NATIONAL HURRICANE CENTER
TROPICAL CYCLONE REPORT

HURRICANE SEYMOUR

(EP202016)

23 – 28 October 2016

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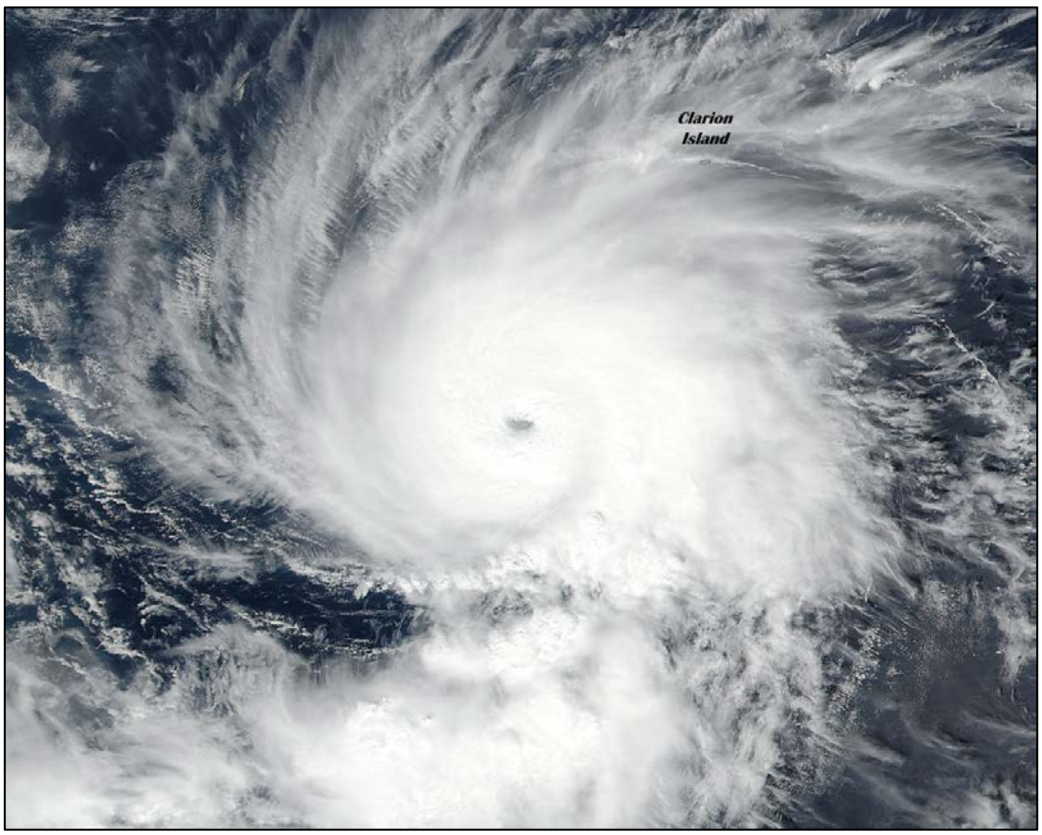

2035 UTC 25 OCTOBER 2016 NASA-NOAA'S SUOMI NPP VISIBLE SATELLITE IMAGE OF HURRICANE SEYMOUR NEAR ITS PEAK INTENSITY OF 130 KT (IMAGE COURTESY OF NOAA/NASA GODDARD MODIS RAPID RESPONSE TEAM).

Seymour was a small category 4 hurricane (on the Saffir-Simpson Hurricane Wind Scale) that remained over the open eastern North Pacific Ocean throughout its lifetime. Seymour was also the strongest hurricane so far west so late in the season in the eastern North Pacific basin.

Hurricane Seymour

23 – 28 OCTOBER 2016

SYNOPTIC HISTORY

A fast-moving tropical wave exited the west coast of Africa on 11 October and emerged over the eastern North Pacific Ocean early on 20 October. As the wave interacted with the eastern Pacific Intertropical Convergence Zone, an area of deep convection developed south of Guatemala late that same day. The following day while located a few hundred n mi offshore of the southern coast of Mexico, the westward-moving disturbance interacted with a Gulf of Tehunatepec gap-wind event, causing a weak low pressure system to develop along the wave axis. The associated shower and thunderstorm activity steadily increased and became better organized, and the low became better defined by early 22 October. Deep convection had become sufficiently organized by 0600 UTC 23 October for the low to be designated as a tropical depression when the system was located about 360 n mi south of Manzanillo, Mexico. The compact tropical cyclone turned west-northwestward and strengthened into a tropical storm 6 h later. 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].

Located south of a strong deep-layer ridge located over central and northern Mexico, Seymour maintained a west-northwestward to westward motion over the next 72 h, moving parallel to but well offshore of the southern coast of Mexico. During that time, the cyclone underwent a 54-h period of rapid intensification (RI) due to very favorable environmental conditions characterized by weak 850–200-mb vertical wind shear (<5 kt), a moist mid-troposphere (RH > 65%), very warm sea-surface temperatures (SST >29^{o}C), and a small eye (diameter ≤10 n mi). Between 1800 UTC 23 October and 0000 UTC 26 October, the cyclone strengthened 90 kt, reaching a peak intensity of 130 kt at the end of the RI process. Within 12 h after reaching its peak intensity, the category 4 hurricane began to rapidly weaken due to the combination of increasing southerly vertical wind shear and oceanic cold upwelling due to the shallow depth of the warm water beneath the intense tropical cyclone (data not shown). By 0000 UTC 27 October, the rapid weakening (RW) process was enhanced further due to southwesterly shear increasing to 20-40 kt, SSTs dropping below 26^{o}C, and mid-level humidity values decreasing to less than 50 percent (Fig. 4). Those unfavorable parameters resulted in Seymour becoming a tropical storm by 1800 UTC 27 October and a post-tropical low pressure system by 0600 UTC 28 October when the cyclone was located about 715 n mi west of the southern tip of the Baja California peninsula. Seymour's intensity decreased 85 kt during that 36-h RW period, exceeding the rate of RI days prior.

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[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.

The convection-less remnant low continued to spin down under the influence of the aforementioned hostile conditions, and dissipated by 1200 UTC 30 October about 500 n mi west of Puerto Cortes, Baja California Sur, Mexico.

METEOROLOGICAL STATISTICS

Observations in Seymour (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 Seymour.

Winds and Pressure

Seymour's analyzed peak intensity of 130 kt at 0000 UTC and 0600 UTC 26 October is based on a blend of Dvorak satellite current intensity estimates of T6.5/127 kt from both SAB and TAFB, and a UW-CIMSS objective intensity estimate of T6.7/132 kt from the ADT technique. The estimated minimum central pressure of 940 mb for these same times is based on the Knaff-Zehr-Courtney (KZC) pressure-wind relationship for an intensity of 130 kt. Seymour's 130-kt intensity made it the strongest hurricane so far west so late in the season in the eastern North Pacific basin.

CASUALTY AND DAMAGE STATISTICS

There were no reports of damage or casualties associated with Hurricane Seymour.

FORECAST AND WARNING CRITIQUE

The genesis of Seymour was reasonably well forecast. Table 2 provides the number of hours in advance of formation associated with the first NHC Tropical Weather Outlook (TWO) forecast in each likelihood category. A low (< 40%) chance of formation during the next five days was introduced into the TWO 108 h before Seymour developed, and the probability was raised to a high (> 60%) chance 36 h before genesis occurred. The precursor disturbance was given a low chance of formation during the next two days 90 h before genesis, but the 48-h probability was raised to a high chance only 18 h before genesis.

A verification of NHC official track forecasts for Hurricane Seymour is given in Table 3a. Official forecast track errors were lower than the mean official errors for the previous 5-yr period at available forecast times. Although the first few track forecasts had a right-of-track bias, the along-track biases were small. Subsequent OFCL track forecasts contained both small cross-track and along-track biases, which led to the smaller-than-average errors (Fig. 5). By comparison, OCD5 historical track errors were the same or slightly higher than average, indicating that Seymour was somewhat more difficult to forecast than normal. A homogeneous comparison of the official track errors with selected guidance models is given in Table 3b. NHC track forecast errors were comparable to or better than the deterministic global and regional models at all time periods. In contrast, OFCL forecasts were outperformed by all of the ensemble and consensus models through 72 h.

A verification of NHC official intensity forecasts for Hurricane Seymour is given in Table 4a. Official forecast intensity errors were greater than the mean official errors for the previous 5-yr period, and had a pronounced low bias due to the first few intensity forecasts not anticipating the rapid intensification that Seymour underwent shortly thereafter. However, subsequent intensity forecasts beginning with the 0300 UTC 24 October advisory reasonably captured both RI and the timing of peak intensity, but also predicted reasonably well the RW cycle after Seymour had reached peak intensity (Fig. 6). A homogeneous comparison of the official intensity errors with selected guidance models is given in Table 4b. Despite the RI and RW periods, which are always difficult to forecast, OFCL intensity forecasts were comparable to or better than the available intensity guidance at all forecast periods, except at 72 h and 96 h.

There were no coastal tropical cyclone watches or warnings issued in association with Hurricane Seymour.

References

D. P. Brown and J. L. Franklin, 2004: Dvorak tropical cyclone wind speed biases determined from recent reconnaissance-based “best track” data (1997-2003). Preprints, 26th Conference on Hurricanes and Tropical Meteorology, Fort Lauderdale, Florida.

Table 1. Best track for Hurricane Seymour, 23-28 October 2016.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
22 / 0600	11.4	98.4	1007	25	low
22 / 1200	11.7	99.5	1007	25	"
22 / 1800	12.0	100.6	1007	25	"
23 / 0000	12.3	101.7	1007	25	"
23 / 0600	12.7	102.9	1007	30	tropical depression
23 / 1200	13.2	104.1	1005	35	tropical storm
23 / 1800	13.7	105.3	1003	40	"
24 / 0000	14.2	106.5	1000	50	"
24 / 0600	14.6	107.8	995	60	"
24 / 1200	14.9	109.1	989	70	hurricane
24 / 1800	15.2	110.5	984	80	"
25 / 0000	15.3	111.9	980	85	"
25 / 0600	15.4	113.2	974	95	"
25 / 1200	15.5	114.5	964	105	"
25 / 1800	15.6	115.8	956	115	"
26 / 0000	15.9	117.1	942	130	"
26 / 0600	16.2	118.4	940	130	"
26 / 1200	16.6	119.7	945	125	"
26 / 1800	17.1	120.7	957	110	"
27 / 0000	18.0	121.4	969	95	"
27 / 0600	19.0	122.0	979	80	"
27 / 1200	19.8	122.6	989	65	"
27 / 1800	20.9	123.0	995	55	tropical storm
28 / 0000	21.6	123.1	1001	40	"
28 / 0600	22.1	122.9	1004	35	low
28 / 1200	22.5	122.5	1006	30	"
28 / 1800	22.8	122.1	1007	25	"
29 / 0000	23.0	121.7	1008	20	"
29 / 0600	23.4	121.5	1009	20	"
29 / 1200	23.8	121.5	1010	15	"
29 / 1800	24.2	121.4	1011	15	"
30 / 0000	24.6	121.3	1012	15	"
30 / 0600	25.0	121.2	1012	15	"
30 / 1200					dissipated
26 / 0600	16.2	118.4	940	130	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%)	90	108
Medium (40%-60%)	36	90
High (>60%)	18	36

Table 3a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Hurricane Seymour, 23-28 October 2016. 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	**15.3**	**22.3**	**36.2**	**51.0**	**70.5**	**105.9**	
OCD5	28.4	71.2	118.8	164.8	245.2	362.7	
Forecasts	18	16	14	12	8	4	
OFCL (2011-15)	23.4	36.4	47.2	59.4	89.0	123.6	159.5
OCD5 (2011-15)	36.6	74.2	116.5	159.7	245.6	331.1	427.4

Table 3b. Homogeneous comparison of selected track forecast guidance models (in n mi) for Hurricane Seymour, 23-28 October 2016. 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	17.3	27.2	36.3	48.5	51.5	130.4	
OCD5	25.8	61.6	104.5	159.9	198.4	298.0	
GFSI	25.0	34.3	45.5	62.6	77.5	162.3	
EMXI	17.4	29.1	38.7	53.7	55.6	**115.2**	
UKMI	21.7	32.6	45.9	59.7	150.9	312.3	
EGRI	21.8	33.7	46.8	62.7	153.6	307.6	
CMCI	27.6	47.5	50.1	**44.8**	57.1	**55.6**	
NVGI	24.7	35.8	44.8	63.3	127.8	**39.7**	
AEMI	**16.8**	**21.6**	**33.6**	49.8	59.7	**100.4**	
HWFI	18.4	**25.0**	**32.8**	52.6	82.8	174.0	
GHMI	24.7	40.6	60.0	84.4	144.6	235.8	
GFNI	**16.7**	**26.1**	**33.4**	**43.0**	72.9	**109.4**	
CTCI	20.7	27.3	**31.9**	**42.7**	**50.4**	**112.1**	
TVCX	**15.8**	**24.4**	**30.8**	**40.6**	**34.6**	131.6	
TVCE	**16.5**	**24.8**	**31.4**	**41.1**	**39.3**	135.8	
TCON	17.8	**24.2**	**33.6**	**44.8**	57.7	157.8	
GFEX	19.2	28.6	**36.1**	**47.3**	**33.7**	130.4	
HCCA	**17.0**	**23.2**	**30.4**	**41.9**	**48.8**	138.6	
FSSE	**16.7**	**27.0**	**35.4**	**48.0**	**48.3**	**117.3**	
BAMM	24.9	45.4	64.3	73.4	115.0	188.5	
Forecasts	12	10	9	9	5	1	

Table 4a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Hurricane Seymour, 23-28 October 2016. 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	8.1	13.8	21.4	25.4	26.3	15.0	
OCD5	14.5	25.8	35.6	40.3	38.6	15.8	
Forecasts	18	16	14	12	8	4	
OFCL (2011-15)	5.9	9.8	12.5	14.0	15.5	16.3	14.9
OCD5 (2011-15)	7.7	12.8	16.4	18.8	21.1	20.9	19.7

Table 4b. Homogeneous comparison of selected intensity forecast guidance models (in kt) for Hurricane Seymour, 23-28 October 2016. 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	7.5	11.5	18.9	21.1	11.0	25.0	
OCD5	14.1	24.6	33.2	35.8	19.8	**10.0**	
DSHP	8.2	15.3	23.1	24.8	12.6	27.0	
LGEM	8.9	13.6	**16.7**	**17.3**	**5.8**	**13.0**	
HWFI	10.1	18.0	21.3	**20.9**	**10.0**	**20.0**	
GHMI	18.3	34.3	42.7	34.6	**10.8**	**20.0**	
CTCI	10.8	21.8	27.6	26.9	**4.0**	**15.0**	
GFNI	13.2	25.0	34.0	23.7	**7.8**	28.0	
IVCN	10.5	20.3	25.0	24.0	**5.6**	**19.0**	
ICON	10.7	19.8	24.9	23.2	**6.6**	**20.0**	
HCCA	**6.5**	13.1	**15.1**	**13.7**	**9.8**	**24.0**	
FSSE	**7.1**	14.5	**17.8**	**16.6**	**8.6**	27.0	
GFSI	16.7	25.6	34.9	38.0	15.2	**8.0**	
EMXI	14.3	24.9	37.9	43.9	26.0	**5.0**	
UKMI	19.4	32.5	40.3	42.0	22.2	**3.0**	
EGRI	19.6	33.0	40.3	42.4	22.0	**4.0**	
CMCI	20.3	32.4	42.1	48.9	27.8	**8.0**	
NVGI	13.8	20.4	25.6	32.9	22.4	**16.0**	
AEMI	22.5	34.9	41.2	44.6	24.2	**1.0**	
Forecasts	12	10	9	9	5	1	

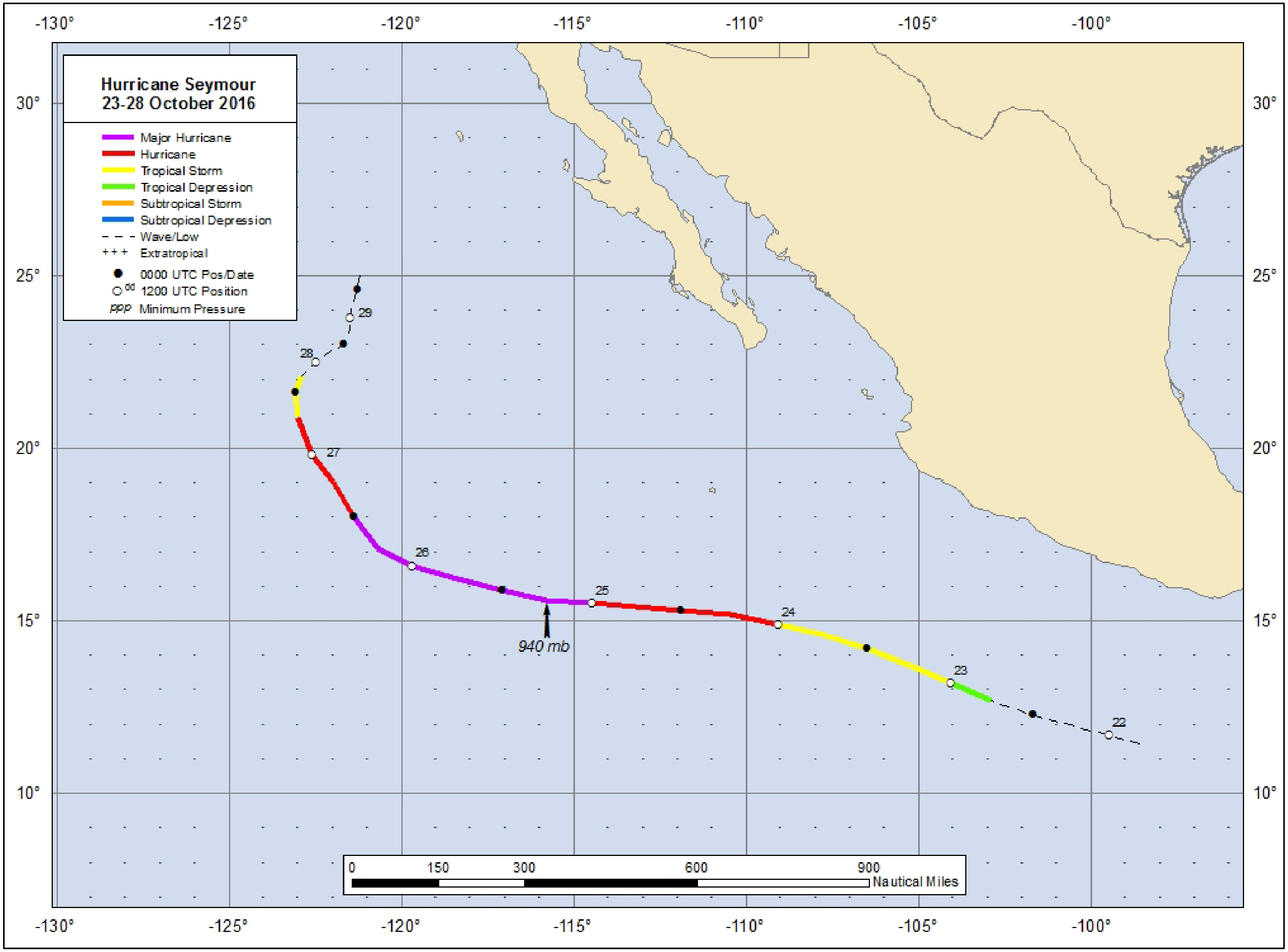

Figure 1. Best track positions for Hurricane Seymour, 23-28 October 2016.

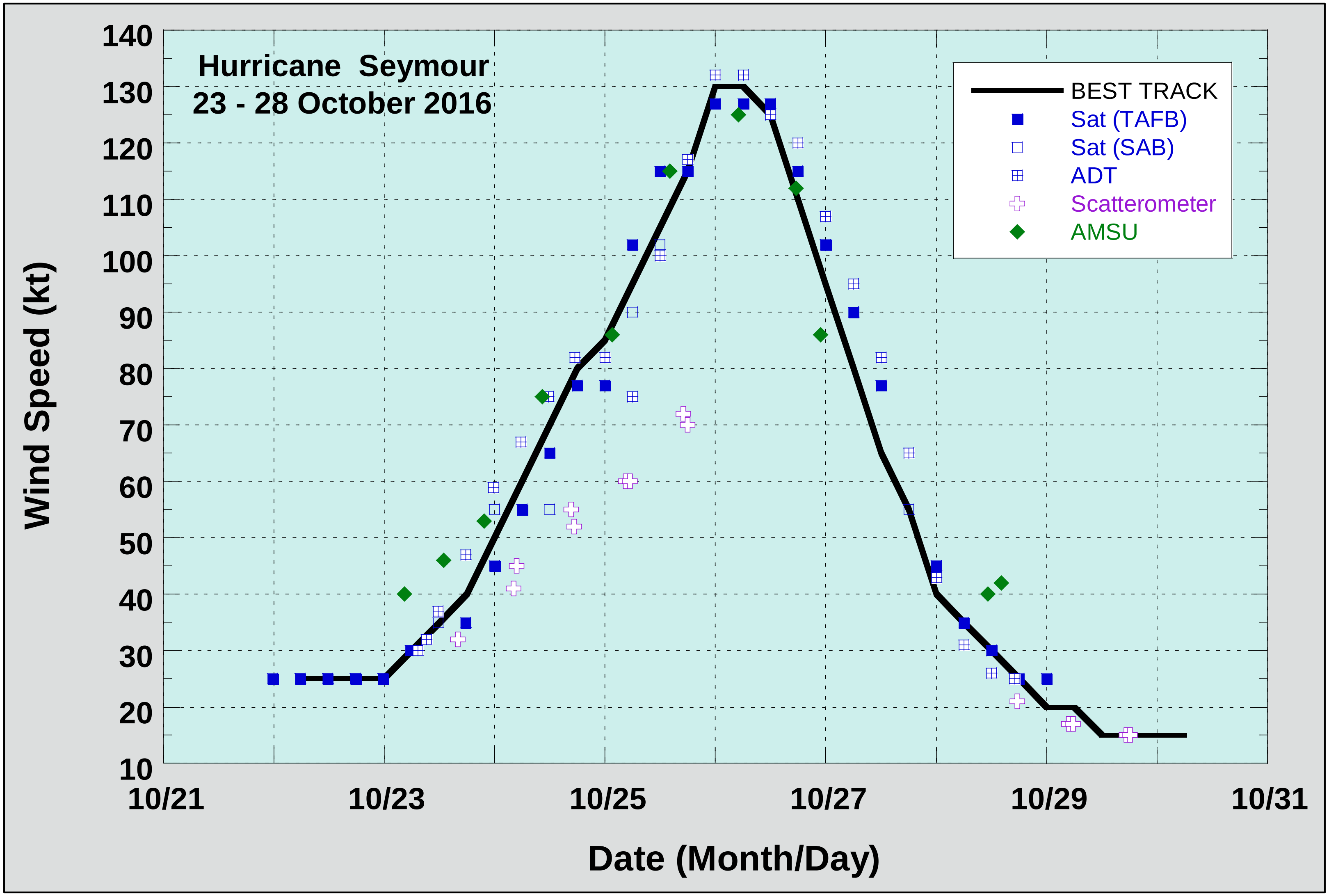

Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Hurricane Seymour, 23-28 October 2016. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. AMSU intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies technique. Dashed vertical lines correspond to 0000 UTC.

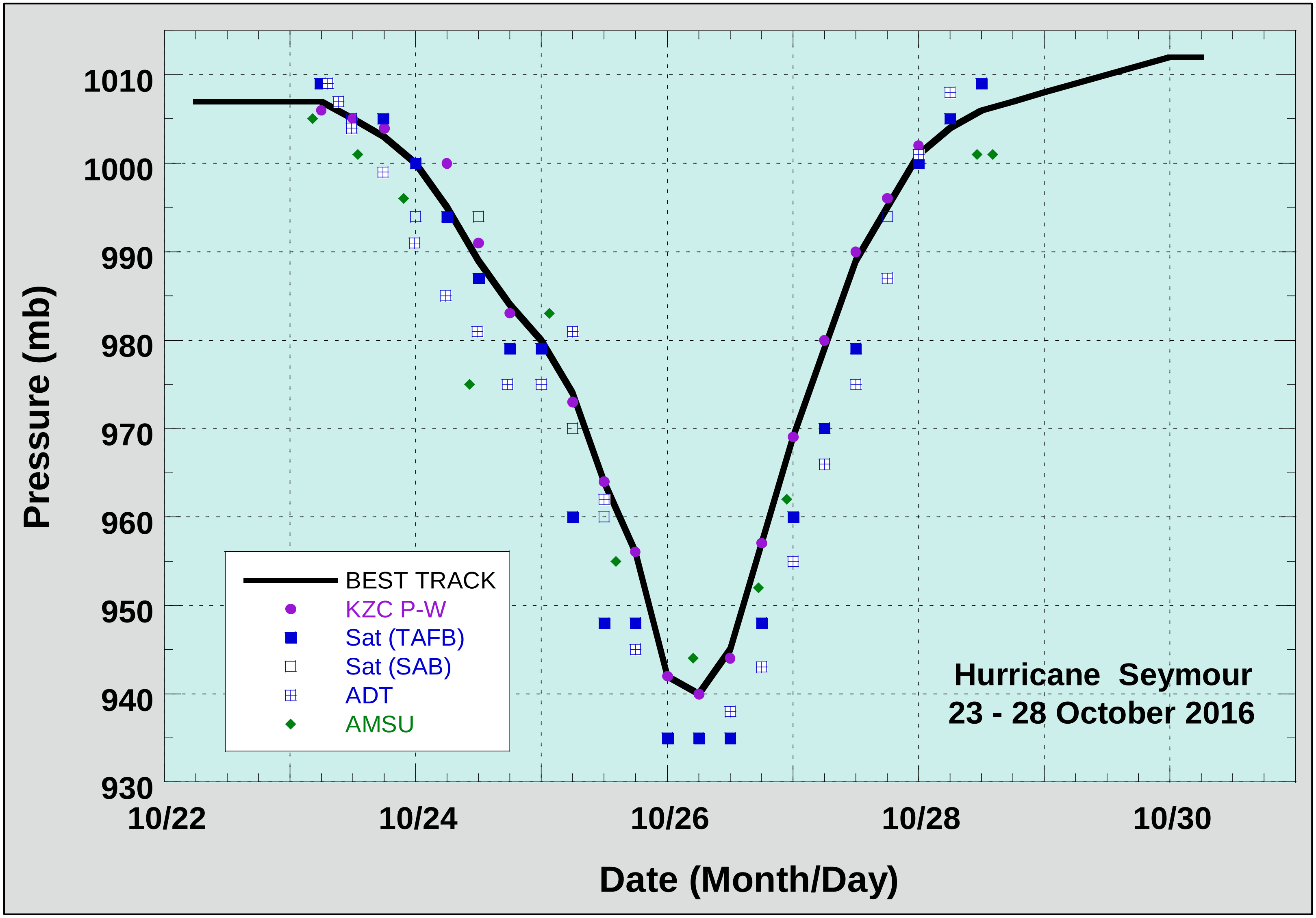

Figure 3. Selected pressure observations and best track minimum central pressure curve for Hurricane Seymour, 23-28 October 2016. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. AMSU intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies technique. KZC P-W refers to pressure estimates derived using the Knaff-Zehr-Courtney pressure-wind relationship. Dashed vertical lines correspond to 0000 UTC.

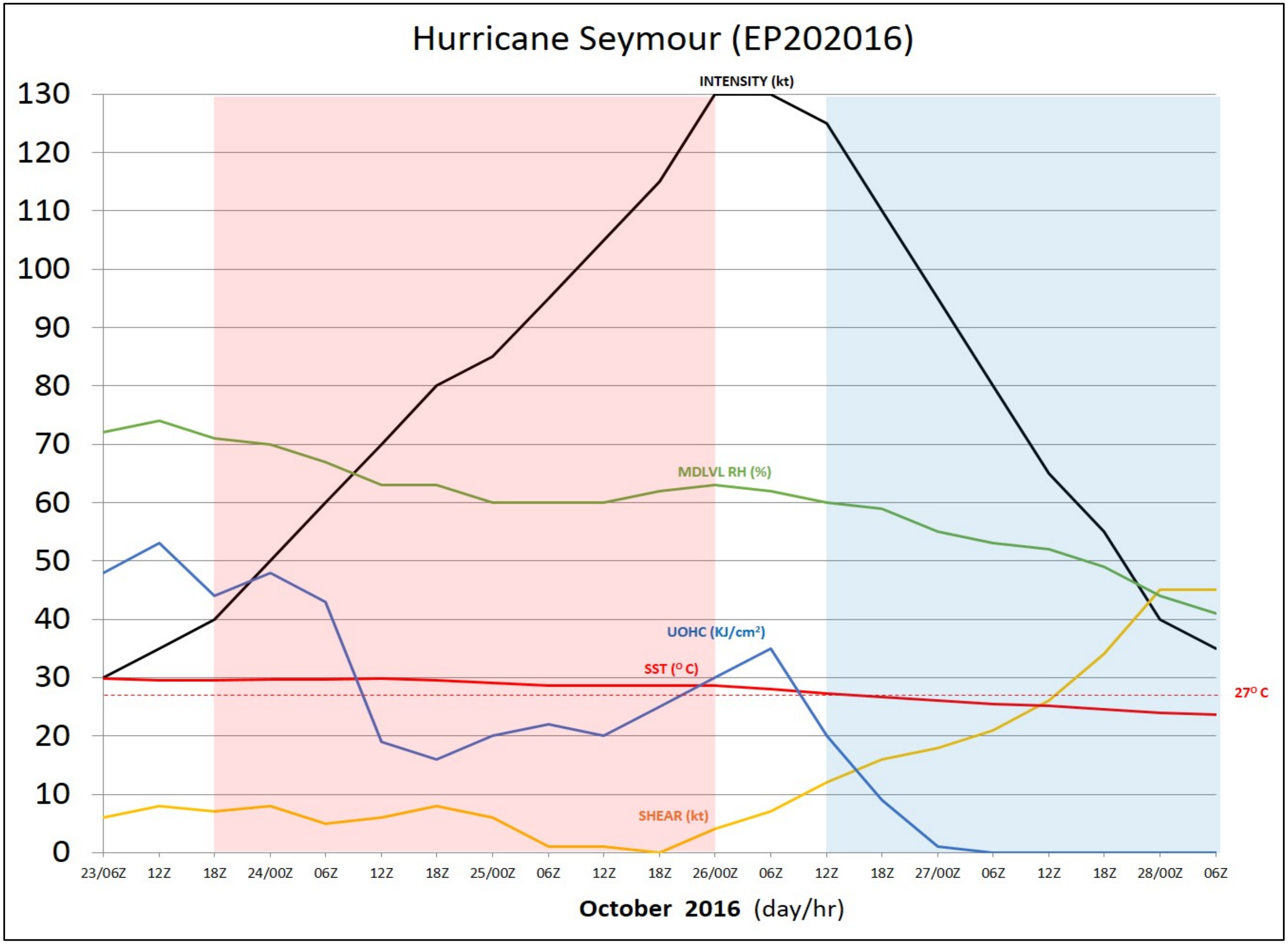

Figure 4. Plot of Hurricane Seymour's intensity versus GFS-based SHIPS model analyzed environmental parameters: 850–200-mb vertical wind shear (**SHEAR**), sea-surface temperature (**SST**), upper-ocean heat content (**UOHC**), and 700-500 mb average relative humidity (**MDLVLRH**). Time period covered is from 0600 UTC 23 October to 0600 UTC 28 October 2016, which includes rapid intensification (red shading) and rapid weakening (blue shading) cycles.

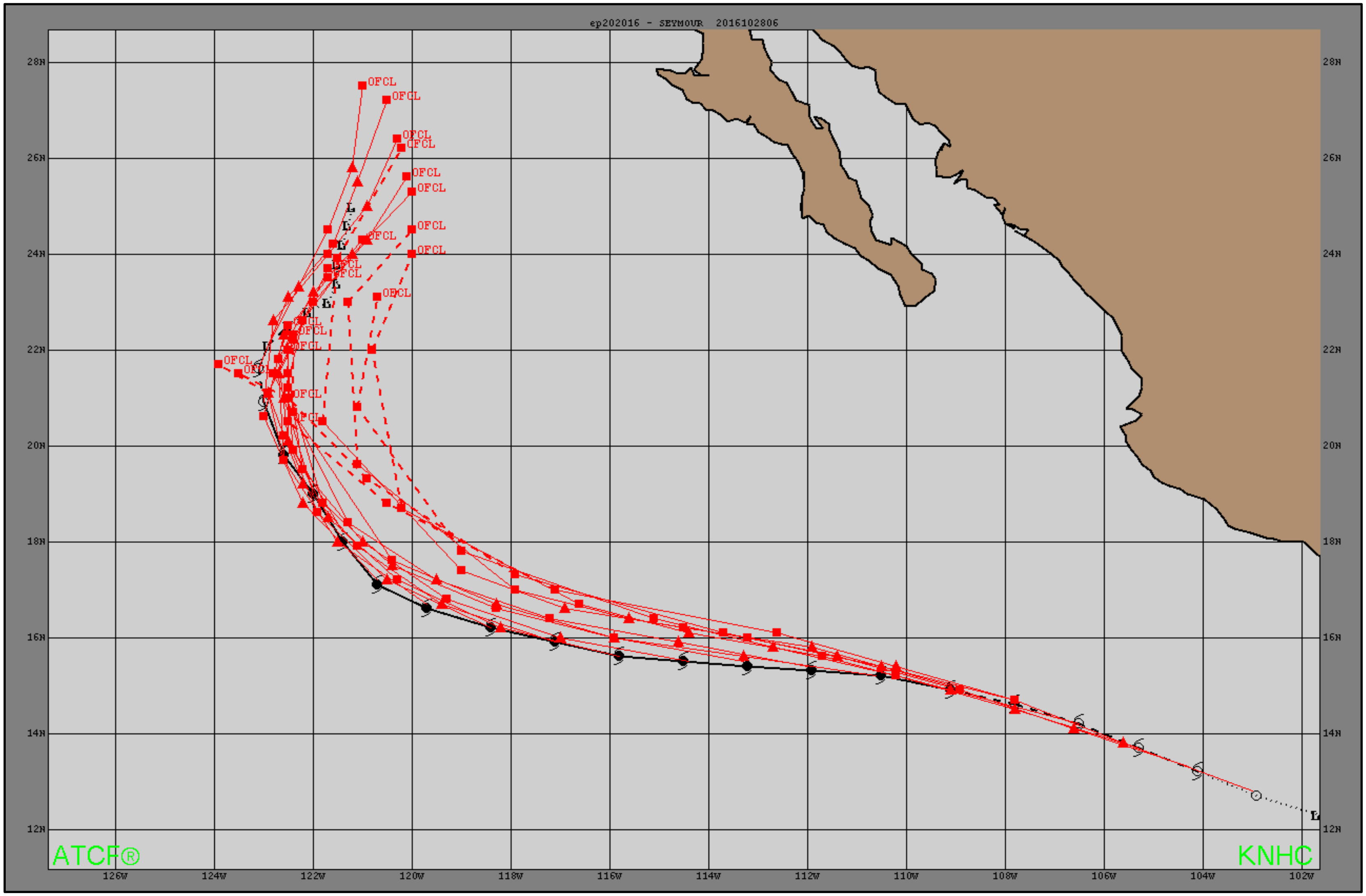

Figure 5. Selected official track forecasts (solid and dashed red lines, with 0, 12, 24, 36, 48, 72, 96, and 120 h positions indicated) for Hurricane Seymour, 23-28 October 2016. The best track is given by the solid black line with positions given at 6 h intervals.

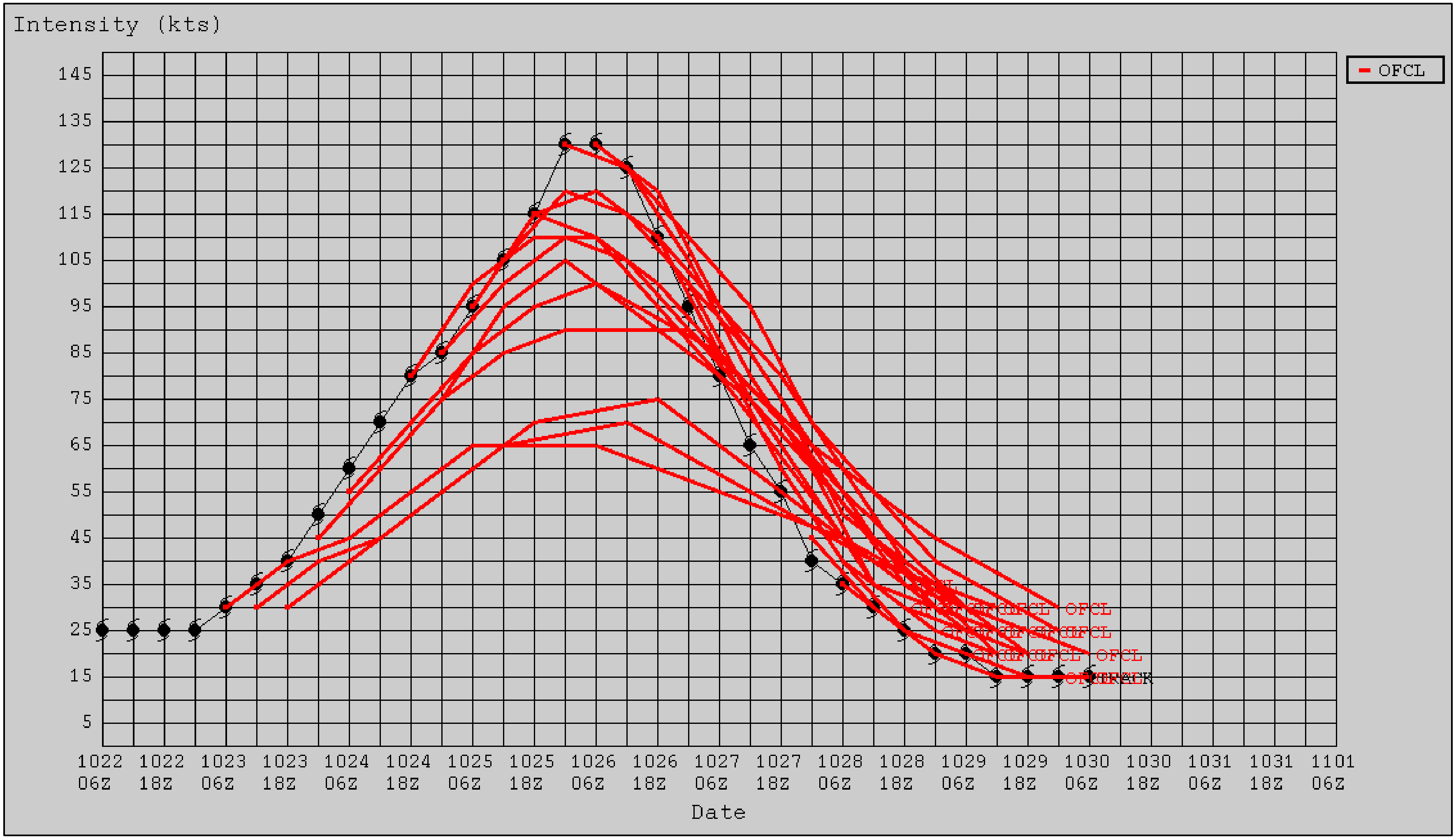

Figure 6. Selected official intensity forecasts (solid red lines, with 0, 12, 24, 36, 48, 72, 96, and 120 h forecast times indicated) for Hurricane Seymour, 23-28 October 2016. The best track is given by the solid black line with positions given at 6 h intervals.