

Tropical Cyclone Report  
Hurricane Lisa  
19 September – 3 October 2004

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Lisa was a long-lived tropical cyclone that reached hurricane strength north of 40E latitude.

a. Synoptic History

Lisa developed from a tropical wave that crossed the African coast on 16 September. Early on 19 September the wave showed enough organization to warrant a Dvorak classification, and by 1800 UTC that day the system had developed into a tropical depression, about 450 n mi west-southwest of the Cape Verde Islands. 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.

The depression moved westward initially at about 10 kt. The synoptic-scale environment was not particularly favorable for development – the depression was located between Hurricane Karl about 650 n mi to its west-northwest and a large and convectively active tropical wave just a few hundred miles to its southeast. Despite outflow from Hurricane Karl impinging on the depression from the north, a small organized core developed and the depression rapidly strengthened on 20 September, becoming a tropical storm by 1200 UTC and reaching an estimated intensity of 60 kt 18 h later. The northerly shear prevailed, however, and Lisa gradually weakened over the next couple of days. Meanwhile, the wave disturbance was approaching Lisa from the east, and the two systems began a Fujiwhara interaction. Lisa turned southward on 22 September and then eastward the next day as the convection from the two systems became hard to distinguish. Although Lisa weakened to a tropical depression on 23 September, it was able to maintain a small but distinct low-level circulation throughout its merger with the disturbance. Lisa completed its cyclonic loop early on 24 September and briefly re-attained tropical storm strength before northerly shear again separated the cyclone from its deep convection.

On 25 September Lisa turned sharply northward ahead of a deep mid- to upper-level trough moving southeastward into the central Atlantic. The northerly shear abated and Lisa became a tropical storm for the third time at 0600 UTC, about 925 miles east of the Lesser Antilles. Lisa moved northward for five days as a tropical storm, nearly reaching hurricane intensity on 29 September when an upper-level trough in the westerlies cut off to the southwest of Lisa, reducing the southwesterly shear over the storm. During this time satellite imagery showed a ragged eye ringed by shallow convection. The following day Lisa crossed some cooler

water upwelled by Hurricane Karl, convection diminished, and the cyclone's winds dropped to 45 kt, even though the eye feature remained distinct.

On 1 October, Lisa turned northeastward and accelerated ahead of an approaching short-wave trough in the westerlies. Southwesterly shear diminished and Lisa re-strengthened over 25EC waters. Early on 2 October, cloud tops cooled significantly around the eye and Dvorak estimates reached as high as 77 kt. Based on the satellite classifications, it is estimated that Lisa became a hurricane, after 13 days of existence as a tropical cyclone, at 0600 UTC 2 October, about 625 n mi southeast of Cape Race, Newfoundland. At this time, water temperatures under the cyclone were close to 23E C. Lisa was a hurricane for less than 12 hours before the cloud pattern began to deteriorate rapidly. Lisa lost tropical characteristics by 0600 UTC 3 October, and was absorbed into a frontal zone a few hours later, about 1000 n mi east-southeast of Cape Race.

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), the Satellite Analysis Branch (SAB) and the U. S. Air Force Weather Agency (AFWA), as well as microwave satellite imagery from NOAA polar-orbiting satellites, the NASA Tropical Rainfall Measuring Mission (TRMM), the NASA QuikSCAT, and Defense Meteorological Satellite Program (DMSP) satellites.

Lisa's estimated maximum intensity of 65 kt represents a blend of widely varying Dvorak intensity estimates on 2 October (Fig. 2). As noted above, Lisa was over cool waters at this time and it is unclear whether hurricane force winds actually reached the surface. Operationally, Lisa was upgraded to a hurricane at 2100 UTC 1 October. However, a QuikSCAT pass shortly thereafter suggests that Lisa's winds were not as strong as indicated by the satellite classifications at that time, and the best track does not show Lisa becoming a hurricane until the following day. Conversely, a careful examination of QuikSCAT passes late on 28 and 29 August (Fig. 2) suggests that during that period Lisa was stronger than indicated by satellite techniques.

Ship reports of winds of tropical storm force associated with Lisa are given in Table 2.

c. Casualty and Damage Statistics

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

d. Forecast and Warning Critique

Average official track errors are given in Table 4. Official errors for Lisa were very close to the average official track errors for the 10-yr period 1994-2003<sup>1</sup>. The GFS model performed very well for Lisa. Among the consensus models, GUNA provided better guidance than either CONU or the FSU super-ensemble (FSSE).

Average official intensity errors were 7, 9, 13, 13, 14, 15, and 15 kt for the 12, 24, 36, 48, 72, 96, and 120 h forecasts, respectively. For comparison, the average official intensity errors over the 10-yr period 1994-2003 are 6, 10, 12, 15, 19, 20, and 21 kt, respectively.

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<sup>1</sup> Errors given for the 96 and 120 h periods are averages over the three-year period 2001-3.

Table 1. Best track for Hurricane Lisa, 19 Sept. - 3 Oct. 2004.

Date/Time (UTC)	Latitude (EN)	Longitude (EW)	Pressure (mb)	Wind Speed (kt)	Stage
19 / 1800	13.3	32.4	1004	30	tropical depression
20 / 0000	13.3	33.3	1004	30	"
20 / 0600	13.4	34.3	1004	30	"
20 / 1200	13.5	35.4	1002	40	tropical storm
20 / 1800	13.7	36.4	997	50	"
21 / 0000	13.7	37.4	994	55	"
21 / 0600	13.9	38.3	990	60	"
21 / 1200	14.1	39.1	990	60	"
21 / 1800	14.3	39.7	990	60	"
22 / 0000	14.4	40.2	994	55	"
22 / 0600	14.4	40.6	997	50	"
22 / 1200	14.2	41.1	1000	45	"
22 / 1800	13.9	41.5	1000	45	"
23 / 0000	13.2	41.4	1000	45	"
23 / 0600	13.0	40.6	1002	40	"
23 / 1200	13.1	40.0	1003	35	"
23 / 1800	14.3	40.5	1005	30	tropical depression
24 / 0000	14.3	41.7	1005	30	"
24 / 0600	13.8	42.4	1002	40	tropical storm
24 / 1200	13.9	43.2	1003	35	"
24 / 1800	14.0	43.8	1005	30	tropical depression
25 / 0000	14.3	44.4	1005	30	"
25 / 0600	14.9	44.9	1003	35	tropical storm
25 / 1200	15.7	45.4	1000	45	"
25 / 1800	16.7	45.7	1000	45	"
26 / 0000	17.4	45.8	1000	45	"
26 / 0600	18.0	45.9	997	50	"
26 / 1200	18.7	46.0	994	55	"
26 / 1800	19.2	46.0	997	50	"
27 / 0000	19.6	46.0	1000	45	"
27 / 0600	20.0	46.1	1000	45	"
27 / 1200	20.6	46.2	1000	45	"
27 / 1800	21.3	46.2	1002	40	"
28 / 0000	22.0	46.4	1002	40	"
28 / 0600	23.0	46.5	1002	40	"
28 / 1200	24.3	46.5	1000	45	"
28 / 1800	25.4	46.5	994	55	"
29 / 0000	26.4	46.4	990	60	"
29 / 0600	27.5	46.2	990	60	"
29 / 1200	28.9	45.8	990	60	"

Date/Time (UTC)	Latitude (EN)	Longitude (EW)	Pressure (mb)	Wind Speed (kt)	Stage
29 / 1800	30.1	45.8	990	60	"
30 / 0000	31.1	46.1	990	60	"
30 / 0600	32.0	46.7	994	55	"
30 / 1200	32.4	47.3	997	50	"
30 / 1800	33.1	47.8	1000	45	"
01 / 0000	34.1	47.8	997	50	"
01 / 0600	35.1	47.6	994	55	"
01 / 1200	36.3	47.0	990	60	"
01 / 1800	37.7	45.8	990	60	"
02 / 0000	38.9	43.8	990	60	"
02 / 0600	40.3	41.6	987	65	hurricane
02 / 1200	41.6	39.1	987	65	"
02 / 1800	42.8	36.0	994	55	tropical storm
03 / 0000	43.8	33.0	997	50	"
03 / 0600	44.5	30.0	1000	45	extratropical
03 / 1200					absorbed into frontal zone
02 / 0600	40.3	41.6	987	65	minimum pressure

Table 2. Selected marine reports with winds of at least 34 kt for Hurricane Lisa, 19 Sept. - 3 Oct. 2004.

Date/Time (UTC)	Ship call sign	Latitude (EN)	Longitude (EW)	Wind dir/speed (kt)	Pressure (mb)
26 / 2100	13602	19.8	44.0	100 / 38	1010.1
27 / 0900	GQUK	20.4	42.9	130 / 35	1011.7
28 / 0940	41595	24.5	43.5	/ 43	1014.2
29 / 1200	ZCGH	28.3	46.6	320 / 47	1008.3
29 / 1800	ZCGH	28.5	44.8	260 / 41	1010.3
02 / 1300	WGMJ	45.9	45.1	040 / 35	1014.4
02 / 2100	WGMJ	47.1	42.3	050 / 40	1013.9

Table 3. Preliminary forecast evaluation (heterogeneous sample) for Hurricane Lisa, 19 Sept. - 3 Oct. 2004. Forecast errors (n mi) are followed by the number of forecasts in parentheses. Errors smaller than the NHC official forecast are shown in bold-face type. Verification includes the depression stage, but does not include the extratropical stage.

Forecast Technique	Forecast Period (h)						
	12	24	36	48	72	96	120
CLP5	54 (52)	107 (50)	163 (48)	214 (46)	283 (42)	399 (38)	523 (34)
GFNI	54 (51)	93 (49)	123 (47)	152 (44)	199 (35)	<b>235 (30)</b>	352 (26)
GFDI	47 (51)	85 (49)	123 (47)	165 (45)	231 (41)	246 (37)	<b>287 (33)</b>
GFDL	46 (51)	82 (49)	113 (47)	151 (45)	230 (41)	257 (37)	<b>276 (33)</b>
GFDN	56 (51)	95 (49)	128 (47)	149 (42)	201 (34)	<b>229 (30)</b>	335 (25)
GFSI	49 (48)	76 (38)	101 (36)	<b>125 (34)</b>	<b>176 (28)</b>	<b>186 (19)</b>	<b>163 (11)</b>
GFSO	52 (47)	85 (41)	104 (35)	<b>124 (33)</b>	<b>174 (28)</b>	<b>194 (18)</b>	<b>191 (12)</b>
AEMI	49 (51)	80 (46)	116 (44)	149 (39)	208 (31)	<b>244 (24)</b>	<b>285 (19)</b>
NGPI	59 (51)	105 (49)	145 (47)	180 (45)	280 (40)	363 (33)	456 (28)
NGPS	63 (52)	109 (50)	148 (48)	184 (46)	261 (40)	320 (32)	441 (29)
UKMI	60 (47)	106 (45)	146 (43)	216 (41)	319 (35)	478 (33)	686 (27)
UKM	61 (26)	94 (24)	125 (23)	166 (22)	266 (18)	416 (18)	617 (15)
A98E	50 (52)	95 (50)	136 (48)	183 (46)	317 (42)	424 (38)	523 (34)
A9UK	51 (26)	94 (25)	131 (24)	172 (23)	301 (21)		
BAMD	52 (52)	91 (50)	129 (48)	166 (46)	262 (42)	343 (38)	423 (34)
BAMM	53 (51)	90 (49)	130 (47)	174 (45)	268 (41)	325 (37)	381 (33)
BAMS	64 (52)	118 (50)	179 (48)	247 (46)	399 (42)	548 (38)	665 (34)
CONU	47 (51)	82 (49)	108 (47)	138 (45)	<b>198 (41)</b>	260 (37)	354 (33)
GUNA	48 (44)	<b>74 (37)</b>	<b>93 (35)</b>	<b>126 (33)</b>	<b>174 (25)</b>	<b>222 (17)</b>	388 (9)
FSSE	44 (43)	75 (41)	109 (39)	153 (36)	215 (30)	272 (22)	412 (12)
OFCL	44 (52)	75 (50)	99 (48)	130 (44)	199 (42)	246 (38)	325 (34)
NHC Official (1994-2003 mean)	44 (3172)	78 (2894)	112 (2636)	146 (2368)	217 (1929)	248 (421)	319 (341)

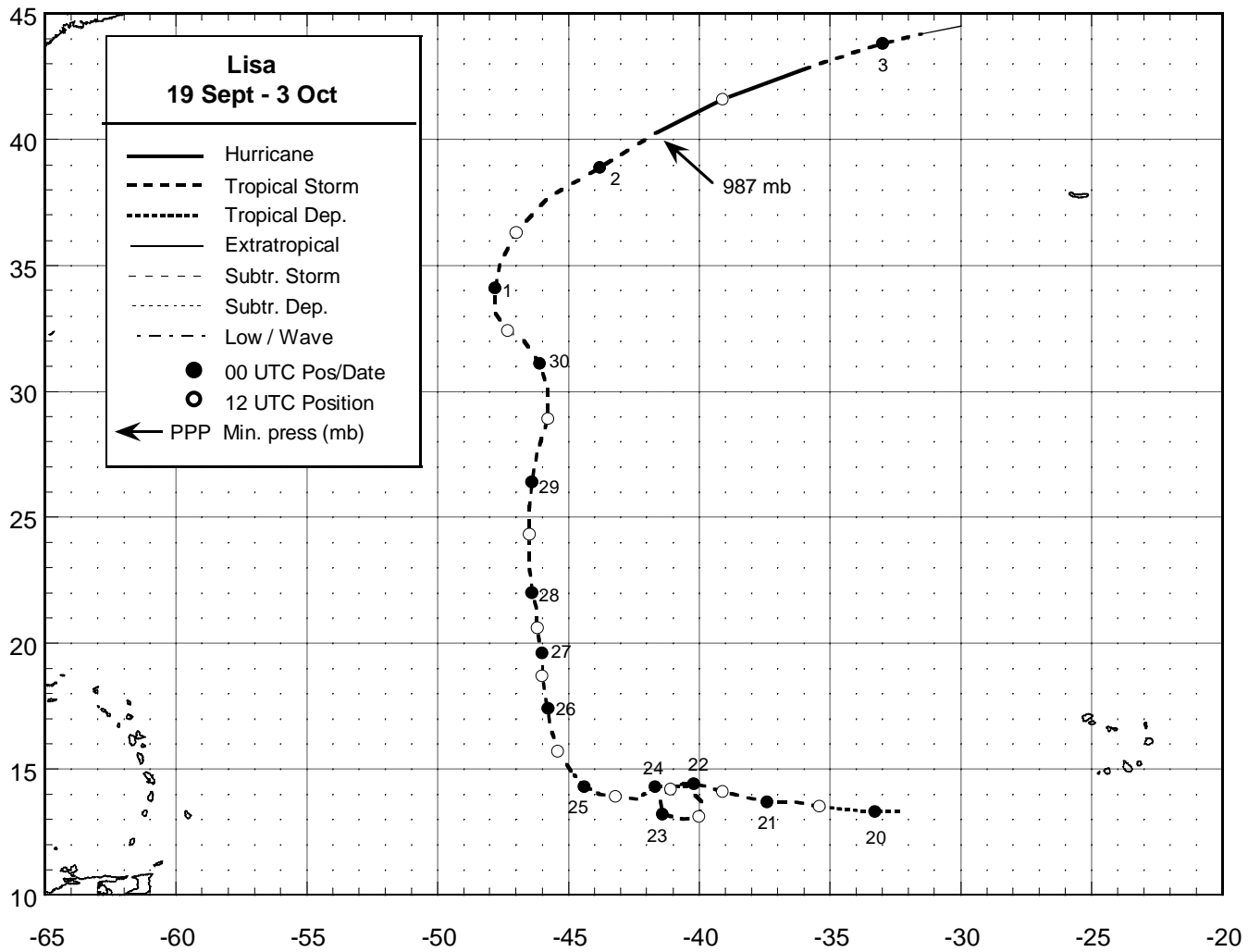


Figure 1. Best track positions for Hurricane Lisa, 19 Sept. - 3 Oct. 2004.



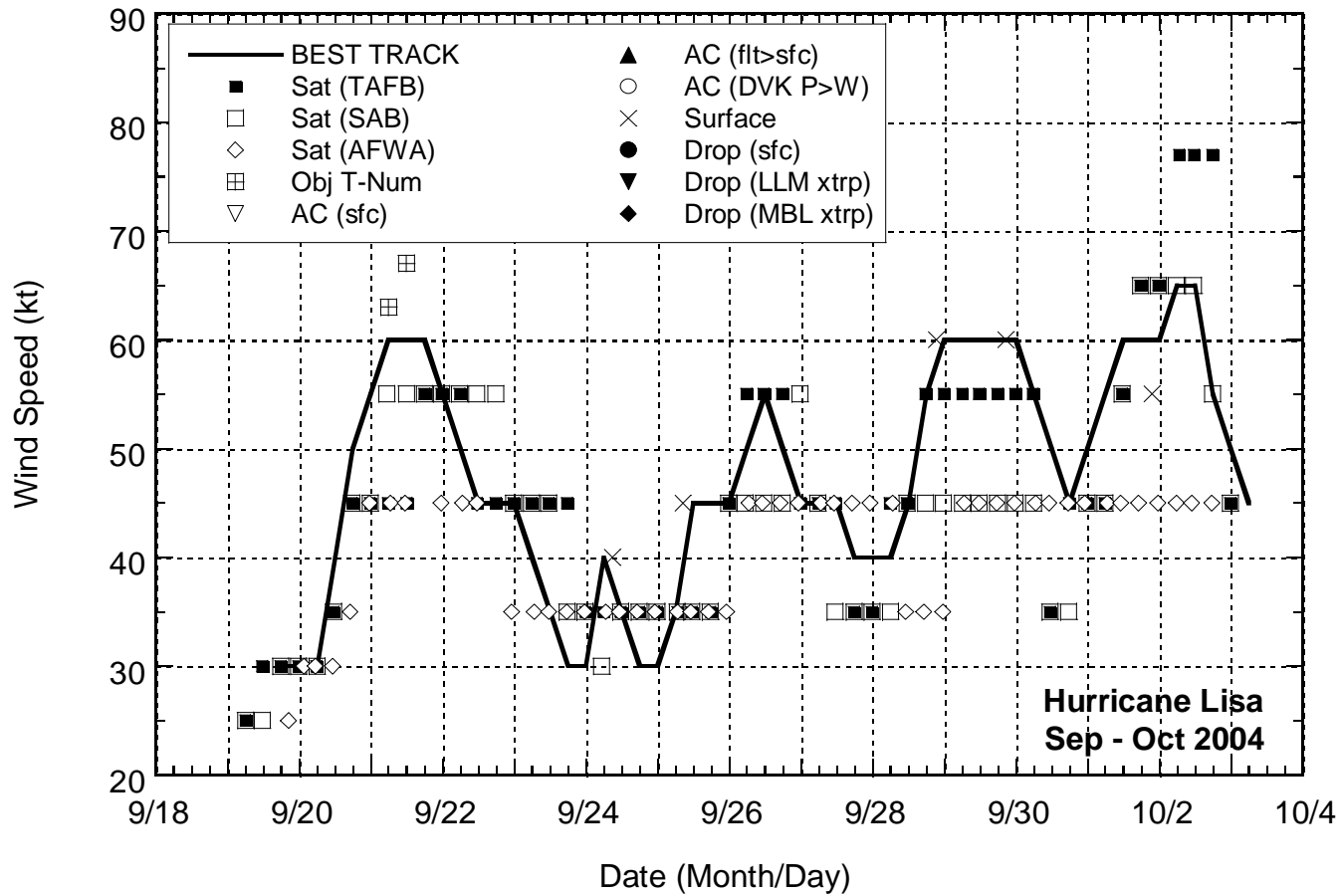


Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Hurricane Lisa, 19 Sept. - 3 Oct. 2004. Surface observations (denoted by X's) represent QuikSCAT estimates of the maximum wind. Objective Dvorak estimates represent linear averages over a three-hour period centered on the nominal observation time.

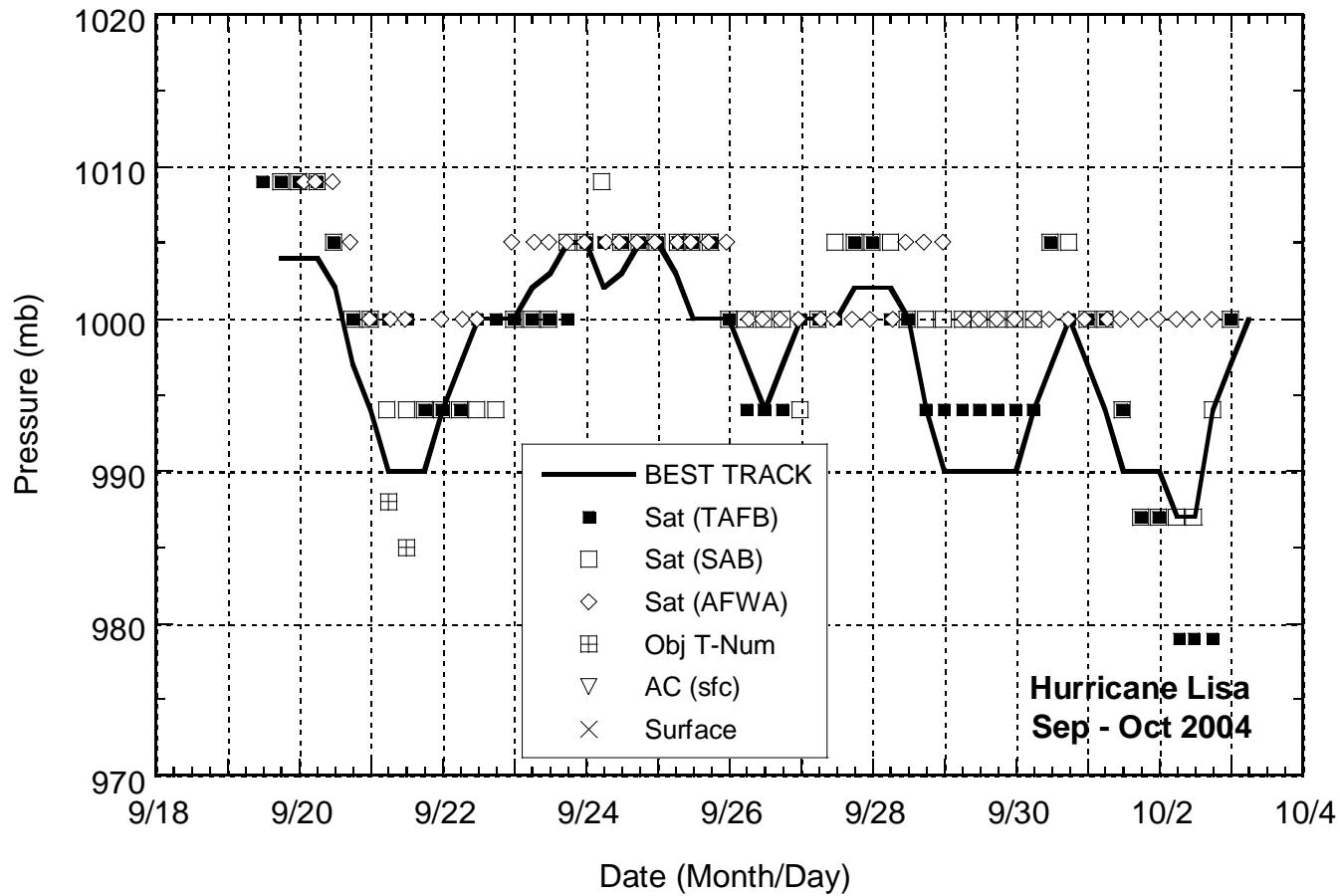


Figure 3. Selected pressure observations and best track minimum central pressure curve for Hurricane Lisa, 19 Sept. - 3 Oct. 2004. Objective Dvorak estimates represent linear averages over a three-hour period centered on the nominal observation time.