

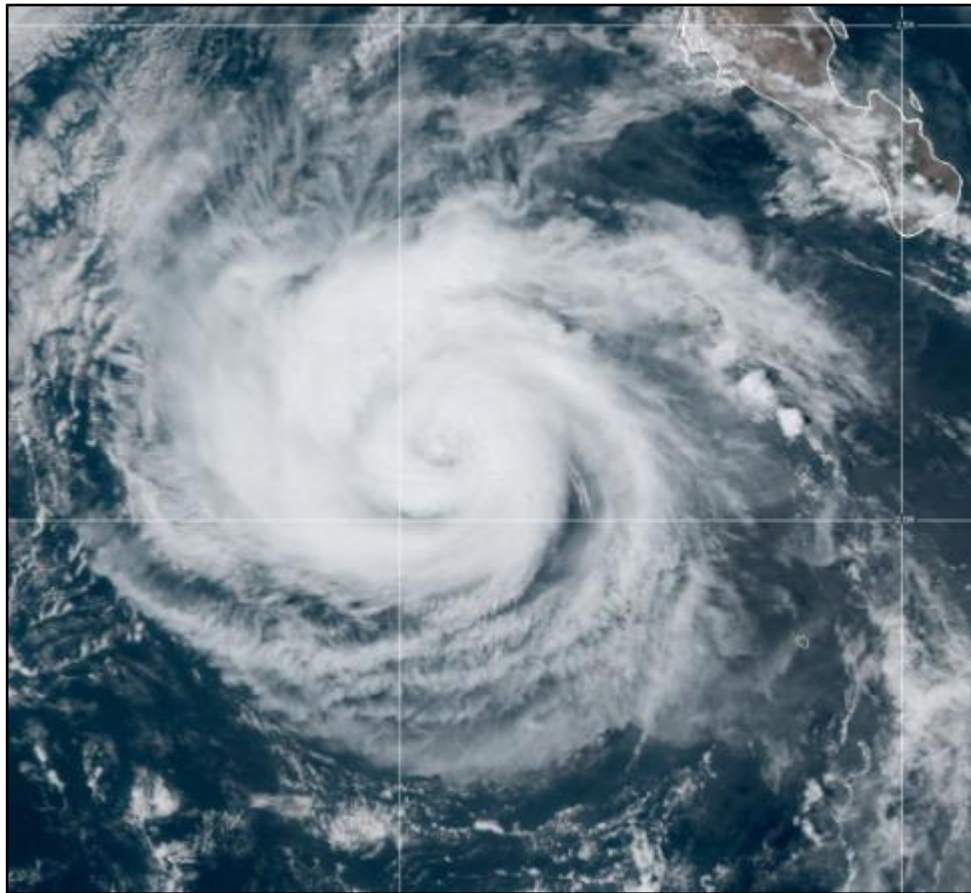


# NATIONAL HURRICANE CENTER TROPICAL CYCLONE REPORT

## HURRICANE HOWARD (EP092022)

6–10 August 2022

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GOES-16 GEOCOLOR IMAGE OF HOWARD AT 2100 UTC 8 AUG 2022 PASSING SOUTHWEST OF BAJA CALIFORNIA SUR.  
IMAGE COURTESY OF NOAA/NESDIS/STAR

Howard was a small August hurricane that passed a few hundred miles southwest of Baja California Sur and brought tropical-storm-force winds to Socorro Island. No deaths or damage were reported.

# Hurricane Howard

6–10 AUGUST 2022

## SYNOPTIC HISTORY

Howard can be traced back to a westward-moving tropical wave that left the coast of west Africa on 26 July. Disorganized thunderstorm activity periodically formed near the wave axis for the next several days, and the wave moved into the eastern Caribbean Sea on 31 July. The wave quickly moved westward, and a large flare-up of convection was noted on 2 August over the southwestern Caribbean Sea. The system traversed Central America on 3 August and emerged over the eastern Pacific waters the next day with a fair amount of convection and a broad elongated surface circulation. While convection increased on 5 August near the system, the low-level circulation remained quite elongated. A burst of convection early on 6 August was enough to form a low-level center that morning, leading to the formation of a tropical depression near 1200 UTC 6 August, about 330 n mi south-southwest of Manzanillo, Mexico. The “best track” chart of the 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<sup>1</sup>.

After formation, a combination of dry air, westerly shear and a somewhat elongated low-level circulation resulted in little change in strength with the depression for about a day, despite warm waters. The system moved northwestward, steered around a ridge over northwestern Mexico, and that steering pattern persisted for a few days. Late on 7 August, the shear weakened, and Howard developed a small, compact circulation. These environmental and structural changes caused Howard to rapidly strengthen on 8 August, intensifying 35 kt in the 24-h period between 0000 UTC 8-9 August. Howard reached a peak intensity of 75 kt between 0000 and 0600 UTC 9 August, located a few hundred miles west-southwest of Baja California Sur. The hurricane then began to steadily weaken late on 9 August due to it moving over cooler waters. Howard was no longer a hurricane by early on 10 August, and it lost all convection late that day, becoming a 40-kt non-convective low-pressure area by 0000 UTC 11 August, about 600 n mi west of the southern tip of Baja California Sur. The weakening system turned westward and gradually lost strength, opening up into a trough of low pressure about 2 days later.

## METEOROLOGICAL STATISTICS

Observations in Howard (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), objective Advanced Dvorak Technique (ADT) estimates and

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<sup>1</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* directory, while previous years’ data are located in the *archive* directory.

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 Howard.

The 75-kt peak intensity of Howard is based on a blend of objective Dvorak estimates, SATCON estimates, and subjective estimates from TAFB and SAB, all of which were between 70-80 kt. The minimum pressure of 983 mb was based on the Knaff-Zehr-Courtney pressure-wind relationship.

Howard made its closest approach to Socorro Island on 8 August. Sustained tropical-storm-force winds of 36 kt were reported on the island near 0000 UTC that day, with a peak gust of 49 kt reported 30 minutes later.

There were no reliable ship reports of tropical-storm-force winds.

## CASUALTY AND DAMAGE STATISTICS

There were no casualties or damage reported with Howard.

## FORECAST AND WARNING CRITIQUE

The genesis of Howard was very well anticipated, with formation eventually occurring within a day of expectations. The system was introduced in the Tropical Weather Outlook (TWO) at 0600 UTC 1 August with a low chance (<40%) of development over the next 5 days, 126 h before genesis occurred (Table 2). The system was assessed a 5-day medium (40-60%) chance of formation 96 h before development, and it reached the high category (>60%) 84 h before tropical cyclone formation took place. The 2-day probability of development reached the medium and high categories 72 and 42 h before formation, respectively. The formation areas on the Graphical TWO were also quite accurate, with 100% of the outlook areas encompassing the area in which Howard actually formed (Fig. 4).

A verification of NHC official track forecasts for Howard is given in Table 3a. Official track forecast errors were lower than the mean official errors for the previous 5-year period at all times. A homogeneous comparison of the official track errors with selected guidance models is given in Table 3b. The consensus model TVCX (consensus double-weighted for ECMWF) had the lowest errors for Howard at most time periods with a significant sample, but the NHC forecasts were only a bit worse. The ECMWF model performed well for this hurricane, while the GFS and UKMET models had much higher errors for Howard.

A verification of NHC official intensity forecasts for Howard is given in Table 4a. Official intensity errors were near or above the mean official errors for the previous 5-year period at all forecast times with a significant sample (through 72 h). NHC forecasts had a notable low bias and did not forecast Howard to become a hurricane until only 6 h before it occurred, completely missing the rapid intensification. A homogeneous comparison of the official intensity errors with selected guidance models is given in Table 4b. Model performances were quite varied for this cyclone, with a large variance of errors (~10 – 31 kt) for generally reliable guidance at 60 h. The GFS and HWRF models had low errors for this hurricane, while the HMON and LGEM models were especially poor for Howard.

There were no land-based watches or warnings issued for Howard.



Table 1. Best track for Hurricane Howard, 6-10 August 2022.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
06 / 1200	14.0	105.3	1006	30	tropical depression
06 / 1800	14.7	106.3	1006	30	"
07 / 0000	15.4	107.4	1006	30	"
07 / 0600	16.0	108.6	1006	30	"
07 / 1200	16.6	109.6	1006	30	"
07 / 1800	17.2	110.4	1005	35	tropical storm
08 / 0000	18.0	111.3	1004	40	"
08 / 0600	18.8	112.2	1003	45	"
08 / 1200	19.7	113.1	999	55	"
08 / 1800	20.3	113.9	991	65	hurricane
09 / 0000	20.9	114.8	983	75	"
09 / 0600	21.4	115.7	983	75	"
09 / 1200	21.9	116.5	986	70	"
09 / 1800	22.4	117.3	989	65	"
10 / 0000	22.9	118.0	992	60	tropical storm
10 / 0600	23.3	118.8	995	55	"
10 / 1200	23.6	119.8	999	50	"
10 / 1800	23.8	120.9	1004	45	"
11 / 0000	24.0	121.9	1006	40	low
11 / 0600	24.0	123.0	1006	35	"
11 / 1200	24.1	124.0	1007	30	"
11 / 1800	24.2	124.8	1007	30	"
12 / 0000	24.2	125.7	1009	25	"
12 / 0600	24.1	126.5	1009	25	"
12 / 1200	23.8	127.3	1011	25	"
12 / 1800	23.6	128.0	1012	20	"
13 / 0000	23.4	128.8	1014	20	"



Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
13 / 0600					dissipated
09 / 0000	20.9	114.8	983	75	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	126
Medium (40%-60%)	72	96
High (>60%)	42	84

Table 3a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Hurricane Howard, 6–10 August 2022. 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>14.7</b>	<b>21.8</b>	<b>26.8</b>	<b>32.5</b>	<b>36.7</b>	<b>50.8</b>	<b>68.5</b>	
OCD5	22.1	40.7	70.3	108.0	140.5	173.9	221.8	
Forecasts	16	14	12	10	8	6	2	
OFCL (2017-21)	21.9	33.8	45.6	56.9	74.8	79.9	99.5	121.3
OCD5 (2017-21)	35.8	72.3	112.7	155.0	198.7	239.0	309.2	372.2

Table 3b. Homogeneous comparison of selected track forecast guidance models (in n mi) for Hurricane Howard, 6–10 August 2022. 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	14.7	21.8	26.8	32.5	36.7	50.8	68.0	
OCD5	22.1	40.7	70.3	108.0	140.5	173.9	240.4	
GFSI	21.6	36.3	47.4	56.1	72.2	105.9	163.0	
EMXI	<b>10.5</b>	<b>15.4</b>	<b>25.2</b>	39.8	45.1	68.6	133.0	
EGRI	19.4	33.4	54.4	83.1	101.4	121.0	275.9	
CMCI	18.4	27.3	30.9	34.9	49.0	69.0	<b>38.9</b>	
HWFI	27.0	41.4	46.7	50.9	52.0	55.3	<b>63.0</b>	
HMNI	20.0	33.9	41.8	42.9	40.2	59.9	<b>21.1</b>	
AEMI	21.6	36.1	47.7	58.9	73.8	101.9	112.7	
HCCA	<b>13.9</b>	<b>21.2</b>	<b>26.7</b>	36.0	43.4	54.3	110.5	
GFEX	14.8	<b>21.3</b>	<b>24.2</b>	<b>30.4</b>	43.2	69.1	126.9	
TABD	23.3	49.8	84.5	124.1	164.2	198.0	230.5	
TABM	19.7	36.5	62.5	92.0	129.4	174.2	276.6	
TABS	17.1	25.7	48.3	80.4	134.9	192.2	337.0	
TVCE	<b>14.5</b>	22.4	26.9	<b>31.4</b>	<b>32.5</b>	<b>44.3</b>	78.2	
TVCX	<b>13.9</b>	<b>19.4</b>	<b>26.2</b>	<b>31.3</b>	<b>35.9</b>	<b>50.0</b>	90.0	
TVDG	<b>14.1</b>	<b>19.4</b>	<b>25.5</b>	33.4	<b>35.8</b>	<b>48.8</b>	96.6	
Forecasts	16	14	12	10	8	6	1	

Table 4a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Hurricane Howard, 6–10 August 2022. 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>5.0</b>	10.4	12.1	15.0	18.8	<b>15.0</b>	<b>2.5</b>	
OCD5	6.1	13.1	16.8	19.9	17.0	10.7	2.5	
Forecasts	16	14	12	10	8	6	2	
OFCL (2017-21)	5.5	9.1	11.1	12.9	15.3	15.6	16.4	17.0
OCD5 (2017-21)	7.0	12.2	15.8	18.6	20.4	21.2	22.3	21.8

Table 4b. Homogeneous comparison of selected intensity forecast guidance models (in kt) for Hurricane Howard, 6-10 August 2022. Errors smaller than the NHC official forecast are shown in boldface type.

Model ID	Forecast Period (h)							
	12	24	36	48	60	72	96	120
OFCL	5.0	10.4	12.1	15.0	18.8	15.0	2.5	
OCD5	6.1	13.1	16.8	19.9	<b>17.0</b>	<b>10.7</b>	2.5	
HWFI	6.9	<b>9.9</b>	12.8	<b>14.4</b>	<b>13.1</b>	<b>6.8</b>	6.0	
HMNI	6.9	11.6	14.3	22.5	31.6	31.2	17.5	
DSHP	6.4	13.4	16.8	17.3	<b>13.8</b>	<b>4.5</b>	12.5	
LGEM	5.7	12.9	18.7	23.8	26.2	22.5	9.5	
ICON	5.5	10.5	14.9	19.0	20.9	15.8	2.5	
IVCN	5.4	10.5	14.6	18.8	20.2	15.7	5.0	
IVDR	5.6	<b>9.9</b>	13.2	17.1	19.0	<b>14.5</b>	4.0	
HCCA	5.0	<b>9.1</b>	<b>11.4</b>	<b>13.6</b>	<b>14.9</b>	<b>12.0</b>	5.5	
GFSI	5.6	<b>9.8</b>	<b>10.8</b>	<b>10.2</b>	<b>9.9</b>	<b>2.5</b>	13.0	
EMXI	7.1	13.4	19.4	26.2	29.9	27.8	21.5	
Forecasts	16	14	12	10	8	6	2	



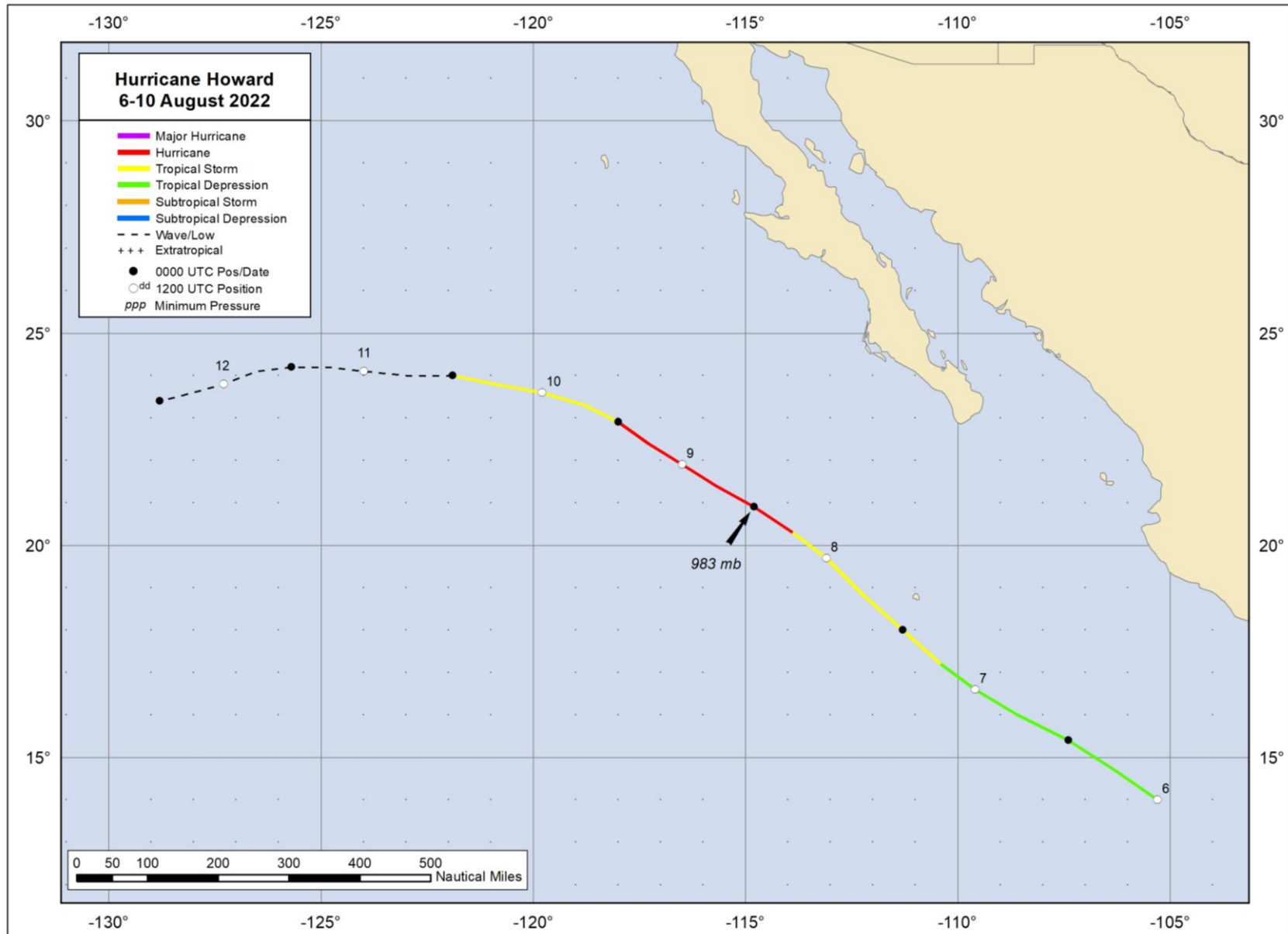


Figure 1. Best track positions for Hurricane Howard, 6–10 August 2022.

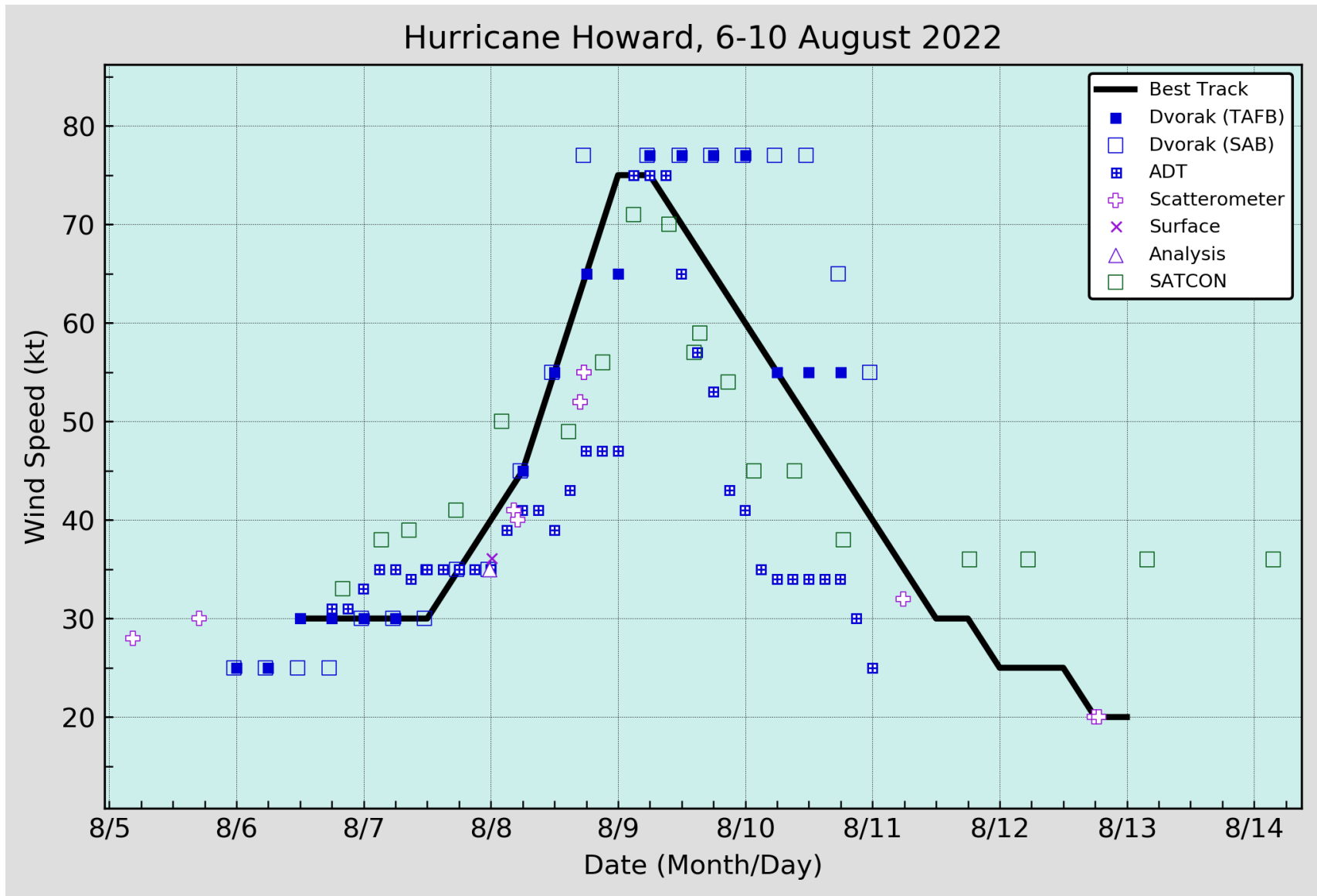


Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Hurricane Howard. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies. Dashed vertical lines correspond to 0000 UTC.

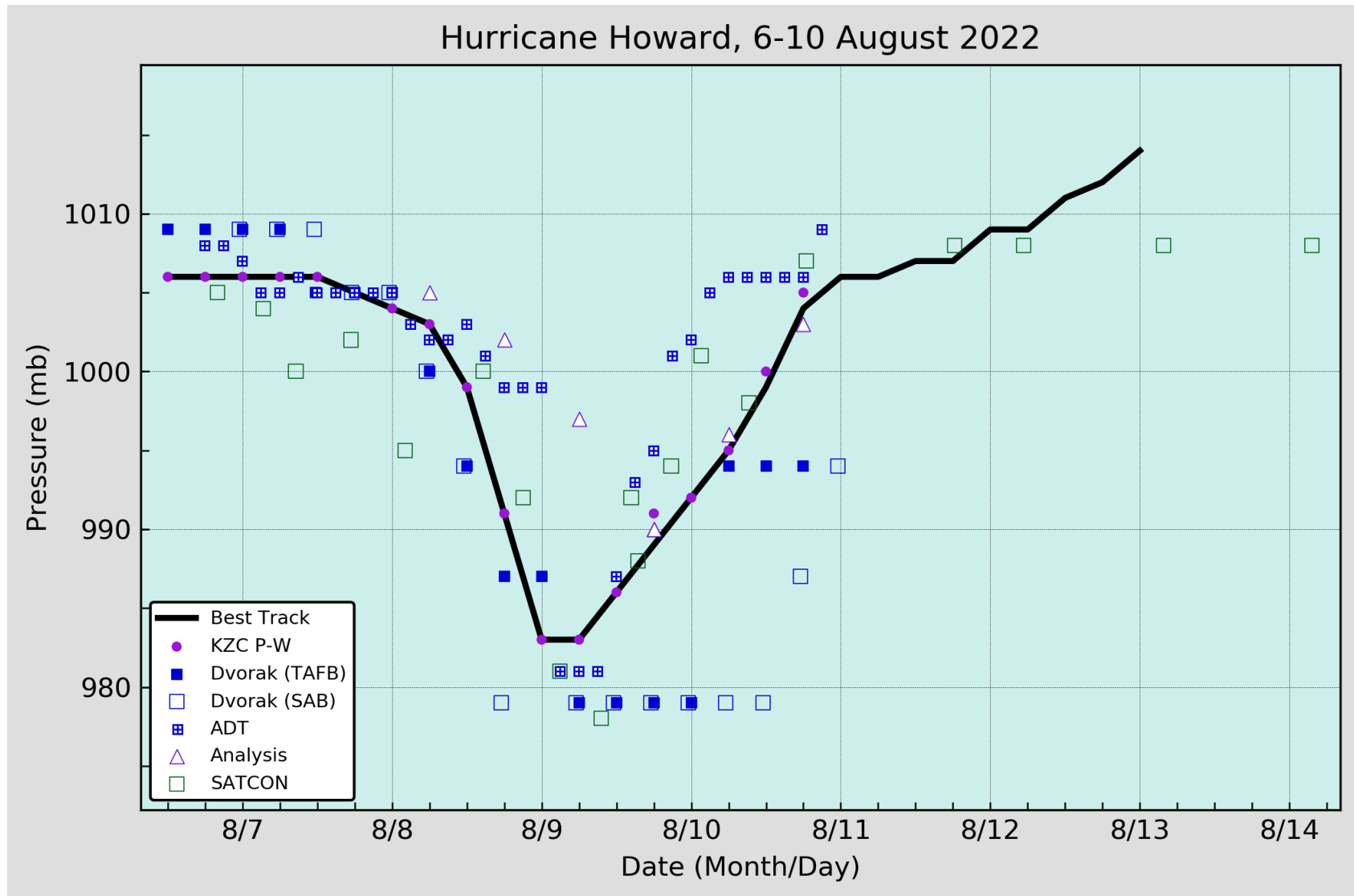


Figure 3. Selected pressure observations and best track minimum central pressure curve for Hurricane Howard. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for Meteorological Satellite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

### Howard 5-day Tropical Weather Outlook Areas

From: 0600 UTC 1 Aug 2022 to 1200 UTC 6 Aug 2022

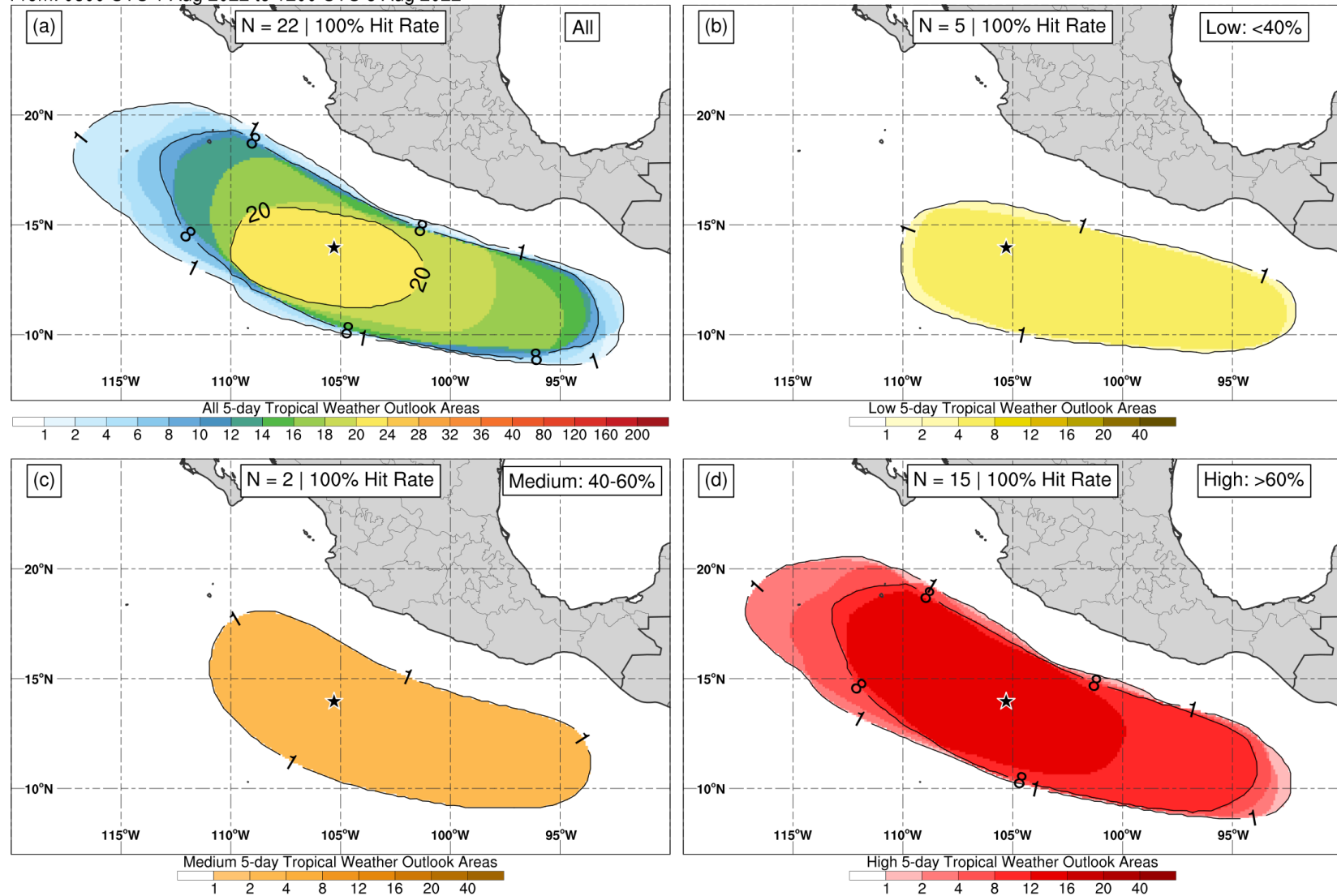


Figure 4. Composites of 5-day tropical cyclone genesis areas depicted in NHC’s Tropical Weather Outlooks prior to the formation of Howard (a) all probabilistic genesis categories, (b) the low (<40%) category, (c) medium (40–60%) category, and (d) high (>60%) category. Howard’s location of genesis is indicated by the black star.