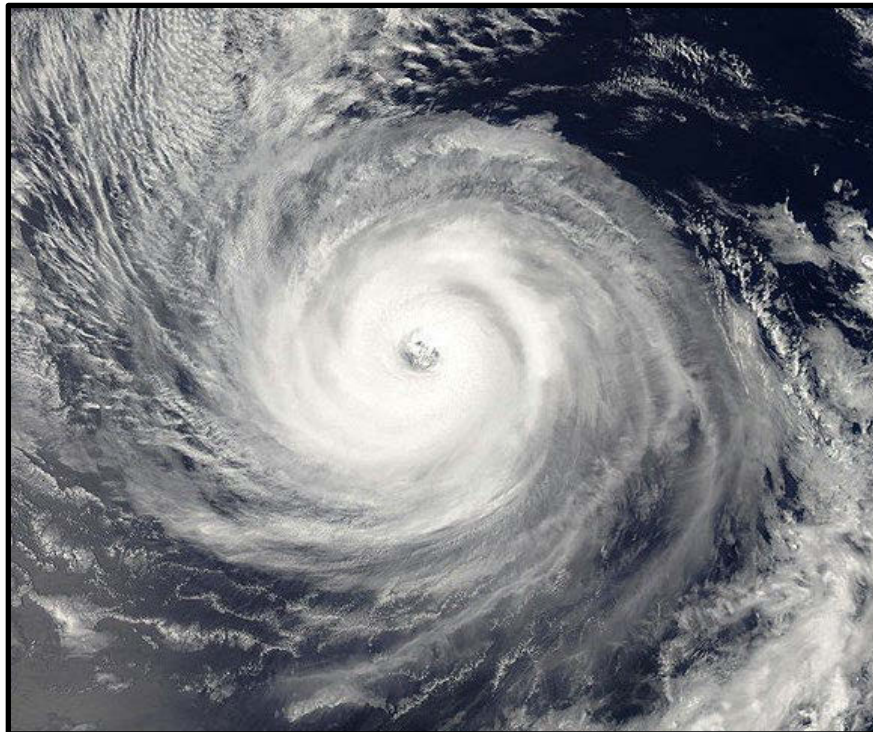# NATIONAL HURRICANE CENTER TROPICAL CYCLONE REPORT[1]

HURRICANE OLIVIA
(EP172018)
1–13 September 2018

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National Hurricane Center
3 December 2018

NASA MODIS VISIBLE SATELLITE IMAGE OF HURRICANE OLIVIA AT 2210 UTC 6 SEPTEMBER.

Olivia was a category 4 hurricane (on the Saffir-Simpson Hurricane Wind Scale) over the eastern Pacific Ocean. It weakened when it crossed into the central Pacific basin and moved across the Hawaiian Islands as a tropical storm.

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[1] This report focuses on Olivia's history in the National Hurricane Center's area of responsibility (east of 140°W longitude). The report will be updated once the Central Pacific Hurricane Center completes its analysis of the storm west of 140°W.

Hurricane Olivia

1–13 SEPTEMBER 2018

SYNOPTIC HISTORY

The genesis of Olivia can be traced back to a disturbance that formed over the southwestern Caribbean Sea on 26 August. This system moved westward across Central America and entered the far eastern North Pacific Ocean a couple of days later. Showers and thunderstorms gradually increased during the next few days, and a broad area of low pressure formed within the area of disturbed weather early on 31 August several hundred miles south of the southwestern coast of Mexico. Satellite images indicate that the low pressure system developed a well-defined center and sufficiently organized deep convection by 0000 UTC 1 September to mark the formation of a tropical depression about 350 n mi southwest 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[2].

Despite being over warm water, northeasterly vertical wind shear prevented the depression from strengthening during the next 18 h while the system moved west-northwestward on the southwestern side of a subtropical ridge. Although the shear remained relatively strong, thunderstorm activity consolidated near and to the west of the center of the cyclone late on 1 September, and as a result, the system strengthened to a tropical storm by 0000 UTC 2 September when it was located about 450 n mi south of Cabo San Lucas, Mexico. Olivia then turned to the northwest, moving toward a weakness in the ridge, and strengthened only slowly due to the continued influence of northeasterly shear during the next day or so.

The shear relaxed significantly by early on 3 September, and Olivia began to rapidly intensify while it turned westward and accelerated due to a building subtropical ridge. Olivia reached hurricane intensity by 0000 UTC 4 September when it was located about 500 n mi southwest of Cabo San Lucas, and it reached its first peak intensity of 110 kt by 0000 UTC the following day. This period marked an impressive 70-kt increase in strength in 48 h. Shortly after that time, however, the northern eyewall began to collapse, likely due to an increase in northerly shear and dry air entrainment, and Olivia weakened. The hurricane's intensity decreased to 85 kt by 1800 UTC 5 September, at which time the eye was quite ragged, and the convective pattern was asymmetric.

Unexpectedly, the hurricane began to restrengthen on 6 September. The eye of Olivia became much more circular, and a ring of deep convection surrounded that feature throughout the day. The hurricane reached its maximum intensity as a category 4 hurricane on the Saffir-Simpson Hurricane Wind Scale with peak winds of 115 kt (cover image) by 0000 UTC 7

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[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.

September when it was located a little more than 1100 n mi west of Cabo San Lucas. While Olivia was strengthening, it was moving west-northwestward at about 13 kt on the south-southwestern periphery of a deep-layer ridge. Around the time of peak intensity, Olivia developed an annular appearance in satellite imagery, consisting of a well-organized inner core and a lack of outer banding features.

Shortly after obtaining category 4 intensity, cool 25–26°C sea-surface temperatures and dry and stable low- to mid-level air caused Olivia to weaken. However, this time the weakening trend persisted, and Olivia crossed 140°W into the Central Pacific Hurricane Center's area of responsibility just before 0000 UTC 9 September as a category 1 hurricane on the Saffir-Simpson Hurricane Wind Scale.

METEOROLOGICAL STATISTICS

Observations in Hurricane Olivia in the eastern Pacific basin (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 and Satellite Consensus (SATCON) 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 Olivia.

Olivia's maximum intensity of 115 kt at 0000 UTC 7 September is based on Dvorak estimates of T6.0/115 kt from TAFB and SAB. This estimate is slightly below the highest ADT values during that time period. The estimated minimum pressure of 951 mb is based on the Knaff-Zehr-Courtney pressure-wind relationship.

There were no land-based or ship reports of winds of tropical storm force in association with Olivia in the eastern Pacific basin.

CASUALTY AND DAMAGE STATISTICS

There were no reports of damage or casualties associated with Olivia within NHC's area of responsibility.

FORECAST AND WARNING CRITIQUE

The genesis of Olivia was fairly well forecast, but the cyclone formed a little sooner than expected (Table 2). The possibility of tropical cyclone formation was introduced in NHC's 5-day Tropical Weather Outlook 102 h before genesis, and the chances were raised to the medium and high categories 66 h and 42 h before formation, respectively. The precursor disturbance was given a 2-day genesis probability in the low category 54 h before formation. The 48-h genesis potential was raised to the medium category 30 h before formation and the high category 12 h before development occurred. The NHC forecasts correctly anticipated the conducive environmental conditions that supported the genesis of Olivia.

A verification of NHC official track forecasts for Olivia is given in Table 3a. The official forecast track errors were much lower than the mean official errors for the previous 5-yr period at all forecast times. In fact, the 120-h error was about 60% smaller than the mean and the lowest 120-h average track forecast error on record in the eastern Pacific basin for tropical cyclones with 20 or more forecasts at this verifying time. A homogeneous comparison of the official track errors with selected guidance models is given in Table 3b. The only guidance that consistently beat the official forecast was the consensus model TVCE, though some of the other consensus aids (HCCA, TVCX, and GFEX) also beat the official forecast at the short lead times. Among the individual models, HMON (HMNI) was a strong performer for Olivia and it also had lower errors than the official forecast at 48 and 72 h.

A verification of NHC official intensity forecasts for Olivia is given in Table 4a. Official forecast intensity errors were lower than the mean official errors for the previous 5-yr period at 36 h, but slightly higher than the mean at the remaining forecast times. A homogeneous comparison of the official intensity errors with selected guidance models is given in Table 4b. Unlike the track forecasts, no model consistently beat the official forecasts. However, HCCA, FSSE, and GFSI had slightly lower errors at some time periods from 12 to 72 h, and HWFI had slightly lower errors at 96 and 120 h. The largest contributor to the error of the official forecasts were low biases during the two intensification phases (Fig. 4).

No coastal watches or warnings were issued in association with Olivia in the eastern Pacific basin.

Table 1.   Best track for Hurricane Olivia, 1–13 September 2018. A post-storm analysis has not yet been completed for the portion of the track west of 140°W longitude, and all data for this portion of the storm's history reflect near-real-time estimates from the Central Pacific Hurricane Center.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
01 / 0000	14.3	107.8	1007	30	tropical depression
01 / 0600	14.5	108.7	1007	30	"
01 / 1200	14.7	109.6	1007	30	"
01 / 1800	15.0	110.5	1006	30	"
02 / 0000	15.4	111.2	1004	35	tropical storm
02 / 0600	15.9	111.7	1002	40	"
02 / 1200	16.5	112.1	1002	40	"
02 / 1800	16.8	112.8	1002	40	"
03 / 0000	16.9	113.4	1001	40	"
03 / 0600	16.8	114.0	999	45	"
03 / 1200	16.7	114.4	996	50	"
03 / 1800	16.7	114.9	991	60	"
04 / 0000	16.8	115.6	987	65	hurricane
04 / 0600	16.9	116.6	985	75	"
04 / 1200	16.9	117.6	971	90	"
04 / 1800	16.8	118.6	963	100	"
05 / 0000	16.8	119.6	954	110	"
05 / 0600	16.8	120.7	963	100	"
05 / 1200	17.0	121.8	966	95	"
05 / 1800	17.2	123.0	975	85	"
06 / 0000	17.5	124.1	976	85	"
06 / 0600	17.8	125.3	975	90	"
06 / 1200	18.1	126.6	959	100	"
06 / 1800	18.5	127.9	954	110	"
07 / 0000	18.9	129.2	951	115	"
07 / 0600	19.4	130.5	955	105	"
07 / 1200	19.9	131.8	965	95	"

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
07 / 1800	20.3	133.2	970	90	"
08 / 0000	20.7	134.5	975	85	"
08 / 0600	21.1	135.9	980	80	"
08 / 1200	21.4	137.3	983	75	"
08 / 1800	21.6	138.7	983	75	"
09 / 0000	21.8	140.3	985	70	"
09 / 0600	21.8	141.7	985	70	"
09 / 1200	21.8	143.2	989	65	"
09 / 1800	21.7	144.5	988	65	"
10 / 0000	21.7	145.6	988	65	"
10 / 0600	21.7	146.5	980	75	"
10 / 1200	21.7	147.5	980	75	"
10 / 1800	21.7	148.2	985	65	"
11 / 0000	21.8	148.9	991	60	tropical storm
11 / 0600	21.9	149.7	996	60	"
11 / 1200	21.9	150.7	999	55	"
11 / 1800	21.7	152.0	1000	50	"
12 / 0000	21.1	153.8	1003	45	"
12 / 0600	20.9	154.3	1005	40	"
12 / 1200	21.0	155.1	1005	40	"
12 / 1800	21.1	156.3	1005	40	"
13 / 0000	20.5	158.1	1007	35	"
13 / 0600	20.1	159.8	1008	30	tropical depression
13 / 1200	19.7	161.5	1008	30	"
13 / 1800	19.1	162.4	1009	30	"
14 / 0000	19.0	163.6	1009	30	low
14 / 0600	19.1	164.7	1009	30	"
14 / 1200	19.0	165.9	1009	30	"
14 / 1800	18.9	167.0	1008	30	"
15 / 0000	18.9	168.3	1008	30	"
15 / 0600	19.1	169.5	1008	30	"

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
15 / 1200	19.6	170.3	1008	30	"
15 / 1800	20.3	170.7	1009	30	"
16 / 0000	20.6	171.6	1009	30	"
16 / 0600	21.2	172.2	1009	30	"
16 / 1200	21.8	173.2	1010	25	"
16 / 1800	22.2	174.0	1011	25	"
17 / 0000	22.6	174.9	1008	25	"
17 / 0600	22.9	175.7	1008	25	"
17 / 1200	23.1	176.5	1008	25	"
17 / 1800	23.1	177.1	1008	25	"
18 / 0000	22.8	177.7	1009	25	"
18 / 0600	22.5	178.3	1009	25	"
18 / 1200	22.3	178.7	1009	25	"
18 / 1800	22.0	179.0	1009	25	"
19 / 0000					dissipated
07 / 0000	18.9	129.2	951	115	maximum wind 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%)	54	102
Medium (40%-60%)	30	66
High (>60%)	12	42

Table 3a.   NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Hurricane Olivia. 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	**17.6**	**27.0**	**32.6**	**38.7**	**50.0**	**56.2**	**60.5**
OCD5	28.7	59.1	96.1	137.6	227.8	323.4	441.1
Forecasts	32	32	32	32	32	32	32
OFCL (2013-17)	21.8	33.2	43.0	53.9	80.7	111.1	150.5
OCD5 (2013-17)	34.9	70.7	109.1	146.1	213.8	269.0	339.7

Table 3b.   Homogeneous comparison of selected track forecast guidance models (in n mi) for Hurricane Olivia. 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	16.3	23.2	29.2	37.8	50.9	54.9	57.8
OCD5	29.2	59.8	98.4	142.9	243.3	350.2	480.0
GFSI	18.2	28.0	34.6	42.5	62.6	88.8	115.3
HWFI	19.4	30.7	36.8	44.0	64.0	73.7	80.6
HMNI	17.9	27.8	32.3	**36.6**	**41.0**	60.7	89.3
EGRI	19.7	28.2	38.7	49.3	73.7	102.7	132.8
EMXI	18.0	28.7	44.0	58.9	84.2	95.1	99.4
CMCI	20.3	32.3	43.1	53.7	58.5	64.3	106.8
NVGI	25.6	42.0	61.9	79.9	104.8	127.0	148.0
AEMI	18.2	32.7	43.6	52.4	71.3	77.8	76.5
HCCA	**15.9**	**20.3**	**25.0**	**32.4**	52.6	57.0	62.9
FSSE	16.7	23.6	29.4	38.7	56.7	70.5	88.8
TVCX	**16.0**	**22.1**	**27.0**	**34.2**	51.6	59.3	58.3
TVCE	**15.6**	**22.0**	**25.1**	**31.9**	**45.3**	**52.7**	**51.6**
GFEX	**15.7**	**21.3**	**28.6**	38.6	57.5	72.6	80.3
TABS	34.6	73.2	110.7	144.7	203.4	227.6	233.3
TABM	20.2	29.7	36.4	45.5	71.9	93.8	117.2
TABD	20.3	29.4	34.2	42.9	63.2	100.1	150.5
Forecasts	28	28	28	28	28	28	28

Table 4a.   NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Hurricane Olivia. 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	7.8	10.8	**11.6**	13.4	15.2	15.8	15.6
OCD5	10.0	15.8	18.3	20.3	24.7	25.1	20.0
Forecasts	32	32	32	32	32	32	32
OFCL (2013-17)	5.8	9.6	11.8	13.2	15.1	15.1	14.6
OCD5 (2013-17)	7.6	12.4	15.6	17.7	19.8	20.8	19.6

Table 4b.   Homogeneous comparison of selected intensity forecast guidance models (in kt) for Hurricane Olivia. 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	8.8	12.0	12.9	14.1	15.4	16.2	16.8
OCD5	10.7	17.5	19.8	21.8	25.0	23.2	17.2
HWFI	9.4	13.5	15.4	14.8	16.9	**15.0**	**15.1**
HMNI	9.2	13.6	15.5	18.4	22.1	23.9	21.7
DSHP	9.7	14.5	15.1	16.8	17.6	18.8	18.1
LGEM	9.1	14.2	16.3	19.6	23.4	25.8	25.6
HCCA	**7.7**	**11.2**	13.4	**13.6**	17.5	18.6	18.9
FSSE	**7.5**	**11.6**	13.0	15.2	19.3	21.4	20.6
IVCN	**7.5**	12.1	13.6	15.9	19.1	19.5	17.9
GFSI	**8.2**	13.0	13.6	**11.9**	**14.5**	19.2	20.9
EMXI	10.6	15.1	17.5	20.5	22.2	24.0	22.1
Forecasts	28	28	28	28	28	28	28
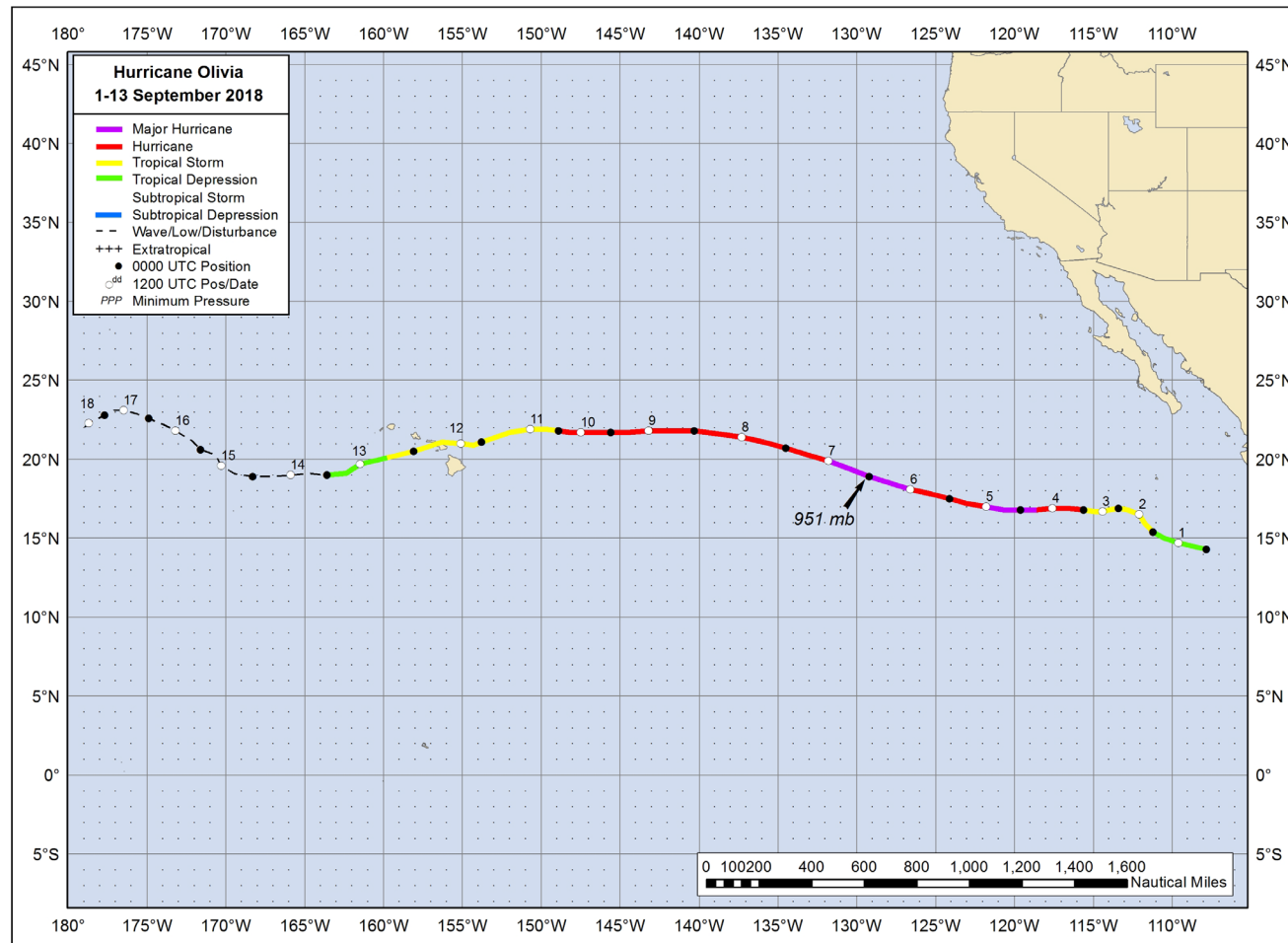
Figure 1.   Best track positions for Hurricane Olivia, 1–13 September 2018. A post-storm analysis has not yet been completed for the portion of the track west of 140°W longitude, and all data for this portion of the storm's history reflect near-real-time estimates from the Central Pacific Hurricane Center.
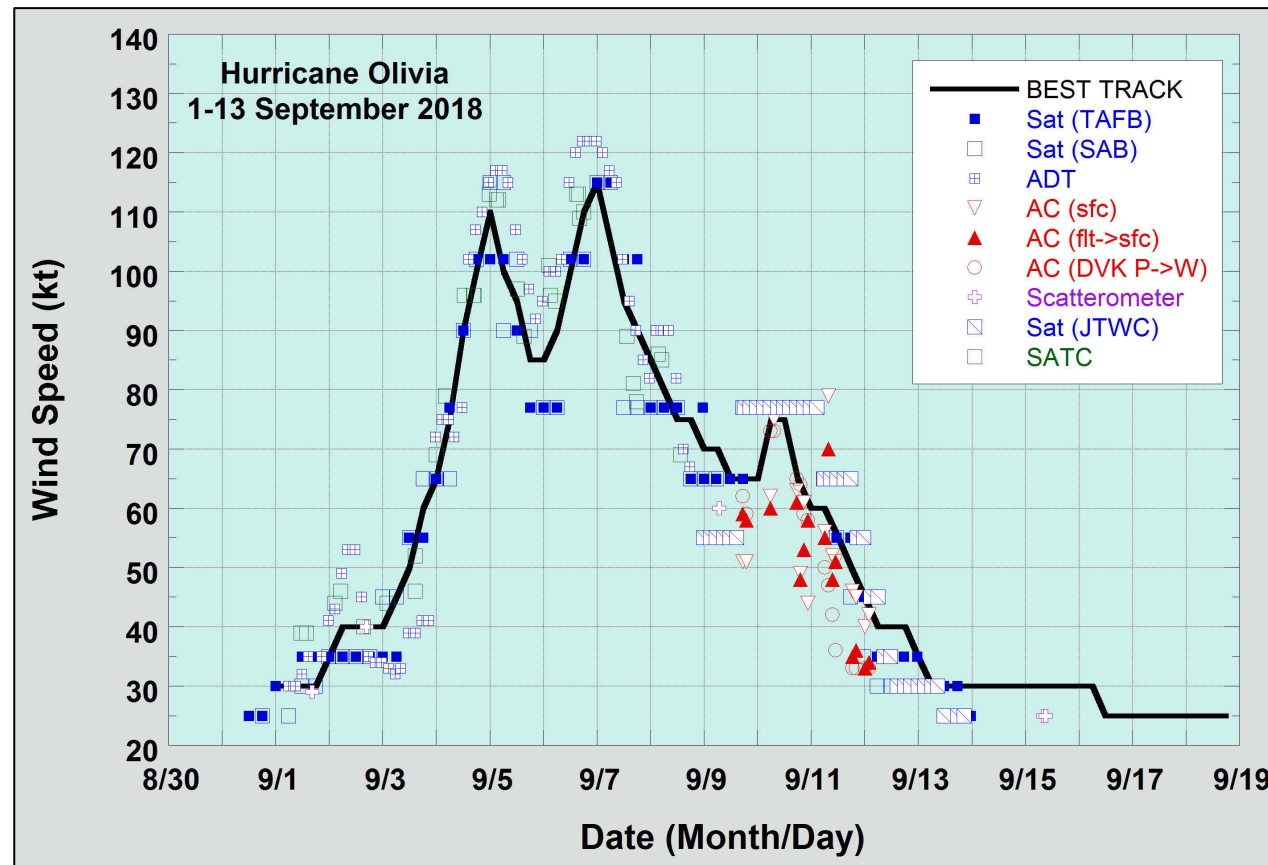
Figure 2.   Selected wind observations and best track maximum sustained surface wind speed curve for Hurricane Olivia, 1–13 September 2018. Aircraft observations have been adjusted for elevation using a 90% adjustment factor for observations from 700 mb. Advanced Dvorak Technique estimates represent 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. A post-storm analysis has not yet been completed for the portion of the track west of 140°W longitude, and all data for this portion of the storm's history reflect near-real-time estimates from the Central Pacific Hurricane Center.
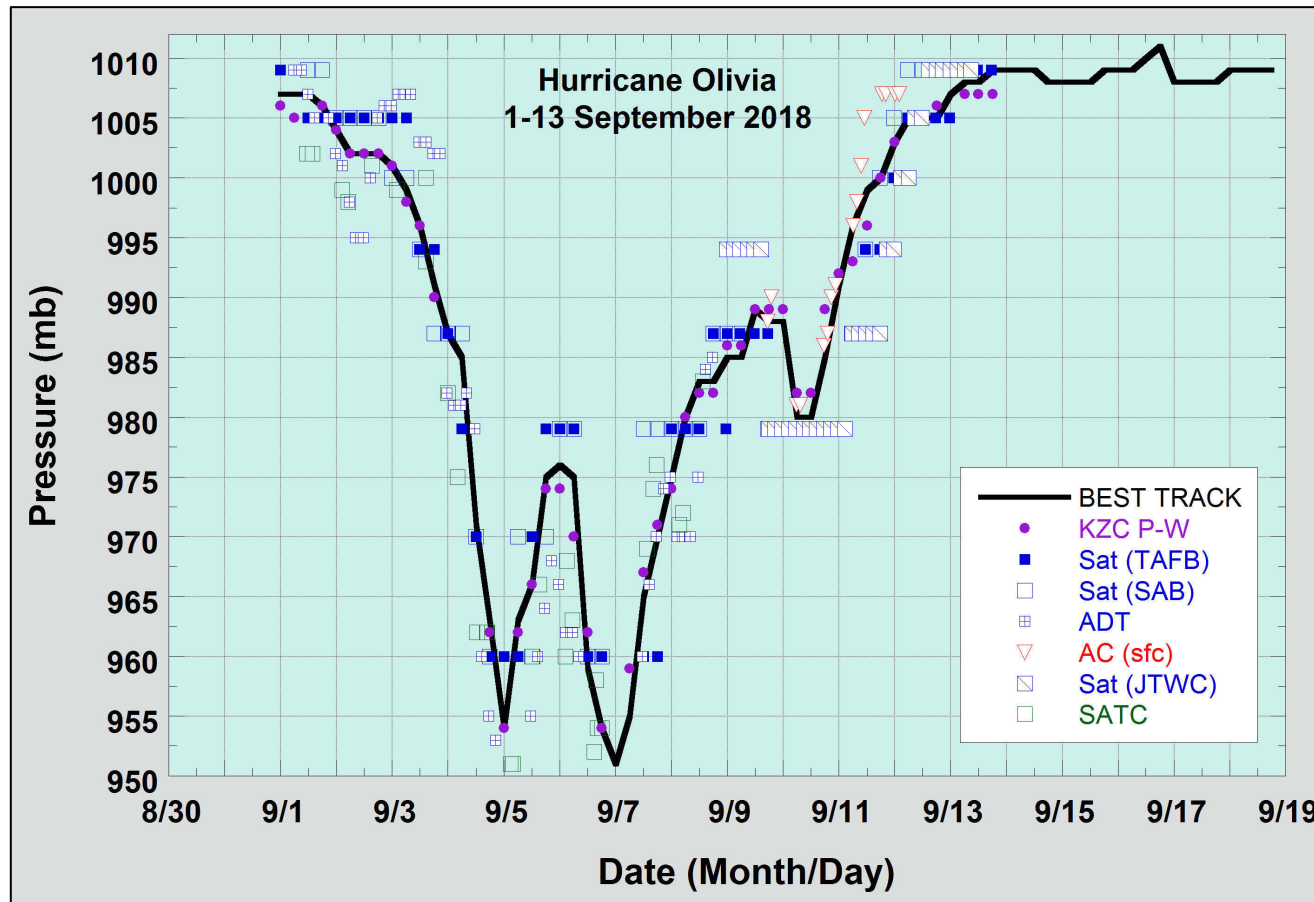
Figure 3.   Selected pressure observations and best track minimum central pressure curve for Hurricane Olivia, 1–13 September 2018. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for Meteorological 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. A post-storm analysis has not yet been completed for the portion of the track west of 140°W longitude, and all data for this portion of the storm's history reflect near-real-time estimates from the Central Pacific Hurricane Center.
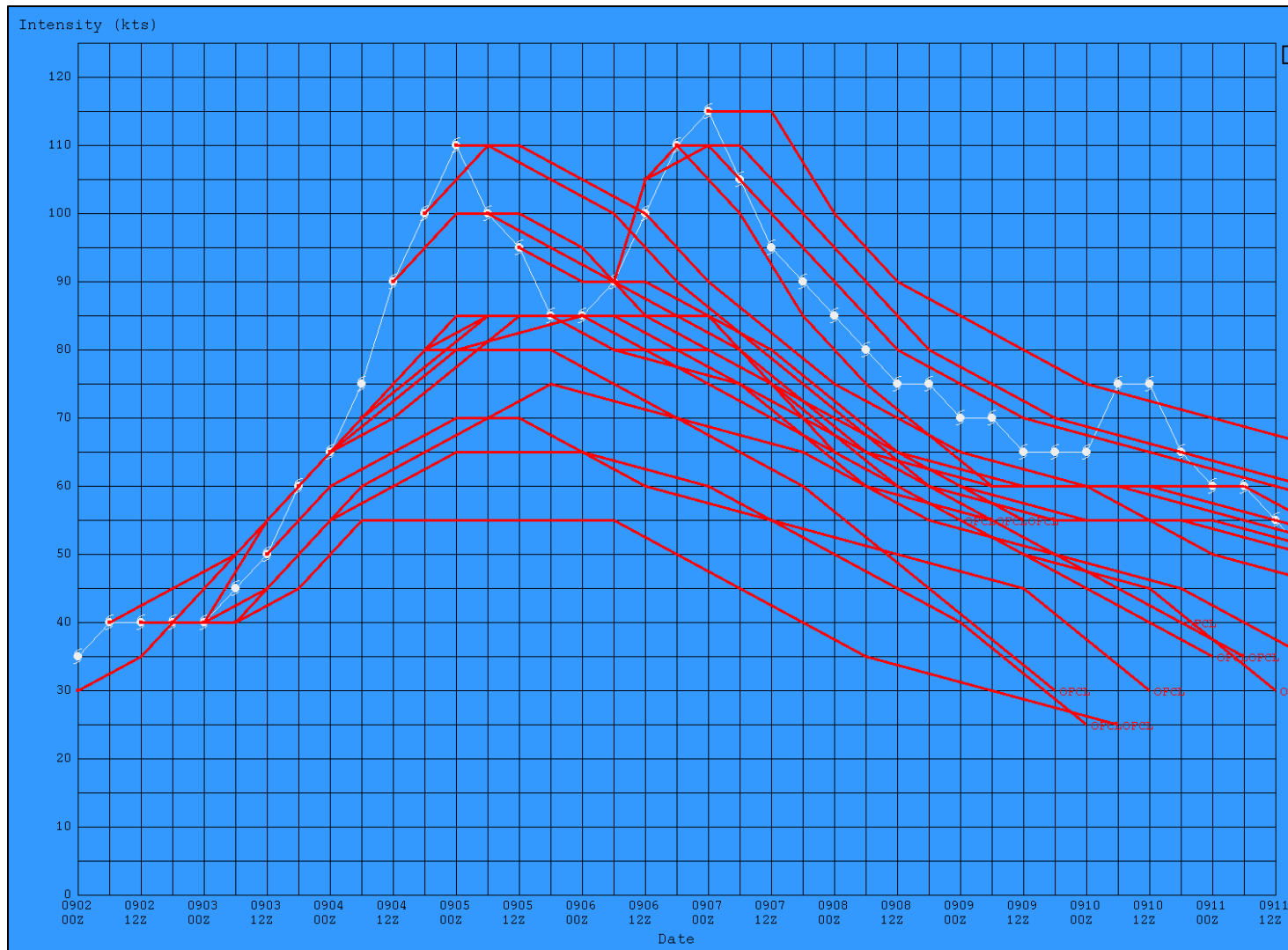
Figure 4.   NHC official intensity forecast (kt, red lines) from 0000 UTC 2 September to 0000 UTC 7 September 2018 for Hurricane Olivia. The verifying intensity is shown in white.