

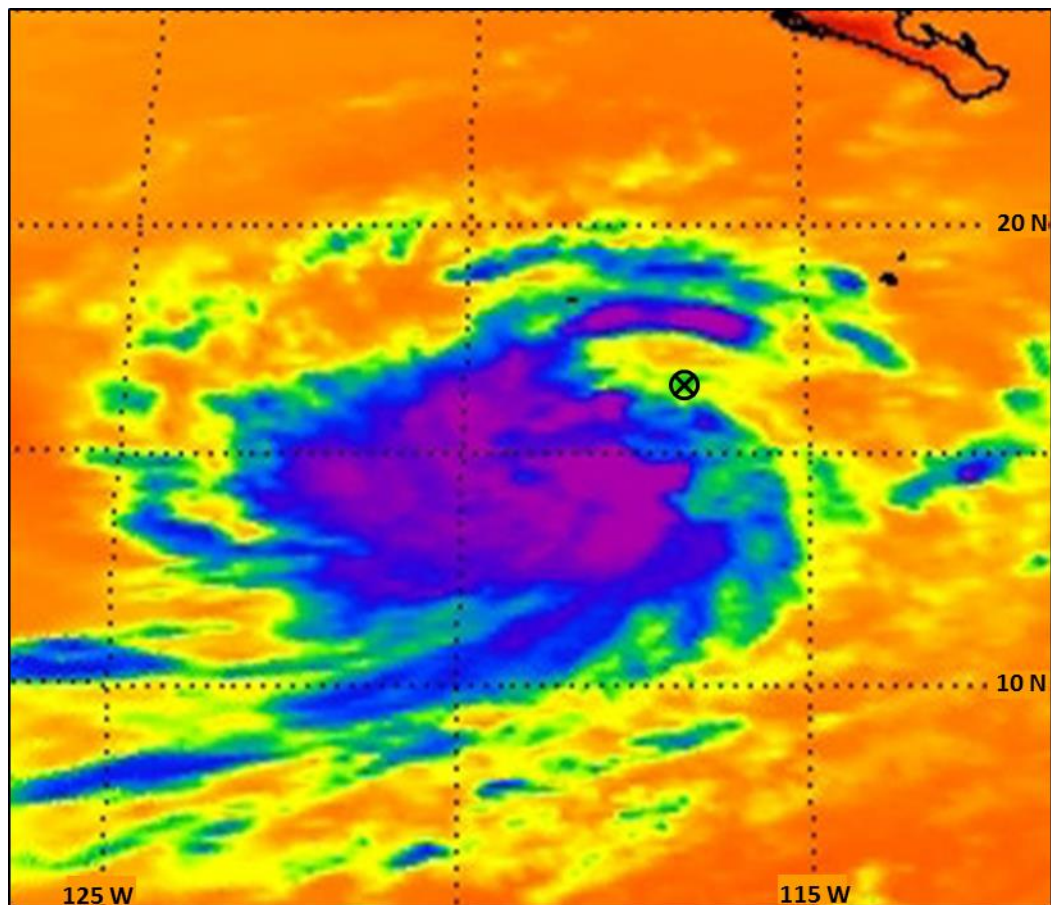


# NATIONAL HURRICANE CENTER TROPICAL CYCLONE REPORT

## TROPICAL STORM EMILIA (EP062018)

27 June–1 July 2018

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AQUA FALSE-COLOR INFRARED SATELLITE IMAGE AT 2059 UTC 28 JUNE 2018 SHORTLY AFTER EMILIA REACHED ITS PEAK INTENSITY OF 50 KT. EMILIA'S CENTER LOCATION IS DEPICTED BY THE CIRCLED-X. (IMAGE COURTESY OF NASA).

Emilia was a moderate-strength tropical storm that remained over the open eastern North Pacific Ocean well to the southwest of the southern Baja California Peninsula.

# Tropical Storm Emilia

27 JUNE–1 JULY 2018

## SYNOPTIC HISTORY

A pronounced tropical wave, especially for mid-June, moved off of the west coast of Africa around midday 14 June. The wave lost most of its convection the next day due to the anomalously cool waters in that area of the Atlantic. The innocuous disturbance moved quickly westward across the low latitudes of the tropical Atlantic for the next several days, crossing the southern portion of Central America on 23 June, and entering into the eastern North Pacific basin early the next day. As the wave moved across Central America and interacted with the eastern North Pacific monsoon trough, convection steadily increased and a broad low pressure system developed along the wave axis early on 25 June. Over the next couple of days, the low moved west-northwestward at speeds of 10–15 kt and convection steadily increased and became better organized. It is estimated that a tropical depression formed around 1800 UTC on 27 June about 410 n mi southwest of Manzanillo, 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>1</sup>.

Slow intensification occurred over the next 18 h, and the depression strengthened into a tropical storm by 1200 UTC 28 June. Only slow strengthening occurred for the next 24 h due to northeasterly vertical wind shear of 15–20 kt. Emilia reached a peak intensity of 50 kt at 1200 UTC 29 June, when the cyclone was located about 520 n mi southwest of the southern tip of the Baja California peninsula. The cyclone maintained that strength for another 6 h, after which steady weakening ensued due to the combination of moderate shear, mid-level dry-air entrainment, and cooling sea-surface temperatures (SST). By 1200 UTC 30 June, Emilia had weakened to a tropical depression when the cyclone was located over 25.5–26°C SSTs, while centered about 600 n mi west-southwest of the southern tip of the Baja California peninsula. Emilia continued its west-northwestward motion over decreasing ocean temperatures, resulting in the cyclone degenerating into a remnant low pressure system by 0000 UTC 2 July, followed by dissipation about 54 h later when the system was located more than 1300 n mi west of Baja California.

## METEOROLOGICAL STATISTICS

Observations in Emilia (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), objective Advanced Dvorak Technique (ADT) estimates and Satellite

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<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.

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 Emilia.

Emilia's estimated peak intensity of 50 kt at 1200 UTC and 1800 UTC 29 June was based on average intensity estimates from TAFB, SAB, and UW-CIMSS AMSU that ranged from 45 kt to 55 kt. The estimated minimum central pressure of 997 mb was based on a blend of AMSU and Knaff-Zehr-Courtney (KZC) pressure estimates.

There were no ship or land reports of tropical-storm-force winds associated with Emilia.

## CASUALTY AND DAMAGE STATISTICS

There were no reports of damage or casualties associated with Tropical Storm Emilia.

## FORECAST AND WARNING CRITIQUE

The genesis of Tropical Storm Emilia was well forecast. The wave from which Emilia developed was introduced in the Tropical Weather Outlook 120-h forecast period with a low probability (<40% chance) of genesis 96 h prior to formation (Table 2). The probabilities were increased to the medium (40%–60%) and high (>60%) categories 84 h and 60 h, respectively, prior to genesis. In the 48-h forecast period, the disturbance was introduced in the low, medium, and high genesis categories 60 h, 48 h, and 36 h, respectively, prior to tropical cyclone formation.

A verification of NHC official track forecasts (OFCL) for Tropical Storm Emilia is given in Table 3a. Official forecast track errors were markedly better than the mean official forecast errors for the previous 5-yr period at the 48-, 72-, and 96-h forecast times, and were comparable to the 5-yr errors at 12, 24, and 36 h. A homogeneous comparison of the OFCL errors with selected guidance models is given in Table 3b. OFCL forecasts were bested by the GFSI, EGRI (UKMET), and the multi-model consensus forecast models, including the NOAA HFIP Corrected Consensus Approach (HCCA), at all time periods. The EGRI was the overall best-performing model, having the lowest track errors at all forecast times.

A verification of NHC official intensity forecasts for Tropical Storm Emilia is given in Table 4a. Official forecast intensity errors were mixed when compared to the mean official errors for the previous 5-yr period. OFCL errors were slightly better at the 12- and 24-h periods, and were near or slightly worse than the 5-yr averages at 36–96 h. A homogeneous comparison of the official intensity errors with selected guidance models is given in Table 4b. OFCL intensity forecasts were bested by almost every model at 24 h and 36 h, and were outperformed by the ECMWF model



(EMXI) at nearly every forecast time period. Although the number of cases was small, the ECMWF model was the best model overall, especially at 72 h where its intensity errors were 75% better than OFCL forecasts. This was due to NHC official intensity errors having a significant high bias, owing to Emilia being forecast to weaken more slowly than what actually transpired.

No coastal watches or warnings were required for Tropical Storm Emilia.

**Table 1. Best track for Tropical Storm Emilia, 27 June–1 July 2018.**

<b>Date/Time (UTC)</b>	<b>Latitude (°N)</b>	<b>Longitude (°W)</b>	<b>Pressure (mb)</b>	<b>Wind Speed (kt)</b>	<b>Stage</b>
27 / 0600	11.7	107.0	1007	30	low
27 / 1200	12.4	107.5	1007	30	"
27 / 1800	12.8	108.1	1007	30	tropical depression
28 / 0000	13.2	109.3	1006	30	"
28 / 0600	13.7	110.5	1006	30	"
28 / 1200	14.2	111.8	1005	35	tropical storm
28 / 1800	14.7	113.1	1004	40	"
29 / 0000	15.1	114.0	1000	45	"
29 / 0600	15.6	115.0	1000	45	"
29 / 1200	16.0	115.8	997	50	"
29 / 1800	16.4	116.5	997	50	"
30 / 0000	16.6	117.3	1000	40	"
30 / 0600	16.8	118.1	1003	35	"
30 / 1200	17.4	118.8	1004	30	tropical depression
30 / 1800	17.7	119.5	1004	30	"
01 / 0000	18.2	120.6	1005	30	"
01 / 0600	18.7	121.5	1006	25	"
01 / 1200	19.1	122.5	1006	25	"
01 / 1800	19.5	123.5	1007	25	"
02 / 0000	20.0	124.7	1007	25	low
02 / 0600	20.6	125.8	1008	25	"
02 / 1200	21.3	127.0	1008	25	"
02 / 1800	21.9	128.1	1008	25	"
03 / 0000	22.4	129.2	1009	20	"
03 / 0600	22.8	130.4	1009	20	"
03 / 1200	23.1	131.7	1009	20	"
03 / 1800	23.3	133.2	1009	20	"
04 / 0000	23.4	134.6	1009	20	"
04 / 0600					dissipated
29 / 1200	16.0	115.8	997	50	minimum pressure and maximum intensity

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%)	60	96
Medium (40%-60%)	48	84
High (>60%)	36	60

Table 3a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Tropical Storm Emilia, 27 June – 1 July 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	<b>18.4</b>	34.3	<b>42.3</b>	<b>42.0</b>	<b>48.4</b>	<b>82.6</b>	
OCD5	23.8	50.4	66.4	78.6	139.7	147.3	
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 Emilia, 27 June–1 July 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	18.7	38.2	46.7	49.2	37.9		
OCD5	25.2	48.9	67.7	77.8	158.0		
GFSI	<b>17.8</b>	<b>36.0</b>	<b>43.4</b>	<b>46.3</b>	<b>21.5</b>		
EGRI	<b>16.1</b>	<b>24.1</b>	<b>34.8</b>	<b>39.0</b>	<b>19.2</b>		
EMXI	24.2	44.1	60.6	76.0	80.5		
CMCI	33.2	48.9	<b>44.4</b>	52.8	77.4		
NVGI	19.4	42.5	64.4	97.1	159.7		
HWFI	25.9	51.2	62.2	59.0	48.2		
HMNI	23.6	49.8	63.7	80.8	58.0		
TVCE	<b>17.5</b>	<b>36.2</b>	<b>45.2</b>	<b>48.1</b>	<b>33.9</b>		
TVCA	<b>16.8</b>	<b>34.8</b>	<b>42.4</b>	<b>44.4</b>	<b>25.5</b>		
TVCX	<b>17.1</b>	<b>35.9</b>	<b>44.7</b>	<b>48.9</b>	<b>30.1</b>		
GFEX	<b>18.3</b>	38.9	49.8	56.3	44.5		
TCON	<b>18.1</b>	<b>34.8</b>	<b>42.8</b>	<b>42.6</b>	<b>23.3</b>		
HCCA	<b>16.6</b>	<b>33.3</b>	<b>43.4</b>	<b>47.0</b>	<b>20.7</b>		
FSSE	19.5	40.2	54.8	63.4	43.1		
AEMI	20.2	<b>38.0</b>	<b>45.8</b>	<b>39.0</b>	<b>27.2</b>		
TABD	37.6	75.0	99.6	107.7	97.3		
TABM	33.2	71.2	101.2	111.7	44.6		
TABS	26.1	68.3	109.1	144.6	160.2		
Forecasts	8	8	8	6	2		



Table 4a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Tropical Storm Emilia, 27 June–1 July 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	<b>3.3</b>	<b>9.2</b>	13.6	16.7	18.0	<b>15.0</b>	
OCD5	4.7	7.9	12.2	14.8	21.0	24.0	
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 Emilia, 27 June–1 July 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	5.6	12.5	16.9	20.0	15.0		
OCD5	<b>5.5</b>	<b>9.9</b>	<b>13.9</b>	<b>19.3</b>	23.5		
HWFI	5.9	<b>8.6</b>	<b>15.6</b>	<b>19.5</b>	18.5		
HMNI	7.2	12.6	21.6	25.3	37.5		
DSHP	5.6	<b>8.9</b>	<b>14.1</b>	21.0	30.5		
LGEM	6.0	<b>9.5</b>	<b>12.2</b>	<b>16.5</b>	16.5		
IVCN	<b>5.2</b>	<b>9.0</b>	<b>14.2</b>	<b>19.3</b>	22.0		
ICON	5.6	<b>9.5</b>	<b>15.4</b>	20.8	26.0		
HCCA	5.8	<b>10.4</b>	<b>16.2</b>	21.3	20.0		
FSSE	6.6	<b>12.0</b>	19.2	24.8	25.5		
GFSI	8.5	14.8	22.8	30.8	33.0		
EMXI	6.6	<b>7.9</b>	<b>8.2</b>	<b>9.0</b>	<b>3.5</b>		
Forecasts	8	8	8	6	2		

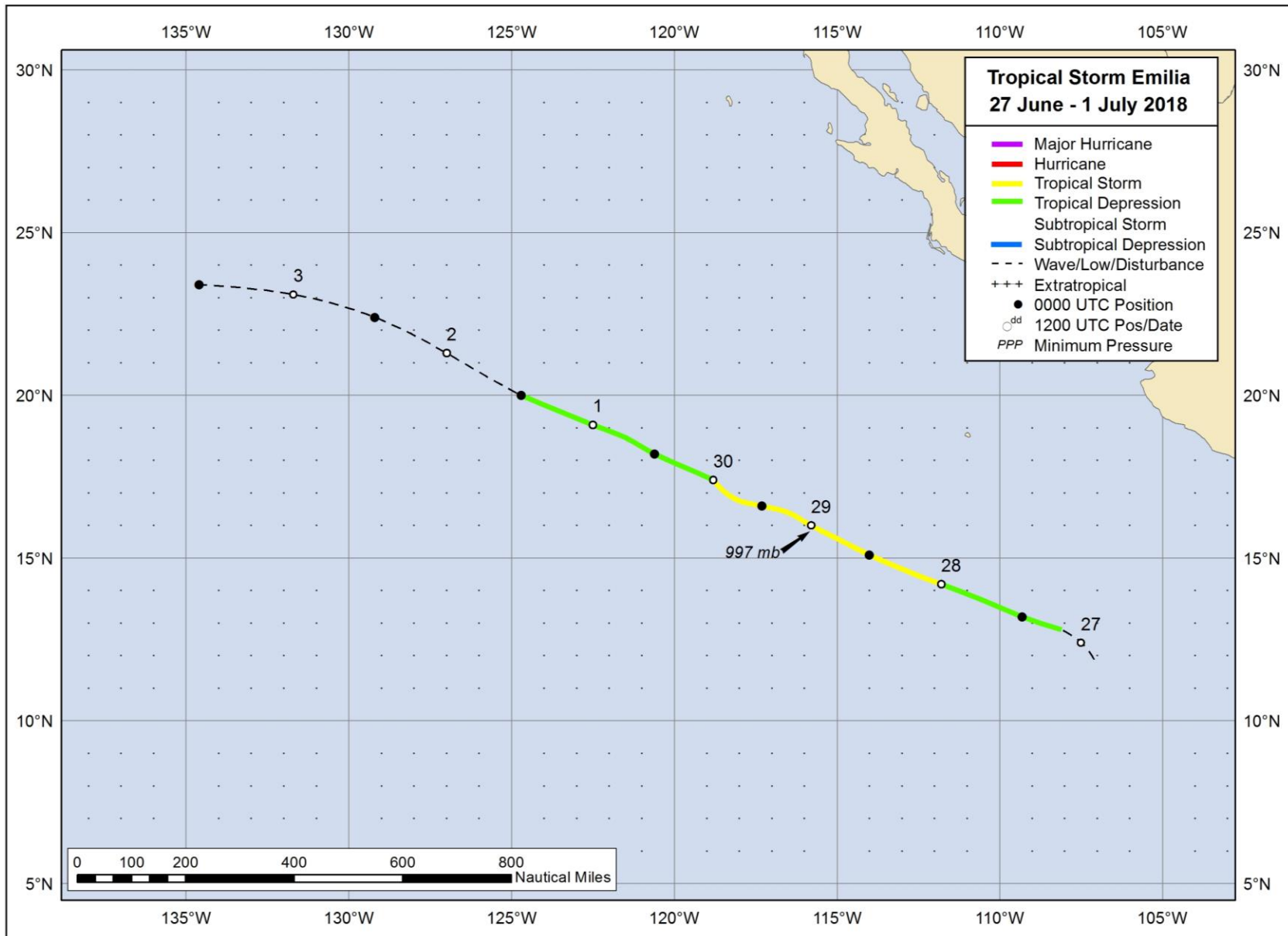


Figure 1. Best track positions for Tropical Storm Emilia, 27 June–1 July 2018.

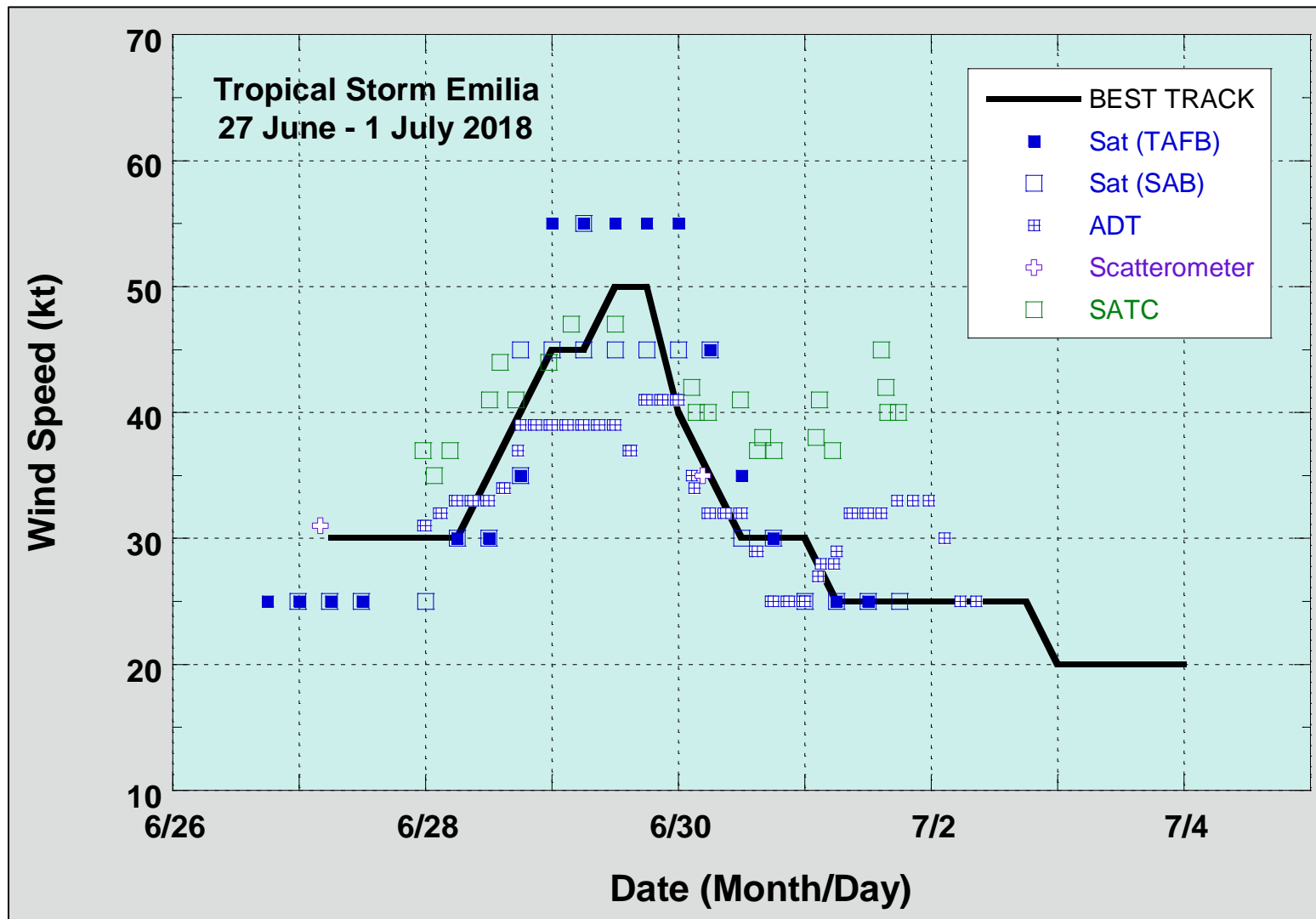


Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Tropical Storm Emilia, 27 June–1 July 2018. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies. Dashed vertical lines correspond to 0000 UTC.

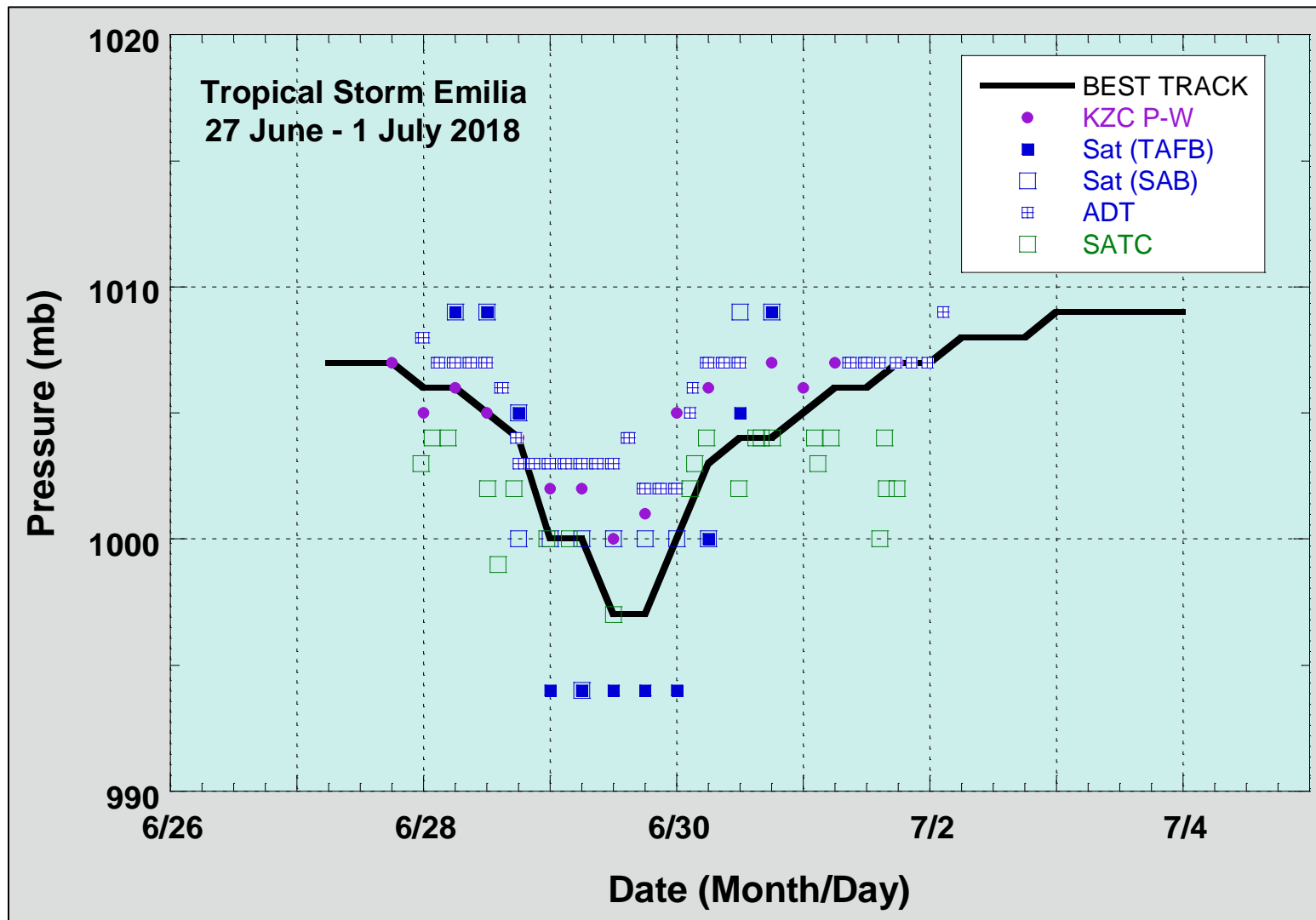


Figure 3. Selected pressure observations and best track minimum central pressure curve for Tropical Storm Emilia, 27 June–1 July 2018. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for 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.