NATIONAL HURRICANE CENTER
CENTRAL PACIFIC HURRICANE CENTER
TROPICAL CYCLONE REPORT

HURRICANE GUILLERMO

(EP092015)

29 July – 7 August 2015

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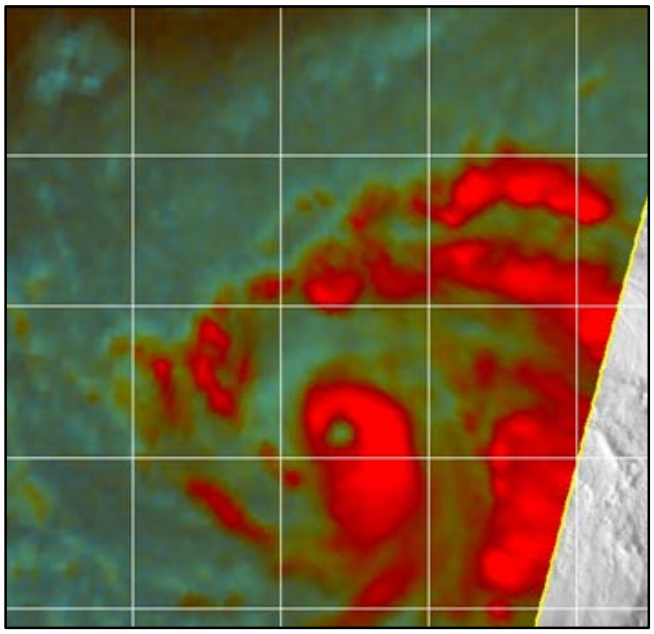
22 February 2016[1]



NOAA F-15 85-GHZ SATELLITE IMAGE AT 1553 UTC 31 JULY SHOWING THE MID-LEVEL EYE OF GUILLERMO, A FEW HOURS BEFORE THE HURRICANE REACHED ITS PEAK INTENSITY. IMAGE COURTESY OF THE NAVAL RESEARCH LABORATORY.

Guillermo was a category 2 hurricane (on the Saffir-Simpson Hurricane Wind Scale) that moved from the eastern North Pacific to the Central Pacific and dissipated just north of the Hawaiian Islands.

[1] Original report date 29 September 2015. Updated 22 February 2016 to include best track analysis from CPHC.

Hurricane Guillermo

29 JULY – 7 AUGUST 2015

SYNOPTIC HISTORY

The tropical wave associated with the development of Guillermo was first observed moving off the west coast of Africa on 13 July. The westward-moving wave was accompanied by a distinct mid-level cyclonic rotation and abundant thunderstorm activity during its trek across the tropical Atlantic, but the shower activity decreased significantly when the wave entered the Caribbean Sea, where the environmental wind shear and stability were less favorable. The wave moved into the eastern North Pacific with minimal convection on 24 July and continued westward. The thunderstorm activity gradually increased, but remained disorganized around an area of low pressure that formed near 6° N and well south of the Baja California peninsula around 1200 UTC 27 July. Over the next two days, the convection became persistent and concentrated near the low with some well-defined cyclonically curved rainbands, marking the formation of a tropical depression at 1800 UTC 29 July about 1200 miles southwest of the southern tip of the Baja California peninsula. 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[2].

The depression moved west-northwestward into a very favorable environment of low shear, abundant moisture, and high sea surface temperatures, which resulted in intensification. It is estimated that the depression became a tropical storm at 0000 UTC 30 July and a hurricane at 0600 UTC 31 July. The strengthening process continued, and Guillermo reached an estimated peak intensity of 95 kt at 1800 UTC that day, when the eye was quite distinct on conventional satellite imagery. After that time, the hurricane weakened a little bit and moved west-northwestward into the Central Pacific Hurricane Center's area of responsibility between 1800 UTC 1 August and 0000 UTC 2 August at an intensity of 90 kt. Guillermo was the second tropical cyclone to cross over from the eastern Pacific basin in 2015, following Ela. Although the 850-200 mb vertical wind shear was initially low in the Central Pacific basin, less than 10 kt, Guillermo weakened to a tropical storm by 1200 UTC 3 August. Southwesterly shear began to increase on 2 August as the cyclone continued to move toward the west-northwest, following a weakness in the subtropical ridge. Guillermo became a depression by 0300 UTC 7 August as it approached to within 80 nm of the island of Maui. The cyclone degenerated to a post-tropical low within an increasingly hostile environment of southwesterly shear in excess of 40 kt. The low dissipated a couple of days later.

[2] 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 Hurricane Guillermo (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. 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 the hurricane. West of 140˚W, flight-level, stepped frequency microwave radiometer (SFMR), and dropwindsonde observations from flights of the 53rd Weather Reconnaissance Squadron of the U. S. Air Force Reserve Command were also available.

The estimated peak intensity of 95 kt at 1800 UTC 30 July was based on a blend of objective and subjective Dvorak T-numbers.

CASUALTY AND DAMAGE STATISTICS

There were no reports of damage or casualties associated with Hurricane Guillermo.

FORECAST AND WARNING CRITIQUE

The genesis of Guillermo was not very well forecast. A low possibility of Guillermo's genesis during the next 5 days was first indicated in the Tropical Weather Outlook 108 h before it occurred. However, the 48-h formation probability was introduced as a low category only 36 h before the cyclone formed. In the final post-analysis, the cyclone had formed before the short-range high category was reached. All of the genesis forecast lead times are included in Table 2.

A verification of NHC official track forecasts for Hurricane Guillermo is given in Table 3a. Official forecast track errors were greater than the mean official errors through 24 h, and lower than the mean errors for the previous 5-yr period at longer ranges. A homogeneous comparison of the official track errors with selected guidance models is given in Table 3b. The GFS and the GFS ensemble mean models had lower errors that the official forecast and the rest of the models at all forecast periods.

A verification of NHC official intensity forecasts for Hurricane Guillermo is given in Table 4a. Official forecast intensity errors were lower than the mean official errors for the previous 5-yr period at all forecast times. A homogeneous comparison of the official intensity errors with selected guidance models is given in Table 4b. In general, the NHC intensity forecasts were better than the models.

A verification of CPHC official track forecasts for Guillermo is given in Table 5a. CPHC errors for this system were lower the mean CPHC errors for the previous 5-yr period. In general, the Canadian Global Model and U.S. Global Forecast System performed best, while the regional dynamical models did worse. The Canadian Global Model was the top performer of all track guidance models used.

A verification of CPHC official intensity forecasts for Guillermo is given in Table 5b. CPHC errors for this system were lower than the mean CPHC errors for the previous 5-yr period. In general, SHIPS and LGEM performed best, while the regional dynamical models did worse. SHIPS and LGEM tied as the top performers.

Watches and warnings were not necessary in the eastern North Pacific basin. A tropical storm watch was issued for the islands of Maui County and for the Big Island of Hawaii with the 0300 UTC 4 August forecast package. Guillermo, then at tropical storm strength, was forecast to weaken as it approached the main Hawaiian Islands, but the size of the circulation, combined with track uncertainty, prompted the watch issuance. This watch was discontinued at 2100 UTC 5 August, as confidence grew that Guillermo was going to take a track far enough north of the islands to remove the threat of tropical-storm-force winds. No tropical-storm-force winds were recorded across the Hawaiian Islands in association with Guillermo.

Table 1. Best track for Hurricane Guillermo, 29 July- 7 August, 2015

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage*
27 / 1200	6.5	112.5	1008	20	low
27 / 1800	6.7	113.7	1008	20	"
28 / 0000	6.8	114.9	1008	20	"
28 / 0600	7.0	116.1	1008	20	"
28 / 1200	7.1	117.3	1008	20	"
28 / 1800	7.2	118.5	1007	25	"
29 / 0000	7.3	119.7	1007	25	"
29 / 0600	7.4	121.0	1006	25	"
29 / 1200	7.6	122.2	1006	25	"
29 / 1800	7.8	123.4	1006	30	tropical depression
30 / 0000	8.0	124.7	1005	35	tropical storm
30 / 0600	8.4	125.7	1004	35	"
30 / 1200	8.9	126.7	1002	40	"
30 / 1800	9.6	127.7	1001	45	"
31 / 0000	10.4	128.7	994	55	"
31 / 0600	11.2	130.0	985	70	hurricane
31 / 1200	12.1	131.9	973	85	"
31 / 1800	12.5	133.9	967	95	"
01 / 0000	12.9	135.5	970	90	"
01 / 0600	13.1	137.0	970	90	"
01 / 1200	13.4	138.4	970	90	"
01 / 1800	13.6	139.4	970	90	"
02 / 0000	13.8	140.5	970	90	"
02 / 0600	14.1	141.8	970	90	"
02 / 1200	14.4	142.8	970	90	"
02 / 1800	14.9	143.7	978	80	"
03 / 0000	15.4	144.5	981	75	"
03 / 0600	16.0	145.0	990	70	"
03 / 1200	16.6	145.7	992	60	tropical storm

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage*
03 / 1800	17.2	146.4	991	55	"
04 / 0000	17.8	147.0	991	55	"
04 / 0600	18.5	147.4	991	60	"
04 / 1200	19.1	147.9	989	60	"
04 / 1800	19.7	148.6	993	60	"
05 / 0000	20.0	149.3	998	60	"
05 / 0600	20.2	150.0	999	55	"
05 / 1200	20.4	150.6	999	50	"
05 / 1800	21.0	151.2	1001	50	"
06 / 0000	21.4	151.8	1003	45	"
06 / 0600	21.7	152.7	1004	40	"
06 / 1200	21.7	153.8	1006	35	"
06 / 1800	21.6	154.8	1006	35	"
07 / 0000	21.6	155.4	1008	30	tropical depression
07 / 0600	22.1	156.5	1008	30	"
07 / 1200	22.5	158.1	1009	30	low
07 / 1800	23.0	159.5	1011	25	"
08 / 0000	23.3	160.9	1011	25	"
08 / 0600	23.6	162.3	1012	25	"
08 / 1200	23.6	163.7	1012	25	"
08 / 1800	23.8	164.9	1013	20	"
09 / 0000					dissipated
31 / 1800	12.5	133.9	967	95	Maximum winds and 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	108
Medium (40%-60%)	12	54
High (>60%)	0	36

Table 3a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Hurricane Guillermo. 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	36.8	53.6	47.7	**43.9**	**55.7**	**81.6**	**103.6**
OCD5	52.6	107.1	151.7	189.5	249.7	292.0	344.1
Forecasts	12	12	12	12	12	12	11
OFCL (2010-14)	23.4	36.4	47.2	59.4	89.0	123.6	159.5
OCD5 (2010-14)	36.6	74.2	116.5	159.7	245.6	331.1	427.4

Table 3b. Homogeneous comparison of the NHC official forecast against selected track forecast guidance models (in n mi) for Hurricane Guillermo. 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	38.8	50.0	41.3	40.3	51.9	88.6	116.2
OCD5	58.1	114.8	154.6	190.5	249.2	298.2	364.9
GFSI	**38.5**	**48.6**	**39.7**	**36.1**	**45.9**	**56.7**	**59.1**
GHMI	**37.7**	50.3	49.1	50.3	73.7	116.9	222.0
HWFI	39.6	54.4	56.6	63.9	94.6	156.1	233.0
EGRI	**32.2**	**47.0**	57.8	80.3	203.6	360.7	476.2
EMXI	**36.1**	**49.0**	53.5	66.0	113.6	163.7	187.9
CMCI	39.3	56.7	66.8	81.2	98.0	93.5	133.3
NVGI	41.6	63.7	70.6	78.4	103.3	157.6	231.6
GFNI	47.3	74.4	89.9	101.9	133.0	184.6	272.9
AEMI	**38.0**	**45.3**	**34.0**	**29.7**	**43.6**	**48.8**	**52.2**
FSSE	**35.1**	**46.6**	44.1	43.1	**50.4**	**67.5**	**93.1**
TVCE	**34.4**	**46.4**	**41.1**	39.0	53.3	101.1	139.4
GFEX	**38.0**	**48.8**	**41.2**	41.4	56.0	89.4	**109.8**
LBAR	46.0	82.3	99.1	124.7	247.7	473.9	827.0
BAMS	61.2	102.6	148.8	187.2	196.7	190.4	232.6
BAMM	**38.2**	51.9	47.7	49.4	58.0	**63.2**	**72.2**
BAMD	44.3	71.1	86.0	96.2	140.2	232.9	467.2
Forecasts	9	9	9	9	9	9	9

Table 4a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Hurricane Guillermo. 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	**5.0**	**9.2**	**10.0**	**7.9**	**9.2**	**5.0**	**4.1**
OCD5	6.0	11.4	12.7	12.6	10.3	4.9	7.1
Forecasts	12	12	12	12	12	12	11
OFCL (2010-14)	5.9	9.8	12.5	14.0	15.5	16.3	14.9
OCD5 (2010-14)	7.7	12.8	16.4	18.8	21.1	20.9	19.7

Table 4b. Homogeneous comparison of the NHC official forecast against selected intensity forecast guidance models (in kt) for Hurricane Guillermo. 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	6.1	9.4	6.7	5.6	7.8	5.6	3.3
OCD5	7.4	12.4	9.2	9.2	10.6	**5.4**	6.3
GHMI	9.0	14.6	14.6	17.0	20.0	21.0	20.2
HWFI	8.9	11.8	8.9	7.4	**5.7**	10.8	11.4
FSSE	7.3	10.8	7.0	**5.4**	**6.1**	7.1	4.7
DSHP	7.8	12.2	12.9	14.4	11.9	5.9	6.6
LGEM	7.8	13.4	12.4	12.8	13.3	7.0	11.9
IVCN	7.9	12.2	10.0	9.9	9.0	**2.8**	6.0
GFNI	14.6	22.6	18.2	14.4	10.2	6.7	11.2
GFSI	8.3	14.3	13.6	11.2	12.0	11.0	16.2
EMXI	10.9	16.1	18.6	19.7	23.0	15.9	25.9
Forecasts	9	9	9	9	9	9	9

Table 5a. Homogeneous comparison of the CPHC official forecast against selected track forecast guidance models (in n mi) for Hurricane Guillermo. Errors smaller than the CPHC official forecast are shown in boldface type.

Model ID	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL (CPHC)	29.9	57.7	87.9	117.2	154.6	147.4	142.5
OCD5	33.8	68.2	95.2	148.1	213.2	337.9	430.8
GFSI	32.9	**56.7**	**82.2**	**111.9**	**146.6**	**144.2**	183.0
GHMI	35.3	67.3	100.5	129.5	163.5	257.3	457.3
HWFI	33.9	58.8	89.2	130.2	180.2	203.6	265.9
EMXI	35.2	58.0	89.5	119.4	169.6	204.1	188.3
CMCI	**27.4**	**44.5**	**62.3**	**81.8**	**112.9**	**146.4**	199.8
TVCE	31.7	**56.2**	**87.1**	120.6	161.6	158.7	185.7
AEMI	37.4	71.8	104.6	136.0	169.1	154.1	**96.3**
BAMS	48.2	91.2	129.7	172.3	241.4	295.3	312.8
BAMM	34.0	66.3	98.3	128.5	**150.4**	**116.7**	**99.3**
BAMD	77.9	156.9	224.2	264.9	244.7	167.0	**16.6**
Forecasts	20	18	16	14	10	6	2

Table 5b. Homogeneous comparison of the CPHC official forecast against selected intensity forecast guidance models (in kt) for Hurricane Guillermo. Errors smaller than the CPHC official forecast are shown in boldface type.

Model ID	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL (CPHC)	4.3	6.7	6.3	6.1	3.5	5.8	10.0
OCD5	4.4	7.4	9.5	10.0	3.7	10.2	22.0
HWFI	6.9	6.9	7.6	10.1	9.7	5.8	**5.5**
GHMI	7.1	10.8	12.4	13.4	18.2	29.5	39.5
DSHP	**4.1**	**6.4**	7.8	**6.0**	5.1	7.3	**7.5**
LGEM	**4.1**	**5.6**	7.9	7.7	7.5	**3.2**	**2.5**
ICON	5.1	6.8	6.9	6.8	4.5	**5.2**	**8.5**
IVCN	5.1	6.8	6.9	6.8	4.5	**5.2**	**8.5**
Forecasts	20	18	16	14	10	6	2

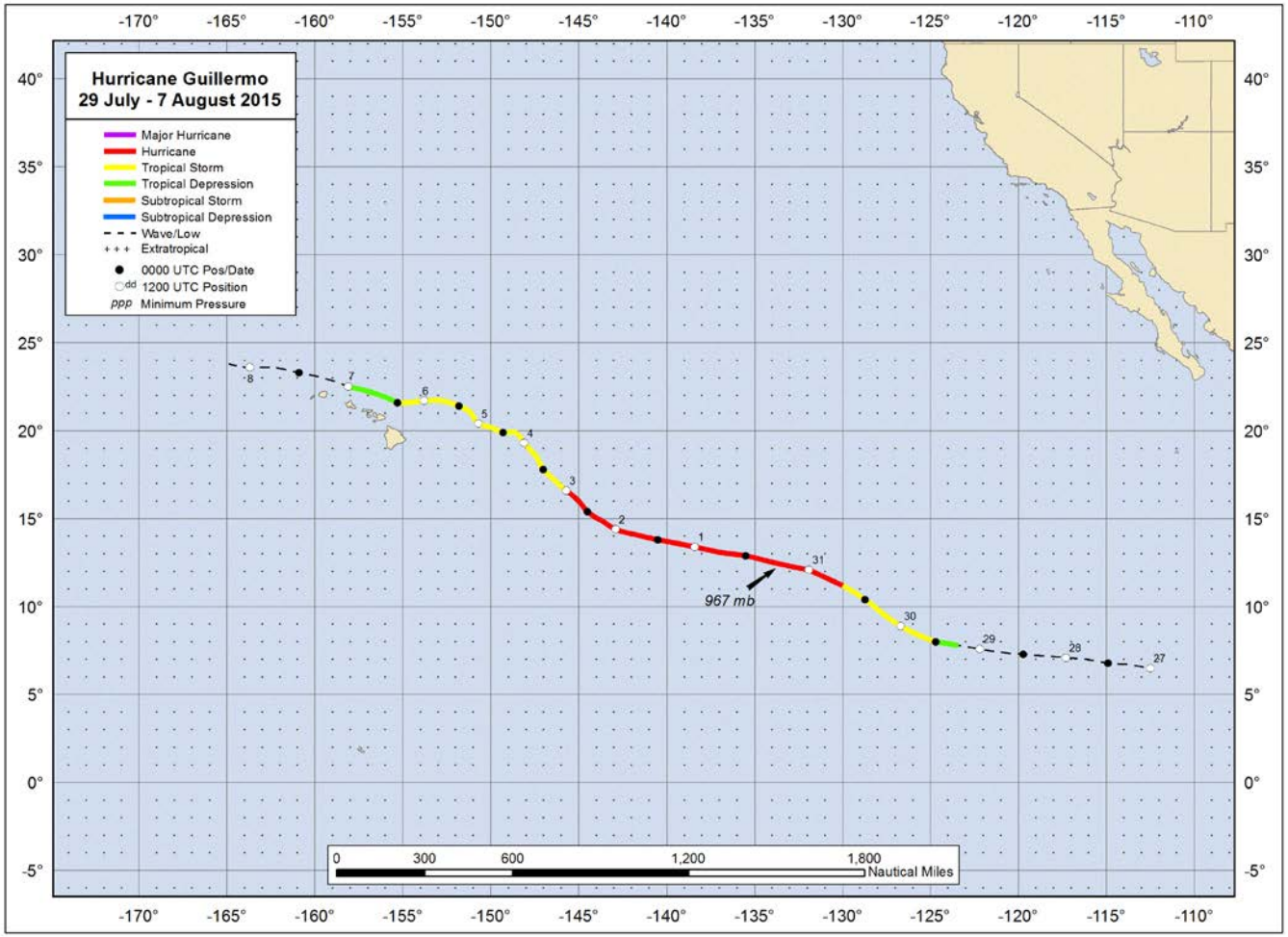


Figure 1. Best track positions for Hurricane Guillermo, 29 July- 7 August 2015.

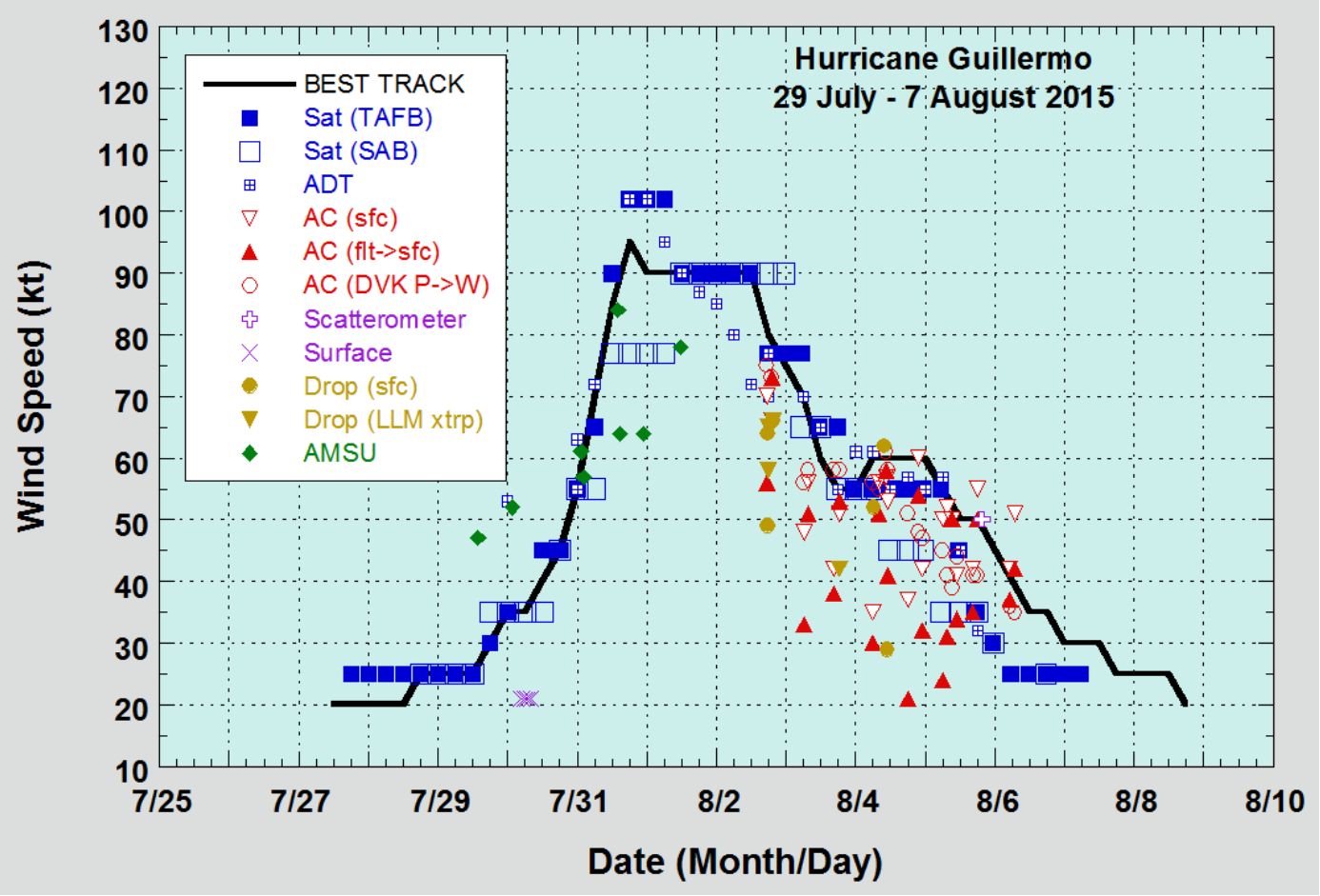


Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Hurricane Guillermo 29 July-7 August, 2015. Aircraft observations have been adjusted for elevation using 90%, 80%, and 80% adjustment factors for observations from 700 mb, 850 mb, and 1500 ft, respectively. 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.

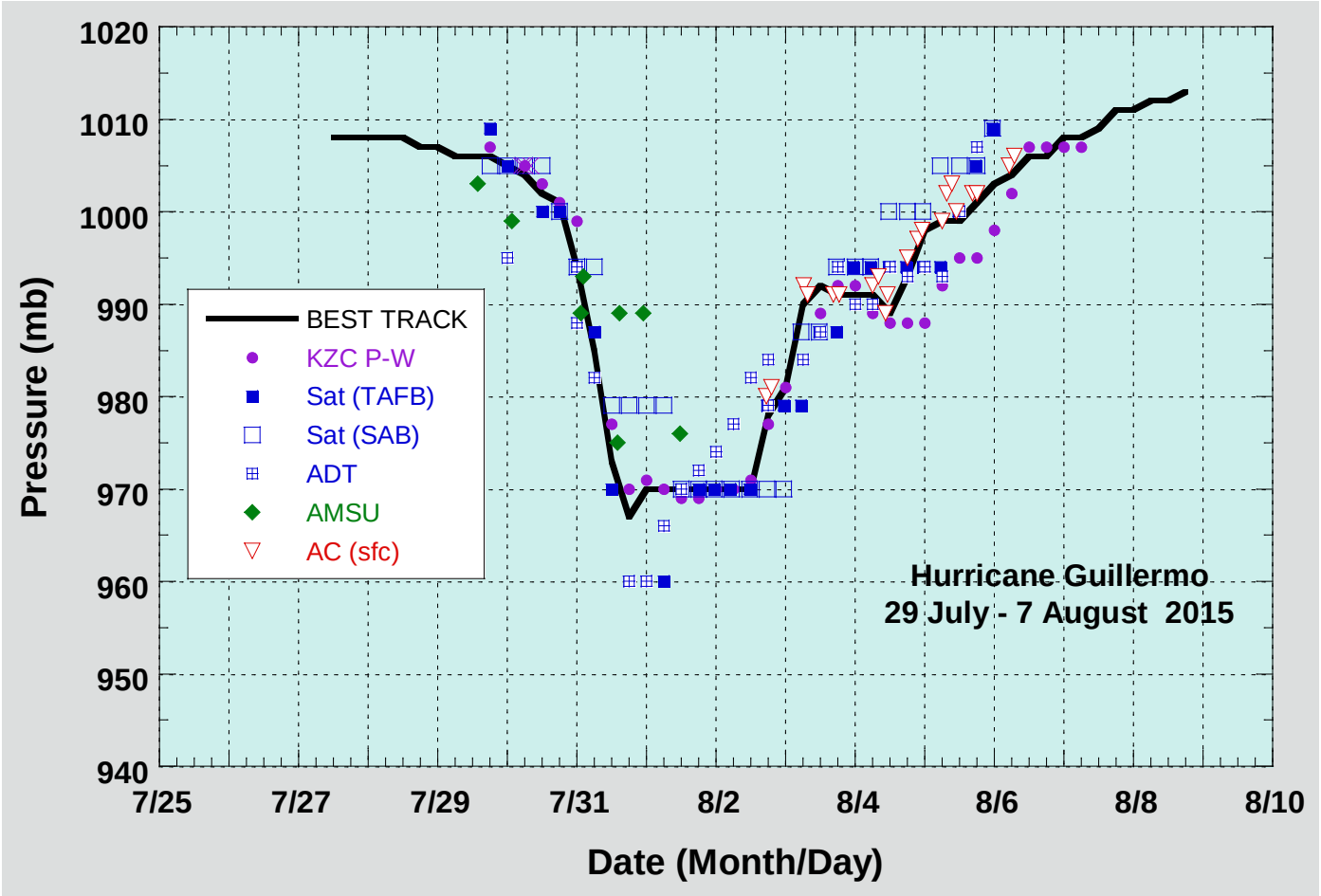


Figure 3. Selected pressure observations and best track minimum central pressure curve for Hurricane Guillermo 29 July-7 August, 2015. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. AMSU intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies technique. KZC P-W refers to pressure estimates derived using the Knaff-Zehr-Courtney pressure-wind relationship.