NATIONAL HURRICANE CENTER TROPICAL CYCLONE REPORT

TROPICAL STORM JULIETTE

(EP102013)

28 - 29 AUGUST 2013

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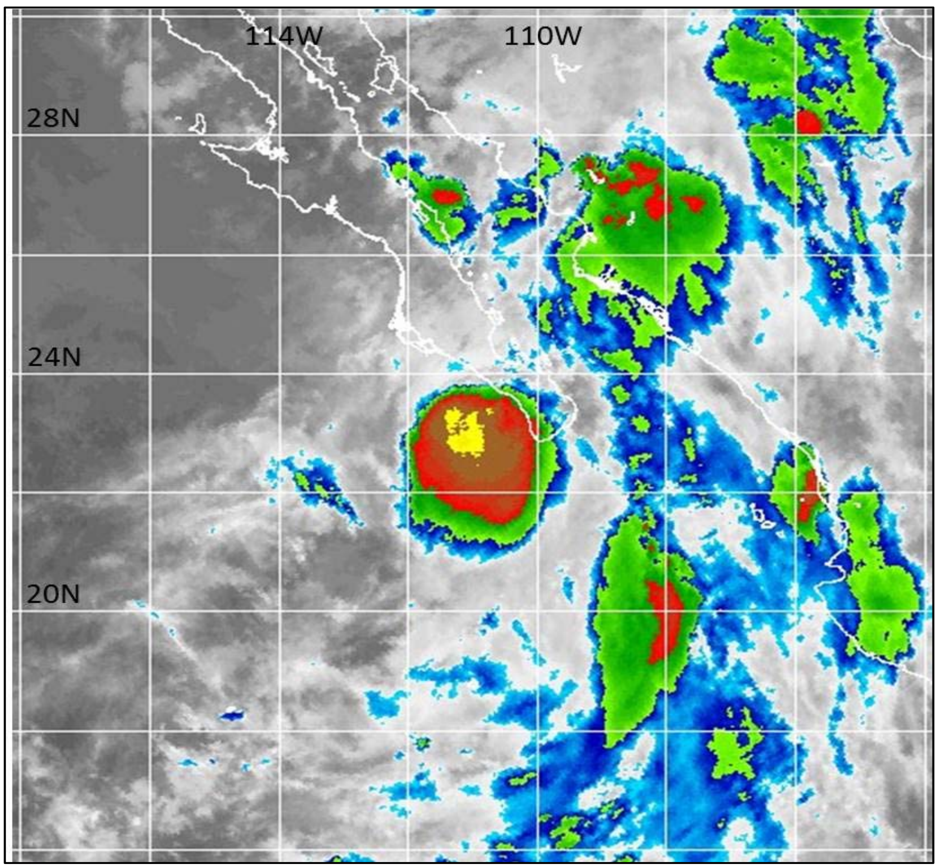

0530 UTC 29 AUGUST 2013 GOES-15 INFRARED IMAGE SHOWING JULIETTE NEAR ITS PEAK INTENSITY OF 55 KT. IMAGE COURTESY FNMOC, MONTEREY, CA.

Juliette was a small, short-lived tropical storm that made landfall along the southwestern coast of the Baja California peninsula near Punta Santa Marina, causing some damage and one indirect death.

Tropical Storm Juliette

28 - 29 AUGUST 2013

SYNOPTIC HISTORY

Juliette developed from the complex interaction of a tropical wave, the eastern North Pacific Ocean Intertropical Convergence Zone (ITCZ), and a large cyclonic gyre. The primary disturbance that triggered the formation of Juliette was a tropical wave that moved off of the west coast of Africa on 9 August. The wave moved quickly westward across the tropical Atlantic and northern South America, producing limited shower activity for the next eleven days. However, as the wave moved into the western Caribbean Sea on 21 August, deep convection increased markedly when the disturbance interacted with an upper-level trough over the Yucatan Peninsula. The upper trough gradually weakened and moved westward, and unfavorable westerly vertical wind shear gradually gave way to a more favorable upper-level divergence pattern as a 200-mb anticyclone built eastward across southeastern Mexico and Central America from the eastern North Pacific Ocean. The wave fractured on 23-24 August, with the northern portion moving westward into the Bay of Campeche, resulting in the development of Atlantic Tropical Storm Fernand on 25 August; the southern portion of the wave continued westward and emerged over the eastern North Pacific on 24 August.

The wave encountered the ITCZ and spawned the development of a broad low south of the Gulf of Tehauntepec early on 25 August. A large subtropical ridge located over northern Mexico steered the low and an attendant ITCZ band of convection west-northwestward and northwestward. On 26 August, the low was absorbed into the southeastern portion of a broad, large-scale cyclonic gyre that covered much of the eastern North Pacific west of 100^{O} W longitude, and opened into a sharp trough that was accompanied by a well-defined low-level vorticity maximum about 450 n mi south of Manzanillo. Meanwhile, a second low-level vorticity maximum was located about 200 n mi south of Manzanillo, and that disturbance passed just offshore of the southwestern coast of Mexico, producing sustained winds of 34 kt in Manzanillo at 2240 UTC. Both the trough that would become Juliette and the second disturbance turned and moved quickly northward by late that day, with the second disturbance failing to develop a closed surface circulation and dissipating near southern Baja California Sur early on 27 August.

Scatterometer wind data indicated that Juliette’s precursor was already producing a band of tropical-storm-force winds to the southeast and east of the broad northeast-to-southwest oriented surface trough. By late on 27 August, the disturbance accelerated and turned north-northwestward at an unusually fast forward speed of 20-25 kt as it moved up the eastern side of the large cyclonic gyre. A burst of deep convection formed near the vorticity maximum, which resulted in the low-level circulation finally closing off on its west side early on 28 August, and it is estimated that a tropical storm formed at 1200 UTC that day when the cyclone was located about 100 n mi west of Manzanillo or about 270 n mi south-southeast of Cabo San Lucas, Mexico. 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[1].

Passive microwave satellite imagery and scatterometer surface wind data (Fig. 4) indicated that the circulation of Juliette was quite small and that tropical-storm-force winds only extended about 30-40 n mi east of the center, and that the circulation was only closed out to about 30 n mi to the west of the center. However, an outer rain band crossed the coast of southwestern Mexico and managed to produce a sustained wind of 30 kt in Manzanillo at 1200 UTC as Juliette was passing west of the city early on 28 August. The small cyclone continued to strengthen during the day as it moved rapidly northwestward toward southwestern Baja California Sur (Fig. 5). It is estimated that Juliette reached its peak intensity of 55 kt when it was located about 50 n mi southeast of Punta Santa Marina at 0600 UTC 29 August, and it made landfall near that location at 0900 UTC with the same intensity.

Almost immediately after landfall, interaction with the mountainous terrain of Baja California severely disrupted the convective pattern, causing Juliette to weaken. As the cyclone turned northwestward and its forward speed decreased abruptly to 12-15 kt, the system lost all of its deep convection while it moved over much cooler waters, and Juliette became a post-tropical low by 0000 UTC 30 August about 45 n mi south of El Pocito, Baja California Sur, Mexico. The low turned west-northwestward over even colder waters later that day, and it is estimated that the cyclone degenerated into an open trough of low pressure by 0000 UTC 31 August when it was more than 150 n mi west of Punta Eugenia, Mexico.

METEOROLOGICAL STATISTICS

Observations in Juliette (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), and objective Advanced Dvorak Technique (ADT) estimates from the Cooperative Institute for Meteorological Satellite Studies/University of Wisconsin-Madison. Data and imagery from NOAA polar-orbiting satellites including the Advanced Microwave Sounding Unit (AMSU), the NASA Tropical Rainfall Measuring Mission (TRMM), the European Space Agency's Advanced Scatterometer (ASCAT), and Defense Meteorological Satellite Program (DMSP) satellites, among others, were also useful in constructing the best track of Juliette.

There were no ship reports of tropical-storm-force winds associated with Juliette. Selected surface observations from land stations are given in Table 2.

The estimated peak intensity of 55 kt is based on a 57-kt surface wind report from a Mexican automated weather observing station located at Cabo Pulmo, Baja California Sur, Mexico at 0450 UTC 28 August, and additional wind reports of 54 kt that occurred at 0440 UTC and 0500 UTC. This observing station is located 85 ft (26 m) above sea level and has good

[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.

exposure. The strongest measured wind speeds occurred at Sierra Laguna, Baja California Sur, which is a mountain station at an elevation of 6393 ft (1949 m) above sea level, where a sustained wind of 74 kt and a gust to 122 kt were recorded at 0220 UTC 29 August.

Due to the small size and fast forward speed of Juliette, rainfall amounts across Baja California Sur were relatively low — less than one inch.

CASUALTY AND DAMAGE STATISTICS

There were reports of damage and casualties[2] associated with Juliette. Although there were no direct deaths, Mexican Emergency Services personnel reported that one indirect death occurred when a man was electrocuted in Cabo San Lucas, Mexico, after strong winds downed trees and powerlines in the city; some roads were closed by the downed trees, and about 1,650 people were evacuated to emergency shelters. In Todos los Santos, located about 40 n mi north-northwest of Cabo San Lucas, media reports indicate that trees and powerlines were also blown down. The power outages caused pumping stations to shut down, resulting in a temporary loss of water in the downtown area.

FORECAST AND WARNING CRITIQUE

The genesis of Juliette was not well anticipated. The area of disturbed weather that Juliette originated from first appeared in the Tropical Weather Outlook (TWO) at 1200 UTC 27 August as part of a broad area of disturbed weather, including the disturbance that preceded Juliette, and the entire system was given a medium (30% - 50%) chance of development during the next 48 h and also in the 5-day genesis period; this was only one day before the actual time that genesis occurred. When the preceding disturbance became disorganized later that day, Juliette's precursor was mentioned in the TWO as a separate entity at 1800 UTC, and remained in the medium (30% - 50%) category until genesis occurred.

A verification of NHC official track forecasts for Juliette is given in Table 3a and a homogeneous comparison of the official track errors with selected guidance models is given in Table 3b. A verification of NHC official intensity forecasts for Juliette is given in Table 4a and a homogeneous comparison of the official intensity errors with selected guidance models is given in Table 4b. However, due to the very limited period for which the National Hurricane Center (NHC) issued forecasts on Juliette, no meaningful comparisons of the track and intensity forecasts can be made.

Watches and warnings associated with Juliette are given in Table 5.

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[2] Deaths occurring as a direct result of the forces of the tropical cyclone are referred to as "direct" deaths. These would include those persons who drowned in storm surge, rough seas, rip currents, and freshwater floods. Direct deaths also include casualties resulting from lightning and wind-related events (e.g., collapsing structures). Deaths occurring from such factors as heart attacks, house fires, electrocutions from downed power lines, vehicle accidents on wet roads, etc., are considered indirect" deaths.

Table 1. Best track for Tropical Storm Juliette, 28-29 August 2013.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
28 / 1200	19.3	106.4	1003	35	tropical storm
28 / 1800	20.9	108.1	1002	40	"
29 / 0000	22.3	109.5	998	50	"
29 / 0600	23.8	111.0	997	55	"
29 / 0900	24.4	111.7	997	55	"
29 / 1200	25.0	112.4	1000	45	"
29 / 1800	25.7	113.3	1005	35	"
30 / 0000	26.4	114.3	1007	30	low
30 / 0600	27.0	115.2	1010	25	"
30 / 1200	27.4	116.3	1010	25	"
30 / 1800	27.8	117.5	1010	25	"
31 / 0000					dissipated
29 / 0600	23.8	111.0	997	55	minimum pressure and maximum intensity
29 / 0900	24.4	111.7	997	55	landfall near Punta Santa Marina, Baja California Sur, Mexico

Table 2. Selected surface observations for Tropical Storm Juliette, 28-29 August 2013.

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[a]	Sustained (kt)[b]	Gust (kt)	
Mexico						
Baja California Sur						
Cabo Pulmo (22.88N 109.93W; elev. 85 ft)	29/0020	1007.1	29/0250	50	66	
			29/0400	51	62	
			29/0420	50	64	
			29/0430	53	65	
			29/0440	54	65	
			29/0450	57	70	
			29/0500	54	72	0.46
San Lucas (BS03) (22.88N 109.93W; elev. 735 ft)	29/0230	997.6 [c]	29/0220	44	57	0.63
Puerto Cortes (BS07) (24.48N 111.83W; elev. 33 ft)	29/1000	1007.4	29/0630		29	
Sierra Laguna (23.55N 109.99W; elev. 6393 ft)			29/0410	74	122	0.50
Weather Underground						
Cabo San Lucas, El Medano (IBAJACAL12)	29/0341	998.7				0.93
Cabo Colorado, San Jose (IBCSSANJ4)	29/0400	1003.4	29/0405	44	54	0.69
Pescadero Heights, Todos Santos (IBCSTODO2)	29/0516	1001.0	29/0531	38	60	0.75
Colima						
Isla Maria Madre (76550) (21.62N 106.52W; elev. 121 ft)	28/0000	1006.9	28/0230		34	0.73
Manzanillo (MMZO; 76654)			28/1200	30		

[a] Date/time is for sustained wind when both sustained and gust are listed.
[b] Sustained winds use a 1-minute averaging period.
[c] Extrapolated from station pressure.

Table 3a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Tropical Storm Juliette, 28-29 August 2013. Mean errors for the previous 5-yr period are shown for comparison. Official errors that are smaller than the 5-yr means are shown in boldface type.

	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL	**24.6**	**17.3**					
OCD5	35.0	68.5					
Forecasts	3	1					
OFCL (2008-12)	27.0	43.1	57.8	71.9	101.7	137.2	165.9
OCD5 (2008-12)	37.4	73.0	114.9	158.3	238.4	313.5	389.1

Table 3b. Homogeneous comparison of selected track forecast guidance models (in n mi) for Tropical Storm Juliette, 28-29 August 2013. Errors smaller than the NHC official forecast are shown in boldface type.

Model ID	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL	24.6	17.3					
OCD5	35.0	68.5					
GFSI	41.1	46.9					
EMXI	49.0	170.1					
GHMI	33.7	20.2					
HWFI	30.4	45.1					
AEMI	38.0	53.1					
TVCA	**24.2**	29.0					
BAMD	68.7	124.4					
BAMM	43.4	74.1					
BAMS	44.6	80.5					
LBAR	33.1	28.2					
Forecasts	3	1					

Table 4a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Tropical Storm Juliette, 28-29 August 2013. Mean errors for the previous 5-yr period are shown for comparison. Official errors that are smaller than the 5-yr means are shown in boldface type.

	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL	10.0	**0.0**					
OCD5	8.3	10.0					
Forecasts	3	1					
OFCL (2008-12)	6.3	10.5	13.4	14.5	15.3	17.0	17.3
OCD5 (2008-12)	7.6	12.5	16.5	18.8	20.4	20.3	20.6

Table 4b. Homogeneous comparison of selected intensity forecast guidance models (in kt) for Tropical Storm Juliette, 28-29 August 2013. Errors smaller than the NHC official forecast are shown in boldface type.

Model ID	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL	10.0	0.0					
OCD5	**8.3**	10.0					
DSHP	10.7	3.0					
LGEM	**8.0**	7.0					
HWFI	**8.7**	7.0					
GHMI	10.0	6.0					
ICON	**9.0**	1.0					
IVCN	**9.0**	1.0					
Forecasts	3	1					

Table 5. Watch and warning summary for Tropical Storm Juliette, 28-29 August 2013.

Date/Time (UTC)	Action	Location
28 / 2100	Tropical Storm Warning issued	San Evaristo to Bahia Magdalena
29 / 0900	Tropical Storm Warning modified to	San Evaristo to La Paz
29 / 0900	Tropical Storm Warning issued	Agua Blanca to Punta Eugenia
29 / 1500	Tropical Storm Warning discontinued	San Evaristo to La Paz
29 / 1500	Tropical Storm Warning modified to	Puerto San Andresito to Punta Eugenia
29 / 1800	Tropical Storm Warning discontinued	All

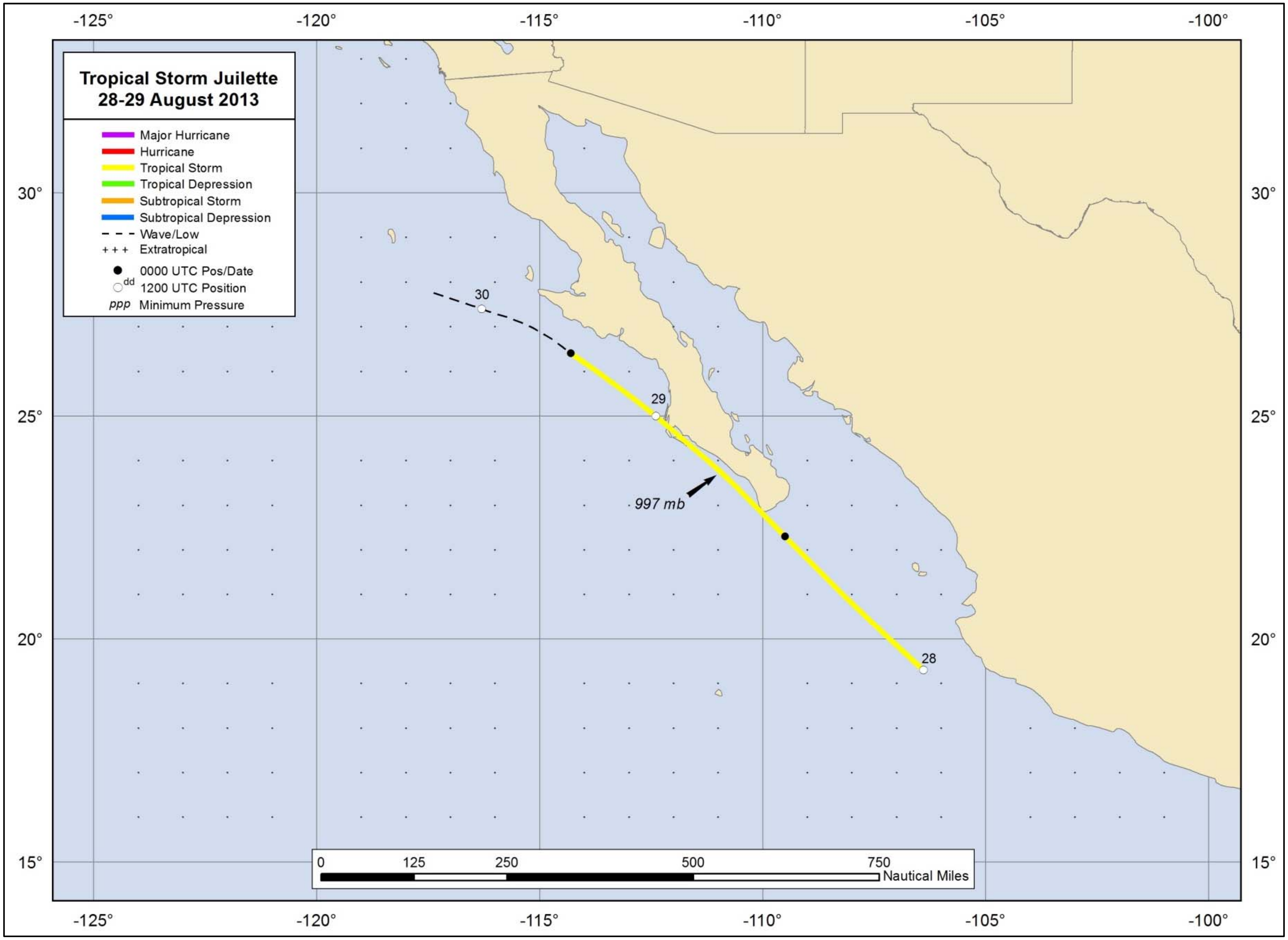

Figure 1. Best track positions for Tropical Storm Juliette, 28-29 August 2013.

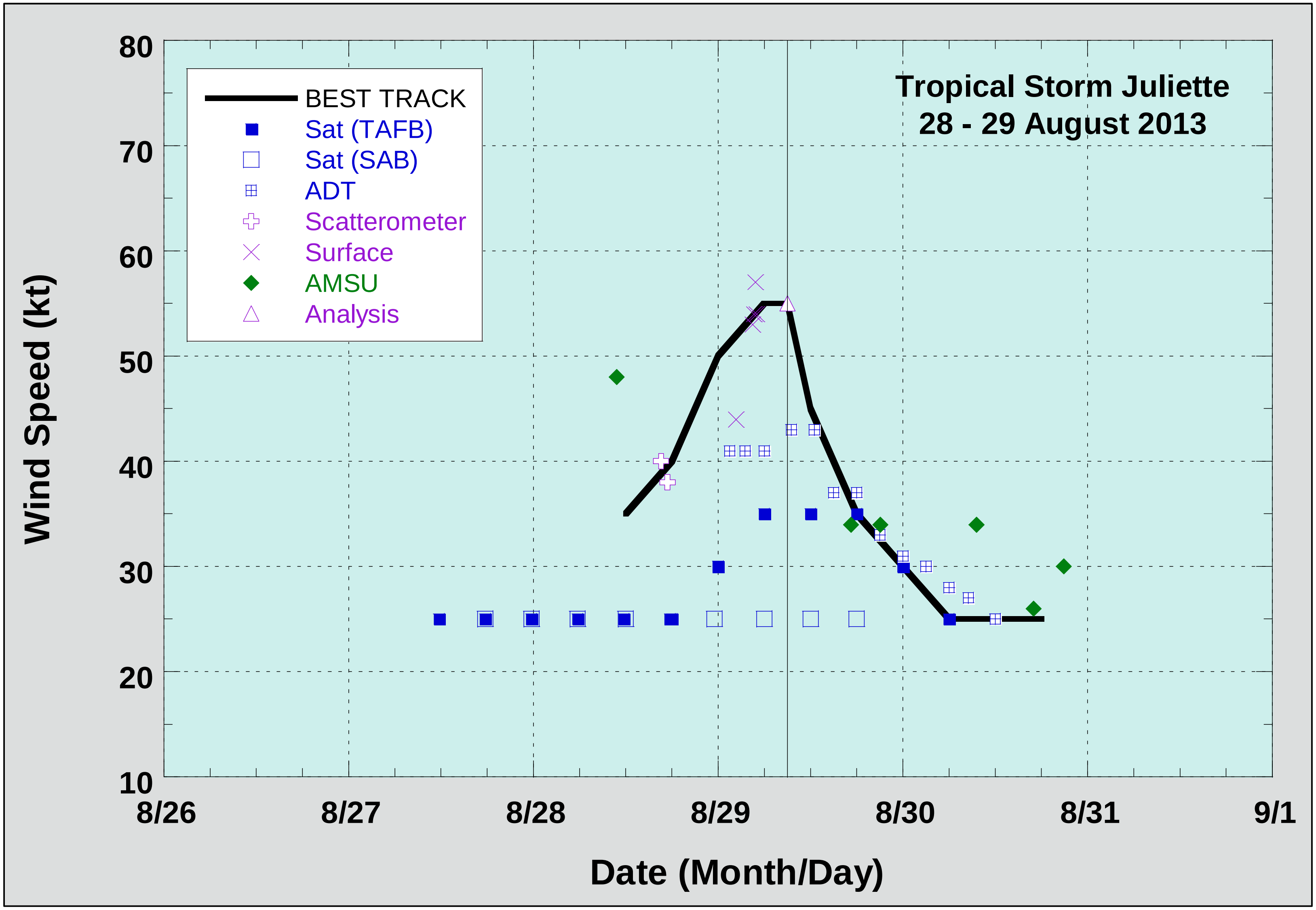

Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Tropical Storm Juliette, 28-29 August 2013. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. AMSU intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies technique. Dashed vertical lines correspond to 0000 UTC.

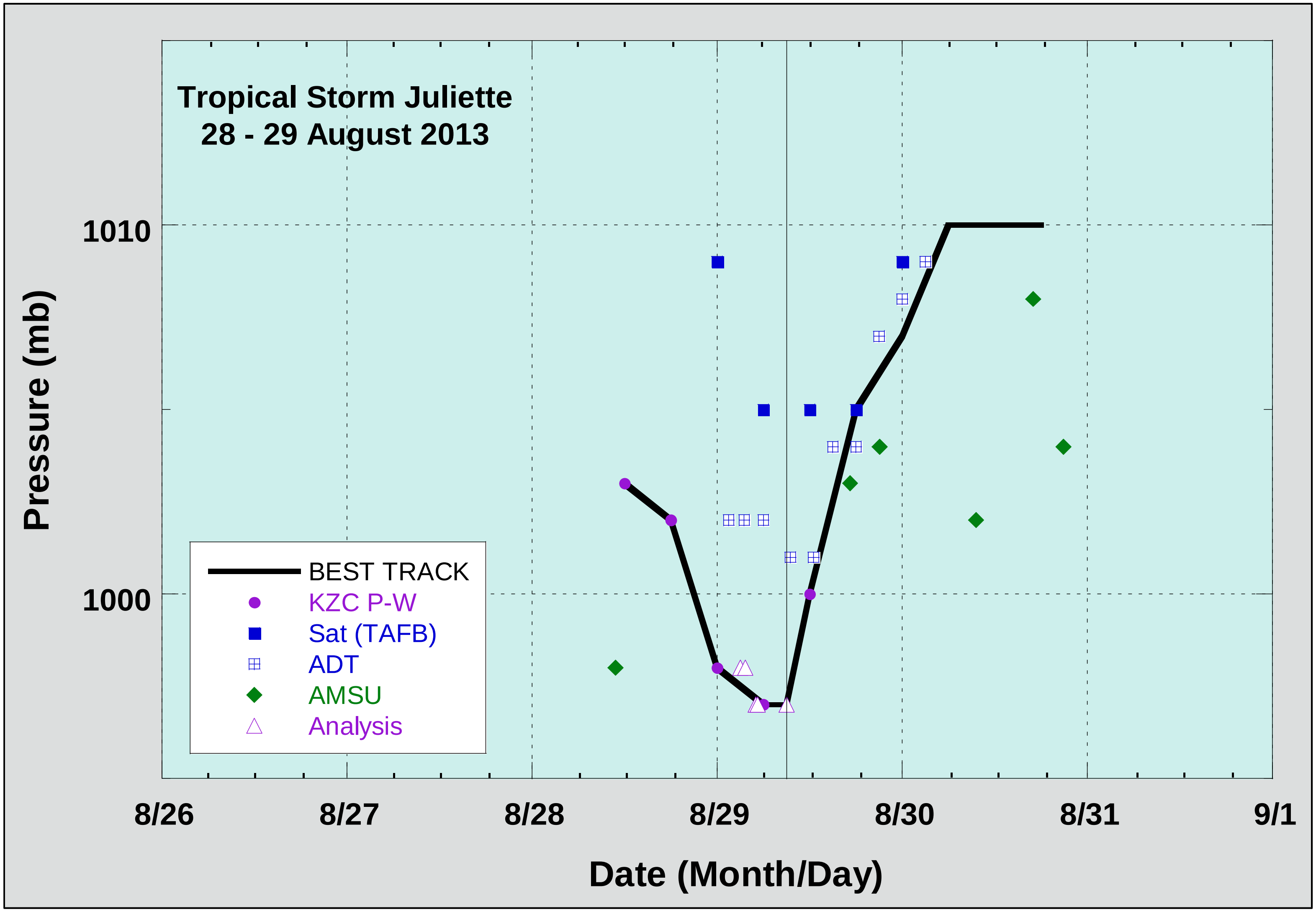

Figure 3. Selected pressure observations and best track minimum central pressure curve for Tropical Storm Juliette, 28-29 August 2013. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. AMSU intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies technique. KZC P-W refers to pressure estimates derived using the Knaff-Zehr-Courtney pressure-wind relationship. Dashed vertical lines correspond to 0000 UTC.

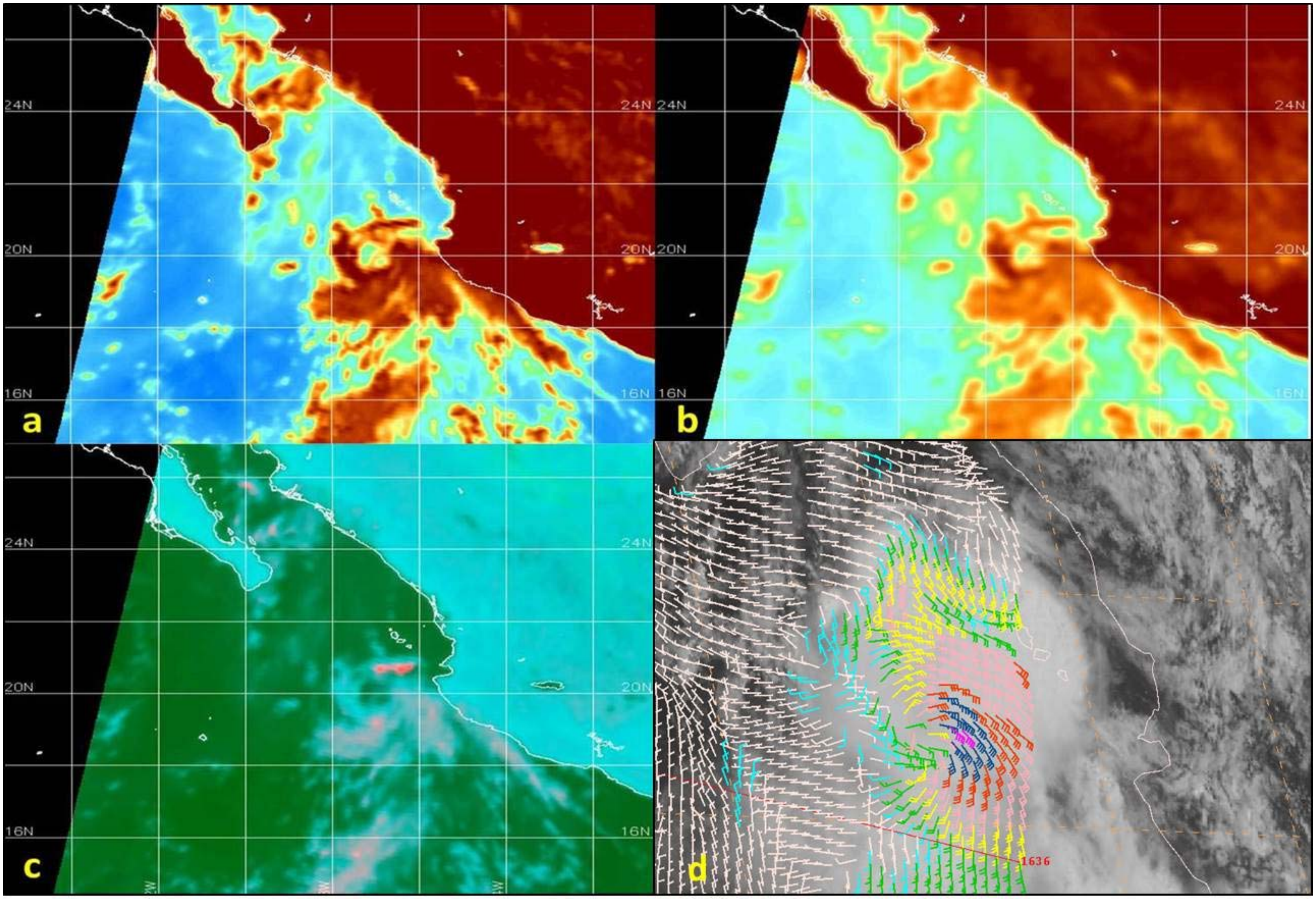

Figure 4. 1319 UTC WINDSAT passive microwave satellite imagery (panels a, b, and c) and 1634 UTC ASCAT-A scatterometer surface wind data on 28 August 2013, revealing the small circulation of Tropical Storm Juliette. Images courtesy of U.S. Navy Fleet Numerical Meteorology and Oceanography Center (FNMOC), Monterey, CA and NOAA-NESDIS, Washington, DC.

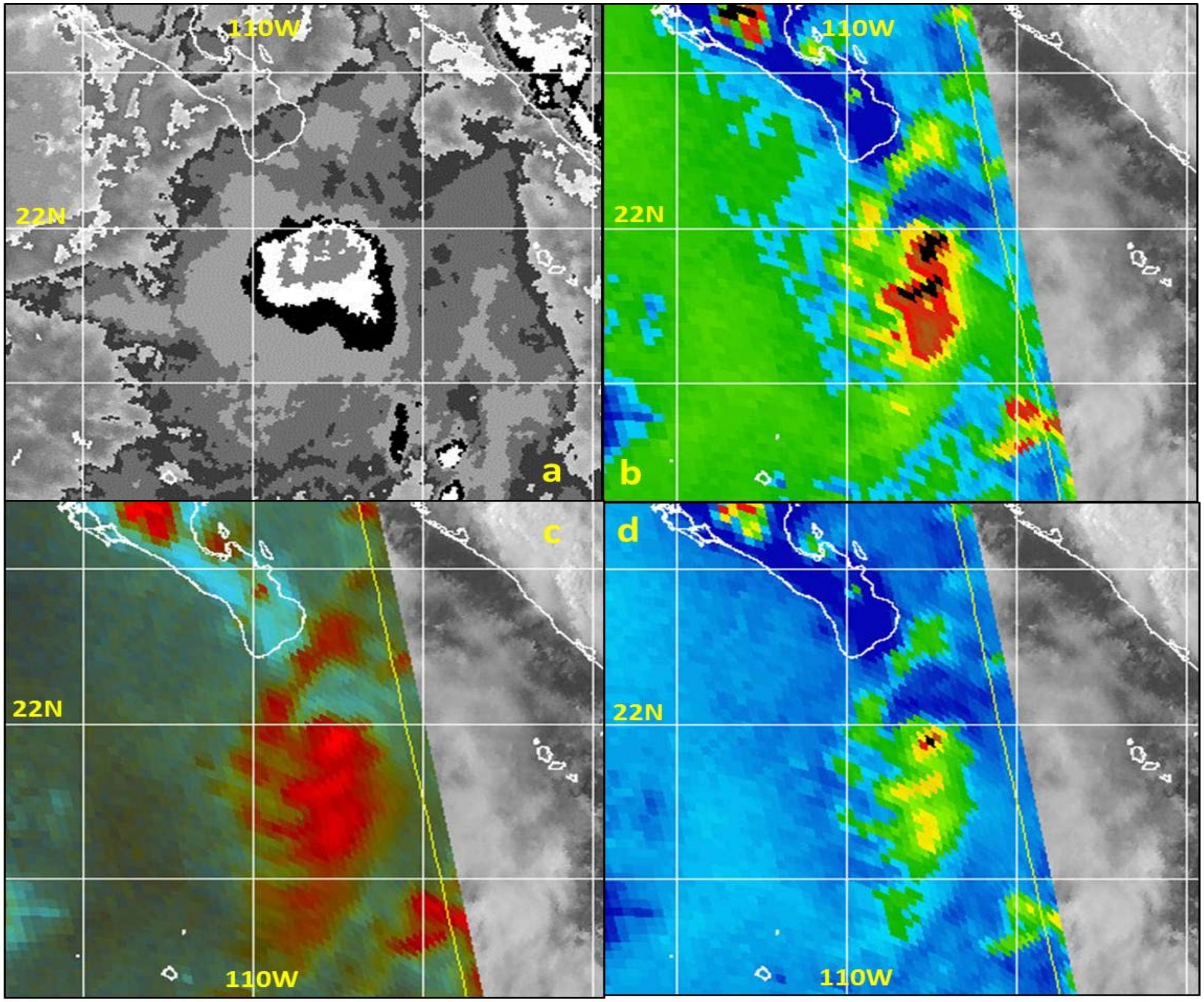

Figure 5. 2231 UTC GOES-15 Infrared image (a) and 2239 UTC SSMI passive microwave imagery (b, c, & d) on 28 AUG 2013, revealing the compact banding structure of Tropical Storm Juliette as it intensified and moved quickly toward the southwestern coast of Baja California Sur. Images courtesy of the U.S. Naval Research Laboratory, Monterey, CA.