

Preliminary Report
Hurricane Dora
06-14 August 1999(eastern Pacific basin)
06-23 August 1999(eastern, central, and western Pacific basins)

Miles B. Lawrence and Todd B. Kimberlain
National Hurricane Center
23 November October 1999

Dora was a long-lived, intense Pacific hurricane. Its only impact to land was the generation of high surf conditions as it passed south of Hawaii.

a. Synoptic history

Dora originated from a tropical wave that moved off the west coast of Africa on 23 July. It moved westward across the tropical Atlantic Ocean and the Caribbean Sea without distinction. By 4 August, the wave was located over the tropical Pacific Ocean south of the Gulf of Tehuantepec with some disorganized convection. In the next 24 hours, there was evidence of a low-level cyclonic circulation in satellite imagery, along with the formation of a curved convective band west of the center. The system is estimated to have become Tropical Depression Seven-E at 0000 GMT on 6 August, while located about 290 nautical miles south of Acapulco, Mexico. The best track begins at this time and is listed in Table 1 and plotted in Fig. 1(a) which are the best-track positions in the eastern Pacific basin. The track is also plotted in Fig. 1(b) which shows the entire track of the hurricane as it moved across the eastern, central, and western Pacific basins. The last time a tropical cyclone moved across all three basins was in 1994, when Hurricane John did so.

During the formation stage, a broad, mid- to upper-level trough covered an area to the northwest of the system. Over several days, this trough weakened and was replaced by a substantial anticyclone. The effect of these features on the track is seen in Fig. 1. The motion was toward the west-northwest on the 6th and 7th and then became westward for the remainder Dora's track across the eastern and central Pacific basins. Finally on the 20th in the western Pacific basin, Dora turned northwestward. It continued this motion until weakening below depression status on the 23rd.

Despite some initial vertical wind shear from the northeast, the system steadily intensified. The depression became Tropical Storm Dora late on the 6th, and then reached hurricane strength on the 8th when a deep and symmetric central dense overcast was observed on satellite imagery. By this time, the vertical wind shear had decreased. A small-diameter eye formed on the 9th and Dora is estimated to have reached its peak intensity of 120 knots at 0000 UTC on the 12th, with a corresponding central surface pressure of 943 millibars. It weakened slightly for several hours and again reached 120 knots on 1800 UTC. During this fluctuation, it is believed that Dora may have experienced a concentric eyewall cycle as SSMI and infrared satellite imagery showed enhanced convection occurring at a larger distance from the center. Dora maintained 120 knots this second time until 0600 UTC on the 13th and then weakened to 100 knots by the 14th when it moved westward into the central Pacific

basin. It is notable that Dora had wind speeds of 100 knots or more for 96 hours from the 10th through the 14th.

Dora moved across the central Pacific basin from the 14th to the 20th and passed about 200 n mi south of the Hawaiian Islands on the 15th. The only significant effect to Hawaii was high surf conditions along the southeast facing shores of the Big Island. The intensity decreased to 70 knots on the 14th and then increased back up to 100 knots on the 16th. The final weakening phase then began and continued as Dora moved westward into the western Pacific basin as a tropical storm on the 20th. It weakened to a depression and dissipated on the 23rd several hundred miles north of Wake Island.

b. Meteorological statistics

Figures 2 and 3, respectively, show best track curves of wind speed and central pressure versus time while the hurricane was located in the eastern Pacific basin. The subjective satellite Dvorak estimates of wind and pressure from the Tropical Analysis and Forecast Branch (TAFB), the Satellite Analysis Branch (SAB), and the Air Force Weather Agency (AFGWC) are plotted on these figures. In addition, objective Dvorak intensity estimates were near 120 knots on the 12th and 13th. There was no other source of intensity data in the eastern Pacific basin.

In the central Pacific basin, there were six U.S. Air Force Reserve reconnaissance missions on the 15th through the 17th while the hurricane was approaching and passing to the south of Hawaii. The maximum wind speed of 100 knots at 0600 UTC on the 16th is based on a 700-millibar flight level wind speed of 114 knots and a 965-millibar central surface pressure reported from an aircraft.

c. Casualty and damage statistics

There are no known casualties or damage associated with this hurricane.

d. Forecast and warning critique

The average National Hurricane Center official track errors for this hurricane were 9 n mi at 0 hours (30 cases), 32 n mi at 12 hours (28 cases), 56 n mi at 24 hours (26 cases), 76 n mi at 36 hours (24 cases), 95 n mi at 48 hours (22 cases), and 132 n mi at 72 hours (18 cases). These errors are smaller than the previous ten-year average official track errors in the eastern Pacific basin. This better-than-average performance is to be expected with such a smooth westward track.

There were several 72-hour wind speed forecast errors of -35 knots during the three days prior to Dora reaching its maximum intensity of 120 knots. The SHIPS intensity guidance model had similar under-forecast errors.

Table 1. Preliminary Best Track - Hurricane Dora, 06-14 August 1999. Data are also listed for 14-20 August as provided by the Central Pacific Hurricane Center and for 20-23 August as provided by the Joint Typhoon Warning Center.

Date/time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed(kt)	Stage
06/0000	12.1	100.9	1007	30	tropical depression
0600	12.4	102.2	1007	30	“
1200	12.8	103.5	1007	30	“
1800	13.2	104.9	1005	35	tropical storm
07/0000	13.6	106.3	1002	40	“
0600	14.0	107.1	999	45	“
1200	14.5	108.0	997	45	“
1800	15.0	108.8	996	50	“
08/0000	15.2	109.9	993	55	“
0600	15.2	111.0	989	60	“
1200	15.1	112.0	987	65	hurricane
1800	15.0	113.1	982	75	“
09/0000	14.9	114.1	974	85	“
0600	14.8	115.0	970	90	“
1200	14.7	115.9	970	90	“
1800	14.6	116.7	967	95	“
10/0000	14.5	117.5	962	100	“
0600	14.4	118.4	958	105	“
1200	14.4	119.4	954	110	“
1800	14.4	120.5	950	115	“
11/0000	14.5	121.5	948	115	“
0600	14.5	122.6	948	115	“
1200	14.6	123.8	948	115	“
1800	14.7	125.1	948	115	“
12/0000	14.9	126.4	943	120	“
0600	15.0	127.8	946	115	“

Table 1. (Continued)

Date/time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed(kt)	Stage
12/1200	15.2	129.1	948	115	hurricane
1800	15.4	130.6	945	120	“
13/0000	15.5	132.3	943	120	“
0600	15.5	134.0	943	120	“
1200	15.5	135.8	946	115	“
1800	15.5	137.7	950	110	“
14/0000	15.5	139.7	960	100	“
The following data were provided by the Central Pacific Hurricane Center at Honolulu.					
0600	15.5	141.7	975	75	“
1200	15.4	143.5	985	70	“
1800	15.3	145.4	985	70	“
15/0000	15.3	147.1	985	70	“
0600	15.4	149.0	982	90	“
1200	15.5	150.8	978	95	“
1800	15.6	152.5	970	95	“
16/0000	15.7	154.2	965	95	“
0600	15.7	155.8	965	100	“
1200	15.6	157.4	972	90	“
1800	15.5	159.1	980	85	“
17/0000	15.5	160.8	980	80	“
0600	15.5	162.5	985	75	“
1200	15.5	164.2	987	75	“
1800	15.5	166.0	990	70	“
18/0000	15.6	167.8	992	65	“
0600	15.7	169.6	995	65	“
1200	15.9	171.5	995	65	“
1800	16.1	173.3	995	65	“

Table 1. (Continued)

Date/time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed(kt)	Stage
19/0000	16.3	174.9	995	65	hurricane
0600	16.6	176.5	995	65	“
1200	16.9	177.8	995	65	“
1800	17.3	179.2	995	65	“
20/0000	17.9	179.4(°E)	996	60	tropical storm
The following data were provided by the Joint Typhoon Warning Center at Pearl Harbor.					
0600	18.4	178.3(°E)		50	tropical storm
1200	19.0	177.5(°E)		45	“
1800	19.6	176.6(°E)		45	“
21/0000	20.4	175.4(°E)		45	“
0600	20.9	174.4(°E)		40	“
1200	21.3	173.4(°E)		40	“
1800	21.8	171.8(°E)		35	“
22/0000	22.5	170.8(°E)		30	tropical depression
0600	23.5	169.9(°E)		30	“
1200	24.1	169.2(°E)		25	“
1800	24.7	168.3(°E)		25	“
23/0000	25.7	167.5(°E)		25	“
0600	26.6	167.6(°E)		25	“
1200	27.5	167.5(°E)		25	“
1800	28.3	167.6(°E)		25	“
12/0000	14.9	126.4	943	120	minimum pressure
13/0000	15.5	132.3	943	120	minimum pressure
13/0600	15.5	134.0	943	120	minimum pressure

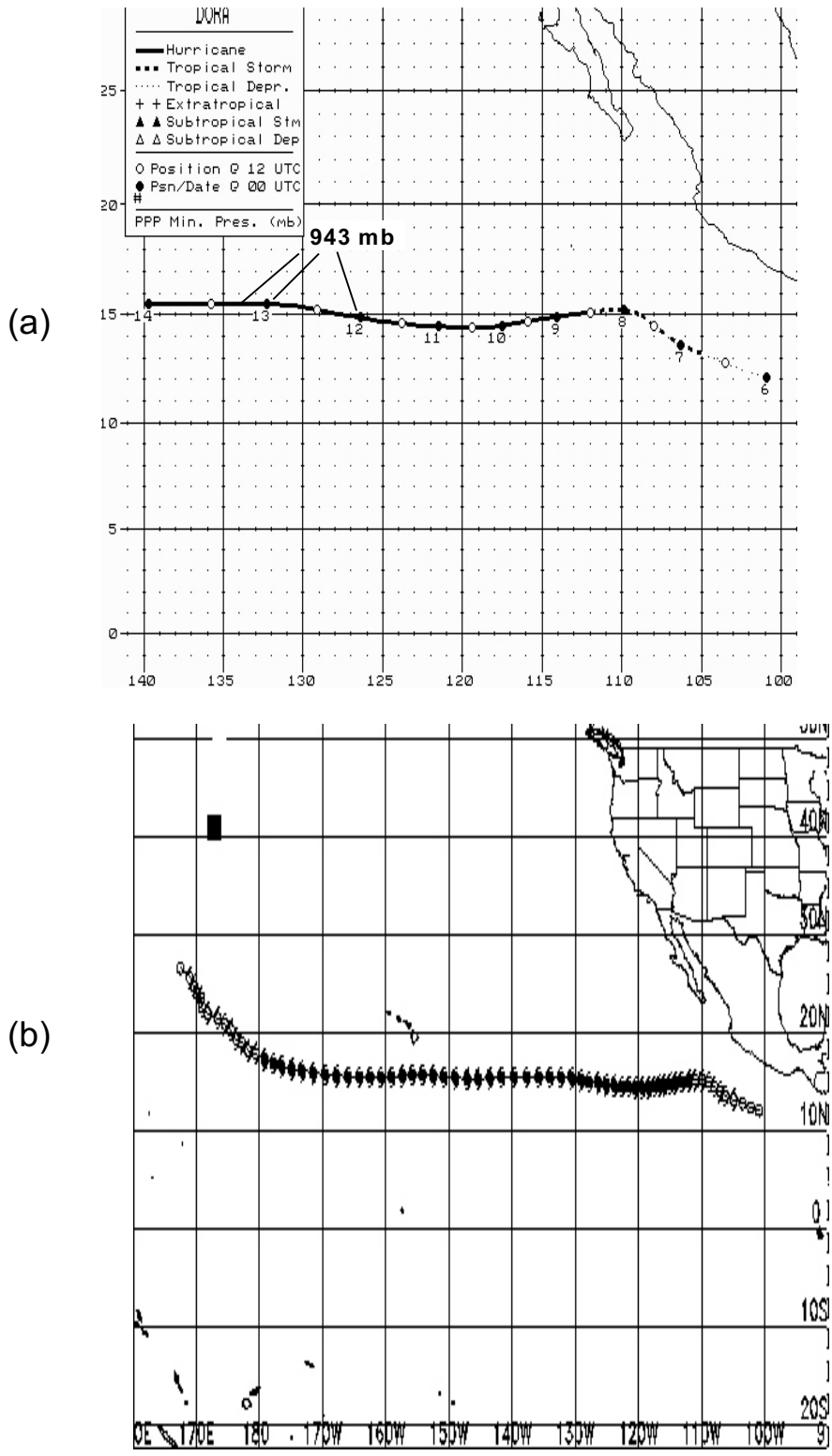


Fig. 1. (a) Best-track positions for Hurricane Dora, 06-14 August 1999, in the eastern Pacific basin. (b) Approximate position estimates for the entire track of Hurricane Dora, 06-23 August 1999.

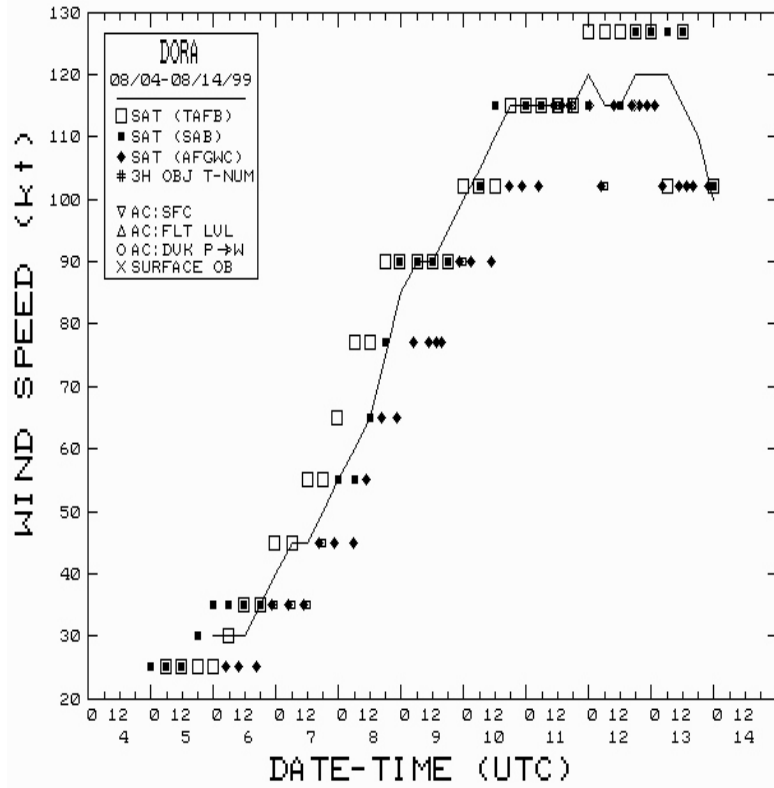


Fig. 2. Best surface wind speed curve for Hurricane Dora, 06-14 August 1999.

track one-minute

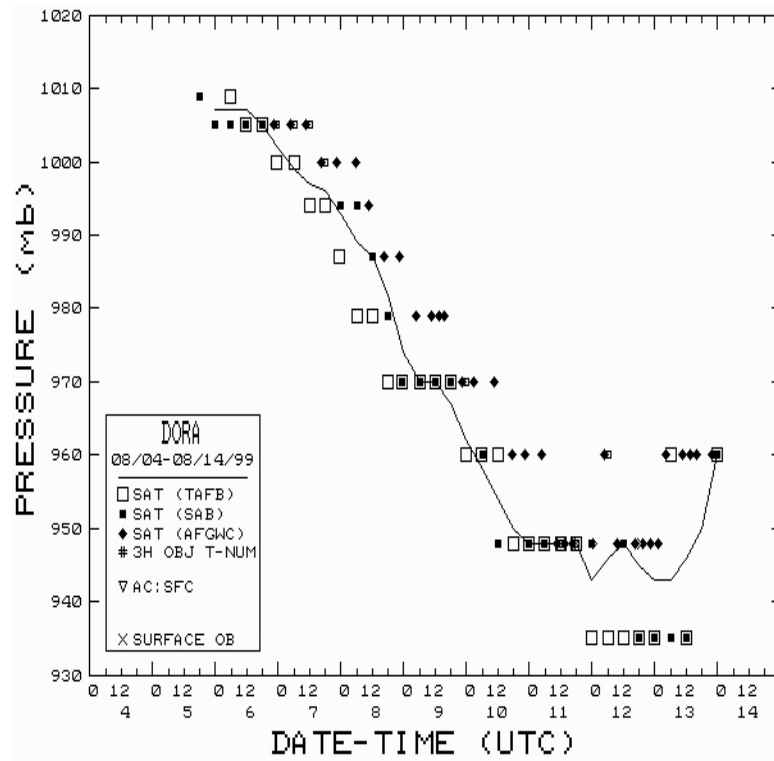


Fig. 3. Best track minimum central pressure curve for Hurricane Dora, 06-14 August 1999.