

Tropical Cyclone Report
Tropical Storm Leslie (Subtropical Depression One)
4-7 October 2000

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Leslie was a short-lived tropical storm that developed from Subtropical Depression One off the east coast of Florida, and subsequently moved northeastward over the western Atlantic. Although neither Leslie nor the subtropical depression was responsible for any damage or casualties, a precursor disturbance combined with a stalled frontal boundary to produce very heavy rainfall, and flood damage estimated at \$950 million in southeast Florida on 2-3 October. Three deaths in south Florida were indirectly attributable to the flooding.

a. Synoptic History

The immediate precursor to Tropical Storm Leslie was a subtropical depression that had formed inland near the east coast of central Florida at 1200 UTC 4 October. Ironically, the disturbance that led to the subtropical cyclone was a tropical wave that entered the eastern Caribbean Sea on 27 September. Although its signature in satellite imagery was extremely weak prior to this point, this was likely the same tropical wave that spawned Hurricane Isaac.

Upon entering the Caribbean Sea, the wave was accompanied by disorganized and sporadic thunderstorm activity over northern sections of South America. On 29 September, the tropical wave and accompanying thunderstorm activity moved north-northwest off the coast of Columbia into the central Caribbean Sea. For the next two days, the disorganized cluster of thunderstorms moved to the north-northwest around the circulation of Hurricane Keith, which at that time was located in the northwest Caribbean Sea. By 1200 UTC 2 October, a distinct mid-level circulation was evident in satellite imagery just south of western Cuba, near the Isle of Youth. This circulation moved northward across western Cuba and the Straits of Florida, and by 1200 UTC 3 October it entered the extreme southeast Gulf of Mexico. Dvorak satellite classifications by the Tropical Analysis and Forecast Branch (TAFB) and the Satellite Analysis Branch (SAB) began at 0600 UTC on the 3rd. Satellite and radar images showed a large area of showers and thunderstorms that extended east of the mid-level circulation center from the Florida Straits northward across the Florida Keys into extreme south Florida. During the early afternoon of 3 October, a NOAA reconnaissance aircraft investigated the disturbance in the southeast Gulf of Mexico, and found an elongated trough of low pressure at a flight-level of 1500 ft but no well-defined surface circulation center.

As the disturbance moved north towards the west coast of Florida, it interacted with a stalled frontal boundary across southern Florida. During the afternoon and evening of 3 October, a band of very heavy rainfall became stationary across southeast Florida. Widespread rainfall, with accumulations of 12 to 18 inches, occurred in a swath extending from southwest Miami-Dade county

to extreme southeast Broward County, and two (F0) tornadoes touched down in Miami-Dade County.

After 0000 UTC 4 October, the mid-level circulation began moving northeast and passed near Sarasota, Florida around 0600 UTC; however, the associated shower and thunderstorm activity remained well southeast of the disturbance in the frontal trough. Surface observations show the remnants of the frontal trough remaining over south Florida for several hours after the passage of the mid-level circulation center. They also show that by 1200 UTC on the 4th, as the mid-level center continued northeastward over central Florida, an associated well-defined surface low and circulation developed just east of Orlando. At this time the convection was still located well southeast of the surface low, with the strongest winds approximately 150 nm from the center. Given this structure, as well as the presence of a nearby upper-level short wave trough that may have assisted in the development, the system at this stage is considered to have been a subtropical depression.

At 1800 UTC on the 4th, the depression moved just offshore near Daytona Beach, Florida (at which point it received a subtropical cyclone classification, ST 1.5, by TAFB). Reconnaissance data at this time confirmed that the strongest flight level winds (30 to 35 kt) remained well southeast of the center. Subtropical Depression One moved slightly north of east at 8 kt overnight, and early-morning satellite imagery on the 5th suggested that the low-level center was located closer to the deep convection. Reconnaissance data near 1200 UTC 5 October confirmed that the wind field had contracted, and that the maximum flight-level winds (44 kt) were within 75 nm of the center. On this basis Subtropical Depression One was upgraded to Tropical Storm Leslie, about 200 n mi east of St. Augustine, Florida. The “best track” chart of the cyclone’s path, including the subtropical stage, is given in Fig. 1, with the wind and pressure histories shown in Figs. 2 and 3, respectively. The best track is listed in Table 1.

Leslie remained a weak tropical storm as it moved to the east-northeast on the 5th, briefly threatened Bermuda but turned to the northeast early on the 7th and passed about 250 miles to the west of the island. The circulation of Leslie began to elongate and became entangled with a cold frontal boundary, and the cyclone became extratropical by 1800 UTC on the 7th, when it was about 325 n mi north-northwest of Bermuda. The remnant extratropical low moved rapidly northeastward, crossing Newfoundland late on the 8th, and was tracked for another day or so as it raced east-northeastward across the North Atlantic.

b. Meteorological Statistics

Observations in Leslie (Figs. 2 and 3) include satellite-based Dvorak technique intensity estimates from TAFB, SAB, and the U. S. Air Force Weather Agency (AFWA). In addition, flight-level observations are available from flights of the 53rd Weather Reconnaissance Squadron of the U. S. Air Force Reserve Command and from the NOAA Aircraft Operations Center.

At 0000 UTC on the 6th, ship 8PNK reported winds of 36 kt about 60 n mi southeast of Leslie. There were no land-based reports of tropical storm force winds. At 1800 UTC on the 7th (at the time of extratropical transition), ship PDHW, about 200 n mi southeast of the center, reported winds of 33 kt.

No significant rainfall amounts are associated directly with either Subtropical Depression One or Tropical Storm Leslie. The interaction of the antecedent disturbance with the frontal trough over south Florida, however, produced a number of rainfall storm totals in excess of 15 inches for the 48 h period ending 7 AM EDT October 4th. These include 17.50 inches in South Miami, 15.79 inches at the Miami Weather Forecast Office (near Sweetwater), and 15.30 inches at Miami International Airport.

c. Casualty and Damage Statistics

There were no reports of damage or casualties associated with either Subtropical Depression One or Leslie. The interaction of the antecedent disturbance with the frontal trough over south Florida, however, resulted in damage estimated at \$950 million, \$500 million of which were agricultural losses, and three deaths indirectly attributable to the flooding, two from drowning as a result of driving vehicles into deep water, and one from a fall.

d. Forecast and Warning Critique

Leslie was a tropical storm for only two days. The average official track errors for Leslie (with the number of cases in parentheses) were 54 (7), 113 (5), 132 (3), and 171(1) n mi for the 12, 24, 36, and 48 h forecasts, respectively. These errors are mostly greater than the average official track errors for the 10-yr period 1990-1999 (46, 85, 122, and 158 n mi, respectively). Intensity forecasts for Leslie, which called for only modest strengthening, were quite good.

Table 2 lists the watches and warnings associated with Leslie. A tropical storm watch and warning were briefly in effect for Bermuda before Leslie turned to the northeast and passed well west of the island.

Table 1. Best track for Tropical Storm Leslie, 4-7 October 2000.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
04 / 1200	29.0	81.4	1012	30	subtropical depression
04 / 1800	29.5	80.8	1012	30	"
05 / 0000	29.7	79.9	1010	30	"
05 / 0600	29.8	78.6	1010	30	"
05 / 1200	29.9	77.3	1009	35	tropical storm
05 / 1800	30.2	75.9	1009	35	"
06 / 0000	30.3	74.3	1010	35	"
06 / 0600	30.6	73.1	1006	40	"
06 / 1200	30.9	72.4	1007	40	"
06 / 1800	31.3	71.8	1007	40	"
07 / 0000	32.1	70.7	1006	40	"
07 / 0600	33.1	69.6	1006	40	"
07 / 1200	35.4	68.3	1006	40	"
07 / 1800	37.4	66.7	1005	40	extratropical
08 / 0000	40.0	64.0	1004	40	"
08 / 0600	43.0	60.0	1003	40	"
08 / 1200	46.0	57.0	1003	40	"
08 / 1800	49.0	54.0	1005	35	"
09 / 0000	51.0	50.0	1007	35	"
09 / 0600	53.0	46.0	1006	35	"
09 / 1200	55.0	41.0	1005	35	"
09 / 1800	56.0	36.0	1003	35	"
10 / 0000	56.0	30.0	999	40	"
10 / 0600	55.0	24.0	987	50	"
10 / 1200	54.0	17.0	980	55	"
10 / 1800	53.0	10.0	973	60	"
06 / 0600	30.6	73.1	1006	40	minimum pressure

Table 2. Watch and warning summary for Tropical Storm Leslie, 4-7 October 2000.

Date/Time (UTC)	Action	Location
06 / 0300	Tropical Storm Watch issued	Bermuda
06 / 0900	Tropical Storm Warning issued	Bermuda
06 / 2100	Tropical Storm Warning discontinued	Bermuda

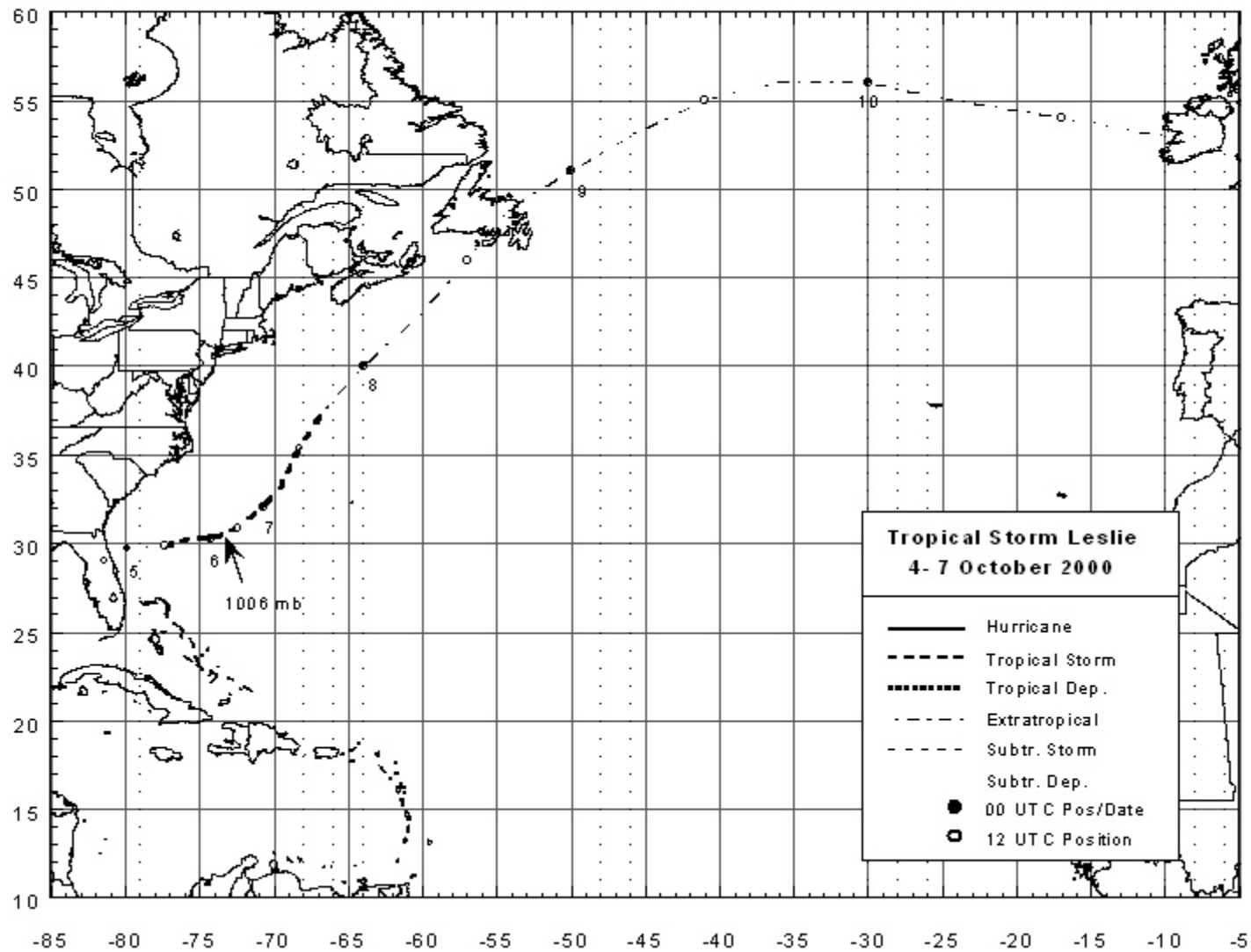


Figure 1. Best track positions for Tropical Storm Leslie, 4-7 October 2000. Track during the extratropical stage is based on analyses from the NOAA Marine Prediction Center.

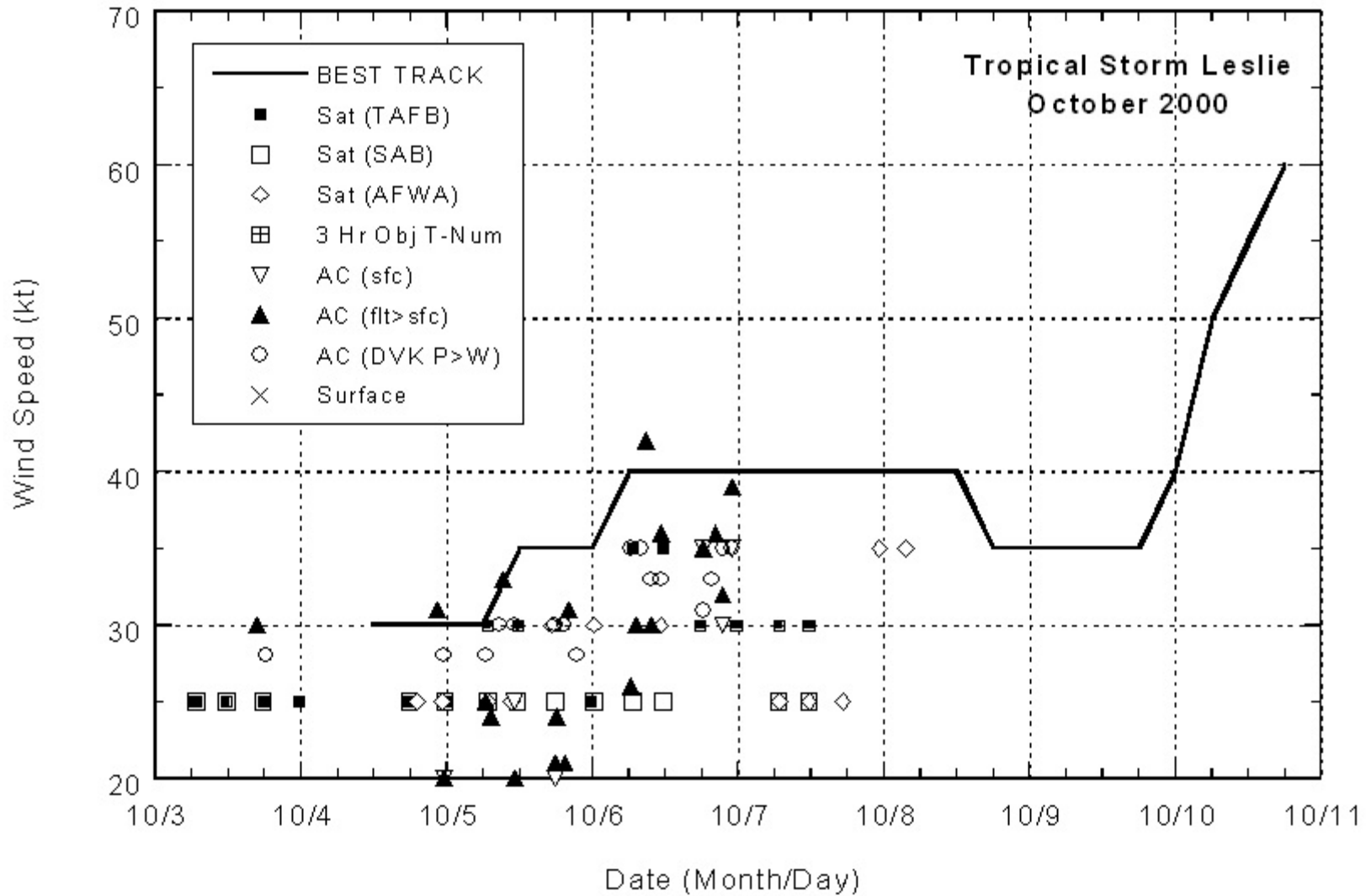


Figure 2. Best track maximum sustained surface wind speed curve for Tropical Storm Leslie, 4-7 October 2000, and the observations on which the best track curve is based. Aircraft observations have been adjusted for elevation using 90%, 80%, and 85% reduction factors for observations from 700 mb, 850 mb, and 1500 ft, respectively. Estimates during the extratropical stage are based on analyses from the NOAA Marine Prediction Center.

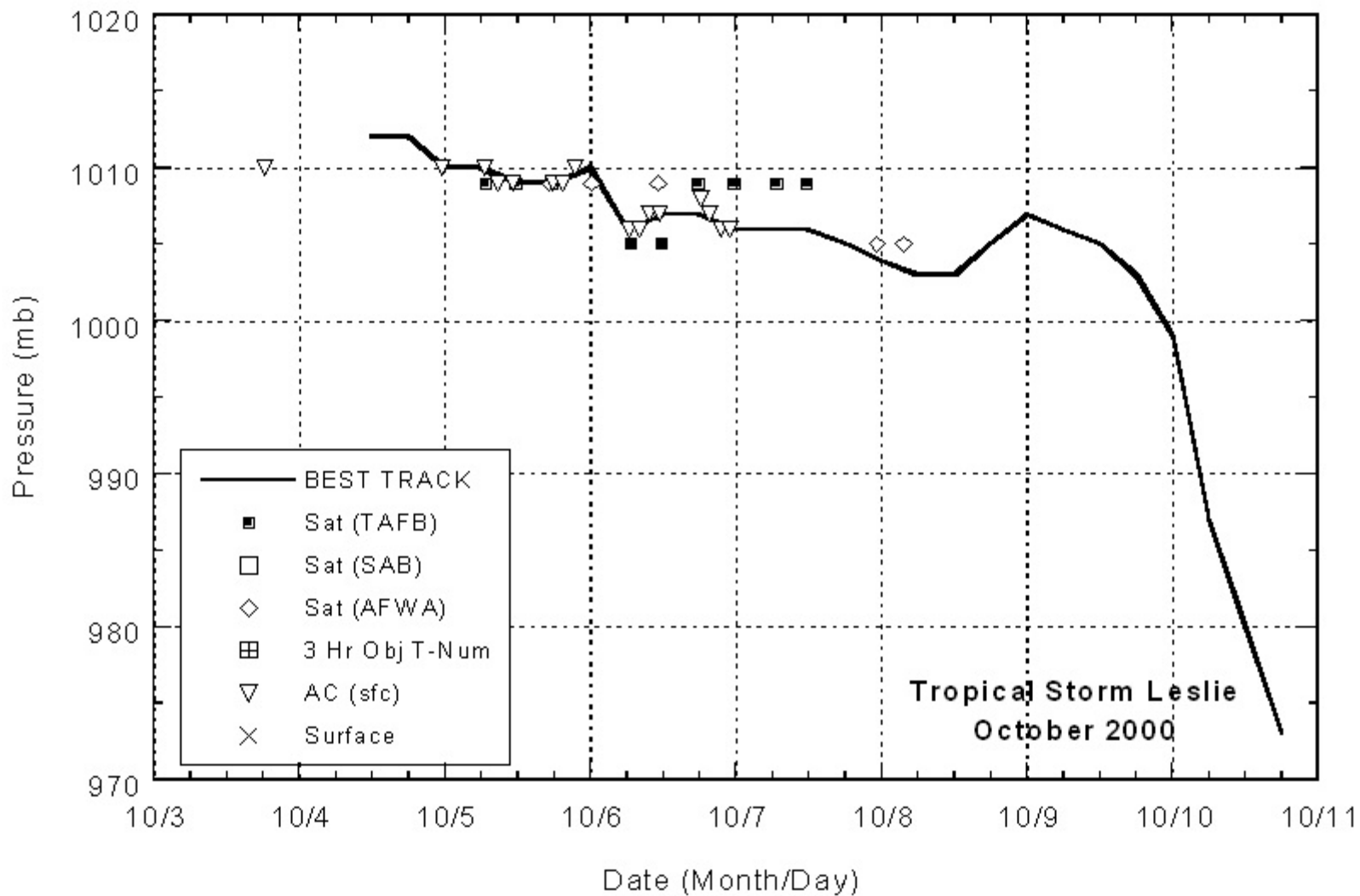


Figure 3. Best track minimum central pressure curve for Tropical Storm Leslie, 4-7 October 2000, and the observations on which the best track curve is based. Estimates during the extratropical stage are based on analyses from the NOAA Marine Prediction Center.