NATIONAL HURRICANE CENTER TROPICAL CYCLONE REPORT

HURRICANE LOWELL

(EP122014)

17 – 24 August 2014

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MODIS VISIBLE IMAGERY OF LOWELL NEAR PEAK INTENSITY AT 1845 UTC 21 AUG 2014

Lowell was a large category one hurricane (on the Saffir-Simpson Hurricane Wind Scale) that stayed offshore of southwestern Mexico.

Hurricane Lowell

17 – 24 AUGUST 2014

SYNOPTIC HISTORY

The genesis of Lowell can be traced to a tropical wave that left the west coast of Africa on 1 August. The wave produced little convection until it reached the Lesser Antilles late on 7 August, although the convective increase was short lived. Thunderstorms expanded again while the wave moved across Central America on 11 August, with mostly diurnal convective activity noted afterward during the next few days. A large surge of southwesterly low-level winds was noted over the central portion of the eastern Pacific on 14 August, likely due to the Madden-Julian Oscillation (MJO) moving through the region. The wave started to amplify in this favorable environment created by the passage of the MJO, with convection greatly increasing late on 15 August and leading to the formation of a very large and broad low. The low became well defined early on 17 August and convection became organized enough by 1200 UTC to result in the formation of a tropical depression about 500 n mi southwest of southern tip of 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[1].

The depression was unusually large, with a circulation about 800 n mi across at the time of genesis, along with a large radius of maximum wind of ~100 n mi. Moderate northeasterly shear kept most of the convection west of the center, and the system only slowly intensified, becoming a tropical storm about 30 h after genesis. During that time, the cyclone turned from a westward to northwestward heading while it moved around a subtropical ridge over Mexico. Lowell became better organized on 19 August, with stronger and more numerous convective bands noted near the center and a decreasing (but still large) radius of maximum winds. The shear diminished on 20 August, and Lowell started to intensify more steadily, with a large ragged eye forming late that day. An upper-level trough extending from California into the eastern Pacific caused Lowell to move toward the north-northwest by 21 August, although a northwesterly course resumed the next day due to the ridge rebuilding north of the cyclone. Although Lowell was moving over marginally warm water, it continued to strengthen within a low-shear, high-moisture environment, and it became a hurricane at 1200 UTC 21 August about 700 n mi west-southwest of the southern tip of the Baja California peninsula. The hurricane had a large eye during the day, with mesovortices rotating around the center (cover image).

By late on 21 August, Lowell was moving over waters colder than ~26°C, and it began to weaken. Despite the cooling waters along the path of the Lowell, the cyclone only gradually lost strength over the next couple of days due to its remaining in a low-shear environment and the

[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.

large size of the circulation. The cyclone became a tropical depression early on 24 August and lost all deep convection by 1200 UTC that day, transitioning into a remnant low about 725 n mi west-southwest of Punta Eugenia, Mexico. The shallow remnant low took a westward turn late in the day, and moved to the west or west-northwest for the next several days over the far western part of the eastern Pacific basin. It maintained a distinct circulation until late on 28 August when it dissipated into a trough about 925 n mi northeast of the Hawaiian Islands.

METEOROLOGICAL STATISTICS

Observations in Lowell (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). Data and imagery from NOAA polar-orbiting satellites including the Advanced Microwave Sounding Unit (AMSU), the NASA Tropical Rainfall Measuring Mission (TRMM), 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 Lowell.

The estimated peak 65-kt intensity of Lowell is based on T4.0 (64 kt) satellite intensity estimates from TAFB and SAB.

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

CASUALTY AND DAMAGE STATISTICS

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

FORECAST AND WARNING CRITIQUE

The genesis of Lowell was not particularly well forecast (Table 2). While the system was first introduced into the five-day Tropical Weather Outlook 84 h ahead of genesis, it only reached the medium (30-50%) category 48 h before formation. In the two-day genesis forecast, Lowell was only given a 10% chance of formation 36 h before genesis, was placed in the medium category only 18 hours prior to formation, and only reached the high category at the time of genesis in the best track.

A verification of NHC official track forecasts for Lowell is given in Table 3a. Official forecast track errors were much lower than the mean official errors for the previous 5-yr period. A homogeneous comparison of the official track errors with selected guidance models is given in Table 3b. The NHC forecast (OFCL) was superior to much of the single-model guidance, although the HWRF and ECMWF models were a bit better at long range. The NHC forecasts did not,

however, beat the track consensus (TVCE), which was better at all time periods. The UKMET model (EGRI) did not have a good performance for this cyclone.

A verification of NHC official intensity forecasts for Lowell is given in Table 4a. Official forecast intensity errors were considerably below the mean official errors for the previous 5-yr period. A homogeneous comparison of the official intensity errors with selected guidance models is given in Table 4b. The official intensity forecasts (OFCL) were outstanding for Lowell, besting almost of the guidance by correctly anticipating the slow intensification and weakening rates. Only the DSHP model was superior at a few time periods, while the HWRF and the LGEM models struggled some with Lowell.

There were no watches or warnings issued in association with Lowell.

Table 1. Best track for Hurricane Lowell, 17 – 24 August 2014.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
17 / 0000	16.0	113.7	1008	20	low
17 / 0600	16.0	114.3	1008	20	"
17 / 1200	16.0	114.9	1007	25	tropical depression
17 / 1800	16.0	115.5	1006	30	"
18 / 0000	16.1	116.2	1005	30	"
18 / 0600	16.2	116.8	1005	30	"
18 / 1200	16.3	117.3	1005	30	"
18 / 1800	16.5	117.8	1002	35	tropical storm
19 / 0000	16.7	118.3	999	40	"
19 / 0600	17.1	118.8	998	45	"
19 / 1200	17.6	119.4	997	45	"
19 / 1800	18.0	120.0	995	45	"
20 / 0000	18.4	120.6	995	45	"
20 / 0600	18.6	121.0	994	45	"
20 / 1200	18.7	121.2	990	50	"
20 / 1800	18.9	121.4	987	55	"
21 / 0000	19.1	121.5	986	55	"
21 / 0600	19.4	121.6	984	60	"
21 / 1200	19.8	121.8	981	65	hurricane
21 / 1800	20.2	122.1	980	65	"
22 / 0000	20.7	122.6	984	60	tropical storm
22 / 0600	21.2	123.2	987	55	"
22 / 1200	21.7	123.8	989	55	"
22 / 1800	22.1	124.4	993	50	"
23 / 0000	22.6	125.0	996	45	"
23 / 0600	23.1	125.6	998	40	"
23 / 1200	23.5	126.2	999	35	"
23 / 1800	23.9	126.7	1000	35	"
24 / 0000	24.4	127.1	1001	30	tropical depression
24 / 0600	24.8	127.5	1002	30	"
24 / 1200	25.2	127.9	1002	30	low

24 / 1800	25.5	128.4	1002	30	"
25 / 0000	25.6	129.0	1002	30	"
25 / 0600	25.7	129.6	1002	30	"
25 / 1200	25.8	130.3	1002	30	"
25 / 1800	25.9	131.0	1002	30	"
26 / 0000	26.0	131.7	1002	30	"
26 / 0600	26.3	132.6	1003	25	"
26 / 1200	26.7	133.5	1004	25	"
26 / 1800	27.3	134.5	1005	25	"
27 / 0000	28.0	135.6	1006	25	"
27 / 0600	28.6	136.6	1007	25	"
27 / 1200	29.2	137.6	1008	25	"
27 / 1800	29.8	138.7	1009	25	"
28 / 0000	30.3	139.9	1010	25	"
28 / 0600	30.6	141.1	1010	25	"
28 / 1200	30.8	142.2	1010	25	"
28 / 1800	31.0	143.3	1010	25	"
29 / 0000					dissipated
21 / 1800	20.2	122.1	980	65	minimum pressure & maximum winds

Table 2. Number of hours in advance of tropical cyclone 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	84
Medium (30%-50%)	18	48
High (>50%)	0	18

Table 3a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Lowell. 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	**19.7**	**30.5**	**34.4**	**43.6**	**65.6**	**94.2**	**134.1**
OCD5	27.2	48.8	73.3	101.8	149.1	219.1	296.9
Forecasts	24	22	20	18	14	10	6
OFCL (2009-13)	25.7	41.4	55.0	68.6	97.8	134.2	167.1
OCD5 (2009-13)	37.2	74.8	118.0	162.5	249.4	332.6	413.3

Table 3b. Homogeneous comparison of selected track forecast guidance models (in n mi) for Lowell. 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	19.5	30.3	35.9	43.1	63.3	89.6	113.8
OCD5	27.7	49.6	73.4	102.0	148.1	213.6	295.4
GFSI	21.3	31.1	40.7	47.5	77.5	122.7	125.5
GHMI	21.8	33.1	42.4	49.7	**57.8**	110.5	155.9
HWFI	24.5	37.8	47.4	55.2	66.3	**67.3**	**72.8**
EGRI	23.5	31.9	46.9	64.8	88.8	125.5	209.4
EMXI	23.6	35.1	39.2	43.2	**57.6**	**56.6**	**74.8**
CMCI	27.3	52.2	70.6	94.2	160.0	276.6	409.7
AEMI	22.0	31.3	39.0	46.4	72.6	122.3	155.3
TVCE	**18.8**	**27.5**	**33.8**	**36.6**	**50.0**	**73.6**	**89.2**
LBAR	27.8	60.6	100.9	148.8	256.2	328.2	353.9
BAMD	36.4	63.8	85.2	100.5	116.3	111.3	**108.6**
BAMM	32.1	55.5	73.8	83.3	95.3	113.0	122.5
BAMS	31.5	54.8	75.4	90.0	111.8	143.1	142.0
Forecasts	23	21	19	17	13	9	5

Table 4a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Lowell. 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	**3.5**	**4.8**	**5.0**	**6.7**	**6.4**	**6.0**	**3.3**
OCD5	5.0	7.5	9.5	11.9	9.7	7.2	14.5
Forecasts	24	22	20	18	14	10	6
OFCL (2009-13)	6.1	10.4	13.4	14.5	15.0	16.4	16.1
OCD5 (2009-13)	7.7	12.7	16.4	18.8	20.5	20.3	20.8

Table 4b. Homogeneous comparison of selected intensity forecast guidance models (in kt) for Lowell. 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	4.8	5.0	6.7	6.4	6.0	3.3
OCD5	5.0	7.5	9.5	11.9	9.7	7.2	14.5
GFSI	4.8	7.0	7.1	8.5	9.9	7.8	6.2
GHMI	4.2	5.6	8.3	7.9	6.8	6.8	5.8
HWFI	3.7	5.3	7.1	8.4	11.0	10.4	8.2
EMXI	5.3	9.2	11.6	13.7	14.3	12.4	9.3
DSHP	4.8	5.1	5.4	**5.1**	**5.1**	**2.5**	5.8
LGEM	5.5	8.3	9.8	11.5	14.3	11.7	8.0
IVCN	4.3	5.1	5.3	6.8	7.5	6.3	**2.7**
Forecasts	24	22	20	18	14	10	6

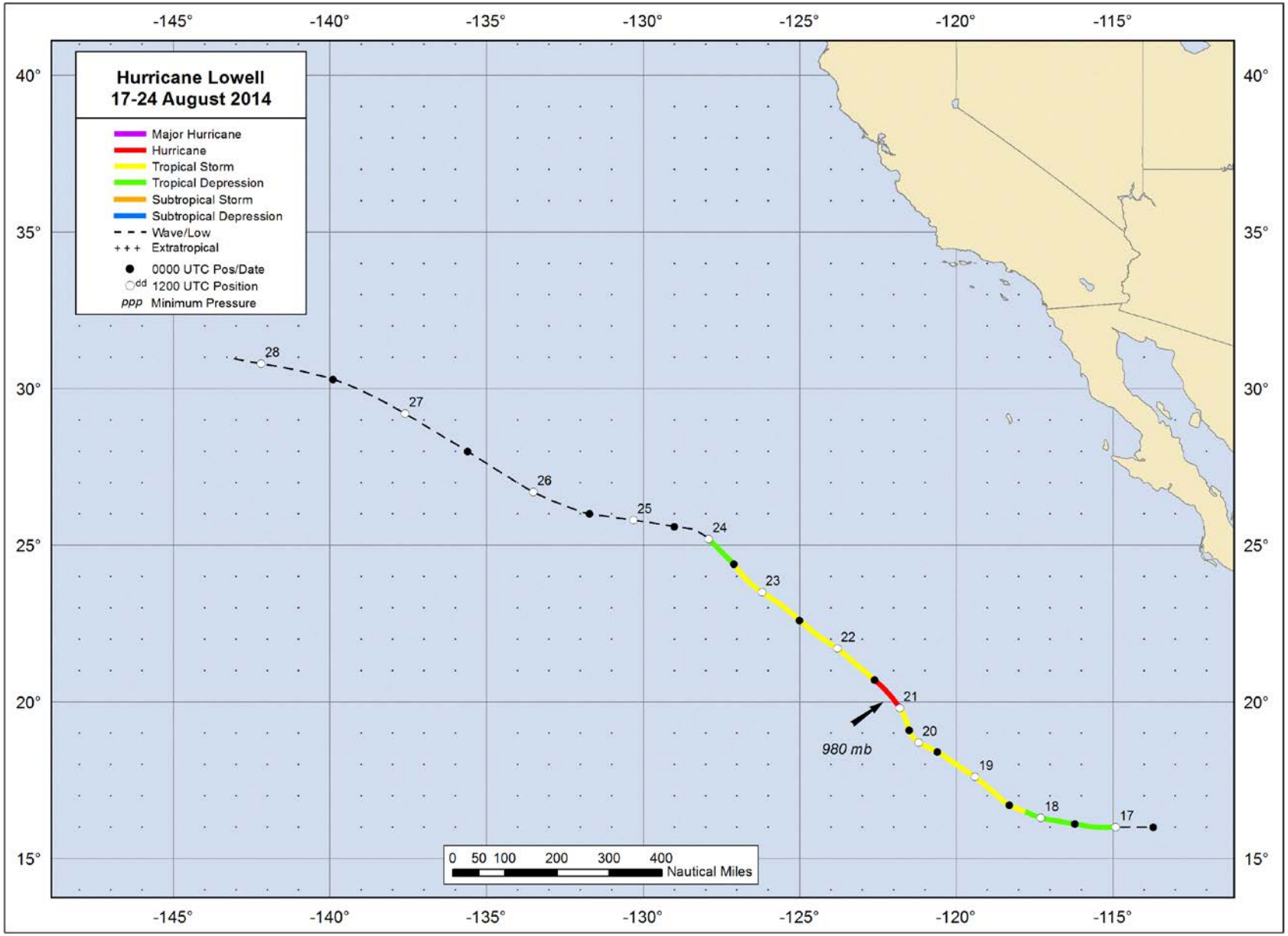

Figure 1. Best track positions for Hurricane Lowell, 17 – 24 August 2014.

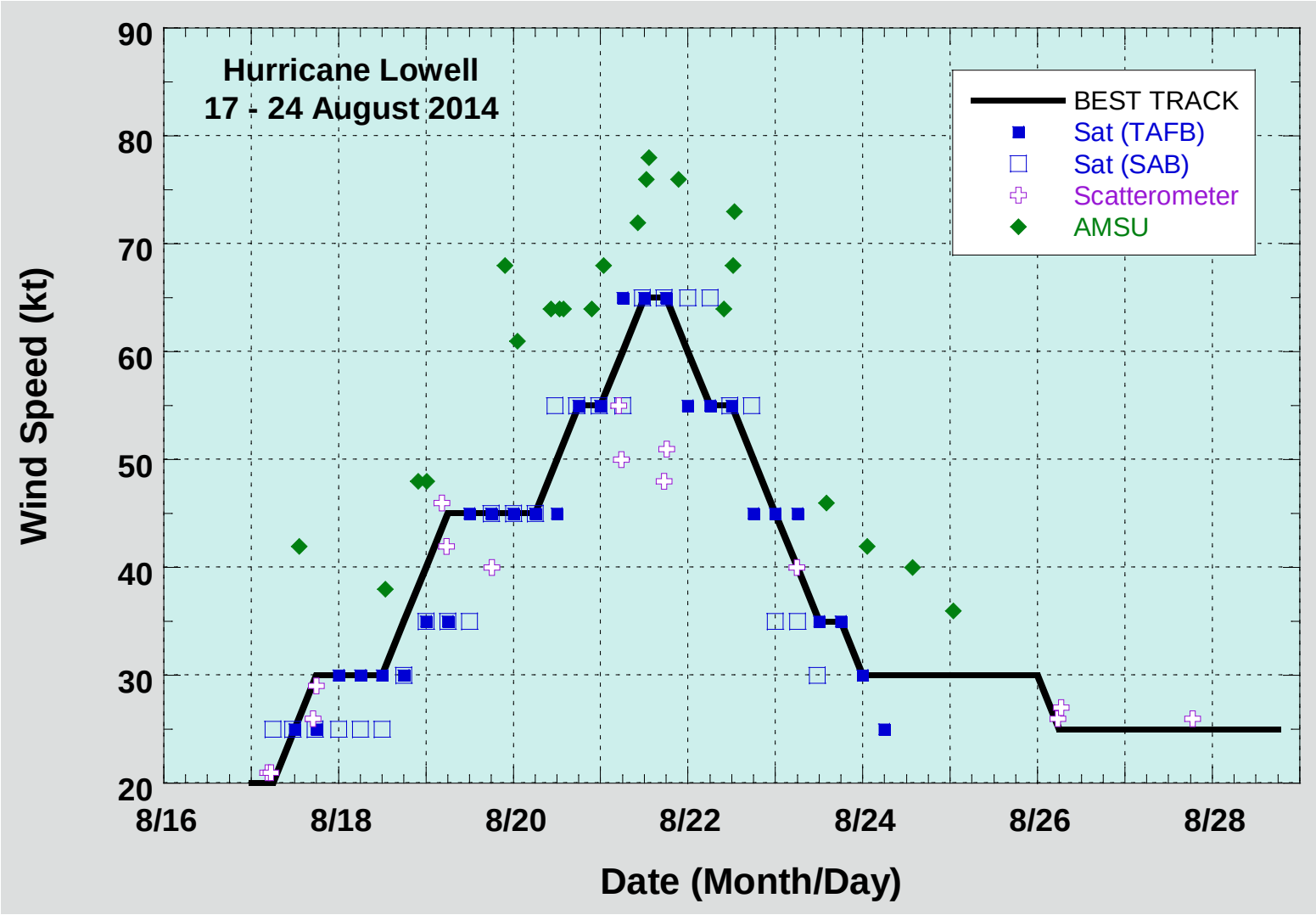

Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Hurricane Lowell, 17 – 24 August 2014. AMSU intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies technique. Dashed vertical lines correspond to 0000 UTC.

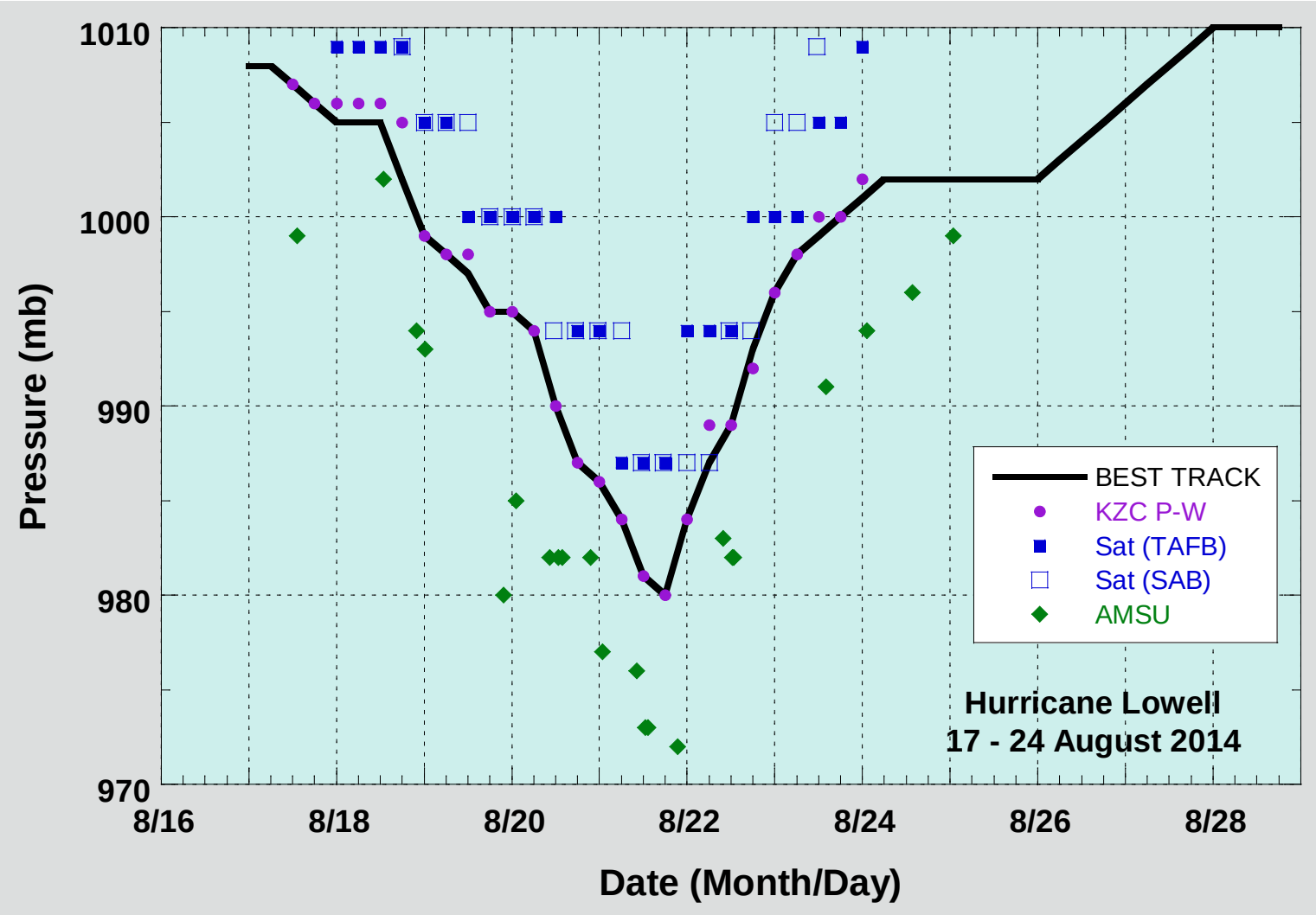

Figure 3. Selected pressure observations and best track minimum central pressure curve for Hurricane Lowell, 17 – 24 August 2014. AMSU intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies technique. KZC P-W refers to pressure estimates derived using the Knaff-Zehr-Courtney pressure-wind relationship. Dashed vertical lines correspond to 0000 UTC.