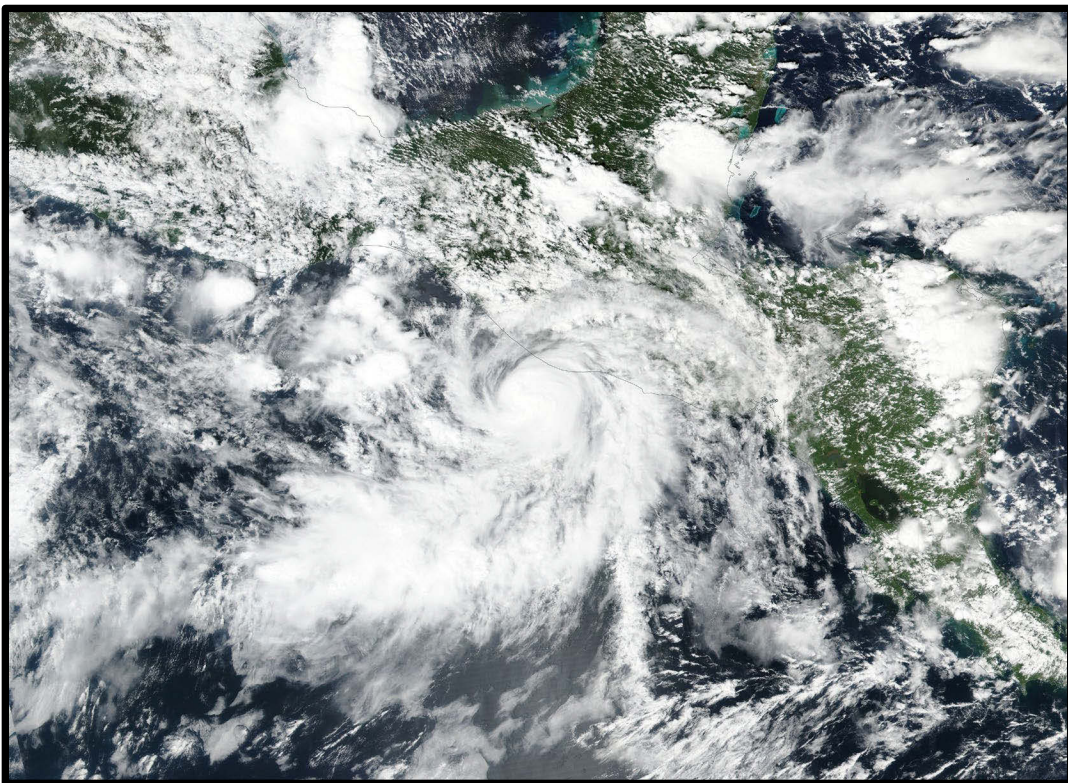# NATIONAL HURRICANE CENTER TROPICAL CYCLONE REPORT

TROPICAL STORM VICENTE

(EP232018)

19–23 October 2018

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National Hurricane Center
10 April 2019

S-NPP VISIBLE INFRARED IMAGING RADIOMETER SUITE (VIIRS) IMAGE (COUTRESY NASA) OF TROPICAL STORM VICENTE AT 1900 UTC ON 19 OCTOBER 2018.

Vicente was a small tropical storm that quickly formed offshore the coasts of El Salvador and Guatemala, and moved near the coast of southeastern and southern Mexico for a few days. While the storm weakened to a tropical depression before it made landfall over the Mexican state of Michoacan, flooding due to rainfall led to 11 deaths in Mexico.

Tropical Storm Vicente

19–23 OCTOBER 2018

SYNOPTIC HISTORY

The origin of Vicente was associated with a tropical wave and low-level vorticity associated with the eastern Pacific monsoon trough. The tropical wave first emerged from the western coast of Africa on 6 October and propagated westward, reaching the Lesser Antilles on 14 October with convection occurring along the northern portion of the wave axis. The convection waned on 15 October and the wave remained devoid of convection until 16 October when it reached Central America. Deep convection re-developed along the monsoon trough in the vicinity of the tropical wave axis on 17 October south of Panama. As the wave continued westward, bursts of deep convection formed over the waters south of Nicaragua and El Salvador. During that time, there was no evidence of a closed surface circulation, but there was an east-west elongated trough collocated with the convection associated with the wave. After yet another burst of convection during the evening of 18 October, the system showed signs of a closed circulation, and a scatterometer pass at 0257 UTC 19 October indicated that a closed circulation existed with 25-kt winds, although at that time the convection lacked organization. A few hours later the convection became better organized, which led to the formation of a tropical depression by 0600 UTC 19 October about 80 n mi west-southwest of Puerto San Jose, Guatemala. 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].

Strengthening occurred after genesis due to warm sea surface temperatures (SST) and a light wind shear environment. The convective structure of the system improved dramatically during the morning of 19 October, with visible and microwave imagery showing increasing convective banding around a small, compact circulation. Guatemalan radar data showed a well-defined circulation center with large convective bands over the southeast quadrant at 1536 UTC 19 October (Fig. 4), and by 1800 UTC that day, the depression became Tropical Storm Vicente. The cyclone moved very slowly northwestward (at less than 5 kt) for much of 19 October within about 100 n mi of the Guatemalan coast. Vicente subsequently paralleled the coastline of extreme southeastern Mexico early on 20 October as it made a gradual turn toward the west-northwest. The cyclone accelerated westward during the night of 20 October as it interacted with a Gulf of Tehuantepec gap wind event, and then became embedded within southeasterly flow around a deep-layer ridge located over the Gulf of Mexico and central Mexico. Vicente reached its estimated peak intensity of 45 kt at 1800 UTC 20 October when it passed within 100 n mi of the coast of the Mexican states of Chiapas and Oaxaca.

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[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.

Although Vicente remained in a warm SST and low-shear environment, the cyclone weakened on 21 October due to a waning of the convection likely caused by mid-level dry air entrainment, and the center became exposed at times. Vicente moved westward to west-southwestward on 21 October and turned west-northwestward early on 22 October as it rounded the southwestern periphery of the ridge centered over central Mexico. A brief respite from the dry air intrusions while the system made the turn allowed for some slight re-strengthening. By late 22 October, the cyclone began to feel the increasing influence of the outflow from the much larger and more powerful Hurricane Willa to its northwest. Increasing northerly shear caused by this outflow created a hostile environment for Vicente for the rest of the cyclone's life. Bursts of convection continued, but became displaced to the southwest of the center, and banding features became less prevalent. Vicente weakened below tropical storm strength at 0600 UTC 23 October, and made landfall as a tropical depression along the coast of Michoacan near Playa Azul at 1330 UTC. The small and poorly organized system rapidly dissipated by 1800 UTC that day, due to interaction with the terrain of Mexico.

METEOROLOGICAL STATISTICS

Observations in Vicente (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), 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 Vicente.

Vicente's estimated peak intensity of 45 kt at 1800 UTC 20 October is based on ASCAT data between 1500–1610 UTC that day and subjective Dvorak intensity estimates. The ASCAT data confirmed that Vicente was a small cyclone with 40 to 45 kt winds extending only 20 n mi from the center. Subsequent SATCON and subjective Dvorak estimates as well as overnight ASCAT passes also supported the 45-kt intensity through 1200 UTC 21 October. The National Meteorological Service of Mexico (SMN) reported several heavy rainfall measurements. In the state of Oaxaca these included 12.23 in (310.7 mm) in National Valley and 6.40 in (162.5 mm) in the town of Tonameca. In the state of Guerrero, Zihuatanejo reported 6.20 in (157.5 mm).

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

CASUALTY AND DAMAGE STATISTICS

Vicente's track close to the coast of Mexico brought very heavy rainfall to the Mexican states of Oaxaca and Guerrero. According to a media report, the SMN confirmed that 11 fatalities occurred in Oaxaca due to flooding and landslides caused by the heavy rainfall as Vicente's northern rain bands passed over the area.

FORECAST AND WARNING CRITIQUE

The genesis of Vicente was poorly anticipated. The first mention of the system's development in the Tropical Weather Outlook came only 6 h prior to genesis, and at that time the system was given a low chance (< 40%) of formation during the next 2 days. One plausible reason that Vicente was not anticipated to develop was the proximity of the larger disturbance to the west that eventually became Hurricane Willa. Numerical models had been very aggressive in developing Willa's disturbance along the same elongated east-to-west area of low pressure extending from southwest of the Gulf of Tehuantepec to southeast of the genesis region of Vicente. In addition, the small size of Vicente's precursor disturbance likely contributed to global models' inability to predict the genesis of the cyclone.

A verification of NHC official track forecasts for Vicente is given in Table 3a. Official NHC forecast track (OFCL) errors were higher than the mean official errors for the previous 5-yr period at all available forecast intervals. A homogeneous comparison of the official track errors with selected guidance models is given in Table 3b. The ECMWF (EMXI) global model was the most successful individual model for Vicente, with track errors less than OFCL at all time periods. HMNI on the other hand had very large errors beyond 24 h, more than double OFCL at 48–96 h. The multimodel consensus (TVCX) was the best consensus aid, with errors lower than OFCL for all time periods.

A verification of NHC official intensity forecasts for Vicente is given in Table 4a. The official NHC intensity forecasts (OFCL) had average errors lower than the mean official errors for the previous 5-yr period at 12–48 h. The 72-h forecast error was close to the 5-yr mean. A homogeneous comparison of the official intensity errors with selected guidance models is given in Table 4b. OFCL was better than all intensity guidance through 48 h, but at 72 h the NHC forecast was outperformed by all of the intensity guidance. The large official forecast errors were due to a high bias in intensity forecasts for the storm on 19–20 October. During the early forecasts for Vicente, Willa had not yet developed. Therefore, the impacts that Willa had on Vicente once Willa developed were not well anticipated.

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

Table 1.   Best track for Tropical Storm Vicente, 19–23 October 2018.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
19 / 0000	13.0	91.5	1007	25	low
19 / 0600	13.1	91.7	1007	25	tropical depression
19 / 1200	13.2	91.8	1006	30	"
19 / 1800	13.3	92.0	1005	35	tropical storm
20 / 0000	13.6	92.4	1005	35	"
20 / 0600	14.0	92.8	1005	35	"
20 / 1200	14.3	93.3	1004	40	"
20 / 1800	14.5	94.0	1002	45	"
21 / 0000	14.7	94.7	1002	45	"
21 / 0600	14.7	95.5	1002	45	"
21 / 1200	14.5	96.5	1002	45	"
21 / 1800	14.2	97.4	1003	40	"
22 / 0000	14.1	98.4	1003	40	"
22 / 0600	14.1	99.3	1003	40	"
22 / 1200	14.6	100.1	1003	40	"
22 / 1800	15.2	100.8	1005	35	"
23 / 0000	16.0	101.3	1006	35	"
23 / 0600	16.8	101.7	1007	30	tropical depression
23 / 1200	17.8	102.2	1008	25	"
23 / 1800					dissipated
20 / 1800	14.5	94.0	1002	45	minimum pressure and maximum winds
23 / 1330	18.0	102.4	1008	25	landfall near Playa Azul, Mexico

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%)	6	6
Medium (40%-60%)	-	-
High (>60%)	-	-

Table 3a.   NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Tropical Storm Vicente, 19–23 October 2018. 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	31.5	48.3	59.8	58.1	101.2	117.4	
OCD5	43.7	100.9	153.0	207.0	320.6	366.0	
Forecasts	15	13	11	9	5	1	
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 3b.   Homogeneous comparison of selected track forecast guidance models (in n mi) for Tropical Storm Vicente, 19–23 October 2018. 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	30.7	49.2	60.3	64.7	99.6	117.4	
OCD5	42.5	83.6	146.2	213.2	328.7	366.0	
GFSI	40.6	59.4	80.7	103.6	190.7	164.5	
EMXI	**28.1**	**41.0**	**48.1**	**39.4**	**63.0**	**67.3**	
AEMI	38.5	67.7	101.0	132.9	181.4	223.2	
HMNI	43.4	74.9	114.5	160.7	289.1	347.1	
HWFI	43.5	77.4	85.1	87.8	**93.4**	186.3	
GFEX	33.0	**46.3**	**59.4**	68.8	118.2	**108.2**	
TVCX	**26.7**	**46.1**	**56.5**	**60.2**	**98.8**	**113.4**	
TVCE	**29.8**	52.6	68.7	82.7	141.4	157.7	
TABS	**23.2**	**36.7**	**44.3**	65.2	107.2	149.5	
TABM	**21.4**	**29.1**	**40.9**	69.5	**86.3**	143.8	
TABD	**27.8**	51.7	83.2	115.8	214.1	229.4	
HCCA	32.2	51.2	61.5	**60.2**	**92.7**	120.9	
Forecasts	13	10	10	8	4	1	

Table 4a.   NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Tropical Storm Vicente, 19–23 October 2018. 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	**4.0**	**3.8**	**3.2**	**7.8**	16.0	30.0	
OCD5	7.4	11.4	14.5	19.8	3.4	2.0	
Forecasts	15	13	11	9	5	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 4b.   Homogeneous comparison of selected intensity forecast guidance models (in kt) for Tropical Storm Vicente, 19–23 October 2018. 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.

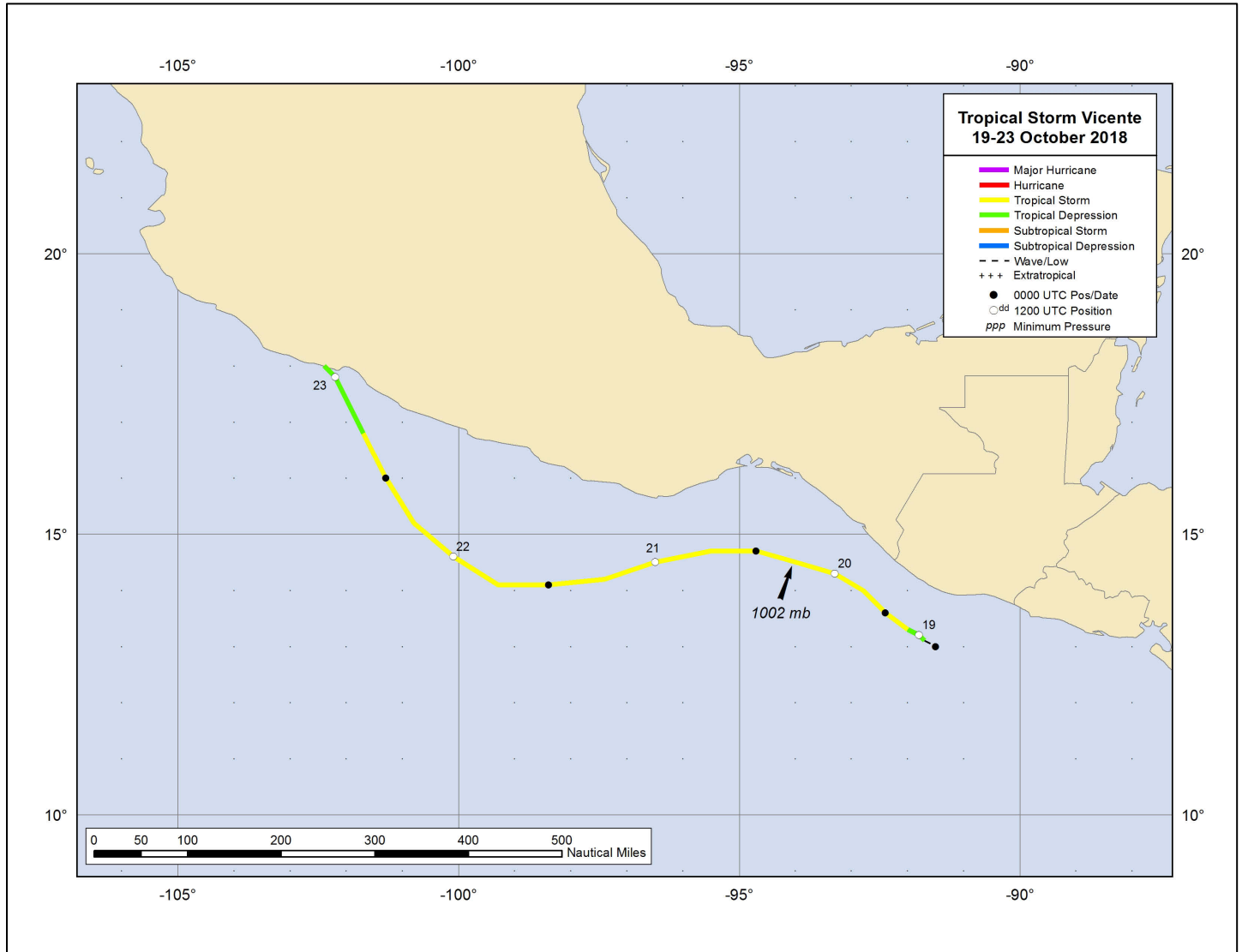| Model ID	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL	3.8	4.0	3.0	8.1	17.5	30.0	
OCD5	7.3	9.6	14.2	21.9	**3.8**	**2.0**	
HWFI	5.4	9.8	9.5	11.9	**16.2**	50.0	
HMNI	8.1	10.7	11.6	13.1	**9.8**	**9.0**	
HCCA	5.5	6.5	7.2	13.1	**14.2**	32.0	
IVCN	5.5	6.9	7.3	8.2	**8.8**	**19.0**	
GFSI	7.2	12.1	11.3	11.0	**5.8**	**27.0**	
EMXI	5.8	8.3	9.9	9.6	**9.8**	36.0	
DSHP	6.5	6.2	7.1	11.2	**15.5**	**29.0**	
LGEM	6.5	7.8	7.7	11.1	**6.5**	**3.0**	
Forecasts	13	10	10	8	4	1	

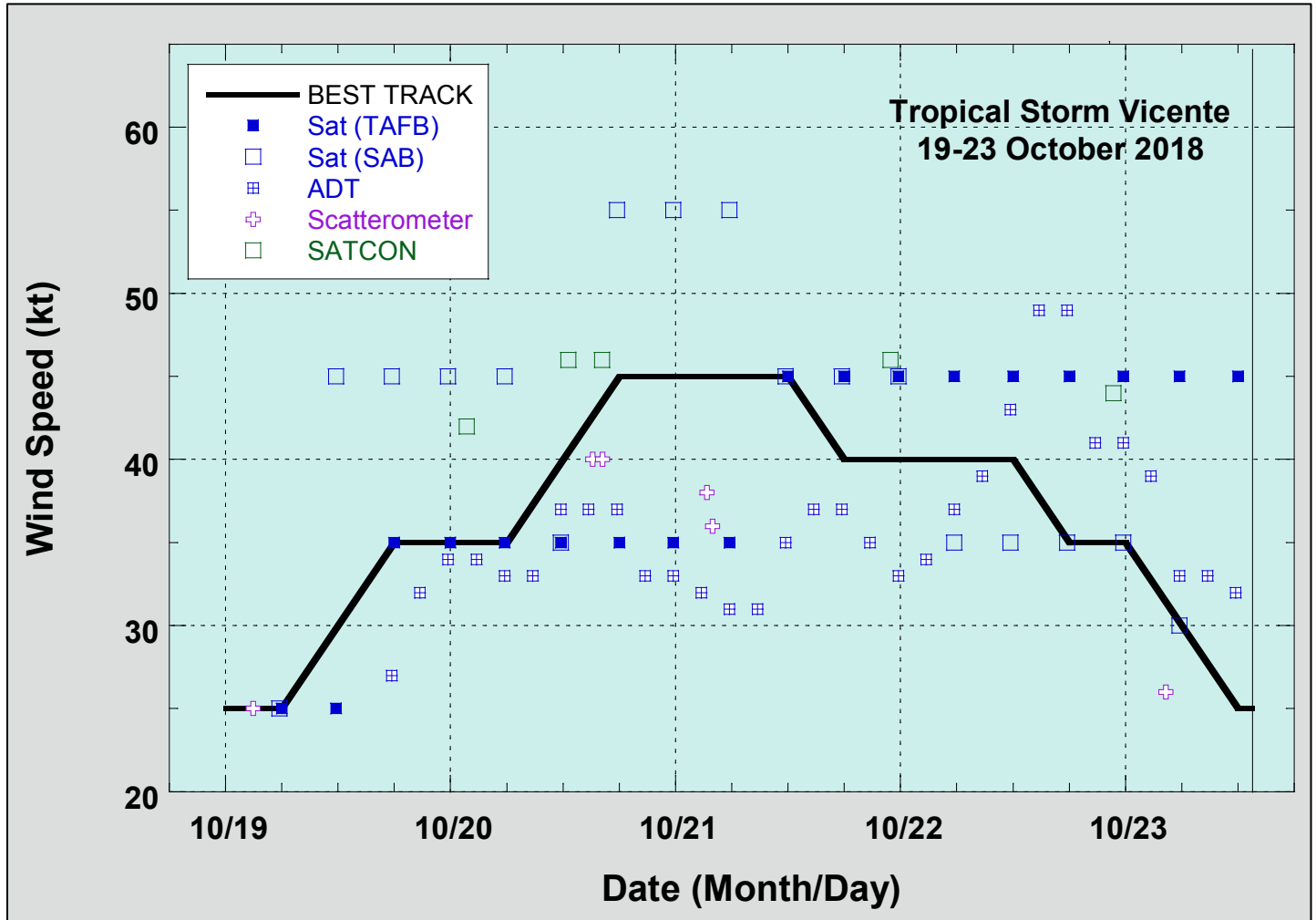Figure 1.   Best track positions for Tropical Storm Vicente, 19–23 October 2018.

Figure 2.   Selected wind observations and best track maximum sustained surface wind speed curve for Tropical Storm Vicente, 19–23 October 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, and the solid vertical line corresponds to landfall.
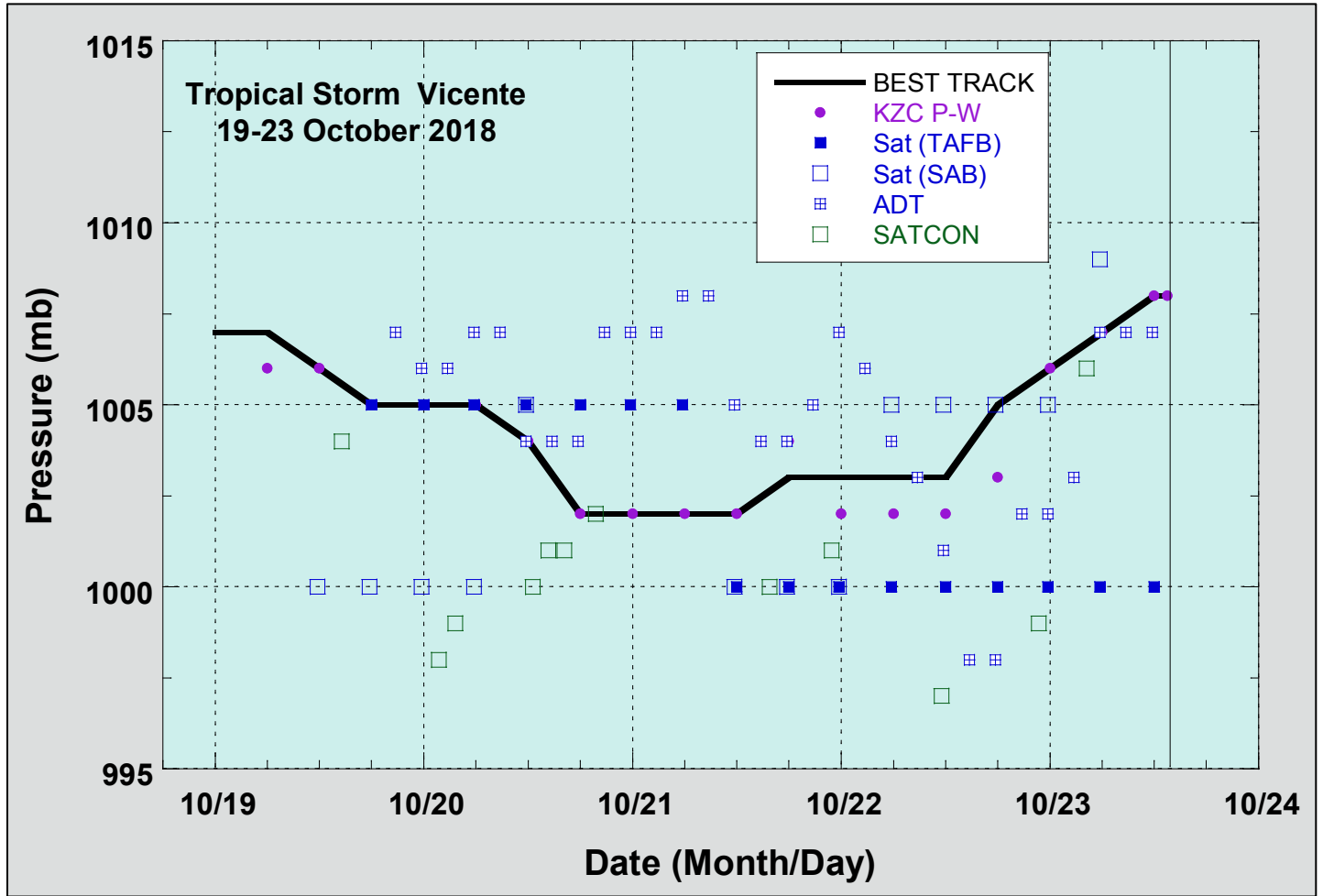
Figure 3.   Selected pressure observations and best track minimum central pressure curve for Tropical Storm Vicente, 19–23 October 2018. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for 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, and the solid vertical line corresponds to landfall.
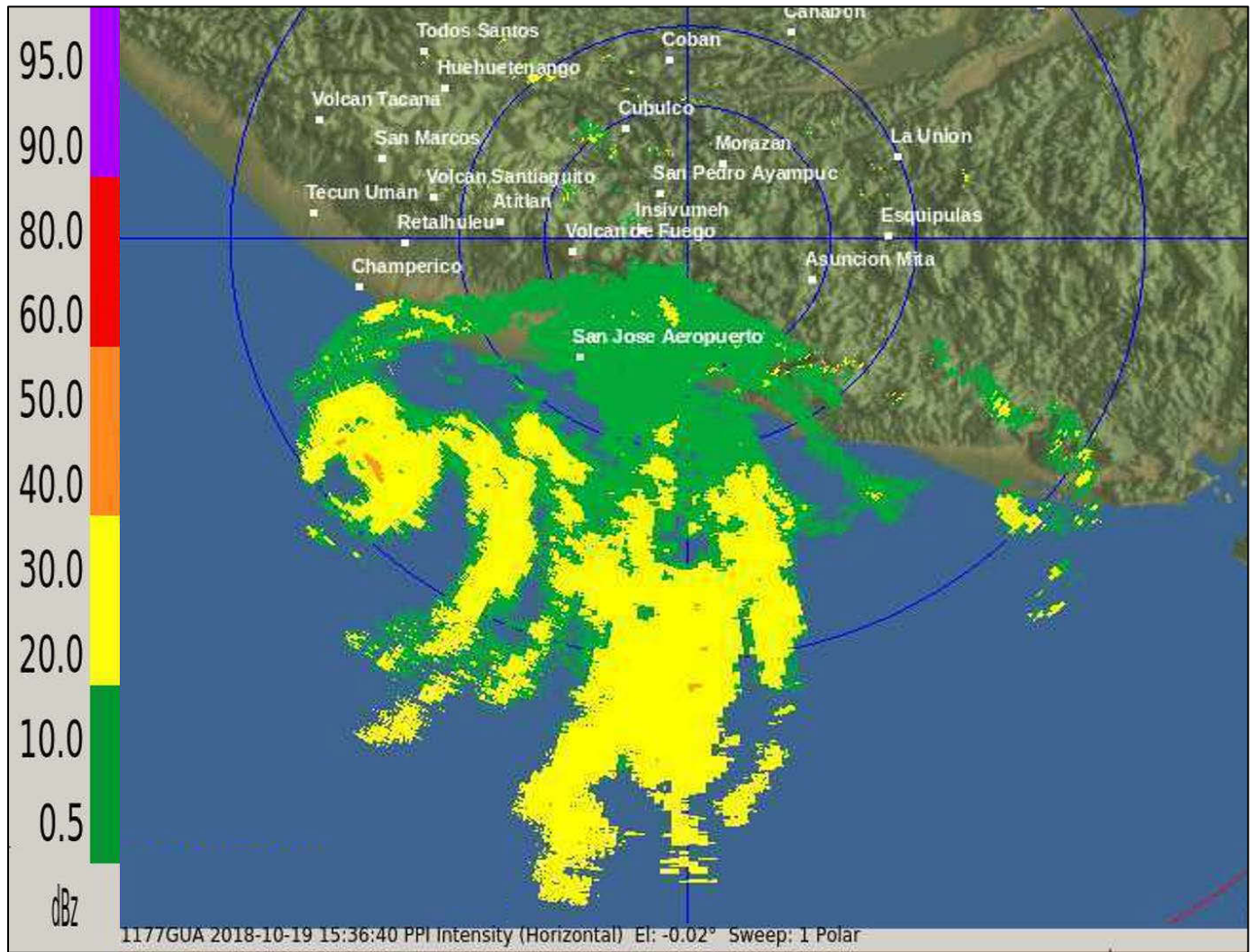
Figure 4.   Radar reflectivity image of Vicente at 1536 UTC 19 October. Courtesy of the Guatemala National Institute of Seismology, Volcanology, Meteorology, and Hydrology.