

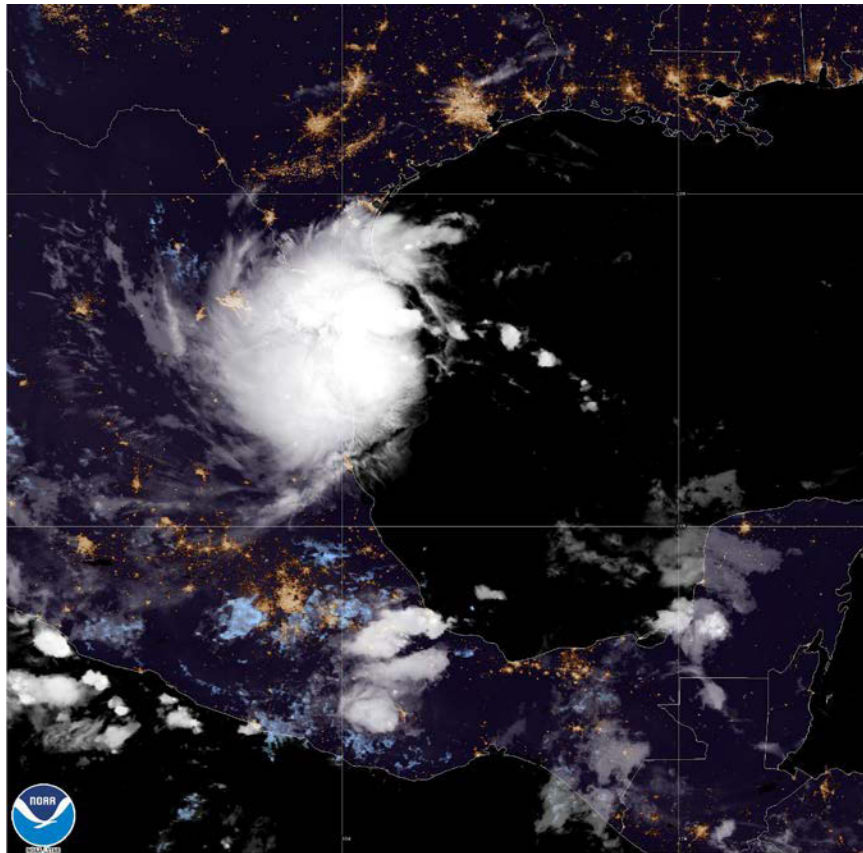


# NATIONAL HURRICANE CENTER TROPICAL CYCLONE REPORT

## TROPICAL STORM FERNAND (AL072019)

3–5 September 2019

Richard J. Pasch  
National Hurricane Center  
14 January 2020



GOES-EAST GEOCOLOR IMAGE OF TROPICAL STORM FERNAND AT 0610 UTC 4 SEPTEMBER 2019. IMAGE COURTESY OF NOAA/NESDIS/STAR.

Fernand was a short-lived tropical storm that made landfall in northeastern Mexico, causing one direct death from flooding.

# Tropical Storm Fernand

3–5 SEPTEMBER 2019

## SYNOPTIC HISTORY

Fernand's origin can be traced back to an upper-level low that moved slowly in a clockwise loop over the western Atlantic during the latter half of August. The low moved eastward from the southeastern United States across Bermuda and then turned southward before turning westward and moving near or over Puerto Rico, Hispaniola and Cuba. On 30 August, the system spawned a broad, weak surface low pressure area near western Cuba. Over the next couple of days, the low drifted generally westward while producing widely scattered, disorganized showers and thunderstorms over much of the eastern Gulf of Mexico. By 1 September, deep convection increased and began to show signs of organization, and curved bands of deep convection became more consolidated over the western Gulf on 2 September. Around 1200 UTC 3 September, the system's low-level circulation had become sufficiently well defined to indicate the formation of a tropical storm centered about 170 n mi east of La Pesca, Mexico. The "best track" chart of the tropical cyclone's path is shown in Fig. 1, with the wind and pressure histories displayed in Figs. 2 and 3, respectively. The best track positions and intensities are listed in Table 1<sup>1</sup>.

The tropical cyclone was situated in an environment of moderate east-southeasterly shear, but was able to intensify a little on 3 September. Fernand reached its maximum intensity of 45 kt by 0000 UTC 4 September. Soon thereafter, increasing southeasterly shear caused a gradual weakening trend to commence. After moving west-southwestward to westward, Fernand moved on a mostly west-northwestward track, to the south of a ridge over the south-central United States. However, the cyclone briefly jogged toward the north-northwest before making landfall in northeastern Mexico at 1530 UTC 4 September about 25 n mi north-northeast of La Pesca with an estimated intensity of 40 kt. Fernand soon weakened to a tropical depression, and the system dissipated over the rugged terrain of northeastern Mexico shortly after 0000 UTC 5 September.

## METEOROLOGICAL STATISTICS

Observations in Fernand (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. Observations also include flight-level and

---

<sup>1</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 *btk* directory, while previous years' data are located in the *archive* directory.

stepped frequency microwave radiometer (SFMR) wind observations from a flight of a NOAA Hurricane Hunter aircraft that made 3 center fixes. 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 Fernand.

The cyclone was estimated to have formed as a 35-kt tropical storm based on ASCAT data. Fernand's estimated peak intensity of 45 kt is based on a blend of SFMR-observed surface winds and flight-level winds from the NOAA aircraft.

Fernand produced torrential rains over portions of northeastern Mexico, especially in the state of Nuevo Leon. Rainfall totals associated with Fernand are displayed in Fig. 4. Amounts as high as 20.83 inches (529 mm) were recorded in Monterrey.

At 1200 UTC 3 September a ship, the *Carnival Dream*, reported southeast winds of 35 kt with a pressure of 1009.5 mb about 260 miles northeast of the center of the tropical cyclone. This observation was at an anemometer height of 50 m, so the equivalent 10-m wind was likely around 30 kt.

The northern fringes of Fernand brought strong gusty winds and locally heavy rains to portions of extreme south Texas. A wind gust to 35 kt was reported at South Padre Island at 1430 UTC 4 September. The highest rainfall total recorded in south Texas was 3.7 in (94 mm) in Port Isabel.

## CASUALTY AND DAMAGE STATISTICS

Fernand's flooding rains resulted in one direct death<sup>2</sup> when a man drowned in Garcia, a town near Monterrey, Mexico.

A damage estimate of \$383 million (USD) was reported by the government of the state of Nuevo Leon, Mexico, presumably due to flooding.

## FORECAST AND WARNING CRITIQUE

The genesis of Fernand was not particularly well anticipated. The system that became Fernand was first introduced into the Tropical Weather Outlook (TWO) 78 h before genesis with a low (<40%) probability of formation at both 2 and 5 days (Table 2). The 2-and 5-day genesis

---

<sup>2</sup> Deaths occurring as a direct result of the forces of the tropical cyclone are referred to as "direct" deaths. These would include those persons who drowned in storm surge, rough seas, rip currents, and freshwater floods. Direct deaths also include casualties resulting from lightning and wind-related events (e.g., collapsing structures). Deaths occurring from such factors as heart attacks, house fires, electrocutions from downed power lines, vehicle accidents on wet roads, etc., are considered "indirect" deaths.



probabilities were increased to medium (40–60%) 24 and 36 h before genesis, respectively. The 2- and 5-day probabilities were increased to high just 6 and 18 h before genesis, respectively. The TWO first mentioned the possibility of tropical depression formation “during the next few days” 24 h prior to its actual occurrence.

A verification of NHC official track forecasts for Fernand is given in Table 3a. Official track forecast track errors were a little higher than the mean official errors for the previous 5-yr period at the 12 through 36 h forecast intervals. A homogeneous comparison of the official track errors with selected guidance models is given in Table 3b. The number of cases in Tables 3a and 3b is too small to draw meaningful conclusions about these statistics.

A verification of NHC official intensity forecasts for Fernand is given in Table 4a. Official intensity forecast errors were higher than the long-term means at 12 through 36 h. A homogeneous comparison of the official intensity errors with selected guidance models is given in Table 4b. As with the track forecasts, the sample sizes in Tables 4a and 4b are too small to make meaningful conclusions from these results.

Watches and warnings associated with Fernand are listed in Table 5.

## ACKNOWLEDGMENTS

John P. Cangialosi produced the track map.



Table 1. Best track for Tropical Storm Fernand, 3–5 September 2019.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
03 / 0600	23.6	94.0	1006	30	disturbance
03 / 1200	23.4	94.7	1004	35	tropical storm
03 / 1800	23.2	95.4	1002	40	"
04 / 0000	23.1	96.1	1000	45	"
04 / 0600	23.4	96.8	1000	45	"
04 / 1200	24.0	97.2	1003	40	"
04 / 1530	24.2	97.7	1003	40	"
04 / 1800	24.3	98.0	1004	30	tropical depression
05 / 0000	24.7	98.6	1007	25	"
05 / 0600					dissipated
04 / 0000	23.1	96.1	1000	45	maximum wind and minimum pressure
04 / 1530	24.2	97.7	1003	40	landfall about 25 n mi north-northeast of La Pesca, 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%)	78	78
Medium (40%-60%)	24	36
High (>60%)	6	18

Table 3a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Tropical Storm Fernand, 3–5 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	28.9	41.4	65.4				
OCD5	40.6	75.0	97.3				
Forecasts	5	3	1				
OFCL (2014-18)	23.6	35.5	47.0	61.8	96.0	136.0	179.6
OCD5 (2014-18)	44.8	97.6	157.4	220.1	340.7	446.6	536.6



Table 3b. Homogeneous comparison of selected track forecast guidance models (in n mi) for Tropical Storm Fernand, 3–5 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	28.9	41.4	65.4				
OCD5	40.6	75.0	97.3				
GFSI	37.3	66.6	150.1				
HMNI	38.0	63.8	<b>61.0</b>				
HWFI	42.4	62.8	74.3				
EMXI	<b>25.6</b>	<b>33.2</b>	<b>37.1</b>				
CMCI	33.6	47.7	<b>32.7</b>				
NVGI	40.7	53.5	87.2				
CTCI	33.8	51.8	<b>60.6</b>				
AEMI	36.5	56.9	122.0				
HCCA	30.5	51.3	80.9				
TVCX	<b>28.0</b>	<b>40.5</b>	<b>60.6</b>				
GFEX	28.9	41.4	70.1				
TVCA	29.0	44.9	<b>64.7</b>				
TVDG	<b>27.8</b>	<b>40.7</b>	68.9				
TABD	46.4	96.0	137.6				
TABM	35.0	59.7	84.5				
TABS	31.1	57.0	78.2				
Forecasts	5	3	1				

Table 4a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Tropical Storm Fernand, 3–5 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	10.0	8.3	15.0				
OCD5	12.4	10.3	24.0				
Forecasts	5	3	1				
OFCL (2014-18)	5.3	7.9	9.9	11.2	13.3	14.4	14.2
OCD5 (2014-18)	6.9	10.9	14.3	17.4	20.9	22.0	22.8

Table 4b. Homogeneous comparison of selected intensity forecast guidance models (in kt) for Tropical Storm Fernand, 3-5 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	10.0	8.3	15.0				
OCD5	12.4	10.3	24.0				
HWFI	<b>7.6</b>	8.3	<b>5.0</b>				
HMNI	<b>5.6</b>	<b>7.0</b>	<b>1.0</b>				
HCCA	<b>7.4</b>	<b>5.7</b>	<b>6.0</b>				
DSHP	10.8	10.3	<b>12.0</b>				
LGEM	12.2	12.0	<b>7.0</b>				
IVCN	<b>8.4</b>	<b>5.3</b>	<b>5.0</b>				
GFSI	<b>6.8</b>	<b>6.3</b>	<b>3.0</b>				
EMXI	<b>9.2</b>	8.3	<b>2.0</b>				
Forecasts	5	3	1				





Table 5. Watch and warning summary for Tropical Storm Fernand, 3–5 September 2019.

<b>Date/Time (UTC)</b>	<b>Action</b>	<b>Location</b>
3 / 0900	Tropical Storm Warning issued	La Pesca to Barra El Mezquital
3 / 1800	Tropical Storm Warning discontinued	La Pesca to Barra El Mezquital
3 / 1800	Tropical Storm Warning issued	Barra del Tordo to TX/MEX border
3 / 2100	Tropical Storm Warning modified to	Puerto Altamira to TX/MEX border
4 / 2100	Tropical Storm Warning discontinued	All

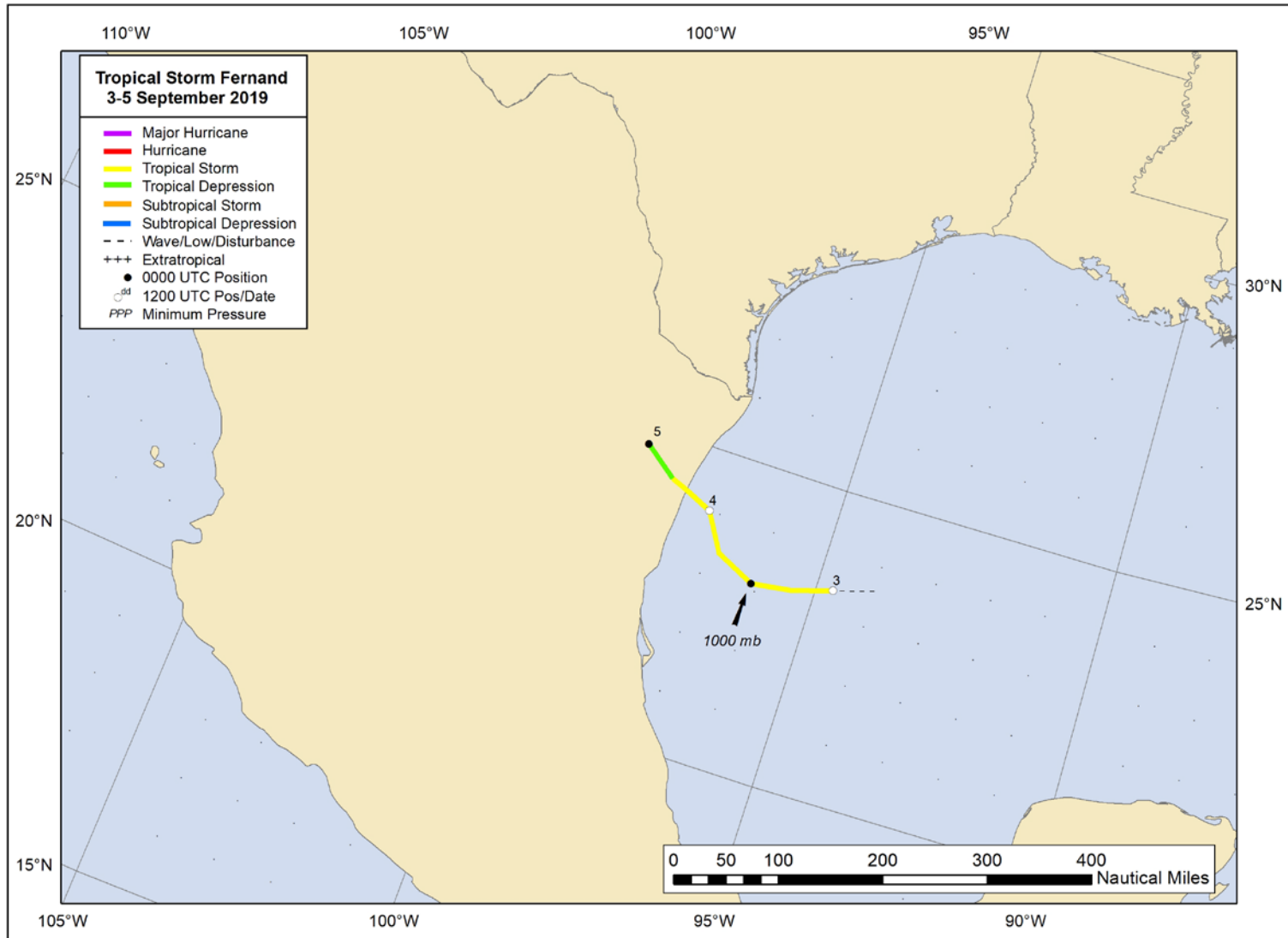


Figure 1. Best track positions for Tropical Storm Fernand, 3–5 September 2019.

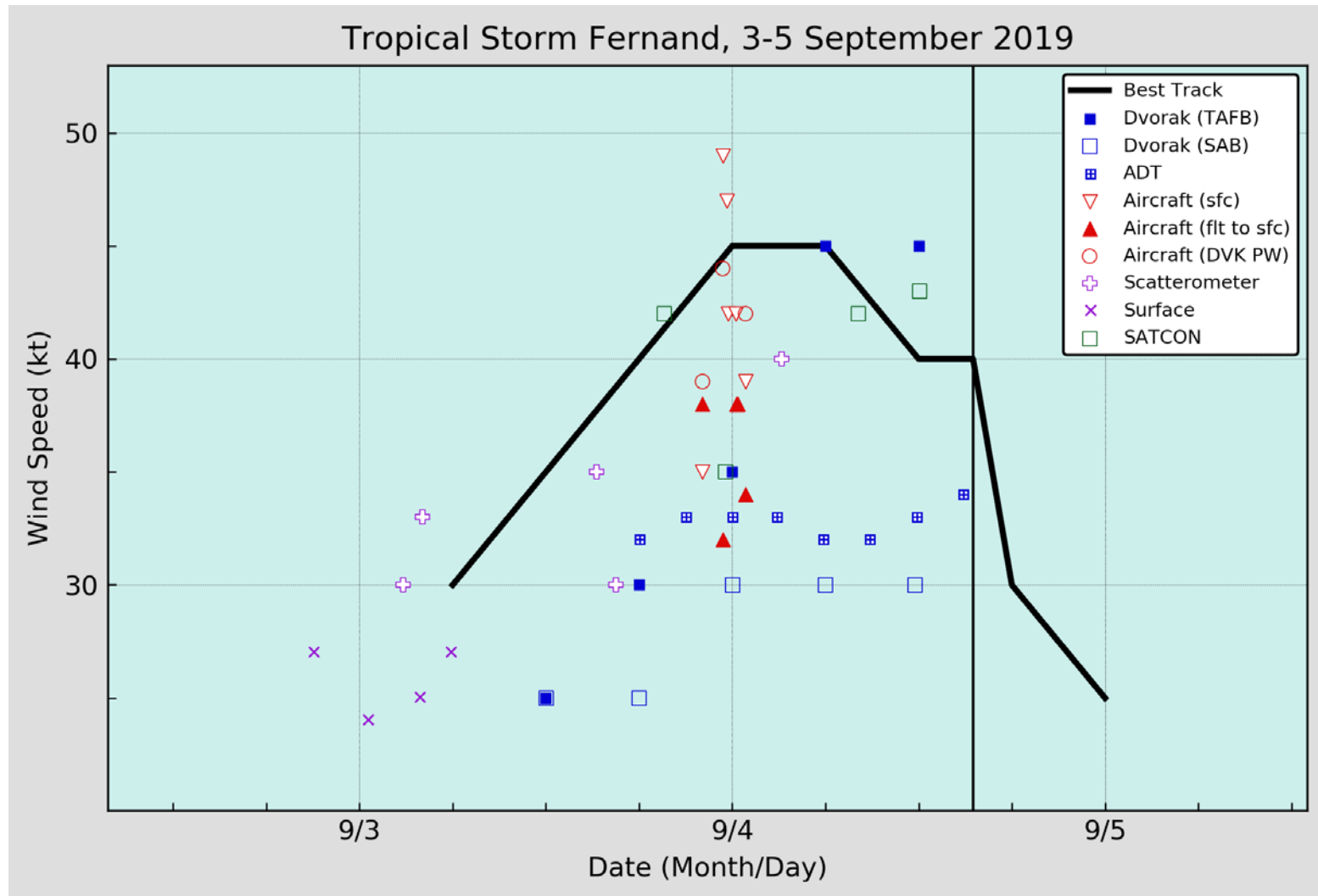


Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Tropical Storm Fernand, 3–5 September 2019. Aircraft observations have been adjusted for elevation using 75% and 80% adjustment factors for observations from 925 mb and 850 mb, respectively. Advanced Dvorak 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.

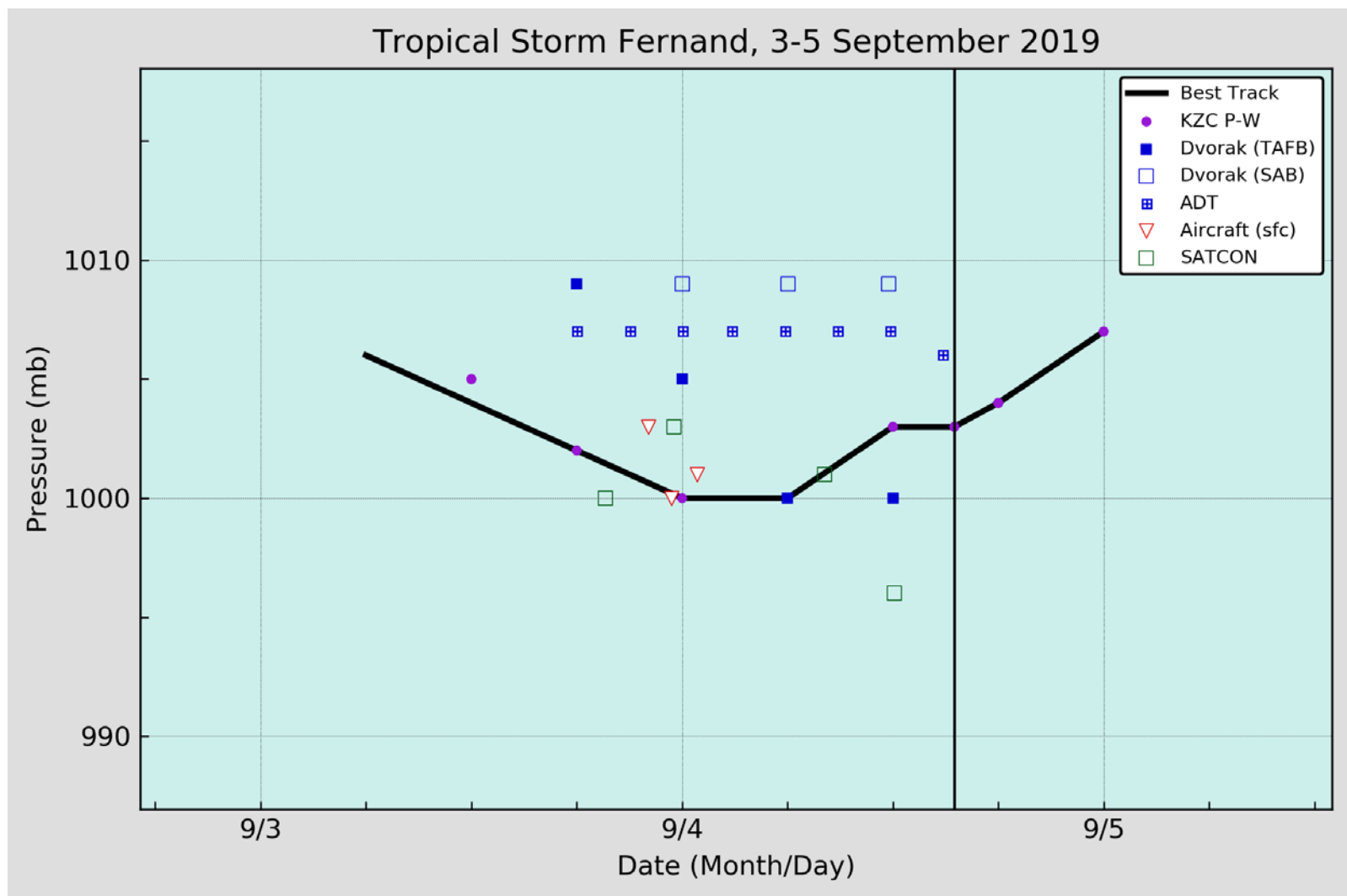


Figure 3. Selected pressure observations and best track minimum central pressure curve for Tropical Storm Fernand, 3–5 September 2019. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for 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, and the solid vertical line corresponds to landfall.

### Precipitación acumulada (mm) del 3 al 5 de septiembre de 2019 por la tormenta tropical Fernand

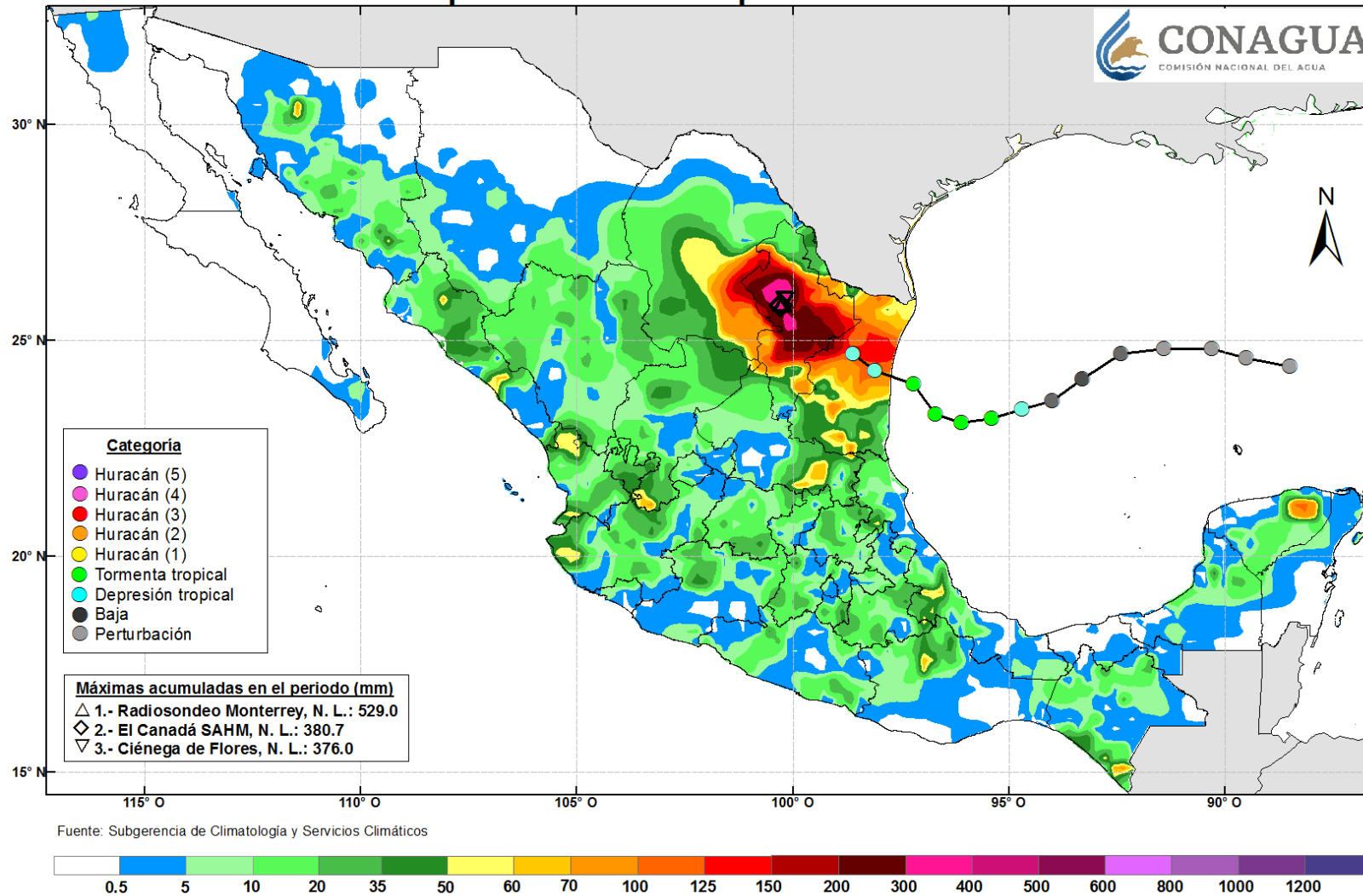


Figure 4. Total rainfall accumulations (mm) associated with Tropical Storm Fernand, 3–5 September 2019. Figure courtesy of the National Meteorological Service of Mexico (CONAGUA).