NATIONAL HURRICANE CENTER
TROPICAL CYCLONE REPORT

TROPICAL STORM PILAR

(EP182017)

23–25 September 2017

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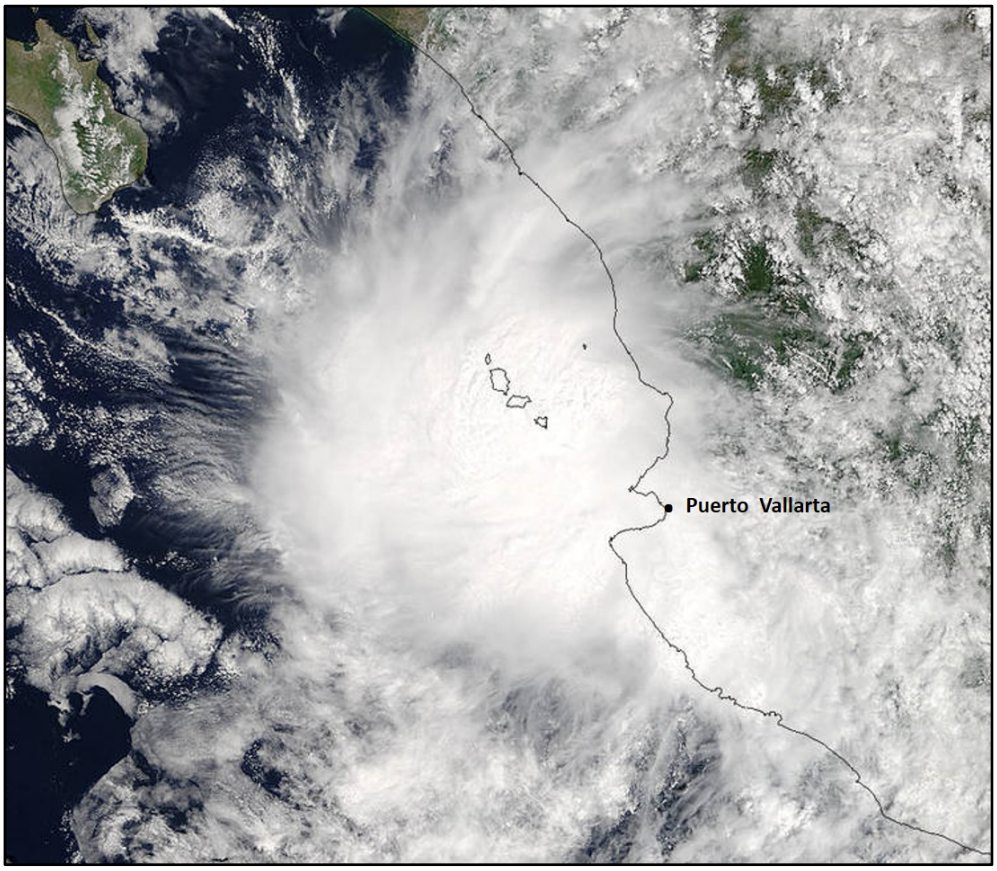

TROPICAL STORM PILAR NEAR ITS PEAK INTENSITY AT 1740 UTC 24 SEPTEMBER 2017. GOES-16 VISIBLE IMAGE COURTESY OF THE NASA GODDARD MODIS RAPID RESPONSE TEAM.

Pilar was a short-lived tropical storm that brought brief periods of locally heavy rainfall and tropical-storm-force winds to the extreme southwestern coast of Mexico and the Islas Marías archipelago before quickly dissipating over the southern Gulf of California.

Tropical Storm Pilar

23–25 SEPTEMBER 2017

SYNOPTIC HISTORY

Pilar developed from a tropical wave that moved off the coast of Africa on 8 September as a broad low pressure area. The system briefly developed organized deep convection near the center on 9 September, but strong westerly vertical shear caused the low to degenerate into an open wave south of the Cabo Verde Islands by early 10 September. The wave moved westward across the tropical Atlantic Ocean and the Caribbean Sea for the next week, reaching Central America on 17 September and emerging over the eastern North Pacific the next day. By 20 September, the disturbance began to interact with the Intertropical Convergence Zone, which was situated very near the southern coast of Mexico, resulting in the development of land-based deep convection. During the early morning hours of 21 September, a large convective complex developed in the Mexican state of Guerrero, which appears to have helped spin up a low-level vorticity maximum along the wave axis just to the southwest of Acapulco, Mexico. Over the next 48 h, the disturbance moved west-northwestward just offshore of the Pacific coast of Mexico. During that time, thunderstorm activity slowly increased and became better organized near the center of the well-defined surface low, resulting in the formation of a tropical depression by 1200 UTC 23 September about 75 n mi south-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[1].

The depression moved slowly northwestward parallel to and less than 100 n mi offshore of the southwestern coast of Mexico for the next three days. The small cyclone acquired tropical storm status 6 h after genesis, with only gradual strengthening occurring during the next 24 h. Proximity to land along with dry, downslope easterly winds, likely inhibited the strengthening process, despite the otherwise favorable environment conditions consisting of high sea-surface temperatures near 30°C and 850–200-mb vertical wind shear values of 10–15 kt (data not shown). Pilar reached its peak intensity of 45 kt by 1200 UTC 24 September when the tropical cyclone was located about 65 n mi southwest of Puerto Vallarta, Mexico. Just 12 h later, southerly to southwesterly vertical wind shear increased to near 20 kt, with the shear exceeding 30 kt by 0000 UTC 26 September. The result was a rapid erosion of the deep convection on the west side of the circulation, with thunderstorm activity shearing away completely around 1200 UTC 25 September, resulting in Pilar becoming a remnant low. Now moving northward, the elongated low pressure system continued to rapidly degenerate and dissipated 6 h later when the system was located over the southern Gulf of California.

[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.

METEOROLOGICAL STATISTICS

Observations in Pilar (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 (UW-CIMSS). 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 Pilar.

Pilar's estimated peak intensity of 45 kt is based on an average of satellite intensity estimates of T3.0/45 kt from TAFB, 49 kt from UW-CIMSS AMSU, and T2.5/35 kt from SAB. The estimated minimum central pressure of 1000 mb is based on the Knaff-Zehr-Courtney (KZC) pressure-wind relationship. This pressure estimate is supported by a 0900 UTC 24 September observation from ship *Cap Pasley* (call sign **A8NQ6**) that included a pressure of 1003.0 mb and a west-northwest wind of 28 kt, which yields an equivalent surface pressure of about 1000 mb.

An elevated (276 ft/84 m) automated station at Chamela-Cuixmala in the Mexican state of Jalisco, located about 45 n mi east of Pilar's center, reported an off-land sustained wind of 31 kt and a gust of 67 kt at 0740 UTC 24 September.

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

CASUALTY AND DAMAGE STATISTICS

There were no reports of damage or casualties associated with Pilar.

FORECAST AND WARNING CRITIQUE

The genesis of Pilar was not forecast particularly well in the short term. The potential for tropical cyclone development was first mentioned in the Tropical Weather Outlook with a low probability of formation (< 40%) in the 120-h period at 1800 UTC 17 September, which was 90 h before genesis occurred. The 5-day probability of formation was increased to the medium category (40–60%) 72 h before development, and to the high category (> 60%) 36 h before formation occurred (Table 2). However, the disturbance was not introduced in the 2-day period with a low probability of formation until 48 h before Pilar developed, and the probabilities were only raised into the medium category 12 h before genesis occurred. The 48-h genesis probabilities never reached the high category. The main reason for the poor genesis forecasts were the disturbance's proximity to the mountainous terrain of southern Mexico and expected prolonged land interaction, which did not occur.

Given the relatively short lifetime of Pilar 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 were 62.0 n mi, 112.6 n mi, and 133.7 n mi at 12, 24 and 36 h, respectively (Table 3), which were unusually large and considerably higher than the mean official errors for the previous 5-yr period. In fact, these errors were worse than the climatology-persistence model OCD5 at 12 h and 24 h. These errors were due to the forecasts having significant right-of-track and slow biases. The EMXI, HCCA, and FSSE models displayed similar errors, keeping Pilar close to the western coast of Mexico. In contrast, the UKMI model forecasts had a left-of-track bias. Given the small sample size, a homogeneous comparison of track and intensity model errors is not shown.

A verification of NHC official intensity forecasts for Pilar is given in Table 4. NHC official forecast (OFCL) intensity errors were lower than the mean official errors for the previous 5-yr period at 12 h and 24 h. OFCL intensity errors were higher than average at 36 h due to a high bias. These errors were the result of the official forecasts not anticipating the rapid demise of Pilar owing to the unforecast sharp increase in the deep-layer vertical wind shear, which was due in part to the slow forward-speed track bias that kept Pilar within more favorable shear conditions for a longer period of time. In general, the global and regional models, plus the SHIPS and LGEM statistical-dynamical intensity models, were forecasting the shear to increase to more than 20 kt by late on 26 September, which was about 24 h later than what actually occurred.

Watches and warnings associated with Pilar are given in Table 5.

Table 1. Best track for Tropical Storm Pilar, 23–25 September 2017.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
22 / 0000	16.7	103.3	1007	25	low
22 / 0600	16.8	103.6	1006	25	"
22 / 1200	16.9	103.9	1005	25	"
22 / 1800	17.1	104.2	1005	25	"
23 / 0000	17.3	104.4	1005	25	"
23 / 0600	17.6	104.7	1005	25	"
23 / 1200	17.9	105.0	1005	30	tropical depression
23 / 1800	18.2	105.2	1004	35	tropical storm
24 / 0000	18.6	105.4	1003	35	"
24 / 0600	19.2	105.7	1002	40	"
24 / 1200	20.0	106.0	1000	45	"
24 / 1800	20.9	106.3	1000	45	"
25 / 0000	21.8	106.6	1002	40	"
25 / 0600	22.3	106.8	1003	35	"
25 / 1200	22.6	107.0	1004	25	low
25 / 1800					dissipated
24 / 1200	20.0	106.0	1000	45	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%)	48	90
Medium (40%-60%)	12	72
High (>60%)	—	36

Table 3. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Tropical Storm Pilar, 23–25 September 2017. 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	62.0	112.6	133.7				
OCD5	54.2	112.1	150.4				
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 4. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Tropical Storm Pilar, 23–25 September 2017. 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	**0.0**	**8.3**	15.0				
OCD5	2.8	8.3	6.0				
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 5. Watch and warning summary for Tropical Storm Pilar, 23–25 September 2017.

Date/Time (UTC)	Action	Location
23 / 2100	Tropical Storm Warning issued	Manzanillo to El Roblito
23 / 2100	Tropical Storm Warning issued	Islas Marias
24 / 1500	Tropical Storm Warning modified to	Playa Perula to El Roblito
25 / 0300	Tropical Storm Warning discontinued	Playa Perula to El Roblito
25 / 0300	Tropical Storm Warning issued	Cabo Corrientes to Bahia Tempehuaya
25 / 1500	Tropical Storm Warning discontinued	All

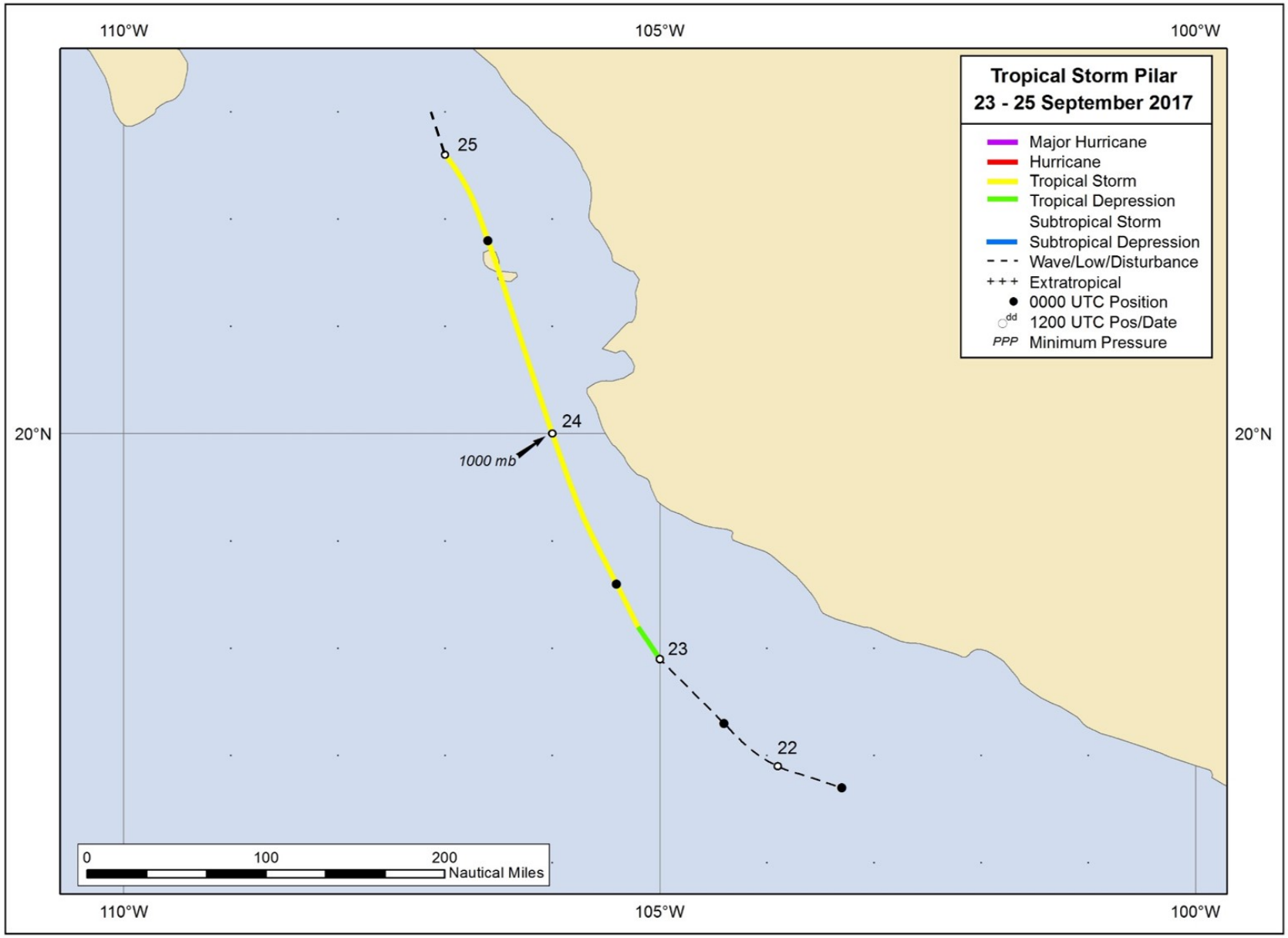

Figure 1. Best track positions for Tropical Storm Pilar, 23–25 September 2017.

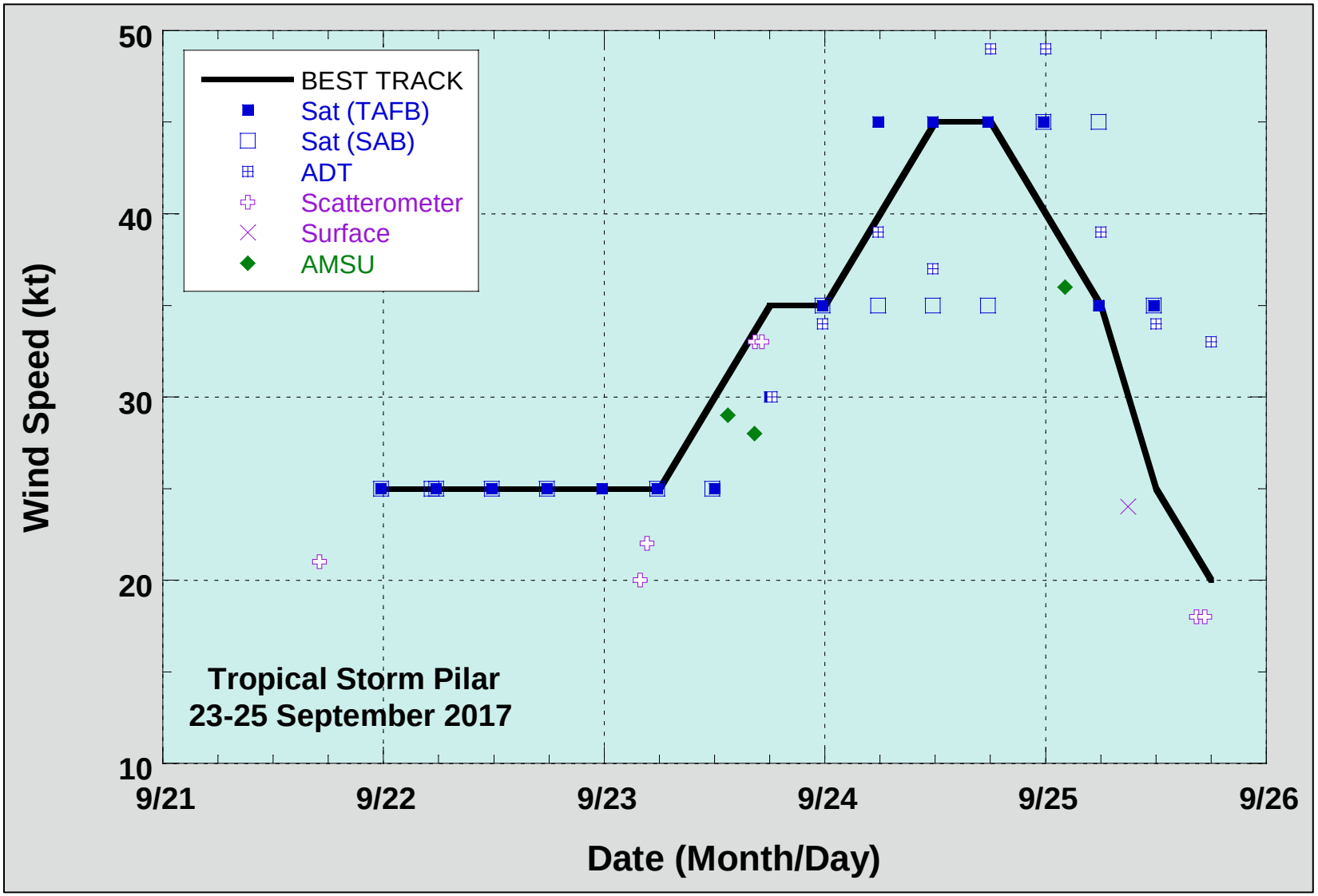

Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Tropical Storm Pilar, 23–25 September 2017. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. AMSU intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies technique. Dashed vertical lines correspond to 0000 UTC.

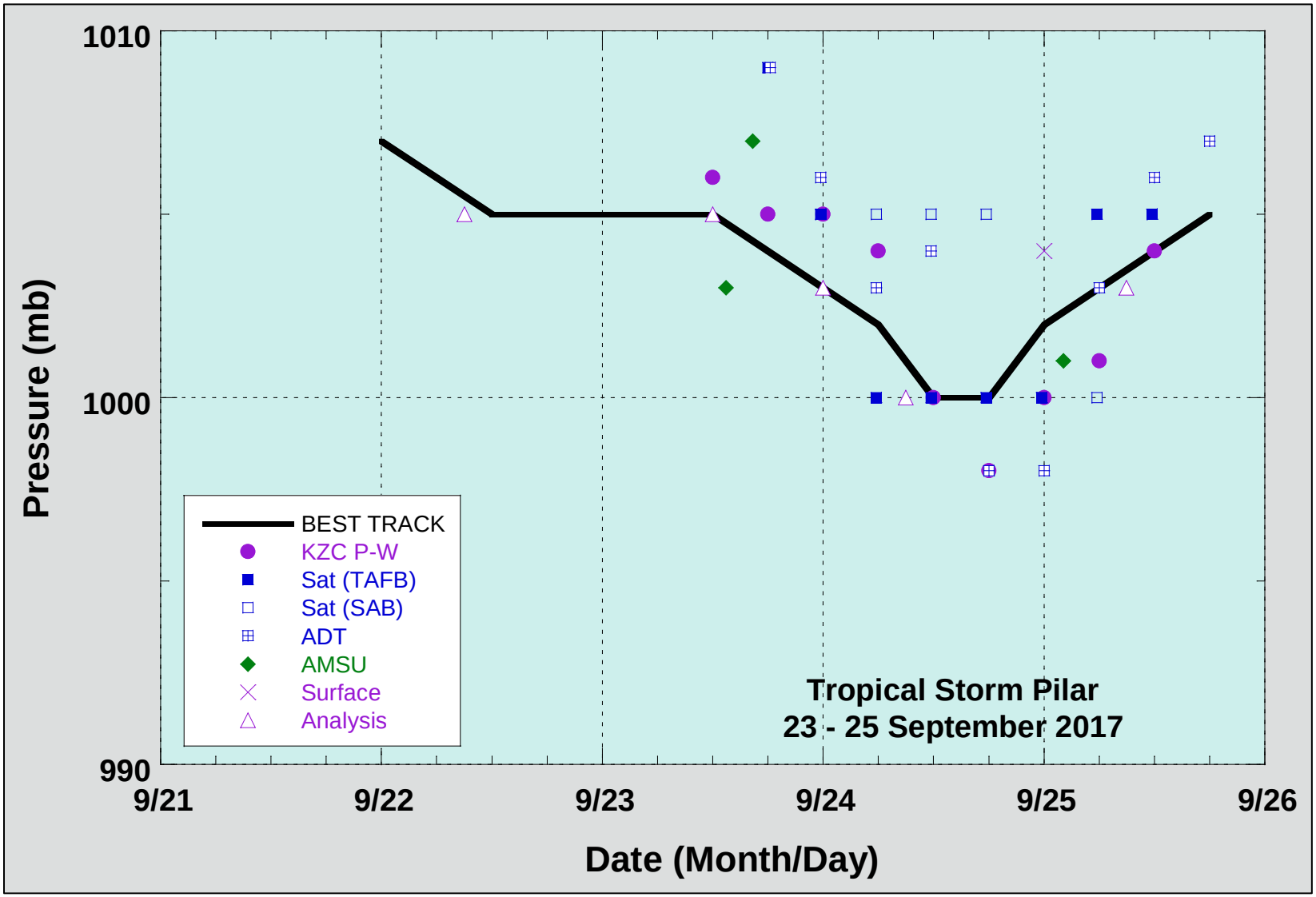

Figure 3. Selected pressure observations and best track minimum central pressure curve for Tropical Storm Pilar, 23–25 September 2017. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. AMSU intensity estimates are from the Cooperative Institute for Meteorological 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.