

Tropical Cyclone Report  
Hurricane Henriette  
(EP112007)  
30 August – 6 September 2007

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Henriette made two landfalls in Mexico, on the southern Baja California peninsula as a category 1 hurricane (on the Saffir-Simpson Hurricane Scale) and on the mainland Gulf of California coast as a strong tropical storm. In addition, prior to becoming a hurricane, Henriette produced very heavy rains along the Pacific coast of Mexico, especially near Acapulco, as its center passed just offshore. At least nine fatalities are directly attributable to Henriette.

a. Synoptic History

Henriette originated from a tropical wave that departed the west coast of Africa on 20 August and moved uneventfully across the tropical Atlantic. The wave produced some convection in the Caribbean Sea but reached Central America on 28 August before any significant development could occur. By 29 August the wave had moved westward into the eastern North Pacific basin, producing disorganized showers and thunderstorms, and late that day a small area of low pressure developed in association with the wave about 350 n mi southeast of Acapulco, Mexico. Convection with the low improved in organization early on 30 August, and by 0600 UTC that day the system became a tropical depression about 315 n mi southeast of Acapulco. 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 cyclone initially headed toward the west-northwest around a subtropical ridge that was centered over the western Gulf of Mexico. It gained organization and became a tropical storm by 1200 UTC 31 August, centered about 75 n mi south of Acapulco. During the next 36 h, Henriette slowly strengthened and continued west-northwestward and parallel to the Pacific coast of Mexico, with its center passing roughly 40-50 n mi offshore. Despite not making landfall during this period, the storm brought heavy rainfall to portions of the coast, especially near Acapulco.

Henriette turned westward and away from the Pacific coast of Mexico late on 1 September as the subtropical ridge built westward over northern Mexico. By 0600 UTC the next day, Henriette had reached an intensity of 55 kt while centered about 95 n mi southwest of Manzanillo, Mexico. The storm remained just shy of hurricane strength for the next two days as it headed generally northwestward, passing about 175 n mi west of Cabo Corrientes on the

Pacific coast of Mexico. At about 0600 UTC 4 September, Henriette reached hurricane status as it turned north-northwestward toward the Baja California peninsula, ahead of a mid-latitude trough approaching the west coast of the United States. The hurricane reached its peak intensity of 75 kt at 1200 UTC that day while centered about 75 n mi south-southeast of Cabo San Lucas, Mexico. Henriette made landfall just east of Cabo San Lucas, near San Jose del Cabo, at about 2100 UTC 4 September with maximum winds near 70 kt. Continuing north-northwestward, Henriette emerged over the Gulf of California early on 5 September. The brief interaction with land caused a slight weakening, but Henriette remained a category 1 hurricane for most of that day. Very late on 5 September, however, Henriette began to weaken. It made its final landfall along the Gulf of California coast of mainland Mexico, near Guaymas, at about 0000 UTC 6 September with an estimated intensity of 60 kt. Henriette deteriorated quickly over land and dissipated over the mountains of northwestern Mexico shortly after 0600 UTC that day.

b. Meteorological Statistics

Observations in Henriette (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), as well as flight-level and Stepped-Frequency Microwave Radiometer (SFMR) observations from one flight of the 53<sup>rd</sup> Weather Reconnaissance Squadron of the U. S. Air Force Reserve 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 Henriette.

The Air Force aircraft made two center “fixes” during the single reconnaissance mission into Henriette on 3 September. The central pressure on the last fix was 981 mb (a central pressure typically associated with hurricane intensity), but maximum flight-level winds at 850 mb during the mission were 71 kt, and the maximum surface wind speed estimate from the SFMR was 58 kt. These data support the best track intensity of 60 kt, just shy of hurricane status, at 1800 UTC 3 September. Geostationary satellite imagery suggests that Henriette slowly gained organization during the following several hours and became a hurricane early the next day. The peak intensity of 75 kt at 1200 UTC 4 September is based on subjective Dvorak intensity estimates. The best track intensity estimates at both Mexico landfalls are a little less than the nearest Dvorak estimates, since the satellite appearance of Henriette was gradually deteriorating during the last 36 hours or so of the cyclone’s existence.

No ship reported winds of tropical storm force in association with Henriette. A sustained wind of 66 kt and a gust to 102 kt were reported at Ciudad Obregon in the Mexican state of Sonora, at 2100 UTC 5 September (about three hours prior to the final landfall of Henriette at an estimated intensity of 60 kt). This station is situated several miles inland at an elevation of about 50 m above sea level, and was about 50 n mi east of the center of Henriette at the time of this observation; the 66 kt observation appears likely to be an overestimate of a sustained wind at 10 m.

Selected rainfall observations from land stations are given in Table 2. Rainfall totals of 5-9 in were common in the states of Oaxaca and Guerrero while the center of Henriette passed just offshore during 30 August - 1 September. Similar amounts fell over the southern Baja California peninsula and in the state of Sonora during 4-6 September.

c. Casualty and Damage Statistics

Media reports indicate at least nine fatalities in Mexico are directly attributable to Henriette. Six of these deaths occurred near Acapulco due to mud slides induced by heavy rains while the center of Henriette passed just offshore, two fishermen perished near the coast of Sonora in the region where Henriette made its final landfall, and one person died in the surf along the southern Baja California peninsula. Four other persons were reported missing at sea on 6 September in association with Henriette. Media reports also indicate that Henriette caused about \$25 million (U. S. dollar equivalent) in damages in the Mexican state of Sonora.

d. Forecast and Warning Critique

The genesis of Henriette was not anticipated very well in NHC Tropical Weather Outlooks. The incipient system was first mentioned only about 31 hours before it became a tropical depression, and the potential for the formation of a depression was explicitly stated beginning only about 13 hours prior to genesis.

A verification of official and guidance model track forecasts is given in Table 3. Average official track errors for Henriette were 33, 58, 80, 101, 126, 172, and 196 n mi for the 12, 24, 36, 48, 72, 96, and 120 h forecasts, respectively. The number of forecasts ranged from 25 at 12 h to 7 at 120 h. The errors out to 48 h are comparable to the average long-term official track errors, while errors at 72-120 h are a bit smaller than the long-term averages (Table 3). The official track forecasts on average outperformed most of the individual models, with the exceptions being the EMXI (interpolated ECMWF global model) beyond 24 h, and the GFDI and GFNI (interpolated GFDL and GFDN) models at 96 and 120 h. The official forecasts generally exhibited a west bias for the latter portion of Henriette's track (although not as much as several of the dynamical models), after the storm turned to the north on 4 September and strengthened into a hurricane. The GFDL and GFDN did not have nearly as much of a west bias, especially at 96 and 120 h. The ECMWF global model performed exceptionally well with Henriette, having smaller average errors than any individual or consensus model beyond 24 h (and by a wide margin at 3-5 days).

Average official and guidance model intensity forecast errors (Table 4) were 6, 7, 11, 9, 7, 9, and 8 kt for the 12, 24, 36, 48, 72, 96, and 120 h forecasts, respectively. These errors are generally much less than the average long-term official intensity errors (Table 4). The official intensity forecast errors were less than for all of the available guidance, except for the FSSE at 24-48 h. The official forecasts were biased somewhat high since they called for Henriette to strengthen more rapidly and reach hurricane strength sooner than it did. This bias was in part due to attention paid to the SHIPS model that forecast significant strengthening to a major

hurricane. The GFDL model (using the GHMI interpolation) struggled early on, forecasting Henriette to remain a tropical storm or even dissipate in less than five days. Later GFDL intensity forecasts were much better and in many cases were more accurate than the official forecast.

Coastal watches and warnings issued for Henriette by the Government of Mexico are listed in Table 5.

Table 1. Best track for Hurricane Henriette, 30 August – 6 September 2007.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
30 / 0600	13.1	95.9	1008	25	tropical depression
30 / 1200	13.6	96.5	1007	30	"
30 / 1800	14.1	97.2	1006	30	"
31 / 0000	14.6	98.0	1006	30	"
31 / 0600	15.1	98.8	1004	30	"
31 / 1200	15.7	99.6	1002	35	tropical storm
31 / 1800	16.3	100.6	1000	40	"
01 / 0000	16.8	101.6	997	45	"
01 / 0600	17.2	102.8	997	45	"
01 / 1200	17.6	103.9	997	45	"
01 / 1800	17.9	104.7	996	50	"
02 / 0000	18.0	105.3	995	50	"
02 / 0600	18.1	105.8	994	55	"
02 / 1200	18.3	106.2	994	55	"
02 / 1800	18.5	106.5	994	55	"
03 / 0000	18.7	106.8	993	55	"
03 / 0600	19.0	107.3	991	55	"
03 / 1200	19.4	107.9	988	60	"
03 / 1800	19.8	108.4	983	60	"
04 / 0000	20.3	108.7	978	60	"
04 / 0600	20.9	109.0	975	65	hurricane
04 / 1200	21.7	109.3	972	75	"
04 / 1800	22.6	109.6	972	70	"
05 / 0000	23.6	109.8	975	65	"
05 / 0600	24.6	110.1	980	65	"
05 / 1200	25.6	110.4	983	65	"
05 / 1800	26.6	110.7	986	65	"
06 / 0000	27.9	110.9	990	60	tropical storm
06 / 0600	29.5	110.5	1002	30	tropical depression
06 / 1200					dissipated
04 / 1200	21.7	109.3	972	75	minimum pressure and maximum wind
04 / 2100	23.1	109.6	973	70	landfall near San Jose del Cabo, Mexico
06 / 0000	27.9	110.9	990	60	landfall near Guaymas, Mexico

Table 2. Selected storm-total rainfall observations for Hurricane Henriette, 30 August – 6 September 2007.

Location	Total rain (in)
<b>Mexico, State of Oaxaca</b>	
Cerro de Oro	8.74
Dique Pescaditos	5.32
Papaloapan	3.91
<b>Mexico, State of Guerrero</b>	
Acapulco (76805)	8.41
Cumbres de Figueroa	9.69
La Garita (Tunel Alto)	8.65
La Mira	7.20
Costa Azul	8.54
La Cruz (Brisas)	9.13
Cumbres del Llano Grande	8.46
Lazaro Cardenas (MMLC)	7.95
Col Simon Bolivar	7.63
Aeropuerto Acapulco (MMAA)	7.09
<b>Mexico, State of Baja California Sur</b>	
Los Planes	9.02
El Sargento	6.11
La Ribera	4.83
La Paz	2.84
Loreto (76305, MMLT)	3.25
<b>Mexico, State of Sonora</b>	
Presa a. R. Cortinez	4.76
San Bernardo	3.43
Tesocoma	6.30

Location	Total rain (in)
Basconcobe	7.17
Etchojoa	7.76
Huatabampo	5.55
Jupare	6.54
Lindero	7.72
Mumuncuera	5.16
Nachuquis	6.10
Navojoa	3.98
Sinahuiza	6.50
Tesia	4.44
Cocoraque	6.89
P. Ignacio R. a la Torre	4.17
San Ignacio	7.52
San Pedro	4.65
C. 200 y Canal Bajo	4.33
C. 600 y Canal Bajo	5.30
C. 1200 y Canal Bajo	7.26
Ciudad Obregon	6.61
Casa del Ciano	5.67
Km. 25 de Canal Alto	4.27
Km. 39 de Canal Alto	7.64
Km. 58 de Canal Alto	6.06
Km. 68 de Canal Alto	4.49
Km. 79 de Canal Alto	6.18
Km. 91 de Canal Alto	5.59
Km. 108 de Canal Alto	3.74
Porfirio Diaz	3.35
Vicam	3.93
Villa Juarez	9.13
Veranito	4.45
Empalme (76256)	5.62

Location	Total rain (in)
Km 20	7.76
Sebampo	5.43
Nainari	5.04
<b>Mexico, State of Sinaloa</b>	
Presa Josefa Ortiz de Dominguez	3.63
Presa Miguel Hidalgo	3.35



Table 3. Preliminary track forecast evaluation (heterogeneous sample) for Hurricane Henriette, 30 August – 6 September 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	48 (27)	87 (25)	134 (23)	177 (21)	213 (17)	226 (13)	242 ( 9)
GFNI	37 (23)	63 (21)	86 (19)	103 (17)	127 (13)	<b>164 ( 9)</b>	<b>156 ( 4)</b>
GFDI	37 (27)	59 (24)	88 (22)	106 (19)	148 (14)	<b>164 (10)</b>	<b>184 ( 6)</b>
HWFI	55 (27)	94 (25)	131 (23)	157 (19)	246 (14)	352 (10)	565 ( 6)
GFSI	51 (27)	84 (25)	119 (23)	136 (19)	188 (14)	246 (10)	252 ( 6)
AEMI	50 (27)	84 (23)	121 (21)	159 (18)	220 (14)	316 (10)	442 ( 5)
NGPI	47 (27)	77 (25)	105 (23)	138 (21)	193 (16)	262 (11)	338 ( 7)
UKMI	47 (22)	82 (21)	108 (19)	135 (17)	224 (11)	444 ( 5)	
EMXI	42 (27)	59 (25)	<b>71 (23)</b>	<b>77 (21)</b>	<b>79 (17)</b>	<b>85 (13)</b>	<b>120 (9)</b>
BAMD	41 (27)	70 (25)	92 (23)	109 (21)	131 (17)	174 (13)	231 ( 9)
BAMM	43 (27)	74 (25)	104 (23)	134 (21)	184 (17)	238 (13)	250 ( 9)
BAMS	42 (26)	75 (24)	109 (22)	149 (20)	219 (16)	275 (12)	296 ( 8)
CONU	38 (27)	61 (25)	81 (23)	105 (21)	<b>120 (16)</b>	<b>167 (12)</b>	<b>164 ( 8)</b>
GUNA	36 (22)	<b>57 (20)</b>	<b>79 (18)</b>	104 (15)	156 (10)	238 ( 5)	
FSSE	34 (21)	58 (19)	<b>72 (17)</b>	<b>90 (15)</b>	146 (12)	218 ( 8)	247 ( 4)
OFCL	33 (25)	58 (23)	80 (21)	101 (19)	126 (15)	172 (11)	196 ( 7)
NHC Official (2002-2006 mean)	33 (1349)	57 (1192)	79 (1039)	99 (897)	140 (655)	188 (465)	233 (311)

Table 4. Preliminary intensity forecast evaluation (heterogeneous sample) for Hurricane Henriette, 30 August – 6 September 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	5.6 (27)	<b>7.0 (25)</b>	<b>8.3 (23)</b>	9.3 (21)	7.1 (17)	9.5 (13)	11.2 (9)
GHMI	6.6 (27)	10.3 (24)	12.9 (22)	13.2 (19)	14.5 (14)	14.3 (10)	17.0 (6)
HWFI	9.0 (27)	12.7 (25)	13.8 (23)	14.8 (19)	17.6 (14)	23.1 (10)	40.0 (6)
SHIP	8.1 (27)	13.6 (25)	18.9 (23)	21.8 (21)	26.8 (17)	25.2 (13)	17.1 (9)
DSHP	6.6 (27)	11.6 (25)	17.0 (23)	21.8 (21)	24.5 (17)	24.5 (13)	16.0 (9)
FSSE	6.2 (21)	<b>6.5 (19)</b>	<b>8.8 (17)</b>	<b>7.5 (15)</b>	9.1 (12)	13.5 (8)	21.5 (4)
ICON	6.6 (27)	9.9 (25)	11.0 (23)	10.9 (20)	8.5 (15)	11.4 (11)	15.3 (7)
OFCL	5.6 (25)	7.2 (23)	10.5 (21)	8.7 (19)	6.7 (15)	8.6 (11)	7.9 (7)
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 5. Watch and warning summary for Hurricane Henriette, 30 August – 6 Sep. 2007.

Date/Time (UTC)	Action	Location
30 / 2100	Tropical Storm Watch issued	Acapulco to Zihuatanejo
30 / 2100	Tropical Storm Warning issued	Lagunas de Chacahua to Acapulco
31 / 0300	Tropical Storm Watch discontinued	Acapulco to Zihuatanejo
31 / 0300	Tropical Storm Watch issued	Tecpan de Galeana to Manzanillo
31 / 0300	Tropical Storm Warning modified to	Lagunas de Chacahua to Tecpan de Galeana
31 / 0900	Tropical Storm Watch modified to	Punta San Telmo to Manzanillo
31 / 0900	Tropical Storm Warning modified to	Lagunas de Chacahua to Punta San Telmo
31 / 1500	Tropical Storm Watch modified to	Manzanillo to Cabo Corrientes
31 / 1500	Tropical Storm Warning modified to	Lagunas de Chacahua to Manzanillo
31 / 2100	Tropical Storm Watch changed to Hurricane Watch	Manzanillo to Cabo Corrientes
1 / 0600	Tropical Storm Warning discontinued	Lagunas de Chacahua to Manzanillo
1 / 0600	Tropical Storm Warning issued	Acapulco to Cabo Corrientes
1 / 1500	Tropical Storm Warning modified to	Punta San Telmo to Cabo Corrientes
1 / 1500	Hurricane Watch discontinued	All
2 / 0300	Tropical Storm Warning discontinued	All
3 / 0300	Hurricane Watch issued	La Paz to Santa Fe
3 / 1500	Hurricane Watch changed to Hurricane Warning	La Paz to Santa Fe
3 / 1500	Hurricane Watch issued	Loreto to La Paz
3 / 1500	Hurricane Watch issued	Puerto San Andresito to Santa Fe
4 / 0900	Tropical Storm Warning issued	Puerto San Andresito to Bahia Magdalena
4 / 0900	Hurricane Watch modified to	Loreto to Mulege
4 / 0900	Hurricane Watch modified to	Puerto San Andresito to Bahia Magdalena
4 / 0900	Hurricane Watch issued	Altata to Guaymas
4 / 0900	Hurricane Warning discontinued	La Paz to Santa Fe

4 / 0900	Hurricane Warning issued	Loreto to Bahia Magdalena
4 / 1500	Tropical Storm Warning issued	Loreto to Mulege
4 / 1500	Tropical Storm Warning issued	Altata to Bahia Kino
4 / 1500	Hurricane Watch modified to	Altata to Bahia Kino
5 / 0300	Tropical Storm Warning discontinued	Puerto San Andresito to Bahia Magdalena
5 / 0300	Tropical Storm Warning modified to	Altata to Topolobampo
5 / 0300	Hurricane Watch discontinued	Puerto San Andresito to Bahia Magdalena
5 / 0300	Hurricane Watch modified to	Altata to Topolobampo
5 / 0300	Hurricane Warning issued	Topolobampo to Bahia Kino
5 / 0900	Hurricane Warning modified to	Loreto to La Paz
5 / 1500	Tropical Storm Warning modified to	La Paz to Mulege
5 / 1500	Hurricane Watch discontinued	Loreto to Mulege
5 / 1500	Hurricane Warning discontinued	Loreto to La Paz
5 / 1800	Tropical Storm Warning modified to	San Evaristo to Mulege
6 / 0300	Tropical Storm Warning discontinued	All
6 / 0300	Hurricane Watch discontinued	All
6 / 0300	Hurricane Warning discontinued	All

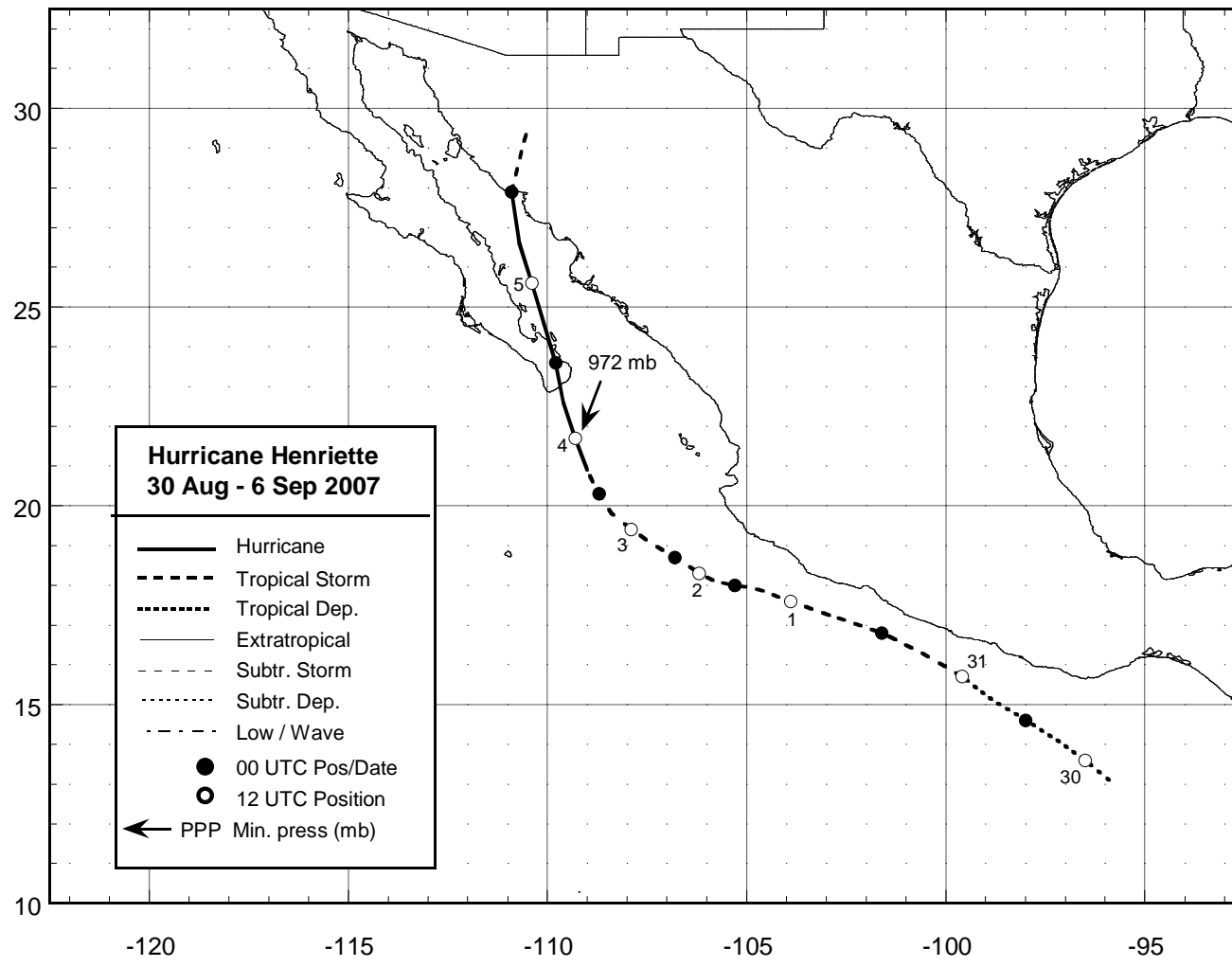


Figure 1. Best track positions for Hurricane Henriette, 30 August – 6 September 2007.

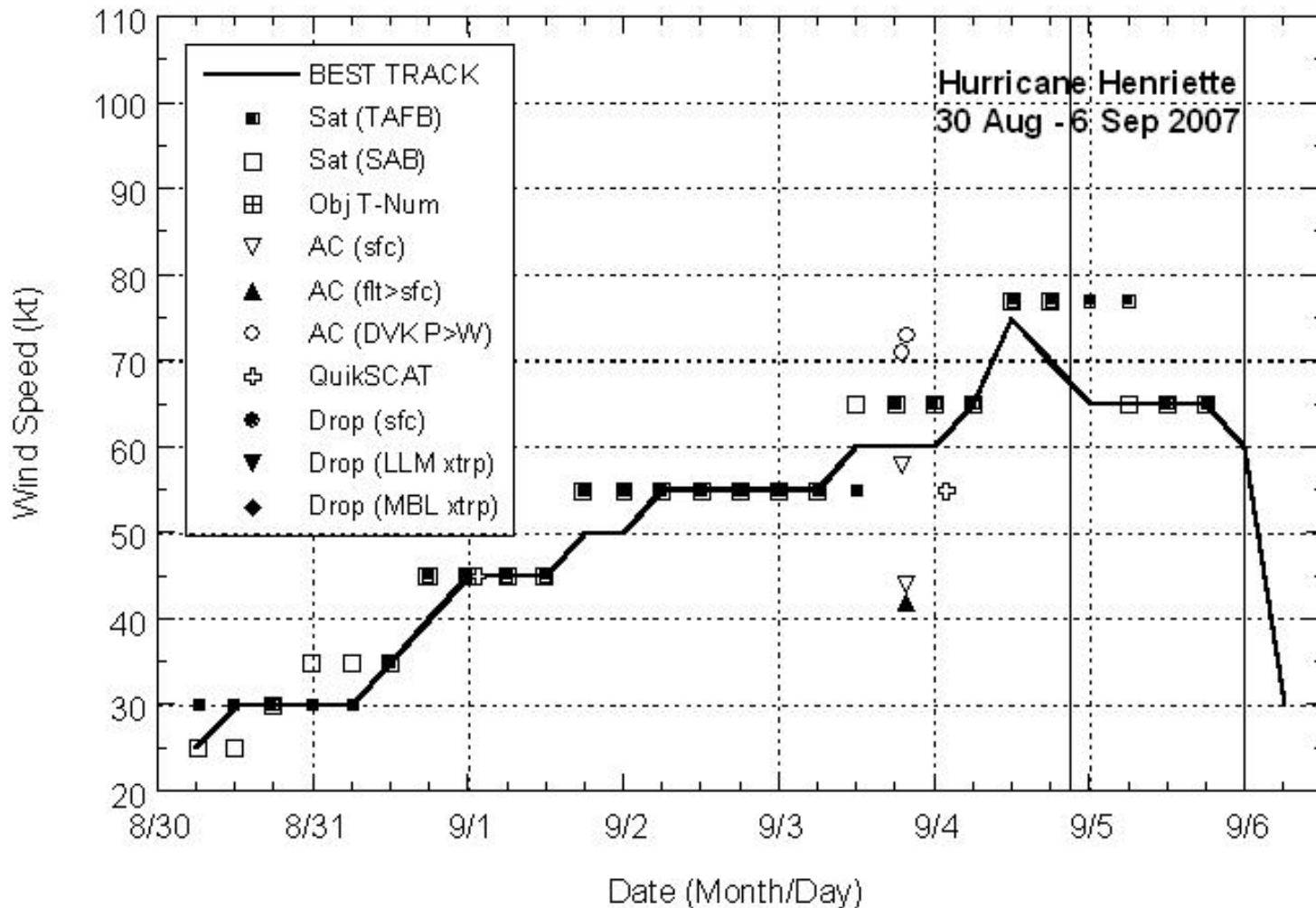


Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Hurricane Henriette, 30 August – 6 September 2007. Flight-level aircraft observations at 850 mb have been adjusted for altitude using an 80% reduction factor. Solid vertical lines indicate the times of landfall of the center.

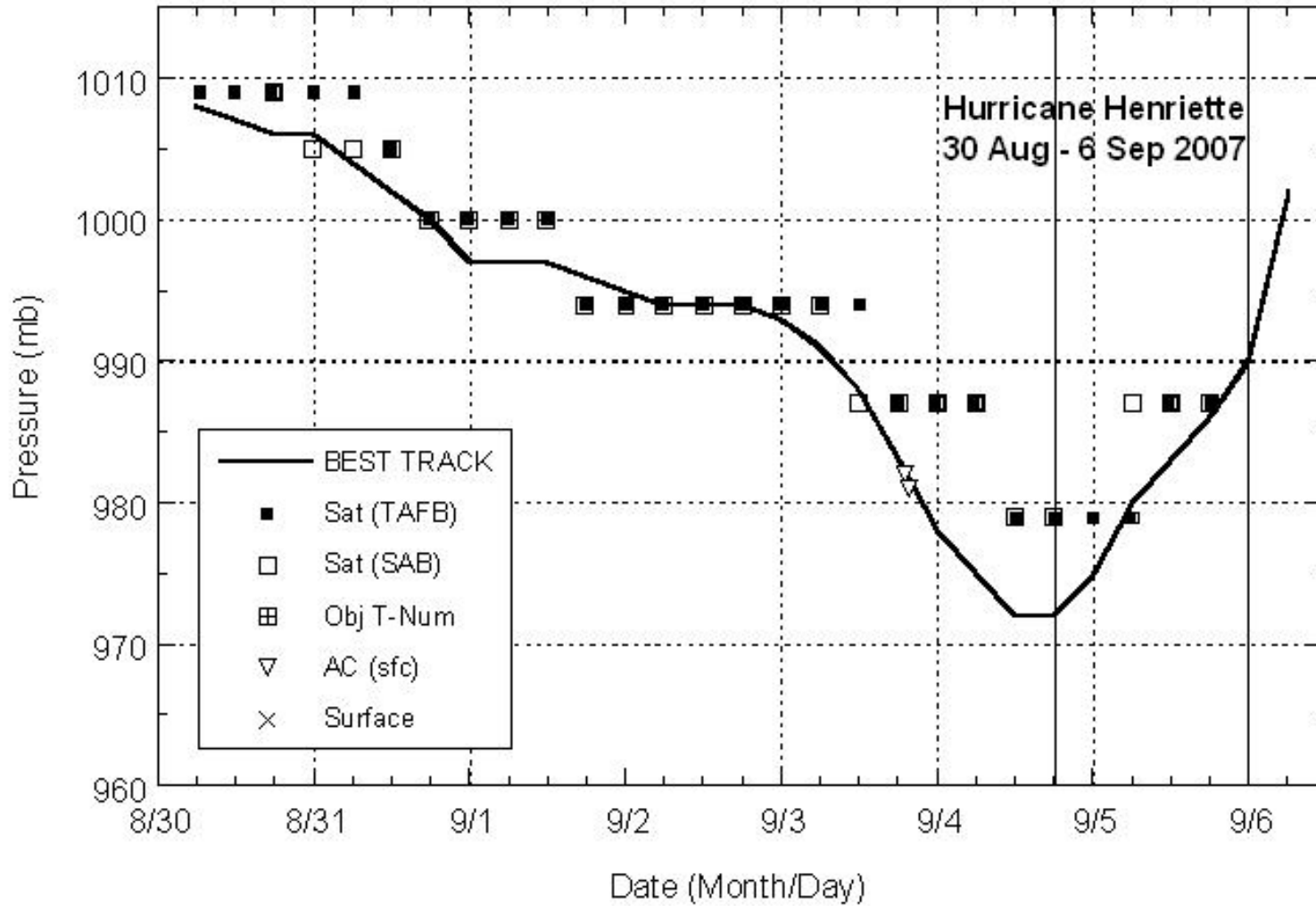


Figure 3. Selected pressure observations and best track minimum central pressure curve for Hurricane Henriette, 30 August – 6 September 2007.