NATIONAL HURRICANE CENTER
TROPICAL CYCLONE REPORT

HURRICANE ALVIN

(EP012019)

25 – 29 June 2019

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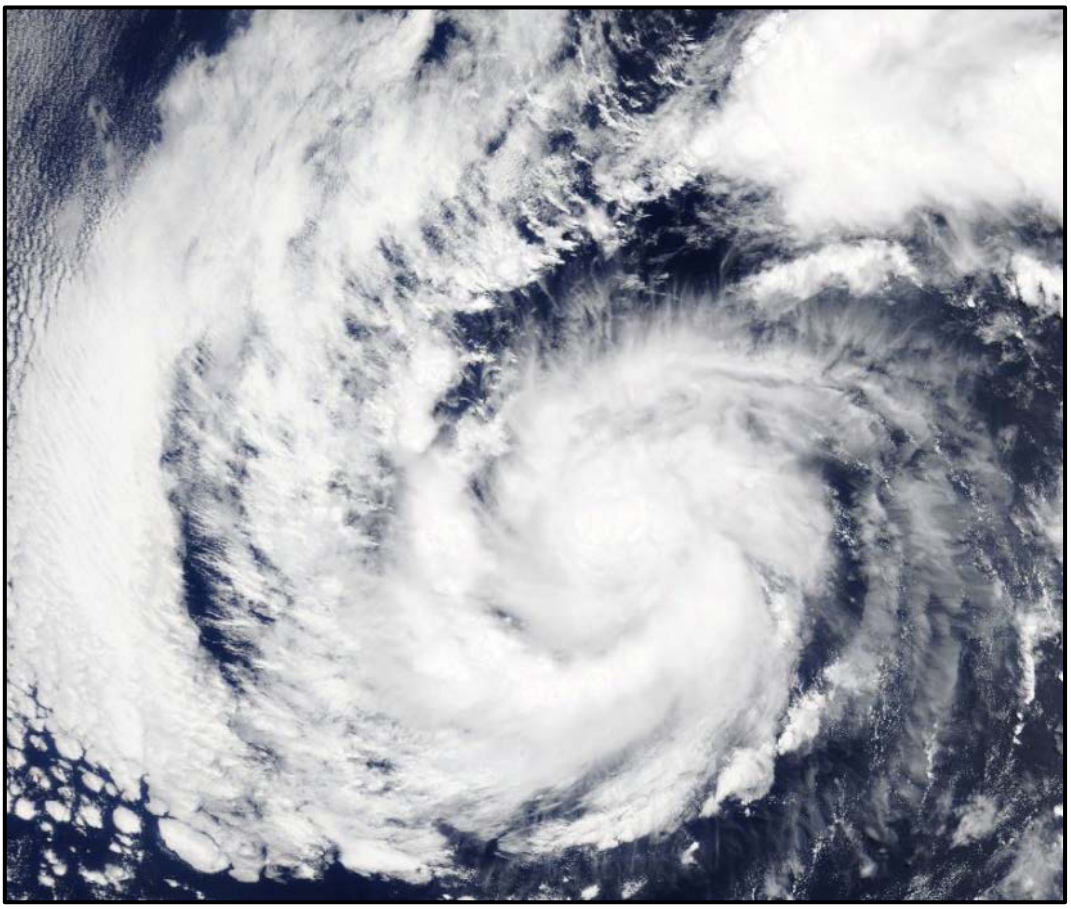

GOES-16 NATURAL-COLOR VISIBLE SATELLITE IMAGE OF HURRICANE ALVIN AT 1730 UTC 26 JUNE 2019. IMAGE COURTESY OF NOAA/RAMMB.

Alvin was a compact hurricane that developed southwest of the southern coast of Mexico and remained well offshore throughout its lifetime.

Hurricane Alvin

25 – 29 JUNE 2019

SYNOPTIC HISTORY

Alvin's precursor disturbance was a tropical wave that emerged off the west coast of Africa on 12 June. The wave reached the Caribbean Sea by 19 June, and then crossed Central America a couple of days later. Showers and thunderstorms increased with the wave on 22 June as it passed south of Guatemala, and the convection started to become better organized on 23 June a few hundred miles south of the southern coast of Mexico. Satellite imagery suggested that a broad area of low pressure formed on 24 June a few hundred miles south of Acapulco, Mexico. The shower and thunderstorm activity gradually became more concentrated around the low, and a tropical depression developed by 1200 UTC 25 June, about 300 miles south of Manzanillo, Mexico. 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].

The tropical depression initially struggled to become better organized after genesis, with limited convective banding and a lack of deep convection over the center, while the system moved just south of due west to the south of a mid-level ridge. Satellite imagery and microwave data indicated that the center of the cyclone redeveloped under the deep convection early on 26 June, allowing the depression to intensify to a tropical storm by 1200 UTC that day. A central dense overcast (CDO) was evident by late that day as Alvin gradually strengthened in a favorable environment of light shear and warm sea surface temperatures (SSTs). During that time, the storm turned toward the west-northwest as it reached the southwestern periphery of the subtropical ridge to the north. The CDO persisted into 27 June while cold cloud tops of -90°C developed over the center. This increase in convective organization allowed Alvin to continue strengthening through much of that day and intensify into a hurricane by 0000 UTC 28 June while moving northwestward about 450 n mi southwest of the southern tip of the Baja California peninsula. During its time as a hurricane, Alvin developed a 10 n mi diameter eye that became evident in microwave imagery (Fig. 4). Alvin did not remain a hurricane for very long however, as increasing southwesterly shear and cooler SSTs caused the system to weaken to a tropical storm by 0600 UTC on 28 June. The northwestward forward speed increased that morning while Alvin continued to move over progressively cooler waters and into a more stable environment with southwesterly shear of 15 to 20 kt. Under these conditions, rapid weakening began, and Alvin became devoid of deep convection by 0600 UTC 29 June as it degenerated into a remnant low about 650 miles west-southwest of the southern tip of southern Baja California. The remnant low drifted westward and dissipated about a day later.

[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 Alvin (Figs. 2 and 3) include subjective satellite-based Dvorak technique estimates from the Tropical Analysis and Forecast Branch (TAFB) and 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 (UW-CIMSS). 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 Alvin.

Alvin's estimated maximum intensity of 65 kt at 0000 UTC 28 June is based on subjective Dvorak classifications from both TAFB and SAB. During its lifetime, Alvin was a small tropical cyclone, and the largest extent of tropical-storm-force winds measured by ASCAT was only 60 n mi from the center.

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

CASUALTY AND DAMAGE STATISTICS

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

FORECAST AND WARNING CRITIQUE

The genesis of Alvin (Table 2) was well forecast. The Tropical Weather Outlook (TWO) indicated that the incipient disturbance had a low (<40%) chance of genesis during the next five days about 138 h (nearly 6 days) before formation. The 5-day probability of genesis was increased to the medium category (40–60%) about 90 h before genesis occurred, and was raised to the high category (>60%) 60 h before formation. The possibility of tropical cyclone formation within 2 days was first mentioned 72 h before formation. The 48-h genesis probabilities were increased to the medium category about 54 h before genesis and were then increased to the high category 12 h before formation occurred.

A verification of NHC official track forecasts for Alvin is given in Table 3a. Official track forecast errors were higher than the mean official errors for the previous 5-yr period through 72 h, with the errors nearly double the long-term means through 48 h. One possible reason for the higher than normal track errors was the southwestern reformation of the center of Alvin on 26 June, which was not well forecast and resulted in a north-of track bias. A homogeneous comparison of the official track errors with selected guidance models is given in Table 3b. Overall,

the consensus aids had lower errors than the NHC official forecast, with TVCE, TVCX, and HCCA outperforming the NHC forecasts from 12 h through 48 h. The HWFI also had smaller track errors than the official forecast during those time periods. Due to the relatively short existence of Alvin, there were no verifying forecasts beyond 72 h. In addition, the 72-h forecast only included one verifying time.

A verification of NHC official intensity forecasts for Alvin is given in Table 4a. The official intensity forecasts had average errors lower than the mean official errors for the previous 5-yr period from 12 through 36 h, but slightly higher than average errors at 48 and 72 h. A homogeneous comparison of the official intensity errors with selected guidance models is given in Table 4b. The official forecast was better than the majority of guidance at 12 and 24 h. The consensus aids ICON, IVCN, and HCCA had lower errors than the NHC official forecast from 24 h through 72 h. The HWFI performed the best overall, with intensity errors less than the official forecast for all time periods.

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

Table 1. Best track for Hurricane Alvin, 25–29 June 2019.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
25 / 1200	14.6	103.8	1007	25	tropical depression
25 / 1800	15.1	105.1	1007	25	"
26 / 0000	15.3	106.5	1006	30	"
26 / 0600	15.2	107.7	1006	30	"
26 / 1200	14.6	108.7	1005	35	tropical storm
26 / 1800	14.3	109.7	1004	40	"
27 / 0000	14.5	110.7	1001	45	"
27 / 0600	15.0	111.6	999	50	"
27 / 1200	15.6	112.6	999	50	"
27 / 1800	16.3	113.7	998	55	"
28 / 0000	17.0	114.8	992	65	hurricane
28 / 0600	17.8	116.0	995	60	tropical storm
28 / 1200	18.6	117.1	997	55	"
28 / 1800	19.3	118.0	999	50	"
29 / 0000	19.8	118.8	1004	40	"
29 / 0600	20.2	119.5	1006	30	low
29 / 1200	20.5	120.1	1007	25	"
29 / 1800	20.8	120.5	1007	25	"
30 / 0000	21.2	121.0	1008	20	"
30 / 0600					dissipated
28 / 0000	17.0	114.8	992	65	minimum pressure and maximum wind speed

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%)	72	138
Medium (40%-60%)	54	90
High (>60%)	12	60

Table 3a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Hurricane Alvin, 25–29 June 2019. 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	35.2	60.9	83.0	108.3	81.5		
OCD5	50.5	101.3	142.0	163.4	51.6		
Forecasts	12	10	8	6	2		
OFCL (2014-18)	21.1	32.2	41.8	51.8	75.7	101.1	133.7
OCD5 (2014-18)	34.0	69.7	109.0	148.4	223.5	285.5	356.7

Table 3b. Homogeneous comparison of selected track forecast guidance models (in n mi) for Hurricane Alvin, 25–29 June 2019. 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	25.8	51.2	81.8	126.1	83.3		
OCD5	41.0	95.9	156.5	205.4	**61.6**		
DSHP	31.1	59.5	99.6	141.4	103.3		
TABS	38.4	73.3	103.5	133.6	**39.6**		
TABM	31.7	62.4	**81.3**	**82.3**	103.3		
TABD	31.4	62.9	**79.5**	**77.6**	180.1		
TVCE	**21.8**	**44.4**	**66.9**	**106.8**	**69.2**		
GFEX	**22.2**	**47.3**	**70.6**	**117.0**	124.8		
TVCX	**21.8**	**42.3**	**64.6**	**111.0**	100.0		
HCCA	**21.3**	**43.2**	**68.5**	**110.3**	139.1		
AEMI	28.6	54.8	**79.4**	**107.5**	108.3		
CTCI	26.5	**48.9**	**74.5**	**121.7**	**80.2**		
NVGI	37.8	71.5	103.9	**117.6**	99.1		
CMCI	27.8	**48.4**	**70.6**	**104.4**	138.1		
EMXI	30.0	53.2	87.5	166.1	249.2		
HWFI	**25.2**	**44.9**	**51.1**	**70.9**	120.8		
HMNI	29.6	55.8	**74.4**	**91.3**	**46.9**		
GFSI	28.5	58.4	85.4	**120.1**	93.6		
Forecasts	10	8	6	4	1		

Table 4a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Hurricane Alvin, 25–29 June 2019. 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	**3.3**	**7.0**	**10.6**	16.7	20.0		
OCD5	6.0	8.1	10.8	15.3	5.5		
Forecasts	12	10	8	6	2		
OFCL (2014-18)	6.1	10.0	12.2	13.7	15.5	15.4	15.7
OCD5 (2014-18)	7.9	13.1	16.7	19.2	21.8	22.9	22.1

Table 4b. Homogeneous comparison of selected intensity forecast guidance models (in kt) for Hurricane Alvin, 25–29 June 2019. 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	3.5	5.6	9.2	10.0	25.0		
OCD5	6.5	7.8	10.3	12.2	**10.0**		
IVCN	3.7	**4.4**	**8.3**	**9.2**	**23.0**		
ICON	3.6	**4.0**	**7.5**	**8.2**	**21.0**		
LGEM	5.9	9.5	12.2	10.5	30.0		
DSHP	5.1	7.6	**9.0**	**8.0**	**18.0**		
HCCA	4.0	**3.1**	**5.2**	**4.2**	**19.0**		
CTCI	3.9	6.4	12.7	16.5	29.0		
EMXI	9.1	13.0	17.8	20.2	28.0		
HWFI	**3.2**	**4.8**	**4.3**	**6.0**	**13.0**		
HMNI	4.0	6.8	10.5	14.2	25.0		
GFSI	5.9	9.4	14.0	14.8	30.0		
Forecasts	11	8	7	5	2		

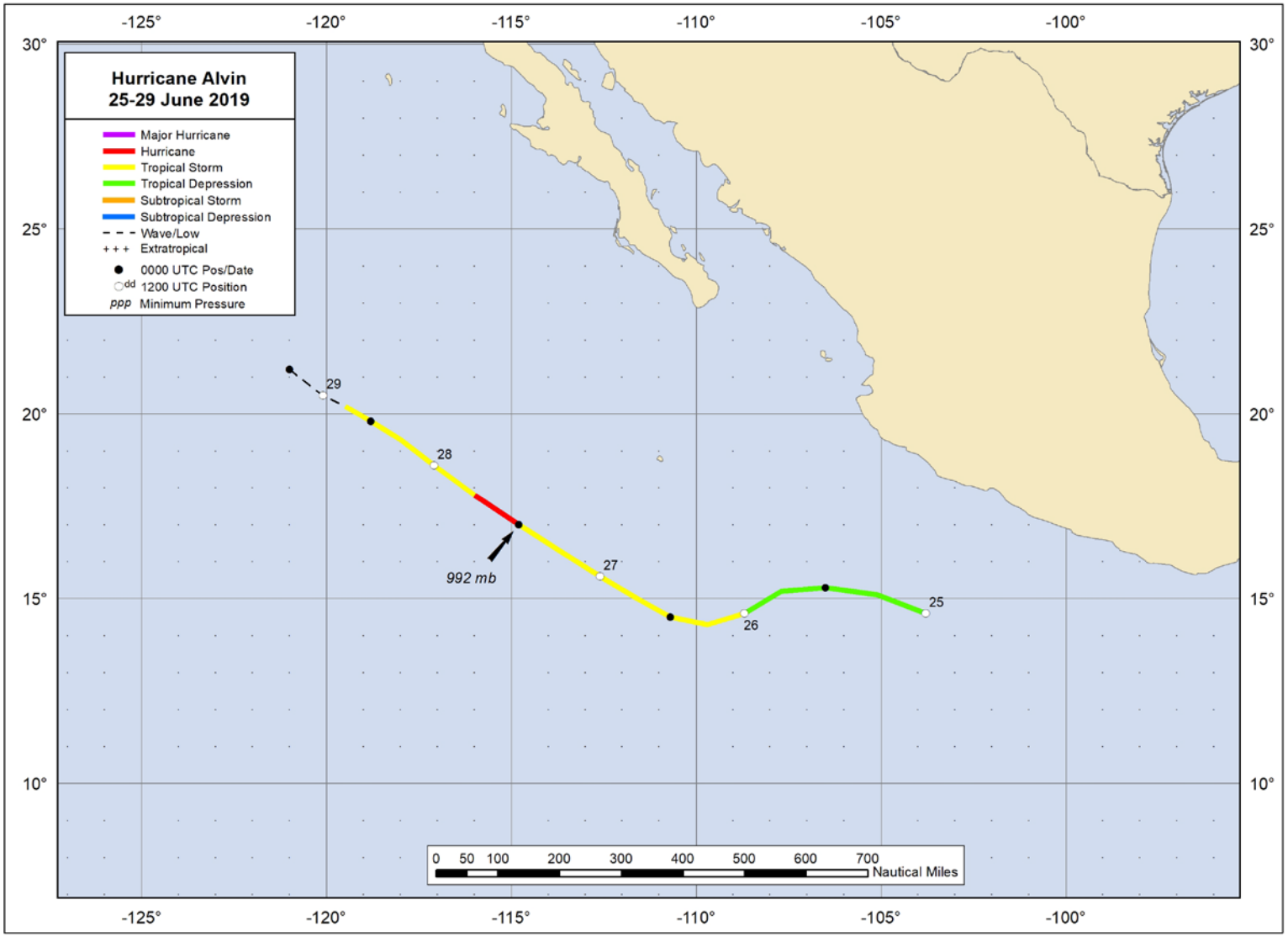

Figure 1. Best track positions for Hurricane Alvin, 25–29 June 2019.

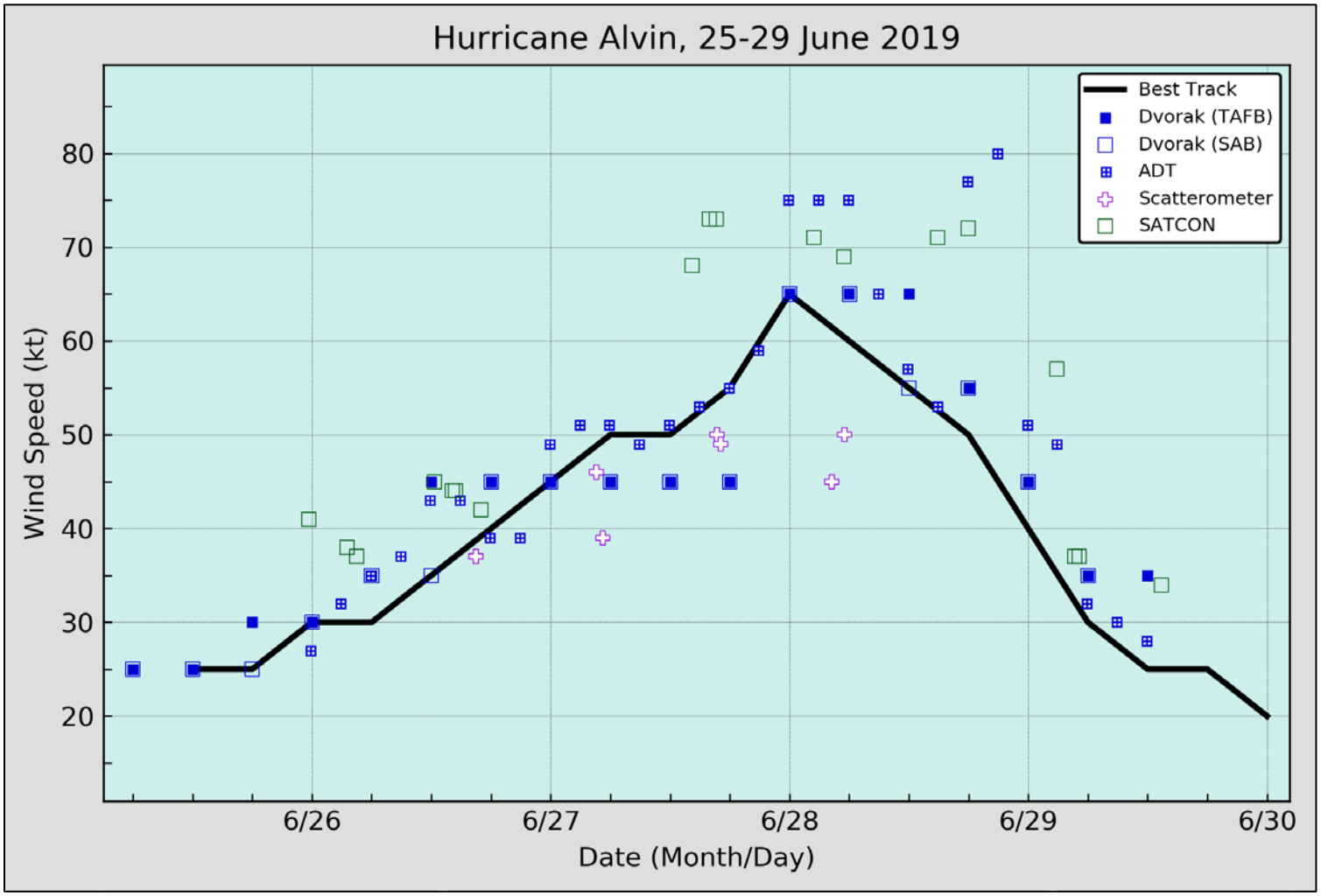

Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Hurricane Alvin, 25–29 June 2019. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies. Dashed vertical lines correspond to 0000 UTC.

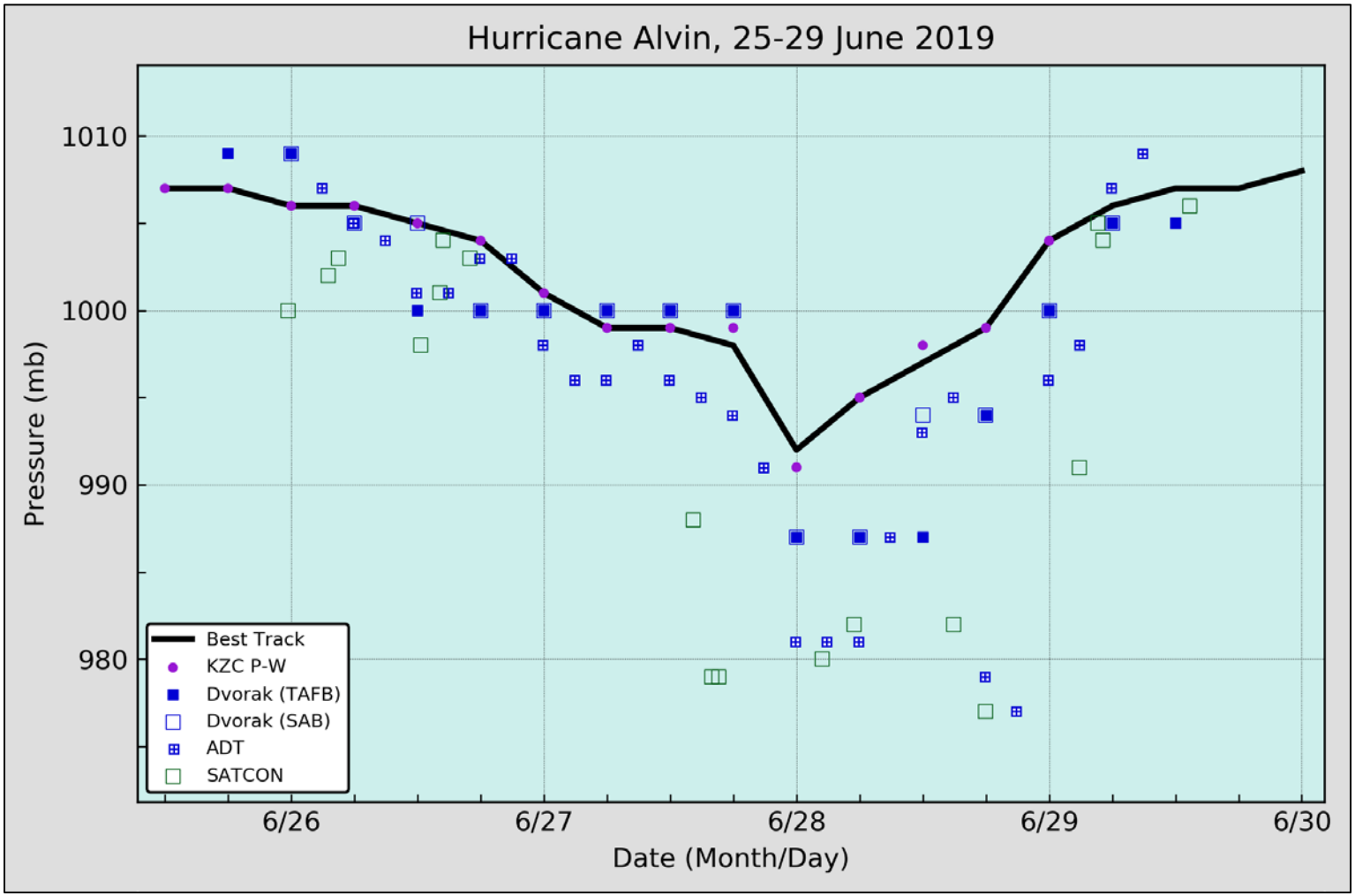

Figure 3. Selected pressure observations and best track minimum central pressure curve for Hurricane Alvin, 25–29 June 2019. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for Meteorological 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.

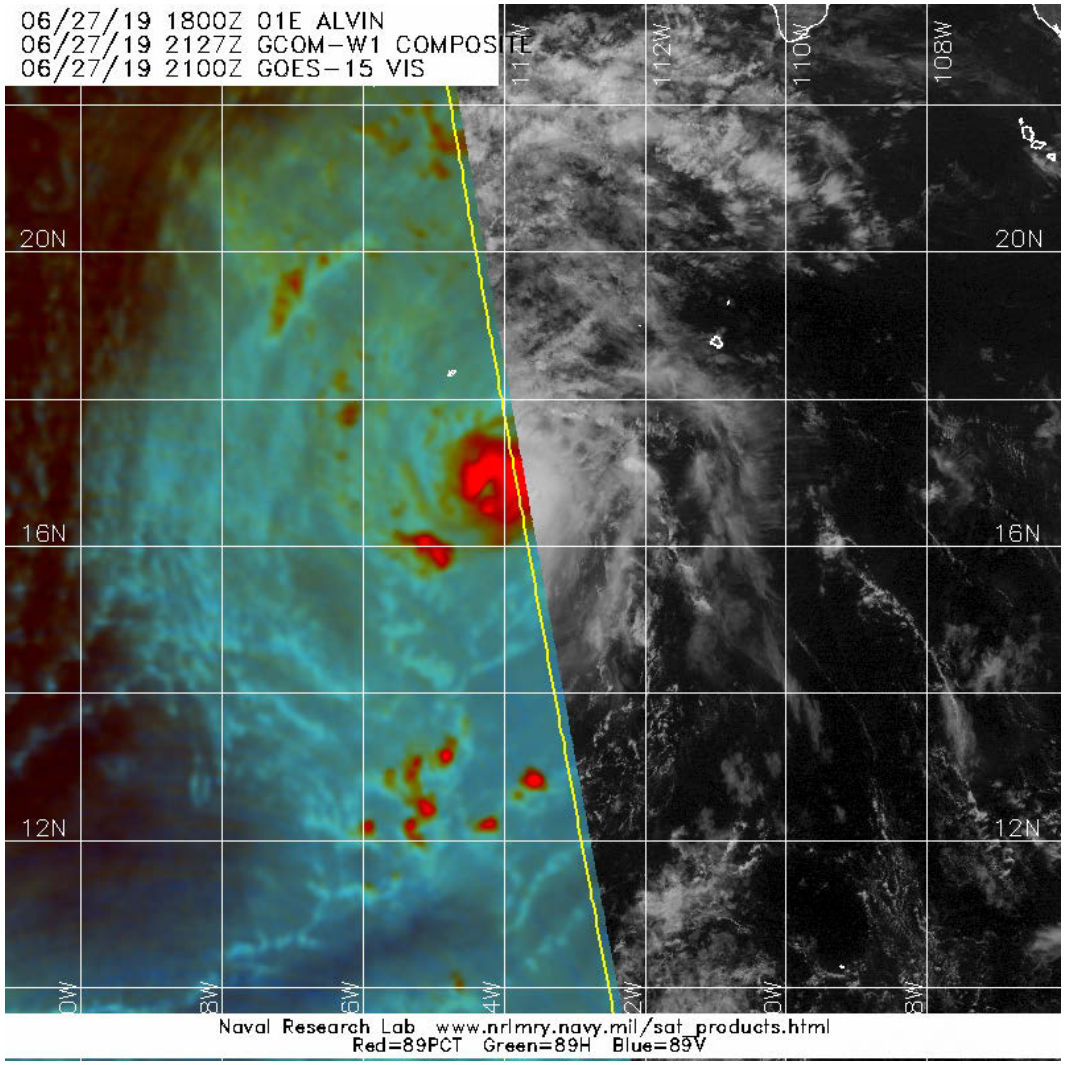

Figure 4. Global Change Observation Mission (GCOM) Advanced Microwave Scanning Radiometer 2 (AMSR2) 89-GHz color composite image of Alvin at 2127 UTC 27 June 2019. Image Courtesy of Naval Research Lab.