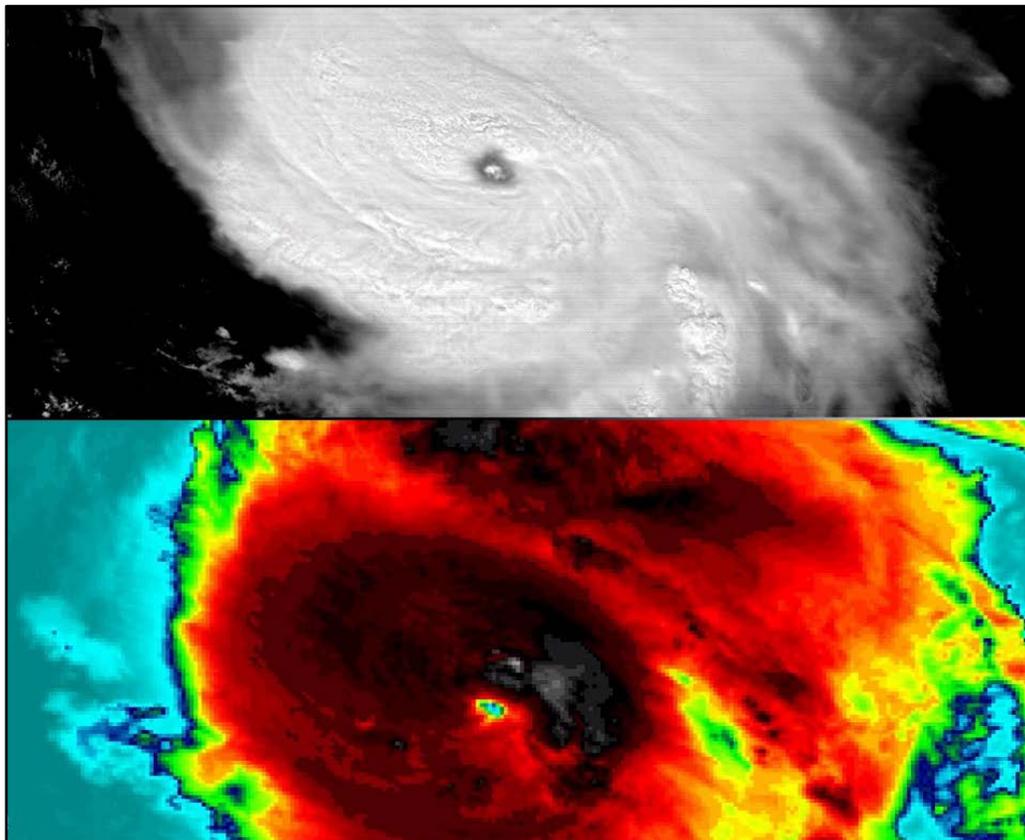# NATIONAL HURRICANE CENTER
TROPICAL CYCLONE REPORT

HURRICANE GERT

(AL082017)

12–17 August 2017

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National Hurricane Center
17 March 2018

GOES-16 HIGH-RESOLUTION VISIBLE-INFRARED SATELLITE IMAGERY SHOWING GERT NEAR ITS PEAK INTENSITY AT 1742 UTC 16 AUGUST 2017. MOSAIC IMAGES COURTESY OF UW-CIMSS SPACE SCIENCE AND ENGINEERING CENTER.

Gert was a high-latitude, category 2 hurricane (on the Saffir-Simpson Hurricane Wind Scale) that remained over the open waters of the western Atlantic Ocean, passing about midway between Bermuda and the southeastern United States.

Hurricane Gert

12–17 AUGUST 2017

SYNOPTIC HISTORY

A convectively active tropical wave, accompanied by 24-h pressure falls of 3–4 mb and a weak surface low pressure system, moved off the west coast of Africa early on 3 August. The well-developed disturbance began to show signs of organization on 3–4 August as the system moved quickly westward through a favorable environment consisting of low vertical wind shear, warm sea-surface temperatures (SST), and a moist mid-level environment. However, by 5 August, when the wave had passed well to the southwest of the Cabo Verde Islands, environmental conditions became less conducive for development, resulting in dissipation of the associated surface low along with a sharp decrease in convection. The wave moved quickly westward at near 20 kt, which likely resulted in the system becoming elongated northeast-to-southwest within the Intertropical Convergence Zone (ITCZ). This quick westward motion continued for the next five days, and the wave generated only intermittent, short-lived bursts of deep convection mainly east of the wave axis. On 10 August, the wave slowed down and fractured, with the northern portion turning west-northwestward; the southern portion of the wave continued westward, moved into the eastern North Pacific basin on 12 August, and triggered the development of Hurricane Kenneth six days later.

Gert's precursor disturbance passed north of the Leeward Islands and Puerto Rico on 11 August, during which time curved convective cloud bands increased and became better organized around a well-defined, low- to mid-level vorticity maximum. By 0000 UTC 12 August, high-resolution GOES-16 visible satellite imagery indicated that a surface low pressure system had formed about 275 n mi east of the Turks and Caicos Islands. During the next 12 h, the low turned northwestward and convection became better organized, resulting in the formation of a tropical depression by 1800 UTC 12 August about 230 n mi northeast of the Turks and Caicos. The center of the cyclone passed just to the west of NOAA buoy 41046 (located about 335 n mi east of San Salvador Island, Bahamas), resulting in a gradual clockwise wind shift from a northeasterly to a south-southwesterly direction. Additional convective organization followed, and the depression strengthened into a tropical storm 6 h later when the system was positioned about 215 n mi northeast of the southeastern Bahamas. 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].

Although SSTs and shear conditions were conducive for development, Gert moved through a relatively dry environment characterized by mid-level (700–500-mb) relative humidity values near 50% (Fig. 4). Intermittent intrusions of dry air, noted in passive microwave satellite

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[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.

imagery (not shown), weakened the central deep convection, resulting in no change in Gert's intensity for the next 18 h. By 0000 UTC 14 August, however, the small tropical cyclone was able to mix out the dry air, which allowed persistent deep convection and a central dense overcast (CDO) feature to develop, resulting in steady intensification over the next 3 days. During this time, the tropical storm turned northward around the western periphery of a deep-layer subtropical ridge and passed just east of NOAA buoy 41047 (located about 350 n mi east-northeast of Nassau, Bahamas), producing a sharp counter-clockwise wind shift from an easterly to a southwesterly direction between 1400 and 1500 UTC 14 August. Gert became a hurricane around 0600 UTC 15 August when the cyclone was located about 380 n mi west of Bermuda.

Southwesterly flow ahead of a mid-latitude shortwave trough that was moving off the east coast of the United States began to accelerate Gert toward the northeast by early on 16 August, causing the cyclone to pass well to the northwest and north of Bermuda. The hurricane developed a small 10-n mi diameter eye (Fig. 5a-c) and reached a peak intensity of 95 kt by 1800 UTC that day when it was located about 385 n mi south-southeast of Halifax, Nova Scotia. Gert maintained that intensity for another 6 h, after which time the cyclone moved over sharply cooler SSTs of less than 26°C and into southwesterly vertical wind shear of more than 30 kt (Fig. 4). The combination of these unfavorable conditions resulted in rapid erosion of the convective cloud pattern (Fig. 5d), causing Gert to weaken to a tropical storm by 1200 UTC 17 August and transition to an extratropical cyclone just 6 h later when the system was located about 290 n mi southeast of St. John's, Newfoundland. The extratropical low moved steadily northeastward on 18 August and continued to weaken before finally dissipating by 0000 UTC 19 August over the cold waters of the far North Atlantic.

METEOROLOGICAL STATISTICS

Observations in Hurricane Gert (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 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 Hurricane Gert.

Gert's estimated peak intensity of 95 kt is based on a blend of satellite intensity estimates of T5.0/90 kt from TAFB and SAB, an ADT estimate of T6.0/115 kt, AMSU estimates of 99 kt and 100 kt, and the small eye structure noted in passive microwave satellite imagery (Fig. 5a-c). Although there were higher estimates of T5.6/105 kt from UW-CIMSS AMSU and ADT, those values appear to have had a high bias. The estimated minimum central pressure of 962 mb closely follows the Knaff-Zehr-Courtney (KZC) pressure-wind relationship.

Ship reports of tropical-storm-force winds associated with Hurricane Gert are given in Table 2.

CASUALTY AND DAMAGE STATISTICS

There were no reports of damage or casualties associated with Hurricane Gert.

FORECAST AND WARNING CRITIQUE

The genesis of Gert was not well forecast. The tropical wave from which Gert eventually developed was first introduced in the Tropical Weather Outlook (TWO) 228 h prior to genesis with a low probability of formation (< 40%) at 0000 UTC 3 August in the 120-h period (Table 3). The 5-day probability of formation was increased to the medium category (40-60%) 222 h before development, and into the high category (> 60%) 210 h before formation occurred. For the 2-day period, the disturbance was introduced with a low probability of formation 228 h before Gert developed, and was upgraded into the medium category 204 h before genesis occurred. The 48-h genesis probabilities never reached the high category.

The fast forward speed of near 20 kt, coupled with dry mid-level air (relative humidity <50%), likely inhibited the disturbance from developing for nearly 9 days despite the otherwise favorable low vertical wind shear and high SST conditions (Fig. 6). As a result, just 66 h after having been initially introduced into the TWO, the 48-h genesis probabilities were decreased to the low category, and the 5-day probabilities were decreased to the medium category. The 5-day probabilities were further decreased to the low category 84 h after originally being introduced in the TWO, which was 144 h before formation occurred. The 5-day probabilities were increased back into the medium category 84 h before tropical cyclone genesis. The disturbance never reached the high category for the 48-h period genesis period, and the 5-day probabilities also did not reach the high category for a second time after having been lowered.

A verification of NHC official track forecasts (OFCL) for Gert is given in Table 4a. Official forecast track errors were considerably greater than the mean official errors for the previous 5-yr period at all forecast times, with OFCL errors being nearly 120% worse at 72 h. The reason for the larger-than-average track errors was a high forward speed (i.e., along-track) bias. In contrast, the OFCL cross-track errors were extremely low, especially for the first 10 forecast cycles (Fig. 7). A homogeneous comparison of the official track errors with selected guidance models is given in Table 4b. OFCL forecasts were bested at every forecast time by the Hurricane Weather Research and Forecast model (HWFI), and by the majority of the remaining track models at most time periods, with the exception of the Canadian (CMCI), Navy NAVGEM (NVGI), Navy COAMPS (CTCI), and the three Beta-advection models (TABS, TABM, and TABD). However, even the typically best-performing models, the NOAA GFS (GFSI) and ECMWF (EMXI), struggled at various times with Gert's track forecasts. The best overall track forecast guidance was the Florida State Superensemble (FSSE) model, which outperformed OFCL and the other individual models at all forecast times.

A verification of NHC official intensity forecasts for Gert is given in Table 5a. Official forecast intensity errors were slightly lower than the mean official errors for the previous 5-yr period through 36 h and slightly higher than the mean errors at 48 h. At 72 and 96 h, however,

the intensity errors were significantly higher, about twice the mean official errors for the previous 5-yr period. The reason for the large errors at those times was the underforecasting of Gert's intensity while the hurricane was strengthening, and then the overforecasting of the cyclone's intensity after it had peaked and was undergoing rapid weakening (Fig. 8). A homogeneous comparison of the official intensity errors with selected guidance models is given in Table 5b. Similar to the official forecasts, most of the available intensity guidance also did not anticipate Gert's more robust development at most forecast times. The exceptions were the consensus models ICON and IVCN, and the HCCA (HFIP Corrected Consensus Approach) and FSSE models.

There were no coastal watches and warnings associated with Hurricane Gert.

ACKNOWLEDGMENTS

Table 1.   Best track for Hurricane Gert, 12–17 August 2017.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
12 / 0000	22.4	66.8	1013	25	low
12 / 0600	22.7	67.8	1013	25	"
12 / 1200	23.2	68.7	1013	25	"
12 / 1800	24.0	69.4	1013	30	tropical depression
13 / 0000	24.9	70.0	1012	35	tropical storm
13 / 0600	25.8	70.6	1012	35	"
13 / 1200	26.8	71.2	1012	35	"
13 / 1800	27.7	71.6	1012	35	"
14 / 0000	28.5	71.9	1009	40	"
14 / 0600	29.2	72.1	1006	45	"
14 / 1200	29.7	72.2	1002	50	"
14 / 1800	30.2	72.3	996	55	"
15 / 0000	30.8	72.3	992	60	"
15 / 0600	31.5	72.3	986	65	hurricane
15 / 1200	32.3	72.1	982	70	"
15 / 1800	33.2	71.8	980	70	"
16 / 0000	34.2	71.0	976	75	"
16 / 0600	35.4	69.5	973	80	"
16 / 1200	36.8	67.1	969	85	"
16 / 1800	38.2	64.1	962	95	"
17 / 0000	39.4	60.4	964	90	"
17 / 0600	40.7	56.2	968	80	"
17 / 1200	42.2	52.0	981	60	tropical storm
17 / 1800	44.0	48.0	988	50	extratropical
18 / 0000	45.9	44.3	991	40	"
18 / 0600	47.7	40.5	994	35	"
18 / 1200	48.8	37.8	996	35	"
18 / 1800	50.5	36.5	998	35	"
19 / 0000					dissipated
16 / 1800	38.2	64.1	962	95	minimum pressure and maximum intensity

Table 2.   Selected ship reports with winds of at least 34 kt for Hurricane Gert, 12–17
August 2017.

Date/Time (UTC)	Ship call sign	Latitude (°N)	Longitude (°W)	Wind dir/speed (kt)	Pressure (mb)
14 / 1000	C6FN4	29.3	73.5	340 / 35	1008.0
16 / 0000	3FSV5	33.5	71.6	280 / 39	1010.4
16 / 0600	C6FT7	31.6	66.5	200 / 35	1016.9
16 / 0900	C6FT7	31.5	67.4	200 / 38	1015.3
16 / 1800	WZZF	32.9	66.0	250 / 44	1019.2
17 / 1400	A8JR4	39.0	49.0	230 / 38	1013.0

Table 3.   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
in parentheses indicate the lead time for which the disturbance was re-entered in
the corresponding Tropical Weather Outlook for that category.

	Hours Before Genesis	
	48-Hour Outlook	**120-Hour Outlook**
Low (< 40%)	228	228
Medium (40% - 60%)	204 (12)	222 (84)
High (> 60%)	-- (--)	210 (--)

Table 4a.   NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Hurricane Gert, 12–17 August 2017. 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	25.1	53.1	83.6	116.9	231.5	231.6	
OCD5	50.0	127.4	204.0	246.4	288.8	552.2	
Forecasts	17	15	13	11	7	3	
OFCL (2012-16)	24.9	39.6	54.0	71.3	105.8	155.4	208.9
OCD5 (2012-16)	47.3	103.9	167.8	230.3	343.1	442.6	531.0

Table 4b.   Homogeneous comparison of selected track forecast guidance models (in n mi) for Hurricane Gert, 12–17 August 2017. 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	72	96	120
OFCL	24.9	50.1	80.6	112.3	204.1		
OCD5	47.7	117.2	207.8	308.1	461.9		
GFSI	**24.8**	**43.5**	90.0	159.8	285.5		
EMXI	25.6	54.6	82.0	**102.7**	**174.9**		
EGRI	25.0	**46.1**	**59.3**	**67.0**	**164.9**		
CMCI	30.5	54.7	**77.3**	**111.6**	**136.6**		
NVGI	45.6	96.0	132.0	151.5	302.4		
HWFI	**24.8**	**40.0**	**68.4**	**108.7**	**142.5**		
CTCI	33.2	64.7	103.7	164.7	464.2		
HCCA	**21.2**	**39.2**	**65.7**	**107.4**	**188.3**		
FSSE	**20.9**	**39.1**	**61.4**	**91.6**	**108.3**		
HMNI	28.9	54.0	90.7	160.7	473.0		
AEMI	25.9	**48.9**	87.1	137.2	**180.5**		
GFEX	**24.1**	**47.8**	82.1	129.8	228.4		
TVCA	**24.2**	**44.4**	**71.8**	**110.0**	**155.1**		
TVCX	**23.7**	**45.1**	**71.1**	**108.0**	**158.2**		
TCON	**22.9**	**38.7**	**66.0**	**103.8**	**85.3**		
TABD	35.6	**49.1**	81.4	114.5	204.1		
TABM	34.5	64.1	104.3	166.1	307.8		
TABS	57.8	123.3	182.7	246.6	226.2		
Forecasts	12	10	9	8	4		

Table 5a.   NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Gert. 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	**4.7**	**7.3**	**9.6**	12.3	25.7	30.0	
OCD5	6.6	9.3	11.5	12.8	21.7	19.7	
Forecasts	17	15	13	11	7	3	
OFCL (2012-16)	5.5	8.2	10.5	12.0	13.4	14.0	14.5
OCD5 (2012-16)	7.1	10.5	13.0	15.1	17.4	18.2	20.6

Table 5b.   Homogeneous comparison of selected intensity forecast guidance models (in kt) for Gert. 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.

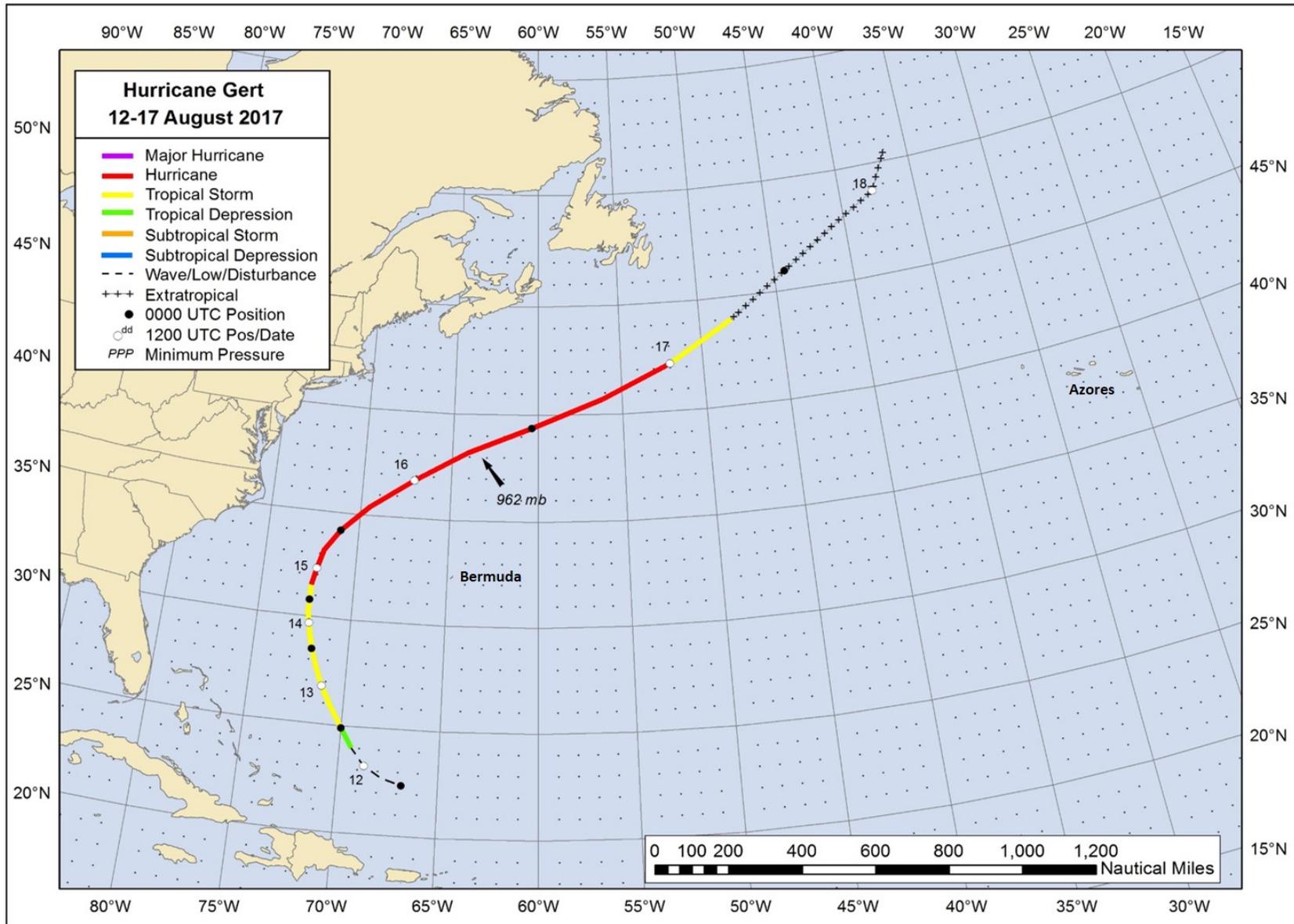| Model ID	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL	4.6	7.5	10.9	12.5	28.3		
OCD5	6.3	9.1	12.6	13.5	**23.7**		
DSHP	5.9	8.3	13.1	15.7	**21.7**		
LGEM	6.1	9.8	15.3	18.0	**23.7**		
CTCI	7.1	10.5	18.4	19.9	47.0		
HWFI	5.2	7.8	12.9	18.6	**28.0**		
HMNI	6.1	11.6	17.5	18.2	35.3		
ICON	4.6	**6.7**	**9.1**	**9.4**	**16.0**		
IVCN	**4.4**	**7.3**	11.3	**11.7**	**15.3**		
GFSI	7.9	12.5	16.4	19.2	39.3		
EMXI	8.9	14.3	21.6	26.1	34.7		
HCCA	**4.2**	**6.3**	**9.3**	**9.1**	**16.7**		
FSSE	**3.8**	**6.7**	**8.6**	**8.7**	**18.7**		
Forecasts	14	12	11	10	3		

Figure 1.   Best track positions for Hurricane Gert, 12–17 August 2017. The track during the extratropical stage is partially based on analyses from the NOAA Ocean Prediction Center.
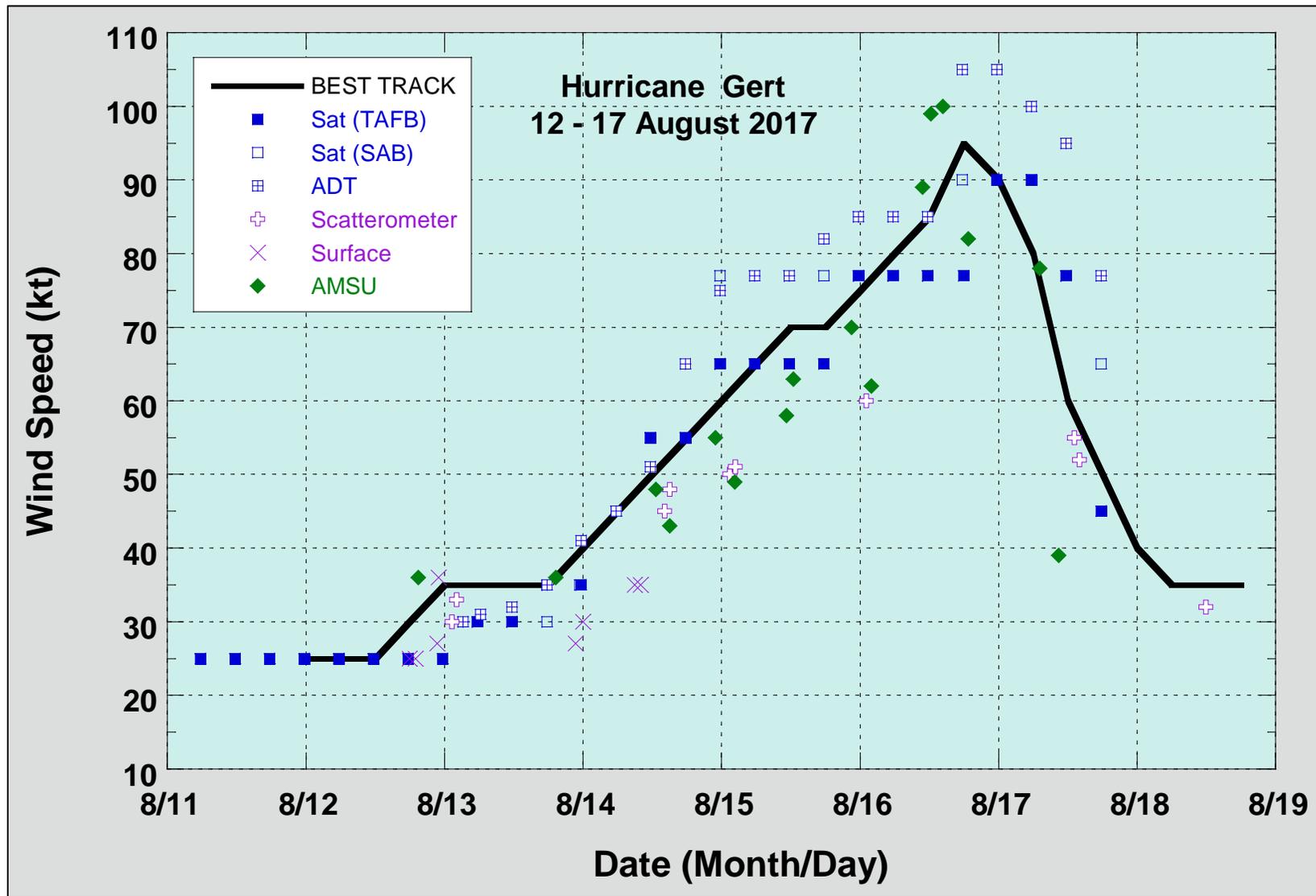
Figure 2.   Selected wind observations and best track maximum sustained surface wind speed curve for Hurricane Gert, 12–17 August 2017. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. AMSU intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies technique. Dashed vertical lines correspond to 0000 UTC.
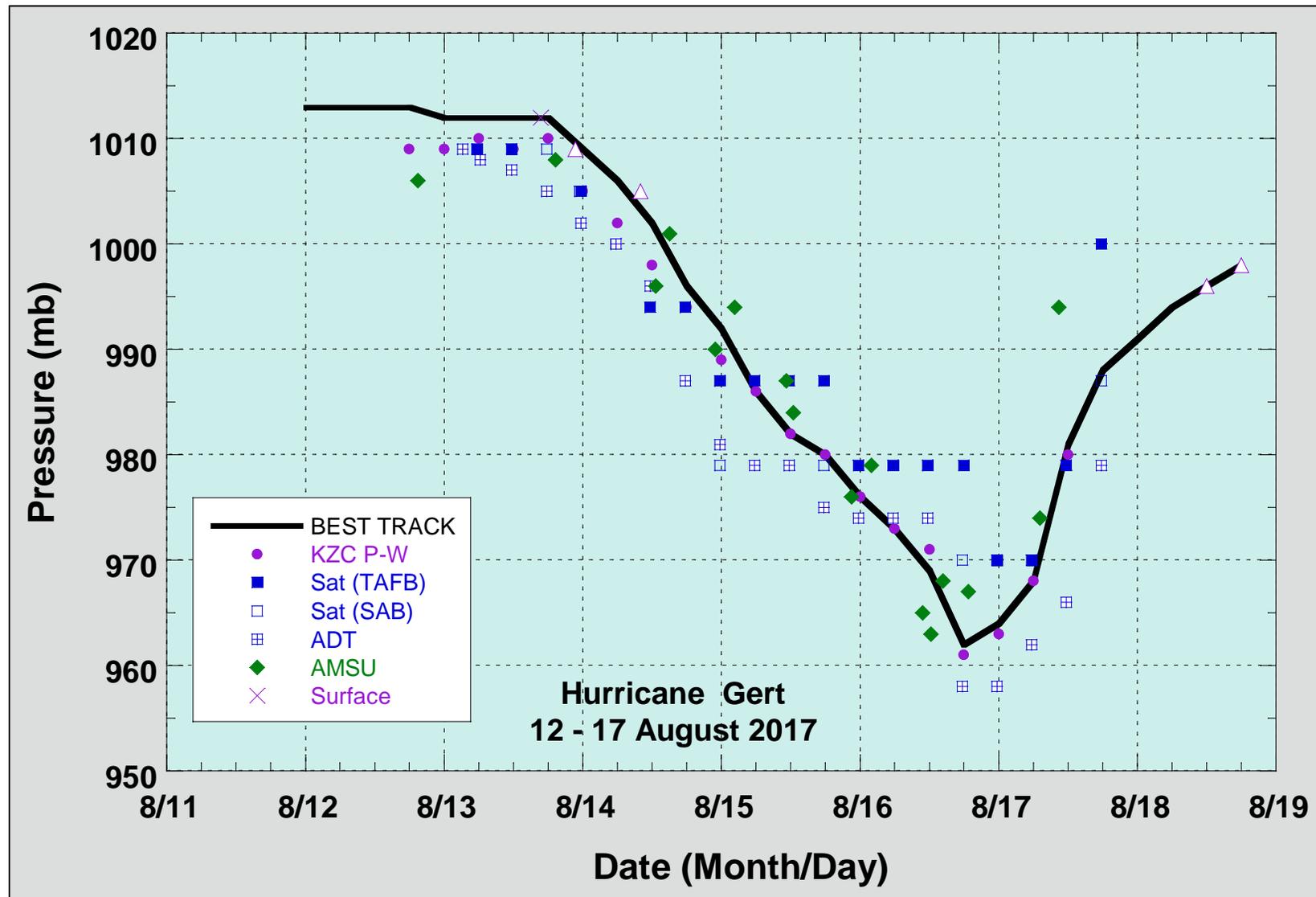
Figure 3.   Selected pressure observations and best track minimum central pressure curve for Hurricane Gert, 12–17 August 2017. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. AMSU intensity estimates are from the Cooperative Institute for Meteorological 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.
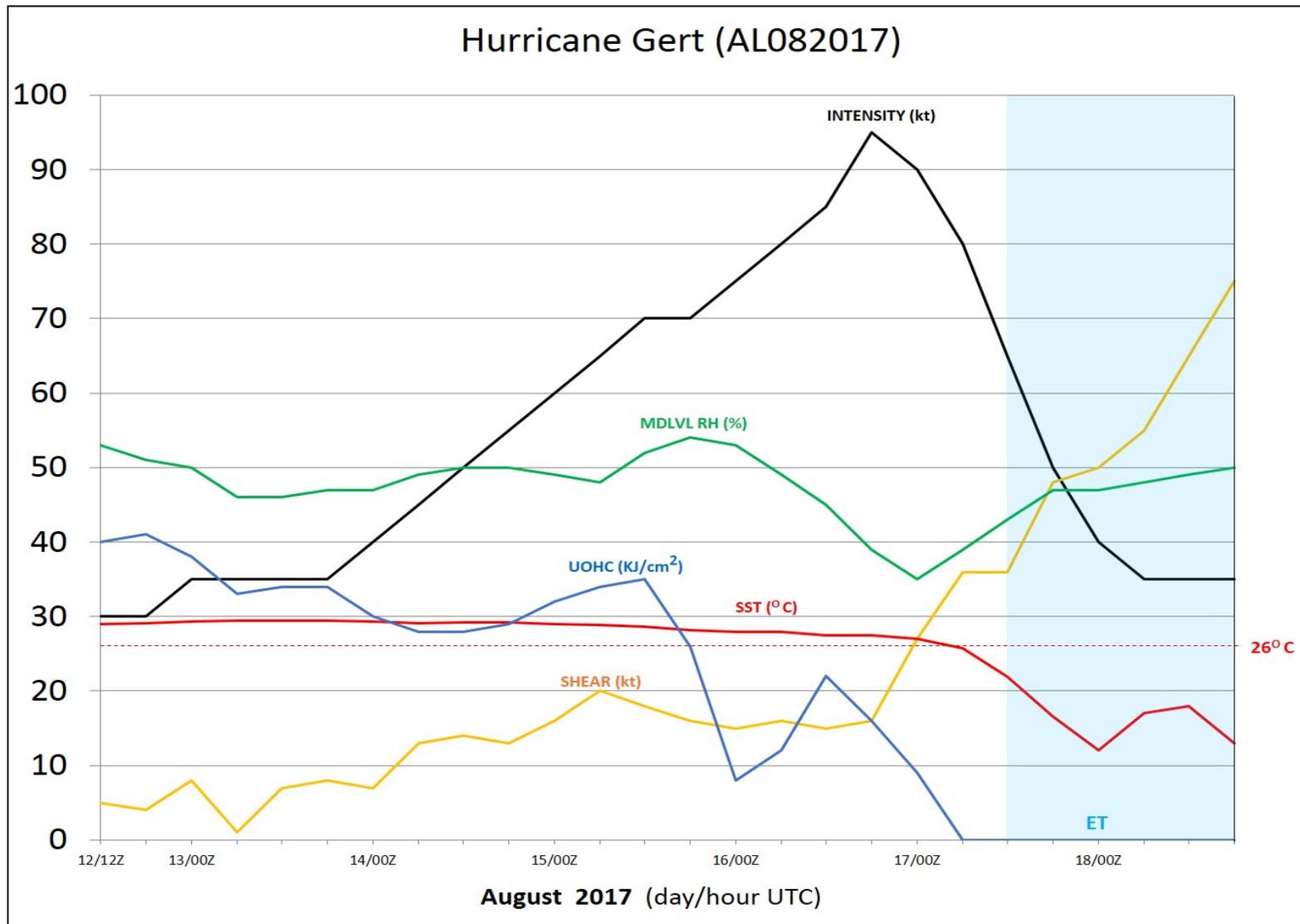
Figure 4.   Graph of Hurricane Gert's intensity versus GFS-based SHIPS model analyzed environmental parameters: 850−200-mb vertical wind shear (SHEAR), sea-surface temperature (SST), upper-ocean heat content (UOHC), and 700−500-mb average relative humidity (MDLVLRH). Time period covered is from 1200 UTC 12 August to 1800 UTC 18 August 2017, which includes Gert's extratropical phase (ET/light-blue shading).
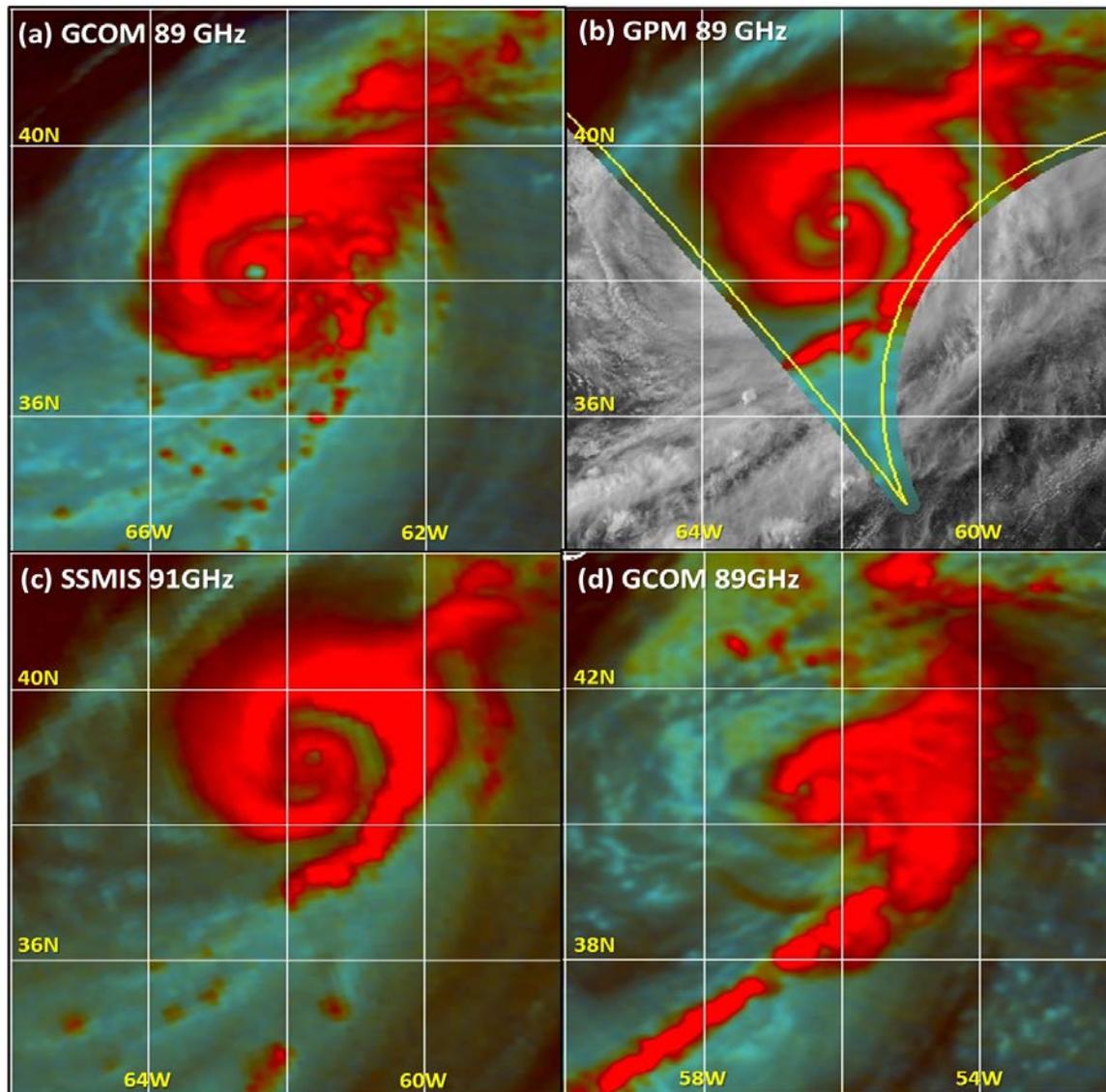
Figure 5.   Microwave satellite imagery showing the evolution of the small eye of Hurricane Gert on 16 October at (a) 1558 UTC, (b) 2131 UTC, and (c) 2204 UTC, followed by (d) significant erosion of Gert's eye and inner-core convection at 0516 UTC 17 October. Images courtesy of the U.S. Naval Research Laboratory, Monterey, CA.
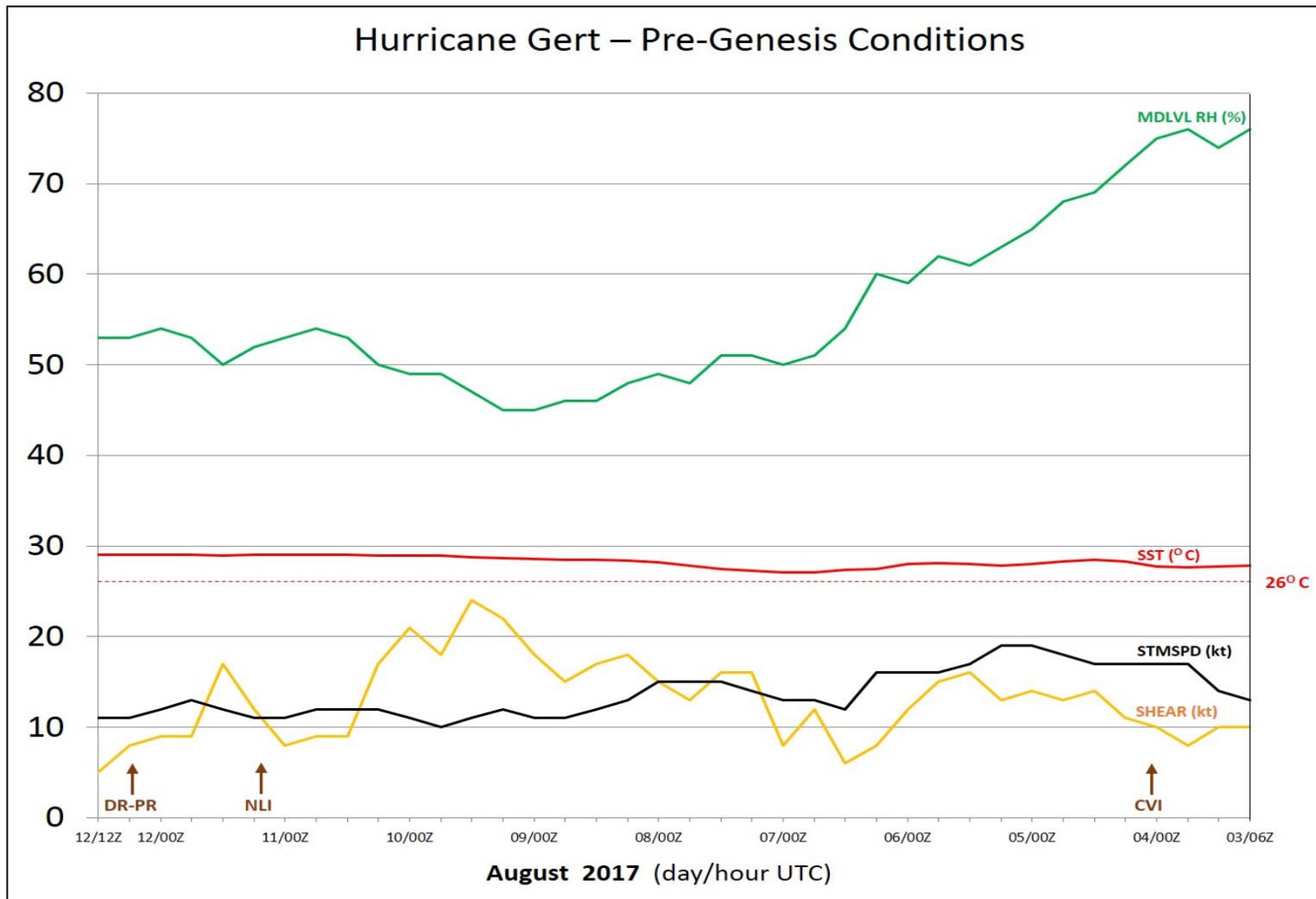
Figure 6.   Graph of conditions during Gert's pre-genesis phase after the incipient disturbance moved off of the west coast of Africa on 3 August. GFS-based SHIPS model analyzed environmental parameters include: 850−200-mb vertical wind shear (**SHEAR**), sea-surface temperature (**SST**), and 700−500-mb average relative humidity (**MDLVLRH**). The disturbance's speed of motion (**STMSPD**) is indicated by the solid black line. Approximate time that the disturbance reached the Cabo Verde Islands (**CVI**), northern Leeward Islands (**NLI**), and Dominican Republic-Puerto Rico (**DR-PR**) is indicated across the bottom of the graph. Time scale increases from right to left to coincide with the disturbance's westerly component of motion.
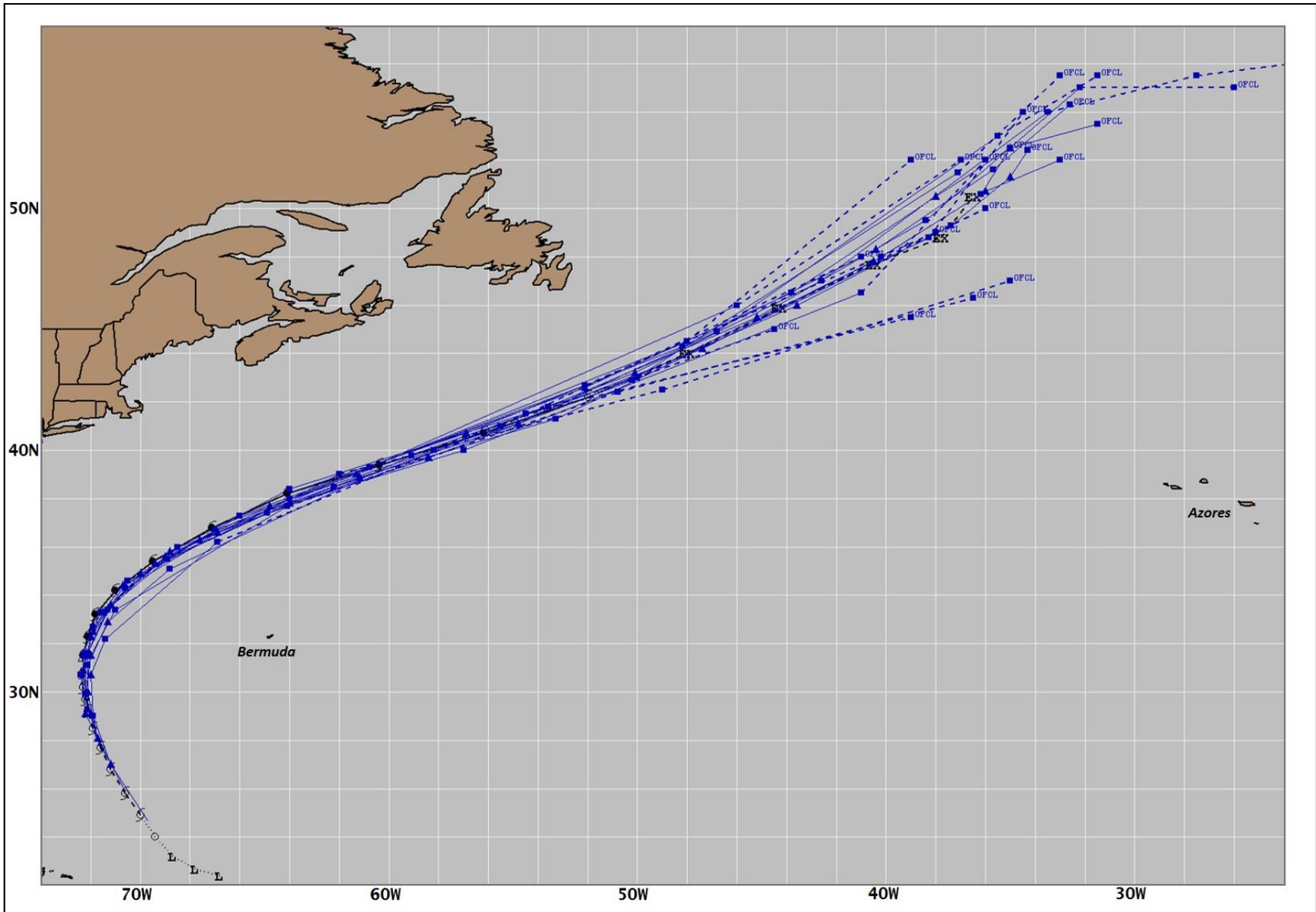
Figure 7.   Selected official track forecasts (solid and dashed blue lines, with 0, 12, 24, 36, 48, 72, and 96 h positions indicated) for Hurricane Gert, 12–17 August 2017. The best track is given by the black line with positions given at 6-h intervals.

Figure 8.   Selected official intensity forecasts (solid blue lines) for Hurricane Gert, 12–17 August 2017. The intensity best track is given by the solid black line with positions given at 6-h intervals.