NATIONAL HURRICANE CENTER TROPICAL CYCLONE REPORT

HURRICANE GAMMA

(AL252020)

2–6 October 2020

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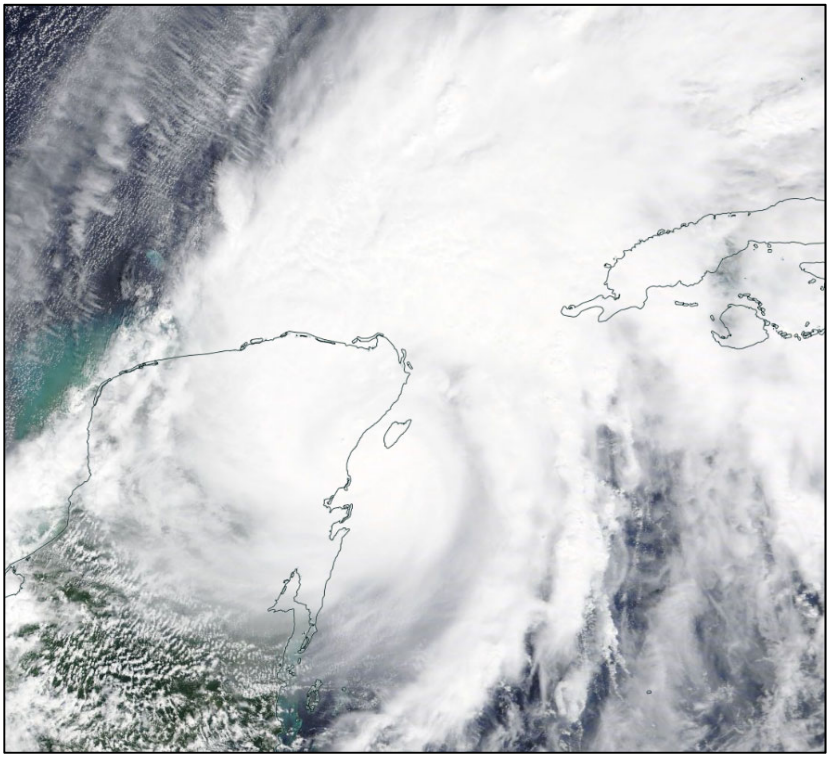
17 April 2021



GOES-16 GEOCOLOR SATELLITE IMAGE OF GAMMA AT 1620 UTC 3 OCTOBER 2020 SHORTLY BEFORE IT MADE LANDFALL IN MEXICO.

Gamma was a category 1 hurricane (on the Saffir-Simpson Hurricane Wind Scale) that formed in the western Caribbean Sea and crossed the Yucatan Peninsula. Gamma's flooding rains caused 6 deaths and forced thousands to evacuate. The cyclone then emerged over the southern Gulf of Mexico and weakened before it moved back over the Yucatan Peninsula and dissipated.

Hurricane Gamma

2–6 OCTOBER 2020

SYNOPTIC HISTORY

Gamma formed from a tropical wave that departed the west coast of Africa late on 21 September. The wave moved westward across the eastern and central tropical Atlantic over the next few days with limited convection due to widespread dry air in the mid-levels of the atmosphere. As the wave approached the Lesser Antilles on 27 September the associated shower and thunderstorm activity increased but was disorganized. The wave then crossed the eastern and central Caribbean Sea on 28–29 September with only intermittent bursts of convection. While the wave entered the western Caribbean Sea on 30 September, thunderstorm activity once again increased, and this time it persisted and gradually became better organized. By early 2 October, satellite images and scatterometer data indicated that a surface low pressure area had developed, and a short time thereafter the convection became sufficiently organized, resulting in the formation of a tropical depression by 0600 UTC that day about 260 n mi southeast of Cozumel, Mexico. The cloud pattern of the depression improved throughout the day, and aircraft reconnaissance data indicated that the system strengthened into a tropical storm by 1800 UTC when it was centered about 120 n mi south-southeast of Cozumel. The "best track" chart of Gamma'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].

During the first couple of days after formation, the cyclone moved northwestward around the southwestern periphery of a mid-tropospheric subtropical ridge. This path took Gamma across the northwestern Caribbean Sea, where the atmospheric and oceanic environments were conducive for strengthening. This favorable background resulted in a period of rapid intensification (RI) on 3 October, with the cyclone undergoing a 30-kt wind increase in under 18 h. By the time Gamma made landfall near Tulum, Mexico on the Yucatan Peninsula at 1645 UTC 3 October, it had reached its peak intensity of 65 kt. The hurricane quickly weakened to a tropical storm after landfall and continued to weaken as the center and much of the storm's inner core spent about 12 h crossing the northwestern portion of the peninsula. By 0600 UTC 4 October, the center emerged over the extreme southern Gulf of Mexico, just off the northern coast of the Yucatan Peninsula, with an intensity of 45 kt. It was around this same time that a weakness developed in the ridge to the north of Gamma due to a mid- to upper-level trough crossing the southeastern United States, causing the cyclone to move northward and then northeastward with a decrease in forward motion. Deep convection redeveloped over the center that morning and persisted for several hours, allowing for some re-intensification, and Gamma reached its second peak intensity of 55 kt by 1800 UTC that day. However, just a few hours later, increasing southerly to southwesterly shear and intrusions of dry air into the western portion of the cyclone began to take

[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.

their toll, and the center of the storm became exposed by early on 5 October as the deep convection was stripped away well to the northeast of the center. By that time, the steering currents had collapsed, and the weakening storm drifted for much of the first half of that day before the combination of a building mid-level ridge to its north and a binary interaction with the circulation of soon-to-be Hurricane Delta entering the western Caribbean Sea began to induce a slow southwestward motion. By 1800 UTC 5 October, Gamma weakened to a tropical depression while located about 120 n mi north-northwest of Cozumel. Although the center continued to remain mostly devoid of deep convection into early 6 October, there was just enough convection over the northeastern portion of the circulation for it remain a tropical cyclone. When the depression made landfall near Nichili, Mexico, around 0300 UTC, deep convection began to re-develop near the center. The depression turned southward later that day as it pivoted around the broader cyclonic envelope of approaching Hurricane Delta, and surface observations indicated that Gamma's circulation dissipated by 1800 UTC 6 October over the Yucatan Peninsula.

METEOROLOGICAL STATISTICS

Observations in Gamma (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 and Satellite Consensus (SATCON) estimates from the Cooperative Institute for Meteorological Satellite Studies/University of Wisconsin-Madison. Observations also include flight-level, stepped frequency microwave radiometer (SFMR), and dropsonde observations from seven flights of the 53rd Weather Reconnaissance Squadron of the U.S. Air Force Reserve Command and one flight of the NOAA WD-P3 Hurricane Hunter aircraft from the NOAA Aircraft Operations Center. A total of 22 center fixes were provided by reconnaissance aircraft during Gamma's lifecycle. 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 Gamma.

Ship reports of winds of tropical storm force associated with Gamma are given in Table 2, and selected surface observations from land stations and data buoys are given in Table 3.

There were several ships that reported winds of tropical storm force in association with Gamma over the southern Gulf of Mexico from 3–5 October.

Winds and Pressure

Gamma's estimated peak intensity at landfall along the coast of the Yucatan Peninsula in the Mexican state of Quintana Roo near Tulum is 65 kt. While the real-time operational estimate was 60 kt, the final best track intensity estimate was determined by a detailed post-storm analysis review of the available aircraft winds, surface winds, surface pressures, and satellite imagery – including data and analyses that were not available in real time. It should be noted that the NHC best track intensities typically have an uncertainty of around ±10 kt. A NOAA P-3 aircraft investigating the system the morning of 3 October, a few hours before landfall, measured a peak SFMR wind of 57 kt around 1318 UTC. Assuming some undersampling by this instrument,

Gamma's intensity was likely near 60 kt at that time. While peak flight-level winds from that aircraft mission were 68 kt, they were reported at 12,000 ft, above the level where established reduction factors can be applied to obtain a surface intensity estimate. A dropsonde released at 1130 UTC into the center of Gamma measured a surface pressure of 987 mb with winds of 8 kt, which would equate to a 986 mb central pressure. By 1314 UTC, near the same time the aircraft sampled the 57-kt SFMR winds, a dropsonde measured 984 mb with winds of 12 kt (a 983 mb central pressure), indicating a 3 mb drop in pressure in 2 hours, with the 983 mb value coinciding with a 60 kt intensity estimate for this cyclone at that time. Although this was the last time that day that the aircraft entered the core of the cyclone, the satellite appearance of Gamma continued to improve over the next several hours until just after landfall on the Yucatan Peninsula, with an eye beginning to appear in visible satellite images (Fig. 4).

As the center crossed the coast of the Yucatan Peninsula near Tulum, a Weatherflow observing station at Xel-Ha Park measured surface pressures of 980.3–981.5 mb during a 25-minute period while the station was within the cyclone's radius of maximum winds. Sustained wind speeds during that time were about 17–23 kt, indicating that the minimum central pressure of Gamma had fallen to 978–979 mb by the landfall at 1645 UTC. This additional 4 to 5 mb drop in pressure from a few hours prior when winds were 60 kt, plus the continued improvement in the cyclone's satellite appearance, indicates that the RI of Gamma continued until landfall that day, and that the estimated intensity had increased to a peak of at least 65 kt by that time. Additionally, the Knaff-Zehr-Courtney (KZC) pressure-wind relationship for a 978 mb central pressure supports an intensity of around 70 kt. It should be noted that the historical record of tropical cyclones in the Caribbean Sea with a central pressure of 978 mb (+/- 2) occurred only in hurricanes with intensities ranging from 65–100 kt, with the mode of that distribution 80 kt. There was only one case each where a central pressure this low coincided with an intensity of 65 or 70 kt (and none of tropical storm strength). The lowest pressure associated with any 60-kt tropical storm on record in the Caribbean is 982 mb.

Gamma made landfall along a sparsely populated stretch of coastline of the Yucatan Peninsula in Mexico. Since the cyclone had a small core, it is not surprising that there were no reports of hurricane-force winds at any observing sites. The strongest winds reported in Mexico were at Xel-Ha Park with sustained east-northeast winds of 53 kt and a gust to 59 kt at 1620 UTC, as the northwestern portion of the eyewall moved across the area. Farther up the coast near Playa del Carmen, a sustained wind of 45 kt and a gust to 50 kt were reported.

Storm Surge

Although it is likely that some inundation from storm surge occurred near and to the north of where Gamma made landfall in Mexico, the Servicio Meteorológico Nacional of Mexico did not report any significant storm surge.

Rainfall and Flooding

Gamma produced a swath of heavy rainfall as it crossed the northern portion of the Yucatan Peninsula (Fig. 5), with some locations near the path of the cyclone receiving greater than 12 inches (300 mm) of total rainfall. The highest rainfall totals reported were 15.11 inches (383.8 mm) at Tizimin, 13.27 inches (337.0 mm) at Conkal, and 11.51 inches (292.3 mm) at

Cozumel. The flow around the circulation of Gamma also produced heavy rainfall across the northern portion of the state of Chiapas and the eastern portion of the state of Tabasco.

CASUALTY AND DAMAGE STATISTICS

As of this writing, reports indicate that Gamma caused 6 direct fatalities[2] in Mexico as a result of flooding and landslides due to heavy rains. In the state of Chiapas, a landslide buried a home killing 4 people that were inside. In the state of Tabasco, 2 people drowned in floodwaters, and 3,400 others were evacuated to shelters. As of this writing, no monetary damage estimates have been received from Mexico.

FORECAST AND WARNING CRITIQUE

The genesis of Gamma was reasonably well forecast (Table 4). The wave from which Gamma developed was first included in the Tropical Weather Outlook 102 h before genesis occurred, giving the system a low (<40%) chance of tropical cyclone formation during the next five days. The probability of genesis reached the medium category (40–60%) 84 h before genesis and the high category 30 h before the system developed. Regarding the 2-day genesis probabilities, a low chance of genesis was shown 48 h, a medium chance 18 h, and a high chance 6 h before Gamma formed. The relatively short lead times in the medium and high categories for the 2-day genesis probabilities were in part due to uncertainty as to whether the system would develop before reaching the Yucatan Peninsula.

A verification of NHC official track forecasts for Gamma is given in Table 5a. Official forecast track errors were near or slightly larger than the long-term mean at 12–60 h, and near or slightly lower than the 5-year mean at 72 and 96 h. There were no verifying forecasts at 120 h. A homogeneous comparison of the official track errors with selected guidance models is given in Table 5b. There were several models that performed slightly better than the NHC track forecast through 60 h, but the official forecast performed better than a vast majority of the guidance beyond 60 h, albeit for a small sample size. The best performing track guidance was from the Hurricanes in a Multi-scale Ocean-coupled Non-hydrostatic model (HMNI), which outperformed the NHC track forecast at all verifying times.

A verification of NHC official intensity forecasts for Gamma is given in Table 6a. Official forecast intensity errors were generally comparable to the mean official errors for the previous 5-yr period through 60 h and larger than the mean errors at 72–96 h. A homogeneous comparison of the official intensity errors with selected guidance models is given in Table 6b. The NHC

[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.

intensity forecast errors were slightly lower than all the verifying guidance at 12 h but underperformed most of the guidance beyond 12 h. The NHC forecasts did not anticipate the RI that Gamma underwent within 24 h of its first landfall on the Yucatan Peninsula (Fig. 6). Then, after the storm was expected to emerge over the Gulf of Mexico, the NHC forecast called for little-to-no change in intensity. However, the combination of hostile environmental atmospheric conditions that developed over the southern Gulf of Mexico and the interaction with land and approaching Hurricane Delta, ultimately weakened Gamma more abruptly than what the NHC forecast was indicating.

Coastal watches and warnings associated with Gamma are given in Table 7. The government of Mexico issued Tropical Storm Watches and Warnings for a portion of the eastern coast of the Yucatan Peninsula at 1500 UTC 2 October. These watches and warnings were expanded westward along portions of the northern Yucatan at 0900 UTC 3 October in anticipation of the system reaching that coastline and entering the Gulf of Mexico. A Hurricane Warning was issued for a portion of the western coast of the Yucatan Peninsula at 1500 UTC 3 October, as it became increasingly likely that Gamma could become a hurricane prior to landfall a short time later.

Acknowledgements

The Servicio Meteorológico Nacional of Mexico provided rainfall data and preliminary casualty information for Mexico that was useful in Gamma's post-analysis. Senior Hurricane Specialist Eric Blake assisted with the "Winds and Pressure" section, and Senior Hurricane Specialist John Cangialosi produced the track map.

Table 1. Best track for Hurricane Gamma, 2–6 October 2020.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
02 / 0000	16.6	83.3	1006	30	low
02 / 0600	17.2	83.9	1006	30	tropical depression
02 / 1200	17.8	84.4	1005	30	"
02 / 1800	18.4	85.0	1002	35	tropical storm
03 / 0000	18.8	85.8	998	40	"
03 / 0600	19.2	86.6	995	45	"
03 / 1200	19.7	87.1	986	55	"
03 / 1645	20.2	87.4	978	65	hurricane
03 / 1800	20.4	87.5	980	60	tropical storm
04 / 0000	21.0	87.9	991	50	"
04 / 0600	21.8	88.2	997	45	"
04 / 1200	22.3	88.1	995	50	"
04 / 1800	22.7	87.7	994	55	"
05 / 0000	22.9	87.4	998	50	"
05 / 0600	22.8	87.4	999	45	"
05 / 1200	22.6	87.5	1001	40	"
05 / 1800	22.3	87.9	1005	30	tropical depression
06 / 0000	21.9	88.2	1005	30	"
06 / 0300	21.6	88.4	1005	30	"
06 / 0600	21.3	88.5	1005	30	"
06 / 1200	20.6	88.5	1007	25	"
06 / 1800					dissipated
03 / 1645	20.2	87.4	978	65	minimum pressure, maximum winds, and landfall near Tulum, Mexico
06 / 0300	21.6	88.4	1005	30	landfall near San Felipe, Mexico

Table 2. Selected ship reports with winds of at least 34 kt for Hurricane Gamma, 2–6 October 2020.

Date/Time (UTC)	Ship call sign	Latitude (°N)	Longitude (°W)	Wind dir/speed (kt)	Pressure (mb)
03 / 1700	V7TY9	21.8	85.4	090 / 35	1009.0
04 / 1600	WMCS	25.3	86.2	080 / 35	1011.7
04 / 1900	MAOR5	24.1	89.7	030 / 36	1007.0
04 / 2300	V7DR9	25.4	86.2	030 / 40	1011.0
05 / 0600	MAOR5	23.4	86.7	130 / 41	1004.0
05 / 1400	D5KM3	23.9	90.9	020 / 42	1011.5

Table 3. Selected surface observations for Hurricane Gamma, 2–6 October 2020.

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft)[c]	Storm tide (ft)[d]	Estimated Inundation (ft)[e]	Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[a]	Sustained (kt)[b]	Gust (kt)				
Mexico									
Weatherflow Sites									
Cancun (XCCN) (21.06N 86.78W)	3/2005	998.7	3/1318	43 (11 m)	48				
Cozumel (XCOZ) (20.53N 86.94W)	3/1722	996.1	3/0753	28 (11 m)	43				
Playa del Carmen (XPDC) (20.58N 87.12W)	3/1651	994.6	3/1725	45 (11 m)	50				
Puerto Morelos (XPRM) (20.83N 86.89W)	3/1638	998.4	3/1859	39 (10 m)	50				
Xel-Ha Park (XTUL) (20.63N 87.07W)	3/1636	979.3	3/1620	53 (10 m)	59				
Other Sites									
Conkal (21.10N 89.50W)									13.27
Cozumel (20.50N 86.90W)									11.51
Tizimin (21.10N 88.20W)									15.11
Buoys									
42056 - Yucatan Basin (19.82N 84.95W)	3/0740	1004.9	3/0810	30	42				
42003 – East Gulf (25.96N 85.62W)	5/0950	1009.0	5/0700	30	40				

[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 reports are 2 min; buoy averaging periods are 8 min.

Table 4. Number of hours in advance of formation 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	102
Medium (40%-60%)	18	84
High (>60%)	6	30

Table 5a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Hurricane Gamma, 2–6 October 2020. 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	25.5	45.7	64.1	79.1	86.1	**96.1**	**124.3**	
OCD5	42.0	94.2	144.7	164.0	154.9	140.2	266.4	
Forecasts	15	13	11	9	7	5	1	
OFCL (2015-19)	24.1	36.9	49.6	65.1	80.7	96.3	133.2	171.6
OCD5 (2015-19)	44.7	96.1	156.3	217.4	273.9	330.3	431.5	511.9

Table 5b. Homogeneous comparison of selected track forecast guidance models (in n mi) for Hurricane Gamma, 2–6 October 2020. 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	25.9	49.5	69.1	87.7	95.3	109.3	124.3	
OCD5	45.2	106.1	164.4	192.4	189.9	163.2	266.4	
GFSI	**22.4**	**45.4**	**54.1**	**81.3**	**75.3**	114.8	175.7	
EMXI	33.5	65.8	108.7	165.2	207.5	229.3	247.2	
CMCI	34.3	62.7	98.4	126.0	156.1	197.0	150.9	
NVGI	29.3	**43.6**	**52.9**	**87.0**	129.6	197.5	**65.6**	
CTCI	**21.3**	**43.0**	**67.5**	99.4	**85.2**	130.8	198.4	
AEMI	**22.1**	**43.2**	**63.0**	**79.6**	**81.5**	**97.5**	127.4	
HWFI	38.2	62.3	76.1	92.0	152.0	179.3	298.0	
HMNI	**22.1**	**39.7**	**62.9**	**85.9**	**86.4**	**94.7**	**96.0**	
HCCA	26.1	**47.2**	**66.0**	91.7	108.4	124.5	135.4	
TVCX	26.7	**49.4**	**66.9**	92.5	106.2	122.3	154.3	
GFEX	**24.9**	51.2	73.8	110.4	125.5	147.7	172.6	
TVCA	27.4	**48.8**	**64.9**	**87.1**	97.2	113.1	146.2	
TVDG	26.5	**49.4**	**64.0**	**86.1**	**95.0**	114.7	157.0	
TABS	56.3	127.3	183.2	226.4	270.7	300.1	342.8	
TABM	39.1	77.9	105.0	122.9	135.3	145.6	136.1	
TABD	47.4	104.8	191.7	296.7	393.5	478.2	617.2	
Forecasts	13	11	9	7	5	3	1	

Table 6a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Hurricane Gamma, 2–6 October 2020. 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	5.3	9.2	10.5	11.7	12.9	16.0	20.0	
OCD5	9.3	14.6	18.3	18.0	13.6	10.0	20.0	
Forecasts	15	13	11	9	7	5	1	
OFCL (2015-19)	5.2	7.7	9.4	10.7	11.9	13.0	14.4	15.5
OCD5 (2015-19)	6.8	10.8	14.1	17.0	18.8	20.6	22.5	24.6

Table 6b. Homogeneous comparison of selected intensity forecast guidance models (in kt) for Hurricane Gamma, 2–6 October 2020. 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 6a due to the homogeneity requirement.

Model ID	Forecast Period (h)							
	12	24	36	48	60	72	96	120
OFCL	4.6	8.6	11.1	11.4	18.0	15.0	20.0	
OCD5	8.9	14.1	18.9	19.0	**17.6**	**10.0**	20.0	
GFSI	5.4	**5.8**	**5.0**	**5.4**	**7.2**	**4.3**	**4.0**	
HMNI	5.5	**6.0**	**4.9**	**6.0**	**10.0**	**7.7**	**5.0**	
HWFI	4.9	**5.5**	**6.6**	**8.0**	**13.6**	15.7	23.0	
EMXI	6.8	9.6	11.1	13.4	**15.4**	**14.3**	**6.0**	
CMCI	8.3	8.7	11.3	15.0	19.4	15.7	**6.0**	
CTCI	7.0	**6.5**	**5.8**	**6.9**	**7.4**	**6.0**	**15.0**	
HCCA	4.8	**6.1**	**6.6**	**7.9**	**11.0**	**10.3**	**14.0**	
IVDR	5.3	**5.5**	**5.3**	**6.1**	**8.2**	**7.0**	**12.0**	
IVCN	5.3	**6.5**	**6.7**	**6.3**	**8.2**	**6.7**	**11.0**	
ICON	5.3	**6.5**	**7.2**	**6.9**	**8.6**	**6.7**	**10.0**	
LGEM	6.8	10.0	**10.8**	**10.7**	**10.2**	**6.7**	**6.0**	
DSHP	6.7	10.1	13.3	14.7	**11.2**	**3.0**	**7.0**	
Forecasts	13	11	9	7	5	3	1	

Table 7. Watch and warning summary for Hurricane Gamma, 2–6 October 2020.

Date/Time (UTC)	Action	Location
2 / 1500	Tropical Storm Watch issued	Puerto Costa Maya to Punta Herrero
2 / 1500	Tropical Storm Watch issued	Cabo Catoche to Dzilam
2 / 1500	Tropical Storm Warning issued	Punta Herrero to Cabo Catoche
3 / 0900	Tropical Storm Watch modified to	Dzilam to Progreso
3 / 0900	Tropical Storm Warning modified to	Punta Herrero to Dzilam
3 / 1500	Hurricane Warning issued	Punta Allen to Cancun
3 / 2100	Tropical Storm Watch discontinued	Puerto Costa Maya to Punta Herrero
3 / 2100	Tropical Storm Warning modified to	Punta Allen to Dzilam
3 / 2100	Hurricane Warning discontinued	All
4 / 0900	Tropical Storm Warning modified to	Cancun to Dzilam
5 / 0300	Tropical Storm Watch modified to	Dzilam to Campeche
5 / 2100	Tropical Storm Watch discontinued	All
5 / 2100	Tropical Storm Warning discontinued	All

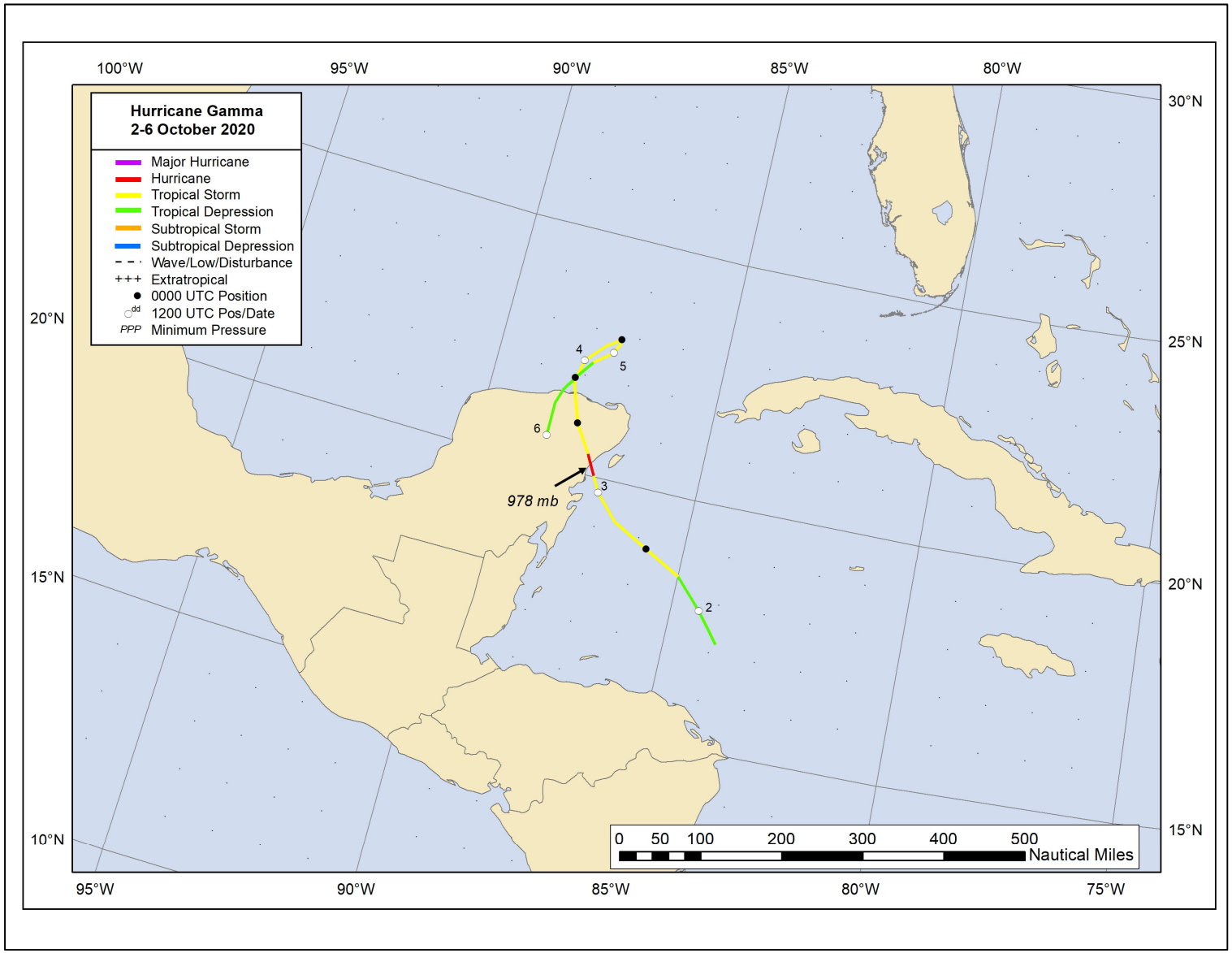


Figure 1. Best track positions for Hurricane Gamma, 2–6 October 2020.

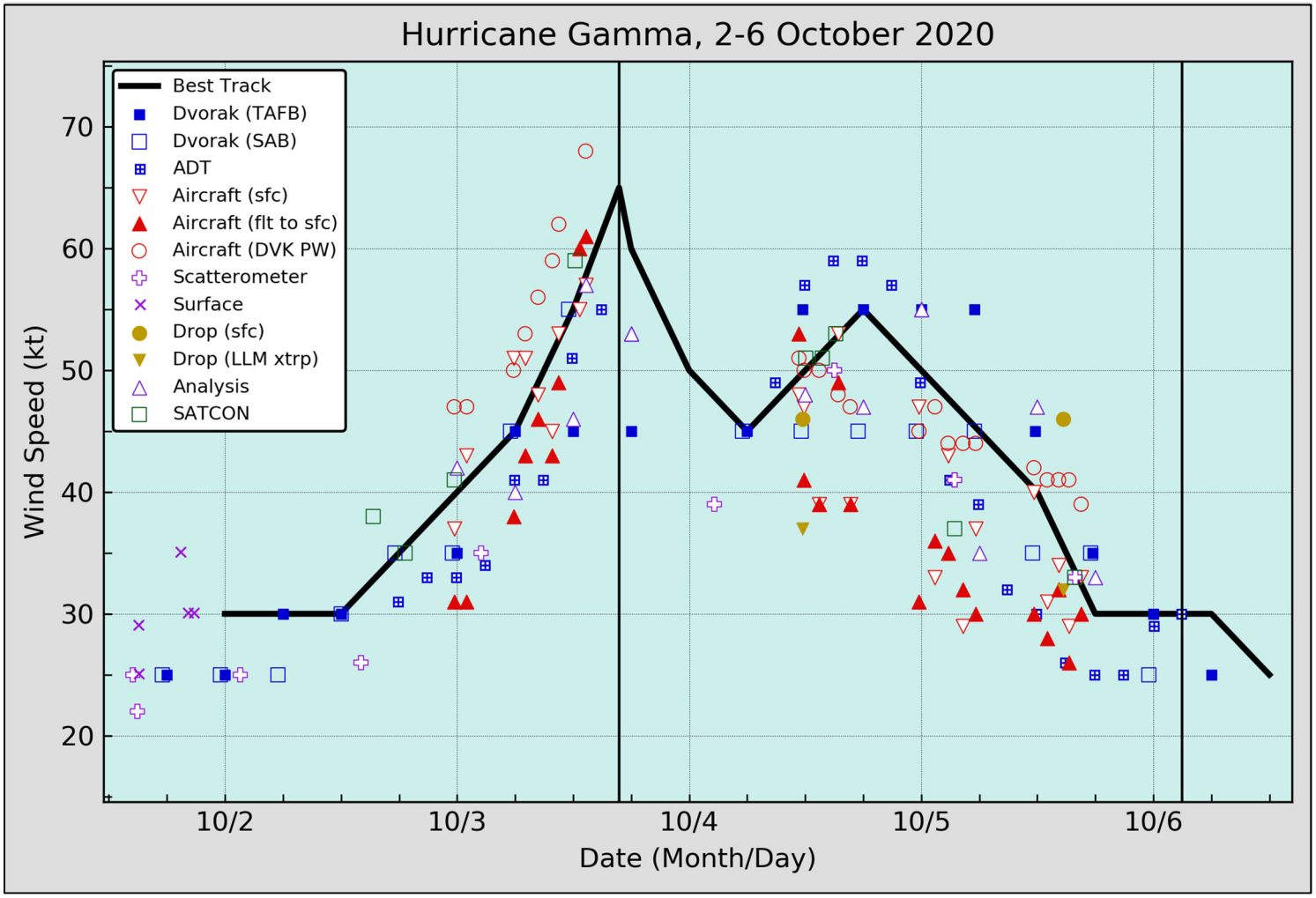


Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Hurricane Gamma, 2–6 October 2020. Aircraft observations have been adjusted for elevation using 90%, 80%, and 80% adjustment factors for observations from 700 mb, 850 mb, and 1500 ft, respectively. Dropsonde observations include actual 10 m winds (sfc), as well as surface estimates derived from the mean wind over the lowest 150 m of the wind sounding (LLM xtrp). 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, and solid vertical lines correspond to landfalls.

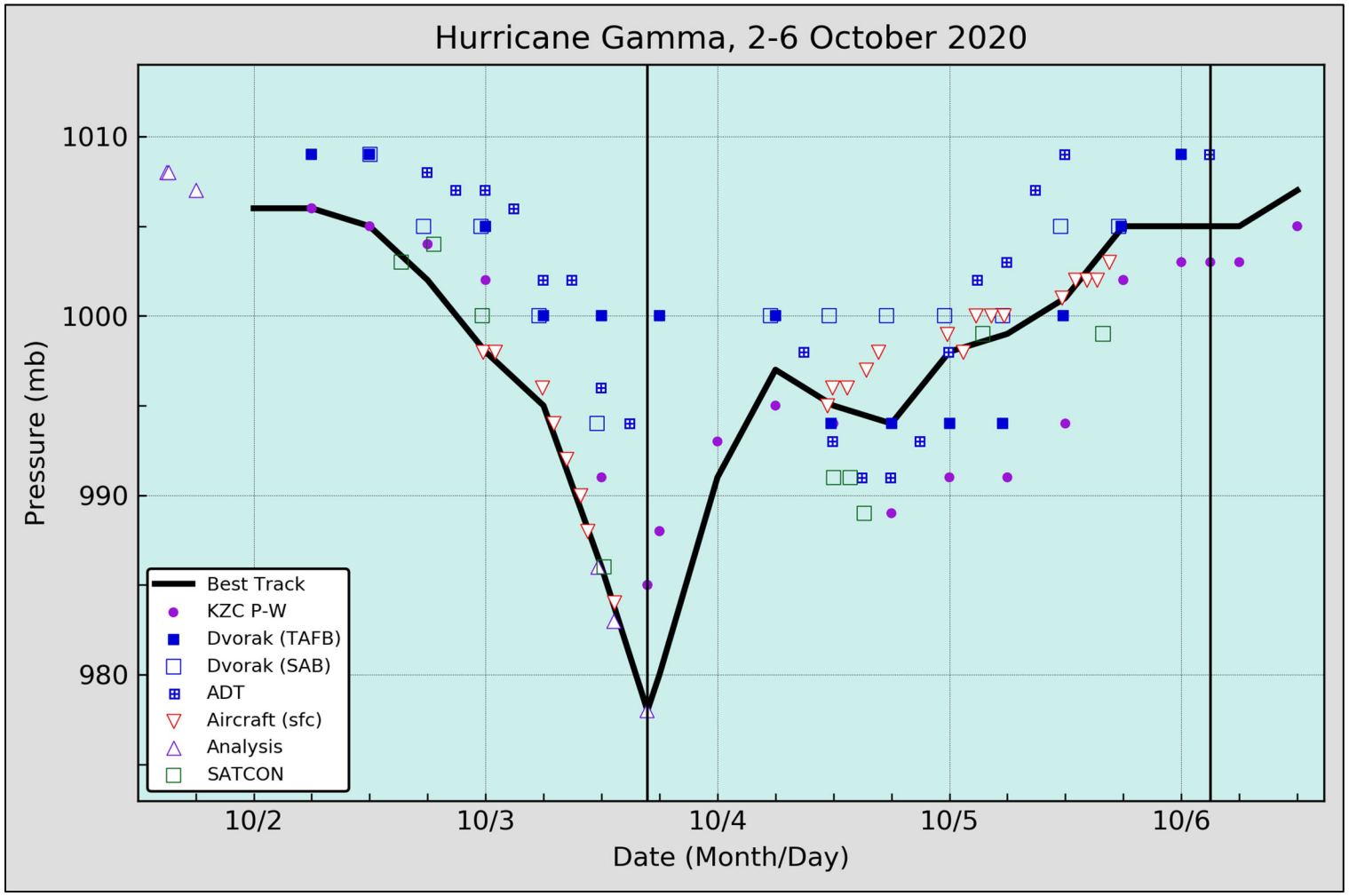


Figure 3. Selected pressure observations and best track minimum central pressure curve for Hurricane Gamma, 2–6 October 2020. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for Meteorological 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, and solid vertical lines correspond to landfalls.

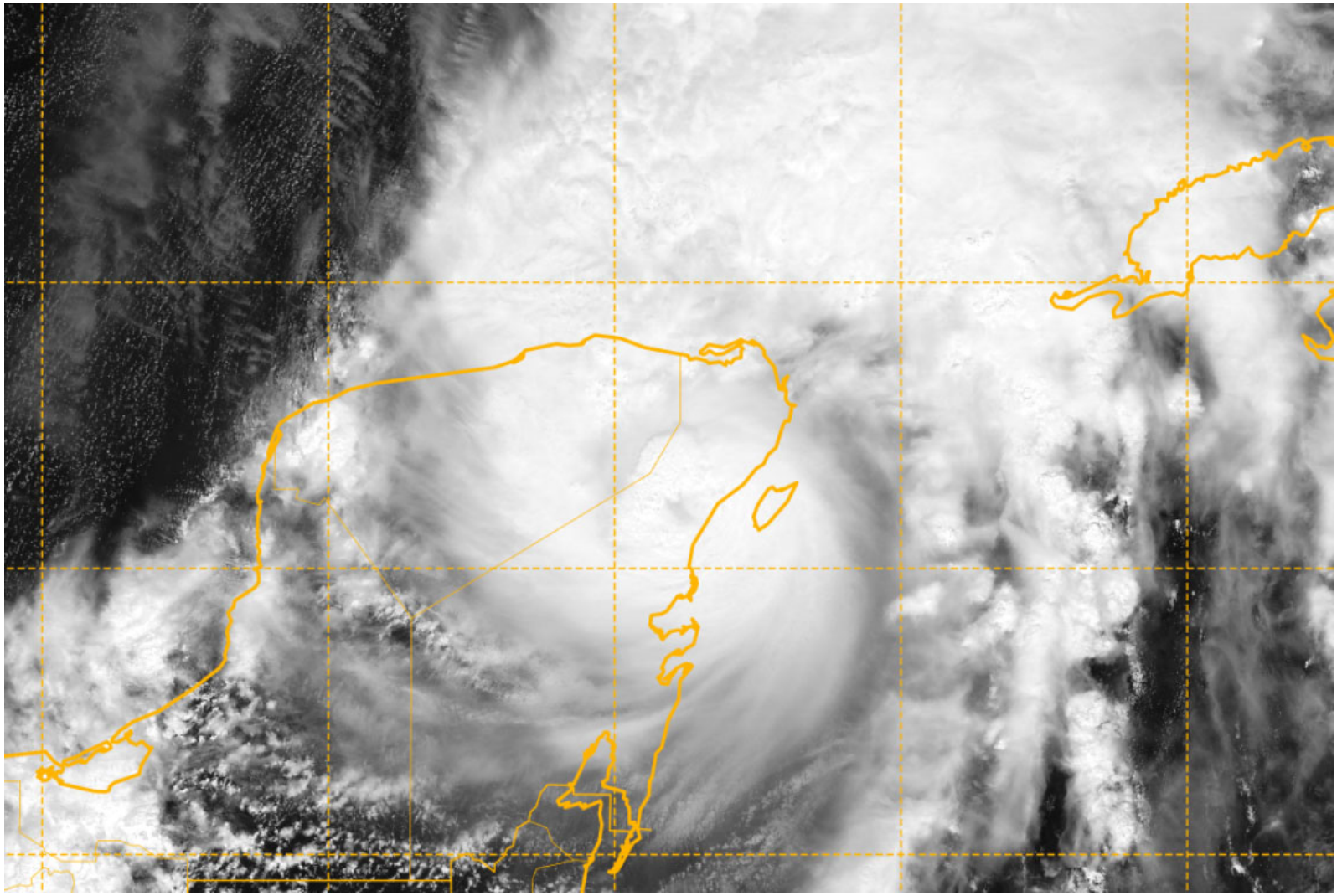


Figure 4. GOES-16 visible satellite image of Gamma at 1740 UTC 03 October, just after landfall near Tulum in the state of Quintana Roo of Mexico.

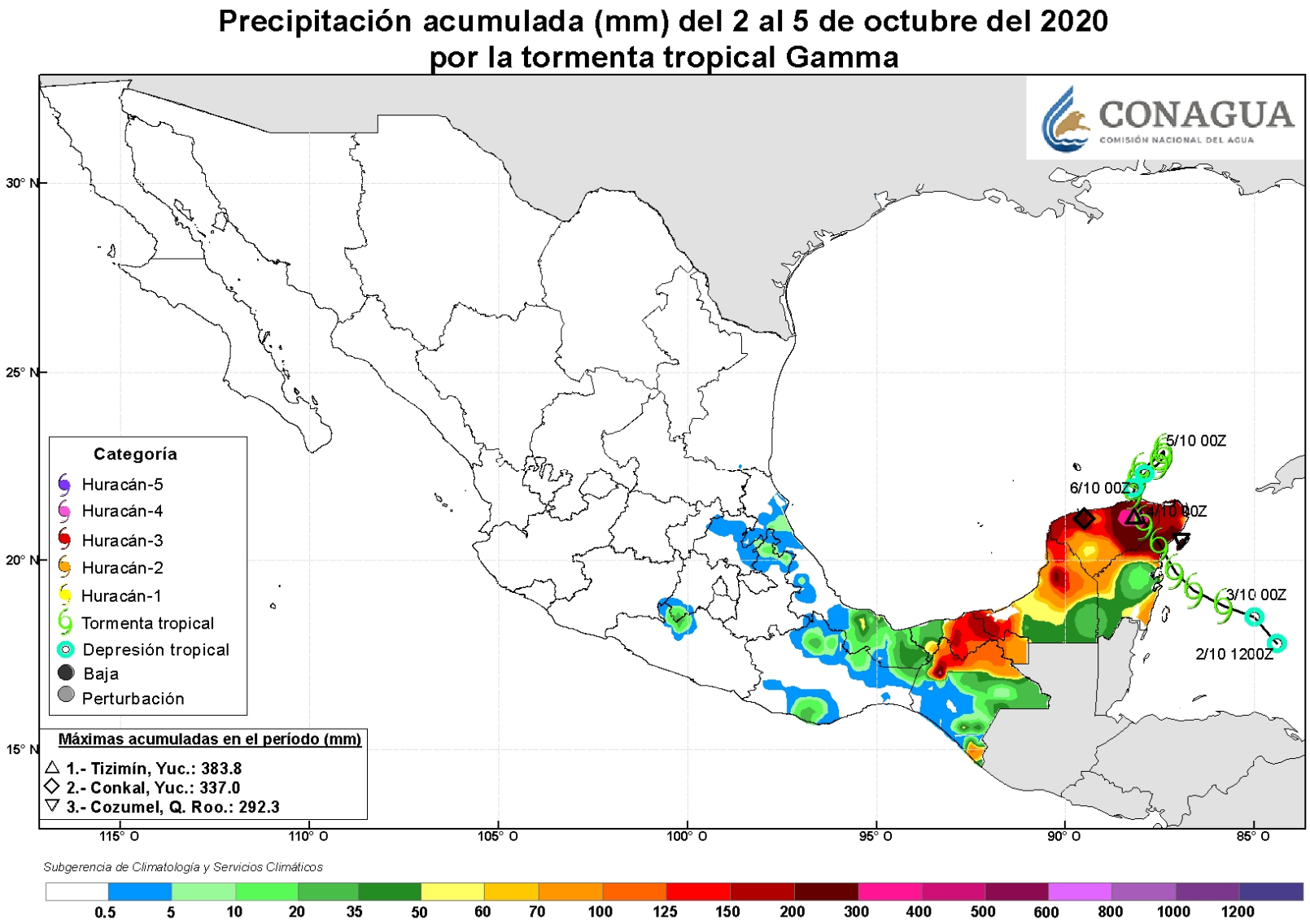


Figure 5. Map of rainfall (mm) associated with Gamma. Figure courtesy of CONAGUA.

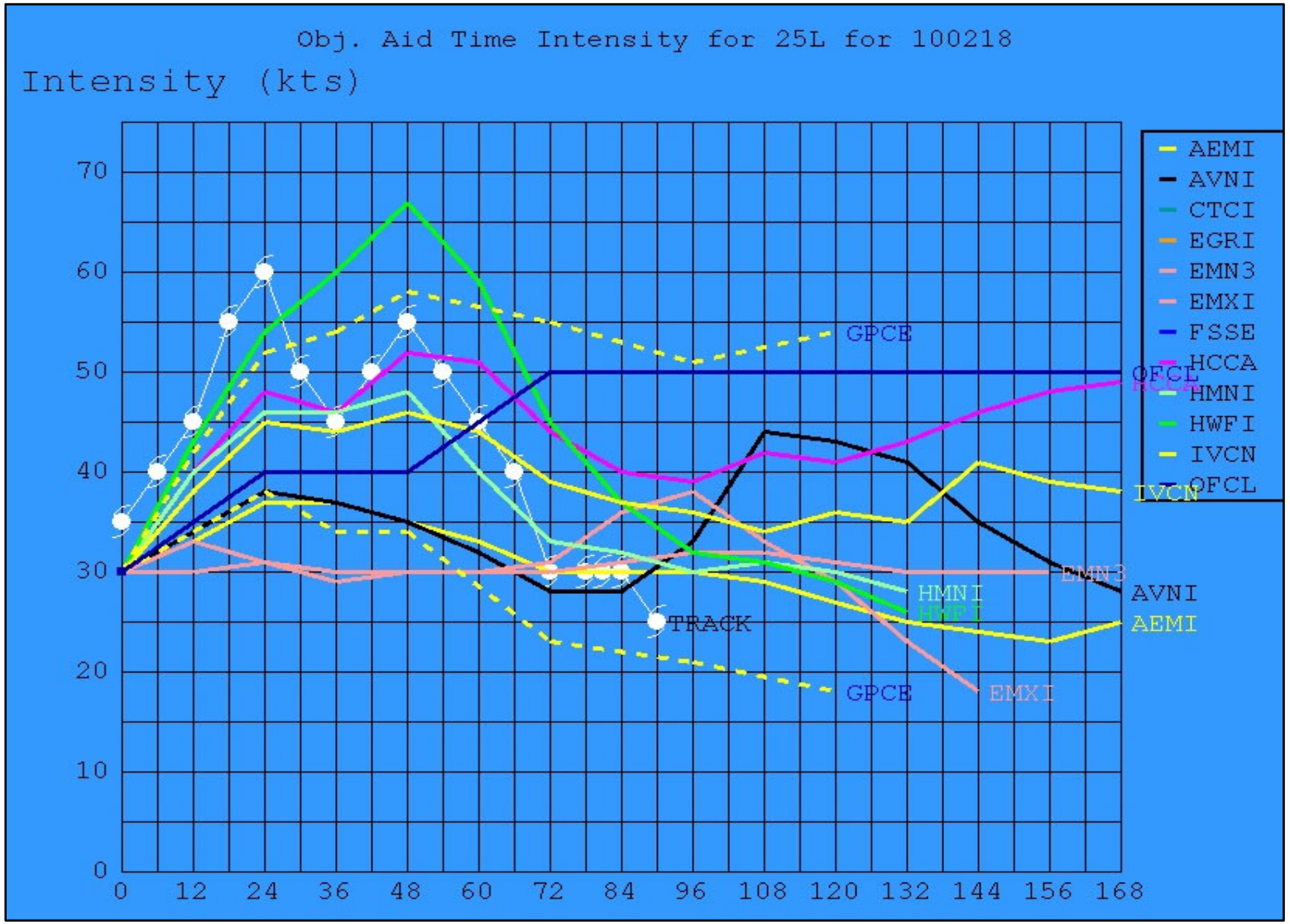


Figure 6. NHC official forecast and intensity model solutions (kt) from 1800 UTC 2 October, less than 24 h before Gamma reached its peak intensity. The best track intensity (kt) is indicated by the white line and symbols.