

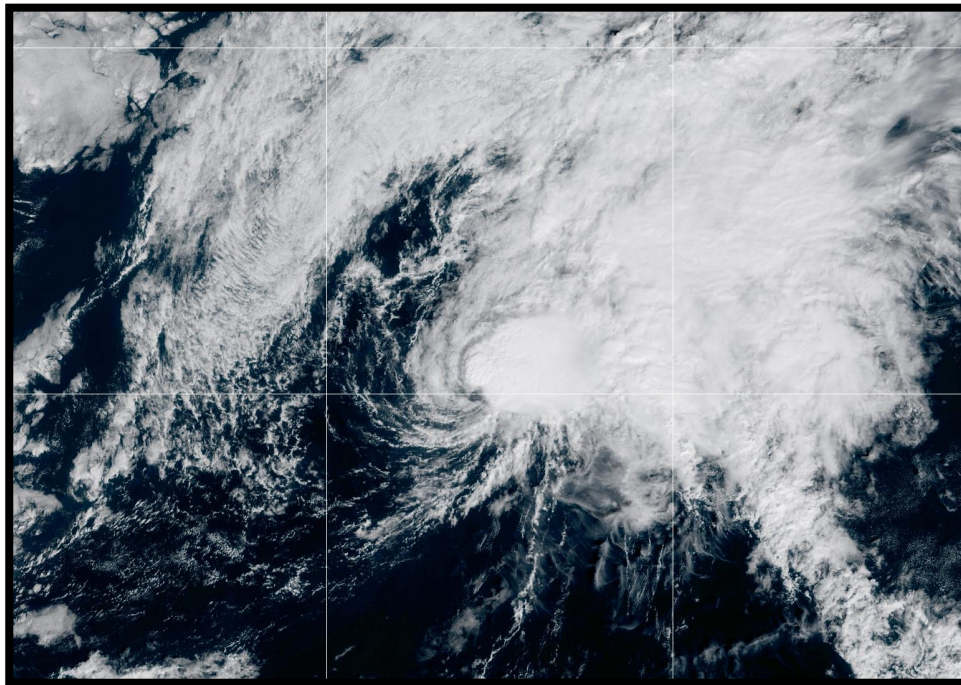


NATIONAL HURRICANE CENTER TROPICAL CYCLONE REPORT¹

TROPICAL STORM RAMON (EP2023)

21–26 November 2023

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National Hurricane Center
18 January 2024



GOES-18 GEOCOLOR SATELLITE IMAGE OF TROPICAL STORM RAMON AT 1800 UTC 25 NOVEMBER 2023 WHEN IT REACHED ITS PEAK INTENSITY. IMAGE COURTESY OF NOAA/NESDIS/STAR.

Ramon meandered over the west-central part of the eastern Pacific basin in mid to late November and was the latest-forming tropical storm in the eastern Pacific basin since Winnie in 1983.

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

Tropical Storm Ramon

21–26 NOVEMBER 2023

BEST TRACK

The “best track²” positions and intensities for Tropical Storm Ramon are listed in Table 1. The best track chart of Ramon’s path is given in Fig. 1, with the wind and pressure histories along with available observations³ shown in Figs. 2 and 3, respectively.

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

Origin

Ramon’s origin is not clear. At a minimum, the cyclone can be traced back to a low-level disturbance that developed within the monsoon trough just west of Central America on 11 November and was likely aided by some vorticity from a Gulf of Tehuantepec gap wind event on 14–15 November. Before that, a westward-moving surface trough was analyzed by the Tropical Analysis and Forecast Branch (TAFB) over the Caribbean Sea from 7–10 November and may have helped spur the development of the disturbance on 11 November. The surface trough may have had a combined origin from a low-latitude easterly wave that moved off the west coast of Africa on 28 October and a mid- to upper-level trough over the central Atlantic in early November.

Ramon’s strengthening to a tropical storm by 1200 UTC 24 November is the latest that a tropical storm has formed in the eastern Pacific basin since Hurricane Winnie (1983) became a tropical storm at 0000 UTC 5 December. Hurricane Sandra (2015) became a tropical storm 12 h earlier than Ramon at 0000 UTC 24 November.

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 *bt*k 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 Satellite Analysis Branch (SAB), and 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 Ramon.

Peak Intensity and Minimum Pressure

Ramon's estimated peak intensity of 40 kt from 1800 UTC 25 November to 0000 UTC 26 November is supported by a blend of conflicting ASCAT-B (33 kt) and ASCAT-C (46 kt) data on the afternoon of 25 November and SATCON estimates around 40 kt. The estimated minimum central pressure of 1002 mb is based on the Knaff-Zehr-Courtney (KZC) pressure-wind relationship.

CASUALTY AND DAMAGE STATISTICS

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

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. Tropical cyclone formation from Intertropical Convergence Zone/monsoon trough disturbances is notoriously difficult to forecast, and Ramon's formation was no different. A low (<40%) chance of genesis during both the next 2 and 7 days was first indicated in the TWO 114 h before Ramon formed, and probabilities never increased into the medium and high categories before genesis is analyzed to have occurred. Operationally, NHC issued medium and high genesis forecasts just before advisories were initiated. However, the post-analysis of Ramon indicates that the system had a sufficiently well-defined center of circulation and organized deep convection (based on TAFB Dvorak estimates) to be classified as a tropical depression as early as 1200 UTC 21 November. Advisories were not initiated earlier since it was assumed that the system would not maintain organized deep convection in the ensuing days. Figure 4 shows composites of 7-day TWO genesis areas for each category prior to the formation of Ramon. Despite the lack of medium- and high-probability forecasts, Ramon's genesis location fell within all potential genesis areas depicted in NHC's Graphical TWO.

A verification of NHC official track forecasts for Ramon is given in Table 3a. Official track forecast errors were higher than the mean official errors for the previous 5-yr period at 12 h but lower from 24 through 60 h. A homogeneous comparison of the official track errors with selected guidance models is given in Table 3b.

A verification of NHC official intensity forecasts for Ramon is given in Table 4a. Official intensity forecast errors were lower than the mean official errors for the previous 5-yr period at 12 through 48 h but higher at 60 h (but only for one forecast). 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 Ramon.

Table 1. Best track for Tropical Storm Ramon, 21–26 November 2023.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
21 / 1200	10.1	119.8	1007	30	tropical depression
21 / 1800	10.3	120.2	1007	30	"
22 / 0000	10.6	120.4	1006	30	"
22 / 0600	11.0	120.5	1006	30	"
22 / 1200	11.4	120.5	1006	30	"
22 / 1800	11.8	120.6	1006	30	"
23 / 0000	11.9	120.8	1006	30	"
23 / 0600	11.9	121.0	1006	30	"
23 / 1200	11.8	121.3	1006	30	"
23 / 1800	11.9	121.7	1005	30	"
24 / 0000	12.3	122.2	1005	30	"
24 / 0600	12.7	122.5	1005	30	"
24 / 1200	13.1	122.6	1004	35	tropical storm
24 / 1800	13.5	122.7	1004	35	"
25 / 0000	13.9	122.8	1004	35	"
25 / 0600	14.3	122.9	1004	35	"
25 / 1200	14.7	123.0	1004	35	"
25 / 1800	15.0	122.9	1002	40	"
26 / 0000	14.9	122.7	1002	40	"
26 / 0600	14.5	123.1	1004	35	low
26 / 1200	14.4	123.7	1006	30	"
26 / 1800	14.3	124.0	1008	25	"
27 / 0000	14.1	124.4	1008	25	"
27 / 0600	13.8	124.7	1008	25	"
27 / 1200	13.7	125.0	1008	25	"
27 / 1800					dissipated
25 / 1800	15.0	122.9	1002	40	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	168-Hour Outlook
Low (<40%)	114	114
Medium (40%-60%)	-	-
High (>60%)	-	-

Table 3a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Tropical Storm Ramon, 21–26 November 2023. 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	26.6	28.5	40.6	34.7	43.6			
OCD5	45.0	65.8	123.5	137.3	91.5			
Forecasts	9	7	5	3	1			
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 Tropical Storm Ramon, 21–26 November 2023. 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	26.6	28.5	40.6	34.7	43.6			
OCD5	45.0	65.8	123.5	137.3	91.5			
GFSI	25.7	34.7	51.8	45.0	49.4			
EMXI	25.8	39.1	47.6	40.2	33.4			
CMCI	32.1	44.4	55.7	53.9	100.0			
NVGI	28.1	33.7	40.6	57.9	60.8			
HWFI	33.6	41.3	63.6	58.1	60.7			
HMNI	28.0	35.3	42.0	33.3	24.0			
HFAI	22.8	33.3	44.6	45.2	77.4			
HFBI	25.2	30.4	37.7	35.4	51.0			
HCCA	22.1	29.1	43.0	38.1	45.9			
AEMI	24.6	32.4	47.4	47.3	25.0			
GFEX	26.7	33.7	47.9	41.5	40.0			
TVCE	25.2	28.1	42.6	33.5	29.6			
TVCX	24.7	29.6	42.6	34.6	29.6			
TVDG	24.5	28.2	43.2	35.7	33.4			
TABD	46.9	77.9	121.7	152.3	191.4			
TABM	32.7	36.1	39.5	62.0	120.0			
TABS	36.3	48.6	68.1	56.8	24.7			
Forecasts	9	7	5	3	1			



Table 4a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Tropical Storm Ramon, 21–26 November 2023. 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	4.4	4.3	6.0	6.7	15.0			
OCD5	4.0	4.1	6.4	5.7	9.0			
Forecasts	9	7	5	3	1			
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 Tropical Storm Ramon, 21–26 November 2023. 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	4.4	4.3	6.0	6.7	15.0			
OCD5	4.0	4.1	6.4	5.7	9.0			
HWFI	2.7	4.6	5.2	2.7	2.0			
HMNI	3.0	2.6	2.6	6.3	2.0			
HFAI	2.4	4.3	4.4	3.3	5.0			
HFBI	2.7	3.3	2.8	5.0	4.0			
DSHP	5.0	8.6	12.2	14.0	14.0			
LGEM	4.9	8.0	11.4	13.3	15.0			
ICON	3.7	5.0	6.2	5.7	7.0			
IVCN	3.0	4.3	5.4	4.3	6.0			
IVDR	2.7	3.4	4.2	3.3	4.0			
HCCA	3.0	2.1	2.8	1.3	6.0			
GFSI	4.0	6.0	7.6	7.7	5.0			
EMXI	3.4	7.0	9.2	6.7	9.0			
Forecasts	9	7	5	3	1			

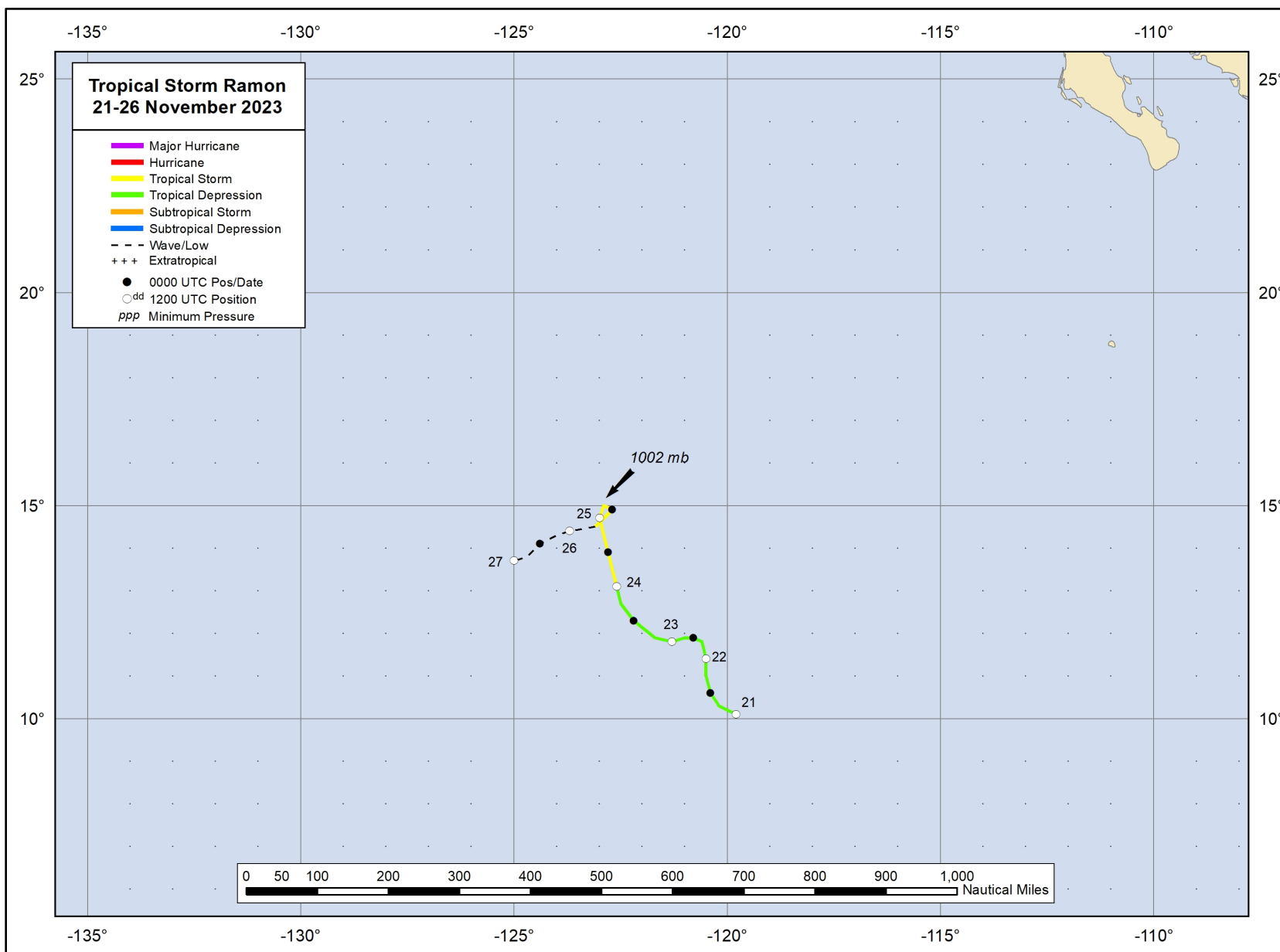


Figure 1. Best track positions for Tropical Storm Ramon, 21–26 November 2023.

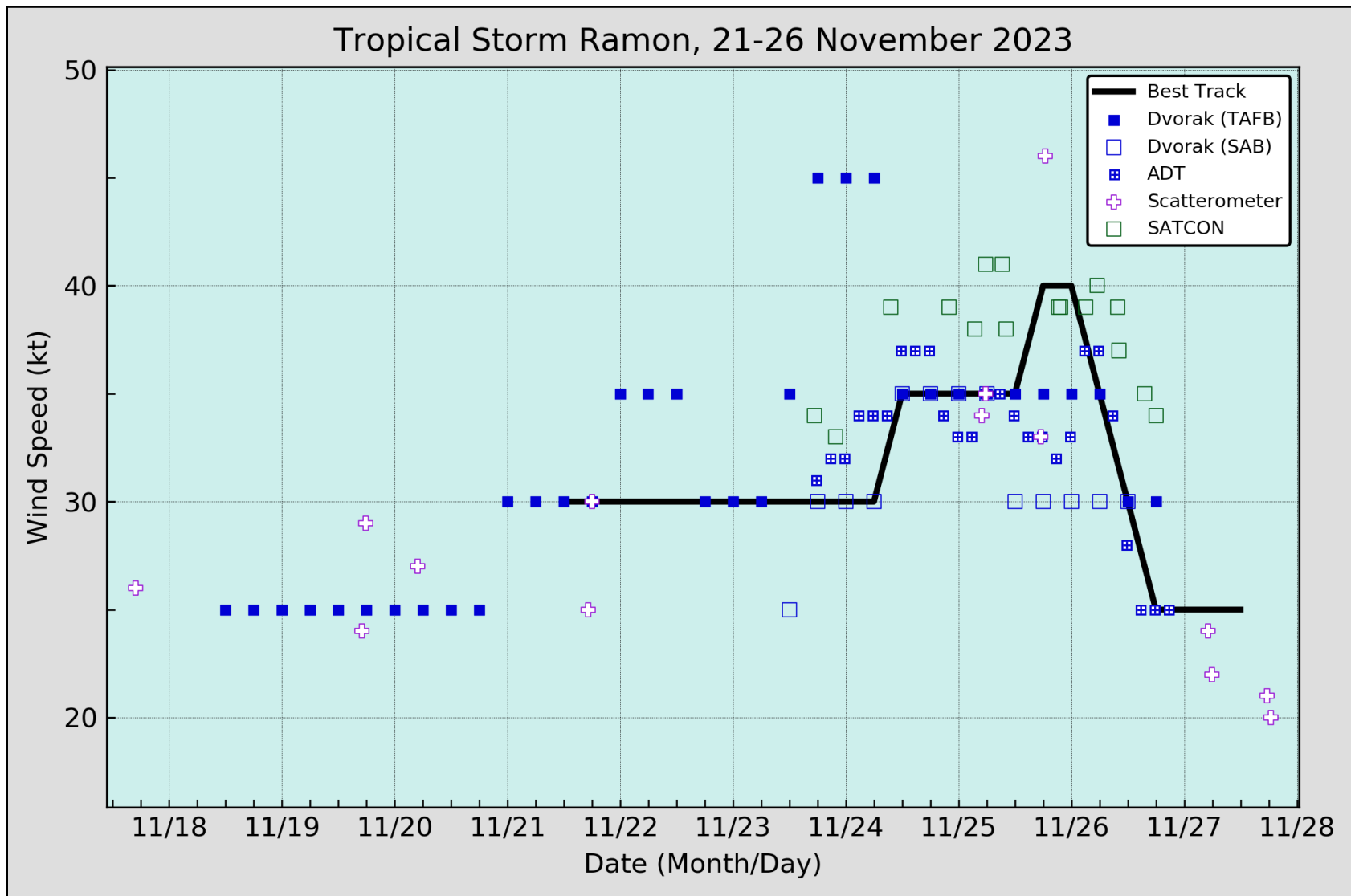


Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Tropical Storm Ramon, 21–26 November 2023. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies. Dashed vertical lines correspond to 0000 UTC.

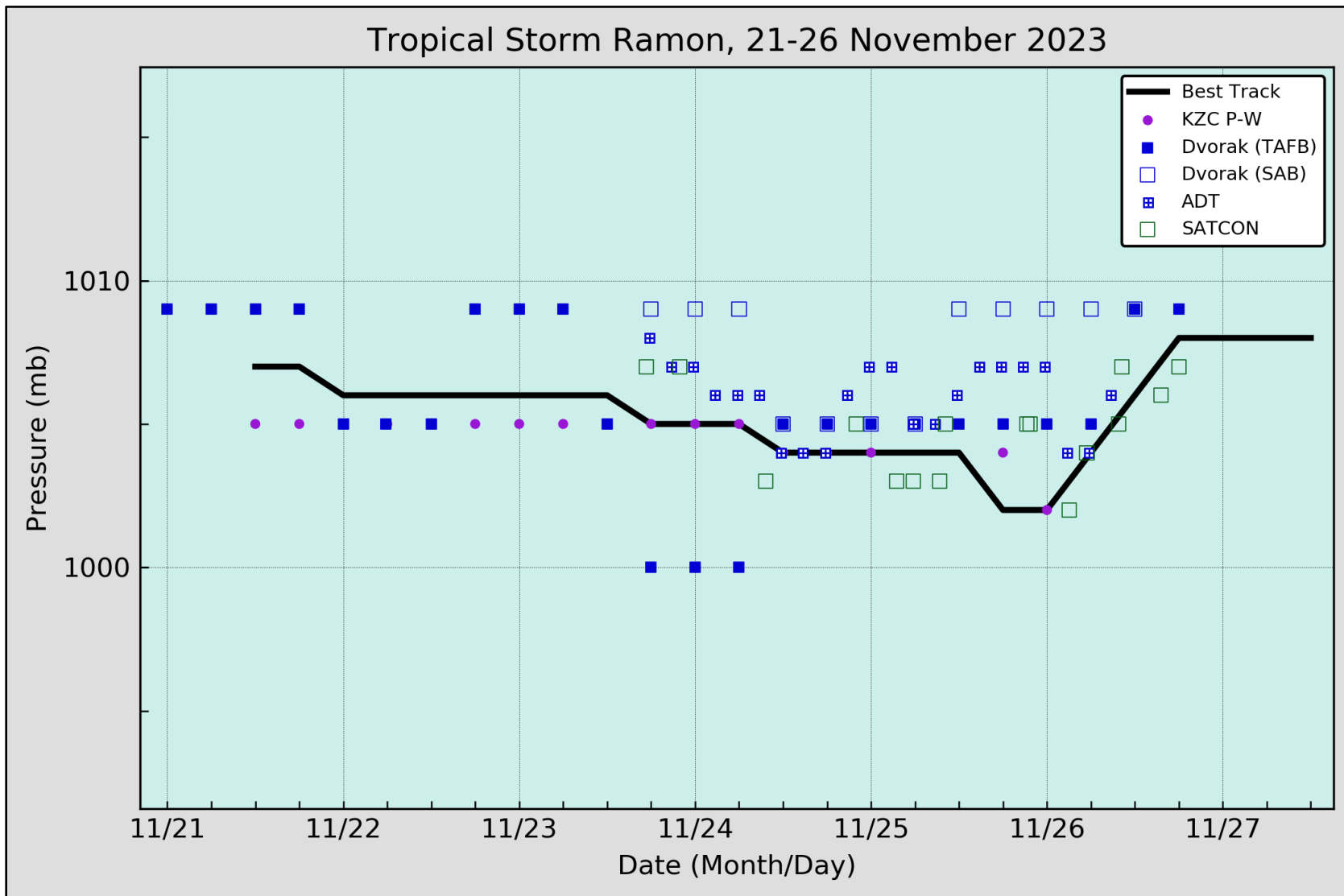


Figure 3. Selected pressure observations and best track minimum central pressure curve for Tropical Storm Ramon, 21–26 November 2023. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for 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.

Ramon 7-day Tropical Weather Outlook Areas

From: 1800 UTC 16 Nov 2023 to 1200 UTC 21 Nov 2023

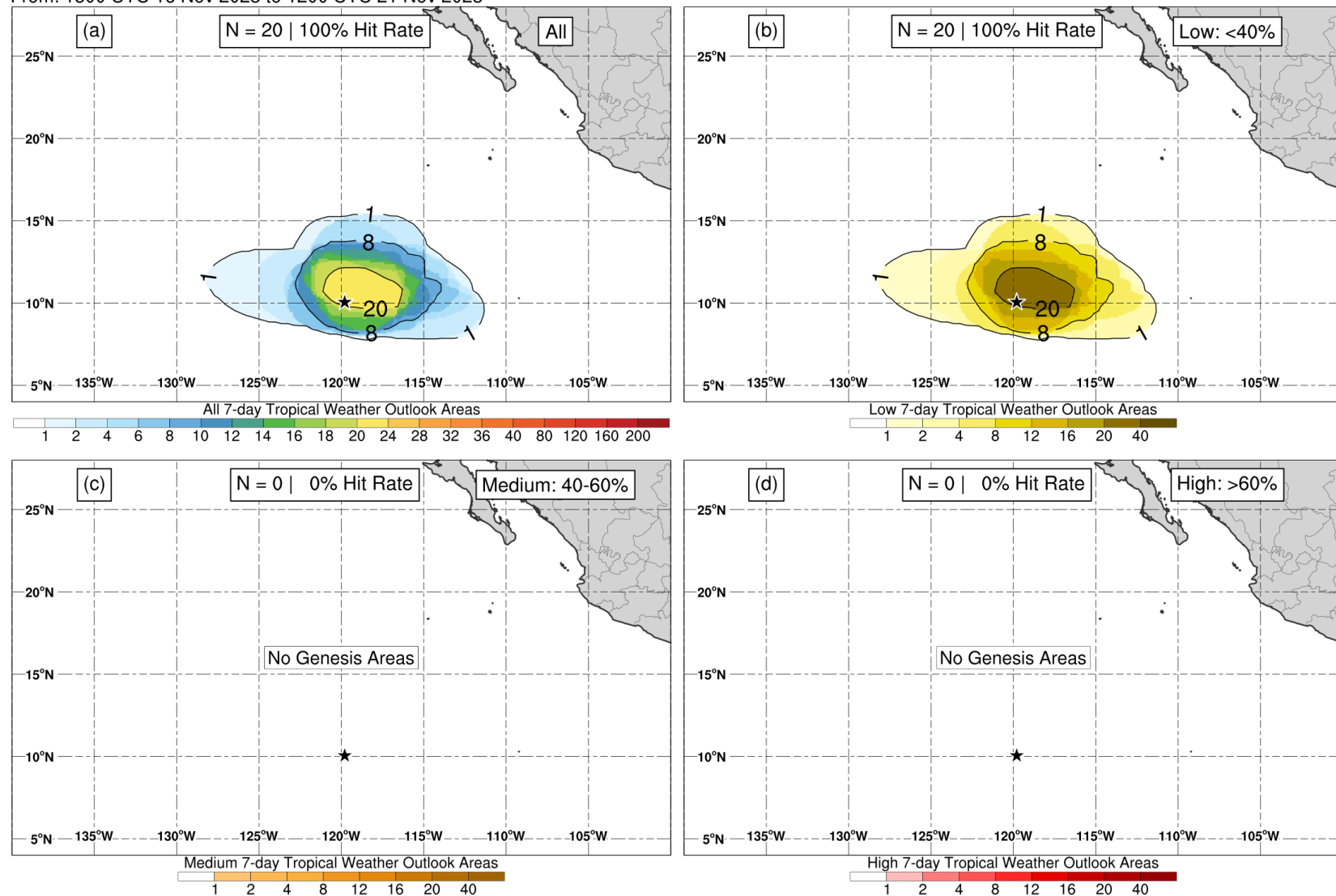


Figure 4. Composites of 7-day tropical cyclone genesis areas depicted in NHC’s Tropical Weather Outlooks prior to the formation of Ramon for (a) all probabilistic genesis categories, (b) the low (<40%) category, (c) medium (40–60%) category, and (d) high (>60%) category. The location of genesis is indicated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