Tropical Cyclone Report
Hurricane Erika
14-17 August 2003

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Erika made landfall in extreme northeastern Mexico shortly after reaching hurricane strength. The hurricane was responsible for two deaths.

a. Synoptic History

Erika's origin was non-tropical. A weak surface low detached from a decaying frontal system about 1000 n mi east of Bermuda on 8 August. This low moved southwestward, and late on 9 August convection flared up when the surface system passed underneath the northern portion of an upper-level cold low about 650 n mi southeast of Bermuda. The two systems appeared to revolve around a common center while the complex moved generally westward, and by 11 August, the surface low had become a trough/vorticity maximum located to the south of the upper-level low about 400 n mi south of Bermuda. This configuration was maintained as the disturbed weather continued westward at 15-20 kt over the next three days. During this time, most of the deep convection was occurring well north of the low-level vorticity maximum near the center of the upper low. This distribution of convection, along with the rapid motion of the system, helped prevent the development of a closed surface circulation.

Late on 13 August, when the system was just east of the northwestern Bahamas, there was a substantial increase in convection around the center of the upper low. The low built downward to the middle levels, developing an anticyclone aloft as it became better organized. Near 0000 UTC 14 August, there was an unofficial report of a 51 kt wind gust on Abaco Island. Convection remained vigorous while the system neared Florida during the morning of 14 August, and a closed circulation nearly developed down to the surface in the southern part of the system east of Key Largo around 0800 UTC that day. However, this feature weakened, while convection was being maintained in the northern, mid-level portion of the disturbance as it moved across the Florida peninsula. It was out of this mid-level circulation that a closed surface low finally formed near 1800 UTC, about 75 n mi west of Ft. Myers, Florida. With winds already of tropical storm strength, the system immediately became Tropical Storm Erika.

The “best track” chart of Erika'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. A strong deep-layer high pressure system over the south-central United States helped initially steer Erika westward at about 22 kt. As the cyclone's central convection intensified and the low-level circulation became better defined late on 14 August, Erika strengthened. Gradual strengthening continued on 15 August while Erika's forward speed began to slow and its convection took on a more banded structure. By late in the day, an eye was visible in land-based radar imagery and Erika's

winds neared hurricane strength. Erika began to outpace the deep-layer high, which had also been moving westward, and early on 16 August Erika's forward speed slowed further, to about 13 kt. Erika became a hurricane and reached its maximum intensity at landfall near1030 UTC 16 August about 40 miles south of Matamoros, Mexico, near Boca San Rafael. The hurricane weakened rapidly after landfall and dissipated shortly after 0000 UTC 17 August over the mountains of northeastern Mexico.

b. Meteorological Statistics

Observations in Erika (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 flight-level and dropwindsonde observations from flights of the 53rd Weather Reconnaissance Squadron of the U. S. Air Force Reserve Command.

Despite an impressive and organized appearance on satellite imagery, the rapid westward motion of the pre-Erika disturbance hindered the development of a closed surface circulation. Data from reconnaissance aircraft, including dropsondes, were instrumental in determining when the disturbance had finally become a tropical cyclone. Around 0800 UTC 14 August, aircraft flight-level data at 850 mb indicated the presence of a closed circulation just east of Key Largo, Florida. However a dropsonde revealed that the west winds measured by the aircraft were not present below flight level and advisories were not initiated until later in the day, when a new low-level circulation formed within the system over the eastern Gulf of Mexico.

Erika was never upgraded to a hurricane operationally. The highest flight-level observations from reconnaissance aircraft were 67 and 66 kt at 0213 UTC and 0820 UTC 16 August, respectively. These observations were made at 700 mb, and correspond to a surface wind of about 60 kt (the operational landfall intensity). Tropical Cyclone Discussions issued at the time of landfall mentioned strong winds being observed by the Brownsville Doppler radar, and suggested the possibility that Erika had reached hurricane strength prior to landfall. A post-storm review of the Doppler data revealed winds in excess of 85 kt over an area several miles across, in the eastern and northeastern (over water) portion of the eyewall near the time of landfall, from around 1000-1200 UTC at an elevation of about 2500 ft. Adjustment of these (85 kt) winds to the surface using the mean eyewall wind profile gives a surface wind estimate of 65 kt. Unfortunately, there were no aircraft reconnaissance observations in this part of the cyclone after 0820 UTC. However, on the basis of the radar observations, Erika has been posthumously upgraded to a hurricane. A pressure fall of at least 5 mb after the time of the 67 kt flight-level wind also suggests that Erika likely reached hurricane intensity. The estimated minimum pressure (986 mb) was determined by extrapolation of the pre-landfall deepening rate to the time of landfall.

Marine reports of winds of tropical storm force associated with Erika are given in Table 2, and selected surface observations from land stations and data buoys are given in Table 3. As is normally the case, land observations were inadequate to document Erika's highest winds. The strongest sustained wind observed over land was 35 kt (10-min mean) at San Fernando, Mexico, with a gust to 55 kt. In south Texas, sustained tropical storm force winds were observed in Brownsville.

In Magueyes, Mexico, 6.71 in of rain was recorded. A number of other sites reported storm total rainfall of 3 in or more. In south Texas, official and co-operative observing sites reported rainfall totals of less than 2 in, although unofficial reports of 2-3 in were also received from the Brownsville area. Doppler radar estimated isolated accumulations of 4-6 in in Kenedy and Brooks counties.

c. Casualty and Damage Statistics

Two persons died in Montemorelos, Mexico, when they tried to cross a bridge that was partially under water and their truck was swept away by flood waters. Damage to roofs and cars was reported in Matamoros, and numerous highways in northeastern Mexico were blocked by mud slides.

Only isolated minor damage was reported in south Texas. Minor coastal flooding and beach erosion occurred on South Padre Island, and there was also a report of one roof being damaged. There were no injuries or fatalities reported in the United States.

d. Forecast and Warning Critique

Forecast accuracy for Erika was better than the long-term average. Average official track errors (with the number of cases in parentheses) for Erika were 31 (8), 59 (6), 73 (4), and 102 (2) n mi for the 12, 24, 36, and 48h forecasts, respectively[1]. These errors are considerably lower that the average official track errors for the 10-yr period 1993-2002 (45, 81, 116, and 150 n mi, respectively). Average official intensity errors were 3, 4, 9, and 15 kt for the 12, 24, 36, and 48 h forecasts, respectively. For comparison, the average official intensity errors over the 10-yr period 1993-2002 are 6, 10, 13, and 15 kt, respectively.

Table 4 lists the watches and warnings associated with Erika. A hurricane watch was issued at 0300 UTC 15 August, about 31 hours prior to landfall. A hurricane warning was issued at 1500 UTC 15 August, or about 19 hours prior to landfall. The center of Erika came ashore roughly in the center of the hurricane warning area.

Acknowledgments:

The Meteorological Service of Mexico, as well as the National Weather Service Forecast Offices in Brownsville and Corpus Christi contributed observations included in this report. Colin McAdie of the Tropical Prediction Center performed the analysis of the Doppler radar data that resulted in Erika's upgrade to a hurricane.

[1] All forecast verifications in this report include the depression stage of the cyclone. National Hurricane Center verifications presented in these reports prior to 2003 did not include the depression stage.

Table 1. Best track for Hurricane Erika, 14-17 August 2003.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
14 / 1800	26.4	83.3	1011	35	tropical storm
15 / 0000	26.6	85.7	1008	40	"
15 / 0600	26.4	88.3	1008	40	"
15 / 1200	26.1	90.5	1007	45	"
15 / 1800	26.0	92.5	1001	50	"
16 / 0000	25.9	94.4	995	55	"
16 / 0600	25.6	96.2	988	60	"
16 / 1200	25.2	97.6	988	65	hurricane
16 / 1800	24.8	98.9	1003	35	tropical storm
17 / 0000	24.7	100.3	1008	25	tropical depression
17 / 0600					dissipated
16 / 1030	25.3	97.4	986	65	landfall near Boca San Rafael, Mexico, and minimum pressure

Table 2. Selected ship reports with winds of at least 34 kt for Hurricane Erika, 14-17 August 2003.

Date/Time (UTC)	Ship/station ID	Latitude (°N)	Longitude (°W)	Wind dir/speed (kt)	Pressure (mb)
15 / 0200	WGXO	28.2	86.8	070 / 38	1016.2
15 / 0300	WGXO	28.1	86.4	080 / 37	1016.4
15 / 0900	HP9685	27.2	90.8	020 / 35	1013.9
15 / 1200	HP9685	27.2	90.8	080 / 40	1010.6

Table 3. Selected surface observations for Hurricane Erika, 14-17 August 2003.

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)			
Texas								
Brownsville (BRO)	16/1004	1002.6	16/0947	34	41			1.11
Valley Intl Airpt (HRL)	16/1143	1007.2	16/1143	27	35			0.52
McAllen/Miller (MFE)	16/1113	1009.7	16/0954	27	35			1.15
Bayview (PIL)	16/0930	1005.3	16/0956	30	38			0.82
Los Fresnos (Co-op)								1.65
Port Mansfield (Co-op)								1.46
Raymondville (Co-op)								1.58
Sarita (Co-op)								1.05
Falfurrias (Co-op)								1.09
Buoys								
42020	16/1000	1009.4	16/0600		41			
42002	16/0100	1009.3	16/0030	34	42			
Texas Coastal Oceanic Observing Network								
Bob Hall Pier			16/1400		35			
Bird Island			16/1300		35			
Baffin Bay			16/1300		34			
Port Isabel			16/0800		44			
S. Padre Is. CG Stn			16/0800	36[d]	46			
Texas Tech Tower								
Port Isabel			16/0903	32	41			
Mexico								
Matamoros	16/1010	1002.3	16/0900	28[c]	39			0.32
San Fernando			16/1350	35[c]	55			2.76
El Cuchillo								0.83
Magueyes								6.71
Presa Cerro Prieto								4.02
Camacho								3.54
Presa La Boca								3.47

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)			
Monterrey Obs								3.42
El Barretal								2.93

[a] Date/time is for sustained wind when both sustained and gust are listed.
[b] Except as noted, sustained wind averaging periods for C-MAN and land-based ASOS reports are 2 min; buoy averaging periods are 8 min.
[c] 10-min average.
[d] Averaging period unknown.

Table 4. Watch and warning summary for Hurricane Erika, 14-17 August 2003.

Date/Time (UTC)	Action	Location
15 / 0300	Hurricane Watch issued	Brownsville to Port O'Connor
15 / 0300	Hurricane Watch issued	Boca Santa Maria to US/MX border
15 / 0900	Tropical Storm Warning issued	Brownsville to Port O'Connor
15 / 0900	Hurricane Watch modified	Soto La Marina to US/MX border
15 / 1500	Tropical Storm Warning modified	Baffin Bay to Port O'Connor
15 / 1500	Hurricane Watch discontinued	All
15 / 1500	Hurricane Warning issued	Brownsville to Baffin Bay
15 / 1500	Hurricane Warning issued	La Pesca to US/MX border
16 / 1300	Tropical Storm Warning discontinued	All
16 / 1300	Hurricane Warning discontinued	Brownsville to Baffin Bay
16 / 1500	Hurricane Warning changed to Tropical Storm Warning	La Pesca to US/MX border
16 / 1800	Tropical Storm Warning discontinued	All

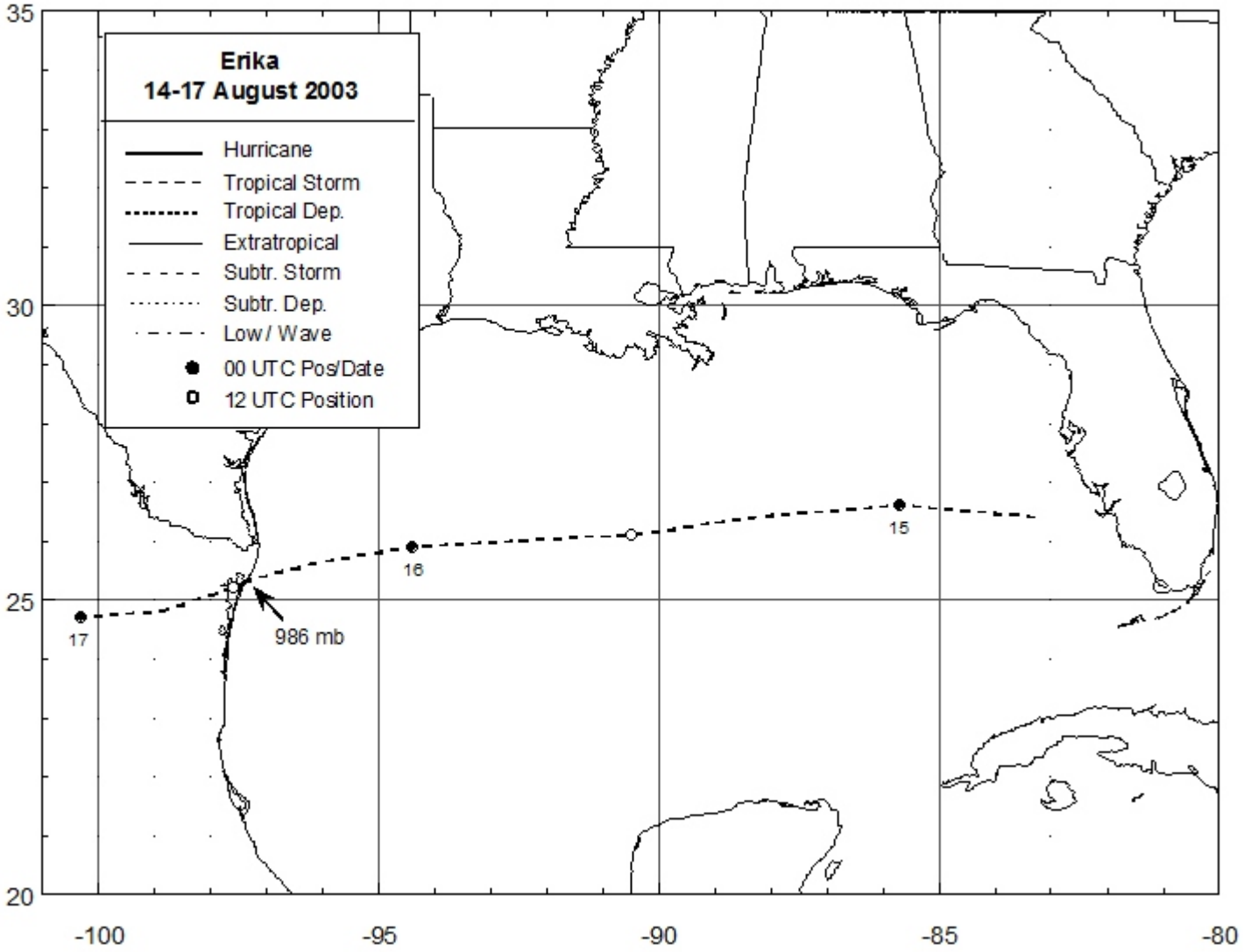

Figure 1. Best track positions for Hurricane Erika, 14-17 August 2003.

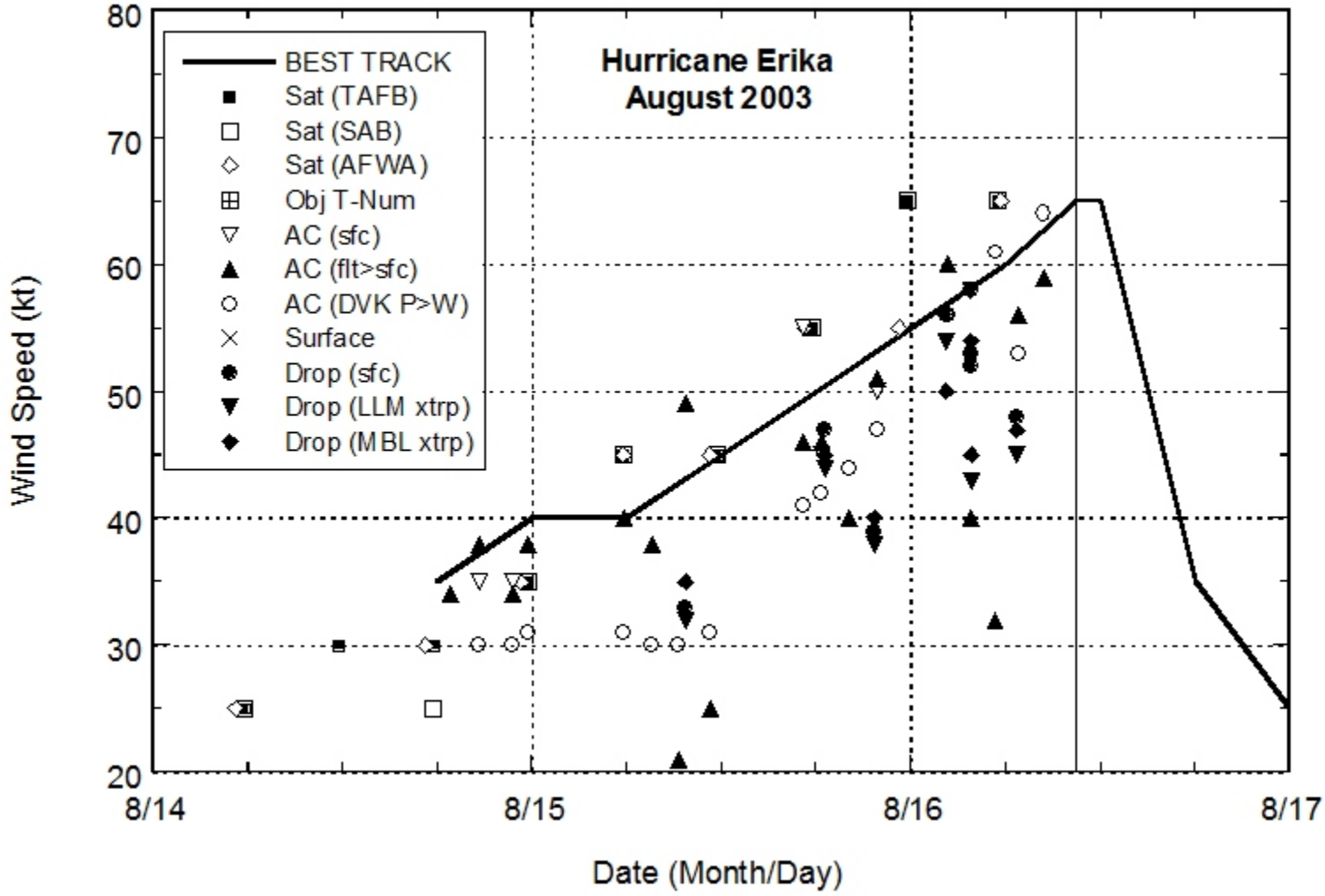

Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Hurricane Erika, 14-17 August 2003. Aircraft observations have been adjusted for elevation using 90%, 80%, and 80% reduction factors for observations from 700 mb, 850 mb, and 1500 ft, respectively. Dropwindsonde 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), and from the sounding boundary layer mean (MBL). The time of landfall is indicated by the solid vertical line.

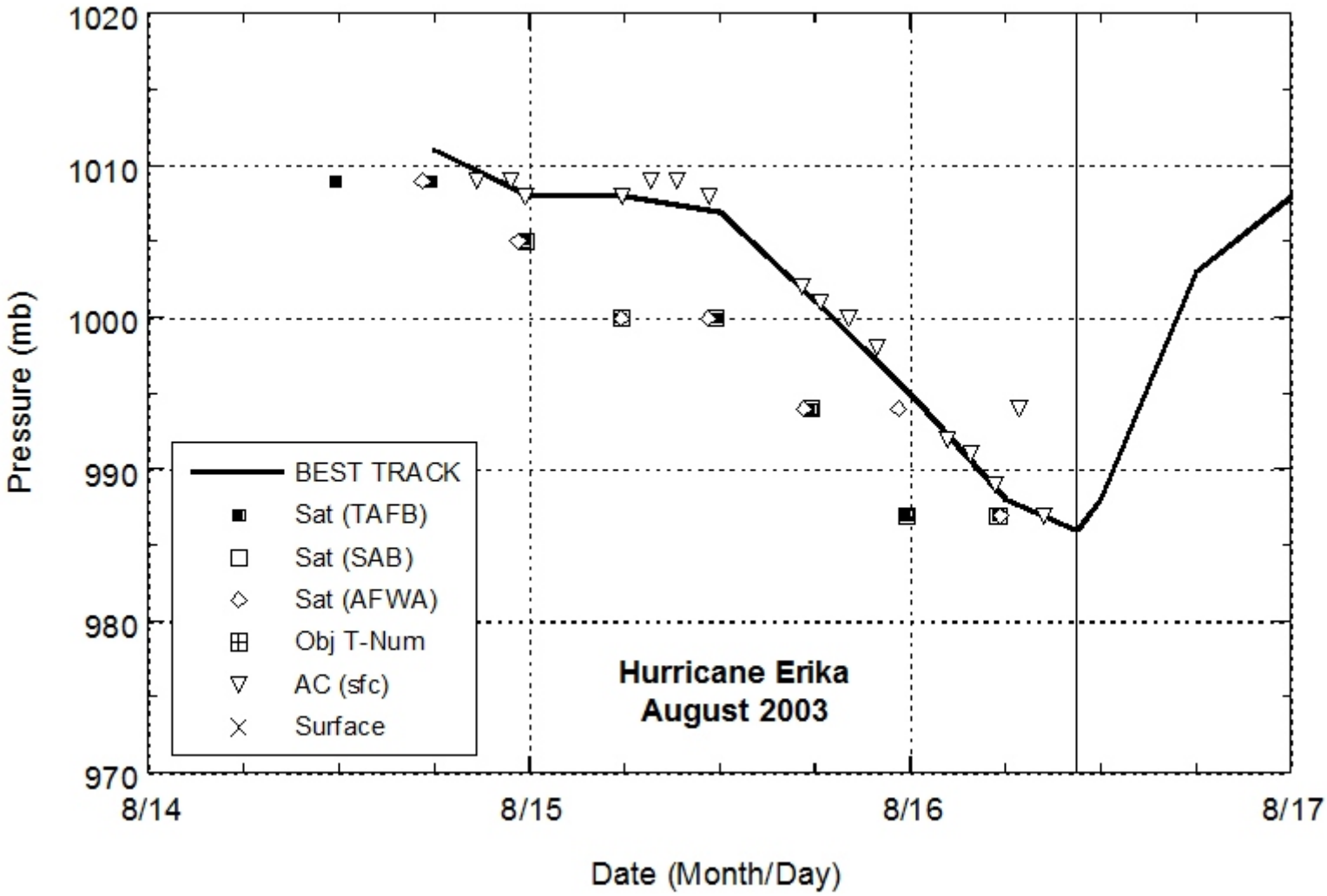

Figure 3. Selected pressure observations and best track minimum central pressure curve for Hurricane Erika, 14-17 August 2003. The time of landfall is indicated by the solid vertical line.