

Tropical Cyclone Report
Tropical Storm Barbara
(EP022007)
29 May – 2 June 2007

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Barbara was a short-lived tropical storm that made landfall near the Mexico-Guatemala border.

a. Synoptic History

The genesis of Barbara appears to have been associated with a tropical wave that left the west coast of Africa on 14 May. The wave crossed Central America on 25 May and emerged over the eastern North Pacific the next day. The wave interacted with the Intertropical Convergence Zone, and on 27 May a broad area of surface low pressure formed a couple hundred miles south of Puerto Escondido, Mexico. Limited and disorganized shower activity accompanied the low as it edged northward during the next couple of days. On 29 May, however, convection increased and became more concentrated near the center of the low, and a tropical depression formed by 1800 UTC that day about 100 n mi south-southeast of Puerto Escondido. 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.

Initially stationary, the depression did not gain any strength during the first 12 hours or so following genesis. The cyclone then strengthened gradually on 30 May while inching toward the south-southeast within an environment of very weak steering currents. It became a tropical storm by 1200 UTC that day and reached an intensity of 40 kt six hours later. Northerly wind shear contributed to Barbara’s weakening early on 31 May, and the storm moved very slowly eastward that day under the influence of a mid- to upper-level trough over the western Gulf of Mexico. By 0000 UTC 1 June, the cyclone had weakened to a tropical depression while centered about 200 n mi west-southwest of the Mexico-Guatemala border. Later that day, however, as wind shear decreased, Barbara strengthened over warm waters and reached an intensity of 45 kt by 1200 UTC 1 June. By that time the storm had also begun a general northeastward motion at about 6 kt that would continue during the next 24 hours. The intensity also remained steady during that period, and Barbara made landfall at about 1300 UTC 2 June, roughly 20 n mi northwest of the Mexico-Guatemala border, with maximum sustained winds of 45 kt. The cyclone quickly deteriorated inland over the rugged terrain of extreme southeastern Mexico while passing near the town of Tapachula. Barbara became a depression by 1800 UTC 2 June and completely dissipated by the end of that day.

b. Meteorological Statistics

Observations in Barbara (Figs. 2 and 3) include satellite-based Dvorak technique intensity estimates from the Tropical Analysis and Forecast Branch (TAFB) and the Satellite Analysis Branch (SAB). 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 were also useful in tracking Barbara.

No ship reports of sustained winds of tropical storm force were reported in association with Barbara. Sustained winds of 40 kt were reported, however, at Tecun Uman, Guatemala (located near the border with Mexico about 15 miles from the Pacific coast) near the time of Barbara's landfall on the morning of 2 June. An automated surface station at Puerto Madero, Mexico (along the coast about 20 miles southwest of Tapachula), operated by the Mexican Navy, reported sustained winds of 31 kt with gusts to 46 kt near the time of landfall. Nearly 5 inches of rain was reported on 2 June at Huixtla, Mexico. A few other reports of 2-4 inches of rain in extreme southeastern Mexico were also received.

The maximum best track intensity for Barbara of 45 kt on 1-2 June is based on subjective Dvorak intensity estimates and data from two QuikSCAT overpasses. The temporary weakening to 30 kt at 0000 UTC 1 June is based on Dvorak data-T numbers of 2.0 from TAFB and SAB at that time.

c. Casualty and Damage Statistics

Structural damages in Mexico and Guatemala caused by Barbara were confined mostly to some damaged roofs and downed trees in coastal areas near the border between the two countries. Rain-induced river floods led to a bridge being washed out in coastal Guatemala. Significant damages to agricultural crops, with an estimated cost of more than \$50 million (U.S. dollars), were reported in southeastern Mexico.

d. Forecast and Warning Critique

Tropical Weather Outlooks issued by the National Hurricane Center first mentioned the incipient area of disturbed weather southwest of the Gulf of Tehuantepec about 48 hours prior to formation of the tropical depression that later became Barbara. Beginning about 13 hours prior to genesis, the Outlooks explicitly mentioned that a tropical depression could form.

A verification of official and guidance model track forecasts is given in Table 2. Average official track errors (with number of cases in parentheses) for Barbara were 32 (15), 62 (13), 98 (11), 141 (9), 226 (5), and 333 (1) n mi for the 12, 24, 36, 48, 72, and 96 h forecasts, respectively; due to Barbara's short life span, only one 96-h forecast and no 120-h forecasts could be verified. Despite the small number of cases, especially at longer lead times, it is clear that most of the official track forecasts were biased well to the west, leading to errors that were noticeably larger than the corresponding 5-year (2002-06) averages. The first two days of

forecasts called for a slow northward motion toward Mexico followed by a northwestward turn near the coast. Forecasts were shifted eastward thereafter but retained a west bias. Model guidance from the U.S. Navy, including both the GFDN (GFNI) and NOGAPS (NGPI), had smaller average errors than the official forecasts, since those models more frequently forecast an eastward component of motion. Overall, however, all of the available models were quite erratic, as is often the case in a weak steering environment, and none of them consistently forecast the eastward motion of Barbara that was ultimately observed.

Average official and guidance model intensity forecast errors (Table 3) were 7, 10, 12, 19, 29, and 60 kt for the 12, 24, 36, 48, 72, and 96 h forecasts; again note that only one forecast could be verified at 96 h. Most of the official intensity forecasts were biased high, and errors beyond 36 h were larger than the corresponding 5-year averages. The first several official forecasts for Barbara called for intensification to a hurricane, based largely on the SHIPS model guidance that generally had an even higher bias than the official forecasts (although SHIPS depends on the official forecast track that had large errors in this case). GFDL intensity forecasts were also biased a little high but were far more conservative, and they exhibited smaller errors than the official forecasts.

Coastal watches and warnings issued by Mexico and Guatemala in association with Barbara are summarized in Table 4.

Table 1. Best track for Tropical Storm Barbara, 29 May – 2 June 2007.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
29 / 1800	14.2	97.5	1007	30	tropical depression
30 / 0000	14.2	97.5	1007	30	"
30 / 0600	14.2	97.4	1006	30	"
30 / 1200	14.0	97.3	1005	35	tropical storm
30 / 1800	13.6	97.2	1003	40	"
31 / 0000	13.2	96.9	1002	40	"
31 / 0600	13.1	96.5	1002	40	"
31 / 1200	13.0	96.1	1004	35	"
31 / 1800	12.9	95.7	1004	35	"
01 / 0000	12.9	95.3	1005	30	tropical depression
01 / 0600	13.0	94.9	1004	35	tropical storm
01 / 1200	13.2	94.4	1001	45	"
01 / 1800	13.4	93.8	1000	45	"
02 / 0000	13.7	93.3	1000	45	"
02 / 0600	14.1	92.8	1000	45	"
02 / 1200	14.6	92.5	1000	45	"
02 / 1800	15.2	92.3	1006	25	tropical depression
03 / 0000					dissipated
01 / 1800	13.4	93.8	1000	45	minimum pressure
02 / 1300	14.7	92.5	1000	45	landfall just northwest of the Mexico-Guatemala border

Table 2. Preliminary track forecast evaluation (heterogeneous sample) for Tropical Storm Barbara, 29 May – 2 June 2007. 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.

Forecast Technique	Forecast Period (h)						
	12	24	36	48	72	96	120
CLP5	44 (15)	106 (13)	176 (11)	252 (9)	454 (5)	599 (1)	
GFNI	40 (13)	61 (11)	77 (9)	132 (7)	163 (2)		
GFDI	43 (15)	72 (13)	100 (11)	123 (9)	181 (5)	410 (1)	
GFSI	53 (15)	99 (13)	155 (11)	208 (8)	174 (4)		
AEMI	55 (15)	102 (13)	158 (11)	295 (6)			
NGPI	31 (15)	50 (13)	79 (11)	122 (9)	160 (5)	158 (1)	
UKMI	56 (2)	100 (1)					
BAMD	69 (15)	144 (13)	223 (11)	318 (9)	529 (5)	767 (1)	
BAMM	55 (15)	117 (13)	187 (11)	277 (9)	446 (5)	672 (1)	
BAMS	52 (15)	110 (13)	168 (11)	233 (9)	358 (5)	466 (1)	
CONU	35 (15)	58 (13)	92 (11)	128 (9)	170 (5)	279 (1)	
GUNA	41 (13)	77 (11)	120 (9)	168 (7)	229 (3)		
FSSE	40 (11)	81 (9)	122 (7)	157 (7)	232 (3)		
OFCL	32 (15)	62 (13)	98 (11)	141 (9)	226 (5)	333 (1)	
NHC Official (2002-2006 mean)	33 (1349)	57 (1192)	79 (1039)	99 (897)	140 (655)	188 (465)	233 (311)

Table 3. Preliminary intensity forecast evaluation (heterogeneous sample) for Tropical Storm Barbara, 29 May – 2 June 2007. Forecast errors (kt) 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.

Forecast Technique	Forecast Period (h)						
	12	24	36	48	72	96	120
SHF5	7.5 (15)	11.0 (13)	11.8 (11)	16.4 (9)	8.2 (5)	19.0 (1)	
GFDI	7.0 (15)	9.6 (13)	11.3 (11)	13.3 (9)	10.0 (5)	12.0 (1)	
SHIP	8.2 (15)	11.2 (13)	16.1 (11)	26.2 (9)	38.8 (5)	53.0 (1)	
DSHP	7.5 (15)	11.2 (13)	16.1 (11)	26.2 (9)	38.8 (5)	35.0 (1)	
FSSE	6.4 (11)	12.3 (9)	16.9 (7)	22.0 (7)	34.0 (3)		
ICON	6.8 (15)	10.2 (13)	15.5 (11)	21.9 (9)	28.0 (5)	17.0 (1)	
OFCL	6.7 (15)	10.0 (13)	12.3 (11)	19.4 (9)	29.0 (5)	60.0 (1)	
NHC Official (2002-2006 mean)	6.3 (1349)	11.0 (1192)	14.6 (1039)	16.9 (896)	18.9 (655)	18.5 (465)	19.3 (311)

Table 4. Watch and warning summary for Tropical Storm Barbara, 29 May – 2 June 2007.

Date/Time (UTC)	Action	Location
1 / 1500	Tropical Storm Watch issued	Sipacate, Guatemala to Barra De Tonalá, Mexico
1 / 2100	Tropical Storm Watch changed to Tropical Storm Warning	Sipacate to Barra De Tonalá
1 / 2100	Tropical Storm Watch issued	Barra De Tonalá to Salina Cruz, Mexico
2 / 1800	Tropical Storm Watch discontinued	All
2 / 1800	Tropical Storm Warning discontinued	All

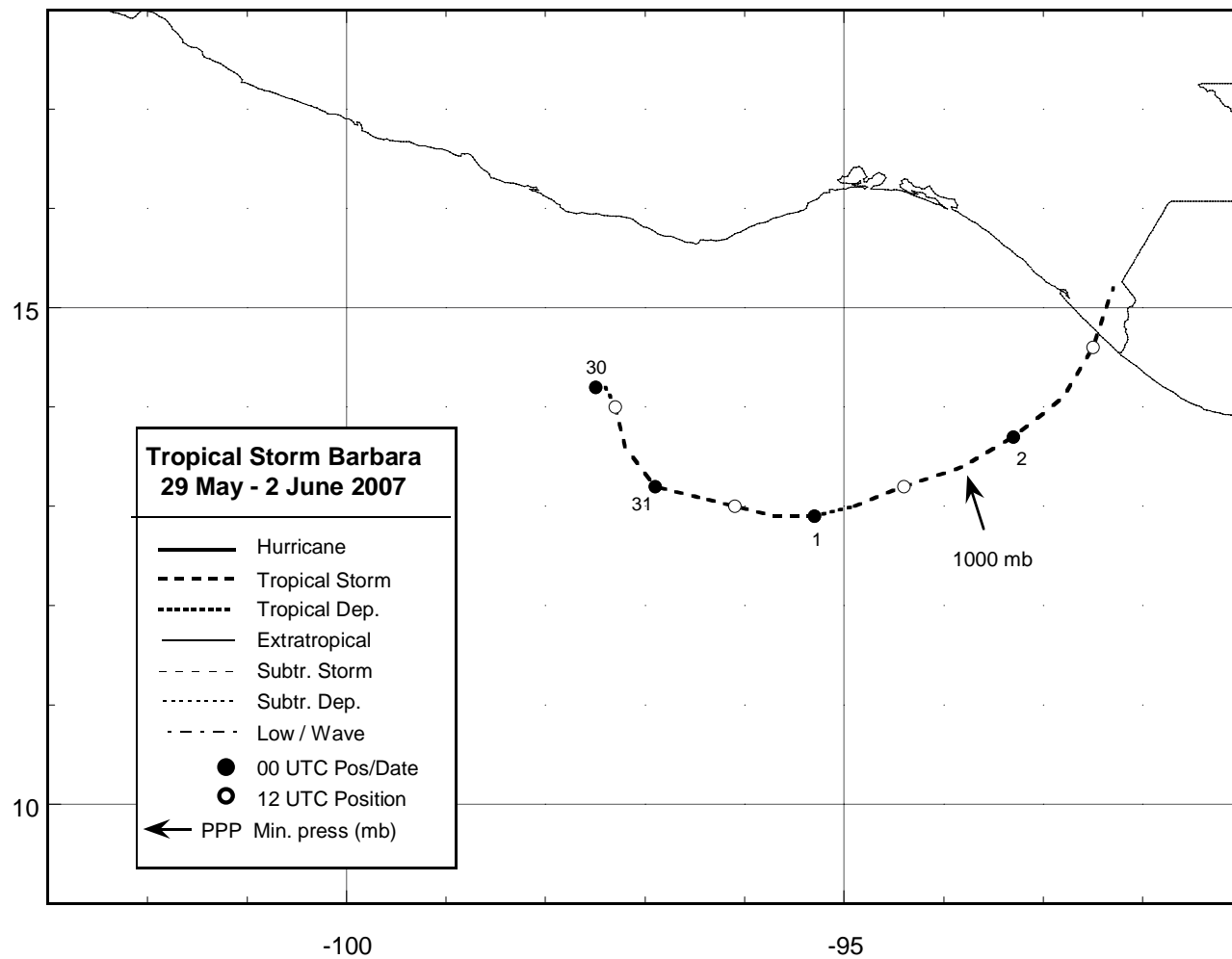


Figure 1. Best track positions for Tropical Storm Barbara, 29 May – 2 June 2007.

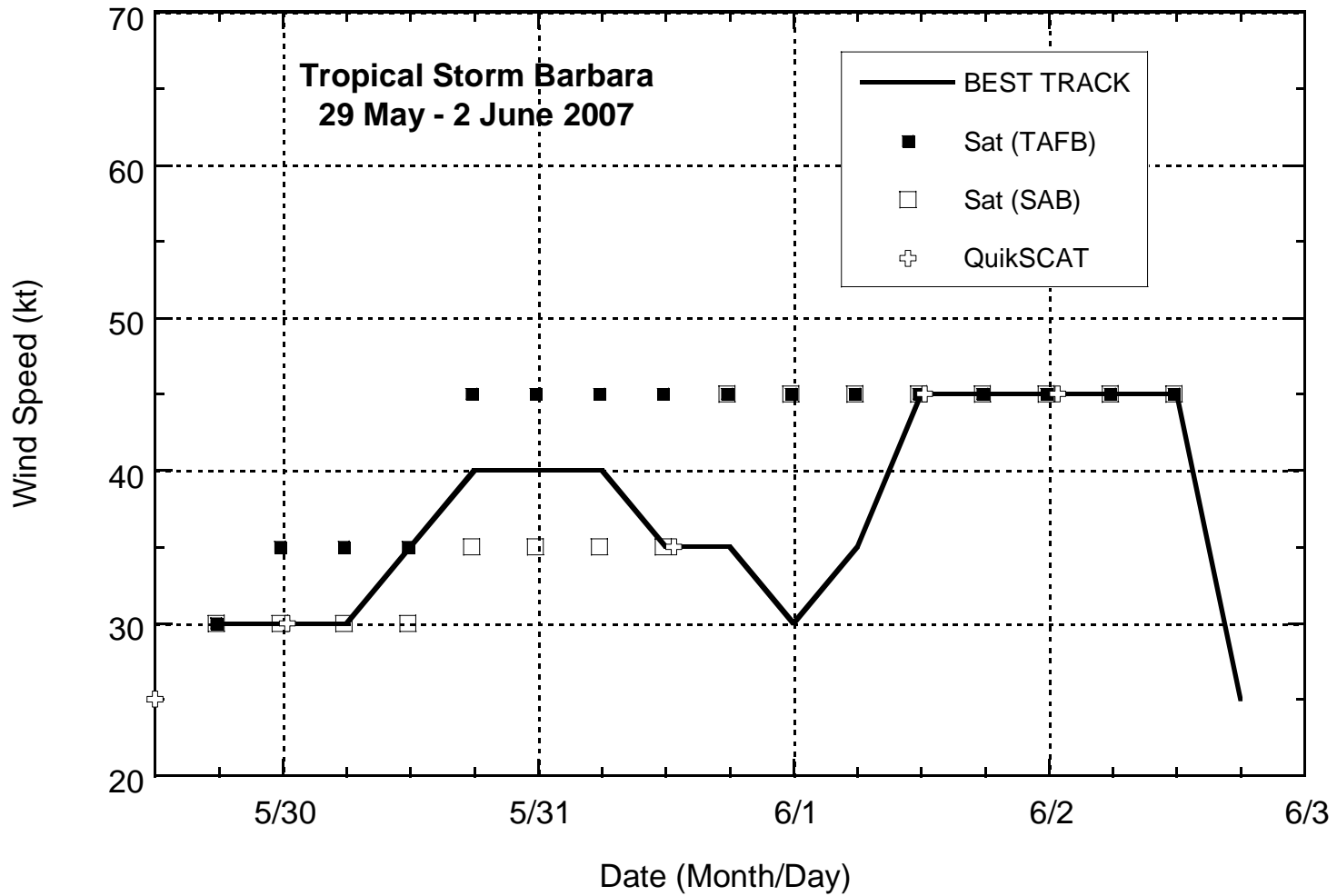


Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Tropical Storm Barbara, 29 May – 2 June 2007.

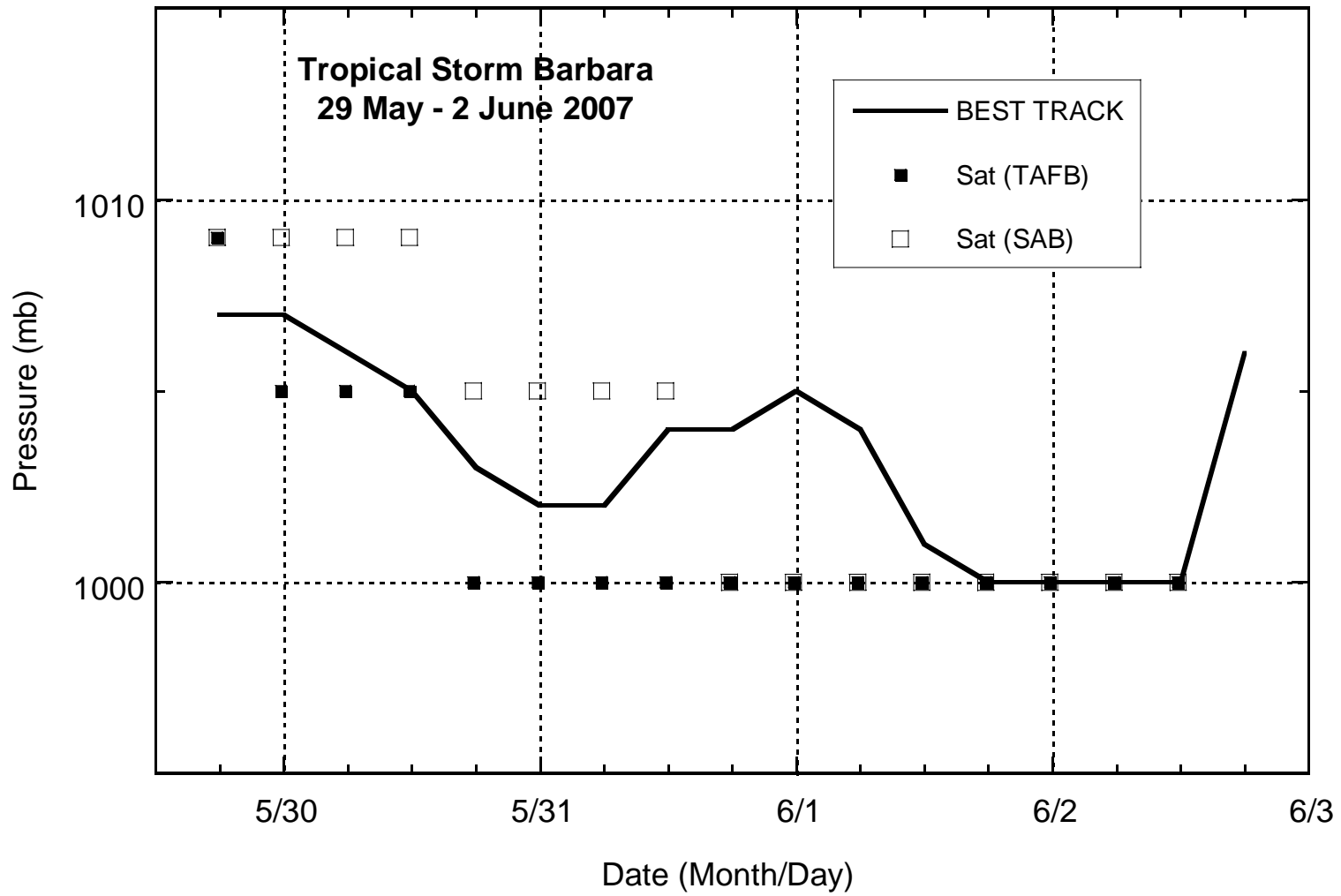


Figure 3. Selected pressure observations and best track minimum central pressure curve for Tropical Storm Barbara, 29 May – 2 June 2007.