NATIONAL HURRICANE CENTER
TROPICAL CYCLONE REPORT

HURRICANE EUGENE

(EP052017)

7 - 12 July 2017

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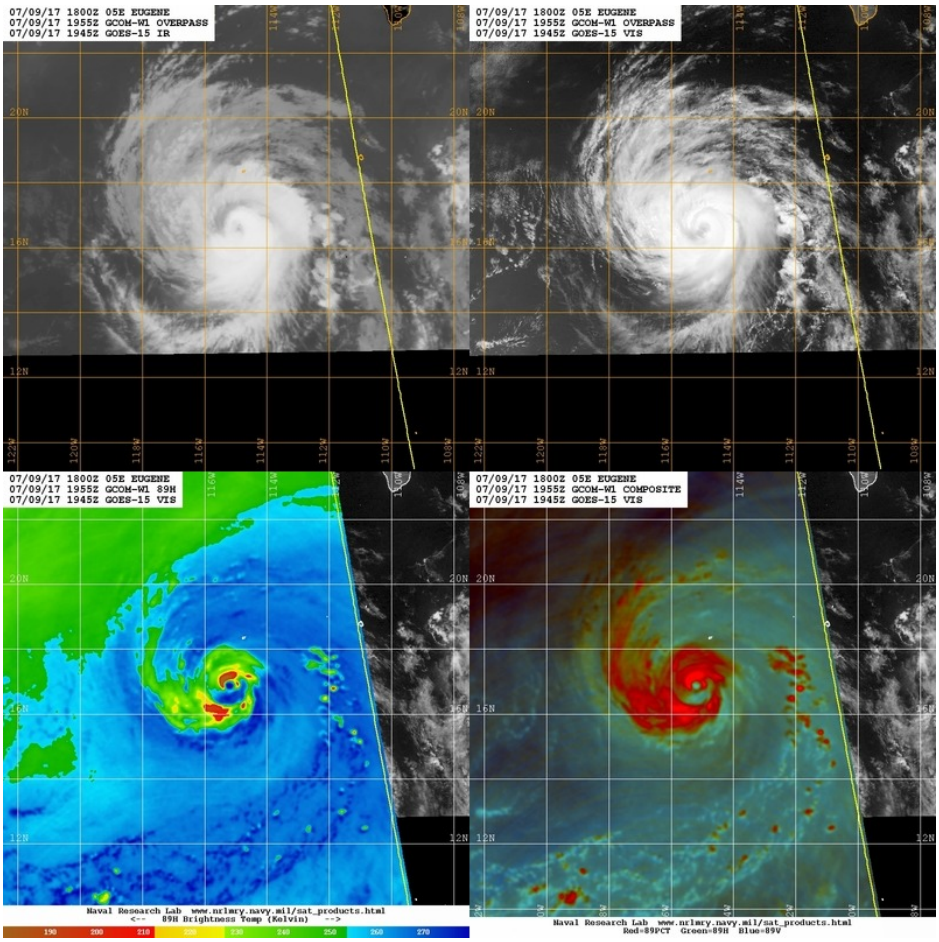

INFRARED (UPPER LEFT), VISIBLE (UPPER RIGHT), GCOM W-1 89-H GHZ MICROWAVE (BOTTOM LEFT), AND COMPOSITE MICROWAVE (BOTTOM RIGHT) IMAGERY FOR HURRICANE EUGENE NEAR MAXIMUM INTENSITY ON 17 JULY 2017 (COURTESY OF NAVAL RESEARCH LABORATORY)

Eugene was a category 3 hurricane (on the Saffir-Simpson Hurricane Wind Scale) that remained over the open waters of the Pacific Ocean.

Hurricane Eugene

7 - 12 JULY 2017

SYNOPTIC HISTORY

An African easterly wave emerged off of the west coast of North Africa on 25 June. The system moved at low latitudes across the Atlantic Ocean with minimal convection and a negligible surface circulation for the next several days. On 2 July, the easterly wave moved into the eastern North Pacific. Deep convection gradually became better organized over the next few days. Additionally, an eastward moving convectively coupled Kelvin wave moved through the area and interacted with the easterly wave on 5 and 6 July, which could have enhanced the easterly wave's convection. By 1200 UTC 7 July, a well-defined center developed within the curved convective bands and the system became a tropical depression at that time, centered about 700 n mi south of the southern tip of the Baja California peninsula. The tropical cyclone continued to become better organized and reached tropical storm status six hours later. The "best track" chart of Eugene'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].

Eugene moved toward the northwest at 8 to 10 knots for nearly its entire time as a tropical cyclone due to the steering influence of a mid-tropospheric ridge over the southwestern United States. This track kept the cyclone well offshore of Mexico. Environmental conditions were initially very conducive for intensification with the tropospheric vertical shear around 5 kt or less, warm sea surface temperatures around 28°C, a moist low- to mid-troposphere, and a divergent upper troposphere. Eugene responded by intensifying rapidly, spinning up from a 35-kt tropical storm to a 100-kt Category 3 hurricane (front cover) on the Saffir-Simpson Hurricane Wind Scale in 42 h between 0000 UTC 8 July and 1800 UTC 9 July. However, Eugene's peak intensity of 100 kt - while located about 490 n mi southwest of the southern tip of Baja California - was short lived, as the hurricane's northwestward trajectory took it across a strong SST gradient. Due to colder waters and a less unstable atmosphere, Eugene rapidly weakened to a tropical storm by 0000 UTC 11 July, after having been a major hurricane only 30 h previously. Deep convection associated with Eugene ceased around 1800 UTC 12 July, marking its transition to a post-tropical cyclone. For the next two days, Eugene's remnant low moved generally toward the west-northwest at about 8 kt before dissipating by 1200 UTC 14 July about 930 n mi west of the southern tip of Baja 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 Eugene (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 Eugene.

Eugene's peak intensity of 100 kt at 1800 UTC 9 July is based upon a blend of ADT, AMSU, TAFB, and SAB maximum sustained wind estimates.

CASUALTY AND DAMAGE STATISTICS

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

FORECAST AND WARNING CRITIQUE

The genesis of Eugene was very well forecast. The disturbance from which Eugene developed was introduced as a low chance of formation in the 5-day Tropical Weather Outlook (TWO) 138 h prior to genesis (Table 2). The 5-day genesis probability reached a high chance 90 h in advance of formation. Likewise, the 48-h TWO well indicated Eugene's formation. The system was introduced with a low chance of formation into the 48-h TWO 36 h prior to genesis and subsequently reached the high category 18 h before genesis.

A verification of NHC official (OFCL) track forecasts for Eugene is given in Table 3a. Official forecast track errors were substantially lower than the mean official errors for the previous 5-yr period, especially at 72 and 96 h. A homogeneous comparison of the official track errors with selected guidance models is given in Table 3b. The European Center for Medium Range Weather Forecasts model (EMXI) was the best performing track guidance, although nearly all of the models had very low track errors.

A verification of NHC OFCL intensity forecasts for Eugene is given in Table 4a. Official forecast intensity errors were larger than the mean official errors for the previous 5-yr period for 12 to 36 h and smaller at 48 h and beyond. A homogeneous comparison of the official intensity errors with selected guidance models is given in Table 4b. The Logistic Growth Equation Model (LGEM) was the best individual intensity model and the HFIP Corrected Consensus Approach (HCCA) was the best consensus guidance for Eugene, both of which outperformed the official forecasts. Figure 4 shows the intensity forecasts for OFCL, LGEM, the Hurricane Weather Research Forecast model (HWFI), and HCCA. Note that all four had difficulty in forecasting the

rapid intensification on 8 and 9 July and the rapid weakening on 10 July. None of the NHC official forecasts issued from 0000 to 1800 UTC 8 July were able to correctly anticipate rapid intensification (at least a 30-kt increase over 24 h), nor were any from 1800 UTC 9 July to 0600 UTC 10 July able to correctly anticipate rapid weakening (at least a 30-kt decrease in 24 h).

No watches and warnings associated with Eugene were issued for land.

Table 1. Best track for Hurricane Eugene, 7–12 July 2017.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
7 / 1200	11.2	110.0	1008	30	tropical depression
7 / 1800	11.6	110.8	1007	35	tropical storm
8 / 0000	12.1	111.3	1007	35	"
8 / 0600	12.7	111.9	1006	40	"
8 / 1200	13.2	112.5	1002	50	"
8 / 1800	13.6	113.0	997	60	"
9 / 0000	14.1	113.4	989	70	hurricane
9 / 0600	14.8	113.8	976	85	"
9 / 1200	15.5	114.4	969	95	"
9 / 1800	16.3	115.0	966	100	"
10 / 0000	17.1	115.6	971	90	"
10 / 0600	17.7	116.2	976	85	"
10 / 1200	18.3	116.9	981	75	"
10 / 1800	19.0	117.5	984	70	"
11 / 0000	19.6	118.0	991	60	tropical storm
11 / 0600	20.3	118.6	995	55	"
11 / 1200	20.9	119.2	998	50	"
11 / 1800	21.5	119.8	1001	45	"
12 / 0000	22.0	120.3	1004	40	"
12 / 0600	22.6	120.8	1005	35	"
12 / 1200	23.2	121.5	1006	30	tropical depression
12 / 1800	23.7	122.2	1006	30	low
13 / 0000	24.2	122.9	1006	30	"
13 / 0600	24.7	123.6	1007	25	"
13 / 1200	25.1	124.2	1008	25	"
13 / 1800	25.5	124.9	1009	20	"
14 / 0000	26.0	125.7	1009	20	"
14 / 0600	26.5	126.5	1009	20	"
14 / 1200					dissipated
9 / 1800	16.3	115.0	966	100	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 (<30%)	36	138
Medium (30%-50%)	24	120
High (>50%)	18	90

Table 3a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Hurricane Eugene. 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	**16.1**	**29.4**	**40.5**	**42.8**	**37.0**	**36.2**	---
OCD5	19.2	35.3	62.6	105.7	219.0	334.1	---
Forecasts	18	16	14	12	8	4	0
OFCL (2012-16)	22.2	33.9	43.8	54.8	80.0	108.9	145.1
OCD5 (2012-16)	36.7	72.0	112.2	150.2	217.0	271.0	340.2

Table 3b. Homogeneous comparison of selected track forecast guidance models (in n mi) for Hurricane Eugene. 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	18.1	30.4	40.2	45.5	40.3	31.6	---
OCD5	**17.9**	34.1	58.0	96.2	223.4	308.3	---
GFSI	19.5	31.6	44.8	55.7	72.9	56.0	---
HWFI	27.1	46.3	61.2	64.5	48.4	79.7	---
EGRI	22.8	39.1	53.9	54.2	57.0	66.3	---
EMXI	**16.4**	**27.7**	**37.5**	**43.8**	40.6	33.9	---
NVGI	28.0	42.3	58.1	73.4	72.2	38.5	---
CMCI	**16.6**	31.9	**37.7**	49.0	53.8	68.1	---
CTCI	22.2	39.5	53.3	64.6	55.4	49.7	---
TCON	19.8	36.1	49.9	54.2	**40.0**	**27.3**	---
TVCE	18.4	32.7	44.5	50.8	**37.6**	**20.9**	---
FSSE	**17.0**	31.3	43.1	52.4	51.2	44.5	---
HCCA	**17.6**	31.9	44.7	58.0	57.8	57.1	---
AEMI	19.2	30.5	**39.3**	48.6	49.4	**28.7**	---
TABS	27.8	59.1	83.9	88.2	93.0	80.3	---
TABM	23.4	41.7	54.5	64.8	88.6	75.9	---
TABD	30.2	56.0	69.3	75.4	65.5	104.2	---
Forecasts	14	12	11	10	5	2	0

Table 4a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Eugene. 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	6.9	10.6	13.2	**10.4**	**5.0**	**6.3**	---
OCD5	7.8	14.7	19.2	21.7	19.4	18.5	---
Forecasts	18	16	14	12	8	4	0
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 4b. Homogeneous comparison of selected intensity forecast guidance models (in kt) for Eugene. 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	8.0	11.1	12.9	9.5	4.2	6.7	---
OCD5	8.6	15.1	18.7	21.0	19.5	19.7	---
HWFI	8.0	12.2	13.5	12.1	8.7	**1.3**	---
DSHP	**7.5**	11.6	**12.5**	12.1	13.7	17.3	---
LGEM	**6.9**	**9.4**	**9.6**	**7.4**	**2.0**	**4.0**	---
ICON	**6.9**	**10.3**	**10.4**	**7.6**	**3.0**	7.3	---
IVCN	**7.1**	**9.5**	**10.3**	**7.4**	**2.8**	**5.3**	---
CTCI	8.0	11.3	12.9	**9.9**	8.5	**1.7**	---
GFSI	9.5	16.6	18.8	18.0	13.5	11.3	---
EMXI	11.4	20.0	24.8	26.4	16.3	**5.0**	---
HCCA	**6.3**	**6.9**	**6.9**	**5.4**	**3.3**	**4.0**	---
FSSE	**6.5**	**7.1**	**6.9**	**6.7**	7.5	9.7	---
Forecasts	15	14	12	11	6	3	---

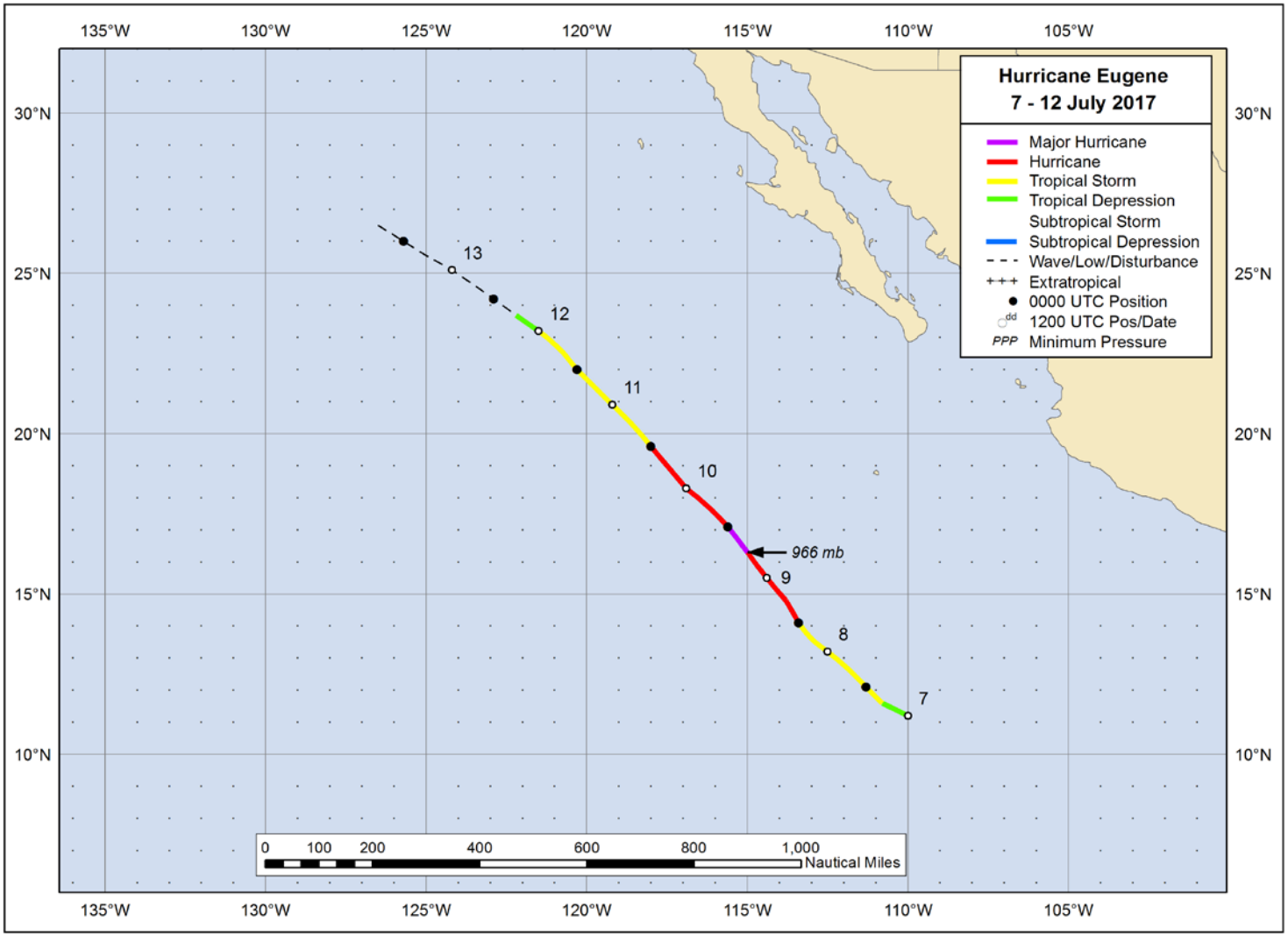

Figure 1. Best track positions for Hurricane Eugene, 7–12 July 2017.

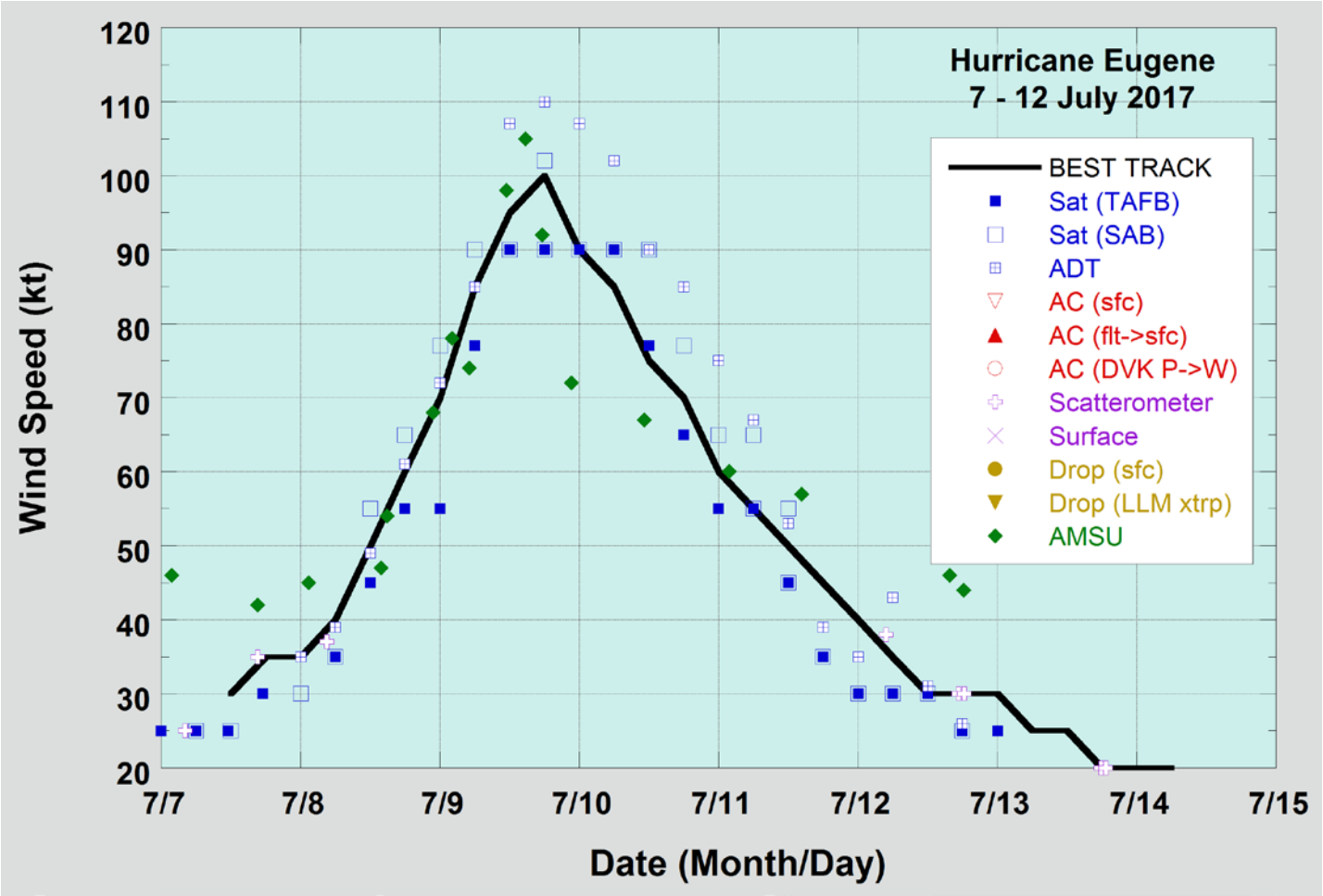

Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Hurricane Eugene, 7–12 July, 2017. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. AMSU intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies technique. Vertical lines correspond to 0000 UTC.

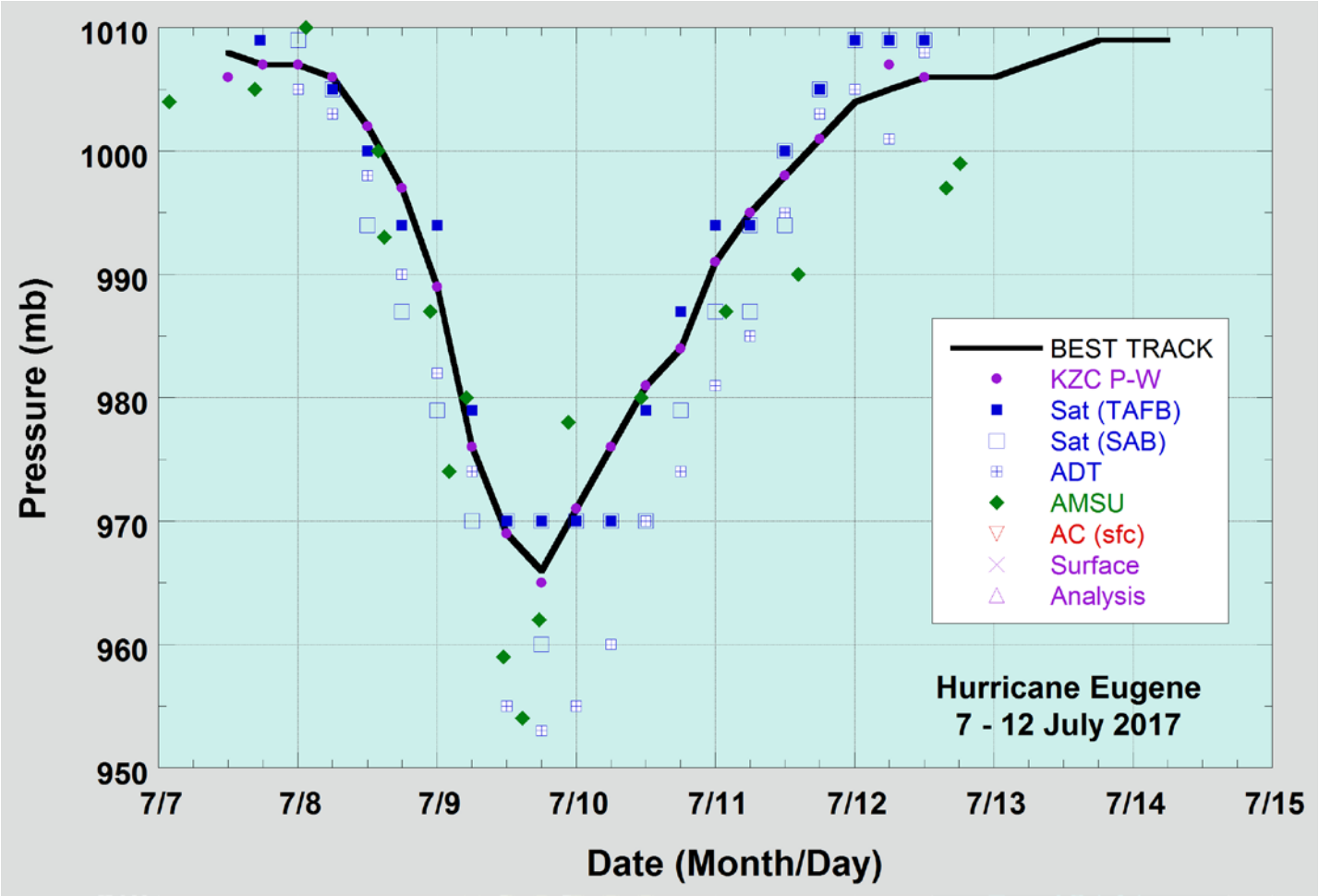

Figure 3. Selected pressure observations and best track minimum central pressure curve for Hurricane Eugene, 7–12 July, 2017. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. AMSU intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies technique. KZC P-W refers to pressure estimates derived using the Knaff-Zehr-Courtney pressure-wind relationship. Vertical lines correspond to 0000 UTC.

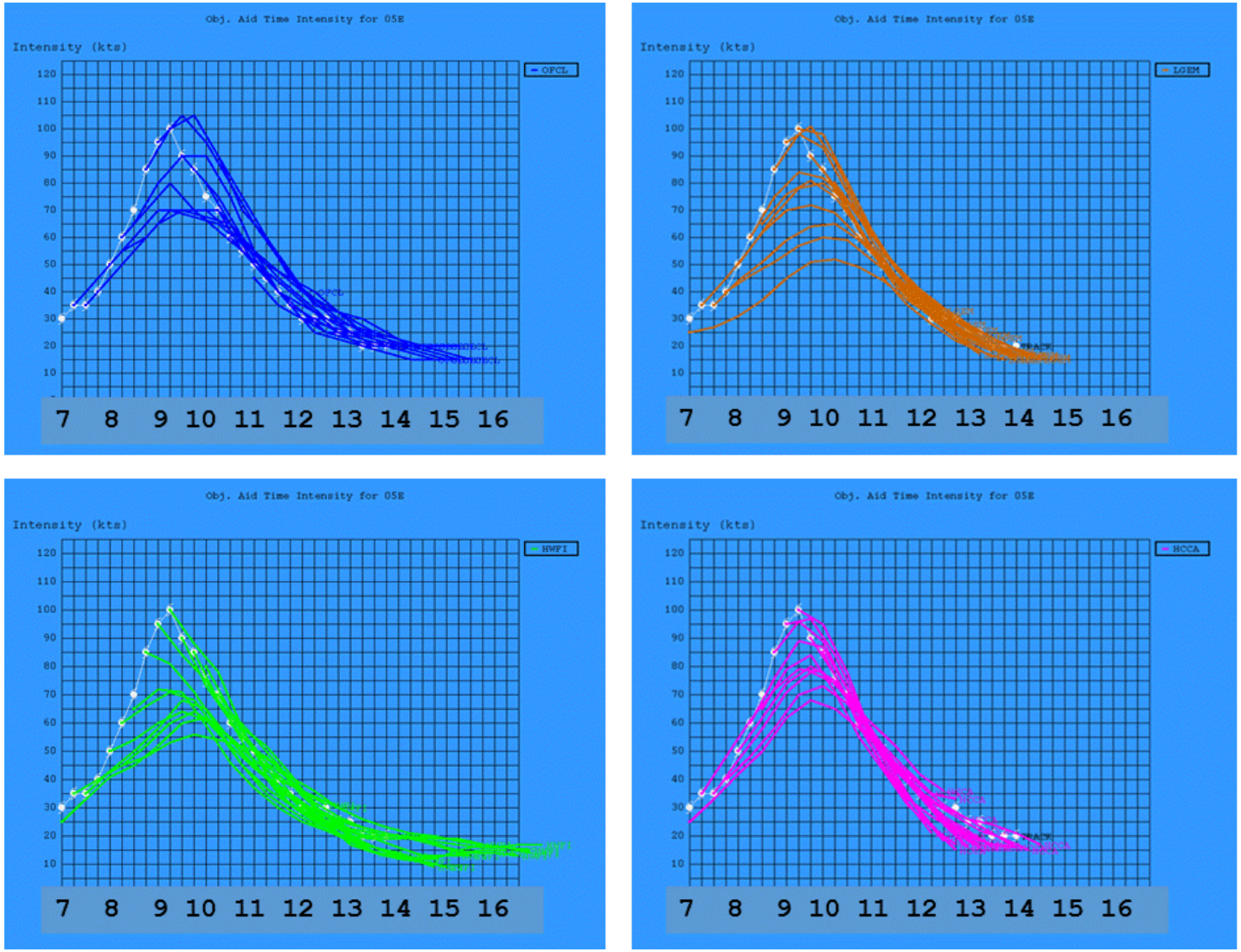

Figure 4. Intensity forecasts for Eugene from NHC official (OFCL – upper left), the Logistic Growth Equation Model (LGEM – upper right), the Hurricane Weather Research Forecast model (HWFI – bottom left), and the HFIP Corrected Consensus Approach (HCCA – bottom right).