NATIONAL HURRICANE CENTER TROPICAL CYCLONE REPORT

TROPICAL STORM FAY

(AL062020)

9–11 July 2020

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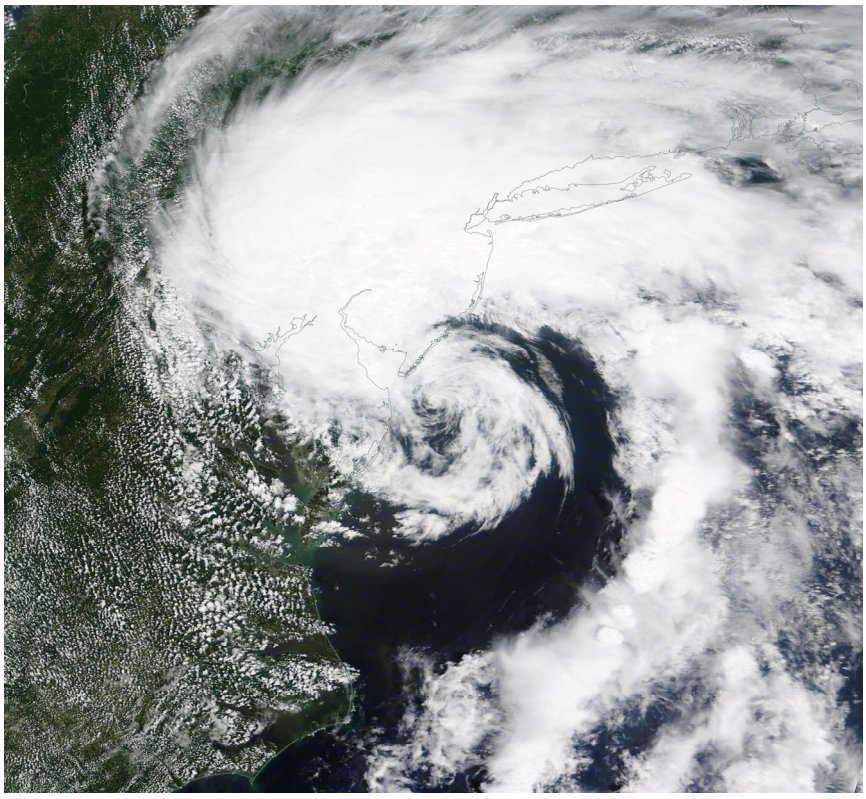
31 March 2021[1]



TERRA MODIS VISIBLE IMAGE OF FAY AT 1620 UTC 10 JULY 2020. IMAGE COURTESY OF NASA WORLDVIEW.

Fay was a short-lived tropical storm that formed off of the coast of North Carolina, and then made landfall over New Jersey, causing minor coastal flooding and inland freshwater flooding.

[1] Original report date 29 March 2021. This version adds tornado information in the Meteorological Statistics section and updates the Acknowledgements.

Tropical Storm Fay

9–11 JULY 2020

SYNOPTIC HISTORY

Fay had a non-tropical origin and a several-day existence as a disturbance before tropical cyclogenesis occurred. A decaying frontal trough moved from the southeastern United States over the southwestern Atlantic, the northern Florida peninsula, and the northern Gulf of Mexico on 1–2 July. A low-pressure area formed along the trough off of the Georgia coast on 2–3 July, and this system became Tropical Storm Edouard over the northwestern Atlantic. Subsequently, cloudiness and shower activity associated with the remaining section of the trough persisted over the northern Gulf of Mexico as the system evolved into an elongated area of low pressure. On 5 July, a smaller-scale low formed inside the larger envelope to the south of the mouth of the Mississippi River. This feature moved quickly northeastward and made landfall between Panama City and Apalachicola, Florida, around 0600 UTC 6 July. Surface and Doppler radar observations before landfall indicated the system had 25–30 kt winds and a small radius of maximum winds characteristic of a tropical cyclone. However, the low lacked sufficient organized convection to be considered a tropical depression.

After landfall, the low continued northeastward at a slower forward speed, with the center reaching central Georgia on 7 July. The system then turned eastward along the southern edge of the mid-latitude westerlies, with the center crossing southern South Carolina before emerging into the Atlantic on 8 July. Once over water, the low moved northeastward parallel to the coast of North Carolina. Around 1800 UTC 9 July, the center re-formed and became better defined near an area of strong convection a short distance east of Cape Hatteras, and near that time an Air Force Reserve Hurricane Hunter aircraft found tropical-storm-force winds of about 40 kt associated with the system. Based on these developments, the low is designated as Tropical Storm Fay at that time. 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].

Fay moved just east of due north after genesis on a track roughly parallel to the coast of the Mid-Atlantic states. Although the storm was entraining dry air and had a non-classical structure, some strengthening occurred, and maximum sustained winds reached 50 kt from 1200 to 1800 UTC 10 July. The storm then slightly weakened to an estimated intensity of 45 kt before the center made landfall near Atlantic City, New Jersey, around 2000 UTC 10 July. Following landfall, the associated convection decreased, and Fay weakened as it continued moving just east of due north through eastern New Jersey. The system became a remnant low pressure area

[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.

with winds below gale force over southeastern New York early on 11 July, and the remnant low was absorbed into a larger mid-latitude low later that day over southeastern Canada.

METEOROLOGICAL STATISTICS

Observations in Fay (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), as well as objective Advanced Dvorak Technique (ADT) estimates and Satellite Consensus (SATCON) estimates from the Cooperative Institute for Meteorological Satellite Studies/University of Wisconsin-Madison. Observations also include flight-level and stepped frequency microwave radiometer (SFMR) winds from four flights of the 53rd Weather Reconnaissance Squadron of the U.S. Air Force Reserve Command. Data and imagery from NOAA polar-orbiting satellites including the Advanced Microwave Sounding Unit (AMSU), the NASA Global Precipitation Mission (GPM), the European Space Agency's Advanced Scatterometer (ASCAT), and Defense Meteorological Satellite Program (DMSP) satellites, among others, were also useful in constructing the best track of Fay.

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

Winds and Pressure

The Air Force Reserve Hurricane Hunters made seven center fixes during Fay. The maximum measured flight-level winds were 65 kt at 925 mb at 1237 UTC about 50 n mi to the north of the center. Using the standard 75% reduction factor from that altitude, the peak flight-level wind results in a surface wind estimate of around 49 kt. The maximum surface wind estimate from the SFMR was 49 kt at 1410 UTC. These data are the basis for the 50-kt peak intensity.

Fay brought tropical-storm conditions to portions of the Mid-Atlantic coast from eastern Maryland and Delaware northward to northern New Jersey. The maximum sustained winds reported at coastal stations were 41 kt at a WeatherFlow station in Lewes, Delaware, and a National Ocean Service (NOS) station at Brandywine Shoals, Delaware. The highest gust at a coastal station was 52 kt at the Lewes WeatherFlow station, followed by a gust of 50 kt at the New Jersey Weather Network station at Sea Girt. Wind gusts to tropical-storm force occurred elsewhere along the Mid-Atlantic and New England coasts from southeastern Virginia to Connecticut.

The minimum central pressure of 998 mb is based on three central pressures of that value reported by a Hurricane Hunter aircraft between 1130–1640 UTC 10 July. On land, the lowest pressure was 999.0 mb reported at four stations along and near the New Jersey coast as the center passed over later that day.

Storm Surge[3]

Fay produced minor coastal flooding along portions of the Mid-Atlantic coast. The highest measured storm surge was 2.67 ft above normal tide levels at a NOAA NOS gauge at Lewes, Delaware. Because the highest surges did not coincide with high tide in most areas, inundation levels were generally around 1 ft above normally dry ground along the Mid-Atlantic coast from North Carolina to New York, with up to 2 ft possibly occurring in some isolated areas, particularly along the New Jersey coast. Many NOS gauges along the Mid-Atlantic coast recorded peak water levels between 1.0 and 1.3 ft above Mean Higher High Water (Fig. 4). It should be noted that some tide gauges reported their highest water levels after the time that Fay dissipated due to the effects of the mid-latitude low.

Rainfall and Flooding

Fay caused a swath of rains mainly in the 3-6 inch range across portions of eastern Maryland, Delaware, eastern Pennsylvania, and New Jersey, with the heaviest reported rainfall of 6.97 inches occurring near Lewes, Delaware (Table 3 and Figure 5). These rains caused minor flooding of streams and urban areas. It should be noted there was a 2-day total rainfall on 9.60 inches at Wilkes-Barre/Scranton International Airport in northeastern Pennsylvania. However, some of this rain seems to have been due to the mid-latitude low that absorbed Fay rather than to the storm itself.

While not included in Table 3, Fay's pre-cursor low caused locally heavy rains of 3–7 inches over portions of the southeastern United States as it moved across the region on 6–8 July. The heaviest rain reported in this area was 12.96 inches just east of St. Helena, South Carolina. These rains also caused minor stream and river flooding**.**

Tornadoes

One tornado was reported due to Fay – an EF-0 tornado between Hiram and Naples, Maine, near 1935 UTC 11 July which occurred during Fay's post-tropical stage. This tornado caused minor damage to trees and strictures. It should be noted that two waterspouts came onshore to become tornadoes in North Carolina on 6 July, but their relationship to the pre-Fay low is unclear.

[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).

CASUALTY AND DAMAGE STATISTICS

Media reports indicate that Fay directly[4] caused two deaths from people who drowned while swimming in high surf conditions caused by the storm – one person each in New Jersey and New York. Media reports also indicate that four other drownings occurred due to the residual high surf conditions after Fay dissipated - two in New Jersey and two in New York.

The NOAA National Centers for Environmental Information (NCEI) estimates that the total damage in the U. S. Mid-Atlantic states from Fay's winds, storm surge, and flooding is $220 million. This does not include any estimates from flooding that occurred across the southeastern U. S. before Fay's genesis.

FORECAST AND WARNING CRITIQUE

Genesis

The genesis of Fay was reasonably well forecast (Table 4). The pre-Fay disturbance was first mentioned in the Tropical Weather Outlook 102 h before genesis occurred with a low (<40%) chance of development in the both the short (2 day) and medium (5 day) ranges. The system's chance for development was increased to medium (40–60%) for the 5-day period 96 h before genesis and to a medium chance in the 2-day period 42 h before genesis. The genesis probabilities were then increased to the high (>60%) category in the medium range 30 h before genesis and in the short range 24 h before genesis. There was some early over-forecasting of the chances for genesis while the system was over the Gulf of Mexico, and the late upgrade to high formations chances was likely due to the uncertainty caused by the system's passage over the southeastern United States.

Track

A verification of NHC official track forecasts for Fay is given in Table 5. Official forecast track errors were lower than the mean official errors for the previous 5-yr period. However, since Fay was a tropical storm for only 30 h the number of verifying forecasts is small, and due to that no verification of the track forecast models is available.

Intensity

A verification of NHC official intensity forecasts for Fay is given in Table 6. Official forecast intensity errors were lower than the mean official errors for the previous 5-yr period. As with the

[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.

official track forecasts, the number of intensity forecast is very small, and thus verification of the track forecast models is available.

Watches and Warnings

Coastal wind watches and warnings associated with Fay are given in Table 7. A Tropical Storm Warning was first issued for the landfall area along the New Jersey coast on the first advisory at 2100 UTC 9 July, which was 23 h before landfall. A short-fused southward extension of the warning area was issued at 1200 UTC 10 July when tropical-storm-force winds developed in the northwestern quadrant of Fay along the Delaware coast. Storm surge watches and warnings were not required for Fay.

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

The NHC was in communication with emergency managers on 9-10 July as Fay approached the Mid-Atlantic and Northeast coasts. This communication included briefings and federal video-teleconferences with FEMA Headquarters and FEMA Regions 1, 2, and 3, along with the New England states. These decision support briefings were coordinated through the FEMA Hurricane Liaison Team, embedded at the NHC. Although the NHC media pool was not activated, NHC conducted media interviews via phone, and provided Key Messages, and other hazard and warning information via Facebook and Twitter.

ACKNOWLEDGEMENTS

The National Weather Service Forecast Offices at Mt. Holly, New Jersey, and Upton, New York contributed much of the data from their areas of responsibility. Weatherflow station data was provided by Weatherflow, while data from the Delaware Environmental Observing System and the New Jersey Weather Network were provided by those organizations. Other data was courtesy of the MesoWest web site. Roger Edwards of the Storm Prediction Center and the staff of the NWS Weather Forecast Office in Portland, Maine, provided data on the tornado. Tiffany O'Connor of FEMA provided part of the IDSS summary. David Roth of the Weather Prediction Center provided the rainfall graphic and much rainfall data.

Table 1. Best track for Tropical Storm Fay, 9–11 July 2020.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage*
05 / 1200	27.7	88.8	1012	20	low
05 / 1800	28.1	87.7	1010	25	"
06 / 0000	28.9	86.2	1008	30	"
06 / 0600	29.9	85.4	1008	30	"
06 / 1200	30.8	85.0	1011	20	"
06 / 1800	31.5	84.6	1013	20	"
07 / 0000	32.2	84.2	1013	20	"
07 / 0600	32.8	83.7	1014	20	"
07 / 1200	33.3	83.2	1014	20	"
07 / 1800	33.3	82.5	1014	20	"
08 / 0000	33.3	81.6	1013	20	"
08 / 0600	33.3	80.5	1012	20	"
08 / 1200	33.3	79.2	1011	20	"
08 / 1800	33.7	77.9	1010	25	"
09 / 0000	33.9	77.1	1009	25	"
09 / 0600	34.1	76.8	1008	25	"
09 / 1200	34.1	76.8	1007	30	"
09 / 1800	35.4	74.9	1006	40	tropical storm
10 / 0000	36.0	74.8	1005	40	"
10 / 0600	36.8	74.8	1004	45	"
10 / 1200	37.7	74.7	998	50	"
10 / 1800	38.9	74.4	998	50	"
10 / 2000	39.4	74.4	999	45	"
11 / 0000	40.2	74.3	1000	35	"
11 / 0600	41.5	74.2	1001	30	low
11 / 1200	43.4	74.0	1001	25	"
11 / 1800	45.4	73.8	999	20	"
12 / 0000					dissipated
10 / 2000	39.4	74.4	999	45	landfall near Atlantic City, New Jersey

10 / 1800	38.9	74.4	998	50	minimum pressure and maximum wind

Table 2. Selected ship reports with winds of at least 34 kt for Tropical Storm Fay, 9–11 July 2020.

Date/Time (UTC)	Ship call sign	Latitude (°N)	Longitude (°W)	Wind dir/speed (kt)	Pressure (mb)
09 / 2100	KRIH	33.5	74.1	180 / 38	1007.2
10 / 0700	C6DL4	36.6	75.1	320 / 42	1005.2
11 / 0000	WCDP	40.3	73.5	150 / 35	1002.6

Table 3. Selected surface observations for Tropical Storm Fay, 9–11 July 2020.

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft)[c]	Storm tide (ft)[d]	Estimated Inundation (ft)[e]	Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[a]	Sustained (kt)[b]	Gust (kt)				
Buoys									
44014 NOAA (36.61N 74.84W) (3m)	10/0540	1004.5[i]	10/0215	35[i] (1-min)	41				
44017 NOAA (40.70N 72.04W) (4m)	11/0340	1008.8[i]	11/0340	26[i] (1-min)	34				
44022 UCONN (40.89N 73.72W) (3.5m)			10/2330	26[i]	36				
44025 NOAA (40.25N 73.16W) (4m)	11/0040	1002.9[i]	10/1931	37[i] (1-min)	43				
44040 UCONN (40.96N 73.58W) (3.5m)			11/0030	25[i]	36				
44065 NOAA (40.37N 73.70W) (4m)	10/2330	1002.2[i]	10/1911	33[i] (1-min)	39				
North Carolina									
National Ocean Service (NOS) Sites									
Duck (DUKN7) (36.18N 75.75W) (8.6m)	10/1748	1008.0	09/2018	24	27	1.66	2.77	1.3	
Hatteras USCG (HCGN7) (35.21N 75.70W) (7.6m)	09/2248	1007.8	10/0030	20	23	1.28	1.26	1.0	
Oregon Inlet Marina (ORIN7) (35.80N 75.55W) (6.7m)	09/2330	1007.9	10/0524		21	1.53	1.60	1.1	
Virginia									
International Civil Aviation Organization (ICAO) Sites									
Wallops Island (KWAL) (37.94N 75.47W)	10/1254	1004.8	10/1430	24	34				0.91
National Ocean Service (NOS) Sites									
Chesapeake Bay Bridge Tunnel (CHBV2) (37.03N 76.08W) (4.6m)	10/0848	1007.2	10/0918		22	1.63		1.2	
Kiptopeke (KPTV2) (37.17N 75.99W) (7.2m)			10/1100	21	24	1.46	2.10	1.1	

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)				
Lewisetta (LWTV2) (38.00N 76.47W) (6.4m)	10/2218	1007.5	09/2224		20	1.36	1.96	1.3	
Money Point (MNPV2) (36.78N 76.30W) (5.8m)	10/2224	1008.1	09/2112		17	1.31		1.3	
Dahlgren (NCDV2) (38.32N 77.04W) (8.3m)	10/2236	1006.4				1.45	2.05	1.2	
Sewells Point (SWPV2) (36.78N 76.30W)	10/2149	1008.2				1.59	2.42	1.3	
Wachapreague (WAHV2) (37.17N 75.99W) (7.2m)	10/1300	1006.9	10/1242		26	1.55	2.94	1.1	
Windmill Point (WNDV2) (37.62N 76.29W)						1.40	1.45	1.2	
Yorktown USCG (YKTV2) (37.23N 76.48W)	10/2206	1007.7	10/2206		23	1.48	2.32	1.3	
Weatherflow									
Tangier Sound Light (37.79N 75.97W) (15.8m)	10/0951	1006.3	10/1501		36				
Wachapreague (37.60N 75.69W) (10.3m)			10/1754		34				
Maryland									
International Civil Aviation Organization (ICAO) Sites									
Ocean City (KOXB) (38.31N 75.12W)	10/1355	1002.4	10/1205	24	36				5.48
Salisbury (KSBY) (38.34N 75.51W)	10/1354	1005.4	10/1415	25	34				2.09
National Ocean Service (NOS) Sites									
Ocean City Inlet (OCIM2) (38.33N 75.09W) (8.5m)	10/1412	1002.9	10/1054	30	41	1.91	1.78	1.1	
Solomons Island (SLIM2) (38.32N 76.45W)	10/2254	1007.1	10/1500		24	1.14	1.73	1.1	
Weatherflow									

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft)[c]	Storm tide (ft)[d]	Estimated Inundation (ft)[e]	Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[a]	Sustained (kt)[b]	Gust (kt)				
Ocean City Inlet (38.33N 75.08W) (10.3m)			10/0949	35	46				
Ocean Pines (38.38N 75.15W)			10/1328	27	41				
Remote Automated Weather Stations (RAWS)									
Assateague Island (ASTM2) (38.08N 75.20W) (6.1m)			10/1140		36				3.76
Maryland Dept. of Transportation Sites									
Salisbury (MD037) (38.37N 75.54W) (13m)			10/1340	20	43				
Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) Sites									
Bishopville 3.1E (MD-WR-4) (38.45N 75.13W)									6.16
Berlin 0.7SW (MD-WR-9) (38.32N 75.23W)									4.48
Ocean Pines 0.9SSW (MD-WR-28) (38.37N 75.16W)									6.58
Ocean City 4.6NNW (MD-WR-28) (38.44N 75.06W)									5.63
Delaware									
International Civil Aviation Organization (ICAO) Sites									
Dover AFB (KDOV) (38.69N 75.36W)	10/1819	1004.3	10/1656	24	36				4.81
Georgetown (KGED) (38.69N 75.36W)	10/1654	1004.6	10/1336	24	37				3.63
National Ocean Service (NOS) Sites									
Brandywine Shoals Light (BRND1) (38.99N 75.11W) (23m)	10/1742	1002.3	10/1412	41	48	1.95		0.9	
Delaware City (DELD1) (38.99N 75.11W) (7.2m)	10/2124	1003.4	10/1536	26	33	1.72		1.1	

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)				
Lewes (LWSD1) (38.78N 75.12W) (9.5m)	10/1712	1003.0	10/1824	38	44	2.67	3.27	1.3	
Reedy Point (RDYD1) (39.56N 75.12W)	10/2124	1003.2				1.76	3.92	1.1	
Weatherflow									
Dewey Beach (38.68N 75.08W)			10/1731	31	43				
Fenwick Island (38.46N 75.06W)			10/1030	29	38				
Lewes (38.79N 75.16W) (14.9m)			10/1303	41	52				
Public/Other									
Harbeson 2NNE (38.74N 75.26W)									4.91
Lewes 1SSE (38.76N 75.12W)									6.17
Lewes 1SW (38.77N 75.14W)									6.97
Milford 2S (38.88N 75.44W)									5.22
Ocean View (38.55N 75.08W)									6.00
Remote Automated Weather Stations (RAWS)									
Redden (REDD1) (38.74N 75.42W) (6.1m)			10/2108		25				3.53
Delaware Environmental Observing System Stations (DEOS)									
Greenville (DE002) (39.80N 75.61W) (3.0m)			11/0020		16				3.44
Blackbird (DE003) (39.39N 75.63W) (6.0m)	10/2015	1005.2	10/1905		21				3.11
Bethany Beach Boardwalk (DE009) (38.53N 75.05W) (4.5m)			10/1200	23	40				4.65
Bethany Beach NGTS (DE010) (38.55N 75.06W) (3.0m)	10/1655	1003.6	10/1100		29				5.08
Georgetown (DE014) (38.64N 75.46W) (10m)	10/1550	1005.4	10/1920		29				3.08
Harbeson (DE015) (38.68N 75.25W) (3.0m)			10/1315		17				5.70

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft)[c]	Storm tide (ft)[d]	Estimated Inundation (ft)[e]	Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[a]	Sustained (kt)[b]	Gust (kt)				
Stockley (DE018) (38.63N 75.32W) (3.0m)			10/1305		21				4.22
Indian River Inlet (DE020) (38.63N 75.07W) (5.4m)			10/1200	24	39				4.76
Rehoboth Beach Boardwalk (DE021) (38.72N 75.08W) (3.8m)	10/1705	1003.1	10/1300	19	35				5.50
Smyrna (DE022) (39.28N 75.58W) (3.0m)			10/1750		19				3.01
Dover SFS (DE026) (39.17N 75.59W) (3.0m)	10/2215	1005.6	10/1710		22				3.32
Delmar (DE029) (38.48N 75.37W) (3.0m)	10/1430	1005.4	10/1325		25				3.06
Kitts Hummock (DE030) (39.09N 75.44W) (5.0m)	10/1900	1004.7	10/1500		14				3.74
Wilmington Prices Corner (DE035) (39.75N 75.61W) (3.0m)			10/1930		20				3.49
Wilmington Talley (DE036) (39.78N 75.53W)									3.72
Claymont (DE038) (39.81N 75.46W) (3.0m)	10/2255	1003.5	10/1825		15				3.40
Millsboro Long Neck (DE048) (39.62N 75.12W) (3.0m)			10/1225		25				4.44
Lewes University (DE050) (38.78N 75.16W) (3.0m)			10/1710		27				3.97
Lewes Nassau (DE051) (38.71N 75.15W) (3.0m)			10/1745		32				5.86
Prime Hook (DE053) (38.83N 75.25W) (6.0m)			10/1425		31				4.88
Dagboro (DE056) (38.54N 75.23W) (3.0m)			10/1925		26				3.82
Dover Paradee (DE057) (39.15N 75.50W)									4.13
Frederica (DE058) (39.00N 75.44W)									4.18
Slaughter Beach (DE060) (38.91N 75.31W) (3.0m)	10/1705	1005.5	10/1540		29				5.25
Wilmington Pike Creek (DPKC) (39.73N 75.69W)									3.04

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)				
Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) Sites									
Felton 3.6NE (DE-KN-1) (39.03N 75.52W)									3.47
Smyrna 2.7SSE (DE-KN-3) (39.26N 75.59W)									3.11
Camden 3.7ESE (DE-KN-12) (39.08N 75.49W)									3.28
Magnolia 1.4SSE (DE-KN-28) (39.05N 75.47W)									3.59
Dover 0.2N (DE-KN-31) (39.16N 75.52W)									4.30
Middletown 5.2ENE (DE-NC-35) (39.49N 75.63W)									3.04
Wilmington 5.6N (DE-NC-40) (39.82N 75.52W)									4.89
Hockessin 2.7ESE (DE-NC-62) (39.77N 75.65W)									3.06
Georgetown 5.8W (DE-SS-2) (38.70N 75.49W)									3.20
Selbyville 7.1E (DE-SS-15) (38.46N 75.09W)									5.53
Milford 2.6SE (DE-SS-30) (38.89N 75.39W)									4.76
Dagsboro 7.1ENE (DE-SS-31) (38.58N 75.12W)									5.63
Lewes 3.9SSW (DE-SS-44) (38.74N 75.20W)									6.24
Dewey Beach 0.2S (DE-SS-45) (38.69N 75.08W)									5.33
Ellendale 3.4ENE (DE-SS-48) (38.83N 75.37W)									4.99

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)				
Milton 3E (DE-SS-61) (38.78N 75.26W)									5.60
Pennsylvania									
International Civil Aviation Organization (ICAO) Sites									
Wilks-Barre Intl. (KAVP) (41.33N 75.73W)									9.60
Philadelphia Intl. (KPHL) (39.87N 74.23W)	10/2254	1002.3	10/1730	29	37				4.15
National Ocean Service (NOS) Sites									
Marcus Hook (MRCP1) (39.82N 75.41W)	10/2236	1002.4				1.69	4.27	1.1	
Philadelphia (PHBP1) (39.93N 75.14W)	10/2206	1001.5				2.00	4.82	1.2	
Delaware Environmental Observing System Stations (DEOS)									
Kennett Square Longwood (DE032) (39.87N 75.68W) (3.0m)			10/2135		13				3.12
West Chester (DE040) (39.94N 75.55W) (3.0m)	10/2250	1005.2	10/1910		23				3.29
Chester Springs (DE046) (40.09N 75.62W) (3.0m)	10/2240	1005.0	10/1845		18				3.57
Marshallton (DE047) (39.94N 75.72W) (3.0m)	10/2255	1003.4	10/2020		14				3.10
Hydrometeorological Automated Data System (HADS) Sites (NWS)									
Valley Forge (VFGP1) (40.08N 75.46W)									3.21
Public/Other									
Bossardsville 1NE (40.94N 75.26W)									3.21
Brookfield 2WSW (39.84N 75.63W)									3.01
Huffs Church (40.44N 75.61W)									3.28

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)				
Sciota 1ESE (40.92N 75.30W)									3.56
Skippack Twp (40.23N 75.41W)									4.19
Thornton (39.91N 75.48W)									3.96
West Chester (39.96N 75.60W)									3.13
Wynnewood (40.00N 75.27W)									5.26
NWS Cooperative Observer Program (COOP) Sites									
Conshohocken 1W (CSHP1) (40.07N 75.32W)									3.94
Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) Sites									
Quakertown 1.9NNE (PA-BK-33) (40.46N 75.33W)									3.50
Alburtis 4.7SW (PA-BR-21) (40.47N 75.67W)									3.12
West Chester 2.4SSE (PA-CH-9) (39.93N 75.60W)									3.21
Unionville 2.2NE (PA-CH-11) (39.92N 75.70W)									3.23
Kennett Square 4.1NNE (PA-CH-28) (39.90N 75.69W)									3.12
Berwyn 0.7WNW (PA-CH-42) (40.05N 75.45W)									3.34
Lansdowne (PA-DL-13) (39.94N 75.27W)									4.52
Emmaus 2.9S (PA-LH-21) (40.49N 75.49W)									3.17
Coopersburg 2.8WSW (PA-LH-25) (40.50N 75.44W)									3.12

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft)[c]	Storm tide (ft)[d]	Estimated Inundation (ft)[e]	Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[a]	Sustained (kt)[b]	Gust (kt)				
Gilbertsville 0.9S (PA-MT-1) (40.31N 75.61W)									3.43
Skippack 1.4SSW (PA-MT-20) (40.20N 75.41W)									3.08
Ardmore 0.5NW (PA-MT-48) (40.01N 75.29W)									4.28
Harleysville 2.9S (PA-MT-51) (40.24N 75.38W)									3.10
Hatfield 2WSW (PA-MT-56) (40.27N 75.33W)									3.19
Fort Washington 0.8NW (PA-MT-67) (40.15N 75.20W)									3.44
Bala Cynwyd 0.8 SSW (PA-MT-88) (40.01N 75.24W)									4.16
Collegeville 0.8NNE (PA-MT-91) (40.20N 75.45W)									3.81
Schwenksville 1.6WSW (PA-MT-96) (40.25N 75.50W)									3.07
North Wales 0.4S (PA-MT-110) (40.20N 75.27W)									3.39
Jenkintown (PA-MT-117) (40.09N 75.62W)									4.25
Wyndmoor 3SSW (PA-PH-6) (40.05N 75.22W)									3.73
Philadelphia 2.7WNW (PA-PH-8) (40.03N 75.18W)									3.55
Milford 8.7NW (PA-PK-22) (41.42N 74.91W)									3.05
New Jersey									
International Civil Aviation Organization (ICAO) Sites									

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft)[c]	Storm tide (ft)[d]	Estimated Inundation (ft)[e]	Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[a]	Sustained (kt)[b]	Gust (kt)				
Atlantic City (KACY) (39.46N 74.57W)	10/1954	1000.5	10/1644	20	38				3.23
Caldwell (KCDW) (40.88N 74.28W)	11/0253	1002.7	11/0014		25				3.09
Millville (KMIV) (39.37N 75.08W)	10/1954	1002.0	10/1440	20	35				3.51
Toms River (KMJX) (39.37N 75.08W)	10/2156	1000.7	10/1500	21	29				2.16
Wildwood (KWWD) (39.46N 74.57W)	10/1856	1002.0	10/1235	26	37				3.84
Coastal-Marine Automated Network (C-MAN) Sites									
Nacote Creek NEERS (JCRN4) (39.54N 74.46W)	10/2100	1000.3	10/1645	25	35				2.22
National Ocean Service (NOS) Sites									
Atlantic City (ACYN4) (39.36N 74.42W)	10/1954	1000.5				2.25	3.21	1.2	
Burlington (BDRN4) (40.08N 74.87W) (7.5m)	10/2248	1000.9	10/1730		25	1.83		1.2	
Cape May (CMAN4) (38.97N 74.96W) (9.7m)	10/1818	1001.5	10/2018	29	34	2.02	3.48	1.1	
Robbins Reef (ROBN4) (40.67N 74.07W) (21m)	11/0042	1002.0	10/2000	33	45				
Sandy Hook (SDHN4) (40.47N 74.01W) (5.5m)	11/0024	1002.4	10/1736	27	36	2.28	3.20	0.8	
Ship John Shoal (SJSN4) (39.31N 75.38W) (15m)	10/1954	1003.3	10/1836		33	1.72		1.1	
Weatherflow									
Barnegat Inlet Light 7 (39.76N 74.09W) (12.2m)			10/1516	33	43				
Bayville Trixies (39.87N 74.14W) (9.8m)			10/1612	27	36				
Brick (40.01N 74.06W) (9.8m)			10/1711	32	40				
Brant Beach (39.62N 74.20W)			10/1409		37				
Brigantine (39.38N 74.41W)			10/1346		38				

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)				
Cape May (38.97N 74.96W) (10.3m)			10/2017	30	37				
Keansburg (40.46N 74.14W)			10/1846	35	47				
Kite Island (39.79N 74.17W) (6.1m)			10/1523	31	37				
Long Beach (39.53N 74.27W)			11/0219	31	37				
Long Beach Island (39.68N 74.21W) (6.4m)			10/1514	28	39				
Ludlam Bay (39.18N 74.70W) (6.1m)			10/1314	30	42				
Monmouth (40.34N 73.99W) (10.3m)			10/1725		34				
Ocean City South (39.22N 74.07W) (10.3m)			10/1308	38	46				
Perth Amboy (XPER) (40.50N 74.28W) (10.3m)			10/2241	27	36				
Seaside Heights (39.94N 74.64W) (13.7m)			10/1716	32	41				
Spray Beach (39.58N 74.23W)			10/1328	31	41				
Tuckerton (39.52N 74.32W) (10.3m)			10/1353	34	42				
Hydrometeorological Automated Data System (HADS) Sites (NWS)									
Atlantic City Abescon Channel (ATLN4) (39.38N 74.42W)	10/1954	999.0	10/1412	31	44				2.60
Belle Mead (BVVN4) (40.47N 74.65W)									3.36
Bivalve (BMDN4) (39.23N 75.18W)									3.66
Boonton (BOON4) (40.89N 74.40W)									3.17
Cape May Harbor (CAPN4) (38.95N 74.89W)	10/1712	1001.0	10/1230	29	41				2.54
Charlotteburg (CHAN4) (41.02N 74.43W)									3.39

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft)[c]	Storm tide (ft)[d]	Estimated Inundation (ft)[e]	Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[a]	Sustained (kt)[b]	Gust (kt)				
Essex Fells (ESXN4) (40.83N 74.29W)									3.52
Folsum (GEHN4) (39.60N 74.85W)									3.50
Greenwich (GRWN4) (39.38N 75.36W)									4.03
Ironia (IRON4) (40.84N 74.64W)									3.08
Morris Plains (MSPN4) (40.84N 74.52W)									3.04
Mantoloking (MTLN4) (40.04N 74.05W)			10/1718	27	43				1.68
Mountainside (MTSN4) (40.68N 74.38W)									3.01
Neshanic (NESN4) (40.47N 74.73W)									3.24
West Orange (ORAN4) (40.76N 74.29W)									3.12
Little Falls N (ORAN4) (40.87N 74.22W)									3.66
Perth Amboy (PABN4) (40.50N 74.26W)			10/1812	23	45				1.23
Pompton Plains (PPPN4) (40.97N 74.28W)									3.32
Ship Bottom (SBTN4) (39.65N 74.19W)	10/2054	999.0	11/0224		30				0.48
Stone Harbor (SHBN4) (39.06N 74.77W)	10/1724	1000.3	10/1242	32	41				2.08
Little Egg Inlet (TKTN4) (39.51N 74.32W)	10/2024	999.0	10/1742	27	44				2.23
Woodstown (WDTN4) (40.97N 74.28W)									4.43
Wayne (WYNN4) (40.93N 74.25W)									3.28
Public/Other									
Sandy Hook (SNDYH) (40.46N 74.00W) (5.5m)			10/1336	27	37				
Belle Meade 2E (40.47N 74.63W)									3.08
Deptford Twp. 1SSW (39.82N 75.13W)									4.15

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft)[c]	Storm tide (ft)[d]	Estimated Inundation (ft)[e]	Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[a]	Sustained (kt)[b]	Gust (kt)				
Egg Harbor Twp. (39.39N 74.63W)									4.62
Erma 1W (39.00N 74.92W)									4.57
Flemington (40.51N 74.86W)									3.72
Franklin Twp. (39.60N 75.06W)									5.28
Hardyston Twp. 2ENE (41.12N 74.50W)									3.15
Howell (40.16N 74.23W)									3.50
Ironia (40.83N 74.63W)									3.16
Kinnelon (41.00N 74.38W)									3.09
Landisville (39.53N 74.94W)									3.50
Lebanon Twp. (40.72N 74.89W)									3.03
Margate City (39.33N 74.51W)									5.50
Mullica Hill (39.74N 75.22W)									5.84
Pitman (39.74N 75.12W)									4.75
Readington Twp. (40.61N 74.78W)									3.05
Sewell (39.77N 75.15W)									3.65
Somers Point 2NE (39.34N 74.58W)									4.43
Spotswood (40.40N 74.39W)									3.05
Villas (39.03N 74.94W)									4.45
Vineland 2S (39.45N 75.03W)									3.35
Washington Twp. (39.75N 75.08W)									4.00
West Deptford Twp. (39.84N 75.20W)									5.07
Whiting (39.96N 74.38W)									4.46
Wildwood Crest 1SW (38.97N 74.84W)									5.86
Remote Automated Weather Stations (RAWS)									

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft)[c]	Storm tide (ft)[d]	Estimated Inundation (ft)[e]	Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[a]	Sustained (kt)[b]	Gust (kt)				
New Middlesex County (DEAN4) (40.41N 74.49W) (6.1m)			11/0410		17				3.11
Woodbine (WOBN4) (39.23N 74.80W) (6.1m)			10/1611		17				3.35
New Jersey Weather Network									
Dennis Twp. (NJ02) (39.20N 74.89W) (3.0m)			10/2320		22				3.53
Egg Harbor Twp. (NJ04) (39.20N 74.89W) (3.0m)			10/1620		26				3.04
Greenwich (NJ05) (39.44N 75.38W) (3.0m)			10/1735		20				3.61
Howell (NJ10) (40.19N 74.20W) (3.0m)	10/2315	999.7	10/1950		20				2.51
Harvey Cedars (NJ11) (39.70N 74.14W) (11m)			10/1535	33	38				1.38
Jersey City (NJ12) (40.71N 74.05W) (11m)	11/0045	1002.0							3.36
Sicklerville (NJ15) (39.76N 74.98W) (10m)	10/2155	1000.7	10/1415		22				3.35
South Harrison (NJ16) (39.71N 75.28W) (3.0m)			10/1715		19				6.23
West Cape May (NJ21) (38.94N 74.94W) (3.0m)			10/1240		35				3.75
Sewell (NJ23) (39.75N 75.11W) (3.0m)			10/1510		15				4.52
Mullica Twp. (NJ24) (39.55N 74.73W) (12m)			10/1325		21				3.32
Atlantic City Marina (NJ25) (39.38N 74.42W) (10m)			10/1425	30	40				2.47
Cape May Courthouse (NJ27) (39.12N 74.79W) (3.0m)			10/1315		21				3.97
Seaside Heights (NJ39) (39.94N 74.07W) (12m)			10/1620	27	40				1.11
Piney Hollow (NJ42) (39.58N 74.93W) (3.0m)			10/1420		15				3.26
Berkeley Twp. (NJ49) (39.93N 74.30W) (10m)	10/2205	999.0	10/1600	26	33				2.73
Upper Deerfield (NJ50) (39.52N 75.20W) (10m)			10/1550		26				3.99

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)				
Sea Girt (NJ52) (40.12N 74.03W) (10m)	10/2300	1000.7	10/1645	33	50				1.81
Pittstown (NJ53) (40.56N 74.96W) (10m)			10/1810		23				3.51
Cream Ridge (NJ54) (40.56N 74.96W) (10m)	10/2250	1000.0	10/1710	25	31				2.38
Woodbine (NJ55) (39.22N 74.79W) (10m)	10/1850	1001.4	10/1325	23	31				3.42
Oswego Lake (NJ56) (39.72N 74.51W) (10m)	10/2115	999.3	10/1430		25				2.68
High Point Monument (NJ61) (41.32N 74.66W) (7.0m)			10/2220	27	34				2.05
Fortescue (NJ67) (39.24N 75.18W) (10m)	10/1915	1003.0	10/2255	30	35				3.28
Vineland (NJ73) (39.46N 75.07W) (10m)	10/1955	1002.4	10/1545	20	30				3.90
Lower Alloways Creek (NJ74) (39.48N 75.54W) (10m)	10/2140	1002.0	10/1850	32	38				3.47
Vernon Twp. (NJ78) (41.18N 74.50W)			10/1835	20	34				2.29
Advanced Hydrological Prediction Service (AHPS) Sites									
Millstone 3S (BKWN4) (40.47N 74.58W)									3.18
Margate (MGTN4) (39.34N 74.51W)									3.87
NWS Cooperative Observer Program (COOP) Sites									
Cape May 2NW (CPMN4) (38.95N 74.93W)									3.58
Estell Manor (ESMN4) (39.40N 74.73W)									4.07
Pennsauken (PENN4) (39.93N 75.00W)									3.27
Somerdale 4SW (SMDN4) (39.84N 75.04W)									3.91
Wertsville (WRTN4) (40.45N 74.80W)									3.30
Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) Sites									

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft)[c]	Storm tide (ft)[d]	Estimated Inundation (ft)[e]	Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[a]	Sustained (kt)[b]	Gust (kt)				
Buena Vista Twp. 2.6NNE (NJ-AT-1) (39.55N 74.87W)									3.74
Folsom 3.2SE (NJ-AT-2) (39.56N 74.80W)									3.65
Linwood 0.7SSW (NJ-AT-9) (39.33N 74.58W)									4.33
Estell Manor 4WNW (NJ-AT-11) (39.37N 74.85W)									3.86
Egg Harbor Twp. (NJ-AT-13) (39.39N 74.62W)									4.18
Brigantine 0.4ESE (NJ-AT-34) (39.41N 74.37W)									3.30
Hamilton Twp. 6.6 ESE (NJ-AT-45) (39.44N 74.64W)									3.08
Galloway Twp. 2.9SW (NJ-AT-46) (39.46N 74.51W)									3.50
Somers Point 0.4N (NJ-AT-48) (39.32N 74.61W)									3.85
N. Arlington 0.7WNW (NJ-BG-15) (40.79N 74.14W)									3.00
Palisades Park 0.2WNW (NJ-BG-18) (40.85N 74.00W)									3.00
Upper Deerfield Twp. 1.7SW (NJ-CD-1) (39.48N 75.24W)									3.68
Millville 4.9WNW (NJ-CD-14) (39.42N 75.14W)									3.99
Woodbine 0.8NNW (NJ-CM-7) (39.24N 74.82W)									3.43
Sea Isle City 1.4SSW (NJ-CM-11) (39.13N 74.71W)									4.05
Wildwood Crest 0.1WSW (NJ-CM-17) (38.97N 74.84W)									4.19

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft)[c]	Storm tide (ft)[d]	Estimated Inundation (ft)[e]	Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[a]	Sustained (kt)[b]	Gust (kt)				
Dennis Twp 2.5S (NJ-CM-30) (39.17N 74.83W)									4.49
Middle Twp. 4.2NNW (NJ-CM-34) (39.00N 74.89W)									4.72
Lower Twp. 1.5NNE (NJ-CM-44) (39.00N 74.89W)									4,08
Winslow Twp. 3.5W (NJ-CN-5) (39.71N 74.97W)									3.12
Berlin (NJ-CN-11) (39.81N 74.94W)									3.75
Mt. Ephraim 0.2NNE (NJ-CN-24) (39.88N 75.09W)									3.01
Maplewood Twp. 0.9SE (NJ-ES-18) (40.72N 74.26W)									3.04
W Caldwell Twp. 1.3NE (NJ-ES-18) (40.86N 74.28W)									3.46
Cedar Grove Twp. 0.4W (NJ-ES-24) (40.86N 74.24W)									3.97
Montclair 0.7N (NJ-ES-31) (40.84N 74.21W)									3.17
Verona Twp. 0.8W (NJ-ES-40) (40.83N 74.26W)									3.08
Livingston Twp. 2NNE (NJ-ES-41) (40.81N 74.31W)									3.16
Pitman 0.1W (NJ-GL-1) (39.73N 75.13W)									4.84
Franklin Twp. 2.7W (NJ-GL-6) (39.59N 75.07W)									5.52
Washington Twp. 2.1NNW (NJ-GL-12) (39.73N 75.09W)									3.70
Pitman (NJ-GL-33) (39.74N 75.12W)									4.75
Monroe Twp. 1.8SE (NJ-GL-41) (39.64N 74.95W)									3.31

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft)[c]	Storm tide (ft)[d]	Estimated Inundation (ft)[e]	Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[a]	Sustained (kt)[b]	Gust (kt)				
S Harrison Twp. 2.1ESE (NJ-GL-44) (39.68N 75.22W)									5.21
Wenonah 0.2SW (NJ-GL-45) (39.79N 75.15W)									4.99
Stockton 4.4NW (NJ-HN-2) (40.45N 75.03W)									3.47
Holland Twp. 2.6NNE (NJ-HN-12) (40.63N 75.10W)									3.15
Flemington (NJ-HN-15) (40.51N 74.85W)									4.14
Kingwood Twp. 2.5S (NJ-HN-22) (40.45N 75.01W)									3.47
Frenchtown 0.5N (NJ-HN-31) (40.53N 75.06W)									3.39
Raritan Twp. 2.4N (NJ-HN-57) (40.54N 74.87W)									3.22
Franklin Twp. 3.1WSW (NJ-HN-62) (40.55N 74.99W)									3.60
Princeton 2.3E (NJ-MC-44) (40.36N 74.77W)									3.09
Hopewell 0.4SSW (NJ-MC-46) (40.38N 74.77W)									3.11
Spotswood (NJ-MD-76) (40.39N 74.38W)									3.05
Rockaway 0.4NNW (NJ-MS-6) (40.90N 74.52W)									3.55
Kinnelon (NJ-MS-16) (40.97N 74.37W)									3.09
Jefferson Twp. 2.4ENE (NJ-MS-18) (41.01N 74.51W)									3.41
Mine Hill Twp. 0.4NE (NJ-MS-23) (40.88N 74.59W)									3.41

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft)[c]	Storm tide (ft)[d]	Estimated Inundation (ft)[e]	Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[a]	Sustained (kt)[b]	Gust (kt)				
Randolph Twp. 0.4NE (NJ-MS-73) (40.82N 74.60W)									3.25
Mt. Arlington 0.8S (NJ-MS-87) (40.91N 74.64W)									3.31
Denville Twp 1.6SSW (NJ-MS-103) (40.87N 74.50W)									3.23
Little Falls Twp. 0.5WNW (NJ-PS-12) (40.88N 74.23W)									3.54
Wayne Twp. 2.3ESE (NJ-PS-42) (40.93N 74.21W)									3.60
Bloomingdale 1.8S (NJ-PS-43) (41.00N 74.33W)									3.05
Woodstown 0.6NW (NJ-SL-2) (39.66N 75.33W)									4.32
Pittsgrove Twp 1.9S (NJ-SL-3) (39.51N 75.14W)									3.84
Salem 0.6ENE (NJ-SL-11) (39.57N 75.46W)									4.01
Pennsville Twp 0.7NW (NJ-SL-13) (39.63N 75.50W)									3.34
Bridgewater Twp 3.3NW (NJ-SM-5) (40.63N 74.65W)									3.19
Bernardsville (NJ-SM-59) (40.71N 74.58W)									3.06
Franklin Twp. 5.9SW (NJ-SM-56) (40.41N 74.62W)									3.19
Hillsborough Twp. 3.5SE (NJ-SM-65) (40.47N 74.62W)									3.23
Vernon Twp. 2.7SSE (NJ-SS-60) (41.16N 74.46W)									3.09
New York									

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)				
International Civil Aviation Organization (ICAO) Sites									
Farmingdale (KFRG) (40.74N 73.41W)	11/0053	1004.5	11/0305	25	38				0.64
Islip (KISP) (40.80N 73.10W)	11/0056	1005.7	10/2136	25	35				0.61
JFK Intl. Arpt. (KJFK) (40.64N 73.76W)	11/0128	1003.1	10/2007	33	40				2.31
Laguardia Arpt. (KLGA) (40.78N 73.88W)	11/0036	1002.8	10/1955	30	37				2.20
National Ocean Service (NOS) Sites									
The Battery (BATN6) (40.70N 74.01W)	11/0054	1002.5				2.22		0.8	
Bergen Point West Reach (BGNN6) (40.64N 74.14W)	11/0042	1001.9				2.44		0.7	
Kings Point (KPTN6) (40.81N 73.77W) (46m)			11/0330	22	31	1.95	4.84	1.20	
Mariners Harbor (MHRN6) (40.64N 74.16W) (46m)			10/2130	28	38				
Weatherflow									
Bayville (40.90N 73.63W) (14m)			10/2021	29	37				
Blue Point (XBLU) (40.74N 73.03W) (12m)	11/0159	1004.0	11/0054	29	37				
Breezy Point (XBRZ) (40.55N 73.93W) (10.3m)			11/0002	23	34				
East Moriches CG (XMOR) (40.79N 72.75W) (10.3m)			10/2206	28	37				
Fire Island (XFIR) (40.63N 73.25W) (10.3m)	11/0049	1003.0	11/0139	30	37				
Great South Bay (XHCK) (40.55N 73.93W) (11.3m)	11/0148	1003.0	11/0238	29	36				
Jones Beach (XJON) (40.59N 73.56W) (10.3m)			10/1829	26	36				

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft)[c]	Storm tide (ft)[d]	Estimated Inundation (ft)[e]	Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[a]	Sustained (kt)[b]	Gust (kt)				
Larchmont Harbor (XLAR) (40.92N 73.73W) (10.3m)			10/2029	31	38				
Oak Beach SBC (40.65N 73.30W) (4.9m)			10/2049	28	36				
Shinnecock Light (40.84N 72.48W) (12m)			11/0506	28	34				
Public/Other									
New York Upper West Side (40.78N 73.98W)									3.11
NWS Cooperative Observer Program (COOP) Sites									
Phoenicia 2SW (PHON6) (42.06N 74.34W)									3.90
Connecticut									
National Ocean Service (NOS) Sites									
Bridgeport (BRHC3) (41.17N 73.18W) (7.6m)			11/0312	24	30	1.46		0.5	
New London (NLNC3) (41.36N 72.09W) (8.2m)			11/0548	20	26	1.08		0.6	
New Haven (NWHC3) (41.28N 72.91W) (6.7m)			11/0400		25	1.21		0.4	
Weatherflow									
Norwalk Light (XNOR) (41.08N 73.38W) (10.3m)			10/2133	29	35				

[a] Date/time is for sustained wind when both sustained and gust are listed.
[b] Except as noted, sustained wind averaging periods for C-MAN and land-based reports are 2 min; buoy averaging periods are 8 min.
[c] Storm surge is water height above normal astronomical tide level.
[d] For most locations, storm tide is water height above the North American Vertical Datum of 1988 (NAVD88).
[e] Estimated inundation is the maximum height of water above ground. For NOS tide gauges, the height of the water above Mean Higher High Water (MHHW) is used as a proxy for inundation.
[i] Incomplete data.

Table 4. For Tropical Storm Fay, 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%)	102	102
Medium (40%-60%)	42	96
High (>60%)	24	30

Table 5. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Tropical Storm Fay, 9–11 July 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	**12.8**	**13.9**						
OCD5	39.9	110.2						
Forecasts	4	2						
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 6. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Tropical Storm Fay, 9–11 July 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	**5.0**	**7.5**						
OCD5	5.8	11.5						
Forecasts	4	2						
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 7. Watch and warning summary for Tropical Storm Fay, 9–11 July 2020.

Date/Time (UTC)	Action	Location
09/2100	Tropical Storm Warning issued	Cape May, New Jersey to Watch Hill Rhode Island
10/1200	Tropical Storm Warning issued	Fenwick Island, Delaware to Cape May, New Jersey
10/2100	Tropical Storm Warning discontinued	South of Great Egg Inlet, New Jersey
11/0300	Tropical Storm Warning discontinued	South and west of East Rockaway Inlet, New York
11/0600	All coastal warnings discontinued	

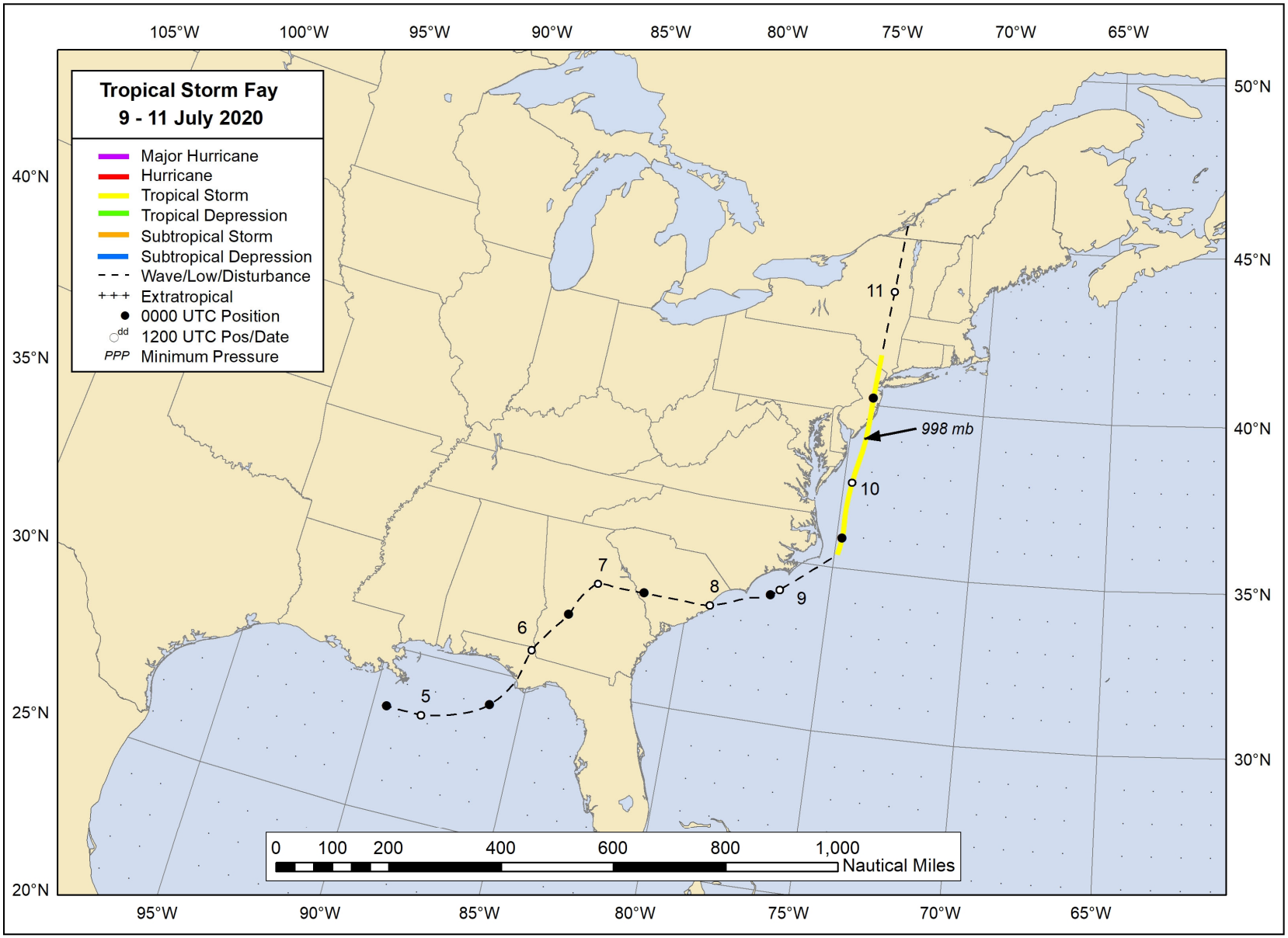


Figure 1. Best track positions for Tropical Storm Fay, 9–11 July 2020.

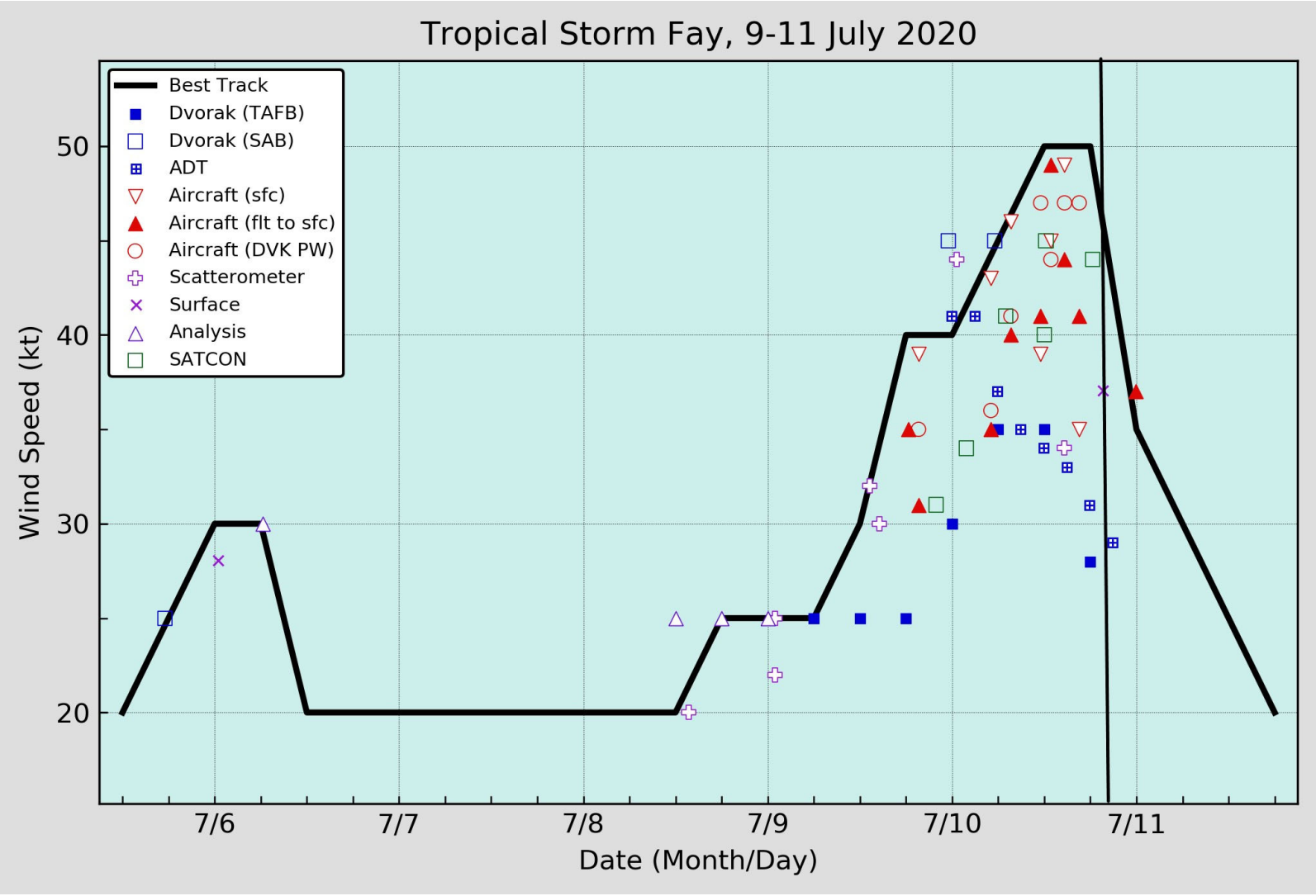


Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Tropical Storm Fay, 9–11 July 2020. Aircraft observations have been adjusted for elevation using 75% and 80% adjustment factors for observations from 925 mb and 1500 ft, respectively. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies. Dashed vertical lines correspond to 0000 UTC, and solid vertical lines correspond to landfalls.

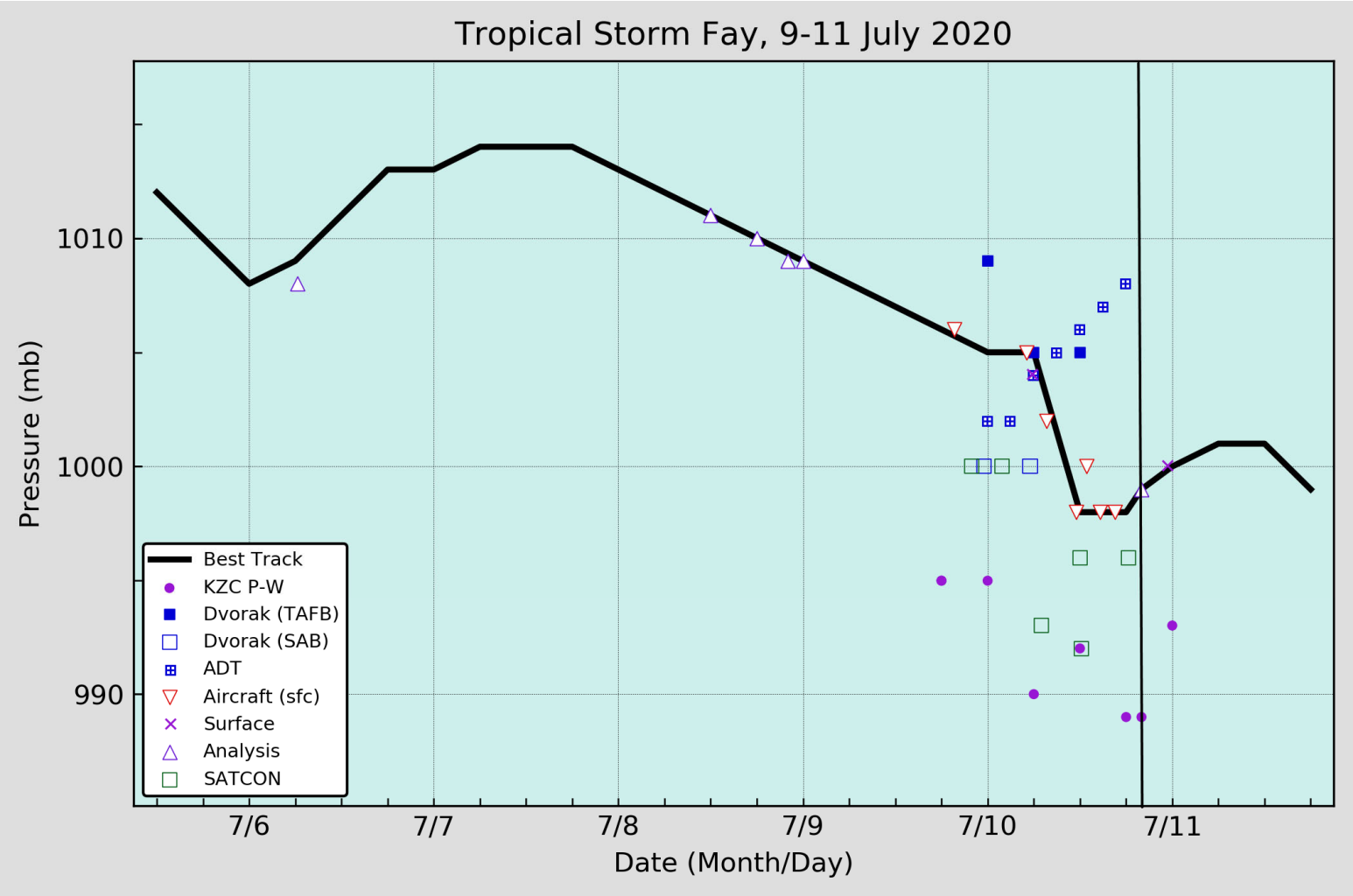


Figure 3. Selected pressure observations and best track minimum central pressure curve for Tropical Storm Fay, 9–11 July 2020. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies. KZC P-W refers to pressure estimates derived using the Knaff-Zehr-Courtney pressure-wind relationship. Dashed vertical lines correspond to 0000 UTC, and solid vertical lines correspond to landfalls.

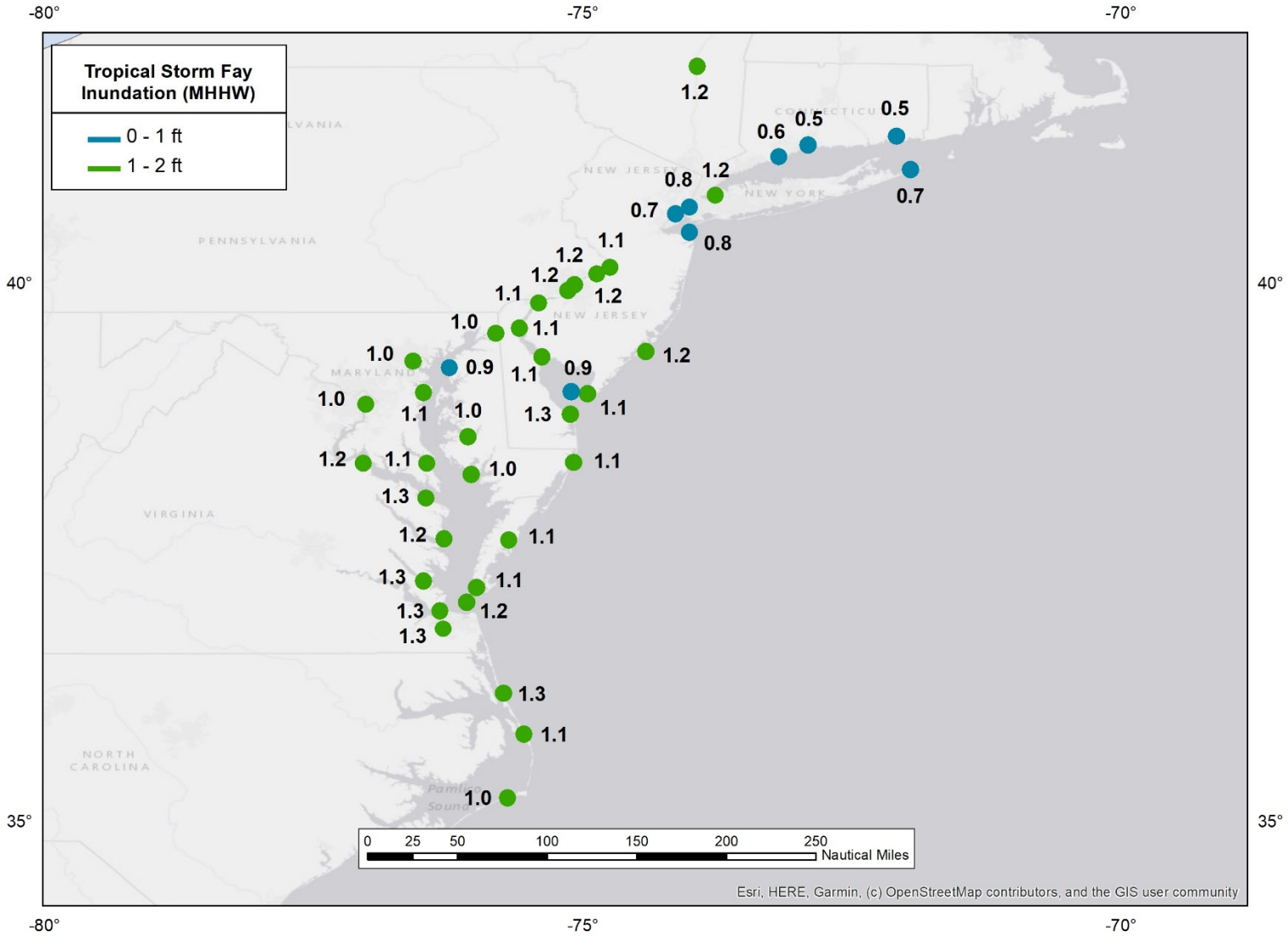


Figure 4. Maximum water levels measured from tide gauges during Tropical Storm Fay, 9–11 July 2020. Water levels are referenced as feet above Mean Higher High Water (MHHW), which is used as a proxy for inundation (above ground level) on normally dry ground along the immediate coastline.

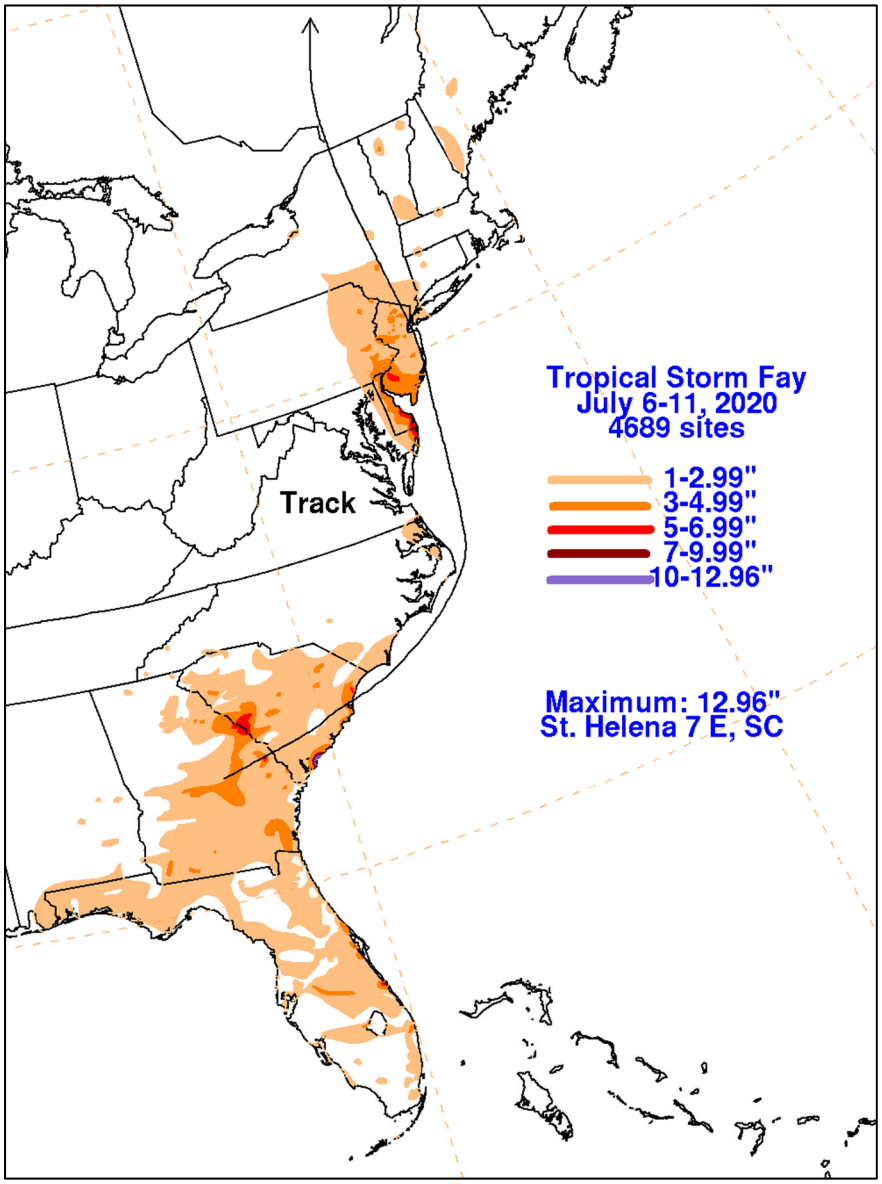


Figure 5. Storm total rainfalls (inches) during Tropical Storm Fay, 9–11 July 2020 and the pre-Fay disturbance. Image and data courtesy of David Roth at the Weather Prediction Center.