NATIONAL HURRICANE CENTER TROPICAL CYCLONE REPORT

HURRICANE ERNESTO

(AL052024)

12–20 August 2024

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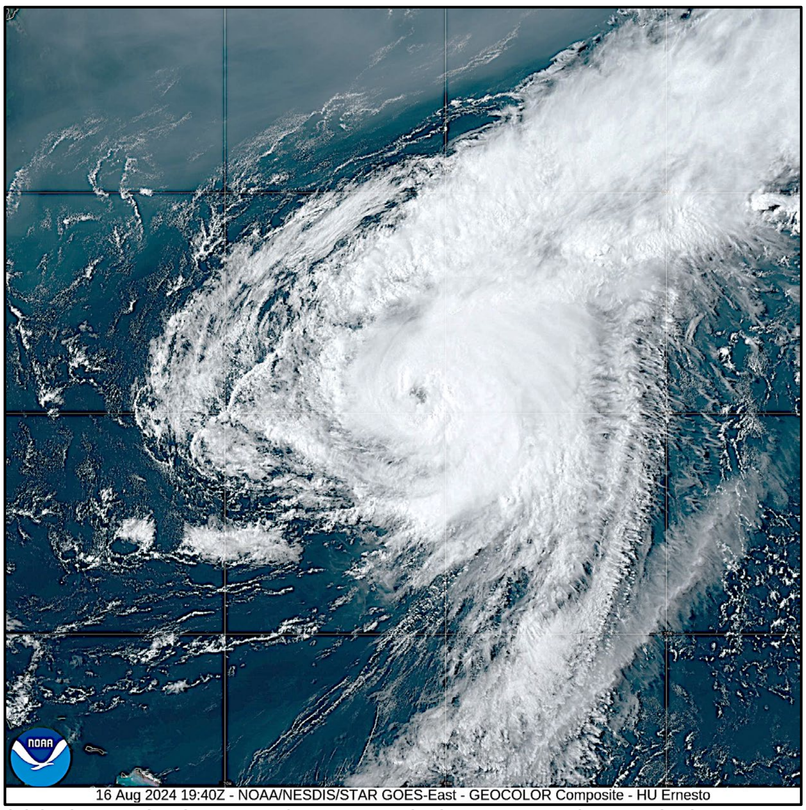

GOES-EAST GEOCOLOR IMAGE OF HURRICANE ERNESTO AT 1940 UTC 16 AUGUST, NEAR THE TIME OF PEAK INTENSITY WHILE APPROACHING THE ISLAND OF BERMUDA. IMAGE COURTESY OF NOAA/NESDIS/STAR.

Ernesto was a category 2 hurricane (on the Saffir-Simpson Hurricane Wind Scale) that made landfall on Bermuda as a category 1 hurricane. Heavy rains and tropical storm conditions also occurred in the Leeward Islands and Puerto Rico as Ernesto moved through as a tropical storm. Rip currents associated with the hurricane took the lives of three people along the southeastern United States coastline.

Hurricane Ernesto

12–20 AUGUST 2024

SYNOPTIC HISTORY

The origins of Ernesto came from a tropical wave that emerged off the coast of Africa on 7 August. Initially the wave was low amplitude and lacked much shower and thunderstorm activity, but as the wave axis moved westward into the central Tropical Atlantic, this activity gradually developed over the next several days. On 10 August, a broad area of low pressure had formed with a large area of somewhat organized showers and thunderstorms as the entire feature moved quickly westward. The next day, shower and thunderstorm activity had become better organized, but scatterometer wind data indicated the system did not yet possess a closed circulation, due to its broad structure and fast (20–25 kt) forward motion. However, deep convection developed overnight closer to the center of the broad low, helping to improve its center definition. At 1200 UTC 12 August, a combination of aircraft data and visible satellite imagery indicated a tropical depression had formed about 390 n mi east of Guadeloupe in the Leeward Islands. The depression became Tropical Storm Ernesto 6 h later. The "best track" chart of Ernesto'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].

After genesis, Ernesto gradually slowed down, initially maintaining a north-of-due-westward heading while being steered by a large subtropical ridge. On this track, Ernesto approached and moved over Guadeloupe as a 35-kt tropical storm around 0940 UTC 13 August. Later that day, Ernesto turned more west-northwestward as it moved over the extreme northeastern portion of the Caribbean Sea and produced tropical storm conditions across a significant portion of the Leeward Islands. Environmental conditions were conducive for intensification, with low (<10 kt) 200–850 mb vertical wind shear, very warm (29–30°C) sea-surface temperatures, and sufficient mid-level moisture. While these favorable conditions allowed Ernesto to intensify on 13–14 August, the broad sprawling structure of the tropical cyclone prevented rapid intensification. After moving across the Virgin Islands, Ernesto re-entered the Atlantic Ocean and passed about 40 n mi north of San Juan, Puerto Rico as a 60-kt tropical storm by 0600 UTC 14 August. While a formative inner core was taking shape on radar images (Fig. 4a), synthetic aperture radar (SAR) data valid at the same time (Fig. 4b) showed the strongest winds were removed from the center in a large principal rainband located to the east of the center. This rainband produced heavy rainfall and gusty winds over the Virgin Islands and Puerto Rico.

Now moving away from Puerto Rico, Ernesto continued to intensify and became a hurricane by 1200 UTC 14 August while located about 100 n mi to the northeast of the eastern tip of the Dominican Republic. Aircraft data and microwave imagery also indicated the formation of an eyewall (Fig. 5a) later that day. However, this initial attempt at inner core structure was short

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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.

lived, as Ernesto struggled to maintain an eyewall and remained a category 1 hurricane on 15 August while a prominent dry slot wrapped into the center (Fig. 5b). Even though the hurricane only slowly intensified, its wind field and radius of maximum wind expanded as a larger eyewall took shape (Fig. 5c). During this period, Ernesto reached a weakness in the subtropical ridge induced by a large mid- to upper-level trough located just off the eastern U.S. seaboard. Consequently, the hurricane began to recurve, first turning northwestward, northward, and, then northeastward while maintaining a forward motion of 10–15 kt between 14–16 August. After its large eyewall consolidated (Fig. 5d), Ernesto reached a peak intensity as an 85-kt category 2 hurricane from 0000–1800 UTC 16 August, while located several hundred miles south-southwest of Bermuda. At peak intensity, an eye was occasionally seen on geostationary satellite imagery (cover image), though the hurricane's convective structure was becoming more asymmetric due to the trough northwest of Ernesto increasing vertical wind shear.

As Ernesto began moving northeastward on 16 August, it approached the island of Bermuda. Weakening began as the mid- to upper-level trough steering the system also increased westerly vertical wind shear to 20–25 kt, which helped import dry air once again into the tropical cyclone's core. Early on 17 August, the center of Ernesto moved directly over Bermuda, with landfall estimated at 0830 UTC that day as a 75-kt category 1 hurricane. Near landfall, Ernesto's inner core and eye had degraded significantly (Fig. 6a) with Bermuda experiencing a significant period of light winds as the hurricane moved across the island (Fig. 6b). The tropical cyclone also slowed down significantly as the trough influencing its motion bypassed the storm to the north. While this environmental change also resulted in a reduction in vertical wind shear, nearby dry air infiltrated the cyclone's core, limiting deep convection (Fig. 5e), and Ernesto briefly weakened to a tropical storm from 0000–1200 UTC 18 August.

It took a day or so for the tropical cyclone to mix out the remaining dry air, but other environmental factors remained favorable, and Ernesto became a hurricane again at 1800 UTC 18 August. The hurricane intensified further as its wind field contracted over the sufficiently warm Gulf Stream waters. Ernesto's inner core structure improved on microwave imagery with an eye re-forming (Fig. 5f), and the hurricane reached a brief second peak of 85 kt at 1200 UTC 19 August, while located about 450 n mi southwest of Cape Race, Newfoundland. Thereafter, the tropical cyclone accelerated northeastward, as the next deep-layer trough amplified along the northeastern U.S. coastline, and Ernesto became steered around the northern periphery of a rebuilding subtropical ridge to its southeast. Passing north of the northern wall of the Gulf Stream, Ernesto began weakening, and it made its closest approach to Newfoundland near the Avalon Peninsula as it was undergoing extratropical transition, completing this process by 1200 UTC 20 August when it was located about 225 n mi east-northeast of St. John. The extratropical cyclone continued to accelerate east-northeastward and ultimately opened into a trough by 0000 UTC 21 August.

METEOROLOGICAL STATISTICS

Observations in Ernesto (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 (CIMSS). Observations also include flight-level, stepped frequency microwave radiometer (SFMR), and dropwindsonde observations from 19 flights of the 53rd Weather Reconnaissance Squadron of the U.S. Air Force Reserve Command, and NOAA's Aircraft Operations Center (flight paths and center fixes are shown in Fig. 7). 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), the Defense Meteorological Satellite Program (DMSP) satellites, and the Time-Resolved Observations of Precipitation structure and storm Intensity with a Constellation of Smallsats (TROPICS) satellites, among others, were also useful in constructing the best track of Ernesto.

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

Winds and Pressure

Ernesto's peak intensity of 85 kt from 0000–1800 UTC 16 August is based on a blend of aircraft observations from Air Force and NOAA hurricane hunter missions. A peak 700-mb flight-level wind of 103 kt was observed in the northeast eyewall of Ernesto at 2305 UTC 15 August. While a typical 90% reduction factor would support an intensity of 90–95 kt, there is reason to believe the flight-level reduction factor was lower than typical. For instance, a coincident dropsonde launched near the peak 700-mb wind only showed a boundary layer wind mean of 72 kt. A dropsonde launched earlier at 2258 UTC in the northeast eyewall of Ernesto also reported a boundary layer wind mean of 85 kt. SFMR data also supported lower winds, however these data were only used qualitatively as reliability issues with the SFMR dataset were identified by NOAA scientists[2] . Thus, using a more conservative 80-85% reduction factor from 700 mb supports an intensity of around 85 kt. The next set of recon observations during the day on 16 August were similar, with the Air Force C-130 reporting a peak 700-mb flight-level wind of 99 kt at 1512 UTC, and the NOAA P-3 reporting a 750-mb flight-level wind of 107 kt at 1647 UTC. However, with even lower dropsonde mean boundary layer winds and SFMR on these flights, a lower than standard 80-85% reduction factor was also used for these flight-level winds, which continues to support an intensity of 85 kt during this period.

Ernesto's second peak of 85 kt at 1200 UTC 19 August is based on a blend of both objective and subjective satellite-based intensity estimates. While subjective Dvorak fixes from TAFB and SAB were only T4.5/77 kt, ADT and SATCON peak values were higher, at 95 kt and 97 kt, respectively. While not depicted in Fig. 2, the highest UW-CIMSS Deep Multispectral Intensity of TCs (D-MINT) and Deep IR Intensity of TCs (D-PRINT) estimates near this time were also 90 kt and 85 kt, respectively[3].

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[2] See the Public Information Statement about degraded quality of 2024 SFMR observations: https://www.nhc.noaa.gov/archive/text/PNSNHC/2024/PNSNHC.202410011258.txt

[3] For more information about D-MINT and D-PRINT, please refer to Griffin, S. M., A. Wimmers, and C. S. Velden, 2024: Predicting Short-Term Intensity Change in Tropical Cyclones Using a Convolutional Neural Network. *Wea. Forecasting*, **39**, 177–202, https://doi.org/10.1175/WAF-D-23-0085.1.

The estimated minimum central pressure of 967 mb at 1200 UTC 16 August is based on a dropsonde launched in the eye of Ernesto at 1203 UTC 16 August which measured a 968-mb pressure with 14 kt of wind at the surface.

Ernesto's landfall intensity on Bermuda is estimated to be at 75 kt, based partially on earlier aircraft data that showed winds weakening and a plethora of surface observations available on the island. The highest sustained wind observed on Bermuda was at the National Museum of Bermuda (elevation 22 m) with a sustained wind of 77 kt gusting to 95 kt at 0450 UTC 17 August. Closer to sea level, the Bermuda L.F. Wade International Airport reported a peak sustained (10-min) wind of 57 kt and a gust to 73 kt at 0450 UTC 17 August. Several observing stations also reported minimum pressures of 972–975 mb as the center of Ernesto moved across the island. The Bermuda Weather Service indicated that Ernesto set the lowest surface pressure record for the island in the month of August.

Ernesto also moved across several Leeward Islands as a tropical storm when it briefly entered the northwestern Caribbean Sea. There were numerous stations that reported tropical-storm-force winds in Guadeloupe, Saint Martin, St. Barthelemy, the U.S. Virgin Islands, and Puerto Rico. Wind gusts at or above hurricane force were observed in both Guadeloupe (at elevation) and in Saint Martin at the Grand Case Airport.

Both Puerto Rico and the Virgin Islands experienced wind gusts above hurricane force, albeit some at elevated locations. For Puerto Rico, a WeatherFlow station at Culebrita Island (elevation 70 m) reported a sustained wind of 58 kt and a wind gust to 75 kt at 0509 UTC 14 August. Another WeatherFlow station at Yabucoa Tanque de Agua (elevation 142 m) reported a sustained wind of 57 kt and a wind gust of 70 kt at 0851 UTC 14 August. On Buck Island, just north of St. Croix, a WeatherFlow station reported a wind gust of 70 kt at 0645 UTC 14 August. The highest sustained winds in the Virgin Islands were reported in St. Thomas, a 44-kt report at a WeatherFlow station at Rupert Rock and 44 kt at a National Ocean Service (NOS) weather station at Lime Tree Bay.

Storm Surge[4]

A NOS station at the Bermuda Biological Station on the eastern side of the island reported a storm surge of 2.27 ft (0.69 m) above normal tide levels. Combined with the low tide, the surge produced a peak water level of 0.84 ft (0.26 m) above Mean Higher High Water (MHHW), and Bermuda did not report any damage associated with storm surge. Minor storm surge was also reported in Puerto Rico and the U.S. Virgin Islands, with a variety of NOS stations in the coastal area only reporting inundation levels under 0.5 to 0.8 ft (0.15–0.24 m).

[4] Several terms are used to describe water levels due to a storm. **Storm surge** is defined as the abnormal rise of water generated by a storm, over and above the predicted astronomical tide, and is expressed in terms of height above normal tide levels. Because storm surge represents the deviation from normal water levels, it is not referenced to a vertical datum. **Storm tide** is defined as the water level due to the combination of storm surge and the astronomical tide, and is expressed in terms of height above a vertical datum, i.e. the North American Vertical Datum of 1988 (NAVD88) or Mean Lower Low Water (MLLW). **Inundation** is the total water level that occurs on normally dry ground as a result of the storm tide, and is expressed in terms of height above ground level. At the coast, normally dry land is roughly defined as areas higher than the normal high tide line, or Mean Higher High Water (MHHW).

Rainfall and Flooding

Ernesto was responsible for a large swath of heavy rainfall that occurred across the Leeward Islands and Puerto Rico, and later over Bermuda. Table 3 provides selected rainfall totals over the entire event, while Figure 8 provides an analysis of total rainfall for Puerto Rico and the U.S. Virgin Islands. A large rainband that formed on the morning of 14 August (Fig. 4a) contributed to widespread rainfall totals for Ernesto between 5–15 inches in Puerto Rico, especially along upslope areas of the island. The highest rainfall total observed was 13.90 inches (353.1 mm) in Ciales County in the higher mountainous terrain of central Puerto Rico. In the U.S. Virgin Islands, somewhat lower rainfall totals of 5–9 inches (125–200 mm) were common, with the highest total of 8.96 inches (227.6 mm) observed just west of Charlotte Amalie in St. Thomas. For the remainder of the Leeward Islands, more general 2–5 inch (50–125 mm) totals were common over Guadeloupe, Antigua, Montserrat, Saint Kitts, Saint Martin, Anguilla, Nevis, Antigua, Saba, and Saint Eustatius.

Significant rainfall in Bermuda from Ernesto also occurred from 16–17 August, generally in the 6–8 inch (152–203 mm) range, with the L.F. Wade International Airport reporting a rainfall total of 6.98 inches (177 mm). This rainfall resulted in urban flooding that covered some roadways with scattered debris from the floodwater.

CASUALTY AND DAMAGE STATISTICS

Ernesto's large wind field generated large swells and life-threatening rip currents along the southeastern United States, and there were 3 rip-current fatalities[5] associated with Ernesto. Two fatalities from drowning, 65- and 73-year-old men, occurred in Hilton Head Island, South Carolina on 16 August. Another rip current death occurred in Surf City, North Carolina, a 41-year-old man who was surfing offshore.

The total monetary damage related to Ernesto was estimated near $520 million U.S. Dollars, per a global catastrophe report by Aon, primarily due to flooding rainfall along with significant wind gusts that occurred in Puerto Rico, the Leeward Islands, and to a lesser extent in Bermuda.

In Guadeloupe, several main roads were closed as Ernesto moved over the island, and scattered power outages and road closures from downed trees were observed in Saint Barthelemy, Saint Martin, and Anguilla, with many ports and airports temporarily closed in preparation of the storm.

The U.S. Virgin Islands experienced widespread power outages that affected more than 45,000 customers due to strong wind gusts early on 14 August. St. Croix, St. Thomas, and St.

[5] 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.

John all lost power completely for a short period of time. Flooding rainfall also led to damaged roadways with downed trees also blocking some roads as Ernesto moved through the region (Fig. 9, top). Dozens of buildings were damaged, along with other structural damage to billboards and rooftops. Urban flooding was also prevalent, and some ship vessels broke free from their moorings.

Puerto Rico's power grid was substantially impacted by Ernesto, with peak outages impacting 1 million households. Wind damage contributed to many uprooted trees, with the San Juan National Weather Service office issuing 130 local storm reports. These reports were mostly associated with wind gust damage. In addition, the substantial rainfall from Ernesto's large outer rain bands led to flooding of multiple rivers and urban areas, leading to mudslides in upslope areas in the interior of Puerto Rico with significant damage to nearby roads and crops (Fig. 9 bottom). Many local crops were destroyed, with estimates above 20 million dollars of agricultural damage. A total of 37 river locations from the U.S. Geological Survey reached flood stage, and several rivers remained above flood stage for multiple days after the heaviest rainfall. In the more urban areas of Añasco and Cabo Rojo, more than 60 vehicles were flooded by a nearby overflowing river, with adjacent roadways destroyed. Several emergency rescues were made to save individuals that tried to cross the flooded roadways.

In Bermuda, hurricane-force wind gusts led to downed power lines and many trees, leading to significant power outages, with more than 75 percent of the island (more than 25,000 customers) losing power that took several days to restore. Overall damage to structures and housing was relatively minor with most cleanup efforts focusing on clearing debris from fallen vegetation for power restoration. Some downed trees and utility poles on roads led to temporary obstructions, and one gas station observed some roof damage from Ernesto's winds (Fig. 10). In anticipation of the storm, the L.F. Wade International Airport was closed for a 12-h period from 16–17 August as Ernesto moved overhead, and shelters were opened for residents ahead of the storm.

FORECAST AND WARNING CRITIQUE

Genesis

The genesis of Ernesto was reasonably well forecast, though with somewhat lower than optimal lead time in the 7-day outlook (Table 4). The wave from which Ernesto developed was introduced in the 7-day Tropical Weather Outlook (TWO) with a low probability (<40%) 102 h prior to genesis. The probabilities were then increased to the medium (40–60%) category 90 h and then high category (>60%) 60 h before the system became a tropical cyclone. In contrast, the 2-day formation probabilities were better calibrated, with Ernesto given a low chance of development 60 h beforehand, which were subsequently increased to the medium and high categories 42 h and 24 h before genesis, respectively. The location of Ernesto's genesis was also well predicted (Fig. 11) with all outlooks issued capturing the correct point of formation, which was close to the center of the sum of all areas issued.

Track

A verification of NHC official track forecasts for Ernesto is given in Table 5a. Official track forecast errors (OFCL) were lower than mean official errors at all forecast lead times for the previous 5-yr period, and in some cases much lower, approximately 50% of the mean official errors at 96 h and 120 h. Climatology-persistence track errors (OCD5) were generally larger than the long-term mean OCD5 errors, suggesting that Ernesto's track was harder to forecast than average. An illustration of the OFCL track forecasts can be seen in Figure 12, showing impressive consistency of the NHC track forecasts issued with the verifying best track falling along those tightly clustered forecasts, albeit verifying on the western portion of the track forecast envelope as Ernesto began to recurve on 14–15 August. A homogeneous comparison of the official track errors with selected guidance models is given in Table 5b. OFCL outperformed most of the deterministic guidance, except for the GFS (GFSI) model from 12–48 h, and a few lead times from the Canadian (CMCI) model. Several consensus aids had slightly lower track errors than OFCL, with the best performing aids being HCCA, FSSE, and GFEX from 12–96 h though no aid outperformed OFCL in the 5-day forecast.

Intensity

A verification of NHC official intensity forecasts for Ernesto is given in Table 6a. OFCL forecast errors were lower than the mean official errors for the previous 5-yr period at 12 h, but then greater than the mean official errors for the remainder of the forecast lead times. OCD5 intensity errors were somewhat lower than the long-term means, suggesting that Ernesto's intensity forecast was easier to forecast than average. An investigation of the individual intensity forecasts for the storm (Fig. 13) reveals that, while Ernesto's intensification to a hurricane was well anticipated, the peak value in many of the forecasts (100 kt) was too high compared to the final best track (85 kt). This discrepancy could have occurred because Ernesto struggled to maintain an inner core due to dry air entrainment and had a pre-existing large wind field (Figs. 4 and 5). Moreover, the weakening that occurred after the hurricane reached peak intensity was more dramatic than forecasted, with none of the OFCL forecasts showing Ernesto weakening to a tropical storm prior to its occurrence. A homogeneous comparison of the official intensity errors with selected guidance models is given in Table 6b. Several intensity aids were able to outperform the official forecast, including HAFS-A (HFAI) from 24–72 h, HAFS-B (HFBI) from 24–48 h, and both HWRF (HWFI) and HMON (HMNI) from 36–72 h. Not surprisingly, the intensity consensus aids also performed well, with HCCA, IVCN, and ICON having lower intensity errors than the official forecasts from the 24–96 h period.

Watches and Warnings

Watches and warnings associated with Ernesto are given in Table 7. Prior to Ernesto's genesis, Potential Tropical Cyclone advisories were initiated at 2100 UTC 11 August to provide sufficient lead time when Tropical Storm Watches went into effect for Guadeloupe, St. Martin, Sint Maarten, St. Kitts, Nevis, Montserrat, Antigua, Barbuda, Anguilla, Saba, and St. Eustatius. For the United States, a Tropical Storm Watch was issued for the U.S. Virgin Islands at 0300 UTC 12 August, and for Puerto Rico at 0900 UTC 12 August, with both areas being upgraded to a Tropical Storm Warning at 1500 UTC 12 August. Tropical storm conditions were observed in both U.S. territories between 0000–1200 UTC 14 August, with the Tropical Storm Warning providing roughly 30–42 h of lead time of tropical storm conditions. Later, the Bermuda Weather Service issued a

Hurricane Watch for the island at 2100 UTC 14 August, which was later upgraded to a warning at 0900 UTC 15 August, about 48 h before Ernesto made landfall on the island as a hurricane.

IMPACT-BASED DECISION SUPPORT SERVICES (IDSS) AND PUBLIC COMMUNICATION

The NHC began communication with emergency managers on 12 August, as Ernesto was developing east of the Caribbean. Three decision support briefings were provided to emergency managers and coordinated through the FEMA Hurricane Liaison Team embedded at the NHC. The briefings were federal video-teleconferences with FEMA HQ and FEMA Region 2. These briefings continued through 14 August, as Ernesto moved north of Puerto Rico and the U.S. Virgin Islands. In addition, NHC provided seven briefings (four live, and three emailed) to U.S. Coast Guard District 7 from 12–15 August.

ACKNOWLEDGEMENTS

Data in Table 3 were compiled from reports issued by the NWS Weather Forecast Office in San Juan, Puerto Rico, National Data Buoy Center, NOS Center for Operational Oceanographic Products and Services, in addition to data provided by Météo France, the Bermuda Weather Service, and storm chaser Josh Morgerman who was in Bermuda. Maria Torres, Christina Rivero, and Michael Spagnolo provided the input for the IDSS section. Dr. Lisa Bucci contributed the recon, track, and intensity verification figures, and David Roth (WPC) produced the total rainfall figure for Puerto Rico.

Table 1. Best track for Hurricane Ernesto, 12–20 August 2024.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
11 / 1800	14.4	47.2	1010	25	disturbance
12 / 0000	14.8	49.8	1009	25	"
12 / 0600	15.3	52.2	1009	25	"
12 / 1200	15.6	54.6	1008	30	tropical depression
12 / 1800	15.9	56.6	1007	35	tropical storm
13 / 0000	16.0	58.6	1007	35	"
13 / 0600	16.1	60.5	1007	35	"
13 / 0940	16.4	61.4	1007	35	"
13 / 1200	16.6	62.0	1005	40	"
13 / 1250	16.7	62.2	1005	40	"
13 / 1800	17.6	63.5	1001	50	"
13 / 2330	18.3	64.7	998	55	"
14 / 0000	18.4	64.9	998	55	"
14 / 0600	19.0	66.0	996	60	"
14 / 1200	19.9	67.2	991	65	hurricane
14 / 1800	21.1	68.0	989	65	"
15 / 0000	22.3	68.7	981	70	"
15 / 0600	23.4	69.2	979	75	"
15 / 1200	24.5	69.3	975	75	"
15 / 1800	25.6	69.0	975	80	"
16 / 0000	26.6	68.3	969	85	"
16 / 0600	27.7	67.5	968	85	"
16 / 1200	28.9	66.8	967	85	"
16 / 1800	30.0	66.1	969	85	"
17 / 0000	31.0	65.4	969	80	"
17 / 0600	31.9	65.0	972	75	"
17 / 0830	32.3	64.8	972	75	"
17 / 1200	32.6	64.6	974	70	"
17 / 1800	33.0	64.2	977	65	"
18 / 0000	33.5	63.6	981	60	tropical storm
18 / 0600	34.3	63.2	982	60	"

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
18 / 1200	35.4	63.0	980	60	"
18 / 1800	36.4	62.6	977	65	hurricane
19 / 0000	37.7	62.0	975	70	"
19 / 0600	39.2	61.2	972	75	"
19 / 1200	40.9	59.8	967	85	"
19 / 1800	42.8	58.1	970	80	"
20 / 0000	44.8	55.0	972	75	"
20 / 0600	46.6	51.4	976	65	"
20 / 1200	48.3	47.2	987	60	extratropical
20 / 1800	49.7	41.9	991	55	"
21 / 0000					dissipated
16 / 1200	28.9	66.8	967	85	minimum pressure and maximum winds
13 / 0940	16.4	61.4	1007	35	landfall on Guadeloupe
13 / 1250	16.7	62.2	1005	40	landfall on Montserrat
13 / 2330	18.3	64.7	998	55	landfall on St. John
17 / 0830	32.3	64.8	972	75	landfall on Bermuda

Table 2. Selected ship reports with winds of at least 34 kt for Hurricane Ernesto, 12–20 August 2024.

Date/Time (UTC)	Ship call sign	Latitude (°N)	Longitude (°W)	Wind dir/ speed (kt)	Pressure (mb)
17 / 0000	WDC941	32.4	64.7	110 / 38	1004.7
17 / 0100	WDC941	32.4	64.7	090 / 37	1001.9
17 / 0200	WDC941	32.4	64.7	090 / 39	999.0
19 / 1500	WDM218	39.7	60.8	220 / 39	1005.5
20 / 0900	HWQ33V	43.8	44.3	190 / 48	1017.5
20 / 1300	HWQ33V	43.6	45.8	210 / 45	1016.2

Table 3. Selected surface observations for Hurricane Ernesto, 12–20 August 2024.

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)				
Guadeloupe									
La Raizet Airport (TFFR) (16.27N 61.53W)	13/0900	1007.0	13/1430	25	44				2.62
La Desirade Meteo elevation 27 m			N/A	51	70				
Point-Noire Col Des Mamelles			13/1334	15	48				
Saint Francois Airport			13/1856	23	47				
Grand-Bourg Les Basses Airport			N/A	23	41				
Point-Noire Morphy									4.58
St. Cluade Maison-Volcano									4.49
Point-Noire Bellevue									4.24
St. Claude Matouba									4.20
Capesterre-Beau Carbet									4.00
St. Martin									
Prinses Juliana (TNCM) (18.04N 63.11W)	13/1800	1008.0	13/1828	35	51				
Grand-Case Airport			13/1711	35	72				0.36
St. Barthelemy									
Gustaf III Airport (TFFJ) (17.90N 62.84W)	13/1730	1006.9	13/0200	33	45				
St. Barthelemy Meteo			13/1834	37	66				
St. Eustatius									
Roosevelt Airport (TNCE) (17.50N 62.98W)	13/1555	1004.8	13/1755	30	43				
British Virgin Islands									
Great Carrot Bay, Tortola WeatherSTEM. (1753W) (18.42N 64.62W)	13/2300	1002.0	13/2130	23	33				
Long Bay Lookout, Tortola (18.40N 64.69W)	13/2240	999.3	14/0009	12	17				
Havers, Tortola (18.40N 64.64W)	13/2305	1002.0	14/0245	12	23				
U.S. Virgin Islands									
Automated Weather Observation Systems (AWOS) Sites									
King Airport, St. Thomas (TIST) (18.34N 64.97W)	14/0035	1001.6	14/0430	41	60				
St. Croix (TISX) (17.70N 64.81W)	13/2253	1006.0	14/0153	31	57				

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)				
National Ocean Service (NOS) Sites									
Charlotte Amalie (CHAV3) (18.34N 64.92W)	14/0024	1001.7	14/0812	43	57			0.7	
Christiansted Harbor St. Croix (CHSV3) (17.75N 64.70W)	13/2042	1004.4	14/0136	30	43			0.5	
Lameshur Bay, St. John (LAMV3) (18.32N 64.7W)	13/2330	1000.5						0.5	
Lime Tree Bay, St. John (LTBV3) (17.69N 64.75W)	14/0130	1005.1	14/0154	44	56			0.7	
WeatherFlow Sites									
Buck Island (XBUK) (18.28N 64.89W)			14/0645		70				
Two Brothers (XBRO) (18.34N 64.82W)			14/0643		65				
Sandy Point NWR (XCRXP) (17.68N 64.90W)			14/0649		60				
Rupert Rock (XRUP) (18.33N 64.93W)	13/2344	1002	14/0409	44	56				
Public/Other									
Cruzan Rum Distillery (1781W) (17.70N 64.83W)	13/2230	1004.3	12/0420	40	51				
Remote Automated Weather Stations (RAWS)									
Cotton Valley, St. Croix (CVAV3) (17.74N 64.62W)			14/0113	30	57				
St. John (SJNV3) (18.36N 64.70W)			14/0129	16	52				
Vieques (VIEP4) (18.12N 65.42W)			14/1011		40				
Puerto Rico									
Automated Weather Observation Systems (AWOS) Sites									
Roosevelt Roads Naval Station (TJNR) (18.26N 65.64W)	14/0253	1005.4	14/0802	42	64				
San Juan International Airport (TJSJ) (18.45N 66.00W)	14/0525	1003.0	13/1545	23	32				3.07
National Ocean Service (NOS) Sites									
Esperanza Vieques (ESPP4) (18.09N 65.47W)	14/0148	1005.1	14/0548	39	50			0.8	
Mayaguez PRSN Station (MGZP4) (18.22N 67.16W)	14/0748	1005.2	14/1806	30	41				

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)				
Magueyes Island Lajas (MGIP4) (17.97N 67.05W)			14/1806		40			0.5	
WeatherFlow Sites									
Culebrita Island (XCUL) elevation 70 m (18.31N 65.23W)	14/0429	1004	14/0509	58	75				
Yabucoa Tanque de Agua (XYTAg) elevation 142 m (18.03N 65.83W)	14/0821	1004	14/0851	57	70				
Del Ray Marina (XREY) (18.29N 65.63W)			14/0953		55				
La Mareas (XMRS) (17.93N 66.16W)			14/1410		45				
Yabucoa EL Negro (XYAB) (18.05N 65.83W)			13/1824		40				
Club Deportivo Del Oeste (XCDP) (18.10N 67.19W)			14/2021		35				
Hydrometeorological Automated Data System (HADS) Sites (NWS)									
3 NNW Villalaba (VLBP4) (18.17N 66.49W)									13.90
2 S Barranquitas (USAP4) (18.16N 66.31W)									11.32
2 NE Villalba (VINP4) (18.16N 66.46W)									10.22
2 NW Duque (NGIP4) (18.28N 65.79W)									10.10
5 NE Marueno (PCEP4) (18.11N 66.60W)									9.75
4 NW Villalba (VILP4) (18.16N 66.53W)									8.74
1 NNW Pastos (ALPP4) (18.13N 66.26W)									8.61
3 ENE Aibonito (AIBP4) (18.16N 66.23W)									8.24
3 NNE Marueno (PRTP4) (18.10N 66.64W)									8.12
Charlotte Amalie West (CRWV3) (18.34N 64.96W)									8.05
3 SSW Naranjito (NRJP4) (18.26N 66.26W)									7.68
6 N Villalba (OROP4) (18.21N 66.48W)									7.65
5 E Espino (SEBP4) (18.28N 67.05W)									7.64
2 NNW Pena Pobre (18.25N 65.83W)									7.46
1 SSW Sumidero (DRAP4) (18.20N 66.14W)									7.34
4 E G. L. Garcia (CAIP4) (18.13N 66.05W)									7.33

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)				
2 NNE Guayabal (TOXP4) (18.10N 66.49W)									7.27
4 SE Sumidero (BZDP4) (18.18N 66.09W)									7.16
4 ESE G. L. Garcia (SLMP4) (18.11N 66.05W)									7.10
COAMO (COAP4) (18.08N 66.35W)									7.09
2 NNW Bairoa (BZAP4) (18.29N 66.08W)									7.00
3 WSW Las Piedras (VAMP4) (18.16N 65.91W)									6.98
1 E Lares (LARP4) (18.30N 66.87W)									6.81
3 SSE Utuado (VIVP4) (18.23N 66.68W)									6.78
5 NNE Ponce Lago Cerrillos (PCXP4) (18.08N 66.58W)									6.66
Lomas (GARP4) (18.27N 65.91W)									6.55
1 ENE Jagual (SLEP4) (18.17N 65.98W)									6.32
3 N Juncal (GUJP4) (18.36N 66.91W)									6.31
3 SE Isabel Segunda (VIEP4) (18.12N 65.42W)									6.28
1 NE Aguas Buenas (BZBP4) (18.27N 66.11W)									6.18
4 S G. L. Garcia (LCSP4) (18.08N 66.11W)									6.16
3 SSE San Lorenzo (SLKP4) (18.15N 65.96W)									6.01
Guayabal (JUNP4) (18.08N 66.50W)									6.00
Remote Automated Weather Stations (RAWS)									
Vieques (VIEP4) (18.12N 65.42W)			14/0611	22	43				
Public/Other									
Fajardo (NOAA meteorologist) (18.36N 65.62W)	14/0245	1002.3							
NWS Cooperative Observer Program (COOP) Sites									
Aguada (DW8435) (18.38N 67.19W)			14/2230		35				
Bermuda									
Bermuda Biological NOS Station (32.37N 64.68W)	17/0906	975.2				2.27		0.84	

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)				
L. F. Wade Intl. Aprt. AWOS (TXKF) (32.37N 64.68W)	17/0915	974.9	17/0450	57 10 min	73				6.98
Airport AviMet-12 (32.36N 64.67W)	17/0917	974.4	17/0452	58 2 min	73				
Maritime Operations Centre (MAROPS) 88 m elevation (32.38N 64.68W)	17/0737	976.9	17/0700	73 1 min	91				
National Museum of Bermuda 22 m elevation (32.33N 64.83W)	17/0850	972.0	17/0450	77 2 min	95				
Paget Parish – Josh Morgerman 22 m elevation (32.28N 64.77W)	17/0843	975.2							
Offshore Sites									
NOAA Buoys									
42060 – Caribbean Valley (16.43N 63.33W)	13/1800	1007.3	13/0413	35	41				
41043 – NE Puerto Rico (21.02N 64.79W)	13/2010	1011.5	14/1402	38	42				
41049 – South Bermuda (27.50N 62.27W)	17/0810	1011.3	17/1421	32	36				
Environment And Climate Change Canada Buoys									
44139 – Banqureau Banks (44.24N 57.10W)	19/2100	988.2	19/2000	37	47				
CarICOOS Buoys									
42085 – Southeast of Ponce, PR (17.86N 66.52W)	14/0640	1003.5	14/1210	30	35				
41056 – North of Vieques (18.27N 65.45W)	14/0200	1002.5	14/0610	36	50				
Saildrones									
Saildrone SD-1031 (31.17N 64.80W)	17/0055	973.7	17/0009	67 1 min	94				
Saildrone SD-1068 (30.76N 65.87W)	16/2046	970.1	16/1951	60 1 min	82				
Saildrone SD-1069 (24.78N 67.21W)	15/1910	1005.3	15/1350	47 1 min	57				
Saildrone SD-1091 (19.33N 65.57W)	14/0606	1003.7	14/0547	52 1 min	66				

[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.
[c] Storm surge is water height above normal astronomical tide level.

[d] For most locations, storm tide is water height above the North American Vertical Datum of 1988 (NAVD88). Storm tide is water height above Mean Lower Low Water (MLLW) for NOS stations in Puerto Rico, the U.S. Virgin Islands, and Barbados.

[e] Estimated inundation is the maximum height of water above ground. For some USGS storm tide pressure sensors, inundation is estimated by subtracting the elevation of the sensor from the recorded storm tide. For other USGS storm tide sensors and USGS high-water marks, inundation is estimated by subtracting the elevation of the land derived from a Digital Elevation Model (DEM) from the recorded and measured storm tide. For NOS tide gauges, the height of the water above Mean Higher High Water (MHHW) is used as a proxy for inundation.

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	168-Hour Outlook
Low (<40%)	60	102
Medium (40%-60%)	42	90
High (>60%)	24	60

Table 5a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Hurricane Ernesto, 12–20 August 2024. 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	**19.1**	**29.0**	**39.3**	**43.4**	**52.1**	**58.7**	**69.0**	**61.6**
OCD5	44.0	107.4	187.1	259.8	313.4	355.0	516.1	775.8
Forecasts	30	28	26	24	22	20	16	12
OFCL (2019-23)	23.9	36.5	49.3	63.4	79.2	93.4	132.9	190.4
OCD5 (2019-23)	45.7	97.1	153.0	205.4	254.9	297.8	372.7	439.1

Table 5b. Homogeneous comparison of selected track forecast guidance models (in n mi) for Hurricane Ernesto, 12–20 August 2024. 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	18.6	29.3	38.1	41.8	48.7	55.3	65.6	60.9
OCD5	44.4	109.9	190.9	265.0	316.9	355.4	505.7	766.2
GFSI	**17.7**	**28.2**	**32.0**	**40.9**	48.9	56.9	79.7	120.1
EMXI	21.5	30.0	41.9	54.3	67.0	82.5	113.1	125.5
CMCI	20.5	**27.8**	**35.1**	42.8	50.6	**54.2**	72.3	93.9
NVGI	23.1	32.4	42.6	50.4	63.7	76.7	120.9	175.7
HFAI	19.3	32.5	47.1	62.4	81.4	90.7	102.9	119.1
HFBI	20.9	36.8	54.2	71.0	86.2	97.8	113.9	116.2
HWFI	20.8	33.2	47.8	61.7	76.9	94.0	142.5	152.4
HMNI	19.7	31.8	44.1	61.0	79.9	95.0	126.3	143.7
HCCA	**17.6**	**25.5**	**33.8**	**36.6**	**41.4**	**48.9**	86.1	101.0
FSSE	**17.3**	**24.8**	**30.6**	**35.1**	**38.7**	**46.2**	82.6	80.0
TVCA	**17.9**	**27.0**	38.1	47.8	57.5	67.9	86.8	84.9
TVDG	**16.9**	**27.0**	**36.0**	44.3	52.6	61.6	80.4	78.8
TVCX	**17.5**	**26.5**	**37.7**	46.9	56.9	65.9	84.5	82.0
AEMI	**16.8**	**26.2**	**33.4**	42.1	**47.7**	57.5	90.1	113.3
GFEX	**18.2**	**24.4**	**30.9**	**37.1**	**43.4**	**52.6**	**64.5**	73.5
TABS	37.6	69.3	97.6	124.4	147.9	158.3	150.9	188.5
TABM	22.8	34.4	49.6	68.5	81.9	102.8	142.4	154.7
TABD	27.7	54.3	86.6	121.9	155.8	195.6	260.4	296.2
Forecasts	29	27	25	23	21	19	15	11

Table 6a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Hurricane Ernesto, 12–20 August 2024. 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	**3.3**	7.7	11.2	12.1	12.3	13.2	16.2	17.1
OCD5	5.7	9.0	11.3	13.0	13.4	14.7	16.1	13.4
Forecasts	30	28	26	24	22	20	16	12
OFCL (2019-23)	5.0	7.3	8.5	9.7	10.4	10.9	12.9	15.5
OCD5 (2019-23)	6.6	10.2	13.1	15.6	17.2	18.6	21.8	22.6

Table 6b. Homogeneous comparison of selected intensity forecast guidance models (in kt) for Hurricane Ernesto, 12–20 August 2024. 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	3.4	7.8	11.0	11.7	12.1	13.4	17.3	16.4
OCD5	5.6	9.0	11.1	12.7	12.3	13.5	**15.0**	**14.1**
HFAI	4.2	**6.7**	**8.0**	**8.6**	**9.3**	**12.7**	19.7	**15.4**
HFBI	4.3	**6.4**	**7.0**	**9.7**	12.4	15.2	18.3	23.9
HWFI	4.8	**5.3**	**6.4**	**6.3**	**8.6**	**11.4**	20.5	23.7
HMNI	4.7	8.0	**9.0**	**7.9**	**9.1**	**10.9**	18.7	**10.9**
DSHP	5.6	9.3	13.2	15.1	15.0	14.5	**13.3**	16.5
LGEM	5.9	8.6	**10.5**	11.8	**10.9**	**11.5**	**13.8**	21.1
HCCA	3.9	**6.3**	**8.1**	**9.2**	**10.0**	**10.6**	**15.7**	**15.2**
FSSE	3.6	**5.9**	**8.9**	11.7	13.8	16.0	22.7	27.2
IVCN	**3.2**	**4.9**	**7.0**	**8.0**	**9.4**	**10.7**	**16.4**	17.9
ICON	4.0	**5.9**	**7.5**	**8.9**	**9.7**	**11.6**	**16.6**	17.7
IVDR	**3.1**	**4.6**	**6.7**	**7.9**	**9.1**	**10.3**	**16.4**	17.5
GFSI	4.6	**7.1**	**8.7**	**9.4**	**9.3**	**11.1**	**11.1**	**13.5**
EMXI	6.0	9.8	11.3	13.7	16.1	15.5	**13.6**	**13.1**
Forecasts	29	27	25	23	21	19	15	11

Table 7. Watch and warning summary for Hurricane Ernesto, 12–20 August 2024.

Date/Time (UTC)	Action	Location
11 / 2100	Tropical Storm Watch issued	Guadeloupe and St. Martin
11 / 2100	Tropical Storm Watch issued	St. Kitts, Nevis, Montserrat, Antigua, Barbuda, and Anguilla
11 / 2100	Tropical Storm Watch issued	Saba and St. Eustatius
11 / 2100	Tropical Storm Watch issued	Sint Maarten
12 / 0300	Tropical Storm Watch issued	U.S. Virgin Islands and British Virgin Islands
12 / 0300	Tropical Storm Watch issued	St. Barthelemy
12 / 0900	Tropical Storm Watch issued	Puerto Rico
12 / 1200	Tropical Storm Watch changed to Tropical Storm Warning	Guadeloupe and St. Martin
12 / 1200	Tropical Storm Watch changed to Tropical Storm Warning	St. Kitts, Nevis, Montserrat, Antigua, Barbuda, and Anguilla
12 / 1200	Tropical Storm Watch changed to Tropical Storm Warning	Saba and St. Eustatius
12 / 1200	Tropical Storm Watch changed to Tropical Storm Warning	Sint Maarten
12 / 1200	Tropical Storm Watch changed to Tropical Storm Warning	St. Barthelemy
12 / 1500	Tropical Storm Watch changed to Tropical Storm Warning	U.S. Virgin Islands and British Virgin Islands
12 / 1500	Tropical Storm Watch changed to Tropical Storm Warning	Puerto Rico
13 / 1500	Hurricane Watch issued	U.S. Virgin Islands and British Virgin Islands
13 / 1800	Tropical Storm Warning discontinued	Guadeloupe
13 / 1800	Tropical Storm Warning discontinued	Antigua and Barbuda
13 / 2100	Tropical Storm Warning discontinued	Montserrat
14 / 0000	Tropical Storm Warning discontinued	St. Martin and St. Barthelemy
14 / 0000	Tropical Storm Warning discontinued	St. Kitts, Nevis, and Anguilla

Date/Time (UTC)	Action	Location
14 / 0000	Tropical Storm Warning discontinued	Saba and St. Eustatius
14 / 0000	Tropical Storm Warning discontinued	Sint Maarten
14 / 0900	Hurricane Watch discontinued	U.S. Virgin Islands
14 / 1200	Hurricane Watch discontinued	British Virgin Islands
14 / 1800	Tropical Storm Warning discontinued	Puerto Rico, U.S. Virgin Islands, and British Virgin Islands
14 / 2100	Hurricane Watch issued	Bermuda
15 / 0900	Hurricane Watch changed to Hurricane Warning	Bermuda
17 / 1800	Hurricane Warning changed to Tropical Storm Warning	Bermuda
18 / 1200	Tropical Storm Warning discontinued	Bermuda

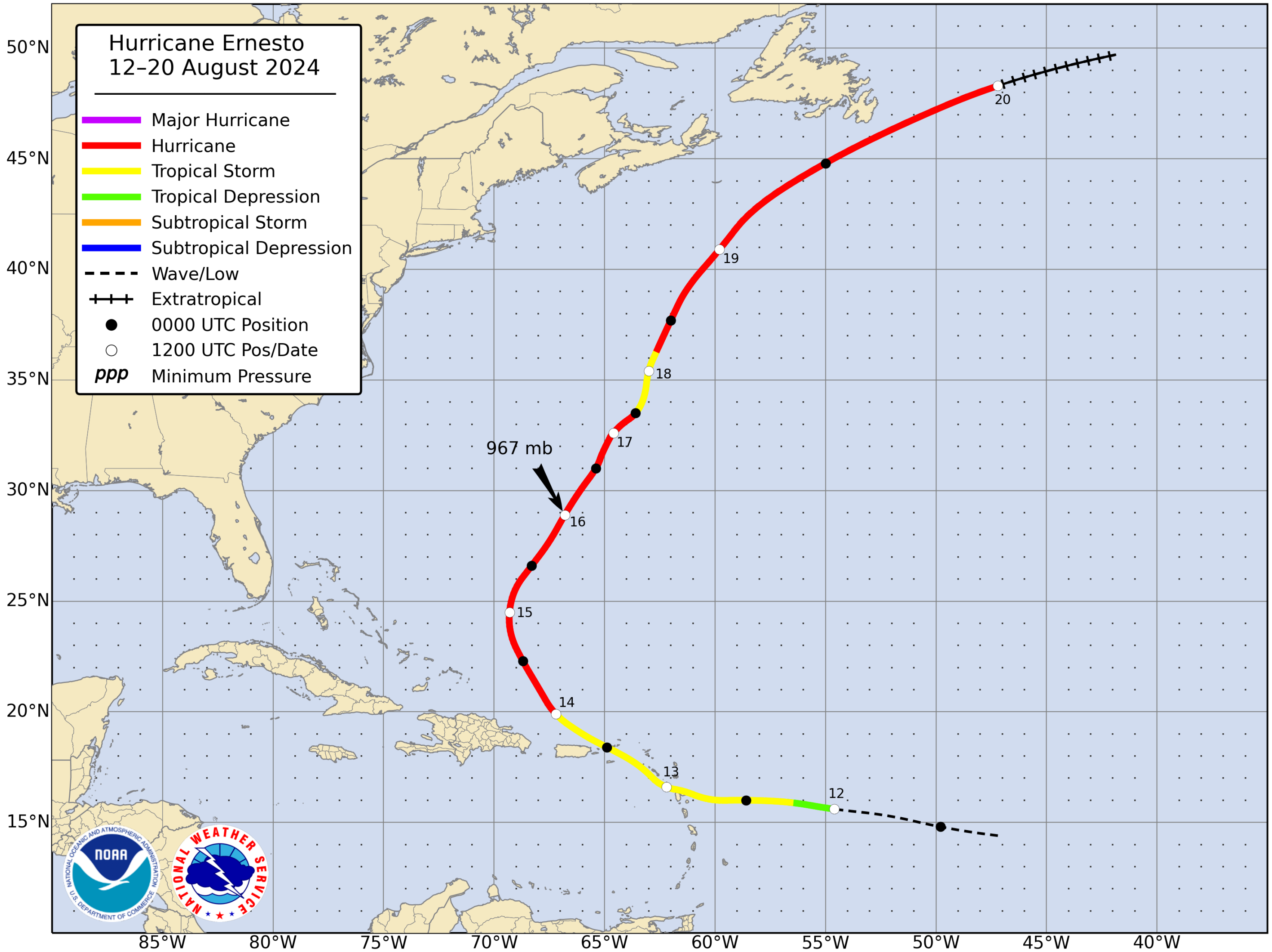

Figure 1. Best track positions for Hurricane Ernesto, 12–20 August 2024. Tracks over the during the extratropical stage are partially based on analyses from the NOAA Ocean Prediction Center.

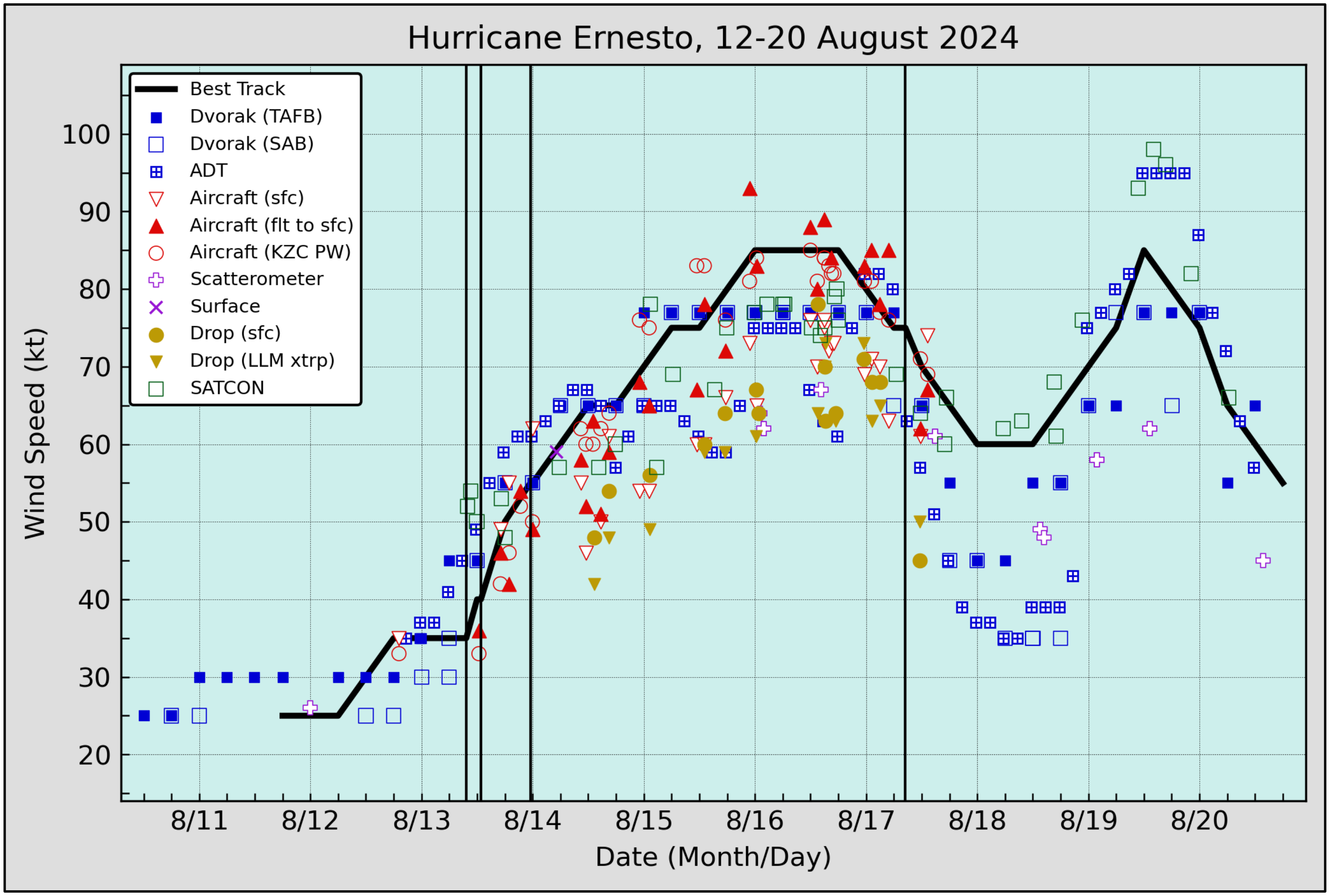

Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Hurricane Ernesto, 12–20 August 2024. Aircraft observations have been adjusted for elevation using 90%, 80%, and 75% adjustment factors for observations from 700 mb, 850 mb, and 925 mb, respectively. Dropwindsonde 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). 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.

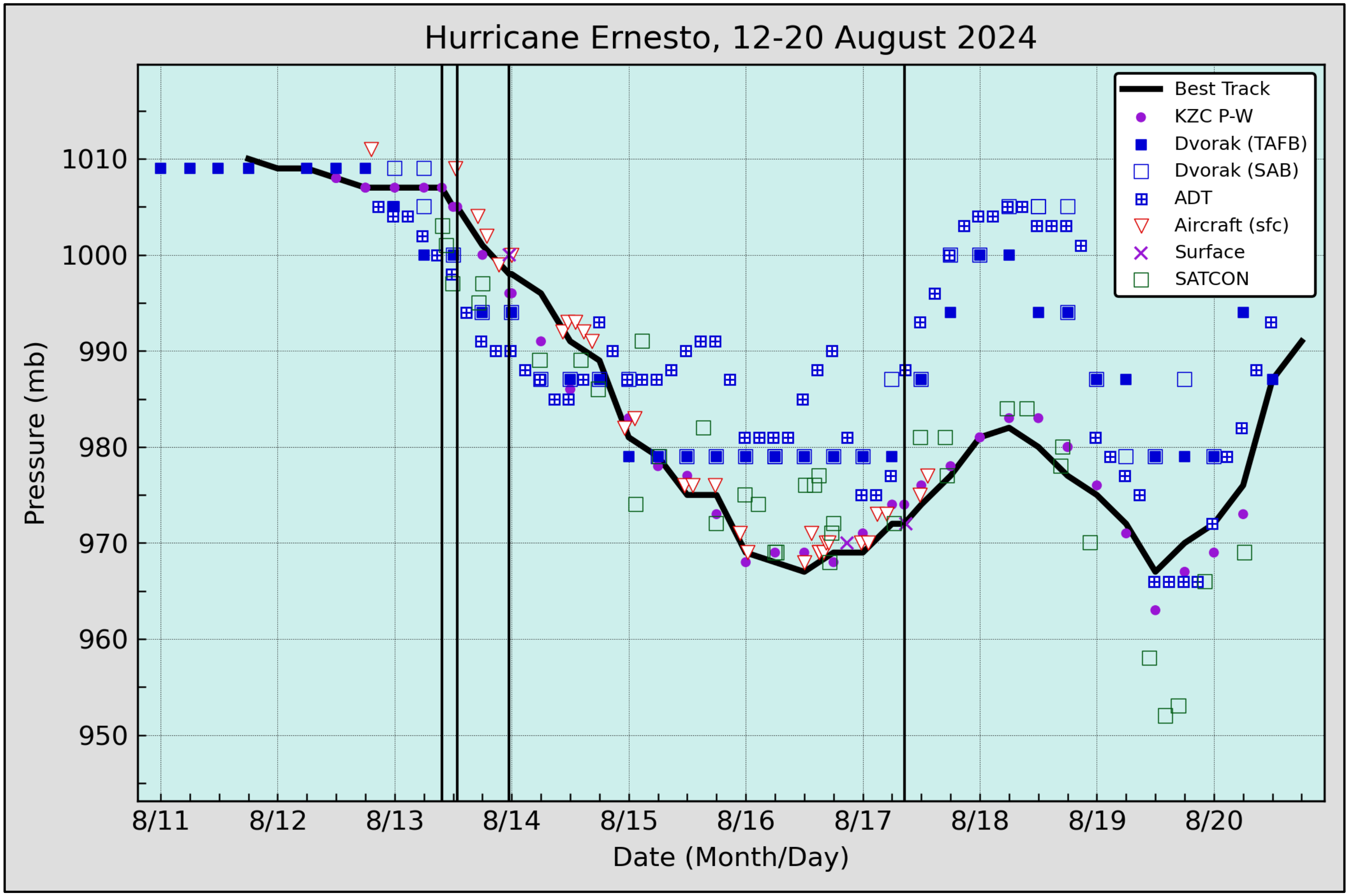

Figure 3. Selected pressure observations and best track minimum central pressure curve for Hurricane Ernesto, 12–20 August 2024. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for Meteorological 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.

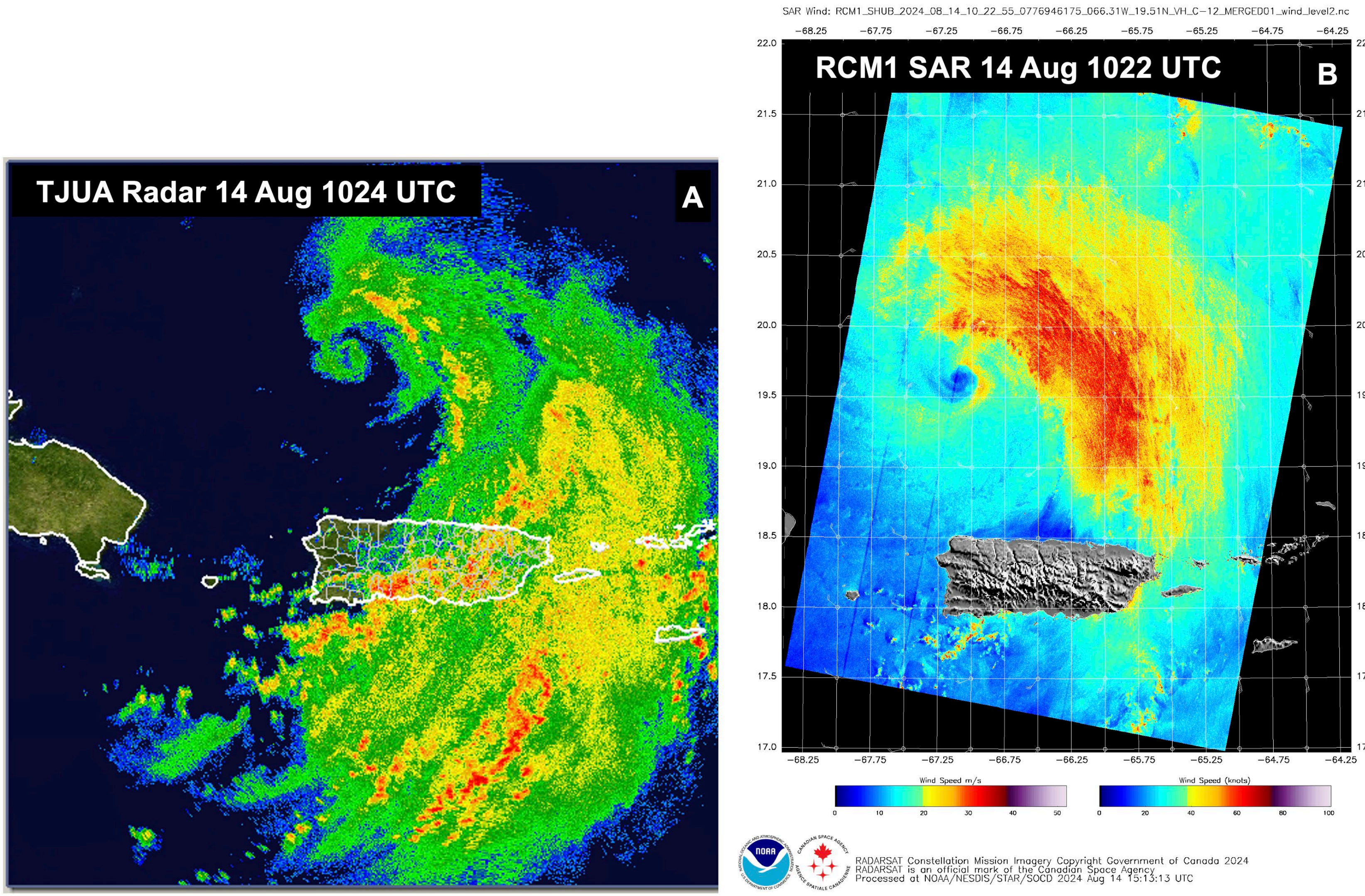

Figure 4. (a) Snapshot of Ernesto passing just to the north of Puerto Rico as a 60-kt tropical storm on radar reflectivity from San Juan, Puerto Rico, at 1024 UTC 14 August, and (b) RCM-1 Synthetic Aperture Radar wind speed data at 500-m resolution (shaded) at 1022 UTC 14 August.

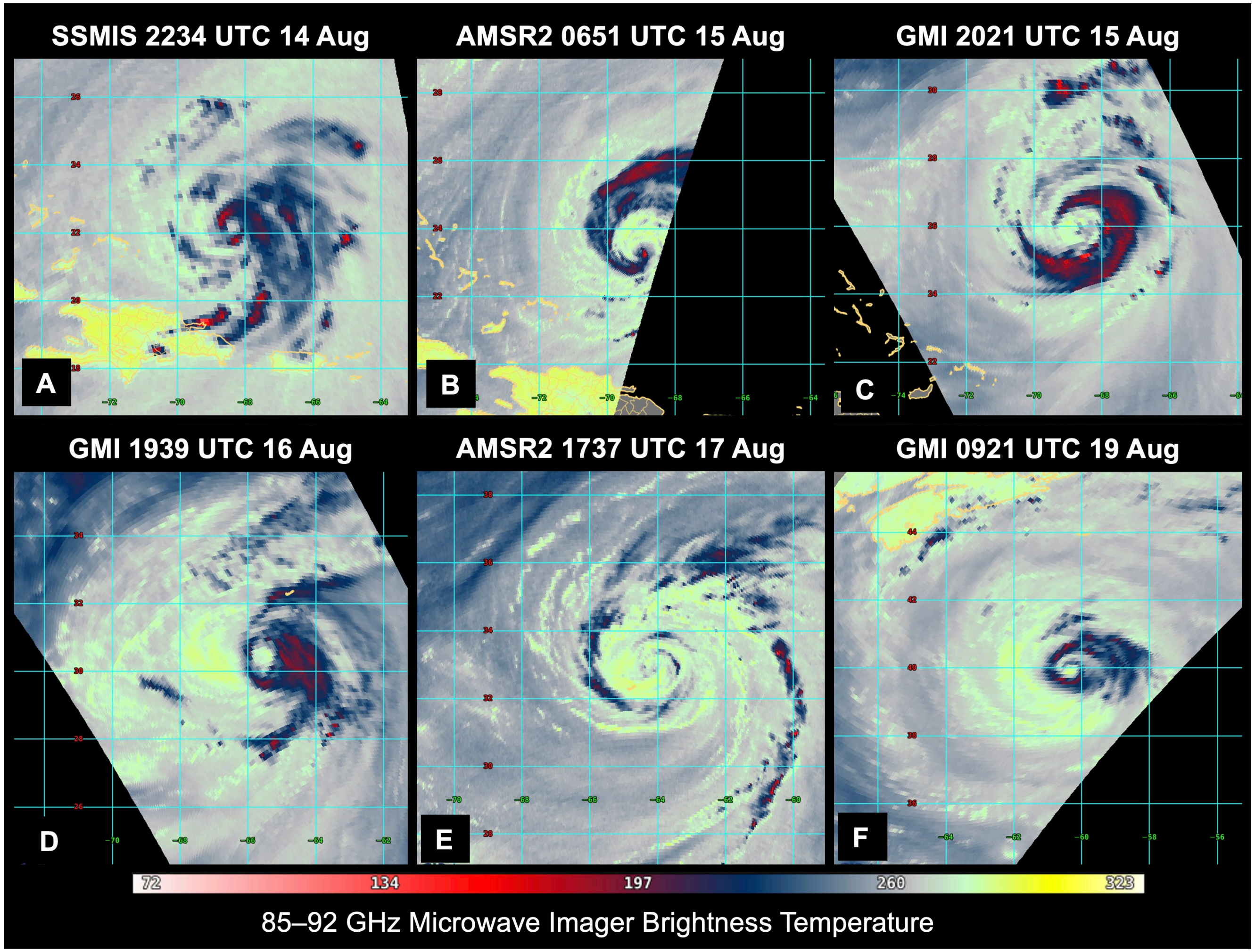

Figure 5. Passive microwave 85-92 GHz brightness temperature imagery showing Ernesto's structural evolution from 14–19 August 2024. (a) 2234 UTC 14 August SSMIS pass showing Ernesto developing an eyewall and eye. (b) 0651 UTC 15 August AMSR2 pass showing Ernesto entraining dry air, which disrupted the smaller inner core. (c) 2021 UTC 15 August GMI pass depicting Ernesto reorganizing with a larger inner core. (d) 1939 UTC 16 August showing Ernesto near peak intensity. (e) 1737 UTC 17 August AMSR2 pass showing Ernesto with a degraded core structure as it weakens after increased shear and dry air entrainment. (f) 0921 UTC 19 August GMI pass showing Ernesto near its second peak with a redeveloped inner core.

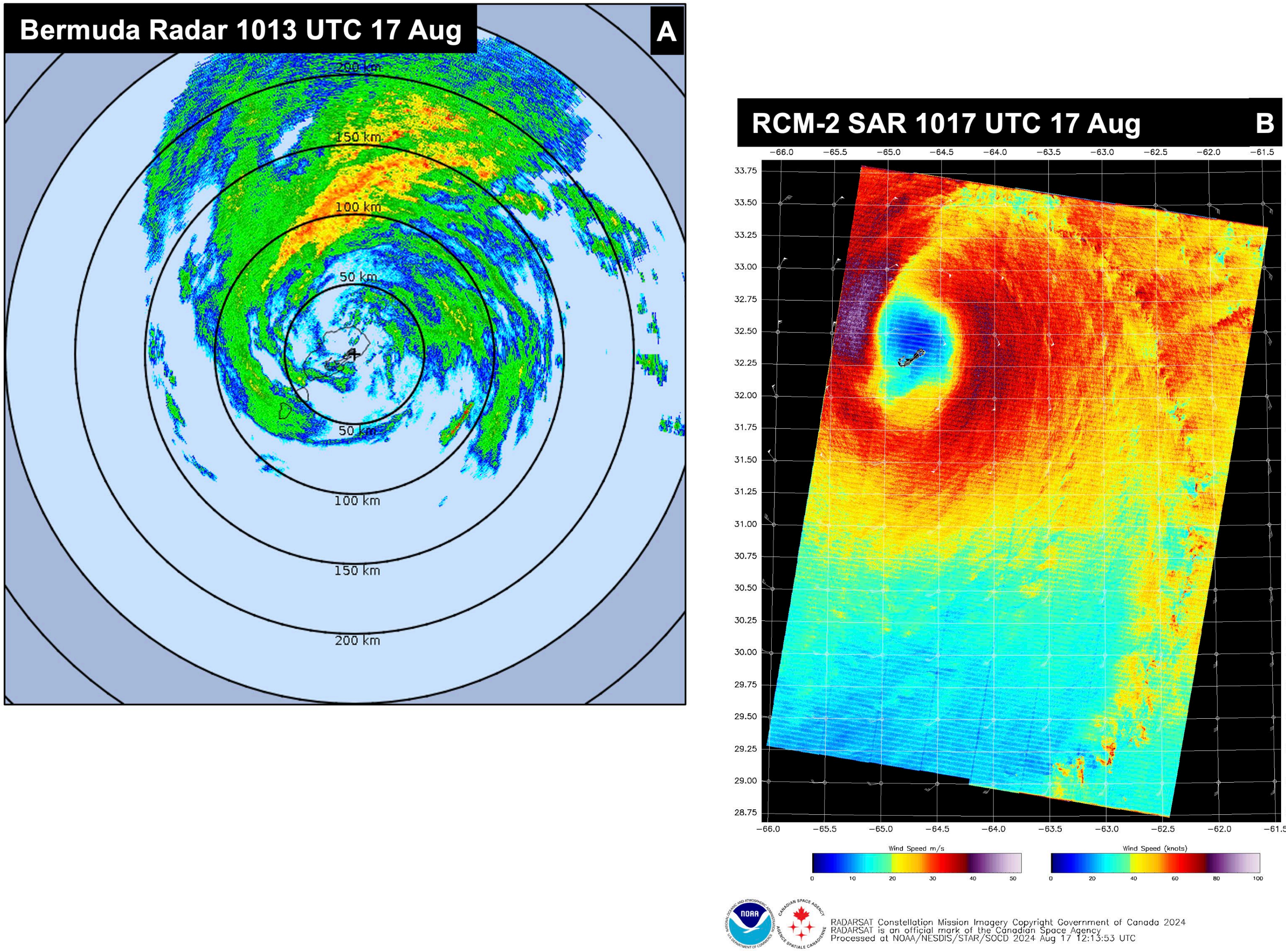

Figure 6. (a) Snapshot of Ernesto over Bermuda as a 75-kt hurricane on radar reflectivity from Bermuda at 1013 UTC 17 August, and (b) RCM-2 Synthetic Aperture Radar wind speed data at 500-m resolution (shaded) at 1017 UTC 17 August.

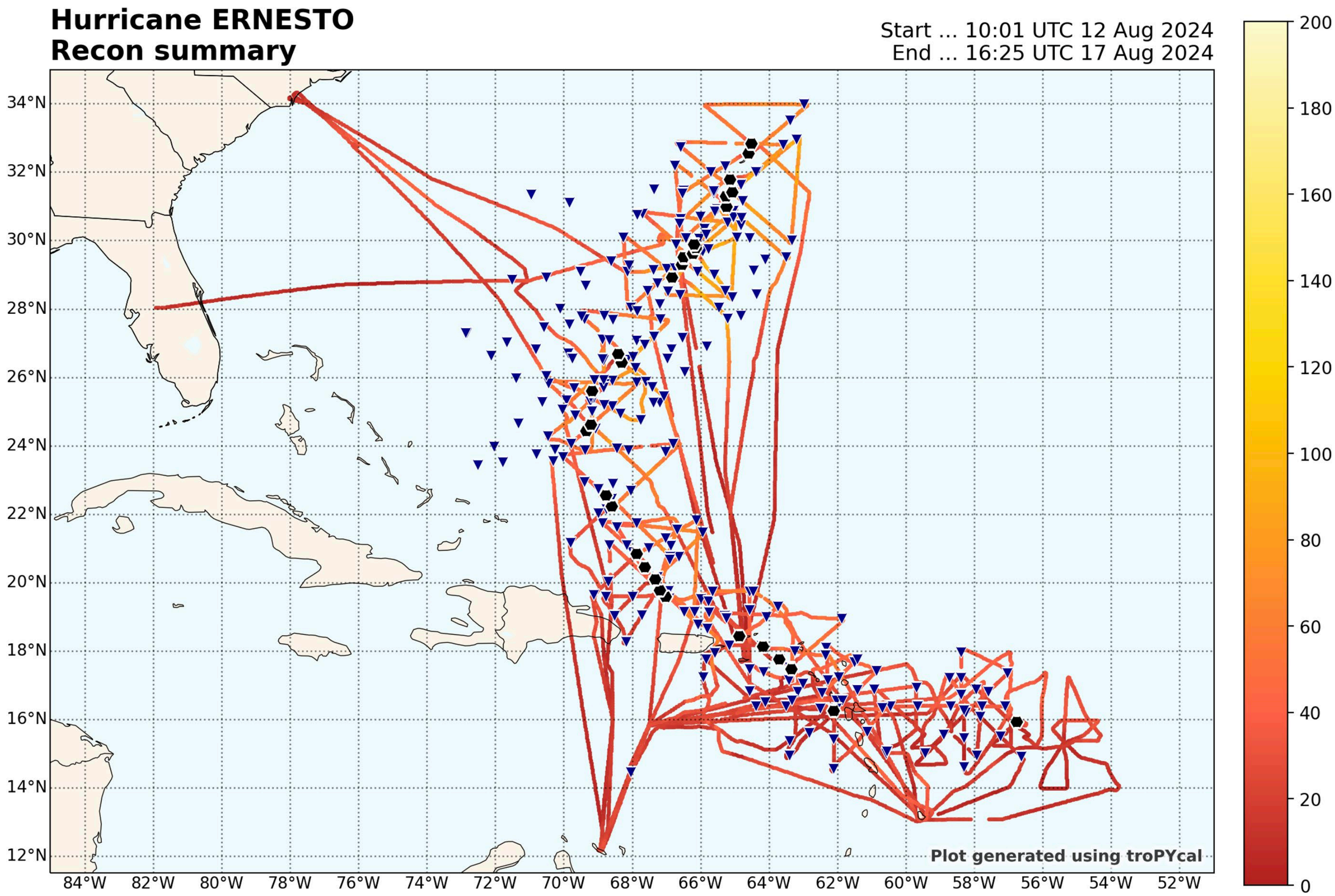

Figure 7. Air Force Reserve and NOAA Hurricane Hunter aircraft flight tracks (red) from reconnaissance missions into Ernesto. The black markers denote center fixes, and the blue triangles indicate dropsonde locations. The color coding of the flight tracks is based on the observed flight-level wind speed with the color legend to the right of the map representing the color associated with the various wind speeds in knots. Dropsondes with no flight tracks are from the NOAA G-IV aircraft.

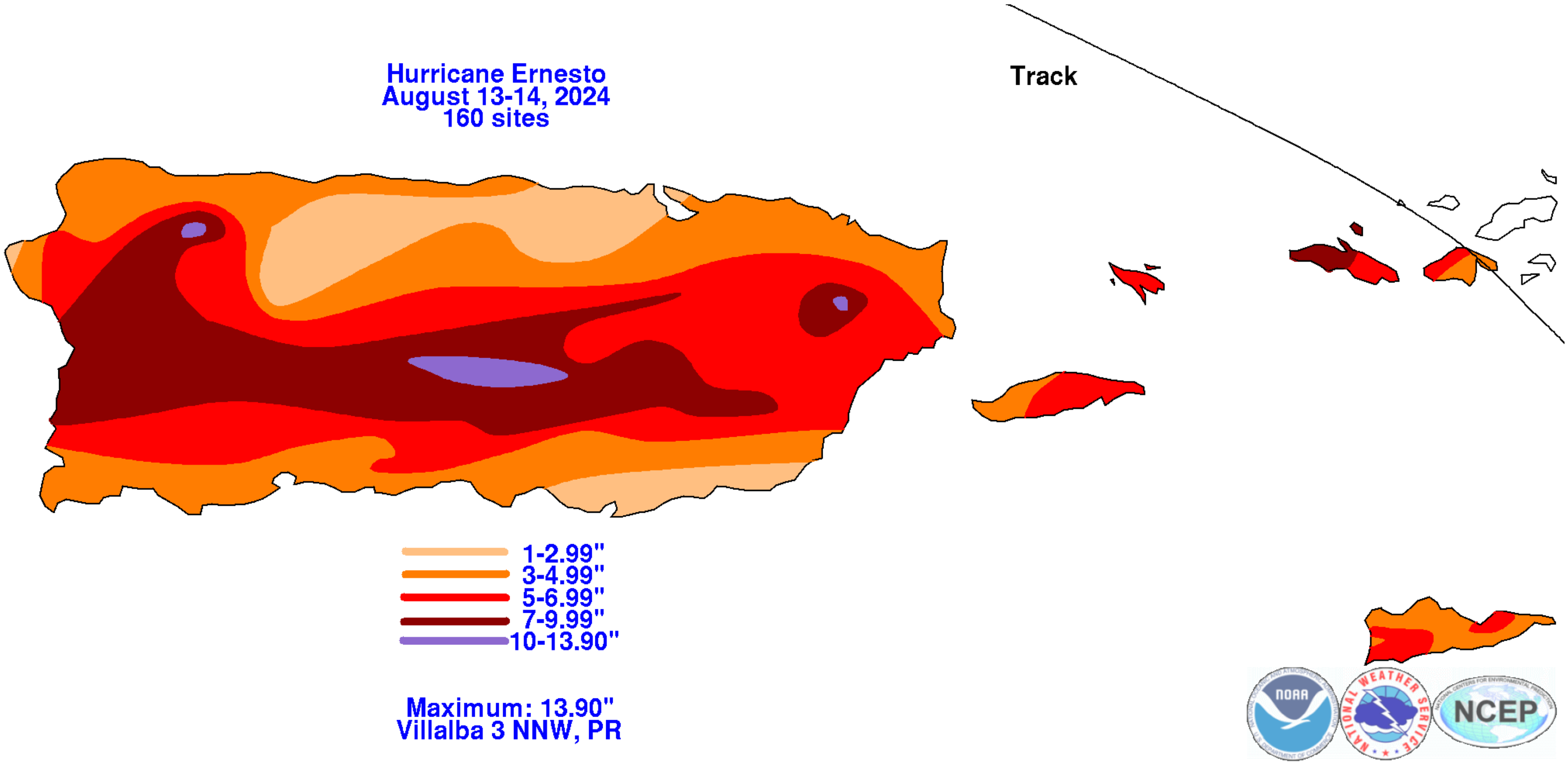

Figure 8. Rainfall totals (shaded, inches) for Puerto Rico and the U.S Virgin Islands between 13–14 August 2024 as Ernesto passed to the northeast (operational track denoted as a black line). Image courtesy of David Roth from the NOAA Weather Prediction Center.

Figure 9. Select photos from the U.S. Virgin Islands and Puerto Rico showing the impacts associated with Ernesto when it affected the region on 13–14 August. Images courtesy of the NWS San Juan, Puerto Rico. Story map of Ernesto's impacts available at https://storymaps.arcgis.com/stories/d2add58bdf6c4ba48b4b021c828de917

Figure 10. Select photos in Bermuda showing the impacts of Ernesto when it affected the island on 17 August. Images available from the Royal Gazette - https://www.royalgazette.com/weather/news/article/20240819/bermuda-successfully-battles-through-ernesto/

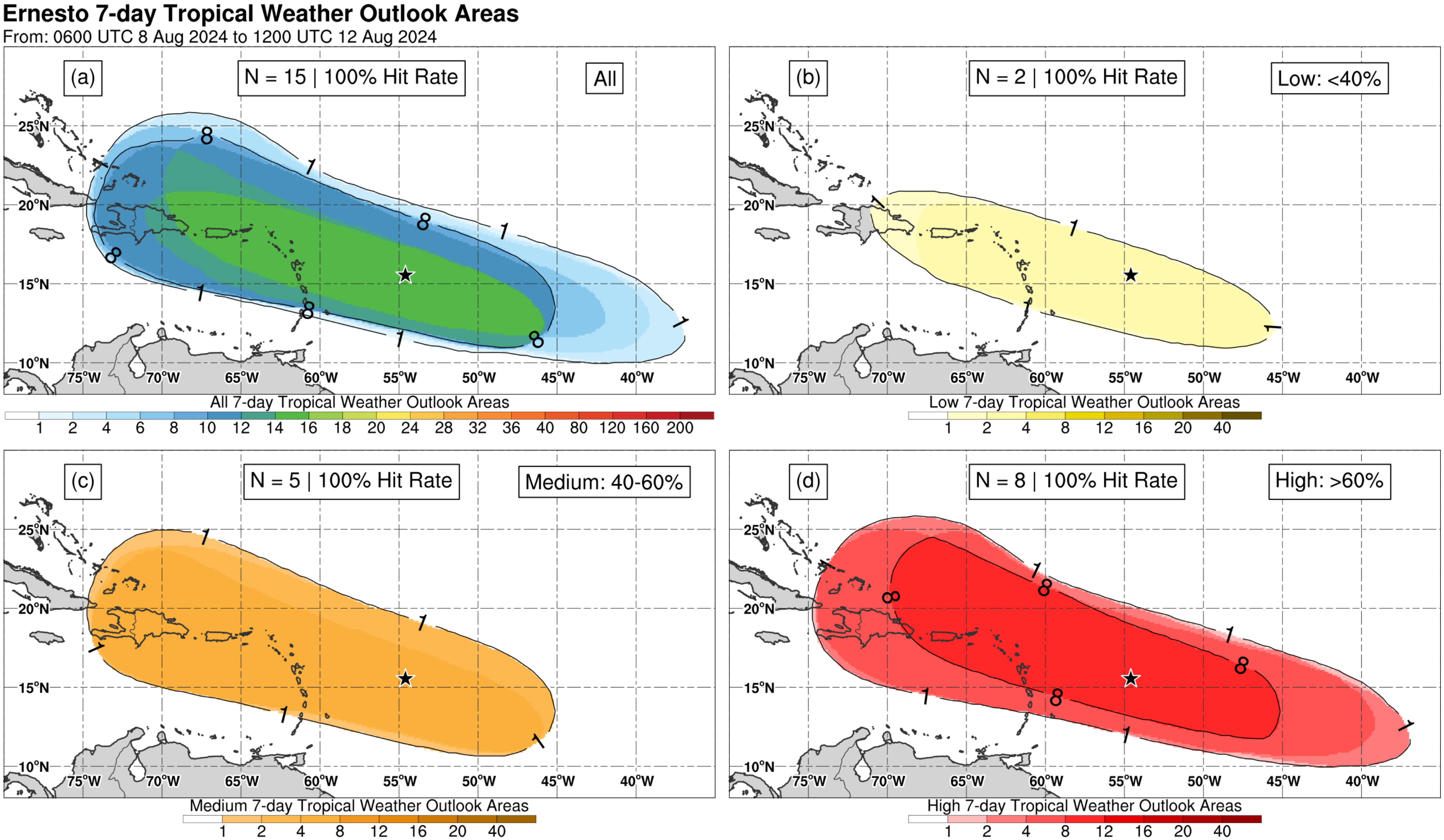

Figure 11. Composites of 7-day tropical cyclone genesis areas depicted in NHC's Tropical Weather Outlooks prior to the formation of Ernesto for (a) all probabilistic genesis categories, (b) the low (<40%) category, (c) medium (40–60%) category, and (d) high (>60%) category. The location of genesis is indicated by the black star.

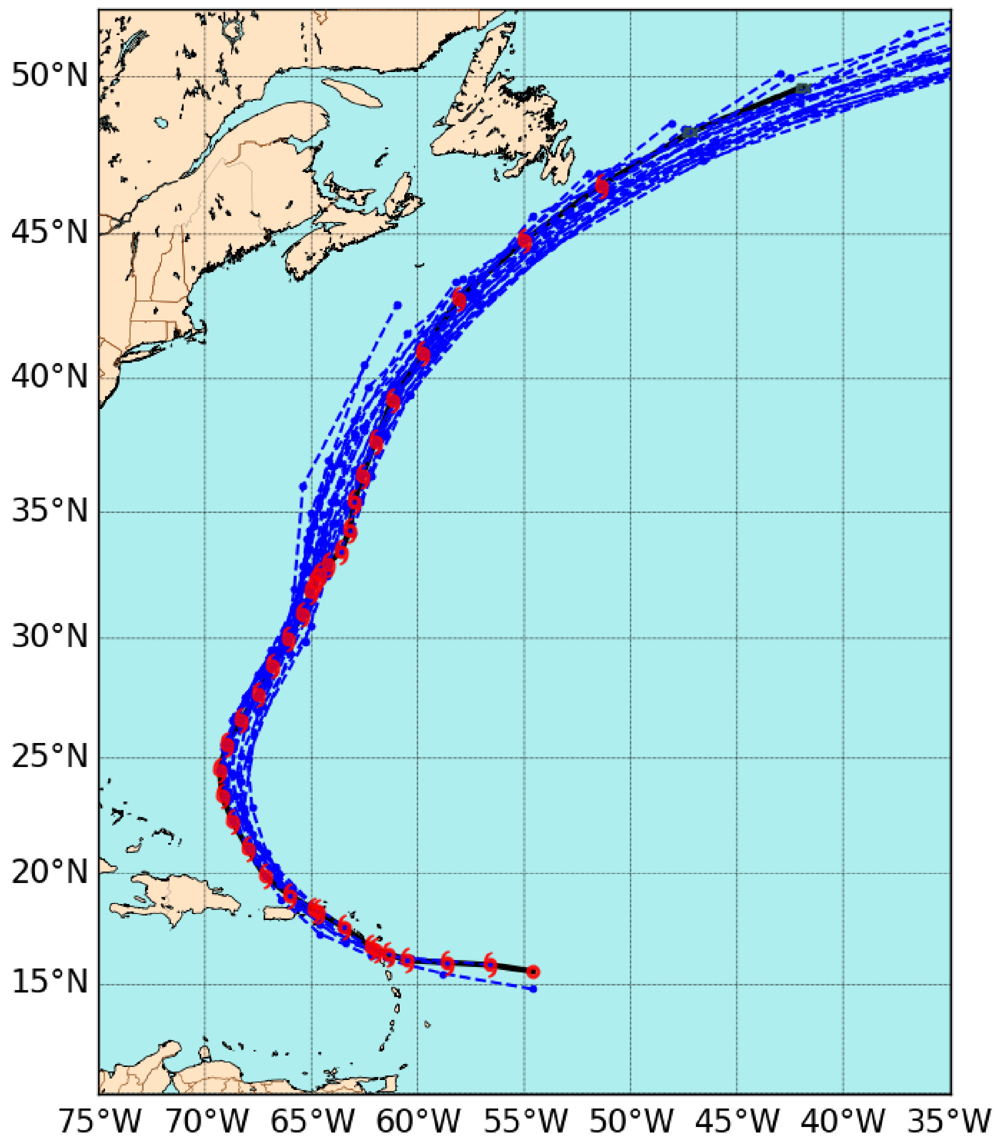

Figure 12. Selected official track forecasts (dashed lines, with 0, 12, 24, 36, 48, 60, 72, 96, and 120 h positions indicated) for Hurricane Ernesto, 12–20 August 2024 after it became a tropical cyclone. The best track is given by the black line with symbols in red depicting positions at 6-h intervals.

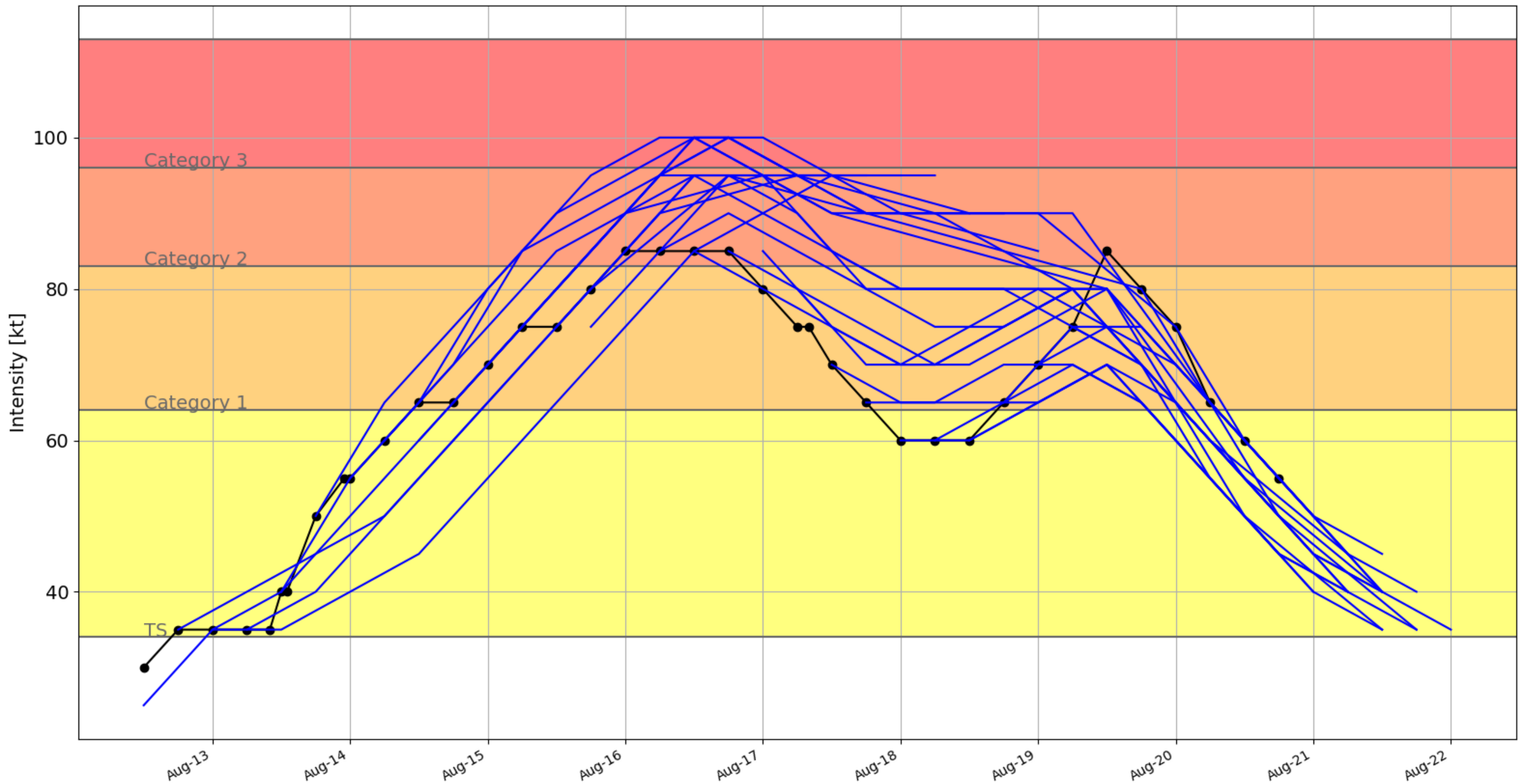

Figure 13. Selected official intensity forecasts for Hurricane Ernesto, 12–20 August 2024 after it became a tropical cyclone. The best track intensity is given by the black line with values given at 6-h intervals.