NATIONAL HURRICANE CENTER
TROPICAL CYCLONE REPORT

TROPICAL STORM WILFRED

(AL232020)

17–21 September 2020

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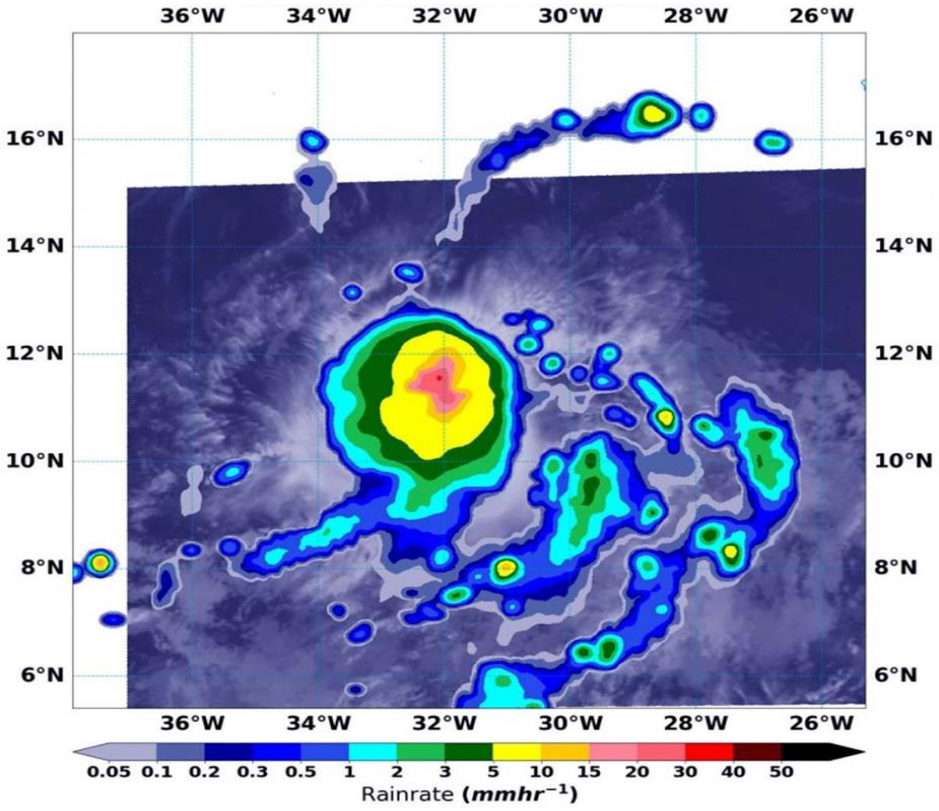

NASA-NOAA IMERG (INTEGRATED MULTI-SATELLITE RETRIEVALS FOR GPM) PRECIPITATION ESTIMATION PRODUCT AT 0930 UTC 18 SEPTEMBER 2020 WHEN WILFRED WAS NEAR ITS PEAK INTENSITY. IMAGE COURTESY OF THE U.S. NAVAL RESEARCH LABORATORY, MONTEREY, CA.

Wilfred was a weak tropical storm that developed over the eastern tropical Atlantic Ocean, and threatened no land areas before dissipating over the central tropical Atlantic well east of the Lesser Antilles.

Tropical Storm Wilfred

17–21 SEPTEMBER 2020

SYNOPTIC HISTORY

A broad surface low pressure system, associated with a low-latitude, westward-moving tropical wave, exited the coast of western Africa south of 10°N on 13 September. The broad disturbance, accompanied by a large area of cloudiness and disorganized convection, turned west-northwestward shortly after emerging over the Atlantic Ocean, and maintained that general motion for the next several days. The low passed about 240 n mi south of the Cabo Verde Islands on 16 September with little change in structure or convective organization. By early on 17 September, however, a strong but short-lived burst of deep convection formed near the center of the broad low, which helped to spin up a well-defined, low-level center of circulation as noted in 1053 UTC scatterometer surface wind data (ASCAT data not shown). Subsequent modest convection began to develop by 1200 UTC that day, and stronger and more organized convection developed into a curved band on the south side of the low around 1800 UTC. Deep convection continued to increase and a 2201 UTC scatterometer pass (ASCAT data not shown) revealed that the circulation had become better defined, and that tropical-storm-force winds also existed in the southeastern quadrant of the low. Thus, it is estimated that a tropical storm had formed by 1800 UTC 17 September when the system was located about 300 n mi southwest of the southernmost Cabo Verde Islands. 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].

Environmental conditions characterized by modest northeasterly 850–200-mb vertical wind shear of around 10 kt, sea-surface temperatures near 28° C, and mid-level humidity values of 60–65% initially appeared to be conducive for Wilfred to intensify some. However, the broad nature of the low-level wind field and proximity to the very dry Saharan Air Layer (SAL) just to the north of the cyclone likely prevented strengthening from occurring. By early on 19 September, the deep-layer wind shear direction switched from northeasterly to westerly as the cyclone came under the influence of a mid-oceanic, upper-level trough that was being enhanced by the outflow from category-4 Hurricane Teddy that was located more than 1000 n mi northwest of the fledgling Wilfred. As the westerly to northwesterly wind shear increased to near 20 kt, deep convection gradually began to wane by early 20 September, causing Wilfred to weaken to a tropical depression by 1200 UTC that day when the cyclone was located a little more than 1000 n mi east of the Leeward Islands. Additional weakening followed, and Wilfred degenerated into an open trough by 0600 UTC 21 September about 800 n mi east of the northern Leeward Islands.

[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 Wilfred (Figs. 2 and 3) include subjective satellite-based Dvorak and intensity estimates from the Tropical Analysis and Forecast Branch (TAFB), 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 Wilfred.

The 35-kt peak intensity of Wilfred was based on a 2201 UTC 17 September ASCAT pass that showed several wind vectors of 35–37 kt. It is possible that Wilfred could have achieved a slightly higher intensity of 40 kt between 0000–0600 UTC 18 September based on the additional increase in convective organization (see cover photo). However, this is within the range of NHC's typical analysis uncertainty for tropical cyclone intensity. The estimated minimum central pressure of 1006 mb is based on the Knaff-Zehr-Courtney (KZC) pressure-wind relationship.

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

CASUALTY AND DAMAGE STATISTICS

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

FORECAST AND WARNING CRITIQUE

The genesis of Wilfred was poorly anticipated in the short term. The precursor disturbance from which Wilfred developed was first introduced in the Tropical Weather Outlook in the low (<40%) category 84 h and 108 h prior to genesis in the 48- and 120-h periods, respectively (Table 2), with formation probabilities increasing to the medium (40%–60%) category 60 h and 84 h, respectively, before the tropical cyclone developed. Although the 5-day genesis forecast reached the high category (>60%) 60 h before the cyclone formed, the 48-h genesis forecasts never made it into the high category. In fact, the 2-day probabilities were lowered 18 h before genesis occurred. The poor short-term genesis forecasts were due to the broad structure of the incipient low and its proximity to the very dry SAL, which was expected to hinder development. Although genesis ultimately did occur, the aforementioned unfavorable conditions that were expected to hinder cyclogenesis did prevent Wilfred from strengthening after it became a tropical cyclone.

A verification of NHC official track forecasts for Wilfred is given in Table 3a. Official forecast track (OFCL) errors were greater than the mean official errors for the previous 5-yr period at 12 h and 24 h, but the track errors at 36 h and 48 h were lower than average. In Table 3b, OFCL forecasts outperformed most of the available model guidance through 48 h. However, the ECMWF (EMXI), HWRF (HWFI), and corrected-consensus models bested the NHC official track forecasts at 60 h by as much 15–30%.

A verification of NHC official intensity forecasts for Wilfred is given in Table 4a. Official forecast intensity errors were lower than the mean official errors for the previous 5-yr period at all available times. A homogeneous comparison of the official intensity errors with selected guidance models is given in Table 4b. NHC intensity forecasts were comparable to or better than the majority of the available intensity guidance, and correctly assessed and incorporated the negative effects of increasing vertical wind shear and northerly dry air entrainment from the nearby SAL.

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

Table 1. Best track for Tropical Storm Wilfred, 17–21 September 2020.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
17 / 0000	10.2	25.0	1009	25	low
17 / 0600	10.3	25.9	1009	25	"
17 / 1200	10.5	27.0	1008	30	"
17 / 1800	10.8	28.1	1007	35	tropical storm
18 / 0000	11.1	29.3	1006	35	"
18 / 0600	11.4	30.6	1006	35	"
18 / 1200	11.7	32.0	1006	35	"
18 / 1800	12.0	33.5	1006	35	"
19 / 0000	12.4	35.0	1006	35	"
19 / 0600	12.8	36.2	1006	35	"
19 / 1200	13.2	37.3	1006	35	"
19 / 1800	13.7	38.5	1006	35	"
20 / 0000	14.3	39.9	1007	35	"
20 / 0600	14.9	41.5	1007	35	"
20 / 1200	15.4	43.2	1008	30	tropical depression
20 / 1800	15.8	45.0	1009	30	"
21 / 0000	15.8	46.7	1009	30	"
21 / 0600					dissipated
18 / 0000	11.1	29.3	1006	35	minimum pressure

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%)	84	108
Medium (40%-60%)	60	84
High (>60%)	--	60

Table 3a. Preliminary NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Tropical Storm Wilfred, 17–21 September 2020. 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	60	72	96	120
OFCL	34.1	47.3	**44.1**	**42.5**	87.7			
OCD5	44.9	77.2	64.5	64.0	172.9			
Forecasts	9	7	5	3	1			
OFCL (2015-19)	24.1	36.9	49.6	65.1	80.7	96.3	133.2	171.6
OCD5 (2015-19)	44.7	96.1	156.3	217.4	273.9	330.3	431.5	511.9

Table 3b. Homogeneous comparison of selected track forecast guidance models (in n mi) for Tropical Storm Wilfred, 17–21 September 2020. Errors smaller than the NHC official forecast are shown in boldface type. The number of official forecasts shown here are smaller than that shown in Table 3a due to the homogeneity requirement.

Model ID	Forecast Period (h)							
	12	24	36	48	60	72	96	120
OFCL	34.3	47.3	44.1	42.5	87.7			
OCD5	44.3	77.2	64.5	64.0	172.9			
GFSI	41.5	55.6	**30.0**	48.0	122.7			
EMXI	41.9	67.6	71.5	103.0	**83.9**			
NVGI	45.6	89.6	110.9	128.6	139.0			
CMCI	**26.5**	**32.7**	61.0	133.8	188.5			
HWFI	**30.0**	66.3	101.8	113.4	**58.7**			
HMNI	**30.9**	**47.2**	61.2	85.0	133.0			
CTCI	36.0	47.6	**34.1**	**40.8**	156.0			
TVCA	34.8	**44.2**	**42.7**	53.9	96.1			
HCCA	36.5	52.4	**41.0**	55.5	**75.0**			
FSSE	**33.5**	**42.4**	44.5	56.4	**76.0**			
AEMI	36.2	50.5	**36.5**	60.8	138.7			
TABD	61.0	164.7	275.4	410.0	629.3			
TABM	53.2	115.8	173.4	241.7	380.2			
TABS	40.4	65.5	74.0	84.3	142.9			
Forecasts	8	7	5	3	1			

Table 4a. Preliminary NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Tropical Storm Wilfred, 17–21 September 2020. 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	60	72	96	120
OFCL	**3.3**	**4.3**	**5.0**	**5.0**	**0.0**			
OCD5	3.0	7.6	12.4	18.3	21.0			
Forecasts	9	7	5	3	1			
OFCL (2015-19)	5.2	7.7	9.4	10.7	11.9	13.0	14.4	15.5
OCD5 (2015-19)	6.8	10.8	14.1	17.0	18.8	20.6	22.5	24.6

Table 4b. Homogeneous comparison of selected intensity forecast guidance models (in kt) for Tropical Storm Wilfred, 17–21 September 2020. Errors smaller than the NHC official forecast are shown in boldface type. The number of official forecasts shown here are slightly smaller than that shown in Table 4a due to the homogeneity requirement.

Model ID	Forecast Period (h)							
	12	24	36	48	60	72	96	120
OFCL	3.8	4.3	5.0	5.0	0.0			
OCD5	**3.2**	7.6	12.4	18.3	21.0			
HWFI	4.1	5.6	5.6	6.0	3.0			
HMNI	**3.0**	**2.4**	**1.6**	5.0	1.0			
DSHP	**1.6**	**2.9**	5.6	8.0	4.0			
LGEM	**1.4**	**2.4**	**3.8**	5.0	2.0			
ICON	**2.2**	**2.9**	**3.8**	6.3	2.0			
IVCN	**2.0**	**2.6**	**3.4**	5.3	2.0			
CTCI	**2.8**	**3.1**	**1.6**	**2.7**	1.0			
GFSI	**2.9**	**3.9**	**4.2**	**4.0**	4.0			
EMXI	**2.1**	**2.6**	**3.4**	**3.0**	5.0			
HCCA	**2.1**	**3.0**	**3.8**	6.3	4.0			
FSSE	**3.0**	4.4	**4.6**	5.7	5.0			
Forecasts	8	7	5	3	1			

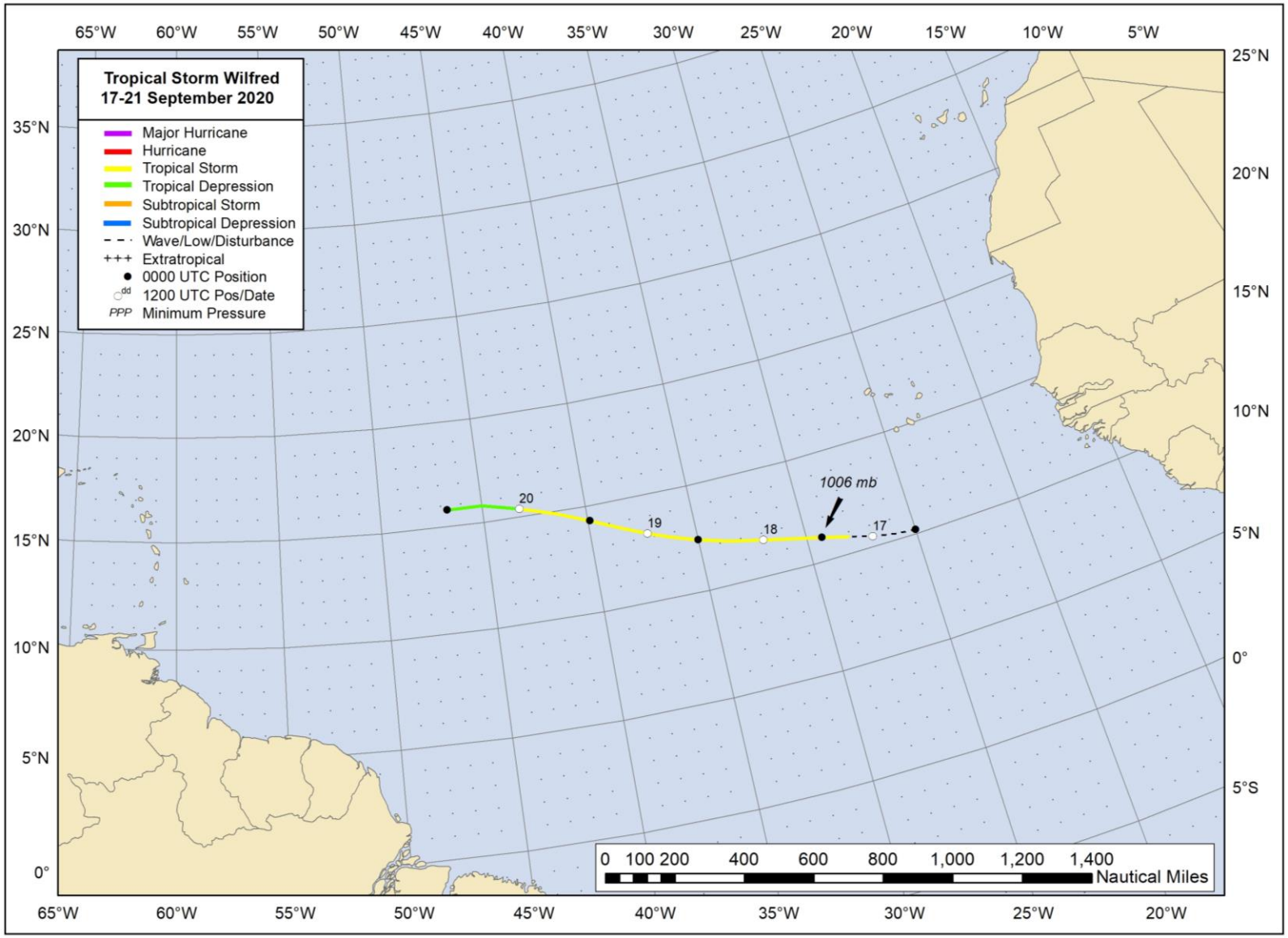

Figure 1. Best track positions for Tropical Storm Wilfred, 17–21 September 2020.

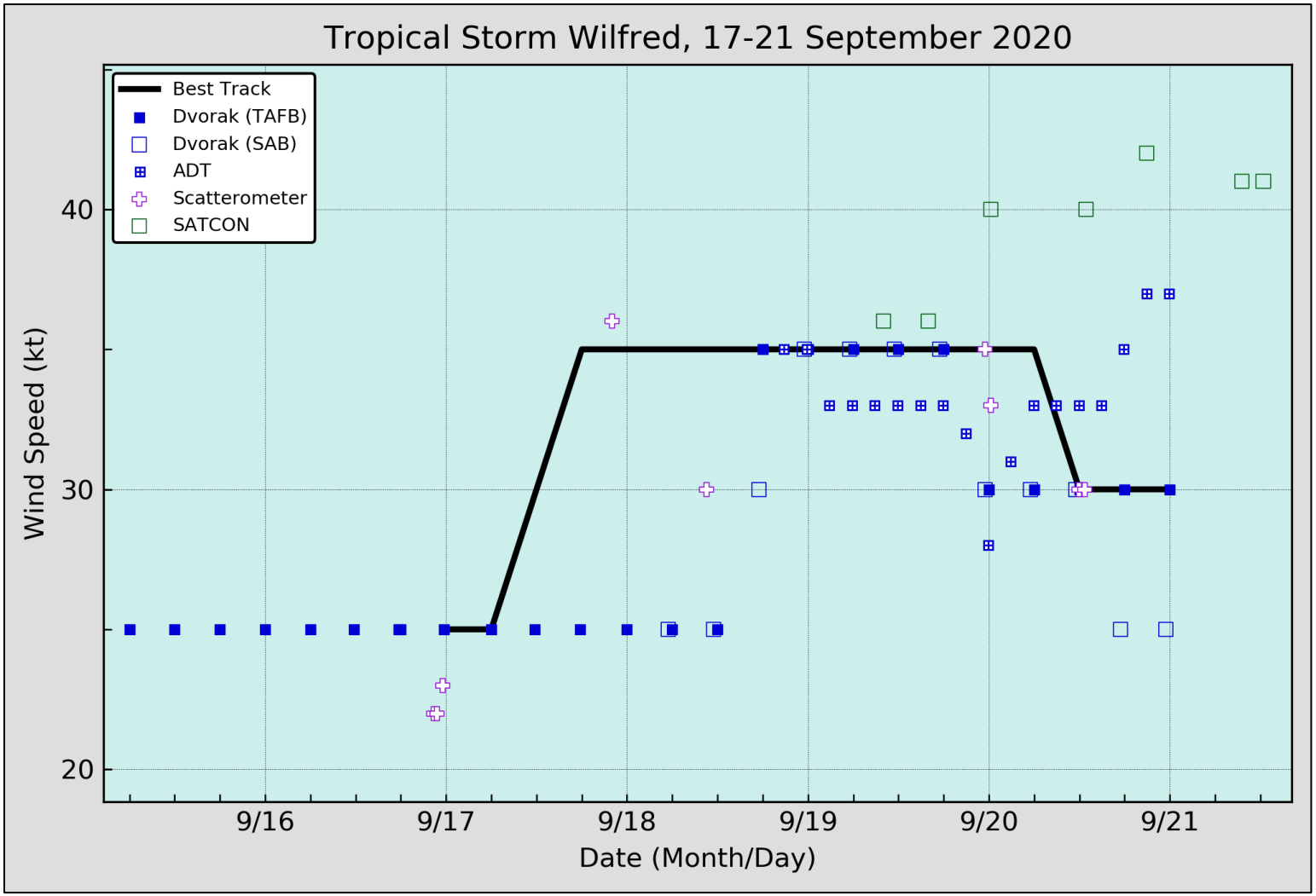

Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Tropical Storm Wilfred, 17–21 September 2020. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies. Dashed vertical lines correspond to 0000 UTC.

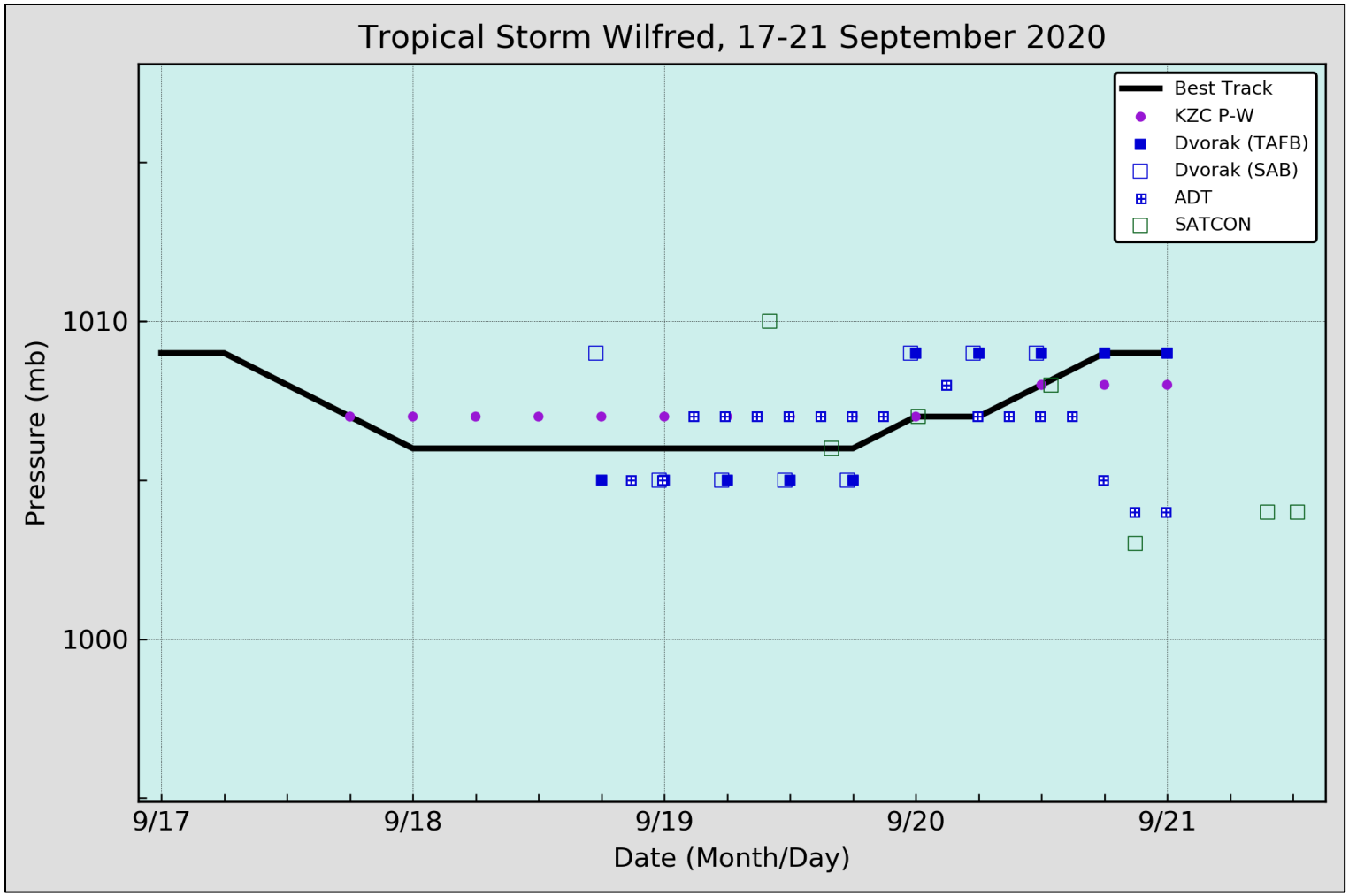

Figure 3. Selected pressure observations and best track minimum central pressure curve for Tropical Storm Wilfred, 17–21 September 2020. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for 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.