NATIONAL HURRICANE CENTER
CENTRAL PACIFIC HURRICANE CENTER
TROPICAL CYCLONE REPORT

HURRICANE DARBY
(EP052016)
11–25 July 2016

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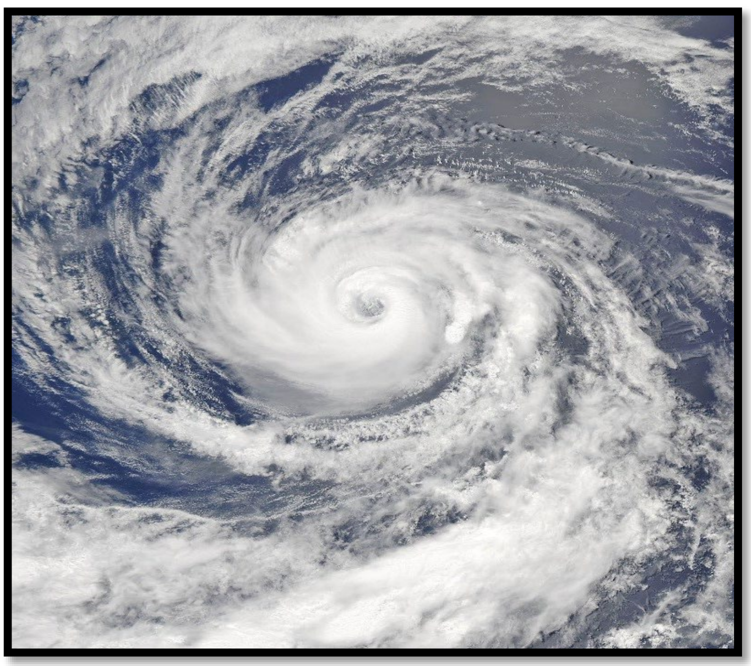

MODIS VISIBLE SATELLITE IMAGE OF HURRICANE DARBY AT 2115 UTC 15 JULY.

Darby was a category 3 hurricane (on the Saffir-Simpson Hurricane Wind Scale) over the eastern Pacific Ocean. The cyclone was weakening when it reached the central Pacific basin, and it moved across portions of the Hawaiian Islands as a tropical storm.

[1] Original report date 8 November 2016. Updated 7 March 2019 to include best track analysis, map, summary, verification, impacts, and damage from the Central Pacific Hurricane Center.

Hurricane Darby

11–25 JULY 2016

SYNOPTIC HISTORY

The primary weather feature that led to the formation of Darby was a tropical wave that moved off of the west coast of Africa on 28 June. The wave moved westward across the tropical Atlantic and reached the eastern Caribbean Sea about a week later. Showers and thunderstorms associated with the wave began to increase when it moved across Central America and into the eastern Pacific basin on 7 and 8 July, and a broad area of low pressure developed along the wave axis a day or so later. Satellite images indicate that a well-defined center of circulation developed with sufficiently organized deep convection around 1200 UTC 11 July, marking the formation of a tropical depression about 250 n mi south-southwest of Manzanillo, Mexico. The "best track" chart of the tropical cyclone's path is given in Fig. 1, with the wind and pressure histories shown in Figs. 2 and 3, respectively. The best track positions and intensities are listed in Table 1[2].

Northeasterly 200 to 850-mb wind shear of about 15 kt prevented strengthening for the next 18 h after genesis, but by 1200 UTC 12 July the shear began to relax and the cyclone strengthened to a tropical storm. In generally conducive environmental conditions, Darby strengthened quickly during the next 24 h as deep convection increased and became more symmetric around the center. While the storm intensified it moved just south of due west, steered by a strong mid-level ridge to its north. Darby reached hurricane intensity by 1800 UTC 13 July when it was about 450 n mi south-southwest of the southern tip of the Baja California peninsula. Occasional intrusions of dry air slowed the intensification rate, but Darby still gradually gained strength during the next few days while it moved westward to west-northwestward. A ragged eye was first apparent in geostationary satellite images by 0000 UTC 15 July, and the eye became well defined the next day. Darby became a major hurricane by 1200 UTC 16 July, and it reached its peak intensity of 105 kt 6 h later when it was located about 875 n mi west-southwest of the southern tip of the Baja California peninsula.

The hurricane did not maintain category 3 intensity for long, as it was in the process of moving over sub-26°C waters when it reached its maximum strength. However, since the shear was light and because Darby had an annular structure (Knaff and Kossin 2003), only gradual weakening occurred over the cool waters. While continuing to move westward to west-northwestward, the cyclone fell below hurricane strength around 0600 UTC 19 July, and moved into the central Pacific basin as a 50-kt tropical storm shortly after 1200 UTC 20 July.

After crossing 140°W, Darby re-strengthened slightly to 55 kt from 0600 UTC 21 July through 0600 UTC 22 July as the system moved over slightly warmer water and vertical shear diminished to 10 kt or less. The strengthening was short lived, however, and gradual weakening

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[2] A digital record of the complete best track, including wind radii, can be found on line at ftp://ftp.nhc.noaa.gov/atcf. Data for the current year's storms are located in the *btk* directory, while previous years' data are located in the *archive* directory.

resumed thereafter as the cyclone began to encounter marginal sea surface temperatures west of 149°W. Movement was initially toward the west southwest as ridging to the north of Hawaii nosed southeastward. Darby began to track westward, then west northwestward after 1800 UTC 22 July as it moved far enough west to pass the nosing ridge and began feeling a weakness in the ridge to its north. The first Tropical Storm Watch was issued for the main Hawaiian Islands at 2100 UTC 21 July, while the first Tropical Storm Warning was issued at 0900 UTC 22 July. Tropical Storm Darby made landfall on the Big Island of Hawaii near Pahala around 0000 UTC 24 July, moving west northwestward across the southern half of that island. This system traversed some of the highest terrain in Hawaii, including the 13,600-foot-tall volcanic summit of Mauna Loa, before re-emerging across waters lee of the Big Island near Captain Cook around 0600 UTC 24 July. Its low-level circulation greatly disrupted, Darby began to track northwestward, passing between the islands of Oahu and Kauai from 0000 UTC to 0600 UTC 25 July as a tropical depression. All associated deep convection collapsed as the weakening remnant circulation center turned sharply westward just northeast of the island of Kauai. Darby finally weakened into an open wave about 200 miles west of Kauai around 1200 UTC 26 July.

METEOROLOGICAL STATISTICS

Observations in Darby (Figs. 2 and 3) include subjective satellite-based Dvorak technique intensity estimates from the Tropical Analysis and Forecast Branch (TAFB), the Satellite Analysis Branch (SAB), the Central Pacific Hurricane Center (CPHC), and the U.S. Joint Typhoon Warning Center (JTWC), plus and objective Advanced Dvorak Technique (ADT) estimates from the Cooperative Institute for Meteorological Satellite Studies/University of Wisconsin-Madison. Observations also include flight-level, stepped frequency microwave radiometer (SFMR), and dropwindsonde observations from flights of the 53rd Weather Reconnaissance Squadron of the U. S. Air Force Reserve Command. Data and imagery from NOAA polar-orbiting satellites including the Advanced Microwave Sounding Unit (AMSU), the NASA Tropical Rainfall Measuring Mission (TRMM), the European Space Agency's Advanced Scatterometer (ASCAT), and Defense Meteorological Satellite Program (DMSP) satellites, among others, were also useful in constructing the best track of Darby.

Darby's estimated peak intensity of 105 kt was based on subjective Dvorak classifications of 5.5/102 kt and 6.0/115 kt from TAFB and SAB, respectively, and on an objective CI-number of 5.6/105 kt from CIMSS at the University of Wisconsin.

There were no observations of tropical-storm-force or greater winds from Darby in the eastern Pacific basin.

The Remote Automated Weather Station (RAWS) at Kealakomo, on the southeast slopes of the Big Island of Hawaii, recorded sustained winds of 34 knots at 2244 UTC 23 July, less than two hours before landfall. No other tropical storm force winds were recorded on land during the Big Island's encounter or as the system passed between Kauai and Oahu. This observation was within the Tropical Storm Warning area and occurred about 36 hours after the Tropical Storm Warning was issued. A list of surface observations, including winds and rainfall amounts, across the main Hawaiian Islands during the encounter with Tropical Storm Darby is given in Table 2. The single observation of minimal tropical storm force winds at Kealakomo on the Big Island occurred just before landfall and verifies the Tropical Storm Warning in effect at that time.

CASUALTY AND DAMAGE STATISTICS

Heavy rainfall created significant flooding impacts across the eastern half of Oahu as Darby's exposed low level circulation center passed between Oahu and Kauai. However, the strongest sustained winds observed on both islands never exceeded 21 kt.

No reports of casualties or wind damage associated with Darby were received within the central north Pacific basin.

FORECAST AND WARNING CRITIQUE

The genesis forecasts for Darby were of mixed quality. The system was first mentioned in the Tropical Weather Outlook about 102 h before genesis, at which time it was given a low (less than 40%) chance of development during the 5-day forecast period (Table 3). However, the chance of development in the 5-day period was not raised to the medium (40-60%) and high (greater than 60%) categories until 48 h and 30 h before genesis, respectively. The system was given a low chance of development in the 2-day period 42 h prior to genesis and a high chance 18 h before formation occurred.

A verification of NHC official track forecasts for Darby is given in Table 4a. Official forecast track errors were lower than the mean official errors by about 25% from the previous 5-yr period for all forecast times. A homogeneous comparison of the official track errors with selected guidance models is given in Table 4b. The most skillful models for Darby were the GFS ensemble mean (AEMI), the GFS, and the Florida State Superensemble (FSSE), which all outperformed the official forecasts at most lead times.

A verification of NHC official intensity forecasts for Darby is given in Table 5a. Official forecast intensity errors were also lower than the mean official errors for the previous 5-yr period at all forecast times. A homogeneous comparison of the official intensity errors with selected guidance models is given in Table 5b. The only model that consistently beat the official forecasts was the HWRF (HWFI) model. Nearly all of the models had a low bias for Darby.

A verification of CPHC official track forecasts for Darby is given in Table 6a. Official track forecast errors were lower than the mean official errors for the most recent 5-yr period (note that the 2015 statistics are unavailable at the time of this report, so the 2010–14 means are shown) for all forecast times from 12 to 72 h. A homogeneous comparison of the official track errors with selected guidance models is given in Table 6b. The most skillful models for Darby were the UK (EGRI), European (EMXI), TVCX ensemble, and the FSSE, which outperformed the official forecasts at all lead times.

A verification of CPHC official intensity forecasts for Darby is shown in Table 7a. Official intensity forecast errors were lower than the mean official errors for the most recent 5-yr period (again, the 2010–14 time period) for all forecast times from 24 to 48 h and at 96 h. A homogeneous comparison of the official intensity errors with selected guidance models is given in Table 7b. DSHP and LGEM performed best overall, while CPHC consistently outperformed the FSSE.

Wind watches and warnings issued for Darby are shown in Table 8. All of the Hawaiian Islands were placed in a Tropical Storm Watch and Warning in advance of Darby's arrival in the area.

REFERENCES

Knaff, J.A. and J.P. Kossin, 2003: Annular Hurricanes. *Weather and Forecasting*, 18, 204–223.

Table 1. Best track for Hurricane Darby, 11–25 July 2016.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
11 / 1200	14.5	105.2	1008	25	tropical depression
11 / 1800	15.0	105.7	1007	30	"
12 / 0000	15.5	106.4	1007	30	"
12 / 0600	15.8	107.2	1007	30	"
12 / 1200	15.9	108.2	1006	35	tropical storm
12 / 1800	15.6	109.2	1002	45	"
13 / 0000	15.4	110.1	1000	55	"
13 / 0600	15.3	111.0	998	60	"
13 / 1200	15.3	111.9	996	60	"
13 / 1800	15.4	112.9	992	65	hurricane
14 / 0000	15.5	114.0	989	70	"
14 / 0600	15.6	115.2	989	70	"
14 / 1200	15.7	116.3	987	70	"
14 / 1800	15.8	117.5	984	75	"
15 / 0000	15.9	118.6	982	80	"
15 / 0600	16.0	119.5	979	85	"
15 / 1200	16.3	120.3	974	90	"
15 / 1800	16.7	121.1	972	90	"
16 / 0000	17.1	121.9	971	90	"
16 / 0600	17.4	122.7	968	95	"
16 / 1200	17.7	123.5	964	100	"
16 / 1800	17.9	124.4	958	105	"
17 / 0000	18.0	125.3	962	100	"
17 / 0600	18.1	126.2	967	95	"
17 / 1200	18.2	127.0	971	90	"

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
17 / 1800	18.3	127.8	975	85	"
18 / 0000	18.3	128.7	979	80	"
18 / 0600	18.4	129.6	982	75	"
18 / 1200	18.5	130.6	986	70	"
18 / 1800	18.8	131.6	988	65	"
19 / 0000	19.0	132.7	988	65	"
19 / 0600	19.3	133.8	990	60	tropical storm
19 / 1200	19.6	134.9	992	60	"
19 / 1800	19.8	136.0	994	55	"
20 / 0000	19.9	137.2	995	55	"
20 / 0600	19.9	138.4	996	55	"
20 / 1200	19.9	139.6	999	50	"
20 / 1800	19.9	140.7	1000	50	tropical storm
21 / 0000	19.7	142.0	1000	50	"
21 / 0600	19.4	143.3	998	55	"
21 / 1200	19.0	144.6	998	55	"
21 / 1800	18.8	145.7	998	55	"
22 / 0000	18.7	146.9	997	55	"
22 / 0600	18.6	148.1	997	55	"
22 / 1200	18.5	149.3	999	50	"
22 / 1800	18.5	150.5	999	50	"
23 / 0000	18.6	151.6	1000	50	"
23 / 0600	18.7	152.6	1000	50	"
23 / 1200	18.7	153.5	1001	45	"
23 / 1800	18.8	154.4	1004	40	"
24 / 0000	19.3	155.3	1006	35	"
24 / 0600	19.4	156.3	1008	30	tropical depression

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
24 / 1200	19.6	157.0	1008	30	"
24 / 1800	20.4	157.7	1010	30	"
25 / 0000	21.2	158.4	1011	30	"
25 / 0600	22.1	159.1	1011	30	"
25 / 1200	22.3	160.3	1011	25	low
25 / 1800	22.0	160.6	1012	25	"
26 / 0000	22.4	161.4	1012	25	“
26 / 0600	22.8	162.0	1013	20	"
26 / 1200					dissipated
16 / 1800	17.9	124.4	958	105	maximum winds and minimum pressure
24 / 0000	19.3	155.3	1006	35	landfall near Pahala, Hawaii

Table 2. Selected surface observations across the main Hawaiian Islands in the vicinity of Darby. Date/time is for sustained wind when both sustained and gusts are listed.

Location Selected surface observations in the Hawaiian Islands (State of Hawaii)	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[a]	Sustained (kt)	Gust (kt)	
International Civil Aviation Organization (ICAO) Sites						
Bradshaw Army Airfield (PHJH)	23/2256	1006.8	24/0001	19	31	
Barking Sands Kehaka (PHBK)	25/0256	1009.5	25/0156	18	25	
Hilo Intl. Aprt. (PHTO)	23/2345	1007.8	23/1253	22	28	2.15
Honolulu Intl. Aprt. (PHNL)	25/0455	1009.8	25/0659	21	30	1.68
Kahului Aprt. (PHOG)	24/1239	1009.8	24/0240	23	32	
Kaneohe Bay Marine Corps Air Station (PHNG)	25/0051	1008.1	24/1730	18	26	
Kalaeloa Arpt (PHJR)	25/0104	1010.5	25/0745	23	28	
Kapalua Aprt. (PHJH)			25/0045	21	29	
Keahole Aprt. Kona (PHKO)	24/0222	1005.4	24/1145	25	31	
Lanai City Aprt. (PHNY)	25/0156	1011.5	24/1551	24	35	
Lihue Aprt. (PHLI)	25/0447	1009.8	25/0200	19	25	
Molokai Aprt. (PHMK)	24/1509	1010.5	24/2300	24	32	
Wheeler Air Force Base (PHHI)	25/0158	1009.1	25/0014	15	26	
Non-METAR Observations						
Honokanaia (HKAH1)			23/1553	21	37	
Kaneloa (KAOH1)			24/0853	24	44	
Kaupo (KPGH1)			24/0435	21	44	
Kealakomo (KMOH1)			23/2244	34	46	
Kohala Ranch (KHRH1)			23/2235	23	49	
Kuaokkala (KKRH1)			24/0336	30	40	
Lanai 1 (LNIH1)			24/0537	26	37	
Makua Ridge (MKGH1)			25/1058	22	37	
Makapulapai (MKPH1)			24/0715	22	34	
Oahu Forest NWR (OFRH1)			24/0436	29	52	
Pali2 (PLIH1)			23/2001	30	46	

PTA Kipuka Alala (PKAH1)			23/2155	19	35	
Puhe CS (PERH1)			23/2324	21	41	
Puu Mali (PMLH1)			23/2200	24	38	
Waikoloa (WKVH1)			23/2035	19	40	
Other						
Aloha Tower (ALOH1) 21.30°N 157.86°W						6.22
Hanalei (HNIH1) 22.20°N 159.50°W						1.50
Kamuela Upper (KUUH1) 20.01°N 155.63°W						6.09
Kawainui Stream (KWSH1) 20.10°N 155.70°W						7.55
Kilohana RG (KLOH1) 21.40°N 157.90°W						5.95
Kula 1 (????) 20.68°N 156.32°W						4.19
Laupahoehoe (LPHH1) 19.98°N 155.23°W						2.57
Mahinahina (MABH1) 20.96°N 156.66°W						1.58
Mililani (MITH1) 21.46°N 158.00°W						2.58
Moanalua (MOGH1) 21.38°N 157.84°W						12.08
Mount Waialeale (WLLH1) 22.10°N 159.50°W						5.37
Mountain View (MTVH1) 19.52°N 155.14°W						4.99
Niu Valley (NIUH1) 21.29°N 157.73°W						2.95
Nuuanu Upper (NUUH1) 21.35°N 157.82°W						11.86
Pahala (PPLH1) 19.20°N 155.00°W						6.32
Punaluu Pump (PUNH1) 21.58°N 157.89°W						6.42
Puu Alii (PAFH1) 21.14°N 156.90°W						4.42
Saddle Road Qry (SDQH1) 19.70°N 155.30°W						6.72
Tunnel RG (TNLH1) 21.40°N 159.66°W						10.19
Waimanalo (WMLH1) 21.34°N 157.71°W						3.07

West Wailuaiki (WWKH1) 20.82°N 156.14°W						9.08

Table 3. Number of hours in advance of formation associated with the first NHC Tropical Weather Outlook forecast in the indicated likelihood category. Note that the timings for the "Low" category do not include forecasts of a 0% chance of genesis.

	Hours Before Genesis	
	48-Hour Outlook	**120-Hour Outlook**
Low (<40%)	42	102
Medium (40%-60%)	30	48
High (>60%)	18	30

Table 4a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Hurricane Darby, 11–25 July 2016. Mean errors for the previous 5-yr period are shown for comparison. NHC official errors that are smaller than the 5-yr means are shown in boldface type.

	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL	**13.7**	**25.1**	**36.3**	**44.1**	**68.0**	**95.8**	**121.9**
OCD5	25.0	53.1	78.2	102.1	153.1	201.3	244.8
Forecasts	36	36	36	36	36	36	35
OFCL (2011-15)	23.4	36.4	47.2	59.4	89.0	123.6	159.5
OCD5 (2011-15)	36.6	74.2	116.5	159.7	245.6	331.1	427.4

Table 4b. Homogeneous comparison of selected track forecast guidance models (in n mi) for Darby for forecasts made in the eastern North Pacific basin. Errors smaller than the NHC official forecast are shown in boldface type. The number of official forecasts shown here will generally be smaller than that show in Table 4a due to the homogeneity requirement.

Model ID	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL	12.3	22.3	36.1	47.0	71.1	91.8	137.4
OCD5	20.2	42.5	64.3	87.8	135.5	196.2	224.2
GFSI	**11.7**	**20.1**	**28.9**	**36.1**	**50.9**	**79.2**	137.8
GHMI	21.3	45.3	65.2	80.4	103.2	145.0	176.9
HWFI	17.4	32.1	47.5	59.7	71.8	**80.8**	**107.5**
EGRI	14.0	28.2	43.9	58.6	87.2	123.2	183.6
EMXI	17.1	29.9	44.4	60.0	92.1	130.6	208.4
CMCI	12.8	23.3	**33.5**	**45.0**	**68.8**	**85.3**	**119.1**
NVGI	15.4	26.5	**35.4**	**44.9**	81.1	160.7	250.3
CTCI	15.9	30.8	44.7	59.9	87.8	115.3	167.0
GFNI	17.4	41.2	63.9	87.6	146.4	210.6	271.1
AEMI	**11.7**	**20.8**	**27.1**	**33.4**	**51.5**	**81.9**	**129.8**
FSSE	**10.7**	**20.8**	**33.8**	**44.0**	**64.9**	**87.7**	**129.9**
TVCX	12.7	24.6	36.7	48.2	**67.1**	**88.5**	**129.0**
GFEX	12.4	22.8	**34.2**	**44.5**	**67.6**	97.9	161.5
TCON	12.3	24.7	36.8	47.1	**58.1**	**72.0**	**99.3**
TVCE	12.4	24.3	37.0	48.5	**64.5**	**83.3**	**119.4**
BAMS	28.4	51.0	76.5	100.2	138.7	153.3	152.3
BAMM	27.0	52.8	78.7	106.8	162.7	200.2	220.9
BAMD	28.4	58.2	90.1	124.0	205.0	307.9	427.3
Forecasts	27	27	27	27	27	27	21

Table 5a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Hurricane Darby, 11–25 July 2016. Mean errors for the previous 5-yr period are shown for comparison. NHC official errors that are smaller than the 5-yr means are shown in boldface type.

Model ID	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL	**5.7**	**7.9**	**8.9**	**9.0**	**12.1**	**15.6**	**14.9**
OCD5	6.9	10.6	14.8	17.7	21.7	20.1	15.3
Forecasts	36	36	36	36	36	36	35
OFCL (2011-15)	5.9	9.8	12.5	14.0	15.5	16.3	14.9
OCD5 (2011-15)	7.7	12.8	16.4	18.8	21.1	20.9	19.7

Table 5b. Homogeneous comparison of selected intensity forecast guidance models (in kt) for Darby for forecasts made in the eastern North Pacific basin. Errors smaller than the NHC official forecast are shown in boldface type. The number of official forecasts shown here will generally be smaller than that shown in Table 5a due to the homogeneity requirement.

Model ID	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL	5.4	6.9	7.2	8.3	13.3	15.4	11.5
OCD5	6.5	8.3	11.7	15.2	20.3	18.0	11.1
HWFI	7.4	**6.3**	**5.9**	**7.0**	**11.7**	**11.7**	**10.2**
GHMI	8.3	10.8	12.0	13.2	15.6	16.3	18.0
DSHP	6.1	7.4	9.1	11.8	17.4	18.8	13.1
LGEM	6.7	8.9	11.4	13.9	18.0	18.4	13.2
GFNI	8.2	11.8	13.3	13.4	17.1	22.1	25.5
IVCN	6.2	**6.5**	8.0	9.8	**13.1**	**14.6**	13.0
GFSI	**5.0**	**5.9**	**6.9**	8.4	**12.5**	**14.5**	14.4
EMXI	5.5	8.1	10.0	12.7	18.0	19.8	20.6
FSSE	6.5	7.6	7.9	9.4	14.6	19.0	16.4
CTCI	7.5	9.9	11.7	12.9	15.1	18.9	19.8
Forecasts	27	27	27	27	27	26	20

Table 6a. CPHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Darby. Mean errors for the previous available 5-yr period are shown for comparison. Official track forecast errors that are smaller than the 5-yr mean intensity errors are shown in bold face type.

Model ID	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL	**21.6**	**30.4**	**47.4**	**64.0**	**113.3**	196.9	-
OCD5	34.6	57.1	80.4	100.4	136.9	117.0	-
Forecasts	17	15	13	11	7	3	0
OFCL (2010-14)	27.9	44.1	56.7	73.9	132.3	183.7	258.9

Table 6b. Homogeneous comparison of selected track forecast guidance models (in n mi) for Darby for forecasts made in the central North Pacific basin. Errors smaller than the CPHC official forecast are shown in boldface type.

Model ID	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL	21.6	30.4	47.4	64.0	113.3	196.9	-
OCD5	34.6	57.1	80.4	100.4	136.9	**117.0**	-
GFSI	**21.3**	38.7	59.0	89.9	166.4	262.2	-
HWFI	**20.2**	**28.9**	**40.0**	**51.0**	113.9	229.2	-
EGRI	**20.4**	**29.1**	**34.0**	**33.2**	**43.0**	**66.6**	-
EMXI	**19.5**	**23.5**	**33.1**	**45.3**	**69.1**	**145.8**	-
CMCI	24.3	**22.8**	**36.3**	**48.4**	**29.0**	**72.0**	-
CTCI	24.7	39.8	**42.6**	**53.6**	**105.1**	**205.2**	-
AEMI	**19.8**	36.7	52.6	73.9	130.3	**189.6**	-
FSSE	**19.6**	**28.9**	**44.0**	**61.4**	**111.2**	**182.3**	-
TVCX	**19.1**	**27.3**	**40.7**	**56.5**	**111.1**	**187.4**	-
GFEX	**18.9**	**27.5**	**40.2**	**61.3**	114.0	199.2	-
TCON	**20.3**	32.7	48.8	69.6	136.7	210.3	-
TVCE	**19.2**	**29.1**	**43.8**	**60.9**	121.6	**196.6**	-
BAMS	34.0	53.8	71.7	92.6	166.8	287.3	-
BAMM	31.4	41.3	60.7	85.3	130.8	256.7	-
BAMD	31.4	54.8	93.7	137.6	229.0	362.4	-
Forecasts	17	15	13	11	7	3	0

Table 7a. CPHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Darby. Mean errors for the previous available 5-yr period are shown for comparison. Official intensity forecast errors that are smaller than the 5-yr mean intensity errors are shown in boldface type.

Model ID	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL	4.7	**6.3**	**8.1**	**10.9**	19.3	**16.7**	**-**
OCD5	4.2	6.7	8.3	9.8	7.4	6.0	-
Forecasts	17	15	13	11	7	3	0
OFCL (2010-14)	4.8	8.6	11.6	13.8	18.5	19.3	20.4

Table 7b. Homogeneous comparison of selected intensity forecast guidance models (in kt) for Darby for forecasts made in the eastern North Pacific basin. Errors smaller than the CPHC official forecast are shown in boldface type.

Model ID	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL	4.7	6.3	8.1	10.9	19.3	16.7	-
OCD5	**4.2**	6.7	8.3	**9.8**	**7.4**	**6.0**	-
HWFI	**4.6**	**5.7**	**7.2**	11.6	**18.3**	30.3	-
DSHP	5.4	**5.6**	**6.6**	**7.7**	**7.7**	**3.0**	-
LGEM	5.1	**5.5**	**6.3**	**8.1**	**10.3**	**4.7**	-
IVCN	4.8	**5.4**	**7.9**	**10.3**	**16.4**	17.0	-
GFSI	**4.1**	6.7	8.1	10.9	**18.7**	27.3	-
EMXI	**4.0**	**4.3**	**5.8**	**7.1**	**13.7**	**14.7**	-
FSSE	4.8	6.9	10.2	13.7	20.1	19.3	-
Forecasts	17	15	13	11	7	3	0

Table 8. Wind watch and warning summary for Darby, 11–25 July 2016.

Date/Time (UTC)	Action	Location
21 / 2100	Tropical Storm Watch issued	Big Island of Hawaii, Maui, Molokai, Lanai, and Kahoolawe
22 / 0900	Tropical Storm Warning issued	Big Island of Hawaii
22 / 2100	Tropical Storm Warning issued	Maui, Molokai, Lanai, and Kahoolawe
23 / 0300	Tropical Storm Watch issued	Oahu
23 / 1500	Tropical Storm Warning issued	Oahu
23 / 1500	Tropical Storm Watch issued	Kauai and Niihau
24 / 0300	Tropical Storm Warning issued	Kauai and Niihau
24 / 1500	Tropical Storm Warning discontinued	Big Island of Hawaii
25 / 1200	Tropical Storm Warning discontinued	Maui, Molokai, Lanai, and Kahoolawe
25 / 1200	Tropical Storm Warning discontinued	Oahu, Kauai and Niihau

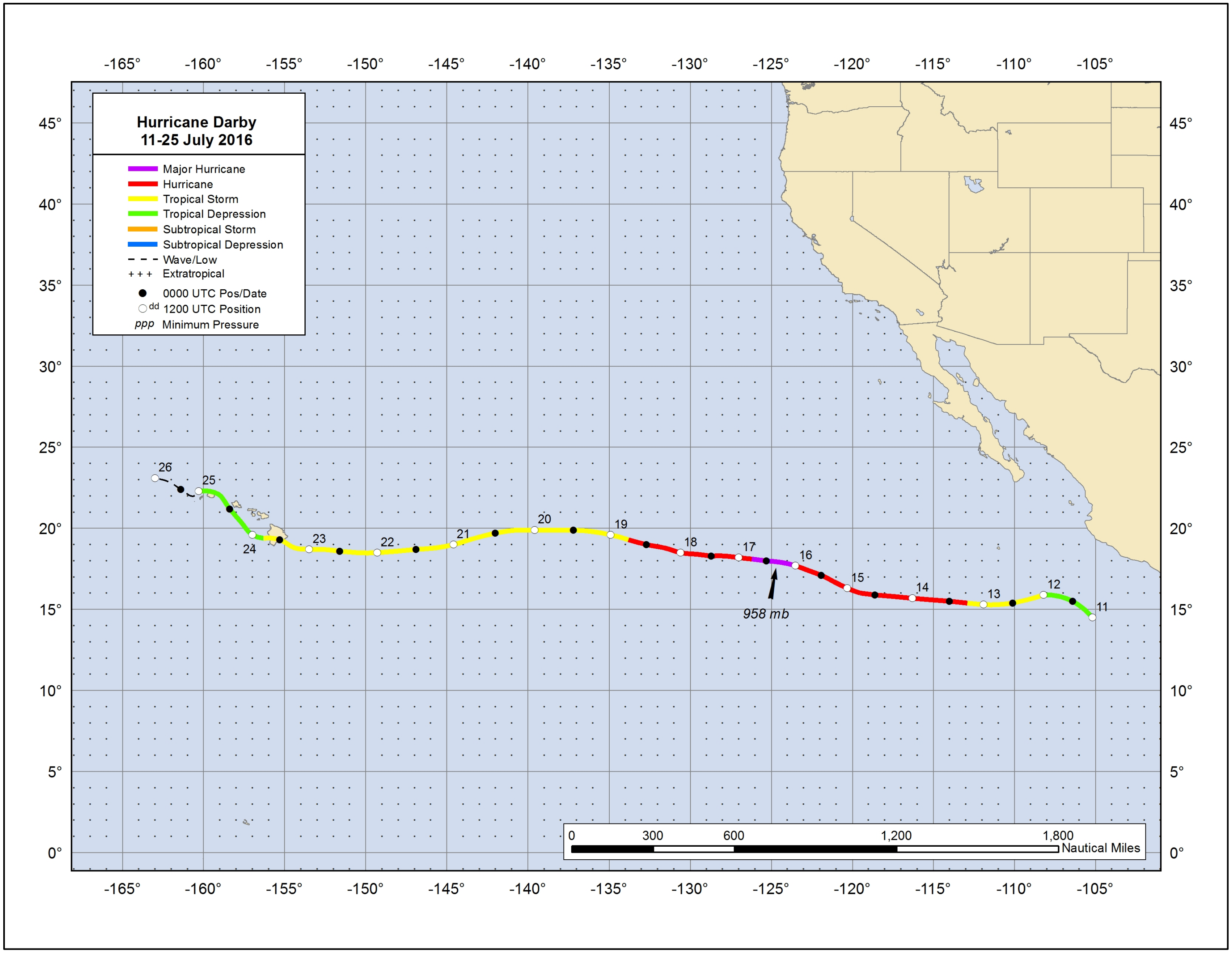

Figure 1. Best track positions for Hurricane Darby, 11–25 July 2016.

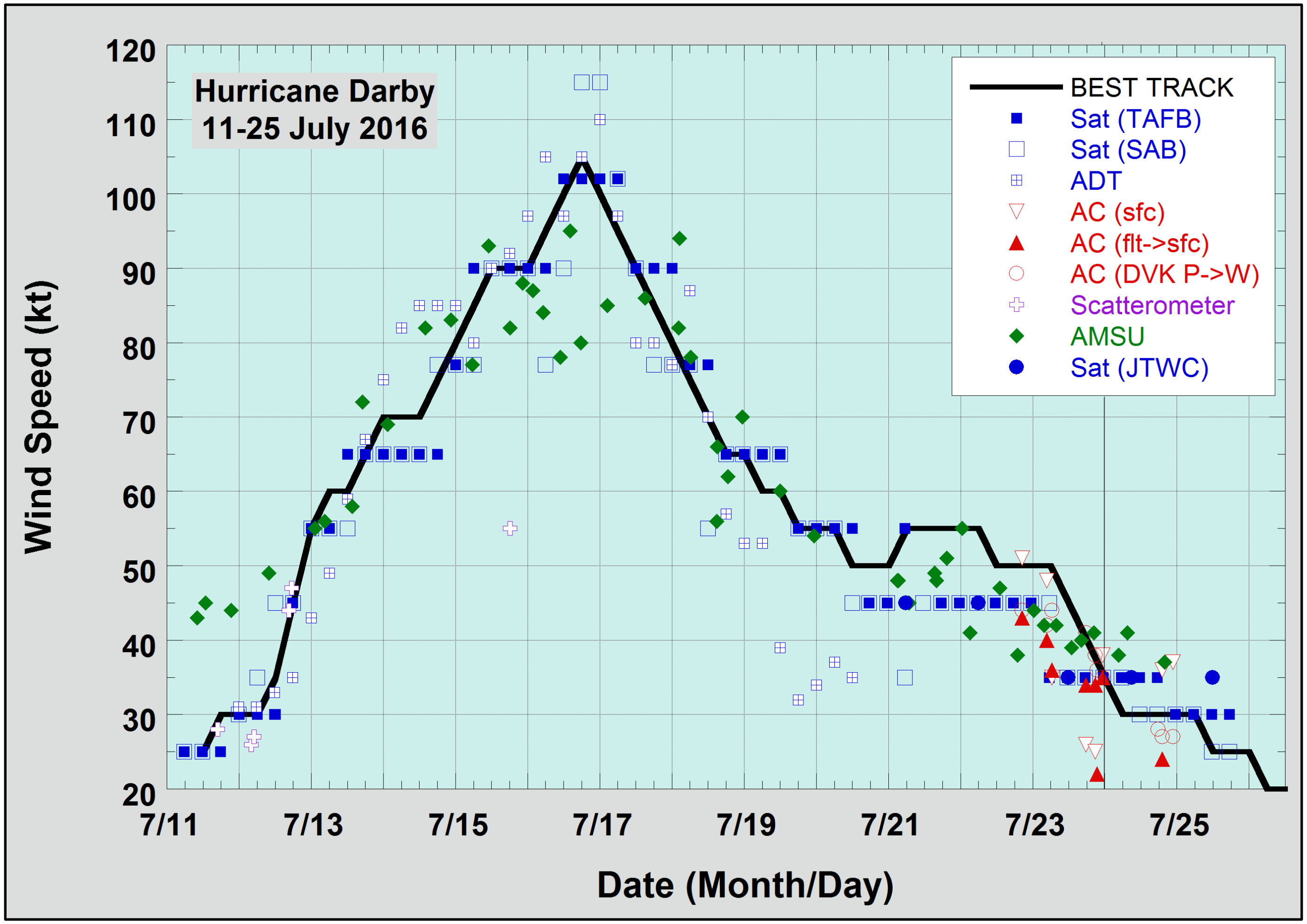

Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Hurricane Darby, 11–25 July 2016. Aircraft observations have been adjusted for elevation using a 90% adjustment factor for observations from 700 mb. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. AMSU intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies technique. Dashed vertical lines correspond to 0000 UTC. Solid vertical line corresponds to landfall.

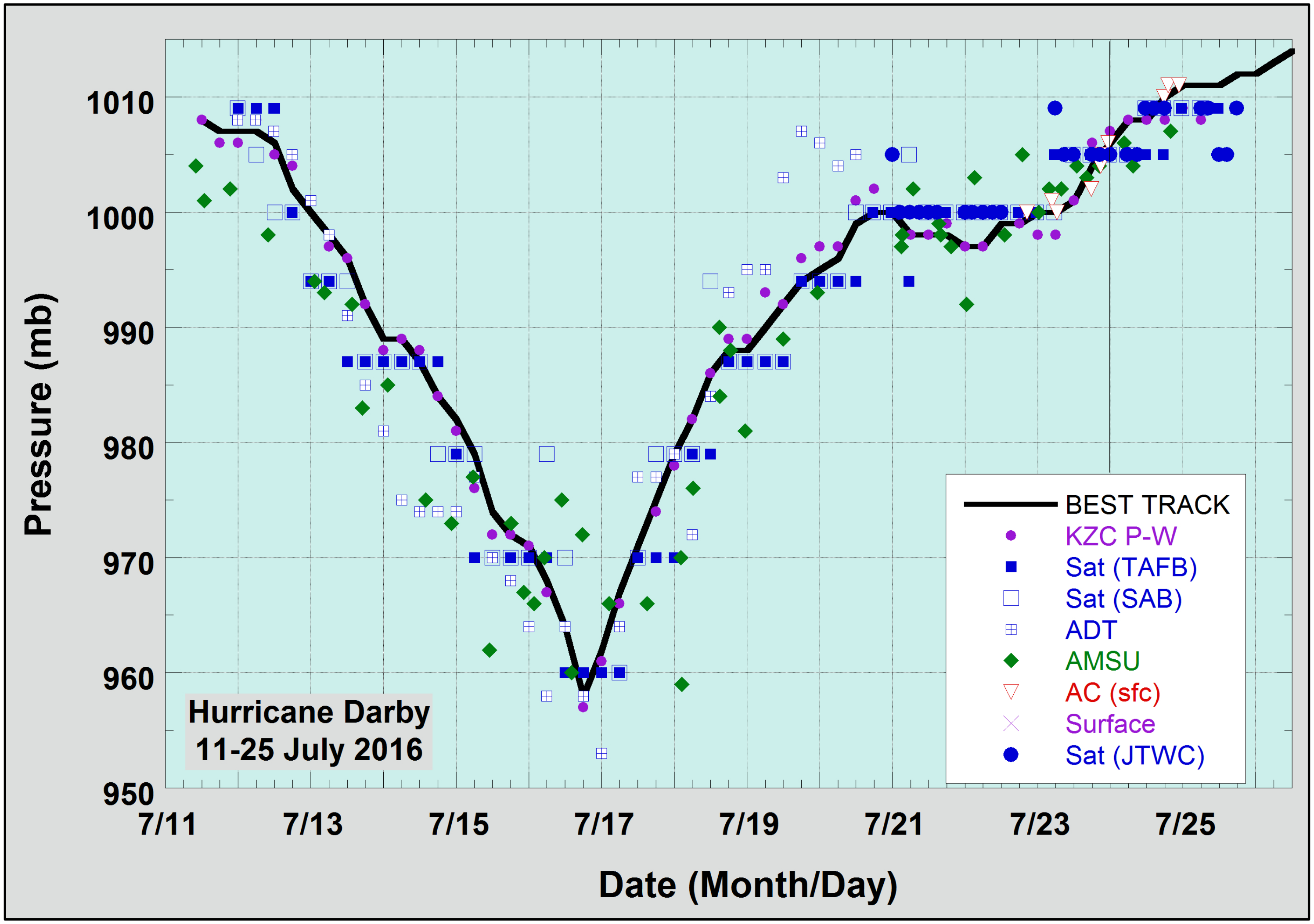

Figure 3 Selected pressure observations and best track minimum central pressure curve for Hurricane Darby, 11–25 July 2016. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. AMSU intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies technique. KZC P-W refers to pressure estimates derived using the Knaff-Zehr-Courtney pressure-wind relationship. Dashed vertical lines correspond to 0000 UTC. Solid vertical line corresponds to landfall.