NATIONAL HURRICANE CENTER TROPICAL CYCLONE REPORT

TROPICAL STORM BETA

(AL222020)

17–22 September 2020

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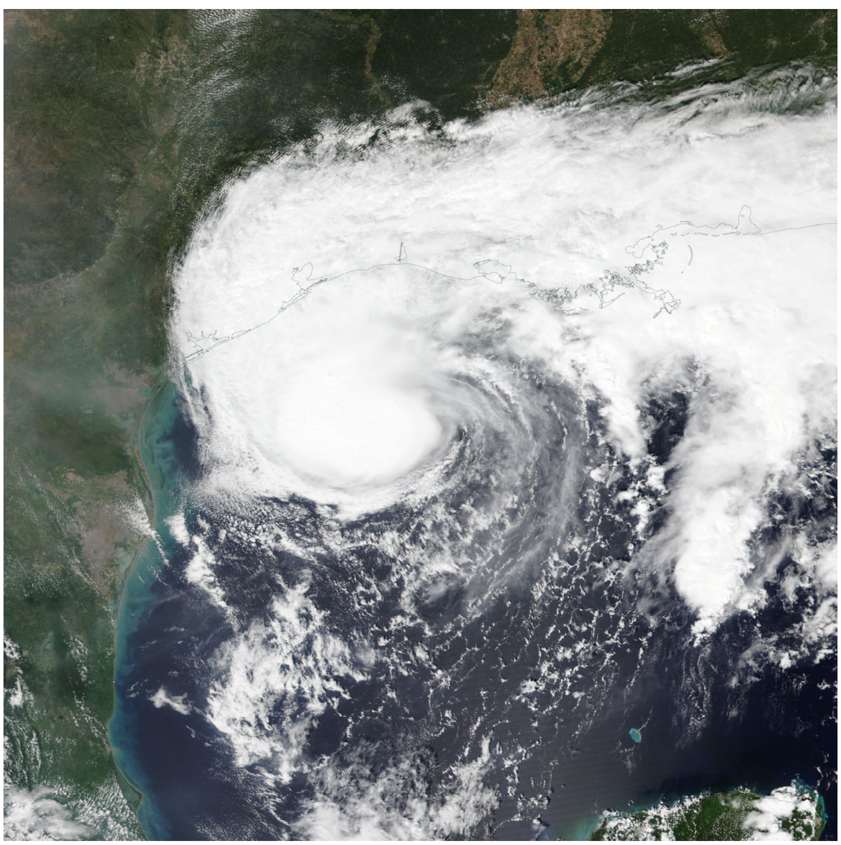

NOAA20 VIIRS VISIBLE IMAGE OF BETA AT 1906 UTC 20 SEP 2020. IMAGE COURTESY OF NASA WORLDVIEW.

Beta was a slow-moving tropical storm over the western Gulf of Mexico and the western Gulf coast states. It brought heavy rains and minor damage to portions of southeastern Texas.

Tropical Storm Beta

17–22 SEPTEMBER 2020

SYNOPTIC HISTORY

Beta had a long and complex genesis process. An area of cloudiness and showers was first noted on 5–6 September extending from the western Caribbean Sea across the Bahamas to the Atlantic off of the southeastern U. S. coast. This activity was associated with multiple weather systems including a tropical wave passing through the Caribbean, an upper-level low near the Bahamas, and an old frontal trough farther north. The area of disturbed weather drifted westward, and by 10 September it had consolidated over the northeastern Gulf of Mexico where a surface trough formed, which drifted westward to a position south of the Louisiana coast on 12 September. By this time, Tropical Storm (and soon to be Hurricane) Sally was developing over the eastern Gulf of Mexico, and the combination of Sally and an upper-level low over the western Gulf of Mexico prevented any development of the pre-Beta disturbance for the next several days. The flow around Sally also caused the disturbance to turn southwestward and southward, and by 15 September an elongated low-pressure area with multiple vorticity centers was present over the western Gulf of Mexico. After Sally made landfall on the northern Gulf coast, and the upper-level low weakened, the disturbance consolidated on 16–17 September with the circulation gradually becoming better defined and the convective organization increasing. It is estimated that a tropical depression formed around 1200 UTC 17 September about 305 n mi south-southeast of Brownsville, Texas. 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].

The cyclone was moving northeastward at the time of genesis, steered between a mid-level trough over Texas and northern Mexico and a mid-level ridge centered near the Bahamas, and a general slow north-northeastward motion would continue into 18 September. Little change in strength occurred on 17 September, but on 18 September a period of intensification began that led to the system becoming a tropical storm between 1200–1800 UTC that day and later reaching an intensity of 50 kt. The trough to the west weakened and lifted northeastward on 18 September, and at the same time a low-level ridge developed to the north of a surface stationary front along the northern Gulf coast. These developments, along with the continued presence of the ridge to the east, caused Beta to become embedded in weak steering currents over the central Gulf of Mexico, and the storm's motion on 19 September was a northward to northeastward drift. While this slow motion occurred, dry air associated with both the surface front and the upper-level trough entrained into the cyclone and stopped intensification.

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[1] A digital record of the complete best track, including wind radii, can be found on line at ftp://ftp.nhc.noaa.gov/atcf. Data for the current year's storms are located in the *btk* directory, while previous years' data are located in the *archive* directory.

The ridge to the north of the tropical cyclone became a little stronger on 20–21 September, and Beta started a slow west-northwestward motion through the western Gulf of Mexico. The storm reached a peak intensity of 55 kt on 20 September, which was followed by weakening to a 40-kt intensity due to decreased convection caused by the dry air entrainment. However, late on 21 September, a convective burst caused the center to re-form with a smaller radius of maximum winds just off of the middle Texas coast. This evolution was accompanied by some re-intensification, and Beta made landfall over Matagorda Bay, Texas near 0245 UTC 22 September with maximum sustained winds near 45 kt. After landfall, the cyclone would weaken to a depression later that day as it meandered over the Texas coastal plain.

Late on 22 September another mid-level trough approaching from the west caused Beta to turn east-northeastward, and as this occurred, the cyclone merged with the old northern Gulf coast frontal system and became an extratropical low. This low moved through southeast Texas into Louisiana on 23 September and moved over portions of Mississippi and Alabama the next day. The cyclone decayed and became elongated during this time, and the post-tropical Beta cyclone dissipated within the baroclinic zone over northeastern Alabama early on 25 September.

METEOROLOGICAL STATISTICS

Observations in Beta (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 (WRS) of the U.S. Air Force Reserve Command. Data and imagery from NOAA polar-orbiting satellites including the Advanced Microwave Sounding Unit (AMSU), the NASA Global Precipitation Mission (GPM), the European Space Agency's Advanced Scatterometer (ASCAT), and Defense Meteorological Satellite Program (DMSP) satellites, among others, were also useful in constructing the best track of Beta.

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

Winds and Pressure

The 53rd WRS flew eight missions into Beta and provided 25 center fixes. The maximum aircraft-reported flight-level winds were 61 kt at 850 mb at 1404 UTC 20 September, which yields a surface wind estimate of 49 kt using the 80% reduction from this flight-level to the surface. The maximum surface wind estimate from the SFMR was 59 kt at 1402 UTC that day, although the reliability of this estimate is unclear due to it occurring in heavy rain. The minimum pressure of 993 mb is based on a center dropsonde with 994 mb and a 14 kt surface wind at 0033 UTC 21 September.

The short-lived 55-kt peak intensity of Beta at 1800 UTC 20 September is based on a blend of the flight-level and SFMR data mentioned above and Doppler radar data from the WSR-88D in Houston, Texas, which showed a mid-level eye feature around that time.

Beta caused tropical-storm conditions along portions of the middle and upper Texas coasts. The center passed near a National Ocean Service (NOS) station at Matagorda Bay, which reported sustained winds of 42 kt at 0100 UTC 22 September, along with a peak gust of 56 kt. A nearby WeatherFlow station reported 40-kt sustained winds at 0103 UTC 22 September along with a peak gust of 46 kt. These data are the basis for the landfall intensity of 45 kt. The NOS station reported a minimum pressure of 997.5 mb at 0206 UTC 22 September, which is the basis for the landfall pressure of 997 mb. Sustained tropical-storm-force winds were reported from the landfall area northward to the Galveston area.

The storm, in combination with the large surface high pressure to the north, also caused an extensive area of strong winds across the northern Gulf of Mexico and portions of the northern Gulf coast from Louisiana to Alabama. A NOS station at the Southwest Pass of the mouth of the Mississippi River reported sustained winds of 45 kt and a gust to 54 kt (anemometer elevation 20 m). A nearby Coastal-Marine Automated Network (CMAN) stations reported 44 kt sustained winds with a gust to 50 kt at an anemometer elevation of 38 m. Tropical-storm-force gusts occurred as far east as Dauphin Island, Alabama. Several offshore oil platforms also reported sustained tropical-storm-force winds, with the highest-reported sustained winds of 60 kt and a gust to 66 kt at the Garden Banks 783 platform (elevation 58 m).

There were many ship reports of sustained tropical-storm-force winds, including some at or above 50 kt. Most of these were in the area of strong winds well to the north of the center. However, the drilling ship *Pacific Khamsin* (call sign D5DE5) reported 47-kt winds and a pressure of 998.5 mb not far from the center of Beta at 2000 UTC 19 September.

Storm Surge[2]

Beta produced storm surge inundation levels of 2–4 ft above ground level (AGL) along much of the coasts of Texas, Louisiana, and Mississippi. Table 3 and Figure 6 provide observations from various tide stations, stream gauges, and surveyed high water marks along the western and central U.S. Gulf coast. In Texas, the highest inundation occurred along the coasts of Galveston and Brazoria Counties, including around Galveston Bay. The highest measurement was from a Texas Coastal Ocean Observing Network (TCOON) station at San Luis Pass, at the southern end of Galveston Island, which recorded a maximum water level of 4.2 ft above Mean Higher High Water (MHHW). Just south of there, a Harris County Flood Control District (HCFCD)/National Weather Service (NWS) team surveyed a high water mark of 4.0 ft above ground level (AGL) on Follet's Island. Multiple observations of 3–4 ft AGL/MHHW occurred elsewhere from Port O'Connor and Matagorda Bay northward to the Texas/Louisiana border. A

[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).

TCOON gauge in the Manchester section of Houston recorded a peak water level of 4.6 ft MHHW, but being located along the Houston Ship Channel/Buffalo Bayou, that station likely had a significant freshwater contribution from Beta's heavy rainfall. Inundation of 1–3 ft AGL occurred along the Middle and Lower Texas coast south of Port O'Connor.

Persistent easterly winds to the north of the front located north and east of Beta's circulation caused storm surge flooding across parts of southeastern Louisiana. Some water levels there were just as high as what occurred in Texas. In St. Bernard Parish, a United States Geological Survey (USGS) stream gauge at Crooked Bayou near Delacroix, Louisiana, measured a peak water level of 4.2 ft MHHW. In addition, an NOS tide gauge at Shell Beach and a U.S. Army Corps of Engineers (USACE) gauge at the Bayou Dupre Flood Gate both recorded peak levels of 4.1 ft MHHW. Elevated water levels also occurred in Lake Pontchartrain, with multiple NOS and USACE gauges surrounding the lake registering peak water levels of 3.8 ft MHHW. Water levels higher than 3 ft MHHW were also measured within Barataria Bay, Caminada Bay, and Caillou Bay. Along the central and southwestern Louisiana coast, winds were more parallel to shore, thus storm surge inundation was more limited. The highest water level recorded in this area was 3.2 ft MHHW by the NOS gauge at Calcasieu Pass.

Shore-parallel winds north of the stationary front kept storm surge inundation below 3 ft AGL along the coasts of Mississippi and Alabama. The highest recorded water levels in each state were 2.9 ft MHHW at the Bay Waveland Yacht Club, Mississippi, and 1.9 ft MHHW at the Bayou La Batre Bridge, Alabama.

Rainfall and Flooding

Although somewhat limited by the dry air entrainment, Beta's slow movement caused widespread heavy rainfall across portions of southeastern Texas, with the heaviest rains falling over the southern portion of Harris County and the adjacent portions of Brazoria County (Figure 7). A HCFCD station near Brookside Village reported a storm-total rainfall of 15.77 inches, and there were numerous other reports of 10–14-inch storm totals in nearby areas. These rains caused widespread moderate to major flooding in the southern portion of the Houston metropolitan area, although the magnitude of the flooding was well short of that seen from Hurricane Harvey in 2017.

Beta also caused heavy rains along the cyclone's track from the middle Texas coast into the Tennessee Valley. Storm total rainfalls of 3–7 inches were common near the landfall area and in a swath extending across other portions of southeastern Texas and central Louisiana into west- central Mississippi. Locally heavier totals in this area included 10.05 inches at Rosetta, Mississippi and 9.60 inches near Marion, Louisiana. Storm totals of 3–7 inches also occurred over portions of northeastern Louisiana and southern Arkansas due to a combination of Beta and the frontal system. Rains of 3–5 inches, with locally higher amounts, occurred across portions of northeastern Mississippi and northern Alabama into southern Tennessee and northwestern Georgia, also likely due to a combination of Beta and the frontal zone. Locally heavy rains associated with the outer portions of Beta's circulation also occurred over portions of eastern and southeastern Mexico.

Tornadoes

There were no known tornadoes associated with Beta.

CASUALTY AND DAMAGE STATISTICS

Media reports indicate there was one death[3] directly associated with Beta – a fisherman who disappeared into a swollen Brays Bayou near Houston, Texas, and was later found drowned.

According to media reports, Beta's winds and tides caused some damage along portions of the Texas coast. The associated rainfall caused flooding over portions of southeastern Texas, particularly in Harris and Brazoria Counties. This flooding caused damage to at least 20–25 homes in the Houston area according to a report from the HCFCD. Between that and other damage for which details are unavailable, the NOAA National Centers for Environmental Information (NCEI) estimates that Beta caused a total of $225 million dollars of damage in the United States.

FORECAST AND WARNING CRITIQUE

Genesis

The genesis forecasts for Beta were problematic due to the slow and complex nature of the genesis. The pre-Beta disturbance was first noted in the Tropical Weather Outlook (TWO) on 10 September – a week before genesis occurred – with a low chance (<40%) of development in both the 2-day and 5-day time ranges (Table 4). Subsequent TWOs during the next few days correctly indicated that the disturbance would be slow to develop, especially when Hurricane Sally was located over the northern Gulf of Mexico. However, the genesis forecasts after Sally moved inland poorly assessed the development potential of the pre-Beta disturbance. The genesis probabilities were raised to the medium category (40–60%) only 30 h before genesis in the 5-day range and only 24 h before formation in the 2-day range. The probabilities were not raised to the high category (>60%) until 18 h before genesis in the 5-day range and until 6 h before genesis in the 2-day range. One reason for the poor later forecasts is that the global models showed little support for genesis through 15 September, particularly in the short range. The model genesis signals increased beginning on 16 September.

[3] 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.

Track

A verification of NHC official track forecasts for Beta is given in Table 5a. Official forecast track errors were lower than the mean official errors for the previous 5-yr period for all of the forecast times except 12 and 120 h. At 12 h, the official errors were equal to the mean of the previous 5-yr period, while at 120 h the official errors were higher, albeit with only one forecast case.

A homogeneous comparison of the official track errors with selected guidance models is given in Table 5b. The official forecasts had lower average errors that most of the guidance at the 12–72 h forecast times, while the guidance was generally better than the official forecasts at 96 and 120 h. The best dynamical model was the COAMPS TC (CTCI), which had lower errors than the official forecasts at all times. The consensus models TVCA and TVCX also had lower average track forecast errors than the NHC forecasts. Examination of the individual forecasts (Fig. 4) shows that the forecasts correctly assessed that Beta would have a slow motion over the Gulf of Mexico and they captured the overall directions of the motion. However, the early forecasts were too slow and failed to show landfall within five days. These forecasts were also too far south in regards to when Beta would turn westward due to the building ridge to the north. The forecasts from 0000 UTC 19 September onward did a better job in capturing the overall track of Beta.

Intensity

A verification of NHC official intensity forecasts for Beta is given in Table 6a. Official forecast intensity errors were lower than the mean official errors for the previous 5-yr period for the 12-, 24-, and 36-h forecast periods. However, the official errors were above both the 5-yr averages and the Climatology-Persistence (OCD5) average errors from 48–120 h. A homogeneous comparison of the official intensity errors with selected guidance models is given in Table 6b. The consensus models ICON, IVCN, and IVDR, the corrected consensus model HCCA, and the CTCI model all had average errors near or lower than those of the official forecasts through 72–96 h. An examination of the individual official forecasts (Figure 5) shows there was a significant high bias, with most of the forecasts showing a higher peak intensity than what actually occurred. The most likely reason for this bias was an underestimation of how much the dry air near the storm would restrain Beta's development.

Wind Watches and Warnings

Tropical cyclone wind watches and warnings associated with Beta are given in Table 7a. Based on the early high-biased intensity forecasts, a hurricane watch was issued for portions of the Texas coast at 0300 UTC 19 September, about 72 h before landfall and about 39 h before the onset of tropical-storm-force winds in the watch area. A tropical storm warning was issued for the landfall area at 1500 UTC 19 September, or about 27 h before the onset of tropical-storm-force winds. The hurricane watch was discontinued at 0900 UTC 20 September when it became apparent that the chances that Beta would become a hurricane before landfall had diminished.

Storm Surge Forecasts and Warnings

Storm surge watches and warnings associated with Beta are given in Table 7b and indicated in Fig. 6. A Storm Surge Watch was first issued for the coast of Texas from Port

Mansfield to High Island at 0300 UTC 19 September, and the watch was extended eastward to Cameron, Louisiana, at 0900 UTC 19 September. The portion of the watch from Port Aransas to High Island, Texas, was upgraded to a Storm Surge Warning at 2100 UTC 19 September, and that warning was extended eastward to the Rockefeller Wildlife Refuge, Louisiana, at 0300 UTC 20 September. Sustained tropical-storm-force winds first began along the coast around 1800 UTC 20 September, and therefore the initial Storm Surge Watch and Warning had lead times of 39 h and 21 h, respectively.

As shown in Fig. 8, nearly all water level observations along the coasts of Texas and southwestern Louisiana that recorded peak water levels of 3 ft AGL/MHHW or higher fell within the Storm Surge Warning area. Two tide stations in the Corpus Christi area, at Bob Hall Pier and Packery Channel, were within the initial storm surge watch (but not warning) area and measured peak water levels of 3.2 ft and 3.0 ft MHHW, respectively. Also, as noted earlier, a couple of tide stations in the Houston area measured water levels above 3 ft MHHW. These stations were also not within the Storm Surge Warning area, but a significant part of water rises there were due to a freshwater component from heavy rainfall.

Portions of southeastern Louisiana were not placed under Storm Surge Watches or Warnings even though water levels exceeded 3 ft AGL in some areas. Since the easterly winds that caused this coastal flooding were not directly associated with Beta's circulation, NHC and Weather Forecast Office (WFO) Slidell opted to have the WFO issue a Coastal Flood Advisory on 19 September for minor coastal flooding of 1–3 ft AGL in southeastern Louisiana and Mississippi. The advisory was upgraded to a Coastal Flood Warning for portions of southeastern Louisiana on the morning of 20 September due to the expectation of moderate coastal flooding with inundation of 3–4 ft AGL along the south shores of Lake Pontchartrain and Lake Borgne and the east-facing shores of St. Bernard and Plaquemines Parishes.

NHC's initial peak storm surge inundation forecast issued at 0300 UTC 19 September was 2–4 ft above normally dry ground somewhere between Port Mansfield and High Island, Texas. This stretch of coastline was modified a couple of times on 19 and 20 September, with the forecast inundation range remaining steady. The forecast was increased to 3–5 ft AGL somewhere between San Luis Pass and Sabine Pass, including Galveston Bay, at 0300 UTC 21 September but then lowered back to 2–4 ft AGL later that day at 1500 UTC. As noted above, available water level observations indicate that peak storm surge inundation levels fell within the forecast ranges and were as high as 4 ft AGL in the area near San Luis Pass.

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

The NHC was in communication with emergency managers in the days leading up to Beta's landfall in Texas. This communication included federal video-teleconferences with FEMA Headquarters and FEMA Region 6. These decision support briefings were coordinated through the FEMA Hurricane Liaison Team, embedded at the NHC. NHC's Tropical Analysis and Forecast Branch provided five briefings to officials at United States Coast Guard (USCG) District 8. The NHC did not open a media pool for Beta. The NHC, however, did make one Facebook Live broadcast at 7:30 a.m. EDT 21 September discussing Beta (along with Delta).

ACKNOWLEDGEMENTS

Data in Table 3 were compiled from Post Tropical Cyclone (PSH) Reports issued by the NWS WFOs in Mobile, Alabama, Slidell and Lake Charles, Louisiana, and Houston, Corpus Christi, and Brownsville, Texas. Additional data were used from reports sent by the National Data Buoy Center and the NOS Center for Oceanographic Products and Services, as well as the Weatherflow, Mesowest, South Alabama, and Iowa Environmental Mesonet web sites. The Harris County Flood Control District also contributed data to the report as did the Meteorological Service of Mexico. Roger Edwards of the NOAA Storm Prediction Center provided the information on the lack of tornadoes, while Dave Roth and Zack Taylor of the Weather Prediction Center provided the rainfall map and other rainfall data. Laura Alaka and William Booth of the NHC Storm Surge Unit provided storm surge data. Dennis Feltgen reported the media interactions mentioned in this report, while Tiffany O'Connor contributed the IDSS report.

Table 1. Best track for Tropical Storm Beta, 17–22 September 2020.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
17 / 0600	21.1	94.9	1007	30	low
17 / 1200	21.5	94.7	1007	30	tropical depression
17 / 1800	21.8	94.4	1005	30	"
18 / 0000	22.0	94.2	1005	30	"
18 / 0600	22.6	94.1	1005	30	"
18 / 1200	23.2	93.8	1005	30	"
18 / 1800	24.1	93.1	1003	40	tropical storm
19 / 0000	25.2	92.3	1000	50	"
19 / 0600	25.8	92.3	996	50	"
19 / 1200	26.4	92.4	994	50	"
19 / 1800	26.6	92.2	995	50	"
20 / 0000	26.8	92.1	997	50	"
20 / 0600	26.9	92.5	998	50	"
20 / 1200	27.1	92.8	996	50	"
20 / 1800	27.5	93.6	996	55	"
21 / 0000	27.5	94.1	993	50	"
21 / 0600	27.6	94.8	995	45	"
21 / 1200	27.8	95.5	997	45	"
21 / 1800	28.1	96.0	999	40	"
22 / 0000	28.3	96.3	998	45	"
22 / 0245	28.4	96.4	997	45	"
22 / 0600	28.6	96.6	999	40	"
22 / 1200	28.8	96.8	1002	35	"
22 / 1800	28.9	96.5	1006	25	tropical depression
23 / 0000	29.0	95.8	1007	25	extratropical
23 / 0600	29.4	95.4	1007	25	"
23 / 1200	30.0	94.6	1007	25	"
23 / 1800	30.3	93.8	1006	25	"
24 / 0000	30.8	92.4	1005	25	"
24 / 0600	31.6	91.5	1004	25	"
24 / 1200	32.4	90.6	1003	25	"

24 / 1800	33.0	89.1	1008	20	"
25 / 0000	33.6	87.6	1009	20	"
25 / 0600	34.1	86.5	1010	15	"
22 / 0245	28.4	96.4	997	45	landfall at Matagorda Bay, Texas
20 / 1200	27.1	92.8	996	55	maximum winds
21 / 0000	27.5	94.1	993	50	minimum pressure

Table 2. Selected ship reports with winds of at least 34 kt for Tropical Storm Beta, 17–22 September 2020.

Date/Time (UTC)	Ship call sign	Latitude (°N)	Longitude (°W)	Wind dir/speed (kt)	Pressure (mb)
18 / 2100	V7VD8	25.4	92.8	050 / 40	1007.0
19 / 0000	WADN	26.2	93.1	030 / 39	1005.8
19 / 0300	WAAT	27.8	92.3	070 / 48	1011.6
19 / 0600	WADN	25.8	92.2	330 / 45	1000.1
19 / 1000	WSEP	27.4	91.6	070 / 40	1003.4
19 / 1200	WAAT	28.0	90.5	080 / 36	1008.3
19 / 1600	WDBH	27.2	92.5	050 / 50	1005.4
19 / 2000	D5DE5	27.0	92.2	020 / 47	998.6
19 / 2000	WDBH	27.3	92.2	050 / 50	1001.4
20 / 0800	KGSG	27.8	92.5	040 / 45	1006.2
20 / 1100	WDD612	27.7	92.2	080 / 40	1013.0
20 / 2200	C6YD3	28.7	93.2	070 / 45	1003.5
20 / 2300	C6FW2	29.9	93.7	050 / 55	1006.3
21 / 0100	C6DD6	28.7	93.7	060 / 49	1008.0
21 / 0100	9V2912	28.9	93.8	040 / 51	1009.0
21 / 0600	WOTA	29.6	93.2	320 / 40	1011.5
21 / 0700	V7XP5	28.5	94.7	050 / 35	1009.0
22 / 0400	WOTA	29.6	93.2	090 / 40	1014.3

Table 3. Selected surface observations for Tropical Storm Beta, 17–22 September 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)				
Buoys									
42002 NOAA (26.06N 93.65W) (4m)	20/0750	1006.2	18/2031	35 (1-min)	43				
42012 NOAA (30.06N 87.55W) (3.8m)			20/0513	32 (1-min)	36				
42019 NOAA (27.91N 95.35W) (3m)			21/0241	37 (1-min)	43				
42035 NOAA (29,23N 94.41W) (4m)	21/0900	1008.7	21/0156	39 (1-min)	41				
42043 TABS (28.98N 94.90W) (4m)	23/1000	1007.1[i]	21/0500	27[i]	35[i]				
42055 NOAA (22.12N 95.94W) (4m)	17/2340	1005.7		31 (1-min)	39				
42395 Shell (26.40N 90.79W) (3m)	19/2140	1003.7	19/0320	35	45				
Offshore Oil Platforms									
West Delta 27A (KDLP) (29.12N 89.55W) (35m)			20/0115	42	48				
Eugene Island 215 (KEIR) (28.22N 91.68W)			19/1915	44[i]	52[i]				
Garden Banks 783 (KGBK) (27.20N 92.20W) (58m)	20/0955	1000.3	19/0705	60	66				
Garden Banks 668 (KGUL) (27.30N 93.53W) (68m)	20/2035	1000.0	19/0435	40	46				
Alaminos Canyon 857 (KGYF) (26.13N 94.90W)			20/0035	37	42				
Mississippi Canyon (KMDJ) (28.64N 87.79W) (68m)			20/0435	39[i]	46[i]				
South Marsh 268 (KSCF) (29.12N 91.87W) (68m)			20/1935	44	53				
East Breaks 643 (KVAF) (27.35N 94.63W)	21/0355	1001.7	18/2315	30	43				
Main Pass 289C (KVKY) (29.25N 88.44W) (115m)			20/0130	39	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)				
Viosca Knoll (KVOA) (29.23N 87.78W)			20/0620	44	46				
Walker Ridge 29 (KWBF) (26.30N 90.50W)				31	39				
Texas									
International Civil Aviation Organization (ICAO) Sites									
Robert Wells Arpt. (K66R) (29.64N 96.52W)	22/2155	1009.1	22/0915		23				6.79
Wharton (KARM) (29.25N 96.15W)			21/1715		23				6.74
Houston SW Arpt. (KAXH) (29.51N 95.48W)			21/1055		22				5.88
Houston Hooks Arpt. (KDWH) (30.07N 95.56W)	23/0953	1007.6	22/0049		20				4.25
Eagle Lake (KELA) (29.60N 96.32W)	22/2135	1008.8	22/0135	21	26				7.91
Galveston (KGLS) (29.27N 94.87W)	23/0852	1007.1	21/0352	30	37				3.50
Houston Hobby Arpt. (KHOU) (29.65N 95.28W)	23/0853	1007.1	21/1553	21	27				12.20
Houston Bush Intl. (KIAH) (29.98N 95.36W)	23/0953	1007.2	22/1036		23				5.53
Angleton.(KLBX) (29.11N 95.46W)	22/2353	1007.5	22/0844		25				4.08
Pearland Clover Field (KLVJ) (29.52N 95.24W)	23/0853	1007.1	21/1453		28				9.75
John Dunn Helistop (KMCJ) (29.71N 95.40W)			21/0235		29				9.50
Port Lavaca (KPKV) (28.65N 96.68W)			22/0415	32	42				2.41
Palacios (KPSX) (28.72N 96.25W)	22/0352	1004.9	22/0432	29	38				1.64
Sugarland (KSGR) (29.62N 95.65W)	23/0853	1007.7	22/0053	22	26				7.46
La Porte (KT41) (29.67N 95.06W)	23/0855	1006.7	21/0015		27				4.47
Victoria (KVCT) (28.85N 96.92W)	22/0851	1002.5	22/0851	32	45				3.63

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft)[c]	Storm tide (ft)[d]	Estimated Inundation (ft)[e]	Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[a]	Sustained (kt)[b]	Gust (kt)				
National Ocean Service (NOS)/Texas Coastal Ocean Observation Network (TCOON) Sites									
Aransas Pass TCOON (ANPT2) (27.84N 97.04W) (4.0m)	21/2248	1008.3	20/2254	28	33	2.97	3.71	2.9	
Aransas Wildlife TCOON (AWRT2) (28.23N 96.80W)	22/0142	1006.0	22/0300	24	30	2.90	4.05	2.8	
Baffin Bay TCOON (BABT2) (27.30N 97.41W) (10m)	22/2254	1009.4	21/0224	25	31		2.82	2.3**	
Brazos Santiago TCOON (BZST2) (26.07N 97.15W) (4.3m)	22/2142	1009.1	19/2300	24	28	2.60		2.6	
Matagorda City TCOON (EMAT2) (28.71N 95.91W) (8.2m)	22/2218	1004.8	22/0054	28	35	3.63	4.59	3.6	
Eagle Point NOS (EPTT2) (29.48N 94.92W) (5.7m)	22/2212	1008.1	22/0130	35	41	3.48		3.8	
Freeport SPIP TCOON (FPST2) (29.94N 95.29W) (15m)	22/2342	1006.3	21/1254	37	43	3.57	4.19	3.2	
Galveston Bay N Jetty NOS (GNJT2) (29.36N 94.72W) (12m)	22/2306	1007.6	21/1124	37	42	3.67	4.67	3.6	
Galveston Railroad NOS (GRRT2) (29.30N 94.90W) (11m)	22/2206	1008.0	21/0330	32	39	3.77	4.67	3.8	
Galveston Pier 21 NOS (GTOT2) (29.31N 94.79W) (11m)	22/2224	1008.3	21/1124	24	33	3.65	4.87	3.8	
High Island TCOON (HIST2) (29.59N 94.39W)	22/2336	1008.9	21/1848	24	28	3.23	3.81	3.2	
South Bird Island TCOON (IRDT2) (27.48N 97.32W) (4m)	22/2136	1009.7	21/0142	24	28		3.20	2.6**	
San Luis Pass TCOON (LUIT2) (29.08N 95.13W)	22/2336	1009.2	21/0900	32	38	4.12	5.01	4.2	
Matagorda Bay NOS (MBET2) (29.43N 96.33W) (12m)	22/0206	997.5	22/0100	42	56	3.46	4.08	3.2	
Morgans Point NOS (MGPT2) (29.68N 94.99W) (3.2m)	22/2318	1008.4	22/0330	27	32	3.38	4.90	3.6	

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)				
Corpus Christi Bob Hall Pier NOS (MGPT2) (27.58N 97.22W) (7.9m)			20/2354	27	30	3.27	4.30	3.2	
Manchester TCOON (NCHT2) (29.73N 95.27W)	22/2218	1007.9	22/0054		22	4.74*	6.33*	4.6*	
Nueces Bay TCOON (NUET2) (27,83N 97.04W)	22/2118	1010.2	21/0130	23	27	2.50		2.5	
Packery Channel TCOON (PACT2) (27.63N 97.24W) (11m)	21/2248	1009.0	21/1636	25	30	2.54	3.76	3.0	
S Padre Island TCOON (PCGT2) (26.07N 97.17W)	22/2206	1009.7	21/2100	21	25	2.47	2.94	2.5	
Port O'Connor TCOON (PCNT2) (28.45N 96.40W) (9.0m)	22/0306	999.5	22/0100	37	48	3.86	4.63	3.5	
Port Mansfield TCOON (PMNT2) (26.56N 97.43W)	22/2136	1010.2					2.08	1.8**	
Port Arthur TCOON (PORT2) (29.87N 93.93W) (11m)	22/2230	1009.9	20/2254		26	2.86	3.65	3.0	
Port Isabel NOS (PTIT2) (26.06N 97.22W) (8.4m)	22/2148	1011.9	19/1854		24	2.60		2.6	
Rainbow Bridge NOS (RBBT2) (29.98N 93.88W)						2.78	3.43	2.9	
Rockport NOS (RCPT2) (28.02N 97.05W) (6.1m)	22/0036	1008.6	21/2342	18	25	2.34	3.94	2.6	
Realitos Peninsula TCOON (RLIT2) (26.26N 97.29W)	22/2200	1008.9	19/2212	21	25	2.40		2.5	
Rollover Pass TCOON (RLOT2) (29.52N 94.51W) (11m)	22/2348	1009.0	21/1412	26	34	3.75	4.39	3.8	
Rincon del San Jose TCOON (RSJT2) (26.80N 97.47W) (10m)	22/2212	1009.7	21/2230	23	27		2.13	1.7**	
Port Aransas TCOON (RTAT2) (27,84N 97.07W) (11m)	21/2300	1008.8	20/2242	24	28	3.25	3.82	2.9	

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)				
Sabine Pass North NOS (SBPT2) (29.73N 93.87W)						3.42		3.2	
Seadrift TCOON (SDRT2) (28.41N 96.71W) (10m)	22/0506	1004.7	22/0624	25	34	2.80	3.99	2.7	
Sargent TCOON (SGNT2) (28.77N 95.62W)	22/2342	1006.0	22/0224	25	32	3.18	4.39	3.3	
Corpus Christi Lexington TCOON (TAQT2) (27.81N 97.39W)	22/2130	1009.2				2.78	3.64	2.6	
Texas Point TCOON (TXPT2) (29.69N 93.84W) (13m)	22/2336	1008.2	21/0148	30	36	3.33	3.83	3.0	
Port Lavaca TCOON (VCAT2) (28.64N 96.61W)	22/0548	999.8	22/0648	29	38	2.74		2.6	
WeatherFlow									
Corinthian Yacht Club (29.53N 95.00W) (6.7m)			21/1333	28	34				
Galveston Fishing Pier (XGPR) (29.25N 94.85W) (12m)			21/0601	38	43				
Levee (XLEV) (29.42N 94.89W) (8.2m)			21/1418	30	38				
Matagorda Bay (XMGB) (28.60N 95.98W) (6.1m)			22/0103	40	46				
Surfside Beach (XSRF) (28.93N 95.29W) (7.6m)			21/1233	37	41				
Texas City (XTEX) (29.37N 94.95W) (20m)			21/1120	29	36				
Remote Automated Weather Stations (RAWS)									
Attwater NWR (ANWT2) (29.66N 96.26W) (6.1m)			22/0735		24				7.48
Brazoria NWR (BZRT2) (29.15N 95.30W) (6.1m)			21/1328		30				4.23
Conroe (CKNT2) (30.24N 95.48W) (6.1m)									3.48

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)				
Cold Springs (CPGT2) (30.52N 95.09W)									3.32
Linden (DENT2) (33.01N 94.36W)									3.28
Sabine North (DRKT2) (31.80N 94.00W)									3.58
Kirbyville (KRBT2) (30.63N 93.83W)									4.27
Sabine South (SSRT2) (31.28N 93.84W)									4.35
Texarkana (TEXT2) (33.37N 94.05W)									5.89
Victoria (VCRT2) (28.86N 96.92W) (6.1m)			22/0904	29	42				3.46
Southern Rough (WRRT2) (30.54N 94.35W) (6.1m)			23/1738		21				7.44
Woodville (WVLT2) (30.74N 94.43W) (6.1m)			23/1704		23				6.06
Harris County Flood Control District / NWS High Water Marks									
Follet's Island (29.03N 95.29W)							6.3	4.0	
Jamaica Beach (29.18N 94.97W)							6.2	3.7	
Galveston – East Beach (29.33N 94.73W)							4.9	3.0	
Shoreacres (29.62N 95.02W)							4.7	3.0	
La Porte (29.76N 95.08W)							4.9	3.0	
Follet's Island (29.05N 95.16W)							4.9	2.5	
Bay Harbor – Galveston Island (29.13N 95.07W)							4.5	2.5	
Seawolf Park – Pelican Island (29.33N 94.78W)							4.4	2.2	
La Marque (29.30N 94.90W)							4.2	2.2	
Sargent (28.77N 95.62W)							5.0	2.0	
Surfside Beach (28.95N 95.29W)							4.0	2.0	

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	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[a]	Sustained (kt)[b]	Gust (kt)				
Seabrook (29.55N 95.02W)							4.6	2.0	
Seabrook (29.56N 95.02W)							3.5	1.1	
Hydrometeorological Automated Data System (HADS) Sites (NWS)									
Austwell (ATWT2) (28.39N 96.84W)									3.05
Katy 3SSE (BBKT2) (29.74N 96.81W)									7.34
Beaumont 5N (BBKT2) (30.18N 94.19W)									4.22
Bon Weir (BWRT2) (30.75N 93.61W)									5.64
Cooper (CPPT2) (33.47N 95.59W)									4.69
Houston Cole Creek (DEHT2) (29.85N 95.49W)									8.49
Hockley 7S (HOCT2) (29.92N 95.84W)									8.27
Sheldon (HSJT2) (29.92N 95.15W)									4.77
Jasper 15NNW (JSPT2) (31.06N 94.11W)									3.59
Kountze 4NE (KOUT2) (30.40N 94.26W)									5.59
Wolf Hill (KTYT2) (29.80N 95.82W)									5.92
Houston Langham Creek (LLYT2) (29.87N 95.65W)									7.43
Inez 2SW (NGCT2) (29.89N 96.82W)									10.26
Woodlands (PGRT2) (30.19N 95.48W)									3.43
Richmond (RMOT2) (29.58N 95.76W)									8.17
Romayor 1WSW (RMYT2) (30.43N 94.85W)									3.64
Houston Keegans Bayou (RRKT2) (29.66N 95.56W)									8.81

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)				
Sour Lake 5SE (SOLT2) (30.11N 94.33W)									3.71
Texarkana 10SW (TXKT2) (33.30N 94.16W)									5.04
Victoria (VICT2) (28.79N 97.01W)									4.26
Houston West Belt (WSBT2) (29.77N 95.55W)									9.77
NWS Cooperative Observer Program (COOP) Sites									
Atlanta (ATAT2) (33.12N 94.17W)									3.61
Avery 5NNW (AVET2) (33.62N 94.81W)									3.74
Beaumont 10W (BAGT2) (30.07N 94.28W)									5.48
Baytown 4NW (BATT2) (29.79N 95.04W)									4.98
Brenham (BHMT2) (30.17N 96.40W)									4.41
Freeport 2NW (DOWT2) (28.98N 95.38W)									4.10
Danevang (DVGT2) (29.05N 96.23W)									5.32
Halletsville (HATT2) (29.47N 96.94W)									4.67
Westbury (HWET2) (29.68N 95.47W)									13.42
Jasper (JAST2) (30.88N 94.03W)									4.60
Houston WFO (KHGX) (29.47N 95.08W)									9.20
Village Creek SP (LLBT2) (30.25N 94.18W)									4.06
Liberty (LRYT2) (30.06N 94.79W)									4.34
Maud 1S (MAUT2) (33.33N 94.34W)									4.19
Montgomery (MGMT2) (30.40N 95.70W)									3.35

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)				
New Boston (NBOT2) (33.45N 94.41W)									4.51
Paris 1N (PART2) (33.66N 95.56W)									4.64
Point Comfort (PTCT2) (28.67N 96.55W)									3.07
Speaks (SPKT2) (29.28N 96.69W)									5.20
West Columbia 1ESE (WSCT2) (29.14N 95.63W)									4.65
Yoakum (YKMT2) (29.27N 97.12W)									3.99
Lower Colorado River Authority Stations (LCRA)									
Bay City (BACT2) (28.97N 96.01W)									3.57
Columbus (CBST2) (29.71N 96.54W)									6.38
Eagle Lake 7NE (EGLT2) (28.66N 96.24W)									7.61
Wharton (EGLT2) (29.31N 96.10W)									5.93
Brazoria County Drainage District 4 Stations (BCDD4)									
Station 4915 (29.55N 95.26W)									11.80
Station 4925 (29.58N 95.36W)									14.12
Station 4945 (29.57N 95.33W)									13.72
Station 4975 (29.53N 95.25W)									11.40
Harris County Flood Control District Stations (HCFCD)									
Mary’s Creek (105) (29.54N 95.20W)									12.76
Cowart Creek (115) (29.50N 95.22W)									10.64
Live Oak Creek (1186) (29.95N 95.92W)									6.52
Brookshire (BKDT2/2090) (29.89N 95.94W)									8.64

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)				
Friendswood 2SW (CCWT2/125) (29.50N 95.22W)									9.00
Pearland 1.3E (GNTT2/150) (29.55N 95.25W)									12.52
Simms Bayou (HCST2/380) (29.62N 95.45W)									13.44
Brookside Village 5.2NW (MSBT2/370) (29.63N 95.39W)									15.77
Brookside Village 1.2E (MYKT2/180) (29.60N 95.30W)									14.36
Clear Creek (PPCT2/175) (29.59N 95.27W)									14.80
NRG Park (RLPT2/1020) (29.69N 95.41W)									14.68
NRG Park (WWHT2/435) (29.66N 95.46W)									14.32
Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) Sites									
Sealy 0.4WNW (TX-AS-5) (29.78N 96.16W)									7.24
San Felipe 1WNW (TX-AS-6) (29.80N 96.12W)									6.13
Cat Spring 1.4N (TX-AS-6) (29.87N 96.33W)									5.49
Bellville 6.5NNE (TX-AS-15) (30.03N 96.22W)									6.37
Alvin 1.6SW (TX-BRZ-18) (29.42N 95.27W)									7.30
Angleton 1.3E (TX-BRZ-21) (29.17N 95.41W)									4.58
Manvel 2.3NNW (TX-BRZ-43) (29.51N 95.37W)									7.50

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	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[a]	Sustained (kt)[b]	Gust (kt)				
Pearland 2.3E (TX-BRZ-44) (29.55N 95.24W)									13.13
Wake Village 0.8WNW (TX-BWE-5) (33.43N 94.13W)									5.18
Texarkana 6.1WSW (TX-BWE-10) (33.41N 94.17W)									4.50
Mont Belvieu 1.5NNW (TX-CHM-8) (29.87N 94.89W)									3.57
New Ulm 7.2S (TX-CLR-6) (29.79N 96.48W)									7.05
Columbus 3.2WSW (TX-CLR-9) (29.68N 96.60W)									7.88
Weimar 5.0E (TX-CLR-13) (29.71N 96.70W)									5.97
Cat Spring 6.9W (TX-CLR-14) (29.84N 96.44W)									5.40
Sugarland 1W (TX-FB-12) (29.62N 95.63W)									8.12
Katy 7.3SSE (TX-FB-53) (29.71N 95.76W)									8.05
Missouri City 5.1SSE (TX-FB-54) (29.50N 95.50W)									6.46
Richmond 4.9NNE (TX-FB-63) (29.65N 95.75W)									10.01
Fulshear 0.9NNE (TX-FB-76) (29.70N 95.88W)									6.77
Dickinson 1.4W (TX-GLV-9) (29.46N 95.09W)									8.34
Texas City 1.5E (TX-GLV-17) (29.41N 94.93W)									6.35
Galveston 6.4NE (TX-GLV-18) (29.28N 94.80W)									6.16

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)				
La Marque 1.8E (TX-GLV-51) (29.36N 94.96W)									4.81
Santa Fe 0.7S (TX-GLV-60) (29.37N 95.10W)									5.58
Friendswood 1SE (TX-GLV-63) (29.50N 95.19W)									11.78
League City 0.9WNW (TX-GLV-69) (29.49N 95.12W)									9.71
Lumberton 1.2WNW (TX-HRN-1) (30.27N 94.22W)									4.99
Kountze 1.1S (TX-HRN-6) (30.36N 94.32W)									6.85
Bunker Hill Village 3.6NNW (TX-HRR-27) (29.81N 95.55W)									11.13
Webster 0.4NW (TX-HRR-28) (29.53N 95.12W)									11.61
Spring Valley 2.7NW (TX-HRR-58) (29.81N 95.54W)									9.63
Pasadena 4.4WNW (TX-HRR-93) (29.68N 95.22W)									5.95
Hockley 2.5ESE (TX-HRR-114) (30.02N 95.80W)									5.81
West University Place 0.4WNW (TX-HRR-119) (29.72N 95.44W)									12.46
Cloverleaf 1.7W (TX-HRR-139) (29.79N 95.20W)									5.85
South Houston 3S (TX-HRR-147) (29.62N 95.23W)									12.47
Pearland 4.0NE (TX-HRR-168) (29.58N 95.21W)									14.27

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)				
Katy 5.2E (TX-HRR-228) (29.79N 95.74W)									8.38
Jersey Village 8.5NW (TX-HRR-251) (29.98N 95.66W)									9.79
Friendswood 2.6NE (TX-HRR-257) (29.54N 95.17W)									14.33
Tomball 4.6SSW (TX-HRR-259) (30.04N 95.66W)									7.06
Houston 5.9SW (TX-HRR-269) (29.70N 95.45W)									13.37
Hillshire Village 2.7ENE (TX-HRR-272) (29.79N 95.44W)									11.45
Spring 10.5WSW (TX-HRR-275) (30.02N 95.55W)									6.98
Seabrook 0.7NW (TX-HRR-280) (29.59N 95.00W)									4.67
Nassau Bay 0.3WNW (TX-HRR-283) (29.55N 95.09W)									7.27
Beaumont 3.3SW (TX-JJ-9) (30.05N 94.18W)									4.52
Ganado 1.5W (TX-JK-5) (29.04N 96.54W)									9.23
Edna 3.8NNW (TX-JK-6) (29.03N 96.67W)									8.37
Dayton 0.2E (TX-LR-14) (30.05N 94.89W)									6.39
Halletsville 17.1SE (TX-LV-2) (29.26N 96.76W)									6.27
Moulton 6.9SE (TX-LV-27) (29.51N 97.05W)									4.58

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	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[a]	Sustained (kt)[b]	Gust (kt)				
Montgomery 0.4N (TX-MNG-21) (30.98N 95.70W)									3.43
Pinehurst 3.8SE (TX-MNG-35) (30.15N 95.66W)									4.31
Roman Forest 1.9ENE (TX-MNG-63) (30.19N 95.13W)									4.54
The Woodlands 4.6NNW (TX-MNG-67) (30.22N 95.53W)									4.01
Spring 4.2N (TX-MNG-79) (30.12N 95.39W)									3.98
Livingston 0.5E (TX-PL-16) (30.71N 94.93W)									3.55
Warren 4S (TX-TR-17) (30.56N 94.40W)									7.34
Woodville 1.8WSW (TX-TR-19) (30.77N 94.45W)									7.10
Fred 0.3S (TX-TR-23) (30.57N 94.18W)									8.00
Victoria 2W (TX-VC-10) (28.82N 97.01W)									3.39
Victoria 10ESE (TX-VC-20) (28.78N 98.83W)									4.52
Victoria 1S (TX-VC-30) (28.81N 98.98W)									3.33
Victoria 2ENE (TX-VC-43) (28.83N 98.96W)									3.64
Chappell Hill 1.0NW (TX-WA-9) (30.16N 96.26W)									4.93
Brenham 1.4NNW (TX-WA-18) (30.18N 96.40W)									4.50
El Campo 2.7NW (TX-WH-11) (29.23N 96.30W)									7.36

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)				
Wharton 1.4ESE (TX-WH-16) (29.31N 96.08W)									5.97
Louisiana									
International Civil Aviation Organization (ICAO) Sites									
Alexandria (KAEX) (31.33N 92.56W)	23/2117	1005.4	23/2053		26				3.62
New Iberia (KARA) (30.03N 90.03W)	23/2153	1006.4	20/1953	22	34				2.83
Alexandria Esler Regional (KESF) (31.39N 92.30W)	24/0053	1005.8	23/2138		20				3.60
Monroe (KMLU) (32.52N 92.04W)	24/0753	1007.4							4.77
New Orleans Lakefront (KNEW) (30.04N 91.88W)			20/1138	29	35				0.19
Fort Polk (KPOE) (31.04N 93.19W)	23/1943	1007.4	21/0158		20				4.97
Port Fourchon (KXPY) (29.12N 90.20W)			21/0515	30	44				
Coastal-Marine Automated Network (C-MAN) Sites									
SW Pass (BURL1) (28.90N 89.43W) (38m)			21/0000	44 (10-min)	50				
National Ocean Service (NOS) Sites									
Amerada Pass (AMRL1) (29.45N 91.34W) (11m)	20/0848	1010.7	19/2206		26	2.59	2.59	1.9	
Bonnet Carre (BCFL1) (30.07N 90.39W)						4.07		4.3	
Bulk Terminal (BKTL1) (30.19N 93.30W)						2.95	3.30	2.6	
Calcasieu Pass (CAPL1) (29.77N 93.34W) (12m)	22/2348	1008.8	21/1630	32	39	3.30	3.62	3.2	
Eugene Island (EINL1) (29.37N 91.38W) (4.0m)	20/0948	1010.0	19/2200	31	36	3.22		2.3	
Grand Isle (GISL1) (29.26N 89.96W) (9m)			20/0018	28	38	2.05		2.4	
Lake Charles (LCLL1) (30.22N 93.22W)						2.76	3.30	2.6	

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 Canal (NWCL1) (30.03N 90.11W) (9.9m)	20/0824	1012.2	20/1630	30	36	3.60	4.90	3.8	
Pilottown (PILL1) (29.18N 89.26W) (9.5m)	20/0824	1011.8	20/2342	21	30	1.83	1.8	2.0	
Southwest Pass (PSTL1) (28.93N 89.41W) (20m)	20/1024	1008.9	21/0006	45	54	2.28		2.6	
Port Fourchon (PTFL1) (29.11N 90.20W)						2.01		2.2	
Shell Beach (SHBL1) (29.87N 89.67W) (16m)	20/0818	1013.2	20/1812	34	41	3.91	4.90	4.1	
Berwick (TESL1) (29.67N 91.24W) (13m)			20/1706	23	29	1.66		0.6	
WeatherFlow									
Bayou Bienvenue (30.00N 89.90W) (27m)			21/1530	34	40				
Cameron (30.00N 89.90W) (10m)			21/1624	27	37				
Remote Automated Weather Stations (RAWS)									
Catahoula (BENL1) (31.50 92.46W)									3.28
Caney (CANL1) (32.80 93.07W)									4.48
Evangeline (GARL1) (31.19 92.63W)									5.18
Gum Springs (GUML1) (31.90 92.78W) (6.1m)			24/0242		23				2.54
Natchitoches (NATL1) (31.49 93.19W)									5.41
LA Portable 1 (TS982) (32.82 92.08W)									10.79
Vernon (VENL1) (31.02 93.19W) (6.1m)			20/2359		20				4.93
Dove Field (VRNL1) (31.03 92.98W)									6.39
Public/Other									
Louisiana Offshore Oil Port (LOPL1) (28.89N 90.02W) (58m)			20/0419	41 (2-min)	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)				
US Geological Survey (USGS) Tide Gauges									
Delacroix (CBDL1) (29.71N 89.72W)							5.59	4.2	
Caillou Bay SW of Cocodrie (CCOL1) (29.08N 90.87W)							4.26	3.3	
Caminada Pass (CPGL1) (29.23N 90.05W)							4.10	3.3	
Cutoff (CTFL1) (29.52N 90.18W)							3.97	3.3	
Dulac (DCLL1) (29.25N 90.92W)							3.54	2.5	
Barataria Pass (EGIL1) (29.27N 89.95W)							4.39	3.6	
Claiborne (EPCL1) (30.20N 89.53W)							4.81		
Empire (EWEL1) (29.30N 89.60W)							3.10		
Grand Pass (GRPL1) (30.12N 89.25W)							4.13	2.9	
Hackberry Bay (HACL1) (29.40N 90.04W)							4.03	3.3	
Vermilion Bay near Intracoastal City (ICCL1) (29.67N 92.14W)							3.86	2.6	
Maurepas (MAUL1) (30.31N 90.61W)							4.04		
Lower Atchafalaya River at Morgan City (MRGL1) (29.69N 91.21W)							4.24	2.3	
Barataria Bay (NGIL1) (29.43N 89.95W)							3.93	3.1	
Black Bay (PSIL1) (29.63N 89.56W)							4.51	3.2	
US Army Corp of Engineers (USACE) Storm Tide Sensors									
Bayou Dupre (BDML1) (29.94N 89.84W)							5.28	4.1	
Bayou Segnette (BSGL1) (29.90N 90.16W)							2.86		

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)				
Chef Pass (CMPL1) (30.07N 89.80W)							4.58	3.5	
Caernarvon (COCL1) (29.86N 89.91W)							4.26		
Lafitte (LBWL1) (29.67N 90.11W)							2.81		
Mandeville (LPML1) (30.37N 90.09W)							4.06	3.4	
Bayou Beinvenue (MBBL1) (30.00N 89.92W)							5.05	3.9	
New Orleans Lakefront Arpt (PLAL1) (30.04N 90.02W)							4.35	3.8	
Pass Manchac (PMPL1) (30.28N 90.40W)							4.16	3.2	
GIWW Paris Road (PRSL1) (30.01N 89.94W)							4.66	3.5	
Rigolets (RIGL1) (30.16N 89.74W)							3.99	2.9	
Springfield (TSPL1) (30.38N 90.55W)							5.47		
New Orleans West End (WEGL1) (30.02N 90.12W)							4.31	3.8	
Hydrometeorological Automated Data System (HADS) Sites (NWS)									
Acme (ACML1) (31.27N 91.83W)									4.83
Alexandria Red River (AEXL1) (31.32N 92.45W)									4.60
Bayou Sorrell 2SSE (BSRL1) (30.13N 91.32W)									3.65
Como (COGL1) (32.09N 91.60W)									6.65
Columbia Lock & Dam (COLL1) (32.17N 92.10W)									4.70
Coushatta (CSHL1) (32.02N 93.35W)									3.11
Clayton (CYNL1) (31.72N 91.54W)									8.02

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)				
Morgan City (MCGL1) (29.70N 91.21W)									7.16
West Monroe (MLUL1) (32.52N 92.13W)									3.79
Melville (MLVL1) (30.69N 90.54W)									3.34
Mittie 1SE (MTTL1) (30.70N 92.90W)									3.97
Fort Necessity (NECL1) (32.07N 91.93W)									5.37
Newlight (NLGL1) (32.08N 91.48W)									3.23
Oberlin 3NW (OBCL1) (30.63N 92.82W)									3.41
Simmesport (SMML1) (30.98N 91.80W)									4.14
Springhill 4SE (SPHL1) (32.99N 93.44W)									3.69
Tendal 12SW (TDGL1) (32.27N 91.43W)									7.09
Advanced Hydrological Prediction Service (AHPS) Sites									
Alto 2NW (ALGL1) (32.37N 91.88W)									5.13
Grand Ecore (GREL1) (31.81N 93.09W)									4.17
Jonesville Lock & Dam (JNEL1) (31.48N 91.85W)									6.47
Krotz Springs (KRZL1) (30.54N 91.75W)									3.19
Lake Charles (LCHL1) (30.25N 93.22W)									5.37
Farmerville (LDBL1) (32.75N 92.41W)									3.41
NWS Cooperative Observer Program (COOP) Sites									
Abbeville (ABBL1) (29.97N 92.13W)									3.11
Arcadia (ARCL1) (32.55N 92.92W)									5.50
Bundicks Lake (BDKL1) (30.73N 93.09W)									3.50

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)				
Bienville 3N (BNVL1) (32.37N 92.94W)									3.90
Boyce 3WNW (BYCL1) (31.38N 92.72W)									4.53
Franklin 3NW (FRAL1) (29.82N 91.55W)									4.84
Galliano (GALL1) (29.45N 90.30W)									3.31
Homer 3SSW (HMRL1) (32.75N 93.07W)									4.12
LSU Iberia Stn. (JENL1) (29.95N 91.72W)									4.34
Leesville (LEEL1) (31.13N 93.25W)									5.51
Mansfield (MANL1) (32.04N 93.71W)									5.03
Minden (MINL1) (32.61N 93.29W)									4.09
Marksville (MKVL1) (31.15N 92.03W)									5.93
Oak Grove 2W (OKCL1) (32.84N 91.43W)									6.86
Oak Ridge (OKRL1) (32.62N 91.77W)									6.48
Plain Dealing (PLNL1) (32.90N 93.69W)									4.41
Rochelle (RHLL1) (31.75N 92.35W)									4.59
LSU NE LA Stn. (STJL1) (31.95N 91.23W)									5.05
Vidalia #2 (VIDL1) (31.58N 91.47W)									4.71
LSU Sweet Potation Stn. (WINL1) (32.09N 91.72W)									3.35
Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) Sites									
DeRidder 8.9SE (LA-BG-3) (30.75N 93.18W)									5.85
Plain Dealing 3ESE (LA-BS-8) (32.89N 93.65W)									5.07

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)				
Homer 1.2N (LA-CB-1) (32.81N 93.06W)									4.13
Vivian 1.5N (LA-CD-27) (32.89N 93.98W)									4.06
Sicily Island 3.3WNW (LA-CT-1) (31.87N 91.71W)									4.52
Columbia 4.1NNW (LA-CW-3) (32.16N 92.11W)									4.89
Winnsboro 5.3NNE (LA-FP-3) (32.23N 91.69W)									4.80
Quitman 2.5E (LA-JC-3) (32.34N 92.68W)									4.80
Ruston 5.5NNW (LA-LN-3) (32.61N 92.66W)									6.52
Swartz 2SSW (LA-OC-1) (32.54N 92.00W)									5.51
Calhoun 4.3SSE (LA-OC-16) (32.45N 92.34W)									5.65
Monroe 9NNE (LA-OC-32) (32.62N 92.00W)									7.30
West Monroe 5.1W (LA-OC-34) (32.52N 92.24W)									6.11
Alexandria 2.8SW (LA-RP-7) (31.26N 92.49W)									4.72
Pleasant Hill 10.2SE (LA-SN-3) (31.70N 92.41W)									3.90
Rocky Branch 1.3W (LA-UN-2) (32.68N 92.22W)									8.98
Marion 8.4SE (LA-UN-4) (32.81N 92.14W)									9.60
Pioneer 0.3WSW (LA-WC-1) (32.74N 91.44W)									6.78

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)				
Minden 2.2NE (LA-WR-4) (32.64N 93.25W)									3.96
Mississippi									
International Civil Aviation Organization (ICAO) Sites									
Greenville (KGLH) (33.48N 90.99W)	24/0953	1008.5	24/0730		22				3.59
Natchez (KHEZ) (31.62N 91.28W)	24/0756	1004.1	24/0006		24				5.34
Jackson (KJAN) (32.32N 90.08W)	24/0854	1003.4	24/1026		29				3.61
National Ocean Service (NOS) Sites									
Pascagoula NOAA Lab (PNLM6) (30.37N 88.56W)						1.85	3.03	2.2	
Petit Bois (PTBM6) (30.21N 88.50W) (4.6m)	19/0636	1013.6	20/2054	28	35				
Waveland Yacht Club (WYCM6) (30.33N 89.33W) (9.9m)	19/0630	1014.4	22/2030	23	29	2.63	3.93	2.9	
WeatherFlow									
Ship Island (30.23N 88.98W) (27m)			21/1537	32	37				
Remote Automated Weather Stations (RAWS)									
Bude 3S (BDEM6) (31.41N 90.85W) (6.1m)			23/1805		24				6.31
Copiah (CYSM6) (31.95N 90.38W) (6.1m)			24/0409		26				3.59
Delta Rd (HLYM6) (32.90N 90.87W) (6.1m)			24/0909		20				4.57
Pike (MPAM6) (31.19N 90.48W) (6.1m)			24/0209		25				3.16
Holmes (RHOM6) (33.22N 90.20W)									4.37
Yallabusha (YALM6) (33.99N 89.80W)									3.32
US Geological Survey (USGS) Tide Gauges									

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)				
Ocean Springs (OFBM6) (30.42N 88.83W)							3.25		
Hydrometeorological Automated Data System (HADS) Sites (NWS)									
Anguilla 3E (ANGM6) (32.97N 90.78W)									4.20
Belzoni (BELM6) (33.17N 90.50W)									3.92
Bouvina 2E (BOVM6) (33.35N 90.70W)									3.15
Bruce (BRCM6) (33.97N 89.35W)									3.70
Bentonia 3S (BTAM6) (32.59N 90.37W)									3.12
Calhoun City (CCTM6) (32.83N 89.32W)									3.64
Greenwood (GREM6) (33.52N 90.18W)									3.84
Kosciusko 2SSE (KSCM6) (33.03N 89.58W)									3.09
Ofahoma 2SE (KSCM6) (32.70N 89.67W)									3.02
West (WSTM6) (33.20N 89.77W)									3.61
Greenwood 7NE (YWGM6) (33.63N 90.10W)									3.77
Yazoo City (YZOM6) (32.84N 90.44W)									3.67
Advanced Hydrological Prediction Service (AHPS) Sites									
Rosetta (RSAM6) (31.33N 91.10W)									10.05
NWS Cooperative Observer Program (COOP) Sites									
Coffeeville (CFFM6) (33.98N 89.67W)									3.19
Canton 1E (CNTM6) (32.63N 90.02W)									5.64
Crystal Springs (CRSM6) (31.97N 90.37W)									3.67

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)				
Meadville (MDLM6) (31.47N 90.88W)									7.74
Natchez (NATM6) (31.55N 91.38W)									5.31
Oakley Exp. Stn. (OESM6) (32.20N 90.52W)									3.45
Union Church (UCHM6) (31.68N 90.78W)									7.23
Vicksburg (VICM6) (32.35N 90.87W)									4.30
Winona 5E (WNOM6) (33.49N 89.64W)									3.03
Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) Sites									
Natchez 9.1ESE (MS-AD-4) (31.48N 91.92W)									7.15
Hazlehurst 8.3WSW (MS-CP-4) (31.81N 90.52W)									7.06
Vaiden 4.8WNW (MS-CR-1) (33.36N 89.83W)									6.13
West Point 4.3N (MS-CY-3) (33.67N 89.63W)									4.50
Grenada 7.9NNW (MS-GD-9) (33.89N 89.84W)									4.60
Terry 5.7NW (MS-HD-12) (32.17N 90.36W)									5.12
Clinton 2.1SW (MS-HD-17) (32.N 90.36W)									6.02
Jackson 6NE (MS-HD-18) (32.38N 90.14W)									5.27
Raymond 2.7E (MS-HD-25) (32.26N 90.38W)									5.25
Fayette 6SE (MS-JF-1) (31.65N 90.99W)									6.42

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)				
Columbus 5.3N (MS-LW-2) (33.58N 88.40W)									4.18
Ridgeland 1.1S (MS-MD-1) (32.41N 90.13W)									4.53
Madison 5.6WNW (MS-MD-7) (32.49N 90.19W)									5.59
Flora 2.3S (MS-MD-10) (32.51N 90.31W)									4.80
Canton 7NNW (MS-MD-25) (32.70N 90.08W)									5.56
Aberdeen 8.7E (MS-MN-5) (33.84N 88.40W)									4.48
Brandon 9N (MS-RN-28) (32.40N 89.87W)									4.35
New Hebron 8.7WNW (MS-SP-1) (31.79N 90.11W)									5.01
Vicksburg 2.2NE (MS-WR-1) (33.35N 90.84W)									3.99
Leland 3.3ENE (MS-WS-1) (33.43N 90.85W)									4.56
Alabama									
National Ocean Service (NOS) Sites									
Bayou La Batre (BLBA1) (30.41N 88.25W)						1.57	2.79	1.9	
Dog River Bridge (BYSA1) (30.42N 87.83W)						1.39		1.6	
Chickasaw Creek (CIKA1) (30.78N 88.07W)						1.67	2.69	1.4	
Dauphin Island (DILA1) (30.25N 88.08W) (36m)	19/0654	1013.5		31	39	1.92	2.52	1.8	

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)				
East Fowl River (EFRA1) (30.44N 88.11W)						1.52	2.53	1.7	
Mobile USCG (MCGA1) (30.65N 88.06W) (7.0m)	19/0000	1014.4	20/0412		24	1.77	2.74	1.6	
Mobile State Docks (OBLA1) (30.71N 88.04W)						1.50	2.67	1.5	
Weeks Bay (WBYA1) (30.42N 87.83W)						1.38		1.5	
West Fowl River (WFRA1) (30.38N 88.16W)						1.46	2.63	1.7	
Remote Automated Weather Stations (RAWS)									
Liri (LWRA1) (34.50N 85.62W)									3.08
Hydrometeorological Automated Data System (HADS) Sites (NWS)									
Chase (CHSA1) (34.82N 86.48W)									3.35
Advanced Hydrological Prediction Service (AHPS) Sites									
Courtland 1W (BNAA1) (34.66N 87.32W)									3.42
Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) Sites									
Sylvania 3.4ESE (AL-DK-8) (34.53N 85.76W)									4.12
Scottsboro 1.7N (AL-JC-11) (34.67N 86.05W)									5.35
Vernon 1.1NNE (AL-LM-4) (33.77N 88.10W)									4.73
Moulton 3.1ENE (AL-LR-7) (34.50N 88.23W)									4.12
Madison 1.4NNE (AL-MD-31) (34.72N 86.74W)									5.23

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)				
Lacey's Springs 3.4SSW (AL-MG-12) (34.49N 86.63W)									5.20
Addison 3.8N (AL-WN-2) (34.26N 87.18W)									3.88
Arkansas									
International Civil Aviation Organization (ICAO) Sites									
El Dorado (KELD) (33.22N 92.81W)									3.16
Hot Springs (KHOT) (34.48N 93.10W)									3.78
Mount Ida (KMWT) (34.55N 93.58W)									3.66
Pine Bluff (KPBF) (34.18N 91.93W)									3.61
Texarkana (KTXK) (33.45N 94.01W)									4.13
Remote Automated Weather Stations (RAWS)									
Bluff City (BLRA4) (33.69N 93.16W)									3.83
Felsenthal NWR (LRRA4) (33.16N 92.19W)									4.44
Sheridan (SDNA4) (34.32N 92.35W)									4.22
Hydrometeorological Automated Data System (HADS) Sites (NWS)									
Caddo Gap 1S (CDDA4) (34.38N 93.61W)									3.24
Lake Village 3NE (CBGA4) (33.37N 91.25W)									6.20
Dierks 4SW (DIRA4) (34.10N 94.08W)									3.35
Fulton (FLTA4) (33.61N 93.81W)									5.71
Ogden 2S (INGA4) (33.55N 94.03W)									5.73

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)				
Sanders Lock & Dam (LADA4) (34.25N 91.90W)									4.08
Langley (LANA4) (34.31N 93.90W)									4.57
NWS Cooperative Observer Program (COOP) Sites									
Antoine (ANTA4) (34.04N 93.42W)									4.51
Ashdown (ASHA4) (33.62N 94.10W)									5.61
Blakely Mtn. Dam (BMDA4) (34.57N 93.20W)									3.03
Thatcher Lock & Dam (CALA4) (33.30N 92.49W)									4.27
DeQueen (DQEA4) (34.03N 94.34W)									3.31
Eudora (EDAA4) (33.12N 91.27W)									6.88
Felsenthal Lock & Dam (FELA4) (33.07N 92.08W)									5.18
Fordyce (FRDA4) (33.82N 92.40W)									3.99
Hot Springs (HOTA4) (34.52N 93.05W)									4.47
Kelso 3NW (KELA4) (33.83N 91.27W)									6.17
Lewisville (LEWA4) (33.36N 93.57W)									6.69
Malvern (MLVA4) (34.38N 92.82W)									5.19
Moro Bay (MOBA4) (33.30N 92.35W)									3.87
Murfreesboro 1W (MRFA4) (34.08N 93.70W)									4.86
Nashville (NSVA4) (33.93N 93.85W)									5.45
Pine Bluff (PBOA4) (34.23N 92.02W)									4.75
Portland (PORA4) (33.23N 91.50W)									5.66
Rowher 2NNE (RHWA4) (33.80N 91.27W)									6.20

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)				
Public/Other									
Magnolia 3N (MAGA4) (33.25N 93.23W)									5.55
Ashdown 8E (MWOA4) (33.68N 93.99W)									4.96
Star City 6E (MWOA4) (33.91N 91.77W)									3.77
Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) Sites									
De Witt 0.2N (AR-AR-2) (34.29N 91.34W)									4.23
Crossett 0.9S (AR-AS-9) (33.11N 91.97W)									4.02
Arkadelphia 2.4NW (AR-CK-7) (34.14N 93.10W)									4.46
McNeil 1.4E (AR-CM-5) (33.35N 93.18W)									5.18
Hampton 6.8SE (AR-CN-3) (33.48N 92.37W)									4.09
Hot Springs 2.3S (AR-GL-16) (34.46N 93.05W)									5.19
Hope 12.2S (AR-HM-6) (33.49N 93.62W)									6.17
Buckner 0.8NNW (AR-LF-1) (33.37N 93.44W)									7.33
Bradley 7.8W (AR-LF-3) (33.12N 93.79W)									4.21
Lewisville 7.8NNW (AR-LF-7) (33.47N 93.63W)									5.45
Ashdown 6.5NNW (AR-LR-1) (33.76N 94.18W)									4.77
Fouke 5.3ENE (AR-ML-11) (33.28N 93.80W)									5.25

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)				
Delight 0.3NNW (AR-PK-1) (34.03N 93.51W)									4.22
Murfreesboro 4.5E (AR-PK-9) (34.08N 93.61W)									6.80
Tennessee									
Remote Automated Weather Stations (RAWS)									
Delano (DLOT1) (35.25N 84.58W)									3.18
Prentice Cooper SF (PCFT1) (35.13N 85.43W)									3.15
Hydrometeorological Automated Data System (HADS) Sites (NWS)									
Fayetteville (FYTT1) (35.13N 86.53W)									3.04
Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) Sites									
Cleveland 4.7S (TN-BR-20) (35.11N 84.87W)									4.98
Harrison 1.7ESE (TN-HL-19) (35.12N 85.12W)									4.18
Ooltewah 3SW (TN-HL-23) (35.04N 85.09W)									5.08
East Ridge 0.9NW (TN-HL-51) (35.01N 85.24W)									4.17
Greenback 2.1ENE (TN-LN-10) (35.67N 85.14W)									4.14
Etowah 0.7NNW (TN-MM-2) (35.34N 84.53W)									4.89
Vonore 2.3SSW (TN-MR-14) (35.56N 84.24W)									4.14
Benton 2.3ESE (TN-PK-1) (35.17N 84.61W)									5.03

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)				
Georgia									
Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) Sites									
Tunnel Hill 4.8N (GA-CS-12) (34.92N 85.04W)									4.05
Blue Ridge 9.4WNW (GA-FN-1) (34.92N 84.48W)									4.43
Cherry Log 6.9NNW (GA-FN-5) (34.88N 84.42W)									4.72
Sugar Valley 2.9NW (GA-GD-3) (34.58N 85.05W)									3.61
Ellijay 9.9NW (GA-GM-4) (34.80N 84.61W)									3.48
Dalton 7.8SE (GA-WF-4) (34.68N 84.90W)									3.34

[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] 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 NOS tide gauges and USGS water level sensors, the height of the water above Mean Higher High Water (MHHW) is used as a proxy for inundation. Values marked with two asterisks (**) are from non-tidal stations, and the water level is referenced above Mean Sea Level (MSL).
* Water levels likely had a significant freshwater contribution from rainfall.
** Station is located in a nontidal area, and the value is referenced above Mean Sea Level (MSL).
[i] Incomplete data.

Table 4. Number of hours in advance of formation of Tropical Storm Beta 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%)	168	168
Medium (40%-60%)	24	30
High (>60%)	6	18

Table 5a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Tropical Storm Beta, 17–22 September 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	24.1	**36.7**	**45.7**	**50.8**	**53.6**	**60.3**	**108.3**	199.1
OCD5	41.7	81.7	128.6	188.9	258.4	324.1	364.9	348.1
Forecasts	19	17	15	13	11	9	5	1
OFCL (2015-19)	24.1	36.9	49.6	65.1	80.7	96.3	133.2	171.6
OCD5 (2015-19)	44.7	96.1	156.3	217.4	273.9	330.3	431.5	511.9

Table 5b. Homogeneous comparison of selected track forecast guidance models (in n mi) for Tropical Storm Beta, 17–22 September 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	24.1	36.7	45.7	50.8	53.6	60.3	108.3	199.1
OCD5	41.7	81.7	128.6	188.9	258.4	324.1	364.9	348.1
GFSI	28.0	47.6	52.4	54.6	61.1	70.3	110.4	213.6
HWFI	37.9	51.6	60.2	66.9	72.1	63.1	**53.4**	**142.1**
HMNI	29.5	40.3	56.4	68.9	74.4	97.1	176.9	**174.3**
EMXI	27.8	47.3	64.4	80.2	81.7	75.9	**65.9**	**72.2**
NVGI	35.5	57.5	75.2	83.6	83.3	82.7	**86.2**	**95.4**
CMCI	28.0	46.9	65.4	71.8	75.7	81.8	**86.0**	**93.8**
CTCI	**23.1**	**26.7**	**35.6**	**36.8**	**38.9**	**30.4**	**46.3**	**66.8**
TVCA	**24.0**	**35.0**	**42.1**	**47.7**	**48.4**	**51.8**	**82.3**	**148.7**
TVCX	**24.7**	**34.8**	**44.7**	**50.3**	**51.1**	**52.7**	**77.2**	**137.1**
GFEX	**26.2**	43.9	55.2	62.0	65.1	67.6	**84.9**	**137.1**
HCCA	24.1	**35.2**	**42.8**	50.9	57.6	66.6	**102.8**	216.6
AEMI	26.9	42.6	49.7	53.2	57.5	67.4	115.8	**175.3**
TABS	42.3	87.6	127.8	159.4	185.2	212.3	270.0	582.2
TABM	41.3	84.6	130.3	160.0	170.3	153.0	**85.9**	**133.2**
TABD	50.2	109.0	170.7	223.4	262.7	276.5	174.1	148.3
Forecasts	19	17	15	13	11	9	5	1

Table 6a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Tropical Storm Beta, 17–22 September 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	**4.2**	**5.0**	**6.0**	12.3	16.4	20.0	22.0	25.0
OCD5	6.3	9.4	11.2	9.5	10.5	11.2	4.6	3.0
Forecasts	19	17	15	13	11	9	5	1
OFCL (2015-19)	5.2	7.7	9.4	10.7	11.9	13.0	14.4	15.5
OCD5 (2015-19)	6.8	10.8	14.1	17.0	18.8	20.6	22.5	24.6

Table 6b. Homogeneous comparison of selected intensity forecast guidance models (in kt) for Tropical Storm Beta, 17–22 September 2020. Errors smaller than the NHC official forecast are shown in boldface type. The number of official forecasts shown here will generally be smaller than that shown in Table 6a due to the homogeneity requirement.

Model ID	Forecast Period (h)							
	12	24	36	48	60	72	96	120
OFCL	4.2	5.0	6.0	12.3	16.4	20.0	22.0	25.0
OCD5	6.3	9.4	11.2	**9.5**	**10.5**	**11.2**	**4.6**	**3.0**
HMNI	4.8	6.5	7.9	**9.1**	**9.5**	**10.2**	**7.6**	**17.0**
HWFI	5.6	7.5	9.4	**10.2**	**12.9**	**13.3**	**10.4**	**9.0**
DSHP	5.3	5.5	**5.3**	**8.7**	**14.1**	**19.4**	24.8	28.0
LGEM	5.3	6.9	6.1	**6.2**	**8.0**	**10.4**	**10.8**	**15.0**
ICON	4.6	**4.4**	**4.1**	**4.0**	**4.8**	**5.3**	**5.2**	**13.0**
IVCN	4.6	**4.7**	**4.4**	**3.6**	**4.5**	**4.9**	**6.8**	**22.0**
IVDR	4.5	**4.6**	**4.9**	**4.0**	**4.9**	**5.2**	**6.0**	**20.0**
CTCI	5.1	6.5	6.6	**4.0**	**3.4**	**3.2**	**15.0**	61.0
GFSI	5.3	7.5	7.1	**5.2**	**7.1**	**7.2**	**9.6**	**1.0**
EMXI	5.5	8.1	8.3	**9.7**	**10.7**	**10.3**	**4.8**	**13.0**
HCCA	4.8	**4.6**	**5.3**	**4.8**	**5.0**	**4.8**	**6.4**	30.0
Forecasts	19	17	15	13	11	9	5	1

Table 7a. Tropical cyclone wind watch and warning summary for Tropical Storm Beta, 17–22 September 2020.

Date/Time (UTC)	Action	Location
19/0300	Hurricane Watch issued	Texas coast from Port Aransas to High Island
19/0300	Tropical Storm Watch issued	Texas coast south of Port Aransas to the mouth of the Rio Grande, and east of High Island to Morgan City, Louisiana
19/1500	Tropical Storm Warning issued	Port Aransas, Texas to Intracoastal City, Louisiana
20/0300	Tropical Storm Warning issued	Louisiana coast east of Intracoastal City to Morgan City
20/0900	Hurricane Watch discontinued	Texas coast from Port Aransas to High Island
20/0900	Tropical Storm Watch discontinued	Texas coast south of Port Mansfield
20/1500	Tropical Storm Watch discontinued	Texas coast south of Baffin Bay
21/2100	Tropical Storm Watch discontinued	Texas coast south of Port Aransas
22/0900	Tropical Storm Warning discontinued	East of Sabine Pass, Texas
22/1500	All coastal warnings discontinued	

Table 7b. Storm surge watch and warning summary for Tropical Storm Beta, 17–22 September 2020.

Date/Time (UTC)	Action	Location
19/0300	Storm Surge Watch issued	Texas coast from Port Mansfield to High Island including Baffin Bay, Corpus Christi Bay, Copano Bay, Aransas Bay, San Antonio Bay, Matagorda Bay, and Galveston Bay
19/0900	Storm Surge Watch issued	East of High Island, Texas to Cameron, Louisiana including Sabine Lake and Calcasieu Lake
19/2100	Storm Surge Warning issued	Texas coast from Port Aransas to High Island including Copano Bay, Aransas Bay, San Antonio Bay, Matagorda Bay, and Galveston Bay
19/2100	Storm Surge Watch discontinued	Texas coast from Port Mansfield to Baffin Bay
20/0300	Storm Surge Warning issued	East of High Island, Texas to Rockefeller NWR, Louisiana
20/0900	Storm Surge Watch discontinued	Texas coast from Baffin Bay to Port Aransas
21/1500	Storm Surge Warning discontinued	East of Sabine Pass, Texas to Rockefeller NWR, Louisiana
22/0600	Storm Surge Warning discontinued	Texas coast south of Sargent
22/1500	All Storm Surge Warnings discontinued	

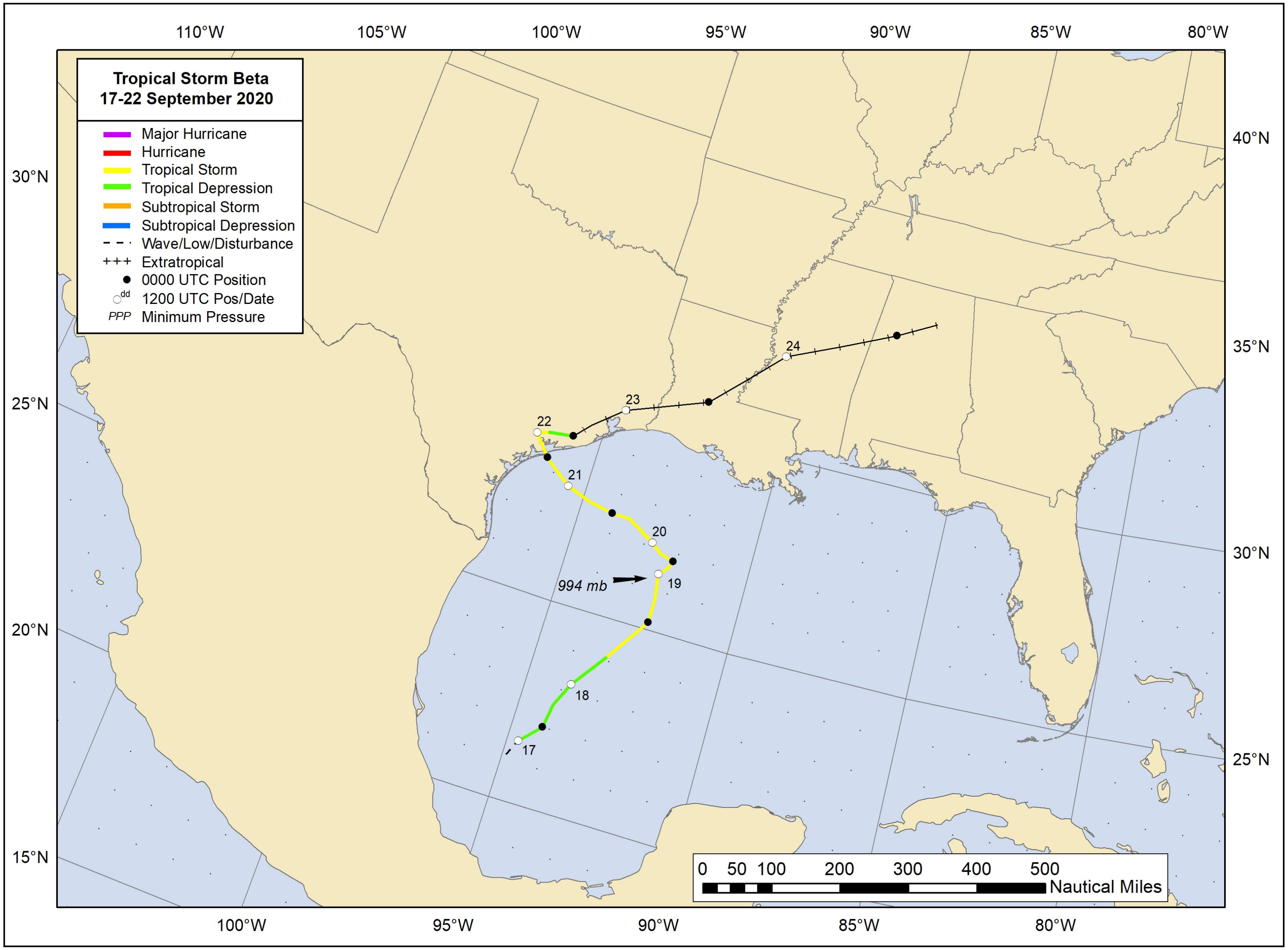

Figure 1. Best track positions for Tropical Storm Beta, 17–22 September 2020. The track over the United States and during the extratropical stage are partially based on analyses from the NOAA Weather Prediction Center.

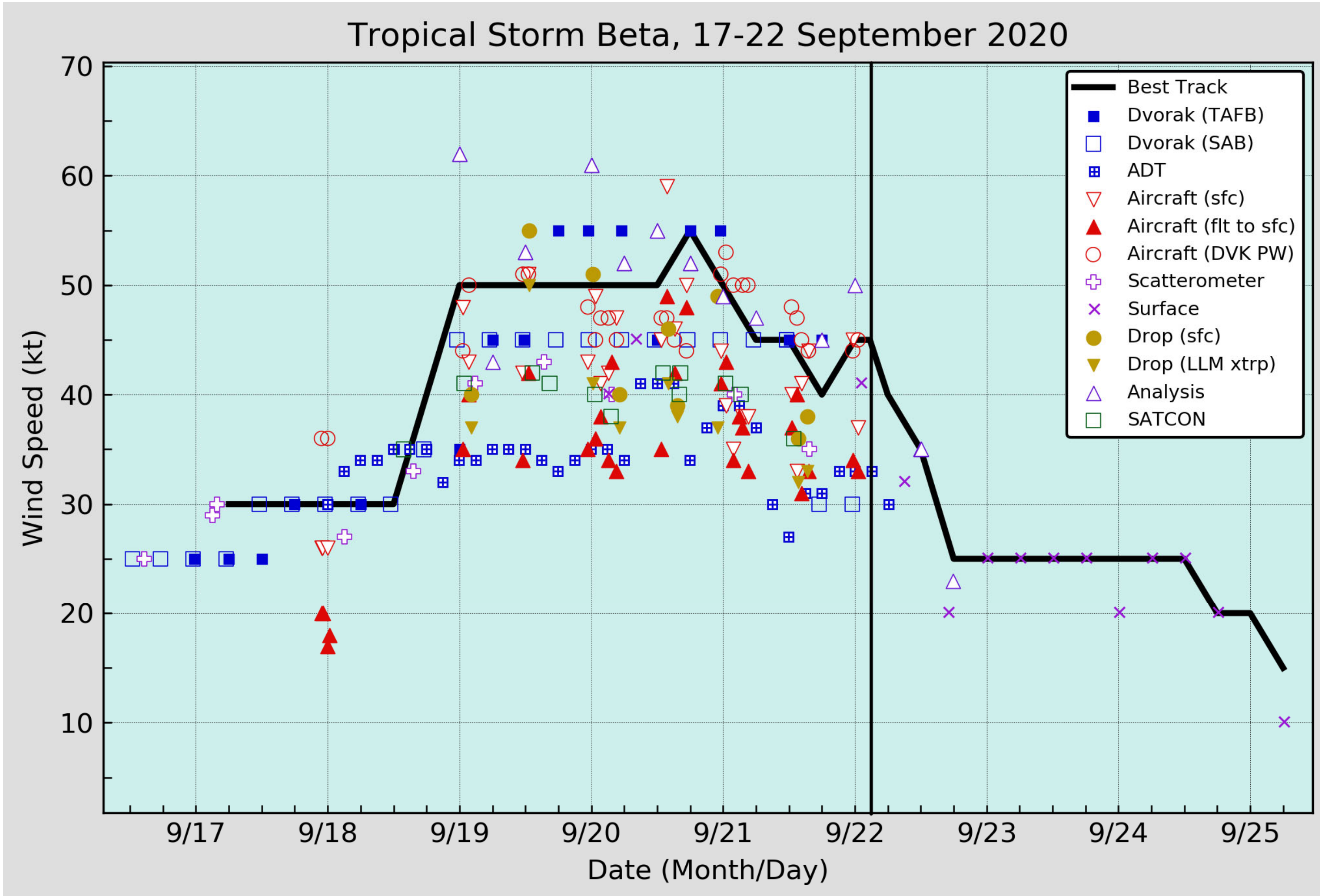

Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Tropical Storm Beta, 17–22 September 2020. Aircraft observations have been adjusted for elevation using 80%, 75%, and 80% adjustment factors for observations from 850 mb, 925 mb, and 1500 ft, respectively. 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.

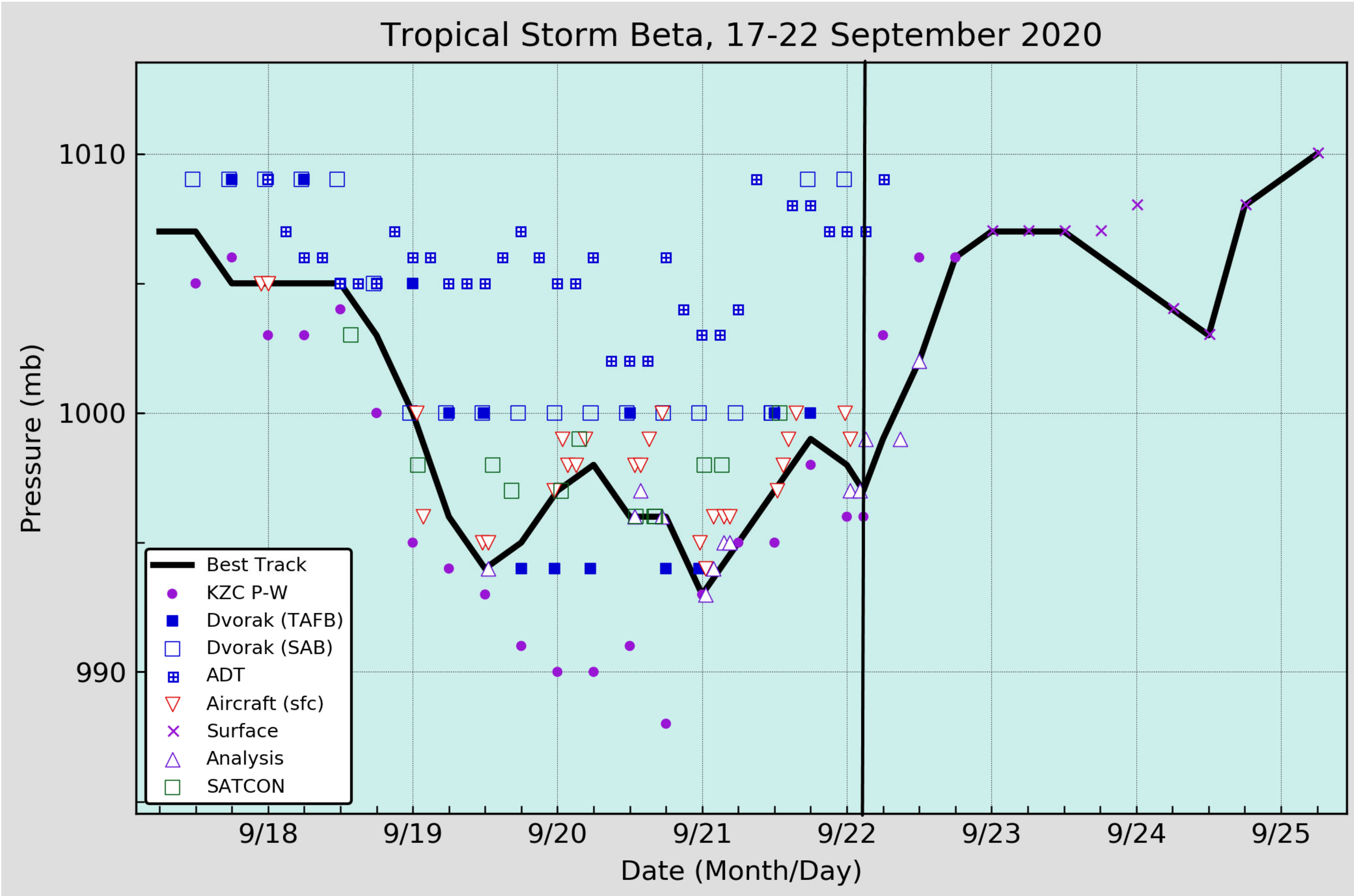

Figure 3. Selected pressure observations and best track minimum central pressure curve for Tropical Storm Beta, 17–22 September 2020. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for 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.

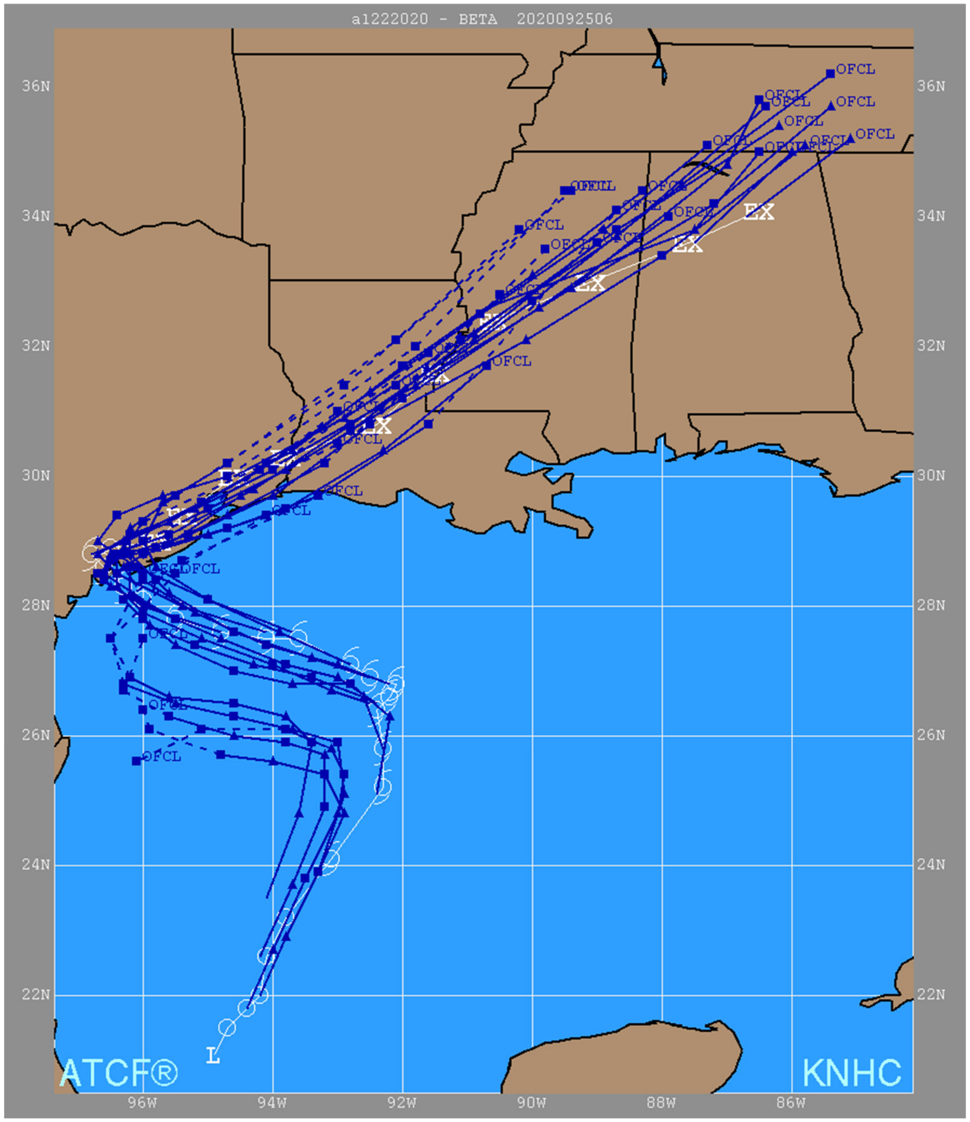

Figure 4. Selected official track forecasts (blue lines, with 0, 12, 24, 36, 48, 60, 72, 96, and 120 h positions indicated) for Tropical Storm Beta, 17–22 September 2020. The best track is given by the white line with positions given at 6-h interval.

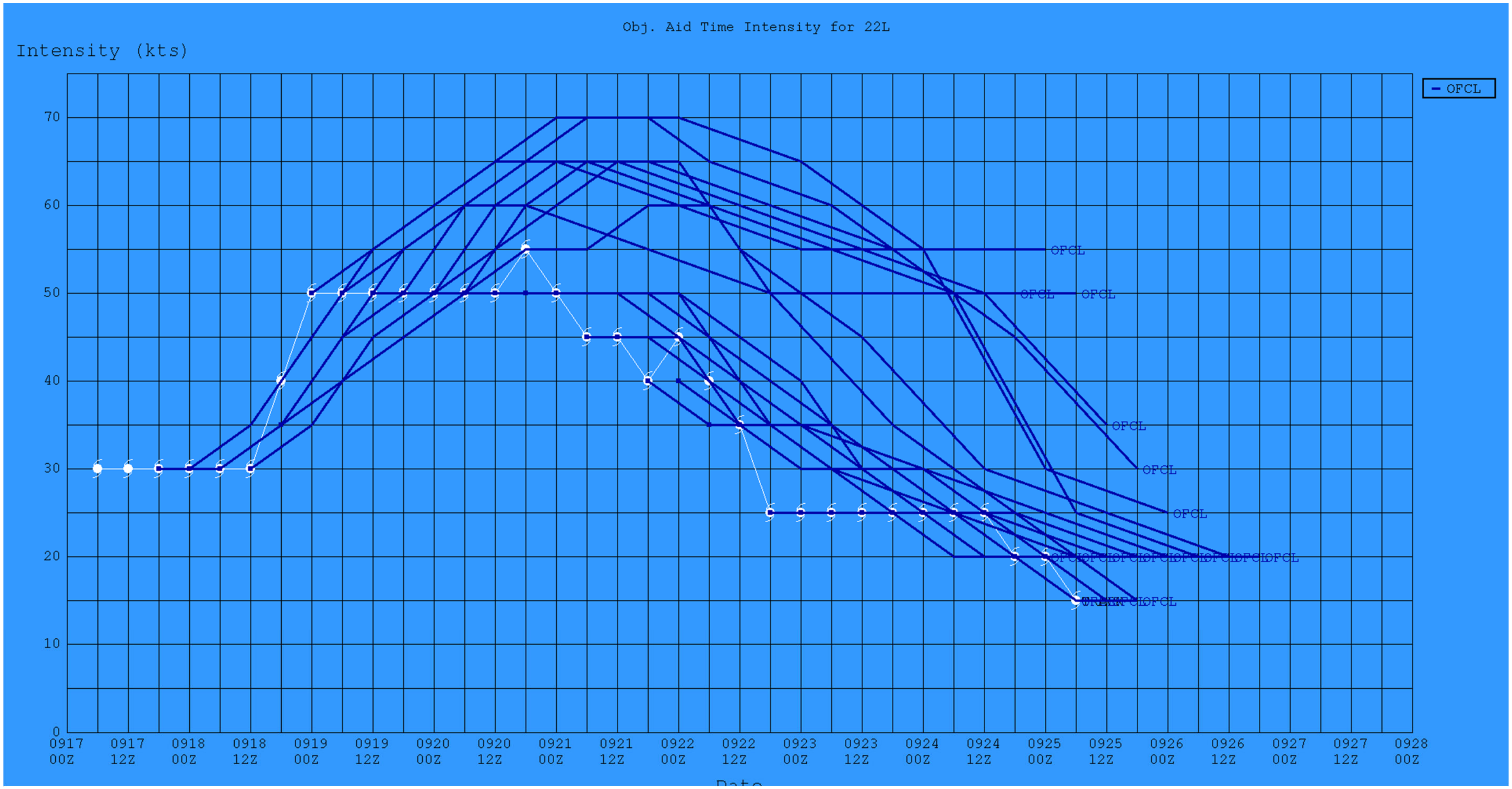

Figure 5. Selected official intensity forecasts (blue lines, kt) for Tropical Storm Beta, 17–22 September 2020. The best track is given by the white line with intensities (kt) given at 6-h intervals.

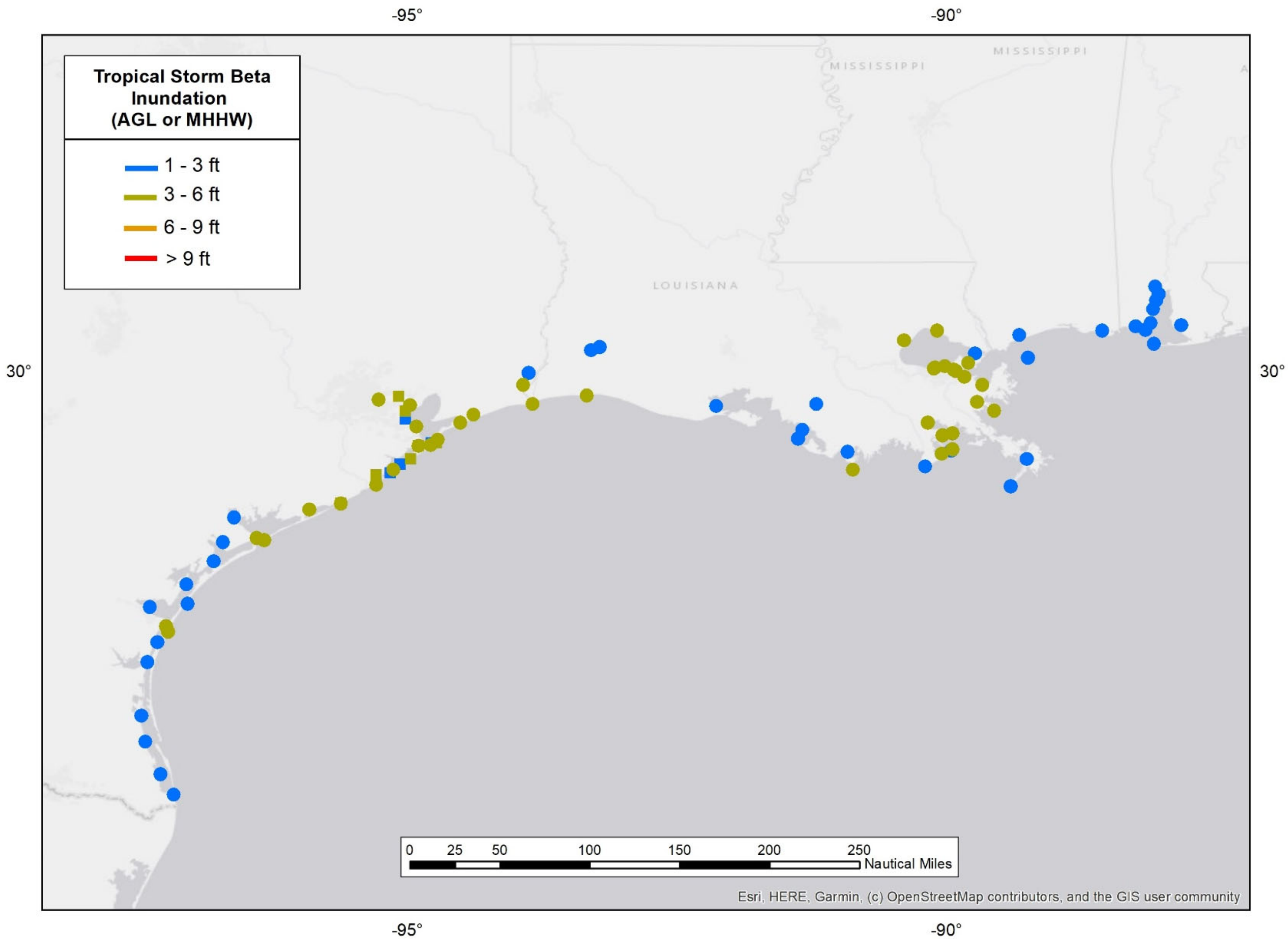

Figure 6. Maximum water levels measured from tide and stream gauges (circles) and surveyed high water marks (squares) from Tropical Storm Beta, 17–22 September 2020. Depending on the data type, water levels are referenced as feet above ground level (AGL), or Mean Higher High Water (MHHW) / Mean Sea Level (MSL), which are used as a proxy for inundation (above ground level) on normally dry ground along the immediate coastline.

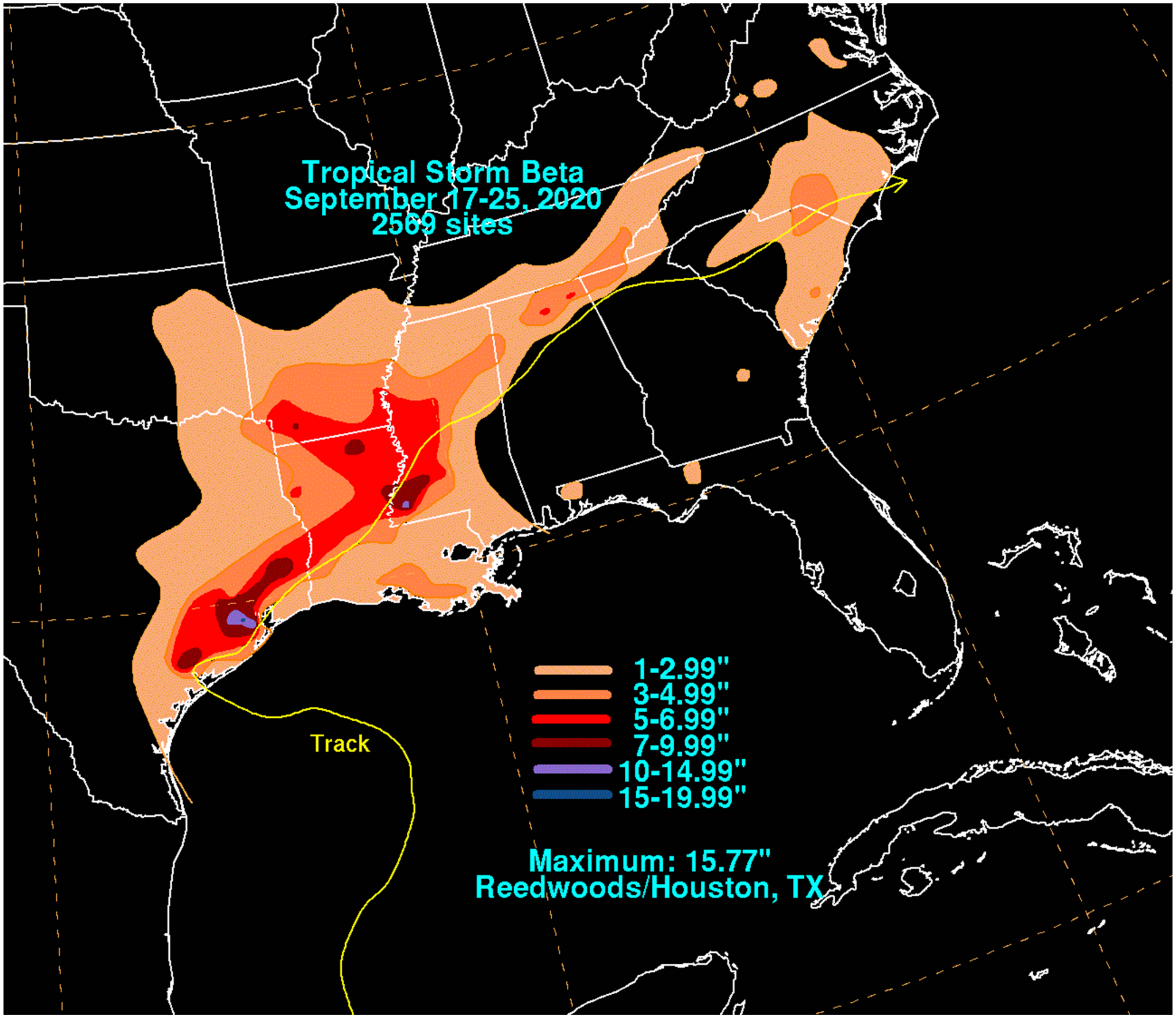

Figure 7. Storm total rainfall (inches) for Tropical Storm Beta, 17–22 September 2020. Data and imager courtesy of Dave Roth and Zack Taylor at the Weather Prediction Center, College Park, MD.

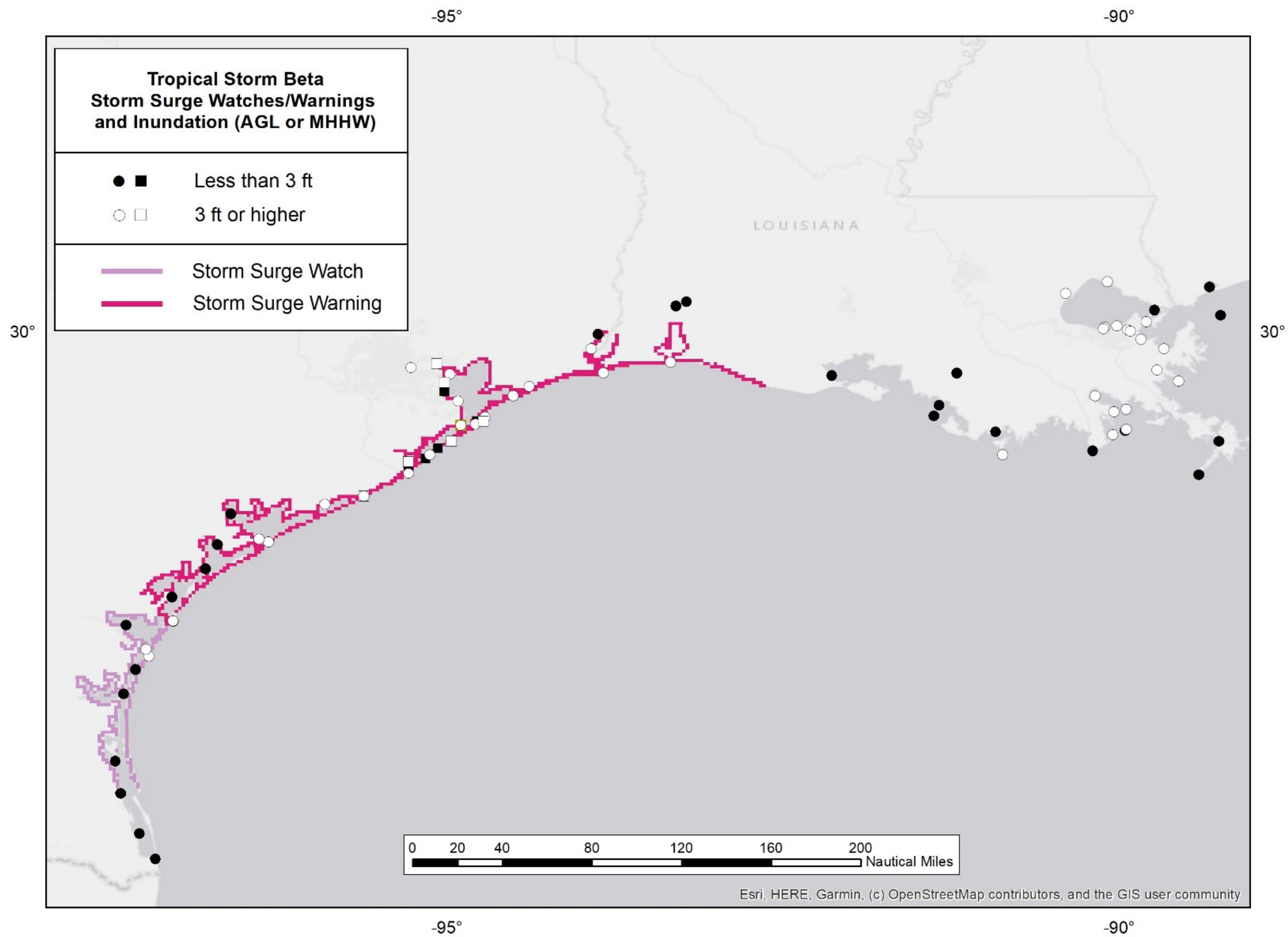

Figure 8. Maximum water levels measured during Tropical Storm Beta from tide and stream gauges (circles) and surveyed high water marks (squares), as well as areas covered by storm surge watches (lavender) and warnings (magenta). Water levels are referenced as feet above ground level (AGL) or Mean Higher 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.