Nine storms were identified as having occurred in 1879. Tracks for these storms are presented in Fig. 3.

Storm 1, 1879 (Aug. 9-12).

This storm has been recently documented by the author. However, strictly speaking, the Monthly Weather Review, Sept. 1878 had referred to this storm, and even showed a track for it without attaching any tropical characteristics to this weather system in spite that the existence of hurricane winds was indicated.

This storm is not included in Neumann et al. (1993) and the author of this study found the following information which allowed him to verify the storm existence and to determine a track for it: 1) The low pressure area probably existed on the North Carolina coast on Aug. 9 and, moving northeastward, produced hurricane winds off Nova Scotia on Aug. 10-11 (Monthly Weather Review, Sept. 1879). 2) Washington, Aug. 9, 1 A.M. Rain has prevailed in the South Atlantic States with slightly cooler S.W. and N.W. winds and no change in pressure (The New York Times, Aug. 9, 1879, p.5, col.6). 3) Washington, Aug. 10, 1 A.M. Local rains prevailed in the South Atlantic and Gulf States with northerly winds and rising barometer (The New York Times, Aug. 10, 1879, p.2, col.2). 4) Quebec, Aug. 16. Capt. Brewis of the steamship "Nettlesworth" caused the seizure of the "Lake Champlain" and the arrest of her captain. The "Lake Champlain", while disabled from heavy weather in the Gulf (Stream), was met by the "Nettlesworth" and the captain of the latter agreed to tow her to Gaspe harbor for 800 pounds which is not yet paid (The New York Times, Aug. 17, 1879, p.7, col.5). 5) Quebec, Aug. 16. The bark "St. Andrew", from New York to Dunkirk, arrived here today. She encountered a hurricane on Aug. 11, in which 2 foretopsail yards and upper maintopsail yard were carried away and her pumps were choked with the cargo which consisted of grains (The New York Times, Aug. 17, 1878, p.7, col.2). 6) Capt. Knudson of ship "P.D. Metcalf", from Antwerp, reported that the vessel encountered a hurricane of 3 hour duration in lat. 41 N., long. 65 W. on Aug. 11. The wind first came from S.E. and went around the compass by the way of W. to N.E. and blew with terrific force. The vessel behaved well and weathered the hurricane without having any damage beyond the loss of a few sails (The New York Times, Aug. 20, 1879, p.8, col.2). 7) Philadelphia, Aug. 23. The ship "Ornen", from Bremenhaven, reported that on Aug. 11, in a hurricane from N.N.E., lost and split sails. Aug. 12, lat. 42 N., long. 64 W., took off the crew, 16 in total, of the Austrian bark "Antonietta" (The New York Times, Aug. 24, 1879, p.5, col. 3). 8) The ship "Prince Louis", which arrived here from Liverpool yesterday, had a stormy passage. On Aug. 11, in lat. 41 50 N., long. 61 06 W., a hurricane from E.S.E. set in. The wind suddenly went around to S.W. and N.W., carrying away the foretopmast, the maintop gallant mast, the spars falling over the sides. Two sailors went overboard with the masts and were lost. The hurricane was terrific and the ship became being tossed about like a log by the heavy seas. For 3 hours the storm continued with unabated fury (The

New York Times, Aug. 26, 1879, p.2, col.4). 9) The "Arfacsad" spoke the "Sirian Star" on Aug. 11 at lat. 41 N., long. 63 W. with loss of foretopmast and all sails. Also saw a British ship, name unknown, with loss of fore and main mast (The Times, London, Aug. 23, 1879, p.12, col.5). Author's note: Curiously, no mention is made to stormy condition; therefore, the day might be in error and could have been Aug. 12 or later. 10) Bath, Me. Aug. 21. The ship "Theobald" arrived here from Liverpool. On Aug. 12, 150 miles E. of Sable Island, she encountered a severe gale and lost some sails (The New York Times, Aug. 22, 1879, p.2, col.3). 11) Map showing a track for this storm. The track was started near lat. 33 degrees N., long. 75 degrees W. and displayed positions near 34 degrees N., 72 degrees W. on Aug. 9, near 38 degrees N., 65 degrees W. on Aug. 10 and near 40 degrees N., 62 degrees W. on Aug. 11 (Monthly Weather Review, Sept. 1879).

Based on information in items 1), 2) and 11), the author of this study estimated a 7 A.M. Aug. 9 position near 33.0 degrees N., 75.0 degrees W. His 7 A.M. Aug. 10 position was based, primarily, on interpolation to the corresponding next day position (Aug. 11); such an interpolated position was near 37.0 degrees N., 70.0 degrees W. The author's 7 A.M. Aug. 11 estimated position was based on items 5) through 8), in general, and on item 6) in particular. This position was near 40.7 degrees N., 65.0 degrees W.. The 7 A.M. Aug. 12 estimated position was based on item 10). This position was near 43.7 degrees N., long. 57.0 degrees W. The author of this study believes that his positions for Aug. 11 and Aug. 12 are more reliable than his positions for the two previous days. The author's track is shown in Fig. 3.

Although barometer readings were not available, there were strong indications that this storm attained full hurricane status.

Storm 2, 1879 (Aug. 13-20).

This is the same storm which Neumann et al. (1993) identify as Storm 1, 1879.

The following information was found in relation to this storm: 1) Aug. 13, lat. 20 N., long. 60 W., a vessel reported rapidly falling pressure, E. wind and thunder, the day ending with heavy squalls and torrents of rain (Monthly Weather Review, Sept. 1879). 2) St. Thomas, 1 A.M. Aug. 14, heavy rain, thunder and lightning (Monthly Weather Review, Sept. 1879). 3) Turks Is., 10 A.M. Aug. 15, barometer 29.75 inches, strong wind and heavy rain; the wind changed to a heavy S.E. gale during the day (Monthly Weather Review, Sept. 1879). 4) The "Adelaide", from Arecibo (Puerto Rico), is reported by cable to have put into Philadelphia with loss of some sails, having encountered a heavy gale on Aug. 15 (The Times, London, Sept. 2, 1879, p.10, col.3). 5) At Santiago de Cuba, heavy showers during the night of Aug. 15 and S.E. squalls on Aug. 16 (Monthly Weather Review, Sept. 1879). 6) Brig "Dashaway". Aug. 16, 20 miles east of Watling Is. (San Salvador), had a severe hurricane lasting 10 hours (Monthly Weather Review, Sept. 1879). 7) Brig "Pomona" (from Jamaica for New York) reported that, on Aug. 16, had a hurricane from N.E. to S.S.W. blowing with great violence and very heavy cross sea, lasting 13 hours (Monthly Weather Review,

Sept. 1879) 8) Aug. 17, fresh W. wind and partly cloudy weather at Key West and Punta Rassa; Savannah, S.E. wind backing to N.W. during the afternoon; Cape Lookout, "tremendous S.E. sea-swell broke out on the beach all day" (Monthly Weather Review, Aug. 1879). 9) The gale at Cape Lookout commenced at 7:50 P.M. Aug. 17 with a heavy S.E. rain squall which lasted until 10:05 P.M.. At midnight (Aug. 17-18) brisk to high S.E. winds were blowing from Cape Hatteras to Cape Lookout, E. to N.E. winds from Smithville to Charleston and brisk N.W. wind at Savannah (Monthly Weather Review, Aug. 1879). 10) Washington, Aug. 18, 1 A.M. The barometer is lowest in the S. Atlantic States. Signals continue for Smithville, Wilmington, Macon, Cape Lookout and Cape Hatteras and are ordered for Kittyhawk, and Cape Henry (The New York Times, Aug. 18, 1879, p.5, col.4). 11) Bark "Energie" (from Havana and Matanzas) was struck by a hurricane on Sunday Aug. 17 (The New York Times, Aug. 24, 1879, p.5, col.3). 12) Schr. "H.W. Race" (coming to New York from Maracaibo) met a severe gale on Aug. 17 which lasted well into the following evening. The schooner ran before it for 32 hours. A high and dangerous sea was running, causing some damage to the vessel (The New York Times, Aug. 24, 1879, p.5, col.3). 13) At 5 A.M. Aug. 18 the wind reached its greatest velocity (37 mph) at Smithville; Wilmington, wind W. 68 mph; Cape Lookout, wind S.E. 80 mph (Monthly Weather Review, Aug. 1879). 14) Cape Lookout, 6:30 A.M. Aug. 18, barometer 29.15 inches, wind 138 mph. The barometer remained at 29.15 inches until 7 A.M., then it started rising; 7:30 A.M., barometer 29.18 inches, estimated wind 165 mph (Monthly Weather Review). 15) At 8:45 A.M. Aug. 18 the wind reached 97 mph at Portsmouth when the anemometer became disabled. Norfolk, 9:45 A.M., barometer 29.58 inches, wind N.E. 24 mph; Norfolk 10:45 A.M., barometer 29.16 inches, wind N.E. 48 mph (Monthly Weather Review, Aug. 1879). 16) Wilmington, N.C., Aug. 18. A terrific storm of wind and rain visited this section early this morning. At 4 A.M. the wind had reached 68 mph. A large number of shade-trees were prostrated and several houses and sheds were unroofed (The New York Times, Aug. 19, 1979, p.5, col.2). 17) Schr. "A.K. Bentley". Aug. 18, lat. 37 06 N., long 74 02 W. At 11 A.M., blowing a S.E. hurricane. Noon, wind hardest ever experienced, rain very heavy and waves estimated at 40 ft. At 2:20 P.M., barometer 29.20 inches. Hurricane increased at 3 P.M. and blew violently to 4:30 P.M. when it settled down to a severe gale, little N. of W. (Monthly Weather Review, Aug. 1879). 18) The "City of Macon" left Savannah Saturday night (Aug. 16) and the wind blew somewhat stormy from the S.E. and "it was a little rough somewhere along the track" (The New York Times, Aug. 20, 1879, p.1, col.7). 19) Observations taken on board the steamer "Johns Hopkins", 20 miles N. of Chincoteaque. 12:30 P.M. Aug. 18, barometer 29.95 inches; 1 P.M., 29.80 inches; 1:30 P.M., 29.65 inches, whole gale from E.S.E.; 2 P.M., 29.05 inches; 2:15 P.M., wind suddenly died out; 2:30 P.M., 28.90 inches, sun occasionally seen; 2:50 P.M., wind blew with great violence from N.N.W. (Monthly Weather Review, Aug. 1879). 20) The "Morgan City" left New Orleans last Wednesday (Aug. 13). On Saturday, Sunday and Monday there was rain and wind blowing from S.E. when off Savannah. As best as the captain could estimate, the ship was off Absecom Light (New Jersey) between 5 and 6 P.M. Monday afternoon (Aug. 18)

when the wind suddenly shifted from S.E. to N.N.W. and sheets of rain and a blast of wind struck the "Morgan City" (The New York Times, Aug. 20, 1879, p.1, col.7). 21) U.S.S. "Wachusetts". 5:30 P.M. Aug. 18, about lat. 39 N., long. 73 30 W., barometer had fallen to 29.15 inches, wind S.E. by E. force 11 (64-73 mph); then fell a calm with confused high seas; 5:45 P.M., light airs from N.N.W. and then hurricane from N.W. until 10 P.M. (Monthly Weather Review, Aug. 1879). 22) Atlantic City, Aug. 18. A severe gale set in the morning and increased to a fierce gale at noon, the wind velocity reaching over 60 mph (The New York Times, Aug. 19, 1879, p.5, col.2). 23) Cape May, N.J., Aug. 18. A violent rain and wind storm has prevailed here all day (The New York Times, Aug. 19, 1879, p.5, col.2). 24) Schr. "Fawn". On the afternoon of Aug. 18, off Absecom Beach, N.J., encountered a "typhoon" during which she lost sails and boats and sprung a leak (The New York Times, Aug. 24, 1879, p.5, col.3). 25) At Atlantic City, maximum wind velocity N.E. 60 mph at 3 P.M. Aug. 18; at Barnegat, maximum wind velocity N. 64 mph around 5 P.M.; at Sandy Hook, maximum wind velocity N.W. 52 mph and lowest barometer 29.59 inches at 9 P.M. (Monthly Weather Review, Aug. 1879). 26) Philadelphia, Aug. 23. Ship "Ornen" Aug. 18, lat. 41 N., long. 71 W., in a hurricane, slipped lower topsail yard for the safety of the ship (The New York Times, Aug. 24, 1879, p.5, col.3). 27) Newport, R.I., minimum barometer 29.11 inches at 11:23 P.M. Aug. 18, wind lulled for 6 minutes; New Bedford, Ma., midnight Aug. 18-19, calm, lowest barometer 29.05 inches at 12:20 A.M. Aug. 19 (Monthly Weather Review, Aug. 1879). 28) Eastport, Me., Aug. 19, minimum barometer 29.16 inches at 11 and 11:15 A.M. (Monthly Weather Review, Aug. 1879). 29) Washington, Aug. 19, 1879, 1 A.M. The depression last night on the South Atlantic coast has moved rapidly on a N.E. track and is now central E. of Boston (The New York Times, Aug. 19, 1879, p.5, col.3). 30) The storm was over Newfoundland on Aug. 20 (Monthly Weather Review, Sept. 1879).

Based on the information contained in the above items, the author of this study proposed a number of modifications along the storm track displayed in Neumann et al. (1993) as for Storm 1, 1879. For the period Aug. 13-16, a slight northward adjustment was made east of about 67 degrees W. and a slight southward adjustment was made west of that meridian in compliance with the information in items 1) through 3) and, in addition, by taking into account that Salivia (1972) does not mention the storm as having affected Puerto Rico. For the period Aug. 18-19, a slight westward adjustment and a minor adjustment in time were made in order to conform with information in some of the items above, particularly in items 14), 19), 21), 27) and 28). The track was extended to Aug. 20 in accordance with information in item 30). The author of this study estimated the following 7 A.M. positions for the days indicated: Aug. 13, 19.0 degrees N., 60.0 degrees W.; Aug. 14, 19.3 degrees N., 65.7 degrees W.; Aug. 15, 20.5 degrees N., 70.0 degrees W.; Aug. 16, 23.3 degrees N., 73.7 degrees W.; Aug. 17, 27.7 degrees N., 77.7 degrees W.; Aug. 18, 35.0 degrees N., 77.3 degrees W.; Aug. 19, 43.3 degrees N., 68.0 degrees W.; Aug. 20, 49.3 degrees N., 55.0 degrees W. The author's track is shown in Fig. 3.

The author believes that the storm was rather weak and probably of a short diameter when it passed near the Virgin Islands

and Puerto Rico on Aug. 14 because high winds were not mentioned to have occurred at the former place (item 2) and Salivia did not record the storm as having affected Puerto Rico. There are strong indications, however, that the storm was a full hurricane on Aug. 16 (items 6 and 7). Dunn and Miller (1960) cited that the storm was an extreme hurricane in North Carolina on the basis of the 165-mph estimated wind at Cape Lookout (item 14). Tannehill (1938) discussed the intensity of this hurricane in the following terms: "A violent hurricane which passed up the Atlantic coast in August 1879 was attended by extremely high winds. At Cape Lookout, N.C., on Aug. 18, a velocity of 138 mph (105 true) was recorded when the anemometer collapsed. The wind continued rise to an estimated velocity of 165 mph. If this estimate was correctly based upon the indications of the Robinson four-cup anemometer then in use, it represented a true velocity of 125 mph". On the basis of items 13) and 14), Cape Lookout was under the eastern eyewall of the storm and, therefore, the central pressure at that time should have been significantly lower than the one of 29.15 inches recorded at Cape Lookout and most likely below 28.50 inches. The lowest central pressure which was measured throughout the life-span of the storm was 28.90 inches on board the steamer "Johns Hopkins" (item 9).

Storm 3, 1879 (Aug. 19-25).

This storm corresponds to Storm 2, 1879 in Neumann et al. (1993).

The following information was found in relation to this storm: 1) Two days after a hurricane had recurved off the U.S. coast on Aug. 17, another hurricane, which was moving towards the west, passed quite to the south of Havana on Aug. 19 (Vines, 1895). 2) Bark "Elvina", 50 miles east of Alacran Reef, had a severe hurricane from E.N.E. on Aug. 20, ending at 4 P.M. Aug. 21 with wind from S.S.E.; very heavy seas and terrific squalls (Monthly Weather Review, Sept. 1879). Author's note: The Alacran Reef is located off the northern coast of Yucatan. 3) At 7:35 A.M. Aug. 22, brisk E, and N. winds prevailed along the Gulf coast, from St. Marks to Galveston. The largest low pressure anomaly was 0.31 inches at Galveston (Monthly Weather Review, Aug. 1879). Author's note: The indicated negative anomaly corresponds to an actual pressure of 29.58 inches. 4) At 4:35 P.M. Aug. 22, the wind was N.W. 27 mph at Indianola and N.W. 38 mph at Galveston. The negative pressure anomaly at Galveston was 0.48 inches (Monthly Weather Review, Aug. 1879). Author's note: The anomaly mentioned is equivalent to an actual pressure of 29.41 inches. 5) The barometer continued to fall at Galveston until 7 P.M. Aug. 22, then reading 29.34 inches. At midnight Aug. 22-23, the course of the depression having changed from N.W. to N., it was then central in eastern Texas, N.E. of Galveston. Galveston reported wind W. 36 mph and Indianola wind N. 28 mph (Monthly Weather Review, Aug. 1879). 6) Washington, Aug. 23, 1 A.M. A storm of great energy, moving on a N.W. track, has entered Texas (The New York Times, Aug. 23, 1879, p.5, col.2). 7) Orange, Texas, Aug. 25. Particulars of the damage at Sabine Pass. The steamer "Vicksburg" was wrecked, the steamer "Laura" was driven ashore, two coastal schooners were totally

wrecked and several slightly damaged. The wharves were nearly washed away; many houses were blown down and other destroyed (The New York Times, Aug. 26, 1879, p.2, col.5). 8) The storm was still over Texas in the morning of Aug. 23 with a negative pressure anomaly of 0.73 inches at Shreveport; the anomaly at that place was 0.60 inches in the afternoon (Monthly Weather Review, Aug. 1879). 9) Washington, Aug. 24, 1 A.M. A storm of great energy is in Arkansas (The New York Times, Aug. 24, 1879, p.5, col.6). 10) In the afternoon of Aug. 24, the low pressure center reached western Kentucky (Monthly Weather Review, Aug. 1879). 11) At midnight Aug. 25-26, the center was near the Virginia Capes. Winds along the coast ranged from 23 mph at Kittyhawk to 36 mph at Cape Henry (Monthly Weather Review, Aug. 1879). 12) Map showing a track for the storm which was started over the eastern portion of the Yucatan peninsula on Aug. 20 (Monthly Weather Review, Sept. 1879).

On the basis of the above information. the author of this study proposed some modifications along the storm track which is shown in Neumann et al. (1993) as for Storm 3, 1879. The modifications were for the period Aug. 19-22; 7 A.M. positions in Neumann et al. (1993) were kept unchanged for the period Aug. 23-25. The author estimated new 7 A.M. positions for these days: Aug. 19, 17. 5 degrees N., 83.0 degrees W.; Aug. 20, 19.7 degrees N., 87.7 degrees W.; Aug. 21, 23.0 degrees N., 92.0 degrees W.; Aug. 22, 27.3 degrees N., 94.0 degrees W. The position for Aug. 19 was based on item 1), and item 2) provided support for the 7 A.M. Aug. 20 and the 7 A.M. Aug. 21 positions; the 7 A.M. Aug. 22 position was primarily based on the meteorological information for Galveston which is contained in items 3) through 5). The track which was prepared by the author of this study is displayed in Fig. 3.

The track in Fig. 3 was terminated at the end of Aug. 25 on the basis of information in item 11). It should be mentioned that the author made an attempt to extend the track to Aug. 29 on the basis of the "whirlwind, commencing from N. and veering to W. and N.E. lasting 1 hour", which was reported by the brig "Casarina", lat. 41 N., long. 66 W. on Aug. 29 (Monthly Weather Review, Sept. 1879) but that he discarded that idea when he found it would have involved too much of a risk.

A central pressure which was significantly below 29.34 inches is suggested by the large negative anomaly of 0.73 inches reported at Shreveport in the morning of Aug. 23 (item 8). Therefore, a central pressure around 29.00 inches or even somewhat lower appears to have occurred at landfall time on the Texas coast. Such a pressure value definitively supports hurricane intensity.

Storm 4, 1879 (Aug. 29- Sept. 2).

This storm corresponds to Storm 3, 1879 in Neumann et al. (1993).

The following information was found in connection with this storm: 1) On Aug. 31 in the morning, brisk N. to E. winds prevailed from St. Marks to Brownsville. A special wind report from Port Eads gave a mean velocity of 28.5 mph for a 71-hr period ending at 10 A.M. Aug. 31, attaining a maximum of 35 mph from the E.N.E. at 7 A.M. Aug. 30 and from the N.E. at 9 A.M. Aug. 30

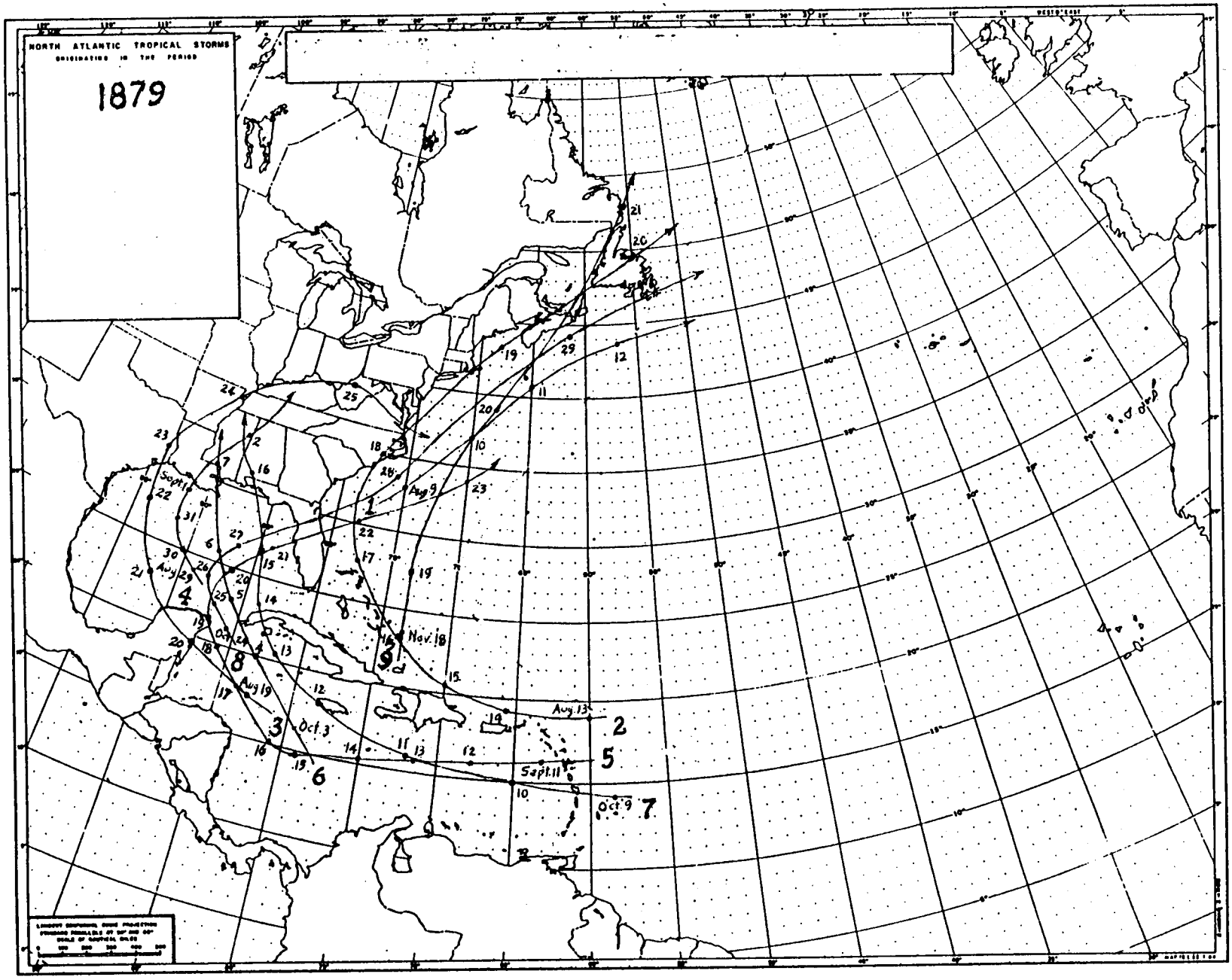
NORTH ATLANTIC TROPICAL STORMS
1879
Sept 1
Aug 9
Nov. 18
Aug 19
Oct. 3
Aug 13
Sept. 11
Oct. 9
1
2
3
4
5
6
7
8
9

Fig. 3

(Monthly Weather Review, Aug. 1879). 2) Morgan City, La., Sept. 2. A very severe storm began here at noon yesterday. The barometer at that time had fallen four-tenths of an inch since 10 A.M to 28.70 inches and was still falling. The steamboats "Sammie" and "Alberta" were sunk. A portion of the iron shed at Morgan's wharf and a portion of the engine shed were blown down. Several dwellings were blown down from their foundation. At 2 P.M. the Presbyterian church and the new school house were blown down. The storm abated at about 5 P.M. The gale was so furious that it carried plates from the iron warehouse at Morgan's wharf clear across the bay into Berwick City (The New York Times, Sept. 3, 1879, p.1, col.4 and 5). 3) New Orleans, Sept. 2. Forty-five coal boats moored above this city sank during the storm yesterday. Many trees, fences and chimneys were blown down and several houses unroofed (The New York Times Sept. 3, 1879, p.1, col.4 and 5). 4) Afternoon, Sept. 1, the storm was central N.W. of New Orleans, where the pressure was 0.61 inches below normal. Maximum wind reported at New Orleans was 40 mph (Monthly Weather Review, Sept. 1879). Author's note: A pressure of 0.61 inches below normal is roughly equivalent to 29.30 inches. 5) New Orleans, Sept. 4. Reports about losses due to the storm continue to come in. At Lewisburg and Mandeville, wharves, bath-houses and fences were destroyed and residences damaged. Houses were blown down at Bayou Sara, Baton Rouge and other towns. The storm at St. John the Baptist was fierce. A continuous gale prevailed from 8 A.M. to 11 P.M. (The New York Times, Sept. 4, 1879, p.2, col.4). 6) Baton Rouge, Sept. 4. Monday's storm (Sept. 1) lasted from noon until about 10 P.M. From every section of the parish come sad tales of the destruction of cotton and corn crops. Fifty yards of wall around the penitentiary were demolished and part of the buildings unroofed (The New York Times, Sept. 5, 1879, p.1, col. 4). 7) New Orleans, Sept. 6. Advices from the parishes show that almost every plantation in the State suffered more or less by damage or destruction of buildings in Monday's storm (The New York Times, Sept, 1879, p.1, col.4). 8) In the morning of Sept. 2 the center was still over Mississippi (Monthly Weather Review, Sept. 1879). 9) The center continued moving N. and at midnight Sept. 2-3 was near Louisville, Kentucky (Monthly Weather Review, Sept. 1879).

The information contained in the items above was found to support, in general, the track for this storm which is displayed in Neumann et al. (1993) as for Storm 3, 1879. Therefore, the author of this study adopted that track and reproduced it in Fig. 3.

The fact that a pressure which was lower than 28.70 inches occurred at Morgan City, La., (item 2) shows that the storm attained hurricane status, and the transport by the wind of plates from the iron warehouse at Morgan's wharf across the bay into Berwick City (item 2) strongly suggests the presence of an intense hurricane.

Storm 5, 1879 (Sept. 11-23).

This storm is the same one which is identified as Storm 4, 1879 in Neumann et al. (1993).

Very little information was found in relation to this storm:

1) Gale in the Gulf of Mexico. The "City of Merida" brings the news of the loss of 12 vessels in a violent N. gale on the coast of Tabasco, Mexico. Few particulars of the destruction made by the norther had reached Veracruz. The gale began on Sept. 18 and 12 vessels were blown upon the bar of Santa Anna Lake. Five of the 12 vessels went ashore on Sept. 19 and the rest the next day (The New York Times, Oct. 7, 1879, p.8, col.1). 2) The "City of New York" arrived from Veracruz yesterday bringing the crews of 10 vessels driven ashore at the Tabasco coast last month. On Sunday, Sept. 14, signs of the approaching storm were observed by the crews. As the evening advanced, the gale steadily increased, bringing high seas from the northward into Santa Anna harbor. The gale continued through Monday night and all day Tuesday. Captains were confident that the gale force would be broken by Wednesday morning Sept. 17, but daybreak found the gale fiercer than ever and the heavy N. swell pushing from the Gulf into the harbor was terrific. On Thursday (Sept. 18) the norther moderated somewhat but the next morning (Friday, Sept. 19) it returned with redoubled fury blowing with hurricane force, and before nightfall the beach was full of wrecks. The norther continued until the following Tuesday (Sept. 23) when it died out entirely (The New York Times, Oct. 20, 1879, p.8, col.1). 3) Washington, Sept. 20, 1 A.M. The lowest barometer is in the Eastern Gulf States where a depression is probably forming (The New York Times, Sept. 20, 1879, p.5, col.4). 4) Washington, Sept. 22, 1 A.M. The depression which existed in the Gulf of Mexico is apparently filling up (The New York Times, Sept. 22, p.5, col.6).

The weather description given in items 1) and 2) seems to fit an unusually early, very long lasting and intense norther rather than a tropical cyclone and the information in item 4) seems to partially contradict the storm evolution shown in Neumann et al. (1993) as for Storm 4, 1879. Based on these two findings and also on the fact that the Monthly Weather Review did not refer to this storm at all, the author of this study is skeptical about the storm as such and, therefore, about its track. However, due to the lack of evidence against its existence, he decided to keep it on record by reproducing in Fig. 3 the storm track which is displayed in Neumann et al. (1993) as for Storm 4, 1879.

Storm 6, 1879 (Oct. 3-7).

This storm corresponds to Storm 5, 1879 in Neumann et al. (1993).

Very limited information was found about this storm: 1) Oct. 4-5. A very weak cyclone crossed Pinar del Rio province (western Cuba) and became better organized in the Gulf of Mexico (Sarasola, 1928). Author's note: Actually taken from the catalog of Cuban hurricanes by M. Gutierrez-Lanza which is included in Sarasola (1928). 2) In the morning of Oct. 6 the barometer read 0.24 inches below normal at New Orleans. At midnight Oct. 6-7, the barometer was 0.37 inches below normal at Mobile; the maximum wind was 25 mph at St. Marks. Morning reports for Oct. 7 showed the center in the central Mississippi Valley; Memphis barometer 0.30 inches below normal. The depression dissipated in the afternoon (Monthly Weather

Review, Oct. 1879). 3) Map showing a track for this storm starting near 15 degrees N., 78 degrees W. on Oct. 3 and ending over Alabama on Oct. 7 (Monthly Weather Review, Nov. 1879).

Information in items 1) through 3) was found to support, in general, the track displayed in Neumann et al. (1993) as for Storm 5, 1879. Therefore, the author of this study adopted such a track and reproduced it in Fig. 3.

Indications are that this storm did not reach hurricane intensity.

Storm 7, 1879 (Oct. 9-16).

This storm is the same one Neumann et al. (1993) identify as Storm 6, 1879.

The following information was found about this storm: 1) On Oct. 11, it was central S.E. of Jamaica. By morning Oct. 12, it had reached the eastern part of that island. From Oct. 11 to Oct. 13, 19.80 inches of rainfall were reported from Kingston, Jamaica; 13 persons died in Kingston (Monthly Weather Review, Oct. 1879). 2) The storm was central near Cuba, S.W. of Havana by midnight Oct. 13-14 (Monthly Weather Review, Oct. 1879). 3) Oct. 13-15. A weak cyclone crossed over Vueltabajo (Pinar del Rio province in western Cuba) and intensified in the Gulf of Mexico. Strong winds and torrential rains were felt at Pinar del Rio, with no great damage (Sarasola, 1928). Author's note: Actually taken from the catalog of Cuban hurricanes by M. Gutierrez-Lanza which is included in Sarasola (1928). 4) Cyclonic weather over central Cuba about the middle of Oct. 1879 (Martinez-Fortun, 1942). Author's note: The storm was also felt in western Cuba. 5) Oct. 14 in the afternoon, the storm was central over the S.E. Gulf of Mexico. At that time Key West had barometer 0.31 inches below normal, with wind S.E. 26 mph (Monthly Weather Review, Oct. 1879). 6) Morning of Oct. 16, center over southern Alabama. Mobile barometer was 0.38 inches below normal. St. Marks wind was E. 28 mph and 2.36 inches of rainfall were recorded there in 8 hours (Monthly Weather Review, Oct. 1879). 7) Map showing a track for this storm which was started near 14 degrees N., 71 degrees W. on Oct. 10 and ended over western Georgia on Oct. 16 (Monthly Weather Review, Nov. 1879).

Information contained in the above items was found to support, in general, the storm track given in Neumann et al. (1993) as for Storm 6, 1879. Consequently, the author of this study adopted such a track and reproduced it in Fig. 3.

Storm 8, 1879 (Oct. 24-29).

This storm corresponds to Storm 1, 1879 in Neumann et al. (1993).

The following information was found in connection with this storm: 1) Midnight Oct. 25-26. Port Eads, wind E.N.E. 39 mph; Key West, wind N.E. 34 mph (Monthly Weather Review, Oct. 1879). 2) Oct. 26, maximum wind velocities: Port Eads, N.E. 43 mph; Key West, N.E. 26 mph (Monthly Weather Review, Oct. 1879). 3) Marine reports showed violent E. gales over the eastern Gulf of Mexico on Oct. 26 and 27. The ship "Capri" reported a "hurricane" 200 miles S.E. of

Port Eads on Oct. 26 and 27. Oct. 27, afternoon, the area of low pressure was located W. of middle Florida and the barometer was 0.12 inches below normal at Punta Rassa (Monthly Weather Review, Oct. 1879). 4) New Orleans, Nov. 3. Schr. "Mary Evelyn" (from Utilla, Honduras, to New Orleans). Oct. 27, encountered a gale; lost foresail, sprung a leak and had to throw her cargo of fruits overboard (The New York Times, Nov. 4, 1879, p.2, col.6). 5) At midnight Oct. 27-28, the center was probably located off the Georgia coast (Monthly Weather Review, Oct. 1879). 6) The steamship "City of Washington" arrived from Havana yesterday and reported severe gales from N. and N.E. during the greater part of the voyage. The ship was delayed over 24 hours due to head winds (The New York Times, Oct,. 31, 1879, p.7, col.4). 7) The storm was central in Rhode Island in the afternoon of Oct. 28 (Monthly Weather Review, Oct. 1879). 8) Portland, Me., Oct. 30. For the past 24 hours storm signals have been flying although the weather has been during that time exceedingly fine (The New York Times, Oct. 31, 1879, p.4, col.7). 9) Halifax Oct. 29. The rainstorm and heavy S.E. gale which began last night continued to late this morning. At one time it was very severe and trees and fences in some quarters of the city were injured. The tide was unusually high and some wharves were submerged (The New York Times, Oct. 30, 1879, p.1, col.4). 10) Halifax, Oct. 30. The storm of yesterday was felt severely in the eastern portion of the province. At Port Mulgrave, the terrific hurricane came from E., raged all the morning, doing much damage to buildings and wharves (The New York Times, Oct. 31, 1879, p.1, col.2). 11) Halifax, Oct. 31. A telegram from Port Hawkesbury stated that on Wednesday morning (Oct. 29) the place was visited by a terrific gale from sea which lasted 3 hours. A report from Canso indicated that the gale of wind commenced from S.E. Wednesday morning (Oct. 29) doing a large amount of damage to buildings and shipping. There are 70 vessels ashore in the Straits of Canso (The New York Times, Nov. 1, 1879, p.1, col.6). 12) St. John, N.B., Nov. 2. Reports continue to be received showing much damage done along the northern shore by the gale of Oct. 29 (The New York Times, Nov. 3, 1879, p.5, col.5 and 6). 13) Steamship "State of Georgia". Tuesday, Oct. 28 at 9 P.M., off the Banks of Newfoundland, wind began to blow heavily from E.S.E. In less than one hour a tremendous sea was running. The wind gradually hauled to the W. and increased to a cyclone. The vessel was nearly thrown to her beam ends by the huge seas (The New York Times, Nov. 2, 1879, p.10, col.6). 14) The steamship "City of Brussels", shortly after 8 A.M. Wednesday Oct. 29, when about 50 miles off Sable Island, was caught in a cyclone which raged for 4 hours. The wind came from E.S.E. and rapidly went to the W. A fearful sea was on and the waves broke over the high bulwarks of the "City of Brussels" (The New York Times, Nov. 2, 1879, p.10, col.6). 15) Halifax, Nov. 9. The "Star of India" left New York on Oct. 25 and on Oct. 29 encountered a cyclone from S.E. to N.W. in which the ship was hove on her beam ends for 36 hours (The New York Times, Nov. 10, 1879, p.1, col.7). 16) Halifax, Nov. 4. The schooner "J.W. Falt" arrived from Torbay (Newfoundland) and the crew stated that the gale of Oct. 29 was severely felt there (The New York Times, Nov. 5, 1879, p.5, col.5). 17) Map showing a track for this storm starting near

25 degrees N., 90 degrees W. on Oct. 26 and extending to the vicinity of 44 degrees N., 63 degrees W. on Oct. 29 (Monthly Weather Review, Nov. 1879).

Based on the information above, the author of this study proposed a modification of the track shown in Neumann et al. (1993) for a good portion of Oct. 28 and to extend the track to Oct. 29. Instead of having brought the storm to Rhode Island and dissipating it near Portland, Me., late on Oct. 28, the author of this study found support for the continuation of a northeastward course off the U.S. coast on Oct. 28 on the basis of the apparently contradictory information in items 7) and 8) and that no report of a storm in the New England area was found in The New York Times and, above all, on the basis of the abundant information which was found about the storm in Nova Scotia and Newfoundland and Atlantic waters to the south on Oct. 29 (items 9 through 17). Based on information in items 9) through 11) and item 14), the author of this study estimated a 7 A.M. Oct. 29 position near 44.3 degrees N., 61.5 degrees W. and, by so doing, extended the track in Neumann et al. (1993) as for Storm 7, 1878 for one day . The author's track for this storm is displayed in Fig. 3.

The author of this study believes that the storm might have reached minimal hurricane intensity on Oct. 29.

Storm 9, 1879 (Nov. 18-21).

This storm is the same one Neumann et al. (1993) identify as Storm 8, 1979.

The following information was found in relation to this storm: 1) Schr. "O.S. Bailey" from Dominica, Nov. 8. On Nov. 17 encountered a furious gale and on Nov. 20 tremendous seas boarded the vessel; the crew was picked up and landed at Baltimore on Nov. 27 (Monthly Weather Review, Nov. 1879). 2) Baltimore, Nov. 29. Bark "Prima Donna" brought the captain and crew of the schooner "O.S. Bailey" which foundered at lat. 36 40 N., long. 72 34 W. on Nov. 22. The schooner left Dominica on Nov. 8. A succession of gales commenced on Nov. 17 and for 5 days the crew tried to save the vessel (The New York Times, Nov. 30, 1879, p.2, col.5). 3) Brig "Shannon", from Cape Haytien, reported a revolving storm which began on Nov.18 and continued for 3 days. She was hove to under two staysails and a storm trysail during the 3 days of the storm (The New York Times, Nov. 28, 1879, p.5, col.4). 4) Schr. "Eclipse", from Grand Cayman, had bowsprit carried away and lost sails during the passage which was an extremely severe one (The New York Times, Nov. 29, 1879, p.8, col. 3). 5) Midnight Nov. 18-19. Falling barometer and increasing wind at Havana, Key West and Punta Rassa. The center of the hurricane was some distance to the east (Monthly Weather Review, Nov. 1879). 6) Schr. "Kit Carson" arrived from Miragoane and reported a N.N.E. gale in the Gulf Stream on Nov. 19 (The New York Times, Nov. 29, 1879, p.8 col.3). Author's note: Miragoane is located in Haiti, about 40 miles W. of Port-au-Prince. 7) Schr. "Victor Ping". Nov. 19, in the Gulf Stream, N.W. gale (Monthly Weather Review, Nov. 1879). 8) Brig "Una". Nov. 19, heavy N.W. gale, barometer 29.25 inches (Monthly Weather Review, Nov. 1879). 9) Augusta, Ga., Nov. 19. Heavy snowfall occurred today. It

snowed steadily for 3 hours (The New York Times, Nov. 20, 1879, p.1, col.4). 10) Charleston, Nov. 19. A heavy rain with some snow fell here today. There are reports of snow in the interior (The New York Times, Nov. 20, 1879, p.1, col.4). 11) Ship "Deverion", from Calcutta, was off Hatteras on Nov. 19 when a terrific gale from S.S.W. set in. After blowing from that direction for sometime, the wind went around to N. and caused a violent cross sea (The New York Times, Nov. 29, 1879, p.8, col.3). 12) Schr. "Eddie Fuller". Nov. 19, lat. 36 03 N., long. 74 33 W. Nov. 20, lat. 34 20 N., long. 74 39 W. Severe hurricane during the night of Nov. 19-20; barometer 29.30 inches about midnight; wind commenced from N.N.E. and gradually backed to N.W., highest force of wind: 80 to 90 mph (Monthly Weather Review, Nov. 1879). 13) The storm rapidly moved N. and N.E. passing Hatteras at 11 P.M. Nov. 19; minimum pressure at Cape Hatteras was 29.47 inches and occurred at that time (Monthly Weather Review, Nov. 1879). 14) Ship "Stewart Freeman". Nov.22, 200 miles E. of Henlopen, gale (Monthly Weather Review, Nov. 1879). Author's note: The gale should have also occurred on Nov. 20. 15) Bark "Lincoln". Nov. 19, lat. 39 N., long. 68 W., heavy gale E.S.E. to W.S.W. (Monthly Weather Review, Nov. 1879). Author's note: The date should be Nov. 20 rather than Nov. 19. 16) Steamer "Hermond", lat. 39 N., long. 66 W., hurricane lasting 5 hours, from S.E. to N.W. (Monthly Weather Review, Nov. 1879). Author's note: The day should be Nov. 20. 17) Steamship "Leipsic". Nov. 19, lat. 40 N., long. 69 W., barometer 29.05 inches, wind N.N.E. to N.W. force 10 (Monthly Weather Review, Nov. 1879). Author's note: The date should be Nov. 20 rather than Nov. 19; force 10 on the Beaufort scale corresponds to winds between 55 and 63 mph. 18) Bark "Gasmere". Nov. 29, lat. 39 N., long. 66 W. Terrific hurricane from E. for 2 hours, then hurricane from S. for 4 hours, then calm for half an hour, then hurricane more severe than at first (Monthly Weather Review, Nov. 1879). Author's note: The day Nov. 29 is obviously wrong, the correct day should be Nov. 20. 19) Schr. "Hattie E. Giles", from Tampico, met N.N.E. to N.N.W. gales during the entire passage. On Nov. 20, the wind increased to a hurricane which lasted 48 hours (The New York Times, Dec. 3, 1879, p.3, col.4). 20) Bark "T.S.B.", which arrived from Rio Grande (Brazil) yesterday, encountered a hurricane on Nov. 20. The wind came from S.E. and then went around to N.N.W. and caused a terrific sea (The New York Times, Nov. 30, 1879, p.10, col.5). 21) Bark "Susan A. Blaisdell" arrived from Singapore. The vessel was hove to for 48 hours in a heavy W.N.W. wind which began on Nov. 20 (The New York Times, Nov. 30, 1879, p.10, col.5). Author's note: The Monthly Weather Review, Nov. 1879, gave a position for the bark in lat. 31 N., long. 72 W, on Nov.20. 22) The steamship "Devon", which arrived yesterday from Bristol, met with very bad weather on Nov. 20 , while east of the banks. At 2 A.M. the wind went around from S. to N.E. and increased in violence until it was blowing a perfect hurricane. The sea became violent and broke over the stern so frequently that, at 5 A.M., it was necessary to heave the vessel with her head to the wind (The New York Times, Nov. 29, 1879, p.8, col.3). 23) Bark "B.T. Watson", from Manila, lost her lower top sails on Nov. 20, having been caught in the edge of a revolving gale (The New York Times, Nov. 30, 1879, p.10, col.5). 24) Steamship "Mangerton" met

the hurricane on Nov. 20, coming from Middlesborough (The New York Times, Nov. 30, 1879, p.10, col.5). 25) The storm passed Halifax at 3 P.M. Nov. 20; a minimum pressure of 28.59 inches was recorded there at that time (Monthly Weather Review, Nov. 1879). 26) Halifax, Nov. 21. The storm of yesterday was severely felt in the Straits of Canso. At Canso, considerable damage was done to shipping and boats in the harbor and several buildings were more or less damaged. About 6 P.M. Nov. 20, the wind hauled around to S.W. and blew even harder than when it came from the S.E. (The New York Times, Nov. 22, 1879, p.1,. col.4). 27) Steamer "Albert, between Magdalen Islands and Peasant Bay. At 3:30 P.M. Nov. 20, wind suddenly rose to a violent gale; at 8:30 P.M.it veered to N.E., hurricane, barometer 27.60 inches (Monthly Weather Review, Nov. 1879). Author's note: The alleged pressure of 27.60 inches might be too low; a reading of 28.59 inches was reported at Halifax a few hours earlier. 28) Halifax, Nov. 25. The steamer "Albert", playing between Pictou and Magdalen Is. has been lost. Her crew and passengers were saved and arrived at Souris, Prince Edward Is. tonight. The steamer ran ashore at St. Mary's Bay during a heavy snowstorm and gale (The New York Times, Nov. 26, 1879, p.1, col.6). 29) Bark "Olustee" arrived from Singapore Monday evening. On Thursday (Nov. 20), when the vessel passed Cape Hatteras, a violent gale from the N.W. began. The storm continued during the night. Very heavy squalls of snow passed over the vessel which labored violently in the heavy seas. The following morning a great wave broke over the bark's quarters, breaking the spanker gaff, partially filling the cabin with water (The New York Times, Nov. 26, 1879, p.2, col.6). 30) Quebec, Nov. 29. According to a report by the mate, the bark "Lydia" went ashore in a heavy snowstorm at 7 A.M. Nov. 20 (The New York Times, Nov. 30, 1879, p.2, col.5). 31) At New York, the maximum temperature yesterday was 35 degrees Fahrenheit and by 9 P.M. the temperature had dropped to 22 degrees Fahrenheit. Wind speed was 27 mph at noon yesterday and, at 2:30 P.M. and 5 P.M., it reached 40 mph (The New York Times, Nov. 21, 1879, p.1, col.5). 32) Map showing the track for this storm starting near Andros Island in the Bahamas on Nov. 19 and moving to a position near 39 degrees N., 68 degrees W. on Nov. 20 and between the northern tip of Newfoundland and Labrador on Nov. 21 (Monthly Weather Review, Dec. 1879). 33) The storm was first detected at 15 degrees N., 68 degrees W., it recurved near 24 degrees N., 78 degrees W. and it was last observed in the middle of the Atlantic (Garriott, 1900).

Based on the information contained in the items above, the author of this study proposed some changes along the storm track shown in Neumann et al. (1993) as for Storm 8, 1879. The fact that the storm is not mentioned in any of the catalogs of Cuban hurricanes (Sarasola, 1928; Martinez-Fortun, 1942) does not favor the idea that the storm crossed over central Cuba on Nov. 18 as shown in Neumann et al. (1993). However, information in items 3) and 6) does support storm positions not far away from the Haiti-New York route on Nov, 18 and Nov. 19. In addition, the presence of a storm just east of the Bahamas is in closer agreement with the gale reported by the "O.S. Bailey" in items 1) and 2) than it would be a storm over central Cuba and the westernmost Bahamas. In the light

of the discussion above, the author of this study estimated 7 A.M. positions near 23.5 degrees N., 73.5 degrees W. for Nov. 18 and near 27.5 degrees N., 73.5 degrees W. for Nov. 19. These positions are about 425 miles and 275 miles to the E.N.E. of the corresponding positions shown in Neumann et al. (1993) for the days which are indicated. The introduction of these new positions not only replaced those in Neumann et al. (1993) but, in addition, automatically eliminated the portion of the track shown by them as having been described by the storm over the western Caribbean Sea prior to Nov. 18. Information contained in items 7), 8) and 11) through 27) was used by the author of this study in constructing his track from 7 A.M. Nov. 19 to 7 A.M. Nov. 21. His 7 A.M. Nov. 20 estimated position was near 39.0 degrees N., 68.0 degrees W. and he adopted the 7 A.M. Nov. 21 position near 53.0 degrees N., 55.0 degrees W. which is shown in Neumann et al. (1993) as for Storm 8, 1879.The author's track is displayed in Fig. 3. This track was found to be to the east of the one in Neumann et al. (1993) for most of Nov. 19. On the other hand, the author's track was found to be slightly to the west of the one in Neumann et al. (1993) for the entire day of Nov. 20 and the early part of Nov. 21.

Based on information in items 9), 10), and 28) through 31), the purely tropical phase of this storm should not have gone beyond Nov. 19 if it ever existed. It is possible that subtropical rather than tropical characteristics were present since the beginning of the storm. What is beyond any doubt, however, was that the storm transformed itself into a very powerful extratropical system as it accelerated towards Nova Scotia and Newfoundland. The size of the storm seems to have been constantly increasing over much of its known life-span as suggested by items 21), 29) and 31).

The alleged lowest pressure of 27.60 inches reported by the "Albert" (item 27) and the reading of 28.59 inches at Halifax (item 25) suggest hurricane force winds in the then extratropical storm.

Finally, the author of this study believes that this storm is likely to have triggered the strong norther which developed along the northern coast of Panama starting on Nov. 20 and which lasted for 5 days. A full account of that northerly gale was published in The New York Times, Dec. 8, 1879, p.8, col.4 and a more reduced narrative appeared in The Times (London), Dec. 9, 1879, p.5, col.5. The N. gale was reported to have occurred on the coast of Panama, setting in during the night of Nov. 20 and to have done much damage to shipping. Heavy seas were driven into the open harbor of Aspinwall (Colon) and rolled against the wharves where the vessels were moored. The brigs "Ella Mc Clone" and "E.B. Rick" and the barks "Georgine" and "Albatross" were wrecked and wharves were damaged. The barkentine "Ada J. Bonner", which was anchored near the mouth of the Chagres River, was struck by a heavy sea which broke her rudder, and the brig "Mironus" narrowly escaped destruction. Steamers lying off the town of Colon managed to escape by putting to sea. The gale continued for 5 days during which they remained hove to at a safe distance from the shore. The Chagres River was overflooded, the inundation causing much damage to property. The Panama Railway was partially under water and, consequently, communication was interrupted. In addition, a report filed by the "Medway", which was published in The Times (London),

Dec. 17, 1879, p.5. col. 6, indicated that she had to leave suddenly the port of Colon during the night of Nov. 20 owing to the furious N. gale which, if possible, was heavier on Friday (Nov. 21) when gusts and squalls were impossible to withstand at times. On Saturday the vessel stood for a port but, as the gale continued, decided to leave for Jamaica where she arrived on Nov. 24.