

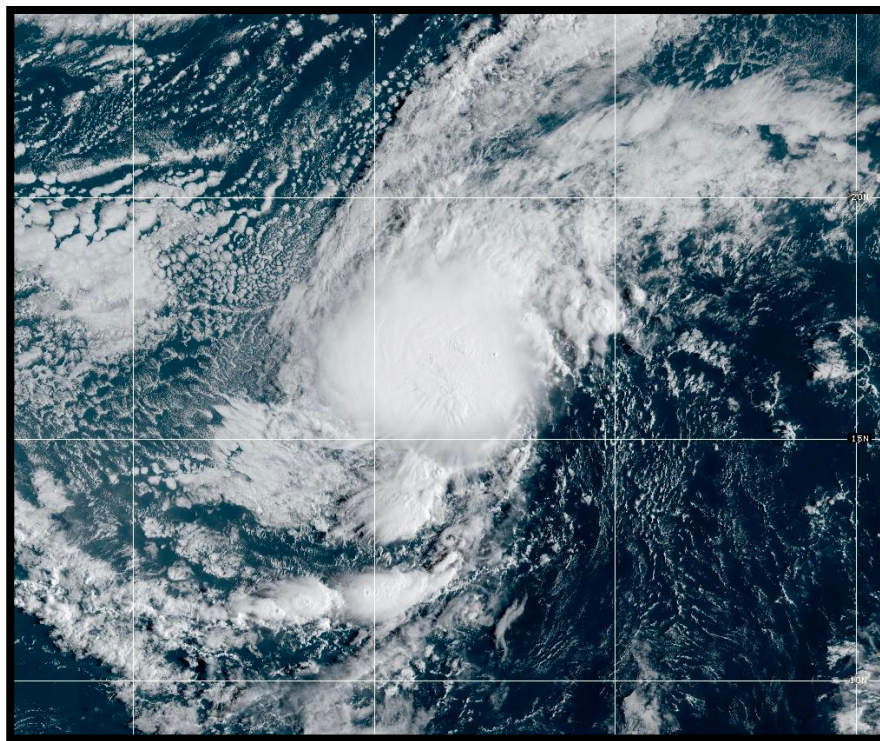


# NATIONAL HURRICANE CENTER TROPICAL CYCLONE REPORT<sup>1</sup>

## TROPICAL STORM KENNETH (EP132023)

19–22 September 2023

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National Hurricane Center  
8 December 2023



GEOCOLOR IMAGE OF KENNETH NEAR PEAK INTENSITY AT 1600 UTC 20 SEPTEMBER 2023.

Kenneth was a short-lived tropical storm that formed in the central part of the eastern North Pacific and did not affect land.

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<sup>1</sup> This is an abbreviated Tropical Cyclone Report since there were no coastal watches or warnings issued and no direct fatalities reported in association with Kenneth.

# Tropical Storm Kenneth

19–22 SEPTEMBER 2023

## BEST TRACK

The “best track<sup>2</sup>” positions and intensities for Kenneth are listed in Table 1. The best track chart of Kenneth’s path is given in Fig. 1, with the wind and pressure histories along with available observations<sup>3</sup> shown in Figs. 2 and 3, respectively.

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

### Origin

The origins of Kenneth are somewhat unclear, but initially there was an easterly wave that was first trackable in the southwestern Caribbean Sea on 11 September. This wave slowly crossed Central America between 12–14 September. After emerging into the East Pacific, the wave axis interacted with a convectively active monsoon trough, and the combination of these features spawned a well-defined area of low pressure by 0000 UTC 18 September. This low went on to become a tropical cyclone 30 h later as it obtained sufficient convective organization.

### Peak Intensity and Minimum Pressure

Kenneth’s peak intensity of 45 kt from 1200 UTC 20 September to 0600 UTC 21 September is based on a blend of higher subjective (TAFB, SAB) and lower objective (SATCON, ADT) satellite intensity estimates.

The estimated minimum central pressure of 1000 mb is based on the Knaff-Zehr-Courtney (KZC) pressure-wind relationship, which was also close to the objective SATCON pressure estimates at that time.

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<sup>2</sup> 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.

<sup>3</sup> Observations include subjective satellite-based Dvorak technique intensity estimates from the Tropical Analysis and Forecast Branch (TAFB) and the Satellite Analysis Branch (SAB), objective Advanced Dvorak Technique (ADT) estimates and Satellite Consensus (SATCON) 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.

## CASUALTY AND DAMAGE STATISTICS

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

## FORECAST AND WARNING VERIFICATION

Table 2 provides the number of hours in advance of formation with the first NHC Tropical Weather Outlook (TWO) forecast in each likelihood category. It is notable that there was only a little more than 3 days (78 h) of lead time from when the first low probability of genesis was issued in the 7-day outlook to when Kenneth became a tropical cyclone. This short lead time suggests the cyclone's genesis was not well anticipated. Figure 4 shows composites of 7-day TWO genesis areas for each category prior to the formation of Kenneth. The tropical storm's genesis location was within all the 7-day formation areas depicted by TWOs issued by NHC.

A verification of NHC official track forecasts for Kenneth is given in Table 3a. Official track forecast errors were a little higher than the mean official errors for the previous 5-yr period from 12–36 h, but a little lower from 48–60 h. A homogeneous comparison of the official track errors with selected guidance models is given in Table 3b. The HFIP Corrected Consensus Approach (HCCA) guidance generally had lower track errors than the official track forecast overall, while the GFS model (GFSI) in general outperformed the ECMWF model (EMXI) at most forecast lead times.

A verification of NHC official intensity forecasts for Kenneth is given in Table 4a. Official intensity forecast errors were lower than the mean official errors for the previous 5-yr period at all forecast time periods. Intensity forecasts correctly indicated Kenneth would be a short-lived tropical cyclone with a peak intensity only as a mid-range tropical storm. A homogeneous comparison of the official intensity errors with selected guidance models is given in Table 4b.

There were no coastal watches or warnings issued for Tropical Storm Kenneth.



Table 1. Best track for Tropical Storm Kenneth 19–22 September 2023.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
18 / 0000	13.2	111.7	1008	20	low
18 / 0600	13.5	112.6	1007	25	"
18 / 1200	13.7	113.7	1007	25	"
18 / 1800	13.8	115.0	1007	25	"
19 / 0000	14.0	116.2	1007	25	"
19 / 0600	14.4	117.5	1006	30	tropical depression
19 / 1200	14.7	118.8	1005	35	tropical storm
19 / 1800	14.8	120.2	1004	40	"
20 / 0000	14.8	121.3	1003	40	"
20 / 0600	15.0	122.3	1002	40	"
20 / 1200	15.6	123.1	1001	45	"
20 / 1800	16.0	123.9	1001	45	"
21 / 0000	16.3	124.5	1000	45	"
21 / 0600	16.6	124.9	1000	45	"
21 / 1200	16.9	125.2	1001	40	"
21 / 1800	17.4	125.6	1002	35	"
22 / 0000	18.0	125.9	1003	35	"
22 / 0600	18.8	126.1	1004	30	tropical depression
22 / 1200	20.0	125.9	1005	30	low
22 / 1800	21.1	125.6	1005	30	"
23 / 0000	21.8	125.4	1005	30	"
23 / 0600	22.4	125.3	1006	30	"
23 / 1200	22.9	125.6	1006	30	"
23 / 1800	23.1	126.0	1007	25	"
24 / 0000	23.2	126.4	1007	25	"
24 / 0600	23.3	127.0	1007	25	"
24 / 1200	23.5	128.1	1007	25	"
24 / 1800	23.5	129.4	1008	20	"
25 / 0000					dissipated
21 / 0000	16.3	124.5	1000	45	maximum wind 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	168-Hour Outlook
Low (<40%)	48	78
Medium (40%-60%)	36	66
High (>60%)	12	48

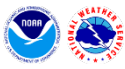


Table 3a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Kenneth. Mean errors for the previous 5-yr period are shown for comparison. Official errors that are smaller than the 5-yr means are shown in boldface type.

	Forecast Period (h)							
	12	24	36	48	60	72	96	120
OFCL	39.3	48.8	49.2	<b>50.7</b>	<b>43.7</b>			
OCD5	63.7	104.9	155.1	204.4	199.7			
Forecasts	10	8	6	4	2			
OFCL (2018-22)	22.1	34.0	45.4	56.0	70.9	78.7	100.5	117.8
OCD5 (2018-22)	36.7	73.4	114.0	156.9	193.2	244.5	317.0	376.0



Table 3b. Homogeneous comparison of selected track forecast guidance models (in n mi) for Kenneth. 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	60	72	96	120
OFCL	38.9	50.7	51.2	63.5	69.2			
OCD5	61.5	108.6	172.0	254.6	349.5			
GFSI	<b>37.0</b>	55.7	<b>43.9</b>	<b>56.2</b>	72.2			
EMXI	48.4	62.7	60.6	73.3	86.8			
EGRI	<b>38.3</b>	51.6	56.2	68.3	<b>47.0</b>			
CMCI	<b>38.0</b>	51.7	61.9	77.8	88.6			
HFAI	<b>38.3</b>	59.9	75.2	101.6	141.2			
HFBI	<b>31.0</b>	57.0	61.2	89.3	91.6			
HWFI	<b>35.8</b>	69.4	96.1	139.6	253.2			
HMNI	42.5	69.4	82.4	119.1	184.8			
CTCI	40.7	53.2	67.1	126.5	138.6			
HCCA	40.1	<b>50.6</b>	<b>46.0</b>	<b>49.4</b>	<b>29.0</b>			
FSSE	<b>38.3</b>	50.8	51.7	68.3	91.6			
AEMI	<b>38.7</b>	<b>50.6</b>	58.2	89.8	114.9			
TVCX	<b>36.4</b>	54.0	60.7	88.4	112.2			
TVCE	<b>35.2</b>	53.4	62.7	90.7	113.9			
GFEX	42.6	58.8	<b>50.0</b>	63.9	79.9			
TVDG	<b>35.8</b>	52.8	59.2	82.1	99.6			
TABS	50.0	70.5	90.2	122.8	196.1			
TABM	49.2	71.3	100.3	155.2	217.2			
TABD	51.7	87.5	114.5	189.5	348.4			
Forecasts	9	7	5	3	1			



Table 4a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Kenneth. 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	60	72	96	120
OFCL	<b>2.5</b>	<b>6.2</b>	<b>5.8</b>	<b>6.2</b>	<b>5.0</b>			
OCD5	4.5	9.1	13.3	15.8	22.5			
Forecasts	10	8	6	4	2			
OFCL (2018-22)	5.4	8.9	11.0	12.8	14.3	15.8	17.0	17.6
OCD5 (2018-22)	6.9	12.1	15.9	18.6	18.7	21.0	22.3	22.1





Table 4b. Homogeneous comparison of selected intensity forecast guidance models (in kt) for Kenneth. 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	60	72	96	120
OFCL	2.2	5.7	6.0	6.7	5.0			
OCD5	4.6	9.6	15.2	20.3	32.0			
HFAI	5.2	7.1	8.4	<b>2.7</b>	<b>4.0</b>			
HFBI	5.7	11.7	12.0	<b>4.3</b>	<b>2.0</b>			
HWFI	2.9	6.3	7.2	<b>2.7</b>	<b>0.0</b>			
HMNI	4.4	8.4	6.8	7.3	<b>2.0</b>			
CTCI	3.6	<b>5.6</b>	<b>3.4</b>	<b>3.7</b>	<b>3.0</b>			
DSHP	3.4	<b>5.4</b>	<b>5.6</b>	8.0	14.0			
LGEM	3.7	5.7	6.4	8.0	13.0			
IVCN	3.1	6.3	<b>5.4</b>	<b>2.7</b>	6.0			
ICON	2.3	<b>5.1</b>	<b>4.8</b>	<b>5.3</b>	8.0			
IVDR	3.3	6.9	6.2	<b>1.7</b>	<b>4.0</b>			
HCCA	3.7	7.7	9.2	<b>4.3</b>	<b>3.0</b>			
FSSE	2.8	6.0	6.2	<b>2.7</b>	5.0			
GFSI	4.2	7.6	6.6	<b>3.0</b>	<b>0.0</b>			
EMXI	3.6	<b>4.7</b>	<b>3.0</b>	<b>1.3</b>	<b>3.0</b>			
Forecasts	9	7	5	3	1			

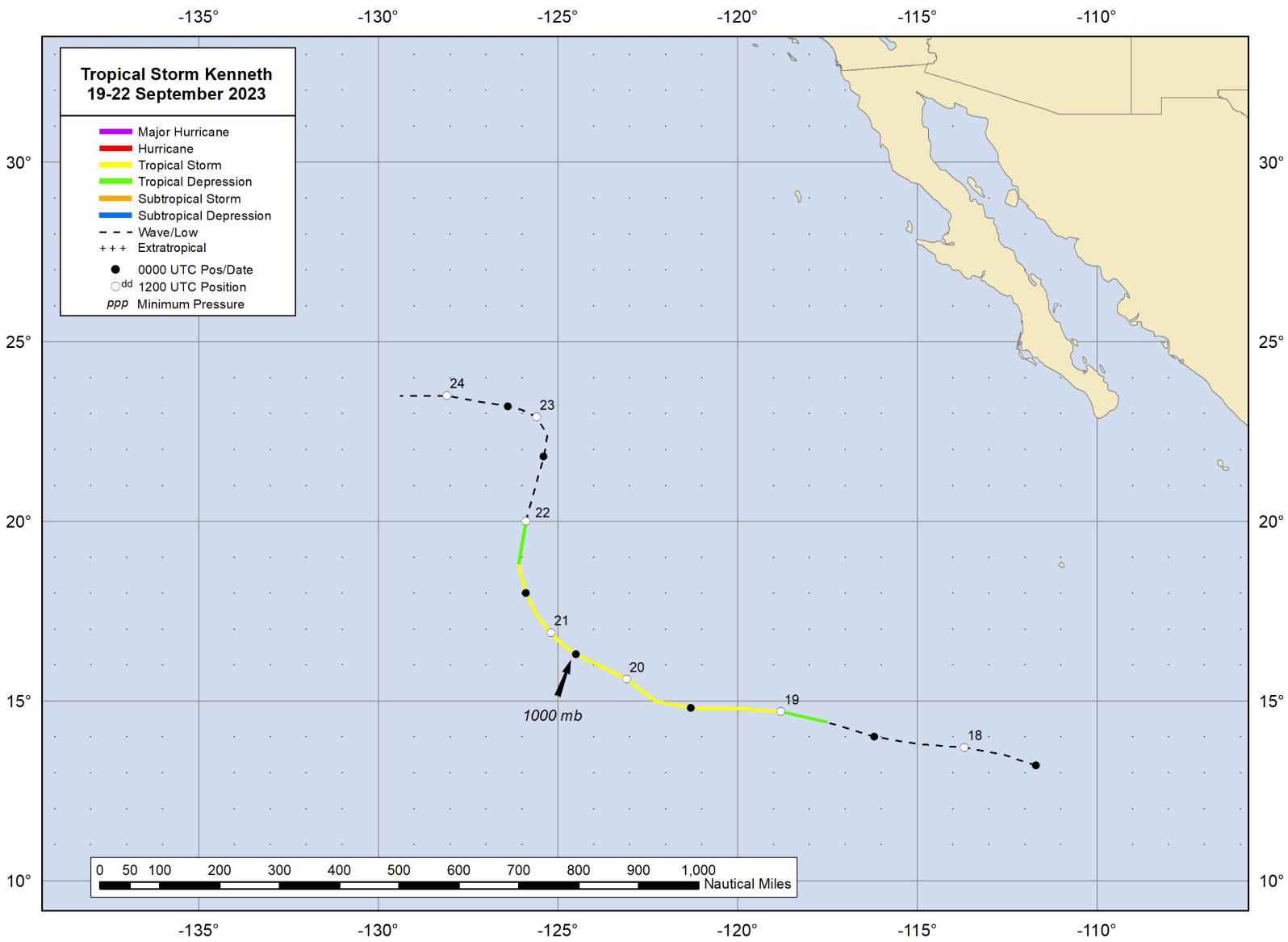


Figure 1. Best track positions for Tropical Storm Kenneth, 19–22 September 2023.

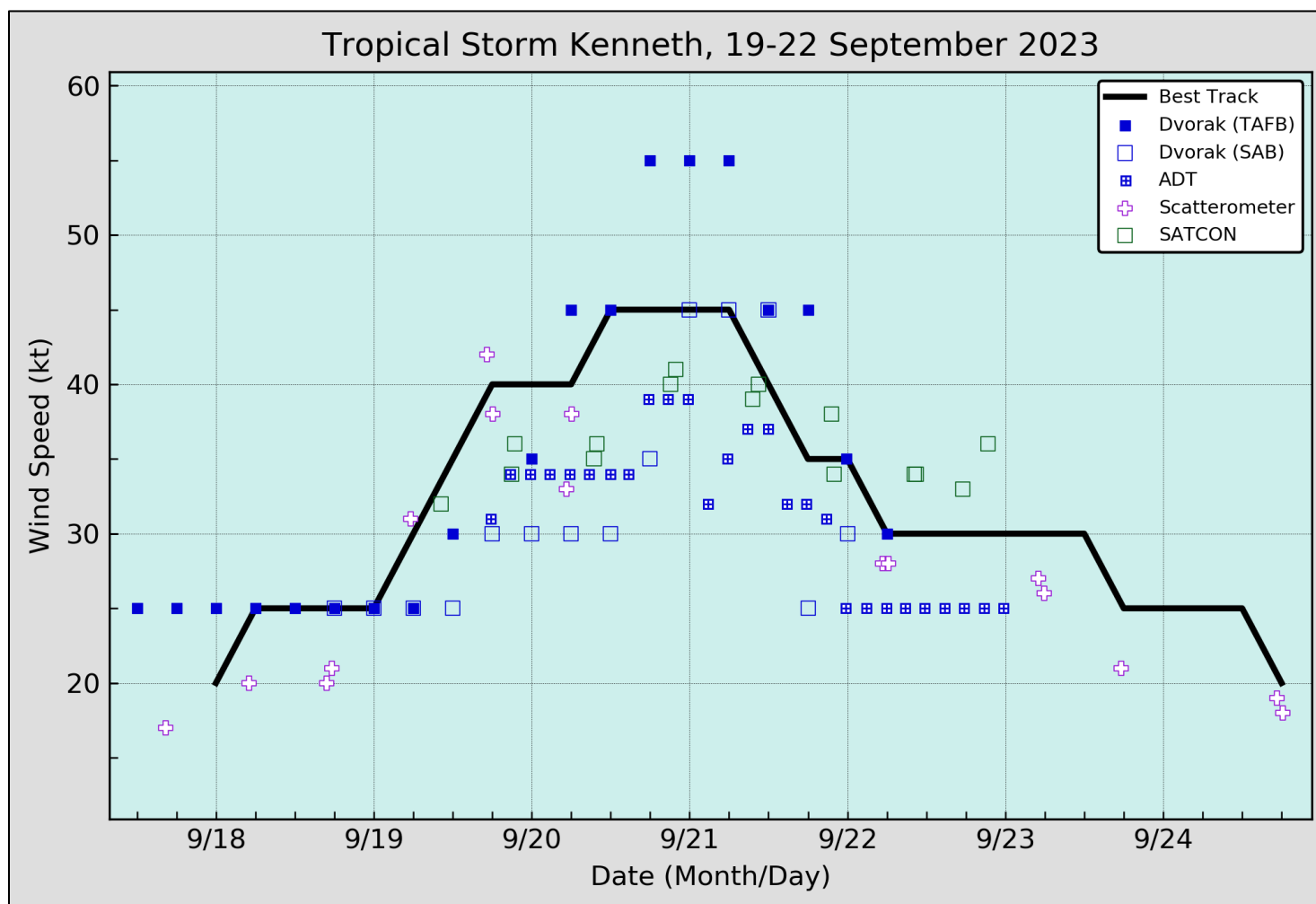


Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Tropical Storm Kenneth, 19–22 September 2023. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies. Dashed vertical lines correspond to 0000 UTC.

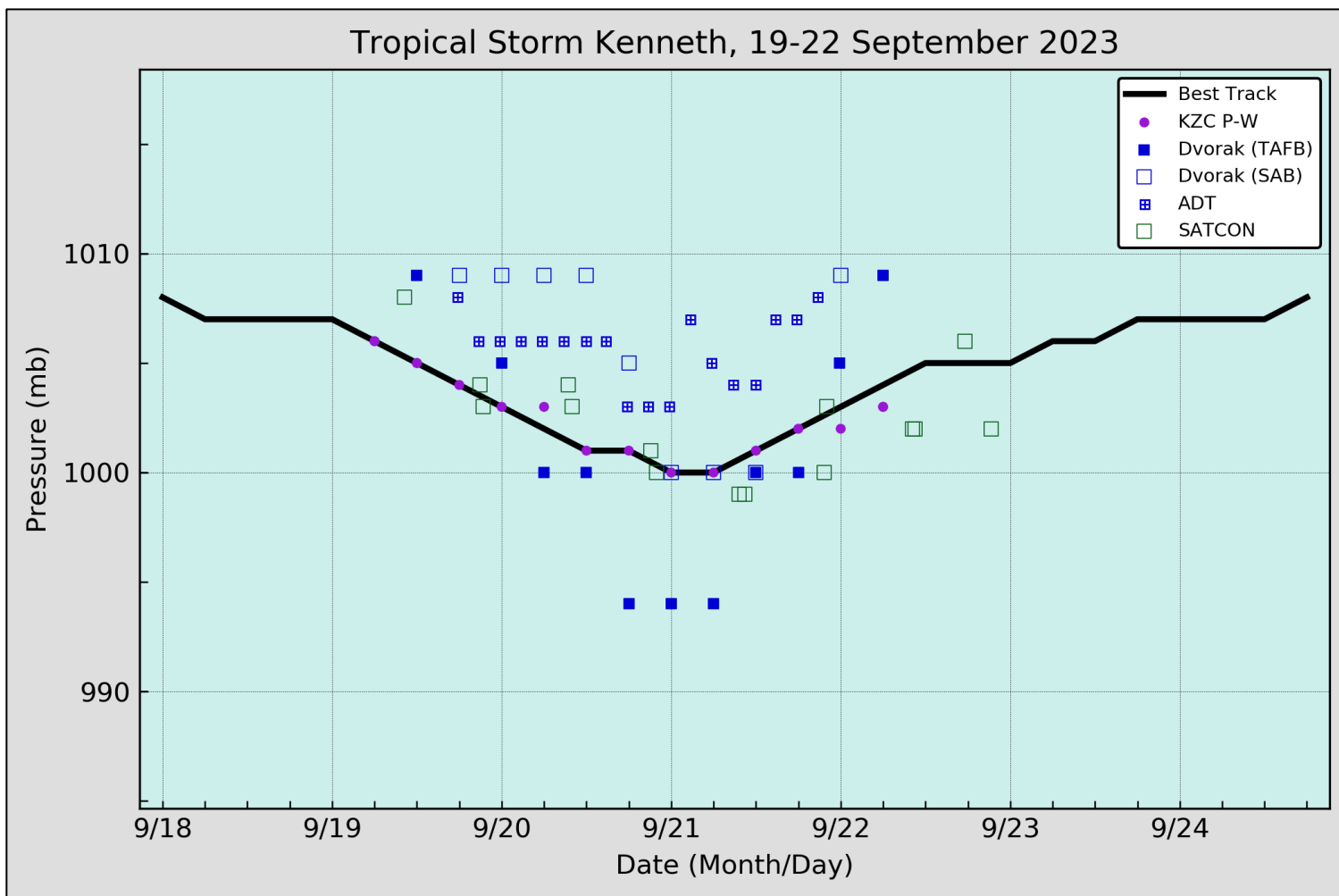


Figure 3. Selected pressure observations and best track minimum central pressure curve for Tropical Storm Kenneth, 19–22 September 2023. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies. KZC P-W refers to pressure estimates derived using the Knaff-Zehr-Courtney pressure-wind relationship. Dashed vertical lines correspond to 0000 UTC.

### Kenneth 7-day Tropical Weather Outlook Areas

From: 0000 UTC 16 Sep 2023 to 0600 UTC 19 Sep 2023

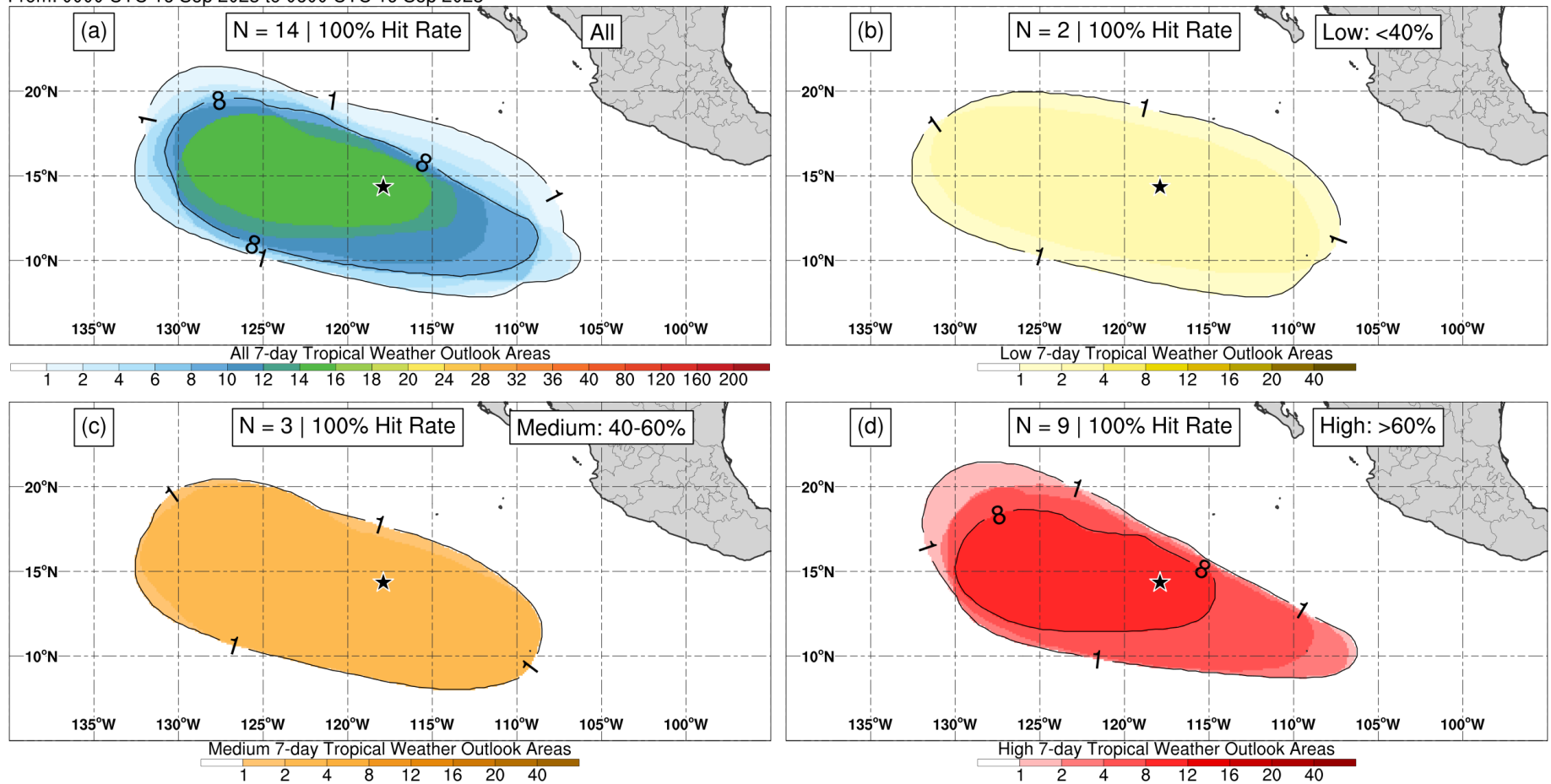


Figure 4. Composites of 7-day tropical cyclone genesis areas depicted in NHC’s Tropical Weather Outlooks prior to the formation of Kenneth for (a) all probabilistic genesis categories, (b) the low (<40%) category, (c) medium (40–60%) category, and (d) high (>60%) category. The location of genesis is indicated by the black star.