NATIONAL HURRICANE CENTER TROPICAL CYCLONE REPORT

TROPICAL STORM BLANCA

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30 May–3 June 2021

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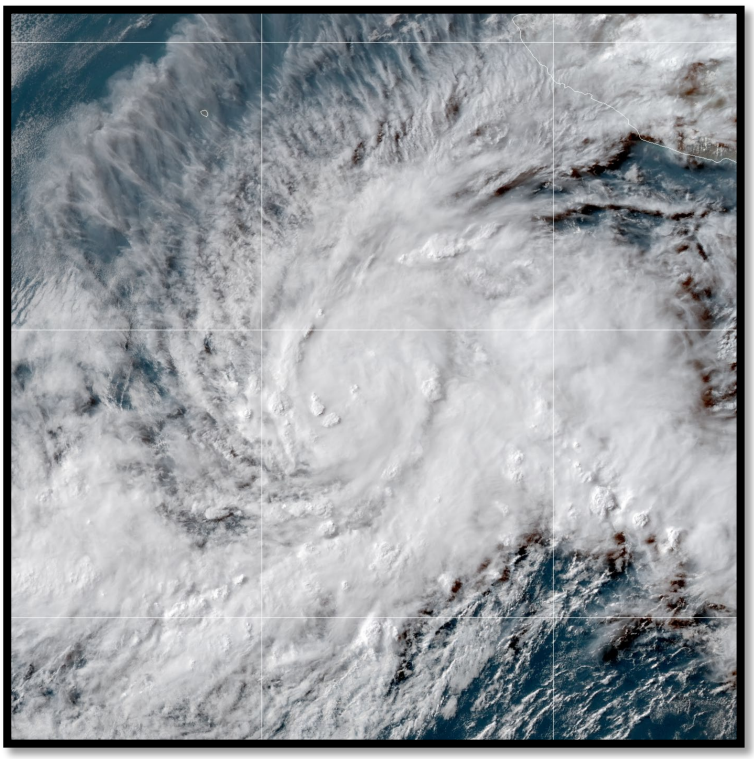

GOES-17 GEOCOLOR SATELLITE IMAGE OF TROPICAL STORM BLANCA AT 0000 UTC 1 JUNE 2021, SHORTLY BEFORE THE CYCLONE REACHED ITS PEAK INTENSITY.

Blanca was a tropical storm that developed several hundred miles offshore of the coast of southwestern Mexico. It moved roughly parallel to the coast, but remained well offshore and did not directly impact any major land areas.

Tropical Storm Blanca

30 MAY–3 JUNE 2021

SYNOPTIC HISTORY

Blanca appears to have originated from a tropical wave that moved across Central America and entered the eastern North Pacific Ocean on 26 and 27 May. Limited shower activity occurred near the wave axis on 27–28 May as it moved westward and passed well offshore of the coasts of El Salvador, Guatemala, and southern Mexico. Convection gradually increased near and ahead of the wave axis on 29 May as it interacted with the eastern Pacific monsoon trough, and a broad low- to mid-level circulation became evident in satellite imagery early on 30 May. Scatterometer wind data indicated that an area of low pressure with a well-defined surface center formed by 1200 UTC 30 May, about 405 n mi south-southwest of Acapulco, Mexico. Deep convection persisted near the low and showed increasing signs of organization during the next several hours, and a tropical depression formed by 1800 UTC that day, about 400 n mi southwest of Acapulco. The low-level center of the depression was initially displaced to the southeast of the persistent shower and thunderstorm activity, but the convective organization improved early on 31 May as more widespread convection with increased curvature developed near and over its center. It is estimated that the depression strengthened into Tropical Storm Blanca by 1200 UTC that day, when it was centered about 430 n mi south-southwest of Manzanillo, Mexico. The "best track" chart of Blanca'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].

Blanca moved generally west-northwestward around a mid-level ridge, roughly parallel to the coast of southwestern Mexico, but remained several hundred miles offshore. The tropical cyclone quickly strengthened on 31 May in a moist, unstable environment with weak (< 10 kt) deep-layer vertical wind shear and warm sea-surface temperatures. Curved convective bands became more prominent around Blanca's center in satellite imagery late on 31 May and early 1 June (cover photo; Fig. 4a), and it is estimated that the cyclone reached a peak intensity of 50 kt by 0600 UTC 1 June. Later that day, the storm encountered increasing southwesterly wind shear associated with a mid- to upper-level trough that extended across the southwestern United States and the Baja California peninsula. The combination of shear and entrainment of drier mid-level air into the core of Blanca eroded the convection on the western side of the circulation (Fig. 4b), which weakened the system and eventually led to its low-level center becoming exposed late on 1 June. The trough also weakened the steering ridge over Mexico, which led to a decrease

[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.

in Blanca's forward speed. The storm steadily weakened on 2 June due to the negative effects of wind shear and drier, more stable air in the surrounding environment, and scatterometer data indicated Blanca became a tropical depression by 1800 UTC that day. The low-level circulation became diffuse on 3 June, with multiple cloud swirls evident in satellite imagery while the mean center moved slowly westward. The depression lost all deep, organized convection late that day and became a remnant low by 0000 UTC 4 June, while located about 500 n mi south-southwest of the southern tip of the Baja California peninsula. The poorly-organized remnant low briefly drifted west-northwestward, then gradually turned westward on 4 June following the low-level trade wind flow. Scatterometer wind data from 1600 UTC 5 June indicated that the remnant low opened up into a trough of low pressure when it was located about 675 n mi southwest of the southern tip of the Baja California peninsula.

METEOROLOGICAL STATISTICS

Observations in Blanca (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), objective Advanced Dvorak Technique (ADT) estimates and Satellite Consensus (SATCON) 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 Global Precipitation Mission (GPM), 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 Blanca.

Blanca reached an estimated peak intensity of 50 kt from 0600 UTC to 1200 UTC 1 June. This intensity is supported by objective ADT estimates of around 50 kt during this time, as well as a blend of the subjective Dvorak estimates of 45 kt and 55 kt received from TAFB and SAB, respectively. An ASCAT-B pass at 0425 UTC 2 June showed winds up to 38 kt in the northeastern quadrant of Blanca, but this is deemed unrepresentative of Blanca's peak intensity since there was likely some undersampling of Blanca's small inner core by the instrument. The estimated minimum central pressure of 998 mb at 0600 UTC 1 June is based on the Knaff-Zehr-Courtney (KZC) pressure-wind relationship and the ADT estimate.

There were no reports of tropical-storm-force winds associated with Blanca from land stations, ships, or buoys. A Mexican Navy weather observation site on Clarion Island, Mexico reported a sustained wind of 25 kt with a gust to 33 kt at 1145 UTC 4 June, as Blanca passed about 165 n mi south-southwest of the island as a remnant low.

CASUALTY AND DAMAGE STATISTICS

There were no reports of casualties or damage associated with Blanca.

FORECAST AND WARNING CRITIQUE

The genesis of Blanca was forecast well in advance, but the tropical cyclone developed sooner than expected (Table 2). The disturbance from which Blanca developed was introduced into the Tropical Weather Outlook (TWO) with a low (<40%) chance of formation 126 h prior to genesis. The 5-day formation chances were raised to the medium (40–60%) and high (>60%) categories 48 h and 24 h before a tropical depression formed, respectively. For the 2-day outlook, a low formation chance was introduced into the TWO 48 h before genesis. The 2-day probabilities were increased to the medium and high categories only 24 h and 6 h before formation, respectively. The shorter lead times for the 2-day outlook were influenced by model guidance that indicated genesis would be delayed as the disturbance gradually consolidated and emerged from the eastern Pacific monsoon trough.

A verification of NHC official track forecasts for Blanca is given in Table 3a. Official NHC forecast track (OFCL) errors were lower than the mean official errors for the previous 5-yr period at all forecast times. Impressively, OFCL errors were more than 40% below the 5-yr average at 48 h and over 60% lower at 60 and 72 h. Meanwhile, the climatology-persistence (OCD5) errors were near or above average for Blanca during the 48–72 h period, which suggests that Blanca's track forecast was somewhat more challenging than for an average eastern Pacific tropical cyclone. A homogeneous comparison of the official track errors with selected guidance models is given in Table 3b. OFCL track forecasts outperformed much of the model guidance at most or all forecast hours. The consensus aids TVCE and the HFIP corrected consensus approach (HCCA) had slightly lower track errors at early forecast periods, but no individual model consistently outperformed OFCL.

A verification of NHC official intensity forecasts for Blanca is given in Table 4a. Official NHC forecast intensity (OFCL) errors were lower than the mean official errors for the previous 5-yr period at all forecast times except 96 h, which only had one verifying forecast. A homogeneous comparison of the official intensity errors with selected guidance models is given in Table 4b. OFCL performed better than most of the guidance through 36 h, as NHC forecasters correctly assessed that favorable environmental conditions would allow Blanca to strengthen early in its lifecycle. However, a majority of the intensity models had lower errors than OFCL from 48–96 h. Early NHC forecasts showed a gradual weakening of Blanca, but hostile environmental conditions led to a more rapid deterioration of the system on 2 June. The Statistical Hurricane Intensity Prediction Scheme (DSHP) performed very poorly, and its pronounced high bias at later forecast periods likely contributed to larger errors in NHC forecast. Overall, the Global Forecast System (GFSI) was the best-performing intensity model for Blanca.

There were no land-based watches or warnings associated with Blanca.

Table 1. Best track for Tropical Storm Blanca, 30 May–3 June 2021.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
30 / 1200	10.8	102.9	1007	30	low
30 / 1800	11.2	103.7	1007	30	tropical depression
31 / 0000	11.6	104.7	1007	30	"
31 / 0600	12.0	106.0	1006	30	"
31 / 1200	12.5	107.2	1004	35	tropical storm
31 / 1800	13.1	108.2	1002	40	"
01 / 0000	13.6	109.0	1000	45	"
01 / 0600	13.9	109.5	998	50	"
01 / 1200	14.2	110.0	999	50	"
01 / 1800	14.6	110.6	1000	45	"
02 / 0000	14.8	111.2	1001	45	"
02 / 0600	15.0	111.7	1002	40	"
02 / 1200	15.2	112.1	1004	35	"
02 / 1800	15.4	112.6	1005	30	tropical depression
03 / 0000	15.5	113.0	1005	30	"
03 / 0600	15.5	113.3	1005	30	"
03 / 1200	15.5	113.7	1005	30	"
03 / 1800	15.5	114.0	1005	30	"
04 / 0000	15.7	114.5	1007	25	low
04 / 0600	16.1	115.1	1007	25	"
04 / 1200	16.3	116.0	1007	25	"
04 / 1800	16.3	116.8	1007	25	"
05 / 0000	16.2	117.6	1007	25	"
05 / 0600	16.1	118.3	1008	20	"
05 / 1200	16.2	119.0	1009	20	"
05 / 1800					dissipated
01 / 0600	13.9	109.5	998	50	minimum pressure and maximum wind

Table 2. Number of hours in advance of formation of Blanca associated with the first NHC Tropical Weather Outlook forecast in the indicated likelihood category. Note that the timings for the "Low" category do not include forecasts of a 0% chance of genesis.

	Hours Before Genesis	
	48-Hour Outlook	**120-Hour Outlook**
Low (<40%)	48	126
Medium (40%-60%)	24	48
High (>60%)	6	24

Table 3a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Blanca. 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	60	72	96	120
OFCL	**19.8**	**25.4**	**26.9**	**30.2**	**30.2**	**28.7**	**40.9**	
OCD5	35.4	72.3	112.3	148.7	207.2	267.1	164.5	
Forecasts	15	13	11	9	7	5	1	
OFCL (2016-20)	21.3	33.1	44.0	54.6	78.4	76.0	95.9	116.6
OCD5 (2016-20)	33.1	69.4	107.8	147.0	186.4	219.7	280.2	342.0

Table 3b. Homogeneous comparison of selected track forecast guidance models (in n mi) for Blanca. 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	60	72	96	120
OFCL	19.5	23.2	26.6	29.6	28.1	22.3	40.9	
OCD5	37.1	74.1	120.8	161.4	226.0	297.7	164.5	
GFSI	**16.3**	27.8	42.0	57.7	69.0	70.2	141.8	
HWFI	25.5	36.2	45.5	54.5	66.9	69.0	133.6	
HMNI	21.4	24.1	**24.1**	**27.0**	31.7	33.3	75.2	
EMXI	27.0	35.7	40.6	35.6	39.6	50.3	104.6	
NVGI	38.8	69.2	96.1	105.8	112.5	156.5	176.0	
CMCI	27.7	34.9	42.2	49.5	64.0	79.7	**39.9**	
CTCI	**16.6**	24.4	31.1	44.4	53.2	47.8	66.3	
TVCE	**16.4**	**20.6**	**25.6**	30.3	34.6	28.8	60.6	
HCCA	**18.1**	**23.0**	29.7	30.7	29.6	26.0	42.8	
AEMI	**18.2**	25.8	32.2	35.7	30.8	31.0	71.7	
TABS	34.3	58.5	70.5	81.0	96.9	108.0	120.0	
TABM	25.2	43.9	51.1	57.5	80.5	98.4	173.8	
TABD	35.9	79.0	131.9	195.2	263.0	310.4	481.8	
Forecasts	12	12	10	8	6	4	1	

Table 4a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Blanca. 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	60	72	96	120
OFCL	**4.0**	**5.4**	**5.5**	**7.8**	**10.0**	**12.0**	20.0	
OCD5	6.0	10.4	11.6	16.0	19.4	18.6	23.0	
Forecasts	15	13	11	9	7	5	1	
OFCL (2016-20)	5.6	9.0	10.9	12.6	15.2	15.3	16.0	16.7
OCD5 (2016-20)	7.2	12.0	15.3	17.6	17.9	20.4	21.2	20.8

Table 4b. Homogeneous comparison of selected intensity forecast guidance models (in kt) for Blanca. 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 4a due to the homogeneity requirement.

Model ID	Forecast Period (h)							
	12	24	36	48	60	72	96	120
OFCL	3.8	5.4	5.5	7.5	8.3	10.0	20.0	
OCD5	7.2	10.8	12.3	17.4	20.3	18.2	23.0	
HWFI	4.2	5.6	5.8	**5.5**	**7.3**	**6.5**	**7.0**	
HMNI	5.8	7.7	8.2	**5.8**	**4.5**	**3.2**	**3.0**	
DSHP	7.0	10.3	11.8	16.4	19.7	20.2	24.0	
LGEM	6.8	8.4	8.1	8.0	**5.0**	**6.2**	**1.0**	
ICON	5.0	6.9	7.3	7.6	8.5	**7.0**	**9.0**	
IVCN	4.2	5.5	5.7	**6.5**	**6.8**	**5.5**	**6.0**	
IVDR	4.0	**4.6**	**4.9**	**5.4**	**5.3**	**4.2**	**4.0**	
CTCI	4.4	5.8	6.5	**4.8**	**3.8**	**1.8**	**7.0**	
GFSI	**3.6**	**3.7**	**5.2**	**3.6**	**2.5**	**3.8**	**2.0**	
EMXI	7.4	8.9	9.1	**7.2**	**3.8**	**3.8**	**3.0**	
AEMI	4.4	**4.4**	6.1	**4.8**	**3.0**	**3.2**	**5.0**	
HCCA	5.3	6.9	6.9	**7.2**	**7.5**	**5.5**	**1.0**	
Forecasts	12	12	10	8	6	4	1	

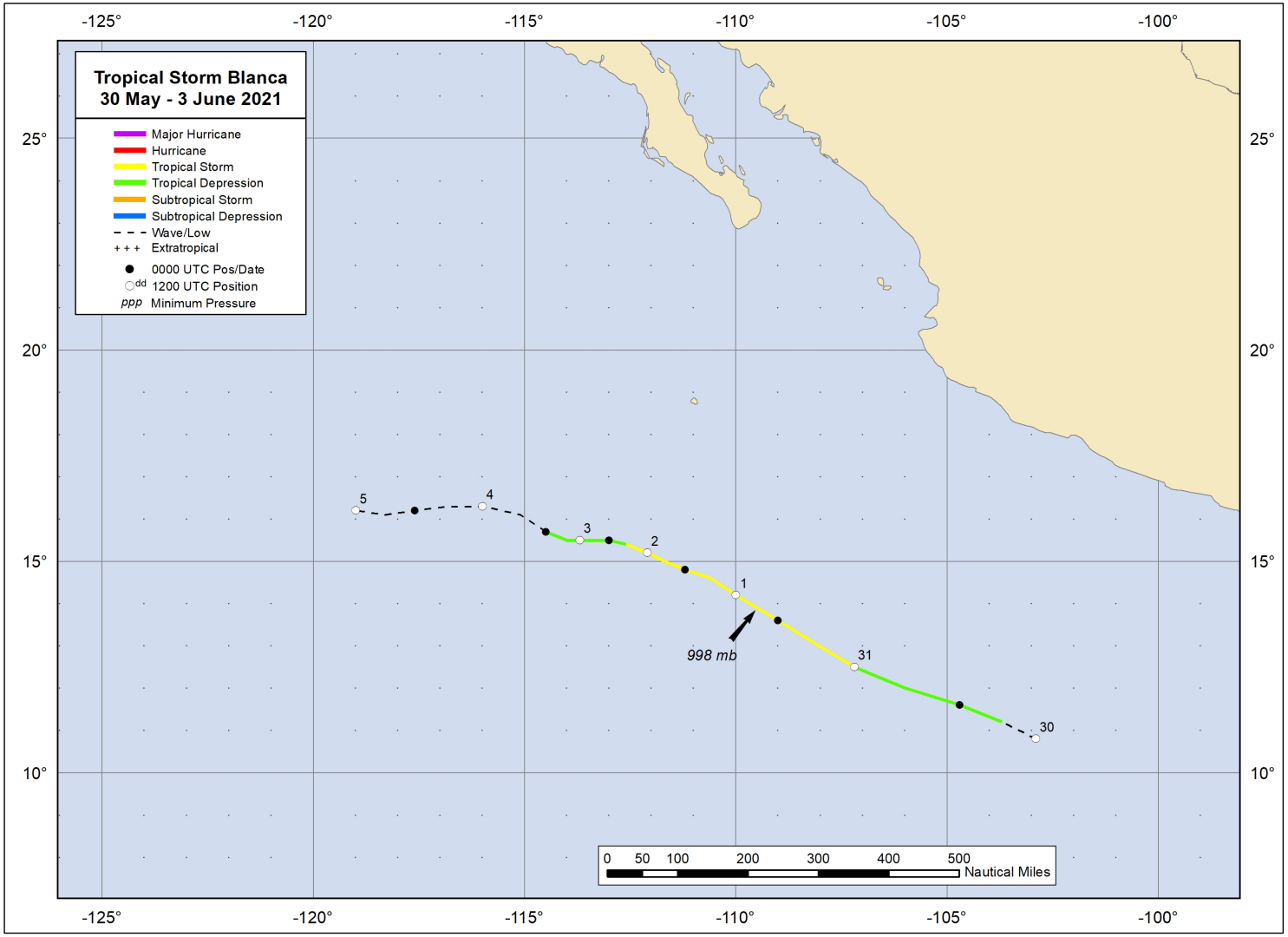

Figure 1. Best track positions for Tropical Storm Blanca, 30 May–3 June 2021.

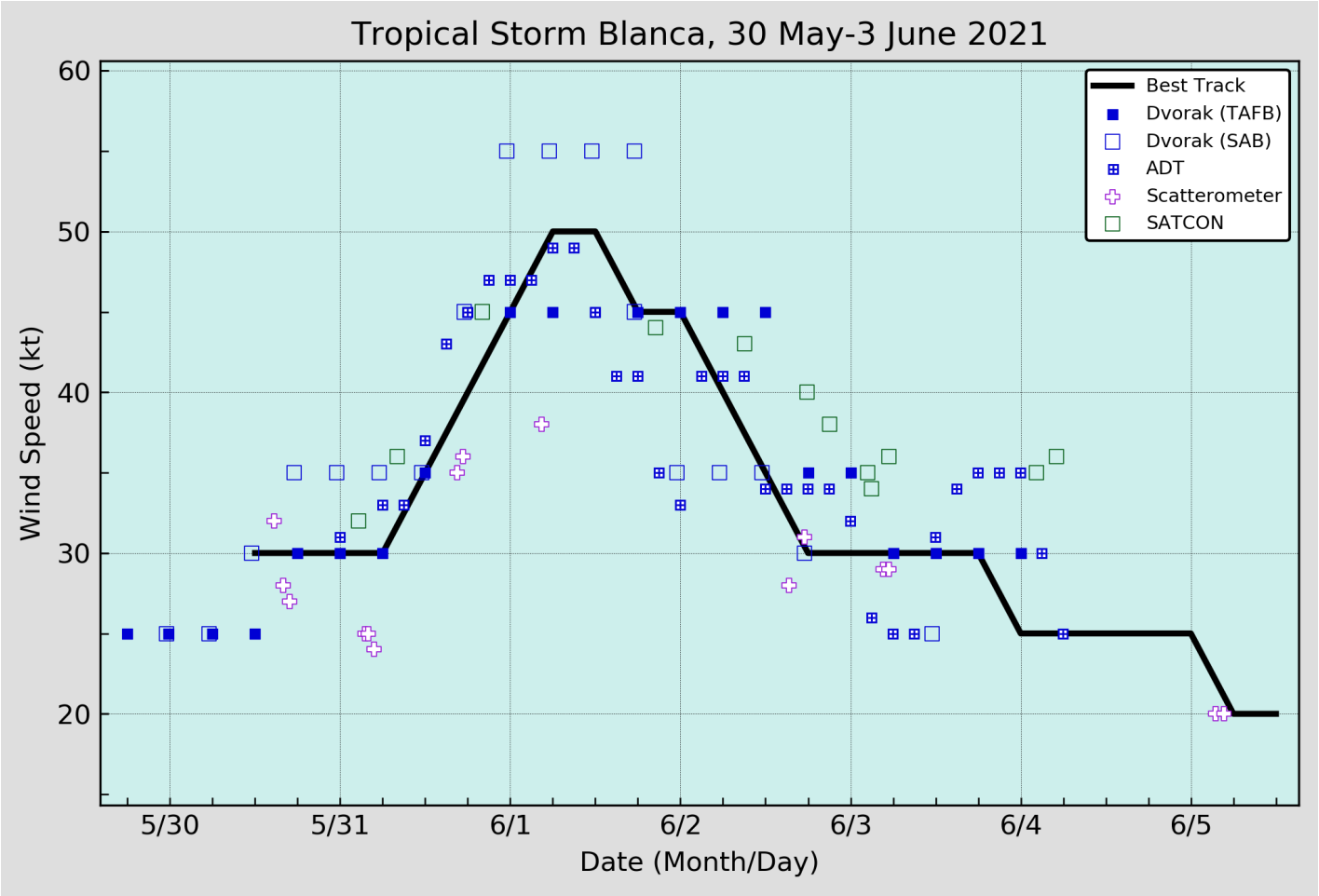

Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Tropical Storm Blanca, 30 May–3 June 2021. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies. Dashed vertical lines correspond to 0000 UTC.

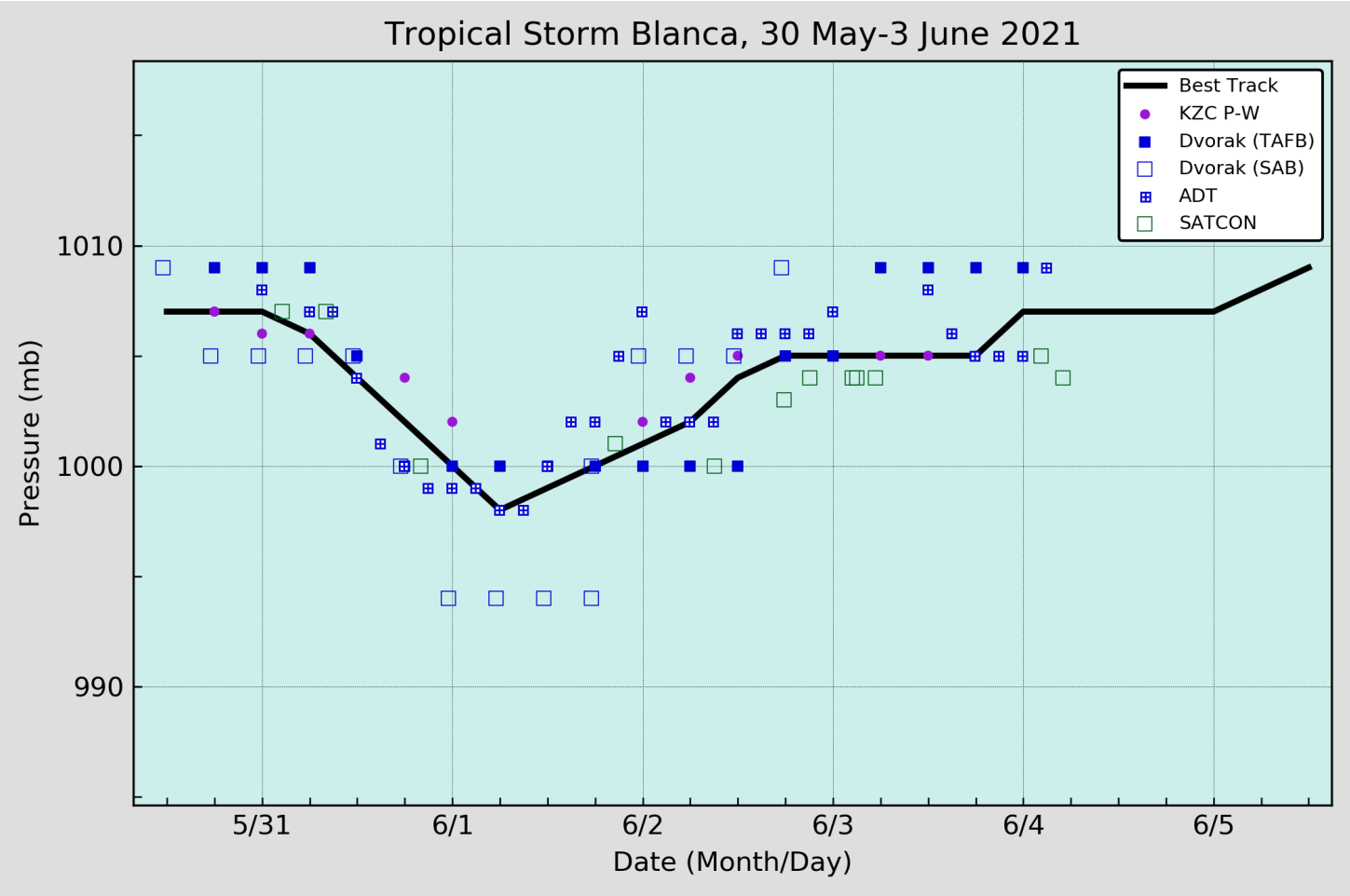

Figure 3. Selected pressure observations and best track minimum central pressure curve for Tropical Storm Blanca, 30 May–3 June 2021. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies. KZC P-W refers to pressure estimates derived using the Knaff-Zehr-Courtney pressure-wind relationship. Dashed vertical lines correspond to 0000 UTC.

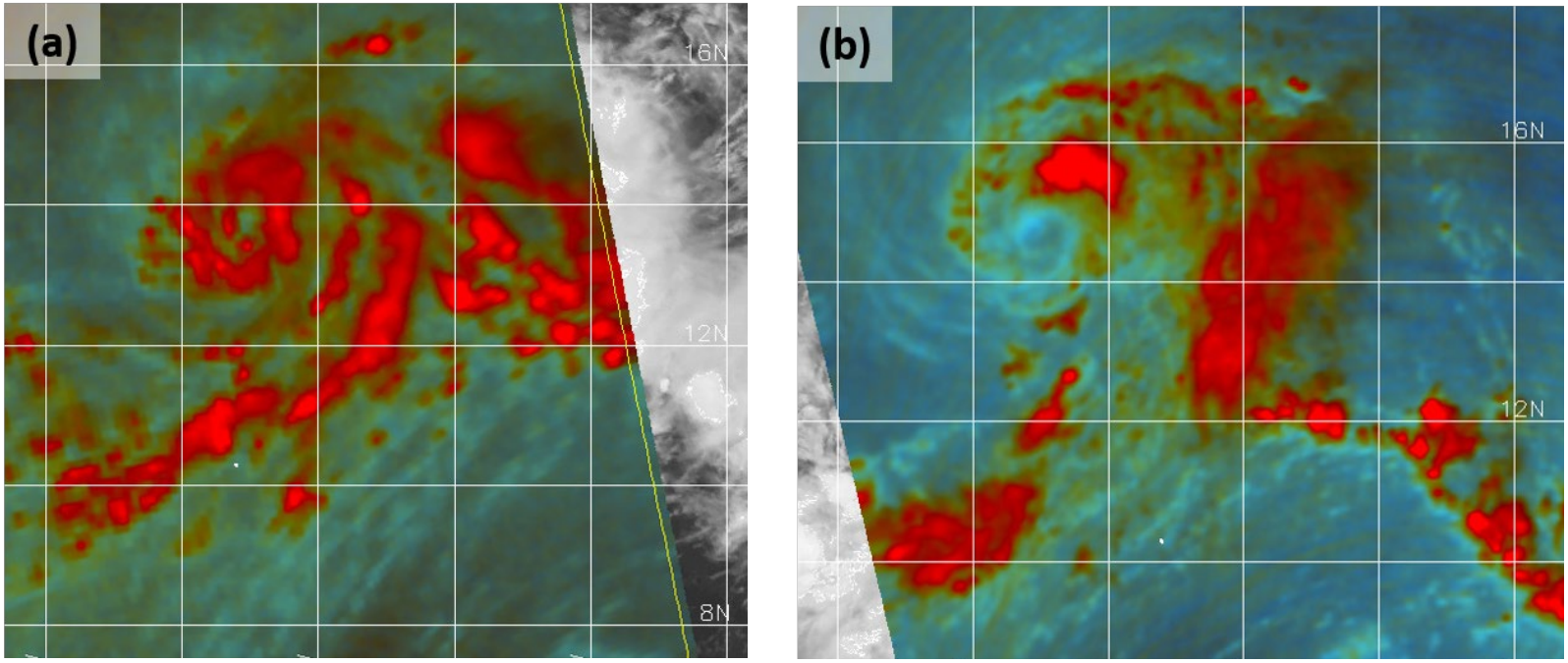

Figure 4. Passive microwave color composite satellite imagery of Tropical Storm Blanca before and after it reached its peak intensity. (a) 2346 UTC 31 May SSMIS imagery (91 GHz) showing curved bands of deep convection surrounding the center of Blanca. (b) 2030 UTC 1 June AMSR2 imagery (89 GHz) showing the effects of dry air and southwesterly vertical wind shear less than 24 hours later, with the only deep convection noted north-northeast (downshear) of Blanca's center.