

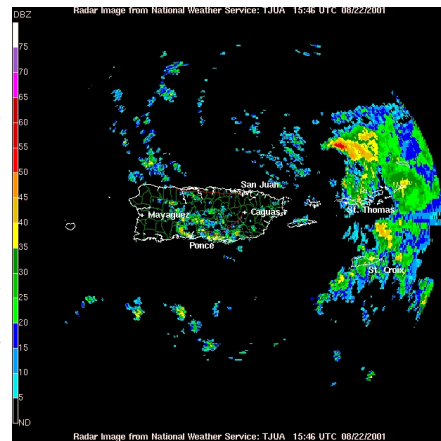
Tropical Cyclone Report
Tropical Storm Dean
22-28 August 2001

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National Hurricane Center
3 October (final)

Dean developed over the Virgin Islands and produced heavy rains in Puerto Rico.

a. Synoptic History

Dean formed from a large tropical wave that crossed Dakar with minimal shower activity between 14 and 15 August. It moved westward and gradually began to develop thunderstorms. By the time the wave was near 58 to 59° W, there was enough organization on satellite imagery to dispatch a reconnaissance plane to the area. Reports from the plane indicated that the wave had a large amplitude and strong winds, but no closed circulation. At 1200 UTC 22 August, as the wave was moving over the northern Leeward Islands at 15 to 20 knots, it developed a surface center. The center was observed on satellite imagery as well as on San Juan radar. This was later confirmed by a reconnaissance plane and surface observations. Figure 1 is a radar image of Dean when it was located to the northeast of Puerto Rico. By the time the system developed a surface circulation, it already had tropical storm force winds, northeast of the 1009 mb center. This transition is not uncommon to occur with strong, fast-moving tropical waves. It is estimated that Dean formed at 1200 UTC 22 August and moved west-northwestward through the U.S. Virgin Islands. During the next 24 hours, Dean encountered a hostile shearing environment produced by an upper-level trough, causing the low-level center to move away from the convection. A reconnaissance mission on the 23rd was not able to find a closed circulation and Dean became a tropical wave by 1500 UTC.



Dean's remnants moved rapidly to the north and became embedded within a large middle-level trough just east of the U.S. A reconnaissance flight on the 24th found a broad area of low pressure and a few squalls. The low appeared to have some non-tropical characteristics since the strongest winds and convection were removed from the minimum pressure area. On the 25th, the low moved very little and convection began to develop near the center of circulation. By 1800 UTC on the 26th, there was enough thunderstorm activity to re-classify the system as a tropical depression and it is estimated that it reached tropical storm status by 0000 UTC on the 27th. Dean continued to strengthen and reached its peak intensity of 60 knots and a minimum pressure of 994 mb at 1800 UTC 27 August. Thereafter, Dean moved over cooler waters and became an extratropical cyclone by 1800 UTC on 28 August. It was absorbed by a frontal low north of 50° N on the 29th.

b. Meteorological Statistics

Table 1 gives the "best track" positions and intensities of Dean at six-hourly intervals. Figure 2 shows a plot of this track. Figures 3a and 3b depict the curves of maximum one-minute

average (10 m above sea-level) wind speed and minimum sea-level pressure, respectively, as functions of time. Also plotted are the observations on which the curves are based. These consist of ship observations, data from reconnaissance flights as well as satellite-based Dvorak-technique estimates using satellite imagery by the Tropical Analysis and Forecast Branch (TAFB), Analysis Branch (SAB), and the U.S. Air Force Weather Agency (AFWA). The strongest wind reported from the reconnaissance plane was 65 knots at the 1500-foot level, well to the northeast of the 1009 mb poorly-defined center, and away from the Leeward Islands.

Juliana Airport at Saint Maarten reported gusts to 35 knots at 1000 UTC on the 22nd. St Thomas reported 35-knot winds with peak gusts to 42 knots at 1818 UTC. St Croix reported gusts to 41 knots at 1731 UTC on the same day. Craig D. Karnits, a private observer in St Croix reported several peak gusts to 63 knots with a Texas Weather Instrument WRL32 anemometer. However, the instrument is located on a 300-foot hill. A report of 55 knots and 1004 mb pressure from the vessel WGMJ was used to reinitiate advisories on Dean. Heaviest rainfall occurred in Puerto Rico. Additional ship data and surface observations are included in Table 2 and 3.

c. Casualty and Damage Statistics

No reports of casualties associated with Dean have been received. However, there were reports of damage caused by heavy rains in Puerto Rico. Widespread flooding along the eastern and southern sections of the island caused two bridges to collapse. A large number of highways were inundated. There were 1320 homes flooded. Preliminary reports indicate that the agricultural damage is about \$2 million. There were power outages, small trees blown down and some roads damaged in the US Virgin Islands.

d. Forecast and Warning Critique

The track errors for the 12 hour forecasts (6 cases) averaged 46 n mi and for 24 hour (2 cases) the average was 72 n mi. The past 10-yr average official track errors for 12 and 24 hours are 44 and 82 n mi respectively. The tropical weather outlooks correctly anticipated both the initial formation and the later redevelopment of Dean. The U.S Virgin Islands briefly reported tropical storm conditions and the possibility of strong gusty winds and rains was indicated in the routine statements issued by the National Hurricane Center. However, because Dean formed over or near the U.S. Virgin Islands, there were no watches or warnings. This situation might require a mechanism to be able to issue a watch or warning prior to cyclogenesis. The government of the Bahamas issued a tropical storm warning for the Southeastern Bahamas and for the Turks and Caicos Islands and a tropical storm watch for the Central Bahamas at 1800 UTC 22 August. Warnings and watches were discontinued at 1500 UTC 23 August when Dean weakened to a tropical wave. The northward turn of the system, away from the continental United States was also always emphasized in the advisories and tropical weather outlooks.

Table 1. Best track, Tropical Storm Dean, 22-28 August, 2001.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
22 / 1200	17.9	64.3	1010	45	tropical storm
22 / 1800	19.1	65.9	1009	50	"
23 / 0000	19.8	67.4	1010	50	"
23 / 0600	20.7	68.9	1010	50	"
23 / 1200	21.6	69.8	1012	30	tropical depression
23 / 1800	23.0	70.2	1012	25	tropical wave
24 / 0000	24.6	70.8	1013	25	low
24 / 0600	26.6	70.7	1013	25	"
24 / 1200	28.6	70.7	1012	25	"
24 / 1800	30.3	70.2	1012	25	"
25 / 0000	31.5	69.4	1011	25	"
25 / 0600	32.7	67.9	1011	25	"
25 / 1200	34.0	66.5	1010	25	"
25 / 1800	35.0	66.0	1008	25	"
26 / 0000	35.0	66.0	1008	25	"
26 / 0600	35.0	66.0	1008	25	"
26 / 1200	35.2	65.5	1008	25	"
26 / 1800	35.5	65.0	1004	30	tropical depression
27 / 0000	36.3	63.3	1001	40	tropical storm
27 / 0600	37.7	62.0	1000	50	"
27 / 1200	38.9	60.7	996	55	"
27 / 1800	40.6	59.4	994	60	"
28 / 0000	42.1	57.5	995	60	"
28 / 0600	43.5	56.0	996	55	"
28 / 1200	44.0	53.4	997	50	"

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
28 / 1800	45.5	50.5	998	45	extratropical
29 / 0000	47.0	48.5	999	45	"
29 / 0600	49.0	45.0	999	45	"
29 / 1200	51.0	40.9	1000	40	"
29 / 1800					Absorbed by ext. low
27 / 1800	40.6	59.4	994	60	minimum pressure

Table 2. Selected ship reports with winds of at least 34 kt for Tropical Storm Dean during August 2001.

Date/Time (UTC)	Ship call sign	Latitude (°N)	Longitude (°W)	Wind dir/speed (kt)	Pressure (mb)
22 / 1100	KRPP	18.8	62.8	110 / 37	1016.0
27 / 0600	WGMJ	37.8	61.6	190 / 55	1004.0
27 / 1200	JPPT	40.5	58.1	150 / 36	1014.0
27 / 1800	JPPT	41.0	55.9	170 / 47	1012.5
28 / 0000	MZIF7	40.8	53.3	170 / 36	1017.2
28 / 0000	JPPT	41.1	53.6	160 / 42	1015.0

Table 3. Selected surface observations for Tropical Storm Dean, August 2001.

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft)	Storm tide (ft)	Total rain (in)
	Date/time (UTC)	Press. (mb)	Date/time (UTC) ^a	Sustained(kt) ^b	Gust (kt)			
Virgin Islands								
St. Thomas	22/1901	1014.9	22/1818	35	42			1.07
St. Croix	22/1158	1014.6	22/1724	28	41			0.49
Maria Hill (300 ft)			22/1713	49	62			
Puerto Rico								
Central Aquirre Salinas								12.70
San Lorenzo								9.78
Ponce 4E								8.99
River Cerrillos in Ponce								8.25
Coamo								8.00
Pico Del Este Luquillo								7.81
Guayama								7.64
Naguabo								7.61
Luquillo								7.59
Juana Diaz								7.31
Vieques Camp Garcia								7.08
Patillas								6.67
Gurabo Upper-Alert								6.54
Maunabo								6.24
Las Piedras								5.86
Aibonito								5.60
Fajardo								4.81
Barranquitas								4.61
Ceiba								3.45
Dorado								3.28

^a Date/time is for sustained wind when both sustained and gust are listed.

^b Except as noted, sustained wind averaging periods for C-MAN and land-based ASOS reports are 2 min; buoy averaging periods are 8 min.

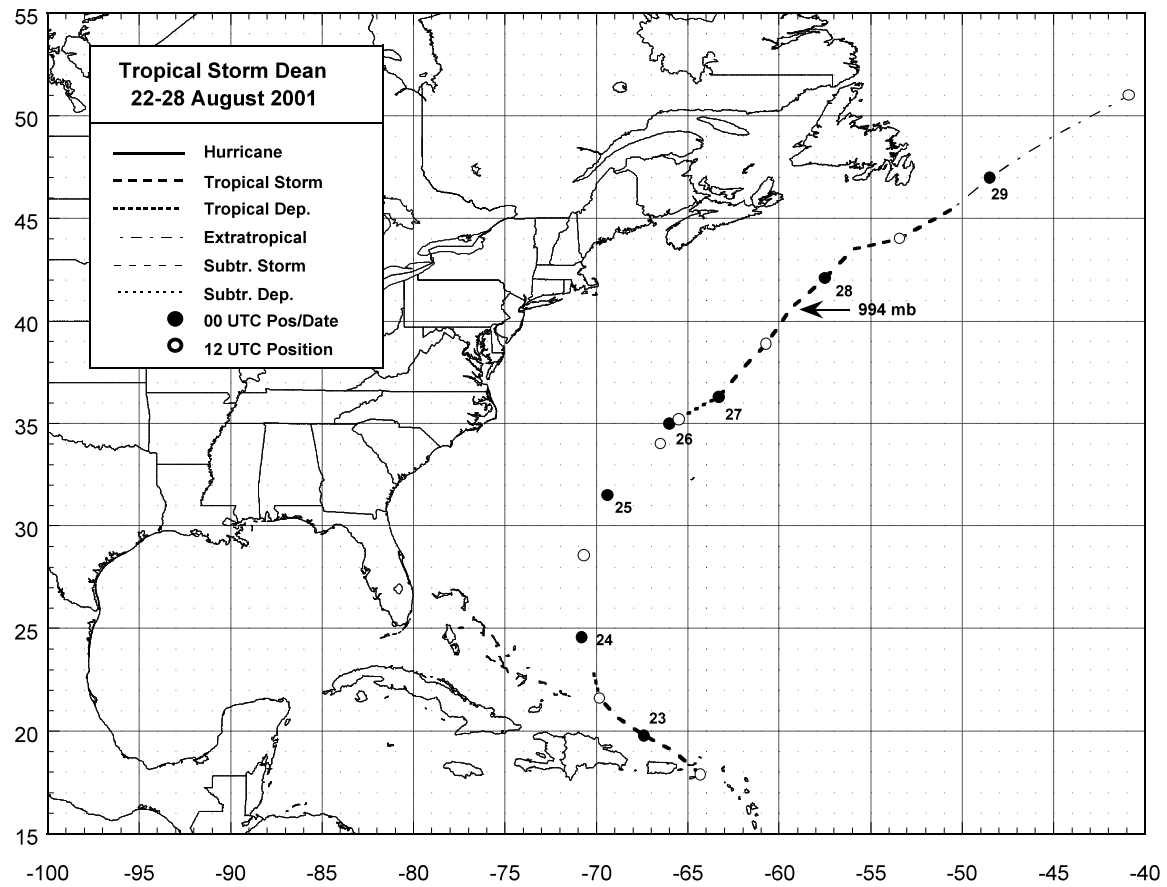


Figure 2. Best track positions for Tropical Storm Dean, 22-28 August 2001.

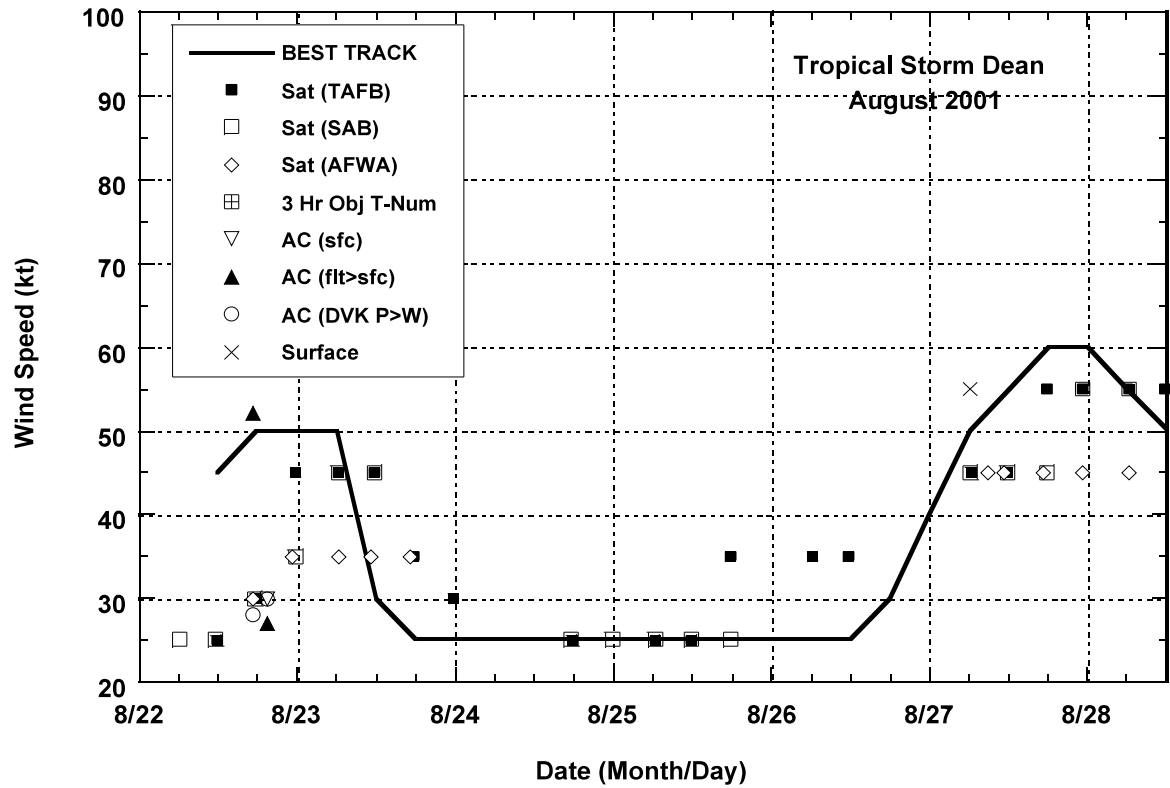


Figure 3a. Best track maximum sustained surface wind speed curve for Tropical Storm Dean, 22-28 August 2001, and the observations on which the best track curve is based. Aircraft observations have been adjusted for elevation using 85% reduction factor for observations from 1500 ft.

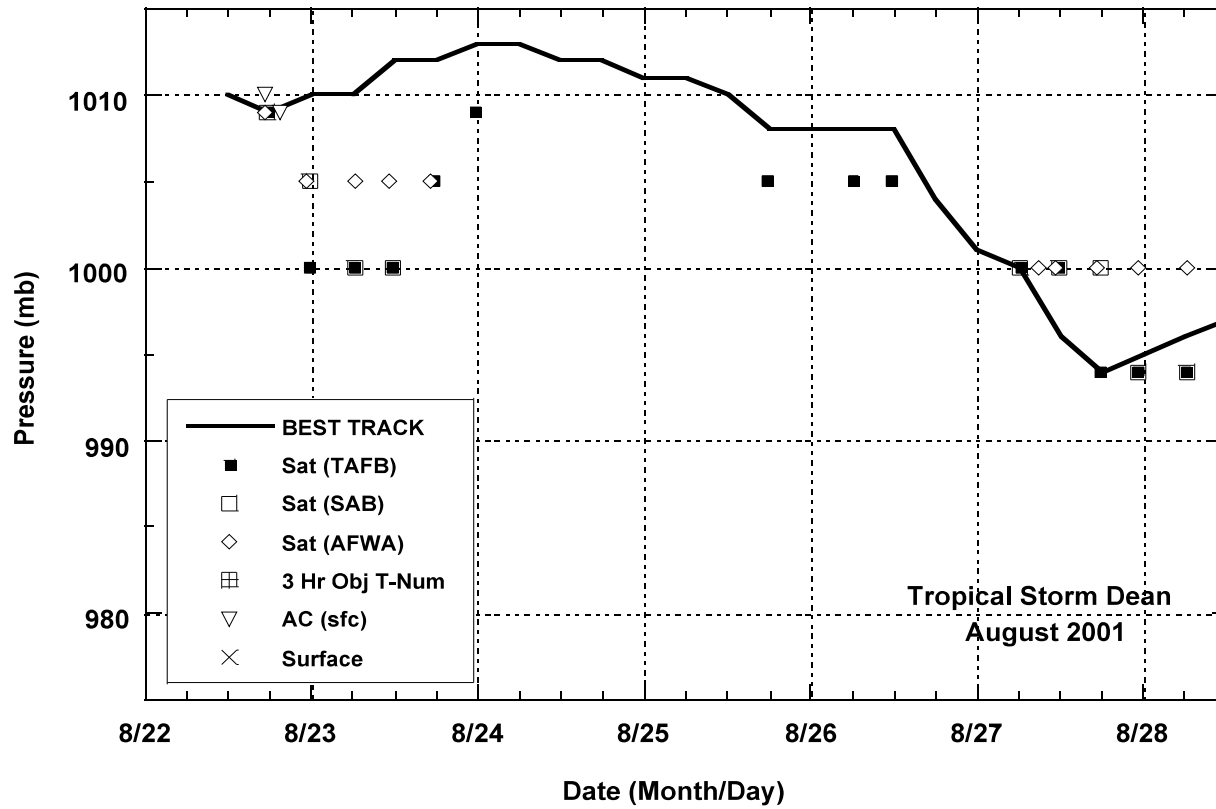


Figure 3b. Best track minimum central pressure curve for Tropical Storm Dean, 22-28 August, 2001.