information was found in relation to this storm:

1) Storm of Oct. 9-24, 1887. Recurved in the Gulf (Tannehill, 1938). 1) Corvette "Nalon", from Belize to Cienfuegos. Oct. 10, lat. 19 50 N., long. 75 20 W., heavy sea from E.S.E., heavy clouds in S.E. quadrant, wind oscillating from E.S.E. to S.E., barometer falling slowly. Oct. 11, in the morning, wind hard from E.S.E., heavy clouds and violent gusts of rain and wind; in the afternoon, the barometer fell considerable, to 29.33 inches at 6 P.M., weather dark and continuous rain; 8 P.M., terrible rolling sea from E.S.E. to S.S.W.; during the night, continuous rain and violent gusts, barometer fell to 29.21 inches. Oct. 12, in the morning, rain continued with hurricane from S.E. to S., the sea a boiling mass and so it continued to the end of the day's run in lat. 20 45 N., long 77 W. (?) with barometer steady at 29.21 inches; in afternoon, much rain and wind, sea more moderate; 6 P.M., weather cleared somewhat and barometer rose; during night violent gusts from S. and S.S.W. Oct. 12 (it should probably read Oct. 13), noon, in lat. 20 50 N., long. 76 30 W., barometer rising slowly to 29.29 inches, hard gusts. Oct. 13, hard S.W. gusts at long intervals, sea from E.S.E. and diminishing, barometer rising (Monthly Weather Review, Oct. 1887). Author's note: The positions given for Oct. 12 and 13 are obviously wrong because they are over land. In addition, some of the barometer readings might be unreliable and the Belize-Cienfuegos sailing seems questionable. 3) Cienfuegos, Oct. 12, 3 P.M., barometer 29.70 inches, S.E. wind, heavy rain, violent gusts (Monthly Weather Review, Oct. 1887). 4) Trinidad and Santa Cruz, violent gales from S.E., light rain, sea swell S.S.E. (Monthly Weather Review, Oct. 1887). Author's note: Although no date is given, these observations from Trinidad and Santa Cruz (del Sur), which are both located on the southern coast of Cuba, were probably taken on Oct. 12. 5) Havana, Oct. 12, 9 A.M., barometer 29.74 inches, wind E. 10 mph, light rain; 3 P.M., barometer 29.64 inches, wind E. 20 mph, heavy rain; Oct. 13 (no time given, but probably in the morning), barometer 29.69 inches, wind E. 25 mph., light rain; Oct. 14, 6 A.M., barometer 29.70 inches, wind S.E. 19 mph., cloudy (Monthly Weather Review, Oct. 1887). 6) Steamship "Neuces" reported a strong gale from Oct. 13 to 15; wind veered from N.N.E. to E.N.E.; lowest barometer 29.73 inches at noon Oct. 14 in lat. 24 50 N., long. 85 03 W.. After the gale, the wind continued to flow from E.S.E., accompanied by heavy rain squalls to Key West (Monthly Weather Review, Oct. 1887). 7) Steamship "Mascotte" reported a whole gale on Oct. 14 and 15, wind veered from N.E. to S.E., lowest barometer 29.68 inches at 1 A.M. Oct. 15 in lat. 29.68 N., long. 82 20 W. (Monthly Weather Review, Oct. 1887). 8) Oct. 12-15, 1887. Extensive cyclone whose center passed S. of the island of Cuba and moved across Pinar del Rio. It affected the four westernmost provinces with torrential rains and great flooding, particularly in Vuelta Abajo and El Roque; winds were moderate (Sarasola, 1928). Author's note: Actually taken from the catalog of Cuban cyclones by M. Gutierrez-Lanza which is included in Sarasola (1928). 9) New

Orleans, La. Moving approximately northeastward towards the mouth of the Mississippi River, the disturbance approached the Louisiana coast with cyclonic energy and reached the vicinity of New Orleans on the morning of Oct. 19. A barometer reading of 29.22 inches, 0.82 inches below normal, was reported in that station, which represented a fall of 0.52 inches in eight hours. Passing to the S.E. of New Orleans, the center of the storm moved N.E. into Alabama on Oct. 19. At New Orleans the maximum wind velocity was 42 mph from the N. at 8:35 and 8:45 A.M. and the wind storm ended at 3:17 P.M. (Monthly Weather Review, Oct. 1887). 10) Pensacola Fl. A heavy gale prevailed during Oct. 19, maximum velocity 48 mph from S.W. (Monthly Weather Review, Oct. 1887). 11) On Oct. 19, winds up to 40 mph were reported at Galveston and up to 50 mph were reported at Mobile (Monthly Weather Review, Oct. 1887). 12) Galveston, Oct. 18. A light N.E. wind which set in here yesterday grew to a brisk gale this morning and as the hours advanced the gale increased until it reached 49 mph. At 10 A.M. the bay was very rough but no damage has been reported (The New York Times, Oct. 19, 1887, p.5, col.2). 13) New Orleans, Oct. 19. The heaviest rain of the year fell yesterday and the barometer reached the lowest point that is on record since the establishment of the Signal (Service) station here. It rained all day, making a total of 4.50 inches (The New York Times, Oct. 20, 1887, p.1, col.2). 14) New Orleans, Oct. 20. News of damage by the recent storm indicated that the steamer "Whitney", which sailed for Veracruz on Tuesday, encountered the hurricane. The tugboat "Minnie Woods" was sunk at quarantine station. The storm blew down a water tank 60 feet high at Magnolia station (The New York Times, Oct. 21, 1887, p.2, col.3). 15) Bark "Adele Sabina" reported a storm on Oct. 19 and 20; wind veered from E.S.E. to W.N.W.; lowest barometer 29.35 inches at 1 P.M. Oct. 19 in lat. 30 08 N., long. 87 10 W. (Monthly Weather Review, Oct. 1887). 16) Bark "Gettysburg" reported a storm on Oct. 19; wind veered from S.E. to W.; lowest barometer 29.38 inches at 11 A.M. in lat. 29 55 N., long. 87 10 W. (Monthly Weather Review, Oct. 1887). 17) The low pressure progressed northeastward towards the coast of North Carolina which it reached in the evening of Oct. 20. Trending afterwards more to the N., it passed with increased energy into the Atlantic and, moving adjacent to the coast, crossed southeastern Massachusetts and entered New Brunswick, where it joined on the evening of Oct. 21 with another pressure area (Monthly Weather Review, Oct. 1887). 18) New York, Oct. 21. The cyclone that has played havoc in the South was off Virginia at 7 A.M. this morning (Monthly Weather Review, Oct. 1887). Author's note: The advertised position seemed to be too far south for 7 A.M. Oct. 21. 19) Block Island, R.I. Light and heavy rains prevailed during the forenoon up to 11:20 A.M. Oct. 21. High S.E. winds began during the early morning and, shifting to N. at 11:20 A.M., attained a maximum velocity of 40 mph from the last-mentioned direction (Monthly Weather Review, Oct. 1887). 20) Provincetown, Ma., Oct. 21. A heavy E. gale raged from midnight last night until noon today. Then the wind shifted suddenly to N.W., blowing heavily from that quarter for 2 hours and causing a heavy sea offshore. (The New York Times, Oct. 22, 1887, p.5, col.3). 21) Map showing a track for this storm. Daily positions along that track are as follows: Oct. 11, 15.5

degrees N., 78 degrees W.; Oct. 12, 18.3 degrees N., 81 degrees W.; Oct. 13, 20.3 degrees N., 82.3 degrees W.; Oct. 14, 21.5 degrees N., 83.7 degrees W.; Oct. 15, 22.5 degrees N., 89 degrees W.; Oct. 16, 22.5 degrees N., 89 degrees W.; Oct. 17, 23.7 degrees N., 96.7 degrees W.; Oct. 18, 27 degrees N., 95 degrees W.; Oct. 19, 30 degrees N., 90.5 degrees W.; Oct. 20, 33 degrees N., 82.5 degrees W.; Oct. 21, 41.5 degrees N., 71.5 degrees W. (Monthly Weather Review, Oct. 1887). Author's note: The track shows a big jump between positions for Oct. 16 and 17, bringing the storm center much closer to the Mexican coast than in the case of the track displayed in Neumann et al. (1993) as for Storm 11, 1887. 21) A second map containing a track for this storm which is very similar to the one in Neumann et al. (1993) as for Storm 11, 1887 (Mitchell, 1924).

Information contained in the above items suggested the need for some modifications to be introduced along the track in Neumann et al. (1993) as for Storm 11, 1887. Modifications were introduced for the period Oct. 11-15 and the track just mentioned was extended to Oct. 20 and 21. No changes were introduced along the track in Neumann et al. (1993) for the periods Oct. 9-10 and Oct. 16-19. The changes and additions which were introduced required new 7 A.M. position estimates by the author of this study as follows: Oct. 11, 19.5 degrees N., 72.7 degrees W., a slight adjustment to the W. aimed at obtaining a better space-time continuity along the track; Oct. 12, 20.0 degrees N., 78.7 degrees W., based on information in items 2) through 4) and on space-time continuity; Oct. 13, 21.5 degrees N., 82.7 degrees W., primarily based on item 5); Oct. 14, 22.5 degrees N., 85.3 degrees W., primarily based on item 6); Oct. 15, 23.3 degrees N., 87.5 degrees W., based on interpolation along a smooth curve between the author's position for 7 A.M. Oct. 14 and the 7 A.M. Oct. 16 position in Neumann et al. (1993); Oct. 20, 33.0 degrees N., 82.5 degrees W., based on information in item 21); Oct. 21, 39.5 degrees N., 72.0 degrees W., chiefly based on space-time continuity as applied backwards, using information in items 19) and 20). The author's track for Storm 13, 1887 is shown in Fig. 1.

Barometer readings of 29.21 inches reported by the "Nalon" (item 2) and of 29.22 inches recorded at New Orleans, both taken outside the center of the storm, were found to support the hurricane status given to it in Neumann et al. (1993) as for Storm 11, 1887.

Storm 14, 1887 (Oct. 10-12), H.

This is the same storm which Neumann et al. (1993) identify as Storm 12, 1887.

The following information was found about this storm: 1) The presence of a depression was shown to the N.E. of the Windward Islands in the morning of Oct. 9 and by Oct. 11 the storm had moved northeastward to lat. 30 N., long. 40 W., from which position it passed northward and united with another depression which had advanced S.E. from Newfoundland (Monthly Weather Review, Oct. 1887). 2) Storm of Oct. 11, 1887. Far out in the Atlantic (Tannehill, 1938). 3) Spanish ship "Navarro, Oct. 10, at night, fine weather, steady W. wind; light clouds moving swiftly from S.,

growing heavier and the wind shifting to the third quadrant; Oct. 11, lat. 34 N., long. 40 20 W. at noon; during the early morning the barometer fell rapidly, with wind S.E. and E.S.E. and violent gusts, and high sea from S.W. and heavy rain. At 7 A.M. the wind was furious from E.N.E., with heavy rain and enormous seas from the second and third quadrants; 8:30 A.M., wind N.E., blowing with terrible fury, sea confused from third, second and first quadrants, being more pronounced from S.W.; 9:30 A.M. wind N.N.E. with terrific squalls, intervals of calm and barometer oscillating between 28 and 29 inches; 11:30 A.M., barometer rising rapidly (Monthly Weather Review, Oct. 1887). Author's note: This extract from the ship's log was furnished by Rev. Benito Vines, S.J., director, Belen Meteorological Observatory, Havana, Cuba. 4) Steamer "Aldanach". Oct. 11, noon, lat. 37 20 N., long. 38 23 W., strong S.W. gale and a very heavy sea, barometer 29.49 inches and very unsteady; 4 P.M. wind increasing to about force 10, low stratus and nimbus clouds moving rapidly from W.S.W., barometer falling; 6 P.M., wind suddenly shifted to W. and blew with hurricane force, causing a fearful sea; continued blowing at about force 12 for 4 hours and commenced to moderate at 10 P.M. During the storm the lowest barometer reading was 29.20 inches and was not so unsteady as at noon; the clouds were very low stratus and were travelling very rapidly from the W. The storm seemed to occupy a small area, as previous observations showed fine weather and the same prevailed after the storm's passage (Monthly Weather Review, Oct. 1887). Author's note: The above extract was also furnished by Father Vines of Havana. The S.W. and W. winds and the cloud direction from the W. reported at all times seemed unreliable. 5) Steamship "Ocean Prince" reported a storm on Oct. 11 and 12, which backed from S.E. to E., N.E. and N.N.W., blowing hardest from N.N.W.; lowest barometer at 7:30 P.M. Greenwich time in lat. 38 07 N., long. 41 55 W. (Monthly Weather Review, Oct. 1887). 6) Storm track showing the following positions: Oct. 9, 19 degrees N., 57 degrees W; Oct. 10, 24 degrees N., 54 degrees W.; Oct. 11, 30 degrees N., 40 degrees W.; Oct. 12, 45 degrees N., 39 degrees W., merged with the Newfoundland storm (Monthly Weather Review, Oct. 1887). 7) Map showing a one-day, S.E.- N.W. oriented track passing through lat. 31 N., long. 42 W. (Mitchell, 1924).

Positions along the track in Neumann et al. (1993) for 7 A.M. Oct. 10 and for 7 A.M. Oct. 12 (Storm 12, 1887 in their publication) were accepted because they could not be verified in the light of the observations in the above items. However, their 7 A.M. Oct. 11 position was adjusted eastward by about 80 miles to 33.5 degrees N., 40.0 degrees W., primarily based on a careful analysis of the observations in item 3). The author's track for Storm 14, 1887 is displayed in Fig. 1.

The hurricane status that Neumann et al. (1993) gave to this storm was fully supported by the information contained in items 3) through 5).

Storm 15, 1887 (Oct. 16-19), T. S.

This storm corresponds to Storm 13, 1887 in Neumann et al. (1993).

Very limited information was found about this storm: 1) This storm apparently originated in the tropics , east of the 50 degrees W. meridian and by Oct. 16 was central in about 17 degrees N., 52 degrees W., whence it moved slowly to the N.W. to the 25 degrees N. parallel by Oct. 18. During the next 24 hours the center recurved northeastward. No special reports have been received relative to this storm and the scarcity of simultaneous observations from the region throughout which it passed renders it impossible to determine its strength (Monthly Weather Review, Oct. 1887). 2) Map showing a track for the storm. Daily positions are as follows: Oct. 16, 17 degrees N., 52 degrees W.; Sept. 17, 22 degrees N., 54 degrees W.; Oct. 18, 25 degrees N., 56 degrees W.; Oct. 19, 30 degrees N., 54 degrees W. (Monthly Weather Review, Oct. 1887). Author's note: A similar track is included in Mitchell (1924).

The track in Neumann et al. (1993) was not found to differ greatly from those in item 2) and its corresponding author's note. Therefore, the track for Storm 13, 1887 in Neumann et al. (1993) was accepted without any modification and reproduced as for Storm 15, 1887 in Fig. 1.

The uncertainty about the storm intensity discussed in item 1) seemed to justify the tropical storm status given in Neumann et al. (1993) as for Storm 13, 1887. Therefore, the author of this study decided to keep that status for Storm 15, 1887.

Storm 16, 1887 (Oct. 29- Nov 6), T. S.

This is the same storm that Neumann et al. (1993) identify as Storm 14, 1887.

The following information was found about this storm: 1) Storm of Oct. 29- Nov. 9. Gulf, over Florida to Atlantic (Tannehill, 1938). 2) Storm of Oct. 29, 1887. S.W. Florida. Minor (Dunn and Miller, 1960). 3) The low pressure area was approximately located off the southwestern coast of Florida, about 200 miles to the N.W. of Key West, on the morning of Oct. 29. Crossing the Florida peninsula during the next 8 hours the center of the disturbance trended more to the N. and, moving approximately parallel to the coast and at a comparatively short distance from it, progressed northeastward (Monthly Weather Review, Oct. 1887). 4) In the vicinity of Norfolk, Va., the storm seemed to have been especially severe on Oct. 31 and to have caused much general damage. On the afternoon that day its energy was perhaps at its maximum and the pressure was then 0.56 inches below normal at Norfolk, where the northerly gale prevailed throughout the day, attaining a maximum velocity of 40 mph from the N.E. At Hatteras, N.C., the storm began at 4:05 A.M. and ended at 2:20 P.M. Oct. 31; a maximum velocity of 54 mph was recorded from the N. at 4:22 A.M. At Kittyhawk, N.C., rainy and brisk N. winds became high with a maximum velocity of 60 mph at 10:15 P.M. Oct. 30. At Raleigh, N.C., a heavy rain storm began during the night of Oct. 30-31 and continued until 1:10 P.M. when hail fell for about 10 minutes. It again turned to heavy rain and was accompanied by snow from 6:30 to 8:30 P.M. (Monthly Weather Review, Oct. 1887). 5) Steamship "Claribel" reported a whole gale with squalls of hurricane force from Oct. 30 to Nov. 1; wind veered from N.N.E. to S.E. and backed again to N.E.; lowest barometer

29.35 inches at 4 P.M. Oct. 31 in lat. 37 N., long 74 W. (Monthly Weather Review, Oct. 1887). 6) Brig "Lilian" reported that on Oct. 30, the wind blew heavily from the N.E. and E.N.E. with heavy rain and lightning; Oct. 31, wind lulled and hauled to S.E. and S., blowing hardest from the S.S.W.; lowest barometer 29.44 inches from sundown to midnight (Oct. 31- Nov. 1) in lat. 35 30 N., long. 74 30 W. (Monthly Weather Review, Oct. 1887). 7) Barkentine "Jose E. More" reported a whole gale from Oct. 30 to Nov. 2; wind veered from N.E. to S.W. and N.W.; lowest barometer 29.39 inches at 4 P.M. Oct. 31 in lat. 35 26 N., long. 75 10 W. (Monthly Weather Review, Oct. 1887). 8) Steamship "Edith Godden" reported a whole gale on Oct. 30 and 31; wind veered from N.E. to E. and to S. by W.; lowest barometer 29.32 inches at noon Oct. 31 in lat. 35 54 N., long. 73 10 W. (Monthly Weather Review, Oct. 1887). 9) Ship "Camalia" brought to this port the captain and crew of brig "Osseo" which had sailed from New York for Trinidad on Oct. 30. Nothing unusual happened until Tuesday (Nov. 1) when she was struck by a terrific hurricane accompanied by a heavy and angry sea. The storm lasted over 12 hours. Decks were started and floods of water began to come in. The pumps were manned but there was soon 4 feet of water in the hold. That night the gale abated somewhat and there was a small hope the brig keeping up more than a few hours at best. On Wednesday (Nov. 2) the storm began to rage again with great fury and a big wave carried away both boats. Then the "Camalia", which took the crew, was sighted (The New York Times, Nov. 8, 1887, p.8, col.2). 10) The steamship "Wyonoka" left Norfolk Tuesday morning (Nov. 1) at 6 A.M. for New York. It was very stormy. At 9 A.M. saw a green object on the ocean about 6 miles from the ship. The wind was blowing fiercely and the sea was running high up on decks. It happened to be the sunken wreck of a schooner with 5 sailors lashed to the masts and ropes. They were rescued by the "Wyonoka" (The New York Times, Nov. 3, 1887, p.2, col.7). 11) From Nov. 1, the depression increased in energy until Nov. 5. when central W. of Ireland, after which it moved towards the E.S.E. into France (Monthly Weather Review, Nov. 1887). 12) Provincetown, Ma., Nov. 1. The heaviest "norther" of the season has been blowing along Cape Cod today, the wind reaching a velocity of 60 mph (Monthly Weather Review, Nov. 1887). 13) Steamship "Rhaetia" reported a storm from Nov. 2 to Nov.5; wind veered from S.S.W. to N.E.; lowest barometer 28.64 inches at 4 P.M. Nov. 3 in lat. 49 43 N., long. 50 56 W. (Monthly Weather Review, Nov. 1887). 14) Steamship "Egypt" encountered a S.S.W. to N.W. storm during Nov. 4 and 5; lowest barometer 29.19 inches at 4 P.M. Nov. 4 in lat. 50 36 N., long. 27 10 W. (Monthly Weather Review, Nov. 1887). Steamship "Australia" reported a storm on Nov. 5 and 6; wind veered from N. to S.; lowest barometer 29.23 inches at 3 A.M. Nov. 5 in lat. 49 30 N., long. 17 30 W. (Monthly Weather Review, Nov. 1887). 16) Map showing a track for this storm. Daily positions are: Oct. 29, 25.5 degrees N., 85.0 degrees W.; Oct. 30, 31.5 degrees N., 78.0 degrees W.; Oct. 31, 34.5 degrees N., 74.5 degrees W. (Monthly Weather Review, Oct. 1887). 17) A second map showing the continuation of the track after Oct. 31. Daily positions are as follows: Nov. 1, 37.0 degrees N., 69.0 degrees W.; Nov. 2, 40.0 degrees N., 64.0 degrees W.; Nov. 3, 42.0 degrees N., 52.0 degrees W.; Nov. 4, 53.0 degrees N., 36.0

degrees W.; Nov. 5, 53.0 degrees N., 19.0 degrees W.; Nov. 6, 50.0 degrees N., 4.0 degrees W. (Monthly Weather Review, Nov. 1887). 18) A third track which is not dramatically different from the combination of the ones above; however, this track is extended to Nov. 8, making the storm to have described a counterclockwise loop over and near northwestern France (Mitchell, 1924).

Information contained in the items above was found to support, in general, the track shown in Neumann et al. (1993) as for Storm 14, 1887. However, such a track extends only from Oct. 29 to Nov. 1 and information in items 11) through 15) and in items 17) and 18) clearly shows the continuation of the track for several days beyond Nov. 1. Therefore, 7 A.M. positions for the period Oct. 29-31 in Neumann et al. (1993), -as for Storm 14, 1887, were accepted and positions in item 17) for the period Nov. 1-6 were accepted as well. The accepted positions, which combine both tracks at the expense of sacrificing the 7 A.M. position for Nov. 1 in Neumann et al. (1993), were used by the author of this study in preparing the track which is displayed in Fig. 1.

Weather information for Raleigh, N.C., which is contained in item 4) clearly shows that the tropical phase of Storm 16, 1887 was quite short and that the storm should have become extratropical by Oct. 31, continuing as such thereafter.

The tropical storm status which Neumann et al. (1993) attributed to this storm (as for Storm 14, 1887) was found to be supported by the limited information available prior to Oct. 31.

Storm 17, 1887 (Nov. 27- Dec.4), H.

This is the same storm that Neumann et al. (1993) identify as Storm 15, 1887.

The following information was found in relation to this storm: 1) Storm of Nov. 27- Dec. 6, 1887. Described a loop in the Bahamas and turned northeastward into the Atlantic (Tannehill, 1938). 2) Steamship "Claribel". Nov. 28, passed Fortune Island, with winds increasing to heavy gale, high sea and frequent squalls. Gale continued from northward and westward blowing with hurricane force at times until Nov. 29, at noon, in lat. 24 N., long. 74 W., when wind shifted to N.E., with heavy cross sea; Nov. 30, noon, in lat. 26 N., long. 74 W., no abatement in either wind or sea, the latter being more to the northward, with heavy rain and wind squalls; towards midnight encountered 3 distinct seas, running from N., N.E. and N.W., those from N. and N.E. being dangerously high (Monthly Weather Review, Nov. 1887). Author's note: Fortune Island is a small island located in the Crooked I. Passage, southeastern Bahamas. 3) Ship "Fidelio" reported a strong N. by E. gale on Nov. 30; barometer lowest at 11 P.M. when in lat. 35 N., long. 68 W. (Monthly Weather Review, Nov. 1887). 4) Philadelphia, Dec. 10. Steamship "Benholm" (from Marbella). Dec. 2, off Bermuda, was struck by a heavy N.E. gale lasting 30 hours. High seas broke over the vessel doing slight damage above the decks (The New York Times, Dec. 11, 1887, p.1, col.4). 5) Bermuda: A heavy gale from N.E. to N. prevailed during Dec. 2 and 3 (Monthly Weather Review, Nov. 1887). 6) Steamship "Marsielle". Dec. 3, noon, lat. 29 N., long. 56 W.; 2 A.M. wind S.; later strong S.S.W. gale, heavy cross sea; Dec.

4, noon, lat. 29 N., long. 59 W.; S.S.W. gale increasing (Monthly Weather Review, Dec. 1887). 7) Track for this storm showing positions for Nov. 29 at 23 degrees N., 67 degrees W. and for Nov. 30 at 27.5 degrees N., 68.5 degrees W. (Monthly Weather Review, Nov. 1887). Author's note: The above positions were found to be in error. 8) A second track showing positions for Dec. 1 through Dec. 8. This track was started near 25 degrees N., 62 degrees W. and ended near 58 degrees N., 25 degrees W. (Monthly Weather Review, Dec. 1887) Author's note: The track is a continuation of the one in item 7). This track shows an essentially westward displacement from long. 56 degrees W. to long. 61.5 degrees W. at near lat. 35 N. from Dec. 4 to Dec. 5. 9) A third track, this one being similar to that in Neumann et al. (1993), but extending from Nov. 27 through Dec. 7 instead of through Dec. 4 (Mitchell, 1924). Author's note: This track appears to be the first one showing the loop described by the storm over the Bahamas which is mentioned in item 1) and which is also presented in Neumann et al. (1993) as for Storm 15, 1887.

The above information suggested some modifications to be introduced along the track in Neumann et al. (1993). Except for Nov. 27 and 28 and for Dec. 4, new 7 A.M. positions were estimated by the author of this study. Such positions primarily affected the timing along the track, with the exception that the new 7 A.M. Nov. 29 position resulted in a loop which was smaller and centered farther to the E. than the one in Neumann et al. (1993). The new 7 A.M. positions were as follows: Nov. 29, 23.7 degrees N., 73.5 degrees W., based on information in item 2); Nov. 30, 24.0 degrees N., 71.3 degrees W., based on space-time continuity along a smooth track; Dec. 1, 26.3 degrees N., 67.3 degrees W., also based on space-time continuity; Dec. 2, 28.5 degrees N., 63.5 degrees W., primarily based on information in item 5); Dec. 3, 31.0 degrees N., 60.3 degrees W., based on items 5) and 6). The above positions, as well as those which were kept unchanged in Neumann et al. (1993), allowed the author to prepare the track which is displayed in Fig. 1. The track was ended on Dec. 4 after having discarded a portion of the track mentioned in item 8) due to a suspicious westward displacement from Dec. 4 to Dec. 5.

The hurricane status which Neumann et al. (1993) attributed to this storm (as for Storm 15, 1887) was found to be supported by information in item 2). Therefore, the author of this study is accepting that status in spite of that Mitchell (1924) had previously indicated a doubtful hurricane intensity for this storm.

Storm 18, 1887 (Dec. 4-10), H.

This is the same storm that Neumann et al. (1993) identify as Storm 16, 1887.

The following information was found about this storm: 1) The depression was central to the eastward of the Lesser Antilles on Dec. 4, whence it moved N.W. to about lat. 25 N., long. 63 W. by Dec. 5. Recurving N. and N.E., the storm was traced to lat. 44 N., long. 32 W., after which it united with another weather system. This storm, in connection with the one in late Nov. and early Dec., was attended by a heavy "norther" over the West Indies during the

first four days of the month during which many vessels were wrecked (Monthly Weather Review, Dec. 1887). 2) On Dec. 4, during a violent gale, an immense wave struck the beach at Baracoa, Cuba, broke and flowed inland, destroying nearly 300 huts and houses without, however, an attendant loss of life (Monthly Weather Review, Dec. 1887). Author's note: The New York Times, Dec. 22, 1887, p.2, col.3, stated that the largest wave occurred at Baracoa on Dec.5 and not on Dec, 4. The newspaper said that the huge wave of Dec. 4 was the result of the blowing of a "norther" for 3 days and that on the previous day a small wave had washed the surface of the town (which is located on the northern coast near the eastern tip of Cuba) causing alarm but no damage. On Dec. 5 at 5 P.M., during the most violent wind, an immense wave was seen approaching, from which the people fled towards the hills. The wave struck the beach , broke and flowed inland, sweeping many huts and several good houses before it. After sweeping in 400 feet, the water flowed back to the ocean. It should be finally mentioned that Sarasola (1928) has wrongly stated that the disaster at Baracoa occurred on Nov. 3-5 instead of in early Dec. 3) Bark "Leocadia". Dec. 6 and 7, encountered a whole gale, veering from S.E. to N.W.; lowest barometer at 9 P.M. Dec. 6.in lat. 31 N., long. 56 W. (Monthly Weather Review, Dec. 1887). 4) Steamship "Kate Fawcett" reported a gale, attaining hurricane force on Dec. 7; position at noon: lat. 36 N., long. 51 30 W. (Monthly Weather Review, Dec. 1887). 5) Steamship "Orsino". Dec. 8, lat. 35 30 N., long. 46 W., had an increasing S.S.W. gale which veered to W.N.W. (Monthly Weather Review, Dec. 1887). 6) Steamship "Westergate". Dec. 9, had a terrific gale with squalls and tremendous cross seas; wind veered from S. to N.W.; position at noon: lat. 38 N., long. 37 30 W. (Monthly Weather Review, Dec. 1887). 7) Map showing a track for this storm. Positions are as follows: Dec. 4, 19 degrees N., 64 degrees W.; Dec. 5, 25 degrees N., 63 degrees W; Dec. 6, 30 degrees N., 61 degrees W.; Dec. 7, 35.3 degrees N., 54.3 degrees W.; Oct. 8, 37 degrees N., 44 degrees W.; Dec. 9, 40 degrees N., 36 degrees W.; Dec. 10, 44 degrees N., 31.7 degrees W. (Monthly Weather Review, Dec. 1887).

Information contained in the above items was found to support, in general, the track in Neumann et al. (1993) as for Storm 16, 1887. Therefore, such a track is reproduced in Fig. 1 as for Storm 18, 1887.

The hurricane status which Neumann et al. (1993) attributed to this storm was found to be justified in the light of item 4).

Storm 18, 1887 should have gradually acquired extratropical characteristics as it moved towards high latitudes over the Atlantic.

Storm 19, 1887 (Dec. 7-12), T. S.

This storm corresponds to Storm 17, 1887 in Neumann et al. (1993).

The following information was found about this storm: 1) This system is given a probable westward track over the Caribbean Sea from Dec. 7 to Dec. 12, after which it apparently passed over Central America into the Pacific Ocean. During Dec. 7 and 8 a heavy

"norther", evidently occasioned by this depression, swept over the West Indies, causing much damage to shipping (Monthly Weather Review, Dec. 1887). 2) New York, Dec. 21. A steamer which has arrived here from Cape Haytien reported that heavy weather was experienced in the northern West Indies from Dec. 6 to 8, causing much damage along the coast. About 70 vessels were wrecked. A coasting steamer while endeavoring to make Cape Haytien capsized and 13 of her crew were drowned. The British schooner "Viola" was also damaged and 2 of her crew perished. H.M.S. gunboat "Wrangler" reached Turks Islands on Dec. 7, having stranded serious damage. About a dozen vessels have been stranded at Monte Christi (The Times, London, Dec. 22, 1887, p.5, col.4). 3) Map showing a track for this storm. Daily positions are as follows: Dec. 7, 12.7 degrees N., 59.7 degrees W.; Dec. 8, 13.5 degrees N., 64 degrees W.; Dec. 9, 13 degrees N., 68 degrees W.; Dec. 10, 11.7 degrees N., 77.7 degrees W.; Dec. 11, 10.7 degrees N., 81.7 degrees W.; Dec. 12, 10.5 degrees N., 83 degrees W. (Monthly Weather Review, Dec. 1887). Author's note: This track was not found to differ significantly from the one in Neumann et al. (1993).

The author of this study is skeptical about the track of this storm because it is difficult to envision how a system so far south could have produced a "norther" along the northern West Indies. However, he could not produce any evidence against the track and, much less, against the existence of the storm itself. Therefore, the track in Neumann et al. (1993) was accepted and reproduced as for Storm 19, 1887 in Fig. 1.

There was no evidence of hurricane intensify and, consequently, the tropical storm status indicated in Neumann et al. (1993) was also accepted.

#### Special statement.

In addition to the above storms, there were some possible cases which were not included because of uncertainties about whether or not the depression attained storm intensity and/or about the track followed by the disturbance. Three of these possible cases are presented next.

##### A) Case of Jun. 10-15, 1887.

This case originated off the U.S. Middle Atlantic coast. The following information is connected with this possible case: 1) Map showing a track for the storm starting near 37 degrees N., 73 degrees W. on Jun. 10. Positions for other days were: Jun. 11, 33.3 degrees N., 74.5 degrees W.; Jun. 12, 34 degrees N., 70.8 degrees W.; Jun. 13, 35 degrees N., 69.7 degrees W.; Jun. 14, 40.5 degrees N., 57.3 degrees W.; Jun. 15, 46 degrees N., 37 degrees W. (Monthly Weather Review, Jun. 1887). 2) Steamer "Edith Godden". Jun. 12, lat. 38 10 N., long. 74 15 W.; 1 P.M., barometer 29.98 inches, wind N.N.E. force 6, moderate N. sea and heavy E. swell; 5 P.M. barometer 29.90 inches, wind N.N.E. force 6, heavy N.N.E. sea, very heavy E. and N. swell; 10 P.M., barometer 29.86 inches, wind N. by E. force 7, heavy N. by E. sea, very heavy E.N.E. swell, weather threatening; Jun. 13, 3 A.M., barometer 29.72 inches, wind N. force 9, very heavy N. sea and N.E. by E. swell, steering S., hauled ship's head to W.S.W.; 9 A.M., lat. 35 04 N., long. 75 10 W.,

barometer 29.78 inches, wind N. by W. force 7, sky covered by scud traveling very fast from N. by W.; noon, less wind and sea, sky clearing (Monthly Weather Review, Jun. 1887). 3) Steamship "Manhattan" reported strong N.E. to N.N.E. winds from Jun. 12 to Jun. 16 during a passage from Havana to Winter Quarter Lightship; also she had very heavy confused seas and had to haul in out of the Gulf Stream to get smoother weather as the sea was very high and the vessel shipped much water. Capt. Stevens of the "Manhattan" reported that this was his roughest passage in 17 months (Monthly Weather Review, Jun. 1887). Author's note: This item was primarily linked to another depression of slight depth which was alledged to have appeared in the subtropics to the N. of the West Indies and circled slowly E. of N. until disappearing after Jun. 16. It was indicated, however, that the latter system, in conjunction with the one described here, caused very unsettled weather off the U.S. coast on Jun. 12-16 and this is why this information is included as being related to this storm as well. 4) Steamship "St. Ronans" reported a strong gale commencing from S. at 6 A.M. Jun. 14 (noon position: lat. 47 53 N., long. 37 01 W.) and ending from N.N.W. at noon Jun. 15 in lat. 46 08 N., long. 41 23 W. (Monthly Weather Review, Jun. 1887). 5) Steamship "Devonia" reported a fresh gale on Jun. 14-15; wind hauled from S.W. to S.; lowest barometer 29.30 inches at 4 A.M. Jun. 15 in lat. 42 53 N., long. 57 31 W. (Monthly Weather Review, Jun. 1887). Author's note: 4 A.M. Jun. 14 would fit better the information in item 1). 6) Steamship "Buenos Ayrean" reported a fresh gale on Jun. 15; wind veered from S.S.W. to N.W. at 6:30 P.M.; lowest barometer 29.50 inches at 6 A.M. in lat. 53 26 N., long. 30 06 W. (Monthly Weather Review, Jun. 1887). 7) Ship "Worcester" reported a strong gale on Jun. 15; wind veered from N. to S.; lowest barometer 29.38 inches at 6 P.M. in lat. 49 N., long. 32 W. (Monthly Weather Review, Jun. 1887).

As this storm allegedly moved southward from higher latitudes and then was near the Gulf Stream for several days (item 1), the possibility is there that it might have acquired tropical characteristics, a happening which is sometimes observed in cases similar to this one. This is why this particular system is being mentioned here as a possible storm case.

#### B) Case of Sept. 1-5, 1887.

The following information was available about this possible case: 1) Brig "Abbie Clifford". Aug. 31, 2:30 P.M., in lat. 25 10 N., long. 80 W., heavy squall from E. with heavy rain and very black weather; the wind died out as the rain ceased. At night the wind increased and at midnight (Aug. 31- Sept. 1) it was blowing from E.N.E. force 8. From Sept. 1 to Sept. 5, between the above position and lat. 28 30 N., long. 80 W., experienced unsettled weather with frequent S.E. and N.E. gales of force 7 to 8 and rain squalls (Monthly Weather Review, Sept. 1887). 2) Bark "Lizzie Carter", from Galveston, reported that the wind set in from E., backing to N.E. and increased to a gale which lasted 8 days. Aug. 31, lat. 31 20 N., long. 77 30 W., passed a large bark abandoned and waterlogged, the sea was breaking over her (The New York Times, Sept. 10, 1887, p.5, col.4). Author's note: It is not clear that the above information pertained to this possible case. 3) Track for this weather system: Sept. 1, 23.5 degrees N., 83 degrees W.; Sept.

2, 24.0 degrees N., 80.5 degrees W.; Sept. 3, 25 degrees N., 80 degrees W.; Sept. 4, 27 degrees N., 79 degrees W.; Sept. 5, 30 degrees N., 77 degrees W. (Monthly Weather Review, Sept. 1887). Author's note: The above mentioned track was extended to 40 degrees N., 48 degrees W. on Sept. 6 and to 53 degrees N., 53 41 degrees W. on Sept. 7, which seems to be a crude mistake.

Although winds of tropical storm intensity (force 8) were reported in item 1), no evidence of westerly winds, implying a closed cyclonic circulation, was found in the available data. Therefore, the validity of the track in item 3) became questionable and this was the main reason to keep this system as a possible storm case.

C) Case of Oct. 22-23, 1887.

The following information allowed one to identify this possible case: 1) The presence of a depression over the ocean between 20 and 25 degrees N., 45 and 50 degrees W, was shown by vessel reports on Oct. 22 and 23, which were not sufficiently numerous in that region to determine its strength and to admit of charting its track previous or subsequent to those days (Monthly Weather Review, Oct. 1887). 2) Map showing a track for this system. Daily positions are: Oct. 22, 23 degrees N., 45 degrees W.; Oct. 23, 24.3 degrees N., 48 degrees W. (Monthly Weather Review, Oct. 1887).

The alleged location and motion of this low pressure area was crucial in considering it as a possible storm case.