

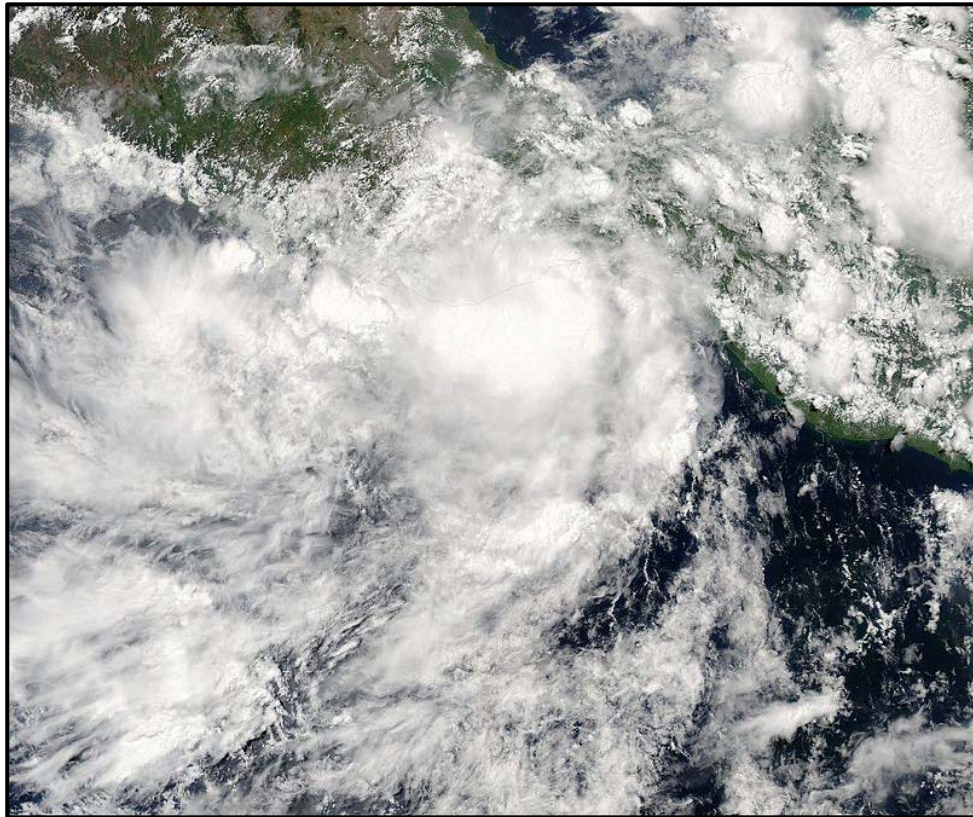


# NATIONAL HURRICANE CENTER TROPICAL CYCLONE REPORT

## TROPICAL STORM CALVIN (EP032017)

11 – 13 June 2017

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National Hurricane Center  
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VISIBLE SATELLITE IMAGE OF TROPICAL STORM CALVIN AT 2000 UTC 12 JUNE 2017 FROM THE NASA AQUA SATELLITE.<sup>1</sup>

Calvin was a short-lived tropical storm that made landfall near Paja Blanca, Mexico. Heavy rainfall associated with Calvin caused flash flooding and mud slides that resulted in some damage in southern Mexico.

<sup>1</sup> Original report 31 August 2017. Corrected typos in Table 1.

# Tropical Storm Calvin

11 – 13 JUNE 2017

## SYNOPTIC HISTORY

The genesis of Calvin appears to have been associated with a tropical wave that departed the west coast of Africa on 31 May. The wave produced only intermittent showers and thunderstorms as it moved westward across the tropical Atlantic and the Caribbean Sea during the next several days. Deep convection increased along the wave axis when it crossed Central America and entered the far eastern North Pacific Ocean on 9 June, and an elongated low pressure area developed along the wave axis late on 10 June a couple of hundred n mi south of the border of Guatemala and Mexico. Satellite data indicate that the low developed a well-defined center and organized deep convection around 1200 UTC 11 June, marking the formation of a tropical depression about 130 n mi south-southeast of Salina Cruz, 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 1<sup>2</sup>.

The depression moved slowly and erratically northwestward to north-northwestward around the western side of a mid-level ridge toward the southern coast of Mexico on 11 and 12 June. Meanwhile, the cloud pattern changed little in structure after genesis with deep convection fluctuating near and to the west of the low-level center due to the entrainment of dry air and easterly shear. Deep convection became more persistent near the center early on 12 June, and it is estimated that the depression strengthened to a tropical storm by 1800 UTC that day when it was located over the Gulf of Tehuantepec about 40 n mi south-southwest of Salina Cruz (cover image). Calvin reached its peak intensity of 40 kt when it made landfall about six hours later near Paja Blanca, Mexico. Shortly after landfall, Calvin weakened to a tropical depression and dissipated over the rugged terrain of southern Mexico by 1200 UTC 13 June. Even though the cyclone dissipated, heavy rains associated with its mid-level remnants continued for about another 24 hours over the southern and southwestern portions of Mexico.

## METEOROLOGICAL STATISTICS

Observations in Calvin (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 from the Cooperative Institute for Meteorological Satellite Studies/University of Wisconsin-Madison. Data

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<sup>2</sup> 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.

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 Calvin.

The 40-kt peak intensity of Calvin at 0000 UTC 12 June is based on Dvorak classifications of T2.5 (35 kt) from TAFB, 3.5 (55 kt) from SAB, and a 43 kt AMSU intensity estimate. There were no observations of sustained tropical-storm-force winds in association with Calvin. The highest official sustained wind observed was 25 kt at Puerto Escondido, Mexico, at 2200 UTC on 12 June.

The main hazard associated with Calvin was heavy rainfall. The tropical storm produced a widespread area of 5 to 10 inches of rainfall across the Mexican states of Oaxaca, Tabasco, and Chiapas during the period of 11-13 June. The heaviest rains occurred near Salina Cruz, where almost 15 inches was reported. After Calvin dissipated, its remnants moved westward and caused heavy rains over the state of Guerrero on 13-14 June that resulted in totals of about 5 inches (Table 2).

## CASUALTY AND DAMAGE STATISTICS

There were no reports of casualties associated with Calvin. Heavy rains associated with the tropical storm flooded portions of the state of Oaxaca (Figure 4), where the ground was saturated about 10 days earlier due to Tropical Storm Beatriz. The episodes of heavy rains from both Beatriz and Calvin damaged roads and caused some towns to be evacuated in Oaxaca. There is no monetary damage estimate available at the time this report was written.

## FORECAST AND WARNING CRITIQUE

The genesis of Calvin was not well predicted. The potential for tropical cyclone development was first mentioned in the Tropical Weather Outlook 54 h before the tropical cyclone formed. The 5-day probability of formation was increased to the medium category (40-60%) 18 h before development, and it failed to reach the high category before Calvin formed (Table 3). The 48-h probability of formation did not reach the medium category until 6 h before genesis. The main reason for the poor genesis predictions was the uncertainty about whether the disturbance would have enough time to organize before it reached the coast of Mexico.

A verification of NHC official intensity forecasts for Calvin is given in Table 4a. Given the short duration of Calvin as a tropical cyclone, there are only five verifying forecasts at 12 h, three at 24 h, and one at 36 h. The average NHC forecast track errors for these time periods were slightly lower than the mean official errors for the previous 5-yr period. A homogeneous comparison of the official track errors with selected guidance models is given in Table 4b. For



the small number of forecasts issued for Calvin, the consensus models (TVCE, TVCX, and HCCA) were the best-performing models and beat the official forecasts at 12 and 36 h.

A verification of NHC official intensity forecasts for Calvin is given in Table 5a. Official forecast intensity errors were lower than the mean official errors for the previous 5-yr period for the verifying forecasts. A homogeneous comparison of the official intensity errors with selected guidance models is given in Table 5b. The NHC intensity forecasts correctly predicted that Calvin would remain a low-end tropical storm.

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

## ACKNOWLEDGEMENTS

Pamela Garcia of the National Meteorological Service of Mexico provided the rainfall reports from Mexico. Gladys Rubio of the National Hurricane Center was very helpful in providing information for the casualty and damage statistics section.



Table 1. Best track for Tropical Storm Calvin, 11 – 13 June 2017.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage*
11 / 1200	14.0	94.7	1006	30	tropical depression
11 / 1800	14.5	94.8	1006	30	"
12 / 0000	14.9	94.9	1006	30	"
12 / 0600	15.2	95.0	1006	30	"
12 / 1200	15.4	95.2	1006	30	"
12 / 1800	15.6	95.4	1005	35	tropical storm
13 / 0000	15.9	95.7	1004	40	"
13 / 0600	16.2	96.1	1007	30	tropical depression
13 / 1200					dissipated
13 / 0000	15.9	95.7	1004	40	maximum wind/minimum pressure and landfall near Paja Blanca, Mexico



Table 2. Selected rainfall observations from Mexico for Tropical Storm Calvin and its remnants.

Location	Rainfall (in)	Location	Rainfall (in)
<b>State of Oaxaca</b>		<b>State of Tabasco</b>	
Salina Cruz	14.90	Boca Del Cerro	11.06
Salina Cruz (Port)	12.37	Tenosique	8.59
Tuxtepec	7.82	Centla	4.67
Rio Verde	7.66		
		<b>State of Veracruz</b>	
<b>State of Chiapas</b>		Calchualco	7.03
Sierra Morena	9.80	Las Choapas	5.81
Salto De Agua	7.94	Totulta	5.34
Finca Cafetalera La Paz	6.93		
		<b>State of Guerrero</b>	
		Ometepec	5.39

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%)	6	18
High (>60%)	-	-



Table 4a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Calvin. 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	<b>21.5</b>	<b>20.5</b>	<b>42.8</b>				
OCD5	28.3	39.3	62.5				
Forecasts	5	3	1				
OFCL (2012-16)	22.2	33.9	43.8	54.8	80.0	108.9	145.1
OCD5 (2012-16)	35.7	72.0	112.2	150.2	217.0	271.0	340.2



Table 4b. Homogeneous comparison of selected track forecast guidance models (in n mi) for Calvin. 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	20.7	20.5	42.8				
OCD5	28.7	39.3	62.5				
GFSI	22.4	50.5	79.4				
EMXI	22.3	28.1	<b>34.0</b>				
CMCI	25.7	57.6	102.1				
NVGI	58.8	100.9	156.3				
AEMI	29.6	62.9	83.3				
HCCA	<b>19.2</b>	30.6	<b>37.8</b>				
TVCX	<b>18.8</b>	24.6	<b>33.3</b>				
TVCE	<b>19.4</b>	26.7	<b>34.6</b>				
GFEX	<b>16.7</b>	32.1	54.1				
TABS	<b>19.8</b>	37.6	78.0				
TABM	<b>16.0</b>	28.7	64.3				
TABD	33.4	63.2	115.2				
Forecasts	4	3	1				



Table 5a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Calvin. 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	<b>3.0</b>	<b>3.3</b>	<b>10.0</b>				
OCD5	5.6	5.7	22.0				
Forecasts	5	3	1				
OFCL (2012-16)	5.8	9.4	11.8	13.2	15.0	15.7	14.9
OCD5 (2012-16)	7.6	12.2	15.7	18.1	20.6	21.8	20.0

Table 5b. Homogeneous comparison of selected intensity forecast guidance models (in kt) for Calvin. 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	2.5	3.3	10.0				
OCD5	6.0	7.3	22.0				
HWFI	9.0	4.0	<b>1.0</b>				
HCCA	7.5	4.0	10.0				
DSHP	4.8	4.3	16.0				
LGEM	4.8	4.3	<b>8.0</b>				
IVCN	6.5	4.0	<b>8.0</b>				
GFSI	7.0	6.3	<b>2.0</b>				
EMXI	5.0	<b>2.0</b>	<b>5.0</b>				
Forecasts	4	3	1				



Table 6. Watch and warning summary for Tropical Storm Calvin, 11 – 13 June 2017.

<b>Date/Time (UTC)</b>	<b>Action</b>	<b>Location</b>
11/ 2100	Tropical Storm Warning issued	Boca De Pijijiapan to Punta Maldonado
13 / 0300	Tropical Storm Warning modified to	Laguna De Chacahua to Salina Cruz
13 / 0600	Tropical Storm Warning discontinued	Laguna De Chacahua to Salina Cruz

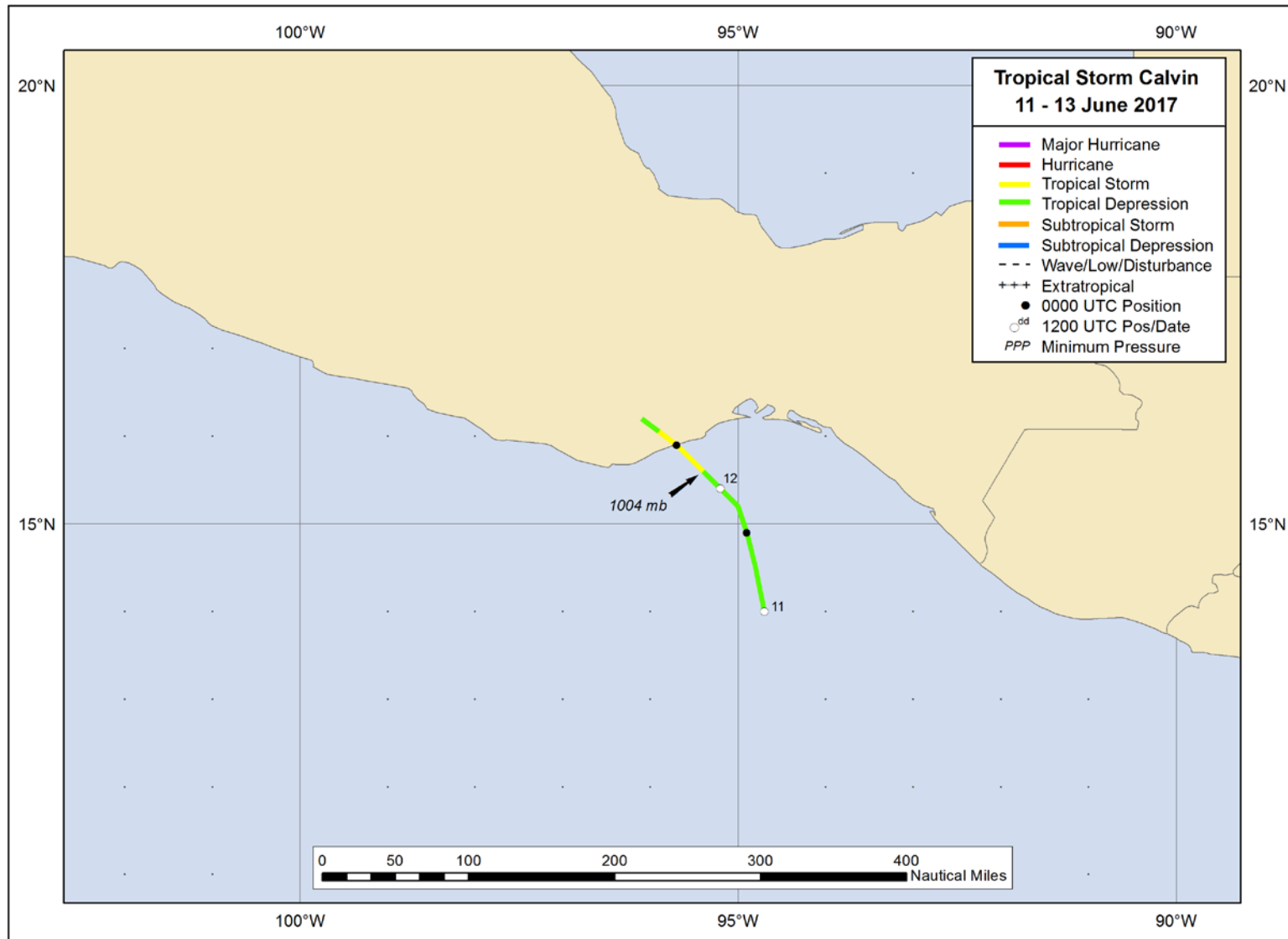


Figure 1. Best track positions for Tropical Storm Calvin, 11 – 13 June 2017.

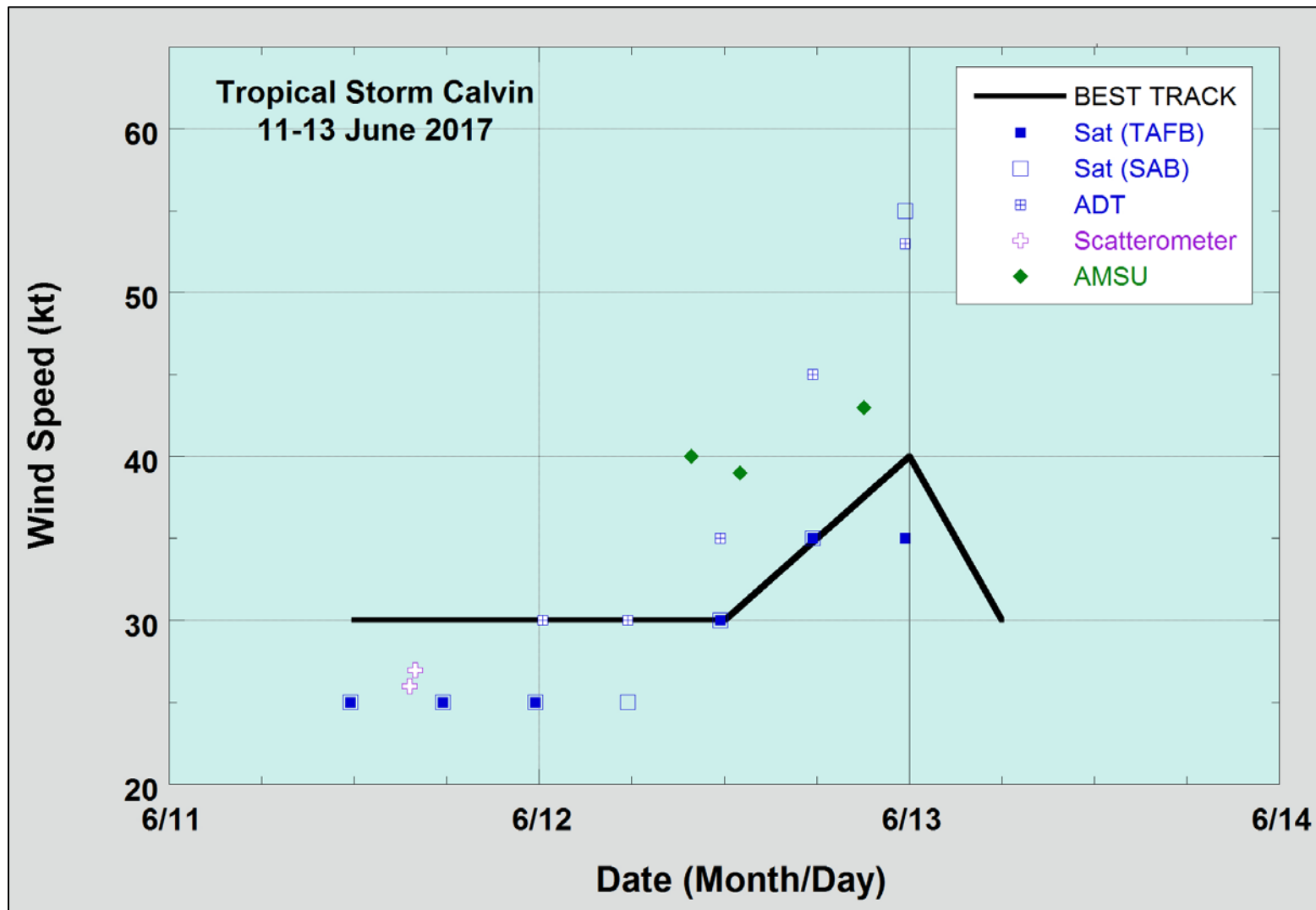


Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Tropical Storm Calvin, 11 – 13 June 2017. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. AMSU intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies technique. Dashed vertical lines correspond to 0000 UTC, and the solid vertical line corresponds to landfall.

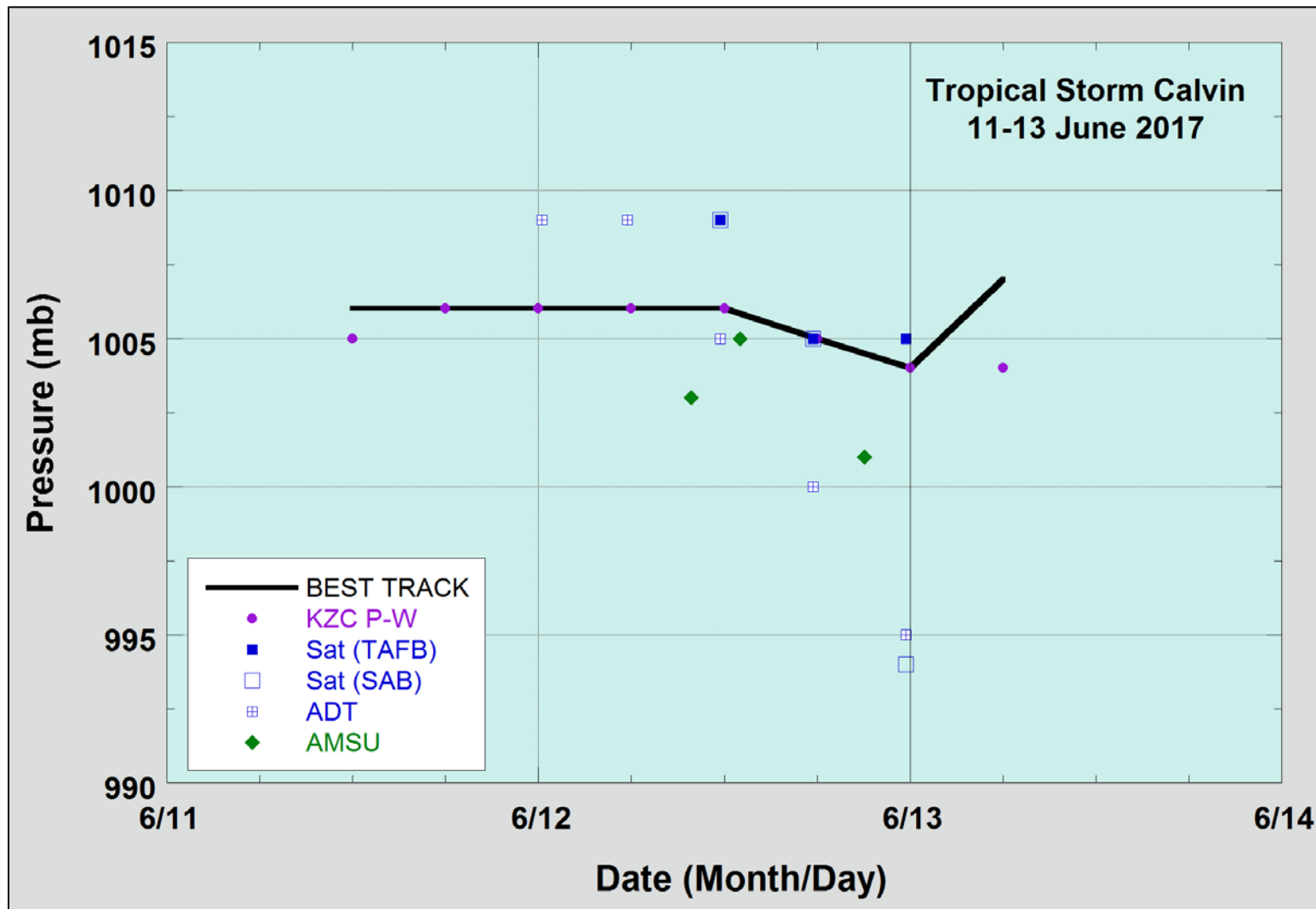


Figure 3. Selected pressure observations and best track minimum central pressure curve for Tropical Storm Calvin, 11 – 13 June 2017. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. AMSU intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies technique. 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. Photo of the flooding in the Mexican state of Oaxaca from Tropical Storm Calvin. Photo courtesy of El Universal news.