NATIONAL HURRICANE CENTER TROPICAL CYCLONE REPORT

TROPICAL STORM ALBERTO

(AL012018)

25–31 May 2018

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NASA TERRA/MODIS VISIBLE IMAGE OF ALBERTO AT 1621 UTC 27 MAY 2018 WHILE IT WAS A SUBTROPICAL STORM

Alberto formed as a subtropical depression over the northwestern Caribbean Sea, became a subtropical storm over the southeastern Gulf of Mexico, and then transformed into a tropical storm before making landfall along the coast of the Florida Panhandle. Alberto continued inland as a tropical depression well north into Michigan and produced heavy rainfall and flooding across the southern and central Appalachian Mountains, which took the lives of eight people in North Carolina and Virginia. Ten people also died in western and central Cuba due to heavy rainfall and flooding.

Tropical Storm Alberto

25–31 MAY 2018

SYNOPTIC HISTORY

Alberto had non-tropical origins. On 12 May, a mid- to upper-level trough moved eastward from Mexico and persisted over the Gulf of Mexico and northwestern Caribbean Sea for over a week. The upper tough became negatively tilted (northwest to southeast) by 20 May, which increased upper-level diffluence over the northwestern Caribbean Sea and caused the development of a broad surface low between Honduras and the Cayman Islands. The broad low drifted westward for the next several days, eventually moved over the Yucatan Peninsula on 23 May, and then meandered over land for another two days. The system re-emerged over the northwestern Caribbean Sea early on 25 May, and a well-defined center of circulation developed once the low was over water. Given the low's broad wind field, asymmetric convective pattern, and involvement with a mid- to upper-level low, it is estimated to have become a subtropical depression by 1200 UTC 25 May while centered about 70 n mi east-northeast of Chetumal, Mexico. The subtropical depression remained relatively disorganized for another day or so, and its convection was displaced well to the east of the low-level center, which itself moved discontinuously and re-formed just north of the Yucatan Channel on 26 May. The "best track" chart of the 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].

Deep convection developed closer to the new center when it re-formed over the southeastern Gulf of Mexico, and the winds began to increase. The cyclone became a subtropical storm by 1800 UTC 26 May while it was centered about 50 n mi north-northwest of the western tip of Cuba. Alberto subsequently moved northward over the eastern Gulf of Mexico and changed little in intensity for the next 12 h. However, a strengthening trend began on 27 May as the deep convection migrated closer to the center of circulation and the radius of maximum winds decreased from about 90 n mi to 40 n mi. Alberto's structural evolution throughout the day on 27 May suggests that the cyclone underwent tropical transition (cover photo), and Alberto coincidentally became a tropical storm and reached its estimated peak intensity of 55 kt by 0000 UTC 28 May when it was centered about 100 n mi south-southwest of Apalachicola, Florida. Alberto rotated around the northern side of an upper-level low located over the central Gulf of Mexico and moved only slowly northward early on 28 May while it approached the northern Gulf coast.

After Alberto became a tropical storm, the intensity of its associated deep convection declined somewhat, and the cyclone's maximum winds gradually decreased on 28 May. Continuing northward at a faster pace, Alberto made landfall near the Bay County/Walton County

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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.

Line in the Florida Panhandle around 2100 UTC 28 May with estimated maximum winds of 40 kt. Weakening continued after landfall, and Alberto became a tropical depression by 0000 UTC 29 May while located near the Florida-Alabama border about 40 n mi southwest of Dothan, Alabama.

Located to the west of a mid-tropospheric ridge, Alberto moved north-northwestward across Alabama and Tennessee on 29 May and then turned northward and northeastward over western Kentucky and Indiana on 30 May ahead of an advancing mid- to upper-level shortwave trough over the Upper Midwest. During that time, Alberto continued to produce organized deep convection near its center, and it still had a compact, well-defined circulation (Fig. 4), allowing it to remain as a tropical depression with maximum winds of 30 kt even as it moved into southwestern Michigan early on 31 May. The cyclone's convective organization deteriorated shortly thereafter, however, and Alberto became a remnant low by 0600 UTC 31 May while centered about 25 n mi west of Saginaw, Michigan. The remnant low continued north-northeastward over Lower Michigan and the western part of Lake Huron but dissipated over southern Ontario soon after 1200 UTC that day.

METEOROLOGICAL STATISTICS

Observations in Alberto (Figs. 2 and 3) include subjective satellite-based Dvorak technique and Hebert-Poteat subtropical cyclone technique intensity estimates from the Tropical Analysis and Forecast Branch (TAFB), and objective Advanced Dvorak Technique (ADT) estimates and Satellite Consensus (SATCON) estimates from the Cooperative Institute for Meteorological Satellite Studies/University of Wisconsin-Madison. Observations also include flight-level, stepped frequency microwave radiometer (SFMR), and dropwindsonde observations from six flights of the 53rd Weather Reconnaissance Squadron 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 Alberto.

Ship reports of winds of tropical storm force associated with Alberto are given in Table 2, and selected surface observations from land stations and data buoys are given in Table 3. Figure 5 shows selected locations along the northern Gulf Coast and over the Gulf of Mexico that reported sustained winds of 34 kt or higher.

Winds, Pressure, and Structure

Alberto is estimated to have attained 35-kt sustained winds as a subtropical storm by 1800 UTC 26 May based on a blend of subtropical Hebert-Poteat classifications from TAFB, ADT estimates, and aircraft observations. A couple of ships reported tropical-storm-force winds early on 25 May when Alberto became a subtropical cyclone, however an Air Force Reserve reconnaissance flight later that day only measured winds that would support an intensity of 20 or 25 kt, at best. Once Alberto's center re-formed near the Yucatan Channel on 26 May, the subsequent two Air Force Reserve missions measured 1000-ft. flight-level winds that supported an intensity at or just below 35 kt.

Alberto's estimated peak intensity of 55 kt from 0000 UTC to 0600 UTC 28 May is based on aircraft data and an increase in subtropical classifications from TAFB. The SFMR measured peak winds of 54 kt at 2348 UTC 27 May in a region of little to no rain, and TAFB's classification increased to ST3.5 at 0600 UTC 28 May, which equates to a range of intensity estimates from 55 to 65 kt.

Winds measured by the Air Force Reserve aircraft and satellite intensity estimates both decreased after 0600 UTC 28 May leading up to Alberto's landfall on the Florida Panhandle. The last pass of the final Air Force Reserve mission measured winds to support an intensity of 45 kt around 1700 UTC, and surface stations along the Florida Panhandle all reported sustained winds less than 40 kt after that time. Based on these data, the landfall intensity at 2100 UTC is estimated to be 40 kt.

Sustained tropical-storm-force winds occurred along the immediate coast of a portion of the Florida Panhandle between Panama City and St. Marks on Apalachee Bay (Fig. 5). The highest sustained wind speed measured by a land station at a standard height was 44 kt by a WeatherSTEM station on the St. George Island Bridge at 1500 UTC 28 May. A sustained wind of 38 kt was also measured by a WeatherFlow station at 1952 UTC 28 May in St. Andrew Bay near Panama City, just to the east of the landfall location.

Alberto's estimated minimum central pressure of 990 mb at 0600 UTC 28 May is based on data from NOAA buoy 42039, located 115 n mi south-southeast of Pensacola, Florida, which measured a pressure of 993.3 mb with 35-kt sustained winds at 0450 UTC that day.

Alberto was classified as a subtropical cyclone at genesis on 25 May for a number of reasons. First, the cyclone was located just to the east of a sharp mid- to upper-level trough, and the associated deep convection was displaced well to the east and north of the low-level center. In the development of their classification scheme, Hebert and Poteat (1975) identified three subcategories of subtropical cyclones, one of which encompasses nonfrontal lows that form east of upper troughs. In addition, the cyclone had a large radius of maximum winds on the order of 90 n mi. A transition from a subtropical to tropical storm occurred on 27 May, with the radius of maximum winds decreasing to about 40 n mi, the deep convection becoming more symmetric and collocated with the low-level center, and Alberto becoming more separated from the upper-level low over the Gulf of Mexico. In addition, as shown in Fig. 6, the cyclone developed a deeper warm core, an evolution which was evident in AMSU data in channels 5 (550 mb), 6 (350 mb), and 7 (200 mb) from 1411 UTC 27 May to 0129 UTC 28 May. Model analyses also detected the development of a deeper warm core, with cyclone phase-space diagrams depicting the transition from a shallow warm core to a deep warm core on 27 May (Fig. 7). Based on these satellite and model data, Alberto is analyzed to have completed its transition from a subtropical storm to a tropical storm by 0000 UTC 28 May. While Alberto was carried operationally as a subtropical cyclone until it was declared tropical late on 29 May when the system was inland over western Tennessee, NHC forecasters recognized ambiguity in the storm's structure and classification prior to landfall. A post-storm analysis, in particular of the above-mentioned AMSU data, is the basis for the current determination that Alberto became a tropical storm by 0000 UTC 28 May.

Storm Surge[2]

The highest measured storm surge was 3.08 ft above normal tide levels at a National Ocean Service (NOS) gauge at Apalachicola, Florida. The combined effect of the surge and tide produced inundation levels of 1 to 3 ft above ground level primarily along the coast of the Florida Panhandle and the west coast of Florida. Some minor, localized coastal flooding also occurred along the coasts of Alabama, Mississippi, and southeastern Louisiana. United States Geological Survey (USGS) gauges at Spring Creek and Shell Point on Apalachee Bay measured water levels of 3.2 ft MHHW, and the NOS gauge at Apalachicola recorded a maximum water level of 3.0 ft MHHW. Figure 8 shows storm tide observations above MHHW from NOS and USGS gauges, which provide rough approximations of inundation above normally dry ground near the gauge locations.

Rainfall and Flooding

Even though Alberto's center moved northward through the Yucatan Channel, heavy rainfall occurred well to the east across much of central and western Cuba. A maximum of 14.41 inches was recorded at Heriberto Duquezne in Villa Clara province, and more than 7 inches were measured in the provinces of Pinar del Rio, Artemisa, Matanzas, Cienfuegos, Sancti Spiritus, and Ciego de Avila. Flooding and mudslides were reported throughout central and western Cuba, and the heavy rainfall caused Cuba's largest reservoir, the Zaza, in Sancti Spiritus province to reach its second highest level on record.

Much like in Cuba, the heaviest rainfall in the United States occurred well to the east of Alberto's center. Heavy rainfall fell over the Florida peninsula over a multi-day period as Alberto moved northward across the eastern Gulf of Mexico, with a maximum six-day total of 11.80 inches reported at Taylor Creek on the northern shore of Lake Okeechobee from 25–30 May. Copious moisture surged northward on the east side of Alberto across Georgia, the Carolinas, and Virginia, where flooding rains occurred on the southeast-facing side of the southern and central Appalachian Mountains. Maximum rainfall totals of 12.30 inches were reported near Helen in northeastern Georgia, 12.21 inches near Jonas Ridge in western North Carolina, 8.89 inches in upstate South Carolina just across the border from Tryon, North Carolina, and 5.48 inches near Lewis Mountain Camp in Virginia. The heavy rains caused flooding of several rivers, especially across western North Carolina. Moderate flooding occurred on the Swannanoa River at Biltmore

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[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) or Mean Lower Low Water (MLLW). **Inundation** is the total water level that occurs on normally dry ground as a result of the storm tide, and is expressed in terms of height above ground level. At the coast, normally dry land is roughly defined as areas higher than the normal high tide line, or Mean Higher High Water (MHHW).

near Asheville, where it crested near 14.3 ft, more than 4 ft above flood stage, and the French Broad River at Fletcher peaked at around 15.3 ft, more than 2 ft above flood stage. The Catawba River near Pleasant Gardens crested at 15.7 ft, almost 5 ft above flood stage.

Lesser rainfall amounts occurred closer to the track of Alberto's center. In Alabama, a maximum of 8.07 inches was reported near Cloverdale in the far northern part of the state, but rainfall totals decreased farther north where Alberto moved across the Tennessee and Ohio Valleys. Other rainfall maximum totals by state were 6.17 inches near Graysville, Tennessee; 3.62 inches near Paducah, Kentucky; 2.35 inches near Evansville, Indiana; 4.48 inches near Barrington, Illinois; and 2.08 inches near Lowell, Michigan.

Tornadoes

Alberto only produced four tornadoes, all of EF-0 intensity (on the Enhanced Fujita Scale). On 27 May, a weak landspout-type tornado occurred near Salerno, Florida, picking up a trampoline and lodging it in power lines. A weak tornado occurred near Cameron, South Carolina, on 28 May, uplifting trees, damaging fencing and signs, and damaging a few roofs and garage doors. On 30 May, a weak landspout-type tornado was observed by a storm chaser near Marseilles, Illinois, but it produced no known damage. About an hour later, another weak tornado touched down near Pleasant Hill, Ohio, destroying an outbuilding and damaging several trees.

CASUALTY AND DAMAGE STATISTICS

Eight direct deaths[3] occurred from Alberto in the United States—five in North Carolina and three in Virginia. A reporter and a photojournalist from WYFF News 4, the NBC affiliate in Greenville, South Carolina, died when a tree fell on their SUV in Polk County, North Carolina. A woman in Polk County also died due to a mudslide at her home near Tryon, and two people died when a landslide caused a gas leak and explosion at their home near Boone, North Carolina. In Virginia, two people were swept away and died in floodwaters near Charlottesville in Albemarle County, and a third person died from flooding in Madison County.

The NOAA National Centers for Environmental Information (NCEI) estimates that wind and water damages from Alberto totaled around $125 million. Winds knocked down trees and caused some power outages across portions of the Florida Panhandle, but otherwise there was no significant wind damage where Alberto made landfall. Coastal flooding from storm surge was reported in Taylor, Wakulla, and Franklin Counties in Florida, with up to 2.5 ft of inundation occurring along Apalachee Bay near the fort in St. Marks and near Mashes Sands Beach.

[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.

Alligator Point Road was overwashed due to surge, and flooding in Eastpoint affected the eastern end of the causeway to Apalachicola. The boat ramp at Mandalay Bay on the Aucilla River was washed off its pilings onto dry land, and the Steinhatchee Boat Ramp flooded with overwash into the adjacent parking lot. In North Carolina, flooding and mudslides closed more than 40 roads in the western part of the state, including portions of the Blue Ridge Parkway. About 2,000 people were evacuated for several hours in McDowell County due to fears that the Lake Tahoma Dam faced imminent failure, however the dam was later inspected and deemed safe.

The Cuban Meteorological Service reports that ten people died in Cuba by drowning in floodwaters. Initial media reports after the storm indicated that at least seven of the victims were men between the ages of 26 and 77. Cuba Interior Minister Julio Cesar Gandarilla also reported that at least four of the deaths were “all due to reckless behavior.”

More than 40,000 people were evacuated in four of Cuba’s central provinces due to the heavy rainfall and flooding. The rains severely damaged segments of the National Highway and rail transport, and several communities were isolated from the rest of the country. A bridge was swept away in Taguasco, Sancti Spiritus, due to the high, fast-moving waters of the Zaza River. In Villa Clara province, 64 homes totally collapsed, and another 138 partially collapsed; damage occurred to the corn, cassava, and sweet potato crops. Wastewater treatment ponds at the Cienfuegos oil refinery overflowed, causing 12,000 cubic meters of oily water to spill into the adjacent bay.

FORECAST AND WARNING CRITIQUE

The genesis forecasts for Alberto were respectable for an out-of-season cyclone. Table 4 provides the number of hours in advance of formation associated with the first NHC Special Tropical Weather Outlook (TWO) forecast in each likelihood category. A Special TWO was first issued at 1230 UTC 21 May to give the incipient disturbance a low (<40%) chance of genesis during the next five days about 96 h (4 days) before it became a subtropical depression. The five-day chance of formation was raised to the medium (40–60%) category 84 h (3.5 days) before formation and the high (>60%) category 36 h (1.5 days) before formation. The immediacy of subtropical cyclone formation was a little more difficult to predict, as the disturbance was only given a low chance of formation in the following two days 36 h (1.5 days) before genesis. The two-day chance of formation was raised to the medium category 24 h (1 day) before formation and the high category 18 h (0.75 days) before formation.

A verification of NHC official track forecasts for Alberto is given in Table 5a. Official forecast track errors were lower than the mean official errors for the previous 5-yr period between 24 and 72 h. Alberto’s track predictability was lower than that of most Atlantic tropical cyclones, with climatology and persistence model (OCD5) errors being higher than their respective mean errors during the previous 5-yr period at all times. A homogeneous comparison of the official track errors with selected guidance models is given in Table 5b. The NHC official forecasts generally performed better than the individual dynamical models, at least through 96 h, but they had larger errors than the multi-model consensus aids (TCON, TVCA, TVCX) and the corrected consensus aids (HCCA and FSSE).

A verification of NHC official intensity forecasts for Alberto is given in Table 6a. Official forecast intensity errors were lower than the mean official errors for the previous 5-yr period at all forecast times from 24 h to 120 h. However, OCD5 errors were significantly lower than their respective 5-yr means, indicating that Alberto's intensity was relatively easier to forecast than that of a typical tropical cyclone. A homogeneous comparison of the official intensity errors with selected guidance models is given in Table 6b. The official intensity forecasts had lower errors than the intensity models for the 12- and 24-h forecasts, but they performed more poorly beyond that, particularly at 48 and 72 h. The Logistic Growth Equation Model (LGEM) and the ICON intensity consensus performed the best overall, having lower errors than the official intensity forecasts at all times from 36 to 120 h.

Coastal wind watches and warnings associated with Alberto are given in Table 7. Tropical storm watches were first issued in association with Alberto for a portion of the Yucatan coast of Mexico and for Pinar del Rio, Cuba, with the watch in Cuba later being upgraded to a Tropical Storm Warning. In the United States, a Tropical Storm Watch was first issued for a portion of the U.S. Gulf Coast at 2100 UTC 25 May from Indian Pass, Florida, to Grand Isle, Louisiana, including metropolitan New Orleans. At 1500 UTC 26 May, the Tropical Storm Watch was extended eastward along the Florida Panhandle, and an additional Tropical Storm Watch was issued from Boca Grande to Anclote River, Florida. Tropical Storm Warnings were issued at 2100 UTC 26 May from Bonita Beach to Anclote River, Florida, and from Aucilla River, Florida, to the Alabama-Mississippi border. Sustained tropical-storm-force winds are estimated to have first reached the coast within the warning area along the Florida Panhandle around 0000 UTC 28 May, indicating that the initial Tropical Storm Watch provided a lead time of 51 h and the Tropical Storm Warning provided a lead time of 27 h. No sustained tropical-storm-force winds were reported within the Tropical Storm Warning area along the west coast of Florida.

Storm surge watches associated with Alberto are given in Table 8. A Storm Surge Watch was first issued for a portion of the U.S. Gulf Coast at 2100 UTC 25 May from Horseshoe Beach, Florida, to the mouth of the Mississippi River. The watch was extended southeastward to Crystal River, Florida, at 1500 UTC 26 May. The watch was not upgraded to a warning, since widespread storm surge inundation greater than 3 ft above ground level was not expected, and the highest measured water levels were right at the 3 ft threshold along parts of Apalachee Bay.

ACKNOWLEDGMENTS

Data in Table 3 were compiled from Post Tropical Cyclone Reports issued by the NWS Forecast Offices (WFOs) in Tampa Bay/Ruskin, Florida; Tallahassee, Florida; Mobile, Alabama; and Slidell, Louisiana. Data from the Weather Prediction Center, WFO Indianapolis, National Data Buoy Center, NOS Center for Operational Oceanographic Products and Services, United States Geological Survey, and Cuban Meteorological Service were also used in this report.

Table 1. Best track for Tropical Storm Alberto, 25–31 May 2018.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
25 / 1200	18.8	87.1	1006	30	subtropical depression
25 / 1800	18.7	86.5	1006	30	"
26 / 0000	18.9	85.9	1006	30	"
26 / 0600	19.6	85.7	1005	30	"
26 / 1200	21.3	85.6	1004	30	"
26 / 1800	22.6	85.3	1002	35	subtropical storm
27 / 0000	23.6	84.8	1000	35	"
27 / 0600	24.9	84.3	998	35	"
27 / 1200	26.6	84.4	995	40	"
27 / 1800	27.6	85.0	992	45	"
28 / 0000	28.2	85.8	991	55	tropical storm
28 / 0600	28.6	86.0	990	55	"
28 / 1200	29.1	85.9	991	50	"
28 / 1800	29.8	85.9	991	45	"
28 / 2100	30.3	86.0	992	40	"
29 / 0000	30.9	86.1	993	30	tropical depression
29 / 0600	31.9	86.6	994	30	"
29 / 1200	33.0	87.0	996	30	"
29 / 1800	34.2	87.3	997	30	"
30 / 0000	35.4	87.6	998	30	"
30 / 0600	36.7	87.9	998	30	"
30 / 1200	38.2	87.7	998	30	"
30 / 1800	39.9	87.0	998	30	"
31 / 0000	41.5	86.0	997	30	"
31 / 0600	43.5	84.6	995	30	low
31 / 1200	46.0	83.3	995	30	"
31 / 1800					dissipated
28 / 0000	28.2	85.8	991	55	maximum winds
28 / 0600	28.6	86.0	990	55	minimum pressure
28 / 2100	30.3	86.0	992	40	landfall near the Bay County/Walton County, FL line

Table 2. Selected ship reports with winds of at least 34 kt for Tropical Storm Alberto, 25–31 May 2018, while it was a tropical or subtropical cyclone. Note that many wind observations are taken from anemometers located well above the standard 10 m observation height.

Date/Time (UTC)	Ship call sign	Latitude (°N)	Longitude (°W)	Wind dir/speed (kt)	Pressure (mb)
25 / 1800	WPAJ	23.4	86.7	060 / 35	1012.1
26 / 0300	3FZO8	21.7	86.5	090 / 38	1011.4
26 / 1900	H3VS	24.3	84.2	120 / 45	1007.0
26 / 2100	C6FZ8	23.7	82.2	120 / 38	1007.5
26 / 2300	WHED	24.4	80.8	120 / 35	1010.6
26 / 2300	H3VS	25.6	83.7	140 / 50	1009.0
27 / 0000	C6XS8	24.2	80.6	130 / 40	1010.0
27 / 1500	C6YR6	26.1	78.0	140 / 35	1015.0
27 / 1500	WHED	28.7	78.8	150 / 35	1015.3
27 / 2000	WHED	30.0	79.9	140 / 35	1013.4
27 / 2100	D5DY4	28.6	88.0	020 / 35	1003.5
28 / 0000	C6XS7	28.0	79.8	170 / 36	1008.0
28 / 0200	H3GS	29.1	87.5	020 / 50	1004.0
28 / 0900	C6VG8	30.2	79.4	130 / 40	1010.4
31 / 1000	WDF702	45.1	82.6	150 / 40	998.6

Table 3. Selected surface observations for Tropical Storm Alberto, 25–31 May 2018.

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)				
Cuba									
Pinar del Río									
Derivadora El Roblar									8.23
Embalse Bacunagua									7.04
La Coloma									6.38
Isla de la Juventud									
Embalse Los Indios I									4.25
Artemisa									
Acueducto San Cristóbal									8.23
Derivadora Bacunagua									8.15
Embalse Combate de Río Hondo									7.52
Las Pozas									5.99
Matanzas									
Pedroso									11.81
Pedro Betancourt									11.80
Jovellanos									10.04
Giraldo Díaz									8.62
Sergio González									8.04
Embalse Cimarrones									7.91
México									7.70
Agramonte									7.16
El Roque									6.97
Estación Meteorológica Colón									6.94
Cienfuegos									
Malezas									7.68
Embalse Voladora									7.32
Yaguaramas									7.24
Acueducto Rodas									7.20
La Sierrita									7.17

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)				
Villa Clara									
Heriberto Duquezne									14.41
Mordazo									8.04
Sierra Morena									7.22
Meteorología Santa Clara									7.17
Sancti Spíritus									
Banao									12.01
Acueducto San Carlos									11.82
Caracusey									9.72
Embalse Zaza									9.59
Delegación Provincial de Recursos Hidráulicos									8.97
Embalse Tuinicú									8.93
Mayajigua									8.84
Acueducto Sierpe Vieja									8.74
Jíquima de Pelaez									8.72
Embalse Lebrije									8.48
Jatibonico									8.43
Venegas									8.31
Tunas de Zaza									7.76
Aliviadero Cayajaná									7.67
Mapos									7.57
Perea									7.23
Embalse Banao II									7.18
Oficina Acueducto Guasimal									7.09
Ciego de Ávila									
Acueducto Majagua									9.33
Marroquí									8.11
Prevención de Incendios Orlando Gonzalez									7.74
CITMA Enrique José Varona									7.46

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)				
Florida									
International Civil Aviation Organization (ICAO) Sites									
Tyndall AFB (Panama City) (KPAM) (30.07N 85.59W)	28/1811	996.2	28/1836	31	51				3.16
Apalachicola (KAAF) (29.72N 85.03W)	28/1553	1000.5	28/1812	32	43				1.92
Northwest Florida Beaches Airport (Panama City) (KECP) (30.35N 85.80W)	28/2053	995.4	28/2001	25	41				
Destin (KDTS) (30.40N 86.47W)	28/2053	997.0	28/1902	22	36				3.63
Holmes County (K1JO) (30.85N 85.60W)	28/2258	994.3	28/1903	19	36				
St. Petersburg-Clearwater Airport (KPIE) (27.91N 82.69W)	27/1753	1005.3	27/1453	20	34				1.87
Cross City (KCTY) (29.62N 83.10W)			28/1935	20	34				1.50
Punta Gorda / Charlotte Co. Airport (KPGD) (26.92N 81..99W)	27/0953	1006.1	27/1818	19	26				7.40
Coastal-Marine Automated Network (C-MAN) Sites									
Pulaski Shoals Light (PLSF1) (24.69N 82.77W)	27/0800	1002.8	27/0030	33 (18 m)	38				
Sand Key (SANF1) (24.46N 81.88W)	27/0850	1004.8							
Sombrero Key (SMKF1) (24.63N 81.11W)	27/0850	1005.5	26/2350	29 (6 m)	35				
Venice (VENF1) (27.07N 82.45W)	27/1100	1004.7	28/1850	27 (12 m)	32				
Keaton Beach (KTNF1) (29.82N 83.59W)	27/2100	1005.6	28/2040	28 (10 m)	36				
Cedar Key (CDRF1) (29.14N 83.03W)	27/2300	1005.9	28/1540	26 (10 m)	34				
Tyndall AFB Tower C (N4) (SGOF1) (29.41N 84.86W)	28/1400	1000.5	28/1250	44 (35 m)	54				
National Ocean Service (NOS) Sites									
Pensacola (PCLF1) (30.40N 87.21W)	28/2112	1001.4	28/1700	15 (10 m)	31	1.31	2.11	1.2	

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)				
Panama City Beach (PCBF1) (30.21N 85.88W)	28/2018	994.0	28/2154	35 (17 m)	40	1.99	2.62	1.7	
Panama City (PACF1) (30.15N 85.67W)	28/2012	995.5	28/2030	34 (10 m)	46	1.81	2.33	1.6	
Apalachicola (APCF1) (29.73N 84.98W)	28/1506	1000.9	28/1536	34 (9 m)	42	3.08	3.85	3.0	
Cedar Key (CKYF1) (29.13N 83.03W)	27/2018	1004.6	28/1530	26 (12 m)	33	2.73	3.35	1.8	
Clearwater Beach (CWBF1) (27.98N 82.83W)	27/1754	1005.2	28/1942	29 (8 m)	37	1.90	2.08	1.1	
Mckay Bay Entrance (MCYF1) (27.91N 82.43W)						2.11	2.50	1.5	
Old Port Tampa (OPTF1) (27.86N 82.55W)	27/1754	1005.6	28/1900	25 (18 m)	30	1.90		1.4	
St. Petersburg (SAPF1) (27.76N 82.63W)	27/1754	1005.1	28/1436	23 (9 m)	29	1.87	2.00	1.2	
Port Manatee (PMAF1) (27.64N 82.56W)	27/1748	1005.5				1.81	1.72	1.1	
Fort Myers (FMRF1) (26.64N 81.87W)	27/0900	1004.9	28/1836	16 (8 m)	24	1.71	2.01	1.7	
Naples (NPSF1) (26.13N 81.81W)	27/0830	1004.9				1.85	2.42	1.8	
Key West (KYWF1) (24.56N 81.81W)	27/0712	1005.3	27/1200	23 (17 m)	34	0.78	0.64	0.6	
United States Geological Survey (USGS) Sites									
Spring Creek (SBIF1) (30.07N 84.33W)							4.86	3.2	
Shell Point (SHPF1) (30.06N 84.29W)							4.83	3.2	
St. Marks River at St. Marks (MRKF1) (30.15N 84.21W)							4.72	2.9	
Aucilla River near Nutall Rise (NUTF1) (30.11N 83.98W)							4.17	2.3	
Suwannee River (SUWF1) (29.34N 83.09W)							3.60	2.2	
Steinhatchee River at Steinhatchee (STIF1) (29.67N 83.38W)							3.15	1.5	
Weatherflow Sites									
St. Andrew Bay (XSTA) (30.13N 85.72W)	28/1937	992.3	28/1952	38 (9 m)	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)				
St. George Island (XSTG) (29.67N 84.86W)	28/1503	998.9	28/1703		43 (15 m)				
Key West CG (XKYW) (24.57N 81.80W)			26/2341		37 (10 m)				
Panama City Beach (XPAN) (30.23N 85.88W)			28/2157		36 (15 m)				
Sarasota (XSAR) (27.35N 82.52)			28/1804		35 (20 m)				
Egmont Channel (XEGM) (27.61N 82.76W)			28/1911		34 (13 m)				
Skyway Fishing Pier (XSKY) (27.60N 82.65W)			28/1515		33 (16 m)				
WeatherSTEM Sites									
St. George Island Bridge (29.69N 84.89W)	28/1500	1003.7	28/1500	44 (9 m)	51				
Shell Point Beach (30.05N 84.29W)	28/2100	1002.5	28/1500	40	42				
FSU Panama City (30.19N 85.72W)	28/2100	993.3	28/1900	37					
FSU Coastal and Marine Lab (29.91N 84.51W)	28/1900	1002.4	28/1800	36	39				
Gulf County EOC (29.81N 85.29W)	28/1800	997.8	28/1900	35	39				
Citizen Weather Observer Program (CWOP) Sites									
Bald Point (DW2896) (29.92N 84.33W)			27/1515		36				
Other Sites									
Archbold (ABS01) (27.18N 81.35W)			27/1515		36				
Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) Sites									
Stuart 1.0 ESE (Martin Co.) (FL-MT-18) (27.19N 80.23W)									7.52
Havana 4.2 SW (Gadsden Co.) (FL-GD-2) (30.58N 84.47W)									7.27
Palm City 1.4 NW (Martin Co.) (FL-MT-31) (27.18N 80.28W)									6.81

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)				
Englewood 3.7 NNW (Sarasota Co.) (FL-SS-44) (27.00N 82.39W)									6.44
Niceville 3.4 ESE (Okaloosa Co.) (FL-OK-20) (30.51N 86.43W)									6.36
Deerfield Beach 1.4 S (Broward Co.) (FL-BW-83) (26.29N 80.12W)									6.21
Niceville 12.7 NE (Walton Co.) (FL-WT-17) (30.67N 86.34W)									6.07
Boca Raton 1.7 W (Palm Beach Co.) (FL-PB-85) (26.37N 80.13W)									6.00
Lauderdale-by-the-Sea 1.2N (Broward Co.) (FL-BW-37) (26.21N 80.10W)									6.00
South Florida Water Management District (SFWMD) Sites									
Taylor Creek (TLCF1) (27.21N 80.80W)									11.80
Indiantown 12 WNW (NELF1) (27.09N 80.66W)									6.86
Florida Mesonet Sites									
Four Seasons Estates 11 ENE									9.50
NWS Cooperative Observer (COOP) Sites									
Stuart 4 E (STRF1) (27.20N 80.16W)									8.22
Alabama									
ICAO Sites									
Decatur – Pryor Field (KDCU) (34.66N 86.94W)	29/2025	1001.0	29/2040	30	41				1.11
Montgomery – Maxwell AFB (KMXF) (32.38N 86.37W)	29/1026	1000.0	29/0856	30	39				

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)				
Montgomery – Dannelly Field (KMGM) (32.30N 86.41W)	29/0845	996.6	29/0755	27	35				3.97
Muscle Shoals (KMSL) (34.74N 87.60W)	29/2115	999.0	29/2155	26	31				2.62
Huntsville International / Jones Field (KHSV) (34.64N 86.79W)	29/1955	1002.4	29/2115	25	33				1.22
Birmingham International Airport (KBHM) (33.57N 86.75W)	29/1425	1000.0	29/1425	23	33				2.76
Greenville (KPRN) (31.84N 86.61W)	29/0556	995.3							
Andalusia (K79J) (31.32N 86.41W)	29/0356	996.6							
Ft. Rucker (KOZR) (31.29N 85.72W)	28/2325	999.3							
NOS Sites									
Weeks Bay, Mobile Bay (WBYA1) (30.42N 87.83W)						1.07		1.0	
Dauphin Island (DILA1) (30.25N 88.08W)	28/2130	1003.9				1.28	2.01	1.3	
Dog River Bridge (BYSA1) (30.57N 88.09W)						1.22		0.6	
East Fowl River Bridge (EFRA1) (30.44N 88.11W)						1.15	1.62	0.8	
Coast Guard Sector Mobile (MCGA1) (30.65N 88.06W)	28/2112	1003.3	27/2324	18 (9 m)	25	1.31	1.76	0.6	
Mobile State Docks (OBLA1) (30.70N 88.04W)	28/2112	1003.3				1.09	1.67	0.5	
Chickasaw Creek (CIKA1) (30.78N 88.07W)						1.33		0.4	
West Fowl River Bridge (WFRA1) (30.38N 88.16W)						1.28	1.94	1.0	
Bayou La Batre (BLBA1) (30.41N 88.25W)						1.47	1.98	1.1	

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	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[a]	Sustained (kt)[b]	Gust (kt)				
CWOP Sites									
NUCOR Trinity (AV155) (34.63N 87.08W)			29/2059		37				
Clanton (FW0039) (32.78N 86.72W)			29/1158		35				
CoCoRaHS Sites									
Cloverdale 6.6 WSW (Lauderdale Co.) (AL-LD-9) (34.91N 87.88W)									8.07
Selma 1.5 WSW (Dallas Co.) (AL-DS-1) (32.40N 87.05W)									7.74
Clanton 2.0 SE (Chilton Co.) (AL-CH-7) (32.82N 86.60W)									7.63
Holt 11.4 SSE (Tuscaloosa Co.) (AL-TS-3) (33.08N 87.40W)									7.04
Northport 18.7 N (Tuscaloosa Co.) (AL-TS-25) (33.51N 87.61W)									6.68
Millbrook 4.0 NNW (Elmore Co.) (AL-EL-4) (32.55N 86.38W)									6.09
Hydrometeorological Automated Data System (HADS) Sites									
Hayneville 15 NW (TYLA1) (32.32N 86.78W)									7.64
Selma (SELA1) (32.41N 87.02W)									7.15
NWS COOP Sites									
Centreville 6 SW (CENA1) (32.87N 87.24W)									6.98
Georgia									
NWS COOP Sites									
Helen 7 N (BRSG1) (34.80N 83.71W)									12.30

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	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[a]	Sustained (kt)[b]	Gust (kt)				
Cleveland 5 NNE (STEG1) (34.66N 83.73W)									9.57
Clayton 1 SSW (CLNG1) (34.87N 83.40W)									8.47
Tiger 7 WSW (TIGG1) (34.78N 83.55W)									8.33
Cleveland 9 NNE (HLEG1) (34.72N 83.72W)									7.08
Clayton 10 WSW (NACG1) (34.67N 83.70W)									6.88
Mountain City 2 SW (MCTG1) (34.90N 83.41W)									6.87
Tallulah Falls (TLUG1) (34.73N 83.37W)									6.73
Clayton 4 NE (TULG1) (34.91N 83.33W)									6.63
CoCoRaHS Sites									
Helen 9.5 ENE (Habersham Co.) (GA-HB-5) (34.77N 83.58W)									11.26
Sautee 3.5 SW (White Co.) (GA-WH-4) (34.66N 83.74W)									9.57
Hiawassee 4.8 SSE (Towns Co.) (GA-TW-1) (34.89N 83.71W)									8.42
Rabun Gap 2.1 SW (Rabun Co.) (GA-RB-4) (34.94N 83.42W)									8.00
Cleveland 3.9 WNW (White Co.) (GA-WH-3) (34.61N 83.83W)									7.19
Rabun Gap 1.1 WNW (Rabun Co.) (GA-RB-6) (34.96N 83.41W)									7.16
Cleveland 7.8 NW (White Co.) (GA-WH-10) (34.67N 83.87W)									7.00

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)				
Cleveland 4.7 W (White Co.) (GA-WH-9) (34.60N 83.85W)									6.76
Cleveland 8.4 WNW (Lumpkin Co.) (GA-LP-4) (34.66N 83.89W)									6.26
Cleveland 0.6 NE (White Co.) (GA-WH-7) (34.60N 83.76W)									6.17
HADS Sites									
Chattahoochee River at Helen (HDCG1) (34.70N 83.73W)									9.77
Titus (TUSG1) (34.95N 83.62W)									6.16
South Carolina									
HADS Sites									
Tryon 5 SW (TRYS1) (35.16N 82.28W)									8.89
CoCoRaHS Sites									
Roebuck 4.1 W (Spartanburg Co.) (SC-SP-79) (34.89N 82.04W)									6.35
North Carolina									
NWS COOP Sites									
Highlands (HLDN7) (35.05N 83.19W)									11.00
Mt. Mitchell State Park (MMTN7) (35.76N 82.27W)									10.77
Old Fort AG 3 W (OLFN7) (35.67N 82.12W)									8.82
Grandfather Mountain / Linville 3 NE (LNNN7) (36.11N 81.83W)									7.99
Davidson River 8 NNW (DARN7) (35.34N 82.78W)									7.93

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)				
Wallace Gap / Franklin 11 SW (WLGN7) (35.10N 83.55W)									6.68
CoCoRaHS Sites									
Jonas Ridge 1.4 S (Burke Co.) (NC-BK-13) (35.95N 81.89W)									12.21
Highlands 1.0 W (Macon Co.) (NC-MC-37) (35.05N 83.22W)									11.90
Black Mountain 2.4 SE (Buncombe Co.) (NC-BC-76) (35.59N 82.31W)									11.23
Spruce Pine 6.6 SW (Mitchell Co.) (NC-ML-10) (35.84N 82.14W)									10.71
Linville Falls 0.5 SW (Avery Co.) (NC-AV-7) (35.95N 81.95W)									10.15
Bat Cave 1.9 N (Buncombe Co.) (NC-BC-87) (35.48N 82.28W)									9.91
Old Fort 4.9 SW (McDowell Co.) (NC-MD-19) (35.58N 82.23W)									9.62
Black Mountain 5.5 SE (Buncombe Co.) (NC-BC-115) (35.55N 82.26W)									9.58
Hendersonville 9.6 ENE (Henderson Co.) (NC-HN-15) (35.39N 82.31W)									9.53
Linville 2.5 ENE (Avery Co.) (NC-AV-9) (36.09N 81.84W)									9.42
Old Fort 3.6 NW (McDowell Co.) (NC-MD-8) (35.68N 82.21W)									9.22

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)				
Old Fort 0.2 W (McDowell Co.) (NC-MD-10) (35.63N 82.18W)									9.12
Hendersonville 6.1 SSW (Henderson Co.) (NC-HN-25) (35.24N 82.50W)									9.04
Linville 2.4 ENE (Avery Co.) (NC-AV-4) (36.09N 81.85W)									8.99
Chimney Rock 0.3 E (Rutherford Co.) (NC-RT-6) (35.44N 82.25W)									8.91
Spruce Pine 3.7 ESE (Mitchell Co.) (NC-ML-11) (35.89N 82.01W)									8.90
Black Mountain 1.3 NNE (Buncombe Co.) (NC-BC-105) (35.63N 82.32W)									8.60
Columbus 6.6 NNW (Polk Co.) (NC-PK-2) (35.33N 82.26W)									8.49
Saluda 0.5 N (Polk Co.) (NC-PK-6) (35.25N 82.35W)									8.23
Gerton 0.4 SW (Henderson Co.) (NC-HN-44) (35.48N 82.35W)									8.08
Hendersonville 6.3 SW (Henderson Co.) (NC-HN-51) (35.25N 82.53W)									8.02
Boone 4.5 SE (Watauga Co.) (NC-WT-24) (36.17N 81.61W)									7.87
Blowing Rock 4.4 NE (Watauga Co.) (NC-WT-6) (36.16N 81.61W)									7.86
HADS Sites									
Highlands (HDSN7) (35.07N 83.22W)									10.34

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)				
Mississippi									
NOS Sites									
Pascagoula NOAA Lab (PNLM6) (30.37N 88.56W)						1.16	2.03	1.1	
Bay Waveland Yacht Club (WYCM6) (30.33N 89.33W)	28/2206	1004.6	28/2354		27	1.38	2.32	1.3	
Louisiana									
NOS Sites									
Pilots Station East, SW Pass (PSTL1) (28.93N 89.41W)	28/2136	1006.2	27/1548	26 (24 m)	31	1.40		1.5	
Pilottown (PILL1) (29.18N 89.26W)	28/2206	1005.2	27/1654	16 (12 m)	26	0.93		1.0	
Tennessee									
ICAO Sites									
Clarksville (KCKV) (36.62N 87.41W)	30/0610	1000.7	30/0645	23	36				2.17
NWS COOP Sites									
Coalmont 1 NW (COAT1) (35.37N 85.70W)									5.90
Parsons (PRST1) (35.62N 88.12W)									5.29
Coalmont (CLMT1) (35.34N 85.70W)									4.87
Lexington (LEXT1) (35.65N 88.40W)									4.50
Pikeville 8 WNW (FCFT1) (35.64N 85.36W)									4.45
Clifton (CLFT1) (35.37N 87.98W)									4.34
Sewanee (SEWT1) (35.20N 85.92W)									4.30
Bruceton (BRUT1) (36.04N 88.26W)									4.20
Lexington (LXNT1) (35.64N 88.38W)									4.15

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)				
CoCoRaHS Sites									
Graysville 5.5 WNW (Bledsoe Co.) (TN-BL-18) (35.47N 85.18W)									6.17
Clifton 1.8 ENE (Wayne Co.) (TN-WY-21) (35.39N 87.96W)									4.95
Dickson 5.8 NW (Dickson Co.) (TN-DC-3) (36.13N 87.46W)									4.65
Dunlap 2.9 W (Sequatchie Co.) (TN-SQ-25) (35.37N 85.44W)									4.30
Dunlap 0.4 SSE (Sequatchie Co.) (TN-SQ-9) (35.36N 85.38W)									4.25
Gruetli-Laager 1.3 E (Grundy Co.) (TN-GY-13) (35.37N 85.61W)									4.19
Bruceton 0.2 E (Carroll Co.) (TN-CR-7) (36.03N 88.24W)									4.11
Jackson 5.6 NE (Madison Co.) (TN-MD-5) (35.70N 88.77W)									4.07
Jackson 4.9 NW (Madison Co.) (TN-MD-21) (35.69N 88.89W)									4.05
Whitwell 3.0 SSE (Marion Co.) (TN-MA-10) (35.16N 85.49W)									4.01
Virginia									
ICAO Sites									
Wakefield (KAKQ) (36.98N 77.01W)									3.54

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)				
Charlottesville (KCHO) (38.14N 78.45W)									3.41
NWS COOP Sites									
Lewis Mountain Camp (LEWV2) (38.43N 78.48W)									5.48
Big Meadows (BGMV2) (38.52N 78.44W)									5.14
Afton Mountain (AFTV2) (38.03N 78.87W)									4.58
Luray (LURV2) (38.52N 78.43W)									4.04
Mathews (MATV2) (38.77N 78.23W)									3.40
Kentucky									
ICAO Sites									
Owensboro (KOWB) (37.74N 87.17W)	30/1135	1000.0	30/1130	27	34				1.26
Hopkinsville - Ft. Campbell US Army Airfield (KHOP) (36.67N 87.50W)	30/0629	999.3	30/0629	26	35				3.04
Madisonville (K2I0) (37.36N 87.40W)	30/0915	999.3	30/1115	21	35				
CoCoRaHS Sites									
Paducah 4.5 SW (McCracken Co.) (KY-MK-6) (37.02N 88.68W)									3.62
Cadiz 2.5 NNW (Trigg Co.) (KY-TG-3) (36.90N 87.84W)									3.41
Hanson 2.2 NE (Hopkins Co.) (KY-HP-1) (37.44N 87.44W)									3.04
NWS COOP Sites									
Hopkinsville (HPKK2) (36.83N 87.50W)									3.13
Cadiz 2 NNW (CADK2) (36.88N 87.85W)									3.12

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)				
Indiana									
ICAO Sites									
Kokomo (KOKK) (40.53N 86.07W)	30/2200	1000.0	30/2112	28	35				0.23
Ft. Wayne (KFWA) (40.97N 85.21W)	31/0030	1001.4	30/2005	27	42				0.39
Indianapolis International Airport (KIND) (39.73N 86.28W)	30/1945	1001.4	30/2005	26	33				0.26
Shelbyville (KGEZ) (39.59N 85.80W)	30/2225	1003.4	30/1730	25	32				0.23
Bloomington (KBMG) (39.14N 86.62W)	30/1710	1001.7	30/1725	24	32				0.81
South Bend (KSBN) (41.71N 86.32W)	31/0115	999.7	30/2043	23	31				0.94
Goshen (KGSH) (41.53N 85.79W)	31/0115	997.6	30/2035	23	31				0.40
Evansville (KEVV) (38.04N 87.52W)	30/1225	999.0	30/1740	20	33				2.35
Huntingburg (KHNB) (38.25N 86.95W)	30/1405	1001.4	30/1410	23	30				0.97
Frankfort (KFKR) (40.27N 86.56W)	30/2055	999.3	30/2155	22	28				
Lafayette / Purdue Univ. Airport (KLAF) (40.41N 86.94W)									1.70
NWS COOP Sites									
Rockville (ROKI3) (39.75N 87.27W)									1.90
West Lafayette 6 NW (WLFI3) (40.47N 87.00W)									1.71
Marshall 2 SSW (MLLI3) (37.82N 87.20W)									1.65
Farmersburg 3 S (FMBI3) (39.24N 87.39W)									1.63
Spencer (SPNI3) (39.28N 86.77W)									1.52
Ohio									
ICAO Sites									
Ottawa - Putnam County Airport (KOWX) (41.04N 83.98W)	31/0155	1004.7	30/2056	35	43				

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)				
Wauseon - Fulton County Airport (KUSE) (41.61N 84.13W)	31/0245	1003.0	30/2205	30	45				
Dayton - Wright Brothers Airport (KMGY) (39.59N 84.22W)	30/2355	1005.4	30/1932	30	37				0.85
Dayton International Airport (KDAY) (39.91N 84.22W)	31/0000	1005.4	30/1925	29	43				0.96
Lima - Allen County Airport (KAOH) (40.71N 84.02W)	31/0045	1004.7	30/2025	27	32				0.47
Defiance (KDFI) (41.34N 84.43W)	31/0030	1002.4	30/2120	24	34				
Hamilton / Butler Co. Regional Arpt. (KHAO) (39.36N 84.52W)									1.23
NWS COOP Sites									
South Point (SOPO1) (38.41N 82.58W)									1.45
Kings Mills (KIMO1) (39.35N 84.25W)									1.12
Illinois									
NWS COOP Sites									
Barrington (BARI2) (42.12N 88.16W)									4.48
Big Bureau Creek at Princeton (PINI2) (41.35N 89.48W)									4.16
CoCoRaHS Sites									
Sparland 6.4 W (Marshall Co.) (IL-MH-3) (41.02N 89.56W)									4.26
Sleepy Hollow 0.7 W (Kane Co.) (IL-KN-118) (42.10N 88.33W)									3.79
Elgin 2.3 WNW (Kane Co.) (IL-KN-2) (42.05N 88.33W)									3.77

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)				
Princeton 1.5 S (Bureau Co.) (IL-BU-10) (41.36N 89.47W)									3.60
Michigan									
ICAO Sites									
Lansing - Capital Region International Airport (KLAN) (42.78N 84.60W)	31/0300	1001.0	30/2345	31	45				0.90
Grand Rapids (KGRR) (42.88N 85.52W)	31/0300	1000.3	30/2345	29	35				1.39
Saginaw County H W Browne Airport (KHYX) (43.43N 83.86W)	31/0655	997.3	31/0715	27	37				
MBS International Airport (KMBS) (43.53N 84.08W)	31/0705	996.6	31/0725	25	32				0.30
Kalamazoo / Battle Creek International Airport (KAZO) (42.23N 85.55W)	31/0300	998.6	30/2220	23	29				1.14
Battle Creek - W.K. Kellogg Airport (KBTL) (42.31N 85.24W)	31/0140	1000.3	30/2240	23	36				0.96
NWS Central Region Sites									
Gravelly Shoals Light (GSLM4) (44.02N 83.54W)			31/0800	41 (25 m)	52				
NWS COOP Sites									
Lowell (LOLM4) (42.93N 85.33W)									2.08
Gladwin (GLAM4) (43.98N 84.50W)									1.95
South Haven (SHVM4) (42.40N 86.28W)									1.87
Garden Corners (GDCM4) (45.89N 86.54W)									1.74
Watton 3 W (WTNM4) (46.51N 88.67W)									1.74
Covington 1 NE (COVM4) (46.56N 88.53W)									1.65

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)				
Offshore									
NOAA Buoys									
Yucatan Basin (42056) (19.92N 84.94W)	26/0920	1004.8	26/0821	25 (4 m, 1 min)	29				
East Gulf (42003) (25.93N 85.64W)	27/0950	1003.3	27/0241	27 (4 m, 1 min)	31				
Pensacola (42039) (28.79N 86.01W)	28/0450	993.3	28/0237	43 (5 m, 1 min)	52				
Orange Beach (42012) (30.06N 87.55W)	28/2040	1002.3	28/0153	27 (4 m, 1 min)	29				
University of South Florida COMPS Stations									
C10 – WFS Central Buoy, 25 m Isobath (42013) (27.17N 82.92W)			27/1200		56 (3 m)				
Shell Point (SHPF1) (30.06N 84.29W)	28/2142	1003.6	28/1830	33 (8 m)	41				

[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 NOS tide gauges, the height of the water above Mean Higher High Water (MHHW) is used as a proxy for inundation.
[I] Incomplete data
[E] Estimated

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%)	36	96
Medium (40%-60%)	24	84
High (>60%)	18	36

Table 5a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Tropical Storm Alberto, 25–31 May 2018. Mean errors for the previous 5-yr period are shown for comparison. Official errors that are smaller than the 5-yr means are shown in boldface type.

	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL	39.8	**34.1**	**40.1**	**47.9**	**70.4**	158.9	288.2
OCD5	69.3	126.5	185.5	248.5	347.2	458.7	648.4
Forecasts	16	16	16	15	11	7	3
OFCL (2013-17)	24.1	37.4	50.5	66.6	98.4	137.4	180.7
OCD5 (2013-17)	44.7	95.8	153.2	211.2	318.7	416.2	490.6

Table 5b. Homogeneous comparison of selected track forecast guidance models (in n mi) for Tropical Storm Alberto, 25–31 May 2018. Errors smaller than the NHC official forecast are shown in boldface type. The number of official forecasts shown here will generally be smaller than that shown in Table 5a due to the homogeneity requirement.

Model ID	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL	36.9	36.6	39.9	41.6	55.8	145.9	300.9
OCD5	78.6	134.7	184.1	233.9	374.3	488.3	733.7
GFSI	42.1	50.1	46.1	46.3	81.2	**133.2**	**211.0**
EMXI	**32.4**	37.5	59.1	64.7	68.7	154.0	**295.3**
EGRI	38.5	**33.4**	43.7	66.6	86.6	**82.9**	**197.4**
NVGI	40.3	45.8	63.3	80.0	139.5	204.6	**286.6**
CMCI	47.4	63.5	58.3	50.4	109.1	165.0	**252.6**
HWFI	47.0	47.5	56.2	75.3	143.1	272.1	371.3
HMNI	42.8	53.9	67.4	76.7	85.1	**104.0**	**240.0**
CTCI	46.7	46.2	65.9	76.3	93.5	**53.7**	**120.3**
TCON	40.0	**34.1**	**30.6**	**34.9**	62.9	**144.4**	**228.2**
TVCA	38.7	**34.4**	**36.5**	**35.0**	**46.0**	**115.7**	**216.0**
TVCX	37.9	**35.2**	**39.5**	**37.4**	**44.8**	**121.6**	**228.0**
GFEX	**35.8**	42.5	49.4	51.7	64.7	**145.5**	**238.5**
HCCA	**36.7**	**31.2**	**39.7**	44.5	**50.8**	**96.1**	**132.7**
FSSE	**34.4**	**33.9**	42.0	52.1	**53.6**	**100.9**	**222.6**
AEMI	42.4	53.2	57.0	57.3	129.4	239.3	442.3
TABS	57.8	76.7	116.9	131.9	148.9	**125.4**	**163.3**
TABM	64.0	90.6	131.7	145.8	156.6	215.1	**267.9**
TABD	65.9	88.0	124.2	149.4	153.8	191.4	485.3
Forecasts	12	12	12	11	8	4	1

Table 6a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Tropical Storm Alberto, 25–31 May 2018. Mean errors for the previous 5-yr period are shown for comparison. Official errors that are smaller than the 5-yr means are shown in boldface type.

	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL	5.9	**5.9**	**6.9**	**9.3**	**10.5**	**4.3**	**10.0**
OCD5	6.6	8.8	7.6	7.9	5.3	3.1	3.7
Forecasts	16	16	16	15	11	7	3
OFCL (2013-17)	5.5	8.0	10.1	11.4	12.7	14.5	15.0
OCD5 (2013-17)	7.1	11.1	14.4	17.4	20.6	22.3	23.7

Table 6b. Homogeneous comparison of selected intensity forecast guidance models (in kt) for Tropical Storm Alberto, 25–31 May 2018. 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	72	96	120
OFCL	6.1	5.7	6.4	8.9	10.5	4.3	10.0
OCD5	7.1	9.6	8.2	**8.3**	**5.5**	**3.1**	**3.7**
DSHP	7.5	7.1	**5.6**	**7.7**	**7.8**	4.4	**2.3**
LGEM	7.0	6.9	**6.3**	**6.4**	**4.1**	**3.1**	**2.7**
HWFI	7.9	10.4	7.9	**5.9**	**6.8**	7.3	**5.7**
HMNI	7.8	9.8	10.0	10.1	11.4	10.1	10.7
CTCI	7.9	10.3	10.3	9.2	**10.2**	10.6	**9.7**
ICON	7.4	7.5	**6.1**	**4.6**	**5.5**	**3.6**	**5.0**
IVCN	7.1	8.1	6.9	**5.4**	**6.2**	4.4	**6.0**
HCCA	7.4	8.4	8.3	**6.4**	**8.0**	7.0	**5.0**
FSSE	7.1	8.5	7.4	**6.8**	**9.5**	5.4	**3.7**
GFSI	**5.8**	5.9	**6.1**	**7.4**	**8.3**	11.1	13.7
EMXI	6.3	8.5	7.7	**6.9**	**6.4**	9.6	13.3
Forecasts	14	14	14	14	10	7	3

Table 7. Coastal wind watch and warning summary for Tropical Storm Alberto, 25–31 May 2018.

Date/Time (UTC)	Action	Location
25 / 1500	Tropical Storm Watch issued	Tulum to Cabo Catoche, Mexico
25 / 1500	Tropical Storm Watch issued	Pinar del Rio, Cuba
25 / 2100	Tropical Storm Watch issued	Indian Pass, FL to Grand Isle, LA, including metropolitan New Orleans
25 / 2100	Tropical Storm Watch issued	Lake Pontchartrain
25 / 2100	Tropical Storm Watch issued	Lake Maurepas
26 / 1200	Tropical Storm Watch discontinued	Tulum to Cabo Catoche, Mexico
26 / 1500	Tropical Storm Watch changed to Tropical Storm Warning	Pinar del Rio, Cuba
26 / 1500	Tropical Storm Watch modified to	Aucilla River, FL to Grand Isle, LA
26 / 1500	Tropical Storm Watch issued	Boca Grande to Anclote River, FL
26 / 1500	Tropical Storm Warning issued	Dry Tortugas, FL
26 / 2100	Tropical Storm Warning issued	Aucilla River, FL to MS/AL Border
26 / 2100	Tropical Storm Warning issued	Bonita Beach to Anclote River, FL
26 / 2100	Tropical Storm Watch modified to	MS/AL Border to the Mouth of the Pearl River
26 / 2100	Tropical Storm Watch discontinued	Lake Pontchartrain
26 / 2100	Tropical Storm Watch discontinued	Lake Maurepas
27 / 0300	Tropical Storm Warning discontinued	Pinar del Rio, Cuba
27 / 0900	Tropical Storm Warning modified to	Bonita Beach, FL to MS/AL Border
27 / 1500	Tropical Storm Watch discontinued	All
27 / 1500	Tropical Storm Warning discontinued	Dry Tortugas
27 / 1800	Tropical Storm Warning modified to	Middle of Longboat Key, FL to MS/AL Border
27 / 2100	Tropical Storm Warning modified to	Anclote River, FL to MS/AL Border
28 / 0300	Tropical Storm Warning modified to	Suwannee River, FL to MS/AL Border
28 / 1500	Tropical Storm Warning modified to	Suwannee River, FL to AL/FL Border
28 / 2100	Tropical Storm Warning modified to	Aucilla River, FL to AL/FL Border

Date/Time (UTC)	Action	Location
29 / 0000	Tropical Storm Warning modified to	Aucilla River to Okaloosa/Walton County Line, FL
29 / 0300	Tropical Storm Warning discontinued	All

Table 8. Storm surge watch summary for Tropical Storm Alberto, 25–31 May 2018.

Date/Time (UTC)	Action	Location
25 / 2100	Storm Surge Watch issued	Horseshoe Beach, FL to the Mouth of the Mississippi River
26 / 1500	Storm Surge Watch modified to	Crystal River, FL to the Mouth of the Mississippi River
26 / 2100	Storm Surge Watch modified to	Crystal River, FL to the Mouth of the Pearl River
27 / 0300	Storm Surge Watch modified to	Crystal River, FL to MS/AL Border
27 / 1500	Storm Surge Watch modified to	Crystal River, FL to FL/AL Border
27 / 2100	Storm Surge Watch modified to	Crystal River to Navarre, FL
28 / 0900	Storm Surge Watch modified to	Suwannee River, FL to MS/AL Border
28 / 1500	Storm Surge Watch modified to	Suwannee River to Mexico Beach, FL
28 / 2100	Storm Surge Watch modified to	Aucilla River to Mexico Beach, FL
29 / 0000	Storm Surge Watch discontinued	All

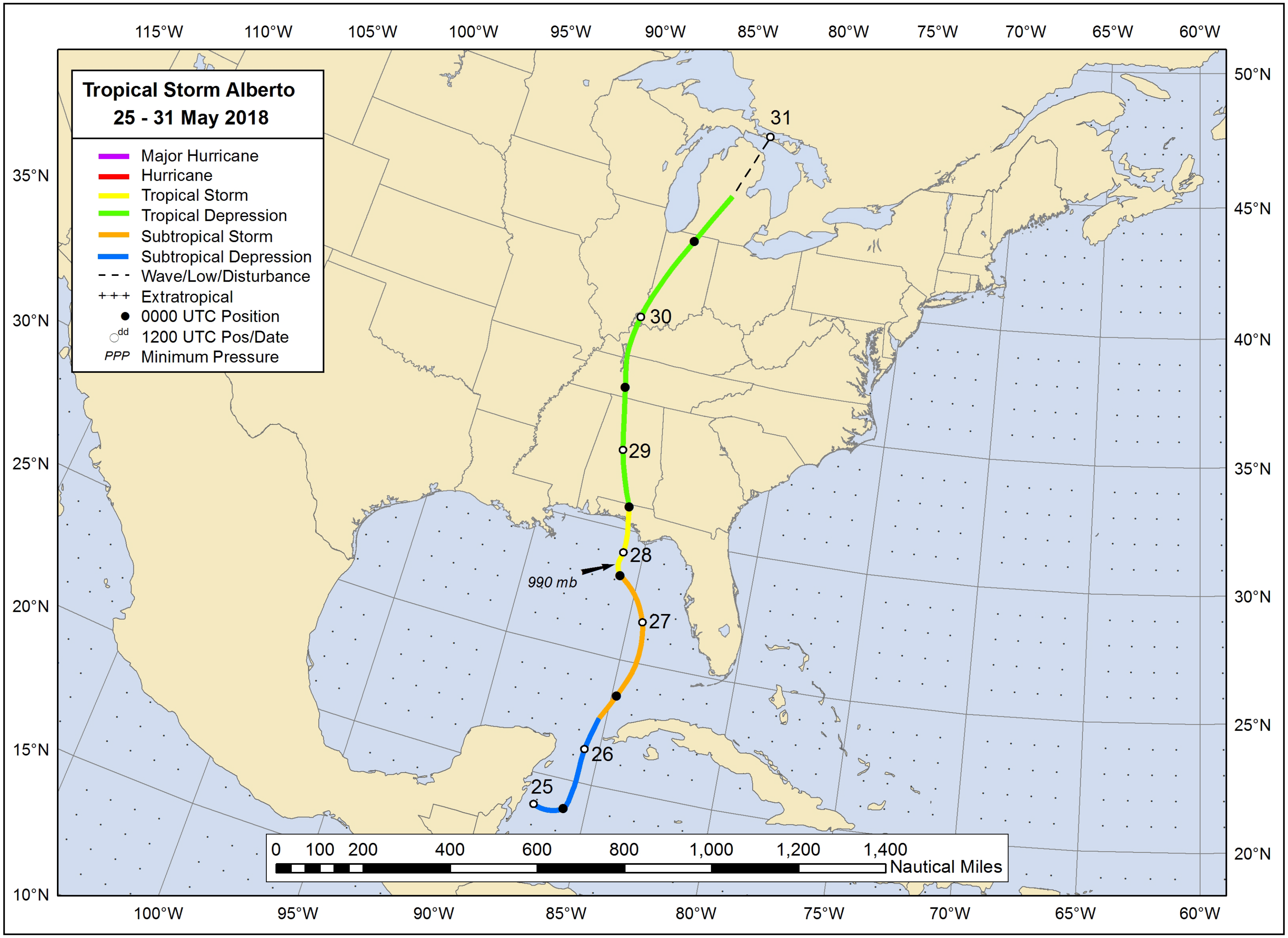

Figure 1. Best track positions for Tropical Storm Alberto, 25–31 May 2018.

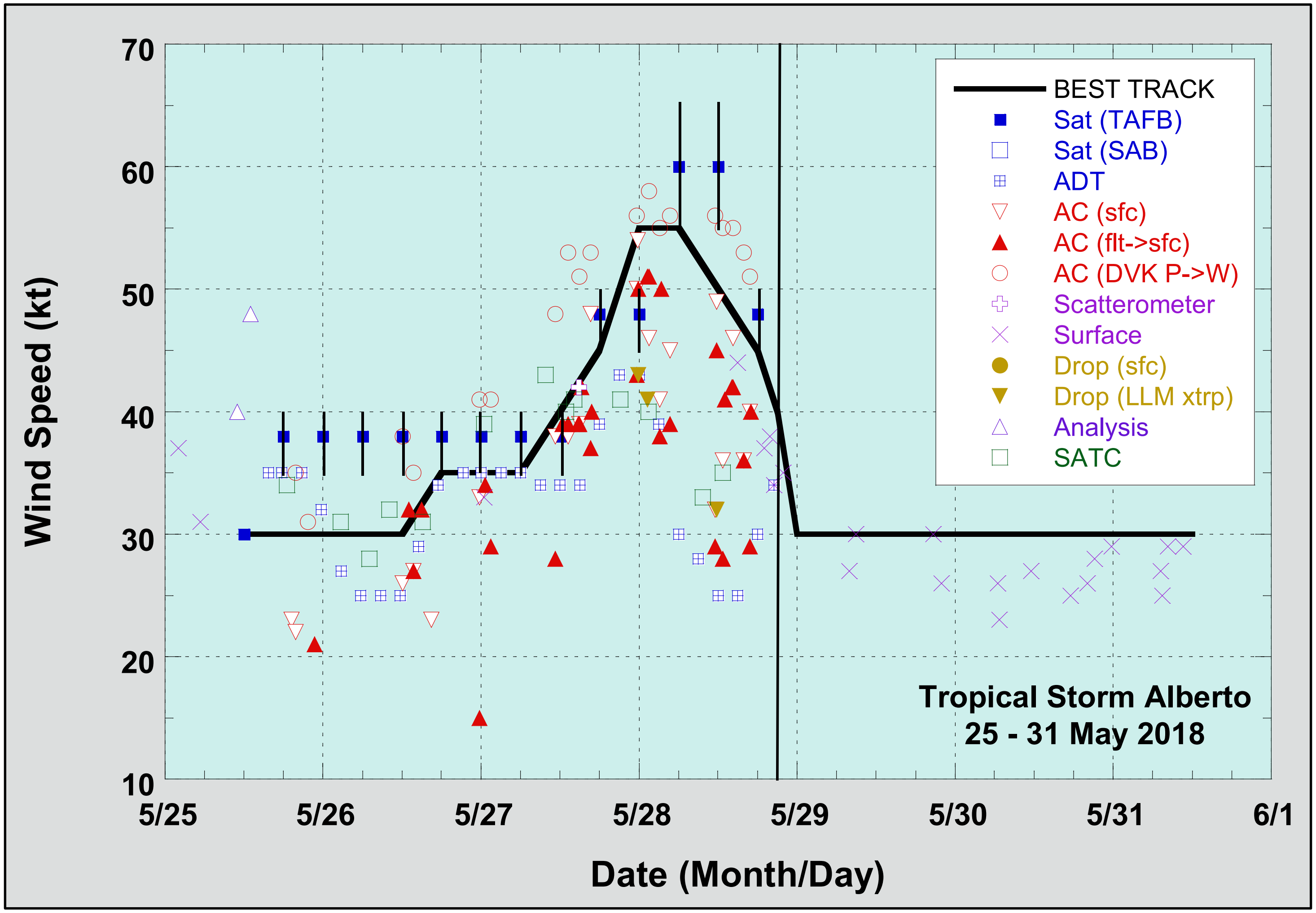

Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Tropical Storm Alberto, 25-31 May 2018. Aircraft observations have been adjusted for elevation using 80% adjustment factors for observations from 850 mb and 1500 ft. Dropwindsonde observations include actual 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, solid vertical lines correspond to landfalls, and short solid lines depict intensity ranges associated with subtropical satellite classifications.

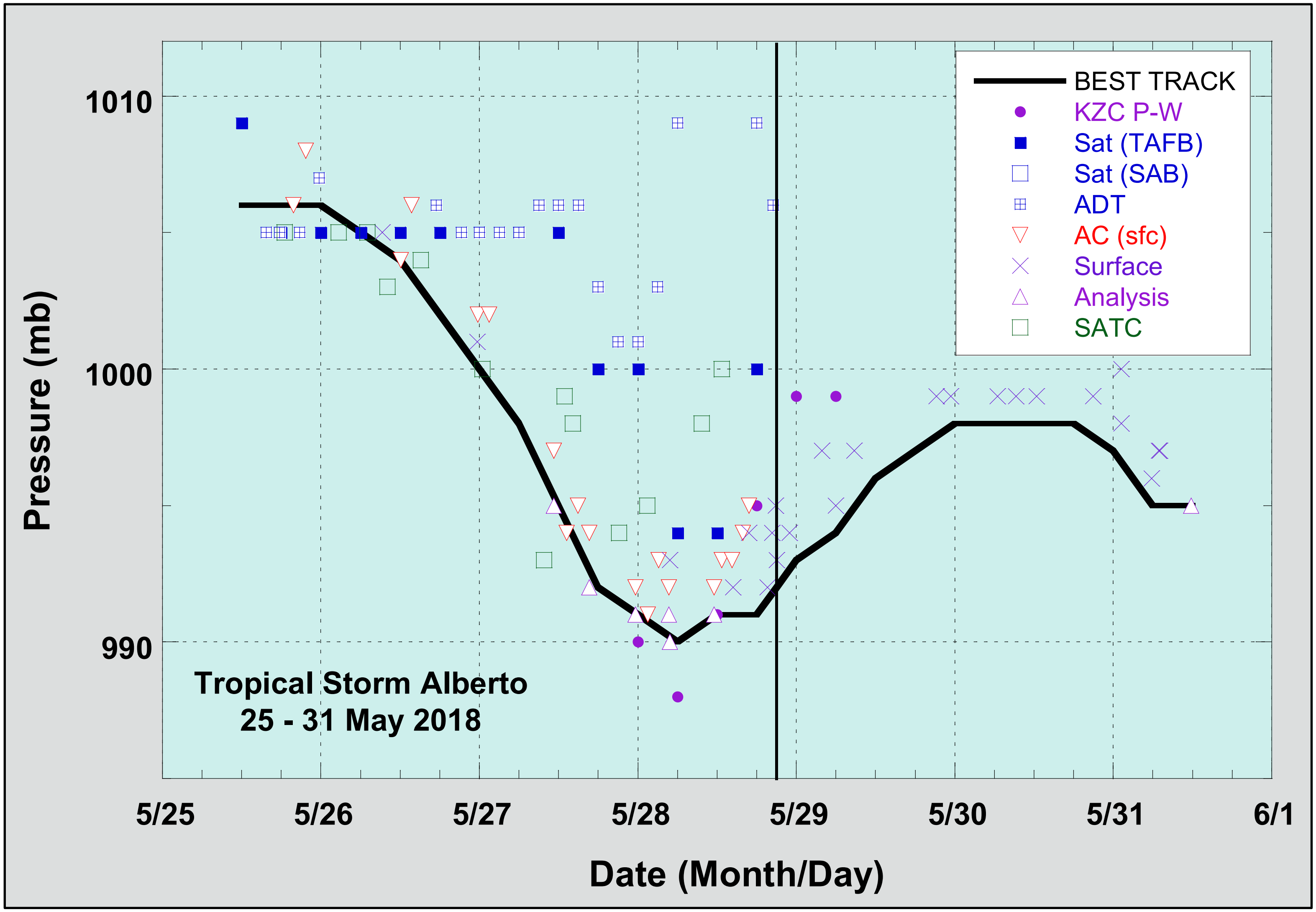

Figure 3. Selected pressure observations and best track minimum central pressure curve for Tropical Storm Alberto, 25-31 May 2018. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies. KZC P-W refers to pressure estimates derived using the Knaff-Zehr-Courtney pressure-wind relationship. Dashed vertical lines correspond to 0000 UTC, and solid vertical lines correspond to landfalls.

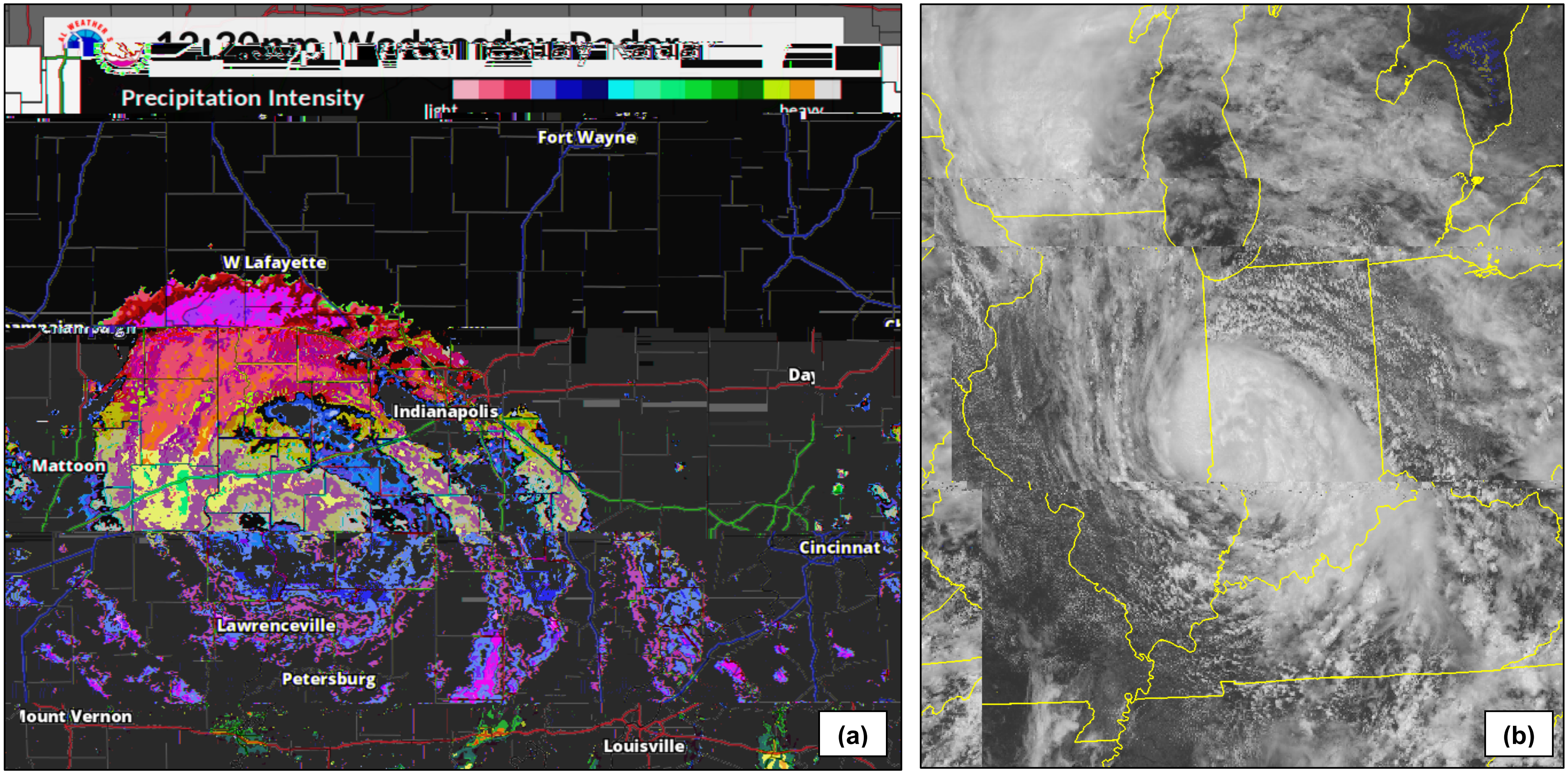

Figure 4. (a) WSR-88D composite radar image of Tropical Depression Alberto at 1630 UTC 30 May while it moved through western Indiana. (b) GOES-16 visible satellite image of Tropical Depression Alberto at 1700 UTC 30 May over western Indiana. Images courtesy of the National Weather Service Weather Forecast Office in Indianapolis, Indiana.

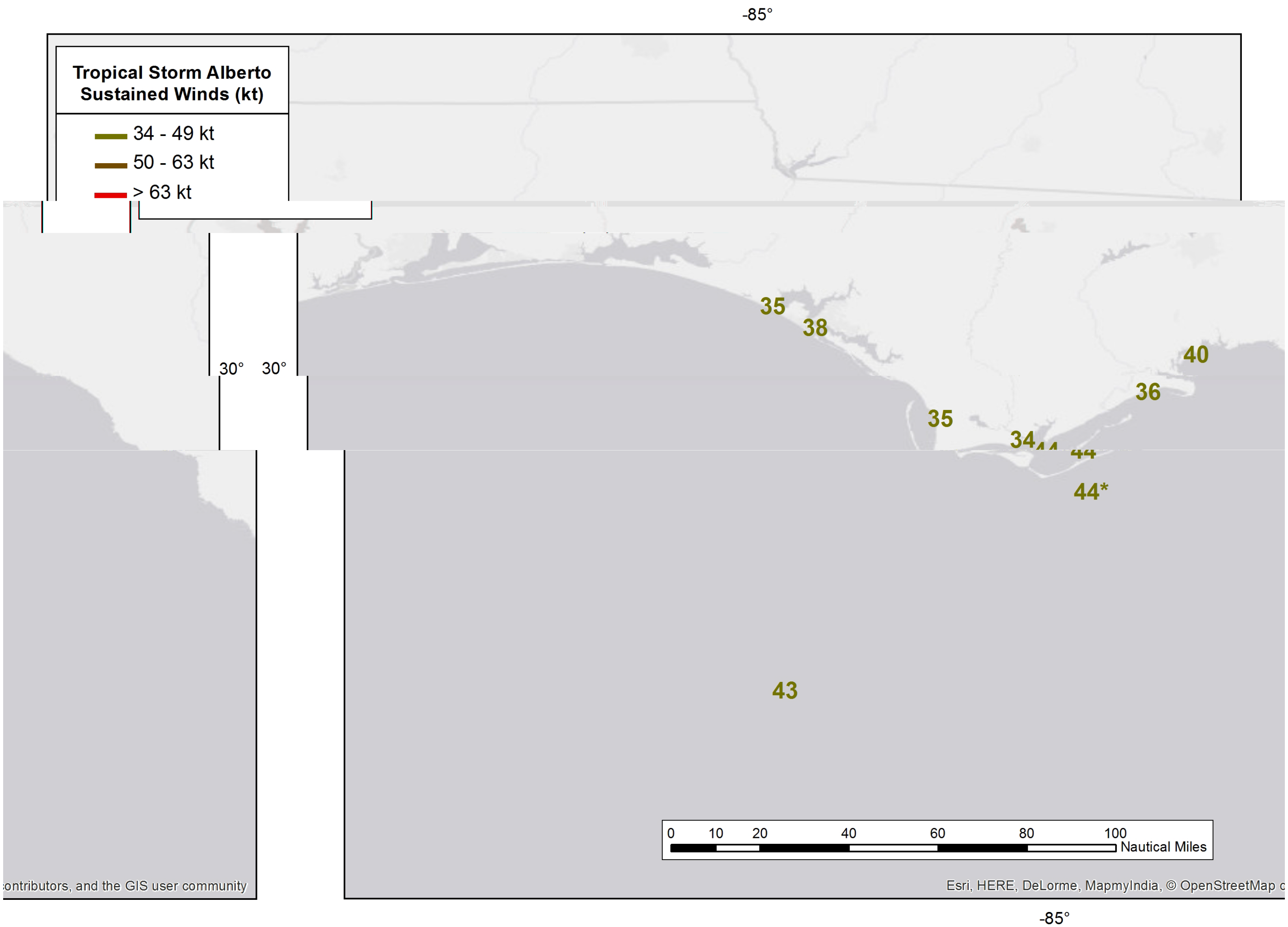

Figure 5. Selected peak sustained winds (kt) reported during Tropical Storm Alberto, 25-31 May 2018. An asterisk denotes observations that were elevated more than 20 m above the surface.

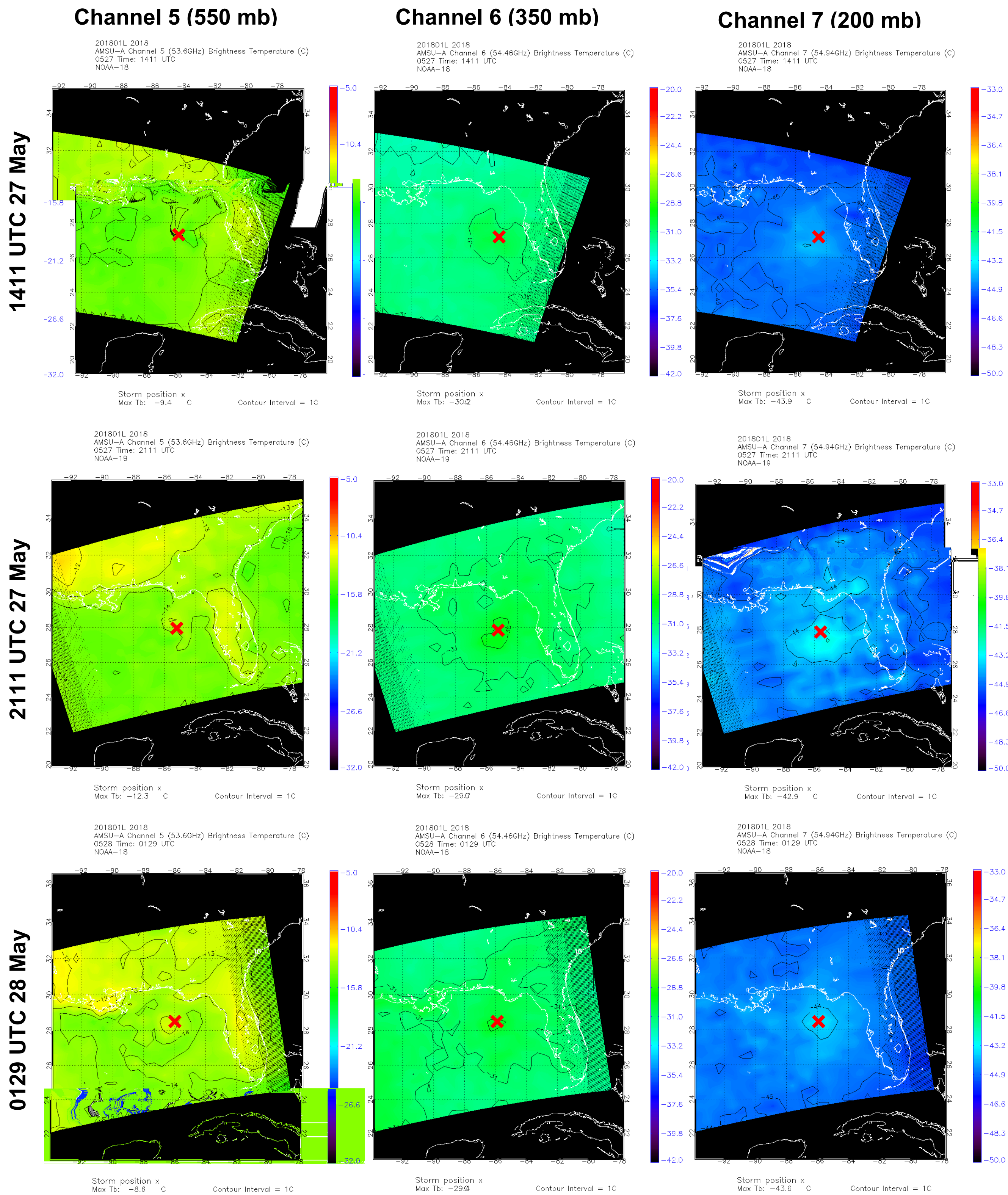

Figure 6. AMSU brightness temperatures (°C) of Tropical Storm Alberto at 1411 UTC 27 May (top row), 2111 UTC 27 May (middle row), and 0129 UTC 28 May 2018 (bottom row) from channel 5 (left column), channel 6 (middle column), and channel 7 (right column). The red "X" in each image denotes the surface center of Alberto. Images courtesy of the Cooperative Institute for Meteorological Satellite Studies at the University of Wisconsin-Madison.

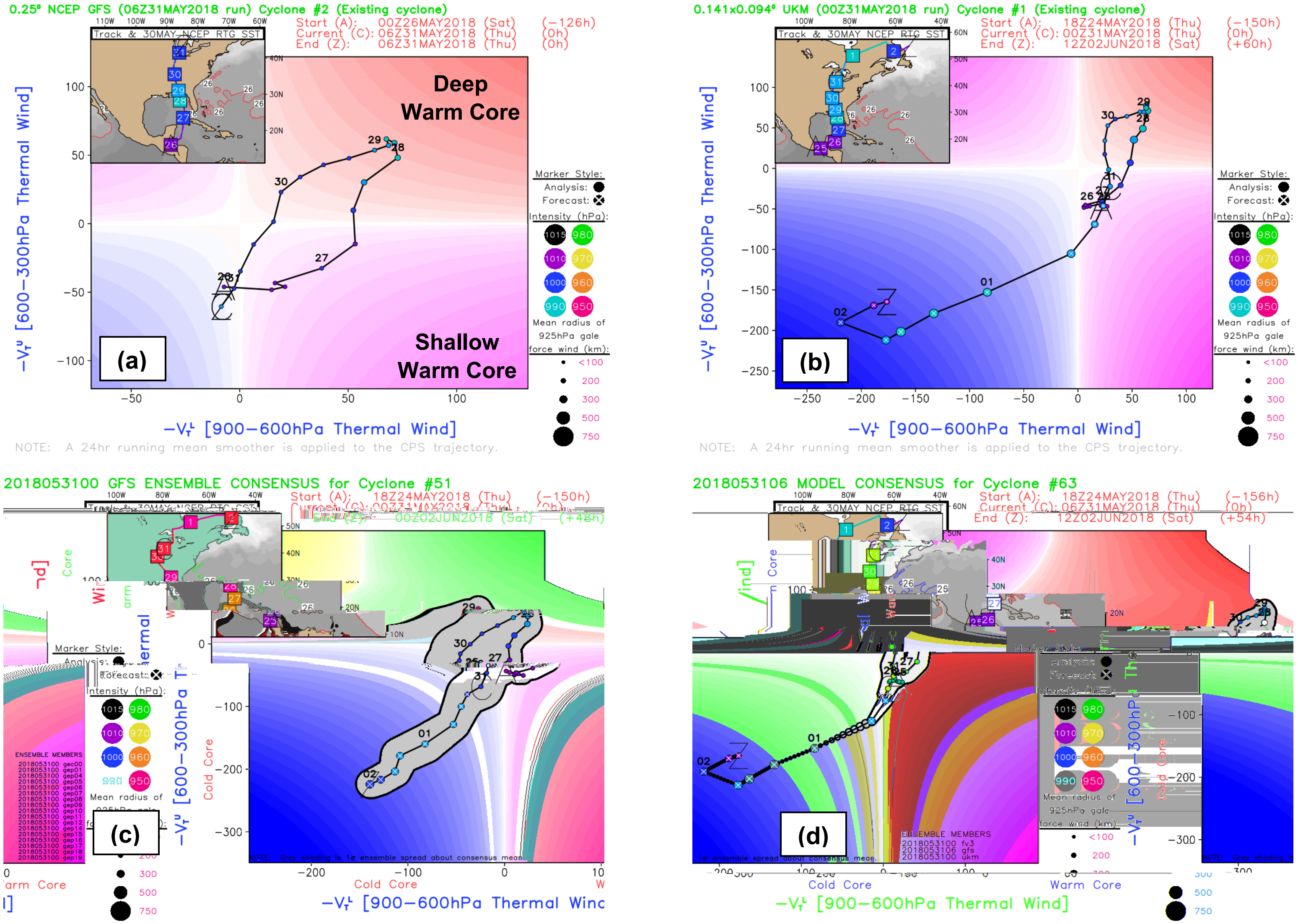

Figure 7. Model-derived cyclone phase-space diagram analyses from the (a) GFS model, (b) UKMET model, (c) GEFS ensemble mean, and (d) mean of the GFS, Canadian, and NAVGEM models for Tropical Storm Alberto, 25-31 May 2018. The bottom right quadrant in each panel denotes a shallow warm core structure while the top right quadrant denotes a deep warm core structure.

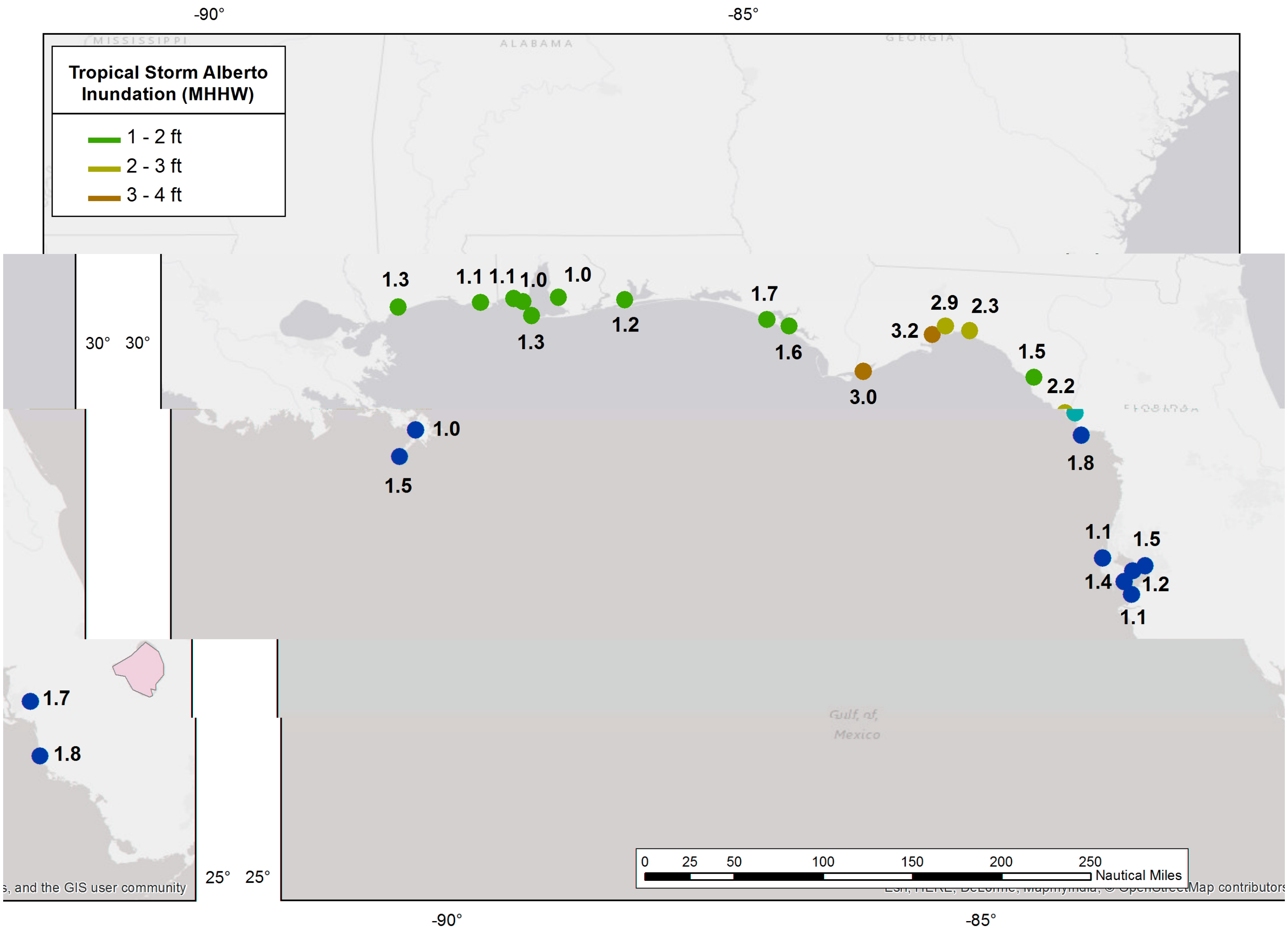

Figure 8. Storm tide measurements (ft) above Mean Higher High Water (MHHW) from NOS and USGS gauges from Tropical Storm Alberto, 25-31 May 2018. MHHW is used as a proxy for inundation, or storm surge covering normally dry ground.

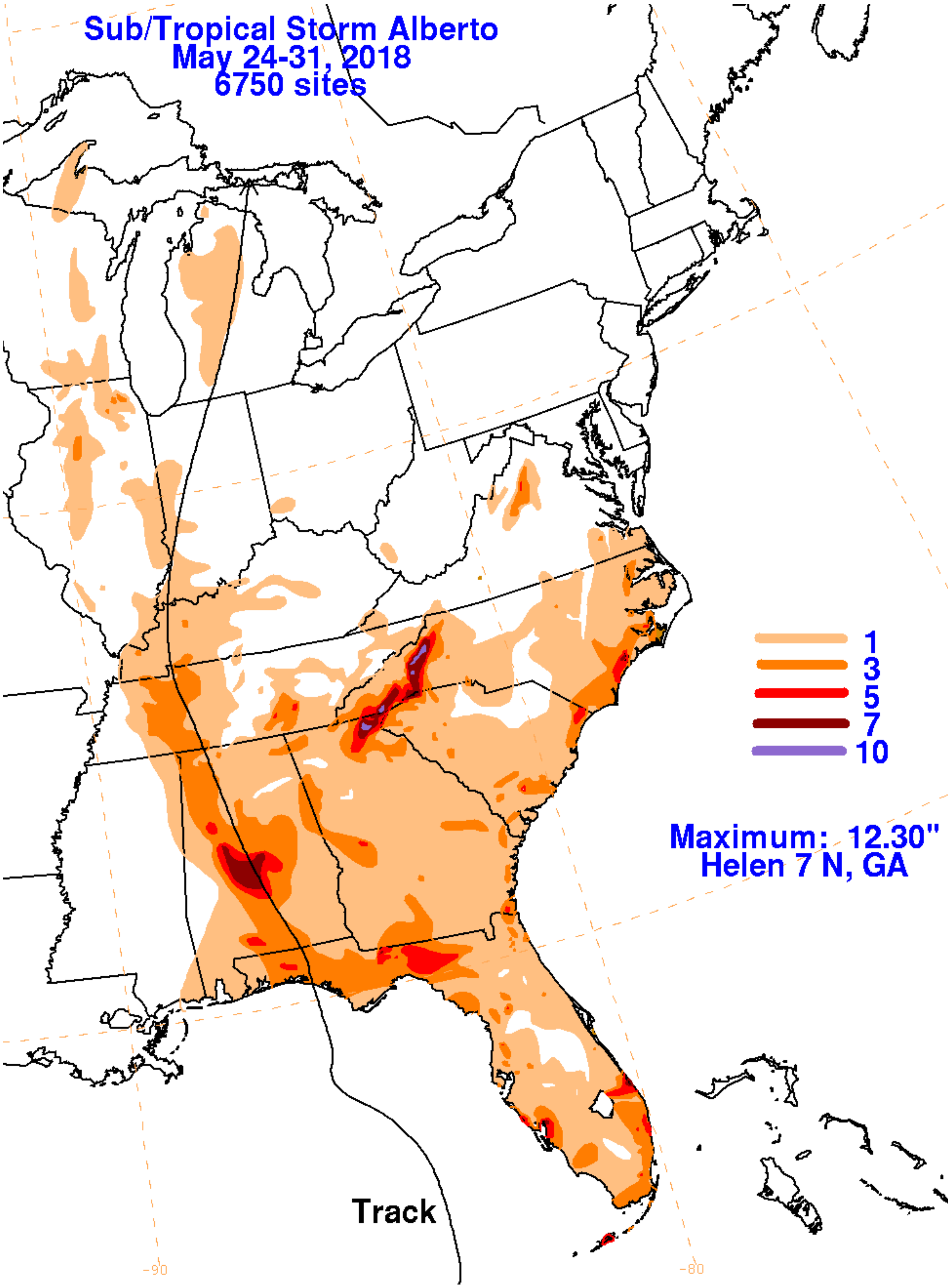

Figure 9. Rainfall accumulations (inches) between 24–31 May 2018 from Tropical Storm Alberto. Image courtesy of David Roth at the NOAA Weather Prediction Center.