

Tropical Cyclone Report
Tropical Storm Odette
4-7 December 2003

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Odette was a rare December tropical storm that made landfall in the Dominican Republic and was responsible for eight deaths. It was the first December tropical storm on record to form in the Caribbean Sea.

a. Synoptic History

As the 2003 Atlantic hurricane season came to a nominal close on 30 November, a stationary front extended across eastern Cuba southwestward into the southwestern Caribbean Sea. An area of low pressure developed in the frontal zone on 1 December just north of Panama, where it remained nearly stationary for a couple of days while the front gradually retreated northward and separated from the surface low. During this time, convection increased and became organized, and by 3 December, a distinct mid-level circulation had developed about 120 n mi north of the surface center. A weak tropical wave moved into the area and this event coincided with an increase in the overall organization of the system early on 4 December. A tropical depression formed at 1200 UTC that day about 300 n mi south of Kingston, Jamaica.

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 strengthened and became a tropical storm at 1800 UTC 4 December about 285 n mi south-southeast of Kingston. Moving east-northeastward, Odette continued to strengthen despite moderate southwesterly shear, and late in the day microwave imagery indicated a formative eyewall. By 1200 UTC the next day, when the first reconnaissance aircraft reached the system, the convective structure was deteriorating and the central pressure was rising. Odette turned north-northeastward with increased forward speed, and strengthened slightly on 6 December, reaching its peak intensity of 55 kt at 0600 UTC. During the day the forward speed of the system slowed again although the convection continued to advance northeastward at a more rapid rate; this lack of organization vertically was typical of Odette throughout its lifetime. Odette weakened slightly by the time it made landfall near Cabo Falso on the Barahona peninsula of the Dominican Republic around 2300 UTC 6 December.

The circulation center became disrupted during its overnight passage across the Dominican Republic, but tropical storm force winds were maintained in the convection east of the center. Odette accelerated northeastward in advance of an approaching cold front, and became extratropical when the low became embedded in the frontal zone near 1800 UTC 7 December. Odette’s extratropical remnant raced northeastward with a distinct circulation for another two days within the frontal zone before dissipating after 1800 UTC 9 December.

b. Meteorological Statistics

Observations in Odette (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. On several occasions dropwindsondes released at the flight-level center of circulation encountered relatively strong winds at the surface; consequently, the best track pressure curve does not precisely follow the aircraft data plotted in Fig. 3.

As noted above, microwave imagery indicated a formative eyewall late on 4 December, but that this feature had weakened by the time the first reconnaissance aircraft reached the cyclone. Scatterometer data are also suggestive that Odette may have been stronger than indicated in the best track on 4 December, but the data were not consistent from pass to pass and have been largely discounted.

Ship reports of winds of tropical storm force associated with Odette are given in Table 2, and selected surface observations are given in Table 3. There was one report of over 9 inches of rain in the Dominican Republic.

c. Casualty and Damage Statistics

The government of the Dominican Republic attributes 8 deaths and 14 injuries directly to Odette, with most of these from mud slides or flash floods. There were also 2 indirect deaths (due to heart attacks) associated with the cyclone. Press reports indicate that Odette downed trees and power lines, and damaged buildings, bridges, and large areas of agricultural land. Approximately 35% of the banana crop was destroyed. Media reports indicate little apparent impact from the storm in Haiti.

d. Forecast and Warning Critique

Average official track errors (with the number of cases in parentheses) for Odette were 62 (11), 128 (9), 233 (7), 506 (5), and 1162 (1) n mi for the 12, 24, 36, 48, and 72 h forecasts, respectively¹. These errors are significantly greater than the average official track errors for the 10-yr period 1993-2002 (45, 81, 116, 150, and 225 n mi, respectively). Official track forecasts were also less accurate than virtually all of the objective forecast guidance (Table 4). The initial forecast for Odette followed the GFDL model, which greatly over-forecast both the strength and the northeastward acceleration of the system. Subsequent official forecasts pulled back on the

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.

acceleration, but in general the forward speed of the cyclone from model guidance was too fast. It appears as though Odette did not fully respond to the strong southwesterly flow aloft, and this may have been related to the poor vertical continuity of Odette's circulation.

Average official intensity errors were 5, 9, 12, 10, and 0 kt for the 12, 24, 36, 48, and 72 h forecasts, respectively. For comparison, the average official intensity errors over the 10-yr period 1993-2002 are 6, 10, 13, 15, and 19 kt, respectively.

Table 4 lists the watches and warnings associated with Odette.

Table 1. Best track for Tropical Storm Odette, 4-7 December 2003.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
04 / 1200	12.9	76.2	1005	30	tropical depression
04 / 1800	13.3	75.7	1003	35	tropical storm
05 / 0000	13.7	75.2	1000	45	"
05 / 0600	13.9	74.8	993	50	"
05 / 1200	14.1	74.4	993	50	"
05 / 1800	14.3	73.8	995	50	"
06 / 0000	15.0	73.0	995	50	"
06 / 0600	15.9	72.5	995	55	"
06 / 1200	16.6	72.2	995	55	"
06 / 1800	17.2	72.0	994	55	"
07 / 0000	17.9	71.4	997	45	"
07 / 0600	18.9	70.6	1000	40	"
07 / 1200	20.5	69.5	1003	40	"
07 / 1800	22.4	68.1	1002	45	extratropical
08 / 0000	23.5	65.9	1002	45	"
08 / 0600	24.4	63.7	1004	45	"
08 / 1200	25.4	61.6	1005	40	"
08 / 1800	26.3	59.5	1005	40	"
09 / 0000	27.4	57.1	1005	40	"
09 / 0600	28.9	54.2	1006	40	"
09 / 1200	30.4	51.1	1006	40	"
09 / 1800	31.9	47.7	1006	40	"
10 / 0000					absorbed in frontal zone
06 / 2300	17.8	71.5	995	50	landfall near Cabo Falso, Dominican Republic
06 / 0600	15.9	72.5	995	55	maximum wind
05 / 0600	13.9	74.8	993	50	minimum pressure

Table 2. Selected ship reports with winds of at least 34 kt for Tropical Storm Odette, 4-7 December 2003.

Date/Time (UTC)	Ship call sign	Latitude (°N)	Longitude (°W)	Wind dir/speed (kt)	Pressure (mb)
05 / 1200	C6FU9	11.8	73.9	210/37	1008.0
06 / 0600	MZRS8	14.5	68.5	130/36	1006.5
06 / 1200	MZRS8	15.7	67.3	130/38	1009.0
08 / 1200	UCAB	23.6	61.3	260/35	1009.3

Table 3. Selected surface observations for Tropical Storm Odette, 4-7 December 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)	Sustained (kt)	Gust (kt)			
Dominican Republic								
Santo Domingo			6/23009		50			
Isla Saona								9.07
Higüey								8.54
Valle Nuevo								5.55
Moca								5.17
Hata Mayor								4.65

Table 4. Preliminary forecast evaluation (heterogeneous sample) for Tropical Storm Odette, 4-7 December 2003. 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, but does not include the extratropical stage.

Forecast Technique	Forecast Period (h)						
	12	24	36	48	72	96	120
CLP5	57 (11)	77 (9)	112 (7)	128 (5)	311 (1)		
GFNI	57 (7)	58 (5)	50 (3)	76 (1)			
GFDI	44 (10)	114 (8)	188 (6)	314 (4)	1150 (1)		
LBAR	54 (11)	124 (9)	200 (7)	330 (5)	641 (1)		
AVNI	70 (9)	142 (7)	185 (5)	202 (3)			
AEMI	59 (7)	106 (5)	194 (4)	182 (2)			
BAMD	64 (11)	137 (9)	215 (7)	359 (5)	946 (1)		
BAMM	52 (11)	100 (9)	146 (7)	185 (5)	507 (1)		
BAMS	83 (11)	129 (9)	160 (7)	158 (5)	70 (1)		
NGPI	66 (9)	113 (7)	115 (5)	181 (3)	376 (1)		
UKMI	47 (10)	80 (8)	104 (6)	121 (4)			
A98E	57 (11)	77 (9)	122 (7)	154 (5)	242 (1)		
A9UK	49 (6)	81 (5)	130 (4)	181 (3)	318 (1)		
GUNS	45 (8)	81 (6)	98 (4)	156 (2)			
GUNA	48 (8)	93 (6)	117 (4)	151 (2)			
OFCL	62 (11)	128 (9)	233 (7)	506 (5)	1162 (1)		
NHC Official (1993-2002 mean)	45 (2985)	81 (2726)	116 (2481)	150 (2230)	225 (1819)		

Table 4. Watch and warning summary for Tropical Storm Odette, 4-7 December 2003.

Date/Time (UTC)	Action	Location
4 / 1500	Tropical Storm Watch issued	Santo Domingo to Haiti/DR Border
4 / 1500	Tropical Storm Watch issued	Turks and Caicos Is to Southeastern Bahamas
4 / 1500	Tropical Storm Warning issued	Haiti
4 / 1800	Tropical Storm Watch issued	Jamaica
4 / 2100	Tropical Storm Watch changed to Tropical Storm Warning	Jamaica
5 / 0300	Tropical Storm Watch changed to Tropical Storm Warning	Santo Domingo to Haiti/DR Border
5 / 1500	Tropical Storm Warning modified	Isla Saona to Haiti/DR Border
5 / 2100	Tropical Storm Warning discontinued	Jamaica
7 / 0900	Tropical Storm Watch discontinued	All
7 / 0900	Tropical Storm Warning discontinued	Haiti
7 / 1200	Tropical Storm Warning discontinued	All

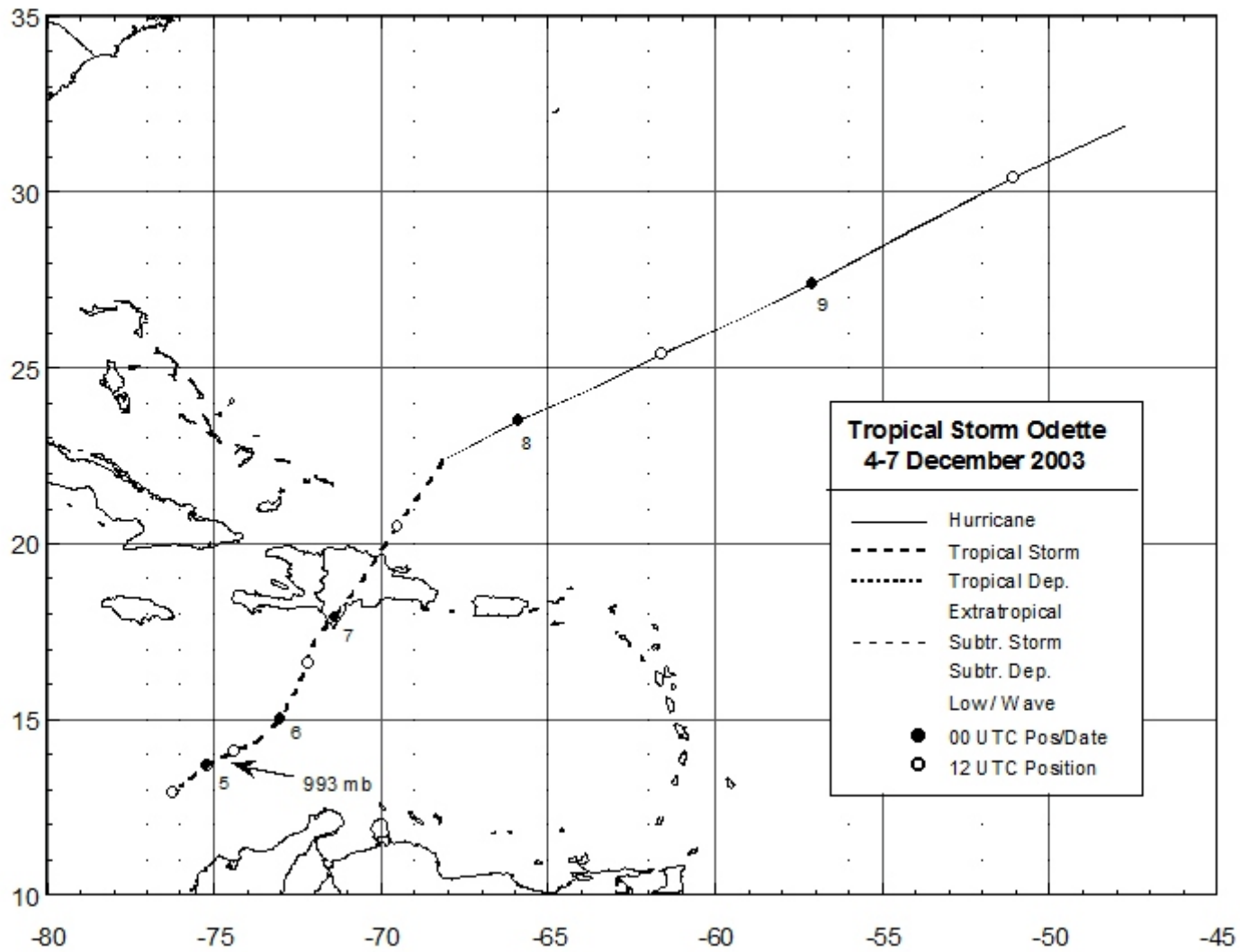


Figure 1. Best track positions for Tropical Storm Odette, 4-7 December 2003.

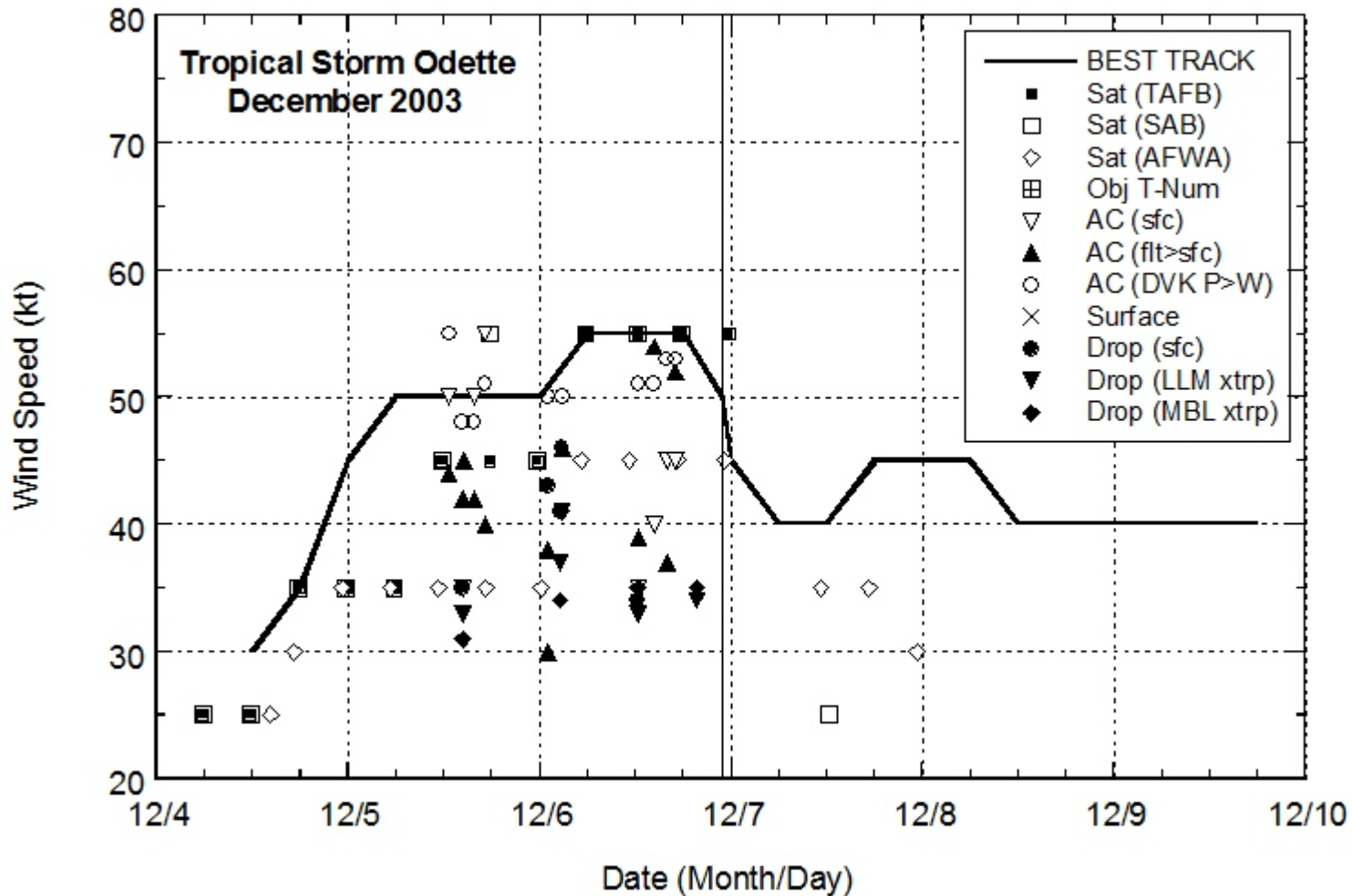


Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Tropical Storm Odette, 4-7 December 2003. Aircraft observations have been adjusted for elevation using 90%, 80%, and 80% reduction factors for observations from 700 mb, 850 mb, and 1500 ft, respectively. 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). Landfall in the Dominican Republic is indicated by the thin vertical line.

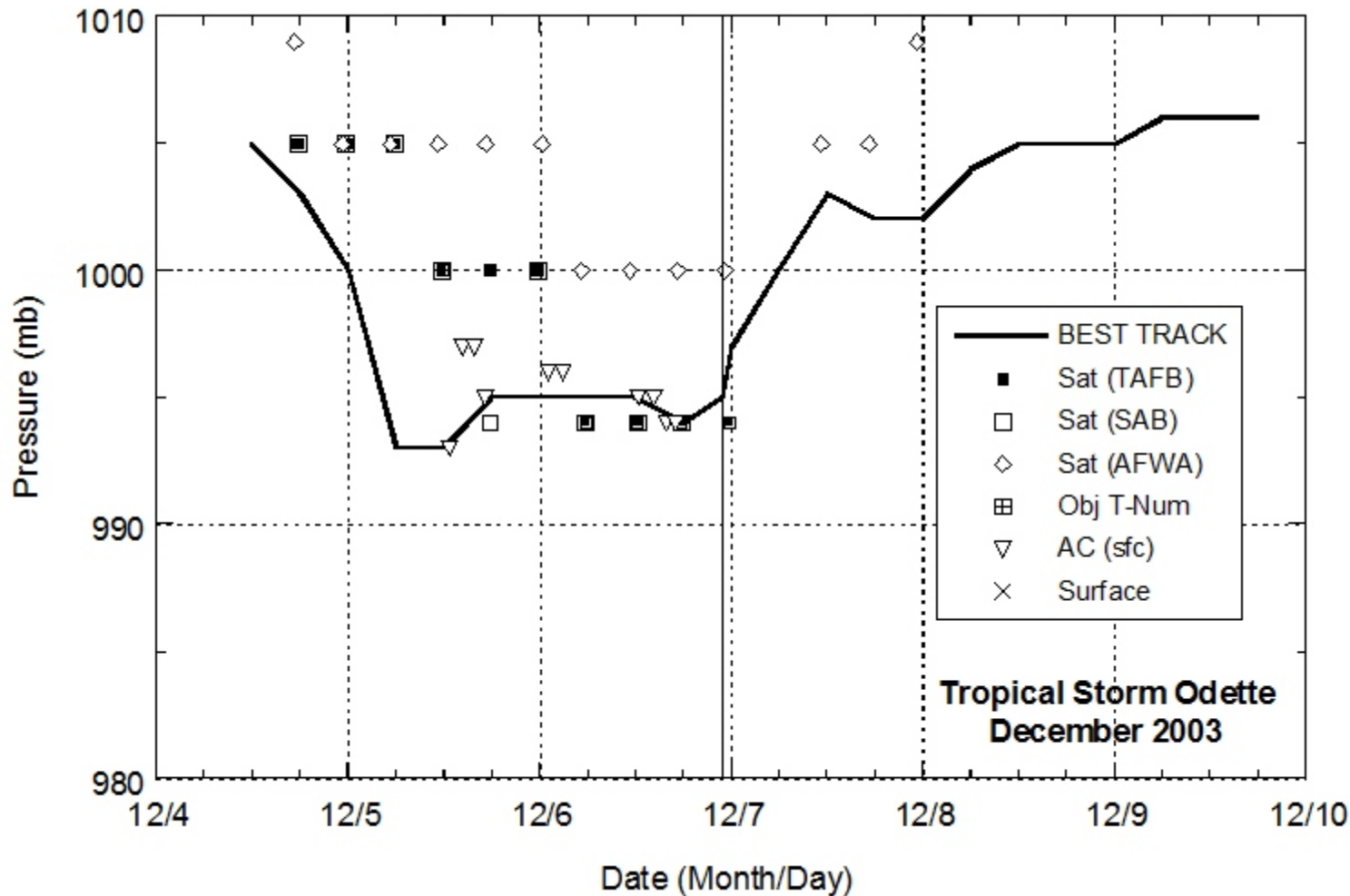


Figure 3. Selected pressure observations and best track minimum central pressure curve for Tropical Storm Odette, 4-7 December 2003. Landfall in the Dominican Republic is indicated by the thin vertical line. On several occasions dropwindsondes released at the flight-level center of circulation encountered relatively strong winds at the surface; consequently, the best track pressure curve does not precisely follow the plotted aircraft data.