Tropical Cyclone Report
Hurricane Jova
(EP102011)
6–12 October 2011

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Updated 7 February 2012 to include pressure observation near time of landfall.

Updated 18 May 2012 to include additional fatalities reported by Mexico.

Jova formed in the eastern North Pacific well south of Mexico and intensified to a category 3 hurricane (on the Saffir-Simpson hurricane wind scale) before making landfall in Mexico as a category 2 hurricane.

a. Synoptic History

Jova appears to have formed from a breakdown of the intertropical convergence zone (ITCZ) that was also associated with the nearly coincident development of Hurricane Irwin. Early on 5 October a circulation developed along the ITCZ about 430 n mi south of Acapulco, Mexico. As this circulation moved westward, it became better defined and a low formed around 1200 UTC that day. Deep convection became more concentrated near the center over the next 12 h, and it is estimated that a tropical depression formed by 0000 UTC 6 October, while located about 475 n mi southwest of Acapulco. After genesis, the depression moved generally west-northwestward around the southwestern periphery of a subtropical ridge and reached tropical storm intensity around 1800 UTC that day, centered about 440 n mi south-southwest of Manzanillo, Mexico. The "best track" chart of Jova'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].

While Jova was moving over waters of 28–29 °C on 7–8 October, moderate northeasterly vertical wind shear allowed for only gradual strengthening. During this time the cyclone's forward speed decreased as Jova turned northwestward and then northward around the western edge of the ridge. By late on 8 October, the vertical shear began to decrease and Jova became a hurricane around 1800 UTC that day, while centered about 390 n mi west-southwest of Manzanillo. The hurricane strengthened steadily during the next couple of days as it moved north of the ridge and turned eastward with a forward speed of around 5 kt. Jova reached major hurricane status around 0600 UTC 10 October while located about 230 n mi southwest of Manzanillo. Steady intensification continued until Jova reached a peak intensity of 110 kt

[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.

around 1800 UTC, by which time a distinct eye was apparent in both geostationary and microwave satellite imagery (Fig. 4).

By early the next day southwesterly shear increased over Jova ahead of a mid-latitude trough digging southward over the Baja California peninsula. This increase in shear resulted in gradual weakening as Jova turned northeastward ahead of the trough. Jova fell below major hurricane status around 1200 UTC 11 October while centered about 120 n mi south-southwest of Manzanillo. Later that day the cyclone accelerated north-northeastward ahead of the trough and maintained an intensity of 85 kt and a distinct eye in microwave imagery (Fig. 5) as it approached the coast of the Mexican state of Jalisco. Jova's center crossed the coast around 0600 UTC 12 October very near El Tabaco, or about 35 n mi northwest of Barra de Navidad. After landfall, Jova continued moving north-northeastward and rapidly weakened over the high terrain of western Mexico. Jova weakened to a tropical storm by 1200 UTC 12 October and then to a tropical depression 6 h later. The low-level circulation dissipated by 0000 UTC 13 October.

b. Meteorological Statistics

Observations in Jova (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. Observations also include flight-level, stepped frequency microwave radiometer (SFMR), and dropwindsonde observations from three flights of the 53rd Weather Reconnaissance Squadron of the U.S. Air Force Reserve Command. 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 Jova.

One ship report of tropical-storm-force winds was received: the *Maersk Derince* (call sign DDAC2) reported 39-kt winds with a pressure of 999.0 mb at 0600 UTC 11 October. There were no land-based observations of tropical-storm-force winds reported in associated with Jova, although a wind gust of 40 kt was reported in Manzanillo. Selected rainfall observations from land stations are given in Table 2.

Jova's analyzed peak intensity of 110 kt is based on a SFMR surface wind estimate of 109 kt at 1848 UTC 10 October. The lowest minimum pressure estimate of 955 mb is based on a dropsonde measurement of 956 mb with 17 kt of wind at the surface at 1901 UTC that day.

The 85-kt intensity estimate for Jova at landfall is based on a blend of a 90-kt Dvorak intensity estimate from TAFB and a 3-h average ADT intensity of 77 kt at 0600 UTC 12 October. The lowest pressure observed along the coast of Mexico was 985.2 mb at 0533 UTC 12 October, as reported by storm chasers in the town of Emiliano Zapata, a few miles southeast of where Jova made landfall.

c. Casualty and Damage Statistics

There were nine deaths in Mexico due to Jova. In Cihuatlan, near Barra de Navidad in the state of Jalisco, a woman and her son were killed in a mudslide and the body of a man who was apparently swept away by a river was found. In Tomatlan, Jalisco, a man and a teenage boy were killed when the walls of their house collapsed due to heavy rain. In the state of Colima a woman drowned when the car she was riding in was swept away by water. The details of the other three fatalities are unknown. The port of Manzanillo was closed due to the storm, with reports of wind damage to power lines and billboards, and flooding that knocked out at least one bridge in that city. Flooding was also reported in Zihuatian, Melaque, and Barra de Navidad. A total of 107,000 people lost power due to the storm and 2,600 people were evacuated by the Mexican Navy. No monetary damage estimates are available.

d. Forecast and Warning Critique

The genesis of Jova was not well anticipated. The area of disturbed weather that eventually became Jova was introduced into the Tropical Weather Outlook only 18 h before genesis and given a low chance (< 30%) of development in the next 48 h. The chance of development was raised to the medium category (30%-50%) 12 h later but did not reach the high category (> 50%) before genesis occurred.

A verification of NHC official track forecasts for Jova is given in Table 3a. Official track forecast errors (OFCL) were well below the 5-yr mean values at all lead times except 12 h. In fact at 36, 48, 72, and 120 h OFCL errors were 32-37% lower than the 5-yr mean errors. These low OFCL errors occurred despite the fact that the average CLIPER baseline errors (OCD5) for Jova were well above the previous 5-yr mean OCD5 errors at 48 h and beyond. In particular, OCD5 errors for Jova were 2–3 times larger than the mean 5-yr OCD5 errors at 96 and 120 h, suggesting that Jova's track was especially atypical. A homogeneous comparison of the official track errors with selected guidance models is given in Table 3b. Overall, the official forecast out-performed all of the individual track guidance models except for the European Centre for Medium Range Weather Forecasts global model (EMXI) at days 3 through 5, the United Kingdom Met Office global model (UKMI) at days 4 and 5, and the U.S. Navy's NOGAPS model (NGPI) at day 4. Of note are the exceptionally small errors of EMXI at days 3 through 5. In addition, the TVCA, TVCE, and TVCC consensus models each bested the official forecast at a few lead times. Also noteworthy is the poor performance of the National Weather Service's Global Forecast System model (GFSI), especially at days 3 through 5, when it had average errors 2–3 times larger than OFCL. These large errors are due to a much broader recurvature and persistent fast bias in the forward motion of Jova in early forecasts from the GFSI (Fig. 6).

A verification of NHC official intensity forecasts for Jova is given in Table 4a. Official intensity forecast errors (OFCL) were near the 5-yr mean values at 12 h, below the 5-yr mean at 24 through 72 h and well above the 5-yr mean at 96 and 120 h. Average SHIFOR5 baseline model errors (OCD5) were above their previous 5-yr mean values at all lead times, especially at 48 h and beyond. While OFCL forecasts anticipated the steady strengthening of Jova, they had a substantial low bias near and just after the time of Jova's peak intensity (Fig. 7) due to a fast bias

in the official forecast track at days 4 and 5, which brought the center of Jova over land too soon (not shown). A homogeneous comparison of the official track errors with selected guidance models is given in Table 4b. The official forecast generally had smaller mean errors than most of the individual guidance models through 96 h, although the HWRF (HWFI), SHIPS (DSHP), and GFDL (GHMI) each beat OFCL at one or two times. The Florida State University Superensemble (FSSE) performed better than OFCL at all forecasts times except 72 and 96 h, while the ICON and IVCN intensity consensus had smaller average errors than OFCL at 24, 36, 48, and 120 h.

Watches and warnings associated with Jova are listed in Table 5.

Acknowledgements

Thanks to Josh Morgerman of iCyclone who provided the pressure report in Emiliano Zapata.

Table 1. Best track for Hurricane Jova, 6–12 October 2011.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
05 / 1200	9.7	102.8	1009	25	low
05 / 1800	10.0	103.7	1006	25	"
06 / 0000	10.5	104.6	1006	25	tropical depression
06 / 0600	11.1	105.5	1006	30	"
06 / 1200	11.6	106.3	1006	30	"
06 / 1800	12.1	107.1	1004	35	tropical storm
07 / 0000	12.6	108.1	1002	40	"
07 / 0600	13.1	109.1	1000	45	"
07 / 1200	13.7	109.9	999	50	"
07 / 1800	14.4	110.3	997	55	"
08 / 0000	15.1	110.5	997	55	"
08 / 0600	15.5	110.6	996	55	"
08 / 1200	15.6	110.6	993	60	"
08 / 1800	15.8	110.4	989	65	hurricane
09 / 0000	16.0	110.0	986	70	"
09 / 0600	16.1	109.5	982	75	"
09 / 1200	16.1	108.9	978	80	"
09 / 1800	16.1	108.3	975	80	"
10 / 0000	16.2	107.7	969	90	"
10 / 0600	16.3	107.2	964	100	"
10 / 1200	16.4	106.8	961	105	"
10 / 1800	16.5	106.5	955	110	"
11 / 0000	16.8	106.2	958	105	"
11 / 0600	17.2	105.9	962	100	"
11 / 1200	17.5	105.7	965	95	"
11 / 1800	17.9	105.5	973	85	"
12 / 0000	18.6	105.3	974	85	"
12 / 0600	19.6	105.1	975	85	"
12 / 1200	20.6	104.9	987	60	tropical storm
12 / 1800	21.3	104.5	1000	30	tropical depression
13 / 0000					dissipated
12 / 0600	19.6	105.1	975	85	Landfall near El Tabaco, Jalisco, Mexico
10 / 1800	16.5	106.5	955	110	minimum pressure and maximum wind

Table 2. Selected surface observations for Hurricane Jova, 6–12 October 2011.

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft)	Storm tide (ft)	Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[a]	Sustained (kt)[b]	Gust (kt)			
Mexico								
International Civil Aviation Organization (ICAO) and Synoptic Sites								
Colima (MMIA)								14.22
Manzanillo (MMZO)	11/2341	992.9	11/2142	20	40			
Manzanillo (76654)								12.48
Other								
Cihuatlan								16.54
Coquimatlan								14.74
Penitas								13.25
Camala								12.87
Colima								12.35
El Chanal								11.39
Manzanillo								11.14

[a] Date/time is for sustained wind when both sustained and gust are listed.
[b] Sustained wind averaging period is 10 min.

Table 3a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Hurricane Jova, 6–12 October 2011. Mean errors for the 5-yr period 2006-10 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 (Jova)	30.0	**39.1**	**43.5**	**54.2**	**79.9**	**131.8**	**128.4**
OCD5 (Jova)	40.0	77.8	125.7	199.5	397.2	629.4	787.0
Forecasts	26	24	22	20	16	12	5
OFCL (2006-10)	29.7	49.9	69.0	86.6	119.0	155.8	197.7
OCD5 (2006-10)	38.4	74.8	115.3	155.9	226.3	273.7	310.4

Table 3b. Homogeneous comparison of selected track forecast guidance models (in n mi) for Hurricane Jova, 6–12 October 2011. 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	24.5	31.9	32.2	41.7	76.6	147.5	171.2
OCD5	37.4	76.1	125.9	203.9	413.2	650.3	790.7
GFSI	30.3	42.4	48.8	62.1	141.7	300.1	528.3
GHMI	33.1	55.5	75.2	87.9	115.3	268.1	388.5
GFNI	43.7	82.2	121.4	155.1	187.4	210.5	228.7
HWFI	29.6	52.3	80.4	126.1	249.1	376.3	467.9
NGPI	39.5	71.7	87.8	84.0	84.2	**143.3**	270.2
UKMI	34.5	60.1	78.8	93.9	91.9	**112.3**	**154.3**
EMXI	26.0	37.0	41.1	44.4	**58.2**	**101.4**	**73.8**
AEMI	27.4	42.9	48.1	47.8	102.9	193.8	294.0
TVCA	25.4	**31.0**	**30.4**	**37.9**	80.0	152.4	284.3
TVCE	26.5	35.0	36.8	**39.1**	**69.6**	**126.4**	283.7
TVCC	**24.1**	**27.8**	37.5	46.7	82.8	158.1	**58.8**
LBAR	31.8	53.1	79.4	104.8	185.6	282.5	467.4
BAMD	34.9	59.1	80.7	95.6	144.3	229.3	353.5
BAMM	34.6	54.2	73.4	92.5	144.5	208.3	290.7
BAMS	34.6	51.5	84.3	114.7	179.8	180.4	214.3
Forecasts	23	22	20	18	14	10	2

Table 4a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Hurricane Jova, 6–12 October 2011. Mean errors for the 5-yr period 2006-10 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 (Jova)	6.9	**9.8**	**9.3**	**10.3**	**9.7**	33.8	45.0
OCD5 (Jova)	8.5	13.6	15.5	21.5	27.8	34.8	35.8
Forecasts	26	24	22	20	16	12	5
OFCL (2006-10)	6.3	10.5	13.7	15.1	17.1	18.6	18.0
OCD5 (2006-10)	7.3	11.9	15.3	17.6	19.0	20.3	21.1

Table 4b. Homogeneous comparison of selected intensity forecast guidance models (in kt) for Hurricane Jova, 6–12 October 2011. 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	7.6	10.7	9.7	11.8	9.2	30.0	55.0
OCD5	8.9	14.7	17.0	23.6	31.7	39.1	**32.5**
GHMI	9.7	11.5	12.2	14.8	9.5	37.1	58.5
GFNI	7.7	12.2	14.1	24.9	37.0	34.3	**4.0**
HWFI	7.3	**10.1**	12.9	**10.5**	28.2	55.6	71.5
DSHP	8.0	10.9	10.9	**10.6**	22.6	45.0	**50.0**
LGEM	8.8	12.9	15.6	18.9	25.8	36.6	**45.5**
FSSE	**7.4**	**8.2**	**8.9**	**7.7**	10.1	37.6	**19.0**
ICON	8.0	**8.5**	**6.6**	**8.2**	18.3	43.4	57.5
IVCN	7.7	**8.2**	**6.4**	**9.9**	22.0	41.7	**45.0**
Forecasts	23	21	19	17	13	7	2

Table 5. Watch and warning summary for Hurricane Jova, 6–12 October 2011.

Date/Time (UTC)	Action	Location
09/2100	Hurricane Watch issued	Punta San Telmo to Cabo Corrientes, Mexico
09/2100	Tropical Storm Watch issued	Lazaro Cardenas to Punta San Telmo, Mexico
10/0300	Hurricane Watch changed to Hurricane Warning	Punta San Telmo to Cabo Corrientes, Mexico
10/0300	Tropical Storm Watch changed to Tropical Storm Warning	Lazaro Cardenas to Punta San Telmo, Mexico
10/2100	Tropical Storm Watch issued	Cabo Corrientes to San Blas, Mexico
11/0300	Tropical Storm Watch changed to Tropical Storm Warning	Cabo Corrientes to San Blas, Mexico
11/0300	Tropical Storm Warning issued	San Blas to El Roblito, Mexico
12/0900	Tropical Storm Warning discontinued	Lazaro Cardenas to Punta San Telmo, Mexico
12/1500	Hurricane Warning changed to Tropical Storm Warning	Manzanillo to Cabo Corrientes, Mexico
12/1500	Hurricane Warning discontinued	Punta San Telmo to Manzanillo, Mexico
12/2100	Tropical Storm Warning discontinued	All

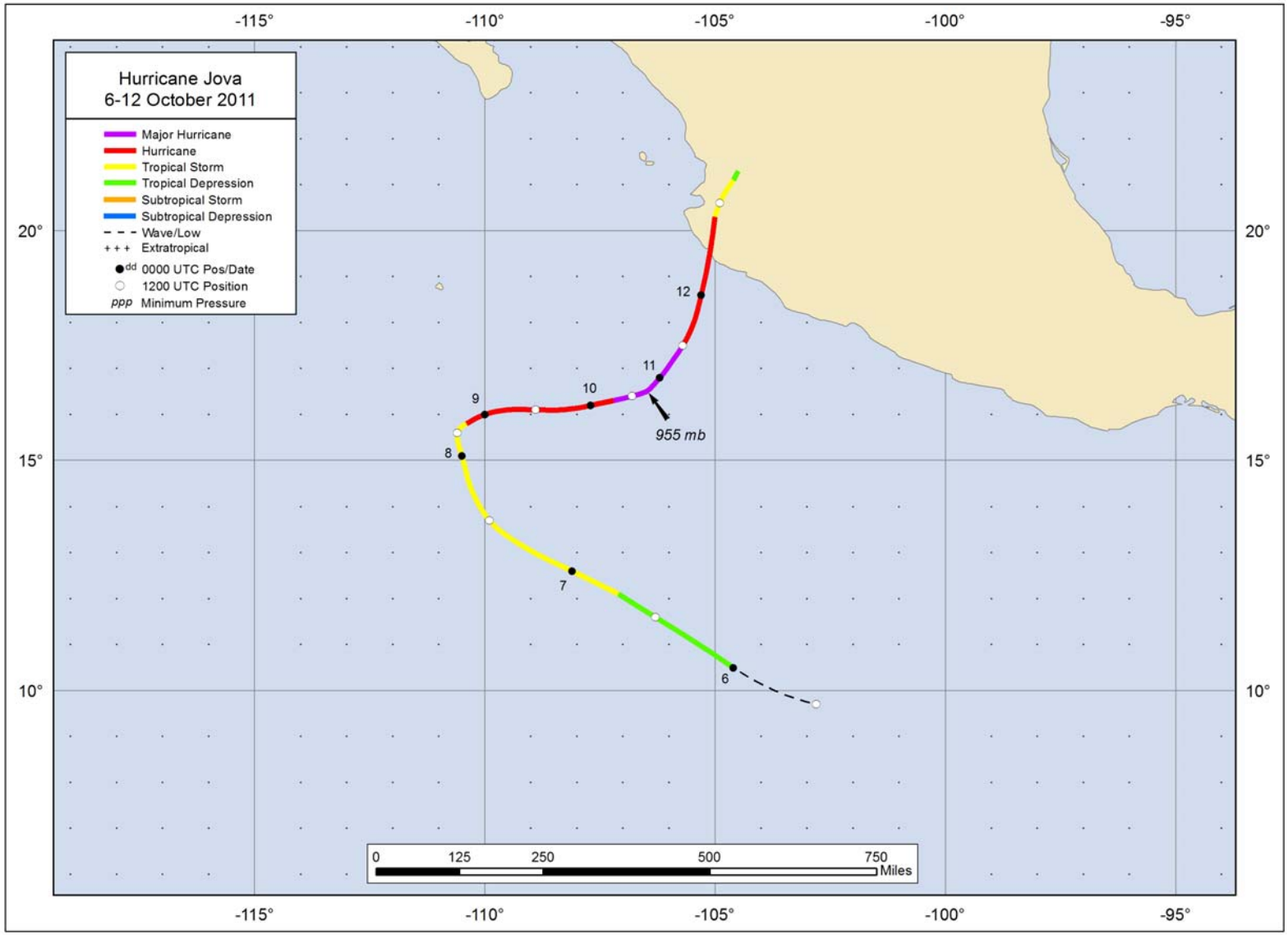

Figure 1. Best track positions for Hurricane Jova, 6–12 October 2011.

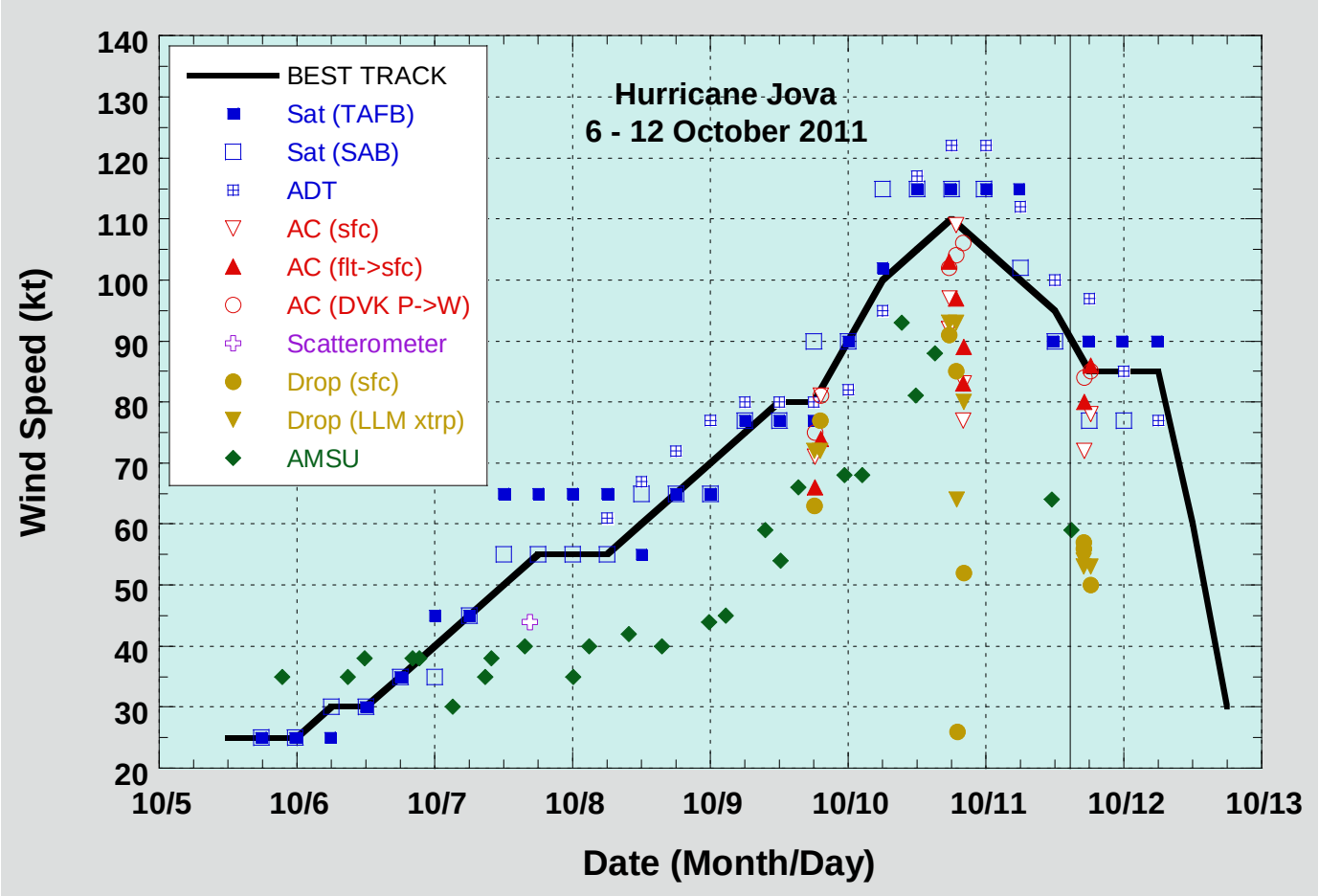

Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Hurricane Jova, 6–12 October 2011. Aircraft observations have been adjusted for elevation using a 90% adjustment factor for observations from 700 mb. Dropwindsonde observations include actual 10 m winds (sfc), as well as surface estimates derived from the mean wind over the lowest 150 m of the wind sounding (LLM). Advanced Dvorak Technique estimates represent linear averages over a 3-hr period centered on the nominal observation time. AMSU intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies technique. Dashed vertical lines correspond to 0000 UTC and the solid vertical line corresponds to landfall.

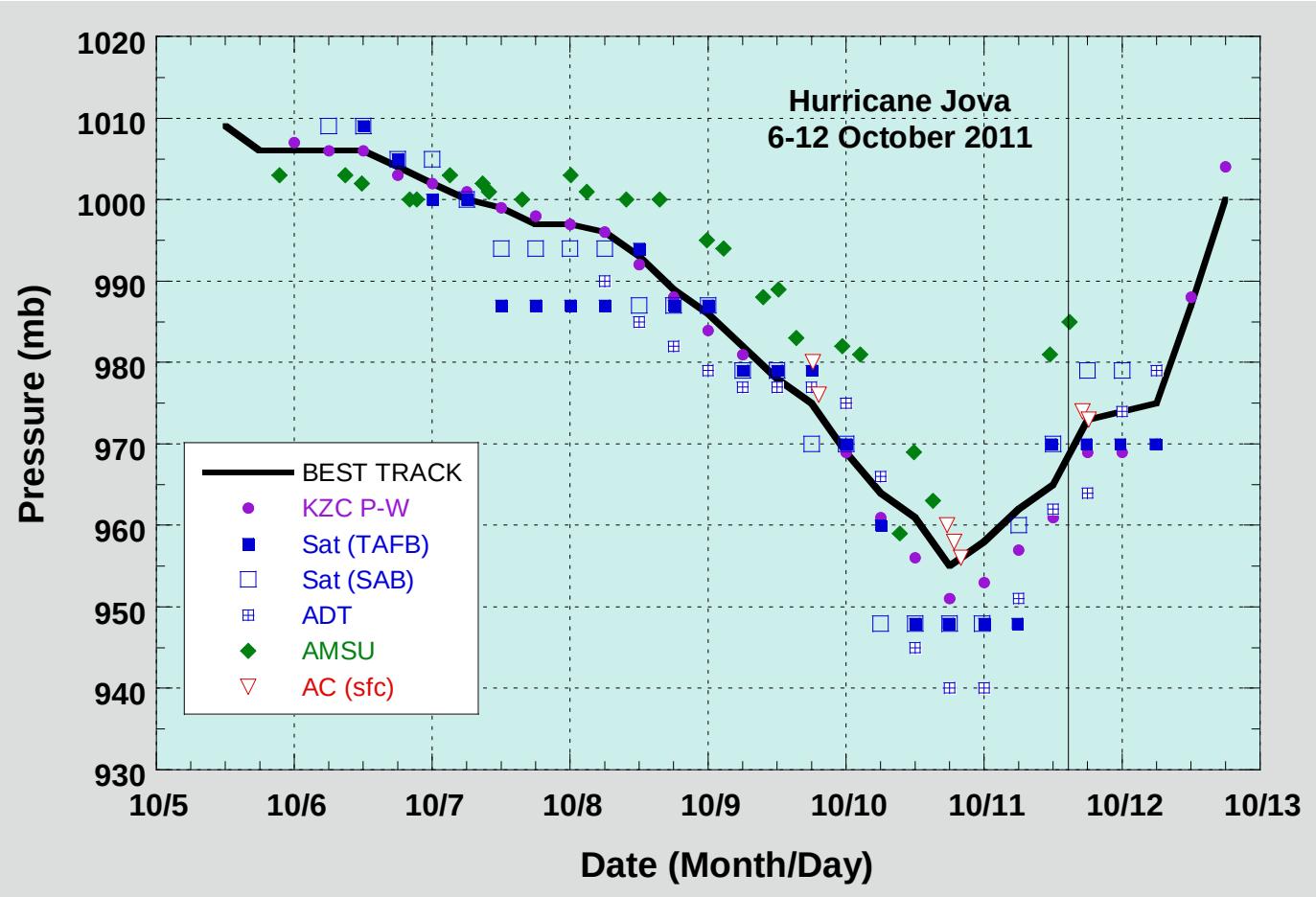

Figure 3. Selected pressure observations and best track minimum central pressure curve for Hurricane Jova, 6–12 October 2011. Advanced Dvorak Technique estimates represent linear averages over a 3-hr period centered on the nominal observation time. AMSU intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies technique. The KZC P-W values are obtained by applying the Knaff-Zehr-Courtney pressure-wind relationship to the best track wind data. Dashed vertical lines correspond to 0000 UTC and the solid vertical line corresponds to landfall.

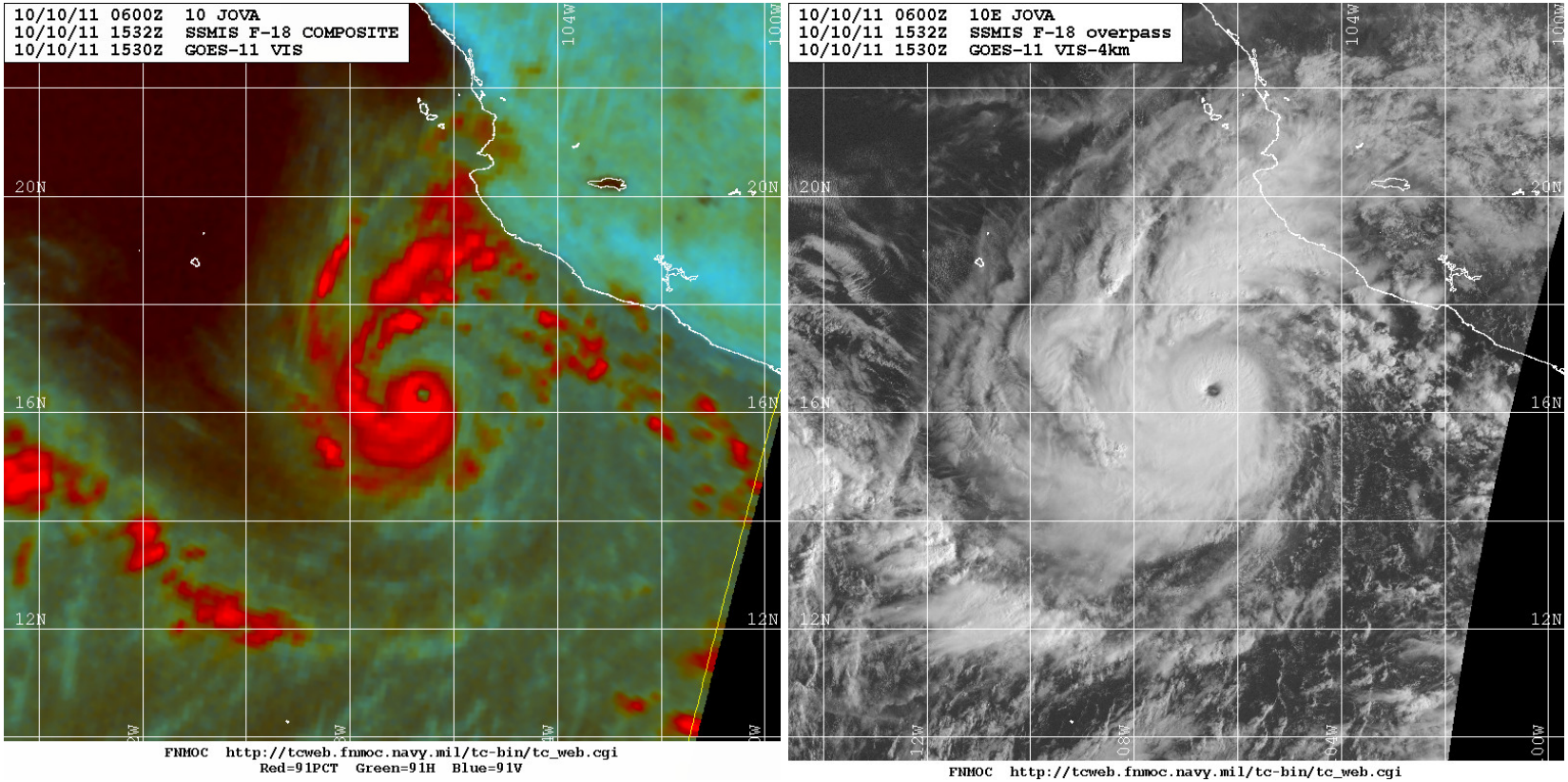

Figure 4. SSMIS 91-GHz color composite (left) and visible (right) images of Hurricane Jova at 1532 UTC 10 October 2011, just prior to the time of Jova's peak intensity. Images courtesy U.S. Navy Fleet Numerical Meteorology and Oceanography Center, Monterey, California.

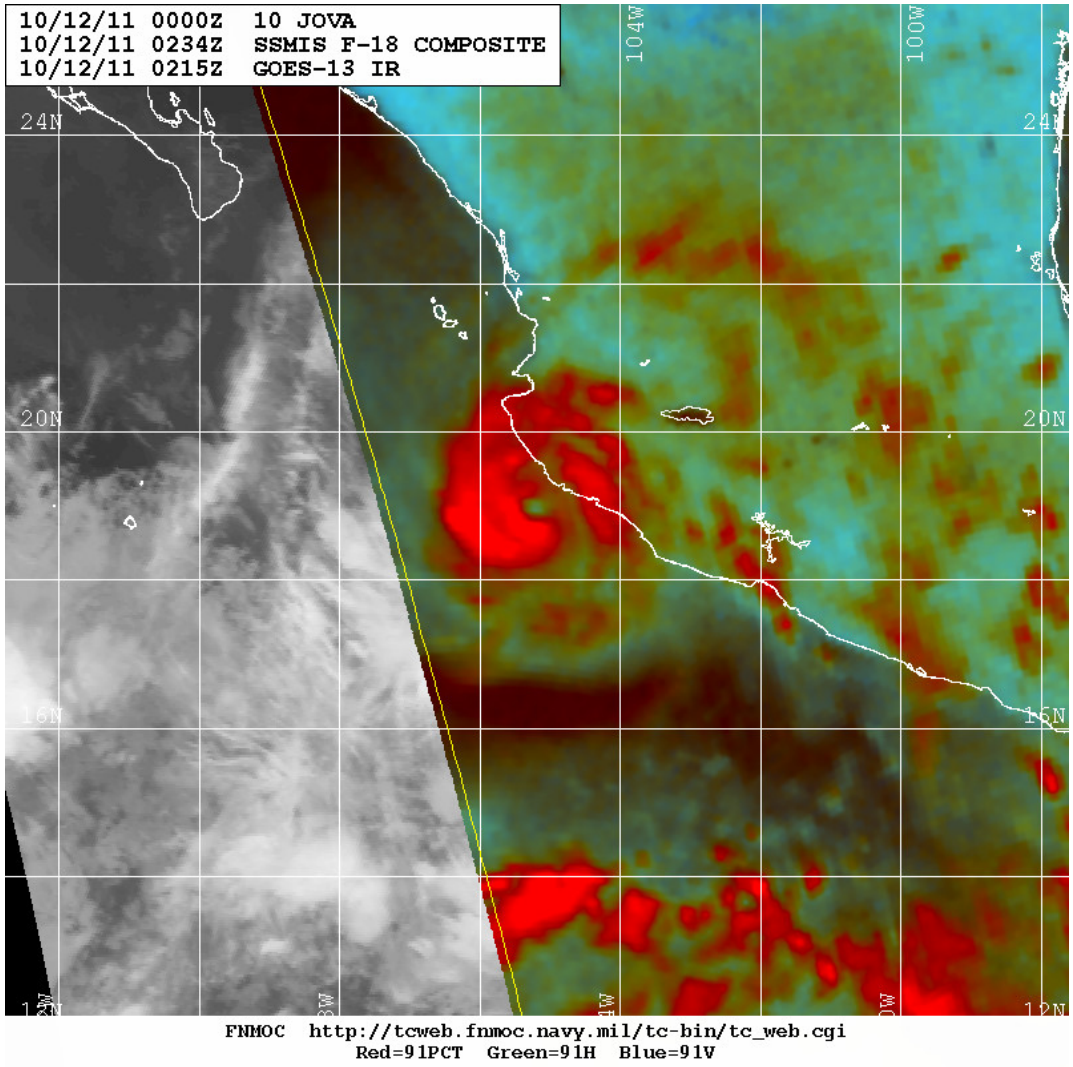

Figure 5. SSMIS 91-GHz color composite satellite image of Hurricane Jova at 0234 UTC 12 October 2011. Image courtesy U.S. Navy Fleet Numerical Meteorology and Oceanography Center, Monterey, California.

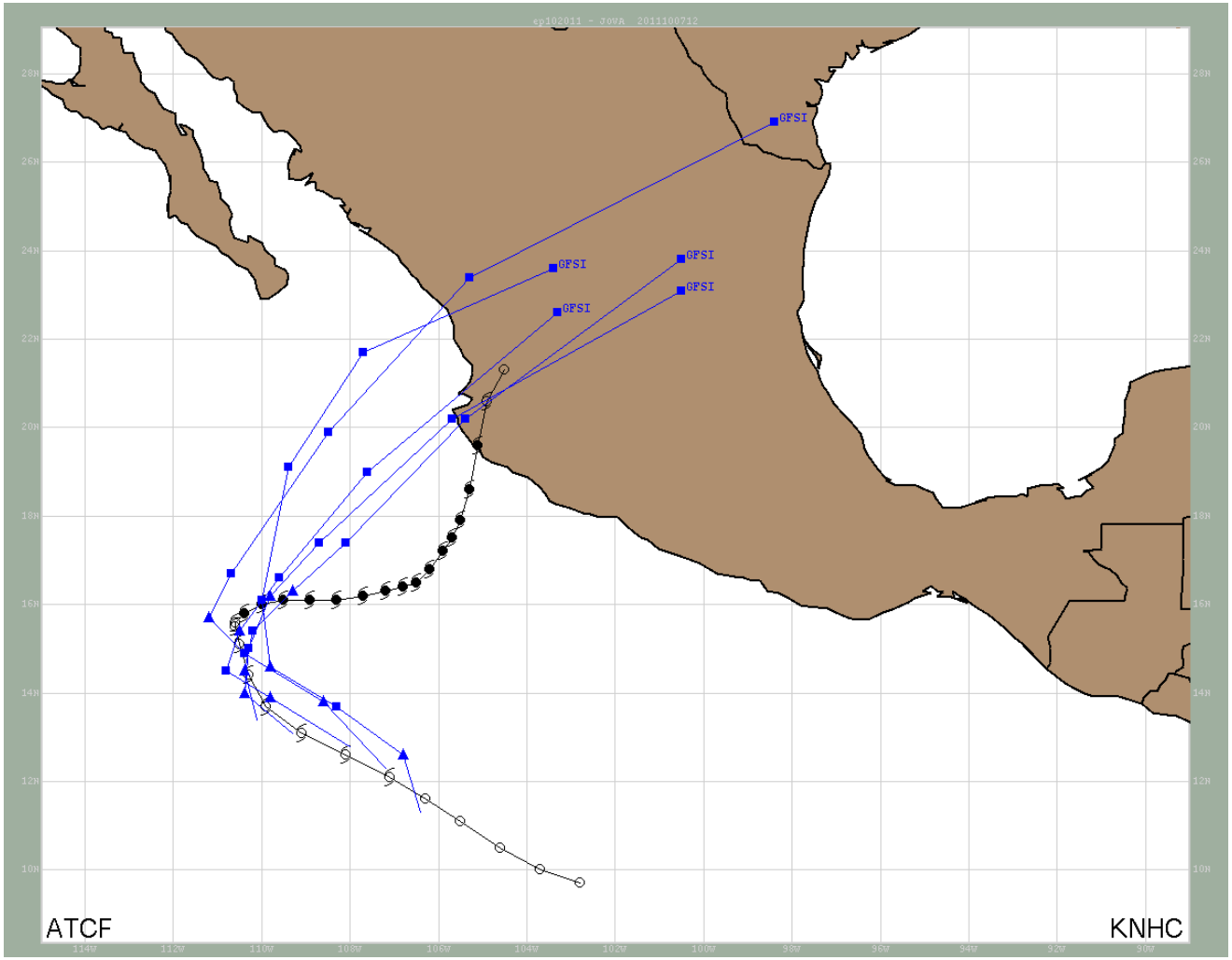

Figure 6. GFSI model 5-day track forecasts for Jova (blue) from 1200 UTC 6 October through 1200 UTC 7 October 2011. The black line shows the best track of Jova.

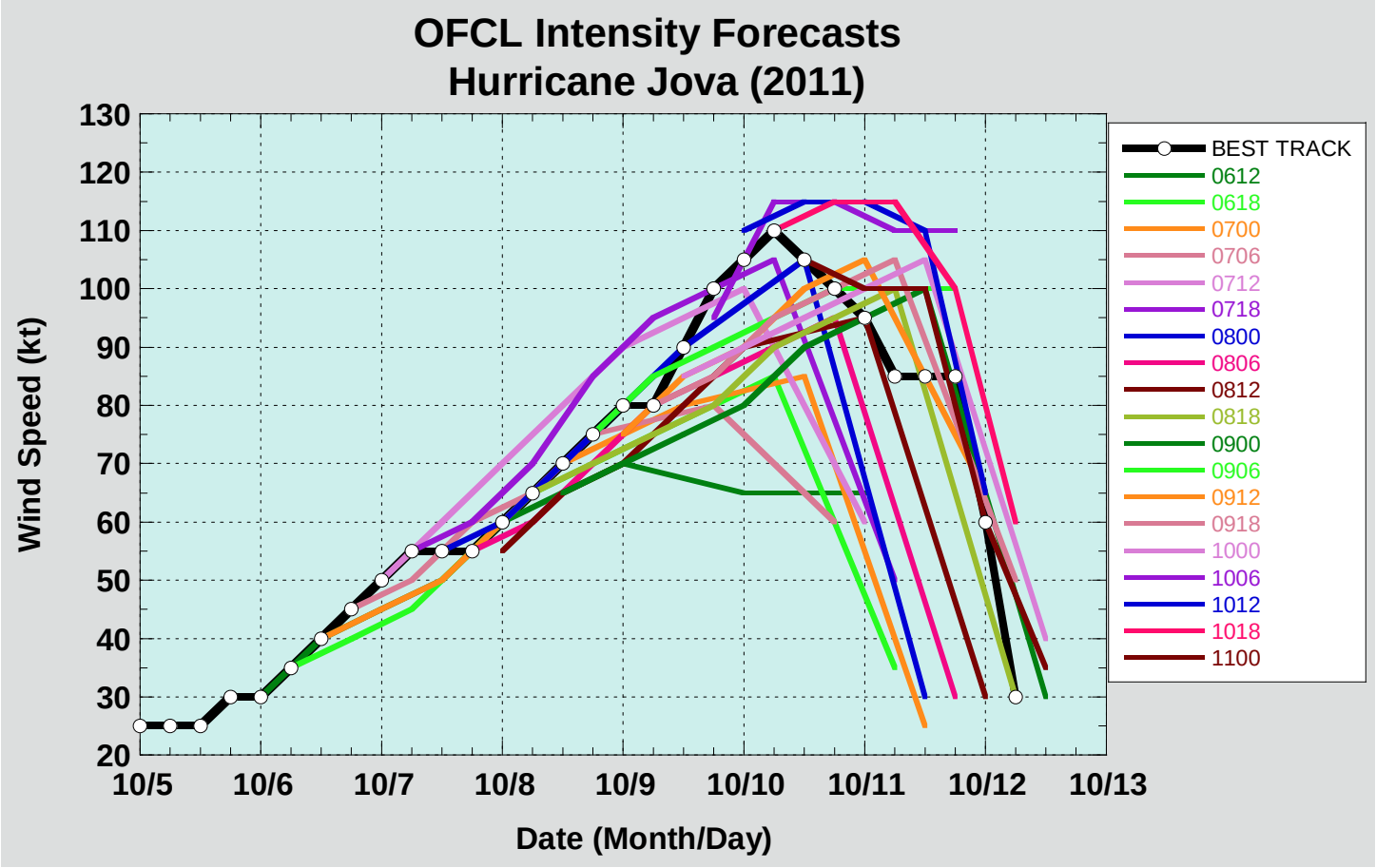

Figure 7. Official intensity forecasts for Jova (colored lines) issues from 1200 UTC 6 October through 0000 UTC 11 October 2011. The black line represents the best track intensity of Jova.