

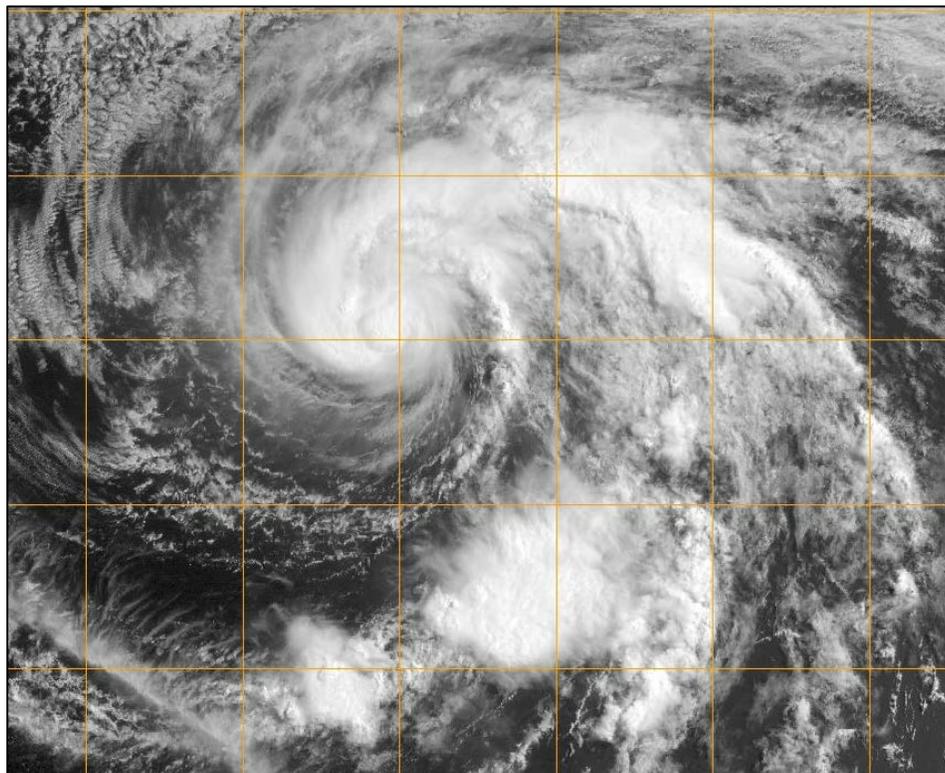


NATIONAL HURRICANE CENTER TROPICAL CYCLONE REPORT

TROPICAL STORM ENRIQUE (EP062015)

12 – 18 July 2015

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National Hurricane Center
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GOES 15 VISIBLE SATELLITE IMAGE OF ENRIQUE NEAR PEAK INTENSITY AT 1745 UTC 14 JULY

Enrique was a tropical storm that remained over the open waters of the eastern North Pacific Ocean.

Tropical Storm Enrique

12 – 18 JULY 2015

SYNOPTIC HISTORY

The development of Enrique appears to have resulted from the combination of a tropical wave and a pre-existing trough of low pressure within the eastern Pacific Intertropical Convergence Zone. The tropical wave crossed the west coast of Africa on 27 June, and moved through the tropical Atlantic and Caribbean Sea with limited shower activity. The wave crossed Central America and entered the eastern North Pacific Ocean on 6 July, where it encountered the favorable phase of a Madden-Julian Oscillation; it then moved westward well south of the coast of Mexico with some increase in thunderstorm activity over the next several days. On 9 July, the wave approached a trough of low pressure located about 1000 n mi southwest of the southern tip of the Baja California peninsula. Shower and thunderstorm activity associated with the trough increased and a broad area of low pressure formed the following day. On 11 July, as the tropical wave continued westward away from the broad low, the low's circulation gradually became better defined. Thunderstorm activity became better organized the next day and the low acquired a well-defined circulation, marking the formation of a tropical depression at 1200 UTC 12 July about 1040 n mi west-southwest of the southern tip of the Baja California peninsula. 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 1¹.

Convective banding associated with the depression gradually increased while the system moved slowly north-northwestward. The cyclone strengthened and became a tropical storm at 0600 UTC 13 July, and turned west-northwestward to the south of a narrow mid-level ridge shortly thereafter. The tropical storm continued moving slowly west-northwestward to the south of the ridge during the next several days. After reaching tropical storm strength, the cyclone's primary convective band became fragmented, apparently the result of dry and stable air to the northwest of the cyclone being entrained into the circulation. On 14 July, within an environment of low vertical wind shear and sea surface temperatures of 27°C, convection increased near the center and became better organized. Enrique strengthened and reached its estimated peak intensity of 45 kt (cover photo) at 1800 UTC 14 July. Early the next day, increasing south-southwesterly vertical wind shear caused the circulation to become tilted, with the low-level center located near the southern edge of the deep convection. The tropical cyclone weakened and Enrique's maximum winds decreased to 35 kt by 1800 UTC 15 July.

Enrique maintained tropical storm strength for the next day or so while it moved over cooler waters and the deep convection gradually decreased in coverage. The forward motion of the tropical cyclone slowed during this time as the ridge to its north weakened. Enrique became a

¹ 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 *bt* directory, while previous years' data are located in the *archive* directory.

tropical depression at 1200 UTC 17 July, and the forward speed of the cyclone further decreased as the large circulation of Hurricane Dolores, located several hundred n mi east of Enrique, caused the low-level steering flow to weaken. Enrique drifted westward and then southward late on 17 July as the remaining deep convection dissipated. Enrique degenerated to a remnant low about 1540 n mi west of the southern tip of the Baja California peninsula at 1200 UTC 18 July. The low drifted southeastward, then eastward, and completed a counterclockwise loop during the next 48 h while continuing to spin down. On 20 July, the low turned northward, then north-northwestward at a faster forward speed before opening into a trough of low pressure about 1575 n mi west of the southern tip of the Baja California peninsula by 0000 UTC 22 July.

METEOROLOGICAL STATISTICS

Observations in Enrique (Figs. 2 and 3) include subjective satellite-based Dvorak technique intensity estimates from the Tropical Analysis and Forecast Branch (TAFB) and the Satellite Analysis Branch (SAB), and objective Advanced Dvorak Technique (ADT) estimates from the Cooperative Institute for Meteorological Satellite Studies/University of Wisconsin-Madison (UW/CIMSS). Data and imagery from NOAA polar-orbiting satellites including the Advanced Microwave Sounding Unit (AMSU), the NASA Global Precipitation Mission (GPM), 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 Enrique.

The 45-kt estimated maximum intensity of Enrique between 1800 UTC 14 July and 0600 UTC 15 July is based on Dvorak intensity estimates of T3.0 or 45 kt from TAFB and SAB, and UW/CIMSS ADT estimates of T3.0 at 0600 UTC 15 July.

There were no ship reports of winds of tropical storm force or greater in association with Enrique.

CASUALTY AND DAMAGE STATISTICS

There were no reports of damage or casualties associated with Enrique.

FORECAST AND WARNING CRITIQUE

The genesis of Enrique was very well predicted. The system from which Enrique formed was first assigned a low chance (<40%) of formation during the next 5 days at 0600 UTC 8 July, about 102 h before development occurred. The five-day formation potential was raised to the medium category (40-60%) 84 h before genesis, and to the high category (>60%) a little more

than 3 days before development occurred. The 48-hour probability of development reached the medium category about 60 h before development, and the system was assessed a high chance of formation during the next 2 days about 48 h before genesis took place. Table 2 shows the number of hours in advance of formation that the NHC Tropical Weather Outlook first showed the indicated likelihood category.

A verification of NHC official track forecasts for Enrique is given in Table 3a. Official forecast track errors were much lower than the mean official errors for the previous 5-yr period. The medium to long-range (48 to 120 h) forecasts were between 27% and 44% lower than 5-yr mean track errors. A homogeneous comparison of the official track errors with selected guidance models is given in Table 3b. The NHC forecasts were better than much of the model guidance. The TVCE consensus aid was the only guidance model that exhibited lower average track errors than the official forecast at more than two forecast times (12, 24, 72, 96, and 120 h). The HWFI performed well for Enrique, especially at the longer lead times where it beat the NHC forecasts at 96 and 120 h.

A verification of NHC official intensity forecasts for Enrique is given in Table 4a. Official forecast intensity errors were much lower than the mean official errors for the previous 5-yr period. A homogeneous comparison of the official intensity errors with selected guidance models is given in Table 4b. Both the NHC forecasts and the intensity models accurately predicted that Enrique would not significantly strengthen. The GFDL model (GHMI) exhibited slightly lower average errors than the NHC forecast through 48 hours, while the ICON and IVCN intensity consensus aids had lower errors at 24, 48, 72, 96, and 120 h.

There were no watches or warnings for any land areas in association with Enrique.

ACKNOWLEDGEMENT

Andrew Latto of NHC's Tropical Analysis and Forecast Branch (TAFB) assisted with the quality control of the satellite fix data.



Table 1. Best track for Tropical Storm Enrique, 12-18 July 2015.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
12 / 1200	13.1	125.0	1005	30	tropical depression
12 / 1800	13.5	125.5	1005	30	"
13 / 0000	14.0	125.8	1005	30	"
13 / 0600	14.7	126.1	1004	35	tropical storm
13 / 1200	15.6	126.5	1004	35	"
13 / 1800	16.3	127.2	1004	35	"
14 / 0000	16.7	128.0	1003	35	"
14 / 0600	17.1	128.7	1002	40	"
14 / 1200	17.5	129.4	1001	40	"
14 / 1800	17.9	130.1	1000	45	"
15 / 0000	18.2	130.9	1000	45	"
15 / 0600	18.5	131.8	1001	45	"
15 / 1200	18.8	132.6	1003	40	"
15 / 1800	19.0	133.3	1004	35	"
16 / 0000	19.1	134.0	1004	35	"
16 / 0600	19.3	134.7	1004	35	"
16 / 1200	19.7	135.3	1004	35	"
16 / 1800	20.1	135.7	1005	35	"
17 / 0000	20.4	136.1	1006	35	"
17 / 0600	20.5	136.5	1006	35	"



17 / 1200	20.5	136.8	1006	30	tropical depression
17 / 1800	20.5	137.0	1007	30	"
18 / 0000	20.4	137.2	1007	30	"
18 / 0600	20.2	137.3	1007	30	"
18 / 1200	20.0	137.4	1007	30	low
18 / 1800	19.8	137.3	1008	25	"
19 / 0000	19.6	137.0	1008	25	"
19 / 0600	19.5	136.7	1008	25	"
19 / 1200	19.5	136.6	1008	25	"
19 / 1800	19.6	136.4	1008	20	"
20 / 0000	19.8	136.2	1008	20	"
20 / 0600	20.0	136.1	1008	20	"
20 / 1200	20.4	136.2	1008	20	"
20 / 1800	20.9	136.4	1008	20	"
21 / 0000	21.3	136.6	1008	20	"
21 / 0600	21.7	137.0	1010	20	"
21 / 1200	22.1	137.6	1010	20	"
21 / 1800	22.4	138.5	1010	20	"
22 / 0000					dissipated
14 / 1800	17.9	130.1	1000	45	minimum pressure and maximum winds



Table 2. 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%)	84	102
Medium (40%-60%)	60	84
High (>60%)	48	78



Table 3a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Tropical Storm Enrique, 12-18 July 2015. Mean errors for the previous 5-yr period are shown for comparison. 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	21.6	31.9	37.1	40.1	50.1	70.3	116.1
OCD5	32.6	61.8	83.6	98.5	136.2	153.3	179.1
Forecasts	22	20	18	16	12	8	4
OFCL (2010-14)	23.4	36.4	47.2	59.4	89.0	123.6	159.5
OCD5 (2010-14)	36.6	74.2	116.5	159.7	245.6	331.1	427.4



Table 3b. Homogeneous comparison of selected track forecast guidance models (in n mi) for Tropical Storm Enrique, 12-18 July 2015. 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 3a due to the homogeneity requirement.

Model ID	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL	21.1	30.8	36.0	38.0	46.2	61.4	103.5
OCD5	33.4	61.6	83.6	98.3	138.0	157.0	176.9
GFSI	20.7	29.7	39.3	51.2	61.7	100.0	153.0
GHMI	26.2	37.7	42.6	47.7	62.6	88.1	153.7
HWFI	23.2	31.6	36.5	44.1	52.5	54.0	80.8
EMXI	21.6	40.7	54.5	61.3	90.9	121.4	148.1
CMCI	23.4	38.0	39.9	51.0	71.8	75.7	116.7
AEMI	20.6	29.3	38.1	49.8	77.7	116.2	144.2
FSSE	19.6	30.2	38.9	45.5	55.6	70.7	88.2
TVCE	19.7	28.7	37.2	41.9	44.0	57.0	82.6
LBAR	34.9	56.5	71.7	89.3	125.4	150.4	198.0
BAMS	27.6	43.2	56.7	67.3	93.7	119.0	158.2
BAMM	31.3	45.4	58.8	60.8	65.8	74.3	70.0
BAMD	44.8	74.3	100.1	115.0	142.6	171.9	159.4
Forecasts	21	19	17	15	11	7	3



Table 4a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Tropical Storm Enrique, 12-18 July 2015. Mean errors for the previous 5-yr period are shown for comparison. 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	3.6	6.0	4.4	5.6	5.0	2.5	5.0
OCD5	4.3	6.1	7.3	6.1	4.7	5.3	15.0
Forecasts	22	20	18	16	12	8	4
OFCL (2010-14)	5.9	9.8	12.5	14.0	15.5	16.3	14.9
OCD5 (2010-14)	7.7	12.8	16.4	18.8	21.1	20.9	19.7

Table 4b. Homogeneous comparison of selected intensity forecast guidance models (in kt) for Tropical Storm Enrique, 12-18 July 2015. 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 4a due to the homogeneity requirement.

Model ID	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL	3.6	6.1	3.5	3.6	5.0	2.5	5.0
OCD5	4.2	6.3	6.5	5.9	5.4	5.5	14.3
HWFI	4.0	4.7	4.0	3.5	5.4	3.3	6.7
GHMI	3.3	2.9	3.2	3.3	6.3	6.8	7.3
DSHP	4.7	9.0	7.5	7.2	10.3	7.3	7.3
LGEM	4.9	6.8	6.8	7.2	6.4	9.3	7.7
ICON	3.9	5.2	4.3	2.5	3.3	2.0	1.7
IVCN	3.9	5.2	4.3	2.5	3.3	2.0	1.7
GFSI	4.2	5.7	6.0	5.1	2.9	3.0	1.7
EMXI	4.2	5.3	6.9	6.3	4.7	3.0	4.0
FSSE	4.1	5.4	4.5	4.5	7.0	3.3	3.0
Forecasts	21	19	13	11	7	4	3

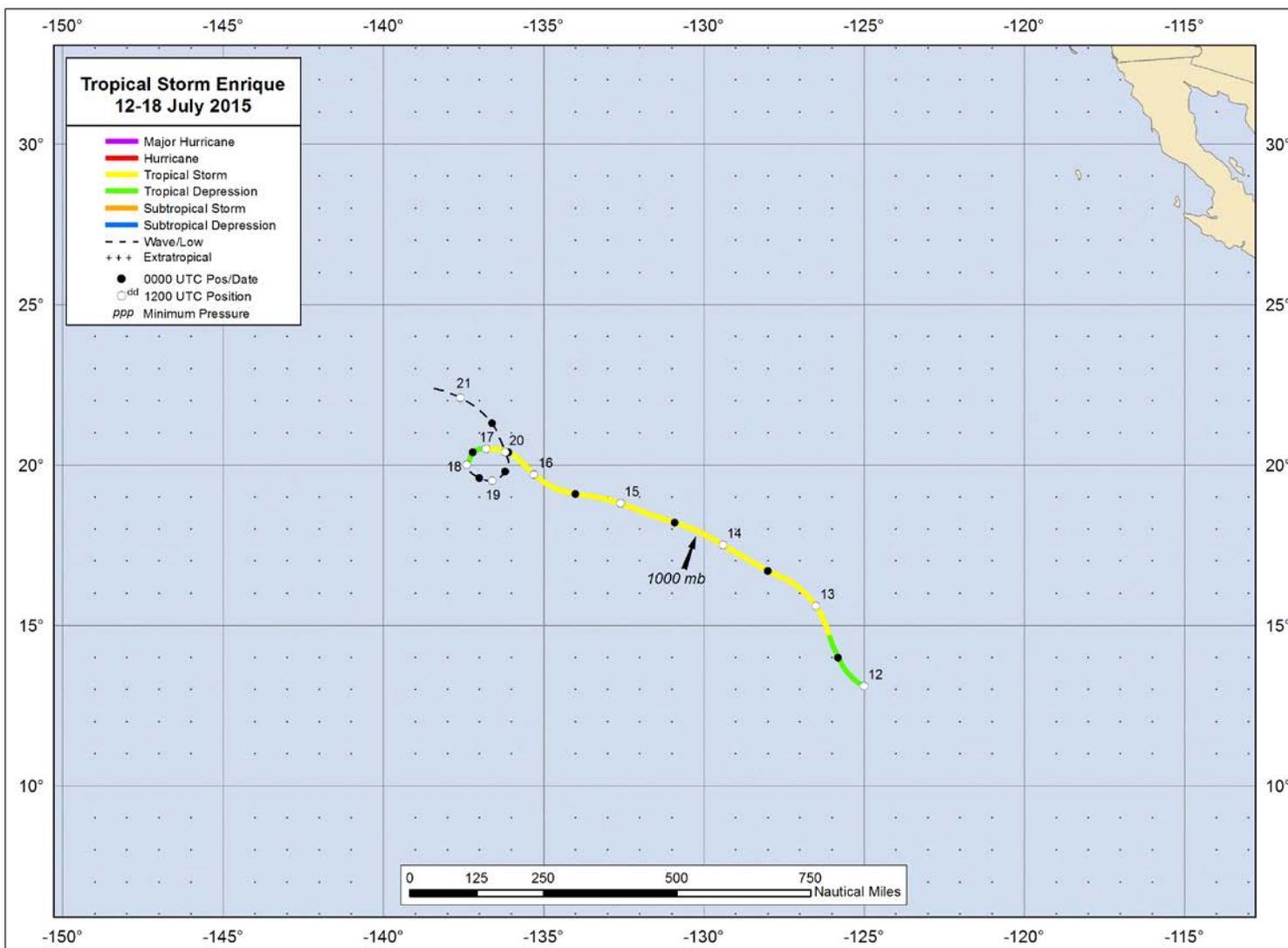


Figure 1. Best track positions for Tropical Storm Enrique, 12-18 July 2015.

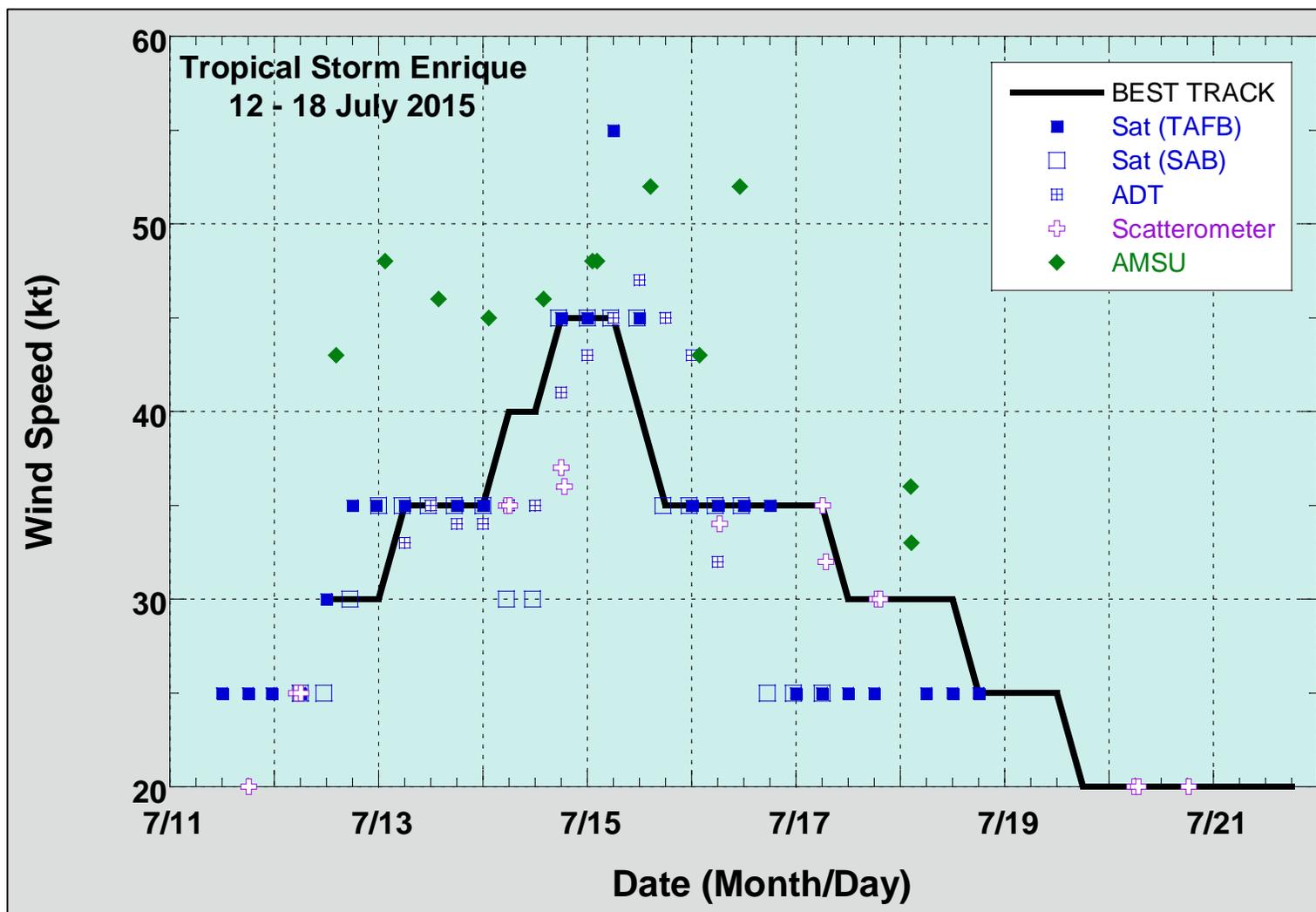


Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Tropical Storm Enrique, 12-18 July 2015. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. AMSU intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies technique. Dashed vertical lines correspond to 0000 UTC.

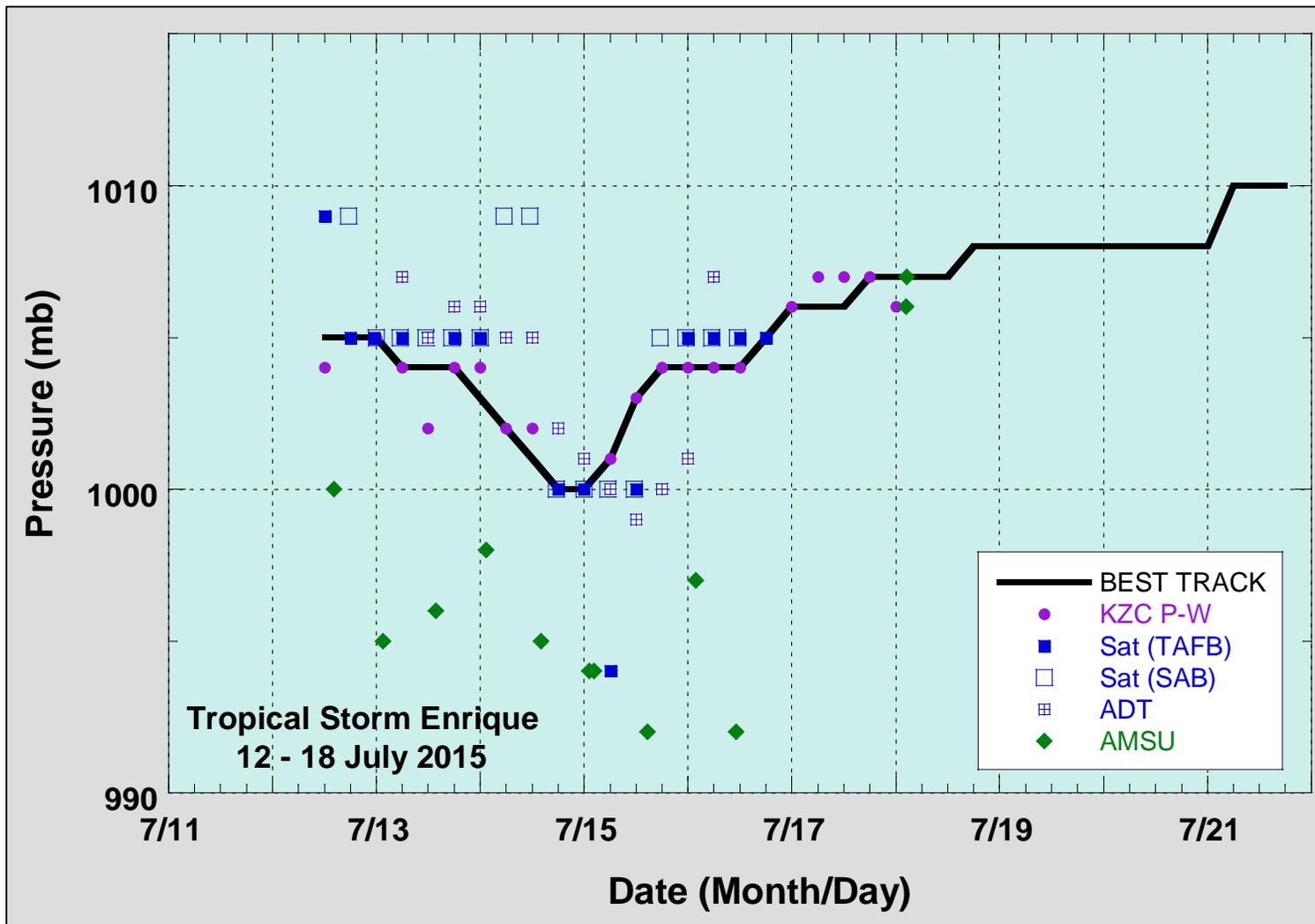


Figure 3. Selected pressure observations and best track minimum central pressure curve for Tropical Storm Enrique, 12-18 July 2015. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. AMSU intensity estimates are from the Cooperative Institute for Meteorological 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.