Tropical Cyclone Report
Hurricane Elida
23 - 30 July 2002

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Hurricane Elida developed extraordinarily quickly, eventually reaching category 5 status on the Saffir-Simpson Hurricane Scale.

a. Synoptic History

Elida formed from a tropical wave that moved westward from the coast of Africa on 13 July. The system showed little development as it moved westward across the Atlantic and the Caribbean. It moved into the Eastern Pacific on 21 July and showed increasing organization the next day. Tropical Depression Six-E formed from the wave near 0600 UTC 23 July about 305 n mi south-southeast of Puerto Escondido, Mexico. 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 cyclone strengthened rapidly as it moved westward. It became a tropical storm near 1200 UTC 23 July and a hurricane less than 18 h later. Elida turned west-northwestward on the 24th while continuing to rapidly deepen. It is estimated to have reached a peak intensity of 140 kt near 0600 UTC on the 25th. Microwave satellite data indicate that Elida began formed concentric eyewalls near that time, and by the time the eyewall replacement cycle was complete the cyclone was moving over cooler sea surface temperatures. Thus, Elida began to weaken, albeit somewhat unsteadily. The hurricane turned westward later on the 25th, then resumed a west-northwestward motion on the 26th. This motion would continue through the 27th as Elida became a tropical storm.

A weakness in the subtropical ridge helped the storm turn northwestward on 28 July and north-northwestward on the 29th. It weakened to a depression on the 29th, then became a non-convective low the next day. The low dissipated late on the 31st about 465 n mi west of Los Angeles, California.

b. Meteorological Statistics

Observations in Elida (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). Three sets of microwave data supplemented the conventional satellite fixes. First was the Special Sensor Microwave/Imager on the U. S. Department of Defense Meteorological Satellite Program (DMSP) satellites. Second was the Tropical Rainfall Measuring Mission (TRMM) Microwave Imager flown by the National

Aeronautics and Space Administration (NASA). The third was scatterometer data from the QuikSCAT satellite flown by NASA.

Many tropical cyclones undergo periods of rapid or explosive deepening. However, Elida began such intensification when it first formed as a tropical depression, which is very unusual. The best track indicates that Elida went from a 25-kt depression to a 70-kt hurricane in 30 h, and then strengthened to 140 kt during the next 24 h. Amongst other recent Eastern Pacific hurricanes, only Linda of 1997 showed a similar rate of strengthening. That storm took 36 h to develop from 25 kt to 65 kt, then strengthened to 155 kt in the ensuing 24 h. It should be noted that for both Elida and Linda there were no in situ observations to verify the satellite intensity estimates, and the apparent development rate violated the constraints built into the Dvorak technique. Thus, there is greater than normal uncertainty as to the exact deepening rates and peak intensity of these two storms.

Elida's peak intensity of 140 kt is based on data from an automated intensity estimation technique developed by the University of Wisconsin. Raw intensity data indicated a peak intensity of 138 kt from 0300-0400 UTC 25 July. The technique uses a comparison of infrared cloud temperatures of the eye and the eyewall on geostationary satellite data. Due to Elida's pinhole eye and the distance of the hurricane from the satellite sub-point it is likely that the eye temperature was incorrectly measured. This would result in an underestimated intensity. However, as noted above it is unknown if Elida strengthened as rapidly as indicated by the satellite signature. Thus, the maximum winds are set to 140 kt as a compromise between more extreme and more conservative possibilities.

The only ship to encounter Elida had the call sign **H9LA** (name unknown). It reported 36 kt winds and a 1008.5 mb pressure at 0000 UTC 24 July while about 200 n mi from the center. This ship also provided useful data during Elida's initial development into a tropical depression.

c. Casualty and Damage Statistics

While high swells from Elida likely affected portions of the coast of Mexico, the high winds and heavy rains stayed well offshore. There were no reports of damage or casualties.

d. Forecast and Warning Critique

Average official track errors (with the number of cases in parentheses) for Elida were 27 (23), 48 (21), 55 (19), 60 (17), and 77 (13) n mi for the 12, 24, 36, 48, and 72 h forecasts, respectively. These errors are considerably lower than the average official track errors for the 10-yr period 1992-2001 (36, 67, 97, 125, and 182 n mi, respectively), with the 48 and 72 h forecasts errors being more than 50% better than the long-term averages. These forecasts also show considerable skill, as the errors are 20-40% better than climatology-persistence (CLP5) at 12-48 h and nearly 60% better at 72 h. The NCEP global model (AVNI, AVNO) and the mean of its ensemble runs (AEMI, AEMN) also produced excellent forecasts with errors close to or slightly better that of the official. Table 2 shows the verification for the official forecast and various guidance models.

Average official intensity errors were 10, 20, 23, 20, and 19 kt for the 12, 24, 36, 48, and 72 h forecasts, respectively. For comparison, the average official intensity errors over the 10-yr period 1992-2001 are 7, 12, 16, 18, and 21 kt, respectively. The intensity forecasts, in sharp contrast to the track forecasts, are worse than the long-term average at all times except 72 h. The forecasts also show no skill with respect to climatology-persistence. Failure to forecast either the extremely rapid strengthening to 140 kt - a chronic problem- or the quick weakening after peak intensity are the reasons for the large errors.

Watches or warnings were neither required nor issued for Elida.

Table 1. Best track, Hurricane Elida, 23- 30 July 2002.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
23 / 0600	11.6	96.7	1006	30	tropical depression
23 / 1200	11.9	98.5	1004	35	tropical storm
23 / 1800	12.2	100.5	1000	45	"
24 / 0000	12.1	102.3	994	55	"
24 / 0600	12.3	103.7	984	70	hurricane
24 / 1200	12.7	105.1	952	110	"
24 / 1800	13.2	106.6	942	120	"
25 / 0000	13.8	108.0	931	130	"
25 / 0600	14.3	109.5	921	140	"
25 / 1200	14.7	111.0	931	130	"
25 / 1800	15.0	112.5	948	115	"
26 / 0000	15.1	113.8	956	105	"
26 / 0600	15.2	114.9	962	100	"
26 / 1200	15.5	116.0	962	100	"
26 / 1800	16.0	117.1	966	95	"
27 / 0000	16.4	118.2	973	85	"
27 / 0600	16.8	119.2	981	75	"
27 / 1200	17.3	120.3	987	65	"
27 / 1800	17.8	121.4	990	60	tropical storm
28 / 0000	18.4	122.5	994	55	"
28 / 0600	19.0	123.3	994	55	"
28 / 1200	19.8	124.1	994	55	"
28 / 1800	20.6	124.9	997	50	"
29 / 0000	21.5	125.8	1000	45	"
29 / 0600	22.6	126.5	1003	40	"

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
29 / 1200	23.7	127.1	1006	35	"
29 / 1800	24.8	127.6	1007	30	tropical depression
30 / 0000	26.2	128.0	1008	30	"
30 / 0600	27.5	128.3	1009	30	"
30 / 1200	28.6	128.5	1011	25	"
30 / 1800	29.6	128.6	1013	20	remnant low
31 / 0000	30.6	128.5	1014	20	"
31 / 0600	31.5	128.3	1014	20	"
31 / 1200	32.4	128.0	1015	15	"
31 / 1800	33.0	127.6	1016	15	"
01 / 0000					dissipated
25 / 0600	14.3	109.5	921	140	minimum pressure

Table 2. Preliminary forecast evaluation (heterogeneous sample) for Hurricane Elida, 23 - 30 July 2002. Forecast errors for tropical storm and hurricane stages (n mi) are followed by the number of forecasts in parentheses. Errors smaller than the NHC official forecast are shown in bold-face type.

Forecast Technique	Forecast Period (h)				
	12	24	36	48	72
CLP5	37 (23)	68 (21)	88 (19)	101 (17)	177 (13)
GFDI	38 (23)	63 (21)	89 (19)	100 (17)	138 (12)
GFDL*	34 (22)	62 (20)	90 (18)	113 (16)	138 (12)
GFNI	38 (21)	71 (19)	97 (17)	125 (15)	161 (11)
GFDN*	36 (11)	71 (10)	96 (9)	117 (8)	160 (6)
AFW1*	64 (11)	109 (10)	139 (9)	173 (8)	211 (6)
COEI	29 (10)	54 (10)	85 (10)	96 (8)	
COCE*	45 (6)	**45** (6)	57 (5)	62 (4)	
LBAR	**26** (23)	48 (21)	87 (19)	139 (17)	264 (13)
P91E	38 (23)	79 (21)	109 (19)	128 (17)	155 (13)
P9UK	41 (12)	93(11)	140 (10)	176 (9)	235 (7)
BAMD	34 (23)	60 (21)	82 (19)	97 (17)	121 (13)
BAMM	27 (23)	**41** (21)	55 (19)	64 (17)	99 (13)
BAMS	35 (23)	50 (21)	57 (19)	63 (17)	119 (13)
AVNI	30 (21)	50 (19)	**54** (17)	**57** (15)	77 (11)
AVNO*	29 (22)	51 (20)	61 (18)	**59** (16)	**72** (12)
AEMI	30 (15)	**39** (13)	**41** (12)	**47** (10)	**73** (7)
AEMN*	31 (11)	57 (10)	61 (9)	**59** (8)	**60** (6)
NGPI	40 (23)	66 (21)	78 (19)	97 (17)	133 (13)
NGPS*	34 (22)	60 (20)	73 (18)	86 (16)	127 (12)
UKMI	31 (22)	65 (20)	88 (18)	97 (16)	101 (12)
UKM*	46 (12)	65 (11)	97 (10)	120 (9)	116 (7)
GUNS	30 (22)	57 (20)	75 (18)	87 (16)	104 (12)
GUNA	28 (21)	53 (19)	67 (17)	73 (15)	78 (11)
Official	27 (23)	48 (21)	55 (19)	60 (17)	77 (13)
NHC Official (1992-2001 mean)	36 (2203)	67 (1947)	97 (1700)	125 (1472)	182 (1091)

* Output from these models was unavailable at time of forecast issuance.

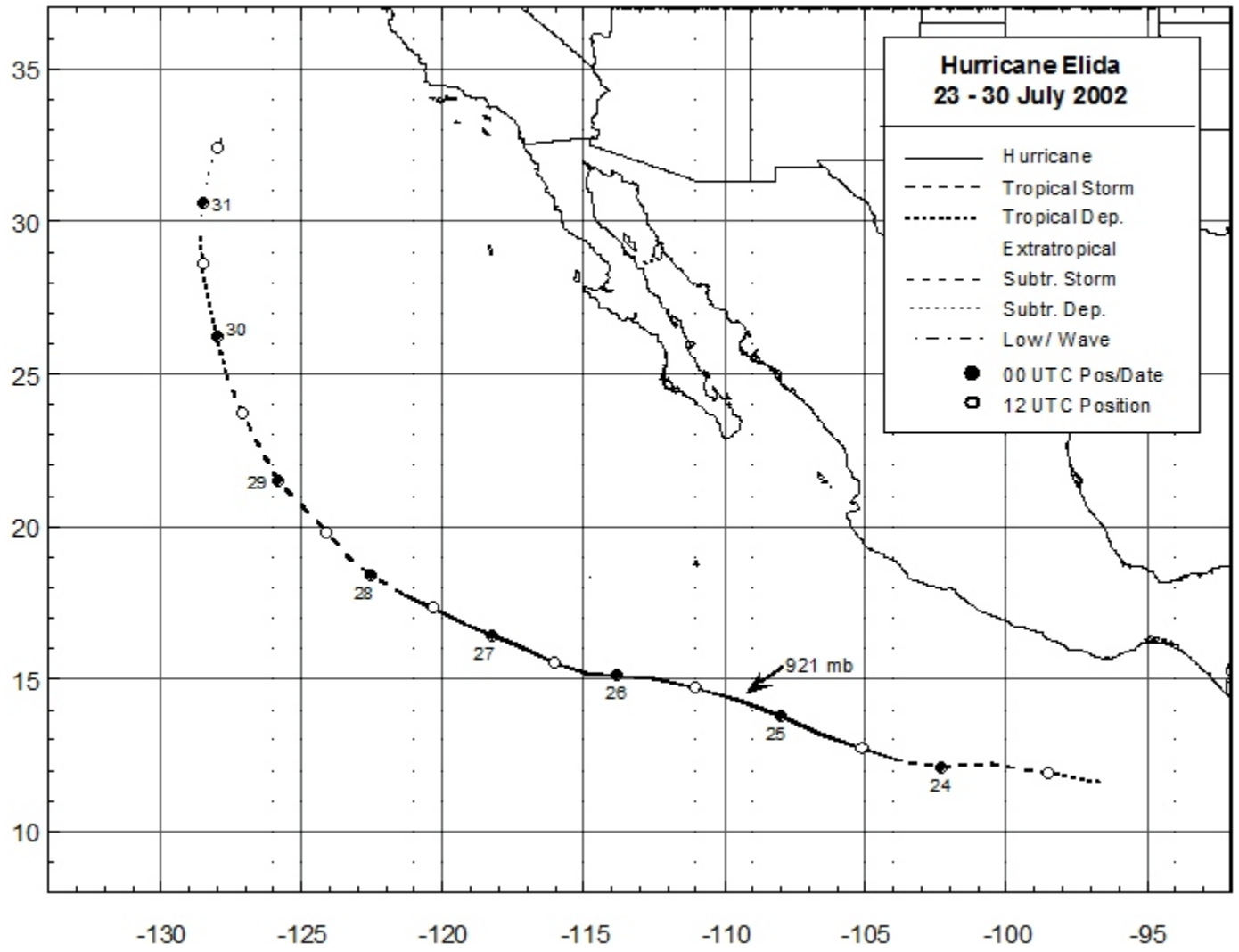

Figure 1.

Best track positions for Hurricane Elida, 23 - 30 July 2002.

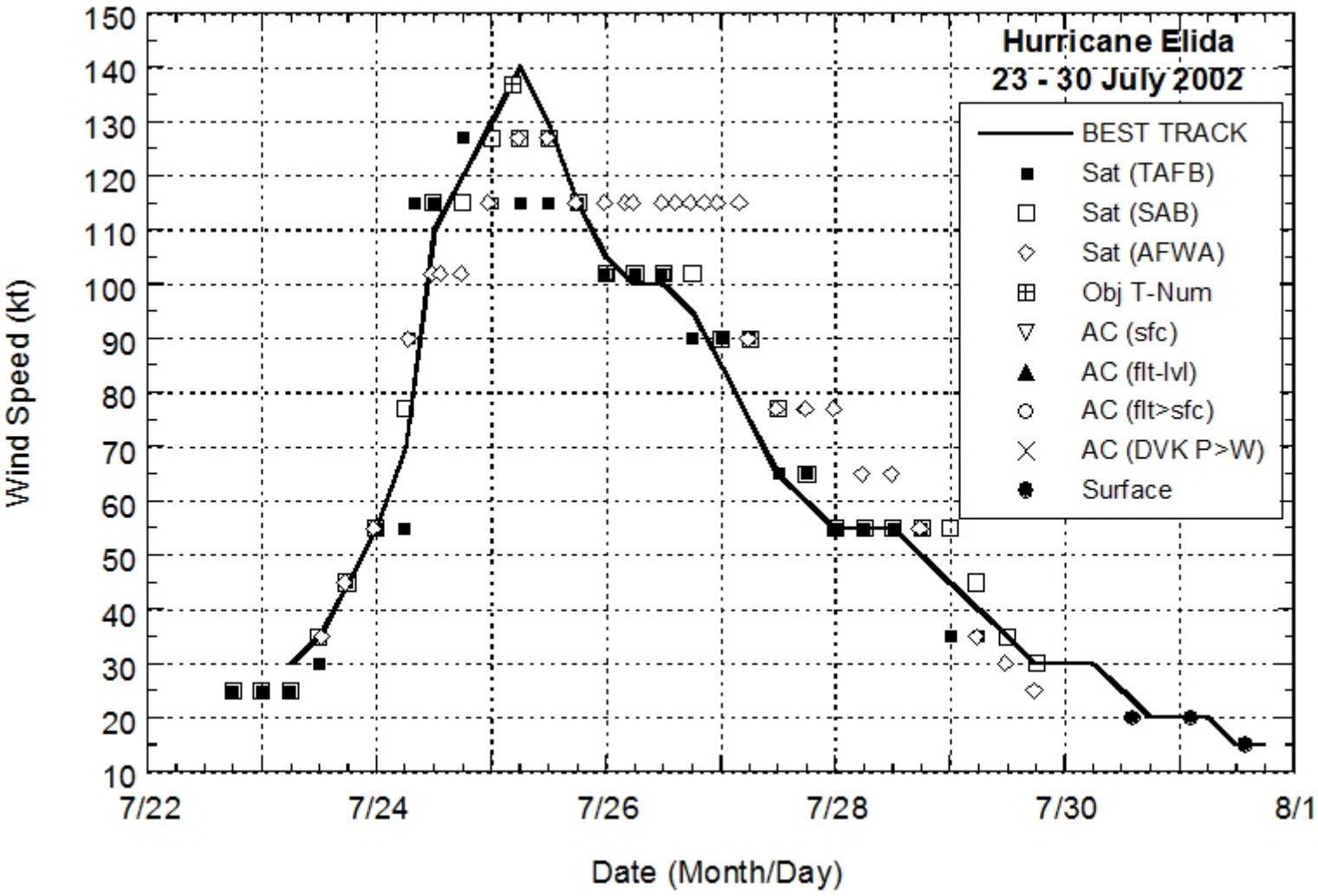

Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Hurricane Elida, 23 - 30 July 2002. Objective Dvorak estimate is for a 1-hr period

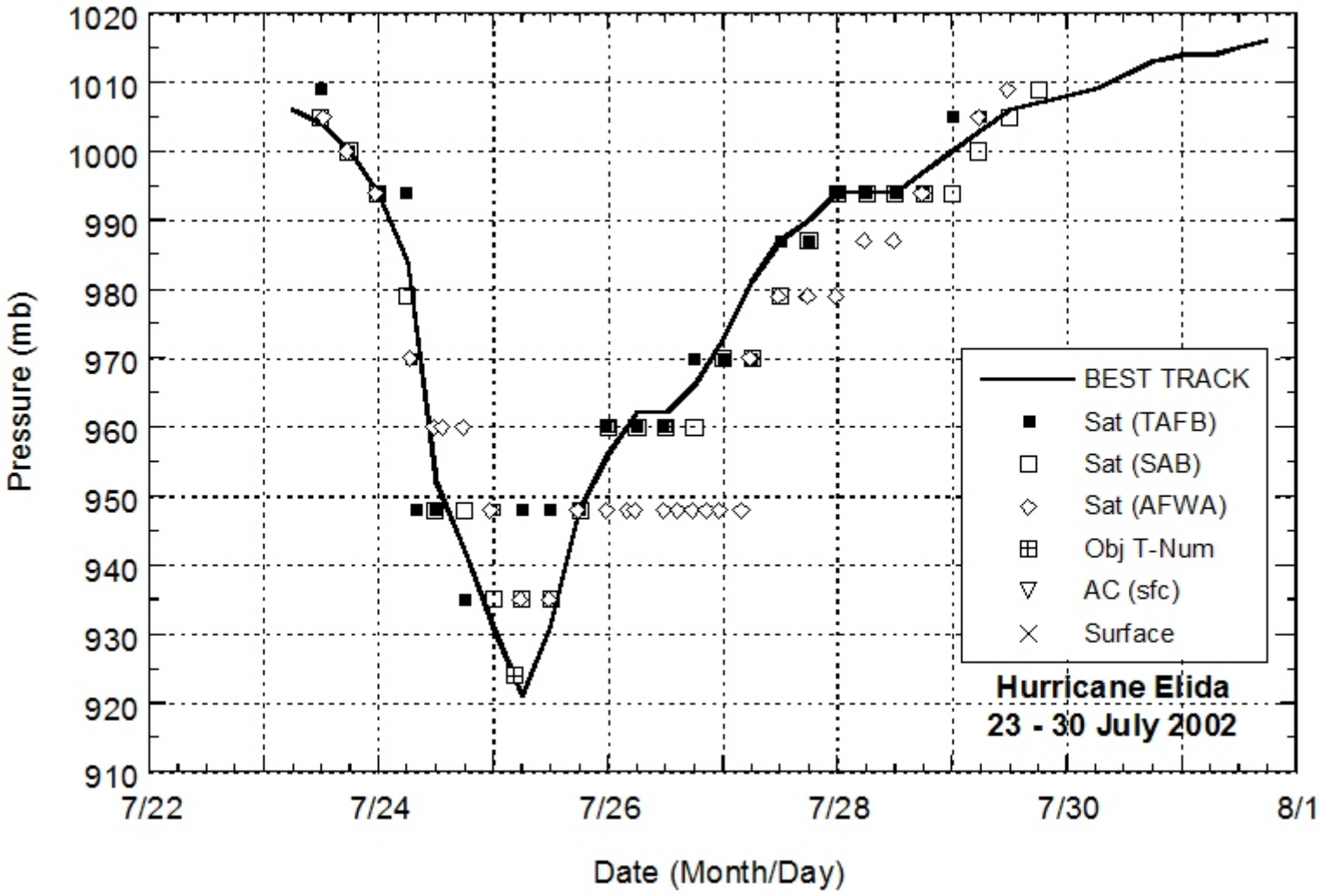

Figure 3. Selected pressure observations and best track minimum central pressure curve for name/dates. Objective Dvorak estimate is for a 1-hr period.