NATIONAL HURRICANE CENTER TROPICAL CYCLONE REPORT

TROPICAL STORM ALEX

(AL012022)

5–6 June 2022

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National Hurricane Center
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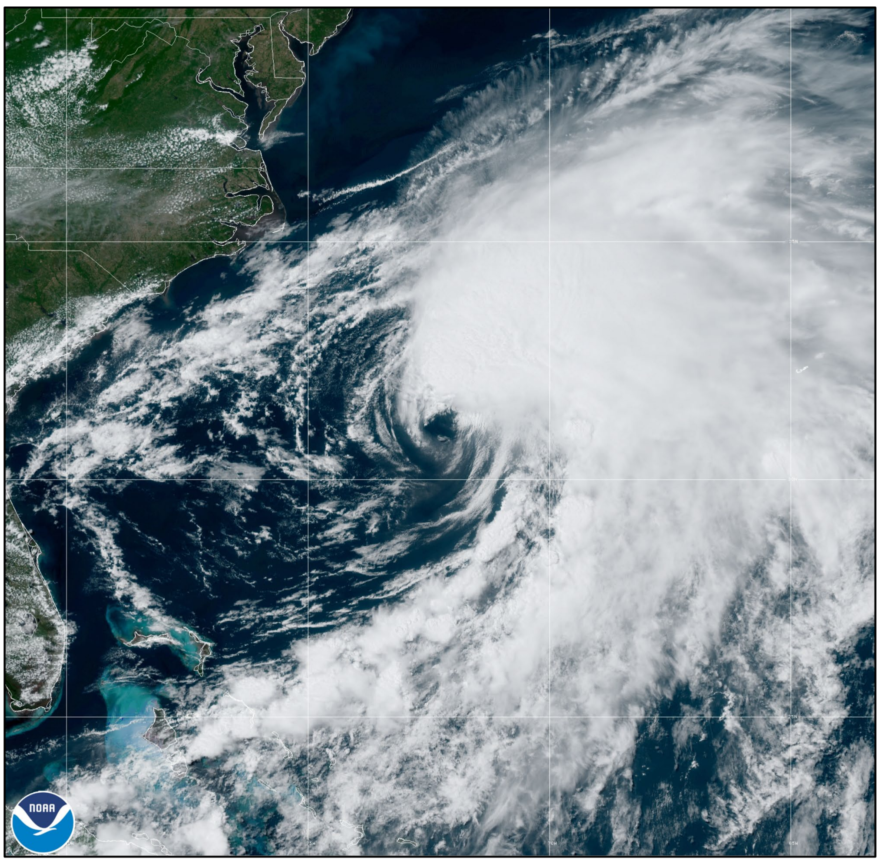

GOES-16 GEOCOLOR IMAGE OF TROPICAL STORM ALEX AT 1840 UTC 5 JUNE 2022 AROUND THE TIME OF ITS PEAK INTENSITY. IMAGE COURTESY OF NOAA/NESDIS/STAR.

Alex was a short-lived tropical storm that formed just east of Florida and became a post-tropical cyclone when it passed near Bermuda. Alex's precursor disturbance produced heavy rainfall and flooding in portions of Cuba and South Florida, and four flood-related fatalities were reported in Cuba.

Tropical Storm Alex

5–6 JUNE 2022

SYNOPTIC HISTORY

Alex's pre-genesis disturbance originated from the mid-level remnants of eastern Pacific basin Hurricane Agatha and a Central America Gyre (CAG) that became established over the far eastern Pacific, Central America, and the western Caribbean Sea in late May. On May 30, Hurricane Agatha made landfall as a category 2 hurricane (on the Saffir-Simpson Hurricane Wind Scale) just west of Puerto Angel, Mexico, and it rapidly weakened early the next day over the mountainous terrain of southern Mexico. Shower and thunderstorm activity gradually increased over the northwestern Caribbean Sea and Yucatan Peninsula around the eastern portion of the large gyre on 31 May. At the same time, the mid-level remnants of Agatha moved east-northeastward over southeastern Mexico and northern Guatemala. As the mid-level remnants of Agatha continued east-northeastward early on 1 June, a large convective burst developed along the east coast of the Yucatan Peninsula and Belize. This convective burst aided in the formation of a broad area of low pressure by 1200 UTC along the east coast of the Yucatan Peninsula just north of the Belize/Mexico border. Although strong upper-level westerly winds caused the convective activity to propagate east-northeastward away from the broad low, it moved slowly northward near the east coast of the Yucatan Peninsula through early 2 June. By 1200 UTC that day, the broad low was located near the northeastern portion of the Yucatan Peninsula, where 24-h pressure falls of 3–4 mb were noted. That morning during the typical diurnal convective maximum period, new clusters of convection developed over the northwestern Caribbean Sea and the Yucatan Channel around the eastern portion of the low's circulation. However, strong westerly vertical wind shear continued to quickly shunt the shower and thunderstorm activity well east of the center of the broad low pressure area.

By 0000 UTC 3 June, the broad low moved off the northeastern coast of the Yucatan Peninsula. Shower and thunderstorm activity once again increased overnight over the eastern portion of the circulation, and data from an Air Force Reserve reconnaissance aircraft around 0600 UTC suggested that the center became a little better defined. Flight-level and Stepped Frequency Microwave Radiometer (SFMR) data from the aircraft also indicated that the disturbance's peak winds had increased to 35 kt. The system nearly had enough organization to become a tropical cyclone early that morning, but strong shear again quickly disrupted its organization shortly thereafter, and the center remained poorly defined. By this time, the disturbance began moving northeastward as it reached the southern extent of the mid-latitude westerlies.

Although the best track of the disturbance indicates a faster northeastward motion across the southeastern Gulf of Mexico by 1800 UTC 3 June, much of that forward progression is a result of nearly continual reformations of the center as the convection waxed and waned due in part to the strong westerly shear. This shear prevented the system from becoming a tropical cyclone before it reached the southwestern coast of Florida just after 1200 UTC 4 June. The disturbance moved northeastward across the Florida Peninsula during the next 6 h and exited the east coast of Florida just north of Jensen Beach shortly after 1800 UTC. Before exiting the east coast of Florida, 40-kt winds were occurring over the Atlantic waters within the eastern and southeastern portions of the circulation. After moving off the east coast of Florida, the disturbance continued northeastward, passing about 60 n mi northwest of the northwest Bahamas. Convective banding increased over the eastern portion of the circulation, and satellite and surface observations indicated that the system's circulation had become better defined. This improved structure resulted in the formation of Tropical Storm Alex by 0000 UTC 5 June when the system was located about 75 n mi north of Grand Bahama Island in the northwestern Bahamas (Fig. 4). The system had an estimated intensity of 40 kt at the time of formation. The "best track" chart of Alex's path is given in Fig. 1, with the wind and pressure histories shown in Figs. 2 and 3, respectively. The best track positions and intensities are listed in Table 1[1].

After formation, deep convection became more concentrated just northeast of the center, and Alex continued to deepen while it accelerated east-northeastward within the mid-latitude westerly flow off the southeastern United States coast. Between 1200 and 1800 UTC 5 June, thunderstorm activity began to wrap around the northern portion of the circulation, and Alex reached its estimated peak intensity of 60 kt by 1800 UTC that day when it was located about 300 n mi south-southeast of Cape Hatteras, North Carolina. Shortly thereafter, an approaching mid-latitude trough caused dry mid-level air to be entrained into the western portion of the circulation, and Alex's satellite presentation began looking less tropical. By 0600 UTC 6 June, deep convection near the center of the storm had weakened with the remaining convection located well to the east and north of the center. This degradation in structure caused the storm to begin filling, and data from an Air Force reconnaissance aircraft indicated that Alex's intensity decreased to 55 kt by 0600 UTC that morning. Alex continued to lose its tropical characteristics over the next several hours as the remaining shower and thunderstorm activity further separated from the low-level center, and it became a post-tropical cyclone by 1200 UTC 6 June when it was located about 90 n mi north-northwest of Bermuda (Fig. 4). Alex brought gale- to storm-force winds to that island for several hours that morning.

After the low passed north of Bermuda, a developing low-level baroclinic zone associated with a strong mid-latitude trough moving southeastward near the Canadian Maritimes caused the circulation of the post-tropical cyclone to become increasingly elongated. Scatterometer data and ERA-5 hourly analysis plots (Fig. 5) indicate that the post-tropical cyclone was absorbed within the baroclinic zone by 0000 UTC 7 June. However, a few hours later, a new low pressure area formed in association with the deepening trough and remnants of Alex. The new extratropical low quickly strengthened while moving to the northeast at 25 to 30 kt over the central Atlantic, and by 1800 UTC 7 June the low was producing hurricane-force winds when it passed about 350 n mi southeast of Cape Race, Newfoundland. Shortly thereafter, the low weakened while continuing northeastward. The low passed between Iceland and the British Isles on 10–11 June before weakening and ultimately dissipating west of Norway a couple of days later.

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[1] A digital record of the complete best track, including wind radii, can be found on line at ftp://ftp.nhc.noaa.gov/atcf. Data for the current year's storms are located in the *btk* directory, while previous years' data are located in the *archive* directory.

METEOROLOGICAL STATISTICS

Observations in Alex (Figs. 2 and 3) include subjective satellite-based Dvorak technique intensity estimates from the Tropical Analysis and Forecast Branch (TAFB) and the Satellite Analysis Branch (SAB), objective Advanced Dvorak Technique (ADT) estimates and Satellite Consensus (SATCON) estimates from the Cooperative Institute for Meteorological Satellite Studies/University of Wisconsin-Madison. Observations also include flight-level, stepped frequency microwave radiometer (SFMR), and dropwindsonde observations from nine 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 Alex.

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

Winds and Pressure

The intensity of the pre-tropical cyclone disturbance is estimated to have reached 35 kt when the system was located over the southern Gulf of Mexico. That intensity is based on SFMR surface winds of 33 to 37 kt and a peak 850-mb flight level wind of 46 kt from an Air Force Reserve reconnaissance mission around 0600 UTC 3 June.

Although the system lost some organization on its approach to Florida, the disturbance still brought tropical-storm-force winds, especially in gusts, to portions of South Florida and the Florida Keys. The highest sustained wind reported in Florida was 41 kt with a gust to 51 kt at the slightly elevated station (16 m) at Sand Key Light. That wind occurred in an area of thunderstorms that preceded the broad low during the afternoon of 3 June. An elevated (26 m) weather station at Government Cut near Miami and another station farther north along the east coast of Florida near Juno Beach reported sustained tropical-storm-force winds of 35 kt during the morning of 4 June. Wind gusts of 35 to 45 kt were reported at many coastal locations in the Florida Keys and southeastern Florida during the morning hours of 4 June when the disturbance was crossing southern Florida. This included a wind gust of 44 kt at Key West International Airport, 45 kt at Dania Pier, and 37 kt at Fort Lauderdale International Airport. Wind gusts of 49 and 51 kt were reported at elevated sites at Turkey Point (20 m) and Government Cut (23 m), respectively, in Miami-Dade County. Squalls associated with the disturbance also produced gusty winds across the western and central portions of Cuba. Casa Blanca and Santiago de Las Vegas in the province of La Habana reported wind gusts of 56 kt and 49 kt, respectively on 3 June.

As the disturbance exited Florida around 1800 UTC 4 June, the intensity is estimated to have increased to 40 kt. This is based on reconnaissance aircraft data that reported peak SFMR winds of 40 kt and a peak 900-mb (~3100 ft) flight-level wind of 53 kt along the southeastern coast of Florida around 1500 UTC that day. By 0000 UTC 5 June, satellite data and surface observations indicate that the circulation of the disturbance became better defined, and although the system was still being affected by southwesterly shear, it had acquired enough organization to be considered a tropical cyclone (Fig. 4).

After formation, Alex quickly strengthened, and the estimated 60-kt peak intensity of the tropical storm at 1800 UTC 5 June and 0000 UTC 6 June is based on a peak believable SFMR wind of 57 kt from an Air Force Reserve reconnaissance mission, and data from NOAA buoy 41048. The buoy reported one-minute sustained winds of 52 kt at 4 m at 2348 UTC 5 June, which equates to a 10-m surface wind of 58 kt. The aircraft reported much stronger flight-level winds during several missions on 5–6 June, including 89 kt at 850 mb at 1213 UTC 5 June and 80 kt at 700 mb at 0408 UTC 6 June. Standard flight-level-to-surface wind reductions for those two wind observations would yield 71 and 72 kt, respectively. However, dropwindsonde and SFMR wind observations indicate that those strong winds were not mixing down to the surface as efficiently as normal. Therefore, Alex's estimated intensity more closely follows the SFMR wind observations from the reconnaissance aircraft on 5 and 6 June.

Alex made its closest approach to Bermuda as a post-tropical cyclone around 1200 UTC 6 June (Fig. 4). That morning, sustained winds of 48 to 50 kt were reported at elevated observing sites on that island. Peak wind gusts of 57 to 63 kt were reported at some of the elevated sites with a peak gust of 68 kt at the National Museum of Bermuda. A wind gust to 49 kt was reported at the L.F. Wade International Airport.

Storm Surge[2]

Alex's incipient disturbance produced minimal storm surge across South Florida and the Florida Keys. Tide gauges along both the southwestern and southeastern coasts of Florida reported storm surge amounts of 1 to 1.5 ft, above normal tide levels with the highest value at Naples where 1.48 ft of storm surge was observed. Combined with the tide, this resulted in storm surge inundation of around 0.5 to 1 ft above normally dry ground.

Rainfall and Flooding

Alex's incipient disturbance produced heavy rainfall and flooding across portions of western and central Cuba, South Florida, the Florida Keys, and the Northwest Bahamas. In Cuba, several locations reported rainfall amounts of 10 to 16 inches between 2–5 June. The maximum rainfall total in Cuba occurred at Topes de Collantes where 16.44 inches was recorded. Other rainfall totals above 10 inches include: 12.57 inches at Paso Real de San Diego, 11.54 inches at San Juan y Martinez, 11.07 inches at Pinar del Rio, and 10.43 inches at Aguada de Pasajeros. At San Juan y Martinez and Paseo Real del San Diego 6 to 7 inches of rain fell during a 3-hour

[2] Several terms are used to describe water levels due to a storm. **Storm surge** is defined as the abnormal rise of water generated by a storm, over and above the predicted astronomical tide, and is expressed in terms of height above normal tide levels. Because storm surge represents the deviation from normal water levels, it is not referenced to a vertical datum. **Storm tide** is defined as the water level due to the combination of storm surge and the astronomical tide, and is expressed in terms of height above a vertical datum, i.e. the North American Vertical Datum of 1988 (NAVD88) or Mean Lower Low Water (MLLW). **Inundation** is the total water level that occurs on normally dry ground as a result of the storm tide, and is expressed in terms of height above ground level. At the coast, normally dry land is roughly defined as areas higher than the normal high tide line, or Mean Higher High Water (MHHW).

period on 3 June. Most locations in the provinces of western and central Cuba received between 5 and 10 inches of rain.

In South Florida, heavy rainfall generally preceded the disturbance's passage across the state. Numerous locations in the Upper Florida Keys and along the southeastern coast of the Florida peninsula reported between 10 and 15 inches of rainfall (Fig. 6). The maximum rainfall occurred near Hollywood, Florida, where 15.28 inches was recorded. In Miami-Dade County, 13.34 inches was reported near Perrine, 13.22 inches was recorded at Biscayne Park, and 12.26 inches fell near Coral Gables. In the Florida Keys, 11.20 inches was reported at Ocean Reef Country Club on Key Largo, 11.12 inches was recorded on Plantation Key, and 10.89 inches was measured at Tavernier. Rainfall amounts of 3 to 6 inches occurred across the Lower and Middle Florida Keys, with the lower amounts falling near Key West where 3.32 inches was measured at the National Weather Service Office on that island. Storm total rainfall amounts of 5 to 10 inches were reported along the coast of southwestern Florida. At Southwest Regional Airport in Fort Myers, 5.62 inches was reported and 8.60 inches was recorded at Marco Island.

In the Bahamas, the highest rainfall total was reported near Freeport, where 9.54 inches fell. Near Governor's Harbor on Eleuthera Island, 8.03 inches was measured and a storm total of 7.08 inches was reported at Alice Town in the Bimini Islands.

The rainfall in Cuba and southeastern Florida caused widespread flash and urban flooding.

Tornadoes

The Cuban Meteorological Service reported that two weak tornadoes occurred in the provinces of Pinar del Rio and Cienfuegos, causing minor damage.

CASUALTY AND DAMAGE STATISTICS

There were no reports of damage or casualties[3] associated with Alex while it was a tropical cyclone. However, the incipient disturbance caused widespread flash and urban flooding across portions of central and western Cuba, and South Florida. Media reports from Cuba indicate that the disturbance caused four direct flood-related fatalities in that country. Two deaths occurred in the province of Pinar del Rio with the other two occurring in the province of La Habana. According to the Cuban government, heavy rainfall and flooding from the disturbance damaged 750 homes with 21 total collapses reported, mainly in the province of La Habana. The flooding also damaged 3,200 hectares of crops, and there were 158,000 customers that lost electricity during the event in Cuba.

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

In South Florida, the heavy rainfall produced extensive urban flooding throughout eastern portions of Miami-Dade, Broward, and southeastern Palm Beach counties, resulting in major street flooding in many locations. Over 2 ft of water flooded streets in portions of Downtown Miami and Brickell. In Key Biscayne, 70% of streets were flooded. Significant street flooding was also reported in many parts of eastern Broward and southeastern Palm Beach Counties. Although there were very few reports of water entering structures, street flooding in southeastern Florida resulted in numerous stranded vehicles with the water rescue of some drivers, impassable streets, and many travel-related delays. There were 3,500 power outages reported in Miami-Dade and Broward Counties. Significant street flooding was also reported in southwestern Florida in parts of Marco Island and east Naples. Tropical-storm-force wind gusts caused some shallow rooted trees to fall, and there was one report of a tree that fell on a mobile home in Pompano Beach. At the time of this writing, there is no monetary damage estimate available.

Alex became a post-tropical cyclone around the time it brought strong winds to Bermuda. Although there were no reports of significant damage on the island, about 950 homes lost power during the event.

Media reports indicate that the U.S. Coast Guard rescued three mariners after the sailboat they were aboard sustained damage during the storm. The boat was located within the path of the tropical storm, about 250 n mi west of Bermuda. A first-hand account of the incident written by one of the mariners (http://faule-haut.de/2022/06/09/fh-killed-by-a-tropical-cyclone/) indicates that the vessel experienced winds up to 50 kt and was rolled by a large wave that caused significant damage. The Coast Guard reported that the sailors activated an Emergency Position-Indicating Radio Beacon (EPIRB) distress signal that aided in their rescue the next day.

FORECAST AND WARNING CRITIQUE

The genesis of Alex was well anticipated, but development occurred much later than originally predicted. The system was introduced in the Tropical Weather Outlook at 1200 UTC 28 May with a low chance (<40%) of development over the next 5 days. This was more than a week before formation occurred (Table 4). The system was assessed a 5-day medium (40-60%) chance of formation 132 h before development, and it reached the high category (>60%) 102 h before tropical cyclone formation took place. Similarly, the 2-day chance of formation also anticipated that the system would form much quicker. The 2-day probability of development reached the medium and high categories 96 and 84 h before formation, respectively. As a result of genesis forecasts that anticipated tropical cyclone formation over the southeastern Gulf of Mexico before the system crossed Florida, NHC initiated Potential Tropical Cyclone advisories at 2100 UTC 2 June to issue Tropical Storm Watches for portions of Florida and western and central Cuba (Table 7).

Since NHC's verification requires the system to be classified as a tropical cyclone at both the forecast's initial time and the projection's valid time, only four 12-h and two 24-h official forecasts satisfied those criteria. Official track forecasts errors for Alex were much greater than the mean official errors for the previous 5-year period (Table 5), albeit for the small sample size. The climatology and persistence (OCD5) model errors were also significantly larger than their 5-

year averages, suggesting that the track of Alex was more difficult than average to predict. Official forecast intensity errors were comparable to the mean official error for the previous 5-year period (Table 6). Due to Alex's brief existence as a tropical cyclone, a meaningful comparison of official forecasts and track and intensity model guidance cannot be made.

Since NHC issued forecasts for Alex's precursor disturbance (Potential Tropical Cyclone One) for more than 48 h, it is worth at least a subjective examination of those track and intensity predictions. Figure 7 shows all the NHC official forecasts for both Potential Tropical Cyclone One and Alex from 1800 UTC 2 June through 1800 UTC 6 June. Although the system lacked a well-defined center when it was a Potential Tropical Cyclone, the NHC forecasts during that time correctly predicted the system's path across the southeastern Gulf of Mexico and Florida, with only a slightly northward bias noted in the forecasts. The NHC intensity forecasts correctly predicted only slight strengthening before the system crossed Florida, but the official forecasts did not anticipate as much strengthening as what occurred when the system was a tropical cyclone over the western Atlantic.

Watches and warnings associated with Alex and its incipient disturbance (Potential Tropical Cyclone One) are given in Table 7. Advisories on Potential Tropical Cyclone One were initiated at 1800 UTC 2 June to issue Tropical Storm Watches for portions of Cuba, the Florida peninsula, and the Florida Keys. The Tropical Storm Watch along the southwest coast of Florida and the Florida Keys was upgraded to a Tropical Storm Warning at 0300 UTC 3 June and for the east coast of Florida 6 h later. Although the system did not become a tropical cyclone before affecting western Cuba or the Florida peninsula, the disturbance brought tropical-storm-force winds (primarily in gusts) and heavy rainfall to those areas. The NHC advisories on the potential tropical cyclone likely heightened public awareness of the threat of wind and rainfall impacts in Cuba and Florida.

ACKNOWLEDGEMENTS

Data in Table 3 were compiled from post-storm reports provided by the National Weather Service Forecast Offices in Key West, Miami, Tampa, and Melbourne. Additional data was provided by the Cuban Meteorological Service, the Bermuda Weather Service, the National Ocean Service, and the National Data Buoy Center. David Roth of the NOAA Weather Prediction Center provided additional rainfall reports and analysis. Philippe Papin of the National Hurricane Center provided the detailed analysis and ERA-5 plots shown in Figure 5 that assisted in the explanation of the absorption of Alex's post-tropical cyclone.

Table 1. Best track for Tropical Storm Alex, 5–6 June 2022.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
02 / 1800	21.3	87.5	1004	30	disturbance
03 / 0000	21.6	87.3	1003	30	"
03 / 0600	21.9	87.1	1003	35	"
03 / 1200	22.2	86.9	1003	35	"
03 / 1800	22.8	86.3	1003	35	"
04 / 0000	23.9	85.1	1003	35	"
04 / 0600	25.0	83.7	1003	35	"
04 / 1200	26.2	82.0	1002	35	"
04 / 1800	27.2	80.4	1001	40	"
05 / 0000	28.0	78.8	999	40	tropical storm
05 / 0600	28.8	77.2	995	45	"
05 / 1200	29.9	75.0	993	50	"
05 / 1800	31.0	72.5	985	60	"
06 / 0000	32.1	70.2	984	60	"
06 / 0600	33.0	67.8	987	55	"
06 / 1200	33.8	65.2	992	55	low
06 / 1800	34.7	62.2	994	50	"
07 / 0000					absorbed within a baroclinic zone
05 / 1800	31.0	72.5	985	60	maximum wind
06 / 0000	32.1	70.2	984	60	minimum pressure

Table 2. Selected ship reports with winds of at least 34 kt for Tropical Storm Alex and its precursor disturbance, 4–6 June 2022.

Date/Time (UTC)	Ship call sign	Latitude (°N)	Longitude (°W)	Wind dir/speed (kt	Pressure (mb)
04 / 1700	9HJD9	25.1	77.6	170 / 36	1009.1
04 / 1800	9HJD9	25.1	77.6	160 / 35	1009.1
04 / 2000	9HJD9	25.1	77.6	160 / 35	1009.1
04 / 2100	9HJD9	25.1	77.6	160 / 35	1009.1
05 / 0500	9HJD9	24.9	77.7	200 / 36	1007.1
05 / 0800	9HJD9	24.9	77.7	200 / 36	1007.1
05 / 0900	9HJD9	24.9	77.7	200 / 36	1007.1
06 / 0600	9HJC9	29.9	64.8	180 / 40	1008.0
06 / 0900	9HJC9	29.6	65.5	210 / 42	1007.8

Table 3. Selected surface observations for Tropical Storm Alex, 5–6 June 2022. Note that the table includes observations from Alex's incipient disturbance and the post-tropical cyclone phase.

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft)[c]	Storm tide (ft)[d]	Estimated Inundation (ft)[e]	Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[a]	Sustained (kt)[b]	Gust (kt)				
Offshore									
Buoys									
Canaveral 20 E (41009) (28.50N 80.18W)	04/2250	1003.0	04/1650	23 (5 m, 1 min)	29				
Canaveral 120 ENE (41010) (28.91N 78.47W)	05/0650	1001.5	04/2117	31 (4 m, 1 min)	35				
West Bermuda 240 W (41048) (31.83N 69.57W)	06/0020	988.2	05/2348	52 (4 m, 1 min)	60				
Cuba									
Topes de Collantes (78342)									16.44
Paso Real de San Diego (78317)									12.57
San Juan y Martínez (78314)									11.54
Pinar del Río (78315)									11.07
Aguada de Pasajeros (78335)									10.43
Playa Girón (78333)					52				9.80
Santiago de las Vegas (78373)					49				9.42
La Fé (78321)									9.04
Sancti Spíritus (78349)									8.96
Tapaste (78374)									8.44
Cuba-Francia (78309)									8.40
Güines (78323)									8.35
Colón (78332)									7.87
Trinidad (78337)									7.86
Batabanó (78322)									7.61

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft)[c]	Storm tide (ft)[d]	Estimated Inundation (ft)[e]	Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[a]	Sustained (kt)[b]	Gust (kt)				
Jagüey Grande (78331)									7.58
Bahía Honda (78318)									7.43
Punta del Este (78324)									7.12
La Piedra (78308)									7.04
Isabel Rubio (78313)									6.87
Melena del Sur (78375)									6.61
Indio Hatuey (78329)									6.29
Casa Blanca (78325)					56				6.28
Bainoa (78340)									6.28
Cienfuegos (78344)									6.18
Santa Lucía (78312)									5.91
La Palma (78316)									5.68
Jovellanos (78330)									5.50
Varadero (78328)									5.23
Venezuela (78346)									5.54
Cabo San Antonio (78310)									4.42
Bauta (78376)									4.32
Florida									
WeatherFlow Sites									
Biscayne Bay Light 20 (XKBS) (25.66N 80.19W)			04/1036	30 (1 min, 6 m)	38				
Boynton Beach (XBOY) (26.55N 80.05W)			04/0859	24	36				
Dania Pier (XDAN) (26.06N 80.11W)			03/1556	30 (5 min, 9 m)	45				
Dodge Island (XBBH) (25.77N 80.15W)					35				
Florida A1A North Beach (27.82N 80.43W)	04/1905	1003.0	04/1745	34	42				
Government Cut (XGVT) (25.75N 80.10W)			04/1136	35 (1 min, 23 m)	51				

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)				
Hillsboro Inlet (XHBI) (26.26N 80.08W)			03/1625	26 (5 min, 5 m)	35				
Jensen Beach (XJEN) (27.22N 80.20W)	04/2135	1000.4	04/1405	25	38				
Jungle Trail Wabasso Beach (27.75N 80.40W)	04/2200	1002.6	04/2250	22	43				
Juno Beach Pier (XJUP) (26.89N 80.06W)			04/0944	35 (1 min, 6 m)	43				
Marathon Key (XKEY) (24.74N 80.98W)			04/1118	25 (13 m)	38				
Melbourne Beach (XMBI) (27.90N 80.47W)	04/1856	1000.8	04/1617	32	42				
Queen Bess CT Indian River Shores (27.69N 80.37W)	04/2205	1002.1	04/1915	22	43				
Sebastian Inlet Pier (SIPF1) (27.86N 80.44W)			04/1456	25	34				
Sea Forest Indian River Shores (27.69N 80.37W)	04/2225	1002.3	04/1915	28	39				
Smith Shoal Light (XSMS) (24.72N 81.92W)	04/0951	1000.9	03/1801	31 (19 m)	43				
Turkey Point (XTKY) (25.43N 80.35W)			04/0955	30 (1 min, 20 m)	49				
International Civil Aviation Organization (ICAO) Sites									
Boca Chica Naval Air Station (KNQX) (24.58N 81.68W)	04/0953	1003.4	03/2056	28	36				3.96
Florida Keys Marathon Intl Airport (KMTH) (24.73N 81.05W)	04/1953	1003.4	03/1844	18	36				5.65
Ft. Myers / SW Florida Intl (KRSW) (26.54N 81.76W)	04/1253	1003.4	04/0114	16	22				5.62
Ft. Myers / Page Field (KFMY) (26.58N 81.87W)	04/1253	1003.9	04/0053	15	23				4.90
Naples (KAPF) (26.15N 81.77W)									4.84

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)				
Ft. Lauderdale Intl Airport (KFLL) (26.07N 80.15W)	04/2153	1001.1	04/1521	28	37				9.21
Fort Lauderdale Executive Airport (KFXE) (26.20N 80.18W)									9.02
Palm Beach International (KPBI) (26.69N 80.10W)									6.08
Miami International Airport (KMIA) (25.80N 80.29W)									8.65
North Perry Airport (KHWO) (26.00N 80.24W)									9.35
Tamiami Airport (KTMB) (25.64N 80.43W)									10.79
Homestead AFB (KHST) (25.48N 80.37W)									9.35
Key West Intl Airport (KEYW) (24.56N 81.76W)	04/0953	1003.4	03/2049	30	44				3.34
Punta Gorda / Charlotte Co (KPGD) (26.92N 81.99W)	04/1253	1004.8	04/0110	21	31				2.50
Sarasota / Bradenton Intl (KSRQ) (27.40N 82.55W)	04/1253	1004.7	02/2343	18	26				0.28
Treasure Coast IAP/ Ft. Pierce (KFPR) (27.50N 80.38W)	04/2213	1001.3	04/1638	28 (2 min, 10 m)	35				4.24
Vero Beach (KVRB) (27.65N 80.41W)	04/2230	1002.0	04/1402	31 (2 min, 10 m)	36				6.21
Coastal-Marine Automated Network (C-MAN) Sites									
Alligator Reef Light (XALG) (24.85N 80.62)	04/2027	1002.8	04/1212	32 (8 m)	43				
Carysfort Reef Light (XCFL) (25.23N 80.21)	04/1848	1001.0	04/1243	35 (15 m)	45				

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft)[c]	Storm tide (ft)[d]	Estimated Inundation (ft)[e]	Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[a]	Sustained (kt)[b]	Gust (kt)				
Fowey Rocks (FWYFI) (25.59N 80.10)	04/2300	1002.7	04/1500	37 (44 m)	43				
Lake Worth Pier (LKWF1) (26.61N 80.03W)	04/2148	1000.6	04/0848	30 (6 m)	37				
Long Key Light (LONF1) (24.84N 80.86W)	04/2010	1003.0		31 (7 m, 1 min)	38				
Sombrero Key (SMKF1) (24.63N 81.11W)	04/1950	1002.9	03/2300	31 (6 m, 1 min)	38				
Sand Key (SANF1) (24.46N 81.88W)	04/1000	1003.5	03/2040	41 (16 m, 1 min)	51				
Virginia Key (VAKF1) (25.73N 80.16W)	04/2300	1002.7	04/1612	28 (6 m)	37				
National Ocean Service (NOS) Sites									
Port Manatee (PMAF1) (27.63N 82.56W)						1.09	1.60	1.02	
Fort Myers (FMRF1) (26.64N 81.87W)						1.30	1.44	1.17	
Naples (NPSF1) (26.13N 81.81W)						1.48	1.64	1.04	
Key West (KYWF1) (25.55N 81.81W)						0.97	0.69	0.64	
Vaca Key (VCAF1) (24.71N 81.10W)						1.29	0.71	1.07	
Lake Worth Pier (LKWF1) (26.61N 80.34)						1.22	1.20	0.64	
South Port Everglades (PEGF1) (26.08N 80.11)						0.98	0.98	0.41	
Virginia Key (VAKF1) (25.73N 80.16)							1.04	0.81	
Trident Pier (TRDF1) (28.41N 80.59W)	04/2154	1003.0	04/1648	17	23	1.32	1.77	0.67	
Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) Sites and other rainfall observations									
Hollywood Downtown 2 NE (HLWF1) (26.03N 80.13W)									15.28

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)				
Margate 0.4W (US1FLBW0079) (26.24N 80.21W)									15.14
S-123 Control Structure (S123-R) (25.61N 80.30W)									13.42
Perrine 2 ESE (CTRF1) (25.61N 80.31W)									13.34
Biscayne Park 1 E (FL-MD-33) (25.88N 80.18W)									13.22
Miami 5.7 N (US1FLMD0079) (25.84N 80.18W)									13.20
Coral Gables 2 ENE (FL-MD-111) (25.74N 80.24W)									12.26
Palmetto Bay 0.5 NW (US1FLMD0081) (25.62N 80.33W)									12.15
Perrine 1 NE (FL-MD-81) (25.62N 80.33W)									12.15
Miami 2.2 S (US1FLMD0094) (25.74N 80.21W)									12.04
South Miami 0.9 SSE (US1FLMD0094) (25.69N 80.28W)									12.03
Tidewater/S-27 Spillway (S247-R) (25.85N 80.18W)									11.94
Miami Shores 1 S (ELPF1) (25.85N 80.19W)									11.88
South Miami 1 NNE (FL-MD-100) (25.73N 80.30W)									11.38
Ocean Reef Country Club Rd (FL-MN-37) (25.32N 80.28W)									11.20

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)				
Plantation Key Kahiki Dr (KFLTAVER7) (25.01N 80.54W)									11.12
Country Walk 3 NNE (FL-MD-41) (25.66N 80.41W)									11.11
Black PT 1 WNW (BCPF1) (25.54N 80.33W)									11.08
Black PT 2 SW (BBBF1) (25.52N 80.35W)									10.97
Tavernier Harry Harris Dr (KFLTAVER51) (25.02N 80.50W)									10.89
Tavernier Mangrove LN (KFL5AVER50) (25.02N 80.51W)									10.80
Key Largo S Andros Dr (FL-MN-25) (25.17N 80.37W)									10.70
Tavernier Harborview Dr (KFLTAVER20) (25.01N 80.52W)									10.67
Weston 2.8 SE (FL-BW-99) (26.07N 80.37W)									10.65
Homestead Park 4 NNW (BHMF1) (25.49N 80.35W)									10.60
Key Largo Dolphin Ave (KFLKEYLA60) (25.14N 80.40W)									10.57
North Miami Beach (NOMF1) (25.93N 80.15W)									10.51

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)				
Key Largo Ryan Ave (FL-MN-35) (25.15N 80.39W)									10.50
Lighthouse Point 1 WNW (FL-BW-7) (26.29N 80.10W)									10.47
Lindgren Acres 0.5 WSW (FL-MD-03) (26.66N 80.40W)									10.45
Southwest Ranches (FL-BW-67) (26.06N 80.33W)									10.41
Tavernier Harborview Dr (KFLTAVER38) (25.01N 80.52W)									10.40
Margate 1 NE (FL-BW-162) (26.26N 80.21W)									10.32
Florida Gardens SW 4 (FL-PB-2) (25.58N 80.20W)									10.32
Goulds 2 E (FL-MD-51) (25.56N 80.35W)									10.28
Key Largo Bonita Ave (FL-MN-64) (25.15N 80.39W)									10.24
Highland Beach (FL-PB-44) (26.40N 80.07W)									10.23
Davie Downtown 2 SE (DVIF1) (26.07N 80.21W)									10.12
Miramar WSW 1 (FL-BW-103) (25.97N 80.37W)									10.06
Country Walk 3 S (PRRF1) (25.58N 80.44W)									10.04
Pompano Beach Arpt (FL-BW-137) (26.25N 80.12W)									10.01

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)				
Tavernier Dickie Way (KFLTAVER28) (25.01N 80.52W)									9.96
Lauderdale By The Sea (FL-BW-159) (26.19N 80.11W)									9.90
Butternut Key (BNKF1) (25.09N 80.52W)									9.88
Kendall 1 NW (FL-MD-80) (25.69N 80.34W)									9.83
Biscayne Park 1 NW (FW7787) (25.89N 80.21W)									9.78
Key Largo PT Pleasant Dr (KFLKEYLA109) (25.10N 80.44W)									9.73
Key Largo Wildwood Dr (KFLKEYLA108) (25.09N 80.44W)									9.71
North Blocks Golden 3 N (FL-CR-52) (26.27N 81.53W)									9.69
Coral Gables 2 ENE (FW3129) (25.73N 80.24W)									9.63
West Miami 2 E (FW6581) (25.76N 80.28W)									9.62
Key Biscayne 1 S (CAFF1) (25.88N 80.18W)									9.61
Homestead 3.1 WNW (FL-MD-97) (25.48N 80.50)									9.52
Key Largo 5.3 SW (FL-MN-04) (25.05N 80.49W)									9.52

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)				
Goulds 1 N (GUSF1) (25.57N 80.38W)									9.51
Hialeah 1 E (25.86N 80.28W)									9.50
Plantation Key Orchid St (KFLTAVER36) (25.00N 80.53W)									9.49
Sunset 2.4 SW (FL-MD-07) (25.68N 80.38W)									9.42
Golden Gate 2.2 SW (FL-CR-62) (26.16N 81.73W)									9.40
Blackwater Sound (BWSF1) (25.18N 80.44W)									9.38
Coral Gables 2 ESE (MAMIA) (25.72N 80.25W)									9.29
Intersection I-595 2 WNW (FTLF1) (26.10N 80.20W)									9.37
Miami International 2 ENE (MINF1) (25.81N 80.26W)									9.36
Homestead Park 2 NNW (BBAF1) (25.47N 80.35W)									9.33
Plantation Key Harbor Ln (FL-MN-63) (25.01N 80.54W)									9.30
Deerfield Beach (FL-BW-167) (26.31N 80.09W)									9.27
Hillsboro Beach 1 NNW (FL-BW-26) (26.30N 80.08W)									9.27
Little Blackwater Sound (LBSF1) (25.21N 80.43W)									9.27

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)				
Metro Zoo 3 NNE (AT361) (25.66N 80.38W)									9.26
Thursday Point (THRF1) (25.20N 80.37W)									9.23
Liberty City 3 SW (2750D) (25.80N 80.24W)									9.14
Lauderhill 1 SE (FTDF1) (26.14N 80.19W)									9.10
Key Largo Shoreland Dr (FL-MN-50) (25.14N 80.40W)									9.10
Plantation Key Ojibway Ave (KFLTAVER19) (24.99N 80.55W)									9.04
Tamarac 2 SSE (LAUDR) (26.19N 80.25W)									9.00
North Bay Village 1 SE (DW5199) (25.87N 80.13W)									8.94
Plantation Key Old Highway (KFLISLAM26) (24.97N 80.56W)									8.93
Royal Palm Ranger ST 4 W (LPIF1) (25.39N 80.68W)									8.91
Margate 1 E (FW0365) (26.25N 80.21W)									8.86
Miami WFO/ Tamiami Fairgrounds (MFL) (25.75N 80.37W)									8.80
Southwest Ranches 2 SE (26.04N 80.31W)									8.77

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft)[c]	Storm tide (ft)[d]	Estimated Inundation (ft)[e]	Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[a]	Sustained (kt)[b]	Gust (kt)				
Miami Beach 2 N (E0888) (25.84N 80.13W)									8.72
Pinecrest 1 W (CW5385) (25.66N 80.30W)									8.71
Redland 1 SE (STDF1) (25.51N 80.50W)									8.70
Davie Downtown 1 NW (FDLF1) (26.09N 80.24W)									8.68
Fort Lauderdale 1 NNE (FLBF1) (26.14N 80.11W)									8.67
Marco Island (MCIF1) (25.94N 81.71W)									8.60
Fort Pierce Inlet 1 NW (FL-SL-15) (27.49N 80.30W)									8.60
Key Largo Tamarind Rd (KFLKEYLA96) (25.11N 80.41W)									8.59
Country Walk 4 NW (RHWF1) (25.66N 80.48W)									8.56
Marathon Ensenada St (KFLMARAT50) (24.70N 81.08W)									8.52
Pembroke Pines 2 NE (FL-BW-168) (26.03N 80.32W)									8.50
Coral Springs 2 SSE (7316D) (26.25N 80.26W)									8.46
FAU South Campus 1 E (IRN02) (26.37N 80.10W)									8.40

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)				
Pembroke Pines 1 N (FL-BW-161) (26.02N 80.34W)									8.31
Coral City 3 NW (LLUF1) (25.97N 80.30W)									8.25
Captiva 4 SSE (26.47N 82.16W)									8.11
Marathon Kyle Way W (KFLMARAT44) (24.71N 81.12W)									8.04
Lauderhill 2 S (FL-BW-76) (26.12N 80.21W)									8.02
Little Rabbit Key (LRKF1) (24.98N 80.83W)									7.93
Belle Meade 2 S (RKXF1) (26.03N 81.70W)									7.89
North Naples 4 ENE (EW9004) (26.24N 81.70W)									7.81
South Beach 2 NNW (27.62N 80.35W)									7.80
Delray Beach 2 SW (FL-PB-61) (26.44N 80.11W)									7.80
Key Largo Avenue A (KFLKEYLA107) (25.14N 80.39W)									7.78
Marathon Sombrero Beach Dr (24.70N 81.08W)									7.75
North Palm Beach 1 W (FL-PB-122) (26.82N 80.07W)									7.70
South Beach 1 S (27.57N 80.33W)									7.69
Whipray Basin (WRBF1) (25.07N 80.74W)									7.66

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft)[c]	Storm tide (ft)[d]	Estimated Inundation (ft)[e]	Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[a]	Sustained (kt)[b]	Gust (kt)				
Florida Gardens 3 N (FL-PB-87) (26.67N 80.18W)									7.66
Lake Worth 1 NNE (FL-PB-13) (26.63N 80.07W)									7.62
South Naples 1 NNE (FL-CR-66) (26.12N 81.75W)									7.56
Highland Beach 1 N (DBCF1) (26.42N 80.07W)									7.55
Parkland 5 NW (WBCF1) (26.36N 80.30W)									7.55
Quail Creek Estates 2 SW (FL-CR-13) (26.28N 80.76W)									7.47
Vero Beach Highland 2 NE (27.58N 80.37W)									7.42
Duck Key (DKKF1) (25.18N 80.49W)									7.34
West Palm Beach 2 NW (DW4888) (26.73N 80.08W)									7.25
Buoy Key (BKYF1) (25.12N 80.83W)									7.19
Bob Allen Keys (BOBF1) (25.03N 80.68W)									7.18
Manatee Bay (MNBF1) (25.24N 80.42W)									7.16
Vero Beach 2 E (27.65N 80.36W)									7.15
Orange Tree 1 N (8039D) (26.29N 81.59W)									7.15
Bonita Springs 3 WSW (26.33N 81.84W)									7.14

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)				
Key Largo Snapper Ave (25.14N 80.40W)									7.10
Lake Worth 2 NNE (LWRF1) (26.64N 80.06W)									7.10
Krome Detention CE 3 NNE (TTRF1) (25.78N 80.48W)									7.10
Redland 9 NNW (CHKF1) (25.63N 80.58W)									7.04
South Beach 1 NNE (27.60N 80.33W)									6.90
North Blocks Golden 1 E (FW7616) (26.23N 81.52W)									6.86
Belle Meade 4 S (FL-CR-65) (26.00N 81.69W)									6.84
Lower Matecumbe Iroquois Dr (FL-MN-8) (24.85N 80.74W)									6.82
Marathon 82nd St Ocean (KFLMARAT20) (24.72N 81.01W)									6.78
Palm Beach Shores 1 NNW (FL-PB-81) (26.80N 80.04W)									6.77
Boynton Beach 3 WNW (EW9792) (26.54N 80.14W)									6.72
Lantana 1 S (CW4042) (26.58N 80.06W)									6.68
Pelican Bay (FL-CR-61) (26.20N 81.79W)									6.64
Lakewood Park 1 NE (27.55N 80.39W)									6.59
Gifford 1 NNE (27.69N 80.40W)									6.58

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)				
Middle Cape Sable 5 E (CSFF1) (25.18N 80.07W)									6.52
Peterson Key (PKYF1) (24.92N 80.75W)									6.52
Vero Beach South 1 ESE (FL-IR-27) (27.61N 80.39W)									6.52
Intersection US 2 ENE (FW1651) (26.02N 80.40W)									6.50
Marathon Calzada Bouqinvilla (24.70N 81.08W)									6.49
Vero Beach South 1 S (FL-IR-26) (27.60N 80.42W)									6.41
Punta Rassa 4 ENE (26.51N 81.95W)									6.29
Florida Gardens 5 S (EW2553) (26.55N 80.18W)									6.25
Ramrod Key Indies Rd (24.65N 80.41W)									6.25
Vero Beach 2 NE (FL-IR-41) (27.66N 80.37W)									6.20
Marathon Bruce Ct (KFLMARAT49) (24.73N 81.05W)									6.12
Gifford 2 WNW (VRBF1) (27.69N 80.43W)									6.11
Plantation Key Harbor Dr (25.00N 80.53W)									6.04
Key Colony Beach 4th St (KFLKEYC05) (24.72N 81.02W)									6.00

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft)[c]	Storm tide (ft)[d]	Estimated Inundation (ft)[e]	Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[a]	Sustained (kt)[b]	Gust (kt)				
Vero Beach Highlands (FL-IR-47) (27.56N 80.39W)									5.96
Marathon 62nd St Ocean (24.71N 81.07W)									5.73
Marathon Avenue G (KFLMARAT67) (24.73N 81.01W)									5.73
Winter Beach 1 WSW (FL-IR-48) (27.71N 80.44W)									5.63
Lower Matecumbe Palm Dr (KFLISLAM25) (24.86N 80.74W)									5.60
Curry Hammock State Park (MTEF1) (24.74N 80.98W)									5.60
Grassy Key Pelican Rd (KFLMARAT57) (24.77N 80.94W)									5.57
Rocky Point 2 NE (27.18N 80.16W)									5.51
Paradise Park 3 E (FL-IR-24) (27.64N 80.45W)									5.44
Marathon Man O War Dr (KFLMARAT47) (24.70N 81.08W)									5.34
Johnson Key (JKYF1) (25.05N 80.90W)									5.27
Big Pine Key Pensacola Rd (KFLBIGPI43) (24.70N 81.38W)									5.01
Sebastian 2 SSW (FL-IR-19) (27.76N 80.49W)									4.83

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)				
Nettles Island 1 NE (FL-SL-54) (27.29N 80.21)									4.82
Big Pine Key Gordon Rd (KFLBIGPI48) (24.69N 81.36W)									4.66
Shark Key Cannon Royal Dr (KFLKEYWE122) (24.61N 81.65W)									4.54
Key West Staples Ave (KFLKEYWE77) (24.56N 81.77W)									4.49
Big Pine Key Warbler Ln (KFLBIGPI49) (24.70N 81.36W)									4.46
Hobe Sound 1 NW (FL-MT-42) (27.08N 80.15)									4.41
Nettles Island 1 NE (27.29N 80.22)									4.39
Nettles Island (NETF1) (27.29N 80.22)									4.35
Summerland Key Bay Dr (KFLSUMME73) (24.65N 81.44W)									4.23
Estero 4 SSE (26.43N 81.78W)									4.21
Key West Linda Dr (KFLKEYWE101) (24.56N 81.78W)									4.20
Big Pine Key Avenue E (KFLBIGPI54) (24.67N 81.34W)									4.10
Sugarloaf Key Buttonwood Dr (KFLSUMME121) (24.64N 81.56W)									4.07

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft)[c]	Storm tide (ft)[d]	Estimated Inundation (ft)[e]	Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[a]	Sustained (kt)[b]	Gust (kt)				
Port Salerno (FL-MT-45) (27.14N 80.20)									3.91
No Name Key Bimini Ln (KFLBIGPI41) (24.70N 81.32W)									3.81
Key West Catherine St (KFLKEYWE106) (24.55N 81.79W)									3.67
Key West Olivia St (KFLKEYWE51) (24.56N 81.79W)									3.66
Ramrod Key Coral Ave (KFLSUMME128) (24.67N 81.41W)									3.56
Barefoot Bay (FL-BV-28) (27.89N 80.53)									3.47
Cudjoe Key Buccaneer Ln (KFLCUDJO5) (24.66N 81.48)									3.38
Key West Harriet Ave (KFLKEYWE60) (24.56N 81.76W)									3.35
Key West NWS Office (KKEY) (24.55N 81.79W)									3.32
Key West Tarpon Pier (KFLNEWTO2) (24.56N 81.78W)									3.32
Key West Hibiscus Ln (KFLKEYWE96) (24.56N 81.80W)									3.29
Key West Virginia St (KFLKEYWE125) (24.56N 81.80W)									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)				
Barefoot Bay (FL-BV-118) (27.91N 80.52)									3.17
Key West Watson St (KFLKEYWE110) (24.55N 81.79W)									3.13
Key West George & Laird St (24.55N 81.78W)									3.09
Other Sites									
Cypress Bay HS (WSTNN) (26.07N 80.40W)					40				
Delray Beach (26.47N 80.06W)					44				
Key West HS (24.55N 81.78W)					34				
Sunrise (SNRSC) (26.16N 80.29W)					35				
Bahamas									
ICAO									
Freeport (MYGF)			04/1500		41				
C-MAN Sites									
Settlement Point (SPGF1) (24.70N 78.99W)	04/2300	1000.9	04/1820	35	41				
Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) Sites									
Freeport Lucaya 7.4 WNW (BHS-FP-1) (26.55N 78.70W)									9.54
Governor's Harbour 8.9 NW (BHS-CE-8) (25.25N 76.29W)									8.03
Alice Town 0.3 SSE (BHS-BI-2) (25.72N 79.29W)									7.08
Hope Town 2.7 NNE (BHS-HT-1) (26.52N 76.96W)									4.65
Cherokee 5.7 NW (BHS-CO-4) (26.31N 77.09W)									4.22

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft)[c]	Storm tide (ft)[d]	Estimated Inundation (ft)[e]	Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[a]	Sustained (kt)[b]	Gust (kt)				
Savannah Sound 0.5 SW (BHS-CE-9) (25.08N 76.13W)									4.08
Stella Maris 1.0 ENE (BHS-LI-5) (23.57N 75.25W)									3.61
Paradise Island 5.1 ENE (BHS-NP-14) (25.09N 77.26W)									2.62
Nassau 4.1 ESE (BHS-NP-11) (25.06N 77.30W)									2.01
Bermuda									
Bermuda Biological NOS Station (32.37N 64.68W)	06/1140	999.7							
Bermuda Weather Service Office (32.37N 64.69W)	06/1140	999.7							
L.F. Wade Intl. AP AWOS (AviMet 12) (32.366N 64.694W)	06/1202	999.2	06/1228	46 (10m, 2 min)	54				
L.F. Wade Intl. AP AWOS (AviMet 30) (32.361N 64.668W)	06/1159	999.6	06/1008	39 (10m, 2 min)	49				
L.F. Wade Intl. AP Heliport (32.36N 64.70W)	06/1202	999.2	06/1203	48 (12 m, 1 min)	63				
National Museum of Bermuda AWOS (32.33N 64.83W)	06/1041	996.7	06/1242	50 (2 min)	68				
Pearl Island AWOS (32.29N 64.84W)	06/1212	996.7	06/1212	47 (1 min)	57				
Marine Ops Centre MAROPS (32.38N 64.68W)	06/1128	1002.0	06/0719	51 (10 min)	62				
The Crescent (32.41N 64.82W)	06/1128	1002.0	06/1022	48 (10 min)	63				

[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 storm tide gauges, the height of the water above Mean Higher High Water (MHHW) is used as a proxy for inundation.

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	180
Medium (40%-60%)	96	132
High (>60%)	84	102

Table 5. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Tropical Storm Alex, 5–6 June 2022. 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	50.3	119.7						
OCD5	56.8	186.3						
Forecasts	4	2						
OFCL (2017-21)	23.6	35.5	47.6	61.4	78.2	91.3	125.6	172.1
OCD5 (2017-21)	45.5	98.3	156.7	213.7	252.4	316.9	403.6	484.6

Table 6. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Tropical Storm Alex, 5–6 June 2022. 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**	10.0						
OCD5	7.0	12.5						
Forecasts	4	2						
OFCL (2017-21)	5.4	8.0	9.5	10.9	11.0	12.1	13.1	14.7
OCD5 (2017-21)	7.0	11.1	14.5	17.1	18.0	20.2	21.9	22.1

Table 7. Watch and warning summary for Tropical Storm Alex, 5–6 June 2022.

Date/Time (UTC)	Action	Location
2 / 2100	Tropical Storm Watch issued	Middle of Longboat Key to Volusia/Brevard County Line, including the Florida Keys, Florida Bay, Lake Okeechobee, and the Dry Tortugas
2 / 2100	Tropical Storm Watch issued	Cuban Provinces of Matanzas, Mayabeque, Havana, Artemisa, Pinar del Rio, and the Isle of Youth
3 / 0000	Tropical Storm Watch issued	Northwestern Bahamas
3 / 0300	Tropical Storm Watch modified to	Middle of Longboat Key to Englewood, including Lake Okeechobee
3 / 0300	Tropical Storm Watch changed to Tropical Storm Warning	Englewood to Card Sound Bridge, including the Florida Keys and Florida Bay
3 / 0900	Tropical Storm Watch changed to Tropical Storm Warning	Northwestern Bahamas
3 / 0900	Tropical Storm Watch changed to Tropical Storm Warning	Middle of Longboat Key to Englewood
3 / 0900	Tropical Storm Watch changed to Tropical Storm Warning	Card Sound Bridge to Volusia/Brevard County Line, including Lake Okeechobee
3 / 0900	Tropical Storm Warning issued	Cuban Provinces of Pinar del Rio, Artemisa, La Habana, and Mayabeque
4 / 1200	Tropical Storm Warning discontinued	Middle of Longboat Key to Bonita Beach
4 / 1200	All Tropical Storm Watches and Warnings discontinued	Cuba
4 / 1500	Tropical Storm Watch issued	Bermuda
4 / 1500	Tropical Storm Warning modified to	Card Sound Bridge to Volusia/Brevard County Line

Date/Time (UTC)	Action	Location
4 / 1800	Tropical Storm Warning modified to	Jupiter Inlet to Volusia/Brevard County Line
4 / 2100	Tropical Storm Warning discontinued	Jupiter Inlet to Volusia/Brevard County Line
5 / 0300	Tropical Storm Warning discontinued	Northwestern Bahamas
5 / 0900	Tropical Storm Watch changed to Tropical Storm Warning	Bermuda
6 / 1800	Tropical Storm Warning discontinued	Bermuda

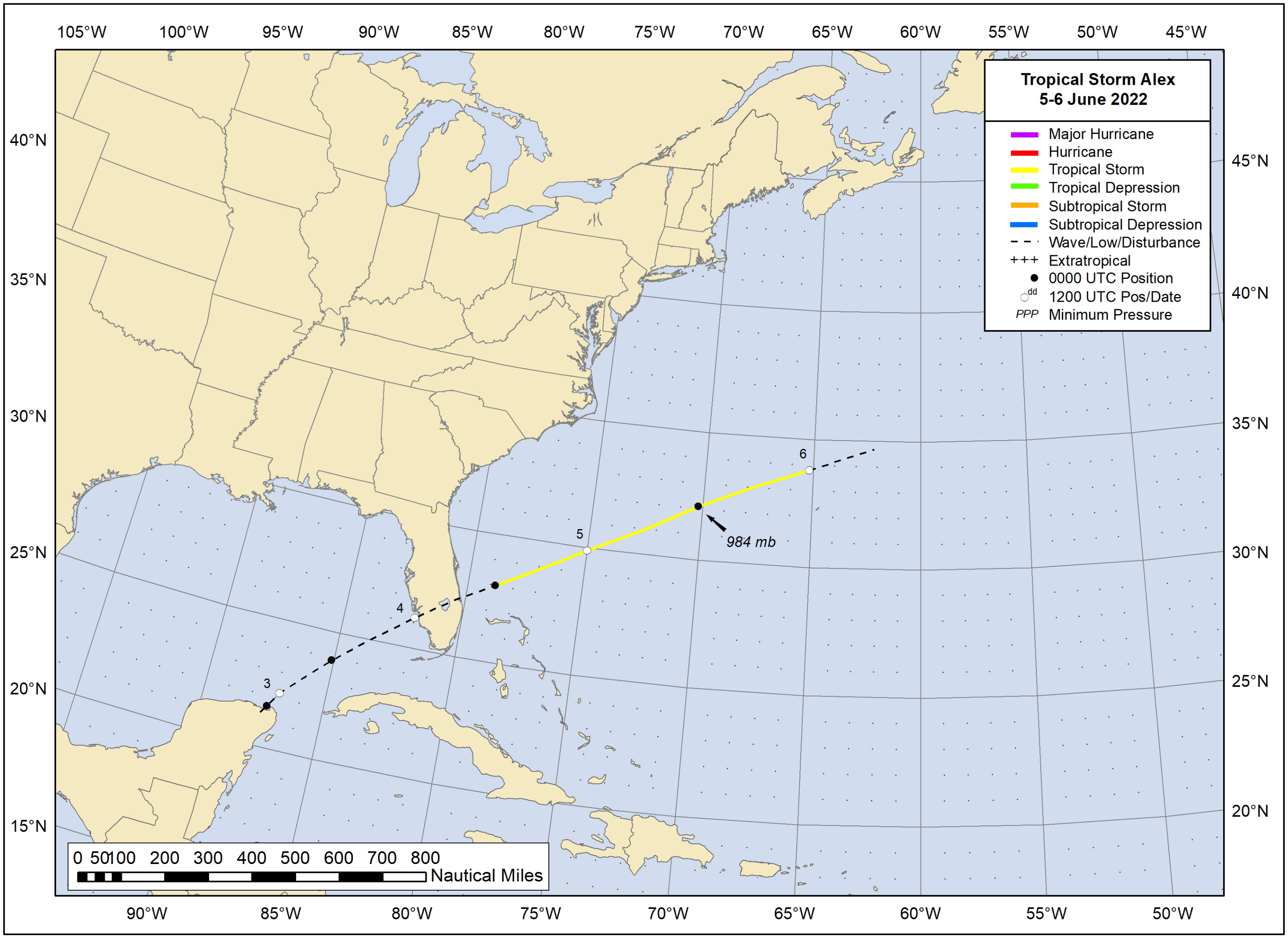

Figure 1. Best track positions for Tropical Storm Alex, 5–6 June 2022.

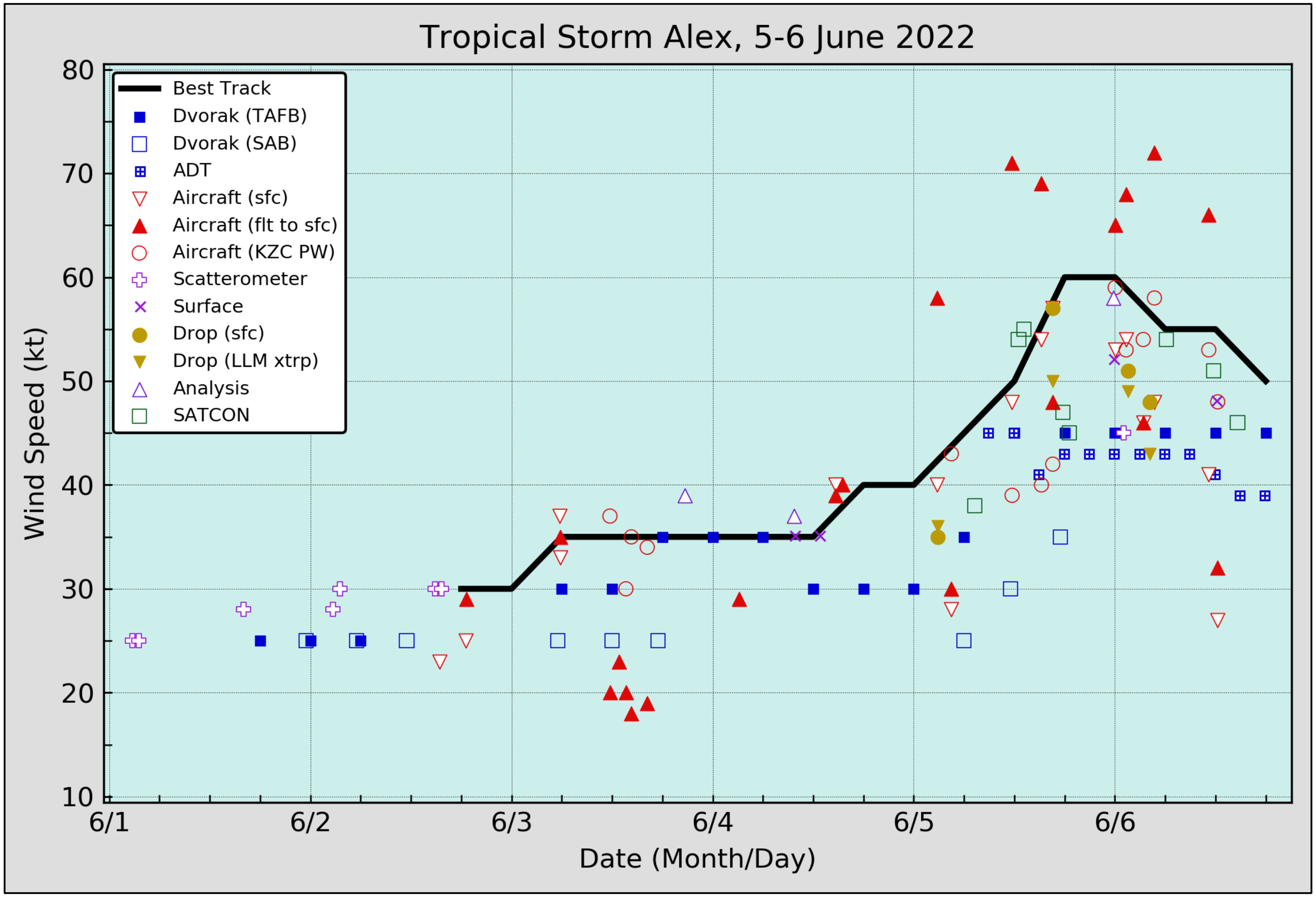

Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Tropical Storm Alex, 5–6 June 2022. Aircraft observations have been adjusted for elevation using 90%, 80%, and 80% adjustment factors for observations from 700 mb, 850 mb, and 1500 ft, respectively. Dropwindsonde observations include actual 10 m winds (sfc), as well as surface estimates derived from the mean wind over the lowest 150 m of the wind sounding (LLM). Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies. Dashed vertical lines correspond to 0000 UTC.

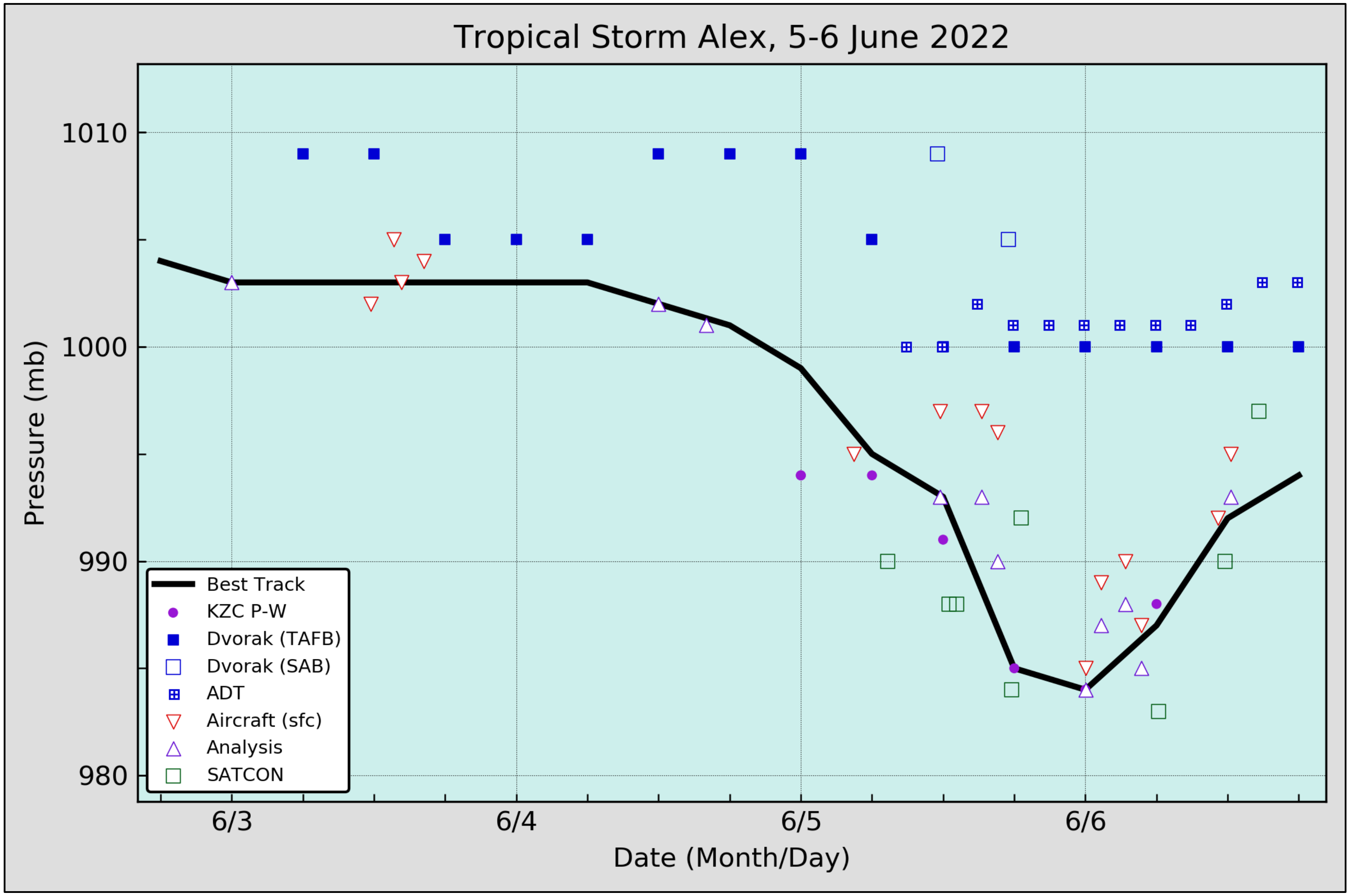

Figure 3. Selected pressure observations and best track minimum central pressure curve for Tropical Storm Alex, 5–6 June 2022. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for Meteorological 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.

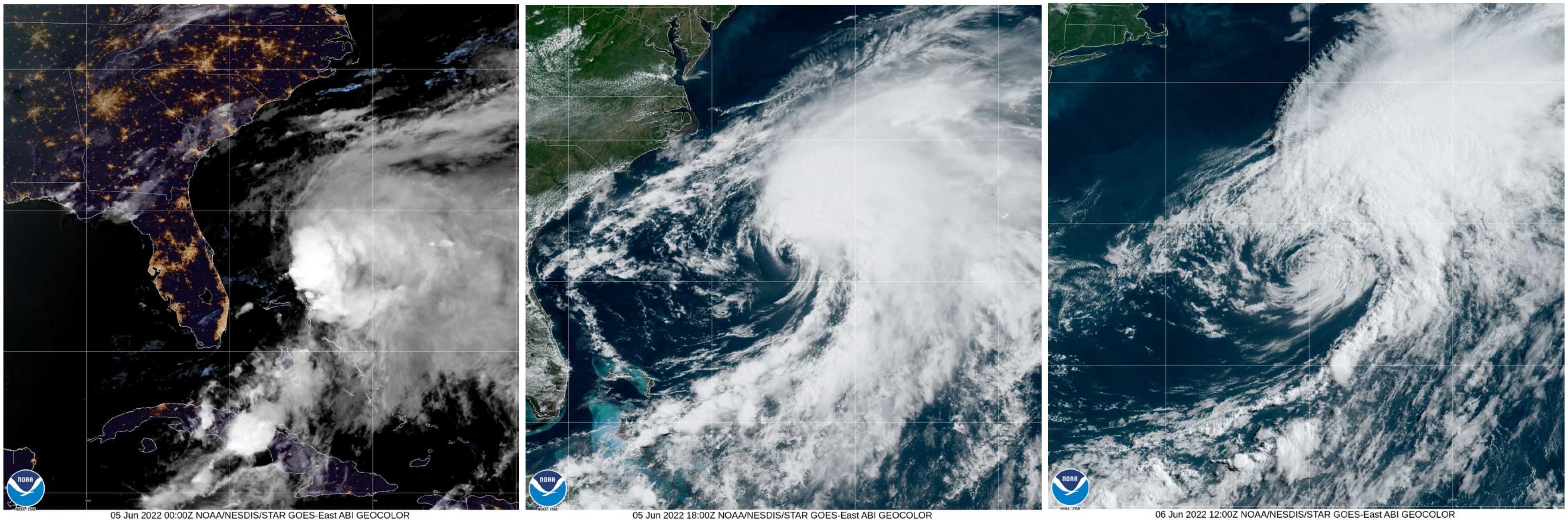

Figure 4. GOES-16 Geocolor satellite images of Alex when it became a tropical storm at 0000 UTC 5 June (left), reached its estimated peak intensity at 1800 UTC 5 June (middle), and became a post-tropical cyclone at 1200 UTC 6 June (right).

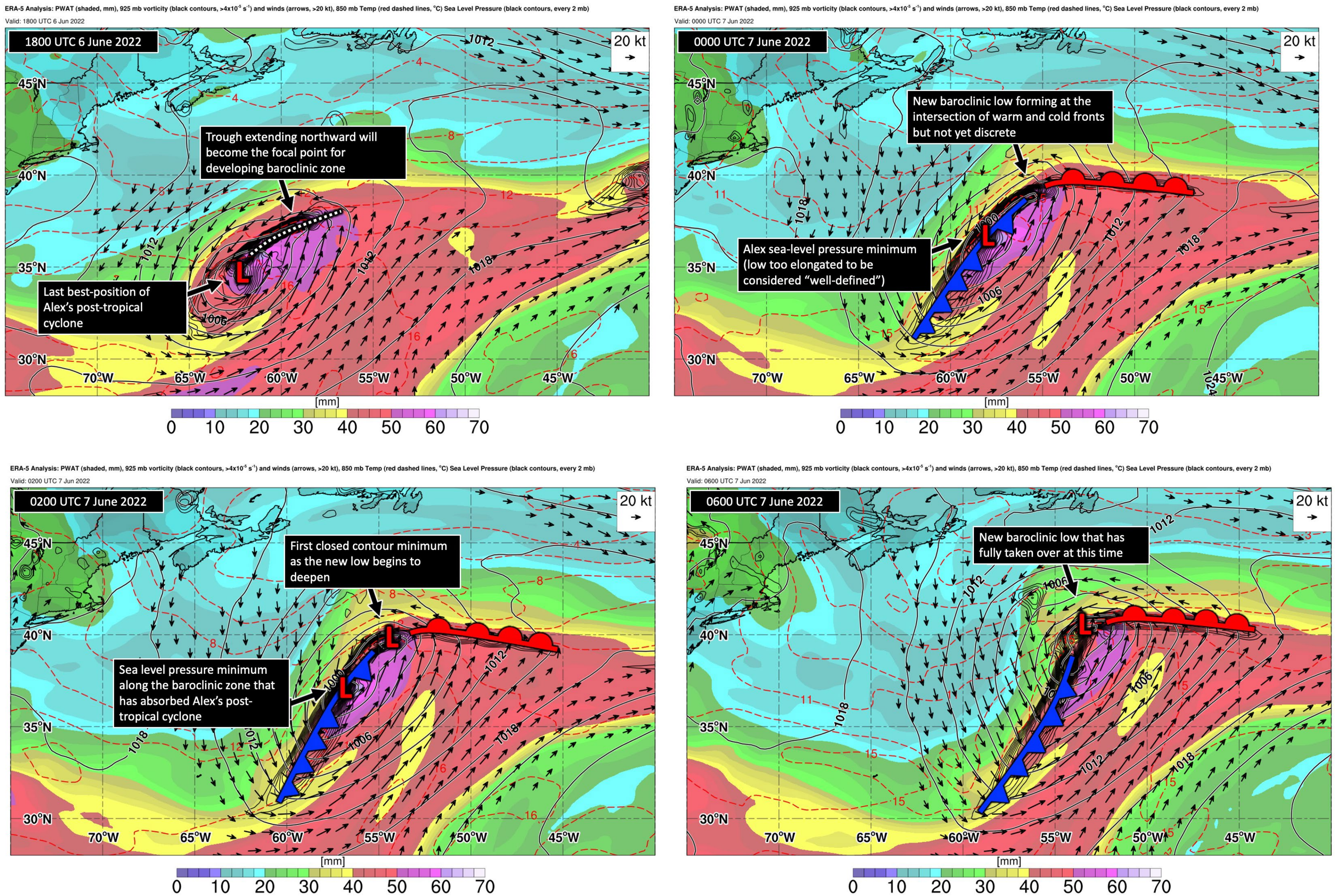

Figure 5. ERA-5 Analysis of precipitable water (shaded, mm), 925 mb vorticity (black contours), 850 mb temperature (dashed red lines, degrees C), and sea level pressure (black contours, every 2 mb) from 1800 UTC 6 June (upper left) through 0600 UTC 7 June (lower right) during the period Alex post-tropical cyclone was absorbed by a baroclinic zone and a new extratropical low formed.

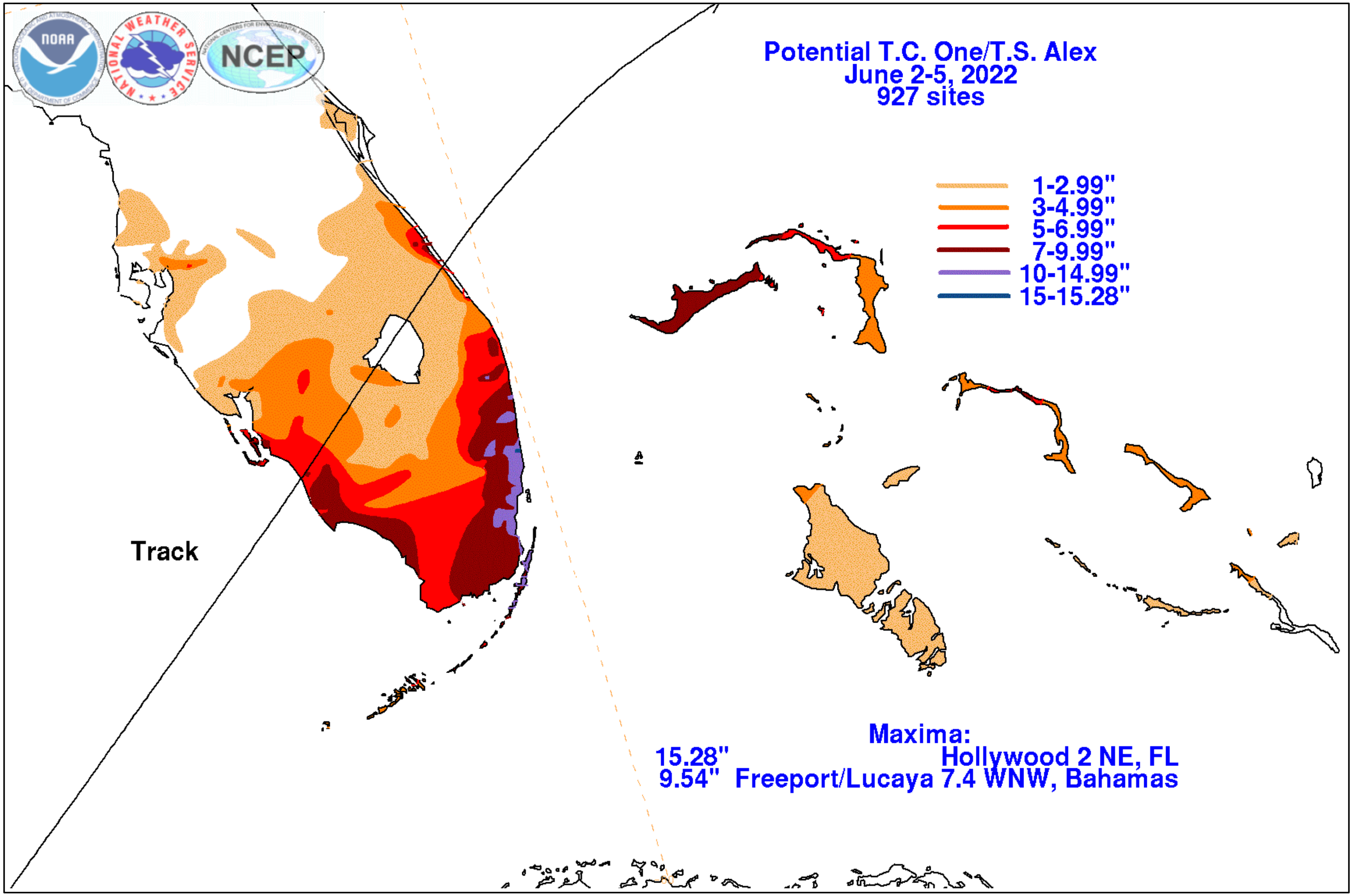

Figure 6. Total rainfall (inches) in South Florida and the Bahamas associated with the disturbance that became Tropical Storm Alex after moving east of the Florida peninsula. Image courtesy of David Roth of the NOAA Weather Prediction Center.

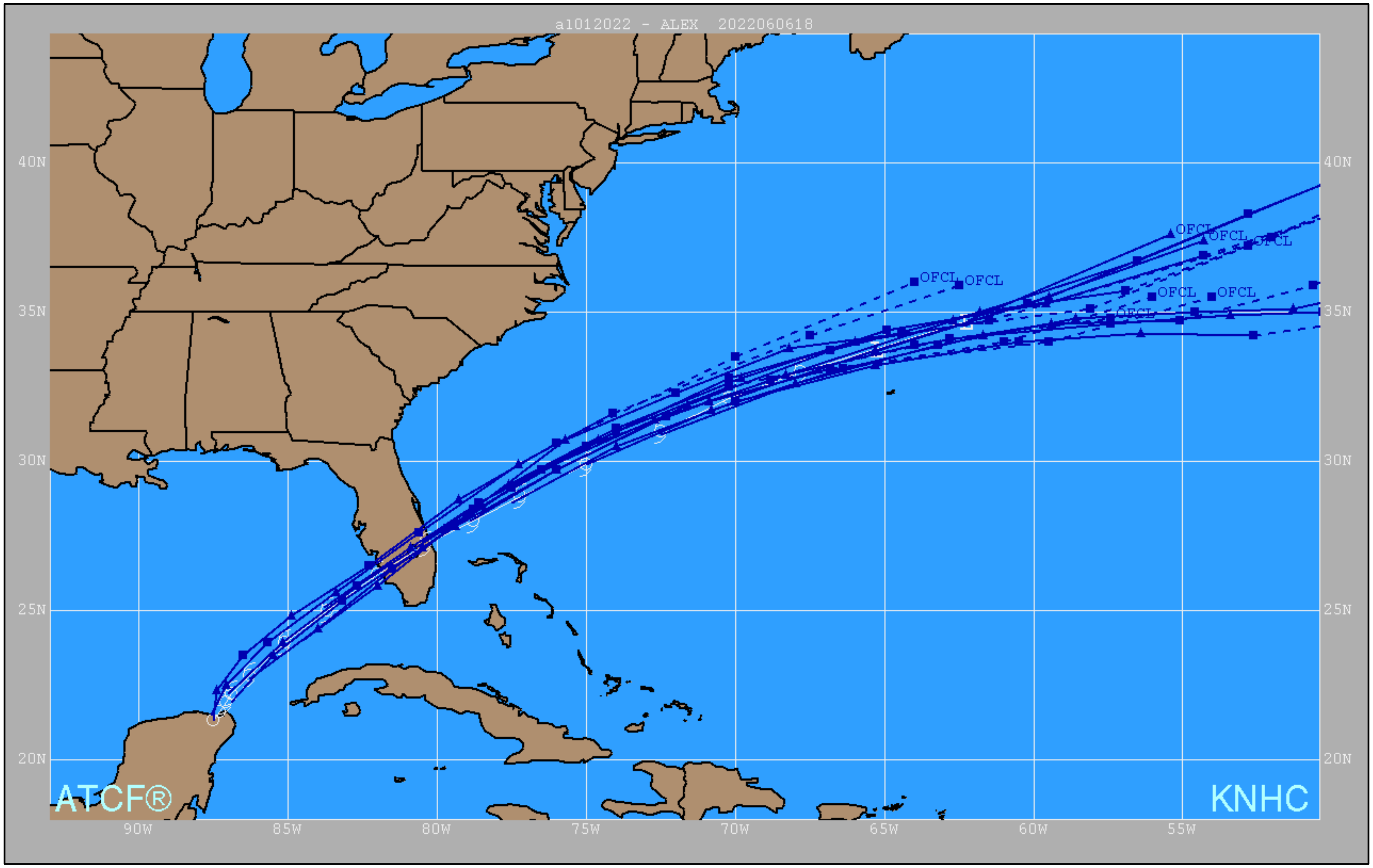

Figure 7. NHC official forecasts (dark blue lines) for Tropical Storm Alex and its incipient disturbance (Potential Tropical Cyclone One). The cyclone's actual track is denoted by the white symbols plotted at 6-h intervals.