

Tropical Cyclone Report
Hurricane Beta
26-31 October 2005

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After pounding the island of Providencia, Beta struck a sparsely-settled area of Nicaragua with maximum sustained winds near 90 kt.

a. Synoptic History

Animation of infrared and visible geostationary satellite images indicates that the same tropical wave that produced Tropical Storm Alpha also generated Beta. This wave entered the Caribbean Sea on 21 October and spawned Alpha over the northeastern Caribbean the following day. The wave continued westward for a few days and by 25 October deep convection became somewhat consolidated over the extreme southwestern Caribbean Sea. On 26 October, curved banding features developed, and the system was sufficiently well-organized by 1800 UTC that day to designate the formation of a tropical depression, centered about 90 n mi north of the northern central coast of Panama.

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 the motion was northwestward, but in response to a mid-tropospheric shortwave trough over the southern Gulf of Mexico and a mid-tropospheric ridge well to the east-northeast, the system gradually turned toward the north. Within an environment of weak vertical wind shear and sea-surface temperatures of at least 29°C, the cyclone strengthened into a tropical storm around 0600 UTC 27 October. There was only slow strengthening over the ensuing 36 h or so, probably due to a slight disruption of the system by weak to moderate northeasterly shear. By 0000 UTC 29 October the shear apparently diminished, and Beta intensified into a hurricane shortly thereafter, while passing near Isla de Providencia. As the Gulf of Mexico shortwave trough lifted northeastward and a mid-tropospheric high built to the north and northwest of the hurricane, Beta turned toward the west and west-southwest and continued to strengthen. Also around 0000 UTC 30 October, the cloud pattern became substantially better organized, and the hurricane strengthened more rapidly. A peak intensity of 100 kt was reached around 0600 UTC 30 October, which resulted in the seventh, and last, major hurricane of the 2005 Atlantic season. Moving southwestward, the center of the hurricane made landfall near La Barra del Rio Grande on the central coast of Nicaragua around 1200 UTC 30 October. Shortly before the eye reached the coast, the central cloud tops warmed, and the hurricane’s intensity at landfall is estimated to have been 90 kt, or category 2 strength on the Saffir-Simpson Hurricane scale. Beta turned back toward the west and dissipated over west-central Nicaragua by 0600 UTC 31 October.

b. Meteorological Statistics

Observations in Beta (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 (AFRES) Command. 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 Beta. The highest (700 mb) flight-level winds measured by the AFRES were 77 kt at 2003 UTC 29 October. However, just after the aircraft left the area, microwave imagery showed that the eye contracted, and Dvorak estimates indicate that Beta strengthened rather rapidly from 0000 to 0600 UTC 30 October. The 100-kt peak intensity estimate is based on a consensus T-number of 5.5 from TAFB, SAB, and AFWA. Beta's landfall intensity of 90 kt is based on a Dvorak data T-number of 5.0 from TAFB.

Aircraft flight-level wind data and satellite images indicate that Beta was a small tropical cyclone; the radius of tropical storm force winds was generally 50 n mi or less.

Rainfall totals as high as 10 to 20 inches were observed over portions of Honduras, with a maximum total of 21.82 inches at Trujillo. However, it is not certain whether all of these rains were directly associated with Beta. There are no meteorological reports available near the point of landfall in Nicaragua. Puerto Cabezas, Nicaragua had a storm total rainfall of 6.39 inches with 5.16 inches falling in a 6-h period on 29 October.

There were two ship reports of winds of tropical storm force associated with Beta, and these are given in Table 2.

c. Casualty and Damage Statistics

Beta reportedly caused extensive damage on the Colombian island of Providencia, however details of these impacts are unknown. According to information from the government of Nicaragua, roofs were removed from numerous dwellings and there was moderate storm surge flooding near the landfall location in Nicaragua. Major flooding occurred in Honduras, but it cannot be determined whether all of this flooding was directly associated with Beta. There are no reported deaths due to Beta.

d. Forecast and Warning Critique

The area of disturbed weather that developed into Beta was first mentioned in the National Hurricane Center's Tropical Weather Outlook (TWO) a little over 24 h prior to genesis. Only slow development of the system was anticipated, however. The TWO that was issued a few hours prior to Beta's genesis did indicate that a tropical depression could form.

Average official track errors (with the number of cases in parentheses) for Beta were 27 (15), 55 (13), 74 (11), 90 (9), and 88 (5) n mi for the 12, 24, 36, 48, and 72 h forecasts,

respectively (there were no official forecasts verifying at 96 or 120 h). These errors are lower than the average official track errors for the 10-yr period 1995-2004 of 42, 75, 107, 138, and 202 n mi, respectively. Even though the mean official track errors were lower than average, there was an overall west-northwest bias in the official forecasts. This resulted in landfall predictions that were too soon and too far north in Nicaragua. It should be noted that the GFDL model generally did a better job of specifying the location of landfall in Nicaragua than the official forecasts. Table 3 lists the mean errors for the various numerical track guidance models or model combinations in comparison to those for the official forecasts (this is a heterogeneous comparison). The consensus models CONU and GUNA had lower average track forecast errors than the official forecasts at 12 through 72 h, and the Florida State University Superensemble (FSSE) had lower mean track errors than the official forecasts at 24 through 72 h.

Average official intensity errors were 10, 14, 11, 11, and 41 kt for the 12, 24, 36, 48, and 72 h forecasts, respectively. For comparison, the average official intensity errors over the 10-yr period 1995-2004 are 6, 10, 12, 15, and 18 kt, respectively, so the mean official intensity forecast was substantially worse than average at 72 h (albeit for only 5 cases).

Table 4 is a listing of the watches and warnings that were issued for Beta. Hurricane warnings were issued for Providencia about 33 h before the closest approach of the center to that island. A hurricane warning was issued for the coast of Nicaragua 39 h prior to landfall of the center.

Table 1. Best track for Hurricane Beta, 26-31 October 2005.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
26 / 1800	10.4	80.9	1007	30	tropical depression
27 / 0000	10.7	81.1	1007	30	"
27 / 0600	11.0	81.3	1005	35	tropical storm
27 / 1200	11.3	81.3	1000	45	"
27 / 1800	11.6	81.3	997	50	"
28 / 0000	11.9	81.2	995	50	"
28 / 0600	12.3	81.1	994	50	"
28 / 1200	12.8	81.0	993	50	"
28 / 1800	13.2	81.1	991	50	"
29 / 0000	13.4	81.2	988	60	"
29 / 0600	13.6	81.4	985	70	hurricane
29 / 1200	13.7	81.6	982	75	"
29 / 1800	13.7	82.1	980	75	"
30 / 0000	13.6	82.6	970	90	"
30 / 0600	13.3	83.1	962	100	"
30 / 1200	12.9	83.5	970	90	"
30 / 1800	12.7	84.1	990	55	tropical storm
31 / 0000	12.7	84.9	1000	20	tropical depression
31 / 0600					dissipated
30 / 0600	13.3	83.1	962	100	minimum pressure
30 / 1200	12.9	83.5	970	90	landfall near La Barra del Rio Grande, Nicaragua

Table 2. Selected ship reports with winds of at least 34 kt for Hurricane Beta, 26-31 October 2005.

Date/Time (UTC)	Ship call sign	Latitude (°N)	Longitude (°W)	Wind dir/speed (kt)	Pressure (mb)
28 / 0900	ZCAM4	12.3	80.9	270 / 50	999.7
30 / 0600	PJRP	18.6	83.6	060 / 39	1013.7

Table 3. Preliminary forecast evaluation (heterogeneous sample) for Hurricane Beta, 26-31 October 2005. 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	42 (16)	90 (14)	138 (12)	176 (10)	237 (6)	266 (2)	
GFNI	29 (16)	46 (14)	52 (12)	58 (9)	91 (5)	67 (2)	
GFDI	32 (16)	50 (13)	77 (11)	112 (9)	194 (5)	280 (1)	
GFSI	23 (13)	38 (11)	56 (9)	62 (7)	132 (3)		
AEMI	26 (13)	39 (11)	51 (9)	54 (7)	109 (3)		
NGPI	36 (16)	59 (14)	72 (12)	72 (10)	62 (6)	27 (2)	
UKMI	33 (12)	69 (10)	89 (8)	120 (6)	218 (2)		
A98E	39 (16)	91 (14)	152 (12)	214 (10)	371 (6)	656 (2)	
A9UK	41 (8)	91 (7)	150 (6)	200 (5)	306 (3)		
BAMD	59 (16)	108 (14)	162 (12)	207 (10)	336 (6)	462 (2)	
BAMM	45 (15)	85 (13)	133 (11)	174 (9)	296 (6)	469 (2)	
BAMS	45 (16)	85 (14)	125 (12)	158 (10)	264 (6)	419 (2)	
CONU	25 (16)	40 (14)	56 (12)	65 (10)	73 (6)	73 (2)	
GUNA	23 (12)	38 (10)	53 (8)	62 (6)	78 (2)		
FSSE	28 (13)	46 (11)	55 (9)	62 (7)	65 (3)		
OFCL	27 (15)	55 (13)	74 (11)	90 (9)	88 (5)		
NHC Official (1995-2004 mean)	42 (3400)	75 (3116)	107 (2848)	138 (2575)	202 (2117)	236 (649)	310 (535)

Table 4. Watch and warning summary for Hurricane Beta, 26-31 October 2005.

Date/Time (UTC)	Action	Location
27/0300	Tropical Storm Warning issued	Nicaragua/Costa Rica border To Cabo Gracias a Dios and adjacent islands
27/0600	Tropical Storm Warning issued	San Andres and Providencia islands
27/0900	Hurricane Watch issued	San Andres and Providencia Islands
27/1500	Hurricane Warning issued	San Andres and Providencia Islands
27/1500	Hurricane Watch issued	Nicaragua/Costa Rica border To Cabo Gracias a Dios and adjacent islands
28/1500	Tropical Storm Watch issued	Limon to Cabo Gracia A Dios
28/2100	Hurricane Warning issued	Bluefields to Cabo Gracias A dios And adjacent islands
28/2100	Tropical Storm Warning and Hurricane Watch modified to	Bluefields to the Costa Rica border
29/0300	Hurricane Watch issued	Punta Patuca to Cabo Gracias A Dios
29/0300	Tropical Storm Watch modified to	Limon to Punta Patuca Including La Ceiba
29/1500	Hurricane Watch changed To Hurricane Warning	Punta Patuca to Cabo Gracias A Dios
30/0000	Hurricane Warning discontinued	San Andres and Providencia Islands
30/1500	Hurricane Warning discontinued	Punta Patuca to Cabo Gracias A Dios
30/1500	Tropical Storm Watch discontinued	Limon to Punta Patuca Including La Ceiba
04/1800	Hurricane Watch discontinued	Bluefields to the Costa Rica border
30/2100	Hurricane Warning discontinued	Bluefields to Cabo Gracias A dios And adjacent islands

30/2100	Tropical Storm Warning discontinued	Bluefields to Costa Rica border
30/2100	Tropical Storm Warning issued	Bluefields to Puerto Cabezas
31/0000	Tropical Storm Warning discontinued	Bluefields to Puerto Cabezas

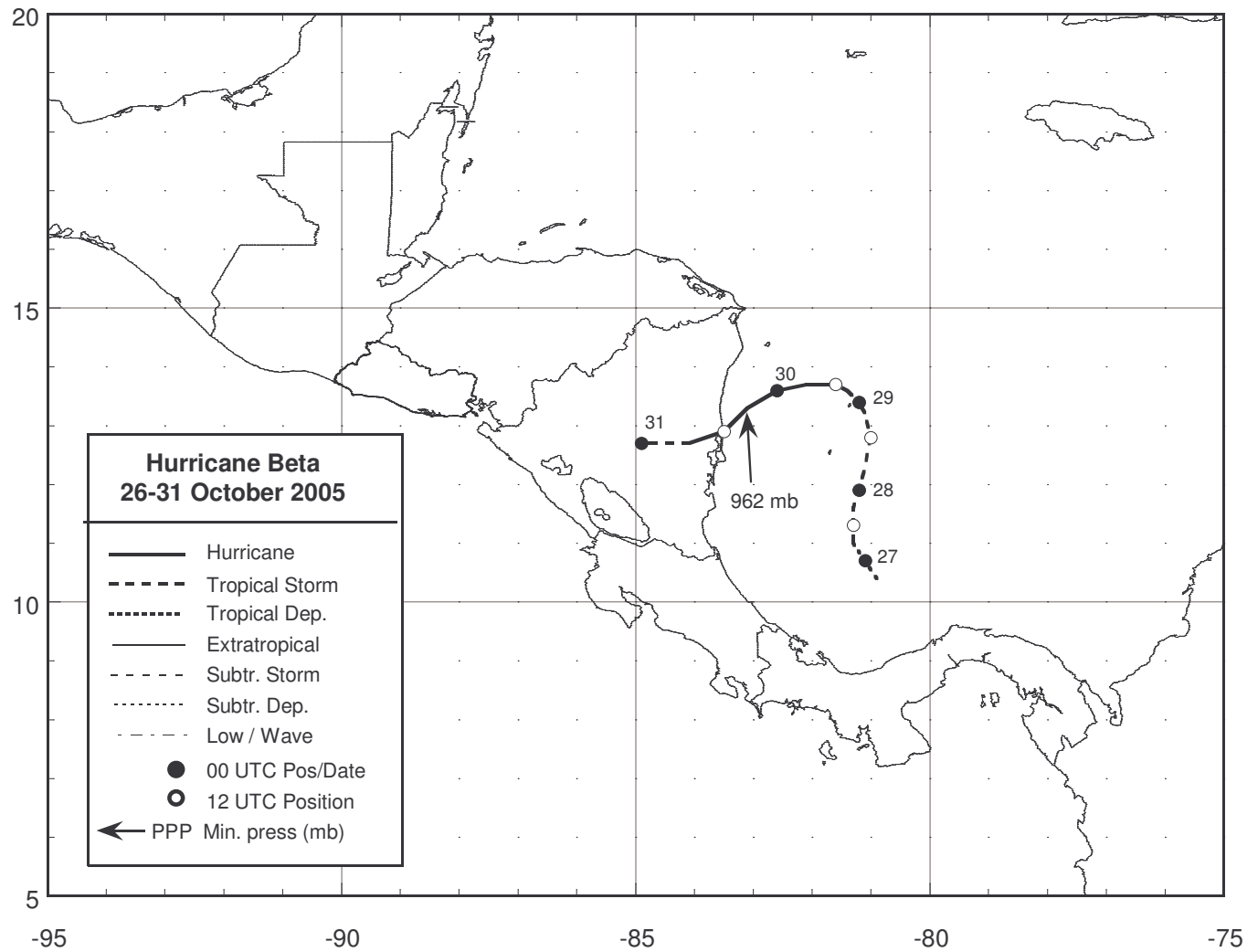


Figure 1. Best track positions for Hurricane Beta, 26-31 October 2005.

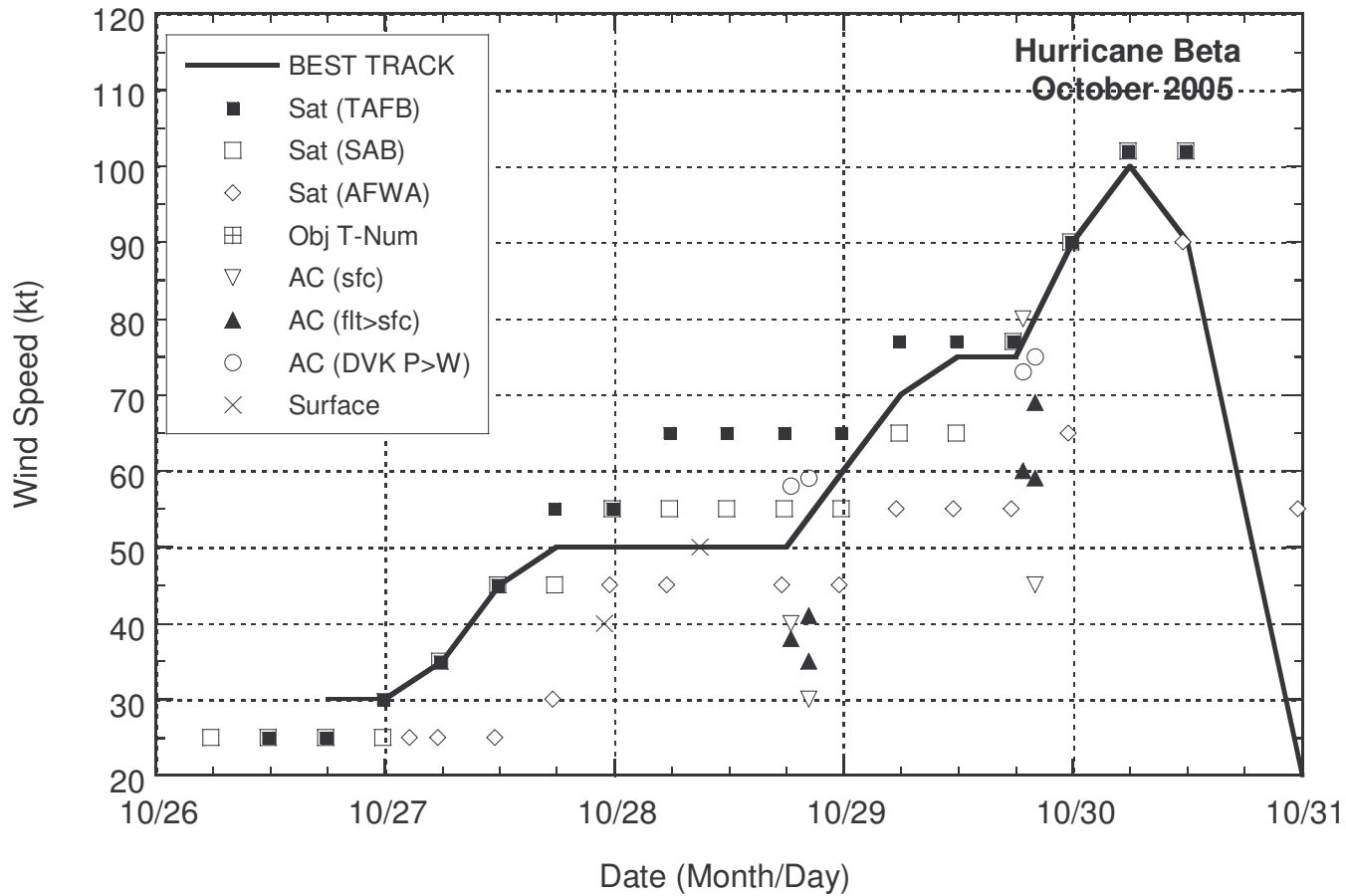


Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Hurricane Beta, 26-31 October 2005. Aircraft observations have been adjusted for elevation using 90% and 80% reduction factors for observations from 700 mb and 850 mb, respectively.

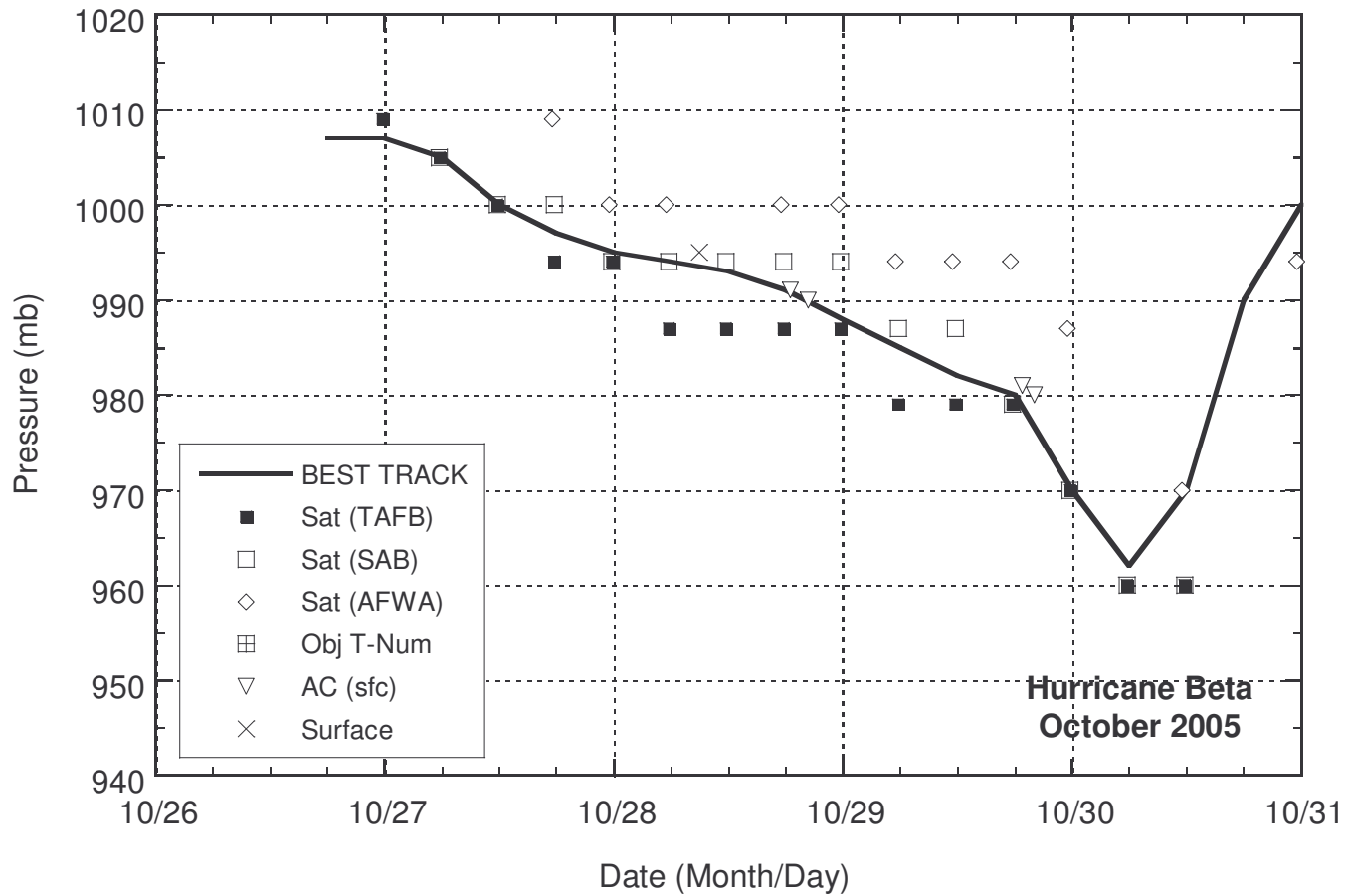


Figure 3. Selected pressure observations and best track minimum central pressure curve for Hurricane Beta, 26-31 October 2005.