

Tropical Cyclone Report
Tropical Storm Fay
5-11 September 2002

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Tropical Storm Fay was a short-lived cyclone that made landfall along the central Texas producing widespread heavy rainfall and inland flooding.

a. Synoptic History

Tropical Storm Fay developed from an area of disturbed weather that included a broad, non-tropical low pressure system over the northwestern Gulf of Mexico. During the first few days of September, a broad mid- to upper-level trough moved southward from the United States and became stationary across the northern Gulf of Mexico. Thunderstorms developed along a surface low pressure trough that hugged the northern Gulf of Mexico coastal areas. Gradually, the trough and a series of weak low pressure systems drifted southward over the warm waters (sea-surface temperatures $\geq 30^{\circ}$ C) of the Gulf. A low in the northwestern Gulf of Mexico became the dominant circulation and developed persistent deep convection near the low-level center by 4 September. On 5 September, an Air Force Reserve Reconnaissance aircraft investigated the system when it was centered about 85 n mi southeast of Galveston, Texas. During the flight, a broad, closed circulation and sufficient winds were found to estimate that a tropical depression had formed at 1800 UTC. 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 steadily south-southwestward and strengthened fairly quickly. The depression became Tropical Storm Fay at 0000 UTC 6 September about 110 n mi southeast of Galveston. Fay moved south-southwestward for 12 hours before turning toward the west where it reached a peak intensity of 50 kt by 1200 UTC that day about 125 n mi southeast of Galveston. Shortly thereafter, Fay turned and moved erratically in a general west-northwestward direction and maintained its 50 kt intensity for nearly 24 hours until landfall occurred at 0900 UTC 7 September on the southern Matagorda Peninsula about 10 n mi east of Port O’Connor, Texas. After making landfall, the broad circulation reformed farther north, about 25 n mi northwest of Palacios. Fay then made a sharp turn toward the west and accelerated to about 15 kt. With more of the circulation being over land, the faster forward speed hastened the weakening process and by 0600 UTC 8 September, Fay had degenerated into a remnant low pressure system about 30 n mi southwest of Hondo, Texas. However, the rather tenacious remnant low meandered across southern Texas and northeastern Mexico for another 3 days producing copious amounts of rainfall before finally dissipating about 65 n mi northwest of Monterrey, Mexico.

b. Meteorological Statistics

Observations in Fay (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 observations from flights of the 53rd Weather Reconnaissance Squadron of the U. S. Air Force Reserve Command.

There were no ship reports of tropical storm force winds associated with Fay. Selected surface observations from land stations and data buoys are given in Table 2.

Fay's peak intensity of 50 kt from 1200 UTC 6 September to 0900 UTC 7 September (near landfall) is based on a blend of a reconnaissance flight-level spot wind report of 68 kt and larger area of 60 kt wind, which convert to surface wind values of 54 kt and 48 kt, respectively, and a pressure-wind relationship surface wind estimate of approximately 43 kt (Fig. 2). This lower maximum wind speed is believed to be more representative of Fay's overall circulation since the isolated peak flight-level wind speed of 68 kt was well removed from the circulation center. In addition, after the center of Fay moved inland, the converted flight-level-to-surface wind speed estimate of 62 kt (Fig. 2) that was observed over land on 7 September was not considered to be representative since it was associated with a large nocturnal thunderstorm complex and little or no thunderstorm activity existed over water. The minimum pressure of 998 mb at 0000 UTC 7 September was based on a reconnaissance aircraft extrapolated surface pressure from 1500 ft.

The 50 kt surface wind value at landfall along the central Texas coast is consistent with previous flight-level-to surface wind conversions when the center of Fay was still offshore and is close to the pressure-wind relationship value of 47 kt. The interpolated landfall minimum pressure of 999 mb is based on a reconnaissance aircraft extrapolated (from 1500 ft) surface pressure of 999.9 mb that was reported approximately 40 n mi northeast of the center.

Maximum storm surge values were generally around 2 -3 ft all along the Texas coast. Along the Louisiana coast, west of Cameron, storm surge values ranged from 1.5 to 2.5 ft and caused minor beach erosion and coastal highway flooding.

Rainfall totals across the San Antonio metropolitan area ranged from 4 to 8 in with some isolated reports in excess of 11 in. Across the remainder of south-central Texas, rainfall totals exceeded 9 to 12 in at several locations (Fig. 4), with a total of 17.29 in reported at Fowlerton.

Twelve tornadoes occurred in association with Tropical Storm Fay. Six of the tornadoes developed across the upper Texas coastal area on 6 and 7 September, while the remaining six tornadoes were reported over the coastal plain of south-central Texas on 8 September. A funnel cloud was also sighted 3 miles west of Belmont, Texas during the early evening of 6 September.

c. Casualty and Damage Statistics

While Fay was only a moderate tropical storm, a combination of the long duration of tropical storm force winds and isolated tornadoes resulted in damage to more than 800 single-family homes, 100 multi-family buildings, and nearly 100 businesses in Brazoria County. Some coastal floods and beach erosion caused \$3.5 million in damage to public roads, bridges, and recreational areas along the upper Texas coast, especially in Galveston County. Farther south, though, only minor beach erosion occurred.

Heavy rainfall and widespread inland freshwater flooding occurred across the upper Texas coastal area, north of where the center of Fay passed. Rainfall totals across the Upper Texas coast and in the Houston metropolitan area ranged from 8 to 12 in in many areas, with some estimated rainfall totals of 20 to 24 in near the town of Sweeney. Severe floods occurred across much of the upper Texas coastal area. In Galveston County, 135 residential structures were affected by Fay, with 23 receiving major damage that totaled about \$500,000 in losses. In Brazoria county, more than 1500 homes and nearly 500 cars were flooded. In Matagorda County, 130 single-family homes and 32 businesses were damaged by flood waters. In addition, over \$1 million in damage was done to public facilities, including roads, bridges, and public buildings. In Wharton County, nearly 200 single-family homes were damaged or destroyed by flood waters.

After moving inland and dissipating as a tropical cyclone, the remnant low generated widespread showers and thunderstorms which, in turn, produced torrential rainfall and widespread flooding across the region. Some homes and businesses across the area were damaged due to the floods. Ten homes were damaged due to floods in La Coste in Medina County, while another 20 homes were damaged in Pearsall in Frio County. Widespread minor damage also occurred to roads and bridges across Bexar, Medina, Wilson, Atascosa, Frio, Comal, and Guadalupe Counties due to the floods. In contrast, the remnants of Fay brought much needed rainfall to help alleviate water shortage problems in the drought-stricken regions of west-central and south Texas.

Several tornadoes were spawned by Fay before and after the system moved inland. Late on 6 September, the first tornado destroyed a beach house in Surfside; a second tornado damaged a home in Matagorda County near Van Vleck. Shortly after midnight on 7 September, a third tornado hit west Columbia knocking down numerous trees along Highway 36; the fourth tornado touched down in Wharton County and destroyed a mobile home, and damaged 3 other mobile homes and a barn near Boling; the fifth and most significant tornado (F1 intensity) touched down in extreme eastern Fort Bend County destroying one mobile home and injuring 3 people; this same thunderstorm later crossed the San Bernard River into Wharton County and produced a sixth tornado that caused minor damage near Hungerford. During the morning and early afternoon of 8 September, a total of 6 weak tornadoes (all F0) occurred in Jim Wells (2 tornadoes), Bee, Live Oak, and Goliad (2 tornadoes) Counties, but produced no damage.

No deaths were reported in association with Fay. Insured losses did not meet the \$25 million threshold in order to be recorded by the American Insurance Services Group and total flood-related damages are not available at this time. No monetary damage figures are available from Mexico.

d. Forecast and Warning Critique

No meaningful track and wind forecast statistics are available due to the limited period for which Fay was a tropical storm. However, a tropical storm warning was issued at 2100 UTC 5 September, which resulted in about 36 hours of lead time.

Table 3 lists the watches and warnings associated with Fay.

Acknowledgments

Some of the data in this report was furnished by National Weather Service Offices in Brownsville, Corpus Christi, Ft. Worth, Houston, San Angelo, and San Antonio, Texas, and Lake Charles, Louisiana.

Table 1. Best track for Tropical Storm Fay, 5-11 September 2002.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
05 / 1800	28.0	93.8	1009	30	tropical depression
06 / 0000	27.8	93.9	1006	35	tropical storm
06 / 0600	27.6	94.1	1005	45	"
06 / 1200	27.7	94.5	1001	50	"
06 / 1800	27.8	94.7	999	50	"
07 / 0000	27.9	95.0	998	50	"
07 / 0600	28.1	95.6	999	50	"
07 / 1200	29.1	96.9	1002	30	tropical depression
07 / 1800	28.9	98.5	1002	25	"
08 / 0000	28.9	98.9	1003	20	"
08 / 0600	28.7	99.3	1007	15	remnant low inland
08 / 1200	29.0	99.5	1007	10	"
08 / 1800	28.9	99.1	1008	10	"
09 / 0000	28.5	99.2	1008	10	"
09 / 0600	28.3	99.2	1008	10	"
09 / 1200	28.1	99.4	1009	10	"
09 / 1800	27.8	99.6	1009	10	"
10 / 0000	27.4	99.5	1008	10	"
10 / 0600	27.0	99.3	1008	10	"
10 / 1200	26.8	99.8	1008	10	"
10 / 1800	26.6	100.4	1008	10	"
11 / 0000	26.5	101.0	1007	10	"
11 / 0600					dissipated inland
07 / 0900	28.5	96.3	999	50	landfall just east of Port O'Connor, TX
07 / 0000	27.9	95.0	998	50	minimum pressure

Table 2. Selected surface observations for Tropical Storm Fay, 5-11 September 2002.

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft) ^c	Storm tide (ft) ^d	Total rain (in)
	Date/time (UTC)	Press. (mb)	Date/time (UTC) ^a	Sustained (kt) ^b	Gust (kt)			
Louisiana								
Lafayette Arpt (KLFT)	06/2329	1010.2	07/0156	14	17			0.03
Lake Charles (KLCH)	07/0321	1009.8	06/1604	24	29			0.31
Texas								
Angleton Arpt (KLBX)	06/1811	1002.4	07/0008	28	37			4.43
Angleton Courthouse								10.00
Aransas Co. Arpt (KRRP)	07/1059	1004.2	06/1851	23	28			2.16
Austin (Bergstrom Arpt)								1.54
Austin/(Georgetown Arpt)								3.53
Austin/Great Hills								5.11
Austin/Lake Georgetown								3.79
Austin/Leander 5SW								4.94
Bay City								6.39
Bay City Coop								8.95
Beaumont Arpt (KBPT)	07/0035	1008.1	07/0215	21	26			0.32
Bertram 3N (Burnet Co.)								5.58
Boerne (Kendall Co.)								5.86
Bulverde								2.93
Brownsville WFO								0.38
Camp Verde 3W								4.00
Canyon Lake Dam								3.94
Cheapside (Gonzales Co.)								3.93
Clute (TECQ site)			06/1945	42 ^g	62			
Clute (TECQ site)			06/2020		72			
Derby/Frio River								8.68
Devine 6SSE								8.12
Dilley (Frio Co.)								10.13
E. Matagorda (TCOON ^f)			07/0354	30	41			
Elgin (Bastrop Co.)								4.35
Evant								2.59
Falcon Dam								4.31
Folwerton Coop (FWTT2)								17.29
Freeport Army COE								10.00
Freeport Dow Chemical								10.27

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft) ^c	Storm tide (ft) ^d	Total rain (in)
	Date/time (UTC)	Press. (mb)	Date/time (UTC) ^a	Sustained (kt) ^b	Gust (kt)			
Freeport/Hwy 36 Bridge			06/1943	41 ^g				12.91
Freeport RTNS(TCOON ^f)			07/0354	50				
Freeport RTNS(TCOON ^f)			07/0512	45	65			
Galveston Arpt (KGLS)	06/1307	1004.4	06/1923	33	40			4.09
Galveston Causeway/I-45			06/2009	32 ^g	49			4.96
Goliad 1SE Coop (GLIT2)								9.03
Harlingen								3.28
Hewitt								2.74
Houston Hobby (KHOU)	06/2011	1005.1	06/1946	25	32			1.25
Houston IAP (KIAH)	06/2314	1006.4	06/2221	23	26			3.37
Karnes City 2N								6.92
Kelly AFB (KSKF)								10.86
La Grange/Colorado River								3.87
Lane City								8.30
Laredo Arpt (KLRD)								3.80
Luling 12NE								3.46
Jamaica Beach Coop	06/1345	1004.4	06/2037	33	44			5.76
Mason								2.11
McAllen								3.28
McGregor								2.20
Mercedes								3.86
New Braunfels 3ENE								3.22
Galv. N. Jetty (TCOON ^f)	07/0100	1004.0	07/0500	33				
Galv. N. Jetty (TCOON ^f)	07/0600	1004.0	07/0600		41			
Galv. S. Jetty (TCOON ^f)	07/0000	1003.4	06/1718	34				
Galv. N. Jetty (TCOON ^f)			06/2245		44			
Palacios Arpt (KPSX)	06/1959	999.7	06/1959	38	50			
Pearsall 9E (Frio Co.)								12.00
Pearsall (Frio Co.)								9.92
Galv. Pleasure Pier (NOS)	07/0100	1003.5	06/2248	39	45			
Port Aransas						2.0		
Port O'Connor (TCOON ^f)			07/0200		35			
Raymondville								6.03
Refugio 2NW (GOIT2)								7.30
Refugio 3SW (REFT2)								6.20

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft) ^c	Storm tide (ft) ^d	Total rain (in)
	Date/time (UTC)	Press. (mb)	Date/time (UTC) ^a	Sustained (kt) ^b	Gust (kt)			
Rio Grande City								6.03
Round Rock								3.77
Sabinal (Uvalde Co.)								6.79
San Antonio Arpt (KSAT)								4.44
San Antonio/Five Palms								11.09
San Antonio/Loop 410								6.67
San Antonio/New Dawn								11.80
San Saba								3.51
Seguin 8S								6.53
South Padre Island								2.91
Taylor Ranch/San Saba								3.30
Tow 10ESE (Llano co.)								6.23
Yorktown								3.89
Victoria Arpt (KVCT)	07/0956	1001.7	06/1954	25	31			
W. Galv. Bay (TCOON ^f)	07/0700	1001.3	07/0518	42	55			
Zapata								4.03

NOAA National Data Buoy Center buoys

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft) ^c	Storm tide (ft) ^d	Total rain (in)
	Date/time (UTC)	Press. (mb)	Date/time (UTC) ^a	Sustained (kt) ^b	Gust (kt)			
42019 (27.9N 95.4W)	07/0100	999.6	06/2000	36	45			
42035 (29.3N 94.4W)	07/0000	1003.9	07/0300	33	41			

NOAA National Data Buoy Center C-MAN stations

PTAT2 (27.8N 97.1W)	07/0900	1004.3	08/1000	29 ^e	34			
SRST2 (29.7N 94.1W)	07/0000	1006.9	07/2110	29 ^e	38			

^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 Storm surge is water height above normal astronomical tide level.

^d Storm tide is water height above National Geodetic Vertical Datum (1929 mean sea level).

^e 10-min average.

^f TCOON -- Texas Coastal Oceanic Observing Network, Texas A&M Univ. Corpus Christi, TX

^g 5-min average.

Table 3. Watch and warning summary for Tropical Storm Fay, 5-11 September 2002.

Date/Time (UTC)	Action	Location
05 / 2100	Tropical Storm Warning Issued	Matagorda, TX to Intracoastal City, LA
06 / 1500	Tropical Storm Warning Extended	Matagorda, TX south to Port Aransas, TX
06 / 1500	Tropical Storm Warning in Effect	Port Aransas to Intracoastal City
06 / 1500	Hurricane Watch Issued	Port O'Connor, TX to High Island, TX
07 / 1200	Hurricane Watch Discontinued	
07 / 1500	Tropical Storm Warning Discontinued	

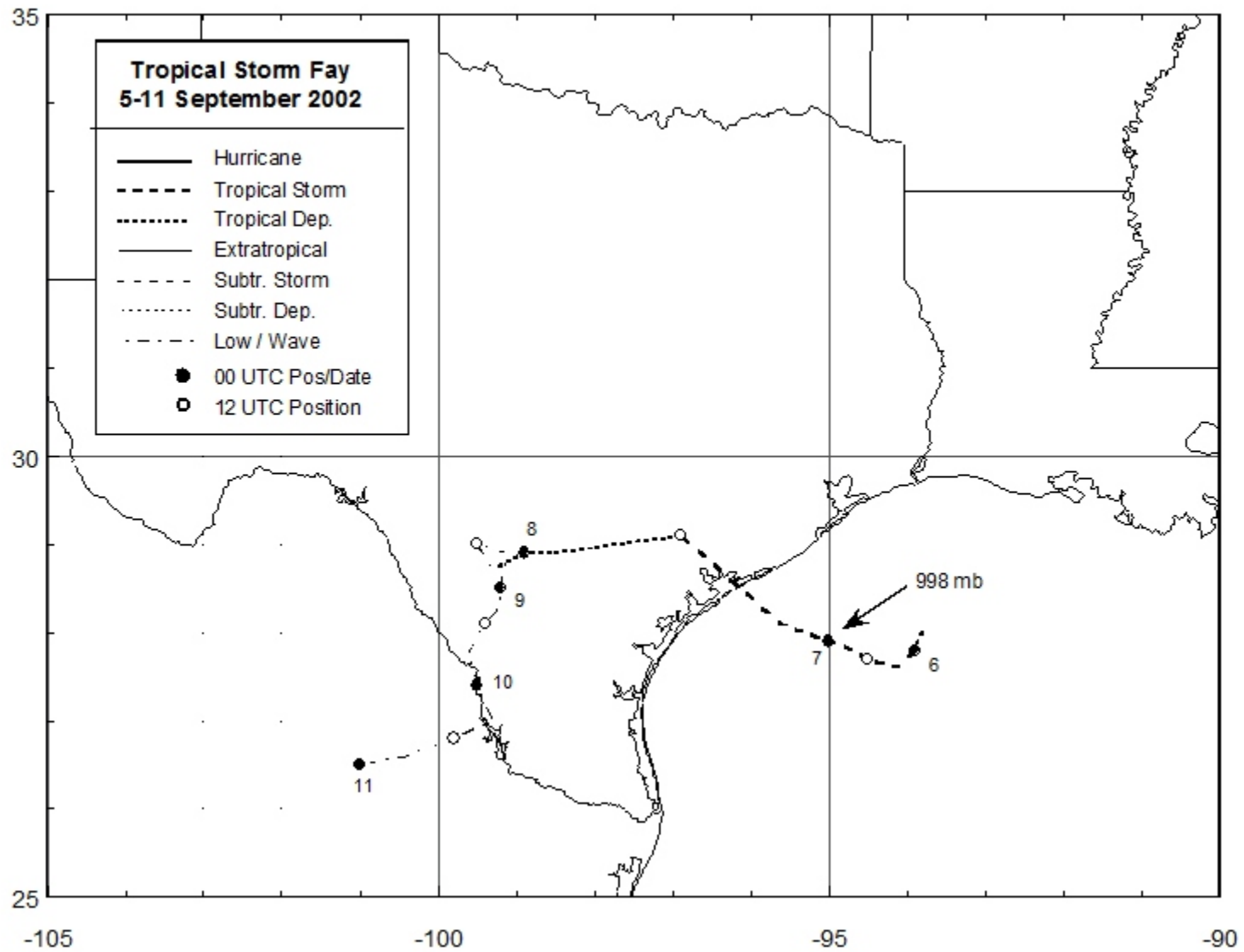


Figure 1. Best track positions for Tropical Storm Fay, 5-11 September 2002, with minimum central pressure.

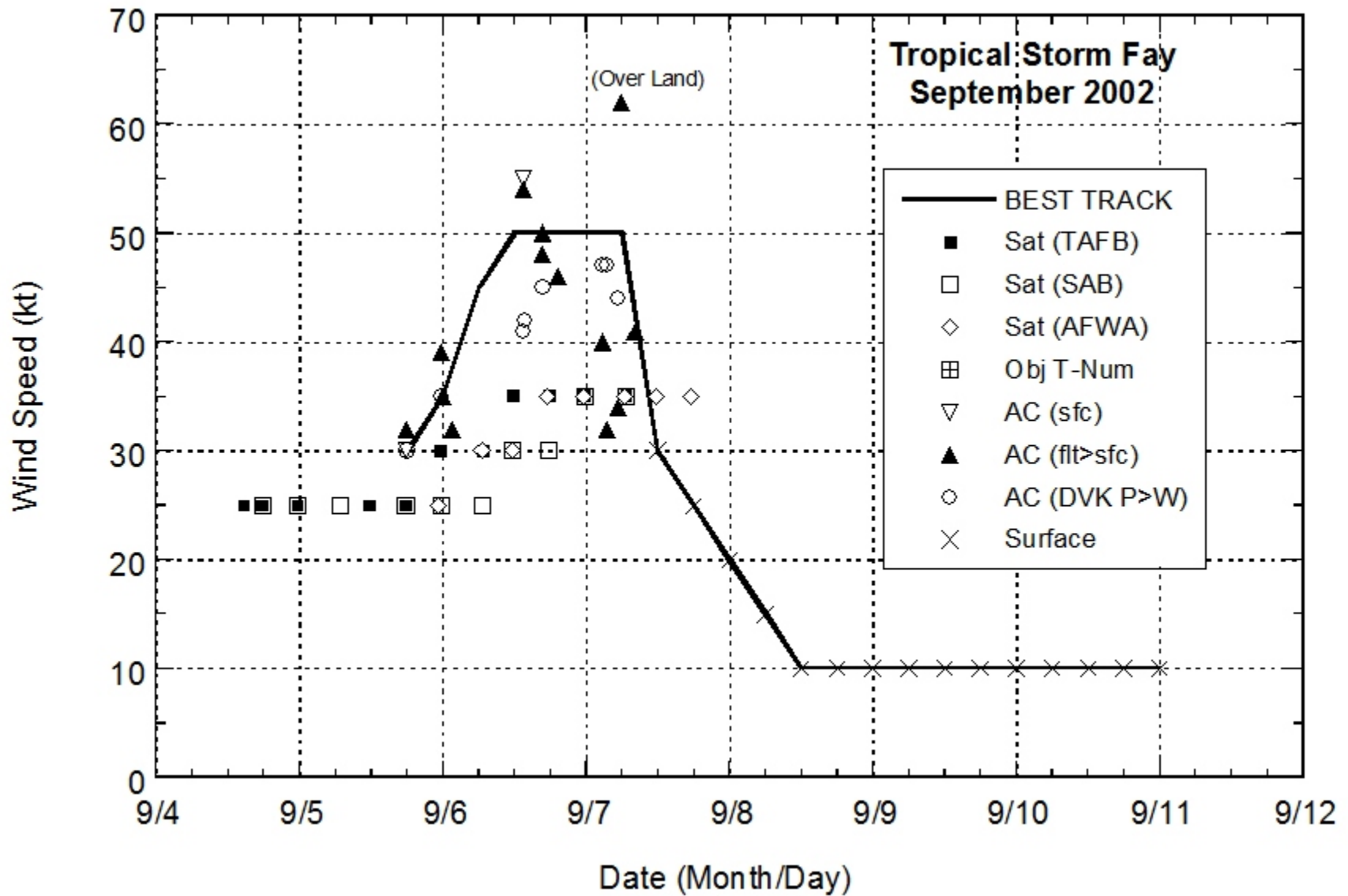


Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Tropical Storm Fay, 5-11 September 2002. Aircraft observations have been adjusted for elevation using 75% and 80% reduction factors for observations from 925 mb and 1500 ft, respectively.

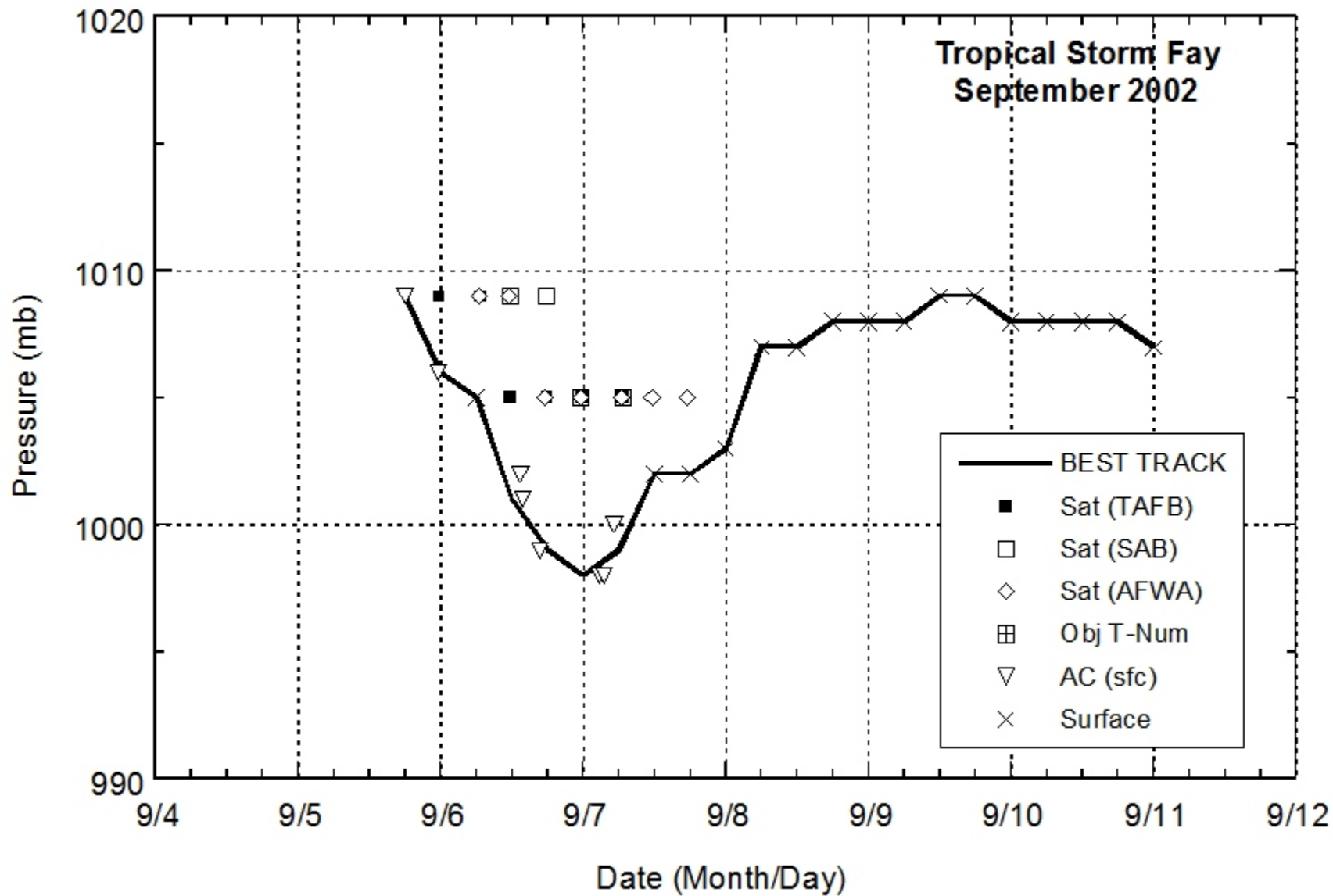


Figure 3. Selected pressure observations and best track minimum central pressure curve for Tropical Storm Fay, 5-11 September 2002.

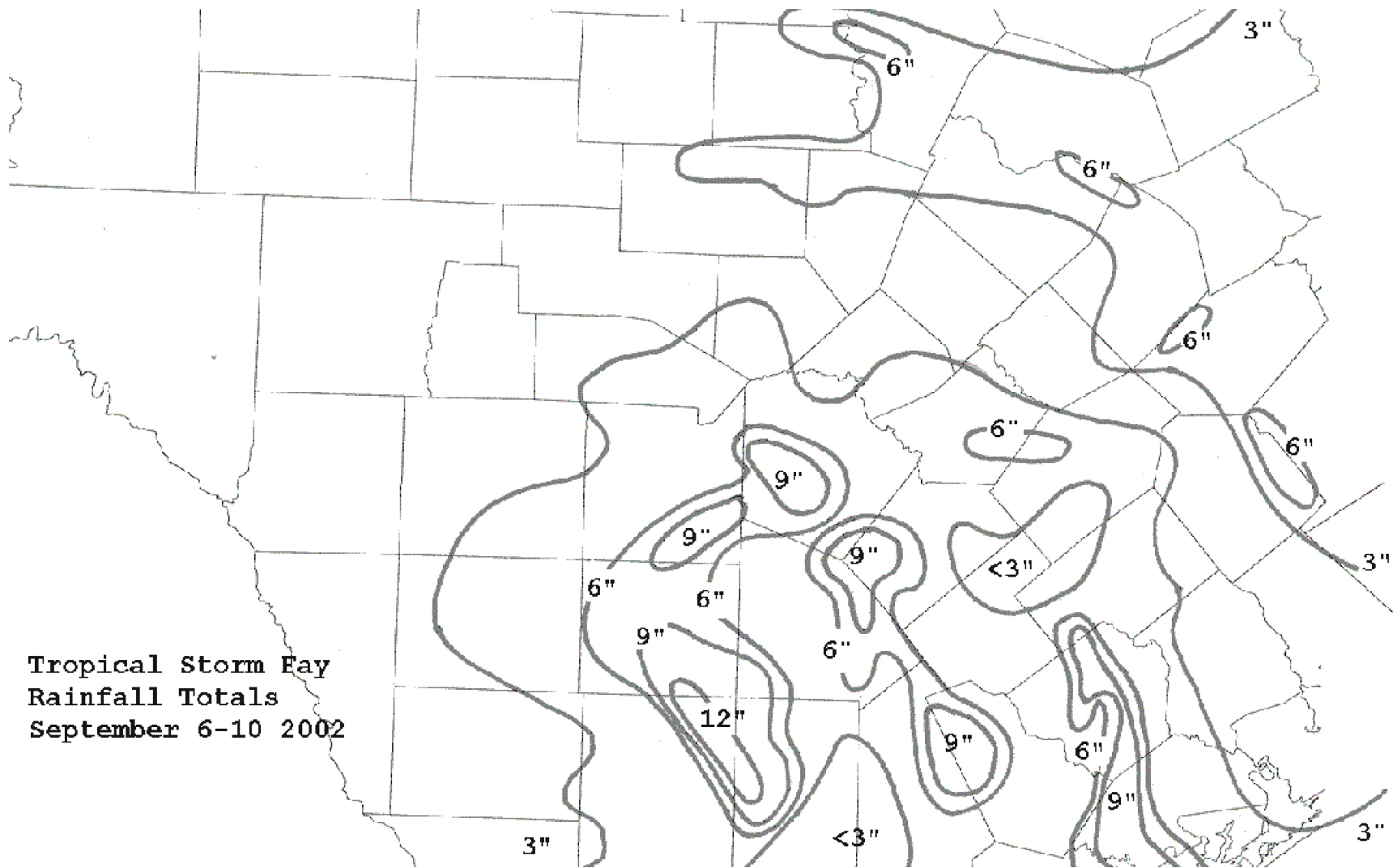


Figure 4. South Texas rainfall totals 6-10 September 2002 associated with Tropical Storm Fay and its remnant low pressure system (Map courtesy of WFO San Antonio, TX).