

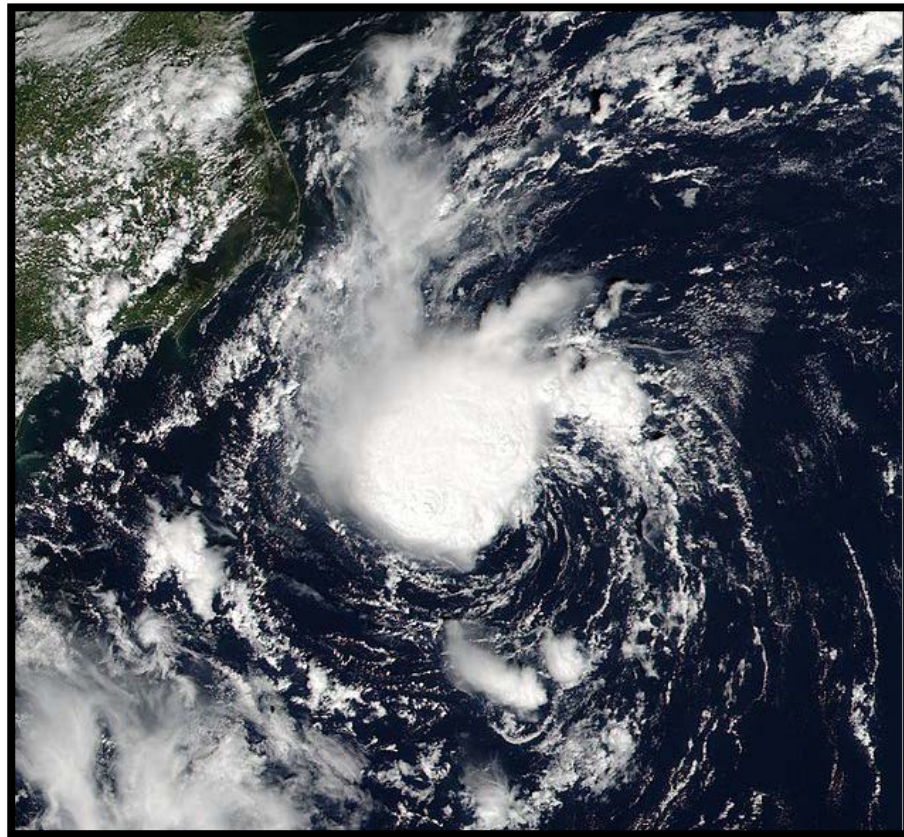


# NATIONAL HURRICANE CENTER TROPICAL CYCLONE REPORT

## TROPICAL DEPRESSION EIGHT (AL082016)

28 August – 1 September 2016

John P. Cangialosi  
National Hurricane Center  
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VISIBLE SATELLITE IMAGE OF TROPICAL DEPRESSION EIGHT AT 1825 UTC AUGUST 29 2016 FROM THE SUOMI NATIONAL POLAR-ORBITING PARTNERSHIP SATELLITE.

Tropical Depression Eight was a short-lived tropical depression that passed just offshore of the southeast coast of the United States.

# Tropical Depression Eight

28 AUGUST – 1 SEPTEMBER 2016

## SYNOPTIC HISTORY

Tropical Depression Eight had non-tropical origins, forming from the southern portion of a frontal boundary over the western Atlantic that became stationary on 25 August. The front weakened the next day, and a broad area of low pressure formed near the tail end of the dissipating boundary. The low pressure system became well defined around 0000 UTC 27 August when it was located about 100 n mi south of Bermuda, but deep convection was intermittent and disorganized until a large burst occurred near and to the west of the center around 1200 UTC 28 August, marking the formation of a tropical depression. A sequence of infrared satellite images shows the evolution of genesis (Fig. 1). The “best track” chart of the tropical cyclone’s path is given in Fig. 2, with the wind and pressure histories shown in Figs. 3 and 4, respectively. The best track positions and intensities are listed in Table 1<sup>1</sup>.

At the time of genesis the depression was located about 350 n mi southeast of Cape Hatteras, North Carolina, and was moving west-northwestward to the south of a mid-level ridge. In an environment of moderate easterly shear and dry air, the depression failed to intensify throughout its lifetime. The cyclone slowed and turned northward on 30 August when it neared a pronounced break in the subtropical ridge, and it reached its closest point of approach to the coast that day, passing about 60 n mi south-southeast of Cape Hatteras. Although the depression was not far offshore, no significant rains, winds, or surf in association with the system were experienced along the coastline. The cyclone turned northeastward the next day when it became embedded in the mid-latitude flow. As the system accelerated northeastward, satellite-derived wind data indicate that the circulation became elongated, and it is estimated that the depression dissipated shortly after 0000 UTC 1 September about 250 n mi east of Virginia Beach, Virginia. The remnants of the cyclone were absorbed into a frontal system about a day later.

## METEOROLOGICAL STATISTICS

Observations in Tropical Depression Eight (Figs. 3 and 4) 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. Observations also include flight-level, stepped frequency microwave radiometer (SFMR), and dropwindsonde observations from flights of the 53<sup>rd</sup> Weather

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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 *bt* directory, while previous years’ data are located in the *archive* directory.

Reconnaissance Squadron of the U. S. Air Force Reserve Command. 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 Tropical Depression Eight.

There were no reports of winds of tropical storm force associated with Tropical Depression Eight.

The estimated maximum wind speed of 30 kt during the lifetime of the depression is largely based on flight-level and SFMR wind data from five U.S. Air Force reconnaissance aircraft missions, which consistently showed the highest reliable winds in the 25 to 30 kt range.

## CASUALTY AND DAMAGE STATISTICS

There were no reports of damage or casualties associated with Tropical Depression Eight.

## FORECAST AND WARNING CRITIQUE

The genesis of Tropical Depression Eight was not well forecast. The low from which the depression developed was introduced in the Tropical Weather Outlook only 36 h prior to genesis, and was never assessed to have more than a low chance of development (Table 2). The global models did not show much deepening of this system, and it was believed that dry air and moderate shear would make genesis unlikely.

A verification of NHC official track forecasts for Tropical Depression Eight is given in Table 3a. Official forecast track errors were much 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 3b. The NOAA corrected consensus HCCA and consensus aid TVCX were the best-performing models and beat the official forecasts at a few time periods. It should be noted that most of the dynamical models and climatology and persistence model OCD5 had relatively low errors for Tropical Depression Eight, indicating that the system was likely easier to forecast than average.

A verification of NHC official intensity forecasts for Tropical Depression Eight is given in Table 4a. Official forecast intensity errors were also much lower than the mean official errors for the previous 5-yr period. A homogeneous comparison of the official intensity errors with selected guidance models is given in Table 4b. The official forecasts outperformed the standard intensity guidance, which incorrectly predicted the depression to strengthen. GFNI and HWFI were among the poorest-performing models, showing the depression reaching hurricane strength in a few runs. Conversely, the global models GFSI and EMXI had the lowest intensity errors and beat the official forecasts at 24 h and beyond.



Since the depression was initially forecast to strengthen as it approached the southeast coast of the United States, tropical storm watches and warnings were issued for a portion of North Carolina (Table 5).



Table 1. Best track for Tropical Depression Eight, 28 August – 1 September 2016.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
27 / 0000	30.7	65.0	1012	20	low
27 / 0600	30.8	65.6	1011	25	"
27 / 1200	30.9	66.2	1011	25	"
27 / 1800	31.0	66.9	1011	25	"
28 / 0000	31.1	67.8	1011	25	"
28 / 0600	31.3	68.7	1011	25	"
28 / 1200	31.5	69.6	1010	30	tropical depression
28 / 1800	31.7	70.6	1010	30	"
29 / 0000	32.0	71.7	1010	30	"
29 / 0600	32.4	72.6	1010	30	"
29 / 1200	32.9	73.2	1011	30	"
29 / 1800	33.4	73.8	1012	30	"
30 / 0000	33.7	74.5	1012	30	"
30 / 0600	33.9	75.0	1011	30	"
30 / 1200	34.2	75.0	1011	30	"
30 / 1800	34.4	74.9	1011	30	"
31 / 0000	34.6	74.7	1011	30	"
31 / 0600	34.8	74.5	1011	30	"



31 / 1200	35.2	73.8	1010	30	"
31 / 1800	35.9	72.7	1010	30	"
01 / 0000	36.8	71.2	1010	30	"
01 / 0600					dissipated
28 / 1200	31.5	69.6	1010	30	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%)	36	36
Medium (40%-60%)	-	-
High (>60%)	-	-



Table 3a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Tropical Depression Eight. 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>14.8</b>	<b>18.3</b>	<b>27.0</b>	<b>34.8</b>	<b>64.4</b>		
OCD5	31.6	54.7	72.2	72.5	80.1		
Forecasts	13	11	9	7	3		
OFCL (2011-15)	28.4	45.0	60.4	77.1	113.1	157.8	210.0
OCD5 (2011-15)	48.3	101.5	161.5	222.6	329.8	412.6	483.9



Table 3b. Homogeneous comparison of selected track forecast guidance models (in n mi) for Tropical Depression Eight. 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	15.1	17.7	28.8	36.3	50.1		
OCD5	27.9	55.9	75.0	79.5	52.8		
GFSI	<b>14.1</b>	24.4	44.1	67.2	66.2		
GHMI	25.7	50.5	74.6	94.7	63.0		
HWFI	16.5	21.5	42.6	64.7	92.2		
EMXI	<b>13.3</b>	19.0	28.9	<b>35.0</b>	72.0		
CMCI	18.5	31.3	52.8	62.7	56.8		
NVGI	17.9	36.5	45.8	60.0	<b>42.3</b>		
CTCI	18.4	39.9	57.0	79.3	134.6		
GFNI	18.2	32.0	32.8	<b>35.8</b>	117.0		
AEMI	16.4	25.5	45.7	56.5	77.2		
HCCA	<b>13.7</b>	<b>14.7</b>	<b>27.6</b>	36.3	<b>48.2</b>		
TVCX	<b>14.1</b>	<b>16.5</b>	<b>27.7</b>	38.8	68.7		
TVCN	<b>13.7</b>	18.0	<b>27.7</b>	40.4	71.1		
GFEX	<b>13.5</b>	19.1	35.6	49.8	66.0		
LBAR	23.5	36.1	49.7	57.3	78.2		
BAMD	31.2	56.9	88.5	127.3	273.8		
BAMM	23.9	43.8	65.9	65.4	<b>12.0</b>		
BAMS	28.9	64.0	111.6	151.1	342.9		
Forecasts	11	10	8	6	1		





Table 4a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Tropical Depression Eight. 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>1.5</b>	<b>5.0</b>	<b>5.6</b>	<b>8.6</b>	<b>8.3</b>		
OCD5	4.5	9.7	19.1	25.4	35.3		
Forecasts	13	11	9	7	3		
OFCL (2011-15)	6.2	9.4	11.5	13.3	14.6	14.6	15.8
OCD5 (2011-15)	7.3	10.8	13.3	15.3	17.7	17.8	17.6



Table 4b. Homogeneous comparison of selected intensity forecast guidance models (in kt) for Tropical Depression Eight. 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	1.5	5.0	5.6	8.6	10.0		
OCD5	4.5	9.7	19.1	25.4	35.0		
GHMI	2.7	5.7	9.3	11.1	20.0		
HWFI	2.5	5.4	7.4	10.7	35.5		
GFNI	7.2	11.5	17.1	21.9	32.5		
DSHP	3.7	8.5	12.8	16.4	24.5		
LGEM	1.5	<b>3.5</b>	6.1	8.7	19.5		
HCCA	1.9	<b>4.0</b>	6.1	11.1	22.5		
IVCN	2.7	5.9	9.3	11.9	22.5		
GFSI	1.6	<b>2.5</b>	<b>2.7</b>	<b>3.3</b>	<b>3.0</b>		
EMXI	1.9	<b>3.0</b>	<b>3.8</b>	<b>3.4</b>	<b>1.5</b>		
Forecasts	13	11	9	7	2		



Table 5. Watch and warning summary for Tropical Depression Eight, 28 August – 1 September.

<b>Date/Time (UTC)</b>	<b>Action</b>	<b>Location</b>
29 / 0300	Tropical Storm Watch issued	Cape Lookout to Oregon Inlet, North Carolina
29 / 2100	Tropical Storm Warning issued	Cape Lookout to Oregon Inlet including Pamlico Sound, North Carolina
31/ 0000	Tropical Storm Warning discontinued	Cape Lookout to Oregon Inlet including Pamlico Sound, North Carolina

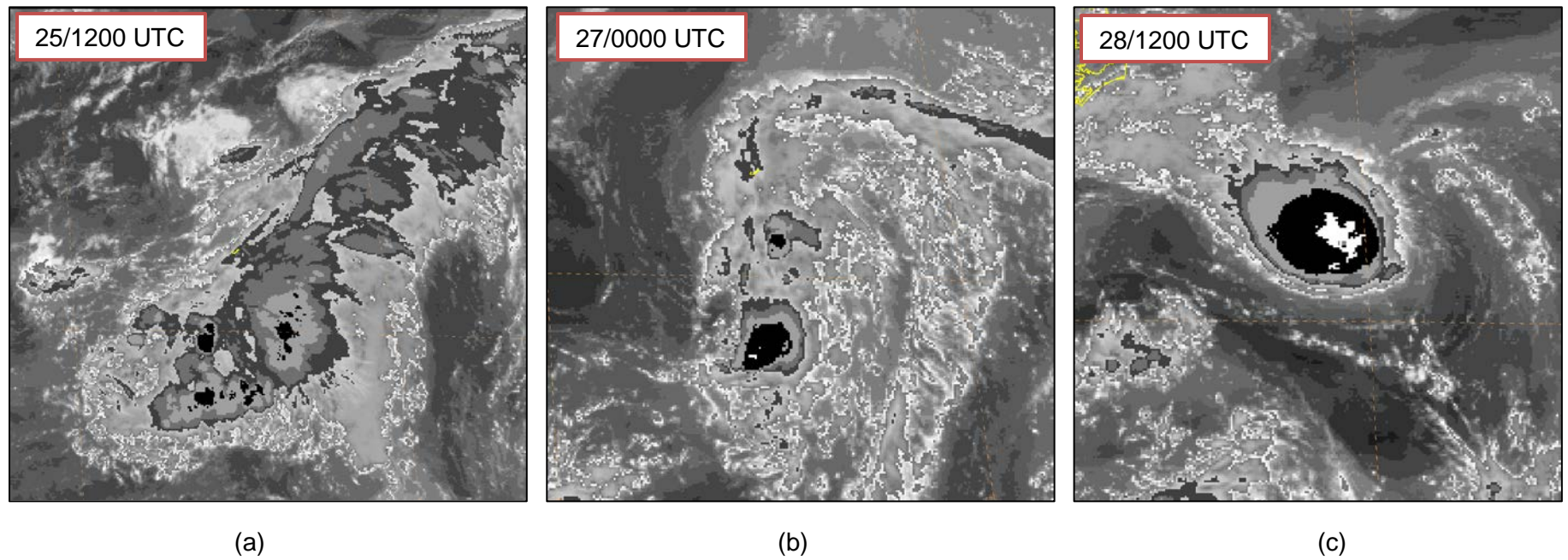


Figure 1. GOES-E Infrared satellite images showing the evolution of the genesis of Tropical Depression Eight as a stationary frontal boundary at 1200 UTC 25 August (a), low at 0000 UTC 27 August (b), and tropical depression at 1200 UTC 28 August (c).

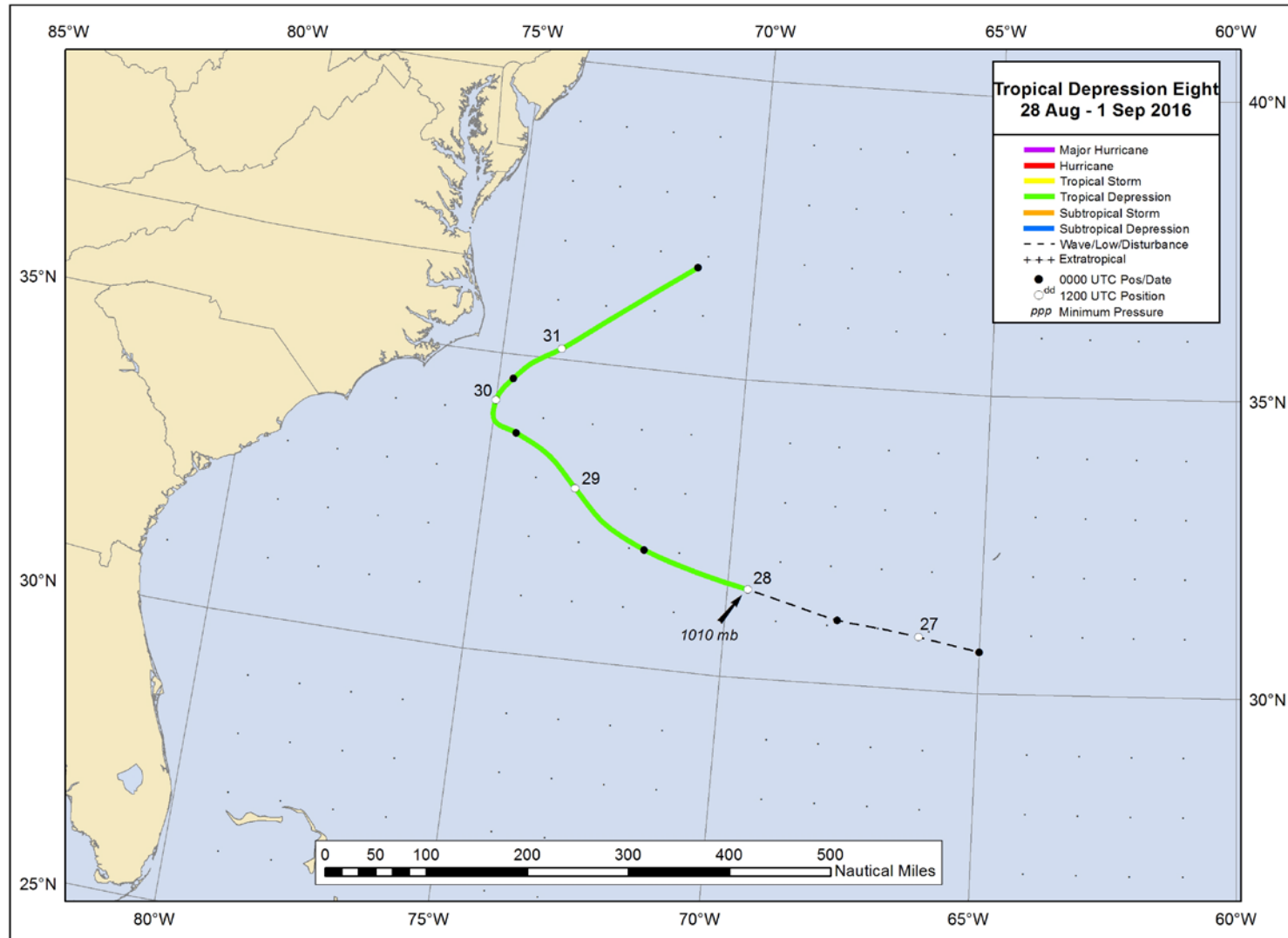


Figure 2. Best track positions for Tropical Depression Eight, 28 August – 1 September 2016.

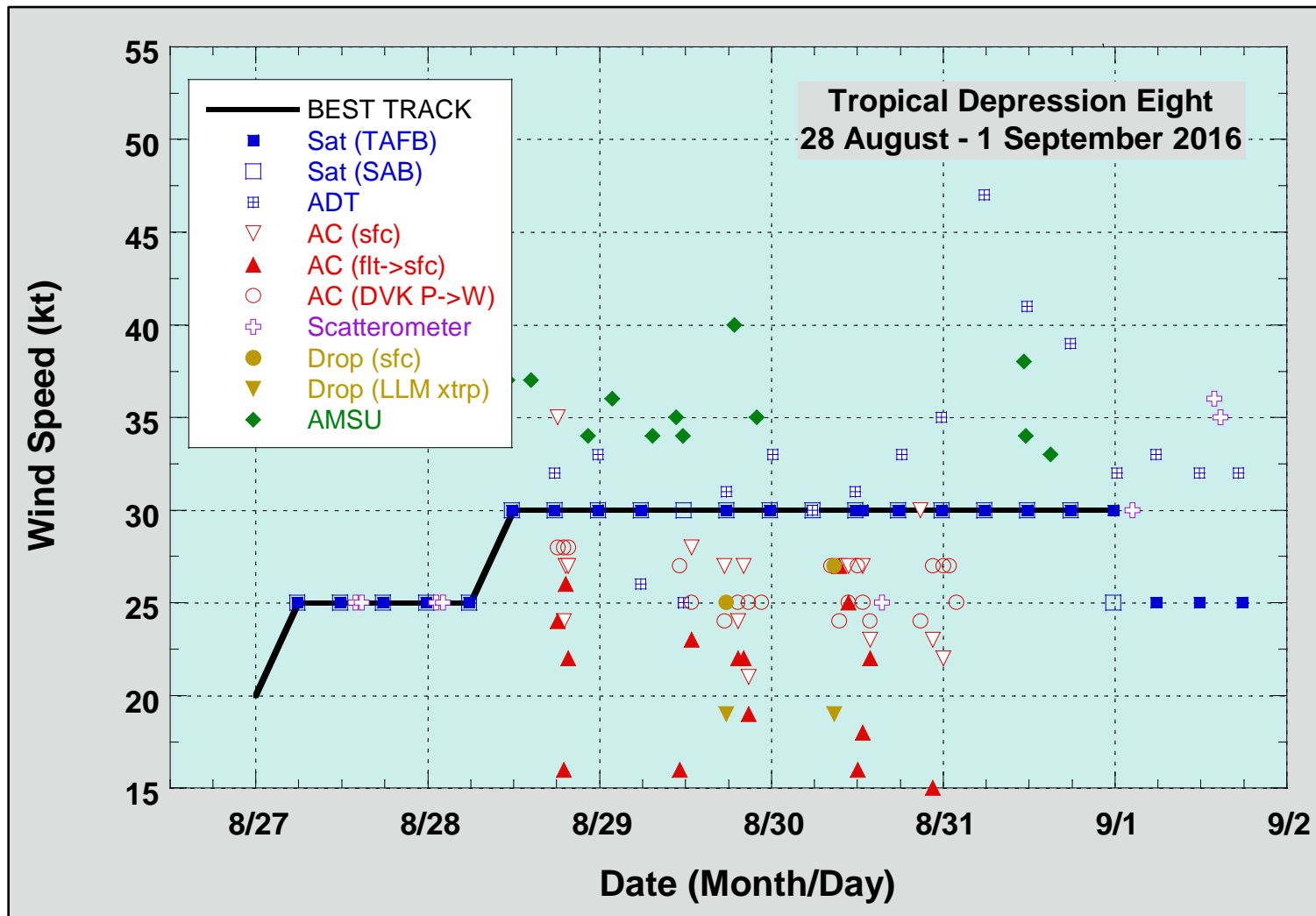


Figure 3. Selected wind observations and best track maximum sustained surface wind speed curve for Tropical Depression Eight, 28 August – 1 September. Aircraft observations have been adjusted for elevation using 80% and 75% adjustment factors for observations from 850 mb and 925 mb, respectively. Dropwindsonde observations include actual 10 m winds (sfc), as well as surface estimates derived from the mean wind over the lowest 150 m of the wind sounding (LLM). 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.

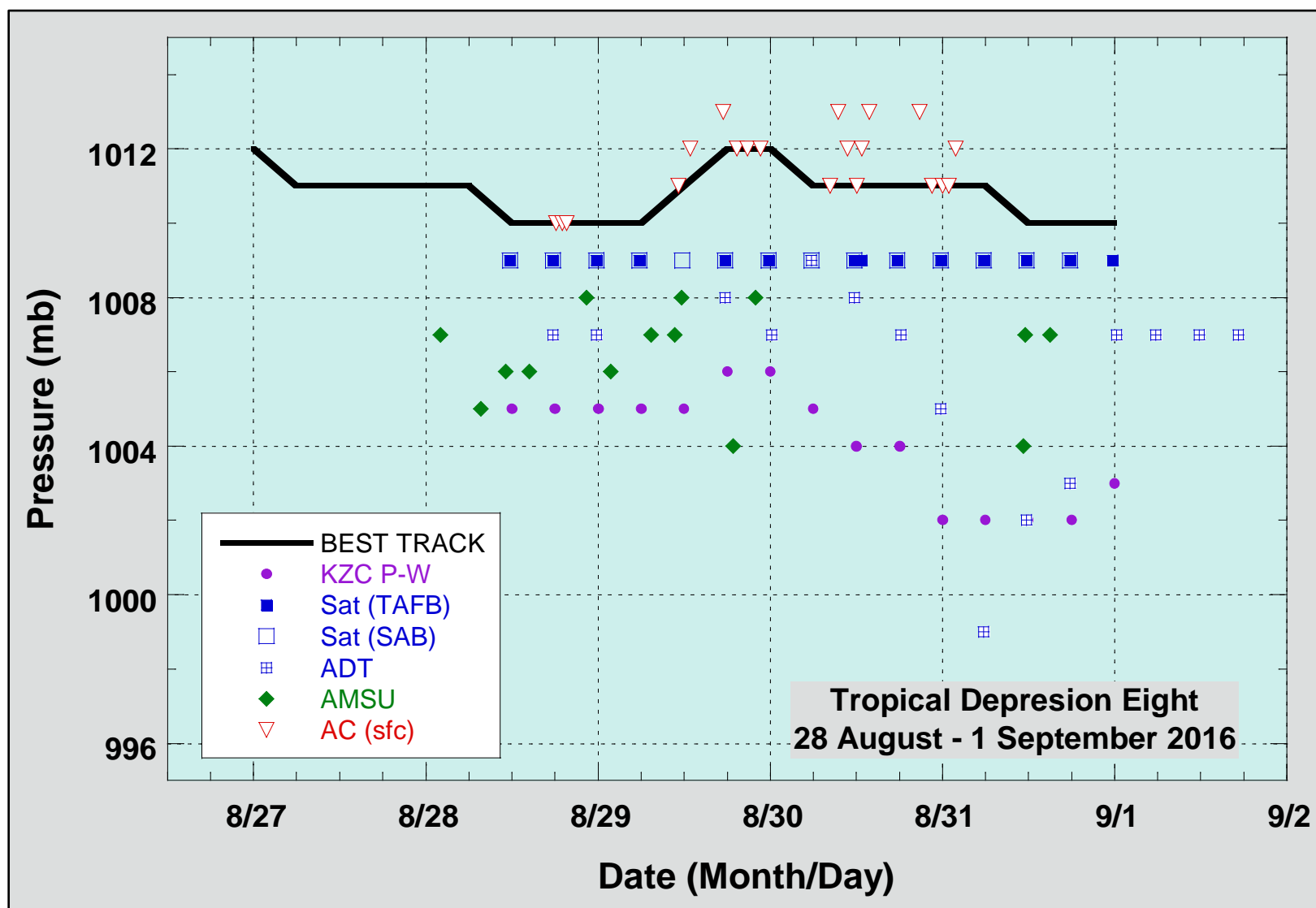


Figure 4. Selected pressure observations and best track minimum central pressure curve for Tropical Depression Eight, 28 August -1 Septemeber. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. AMSU intensity estimates are from the Cooperative Institute 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.