



NATIONAL HURRICANE CENTER CENTRAL PACIFIC HURRICANE CENTER TROPICAL CYCLONE REPORT



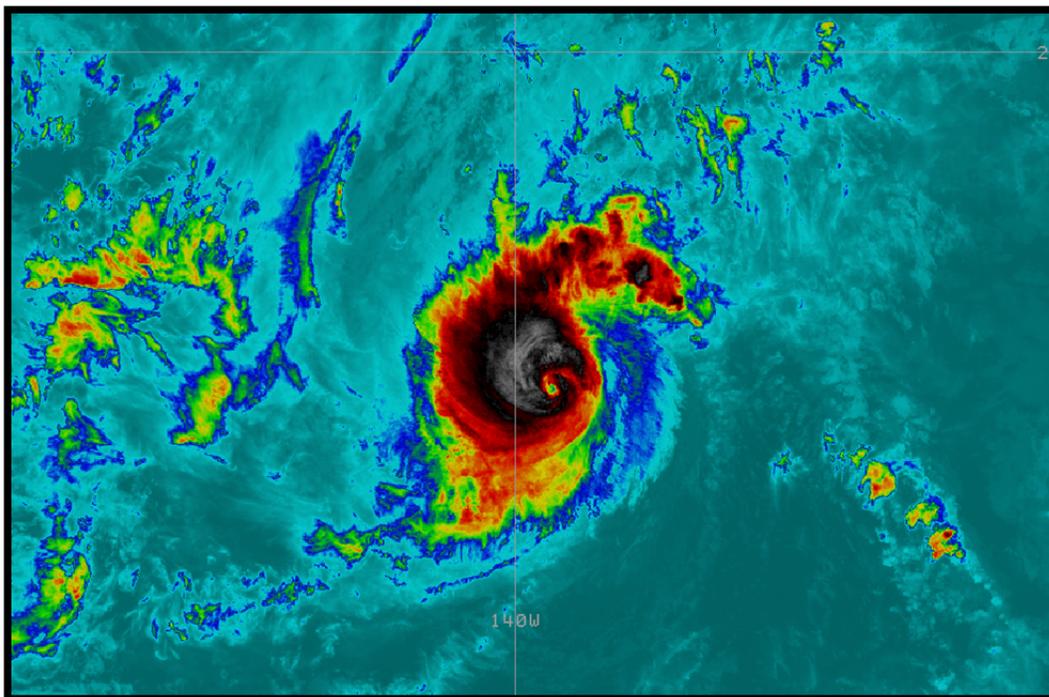
HURRICANE HENRIETTE (EP082013)

3 – 11 August 2013

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SUOMI NPP VIIRS INFRARED IMAGE OF HURRICANE HENRIETTE AT 2226 UTC ON 8 AUGUST 2013 (COURTESY OF UW-CIMSS)

Henriette was a small hurricane that formed over the eastern North Pacific Ocean and reached category 2 intensity (on the Saffir-Simpson Hurricane Wind Scale) just before moving into the central Pacific basin. Henriette ultimately dissipated several hundred miles southwest of Hawaii.

Hurricane Henriette

3 – 11 AUGUST 2013

SYNOPTIC HISTORY

A large tropical wave that moved off the coast of Africa on 19 July appears to have had some role in the formation of Henriette. The wave fractured after emerging over the eastern Atlantic Ocean, and the faster-moving southern portion moved quickly westward across the tropical Atlantic, producing very little shower and thunderstorm activity. The wave reached northern South America on 23 July and moved over the eastern North Pacific on 26 July, at which point it began to produce more significant deep convection.

The low-amplitude wave was embedded within the Intertropical Convergence Zone for several days while it moved westward, trailing not too far behind the disturbance that eventually became Hurricane Gil. The system became a little better organized on 31 July; however showers and thunderstorms were intermittent near the disturbance for several more days. A low formed along the wave axis on 2 August, and deep convection became organized and persistent near the low center on 3 August, leading to the formation of a tropical depression at 1200 UTC. The depression gradually gained additional organization and became a tropical storm at 0000 UTC 4 August while centered about 1025 n mi southwest of the southern tip of the Baja California peninsula. The “best track” chart of Henriette’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.

Soon after becoming a tropical storm, Henriette moved slowly west-southwestward and southwestward for almost a day due to strong high pressure to its north. The cyclone turned back toward the west and northwest on 5 and 6 August, moving around the western periphery of a mid-level ridge. Henriette gradually intensified over warm water, becoming a hurricane by 0600 UTC 6 August while centered about 1300 n mi west-southwest of the southern tip of the Baja California peninsula. Henriette is estimated to have attained maximum winds of 80 kt by 1800 UTC that same day, and it maintained that intensity until early on 8 August. Then, despite moving over sub-26°C water and into a more stable environment, Henriette unexpectedly strengthened a little more, reaching a peak intensity of 90 kt at 1800 UTC 8 August while centered about 935 n mi east of Hilo, Hawaii.

Henriette crossed 140°W into the central Pacific basin between 0000 UTC and 0600 UTC 9 August while weakening rapidly to a minimal hurricane. Henriette was the third tropical cyclone to cross over from the eastern Pacific basin in 2013, following Flossie and Gil. Although the shear was relatively low on 9-11 August, Henriette continued to weaken over sub-27°C waters, becoming a tropical storm by 1200 UTC 9 August. Southerly shear began to increase

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.

after 0600 UTC 11 August as the cyclone continued moving to the west-southwest along the southern periphery of strengthening deep-layer high pressure, and Henriette became a depression by 1200 UTC 11 August as it passed about 330 n mi south of South Point on the Big Island of Hawaii. The cyclone degenerated to a remnant low within the increasing shear environment even after water temperatures warmed on 11 August, and the low dissipated at 0000 UTC 12 August about 470 n mi southwest of Kailua-Kona, Hawaii.

METEOROLOGICAL STATISTICS

Observations in Henriette (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 (HFO), and the Joint Typhoon Warning Center (JTWC), and objective Advanced Dvorak Technique (ADT) estimates from the Cooperative Institute for Meteorological Satellite Studies/University of Wisconsin-Madison. 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 Henriette.

Henriette's estimated peak intensity of 90 kt at 1800 UTC 8 August is based on subjective Dvorak satellite intensity estimates of T5.0 (90 kt) from TAFB and SAB. Because Henriette had a small tropical-storm-force wind field, its estimated minimum central pressure of 976 mb, based on the Knaff-Zehr-Courtney pressure-wind relationship, is higher than that of a typical 90-kt hurricane.

There were no ship reports of winds of tropical storm force associated with Henriette.

CASUALTY AND DAMAGE STATISTICS

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

FORECAST AND WARNING CRITIQUE

The genesis of Henriette was not particularly well forecast. The disturbance that became Henriette was first introduced into the 48-h Tropical Weather Outlook at 1800 UTC 30 July (90 h before genesis) and given a low chance (< 30%) of tropical cyclone formation. The probability of genesis was then raised to a high chance (> 50%) at 0000 UTC 31 July, 3.5 days before the disturbance became a tropical depression. However, genesis probabilities were

lowered to a medium chance (30-50%) for several days beginning at 1200 UTC 31 July and were never raised back to high before the system became a tropical depression.

A verification of NHC official track forecasts for Henriette is given in Table 2a. Official forecast track errors were lower than the mean official errors for the previous 5-yr period at all forecast times. A homogeneous comparison of the official track errors with selected guidance models is given in Table 2b. In general, NHC official track forecasts had average errors lower than the individual track models. However, the multi-model variable consensus TVCE had the lowest track errors, beating the official forecast average errors at all forecast times except 96 h (where the track errors were comparable).

A verification of NHC official intensity forecasts for Henriette is given in Table 3a. Official forecast intensity errors were lower than the mean official errors for the previous 5-yr period for the 24- through 72-h forecast times and were comparable at 96 h. A homogeneous comparison of the official intensity errors with selected guidance models is given in Table 3b. NHC official intensity forecasts had lower average errors than all of the individual models and consensus at the short-term (12- and 24-h) forecast times, but nearly all of the models and consensus had lower average errors than the official forecasts at the long-term (96- and 120-h) forecast times. The NHC official intensity forecasts tended to have a low bias and were not able to accurately predict when a peak in intensity would occur. For example, the first few forecasts after genesis showed Henriette peaking in strength in about 48 h as a tropical storm. However, the cyclone actually reached its peak intensity five days after genesis as a category 2 hurricane, resulting in higher-than-normal average errors at 96 and 120 h.

A verification of CPHC official track forecasts for Henriette is given in Table 4. No 72-, 96-, or 120-h forecast verification points are available, so the forecast verification sample size of CPHC forecasts for this system is quite small. The CPHC official track forecasts had lower average errors than the medium-layer and deep-layer Beta and Advection models (BAMM and BAMD, respectively) track models at all available times, as well as the Geophysical Fluid Dynamics Laboratory model (GFDL) through 24 h. However, Global Forecast System (GFS) and shallow-layer Beta and Advection model (BAMS) had lower average errors than the CPHC track forecasts. CPHC track forecasts had lower errors than the Canadian dynamical model (CMC), but larger errors than the European Centre for Medium-Range Weather Forecasting model (EMXI) and the consensus models (TVCE and AEMI). The Henriette best track had only twelve points west of 140°W, enough for only two 48-h verification points.

A verification of CPHC official intensity forecasts for Henriette is given in Table 5. The CPHC official intensity forecasts had lower average errors than all intensity models at all forecast times, except for LGEM at 48 h.

There were no coastal watches or warnings issued in association with Henriette.



Table 1. Best track for Hurricane Henriette, 3 – 11 August 2013.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
02 / 0000	12.7	116.8	1009	25	low
02 / 0600	12.7	117.6	1009	25	"
02 / 1200	12.8	118.5	1009	25	"
02 / 1800	12.9	119.5	1009	25	"
03 / 0000	12.9	120.5	1009	25	"
03 / 0600	12.8	121.5	1009	25	"
03 / 1200	12.7	122.5	1008	25	tropical depression
03 / 1800	12.7	123.5	1007	30	"
04 / 0000	12.8	124.4	1006	35	tropical storm
04 / 0600	12.7	125.3	1006	35	"
04 / 1200	12.5	126.0	1004	40	"
04 / 1800	12.1	126.6	1002	45	"
05 / 0000	11.9	127.0	1002	45	"
05 / 0600	11.8	127.5	1002	45	"
05 / 1200	12.0	128.0	1000	50	"
05 / 1800	12.4	128.7	998	55	"
06 / 0000	12.9	129.5	995	60	"
06 / 0600	13.5	130.4	989	70	hurricane
06 / 1200	14.0	131.2	984	75	"
06 / 1800	14.4	132.0	981	80	"
07 / 0000	14.8	132.8	981	80	"
07 / 0600	15.3	133.6	981	80	"
07 / 1200	15.8	134.4	981	80	"
07 / 1800	16.4	135.3	981	80	"
08 / 0000	16.8	136.2	981	80	"
08 / 0600	17.1	137.0	981	80	"



Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
08 / 1200	17.2	137.9	979	85	"
08 / 1800	17.2	138.9	976	90	"
09 / 0000	17.0	139.9	980	85	"
09 / 0600	16.6	140.8	992	65	hurricane
09 / 1200	16.1	141.8	995	60	tropical storm
09 / 1800	15.6	143.3	996	55	"
10 / 0000	15.1	144.6	998	50	"
10 / 0600	14.5	145.9	1002	45	"
10 / 1200	14.2	147.5	1002	45	"
10 / 1800	14.0	149.3	1002	45	"
11 / 0000	13.9	151.0	1006	35	"
11 / 0600	13.7	153.0	1008	35	"
11 / 1200	13.6	155.0	1009	30	tropical depression
11 / 1800	13.5	157.2	1010	30	low
12 / 0000	13.4	159.3	1010	25	"
12 / 0600					dissipated
08 / 1800	17.2	138.9	976	90	maximum wind and minimum pressure



Table 2a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Hurricane Henriette, 3 – 11 August 2013. 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 (NHC)	23.2	36.7	46.7	53.8	81.5	108.2	143.7
OCD5	33.6	71.8	113.4	155.9	236.9	253.2	237.8
Forecasts	23	23	23	23	21	17	13
OFCL (2008-12)	27.0	43.1	57.8	71.9	101.7	137.2	165.9
OCD5 (2008-12)	37.4	73.0	114.9	158.3	238.4	313.5	389.1

Table 2b. Homogeneous comparison of selected track forecast guidance models (in n mi) for Hurricane Henriette, 3 – 11 August 2013. 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 2a due to the homogeneity requirement.

Model ID	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL (NHC)	25.5	40.2	52.5	56.0	70.6	80.9	135.1
OCD5	38.3	82.7	126.4	164.3	212.8	180.6	222.2
GFSI	29.0	45.6	60.4	70.7	89.1	119.2	217.6
GHMI	26.2	34.8	52.5	68.8	91.5	109.5	183.6
HWFI	29.7	49.5	60.9	69.6	88.8	124.1	132.2
EMXI	25.7	41.0	54.4	63.8	87.2	112.6	167.0
CMCI	41.1	72.3	112.1	153.6	209.9	204.1	262.2
TVCE	23.5	35.0	44.6	50.7	62.2	81.6	118.2
AEMI	27.6	42.7	59.5	64.1	84.0	121.9	189.6
BAMS	36.7	63.0	92.3	112.8	177.3	232.2	352.5
BAMM	38.1	73.8	108.3	133.0	189.1	212.7	397.2
BAMD	40.4	79.7	117.2	150.3	216.4	248.5	468.2
Forecasts	19	19	19	18	15	12	9

Table 3a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Hurricane Henriette, 3 – 11 August 2013. 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 (NHC)	7.2	9.6	11.5	12.8	14.8	17.1	18.5
OCD5	8.3	11.7	13.5	15.3	14.4	15.5	17.0
Forecasts	23	23	23	23	21	17	13
OFCL (2008-12)	6.3	10.5	13.4	14.5	15.3	17.0	17.3
OCD5 (2008-12)	7.6	12.5	16.5	18.8	20.4	20.3	20.6

Table 3b. Homogeneous comparison of selected intensity forecast guidance models (in kt) for Hurricane Henriette, 3 – 11 August 2013. Errors smaller than the NHC official forecast are shown in boldface type.

Model ID	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL (NHC)	7.2	9.6	11.5	12.8	14.8	17.1	18.5
OCD5	8.3	11.7	13.5	15.3	14.4	15.5	17.0
HWFI	7.3	10.0	9.6	8.3	12.0	7.4	18.7
GHMI	9.8	14.6	16.5	16.3	16.6	16.3	14.8
DSHP	7.8	9.9	10.2	10.0	12.1	12.7	14.0
LGEM	8.7	12.2	14.1	15.5	15.6	16.9	15.6
ICON	7.9	10.4	11.2	11.3	12.4	11.9	13.2
IVCN	7.9	10.4	11.2	11.3	12.4	11.9	13.2
Forecasts	23	23	23	23	21	17	13

Table 4. Homogeneous comparison of selected track forecast guidance models (in n mi) for Hurricane Henriette, 3 – 11 August 2013. 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 (CPHC)	22.4	36.9	59.6	99.3			
CLP5	41.6	97.7	176.4	283.3			
BAMD	53.4	93.5	156.2	240.9			
BAMM	30.1	44.3	66.6	124.7			
BAMS	20.9	35.0	48.8	65.6			
GFDI	24.6	34.5	54.0	105.1			
GFSI	23.4	28.5	40.6	94.6			
HWFI	37.6	58.7	72.0	110.8			
EMXI	20.2	27.8	54.7	94.7			
CMCI	37.7	52.0	82.9	183.8			
TVCE	25.5	34.4	52.0	87.5			
AEMI	20.6	21.4	29.9	72.3			
OCD5	38.3	64.0	90.4	119.3			
Forecasts	8	6	4	2			

Table 5. Homogeneous comparison of selected intensity forecast guidance models (in kt) for Hurricane Henriette, 3 – 11 August 2013. 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 (CPHC)	3.1	4.2	5.0	2.5			
HWFI	5.1	6.2	9.5	5.0			
GFDI	4.3	5.2	9.3	6.0			
DSHP	4.8	6.3	8.3	11.0			
LGEM	5.3	4.8	7.0	1.5			
ICON	4.8	4.5	6.5	2.5			
IVCN	4.8	4.5	6.5	2.5			
OCD5	4.8	8.5	12.2	14.7			
Forecasts	8	6	4	2			

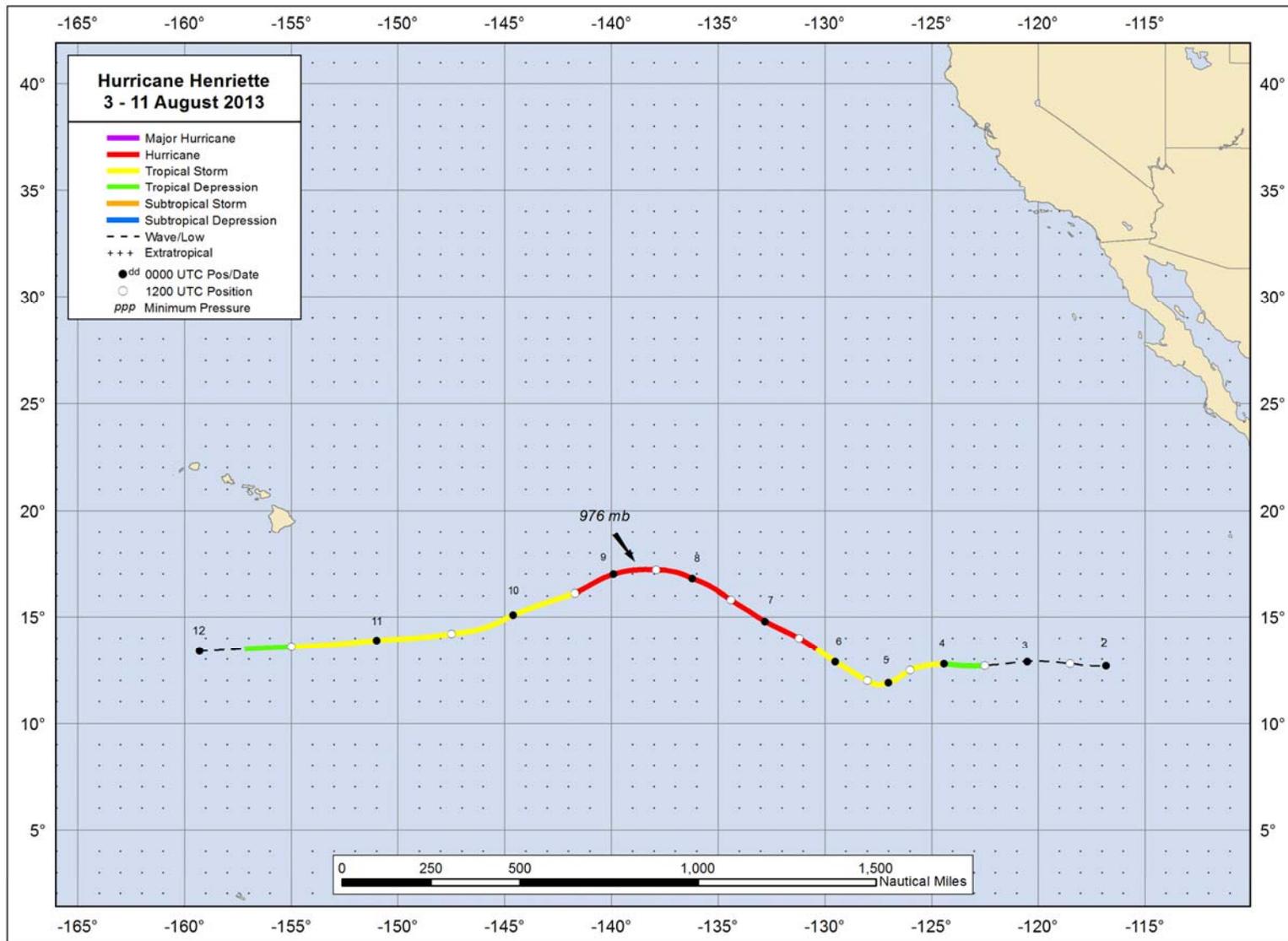


Figure 1. Best track positions for Hurricane Henriette, 3 – 11 August 2013.

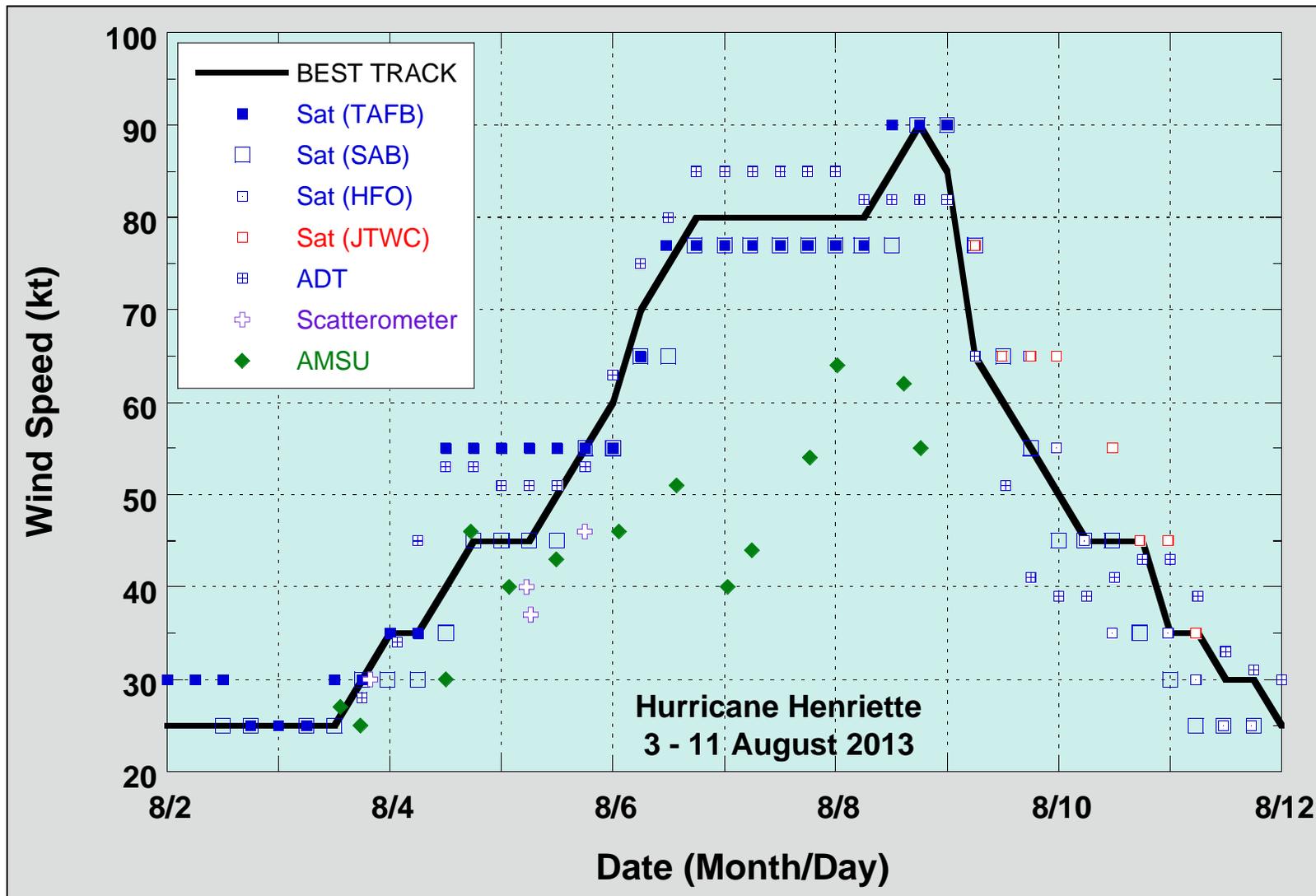


Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Hurricane Henriette, 3 – 11 August 2013. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. AMSU intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies technique. Dashed vertical lines correspond to 0000 UTC.

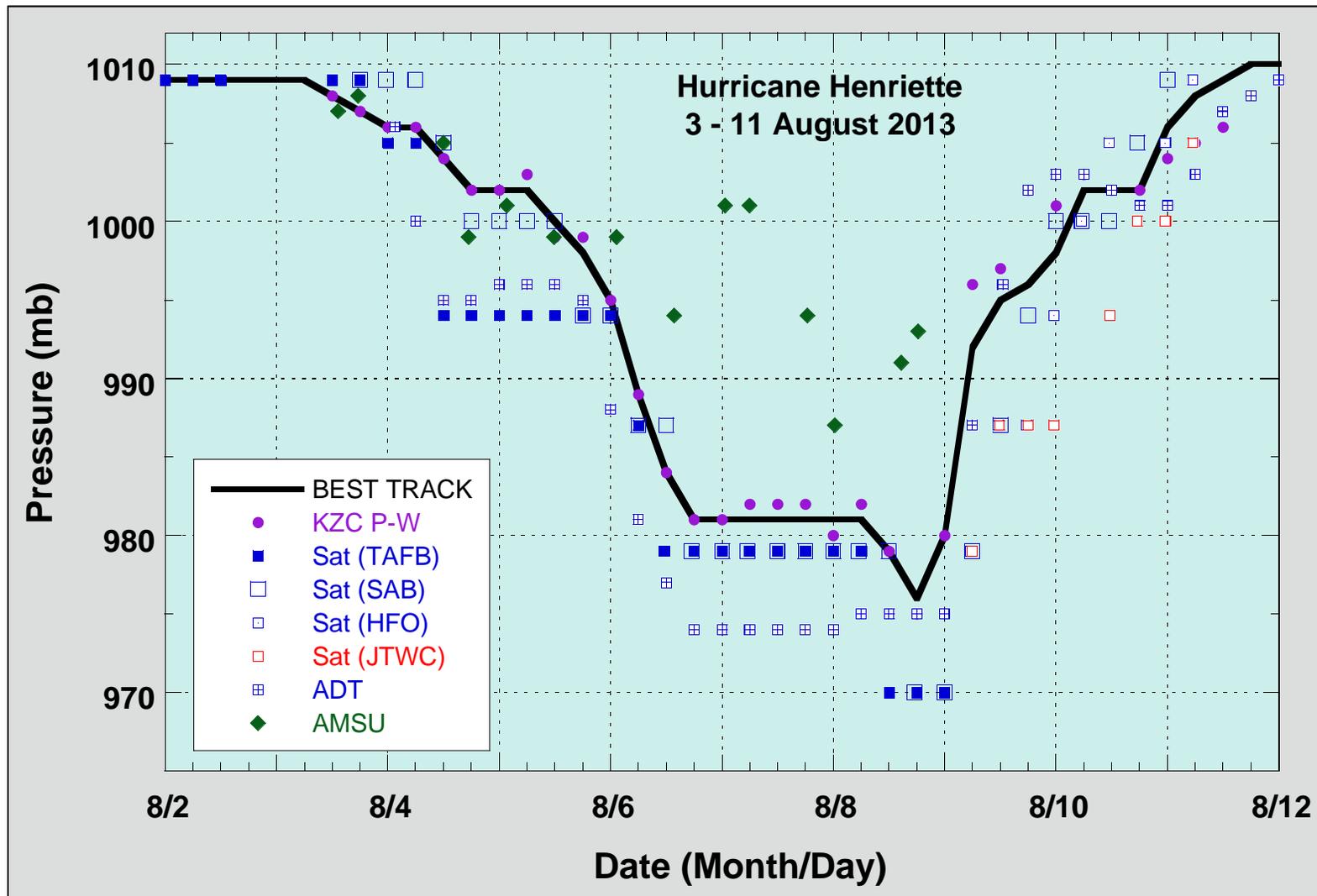


Figure 3. Selected pressure observations and best track minimum central pressure curve for Hurricane Henriette, 3 – 11 August 2013. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. AMSU intensity estimates are from the Cooperative Institute for Meteorological 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.