NATIONAL HURRICANE CENTER TROPICAL CYCLONE REPORT

HURRICANE LAURA

(AL132020)

20–29 August 2020

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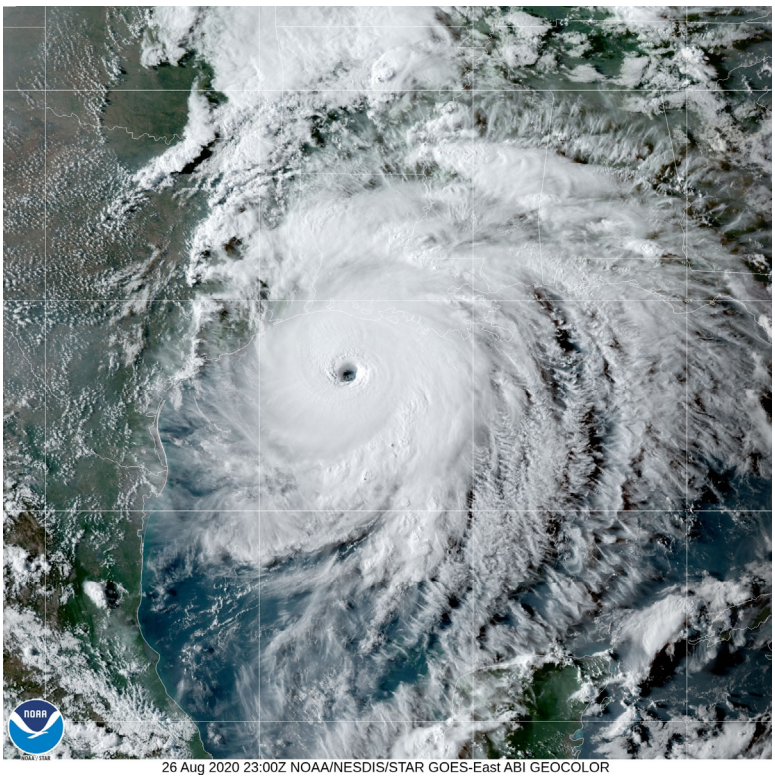

GOES-16 GEOCOLOR VISIBLE IMAGE OF HURRICANE LAURA NEARING PEAK INTENSITY AT 2300 UTC 26 AUGUST 2020. IMAGE COURTESY OF NOAA/NESDIS/STAR.

Laura was a powerful category 4 hurricane (on the Saffir-Simpson Hurricane Wind Scale) that made landfall near Cameron, Louisiana, accompanied by a catastrophic storm surge of up to 18 feet above ground level. Laura was responsible for 47 direct deaths in the United States and Hispaniola, and about $19 billion in damage in the United States.

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Hurricane Laura

20–29 AUGUST 2020

SYNOPTIC HISTORY

Laura can be traced back to a tropical wave that moved off the coast of west Africa on 16 August, accompanied by a well-defined easterly jet around the 700-mb level. The system moved swiftly westward for a day or two with little change in organization. By early on 18 August the wave combined with a broad area of low pressure located a few hundred miles west-southwest of the Cabo Verde Islands. Deep convection associated with the combined disturbance increased and became better organized, with some curved banding features apparent that day. On 19 August, the system's cloud pattern continued to gradually become better organized and more consolidated. Around 0000 UTC 20 August, the system had enough organization of its associated deep convection and a sufficiently well-defined low-level circulation to designate the formation of a tropical depression centered about 850 n mi east-southeast of Antigua. 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].

A strong subtropical ridge to the north of the depression caused the system to move on a west-northwestward to westward track. The cyclone was not very well organized, with the cloud pattern elongated from north-northwest to south-southeast, with poorly-defined banding features. Some southeasterly mid-level shear appeared to be affecting the system, and the low-level circulation became ill-defined at times. Early on 21 August, the cyclone became a little better organized, and strengthened into a 40-kt tropical storm. Laura's strengthening trend quickly ended as it moved westward, and it crossed the northern Leeward Islands as a poorly-organized tropical storm late on 21 August and early on 22 August. Later on the 22nd, the storm again became better organized while passing just south of the U.S. Virgin Islands and Puerto Rico, and its maximum winds increased to near 45 kt. Slightly stronger winds occurred in a mesocyclone embedded within Laura's circulation which moved over central Puerto Rico from around 1800 to 2000 UTC that day; however, these transient winds are not considered representative of the overall intensity of the tropical cyclone.

Laura then turned toward the west-northwest, while remaining south of the subtropical ridge, and made landfall on the south coast of the Dominican Republic with an intensity near 45 kt early on 23 August. The storm moved across Hispaniola and over the waters of the Windward Passage later that day. Laura did not have a well-defined inner core while it quickly traversed the Dominican Republic and Haiti, and there was little change in its maximum winds by the time it moved back over the water. The tropical storm moved over a portion of eastern Cuba

[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.

to the west of Guantanamo early on 24 August, and surface observations indicate that it had strengthened to an intensity of about 55 kt while moving over the Windward Passage. Continuing west-northwestward, Laura then moved just south of, and roughly parallel to, the island of Cuba on 24 August with little change in intensity. Around 0000 UTC 25 August, the storm made landfall in the Pinar del Rio province of western Cuba with maximum winds near 55 kt.

After crossing western Cuba, the center of the tropical cyclone emerged over the warm waters of the southeastern Gulf of Mexico early on 25 August, and the storm soon began a steady strengthening trend. Laura became a hurricane around 1200 UTC that day while centered about 375 n mi south-southeast of the mouth of the Mississippi River, as its central dense overcast became better defined. The system continued to move west-northwestward at a slightly slower forward speed of around 14–15 kt to the southwest of a mid-level ridge that extended across northern Florida. Laura's central convection continued to become better organized, and the hurricane strengthened to 75 kt by 0000 UTC 26 August. Around that time, while situated within a highly conducive atmospheric and oceanic environment over the central Gulf of Mexico, Laura began an episode of rapid intensification (RI). A mid-level low near Oklahoma caused the hurricane to turn northwestward and then northward, and the system intensified by about 55 kt over the 24-h period ending at 0000 UTC 27 August. At that time, Laura reached its peak intensity of about 130 kt while it approached the coast of southwestern Louisiana. The strength of the hurricane more or less leveled off for a few hours before landfall, and the well-defined eye of this devastating category 4 hurricane crossed the coast near Cameron, Louisiana, around 0600 UTC 27 August. Laura was the strongest hurricane to strike Louisiana since Hurricane Camille of 1969 (which produced category 5 conditions over the southeastern part of the state).

An hour or two after landfall, the center passed very near Lake Charles, Louisiana, while Laura was still a very powerful category 4 hurricane. Afterwards, the cyclone moved northward over western Louisiana and weakened to a tropical storm over the northern part of the state by 1800 UTC 27 August. Laura then moved into Arkansas while continuing to weaken. Laura turned toward the north-northeast and northeast and weakened to a tropical depression by 0600 UTC 28 August while crossing Arkansas. The weakening depression passed over extreme southeastern Missouri late that day, and then it moved over western Kentucky and degenerated into a remnant low early on 29 August. The system was absorbed by another low centered near the Great Lakes by 1200 UTC 29 August.

METEOROLOGICAL STATISTICS

Observations in Laura (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. Observations also include flight-level, stepped frequency microwave radiometer (SFMR), and dropwindsonde observations from flights of the 53rd Weather Reconnaissance Squadron of the U.S. Air Force Reserve Command and WD-P3 aircraft of the NOAA Aircraft Operations Center. There were 29 center fixes in Laura made by the Air Force, and 13 made by NOAA. There were also 6 synoptic surveillance flights performed

by the NOAA G-IV aircraft. 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, WSR-88D radar data from San Juan, Puerto Rico, and the southern United States along with other radars across the Caribbean were also useful in constructing the best track of Laura.

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

Winds and Pressure

Laura's estimated peak intensity of 130 kt and minimum central pressure of 937 mb are based on data from Air Force Reserve Unit and NOAA reconnaissance aircraft. The maximum 700-mb flight-level winds observed by the Air Force and NOAA aircraft were 148 kt and 144 kt, corresponding to estimated surface winds of 133 kt and 130 kt, respectively, and the maximum SFMR-observed surface winds from both aircraft were 126 kt and 137 kt, respectively. Taking a blend of these data supports a peak and landfall intensity of about 130 kt. A dropsonde in the eye at 0057 UTC 27 August measured a minimum pressure of 938 mb with a 10-kt wind at the surface, supporting a central pressure of 937 mb. The 939-mb minimum pressure at landfall is based on a pressure report of 940.0 mb with an 11-kt wind at a National Ocean Service (NOS) station at Calcasieu Pass, Louisiana, very close to the landfall point, at 0554 UTC 27 August.

In Louisiana, a wind gust to 133 kt was measured at Holly Beach, and a gust to 119 kt was observed in Lake Charles. A WeatherFlow station in Sulphur reported 90-kt sustained winds with a gust to 115 kt at 0700 UTC 27 August. Another WeatherFlow site in Cameron reported sustained wind of 88 kt with a gust to 101 kt. The NWS observing site at the Lake Charles Regional Airport recorded a maximum sustained wind of 85 kt with a gust to 116 kt at 0654 UTC and 0642 UTC, respectively, on 27 August. However, the measuring instrument was destroyed (Fig. 4), so its data record is incomplete. After landfall, damaging winds associated with Laura extended well inland over Louisiana and surface observations indicate that hurricane-force-winds in gusts occurred inland at least halfway across the state near the track of the cyclone's center.

Sustained hurricane-force winds were also observed over extreme southeastern Texas. A sustained wind of 65 kt with a gust to 78 kt were observed at Sabine Pass.

In Arkansas, a sustained wind of 38 kt with a gust to 49 kt were observed at South Arkansas Regional Airport in El Dorado.

In Florida, the Key West International Airport observed a sustained wind of 34 kt with a peak gust to 41 kt late on 24 August.

Laura also produced sustained tropical-storm-force winds as it was crossing over Cuba. The highest winds were observed at Guantanamo Bay, which recorded a sustained wind of 52 kt with a gust to 63 kt as the northern portion of the cyclone moved overhead late on the 23 August. Numerous other stations across Cuba also observed tropical-storm-force winds with gusts above 50 kt from 23–24 August.

No reports of sustained tropical-storm-force winds were received from Hispaniola; however, significant heavy rainfall occurred as Laura moved across the island (see below).

In Puerto Rico there were a number of WeatherFlow sites that had significant wind gusts associated with a mesovortex embedded within Laura as it moved across the island on 22 August. A peak wind gust of 65 kt was observed at Cam Santiago, while La Mareas reported a gust to 62 kt. Several other stations recorded gusts over 50 kt, though incomplete data made it impossible to obtain sustained winds from these observations.

Storm Surge[2]

Laura produced catastrophic storm surge inundation levels of 12 to 18 ft above ground level (AGL) to the east of its landfall location in and around Creole and Grand Chenier, Louisiana. Table 3 and Figures 5 and 6 provide observations from various tide stations, water level sensors, and surveyed high water marks along much of the U.S. Gulf coast. A United States Geological Survey (USGS) team surveyed a stillwater high water mark of 17.1 ft AGL in the second-story bathroom of a home in the Oak Grove neighborhood of Creole (Fig. 7). This is the highest storm surge measurement from the event that does not include wave action. The National Weather Service (NWS) Weather Forecast Office (WFO) in Lake Charles, Louisiana, measured a high water mark of 17.2 ft AGL on a structure at Rutherford Beach, on the coast south of Creole, but it is likely that this location was exposed to significant wave action. A third survey team from the Harris County Flood Control District (HCFCD) and the Houston/Galveston NWS WFO recorded five other stillwater marks of 12 ft or greater AGL in the Creole and Grand Chenier areas. All of these marks were located along Louisiana Highway 82, which is located about 2 to 3 n mi inland from the immediate coastline. In addition, a U.S. Army Corps of Engineers (USACE) gauge on the Mermentau River at Grand Chenier recorded a maximum water level of 14.23 ft above the North American Vertical Datum of 1988 (NAVD88) *on the hour*, so it is likely that the actual peak water level was higher between hours. In fact, a USACE team found a clear debris line above that height at 15.81 ft NAVD88, which converts to 15.0 ft MHHW. A high-resolution storm surge hindcast simulation produced by the NHC Storm Surge Unit (not shown) suggests that peak inundation heights could have been a little higher in areas where there were no observations or surveyed high water marks; thus, the maximum inundation produced by Laura is estimated to be 18 ft AGL.

Outside of the Creole and Grand Chenier areas, storm surge inundation of 6 to 12 ft AGL occurred in other parts of Cameron Parish and in parts of Vermilion, Iberia, and western St. Mary Parishes near Vermilion Bay. In the city of Cameron, the HCFCD/NWS crew surveyed a high

[2] 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). **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).

water mark of 11.0 ft AGL. Nearby, the NOS tide gauge at Calcasieu Pass recorded a peak water level of 9.2 ft MHHW. In the community of Holly Beach, just west of Laura's landfall location, a USGS water level sensor measured a converted wave-filtered water level of 7.8 ft MHHW. Even well inland from the immediate coast, a high water mark of 6.1 ft AGL was surveyed in Grand Lake on the northern shore of Calcasieu Lake, and a USGS stream gauge in northern Calcasieu Lake measured a peak water level of 6.5 ft MHHW. Farther to the east, a USGS water level sensor within the Rockefeller Wildlife Refuge, about 5 n mi inland, recorded a peak wave-filtered water level of 10.05 ft NAVD88 (Fig. 8), which converts to 9.1 ft MHHW. Two other USGS pressure sensors measured peak wave-filtered water levels of 7.9 ft and 7.4 ft MHHW at Freshwater City and Cypremort Point, respectively, and a USGS stream gauge also at Cypremort Point recorded a peak water level of 8.1 ft MHHW. High water marks of 6.0 ft AGL were also surveyed in the Esther and Erath areas near Vermilion Bay.

Laura not only produced extremely high inundation along the coast, but observations and the storm surge hindcast indicate that the surge penetrated 20 to 30 n mi inland from the coast across southwestern Louisiana, and even farther where the surge had inland access through waterways such as Calcasieu Pass, Calcasieu Lake, and adjacent bayous. As far inland as the city of Lake Charles, NOS gauges at Lake Charles and Bulk Terminal recorded peak water levels of 4.7 ft and 4.5 ft MHHW, respectively. Although the density of surveyed high water marks in the Lake Charles area was much sparser compared to areas near the coast, the HCFCD/NWS crew did measure marks of 4.0 and 3.1 ft AGL within the city. These data, combined with the storm surge hindcast, indicate that peak water levels in the Lake Charles area were 3 to 6 ft AGL.

Storm surge inundation of 3 to 5 ft AGL occurred along the south-central Louisiana coast from Atchafalaya Bay to Caillou Bay and along the Upper Texas coast. In south-central Louisiana, NOS tide gauges at Amerada Pass and Eugene Island recorded peak water levels of 4.8 ft and 4.7 ft MHHW. Along the Upper Texas coast, the highest observations were from USGS water level sensors at East Beach on Galveston Island and at Sea Rim State Park, which each measured peak wave-filtered water levels of 5.0 ft and 4.5 ft MHHW, respectively. Numerous NOS and Texas Coastal Ocean Observing Network (TCOON) gauges from Freeport northward to the Louisiana border measured peak water levels of 3 ft MHHW or greater, the highest being 4.1 ft MHHW at the Galveston Bay Entrance (North Jetty).

Peak water levels along the coasts of southeastern Louisiana, the remainder of Texas, Mississippi, Alabama, and the Florida Panhandle were generally less than 3 ft MHHW[3]. However, water levels were a bit higher in a few areas of southeastern Louisiana, including around Lake Pontchartrain and Barataria Bay. Around Lake Pontchartrain, USACE stream gauges recorded peak water levels of 3.2 ft MHHW at Mandeville and Lakefront Airport, and NOS gauges at the Interstate 10/Bonnet Carre Floodway and New Canal Station measured peak water levels of 3.1 ft and 3.0 ft MHHW. A water level of 3.9 ft MHHW was measured by a USGS gauge at Barataria Pass near Grand Isle.

[3] Several gauges along the Lower Texas coast are located within non-tidal parts of Laguna Madre, and their data are referenced above Mean Sea Level (MSL).

Even though Laura passed very near Puerto Rico and the U.S. Virgin Islands as a tropical storm, peak observed water levels in the area were less than 1 ft MHHW. The highest measured water level was 0.9 ft MHHW at Magueyes Island, Puerto Rico.

Rainfall and Flooding

Rainfall in Puerto Rico was not especially heavy overall, but there was a small area of totals in excess of 5 inches over the south-central part of the island (Fig. 9).

Maximum rainfall totals of over 11 inches (nearly 300 mm) occurred near the Barahona Peninsula of the Dominican Republic (Fig. 10). Locally severe flooding caused significant damage and 40 deaths across Hispaniola.

Rainfall totals in Cuba were not particularly large, with the highest reported amount of around 4.5 inches in the extreme western part of the island.

In the southern United States, Laura produced locally heavy rains near its path, with maximum amounts of a little below 12 inches over the southwestern part of Louisiana (Fig. 11). The peak total recorded was 11.74 inches near Starks, Louisiana at Bearhead Creek. Flooding from rainfall in addition to storm surge occurred in Calcasieu Parish, Louisiana, due to high water levels in Lake Charles. There was some flooding of low-lying areas in Acadia Parish, and widespread flooding occurred across much of Natchitoches Parish, Louisiana. Minor flooding from the Vermilion River was noted in Lafayette Parish, Louisiana. A rainfall total of 11.10 inches was reported at Moro Bay, Arkansas. Street flooding was reported in various locations in Arkansas, mainly in the central part of the state.

Tornadoes

Laura produced a total of 16 tornadoes in the United States. The most significant of these was an EF-2 tornado with a 12-n mi track in Randolph County, Arkansas, that caused about $200,000 in damage. There were 4 other tornadoes in Arkansas that were rated as EF-1, and 3 EF-1 tornadoes occurred in Alabama. There were also 8 EF-0 tornadoes in Mississippi, Alabama and Tennessee. None of the tornadoes caused deaths or injuries.

CASUALTY AND DAMAGE STATISTICS

In the United States, 7 direct deaths[4] were associated with Laura. There were 4 fatalities in Louisiana, 1 each in Acadia, Allen, Jackson and Vernon Parishes, and 1 in Sabine County Texas, all due to falling trees. There were 2 surf-related drownings, 1 in Corpus Christi, Texas,

[4] 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.

and 1 in St. George Island, Florida. In the Caribbean region, 31 persons drowned in Haiti, and 9 drowned in the Dominican Republic. This brings the total direct death toll to 47. Laura also caused 34 indirect deaths in the United States, 26 in Louisiana and 8 in Texas, from carbon monoxide poisoning, storm cleanup-related activities, electrocutions, and heat stress, among other indirect causes.

This was a devastating hurricane for southwestern Louisiana. Laura's winds and surge severely damaged or destroyed numerous homes and other structures in that part of the state, especially from the areas around Cameron through Lake Charles (Figs. 12, 13, and 14). In Cameron Parish, as exemplified in Fig. 12, many structures were simply swept away by the storm surge.

In Louisiana, wind damage to buildings and trees and storm surge damage was major to catastrophic across Cameron and Calcasieu parishes, with considerable damage occurring where the core of the hurricane passed across Beauregard and Vernon parishes. Wind damage to trees and structures as well as damage from the storm surge occurred in Vermilion and Iberia Parishes. Numerous trees, power lines and power poles were blown down in Jefferson, Orange, Hardin, Tyler, Jasper, and Newton Counties in Texas, with some homes and businesses damaged from the trees or the winds in those counties. Homes and other structures were damaged from fallen trees or the winds in Jefferson Davis, Acadia, Lafayette, Saint Martin, Beauregard, Allen, Evangeline, Saint Landry, Vernon, Rapides, and Avoyelles Parishes, Louisiana.

Farther north in the state, scattered to widespread tree damage and some structural damage due to winds was reported in Grant Parish and scattered tree damage with some structural damage (mainly to roofs) was noted in Sabine, Natchitoches, and Winn Parishes, Louisiana. There was significant tree damage in Jackson Parish, including a fatal impact on a mobile home. Numerous trees and power lines were downed in De Soto, Red River, Bienville, Caddo, Bossier, Webster, Claiborne, and Union Parishes, Louisiana. Sporadic to scattered wind damage was reported in Lincoln Parish.

Scattered tree and power line damage occurred in Angelina, San Augustine, Shelby, and Sabine Counties in Texas, with a roof collapse to a business reported in the Sabine County. There was some damage to trees and powerlines in Panola and Rusk Counties in Texas, and a tree was blown down onto a house in Harrison County, Texas. Sporadic to extensive tree and power line damage was reported in Hempstead, Miller, Lafayette, Columbia, and Union Counties in Arkansas. There were downed trees, at least one onto a home, in Ouachita County, Arkansas. A tornado severely damaged a home and destroyed an agriculture shop in Randolph County, Arkansas. Also in Arkansas there was roof damage in Pope and Jackson Counties, and trees came down on houses in Ouachita, Calhoun, and Cleveland Counties, and there were scattered reports of tree and powerline damage across the state.

Louisiana Governor John Bel Edwards stated that 10,000 homes were demolished in his state.

Shortly after the core of the hurricane passed the area, Laura triggered a fire at a chemical plant in Westlake, Louisiana, near Lake Charles, that discharged a cloud of potentially toxic

smoke that spread for miles. This led to a shelter-in-place order by the Environmental Protection Agency.

As it made landfall, Laura destroyed the Lake Charles WSR-88D radar (Fig. 15 is the last image sent by the radar, and Fig. 16 shows the destruction to the instrument).

In Louisiana and Texas, the hurricane caused a total of about 568,000 power outages.

There were reports of downed trees and some roof damage in portions of Cuba.

According to the NOAA National Centers for Environmental Information, Laura caused an estimated $19 billion worth of total damage in the United States. This included $17.5 billion in Louisiana, $975 million in Texas, $215 million in Arkansas, $210 million in Tennessee, and $50 million in Mississippi. There was also an estimated $100 million damage in the Caribbean region, according to the insurance company Aon.

FORECAST AND WARNING CRITIQUE

Genesis

The genesis of Laura was reasonably well anticipated. There was good support for the development of a tropical cyclone from the ECMWF model ensemble runs, which certainly influenced the official genesis forecasts. The tropical wave that led to Laura's formation was introduced into the Tropical Weather Outlook (TWO) with a low (<40%) 5-day probability of genesis, just as it emerged from Africa, 90 h before development (Table 4). The system was first given a (nonzero) low 2-day chance of development in the TWO 66 h prior to genesis. The 2- and 5-day probabilities of development were raised to the medium (40%–60%) category 48 h and 78 h, respectively, prior to genesis, and boosted into the high (>60%) category 42 h and 54 h, respectively, before genesis.

Track

A verification of NHC official track forecasts for Laura is given in Table 5a. Official track forecast errors were comparable to the mean official errors for the previous 5-yr period at 12 through 72 h, were somewhat lower than the long-term mean at 96 h, and were higher than the long-term mean at 120 h. A homogeneous comparison of the official track errors with selected guidance models is given in Table 5b. The GFSI track forecasts had a strong performance, with lower mean errors than the official forecasts at 36 through 120 h. The consensus models HCCA and TVCA had errors that were comparable to or lower than the official forecasts at most forecast intervals. The ECMWF model track forecast (EMXI) errors were higher than the official errors and the mean errors for a number of the other guidance models at all forecast intervals, which is a bit surprising considering that model's generally stellar track record. Although the official and consensus model track forecasts had a slight right-of-track bias overall, in general they were fairly accurate in predicting the path of Laura. There were some occasional southward center re-formations, however, that resulted in a more westward than expected track in the earlier parts of the storm's lifecycle. It is important to note that the official track forecasts that were issued

72 h or less before Laura's landfall in the United States consistently showed the center crossing the coast very near or over the observed landfall location in southwestern Louisiana, as shown in Fig. 17.

Intensity

A verification of NHC official intensity forecasts for Laura is given in Table 6a. Official intensity forecast errors were below the mean official errors for the previous 5-yr period for the 12- through 96-h forecast intervals, and above the long term mean at 120 h. A homogeneous comparison of the official intensity errors with selected guidance models is given in Table 6b. The official forecasts were outstanding and better than the guidance models at all forecast intervals save 120 h, where the dynamical models HWFI and HMNI and the consensus predictions, HCCA and IVCN, beat the official forecast.

Forecasting Laura's RI on 26 August was somewhat problematic. Not surprisingly, the official NHC intensity forecasts did not fully capture Laura's RI (Fig. 18). Some of the guidance models such as CTCI, HMNI, FSSE, and HCCA showed more strengthening than the official forecast, but still not enough (Fig. 19).

Storm Surge Forecasts and Warnings

Storm surge watches and warnings associated with Laura are given in Table 7 and indicated in Fig. 20. A Storm Surge Watch was first issued for the northern Gulf coast from San Luis Pass, Texas, to Ocean Springs, Mississippi, including Lake Pontchartrain, Lake Maurepas, and Lake Borgne outside of the Hurricane and Storm Damage Risk Reduction System (HSDRRS) at 2100 UTC 24 August. The portion of the watch area from San Luis Pass to the mouth of the Mississippi River was upgraded to a Storm Surge Warning at 1500 UTC 25 August. At that time, the Storm Surge Watch was also extended farther south along the Texas coast to Freeport. This watch was upgraded to a Storm Surge Warning at 0900 UTC 26 August. In effect, then, the final Storm Surge Warning area extended from Freeport, Texas, to the mouth of the Mississippi River, and it also extended well inland from the immediate coast in portions of Louisiana. As shown on the timeline in Fig. 22, the initial Storm Surge Watch and Warning were issued approximately 50 h and 32 h, respectively, before the onset of sustained tropical-storm-force winds along the coast.

Most tide and stream gauge observations, water level sensor measurements, and surveyed high water marks that indicated storm surge inundation of 3 ft or greater above normally dry ground (which NHC uses as a first-cut threshold for the storm surge watch/warning) fell within the Storm Surge Warning area (white markers, Fig. 20). Several gauges around Lake Pontchartrain and near Breton Sound outside of the Storm Surge Warning area measured water levels as high as 3.2 ft MHHW. However, many of those stations are located outside of the HSDRRS surrounding metropolitan New Orleans, and it is unlikely that significant coastal flooding resulted from those water levels. No observations of 3 ft or greater above normally dry ground were received from some parts of the Storm Surge Warning area, particularly around Galveston Bay.

Although inland water level observations were sparse and primarily limited to areas near Lake Charles and north of Vermilion Bay, the storm surge hindcast simulation indicates that inundation of 3 ft AGL penetrated roughly as far inland as Louisiana State Road 14, south of a line from Lake Charles to Lake Arthur to Esther. The Storm Surge Warning area extended a little farther north than that line, but the overall extent of the warning inland was justified based on the hindcast and available observations. The inland extent of the warning also communicated the risk that the surge could have penetrated even farther inland if Laura had been just a little stronger, a little bigger, or moved a little slower.

As shown in Fig. 21, the initial peak storm surge inundation forecast issued at 2100 UTC 24 August was 7 to 11 ft above normally dry ground somewhere between High Island, Texas, to Morgan City, Louisiana. Over the ensuing couple of days, NHC honed in on the specific area that would receive the highest inundation and raised the peak storm surge inundation forecasts. At 1500 UTC 25 August, the peak forecast was 9 to 13 ft AGL somewhere between Sea Rim State Park, Texas, to Intracoastal City, Louisiana, with that range increasing to 10 to 15 ft AGL through early the next morning. At 1500 UTC 26 August, the range of expected maximum inundation was raised again—to 15 to 20 ft AGL—and was focused on the area between Johnson Bayou to Rockefeller Wildlife Refuge in southwestern Louisiana.

Given the severity and urgency of this forecast, NHC took the unprecedented step of describing the expected impacts of the surge as “unsurvivable” and “catastrophic.” As noted, Laura is analyzed to have produced maximum storm surge inundation of 12 to 18 ft AGL in the areas of Creole and Grand Chenier, Louisiana, which indeed resulted in catastrophic damage. But evacuation compliance in the hardest-hit areas of Cameron Parish is estimated to have been at or near 100% since there were no rescues after the storm, and as of this writing, there are no known deaths from Laura as a result of storm surge.

Laura has become another prime example of how dependent the areal footprint of storm surge inundation and the location of the highest inundation are on the exact track of the center of a storm—and how communicating a realistic range of risks is critical. To illustrate this, Fig. 22a shows a storm surge hindcast simulation from Laura’s actual track. The amount of water pushed through Calcasieu Pass into Calcasieu Lake and the Lake Charles area was mitigated by the center making landfall just east of the pass. In this case, the strongest onshore winds caused the most significant inundation to occur in the Creole and Grand Chenier areas. However, if Laura’s center had made landfall just 20 miles to the west (and thus west of Calcasieu Pass), storm surge simulations (Figs. 22b and 22c) show that inundation would have been as much as 10 to 15 ft higher in areas such as Holly Beach, Louisiana. Also, in this scenario water would have been pushed more directly into Calcasieu Lake, and storm surge inundation could have been as much as 5 to 10 ft higher in some parts of the Lake Charles area. Although some areas of southwestern Louisiana may not have experienced the highest inundation levels advertised in NHC’s forecasts, there was a realistic risk of realizing those storm surge heights if Laura’s track had shifted just a very small distance to the west.

Wind Watches and Warnings

Wind watches and warnings associated with Laura are given in Table 8. A Hurricane Warning was issued for southwestern Louisiana about 32 h before the arrival of tropical-storm-force winds within that area, and a Hurricane Watch was issued about 50 h prior to the arrival of these winds.

Impact-Based Decision Support Services (IDSS) and Public Communication

The NHC began communication with emergency managers on 20 August to convey the impacts and timeline of back-to-back tropical threats posed by Laura and Marco[5] (Marco dissipated a couple of days before Laura made landfall in Louisiana). Briefings in support of Laura included teleconferences with Gulf coast states, federal/state video-teleconferences, and a presidential briefing. These were coordinated through the FEMA Hurricane Liaison Team, embedded at the NHC. In addition, the NHC director maintained direct communications with senior state emergency management officials to discuss the evolving threat to the Gulf coast. The Tropical Analysis and Forecast Branch of NHC provided 17 live briefings on Hurricane Laura to the U.S. Coast Guard Districts 7 and 8 in support of their life-saving mission. The decision support provided for Laura concluded on 27 August as the storm weakened after moving inland. In addition to NHC's IDSS described above, there was a large-scale collaborative IDSS effort across the NWS, including WFOs, RFCs, and National Centers, in response to the multiple life-threatening hazards produced by Laura along the U.S. Gulf coast.

NHC web pages were accessed approximately 150 million times between 20–28 August resulting in approximately 2.9 billion hits. Some of this traffic was related to Tropical Storm Marco which also occurred during this time, however, Laura generated most of the traffic during this period. A majority of the page views went to graphical products such as the key messages, cone graphic, and the wind speed probabilities. In particular, the key messages graphics for Laura were viewed approximately 50 million times on the NHC website from 19–29 August.

With Laura moving over the Greater Antilles and posing a threat to the U.S., a media pool was opened on 23 August. All local TV outlets along the U.S. Gulf coast from Houston, Texas, to Pensacola, Florida, as well as all network broadcast and cable news/weather outlets were notified of the pool. NHC added the availability of Skype media interviews during the pool operation hours. A total of 92 broadcasts were provided before the pool closed on 27 August at 1300 UTC.

NHC also provided 23 Facebook Live broadcasts via its Facebook page during the five-day span of this media pool. NHC experienced two million views, with a single peak of 207,000 views on its 26 August 1230 UTC broadcast when Laura became a major hurricane as it approached the northwestern Gulf coast. Postings of the latest NHC advisories were made onto the NHC Facebook page every 3 h. NHC also had about 71 million views on Twitter during Laura,

[5] Beven II, John L., and Robbie Berg. "Tropical Cyclone Report: Hurricane Marco." National Oceanic and Atmospheric Administration / National Weather Service / National Hurricane Center, 31 Mar. 2021, /www.nhc.noaa.gov/data/tcr/AL142020_Marco.pdf

from when it was given a medium chance of formation in the TWO to dissipation, with a maximum of 21 million views on the day of landfall.

ACKNOWLEDGMENTS

Much of the observed data in this report came from Post Tropical Cyclone (PSH) Reports issued by NWS Weather Forecast Offices (WFOs) in Lake Charles, New Orleans, and Shreveport, Louisiana; Houston, Texas; Little Rock, Arkansas; Jackson, Mississippi; Key West, Florida; and San Juan, Puerto Rico.

John P. Cangialosi produced the track map and assisted with the forecast verification. Roger Edwards of the NOAA Storm Prediction Center provided tornado information. David Roth of the NOAA Weather Prediction Center produced the rainfall map. Roger Erickson, NWS Lake Charles, provided casualty and damage information. Tiffany O'Connor and Matthew Green gave IDSS briefing information. Matthew Onderlinde provided web statistics. Dennis Feltgen provided the media briefing summary.

Table 1. Best track for Hurricane Laura, 20–29 August 2020.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
20 / 0000	14.4	47.3	1008	30	tropical depression
20 / 0600	15.4	49.6	1008	30	"
20 / 1200	16.1	51.6	1008	30	"
20 / 1800	16.6	53.4	1008	30	"
21 / 0000	16.8	55.5	1008	30	"
21 / 0600	16.9	57.5	1008	30	"
21 / 1200	17.0	59.4	1008	40	tropical storm
21 / 1800	17.1	61.1	1007	40	"
21 / 2030	17.1	61.8	1007	40	"
21 / 2330	17.1	62.6	1007	40	"
22 / 0000	17.1	62.8	1007	40	"
22 / 0600	17.4	64.4	1007	40	"
22 / 1200	17.7	65.9	1006	45	"
22 / 1800	17.9	67.4	1004	45	"
23 / 0000	18.2	68.8	1004	45	"
23 / 0430	18.4	70.0	1004	45	"
23 / 0600	18.5	70.3	1004	45	"
23 / 1200	18.8	72.3	1004	45	"
23 / 1800	19.4	74.3	1002	55	"
24 / 0000	19.8	76.0	1000	55	"
24 / 0200	20.0	76.6	1000	55	"
24 / 0600	20.2	77.8	1000	50	"
24 / 1200	20.8	79.7	1002	50	"
24 / 1800	21.5	81.5	1001	50	"
25 / 0000	22.3	83.3	998	55	"
25 / 0600	22.8	84.8	995	60	"

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
25 / 1200	23.4	86.2	990	65	hurricane
25 / 1800	24.1	87.5	990	70	"
26 / 0000	24.9	88.9	983	75	"
26 / 0600	25.6	90.2	978	90	"
26 / 1200	26.4	91.4	963	100	"
26 / 1800	27.3	92.5	952	120	"
27 / 0000	28.5	93.0	937	130	"
27 / 0600	29.8	93.3	939	130	"
27 / 1200	31.2	93.3	970	85	"
27 / 1800	32.8	92.9	988	55	tropical storm
28 / 0000	34.4	92.5	993	35	"
28 / 0600	35.4	92.0	998	25	tropical depression
28 / 1200	36.1	91.2	1000	25	"
28 / 1800	37.0	90.0	1003	25	"
29 / 0000	37.5	88.0	1004	25	"
29 / 0600	38.3	84.8	1004	20	low
29 / 1200					dissipated
27 / 0000	28.5	93.0	937	130	maximum wind and minimum pressure
21 / 2030	17.1	61.8	1007	40	landfall on Antigua
21 / 2330	17.1	62.6	1007	40	landfall on Nevis
23 / 0430	18.4	70.0	1004	45	landfall about 20 n mi west of Santo Domingo, Dominican Republic
24 / 0200	20.0	76.6	1000	55	landfall near Uvero, Santiago de Cuba
25 / 0000	22.3	83.3	1000	55	landfall near Playa de las Tunas, Pinar del Rio, Cuba
27 / 0600	29.8	93.3	939	130	landfall near Cameron, Louisiana

Table 2. Selected ship reports with winds of at least 34 kt for Hurricane Laura, 20-29 August 2020.

Date/Time (UTC)	Ship call sign	Latitude (°N)	Longitude (°W)	Wind dir/speed (kt)	Pressure (mb)
22 / 2100	J8PE3	17.7	65.7	200 / 35	1012.2
23 / 2100	6YRG6	17.9	74.2	020 / 60	1011.0
24 / 0000	VRRQ7	24.9	73.1	110 / 35	1016.6
24 / 0000	9HJC9	25.7	78.1	150 / 35	1013.0
24 / 0300	6YRG6	18.8	74.5	130 / 40	1014.0
24 / 0400	3FZO8	25.7	78.3	120 / 35	1014.7
24 / 0500	C6FN5	25.7	78.4	090 / 40	1014.9
24 / 0500	HPYE	26.8	79.4	110 / 35	1013.9
24 / 0700	C6XS7	25.7	78.2	100 / 37	1013.3
24 / 0800	9HA461	25.7	78.1	110 / 38	1014.8
24 / 0800	C6SJ5	25.8	78.0	100 / 35	1012.1
24 / 0900	C6FN5	25.7	78.4	090 / 39	1013.0
24 / 1000	3FZO8	25.7	78.3	110 / 35	1014.7
24 / 1000	9HA461	25.7	78.1	100 / 35	1019.5
24 / 1000	3FPS9	25.8	78.4	100 / 40	1016.9
24 / 1100	3FZO8	25.7	78.3	090 / 35	1013.7
24 / 1100	H3GR	25.8	78.2	100 / 40	1016.8
24 / 1200	3FZO8	25.7	78.3	090 / 38	1013.7
24 / 1200	9HA461	25.7	78.1	110 / 35	1020.0
24 / 1200	9HJC9	25.7	78.1	100 / 35	1014.0
24 / 1300	3FPS9	25.8	78.4	110 / 40	1017.5
24 / 1300	H3VU	27.5	79.1	110 / 36	1014.5
24 / 1400	H3VU	27.4	79.2	120 / 35	1015.9
25 / 1600	WCDP	22.5	86.2	170 / 50	1006.2
25 / 1700	WCDP	22.5	86.0	170 / 45	1007.0
25 / 1800	WCDP	22.5	85.7	180 / 35	1008.2
25 / 1900	WCDP	22.6	85.4	170 / 35	1007.6
27 / 0700	KLIO	26.8	90.9	200 / 62	1014.1
29 / 0000	WDH756	43.0	87.2	320 / 40	1005.0
29 / 0300	WDH756	42.4	87.3	270 / 55	1002.3
29 / 0300	WDE356	44.5	86.1	270 / 35	999.6

Table 3. Selected surface observations for Hurricane Laura, 20-29 August 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)				
Virgin Islands									
International Civil Aviation Organization (ICAO) Sites									
St Thomas (TIST) (18.33N, 64.97W)	22/0753	1007.4	22/1200	25 (10 m, 2 min)	36				
St Croix (TISX) (17.7N, 64.8W)	22/0653	1007.5	22/1656	20 (10 m, 2 min)	33				
WeatherFlow Sites									
Cotton Valley (CVAV3) (17.74N, 64.62W)			22/1213		40[i]				
Rupert Rock (XRUP) (18.33N, 64.93W)			22/1530		37[i]				
Buck Island (XBUK) (18.28N, 64.89W)			22/1130		36[i]				
Dominican Republic									
Puerto Plata (MDPP)	22/2200	1009.0	23/0900	16					1.69
Santiago (MDST)	22/2200	1009.0	23/0900	20					2.19
Catey (MDCY)	22/2200	1008.0	22/2100	08					2.21
Arroyo Barril (MDAB)	22/2200	1008.0	23/0900	10					2.03
Sabana de la Mar (78467)	22/2100	1006.9	23/0900	18					1.48
Bayaguana (78473)	22/2100	1008.8	23/0900	16					4.48
Punta Cana (MDPC)	22/2200	1008.0	22/2100	12	26				2.01
Jimani (78480)	22/2100	1007.8	22/2100	16					2.99
Barahona (MDBH)	22/2200	1007.0	23/0900	18					11.09
Higuero (MDJB)	22/1500	1010.4	22/1800	10					9.00
Las America (MDSD)	22/2200	1007.0	23/0900	14					9.15
Central (78486)	22/2100	1008.9	23/0900	10					6.93
La Romana (MDLR)	22/2200	1006.0	23/0900	10					8.40
Cuba									
Punta de Maisi (78369)	23/1950	1007.1	23/2017	38	57				0.22
Jamal, Baracoa (78356)	23/2100	1004.7	23/2110	27	77				1.01
Contramaestre (78363)	24/0000	1003.1	23/2221	25	38				3.31
Guantanamo Bay (78367) (19.90N, 75.13W)	23/2150	1002.3	23/2351	52	63				
Guantanamo (78368)	23/2100	1005.1	23/2110	30	36				3.33
Provincia De Granma (78360)	23/2310	1004.3	24/0200	43	56				1.20
(78361)	24/0000	1006.8	24/0020	37	41				1.59
La Jiquima (78362)	23/2100	1005.4	23/2150	27	40				1.02

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)				
Guaro (78370)	23/2000	1005.2	23/2040	17	46				0.38
Las Tunas (78357)	23/2110	996.3	23/2150	25	44				0.69
Puerto Padre (78358)	23/2015	1008.2	23/2105	24	46				0.15
Florida (350)	24/0900	1005.5	24/1000	22	53				0.02
Santa Cruz del Sur (351)	24/0900	1003.9	24/0900	35	57				1.08
Esmeralda (352)	24/0600	1008.2	24/0400	16	35				0.13
Nuevitas (353)	24/0000	1007.8	24/0300	23	50				0.02
Palo Seco Guáimaro (354)	24/0300	1007.5	24/0600	22	41				0.24
Camagüey (355)	24/0600	1007.6	24/0500	38	59				0.10
Cayo Coco (78339)	24/0830	1008.0	24/0811	36	40				0.07
Falla (78347)	24/0745	1004.0	24/0740	23	35				0.00
Venezuela (78346)	24/0700	1003.9	24/0935	26	39				0.19
Júcaro (78345)	24/0800	1006.0	24/1010	24	49				0.71
Sancti Spíritus (78349)	24/0900	1006.0	24/1320	35	40				0.35
El Jíbaro (78341)	24/0020	1005.4	24/1120	43	49				0.71
Trinidad (78337)	24/1100	1005.1	24/1550	35	43				2.11
La Piedra (78308)	24/1200	1000.0	24/1300	30	49				1.54
Santo Domingo (78326)	24/0900	1008.7	24/1600	19	45				0.21
Sagua la Grande (78338)	24/1500	1007.0	24/1600	30	51				0.02
El Yabú (78343)	24/0800	1007.0	24/1235	16	43				0.09
Caibarién (78348)	24/1530	1006.0	24/1530	16	44				0.09
Aguada de Pasajeros (335)		1002.8	24/1900	27	49				1.26
Cienfuegos (344)		1001.6	24/1720	30	48				0.64
Unión de Reyes (78327)	24/1900	1006.6	24/1600	22	50				0.13
Varadero (78328)	24/2000	1007.0	24/1700	41	52				0.01
I. Hatuey (78329)	24/1800	1007.5	24/1600	24	40				0.14
Jovellanos (78330)	24/1610	1006.5	24/1600	24	40				0.11
Jagüey Grande (78331)	24/2110	1006.5	24/2000	36	57				0.40
Colón (78332)	24/2010	1006.2	24/1700	21	52				0.19
Playa Girón (78333)	24/1754	1005.4	24/1735	49	59				0.91
Batabanó (322)	24/ 2110	1000.1	24/2135	49	65				1.28
Güines (323)	24/ 2110	999.5	24/2025	38	54				0.77
Bainoa (340)	24/ 2100	994.1	24/2205	40	52				0.10
Bahia Honda (318)	25/0000	1004.6	25/0213	38	52				0.76

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)				
Guira de Melena (320)	24/2230	999.8	24/2235	43	53				0.98
Bauta (376)	24/2305	996.0	24/2320	35	50				0.39
Punta del Este (78324)	24/2100	1003.1	24/2340	46	49				2.31
La Fe (78321)	24/2200	1002.2	25/0220	32	42				1.74
Cuba-Francia (78309)	24/2200	1002.7	25/0207	28	38				1.54
Casablanca (78325)	24/2100	1004.8	24/2155	46	57				1.14
Santiago de Las Vegas (78373)	24/2300	1004.0	24/2250	26	46				0.70
Cabo de San Antonio (78310)									4.58
Santa Lucía (78312)	25/0210	999.1	25/0750	38	45				1.43
Isabel Rubio (78313)	25/0310	1001.9	25/0820	32	48				1.83
S Juan y Martínez (78314)	25/0020	1001.7	25/0558	43	55				1.65
Pinar del Río (78315)	25/0056	1001.4	25/0600	32	46				1.89
La Palma (78316)	25/0100	998.4	25/0400	27	51				3.29
Paso Real de San Diego (78317)	25/0000	998.9	25/0258	29	44				4.58
Offshore Sites									
NOAA Buoys									
Caribbean Valley (42060) (16.43N, 63.33W)	21/2110	1008.2	22/0606	29	33				
North of Vieques, PR (41056) (18.27N, 65.45W)	22/0800	1006.4	22/1950	27 (4 m)	35				
Sand Key, FL (SANF1) (24.46N, 81.88W)	24/2100	1010.0	24/1942	45	50				
East Gulf (42003) (25.93N, 85.62W)	25/1020	1008.9	25/2222	35	41				
Mid Gulf (42001) (25.94N, 89.66W)	26/0540	990.5	26/0548	58[i]	70[i]				
West Gulf (42002) (26.01N, 93.65W)	26/2120	1003.5	26/1806	25	33				
Southwest Pass, LA (BURL1) (28.91, 89.43W)			26/1100	32	35				
Galveston, TX (42035) (29.23N,94.41W)	27/0350	997.9	27/0217	37	45				
SHELL ALCYONE Buoy (42395) (26.40N,90.79W)	26/1300	970.9	26/1140	66	93				
BW Pioneer Buoy (42360) (26.69N,90.46W)	26/1100	993.6	26/1100	51					
United States									
Puerto Rico									

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)				
International Civil Aviation Organization (ICAO) Sites									
San Juan International (TJSJ) (18.43N, 66W)	22/1056	1008.3	21/2110	20 (10 m, 2 min)	29				
Roosevelt Roads (TJNR) (18.25N, 65.63W)	22/0753	1007.4	22/2004	25 (10 m, 2 min)	37				
National Ocean Service (NOS) Sites									
Esperanza Vieques (ESPP4) (18.09N, 65.47W)	22/0754	1007.5	22/1706	30 (4 m)	35				
Magueyes Island Lajas (MGIP4) (17.97N, 67.05W)	22/1312	1008.3	22/2130	25 (4 m)	32				
Hydrometeorological Automated Data System (HADS) Sites (NWS)									
Villalba 3 NW (VILP4) (18.16N,66.53W)									5.82
Duque 4 NW (NGIP4) (18.28N,65.78W)									4.81
Pena Pobre 2 N (GUSP4) (18.25N,65.82W)									4.47
Villalba 3 NE (VINP4) (18.16N,66.46W)									4.42
Coamo (COAP4) (18.08N,66.35W)									4.30
WeatherFlow Sites									
Camp Santiago (CSAP4) (18.01N, 66.29W)			22/1809		65[i]				
La Mareas (XMRS) (17.93N, 66.16W)			22/1747		62[i]				
Culebrita Island (XCUL) (18.31N, 65.23W)			22/1947		58[i]				
Yabucoa Tanque De Agua (XYTA) (18.03N, 65.84W)			22/1655		50[i]				
Cabo Rojo (CRRP4) (17.97N, 67.16W)			22/2157		35[i]				
Marina Del Rey (XREY) (18.29N, 65.63W)			22/2004		38[i]				
Yabucoa-El Negro (XYAB) (18.05N, 65.83W)			22/2158		42[i]				
San Juan Navaid (XJUA) (18.46N, 66.13W)			22/1743		41[i]				
Louisiana									
International Civil Aviation Organization (ICAO) Sites									
Alexandria International Airport (KAEX) (31.33N, 92.55W)	27/1240	986.3	27/1220	54 (10 m, 2 min)	78				6.50
Alexandria, LA (KESF) (31.40N, 92.30W)	27/0910	996.6	27/0855	18[i] (10 m, 2 min)	36[i]				1.06
Oakdale, LA (KACP) (30.75N, 92.69W)	27/0615	996.5	27/0535	15[i] (10 m, 2 min)	36[i]				0.01
DeRidder, LA (KDRI) (30.83N, 93.34W)	27/1015	965.9	27/0940	42 (10 m, 2 min)	71				1.44

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)				
Chenault Airpark (KCWF) (30.21N, 93.14W)	27/0735	965.0	27/0735	66[i] (10 m, 2 min)	81[i]				4.71
DeQuincy, LA (K5R8) (30.44N, 93.47W)	27/0815	955.2	27/0735	33[i] (10 m, 2 min)	59[i]				3.06
Polk Army Airfield, Fort Polk (KPOE) (31.05N, 93.18W)	27/1113	969.5	27/1010	39[i] (10 m, 2 min)	61				5.64
Jennings (K3R7) (30.24N 92.67W)	27/0755	991.1	27/0555	41 (10 m, 2 min)	63				1.93
Lafayette (KLFT) (30.20N, 91.99W)	27/0610	998.6	27/0953	31 (10 m, 2 min)	50				7.91
Lake Charles Municipal Airport (KLCH) (30.12N, 93.22W)	27/0720	956.0	27/0654	85[i] (10 m, 2 min)	116[i]				2.51
GOMEX Marsh Oil Platform (KSCF) (29.12N, 91.87W)	27/0025	990.9	27/0025	56	70				
New Iberia (KARA) (30.03N, 91.88W)	27/0555	1000.9	27/0931	46 (10 m, 2 min)	66				4.54
Patterson (KPTN) (29.71N, 91.34W)	27/0520	1003.4	27/1303	31 (10 m, 2 min)	45				3.35
Salt Point (KP92) (29.56N, 91.53W)	27/0459	1003.3	27/0559	28[i] (10 m, 2 min)	49[i]				1.10
Sulphur (KUXL) (30.13N, 93.38W)	27/0515	988.4	27/0515	38[i] (10 m, 2 min)	56[i]				
Opelousas (KOPL) (30.56N, 92.10W)	27/0855	997.0	27/0815	30 (10 m, 2 min)	49				5.58
Shreveport Regional Airport (KSHV) (32.45N, 93.83W)	27/1545	988.2	27/1511	46 (10 m, 2 min)	57				
Monroe Regional Airport (KMLU) (32.52N, 92.03W)	27/1653	994.9	27/1653	38[i] (10 m, 2 min)	54[i]				
Rusty Williams Airport Mansfield (K3F3) (32.07N, 93.76W)	27/1410	996.3	27/1255	31 (10 m, 2 min)	51				
Shreveport Downtown Airport (KDTN) (32.53N, 93.75W)	27/1536	991.2	27/1536	32 (10 m, 2 min)	50				
Barksdale Air Force Base (KBAD) (32.5N, 93.67W)	27/1626	989.8	27/1406	34 (10 m, 2 min)	48				
Ruston Regional Airport (KRSN) (32.52N, 92.51W)	27/1455	996.9	27/1315	21[i] (10 m, 2 min)	38[i]				
Natchitoches Regional Airport (KIER) (31.74N, 93.09W)	27/1335	977.5	27/1255	35[i] (10 m, 2 min)	57[i]				
McComb Airport (KMCB) (31.18N, 90.47W)	27/1042	1007.5	27/1530	28 (10 m, 2 min)	44				
New Orleans Lakefront Airport (KNEW) (30.04N, 90.03W)	27/1037	1008.8	27/1519	29 (10 m, 2 min)	42				
Baton Rouge Airport (KBTR) (30.54N, 91.15W)	27/1016	1004.4	27/1450	28 (10 m, 2 min)	36				

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)				
New Orleans Armstrong Intl Airport (KMSY) (29.98N, 90.25W)	27/1037	1008.8	26/1715	27 (10 m, 2 min)	35				
Bastrop Airport (KBQP) (32.76N, 91.88W)			27/1655	21 (10 m, 2 min)	37				
Vicksburg/Tallulah Airport (KTVR) (32.35N, 91.03W)	27/1951	1005.1	27/1917	27 (10 m, 2 min)	43				
Coastal-Marine Automated Network (C-MAN) Sites									
SW Pass (BURL1) (28.9N, 89.43W)			26/0200	32 (38 m, 10 min)	36				
Grand Isle (GISL1) (29.26N, 89.96W)			27/2036	24 (6.6 m, 2 min)	34				
National Ocean Service (NOS) Sites									
Calcasieu Pass (CAPL1) (29.77N 93.34W)	27/0554	940.0	27/0518	81 (12 m)	111	8.88	9.82	9.2	
Amerada Pass (AMRL1) (29.45N 91.34W)	27/0512	1004.9	27/0954	24 (11 m)	42	4.73	5.64	4.8	
Eugene Island (EINL1) (29.37N 91.38W)	27/0512	1004.3	27/0448	44 (10 m)	55	4.64		4.7	
Lake Charles (LCLL1) (30.22N 93.22W)	27/0736	954.8				4.48	5.39	4.7	
Bulk Terminal (BKTL1) (30.19N 93.30W)						4.56	5.20	4.5	
Freshwater Canal Locks (FRWL1) (29.55N 92.31W)	27/0006	1002.0	26/2348	32 (20 m)	44	4.73	4.85*	4.0*	
Berwick, Atchafalaya River (TESL1) (29.67N 91.24W)			27/1342	29 (13 m)	45	4.13	5.34	3.2	
I-10 Bonnet Carre Floodway (BCFL1) (30.07N 90.39W)						3.05	3.54	3.1	
New Canal Station (NWCL1) (30.03N 90.11W)	27/1030	1008.5	27/1518	18 (10 m)	27	2.76	3.35	3.0	
Shell Beach (SHBL1) (29.87N 89.67W)	27/1048	1010.1	27/0648	27 (16 m)	32	2.63	3.56	2.8	
Port Fourchon (PTFL1) (29.11N 90.20W)						2.10		2.4	
Pilot's Station East (PSTL1) (28.93N 89.41W)	26/0836	1008.0	26/1312	33 (24 m)	43	2.15		2.3	
Grand Isle (GISL1) (29.26N 89.96W)			27/2036	25 (9 m)	34	2.07		2.3	
Pilottown (PILL1) (29.18N 89.26W)	26/0854	1010.3	27/1512	21 (12 m)	26	1.05		1.3	
Frenier Landing (FREL1) (30.11N 90.42W)	27/1018	1007.7	27/0712	25 (10 m)	34				
WeatherFlow Sites									
Cameron (XCAM) (29.78N, 93.29W)			27/0519	88 (10 m)	101				
FCMP T1 Sulphur (UF1T) (30.20N, 93.15W)			27/0700	90 (10 m)	115				
FCMP T3 Lake Charles (UF5T) (30.20N, 93.37W)			27/0702	69 (10 m)	96				

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)				
Dulac (KDUL) (29.35N, 90.73W)	27/0816	1006.9	27/0900	35 (10 m)	44				
Mandeville (XMVL) (30.40N, 90.09W)	27/1043	1007.5	27/0941	34 (10 m)	38				
Pontchartrain Causeway (XPTN) (30.20N, 90.12W)	27/1038	1007.4	26/2207	30 (13 m)	39				
Bayou Bienvenue (XBYU) (30.00N, 89.9W)	27/1023	1006.1	26/1818	30 (27 m)	36				
Lakefront Airport (KLKF) (30.04N, 90.02W)			26/1739	27 (10 m)	36				
Remote Automated Weather Stations (RAWS)									
Hackberry (HAKL1) (29.89N, 93.40W)			27/0449	38	63				1.82
Lacassine (LACL1) (30.00N, 92.89W)			27/0646	54	83				10.39
Vernon (LEVL1) (31.02N, 93.19W)			27/0959	24	64				5.58
Evangeline/Gardner (GARL1) (31.19N, 92.63W)			27/1343	24	63				
Dove Field (VRNL1) (31.03N, 92.98W)			27/1134	22	52				
Gum Springs (GUML1) (31.9N, 92.78W)			27/1442	28 (10 m, 2 min)	61				
Catahoula (BENL1) (31.5N, 92.46W)			27/1343	22 (10 m, 2 min)	49				
Texas Tech University Hurricane Research Team Sticknet									
102 (30.14N, 93.59W)		952.2		71[i] (2.25 m)	89[i]				
107 (30.16N, 93.56W)		954.9		64 (2.25 m)	83				
217 (30.14N, 93.13W)		961.7		73[i] (2.25 m)	91[i]				
219 (30.02N, 92.00W)		999.4		35 (2.25 m)	44				
220 (30.21N, 92.82W)		987.0		50 (2.25 m)	62				
221 (30.17N, 93.03W)		974.0		68[i] (2.25 m)	78[i]				
325 (30.22N, 93.54W)		954.9		60 (2.25 m)	82				
326 (30.18N, 93.47W)		949.7		63 (2.25 m)	84				
327 (30.14N, 93.45W)		947.9		57 (2.25 m)	98				
328 (30.15N, 93.64W)		964.6		60 (2.25 m)	80				
329 (30.15N, 93.56W)		953.0		72 (2.25 m)	93				
331 (30.13N, 93.52W)		950.4		67[i] (2.25 m)	87[i]				
332 (30.11N, 93.35W)		945.9		71[i] (2.25 m)	92[i]				
334 (30.28N, 93.56W)		956.3		53 (2.25 m)	86				

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)				
335 (30.23N, 93.64W)		963.5		55 (2.25 m)	84				
437 (29.82N, 90.87W)		1005.5		21 (2.25 m)	32				
438 (30.00N, 92.34W)		996.8		47 (2.25 m)	59				
439 (30.02N, 92.43W)		996.2		46 (2.25 m)	55				
440 (30.10N, 93.18W)		954.7		83 (2.25 m)	108				
442 (30.04N, 92.77W)		967.4		36 (2.25 m)	54				
443 (30.10N, 92.92W)		980.9		56 (2.25 m)	70				
444 (29.69N, 91.21W)		1004.5		25 (2.25 m)	35				
445 (30.08N, 92.71W)		990.5		49 (2.25 m)	65				
447 (30.13N, 93.22W)		954.2		66[i] (2.25 m)	87[i]				
448 (30.07N, 93.09W)		963.7		74[i] (2.25 m)	99[i]				
Citizen Weather Observer Program (CWOP) Sites									
2-Monroe (KD5MWL) (32.54N, 92.00W)	27/1630	997.6			53				
Mansfield (AS283) (31.93N, 93.89W)	27/1259	989.2	27/1158	27	33				
Bastrop (EW1438) (32.8N, 91.92W)	27/1646	997.8	27/1400	16	37				
Monticello (DW9592) (32.61N, 91.35W)	27/1801	1001.9	27/2015	19	37				
Public/Other									
Holly Beach – Mike Theiss, Reed Timmer, Jon Bowser (29.77N, 93.46W)	27/0536	945.0	27/0533		133				
Sulphur – Josh Morgerman (30.22N, 93.37W)	27/0739	948.0							
Lake Charles 901 Lakeshore Drive (30.23N, 93.22W)	27/0635	971.6	27/0635	88	119				
Hanna Hall Roof Monroe (ULM) (32.53N, 92.07W)			27/1840		48				
Red River (LSU09-Agnet) (32.42N, 93.64W)	27/1547	987.1	27/1539	38	50				
Shreveport (UR386) (32.37N, 93.66W)			27/1510	39	45				
Main Pass 140B (KMIS) (29.30N, 88.84W)	26/0915	1010.4	26/0035	24 (85 m, 2 min)	34				
Chase (LSU-Agnet) (LSU02) (32.10N, 91.70W)	27/1548	1001.9	27/1814	34	47				
Newellton Airport (KLANEWEL3) (32.06N, 91.25W)			24/2100	30	36				
Start (KLARAYVI17) (32.45N, 91.85W)			27/1709	31	49				

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)				
United States Geological Survey (USGS) Water Level Sensors									
Rockefeller Wildlife Refuge (LACAM27067) (29.71N 92.77W)							10.05	9.1	
Vermilion Parish – Freshwater Canal (LAVER27068) (29.54N 92.31W)							9.90	7.9	
Cypremort Point (LASTM27175) (29.73N 91.86W)							8.72	7.4	
Holly Beach (LACAM27066) (29.77N 93.46W)							9.22	7.8	
Dularge (LATER27180) (29.34N 90.84W)							4.36	3.4	
Cameron Parish – Mae's Beach (LACAM04361) (29.75N 93.66W)							6.36	4.9	
Golden Meadow (LALAF27100) (29.34N 90.25W)							3.82	1.8	
USGS Stream Gauges									
Vermilion Bay near Cypremort Point (VCPL1) (29.71N 91.88W)							9.45	8.1	
North Calcasieu Lake near Hackberry (NCLL1) (30.03N 93.30W)							7.42	6.5	
Calcasieu River at Cameron (CCRL1) (29.82N 93.35W)							5.56	4.6	
Caillou Lake SW of Dulac (DCLL1) (29.25N 90.92W)							5.38	4.4	
Lower Atchafalaya River at Morgan City (MRGL1) (29.69N 91.21W)							6.30	4.3	
Caillou Bay SW of Cocodrie (CCOL1) (29.08N 90.87W)							4.85	3.9	
Barataria Pass at Grand Isle (EGIL1) (29.27N 89.95W)							4.70	3.9	
Barataria Bay N of Grand Isle (NGIL1) (29.42N 89.95W)							4.48	3.6	
Little Lake near Cutoff (CTFL1) (29.52N 90.18W)							4.24	3.5	
Black Bay near Pointe-a-la-Hache (PSIL1) (29.63N 89.56W)							4.58	3.2	
Hackberry Bay NW of Grand Isle (HACL1) (29.40N 90.04W)							3.96	3.2	

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)				
Caminada Pass NW of Grand Isle (CPGL1) (29.23N 90.05W)							3.70	2.9	
Crooked Bayou near Delacroix (GRPL1) (29.71N 89.72W)							4.03	2.7	
Mississippi Sound near Grand Pass (GRPL1) (30.12N 89.25W)							3.26	2.0	
US Army Corps of Engineers (USACE) Gauges									
Lake Pontchartrain at Mandeville (LPML1) (30.37N 90.09W)							3.89	3.2	
Lake Pontchartrain at Lakefront Airport (LPML1) (30.04N 90.02W)							3.77	3.2	
Lake Pontchartrain – West End (WEGL1) (30.02N 90.12W)							3.51	3.0	
Pass Manchac Pontchatoula (LPML1) (30.28N 90.40W)							3.83	2.8	
Bayou Dupre Flood Gate (BDML1) (29.94N 89.84W)							3.89	2.7	
Chef Manteur Pass near Lake Borgne (CMPL1) (30.07N 89.80W)							3.41	2.3	
Rigolets near Lake Pontchartrain (RIGL1) (30.16N 89.74W)							3.36	2.3	
Mississippi River SW Pass at East Jetty (SWBL1) (28.93N 89.41W)							3.10	1.5	
Gulf Intracoastal Waterway near Paris Bridge Road (PRSL1) (30.01N 89.94W)							2.15	1.0	
USGS High Water Marks									
Creole (LACAM30163) (29.78N 93.07W)							20.80	17.1	
Creole (LACCAM30161) (29.82N 93.12W)							12.60	9.7	
Grand Chenier (LACAM30159) (29.77N 92.98W)							16.60	9.3	
Creole (LACAM30160) (29.82N 93.12W)							13.10	9.1	
Creole (LACAM30162) (29.82N 93.11W)							12.40	9.1	
Creole (LACAM30164) (29.82N 93.11W)							14.40	8.9	
Cameron (LACAM30168) (29.78N 93.30W)							13.00	8.3	
Cameron (LACAM30165) (29.80N 93.32W)							10.10	5.3	

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)				
Cameron (LACAM30167) (29.80N 93.32W)							9.40	5.0	
Holly Beach (LACAM27066) (29.77N 93.46W)							9.50	5.0	
Holly Beach (LACAM30187) (29.77N 93.46W)							7.80	4.8	
Holly Beach (LACAM30186) (29.77N 93.46W)							9.50	4.4	
Deatonville (LACAL30189) (30.06N 93.29W)							7.70	3.5	
Grand Chenier (LACAM30158) (29.75N 92.91W)							11.70	3.1	
Cameron (LACAM30166) (29.80N 93.34W)							6.10	2.9	
Hackberry (LACAM30174) (30.01N 93.34W)							5.00	2.2	
Lake Charles (LACAL30188) (30.09N 93.29W)							5.60	2.0	
Grand Lake (LACAM30190) (30.03N 93.28W)							7.60	1.8	
Grand Lake (LACAM30191) (30.02N 93.25W)							7.80	1.3	
Lake Arthur (LAJEF30169) (30.04N 92.75W)							3.04	1.1	
Hackberry (LACAM30172) (30.00N 93.34W)							4.20	1.0	
Harris County Flood Control District / NWS High Water Marks									
Grand Chenier (29.78N 93.07W)							18.8	15.5	
Creole (29.79N 93.10W)							17.0	13.5	
Grand Chenier (29.77N 93.03W)							16.0	13.2	
Creole (29.79N 93.15W)							17.9	13.0	
Grand Chenier (29.78N 93.07W)							15.8	12.8	
Cameron (29.79N 93.26W)							14.8	11.0	
Creole (29.81N 93.10W)							12.3	9.6	
Cameron (29.79N 93.20W)							15.32	9.4	
Creole (29.81N 93.14W)							12.6	8.7	
Grand Chenier (29.75N 92.90W)							13.6	8.1	
Cameron (29.80N 93.19W)							12.58	8.1	
Grand Chenier (29.76N 92.95W)							12.8	7.8	
Grand Chenier (29.72N 92.76W)							10.0	7.0	

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)				
Cameron (29.82N 93.34W)							8.8	6.8	
Grand Lake (30.03N 93.28W)							8.0	6.1	
Erath (29.84N 92.03W)							8.6	6.0	
Esther (29.80N 92.14W)							8.5	6.0	
Grand Chenier (29.74N 92.84W)							11.0	6.0	
Cameron (29.79N 93.30W)							10.32	5.9	
Freshwater City (29.55N 92.31W)							10.2	5.8	
Pecan Island (29.66N 92.52W)							8.1	5.8	
Cameron (29.80N 93.32W)							9.83	5.8	
Pecan Island (29.64N 92.44W)							8.15	5.8	
Erath (29.85N 92.03W)							8.3	5.6	
Esther (29.78N 92.16W)								5.5	
Delcambre (29.88N 92.00W)							7.9	5.3	
Deatonville (30.06N 93.29W)							7.72	4.9	
Holly Beach (29.77N 93.44W)							9.3	4.1	
Esther (29.84N 92.18W)							6.0	4.0	
Pecan Island (29.66N 92.36W)							6.3	4.0	
Lake Charles (30.17N 93.30W)							5.0	4.0	
Cameron (29.79N 93.35W)							9.5	4.0	
Lake Charles (30.23N 93.22W)							5.1	3.1	
Erath (29.94N 91.99W)								3.0	
Erath (29.88N 92.03W)							7.5	2.2	
Gibbstown (29.93N 93.08W)							5.14	2.1	
Peveto Beach (29.76N 93.58W)							7.0	2.0	
Hackberry (30.01N 93.33W)							3.4	1.6	
Erath (29.88N 92.08)							6.7	1.4	
NWS High Water Marks									
Grand Chenier (29.78N 93.03)								13.5	
Grand Chenier (29.77N 92.97)								11.2	

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)				
Grand Chenier (29.74N 92.84)								6.0	
Calcasieu Parish Police Jury (CPPJ)									
Bearhead Creek, Hwy 12 (30.33N,93.62W)									11.74
Bayou Serpent, Hecker Road (30.33N,93.07W)									10.59
L-4, Green Moore Road (30.25N,93.65W)									10.40
Lacassine Bayou, Lorraine Bridge (30.13N,92.9W)									10.09
L-9, Old River Road (30.35N,93.69W)									9.85
Bayou Arsene, Hecker Road (30.3N,93.06W)									9.18
Kayouchee Coulee, East Prien Lake Road (30.19N,93.16W)									9.09
L-3, Addison Loop (30.14N,93.16W)									8.25
Contraband Bayou, Common Street (30.17N,93.21W)									8.00
Hydrometeorological Automated Data System (HADS) Sites (NWS)									
Lake Charles 2N (LCHL1) (30.25N,93.22W)									11.56
Lake Charles 7NW (LCRL1) (30.3N,93.27W)									10.38
Grand Coteau (GRCL1) (30.43N,92.03W)									10.13
Carencro (BVCL1) (30.37N,91.99W)									9.06
Dry Creek 5 NW (BKDL1) (30.73N,93.09W)									8.97
Mittie (MTTL1) (30.7N,92.9W)									7.55
Oberlin 3 NW (OBCL1) (30.63N,92.82W)									7.44
Bienville 3 NE (BNVL1) (32.37N,92.94W)									7.20
Basile 2W (BSLL1) (30.48N,92.63W)									7.06
Leesville (LEEL1) (31.13N,93.25W)									6.87
Lafayette-Vermilion (VLSL1) (30.22N,92W)									6.77
Mermentau (MRML1) (30.18N,92.58W)									6.76
Minden 3W (MNEL1) (32.59N,93.33W)									6.70
Franklin 3Nw (FRAL1) (29.82N,91.55W)									6.30

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)				
Glenmora 5Wnw (GLML1) (31N,92.67W)									6.25
Kinder 4 WNW (KDRL1) (30.5N,92.92W)									6.16
Community Collaborative Rain, Hail, and Snow Network (CoCoRaHS) Sites									
0.7 WSW Church Point (LA-AC-2) (30.4N,92.22W)									9.40
3.9 ENE Carencro (LA-LY-7) (30.33N,91.97W)									8.99
Grand Coteau 2.7 E (LA-SL-1) (30.41N,91.99W)									8.93
Scott 1.0 N (LA-LY-6) (30.25N,92.08W)									8.22
Deridder 8.9 Se (LA-BG-3) (30.75N,93.18W)									7.93
Rayne 1.0 W (LA-AC-3) (30.23N,92.28W)									7.52
Quitman 2.5 E (LA-JC-3) (32.34N,92.67W)									7.26
Natchitoches 4.8 WNW (LA-NT-3) (31.78N,93.17W)									7.11
Opelousas 1 ESE (LA-SL-6) (30.52N,92.07W)									7.02
Leesville 7.1 SSW (LA-VN-4) (31.03N,93.31W)									6.45
Breaux Bridge 0.7 NNW (LA-SM-3) (30.28N,91.9W)									6.34
Bunkie 0.3 WSW (LA-AV-1) (30.95N,92.19W)									6.09
Alexandria 2.8 SW (LA-RP-7) (31.26N,92.49W)									6.00
Texas									
International Civil Aviation Organization (ICAO) Sites									
Beaumont Municipal Airport (KBMT) (30.07N, 94.22W)	27/0715	992.1	27/0715	42	64				
Beaumont/Port Arthur (KBPT) (29.25N, 94.03W)	27/0639	988.0	27/0639	42	63				1.3
Jasper (KJAS) (30.89N 94.03W)	27/0730	992.0	27/0715	19[i]	30[i]				0.42
Orange City Airport (KORG) (30.07N, 93.80W)	27/0615	985.0	27/0615	33[i]	47[i]				1.12
Marshall Airport (KASL) (32.52N, 94.31W)	27/1635	1003.4	27/1635	25 (10 m, 2 min)	42				

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)				
Panola County Airport Sharpe Field (K4F2) (32.18N, 94.3W)	27/1555	1002.1	27/1535	26 (10 m, 2 min)	37				
Gregg County Airport (KGGG) (32.38N, 94.72W)	27/1700	991.5	27/1700	22 (10 m, 2 min)	35				
NOS Sites									
Galveston Bay Entrance (North Jetty) (GNJT2) (29.36N 94.72W)	27/0618	999.6	27/0200	30 (12 m)	36	4.07	5.19	4.1	
Galveston Pier 21 (GTOT2) (29.31N 94.79W)	27/0624	1001.4	27/0542	20 (5 m)	29	3.87	5.08	4.0	
Sabine Pass North (SBPT2) (29.73N 93.87W)	27/0630	987.8	27/0430	45 (8 m)	58	3.91		3.6	
Bob Hall Pier / Corpus Christi (MQTT2) (27.58N 97.22W)			27/2054	19 (13 m)	21	3.26	4.02	2.8	
Matagorda Bay Entrance Channel (MBET2) (28.43N 96.33W)	26/2318	1003.5	26/1724	19 (12 m)	23	2.80	3.71	2.8	
Eagle Point (EPTT2) (29.48N 94.92W)	27/0630	1001.2	27/0042	25 (8 m)	31	3.35		2.8	
Morgan's Point (MGPT2) (29.68N 94.98W)	27/0636	1001.6	26/2142	25 (8 m)	31	2.55	3.64	2.4	
Port Isabel (PTIT2) (26.06N 97.22W)	26/2254	1007.3	27/2130	16 (12 m)	20	2.23	2.36	1.8	
Rockport (RCPT2) (28.02N 97.05W)	27/0000	1005.0	27/2236	15 (8 m)	19	1.83	3.04	1.8	
Remote Automated Weather Stations (RAWS)									
Kirbyville (KRBT2) (30.63N, 93.83W)	27/0905	978.7	27/0905	27 (6.1 m)	69				5.06
McFadden (FADT2) (29.71N, 94.12W)			27/0535	27 (6.1 m)	41				0.84
Southern Rough (WRRT2) (30.54N, 94.35W)			27/0838	11 (6.1 m)	35				1.72
Woodville (WVLT2) (30.74N, 94.43W)	27/1004	985.8	27/0904	25 (6.1 m)	44				2.17
Sabine South (SSRT2) (31.28N, 93.84W)			27/1307	12	38				
Bluff City (BLRA4) (33.69N, 93.16W)			28/0110	17	34				
WeatherFlow Sites									
Galveston Fishing Pier (XGPR) (29.25N, 94.85W)			26/1800	31 (12 m)	34				
Galveston Bay (XGAL) (29.54N, 94.91W)			26/1820	31 (5 m)	37				
Crab Lake (XCRB) (29.47N, 94.61W)			27/0451	36 (20 m)	42				
Texas Water Development Board (TWDB) Sites									
Carthage (TWB64) (32.13N, 94.35W)	27/1605	993.9	27/1450	25	41				
Texas Tech University Hurricane Research Team Sticknet									

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)				
104 (29.71N, 94.38W)		994.5		27[i] (2.25 m)	42[i]				
105 (29.83N, 94.25W)		993.8		26 (2.25 m)	38				
106 (29.95N, 94.25W)		993.6		31 (2.25 m)	42				
111 (29.84N, 94.17W)		991.6		32 (2.25 m)	40				
112 (30.14N, 93.75W)		953.1		60 (2.25 m)	81				
213 (29.88N, 94.01W)		986.0		41 (2.25 m)	51				
214 (30.06N, 93.75W)		972.7		46[i] (2.25 m)	63[i]				
216 (30.11N, 94.21W)		991.1		29 (2.25 m)	37				
224 (30.08N, 93.90W)		983.8		42 (2.25 m)	59				
330 (29.89N, 94.04W)		988.8		37 (2.25 m)	60				
333 (30.08N, 93.80W)		978.1		45 (2.25 m)	68				
336 (29.86N, 93.94W)		984.7		41 (2.25 m)	70				
446 (29.95N, 93.88W)		983.5		45 (2.25 m)	65				
Texas Coastal Ocean Observing Network (TCOON) Sites									
Rollover Pass (RLOT2) (29.52N 94.51W)	27/0618	998.7	27/0454	32 (11 m)	40	4.11	4.65	4.0	
Texas Point – Sabine Pass (TXPT2) (29.69N 93.84W)	27/0554	980.2	27/0530	65 (13 m)	78	4.05	4.79	4.0	
Freeport SPIP (FPST2) (28.94N 95.29W)	27/0042	1002.8	26/2242	26 (15 m)	32	3.93	4.73	3.8	
Galveston Railroad Bridge (GRRT2) (29.30N 94.90W)	27/0612	1001.5	26/2248	26 (11 m)	32	3.47	4.36	3.4	
San Luis Pass (LUIT2) (29.08N 95.13W)	27/0554	1004.5	26/2036	26	31	3.73	4.10	3.2	
High Island (HIST2) (29.59N 94.39W)	27/0612	996.6	27/0554	28 (9m)	36	3.10	3.56	2.9	
Port O'Connor (PCNT2) (28.45N 96.40W)	26/2306	1004.5	26/2248	18 (9 m)	21	2.57	3.78	2.7	
Port Arthur (PORT2) (29.87N 93.93W)	27/0642	985.4	27/0642	39 (11 m)	65	2.82	3.09	2.5	
Aransas Pass (ANPT2) (27.84N 97.04W)	26/2330	1004.5	26/1518	20 (14 m)	22	2.94	3.28	2.5	
Manchester (NCHT2) (29.73N 95.27W)	27/0630	1002.7	26/2048	19	25	2.68	4.23	2.5	
Port Lavaca (VCAT2) (28.64N 96.61W)	26/2312	1005.0	27/0000	17	21	2.60		2.5	
Sargent (SGNT2) (28.77N 95.62W)	26/2354	1003.5	26/1736	18	25	2.41		2.4	
Matagorda City (EMAT2) (28.71N 95.91W)	26/2342	1003.9	26/2148	20 (9 m)	24	2.41	3.24	2.4	

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)				
Port Aransas (RTAT2) (27.84N 97.07W)	26/2336	1005.4	26/1536	15 (11 m)	18	2.76	3.23	2.3	
Rainbow Bridge (8770520) (29.98N 93.88W)						2.35	2.63	2.1	
USS Lexington – Corpus Christi (TAQT2) (27.81N 97.39W)	27/0036	1004.6				2.15	3.02	2.0	
Seadrift (SDRT2) (28.41N 96.71W)	26/2312	1005.0	27/2148	16 (10 m)	19	2.09	3.33	2.0	
South Padre Island -Brazos Santiago (BZST2) (26.07N 97.15W)	26/2254	1004.5	26/1918	17 (10 m)	20	2.19	2.16	1.9	
South Padre Island Coast Guard Station (PCGT2) (26.07N 97.17W)	26/2254	1005.2	27/1930	18	21	2.16	2.28	1.8	
Aransas Wildlife Refuge (AWRT2) (28.23N 96.80W)	26/2318	1004.2	27/2306	14	18	1.87	3.08	1.8	
Realitos Peninsula (RLIT2) (26.26N 97.29W)	26/2306	1004.4	27/2154	21	24	1.82		1.8	
Packery Channel (PACT2) (27.63N 97.24W)	26/2354	1004.9	27/2136	17 (11 m)	20	1.61	2.59	1.8	
Rincon del San Jose (RSJT2) (26.80N 97.47W)	27/2354	1005.4	27/2336	21 (10 m)	24		1.97	1.5**	
South Bird Island (IRDT2) (27.48N 97.32W)	27/0036	1005.2	27/2154	19 (4 m)	22		2.01	1.4**	
Port Mansfield (PMNT2) (26.56N 97.43W)	26/2312	1005.9					1.45	1.2**	
Baffin Bay (BABT2) (27.30N 97.41W)	26/2312	1004.7	27/2342	18 (10 m)	21		1.50	1.0**	
USGS Water Level Sensors									
Galveston – East Beach (TXGAL27185) (29.33N 94.74W)							6.32	5.0	
Sea Rim State Park (TXJEF27031) (29.67N 94.04W)							6.06	4.5	
Jamaica Beach (TXGAL27244) (29.20N 94.99W)							4.09	3.0	
Smith Point – Galveston Bay (TXCHA27033) (29.53N 94.77W)							3.96	2.8	
Baytown – Galveston Bay (TXHAR27027) (29.71N 95.00W)							3.70	2.4	
Gulf Intracoastal Waterway near McFaddin National Wildlife Refuge (TXJEF27030) (29.69N 94.17W)							3.25	1.8	
Rollover Pass (TXGAL27093) (29.51N 94.50W)							2.86	1.4	

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)				
Harris County Flood Control District / NWS High Water Marks									
Port Arthur (29.77N 93.93W)							4.3	3.0	
Sabine Pass (29.74N 93.89W)							4.0	2.0	
Sabine Pass (29.71N 93.86W)							4.0	2.0	
Sabine Pass (29.74N 93.89W)								2.0	
Port Arthur (29.87N 93.92W)							4.0	1.0	
Sabine Pass (29.76N 93.94W)							3.0	1.0	
Hydrometeorological Automated Data System (HADS) Sites (NWS)									
Orange #2/Sabine River (ORNT2) (30.1N,93.72W)									8.84
Bon Wier 2 ENE (BWRT2) (30.75N,93.61W)									7.43
Avery 5 NNW (AVET2) (33.62N,94.81W)									6.74
San Augustine (Site 1) (SAUT2) (31.51N,94.11W)									5.36
Burkeville 16 NNE (BKLT2) (31.18N,93.57W)									5.14
Community Collaborative Rain, Hail, and Snow Network (CoCoRaHS) Sites									
Center 0.6 NW (TX-SL-1) (31.79N,94.18W)									7.10
Lincoln Park 3.1 ENE (TX-DN-70) (33.23N,96.91W)									6.32
Athens 10.1 SSW (TX-HND-5) (32.07N,95.93W)									5.81
Athens 10.8 SSW (TX-HND-12) (32.06N,95.93W)									5.46
Woodville 7.4 ENE (TX-TR-21) (30.8N,94.29W)									5.25
Kirbyville 1.5 SE (TX-JS-3) (30.64N,93.88W)									4.94
Bridge City 1.3 NW (TX-OR-1) (30.04N,93.86W)									4.14
Northlake 2.5 NNW (TX-DN-6) (33.1N,97.27W)									4.11
Roman Forest 1.9 ENE (TX-MNG-63) (30.19N,95.13W)									4.04
Public/Other									

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)				
Orange – Josh Morgerman (30.12N, 93.76W)	27/0723	974.9							
Sabine Pass – Mark Sudduth (29.74N, 93.88W)	27/0544	980.3	27/0624	66	91				
Arkansas									
International Civil Aviation Organization (ICAO) Sites									
South Arkansas Regional Airport (KELD) (33.22N, 92.82W)	27/1853	981.4	27/1740	38 (10 m, 2 min)	49				
Conway (KCXW) (35.02N, 92.56W)	28/0115	998.6	27/2155	28 (10 m, 2 min)	46				
Little Rock/Adams Field (KLIT) (34.73N, 92.23W)	28/0143	997.6	27/2032	32 (10 m, 2 min)	41				
North Little Rock (KLZK) (34.84N, 92.25W)	28/0044	998.3	27/2158	31 (10 m, 2 min)	42				
Benton/Bryant (KSUZ) (34.59N, 92.48W)	28/0035	997.29	27/2015	28 (10 m, 2 min)	45				
Florence Mem Airport, Arkadelphia (KADF) (34.1N, 93.07W)	27/2330	997.29	27/1830	28 (10 m, 2 min)	40				
Stuttgart (KSGT) (34.61N, 91.57W)	28/0047	999.66	27/2049	33 (10 m, 2 min)	38				
Newport Muni, Newport (KM19) (35.64N, 91.18W)	28/0955	1000.3	28/0020	26 (10 m, 2 min)	35				
Little Rock AFB (KLRF) (34.93N, 92.15W)	28/0056	998.3	27/2047	25 (10 m, 2 min)	45				
Hot Springs (KHOT) (34.48N, 93.1W)	27/2351	997.2	27/1851	20 (10 m, 2 min)	36				
Harrell Field Airport, Camden (KCDH) (33.62N, 92.76W)	27/2035	993.2	27/1735	27 (10 m, 2 min)	38				
Pine Bluff/ Grider Field Airport (KPBF) (34.18N, 91.93W)	28/0028	997.6	27/2056	33 (10 m, 2 min)	45				
Monticello Muni/Ellis Field (KLLQ) (33.64N, 91.75W)	27/1918	998.6	27/1920	30 (10 m, 2 min)	43				
Batesville (KBVX) (35.73N, 91.65W)	28/0041	1002	28/0101	31 (10 m, 2 min)	37				
Remote Automated Weather Stations (RAWS)									
Uam (AMOA4) (33.59N, 91.81W)			27/2200	23 (20 m)	41				
Hydrometeorological Automated Data System (HADS) Sites (NWS)									
Moro Bay (MOBA4) (33.3N,92.35W)									11.10
Gillham 5 NE (GLOA4) (34.21N,94.25W)									10.10
Judsonia (JUDA4) (35.27N,91.63W)									9.93

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)				
Vandervoort 1 ENE (VVOA4) (34.39N,94.35W)									8.64
Benton (Site 2) (BTNA4) (34.57N,92.62W)									7.83
Des Arc (No.2-River) (DSCA4) (34.97N,91.5W)									6.92
Boughton (BHTA4) (33.88N,93.3W)									6.89
Palestine 1E (PLGA4) (34.97N,90.89W)									6.70
Black Rock - Black River (BKRA4) (36.09N,91.1W)									6.64
Clarendon (Site 2) (CLDA4) (34.68N,91.32W)									6.57
De Queen 4 W (DQNA4) (34.05N,94.42W)									6.55
Newport - White River (NPTA4) (35.59N,91.28W)									6.41
Arkadelphia (No. 2) (AKDA4) (34.12N,93.05W)									6.32
Augusta 2 NW (AUGA4) (35.3N,91.38W)									6.21
Patterson 1N (PTTA4) (35.27N,91.23W)									6.19
Oden 1 SE (ODNA4) (34.59N,93.77W)									6.18
Pocahontas (POCA4) (36.25N,90.97W)									6.15
White River at Batesville (BAGA4) (35.77N,91.63W)									6.07
Rye 4 SW (RYEA4) (33.7N,92.03W)									5.98
Community Collaborative Rain, Hail, and Snow Network (CoCoRaHS) Sites									
Smithville 6.2 WSW (AR-SH-10) (36.03N,91.39W)									6.27
Heber Springs 5.5 SE (AR-CB-10) (35.44N,91.96W)									5.91
North Little Rock 2.6 NNE (AR-PS-52) (34.82N,92.23W)									5.84
North Little Rock 1.2 E (AR-PS-16) (34.78N,92.23W)									5.45
Fordyce 6.6 NNW (AR-DL-1) (33.90N,92.46W)									5.35
North Little Rock 0.1 NW (AR-PS-80) (34.78N,92.25W)									5.35

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)				
Mena 1.2 NNE (AR-PL-6) (34.59N,94.22W)									5.31
Strawberry 0.5 NNW (AR-LW-1) (35.97N,91.32W)									5.18
Carlisle 3.3 W (AR-LK-6) (34.78N,91.8W)									5.17
Public/Other									
Crossett Airport (KARCROSS14) (33.17N, 91.89W)			27/1718	35	49				
Lake Village Airport (KARLAKEV6) (33.34N, 91.31W)			27/2245	26	42				
Citizen Weather Observer Program (CWOP) Sites									
Hope (FW2832) (33.51N, 93.59W)	27/1958	976	27/1539	17	36				
Mississippi									
International Civil Aviation Organization (ICAO) Sites									
Cleveland Airport (KRNV) (33.76N, 91.76W)			27/2115	26 (10 m, 2 min)	37				
Greenville Airport (KGLH) (33.48N, 90.98W)	27/2022	1001.7	28/2325	32 (10 m, 2 min)	46				
Natchez Airport (KHEZ) (31.62N, 91.3W)			27/1314	27 (10 m, 2 min)	40				
NOS Sites									
Bay Waveland Yacht Club (WYCM6) (30.33N 89.33W)	27/0936	1011.2	27/1148	26 (10 m)	31	2.27	3.79	2.7	
Pascagoula NOAA Lab (PNLM6) (30.37N 88.56W)						1.89	3.10	2.2	
Petit Bois Island, Port of Pascagoula (PTBM6) (30.21N 88.51W)	27/0824	1012.3	27/2342	20 (5 m)	26				
Citizen Weather Observer Program (CWOP) Sites									
Shelby (FW5443) (33.93N, 91.79W)	27/2140	999.5	27/2146	31	43				
USGS Water Level Sensors									
Pearlington - East Pearl River (MSHAN06615) (30.24N 89.61W)							3.56		
Bayou Cumbest (MSJAC25056) (30.40N 88.45W)							2.88		
Hydrometeorological Automated Data System (HADS) Sites (NWS)									
Pleasant Hill (PLTM6) (34.9N,89.9W)									4.20

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)				
Oxford University (OXFM6) (34.38N,89.53W)									3.86
Guntown 3 NW (GNTM6) (34.48N,88.7W)									3.81
Holcut (HCTM6) (34.73N,88.3W)									3.73
Enterprise (ENSM6) (32.18N,88.82W)									3.71
Prentiss 3 NW (PREM6) (31.62N,89.92W)									3.60
Wiggins 6 E (BLCM6) (30.85N,89.03W)									3.46
Tupelo Regional Airport (KTUP) (34.26N,88.77W)									3.29
Sarah 1W (SARM6) (34.58N,90.22W)									3.20
Etta (ETAM6) (34.48N,89.23W)									3.19
Community Collaborative Rain, Hail, and Snow Network (CoCoRaHS) Sites									
Taylorsville 6.0 E (MS-SM-3) (31.82N,89.33W)									4.32
Southaven 4.8 SE (MS-DS-2) (34.92N,89.94W)									4.20
Abbeville 8.2 SE (MS-LY-4) (34.43N,89.38W)									3.72
Perkinston 1.7 NE (MS-ST-4) (30.79N,89.11W)									3.61
Tupelo 2.0 S (MS-LE-8) (34.23N,88.72W)									3.37
Alabama									
NOS Sites									
Coast Guard Sector Mobile (MCGA1) (30.65N 88.06W)	27/0900	1013.2	26/1742	16 (9 m)	30	2.52	3.44	2.3	
East Fowl River Bridge (EFRA1) (30.44N 88.11W)						2.01	2.90	2.1	
Dauphin Island (DILA1) (30.25N 88.08W)	27/0842	1012.5	27/1206	23 (11 m)	27	2.09	2.77	2.1	
Mobile State Docks (OBLA1) (30.71N 88.04W)	27/0900	1013.2				2.08	3.22	2.1	
West Fowl River Bridge (WFRA1) (30.38N 88.16W)						1.93	2.96	2.1	
Bayou La Batre Bridge (BLBA1) (30.41N 88.25W)						1.92	3.00	2.1	
Dog River Bridge (BYSA1) (30.57N 88.09W)						2.00		2.0	
Chickasaw Creek (CIKA1) (30.78N 88.07W)						2.39	3.26	1.9	

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)				
Weeks Bay, Mobile Bay (WBYA1) (30.42N 87.83W)						1.90		1.9	
Fort Morgan (FMOA1) (30.23N 88.03W)	27/0836	1012.6	27/1218	26 (38 m)	28				
USGS Water Level Sensors									
Fairhope (ALBAL00004) (30.53N 87.91W)							3.40	2.2	
Hydrometeorological Automated Data System (HADS) Sites (NWS)									
Hodges (HGSA1) (34.39N,87.89W)									5.71
Community Collaborative Rain, Hail, and Snow Network (CoCoRaHS) Sites									
Danville 10.6 WSW (AL-LR-9) (34.34N,87.25W)									4.36
Hampton Cove 2.1 WNW (AL-MD-33) (34.67N,86.51W)									4.29
Moulton 3.1 ENE (AL-LR-7) (34.49N,87.22W)									4.11
Florida									
International Civil Aviation Organization (ICAO) Sites									
Key West International Airport (KEYW) (24.56N, 81.76W)	24/2053	1009.9	24/1914	34 (10 m, 2 min)	41				
Naval Air Station Key West Boca Chica Field (KNQX) (24.58N, 81.68W)	24/2053	1009.5	24/2344	31 (10 m, 2 min)	41				
Florida Keys Marathon International Airport (KMTH) (24.73N, 81.05W)	24/0853	1010.4	24/1034	25 (10 m, 2 min)	36				
NOS Sites									
Apalachicola (APCF1) (29.73N 84.98W)	26/0818	1014.9	27/0924	16 (9 m)	19	1.75	2.62	1.8	
Pensacola (PCLF1) (30.40N 87.21W)	27/0818	1013.6	27/1530	13 (10 m)	20	1.90	2.68	1.8	
Panama City Beach (PCBF1) (30.21N 85.88W)	27/0900	1014.7	27/1518	19 (17 m)	21	1.56	2.71	1.8	
Panama City (PACF1) (30.15N 85.67W)			27/1918	15 (10 m)	19	1.27	2.38	1.6	
Key West (KYWF1) (25.55N, 81.88W)	24/2142	1009.8	24/2118	26	38	0.60	0.88		
Vaca Key (VCAF1) (24.71N, 81.11W)	24/0906	1010.6	24/1942	19	39				
Coastal-Marie Automated Network (C-MAN) Sites									
Sand Key (SANF1) (24.46N,81.88W)	24/2050	1010.1	24/1950	39	48				
Fowey Rock (FWYF1) (25.59N,80.10W)	24/2200	1012.8	24/1800	37	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)				
WeatherFlow Sites									
U.S. Coast Guard Sector Key West (XSMS) (24.57N, 81.8W)	24/2138	1007.3	24/1443	27	48				
Weatherflow Marathon-Crawl Key (XKEY) (24.74N, 80.98W)	24/0916	1009.4	24/1026	31 (13.4m)	42				
Tavernier Florida Keys Electric Cooperative Substation (XTVS) (25.01N, 80.52W)	24/0913	1010.8	24/1128	19 (12.1m)	38				
Smith Shoal Light (XSMS) (24.72N, 81.92W)	24/2050	1006.5	24/1935	41 (19.2m)	54				
Alligator Reef Light (XALG) (24.85N, 80.62W)	24/1426	1009.1	24/1126	31 (7.5m)	42				
Carysfort Reef Light (XCFL) (25.23N, 80.21W)	24/2147	1011.2	24/1742	33 (14.5m)	42				
Public/Other									
NWS WFO Key West Rooftop (KKEY) (24.55N, 81.79W)					60				
Energy Services James Street Service (KEYS) (24.56N, 81.8W)					49				
Energy Services Stock Island T and D (KEYS) (24.56N, 81.73W)					38				
Energy Services Big Coppitt Key Substation (KEYS) (24.6N, 81.65W)					40				
Lower Sugarloaf Key (FW5749) (24.64N, 81.54W)			24/1931	19	37				
Cudjoe Key (CW0925) (24.65N, 81.48W)			24/2203	22	34				
Ramrod Key (DW8495) (24.65N, 81.41W)			24/1440	24	37				
Keys Energy Services Big Pine Key Substation (24.67N, 81.35W)					37				
Islamorada - Upper Matecumbe Key (24.93N, 80.63W)			24/1553	30	35				
Key Largo Yacht Club Tempest (25.08N, 80.44W)			24/1153	31	36				
Ocean Reef Tempest (F1030) (25.33N, 80.26W)			24/1141	21	34				

[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).

[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.

[i] Incomplete record.

* Last observed water level before the station was destroyed. Actual water levels likely exceeded the reported value.

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%)	66	90
Medium (40%-60%)	48	78
High (>60%)	42	54

Table 5a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Hurricane Laura, 20–29 August 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	26.3	39.5	56.1	69.4	**79.3**	**91.1**	**120.3**	182.3
OCD5	46.5	89.8	151.5	238.6	314.1	378.2	549.2	735.0
Forecasts	35	33	31	29	27	25	21	17
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 Laura, 20–29 August 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	24.6	36.2	52.7	62.2	69.1	77.0	94.6	131.8
OCD5	43.2	86.5	149.3	235.1	301.2	354.6	479.4	578.7
GFSI	25.2	37.4	**50.4**	**57.2**	**63.9**	**70.7**	**80.1**	**93.7**
EMXI	26.7	45.1	65.1	81.9	98.4	111.0	134.7	243.8
CMCI	33.0	52.9	80.0	106.7	141.5	176.6	272.5	478.0
HMNI	27.4	41.4	58.6	74.1	80.9	91.7	121.5	162.8
HWFI	29.5	44.3	62.7	81.8	95.5	112.4	139.7	147.2
AEMI	27.2	42.7	65.6	91.4	115.3	135.9	142.4	165.1
HCCA	**23.2**	**33.7**	**48.0**	62.4	76.8	89.9	98.6	142.9
TVCA	**24.3**	**34.9**	**49.1**	**61.1**	71.6	80.4	**86.4**	**113.8**
TVCX	**23.6**	**35.3**	**49.0**	**61.8**	72.9	81.3	**90.8**	136.4
TVDG	**23.9**	**34.4**	**46.8**	**57.9**	**67.2**	**75.8**	**82.1**	**112.8**
GFEX	25.1	37.5	**51.1**	63.5	73.8	82.0	**91.3**	136.6
TABD	31.7	56.0	80.9	104.1	132.2	163.3	250.7	297.1
TABM	32.6	49.9	64.0	68.9	72.9	**76.0**	95.3	136.5
TABS	47.5	99.7	157.5	207.1	247.0	275.0	286.6	291.2
Forecasts	32	31	29	26	23	21	16	11

Table 6a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Hurricane Laura, 20–29 August 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	**4.1**	**7.3**	**8.2**	**8.6**	**10.6**	**10.4**	**13.6**	21.2
OCD5	7.7	12.6	15.0	18.1	21.5	26.6	37.0	29.8
Forecasts	35	33	31	29	27	25	21	17
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 Laura, 20–29 August 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	3.9	7.4	8.3	10.2	11.3	11.0	15.0	28.6
OCD5	7.9	13.2	16.2	21.0	23.8	29.5	44.6	42.3
HWFI	7.6	8.8	10.0	12.1	18.1	26.7	25.2	**22.1**
HMNI	7.2	12.5	15.5	14.5	14.5	13.0	16.6	**15.7**
DSHP	7.9	11.7	14.2	17.2	19.1	21.8	30.2	34.3
LGEM	7.4	11.5	15.2	18.6	21.0	23.0	26.8	30.4
HCCA	5.9	9.0	10.4	10.2	12.4	15.2	15.6	**21.4**
IVCN	6.4	8.9	10.3	10.3	12.2	14.4	20.3	**24.4**
GFSI	9.1	12.7	14.7	15.6	16.8	18.7	25.8	32.5
EMXI	8.3	13.7	15.4	18.4	24.3	29.1	36.1	45.0
Forecasts	32	31	27	24	23	21	16	11

Table 7. Storm surge watch and warning summary for Hurricane Laura.

Date/Time (UTC)	Action	Location
24 / 2100	Storm Surge Watch issued	San Luis Pass TX to Ocean Springs MS
24 / 2100	Storm Surge Watch issued	Lake Pontchartrain, Lake Maurepas, and Lake Borgne
25 / 1500	Storm Surge Warning issued	San Luis Pass TX to the mouth of the Mississippi River LA
25 / 1500	Storm Surge Watch issued	Freeport TX to San Luis Pass TX
26 / 0900	Storm Surge Warning modified	Freeport TX to the mouth of the Mississippi River LA
26 / 2100	Storm Surge Watch discontinued	All
27 / 0900	Storm Surge Warning discontinued	Freeport TX to High Island TX
27 / 1500	Storm Surge Warning discontinued	High Island TX to Sabine Pass
27 / 1500	Storm Surge Warning discontinued	Port Fourchon LA to the mouth of the Mississippi River LA
27 / 2100	Storm Surge Warning discontinued	All

Table 8. Wind watch and warning summary for Hurricane Laura, 20-29 August 2020.

Date/Time (UTC)	Action	Location
20 / 0300	Tropical Storm Watch issued	Saba and St. Eustatius
20 / 1200	Tropical Storm Watch issued	St. Maarten
20 / 1200	Tropical Storm Watch issued	Antigua, Barbuda, St. Kitts, Nevis, and Anguilla
20 / 2100	Tropical Storm Watch issued	Puerto Rico to U.S. Virgin Islands
20 / 2100	Tropical Storm Watch issued	British Virgin Islands
20 / 2100	Tropical Storm Watch issued	St. Martin and St. Barthelemy
21 / 0900	Tropical Storm Watch issued	Southeastern Bahamas to Turks and Caicos
21 / 1500	Tropical Storm Watch changed to Tropical Storm Warning	Puerto Rico to U.S. Virgin Islands
21 / 1500	Tropical Storm Watch changed to Tropical Storm Warning	Saba and St. Eustatius
21 / 1500	Tropical Storm Watch changed to Tropical Storm Warning	St. Maarten
21 / 1500	Tropical Storm Watch changed to Tropical Storm Warning	Antigua, Barbuda, St. Kitts, Nevis, and Anguilla
21 / 1500	Tropical Storm Watch changed to Tropical Storm Warning	St. Martin and St. Barthelemy
21 / 1500	Tropical Storm Watch discontinued	British Virgin Islands
21 / 1500	Tropical Storm Watch issued	Cabo Cabron to Le Mole St Nicholas
21 / 1500	Tropical Storm Warning issued	British Virgin Islands and Montserrat
21 / 1800	Tropical Storm Watch modified to	Haiti/DR Border to Le Mole St Nicholas

Date/Time (UTC)	Action	Location
21 / 1800	Tropical Storm Warning issued	Cabo Engano to Haiti/DR Border
21 / 2100	Tropical Storm Watch discontinued	Haiti/DR Border to Le Mole St Nicholas
21 / 2100	Tropical Storm Warning modified to	Cabo Engano to Le Mole St Nicholas
22 / 0300	Tropical Storm Watch changed to Tropical Storm Warning	Southeastern Bahamas to Turks and Caicos
22 / 0300	Tropical Storm Watch issued	Central Bahamas
22 / 0300	Tropical Storm Warning discontinued	Antigua, Barbuda, St. Kitts, Nevis, and Anguilla
22 / 0300	Tropical Storm Warning discontinued	British Virgin Islands and Montserrat
22 / 0300	Tropical Storm Warning issued	British Virgin Island
22 / 0600	Tropical Storm Warning modified to	Punto Palenque to Le Mole St Nicholas
22 / 1200	Tropical Storm Warning discontinued	Saba and St. Eustatius
22 / 1500	Tropical Storm Watch issued	Granma to Las Tunas
22 / 1500	Tropical Storm Warning discontinued	British Virgin Islands
22 / 1500	Tropical Storm Warning discontinued	St. Maarten
22 / 1500	Tropical Storm Warning discontinued	St. Martin and St. Barthelemy
22 / 2100	Tropical Storm Watch discontinued	Granma to Las Tunas
22 / 2100	Tropical Storm Watch issued	Andros

Date/Time (UTC)	Action	Location
22 / 2100	Tropical Storm Watch issued	Dry Tortugas to Ocean Reef
22 / 2100	Tropical Storm Warning issued	Granma to Camaguey
23 / 0000	Tropical Storm Watch issued	Ciego De Avila to Pinar del Rio
23 / 0600	Tropical Storm Warning discontinued	Puerto Rico
23 / 0900	Tropical Storm Warning discontinued	Granma to Camaguey
23 / 0900	Tropical Storm Warning issued	Guantanamo to La Habana
23 / 1500	Tropical Storm Watch changed to Tropical Storm Warning	Guantanamo to Pinar del Rio
23 / 1500	Tropical Storm Warning modified to	Punto Palenque to N. Border Haiti/DR
23 / 1500	Tropical Storm Warning modified to	Guantanamo to Pinar del Rio
23 / 1500	Tropical Storm Warning issued	Haiti
23 / 1500	Tropical Storm Warning issued	Isle of Youth
23 / 1800	Tropical Storm Warning modified to	Samana to N. Border Haiti/DR
23 / 2100	Tropical Storm Watch discontinued	Andros
23 / 2100	Tropical Storm Watch discontinued	Central Bahamas
23 / 2100	Tropical Storm Watch modified to	Dry Tortugas to Craig Key
23 / 2100	Tropical Storm Warning discontinued	Samana to N. Border Haiti/DR

Date/Time (UTC)	Action	Location
23 / 2100	Tropical Storm Warning discontinued	Southeastern Bahamas to Turks and Caicos
23 / 2100	Tropical Storm Warning issued	Inagua to Ragged Islands
23 / 2100	Tropical Storm Warning issued	Little Cayman to Cayman Brac
24 / 0000	Tropical Storm Warning discontinued	Inagua to Ragged Islands
24 / 0300	Tropical Storm Watch changed to Tropical Storm Warning	Dry Tortugas
24 / 0300	Tropical Storm Watch issued	Key West to Craig Key
24 / 0300	Tropical Storm Warning discontinued	Haiti
24 / 0900	Tropical Storm Watch discontinued	All
24 / 1500	Tropical Storm Warning modified to	Las Tunas to Pinar del Rio
24 / 2100	Tropical Storm Watch issued	San Luis Pass to Port Bolivar
24 / 2100	Tropical Storm Watch issued	Morgan City to Mississippi River
24 / 2100	Tropical Storm Warning modified to	Ciego De Avila to Pinar del Rio
24 / 2100	Tropical Storm Warning discontinued	Little Cayman to Cayman Brac
24 / 2100	Hurricane Watch issued	Port Bolivar to Morgan City
25 / 0000	Tropical Storm Warning modified to	Villa Clara to Pinar del Rio
25 / 0300	Tropical Storm Warning modified to	Dry Tortugas to Seven Mile Bridge

Date/Time (UTC)	Action	Location
25 / 0900	Tropical Storm Watch modified to	Freeport to San Luis Pass
25 / 0900	Hurricane Watch modified to	San Luis Pass to Morgan City
25 / 1500	Tropical Storm Watch discontinued	All
25 / 1500	Tropical Storm Warning discontinued	Villa Clara to Pinar del Rio
25 / 1500	Tropical Storm Warning discontinued	Isle of Youth
25 / 1500	Tropical Storm Warning discontinued	Dry Tortugas
25 / 1500	Tropical Storm Warning issued	Sargent to San Luis Pass
25 / 1500	Tropical Storm Warning issued	Intracoastal City to Mississippi River
25 / 1500	Hurricane Watch modified to	Intracoastal City to Morgan City
25 / 1500	Hurricane Warning issued	San Luis Pass to Intracoastal City
27 / 0600	Tropical Storm Warning modified to	High Island to San Luis Pass
27 / 0600	Hurricane Warning modified to	High Island to Intracoastal City
27 / 0900	Tropical Storm Warning discontinued	High Island to San Luis Pass
27 / 0900	Hurricane Watch discontinued	All
27 / 1200	Tropical Storm Warning modified to	High Island to Mississippi River
27 / 1200	Hurricane Warning discontinued	All

Date/Time (UTC)	Action	Location
27 / 1800	Tropical Storm Warning discontinued	All

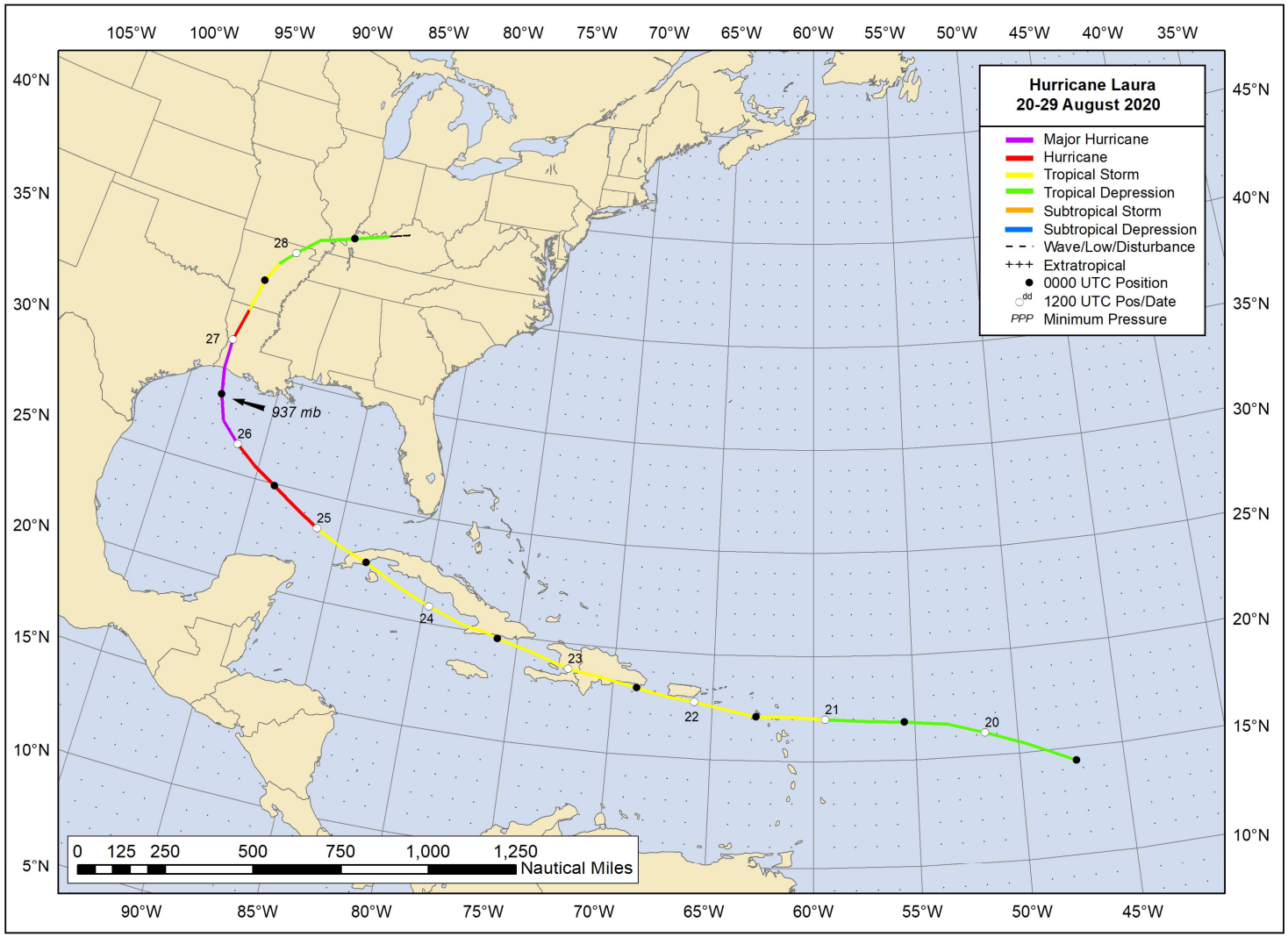

Figure 1. Best track positions for Hurricane Laura, 20–29 August 2020. Track over the United States is partially based on analyses from the NOAA Weather Prediction Center.

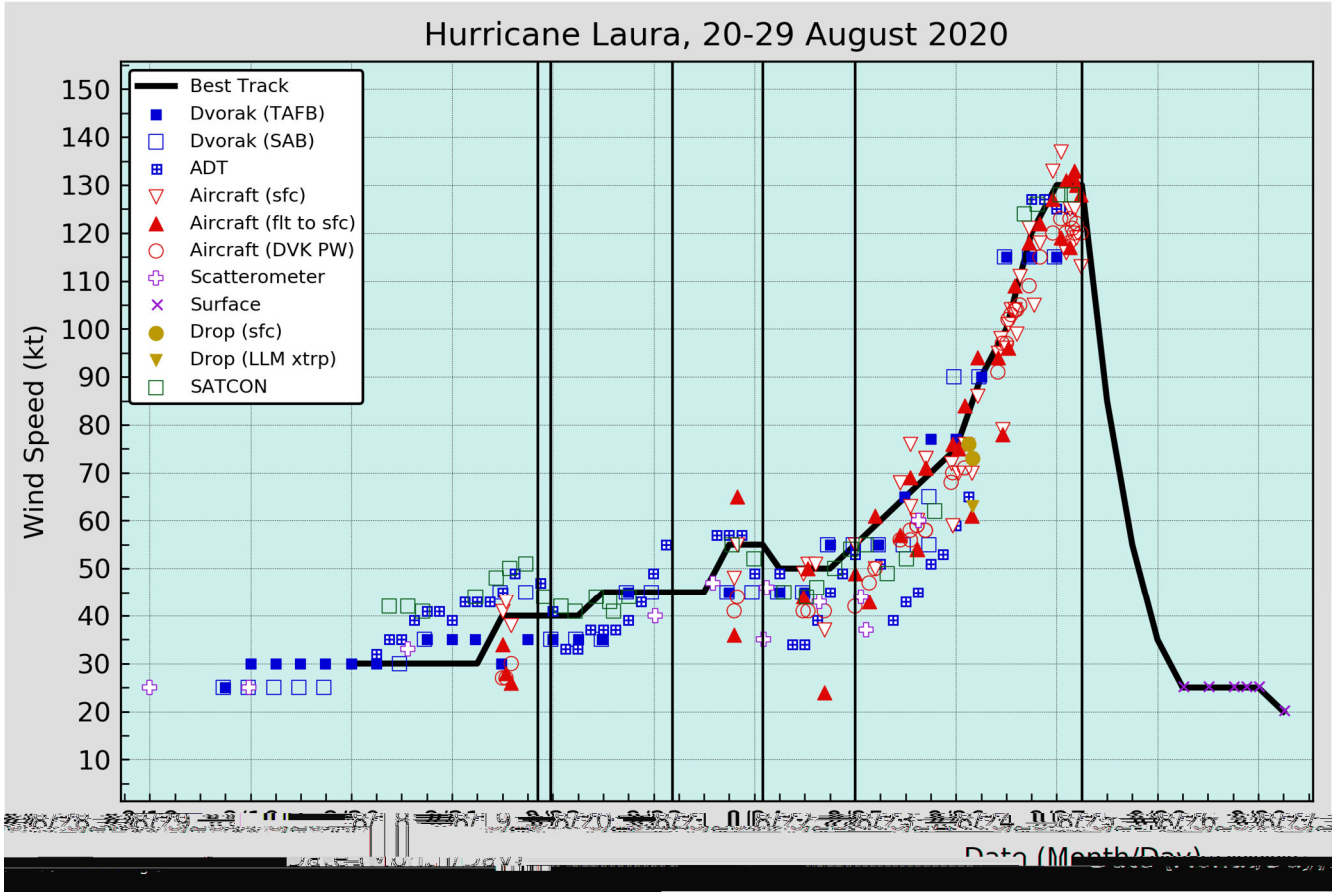

Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Hurricane Laura, 20–29 August 2020. Aircraft observations have been adjusted for elevation using 90%, 80%, and 80% adjustment factors for observations from 700 mb, 850 mb, and 1500 ft, respectively. Dropwindsonde 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.

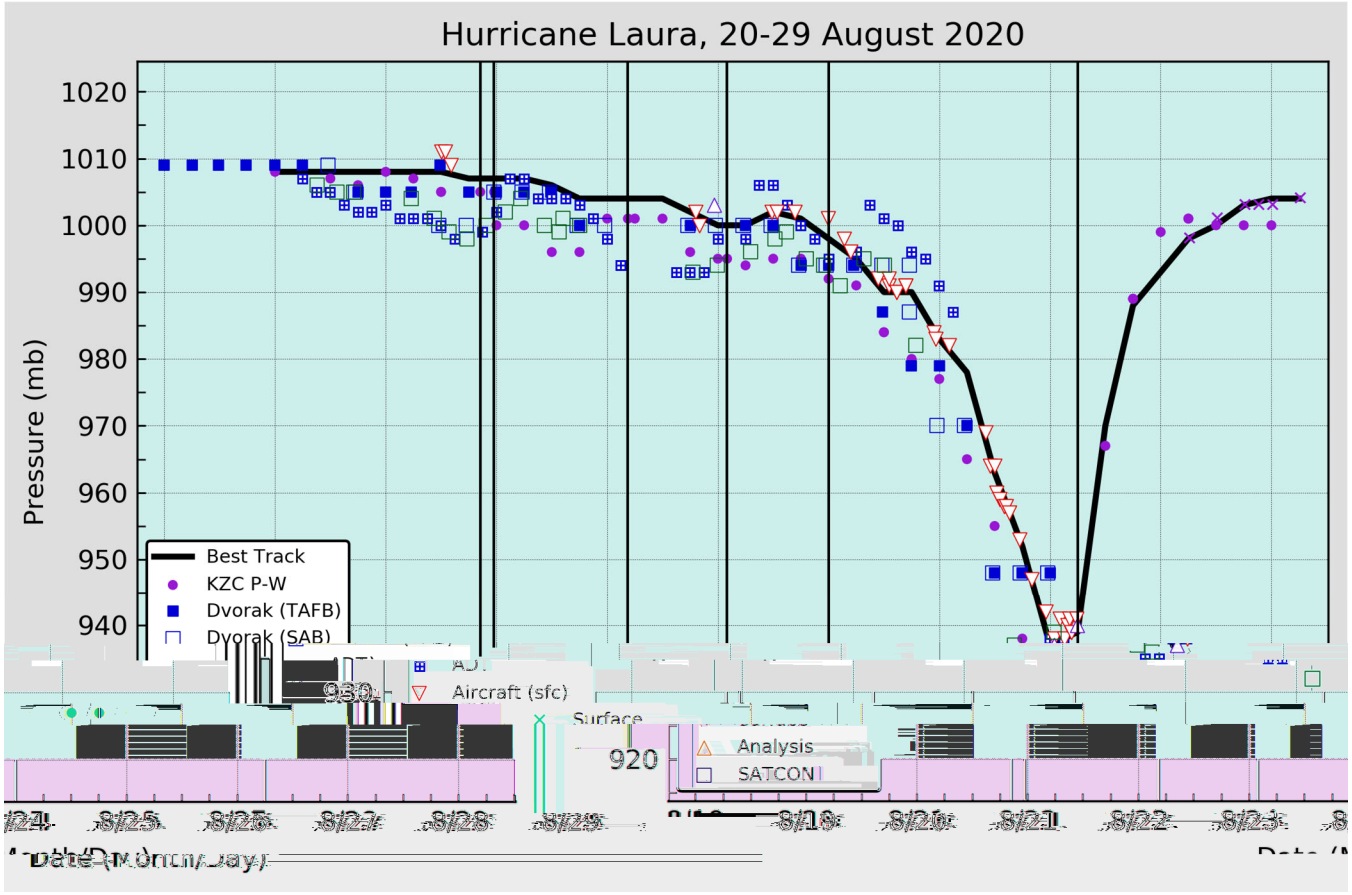

Figure 3. Selected pressure observations and best track minimum central pressure curve for Hurricane Laura, 20–29 August 2020. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for Meteorological 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. The Lake Charles NWS ASOS surface weather measuring instruments after Hurricane Laura. Image courtesy of David Fontenot, NWS Lake Charles WFO.

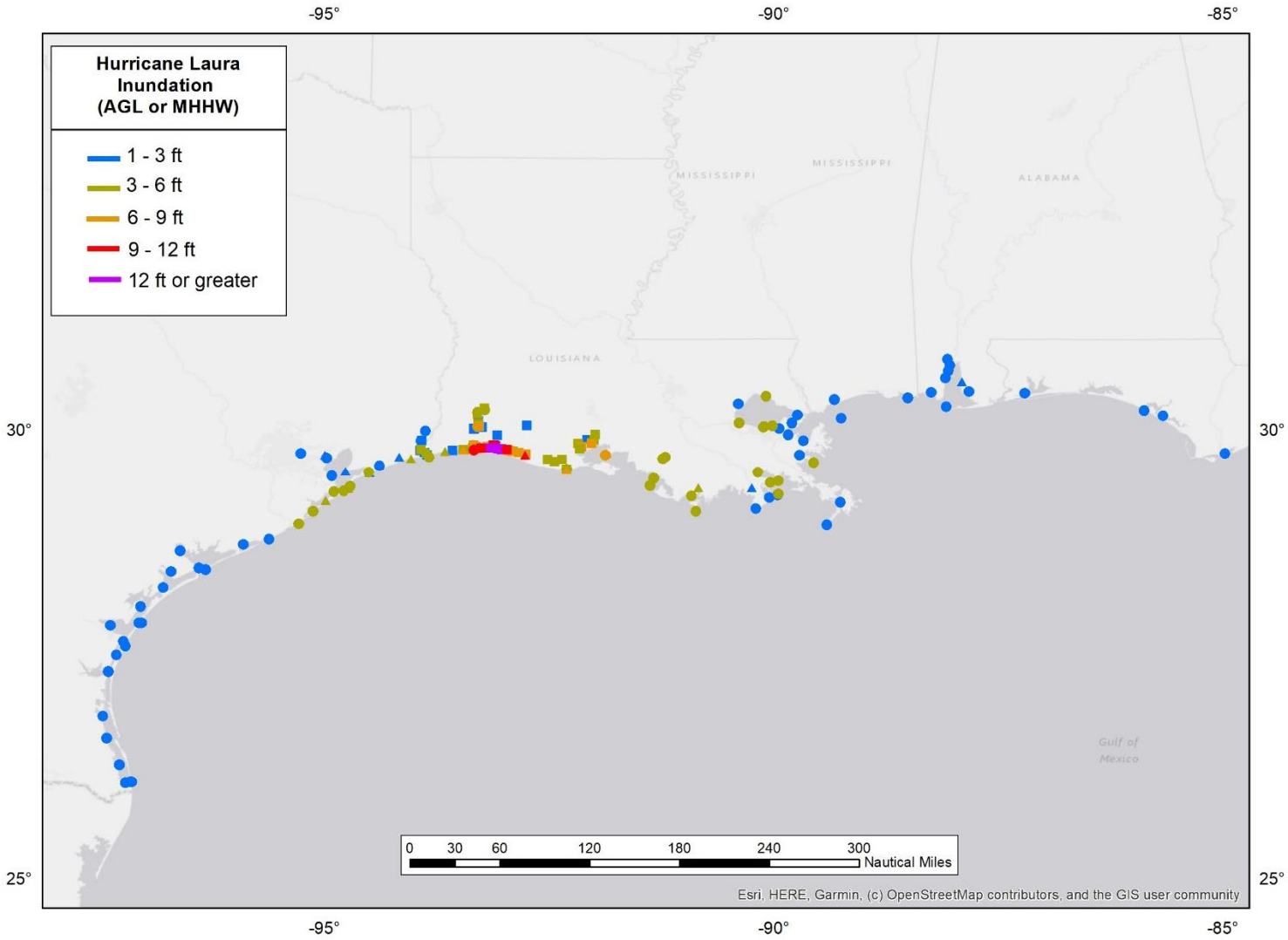

Figure 5. Maximum water levels measured from tide and stream gauges (circles), USGS water level sensors (triangles), and surveyed high water marks (squares) from Hurricane Laura. Depending on the data type, water levels are referenced as feet above ground level (AGL), or Mean Higher High Water (MHHW) / Mean Sea Level (MSL), which are used as a proxy for inundation (above ground level) on normally dry ground along the immediate coastline.

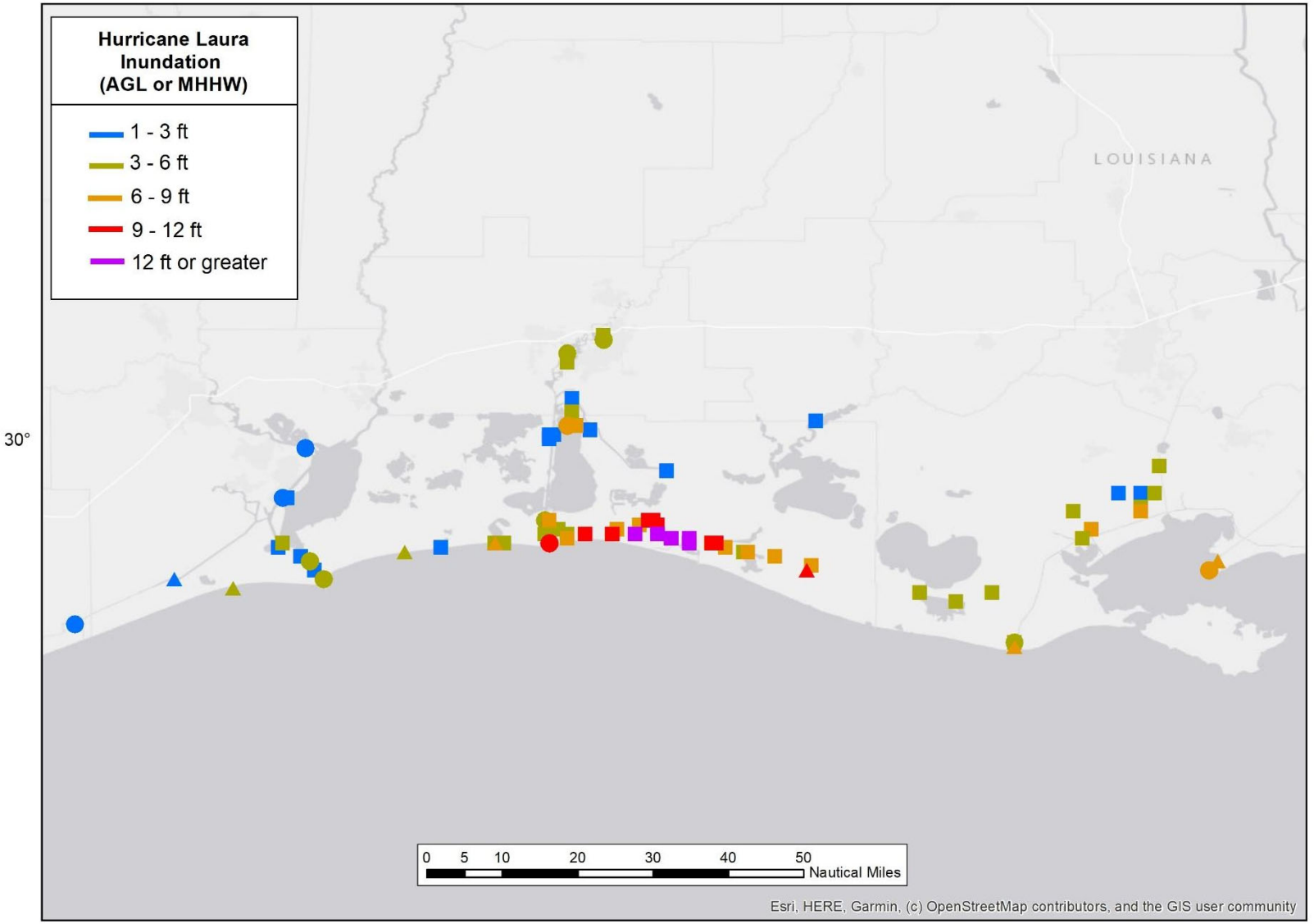

Figure 6. Same as Figure 5 but zoomed in where the highest storm surge inundation from Hurricane Laura occurred over southwestern Louisiana.

Figure 7. (a) Storm surge high water mark above a bathtub on the second story of a home in the Oak Grove neighborhood of Creole, Louisiana. (b) USGS survey team extrapolating the high water mark to the outside of the home to survey its elevation of 17.1 ft above ground level. Images courtesy of the NWS and USGS.

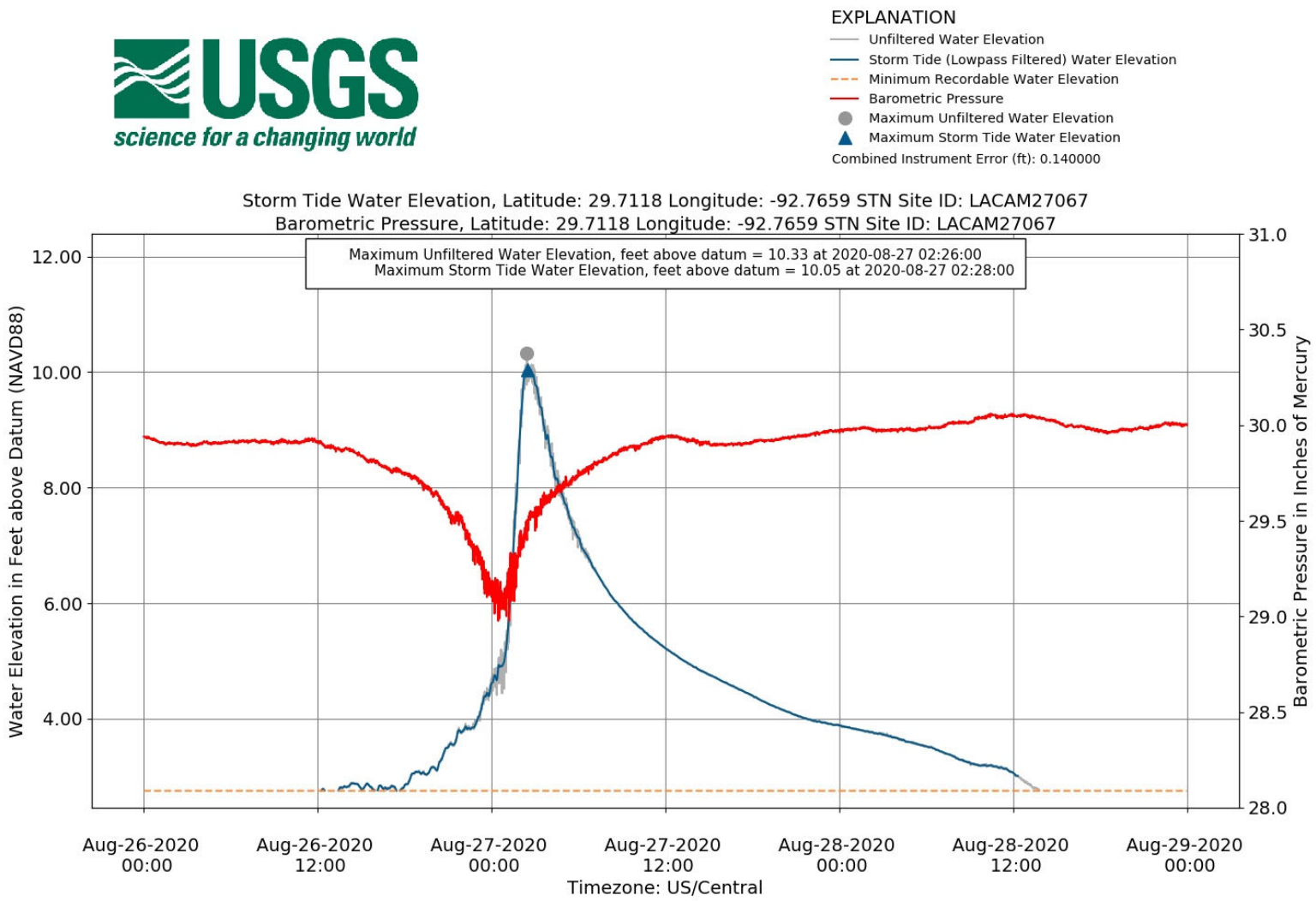

Figure 8. Unfiltered water level (gray, ft), wave-filtered water level (blue, ft), and barometric pressure (red, inches) measured during Hurricane Laura from a USGS sensor in the Rockefeller Wildlife Refuge in eastern Cameron Parish, 5 n mi inland from the coast. This sensor was located east of the area of highest storm surge inundation yet still measured a converted peak wave-filtered water level of 10.05 ft NAVD88 (9.1 ft MHHW). Image courtesy of the USGS.

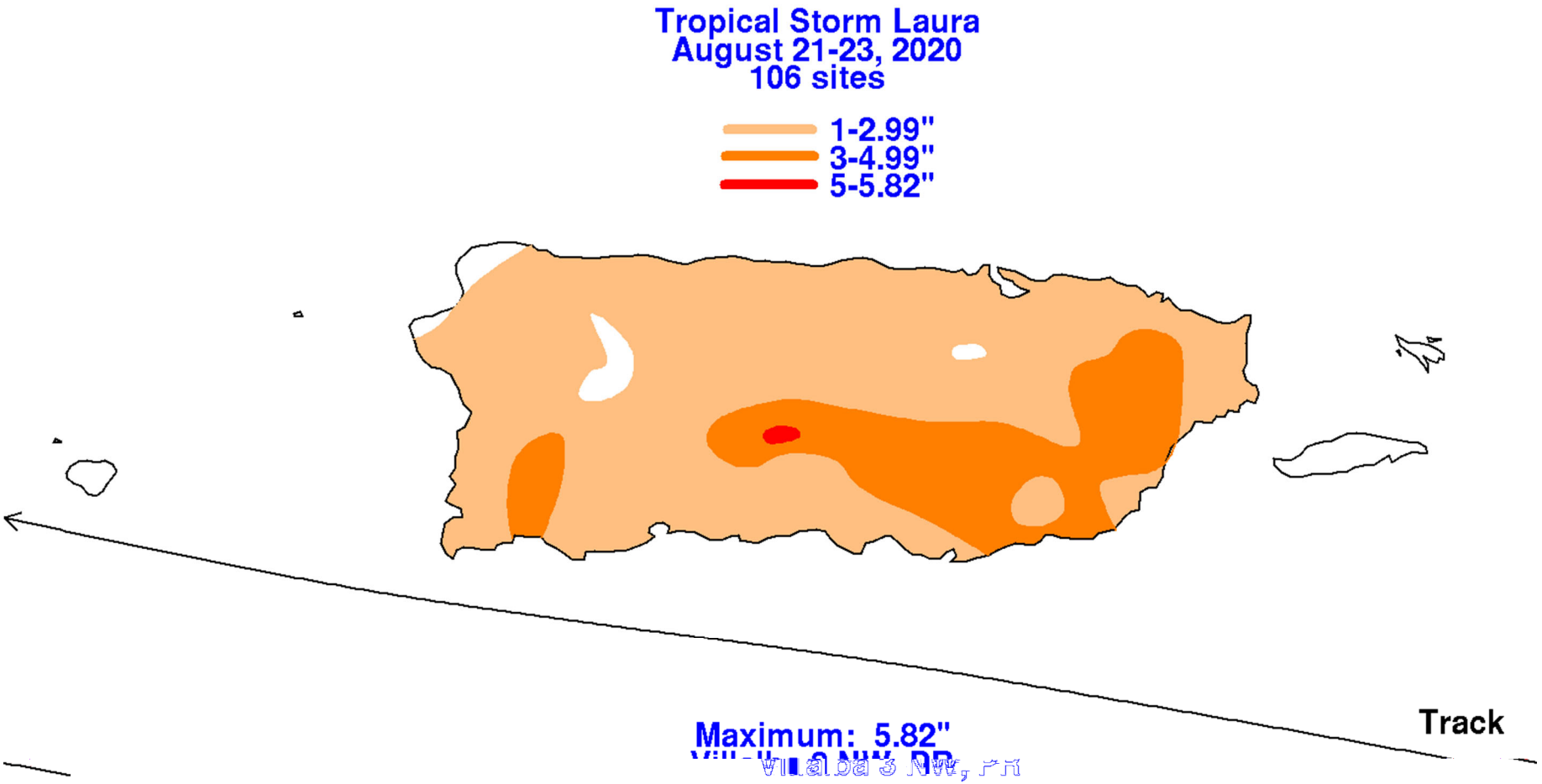

Figure 9. Rainfall totals (inches) in Puerto Rico due to Laura. Image courtesy of David Roth, NOAA Weather Prediction Center.

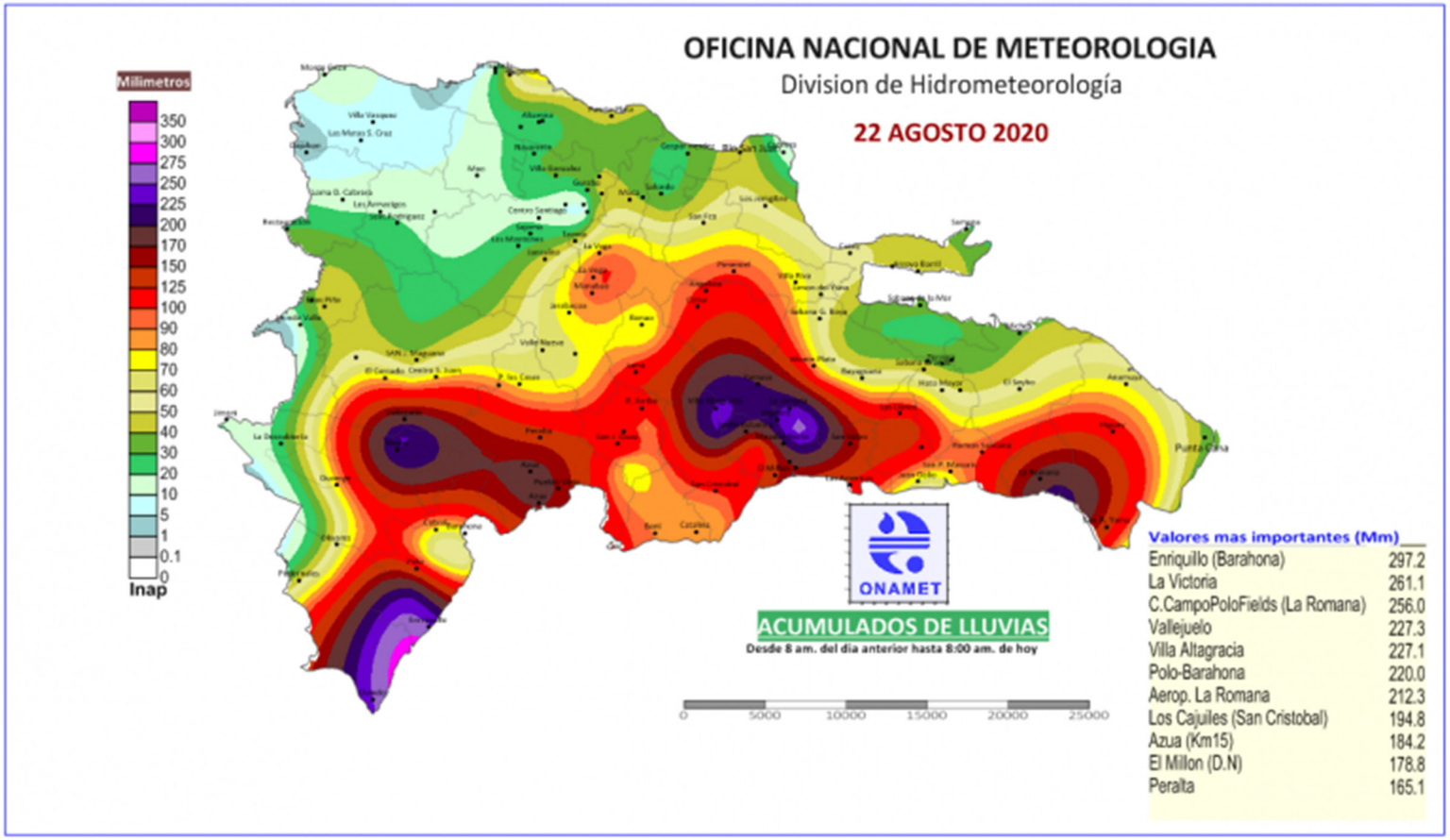

Figure 10. Rainfall (mm) in the Dominican Republic due to Laura. Image courtesy of ONAMET.

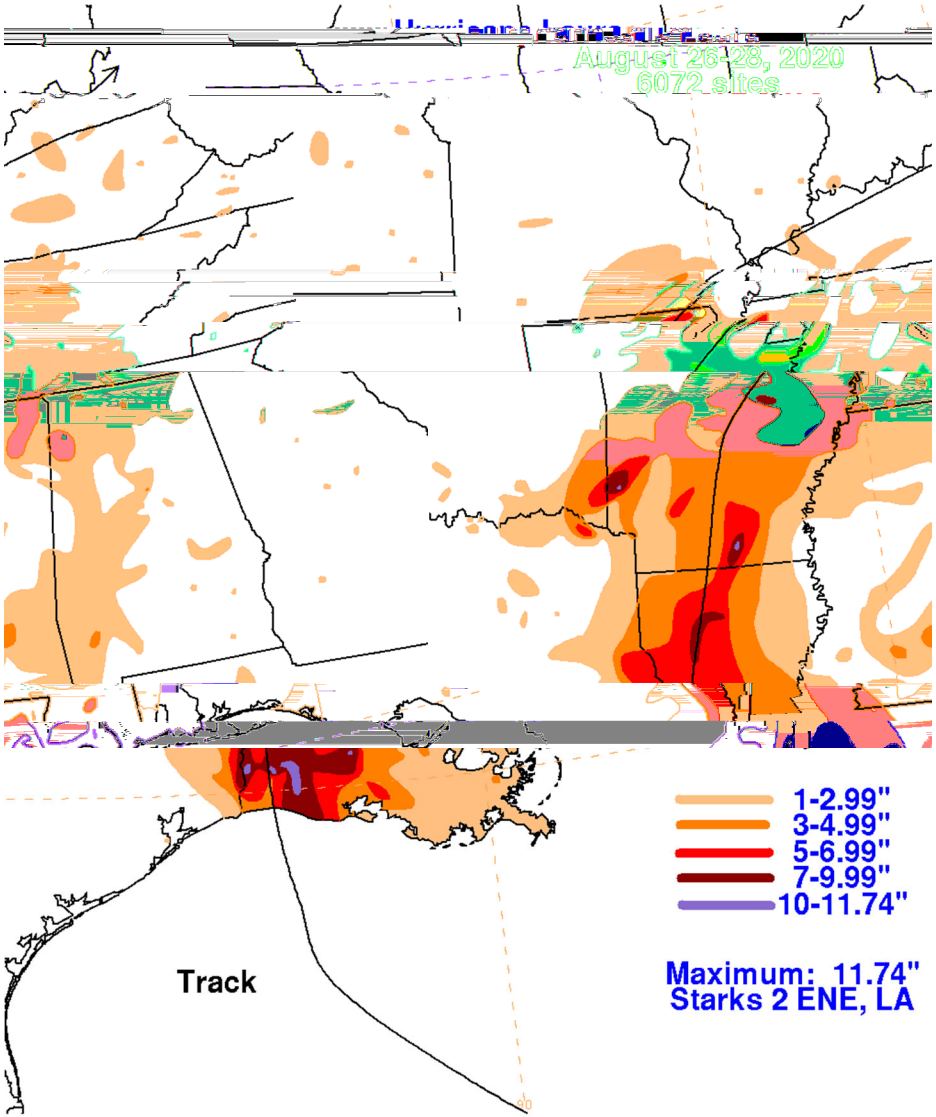

Figure 11. Rainfall totals (inches) over the southern United States due to Laura. Figure courtesy of David Roth, NOAA Weather Prediction Center.

Figure 12. Near Cameron, Louisiana before (top) and after (bottom) Hurricane Laura. Images courtesy of NOAA National Ocean Service.

Figure 13. Severe Hurricane Laura damage near Lake Charles, Louisiana. STRINGER/AFP via Getty Images.

Figure 14. Windows blown out of the Capital One Tower in downtown Lake Charles after Hurricane Laura. Joe Raedle/Getty Images.

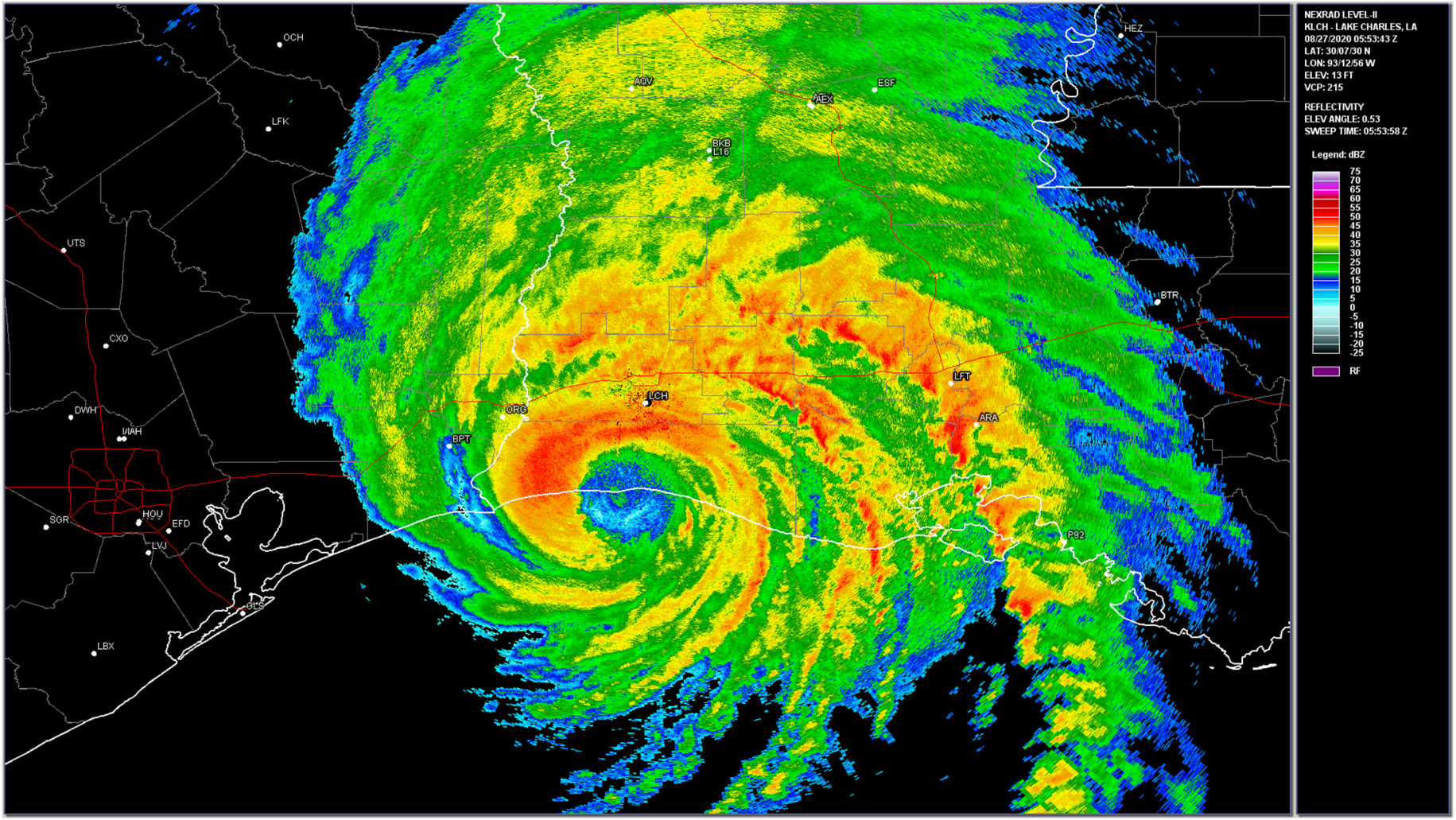

Figure 15. Last KLCH WSR-88D radar reflectivity image of Hurricane Laura at 0554 UTC 27 August 2020 before the radar was destroyed. Image courtesy of NWS Lake Charles WFO.

Figure 16. Lake Charles WSR 88-D radar after Hurricane Laura. Courtesy NWS Lake Charles WFO.

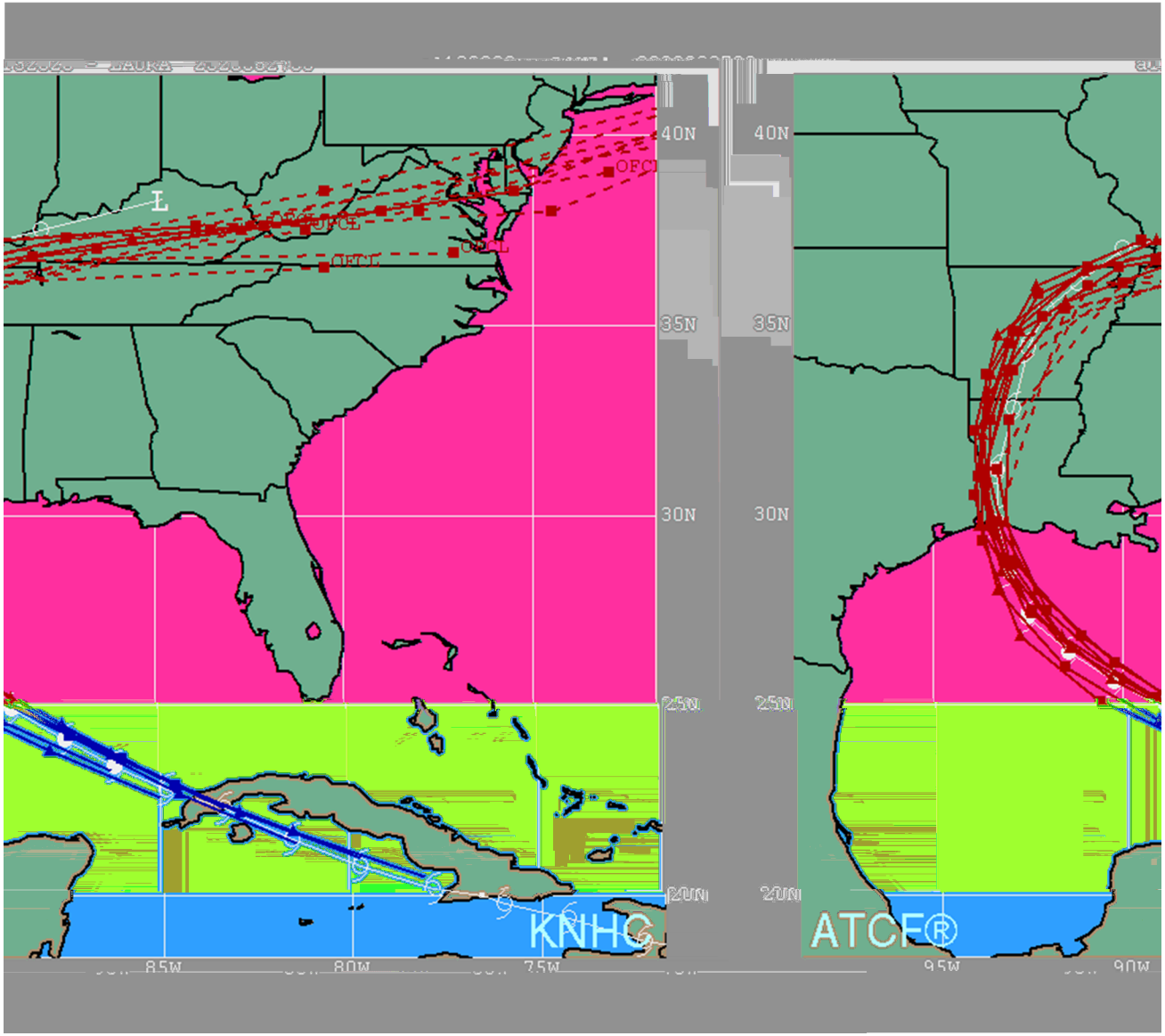

Figure 17. Official track forecasts (blue lines) for Hurricane Laura, 24 August 0600 UTC to 27 August 0000 UTC 2020. The best track is shown by the white curve with the tropical cyclone symbols.

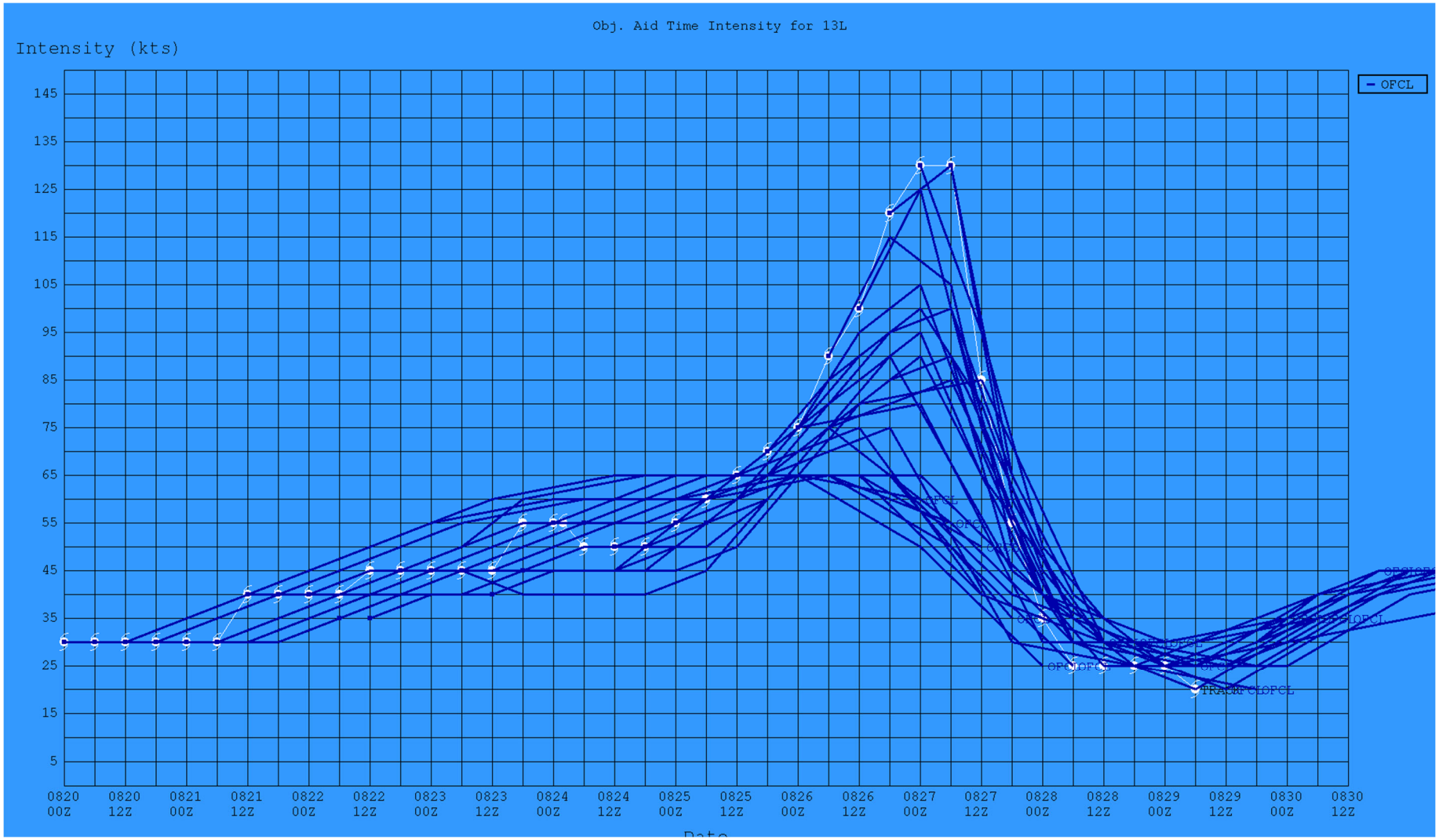

Figure 18. Official intensity forecasts (blue lines, kt) for Hurricane Laura, 20–29 August 2020. The best track intensity (kt) is shown by the white curve.

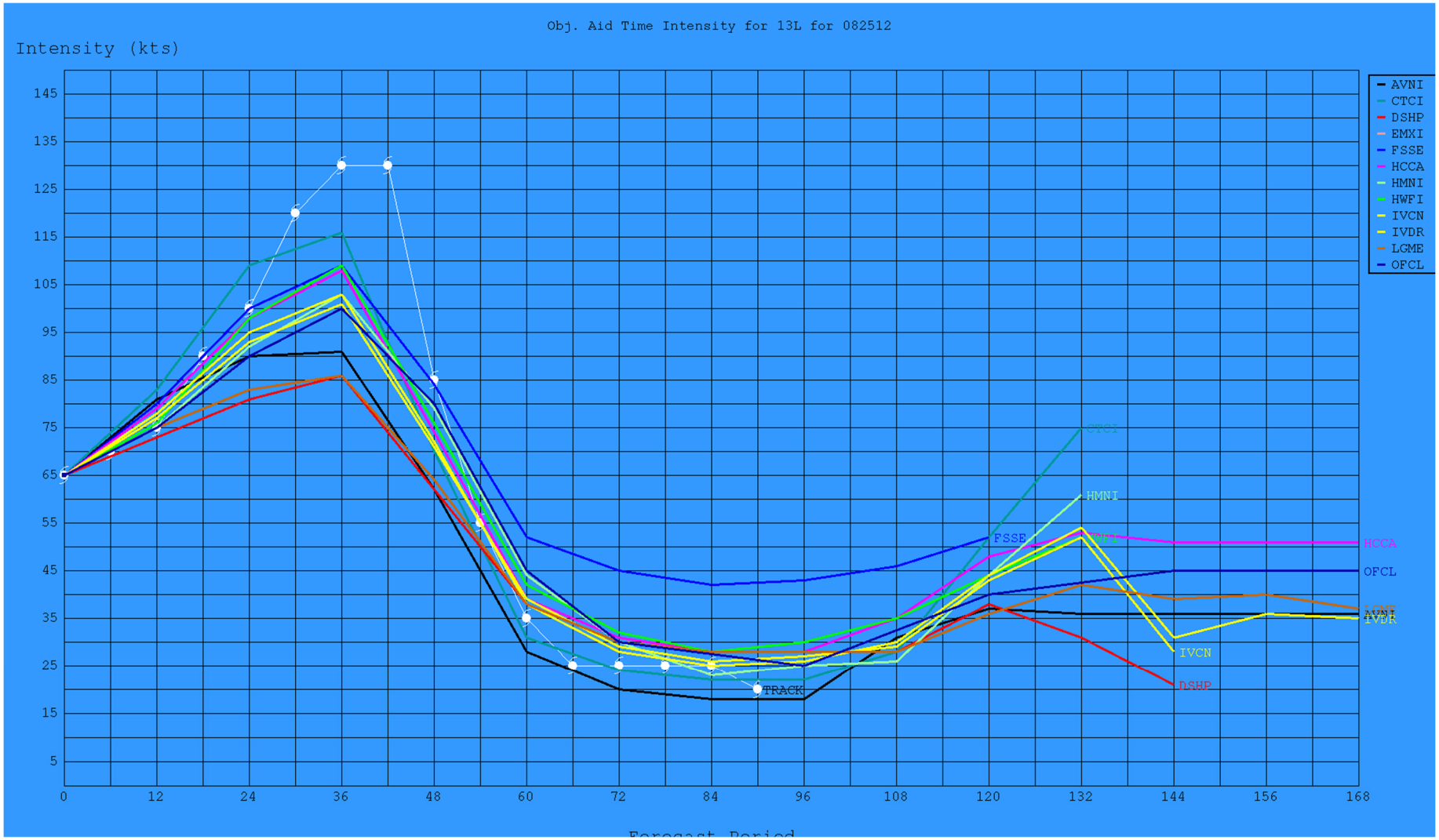

Figure 19. Official (darkest blue) and model intensity forecasts (kt) for Hurricane Laura from 1200 UTC August 25 2020. The best track intensity (kt) is shown by the white curve.

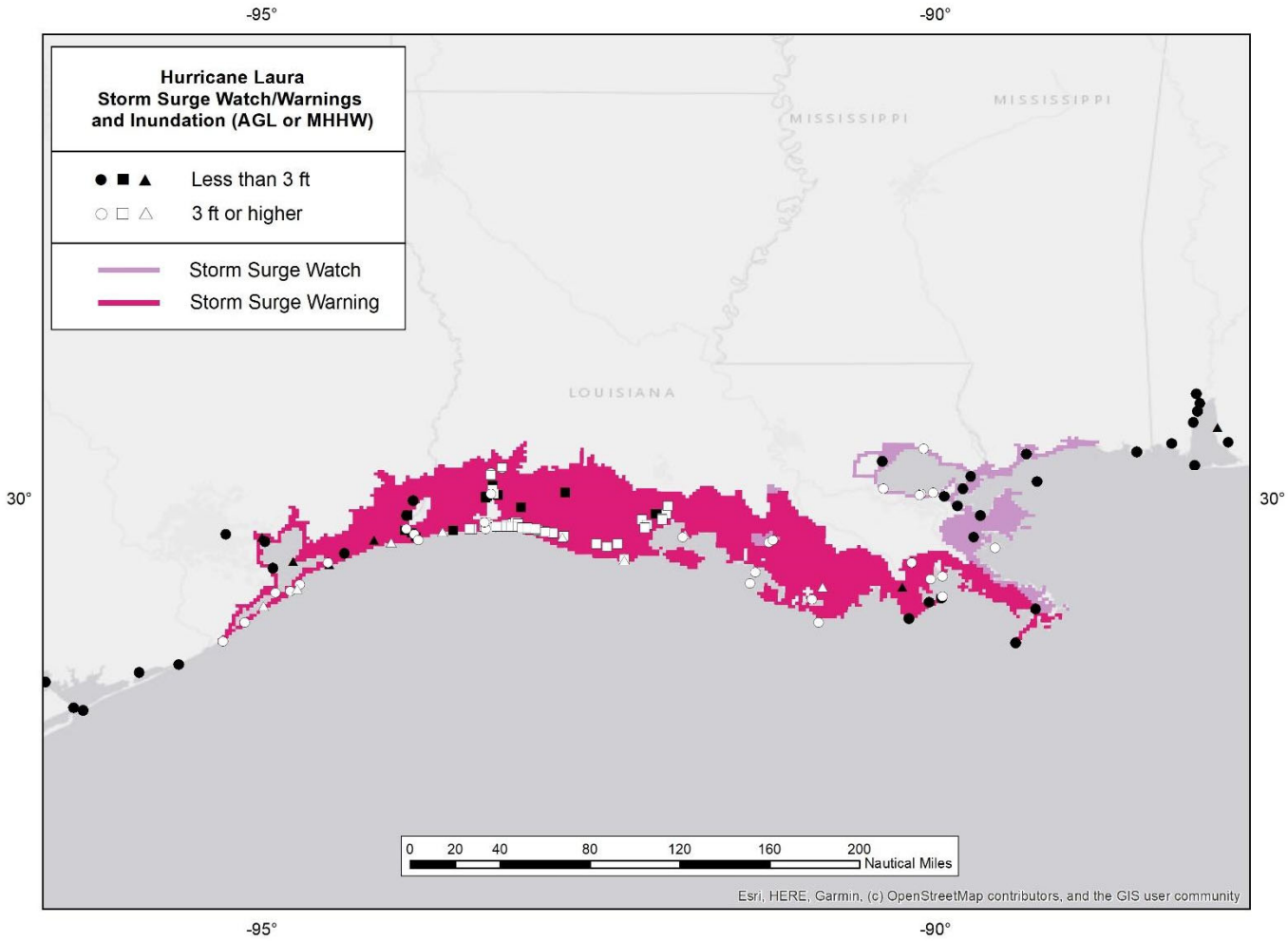

Figure 20. Maximum water levels measured during Hurricane Laura from tide gauges (circles), USGS water level sensors (triangles) and surveyed high water marks (squares), as well as areas covered by storm surge watches (lavender) and warnings (magenta). Water levels are referenced as feet above ground level (AGL) or Mean Higher High Water (MHHW), which is used as a proxy for inundation (above ground level) on normally dry ground along the immediate coastline. Black markers denote water levels less than 3 ft above ground level, and white markers denote water levels 3 ft or higher above ground level.

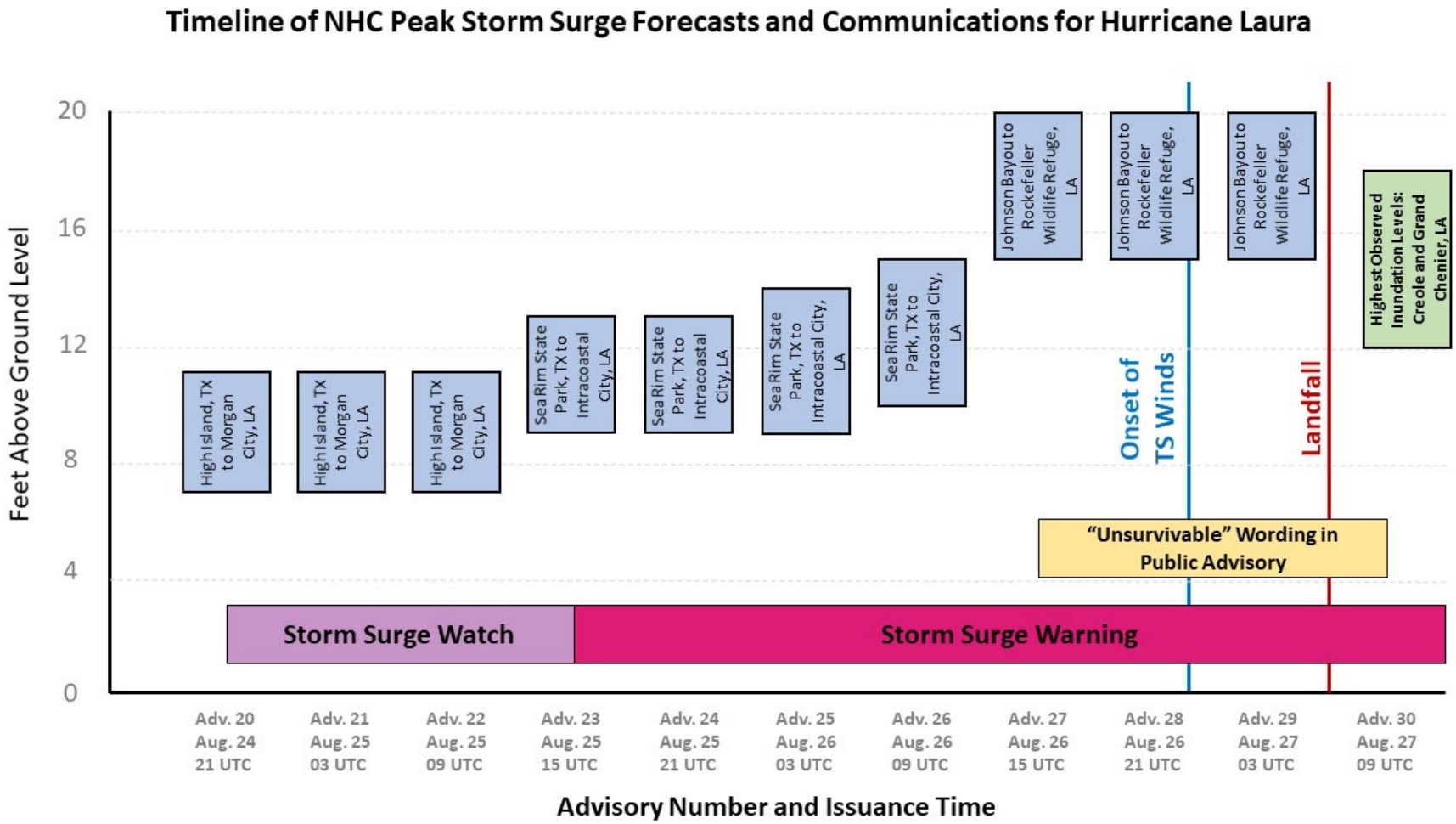

Figure 21. Timeline of NHC peak storm surge forecasts and communications for Hurricane Laura compared with verifying onset time of tropical-storm-force winds, landfall, and range of highest observed inundation levels.

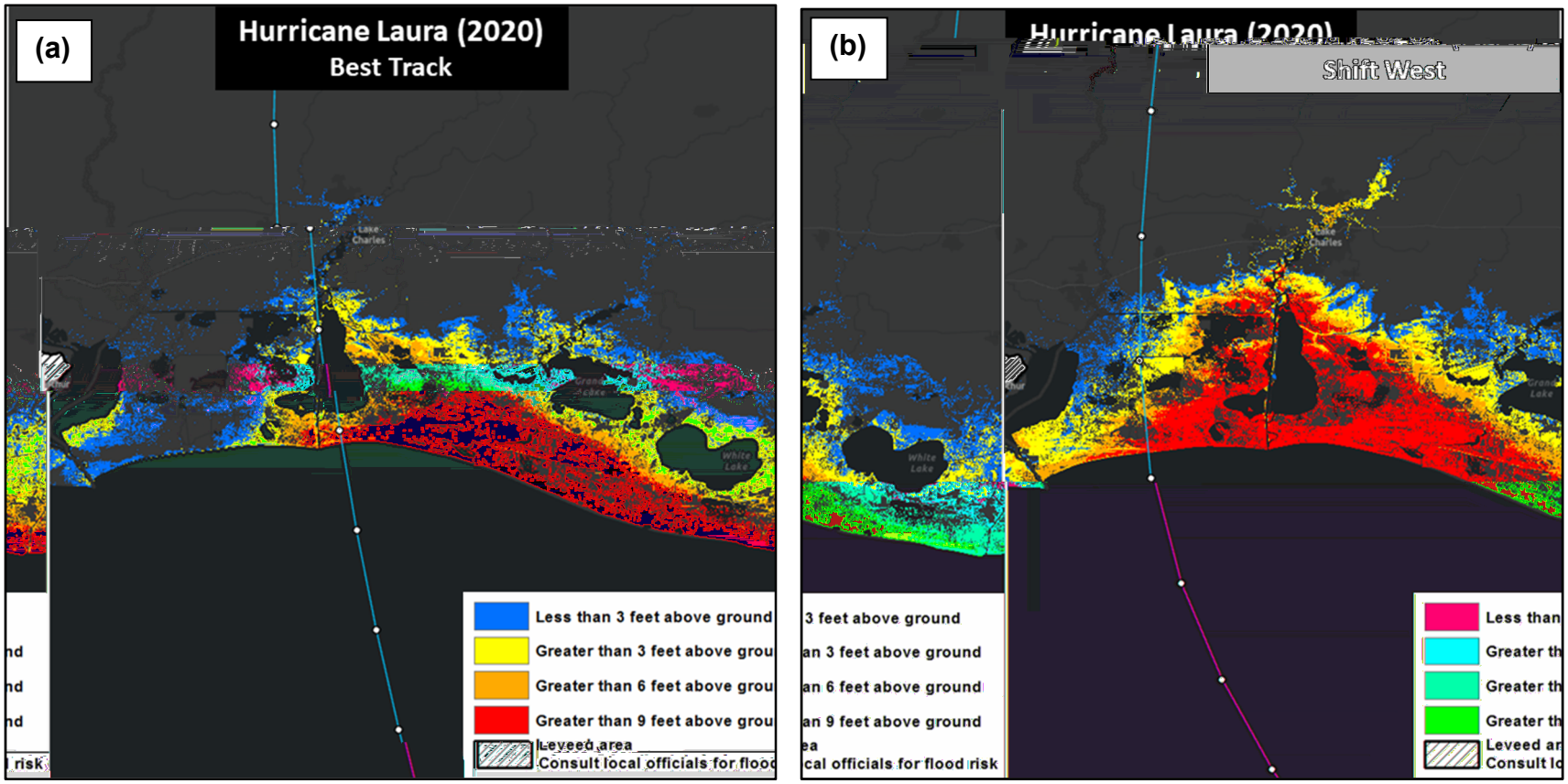

Figure 22. (a) Storm surge inundation hindcast simulation based on Laura's best track. (b) Storm surge inundation simulation based on Laura's track shifted 20 miles to the west. Colors denote inundation in feet above ground level (AGL). Images courtesy of the NHC Storm Surge Unit.

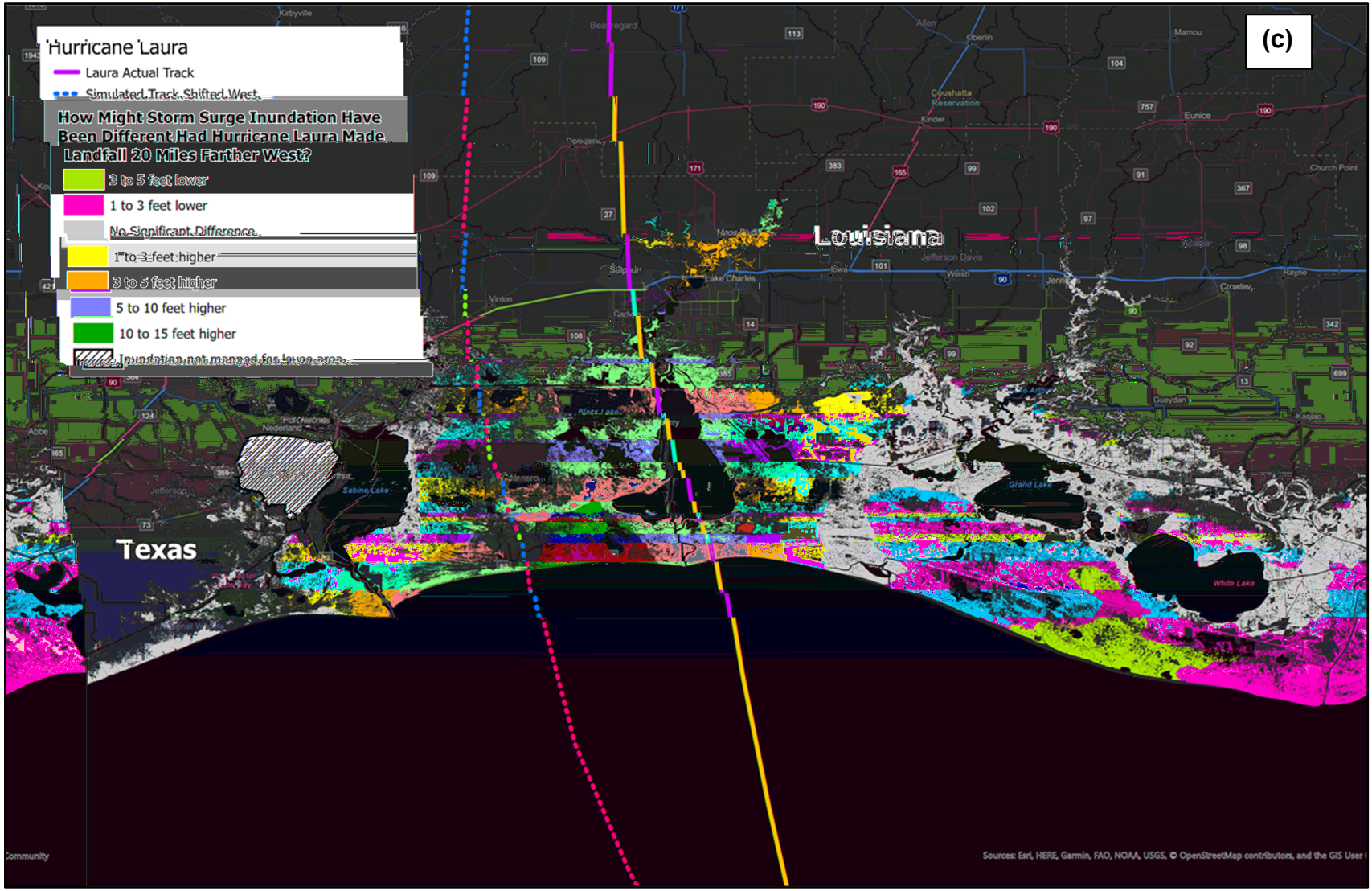

Figure 22. (c) Storm surge inundation height difference (ft) if Laura's track had shifted 20 miles to the west (dashed blue line) from its actual track (magenta line) ((a) subtracted from (b)). Image courtesy of the NHC Storm Surge Unit.