

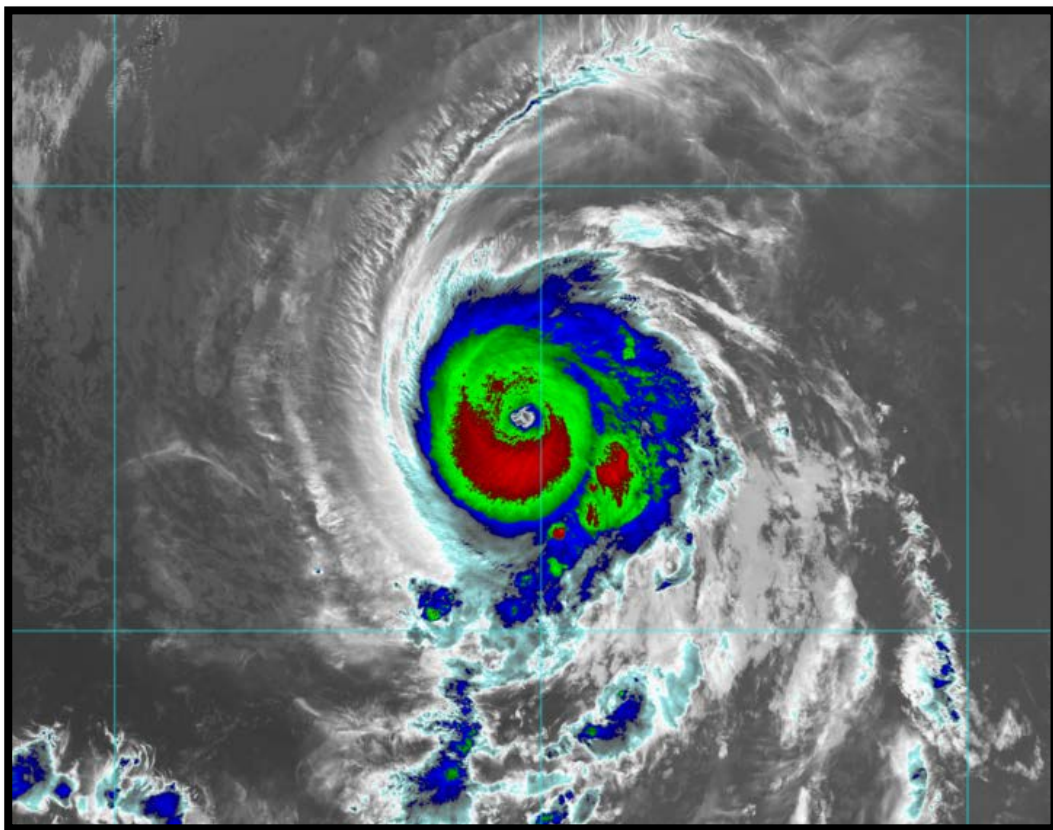


NATIONAL HURRICANE CENTER TROPICAL CYCLONE REPORT

HURRICANE KENNETH (EP132017)

18–23 August 2017

Robbie Berg
National Hurricane Center
26 January 2018



NASA-NOAA SUOMI NPP ENHANCED INFRARED SATELLITE IMAGE OF HURRICANE KENNETH AT 1034 UTC 21 AUGUST 2017 WHILE AT PEAK INTENSITY

Kenneth was a category 4 hurricane (on the Saffir-Simpson Hurricane Wind Scale) over the eastern North Pacific Ocean that did not affect land.

Hurricane Kenneth

18–23 AUGUST 2017

SYNOPTIC HISTORY

Kenneth formed from the interaction of two tropical waves which moved off the west coast of Africa on 29 July and 2 August. The first wave moved across the Atlantic Ocean and northern South America at low latitudes and reached the eastern North Pacific Ocean on 8 August. At that point, the wave became more convectively active, but it moved only slowly westward for the next week due to its position south of Hurricane Franklin over the Bay of Campeche. In the meantime, the second tropical wave spawned Hurricane Gert over the western Atlantic, with the southern portion of the wave reaching the eastern North Pacific waters on 12 August. With the subtropical ridge rebuilding over the Gulf of Mexico, the second wave moved at a faster speed toward the west and reached the first tropical wave on 16 August (Fig. 1). The interaction of the two waves caused the development of a low by 1200 UTC 17 August about 530 n mi southwest of Manzanillo, Mexico. Convective banding became more organized and persistent through the day, and the low was designated as a tropical depression by 0600 UTC 18 August about 585 n mi south-southwest of the southern tip of the Baja California peninsula. The depression strengthened to a tropical storm 18 h later. The “best track” chart of Kenneth’s path is given in Fig. 2, with the wind and pressure histories shown in Figs. 3 and 4, respectively. The best track positions and intensities are listed in Table 1¹.

For the next two days, Kenneth moved westward to the south of a mid-tropospheric ridge and strengthened in an environment of low-to-moderate shear and warm sea surface temperatures of 27–28°C. In fact, the environment was conducive enough for a 36-h period of rapid intensification to occur beginning at 1800 UTC 19 August, with Kenneth becoming a hurricane by 1200 UTC 20 August about 1035 n mi west-southwest of the southern tip of the Baja California peninsula. An eye appeared about 6 h later, and Kenneth reached major hurricane strength later that evening, followed by its peak intensity as a 115-kt category 4 hurricane by 0600 UTC 21 August. After reaching its maximum intensity, Kenneth turned northwestward in response to a closed mid- to upper-level low which had developed off the coast of southern California.

Southwesterly vertical shear began to increase early on 22 August as Kenneth approached another upper-level low to its northwest, and the hurricane coincidentally moved over sub-26°C waters. As a result, the hurricane weakened rapidly, becoming a tropical storm by 0000 UTC 23 August about 1320 n mi west of the southern tip of the Baja California peninsula. Deep convection dissipated within the next 12 h, at which point Kenneth became a post-tropical low, but it continued to produce gale-force winds through 1200 UTC 25 August while moving generally

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*k directory, while previous years’ data are located in the *archive* directory.

northward at a slower speed. For the next couple of days, the low meandered and spun down, ultimately dissipating after 1800 UTC 27 August about 1095 n mi west of Punta Eugenia, Mexico.

METEOROLOGICAL STATISTICS

Observations in Kenneth (Figs. 3 and 4) 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. 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 Kenneth.

Kenneth's estimated peak intensity of 115 kt from 0600 UTC to 1200 UTC 21 August is based on a blend of subjective satellite intensity estimates of T6.0 (115 kt) from TAFB and T5.5 (102 kt) from SAB, as well as an objective ADT estimate of T6.3 (122 kt). The estimated minimum pressure of 951 mb is based on the Knaff-Zehr-Courtney pressure-wind relationship.

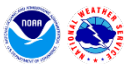
There were no land-based or ship reports of winds of tropical storm force in association with Kenneth.

CASUALTY AND DAMAGE STATISTICS

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

FORECAST AND WARNING CRITIQUE

Kenneth's genesis was not well forecast, particularly in its timing. Table 2 provides the number of hours in advance of formation associated with the first NHC Tropical Weather Outlook (TWO) forecast in each likelihood category. The possibility of tropical cyclone formation associated with the first of the two tropical waves was initially included with a low (<40%) chance in the Tropical Weather Outlook 222 h (9.25 days) before genesis occurred. The 5-day genesis probabilities were raised to the medium (40-60%) and high (>60%) categories 210 h (8.75 days) and 150 h (6.25 days) before genesis, respectively. The disturbance was also given a 2-day genesis probability in the low category 156 h (6.5 days) before formation. In the ensuing days, the chances of tropical cyclone formation appeared to be decreasing, and the disturbance was removed from the TWO 54 h (2.25 days) before genesis. Once the second tropical wave (which itself had been given a low chance of genesis for a time) reached the disturbance, the prospects



for tropical cyclone formation again increased, and the system was re-introduced into the TWO 30 h before genesis. However, the 2-day chance of genesis was only raised to the medium and high categories 18 h and 6 h before the system became a tropical depression, respectively.

A verification of NHC official track forecasts for Kenneth is given in Table 3a. Official forecast track errors were lower than the mean official errors for the previous 5-yr period at all forecast times. The official 4-day track errors were especially low, being about 50% of the 4-day track errors for the previous 5-yr period. A homogeneous comparison of the official track errors with selected guidance models is given in Table 3b. The Hurricane Weather Research and Forecasting model (HWFI) was the only individual model to have lower overall errors than the NHC official track forecasts, doing so between 24 and 72 h. However, the various multi-model consensus aids, including TCON, TVCE, TVCX, GFEX, and the HFIP Corrected Consensus Approach (HCCA), all performed quite well and beat the NHC track forecasts at most forecast times.

A verification of NHC official intensity forecasts for Kenneth is given in Table 4a. Official forecast intensity errors were higher than the mean official errors for the previous 5-yr period from 12 to 72 h but lower at 96 h. NHC's large intensity errors through day 3 are likely related to the poor predictability of Kenneth's rapid intensification and rapid weakening phases, which occurred over the span of four days. In fact, climatology and persistence (OCD5) errors were twice as high as their respective 5-yr means at some forecast times, indicating that Kenneth's intensity changes were more difficult to forecast than for a typical eastern Pacific tropical cyclone. A homogeneous comparison of the official intensity errors with selected guidance models is given in Table 4b. The corrected consensus techniques performed best with Kenneth's intensity, with the Florida State Superensemble (FSSE) and HCCA being the only models that outperformed the NHC official intensity forecasts at most forecast times.

There were no coastal watches or warnings associated with Kenneth.



Table 1. Best track for Hurricane Kenneth, 18–23 August 2017.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
17 / 1200	13.2	111.4	1008	25	low
17 / 1800	13.5	112.4	1008	25	"
18 / 0000	13.9	113.4	1007	25	"
18 / 0600	14.2	114.6	1006	30	tropical depression
18 / 1200	14.5	115.9	1006	30	"
18 / 1800	14.7	117.2	1006	30	"
19 / 0000	14.9	118.5	1005	35	tropical storm
19 / 0600	15.1	119.9	1004	40	"
19 / 1200	15.3	121.4	1003	45	"
19 / 1800	15.5	122.9	1001	50	"
20 / 0000	15.7	124.3	999	55	"
20 / 0600	15.9	125.6	995	60	"
20 / 1200	16.1	126.8	990	65	hurricane
20 / 1800	16.3	127.8	980	80	"
21 / 0000	16.5	128.8	967	95	"
21 / 0600	16.9	129.7	951	115	"
21 / 1200	17.5	130.5	951	115	"
21 / 1800	18.1	131.2	959	105	"
22 / 0000	18.8	131.8	966	95	"
22 / 0600	19.5	132.4	974	85	"
22 / 1200	20.3	132.9	980	75	"
22 / 1800	21.2	133.4	987	65	"



Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
23 / 0000	22.2	133.8	993	60	tropical storm
23 / 0600	23.2	134.2	999	50	"
23 / 1200	24.1	134.8	1002	40	low
23 / 1800	24.9	135.4	1004	35	"
24 / 0000	25.6	136.0	1005	35	"
24 / 0600	26.3	136.5	1006	35	"
24 / 1200	27.0	136.7	1006	35	"
24 / 1800	27.6	136.6	1006	35	"
25 / 0000	28.0	136.3	1006	35	"
25 / 0600	28.1	135.9	1006	35	"
25 / 1200	28.2	135.5	1006	35	"
25 / 1800	28.4	135.1	1007	30	"
26 / 0000	28.7	134.9	1008	30	"
26 / 0600	28.9	135.0	1009	25	"
26 / 1200	29.0	135.2	1010	25	"
26 / 1800	29.1	135.4	1011	25	"
27 / 0000	29.2	135.5	1012	20	"
27 / 0600	29.3	135.6	1013	20	"
27 / 1200	29.3	135.7	1015	15	"
27 / 1800	29.2	135.8	1017	15	"
28 / 0000					dissipated
21 / 0600	16.9	129.7	951	115	maximum winds and minimum pressure

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%)	156	222
Medium (40%-60%)	18	210
High (>60%)	6	150

Table 3a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Hurricane Kenneth, 18–23 August 2017. 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	17.3	26.0	38.9	49.3	57.9	54.9	
OCD5	32.0	75.4	127.2	168.8	191.6	176.5	
Forecasts	18	16	14	12	8	4	
OFCL (2012-16)	22.2	33.9	43.8	54.8	80.0	108.9	145.1
OCD5 (2012-16)	35.7	72.0	112.2	150.2	217.0	271.0	340.2



Table 3b. Homogeneous comparison of selected track forecast guidance models (in n mi) for Hurricane Kenneth, 18–23 August 2017. 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	17.6	25.7	37.3	45.4	52.2	67.3	
OCD5	30.7	73.7	125.6	169.9	199.0	207.7	
GFSI	19.8	27.6	37.9	46.7	61.6	123.8	
EMXI	18.5	31.1	43.0	54.5	69.6	41.4	
EGRI	23.9	44.1	63.5	74.1	67.0	79.4	
NVGI	28.9	47.0	57.2	62.4	54.5	56.5	
CMCI	35.2	59.8	69.1	80.8	166.3	290.3	
HWFI	19.6	24.2	33.4	41.1	45.9	105.8	
HMNI	24.4	37.0	42.0	38.6	66.0	109.3	
CTCI	23.6	39.4	50.8	55.0	68.3	133.7	
TCON	17.5	24.3	35.0	43.0	49.0	81.2	
TVCE	16.7	24.6	34.6	43.0	49.4	67.6	
TVCX	16.9	26.5	35.5	44.2	49.8	50.7	
GFEX	17.6	25.3	34.0	41.8	51.9	41.6	
HCCA	16.5	24.8	35.1	45.5	54.2	65.6	
FSSE	16.7	26.5	36.9	47.0	55.2	77.0	
AEMI	21.7	33.8	41.6	51.0	77.5	149.1	
TABS	44.4	81.4	95.6	87.3	107.3	65.8	
TABM	36.7	60.0	61.5	38.1	106.3	73.8	
TABD	31.3	57.7	70.5	61.8	81.8	162.8	
Forecasts	16	14	12	10	6	2	



Table 4a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Hurricane Kenneth, 18–23 August 2017. 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	6.7	11.6	16.1	19.6	16.9	2.5	
OCD5	10.3	20.7	29.5	35.0	27.4	10.3	
Forecasts	18	16	14	12	8	4	
OFCL (2012-16)	5.8	9.4	11.8	13.2	15.0	15.7	14.9
OCD5 (2012-16)	7.6	12.2	15.7	18.1	20.6	21.8	20.0

Table 4b. Homogeneous comparison of selected intensity forecast guidance models (in kt) for Hurricane Kenneth, 18–23 August 2017. 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	7.2	12.9	18.3	22.0	10.8	0.0	
OCD5	11.1	22.6	32.1	36.7	17.8	3.0	
DSHP	8.7	14.8	20.5	23.5	10.8	10.0	
LGEM	8.2	14.7	22.5	27.4	19.3	9.5	
HWFI	9.9	15.1	18.4	16.0	9.3	2.0	
HMNI	7.1	14.6	21.8	26.9	13.2	4.0	
CTCI	12.2	20.0	25.2	26.5	16.3	5.5	
ICON	8.6	14.1	19.8	22.2	12.7	1.0	
IVCN	9.3	15.4	20.7	23.4	13.0	2.0	
HCCA	7.8	11.6	14.5	16.9	10.3	2.0	
FSSE	7.3	10.5	13.5	14.1	6.3	6.0	
GFSI	8.2	15.3	21.2	25.2	17.5	12.0	
EMXI	16.7	30.5	41.1	41.3	18.3	6.0	
Forecasts	16	14	12	10	6	2	

800–600mb RH & Vort Anomalies (lat=5–15)

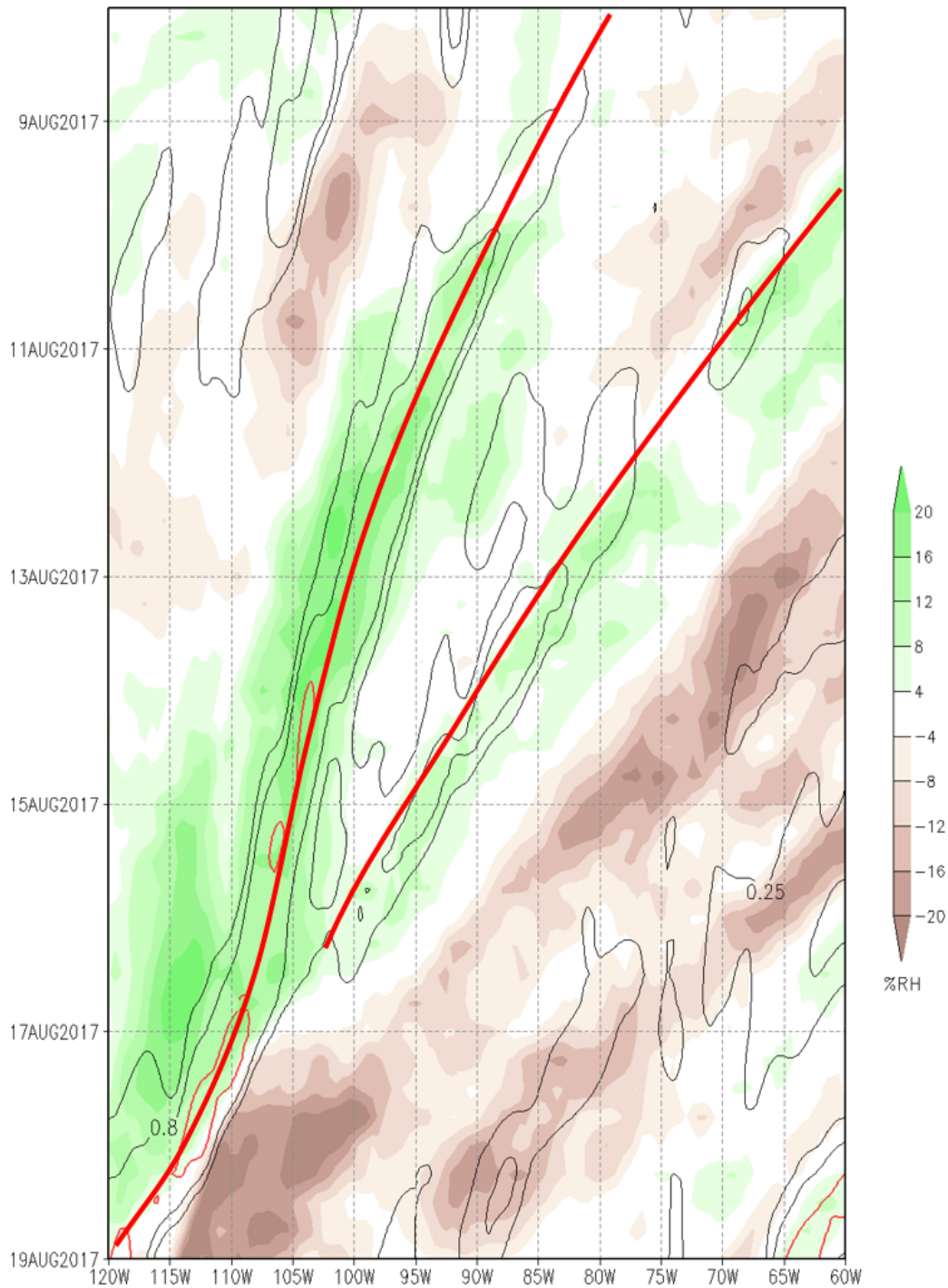


Figure 1. Hovmöller diagram of 800-600-mb relative humidity anomalies (percent, shaded) and relative vorticity anomalies ($\times 10^{-5} \text{ s}^{-1}$, contours) based on GFS analyses, averaged between 5°N and 15°N from 8 August through 19 August 2017. The solid red lines denote the tropical waves that contributed to the formation of Kenneth.

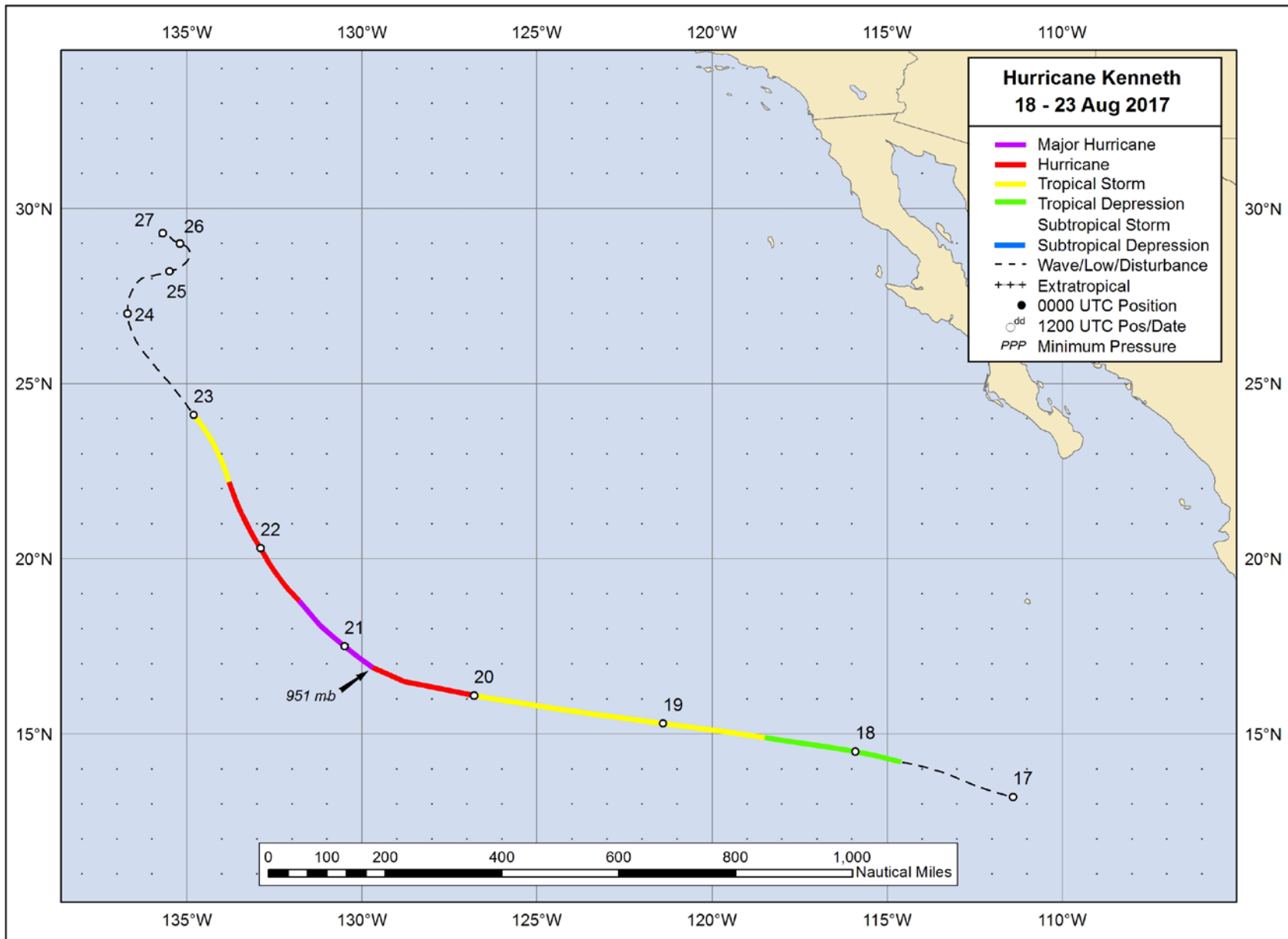


Figure 2. Best track positions for Hurricane Kenneth, 18–23 August 2017.

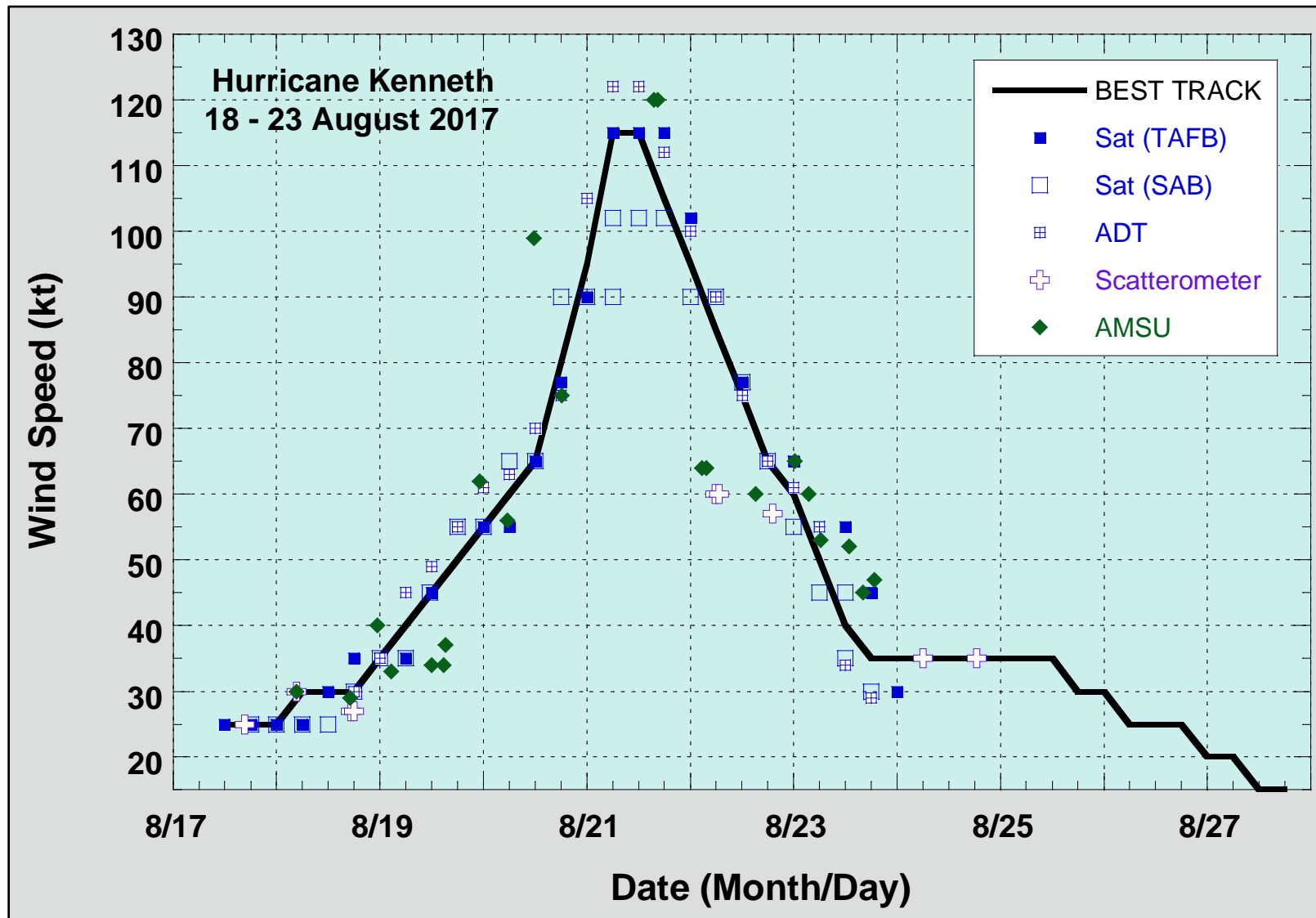


Figure 3. Selected wind observations and best track maximum sustained surface wind speed curve for Hurricane Kenneth, 18–23 August 2017. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. AMSU intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies technique. Dashed vertical lines correspond to 0000 UTC.

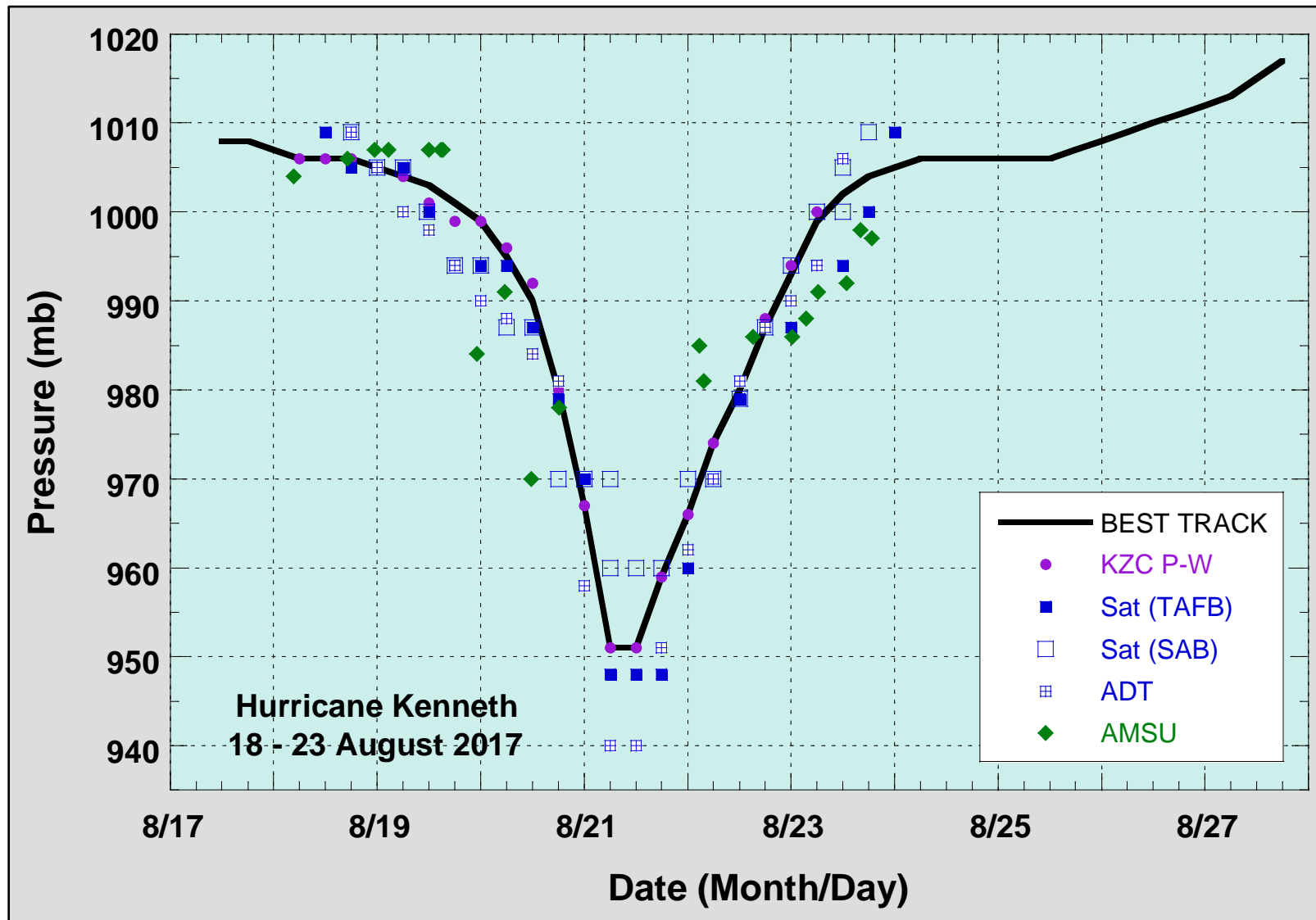


Figure 4. Selected pressure observations and best track minimum central pressure curve for Hurricane Kenneth, 18–23 August 2017. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. AMSU intensity estimates are from the Cooperative Institute for Meteorological 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.