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NOTES ON THE  
TROPICAL CYCLONES OF PUERTO RICO, 1508-1970

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During recent years, a need for a list of hurricanes that have affected Puerto Rico has come to our attention. These hurricane data are frequently requested by students, government agencies, and the public in general. The present compilation has been prepared with this requirement in mind. The information included is rather brief, bringing out only the most significant facts about the event.

More detailed information and historical discussions of the hurricanes of Puerto Rico are found in the books by Dr. Luis A. Salivia (1) and Dr. José Carlos Millás (2).

Dr. José A. Colón, Meteorologist in Charge of the National Weather Service (NWS) at San Juan, recently edited an historical list of the Puerto Rico hurricanes and tropical storms, and after eliminating doubtful cases, made a selection of 73 tropical cyclones that have affected Puerto Rico. These show the following distribution by months of occurrence, and by centuries:

<u>By months</u>		<u>By centuries</u>	
June	1	16th century 1500-1599	10
July	8	17th century 1600-1699	4
August	28	18th century 1700-1799	20
September	28	19th century 1800-1899	25
October	7	20th century 1900-1960	<u>14</u>
November	<u>1</u>		
Total, years 1508-1960	73	Total, years 1508-1960	73

Dr. Colón encouraged the inclusion in the present list of the historical data, trajectory, damages, plus wind, pressure and other weather data. Accordingly, this list has been revised to include available meteorological data users and students usually request from the National Weather Service at San Juan.

The main source consulted for the historical data on the tropical cyclones of past centuries has been the work of Dr. Luis A. Salivia, "Historia de los Temporales de Puerto Rico, 1508-1949". Dr. Salivia conducted a research in the "Archivo de las Indias" of Spain, and all known bibliography, including the hurricane lists of such distinguished writers and historians as Tapia, Brau, Coll y Toste, Ramírez, Miller, Tannehill, Poey, etc. Dr. Salivia includes 94 tropical cyclones in his catalogue.

Another valuable source has been the recent book (1968) of the late Dr. José Carlos Millás, "Hurricanes of the Caribbean and Adjacent Regions, 1492-1800". Dr. Millás consulted English and French historical records. It is regrettable that he did not live to complete the second volume of his catalogue of hurricanes of the Antilles.

Data for the tropical cyclones of the 20th century, since "San Ciriaco" of August 8, 1899, have been abstracted from NWS (formerly U. S. Weather Bureau) records.

It is often not easy to determine which cyclones are properly includable in a list of major storms that have affected Puerto Rico since its discovery. In the early centuries the paucity of data makes it difficult to determine the actual occurrence of the hurricane, much less its effects. Even in modern times the decision may be difficult because of the so-called "near misses". The near misses of the 1961-1970 decade have been added to this list as unnumbered storms for the reason that it is known these tropical cyclones produced some damage to the nearest Puerto Rico coastline, and also because these storms are still within the recent memory of the public.

Dr. Millás calls attention to the discrepancies in dates of the cyclones of past centuries and believes some may be the result of the use of two different calendars at the time, the Julian and the Gregorian calendars. Spain and its colonies adopted the present Gregorian calendar in 1582. The day following October 4, 1582, was designated as October 15. England did not adopt the Gregorian calendar until about two centuries later, on the day after September 2, 1752. The dates of occurrence in the Julian calendar of the 10 Puerto Rico tropical cyclones on this list prior to 1582 have been converted to the corresponding date of the present Gregorian calendar. The Gregorian calendar date has been included in parenthesis on this list, following the traditional date. The distribution of the tropical cyclones by months of occurrence, after converting the 16th century storms to the present calendar, reflects the following changes:

June	1
July	7
August	26
September	30
October	8
November	1
Total,	<hr/>
1508-1960	73

The term "tropical cyclone", as used on this list, is the generic term used by international agreement for these tropical cyclonic storms, which are classified by organization and intensity, as follows:

"Tropical Depression": An area of disturbed weather with some rotary circulation on the surface, and maximum wind speed of 39 mph (34 knots).

"Tropical Storm": The cyclone has formed with a distinct rotary circulation, has maximum wind speeds of 39-73 mph (34-63 knots).

"Hurricane": The cyclone has very strong rotary circulation, with wind speeds of 74 mph (64 knots) or more.

However, tropical depressions or systems of lesser intensity such as tropical disturbances, frequently observed in the formative stage of a tropical cyclone, are not included as they are not within the scope of this list. Tropical cyclones are classified by the National Weather Service on the basis of their intensity and organization near the center of the system, regardless of the intensity of their effects in Puerto Rico. Thus, while some systems are listed in this list as hurricanes, their passage through the vicinity of Puerto Rico was such that their effects on the island were not of hurricane intensity.

The abbreviations of T/S for tropical storm; H, for a hurricane; and T/C for an unclassified tropical cyclone, have been used on this list. No effort has been made to change the classification appearing on the historical lists, because of the lack of wind or pressure data on storms prior to the 19th century. The figures in parenthesis indicate the source data.

The following records are attributed to those 73 tropical cyclones in Puerto Rico:

First tropical cyclone after the Discovery of Puerto Rico .....	San Roque, Aug. 16, 1508 JC (Aug. 26, 1508 GC)
First hurricane under the United States flag .....	San Ciriaco, Aug. 8-9, 1899
Only June tropical cyclone .....	San Antonio, June 13, 1780
Only November tropical cyclone .....	San Aupo, Nov. 28, 1878
First hurricane for which barometer records are available .....	Nuestra Señora de los Angeles, Aug. 2-3, 1837
First hurricane for which rainfall readings are available .....	Santa Juana, Aug. 21, 1871
First tropical cyclone designated with the name of the saint of the day....	San Bartolomé, Aug. 24-25, 1568 (Sept. 3-4 JC)
Occurrence of 2 tropical cyclones in one year.....	1713, San Zacarías and San Cándido 1738, Santa Rosa and San Leoncio 1740, San Esteban and San Vicente 1766, San Jonaro and San Marcos 1772, San Agustín and San Ramón 1780, San Antonio and San Calixto 1813, San Liborio and Santa Juana 1901, San Cirilo and San Vicente
Occurrence of 3 tropical cyclones in one year.....	1530, Santa Ana, San Hipólito, and San Ramón

Consecutive years with tropical cyclone occurrences .....	1766-1767	1824-1825
	1806-1807	1851-1852
	1813-1814	1888-1389
	1813-1819	1916-1916
		1931-1932
First storm warning flags displayed..	San Nagin, Aug. 19-20, 1891	
First hurricane warnings received by cable.....	Santa Juana, Aug. 21, 1871	
First hurricane warnings telegraphed to interior towns .....	Santa Juana, Aug. 21, 1871	
First hurricane warnings by radio ...	San Felipe, Sept. 13, 1928	
First hurricane warnings by television	Santa Clara (Betsy), Aug. 12, 1956	
First radar observations in P. R. during a hurricane.....	Santa Clara (Betsy), Aug. 12, 1956	
First tropical cyclone covered by aircraft reconnaissance in San Juan area	San Calixto, Oct. 14, 1943	
Last hurricane to cross the island...	Santa Clara (Betsy), Aug. 12, 1956	
Lowest barometric reading in P. R. during a hurricane.....	San Felipe, Sept. 13, 1928 27.50 inches at Guayama	
Highest wind measurement in P. R. during a hurricane.....	San Felipe, Sept. 13, 1928 160 mph at San Juan	
Most deaths during a hurricane.....	San Ciriaco, Aug. 8, 1899 3369	
Last tragedy during a hurricane.....	Hurricane Donna, Sept 5-6, 1960 107 drowned mostly at Humacao	
Most intense hurricane in P. R. ....	Most probably San Felipe, Sept. 13, 1928	
Hurricane of greater size .....	Most probably San Felipe, Sept. 13, 1928	
Greatest 24-hour rainfall amount during a hurricane.....	San Ciriaco, Aug. 8, 1899, 23.00 inches at Adjuntas	
Greatest 48-hour rainfall amount during a hurricane .....	San Felipe, Sept. 13-14, 1928, 29.60 inches at Adjuntas	
Greatest 2-hour rainfall amount during a hurricane .....	Donna, Sept. 5, 1960 6.10 inches at Carite Dam	
Five top hurricanes in Puerto Rico...	Santa Ana, July 26-27, 1825 Los Angeles, Aug. 2-3, 1837 San Narciso, Oct. 29, 1867 — San Ciriaco, Aug. 8-9, 1899 San Felipe, Sept. 13, 1928	

#### Bibliography

- (1) Salivia (Dr.) Luis A.: Historia de los Temporales de Puerto Rico, 1508-1949 (1950)
- (2) Millás (Dr.) José Carlos: Hurricanes of the Caribbean and Adjacent Regions, 1492-1800 (1968)
- (3) U. S. Weather Bureau Technical Paper No. 36: North Atlantic Tropical Cyclones --Tracks and Frequencies of Hurricanes and Tropical Storms, 1886-1968; and U. S. Weather Bureau Technical Paper No. 55: North Atlantic Tropical Cyclones --Tracks and Frequencies of Hurricanes and Tropical Storms, 1871-1963.

- (4) Miscellaneous San Juan Weather Forecast Service Office records.
- (5) U. S. Weather Bureau: Climate and Crops Service

<u>T/C</u> <u>No.</u>	<u>Date &amp; Name</u>	<u>Details</u>
1	1508 Aug. 16 San Roque (Aug. 26 GC) T/C	The first tropical cyclone of record in Puerto Rico reported by Ponce de León. Affected south and southwest Puerto Rico, from the area Guayanilla-Guánica westward. Rough seas and SE winds grounded Ponce de León's caravel. (1), (2).
2	1514 July Date unknown San Laureano or Santa Cruz T/C	There is a disagreement as to whether this storm occurred in 1514 or 1515, but the 1514 date is preferred by modern researchers. Damages to agriculture. A famine and an epidemic was the aftermath of this storm, resulting in the deaths of many native indians. (1), (2).
3	1526 Oct. 4-5 San Francisco (Oct. 14-15 GC) H	A furious, slow-moving hurricane passed over northern Puerto Rico on the night of Oct. 4th, reached Santo Domingo the next day. Extensive damages and great floods to both islands. Most of city of San Juan destroyed; rains and winds lasted 24 hours. Millás (2) believes it moved in a west or westnorthwest trajectory, and probably affected the Leeward and Virgin Islands also. (1), (2).
4	1530 July 26 Santa Ana (Aug 5 GC) H	The first of a series of 3 tropical cyclones that struck the island in 1530. Dr. Salivia includes 2 additional storms in September (dates unknown) which would make a record of 5 tropical cyclones in one year. Other sources give the date of the first hurricane of 1530 as July 28th rather than July 26th. Affected the entire island, and destroyed half of the houses at San Juan. (1), (2).
5	1530 Aug. 22 San Hipólito (Sept. 1 GC) T/C	Affected the entire island. Floods drowned livestock and damaged the crops that remained from the first storm of 1530. (1), (2).
6	1530 Aug 31 San Ramón (Sept. 10 GC) H	Third tropical cyclone of 1530, within 36 days, and 9 days after the second storm. A violent hurricane. Floods isolated communities, with great damages to livestock and agriculture. Uncounted number of deaths by drowning. So great was the distress among the Spanish colonists that they considered abandoning the island. (1), (2).
7	1537 July or Aug. No name T/C	The date is in dispute; some historians claim the island was struck by 3 tropical cyclones this year. The dates of July 11 and August 9 have been given, but no date has been furnished for the third storm.

T/C No.	Date & Name	Details
		Until further historical data is found, only one storm is entered for this year. Historians agree that there were great floods and damages to crops, livestock, loss of life, mostly of slaves. (1), (2).
8	1545 Sept. 7 (Sept. 17 GC) No name H	This storm is included by Millás on the basis of report by Oviedo, eye witness at Santo Domingo. He reported this hurricane, which produced copious rains in Santo Domingo from Sunday night thru Tuesday, also caused great damage in Puerto Rico especially to houses and plantations. Millás, a meteorologist, deduced from Oviedo's account that this was a hurricane of great size, slow movement, excessive rainfall, but not of severe intensity. (2).
9	1568 Aug. 24-25 San Bartolomé (Sept. 3-4 GC) H	According to historian Tapia, this was the first tropical cyclone designated with the name of the saint of the day. The names of storms 1-8 were assigned retroactively by historians. San Bartolomé is considered a severe hurricane, struck San Juan at sundown Aug. 25th and lasted till the early morning hours of the 26th. It was also felt at Santo Domingo on 25-26th. At San Juan, wind began blowing from the N, and thunder was reported in the early morning hours when the worst was over. (1), (2).
10	1575 Sept. 21 San Mateo (Oct. 1 GC) T/C	Last of Puerto Rico's 10 tropical cyclones of the 16th century, and last in the Julian calendar. Details lacking. (1) (2).
11	1615 Sept. 12 San Leoncio H	Unroofed San Juan cathedral. Damages to crops and sugar cane. Some deaths. Sunk or damaged ships at San Juan harbor, and all cargo lost. Foodstuff had to be imported from neighboring islands. Spanish records indicate hail occurred at San Juan in 1614, to the astonishment of the people, as hail had not been observed before. (1).
12	1626 Sept. 15 San Nicomedes T/S	Occurred one year after the Dutch siege of San Juan. Apparently passed over northern Puerto Rico. 38 deaths, incomplete count. 3 ships lost at San Juan harbor. (1).
13	1642 Sept No name H	Severely damaged the San Juan cathedral, destroyed houses, and the entire cotton and tobacco crops. The land was unproductive for two years; afterwards the island suffered a famine. Millás concludes this must have been a severe hurricane of great size and intensity, and copious rainfall. Millás says it affected Guadeloupe, Martinique, St. Kitts, Puerto Rico, and Santo Domingo. (1), (2).
14	1657 Aug No name H	Tremendous damage at Guadeloupe. In Puerto Rico, its adverse effects on crops lasted for 3 years and produced a famine. (1), (2).

<u>T/C</u>	<u>No.</u>	<u>Date &amp; Name</u>	<u>Details</u>
	15	1713 Sept. 6 San Zacarías H	A period of 56 years without any hurricanes had passed since the storm of 1657. San Zacarías crossed over Guadeloupe on the 5th, crossed the Caribbean into southern Puerto Rico. Millás believes that although it must have been a hurricane of small diameter but of great intensity, it affected the entire island of Puerto Rico. A huge storm surge inundated the south coast. (1), (2).
	16	1713 Oct 3 San Candido T/C	The second storm of 1713 occurred 28 days after San Zacarías. Passed to the south of the island, and later affected also Santo Domingo. Southern Puerto Rico experienced another hurricane tide. Great damages, adding to the adverse effects of the first storm of the same year. (1).
	17	1718 Sept. 7 Santa Rogina T/C	This storm struck Nevis, St. Kitts, Virgin Islands, and passed over or near northeastern Puerto Rico. Was felt at San Juan, and damages probably were limited to northeastern Puerto Rico.
	18	1730 Aug. 30 Santa Rosa T/S	No details known, except that Santa Rosa caused damages to homes and plantations in Puerto Rico. Some believe to be the same storm that passed close to south coast of Jamaica Sept. 1st, sinking two frigates.
	19	1738 Aug. 30 Santa Rosa H	First of 2 tropical cyclones that hit Puerto Rico in 1738, damaging housing and agriculture. Great damages at San Juan. Millás says this was a hurricane of normal size, but severe, arriving from the east, crossed over Puerto Rico moving west, and crossed also southern Hispaniola.
	20	1738 Sept. 12 San Leoncio H	Erratic storm. Apparently this hurricane of small diameter changed its course many times. This Atlantic cyclone passed Sept. 10-11 over the north part of Guadeloupe (great devastation there), moved westnorthwest near and to the south of St. Thomas, then moved westsouthwestward and afterwards west, crossing southern Puerto Rico on Sept. 12th, and south of Santo Domingo on the 13th. Produced floods in Puerto Rico, especially in the southern part, drowning cattle, ruining crops and fruits. Great misery at Coamo and Ponce. Damages in Puerto Rico were due mostly to the rains. A malaria epidemic followed, and a plague of warms ate the newly-planted crops. A famine was the aftermath. Apparently, the cyclone was not felt at San Juan. (1), (2).

T/C	No.	Date & Name	Details
	21	1740 Aug. 3 San Esteban H	An erratic Atlantic hurricane of apparently small diameter. Struck Martinique and Guadeloupe on Aug. 1st, passed close to Antigua, turned to westnorthwest or west, and passed near St. Kitts, and close to south coast of Puerto Rico on the 3rd, and probably over southwest Puerto Rico, then apparently turned northnorthwest, passing the extreme northeast portion of Santo Domingo the night of Aug. 3-4. San Esteban wiped out an entire coconut plantation in Ponce, and did great damage to crops in southern Puerto Rico.
	22	1740 Sept. 11-12 San Vicente H	The second storm that struck Puerto Rico in 1740. It affected San Juan. Dr. Salivia (1) is of the opinion it affected northern Puerto Rico; and Dr. Millás (2) reasons that, since there is no record of a September cyclone in the Leeward and Virgin Islands, it appears this hurricane must have arrived from the southeast or an approximate direction, and apparently was of weak or normal intensity. (1), (2).
	23	1742 Oct. 28 San Judas Tadeo H	The center of this hurricane apparently passed some distance to the north of the island. It struck St. Thomas either during the night of Oct. 27th or at daytime Oct. 28th, moving west or westnorthwest. Very strong southerly winds produced high seas that grounded an English vessel near the two mouths of the Jacaguas River. An English rescue boat was repelled by the local militia in what was called "The Battle of Boca Chica". The hurricane sunk a Spanish vessel off Anegada Island. (1), (2).
	24	1751 Aug. 18 San Agapito T/C	Was felt in the entire island. An earthquake was reported during the passage of this cyclone, and the seism was felt in the Antilles, including Santo Domingo and Jamaica. Dr. Millás believes the storm crossed Puerto Rico, moving northward. (1) (2).
	25	1766 Sept. 19 San Jenaro H	Severe hurricane. First of two tropical cyclones that affected the island that year. According to Millás (2), it crossed eastern Puerto Rico on a northwest track. Was felt in the entire island, but towns hardest hit were Guayama, Fajardo, Caguas, Las Piedras, Loíza, Río Piedras, and Santurce. It destroyed most crops, especially the rice, corn, bananas, fruits, coconuts, and minor crops. A plague of worms ate the newly-planted crops after the storm, as in the case of "San Leoncio" of 1738. The trajectory is in dispute, as it is claimed the 6-day period of travel from Montserrat to Puerto Rico is unheard of. This slow-moving, erratic Atlantic cyclone apparently passed north of Guadeloupe on a westnorthwest track until it struck the Island of Montserrat on the night of Sept. 13; then changed to



T/C

No. Date & Name

Details

a northwest track and hit St. Kitts, and began making a slow loop, during which time the rains did not cease drenching Montserrat with copious rains and winds for 3 days. The devastating flood destroyed half of the town. After completing the loop, the hurricane continued in its slow drift towards Puerto Rico. (1), (2).

26 1766  
Oct. 7-8  
San Marcos  
H

The second storm of 1766, just 18 days after San Jenaro, passed over or close to Dominica Oct. 6th on a northnorthwest track, then over Marie Galante and Guadeloupe. A huge storm surge hit Guadeloupe that, in combination with a river rise of 25 feet, caused a great inundation. It moved close or east of St. Kitts and over St. Eustatius (55 ships lost). Then moved west to the south of St. Croix, entered southeast Puerto Rico about midnight Oct. 7, crossed the island on a SE to NNW track on the early morning hours of Oct. 8. It was felt throughout the island, but the worst damages were suffered by eastern Puerto Rico. Especially hit were the towns of Guayama, Fajardo, Caguas, Loiza, Rio Piedras, Santurce. (1), (2).

27 1767  
Aug. 7  
San Cayotano  
H

Apparently, Puerto Rico received the fringe of this cyclone, which destroyed the banana crop and drowned much cattle. It produced copious rains and great floods. It caused a major disaster at Martinique (1600 deaths) supposedly by drowning. (1), (2).

28 1772  
Aug. 28-29  
San Agustín  
H

Major hurricane. This Atlantic cyclone appeared Aug. 28th, 7 a.m., east of the Leeward Islands, near Barbuda, moving west, and passed over St. Martin and Anguilla. The center was close to St. Thomas at 7 p.m., and entered Puerto Rico south of Fajardo about 9 p.m. Crossed the island east-west, leaving Puerto Rico (near Mayaguez) in the morning hours of Aug. 29th.; was near Mona Island by 7 a.m. Passed over south-central Hispaniola, and on the 31st was close to the south coast of eastern Cuba. Affected Jamaica with high winds. The hurricane continued moving close to south coast of Cuba. From thence the track seemed doubtful as Millás (2) says it went into the Bay of Honduras, but Tannehill indicated that the hurricane battered the State of Louisiana on Sept. 3. Great destruction at St. Martin, in fact only a few houses were left standing there. Historian Fray Iñigo Abad was an eye witness to this hurricane while at the town of Aguada, and described the wind changes preceded by intervals of 6-8 minutes of relative calm. Fray Iñigo Abad says the wind first blew from the north, then shifted to the south, to the west and finally to the east. He estimated the forward speed at 20 mph. At Aguada

T/C	No.	Date & Name	Details
			the storm lasted from 2:30 a.m. until 12 noon. At San Juan the cyclone began at 10:45 a.m. of the 28th, accompanied by continuous thunder, lightning, and earthquake. The sky had been covered for 2 days, with heavy breakers. The hurricane affected the entire island with copious rains, winds, and floods; destroyed housing, crops, shipping, many deaths. (1) (2)
	29	1772 Aug. 31 San Ramón H	Severe hurricane of relative large size, the second that hit Puerto Rico in 3 days. The only reported case of 2 hurricanes (San Agustín and San Ramón of 1772) that although moving in two distinct trajectories, struck the Island withing 3 days. While the San Agustín hurricane was over south-central Hispaniola, the second cyclone, hurricane San Ramón, appeared Aug. 30th some 75 miles N of Barbados, moving north-westward. Passed very near east coast of Dominica late afternoon and early evening (18 vessels lost); the vortex crossed over Marie Galante and Guadeloupe (great damages, especially to housing), and by 7 a.m. of Aug. 31st was between Montserrat and Antigua, moving westnorthwest. The hurricane had increased in size. The vortex passed over St. Kitts, where almost every house was blown down with a great loss of life; similarly, at Montserrat and Nevis. The eye passed over St. Croix, Virgin Islands, which was battered by the storm for 6 hours, according to the eye-witness account of the famous statesman, Alexander Hamilton, then a youth at St. Croix. He said the wind began blowing from the north from sunset to 10 p.m.; then a sudden and unexpected interval which lasted about one hour (the central calm) followed by a shift to the southwest with redoubled fury until about 3 a.m. Alexander Hamilton wrote: "Misery, in its most hideous shapes, spread over the face of the country". Copious rains produced damaging landslides. A huge hurricane overtook 250 persons who tried to save their lives climbing a mountain. The hurricane passed between St. Thomas and Puerto Rico that night, affected northeastern Puerto Rico. At San Juan, it unroofed buildings, including La Fortaleza, the Governor's mansion. (1), (2).
	30	1775 Aug. 1 San Pedro T/C	After affecting Martinique, Aves Island on July 31st, and St. Croix, this storm apparently passed some distance south of Puerto Rico on Aug. 1st, possibly nearest to the southwest tip of the island; then moved northwest through Mona Passage and very close or over the extreme eastern end of Santo Domingo. (1) (2)
	31	1780 June 13 San Antonio T/C	Rare Atlantic June tropical cyclone, the only June cyclone of record in Puerto Rico. Appeared a short distance west of St. Lucia June 12, crossed the Caribbean and passed near or over south Puerto Rico