CENTRAL PACIFIC HURRICANE CENTER
TROPICAL CYCLONE REPORT

TROPICAL STORM IUNE

(CP022015)

10 – 13 July 2015

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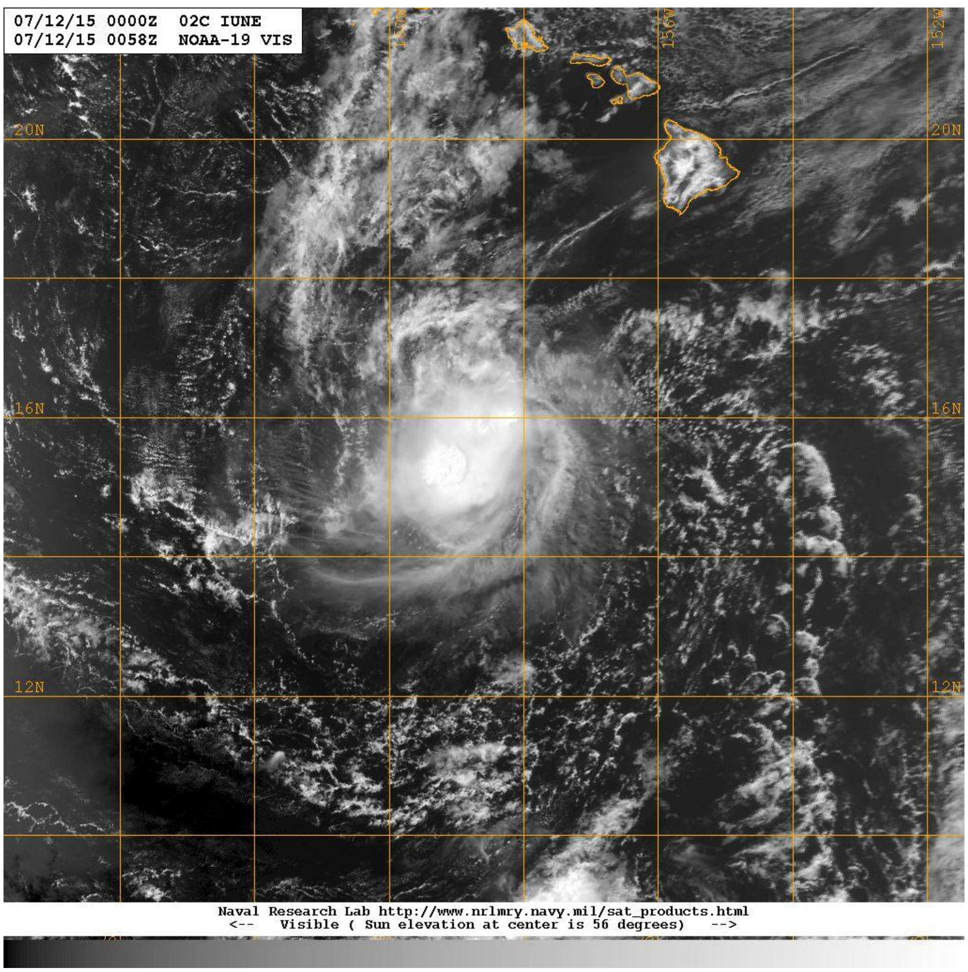

NOAA-19 VISIBLE SATELLITE IMAGE OF TROPICAL STORM IUNE AT 0058 UTC 12 JULY 2015 (COURTESY OF THE NAVAL RESEARCH LABORATORY)

Iune was a minimal and short-lived tropical storm that remained over the open waters of the Central North Pacific basin during the historically active 2015 hurricane season.

Tropical Storm Iune

10 – 13 JULY 2015

SYNOPTIC HISTORY

Iune developed from a persistent and highly anomalous monsoon trough over the central Pacific basin. As previously noted by the Tropical Cyclone Report for Tropical Storm Halola[1], this trough, which had already spawned a pair of tropical cyclones in the western Pacific, would ultimately produce three additional tropical cyclones in the central Pacific basin and the far western portion of the eastern Pacific basin during the 8 to 10 July time period. Iune was between the two other systems (Tropical Storm Ela to the east and Tropical Storm Halola to the west), all of which developed within a couple of days of each other. Iune formed on the same date, 10 July, that Halola also became a tropical cyclone. These two systems were among the first systems observed in what would become the most active central Pacific hurricane season on record.

The disturbance within the monsoon trough which would eventually develop into Iune was first identified as a weak low pressure area on 2 July, located about 800 n mi southeast of Hawaii. This feature developed very slowly during the next several days while drifting generally to the west-northwest. Evidence of a broad low-level circulation appeared in the European Space Agency Advanced Scatterometer (ASCAT) pass at 0700 UTC on 7 July. The low pressure area continued to gradually become better defined while moving slowly westward, with the associated deep convection becoming more separated from the monsoon trough, during the subsequent 48 hours. By 0600 UTC 10 July, there was sufficient persistent and organized deep convection near the low-level circulation center (LLCC), with subjective Dvorak intensity estimates of 25-30 kt from all of the satellite fix agencies, to designate the system as Tropical Depression Two-C, centered about 650 n mi southeast of Honolulu, Hawaii.

Immediately after being declared a tropical cyclone, the depression turned abruptly to the northwest, after moving generally westward to the south of a low-level ridge during the previous couple of days. This turn occurred due to the combined influences of a low-level trough extending southwest from the remnants of Tropical Storm Ela, and a large upper-level trough located to the northwest of the depression. Two-C continued to the northwest with no significant change of intensity for the remainder of 10 July, with the LLCC becoming partially exposed on the southeast side of a small area of deep convection that evening. Although analyzed vertical wind shear was only 10 to 15 kt at this time, the small size of the system likely caused increased sensitivity to even relatively low amounts of shear.

During the morning of 11 July, the tropical cyclone began to track more toward the west-northwest, with deep convection developing over the LLCC once again. Analyzed vertical wind shear decreased to

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[1] "Central Pacific Hurricane Center Tropical Cyclone Report – Tropical Storm Halola" 9 July 2017 http://www.prh.noaa.gov/cphc/summaries/2015/Final-CP012015.pdf

5 kt or less during this time, and there was sufficient persistence and organization of deep convection to support upgrading the cyclone to Tropical Storm Iune at 1800 UTC. This status was confirmed by a subsequent 1949 UTC ASCAT pass, which depicted a small area of 35 kt winds in the northeast quadrant of Iune. However, this improved organization would be short-lived, as by 0600 UTC 12 July, data from the Advanced Microwave Sounding Unit (AMSU) instrument revealed that the LLCC had become exposed once again to the south of the deep convection. Iune turned toward the west-southwest around this time, and did not regain organized central deep convection over the LLCC during the day of 12 July. It appears that light southerly shear due to the continued presence of an upper-level trough to the north, combined with mid-level dry air entrainment from the west into the small circulation of Iune was sufficient to permanently disrupt the fragile system. Iune became a 30 kt tropical depression at 1800 UTC 12 July.

Due to a continued lack of any organized deep convection near the fully exposed LLCC, Iune was declared a post-tropical remnant low at 1200 UTC 13 July, located about 520 n mi southwest of Honolulu, Hawaii. The remnant low of Iune continued tracking westward for the next few days to the south of the low-level ridge, producing intermittent but disorganized bursts of convection, and passing about 160 n mi south of Johnston Atoll on 14-15 July. The remnant low finally dissipated by 1200 UTC 17 July, when it was located about 450 n mi west of Johnston Atoll and was approaching the International Date Line.

The “best track” chart of the tropical cyclone’s path is given in Fig. 1. The best track positions and intensities are listed in Table 1[2].

METEOROLOGICAL STATISTICS

Observations of Iune include subjective satellite-based Dvorak technique intensity estimates from the Satellite Analysis Branch (SAB), the Central Pacific Hurricane Center (CPHC), and the Joint Typhoon Warning Center (JTWC) using satellite imagery from the Himawari and GOES-15 satellites. They also include objective Advanced Dvorak Technique (ADT) estimates from the Cooperative Institute for Meteorological Satellite Studies/University of Wisconsin-Madison (CIMSS). Data and imagery from NOAA polar-orbiting satellites including the Advanced Microwave Sounding Unit (AMSU), the European Space Agency’s Advanced Scatterometer (ASCAT), WindSat, and Defense Meteorological Satellite Program (DMSP) satellites, among others, were also useful in constructing the best track of Iune.

The peak intensity of 35 kt for Iune is based on Dvorak satellite estimates from CPHC, SAB, and JTWC, ASCAT data, and ADT estimates from CIMSS. There were no surface observations or ship reports received of tropical-storm-force winds associated with Iune.

CASUALTY AND DAMAGE STATISTICS

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

[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.

FORECAST AND WARNING CRITIQUE

The genesis of Tropical Storm Iune was anticipated many days in advance, although genesis probability forecasts near the time of actual tropical cyclone formation were increased to the medium and high categories with little to no lead time (see Table 2). It should be noted that in 2015, CPHC only produced tropical cyclone genesis forecasts for a 48 h outlook period. The first mention of the precursor disturbance appeared in the Tropical Weather Outlook issued at 0000 UTC 4 July, with the 48 h tropical cyclone formation probability assessed at 20% at that time. This was 150 hours prior to the eventual development of the disturbance into a tropical cyclone at 0600 UTC 10 July. 48 h formation probabilities were held in the "low" category (10-30%) for several days thereafter, as the weak low pressure area remained entangled within the monsoon trough for much of that time period. The 48 h formation probability was increased to the "medium" category (40-60%) at 0000 UTC 10 July, with "some signs of low-level organization" noted in the Tropical Weather Outlook text. Visible satellite imagery depicted the LLCC becoming increasingly well-defined and detached from the monsoon trough around this time. The 48 h formation probability was further increased to the "high" category (> 60%) just six hours later at 0600 UTC 10 July. CPHC declared the system to be a tropical depression at that same synoptic hour and commenced issuing advisories.

A verification of CPHC official track forecasts for Iune is provided in Table 3a. The official track forecast errors were slightly higher than the average for the previous 5-yr period at the 12 h and 24 h projections, then were lower than the previous 5-yr period averages at the projections for 36 h through 72 h (Iune did not exist as a tropical cyclone long enough for there to be any verifying forecasts at 96 h and 120 h). The relatively larger errors in the 12 h and 24 h projections appear to be mainly due to an abrupt turn to the northwest that occurred during the first 12 hours after Iune became a tropical cyclone. This motion represented a large change from the previously observed west to west-southwest track during the incipient disturbance stage. The cyclone motion settled into a more predictable and gradual curve from northwestward to westward then west-southwestward thereafter, resulting in relatively smaller track errors for forecasts issued early in the life cycle of the cyclone valid for the later time projections. A homogeneous comparison of the official track errors with selected guidance models is given in Table 3b. As noted above, the official forecast errors were relatively large at the 12 h and 24 h projections, with all of the track models included in the analysis recording lower errors than the official forecasts at 12 h, and the majority of the track models also recording lower errors than official at 24 h. Examination of the initial few track forecasts issued after Iune became a tropical cyclone shows that the majority of the track guidance was able to forecast the abrupt northwestward turn more accurately than the official CPHC forecasts. Forecast difficulty was increased by significant spread in the models during this time, with normally reliable guidance such as the EMXI well to the south and west of the actual track. The Canadian CMCI model performed the best overall, with lower errors than OFCL at all forecast times, and the lowest errors of any track model analyzed at the 36 h through 72 h forecast times. The consensus TVCE also performed very well during Iune, with the exception of the 72 h forecast time, when a significantly larger error was observed. This was caused by some unusually large errors in the normally reliable GFSI and EMXI components of the consensus for the lone forecast that verified at 72 h.

A verification of CPHC official intensity forecasts for Iune is given in Table 4a. The official forecast intensity errors were lower than the mean official errors for the previous 5-yr period for all projections through 48 h, then were somewhat higher than the previous 5-yr average for the single verifying 72 h forecast. A homogeneous comparison of the official intensity errors with selected guidance models is given in Table 4b. The GFSI and EMXI performed extremely well with Iune, correctly forecasting little change of intensity throughout the cyclone's lifetime, with the GFSI performing the best of any guidance model. The statistical DSHP and LGEM intensity models did not perform as well, with large errors of 33 kt and 28 kt respectively for the single verifying 72 h forecast. The statistical models, and many of the earlier official forecasts, predicted significant intensification, when in fact little intensification occurred. The CPHC tropical cyclone discussions did consistently note the higher than normal uncertainty associated with the intensity forecast.

No coastal tropical cyclone watches or warnings were issued for Iune.

Table 1. Best track for Tropical Storm Iune, 10-13 July 2015.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
08 / 1800	11.5	150.5	1007	25	low
09 / 0000	11.5	151.3	1007	25	"
09 / 0600	11.5	152.0	1007	25	"
09 / 1200	11.4	152.7	1007	25	"
09 / 1800	11.2	153.5	1007	25	"
10 / 0000	11.0	154.1	1007	25	"
10 / 0600	10.9	154.4	1006	30	tropical depression
10 / 1200	11.3	154.9	1005	30	"
10 / 1800	11.9	154.8	1005	30	"
11 / 0000	12.5	155.2	1005	30	"
11 / 0600	13.1	155.9	1005	30	"
11 / 1200	13.7	156.8	1005	30	"
11 / 1800	14.4	157.6	1004	35	tropical storm
12 / 0000	14.9	158.5	1004	35	"
12 / 0600	15.2	159.3	1004	35	"
12 / 1200	15.1	160.0	1005	35	"
12 / 1800	14.8	160.6	1006	30	tropical depression
13 / 0000	14.5	161.4	1007	25	"
13 / 0600	14.4	162.3	1008	25	"
13 / 1200	14.4	163.4	1008	25	low
13 / 1800	14.3	164.4	1008	25	"
14 / 0000	14.3	165.3	1008	25	"
14 / 0600	14.2	166.3	1008	20	"
14 / 1200	14.1	167.5	1008	20	"
14 / 1800	14.0	168.7	1008	20	"
15 / 0000	13.9	169.9	1008	20	"
15 / 0600	14.1	170.9	1008	20	"
15 / 1200	14.3	171.7	1008	20	"
15 / 1800	14.4	172.4	1009	20	"

16 / 0000	14.4	173.1	1009	20	“
16 / 0600	14.4	173.9	1009	20	“
16 / 1200	14.4	174.9	1009	20	“
16 / 1800	14.5	175.9	1009	20	“
17 / 0000	14.8	176.6	1009	20	“
17 / 0600	15.2	177.2	1009	20	“
17 / 1200					dissipated
11 / 1800	14.4	157.6	1004	35	maximum wind and minimum pressure

Table 2. Number of hours in advance of formation associated with the first CPHC 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.

Category	Hours Before Genesis
	48-Hour Outlook
Low (10-30%)	150
Medium (40%-60%)	6
High (>60%)	0

Table 3a. CPHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Tropical Storm Iune, 10-13 July 2015. Mean OFCL errors for the previous 5-yr period are shown for comparison. Official errors that are smaller than the 5-yr mean are shown in boldface type.

	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL	34.2	48.6	**47.1**	**52.1**	**81.4**		
OCD5	60.1	115.1	145.8	161.9	261.0		
Forecasts	11	9	7	5	1		
OFCL (2010-14)	27.9	44.1	56.7	73.9	132.3		

Table 3b. Homogeneous comparison of selected track forecast guidance models (in n mi) for Tropical Storm Iune, 10-13 July 2015. 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	34.2	48.6	47.1	52.1	81.4		
OCD5	60.1	115.1	145.8	161.9	261.0		
GFSI	**31.9**	54.2	65.9	76.2	114.6		
AEMI	**31.4**	51.5	65.7	77.1	**58.5**		
CMCI	**26.0**	**43.1**	**42.3**	**40.2**	**30.6**		
EMXI	**25.2**	**36.1**	49.7	80.2	200.4		
TVCE	**28.1**	**39.5**	**39.0**	**40.9**	153.3		
GFEX	**28.1**	**44.1**	49.4	66.8	153.3		
Forecasts	11	9	7	5	1		

Table 4a. CPHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Tropical Storm Iune, 10-13 July 2015. Mean OFCL 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	**3.6**	**4.4**	**6.4**	**13.0**	25.0		
OCD5	3.6	6.8	7.0	7.2	25.0		
Forecasts	11	9	7	5	1		
OFCL (2010-14)	4.8	8.6	11.6	13.8	18.5		

Table 4b. Homogeneous comparison of selected intensity forecast guidance models (in kt) for Tropical Storm Iune, 10-13 July 2015. 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	3.6	4.4	6.4	13.0	25.0		
OCD5	3.6	6.8	7.0	**7.2**	25.0		
GFSI	**2.7**	**4.3**	**4.7**	**3.8**	**2.0**		
EMXI	**2.7**	5.1	**5.3**	**3.0**	**9.0**		
IVCN	**3.5**	5.8	**4.6**	**6.2**	31.0		
DSHP	4.7	8.7	7.6	11.6	33.0		
LGEM	3.8	7.9	6.7	7.8	28.0		
Forecasts	11	9	7	5	1		

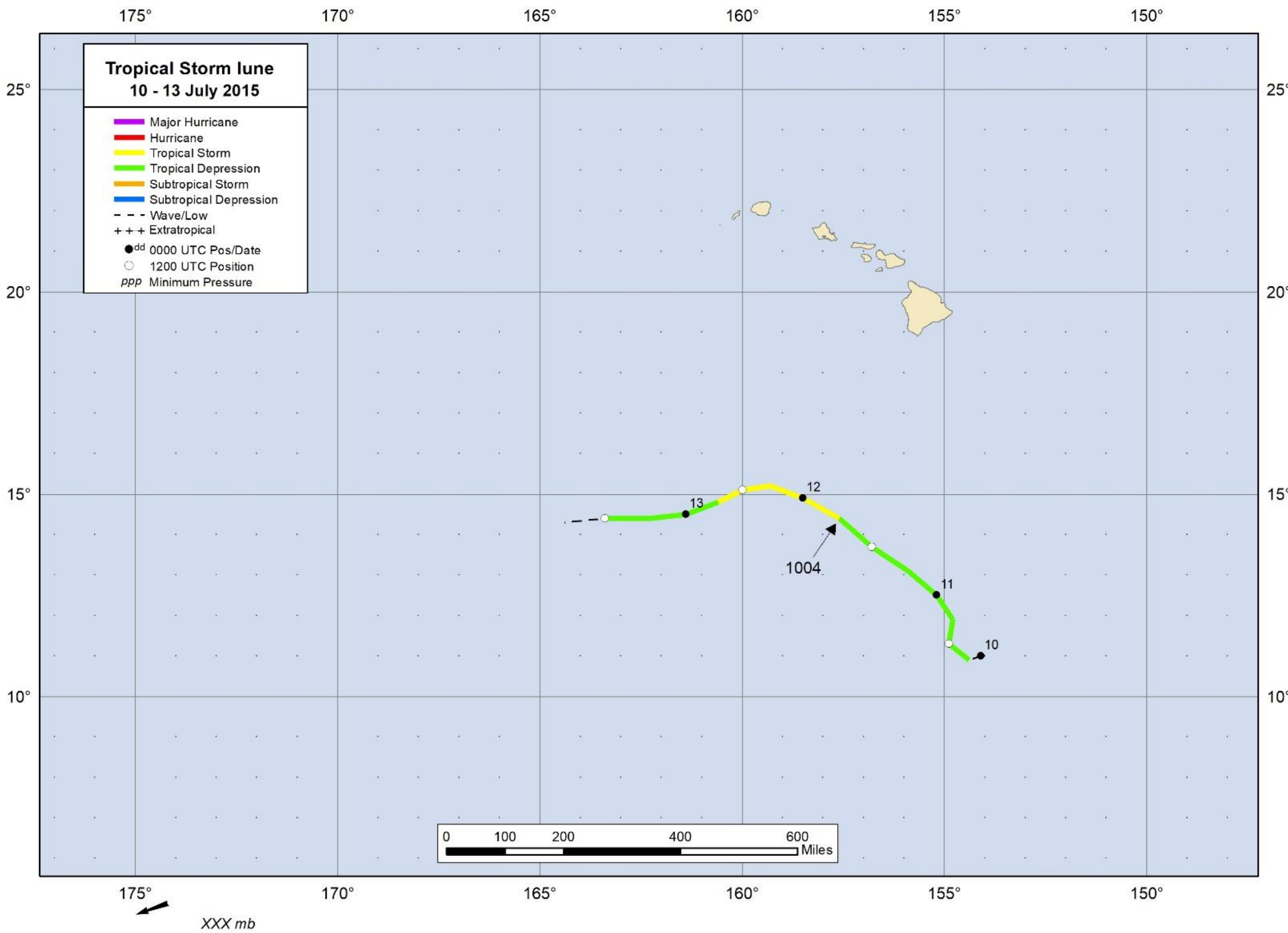

Figure 1. Best track positions for Tropical Storm Iune, 10-13 July 2015.