

Tropical Cyclone Report
Tropical Storm Olga
(AL172007)
11 – 12 December 2007

Michelle Mainelli
National Hurricane Center
24 January 2008

Olga was a short-lived out of season tropical storm that produced torrential rains, flooding, and loss of life across portions of the Dominican Republic, Haiti, and Puerto Rico. Olga's remnants continued across the northwestern Caribbean Sea and into the eastern Gulf of Mexico before being absorbed by a cold front over central Florida.

a. Synoptic History

Olga's genesis resulted from the interaction of an upper-level low with a low-level trough over the central Atlantic Ocean. Early on 6 December, a broad upper-level low developed over the east-central Atlantic along with an associated low-level trough that stretched along 35°W between 20°N and 30°N. These features moved westward, in tandem, at 15-20 kt uneventfully during the next couple of days. Late on 8 December, shower and thunderstorm activity developed in the vicinity of the upper-level low and surface trough. By 10 December, a broad area of surface low pressure formed about 350 n mi east of Puerto Rico, and although thunderstorm activity remained disorganized at that time, the low produced gale force winds to the north of the center. Around 0000 UTC 11 December, satellite imagery and radar data from San Juan, Puerto Rico WSR-88D and surface observations over the Virgin Islands indicated that the system developed a well-defined surface circulation and sufficiently organized convection relatively close to the center for the system to be designated as a subtropical storm about 50 n mi east of San Juan, Puerto Rico. Because the surface low was still associated with a cold low aloft, the system is considered to be subtropical at this time. In addition, the cyclone had radius of maximum winds of about 175 n mi, which is typical of subtropical cyclones. 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.

Under the influence of a low- to mid-level ridge to the north, Olga moved westward along the northern coast of Puerto Rico on 11 December and made landfall along the north central coast of Puerto Rico around 0700 UTC. Later that day, satellite imagery indicated that shower and thunderstorm activity increased near the center, and surface observations along with surface wind data from the Advanced Scatterometer (ASCAT) suggested that the radius of maximum winds had decreased. By 1800 UTC 11 December, Olga became a tropical storm by the time it made landfall just south of Punta Cana in the Dominican Republic with a peak intensity of 50 kt. Despite the mountainous terrain, Olga maintained its peak intensity for about 12 h while moving across eastern Hispaniola, with the strongest winds remaining offshore in the area of deepest convection. Olga finally weakened over central Hispaniola, and by the time the cyclone emerged over the Windward Passage around 1200 UTC 12 December the intensity had decreased to 35 kt. Olga became a tropical depression six hours later and degenerated into a remnant low the next day just north of Jamaica.

The remnant low continued westward across the northwestern Caribbean Sea during the next couple of days. By 15 December, the non-convective low moved northwestward and northward around the western periphery of a low- to mid-level ridge. Later that day and early on 16 December, the remnants of Olga accelerated northeastward over the eastern Gulf of Mexico ahead of an approaching cold front, producing somewhat organized thunderstorm activity. Satellite imagery and radar data from Tampa, Florida suggested that a small circulation crossed the west-central coast of Florida just north of Tampa around 1000 UTC 16 December. During that time, Olga's remnants interacted with an intense squall line that stretched across north central Florida. While post-analysis does not indicate that redevelopment into a tropical cyclone occurred, the remnants of Olga in conjunction with the cold front and pre-frontal squall line produced sustained winds of tropical storm force with gusts to hurricane force in Clearwater Beach, Florida. Within two hours of Olga's remnants reaching the west central coast of Florida, the remnants were absorbed by the cold front.

b. Meteorological Statistics

Observations in Olga (Figs. 2 and 3) include satellite-based Hebert-Poteat and 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) surface observations from one mission of the 53rd 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 Aqua, the NASA QuikSCAT, the Department of Defense WindSat, ASCAT, and Defense Meteorological Satellite Program (DMSP) satellites were also useful in tracking Olga. Conventional land-based surface observations, buoys, and National Weather Service Doppler radar data were helpful in tracking the path of Olga.

The estimated 50 kt peak intensity of Olga while it was making landfall over the Dominican Republic early on 12 December is based on a blend of the surface-adjusted flight-level winds and SFMR data from U.S. Air Force aircraft. Peak flight-level winds measured by the plane were 55 kt, corresponding to 44 kt at the surface. There was an SFMR surface report of 54 kt, but this measurement was determined to be too high due to shoaling along the coast. A couple of SFMR measurements, however, indicated surface winds around 47 kt prior to the aircraft reaching the shallow waters just north of the Dominican Republic.

The primary impact of Olga was the heavy rainfall that affected portions of Puerto Rico and the island of Hispaniola. Maximum rainfall totals across the region ranged from around 11 inches in central Puerto Rico to over 15 inches in the Dominican Republic. Figure 4 shows the rainfall distribution across Puerto Rico. Tropical storm force winds were present north of the center during both the subtropical and tropical stages of Olga. While several ship reports from 11 – 12 December across the Southwestern Atlantic Ocean measured tropical storm force winds, these winds were due to a strong environmental pressure gradient and were not directly associated with the circulation of Olga. Table 2 provides a summary of selected ship observations that reported sustained winds of tropical storm force directly associated with Olga, and Table 3 provides a summary of rainfall totals.

c. Casualty and Damage Statistics

Due primarily to torrential rainfall, mudslides, and flooding of the Yaque River in the Dominican Republic, at least 22 deaths are directly associated with Olga in that country, according to the Dominican Republic Meteorological Office. In addition, 2 deaths in Haiti and 1 death in Puerto Rico were reported in association with Olga. Olga's impact was unusually severe due to the grounds having been previously saturated from the passage of Tropical Storm Noel at the end of October. News reports indicate that almost 12,000 homes were damaged, including 370 that were completely destroyed, which caused more than 60,000 people to be displaced. During the time when Olga's remnants moved rapidly across Florida, a tornado touched down in central Florida in Pasco County causing damage to several buildings including a County Fire Station and the Pasco County Jail.

d. Forecast and Warning Critique

Olga developed outside of the official hurricane season and Tropical Weather Outlook (TWO) statements were not being routinely generated; however, Special Tropical Disturbance Statements (DSA) were issued beginning at 2200 UTC 9 December, about 26 hours prior to genesis. In total, six DSAs were disseminated by NHC prior to the first advisory issuance and all statements indicated that tropical or subtropical cyclone formation could occur.

A verification of NHC official and guidance model track forecasts can be found in Table 4. Since Olga was a short-lived cyclone, very few forecasts verified. The number of forecasts ranged from six at 12 h to two at 36 h. The average official track errors for Olga were 47, 61, and 52 n mi for the 12, 24, and 36 h forecasts, respectively. These errors are close to the average long-term official track errors.

Average NHC official intensity errors were 7, 9, and 5 kt for the 12, 24, and 36 h forecasts, respectively (Table 5). For comparison, the average long-term official intensity errors are 6, 10, and 12 kt, respectively. The official intensity forecast errors were below or near the average long-term errors at each forecast time.

Due to the close proximity of Olga's genesis to Hispaniola, tropical storm warnings and watches were issued in the first advisory early on 11 December. Even though the center of Olga moved across northwestern Puerto Rico, watches and warnings were not necessary for the island as the tropical storm force winds were confined to the north of the center and rainfall was the primary threat. Table 6 provides a summary of the watches and warnings issued in association with Olga.

e. Acknowledgements:

Observations from the Dominican Republic were provided by the Dominican Republic Meteorological Office. Lixion Avila and Daniel Brown from NHC, Roham Abtahi from WFO/SJU, and David Roth from HPC assisted in the compilation of the observation table. Colin

McAdie (NHC) provided access to and analysis of archived WSR-88D radar data from the WFO in Tampa, Florida. Roger Edwards (SPC) and Jiann-Gwo Jiing (NHC) provided valuable insight of the remnants of Olga as it moved across the eastern Gulf of Mexico and across Florida. I would also like to thank my colleagues at NHC for their valuable suggestions to this report.

Table 1. Best track for Tropical Storm Olga, 11-12 December 2007.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
10 / 1200	18.3	61.8	1009	35	low
10 / 1800	18.3	63.2	1008	35	"
11 / 0000	18.4	64.7	1007	35	subtropical storm
11 / 0600	18.5	66.3	1005	40	"
11 / 1200	18.3	67.4	1004	45	"
11 / 1800	18.5	68.4	1003	50	tropical storm
12 / 0000	19.0	70.0	1003	50	"
12 / 0600	19.1	71.9	1005	40	"
12 / 1200	19.1	73.8	1008	35	"
12 / 1800	19.0	75.7	1008	30	tropical depression
13 / 0000	18.9	77.2	1008	30	remnant low
13 / 0600	19.0	78.7	1007	30	"
13 / 1200	19.4	80.1	1007	30	"
13 / 1800	19.6	81.3	1007	30	"
14 / 0000	19.7	82.3	1007	30	"
14 / 0600	19.7	83.3	1007	30	"
14 / 1200	19.6	84.2	1007	30	"
14 / 1800	19.5	85.1	1007	30	"
15 / 0000	20.0	85.8	1006	30	"
15 / 0600	20.6	86.5	1006	30	"
15 / 1200	21.7	87.4	1007	30	"
15 / 1800	23.3	88.2	1007	30	"
16 / 0000	25.0	87.2	1005	30	"
16 / 0600	26.3	85.2	1006	25	"
16 / 1000	28.2	82.7	1003	30	remnant low crossed Florida west coast just north of Tampa
16 / 1200					merged with frontal system
11 / 1800	18.5	68.4	1003	50	minimum pressure
11 / 0700	18.4	66.5	1005	40	landfall north central Puerto Rico just west of Vega Baha
11 / 1800	18.5	68.4	1003	50	landfall just south of Punta Cana, Dominican Republic

Table 2. Selected ship reports with winds of at least 34 kt for Tropical Storm Olga, 11-12 December, 2007.

Date/Time (UTC)	Ship call sign	Latitude (°N)	Longitude (°W)	Wind Dir/speed (kt)	Pressure (mb)
11/0000	PFRO	19.1	67.8	090 / 35	1013.0
11/0300	PBIG	19.9	67.8	030 / 37	1010.0
11/0600	A8EG8	19.2	66.3	040 / 41	1012.3
11/1200	PBIG	19.3	65.9	080 / 45	1008.0
11/1300	PFRO	20.8	68.4	080 / 45	1012.6
11/1500	WBJJ	20.8	66.5	090 / 35	1014.9
11/1900	PFRO	20.3	68.3	070 / 51	1010.5
11/2300	ZCDG8	21.2	68.3	090 / 40	1015.9
12/0000	PINX	19.7	69.0	060 / 51	1014.0
12/0000	C6FV9	20.9	69.0	090 / 36	1016.0

Table 3. Selected surface observations for Tropical Storm Olga, 11-12 December 2007.

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)			
Dominican Republic^e								
Altamira								6.52
Angelina								
Arroyo Barril								3.70
Azua								6.66
Bani								6.73
Barahona								4.87
Bayaguana (78473)	12/0000	1007.6						2.63
Bohechio								2.36
Bonao								7.44
Cabrera								3.37
Catey Airport			11/2300		55			4.65
Constanza								4.94
Cotui								6.94 ^f
Dajabon								2.37
Duverge								4.17
El Cercado								1.95
Elias Pina								0.89
Gaspar Hdez								3.20
Hato Mayor								1.45
Herrera (78484)	11/2300	1006.0						
Higüey								4.25
Jarabacoa								8.92 ^f
Joaquin Balaguer Airport								4.96
Juma Bonao								7.35
La Descubierta								0.98
La Romana	11/2100	1004.7						1.94
La Union (Airport)								7.18
La Vega								6.30
Las Americas (78485)	12/0000	1007.0						3.50

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)			
Las Matas de Cruz								2.38 ^f
Limon del Yuna								4.78
Loma Cabrera								1.50
Los Llanos								0.99
Luperon								3.12
Mao								2.38
Miches								1.20
Moca								8.32
Moncion								2.84
Monte Cristi								1.58
Monte Plata								5.11
Nagua								2.93
Neyba								3.89
Oviedo								2.18
Padre Las Casas								3.03
Pimentel								2.50
Polo								15.32
Puerto Plata (78458)	12/0300	1010.0	12/0300		35			
Punta Cana (78479)	11/1300	1003.0	11/1300	35				5.65
Rancho Arriba								10.05 ^f
Restauracion								1.89
Rio San Juan								7.40
S.G. Boya								5.35
Sabana De La Mar (78467)	11/2100	1006.7						3.01
Salcedo								4.61
Samana								3.04
San Cristobal								5.79
San Jose Ocoa								7.48
San Juan de la Maguana								1.66
San Rafael Del Yuma								4.13
Sanchez								3.28
Santiago (78460)	12/0300	1008.0	12/0300	20	25			7.48

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)			
Santo Domingo (78488)	11/2100	1007.6						4.92
STGO. Rodriguez								1.93
Villa Altagracia								1.91
Villa Riva								6.72
Villa Vasquez								2.91 ^f
Yamasa								7.19 ^f
Puerto Rico and Virgin Islands								
St. Thomas Airport (78543)			10/1153		42			
San Juan Airport (78526)			11/0426		32			
Ponce, Rio Cerrillos above Lago Cerrillos								11.13
Villalba								9.54
Rio Matrullas								7.80
Rio Toa Vaca above Dam								7.26
Rio Grande de Loiza, San Lorenzo								6.93
Rio Jacaquas-Villalba								6.72
Vaqueria el Nimo, Caguas								6.26
Canaboncito, Caguas/Agua Buenas								6.23
Bairoa Arriba, Agua Buenas								6.06
Rio Bayamon @ Arenas, Cidra								5.92
Queb Blanco, San Lorenzo								5.35
Lago Toa Vaca								5.24
Rio Bayamon, Cidra								5.23
Rio Bauta, Orocovis								5.15
Lago Carite, Guayama								5.05
Rio Saliente, Jayuya								4.87
Ponce North								4.62
Rio Guanajibo-Sabana Grande								4.26
Bahamas								

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)			
Turks Island (78118)			12/0316	34				
Buoys								
41043 – Southwestern Atlantic (21.0°N 65.1°W)	11/0350	1012.3	02/0616	37 ^g	49			

^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 Rainfall totals from the Dominican Republic are accumulations between 11-12 December. All information received from the Dominican Republic Meteorological Office

^f Incomplete.

^g 1-min average.

Table 4. Preliminary track forecast evaluation (heterogeneous sample) for Tropical Storm Olga, 11-12 December 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 but does not include the remnant low stage.

Forecast Technique	Forecast Period (h)						
	12	24	36	48	72	96	120
CLP5	64 (6)	84 (4)	147 (2)				
GFNI	184 (3)	359 (1)					
GFDI	46 (6)	48 (4)	34 (2)				
HWFI	42 (6)	47 (4)	48 (2)				
GFSI	49 (5)	66 (3)	82 (1)				
AEMI	48 (6)	64 (4)	59 (2)				
NGPI	51 (5)	133 (3)	181 (2)				
UKMI	40 (4)	27 (2)	80 (1)				
BAMD	101 (6)	182 (4)	269 (4)				
BAMM	43 (6)	46 (4)	74 (2)				
BAMS	43 (6)	66 (4)	91 (2)				
CONU	53 (6)	74 (4)	83 (2)				
GUNA	51 (2)	72 (1)	42 (1)				
FSSE	49 (5)	61 (3)	76 (1)				
OFCL	47 (6)	61 (4)	52 (2)				
NHC Official (2002-2006 mean)	35 (1852)	61 (1686)	86 (1519)	112 (1362)	162 (1100)	221 (885)	290 (723)

Table 5. Preliminary intensity forecast evaluation (heterogeneous sample) for Tropical Storm Olga, 11-12 December 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 but does not include the remnant low stage.

Forecast Technique	Forecast Period (h)						
	12	24	36	48	72	96	120
SHF5	10.3 (6)	10.0 (4)	9.5 (2)				
GHMI	6.8 (6)	8.5 (4)	15.0 (2)				
HWFI	8.0 (6)	8.3 (4)	6.5 (2)				
SHIP	10.2 (6)	5.5 (4)	4.5 (2)				
DSHP	10.2 (6)	7.0 (4)	4.0 (2)				
FSSE	10.8 (5)	6.0 (3)	8.0 (1)				
ICON	8.0 (6)	7.0 (4)	4.5 (2)				
OFCL	6.7 (6)	8.8 (4)	5.0 (2)				
NHC Official (2002-2006 mean)	6.4 (1852)	9.8 (1686)	12.0 (1519)	14.1 (1362)	18.3 (1100)	19.8 (885)	21.8 (723)

Table 6. Watch and warning summary for Tropical Storm Olga, 11 – 12 December, 2007.

Date/Time (UTC)	Action	Location
11 / 0300	Tropical Storm Warning issued	Northern coast of the Dominican Republic from Cabo Engano to Bahio de Manzanillo
11 / 0300	Tropical Storm Watch issued	Southern coast of the Dominican Republic from Cabo Engano to Punta Palenque
11 / 1500	Tropical Storm Warning extended	Extended westward to include the entire northern coasts of the Dominican Republic and Haiti
11 / 1800	Tropical Storm Warning issued	Southeastern Bahamas and the Turks and Caicos Islands
12 / 1500	Tropical Storm Warnings discontinued	Dominican Republic and Haiti
12 / 1500	Tropical Storm Watch discontinued	Dominican Republic
12 / 2100	Tropical Storm Warning discontinued	Southeastern Bahamas and the Turks and Caicos Islands

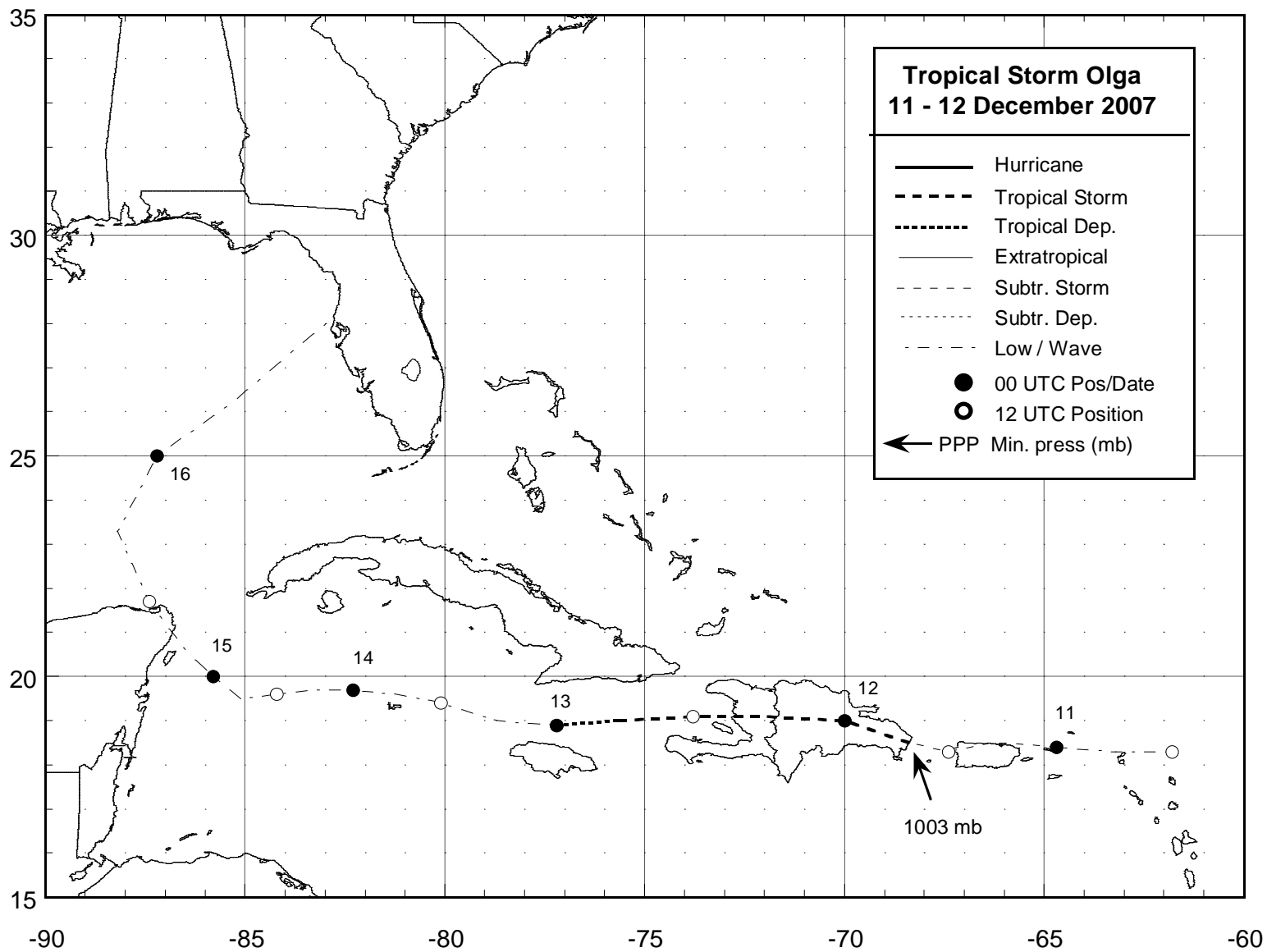


Figure 1. Best track positions for Tropical Storm Olga, 11- 12 December 2007.

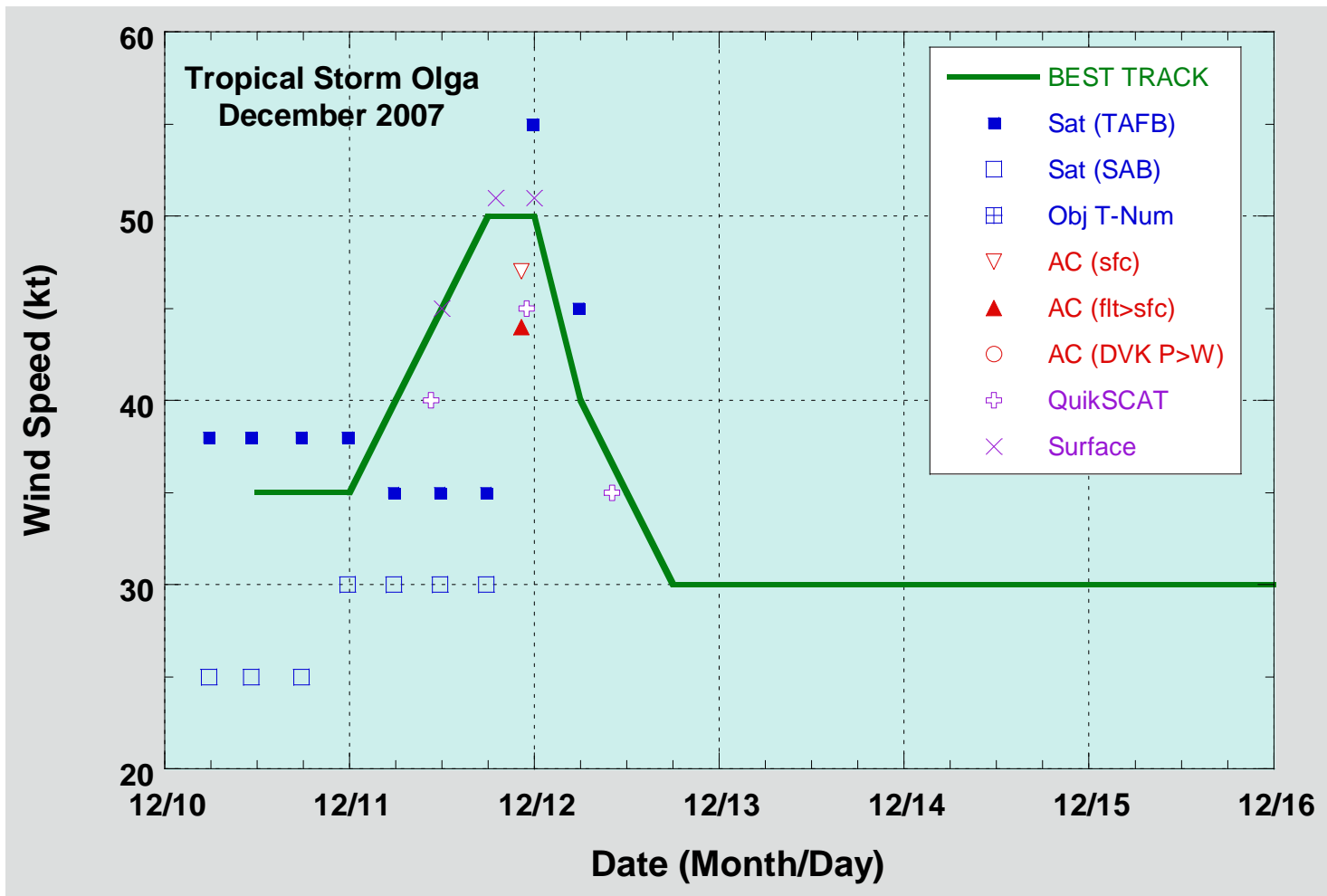


Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Tropical Storm Olga, 11-12 December 2007.

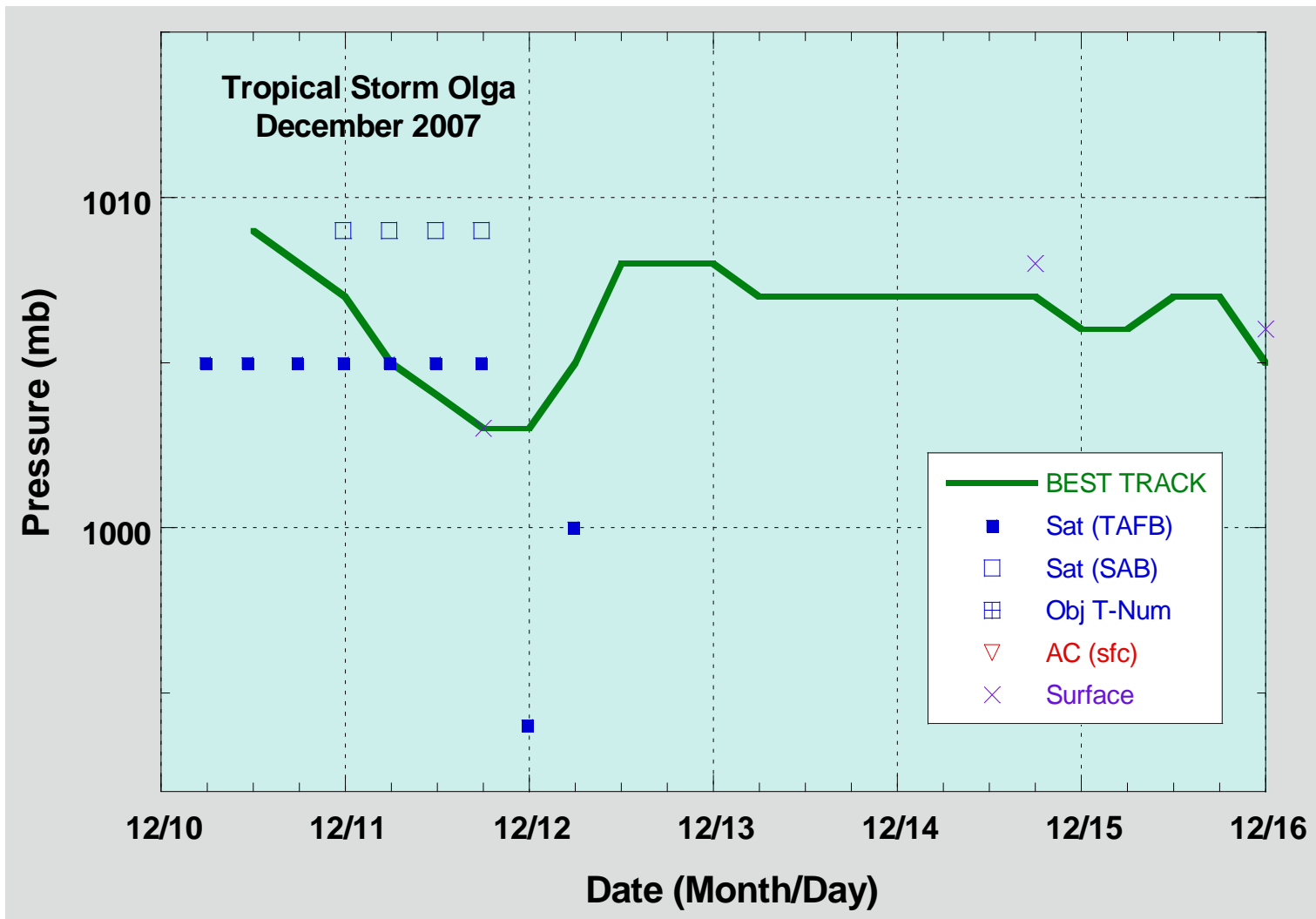


Figure 3. Selected pressure observations and best track minimum central pressure curve for Tropical Storm Olga, 11-12 December 2007.

**Tropical Storm Olga
December 10-12, 2007
86 sites**

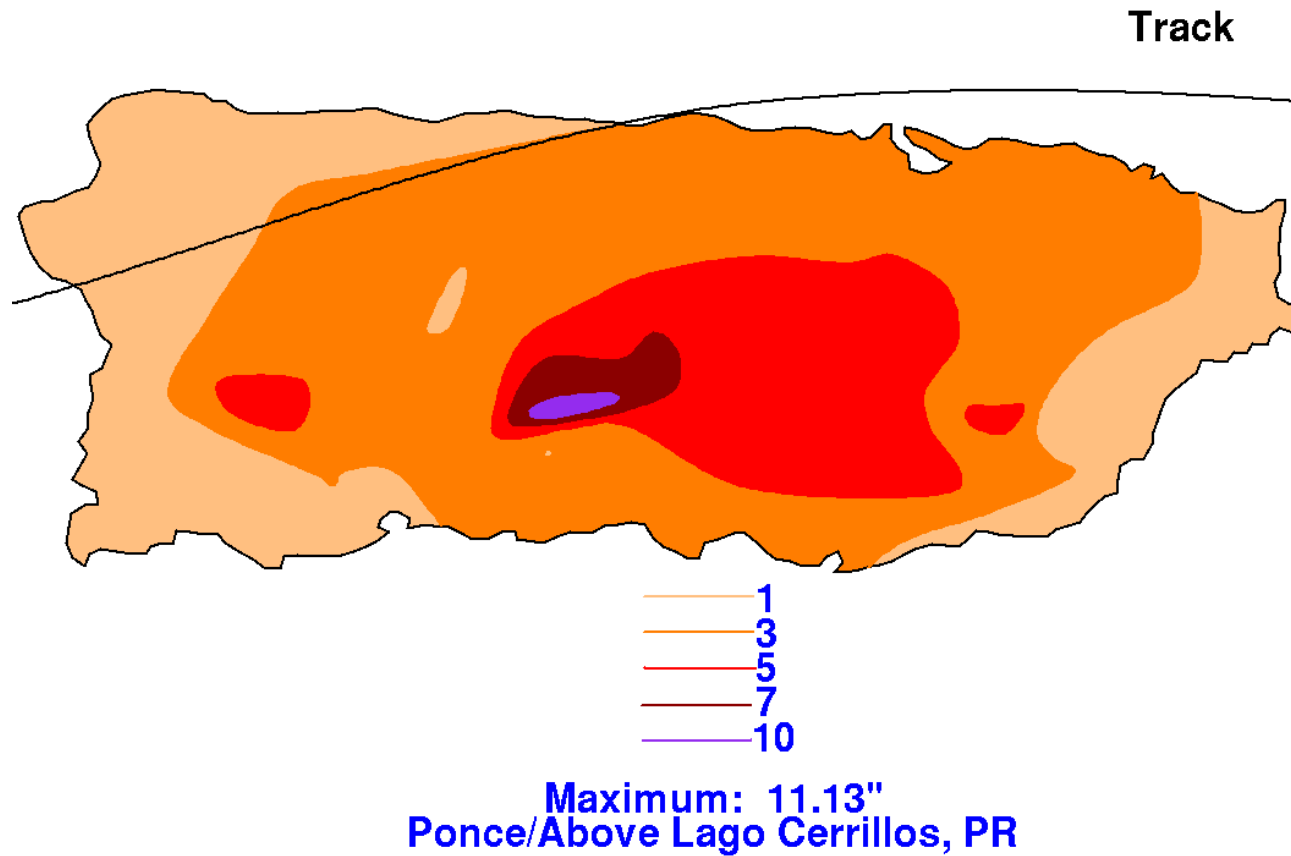


Figure 4. Storm total precipitation associated with Olga and its pre-formation stage over Puerto Rico. Figure courtesy of David Roth at the Hydrometeorological Prediction Center, Camp Springs, MD.