NATIONAL HURRICANE CENTER TROPICAL CYCLONE REPORT

HURRICANE ISAIAS

(AL092020)

30 July–4 August 2020

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National Hurricane Center
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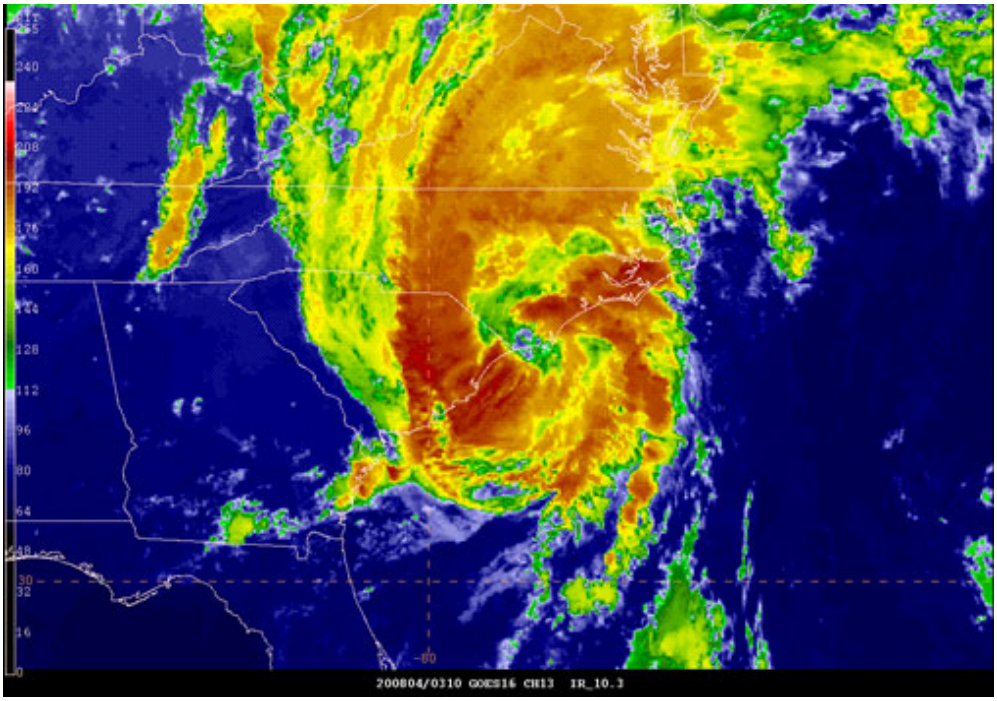

GOES-16 10.3-μM INFRARED SATELLITE IMAGE OF HURRICANE ISAIAS AT 0310 UTC 04 AUGUST 2020 AS IT MADE LANDFALL NEAR OCEAN ISLE BEACH, NORTH CAROLINA.

Isaias was a hurricane that formed in the eastern Caribbean Sea. The storm affected the Leeward Islands, Puerto Rico, Hispaniola, Cuba, the Bahamas, and a large portion of the eastern United States.

[1] Original report date 30 March 2021. Second version on 15 April updated Figure 12. This version corrects a wind gust value in the Winds and Pressures section and the track length of a tornado in Delaware.

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Hurricane Isaias

30 JULY–4 AUGUST 2020

SYNOPTIC HISTORY

The origin of Isaias can be traced back to a vigorous tropical wave that emerged off the coast of Africa on 24 July. The wave moved westward over the next couple of days, steered by an expansive subtropical ridge to its north. A broad area of low pressure developed in association with the wave on 25 July, but convection remained disorganized and confined mainly to the southern portion of the circulation through early 26 July due to dry air entrainment. Later that day, the convection briefly became better organized while the disturbance was located about midway between the African coast and the Lesser Antilles, but quickly waned. The convection once again became better organized by late 27 July; however, the system's low-level circulation remained broad and elongated. By 0000 UTC 29 July, the system began to produce tropical-storm-force winds over a large area within the northern portion of the circulation as it approached the Lesser Antilles but it still lacked a well-defined center. The disturbance crossed the Lesser Antilles that day, bringing widespread heavy rainfall and strong winds to the central and northern portions of those islands, with these conditions spreading across the Virgin Islands and Puerto Rico by late that day. Scatterometer passes by early on 30 July indicated that the system had developed a sufficiently well-defined center and it is estimated that the system became a tropical storm by 0000 UTC 30 July when it was located about 120 n mi south of Ponce, Puerto Rico. The "best track" chart of the tropical cyclone's path is given in Fig. 1, with the wind and pressure histories shown in Figs. 2 and 3, respectively. The best track positions and intensities are listed in Table 1[2].

After formation, Isaias turned toward the west-northwest and then northwest as the cyclone reached the southwestern portion of the ridge. During the first day or so after genesis, Isaias continued to exhibit a large area of tropical-storm-force winds and a band of deep convection over the northern portion of the circulation, which spread across Puerto Rico and eastern portions of the Dominican Republic. The first landfall of Isaias occurred at 1615 UTC 30 July near San Pedro De Macoris in southeastern Dominican Republic, and the cyclone's center crossed the eastern portion of the country during the next several hours. Despite the land interaction, Isaias strengthened as a mid-level center emerged near the northern coast of Hispaniola, and surface observations indicated that the low-level center began to redevelop under that feature later that day. By 0000 UTC 31 July, about the same time that the bulk of Isaias' circulation had emerged over the Atlantic waters, data from an Air Force Reserve reconnaissance

[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.

aircraft indicated that the cyclone had strengthened into a hurricane while the center was located just offshore of the northern coast of Hispaniola.

Isaias continued to move northwestward and made its second landfall around 0900 UTC 31 July as the center crossed Great Inagua Island in the southeastern Bahamas and then passed just west of the central Bahamas through early 1 August. During that time, the wind field gradually contracted, and a central dense overcast (CDO) feature temporarily developed with an embedded small eye as noted in radar imagery from the Bahamas (not shown). By 0000 UTC 1 August, Isaias reached its initial peak intensity of 75 kt while located about 175 miles south-southeast of Nassau. However, both the satellite and radar appearance of the cyclone began to degrade early on 1 August due to an increase in westerly shear and dry air entrainment, and a weakening trend began. Isaias made its third landfall on Andros Island at 1300 UTC 1 August and weakened to a tropical storm by 1800 UTC that day as it emerged back over the waters west of the island. Early on 2 August, the tropical storm made its closest approach to southeastern Florida, with the center coming within 40 n mi of West Palm Beach and Fort Lauderdale. The cyclone turned toward the north-northwest that day into a weakness of the Bermuda-Azores ridge that had developed from northern Florida to offshore of Georgia. This path kept the center of Isaias offshore of the east coast of Florida and over the warm waters of the Gulf Stream, which helped to maintain the storm's intensity while it continued to be affected by strong westerly shear. On 3 August, Isaias turned toward the north, and then toward the north-northeast with an increase in forward speed as the cyclone moved through the weakness in the ridge and came under the influence of southwesterly flow ahead of an approaching mid- to upper-level trough over the United States. Later that day, the shear magnitude decreased while the cyclone's motion became parallel to the shear vector. This allowed Isaias to regain organization and strengthen into a hurricane once again by 1800 UTC that day while located about 100 n mi south of Charleston, South Carolina. Isaias continued to quickly strengthen, reaching its peak intensity of 80 kt by 0000 UTC 4 August when it was located just off the coast of South Carolina. The hurricane made its fourth and final landfall near Ocean Isle Beach, North Carolina, at 0310 UTC 4 August with maximum sustained winds of 80 kt. Isaias then weakened to a tropical storm by 0600 UTC that morning while located about 50 n mi southwest of Greenville, North Carolina.

The cyclone continued to accelerate north-northeastward after landfall, with the center moving across Virginia, Maryland, Delaware, Pennsylvania, New Jersey, New York, and Vermont on 4 August. Isaias did not weaken as rapidly as a typical tropical cyclone moving over land due to baroclinic forcing from a mid- to upper-level trough and a significant portion of Isaias' circulation remaining over water. This resulted in the storm maintaining an intensity of 55–60 kt as its center moved parallel to but about 100 n mi inland of the U.S. east coast. During this time, Isaias produced a swath of heavy rainfall, strong damaging winds, and tornadoes from South Carolina through the Mid-Atlantic states and New England. By 0000 UTC 5 August, surface and radar observations indicated that Isaias had lost tropical characteristics and became an extratropical low as it crossed from Vermont into southeastern Canada. The extratropical low dissipated later that morning over the Canadian Province of Quebec.

METEOROLOGICAL STATISTICS

Observations in Isaias (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 Isaias. Aircraft observations include flight-level, stepped frequency microwave radiometer (SFMR), and dropwindsonde observations from 15 flights (including 50 center fixes) of the 53rd Weather Reconnaissance Squadron of the U.S. Air Force Reserve Command and 10 missions (including 2 center fixes) from the NOAA Hurricane Hunters of the NOAA Aircraft Operations Center (AOC). In addition, the NOAA AOC G-IV aircraft flew 3 synoptic surveillance flights around Isaias, collecting valuable data on the surrounding steering currents and other environmental conditions. Radar data from the Bahamas and National Weather Service WSR-88D radars from San Juan, Puerto Rico, and along the United States east coast were beneficial in tracking Isaias.

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

Winds and Pressure

Isaias' initial peak intensity of 75 kt at 0600 UTC 1 August is based on a blend of flight-level winds and SFMR surface wind speed measurements from the Air Force Reserve Hurricane Hunters. The highest SFMR value during that time was 73 kt, while the aircraft measured flight-level winds of 90 kt at 850 mb, which corresponds to an intensity of 72 kt. Isaias' second peak intensity of 80 kt from 0000 UTC 4 August through landfall in North Carolina is also based on a blend of flight-level winds and SFMR surface wind speed measurements observed by the Hurricane Hunters. The highest SFMR values during that time were 75 kt measured at 0042 UTC and again at 0253 UTC. There were several flight-level observations at 700 mb from 0042–0044 UTC of 100–106 kt, which would yield an intensity of 93 kt using the typical 90% reduction factor from that altitude. However, radar and satellite imagery at the time indicated that the core convection of Isaias was not as deep or well organized as seen in most hurricanes, indicating that a reduction factor less than the usual 90% would be more suitable. Therefore, a blend of the peak 75-kt SFMR measurement and a more conservative flight-level to surface wind reduction supports an intensity estimate of 80 kt from 0000 UTC 4 August through landfall in North Carolina, although the uncertainty in this estimate is larger than usual given the structure of Isaias at the time. While there was one flight-level wind observation of 117 kt, this observation appears to be a singular spike, possibly in a meso-vortex sampled around that same time and is not considered representative of Isaias' intensity.

The minimum pressure of 986 mb at 0000 4 August and at landfall is based on aircraft and buoy observations.

Caribbean Islands and Bahamas

Prior to being designated as a tropical cyclone, the precursor disturbance of Isaias produced a large area of strong winds that spread across the northern Leeward and Virgin Islands as the center of the broad circulation moved westward over the Leeward Islands and into the eastern Caribbean Sea on 29 July. Most of the northern Leeward Islands experienced wind gusts of 35 to 45 kt during the passage of the disturbance. A wind gust to 45 kt was reported on St. Thomas at 1853 UTC, while a gust to 44 kt was reported at the San Juan International Airport in Puerto Rico at 1856 UTC. The disturbance became Tropical Storm Isaias over the eastern Caribbean by 0000 UTC 30 July, and sustained winds to 34 kt and 36 kt were reported at Magueyes Island, Puerto Rico and on Vieques at 1342 UTC and 1418 UTC that day, respectively. A wind gust to 51 kt was reported from the observing station on Vieques.

The highest wind gusts reported in the Dominican Republic were 30 kt at Punta Cana and Sabana de la Mar at 1500 and 1800 UTC 30 July, respectively. While there were no sustained winds of tropical storm force reported in the Dominican Republic, scatterometer wind data suggested that tropical-storm-force winds likely occurred along the southeastern coast of the island.

A peak sustained wind of 48 kt and a gust to 51 kt was observed on Providenciales in the Turks and Caicos at 0434 UTC 31 July before the instrument stopped reporting. In the Bahamas, a wind gust to 47 kt was reported at 1424 UTC 31 July at San Salvador Airport on San Salvador Island, and a gust to 49 kt was measured at 1200 UTC 1 August at Lynden Pindling Airport in Nassau. At 1430 UTC 2 August, sustained winds of 41 kt and a gust to 56 kt were reported by an observing station at Settlement Point, located on the westernmost tip of Grand Bahama Island.

United States

The strongest sustained surface wind reported in southeast Florida during Isaias was 42 kt at Stuart Beach at 1154 UTC 2 August. The highest wind gust was 50 kt, observed at Dania Beach Pier near Ft. Lauderdale at 0232 UTC that day. The strong winds from the storm spread northward over east-central Florida, while the center of the cyclone slowly increased its distance from the shoreline. At Melbourne Beach, sustained winds reached 36 kt at 2006 UTC with a gust to 43 kt. Farther north at Jacksonville Beach, a wind gust to 36 kt was reported the morning of 3 August.

A sustained wind of 33 kt and gust to 36 kt occurred on Tybee Island, Georgia, at 1724 UTC 3 August. Late that day, the center of the hurricane passed near NOAA buoy 41004, producing a sustained wind of 58 kt at 2349 UTC and a gust to 69 kt. The lowest pressure reported from the buoy was 988.8 mb at 2240 UTC, while the winds had decreased to around 21 kt as the center of the cyclone passed over. Just prior to U.S. landfall, the ragged eye of Isaias (cover photo) passed directly over NOAA buoy 41024, where the lowest pressure reported was 988.3 mb at 0223 UTC while sustained winds were about 25 kt.

The strongest winds reported in North Carolina were at Federal Point, with sustained winds of 69 kt at 0250 UTC, and a gust to 86 kt. Oak Island reported sustained winds of 66 kt at 0321 UTC and a gust to 76 kt. There were several other reports of sustained winds of 50 to 60 kt and gusts of 60 to 74 kt across coastal sections of southern North Carolina around the time of landfall. The lowest pressure recorded over land of 989.0 mb was at Lockwoods Folly Inlet and Oak Island at 0307 and 0321 UTC, respectively. In South Carolina, the highest sustained wind reported was 53 kt at Winyah Bay at 2316 UTC on 3 August. The highest wind gust in the state was 61 kt at Crescent Beach at 0314 UTC 4 August.

Tropical storm conditions spread northward along the Mid-Atlantic coast and adjacent inland areas east of the storm's center (Fig. 4). The highest sustained wind reported in Virginia was 63 kt that was observed at 1157 UTC at the elevated height of 52 feet at the Third Island Chesapeake Bay Bridge Tunnel. A wind gust to 76 kt was observed at 1118 UTC at Chesapeake Channel. In Ocean City, Maryland, a sustained wind of 55 kt and a gust to 64 kt was reported. The strongest winds reported in Delaware near the standard surface elevation was a sustained wind of 52 kt and a gust to 59 kt. There were numerous other observations across this region of sustained winds of 50 to 55 kt with gusts to hurricane force.

There were several observations of sustained winds of 50+ kt along the coastal areas from New Jersey to New York, while sustained winds to tropical storm force were reported as far inland as Allentown, Pennsylvania. The highest sustained wind reported on land in this region was 57 kt at 1456 UTC on Long Beach Island, New Jersey. There was also a wind gust to 95 kt at this same observing station. However, these values were due to the passage of a waterspout at that location and therefore were not representative of the wind field of the tropical cyclone. A wind gust to 70 kt was reported at Egg Harbor, New Jersey, and there were several other observing sites that reported gusts of 65 to 68 kt across coastal sections of Delaware, New York, and New Jersey (Fig. 5). Sustained winds of 40–45 kt and wind gusts of 50–60 kt occurred across Massachusetts, Rhode Island, Connecticut, and coastal sections of New Hampshire, well to the east of the center of Isaias. There were several locations across Vermont and Maine that reported wind gusts of tropical storm force. It is interesting to note that Isaias passed close to the summit of Mount Washington, New Hampshire, where sustained winds of 84 kt were recorded at 2210 UTC 4 August along with a gust to 108 kt around that same time.

Rainfall and Flooding

Even though the center of Isaias did not directly pass over Puerto Rico, rainfall totals between 8 and 13 inches occurred at many locations across the island associated with the outer bands of the storm (Fig. 6). This rainfall resulted in flash and river flooding which flooded numerous roadways. Isaias also produced heavy rainfall over the Dominican Republic, where there were multiple reports over 8 inches (203 mm), which produced widespread flooding (Fig. 7).

There were only minor impacts from Isaias' rainfall as it moved across Inagua Island and across Andros Island. Although the center of the cyclone passed within 40 n mi of the southeastern Florida coast, dry air on the western side of the circulation as well as westerly shear limited storm-total rainfall in the state to under 3 inches.

Isaias produced a swath of heavy rainfall extending from the Carolinas through the Mid-Atlantic region and into southern New England (Fig. 8). In the Carolinas, there were several storm total reports of 5–7 inches of rainfall along coastal sections of the upper South Carolina coast. The highest rainfall total reported in South Carolina was 7.01 inches near McClellanville. North Carolina experienced rainfall totals of 3–6 inches, primarily over the inland sections of the eastern portion of the state. The highest rainfall total in the state was 6.00 inches just west-northwest of Windsor. Other than a couple of road and lane closures, there was no significant flooding reported due to this rainfall.

There were numerous observations of 5-8 inches of rainfall across Virginia, Maryland, and Delaware, with some localized higher amounts. In Virginia, the highest rainfall total was 7.03 inches near the town of Lightfoot, while the maximum rainfall total reported in Maryland was 9.15 inches near Leonardtown. In Delaware, 6.7-inch totals were reported at two different observing stations. Several streams rose above their flood stages, resulting in road closures and flash flooding. The stream gauge at Saint Clements Creek in Clements, Maryland, reached moderate flood stage and peaked over 2 ft above its flood stage on 4 August.

In eastern Pennsylvania and extreme western New Jersey, widespread rainfall totals of 4–7 inches were reported, with a few amounts in excess of 7–8 inches. The highest totals were 8.85 inches reported in Harleysville, Pennsylvania, and 7.86 inches near Salem, New Jersey. In eastern Pennsylvania, some of the worst flooding associated with Isaias in the United States occurred as this heavy rain fell on ground already saturated due to recent rains. This led to severe flash flooding and significant river flooding (Fig. 9). Widespread minor to moderate flooding occurred with a few rivers reaching major flood stage. A couple of sites, including the Little Lehigh Creek at Allentown and the Perkiomen Creek at Graterford, reached their highest levels on record.

Rainfall totals gradually tapered off as the cyclone moved across New York and New England. The highest storm total rainfall reported in New York was 5.92 inches in Tannersville, while there were several locations across New England observing rainfall amounts between 3–4 inches, but with no significant flooding impacts.

Storm Surge[3]

Isaias produced peak storm surge inundation levels of 3 to 6 ft above ground level along the extreme southern coast of North Carolina and the Grand Strand region of South Carolina (Table 3, Fig. 10). The highest inundation occurred along the coast of Brunswick County, North Carolina, between Cape Fear and the North Carolina/South Carolina border, just to the east of Isaias' landfall location. Two United States Geological Survey (USGS) water level pressure

[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).

sensors deployed on the beachfront at Ocean Isle Beach and Oak Island recorded wave-filtered water levels of 8.68 ft and 8.13 ft above the North American Vertical Datum of 1988 (NAVD88), respectively. These readings convert to 6.3 ft and 6.0 ft, respectively, above Mean Higher High Water (MHHW) and indicate that the highest inundation levels in that area were around 6 ft above ground level. Sensors were also deployed along the Intracoastal Waterway behind the barrier islands at Ocean Isle Beach and Holden Beach, and each of these instruments measured water levels of 4.8 ft MHHW. Along the Grand Strand of South Carolina, USGS sensors deployed at Myrtle Beach and Surfside Beach recorded peak wave-filtered water levels of 7.60 ft and 7.73 ft above NAVD88, respectively, which each convert to 5.3 ft MHHW. Multiple sensors from Winyah Bay northward to the North Carolina border measured peak water levels of 3 ft MHHW or greater. A National Ocean Service (NOS) tide gauge at Springmaid Pier in Myrtle Beach measured a storm surge of 4.26 ft above normal tide levels and a peak water level of 4.6 ft MHHW. An NOS gauge at Oyster Landing recorded a peak water level of 3.5 ft MHHW.

Storm surge inundation levels of 2 to 4 ft above ground level occurred along other parts of the southern North Carolina coast, particularly up the Cape Fear River into Wilmington. The NOS gauge at Wilmington recorded a record water level of 4.35 ft MHHW, surpassing the previous record of 3.60 ft MHHW measured during Hurricane Florence (2018). This gauge also registered the highest departure from normal tides of any NOS gauge during Isaias, recording a storm surge of 5.57 ft above normal tide levels. Along the open coast, two USGS sensors recorded wave-filtered water levels of 3.3 ft MHHW at Carolina Beach and Topsail Beach.

Inundation of 1 to 3 ft above ground level occurred along the remainder of the North Carolina coast, including on the Outer Banks and along Pamlico and Albemarle Sounds. Within that area, the highest available water level readings were 3.1 ft MHHW from a USGS sensor in Belhaven along the Pungo River (an arm of Pamlico Sound) and 3.1 ft MHHW from a USGS sensor at Nags Head. A storm surge hindcast (not shown) suggests that inundation a little higher than 3 ft above ground level may have occurred in some areas along Pamlico and Albemarle Sounds, but most of these areas appear to be wetlands adjacent to rivers that empty into the sounds.

Along the coasts of eastern Florida, Georgia, and the remainder of South Carolina (west of the track of Isaias' center), maximum recorded water levels were 1 to 2 ft above ground level (Fig. 11). The highest water levels recorded by NOS tide gauges in each region were 1.6 ft MHHW at Fernandina Beach, Florida; 1.7 ft MHHW at Fort Pulaski, Georgia; and 1.7 ft MHHW at Charleston, South Carolina.

Storm surge inundation levels were also generally 1 to 2 ft above ground level along the U.S. Mid-Atlantic coast, however localized inundation higher than 2 ft likely occurred in some areas within Chesapeake Bay and Delaware Bay. The highest observed water level in Chesapeake Bay was 2.5 ft MHHW at an NOS gauge in Cambridge, Maryland, which was just high enough to reach the National Weather Service's level of major coastal flooding at that location. All other NOS gauges within the bay had peak water levels less than 2 ft MHHW. A combination of storm surge and heavy rainfall also caused moderate to minor flooding within portions of Delaware Bay and along tidal portions of the Delaware River, with most NOS tide

gauges in that region recording peak water levels of 2.0 ft MHHW or higher. The NOS gauge farthest upriver at Newbold, Pennsylvania, measured a peak water level of 3.0 ft MHHW.

A noteworthy storm surge (departure from normal tide levels) also occurred along the New Jersey coast and in the New York City metropolitan area, but there was little to no coastal flooding because the peak surge occurred just before low tide. For example, the NOS gauges at Bergen Point West, New Jersey, and The Battery in Lower Manhattan recorded storm surges of 4.91 ft and 4.49 ft, respectively, above normal tide levels, but the actual peak water levels measured by the gauges were only 1.7 ft and 1.6 ft MHHW.

Negligible storm surge occurred along the coast of Puerto Rico and the U.S. Virgin Islands when Isaias passed to the south of the islands as a tropical storm. The maximum measured storm surge recorded by an NOS gauge was 1.36 ft above normal tide levels on Magueyes Island, Puerto Rico, which resulted in a peak water level of 1.2 ft MHHW. All other NOS gauges on the islands recorded peak water levels less than 1 ft MHHW.

There were no known storm surge reports from the Dominican Republic or the Bahamas.

Tornadoes

Isaias produced 39 confirmed tornadoes: 13 in North Carolina, 10 in Maryland, 7 in Virginia, 3 in Delaware, 2 in New Jersey, 2 in Pennsylvania, 1 in South Carolina, and 1 in Connecticut (Fig. 12). Of the tornadoes, 1 was rated EF-3 (on the enhanced Fujita Scale), 7 were EF-2, 17 were EF-1, and 14 were EF-0. The 39 tornadoes that occurred during Isaias was the largest number produced by a U.S. landfalling tropical cyclone since Hurricane Florence in 2018 (44 tornadoes).

The tornado outbreak began at 1855 UTC 3 August, as outer rain bands began to spread inland across the Carolinas well before Isaias made landfall in North Carolina. A cold front and associated upper-level trough approaching the region helped to enhance vertical wind shear profiles as Isaias approached, resulting in a favorable environment for the development of tornadoes. Seventeen of the 39 tornadoes occurred before the hurricane made landfall early on 4 August – over a span of about 8 hours. Another 21 tornadoes were spawned in a 7-hour period beginning when Isaias made landfall in North Carolina.

The EF-3 tornado that Isaias spawned in Bertie County, North Carolina was the first tornado of that intensity produced by a tropical cyclone since Hurricane Rita in 2005. One of the EF-2 tornadoes that occurred in Delaware remained on the ground for 35.5 miles, becoming the longest-track tornado on record for that state. The winds of two of the tornadoes that occurred were sampled by surface weather observing equipment. A wind gust to 83 kt was measured at a Delaware Department of Transportation weather station as the circulation of an EF-2 tornado passed by. A wind gust to 95 kt was reported near Long Beach Island, New Jersey, and was the basis for the EF-1 intensity assigned to the tornado that struck the observing site. For specifics about the damage and casualties from some of the individual tornadoes, please see the “Casualty and Damage Statistics” section of this report.

CASUALTY AND DAMAGE STATISTICS

Isaias caused 12 direct[4] deaths as a result of strong winds, heavy rains, tornadoes, and high surf across the Caribbean Islands and eastern United States. Ten of the casualties occurred in the continental United States, where Isaias affected a large geographical area while spawning a tornado outbreak and bringing heavy rainfall to already saturated areas. The storm also caused 2 direct fatalities in the Caribbean – 1 in Puerto Rico and 1 in the Dominican Republic. Of the direct fatalities, 6 were due to wind, 3 were drownings due to freshwater flooding, 2 were the result of tornadoes and 1 was a drowning due to a rip current. In addition to the direct fatalities, 4 indirect deaths were reported in the United States and 1 in the Dominican Republic. Numerous others were injured before, during, or after the passage of Isaias.

Caribbean and the Bahamas

In Puerto Rico, a 56-year-old woman drowned as she was swept away in her vehicle by floodwaters in the coastal town of Rincón. In the Dominican Republic, a 5-year-old boy was killed when the winds from Isaias blew a tree onto a home in the town of Altamira in Puerto Plata.

Strong winds from Isaias damaged roofs, knocked over billboards, and caused numerous trees and power lines to fall across Puerto Rico. Nearly a half a million people lost power, including 23 hospitals. Heavy rainfall produced widespread flooding that forced several dams' floodgates to be opened. This flooding resulted in 150,000 people losing drinking water service. In Mayagüez, Puerto Rico, 25 people were trapped by flood waters which resulted in water rescues by the National Guard. According to the Puerto Rico Department of Agriculture, nearly 50 million USD in damage occurred to agriculture on the island due the effects of Isaias. The Dominican Republic experienced similar conditions as Puerto Rico, with reports of downed limbs and trees as well as widespread flooding.

The effects of Isaias across the Bahamas from 31 July to 1 August produced damage to roofs and knocked down trees. Although the center of Isaias crossed Andros Island, the damage reported there was generally minor. The passage of the storm made it particularly difficult for those locations still trying to recover from Hurricane Dorian from the year prior.

Continental United States

In the continental United States, there were 10 direct fatalities: two in both North Carolina and Pennsylvania and one each in the states of South Carolina, Maryland, Delaware, New York,

[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.

Connecticut, and New Hampshire. At one point in time, nearly 3 million customers were without power in the United States along the path of the storm.

In addition to the 10 direct deaths, Isaias produced widespread wind damage, heavy rainfall, and both inland and coastal flooding across much of the United States east coast. The storm also spawned 39 tornadoes, some that caused extensive to catastrophic damage. The NOAA Centers for Environmental Information (NCEI) estimates that the wind and water damage caused by Isaias in the United States, including Puerto Rico and the U.S. Virgin Islands, totaled approximately 4.8 billion USD. Nearly 3.5 billion of this damage occurred in the northeastern United States, making Isaias the costliest tropical cyclone to affect that region since Hurricane Sandy in 2012.

Florida and Georgia

Damage in Florida was mostly minor. There was minor beach erosion that occurred due to wave action on top of the abnormally high tide. About 3,000 customers lost power, most of them in Palm Beach County. In Georgia, impacts were minimal, with a few road closures in anticipation of the minor storm surge flooding.

South Carolina

Most of the southern coastal sections of the state were spared significant damage, but minor coastal flooding occurred, and trees and power lines were downed. Across the northern coast, where the northern and western eyewall of Isaias reached the coastal sections, greater impacts occurred. The storm surge of 3 to 6 ft that occurred along the Grand Strand region of South Carolina caused significant damage in Horry County. Portions of a pier were destroyed, while homes in low-lying areas near the beach were flooded. In that county, a 76-year-old man drowned in rip currents along the coast while he was trying to save a swimmer in distress. In Myrtle Beach alone, 483 properties sustained damage, and over 100 baby sea turtles were found dead in North Myrtle Beach.

An EF-0 tornado that began as a waterspout moved onshore in Garden City, South Carolina, where it damaged a few homes and caused an injury to a person.

North Carolina

Hurricane-force wind gusts caused damage to trees, power lines, and some structures along the southeastern coast. The Fort Anderson State Historic Park in Brunswick County reported comparable tree damage to that caused by Hurricane Florence in 2018. That county reported 53,000 customers without power at the height of the storm. Across New Hanover County, downed trees and power lines knocked out electrical service to 85,000 residents. Pender County reported that 27,500 residents lost electrical power, with damage to trees and power lines limited to the coastal sections of the county. Over 200,000 residents lost power in North Carolina during the passage of Isaias.

Isaias spawned 13 tornadoes across eastern North Carolina causing swaths of significant damage along their paths. The EF-3 tornado that Isaias spawned touched down early on 4 August near the town of Woodard in Bertie County. The tornado moved near the town of Windsor, destroying several mobile homes and stick-built houses in the area, with unrecognizable debris remaining of some of the mobile homes (Fig. 13). There were two direct fatalities and fourteen injuries resulting from this tornado. The first EF-2 tornado spawned by Isaias occurred the evening of 3 August, several hours prior to the hurricane making landfall. This tornado began as a strong waterspout that moved onshore near East Beach of Bald Head Island, where it produced swaths of damage to vegetation. The tornado crossed the island and blew in windows and removed roofs off homes. After crossing the Cape Fear River and moving onto the mainland near Southport, the tornado damaged additional homes and trees before it dissipated.

In Brunswick County, Isaias caused extensive damage to a hundred or more boats moored in a marina. Some of these boats were pushed across a marsh and into a nearby neighborhood. Heavy damage occurred to waterfront shops in the town of Southport. Storm surge flooding damaged or destroyed an estimated 75–100 vehicles on Oak Island (Fig. 14). Bulkheads were eroded and sand dunes were destroyed, with some of the sand pushed up to 3 blocks inland. On Holden Beach, 42 of the 45 sea turtle nests identified before the storm were destroyed. The storm surged moved up the tidal portion of the Cape Fear River into downtown Wilmington, causing significant street flooding and damaging some first-floor businesses. Farther up the coast, the combination of the storm surge and waves washed away a roadway in Bayview (Fig. 15).

Virginia

Isaias remained a strong tropical storm as the center crossed the southeastern portion of the state. The strongest winds occurred across eastern Virginia (Fig. 4), downing numerous trees and power lines, resulting in over 200,000 power outages.

The tornado outbreak during the approach of Isaias produced 7 tornadoes in the state (2 of them EF-2), resulting in extensive damage. An EF-2 tornado touched down at 0149 UTC 4 August a few miles west-southwest of Franklin and produced a swath of damage until 4 miles north of Sebrell. The tornado crossed the town of Courtland where it caused damage to numerous homes and businesses, including lifting the second story roof off a hotel building. Several vehicles were also flipped over. Numerous trees were downed or snapped along this tornado's path. The other EF-2 tornado touched down at 0440 UTC just east-northeast of Palmer and intensified, causing significant roof loss and structural damage to numerous houses near Antipoison Creek. The tornado weakened after that, but still caused damage to numerous roofs and siding of structures in the area as well as snapping or uprooting many trees. Five people were injured as a result of this tornado. An EF-1 tornado touched down near Suffolk and caused significant damage to 8 buildings and uprooted or snapped numerous trees along its path.

Maryland

Strong winds overturned 3 tractor trailers along U.S. Route 50 and caused roof damage and downed trees and power lines. Due to the high winds, a 31-year-old female was killed in St. Mary's County when a tree fell on the vehicle she was inside. Over 60,000 customers lost power in the state. The strong south to southeast winds caused water to pile up in the mid- to upper Chesapeake Bay early on 4 August. Then the winds shifted from the west, causing water levels to rise rapidly on the Lower Eastern Shore where moderate to locally major tidal flooding occurred, particularly in Cambridge (Fig. 16).

The 10 tornadoes (including 2 EF-2s) that occurred in the state were second in number only to North Carolina. An EF-2 tornado touched down at 0455 UTC 4 August just south of Mardela Springs and caused a house to be shifted off its foundation as well as numerous downed trees and roofs damaged. At 0614 UTC that day, an EF-2 tornado occurred near Girdletree. This tornado destroyed several chicken houses and snapped or downed numerous trees along its path (Fig. 17).

The flash flooding that occurred in the state washed out several roads, and the combination of these road closures and downed trees complicated accessibility to some of those areas affected by the tornadoes.

Delaware

Numerous trees and power lines were knocked down, causing widespread power outages affecting around 60,000 homes. In Milford, a woman died after she was struck by a falling tree branch.

Of the 3 tornadoes that occurred in the state due to Isaias, one was rated EF-2. At 0755 UTC on 4 August, this tornado touched down in the southern suburbs of Dover. The tornado tore off pieces of a middle school roof, a warehouse had parts of its metal walls removed, and tractor trailers were flipped over. Numerous trees were damaged or uprooted while the tornado was on the ground in Kent County. The long-track tornado then entered New Castle County where it snapped and uprooted numerous trees, destroyed a garage at a residence, blew out several garage doors, downed the walls of a home, and produced extensive damage to many residences' roofs. About a dozen of these residences sustained enough damage to be declared uninhabitable.

The heavy rainfall during the passage of Isaias produced flash flooding at many locations in northern Delaware, where streams came out of their banks resulting in several road closures and water rescues (Fig. 18).

New Jersey

The conditions and damage that occurred in Delaware were similar to what occurred in New Jersey, with numerous downed trees and power lines commonplace from the winds of the storm. There were at least 2 direct injuries in the state from falling trees as a result of Isaias. At one point, about 1 million customers were without power.

The state was not spared from Isaias' tornado outbreak, with 2 tornadoes – both EF-1 – occurring as the center of the storm approached from the south-southwest. One of these tornadoes produced significant damage to homes and businesses, flipped a truck trailer, and upended a shed in Cape May County.

Heavy rainfall across the state resulted in flash flooding in several counties, including Cumberland, Ocean, Gloucester, Warren, and Hunterdon. The main impact from this flooding was numerous road closures.

New York

Isaias produced widespread tropical-storm-force winds and occasional gusts to hurricane force across the southeastern portion of the state, including Long Island and New York City (Fig. 5). In Queens, a 60-year-old male was killed when a tree fell on a car he was inside. In Brooklyn, a woman was critically injured when a falling tree branch hit her as she was walking down a street. There was also damage to homes, businesses, and vehicles as a result of the strong winds blowing down trees and limbs across eastern New York. At the height of the storm about 800,000 utility customers lost service in the southeastern portion of the state, resulting in the largest power outage in that area by a tropical cyclone since Hurricane Sandy in 2012.

Pennsylvania

Recent heavy rainfall preceding Isaias made the region more vulnerable to flash flooding. The heavy rainfall produced by the cyclone caused streams and rivers to breach their banks, causing widespread road closures and numerous water rescues. A 5-year-old girl in Montgomery County and a 44-year-old female in Lehigh County both drowned after being swept away by flood waters. The strongest winds associated with the storm were to the east of the center when it clipped the extreme eastern portion of the state, and so the tree and power line damage was primarily confined to that area. Even so, there were 300,000 customers in the state that lost power as the storm passed.

There was one EF-2 tornado spawned by Isaias in the state. This tornado touched down at 0950 UTC 4 August just east of Philadelphia Mills Mall in the northeastern suburbs of Philadelphia, where it blew construction equipment off a former Walmart store, tore roofs, siding, and awnings off many homes in the area, tossed or overturned a few cars, and snapped numerous trees resulting in additional car and home damage. The tornado strengthened and passed near the Doylestown Hospital Complex, tossing at least 6 cars some distance and bending over metal lamp posts. The tornado produced substantial damage to the Children's Village Daycare Center, then snapped and downed many additional trees and damaged more homes before it lifted. There were 6 injuries as a result of this tornado, but none were serious.

New England

Across Connecticut, Rhode Island, and Massachusetts, sustained winds up to 40 kt and gusts to 55 kt were commonly observed. A man of 66 years died in Naugatuck, Connecticut after

he was struck by a falling tree while trying to remove debris off the road. Nearly 700,000 customers lost power across these 3 states due to the strong winds knocking down power lines. In Massachusetts and Rhode Island, over 140,000 and nearly 250,000 customers lost power, respectively. The tree damage was extensive across the region, with many trees blocking roadways that made power restoration quite difficult.

The center of Isaias crossed Vermont as the cyclone lost its tropical characteristics. Wind gusts of 40–45 kt were observed at several locations in Vermont, New Hampshire, and Maine as the system moved quickly through the area. A 60-year-old woman died in North Conway, New Hampshire, when these winds blew a tree down on her apartment home. As a result of the strong winds blowing down limbs and power lines, there were nearly 70,000 power outages in New Hampshire, about 18,000 in Vermont, and 64,000 in Maine.

FORECAST AND WARNING CRITIQUE

Genesis

The genesis of Isaias was well forecast, with formation occurring a little later than anticipated as the precursor disturbance took longer than expected to develop a well-defined center, primarily due to the initially broad wind field and fast forward motion. The disturbance was first introduced into the Tropical Weather Outlook (TWO) 150 h prior to genesis, with a low (<40%) chance for formation within the next 5 days (Table 4). The 5-day probabilities were increased to medium (40–60%) and high (>60%) 126 and 102 h prior to formation, respectively. The first 2-day probabilities were introduced with a low chance for genesis 108 h prior to formation. These probabilities were then raised to the medium and high categories 96 and 78 h prior to genesis, respectively. Due to the threat the system posed to the land areas of the eastern Caribbean, Potential Tropical Cyclone advisories were issued on 28 July, 36 h before genesis occurred to allow for the issuance of Tropical Storm Watches and Warnings for portions of that area.

Track

A verification of NHC official track forecasts for Isaias is given in Table 5a. Official track forecast errors were slightly lower than the mean official errors for the previous 5-yr period at 12, 24, and 96 h, but were slightly higher than the mean official errors at 36–72 h and 120 h. A homogeneous comparison of the official track errors with selected guidance models is given in Table 5b. Generally, the consensus aids had the lowest overall errors. The best-performing of these was TVDG (which includes a double weighting of the global models), which beat the official NHC forecasts at all but one verifying time. TVCX and the corrected consensus HCCA also beat the NHC forecasts at most of the verifying times. The official NHC track forecasts beat the GFS ensemble mean (AEMI), the ECMWF (EMXI), and UKMET (EGRI) at all verifying times.

Intensity

A verification of NHC official intensity forecasts for Isaias is given in Table 6a. Official intensity forecast errors were above the mean official errors for the previous 5-yr period at 12–60 h and below the mean official errors at 72–120 h. A homogeneous comparison of the official intensity errors with selected guidance models is given in Table 5b. The consensus models IVCN and IVDR as well as the corrected consensus HCCA were the best performers, beating the NHC forecasts at all but 2 verifying times. The dynamical models generally performed better than the NHC forecast in the 12–36 h forecast timeframes, while the NHC forecasts performed better than most of those models beyond 36 h. There were a couple of forecast challenges for intensity during the lifecycle of Isaias. The first occurred while the cyclone was crossing the eastern Caribbean Sea and it was anticipated that the storm would weaken over Hispaniola (Fig. 19). However, the apparent reformation of the low-level center underneath a strong mid-level vortex near the northern coast of Hispaniola could have helped Isaias to increase in strength during its passage over the island. The second challenge in forecasting the intensity of Isaias occurred on its approach and landfall over the southeastern United States. Until within 24 h of landfall, model guidance and the NHC forecast were not indicating that Isaias would regain hurricane intensity prior to landfall (Fig. 20). The main reason for this was that strong southwesterly vertical wind shear that was impacting the system was expected to counteract any effects of the cyclone crossing the warm waters of the Gulf Stream. However, as Isaias turned toward the north-northeast on 3 August, it began to move parallel to the shear vector, which provided a more conducive environment for strengthening prior to landfall.

Watches and Warnings

Coastal tropical storm and hurricane watches and warnings associated with Isaias are listed in Table 7. Tropical Storm Watches and Warnings were issued across portions of the eastern Caribbean, Turks and Caicos Islands, and the southeastern Bahamas in conjunction with potential tropical cyclone advisories prior to the formation of Isaias, in anticipation of the arrival of tropical-storm force winds.

For the United States, a Tropical Storm Warning was first issued for Puerto Rico and the U.S. Virgin Islands at 1500 UTC 28 July. Sustained tropical-storm-force winds first arrived just after 1200 UTC on 30 July, so a lead time of about 42 h was provided. A Tropical Storm Watch was first issued for the southeastern Florida coastline from Ocean Reef to Sebastian Inlet, at 1500 UTC 31 July. Since sustained tropical-storm-force winds first reached this portion of the coast within the Tropical Storm Watch around 0800 UTC 2 August, a lead time of 41 h was provided for this area. Hurricane Watches and Warnings were also issued for a portion of the eastern Florida coast. However, the track of Isaias gradually trended farther offshore, and sustained hurricane-force winds were not experienced in Florida. Additional Tropical Storm Watches and Warnings were issued along much of the eastern coast of the United States along with Hurricane Watches and Warnings in the Carolinas. A Tropical Storm Watch was first issued from South Santee River, SC to Surf City, NC (the stretch of coast where Isaias was expected to make landfall) at 0900 UTC 2 August. The Tropical Storm Watch was upgraded to a Tropical Storm Warning at 1500 UTC that day, and at 2100 UTC a Hurricane Watch was issued for that stretch of coastline. This

watch was then upgraded to a Hurricane Warning at 0900 UTC 3 August. Sustained tropical-storm-force winds began to spread across this portion of coastline by around 2100 UTC 3 August, resulting in a lead time of 36 h for the initial Tropical Storm Watch and 24 h and 12 h for the Hurricane Watch and Hurricane Warning, respectively.

Storm surge watches and warnings associated with Isaias are given in Table 8 and indicated in Fig. 21. Because Isaias was forecast to be near or over the east coast of Florida as a hurricane, a Storm Surge Watch was issued from Jupiter Inlet to Ponte Vedra Beach at 2100 UTC 31 July for the possibility of significant storm surge inundation. However, since Isaias weakened to a tropical storm as it approached Florida and its center remained just off the east-central coast of the state, the watch was never upgraded to a warning. Water levels along the east coast of Florida remained below warning criteria, and the watch was discontinued at 1500 UTC 2 August.

For the Carolinas, a Storm Surge Watch was first issued from Edisto Beach, South Carolina, to Surf City, North Carolina, at 0900 UTC 2 August. At 2100 UTC that day, the portion of the watch from Edisto Beach to Cape Fear, North Carolina, was upgraded to a Storm Surge Warning, and the watch area was extended northward to Duck, North Carolina, including portions of Pamlico and Albemarle Sounds. Storm surge inundation of 3 ft or greater above normally dry ground (which NHC uses as a first-cut threshold for the storm surge watch/warning) occurred within this Storm Surge Warning area (Fig. 21). Sustained tropical-storm-force winds are estimated to have reached the area where 3 ft or greater inundation above ground level occurred around 2100 UTC 3 August, 36 h and 24 h after the watch and warning, respectively, were issued.

Farther north, a Storm Surge Warning was issued for portions of Pamlico and Albemarle Sounds and the Outer Banks from Oregon Inlet to the North Carolina/Virginia border at 1500 UTC 3 August. The warning was extended southward to Ocracoke Inlet at 0300 UTC 4 August. Although not widespread, storm surge inundation of 3 ft above normally dry ground occurred within some parts of this warning area, particularly near the mouths of rivers that empty into Pamlico and Albemarle Sounds.

The portion of the North Carolina coast from Cape Fear to Ocracoke Inlet was not upgraded from a storm surge watch to a warning. Water levels within this area generally remained below warning criteria, although observations in a few localized areas reached near or just above 3 ft MHHW, especially along the New Hanover and Pender County coasts.

For the southern coast of North Carolina and the Grand Strand of South Carolina, the initial storm surge inundation forecast, issued with the Storm Surge Watch at 0900 UTC 2 August, was 2 to 4 ft above normally dry ground somewhere between Edisto Beach, South Carolina, to Cape Fear, North Carolina. This forecast was raised to 3 to 5 ft above normally dry ground for a portion of that original area, from South Santee River, South Carolina, to Cape Fear at 0900 UTC 3 August. That forecast remained steady through Isaias' landfall and ultimately turned out to have a slight low bias, since the estimated maximum storm surge inundation was about 6 ft above ground level along the Brunswick County, North Carolina coastline.

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

The NHC began communication with emergency managers on 29 July when Isaias was a potential tropical cyclone moving through the easternmost Leeward Islands. Initial communication was in support of Puerto Rico and the U.S. Virgin Islands and included FEMA headquarters and FEMA Region 2. As the threat expanded to the continental U.S., NHC briefings continued on joint Federal-State video-teleconferences with FEMA headquarters, impacted FEMA Regions and states. NHC also provided briefings on state-specific teleconferences for Florida, North Carolina, Virginia, FEMA Region 1 states, and FEMA Region 2 states to communicate the evolving forecast and impacts. These briefings were coordinated through the FEMA Hurricane Liaison Team, embedded at the NHC. The coordination of information continued through 4 August when the impacts associated with Isaias exited the northeastern U.S. In total, NHC provided over 30 briefings for state and federal emergency managers during the storm. In addition, the Tropical Analysis and Forecast Branch of NHC provided 14 live briefings on Hurricane Isaias to the U.S. Coast Guard Districts 7 and 8, in support of their life-saving mission. In addition to NHC's IDSS described above, there was a large-scale collaborative IDSS effort across the NWS, including WFOs, RFCs, and National Centers, in response to the multiple life-threatening hazards produced by Isaias in Puerto Rico and along much of the U.S. East Coast.

The NHC media pool was in operation from 31 July–4 August to provide live briefings to national and local television outlets in both English and Spanish. NHC provided 149 live interviews through the pool, comprising 52 to local television stations, 57 to networks, and 40 generic broadcasts, which were also recorded and made available on the NHC website during the daytime hours. Numerous telephone media interviews were also given. NHC was active on social media to keep the public informed on the latest NHC/NWS forecasts and warnings in real time. There were 18 Facebook Live broadcasts provided during the 5-day span of this media pool, with 1.4 million views received during that time period, including 117,000 the morning of 1 August near the time Isaias was making landfall on Andros Island in the Bahamas. Postings of the latest advisory information on Facebook were made at least every 3 hours with these posts reaching nearly 5 million and post engagement of nearly 3 million, while adding 27,000 followers. The posts on Twitter during Isaias resulted in 28 million impressions and added 15,000 followers. During the eight-day threat from Isaias (28 July - 4 August), the NHC web site had approximately 102 million page views. The majority of the views went to the graphical products, particularly the cone graphic, the key messages, and the wind speed probabilities.

ACKNOWLEDGEMENTS

Data in Table 3 were compiled from Post Tropical Cyclone Reports issued by the NWS Forecast Offices (WFOs) in San Juan, Miami, Melbourne, Jacksonville, Charleston S.C., Morehead City, Wilmington N.C., Wakefield, Sterling, Philadelphia, New York City, Boston/Norton, and Gray/Portland. Additional data were used from reports sent by WFOs in

Raleigh, State College, Binghamton, Albany, and Burlington. 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, the Dominican Republic Meteorological Service, and the Bahamas Department of Meteorology were also used in this report. Roger Edwards of the NOAA Storm Prediction Center provided tornado information. David Roth of the NOAA Weather Prediction Center produced the rainfall map. John Cangialosi produced the track map and tornado map. Dennis Feltgen reported the media statistics used in this report, Tiffany O'Connor contributed to the IDSS report, and Matt Onderlinde provided the web statistics.

Table 1. Best track for Hurricane Isaias, 30 July–4 August 2020.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
28 / 1200	12.5	54.0	1007	35	disturbance
28 / 1800	13.2	56.4	1006	35	"
29 / 0000	14.1	58.3	1005	40	"
29 / 0600	14.8	60.3	1005	40	"
29 / 1200	15.2	62.2	1005	40	"
29 / 1800	15.3	64.0	1005	40	"
30 / 0000	15.8	65.7	1004	45	tropical storm
30 / 0600	16.7	67.2	1003	50	"
30 / 1200	17.7	68.5	1002	55	"
30 / 1615	18.4	69.3	1002	55	"
30 / 1800	18.9	69.8	999	60	"
31 / 0000	19.9	71.2	996	65	hurricane
31 / 0600	20.5	72.7	990	70	"
31 / 0900	20.9	73.4	990	70	"
31 / 1200	21.3	74.0	992	65	"
31 / 1800	22.1	75.1	990	70	"
01 / 0000	22.9	75.9	987	75	"
01 / 0600	23.6	76.7	987	75	"
01 / 1200	24.3	77.5	987	70	"
01 / 1300	24.4	77.7	989	70	"
01 / 1800	24.8	78.3	993	60	tropical storm
02 / 0000	25.3	78.9	995	60	"
02 / 0600	25.9	79.2	996	55	"
02 / 1200	26.6	79.5	995	55	"
02 / 1800	27.4	79.6	995	60	"
03 / 0000	28.2	79.7	995	60	"
03 / 0600	29.1	79.9	995	60	"
03 / 1200	30.1	80.0	995	60	"
03 / 1800	31.2	79.7	991	65	hurricane
04 / 0000	32.8	79.1	986	80	"

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
04 / 0310	33.9	78.5	986	80	"
04 / 0600	35.0	78.1	992	60	tropical storm
04 / 1200	37.7	76.8	993	60	"
04 / 1800	40.9	75.1	994	55	"
05 / 0000	44.0	73.1	998	45	extratropical
05 / 0600	46.7	71.8	1000	35	"
05 / 1200					dissipated
04 / 0000	32.8	79.1	986	80	minimum pressure and maximum winds
30 / 1615	18.4	69.3	1002	55	Landfall near San Pedro De Macoris, Dominican Republic
31 / 0900	20.9	73.4	990	70	Landfall on Great Inagua Island, Bahamas
01 / 1300	24.4	77.7	987	70	Landfall on Andros Island, Bahamas
04 / 0310	33.9	78.5	986	80	Landfall near Ocean Isle Beach, NC

Table 2. Selected ship reports with winds of at least 34 kt for Hurricane Isaias, 30 July – 4 August 2020.

Date/Time (UTC)	Ship call sign	Latitude (°N)	Longitude (°W)	Wind dir/speed (kt)	Pressure (mb)
28 / 0900	2AKI3	13.4	53.4	080 / 36	1007.4
30 / 1100	9V9917	18.4	74.7	030 / 35	1011.0
31 / 1400	C6FV9	26.0	78.5	050 / 49	1015.3
01 / 0500	C6YR6	24.4	81.2	020 / 55	1011.7
02 / 2200	OYCY2	27.9	77.3	130 / 37	1010.2
03 / 0200	WNFQ	27.7	79.5	220 / 45	1007.2
03 / 0700	J8QY1	27.2	79.3	080 / 46	1010.4
03 / 0700	WNFQ	28.7	79.2	180 / 44	1006.1
03 / 1400	WNFQ	30.0	78.5	180 / 45	1013.0
03 / 1800	WNFQ	30.7	78.1	170 / 55	1009.2
03 / 1800	KABP	32.3	77.6	150 / 35	1012.5
03 / 2100	KABP	31.5	77.4	170 / 42	1008.6
03 / 2200	KABP	31.2	77.4	170 / 45	1010.1
03 / 2300	KABP	30.8	77.3	180 / 35	1010.8
04 / 0000	WAIU	31.1	77.2	170 / 40	1015.0
04 / 0000	OWWS2	34.1	75.3	130 / 35	1014.0
04 / 0200	WNFQ	32.0	77.2	190 / 45	1016.6
04 / 0200	OWWS2	33.7	75.5	170 / 37	1012.0
04 / 0600	OWWS2	32.8	75.9	170 / 44	1013.0
04 / 0600	VRFO7	36.2	74.2	140 / 40	1015.5
04 / 1200	WTEA	36.9	76.3	210 / 36	999.9
04 / 1400	WNFQ	34.3	74.4	200 / 35	1019.2
04 / 1800	VRFX6	37.8	72.7	200 / 36	1005.8

Table 3. Selected surface observations for Hurricane Isaias, 30 July–4 August 2020.

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft)[c]	Storm tide (ft)[d]	Estimated Inundation (ft)[e]	Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[a]	Sustained (kt)[b]	Gust (kt)				
ANGUILLA									
Clayton J. Lloyd Intl. Airport (TQPF) (18.21N 63.05W)			29/1500	30 (31 m)	42				
ANTIGUA									
V.C. Bird Intl Airport (TAPA) (17.14N 61.79W)			29/0700	26 (10 m)	41				
DOMINICA									
Canefield Airport (TDCF) (15.34N 61.39W)	29/0430	1005.1	29/0020		34				
ST. BARTHELEMY									
St. Barthelemy BL (FW2827) (17.92N 62.86W)			29/1446		43				
ST. EUSTATIUS									
F.D. Roosevelt Airport (TNCE) (17.49N 62.97W)			29/1055	25 (10 m)	36				
ST. MARTIN									
Grand Case-Espérance Airport (TFFG) (18.10N 63.05W)			29/1055	26 (10 m)	44				
DOMINICAN REPUBLIC									
Arroyo Barril (MDAB) (19.64N 69.90W)	30/1800	1004.9	30/1800	18					10.26
Cabrera (78464) (19.64N 69.90W)	30/1800	1004.3	30/1800	10					8.47
Las Américas (MDSD) (19.64N 69.90W)	30/2100	1005.5	29/2300	16					6.18
La Romana (MDLR) (18.45N 68.91W)	30/1500	1004.0	29/2300	20					1.64
Puerto Plata (MDPP) (19.76N 70.56W)	30/2100	1003.0	30/1800	26					3.45
Sabana de la Mar (78467) (19.05N 69.39W)	30/1800	1006.9	29/0600	16	30				12.90
BAHAMAS									
Lynden Pindling (Nassau) IAP (MYNN) (25.04N 77.47W)			01/1200	30	49				
San Salvador Airport (MYSM) (24.06N 74.52W)			31/1424	31	47				
Settlement Point (SPGF1) (26.70N 79.00W)	02/1300	1000.5	02/1430	41 (10 min, 7 m)	56				
TURKS AND CAICOS									

Providenciales (21.78N 72.16W)			31/0434	48 [I]	51 [I]				
UNITED STATES									
Buoys									
41004 – NOAA (32.50N 79.10W)	03/2240	988.8	03/2349	58 (1 min, 4 m)	68				
41009 – NOAA (28.51N 80.19W)	03/0140	1002.9	02/2238	39 (1 min, 5 m)	47				
41010 – NOAA (28.88N 78.49W)	03/0230	1007.0	03/0305	47 (1 min, 4 m)	54				
41013 – NOAA (33.44N 77.76W)	04/0210	999.8	04/0219	52 (1 min, 4 m)	56				
41024 – CORMP (33.84N 78.48W)	04/0223	988.3	04/0338	43 (8 min, 3 m)	66				
41025 – NOAA (35.03N 75.36W)	04/0830	1009.5[I]	04/0826	43 (1 min, 4 m)	54				
41029 – CORMP (32.80N 79.62W)	03/2338	999.9	03/2308	35 (3 m)	52				
41033 – CORMP (32.28N 80.41W)	04/2138	1006.3	03/1908	29 (3 m)	41				
41037 – CORMP (33.99N 77.36W)	04/0308	1004.5	04/0408	39 (8 min, 3 m)	56				
41038 – CORMP (34.14N 77.71W)	04/0408	995.0	04/0408	45 (8 min, 3 m)	66				
41043 – NOAA (21.03N 64.79W)	30/0800	1013.4	29/2342	45 (1 min, 4 m)	54				
41064 – CORMP (34.21N 76.95W)	04/0508	1006.9	04/0308	35 (3 m)	52				
42059 – NOAA (15.25N 67.48W)	30/0730	1005.6	30/1422	27 (1 min, 4 m)	31				
42060 – NOAA (16.43N 63.33W)	29/1350	1006.6	29/1038	33 (1 min, 4 m)	35				
44007 – NOAA (43.53N 70.14W)	05/0250	1006.3	05/0016	34 (1 min, 5 m)	43				
44013 – NOAA (42.35N 70.65W)	04/2150	1006.4	04/2150	34 (10 min, 5 m)	43				
44014 – NOAA (36.61N 74.82W)	04/1030	1008.2	04/1036	43 (1 min, 3 m)	51				
44017 – NOAA (40.69N 72.05W)	04/1950	1008.3	04/1906	41 (1 min, 4 m)	45				
44020 – NOAA (41.49N 70.28W)	04/2200	1010.2	04/2200	31 (8 min, 4 m)	41				
44022 – UCONN (40.88N 73.73W)			04/1800	31 (4 m)	54				
44025 – NOAA (40.25N 73.16W)	04/1820	1003.5	04/1804	49 (1 min, 4 m)	58				
44040 – UCONN (40.96N 73.58W)			04/1800	31[I] (4 m)	54[I]				
44058 – CBIBS (37.57N 76.26W)	04/1212	999.1	04/1300	37 (3 m)	45				
44065 – NOAA (40.37N 73.70W)	04/1830	998.2	04/1734	49 (1 min, 4 m)	62				
44069 – Stony Brook U (40.70N 73.09W)			04/2000	39 (3 m)	51				
44072 – CBIBS (37.20N 76.27W)			04/1120	39 (3 m)	51				
PUERTO RICO AND VIRGIN ISLANDS									
International Civil Aviation Organization (ICAO) Sites									
San Juan, PR (TJSJ) (18.43N 66.00W)	29/2256	1006.9	29/1856	28	44				6.20
St. Thomas, VI (TIST) (18.33N 64.97W)	29/2053	1006.3	29/1853	29	45				

National Ocean Service (NOS) Sites									
Esperanza, Vieques Island (ESPP4) (18.09N 65.47W)	29/2130	1006.3	30/1418	36	51	0.89		0.7	
Lime Tree Bay, VI (LTBV3) (17.69N 64.75W)	29/1954	1006.2	30/1630	29	38	0.63		0.7	
Magueyes Island, PR (MGIP4) (17.97N 67.05W)	30/0930	1005.1	30/1342	34	47	1.36		1.2	
San Juan Bay, PR (SJNP4) (18.46N 66.12W)	29/2248	1006.9	30/1018	32	44	0.57		0.7	
Hydrometeorological Automated Data System (HADS) Sites (NWS)									
Duque, 4 NW (NGIP4) (18.28N 65.78W)									10.48
G. L. Garcia, 4 E (CAIP4) (18.13N 66.05W)									11.53
Rio Blanco, 1 NE (LBLP4) (18.23N 65.78W)									12.43
Weatherflow									
Buck Island, VI (XBUK) (18.28N 64.89W)			30/0454		48				
Culebrita Island, PR (XCUL) (18.31N 65.23W)			29/1750		54				
La Mareas, PR (XMRS) (17.93N 66.16W)			30/1312		55[I]				
Marina Del Ray, PR (XREY) (18.29N 65.63W)			30/1439		48				
Yabucoa- El Negro, PR (XYAB) (18.05N 65.83W)			30/0938		53				
FLORIDA									
International Civil Aviation Organization (ICAO) Sites									
Ft. Lauderdale (KFLL) (26.07N 80.15W)	02/0942	1004.0	01/1827	27 (2 min, 10 m)	39				
Vero Beach (KVRB) (27.65N 80.41W)	02/2155	1005.1	02/1827	28 (2 min, 10 m)	40				
West Palm Beach (KPBI) (26.68N 80.09W)	02/1253	1004.8	02/0855	27 (2 min, 10 m)	46				
Coastal-Marine Automated Network (C-MAN) Sites									
Fowey Rocks (FWYF1) (25.59N 80.10W)	02/0800	1006.0	01/1300	31 (10 min, 44 m)	43				
St. Augustine (SAUF1) (29.86N 81.27W)	03/1000	1008.0	03/1010	29 (10 min, 8 m)	36				
National Ocean Service (NOS) Sites									
Fernanda Beach (FRDF1) (30.67N 81.47W)	03/1300	1009.8	03/1406	15	25	2.72	4.33	1.6	
Lake Worth (LKWF1) (26.61N 80.03W)	02/1036	1003.1	02/0812	36 (10 m)	46	1.56	1.49	0.9	
Mayport (MYPF1) (30.40N 81.43W)	03/1148	1009.6				2.00	3.40	1.4	
Port Canaveral (TRDF1) (28.42N 80.59W)	03/0330	1007.9	03/0112	25	36	1.42	2.49	1.4	

Virginia Key (VAKF1) (25.73N 80.16W)	02/0742	1006.0	01/1754	27 (10 m)	37	1.06	1.09	0.9	
Weatherflow									
Banana River at 520 (XCCB) (28.36N 80.66W)	03/0333	1007.0	03/0112	34 (1 min, 5 m)	41				
Biscayne Light 20 (XKBS) (25.66N 80.19W)			01/1757	35 (1 min, 6 m)	40				
Carysfort Reef Light (XCFL) (25.23N 80.21W)	01/2131	1006.5	01/1819	39 (1 min, 14 m)	43				
Crandon (XCRN) (25.72N 80.15W)	02/0749	1005.2	01/1754	34 (1 min, 8 m)	39				
Dania Pier (XDAN) (26.05N 80.11W)	02/0917	1002.7	02/0232	32 (5 min, 9 m)	50				
Government Cut (XGVT) (25.75N 80.10W)	02/0722	1002.0	01/1748	41 (1 min, 23 m)	43				
Grant Indian River (XIND) (27.96N 80.53W)	02/2305	1005.2	02/2007	34 (1 min, 5 m)	40				
Jacksonville Beach Pier (XJAX) (30.30N 81.38W)			03/1129	31 (1 min, 12 m)	36				
Juno Beach Pier (XJUP) (26.89N 80.06W)	02/1455	1003.7	02/1152	36 (1 min, 6 m)	41				
Malbar Indian River (XRPT) (27.98N 80.55W)	02/2203	1006.0	02/2007	34 (1 min, 6 m)	38				
Melbourne Beach (XMBI) (27.90N 80.47W)	02/2119	1002.9	02/2006	37 (1 min, 10 m)	43				
Sea Forest Indian River Shores (27.69N 80.37W)	02/2134	1005.1	02/1817	35	43				
St. Lucie Nuclear Power Plant (XSTL) (27.35N 80.23W)	02/2250	1001.5	02/1205	36 (1 min, 10 m)	40				
Weather Stem									
Stuart Beach (27.20N 80.17W)	02/1905	1003.3	02/1154	42	45				
Florida Institute of Technology Weather Stations									
Sebastian Inlet (SIPF1) (27.86N 80.44W)	02/2131	1004.6	02/2131	34 (11 m)	43				
U.S. Air Force Sites									
Launch Complex 39B NW (KSC0397) (28.63N 80.62W)			03/0400	42 (5 min, 78 m)	49				
Launch Complex 39B NW (KSC0397) (28.63N 80.62W)			03/0355	49 (1 min, 66 m)					
USAF Tower 2 (KSC0002) (28.44N 80.56W)			03/0422	41 (1 min, 17 m)					
USAF Tower 2 (KSC0002) (28.44N 80.56W)			03/0105	29 (5 min, 27 m)	45				
USAF Tower 6 (KSC0006) (28.51N 80.56W)			03/0055	40 (5 min, 49 m)	50				
USAF Tower 19 (KSC0019) (28.74N 80.70W)			03/0125	32 (5 min, 17 m)	40				

USAF Tower 22 (KSC0022) (28.80N 80.74W)			02/2305	31 (5 min, 17 m)	41				
USAF Tower 62 (KSC0062) (28.51N 80.56W)			03/0055	40 (1 min, 17 m)					
USAF Tower 108 (KSC0108) (28.54N 80.57W)			03/0055	28 (5 min, 17 m)	46				
USAF Tower 300 (KSC0300) (28.40N 80.65W)			02/2335	33 (5 min, 17 m)	42				
UASF Tower 1007 (KSC1007) (28.53N 80.77W)			03/0155	29 (5 min, 17 m)	41				
Public/Other									
Key Largo Yacht Club (25.08N 80.44W)			01/0214	34	41				
GEORGIA									
National Ocean Service (NOS) Sites									
Fort Pulaski (FPKG1) (32.04N 80.90W)	03/2100	1008.8	03/1336	27 (7 m)	35	3.19	5.17	1.7	
Weatherflow									
Tybee Island North (XTYB) (32.02N 80.84W)	03/2044	1006.1	03/1724	33 (1 min, 10 m)	36				
SOUTH CAROLINA									
International Civil Aviation Organization (ICAO) Sites									
Georgetown (KGGE) (33.31N 79.32W)	04/0035	1001.0	04/0035	27 (2 min, 10 m)	43				
Myrtle Beach (KMYR) (33.69N 78.93W)	04/0156	997.2	04/0245	37 (2 min, 10 m)	46				2.98
North Myrtle Beach (KCRE) (33.81N 78.72W)	04/0220	993.2	04/0217	29 (2 min, 10 m)	46				2.38
Coastal-Marine Automated Network (C-MAN) Sites									
Folly Island (FBIS1) (32.69N 79.89W)	03/2300	1003.8	03/2110	36 (10 min, 10 m)	45				
National Ocean Service (NOS) Sites									
Charleston (CHTS1) (32.78N 79.92W)	03/2236	1003.1	03/2100	30	37	2.07	4.35	1.7	
Oyster Landing (N Inlet Estuary) (NITS1) (33.35N 79.19W)						3.44	5.93	3.5	
Springmaid Pier (MROS1) (33.66N 78.92W)	04/0200	1000.8				4.26	7.02	4.6	
Hydrometeorological Automated Data System (HADS) Sites (NWS)									
McClellanville 7 NE CRN (SRES1) (33.15N 79.36W)									7.01
Winyah Bay North Inlet (NIWS1) (33.35N 79.19W)	04/0030	998.0	04/0145	26	44				5.79
Weatherflow									
Folly Beach (XFOL) (32.65N 79.94W)	03/2229	1001.9	03/2306	41 (1 min, 11 m)	49				

Fort Sumter (XSUM) (32.75N 79.87W)	03/2244	998.7	03/2209	34 (1 min, 12 m)	43				
Georgetown (XGEO) (33.37N 79.27W)	04/0043	998.0	04/0136	33 (1 min, 10 m)	41				
Lake Arrowhead (33.78N 78.77W)	04/0222	991.0	04/0302		43 (10 m)				
Murrells Inlet (XMUR) (33.52N 79.03W)	04/0110	996.0	03/2340	34 (5 min, 7 m)	44				
Shutes Folly (XSHF) (32.77N 79.91W)	03/2232	1001.3	03/2152	33 (1 min, 13 m)	39				
Winyah Bay (33.19N 79.18W)	04/0033	995.0	03/2316	53 (1 min, 15 m)	60				
Citizen Weather Observer Program (CWOP)									
Georgetown (D6758) (33.38N 79.18W)									6.54
Isle of Palms (F1744) (32.80N 79.78W)			03/2215		41				
Little River (AU245) (33.88N 78.63W)			04/0356		42				
Little River (AU254) (33.89N 78.63W)			04/0340		43				
McClellanville (F2360) (33.18N 79.41W)			04/0005		41				
Myrtle Beach (C0637) (33.78N 78.95W)			04/0307	25	40				
Myrtle Beach (F5285) (33.65N 78.94W)			04/0255		43				
NWS Cooperative Observer Program (COOP) Sites									
Georgetown (GEOS1) (33.32N 79.32W)									5.80
Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) Sites									
Georgetown 1 E (SC-GT-27) (33.37N 79.28W)									5.45
Georgetown 6 S (SC-GT-4) (33.28N 79.29W)									6.54
Georgetown 11.2 SW (SC-GT-38) (33.23N 79.41W)									5.32
Pawleys Island 0.8 NW (SC-GT-26) (33.43N 79.14W)									5.53
Pawleys Island 2.4 NW (SC-GT-42) (33.44N 79.16W)									6.97
Pawleys Island 2.6 N (SC-GT-24) (33.46N 79.11W)									5.11
United States Geological Survey (USGS) Water Level Sensors									
Huntington Beach State Park - Murrells Inlet (SCGEO14321) (33.53N 79.03W)							6.79	4.5	
Myrtle Beach (SCHOR00003) (33.68N 78.89W)							7.60	5.3	
Myrtle Beach (SCHOR17779) (33.66N 78.92W)							7.52	5.1	

Myrtle Beach - Briarcliffe Acres (SCHOR17780) (33.76N 78.79W)							7.26	4.8	
North Myrtle Beach (SCHOR14333) (33.79N 78.74W)							6.79	4.4	
North Myrtle Beach - Cherry Grove Beach (SCHOR14329) (33.84N 78.62W)							6.99	4.6	
Sullivans Island (SCCHA14309) (32.76N 79.86W)							4.14	1.6	
Surfside Beach (SCHOR14328) (33.60N 78.97W)							7.73	5.3	
USGS High Water Marks									
Myrtle Beach (SCHOR00003) (33.68N 78.89W)							7.94	3.0	
Public/Other									
Crescent Beach KSCNORTH95 (33.83N 78.66W)	04/0224	992.6	04/0314		61				
NORTH CAROLINA									
International Civil Aviation Organization (ICAO) Sites									
Beaufort (KMRH) (34.73N 76.66W)	04/0432	1009.4[I]	04/0422	32[I] (2 min, 10 m)	49[I]				
Bogue Field (KNJM) (34.69N 77.04W)	04/0557	1006.1[I]	04/0537	37[I] (2 min, 10 m)	56[I]				
Cape Fear (KSUT) (33.93N 78.07W)	04/0315	991.5	04/0235	39 (2 min, 10 m)	57				
Cherry Point (KNKT) (34.90N 76.88W)	04/0654	1005.3	04/0509	30 (2 min, 10 m)	53				
Edenton (KEDE) (36.03N 76.56W)	04/0835	1002.0[I]	04/0935	37[I] (2 min, 10 m)	51[I]				
Elizabeth City (KECG) (36.26N 76.17W)	04/0954	1003.1	04/1034	36 (2 min, 10 m)	56				1.45
Elizabethtown (KEYF) (34.60N 78.58W)	04/0415	998.2	04/0455	29 (2 min, 10 m)	44				2.34
Goldsboro (KGSB) (35.35N 77.95W)	04/0656	994.1	04/0556	30	41				3.36
Greenville (KPGV) (35.63N 77.40W)	04/0755	997.6	04/0735	33 (2 min, 10 m)	47				1.85
Hatteras (KHSE) (35.22N 75.62W)	04/0851	1009.6	04/0809	37 (2 min, 10 m)	51				
Hyde County AP (K7W6) (35.56N 75.96W)	04/0835	1007.1	04/0935	31	45				
Jacksonville (KNCA) (34.71N 77.43W)	04/0556	1000.1	04/0528	39 (2 min, 10 m)	60				1.42
Jacksonville (KOAJ) (34.83N 77.62W)	04/0556	995.8	04/0630	34 (2 min, 10 m)	53				
Kenansville (KDPL) (35.00N 77.98W)	04/0555	993.1	04/0655	22 (2 min, 10 m)	33				2.78
Kill Devil Hills (KFFA) (36.02N 75.67W)	04/0935	1006.4	04/0855	20 (2 min, 10 m)	42				
Kinston (KISO) (35.33N 77.61W)	04/0655	995.2	04/0715	27 (2 min, 10 m)	37				1.02
Manteo (KMQI) (35.92N 75.70W)	04/0935	1006.8	04/0935	44 (2 min, 10 m)	59				

New Bern (KEWN) (35.07N 77.04W)	04/0654	1003.4	04/0650	32 (2 min, 10 m)	51				1.36
Piney Island (KNBT) (35.02N 76.46W)	04/0834	1007.5	04/0632	35 (2 min, 10 m)	53				
Washington/Warren Field (KOCW) (35.57N 77.05W)	04/0655	1001.6[I]	04/0615	24[I] (2 min, 10 m)	38[I]				
Wilmington (KILM) (34.28N 77.92W)	04/0410	992.6	04/0343	41 (2 min, 10 m)	64				2.30
Coastal-Marine Automated Network (C-MAN) Sites									
Cape Lookout (CLKN7) (34.62N 76.53W)	04/0700	1008.1	04/0420	45 (10 min, 10 m)	60				
National Ocean Service (NOS) Sites									
Beaufort Tide Gauge (BFTN7) (34.72N 76.67W)	04/0648	1006.5[I]	04/0536	43[I]	53[I]	3.31	2.89	1.4	
Duck Tide Gauge (DUKN7) (36.18N 75.75W)	04/0900	1004.4[I]	04/0900	48[I]	65[I]				
Hatteras Tide Gauge (HCGN7) (35.21N 75.70W)	04/0830	1009.3[I]	04/0724	34[I]	49[I]				
Oregon Inlet Tide Gauge (ORIN7) (35.78N 75.53W)	04/0906	1007.8[I]	04/0942	41[I]	50[I]	2.79	2.90	2.4	
Wilmington (WLON7) (34.23N 77.95W)	04/0354	991.4				5.57	6.43	4.4	
Wrightsville Beach (JMPN7) (34.21N 77.79W)	04/0400	993.5	04/0406	60 (2 min, 8 m)	74	4.45	4.36	2.6	
Weatherflow									
Alligator River Bridge (XALI) (35.90N 76.01W)	04/0844	1006.0	04/0924	51 (1 min, 12 m)	62				
Avon Sound (XAVN) (35.34N 75.50W)	04/0737	1008.4	04/0813	45 (1 min, 5 m)	59				
Avon (XAVO) (35.35N 75.50W)	04/0902	1007.9[I]	04/0811	54[I] (12 m)	63[I]				
Buxton (XBUX) (35.26N 75.59W)	04/0926	1008.3	04/0650	33 (1 min, 10 m)	47				
Croatan Sound (XCTN) (35.87N 75.66W)	04/0844	1006.4	04/0805	47 (1 min, 8 m)	55				
Federal Point (XFED) (33.96N 77.94W)	04/0250	996.0	04/0326	69 (1 min, 15 m)	86				
Fort Macon (XMAC) (34.70N 76.71W)	04/0706	1005.3	04/0517	46 (1 min, 10 m)	56				
Frisco Woods (XFRI) (35.24N 75.63W)			04/0808	40 (1 min, 6 m)	53				
Hatteras High (XHAT) (35.26N 75.55W)	04/0838	1007.1	04/0806	34 (1 min, 10 m)	50				
Jennettes Pier (XJNP) (35.91N 75.59W)	04/0905	1001.7	04/0841	53 (1 min, 18 m)	66				
Kites Resort (KRTH) (35.58N 75.47W)	04/0932	1006.3[I]	04/1030	47[I] (16 m)	55[I]				
Lockwoods Folly Inlet (XLOC) (33.92N 78.23W)	04/0307	989.0	04/0208	50 (1 min, 6 m)	67				
Nags Head (35.91N 75.59W)	04/0905	1001.7	04/0840	45 (18 m)	66				
North River (XNRV) (34.77N 76.62W)	04/0541	1005.8	04/0551	39 (1 min, 5 m)	46				
Oak Island (XOKI) (33.91N 78.12W)	04/0321	989.0	04/0241	66 (2 min, 10 m)	76				

Ocracoke Sound (XOCR) (35.14N 76.00W)	04/0752	1006.9	04/0631	45 (1 min, 8 m)	52				
Oregon Inlet CG (XORE) (35.80N 75.55W)	04/0942	1003.6	04/1039	43 (1 min, 10 m)	55				
Pamlico Sound (XPM2) (35.42N 75.83W)	04/1032	1008.4	04/0736	52 (1 min, 13 m)	60				
Real Slick (XSLK) (35.57N 75.49W)	04/0808	1008.6	04/0828	38 (5 min, 6 m)	50				
Roanoke Sound Channel (XRNK) (35.94N 75.66W)	04/0957	1005.5	04/0937	46 (1 min, 5 m)	54				
Waves (XWAV) (35.57N 75.49W)	04/0854	1007.2	04/1038	42 (11 m)	50				
Waves (35.57N 75.48W)	04/0808	1008.6	04/0828	38 (6 m)	50				
Remote Automated Weather Stations (RAWS)									
Back Island NBAC (BKIN7) (34.53N 77.72W)			04/0400	22 (10 min, 6 m)	57				2.44
Beaufort (BNYN7) (35.52N 76.93W)			04/0913		43				2.28
Dare Bomb Range (STCN7) (35.76N 75.87W)			04/0928	28	47				
Elizabeth City (ELRN7) (36.35N 76.28W)			04/1013	28	52				1.15
Goldsboro (GBON7) (35.43N 78.02W)			04/0514		40				3.02
Green Cross (GCRN7) (36.03N 76.89W)			04/0917		41				3.33
Jacksonville (CLJN7) (34.61N 77.49W)			04/0619		47				1.53
Nature Conservancy NNAC (NATN7) (34.09N 78.31W)			04/0318		49 (6 m)				
Newport (NPTN7) (34.76N 76.90W)			04/0605		45				2.63
Pocosin Lakes (POCN7) (35.74N 76.51W)			04/0917		42				
Sunny Point NSUN (SUNN7) (34.00N 78.00W)			04/0300	28 (10 min, 6 m)	55				
Whiteville NWHI (WHIN7) (34.34N 78.73W)			04/0418		43 (6 m)				3.91
North Carolina ECONET									
Bald Head Island (33.85N 77.97W)	04/0214	995.1	04/0221	52 (2 min, 10 m)	61				
Castle Hayne (34.32N 77.92W)	04/0315	992.4	04/0226	35 (2 min, 10 m)	51				
Citizen Weather Observer Program (CWOP)									
Belhaven (E4218) (35.52N 76.64W)	04/0654	1003.7	04/0636		52				
Chapanoke (F2560) (36.24N 76.36W)			04/1005	32	60				
Conway (E0790) (36.43N 77.23W)	04/0930	994.6	04/1010		45				
Corolla (F1502) (36.30N 75.80W)	04/0947	1005.0	04/0900		48				
Hertford (C6395) (36.16N 76.32W)	04/0900	1001.0	04/1030		47				
Indian Beach (F5126) (34.69N 76.90W)	04/0632	1006.1	04/0600	47	59				1.04

Newport (E4592) (34.72N 76.93W)	04/0501	1005.1[I]	04/0501	33[I]	46[I]				
Newport (F4380) (34.78N 76.73W)			04/0318	28[I]	46[I]				
Oriental (F4381) (35.05N 76.67W)	04/0710	1006.4	04/0535		46				
Rodanthe (E7670) (35.60N 75.47W)	04/0940	1007.4	04/1243	33	49				
Roper (F0226) (35.95N 76.47W)			04/0945		45				
Sneads Ferry (C7779) (34.54N 77.37W)	04/0931	1001.7[I]	04/0416		44[I]				
Wilmington (F4721) (34.18N 77.86W)	04/0359	995.9	04/0359		48				1.91
Wilmington (F7311) (34.29N 77.83W)	04/0427	996.6	04/0411		43				2.13
Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) Sites									
Leland 5.7 WSW (NC-BR-2) (33.91N 78.59W)									5.05
Oxford 3 WSW (NC-GV-10) (36.30N 78.63W)									5.06
Windsor 4.5 WNW (NC-BT-35) (36.03N 77.01W)									6.00
USGS Water Level Sensors									
Atlantic Beach (NCCAR12348) (34.70N 76.73W)							2.62	1.3	
Aurora (NCBEA11728) (35.38N 76.75W)							2.43	2.3	
Avon (NCDAR00004) (35.35N 75.51W)							1.73	1.5	
Beaufort (NCCAR12248) (34.72N 76.67W)							2.82	1.3	
Belhaven (NCBEA13648) (35.53N 76.61W)							3.30	3.1	
Buxton (NCDAR00002) (35.27N 75.56W)							1.33	1.1	
Carolina Beach (NCNEW00004) (34.06N 77.88W)							5.22	3.3	
Carolina Beach (NCNEW12888) (34.06N 77.89W)							4.96	3.0	
Columbia (NCTYR13548) (35.99N 76.18W)							1.28	1.3	
Edenton (NCCHO12448) (36.06N 76.68W)							2.32	2.3	
Emerald Isle (NCCAR12412) (34.66N 77.03W)							4.41	2.5	
Hatteras (NCDAR00001) (35.21N 75.70W)							1.18	1.1	
Kill Devil Hills (NCDAR12668) (36.02N 75.73W)							2.66	2.7	

Kitty Hawk (NCDAR12669) (36.10N 75.71W)							2.98	1.5	
Nags Head (NCDAR12631) (35.91N 75.60W)							2.95	3.1	
Nags Head - Oregon Inlet (NCDAR00005) (35.80N 75.55W)							2.69	2.2	
Oak Island (NCBRU11891) (33.90N 78.08W)							8.13	6.0	
Ocean Isle Beach (NCBRU00012) (33.89N 78.44W)							8.68	6.3	
Ocean Isle Beach (NCBRU00014) (33.90N 78.44W)							7.20	4.8	
Rodanthe (NCDAR12709) (35.58N 75.47W)							2.94	2.5	
Southport (NCBRU12068) (33.92N 78.02W)							5.98	4.0	
Supply - Holden Beach (NCBRU12008) (33.92N 78.27W)							7.00	4.8	
Swansboro (NCONS00001)							2.93	2.4	
Topsail Beach (NCPEN00002) (34.37N 77.63W)							3.85	2.0	
Topsail Beach (NCPEN00003) (34.37N 77.63W)							5.33	3.3	
Sneads Ferry (NCONS13128) (34.58N 77.40W)							1.67	1.5	
Wrightsville Beach (NCNEW13008) (34.22N 77.81W)							4.66	2.7	
USGS High Water Marks									
Varnamtown (NCBRU12028) (33.68N 78.89W)							6.80	2.3	
Public/Other									
Frying Pan Shoals Tower (33.49N 77.59W)			04/0310		90 (41 m)				
Holden Beach (KNCSUPPL23) (33.91N 78.28W)			04/0224		63				
Oak Island (KNCOAKIS30) (33.92N 78.19W)	04/0309	989.2	04/0234		72				
Scotts Hill (KNCWILMI201) (34.31N 77.73W)		992.9	04/0308		47				
Surf City Bridge (34.43N 77.55W)			04/0405	42 (2 min, 20 m)	72				
NWS Owned Station									

Cedar Island (35.02N 76.32W)	04/0802	1008.0	0421	47	68				
VIRGINIA									
International Civil Aviation Organization (ICAO) Sites									
Accomack Airport (KMFV) (37.65N 75.77W)	04/1235	999.6	04/1335	35[I] (2 min, 10 m)	52[I]				
Fentress (KNFE) (36.70N 76.13W)			04/0825	28[I] (2 min, 10 m)	43[I]				
Fort Eustis (KFAF) (37.14N 76.62W)	04/1056	996.9	04/1042	28 (2 min, 10 m)	48				1.36
Langley AFB (KLFI) (37.10N 76.34W)	04/1054	999.2	04/1033	34 (2 min, 10 m)	51				1.07
Newport News (KPHF) (37.14N 76.50W)	04/1030	998.4[I]	04/1205	34 (2 min, 10 m)	49				
Norfolk NAS (KNGU) (36.96N 76.29W)	04/1059	999.9	04/1048	31 (2 min, 10 m)	52				
Norfolk (KORF) (36.91N 76.20W)	04/1051	999.8	04/1157	44 (2 min, 10 m)	53				
Oceana NAS (KNTU) (36.83N 76.03W)	04/1056	1001.6	04/1156	32 (2 min, 10 m)	58				1.26
Richmond (KRIC) (37.51N 77.31W)	04/1110	1000.9	04/1123	31 (2 min, 10 m)	44				5.20
Suffolk (KSFQ) (36.68N 76.60W)	04/1015	999.3	04/1055	29 (2 min, 10 m)	43				3.15
Wallops Island (KWAL) (37.97N 75.47W)	04/1335	998.5	04/1304	42 (2 min, 10 m)	58				
Coastal-Marine Automated Network (C-MAN) Sites									
Cape Henry (CHYV2) (36.91N 75.78W)	04/1112	1001.3	04/1042	36 (28 m)	59				
Dominion Terminal (DOMV2) (36.96N 76.42W)	04/1036	997.3	04/1036	43	56				
Rappahannock Light Tower (RPLV2) (37.54N 76.02W)	04/1254	997.9	04/1218	51 (17 m)	62				
South Craney Island (CRYV2) (36.89N 76.34W)	04/1112	999.2	04/1030	41 (9 m)	56				
Willoughby Degaussing Station (WDSV2) (36.98N 76.32W)	04/1036	997.2	04/1200	48	64				
York River Range Light (YKRV2) (37.25N 76.34W)	04/1206	997.7	04/1100	52	65				
National Ocean Service (NOS) Sites									
Chesapeake Channel (CHBV2) (37.03N 76.08W)	04/1118	999.2	04/1154	44 (5 m)	76	1.52			
Kiptopeke (KPTV2) (37.17N 75.98W)			04/1212	47 (7 m)	60	1.44			
Lewisetta (LWTV2) (38.00N 76.47W)	04/1248	997.1	04/1324	38 (6 m)	55	2.26	2.16	1.5	
Money Point (MNPV2) (36.78N 76.30W)	04/1000	999.9	04/1000	30 (6 m)	46				
Wachapreague (WAHV2) (37.61N 75.69W)	04/1248	999.0	04/1248	42 (7 m)	52	1.73	2.84	1.0	
Yorktown USCG (YKTV2) (37.23N 76.48W)	04/1124	996.9	04/0848	40 (10 m)	53	1.84			
Weatherflow									

Cape Charles – Plantation Flats (XPLT) (37.26N 76.03W)	04/1146	999.4	04/1201	43 (5 min, 8 m)	57				
Cape Henry (XHEN) (36.92N 76.01W)	04/1105	997.7	04/1140	42 (1 min, 23 m)	59				
3rd Island Chesapeake Bay Bridge Tunnel (XBBT) (37.03N 76.08W)	04/1127	995.2	04/1157	63 (16 m)	71				
Deltaville (XDLT) (37.56N 76.30W)	04/1032	1000.4	04/1258	42 (1 min, 6 m)	51				
Hampton Flats (XHMP) (36.98N 76.34W)	04/1109	998.0	04/1104	47 (1 min, 7 m)	59				
Lafayette River (XODU) (36.89N 76.32W)	04/1025	999.4	04/1055	47 (1 min, 6 m)	55				
Lynnhaven Inlet Light 1L (XLHI) (36.92N 76.09W)	04/1028	997.1	04/1155	46 (1 min, 8 m)	64				
Middle Ground Lighthouse (XMGL) (36.95N 76.39W)	04/1048	994.7	04/1031	53 (1 min, 20 m)	61				
New Point Comfort (XPNC) (37.33N 76.27W)	04/1142	996.1	04/1030	45 (1 min, 13 m)	53				
Norfolk- Lafayette River (36.89N 76.31W)	04/1105	999.4	04/1110	39 (6 m)	55				
Onancock (XHAK) (37.66N 75.87W)	04/1309	994.4	04/1321	53 (1 min, 14m)	61				
Poquoson (XPOQ) (37.11N 76.31W)	04/1141	997.2	04/1212	45 (1 min, 10 m)	59				
Poquoson River Light 11 (XPQR) (37.16N 76.38W)	04/1106	998.9	04/1032	42 (1 min, 7 m)	49				
Potomoc Light 33 (XP33) (38.34N 76.99W)	04/1231	1001.1	04/1141	41 (1 min, 8 m)	47				
Pylons Dahlgren (XPYL) (38.31N 77.03W)	04/1217	1001.0	04/1236	36 (1 min, 8 m)	42				
Rudee Inlet (XRUD) (36.83N 75.97W)	04/1038	1000.1	04/0850	58 (1 min, 9 m)	64				
Sandbridge (XSBR) (36.70N 75.93W)			04/1103	45 (5 min, 5 m)	58				
Silver Beach (XSIL) (37.49N 75.97W)	04/1210	995.1	04/1208	37 (1 min, 8 m)	42				
South Norfolk Jordan Bridge (XSNJ) (36.81N 76.29W)	04/1032		04/1037	59 (1 min, 59 m)	66				
Tangier Island (XTSL) (37.78N 75.98W)	04/1253	995.5	04/1021	53 (1 min, 16 m)	61				
Thimble Shoals (XTHM) (37.05N 76.26W)	04/1120	998.4	04/1110	48 (6 m)	59				
Virginia Beach- Lynnhaven Pier (36.92N 76.08W)	04/1118	997.5	04/1148	40 (8 m)	56				
Wachapreague (XWAC) (37.60N 75.69W)	04/1258	998.6	04/1305	53 (1 min, 10 m)	58				
Remote Automated Weather Stations (RAWS)									
Suffolk (GDSV2) (36.61N 76.55W)			04/1126		43				3.08
Citizen Weather Observer Program (CWOP)									
Chesterfield (F6249) (37.32N 77.49W)	04/1045	1000.3							5.61
Dunnsville 2 NNE (37.89N 76.81W)	04/1203	998.0							5.26

Ford's Colony (D6344) (37.30N 76.75W)	04/1143	999.3							6.09
Hampton (E9762) (37.06N 76.28W)	04/1135	999.0	04/1200	29	46				
Machipongo (F4496) (37.41N 75.97W)	04/1242	998.0	04/1052	31	49				
Parksley (E1045) (37.73N 75.61W)	04/1316	999.0	04/1301	31	46				
Skimino (F2571) (37.35N 76.70W)									6.02
Virginia Beach (D4577) (36.77N 76.04W)	04/1105	1001.4	04/1030		50				
Virginia Beach (E1337) (36.75N 75.99W)	04/1110	1002.0	04/1155		51				
NWS Cooperative Observer Program (COOP) Sites									
Dispuanta 2 ESE (DSPV2) (37.11N 77.20W)									5.53
Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) Sites									
Centerville 1 SE (VA-JC-23) (37.31N 76.78W)									5.05
Ewell 2 SSW (VA-JC-48) (37.30N 76.75W)									6.60
Five Forks 2 N (VA-JC-1) (37.27N 76.76W)									5.42
Lightfoot 1 NW (VA-JC-59) (37.35N 76.77W)									7.03
Lightfoot 1 W (VA-JC-58) (37.34N 76.78W)									5.54
Oak Tree (VA-YR-7) (37.33N 76.71W)									6.28
Skimino 1 NNE (VA-YR-4) (37.36N 76.70W)									6.19
Stampers 1 WSW (VA-MX-1) (37.54N 76.44W)									6.08
Varnia 1 N (VA-HR-13) (37.46N 77.35W)									5.44
Williamsburg Airport 1 N (VA-WLC-1) (37.25N 76.72W)									5.32
Williamsburg Airport 1 NW (VA-JC-40) (37.25N 76.73W)									5.63
Public/Other									
Lewisetta (37.99N 76.46W)	04/1100	1001.5[I]	04/1324	38 (8 m)	55				
Monroe Creek (38.23N 76.95W)	04/1215	999.6	04/1200	36 (12 m)	46				
Stingray Point (CBIBS) (37.55N 76.25W)	04/1212	999.1	04/1130	37 (3 m)	45				
MARYLAND									
International Civil Aviation Organization (ICAO) Sites									
Annapolis (KNAK) (38.98N 76.48W)	04/1356	1000.3	04/1408	34 (2 min, 10 m)	49				3.74
Easton Newman Field (KESN) (38.80N 76.07W)	04/1350	998.6	04/1450	34 (2 min, 10 m)	49				2.13

Ocean City (KOXB) (38.31N 75.12W)	04/1420	999.3	04/1433	37 (2 min, 10 m)	49				
Patuxent River NAS (KNHK) (38.29N 76.40W)	04/1304	997.3	04/1413	35 (2 min, 10 m)	50				5.29
Salisbury (KSBY) (38.35N 75.50W)	04/1354	997.9	04/1513	36 (2 min, 10 m)	53				1.09
St Inigoes (KNUI) (38.14N 76.43W)	04/1253	997.0	04/1350	26 (2 min, 10 m)	45				4.30
Stevensville (KW29) (38.98N 76.33W)	04/1355	999.0	04/1415	27 (2 min, 10 m)	41				6.51
Coastal-Marine Automated Network (C-MAN) Sites									
Cove Point (COVM2) (38.40N 76.39W)	04/1312	997.4	04/1054	36 (28 m)	55				
Francis Scott Key Bridge (FSKM2) (39.22N 76.53W)	04/1418	1000.6	04/1418	36 (7 m)	42				
Francis Scott Key Bridge (FSNM2) (39.22N 76.53W)	04/1354	1001.0	04/1348	43 (42 m)	51				
Piney Point (PPTM2) (38.14N 76.53W)			04/1324	44 (7 m)	53				
Thomas Point (TPLM2) (38.90N 76.44W)	04/1300	1001.1	04/1340	40 (10 min, 18 m)	50				
National Ocean Service (NOS) Sites									
Annapolis (APAM2) (38.98N 76.48W)	04/1354	999.4	04/1348	35 (9 m)	49	1.72			
Baltimore (BLTM2) (39.27N 76.58W)	04/1424	1001.9	04/1412	25 (7 m)	37	2.00			
Bishops Head (BISM2) (38.22N 76.04W)	04/1318	996.2	04/1406	46 (7 m)	62	2.63	2.59	1.7	
Cambridge (CAMM2) (38.57N 76.06W)	04/1412	996.2	04/1442	43 (6 m)	60	3.96	3.45	2.5	
Chesapeake City (CHCM2) (39.53N 75.81W)	04/1512	998.1	04/1600	26 (7 m)	42	2.38			
Ocean City Inlet (OCIM2) (38.33N 75.09W)	04/1412	1001.3	04/1424	49 (9 m)	64				
Solomons Island (SLIM2) (38.32N 76.45W)	04/1254	997.3	04/1048	36 (9 m)	45	2.35	2.03	1.4	
Tolchester Beach (TCBM2) (39.22N 76.24W)	04/1406	999.7	04/1348	41 (7 m)	52	2.03			
Weatherflow									
Assateague Island (XAST) (38.21N 75.20W)	04/1359	998.6	04/1332	45 (1 min, 4 m)	54				
Blackwalnut Harbor (XBWH) (38.68N 76.33W)	04/1349	996.3	04/1400	44 (1 min, 7 m)	53				
Chesapeake City (39.53N 75.81W)			04/1422	43					
Cobb Point (XCOB) (38.24N 76.83W)	04/1214	995.1	04/1209	37 (5 min, 14 m)	49				
Crisfield CG (XCRS) (37.97N 75.88W)	04/1310	997.4	04/1408	45 (1 min, 6 m)	55				
Cuckold Creek (XCCK) (38.31N 76.93W)	04/1232	1000.0	04/1302	38 (1 min, 6 m)	45				
Greenbury Point (XGRN) (38.97N 76.46W)	04/1338	997.6	04/1413	40 (5 min, 8 m)	56				
Grove Point (XGVP) (39.40N 76.04W)			04/1422	43 (5 min, 11 m)	51				

Gunpowder (XGUN) (39.36N 76.32W)	04/1408	999.1	04/1413	39 (6 m)	44				
Hart Miller Island (XHRT) (39.25N 76.37W)	04/1359	997.2	04/1402	38 (1 min, 18 m)	45				
Herring Bay (XHEB) (38.73N 76.54W)	04/1335	997.5	04/1150	40 (1 min, 7 m)	45				
Lower Hooper Island (XHPR) (38.26N 76.18W)	04/1303	995.8	04/1408	46 (1 min, 9 m)	58				
Ocean City (XOCN) (38.33N 75.08W)	04/1434	996.7	04/1402	55 (1 min, 10 m)	64				
Point Lookout (XPTL) (38.04N 76.32W)	04/1251	996.4	04/1334	53 (11 m)	60				
Tolly Point (XTOL) (38.94N 76.44W)			04/1409	40 (5 min, 6 m)	56				
Remote Automated Weather Stations (RAWS)									
Assateague Island (ASTM2) (38.08N 75.20W)			04/1340	40	59				
Blackwater (BLWM2) (38.45N 76.09W)			04/1426	30	56				
Citizen Weather Observer Program (CWOP)									
Grasonville (E5728) (38.92N 76.20W)	04/1405	1000.7	04/1425	40	62				7.24
Huntingtown (D4923) (38.64N 76.62W)	04/1259	999.0							7.68
Mechanicsville (D0282) (38.40N 76.66W)	04/1243	998.3							7.22
Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) Sites									
Brandywine 7 ESE (MD-PG-37) (38.67N 76.74W)									7.20
Charlotte Hall 4 ENE (MD-SM-4) (38.49N 76.72W)									8.52
Dares Beach 4 N (MD-CV-20) (38.62N 76.51W)									6.95
Huntingtown 3 NNW (MD-CV-17) (38.65N 76.64W)									7.82
Leonardtown 1 NE (MD-SM-3) (38.31N 76.63W)									9.15
Mechanicsville 4 N (MD-SM-18) (38.49N 76.73W)									8.30
Millington 4 WSW (MD-QA-10) (39.24N 75.91W)									7.30
North Beach 2 WNW (MD-CV-21) (38.72N 76.57W)									7.43
Prince Frederick 1 W (MD-CV-7) (38.55N 76.62W)									7.58
St. Michaels 1 SE (MD-TB-4) (38.78N 76.21W)									8.45
Public/Other									
Barber Point (38.24N 76.83W)	04/1221	1001.3	04/1246	28 (5 m)	40				

California 2 W (38.30N 76.53W)									5.41
Cape St. Claire 1 E (39.04N 76.43W)									5.75
La Plata 3 ENE (38.55N 76.92W)									5.77
Potomoc Light 33 (38.34N 76.99W)	04/1231	1001.1	04/1141	36 (8 m)	47				
Prince Frederick 1 S (38.53N 76.59W)									8.42
Raccon Point (38.94N 76.44W)	04/1304	995.5	04/1429	41 (6 m)	57				
Sotterly 1 WNW (38.38N 76.55W)									9.00
Tilghman (38.72N 76.33W)			04/1400	41	60				
Tilghman Island (TILHM) (38.71N 76.34W)	04/1349	996.3	04/1014	40 (7 m)	53				
Trappe (38.66N 76.06W)									8.10
DELAWARE									
International Civil Aviation Organization (ICAO) Sites									
Cheswold (K33N) (39.22N 75.60W)	04/1515	996.9	04/1255	22 (2 min, 10 m)	40				
Dover AFB (KDOV) (39.14N 75.47W)	04/1508	996.6	04/1305	33 (2 min, 10 m)	52				1.40
Georgetown/Sussex Co (KGED) (38.70N 75.36W)	04/1454	997.0	04/1350	36 (2 min, 10 m)	50				1.22
Wilmington (KILG) (39.68N 75.60W)	04/1550	997.3	04/1628	37 (2 min, 10 m)	50				4.49
National Ocean Service (NOS) Sites									
Brandywine Shoal Light (BRND1) (38.99N 75.11W)	04/1536	998.1	04/1618	54[I] (21 m)	67[I]	2.62			
Delaware City (DELD1) (39.58N 75.59W)	04/1542	996.7	04/1336	32 (7 m)	53	2.76		2.2	
Lewes (LWSD1) (38.78N 75.12W)	04/1454	997.5	04/1554	42 (10 m)	53	1.95			
Reedy Point (RDYD1) (39.56N 75.57W)	04/1536	996.1				2.38	4.84	2.0	
Weatherflow									
Dewey Beach (XDEW) (38.68N 75.08W)	04/1515	995.4	04/1547	52 (1 min, 11 m)	59				
Lewes (XLEW) (38.79N 75.16W)	04/1502	995.8	04/1558	48 (1 min, 15 m)	58				
Citizen Weather Observer Program (CWOP)									
Greenwood (E7993) (38.78N 75.58W)	04/1455	995.6	04/1320	31	44				
Delaware Environmental Observing System (DEOS)									
Claymont Park (DE038) (39.81N 75.46W)	04/1615	997.6							6.70
Indian River Inlet (DE020) (38.63N 75.07W)			04/1355	39 (5 m)	59				
Millsboro – Long Neck (38.62N 75.12W)			04/1405		51				
Rehoboth Beach (RHBTH) (38.72N 75.08W)	04/1510	998.0	04/1420	32 (4 m)	52				

Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) Sites									
Clayton 1.5 SW (DE-KN-20) (39.28N 75.66W)									6.00
Wilmington 7 NNE (DE-NC-65) (39.83N 75.49W)									6.70
Public/Other									
Magnolia 1 NE (39.08N 75.46W)			04/1255		67				
Milford (MILFD) (38.93N 75.41W)			04/1559	25	42				
Smyrna Landing 2 NW (39.32N 75.61W)			04/1315	46	83				
PENNSYLVANIA									
International Civil Aviation Organization (ICAO) Sites									
Allentown (KABE) (40.66N 75.43W)	04/1700	997.3	04/1715	34 (2 min, 10 m)	45				4.92
Doylestown (KDYL) (40.33N 75.12W)	04/1730	995.9	04/1755	25 (2 min, 10 m)	37				4.35
Mount Pocono (KMPO) (41.14N 75.38W)	04/1815	1000.0	04/1750	33	44				4.39
North Philadelphia (KPNE) (40.09N 75.02W)	04/1654	996.8	04/1525	35 (2 min, 10 m)	46				2.40
Philadelphia (KPHL) (39.87N 75.23W)	04/1606	996.9	04/1737	33 (2 min, 10 m)	41				4.16
Pottstown (KPTW) (40.24N 75.56W)	04/1605	997.2	04/1710	27[I] (2 min, 10 m)	43[I]				5.06
Reading (KRDG) (40.37N 75.96W)	04/1705	1001.3	04/1600	30 (2 min, 10 m)	41				3.22
National Ocean Service (NOS) Sites									
Bridesburg (BDSP1) (39.98N 75.08W)	04/1654	996.8				3.11		2.4	
Marcus Hook (MRCP1) (39.81N 75.41W)	04/1554	996.8				2.80	5.42	2.2	
Newbold (NBLP1) (40.14N 74.75W)	04/1706	997.3	04/1830	28 (6 m)	43			3.0	
Philadelphia (PHBP1) (39.93N 75.14W)	04/1648	996.3				3.00	6.03	2.4	
Hydrometeorological Automated Data System (HADS) Sites (NWS)									
Avondale 2 N (AVOP1) (39.86N 75.79W)									7.34
Citizen Weather Observer Program (CWOP)									
Center Valley (F7623) (40.53N 75.40W)	04/1707	998.0							7.28
Gilbertsville (F7071) (40.28N 75.56W)	04/1603	999.0							7.46
Palmer Township (E6123) (40.71N 75.26W)			04/1705	31	46				3.85
Reading (E3190) (40.35N 75.90W)			04/1610	43	65				
Sellersville (F3600) (40.39N 75.31W)									7.43
Wayne (C8212) (40.05N 75.37W)	04/1616	996.3							7.48
Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) Sites									

Ardmore (PA-MT-48) (40.01N 75.30W)									7.57
Blue Bell 2 NW (PA-MT-13) (40.17N 75.30W)									7.00
Bryn Mawr 1 W (PA-DL-15) (40.02N 75.33W)									8.73
Collegeville 1 NNE (PA-MT-91) (40.20N 75.45W)									8.10
Gladwyne (PA-MT-116) (40.05N 75.28W)									7.15
Graterford 1 WSW (40.22N 75.47W)									8.00
Harleysville 3 S (PA-MT-51) (40.24N 75.38W)									8.85
North Wales (PA-MT-110) (40.20N 75.27W)									7.37
North Wales 1 SW (PA-MT-72) (40.20N 75.29W)									7.65
North Wales 1 WSW (PA-MT-16) (40.21N 75.30W)									7.36
Plymouth Meeting 2 NW (PA-MT-112) (40.13N 75.31W)									7.75
Quakertown 2 NNE (PA-BK-33) (40.46N 75.33W)									7.17
Saylorsburg 3 WNW (PA-MN-11) (40.90N 75.37W)									7.83
West Chester 2 SE (PA-CH-21) (39.94N 75.58W)									7.71
Public/Other									
Canadensis (41.19N 75.25W)									7.00
Gap (39.99N 76.02W)									5.65
Gouldsboro (41.24N 75.46W)									6.28
Lakeville (41.43N 75.28W)									6.00
Skippack (40.23N 75.39W)									8.00
Wynnewood (40.00N 75.27W)									8.59
NEW JERSEY									
International Civil Aviation Organization (ICAO) Sites									
Atlantic City (KACY) (39.46N 74.57W)	04/1654	998.2	04/1500	37 (2 min, 10 m)	56				
Belmar (KBLM) (40.18N 74.13W)	04/1700	999.6[I]	04/1640	32[I] (2 min, 10 m)	46[I]				
Caldwell (KCDW) (40.88N 74.28W)	04/1826	997.5	04/1717	28 (2 min, 10 m)	45				1.97
Cape May (KOBI) (39.22N 74.79W)	04/1428	1000.6[I]	04/1431	32[I] (2 min, 10 m)	40[I]				

Linden Airport (KLDJ) (40.62N 74.24W)	04/1815	996.9	04/1715	30 (2 min, 10 m)	45				1.40
Millville (KMIV) (39.37N 75.07W)	04/1525	997.1	04/1701	33 (2 min, 10 m)	50				2.05
Morristown (KMMU) (40.80N 74.42W)	04/1755	997.1[I]	04/1945	28[I] (2 min, 10 m)	51[I]				
Newark (KEWR) (40.69N 74.16W)	04/1815	996.9	04/1950	41 (2 min, 10 m)	59				1.06
Somerville/Somerset (KSMQ) (40.62N 74.67W)	04/1751	995.8	04/1922	19 (2 min, 10 m)	42				2.77
Teterboro (KTEB) (40.86N 74.05W)	041905	996.9	04/2003	31 (2 min, 10 m)	48				1.45
Toms River (KMJX) (39.93N 74.29W)	04/1735	998.6	04/1600	39 (2 min, 10 m)	52				
Trenton (KTTN) (40.28N 74.81W)	04/1745	995.5	04/1605	37 (2 min, 10 m)	50				2.15
Wildwood (KWWD) (39.02N 74.92W)	04/1550	998.4	04/1456	38[I] (2 min, 10 m)	54[I]				
Wrightstown (KWRI) (40.02N 74.60W)	04/1656	997.2	04/1605	28 (2 min, 10 m)	54				
Coastal-Marine Automated Network (C-MAN) Sites									
Cape May (CMAN4) (38.97N 74.96W)	04/1518	997.8	04/1618	47 (10 m)	65	2.85			
National Ocean Service (NOS) Sites									
Atlantic City (ACYN4) (39.36N 74.42W)	04/1630	999.4				3.06	3.42	1.4	
Burlington (BDRN4) (40.08N 74.87W)	04/1706	996.2	04/1812	32 (8 m)	44	3.79		2.8	
Sandy Hook (SDHN4) (40.47N 74.01W)	04/1824	997.9	04/1930	45 (6 m)	58	4.29	4.02	1.6	
Ship John (Delaware Bay) (SJSN4) (39.31N 75.38W)	04/1506	996.5	04/1418	51 (15 m)	66	3.25		2.8	
Hydrometeorological Automated Data System (HADS) Sites (NWS)									
Atlantic City Marina (ATLN4) (39.38N 74.42W)	04/1630	998.0	04/1718	35 (2 m)	59				
Egg Harbor EGGHB (TKTN4) (39.51N 74.32W)	04/1642	997.3	04/1548	46	70				
Margate MRGRC (ALCN4) (39.35N 74.46W)	04/1654	998.3	04/1736	32	47				
Stone Harbor (39.06N 74.77W)			04/1642	43	61				
Weatherflow									
Barnegat Inlet Light 7 (XBRN) (39.76N 74.09W)	04/1649	995.1	04/1459	54 (1 min, 12 m)	65				
Bayonne (XBYO) (40.68N 74.09W)	04/1756	995.1	04/1722	42 (1 min, 10 m)	54				
Cape May (XMAY) (38.97N 74.96W)	04/1517	996.2	04/1624	49 (1 min, 10 m)	56				
Kite Island (XKIT) (39.80N 74.17W)	04/1658	996.3	04/1633	47 (1 min, 6 m)	55				
Long Beach Island Surf (XLBI) (39.66N 74.21W)	04/1718	997.9	04/1456	57 (1 min, 6 m)	95				
Ludlam Bay (XLUD) (39.18N 74.70W)	04/1544	996.3	04/1459	47 (1 min, 6 m)	58				
Ocean City South Beach (XOCS) (39.22N 74.64W)	04/1604	996.5	04/1349	52 (1 min, 10 m)	63				

Perth Amboy (XPER) (40.51N 74.28W)	04/1808	994.8	04/1648	47 (1 min, 10 m)	57				
Pleasantville Point (XPTP) (39.38N 74.50W)	04/1625	998.9	04/1550	43 (1 min, 6 m)	57				
Seaside Heights (XSEA) (39.94N 74.07W)	04/1745	997.0	04/1618	49 (1 min, 14 m)	57				
Tuckerton (XTUK) (39.52N 74.32W)	04/1716	996.9	04/1525	49 (1 min, 10 m)	58				
Remote Automated Weather Stations (RAWS)									
Coyle Field (CTWN4) (39.81N 74.43W)			04/1610	27 (6 m)	49				
Galloway (OCVN4) (39.46N 74.45W)			04/1525	36 (6 m)	57				
Citizen Weather Observer Program (CWOP)									
Beach Haven (E4321) (39.54N 74.26W)	04/1616	1000.3[I]	04/1431	41[I]	57[I]				
Bridgewater (F7617) (40.58N 74.59W)	04/1755	996.6	04/1520	26	50				3.57
Island Heights (AR575) (39.94N 74.15W)	04/1751	998.0	04/1636	40	60				
Jersey City (F2280) (40.70N 74.04W)	04/1804	996.3	04/1728	43	68				
Logan Township (E2237) (39.76N 75.36W)	04/1603	996.6							5.41
Maywood (F6101) (40.89N 74.07W)			04/1653	44					
Middletown (E2017) (40.43N 74.10W)	04/1830	997.0	04/2000	25	47				
Monmouth Beach MNMTB (D8195) (40.34N 73.97W)	04/1831	997.9	04/1546	27	40				
North Beach Haven (C2530) (39.58N 74.23W)	04/1615	998.0[I]	04/1615	29[I]	56[I]				
Ocean City (F2611) (39.28N 74.57W)	04/1630	998.0	04/1545	31	51				
Sea Isle City (D8913) (39.15N 74.69W)	04/1601	998.6	04/1532	27	46				
Sea Isle City (E8445) (39.12N 74.71W)	04/1545	998.0	04/1645	36	50				
South Seaside Park (C4845) (39.91N 74.08W)	04/1601	1001.7[I]	04/1525	38[I]	52[I]				
Surf City (F2015) (39.67N 74.16W)	04/1715	998.6	04/1416	25	50				
Tabernacle (F3950) (39.85N 74.71W)	04/1512	999.3[I]	04/1511	30[I]	46[I]				
Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) Sites									
Bethlehem TWP 1 S (NJ-HN-7) (40.66N 75.01W)									5.22
Blairstown TWP 4 SE (NJ-WR-8) (40.94N 74.94W)									5.14
Franklin TWP 3 WSW (NJ-HN-62) (40.55N 74.99W)									5.13
Pennsville TWP 1 NE (NJ-SL-13) (39.63N 75.50W)									5.95
Salem 1 ENE (NJ-SL-11) (39.57N 75.46W)									7.86

White TWP 2 S (NJ-WR-23) (40.80N 75.04W)									5.14
Public/Other									
Elsinboro TWP 4 SSW (39.48N 75.54W)			04/1330	38	40				
Fortescue 1 NW (39.25N 75.18W)			04/1430	51					
Harvey Cedars OEM (39.71N 74.14W)			04/1440	43					
Manasquan 1 ESE (40.12N 74.03W)			04/1705	43	56				
Millstone 2 SW (40.48N 74.62W)			04/1519	38					
Ocean City OCNCS (39.26N 74.61W)	04/1604	998.3	04/1729	33	44				
NEW YORK									
International Civil Aviation Organization (ICAO) Sites									
Farmingdale (KFRG) (40.74N 73.41W)	04/1853	999.9	04/1750	42 (2 min, 10 m)	68				
Islip (KISP) (40.80N 73.10W)	04/1905	1001.7	04/1835	43 (2 min, 10 m)	60				
New York JFK (KJFK) (40.64N 73.76W)	04/1905	998.0	04/1725	47 (2 min, 10 m)	61				
New York LGA (KLGA) (40.78N 73.88W)	04/1905	997.2	04/1736	46 (2 min, 10 m)	60				
New York Central Park (KNYC) (40.79N 73.96W)	04/1920	997.7	04/2000	22 (2 min, 10 m)	42				1.09
New York City Downtown (KJRB) (40.70N 74.01W)	04/1905	998.0	04/2015	31 (2 min, 10 m)	43				
Shirley (KHWV) (40.83N 72.86W)	04/1856	1004.5	04/1856	35 (2 min, 10 m)	53				
Stewart (KSWF) (41.50N 74.10W)	04/1845	997.1	04/2120	32 (2 min, 10 m)	44				
Westhampton (KFOK) (40.86N 72.61W)	04/2005	1005.9	04/1840	29 (2 min, 10 m)	45				
White Plains (KHPN) (41.07N 73.70W)	04/1905	998.2	04/1800	34 (2 min, 10 m)	51				1.10
Coastal-Marine Automated Network (C-MAN) Sites									
Mariners Harbor (MHRN6) (40.64N 74.16W)			04/1612	39 (46 m)	57				
National Ocean Service (NOS) Sites									
Bergen Point West Research (BGNN6) (40.64N 74.14W)	04/1812	996.9				4.91		1.7	
Kings Point (KPTN6) (40.81N 73.77W)	04/1918	998.1	04/1742	44 (9 m)	59	2.28	4.92	1.3	
The Battery (BATN6) (40.70N 74.01W)	04/1824	997.8				4.49	3.84	1.6	
Weatherflow									
Bannerman Island (XBAN) (41.46N 73.99W)	04/1839	995.6	04/1829	38 (5 min, 19 m)	53				
Bayville (XBAY) (40.91N 73.63W)	04/1939	995.0	04/2019	48 (14 m)	51				
Blue Point (XBLU) (40.74N 73.03W)	04/1758	1000.3	04/1829	51 (1 min, 12 m)	62				

Breezy Point (XBRZ) (40.55N 73.93W)	04/1826	994.0	04/1718	47 (1 min, 10 m)	56				
Croton (XCRO) (41.20N 73.88W)	04/1850	995.1	04/2040	30 (14 m)	45				
East Moriches Inlet CG (XMOR) (40.79N 72.74W)	04/1731	1004.4	04/1918	50 (1 min, 10 m)	58				
Eatons Neck (XEAT) (40.96N 73.39W)	04/1925	993.6	04/1655	28 (1 min, 22 m)	50				
Fire Island CG (XFIR) (40.62N 73.26W)	04/1859	999.1	04/1824	51 (1 min, 10 m)	63				
Fishers Island (XFSH) (41.26N 72.03W)	04/1955	1005.7	04/2129	43 (1 min, 10 m)	50				
Great Gull Island (XGUL) (41.20N 72.12W)	04/2047	1003.7	04/2047	54 (1 min, 16 m)	64				
Great South Bay (XHCK) (40.66N 73.40W)	04/1903	999.4	04/1818	49 (5 min, 11 m)	65				
Jones Beach (XJON) (40.60N 73.55W)	04/1844	996.3	04/1755	43 (1 min, 10 m)	56				
Kingston (XRND) (41.92N 73.96W)	04/2003	995.7	04/1940	34 (1 min, 10 m)	42				
Larchmont Harbor (XLAR) (40.92N 73.73W)	04/1935	998.8	04/1819	52 (1 min, 12m)	67				
Mecox Bay (XMCX) (40.91N 72.31W)	04/1949	1005.5	04/2027	40 (1 min, 10 m)	47				
Napeague (XNAP) (41.01N 72.05W)	04/2000	1006.7	04/1845	28 (10 m)	42				
Point O'Woods Yacht Club (XPOW) (40.66N 73.13W)	04/1901	999.9	04/2000	44 (1 min, 6 m)	57				
Shinnecock Light (XSHN) (40.84N 72.47W)	04/1951	1000.8	04/1952	49 (1 min, 12m)	57				
Sinai Harbor (XSIN) (40.96N 73.04W)	04/1948	999.8[I]	04/1824	41[I] (1 min, 8 m)	51[I]				
State Boat Channel (XGRS) (40.65N 73.30W)	04/1854	998.8	04/1833	46 (1 min, 5 m)	57				
Tappan Zee Light (XTPZ) (41.14N 73.87W)	04/1841	994.7	04/1806	43 (1 min, 13 m)	56				
Citizen Weather Observer Program (CWOP)									
Baiting Hollow (E4141) (40.97N 72.71W)	04/1933	1002.4	04/1808		45				
Bay Shore (F0858) (40.72N 73.23W)	04/1947	1001.4	04/1821	32	46				
Blue Point (E8546) (40.75N 73.04W)	04/1916	1003.4	04/2001		49				
Brookhaven (E4378) (40.76N 72.91W)	04/1901	1000.0[I]	04/1830	39[I]	52[I]				
Cutchogue (D5360) (41.00N 72.44W)	04/1945	1003.7	04/2235	31	46				
Eastport (F1522) (40.85N 72.73W)	041929	1011.8	04/1929	29	48				
Hampton Bays (E9356) (40.85N 72.49W)	04/2034	1005.8	04/2007	40	52				
Jackson Heights (Queens) (D9152) (40.75N 73.88W)	04/1907	997.3	04/1812	32	63				
Manhattan Beach/Brooklyn (F1729) (40.58N 73.93W)	04/1826	998.6	04/1617	32	49				
Muttontown (C0028) (40.83N 73.56W)	04/1931	998.6	04/1825		45				
Orient (F2389) (40.75N 73.88W)	04/1846	1000.0	04/2101	43	56				

Stony Brook (E5678) (40.91N 73.12W)			04/1900	31	65				
Valley Stream (C3340) (40.65N 73.69W)	04/1911	998.3	04/1746	25	49				
West Gilgo Beach (F3143) (40.61N 73.42W)	04/1901	999.7	04/1800	46	66				
West Islip (C0354) (40.71N 73.31W)	04/1909	1000.0	04/1909		46				
National Estuarine Research Reserve System (NERRS) Sites									
Turkey Point Hudson River (TKPN6) (42.01N 73.94W)	04/2036	997.4	04/1806	19	27	4.2		1.5	
Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) Sites									
Albany 1 SW (NY-AB-23) (42.66N 73.81W)									5.35
Tannersville 4.5 SSE (NY-GR-13) (42.14N 74.09W)									5.37
Wurtsboro (NY-SV-8) (41.57N 74.49W)									5.45
Public/Other									
Bronx – Lehman College (NYSMBRON) (40.88N 73.89W)			04/1810	25 (10 m)	55				
Brooklyn College (NYSMBKLN) (40.64N 73.95W)			04/1740	29 (10 m)	52				
NYC Hunter College (NYSMMANH) (40.77N 73.96W)			04/1745	26 (10 m)	60				
Otisville (NYSMOTIS) (41.49N 74.50W)			04/2055	36 (10 m)					
Princetown (42.78N 74.06W)									5.47
Queens College (NYSMQUEE) (40.74N 73.81W)			04/1750	35 (10 m)	59				
Somers (NYSMSOME) (41.32N 73.76W)			04/1820	28 (10 m)	49				
Staten Island (NYSMSTAT) (40.61N 74.14W)			04/1945	26 (10 m)	50				
Stony Brook (NYSMSTON) (40.92N 73.13W)			04/1840		48 (10m)				
Suffern (NYSMSUFF) (41.14N 74.08W)			04/2040	20 (10 m)	45				
Tannersville 5 SSE (42.14N 74.09W)									5.92
Wantagh (NYSMWANT) (40.66N 73.50W)			04/1740	37 (10 m)	59				
Warwick (NYSMWARW) (41.25N 74.39W)			04/1810	25 (10 m)	43				
CONNECTICUT									
International Civil Aviation Organization (ICAO) Sites									
Bridgeport (KBDR) (41.17N 73.12W)	04/1952	1000.1	04/2100	38[I] (2 min, 10 m)	54[I]				
Chester (KSNC) (41.38N 72.51W)	04/2055	1003.9	04/2015	27 (2 min, 10 m)	45				

Danbury (KDXR) (41.37N 73.48W)	04/1957	998.8	04/1745	30 (2 min, 10 m)	43				
Groton (KGON) (41.33N 72.04W)	04/2105	1005.1	04/2056	39 (2 min, 10 m)	50				
Hartford (KHFD) (41.74N 72.65W)	04/1942	1001.6[I]	04/1909	29 (2 min, 10 m)	45				
Mediden (KMMK) (41.51N 72.82W)	04/2045	1000.6	04/2020	27 (2 min, 10 m)	47				
New Haven (KHVN) (41.26N 72.88W)	04/2035	1001.9	04/1957	33[I] (2 min, 10 m)	49[I]				
Oxford (KOXC) (41.48N 73.13W)	04/2010	1000.9	04/1900	33 (2 min, 10 m)	52				
Willimantic (KIJD) (41.74N 72.18W)	04/2150	1003.8	04/2010	34 (2 min, 10 m)	47				
Windsor Locks (KBDL) (41.94N 72.68W)	04/2151	1000.5	04/2030	39 (2 min, 10 m)	53				
National Ocean Service (NOS) Sites									
Bridgeport (BRHC3) (41.17N 73.18W)	04/1954	999.1	04/1842	39 (8 m)	59	2.43			
New Haven (NWHC3) (41.28N 72.91W)	04/2024	1001.3	04/1936	38 (7 m)	48	2.61			
New London (NLNC3) (41.36N 72.09W)	04/2100	1005.8	04/2030	31 (8 m)	45	2.46			
Weatherflow									
Lighthouse Point (XLTH) (41.25N 72.90W)	04/2023	999.7	04/1918	42 (5 min, 8 m)	57				
Norwalk Light (XNOR) (41.08N 73.38W)	04/1953	997.6	04/1825	45 (5 min, 10 m)	61				
Stonington Outer Breakwater 4 (XSTO) (41.32N 71.91W)	04/2057	1004.5	04/2122	36 (5 min, 11 m)	47				
US Coast Guard Academy (XCGA) (41.38N 72.09W)	04/2059	1003.8	04/2109	35 (1 min, 17 m)	45				
Citizen Weather Observer Program (CWOP)									
Bethany (E0704) (41.40N 73.03W)	04/1919	1001.0	04/2137	52	56				
Bridgeport (E6717) (41.03N 73.53W)	04/1946	1001.7	04/1815		48				
Fairfield (AU922) (41.14N 73.24W)	04/1930	999.3[I]	04/1745	35[I]	58[I]				
Greenwich (E3387) (41.01N 73.57W)	04/1946	997.6	04/1800	45	58				
RHODE ISLAND									
International Civil Aviation Organization (ICAO) Sites									
Block Island (KBID) (41.17N 71.58W)	04/1939	1008.4	04/2005	37 (2 min, 10 m)	51				
Newport (KUUU) (41.53N 71.28W)	04/2110	1008.5	04/2050	28 (2 min, 10 m)	40				
North Kingston (KOQU) (41.60N 71.41W)	04/2025	1004.0	04/2025	45 (2 min, 10 m)	53				
Providence (KPVD) (41.72N 71.43W)	04/2025	1006.3	04/2025	36 (2 min, 10 m)	51				
Westerly (KWST) (41.35N 71.80W)	04/2053	1008.1	04/1941	28 (2 min, 10 m)	44				
Coastal-Marine Automated Network (C-MAN) Sites									
Providence (PVDR1) (41.79N 71.38W)	04/2024	1006.7	04/2030	40	53				
National Ocean Service (NOS) Sites									

Conimicut Light (CPTR1) (41.72N 71.34W)	04/2024	1006.9				2.61			
Newport (NWPR1) (41.50N 71.33W)	04/2024	1008.5	04/2042	32 (8 min, 8 m)	43	1.66			
Providence (FOXR1) (41.81N 71.40W)	04/2030	1006.8	04/1942	39 (8 min, 18 m)	53	3.32			
Quonset (QPTR1) (41.59N 71.41W)	04/2012	1007.7	04/2042	39 (8 min, 7 m)	51	1.88			
Weatherflow									
Block Island Jetty (XBLK) (41.19N 71.59W)	04/1943	1006.2	04/2004	42 (1 min, 11 m)	49				
Bristol Harbor (XCAS) (41.65N 71.29W)	04/2017	1006.0	04/2140	41 (1 min, 9 m)	52				
Fogland (XFOG) (41.56N 71.22W)	04/2037	1005.6	04/2053	45 (1 min, 26 m)	50				
Halfway Rock (XHLF) (41.53N 71.31W)			04/2011	40 (1 min, 9 m)	47				
Ninigret Pond (XNIN) (41.34N 71.69W)	04/2003	1006.8	04/1951	43 (1 min, 11 m)	48				
Pt. Judith (XJUD) (41.36N 71.50W)	04/2004	1006.6	04/2021	42 (1 min, 16 m)	49				
Rose Island (XROS) (41.50N 71.34W)	04/2020	1007.9	04/2045	34 (5 min, 11 m)	47				
Sabin Point (XSBN) (41.77N 71.39W)	04/2030	1002.9	04/2047	44 (1 min, 9 m)	52				
Sakonnet Vineyards (XSAK) (41.53N 71.19W)	04/2038	1003.8	04/2118	23 (1 min, 10 m)	42				
URI (XURI) (41.49N 71.42W)	04/1959	1006.6	04/2011	39 (1 min, 10 m)	46				
Remote Automated Weather Stations (RAWS)									
Charlestown (NINR1) (41.38N 71.58W)			04/2125	26 (6 m)	46				
Citizen Weather Observer Program (CWOP)									
Providence (E0927) (41.83N 71.40W)			04/2030		50				
MASSACHUSETTS									
International Civil Aviation Organization (ICAO) Sites									
Bedford (KBED) (42.47N 71.29W)	04/2216	1006.1	04/2035	30 (2 min, 10 m)	42				
Boston (KBOS) (42.36N 71.01W)	04/2235	1006.8	05/0000	37 (2 min, 10 m)	46				
Chicopee (KCEF) (42.19N 72.54W)	04/2226	1001.1	04/2056	25 (2 min, 10 m)	48				
Fitchburg (KFIT) (42.55N 71.76W)	04/2152	1003.5	04/2250	27 (2 min, 10 m)	45				
Marshfield (KGHG) (42.10N 70.67W)	04/2235	1008.5	04/2135	27 (2 min, 10 m)	55				
Milton (KMQE) (42.21N 71.11W)	04/2151	1007.5	04/2151	34 (2 min, 10 m)	51				
New Bedford (EWB) (41.68N 70.96W)	04/2053	1008.5	04/2110	28 (2 min, 10 m)	49				
Norwood (KOWD) (42.19N 71.17W)	04/2225	1006.4	04/2100	27 (2 min, 10 m)	44				
Orange (KORE) (42.57N 72.29W)	04/2152	1001.8	05/0025	32 (2 min, 10 m)	45				
Pittsfield (KPSF) (42.73N 73.29W)	04/2054	996.6	04/2315	27 (2 min, 10 m)	40				
Plymouth (KPYM) (41.91N 70.73W)	04/2240	1009.0	04/2100	22 (2 min, 10 m)	43				

Taunton (KTAN) (41.87N 71.02W)	04/2100	1007.7	04/2050	27 (2 min, 10 m)	43				
Westfield (KBAF) (42.16N 72.72W)	04/2040	1000.0[I]	04/2025	23[I] (2 min, 10 m)	54[I]				
Worcester (KORH) (42.27N 71.88W)	04/2154	1004.1	04/2030	33 (2 min, 10 m)	46				
Coastal-Marine Automated Network (C-MAN) Sites									
Borden Flats Light (BLTM3) (41.70N 71.17W)	04/2048	1008.0	04/2100	34 (8 min, 16 m)	51				
Buzzards Bay (BUZM3) (41.40N 71.03W)	04/2100	1009.7	04/2100	43 (10 min, 25 m)	53				
National Ocean Service (NOS) Sites									
Fall River (FRVM3) (41.70N 71.16W)	04/2048	1008.5				2.78			
Woods Hole (BZBM3) (41.52N 70.67W)						2.05			
Weatherflow									
Carson Beach (XCAR) (42.33N 71.05W)	04/2117	1004.0	04/2117	26 (1 min, 14 m)	41				
Chapin (XCHP) (41.73N 70.23W)	04/2237	1010.2	04/2257	29 (1 min, 9 m)	40				
Children's Island (XCHD) (42.51N 70.82W)	05/0035	1002.9	05/0037	39 (1 min, 9 m)	43				
Courageous Sailing (XCOR) (42.37N 71.05W)	04/2217	1003.9	04/2109	37 (1 min, 22 m)	45				
Deer Island (XDER) (42.31N 70.89W)	04/2125	1004.3	04/2130	43 (1 min, 18 m)	51				
Dog Bar Breakwater (XDOG) (42.58N 70.67W)	04/2253	1002.3	04/2153	46 (1 min, 14 m)	51				
Duxbury (XDUX) (42.06N 70.65W)	04/2115	1006.3	04/2129	43 (1 min, 12 m)	53				
Duxbury Bay (XDXB) (42.04N 70.67W)	04/2232	1007.0	04/2105	40 (1 min, 14 m)	50				
East Boston (XSHP) (42.36N 71.04W)	04/2121	1005.0	04/2111	27 (1 min, 8 m)	41				
Fenway Park (XFEN) (42.35N 71.10W)	04/2225	1000.6	04/2040	24 (1 min, 30 m)	42				
Harvard Bridge (XHRV) (42.36N 71.09W)			05/0027	28 (1 min, 8 m)	40				
Hatch Beach (XHCH) (41.82N 70.00W)	04/2217	1009.8	04/2202	26 (1 min, 10 m)	40				
Horseneck Beach (XHOR) (41.51N 71.09W)	04/2054	1004.0	04/2054	43 (5 min, 11 m)	53				
Hull (XHUL) (42.31N 70.89W)	04/2124	1000.8	04/2139	43 (1 min, 12 m)	52				
Kalmus (XKAL) (41.63N 70.28W)	04/2259	1009.3	04/2214	38 (1 min, 10 m)	43				
Mt. Tom (XTOM) (42.25N 72.65W)	04/2052		04/2346	37 (1 min, 17 m)	47				
Ned's Point (XNED) (41.65N 70.78W)	04/2048	1009.0	04/2107	37 (5 min, 7 m)	48				
Pleasure Bay (XPLB) (42.33N 71.02W)	04/2134	1003.0	04/2137	47 (1 min, 9 m)	54				
Vineyard Haven (XVIN) (41.46N 70.59W)	04/2227	1008.4	04/2057	28 (1 min, 10 m)	41				
West Dennis (XWDN) (41.65N 70.17W)	04/2232	1009.8	04/2232	35 (1 min, 13 m)	39				

West Falmouth (XWFL) (41.60N 70.65W)	04/2222	1009.1	04/2108	36 (1 min, 10 m)	41				
West Island (XWST) (41.58N 70.82W)	04/2210	1008.3	04/2100	38 (5 min, 10 m)	49				
Woods Hole Passage Light (XWHL) (41.52N 70.68W)	04/2047	1007.0	04/2059	41 (1 min, 12 m)	49				
Citizen Weather Observer Program (CWOP)									
Clarksburg (C2493) (42.73N 73.07W)	04/2143	999.0							2.85
Fairhaven (D4678) (41.59N 70.83W)	04/2232	1010.2	04/2100	37					
Milton (C2236) (42.21N 71.11W)	04/2226	1006.4	04/2216	36	63				
New Bedford (AV436) (41.59N 70.91W)			04/2055	41					
Palmer (D7801) (42.19N 72.35W)	04/2215	1000.0	04/2315		51				
Provincetown (F5907) (42.07N 70.15W)	04/2230	1008.1	04/2215	36	53				
Rockport (AV086) (42.64N 70.58W)	05/0015	1004.7	04/2200	36	51				
Truro (F6034) (41.99N 70.01W)	04/2258	1010.5	04/2118	30	45				
Woods Hole (F2970) (41.53N 70.68W)	04/2231	1011.1	04/2100	29	50				
Wrentham (AT213) (42.04N 71.41W)	04/2213	1006.8	04/2338		46				
Public/Other									
Savoy (42.60N 73.04W)									3.00
NEW HAMPSHIRE									
International Civil Aviation Organization (ICAO) Sites									
Berlin (KBML) (44.58N 71.17W)	05/0252	1003.1	05/0045	26 (2 min, 10 m)	43				
Jaffrey (KAFN) (42.80N 71.99W)	04/2200	1002.9	04/2205	22 (2 min, 10 m)	40				
Lebanon (KLEB) (43.63N 72.31W)	04/2250	998.7							1.29
Manchester (KMHT) (42.93N 71.44W)	04/2353	1004.2	05/0110	29 (2 min, 10 m)	43				
Mount Washington (KMWN) (44.28N 71.30W)			04/2210	84	128				2.59
Portsmouth (KPSM) (43.09N 70.81W)	05/0156	1006.3	04/2230	35 (2 min, 10 m)	44				
Rochester (KDAW) (43.28N 70.92W)	05/0051	1005.3	04/2240	23 (2 min, 10 m)	40				
Whitefield (KHIE) (44.35N 71.52W)	05/0030	1001.1	05/0005	25 (2 min, 10 m)	42				
Coastal-Marine Automated Network (C-MAN) Sites									
Isle of Shoals (IOSN3) (42.97N 70.62W)	04/2300	1005.8	04/2240	44 (10 min, 19 m)	54				
Citizen Weather Observer Program (CWOP)									
Gilford (D3310) (43.56N 71.35W)	04/2330	1003.0	05/0301	29	51				
Hudson (F4199) (42.81N 71.38W)	04/2235	1003.7	04/2235		68				
VERMONT									

International Civil Aviation Organization (ICAO) Sites									
Bennington (KDDH) (42.89N 73.25W)	04/2125	997.9	04/2141	27 (2 min, 10 m)	41				1.40
Citizen Weather Observer Program (CWOP)									
Charlotte (E9454) (44.27N 73.31W)	05/0003	998.6	05/0003	33	44				2.02
Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) Sites									
Braintree 3 SW (VT-OG-10) (43.94N 72.75W)									3.16
Pomfret 3 N (VT-WR-2) (43.74N 72.53W)									3.35
Warren 3 SSE (VT-WS-22) (44.07N 72.83W)									3.15
MAINE									
International Civil Aviation Organization (ICAO) Sites									
Bar Harbor (KBHB) (44.45N 68.37W)	05/0556	1011.1	05/0330	33 (2 min, 10 m)	38				
Frenchville (KFVE) (47.28N 68.31W)	05/0925	1005.5	05/0905	25 (2 min, 10 m)	37				
Greenville (KGNR) (45.46N 69.56W)	05/0456	1005.8	05/0156	27 (2 min, 10 m)	41				
National Ocean Service (NOS) Sites									
Portland (CASM1) (43.66N 70.24W)	05/0206	1007.3	05/0318	31	40				
Wells (WELM1) (43.32N 70.56W)	05/0200	1007.2	04/2300	29	36	1.18			
Citizen Weather Observer Program (CWOP)									
Denmark (E9735) (44.02N 70.86W)	05/0231	1004.7	04/2331		48				
Portland (E2983) (43.65N 70.28W)	05/0245	1012.2	05/0245	29	49				
Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) Sites									
Andover 4 W (44.64N 70.83W)									1.93

[a] Date/time is for sustained wind when both sustained and gust are listed.
[b] Except as noted, sustained wind averaging periods for C-MAN and land-based reports are 2 min; buoy averaging periods are 8 min.
[c] Storm surge is water height above normal astronomical tide level.
[d] For most locations, storm tide is water height above the North American Vertical Datum of 1988 (NAVD88). Storm tide is water height above the Puerto Rico Vertical Datum of 2002 (PRVD02) and the Virgin Islands Vertical Datum of 2009 (VIVD09) for NOS stations in Puerto Rico and the U.S. Virgin Islands, respectively.
[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. For USGS water level sensors, the data are converted to above MHHW.
[l] Incomplete Data

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%)	108	150
Medium (40%-60%)	96	126
High (>60%)	78	102

Table 5a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Hurricane Isaias, 30 July–4 August 2020. Mean errors for the previous 5-yr period are shown for comparison. Official errors that are smaller than the 5-yr means are shown in boldface type.

	Forecast Period (h)							
	12	24	36	48	60	72	96	120
OFCL	**22.1**	**36.0**	54.7	73.4	82.2	97.7	**124.0**	183.1
OCD5	44.0	91.4	125.8	157.3	179.6	183.2	242.4	405.5
Forecasts	22	20	18	16	14	12	8	4
OFCL (2015-19)	24.1	36.9	49.6	65.1	80.7	96.3	133.2	171.6
OCD5 (2015-19)	44.7	96.1	156.3	217.4	273.9	330.3	431.5	511.9

Table 5b. Homogeneous comparison of selected track forecast guidance models (in n mi) for Hurricane Isaias, 30 July–4 August 2020. Errors smaller than the NHC official forecast are shown in boldface type.

Model ID	Forecast Period (h)							
	12	24	36	48	60	72	96	120
OFCL	22.1	36.0	54.7	73.4	82.2	97.7	124.0	183.1
OCD5	44.0	91.4	125.8	157.3	179.6	183.2	242.4	405.5
TABS	68.4	128.3	171.0	213.3	263.3	327.3	567.3	916.6
TABM	35.1	49.6	**51.3**	**61.6**	90.3	125.2	250.6	506.6
TABD	32.7	61.3	95.6	142.1	197.4	240.8	351.6	458.8
TVDG	**21.8**	**32.2**	**51.0**	**72.0**	83.0	**91.8**	**101.1**	**177.9**
TVCA	22.4	**33.7**	**53.0**	73.9	86.1	**96.1**	**120.2**	218.9
GFEX	22.7	**35.4**	**54.1**	74.6	87.0	99.7	**113.7**	235.9
TVCX	**21.5**	**33.0**	**53.6**	73.4	84.6	**92.8**	**101.7**	184.1
FSSE	22.6	**33.9**	**50.6**	**68.6**	87.4	102.0	124.4	**108.5**
HCCA	**21.5**	**35.4**	56.3	78.3	87.1	**96.7**	**99.4**	**148.0**
AEMI	25.2	46.5	70.7	94.0	106.9	116.6	143.4	261.8
NVGI	32.5	54.4	78.6	90.0	114.9	147.3	218.5	402.8
CMCI	30.6	53.5	73.1	88.8	94.0	**93.7**	130.8	**124.8**
EMXI	23.0	41.3	64.6	88.8	100.3	113.2	169.3	304.1
EGRI	29.2	39.3	71.3	101.1	121.2	135.0	164.5	258.9
HWFI	**21.9**	37.8	**51.5**	**69.9**	90.3	130.8	276.6	627.1
HMNI	**22.0**	40.3	64.2	105.6	158.8	240.9	462.4	667.1
GFSI	25.7	38.7	**53.6**	**71.4**	98.3	139.2	260.9	421.1
Forecasts	22	20	18	16	14	12	8	4

Table 6a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Hurricane Isaias, 30 July–4 August 2020. Mean errors for the previous 5-yr period are shown for comparison. Official errors that are smaller than the 5-yr means are shown in boldface type.

	Forecast Period (h)							
	12	24	36	48	60	72	96	120
OFCL	7.5	11.0	11.4	11.2	**7.9**	**7.1**	**3.8**	**8.8**
OCD5	9.0	12.9	16.1	16.5	13.4	12.4	16.5	13.0
Forecasts	22	20	18	16	14	12	8	4
OFCL (2015-19)	5.2	7.7	9.4	10.7	11.9	13.0	14.4	15.5
OCD5 (2015-19)	6.8	10.8	14.1	17.0	18.8	20.6	22.5	24.6

Table 6b. Homogeneous comparison of selected intensity forecast guidance models (in kt) for Hurricane Isaias, 30 July–4 August 2020. Errors smaller than the NHC official forecast are shown in boldface type.

Model ID	Forecast Period (h)							
	12	24	36	48	60	72	96	120
OFCL	7.5	11.0	11.4	11.2	7.9	7.1	3.8	8.8
OCD5	9.0	12.9	16.1	16.5	13.4	12.4	16.5	13.0
IVDR	**6.6**	**9.1**	**9.3**	**8.4**	**6.1**	**6.2**	8.5	11.5
IVCN	**7.2**	**10.1**	**10.3**	**9.5**	**6.7**	**6.5**	9.4	14.0
ICON	7.8	**10.6**	**11.1**	**10.7**	7.9	7.7	10.0	13.8
LGEM	9.9	14.3	15.8	16.8	14.5	14.2	18.0	22.8
DSHP	9.6	13.0	13.6	13.9	12.9	12.9	17.4	22.0
FSSE	**6.8**	**9.1**	**9.4**	**8.6**	**7.2**	8.3	9.1	12.5
HCCA	**6.7**	**8.8**	**8.7**	**7.6**	**5.1**	7.2	7.9	**8.0**
CMCI	8.1	**10.3**	12.2	14.1	14.1	17.2	22.2	17.8
EMXI	**6.5**	**7.6**	**8.9**	12.9	13.9	14.8	19.6	27.5
EGRI	8.1	**10.5**	12.1	14.6	12.1	16.6	17.5	21.0
HWFI	**6.6**	**8.2**	**8.2**	**7.1**	9.7	12.6	13.5	**5.8**
HMNI	9.0	**9.1**	**10.4**	11.9	12.1	15.2	13.1	17.2
GFSI	**6.3**	**8.7**	11.4	12.9	12.5	12.9	13.8	8.8
Forecasts	22	20	18	16	14	12	8	4

Table 7. Wind watch and warning summary for Hurricane Isaias, 30 July–4 August 2020.

Date/Time (UTC)	Action	Location
28 / 1500	Tropical Storm Watch issued	Cabo Engano to Northern Dominican Republic/Haiti Border
28 / 1500	Tropical Storm Warning issued	Puerto Rico and U.S. Virgin Islands
28 / 1500	Tropical Storm Warning issued	Antigua/Barbuda/British Virgin Islands/Montserrat
28 / 1500	Tropical Storm Warning issued	St. Kitts/Nevis
28 / 1500	Tropical Storm Warning issued	Guadeloupe/Martinique/St. Martin
28 / 1500	Tropical Storm Warning issued	Saba/St. Eustatius
28 / 1500	Tropical Storm Warning issued	St. Maartin
28 / 1500	Tropical Storm Warning issued	Anguilla/St. Barthelemy
28 / 1800	Tropical Storm Warning issued	Dominica
28 / 2100	Tropical Storm Watch discontinued	Cabo Engano to Northern Dominican Republic/Haiti Border
28 / 2100	Tropical Storm Watch issued	Southern Dominican Republic/Haiti Border to Cabo Caucedo
28 / 2100	Tropical Storm Warning issued	Cabo Caucedo to Northern Dominican Republic/Haiti Border
29 / 0300	Tropical Storm Watch issued	Turks and Caicos
29 / 1200	Tropical Storm Warning discontinued	Dominica
29 / 1500	Tropical Storm Watch changed to Tropical Storm Warning	Turks and Caicos to Southeast Bahamas
29 / 1500	Tropical Storm Watch issued	Central Bahamas

29 / 1800	Tropical Storm Warning discontinued	Antigua/Barbuda
29 / 1800	Tropical Storm Warning discontinued	Guadeloupe/Martinique/St. Martin
29 / 1800	Tropical Storm Watch changed to Tropical Storm Warning	South coast of the Dominican Republic west of Cabo Caucedo to Southern Dominican Republic/Haiti Border
29 / 2100	Tropical Storm Warning discontinued	Montserrat
29 / 2100	Tropical Storm Warning discontinued	St. Kitts/Nevis
30 / 0300	Tropical Storm Watch changed to Tropical Storm Warning	Central Bahamas
30 / 0300	Tropical Storm Watch issued	Northwestern Bahamas
30 / 0300	Tropical Storm Warning discontinued	Anguilla
30 / 0900	Tropical Storm Warning discontinued	St. Martin
30 / 0900	Tropical Storm Warning discontinued	Saba/St. Eustatius
30 / 0900	Tropical Storm Warning discontinued	St. Maartin
30 / 0900	Tropical Storm Warning discontinued	St. Barthelemy
30 / 1500	Tropical Storm Warning discontinued	British Virgin Islands
30 / 1800	Tropical Storm Warning discontinued	Puerto Rico and U.S. Virgin Islands

30 / 2100	Tropical Storm Watch changed to Tropical Storm Warning	Northwestern Bahamas
30 / 2100	Tropical Storm Watch issued	Ocean Reef to Sebastian Inlet, including Lake Okeechobee
31 / 0000	Tropical Storm Warning changed to Hurricane Warning	Northwestern Bahamas
31 / 0400	Tropical Storm Warning changed to Hurricane Warning	Central and Southeastern Bahamas
31 / 1200	Tropical Storm Warning discontinued	Le Mole St Nicholas to Northern Dominican Republic/Haiti Border
31 / 1500	Tropical Storm Watch changed to Tropical Storm Warning	Ocean Reef to Sebastian Inlet
31 / 1500	Tropical Storm Warning discontinued	Dominican Republic
31 / 1500	Hurricane Watch issued	Deerfield Beach to Volusia/Brevard County Line
31 / 2100	Tropical Storm Watch issued	Flagler/Volusia County Line to Ponte Vedra Beach
31 / 2100	Tropical Storm Warning modified to	Ocean Reef to Boca Raton
31 / 2100	Hurricane Watch modified to	Volusia/Brevard County Line to Flagler/Volusia County Line
31 / 2100	Hurricane Watch issued	Hallandale to Boca Raton
31 / 2100	Hurricane Warning issued	Boca Raton to Volusia/Brevard County Line
1 / 0000	Tropical Storm Warning discontinued	Turks and Caicos
1 / 0000	Hurricane Warning modified to	Northwestern Bahamas to Central Bahamas

1 / 0300	Hurricane Warning modified to	Boca Raton to Flagler/Volusia County Line
1 / 1500	Tropical Storm Watch changed to Tropical Storm Warning	Flagler/Volusia County Line to Ponte Vedra Beach
1 / 1500	Tropical Storm Watch issued	Ponte Vedra Beach to Altamaha Sound
1 / 2100	Tropical Storm Watch modified to	Ponte Vedra Beach to South Santee River
1 / 1500	Tropical Storm Watch changed to Tropical Storm Warning	Lake Okeechobee
1 / 2100	Hurricane Watch discontinued	Hallandale to Boca Raton
2 / 0900	Tropical Storm Watch modified to	South Santee River to Surf City
2 / 0900	Tropical Storm Warning discontinued	Ocean Reef to Hallandale
2 / 0900	Tropical Storm Warning issued	Hallandale to South Santee River
2 / 0900	Hurricane Warning discontinued	Boca Raton to Flagler/Volusia CL
2 / 1200	Hurricane Warning discontinued	All
2 / 1500	Tropical Storm Watch modified to	Surf City to Duck
2 / 1500	Tropical Storm Warning discontinued	Hallandale to Jupiter Inlet, including Lake Okeechobee
2 / 1500	Tropical Storm Warning issued	South Santee River to Surf City
2 / 2100	Tropical Storm Watch issued	Ocracoke Inlet to Watch Hill
2 / 2100	Tropical Storm Warning discontinued	Jupiter Inlet to Sebastian Inlet
2 / 2100	Tropical Storm Warning issued	Surf City to Ocracoke Inlet
2 / 2100	Hurricane Watch issued	South Santee River to Surf City

3 / 0300	Tropical Storm Watch modified to	Fenwick Island to Watch Hill
3 / 0300	Tropical Storm Warning modified to	Sebastian Inlet to Fenwick Island
3 / 0600	Tropical Storm Warning discontinued	Volusia/Brevard County Line to Sebastian Inlet
3 / 0900	Hurricane Watch changed to Hurricane Warning	South Santee River to Surf City
3 / 0900	Tropical Storm Watch modified to	Watch Hill to Stonington
3 / 0900	Tropical Storm Warning issued	West of Watch Hill, Tidal Potomac south of Cobb Island, Chesapeake Bay south of North Beach, Delaware Bay, Long Island, Long Island Sound
3 / 1500	Tropical Storm Watch changed to Tropical Storm Warning	West of Watch Hill to the mouth of the Merrimack River, including Martha's Vineyard, Nantucket, and Block Island
3 / 1500	Tropical Storm Watch issued	Merrimack River to Eastport
3 / 1500	Tropical Storm Watch changed to Tropical Storm Warning	Remainder of the Chesapeake Bay and Tidal Potomac River north of Cobb Island
3 / 1500	Tropical Storm Warning discontinued	Volusia/Brevard County line to Altamaha Sound
3 / 2100	Tropical Storm Watch changed to Tropical Storm Warning	Mouth of Merrimack River to Stonington
3 / 2100	Tropical Storm Warning discontinued	Altamaha Sound to Savannah River
4 / 0000	Tropical Storm Warning discontinued	Savannah River to Edisto Beach
4 / 0300	Tropical Storm Warning discontinued	Edisto Beach to South Santee River

4 / 0300	Tropical Storm Watch changed to Tropical Storm Warning	North of Stonington to Eastport
4 / 0600	Hurricane Warning modified to	Little River Inlet to Surf City
4 / 0900	Hurricane Warning discontinued	All
4 / 1500	Tropical Storm Warning discontinued	Duck to North of Surf City, including Pamlico and Albemarle Sounds
4 / 1800	Tropical Storm Warning modified to	Chincoteague to Eastport
4 / 2100	Tropical Storm Warning modified to	South of Sandy Point, New Jersey to Stonington
5 / 0000	Tropical Storm Warning modified to	Watch Hill to Stonington
5 / 0300	Tropical Storm Warning modified to	Merrimack River to Stonington
5 / 0300	Tropical Storm Warning discontinued	Block Island
5 / 0300	Tropical Storm Warning discontinued	Nantucket Island
5 / 0300	Tropical Storm Warning discontinued	Marthas Vineyard
5 / 0600	Tropical Storm Warning discontinued	All

Table 8. Storm Surge watch and warning summary for Hurricane Isaias, 30 July–4 August 2020.

Date/Time (UTC)	Action	Location
31 / 2100	Storm Surge Watch issued	Jupiter Inlet to Ponte Vedra Beach, FL
2 / 0900	Storm Surge Watch issued	Edisto Beach, SC to Cape Fear, NC
2 / 1500	Storm Surge Watch discontinued	Jupiter Inlet to Ponte Vedra Beach, FL
2 / 2100	Storm Surge Watch changed to Storm Surge Warning	Edisto Beach, SC to Cape Fear, NC
3 / 1500	Storm Surge Watch changed to Storm Surge Warning	Neuse and Pamlico Rivers in NC, and Oregon Inlet, NC to the North Carolina/Virginia border.
4 / 0000	Storm Surge Warning discontinued	Folly Beach to Edisto Beach, SC
4 / 0300	Storm Surge Watch changed to Storm Surge Warning	Ocracoke Inlet to Oregon Inlet, NC
4 / 0600	Storm Surge Warning discontinued	Little River Inlet to Folly Beach, SC
4 / 0900	Storm Surge Watch discontinued	Cape Fear to Surf City, NC
4 / 1200	Storm Surge Warning discontinued	Neuse River in NC
4 / 1200	Storm Surge Watch discontinued	All
4 / 1500	Storm Surge Warning discontinued	All

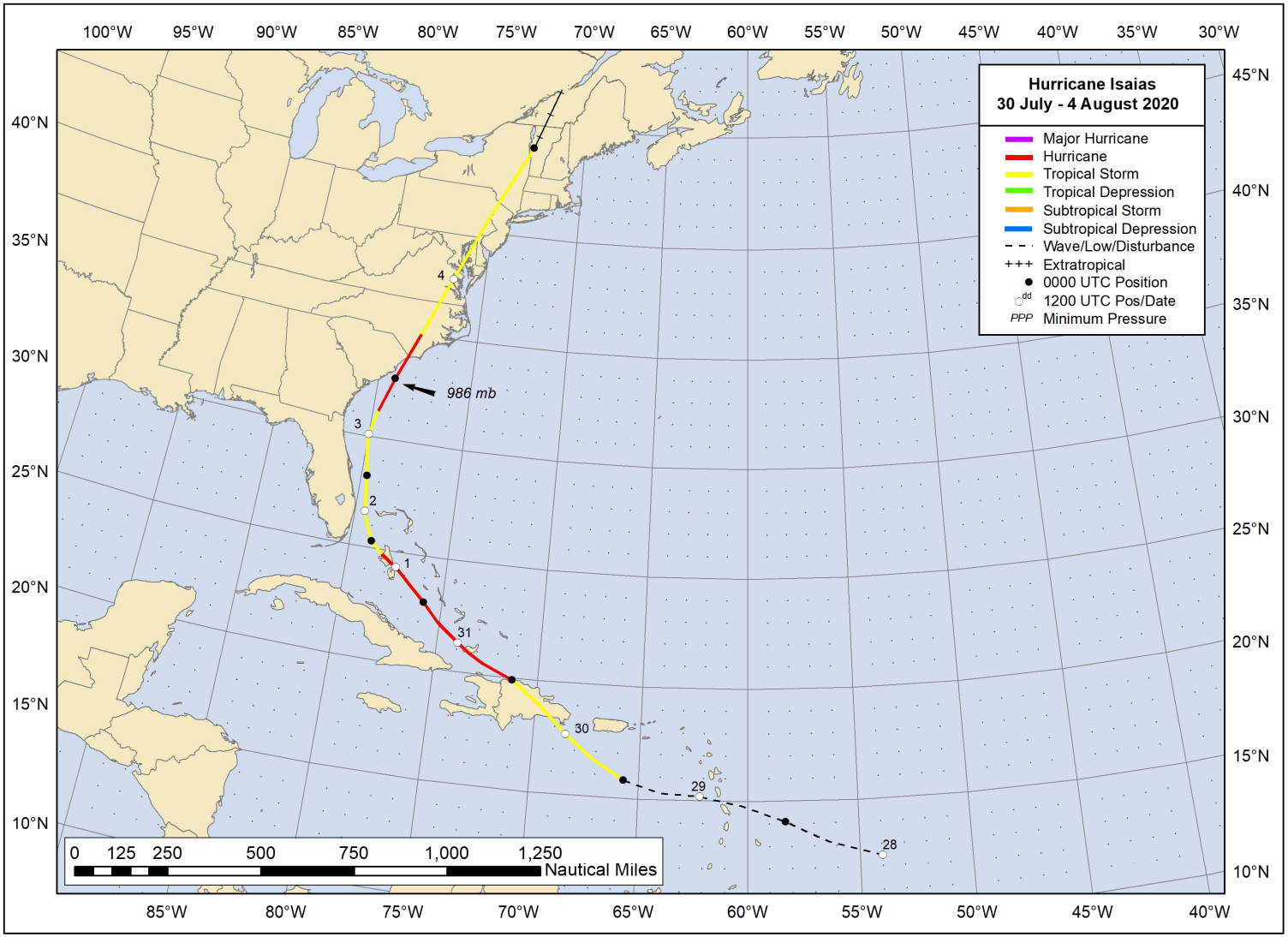

Figure 1. Best track positions for Hurricane Isaias, 30 July–4 August 2020.

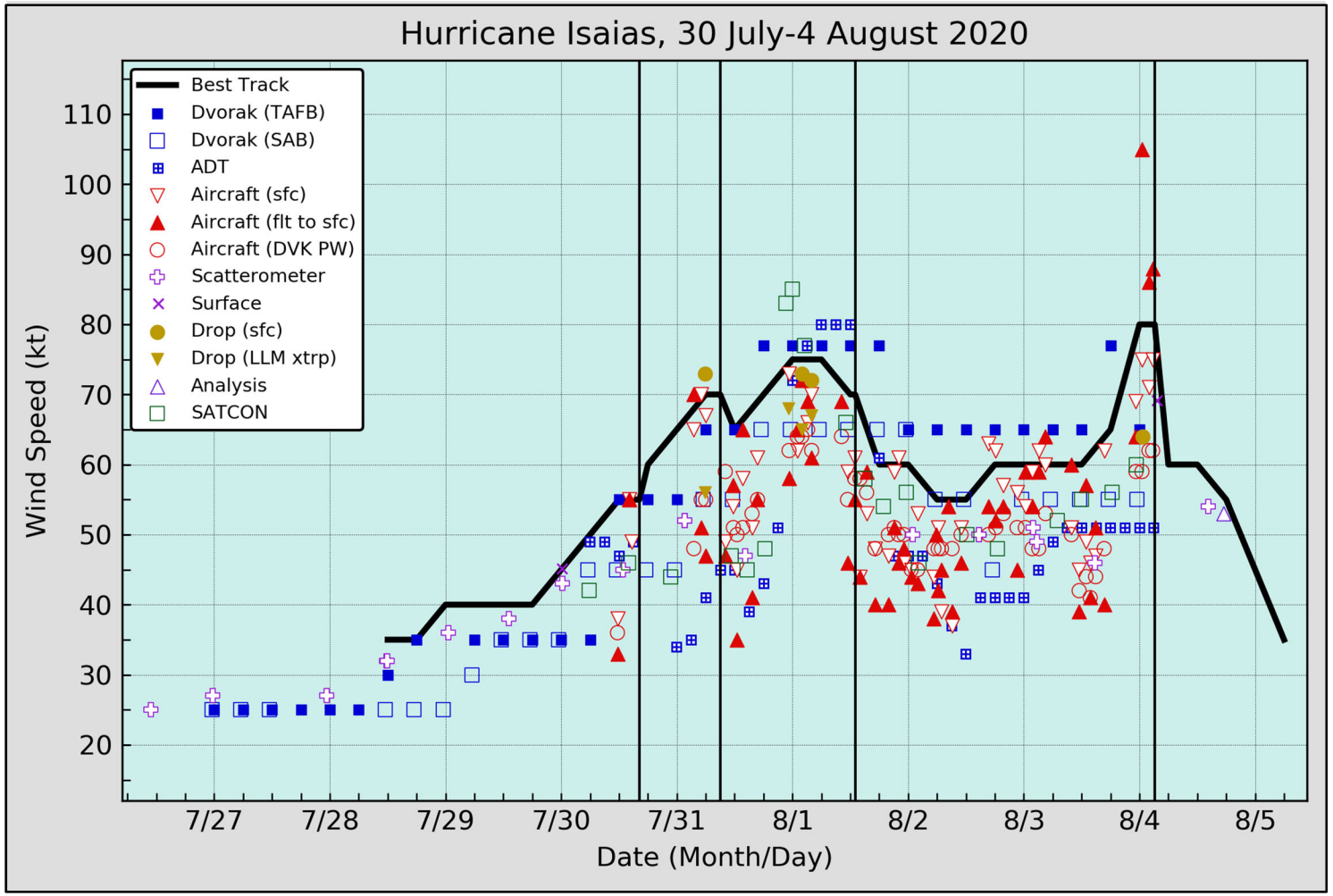

Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Hurricane Isaias, 30 July–4 August 2020. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies. 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. Dashed vertical lines correspond to 0000 UTC, and the solid vertical lines correspond to landfalls.

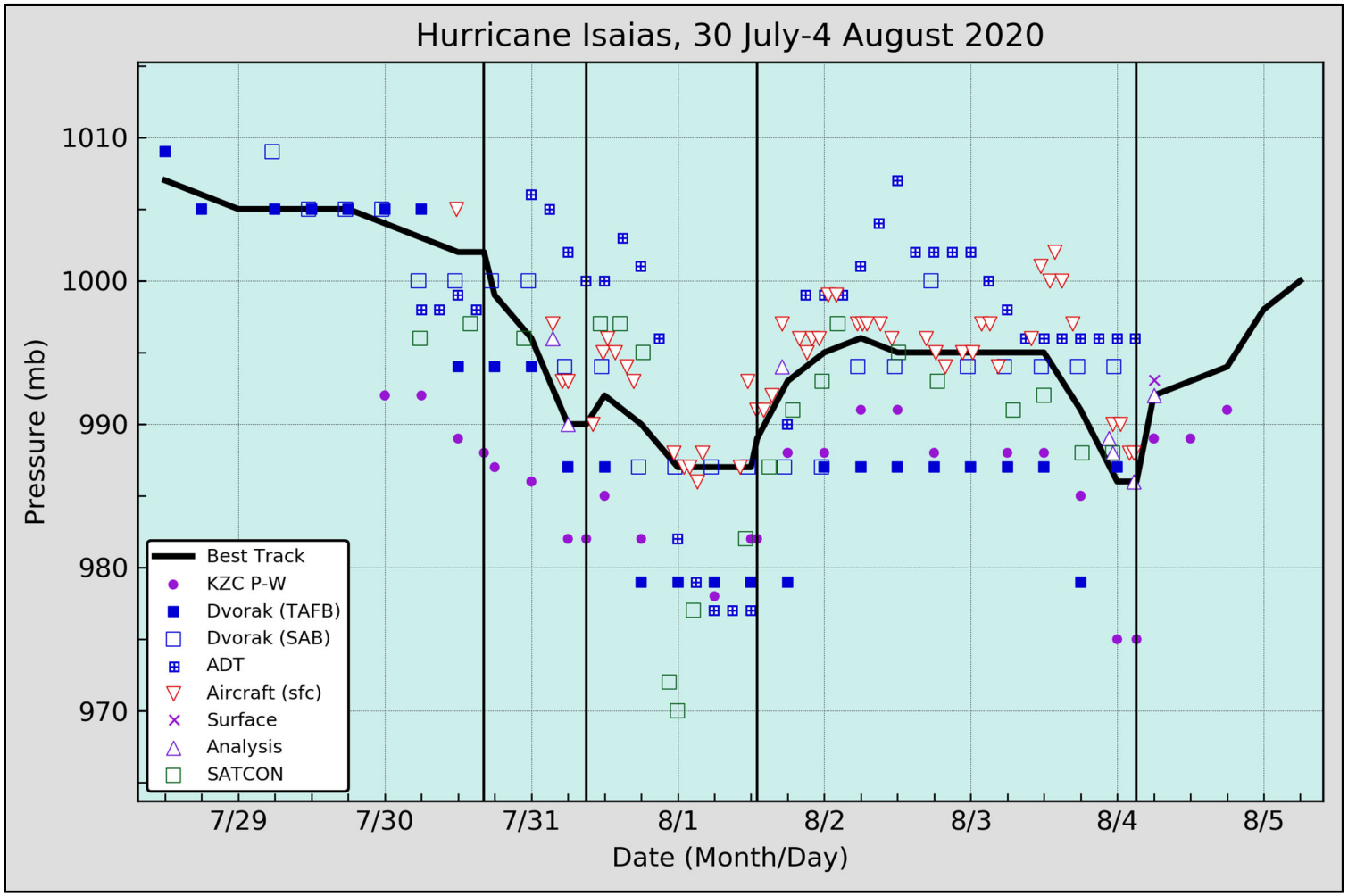

Figure 3. Selected pressure observations and best track minimum central pressure curve Hurricane Isaias, 30 July–4 August 2020. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies. KZC P-W refers to pressure estimates derived using the Knaff-Zehr-Courtney pressure-wind relationship. Dashed vertical lines correspond to 0000 UTC, and the solid vertical lines correspond to landfalls.

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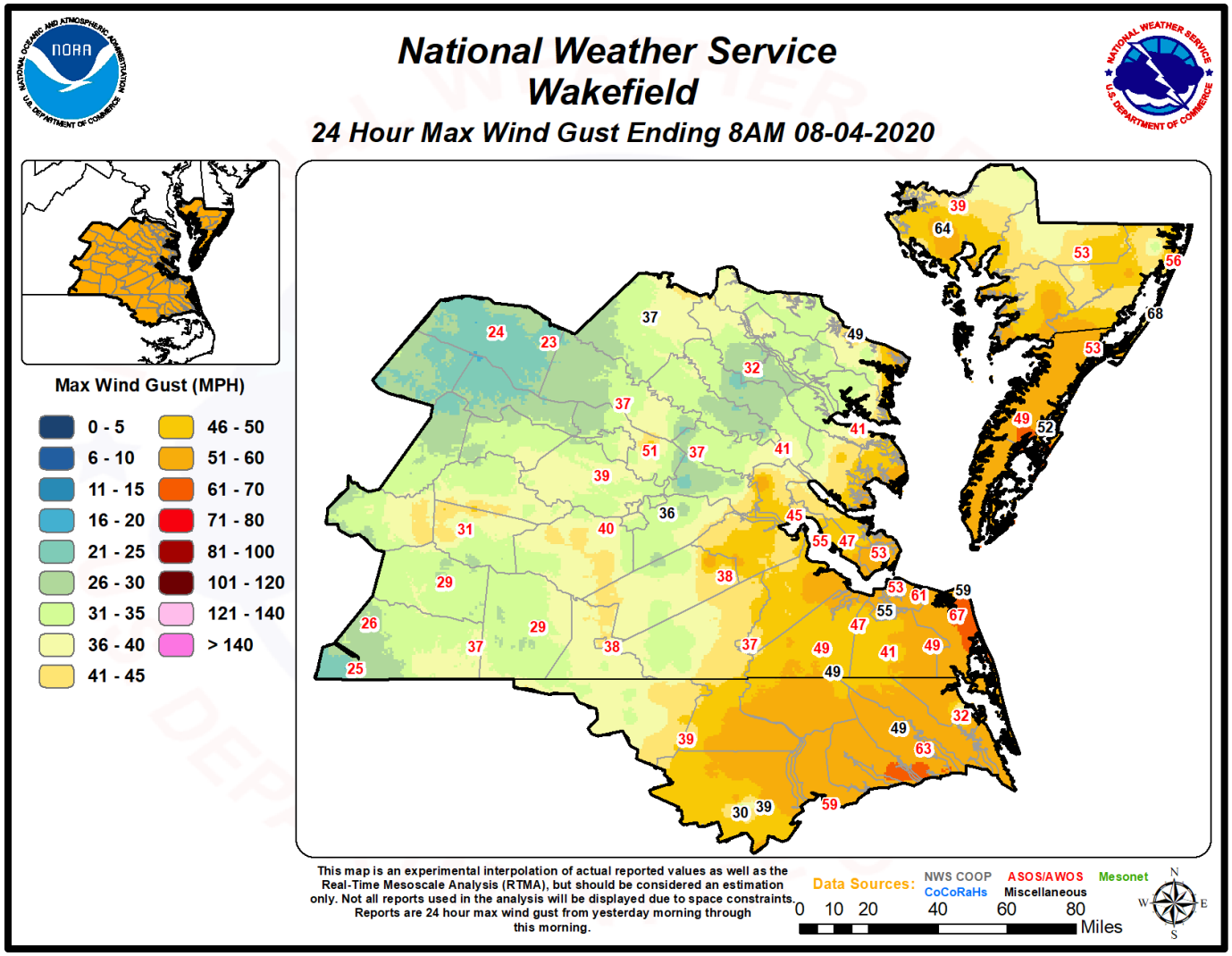

Figure 4. Select wind gusts (mph) and interpolated values (shaded) across the NWS WFO Wakefield, VA area of responsibility. Image courtesy of NWS WFO Wakefield.

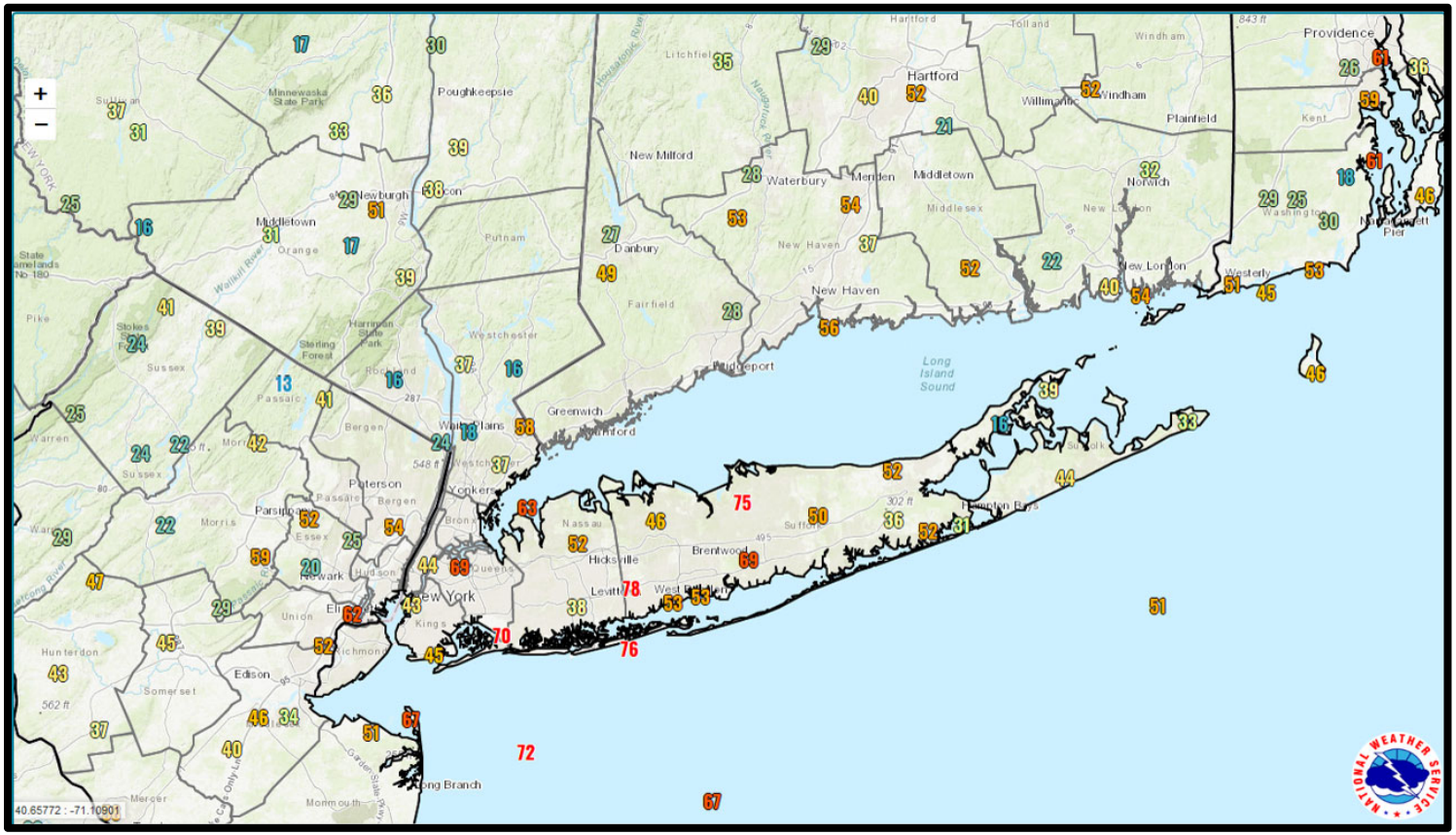

Figure 5. Select wind gusts (mph) across the NWS WFO New York, NY area of responsibility. Image courtesy of NWS WFO New York.

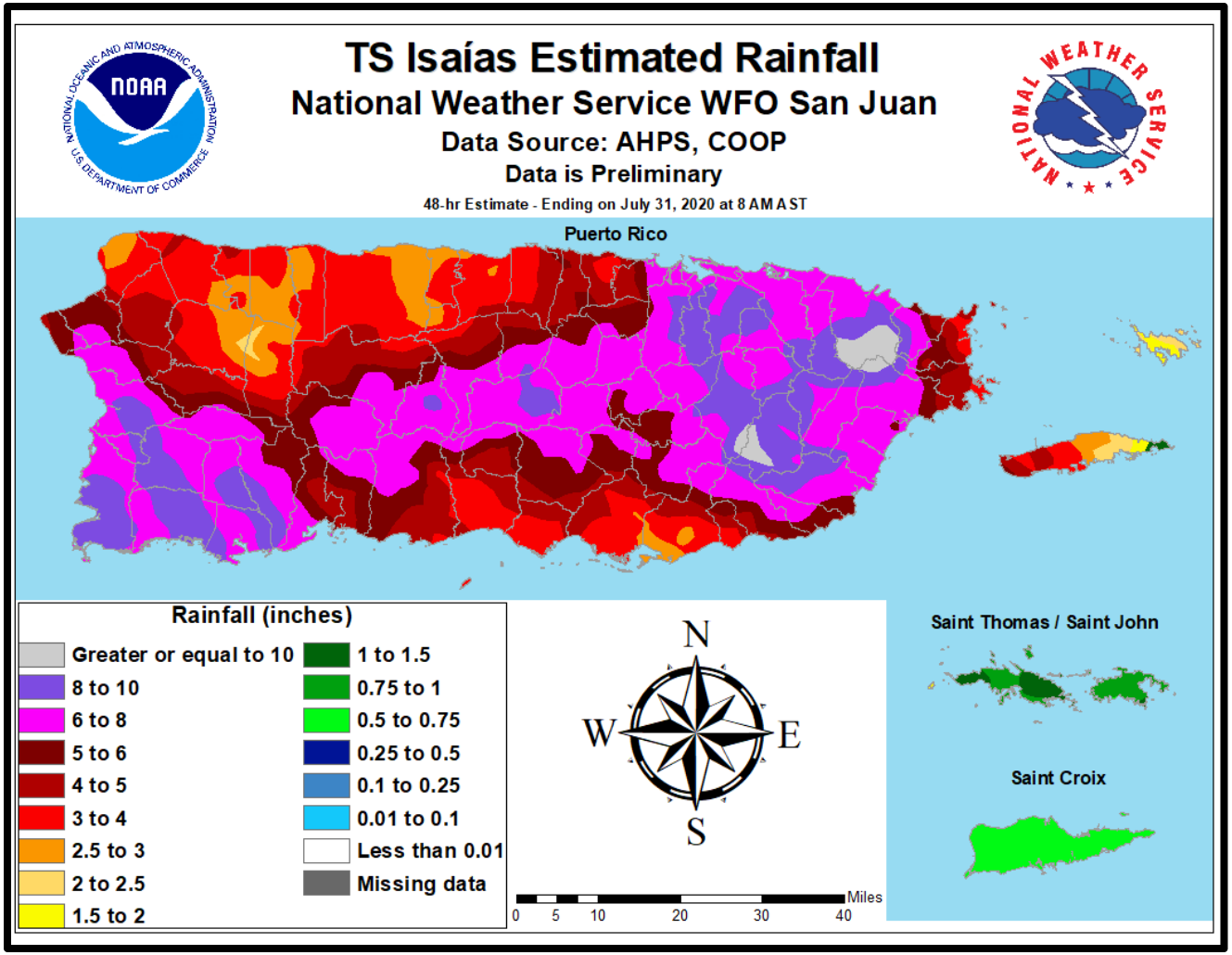

Figure 6. 48-h rainfall estimates (inches) ending 31 July at 1200 UTC for Puerto Rico and the U.S. Virgin Islands. Image courtesy of NWS WFO San Juan.

Figure 7. Isaias' flash flooding damage in the Dominican Republic. Photo credit Getty Images.

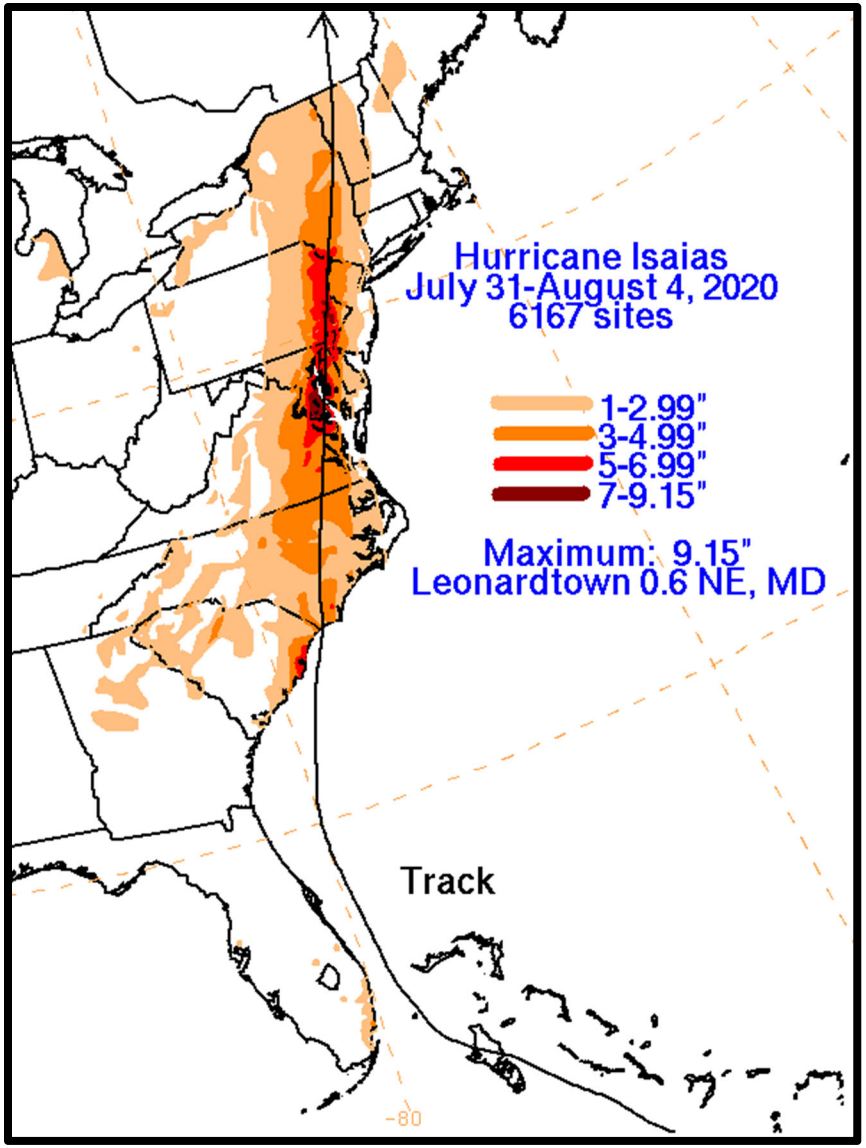

Figure 8. Hurricane Isaias total rainfall map (inches) over the U.S. compiled from 6,167 rain gauges from 31 July–4 August 2020. Image courtesy of the NOAA Weather Prediction Center.

Figure 9. Isaias' flash flooding in Conshohocken, Pennsylvania. Photo credit WHYY News.

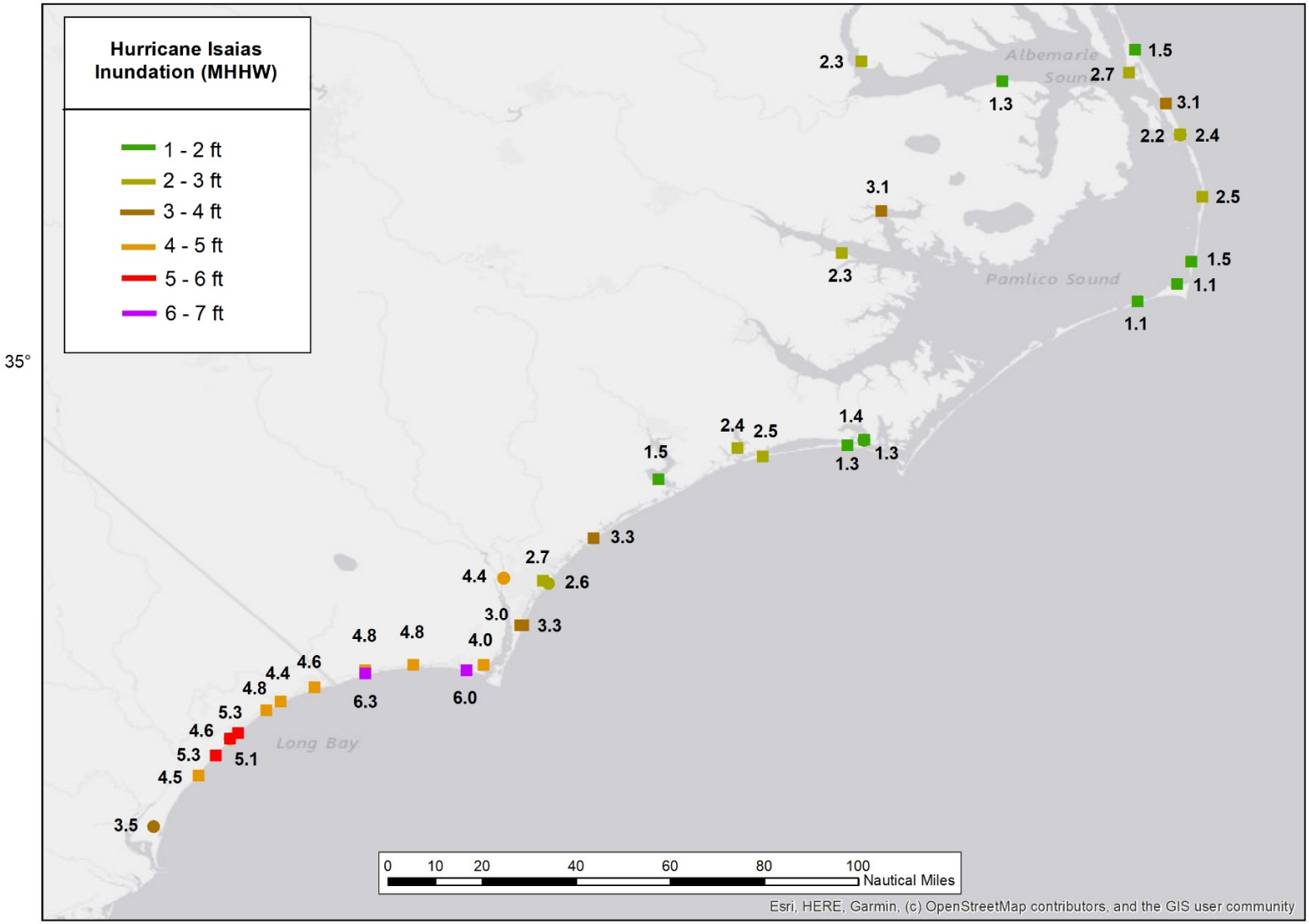

Figure 10. Maximum water levels measured from NOS tide gauges (circles) and USGS water level sensors (squares) during Hurricane Isaias. Water levels are referenced as feet above Mean Higher High Water (MHHW), which is used as a proxy for inundation (above ground level) on normally dry ground along the immediate coastline.

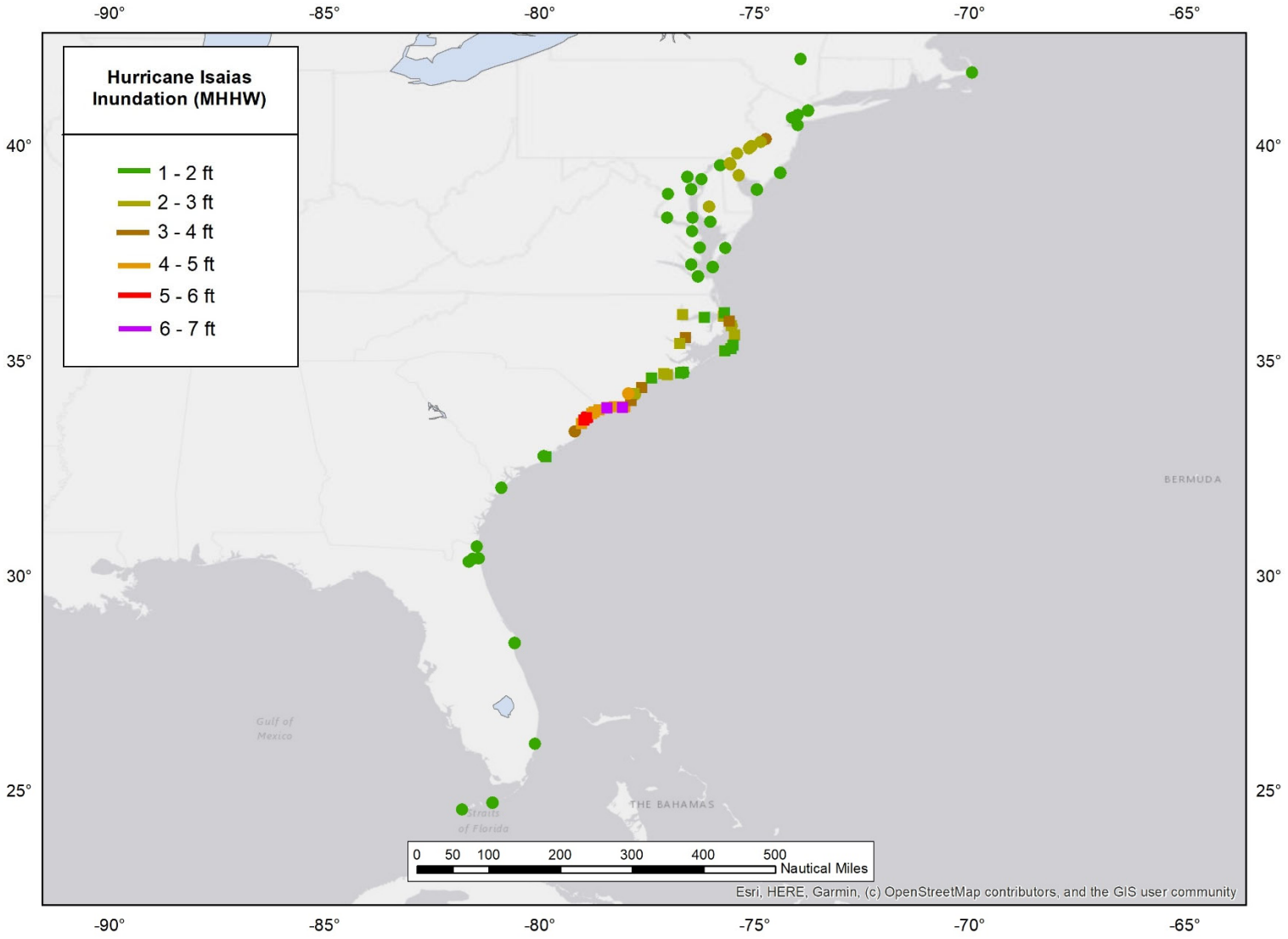

Figure 11. Maximum water levels measured from NOS tide gauges (circles) and USGS water level sensors (squares) during Hurricane Isaias. Water levels are referenced as feet above Mean Higher High Water (MHHW), which is used as a proxy for inundation (above ground level) on normally dry ground along the immediate coastline.

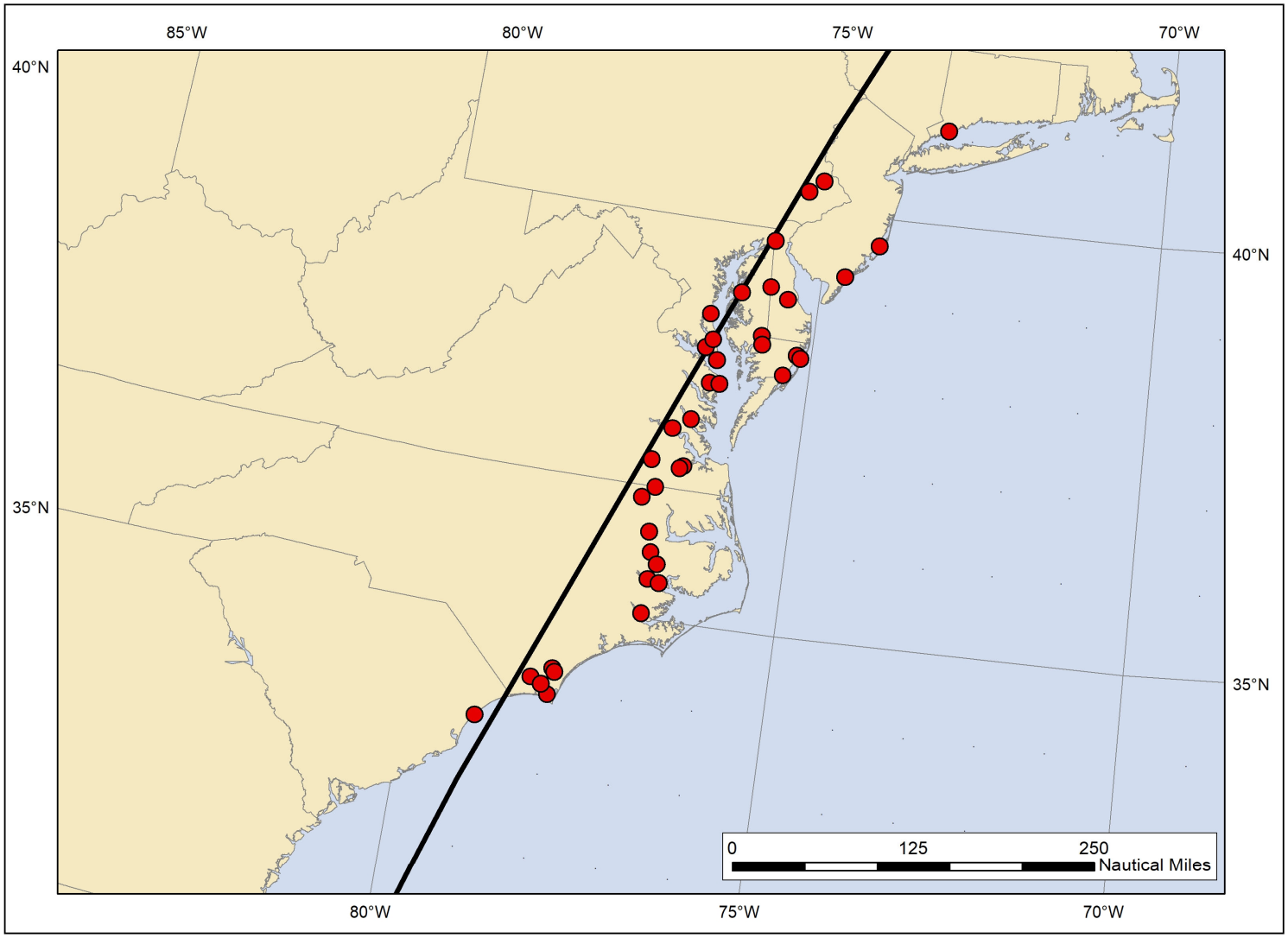

Figure 12. Map of tornado reports from Hurricane Isaias with the cyclone's track overlaid.

Figure 13. Tornado damage in Bertie County, NC. Photo credit NWS WFO Wakefield, VA.

Figure 14. Storm surge damage in Brunswick County, NC. Photo credit Town of Southport.

Figure 15. Storm surge damage in Bayview, NC. Image courtesy of North Carolina Department of Transportation.

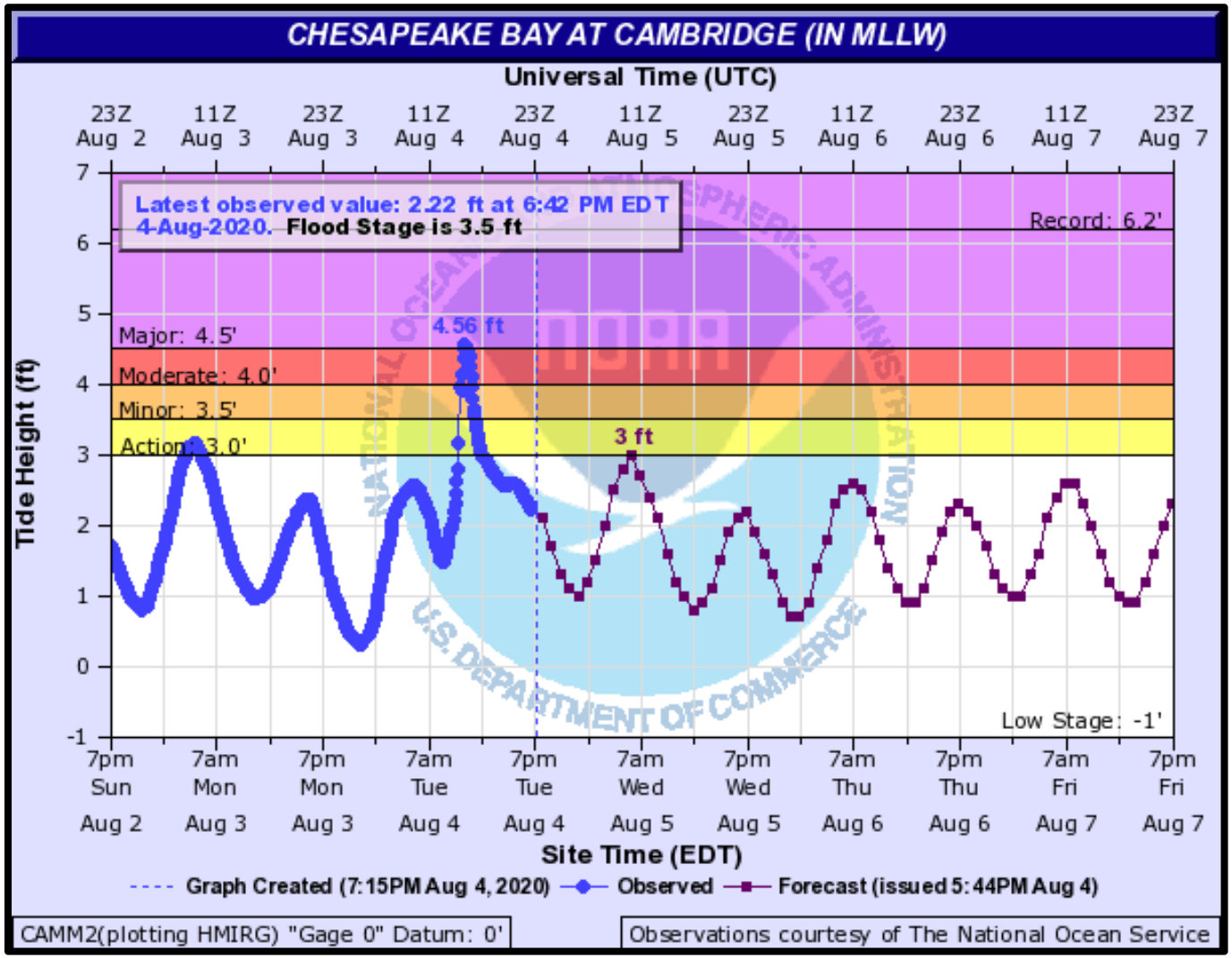

Figure 16. NOS water level stream gauge data from Chesapeake Bay at Cambridge, Virginia.

Figure 17. Tornado damage in Stockton, MD. Photo credit NWS WFO Wakefield, VA.

Figure 18. A water rescue in Delaware. Photo credit John J. Jankowski Jr.

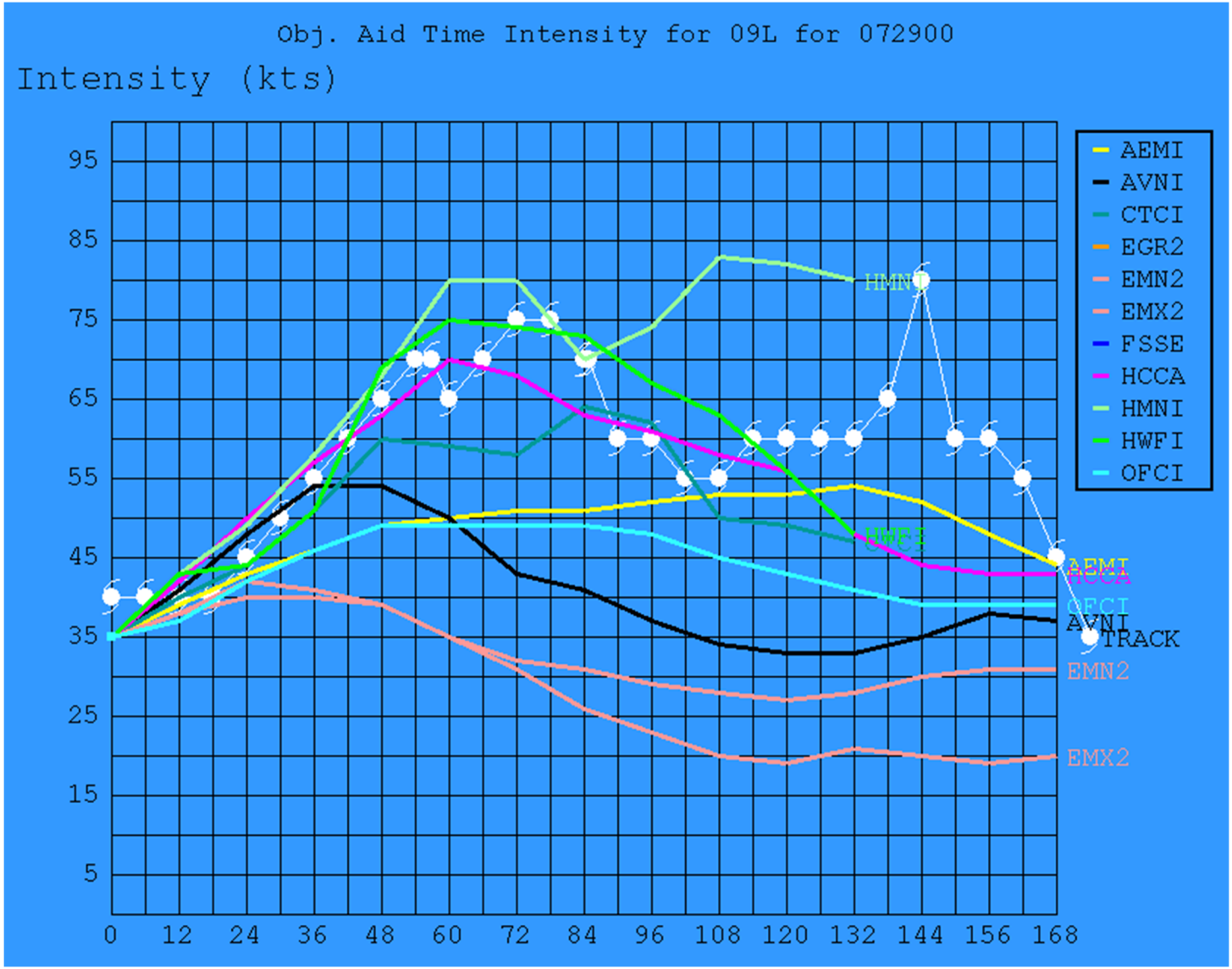

Figure 19. Selected intensity model forecasts (kt) for Isaias at 0000 UTC 29 July 2020. The best track intensity (kt) is given by the solid white line, with intensity values marked with a cyclone symbol at 6 h interval.

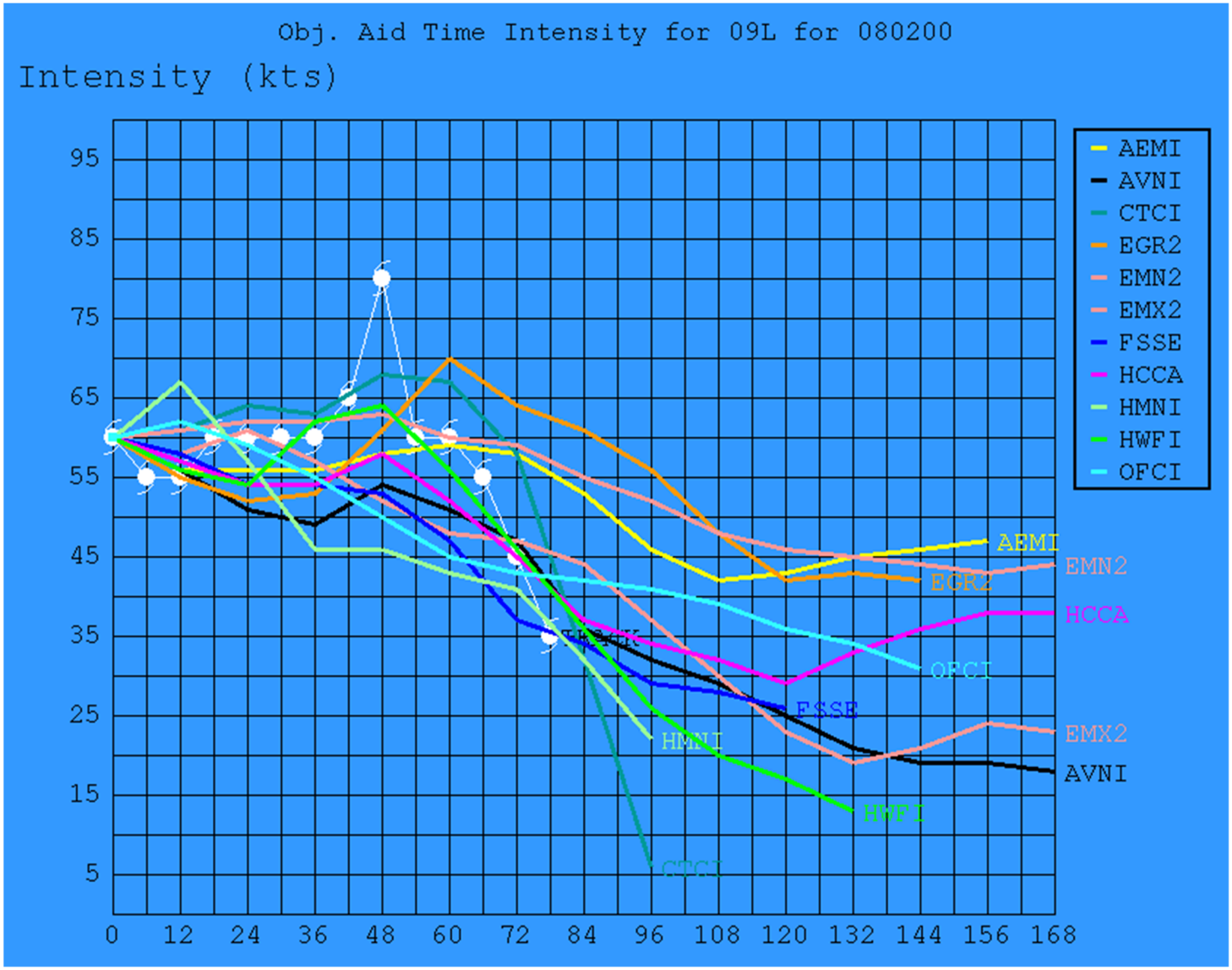

Figure 20. Selected intensity model forecasts (kt) for Isaias at 0000 UTC 2 August 2020. The best track intensity (kt) is given by the solid white line, with intensity values marked with a cyclone symbol at 6 h interval.

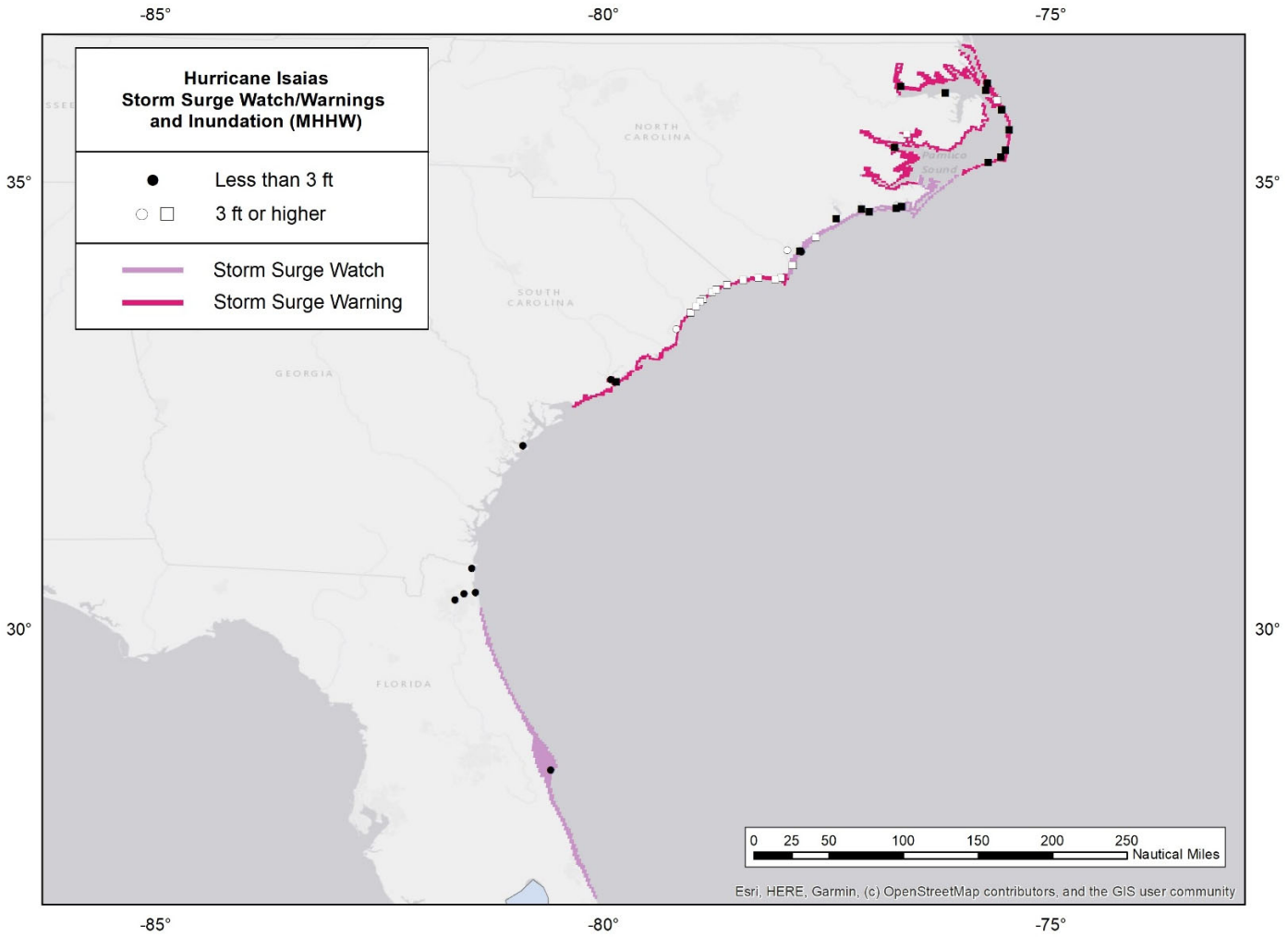

Figure 21. Maximum water levels measured during Hurricane Isaias from tide gauges (circles) and USGS water level sensors (squares), and areas covered by storm surge watches (lavender) and warnings (magenta). Water levels are referenced as feet above Mean Higher High Water (MHHW), which is used as a proxy for inundation (above ground level) on normally dry ground along the immediate coastline. Black markers denote water levels less than 3 ft above ground level, and white markers denote water levels 3 ft or higher above ground level.