NATIONAL HURRICANE CENTER TROPICAL CYCLONE REPORT

HURRICANE IRMA

(AL112017)

30 August–12 September 2017

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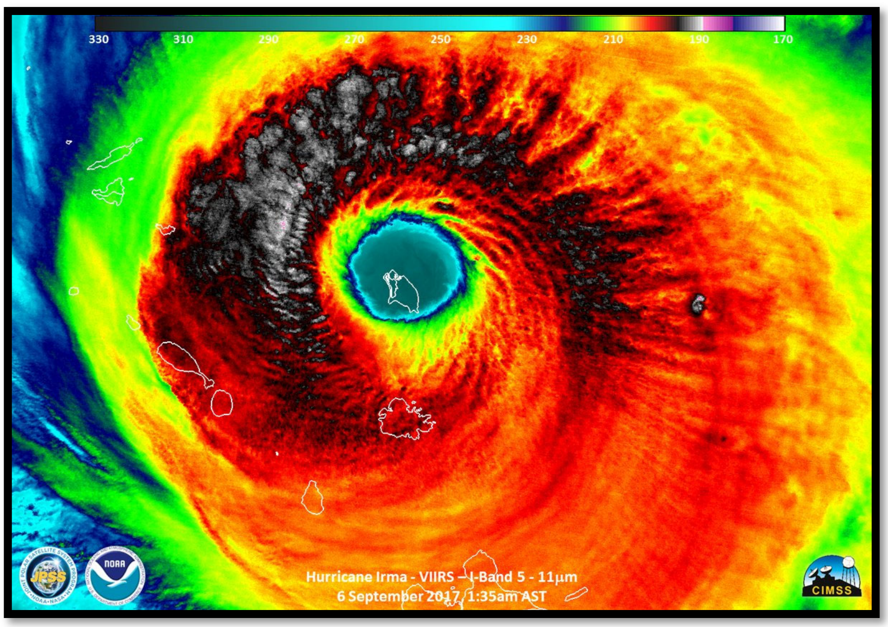

VIIRS SATELLITE IMAGE OF HURRICANE IRMA WHEN IT WAS AT ITS PEAK INTENSITY AND MADE LANDFALL ON BARBUDA AT 0535 UTC 6 SEPTEMBER.

Irma was a long-lived Cape Verde hurricane that reached category 5 intensity on the Saffir-Simpson Hurricane Wind Scale. The catastrophic hurricane made seven landfalls, four of which occurred as a category 5 hurricane across the northern Caribbean Islands. Irma made landfall as a category 4 hurricane in the Florida Keys and struck southwestern Florida at category 3 intensity. Irma caused widespread devastation across the affected areas and was one of the strongest and costliest hurricanes on record in the Atlantic basin.

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[1] Original report date 9 March 2018. Second version on 30 May 2018 updated casualty statistics for Florida, meteorological statistics for the Florida Keys, and corrected a typo. Third version on 30 June 2018 corrected the year of the last category 5 hurricane landfall in Cuba and corrected a typo in the Casualty and Damage Statistics section. This version corrects the maximum wind gust reported at St. Croix Airport (TISX).

Hurricane Irma

30 AUGUST–12 SEPTEMBER 2017

SYNOPTIC HISTORY

Irma originated from a tropical wave that departed the west coast of Africa on 27 August. The wave was then producing a widespread area of deep convection, which became more concentrated near the northern portion of the wave axis on 28 and 29 August. By 0000 UTC 30 August, satellite images indicated that a well-defined surface circulation had developed and since deep convection was already sufficiently organized, it is estimated that the system became a tropical depression at this time when it was centered about 120 n mi west-southwest of São Vicente in the Cabo Verde Islands. Banding features increased after genesis, and the depression became a tropical storm 6 h later. The "best track" chart of Irma'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[2].

While moving westward to the south of a mid-level ridge over the eastern Atlantic, Irma strengthened rapidly in environmental conditions of low vertical wind shear and a fairly moist lower troposphere while it was over marginally warm sea surface temperatures (SSTs). Irma developed a ragged eye around the time it became a hurricane near 0600 UTC 31 August, which was only 30 h after it became a tropical depression. Irma reached hurricane strength when it was still located over the eastern Atlantic about 400 n mi west of the Cabo Verde Islands. Later on 31 August, Irma turned west-northwestward as the ridge to the north of the cyclone weakened a little. Meanwhile, Irma continued to rapidly strengthen, and it reached major hurricane status (>= 100 kt) by 0000 UTC 1 September, only two days after genesis. This 70-kt increase in intensity over a 48-h period is a remarkable rate that is only achieved by a small fraction of Atlantic tropical cyclones (about 1 in 30). Although Irma was a very intense hurricane at this time, the inner core was quite compact with hurricane-force winds estimated to extend no more than 15 n mi from the center (Fig 4).

After becoming a category 3 hurricane, Irma's intensification paused with the eye occasionally becoming cloud filled and deep convection in the eyewall appearing less intense. Irma fluctuated between category 2 and 3 strength from 0000 1 September to 0000 UTC 4 September. The main causes for the intensity fluctuations were likely eyewall replacement cycles and intrusions of dry air. Meanwhile, the hurricane turned west-southwestward in response to a strong high pressure system to its north (Fig 5a), and lost 2.5° of latitude between 2 and 4 September. This south of west motion was very significant because it brought the cyclone over higher SSTs and in a position poised to affect the northern Leeward Islands.

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[2] 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.

By early on 4 September, Irma's eye was growing in size and becoming better defined, and deep convection around the eye was gaining symmetry. Irma was on a strengthening trend once again, likely due to the completion of an eyewall replacement cycle, and it was headed toward the northern Leeward Islands. Irma turned west-northwestward, due to the erosion of the western side of the mid-level ridge (Fig 5b), and went through another round of rapid intensification. The hurricane reached its maximum intensity of 155 kt around 1800 UTC 5 September, when it was located about 70 n mi east-southeast of Barbuda. As a category 5 hurricane, Irma made landfall on Barbuda around 0545 UTC 6 September with maximum winds of 155 kt and a minimum pressure of 914 mb (Fig. 6a).

After crossing Barbuda, Irma continued to exhibit an impressive satellite appearance and made its second landfall on St. Martin at 1115 UTC that day, with the same wind speed and pressure as for its Barbuda landfall. Still moving west-northwestward to the south of a mid-level ridge, Irma made its third landfall on the island of Virgin Gorda in the British Virgin Islands at 1630 UTC 6 September still as a 155-kt category 5 hurricane. Later that day, as Irma moved away from the Virgin Islands, reconnaissance data from the Air Force indicated that the major hurricane had weakened slightly and had a double wind maximum, indicative of concentric eyewalls. The double eyewall structure was also evident in Doppler radar data from San Juan, Puerto Rico (Fig. 7). Even though Irma was no longer at its peak intensity, it remained a category 5 hurricane with a larger wind field than it had previously (Fig. 4). The eye of Irma tracked about 50 n mi to the north of the northern shore of Puerto Rico and the Dominican Republic from 1800 UTC 6 September to 1800 UTC 7 September, with the strongest winds to the north of the center.

The eye of Irma passed just south of the Turks and Caicos Islands around 0000 UTC 8 September, and it made landfall on Little Inagua Island in the Bahamas at 0500 UTC that day at category 4 intensity, with estimated maximum winds of 135 kt and a minimum pressure of 924 mb. This slight weakening ended Irma's 60-h period of sustained category 5 intensity, which is the second longest such period on record (behind the 1932 Cuba Hurricane of Santa Cruz del Sur). Irma then turned slightly to the left, due to a building subtropical ridge, and moved toward the northern coast of Cuba (Fig. 5c). Reconnaissance and microwave data indicate that the inner core had become better organized, and it is estimated that Irma strengthened to a category 5 hurricane again around 1800 UTC 8 September, only 18 h after weakening below that threshold.

Irma then intensified a little more and made its fifth landfall near Cayo Romano, Cuba, at 0300 UTC 9 September, with estimated maximum winds of 145 kt (Fig. 6b). This marked the first category 5 hurricane landfall in Cuba since Huracan sin Precedentes in 1924. Irma tracked along the Cuban Keys throughout that day, and its interaction with land caused it to weaken significantly, first to a category 4 storm a few hours after landfall in the Cuban Keys and then down to a category 2 hurricane by 1800 UTC that day when the eye was very near Isabela de Sagua. Shortly after that time, the forward speed of Irma slowed, and it began to make a turn to the northwest, which caused the core of the hurricane to move over the Florida Straits early on 10 September.

When Irma moved over the warm waters of the Florida Straits, the hurricane reintensified once again. Data from the Air Force Hurricane Hunters indicate that Irma became a category 4 hurricane by 0600 UTC 10 September when it was centered about 55 n mi south-southeast of Key West, Florida. Meanwhile, Irma had turned to the north-northwest in the flow between a subtropical ridge over the western Atlantic and a mid- to upper-level low pressure system over the Gulf of Mexico (Fig 5d). The category 4 storm made yet another landfall near Cudjoe Key in the lower Florida Keys around 1300 UTC that day with maximum winds of 115 kt and a minimum pressure of 931 mb (Fig 6c).

The convective pattern of the hurricane then became more ragged, likely due to increasing southwesterly vertical wind shear, and in response, Irma weakened to a category 3 hurricane around 1800 UTC 10 September. Irma made its final landfall near Marco Island, Florida, at 1930 UTC 10 September (Fig. 6d), with estimated maximum winds of 100 kt and minimum pressure of 936 mb. Once inland over southwestern Florida, Irma weakened quickly, due to the influences of land and strong wind shear, while moving north-northwestward on the east side of a large cyclonic gyre that was centered over the Gulf of Mexico. Irma's center tracked just east of Naples and Ft. Myers by 0000 UTC 11 September as a category 2 hurricane and passed between Tampa and Orlando by 0600 UTC that day as a category 1 storm. Although Irma was weaker while over Florida, the wind field of the hurricane spread out significantly, with tropical-storm-force winds extending up to 360 n mi from the center (Fig. 4).

Irma weakened to a tropical storm by 1200 UTC 11 September when it was centered about 20 n mi west of Gainesville, Florida. While Irma was moving across northern Florida, most of the deep convection was located well to the northeast of the center, and the strongest winds were confined to the northeast coast of Florida and southeastern Georgia. The center of Irma moved over southern Georgia just west of Valdosta around 1800 UTC that day with maximum winds of 45 kt, and the system became a remnant low with 25-kt winds once it crossed into Alabama by 0600 UTC 12 September. The remnant low continued northwestward while weakening and dissipated shortly after 1200 UTC 13 September over southeastern Missouri.

METEOROLOGICAL STATISTICS

Observations in Irma (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), and objective Advanced Dvorak Technique (ADT) estimates from the Cooperative Institute for Meteorological Satellite Studies/University of Wisconsin-Madison. 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 Irma.

Aircraft observations include flight-level, stepped frequency microwave radiometer (SFMR), and dropwindsonde observations from 15 flights (including 56 center fixes) of the 53rd Weather Reconnaissance Squadron of the U.S. Air Force Reserve Command and 8 flights (including 26 center fixes) of the NOAA Aircraft Operations Center (AOC). In addition, the NOAA AOC G-IV aircraft flew 8 synoptic surveillance flights around Irma.

National Weather Service WSR-88D Doppler radar data from San Juan, Puerto Rico; Miami, Florida; Key West, Florida; Melbourne, Florida; Jacksonville, Florida; Tampa, Florida; and Tallahassee, Florida, were used to make center fixes and obtain velocity data while Irma was near the U. S. coast. Météo-France radar data from Guadeloupe and Martinique as well as radar data from the Institute of Meteorology of Cuba were also helpful in tracking the center of Irma.

Selected ship reports of winds of tropical storm force or greater associated with Irma are given in Table 2, and selected surface observations from land stations and data buoys are given in Table 3.

Winds and Pressure

Irma's estimated peak intensity of 155 kt from 1800 UTC 5 September to 1200 UTC 6 September is based on a blend of multiple SFMR surface wind estimates and flight-level winds observed by the Air Force Reserve and NOAA Hurricane Hunters during that time period. The highest unflagged SFMR surface wind estimate from the Air Force Reserve was 160 kt at 1633 UTC 5 September. The flight-level winds measured during that mission were around the same speed. The peak 700-mb flight-level winds of 164 kt, which correspond to a peak surface wind of 145–150 kt, were measured by the Air Force Reserve early on 6 September. The NOAA Hurricane Hunters measured maximum 750-mb flight-level winds of 167 kt, which correspond to about 150 kt at the surface, and peak SFMR winds of 152 kt. It should be noted that this intensity estimate is somewhat uncertain given the disparity between the peak SFMR winds and the intensity supported by the highest flight-level winds. The 155-kt peak intensity of Irma is 5 kt lower than the operational assessment in favor of blending the flight-level and SFMR reports.

Irma's estimated minimum central pressure of 914 mb at 0600 UTC 6 September is based on a dropwindsonde surface pressure measurement of 915 mb at 0503 UTC 6 September, which was accompanied by a surface wind of 15 kt. This estimate is also consistent with a weather station on St. Barthelemy that reported a minimum pressure of 915.9 mb, and a station on Barbuda that reported a minimum pressure of 916.1 mb. The Barbuda station reported sustained winds of 105 kt and a gust of 139 kt when it was in the southern eyewall. Also, an unofficial observation in St. Barthelemy reported a maximum wind gust of 173 kt.

Caribbean Islands

Around 1700 UTC 6 September, the center of Irma passed just north of Buck Island in the U.S. Virgin Islands, where sustained winds of 92 kt and a gust of 119 kt were reported.

Irma's center passed about 50 n mi north of San Juan, Puerto Rico, just before 0000 UTC 7 September. The lowest pressure observed on mainland Puerto Rico during Irma was from a National Ocean Service (NOS) station in Fajardo, which recorded a pressure of 980.1 mb at 2118 UTC 6 September. The highest wind speed reported in Puerto Rico was 48 kt with a gust of 64 kt at an NOS site at La Puntilla in San Juan Bay at 2230 UTC 6 September.

The Turks and Caicos Islands experienced the northern eyewall of Hurricane Irma around 0000 UTC 8 September. However, no observations were available from these locations due to failure of the observing equipment.

The hurricane then took a long duration track along or near the northern coast of Cuba from 8 September through early 10 September. Irma approached the northern coast of eastern Cuba late on 8 September, with sustained 10-minute winds of 44 kt and a peak gust of 63 kt observed in the town of Velasco at 1959 UTC. The lowest pressure recorded on land that day was 991.0 mb at 2100 UTC in La Jiquima, Holguin. Irma tracked near or over the Cuban Keys on 9 September and, at 1430 UTC, a coastal station at Caibarien recorded sustained winds of 85 kt with an accompanying gust of 122 kt, and a minimum pressure of 969.9 mb when Irma's center passed approximately 15 n mi northeast of that location. The lowest recorded pressure in Cuba during Irma was 933.1 mb at Cayo Coco at 0520 UTC 9 September, which was in the eye of the hurricane at that time. The western eyewall was also sampled at that station, with sustained winds of 83 kt and a gust of 105 kt observed at 0500 UTC that day. The highest wind speed recorded in Cuba was just inland of Cayo Coco at a station near Camilo, Cienfuegos, where sustained winds of 108 kt and a gust of 138 kt were measured at 0720 UTC 9 September. Early on 10 September, Irma departed the coastal region of central Cuba as it turned north-northwestward toward Florida. Tropical storm conditions continued over a portion of Cuba that day, with sustained winds of 49 kt and a gust of 73 kt observed at San Antonio de los Banos. Although observations were not available from Havana, two observations recorded tropical-storm-force winds just southeast of the capital city.

United States

The earliest significant report of high winds in Florida came from an observation at Alligator Reef Light at 1159 UTC 10 September, where sustained winds of 62 kt and a gust of 81 kt were measured. At 1204 UTC that day, a minimum pressure of 977.0 mb was recorded at that same station when the center of Irma was nearly 50 n mi to its west-southwest. The lowest pressure reported in the Florida Keys was 933.7 mb at 1216 UTC by a spotter in Big Pine Key. The strongest wind speed in the Florida Keys was reported by an automated station on Big Pine Key, where a 104-kt gust at an observing site of 6 meter elevation was recorded (10 m is standard height).

Irma made its final landfall near Marco Island, Florida, at 1930 UTC 10 September. A spotter in Marco Island reported a minimum pressure of 936.9 mb, with maximum sustained winds of 97 kt and a gust of 112 kt. In addition, the Marco Island Police Department reported a wind gust of 113 kt at 1900 UTC, and the Naples Municipal Airport reported a 123-kt wind gust around the same time. Sustained hurricane force winds extended well inland over the southern Florida peninsula. At Government Cut off of Miami Beach sustained winds of 65 kt at an elevation of 23 meters occurred, and a wind gust of 97 kt was measured at Deerfield Beach. Nearly all of the inland observations in the Miami-Dade and Broward County metro area reported sustained winds just below hurricane force. At 1903 UTC that day, the Opa Locka Airport reported 2-minute averaged sustained winds of 56 kt with a gust of 74 kt, and several other nearby stations reported similar wind speeds.

The hurricane continued northward across central Florida with hurricane conditions decreasing in areal coverage when Irma's center approached the Orlando and Tampa areas. Tropical storm conditions were experienced on both the west and east coasts of the state on 10 and 11 September. The center passed near Plant City at 0509 UTC 11 September, where a spotter reported a minimum pressure of 964.4 mb. At 0142 UTC, a couple of hours before the eyewall and strongest winds arrived, that spotter measured 10-second 7-meter winds of 63 kt and a gust to 71 kt. Reports from both sides of the state confirmed Irma's expansive wind field. For example, buoy 42036 offshore of Tampa in the Gulf of Mexico measured 44 kt sustained winds at 5-meters with a 10-min averaging period at 0420 UTC 11 September. Also in the Gulf of Mexico, at 0823 UTC that day, buoy 42039 offshore of Pensacola measured 37 kt sustained winds at an elevation of 4 meters. Off the east coast, buoy 41009 off of Cape Canaveral measured sustained winds of 56 kt at 4 meters.

Irma moved across north-central Florida through early 11 September and then moved into southeastern Georgia late that day and early 12 September. Tropical storm conditions were reported across much of northern Florida, especially to the east of the center. The Jacksonville International Airport measured sustained 2-minute 10-meter winds of 51 kt at 1053 UTC 11 September with a gust of 75 kt. At the Gainesville Regional Airport, closer to where the center passed, a minimum pressure of 979.5 mb was observed at 1053 UTC with maximum sustained 2-minute 10-meter winds of 40 kt.

Several sites in Georgia and South Carolina reported tropical storm conditions from Irma on 11 September. These reports include locations as far north as the Atlanta International Airport, which measured 2-minute 10-meter winds of 39 kt at 1910 UTC and a gust of 56 kt. At 1609 UTC, Charleston International Airport in South Carolina measured 2-minute 10-meter winds of 42 kt and a gust of 52 kt.

Figure 8 shows observed maximum sustained wind speeds during Hurricane Irma for Cuba and portions of the southeastern United States, and Fig. 9 show maps of maximum wind gusts for the same geographical areas.

Landfall Intensity Estimates

Barbuda: The estimated landfall intensity of 155 kt at 0545 UTC 6 September is based on a blend of SFMR surface wind values near 160 kt and flight-level winds of 161 kt, which reduce to about 145 kt at the surface, measured by the Air Force Hurricane Hunters around the time of landfall. The lowest pressure observed in Barbuda was 916.1 mb.

St. Martin: The estimated landfall intensity of 155 kt at 1115 UTC 6 September is based on similar data to the Barbuda landfall with SFMR values around 155 kt.

British Virgin Islands: The estimated landfall intensity of 155 kt at 1630 UTC 6 September on Virgin Gorda is based on SFMR winds around 155 kt.

Bahamas: The estimated landfall intensity of 135 kt on Little Inagua Island at 0500 UTC 8 September is based on flight-level winds reported by the Air Force of 147 kt, which reduce to 132 kt at the surface, and an ADT estimate of 7.0/140 kt.

Cuba: The estimated landfall intensity of 145 kt near Cayo Romano at 0300 UTC 9 September is based on SFMR winds of 145 kt measured by the Air Force a few hours before landfall.

Florida Keys: The estimated landfall of 115 kt at 1300 UTC 10 September near Cudjoe Key is based on SFMR winds between 110 and 120 kt just prior to landfall.

Southwest Florida: The estimated landfall intensity of 100 kt at 1930 UTC 10 September near Marco Island is based on a sustained surface wind measurement of 97 kt from a nearby weather spotter.

Storm Surge[3]

Caribbean

Significant storm surge occurred on the island of Barbuda, where Irma made landfall as a category 5 hurricane. A tide gauge on the island, maintained by the Antigua and Barbuda Meteorological Service, recorded a peak water level of 7.9 ft Mean Higher High Water (MHHW), suggesting that inundation of at least 8 ft above ground level occurred on parts of the island.

Significant storm surge likely occurred on the U.S. Virgin Islands, especially on St. Thomas and St. John. However, specific inundation amounts are not available. The NOS tide gauge at Charlotte Amalie on St. Thomas went offline during the storm and did not transmit a peak water level, and the other tide gauge reports are likely not representative of the highest inundation on the islands. Maximum inundation levels of 1 to 2 ft above ground level occurred along the coast of Puerto Rico. The highest water level observation there from a tide gauge was 1.5 ft MHHW at Arecibo along the north coast of Puerto Rico.

The Instituto de Meteorología de Cuba reports that Irma produced significant coastal flooding along the north coast of Cuba due to storm surge and large waves. In Ciego de Ávila Province, the sea rose by 3 to 3.5 m (~10 to 11.5 ft) and penetrated inland more than 800 m (0.5 miles) from the coast. Wave heights on Cayo Coco were estimated to be between 5 and 6 m (16 to 20 ft) high. In Camagüey Province, water reached a height of 2 m (6.5 ft) and pushed inland 200 m (650 ft) from the coast on Cayo Romano, where Irma made landfall as a category 5 hurricane. Wave heights there were observed to be over 8 m (26 ft) high. In Puerto Piloto, the sea retreated offshore by 10 to 12 m (33 to 39 ft) due to the southerly winds on the eastern side of Irma's circulation. The sea rose by as much as 3 m (10 ft) in Caibarién in Villa Clara Province, and the surge penetrated approximately 2 km (1.2 miles) inland in Isabela de Sagua. Unprecedented storm surge flooding occurred in portions of La Habana Province, in some cases surpassing the coastal floods produced by the Storm of the Century (March 1993) and Hurricane Wilma (October 2005). Water levels reached 2.25 m (7.4 ft) in some locations.

Florida Keys

The combined effect of storm surge and the tide produced maximum inundation levels of 5 to 8 ft above ground level for portions of the Lower Florida Keys from Cudjoe Key eastward to Big Pine Key and Bahia Honda Key, near and to the east of where Irma's center made landfall. NHC and WFO Key West conducted a survey of the area and found a high water mark of 6.0 ft above ground level in a garage on Big Pine Key. Accounting for land elevation at the house, the

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[3] 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).

high water mark measurement converts to 7-8 ft MHHW, implying that maximum inundation heights were 8 ft above ground level at the lowest spots near the shoreline on Big Pine Key. Several high water marks of at least 4 ft above ground level were also surveyed by the United States Geological Survey (USGS) in this area, with the highest mark being 5.45 ft above ground level (6.71 ft North American Vertical Datum (NAVD88) / 6.8 ft MHHW) on Little Torch Key.

Maximum inundation levels of 4 to 6 ft above ground level occurred across the Middle and Upper Keys. A high water mark of 4.11 ft above ground level was surveyed in Key Largo, and a mark of 3.72 ft above ground level was recorded in Marathon. The NOS tide gauge on Vaca Key measured a peak water level of 2.6 ft MHHW. Farther south, maximum inundation levels of 2 to 4 ft above ground occurred on the Lower Keys west of Cudjoe Key to Key West. The NOS gauge on Key West recorded a peak water level of 2.7 ft MHHW.

Southwestern Florida

The combined effect of storm surge and the tide produced maximum inundation levels of 6 to 10 ft above ground level along the unpopulated coast of southwestern Florida between Cape Sable and Cape Romano, within Everglades National Park and the Ten Thousand Islands National Wildlife Refuge (Fig. 10). In Everglades City, a USGS storm tide sensor recorded a wave-filtered water level of 8.31 ft NAVD88 (which converts to 7.5 ft MHHW). The USGS also surveyed two high water marks in Everglades City that were greater than 5 ft above ground level. In Goodland, a USGS storm tide sensor measured a water level of 7.03 ft NAVD88 (6.1 ft MHHW), and several high water marks of 2-3 ft above ground level were surveyed in the area. Since Irma's eastern eyewall moved onshore between Everglades City and Goodland, peak inundation along that portion of the coast could have been as much as 10 ft above ground level; however, there were no observations in that area to definitively corroborate this estimate. Inundation of at least 6 ft above ground level likely occurred along the coast of the remainder of Everglades National Park south of Everglades City. Observations from stream gauges jointly funded by the National Park Service and South Florida Water Management District indicate that water levels reached 7.01 ft NAVD88 (6.1 ft MHHW) at Shark River, 5.3 ft NAVD88 (5.5 ft MHHW) at Garfield Bight, and 5.5 ft NAVD88 at Lostmans River.

Maximum inundation levels of 3 to 5 ft above ground level occurred along the remainder of the southwestern coast of Florida from Marco Island northward through Naples to Ft. Myers, an area which was affected by weakened onshore winds within Irma's deteriorating western eyewall. The National Ocean Service (NOS) tide gauge at Naples measured a water level of 4.25 ft MHHW, while the gauge at Ft. Myers on the Caloosahatchee River recorded a water level of 3.28 ft MHHW. In addition, USGS storm tide sensors in Naples and at Delnor-Wiggins State Park near Naples Park measured water levels of 5.06 ft NAVD88 (4.5 ft MHHW) and 3.90 ft NAVD88 (3.4 ft MHHW), respectively.

Before inundation occurred along portions of the southwestern coast of Florida, strong offshore winds on the northern side of Irma's circulation initially blew water away from the coast and caused water levels to recede below normal levels. The NOS tide gauge at Naples recorded a minimum water level of 4.8 ft below MHHW (2.0 ft below Mean Lower Low Water [MLLW]) before Irma's center arrived. Once the center moved north of Naples and the winds shifted to onshore, the water level at the site increased by 9 ft in only 3 hours, and 6 ft within the first hour.

Florida East Coast

The combined effect of storm surge and the tide produced maximum inundation levels of 4 to 6 ft above ground level for portions of Miami-Dade County in southeastern Florida, especially along Biscayne Bay. A USGS storm tide sensor at Matheson Hammock Park in Miami measured a peak water level of 5.75 ft NAVD88 (5.6 ft MHHW), consistent with a high water mark of 5.1 ft above ground level which was surveyed in the park. The NOS tide gauge on Virginia Key recorded a peak water level of 3.7 ft MHHW.

Significant flooding occurred in downtown Miami; however, the flooding was likely caused by a combination of heavy rainfall and urban runoff, wave overwash becoming trapped behind seawalls, and seawater coming up from below through the city's drainage systems. Soil samples were collected by the Physical Oceanography Division of NOAA's Atlantic Oceanographic and Meteorological Laboratory (AOML) in the Brickell area of downtown Miami two days after Irma, and their analysis indicates that there was a notable gradient of soluble salts and electrical conductivity of the soil from the bayfront to Brickell Avenue. Along Brickell Bay Drive, directly adjacent to the bay, soluble salt concentrations averaged around 3400 parts per million (ppm), with an average electrical conductivity of 6-7 millisiemens per centimeter (mS/cm). Similar concentration and conductivity values were analyzed from soil samples collected up to one block from the coast on Key Biscayne. These soil samples can be characterized as being moderately saline. The highest sampled conductivity along Brickell Bay Drive was 9.83 mS/cm, characterized as strongly saline. Along Brickell Avenue, a few blocks inland from the bay, soluble salt concentrations averaged around 1000 ppm, with an average electrical conductivity of about 2 mS/cm, on the threshold between non-saline and slightly saline. AOML's analysis suggests that saltwater inundation in Downtown Miami was largely confined within a block or two of the bay, and much of the flooding that occurred in other parts of the downtown area, including along Brickell Avenue, was the result of rainfall runoff that was unable to drain into the bay due to elevated water levels caused by the storm surge.

Maximum inundation levels of 2 to 4 ft above ground level occurred across coastal sections of northern Miami-Dade, Broward, and Palm Beach Counties. A storm tide sensor mounted to an electrical pole at a park on Biscayne Bay just north of downtown Miami measured a wave-filtered water level of 1.5 ft above ground level (3.35 ft NAVD88 / 3.1 ft MHHW), while a sensor along a canal in Pompano Beach (Broward County) recorded a wave-filtered water level of 3.4 ft NAVD88 (3.1 ft MHHW). In Palm Beach County, a storm tide sensor along the Intracoastal Waterway in Boca Raton recorded a wave-filtered water level of 3.05 ft NAVD88 (2.7 ft MHHW), and the NOS tide gauge at Lake Worth measured a peak water level of 1.5 ft MHHW. Farther north, maximum inundation levels of 1 to 3 ft above ground level occurred across coastal sections of Martin, St. Lucie, Indian River, and southern Brevard Counties.

Even though Irma made landfall along the southwestern coast of Florida, the hurricane's large wind field produced significant storm surge flooding along the northeastern coast of Florida, where a maximum of 3 to 5 ft of inundation above ground level occurred from Cape Canaveral northward to the Florida-Georgia border. The NOS tide gauge on Trident Pier at Port Canaveral measured a peak water level of 4.2 ft MHHW, and a USGS storm tide sensor at Ormand Beach recorded a water level of 4.37 ft NAVD88 (4.5 ft MHHW). Farther north, a storm tide sensor on the Matanzas River south of St. Augustine recorded a wave-filtered water level of 6.65 ft NAVD88 (4.8 ft MHHW), and the USGS surveyed several high water marks of 2 to 4 ft above ground level in that area. The highest was a mark of 3.3 ft above ground level near Vilano Beach. Along the coast of extreme northeastern Florida, a storm tide sensor at Jacksonville Beach recorded a wave-filtered water level of 6.55 ft NAVD88 (4.1 ft MHHW). In addition, the NOS gauges at Mayport (Bar Pilots Dock) and Fernandina Beach both measured peak water levels of 3.6 ft MHHW.

Significant flooding occurred along the banks of the St. Johns River, likely due to a combination of storm surge and rainfall runoff into the river. The NOS gauge at the I-295 bridge on the south side of Jacksonville measured a peak water level of 5.3 ft MHHW, while gauges at Southbank Riverwalk in Downtown Jacksonville and at Racy Point recorded peak water levels of 4.9 ft MHHW and 4.0 ft MHHW, respectively. As an illustration of the combined effect of storm surge and rainfall runoff, observations from a USGS station in downtown Jacksonville showed that salinity within the river gradually increased from less than 5 parts per thousand (ppt) on 8 September to about 30 ppt (just a little less than the average salinity of the ocean) late on 10 September. These data indicate that the initial water rises were likely due to easterly winds ahead of Irma pushing seawater upstream in the St. Johns River. However, the USGS data then showed salinity decreasing rapidly back to normal levels at the downtown site on 11 September, while the water level at the site continued to increase and reached its maximum about six hours after the salinity peak. This suggests that the freshwater input from rainfall runoff was also a significant contributor to the flooding that occurred along the St. Johns River.

Florida Central West Coast

The combined effect of storm surge and the tide produced maximum inundation levels of 1 to 2 ft above ground level along the west coast of Florida north of Charlotte Harbor to Apalachee Bay. NOS tide gauges along the west coast, including within Tampa Bay, generally recorded peak water levels of a little more than 1 ft MHHW, with the highest observation being 1.7 ft MHHW at the McKay Bay Entrance near Downtown Tampa.

Offshore winds on the northern side of Irma's circulation initially caused water levels to recede below normal levels along much of the west coast of Florida, including Tampa Bay. In fact, some normally submerged areas went virtually dry, allowing people to (inadvisably) walk out onto the sea or bay floor, while also stranding marine vessels and even manatees (Fig. 11). At the McKay Bay Entrance near Downtown Tampa, the NOS tide gauge measured a minimum water level of 7.4 ft below MHHW (4.7 ft below MLLW), which was more than 6 ft below normal tide levels. The water level in Tampa Bay at St. Petersburg was about 5 ft below normal, reaching a minimum of 6.0 ft below MHHW (3.7 ft below MLLW), and the water level was so low at Old Port Tampa that the gauge was unable to obtain a reading for several hours.

Georgia and South Carolina

The combined effect of storm surge and the tide produced maximum inundation levels of 3 to 5 ft above ground level along the coast of Georgia and much of South Carolina. In Georgia, the NOS tide gauge at Fort Pulaski measured a peak water level of 4.7 ft MHHW, while in South Carolina, the NOS gauge at Charleston recorded a peak water level of 4.2 ft MHHW. Water levels of 3.4 ft MHHW and 2.9 ft MHHW were also reported at the tide gauges at Oyster Landing and Springmaid Pier (Myrtle Beach), respectively. Although the storm surge produced by Irma was less than that produced by Hurricane Matthew (2016) along the coast of South Carolina, slightly higher tides, as well as closer timing of high tide with the peak storm surge, caused water levels at the Charleston and Springmaid Pier NOS gauges to exceed those observed during Matthew.

Rainfall and Flooding

Even though Puerto Rico did not experience a direct hit from Irma, rainfall totals between 10 and 15 inches occurred over high elevations in the central portion of the island between 5 and 7 September. Irma also produced very heavy rainfall across a large portion of Cuba. Instituto de Meteorología de Cuba provided multiple reports over 10 inches, with the maximum observed rainfall of 23.90 inches measured in Topes De Collantes. The second highest report was in Sancti Spiritus where 19.02 inches was measured. Several rivers in Cuba reached major flood stage. In particular, the Zaza River, in the municipality of Cabaiguán, was the most affected as Irma caused one of the largest measured floods of this river on record.

Irma produced heavy rain across much of the state of Florida, and rainfall totals of 10 to 15 inches were common across the peninsula and the Keys (Fig. 12). The maximum reported storm-total rainfall was near Ft. Pierce, Florida, in St. Lucie County, where 21.66 inches of rain was measured between 9 and 12 September. The heavy rainfall caused flooding of streets and low-lying areas across much of the Florida peninsula. In Indian River County, 12 people were rescued from flood waters, and in Orange County residents were rescued from flooded homes. Heavy rains of 6 to 10 inches occurred across the Florida Keys. Flooding occurred on most rivers in northern Florida, and major or record flood stages were reported at rivers in Bradford, Clay, Marion, Flagler, Duval, Putnam, St. Johns, Nassau, and Alachua counties. The St. John's River set record flood stages at many locations in Duval County, causing major flooding in the Jacksonville metropolitan area, where hundreds of people were rescued. Similar flooding occurred in Bradford County where record flood stages were set at Alligator Creek, Hampton Lake, Lake Sampson, and New River.

In Georgia, major flooding occurred in St. Simon's Island and along the Satilla River. Rainfall totals were generally between 5 and 10 inches in coastal Georgia, and the maximum rainfall measured in the state was 10.34 inches in Nahunta in Brantley County from 11 to 12 September. Lesser rainfall amounts occurred over inland Georgia and South Carolina where rainfall totals between 3 and 7 inches were common. In South Carolina, the maximum rainfall total was 9.07 inches in Beaufort from 10 to 13 September. These rains caused some flash flooding and minor to moderate river flooding in South Carolina. Several rescues occurred in Chatham County in Georgia and in Jasper County in South Carolina due to the flooding. Even after Irma became a remnant low pressure system it still produced heavy rains in Alabama, where up to 5 inches accumulated. Rainfall totals near 6 inches occurred in the mountains of western North Carolina.

Tornadoes

Irma produced 25 confirmed tornadoes: 21 in Florida and 4 in South Carolina (Fig 13). Of the tornadoes, 3 were EF-2 (on the Enhanced Fujita Scale), 15 were EF-1, and 7 EF-0. The majority of the tornadoes occurred along the east coast of central and northern Florida. One of the EF-2 tornadoes touched down in Mims, Florida, with estimated winds of 100 to 110 kt. This tornado caused severe roof damage to numerous homes and uprooted many trees in the area. An EF-2 tornado struck near Crescent Beach, Florida, with peak winds between 95 and 115 kt. This tornado caused significant structural damage to vacation rentals in the area. Another EF-2 tornado hit Polk City, Florida, knocking down seven high power transmission poles.

Weaker but still notable tornadoes in Florida included an EF-1 that went through Miramar and caused tree and roof damage. An EF-1 tornado affected St. Augustine causing significant damage to a cemetery. Another EF-1 tornado with peak winds in the 85 to 95 kt range occurred in Merritt Island and damaged numerous homes and a church.

In South Carolina, the strongest tornado that occurred from Irma was an EF-1 in John's Island. This tornado caused home and tree damage along a 0.5 mile path.

CASUALTY AND DAMAGE STATISTICS

Irma caused 47 direct deaths[4] as a result of its strong winds, heavy rains, and high surf across the Caribbean Islands and the southeastern United States. The majority of the causalities were in the Caribbean Islands, where Irma's winds were the strongest. Eleven direct deaths were reported combined in Saint Martin and Saint Barthelemy, 9 in Cuba, 4 in Sint Maarten, 4 in the British Virgin Islands, 3 in the U.S. Virgin Islands, 3 in Barbuda, 1 in Barbados, 1 in Haiti, and 1 in Anguilla.

In the United States, 10 direct deaths were reported, and an additional 82 indirect deaths occurred, 77 of which were in Florida. Hundreds more were injured before, during, or after the hurricane. About 6 million residents in Florida were evacuated from coastal areas.

Barbuda

This small island took a direct hit from Irma at its peak intensity. Irma's catastrophic winds caused destruction across the island, damaging or destroying about 95% of the structures, including the local airport (Fig 14). The island had no water or communications after the storm, and was considered nearly uninhabitable. Irma caused most Barbudans to leave their island for Antigua, with the remaining islanders evacuating soon thereafter when Hurricane Jose threatened, leaving Barbuda uninhabited for the first time in 300 years. Few residents have returned as of February 2018. Preliminary estimates of property damage on the island are between 150 and 300 million USD.

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[4] Deaths occurring as a direct result of the forces of the tropical cyclone are referred to as "direct" deaths. These would include those persons who drowned in storm surge, rough seas, rip currents, and freshwater floods. Direct deaths also include casualties resulting from lightning and wind-related events (e.g., collapsing structures). Deaths occurring from such factors as heart attacks, house fires, electrocutions from downed power lines, vehicle accidents on wet roads, etc., are considered indirect" deaths.

Saint Martin/Sint Maarten

Like Barbuda, Saint Martin took a direct hit from the catastrophic category 5 hurricane. Total damage on the island is estimated to be around 1.5 billion USD. According to media reports, on the Saint Martin (French) side of the island, 90% of the structures were damaged with 60% of those being considered uninhabitable. Irma's intense winds heavily damaged the marina and ripped trees out of the ground. Total losses are estimated to be near 1 billion USD.

On the Dutch side of the island (Sint Maarten), Irma caused severe damage to the airport and damaged or destroyed about 70% of the structures. In addition to the 4 deaths, the hazards from Irma injured 23 people.

St. Barthelemy

St. Barthelemy was in the southern eyewall of Hurricane Irma and suffered significant damage, like the surrounding islands. Preliminary assessments from the French government indicate that economic losses could exceed 480 million USD.

Anguilla

The northern eyewall of Irma passed over Anguilla and caused widespread damage and one death. Most homes and schools were destroyed, and the only hospital on the island was severely damaged. About 90% of the roads were impassable, and the strong winds uprooted numerous trees and power poles. Economic losses from the hurricane are estimated to be at least 190 million USD.

U.S. and British Virgin Islands

Irma was responsible for three deaths in the U.S. Virgin Islands. Damage in the U.S. Virgin Islands was most notable in St. Thomas and St. John (Fig 14). In both of these islands, widespread catastrophic damage was reported, and the islands were stripped of most of their foliage. Numerous reports of collapsed homes, businesses, and power lines were reported. In addition, the fire and police stations collapsed and the hospitals experienced major damage. In St. Croix, although the damage was not as severe, about 70% of the homes and structures suffered damage.

Irma's direct hit on the British Virgin Islands caused extensive damage there. Four deaths occurred during the storm there, and numerous buildings and roads were destroyed in Tortola. Authorities from the islands reported that it would take several months to restore electricity.

Puerto Rico

Although Irma's eyewall passed to the north of Puerto Rico, tropical-storm-force winds and heavy rains caused widespread power outages and minor damage to homes and businesses. Weak structures on the island collapsed and numerous trees were uprooted. There was also a near-total loss of electricity and water supply for several days. Three indirect deaths occurred in Puerto Rico from Hurricane Irma.

In the island of Culebra, there was also a near-total power and water loss. Many homes on the island were destroyed or suffered major damage, and widespread uprooted trees were reported.

Turks and Caicos Islands

Irma's northern eyewall passed near or over the Turks and Caicos Islands, causing significant damage to the islands' structures and communication infrastructure. In particular, the island of Providenciales, including its hospital, was heavily damaged. No deaths occurred during Irma, but the damage was estimated to be at least 500 million USD.

The Bahamas

Most of the southeastern Bahamian islands experienced hurricane conditions. According to media reports, Irma damaged about 70% of the homes on Great Inagua Island, and widespread damage also occurred on Crooked Island. The central and northwestern Bahamas were well outside of Irma's most intense winds, but many of these islands experienced tropical storm conditions and minor damage.

Dominican Republic and Haiti

The island of Hispaniola was not directly impacted by Irma, as the eye of the hurricane passed to the north of the Dominican Republic and Haiti, and damage there was minor compared to some of the surrounding islands. One death was reported in Haiti from Irma.

Cuba

Irma struck a portion of the Cuban Keys as a category 5 hurricane. Nine direct deaths in Cuba are blamed on Irma. During the storm, two women on a Havana bus were killed when a balcony tumbled onto the vehicle. Two men died when their home collapsed on them in Havana, and three men died in their individual homes in the provinces of Matanzas, Ciego de Avila, and Camagüey. Also, an 89-year-old woman was found drowned in the water in front of her Vedado home, her death likely due to Irma's storm surge.

In terms of damage, the tourist areas of Cayo Coco, Cayo Guillermo, Cayo Santa Maria and the town of Calibarien (Fig. 14) were hit the hardest, with widespread damage reported in those areas. Severe damage also occurred in the provinces of Ciego de Ávila and Villa Clara. More than 150,000 homes were damaged with nearly 15,000 completely destroyed by Irma in Cuba. Irma also greatly affected the country's poultry farms with 466 of them being destroyed. Across the island, uninsured losses from damage caused by Irma is estimated to be near 200 million USD, which is the highest value in Cuba during the past 55 years.

United States

There were 10 direct deaths in the United States, and a breakdown by state is as follows: Florida – seven, Georgia – two, South Carolina – one. The NOAA National Centers for Environmental Information (NCEI) estimates that wind and water damage in the United States caused by Irma totaled approximately 50.0 billion USD, with a 90% confidence interval of 37.5 to 62.5 billion USD. This makes Irma the fifth-costliest hurricane to affect the United States, behind Katrina (2005), Harvey (2017), Maria (2017) and Sandy (2012).

Loss of life and specific damage by state is discussed below:

Florida

There were seven direct deaths in Florida from Hurricane Irma. The Monroe County Medical Examiner reported that three adult males drowned in the middle or lower Florida Keys during Hurricane Irma's passage. Two of the victims were found near the boats on which they lived just offshore. The remaining circumstances and events responsible for the deaths are not known. The locations where the victims were found had been subjected to extreme wind and ocean conditions, including large waves and storm surge. Given the presence of multiple possible contributing factors, storm-related and otherwise, we are not able to conclusively attribute these "direct" deaths primarily to any particular hazard.

Two direct deaths occurred in Duval County, where a 59-year-old male and a 54-year-old female drowned due to fresh water flooding when their tent was submerged in water in the woods. An 89-year-old male drowned in Manatee County when he went outside during the hurricane to secure his boat to the dock and fell into a canal. In Broward County, an 86-year-old male opened the front door during the hurricane and a gust of wind caused him to fall and hit his head fatally. Of the 80 indirect deaths in Florida, a combination of falls during preparations for Irma's approach, vehicle accidents, carbon monoxide poisoning from generators, chainsaw accidents, and electrocutions were mainly to blame. In Broward County, 14 indirect deaths occurred in one nursing home due to overheating when air conditioners failed as power faltered.

The damage was the most severe in the Florida Keys where Irma struck as a category 4 hurricane. In the Middle and Lower Keys, most homes were badly damaged or destroyed, and many structures became uninhabitable. There were widespread power outages and extensive tree damage throughout the island chain. More than 40 injuries were reported after the storm. More than 1,300 boats were damaged or destroyed, and many of them were displaced due to the storm surge. Estimates from FEMA indicate that 25% of buildings were destroyed, 65% were significantly damaged, and 90% of houses sustained some damage. Approximately 75% of the residents in the Keys evacuated before Irma.

In Collier County, Florida, where Irma came ashore near Marco Island as a category 3 hurricane, there was significant damage. The majority of the structures in Everglades City suffered major wind and/or water damage. At least 88 buildings were destroyed county-wide, and 1,500 buildings were badly damaged. There was heavy tree and power pole damage in Marco Island, Golden Gate, and portions of Naples.

In Miami-Dade County, about 1,000 homes sustained major damage. About 50% of the agricultural industry was damaged with estimated losses near 245 million USD. Otherwise, there was widespread tree and power pole damage in the Miami-Fort Lauderdale metro area, and some damage occurred along the Biscayne Bay shoreline due to storm surge.

Although Irma was weakening while it moved northward over Florida, there was still a fair amount of damage in the central portion of the state. A combination of Irma's strong winds, embedded tornadoes, and heavy rains caused minor to moderate damage to many structures and widespread tree damage. In Brevard County, more than 7,000 homes sustained damage, including 450 that were destroyed or suffered major damage. Moderate to locally severe beach erosion was observed at the coast. Near Orlando, in Osceola County, about 4,000 structures were damaged, and the estimated cost in that county is near 100 million USD. Irma also caused significant damage to the southwest and central Florida orange groves, totaling about 760 million USD.

In northern Florida, flooding was the biggest issue. Heavy rains and rivers that reached major or record flood stage caused significant flooding in the Jacksonville area. Flood waters rushed into the city's streets and reached up to 5 ft deep in some locations. The flooding in Jacksonville was record-breaking in some locations, and overall Irma was responsible for one of the worst flooding events in the city's 225+ year history. The northeastern portion of the state also experienced hurricane-force wind gusts and embedded tornadoes that caused structural damage to homes and businesses. There was also widespread tree and power line damage across the area.

Figure 15 shows examples of some of the damage from across the state of Florida.

Georgia

Tropical-storm-force winds and heavy rains from Irma caused two direct deaths in Georgia. In Fulton County, a 55-year-old man was crushed by a tree that fell on his home while he slept. A 67-year-old woman in Forsythe County perished when a tree fell on her vehicle while she was in her driveway. An indirect death occurred when a man in Worth County had a heart attack while he was climbing off the roof of his shed during Irma.

In Camden County, numerous trees and power lines were damaged due to the strong winds. Dozens of people were rescued by boats near the coast from flooding caused by storm surge and rainfall. Across the state, there were widespread downed trees, and over 1.5 million people lost power during the storm.

South Carolina

One direct death occurred from Irma in South Carolina. A 57-year-old man was fatally struck by a falling tree limb during the storm. Two indirect deaths occurred from vehicle accidents during the storm, and another person died of carbon monoxide poisoning.

In Beaufort County, numerous trees and power lines were downed from tropical-storm-force winds and tornadoes. Storm surge damaged Fripp Island, where the sea wall was breached and homes were inundated. On Lady's Island, strong winds damaged the airport infrastructure, and runways were inundated. Storm surge also caused minor damage in downtown Charleston and surrounding areas within the tidal zone. Severe beach erosion occurred on the Folly Beach, Isle of Palms, and Sullivan Island.

FORECAST AND WARNING CRITIQUE

Genesis

The genesis predictions for Irma were somewhat successful, but the cyclone formed sooner than predicted. Table 4 provides the number of hours in advance of formation associated with the first NHC Tropical Weather Outlook (TWO) forecast in each likelihood category. The tropical wave that led to the development of Irma was introduced in the TWO and given a low (<40%) chance of genesis during the next five days 78 h before Irma formed. The system was given a medium (40-60%) and high chance (> 60%) 48 h and 36 h before genesis, respectively. For the short term (48-h) forecasts, NHC gave the disturbance a low and medium chance of genesis 42 h and 30 h before it formed, respectively, but it was not assessed to a have a high chance until 12 h before genesis occurred. The global models were not consistent in showing development of Irma, and most of them were too slow in predicting its formation. This was the main cause for the limited lead time of formation in the NHC forecasts.

Track

A verification of NHC official track forecasts for Irma is given in Table 5a. Official forecast track (OFCL) errors were roughly 30-40% lower than the mean official errors for the previous 5-yr period for all forecast times. At 96 and 120 h, the climatology and persistence model (OCD5) errors were larger than their 5-yr averages, which suggests that Irma was a more difficult hurricane than usual to forecast at those longer time periods. Figure 16 shows OFCL forecasts plotted against the best track for Irma. The NHC forecasts had a slight left-of-track bias while the hurricane was over the central Atlantic, as the subtropical ridge to the north of the tropical cyclone weakened a little more than anticipated during the early stages of Irma's lifecycle. A moderate right-of-track bias in the NHC forecasts is evident while Irma was over the western Atlantic and when it was forecast to move over the southeastern United States. Irma moved west of many of the predicted tracks because the subtropical ridge built westward more than expected (Fig 5c), which delayed the northward turn toward Florida.

A homogeneous comparison of the official track errors with selected guidance models is given in Table 5b and illustrated in Fig. 17. Among the individual models, the European Centre for Medium-Range Weather Forecasts model (EMXI) was the best-performing model and the only one to consistently beat the NHC official forecasts. The NOAA HFIP Corrected Consensus Approach (HCCA) model and the Florida State Superensemble (FSSE) also performed very well and had lower average errors than the official forecasts at most time periods. Figure 18 shows the tracks of the typically better-performing models when Irma was forecast to be near the Bahamas, Cuba, and the southeastern United States. Among the guidance shown, all of the models had a right-of-track bias and predicted Irma to turn northward sooner and farther east over Florida, but the bias was the smallest in the ECMWF and UKMET models, which handled the large-scale steering features better than the GFS and HWRF models.

Intensity

A verification of NHC official intensity forecasts for Irma is given in Table 6a. The NHC official intensity forecast errors were larger than their 5-yr means at all forecast times, but the OCD5 errors were also notably larger than their respective 5-yr means at all forecast times, indicating that Irma's intensity was more difficult to forecast than for a typical tropical cyclone. The NHC forecasts during the early stages of Irma's lifecycle were too low because the extended period of rapid intensification was under-forecast. Conversely, the NHC forecasts did not expect Irma to interact with Cuba as much as it did, and consequently, Irma weakened more than expected when it was near that island.

A homogeneous comparison of the official intensity errors with selected guidance models is given in Table 6b and illustrated in Fig 19. Among the individual models, the Hurricane Weather Research and Forecast System (HWFI), Hurricanes in a Multi-scale Ocean-coupled Non-hydrostatic model (HMNI), and the Coupled Ocean/Atmosphere Mesoscale Prediction System Tropical Cyclone model (CTCI) had similar or slightly lower errors than the NHC official forecasts. On the other hand, the Statistical Hurricane Intensity Prediction Scheme (DSHP), Logistic Growth Equation Model (LGEM), Global Forecast System (GFSI), and EMXI all had notably larger errors than the NHC official forecasts. An illustration of selected intensity model biases is given in Fig 20. All of the models shown had a low bias beyond 36 h, with DSHP and LGEM having a significant low bias of around 20 kt at 96 and 120 h, which was not surprising given that Irma maintained its category 5 intensity for an unusually long time. The NHC official forecasts had a small high bias through 48 h, and a slight low bias at later forecast hours.

Watches and Warnings

Coastal tropical storm and hurricane watches and warnings associated with Irma are listed in Table 7 and illustrated in Fig. 21. Storm surge watches and warnings are given in Table 8.

NHC provided support to many government meteorological services for areas around the Caribbean Sea, including Barbados (which has responsibility for Dominica), France (for Martinique, Guadeloupe, and St. Martin), Antigua (which also has responsibility for Montserrat, St. Kitts, Nevis, Barbuda, Anguilla and the British Virgin Islands), the Netherlands (which has responsibility for Saba and St. Eustatius), St. Maarten, Dominican Republic, the Bahamas, and Cuba.

For the United States, a hurricane watch was first issued for the southern Florida coastline from Jupiter Inlet southward on the east coast and from Bonita Beach southward on the west coast, including the Florida Keys, at 1500 UTC 7 September. Since sustained tropical-storm-force winds first reached the Florida Keys within the hurricane watch area around 2100 UTC 9 September, a lead time of 54 h was provided. The hurricane watch area was upgraded to a hurricane warning at 0300 UTC 8 September, a lead time of 42 h before the tropical-storm-force winds began. Hurricane watches and warnings were subsequently issued at various times for much of the remainder of Florida. Tropical storm watches and warnings were issued for the Georgia coast and much of the coast of South Carolina.

Storm surge watches and warnings associated with Irma are given in Table 8. At various points in time, the NWS issued storm surge warnings for most of the Florida coast—from the Florida-Georgia border southward on the east coast and from the Ochlockonee River southward on the west coast, including the Florida Keys, Tampa Bay, and the lower portion of the St. Johns River north of the I-295 bridge. Storm surge warnings were also issued for the coast of Georgia and for the coast of South Carolina south of the South Santee River (Fig. 22). NWS issued the initial storm surge watch for Irma along the Florida coast from Jupiter Inlet to Bonita Beach, including the Florida Keys, at 1500 UTC 7 September, and that same area was upgraded to a storm surge warning at 0300 UTC 8 September. Storm surge watches and warnings were subsequently extended and modified northward along both the Atlantic and Gulf Coasts, encompassing almost the entire coastline from the South Santee River to the Ochlockonee River by 0300 UTC 10 September. Water level observations and high water mark surveys indicate that at least 3 ft of inundation (which NHC uses at a 10% probability of occurrence as a first-cut threshold for the storm surge watch/warning) occurred in areas within the bounds of the storm surge warning area roughly from Charlotte Harbor southward around the Florida Peninsula to Miami-Dade and Broward Counties, including the Florida Keys. At least 3 ft of inundation also occurred within the storm surge warning area from near Cape Canaveral northward to the South Santee River.

The Storm Surge Warning north of Charlotte Harbor to the Ochlockonee River, including Tampa Bay, did not verify, as water level observations suggested inundations of less than 3 ft above ground level occurred in that area. However, the storm surge warning along that portion of the coast was necessary, given that a slight westward deviation in Irma's track, or the continuation of strong winds on the back side of the storm, would have produced significantly more inundation (Fig. 22). Elsewhere, some portions of the southeastern coast of Florida generally had 3 ft or less of inundation. The Storm Surge Warning was discontinued from North Miami Beach to Jupiter Inlet at 0300 UTC 10 September in anticipation of the fact that coastal inundation within that area would likely not reach warning criteria.

NHC's first forecast for maximum storm surge heights in Florida (at 1500 UTC 7 September) was 5 to 10 ft above ground level within the storm surge watch area from Jupiter Inlet to Bonita Beach, including the Florida Keys. By the next day, the risk of significant storm surge increased for the southwestern coast of Florida, and NHC's forecast was increased to 6 to 12 ft above ground level from Cape Sable to Captiva at 1500 UTC 8 September and then 10 to 15 ft above ground level at 1500 UTC 9 September. Maximum inundation heights from Irma were analyzed to be around 10 ft above ground level, at the lower end of the forecast range, in the unpopulated area between Cape Sable and Cape Romano. Storm surge inundation forecasts for the Florida Keys (5 to 10 ft), extreme southeastern Florida (4 to 6 ft), the east coast of Florida (2 to 4 ft), and Georgia and South Carolina (4 to 6 ft) were generally accurate, with the highest observations falling within each of those ranges. However, storm surge inundation forecasts were generally too high for the rest of the west coast of Florida, largely because Irma made landfall well to the south on Marco Island. Had the hurricane deviated only slightly to the west and made landfall farther up the west coast, inundation from storm surge would have been significantly higher in those areas (Fig. 23), and potentially devastating for the Naples-Fort Myers area.

NHC does not have responsibility for issuing warnings for inland flooding, but coordinates with the Weather Prediction Center (WPC) on hazard statements included in NHC public products. The risk of life-threatening flash flooding from Florida to South Carolina was first mentioned in the NHC Public Advisory at 1500 UTC 7 September. The threat of inland flooding was included as a "Key Message" in NHC's Tropical Cyclone Discussion beginning the following day.

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

The NHC began providing IDSS to emergency managers on 1 September, several days before Irma neared the U.S. Virgin Islands and Puerto Rico, and the service continued through 11 September, when Irma was inland over the southeastern United States. The IDSS included calls and briefings coordinated through the FEMA Hurricane Liaison Team, embedded at NHC. The briefings included the territories of Puerto Rico and the U.S. Virgin Islands, the states of Florida, Georgia, South Carolina, and FEMA Regions 4 and 2, as well as Federal/State video-teleconferences. At the request of the state of Florida, the NHC began to provide the state with twice-daily IDSS coordination calls beginning September 4, six days before landfall. That day, the Florida governor declared a state of emergency.

The NHC also collaborated with the affected NWS offices to ensure a consistent message, and NWS meteorologists provided IDSS for local and state emergency management offices during this event.

Although the average track errors for Irma were fairly small, there were differences in the details of the numerical model forecasts that were key to the implied magnitude and location of the greatest impacts in South Florida and the Florida Keys, including whether the center would move closer to the east or west coast of the Florida peninsula. Despite those differences, the NHC forecasts were relatively steady in showing an increasing risk for the area as Irma approached. Language in advisory products such as the Tropical Cyclone Discussion (TCD) and in media and emergency management briefings emphasized the threat and the accompanying uncertainty. For example, four days before landfall, the TCD stated that "Irma is forecast to turn northwestward and northward, but there is still a fair amount of uncertainty regarding the exact timing and location of recurvature", and one of the TCD "Key Messages" at that time said, "Direct impacts from wind, storm surge, and rainfall are possible in the Florida Keys and portions of the Florida Peninsula beginning later this week and this weekend. However, given the forecast uncertainty at these time ranges, it is too soon to specify the location and magnitude of these impacts." Two days before landfall in the Keys, the TCD said "This turn will occur, but the precise moment is still uncertain, and that is why NHC emphasizes that nobody should focus on the exact track of the center."

Due to the possibility of Irma affecting NHC in Miami, a back-up operation was initiated, which included a deployment of three NHC forecasters and two Central Pacific Hurricane Center forecasters to the NOAA Center for Weather and Climate Prediction in the Washington, D.C. area. While NHC maintained operations for Hurricane Irma in Miami, forecasters at the back-up location produced advisories for Hurricanes Jose and Katia, which were active at the same time as Irma. The rest of the NHC staff continued Irma and other forecast operations, remaining within the office during a 36-h shelter-in-place activation coinciding with Irma's local threat and impact.

In addition, an NHC media pool was in operation from 5–10 September to provide live briefings to national and local television outlets in both English and Spanish. NHC provided around 300 live interviews through the pool, comprising 201 to local television stations, 78 to network TV, 14 to radio stations, and 10 to print media. It also gave more than 200 media interviews by phone. NHC was also active on social media to keep the public informed in real-time on the latest NHC/NWS forecasts and warnings, with posts on Twitter generating 98 million impressions and Facebook posts reaching more than 18.9 million users and causing more than 12.9 million post engagements. Regarding the NHC website, over 500 million pages were viewed between 1–30 September resulting in approximately 9 billion hits, primarily due to Hurricane Irma. Just prior to Irma's landfall in Florida, the NHC website had approximately 1.1 billion hits (57 million page views) on one day, equaling the total number of hits received during the entirety of Hurricane Matthew in 2016. At advisory times, over 200,000 users were simultaneously accessing information on the NHC website. The 7 billion hits attributed to Irma is approximately 3 times the traffic ever handled by the NHC website during a single storm event.

The above-noted activities were conducted in addition to previously-mentioned support that NHC provided to government meteorological partner agencies in the Caribbean.

ACKNOWLEDGMENTS

Data in Table 3 were compiled from Post Tropical Cyclone Reports issued by the NWS Forecast Offices (WFOs) in San Juan, Miami, Tampa Bay/Ruskin, Melbourne, Tallahassee, Jacksonville, and Charleston. Additional data were used from reports sent by WFOs in Peachtree City and Columbia. Data from the Weather Prediction Center, 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. Jose Rubiera from the Cuban Meteorological Service was very helpful in sending data and damage information from Cuba. The authors would also like to thank the following individuals at the National Hurricane Center: Laura Paulik for creating the storm surge figures, Jeri Schwietert for producing the wind watch/warning graphic, Lixion Avila for collecting data and reports from Caribbean countries, Jack Beven for helping collect and quality control surface observations, and Gladys Rubio for translating information from Spanish to English. Brad Klotz of the Hurricane Research Division was also very helpful in analyzing some of the aircraft data.

Table 1. Best track for Hurricane Irma, 30 August–12 September 2017.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
30 / 0000	16.1	26.9	1008	30	tropical depression
30 / 0600	16.2	28.3	1007	35	tropical storm
30 / 1200	16.3	29.7	1006	45	"
30 / 1800	16.3	30.8	1004	50	"
31 / 0000	16.3	31.7	999	55	"
31 / 0600	16.4	32.5	994	65	hurricane
31 / 1200	16.7	33.4	983	80	"
31 / 1800	17.1	34.2	970	95	"
01 / 0000	17.5	35.1	967	100	"
01 / 0600	17.9	36.1	967	100	"
01 / 1200	18.4	37.3	967	100	"
01 / 1800	18.8	38.5	967	100	"
02 / 0000	19.1	39.7	967	100	"
02 / 0600	19.1	41.1	967	100	"
02 / 1200	18.9	42.6	973	95	"
02 / 1800	18.7	44.1	973	95	"
03 / 0000	18.5	45.5	973	95	"
03 / 0600	18.2	46.7	973	95	"
03 / 1200	17.9	47.9	969	100	"
03 / 1800	17.6	49.2	965	100	"
04 / 0000	17.3	50.4	959	100	"
04 / 0600	17.0	51.5	952	105	"
04 / 1200	16.8	52.6	945	110	"
04 / 1800	16.7	53.9	944	115	"
05 / 0000	16.6	55.1	943	125	"
05 / 0600	16.6	56.4	933	135	"

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
05 / 1200	16.7	57.8	929	150	"
05 / 1800	16.9	59.2	926	155	"
06 / 0000	17.3	60.6	915	155	"
06 / 0600	17.7	61.9	914	155	"
06 / 1115	18.1	63.1	914	155	"
06 / 1200	18.1	63.3	915	155	"
06 / 1800	18.6	64.7	916	150	"
07 / 0000	19.2	66.2	916	150	"
07 / 0600	19.7	67.6	920	145	"
07 / 1200	20.2	69.0	921	145	"
07 / 1800	20.7	70.4	922	145	"
08 / 0000	21.1	71.8	919	140	"
08 / 0600	21.5	73.2	925	135	"
08 / 1200	21.8	74.7	927	135	"
08 / 1800	22.0	76.0	925	140	"
09 / 0000	22.1	77.2	924	145	"
09 / 0600	22.4	78.3	930	130	"
09 / 1200	22.7	79.3	941	110	"
09 / 1800	23.1	80.2	938	95	"
10 / 0000	23.4	80.9	932	100	"
10 / 0600	23.7	81.3	930	115	"
10 / 1200	24.5	81.5	931	115	"
10 / 1800	25.6	81.7	936	100	"
11 / 0000	26.8	81.7	942	80	"
11 / 0600	28.2	82.2	961	65	"
11 / 1200	29.6	82.7	970	50	tropical storm
11 / 1800	30.9	83.5	980	45	"

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
12 / 0000	31.9	84.4	986	35	"
12 / 0600	32.9	85.6	997	25	low
12 / 1200	33.8	86.9	1000	20	"
12 / 1800	34.8	88.1	1003	15	"
13 / 0000	35.6	88.9	1004	15	"
13 / 0600	36.2	89.5	1004	15	"
13 / 1200	36.8	90.1	1005	15	"
13 / 1800					dissipated
06 / 0600	17.7	61.9	914	155	maximum wind and minimum pressure
06 / 0545	17.7	61.8	914	155	landfall on Barbuda
06 / 1115	18.1	63.1	914	155	landfall on St. Martin
06 / 1630	18.5	64.4	915	155	landfall on Virgin Gorda, British Virgin Islands
08 / 0500	21.5	73.0	924	135	landfall on Little Inagua, Bahamas
09 / 0300	22.3	77.9	924	145	landfall near Cayo Romano, Cuba
10 / 1300	24.7	81.5	931	115	landfall on Cudjoe Key, Florida
10 / 1930	25.9	81.7	936	100	landfall near Marco Island, Florida

Table 2. Selected ship reports with winds of at least 34 kt for Hurricane Irma, 30 August–12 September 2017. 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)
02 / 0700	BATFR1	18.6	42.0	310 / 41	1002.8
05 / 1600	J8PE3	13.6	61.0	170 / 38	1009.1
06 / 0900	C6FM9	13.2	59.9	290 / 35	1014.2
09 / 0600	3FOB5	23.2	82.5	030 / 42	1005.0
09 / 0700	3FOB5	23.2	82.8	030 / 35	1006.0
09 / 1800	CQGZ	19.4	80.4	260 / 35	1004.7
10 / 0300	J8PE4	19.4	80.3	250 / 38	1005.0
10 / 0600	C6FZ8	20.6	81.9	250 / 35	1001.0
10 / 0600	PLSF1	24.7	82.8	040 / 50	993.4
10 / 2000	C6FN5	26.6	88.3	050 / 40	1005.1
10 / 2100	WMCU	25.9	77.8	130 / 45	1003.6
10 / 2100	SAUF1	29.9	81.3	060 / 38	1007.5
11 / 0000	WDD612	26.2	78.6	120 / 64	1000.1
11 / 0000	C6FN5	27.8	88.8	060 / 52	1006.1

Table 3. Selected surface observations for Hurricane Irma, 30 August–12 September 2017.

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)				
Antigua and Barbuda									
Barbuda NOS Site (BARA9 - 9761115) (17.59N 61.82W)	06/0536	916.1	06/0454	105	139	7.94		7.9	
Virgin Islands									
International Civil Aviation Organization (ICAO) Sites									
Henry E Rohlsen AP (TISX) (17.68N 64.90W)	06/1653	995.9	06/1843	33 (2 min, 10 m)	50				
Cyril E. King AP (TIST) (18.33N 64.97W)			06/1153	51* (2 min, 10 m)	76*				
*Site damaged during storm									
Weatherflow Sites									
Buck Island (XBUK) (18.28N 64.90W)	06/1653	969.6	06/1723	92 (12.1 m)	119				
Rupert Rock (XRUP) (18.33N 64.93W)			06/1750	72 (5.5 m)	115				
Sandy Point NWR (XCRX) (17.68N 64.90W)			06/1903	36 (14 m)	51				
Savana Island (XSAV) (18.34N 65.08W)			06/1815	50 (6.1 m)	77				
NOS Sites									
Charlotte Amalie, St. Thomas (CHAV3 - 9751639) (18.34N 64.92W)	06/1742	967.5	06/1736	55	85	1.45[J]	1.71[J]	1.3[J]	
Lameshur Bay, St. John (LAMV3 - 9751381) (18.32N 64.72W)	06/1736	945.1				1.62	1.60	1.2	
Christiansted Harbor, St. Croix (CHSV3 - 9751364) (17.75N 64.71W)	06/1706	995.0	06/1642	33	50	2.28	2.01	1.7	

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)				
Lime Tree Bay, St. Croix (LTBV3 - 9751401) (17.69N 64.75W)	06/1706	996.4	06/1848	43	53	0.60	0.80	0.5	
Puerto Rico									
International Civil Aviation Organization (ICAO) Sites									
Luis Munoz Marin Intl AP (TJSJ) (18.45N 66.00W)	06/1656	993.4	06/1828	42 (2 min, 10 m)	60				
Roosevelt Roads AP (TJNR) (18.25N 65.64W)	06/1654	991.0	06/1905	42 (2 min, 10 m)	57				
Weatherflow Sites									
Del Rey Marina (XREY) (18.29N 65.63W)			06/1215	35 (5 min, 10 m)	59				
Isla Culebrita Light (XCUL) (18.34N 65.08W)	06/1840	952.1	06/1815	50 (5min, 10 m)	77				
Las Mareas (XMRS) (17.94N 66.26W)			07/0104	39 (5 min, 10 m)	47				
San Juan NAVAID (XJUA) (18.29N 65.63W)			06/2140	41 (5 min, 14.3 m)	46				
NOS Sites									
Arecibo (AROP4 - 9757809) (18.48N 66.70W)	07/0036	998.7	07/0130	38	47	1.37		1.5	
Esperanza, Vieques Island (ESPP4 - 9752695) (18.09N 65.47W)	06/2006	991.9	06/2130	45	56	1.44	1.57	1.2	
Fajardo (FRDP4 - 9753216) (18.33N 65.63W)	06/2118	980.1	06/1930	35	50	1.21		1.2	
Isabel Segunda, Vieques Island (VQSP4 - 9752619) (18.15N 65.44W)			06/2000	42	55	1.80		1.0	

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft)[C]	Storm tide (ft)[D]	Estimated Inundation (ft)[E]	Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[A]	Sustained (kt)[B]	Gust (kt)				
La Puntilla, San Juan Bay (SJNP4 - 9755371) (18.46N 66.12W)	06/2300	989.3	06/2230	48	64	1.55	2.10	1.3	
Culebra (CLBP4 - 9752235 (18.30N 65.30W)	06/1948	981.5				1.74		1.0	
Yabucoa Harbor (YABP4 – 9754228) (18.06N 65.83W)			06/2224	22	37	1.11		0.8	
Magueyes Island (MGIP4 – 9759110) (17.97N 67.05W)	07/0012	1001.9	07/0354	29	39	0.56		0.7	
Mayaguez (MGZP4 – 9759394) (18.22N 67.16W)	07/0018	1001.5	07/0606	27	36	1.37	2.00	1.3	
Mona Island (MISP4 – 9759938) (18.09N 67.94W)	07/0630					1.47	1.50	1.1	
NWS Cooperative Observer Program (COOP) Sites									
Barranquitas (USAP4) (18.18N 66.31W)									7.05
Bayamon (BAYP4) (18.38N 66.16W)									13.04
Ciales (VILP4) (18.33N 66.47W)									10.27
Comerio (COMP4) (18.22N 66.22W)									7.07
Orocovis (OROP4) (18.22N 66.39W)									9.13
San Lorenzo (SLGP4) (18.19N 65.97W)									6.35
Utuado (VIVP4) (18.27N 66.70W)									6.74
Villalba (VINP4) (18.13N 66.48W)									7.50

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft)[C]	Storm tide (ft)[D]	Estimated Inundation (ft)[E]	Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[A]	Sustained (kt)[B]	Gust (kt)				
Cuba									
International Civil Aviation Organization (ICAO) Sites									
Frank País/Holguin Arpt (78372) (20.79N 76.32W)	08/2015	991.2							8.08
Hermanos Ameijeiras/ Las Tunas Arpt (MUVT/78357) (20.99N 76.94W)	08/2200	992.9	08/2225	38 (1 min, 10 m)	60				4.10
MUCA, Venezuela (78346) (22.03N 78.79W)	09/0700	981.3	09/0800	36 (1 min, 10 m)	62				8.33
MUTD, Trinidad (78337) (21.78N 79.98W)	09/1250	983.4	09/1417	40 (1 min, 10 m)	62				12.46
Punta de Maisí Arpt (MUMA/78369) (20.24N 74.14W)	08/0825	996.7	06/1612	35 (1 min, 10 m)	52				2.96
Other Sites									
Aguada De Pasajeros (78335) (22.38N 80.85W)	09/2055	981.2	10/0225	36	46				6.05
Bauta (78376) (22.97N 82.53W)	10/0800	997.5	10/0235	40	51				3.07
Caibarien (78348) (22.52N 79.45W)	09/1200	969.9	09/1430	85	122				17.11
Camaguey 09 (78355/elev.122m) (21.40N 77.85W)	09/0300	982.2	09/0350	38	67				7.53
Camilo Cienfuegos (78347) (22.15N 78.75W)	09/0650	959.8	09/0720	108	138				11.50
Cantarrana (78344) (21.92N 80.17W)	09/1800	981.1	09/2310	36	48				4.63
Caujeri (78319) (20.22N 74.81W)	08/0400	998.0	08/0600	40 (1 min, 10 m)	59				3.41

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft)[C]	Storm tide (ft)[D]	Estimated Inundation (ft)[E]	Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[A]	Sustained (kt)[B]	Gust (kt)				
Cayo Coco (78339) (22.52N 78.45W)	09/0520	933.1	09/0500	83	105				
El Jibaro (78341) (21.72N 79.22W)	09/1000	982.8	09/1440	42	63				13.79
El Yabu (78343) (22.43N 79.98W)	09/1500	981.5	09/1345	39	77				7.56
Esmeralda (78352) (21.85N 78.12W)	09/0400	965.7	09/0400	60	130				10.20
Florida (78350) (21.52N 78.23W)	09/0300	984.2	09/0500	43	73				6.38
Guaro (78370) (20.67N 75.78W)	08/1830	994.1	08/1740	40 (1 min, 10 m)	59				4.20
Jaguey Grande (78331) (22.63N 81.27W)	09/1900	982.0	09/1940	38	64				6.57
Jovellanos (78330) (22.78N 81.18W)	09/2200	979.8	09/2200	50	60				3.94
Jucaro (78345) (21.62N 78.85W)	09/0700	984.3	09/0700	38	78				7.61
La Jiquima (78362) (20.93N 76.53W)	08/2100	991.0	09/0412	37 (1 min, 10 m)	53				7.28
Matanzas 4 (78326) (23.02N 81.52W)	09/1800	976.5	09/1450	30	63				12.49
Nuevitas (78353) (21.53N 77.25W)	09/0000	977.2	09/0320	42	87				7.54
Palenque de Yatera (78334) (20.45N 74.92W)	08/1110	998.0	08/1015	23 (1 min, 10 m)	43				16.69
Palo Seco (78354) (21.13N 77.32W)	09/0100	991.0	09/0250	28	60				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)				
Pinares De Miyari (78371/elev. 646m) (20.48N 75.80W)	09/1800	930.0							8.17
Puerto Padre (78358) (21.20N 76.62W)	09/0850	993.7	08/1430	52 (1 min, 10 m)	69				4.15
Sagua La Grande (78338) (22.82N 80.08W)	09/1800	963.0	09/1235	68	94				11.55
San Antonio Banos (78328/MUSA) (22.87N 82.51W)	10/0045	966.8	10/0100	49	73				4.47
Sancti Spiritus (78349) (21.93N 79.45W)	09/1200	977.2	09/1515	45	70				19.02
Santiago De Las Vegas (78373) (22.97N 82.38W)			09/2100	44	56				3.20
Topes De Collantes (78342) (21.92N 80.02W)	09/1300	961.8	09/1835	38	59				23.90
Union De Reyes (78327) (22.77N 81.53W)	09/2305	976.9	09/1830	41	68				4.19
Velasco (78378) (21.08N 76.30W)	08/1959	998.6	08/1728	44 (1 min, 10 m)	63				7.44
NOAA and Marine Partner Buoys									
Canaveral (41009) (28.50N 80.18W)	11/0230	993.7	11/0245	56 (1 min, 4 m)	66				
COMPS C12 (42022) (27.50N 83.74W)				48 (? min, 3.1 m)	61				
Edisto (41004) (32.50N 79.10W)	11/1850	1003.1	11/1505	45 (1 min, 4 m)	58				
Grays Reef (41008) (31.40N 80.87W)	11/1450	995.1	11/0910	44 (10 min, 5 m)	60				
NE Puerto Rico (41043) (21.13N 64.86W)	06/2200	1007.5	06/2346	39 (1 min, 4 m)	47				

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)				
Pensacola (42039) (28.79N 86.01W)	11/1050	1000.9	11/0823	37 (1 min, 4 m)	41				
San Juan (41053) (18.50N 66.10W)	06/1900	988.9	06/1900	39 (1 min, 4 m)	52				
S. of St. John, VI (41052) (18.30N 64.80W)	06/1100	992.4	06/1500	44 (1 min, 4 m)	56				
Viques Island (41056) (18.30N 65.50W)	06/2030	985.7	06/2110	43 (1 min, 4 m)	55				
West Tampa (42036) (28.50N 84.52W)	11/0850	990.9	11/0420	44 (10 min, 5 m)	56				
United States									
Florida									
International Civil Aviation Organization (ICAO) Sites									
Albert Whitted Airport (KSPG) (27.77N 82.63W)	11/0453	973.8	11/0053	47 (2 min, 10 m)	60				
Cape Canaveral AFD Skid Strip (KXMR) (28.46N 80.56W)	11/0441	990.1	11/0207	51 (2 min, 10 m)	70				12.08
Craig Municipal Airport (KCRG) (30.33N 81.52W)	11/1153	987.0	11/1227	40 (2 min, 10 m)	61				
Daytona Beach Intl (KDAB) (29.18N 81.05W)	11/0937	984.8	11/0246	47 (2 min, 10 m)	68				
Fort Myers Page Field (KFMY) (26.58N 81.97W)	10/2253	952.4	10/2216	50 (2 min, 10 m)	73				10.60
Fort Pierce/St. Lucie Co Intl (KFPR) (27.49N 80.36W)	11/0238	987.8	10/2306	62 (2 min, 10 m)	77				15.88
Ft. Lauderdale Executive (KFXE) (26.20N 80.17W)	10/2202	989.5	10/1847	53 (2 min, 10 m)	72				9.57
Ft. Lauderdale International (KFLL) (26.07N 80.15W)	10/2120	989.0	10/0153	46 (2 min, 10 m)	61				

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)				
Gainesville Regional Airport (KGNV) (29.68N 82.27W)	11/1053	979.5	11/0527	40 (2 min, 10 m)	50				12.40
Hollywood North Perry Airport (KHWO) (26.00N 80.24W)	10/1701	993.3	10/1651	49 (2 min, 10 m)	68				
Jacksonville Intl Airport (KJAX) (30.49N 81.69W)	11/1156	986.6	11/0748	51 (2 min, 10 m)	75				9.20
Jacksonville Naval Air Station (KNIP) (30.24N 81.68W)	11/1153	984.6	11/1053	43 (2 min, 10 m)	63				7.08
Key West Intl Airport (KEYW) (24.56N 81.76W)			10/1115	52 (2 min, 10 m)	82				
Leesburg Intl Airport (KLEE) (28.82N 81.80W)	11/0820	977.0	11/0735	42 (2 min, 10 m)	60				
Mayport Naval Station (KNRB) (30.39N 81.42W)	11/1152	988.5	11/0738	59 (2 min, 10 m)	76				7.96
Melbourne Intl Airport (KMLB) (28.10N 80.64W)	11/0532	988.1							11.84
Miami Executive/West Kendall (KTMB) (25.65N 80.43W)	10/1718	986.8	10/1110	48 (2 min, 10 m)	63				
Miami International (KMIA) (25.80N 80.29W)	10/2116	988.8	10/1313	46 (2 min, 10 m)	63				
Naples Municipal Airport (KAPF) (26.15N 81.77W)	10/1932	959.4	10/1801	53 (2 min, 10 m)	71				
Okeechobee County AP (KOBE) (27.26N 80.85W)			11/0315	40 (2 min, 10 m)	62				
Opa Locka Airport (KOPF) (25.91N 80.28W)	10/2112	988.8	10/1903	56 (2 min, 10 m)	74				8.03
Orlando Executive (KORL) (28.54N 81.33W)	11/0804	981.4	11/0504	49 (2 min, 10 m)	68				
Orlando Intl Airport (KMCO) (28.42N 81.31W)	11/0720	980.4	11/0519	51 (2 min, 10 m)	69				

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)				
Orlando/Sanford (KSFB) (28.77N 81.24W)	11/0746	982.1	11/0651	48 (2 min, 10 m)	65				
Pompano Beach Airpark (KPMP) (26.24N 80.11W)	10/2205	990.1	10/2039	60 (2 min, 10 m)	76				
Punta Gorda Airport (KPGD) (26.92N 81.99W)	11/0053	962.7	10/2153	44 (2 min, 10 m)	64				
Regional Southwest (KRSW) (26.54N 81.76W)	10/2353	958.1	10/2153	54 (2 min, 10 m)	77				9.70
Saint Augustine Airport (KSGJ) (29.97N 81.33W)	11/0656	994.3	11/0506	45 (2 min, 10 m)	62				
Saint Petersburg (KPIE) (27.91N 82.69W)	11/0553	975.0	11/0553	43 (2 min, 10 m)	64				
Sarasota Airport(KSRQ) (27.40N 82.55W)	11/0353	975.5	11/0120	42 (2 min, 10 m)	61				
Tampa International Airport (KTPA) (28.82N 81.80W)	11/0553	971.8	11/0335	40 (2 min, 10 m)	58				
West Palm Beach International (KPBI) (26.68N 80.09W)	10/2320	990.2	10/2101	57 (2 min, 10 m)	79				
Winter Haven Airport (KGIF) (28.05N 81.75W)	11/0453	971.5	11/0445	44 (2 min, 10 m)	66				
Texas Tech University Hurricane Research Team StickNet (South Florida Observations)									
2 NNW Royal Palm Hammock (0111A) (26.04N 81.62W)			10/2008	74 (1 min, 2.25 m)	99				
4 E Orangetree (0103A) (26.29N 81.51W)			10/2151	61 (1 min, 2.25 m)	77				
5 SW Florida City (0214A) (25.40N 80.56W)			10/1558	66 (1 min, 2.25 m)	77				
6 E Miccosukee Village (0105A) (25.76N 80.67W)			10/1703	48 (1 min, 2.25 m)	66				
9 E Miles City (0102A) (26.16N 81.19W)			10/1636	45 (1 min, 2.25 m)	60				

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)				
9 ESE Golden Gate (0112A) (26.15N 81.54W)			10/2052	52 (1 min, 2.25 m)	77				
Miami Beach (0104A) (25.76N 80.12W)			10/2239	52 (1 min, 2.25 m)	64				
Miles City (0220A) (26.15N 81.34W)			10/2032	55 (1 min, 2.25 m)	73				
Hollywood Beach (0106A) (26.05N 80.11W)			10/1954	49 (1 min, 2.25 m)	60				
Station 109A (26.05N 80.11W)			10/1727	51 (1 min, 2.25 m)	68				
Station 110A (26.37N 81.76W)			10/2142	60 (1 min, 2.25 m)	66				
Coastal-Marine Automated Network (C-MAN) and NOS Sites									
Clearwater Beach (CWBF1) (27.98N 82.83W)	11/0606	976.2	11/0548	62 (6 min, 6.7 m)	77	1.67	1.85	0.9	
Fort Myers (FMRF1) (26.65N 81.87W)	10/2324	953.0	10/2254	44	59	3.88	3.55	3.3	
Fowey Rock (FWYF1) (25.59N 80.10W)	10/1900	989.5	10/1830	73 (10 min, 44 m)	87				
Fred Howard Park COMPS (FHPF1) (28.15N 82.80W)	11/0612	974.7	11/0436	60 (6 min, 10 m)	73				
Lake Worth Pier (LKWF1) (26.61N 80.03W)			10/2100	55	79	2.23	2.05	1.5	
Key West (KYWF1) (25.55N 81.81W)	10/1236	956.6	10/1224	63 (15 m)	81	3.29	2.73	2.7	
Middle Tampa Bay (MTBF1) 27.66N 82.59W)			11.0130	56	68				
Molasses Reef (MLRF1) (25.01N 80.38W)	10/1300	984.7	10/1200	60 (10 min, 16 m)	78				

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	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[A]	Sustained (kt)[B]	Gust (kt)				
Naples (NPSF1) (26.13N 81.81W)	10/2054	939.7	10/2200	56	72	5.14	4.83	4.3	
Mayport (Bar Pilots Dock) (MYPF1) (30.40N 81.43W)	11/1218	988.3	11/0736	57	78	6.44	5.58	3.6	
Old Port Tampa (OPTF1) (27.86N 82.55W)	11/0418	972.5	11/0254	50	60	2.37		1.2	
Port Manatee (PMAF1) (27.642N 82.56W)	11/0418	973.3				2.17	1.87	1.2	
St. Petersburg (SAPF1) (27.76N 82.63W)	11/0506	975.1	10/2342	33	52	2.17	1.96	1.2	
McKay Bay Entrance (MCYF1) (27.91N 82.43W)						3.07	2.75	1.7	
Port Canaveral - Trident Pier (TRDF1) (28.42N 80.59W)	11/0700	990.1	11/0942	46	59	4.60	5.23	4.2	
Pulaski Shoals Light (PLSF1) (24.69N 82.77W)	10/1500	986.5	10/1200	57 (10 min, 12 m)	72				
St. Augustine (SAUF1) (29.86N 81.26W)	11/0700	986.0	11/0720	59	73				
Sand Key (SANF1) (24.46N 82.77W)	10/1150	966.1							
Vaca Key (VCAF1) (24.71N 81.1W)	10/1318	964.2	10/1342	54	81	2.72	2.20	2.6	
Venice (VENF1) (27.07N 82.45W)	11/0200	974.9	11/0200	57 (10 min, 12 m)	69				
Virginia Key (VAKF1) (25.73N 80.16W)	10/1918	989.0	10/1900	46	62	3.92	3.87*	3.7	
Fernandina Beach (FRDF1) (30.67N 81.47W)	11/1312	990.0	11/1548	30	52	7.78	6.34	3.6	
Dames Point (DMSF1) (30.39N 81.56W)						5.97	5.11	3.7	

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)				
I-295 Bridge, St. Johns River (BKBF1) (30.18N 81.68W)	11/1142	983.9	11/0648	50	60	5.71[L]	5.63[L]	5.3[L]	
Southbank Riverwalk, St. Johns River (8720226) (30.32N 81.66W)						6.61[L]	5.56[L]	4.9[L]	
Racy Point, St. Johns River (RCYF1) (29.80N 81.55W)						4.72[L]	4.60[L]	4.0[L]	
Cedar Key (CDRF1) (29.13N 83.03W)	11/0936	977.2	11/1536	31	47	2.59	2.71	1.2	
Apalachicola (APCF1) (29.73N 84.98W)	11/1206	995.6	11/0918	34	45	0.93	1.68	0.8	
Panama City (PACF1) (30.15N 85.67W)	11/1942	999.3	11/1918	25	39	0.56	1.08	0.3	
Panama City Beach (PCBF1) (30.21N 85.88W)	11/2206	999.4	11/2218	29	38	0.59	1.28	0.3	
Pensacola (PCLF1) (30.40N 87.21W)	11/2054	1004.0	10/2224	17	28	1.00	1.56	0.6	
Weatherflow Sites									
Alligator Reef Light (XALG) (24.85N 80.62W)	10/1204	977.0	10/1159	62	81				
Biscayne Bay Light 20 (XKBS) (25.65N 80.19W)	10/1824	987.2	10/1824	53	75				
Boca Raton (XBOC) (26.37N 80.08W)	10/2038	986.2	10/2058	44	69				
Boyton Beach (XBOY) (26.54N 80.05W)	10/2037	989.4	10/2017	44	68				
Buck Island (XJAK) (30.39N 81.48W)	11/1235	983.0	11/0735	55	69				
Carysfort Reef Light (XCFL) (25.23N 80.21W)	10/1325	986.8	10/1240	62 (14.3 m)	81				

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	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[A]	Sustained (kt)[B]	Gust (kt)				
Cocoa Beach Club (XCOA) (28.31N 80.63W)			11/0022	47	72				
Crandon Key Biscayne (XCRN) (25.72N 80.15W)	10/2120	990.8	10/1555	48	65				
Crescent Beach Summerhouse (XHSE) (29.71N 81.23W)	11/1005	987.0	11/1025	47	60				
Dania Pier (XDAN) (26.05N 80.11W)			10/1839	55	70				
Dinner Key (XDIN) (25.71N 80.21W)	10/1803	990.3	10/1828	50	71				
Dodge Island Miami (XDGE) (25.76N 80.14W)	10/1917	987.0	10/1917	48	69				
DORAL (XURB) (25.85N 80.37W)	10/2111	984.7	10/1701	43 (15 min, 5 m)	67				
Grant-Valkaria - Indian River (XIND) (27.96N 80.53W)			10/2306	44	58				
Government Cut (XGVT) (25.75N 80.10W)	10/1907	983.0	10/1852	65	79				
Hobe Sound (XHOB) (27.05N 80.17W)			10/2144	40	62				
Huguenot Park (XHUP) (30.41N 81.41W)	11/1116	985.0	11/0746	57	74				
Isles of Capri (XCAP) (26.03N 81.60W)	10/2012	934.8	10/1957	62	86				
Jacksonville Beach Pier (XJAX) (30.29N 81.39W)	11/1010	986.0	11/1310	49	65				
Jensen Beach (XJEN) (27.22N 80.20W)			10/2345	48	61				
Juno Beach Pier (XJUP) (26.89N 80.06W)	10/2354	987.9	10/2354	61	74				

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)				
Jupiter (XOAK) (26.91N 80.07W)	10/2126	987.5	10/2301	42	67				
Key West Coast Guard Sector (XSMS) (24.57N 81.79W)	10/1225	952.9	10/1140	53	77				
Lewis St. Johns (XLWS) (29.91N 81.33W)	11/1044	984.0	11/1149	45	65				
Merritt Island - Banana River - SR520 (XCCB) (28.36N 80.65W)			11/0107	49	63				
Merritt Island - Banana River - SR528 (XMER) (28.40N 80.66W)			11/0120	51	82				
Melbourne Beach Aquarina (XAQU) (27.94N 80.49W)			10/2302	48	65				
Miramar (XFLM) (25.96N 80.30W)	10/2152	982.0	10/1827	43 (15 min, 5 m)	73				
Morningside Park Miami (XMSP) (25.82N 80.18W)	10/1924	987.5	10/1854	55	73				
New Smyrna Beach (XNSB) (29.04N 80.90W)			11/0309	53	71				
Port Everglades (XPEG) (26.08N 80.12W)	10/2145	985.2	10/2005	61	74				
Port Everglades South (XPES) (26.06N 80.13W)	10/2137	988.1	10/1852	40	71				
Smith Shoal Light (XSMS) (24.72N 81.92W)	10/1230	964.6	10/1210	67	84				
South Key Largo (XSKL) (25.10N 80.43W)	10/1347	980.8	10/1347	54	74				
South Miami (XSOM) (25.63N 80.30W)	10/1730	986.4	10/1300	50	71				
St. Lucie Power Plant (XSTL) (27.35N 80.24W)			10/2304	62	87				

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	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[A]	Sustained (kt)[B]	Gust (kt)				
Tamarac (XCVN) (26.19N 80.30W)	10/2123	986.1	10/1853	43 (5 min, 10 m)	61				
Terminal Channel Jacksonville (XTRM) (30.33N 81.62W)	11/1158	983.0	11/1143	40	65				
Titusville - Parrish Park North (XPAR) (28.63N 80.81W)			11/0220	49	65				
Turkey Point (XTKY) (25.43N 80.35W)	10/1726	977.4	10/1746	62	81				
Upper Matecumbe Key (XUMK) (24.92N 80.64W)	10/1256	976.3	10/1436	61	81				
US Air Force Sites									
USAF Tower 1 (KSC0001) (28.43N 80.57W)			11/0220	68 (16.5 m)	82				
USAF Tower 108 (KSC0108) (28.54N 80.57W)			11/0205	49 (16.5 m)	81				
USAF Tower 211 (KSC0211) (28.61N 80.62W)			11/0220	40 (16.5 m)	73				
USAF Tower 211 (KSC0211) (28.61N 80.62W)			11/0220	40 (16.5 m)	73				
USAF Tower 3 – Lower (KSC0003) (28.46N 80.53W)			11/0202	49 (3.7 m)					
USAF Tower 3 – Upper (KSC0003) (28.46N 80.53W)			11/0205	58 (16.5 m)	74				
USAF Tower 300 (KSC0300) (28.40N 80.65W)			11/0230	56 (16.5 m)	79				
USAF Tower 311 (KSC0311) (28.60N 80.57W)			11/0220	48 (16.5 m)	72				
USAF Tower 397 – Lower (KSC0397) (28.60N 80.57W)			11/0015	81 (78.9 m)	94				

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	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[A]	Sustained (kt)[B]	Gust (kt)				
USAF Tower 397 – Upper (KSC0397) (28.60N 80.57W)			11/0015	90 (139.6 m)	101				
USAF Tower 403 (KSC0403) (28.60N 80.57W)			11/0220	44 (16.5 m)	72				
USAF Tower 412 (KSC0412) (28.61N 80.67W)			11/0219	56 (16.5 m)	76				
USAF Tower 418 (KSC0418) (28.71N 80.73W)			11/0145	42 (16.5 m)	69				
USAF Tower 19 (KSC0019) (28.74N 80.70W)			11/0315	54 (16.5 m)	70				
USAF Tower 506 (KSC0506) (28.52N 80.64W)			11/0130	42 (16.5 m)	72				
Remote Automated Weather Stations (RAWS) and HADS Sites									
Big Cypress Reservation (TS909) (26.30N 80.98W)			11/0105		49				8.23
Big Pine Key (TS607) (24.72N 81.39W)			10/1438	48 (10 min, 6.1 m)	104				12.54
Brighton Seminole 3 NNW (TS896) (27.12N 81.08W)				23 (6 m)	47				7.74
Chekika (CHKF1) (25.62N 80.58W)			10/1723	49 (10 min, 6 m)	78				13.63
Deerfield Beach (DFBS1) (26.29N 80.12W)			10/2200	51 (15 m)	97				
Golden Gate Estates 5 SE (PHWF1) (26.15N 81.58W)			10/2211	21 (10 min, 6 m)	59				10.41
Homestead (STDF1) (25.50N 80.50W)			10/1700	45 (15 min, 10 m)	63				9.16
Honeymoon (HMRF1) (26.19N 81.07W)			10/2145		59				10.55

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	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[A]	Sustained (kt)[B]	Gust (kt)				
Immokalee (IMKF1) (25.50N 80.50W)			10/2300	56 (15 min, 10 m)	72				14.48
Loxahatchee NWR (LOHF1) (26.49N 80.43W)			10/2232	40	66				8.08
Miles City 7 NE (RKIF1) (26.25N 81.30W)			10/2045	31 (6 min, 10 m)	65				10.23
North Key Largo Handar (KLNF1) (25.19N 80.35W)	10/1400	987.5	10/1330	45	63				7.16
Oasis Ranger Station (OASF1) (25.86N 81.03W)			10/1637	39 (10 min, 6 m)	67				9.90
Ochopee (OCOF1) (25.90N 81.32W)			10/1903	55 (10 min, 6 m)	83				9.61
Panther East (PSTF1) (26.17N 81.36W)			10/1711	31	65				10.73
Raccoon Point (RACF1) (25.98N 80.90W)			10/1722		62				7.72
Royal Palm Ranger Station (LPIF1) (25.39N 80.68W)			10/1623	48 (10 min, 6 m)	79				11.31
South Florida Water Management District Sites									
Ave Maria (AVEMARIA) (26.30N 81.43W)			10/2200	57 (15 min, 8 m)	77				
Belle Glade (BELLW) (26.65N 80.63W)			10/2245	44 (15 min, 8 m)	62				
Brighton (S75WX) (27.19N 81.13W)			10/2345	48 (15 min, 8 m)	68				
Clewiston (CFSW) (26.73N 80.89W)			10/2300	43 (15 min, 8 m)	60				
Ft. Pierce (NCSF1) (27.47N 80.47W)									15.18

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Golden Gate Estates (SGGEW) (26.14N 81.58W)			10/2130	47 (15 min, 8 m)	84				10.36
Kissimmee River (S65DWX) (27.31N 81.02W)			10/2000	46 (15 min, 8 m)	63				
Lake Hatchineha (WRWX) (28.05N 81.40W)			11/0000	36 (15 min, 8 m)	48				6.78
Lake Istokpoga (S68) (27.33N 81.25W)									6.82
Lake Okeechobee Center (LZ40) (26.90N 80.79W)			11/0030	52	67				
Lake Okeechobee North (L001) (27.14N 80.79W)			11/0115	52	65				
Lake Okeechobee South (L006) (26.82N 80.78W)			11/0030	52	62				
Lake Okeechobee West (L005) (26.96N 80.94W)			11/0030	55	68				
Lake Tohopekaliga (S61W) (28.14N 81.35W)			11/0200	37 (15 min, 8 m)	70				
Miccosukee Village (3AS3W) (25.85N 80.77W)			10/1715	59 (15 min, 8 m)	75				
North Kissimmee River (S65AMW) (27.66N 81.13W)									7.69
Ortona (S78W) (26.79N 81.30W)			11/0015	44 (15 min, 8 m)	65				
The Redland (S331W) (25.61N 80.51W)			10/1700	44 (15 min, 8 m)	61				
Rotenberger WMA (ROTNWX) (26.33N 80.88W)			10/2130	47 (15 min, 8 m)	65				

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	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[A]	Sustained (kt)[B]	Gust (kt)				
Ten Mile Creek (TMWF1) (27.40N 80.43W)			10/1745	39 (15 min, 8 m)	57				11.82
West Palm Beach Forrest Hill (FHCHSX) (26.65N 80.07W)			10/1630	38 (15 min, 8 m)	67				
Yeehaw Junction - (YEHF1) (27.68N 81.02W)									10.61
United States Geological Survey (USGS) Storm Tide Sensors									
Everglades City (FLCOL03237) (25.85N 81.39W)							8.31		
Goodland (FLCOL03176) (25.92N 81.65W)							7.03		
Crescent Beach (FLSTJ03125) (29.76N 81.25W)							6.65		
Jacksonville Beach (FLDUV21045) (30.29N 81.39W)							6.55		
Miami – Dinner Key (FLMIA03335) (25.73N 80.24W)							5.75		
Lakes by the Bay – Black Creek Marina (FLMIA03786) (25.54N 80.33W)							5.61		
Miami – Matheson Hammock Park (FLMIA21077) (25.68N 80.26W)							5.36		
Marco Island – Tigertail Beach (FLCOL03171) (25.95N 81.74W)							5.20		
Naples (FLCOL03296) (26.13N 81.81W)							5.06		
Port of the Islands – Faka Union Canal (FLCOL03089) (25.96N 81.51W)							4.86		

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	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[A]	Sustained (kt)[B]	Gust (kt)				
Miami – Black Creek (FLMIA21052) (25.55N 80.35W)							4.84		
Bonita Springs (FLLEE03292) (26.37N 81.81W)							4.64		
Ormond Beach (FLVOL03138) (29.29N 81.05W)							4.37		
Henderson Creek (FLCOL03148) (26.05N 81.71W)							4.12		
Homestead – Turkey Point (FLMIA03794) (25.44N 80.33W)							4.07		
Delnor-Wiggins State Park (FLCOL03294) (26.28N 81.83W)							3.90		
Karl E. Johnson State Park (FLLEE03288) (26.40N 81.88W)							3.56		
Pompano Beach (FLBRO03525) (26.22N 80.10W)							3.41		
Miami – Albert Pallot Park (FLMIA03213) (25.81N 80.19W)							3.35		
Boca Raton – Silver Palm Park (FLPAL03554) (26.35N 80.08W)							3.05		
CoCoRaHS Sites									
Aberdeen (FL-PB-77) (26.56N 80.17W)									8.68
Aberdeen 2 WNW (FL-PB-2) (26.58N 80.20W)									8.96
Alachua 5.2 NNW (FL-AL-56) (29.84N 82.51W)									11.03

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Apopka (FL-OR-16) (28.68N 81.47W)									11.58
Apopka (FL-OR-43) (28.67N 81.46W)									11.80
Arcadia 7.1 WSW (FL-DS-1) (27.18N 81.96W)									11.34
Auburndale 3.0 SSW (FL-PK-01) (28.03N 81.82W)									11.00
Avon Park 0.6 NW (FL-HL-10) (27.60N 81.51W)									9.42
Babson Park 0.9 NW (FL-PK-58) (27.84N 81.54W)									9.85
Biscayne Park (FL-MD-33) (25.88N 80.18W)									8.19
Belleview 4.8 E (FL-MR-18) (29.05N 81.97W)									9.50
Bloomingdale 1.3 ESE (FL-HB-14) (27.87N 82.24W)									7.32
Brooksville 1.2 E (FL-HN-17) (28.56N 82.37W)									6.59
Boynton Beach 1 WNW (FL-PB-70) (26.54N 80.10W)									7.56
Bunnell 1.0 ENE (FL-FL19) (29.47N 81.24W)									8.48
Chiefland 8.4 ENE (FL-LV-9) (29.50N 82.72W)									7.92
Chuluota (FL-SM-8) (28.65N 81.12W)									11.22
Cudjoe Key 0.9 SSW (FL-MN-6) (24.66N 81.51W)									9.76

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	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[A]	Sustained (kt)[B]	Gust (kt)				
De Land (FL-VL-21) (29.04N 81.33W)									11.53
De Land - Cocorahs (FL-VL-9) (29.10N 81.36W)									11.82
Englewood 3.7 NNW (FL-SS-44) (27.00N 82.39W)									6.30
Florida Gardens 3 N (FL-PB-87) (26.67N 80.18W)									6.61
Ft. Pierce (FL-SL-41) (27.56N 80.40W)									17.25
Gainesville 1.7 SE (FL-AL-26) (29.65N 82.32W)									10.94
Gainesville 2.4 SW (FL-AL-50) (29.64N 82.36W)									10.75
Gainesville 2.4 NW (FL-AL-57) (29.69N 82.36W)									12.22
Gainesville 3.8 W (FL-AL-10) (29.67N 82.40W)									10.89
Gainesville 5.4 W (FL-AL-48) (29.67N 82.43W)									8.87
Gainesville 7.5 WSW (FL-AL-60) (29.63N 82.45W)									11.15
Gainesville 7.7 W (FL-AL-55) (29.67N 82.46W)									10.33
Hernando 1.6 N (FL-CT-11) (28.93N 82.37W)									10.28
High Springs 3.2 SW (FL-AL-17) (29.78N 82.63W)									8.23
Interlachen 8.8 S (FL-MR-46) (29.48N 81.90W)									11.51
Keystone Heights 1.8 ESE (FL-CY-24) (29.76N 82.01W)									10.36

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft)[C]	Storm tide (ft)[D]	Estimated Inundation (ft)[E]	Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[A]	Sustained (kt)[B]	Gust (kt)				
Keystone Heights 3.5 ENE (FL-CY-7) (29.79N 81.98W)									6.78
Keystone Heights 10 NE (FL-CY-38) (29.88N 81.91W)									8.55
Key Largo 5.3 SW (FL-MN-4) (25.05N 80.49W)									9.98
Key Largo 6.2 NE (FL-MN-25) (25.17N 80.37W)									6.93
Key West 1.3 ENE (FL-MN-16) (24.57N 81.76W)									9.03
LaBelle 2 WNW (FL-HY-3) (26.76N 81.48W)									10.31
Lady Lake (FL-LK-16) (28.89N 81.94W)									11.03
Lake City 7.9 SSW (FL-CB-12) (30.08N 82.69W)									8.44
Lake Wales 0.7 SE (FL-PK-59) (27.89N 81.58W)									9.84
Leesburg (FL-LK-30) (28.84N 81.91W)									10.13
Marathon 6.8 ENE (FL-MN-23) (24.74N 80.98W)									9.42
Micanopy 2.1 NNE (FL-AL-51) (29.53N 82.26W)									10.70
Micanopy 4.6 SSE (FL-MR-42) (29.44N 82.25W)									6.83
Mims (FL-VL-49) (28.69N 80.99W)									12.87
Miramar 1 WSW (FL-BW-10) (25.98N 80.37W)									9.92
North Port 2.6 E (FL-SS-34) (27.05N 82.15W)									6.55

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)				
Ocala 1.1 SE (FL-MR-54) (29.17N 82.12W)									8.63
Ocala 10.7 WSW (FL-MR-56) (29.12N 82.29W)									9.90
Ocala 11.2 SW (FL-MR-59) (29.07N 82.26W)									9.96
Ocala 4.6 N (FL-MR-57) (29.25N 82.13W)									10.12
Ocala 9.80 SW (FL-MR-43) (29.08N 82.24W)									9.91
Ocala 14.3 S (FL-MR-36) (28.97N 82.13W)									9.65
Ocklawaha 4.9 NE (FL-MR-22) (29.09N 81.87W)									9.00
Orange (FL-OR-23) (28.59N 81.11W)									10.51
Orange Park 1.8 WSW (FL-CY-25) (30.15N 81.73W)									11.03
Orlando (FL-OR-27) (28.59N 81.11W)									10.51
Oviedo (FL-SM-12) (28.66N 81.25W)									12.14
Palm Coast 0.6 ESE (FL-FL-21) (29.56N 81.20W)									7.67
Palm Coast 1.9 S (FL-FL-26) (29.54N 81.21W)									6.72
Palm Coast 5.9 S (FL-FL-25) (29.48N 81.21W)									9.10
Palm Bay (FL-BV-1) (27.95N 80.64W)									11.10

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)				
Palm Shores (FL-BV-2) (28.19N 80.68W)									10.01
Penney Farms (FL-CY-41) (29.98N 81.81W)									7.46
Poinciana Place 2.5 SSW (FL-PK-53) (28.12N 81.50W)									10.14
Port St. Lucie (FL-SL-19) (27.32N 80.31W)									10.36
Riverview 4.8 SSW (FL-HB-98) (27.80N 82.34W)									6.82
Ruskin 1.8 ESE (FL-HB-44) (27.71N 82.40W)									6.78
Sebring 4.7 WNW (FL-HL-13) (27.52N 81.53W)									10.54
Starke 0.9 ESE (FL-BF-2) (29.94N 82.10W)									11.74
The Villages 2.7 NNW (FL-ST-13) (28.90N 81.97W)									9.18
Titusville (FL-BV-38) (28.63N 80.86W)									11.33
Trenton 4 NW (FL-GC-8) (28.63N 80.86W)									6.53
Trenton 8.0 ENE (FL-GC-1) (29.65N 82.69W)									7.60
Union Park (FL-OR-10) (28.59N 81.22W)									13.79
Valrico 1.1 SE (FL-HB-3) (27.93N 82.23W)									6.52
Valrico 2.2 SE (FL-HB-4) (27.91N 82.23W)									6.31

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)				
Vero Beach (FL-IR-15) (27.64N 80.42W)									10.00
Weeki Wachee 7.1 NNE (FL-HN-24) (28.61N 82.54W)									7.36
Weston 2 SSE (FL-BW-99) (26.13N 80.39W)									8.80
NWS Cooperative Observer Program (COOP) Sites									
Bahia Honda Key 1 WSW (BPNF1) (24.66N 81.28W)									7.58
Boca Raton 12 W (WBCF1) (26.36N 80.30W)									9.24
Buckhead Ridge 7 WSW (IPEF1) (27.09N 81.01W)									6.18
Buckhead Ridge 9 SW (NWLF1) (27.03N 81.00W)									7.11
Buckhead Ridge 12 WSW (BRGF1) (27.03N 81.07W)									7.30
Buckhead Ridge 14 WNW (IPIF1) (27.19N 81.13W)									6.03
Buckhead Ridge 15 W (IPRF1) (27.12N 81.16W)									6.18
Carol City 2 NW (LLUF1) (25.97N 80.30W)									8.00
Coral Springs 3 SW (CSGF1) (26.23N 80.30W)									9.72
Cutler Bay 3 NE (CTRF1) (25.61N 80.31W)									6.48
Cutler Bay 3 SSE (BCPF1) (25.54N 80.33W)									6.07

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft)[C]	Storm tide (ft)[D]	Estimated Inundation (ft)[E]	Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[A]	Sustained (kt)[B]	Gust (kt)				
Deerfield Beach 2 WNW (BORF1) (26.33N 80.13W)									6.76
El Portal (ELPF1) (25.85N 80.19W)									6.79
Florida City 5 SW (EVGF1) (25.40N 80.56W)									6.49
Ft. Lauderdale 4 W (FTDF1) (26.14N 80.20W)									9.90
Ft. Pierce WP (FPCF1) (27.44N 80.35W)									21.66
Juno Beach (JUBF1) (26.86N 80.06W)									6.47
Jupiter 3 W (JPTF1) (26.93N 80.14W)									6.32
Lake Harbor (SLOF1) (26.70N 80.81W)									7.75
Lakeport 2 E (LKPF1) (26.98N 81.09W)									6.60
Lauderdale Lakes 1 E (LDLF1) (26.17N 80.18W)									7.68
Leisure City 5 E (BHMF1) (25.49N 80.35W)									6.88
Melbourne WFO (MLBF1) (28.11N 80.65W)									11.82
Miami Lakes (MMLF1) (25.91N 80.32W)									6.33
Miami Springs 2 E (MINF1) (25.81N 80.26W)									6.94
Moore Haven (MHVF1) (26.84N 81.09W)									7.70

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)				
Moore Haven 3 NW (MRHF1) (26.86N 81.14W)									6.98
Mt. Plymouth (PLTF1) (28.79N 81.53W)									11.59
Naples 7 E (NPLF1) (26.17N 81.68W)									11.46
Plantation 2 SE (PLAF1) (26.09N 80.23W)									8.10
Plantation7 W (WSTF1) (26.13N 80.37W)									10.81
Pompano Beach (PNOF1) (26.23N 80.12W)									6.39
Princeton (PRNF1) (25.54N 80.41W)									6.79
Richmond Heights 7 WNW (RHWF1) (25.66N 80.48W)									6.18
Sanford (SFNF1) (28.81N 81.28W)									11.95
South Bay 13 SSE (SWAF1) (26.48N 80.65W)									6.03
Stuart (STRF1) (27.19N 80.24W)									10.53
Sunrise (SNRF1) (26.16N 80.30W)									7.95
Sweetwater 9 W (TTLF1) (25.76N 80.50W)									6.11
Regional Observation Monitoring Program Sites (ROMP)									
Avon Park Romp 43XX (7174) (27.60N 81.48W)									8.19

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)				
Brownsville Romp 26 (4334) (27.30N 81.82W)									8.77
Caspersen Romp TR 4-1 (8634) (27.06N 82.44W)									6.71
Cecil Webb Romp 5 (2754) (26.95N 81.81W)									8.86
Cristina Romp 62 (8414) (27.86N 82.31W)									6.06
Cumpressco Romp 89 (1834) (28.36N 82.04W)									11.34
Dade City Romp 90 (6174) (28.36N 82.14W)									8.67
Davenport Romp 74X (8094) (28.16N 81.57W)									9.64
Fort Meade Romp 45 (1354) (27.76N 81.79W)									10.11
Fort Ogden Romp 16.5 (5094) (27.06N 81.88W)									8.38
Green Swamp Romp 87 (1254) (28.22N 82.03W)									9.61
Hicoria Romp 14 (7554) (27.15N 81.35W)									8.65
Horse Creek Romp 17 (1554) (27.17N 81.96W)									8.94
Horse Lake Romp 105 (8454) (28.56N 82.40W)									7.33
Josephine Creek Romp 28 (2634) (27.37N 81.44W)									9.18

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)				
Joshua Creek Romp 16 (1574) (27.19N 82.13W)									8.04
Kuka Romp CB-1NW (7274) (28.43N 82.48W)									6.47
Lake Medard Romp 61 (1854) (27.91N 82.16W)									6.57
Lake Placid Romp 28X (1494) (27.27N 81.34W)									7.82
Lemon Bay Romp TR 3-3 (7594) (26.93N 82.33W)									6.49
Lily Romp 25 (7954) (27.37N 81.01W)									8.40
Long Island Marsh Romp 15 (7934) (27.21N 81.66W)									8.80
Mulberry Romp 60 (1314) (27.89N 81.98W)									6.36
Murdock Romp 18 (8514) (27.19N 82.13W)									7.00
Myakka City Romp 23 (1474) (27.31N 82.18W)									6.64
Myakka Head Romp 32 (1414) (27.47N 82.06W)									7.14
North Port Romp 9 (7834) (27.08N 82.15W)									8.03
Old Polk City Romp 76 (8114) (28.18N 81.83W)									8.66
ONA Romp 31 (1434) (27.45N 81.92W)									6.34

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)				
Ozello Romp TR 21-2 (1174) (28.85N 82.60W)									7.43
Prairie Creek Romp 12 (2834) (27.04N 81.74W)									9.51
Ringgold Romp 107 (1214) (28.66N 82.46W)									6.30
Rock Ridge Romp 88 (1874) (28.31N 81.91W)									9.62
Romp 35 (3394) (27.29N 82.04W)									6.95
Romp 39 (2594) (27.59N 82.25W)									6.37
Romp 131 (4434) (28.33N 82.56W)									7.26
Rutland Romp 112 (8434) (28.88N 82.23W)									8.48
Shell Creek Romp 11 (1614) (26.98N 81.94W)									6.79
Starling Romp 123 (1374) (27.68N 82.25W)									6.20
Tippen Bay Romp 13 (2614) (27.07N 81.62W)									8.96
Tsala Apopka Romp 116 (6734) (28.96N 82.34W)									10.19
Romp TR 1-2 (7754) (26.84N 81.98W)									7.98
Romp TR 3-1 (1594) (26.94N 82.22W)									7.33

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft)[C]	Storm tide (ft)[D]	Estimated Inundation (ft)[E]	Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[A]	Sustained (kt)[B]	Gust (kt)				
Romp TR 5-3 (8574) (27.16N 82.40W)									6.79
Utopia Romp 22 (7474) (27.31N 82.34W)									6.21
Warner Southern Romp 44 (8054) (27.82N 81.60W)									9.46
Waterbury Romp 33 (7694) (27.46N 82.26W)									6.62
Williston Romp 134 (6774) (28.75N 82.23W)									7.77
Winter Haven Romp 73 (8034) (28.02N 81.73W)									7.43
Zolfo Springs Romp 30 (2794) (27.46N 81.80W)									10.58
Other Sites									
Airglades FAWN Clewiston (AIRGL) (26.73N 81.05W)			11/0015	59 (15 min, 10 m)	78				
Alachua 5 SE (29.72N 82.42W)									7.51
Alva (ALVA) (26.71N 81.61W)									7.05
Apopka - FAWN (POPF1) (28.64N 81.55W)			11/0530	32	53				11.01
Arcadia – FAWN (ARCAD) (27.23N 81.84W)			11/0130	41	67				9.83
Avon Park Bomb Range (AVONPK) (27.63N 81.26W)									8.23
Bellair 4 W (29.75N 82.93W)									15.11

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)				
Belle Glade 3 SE FAWN (BLDF1) (26.65N 80.64W)			10/2245	44	57				10.35
Belleview 3 SSW (29.01N 82.07W)									9.64
Bird Creek (4074) (29.01N 82.75W)									6.33
Bithlo - USGS (WELF1) (28.44N 81.17W)									10.54
Bonita Springs Utilities (BSUTIL) (26.34N 81.75W)									9.92
Boca Raton 2 NNW (E5514) (26.39N 80.11W)									7.36
Bowling Green (7114) (27.64N 81.84W)									8.94
Bronson - FAWN (BRZF1) (29.40N 82.59W)			11/0545	23	43				6.81
Broward County EOC (26.12N 80.27W)			10/2100	50	67				
Chinsegut Hill (9174) (28.62N 82.37W)									7.65
Christmas - Spotter (ORA-048) (28.57N 81.02W)									17.44
Clewiston 7 W (CLWF1) (26.75N 80.94W)									9.65
Coleman LP-6 (2774) (28.81N 82.09W)									9.26
Coley NR Frostproof (6070) (27.74N 81.53W)									8.45

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)				
Collier County EOC (NPLCC) (26.11N 81.69W)			10/2000	71	106				
Coral Springs (CRLCG) (26.26N 80.30W)			10/1900	43	77				
Creek Ranch (CREEKR) (28.04N 81.46W)									7.93
Cypress Creek TMR-5 (2734) (28.26N 82.40W)									7.48
Dade City - FAWN (311) (28.35N 82.20W)			11/0615	27	42				8.67
Davie - FAWN (FDLF1) (26.09N 80.30W)			10/1900	30	57				9.68
Daytona Beach Embry Riddle (KFLDAYTO14) (29.19N 81.05W)			11/0324	61	70				
Deerfield Beach (DRFCE) (26.31N 80.15W)			10/2200	61	87				
Doral (WFORT) (25.79N 80.34W)			10/1800	41	83				
DV-1 Dover (1294) (27.99N 82.21W)									6.95
DV-2 Dover (7714) (27.97N 82.15W)									7.12
East Palatka 3.5 NNW (29.69N 81.62W)									10.96
Fernandina Beach (30.65N 81.45W)									12.70
Fernandina Beach 0.4 N (30.66N 81.45W)									9.86

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft)[C]	Storm tide (ft)[D]	Estimated Inundation (ft)[E]	Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[A]	Sustained (kt)[B]	Gust (kt)				
Fernandina Beach 6.3 S (30.56N 81.45W)									9.92
Floral City Pool (2014) (28.75N 82.28W)									8.52
Florence 9 N (29.86N 81.88W)									8.55
Ft. Wilderness - Reedy Creek (M) (28.41N 81.56W)									10.21
Gateway (GATEWAY) (26.57N 81.74W)									7.38
Geneva - USGS (GNEF1) (28.71N 81.04W)									11.74
Green Cove Springs 2.6 WNW (30.00N 81.72W)									10.48
Hanna Lake (7534) (28.14N 82.45W)									6.07
Hernando Pool (2054) (28.90N 82.37W)									8.13
Indian Lakes Fire (INDIANL) (27.79N 81.33W)									9.21
Indian River - FAWN (IRVF1) (27.62N 80.57W)			11/0400	31	46				14.15
Inverness Pool (2034) (28.85N 82.32W)									8.20
Island Ford Lake (1634) (28.15N 82.60W)									6.24
Jacksonville 6.7 WSW (30.30N 81.76W)									7.37

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)				
Jacksonville 10 SW (30.24N 81.79W)									11.04
Jacksonville 12 SSE (30.18N 81.57W)									11.00
Jacksonville Heights 5 WNW (30.27N 81.86W)									7.54
Johnson Pond (2294) (29.50N 82.38W)									7.98
Joshua - FAWN (241) (27.26N 81.61W)									8.72
Lake Apopka NSRA - SJRWMD (M) (28.65N 81.57W)									10.65
Lake Arbuckle (ARBCKL_P) (27.66N 81.37W)									6.36
Lake Buena Vista - Reedy Creek (M) (28.39N 81.52W)									10.65
Lake Gibson 2 (2434) (28.10N 81.95W)									8.59
Lake Hamilton (1754) (28.04N 81.64W)									8.68
Lake Henry (1814) (28.08N 81.66W)									8.84
Lakeland L. Field (KLAL) (27.99N 82.01W)			11/0415	44	58				
Lake Lowery (6184) (28.13N 81.69W)									8.41
Lake Mary - USGS (LSPF1) (28.79N 81.41W)									12.46

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	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[A]	Sustained (kt)[B]	Gust (kt)				
Lakes Regional Park (LAKES) (26.53N 81.89W)									9.20
Lauderhill (FRBCS) (26.12N 80.18W)			10/1300	43	70				
Lecanto - FAWN (275) (28.83N 82.50W)			11/0315	23	36				8.41
Lehigh Acres (LEHI) (26.61N 81.65W)									10.07
Leslie Heifner (6774) (28.75N 82.23W)									7.72
Lorida-McArthur (MCARTH) (27.44N 81.21W)									7.79
Lovers Key (LOVERSKE) (26.39N 81.87W)									8.78
Magic Kingdom - Reedy Creek (M) (28.43N 81.58W)									10.29
Mandarin 4 NNE (30.20N 81.61W)									7.35
Marco Island PD (25.94N 81.71W)			10/1900		113				
Marco Island – (Spotter) (25.92N 80.73W)		936.9		97	112				
Big Pine Key – (Spotter) (21.67N 81.35W)	10/1216	933.7							
Margate (PMPNB) (26.25N 80.19W)			10/1925	46	69				
McIntosh (5074) (28.07N 82.14W)									7.51
MIA - ITWS (25.80N 80.29W)			10/1646	58 (1 min, 15 m)	86				
Melbourne Shores (KFLMELBO72) (27.96N 80.51W)			11/0325	56 (10.4 m)	75				

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)				
Middleburg 8.8 E (30.04N 81.75W)									11.32
Moore Haven (MRHMG) (26.83N 81.10W)			10/2300	47	68				
N. Serv (NRESV) (26.71N 81.84W)									9.68
Naples 1 E (NPLMP) (26.15N 81.77W)			10/2000	81	123				
National Weather Service Miami (25.76N 80.38W)		989.5	10/1708		70				
Near N Perry Airport (CLWCH) (26.04N 80.22W)			10/1950	70	95				
North Kissimmee River (KREF) (27.75N 81.18W)									9.48
North Port - FAWN (NPORT) (27.14N 82.34W)			10/2330	31	51				7.44
Oakland Park (FTPCS) (26.20N 80.13W)			10/2100	43	74				
Olga (OLGA) (26.72N 81.68W)									8.81
Olustee 3 N (30.24N 82.43W)									9.76
Ortega 1 WNW (30.27N 81.72W)									11.11
Palm Bay Public Works - SJRWMD (M) (27.99N 80.70W)									10.52
Palm Bay Stp - SJRWMD (M) (28.02N 80.60W)									10.67

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft)[C]	Storm tide (ft)[D]	Estimated Inundation (ft)[E]	Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[A]	Sustained (kt)[B]	Gust (kt)				
Palmdale - FAWN (PALF1) (26.94N 81.31W)			11/0045	36	59				8.38
Pana Vista Lake Panasoffkee (8974) (28.81N 82.14W)									9.98
Parkland (PRKLN) (26.30N 80.27W)			10/2000	42	71				
Parrish Park - SJRWMD (M) (28.76N 80.88W)									10.07
Peace River (7394) (27.09N 82.01W)									8.43
Pembroke Park (HLLYW) (25.99N 80.16W)			10/2200	47	75				
Pembroke Pines (PBRPN) (26.01N 80.27W)			10/1520	53	95				
Pierson - USGS (LGRF1) (29.23N 81.49W)									10.03
Plant City 3 W (Spotter) (28.04N 82.16W)	11/0509	964.4	11/0142	63 (10 sec, 7 m)	71				
Raiford 0.9 NE (30.04N 82.23W)									9.62
Ransom Rd - NASA - SJRWMD (M) (28.51N 80.68W)									11.34
Rock Springs Well - SJRWMD (28.77N 81.44W)									11.16
S-161 Along Harney Rd (6614) (28.02N 82.37W)									6.52
Saddle Creek (1774) (27.94N 81.85W)									8.90

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)				
Satsuma 4 NE (29.59N 81.61W)									10.05
Sebring - FAWN (SEBF1) (27.42N 81.40W)			11/0300		49				9.03
Sebring (SEBRNG) (27.46N 81.35W)									7.92
St. Augustine South (29.84N 81.31W)									10.22
St. George Island Bridge (Weatherstem) (29.69N 84.89W)			11/1210	47	47				
St Pete 42 (3014) (28.18N 82.52W)									7.58
Southwest Ranches (WSTNF) (26.06N 80.39W)			10/1700	47	85				
Starkey (3154) (28.25N 82.35W)									6.69
Sunrise (FTDST) (26.16N 80.25W)			10/1700	45	71				
Sunrise (SNRSC) (26.16N 80.29W)			10/2100	42	85				
SWFWMD Headquarters (7094) (28.47N 82.44W)									6.46
Tampa SVC Office (9274) (28.02N 82.35W)									6.87
Taylor 7 NNW (30.53N 82.34W)									7.79
Ten Mile Canal NR Daniel (10MILE) (26.55N 81.86W)									10.03

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft)[C]	Storm tide (ft)[D]	Estimated Inundation (ft)[E]	Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[A]	Sustained (kt)[B]	Gust (kt)				
The Villages 2.8 ESE (28.90N 81.97W)									10.59
Tick Island-Kiss. River (TICK) (27.69N 81.19W)									8.38
Umatilla - FAWN (UMLF1) (28.93N 81.65W)			11/1100	29	45				10.49
University Park (MFL) (25.75N 80.38W)									6.96
Urban Estates (NPLLV) (26.27N 81.75W)			10/2100	48	97				
Venus (VENUSR) (27.08N 81.34W)									8.40
Vilano Beach 4 NNW (30.02N 81.32W)	11/0308	1005.0	10/2223	51	60				
Walt Disney World Svc Area - Reedy Creek (28.38N 81.59W)									10.21
Wasteplant (WTEP) (26.63N 81.76W)									11.59
Webster City (9074) (28.61N 82.05W)									10.60
West Miami (MMMCH) (25.74N 80.30W)			10/1540	59	81				
Wildwood II (7034) (28.86N 82.03W)									8.57
Whidden Properties (WHID) (26.95N 81.57W)									9.76
Wilton Manors 1 S (D0271) (26.14N 80.13W)									9.94

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)				
Withlacoochee River (6082) (28.48N 82.18W)									10.31
Wolfe Nr Jumping Gully (7254) (28.38N 82.50W)									6.49
Yeehaw Junction - SJRWMD (M) (27.70N 80.90W)									12.00
Yellow Fever Creek (YELLOWFE) (26.68N 81.90W)									6.78
Georgia									
International Civil Aviation Organization (ICAO) Sites									
Atlanta International Airport (KATL) (33.64N 84.43W)	12/0200	999.0	11/1910	39 (2 min, 10 m)	56				
Bacon County Airport - GA (KAMG) (31.54N 82.51W)			11/1314		38				6.04
Brunswick/Clynco Airport (KBQK) (31.15N 81.47W)			11/0915	35 (2 min, 10 m)	52				
Hunter Army Airfield (KSVN) (32.01N 81.16W)			11/1458	33	51				6.47
Middle Georgia Regional AP (KMCN) (32.69N 83.65W)	11/2110	994.6	11/1555	37 (2 min, 10 m)	53				
Savannah Intl Airport - GA (KSAV) (32.13N 81.20W)	11/1956	997.6	11/1152	38 (2 min, 10 m)	52				
Valdosta - GA (KVLD) (30.97N 83.28W)	11/0953	996.5	11/1005	36 (2 min, 10 m)	49				
Valdosta/Moody AFB - GA (KVAD) (30.97N 83.20W)	11/1443	984.8	11/1214	38 (2 min, 10 m)	54				
Coastal-Marine Automated Network (C-MAN), and NOS Sites									
Fort Pulaski (FPKG1) (32.03N 80.90W)	11/1706	999.7	11/1218	42 (6.5 m)	61	5.63	8.18	4.7	
Weatherflow Sites									

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)				
Jeckyll Island - GA (XJEK) (31.05N 81.41W)	11/1322	988.0	11/1337	50	67				
Tybee Island North - GA (XTYB) (32.02N 80.84W)	11/1729	997.0	11/1219	43 (10 m)	56				
Tybee Island South - GA (XTYE) (31.99N 80.85W)	11/1702	997.0	11/1447	43 (9.1 m)	55				
Remote Automated Weather Stations (RAWS) and HADS Sites									
Baxley (BXTG1) (31.71N 82.39W)			11/1504		56				
Jones Island Okefenokee (JONG1) (30.82N 82.36W)			11/1801		44				
Okefenokee NWR East (TS818) (30.74N 82.13W)			11/1801		44				
Okefenokee NWR West (TT331) (30.97N 82.40W)			11/1801		48				
Sapelo Island Reserve (SAXG1) (31.42N 81.30W)	11/1415	994.0	11/2000	35 (10 m)	52				7.20
Sterling Glynn (STRG1) (31.25N 81.61W)			11/1104		48				
Waycross (OKEG1) (31.24N 82.40W)			11/1004		55				
CoCoRaHS Sites									
Reevesville 1 SSE (SC-DC-18) (33.18N 80.64W)									6.00
Richmond Hill 1 NE (GA-BR-2) (31.94N 81.30W)									6.66
Richmond Hill 7 ESE (GA-BR-5) (31.88N 81.20W)									6.67
Rincon 5 NNE (GA-EF-18) (32.36N 81.21W)									7.86

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft)[C]	Storm tide (ft)[D]	Estimated Inundation (ft)[E]	Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[A]	Sustained (kt)[B]	Gust (kt)				
NWS Cooperative Observer Program (COOP) Sites									
Darien 7 NNE (MERG1) (31.45N 81.36W)									6.00
Fort Stewart (FSBG1) (31.96N 81.46W)									6.63
Richmond Hill 3 NE (RICG1) (31.97N 81.29W)									6.12
Sapelo Island (SPIG1) (31.39N 81.28W)									7.53
Other Sites									
Atkinson 1 WSW (31.21N 81.87W)									8.74
Blackshear 5 NNW (31.36N 82.28W)									8.45
Decatur (33.71N 84.24W)									6.32
Deenwood 2 W (31.25N 82.40W)			11/0604		48				
Fargo 2 NE (30.70N 82.54W)									8.66
Folkston 10 SW (30.73N 82.13W)									9.30
Homeland (30.85N 82.02W)									9.85
Jesup 4.2 NNW (31.65N 81.92W)									7.22
Jesup 10 NNW (31.73N 81.95W)									6.96

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft)[C]	Storm tide (ft)[D]	Estimated Inundation (ft)[E]	Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[A]	Sustained (kt)[B]	Gust (kt)				
Kingsland 2 SSE (30.75N 81.65W)			11/0511		49				
Kingsland 3 WSW (30.77N 81.71W)									6.84
Little Satilla River (31.45N 82.05W)									7.14
Nahunta 6 S (31.12N 81.98W)									10.34
Pearson 3.5 NE (31.33N 82.81W)									6.50
Satilla River HWY 158 (31.30N 82.56W)									6.49
Screven 2.3 ENE (31.49N 81.98W)									8.56
Steven Foster St Park 1 WNW (30.83N 82.36W)									7.66
Steven Foster St Park 11 NNW (30.98N 82.40W)			11/0510		42				
Sun Belt Ag Expo Weatherstem (31.13N 83.71W)		992.2	11/1214	37	41				
Suwanee River US Hwy 44 (30.68N 82.56W)									8.44
Thalmann 5 ESE (31.26N 81.61W)			11/0704		42				9.65
Waycross (31.21N 82.36W)									6.86
South Carolina									
International Civil Aviation Organization (ICAO) Sites									

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)				
Beaufort County Airport - SC (KARW) (32.41N 80.63W)	11/1355	1001.4	11/1235	35 (2 min, 10 m)	51				
Charleston Executive Airport (KJZI) (32.70N 80.01W)	11/2035	1003.4	11/1615	35 (2 min, 10 m)	51				
Charleston Intl Airport (KCHS) (32.90N 80.04W)	11/1846	1000.6	11/1609	37 (2 min, 10 m)	52				
Coastal-Marine Automated Network (C-MAN), and NOS Sites									
Charleston (CHTS1) (32.78N 79.93W)	11/1654	1002.8	11/1654	42 (8.8 m)	53	4.86	6.78	4.2	
Oyster Landing (N Inlet Estuary) (NIWS1) (33.35N 79.19W)						4.64	5.75	3.4	
Springmaid Pier (MROS1) (33.66N 78.92W)	12/0224	1006.6				3.27	5.31	2.9	
Folly Beach C-MAN (FBIS1) (32.69N 79.89W)	11/2200	1004.3	11/1620	44 (10 m)	56				
Sumter/Charleston Harbor (XSUM-FT) (32.75N 79.87W)	11/1651	1001.0	11/1656	43 (12.1 m)	56				
Weatherflow Sites									
Beaufort (XBUF) (32.34N 80.59W)	11/1351	995.0	11/1356	49 (10 m)	66				
Charleston/Battery Point (XCHA) (32.76N 79.95W)	11/1700	998.0	11/1620	42 (10 m)	57				
Folly Beach Pier (XFOL) (32.65N 79.94W)	11/2144	1001.0	11/1604	51 (12.8 m)	63				
Isle of Palms (XIOP) (32.78N 79.79W)	11/1830	1002.0	11/1645	49 (9.4 m)	59				
Sullivans Island (XSUL) (32.77N 79.82W)	11/1645	1001.0	11/1655	46 (12.8 m)	59				

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									
Beaufort 4 NNE (SC-BF-35) (32.47N 80.67W)									9.07
Bluffton 7 W (SC-BF-50) (32.21N 80.98W)									6.13
Bluffton 6 WNW (SC-BF-10) (32.26N 80.96W)									7.44
Canadys (SC-CL-6) (33.05N 80.63W)									7.33
Charleston 2 S (SC-CR-88) (32.75N 80.00W)									7.26
Charleston 2 SE (SC-CR-89) (32.76N 79.98W)									7.95
Charleston 5 SSE (SC-CR-13) (32.72N 79.96W)									7.82
Charleston 2 W (SC-CR-34) (32.78N 80.03W)									6.90
Charleston 3 W (SC-CR-11) (32.78N 80.05W)									6.30
Cottageville 3 NNW (SC-CL-17) (32.77N 79.82W)									6.01
Charleston 6 NW (SC-CR-45) (32.83N 80.07W)									8.53
Charleston 5 WNW (SC-CR-97) (32.80N 80.07W)									8.86
Cottageville 6 WSW (SC-CL-16) (32.89N 80.57W)									6.01
Daniel Island 1 SE (SC-BK-48) (32.84N 79.90W)									7.29

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)				
Goose Creek 5 WNW (SC-BK-17) (33.00N 80.08W)									6.45
Hollywood 2 S (SC-CR-10) (32.75N 80.24W)									6.38
Lodge 3 SW (SC-CL-9) (33.02N 80.99W)									6.97
Meggett 2 W (SC-CR-32) (32.70N 80.29W)									7.27
Moncks Corner 4 E (SC-BK-38) (33.19N 79.94W)									7.28
Moncks Corner 7 SW (SC-BK-25) (33.11N 80.07W)									6.33
NWS Charleston (SC-CR-49) (32.89N 80.03W)									6.30
North Charleston 3 NW (SC-CR-34) (32.92N 80.07W)									6.82
North Charleston 3 WNW (SC-DC-3) (32.92N 80.08W)									6.87
Pineville (SC-BK-29) (33.42N 80.03W)									6.10
Ravenel 2 WNW (SC-CR-92) (32.78N 80.26W)									6.48
Reevesville 1 SSE (SC-DC-18) (33.18N 80.64W)									6.00
Summerville 2 N (SC-DC-41) (33.03N 80.17W)									7.51
Summerville10 NNE (SC-BK-43) (33.12N 80.09W)									6.24

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)				
Summerville 5 NNW (SC-BK-46) (33.07N 80.22W)									6.43
Summerville 2 SSE (SC-DC-52) (32.97N 80.17W)									7.28
Summerville 1 SSW (SC-DC-36) (32.98N 80.18W)									7.02
NWS Cooperative Observer Program (COOP) Sites									
Edisto Island Middleton (EDSS1) (32.60N 80.33W)									6.10
Sullivans Island (SULS1) (32.76N 79.85W)									6.26
Summerville 4 W (SMVS1) (33.03N 80.23W)									6.35
Yemassee 1 N (YEMS1) (32.70N 80.85W)									7.00
Other Sites									
Bennetts Point (ACXS1) (32.55N 80.45W)									6.06
Charleston 6 NW (BEES1) (32.83N 80.07W)									8.97
Furman 1 SW (YMFS1) (32.66N 81.20W)									8.22
Mount Pleasant (MWPS1) (32.80N 79.90W)									6.44

[A] Date/time is for sustained wind when both sustained and gust are listed.
[B] Except as noted, sustained wind averaging periods for C-MAN and land-based reports are 2 min; buoy averaging periods are 8 min.
[C] Storm surge is water height above normal astronomical tide level.
[D] Storm tide is water height above the North American Vertical Datum of 1988 (NAVD88) in the continental United States. Storm tide is water height above the Puerto Rico Vertical Datum of 2002 (PRVD02) in Puerto Rico and above the Virgin Islands Vertical Datum of 2009 (VIVD09) in the U.S. Virgin Islands.

[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.
[F] Last of several occurrences.
[G] Wind speed data missing 0510-0650 UTC 3 October 2016.
[H] All wind data missing 0800-1000 UTC 6 October 2016.
[I] Record water level.
[J] Station went offline and did not transmit a peak water level during the event. Peak values represent the highest transmitted prior to outage.
[K] All wind data missing 1300 UTC 9 October – 0200 10 October 2016.
[L] Water levels within the St. Johns River are were affected by a combination of storm surge and freshwater runoff.

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%)	42	78
Medium (40%-60%)	30	48
High (>60%)	12	36

Table 5a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for forecasts issued for Hurricane Irma, 30 August–12 September 2017. 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	**14.8**	**25.5**	**37.6**	**50.5**	**73.9**	**101.8**	**135.0**
OCD5	31.2	74.3	122.2	175.8	291.7	463.2	677.1
Forecasts	49	47	45	43	39	35	31
OFCL (2012-16)	24.9	39.6	54.0	71.3	105.8	155.4	208.9
OCD5 (2012-16)	47.3	103.9	167.8	230.3	343.1	442.6	531.0

Table 5b. Homogeneous comparison of selected track forecast guidance models (in n mi) for forecasts issued for Hurricane Irma, 30 August–12 September 2017. 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	14.5	25.8	38.9	51.8	74.7	104.2	140.2
OCD5	29.9	73.8	124.2	181.0	302.0	473.4	691.0
GFSI	18.7	33.7	50.5	68.2	105.5	153.7	205.5
HMNI	18.1	31.9	45.2	63.8	110.0	156.6	213.6
HWFI	20.5	37.9	52.5	67.0	87.8	117.1	150.8
EGRI	15.2	27.1	43.7	64.2	113.8	170.3	212.5
EMXI	**14.3**	**23.3**	**33.2**	**40.3**	**54.9**	**78.2**	**119.5**
CMCI	20.6	33.2	47.8	61.5	87.8	129.5	182.1
CTCI	19.5	38.8	58.6	80.9	136.5	208.5	296.7
AEMI	18.9	32.1	46.9	62.7	94.8	138.7	188.5
HCCA	14.5	26.1	**37.7**	**47.8**	**65.1**	**84.7**	**106.8**
TVCA	15.2	27.6	40.9	55.7	89.2	129.8	176.6
TVCX	**14.1**	26.4	39.1	53.0	82.4	119.5	165.1
FSSE	14.9	**25.0**	**35.7**	**43.7**	**64.1**	**97.0**	**120.6**
GFEX	**14.2**	26.1	39.6	52.2	77.9	111.5	152.2
TABS	29.3	44.9	56.9	64.5	89.2	137.8	190.2
TABM	20.1	33.5	51.9	68.7	99.9	147.6	193.4
TABD	24.9	56.7	75.7	84.1	109.2	154.9	207.1
Forecasts	45	43	41	39	35	31	27

Table 6a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Hurricane Irma, 30 August–12 September 2017. 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	9.0	12.4	15.8	17.4	18.7	24.9	29.7
OCD5	11.0	17.1	22.3	27.0	33.5	39.8	39.5
Forecasts	49	47	45	43	39	35	31
OFCL (2012-16)	5.5	8.2	10.5	12.0	13.4	14.0	14.5
OCD5 (2012-16)	7.1	10.5	13.0	15.1	17.4	18.2	20.6

Table 6b. Homogeneous comparison of selected intensity forecast guidance models (in kt) for forecasts issued for Hurricane Irma, 30 August–12 September 2017. 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	9.0	11.6	15.1	17.3	19.4	26.1	30.2
OCD5	10.9	16.1	21.3	26.6	34.3	40.7	38.9
HMNI	**8.9**	**9.8**	**13.2**	**15.8**	19.5	**25.6**	**28.1**
HWFI	**8.7**	11.7	**13.2**	**14.1**	**15.4**	**22.1**	**30.0**
CTCI	9.3	11.9	**14.6**	**16.6**	**14.7**	**15.8**	**23.9**
DSHP	10.0	14.4	18.3	19.0	23.3	30.9	34.4
LGEM	9.6	13.6	18.1	18.4	21.8	30.1	33.5
IVCN	**8.1**	**10.4**	**13.1**	**14.1**	**16.1**	**23.8**	**28.7**
HCCA	**7.9**	**10.4**	**12.7**	**14.0**	**16.0**	**24.4**	33.1
FSSE	**8.0**	**9.9**	**11.6**	**12.5**	**17.6**	28.7	33.9
GFSI	10.4	13.8	16.6	20.6	27.3	32.7	35.0
EMXI	12.8	19.2	25.4	29.6	33.3	33.4	32.5
Forecasts	46	44	42	40	36	32	28

Table 7. Hurricane and tropical storm watch and warning summary for Hurricane Irma, 30 August–12 September 2017.

Date/Time (UTC)	Action	Location
3 / 2100	Hurricane Watch issued	Antigua, Barbuda, Anguilla, Montserrat, St. Kitts and Nevis
3 / 2100	Hurricane Watch issued	Saba, St. Eustatius, and St. Maarten
3 / 2100	Hurricane Watch issued	St. Martin and St. Barthelemy
4 / 1500	Hurricane Watch changed to Hurricane Warning	Antigua, Barbuda, Anguilla, Montserrat, St. Kitts and Nevis
4 / 1500	Hurricane Watch changed to Hurricane Warning	Saba, St. Eustatius, and St. Maarten
4 / 1500	Hurricane Watch changed to Hurricane Warning	St. Martin and St. Barthelemy
4 / 1500	Tropical Storm Watch issued	Dominica
4 / 1500	Hurricane Watch issued	Guadeloupe
4 / 1500	Hurricane Watch issued	British Virgin Islands
4 / 1500	Hurricane Watch issued	U.S. Virgin Islands
4 / 1500	Hurricane Watch issued	Puerto Rico, Vieques. and Culebra
4 / 2100	Tropical Storm Warning issued	Guadeloupe
5 / 0300	Hurricane Watch changed to Hurricane Warning	British Virgin Islands
5 / 0300	Hurricane Watch changed to Hurricane Warning	U.S. Virgin Islands
5 / 0300	Hurricane Watch changed to Hurricane Warning	Puerto Rico, Vieques. and Culebra
5 / 0900	Tropical Storm Watch changed to Tropical Storm Warning	Dominica
5 / 1200	Tropical Storm Watch issued	Cabo Engano to Isla Saona, Dominican Republic
5 / 1500	Tropical Storm Watch issued	Le Mole to Port-Au-Prince, Haiti
5 / 1500	Hurricane Watch issued	Cabo Engano, Dominican Republic to Northern Border with Haiti
5 / 1500	Hurricane Watch issued	Northern border of Haiti and Dominican Republic to Le Mole
5 / 1500	Hurricane Watch issued	Turks and Caicos Islands
5 / 1500	Hurricane Watch issued	Southeastern Bahamas

Date/Time (UTC)	Action	Location
5 / 2100	Hurricane Watch changed to Hurricane Warning	Cabo Engano to Northern Border with Haiti
5 / 2100	Tropical Storm Warning issued	Cabo Engano to Southern Border with Haiti
6 / 0000	Tropical Storm Warning changed to Hurricane Warning	Guadeloupe
6 / 0000	Hurricane Watch discontinued	Guadeloupe
6 / 0000	Hurricane Watch issued	Matanzas to Guantanamo, Cuba
6 / 0900	Hurricane Watch changed to Hurricane Warning	Turks and Caicos Islands
6 / 0900	Hurricane Watch changed to Hurricane Warning	Southeastern Bahamas
6 / 0900	Tropical Storm Warning discontinued	Dominica
6 / 0900	Hurricane Watch issued	Central Bahamas
6 / 1500	Tropical Storm Watch changed to Tropical Storm Warning	Le Mole to Port-Au-Prince
6 / 1500	Hurricane Watch changed to Hurricane Warning	Le Mole to northern border with Dominican Republic
6 / 1500	Hurricane Warning discontinued	Antigua, Barbuda, Montserrat, St. Kitts and Nevis
6 / 1500	Hurricane Warning discontinued	Guadeloupe
6 / 1600	Hurricane Warning discontinued	Saba and St. Eustatius
6 / 1800	Hurricane Warning discontinued	Anguilla
6 / 1800	Hurricane Warning discontinued	St. Maarten
6 / 2100	Hurricane Watch changed to Hurricane Warning	Central Bahamas
6 / 2100	Tropical Storm Warning issued	Las Tunas to Guantanamo
6 / 2100	Hurricane Watch issued	Northwestern Bahamas
6 / 2100	Hurricane Warning discontinued	St. Martin and St. Barthelemy
7 / 0300	Hurricane Warning discontinued	British Virgin Islands
7 / 0300	Hurricane Warning discontinued	U.S. Virgin Islands
7 / 0900	Hurricane Watch changed to Hurricane Warning	Northwestern Bahamas
7 / 0900	Hurricane Warning discontinued	Puerto Rico, Vieques, and Culebra

Date/Time (UTC)	Action	Location
7 / 1500	Tropical Storm Warning modified to	Villa Clara to Guantanamo
7 / 1500	Hurricane Watch issued	Jupiter Inlet to Bonita Beach, Florida Bay, Lake Okeechobee, and Florida Keys
7 / 2100	Tropical Storm Warning modified to	Las Tunas to Guantanamo
7 / 2100	Hurricane Watch modified to	Las Tunas to Guantanamo
7 / 2100	Hurricane Warning issued	Villa Clara to Camaguey, Cuba
8 / 0000	Tropical Storm Warning discontinued	Cabo Engano to Southern Border with Haiti
8 / 0000	Hurricane Warning modified to	Cabo Frances Viejo to Northern Border with Haiti
8 / 0300	Hurricane Watch changed to Hurricane Warning	Jupiter Inlet to Bonita Beach and Florida Bay, Lake Okeechobee, and Florida Keys
8 / 0300	Hurricane Watch issued	Jupiter Inlet to Sebastian Inlet
8 / 0300	Hurricane Warning discontinued	Cabo Frances Viejo to Northern Border with Haiti
8 / 0300	Hurricane Watch issued	Bonita Beach to Anna Maria Island
8 / 1200	Tropical Storm Warning discontinued	Le Mole to Port-Au-Prince
8 / 1200	Hurricane Warning discontinued	Northern border of Haiti and Dominican Republic to Le Mole
8 / 1500	Hurricane Watch modified to	Jupiter Inlet to Flagler/Volusia County Line
8 / 1500	Hurricane Watch modified to	Bonita Beach to Anclote River
8 / 1800	Hurricane Warning discontinued	Turks and Caicos Islands
8 / 2100	Hurricane Watch modified to	Sebastian Inlet to Flagler/Volusia County Line
8 / 2100	Hurricane Watch discontinued	Bonita Beach to Anclote River
8 / 2100	Hurricane Watch issued	Anna Maria Island to Suwannee River, Florida
8 / 2100	Hurricane Warning modified to	Sebastian Inlet to Anna Maria Island
9 / 0000	Hurricane Warning discontinued	Southeastern Bahamas

Date/Time (UTC)	Action	Location
9 / 0300	Hurricane Watch changed to Hurricane Warning	Matanzas to Camaguey
9 / 0300	Tropical Storm Warning discontinued	Las Tunas to Guantanamo
9 / 0300	Tropical Storm Warning issued	La Habana to Holguin
9 / 0300	Tropical Storm Warning issued	Ciudad de la Habana
9 / 0300	Hurricane Watch modified to	Las Tunas to Holguin
9 / 0300	Hurricane Watch issued	Volusia/Brevard County Line to Fernandina Beach
9 / 0300	Hurricane Watch issued	Anclote River to Indian Pass
9 / 0300	Hurricane Warning modified to	Matanzas to Camaguey
9 / 0300	Hurricane Warning modified to	Volusia/Brevard County Line to Anclote River, including Florida Keys, Florida Bay, Lake Okeechobee
9 / 0900	Hurricane Watch modified to	Flagler/Volusia County Line to Fernandina Beach
9 / 0900	Hurricane Watch modified to	Chassahowitzka to Indian Pass
9 / 0900	Hurricane Warning modified to	Flagler/Volusia County Line to Chassahowitzka, Florida Keys, Lake Okeechobee, Florida Bay
9 / 0900	Tropical Storm Watch issued	north of Fernandina Beach to Altamaha, Georgia
9 / 1200	Hurricane Warning discontinued	Central Bahamas
9 / 1500	Tropical Storm Warning changed to Hurricane Warning	Ciudad de la Habana
9 / 1500	Tropical Storm Watch issued	Edisto Beach to South Santee River
9 / 1500	Tropical Storm Watch issued	Indian Pass to Okaloosa/Walton County Line
9 / 1500	Tropical Storm Warning modified to	Las Tunas to Holguin
9 / 1500	Hurricane Watch modified to	Fernandina Beach to Edisto Beach
9 / 1500	Hurricane Watch modified to	Aucilla River to Indian Pass
9 / 1500	Hurricane Warning discontinued	Northwestern Bahamas
9 / 1500	Hurricane Warning modified to	La Habana to Camaguey
9 / 1500	Hurricane Warning issued	Andros Island, Bimini, and Grand Bahama Island

Date/Time (UTC)	Action	Location
9 / 1500	Hurricane Warning modified to	Fernandina Beach to Aucilla River
9 / 2100	Tropical Storm Watch changed to Tropical Storm Warning	Indian Pass to Okaloosa/Walton County Line
9 / 2100	Tropical Storm Watch discontinued	All
9 / 2100	Tropical Storm Warning discontinued	Las Tunas to Holguin
9 / 2100	Tropical Storm Warning issued	Fernandina Beach to South Santee River
9 / 2100	Hurricane Watch discontinued	Aucilla River to Indian Pass
9 / 2100	Hurricane Watch discontinued	Las Tunas to Holguin
9 / 2100	Hurricane Warning modified to	Fernandina Beach to Indian Pass
10 / 0900	Tropical Storm Watch issued	Bimini and Grand Bahamas Island
10 / 0900	Hurricane Warning discontinued	Andros Island, Bimini, and Grand Bahama Island
10 / 0900	Hurricane Warning modified to	La Habana to Ciego de Avila
10 / 1200	Hurricane Warning modified to	La Habana to Matanzas
10 / 1500	Tropical Storm Watch changed to Tropical Storm Warning	Bimini and Grand Bahamas Island
10 / 1800	Hurricane Warning discontinued	La Habana to Matanzas
10 / 1800	Hurricane Warning discontinued	Ciudad de la Habana
11 / 0300	Hurricane Warning changed to Tropical Storm Warning	Florida Bay
11 / 0300	Hurricane Warning changed to Tropical Storm Warning issued	Jupiter Inlet to Bonita Beach
11 / 0300	Hurricane Warning modified to	Jupiter Inlet to Fernandina Beach
11 / 0900	Hurricane Warning changed to Tropical Storm Warning	Lake Okeechobee
11 / 0900	Tropical Storm Warning modified to	Anclote River to Bonita Beach
11 / 0900	Tropical Storm Warning discontinued	Florida Bay
11 / 0900	Tropical Storm Warning discontinued	Bimini and Grand Bahamas Island
11 / 0900	Hurricane Warning modified to	Sebastian Inlet to Fernandina Beach
11 / 0900	Hurricane Warning modified to	Anclote River to Indian Pass

Date/Time (UTC)	Action	Location
11 / 1200	Tropical Storm Warning modified to	Bonita Beach to Okaloosa/Walton County Line
11 / 1200	Tropical Storm Warning modified to	Jupiter Inlet to South Santee River
11 / 1200	Hurricane Watch discontinued	All
11 / 1500	Tropical Storm Warning modified to	Anclote River to Okaloosa/Walton County Line
11 / 1500	Tropical Storm Warning modified to	Volusia/Brevard County Line to South Santee River
11 / 1500	Tropical Storm Warning discontinued	Lake Okeechobee
11 / 1800	Tropical Storm Warning modified to	Suwannee River to Okaloosa/Walton County Line
11 / 1800	Tropical Storm Warning modified to	Flagler/Volusia County Line to South Santee River
11 / 2100	Tropical Storm Warning discontinued	Suwannee River to Okaloosa/Walton County Line
11 / 2100	Tropical Storm Warning modified to	Fernandina Beach to South Santee River
11 / 2100	Tropical Storm Warning modified to	Altamaha Sound to South Santee River
12 / 0300	Tropical Storm Warning discontinued	All

Table 8. Storm surge watch and warning summary for Hurricane Irma, 30 August–12 September 2017.

Date/Time (UTC)	Action	Location
7 / 1500	Storm Surge Watch issued	Jupiter Inlet to Bonita Beach, including Florida Keys
8 / 0300	Storm Surge Watch changed to Storm Surge Warning	Jupiter Inlet to Bonita Beach, including Florida Keys
8 / 1500	Storm Surge Warning modified to	Sebastian Inlet to Venice, including Florida Keys
8 / 1500	Storm Surge Watch issued	North of Sebastian Inlet to Ponce Inlet
8 / 2100	Storm Surge Watch issued	north of Venice to Anclote River, including Tampa Bay
8 / 2100	Storm Surge Watch modified to	Ponce Inlet to Flagler/Volusia County Line
9 / 0300	Storm Surge Warning modified to	Volusia/Brevard County Line to Anclote River, including Florida Keys and Tampa Bay
9 / 0300	Storm Surge Watch modified to	north of Anclote Rive to Suwanee River
9 / 0900	Storm Surge Warning modified to	Volusia/Brevard County Line to Chassahowitzka, Florida Keys, Tampa Bay
9 / 1500	Storm Surge Warning modified to	Volusia/Brevard County Line to Suwanee River, Florida Keys, Tampa Bay
9 / 1500	Storm Surge Watch modified to	north of Volusia/Brevard County line to the Isle of Palms, South Carolina
9 / 1500	Storm Surge Watch modified to	north of Suwanee River to Ochlocknee River
9 / 2100	Storm Surge Warning modified to	South Santee River to Suwanee River, Florida Keys, Tampa Bay
10 / 0300	Storm Surge Warning modified to	South Santee River to Jupiter Inlet, North Miami Beach to Ochlocknee River, Florida Keys
11 / 0900	Storm Surge Warning discontinued	Florida Keys, North Miami Beach to Cape Sable
11 / 1500	Storm Surge Warning discontinued	Bonita Beach southward

Date/Time (UTC)	Action	Location
11 / 2100	Storm Surge Warning discontinued	From Fernandina Beach southward, from Aucilla River westward, from Clearwater Beach southward
12 / 0300	Storm Surge Warning discontinued	All

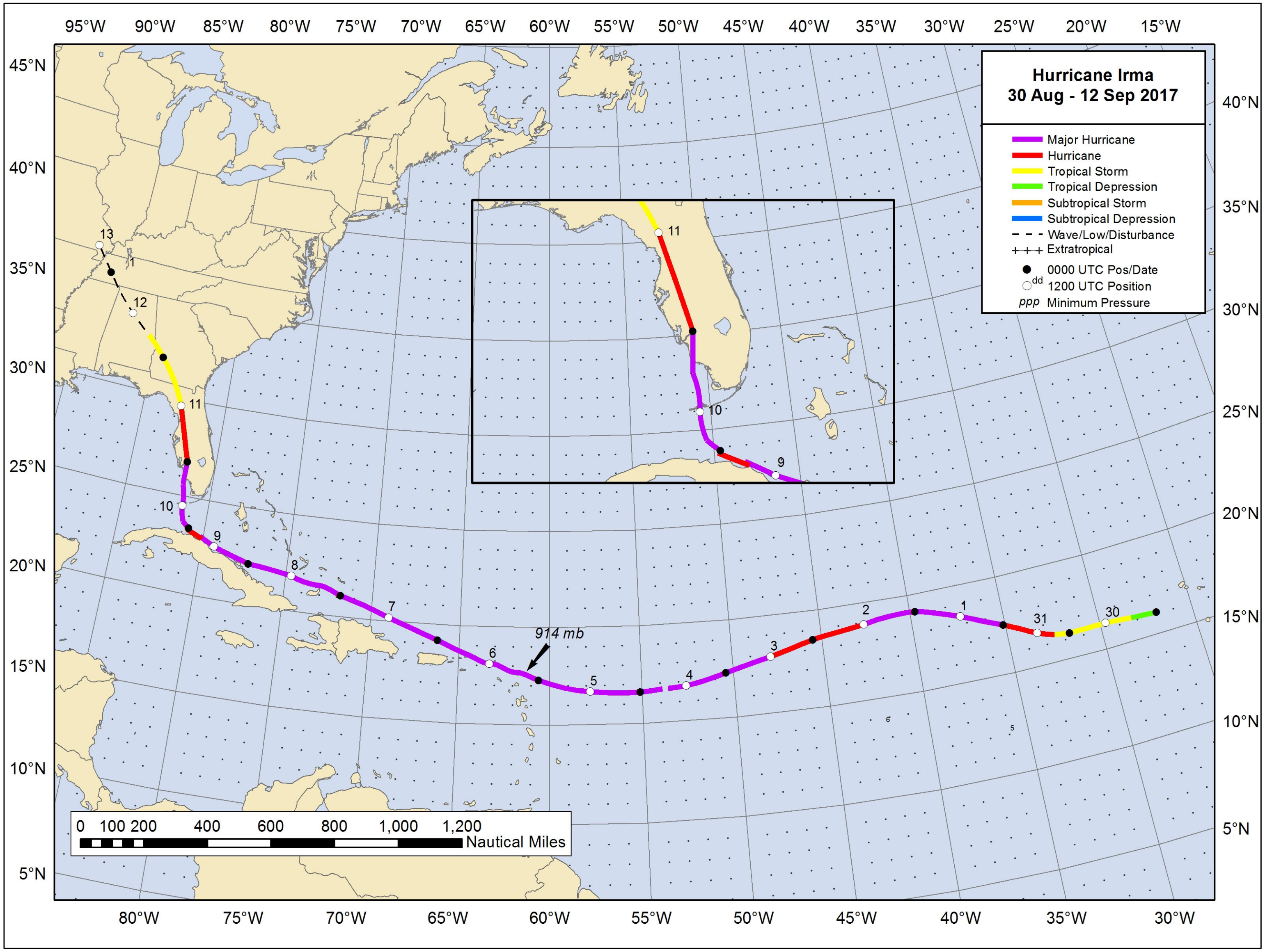

Figure 1. Best track positions for Hurricane Irma, 30 August–12 September 2017.

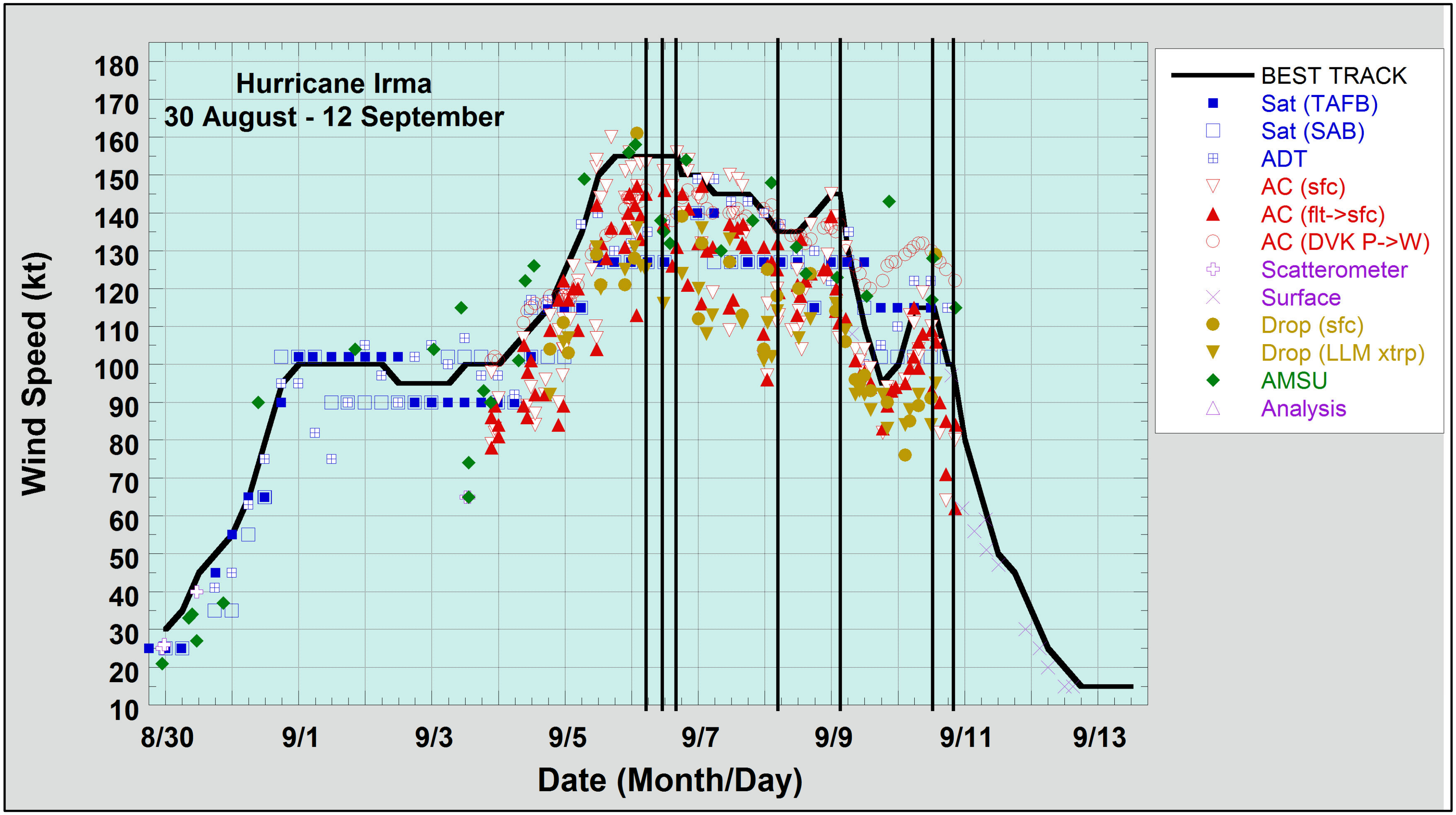

Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Hurricane Irma, 30 August–12 September 2017. Aircraft observations have been adjusted for elevation using 90%, 80%, and 80% adjustment factors for observations from 700 mb, 850 mb, and 1500 ft, respectively. Dropwindsonde observations include actual 10 m winds (sfc), as well as surface estimates derived from the mean wind over the lowest 150 m of the wind sounding (LLM). Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. AMSU intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies technique. Dashed vertical lines correspond to 0000 UTC, and the solid vertical lines correspond to landfalls.

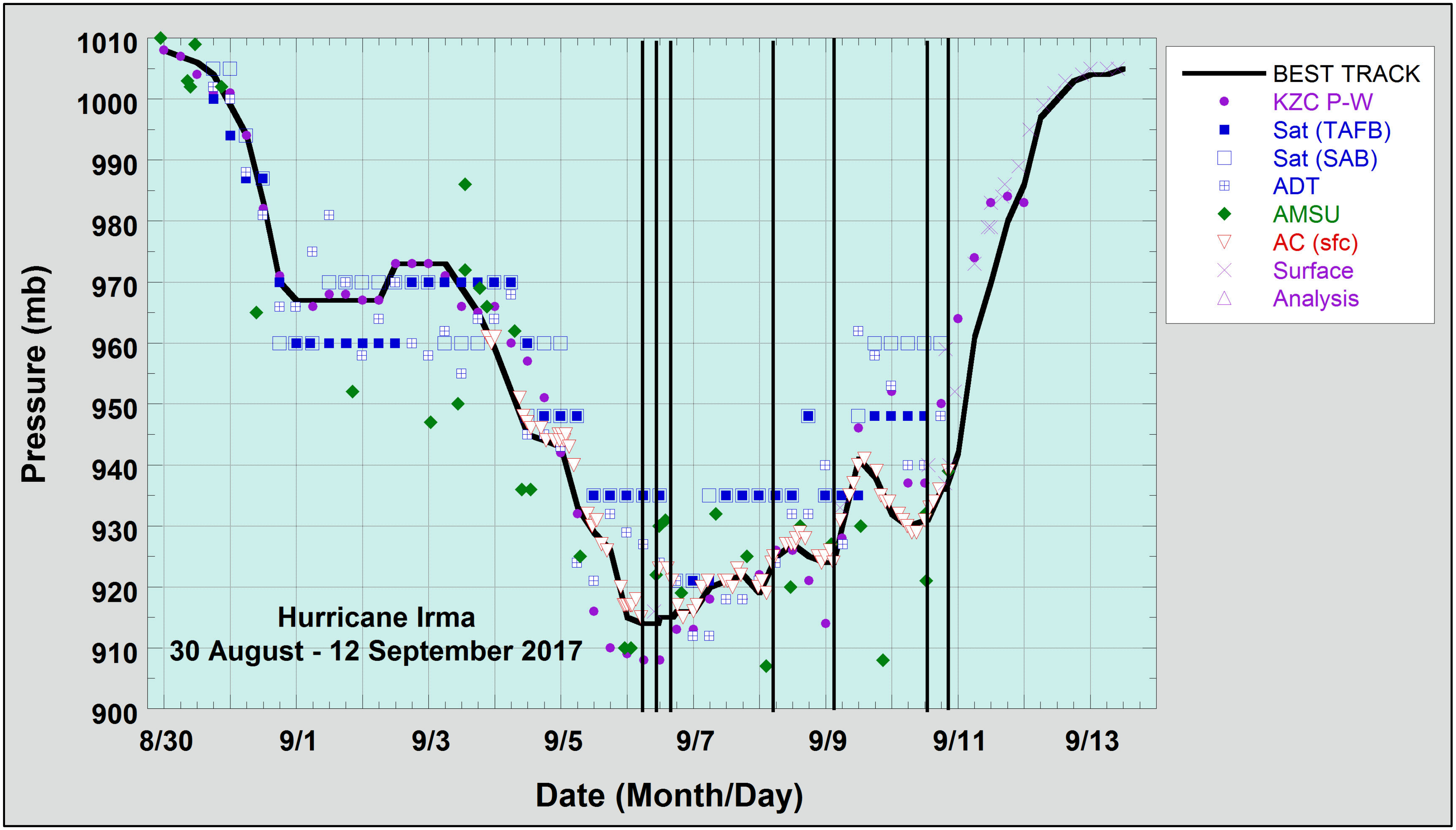

Figure 3. Selected pressure observations and best track minimum central pressure curve for Hurricane Irma, 30 August–12 September 2017. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. AMSU intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies technique. KZC P-W refers to pressure estimates derived using the Knaff-Zehr-Courtney pressure-wind relationship. Dashed vertical lines correspond to 0000 UTC, and the solid vertical lines correspond to landfalls.

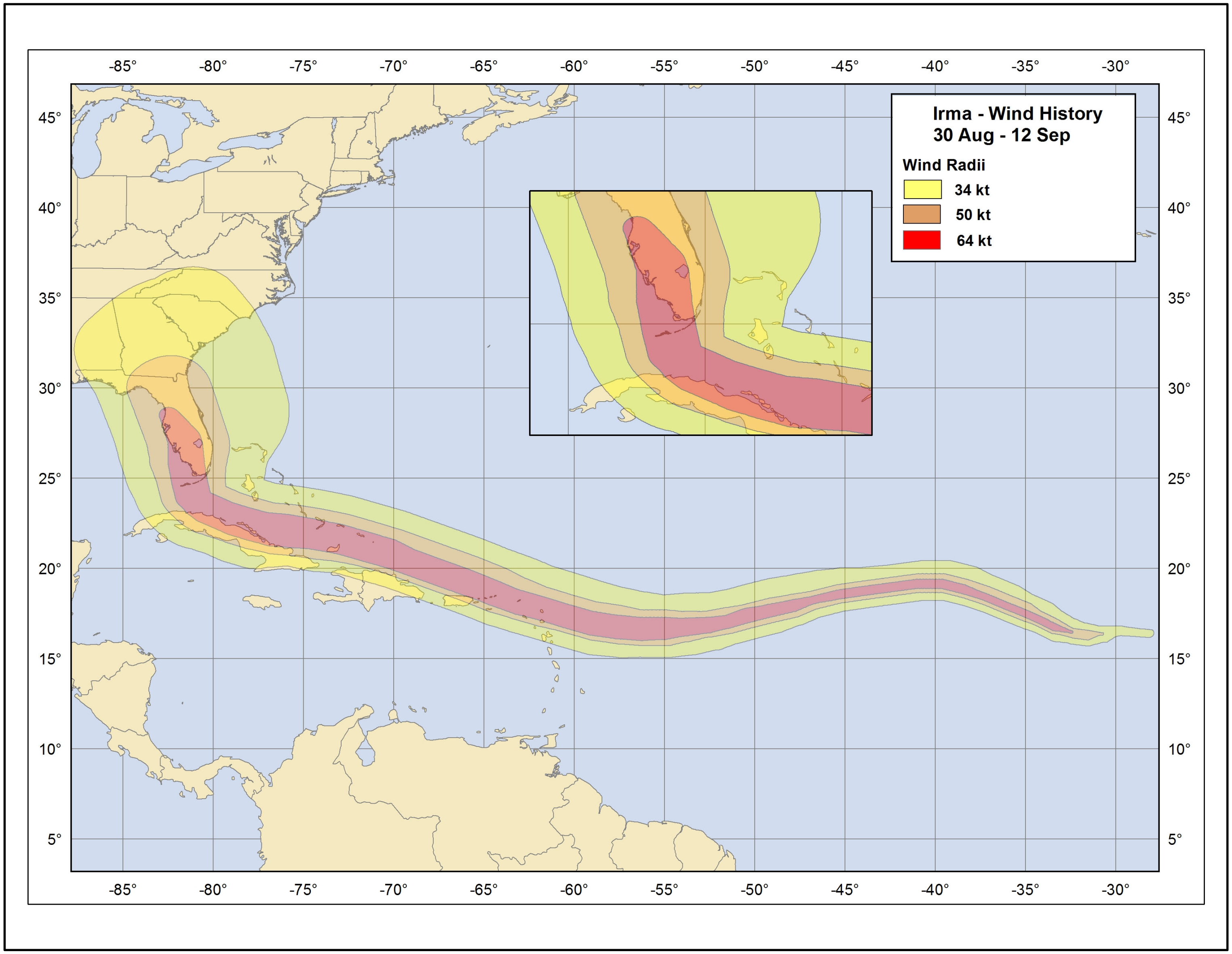

Figure 4. Wind swath depicting the radius of 34-, 50-, and 64-kt winds for Hurricane Irma, 30 August–12 September 2017.

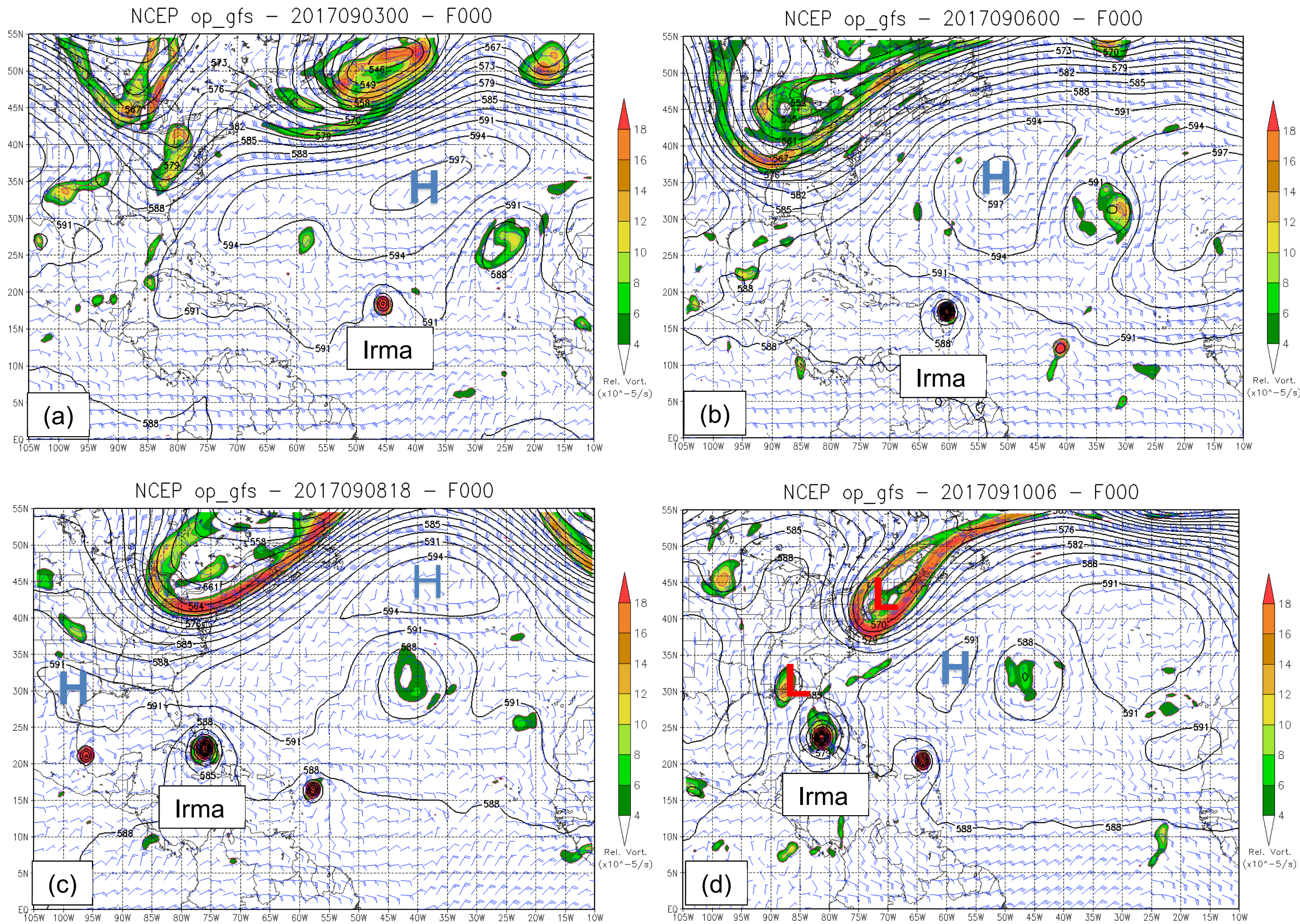

Figure 5. GFS analyses of 500-mb heights (dam, black contours), 500-mb relative vorticity ($x10^{-5}$ s^{-1}, color shading) and 500-mb wind (kt, barbs) at (a) 0000 UTC 3 September, (b) 0000 UTC 6 September, (c) 1800 UTC 8 September, and (d) 0600 UTC 10 September.

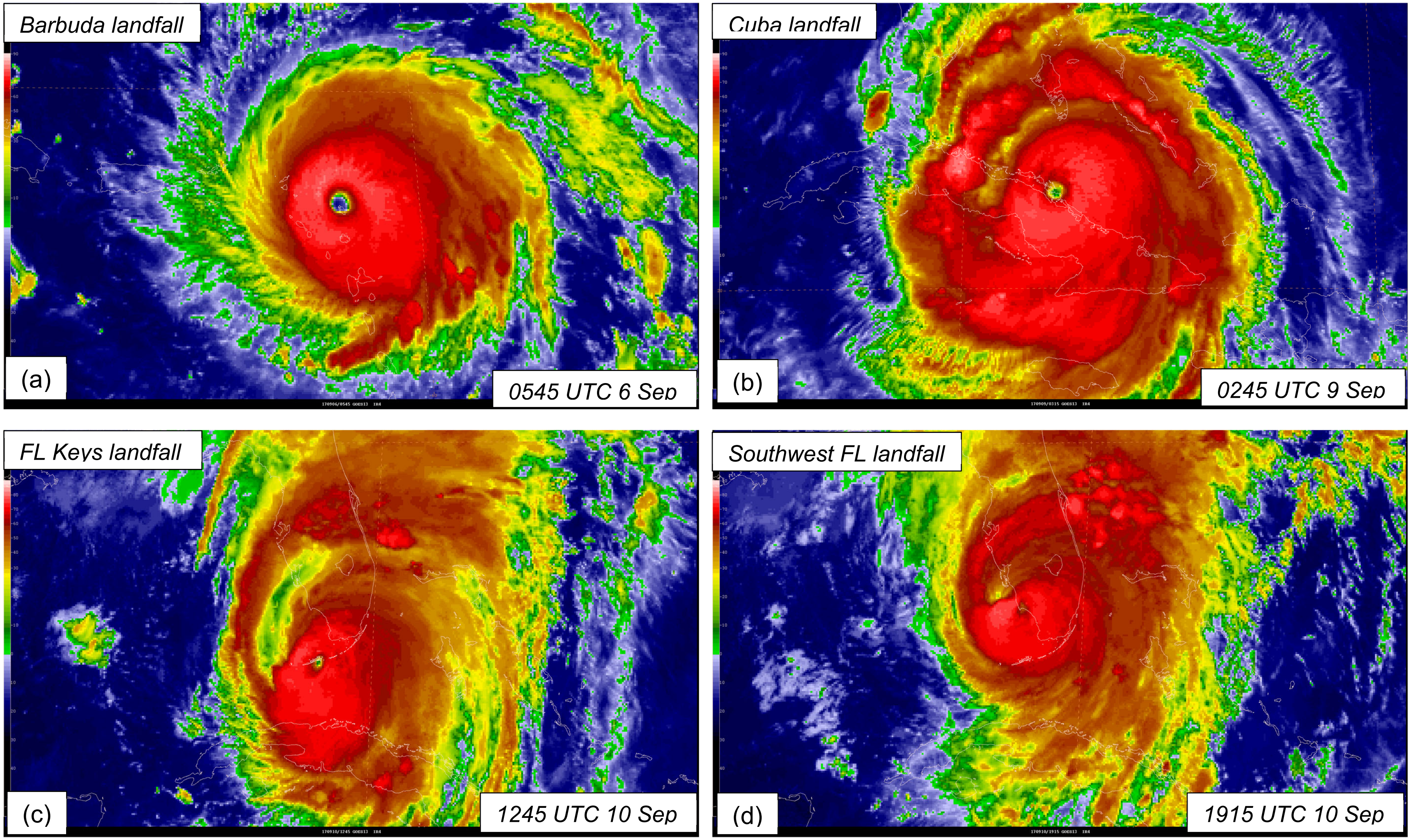

Figure 6. GOES-13 infrared satellite images of selected landfalls of Hurricane Irma, including (a) Barbuda landfall at 0545 UTC 6 September, (b) just prior to Cuba landfall at 0245 UTC 9 September, (c) around the Florida Keys landfall at 1245 UTC 10 September, and (d) while making landfall over southwestern Florida at 1915 UTC 10 September.

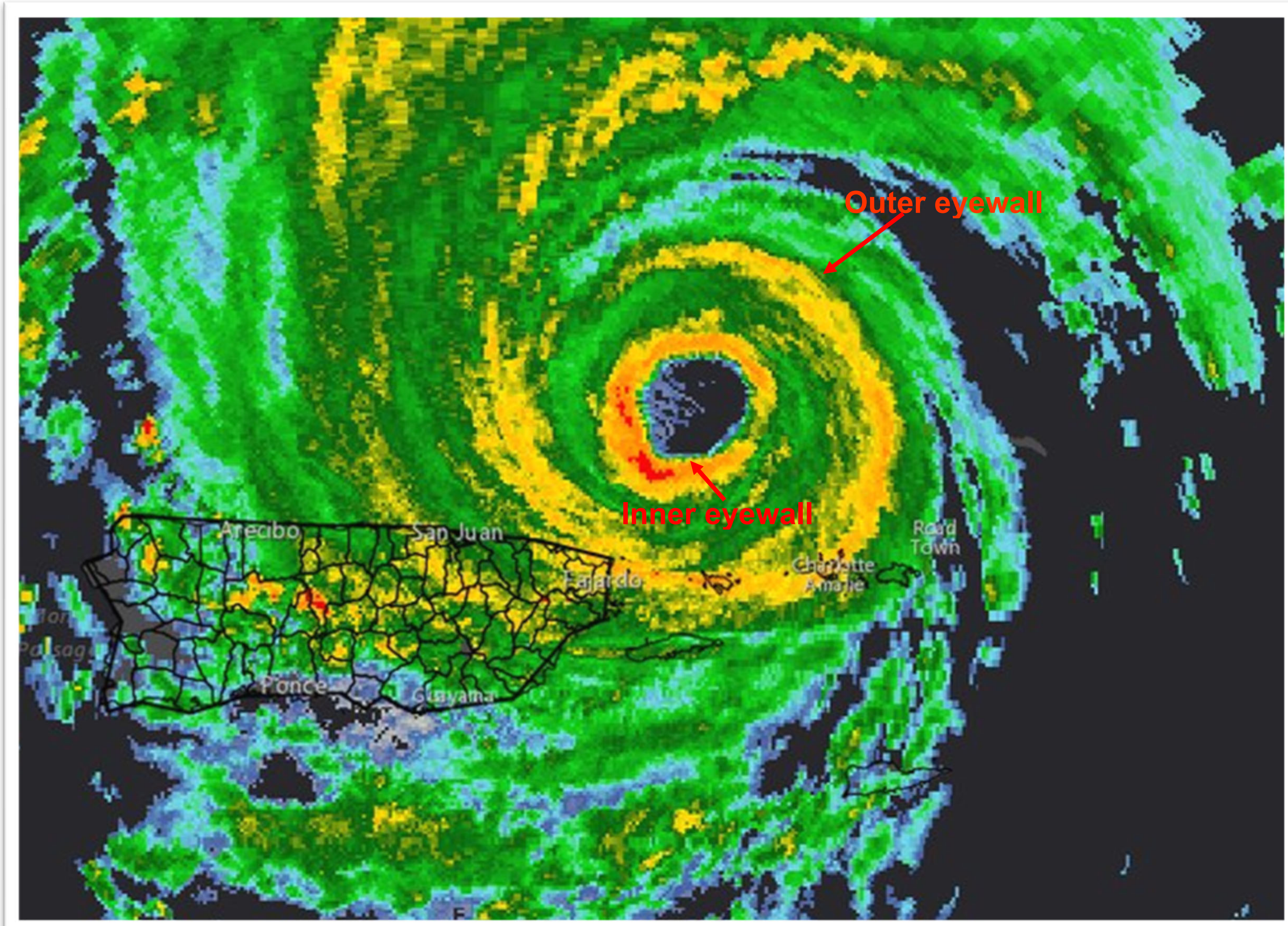

Figure 7. WSR-88D San Juan Doppler radar reflectivity image at 2115 UTC 6 September showing Hurricane Irma's concentric eyewalls.

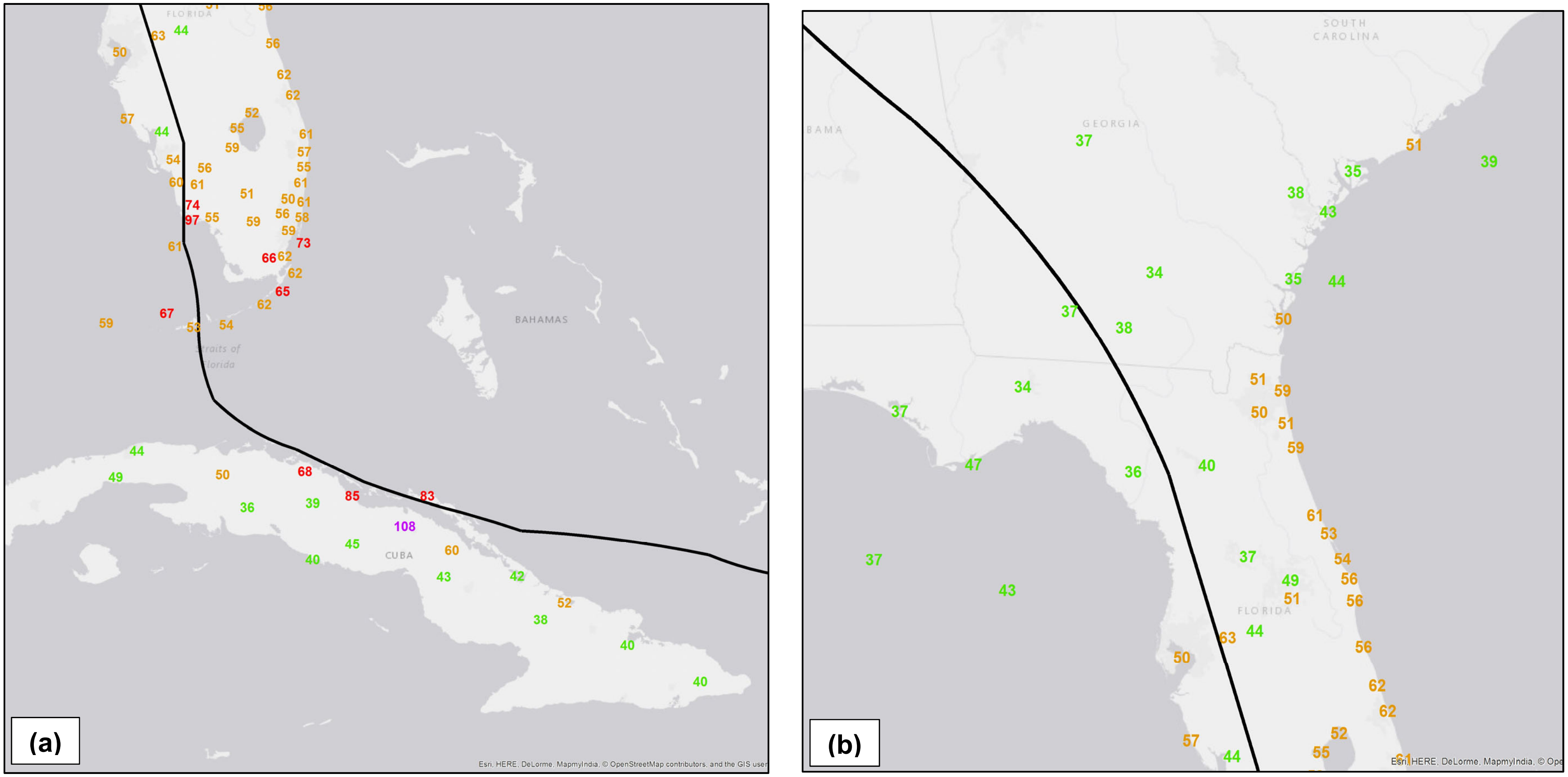

Figure 8. Map of selected observed sustained maximum wind speeds (kt) during Hurricane Irma when it passed over Cuba and the southeastern United States.

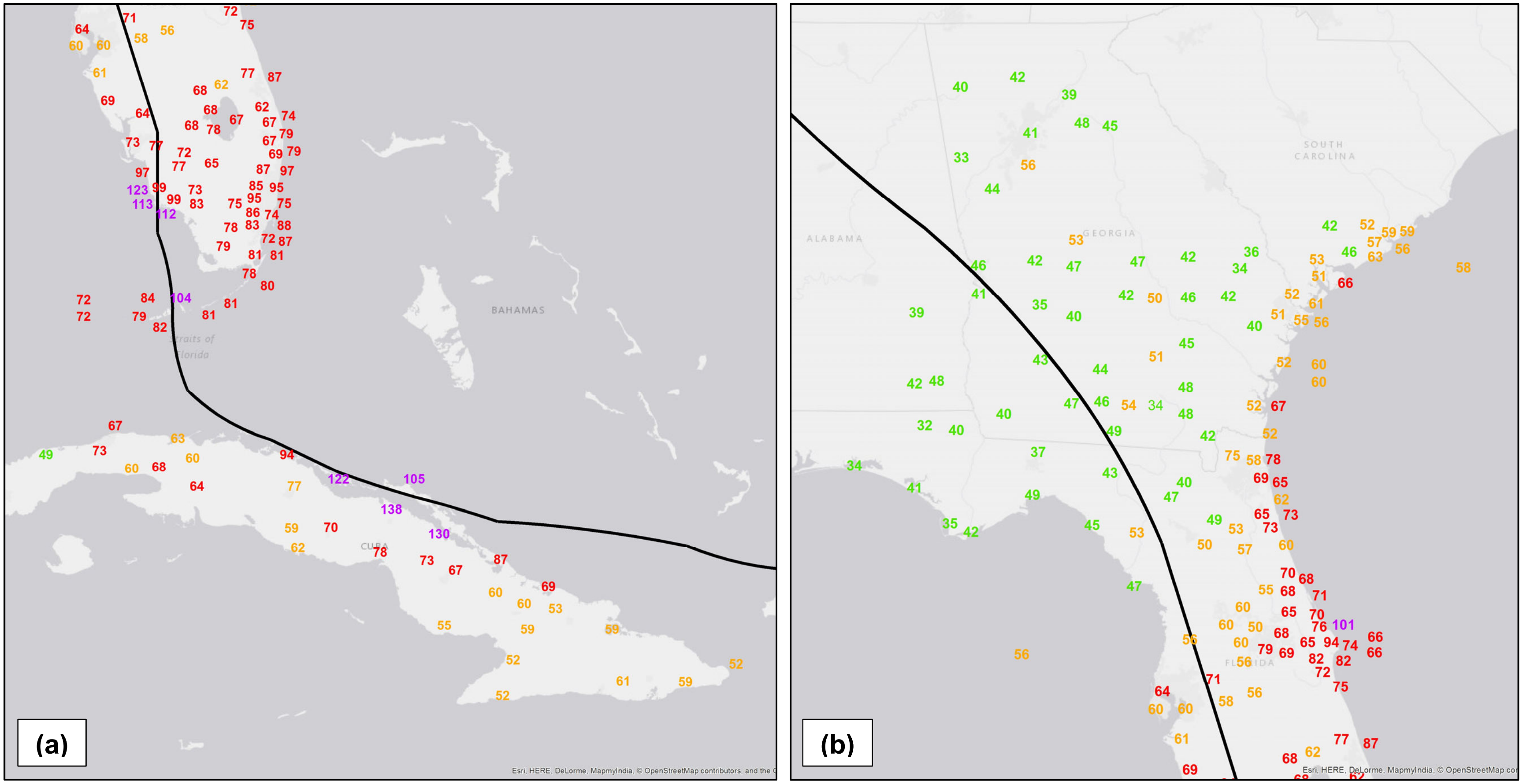

Figure 9. Map of selected observed maximum wind gusts (kt) during Hurricane Irma when it was near Cuba and the southeastern United States.

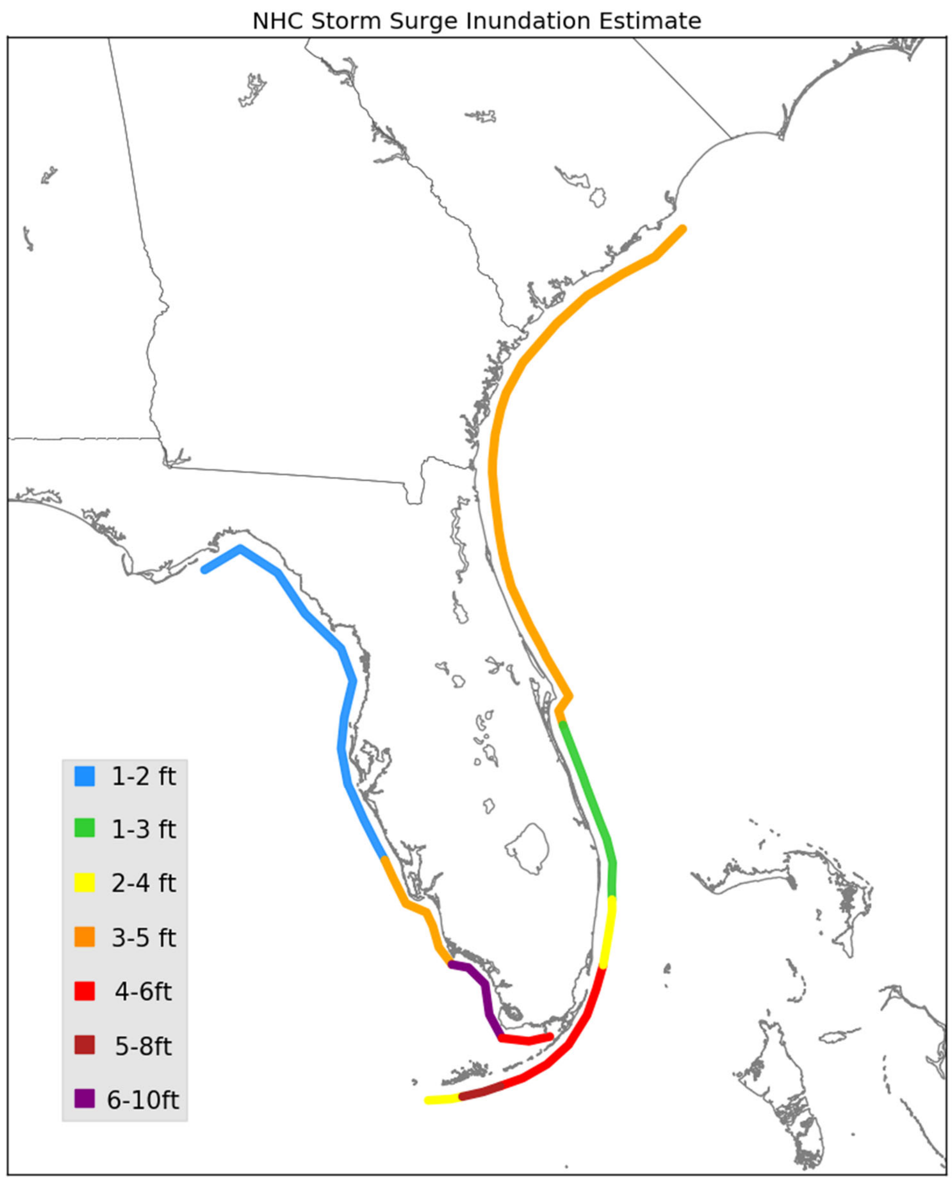

Figure 10: Analyzed storm surge inundation (feet above ground level) along the coasts of Florida, Georgia, and South Carolina from Hurricane Irma. Image courtesy of the NHC Storm Surge Unit.

Figure 11. Pictures showing the depletion of water in Tampa Bay and stranded manatees during Hurricane Irma.

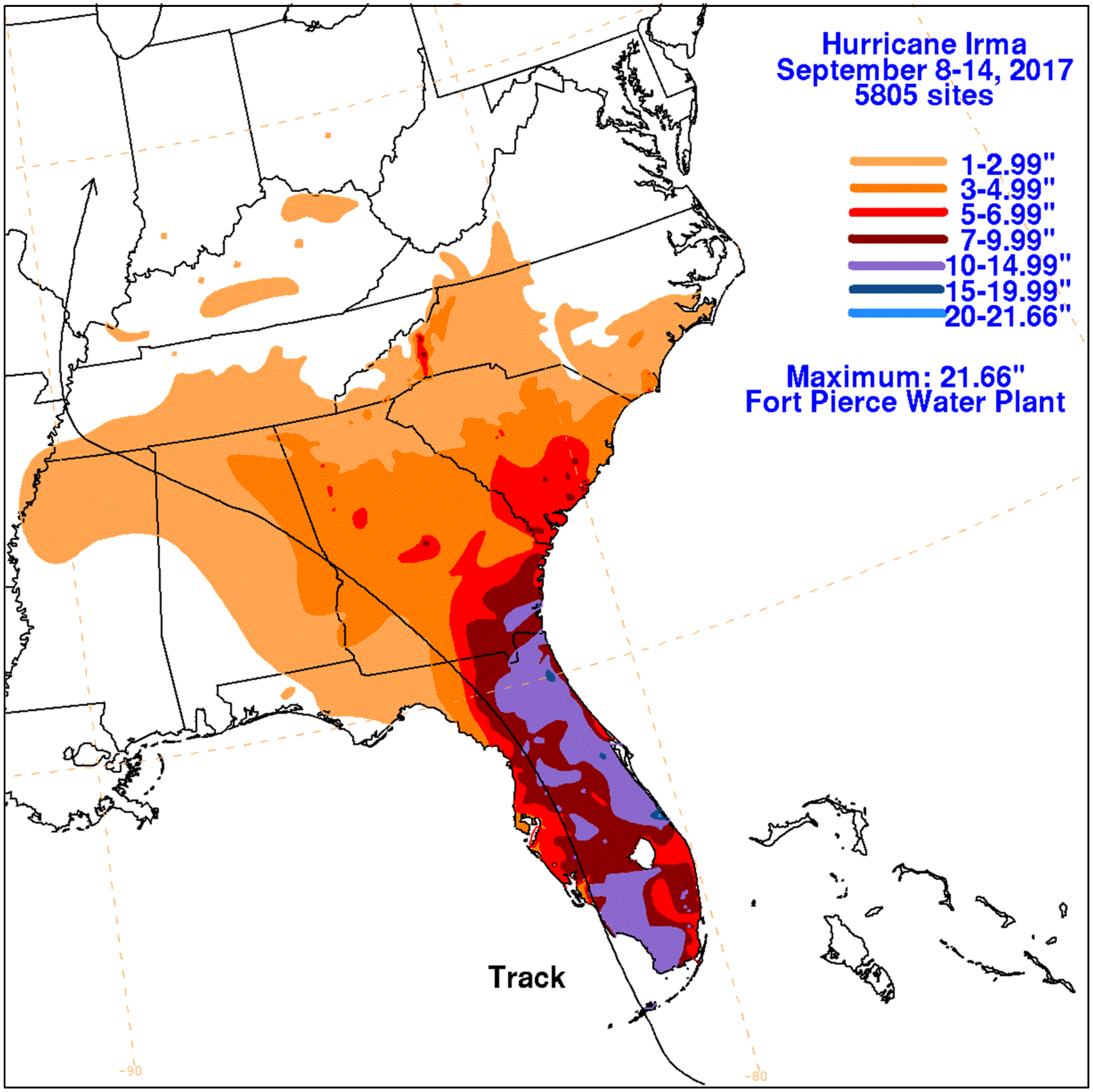

Figure 12. Observed rainfall (inches) from Hurricane Irma over the southeastern United States. Courtesy of David Roth from NOAA's Weather Prediction Center.

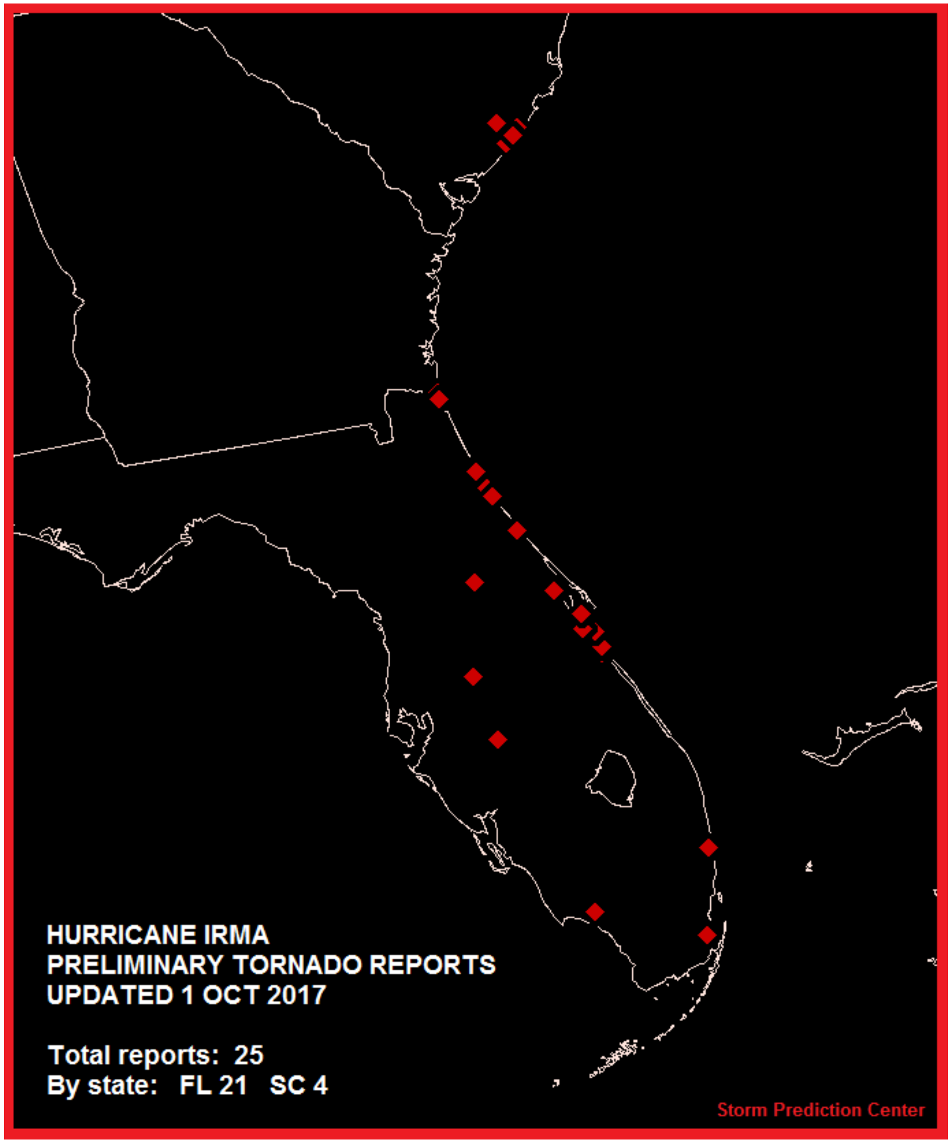

Figure 13. Map of tornado reports from Hurricane Irma. Courtesy of NOAA's Storm Prediction Center.

Figure 14. Examples of damage caused by Hurricane Irma across the Caribbean Islands.

Figure 15. Examples of damage caused by Hurricane Irma across Florida.

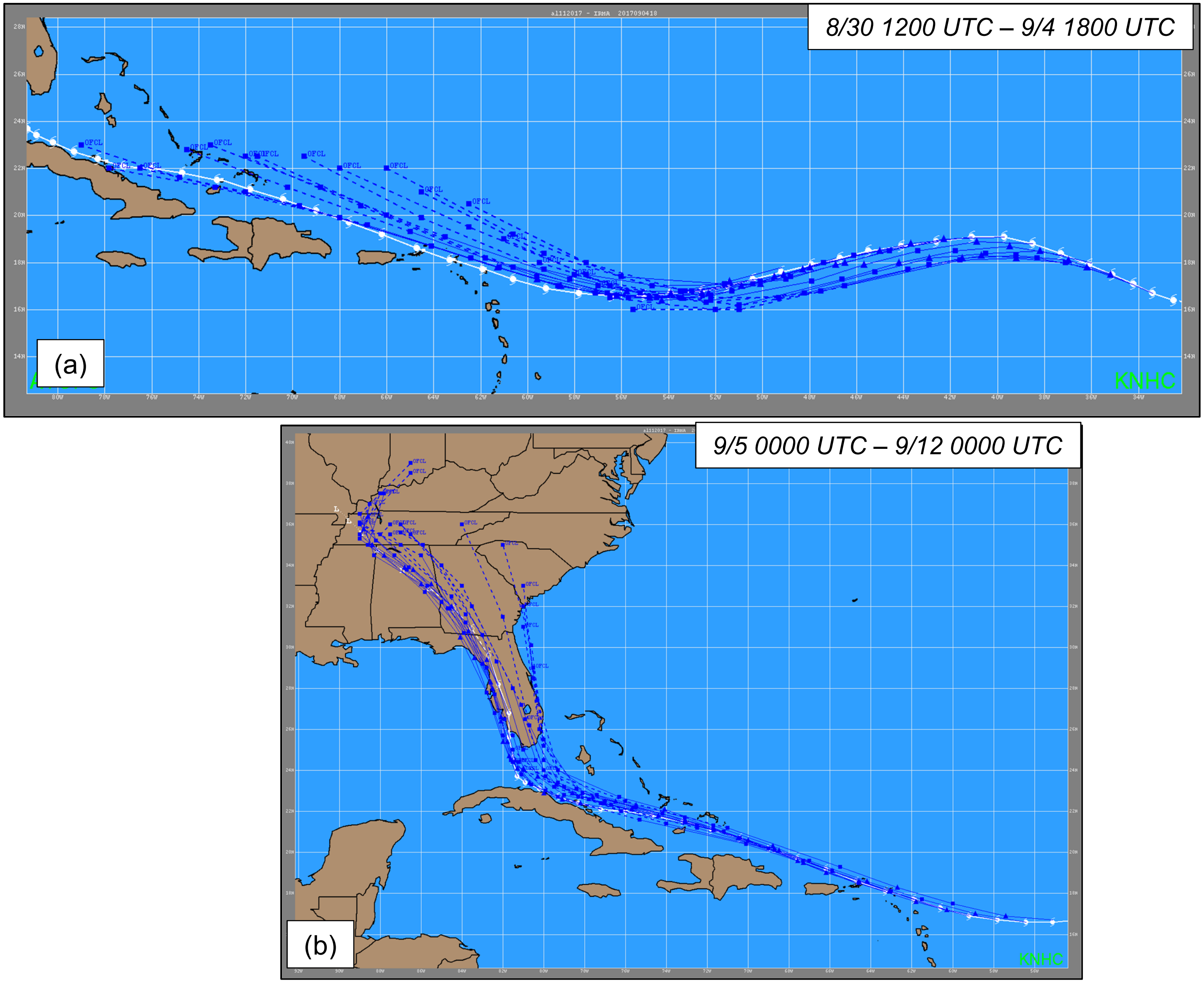

Figure 16. (a) NHC official track forecasts (dashed blue lines) from 1200 UTC 30 August to 1800 UTC 4 September. The best track is given by the white line with positions given at 6 h interval. (b) NHC official track forecasts (dashed blue lines) from 0000 UTC 5 September to 0000 UTC 12 September. The best track is given by the white line with positions given at 6 h interval.

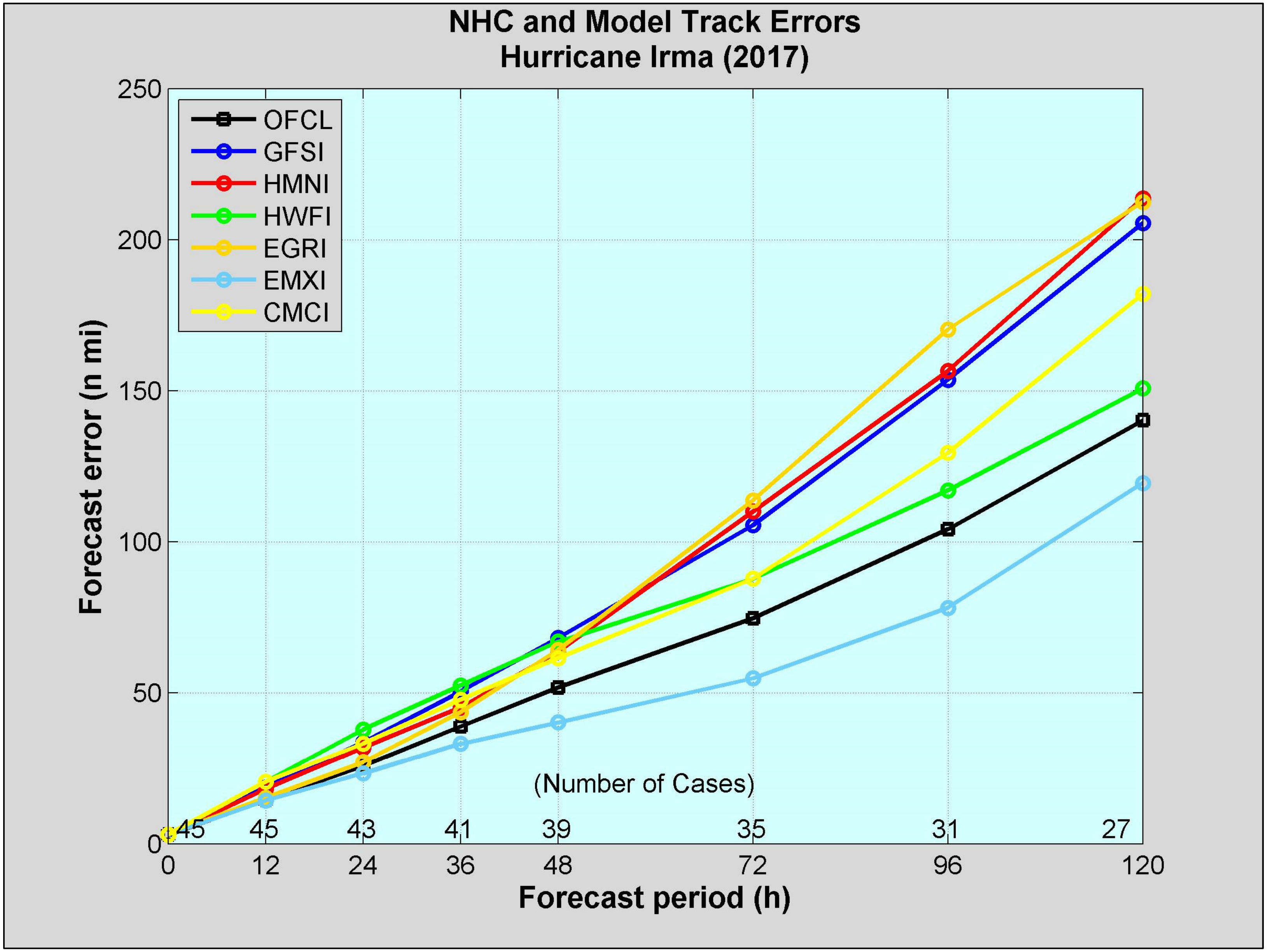

Figure 17. NHC and selected model track forecast errors for Hurricane Irma, 30 August–12 September 2017.

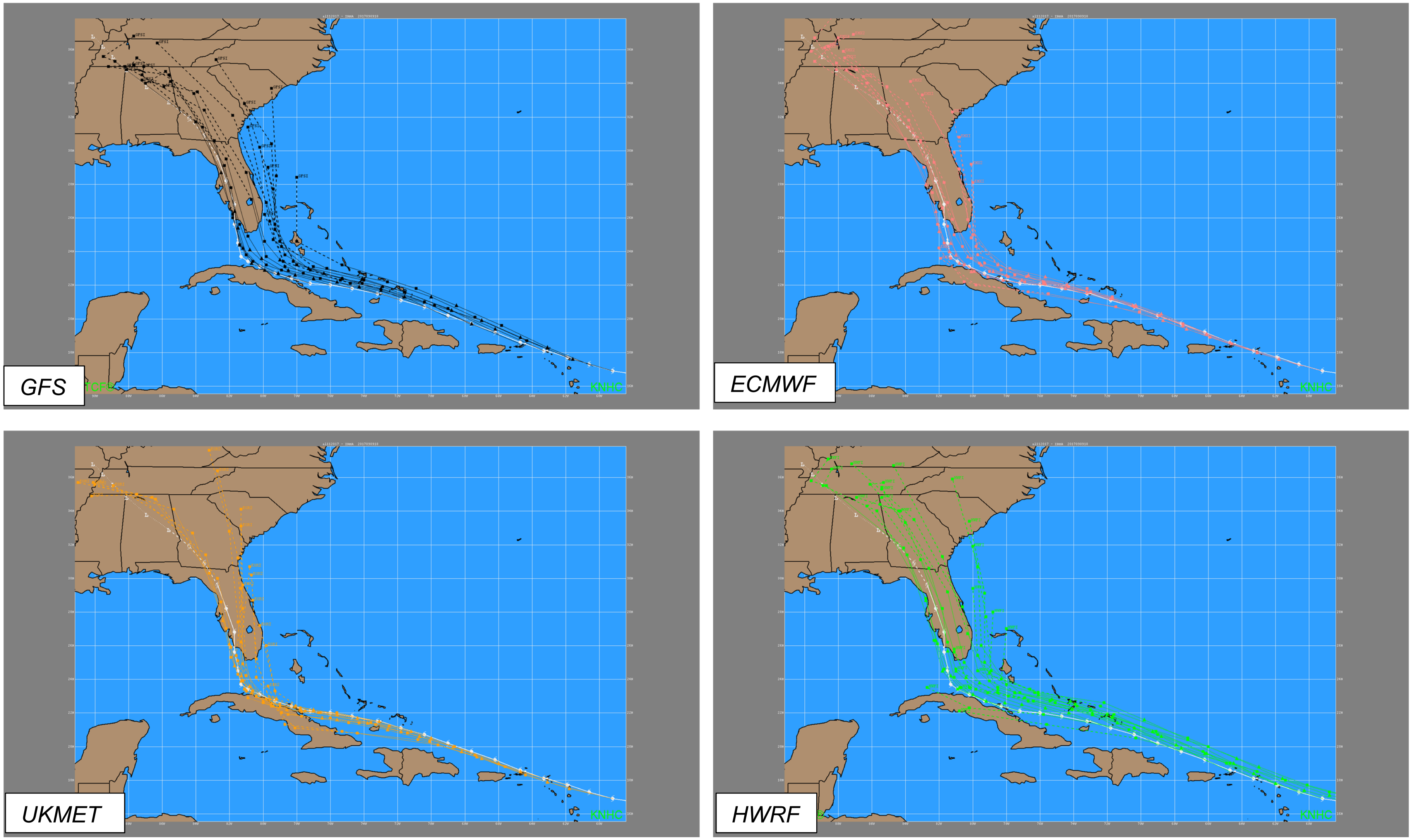

Figure 18. Selected model tracks from 1800 UTC 5 September to 1800 UTC 9 September. The best track is given by the white line with positions shown at 6 h intervals.

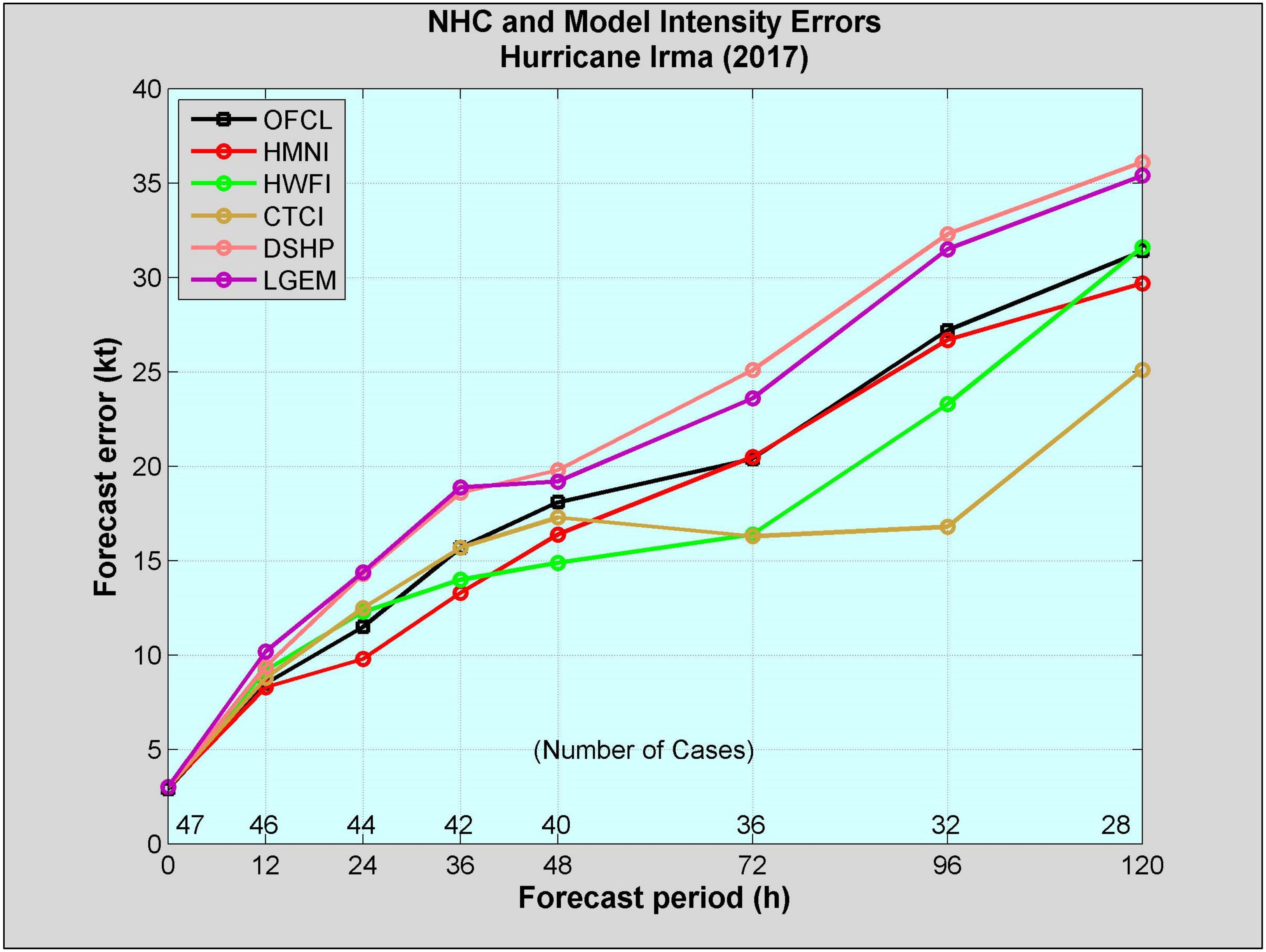

Figure 19. NHC and selected model intensity forecast errors for Hurricane Irma, 30 August–12 September 2017.

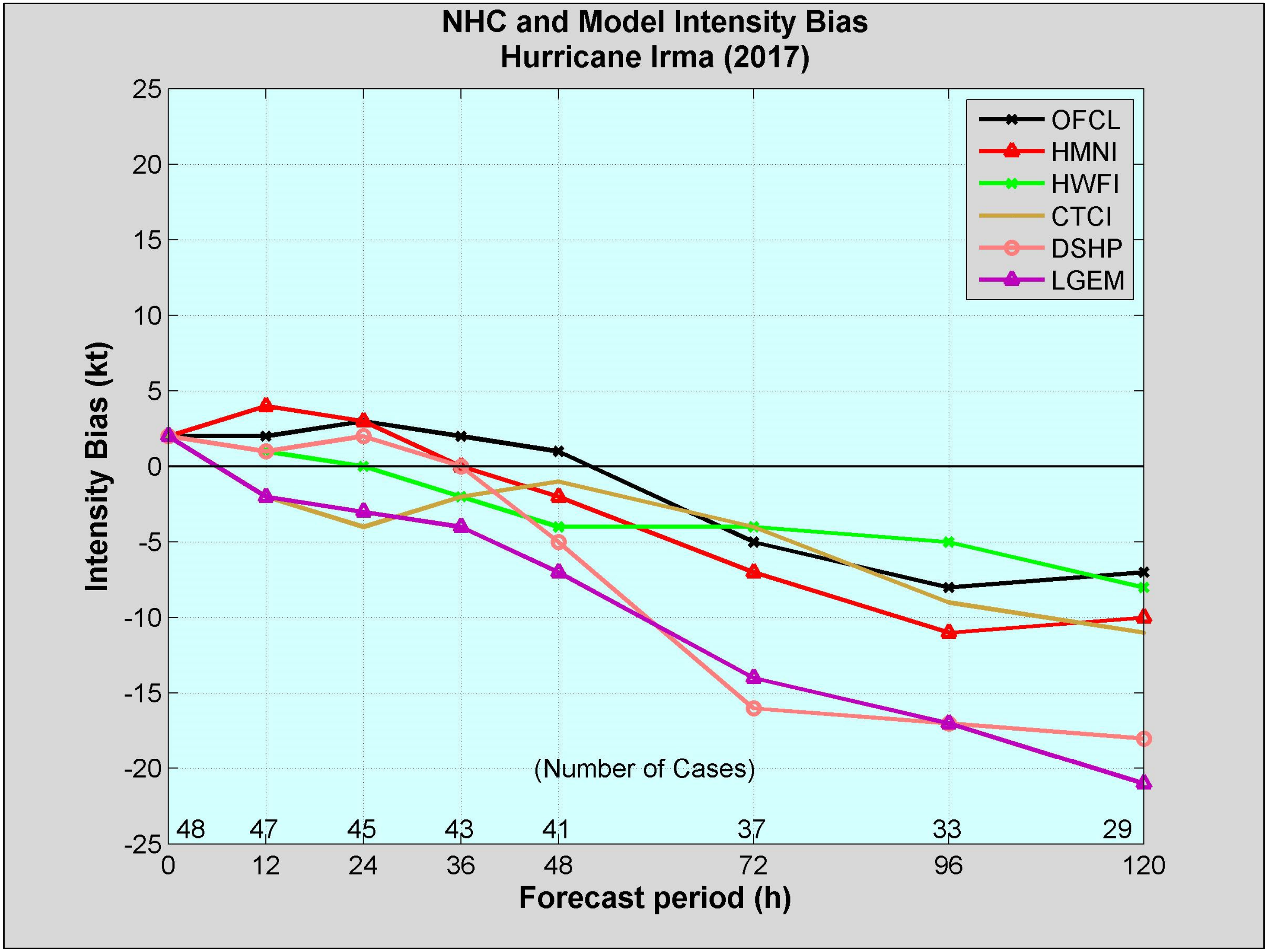

Figure 20. NHC and selected model intensity forecast biases for Hurricane Irma, 30 August–12 September 2017.

Figure 21. Hurricane and tropical storm warnings issued for Hurricane Irma.

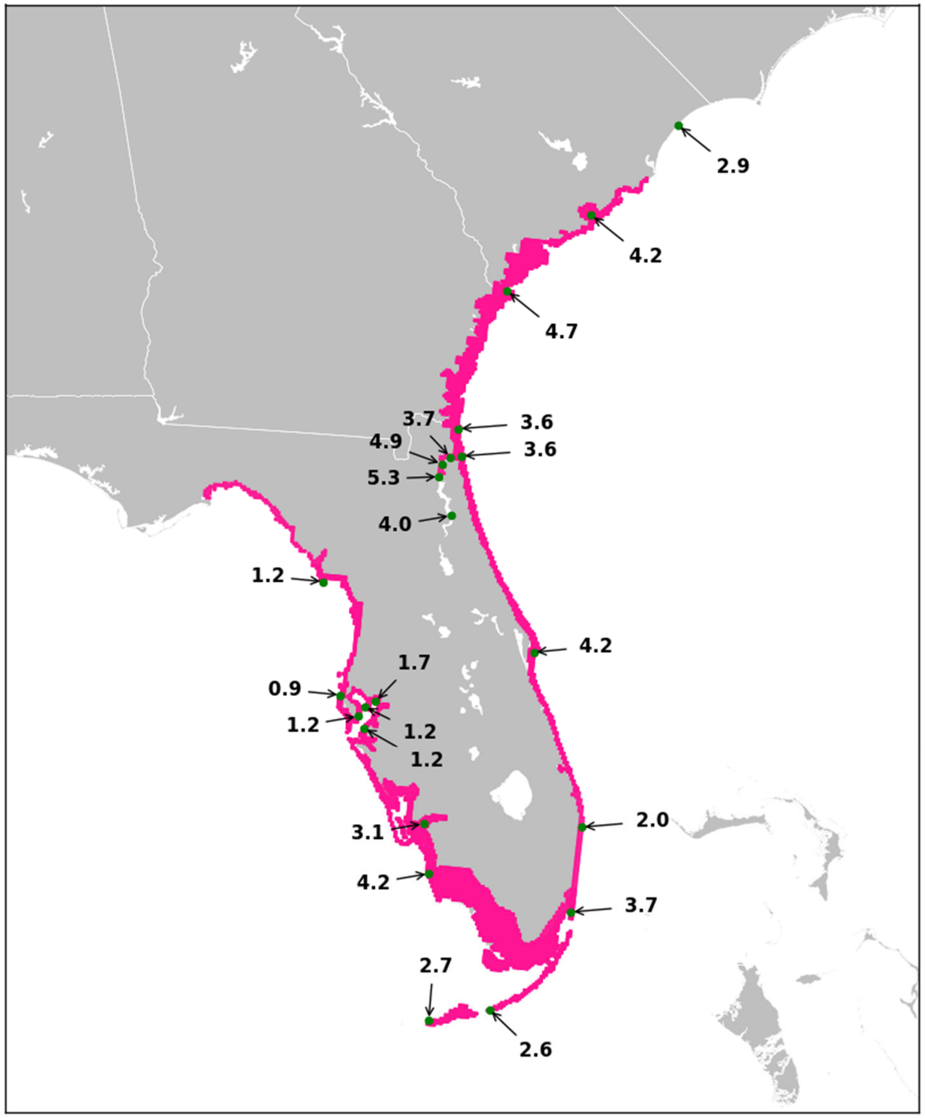

Figure 22. Maximum water level (feet) measured from tide gauges along the coasts of Florida, Georgia, and South Carolina coasts during Hurricane Irma and illustration of the Storm Surge Warning area (magenta). Water levels are referenced above Mean Higher High Water (MHHW), which is used as a proxy of inundation (above ground level) on normally dry ground along the coastline. Image courtesy of the NHC Storm Surge Unit.

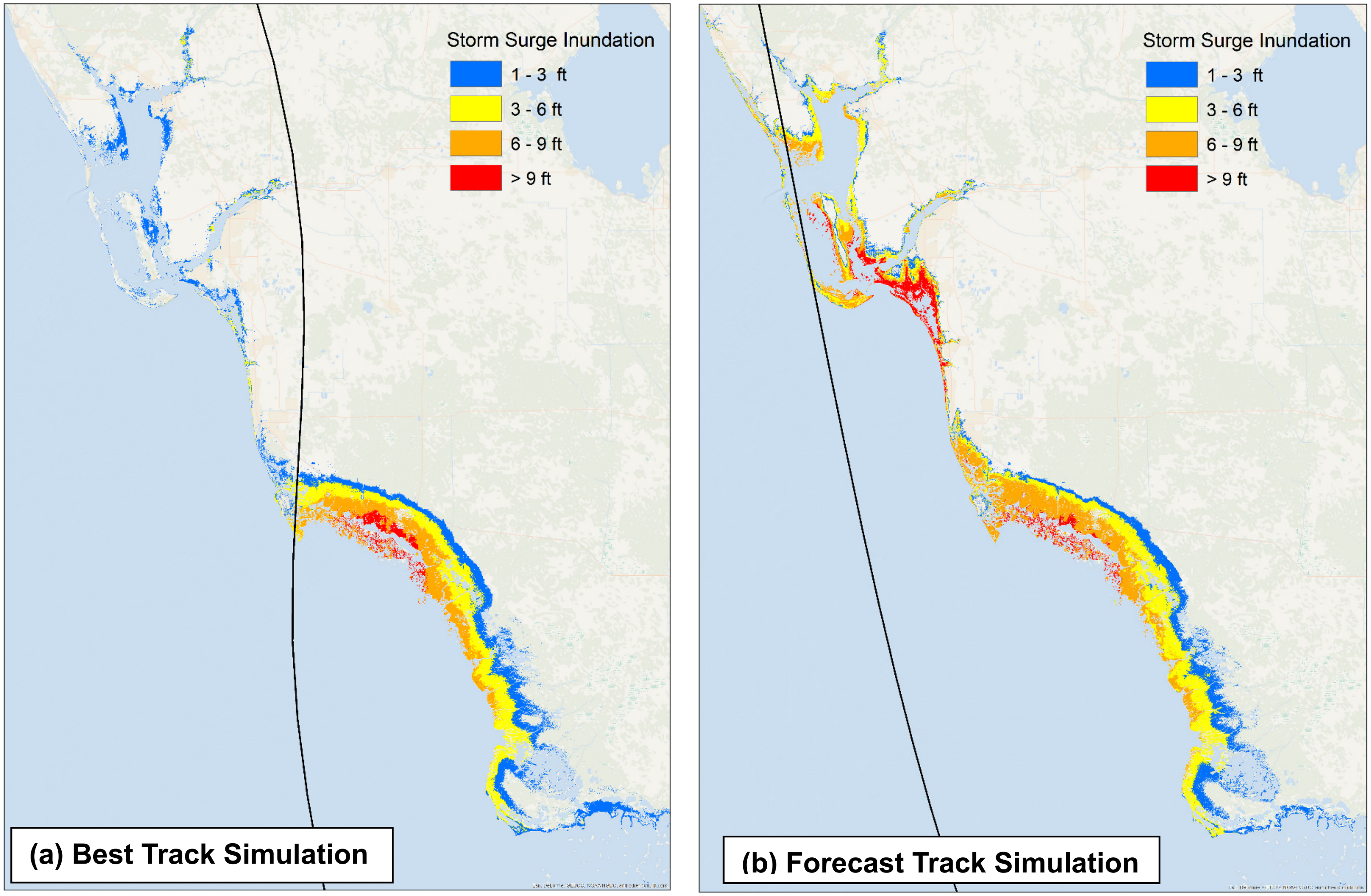

Figure 23. (a) Simulated storm surge inundation (feet above ground level) based on Irma's best track, showing that the highest inundation occurred within the unpopulated area of the Florida coast between Cape Romano and Cape Sable. (b) Simulated storm surge inundation (feet above ground level) based on the NHC official forecast for Irma issued at 2100 UTC 9 September. The simulation shows that if Irma had moved slightly to the west and made landfall farther up the west coast of Florida, significantly higher storm surge inundation (greater than 9 feet above ground level) would have occurred from Naples northward to the Cape Coral area. Images courtesy of the NHC storm surge unit.