Tropical Cyclone Report
Tropical Storm Georgette
(EP122010)
20-23 September 2010

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Georgette formed off of the west coast of Mexico and made landfall in southern Baja California as a tropical storm, bringing 1 to 2 inches of rainfall to that area. It then emerged into the Gulf of California and made landfall along the mainland coast of Mexico as a tropical depression, producing heavy rainfall and flooding in the states of Sonora and Sinaloa.

a. Synoptic History

The formation of Georgette was associated with a tropical wave that crossed the west coast of Africa on 1 September. The wave was difficult to identify as it moved across the tropical Atlantic, but convection increased as the wave approached the Lesser Antilles on 9 September. As the wave moved through the Caribbean Sea, it was associated with the genesis of Atlantic Hurricane Karl on 14 September. The wave then continued westward and crossed Mexico on 17-18 September before entering the eastern North Pacific on 19 September. Convection increased on 19 and 20 September and well-defined center became apparent in microwave satellite imagery around 1200 UTC 20 September, marking the formation of a tropical depression about 210 n mi south-southeast of Cabo San Lucas. Shortly after that time deep convection diminished markedly, likely due to strong easterly vertical wind shear. Even with a reduction in the deep convection however, data from the ASCAT scatterometer indicate that maximum winds increased to 35 kt by 1800 UTC that day, and the depression became a tropical storm while centered about 180 n mi south-southeast of Cabo San Lucas. The "best track" chart of Georgette's track 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[1].

Georgette was situated on the western periphery of a subtropical ridge over northern Mexico. The flow associated with the ridge steered the cyclone on a north-northwestward to northward track with a forward speed of 7 to 12 kt through most its lifetime. On 21 September Georgette approached the southern tip of Baja California and made landfall around 1800 UTC near San Jose del Cabo in the state of Baja California Sur as a 35-kt tropical storm. After landfall, Georgette continued northward across southeastern Baja California and weakened to a tropical depression around 0000 UTC 22 September. Shortly after that time, the center moved into the Gulf of California and continued northward with no change in strength. Around 2200 UTC that day, the center made landfall along the west coast of mainland Mexico near San

[1] A digital record of the complete best track, including wind radii, can be found on line at ftp://ftp.nhc.noaa.gov/atcf. Data for the current year's storms are located in the *btk* directory, while previous years' data are located in the *archive* directory.

Carlos, west of Guaymas, in the state of Sonora. After landfall, the low-level circulation moved inland and dissipated by 0600 UTC 23 September.

b. Meteorological Statistics

Observations in Georgette (Figs. 2 and 3) include subjective satellite-based Dvorak technique intensity estimates from the Tropical Analysis and Forecast Branch (TAFB) and the Satellite Analysis Branch (SAB). Data and imagery from NOAA polar-orbiting satellites including the Advanced Microwave Sounding Unit (AMSU) instrument, NASA's Tropical Rainfall Measuring Mission (TRMM), the European Space Agency's ASCAT, the U.S. Navy's WindSat, and Defense Meteorological Satellite Program (DMSP) satellites, among others, were also useful in constructing the best track of Georgette.

The estimated peak intensity of 35 kt is based on ship and ASCAT observations and satellite classifications just prior to and after the time that Georgette was classified as a tropical cyclone. The central pressure at the first landfall in Baja California is based on an observation of 1000.7 mb with a 15-kt wind at San Jose del Cabo at 1900 UTC on 21 September. The central pressure at the second landfall is based on an observation of 1002.0 mb with a 25-kt wind at Guyamas at 2300 UTC on 22 September.

There were no reports of sustained tropical-storm-force winds on land. Rainfall of 1.02 in. (25.9 mm) was observed at Loreto on the east coast of the Baja peninsula. Several private weather stations in southern Baja California reported rainfall amounts of 1.5 to 2 in. (38-50 mm). Along the coast of mainland Mexico, 1.69 in. (42.9 mm) of rain was observed at Empalme and a private weather station in San Carlos reported 2.74 in. (69.6 mm) of rain. According to media reports up to 4.7 in. (120 mm) of rain fell in the vicinity of Guaymas.

There was one ship reports of tropical-storm-force winds in association with Georgette. The ship *Zim San Francisco* (call sign **DFZA2**) reported a wind of 35 kt and a pressure of 1005.0 mb at 0300 UTC 21 September when located about 75 n mi north-northwest of the center of Georgette.

c. Casualty and Damage Statistics

Flooding was reported in Empalme, Etchojoa, Navojoa, and Guaymas in the state of Sonora, and 500,000 people were evacuated in those areas. Flooding was also reported in the city of Los Mochis in Sinaloa. No monetary damage estimates are available, and there were no casualties reported in association with Georgette.

d. Forecast and Warning Critique

The genesis of Georgette was not well anticipated due to the presence of unfavorable upper-level winds. The precursor disturbance that developed into Georgette was first mentioned in the Tropical Weather Outlook at 1800 UTC 18 September, 42 h prior to genesis. The probability of formation first reached the medium category (30-50%) 12 h later, but was not raised to the high category (> 50%) until after genesis occurred.

A verification of NHC official track forecasts for Georgette is given in Table 2a. Official forecast track errors were smaller than the mean official errors for the previous five-year period (2005-2009) through 24 h, although the sample size is too small to draw any meaningful conclusions about the forecast performance. A homogeneous comparison of the official track errors with selected guidance models is given in Table 2b. Several models had difficulty tracking the weak vortex associated with Georgette and were therefore not available for verification. Of the models that did produce track forecasts for Georgette, most had errors that were quite large.

A verification of NHC official intensity forecasts for Georgette is given in Table 3a. Official forecast intensity errors were smaller than the mean official errors for the previous five-year period (2005-2009) at all forecast times. As with the track verification, the sample size is too small to draw any meaningful conclusions about the forecast performance. A homogeneous comparison of the official intensity errors with selected guidance models is given in Table 3b. All of the guidance had very small intensity forecast errors for Georgette.

Tropical storm warnings were issued for the southern portion of Baja California about 6 hour prior to landfall near San José del Cabo (Table 4). Whereas tropical storm watches were issued early on 22 September for part of the coast of mainland Mexico, the cyclone was not forecast to and did not re-intensify to tropical storm strength, so warnings were not issued for this area.

Table 1. Best track for Tropical Storm Georgette, 20-23 September 2010.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
20 / 1200	19.7	108.4	1001	30	tropical depression
20 / 1800	20.1	108.6	1001	35	tropical storm
21 / 0000	20.8	109.0	1000	35	"
21 / 0600	21.5	109.3	1000	35	"
21 / 1200	22.3	109.5	999	35	"
21 / 1800	23.0	109.7	999	35	"
22 / 0000	24.0	110.0	1000	30	tropical depression
22 / 0600	25.1	110.4	1000	30	"
22 / 1200	26.3	110.8	1000	30	"
22 / 1800	27.4	111.1	999	30	"
23 / 0000	28.3	111.1	1000	30	"
23 / 0600					dissipated
21 / 1200	22.3	109.5	999	35	minimum pressure and maximum wind
21 / 1800	23.0	109.7	999	35	landfall near San José del Cabo, Baja California Sur, Mexico
22 / 2200	28.0	111.1	999	30	landfall near San Carlos, west of Guyamas, Sonora, Mexico

Table 2a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Tropical Storm Georgette. Mean errors for the five-year period 2005-9 are shown for comparison. Official errors that are smaller than the five-year means are shown in boldface type.

	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL (Georgette)	**26.5**	**48.1**	89.8				
OCD5 (Georgette)	30.2	90.3	169.1				
Forecasts	6	4	2				
OFCL (2005-9)	30.8	51.5	71.6	89.6	120.9	155.0	192.0
OCD5 (2005-9)	38.9	75.3	115.7	155.8	226.9	275.1	321.5

Table 2b. Homogeneous comparison of selected track forecast guidance models (in n mi) for Tropical Storm Georgette. Errors smaller than the NHC official forecast are shown in boldface type. The number of official forecasts shown here will generally be smaller than that shown in Table 2a due to the homogeneity requirement.

Model ID	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL	27.0	47.7	89.8				
GFSI	39.4	**42.8**	91.8				
GFDI	38.5	50.9	**55.9**				
HWFI	66.6	92.3	115.5				
NGPI	49.9	88.3	201.9				
AEMI	40.5	64.8	150.5				
TVCN	42.5	**47.0**	**87.1**				
TVCC	42.0	53.4	91.2				
LBAR	33.7	77.9	103.5				
BAMD	59.4	114.5	136.7				
BAMM	42.6	78.6	**89.7**				
BAMS	51.6	125.8	168.3				
Forecasts	5	3	2				

Table 3a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Tropical Storm Georgette. Mean errors for the five-year period 2005-9 are shown for comparison. Official errors that are smaller than the five-year means are shown in boldface type.

	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL (Georgette)	**0.8**	**1.3**	**5.0**				
OCD5 (Georgette)	3.0	3.0	0.5				
Forecasts	6	4	2				
OFCL (2005-9)	6.3	10.5	13.8	15.5	17.5	19.0	18.8
OCD5 (2005-9)	7.1	11.6	15.0	17.4	18.7	19.8	19.4

Table 3b. Homogeneous comparison of selected intensity forecast guidance models (in kt) for Tropical Storm Georgette. Errors smaller than the NHC official forecast are shown in boldface type. The number of official forecasts shown here will generally be smaller than that shown in Table 3a due to the homogeneity requirement.

Model ID	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL	0.8	1.3	5.0				
DSHP	3.0	3.3	**4.0**				
LGEM	2.0	2.5	**2.0**				
GHMI	2.8	3.3	**1.5**				
HWFI	3.5	3.0	**4.0**				
ICON	1.5	2.5	**2.0**				
IVCN	1.7	2.3	**2.0**				
Forecasts	6	4	2				

Table 4. Watch and warning summary for Tropical Storm Georgette, 20-23 September 2010.

Date/Time (UTC)	Action	Location
21/1200	Tropical Storm Warning issued	Baja California peninsula from Agua Blanca southward on the west coast and from Buenavista southward on the east coast
22/0000	All Tropical Storm Warnings discontinued	
22/0300	Tropical Storm Watch issued	Huatabampito, Mexico, northward to Bahia Kino, Mexico
23/0000	All Tropical Storm Watches discontinued	

Figure 1. Best track positions for Tropical Storm Georgette, 20-23 September 2010.

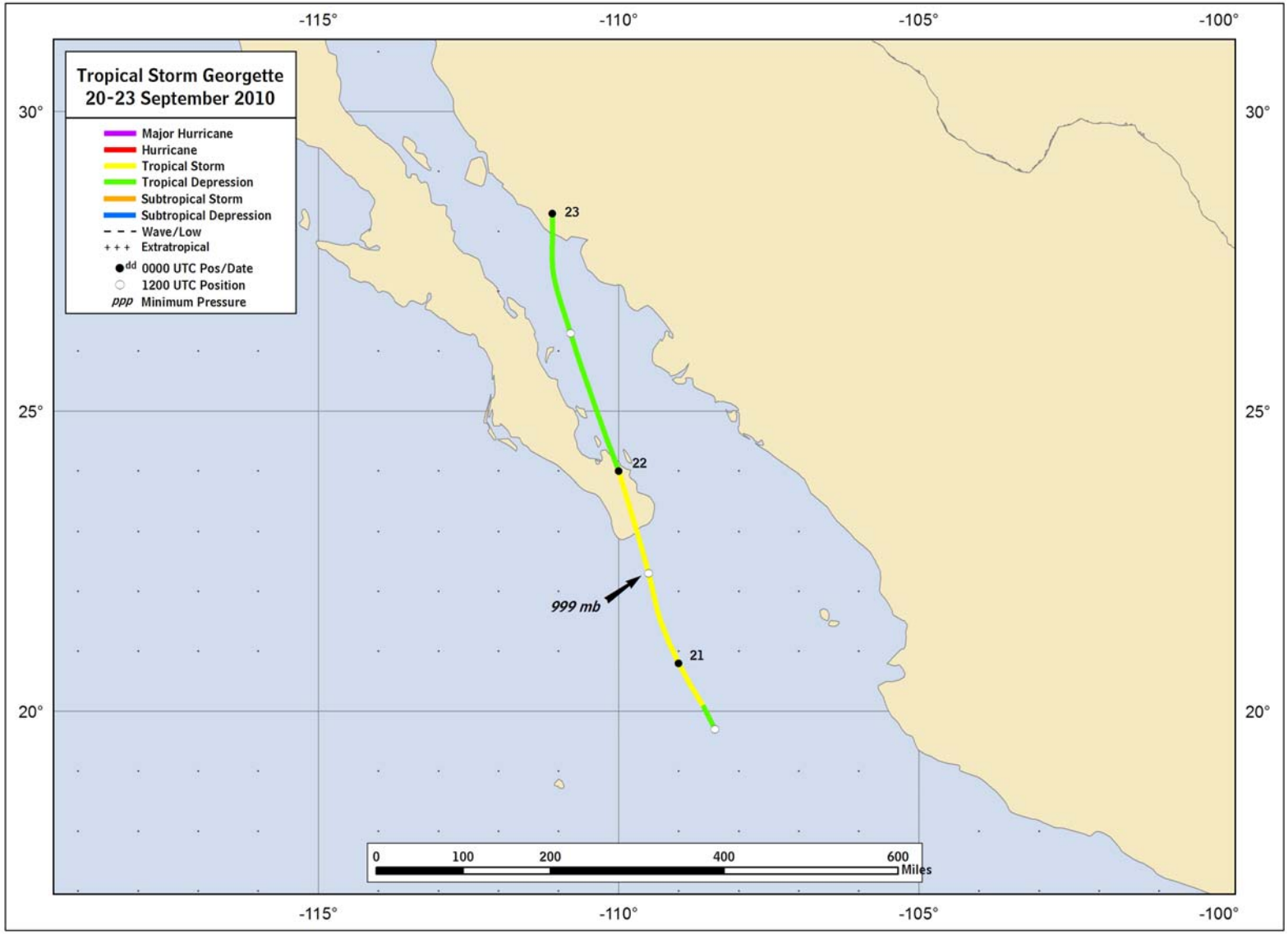

Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Tropical Storm Georgette, 20-23 September 2010. Dashed vertical lines correspond to 0000 UTC. Solid vertical lines correspond to landfalls. AMSU data are from the Cooperative Institute of Meteorological Satellite Studies (CIMSS) at the University of Wisconsin intensity technique.

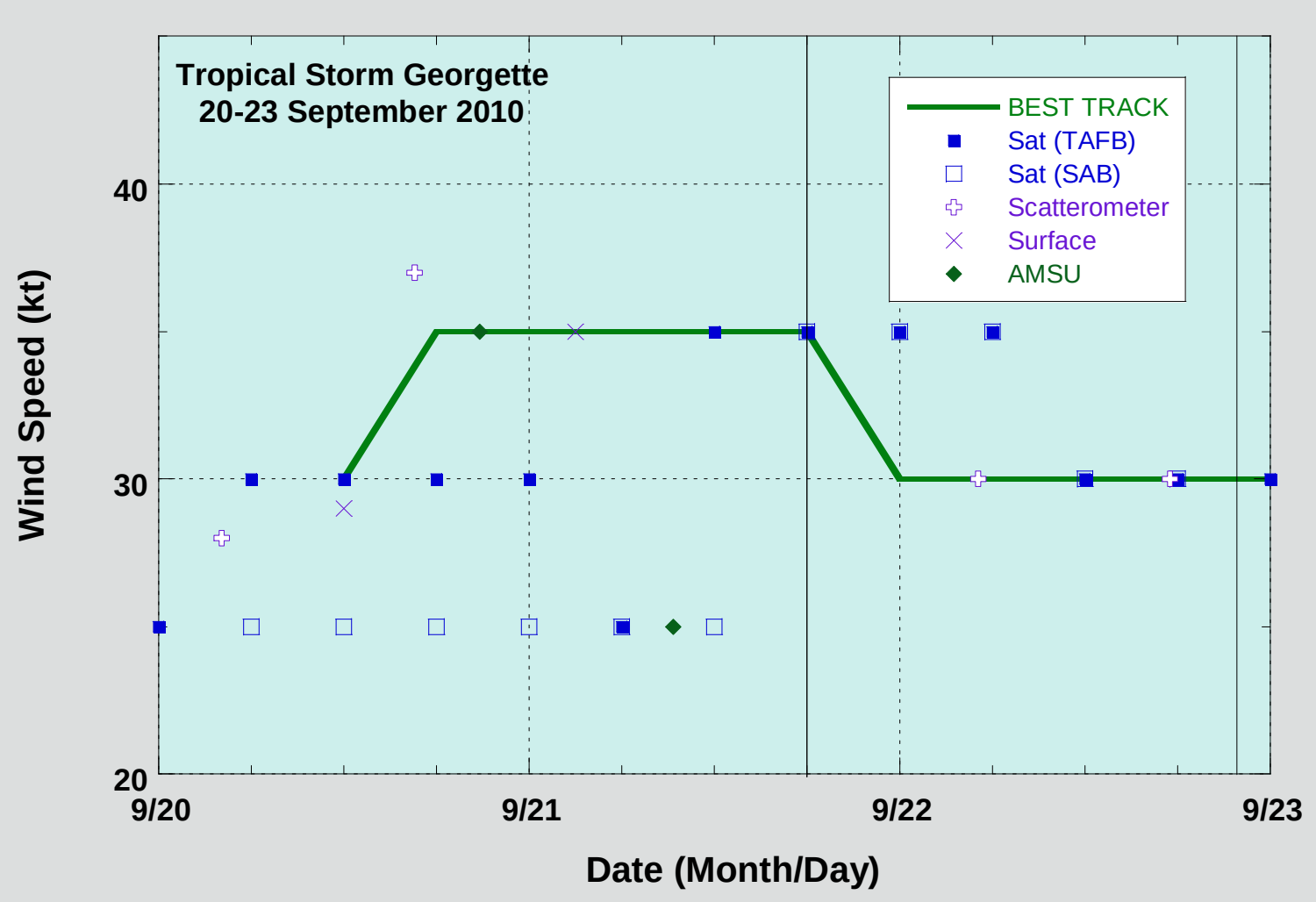

Figure 3. Selected pressure observations and best track minimum central pressure curve for Tropical Storm Georgette, 20–23 September 2010. Dashed vertical lines correspond to 0000 UTC. Solid vertical lines correspond to landfalls. AMSU data are from the Cooperative Institute of Meteorological Satellite Studies (CIMSS) at the University of Wisconsin intensity technique.