CENTRAL PACIFIC HURRICANE CENTER TROPICAL CYCLONE REPORT

TROPICAL CYCLONES 2000

Central Pacific Hurricane Center

2000 Tropical Cyclones - Central North Pacific
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INTRODUCTION

Tropical cyclone activity in the Central North Pacific basin was near normal for 2000 with four systems forming within or moving into the region north of the equator between 140oW and 180o. The 38-year average for this basin is 4.5 tropical cyclones per year. The overall climate setting was one of weak La-Nina conditions where Central and Eastern Pacific equatorial sea surface temperature anomalies were between 0.0 and -1.0 degrees Celsius.

Central North Pacific tropical cyclone activity officially commenced on 20 July 2000 with the development of Tropical Depression 1-C which became Tropical Storm Upana during the latter hours of the same day. Upana was followed by Hurricane Daniel (28 July to 6 August 2000), the only hurricane of the year for the Central North Pacific. Daniel was also the greatest threat to the Hawaiian Islands. Fluctuating intensities and its projected path over the Hawaiian chain as a strong tropical storm caused considerable concern among residents. In the end, Daniel veered to the northwest and missed the Hawaiian Islands.

The 2000 season also saw an unusual occurrence of a tropical cyclone entering the basin from the west. Tropical Storm Wene initially formed as Tropical Depression 16-W on 15 August 2000 and crossed into the Central Pacific Hurricane Center's (CPHC) Area of Responsibility (AOR) late that same day.

Tropical Storm John closed out tropical cyclone activity in the Central North Pacific. John developed within the National Hurricane Center's (NHC) AOR near 15oN 135oW on 28 August 2000 and moved slowly west, crossing 140oW on 30 August and dissipating on 1 September.

TROPICAL STORM UPANA
20 - 23 JULY 2000

HISTORY. Tropical Depression One-C (TD-1C) developed near 10.7oN 147.1oW on 20 July 2000 from a westward moving disturbance southeast of the Hawaiian Islands. Sea surface temperatures of around 28oC in the formation region of the depression were near normal and more than warm enough to sustain tropical cyclone development. TD-1C intensified to tropical storm intensity on 1800 UTC 21 July and named Upana ("Urban" in English). Upana maintained a roughly westward track (Figure 1) and reached peak intensity at 0600 UTC 21 July with maximum sustained winds of 40 knots. This level of intensity was maintained through 0000 UTC 22 July as the center passed well to the south of the Hawaiian Islands.

With no deep convection in its circulation, Upana was downgraded to a tropical depression on 1800 UTC 22 July carrying maximum sustained winds of 25 knots. Deep convective activity flared up during the later hours of 23 July and helped briefly raise the intensity of Upana to 30 knots, though the system remained poorly organized overall. Despite being in a low shear environment with sufficient sea surface warmth, Tropical Depression Upana dissipated near 9.5oN 170.5oW on 0600 UTC 24 July.

Due to the large distance away from land, no significant weather-related impacts were noted in the Hawaiian Islands.

SYNOPTIC SITUATION (20 July - 23 July 2000)

LOWER LEVELS. Large-scale easterly winds of 15 to 20 knots were firmly entrenched in the lower levels of the troposphere within the region from 10oN and 30oN between 140oW and 160oW. Surface winds south of 10oN were from the southeast at 10 to 15 knots based on scatterometer data. These surface conditions were normal for this time of year to include the position of the Intertropical Convergence Zone (ITCZ) near 10oN.

MIDDLE AND UPPER LEVELS. During the formation stage of TD-1C, a ridge at 250 hPa was along 12oN in the region between 140oW and 160oW. Deep easterly flow to the south of the ridge meant little vertical shear of the horizontal wind and a westward track for the storm system. By 22 July, a deepening upper level trough along an axis from 28oN 144oW to 11oN 163oW increased the vertical shear over Upana and helped weaken the system. As Upana moved westward, it once again entered a region of low vertical shear but could not effectively reorganize and intensify.

SATELLITE DATA. The incipient stages of TD-1C included several distinct bands of active convection with a relatively symmetric cloud pattern (Figure 2). Deep convection collapsed completely by 1230 UTC 22 July and left a fully exposed low level circulation center revealed by early morning (local time) visible sector images (Figure 3). However, by 2330 UTC 22 July thunderstorms rapidly redeveloped and began obscuring the low level circulation features. The reinvigoration of Upana was short-lived as deep convection became poorly organized about the system's center. After 0600 UTC 24 July, visible sector satellite images revealed easterly low level cloud movement across the entire system with no center detectable.

Table 1: Best Track for Tropical Storm Upana

Date/Time (UTC)	**Latitude (deg N)**	**Longitude (deg W)**	**Maximum Winds (knots)**
0000/20July	10.8	144.6	30
0600	10.7	146.2	30
1200	10.6	147.7	30
1800	10.3	149.0	35
0000/21July	10.2	150.3	35
0600	10.2	151.4	40
1200	10.2	152.6	40
1800	10.1	153.9	40
0000/22July	10.2	155.3	40
0600	10.3	156.8	35
1200	10.4	158.6	35
1800	10.7	160.5	25
0000/23July	10.9	162.5	25
0600	10.9	164.4	25
1200	10.8	166.1	30
1800	10.6	167.6	30
0000/24July	10.1	169.2	30

0600	9.5	170.5	20

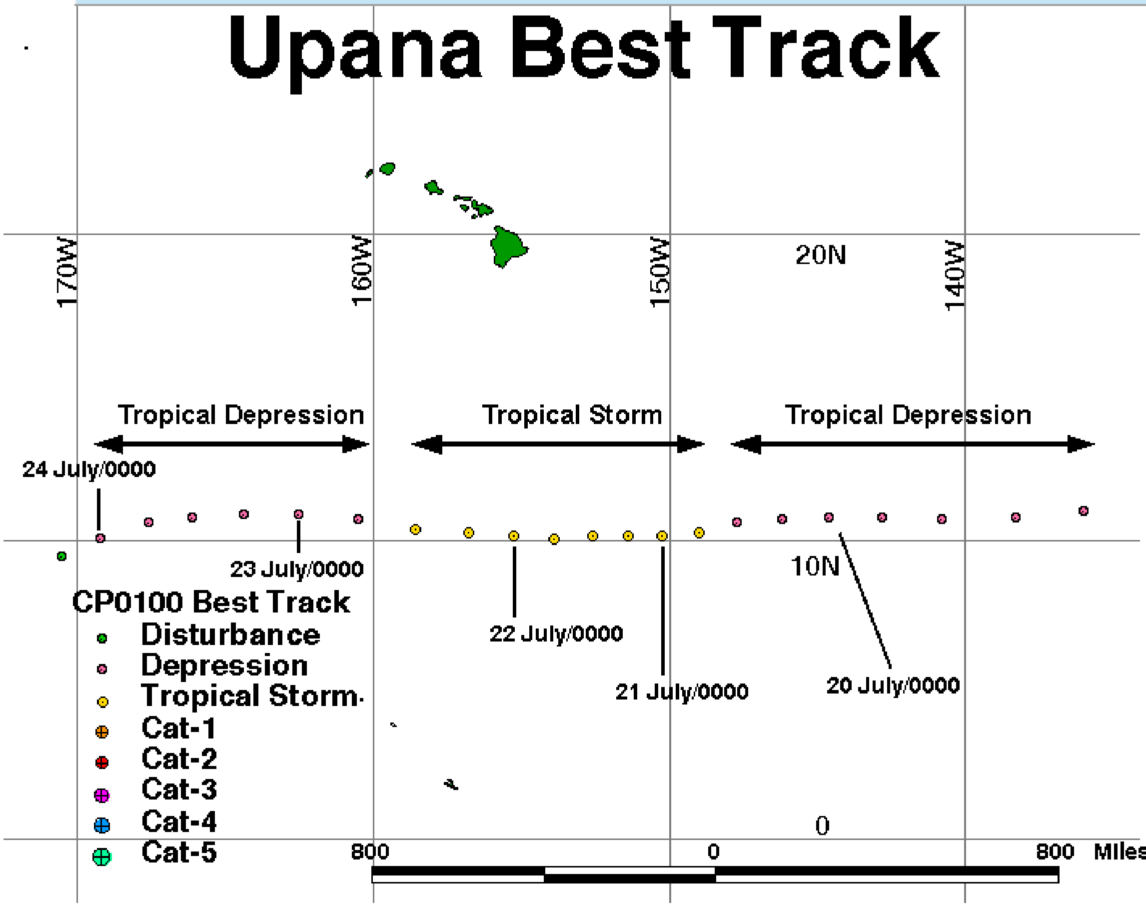

Figure 1. Best track plot for Tropical Storm Upana. Position dots are in 6 hour increments. Plotted times are in UTC.

HURRICANE DANIEL
29 JULY - 5 AUGUST 2000

HISTORY. Hurricane Daniel was the strongest tropical cyclone in the Central Pacific and provided the greatest threat to any populated landmass during the season for the year 2000. Daniel originated in the Eastern Pacific as Tropical Depression Six-E near 10.1oN 102.3oW at 0000 UTC 23 July. Further intensification prompted the National Hurricane Center to upgrade the cyclone to Tropical Storm Daniel at 1800 UTC 23 July. Daniel moved toward the west northwest and continued its rapid intensification, becoming a hurricane at 1800 UTC 24 July after only 24 hours as a tropical storm. Peak intensity was achieved on 25 July with 110 knots maximum sustained winds, followed by a slow weakening over the next several days.

Daniel crossed 140oW near 18oN late on 28 July as a weak hurricane with maximum sustained winds of 80 knots and only a small amount of deep convection (Figure 4). Although Daniel was expected to weaken to tropical storm intensity, its projected path near the Hawaiian Islands prompted the issuance of a Tropical Storm Watch for Maui County and the island of Hawai'i on 2100 UTC 29 July, followed by a Tropical Storm Warning for both counties at 0900 UTC 30 July. A Tropical Storm Watch was also issued at the same time for the islands of O'ahu and Kaua'i. Continued weakening of Daniel resulted in the expected downgrade to tropical storm status at 0300 UTC 30 July. However, with its projected track still over the island chain, the Tropical Storm Warning area was increased to also include the island of Oahu. To further complicate the situation, thunderstorm activity fluctuated considerably on 30 and 31 July with cycles of sheared convection exposing the low level circulation center followed by rapid thunderstorm development. These fluctuations added to the uncertainty of the forecast as the objective guidance packages proposed a wide range of scenarios.

Tropical Storm Daniel made its closest approach to land northeast of the Hawaiian Islands during the late hours of 31 July. It was during this time that the system rapidly intensified, shifted to the north of its previous track, and briefly formed an eye before rapidly collapsing again. Aerial reconnaissance data estimated maximum surface winds of 55 knots at 1940 UTC 31 July followed by 65 knots from 2117 to 2307 UTC 31 July. About seven hours later (0555 UTC 1 August), aircraft data indicated maximum flight level winds of just 32 knots (no surface estimate was available).

Over the next three days, Daniel maintained a track toward the northwest at 10 to 15 knots and slowly weakened, becoming a tropical depression at 1500 UTC 3 August. Tropical Depression Daniel hung on for two more days despite moving into cooler waters and was finally declared as "dissipated" near 36.7oN 170.8oW at 0900 UTC 5 August.

Impacts to the Hawaiian Islands from Daniel were mainly in the form of high surf where waves as high as 10 feet impacted the eastern side of the island of Hawai'i. Heavy showers and thunderstorms associated with Daniel's trailing rain band affected the islands of Hawai'i and Maui on August 1, though no significant flooding resulted.

SYNOPTIC SITUATION. (29 July - 5 August 2000)

LOWER LEVELS. A 1024 hPa subtropical high centered near 31oN 141oW and the associated subtropical ridge along 31oN sustained a solid easterly low level current as Daniel entered the Central Pacific. By 31 July, an upper level trough began to induce a surface trough from 38oN 141oW to 25oN 166oW. This weakness in the subtropical ridge resulted in east southeasterly low level flow in the area near the Hawaiian Islands. This low level flow continued through 4 August and became the dominant factor in Daniel's steering current during its decay process.

Sea surface temperatures were around 25oC in the area where Hurricane Daniel crossed into the Central Pacific. These temperatures were near normal and slightly cooler than what is considered necessary to sustain a tropical cyclone's warm core.

MIDDLE AND UPPER LEVELS. Hurricane Daniel was already on a weakening trend as it crossed into the Central Pacific due to the combination of cooler sea surface temperatures and the presence of southerly vertical shear from a weak upper level trough. As Daniel weakened to tropical storm strength, a stronger upper level trough moved over the Hawaiian Islands on 31 July with an axis running from a low center near 25oN 157oW to 18oN 162oW. This second upper level trough enhanced the outflow channel over the tropical storm and triggered a new burst of convective activity that briefly formed an eye just prior to 1 August. For the period from

1 August through 5 August, the upper level trough continued to support deep convection but also maintained enough vertical shear over Daniel to prevent significant intensification.

SATELLITE DATA. Hurricane Daniel lost its eye as it moved westward over 140oW on 28 July through the previously mentioned vertical shear. A poorly defined eye reappeared and was noted in the 1730 and 2330 UTC 29 July fix, but overall organization continued to deteriorate (Figure 5). By 1130 UTC 30 July, the effects of vertical shear exposed the low level circulation center to the west northwest of the deep convection. A surge in thunderstorm activity covered up the center by 1730 UTC, only to be exposed once again early on 31 July (Figure 6). During Daniel's dramatic intensification near Hawai'i late on 31 July, an eye became evident in visible sector images (Figure 7). Rapid scan images from GOES-10 clearly showed deep convection wrapping around the system center as the eye wall formed. Just 7 hours later, deep convection once again sheared toward the northeast and exposed a low level center. Deep convection remained sheared away from Daniel's center for the remainder of its life cycle (Figure 8).

Table 2: Best Track for Hurricane Daniel

Date/Time (UTC)	**Latitude (deg N)**	**Longitude (deg W)**	**Maximum Winds (knots)**
0000/29July	18.0	141.3	80
0600	18.4	142.9	65
1200	18.7	144.6	65
1800	18.9	146.3	65
0000/30July	19.3	147.7	60
0600	19.8	148.9	55
1200	20.1	150.0	55
1800	20.5	151.0	50
0000/31July	20.7	151.8	55
0600	20.8	152.5	50
1200	21.0	153.1	45
1800	21.3	153.8	60
0000/1August	21.8	154.5	60
0600	22.3	155.2	50

1200	22.9	156.1	45
1800	23.6	157.2	45
0000/2August	24.2	158.4	40
0600	25.0	159.6	45
1200	25.8	160.9	45
1800	26.9	162.3	45
0000/3August	27.9	163.7	40
0600	28.8	165.2	35
1200	29.8	166.5	30
1800	30.5	167.6	30
0000/4August	31.4	168.6	30
0600	32.2	169.3	30
1200	33.0	169.9	25
1800	33.9	170.3	25
0000/5August	35.0	170.5	25
0600	36.1	170.7	25

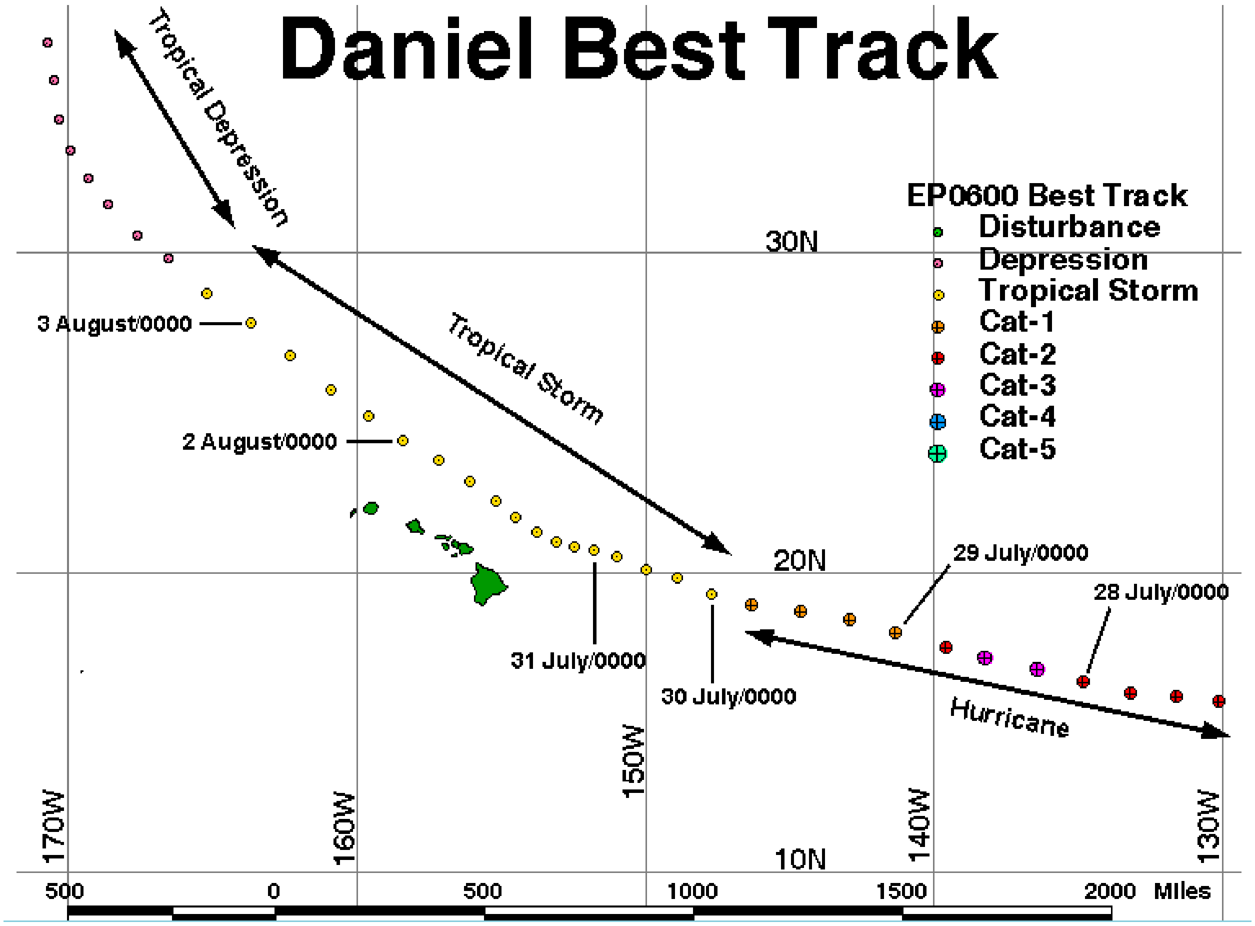

Figure 4. Best track plot for Hurricane Daniel. Position dots are in 6 hour increments. Plotted times are in UTC.

TROPICAL STORM WENE
15-17 AUGUST 2000

HISTORY. This system originated near 33.1oN 179.7oE along the eastern periphery of a northward displaced monsoon trough and designated Tropical Depression Sixteen-W (TD-16W) by the Joint Typhoon Warning Center (JTWC) on 15 August. The depression moved toward the northeast and intensified to tropical storm strength, entering the Central Pacific during the late hours of 15 August (Figure 9). Since tropical storm intensity was attained in the Central Pacific, it was given the Hawaiian name of Wene (English translation: Wayne). Tropical Storm Wene shifted its movement slightly to a north northeastward direction and reached its peak intensity of 45 knots maximum sustained winds at 0900 UTC 16 August. With its movement toward the north, Wene subsequently began to weaken in cooler waters and merge with an extratropical system. The final advisory on Wene was issued at 0900 UTC 17 August as it rapidly made the transition to an extratropical system.

Tropical Storm Wene did not have any significant impacts to the Hawaiian Islands.

SYNOPTIC SITUATION. (15 August - 17 August 2000)

LOWER LEVELS. TD 16-W formed north of the subtropical ridge within an elongated west- east oriented surface pressure trough that appeared to be a long eastward extension of the Asian monsoon trough. Sea surface temperatures in the formation region of the depression were around 27oC, or roughly 2oC warmer than normal.

MIDDLE AND UPPER LEVELS. Genesis of TD-16W occurred beneath a diffluence region in the upper levels with an east to west subtropical ridge axis roughly along 27oN and an upper level trough from 40oN 173oE to 30oN 179oW. While in the Central Pacific, Tropical Storm Wene remained primarily under the influence of this upper level trough that resulted in a northeastward-directed steering current.

SATELLITE DATA. After entering the Central Pacific, most of the thunderstorm activity and best-defined rain bands of Wene were in the system's northeastern quadrant (Figure 10). Evidence of vertical shear was apparent in the satellite images and served as the basis for Dvorak intensity classifications. Deep convective activity collapsed after 0000 UTC 17 August and the final Dvorak classification conducted at 0530 UTC of the same day.

Table 3: Best Track for Tropical Storm Wene

Date/Time (UTC)	Latitude (deg N)	Longitude (deg W)	Maximum Winds (knots)
0000/16Aug	34.4	178.5	45
0600	35.3	177.9	45
1200	36.4	177.4	40
1800	37.6	176.9	40
0000/17Aug	39.0	176.4	40
0600	40.2	176.0	35

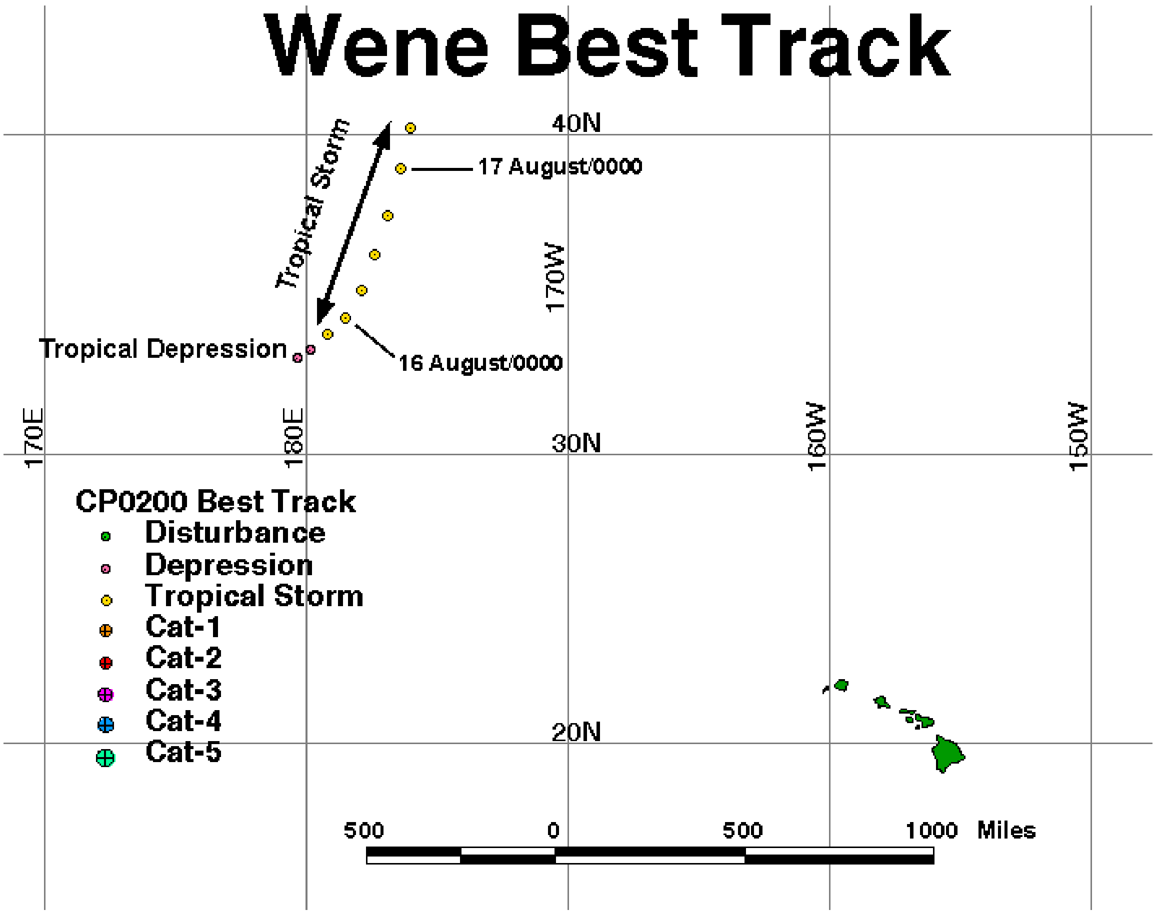

Figure 9. Best track plot for Tropical Storm Wene. Position dots are in 6 hour increments. Plotted times are in UTC.

TROPICAL STORM JOHN
30 AUGUST - 1 SEPTEMBER 2000

HISTORY. Tropical Depression Twelve-E (TD-12E) formed near 15.4oN 138.0oW on 28 August 2000 within a long monsoon trough extending westward from Central America. Rapid intensification occurred and TD-12E was upgraded to Tropical Storm John at 2100 UTC 28 August by the National Hurricane Center. John was rated at 55 knots maximum sustained winds on 0300 UTC 29 August while moving slowly toward the west northwest and crossed into the Central Pacific during the early hours of 30 August (Figure 11). Peak intensity of 60 knots maximum sustained winds was reached at 2100 UTC 30 August 2000. Over the ensuing hours, Tropical Storm John began to succumb to an unfavorable amount of vertical shear and lost almost all of its deep convection by 0900 UTC 31 August. Steady weakening continued until 2100 UTC 1 September when the CPHC declared John to be a dissipated system.

SYNOPTIC SITUATION (30 August - 1 September 2000)

LOWER LEVELS. A 1035 hPa high pressure center near 45oN 151oW with a weaker 1018 hPa high pressure center near 27oN 124oW maintained solid easterly flow in the lower levels near

Tropical Storm John. Erosion of the secondary high on 31 August and 1 September caused low level winds to turn to a more northeasterly direction. Sea surface temperatures were near 28oC, more than adequate to sustain tropical cyclone activity.

MIDDLE AND UPPER LEVELS. Tropical Storm John crossed into the Central Pacific just south of a weak mid-level ridge. With this weather pattern, steering currents were very sluggish and John's progress was rated at 5 knots or less during its entire time west of 140oW. An upper level trough along an axis from 30oN 130oW to 31oN 160oW to 17oN 180o produced southwesterly vertical shear that severely impacted the storm on 30 and 31 August and contributed substantially to its demise.

SATELLITE DATA. As Tropical Storm John crossed into the Central Pacific, satellite images showed its cloud pattern to be elongated to the northeast due to the effects of the aforementioned southwesterly shear (Figure 12). At about the same time, data from the DMSP SSM/I sensor indeed revealed strongest convective activity confined to the northeast quadrant of a well-defined circulation center. By 0900 UTC 31 August, Tropical Storm John lost all of its deep convection and daytime visible images showed only a well-defined swirl of low clouds (Figure 13).

Table 4: Best Track for Tropical Storm John

Date/Time (UTC)	**Latitude (deg N)**	**Longitude (deg W)**	**Maximum Winds (knots)**
0600/30Aug	17.1	140.4	55
1200	17.2	140.5	55
1800	17.3	140.4	60
0000/31Aug	17.4	140.3	55
0600	17.2	140.6	45
1200	17.0	141.2	35
1800	17.1	141.7	35
0000/1Sep	17.3	141.9	30
0600	17.4	141.9	30
1200	17.5	141.9	25

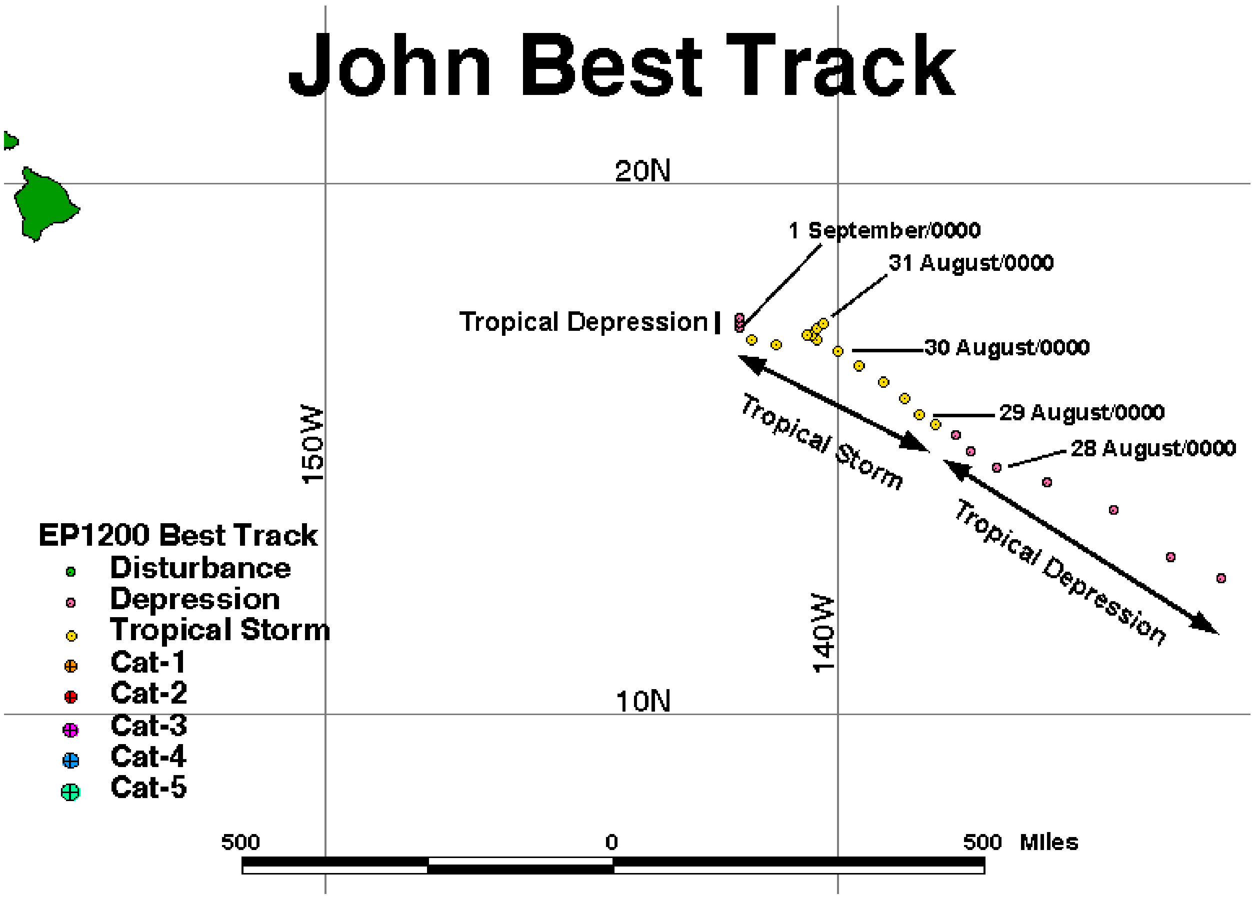

Figure 11. Best track plot for Tropical Storm John. Position dots are in 6 hour increments. Plotted times are in UTC.

VERIFICATION STATISTICS

This section contains track and intensity verification statistics for Tropical Storm Upana, Hurricane Daniel, Tropical Storm Wene, and Tropical Storm John. Track statistics include data from the official CPHC forecast plus 7 objective guidance packages. Intensity statistics include the official CPHC forecast and data from the Statistical Hurricane Intensity Prediction (SHIP) model.

The Medium Layer Beta Advection Model (BAMM) provided the best overall track guidance with the lowest or second-lowest errors through 72-hours (Table 5, below). Poorest performance was from the Climatology and Persistence (CLIPER) guidance. The official CPHC forecast was in the middle of the pack with a rank of 3rd or 4th (out of 8) for 12- through 48-hours and a rank of 7th for 72-hours.

Track error statistics for CPHC in 2000 showed a drop in performance from 1999. However, this point must be tempered by the fact that the Central Pacific tropical cyclones in 1999 had relatively straight, well-behaved paths toward the west.

For intensity forecasts, the official CPHC forecast beat the SHIP model at all time periods (Table 6, below). Intensity errors for CPHC also showed an improvement over 1999.

Table 5. Track forecast verification statistics for all Central Pacific tropical cyclones in 2000 at 12-, 24-, 36-, 48-, and 72-hours. The first number is the position error in nautical miles and the number in parentheses is the number of available forecasts. Please refer to the list of acronyms for definitions.

Forecast	**12-hr**	**24-hr**	**36-hr**	**48-hr**	**72-hr**
CPHC	49(56)	79(48)	131(40)	173(34)	257(24)
CLIP	57(55)	103(47)	155(38)	219(32)	322(23)
BAMD	55(54)	97(46)	137(38)	178(32)	219(23)
BAMM	47(54)	77(46)	101(38)	127(32)	170(23)
P91E	54(54)	95(46)	132(38)	173(32)	192(22)
LBAR	58(36)	92(34)	115(32)	190(29)	167(21)
GFDL	46(48)	75(37)	117(33)	160(29)	251(21)
NGPS	77(18)	113(16)	148(11)	165(7)	211(4)

Table 6. Intensity forecast verification statistics for all Central Pacific tropical cyclones in 2000 at 12-, 24-, 36-, 48-, and 72-hours. The first number is the intensity error in knots and the number in parentheses is the number of available forecasts. Please refer to the list of acronyms for definitions.

Forecast	**12-hr**	**24-hr**	**36-hr**	**48-hr**	**72-hr**
CPHC	5.0(56)	7.0(48)	8.9(40)	10.3(34)	10.8(24)
SHIP	9.5(32)	11.0(28)	12.5(28)	13.7(22)	15.1(22)

The following tables contain individual tropical cyclone verification statistics for Tropical Storm Upana (Tables 7 and 8), Hurricane Daniel (Tables 9 and 10), Tropical Storm Wene (Tables 11 and 12), and Tropical Storm John (Tables 13 and 14).

Table 7. Track forecast verification statistics for Tropical Storm Upana at 12-, 24-, 36-, 48-, and 72-hours. The first number is the position error in nautical miles and the number in parentheses is the number of available forecasts. Please refer to the list of acronymsfor definitions.

Forecast	**12-hr**	**24-hr**	**36-hr**	**48-hr**	**72-hr**

CPHC	80(16)	121(14)	174(12)	184(10)	189(6)
CLIP	81(15)	139(13)	197(11)	268(9)	266(5)
BAMD	75(15)	129(13)	197(11)	270(9)	405(5)
BAMM	72(15)	116(13)	166(11)	207(9)	273(5)
P91E	83(15)	136(13)	209(11)	298(9)	378(5)
LBAR	88(11)	141(11)	168(11)	364(8)	121(5)
GFDL	60(15)	90(11)	137(10)	192(8)	279(4)
NGPS	107(6)	157(5)	234(3)	243(2)	240(2)

Table 8. Intensity forecast verification statistics for Tropical Storm Upana at 12-, 24-, 36-, 48- and 72-hours. The first number is the intensity error in knots and the number in parentheses is the number of available forecasts. Please refer to the list of acronyms for definitions.

Forecast	**12-hr**	**24-hr**	**36-hr**	**48-hr**	**72-hr**
CPHC	4.4(16)	6.4(14)	9.2(12)	14.5(10)	21.7(6)
SHIP	10.3(11)	13.9(9)	20.0(9)	25.2(5)	34.0(5)

Table 9. Track forecast verification statistics for Hurricane Daniel at 12-, 24-, 36-, 48-, and 72-hours. The first number is the position error in nautical miles and the number in parentheses is the number of available forecasts. Please refer to the list of acronymsfor definitions.

Forecast	**12-hr**	**24-hr**	**36-hr**	**48-hr**	**72-hr**
CPHC	31(28)	72(26)	120(24)	174(22)	279(18)
CLIP	38(28)	84(25)	140(23)	197(21)	338(18)
BAMD	51(27)	92(25)	124(23)	146(21)	167(18)
BAMM	30(27)	54(25)	74(23)	94(21)	141(18)
P91E	38(27)	74(25)	102(23)	131(21)	140(18)
LBAR	44(17)	71(17)	100(17)	127(17)	170(16)
GFDL	33(23)	67(20)	107(19)	146(19)	244(17)

NGPS	56(8)	97(8)	128(6)	139(4)	183(2)

Table 10. Intensity forecast verification statistics for Hurricane Daniel at 12-, 24-, 36-, 48-, and 72-hours. The first number is the intensity error in knots and the number in parentheses is the number of available forecasts. Please refer to the list of acronyms for definitions.

Forecast	**12-hr**	**24-hr**	**36-hr**	**48-hr**	**72-hr**
CPHC	5.0(28)	6.5(26)	7.1(24)	7.7(22)	7.2(18)
SHIP	8.7(17)	9.8(17)	9.1(17)	10.3(17)	9.5(17)

Table 11. Track forecast verification statistics for Tropical Storm Wene at 12-, 24-, 36-, 48-, and 72-hours. Statistics beyond 24-hours are not available (N/A) due to the short duration of this storm. The first number is the position error in nautical miles and the number in parentheses is the number of available forecasts. Please refer to the list of acronyms for definitions.

Forecast	**12-hr**	**24-hr**	**36-hr**	**48-hr**	**72-hr**
CPHC	33(4)	86(2)	N/A	N/A	N/A
CLIP	43(4)	152(2)	N/A	N/A	N/A
BAMD	25(4)	62(2)	N/A	N/A	N/A
BAMM	37(4)	81(2)	N/A	N/A	N/A
P91E	37(4)	113(2)	N/A	N/A	N/A
LBAR	N/A	N/A	N/A	N/A	N/A
GFDL	43(2)	N/A	N/A	N/A	N/A
NGPS	N/A	N/A	N/A	N/A	N/A

Table 12. Intensity forecast verification statistics for Tropical Storm Wene at 12-, 24-, 36-, 48-, and 72-hours. Statistics beyond 24-hours are not available (N/A) due to the short duration of this storm. SHIP data are also not available. The first number is the intensity error in knots and the number in parentheses is the number of available forecasts. Please refer to the list of acronyms for definitions.

Forecast	**12-hr**	**24-hr**	**36-hr**	**48-hr**	**72-hr**
CPHC	7.5(4)	0.0(2)	N/A	N/A	N/A

SHIP	N/A	N/A	N/A	N/A	N/A

Table 13. Track forecast verification statistics for Tropical Storm John at 12-, 24-, 36-, 48-, and 72-hours. Statistics beyond 48-hours are not available (N/A) due to the short duration of this storm in the Central Pacific. The first number is the position error in nautical miles and the number in parentheses is the number of available forecasts. Please refer to the list of acronyms for definitions.

Forecast	**12-hr**	**24-hr**	**36-hr**	**48-hr**	**72-hr**
CPHC	61(8)	80(6)	71(4)	103(2)	N/A
CLIP	66(8)	92(6)	124(4)	231(2)	N/A
BAMD	46(8)	57(6)	51(4)	100(2)	N/A
BAMM	62(8)	86(6)	78(4)	122(2)	N/A
P91E	63(8)	85(6)	87(4)	45(2)	N/A
LBAR	45(8)	60(6)	36(4)	31(2)	N/A
GFDL	66(8)	88(6)	101(4)	149(2)	N/A
NGPS	75(4)	80(3)	76(2)	114(1)	N/A

Table 14. Intensity forecast verification statistics for Tropical Storm John at 12-, 24-, 36-, 48-, and 72-hours. Statistics beyond 48-hours are not available (N/A) due to the short duration of this storm. SHIP data are also not available. The first number is the intensity error in knots and the number in parentheses is the number of available forecasts. Please refer to the list of acronyms for definitions.

Forecast	**12-hr**	**24-hr**	**36-hr**	**48-hr**	**72-hr**
CPHC	5.0(8)	12.5(6)	18.8(4)	17.5(2)	N/A
SHIP	11.0(4)	7.0(2)	8.0(2)	N/A	N/A

ACRONYMS that may have been used in this report.

Acronym	**Full Spelling/Definition**
AOR	Area of Responsibility

AVNO	Operation global forecast system model
BAMD	Deep Layer Beta Advection Model (mean layer averaged between 850 hPa and 250 hPa)
BAMM	Medium Layer Beta Advection Model (mean layer averaged between 850 hPa and 400 hPa)
BAMS	Shallow Layer Beta Advection Model (mean layer averaged between 850 hPa and 700 hPa)
CLIP	Climatology and Persistence
CPHC	Central Pacific Hurricane Center
GFDL	Geophysical Fluid Dynamics Laboratory model
hPa	Hectopascal (formerly millibar)
ITCZ	Inter-tropical Convergence Zone
JTWC	Joint Typhoon Warning Center
kts	knots
LBAR	Barotropic limited area sine transform
mb	millibars
NA	Not Available
NGPS	NOGAPS (Navy Operational Global Atmospheric Prediction System) Vortex Tracking Routine
NHC	National Hurricane Center
nm	nautical miles
P91E	Pacific Statistical Dynamic Model (adapted from NHC90 for the Eastern Pacific)
SHIFR	Statistical Hurricane Intensity Forecast
SHIP	Statistical Hurricane Intensity Prediction
SST	Sea Surface Temperature

TD	Tropical Depression
TPC	Tropical Prediction Center, Miami, FL
TUTT	Tropical Upper Tropospheric Trough
UTC	Universal Time Coordinated
WFO	Weather Forecast Office