

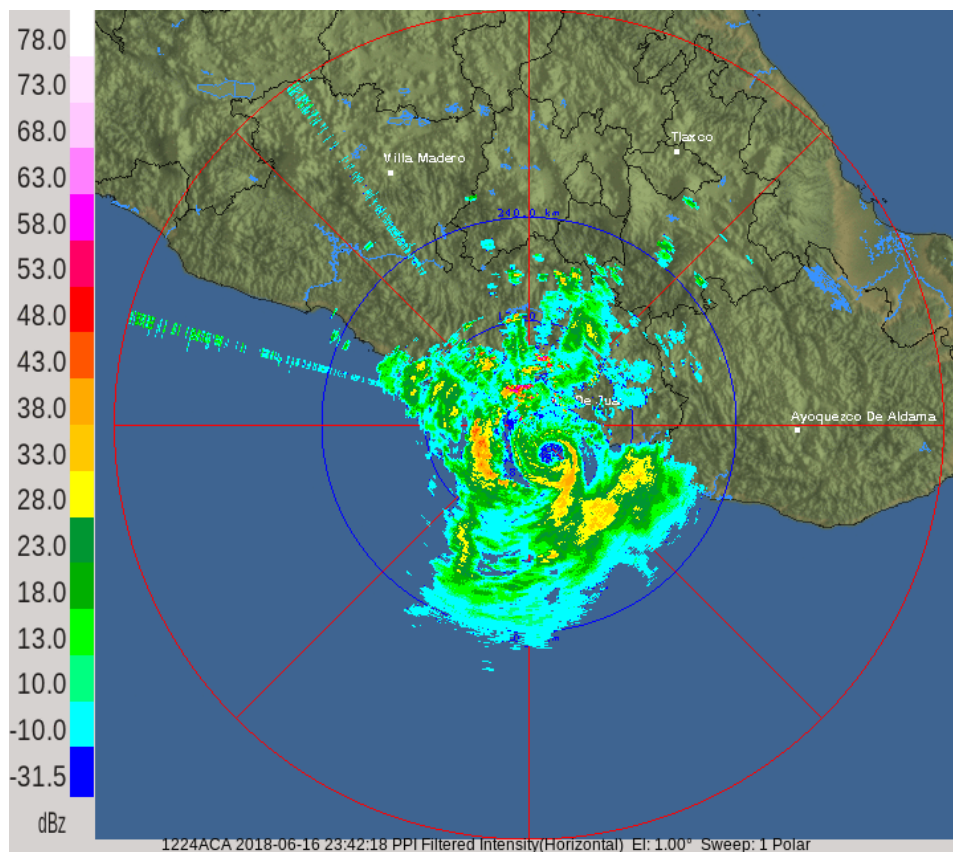


NATIONAL HURRICANE CENTER TROPICAL CYCLONE REPORT

TROPICAL STORM CARLOTTA (EP042018)

14–18 June 2018

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National Hurricane Center
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RADAR REFLECTIVITY IMAGE OF TROPICAL STORM CARLOTTA AT 2342 UTC 16 JUNE 2018 FROM ACAPULCO, MEXICO, COURTESY OF CONAGUA.

Carlotta was a tropical storm that formed and remained close to the southern coast of Mexico throughout its lifetime.



Tropical Storm Carlotta

14–18 JUNE 2018

SYNOPTIC HISTORY

Carlotta's formation appears to have mainly been due to an ITCZ breakdown to the south of Mexico, but a tropical wave that crossed Central America around 10–11 June may have also contributed to its genesis. A broad area of low pressure formed a couple of hundred miles to the south-southwest of the Gulf of Tehuantepec on 12 June. The associated deep convection increased, but remained disorganized, over the next day or so. On 14 June, the convection became better organized, with the development of some banding features, and by 1800 UTC that day, the low-level circulation became sufficiently well defined to denote the formation of a tropical depression centered about 120 n mi south of Acapulco, Mexico. 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 1¹.

With a weak area of high pressure at mid-levels located to its east and southeast, the cyclone moved slowly northward to northeastward. Northerly shear inhibited intensification for a while, but the system became better organized and strengthened into a tropical storm by 1800 UTC 15 June while centered about 60 n mi south of Acapulco. Steering currents then collapsed, and early on 16 June, the small storm became nearly stationary a short distance offshore of the southern coast of Mexico. On that day, the shear over Carlotta appeared to relax somewhat, and the cyclone strengthened. Carlotta reached its peak intensity of 55 kt around 0000 UTC 17 June while centered about 25 n mi south-southeast of Acapulco. Carlotta soon began to weaken, likely due to its interaction with land, and moved west-northwestward, parallel to and not far offshore of the coast of Mexico. The system had become quite disorganized after moving very close to the coast, and Carlotta soon weakened to a tropical depression around 1800 UTC 17 June. On 18 June, the depression continued to move parallel to the coast with little change in strength, however, drier air and increased shear caused the system to degenerate into a remnant low by 0000 UTC 19 June. Shortly thereafter, the low dissipated just offshore of the coast between Manzanillo and Zihuatanejo, Mexico.

METEOROLOGICAL STATISTICS

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

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



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 Carlotta.

The estimated peak intensity of 55 kt is based on a subjective Dvorak estimate from TAFB, and is analyzed to have occurred around 0000 UTC 17 June, at which time the storm appeared best organized on Acapulco radar images (cover picture).

A ship report of winds of tropical storm force associated with Carlotta is listed in Table 2. An observing site at Acapulco International Airport reported a sustained wind of 28 kt with a gust to 40 kt at 0249 UTC 17 June, and a minimum pressure of 1006 mb at 2347 UTC 16 June. Carlotta produced locally heavy rainfall over portions of southern Mexico, but no rainfall totals are available.

CASUALTY AND DAMAGE STATISTICS

Although Carlotta probably caused flooding over portions of southern Mexico, there were no reports of damage or casualties associated with this system.

FORECAST AND WARNING CRITIQUE

The genesis of Carlotta was not well predicted. Only 54 h before formation, the NHC Tropical Weather Outlook first mentioned that an area of low pressure was forecast to form a couple hundred miles south of southeastern Mexico in a couple of days, and that conditions could become marginally conducive for development thereafter. The 5-day genesis probability was set to the low (<40%) category at that time (Table 3), and was not raised to medium (40–60%) until just 24 h prior to formation. The 2-day probability was introduced in the low category 30 h before formation, and was raised to the medium category only 24 h before formation. Neither the 5-day nor the 2-day probabilities reached the high (>60%) categories until the actual time of formation. The main reason for the poor genesis forecasts by NHC was that the global models, primarily the GFS and the ECMWF, did not show genesis until less than a day before the formation of Carlotta.

A verification of NHC official track forecasts for Carlotta is given in Table 4a. The official track forecast errors were substantially higher than the mean official errors for the previous 5-yr period. For the first couple of days of Carlotta's existence, the NHC forecasts erroneously predicted that the system would move inland over southern Mexico, which likely contributed to the larger-than-average track forecast errors. A homogeneous comparison of the official track errors with selected guidance models is given in Table 4b. The corrected consensus models,



HCCA and FSSE, were more accurate than the official forecasts for the 12- through 36-h forecast intervals.

A verification of NHC official intensity forecasts for Carlotta is given in Table 5a. The official intensity forecast errors were lower than the mean official errors for the previous 5-yr period for the 12- through 72-h forecast intervals. For the first couple of days, the NHC intensity forecasts had a low bias because it was anticipated that Carlotta would soon move inland and weaken. A homogeneous comparison of the official intensity errors with selected guidance models is given in Table 5b. For all but a few cases, the model guidance was not better than the official intensity forecasts.

Watches and warnings associated with Carlotta are given in Table 6.

ACKNOWLEDGMENTS

Andrew B. Penny produced the track and intensity verification statistics.



Table 1. Best track for Tropical Storm Carlotta, 14–18 June 2018.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
14 / 1800	14.9	100.0	1008	30	tropical depression
15 / 0000	15.1	100.0	1007	30	"
15 / 0600	15.4	99.9	1007	30	"
15 / 1200	15.6	99.8	1007	30	"
15 / 1800	15.8	99.6	1006	35	tropical storm
16 / 0000	15.9	99.4	1006	35	"
16 / 0600	15.9	99.3	1000	45	"
16 / 1200	15.9	99.2	1000	45	"
16 / 1800	16.0	99.2	1000	45	"
17 / 0000	16.4	99.5	997	55	"
17 / 0600	16.6	100.4	1000	45	"
17 / 1200	16.8	101.0	1005	35	"
17 / 1800	17.0	101.7	1007	25	tropical depression
18 / 0000	17.2	102.2	1007	25	"
18 / 0600	17.4	102.6	1008	25	"
18 / 1200	17.7	103.0	1008	25	"
18 / 1800	18.0	103.3	1007	25	"
19 / 0000	18.1	103.5	1008	20	low
19 / 0600					dissipated
17 / 0000	16.4	99.5	997	55	maximum wind and minimum pressure



Table 2. Selected ship reports with winds of at least 34 kt for Tropical Storm Carlotta, 14–18 June 2018.

Date/Time (UTC)	Ship call sign	Latitude (°N)	Longitude (°W)	Wind dir/speed (kt)	Pressure (mb)
16 / 0600	7JZJ	15.0	99.1	150 / 39	1009.1

Table 3. 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%)	30	54
Medium (40%-60%)	24	24
High (>60%)		



Table 4a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Tropical Storm 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	72	96	120
OFCL	27.8	59.7	86.2	80.2	138.6	162.8	
OCD5	36.5	79.4	124.3	163.9	165.2	271.9	
Forecasts	15	12	9	4	3	1	0
OFCL (2013-17)	21.8	33.2	43.0	53.9	80.7	111.1	150.5
OCD5 (2013-17)	34.9	70.7	109.1	146.1	213.8	269.0	339.7

Table 4b. Homogeneous comparison of selected track forecast guidance models (in n mi) for Tropical Storm 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	72	96	120
OFCL	31.0	38.0	34.8	81.6			
OCD5	50.2	98.9	138.0	127.9			
GFSI	37.6	38.0	32.1	112.4			
HWFI	34.5	39.3	34.2	60.4			
TVCE	24.2	23.3	38.0	107.8			
HCCA	23.0	23.3	33.7	93.7			
FSSE	26.4	29.8	31.4	83.3			
AEMI	32.6	38.9	43.5	104.5			
TABS	50.4	53.9	105.2	196.3			
TABM	45.3	29.3	51.6	149.2			
TABD	41.6	22.3	42.9	136.9			
Forecasts	5	3	3	3	0	0	0



Table 5a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Tropical Storm 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	72	96	120
OFCL	4.7	7.5	6.7	6.2	10.0	5.0	
OCD5	6.1	10.8	15.1	7.2	15.3	13.0	
Forecasts	15	12	9	4	3	1	
OFCL (2013-17)	5.8	9.6	11.8	13.2	15.1	15.1	14.6
OCD5 (2013-17)	7.6	12.4	15.6	17.7	19.8	20.8	19.6

Table 5b. Homogeneous comparison of selected intensity forecast guidance models (in kt) for Tropical Storm 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 5a due to the homogeneity requirement.

Model ID	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL	1.7	3.8	8.8	3.3	15.0		
OCD5	3.7	5.0	10.0	7.3	14.0		
HWFI	4.3	5.0	3.2	7.3	45.0		
DSHP	3.3	6.2	7.8	4.3	37.0		
LGEM	3.2	8.0	13.0	9.3	23.0		
IVCN	3.0	4.5	10.2	8.7	23.0		
GFSI	6.0	11.5	23.0	19.7	7.0		
HCCA	3.0	4.8	4.0	5.7	33.0		
Forecasts	6	4	4	3	1	0	0



Table 6. Watch and warning summary for Tropical Storm Carlotta, 14–18 June 2018.

Date/Time (UTC)	Action	Location
14 / 2100	Tropical Storm Watch issued	Tecpan de Galeana to Punta Maldonado
15 / 0300	Tropical Storm Watch changed to Tropical Storm Warning	Tecpan de Galeana to Punta Maldonado
15 / 1500	Tropical Storm Warning modified to	Tecpan de Galeana to Lagunas de Chacahua
15 / 2100	Tropical Storm Warning modified to	Acapulco to Lagunas de Chacahua
17 / 0300	Tropical Storm Warning modified to	Punta Maldonado to Tecpan De Galenana
17 / 0900	Tropical Storm Warning modified to	Tecpan De Galenana to Lazaro Cardenas
17 / 1800	Tropical Storm Warning discontinued	All

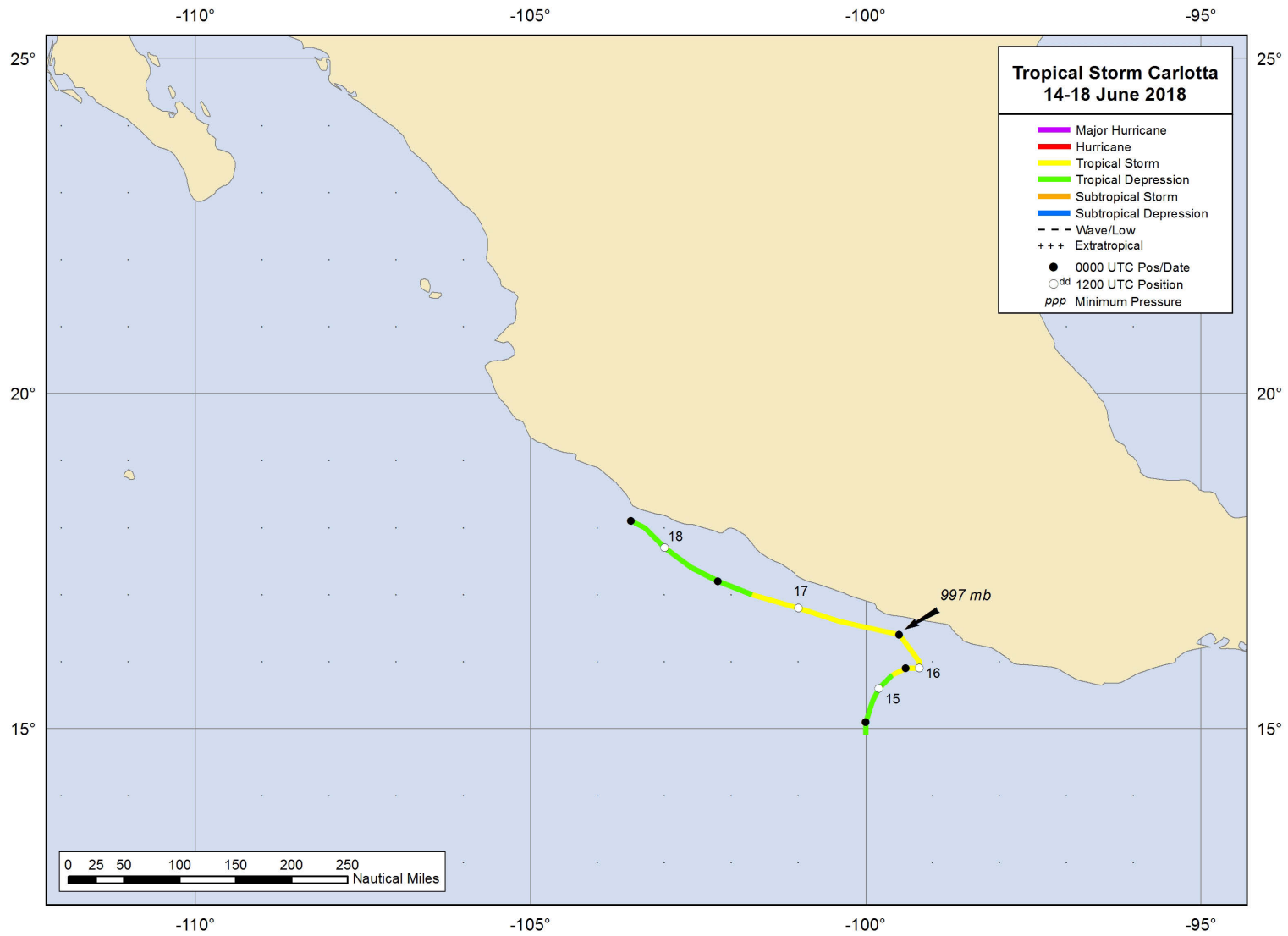


Figure 1. Best track positions for Tropical Storm Carlotta, 14–18 June 2018.

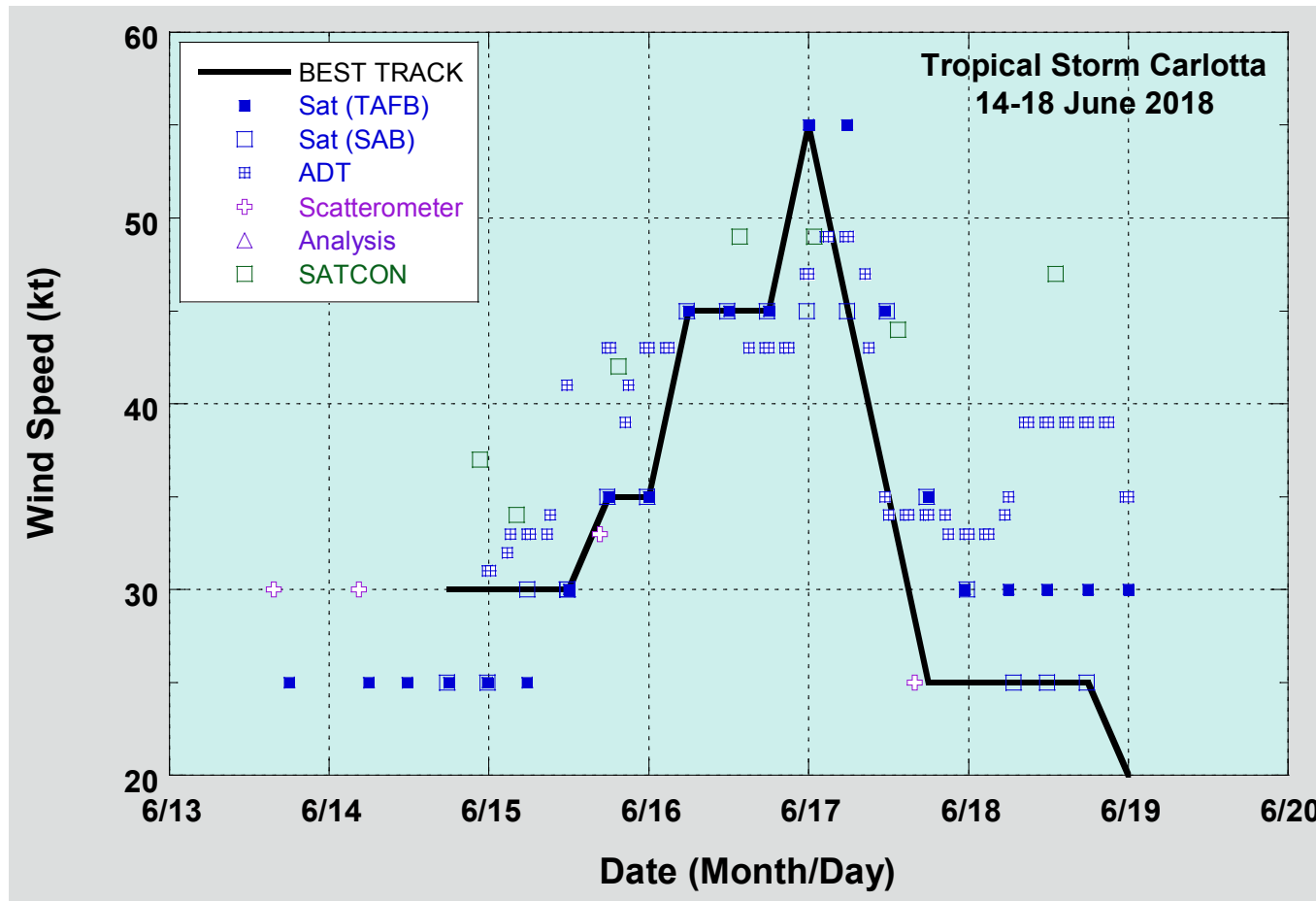


Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Tropical Storm Carlotta, 14–18 June 2018. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies. Dashed vertical lines correspond to 0000 UTC.

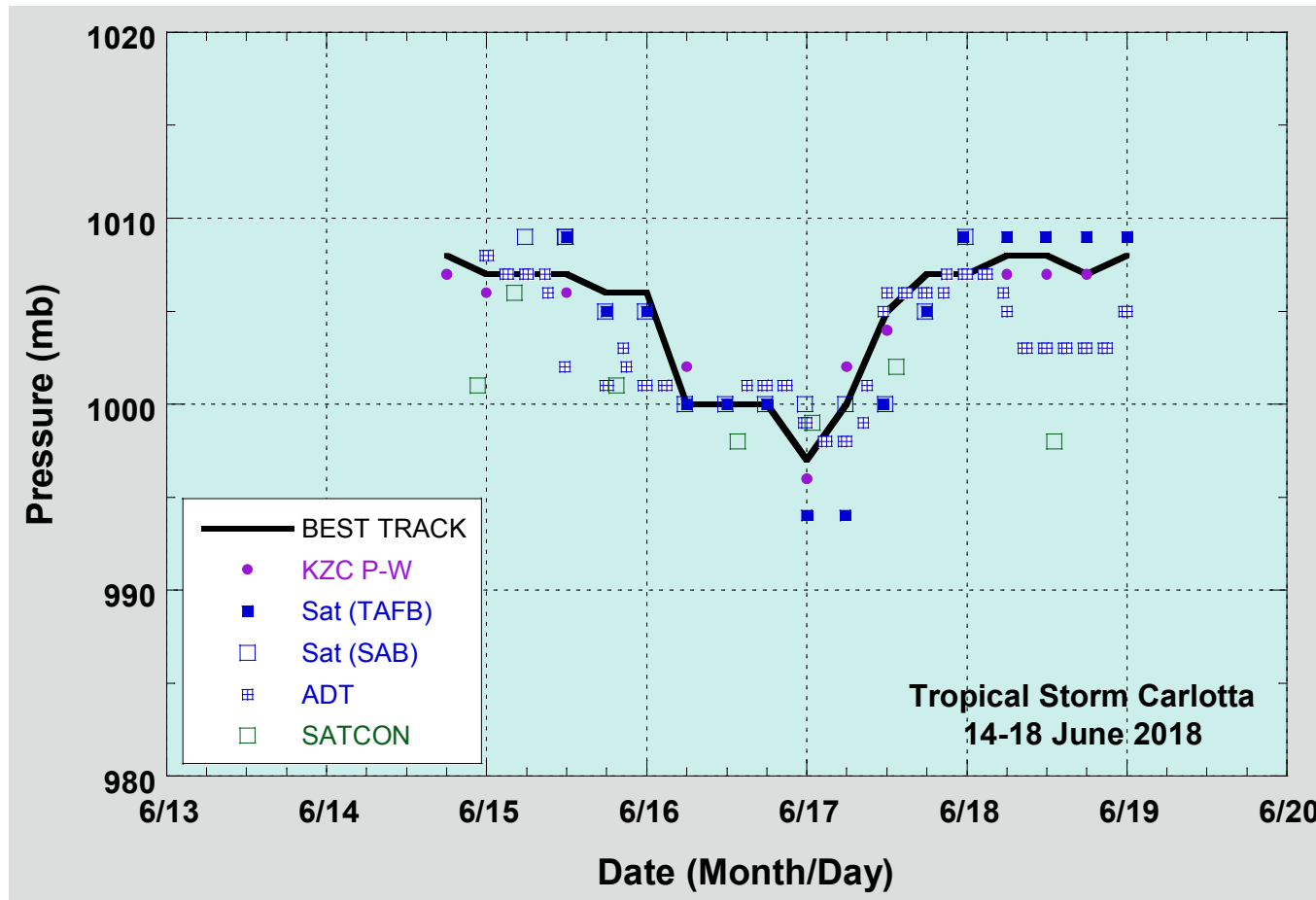


Figure 3. Selected pressure observations and best track minimum central pressure curve for Tropical Storm Carlotta, 14–18 June 2018. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for Meteorological 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.