NATIONAL HURRICANE CENTER
TROPICAL CYCLONE REPORT

TROPICAL STORM DOUGLAS

(EP042014)

28 June – 5 July 2014

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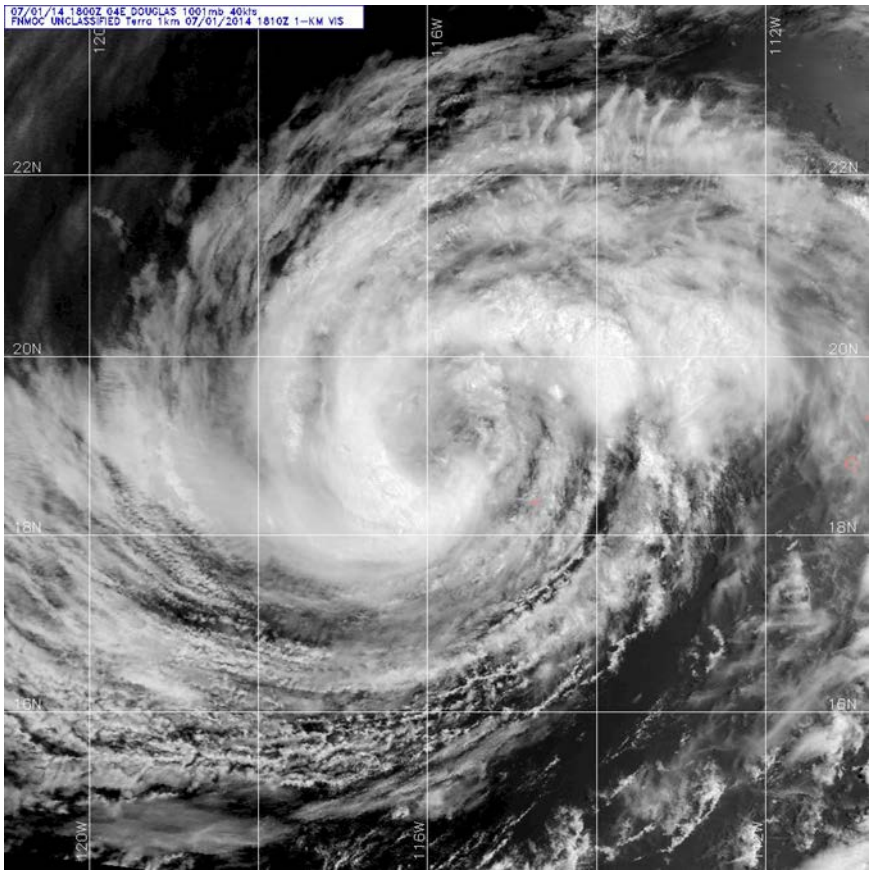

NASA MODIS VISIBLE IMAGE OF TROPICAL STORM DOUGLAS AT 1800 UTC 1 JULY 2014.

Douglas was a large but relatively weak tropical storm that remained well offshore of the coast of southwestern Mexico.

Tropical Storm Douglas

28 JUNE – 5 JULY 2014

SYNOPTIC HISTORY

Douglas appears to have originated from a tropical wave that emerged from western Africa on 17 June. Over the following week, the wave moved across the tropical Atlantic Ocean and the Caribbean Sea while producing very little shower activity. However by 25 June, while the system was crossing Central America, the associated deep convection increased. There was little change in organization over the next couple of days while the disturbance moved generally westward over the far eastern North Pacific. On 28 June, deep convection became substantially better organized with distinct curved bands, and a well-defined low-level circulation became evident about 300 n mi south-southwest of Manzanillo, Mexico by 1800 UTC, signifying that a tropical depression had formed. For about a day after formation, the tropical cyclone moved on a west-northwestward heading at a brisk 13-16 kt with little change in strength while situated on the south side of a mid-level high pressure area, but by 0000 UTC 30 June, the system's cloud pattern became better organized and the cyclone strengthened into a tropical storm. Douglas had a broad and sprawling circulation and was slow to strengthen. Later on 30 June the storm turned northwestward with a considerable decrease in forward speed, reaching its peak intensity of only 45 kt by 1800 UTC July 1 while located about 400 n mi southwest of Cabo San Lucas, Mexico. After that, Douglas turned north-northwestward into a break in the subtropical ridge and began to slowly weaken while it passed over cooler waters and entrained a drier and more stable air mass. The storm turned back toward the northwest on 3 July, and the large system maintained 35-kt winds for a couple more days. Around 0600 5 July, Douglas lost all of its deep convection and degenerated into a remnant low. The low moved northwestward to west-northwestward over the open waters of the east Pacific for a few more days before dissipating on 8 July.

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].

METEOROLOGICAL STATISTICS

Observations in Douglas (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.

[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.

Data and imagery from NOAA polar-orbiting satellites including the Advanced Microwave Sounding Unit (AMSU), the NASA Tropical Rainfall Measuring Mission (TRMM), 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 Douglas. The estimated 45-kt maximum intensity of Douglas is based on subjective Dvorak estimates of 45 kt from both TAFB and SAB. It should be noted that the ADT estimates, which can be very useful for estimating the intensity of stronger tropical cyclones, showed a lot of scatter and did not accurately depict the strengthening and weakening of Douglas. The AMSU intensity estimates for Douglas generally had a high bias, although this bias was not very large around the time of peak intensity.

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

CASUALTY AND DAMAGE STATISTICS

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

FORECAST AND WARNING CRITIQUE

The genesis of Douglas was well anticipated in the longer time ranges, but not that well anticipated in the short term. Table 2 shows the number of hours in advance of formation that the Tropical Weather Outlook (TWO) first included each likelihood category. It was stated in the TWO, 120 hours prior to genesis, that there was a low chance of TC formation over the next five days in the area within which Douglas formed. The five-day probability was raised to medium 114 hours before genesis, and to high 72 hours prior to genesis. The two-day probability of genesis was not set to high until just six hours before Douglas formed, however.

A verification of NHC official track forecasts for Douglas is given in Table 3a. Official track forecast errors were lower than the mean official errors for the previous 5-yr period for the 12- through 72 hour forecast intervals, and greater than the 5-yr means at 96 and 120 hours. The official forecasts generally had a westward bias for this storm. A homogeneous comparison of the official track errors with selected guidance models is given in Table 3b. The GFS and its ensemble mean AEMI, the model consensus TVCE, and the Florida State University Superensemble FSSE were among the best performers. Those models generally had a westward bias, albeit not as large as in the official forecasts.

A verification of NHC official intensity forecasts for Douglas is given in Table 4a. The mean official intensity forecast errors were generally well below the mean official errors for the previous 5-yr period. This is not surprising since Douglas did not undergo any rapid intensification or rapid weakening, and never became very strong. This is also consistent with the fact that the mean climatology-persistence intensity forecast errors were much lower than the 5-yr means. A homogeneous comparison of the official intensity errors with selected guidance models is given

in Table 4b. Much of the numerical intensity guidance had errors that were comparable to or lower than the mean NHC forecasts.

There were no watches or warnings associated with Douglas.

Table 1. Best track for Tropical Storm Douglas, 28 June – 5 July 2014.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
28 / 1800	14.2	105.5	1006	30	tropical depression
29 / 0000	14.7	106.9	1006	30	"
29 / 0600	15.3	108.3	1006	30	"
29 / 1200	15.8	109.8	1005	30	"
29 / 1800	16.0	111.1	1005	30	"
30 / 0000	16.3	112.2	1003	35	tropical storm
30 / 0600	16.7	113.0	1003	35	"
30 / 1200	17.2	113.7	1003	35	"
30 / 1800	17.7	114.2	1003	35	"
01 / 0000	18.2	114.7	1001	40	"
01 / 0600	18.6	115.1	1001	40	"
01 / 1200	18.9	115.5	1001	40	"
01 / 1800	19.1	115.7	999	45	"
02 / 0000	19.3	115.8	1000	45	"
02 / 0600	19.5	115.9	1001	40	"
02 / 1200	19.7	116.0	1002	40	"
02 / 1800	19.9	116.1	1002	40	"
03 / 0000	20.0	116.2	1004	35	"
03 / 0600	20.1	116.3	1004	35	"
03 / 1200	20.2	116.4	1004	35	"
03 / 1800	20.4	116.6	1006	35	"
04 / 0000	20.7	116.9	1006	35	"
04 / 0600	21.1	117.3	1006	35	"
04 / 1200	21.4	117.8	1006	35	"
04 / 1800	21.7	118.3	1006	35	"
05 / 0000	22.2	118.8	1006	35	"
05 / 0600	22.8	119.3	1008	30	low
05 / 1200	23.4	119.8	1008	30	"

05 / 1800	24.2	120.6	1008	25	"
06 / 0000	24.8	121.5	1008	25	"
06 / 0600	25.3	122.2	1008	25	"
06 / 1200	25.8	122.8	1008	25	"
06 / 1800	26.2	123.5	1008	25	"
07 / 0000	26.5	124.1	1008	25	"
07 / 0600	26.7	124.6	1009	20	"
07 / 1200	26.8	125.0	1009	20	"
07 / 1800	26.9	125.4	1009	20	"
08 / 0000	26.9	125.8	1009	20	"
08 / 0600	26.9	126.1	1009	20	"
08 / 1200	26.9	126.3	1009	20	"
08 / 1800	26.9	126.5	1009	20	"
09 / 0000	26.9	126.6	1009	15	"
09 / 0600					dissipated
01 / 1800	19.1	115.7	999	45	minimum pressure and maximum wind

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 (<30%)	66	120
Medium (30%-50%)	24	114
High (>50%)	6	72

Table 3a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Tropical Storm Douglas, 28 June – 5 July 2014. 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	**19.0**	**22.1**	**31.1**	**49.7**	**94.5**	156.2	234.4
OCD5	37.1	70.6	110.7	163.8	303.2	475.4	632.9
Forecasts	24	22	20	18	14	10	6
OFCL (2009-13)	25.7	41.4	55.0	68.6	97.8	134.2	167.1
OCD5 (2009-13)	37.2	74.8	118.0	162.5	249.4	332.6	413.3

Table 3b. Homogeneous comparison of selected track forecast guidance models (in n mi) for Tropical Storm Douglas, 28 June – 5 July 2014. 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	16.8	21.6	29.3	42.2	85.7	149.0	218.7
OCD5	31.6	64.4	105.2	161.1	321.3	553.2	780.9
GFSI	19.2	29.2	36.4	**39.9**	**63.2**	**87.5**	**93.5**
GHMI	20.9	36.7	48.1	55.4	**71.4**	**81.1**	**187.6**
HWFI	17.1	22.1	**28.7**	**40.3**	87.2	**129.6**	249.3
EGRI	23.8	37.7	56.2	76.7	163.5	295.5	405.4
EMXI	18.0	24.0	33.8	44.3	96.8	199.2	265.4
CMCI	19.9	31.1	50.1	72.2	149.4	306.1	513.9
AEMI	20.0	25.7	29.5	**41.6**	**83.0**	**96.6**	**86.8**
FSSE	**16.6**	**21.2**	**26.5**	**33.3**	**74.0**	**144.1**	**210.9**
TCON	16.9	23.8	31.5	**39.4**	**67.8**	**79.5**	**80.6**
TVCE	**15.7**	21.7	**28.7**	**35.6**	**66.7**	**98.0**	**106.8**
LBAR	26.9	61.7	108.6	164.7	311.1	512.6	624.4
BAMD	25.5	40.7	59.6	80.3	147.5	217.2	254.2
BAMM	28.2	47.0	72.3	103.3	175.6	234.8	245.1
BAMS	31.6	55.6	82.1	110.4	185.2	262.9	291.3
Forecasts	18	17	15	13	9	5	3

Table 4a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Tropical Storm Douglas, 28 June – 5 July 2014. 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	**4.8**	**6.1**	**8.0**	**8.1**	**6.8**	**8.5**	**8.3**
OCD5	4.5	5.7	6.6	8.6	4.6	5.8	6.7
Forecasts	24	22	20	18	14	10	6
OFCL (2009-13)	6.1	10.4	13.4	14.5	15.0	16.4	16.1
OCD5 (2009-13)	7.7	12.7	16.4	18.8	20.5	20.3	20.8

Table 4b. Homogeneous comparison of selected intensity forecast guidance models (in kt) for Tropical Storm Douglas, 28 June – 5 July 2014. 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	5.0	5.8	7.4	6.8	6.3	8.1	8.8
OCD5	**4.1**	**5.7**	**6.5**	7.6	**5.0**	**5.8**	**5.5**
HWFI	5.0	6.4	**6.8**	7.4	8.0	11.1	10.8
GHMI	**3.5**	**5.2**	7.9	8.8	6.8	**6.6**	**5.0**
DSHP	**4.9**	8.3	7.8	7.8	9.7	9.9	**5.5**
LGEM	**4.3**	**5.6**	**5.4**	**5.1**	**6.0**	**6.3**	**2.8**
FSSE	**4.3**	**5.6**	**5.1**	**5.4**	6.9	8.4	**6.8**
IVCN	**4.0**	**5.0**	**5.2**	**4.6**	**5.8**	**7.4**	**4.8**
GFSI	**3.8**	6.2	**6.9**	7.4	6.9	**7.6**	**5.8**
EMXI	**3.2**	**4.4**	**4.9**	**6.1**	**6.0**	**4.6**	**6.5**
Forecasts	21	20	17	14	12	8	4

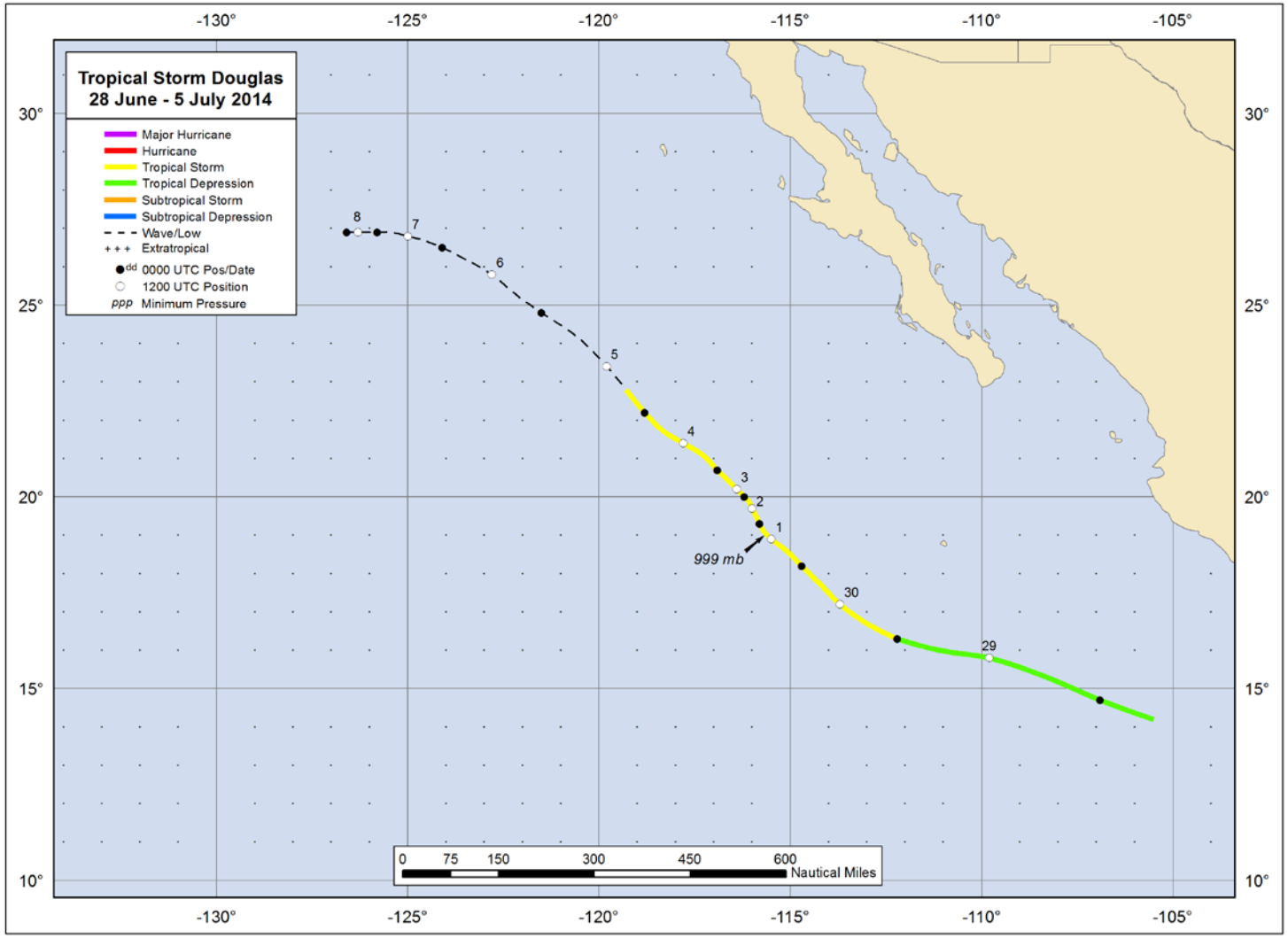

Figure 1. Best track positions for Tropical Storm Douglas, 28 June – 5 July 2014.

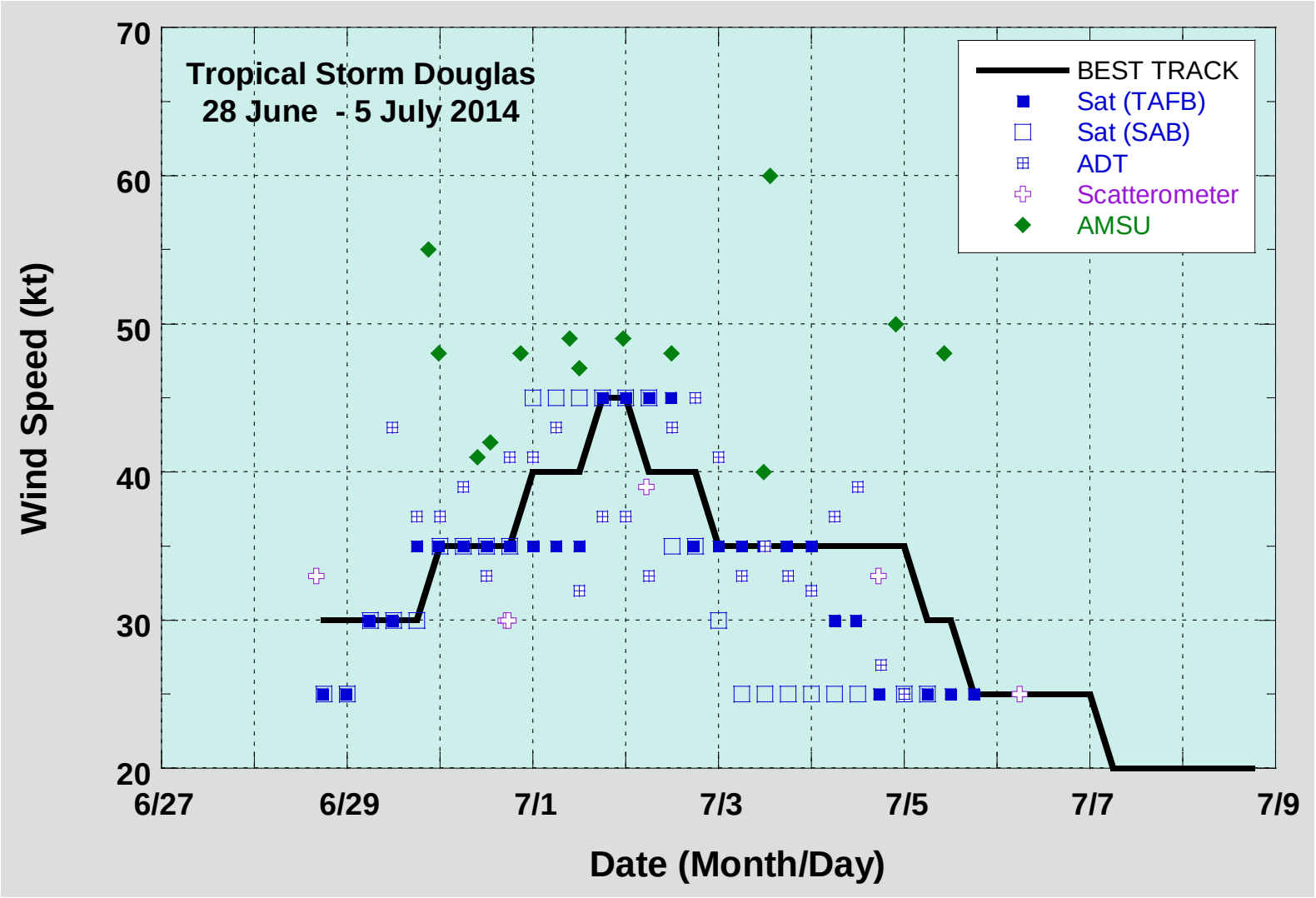

Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Tropical Storm Douglas, 28 June – 5 July 2014. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. AMSU intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies technique. Dashed vertical lines correspond to 0000 UTC.

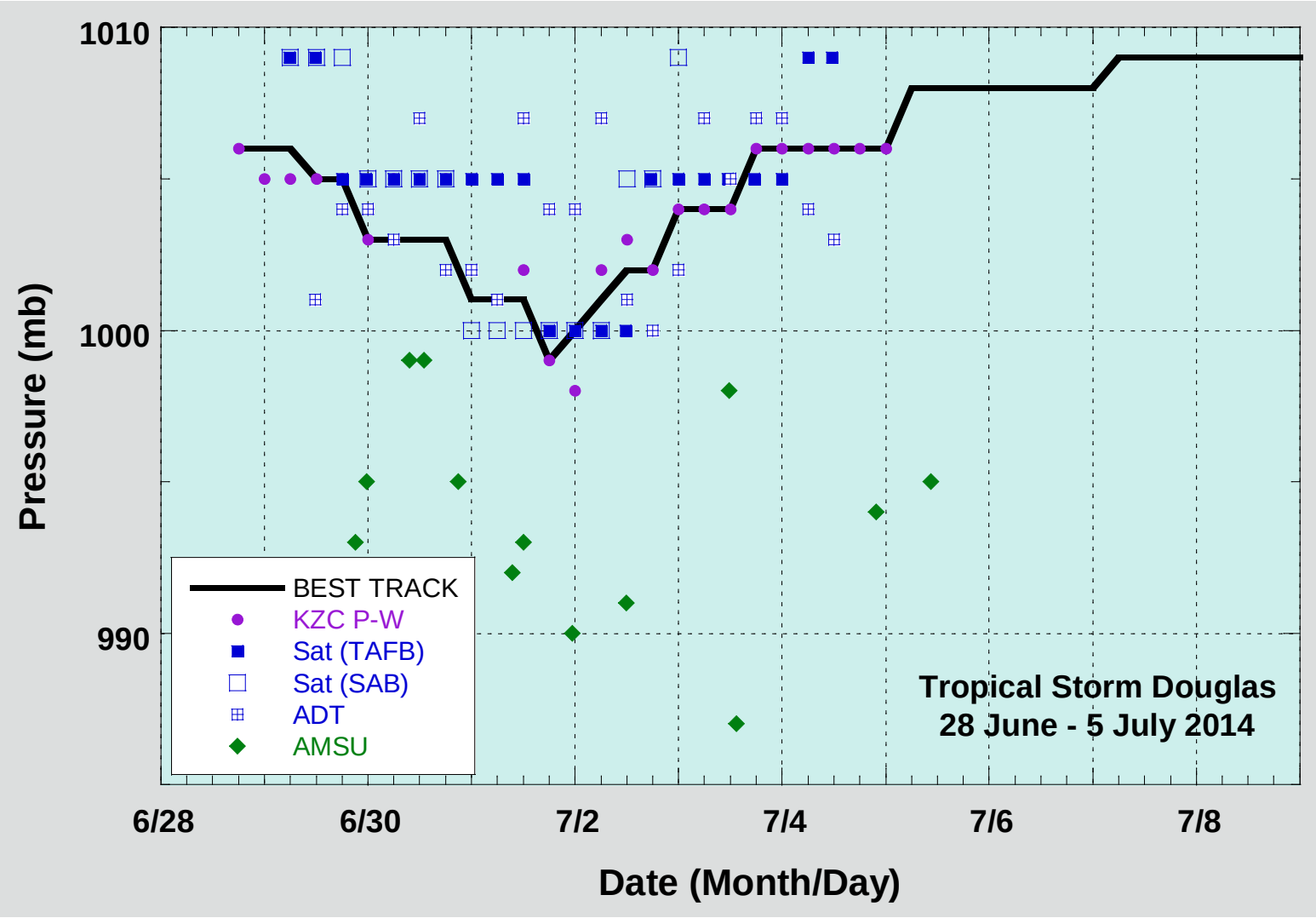

Figure 3. Selected pressure observations and best track minimum central pressure curve for Tropical Storm Douglas, 28 June – 5 July 2014. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. AMSU intensity estimates are from the Cooperative Institute for 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.