

Tropical Cyclone Report  
Hurricane Lisa  
(AL142010)  
20-26 September 2010

Daniel P. Brown  
National Hurricane Center  
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Lisa was a small tropical cyclone that became a category one hurricane (on the Saffir-Simpson Hurricane Wind Scale) over the far eastern Atlantic Ocean.

a. Synoptic History

Lisa developed from a tropical wave that exited the west coast of Africa on 16 September. A couple of days later, a broad area of low pressure developed along the wave axis to the southwest of the Cape Verde Islands. During 19-20 September, the circulation became better defined and thunderstorm activity associated with the low slowly gained organization. At 1800 UTC 20 September, when the system was located about 400 n mi west of the Cape Verde Islands it acquired enough organization to be considered a tropical cyclone. 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<sup>1</sup>.

At the time of genesis, the subtropical ridge over the eastern Atlantic was unusually weak due to a large mid-latitude trough over the northeastern Atlantic, and this caused the depression to move slowly northward after genesis. The depression became a tropical storm 6 h later and attained an intensity of 40 kt at 0600 UTC 21 September. Lisa turned southeastward and then eastward the next day in weak westerly steering flow to the south of the deep-layer trough.

Thunderstorm activity became limited on 22 September, possibly due to the entrainment of drier air into the circulation. This caused Lisa to weaken to a tropical depression by 1800 UTC 22 September. The weakening was short-lived however, and the depression regained tropical storm status 18 h later. After becoming a tropical storm again, Lisa turned northeastward and a period of rapid intensification began early on 24 September. The tropical cyclone turned northward and strengthened from a 35-kt tropical storm to a 65-kt hurricane in about 21 h on 24 September. Late that day a small eye became evident in infrared and microwave satellite imagery (Fig 4). Lisa reached a peak intensity of 75 kt at 0000 UTC 25 September about 240 n mi northwest of the Cape Verde Islands. Shortly thereafter, the hurricane moved over progressively cooler water and into an area of strong westerly upper-level winds. This caused the hurricane to rapidly weaken, and Lisa became a tropical depression by 1200 UTC 26 September. Thunderstorm activity dissipated soon thereafter, and Lisa degenerated to a

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<sup>1</sup> 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.

remnant low 6 h later. The remnant low moved northwestward for about 36 h before turning northward and decelerating. The remnant low dissipated by 0600 UTC 29 September about 515 n mi south-southwest of the Azores Islands.

b. Meteorological Statistics

Observations in Lisa (Figs. 2 and 3) include 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, the NASA Tropical Rainfall Measuring Mission (TRMM) and Aqua, 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 Lisa.

The 75-kt analyzed peak intensity of Lisa is based on a blend of objective and subjective Dvorak intensity estimates. Satellite imagery indicates that Lisa's peak in organization occurred around 0000 UTC 25 September. Although Dvorak rules restricted the final T-numbers from showing a greater intensity at that time, data T-numbers from both SAB and TAFB were 4.5 or 77 kt. Objective T-numbers from the Advanced Dvorak Technique also reached 4.3 or 72 kt around that time.

There were no ship observations of tropical-storm-force winds associated with Lisa.

c. Casualty and Damage Statistics

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

d. Forecast and Warning Critique

The genesis of Lisa was well forecast. The disturbance from which Lisa developed was introduced in the Tropical Weather Outlook at 1200 UTC 17 September, about 78 h prior to genesis. The assigned probabilities were initially in the low category (<30%), but were raised to the medium category (30-50%) 54 h before development, and the high category (>50%) 36 hours before tropical cyclone formation.

A verification of NHC official track forecasts for Lisa is given in Table 2a. Official forecast track errors were much larger than the mean official errors for the previous five-year period. Official errors at days 3-5 were more than double the long term mean. The OCD5 errors were also larger than their 5-year mean, especially at 72 h and beyond, indicating that the forecasts for Lisa were more difficult than normal. A homogeneous comparison of the official track errors with selected guidance models is given in Table 2b. Most of the track guidance (Fig. 5) and the NHC forecast initially predicted a slow northward or northwestward motion. Although several of the track models had lower mean errors than the official forecast, the track

models also had difficulty forecasting Lisa's atypical track. The EMXI model had some of the lowest track errors through 48 h, and the BAMD had the smallest errors at 72-120 h.

A verification of NHC official intensity forecasts for Lisa is given in Table 3a. Official forecast intensity errors were above the long term mean through 48 h, and lower than the five-year means at 72-120 h. A homogeneous comparison of the official intensity errors with selected guidance models is given in Table 3b. All of the credible intensity guidance beat the official forecast at 24, 36, and 48 h, while the official forecast was better than nearly all of the guidance at 72 and 96 h.

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

Table 1. Best track for Lisa, 20-26 September 2010.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
20 / 0000	15.2	32.0	1008	25	low
20 / 0600	15.5	32.1	1007	25	"
20 / 1200	15.9	32.1	1007	25	"
20 / 1800	16.3	32.0	1006	30	tropical depression
21 / 0000	16.8	31.9	1005	35	tropical storm
21 / 0600	17.3	31.8	1003	40	"
21 / 1200	17.7	31.7	1002	40	"
21 / 1800	17.8	31.5	1002	40	"
22 / 0000	17.6	31.3	1003	35	"
22 / 0600	17.3	30.9	1003	35	"
22 / 1200	17.3	30.4	1003	35	"
22 / 1800	17.4	30.0	1005	30	tropical depression
23 / 0000	17.5	29.7	1005	30	"
23 / 0600	17.5	29.3	1005	30	"
23 / 1200	17.5	28.8	1004	35	tropical storm
23 / 1800	17.6	28.3	1003	35	"
24 / 0000	17.9	28.0	1002	35	"
24 / 0600	18.3	27.7	1001	40	"
24 / 1200	19.0	27.6	998	50	"
24 / 1800	19.7	27.7	993	60	"
24 / 2100	20.0	27.7	988	65	hurricane
25 / 0000	20.4	27.8	982	75	"
25 / 0600	21.3	28.0	986	70	"
25 / 1200	22.3	28.3	990	60	tropical storm
25 / 1800	23.2	28.6	996	50	"
26 / 0000	24.0	28.8	1002	40	"
26 / 0600	24.8	28.9	1004	35	"
26 / 1200	25.3	29.0	1006	30	tropical depression
26 / 1800	25.8	29.2	1007	30	low
27 / 0000	26.3	29.6	1008	30	"
27 / 0600	26.8	30.1	1009	30	"
27 / 1200	27.4	30.6	1011	30	"
27 / 1800	28.0	31.1	1013	30	"
28 / 0000	28.6	31.5	1013	30	"
28 / 0600	29.1	31.7	1015	30	"
28 / 1200	29.5	31.7	1015	30	"
28 / 1800	29.9	31.6	1016	25	"
29 / 0000	30.2	31.5	1016	25	"
29 / 0600					dissipated
25 / 0000	20.4	27.8	982	75	minimum pressure

Table 2a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Lisa, 20-26 September 2010. Mean errors for the five-year period 2005-9 are shown for comparison. Official errors that are smaller than the five-year means are shown in boldface type.

	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL	39.2	74.8	122.6	183.3	332.2	439.3	464.4
OCD5	47.4	97.7	163.6	247.8	370.5	500.7	568.7
Forecasts	21	19	17	15	11	7	3
OFCL (2005-9)	31.8	53.4	75.4	96.8	143.8	195.6	252.1
OCD5 (2005-9)	46.9	97.3	155.4	211.6	304.8	387.9	467.8

Table 2b. Homogeneous comparison of selected track forecast guidance models (in n mi) for Lisa, 20-26 September 2010. 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 2a due to the homogeneity requirement.

Model ID	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL	39.4	76.4	120.5	194.4	340.3	439.0	512.0
OCD5	51.4	106.1	167.7	264.0	385.4	474.3	545.5
GFSI	40.7	<b>70.9</b>	<b>106.6</b>	<b>160.6</b>	<b>317.4</b>	<b>435.2</b>	594.9
GHMI	<b>34.4</b>	<b>70.4</b>	<b>112.7</b>	<b>171.1</b>	<b>307.3</b>	<b>408.2</b>	<b>258.8</b>
HWFI	<b>35.2</b>	<b>68.1</b>	<b>101.8</b>	<b>151.3</b>	<b>226.5</b>	<b>207.5</b>	<b>308.6</b>
NGPI	42.5	86.6	142.0	231.7	397.4	575.4	770.8
EGRI	<b>34.4</b>	<b>61.8</b>	<b>96.4</b>	<b>154.7</b>	<b>291.4</b>	449.5	540.4
EMXI	<b>33.6</b>	<b>62.8</b>	<b>93.9</b>	<b>137.9</b>	<b>224.2</b>	<b>295.2</b>	<b>387.7</b>
AEMI	41.3	81.4	123.2	<b>182.5</b>	<b>309.1</b>	<b>386.4</b>	513.4
FSSE	<b>31.3</b>	<b>68.4</b>	<b>110.5</b>	<b>176.2</b>	<b>332.2</b>	<b>436.6</b>	<b>475.5</b>
TCON	<b>33.7</b>	<b>66.5</b>	<b>102.9</b>	<b>162.5</b>	<b>290.0</b>	<b>370.3</b>	<b>479.6</b>
TCCN	<b>32.9</b>	<b>63.5</b>	<b>99.3</b>	<b>155.4</b>	<b>292.1</b>	<b>399.6</b>	542.5
TVCN	<b>34.7</b>	<b>72.3</b>	<b>114.3</b>	<b>183.6</b>	<b>324.8</b>	<b>427.9</b>	<b>506.5</b>
TVCC	<b>33.5</b>	<b>69.3</b>	<b>109.3</b>	<b>173.8</b>	<b>318.7</b>	443.6	527.3
GUNA	<b>34.6</b>	<b>67.4</b>	<b>105.1</b>	<b>168.2</b>	<b>307.0</b>	<b>415.7</b>	530.2
CGUN	<b>33.8</b>	<b>65.1</b>	<b>101.7</b>	<b>162.7</b>	<b>310.9</b>	441.9	582.0
LBAR	52.1	116.3	181.8	265.9	428.4	481.9	758.7
BAMD	53.2	89.3	133.5	<b>171.1</b>	<b>193.9</b>	<b>202.1</b>	<b>249.5</b>
BAMM	43.9	81.0	128.1	<b>188.1</b>	<b>292.7</b>	<b>343.2</b>	<b>343.7</b>
BAMS	42.0	80.8	124.1	<b>188.3</b>	343.3	<b>427.3</b>	525.8
Forecasts	17	15	14	11	8	6	2

Table 3a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Lisa, 20-26 September 2010. Mean errors for the five-year period 2005-9 are shown for comparison. Official errors that are smaller than the five-year means are shown in boldface type.

	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL	9.5	17.9	19.7	17.3	<b>10.5</b>	<b>12.1</b>	<b>13.3</b>
OCD5	10.8	18.6	20.1	16.5	11.0	15.4	18.0
Forecasts	21	19	17	15	11	7	3
OFCL (2005-9)	7.0	10.7	13.1	15.2	18.6	18.7	20.1
OCD5 (2005-9)	8.6	12.5	15.8	18.2	21.0	22.7	21.7

Table 3b. Homogeneous comparison of selected intensity forecast guidance models (in kt) for Lisa, 20-26 September 2010. 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	10.3	18.8	19.7	18.3	10.0	10.8	12.5
OCD5	11.2	19.1	<b>18.8</b>	<b>15.9</b>	12.0	13.8	21.5
GHMI	10.6	<b>13.0</b>	<b>11.1</b>	<b>14.0</b>	22.3	15.7	<b>7.5</b>
HWFI	<b>9.2</b>	<b>12.4</b>	<b>12.7</b>	<b>12.3</b>	11.7	15.8	<b>5.0</b>
DSHP	11.0	<b>17.1</b>	<b>16.3</b>	<b>13.5</b>	11.3	11.2	<b>4.5</b>
LGEM	10.9	<b>17.8</b>	<b>17.3</b>	<b>14.7</b>	10.9	12.2	18.0
ICON	<b>10.1</b>	<b>14.4</b>	<b>13.7</b>	<b>12.5</b>	11.4	12.5	<b>6.0</b>
IVCN	<b>9.9</b>	<b>13.6</b>	<b>12.5</b>	<b>12.5</b>	12.9	12.8	<b>5.5</b>
FSSE	10.5	<b>14.7</b>	<b>14.3</b>	<b>13.8</b>	12.8	<b>9.8</b>	<b>7.5</b>
Forecasts	19	17	15	12	9	6	2

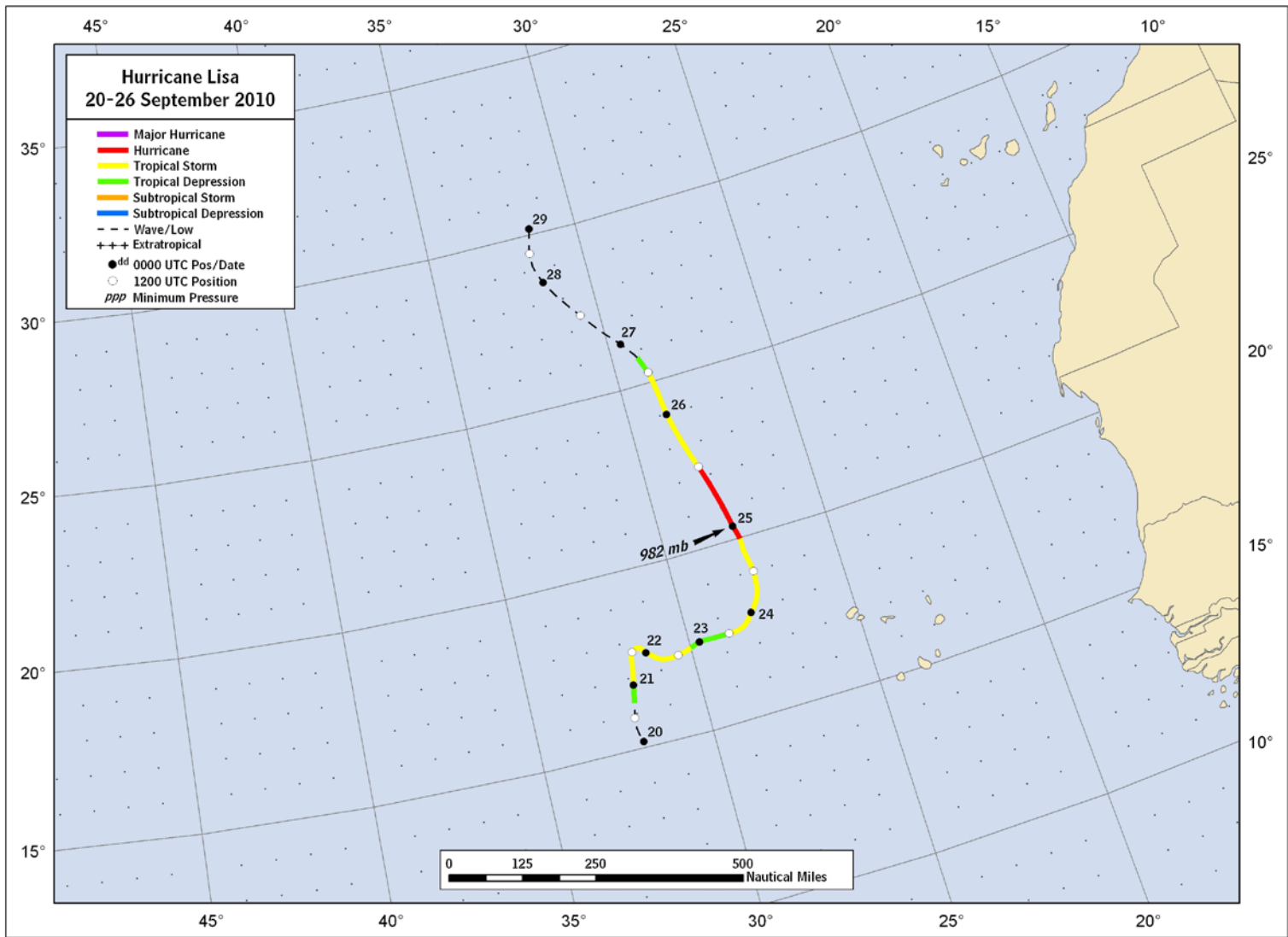


Figure 1. Best track positions for Lisa, 20-26 September 2010.



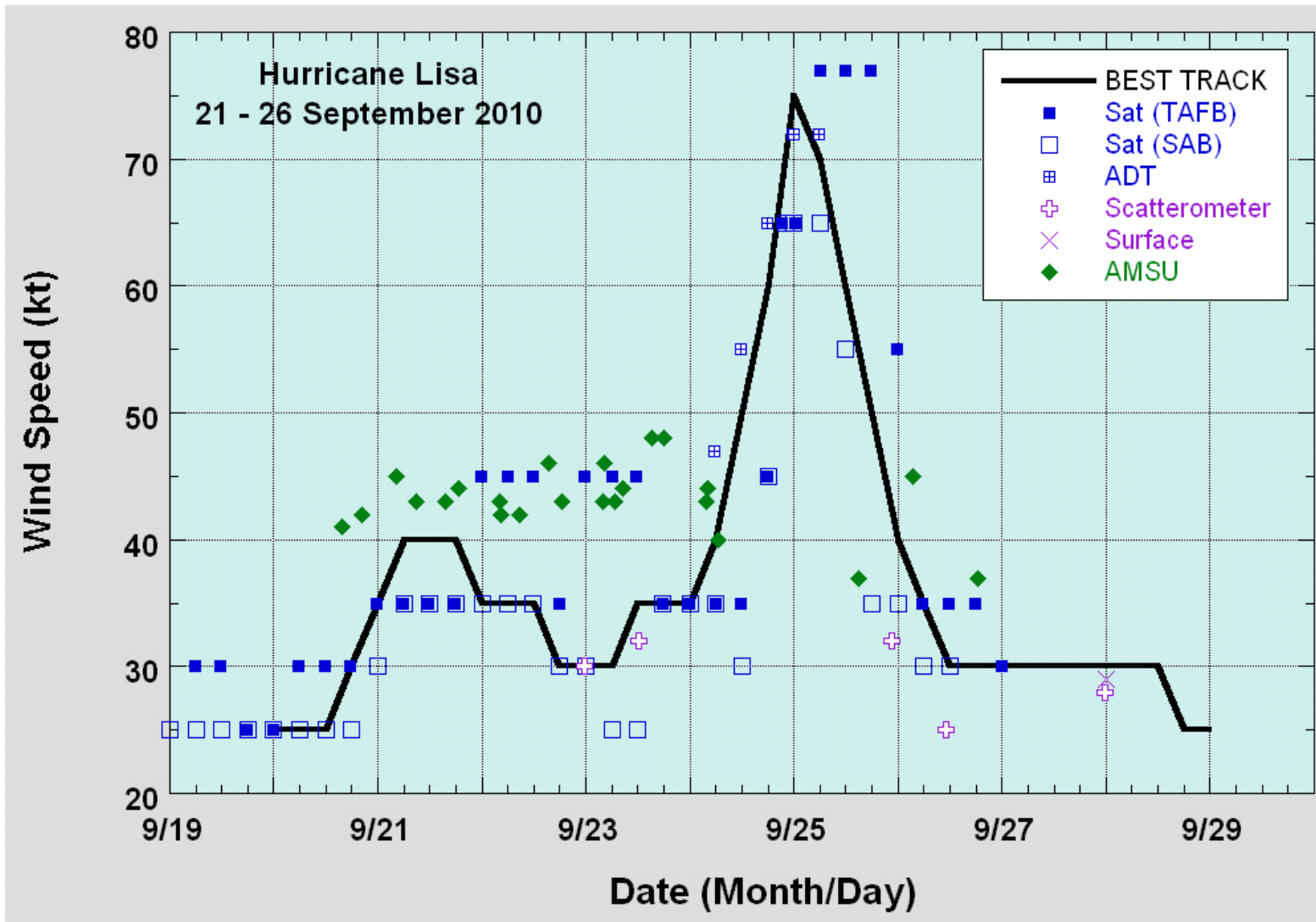


Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Lisa, 20-26 September 2010. AMSU and Advanced Dvorak Technique (ADT) estimates are provided by the Cooperative Institute for Meteorological Satellite Studies (CIMSS). Dashed vertical lines correspond to 0000 UTC.

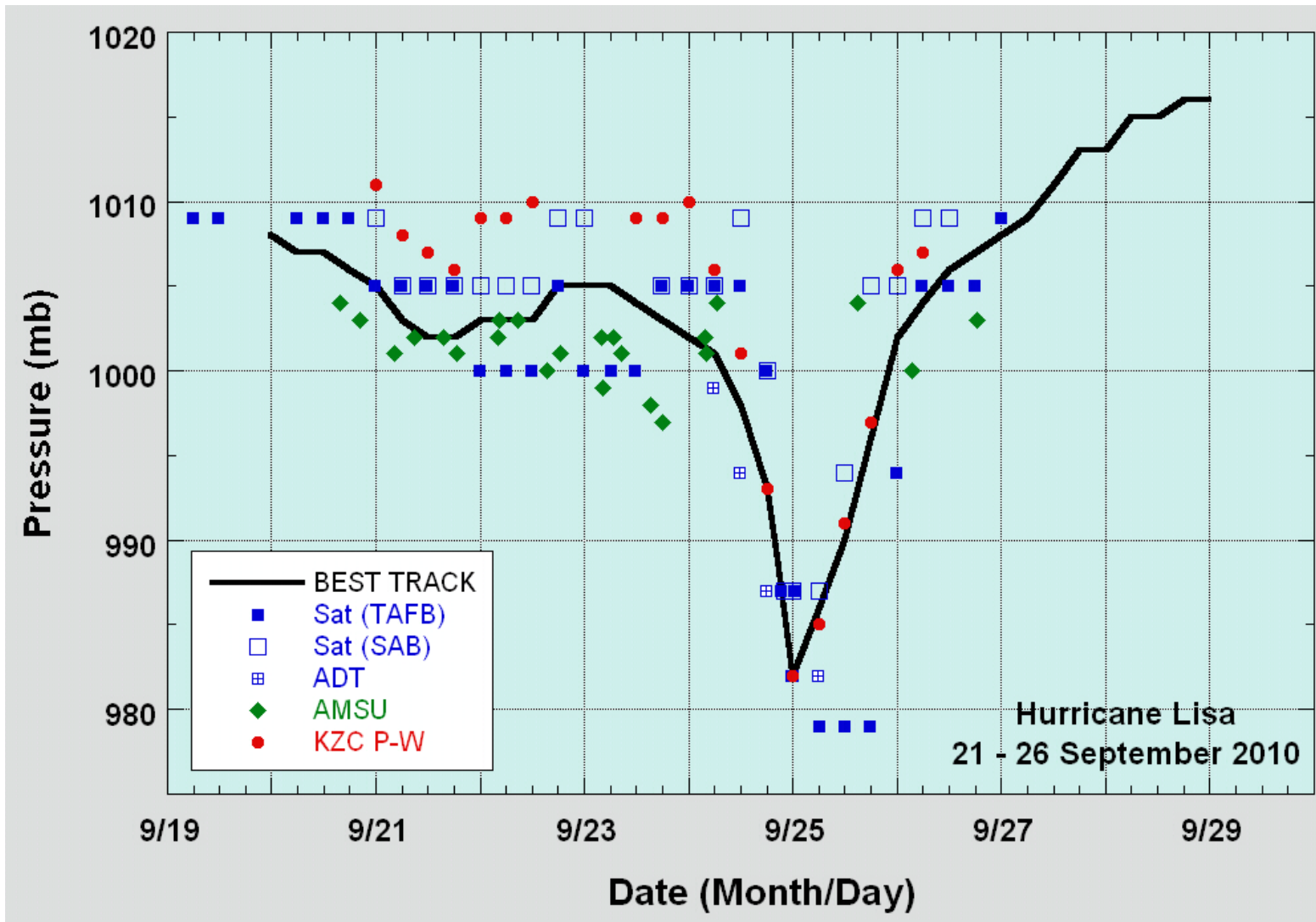


Figure 3. Selected pressure observations and best track minimum central pressure curve for Lisa, 20-26 September 2010. AMSU Advanced Dvorak Technique (ADT) estimates are provided by the Cooperative Institute for Meteorological Satellite Studies (CIMSS). Dashed vertical lines correspond to 0000 UTC.

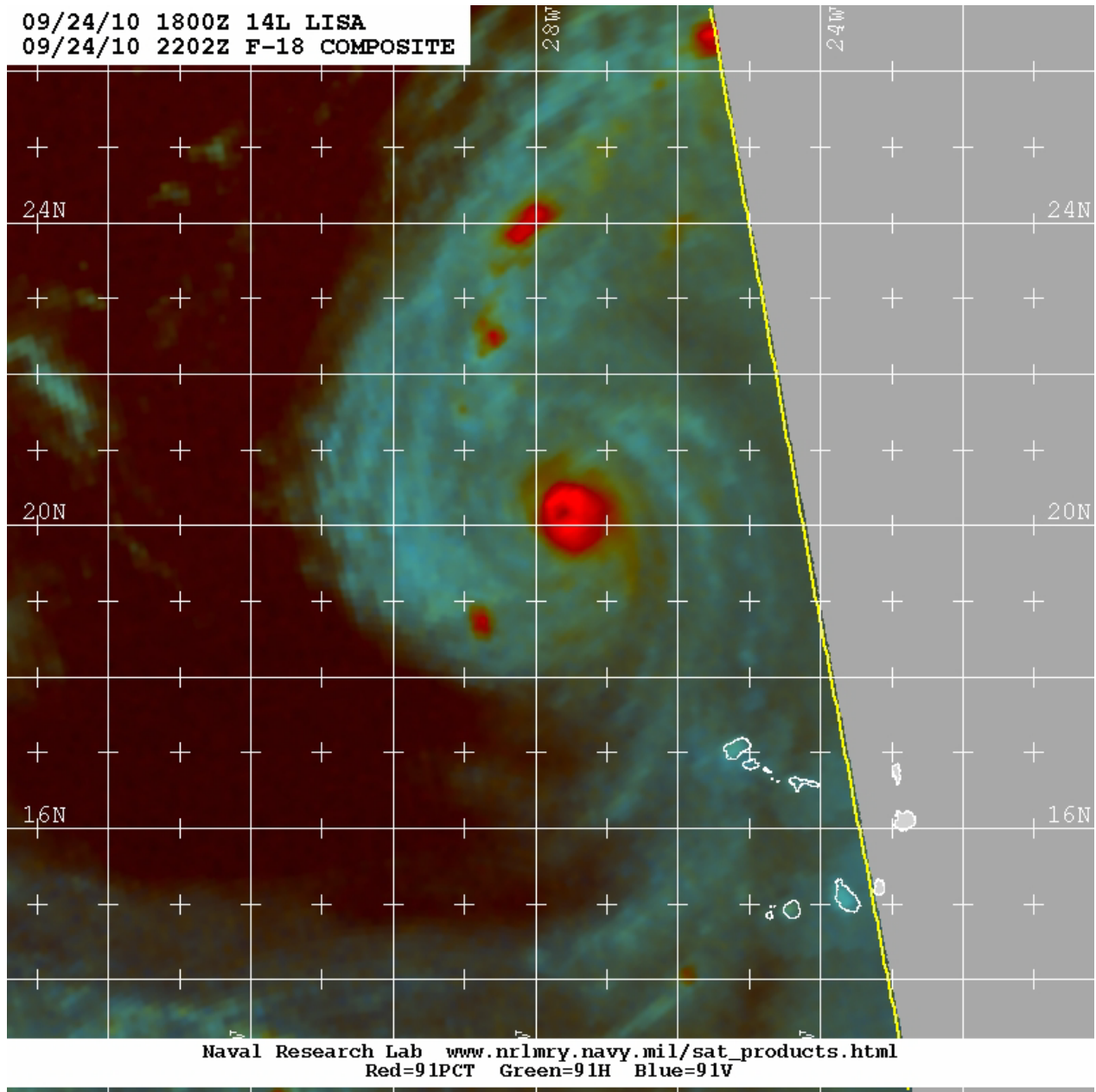
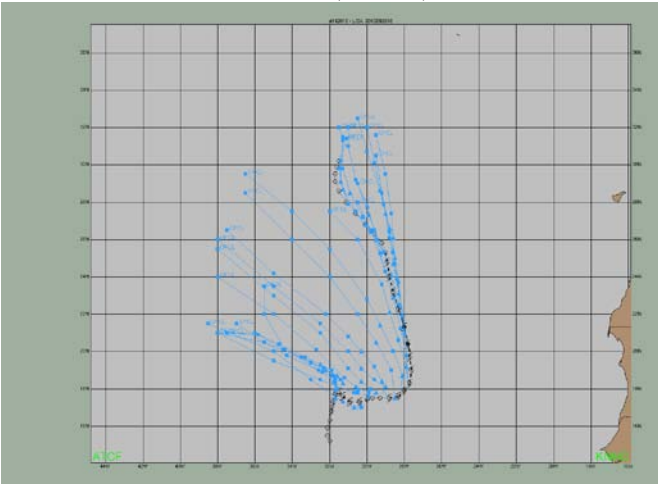
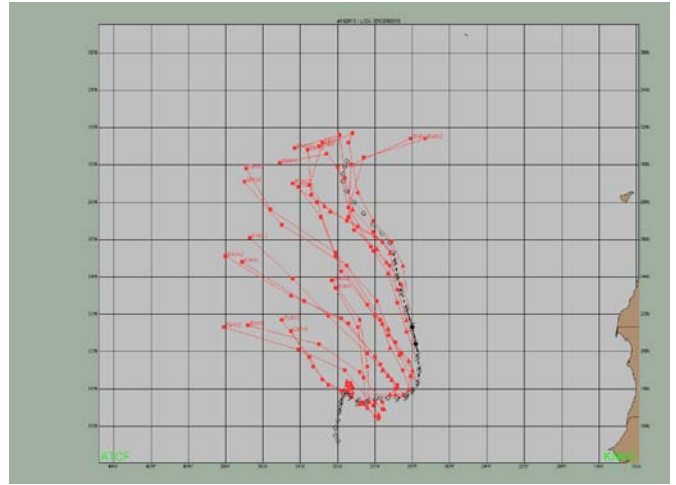


Figure 4. Special Sensor Microwave Imager/Sounder (SSMIS) 91 GHz composite image of Hurricane Lisa at 2202 UTC 24 September, near the time of Lisa's estimated peak intensity. Image courtesy of the Naval Research Laboratory.

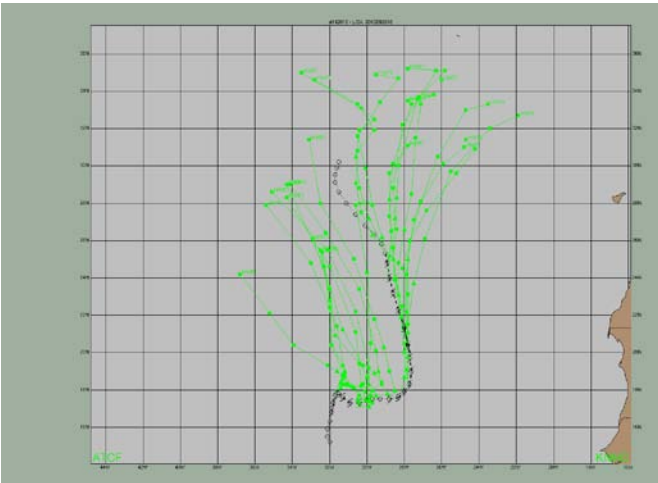
a. official NHC forecasts (OFCL)



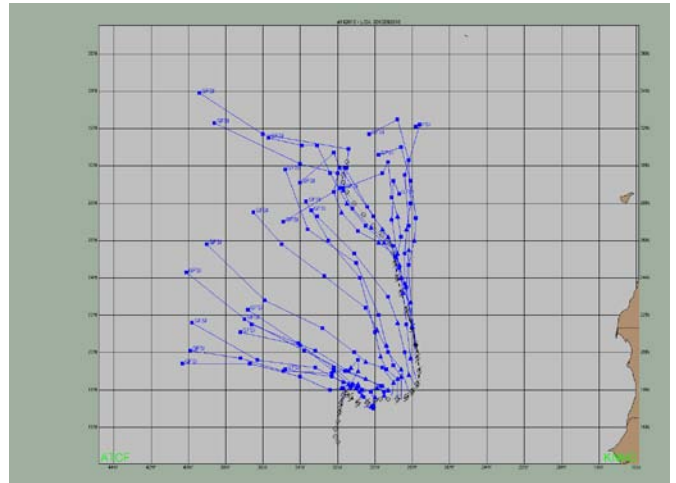
d. EMXI and EMX2



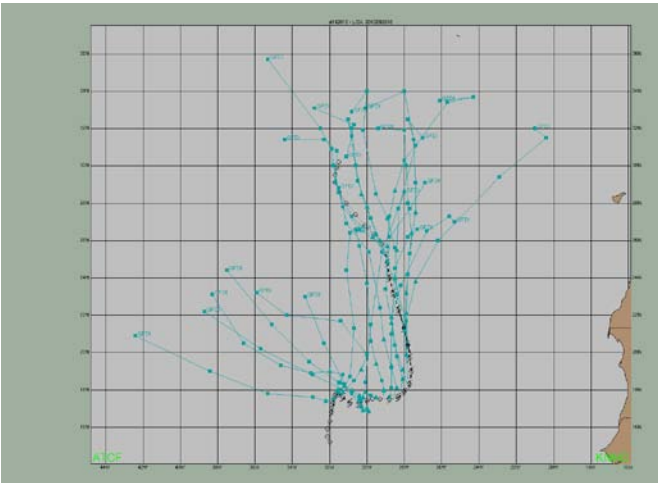
b. HWFI



e. GFSI



c. GFDI



f. UKMI and UKM2

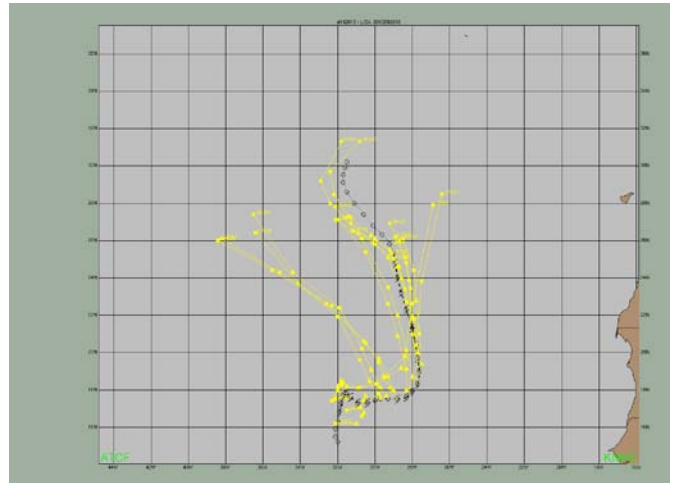


Figure 5. Official NHC and interpolated model track forecasts for Lisa every 6 h from 0000 UTC 21 September to 1800 UTC 26 September. Note that the NHC forecast and most of the track guidance initially predicted Lisa to move toward the northwest. Instead, Lisa moved slowly eastward for a couple of days before turning northward.