



# CENTRAL PACIFIC HURRICANE CENTER TROPICAL CYCLONE REPORT

## TROPICAL CYCLONES 2001

Central Pacific Hurricane Center

**NOAA Technical Memorandum NWSTM PR-##**

2001 Tropical Cyclones Central North Pacific

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### **Introduction**

Tropical activity was light during the 2001 season. Although the season was off to the quickest start in history with the first named tropical cyclone ever in June, there were only four total tropical cyclones, and two of them were short-lived.

Tropical Storm Barbara in the East Pacific moved into Central Pacific waters June 22, but rapidly dissipated. Only two advisories were issued by the Central Pacific Hurricane Center (CPHC) on T.S. Barbara.

Tropical Depression One-C developed September 11, but only lasted for twelve hours before dissipating.

Tropical Depression Two-C developed September 23 over somewhat warmer waters near 10N, and developed enough convection to last 48 hours. Winds persisted at 30 KT through most of its cycle as it tracked westward.

The former Hurricane Narda was the best organized of the Central Pacific tropical cyclones. Moving into the Central Pacific as a tropical storm October 23, it encountered a strongly sheared environment at 16 N. Despite the organized low-level center, the shearing kept the convection far away from the center and the system gradually eroded until the last advisory twenty-four hours later.

None of the tropical cyclones threatened the Hawaiian Islands. The trend of neutral or La Nina conditions since 1998 continued through 2000. The number of tropical cyclones was about the long-term average (4.5) this season, but the systems were neither vigorous nor a threat to develop into something more substantial.

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## TROPICAL STORM BARBARA

### JUNE 20 - 23, 2001

**HISTORY.** Tropical Depression Two-E (TD-2E) formed near 12N 127W off the southern tip of Baja California on June 20, 2001. Moving west-northwestward, TD-2E was upgraded to Tropical Storm Barbara on June 20 at 2100 UTC by the National Hurricane Center. This is the first tropical storm to reach the Central Pacific during the month of June. Although Barbara entered the Central Pacific as a tropical storm, it was quickly downgraded to a tropical depression by the CPHC on June 22 at 2100 UTC. Tropical Depression Barbara continued to weaken as it moved west northwestward over cooler water, until 0300 UTC June 23, when CPHC issued its last advisory.

#### **SYNOPTIC SITUATION (JUNE 22 - JUNE 23)**

**LOWER LEVELS.** A high pressure center and its associated ridge remained north of the Hawaiian Islands from June 22 through June 23. The high center maintained its position near 39N 154W, and weakened from 1032 hPa on June 22 to 1028 hPa on June 23. The ridge extended well to the west, and remained well north of the Tropical Cyclone.

**MIDDLE AND UPPER LEVELS.** As Barbara moved westward to the south of the surface ridge, it moved into a sheared environment as an upper level trough passed over the area. The shear and the cool (less than 23C) sea surface temperature (SST) contributed to the rapid dissipation of the tropical storm.

**SATELLITE DATA.** Convection was isolated as Barbara moved into Central Pacific waters, and shifted away from center with westerly shearing aloft. The shear increased, and Barbara dissipated with only a single CB visible on satellite. (Fig. 2)

#### **BEST TRACK.**

Table 1. Best Track Barbara

Date/Time (UTC)	Latitude (deg N)	Longitude (deg W)	Max winds (KT)
June 22/ 1800	17.0	140.7	30
June 23/ 0000	17.3	141.2	30

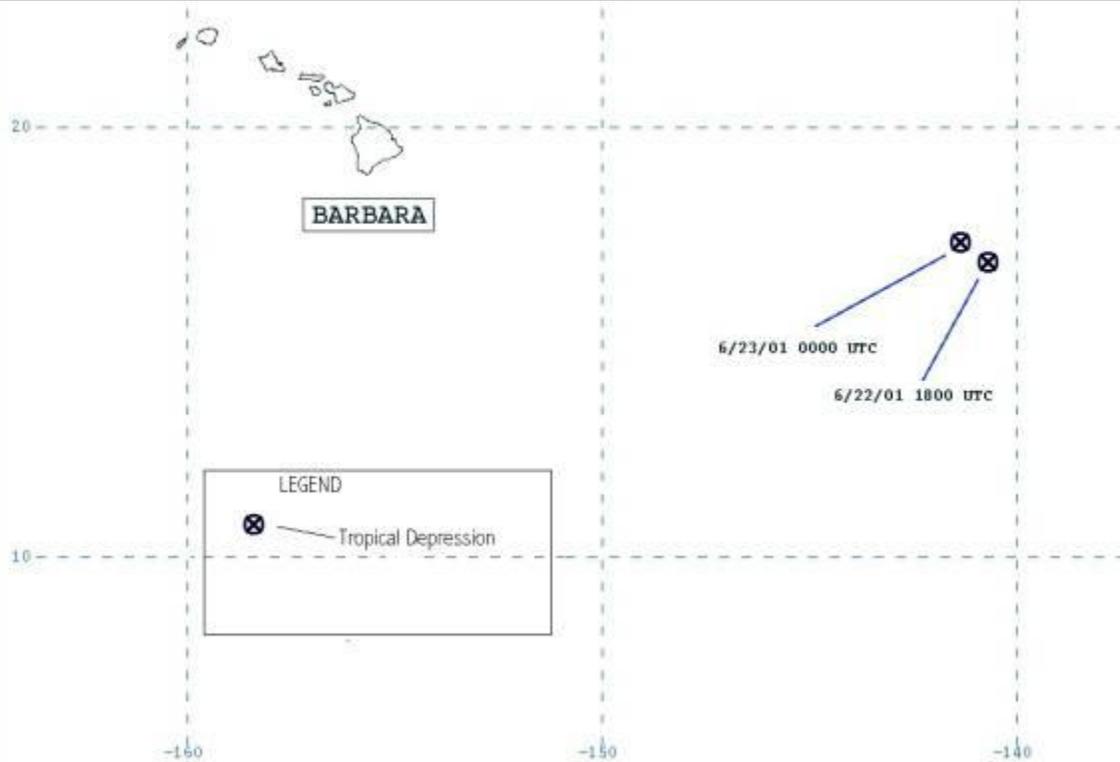
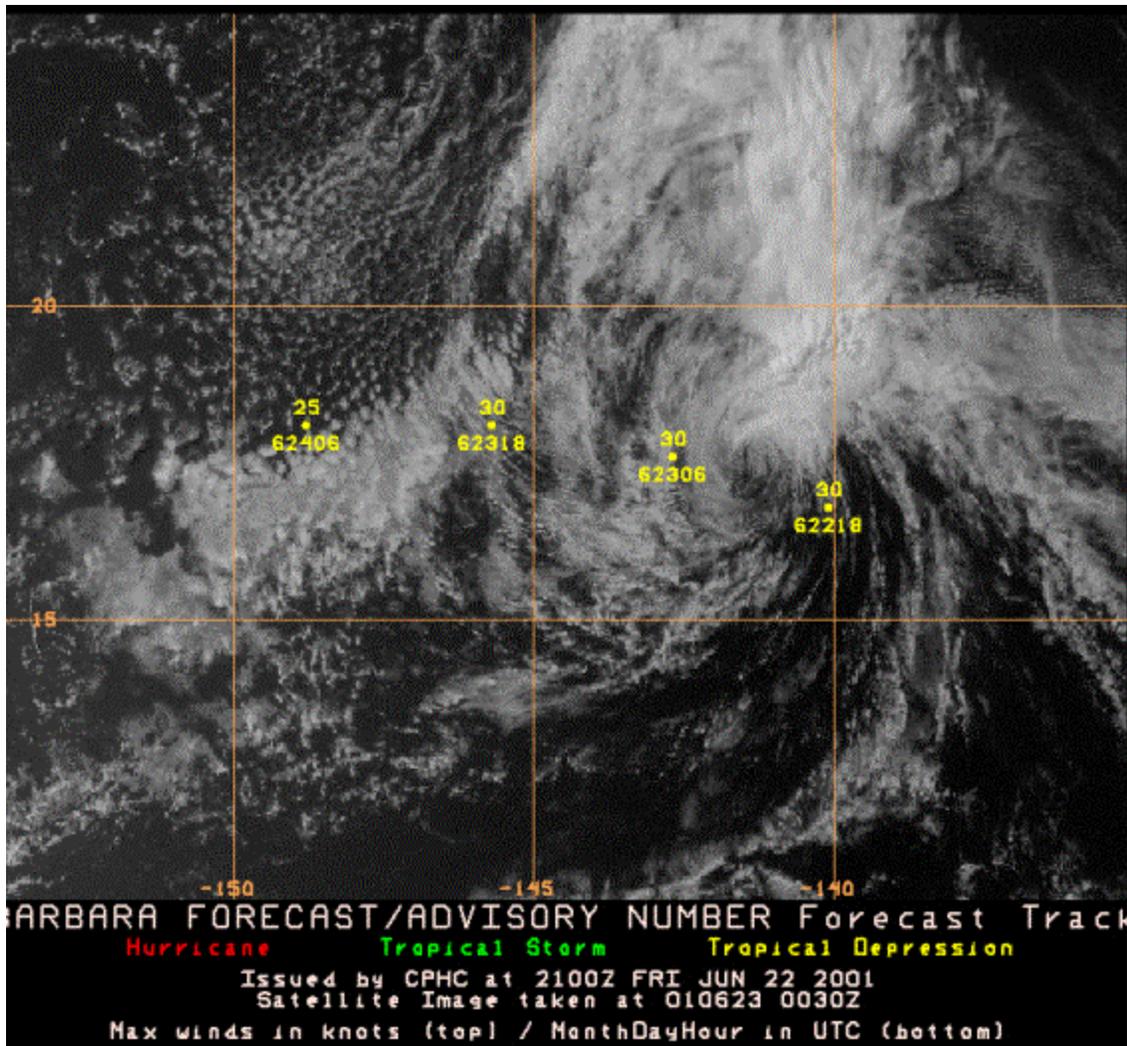


Figure 1. Best Track for Tropical Storm Barbara



**Figure 2. Satellite picture of Tropical Depression Barbara.**

Advisory 2100 UTC June 22 2001

Max Winds 30 KT

Satellite Picture at 0030 UTC June 23

## TROPICAL DEPRESSION ONE-C

### SEPTEMBER 11, 2001

**HISTORY.** Tropical Depression One-C (TD-1C) formed on September 11 more than 400 NM southeast of the Island of Hawaii, near 14.1N 152.1W. The system moved west northwestward to 15N 153W by 0600 UTC September 11, and then southwestward to 12.6N 154.8W by 1200 UTC September 11. The system was poorly organized, and the convection of TD One-C dissipated by 1200 UTC September 11. Tropical Depression One-C never reached tropical storm strength.

## SYNOPTIC SITUATION (SEPTEMBER 11, 2001)

**LOWER LEVELS.** A high pressure center 1022 hPa was located near 35N 144W, with a ridge that extended southwest to 25N 170W. Easterly winds were maintained between the equator and 20N. The SST was about 26C. A weak low (1012 hPa) east of the Hawaiian chain remained relatively stationary near 22N 140W.

**MIDDLE AND UPPER LEVELS.** Tropical Depression One-C formed just south of a weak mid-level high located near 25N 155W.

**SATELLITE DATA.** This tropical depression was never well organized, and became difficult to track accurately. The track appears erratic, and this was related to the difficulty of identifying a system center. Satellite showed other areas of convection in the vicinity of TD One-C. (Fig. 4)

## BEST TRACK

Table 2. Best Track TD One-C

Date/Time (UTC)	Latitude (deg N)	Longitude (deg W)	Max winds (kts)
September 11/ 0300	13.9	151.5	25
September 11/ 0900	15.0	153.0	30
September 11/ 1500	12.6	154.8	25

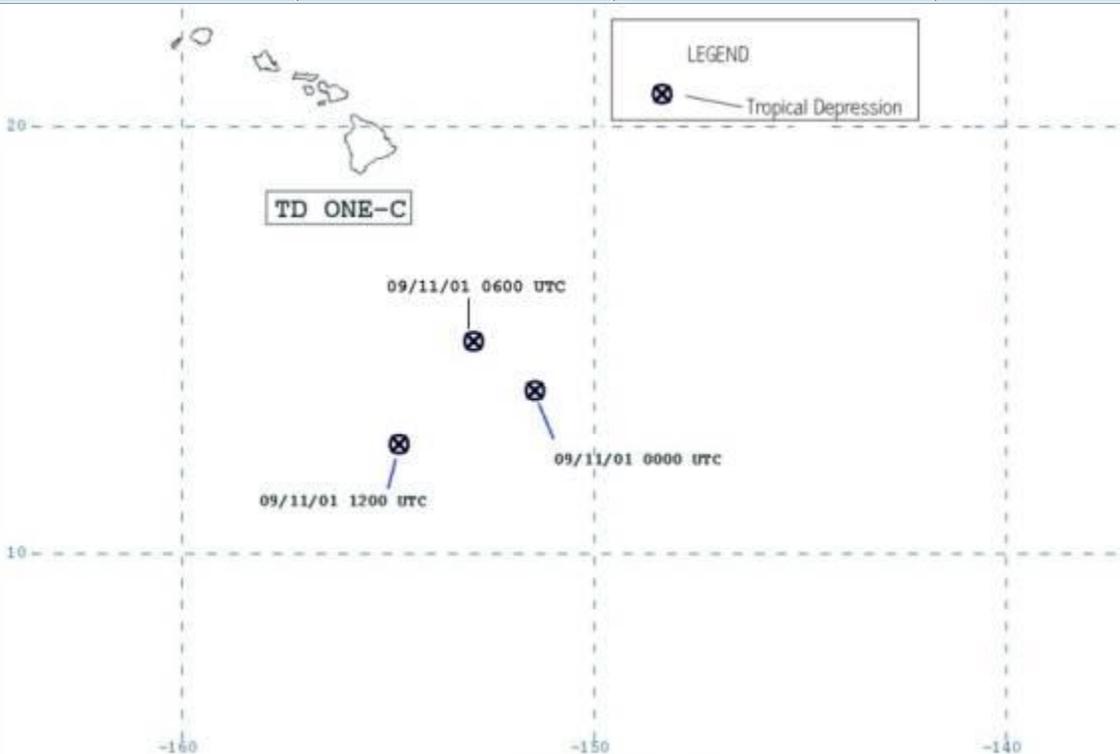


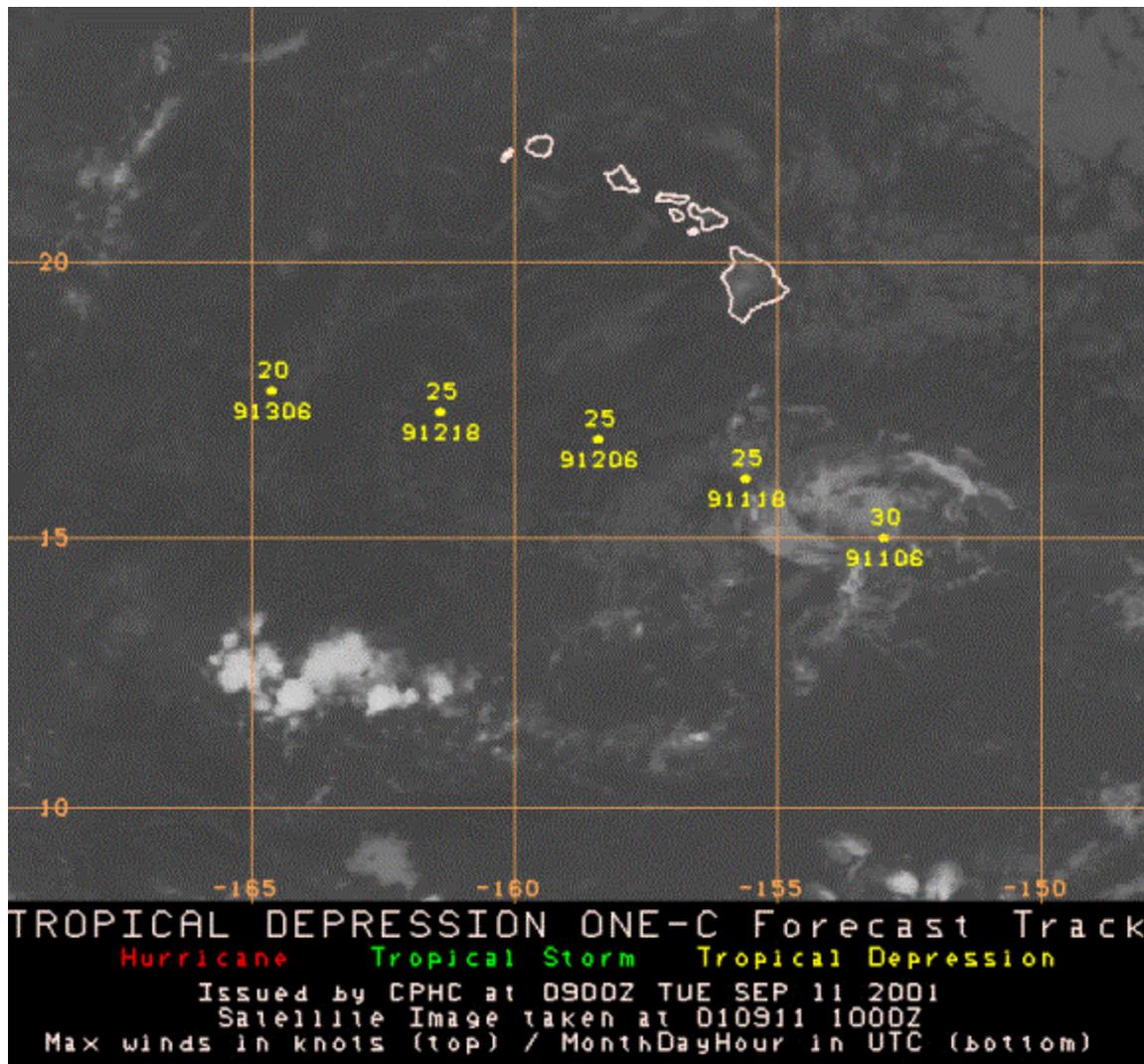
Figure 3. Best Track TD One-C

Table 3. Verification table for TD One-C. Table entries are track forecast errors, measured in nautical miles. Value in parenthesis indicates the number of forecasts.

<b>Forecast</b>	<b>12-hr</b>	<b>24-hr</b>	<b>36-hr</b>	<b>48-hr</b>	<b>72-hr</b>
CPHC	130 (1)	N/A	N/A	N/A	N/A
BAMD	132 (1)	N/A	N/A	N/A	N/A
BAMM	115 (1)	N/A	N/A	N/A	N/A
BAMS	112 (1)	N/A	N/A	N/A	N/A
CLIP	131 (1)	N/A	N/A	N/A	N/A
GFDL	N/A	N/A	N/A	N/A	N/A
LBAR	131 (1)	N/A	N/A	N/A	N/A
NGPS	N/A	N/A	N/A	N/A	N/A
P91E	N/A	N/A	N/A	N/A	N/A

Table 4. Wind Verification for TD One-C. Table entries are errors in wind forecast, measured in knots.

<b>Forecast</b>	<b>12-hr</b>	<b>24-hr</b>	<b>36-hr</b>	<b>48-hr</b>	<b>72-hr</b>
CPHC	0 (1)	N/A	N/A	N/A	N/A
SHIP	3 (1)	N/A	N/A	N/A	N/A



**Figure 4. Satellite picture of TD One-C**

Advisory Issued 0900 UTC Sep 11, 2001

Max Winds 30 KT

Satellite picture 1000 UTC Sep 11

## TROPICAL DEPRESSION TWO-C

### SEPTEMBER 23 - 25, 2001

**HISTORY.** Tropical Depression Two-C (TD-2C) formed near 10N 147.4W on September 22, 2001, southwest of Tropical Storm Kiko (in the East Pacific). Throughout September 23, TD-2C remained a poorly organized system that slowly moved west-northwestward. A slight increase in convection became apparent 0300 UTC September 24, and was followed by a period of consistent thunderstorm activity near the circulation center. Tropical Depression Two-C continued in the west-northwest direction, but weakened by 0300 UTC September 25.

## SYNOPTIC SITUATION (SEPTEMBER 23 - SEPTEMBER 25, 2001)

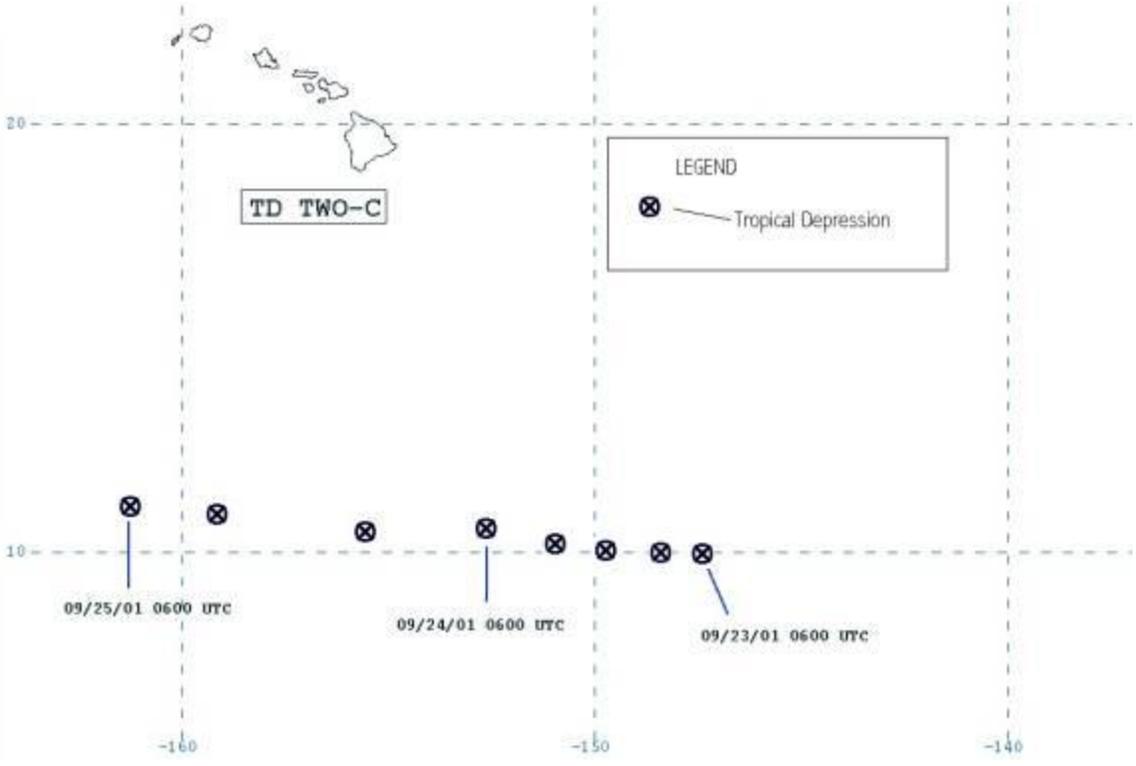
**LOWER LEVELS.** A subtropical high center (1018 hPa) remained near 27N 130W throughout the duration of Tropical Depression Two-C. Tropical Storm Kiko remained to the east near 18N 124W. On September 23 at 1200 UTC a low pressure center developed near 40N 134W with a shear line that extended north of the Hawaiian island chain to 28N 170W. By September 25, the shear line had moved southward reaching 26N 160W. East-southeast trade winds persisted throughout the duration of Tropical Depression Two-C.

**MIDDLE AND UPPER LEVELS.** There was a mid-level ridge north of TD Two-C September 24 near 15N 140-155W, steering the system to the west. A weakness in the ridge near 15N 152-162W became noticeable by September 25. There was an upper level low northwest of TD-2C near 22N 162W on September 23. The SST was about 26C-27C. As the environment became more sheared the system dissipated.

**SATELLITE DATA.** Satellite showed the system to be generally well organized, with persistent convection through the life cycle. Satellite fixes were reliable (Fig. 6), and showed a consistent westward movement, increasing in forward speed over the second half of the storm's cycle as the upper trough moved into the area.

Table 5. Best Track for TD Two-C

Date/Time (UTC)	Latitude (deg N)	Longitude (deg W)	Max winds (KT)
September 23/ 0900	10.0	147.4	30
September 23/ 1500	10.0	148.4	30
September 23/ 2100	10.0	149.7	30
September 24/ 0300	10.2	151.0	30
September 24/ 0900	10.5	152.6	30
September 24/ 1500	10.5	155.6	30
September 24/ 2100	10.4	155.6	30
September 25/ 0300	10.9	159.1	25
September 25/ 0900	11.1	161.2	25



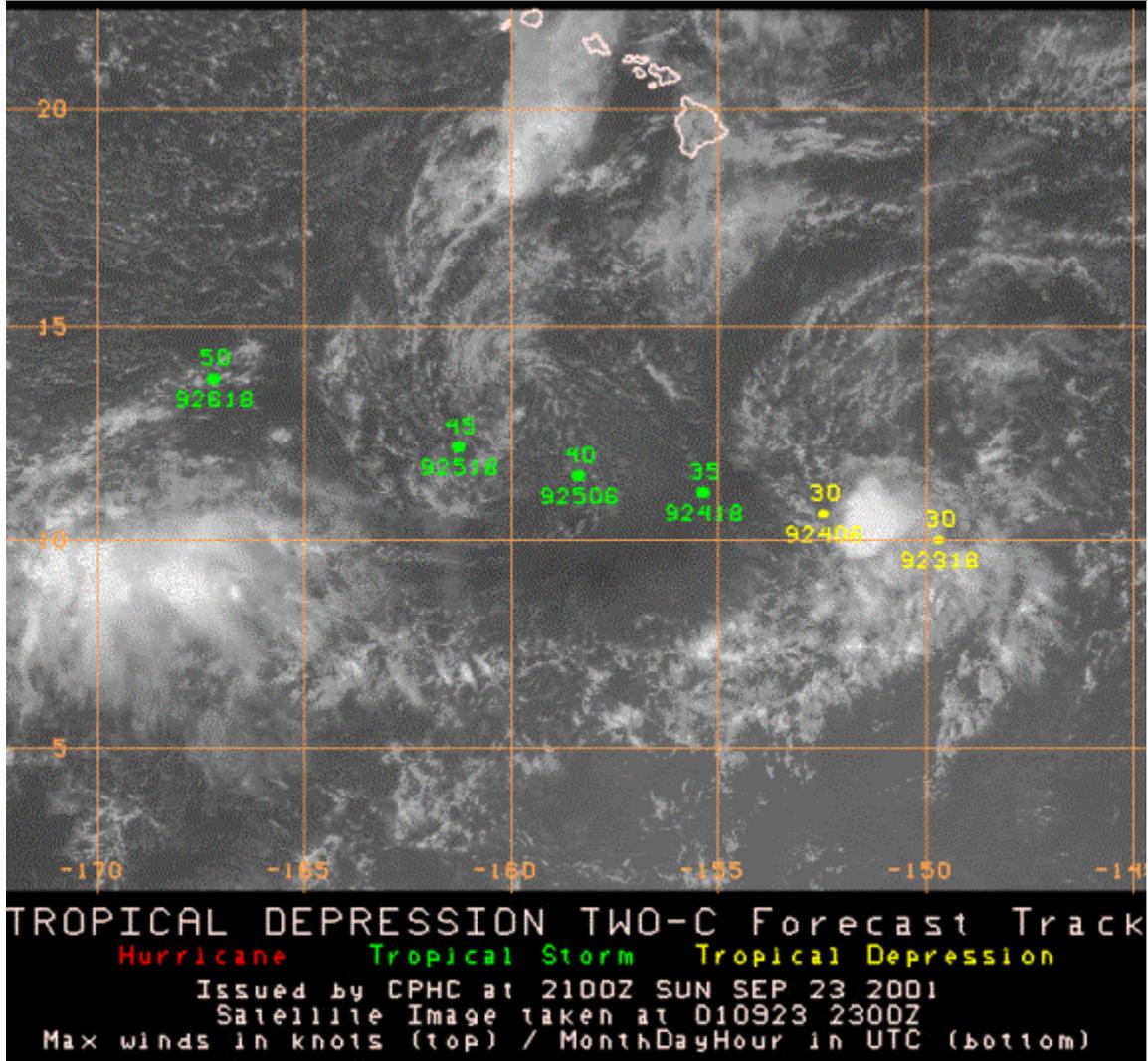
**Figure 5. Best Track TD Two-C**

Table 6. Track Verification for TD Two-C. Table entries are track forecast errors, measured in nautical miles. Value in parenthesis indicates the number of forecasts.

Forecast	12-hr	24-hr	36-hr	48-hr	72-hr
CPHC	54 (7)	84 (5)	147 (3)	185 (1)	N/A
BAMD	64 (7)	149 (5)	219 (3)	309 (1)	N/A
BAMM	43 (7)	94 (5)	153 (3)	237 (1)	N/A
BAMS	43 (7)	128 (5)	175 (3)	221 (1)	N/A
CLIP	53 (7)	153 (5)	227 (3)	324 (1)	N/A
GFDL	84 (4)	141 (4)	233 (2)	261 (1)	N/A
LBAR	60 (7)	141 (5)	193 (3)	272 (1)	N/A
NGPS	N/A	N/A	N/A	N/A	N/A
P91E	N/A	N/A	N/A	N/A	N/A

Table 7. Wind Verification for TD Two-C. Table entries are errors in wind forecast, measured in knots. Value in parenthesis indicates the number of forecasts.

Forecast	12-hr	24-hr	36-hr	48-hr	72-hr
CPHC	1.4 (7)	7 (5)	13.3 (3)	20 (1)	N/A
SHIP	5 (7)	12 (5)	19 (3)	29 (1)	N/A



**Figure 6. Satellite picture of TD Two-C**  
Advisory issued 2100 UTC Sep 23, 2001  
Max Winds 30 KT  
Satellite picture at 2300 UTC Sep 23

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## TROPICAL STORM NARDA

OCTOBER 20 - 25

**HISTORY.** In the East Pacific near 11.3N 125.8W, sea surface temperatures of 27C to 28C on October 20, 2001 1500 UTC, supported the development of Tropical Depression Sixteen-E (TD-16E) from a band of convective clouds. Six hours later TD-16E was upgraded to Tropical Storm Narda near 11.9N 127W. Maintaining a west-northwestward path, Tropical Storm Narda steadily intensified until it reached hurricane status October 21, 2100 UTC near 14.2N 131.2W. Narda reached a maximum wind speed of 75 knots October 22, and then began to weaken from an increase of vertical shear aloft. Narda was downgraded to a Tropical Storm near 16.3N 135.7W 0300 UTC October 23. Tropical Storm Narda continued to weaken as it crossed into the Central North Pacific, where CPHC downgraded the storm to a Tropical Depression at 0300 UTC October 24 near 16.5N142W. CPHC issued the last advisory on Tropical Depression Narda at 0300 UTC on October 25, 2001.

**SYNOPTIC SITUATION (OCTOBER 23 - OCTOBER 25)**

**LOWER LEVELS.** A high pressure center of 1032 hPa was positioned at 42N 137W on October 23, with a ridge extending to 17N 168W. The high center gradually weakened and moved northeastward with a pressure of 1024 hPa at 37N 134W by October 25. A tropical wave ahead of Narda was apparent from 15N 154W to 30N 150W on October 23. The wave moved across the island chain from Hawaii to Kauai with a final position west of the islands from 5N 172W to 25N 162W.

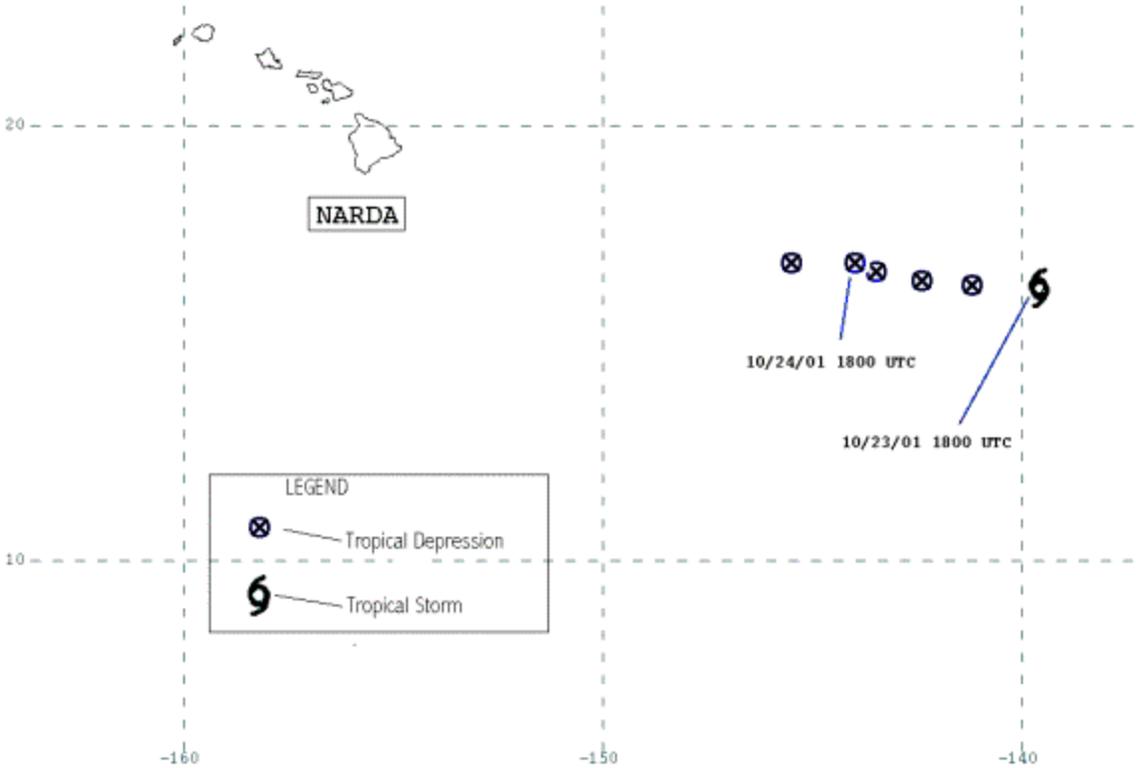
**MIDDLE TO UPPER LEVELS.** Tropical Storm Narda entered the Central Pacific south of an upper-level ridge near 17N 160W to 20N 140W. The immediate environment was dominated by a ridge at mid and upper levels. Narda dissipated before an upper level trough, to the northwest, moved into the storm’s vicinity.

**SATELLITE DATA.** Narda entered Central Pacific with very little deep convection, but with a well-defined low level circulation. (Fig 8) Convection developed about 60 NM northeast of the center as Narda moved into a more strongly sheared environment. Convection continued in bursts north and east of the center, with upper level outflow indicating strong shear. The low level circulation gradually weakened and dissipated.

**BEST TRACK.**

Table 8. Best track Narda

Date/Time (UTC)	Latitude (deg N)	Longitude (deg W)	Max winds (KT)
October 23/ 2100	16.3	139.6	35
October 24/ 0300	16.4	141.2	30
October 24/ 0900	16.5	142.4	30
October 24/ 1500	16.7	143.5	30
October 24/ 2100	16.9	144.0	30



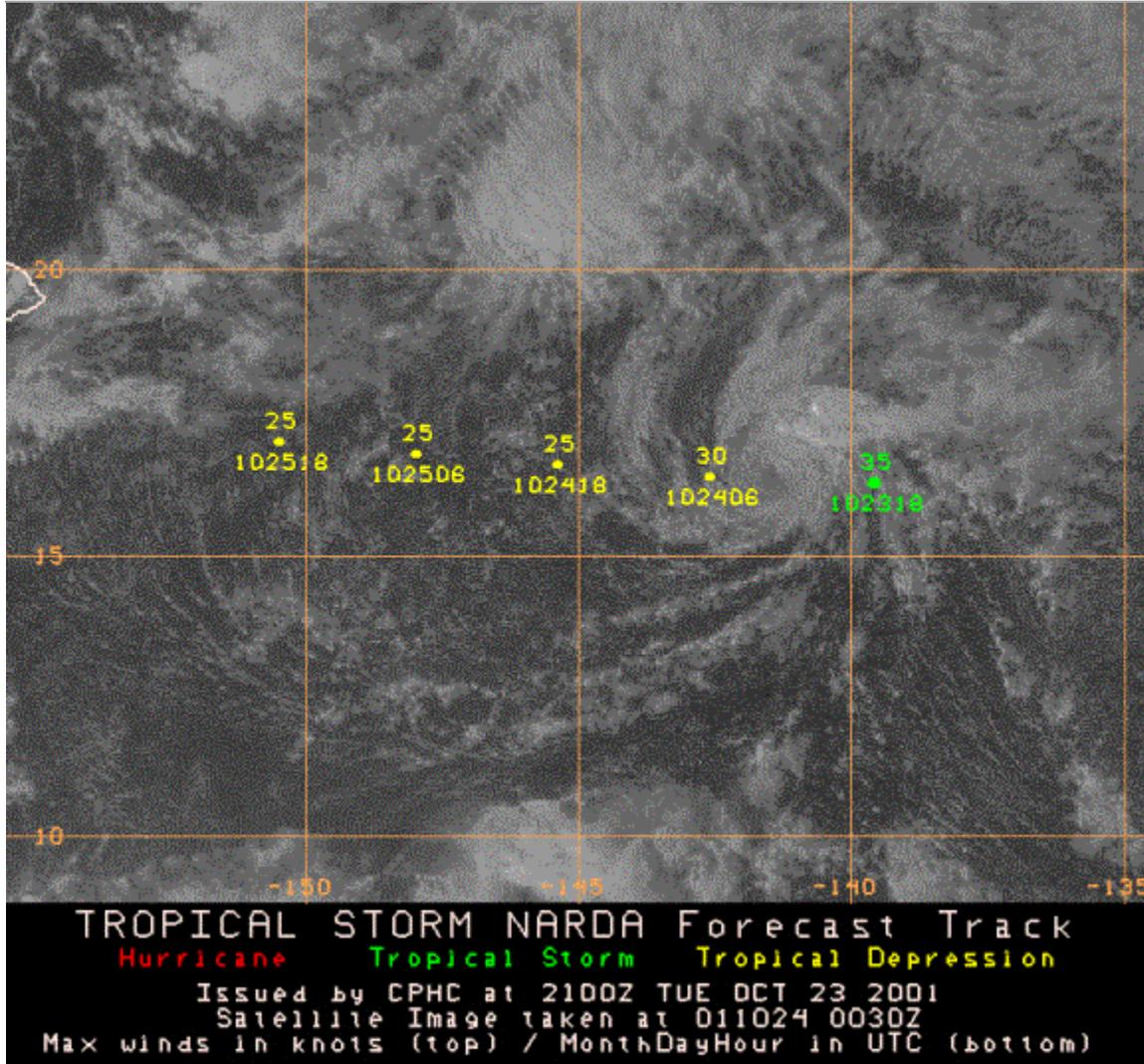
**Figure 7. Best track Narda**

Table 9. Track Verification for Narda. Table entries are track forecast errors, measured in nautical miles. Value in parenthesis indicates the number of forecasts.

Forecast	12-hr	24-hr	36-hr	48-hr	72-hr
CPHC	36 (4)	107 (2)	N/A	N/A	N/A
BAMD	197 (3)	372 (1)	N/A	N/A	N/A
BAMM	71 (3)	134 (1)	N/A	N/A	N/A
BAMS	28 (3)	67 (1)	N/A	N/A	N/A
CLIP	36 (30)	66 (1)	N/A	N/A	N/A
GFDL	N/A	N/A	N/A	N/A	N/A
LBAR	57 (3)	108 (1)	N/A	N/A	N/A
NGPS	47 (1)	N/A	N/A	N/A	N/A
P91E	22 (3)	27 (1)	N/A	N/A	N/A

Table 10. Wind Verification for Narda. Table entries are errors in wind forecast, measured in knots. Value in parenthesis indicates the number of forecasts.

Forecast	12-hr	24-hr	36-hr	48-hr	72-hr
CPHC	0 (4)	5 (2)	N/A	N/A	N/A
SHIP	5.3 (3)	14 (1)	N/A	N/A	N/A



**Figure 8. Satellite picture of Tropical Storm Narda**

Advisory 2100 UTC Oct 23 2001

Max winds 35 KT

Satellite picture at 0030 UTC Oct. 24

## SUMMARY

Although there were not sufficient data to give a strong statistical base, CPHC did demonstrate better skill than most of the models during 2000. The Shallow layer Beta and Advection Model

(BAMS) showed the greatest skill. Compared to the eight models used, CPHC produced the second best forecasts.

Figure 9. Composite forecast track errors, all storms, nautical miles. Number in parenthesis indicates number of forecasts.

(There were no 72 hour forecast verifications because all tropical cyclones dissipated by 48 hours.)

Forecast	12-hr (12)	24-hr (9)	36-hr (5)	48-hr (3)
CPHC	54	100	147	185
BAMD	104	172	205	349
BAMM	57	108	189	240
BAMS	40	94	117	150
CLIP	125	117	187	261
GFDL	84	141	233	261
LBAR	63	128	185	261
NGPS	47			
P91E	23	78	209	357

Figure 10. Total forecast errors for intensity (KT). Number in parentheses indicates number of forecasts.

Forecast	12-hr (12)	24-hr (9)	36-hr (5)	48-hr (3)
CPHC	1	6	13	20
SHIP	5	12	19	29

CPHC showed better skill than the SHIP model in forecasting maximum wind. The sample was too small to be considered too significant, but the trends were in the right direction.

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