NATIONAL HURRICANE CENTER TROPICAL CYCLONE REPORT

HURRICANE IDALIA
(AL102023)

26–31 August 2023

John P. Cangialosi and Laura Alaka
National Hurricane Center
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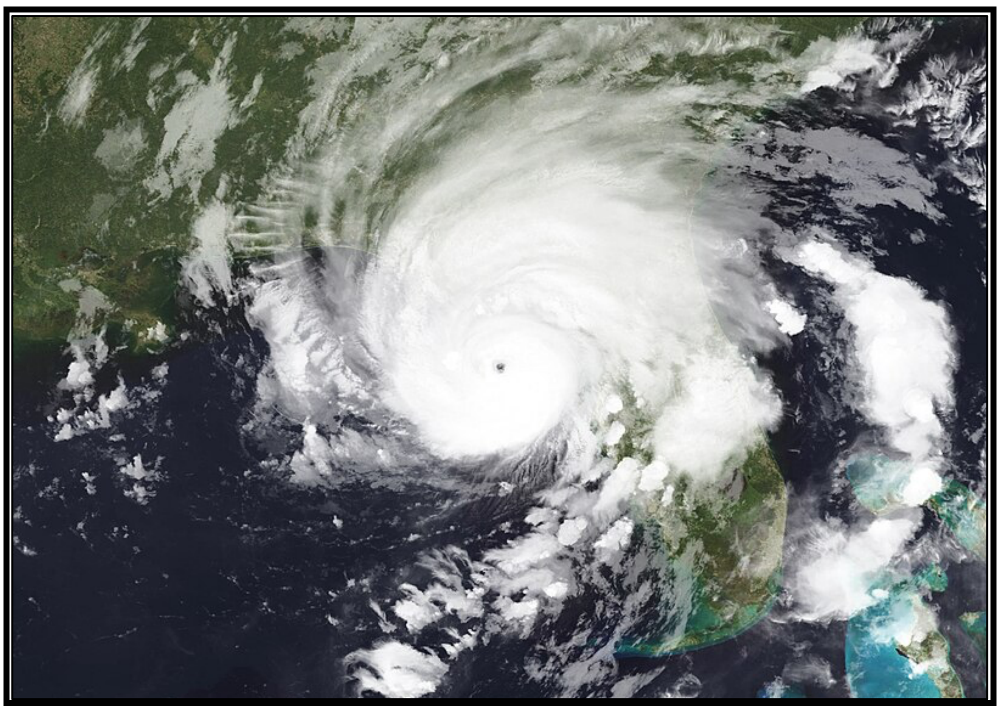

GOES-16 GEOCOLOR IMAGE OF HURRICANE IDALIA AT 0715 UTC 30 AUGUST 2023.
IMAGE COURTESY OF NOAA/NESDIS/STAR.

Idalia was a category 4 hurricane (on the Saffir Simpson Hurricane Wind Scale) that rapidly intensified over the Gulf of Mexico. It made landfall as a category 3 hurricane along the Florida Big Bend and is the third strongest landfalling hurricane in modern history for that region. Idalia is responsible for 12 fatalities and an estimated $3.6 billion in damage in the United States.

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Hurricane Idalia

26–31 AUGUST 2023

SYNOPTIC HISTORY

Idalia originated in the far eastern Pacific Ocean, where an area of showers and thunderstorms became concentrated within the monsoon trough on 23 August. This disturbance moved northeastward and crossed Central America the next day, bringing areas of heavy rain to portions of El Salvador, Honduras, and Nicaragua. A broad area of low pressure developed over the northwestern Caribbean Sea early on 25 August, with a band of disorganized showers and thunderstorms developing north of the low. The system turned northward later that day, and the circulation gradually became better defined while the associated showers and thunderstorms consolidated near the center. Satellite images suggest that the system developed sufficiently organized deep convection to be classified as a 25-kt tropical depression by 1200 UTC 26 August over the Yucatán Channel about 40 n mi east-southeast of Cancun, Mexico. 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].

Around the time of genesis, the cyclone was barely moving as the depression was caught in weak steering currents due to a weakness in the subtropical ridge to its north. In fact, the system unusually jogged back southward after genesis, and the center made landfall in Cozumel, Mexico, around 0600 UTC 27 August. Shortly after that, deep convection increased near the center and in bands on the system's east side. As a result, the depression strengthened into Tropical Storm Idalia by 1200 UTC that day when it was located about 45 n mi southeast of Cozumel. Idalia then turned eastward and continued to strengthen. The storm's center passed near NOAA buoy 42056 over the northwestern Caribbean Sea, which reported sustained winds of 45 kt around 0200 UTC 28 August. Idalia stalled around that time, but a sharp turn to the north and a faster forward motion began between 0600 and 1200 UTC 28 August when a south-to-north steering current became established between a mid- to upper-level trough over the central Gulf of Mexico and a building ridge over the Greater Antilles. Idalia steadily gained strength while moving back through the Yucatán Channel, and the center passed about 10 n mi west of the western tip of Cuba around 0000 UTC 29 August. Radar data from Cuba revealed that Idalia had developed a partial eyewall around that time, and data from NOAA and Air Force Reserve Hurricane Hunter aircraft indicated that the storm was just below hurricane strength when it was offshore of the island.

Idalia became a hurricane as it entered the far southeastern Gulf of Mexico around 0600 UTC 29 August. The hurricane developed a well-organized central dense overcast feature and

[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.

strong convective bands, extending well south of the center. In conducive environmental conditions of very warm and deep waters over the Gulf of Mexico's Loop Current and a moist and low vertical wind shear airmass, Idalia began to rapidly intensify while accelerating toward the north and north-northeast. The NOAA Hurricane Hunters reported that a closed eye had developed around 1200 UTC that day, and that feature became apparent in satellite images a few hours later. The eye of Idalia passed about 180 n mi west of Key West, Florida, around 1500 UTC 29 August, and the outer-most bands of the cyclone moved across portions of the Florida Keys and southern Florida during the afternoon and evening hours that day. The hurricane continued northward, with the eye passing about 110 n mi west of Tampa, Florida, around 0000 UTC 30 August. Although the inner core remained offshore at that time, bands of heavy rain and gusty winds spread across southwest and central Florida throughout the evening and overnight hours. Idalia became a major hurricane by 0600 UTC that day, and data from the Air Force Hurricane Hunters indicate that it became a 115-kt category 4 hurricane around 0900 UTC when the center was approaching the Florida Big Bend region, about 80 n mi south of Tallahassee (cover image). While Idalia was rapidly strengthening, the 34- and 50-kt wind radii expanded, but the inner core and associated hurricane-force winds remained fairly compact (Fig. 4).

Very shortly after attaining category 4 status, satellite and radar data showed that the eye feature had become a little less defined, and Air Force Reserve Hurricane Hunter data indicated that the winds had decreased some while the central pressure rose several millibars. This weakening was likely due to an eyewall replacement cycle that began just after the hurricane reached its peak intensity. Idalia made landfall near Keaton Beach, Florida, around 1145 UTC that day with estimated maximum sustained winds of 100 kt (Fig. 5). Idalia was the third-strongest hurricane to affect the Big Bend region of Florida, only behind the 1896 Cedar Key Hurricane and Hurricane Easy in 1950. After the core of Idalia moved inland, rapid weakening began, and the cyclone fell below hurricane strength while centered over southern Georgia, only about 6 hours after it made landfall in Florida. The storm produced a large area of heavy rains and tropical-storm-force winds across southeastern Georgia and eastern portions of the Carolinas on 30-31 August. Idalia turned northeastward late on 30 August and the center moved off the coast of South Carolina near Myrtle Beach around 0600 UTC the next day with peak winds of about 50 kt.

A combination of land interaction and a notable increase in southwesterly vertical wind shear and dry air caused Idalia's inner core to collapse and deep convection to be confined to the northeastern portion of the circulation when the system's center was just off the southeast U.S. coast. In addition, the cyclone began to interact with a frontal boundary that was draped offshore of the North Carolina Outer Banks, and it is estimated that Idalia transitioned into an extratropical cyclone around 1200 UTC 31 August when it was located about 50 n mi east of Cape Fear, North Carolina. Data from the Air Force Reserve Hurricane Hunters and ASCAT winds indicated that Idalia strengthened a little during its extratropical transition, with a band of 50 to 55-kt winds occurring near the front. Meanwhile, Idalia turned eastward within the flow at the base of a mid- to upper-level trough, and that motion continued through 1 September.

The center of Idalia passed just to the south of Bermuda between 0000 and 0600 UTC 2 September. An area of deep convection formed over and to the north of Bermuda in association with the storm, but the cyclone remained frontal. Idalia continued trekking eastward, but at a much slower pace as the steering currents weakened later that day. The extratropical storm turned north-northeastward on 3 September and intensified due to baroclinic forcing. The cyclone lost that baroclinic forcing on 4 September and weakened while slowing down during the next few days. Idalia dissipated off the coast of Atlantic Canada on 8 September.

METEOROLOGICAL STATISTICS

Observations in Idalia (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 seven flights of the 53rd Weather Reconnaissance Squadron of the U.S. Air Force Reserve Command and five flights from NOAA's Aircraft Operations Center (Fig. 6). These flights provided a total of 32 center "fixes" during Idalia's lifecycle. In addition, there were four surveillance flights conducted by the NOAA G-IV jet. 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 Idalia. In addition, radar data from the United States, Cuba, and Bermuda provided important information on Idalia.

Ship reports of winds of tropical storm force associated with Idalia are given in Table 2, and selected observations given in Table 3. A supplemental file containing a larger selection of surface and buoy observations is available for download on the NHC website at https://www.nhc.noaa.gov/data/tcr/supplemental/idalia.zip. This file also contains rainfall reports from National Weather Service Cooperative (COOP) stations and the Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) sites.

Winds and Pressure

Idalia rapidly intensified while it was over the Gulf of Mexico and reached an estimated peak intensity of 115 kt (category 4 on the Saffir-Simpson Hurricane Wind Scale) at 0900 UTC 30 August (cover image). The estimated peak intensity is based on data collected by the Air Force Reserve Hurricane Hunters between 0700 and 0900 UTC that day. The highest 700-mb flight-level wind recorded was 123 kt, which adjusts to about 111 kt at the surface using a standard reduction factor. The peak reliable SFMR wind was 116 kt around the same time. The minimum pressure of 942 mb is based on dropsonde data and agrees well with the estimates from the Knaff-Zehr-Courtney pressure-wind relationship.

Idalia began to weaken before it made landfall in Florida. Data from the reconnaissance aircraft indicated that the peak winds decreased while the central pressure rose by several millibars. An inspection of Doppler radar reflectivity data from Tallahassee, Florida, indicates that Idalia was going through an eyewall replacement cycle during this time, and the inner eyewall was opening on the south side around the time it made landfall (Fig. 5). The estimated peak intensity at landfall is 100 kt, but there is some uncertainty around that value given the lack of surface data and the ongoing structural evolution of Idalia at that time.

Since Idalia had a compact inner core (Fig. 4) and made landfall in one of the more remote parts of Florida, there were no observations of sustained hurricane-force winds. The highest observed wind was in Horseshoe Beach, Florida, where a WeatherSTEM observation site recorded a peak sustained wind of 63 kt and a wind gust of 70 kt at 1026 UTC 30 August, about an hour before Idalia made landfall. The highest reported wind gust was 74 kt in Perry, Florida, near the landfall location. The lowest minimum pressure observed on land was from storm chaser Josh Morgerman of iCyclone that recorded a pressure of 954.7 mb at 1217 UTC just south of Perry, Florida. The official reporting site in Perry, Florida reported a minimum pressure of 957.7 mb at 1215 UTC 30 August. That station also reported a sustained wind of 54 kt at that time.

Damaging winds spread across southern Georgia during the afternoon and evening hours on 30 August. The highest wind gusts reported were along the coast in St. Simons and Tybee Sound, where gusts to 57 kt and 60 kt occurred, respectively. Tropical-storm-force winds were also reported along the coast in North Carolina and South Carolina. The highest wind reported in that region was in Cape Lookout, North Carolina, where an observation site recorded a sustained wind of 44 kt and a wind gust of 64 kt.

Although Idalia did not make landfall in Cuba, tropical-storm-force winds are estimated to have affected the far western provinces, with the strongest winds likely occurring in Pinar Del Rio near the western tip of the island.

Rainfall and Flooding

Idalia produced an area of heavy rain along and just west of its track across portions of the southeast United States (Fig. 7). There were widespread totals of 5-7 inches of rain from the Florida Big Bend to eastern North Carolina. However, there were some pockets of notably higher rainfall totals (7-10 inches) just west of the track of Idalia’s center in southern Georgia, South Carolina, and far southeastern North Carolina. Holly Hill, South Carolina, received the most rain from Idalia, where 13.55 inches was reported. Farther south in Florida, a swath of 4 to 8 inches of rain occurred in southwest and west-central Florida, due to trailing rainbands on Idalia’s southwest side.

At the time of this writing, there are no rainfall totals available from Cuba, but there were some reports of flooding in Pinar Del Rio, Artemisa, and La Habana.

Tornadoes

There were 12 tornadoes spawned by Idalia as it tracked across the southeastern United States (Fig. 8). One EF-0 tornado occurred in Florida, three EF-0 tornadoes and one EF-1 tornado occurred in Georgia, two EF-0 and one EF-1 tornadoes affected South Carolina, and two EF-0 and two EF-1 tornadoes were spawned in North Carolina.

Among the more damaging tornadoes was an EF-1 that occurred in Brunswick, Georgia. This tornado downed numerous trees and damaged some buildings as it passed through the south and west sides of the city and near I-95. Another EF-1 tornado moved through portions of Wilmington, North Carolina. This tornado was originally a waterspout that came onshore, uprooting numerous pine and oak trees along its path. The falling trees caused some damages to homes and properties. Only minor injuries were reported in association with these tornadoes.

Storm Surge

Hurricane Idalia brought a dangerous storm surge to the Florida Big Bend region, with the maximum inundation of 8 to 12 ft above ground level (AGL) occurring from Keaton Beach to Steinhatchee, Florida (Fig. 9). While a large portion of this coastline is natural wetlands and evergreen forest, significant storm surge inundation occurred in small coastal communities. Minor storm surge inundation also occurred along the U.S. southeast coast as Idalia tracked to the northeast across Florida, Georgia, and South Carolina. Storm surge observations from this event include National Ocean Service (NOS) tide gauges, United States Geological Survey streamgages, North Carolina Department of Public Safety water level gauges, and high water marks surveyed by the National Weather Service (NWS). Lastly, Idalia made landfall in a relatively remote location in the Big Bend of Florida, and for this reason, it is unlikely that the highest storm surge values were observed or measured. A storm surge hindcast (not shown) was used to supplement the lack of observations in this region.

Florida West Coast

A maximum storm surge inundation of 8 to 12 ft AGL occurred from near the landfall location in Keaton Beach southward through Steinhatchee (Fig. 9). Idalia had a 10-n mi radius of maximum wind at landfall, and the storm surge hindcast suggests the most severe impacts occurred near the eyewall, with storm surge inundation up to 12 ft AGL occurring in unpopulated wetlands. Figure 10 shows the maximum water levels from sensor networks referenced as feet above Mean Higher High Water (MHHW), an approximation for inundation above normally dry ground at the immediate coastline. Radar reflectivity data from Tampa (KTBW) WSR-88D radar near the time of landfall is overlaid (Fig. 10) to illustrate the small inner core and sprawling rain bands associated with the gradient of water level observations along the Florida peninsula. A USGS streamgage that is monitored in cooperation with the Suwannee River Water Management District on the Steinhatchee River, located approximately two miles upstream from the mouth of the river, recorded a maximum water level of 8.04 ft above MHHW, the highest recorded during Idalia (Fig. 10). Examining the hydrograph from this sensor indicates that the water level rose very quickly, 7.2 ft in 1 hour, and peaked between high tide cycles. Also note that this sensor records an instantaneous water level measurement every 15 minutes, and given the rapid rise, it's possible that a higher water level occurred between the 15-minute recordings. Approximately one mile downstream of this sensor, NWS crews surveyed a high water mark of 9.6 ft above MHHW along the river bank, and found significant inundation in homes (5 to 7 ft AGL) with water penetrating inland several blocks. In Keaton Beach, NWS crews found evidence of water marks with suspected wave action between 10 and 14 ft AGL, but there were few structures to identify high quality still water lines on in this area.

Storm surge inundation of 6 to 9 ft AGL occurred from south of the Steinhatchee to the Suwannee River, including Horseshoe Beach (Fig. 9). Horseshoe Beach was particularly hit hard by waves on top of the storm surge inundation due to the exposed coastline. Post-storm aerial overflight imagery from NOAA’s Aircraft Operations Center shows large amounts of debris filling canals and a few structures removed from their foundations (Fig. 11). There were no water level sensors in this community, but NWS crews found significant wave damage to exposed coastal structures, and surveyed several still high water marks of 5 to 6 ft AGL along more inland and protected portions of the small peninsula.

Storm surge inundation 5 to 7 ft AGL occurred between the Suwannee River and Chassahowitzka including Cedar Key (Fig. 9). The NOS tide gauge at Cedar Key recorded a maximum water level of 6.89 ft above MHHW (Fig. 10). The peak water level occurred at low tide, with the storm surge measuring 8.91 ft above normal tide levels. If the timing of the storm surge had occurred with high tide, the impacts would have been more severe. NWS crews surveyed widespread still high water marks of 3 to 5 ft AGL on Cedar Key, with additional evidence of wave damage. Southeast of Cedar Key, USGS streamgages from the Crystal River and the Chassahowitzka River recorded maximum water levels of 7.01 ft and 6.06 ft above MHHW, respectively (Fig. 10), and several high water marks measuring 4 to 5 ft AGL were surveyed in Yankeetown, along the Withlacoochee River.

Storm surge inundation of 3 to 5 ft AGL occurred from Chassahowitzka southward to Englewood, including Tampa Bay (Fig. 9). The 34-kt wind radii extended out to 180 n mi southeast of the center of Idalia at landfall leading to widespread storm surge impacts over this area. The NOS tide gauge on the ocean pier in Clearwater recorded a maximum water level of 3.86 ft above MHHW (5.33 ft above normal tides), and in Tampa Bay, the gauge at East Bay recorded a maximum of 4.56 ft above MHHW (5.70 ft above normal tides). Similar to Steinhatchee and Cedar Key, these peak water levels did not occur at high tide. The City of Tampa reported flooded and impassable streets along Tampa Bay, and NWS survey crews reported storm surge inundation in homes up to 1 ft AGL.

Storm surge inundation of 2 to 4 ft AGL occurred between Englewood and Naples, including Charlotte Harbor (Fig. 9). The NOS tide gauges on the Caloosahatchee River near Fort Myers and on Naples Pier recorded maximum water levels of 3.20 and 3.02 ft above MHHW, respectively. The NWS reported beach erosion and road washout damage in these areas. Maximum storm surge inundation of 1 to 3 ft AGL occurred south of Naples, in areas such as Marco Island, Everglades City, and Everglades National Park.

Storm surge impacts in the Florida Keys were minimal with maximum inundation of 1 to 2 ft AGL, where the NOS tide gauge at Key West recorded a maximum water level of 1.47 ft above MHHW.

West of the landfall location, storm surge inundation levels dropped off where there were predominantly offshore winds (Fig. 9). Maximum inundation of 4 to 6 ft AGL occurred in remote wetlands west of Dekle Beach, and 3 to 5 ft AGL occurred in the Big Bend where a USGS streamgage at Spring Creek recorded a water level of 3.95 ft above MHHW. Further to the west, the NOS tide gauge at Apalachicola measured a maximum water level of 2.84 ft above MHHW.

Southeast U.S. Coast

Storm surge inundation of 2 to 4 ft AGL occurred along the Georgia and South Carolina coastline. In Georgia, the NOS tide gauge at Fort Pulaski recorded a maximum water level of 2.39 ft MHHW. In South Carolina, the NOS tide gauges at Charleston and Springmaid Pier (near Myrtle Beach) measured a maximum water level of 3.46 and 3.53 ft above MHHW, respectively. USGS streamgages in Charleston Harbor also measured water levels in excess of 3 ft MHHW. Minor storm surge flooding impacts occurred in Edisto Beach and Charleston, South Carolina, with the NWS crews surveying high water marks of 2 to 3 ft AGL.

Maximum storm surge inundation of 1 to 3 ft AGL occurred in coastal North Carolina, including the Outer Banks. NOS tide gauges in Wilmington and Wrightsville Beach recorded 2.05 and 2.60 ft above MHHW, respectively. And on the Outer Banks, gauges at Hatteras and Duck recorded 2.58 and 2.83 ft MHHW, respectively.

Maximum storm surge inundation of 2 to 4 ft AGL occurred in the Neuse River and Bay River near New Bern, North Carolina. Water level gauges operated by the North Carolina Department of Public Safety measured 4.26 ft above MHHW at New Bern along the Neuse River and 3.77 ft above MHHW at Cedar Island on the Pamlico Sound, while the USGS gauge at Washington along the Pamlico River recorded 1.80 ft above MHHW.

CASUALTY AND DAMAGE STATISTICS

United States

Idalia was responsible for 12 fatalities, all of which occurred in the United States (Table 4). Of the casualties, 8 of them were direct. All of the direct fatalities were caused by rough surf and rip currents. In Brevard County, Florida, a 60-year-old man drowned while windsurfing in rough surf due to Idalia's winds. When Idalia was off the southeast U.S. coast, the associated rough surf took the lives of 7 individuals: 3 in North Carolina, 3 in New Jersey, and 1 in Delaware. Of the four indirect fatalities, two were due to falling trees during cleanup after the storm's passage, one in Florida and one in Georgia. The other two indirect fatalities occurred due to vehicle accidents in Florida while the storm was passing through the area.

Idalia made landfall in a rural part of Florida, which resulted in less damage than other recent hurricanes that have impacted the state. According to the NOAA National Centers for Environmental Information (NCEI), the estimated damage from Idalia is $3.6 billion[2], most of which occurred in Florida's Big Bend region, with a 90% confidence interval of damage ranging from $2.6 to $4.2 billion. The majority of the damage affected Florida's agriculture industry in the Big Bend region and northern portions of the state. In particular, strong winds caused damage to buildings, trees, peanut and cotton crops, infrastructure, irrigation rigs, aquaculture, and livestock. Along the coast in Taylor and Dixie Counties, a devastating storm surge occurred, inundating numerous structures along the coast and flooding residences and businesses many miles inland. Significant storm surge damage to property and infrastructure will take a considerable time to rebuild. Although impacts were notably lower outside of the Big Bend region, gusty winds and heavy rains caused damage to tens of thousands of structures in portions of southwest, central, and northeast Florida. Examples of the damage in Florida can be seen in Fig. 12.

In Georgia, heavy rains resulted in flooding across the southeast and south-central portions of the state that shut down numerous roads, especially in Candler and Chatham Counties. The strong winds downed powerlines, uprooted trees, knocked down traffic lights, signs, and billboards across the southern portions of the state. In addition, tornadoes that moved through St. Simons and Fleming caused damage to some homes. In South Carolina, numerous trees were downed in Beaufort County, especially near Hilton Head, and in Hampton and Jasper

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[2] NOAA National Centers for Environmental Information (NCEI) U.S. Billion-Dollar Weather and Climate Disasters (2023). https://www.ncei.noaa.gov/access/billions, DOI: 10.25921/stkw-7w73

Counties. In Charleston, heavy rainfall combined with storm surge flooding resulted in some flooded roadways and several flooded structures. Numerous homes were flooded in Edisto Beach, where significant storm surge occurred.

In addition to the rip current fatalities along the coast of North Carolina, Delaware, and New Jersey, numerous rescues were made along the beaches of the southeast U.S. and mid-Atlantic region.

Cuba

The primary hazard that affected Cuba was heavy rainfall that resulted in flooding in some locations. In particular, the worst impacts occurred in the far western provinces of Pinar del Rio and Artemisa, where more than 10,000 people were evacuated. No injuries, fatalities, or damage estimates were reported.

FORECAST AND WARNING CRITIQUE

Genesis

The genesis of Idalia was not particularly well forecast as the system formed sooner than expected. The system from which Idalia developed was introduced in the Tropical Weather Outlook 60 h prior to genesis (Table 5). The 7-day probabilities were raised to the medium (40-60%) and high (>60%) categories 54 and 36 h before genesis, respectively. A 2-day chance of formation was introduced into the outlook 54 h before formation, and the 2-day probabilities were raised to the medium category 18 h before development. The probabilities failed to reach the high category prior to genesis. Idalia's location of formation was well anticipated as every NHC genesis area drawn correctly encapsulated the formation location over the Yucatán Channel (Fig. 13).

Track

A verification of NHC official track forecasts for Idalia is given in Table 6a. Official track forecast errors were quite low overall, and below the previous 5-year means at all times, except 24 and 36 h. In fact, the NHC official track errors at 72 and 96 h were about half the size of the previous 5-year means. An inspection of the official track forecasts shows that the overall predictions were accurate and consistent, and well captured the landfall location in Florida (Fig. 14). A homogeneous comparison of the official track errors with selected guidance models is given in Table 6b and illustrated in Fig. 15. The best-performing model was the HFIP Corrected Consensus (HCCA), which slightly outperformed the official forecasts at most times. NHC generally beat all of the individual models, but the Hurricane Analysis and Forecast System (HFAI/HFBI) models performed quite well and had lower errors than the global models at most forecast times. The poorest-performing track models were the United Kingdom global model (EGRI) and the U.S. Navy Global Environmental Model (NVGI).

It should be noted that many forecasts were made when Idalia was an extratropical cyclone over the western Atlantic due to tropical storm watches/warnings that were issued for Bermuda. These forecasts are not included in the verification statistics since the standard rules of NHC verification require the cyclone to be a tropical cyclone at both the initial and forecast verifying times.

Intensity

A verification of NHC official intensity forecasts for Hurricane Idalia is given in Table 7a. Official intensity forecast errors were lower than the mean official errors for the previous 5-year period at 36, 48, 60, and 96 hours but slightly larger than the long-term means at the other verifying forecast times. The NHC forecasts generally predicted the rapid intensification and weakening phases of Idalia well, except for the early forecasts which had a notable low bias (Fig. 16). A homogeneous comparison of the official intensity errors with selected guidance models is given in Table 7b and illustrated in Fig. 17. Like for track, the best-performing model was HCCA, which slightly outperformed the official forecasts at the short lead times. NHC generally beat the individual models, but the hurricane regional models (HFAI, HFBI, HWFI, and HMNI) beat the global models and statistical-dynamical models.

Wind Watches and Warnings

Coastal wind watches and warnings associated with Hurricane Idalia are given in Table 8 and illustrated in Fig. 18. A verification of select coastal watches and warnings is provided below.

For the United States, a Hurricane Watch was issued for much of Florida's west coast from Englewood northward to Indian Pass, and a Tropical Storm Watch was issued for the Dry Tortugas and southwestern Florida at 2100 UTC 27 August. Warnings were issued for the Dry Tortugas at 0300 UTC 28 August and for Florida's west coast at 1500 UTC 28 August. Watches for the Florida peninsula provided a lead time of about 54 h before the arrival of tropical-storm-force winds, and warnings provided a lead time of about 36 h. The lead time for the Dry Tortugas and Lower Florida Keys was shorter, but winds are estimated to have been near the lower end of tropical-storm-force range in those locations.

A Tropical Storm Watch was issued for portions of Georgia and South Carolina at 2100 UTC 28 August, and that area was upgraded to a Tropical Storm Warning at 1500 UTC 29 August. A Hurricane Warning was issued for much of southern Georgia and far southern South Carolina at 0900 UTC 30 August. The watches provided about 48 h of lead time, and the warnings were issued about 30 h before tropical-storm-force winds began. However, as described in the other sections, Idalia weakened very quickly after landfall, and hurricane-force winds did not occur in the Hurricane Warning areas in Georgia and South Carolina.

A Tropical Storm Watch was issued for Bermuda by the Bermuda Weather Service at 2100 UTC 31 August, and it was upgraded to a warning at 1500 UTC 1 September. This watch/warning was issued in case Idalia transitioned back to a tropical storm, which did not occur. Nonetheless, gale-force winds did occur on the island on 2 September.

Storm Surge Watches and Warnings

Figure 19 shows the geographic extent of the Storm Surge Watch and Warning in effect at 0900 UTC 30 August, approximately three hours prior to landfall in the Big Bend. Figure 20 shows the timeline of the storm surge watch/warning overlaid on the hydrograph at select NOS gauges (Naples, Fort Myers, East Bay Tampa, Cedar Key, Apalachicola, and Charleston) and a USGS streamgage (Steinhatchee[3]), which are geographically labeled in Figure 19. The watch/warning timeline demonstrates location-specific lead times prior to the onset of hazardous conditions (e.g. onset of tropical-storm-force winds, landfall, and peak water level). Observed water levels in excess of 3 ft MHHW are used as a first-cut threshold to verify a storm surge warning (Figs. 19-20).

A storm surge watch was first issued at 2100 UTC 27 August for the Gulf Coast of Florida from Chokoloskee to Indian Pass. This initial watch area included Naples, Tampa, Cedar Key, Steinhatchee, and Apalachicola (Fig. 20). At 1500 UTC 28 August, a portion of the Storm Surge Watch from Englewood to the Ochlocknee River was upgraded to a Storm Surge Warning. The warning area included the area of maximum storm surge inundation (Fig. 9) as well as Tampa, Cedar Key, and Steinhatchee (Fig. 20). Ultimately, water levels at these locations exceeded warning criteria. The lead time of the Storm Surge Watch was 54 h prior to the onset of tropical-storm-force winds in Tampa Bay and 57 hours prior at Cedar Key and Steinhatchee. The lead time of the Storm Surge Warning was 36 h prior to the onset of tropical-storm-force winds at Tampa Bay, and 39 hours prior at Cedar Key and Steinhatchee. The onset of dangerous water levels occurred after the arrival of tropical-storm-force winds, and water levels remained greater than 3 ft above MHHW for at least 7 h at these locations.

The western edge of the Storm Surge Warning was extended to Indian Pass at 2100 UTC 28 August, including Apalachicola (Fig. 20). This portion of the storm surge warning along Apalachicola Bay and the Saint George Sound did not verify, however the uncertainty of the track forecast and the area’s extreme vulnerability to storm surge supported the issuance of the warning.

The Storm Surge Watch south of Englewood, including Naples and Fort Myers, was never upgraded to a Storm Surge Warning (Fig. 20). The watch area south of Bonita Beach was taken down at 2100 UTC 29 August (Fig. 20, see Naples), and the watch area between Englewood and Bonita Beach remained in place for the entirety of the event (Fig. 20, see Fort Myers). The water levels at Naples and Fort Myers hovered near warning criteria over several tidal cycles, but the storm surge watch was used in lieu of a warning to communicate minor storm surge impacts.

The initial peak storm surge inundation forecast issued along with the storm surge watch was 7 to 11 ft AGL from the Aucilla River to Chassahowitzka including Cedar Key and Steinhatchee (Fig. 20). The storm surge forecast range for these areas slowly increased prior to landfall due to the intensification trends and a growing outer wind field (i.e. radius of 34-kt winds). The peak storm surge inundation forecast at the time of landfall was 12 to 16 ft AGL between the

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[3] Note that this streamgage is monitored in cooperation with the Suwannee River Water Management District.

Wakulla/Jefferson County Line and Yankeetown, Florida. The final NHC storm surge analysis of 8 to 12 ft AGL (Fig. 9) is very close to the initial forecast range but is at the lower end of the final forecast range. The timing of Idalia's landfall with low tide and the onset of an eyewall replacement cycle that led to weakening prior to landfall contributed to reducing the peak storm surge inundation.

On the U.S. east coast, a Storm Surge Watch was first issued at 1500 UTC 28 August for portions of the Georgia coast. Six hours later (2100 UTC 28 August), the watch was extended to the South Santee River, including Charleston, South Carolina (Fig. 17). The peak storm surge inundation forecast was 2 to 4 ft AGL in the watch area. A Storm Surge Warning was issued at 0900 UTC 30 August from St. Catherine's Sound, Georgia, to South Santee River including Charleston, with a peak storm surge forecast of 3 to 5 ft AGL. The NOS tide station at Charleston ultimately measured 3.46 ft MHHW, reaching major flood stage at this location (note, flood stage is an established gage height for a given location above which a rise in water surface level begins to create a hazard to lives, property, or commerce). The lead time of the Storm Surge Watch and Warning prior to onset of tropical-storm-force winds was 48 h and 12 h, respectively. The short lead time of the warning was due to the forecast to only modestly meet the storm surge warning criteria (i.e. greater than 3 ft above MHHW). While elevated water levels also occurred north of the warning area in Myrtle Beach, South Carolina, the hazard messaging was handled by the local NWS office using coastal flood advisories and warnings.

In North Carolina, a Storm Surge Watch was issued at 2100 UTC 29 August from Beaufort Inlet to Drum Inlet, as well as for the Neuse River, Pamlico Rivers, and portions of the Pamlico Sound. A peak storm surge inundation forecast of 2 to 4 ft AGL was made for the watch area. The watch was extended northeastward to Ocracoke Inlet at 0900 UTC 30 August. The watch was never upgraded to a warning, but remained for the entirety of the event to communicate minor storm surge impacts. Water levels reached 2 to 4 ft above MHHW, within the minor flood stage for this area.

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

The NHC began communication with emergency managers in the United States on 27 August when Idalia was located near the Yucatán Peninsula. Fifteen decision support briefings were provided to emergency managers and coordinated through the FEMA Hurricane Liaison Team embedded at the NHC. The briefings included video-teleconferences with FEMA Headquarters, FEMA Region 4, and the states of Florida, Georgia, South Carolina, and North Carolina. These briefings continued through 31 August until Idalia moved offshore over the southwestern Atlantic. NHC/TAFB provided 8 live briefings to the U.S. Coast Guard District 7 beginning 27 August, in support of their life-saving mission.

NHC provided 10 live stream broadcasts via YouTube and Facebook Live. The total viewership spiked on the morning before landfall with about 149,000 views on YouTube and 148,700 on Facebook (a total of 297,700 views the day before landfall). The total reach during

Idalia on NHC's social media platforms was 1.142 million. Numerous broadcast media outlets from Florida, Georgia, South Carolina, and North Carolina participated in the NHC media pool during Idalia. In total, Idalia generated more than 29,200 mentions in print and broadcast media in a 5-day period.

ACKNOWLEDGMENTS

Much of the data in this report came from Post Tropical Cyclone (PSH) Reports issued by NWS Weather Forecast Offices (WFOs) in Tallahassee, Tampa Bay, Melbourne, Miami, Key West, and Jacksonville, Florida; Charleston and Columbia, South Carolina; Wilmington, Raleigh, and Morehead City, North Carolina; and Wakefield, Virginia. Dr. Michael Folmer of the NOAA Ocean Prediction Center provided guidance on the extratropical stage of Idalia. David Roth of the NOAA Weather Prediction Center produced the rainfall map. Data from the National Data Buoy Center, NOS Center for Operational Oceanographic Products and Services, United States Geological Survey, Storm Prediction Center, and the Cuban Meteorological Service were also used in this report. The authors would like to thank those at NHC for their contributions to this report. Michael Spagnolo and Matthew Green from FEMA supplied the IDSS briefing information; Dr. Chris Landsea supplied the TAFB briefing information; Maria Torres provided the media information; Dr. Philippe Papin provided the genesis figure; Dr. Lisa Bucci provided the track and intensity verification figures and aircraft reconnaissance map; Dr. Cody Fritz, William Booth, and Dr. Allison Brannan contributed to the storm surge analysis and figures; and the Hurricane Specialist Unit peer reviewed the report. The National Centers for Environmental Information provided the monetary damage estimate for the United States.

Table 1. Best track for Hurricane Idalia, 26–31 August 2023.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
26 / 1200	20.8	86.1	1006	25	tropical depression
26 / 1800	21.3	86.2	1006	25	"
27 / 0000	21.1	86.4	1004	30	"
27 / 0600	20.5	86.8	1002	30	"
27 / 1200	19.9	86.3	999	35	tropical storm
27 / 1800	19.9	85.8	996	40	"
28 / 0000	19.8	85.4	992	45	"
28 / 0600	19.9	85.2	989	55	"
28 / 1200	20.6	85.2	989	55	"
28 / 1800	21.2	85.2	986	60	"
29 / 0000	21.8	85.1	984	60	"
29 / 0600	22.6	85.0	981	65	hurricane
29 / 1200	23.8	84.8	978	70	"
29 / 1800	25.3	84.8	973	80	"
30 / 0000	26.9	84.7	965	90	"
30 / 0600	28.3	84.5	945	105	"
30 / 0900	29.1	84.1	942	115	"
30 / 1145	29.9	83.6	950	100	"
30 / 1200	30.0	83.5	954	100	"
30 / 1800	31.5	82.5	981	60	tropical storm
31 / 0000	32.7	80.9	985	50	"
31 / 0600	33.5	78.9	990	50	"
31 / 1200	33.7	77.0	990	55	extratropical
31 / 1800	33.6	74.6	993	55	"
01 / 0000	33.4	72.3	996	55	"
01 / 0600	32.7	70.5	997	50	"
01 / 1200	32.3	68.8	998	50	"
01 / 1800	32.1	67.1	999	50	"

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
02 / 0000	31.9	65.7	999	50	"
02 / 0600	31.8	64.7	999	50	"
02 / 1200	31.8	63.9	998	50	"
02 / 1800	31.8	63.1	997	50	"
03 / 0000	32.0	62.2	996	50	"
03 / 0600	32.5	61.3	994	50	"
03 / 1200	33.4	60.5	992	50	"
03 / 1800	34.9	59.7	990	55	"
04 / 0000	36.2	58.9	988	60	"
04 / 0600	37.6	58.0	985	60	"
04 / 1200	39.2	57.5	985	55	"
04 / 1800	40.5	57.9	986	55	"
05 / 0000	41.1	58.7	986	50	"
05 / 0600	41.6	59.1	986	50	"
05 / 1200	42.2	59.3	986	45	"
05 / 1800	42.6	59.8	987	40	"
06 / 0000	42.6	60.5	988	35	"
06 / 0600	42.6	61.4	991	35	"
06 / 1200	42.6	62.0	992	35	"
06 / 1800	42.6	62.8	994	35	"
07 / 0000	42.9	62.9	996	30	"
07 / 0600	43.0	62.1	998	30	"
07 / 1200	43.2	61.1	1000	30	"
07 / 1800	43.6	60.1	1001	30	"
08 / 0000	44.3	59.3	1002	30	"
08 / 0600	45.2	58.3	1003	30	"
08 / 1200					dissipated
30 / 0900	29.1	84.1	942	115	maximum wind and minimum pressure

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
27 / 0600	20.5	86.8	1002	30	landfall on Cozumel, Mexico
30 / 1145	29.9	83.6	950	100	landfall near Keaton Beach, Florida

Table 2. Selected ship reports with winds of at least 34 kt for Hurricane Idalia, 26–31 August 2023.

Date/Time (UTC)	Ship call sign	Latitude (°N)	Longitude (°W)	Wind dir/speed (kt)	Pressure (mb)
30 / 1000	9HA463	26.2	79.0	170 / 37	1014.3
30 / 1200	3FOB5	24.5	80.7	200 / 36	1008.9
30 / 1200	9HA463	26.2	79.3	180 / 35	1015.3
30 / 1400	KAPD	24.2	82.0	220 / 35	1010.5
30 / 1400	3FOB5	24.2	81.3	070 / 36	1009.3
30 / 1400	9HA463	25.9	79.3	180 / 35	1016.3
30 / 1600	9HA463	25.8	79.6	180 / 45	1015.3
30 / 1600	V7IE2	26.2	79.9	210 / 40	1011.0
30 / 1700	VROL6	29.7	79.8	200 / 36	1004.8
30 / 1800	9HA463	26.0	79.7	190 / 45	1010.3
31 / 0400	9HA463	27.5	80.0	190 / 35	1015.3
31 / 0400	9HA502	29.9	79.8	250 / 40	1005.6
31 / 0600	WDM220	29.6	77.8	230 / 35	1005.3
31 / 0700	WDC669	30.2	74.5	200 / 39	
31 / 0800	WDM220	29.7	78.5	270 / 38	1005.4
31 / 0800	WDC669	30.2	74.4	210 / 37	
31 / 1400	VRSQ6	29.7	74.1	240 / 40	1012.0
31 / 1400	VRSQ6	29.8	74.0	230 / 40	1012.0
31 / 1400	WTEA	38.0	76.2	120 / 38	1009.7
31 / 1400	CLKN7	34.6	76.5	010 / 44	999.7
31 / 1700	WTEA	38.0	76.3	120 / 35	1012.3
01 / 0100	VRSQ6	28.8	75.3	290 / 37	1016.0
01 / 1900	VRTX6	35.8	65.6	030 / 40	1011.0
02 / 1000	C6CX3	32.3	64.8	010 / 50	1005.2
02 / 1800	VRTX6	37.9	64.2	050 / 35	1017.0
04 / 0700	WMKA	40.6	59.2	360 / 50	998.4

Date/Time (UTC)	Ship call sign	Latitude (°N)	Longitude (°W)	Wind dir/speed (kt)	Pressure (mb)
04 / 1500	9HA502	43.7	55.6	080 / 38	1004.6
07 / 0500	C6PZ8	45.2	60.5	110 / 35	999.5

Table 3. Selected surface observations for Hurricane Idalia, 26–31 August 2023. A detailed list can be found at https://www.nhc.noaa.gov/data/tcr/supplemental/idalia.zip.

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[a]	Sustained (kt)[b]	Gust (kt)	
Keaton Beach (KTNF1) (29.82ºN 83.59ºW)	30/1200	960.6	30/1100	53	72	
Perry-Foley Airport (KFPY) (30.07ºN 83.58ºW)	30/1215	957.7	30/1215	54	74	
Perry (Josh Morgerman – icyclone)	30/1217	954.7				
Tallahassee (KTLH) (30.39ºN 84.35ºW)	30/1156	993.9	30/1147	29	44	
Horseshoe Beach FSWN (WeatherStem) (29.44ºN 83.30ºW)			30/1026	63	70	
Mayo - Lafayette High School (WeatherStem) (30.05ºN 83.17ºW)			30/1417	51	63	
Jacksonville (KJAX) (30.50ºN 81.69ºW)	30/1649	996.1	30/1616	34	52	
Hamilton (WeatherStem) (30.49ºN 83.13ºW)			30/1410	45	69	
Sarasota (KSRQ) (27.24ºN 82.33ºW)	30/0642	1001.4	30/0815	42	61	
St. Pete-Clearwater (KPIE) (27.55ºN 82.41ºW)	30/0645	1000.0	30/0653	34	53	
Cedar Key (CDRF1) (29.14ºN 83.03ºW)	30/1000	992.5	30/1040	46	60	
St. Simons (KSSI) (31.15ºN 81.38ºW)	30/1953	992.3	30/2053	35	57	
Waycross (KAYS) (31.25ºN 82.40ºW)	30/1755	983.2	30/1654	32	44	
Bacon County Airport (KAMG) (31.54ºN 82.50ºW)	30/1853	985.4	30/1949	29	49	
Savannah (KSAV) (31.23ºN 81.20ºW)	30/1709	987.5	30/2019	34	45	

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[a]	Sustained (kt)[b]	Gust (kt)	
Tybee Sound (WxFlow -XTYE) (31.99ºN 80.85ºW)	30/2224	987.4	30/2129	44	60	
Charleston (KCHS) (32.90ºN 80.05ºW)	30/2130	990.5	30/2355	28	39	
Beaufort (WxFlow- XBUF) (32.34ºN 80.59ºW)	30/2359	987.4	30/2219	35	58	
Wilmington (KLIM) (34.27ºN 77.90ºW)				28	45	
Cape Lookout (CLKN7) (34.62ºN 76.53ºW)		996.6		44	64	
Federal Point (WxFlow – XFED) (33.96ºN 77.94ºW)				40	53	
Lumberton (KLBT) (34.61ºN 79.06ºW)				28	40	

[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.

Table 4. Count of fatalities by state from Hurricane Idalia.

State	Number of Direct Fatalities	Number of Indirect Fatalities
Florida	1 (surf)	3 (2 vehicle accidents, 1 cleanup)
Georgia		1 (cleanup)
North Carolina	3 (surf)	
Delaware	1 (surf)	
New Jersey	3 (surf)	

Table 5. Number of hours in advance of formation associated with the first NHC Tropical Weather Outlook forecast in the indicated likelihood category. Note that the timings for the "Low" category do not include forecasts of a 0% chance of genesis.

	Hours Before Genesis	
	48-Hour Outlook	168-Hour Outlook
Low (<40%)	54	60
Medium (40%-60%)	18	54
High (>60%)	-	36

Table 6a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Hurricane Idalia. 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	**23.6**	38.7	51.8	**56.9**	**61.7**	**46.1**	**58.4**	
OCD5	49.7	99.8	165.8	249.7	334.0	409.6	515.6	
Forecasts	17	15	13	11	9	7	3	
OFCL (2018-22)	23.8	35.7	47.8	61.4	76.1	90.5	125.7	172.1
OCD5 (2018-22)	46.4	99.2	157.4	215.0	254.9	321.2	405.1	486.6

Table 6b. Homogeneous comparison of selected track forecast guidance models (in n mi) for Hurricane Idalia. 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	20.3	33.6	48.0	54.0	54.8	44.1	119.2	
OCD5	45.5	92.6	164.6	270.6	382.7	508.0	771.5	
GFSI	21.3	38.7	60.4	72.6	82.6	71.1	237.6	
EMXI	24.9	39.4	49.4	60.1	76.8	101.1	202.7	
EGRI	32.7	60.0	88.4	114.3	123.1	115.0	120.4	
CMCI	26.7	51.5	69.6	68.6	66.0	75.8	197.0	
NVGI	35.2	67.2	87.4	111.1	104.6	131.9	176.6	
HWFI	24.4	44.7	54.4	69.4	89.9	91.8	**85.3**	
HMNI	24.0	44.0	62.3	72.6	70.3	51.4	158.7	
HFAI	**18.4**	**32.5**	54.1	60.5	69.4	98.6	**26.0**	
HFBI	**18.3**	34.6	56.5	58.1	65.0	75.5	**55.4**	
AEMI	25.3	48.1	74.3	91.6	101.4	92.3	181.3	
HCCA	**19.6**	**31.0**	**42.9**	**49.0**	**47.8**	46.8	**90.0**	
TVCA	22.0	39.5	54.1	59.5	59.7	44.5	**111.7**	
Forecasts	15	13	11	9	7	5	1	

Table 7a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Hurricane Idalia. 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	6.2	7.7	**5.8**	**6.8**	**10.0**	15.0	**8.3**	
OCD5	8.5	12.4	13.8	21.1	28.2	31.7	12.0	
Forecasts	17	15	13	11	9	7	3	
OFCL (2018-22)	5.1	7.6	8.9	10.1	10.7	11.5	13.3	15.5
OCD5 (2018-22)	6.8	10.7	13.9	16.5	18.3	20.2	22.9	23.4

Table 7b. Homogeneous comparison of selected intensity forecast guidance models (in kt) for Hurricane Idalia. 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 7a due to the homogeneity requirement.

Model ID	Forecast Period (h)							
	12	24	36	48	60	72	96	120
OFCL	6.2	7.7	5.8	6.8	10.0	15.0	8.3	
OCD5	8.5	12.4	13.8	21.1	28.2	31.7	12.0	
HWFI	6.6	**7.5**	5.9	12.3	18.0	16.3	**6.7**	
HMNI	6.2	**7.0**	10.0	9.9	13.1	18.6	16.0	
HFAI	7.8	**6.4**	9.7	9.1	14.4	**13.4**	**7.3**	
HFBI	7.2	**5.3**	6.9	7.0	12.7	15.4	12.3	
DSHP	6.4	8.9	10.3	8.2	15.2	18.9	11.3	
LGEM	6.6	11.3	12.6	11.9	19.7	27.7	13.3	
HCCA	**5.6**	**5.3**	**5.6**	**6.7**	**9.9**	**14.9**	10.3	
IVCN	6.2	**6.4**	7.2	**6.6**	11.0	**14.9**	10.0	
GFSI	9.7	13.9	14.9	16.1	21.9	26.4	18.0	
EMXI	14.6	19.5	21.1	25.5	30.3	33.7	13.0	
Forecasts	17	15	13	11	9	7	3	

Table 8. Watch and warning summary for Hurricane Idalia, 26–31 August 2023.

Date/Time (UTC)	Action	Location
26 / 2100	Tropical Storm Watch issued	Isle of Youth to Pinar del Rio, Cuba
26 / 2100	Tropical Storm Warning issued	Tulum to Rio Lagartos, Mexico
27 / 0300	Tropical Storm Watch changed to Tropical Storm Warning	Pinar del Rio, Cuba
27 / 2100	Tropical Storm Watch issued	Englewood to Chokoloskee, FL
27 / 2100	Tropical Storm Watch issued	Dry Tortugas, FL
27 / 2100	Hurricane Watch issued	Indian Pass to Englewood, FL
28 / 0300	Tropical Storm Watch changed to Tropical Storm Warning	Isle of Youth, Cuba
28 / 0300	Tropical Storm Warning changed to Hurricane Warning	Pinar del Rio, Cuba
28 / 0300	Tropical Storm Watch changed to Tropical Storm Warning	Dry Tortugas
28 / 0300	Tropical Storm Watch issued	Key West to Seven Mile Bridge, FL
28 / 1500	Tropical Storm Watch issued	Sebastian Inlet, FL to Altamaha Sound, GA
28 / 1500	Tropical Storm Warning issued	Longboat Key to Chokoloskee, FL
28 / 1500	Tropical Storm Warning issued	Indian Pass to Ochlockonee River, FL
28 / 1500	Hurricane Watch issued	Longboat Key to Englewood, FL
28 / 1500	Hurricane Watch issued	Ochlockonee River to Indian Pass, FL
28 / 1500	Hurricane Warning issued	Ochlockonee River to Longboat Key
28 / 2100	Tropical Storm Watch modified to	Sebastian Inlet, FL to South Santee River, SC
28 / 2100	Tropical Storm Warning modified to	Mexico Beach to Indian Pass, FL
28 / 2100	Hurricane Watch discontinued	Indian Pass to Ochlockonee River
28 / 2100	Hurricane Warning modified to	Indian Pass to Longboat Key, FL
29 / 0300	Tropical Storm Watch modified to	Altamaha Sound, GA to South Santee River, SC

Date/Time (UTC)	Action	Location
29 / 0300	Tropical Storm Warning issued	Sebastian Inlet, FL to Altamaha Sound, GA
29 / 0900	Tropical Storm Warning discontinued	Tulum to Rio Lagartos, Mexico
29 / 1500	Tropical Storm Watch modified to	South Santee River, SC to Surf City, NC
29 / 1500	Tropical Storm Warning modified to	Sebastian Inlet, FL to South Santee River, SC
29 / 1800	Tropical Storm Warning discontinued	Isle of Youth, Cuba
29 / 1800	Hurricane Warning discontinued	Pinar del Rio, Cuba
29 / 2100	Tropical Storm Watch modified to	Surf City, NC to NC/VA Border
29 / 2100	Tropical Storm Warning modified to	Sebastian Inlet, FL to Surf City, SC
29 / 2100	Hurricane Watch discontinued	Longboat Key to Englewood, FL
29 / 2100	Hurricane Watch issued	FL/GA Border to Edisto Beach, SC
30 / 0300	Tropical Storm Watch discontinued	Key West to Seven Mile Bridge, FL
30 / 0300	Tropical Storm Warning discontinued	Dry Tortugas, FL
30 / 0900	Tropical Storm Watch discontinued	All
30 / 0900	Tropical Storm Warning modified to	Longboat Key to Bonita Beach, FL
30 / 0900	Tropical Storm Warning modified to	Sebastian Inlet, FL to Altamaha Sound, GA
30 / 0900	Tropical Storm Warning issued	Edisto Beach, SC to NC/VA Border
30 / 0900	Hurricane Watch modified to	FL/GA Border to Altamaha Sound, GA
30 / 0900	Hurricane Warning issued	Altamaha Sound, GA to Edisto Beach, SC
30 / 1500	Tropical Storm Warning modified to	Suwannee River to Bonita Beach, FL
30 / 1500	Tropical Storm Warning discontinued	Mexico Beach to Indian Pass, FL
30 / 1500	Hurricane Warning modified to	Indian Pass to Suwannee River, FL

Date/Time (UTC)	Action	Location
30 / 1800	Tropical Storm Warning modified to	Ochlocknee River to Bonita Beach, FL
30 / 1800	Tropical Storm Warning modified to	Volusia/Brevard Line, FL to Altamaha Sound, GA
30 / 1800	Hurricane Warning discontinued	Indian Pass to Suwannee River, FL
30 / 2100	Tropical Storm Warning discontinued	Ochlocknee River to Bonita Beach, FL
30 / 2100	Tropical Storm Warning modified to	Volusia/Brevard Line, FL to NC/VA Border
30 / 2100	Hurricane Watch discontinued	All
30 / 2100	Hurricane Warning discontinued	All
31 / 0000	Tropical Storm Warning modified to	Altamaha Sound, GA to NC/VA Border
31 / 0300	Tropical Storm Warning modified to	Savannah River, GA to NC/VA Border
31 / 0600	Tropical Storm Warning modified to	South Santee River, SC to NC/VA Border
31 / 1500	Tropical Storm Warning modified to	Cape Fear, NC to NC/VA Border
31 / 1800	Tropical Storm Warning modified to	Surf City, NC to NC/VA Border
31 / 2100	Tropical Storm Watch issued	Bermuda
31 / 2100	Tropical Storm Warning discontinued	All
1 / 1500	Tropical Storm Watch changed to Tropical Storm Warning	Bermuda
2 / 2100	Tropical Storm Warning discontinued	Bermuda

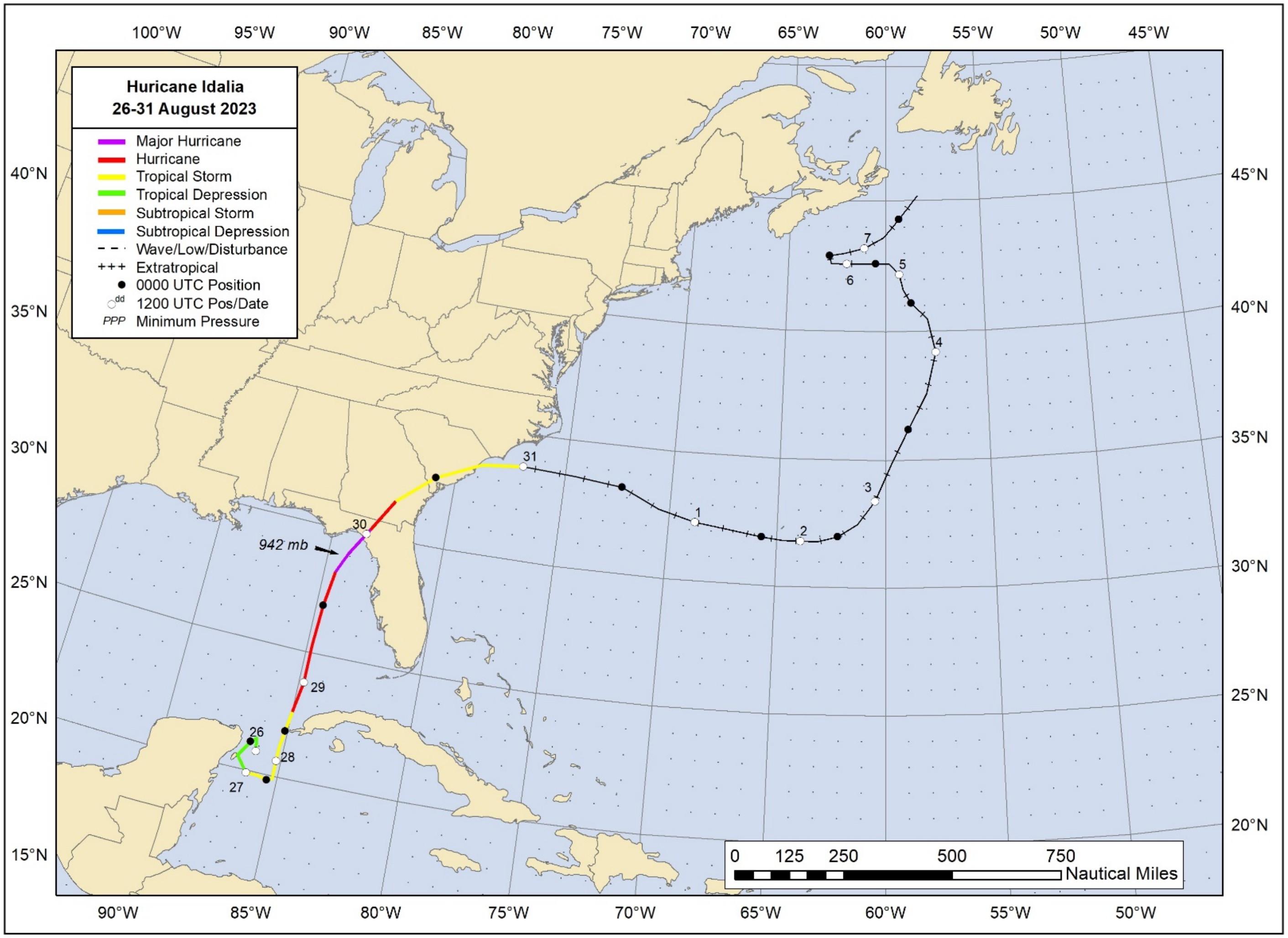

Figure 1. Best track positions for Hurricane Idalia, 26–31 August 2023. Tracks during the extratropical stage are partially based on analyses from the NOAA Ocean Prediction Center.

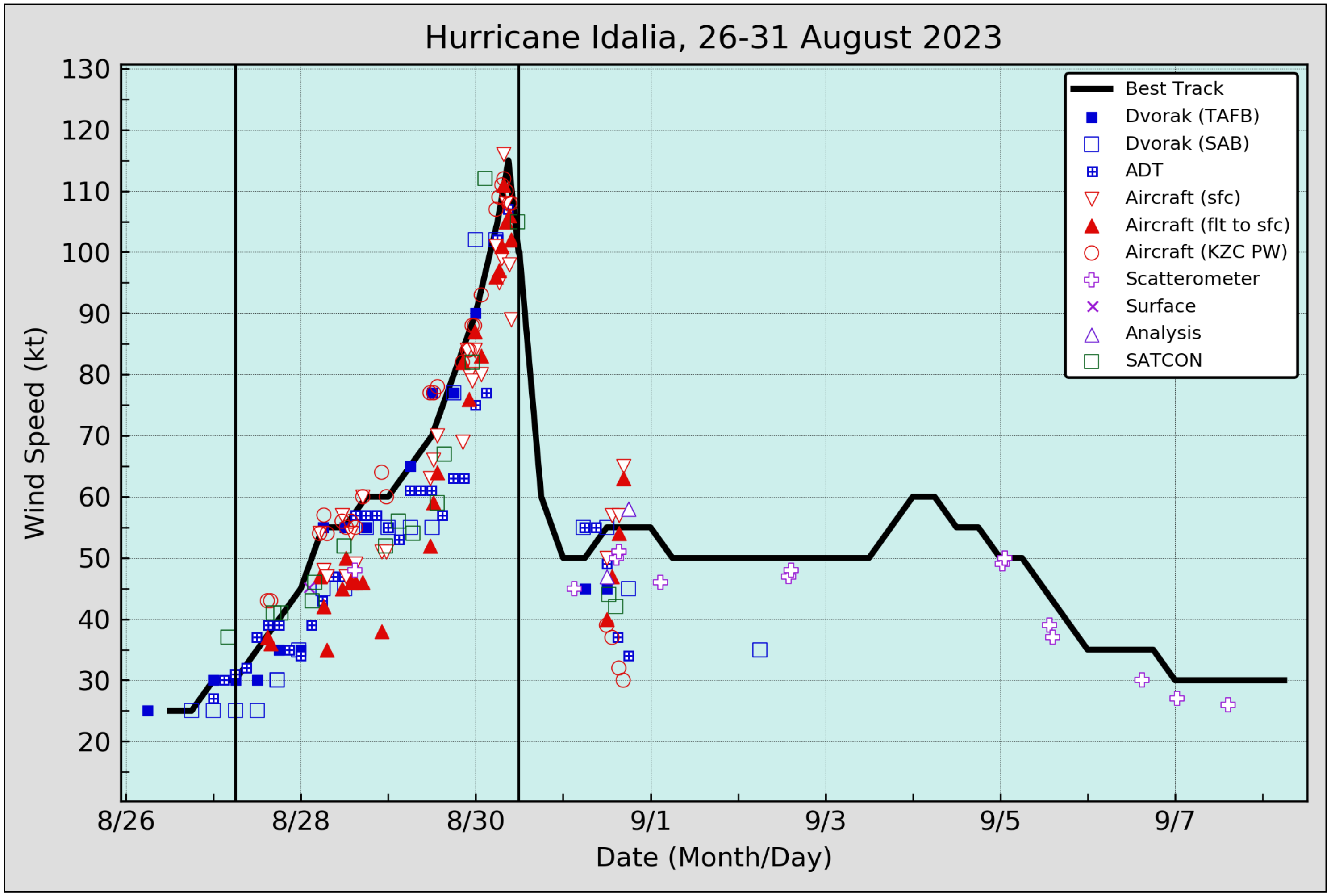

Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Hurricane Idalia, 26–31 August 2023. Aircraft observations have been adjusted for elevation using 90%, 80%, and 75% adjustment factors for observations from 700 mb, 850 mb, and 925 mb, respectively. Advanced 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 line correspond to landfall.

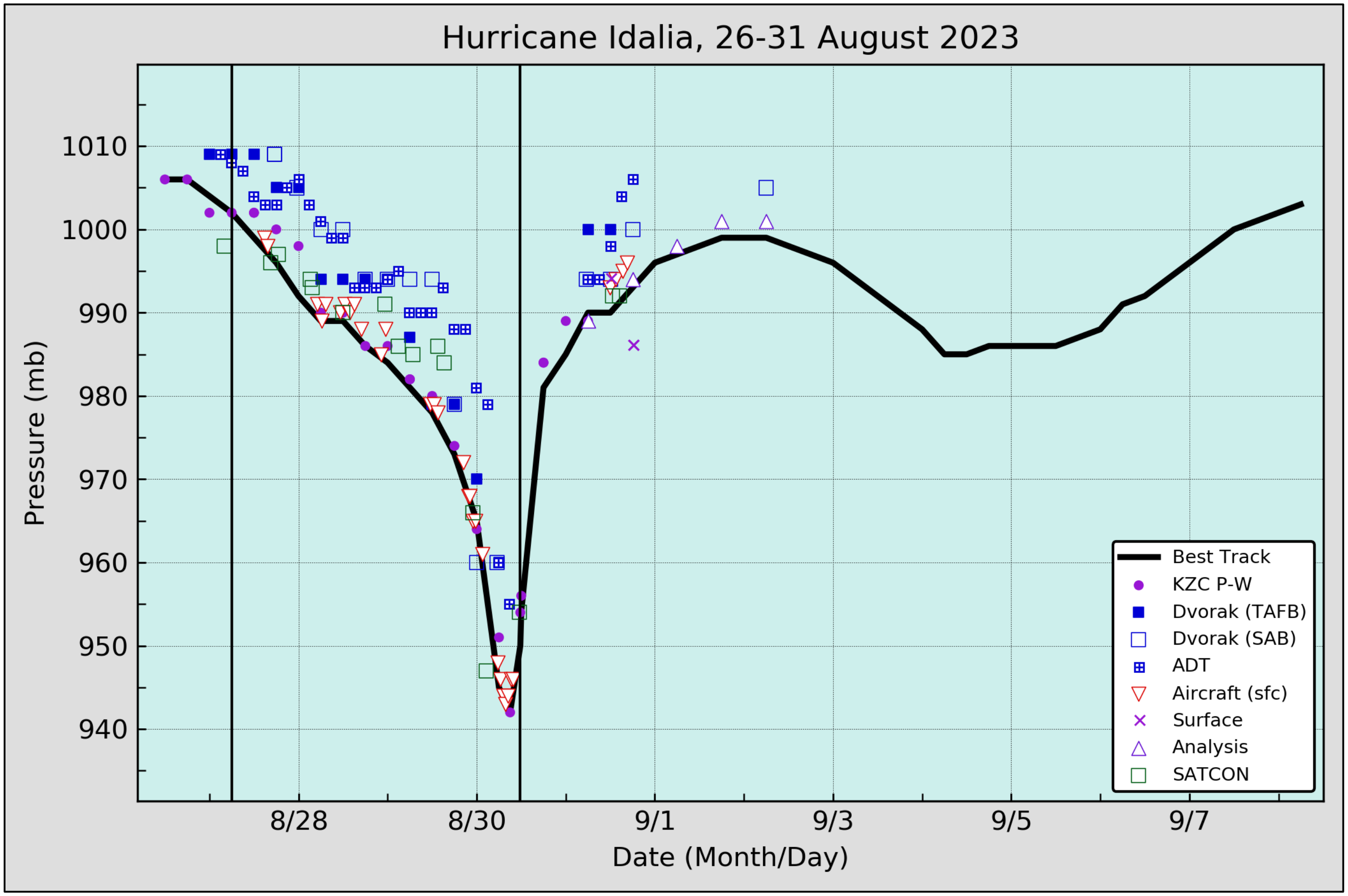

Figure 3. Selected pressure observations and best track minimum central pressure curve for Hurricane Idalia, 26–31 August 2023. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for Meteorological 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 line correspond to landfall.

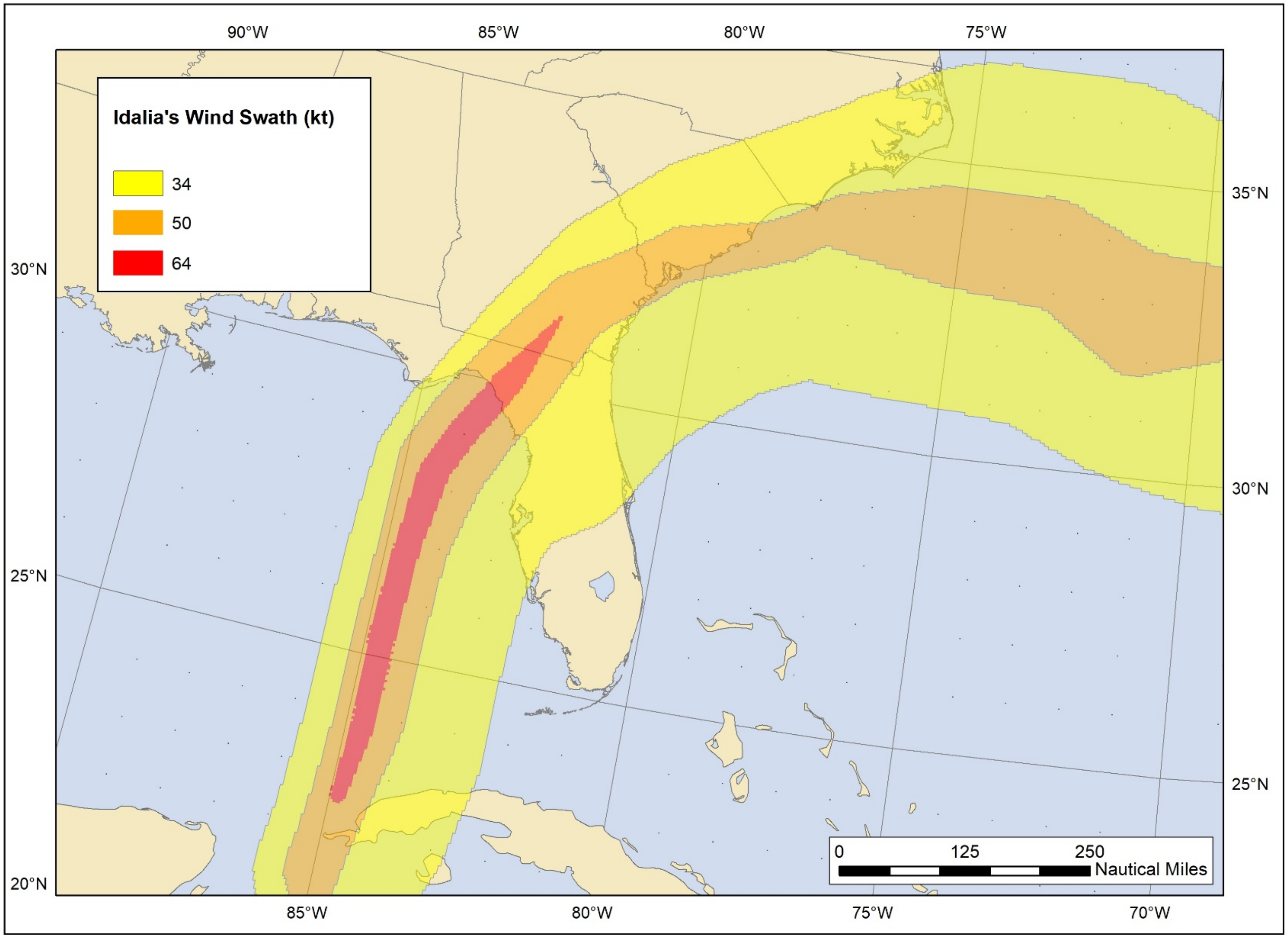

Figure 4. Wind swath depicting the cumulative 34-, 50-, and 64-kt wind radii of Hurricane Idalia, 26–31 August 2023.

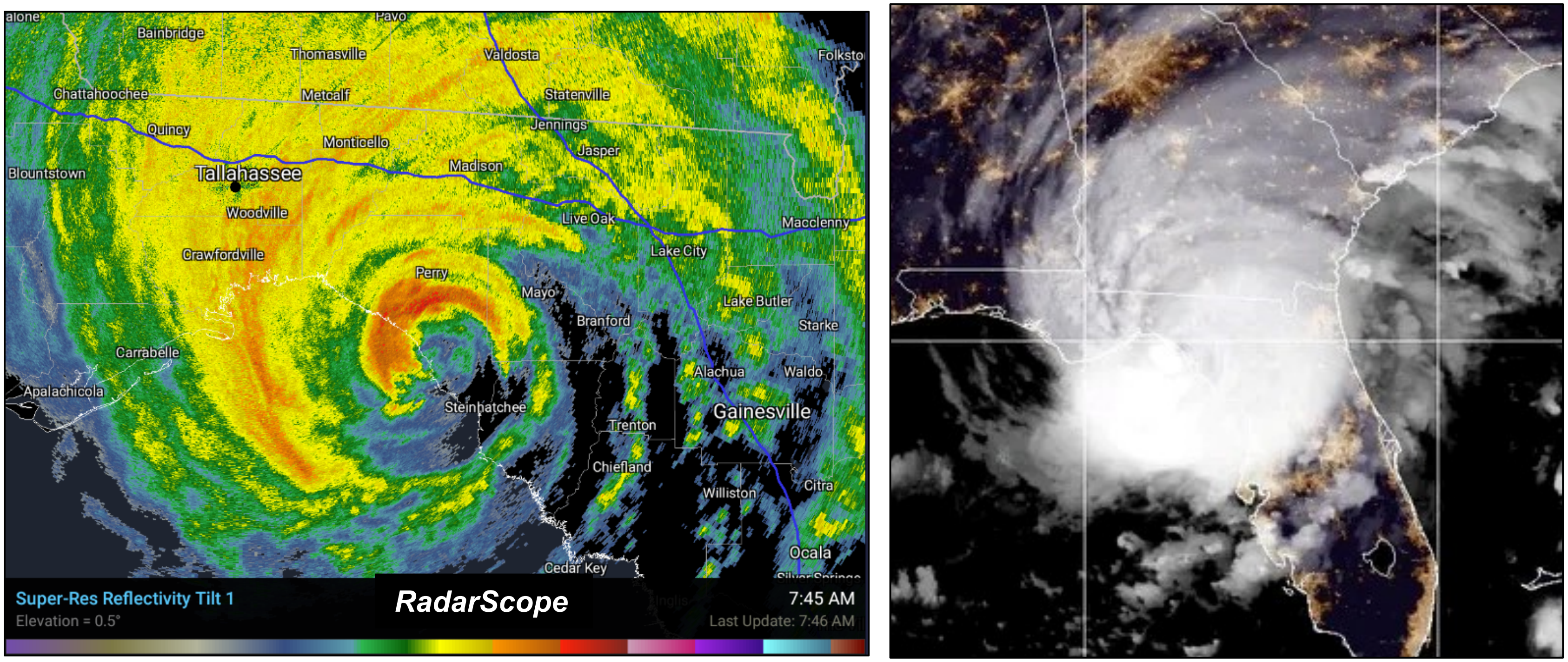

Figure 5. National Weather Service reflectivity radar image from Tallahassee, Florida, when Idalia made landfall (left). GOES-16 Geocolor satellite image around the time Idalia made landfall (right).

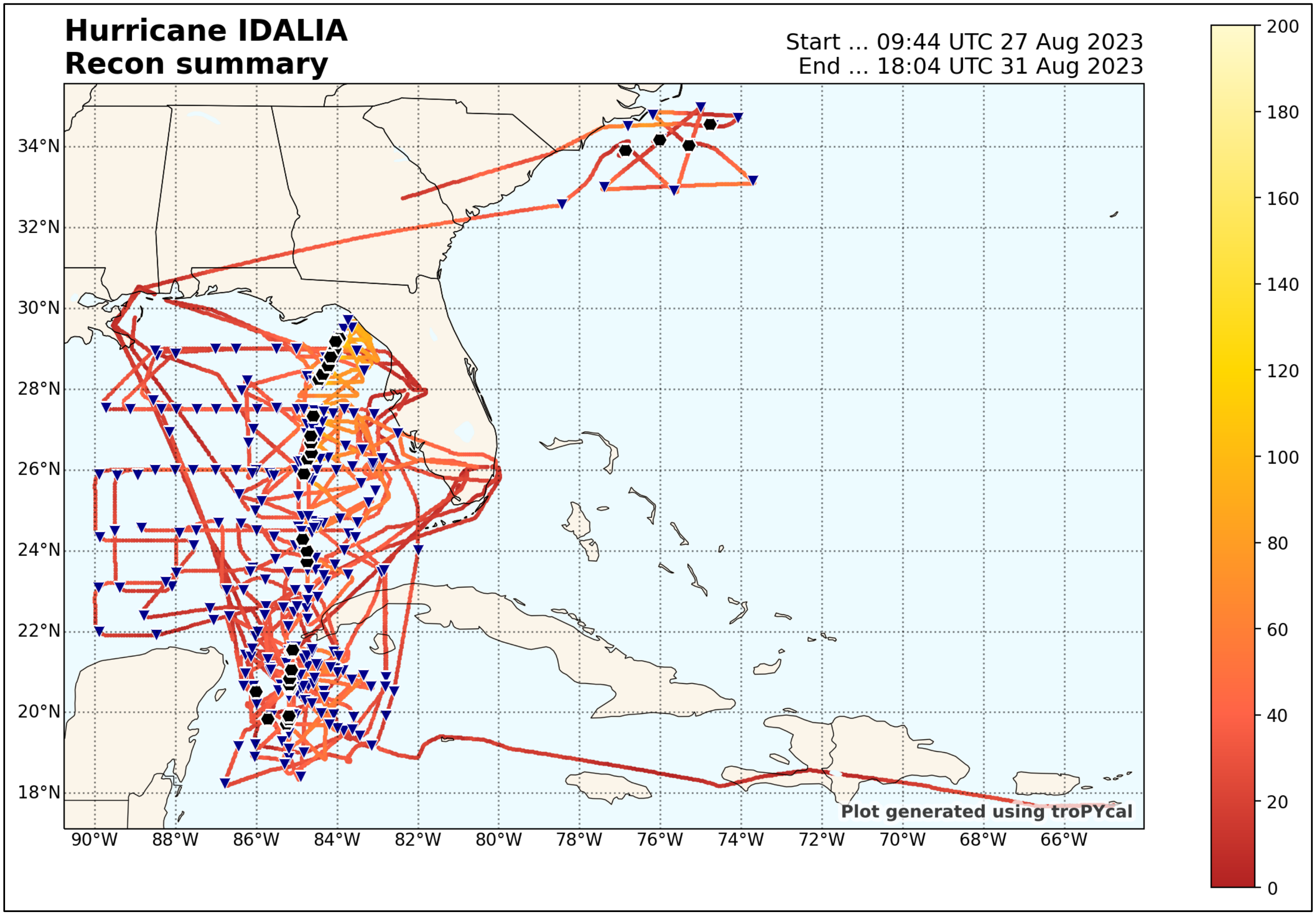

Figure 6. Air Force Reserve and NOAA Hurricane Hunter aircraft flight tracks (red) from reconnaissance missions into Idalia. The black markers denote center fixes, and the blue triangles indicate dropsonde locations. The color coding of the flight tracks is based on the observed flight-level wind speed with the color legend to the right of the map representing the color associated with the various wind speeds in knots.

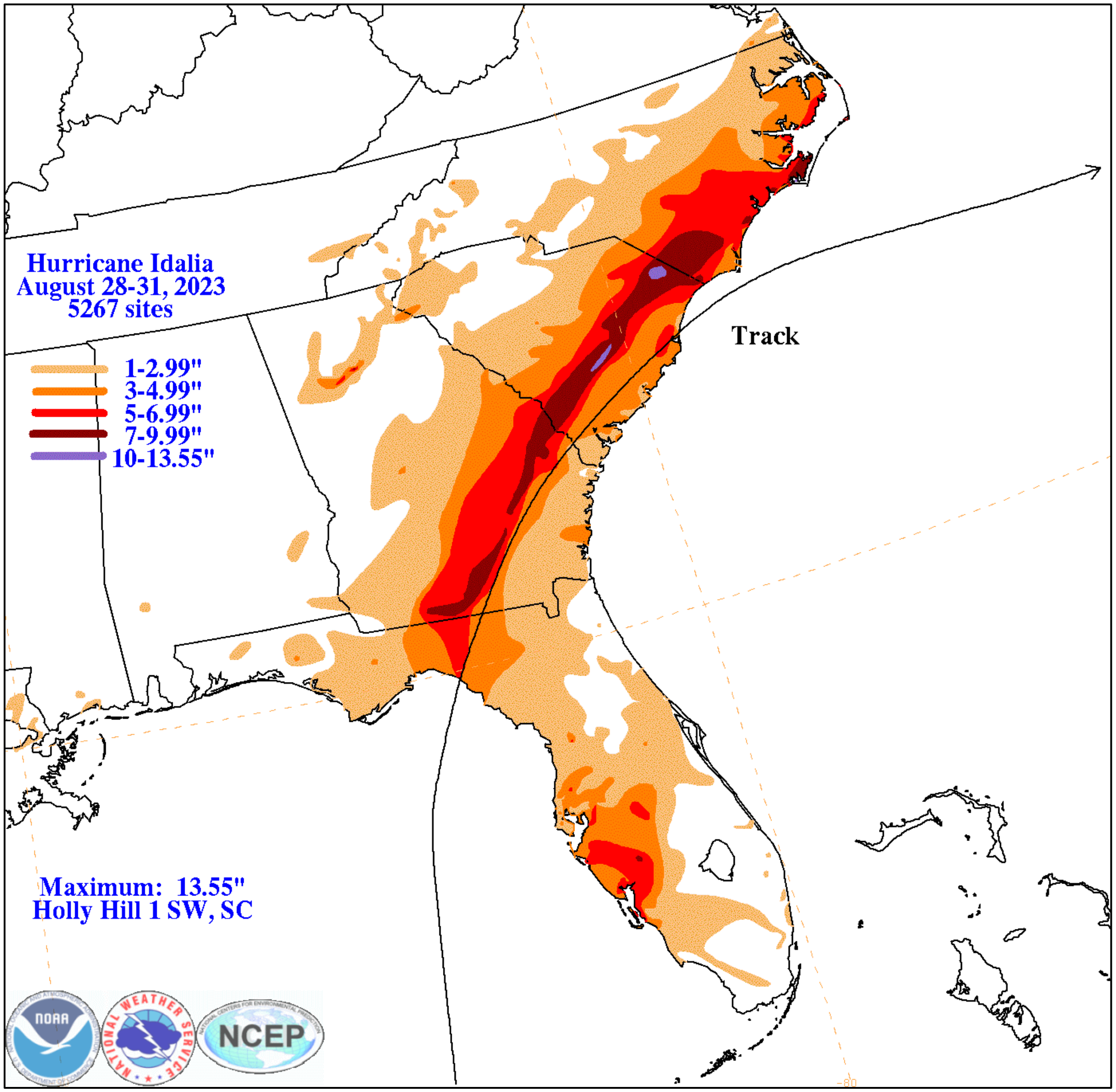

Figure 7. Total rainfall (inches) from Hurricane Idalia across the southeastern U.S.

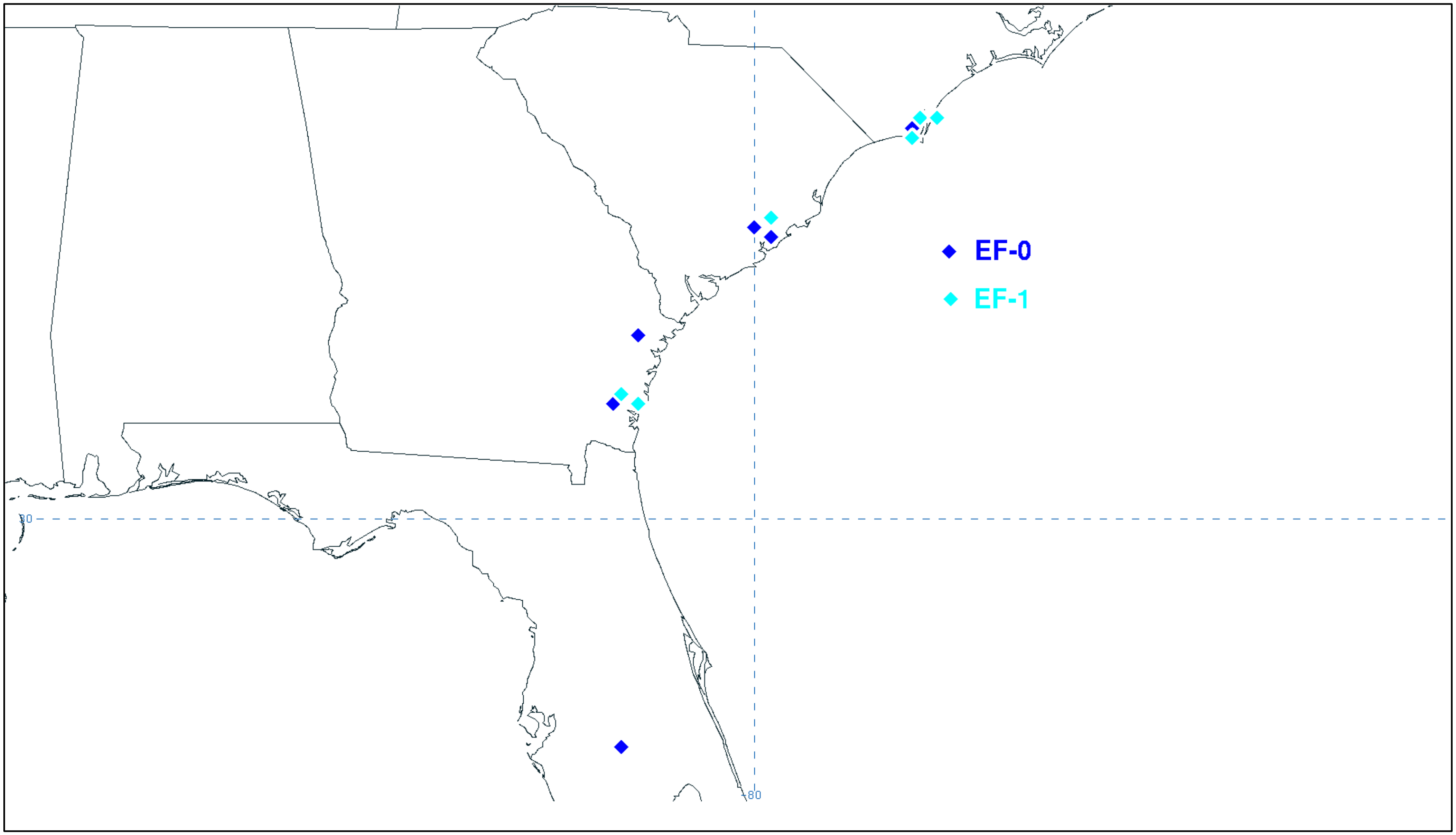

Figure 8. Map of NWS confirmed tornadoes spawned by Hurricane Idalia.

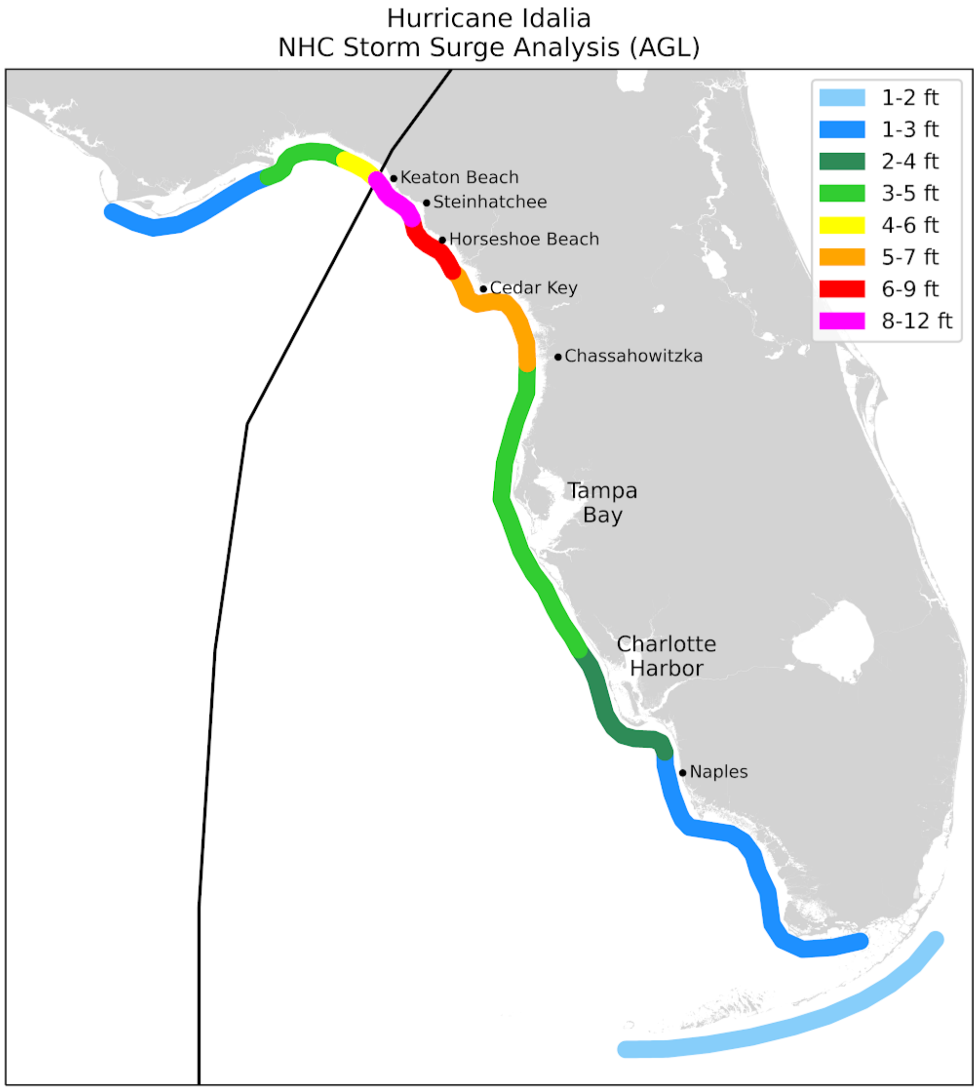

Figure 9. Analyzed storm surge inundation (feet above ground level) along the coast of Florida from Hurricane Idalia.

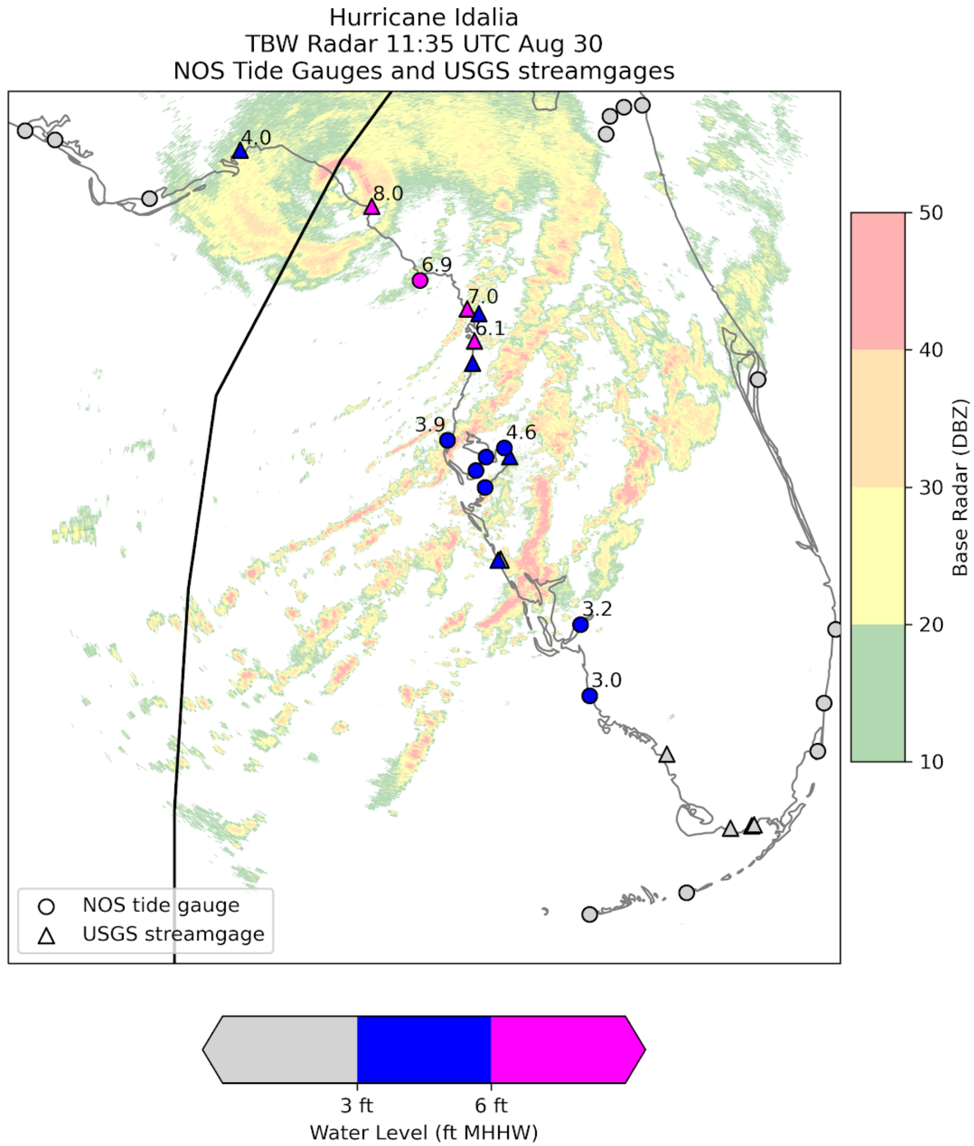

Figure 10. Maximum water levels (ft above MHHW) during Hurricane Idalia measured by the NOS tide gauge network and USGS streamgages, overlaid with TBW radar reflectivity at 1135 UTC 30 August. Idalia's track is overlaid (black line).

Figure 11. Before (left) and after (right) imagery of a portion of the Horseshoe Beach, FL, showing the damage caused by Hurricane Idalia. Imagery courtesy of the NOAA Remote Sensing Division at https://storms.ngs.noaa.gov/storms/idalia/index.html#17.32/29.442896/-83.289186

Figure 12. Examples of damage in Florida near the path of Idalia. Images courtesy of theguardian.com.

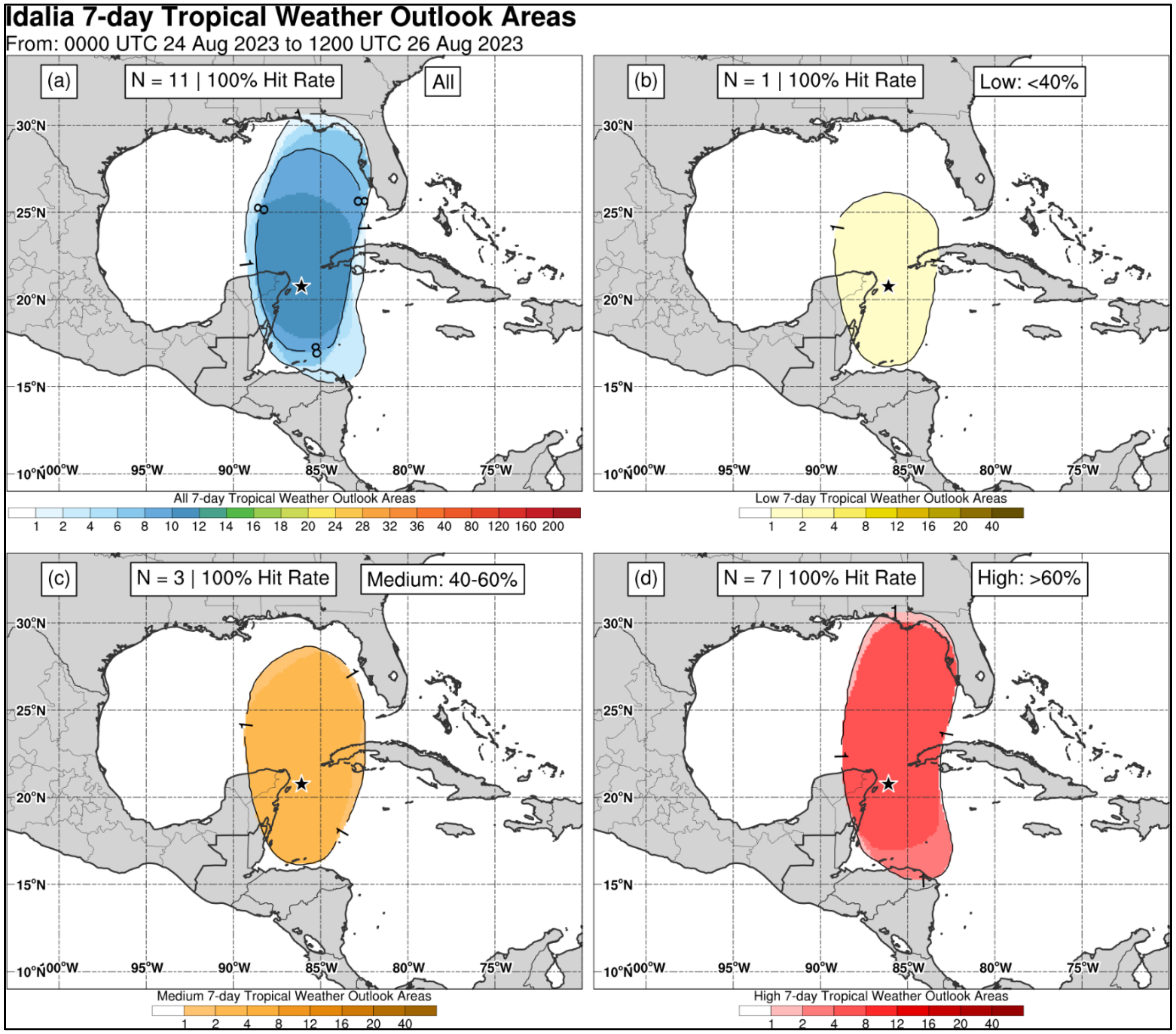

Figure 13. Composites of 7-day tropical cyclone genesis areas depicted in NHC's Tropical Weather Outlooks prior to the formation of Hurricane Idalia for (a) all probabilistic genesis categories, (b) the low (<40%) category, (c) medium (40–60%) category, and (d) high (>60%) category. Idalia's location of genesis is indicated by the black star.

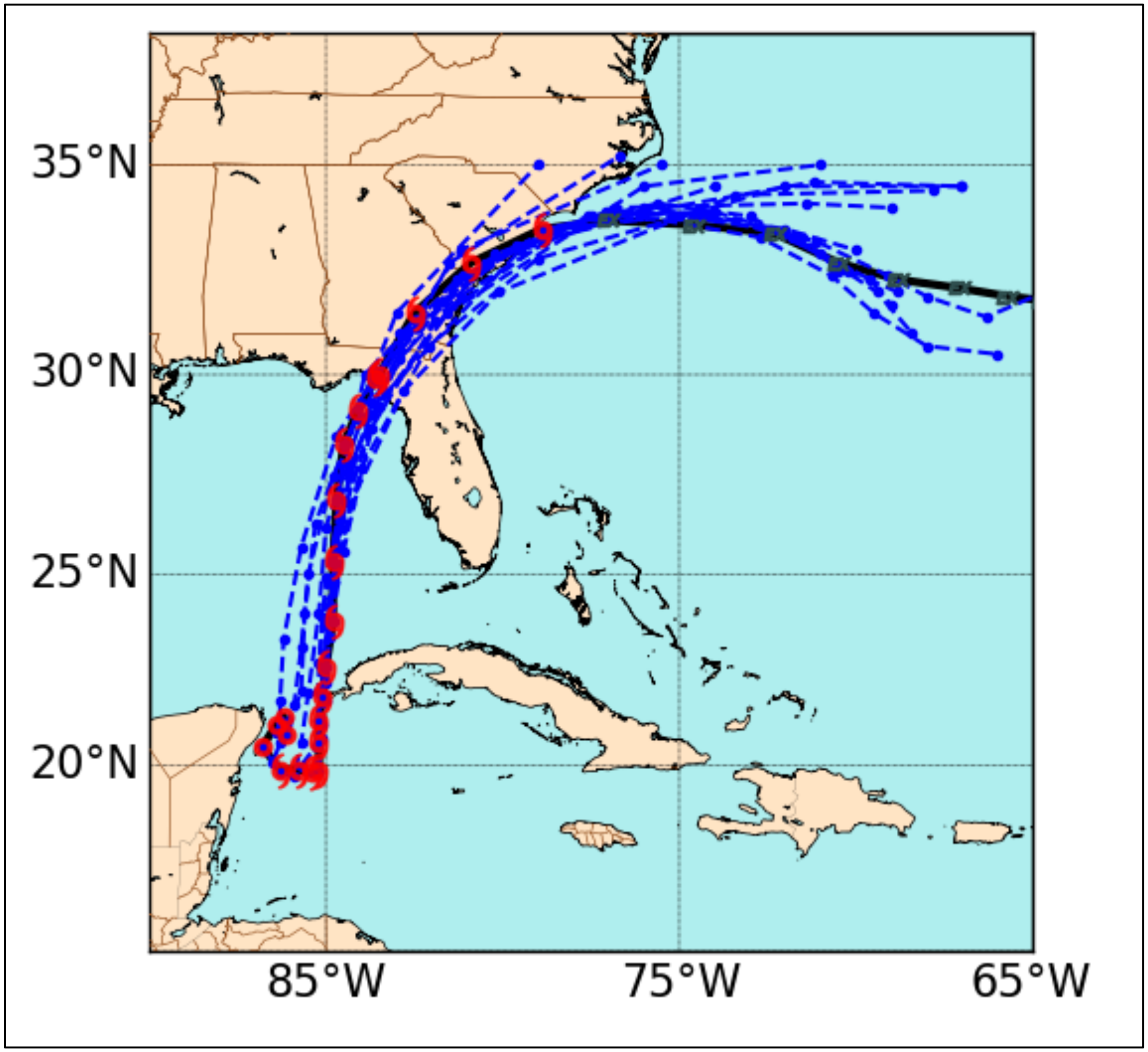

Figure 14. NHC official track forecasts (blue lines) from 1800 UTC 26 August to 1200 UTC 30 August. The best track is depicted by the black line with red (tropical) and gray (extratropical) markers shown every 6 hours.

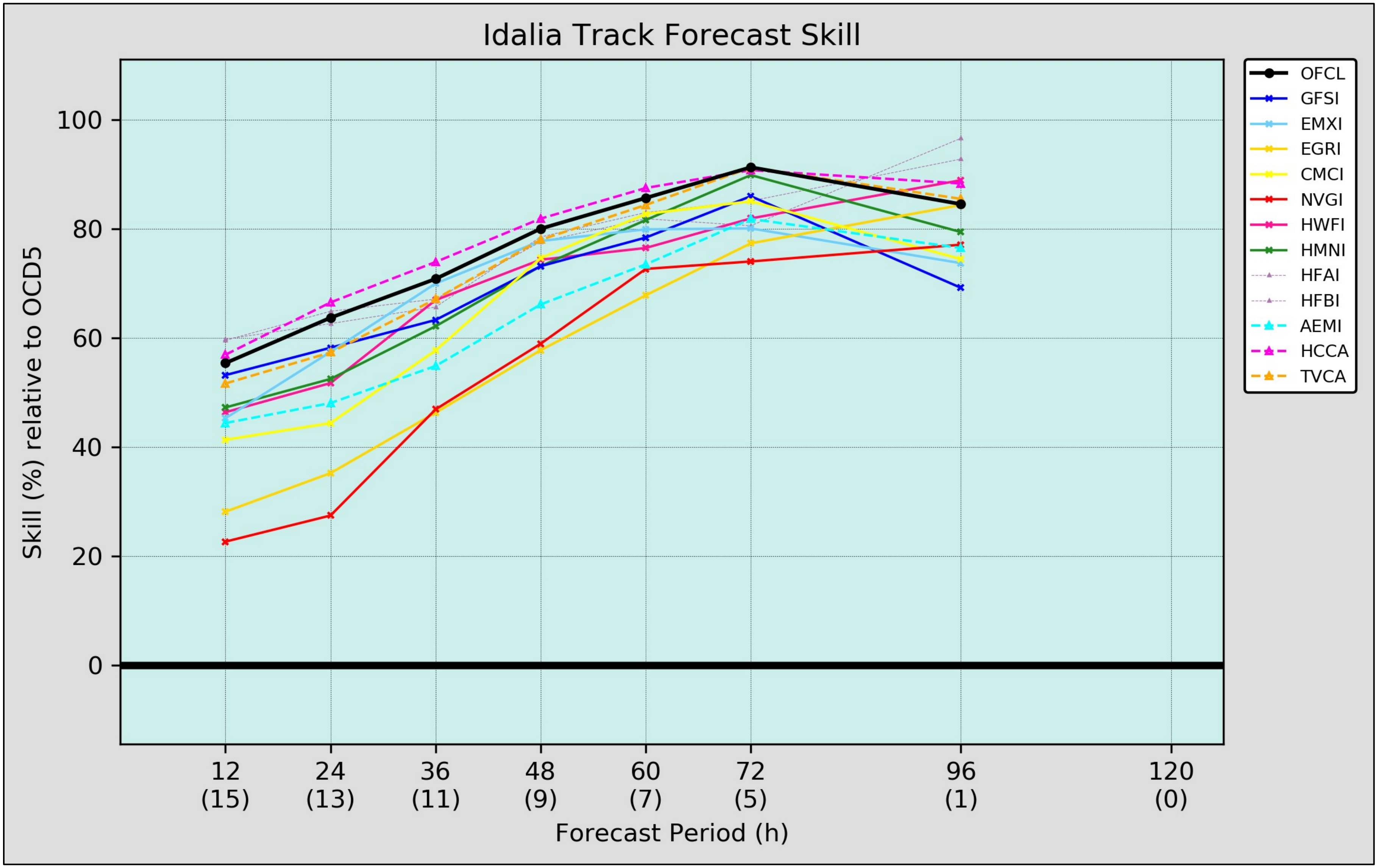

Figure 15. Official forecast and selected model forecast track skill for Hurricane Idalia, 26–31 August 2023.

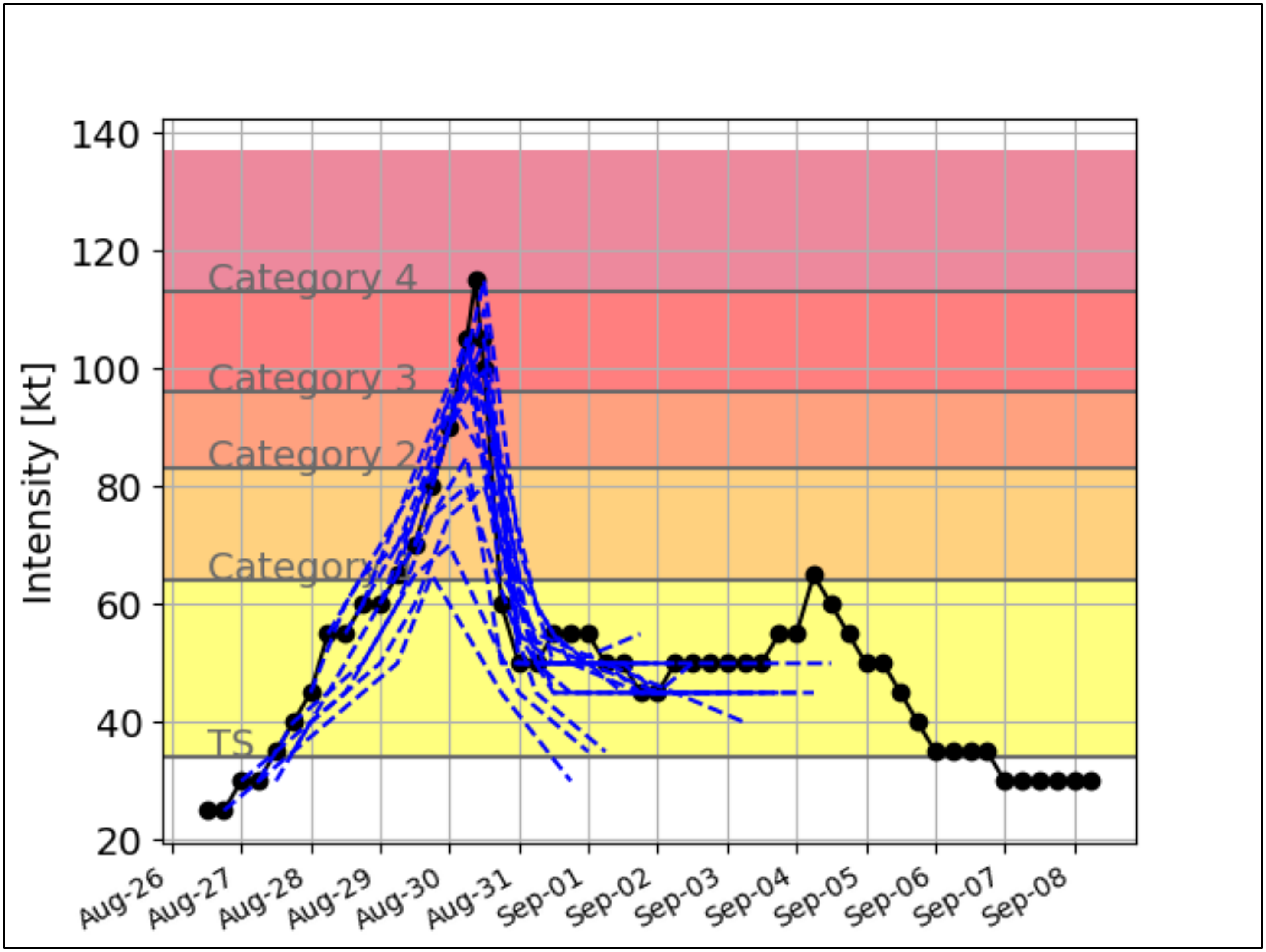

Figure 16. NHC official intensity forecasts (blue lines) from 1800 UTC 26 August to 1200 UTC 30 August. The best track is depicted by the black line with markers shown every 6 hours.

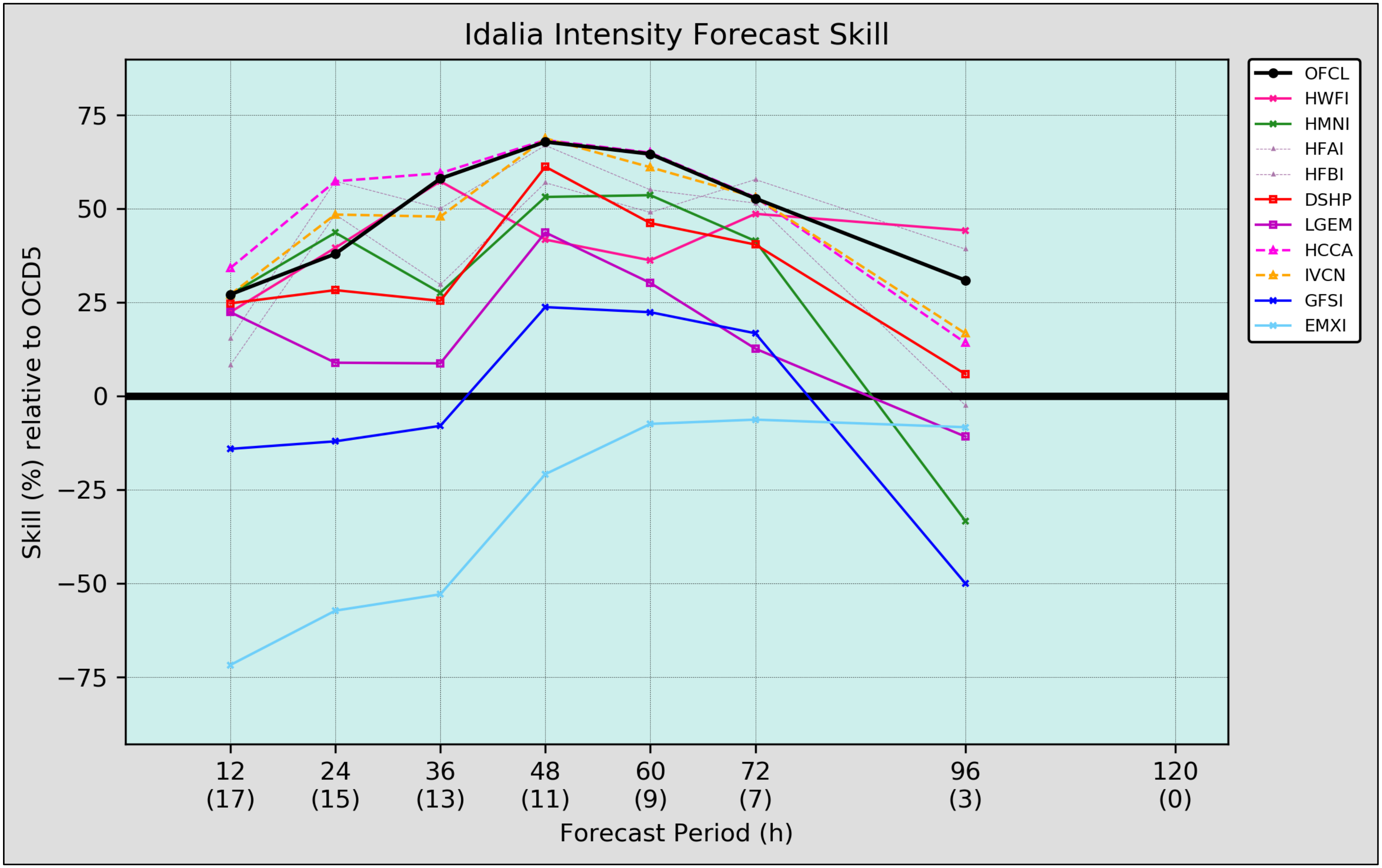

Figure 17. Official forecast and selected model forecast intensity skill for Hurricane Idalia, 26–31 August 2023.

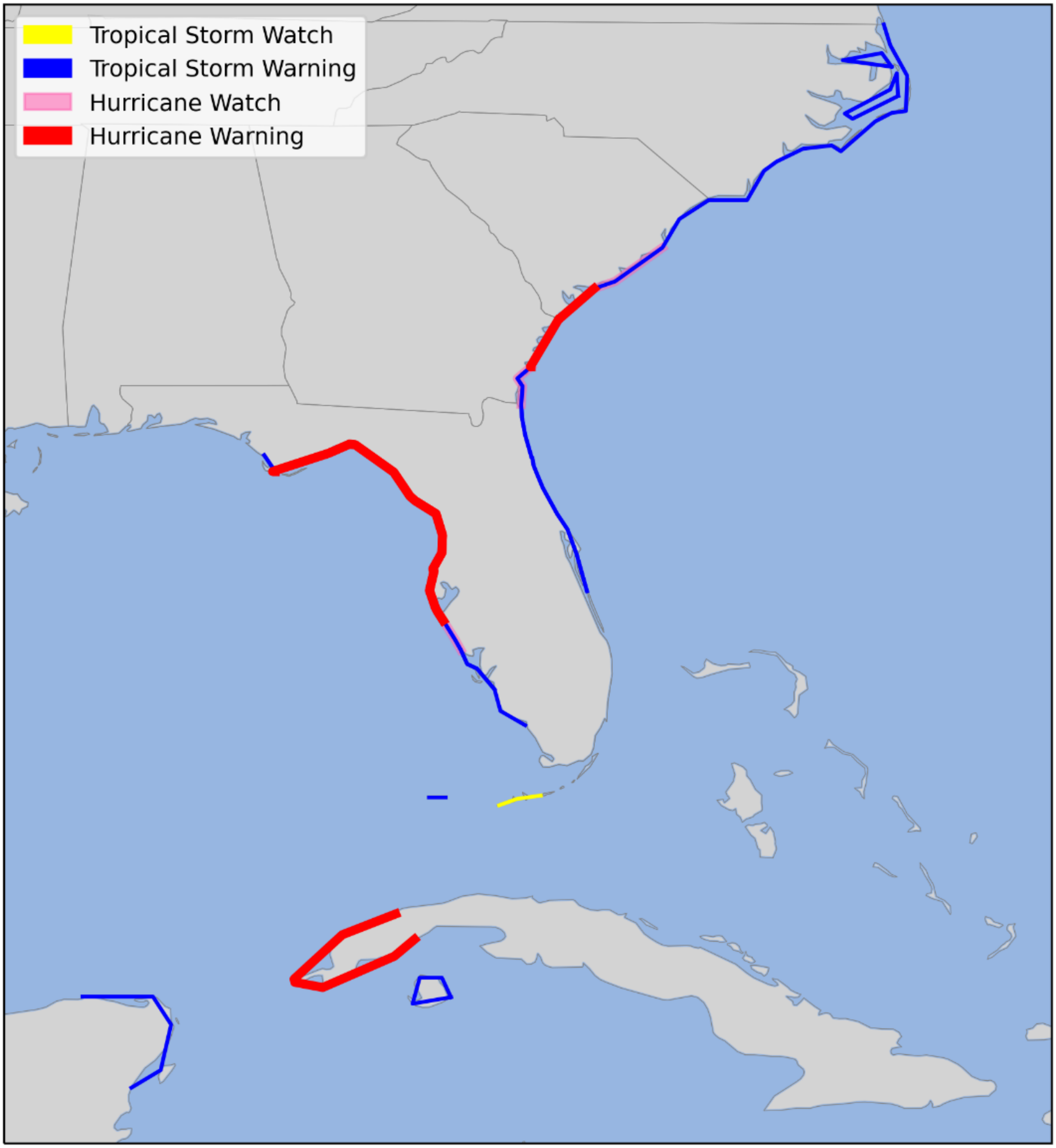

Figure 18. Coastal wind watches and warnings (only highest severity shown) for Hurricane Idalia.

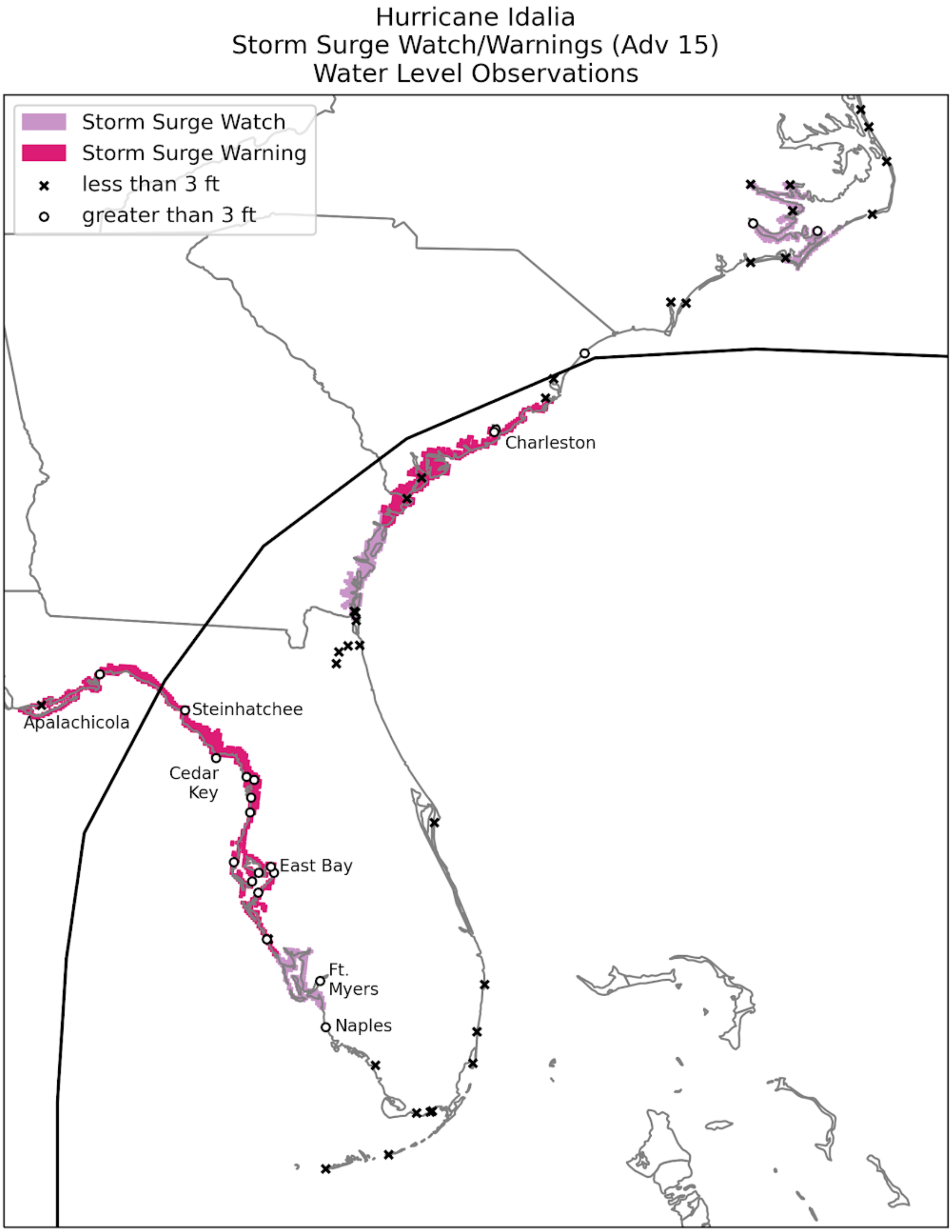

Figure 19. The Storm Surge Watches (lavender) and Warnings (magenta) from 0900 UTC 30 August (Adv. 15) and maximum water levels measured from NOS tide gauges and USGS streamgages. Water levels greater than 3 ft above MHHW are designated as a white "o" and water levels less than 3 ft above MHHW as a black "x".

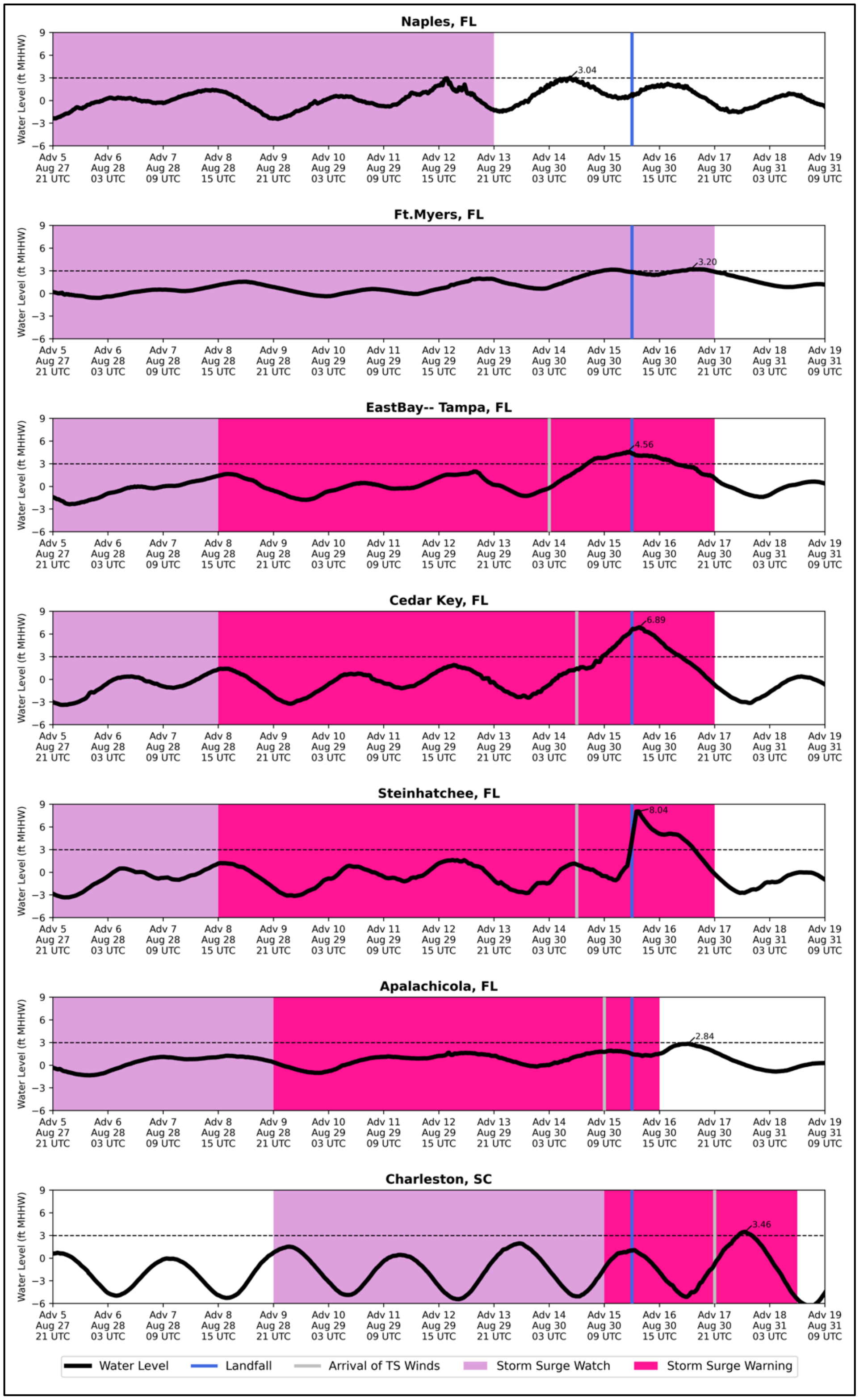

Figure 20. Timeline of NHC storm surge watches and warnings during Hurricane Idalia overlaid on hydrograph (black line) at NOS/USGS sensors throughout the watch/warning area. The time of the onset of tropical-storm-force winds (gray line), landfall at Keaton Beach, Florida (blue line), and the maximum water level (number indicating peak) are shown. See Figure 19 for location references.