NATIONAL HURRICANE CENTER TROPICAL CYCLONE REPORT

HURRICANE BLAS

(EP022022)

14–19 June 2022

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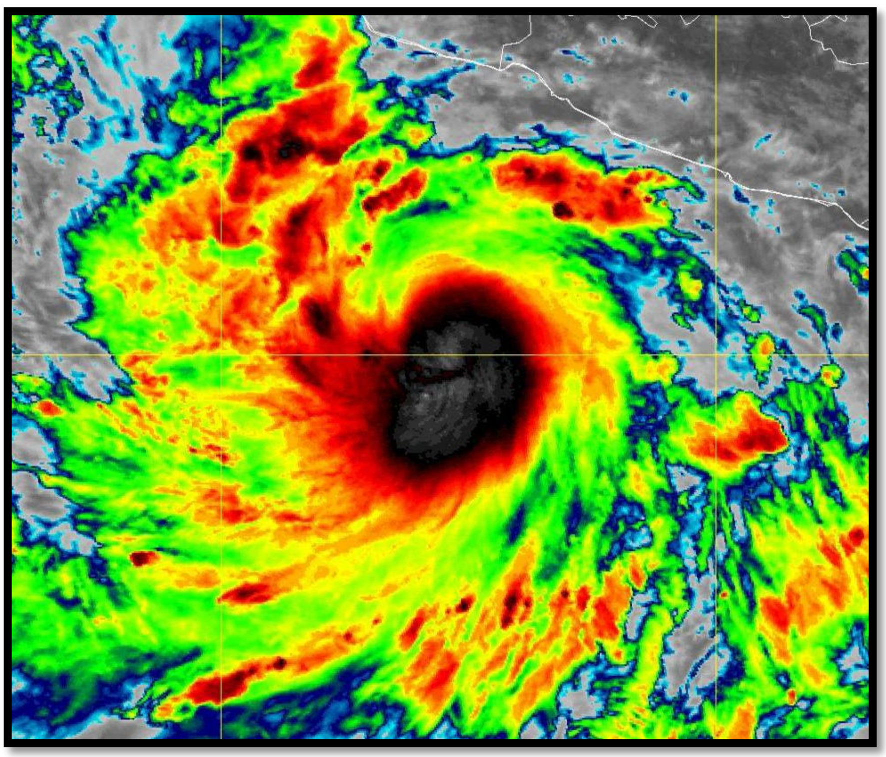
26 October 2022



GOES-16 INFRARED SATELLITE IMAGE OF CATEGORY 1 HURRICANE BLAS AT 1800 UTC 15 JUNE 2022.
IMAGE COURTESY NOAA/NESDIS/STAR.

Blas was a category 1 hurricane (on the Saffir-Simpson Hurricane Wind Scale) that passed well offshore of the coast of southwestern Mexico. The hurricane weakened as it moved away from land and dissipated over the central portion of the eastern North Pacific.

Hurricane Blas

14–19 JUNE 2022

SYNOPTIC HISTORY

Blas does not appear to have originated from a tropical wave. An area of disturbed weather developed along the eastern North Pacific monsoon trough on 10 June, a couple of hundred n mi offshore of the coast of southern Mexico. The associated convection resulted in a broad, mid-level cyclonic circulation that moved slowly westward over the next couple of days. The disturbance struggled to sustain deep convection on 11–12 June as it contended with some moderate deep-layer shear and bouts of drier mid-level air from the north and west. On 13 June, a larger area of convection flared up along the monsoon trough west of 100°W and gradually consolidated within a broad low-level circulation. Scatterometer passes that day indicated the disturbance was producing 25–30 kt winds, but the surface circulation was poorly defined as the elongated system remained embedded in the monsoon trough. After a brief lull in convective activity, deep convection returned shortly after 0000 UTC 14 June and quickly became organized around a well-defined circulation center that became evident in passive microwave imagery early that day (Fig. 1a). It is estimated that Tropical Storm Blas formed at 0600 UTC 14 June, when it was centered about 250 n mi southwest of Acapulco, Mexico. The "best track" chart of Blas' path is given in Fig. 2, with the wind and pressure histories shown in Figs. 3 and 4, respectively. The best track positions and intensities are listed in Table 1[1].

Blas initially drifted north-northeastward on 14 June within weak steering currents, then moved westward to west-northwestward over the next couple of days as a mid-level ridge built to the north of the cyclone. Blas underwent a period of rapid intensification on 14–15 June as it moved over 29°C sea surface temperatures (SSTs) within a low to moderate deep-layer shear environment. A well-defined inner core and a mid-level eye feature was noted in microwave imagery (Fig. 1b), and it is estimated that Blas became a hurricane by 1200 UTC 15 June while it was centered about 185 n mi southwest of Acapulco. The hurricane continued to strengthen and reached a peak intensity of 75 kt just 6 h later (cover photo). Soon thereafter, increasing deep-layer easterly shear over the hurricane eroded the northern and eastern portions of its eyewall (Fig. 1c), and the vortex became vertically tilted as the shear displaced the low- and mid-level centers. This led to a slight weakening of the hurricane on 16 June while it continued moving west-northwestward, roughly parallel to the coast of Mexico. Early on 17 June, Blas became better organized in conventional satellite imagery as deep convection increased and its center became embedded deeper within an expanding central dense overcast. The inner core structure also improved in microwave imagery early that day (Fig. 1d), and it is estimated that Blas again

[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.

reached a peak intensity of 75 kt by 0600 UTC 17 June, when it was located about 190 n mi southwest of Manzanillo, Mexico.

Late on 17 June, rapid weakening commenced as Blas succumbed to hostile atmospheric conditions and cooler SSTs. The low-level center of the cyclone became exposed as moderate northeasterly shear stripped away most of its convection, and Blas weakened into a tropical storm by 0600 UTC 18 June. Some new deep convection developed over the eastern portion of Blas' circulation later that day, but this convection collapsed on 19 June while Blas moved into a drier, more stable airmass and over cooler SSTs. Blas degenerated into a 35-kt post-tropical cyclone at 1800 UTC that day when it was centered about 270 n mi south-southwest of the southern tip of the Baja California peninsula. It weakened to a remnant low 12 h later and then continued to spin down over the next couple of days while moving generally westward across the central portion of the eastern Pacific basin. Scatterometer data indicate the post-tropical cyclone opened into a trough and dissipated by 0000 UTC 23 June, about 450 n mi west-southwest of the southern tip of the Baja California peninsula.

METEOROLOGICAL STATISTICS

Observations in Blas (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 Blas.

Ship reports of winds of tropical storm force associated with Blas are given in Table 2.

Winds and Pressure

Blas' peak intensity of 75 kt from 1800 UTC 15 June to 0600 UTC 16 June is based on a blend of objective and subjective satellite estimates. TAFB and SAB provided consensus T4.5/77 kt Dvorak current intensity estimates during this period, while the ADT and SATCON estimates ranged from 68–82 kt. It is estimated that Blas reached a 75-kt intensity again from 0600 UTC to 1800 UTC 17 June, when its convective structure improved in passive microwave imagery and the ADT and SATCON estimates peaked at 80 kt and 72 kt, respectively. The estimated minimum pressure of 978 mb at 0000 UTC 16 June is based on the Knaff-Zehr-Courtney (KZC) pressure-wind relationship.

Some of the satellite intensity estimates on 16–17 June were notably higher than the peak intensity reflected in this report. During this period, Blas encountered 20–25 kt of northeasterly shear, which caused an asymmetry in the vertical structure of the hurricane (Fig. 5). Passive microwave data indicate that Blas' mid-level center was consistently displaced 15–20 n mi downshear of its low-level center. Most of the higher satellite intensity estimates applied either an embedded center or central dense overcast pattern, both of which are highly sensitive to the center position of the storm. Since the center positions of these higher estimates were inconsistent with the final best track positions, the estimates were deemed too high.

A Mexican Navy automated weather observation site on Socorro Island reported a maximum sustained wind of 34 kt at 1545 UTC 18 June with a gust to 45 kt, as the center of Blas passed about 35 n mi southwest of the island.

Rainfall and Flooding

Although the center of Blas remained well offshore, the combination of moisture from Blas and a nearby tropical wave interacted with the topography of southwestern Mexico to produce heavy rainfall along portions of the coast, particularly in the state of Guerrero (Fig. 6). A total of 12.60 inches (320.0 mm) of rainfall was measured at Laguna de Coyuca. Elsewhere, 7.95 inches (202.0 mm) fell at Kilometro 21, and 7.92 inches (201.2 mm) was reported at the Observatorio de Acapulco. This heavy rainfall resulted in some flash flooding, river flooding, and at least a couple of landslides.

CASUALTY AND DAMAGE STATISTICS

There are no known direct deaths[2] associated with Blas. According to media reports, two bodies were discovered floating in the water at Playa Manzanillo in Acapulco early on 16 June. However, their cause of death is unknown, and it remains unclear whether the fatalities were storm related as of the writing of this report.

Media reports indicate there was some minor damage in the state of Guerrero. A couple of dozen vehicles were stranded in flooded neighborhoods in and around Acapulco, and a sinkhole was reported on the Acapulco-Zihuatanejo Bypass. Gusty winds over the saturated ground downed a few trees, fences, and utility poles. Large waves and rough surf associated with Blas caused some beach erosion along the coast.

[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.

FORECAST AND WARNING CRITIQUE

The timing and location of the genesis of Blas was forecast well (Table 3, Fig. 7). The disturbance from which Blas developed was introduced into the Tropical Weather Outlook (TWO) with a low (<40%) chance of formation 156 h prior to genesis. The 5-day formation chances were increased to the medium (40–60%) and high (>60%) categories 144 h and 90 h before Blas formed, respectively. Almost all of the genesis areas highlighted in the 5-day graphical TWO (Fig. 7) captured the location where Blas formed. For the 2-day outlook, a low formation chance was added into the TWO 102 h before formation. The 2-day probabilities were raised to the medium and high categories 42 h and 24 h before Blas developed, respectively. Although Blas took a little longer to form than initially forecast, the near-term genesis forecasts anticipated the timing of its development quite well.

A verification of NHC official track forecasts for Blas is given in Table 4a. Official track forecast (OFCL) errors were greater than the mean official errors for the previous 5-yr period from 12–48 h, but lower than the mean official errors from 60–120 h. Some of the above-average track errors at early forecast times may have been the result of difficulties in identifying the initial center position of the highly-sheared tropical cyclone, especially during periods when scatterometer or microwave data were unavailable in real time. A homogeneous comparison of the official track errors with selected guidance models is given in Table 4b. Due to the homogeneity requirement, the HFIP corrected consensus approach (HCCA) was not included in the verification. One of the best-performing track models was the Florida State Superensemble (FSSE), which had lower errors than OFCL at most forecast times. The HMON (HMNI) and HWRF (HWFI) performed very poorly, with much larger track errors than OFCL at all forecast times. These models were generally too fast with the forward speed of Blas, and early HWRF runs also had a significant southward (left-of-track) bias.

A verification of NHC official intensity forecasts for Blas is given in Table 5a. Official intensity forecast (OFCL) errors were lower than the mean official errors for the previous 5-yr period at all forecast times. The climatology and persistence (OCD5) errors for Blas were lower than the 5-yr means at all forecast times, which suggests that its intensity was easier to forecast than an average east Pacific tropical cyclone. NHC forecasters correctly recognized that environmental conditions would allow Blas to quickly strengthen into a hurricane, although its intensity peaked a little earlier and slightly lower than forecast. A homogeneous comparison of the official intensity errors with selected guidance models is given in Table 5b. Once again, HCCA was not included in the verification due to the homogeneity requirement. The NHC intensity forecast outperformed many of the models individually, but OFCL was bested by some of the consensus aids including ICON, IVCN, and IVDR (double-weighted HWRF, HMON, and CTCI).

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

Table 1. Best track for Hurricane Blas, 14–19 June 2022.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
14 / 0600	13.6	102.5	1004	35	tropical storm
14 / 1200	14.0	102.1	1002	40	"
14 / 1800	14.4	102.0	1000	45	"
15 / 0000	14.6	102.0	998	45	"
15 / 0600	14.7	102.1	994	55	"
15 / 1200	14.9	102.3	987	65	hurricane
15 / 1800	15.1	102.5	979	75	"
16 / 0000	15.4	103.0	978	75	"
16 / 0600	15.7	103.7	979	75	"
16 / 1200	15.8	104.3	981	70	"
16 / 1800	16.1	105.1	982	70	"
17 / 0000	16.6	105.9	982	70	"
17 / 0600	17.0	106.9	979	75	"
17 / 1200	17.4	108.2	979	75	"
17 / 1800	17.4	109.2	980	75	"
18 / 0000	17.6	109.9	986	65	"
18 / 0600	17.8	110.4	993	55	tropical storm
18 / 1200	18.0	110.8	997	45	"
18 / 1800	18.3	111.3	999	45	"
19 / 0000	18.6	111.7	1001	40	"
19 / 0600	18.8	112.0	1002	40	"
19 / 1200	18.9	112.2	1002	40	"
19 / 1800	19.0	112.4	1003	35	low
20 / 0000	19.1	112.7	1004	35	"
20 / 0600	19.1	113.0	1005	30	"
20 / 1200	19.1	113.4	1006	30	"
20 / 1800	19.0	113.8	1006	30	"
21 / 0000	19.0	114.3	1007	25	"
21 / 0600	19.1	114.6	1007	25	"
21 / 1200	19.2	114.9	1007	25	"

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
21 / 1800	19.3	115.4	1007	25	"
22 / 0000	19.3	115.9	1007	25	"
22 / 0600	19.3	116.4	1008	20	"
22 / 1200	19.3	116.6	1008	20	"
22 / 1800	19.2	116.8	1009	20	"
23 / 0000					dissipated
16 / 0000	15.4	103.0	978	75	minimum pressure

Table 2. Selected ship reports with winds of at least 34 kt for Hurricane Blas, 14–19 June 2022.

Date/Time (UTC)	Ship call sign	Latitude (°N)	Longitude (°W)	Wind direction/ speed (kt)	Pressure (mb)
16 / 1900	VRUC3	18.3	103.8	120 / 40	1010.4
16 / 2000	VRUC3	18.5	104.1	090 / 37	1010.4
17 / 0000	3FDF7	18.4	104.2	120 / 36	1005.7

Table 3. Number of hours in advance of formation of Blas 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%)	102	156
Medium (40%-60%)	42	144
High (>60%)	24	90

Table 4a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Hurricane Blas, 14–19 June 2022. 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	25.2	38.0	55.5	59.1	**61.0**	**59.6**	**68.4**	**99.6**
OCD5	38.0	65.7	100.1	108.1	109.8	119.4	169.8	108.1
Forecasts	20	18	16	14	12	10	6	2
OFCL (2017-21)	21.9	33.8	45.6	56.9	74.8	79.9	99.5	121.3
OCD5 (2017-21)	35.8	72.3	112.7	155.0	198.7	239.0	309.2	372.2

Table 4b. Homogeneous comparison of selected track forecast guidance models (in n mi) for Hurricane Blas, 14–19 June 2022. 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	21.5	37.0	54.8	56.8	68.3	52.1	56.6	105.1
OCD5	34.5	61.8	96.7	95.9	112.7	143.1	227.7	148.0
GFSI	23.7	43.4	62.8	72.5	89.9	87.9	65.2	**13.3**
HMNI	31.1	58.1	87.9	110.9	139.8	144.9	208.1	282.3
HWFI	27.2	52.4	84.9	100.3	127.0	112.3	105.9	210.6
EGRI	24.9	48.5	73.1	90.1	117.8	119.8	143.1	142.1
EMXI	**20.5**	**34.1**	**49.9**	**53.6**	69.3	58.5	**53.5**	162.0
CMCI	26.1	48.9	73.5	70.9	**66.5**	61.4	**39.6**	**100.1**
NVGI	26.8	64.0	104.8	147.6	176.6	198.7	323.2	304.3
CTCI	22.3	**29.6**	**35.4**	**37.5**	**50.1**	**46.0**	100.1	227.2
AEMI	25.6	45.5	65.7	79.7	96.3	97.5	71.1	**45.4**
FSSE	**18.1**	**30.5**	**47.4**	**53.8**	70.1	61.2	**25.9**	**91.0**
TVCX	**20.7**	**34.8**	**51.5**	57.7	74.5	60.1	57.0	147.8
GFEX	**18.9**	**35.4**	**49.8**	59.8	78.1	71.4	**36.4**	**81.6**
TVCE	21.8	39.8	58.5	66.7	87.0	71.8	84.3	165.0
TVDG	**21.4**	37.4	54.9	63.3	81.4	69.5	61.3	130.7
TABD	23.1	**32.7**	**47.8**	61.0	84.2	85.3	57.1	**61.0**
TABM	27.7	48.5	80.2	115.0	148.5	168.8	146.3	123.0
TABS	44.2	99.0	155.4	202.9	240.6	270.0	267.0	234.2
Forecasts	15	13	11	9	8	6	3	1

Table 5a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Hurricane Blas, 14–19 June 2022. 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	**5.0**	**6.9**	**6.9**	**4.3**	**6.2**	**9.5**	**3.3**	**0.0**
OCD5	6.3	11.8	14.1	14.4	18.1	19.2	8.0	8.0
Forecasts	20	18	16	14	12	10	6	2
OFCL (2017-21)	5.5	9.1	11.1	12.9	15.3	15.6	16.4	17.0
OCD5 (2017-21)	7.0	12.2	15.8	18.6	20.4	21.2	22.3	21.8

Table 5b. Homogeneous comparison of selected intensity forecast guidance models (in kt) for Hurricane Blas, 14–19 June 2022. 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 5a due to the homogeneity requirement.

Model ID	Forecast Period (h)							
	12	24	36	48	60	72	96	120
OFCL	4.7	6.5	5.5	3.9	7.5	10.0	3.3	0.0
OCD5	5.5	10.8	13.5	13.3	18.5	20.5	4.7	8.0
GFSI	6.5	8.8	7.2	5.2	**4.9**	**8.0**	**1.7**	1.0
HMNI	**4.4**	**6.2**	8.1	9.0	8.9	12.3	5.7	7.0
HWFI	5.0	8.5	10.4	9.1	**6.0**	**7.2**	14.0	16.0
EGRI	5.7	10.5	9.4	10.2	15.4	19.8	**1.7**	2.0
EMXI	5.9	9.6	12.2	10.8	11.1	14.3	12.7	15.0
CMCI	5.3	9.8	12.4	11.6	18.1	23.2	9.7	7.0
NVGI	7.0	12.3	10.7	7.8	14.2	20.5	12.0	8.0
CTCI	**4.6**	**6.2**	6.9	6.4	**5.1**	11.0	11.3	16.0
AEMI	6.6	9.2	8.4	7.4	11.9	18.2	4.3	4.0
FSSE	**4.1**	**4.2**	**3.5**	3.9	**6.4**	**9.7**	4.3	0.0
DSHP	5.3	9.0	9.5	8.3	9.1	**8.8**	13.0	11.0
LGEM	5.5	8.6	7.7	4.4	**6.9**	10.3	**1.7**	3.0
ICON	**3.9**	**5.2**	**5.3**	**3.3**	**4.5**	**7.2**	6.0	4.0
IVCN	**3.6**	**4.8**	**4.5**	**3.3**	**3.6**	**7.5**	**2.7**	0.0
IVDR	**3.4**	**5.0**	**5.0**	**3.7**	**3.1**	**7.2**	**1.7**	0.0
Forecasts	15	13	11	9	8	6	3	1

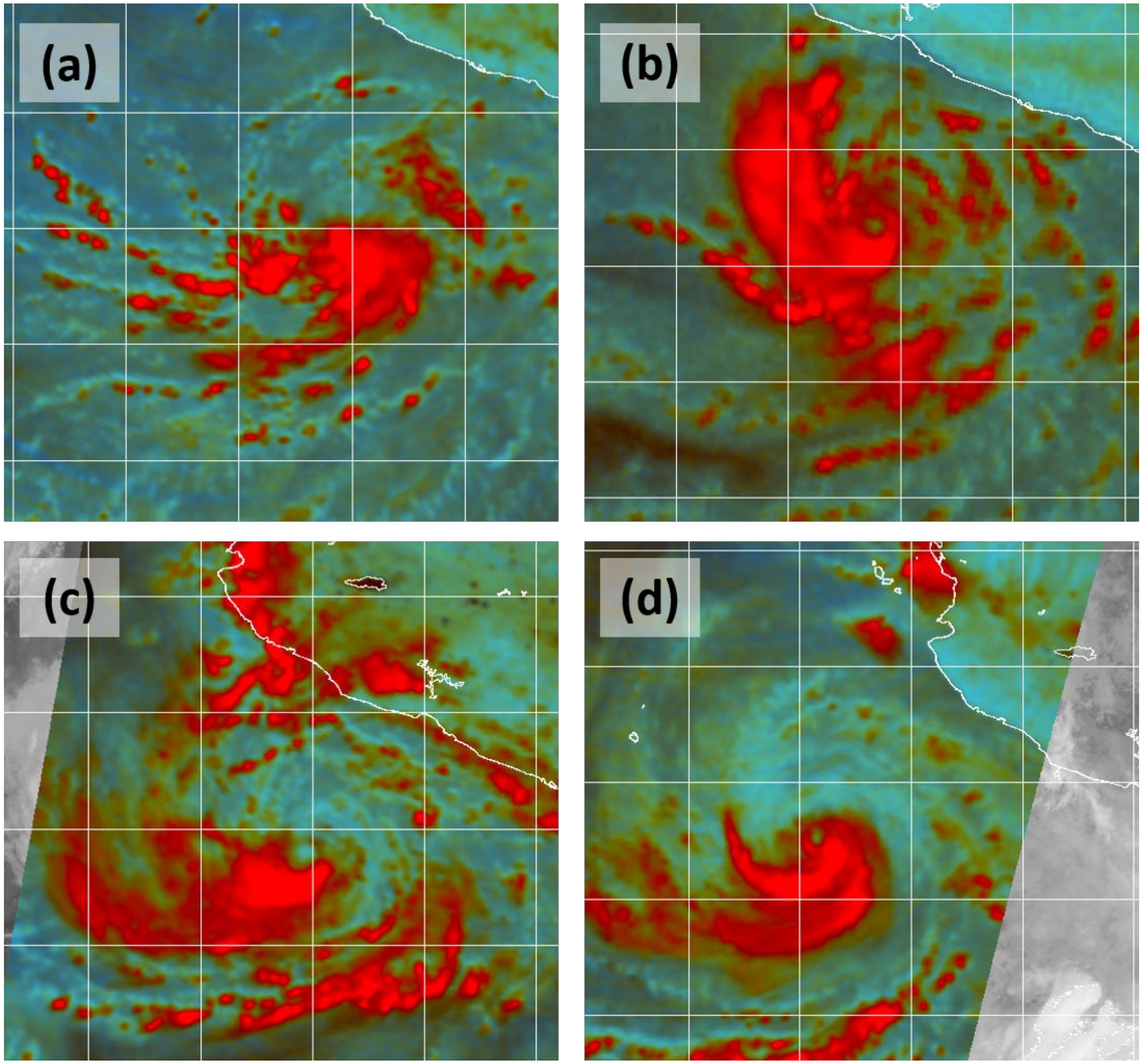


Figure 1. A series of color composite passive microwave images of Blas: (a) 0838 UTC 14 June AMSR2 89 GHz; (b) 1147 UTC 15 June SSMIS 91 GHz; (c) 0826 UTC 16 June AMSR2 89 GHz; (d) 0908 UTC 17 June AMSR2 89 GHz.

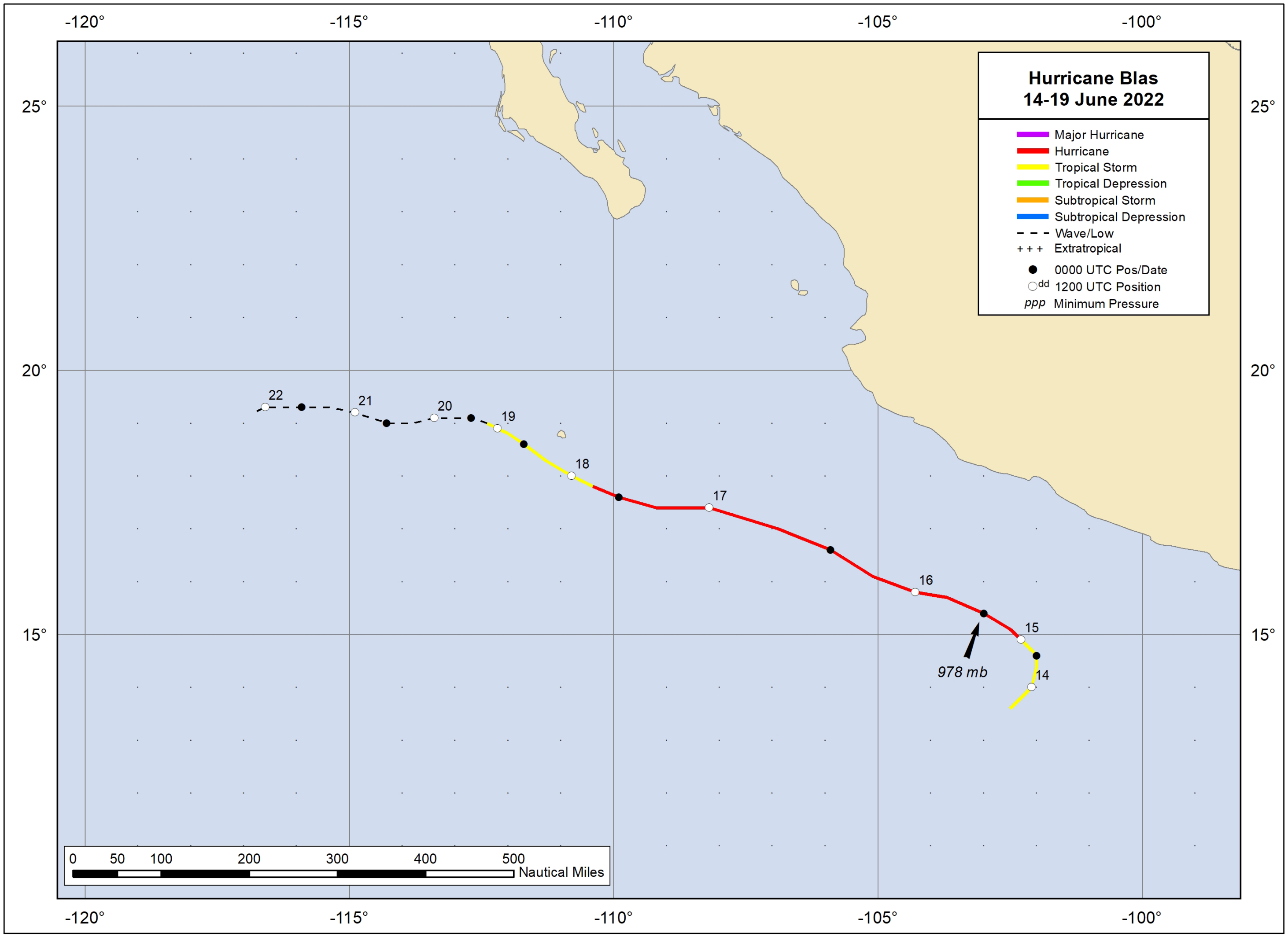


Figure 2. Best track positions for Hurricane Blas, 14–19 June 2022.

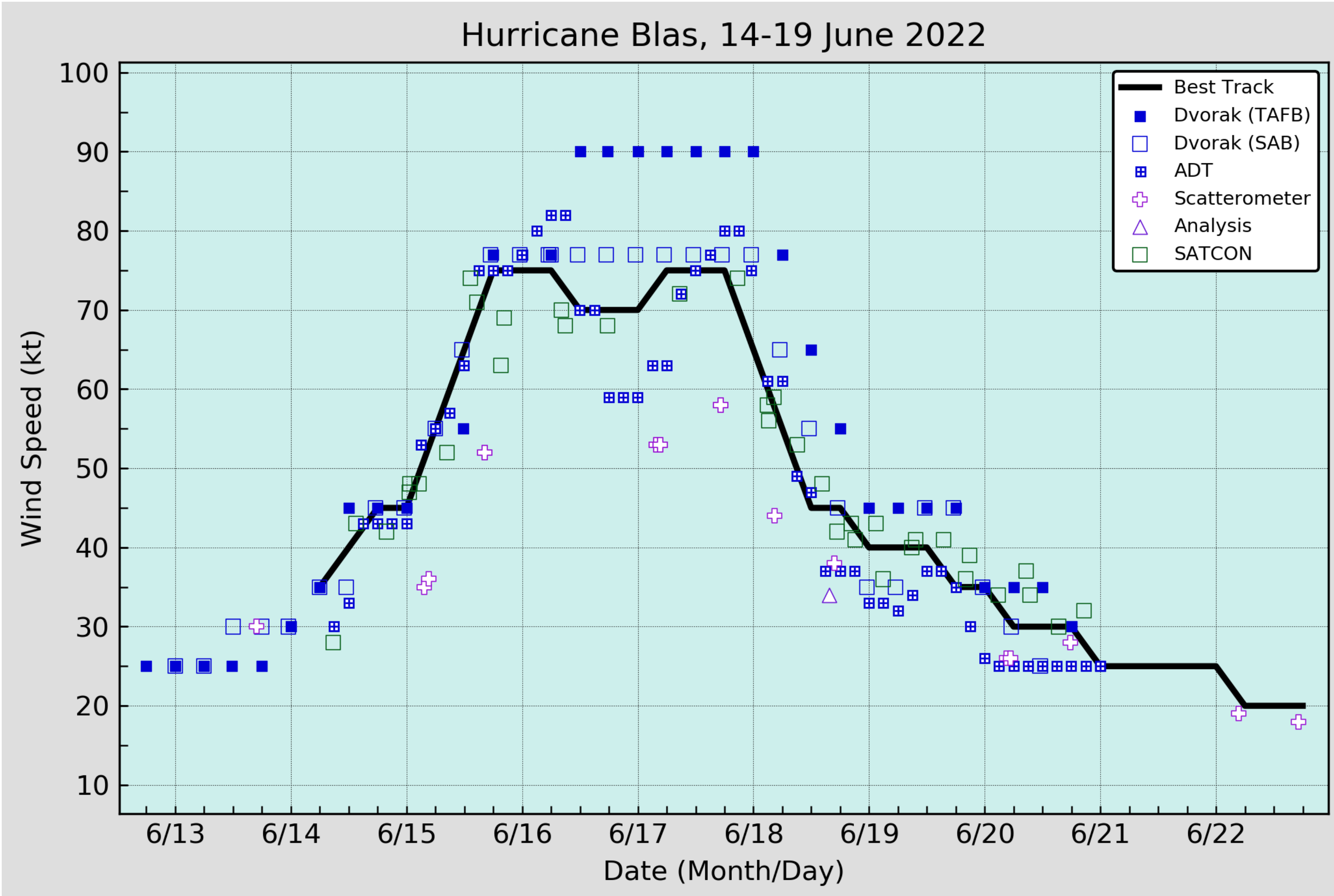


Figure 3. Selected wind observations and best track maximum sustained surface wind speed curve for Hurricane Blas, 14–19 June 2022. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies. Dashed vertical lines correspond to 0000 UTC.

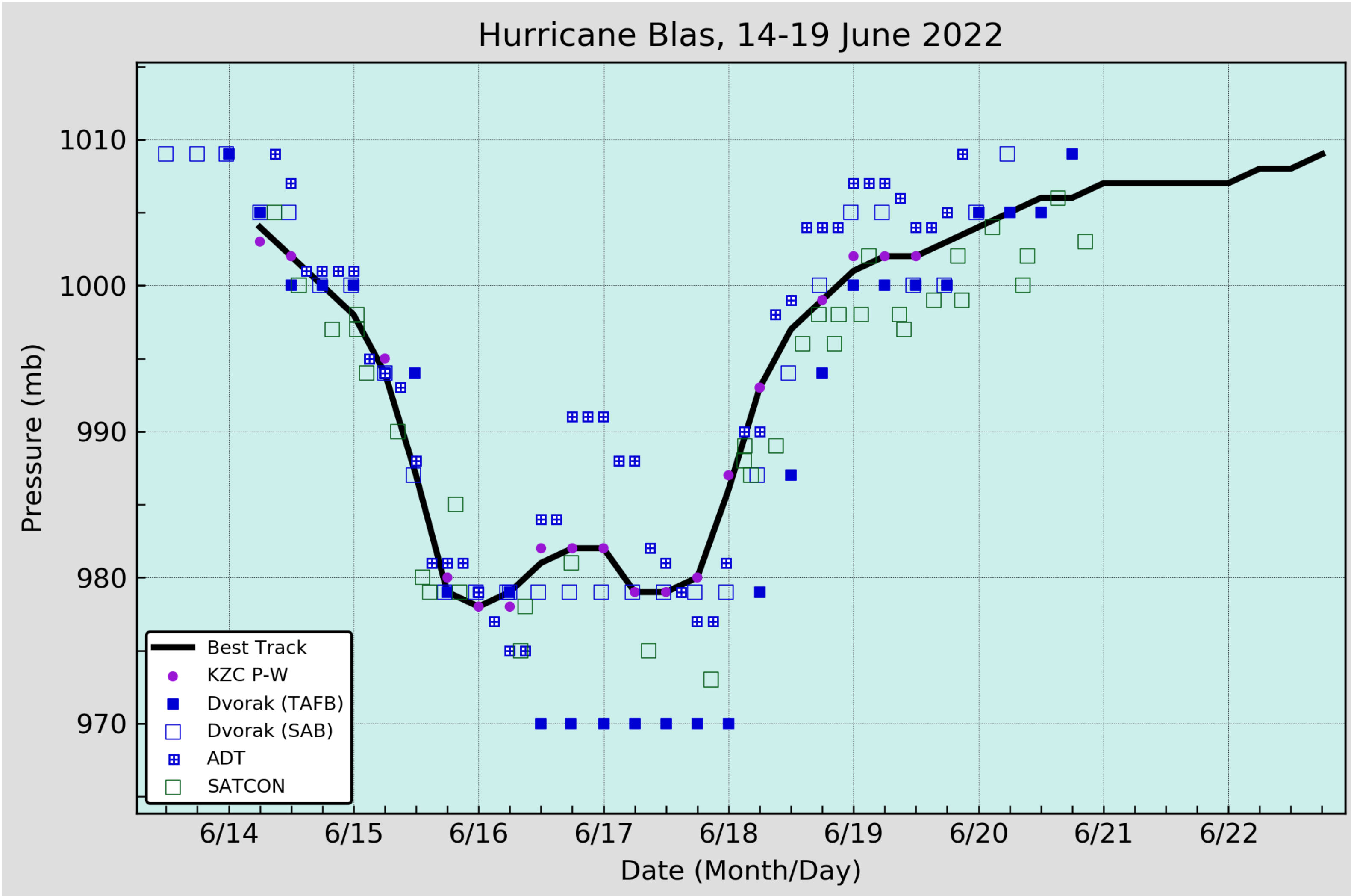


Figure 4. Selected pressure observations and best track minimum central pressure curve for Hurricane Blas, 14–19 June 2022. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for Meteorological 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.

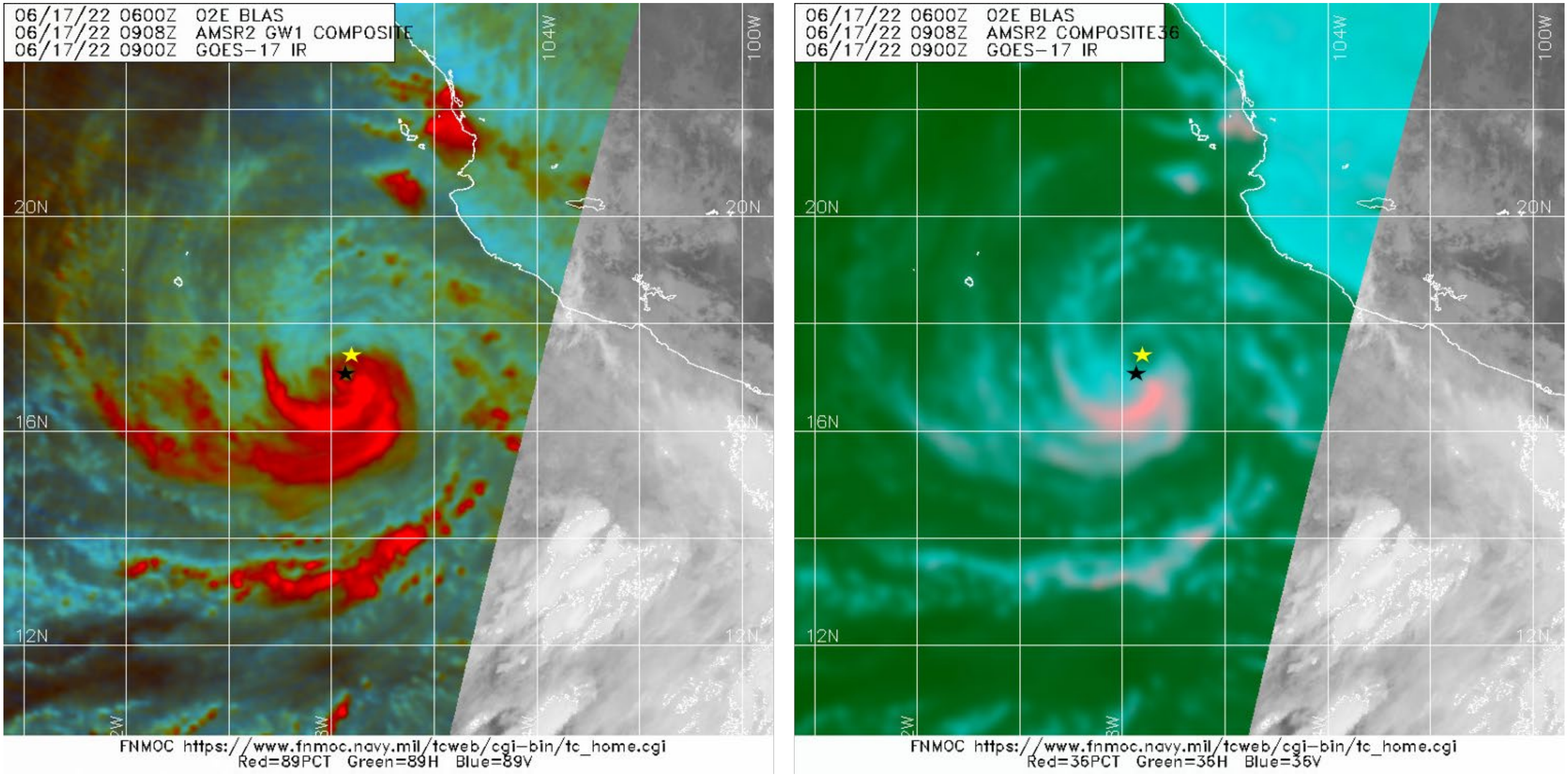


Figure 5. 0908 UTC 17 June AMSR2 89 GHz (left) and 36 GHz (right) passive microwave images of Hurricane Blas, while the storm was experiencing 15–20 kt of deep-layer northeasterly shear. The yellow (black) star indicates the estimated position of the low-level (mid-level) center of the hurricane based on analysis of the microwave images.

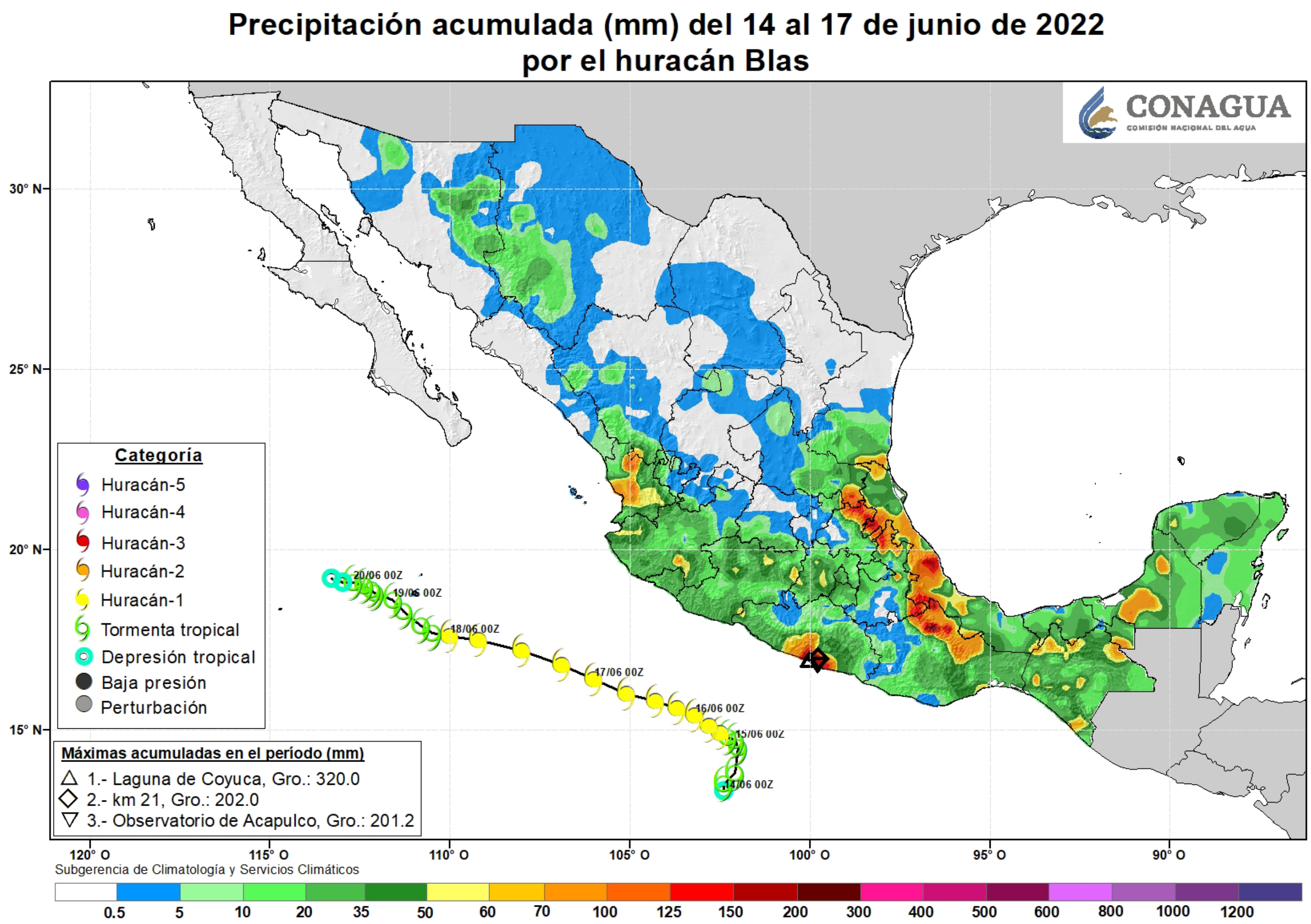


Figure 6. Rainfall accumulations (mm) from 14–17 June 2022 as Hurricane Blas passed offshore the southwestern coast of Mexico. Track and intensity are based on the operational NHC assessment. Image courtesy of CONAGUA and the National Meteorological Service of Mexico.

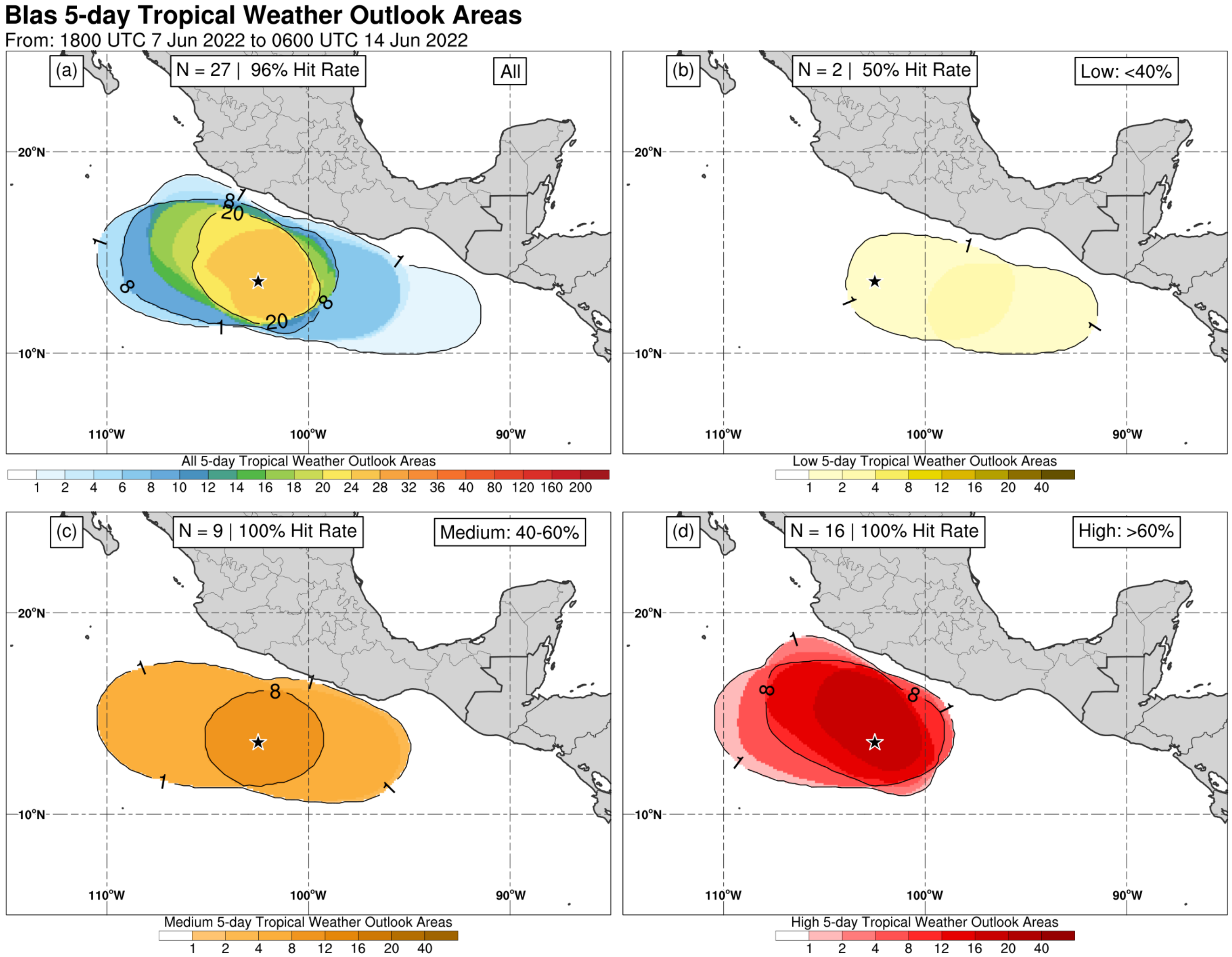


Figure 7. Composite of 5-day Tropical Weather Outlook areas associated with the disturbance that developed into Blas for (a) all probability areas (10–100%, multi-color shading), (b) low probability areas (< 40%, yellow shading), (c) medium probability areas (40–60%, orange shading), and (d) high probability areas (< 60%, red shading). The black star in each panel indicates the genesis location of Blas. Black contours denote where at least one and eight outlook areas overlap. The hit rate in each plot indicates the percentage of outlook areas that capture the location of genesis.