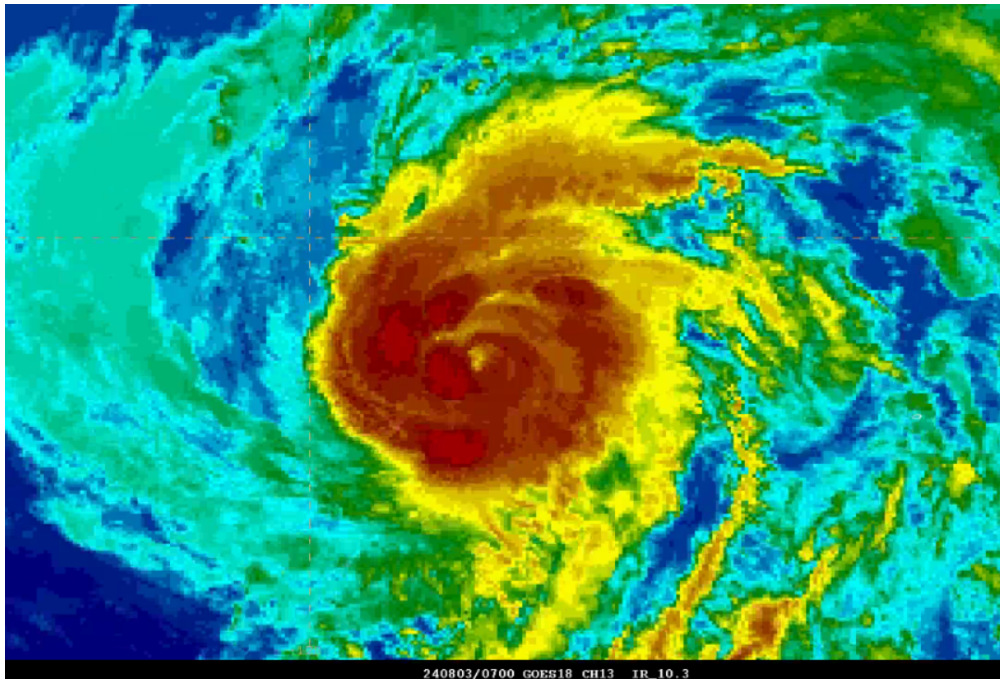# NATIONAL HURRICANE CENTER TROPICAL CYCLONE REPORT[1]

HURRICANE CARLOTTA
(EP032024)
31 July–5 August 2024

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National Hurricane Center
19 November 2024

GOES-WEST INFRARED SATELLITE IMAGE OF HURRICANE CARLOTTA AROUND THE TIME OF ITS PEAK INTENSITY AT 0700 UTC 3 AUGUST 2024.

Carlotta was a typical early-season hurricane that moved near Clarion Island as a category 1 hurricane before dissipating over cool waters.

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[1] This is an abbreviated Tropical Cyclone Report since there were no coastal watches or warnings issued and no direct fatalities reported with Carlotta.

Hurricane Carlotta

31 JULY–5 AUGUST 2024

BEST TRACK

The "best track[2]" positions and intensities for Hurricane Carlotta are listed in Table 1. The best track chart of Carlotta's path is given in Fig. 1, with the wind and pressure histories along with available observations[3] shown in Figs. 2 and 3, respectively.

Origin

Carlotta's origins were likely related to a fast-moving tropical wave that departed the west coast of Africa on 18 July. The wave moved over Central America on 26 July with plenty of deep convection. An area of low pressure was first noted several hundred miles south of the coast of southern Mexico on 29 July. Satellite data indicate that this system became organized enough to be considered a tropical depression near 0600 UTC 31 July, about 350 n mi south-southwest of Manzanillo, Mexico.

Peak Intensity and Minimum Pressure

Carlotta's peak intensity of 80 kt early on 3 August is primarily based on a combination of available objective and subjective Dvorak estimates, which ranged from 77 to 90 kt.

A surface observation site on Clarion Island (station ICLC8) reported maximum sustained winds of 47 kt and a gust of 71 kt at 1245 UTC 2 August, along with a minimum pressure of 985.8 mb at 1300 UTC that day with 6 kt of wind.

The estimated minimum pressure of Carlotta was 979 mb at 0600 UTC 3 August, which was based on a combination of the Knaff-Zehr-Courtney (KZC) pressure-wind relationship, nudged downward a bit based on comparison with the Clarion Island observation on the previous day.

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[2] 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 *btk* directory, while previous years' data are located in the *archive* directory.

[3] 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 Carlotta.

CASUALTY AND DAMAGE STATISTICS

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

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. Figure 4 shows composites of 7-day TWO genesis areas prior to the formation of Carlotta. The genesis forecasts for Carlotta were skillful, but with less-than-ideal lead time. The system that became Carlotta was first mentioned in the TWO 120 h prior to genesis with a low chance (<40%) of development within 7 days. Likewise, the 2-day formation probabilities were introduced 78 h prior to genesis. However, the probabilities only reached the 2-day medium category 36 h before genesis, suggesting that genesis happened a bit faster than expected. Regarding the 7-day graphical TWO, 100% of the areas correctly captured the tropical cyclone's genesis location, albeit centered a bit north of where genesis occurred (Fig. 4).

A verification of NHC official track forecasts for Carlotta is given in Table 3a. Official track forecast errors were lower than the mean official errors for the previous 5-yr period through 72 h then slightly above at 96-120 h. A homogeneous comparison of the official track errors with selected guidance models is given in Table 3b. All of the dynamical model consensus aids performed quite well for Carlotta. As far as the individual track models, the HMON model (HMNI) had a good performance for this hurricane, while the ECMWF model (EMXI) had much higher errors than most models.

A verification of NHC official intensity forecasts for Carlotta is given in Table 4a. Official intensity forecast errors were also smaller than the mean official errors for the previous 5-yr period through 72 h and slightly above at 96-120 h. A homogeneous comparison of the official intensity errors with selected guidance models is shown in Table 4b. Almost all of the intensity forecast aids beat the NHC official forecast for this storm. An examination of the guidance indicates that the NHC forecast had a significant high bias at and after peak intensity (did not show weakening fast enough), while the consensus aid IVCN had quite low errors (Fig. 5).

There were no coastal watches or warnings issued for Carlotta.

Table 1.   Best track for Hurricane Carlotta, 31 July–5 August 2024.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
31 / 0600	14.3	105.8	1006	30	tropical depression
31 / 1200	15.0	106.7	1005	35	tropical storm
31 / 1800	15.8	107.6	1004	40	"
01 / 0000	16.4	108.4	1001	45	"
01 / 0600	16.8	109.4	1000	50	"
01 / 1200	17.1	110.4	999	50	"
01 / 1800	17.4	111.3	998	55	"
02 / 0000	17.8	112.4	995	60	"
02 / 0600	18.1	113.5	991	65	hurricane
02 / 1200	18.3	114.6	986	70	"
02 / 1800	18.5	115.8	983	75	"
03 / 0000	18.7	117.2	980	80	"
03 / 0600	18.8	118.4	979	80	"
03 / 1200	18.8	119.5	980	80	"
03 / 1800	19.0	120.5	983	75	"
04 / 0000	19.3	121.4	986	70	"
04 / 0600	19.5	122.4	989	65	"
04 / 1200	19.7	123.5	992	60	tropical storm
04 / 1800	19.8	124.4	996	55	"
05 / 0000	19.9	125.4	999	50	"
05 / 0600	20.1	126.1	1002	45	"
05 / 1200	20.3	126.8	1003	40	"
05 / 1800	20.5	127.4	1003	40	"
06 / 0000	20.6	128.1	1003	40	low
06 / 0600	20.6	128.8	1005	35	"
06 / 1200	20.6	129.4	1007	30	"
06 / 1800	20.6	130.1	1008	30	"
07 / 0000	20.6	131.0	1008	30	"
07 / 0600	20.4	131.8	1008	30	"
07 / 1200	20.1	132.6	1008	25	"

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
07 / 1800	19.9	133.3	1008	25	"
08 / 0000	19.6	134.2	1008	25	"
08 / 0600	-	-	-	-	dissipated
03 / 0600	18.8	118.4	979	80	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	**168-Hour Outlook**
Low (<40%)	78	120
Medium (40%-60%)	36	96
High (>60%)	30	48

Table 3a.   NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Carlotta. 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	**15.6**	**24.8**	**29.6**	**35.0**	**47.9**	**60.3**	125.5	210.3
OCD5	27.5	50.3	68.0	97.3	134.3	164.0	209.2	163.4
Forecasts	20	18	16	14	12	10	6	2
OFCL (2019-23)	22.6	34.4	46.0	57.6	69.6	83.5	112.4	137.2
OCD5 (2019-23)	38.2	75.5	117.0	160.0	203.5	247.6	329.5	404.4

Table 3b.   Homogeneous comparison of selected track forecast guidance models (in n mi) for Carlotta. 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	13.6	22.9	26.8	31.4	43.0	55.2	120.1	204.9
OCD5	27.3	50.3	69.5	102.9	142.9	173.0	227.3	**201.5**
GFSI	15.9	26.1	32.9	39.9	48.3	62.2	**89.8**	**107.0**
EMXI	14.9	27.2	37.7	49.2	66.5	88.9	158.3	237.8
HMNI	18.1	28.0	31.1	**30.9**	**37.9**	**46.1**	**92.3**	371.0
HWFI	21.0	35.2	42.9	52.9	63.7	83.0	**83.3**	**145.3**
HFAI	**13.2**	22.9	31.2	37.0	53.7	68.1	**115.0**	325.9
HFBI	15.5	25.2	28.1	**29.8**	44.3	66.9	149.3	437.2
CMCI	20.5	35.2	45.1	67.7	114.2	193.8	395.9	482.8
NVGI	25.7	42.6	48.0	48.4	51.5	55.8	**42.9**	**90.7**
AEMI	16.4	25.4	29.3	33.4	**39.7**	**51.0**	**83.6**	225.3
FSSE	15.5	**20.5**	**24.9**	**27.5**	**37.9**	56.2	**99.3**	**185.5**
HCCA	15.0	**22.7**	**26.3**	33.5	**40.4**	**46.9**	105.7	296.9
TVCE	13.7	**20.4**	**23.7**	**27.2**	**36.9**	**45.6**	**85.1**	251.3
TVCX	13.7	**20.4**	**24.6**	**29.1**	**39.5**	**48.7**	**86.8**	235.6
GFEX	14.0	22.9	27.8	31.6	**38.3**	**50.3**	**90.0**	**149.1**
TVDG	**13.1**	**19.5**	**23.7**	**29.5**	**39.9**	**48.1**	**81.1**	217.6
TABD	24.7	53.5	75.3	92.2	111.3	145.4	171.1	**55.9**
TABM	22.7	38.5	43.1	39.7	51.5	75.9	**113.8**	**192.8**
TABS	23.9	39.1	47.7	59.2	82.2	90.0	124.2	332.0
TVCN	14.5	**21.9**	**25.6**	**30.7**	**39.8**	**47.2**	**68.4**	**144.0**
Forecasts	18	17	15	13	11	9	5	1

Table 4a.   NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Carlotta. 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	**4.8**	**7.2**	**8.4**	**9.3**	**10.0**	**13.5**	20.8	22.5
OCD5	5.9	8.2	13.4	16.6	15.8	12.8	9.0	4.0
Forecasts	20	18	16	14	12	10	6	2
OFCL (2019-23)	5.5	8.7	10.8	12.7	14.5	15.6	17.1	18.0
OCD5 (2019-23)	7.2	12.2	15.9	18.6	19.9	20.0	19.6	18.7

Table 4b.   Homogeneous comparison of selected intensity forecast guidance models (in kt) for Carlotta. 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	4.4	7.1	8.3	9.2	10.0	14.4	23.0	25.0
OCD5	5.5	8.1	13.2	16.0	14.3	**10.9**	**8.6**	**1.0**
HWFI	5.7	7.2	8.7	**7.9**	**5.9**	**4.3**	**9.6**	**15.0**
HMNI	**3.2**	**3.9**	**5.9**	**5.6**	**5.1**	**4.6**	**7.6**	**17.0**
HFAI	**4.3**	**6.1**	**8.2**	9.9	**7.5**	**5.1**	**8.8**	**0.0**
HFBI	6.8	11.0	13.7	12.6	**9.4**	**9.0**	**10.4**	**5.0**
DSHP	5.0	7.1	**7.3**	**5.4**	**5.2**	**8.4**	17.0	22.0
LGEM	5.2	**6.9**	**7.5**	**5.8**	**3.6**	**5.1**	18.6	21.0
ICON	**4.2**	**5.6**	**5.9**	**4.9**	**2.7**	**4.7**	13.2	19.0
IVCN	**3.6**	**4.8**	**5.7**	**5.0**	**2.8**	**4.6**	**9.4**	13.0
IVDR	**3.6**	**4.8**	**6.4**	**5.7**	**3.2**	**3.9**	**8.2**	12.0
HCCA	**4.0**	**5.6**	**5.8**	**5.6**	**7.6**	**9.4**	**7.2**	**4.0**
FSSE	**3.3**	**4.5**	**5.8**	**5.4**	**4.0**	**5.2**	**8.4**	13.0
GFSI	4.8	**6.7**	9.2	9.7	**7.7**	**4.0**	**5.0**	11.0
EMXI	6.2	10.8	14.8	16.7	15.5	**12.0**	**6.8**	11.0
Forecasts	18	17	15	13	11	9	5	1
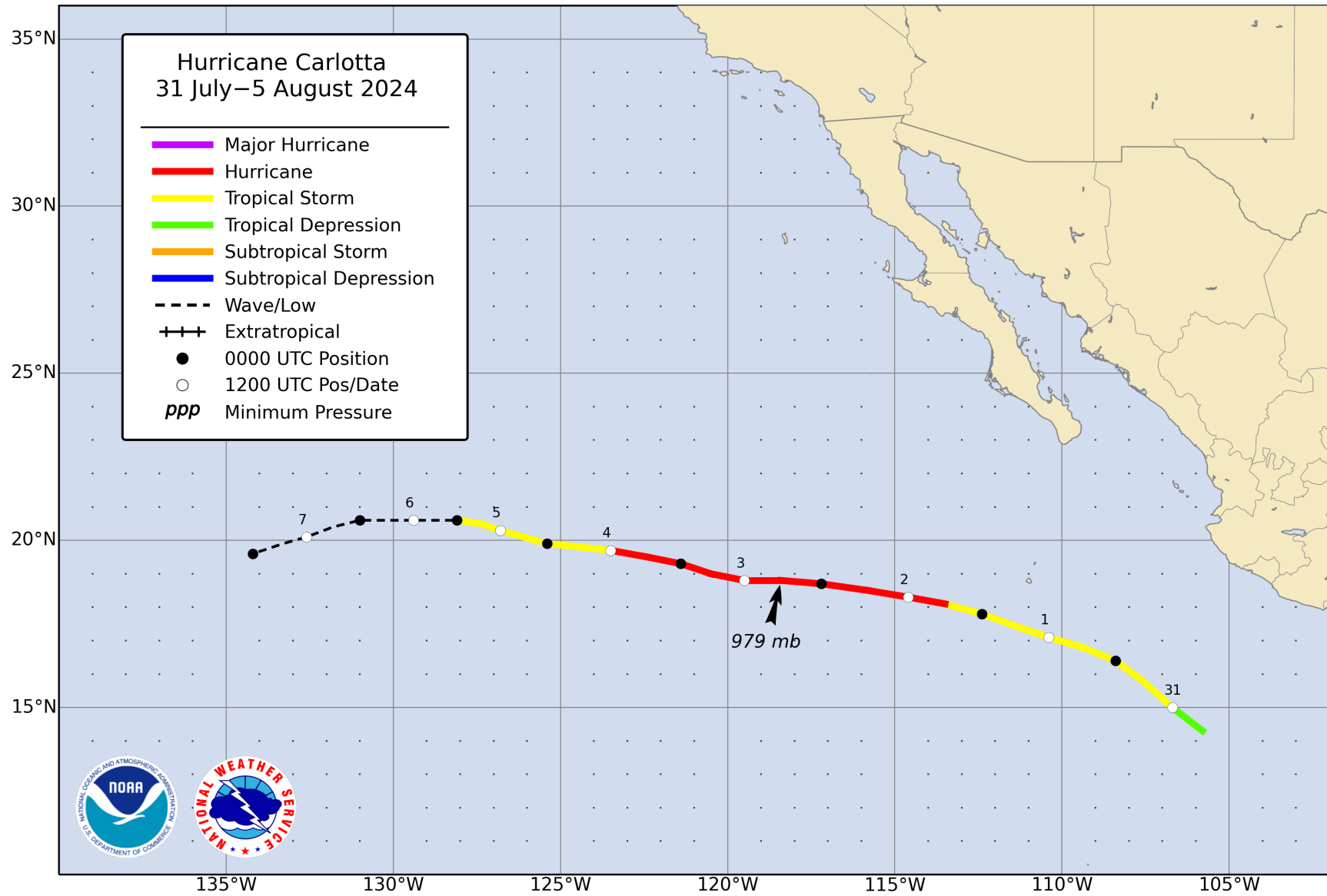
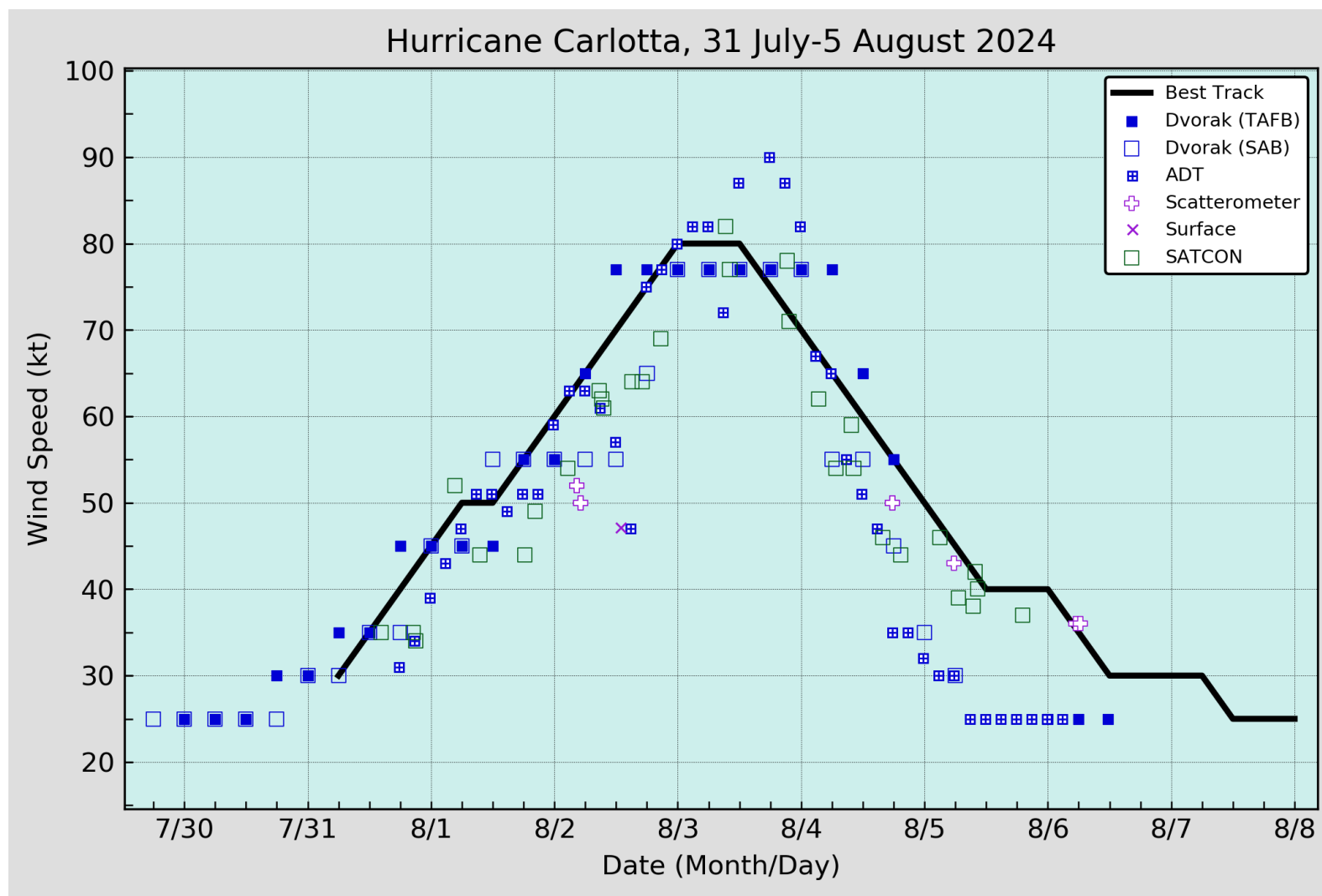Figure 1.   Best track positions for Hurricane Carlotta, 31 July–5 August 2024.

Figure 2.   Selected wind observations and best track maximum sustained surface wind speed curve for Hurricane Carlotta, 31 July–5 August 2024. 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.
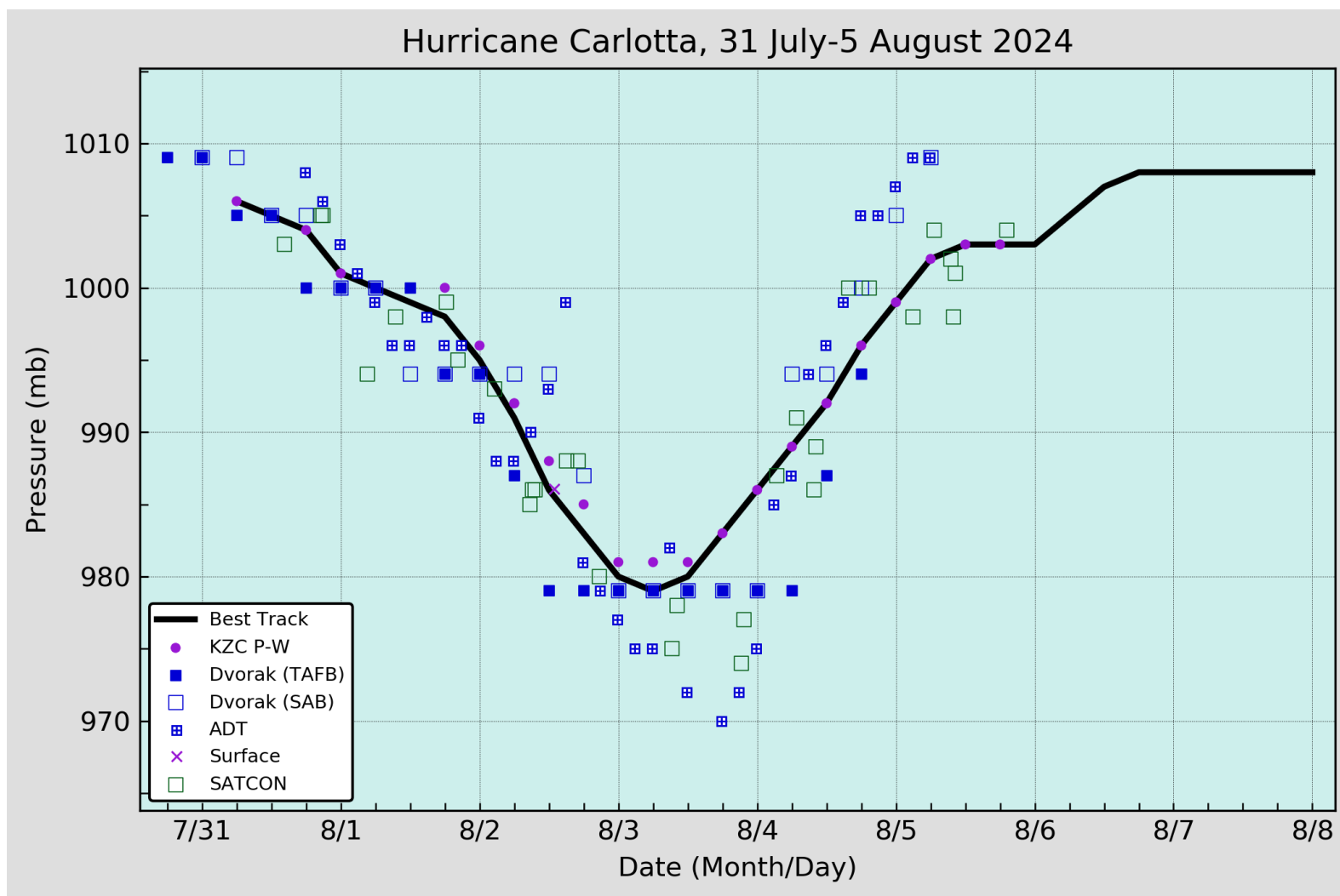
Figure 3.   Selected pressure observations and best track minimum central pressure curve for Hurricane Carlotta, 31 July–5 August 2024. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for 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.

Carlotta 7-day Tropical Weather Outlook Areas
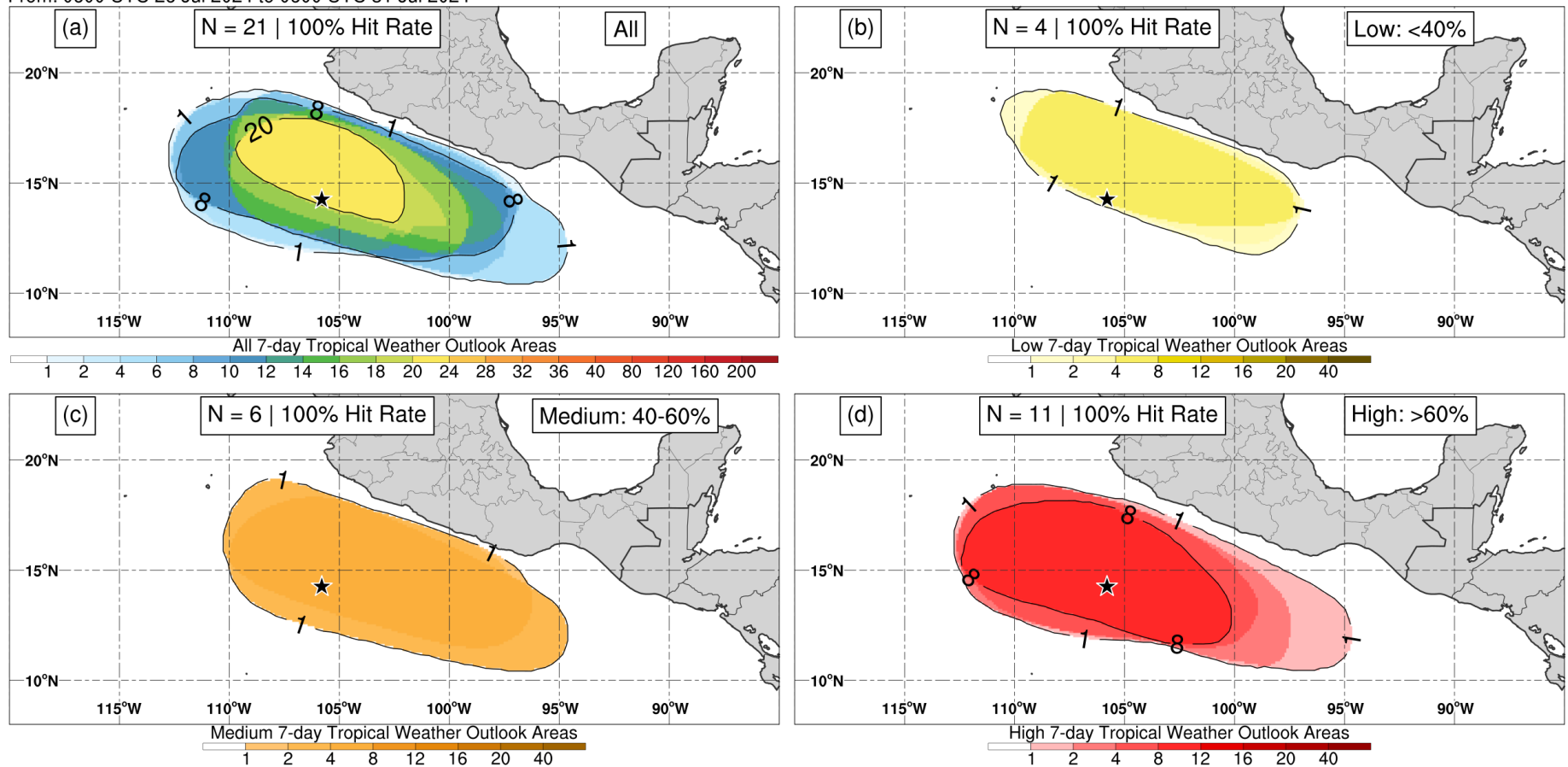From: 0600 UTC 26 Jul 2024 to 0600 UTC 31 Jul 2024

Figure 4.   Composites of 7-day tropical cyclone genesis areas depicted in NHC's Tropical Weather Outlooks prior to the formation of Carlotta 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.
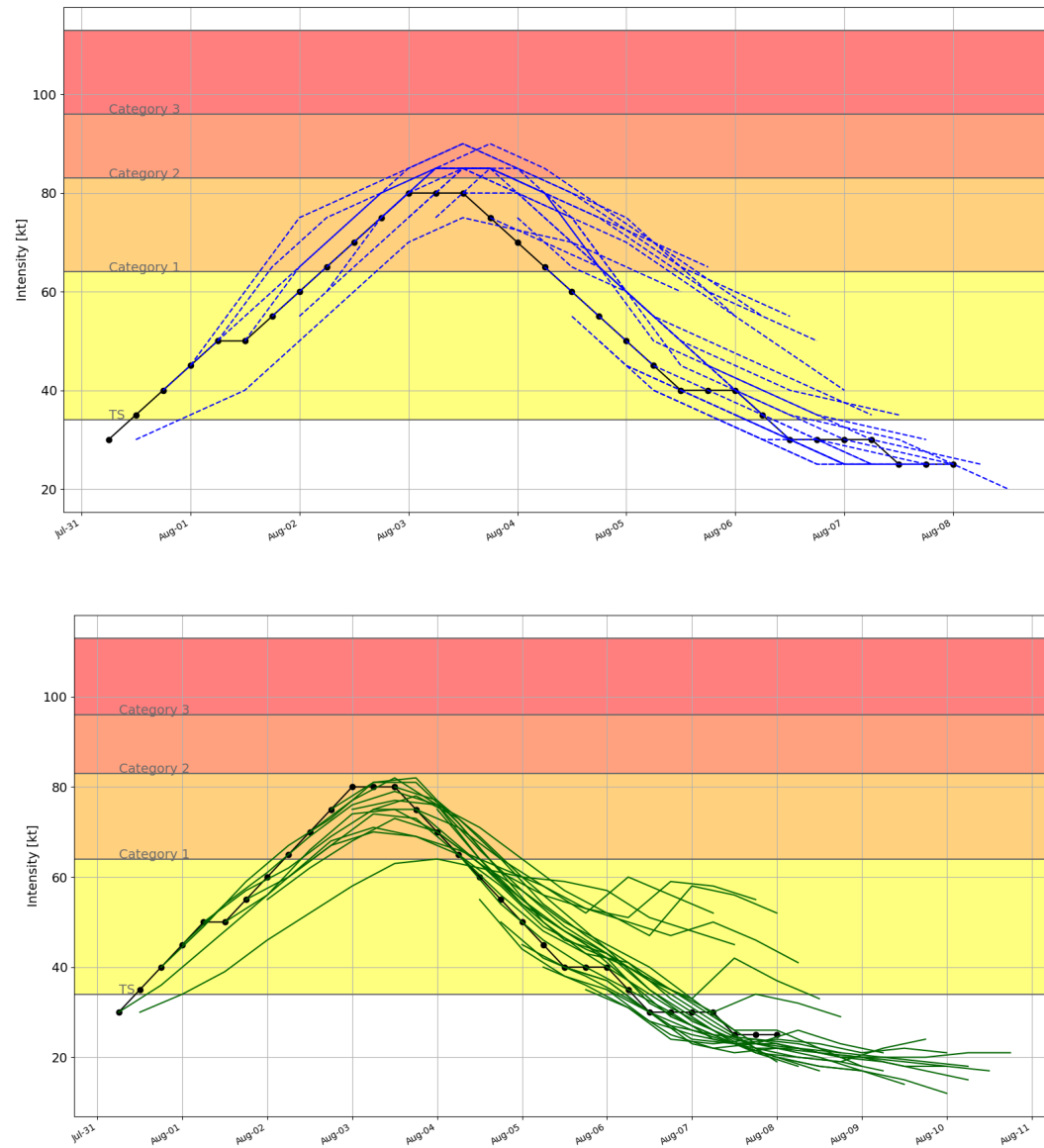
Figure 5.   All intensity forecasts for Carlotta (colored lines) with the verifying intensity in white symbols. The NHC official forecast is on the top panel (blue lines), while the intensity model consensus IVCN is on the bottom panel (green lines).