NATIONAL HURRICANE CENTER
TROPICAL CYCLONE REPORT

HURRICANE JULIETTE

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1–7 September 2019

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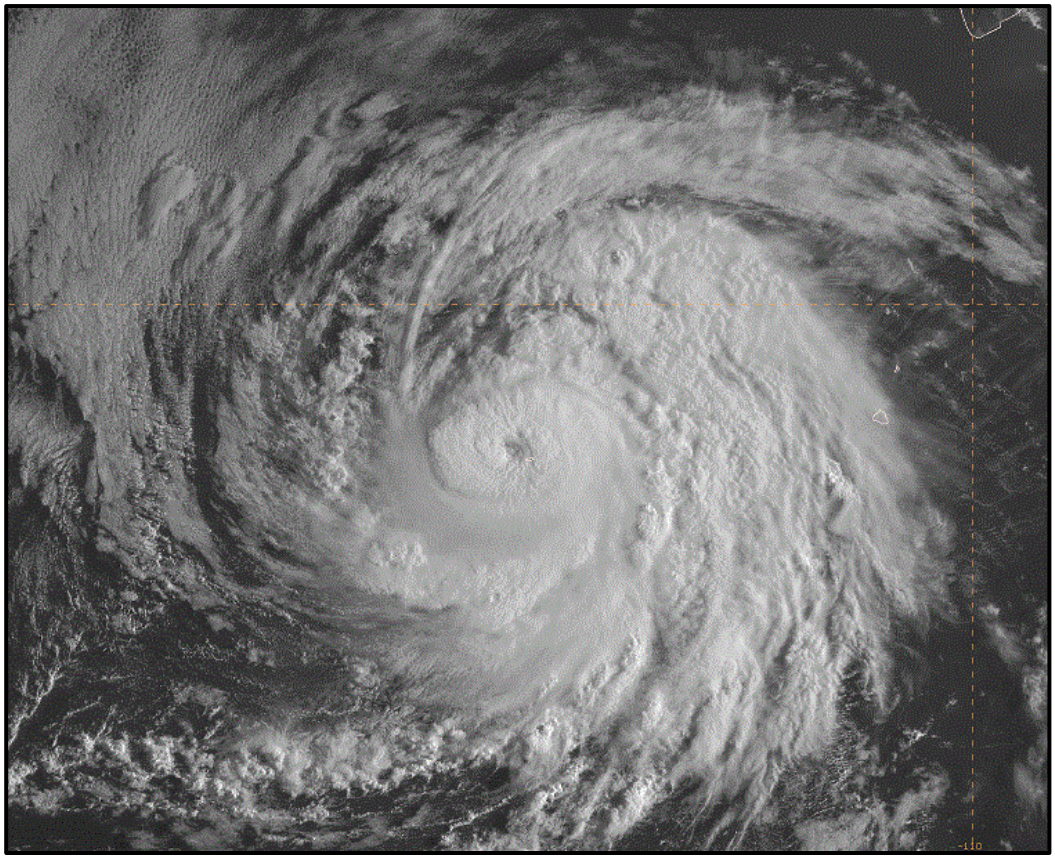

GOES-17 0.64-MICRON VISIBLE SATELLITE IMAGE OF HURRICANE JULIETTE AT 1510 UTC 3 SEPTEMBER 2019 NEAR ITS PEAK INTENSITY WHEN IT WAS LOCATED NEAR CLARION ISLAND.

Juliette was a major hurricane that developed well offshore of the southwestern coast of Mexico and moved northwest over the eastern Pacific, crossing Clarion Island before weakening.

Hurricane Juliette

1–7 SEPTEMBER 2019

SYNOPTIC HISTORY

Juliette's precursor disturbance can be traced back to a tropical wave that emerged off the west coast of Africa on 18 August and lost all of its convection by the next day. Still lacking any deep convection, the wave reached the Caribbean Sea by 23 August, and then crossed Central America on 27 August. Showers and thunderstorms associated with the wave re-developed and increased over the next couple of days, and a broad area of low pressure formed on 30 August several hundred miles south-southwest of the southern coast of Mexico. Showers and thunderstorms became better organized throughout the day on 31 August while scatterometer data indicated that the broad low began to produce winds of tropical storm strength. By 0000 UTC 1 September the low became well-defined, marking the formation of a tropical storm about 415 n mi south-southwest of Manzanillo, Mexico. Prior to and after genesis, this system was steered northwestward by a large ridge centered to its north and northeast. The "best track" chart of the tropical 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[1].

Juliette quickly organized on 1 September in a favorable environment of low shear, deep moisture, and warm sea surface temperatures. A small central dense overcast developed that day as well as extensive banding over the eastern portion of the tropical storm. By early on 2 September, a mid-level eye became apparent in microwave imagery. This development marked the beginning of a period of rapid intensification, as Juliette underwent a 60-kt increase in strength over a period of 36 h. Juliette became a hurricane by 1200 UTC 2 September while located about 410 n mi south-southwest of the southern tip of the Baja California peninsula. The hurricane then reached its peak intensity of 110 kt as a Category 3 hurricane (on the Saffir-Simpson Hurricane Wind Scale) at 1200 UTC 3 September, about the same time that the inner core passed over Clarion Island. Juliette maintained its peak intensity for about 12 h and then weakened rather quickly to 85 kt by 1200 UTC 4 September as the eyewall collapsed. The hurricane weakened at a slower pace over the next couple of days as it moved over cooler waters and into a drier, more stable environment while southwesterly shear increased. Juliette weakened to a tropical storm by 1800 UTC 6 September while located about 800 n mi west of the southern tip of the Baja California peninsula. The cyclone continued to weaken and degenerated into a post-tropical cyclone void of deep convection by 0600 UTC 7 September, while located about 920 n mi west of the southern tip of the Baja California peninsula. The post-tropical cyclone gradually lost strength while steered by the low-level easterlies for a couple of days before opening into a surface trough around 1200 UTC 9 September about 1475 n mi west of the southern Baja California peninsula.

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

METEOROLOGICAL STATISTICS

Observations in Juliette (Figs. 2 and 3) include subjective satellite-based Dvorak technique estimates from the Tropical Analysis and Forecast Branch (TAFB) and the 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 (UW-CIMSS). 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 Juliette.

Juliette's estimated peak intensity of 110 kt on 3 September is based on a blend of subjective Dvorak classifications from both TAFB and SAB and objective ADT and SATCON intensity estimates. These estimates ranged from 100–115 kt around that time.

A Mexican Navy automated weather station on Clarion Island reported a peak sustained wind of 86 kt and a gust to 113 kt at 1045 UTC 3 September. The station also reported a minimum pressure of 958.1 mb at 1230 UTC, but it should be noted that the pressure observations at this station appear to run about 4 to 5 mb too low.

There were no ship reports of tropical-storm-force winds associated with Juliette.

CASUALTY AND DAMAGE STATISTICS

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

FORECAST AND WARNING CRITIQUE

The genesis of Juliette was not well anticipated (Table 2). NHC's Tropical Weather Outlook initially indicated that the incipient disturbance had a low (<40%) chance of genesis during the next five days about 42 h before formation. The 5-day probability of genesis was increased to the medium category (40–60%) about 24 h before genesis occurred, and was raised to the high category (>60%) only 18 h before genesis. The possibility of tropical cyclone formation within 2 days was first mentioned only 24 h before formation. The 48-h genesis probabilities were increased to the medium category about 12 h before genesis and were then increased to the high category just 6 h before formation occurred. Some global models were not giving strong indications of tropical cyclone formation until the incipient disturbance began to organize quickly, just before genesis. Other models that did indicate genesis suggested it would not happen as quickly as it actually occurred.

A verification of NHC official track forecasts for Juliette is given in Table 3a. Official track forecast errors were lower than the mean official errors for the previous 5-yr period through 36 h, and higher from 48 through 120 h. A homogeneous comparison of the official track errors with selected guidance models is given in Table 3b. Overall, the consensus aids performed a little better than the official forecast with lower errors at most time intervals. Particularly, TVCA, FSSE, and HCCA had slightly lower errors than the official forecast at all time intervals. The HWFI had much lower errors than the official forecast at 96 and 120 h. A likely reason for the official forecast errors being higher than much of the guidance was due to a left-of-track bias (not shown). It is worth noting that OCD5 errors were quite low at day 4 and 5, indicating that the storm's track was more predictable than normal. However, the NHC forecast and many of the models had errors larger than OCD5, and therefore had little to no skill for the track forecasts for Juliette at those times.

A verification of NHC official intensity forecasts for Juliette is given in Table 4a. The official intensity forecasts were quite good, with errors lower than the mean official errors for the previous 5-yr period at all forecast time intervals. A homogeneous comparison of the official intensity errors with selected guidance models is given in Table 4b. The official forecast was better than the vast majority of the guidance from 12 through 48 h. The only models that were consistently better than the official forecast from 72 through 120 h were DSHP and the FSU Superensemble (FSSE).

No coastal watches or warnings were issued in association with Juliette.

Table 1. Best track for Hurricane Juliette, 1–7 September 2019.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
01 / 0000	12.7	107.2	1006	35	tropical storm
01 / 0600	13.2	107.7	1004	40	"
01 / 1200	13.8	108.2	1000	45	"
01 / 1800	14.5	109.1	998	50	"
02 / 0000	15.1	110.1	998	50	"
02 / 0600	15.7	111.1	997	55	"
02 / 1200	16.3	112.1	991	65	hurricane
02 / 1800	16.9	112.9	988	75	"
03 / 0000	17.5	113.6	971	85	"
03 / 0600	17.9	114.2	963	100	"
03 / 1200	18.2	114.7	953	110	"
03 / 1800	18.5	115.3	953	110	"
04 / 0000	18.8	115.8	958	105	"
04 / 0600	19.0	116.3	966	95	"
04 / 1200	19.1	116.9	972	85	"
04 / 1800	19.2	117.5	972	85	"
05 / 0000	19.5	118.2	976	80	"
05 / 0600	19.9	118.8	976	80	"
05 / 1200	20.4	119.6	976	80	"
05 / 1800	21.0	120.5	976	80	"
06 / 0000	21.5	121.3	979	75	"
06 / 0600	22.1	122.2	984	70	"
06 / 1200	22.6	123.3	984	70	"
06 / 1800	23.2	124.4	992	60	tropical storm
07 / 0000	23.6	125.5	997	50	"
07 / 0600	23.9	126.6	1005	40	low
07 / 1200	24.2	127.8	1005	40	"
07 / 1800	24.4	128.9	1006	35	"
08 / 0000	24.5	130.0	1006	35	"
08 / 0600	24.5	131.1	1006	30	"

08 / 1200	24.4	132.2	1006	30	"
08 / 1800	24.3	133.4	1006	30	"
09 / 0000	24.3	134.7	1006	30	"
09 / 0600	24.3	135.9	1006	25	"
09 / 1200	24.3	137.1	1006	25	"
09 / 1800					dissipated
03 / 1200	18.2	114.7	953	110	minimum pressure and maximum wind speed

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%)	24	42
Medium (40%-60%)	12	24
High (>60%)	6	18

Table 3a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Hurricane Juliette, 1–7 September 2019. 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	**14.5**	**24.5**	**37.5**	52.9	98.0	139.9	144.4
OCD5	29.3	61.3	92.2	108.3	107.5	62.5	138.8
Forecasts	22	20	18	16	12	8	4
OFCL (2014-18)	21.1	32.2	41.8	51.8	75.7	101.1	133.7
OCD5 (2014-18)	34.0	69.7	109.0	148.4	223.5	285.5	356.7

Table 3b. Homogeneous comparison of selected track forecast guidance models (in n mi) for Hurricane Juliette, 1-7 September 2019. 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	14.9	24.3	36.7	53.0	101.3	142.1	143.9
OCD5	28.4	58.4	91.1	108.0	**97.9**	**49.8**	**105.8**
TABS	28.9	51.3	78.7	103.0	150.7	173.2	**107.6**
TABM	26.2	45.1	68.6	90.3	141.8	172.0	**104.1**
TABD	24.2	40.9	62.2	81.7	139.8	222.4	380.4
TVDG	**14.7**	**21.3**	**34.8**	**49.0**	**95.4**	**139.4**	**135.8**
TVCE	**14.8**	**23.9**	37.1	**51.4**	**96.7**	**140.0**	147.1
TVCA	**14.2**	**21.7**	**36.0**	**48.9**	**93.9**	**137.2**	**141.7**
GFEX	15.7	**23.4**	**32.4**	**43.2**	**87.5**	**129.0**	**117.6**
TVCX	**14.5**	**22.4**	**35.3**	**48.7**	**94.7**	**138.5**	145.5
FSSE	**13.2**	**18.9**	**30.7**	**44.9**	**87.5**	**137.6**	**135.4**
HCCA	**13.2**	**19.8**	**33.0**	**44.8**	**82.1**	**120.4**	**124.3**
AEMI	16.9	**22.6**	**35.4**	**47.2**	**81.8**	**115.2**	**128.9**
NVGI	25.3	41.4	56.4	82.9	157.7	229.0	307.6
CMCI	16.1	**22.8**	**30.7**	**45.3**	**76.8**	**142.0**	**124.7**
EMXI	15.8	28.3	40.7	53.7	113.6	180.6	252.1
EGRI	**14.4**	26.7	42.5	58.2	130.0	203.0	198.6
HWFI	15.9	26.6	43.6	57.6	**76.9**	**94.1**	**85.5**
HMNI	23.1	34.1	48.1	66.9	121.6	164.5	170.1
GFSI	19.1	25.9	**35.2**	**43.7**	**88.3**	**124.0**	**98.5**
Forecasts	18	17	16	14	10	7	3

Table 4a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Hurricane Juliette, 1–7 September 2019. 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	**5.7**	**9.0**	**10.3**	**9.7**	**9.2**	**10.6**	**8.8**
OCD5	9.2	15.6	16.7	16.3	12.1	12.6	8.0
Forecasts	22	20	18	16	12	8	4
OFCL (2014-18)	6.1	10.0	12.2	13.7	15.5	15.4	15.7
OCD5 (2014-18)	7.9	13.1	16.7	19.2	21.8	22.9	22.1

Table 4b. Homogeneous comparison of selected intensity forecast guidance models (in kt) for Hurricane Juliette, 1–7 September 2019. 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	5.5	9.7	10.9	8.6	8.0	10.7	6.7
OCD5	9.4	16.1	17.7	16.7	11.9	12.7	7.3
IVDR	7.7	11.2	13.0	12.4	10.5	15.1	12.0
IVCN	7.8	11.6	12.9	12.4	10.1	13.9	10.3
LGEM	8.4	14.7	16.1	15.6	12.2	13.3	10.0
DSHP	7.6	12.2	12.2	9.4	**6.7**	**7.4**	**6.0**
FSSE	7.4	10.8	11.1	10.7	**5.0**	**4.7**	**6.0**
HCCA	7.6	11.2	12.7	10.6	**7.7**	12.4	9.3
EMXI	10.4	18.2	22.4	21.8	16.0	12.4	**5.7**
HWFI	7.9	**8.7**	12.1	14.2	13.3	15.7	11.0
HMNI	9.4	13.0	14.9	15.5	11.0	16.3	14.7
GFSI	7.2	13.7	16.8	15.6	9.9	17.0	18.0
Forecasts	20	18	16	14	10	7	3

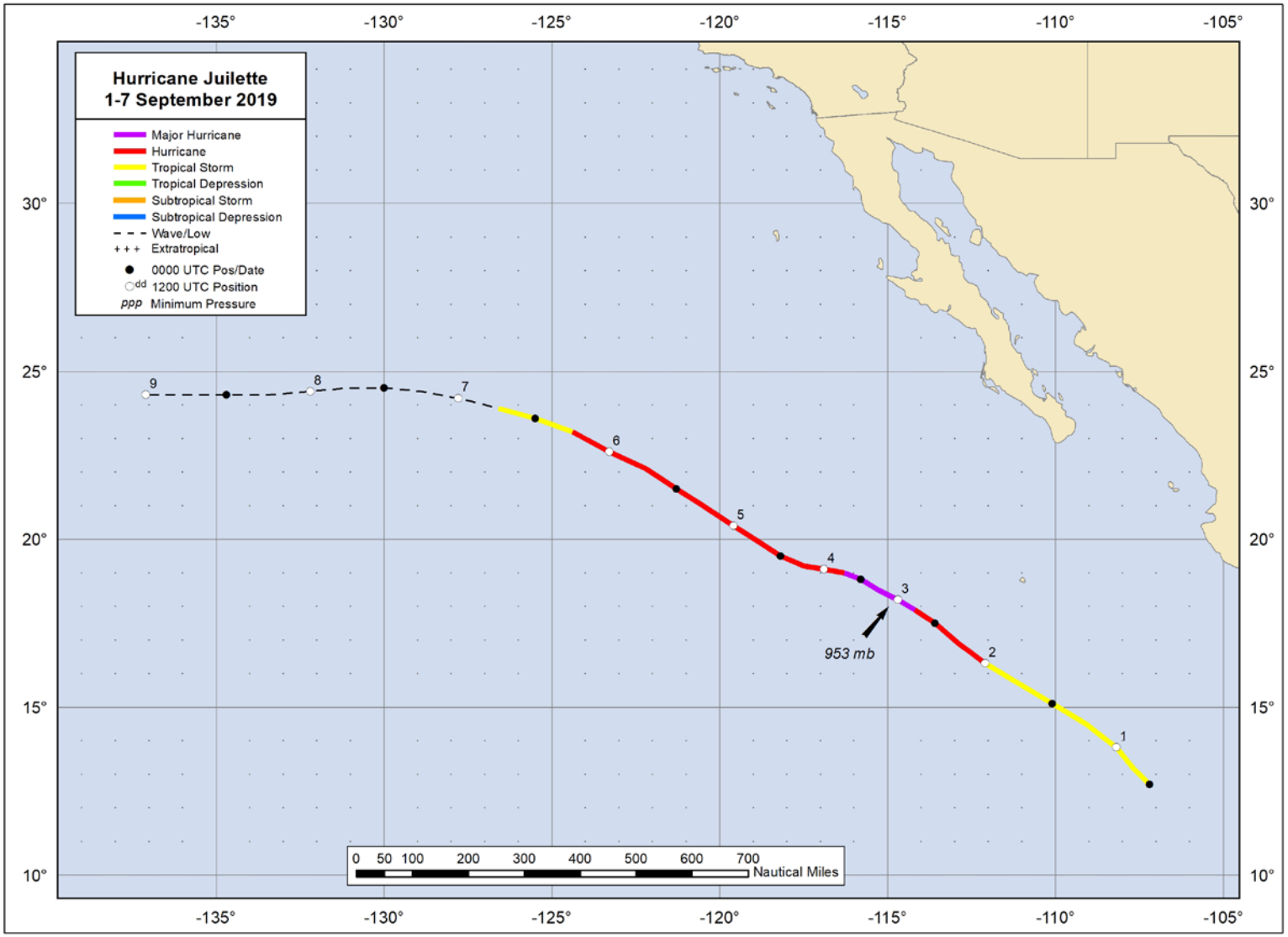

Figure 1. Best track positions for Hurricane Juliette, 1–7 September 2019.

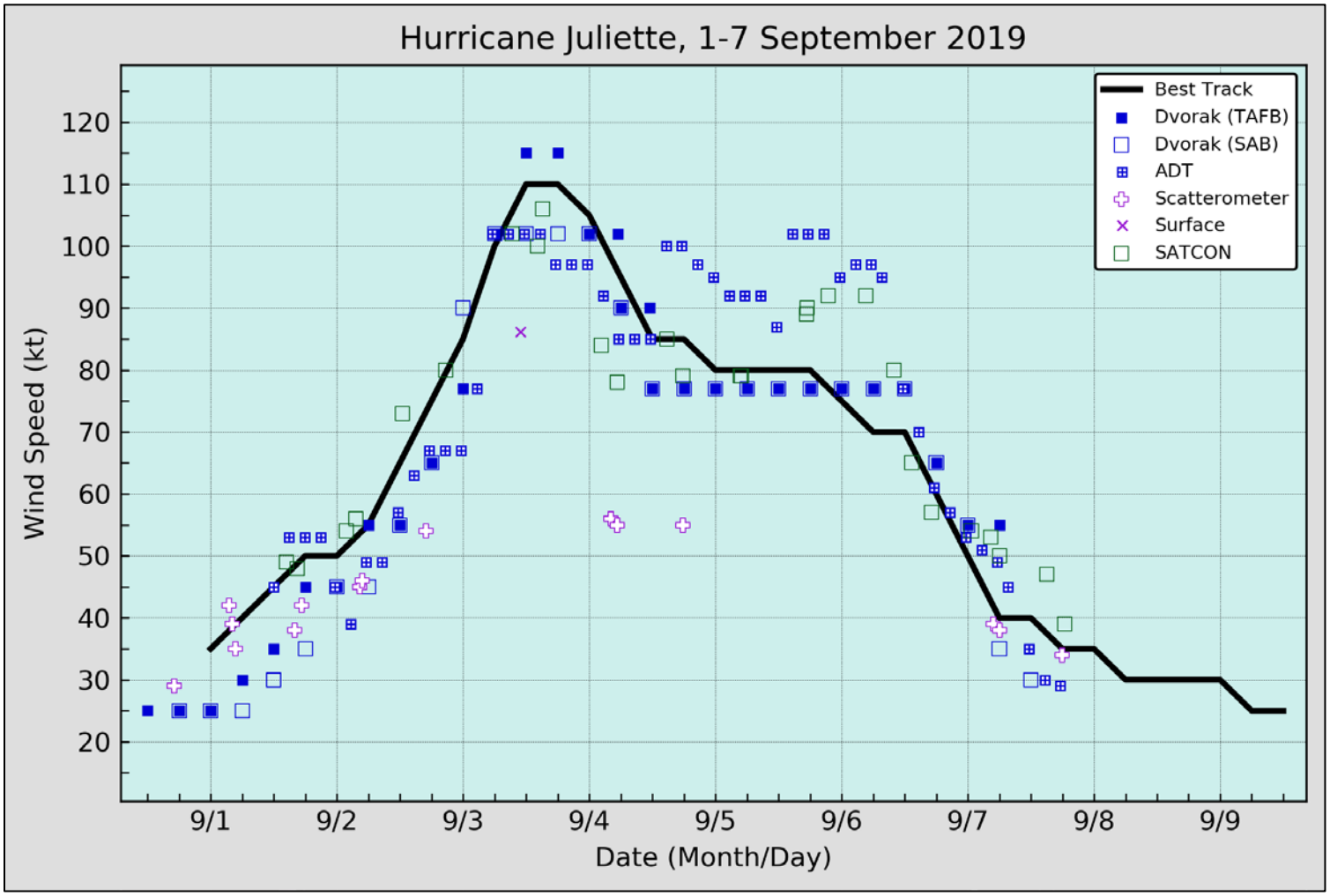

Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Hurricane Juliette, 1–7 September 2019. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies. Dashed vertical lines correspond to 0000 UTC.

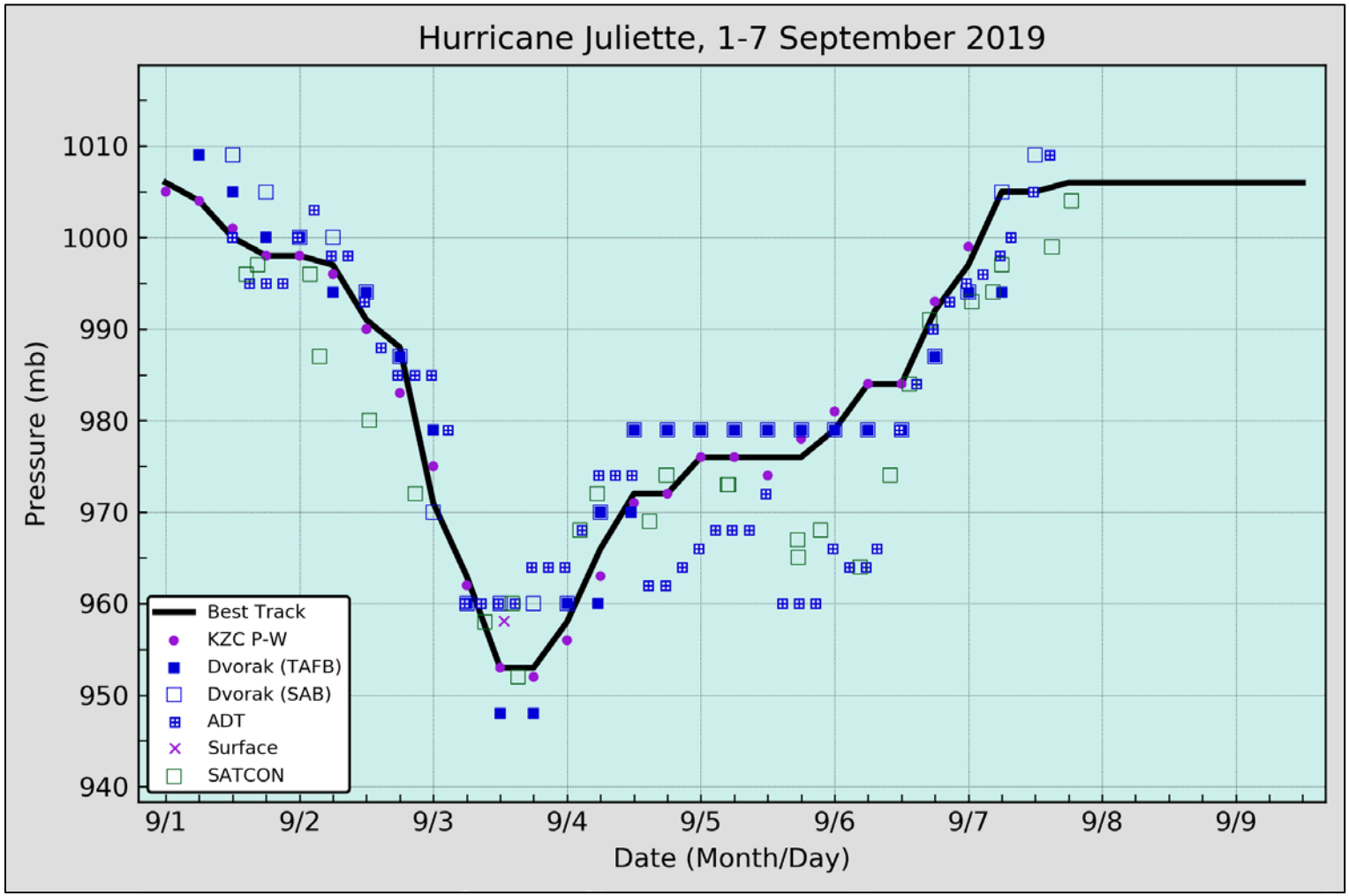

Figure 3. Selected pressure observations and best track minimum central pressure curve for Hurricane Juliette, 1–7 September 2019. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for Meteorological 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.