NATIONAL HURRICANE CENTER TROPICAL CYCLONE REPORT

HURRICANE TEDDY

(AL202020)

12–23 September 2020

Eric S. Blake
National Hurricane Center
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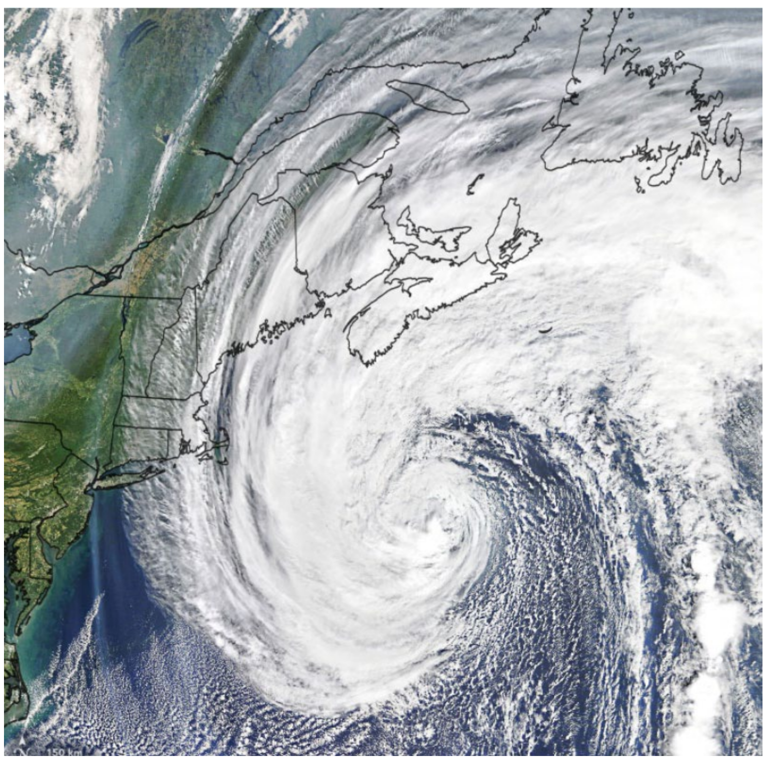

NASA TERRA MODIS VISIBLE SATELLITE IMAGE OF HURRICANE TEDDY AT 1520 UTC 22 SEPTEMBER 2020.

Teddy was a classic, long-lived Cape Verde category 4 hurricane on the Saffir-Simpson Hurricane Wind Scale. It passed northeast of the Leeward Islands and became extremely large over the central Atlantic, eventually making landfall in Nova Scotia as a 55-kt extratropical cyclone. There were 3 direct deaths in the United States due to rip currents.

Hurricane Teddy

12–23 SEPTEMBER 2020

SYNOPTIC HISTORY

Teddy originated from a strong tropical wave that moved off the west coast of Africa on 10 September, accompanied by a large area of deep convection. The wave was experiencing moderate northeasterly shear, but a broad area of low pressure and banding features still formed on 11 September a few hundred n mi southwest of the Cabo Verde Islands. Convection decreased late that day, as typically happens in the evening diurnal minimum period, but increased early on 12 September. This convection led to the development of a well-defined surface center, confirmed by scatterometer data, and the formation of a tropical depression near 0600 UTC 12 September about 500 n mi southwest of the Cabo Verde Islands. The "best track" chart of the tropical cyclone's path is given in Fig. 1, with the wind and pressure histories shown in Figs. 2 and 3, respectively. The best track positions and intensities are listed in Table 1.[1]

After the depression formed, further development was slow during the next couple of days due to a combination of northeasterly shear, dry air in the mid-levels and the large size and radius of maximum winds of the system. The depression became a tropical storm near 0000 UTC 14 September while it continued to move quickly toward the west and west-northwest around a strong subtropical ridge in the central Atlantic. Gradual strengthening occurred for the next couple of days as Teddy moved over warmer waters in the tropical Atlantic and northeasterly shear decreased, although a somewhat dry mid-level environment persisted. The first rapid intensification (RI) episode of the tropical cyclone's life cycle started late on 15 September. During this time, an eye formed on microwave images, and Teddy becoming a hurricane near 0000 UTC 16 September about 700 n mi east-northeast of Barbados. This strengthening coincided with the system turning northwestward due to the orientation of the ridge, and this general track would continue for the next several days, taking Teddy away from the Lesser Antilles.

Teddy's intensity levelled off by midday on 16 September at about 85 kt, with a slight increase in westerly shear noted. However, the shear caused only a temporary pause in the overall intensification trend, and the hurricane started another RI period by early the next day. Satellite and reconnaissance data showed that the eye became better defined during this time, and Teddy strengthened into a major hurricane near 1200 UTC 17 September while centered about 500 n mi east-northeast of Guadeloupe. Teddy reached its peak intensity of 120 kt near 0000 UTC on 18 September then began to gradually weaken, first due to an eyewall replacement cycle, and later due to an increase in southwesterly shear the next day. The cyclone dropped below major hurricane status by 0000 UTC 20 September and continued to steadily weaken that day, although the system's 50-kt and hurricane-force wind fields remained large.

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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.

The hurricane was centered a few hundred n mi southeast of Bermuda on 20 September when some notable changes occurred to the synoptic environment. First, a mid- to upper-level trough dropping out of the northwestern Atlantic eroded the western side of the central Atlantic ridge, causing Teddy to turn northward and north-northeastward on 21 September. Teddy passed about 200 n mi east of Bermuda on that day with tropical-storm-force winds observed on the island. The weakening trend stopped late on 21 September due to a favorable interaction with a negatively tilted trough, which caused an increase in both the maximum wind speed and size of the hurricane. Teddy moved rapidly northward and then north-northwestward due to the flow around the trough, and became a very large cyclone. Figure 4 shows the increase in the extent of tropical-storm-force winds from 0000 UTC 22 September to 1200 UTC that day, more than doubling in size in only 12 h, as confirmed by both aircraft reconnaissance and scatterometer wind data. Teddy also reached a secondary peak intensity of 90 kt between 0600 and 1200 UTC that day, with a shallow eye noted.

This trough interaction also started the extratropical transition process, with Teddy's wind field becoming more asymmetric, frontal features forming away from the center and the associated convection become less centralized (cover). Teddy moved across cooler water and lost deep convection in the core, causing the cyclone to quickly weaken and transition to an extratropical low just after 0000 UTC 23 September, when it was centered about 160 n mi south of Halifax, Canada. The low turned northward and north-northeastward and moved onshore of the coast of Nova Scotia near Ecum Secum at 1200 UTC that day, with sustained winds of 55 kt estimated from a timely scatterometer pass. The extratropical storm continued to weaken while it moved across eastern Nova Scotia and the Gulf of St. Lawrence, and was absorbed by a larger non-tropical low just after 0600 UTC 24 September near eastern Labrador.

METEOROLOGICAL STATISTICS

Observations in Hurricane Teddy (Figs. 2 and 3) include subjective satellite-based Dvorak technique intensity estimates from the Tropical Analysis and Forecast Branch (TAFB) and the Satellite Analysis Branch (SAB), and objective Advanced Dvorak Technique (ADT) estimates and Satellite Consensus (SATCON) estimates from the Cooperative Institute for Meteorological Satellite Studies/University of Wisconsin-Madison. Data and imagery from NOAA polar-orbiting satellites including the Advanced Microwave Sounding Unit (AMSU), the NASA Global Precipitation Mission (GPM), the European Space Agency's Advanced Scatterometer (ASCAT), and Defense Meteorological Satellite Program (DMSP) satellites, among others, were also useful in constructing the best track of Teddy. Aircraft observations include flight-level, stepped frequency microwave radiometer (SFMR), and dropsonde observations from eight flights of the 53rd Weather Reconnaissance Squadron of the U.S. Air Force Reserve (USAFR) and four missions from the NOAA Hurricane Hunters of the NOAA Aircraft Operations Center (AOC). In addition, the NOAA AOC G-IV aircraft flew a combination of four synoptic surveillance and research flights around Teddy, collecting valuable data on the surrounding steering currents and other environmental conditions.

Ship reports and Canadian buoy reports of winds of tropical storm force associated with Teddy are given in Table 2, and selected surface observations from land stations and other buoys are given in Table 3.

Winds and Pressure

Teddy's estimated peak intensity of 120 kt is based on a blend of data from USAFR Hurricane Hunter aircraft around 2100 UTC 17 September and NOAA Hurricane Hunter data around 2300 UTC that day. The USAFR aircraft measured a peak SFMR surface wind of 124 kt and peak 700-mb flight-level winds of 130 kt, which adjusts to 117 kt at the surface. Additionally, a Doppler radar velocity analysis (2-km resolution) from the NOAA P-3 aircraft (Fig. 5) noted a wind speed of 147 kt at an altitude of 0.5 km, which reduces to 115–120 kt at the surface.

The peak wind recorded in Canada during Teddy's extratropical landfall was a gust to 78 kt (time unknown) at Grand Etang, Nova Scotia. Tropical-storm-force winds were recorded on Bermuda by a few stations, and primarily in gusts over New Brunswick and Prince Edward Island.

The minimum pressure of 945 mb is based on dropsonde data at 2245 UTC 17 September that measured 946 mb and reported 9 kt of wind at the surface.

While sustained tropical-storm-force winds were recorded in the coastal waters near Cape Cod, Nantucket, and eastern Maine (Table 3), there are no observations that these winds impacted land areas in the United States.

Storm Surge[2]

Although not a result of storm surge itself, a combination of the spring tide (new moon) and Teddy's large swells caused elevated water levels along the east coast of the United States. The highest water levels measured by National Ocean Service (NOS) tide gauges were 2.77 ft Mean Higher High Water (MHHW) at Fernandina Beach, Florida, on 20 September at 1630 UTC and 2.74 ft MHHW at Duck, North Carolina, on 19 September at 1312 UTC. Minor-to-moderate coastal flooding occurred at many locations. However, major flooding was reported in the Charleston, South Carolina, area, and the NOS gauge there recorded a peak water level of 2.36 ft MHHW.

No specific storm surge values are available in Canada, but the surge appears to be less than 1 m (3.3 ft), and the most significant effects were due to large pounding surf, especially on the southern shores of Nova Scotia and Newfoundland. Similar water values were seen in

[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). **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).

Bermuda, mostly from the extremely large wind and wave field, with extremely dangerous surf noted by local officials.

Rainfall

The heaviest rainfall from Teddy was located in northeastern Nova Scotia, with the highest recorded total of 5.21 inches (132 mm) in Ingonish Beach, and a secondary maximum was noted in the central part of the province (Fig. 6). Outside of Nova Scotia, 1–3 inches (25–75 mm) of rain was noted in eastern New Brunswick, Prince Edward Island and across southeastern Newfoundland, as well as on Bermuda.

Tornadoes

There were no tornadoes reported with Teddy.

CASUALTY AND DAMAGE STATISTICS

There were three direct deaths[3] from Teddy in the United States, 2 in Puerto Rico and 1 in New Jersey. All of these were drownings due to rip currents from to the large wave field.

Teddy's enormous size caused strong wave action in many places in eastern North America. High water levels were noted in Charleston, South Carolina, with some areas of downtown flooded. The Outer Banks of North Carolina also recorded flooding as some roads were covered with sand and water due to the high waves and tides, with some sand dunes washed away. Damage was estimated at $20 million or less from AON insurance.

About 18,000 customers were without power in Atlantic Canada due to Teddy. Damage was mostly minor there, with some flooding reported at a local park on the Sackville River, and a small boat sunk in Herring Cove. No damage estimates are available, but many news reports suggested the damage was less than expected.

No serious damage was reported on Bermuda. About 220 homes lost electricity during the storm, with the most significant effects from sand and debris deposited on some of the roads on the southern side island due to extremely high surf.

[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.

FORECAST AND WARNING CRITIQUE

Genesis

The genesis of Teddy was very well forecast overall, but the 48-h outlooks were not as well timed as the 5-day outlooks (Table 4). The tropical wave that spawned Teddy was first included in the Tropical Weather Outlook 126 h before genesis occurred, with NHC giving the system a low (<40%) chance of 5-day tropical cyclone formation. The probability of genesis reached the medium category (40–60%) 114 h before genesis occurred and the high category (>60%) 90 h before the system formed. Regarding the 2-day genesis probabilities, a low chance of genesis was shown 84 h, a medium chance 66 h, and a high chance 18 h before Teddy formed, respectively, suggesting that the 2-day low-to-medium probabilities were raised a day earlier than ideally desired. It is possible that the proximity of this system to the wave that spawned Tropical Storm Vicky[4] enhanced the northeasterly shear over Teddy from 10–12 September and delayed Teddy's genesis.

Track

A verification of NHC official track forecasts for Teddy is given in Table 5a. Official forecast track errors were near the mean official errors for the previous 5-yr period through 36 h, then below the long-term mean through 120 h. A homogeneous comparison of the official track errors with selected guidance models is given in Table 5b. The consensus models TVCA/TVCX were excellent performers during Teddy, and beat most of the other guidance. Interestingly, the corrected-consensus FSSE (Florida State Superensemble) did not verify well and was beaten by several of the single-model deterministic aids. The ECMWF (EMXI) also verified poorly for Teddy at long range, with the majority of the other guidance having superior skill.

Intensity

A verification of NHC official intensity forecasts for Teddy is given in Table 6a. Official forecast intensity errors were above the mean official errors for the previous 5-yr period through 24 h, then below or well below the mean through 120 h. A homogeneous comparison of the official intensity errors with selected guidance models is given in Table 6b. The official forecast generally verified better than the guidance at longer ranges compared to short lead times, which is the opposite of what usually happens. The NOAA Corrected-consensus model HCCA was the best overall performer, and the HWRF model (HWFI) was the best single-model aid. Notably, the statistical-dynamical models LGEM and DSHP had lagging performances during Teddy.

It is instructive to look at intensity forecasts and guidance near the start of the RI episodes of Teddy. The first RI period (Fig. 7, 0600 UTC 15 September) was well forecast by both the NHC and the models, with the longer-term guidance also showing steady-to-rapid intensification for about 3 days. However, this trend did not continue in the models (Fig. 8, 0000 UTC 17

[4] Pasch, Richard J. "Tropical Cyclone Report: Tropical Storm Vicky." National Oceanic and Atmospheric Administration / National Weather Service / National Hurricane Center, 5 Mar. 2021, https://www.nhc.noaa.gov/data/tcr/AL212020_Vicky.pdf

September), and the second RI episode was essentially missed by the guidance (save the ECMWF model, which historically has no skill in this type of forecast).

Wind Watches and Warnings

Coastal tropical storm watches and warnings associated with Teddy are listed in Table 7. Tropical storm watches and warnings were used to communicate the wind hazard in Canada even though Teddy was forecast to become extratropical.

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

NHC began communication with emergency managers on 18 September, when Teddy was northeast of the Lesser Antilles, and continued through 22 September. Briefings included federal video-teleconferences with FEMA Headquarters along with regular NWS conference calls. These decision support briefings were coordinated through the FEMA Hurricane Liaison Team, embedded at the NHC.

In addition, the NHC Hurricane Specialists conducted regular coordination calls with the Bermuda Weather Service starting around 16 September and commencing a few days later with the Canadian Hurricane Centre through late on 23 September. Advisories on Teddy were continued for about a day after the system became post-tropical near Canada to provide support for the continuation of Canadian Hurricane Centre's tropical storm warnings through the transition process. In terms of social media, dozens of Facebook posts were made, and the NHC Atlantic Twitter account had roughly 5 million impressions related to Teddy.

ACKNOWLEDGMENTS

Most of the data in Table 3 were compiled from the Canadian Hurricane Centre and the Bermuda Weather Service. Tiffany O'Connor of FEMA contributed most of the IDSS section and John Cangialosi of NHC created the GIS track map. Sim Aberson of HRD provided the analysis of radar data near the peak intensity of Teddy.

Table 1. Best track for Hurricane Teddy, 12–23 September 2020.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
12 / 0600	11.0	31.4	1007	25	tropical depression
12 / 1200	11.2	32.4	1006	30	"
12 / 1800	11.4	33.3	1005	30	"
13 / 0000	11.6	34.2	1005	30	"
13 / 0600	11.9	35.1	1005	30	"
13 / 1200	12.2	36.2	1006	30	"
13 / 1800	12.6	37.4	1006	30	"
14 / 0000	12.9	38.7	1004	35	tropical storm
14 / 0600	12.9	40.4	1004	35	"
14 / 1200	12.9	42.1	1004	35	"
14 / 1800	12.9	43.4	1003	40	"
15 / 0000	13.0	44.5	1002	45	"
15 / 0600	13.4	45.5	1001	50	"
15 / 1200	13.8	46.6	999	55	"
15 / 1800	14.2	47.4	997	55	"
16 / 0000	14.7	48.0	987	65	hurricane
16 / 0600	15.4	48.6	978	80	"
16 / 1200	16.1	49.3	972	85	"
16 / 1800	16.8	50.2	972	85	"
17 / 0000	17.4	51.1	970	85	"
17 / 0600	18.1	52.0	966	90	"
17 / 1200	18.9	52.8	960	100	"
17 / 1800	19.7	53.7	948	115	"
18 / 0000	20.4	54.4	945	120	"
18 / 0600	21.1	55.1	946	115	"
18 / 1200	21.7	55.8	947	110	"
18 / 1800	22.5	56.5	949	105	"
19 / 0000	23.5	57.2	945	105	"
19 / 0600	24.4	57.9	947	100	"
19 / 1200	25.4	58.7	950	100	"

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
19 / 1800	26.2	59.7	953	100	"
20 / 0000	26.9	60.8	956	95	"
20 / 0600	27.5	61.9	958	90	"
20 / 1200	28.0	62.6	963	85	"
20 / 1800	28.5	63.3	964	80	"
21 / 0000	29.0	63.7	963	80	"
21 / 0600	29.7	63.5	962	80	"
21 / 1200	30.5	62.9	960	80	"
21 / 1800	32.2	61.8	958	80	"
22 / 0000	34.6	61.4	956	85	"
22 / 0600	37.6	62.1	952	90	"
22 / 1200	39.1	63.5	949	90	"
22 / 1800	40.3	64.2	952	80	"
23 / 0000	41.8	64.2	954	65	"
23 / 0600	43.2	63.3	957	60	extratropical
23 / 1200	45.0	62.1	964	55	"
23 / 1800	47.4	60.4	974	50	"
24 / 0000	49.7	58.2	975	45	"
24 / 0600	52.8	55.8	977	40	"
24 / 1200					dissipated
18 / 0000	20.4	54.4	945	120	maximum wind and minimum pressure
23 / 1200	45.0	62.1	964	55	landfall near Ecum Secum, Nova Scotia (extratropical)

Table 2. Selected ship and buoy reports (non-U.S.) with winds of at least 34 kt for Hurricane Teddy, 12–23 September 2020.

Date/Time (UTC)	Ship call sign	Latitude (°N)	Longitude (°W)	Wind dir/speed (kt)	Pressure (mb)
21 / 0000	CQIV4	33.1	68.8	030 / 40	1013.0
21 / 0400	CQIV4	33.7	69.2	020 / 42	1015.0
21 / 1600	V7A207	34.2	69.2	010 / 38	1013.8
21 / 1800	V7A207	33.9	68.9	360 / 37	1011.1
22 / 1500	44150	42.5	64.0	080 / 47	993.5
22 / 1700	44139	44.2	57.1	130 / 35	1010.1
23 / 0004	44034	44.1	68.1	010 / 35	1003.9
23 / 0200	44150	42.5	64.0	110 / 39	963.7
23 / 0300	44137	42.3	62.0	200 / 45	981.0
23 / 0400	44137	42.3	62.0	200 / 43	980.0

Table 3. Selected surface observations for Hurricane Teddy, 12–23 September 2020. The observations span both the tropical and extratropical stages of Teddy.

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)				
Bermuda									
Bermuda Weather Service Office (32.37N 64.68W)	21/2007	993.6							
L.F. Wade Intl. AP AWOS (32.36N 64.67W)	21/2010	993.8	21/1405	30 (2 min, 8 m)	37				
L.F. Wade Intl. AP Heliport (32.36N 64.67W)			22/0554	34 (1 min, 12 m)	46				
Pearl Island AWOS (32.37N 64.70W)		993.7	21/1617	40 (1 min, 8 m)	45				
The Crescent (32.41N 64.82W)			22/0633	35 (10 min, 6 m)	42	2.92			1.42
Marine Ops Centre MAROPS (32.38N 64.68W)	21/2010	996.0	22/0559	42 (10 min, 88 m)	48				
Canada									
Nova Scotia									
Grand Etang					78				
Eskasoni First Nation					64				
Cheticamp					59				
Hart Island					59				
Beaver Island					55				
Brier Island					51				
Sable Island Airport					51				
Baccaro Pt					47				
Louisbourg					47				
Sydney Airport					50				
Yarmouth Airport					44				
Port Hawkesbury					45				
Lunenburg					42				
Caribou Point					40				
Parrsboro					39				
Osborne Head					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)				
Shearwater Jetty					38				
Spanish Ship Bay (INOVASCO39) (45.03N 62.03W)	23/1205	966.3	23/1029	32	35				
Ecowitt (INEWHA6) (45.21N 61.49W)	23/1254	968.5	23/1229	34	43				
Ingonish Beach									5.21
Aspy Bay									4.79
South Harbour									4.73
Bedford Range									4.34
Hammonds Plains									4.29
New Brunswick									
Moncton Intl Airport					44				1.57
Saint John Airport					42				
Miscou Island					40				1.29
Crowe Brook					38				
Bouctouche					35				1.30
Mechanic Settlement					35				2.26
Grand Manan					32				
Prince Edward Island									
North Cape					44				
East Point					40				
Summerside					41				2.65
Charlottetown Airport					39				2.19
Harrington					37				2.67
St. Peter					32				2.11
Stanhope					32				2.16
Offshore buoys/ CMANS									
NE St. Martin (41044) (21.58N 58.63W)	18/1910	1001.8	18/1113	39 (4 m, 1 min)	43				
S Bermuda (41049) (27.49N 62.94W)	20/1150	976.7[i]	20/0633	51 (4 m, 1 min)	60				
Nantucket (44008) (40.50N 69.25W)	22/2210	1004.3	22/1644	39 (4 m, 1 min)	49				

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)				
Nantucket Sound (44020) (41.49N 70.28W)			22/1750	33 (4 m, 1 min)	39				
Cape Cod (44018) (42.21N 70.14W)	23/0150	1004.0	22/1834	31 (5 m, 1 min)	35				
Mt. Desert Rock ME (MDRM1) (43.97N 68.13W)	23/0500	998.5	23/0020	46 (23 m, 10 min)	54				
Portland (44007) (43.53N 70.14W)	23/0650	1002.7	23/0407	25 (5 m, 1 min)	31				
Jonesport ME (44027) (44.28N 67.30W)	23/0650	995.1	22/2048	39 (1 m, 1 min)	47				

[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.

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%)	84	126
Medium (40%-60%)	66	114
High (>60%)	18	90

Table 5a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Teddy. 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	28.5	41.5	50.2	**56.4**	**68.2**	**81.5**	**103.3**	**128.4**
OCD5	53.3	107.7	142.3	161.0	169.2	185.6	229.8	234.2
Forecasts	40	38	36	34	32	30	26	22
OFCL (2015-19)	24.1	36.9	49.6	65.1	80.7	96.3	133.2	171.6
OCD5 (2015-19)	44.7	96.1	156.3	217.4	273.9	330.3	431.5	511.9

Table 5b. Homogeneous comparison of selected track forecast guidance models (in n mi) for Teddy. Errors smaller than the NHC official forecast are shown in boldface type. The number of official forecasts shown here will generally be smaller than that shown in Table 5a due to the homogeneity requirement.

Model ID	Forecast Period (h)							
	12	24	36	48	60	72	96	120
OFCL	26.6	34.8	40.3	45.9	61.5	76.9	96.7	115.8
OCD5	54.5	111.4	147.4	170.0	186.3	214.0	277.1	296.0
HMNI	**25.9**	39.6	47.1	58.6	72.6	91.4	97.9	161.6
HWFI	**25.6**	39.3	50.8	63.9	72.2	86.6	107.7	158.7
GFSI	**24.6**	36.3	43.7	53.7	**58.4**	**67.2**	**71.9**	135.5
EMXI	**24.9**	**33.5**	**38.4**	50.0	69.8	92.3	154.9	175.1
EGRI	**24.8**	36.0	43.3	49.1	63.8	77.4	115.1	182.5
CMCI	26.9	39.2	46.7	51.4	65.3	**76.0**	**93.4**	129.3
NVGI	28.1	37.5	52.1	68.0	78.1	87.9	114.9	187.1
CTCI	**23.8**	**33.7**	44.8	59.4	73.9	92.3	109.6	143.1
AEMI	**25.6**	39.4	49.5	58.6	64.9	**74.4**	**91.5**	**108.9**
HCCA	**22.4**	**30.7**	**37.2**	47.6	67.0	90.1	131.8	144.0
FSSE	**24.8**	35.1	43.6	58.3	85.1	115.8	162.7	189.8
TVCX	**23.1**	**32.1**	**37.1**	**44.1**	**52.4**	**67.2**	**93.8**	**112.0**
TVCA	**23.0**	**31.9**	**37.9**	**43.8**	**52.6**	**66.5**	**87.5**	**114.4**
TVDG	**23.4**	**31.9**	**36.8**	**43.0**	**52.0**	**65.9**	**90.7**	119.2
GFEX	**23.8**	**32.4**	**37.7**	**44.4**	**55.0**	**70.5**	102.9	**111.3**
TABS	43.2	74.5	99.5	116.6	129.5	147.2	187.0	266.6
TABM	35.0	46.5	60.6	70.2	81.8	98.2	108.3	149.6
TABD	38.3	61.2	89.0	119.5	157.2	185.0	157.4	182.9
Forecasts	33	31	29	27	25	23	19	15

Table 6a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Teddy. Mean errors for the previous 5-yr period are shown for comparison. Official errors that are smaller than the 5-yr means are shown in boldface type.

	Forecast Period (h)							
	12	24	36	48	60	72	96	120
OFCL	7.2	9.3	**8.1**	**10.0**	**9.8**	**8.0**	**8.3**	**10.5**
OCD5	9.0	12.1	13.6	15.8	17.5	20.2	22.6	21.6
Forecasts	40	38	36	34	32	30	26	22
OFCL (2015-19)	5.2	7.7	9.4	10.7	11.9	13.0	14.4	15.5
OCD5 (2015-19)	6.8	10.8	14.1	17.0	18.8	20.6	22.5	24.6

Table 6b. Homogeneous comparison of selected intensity forecast guidance models (in kt) for Teddy. Errors smaller than the NHC official forecast are shown in boldface type. The number of official forecasts shown here will generally be smaller than that shown in Table 6a due to the homogeneity requirement.

Model ID	Forecast Period (h)							
	12	24	36	48	60	72	96	120
OFCL	8.2	10.3	7.9	9.3	10.0	8.5	8.6	6.3
OCD5	10.0	13.7	14.5	16.2	17.0	18.6	17.2	11.3
HMNI	**8.0**	**9.7**	9.6	10.2	11.0	11.6	13.0	13.1
HWFI	**7.1**	**9.1**	8.9	**7.0**	**8.1**	**7.8**	**7.1**	**5.9**
CTCI	**7.3**	**8.7**	9.3	**8.3**	11.3	15.2	14.7	14.9
DSHP	9.3	12.3	12.2	13.9	15.0	15.3	14.3	7.7
LGEM	9.0	12.2	12.0	13.3	14.4	16.1	15.9	8.1
GFSI	10.0	13.1	14.7	15.2	15.4	14.6	10.2	8.0
EMXI	9.2	12.9	12.7	14.1	13.6	10.9	10.2	11.7
FSSE	**8.1**	**9.0**	**7.6**	**6.9**	**7.2**	9.5	11.5	8.0
HCCA	**7.9**	**9.7**	**7.5**	**6.4**	**6.1**	**6.7**	**6.6**	**4.4**
IVCN	**7.8**	**9.6**	8.9	**8.5**	**9.1**	10.7	9.6	**5.1**
IVDR	**7.8**	**9.3**	8.9	**8.1**	**8.6**	10.1	9.5	**6.0**
Forecasts	33	31	29	27	25	23	18	15

Table 7. Tropical storm watch/warning summary for Hurricane Teddy, 12–23 September 2020.

Date/Time (UTC)	Action	Location
18 / 2100	Tropical Storm Watch issued	Bermuda
19 / 0900	Tropical Storm Watch changed to Tropical Storm Warning	Bermuda
20 / 2100	Tropical Storm Watch issued	Lower East Pubnico to Canso Canada
21 / 0600	Tropical Storm Watch modified to	Lower East Pubnico to Main-a-Dieu
21 / 1800	Tropical Storm Watch discontinued	Lower East Pubnico to Main-a-Dieu
21 / 1800	Tropical Storm Watch issued	Meat Cove to Tidnish
21 / 1800	Tropical Storm Watch issued	Digby to Fort Lawrence
21 / 1800	Tropical Storm Watch issued	Magdalen Islands
21 / 1800	Tropical Storm Watch issued	Prince Edward Island
21 / 1800	Tropical Storm Watch issued	Port aux Basques to Francois
21 / 1800	Tropical Storm Warning issued	Digby to Meat Cove
21 / 2100	Tropical Storm Warning discontinued	Bermuda
22 / 2100	Tropical Storm Watch changed to Tropical Storm Warning	Port aux Basques to Francois
23 / 1500	Tropical Storm Watch modified to	Meat Cove to Brule
23 / 1500	Tropical Storm Watch discontinued	Digby to Fort Lawrence
23 / 1500	Tropical Storm Warning modified to	Ecum Secum to Meat Cove
23 / 1800	Tropical Storm Watch discontinued	All
23 / 1800	Tropical Storm Warning discontinued	Ecum Secum to Meat Cove
24 / 0000	Tropical Storm Warning discontinued	All

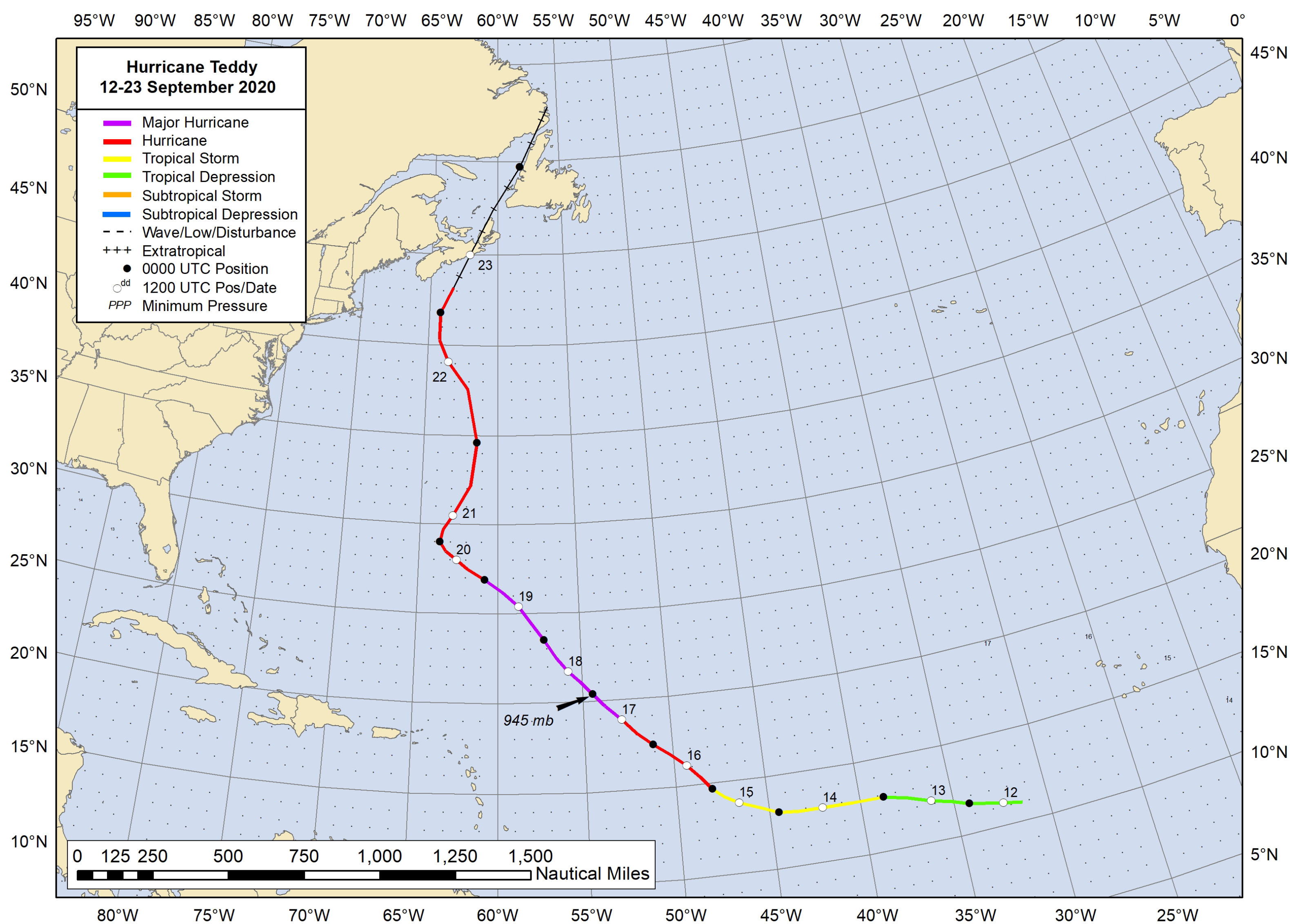

Figure 1. Best track positions for Hurricane Teddy, 12–23 September 2020.

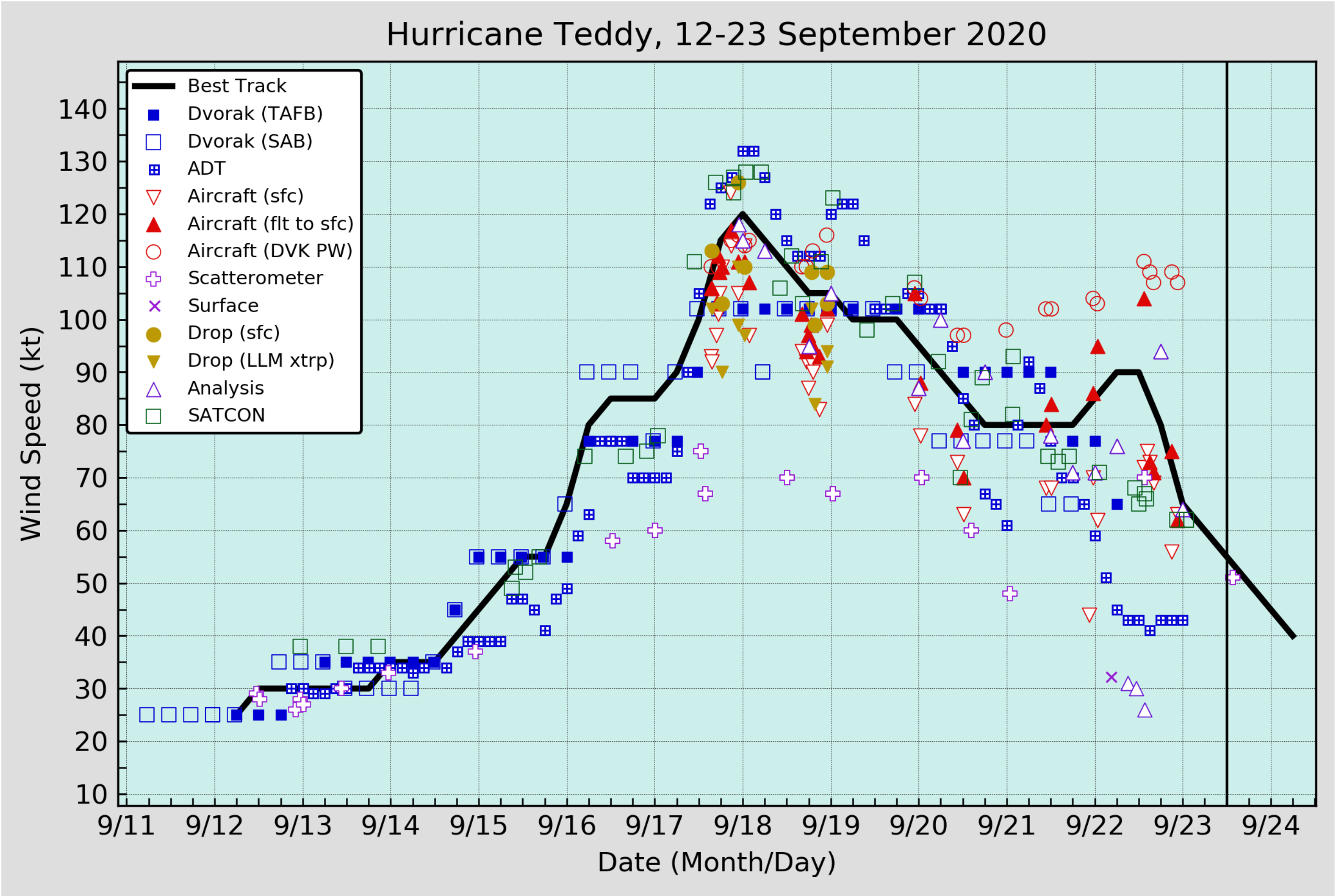

Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Hurricane Teddy, 12–23 September 2020. Aircraft observations have been adjusted for elevation using 90% and 80% adjustment factors for observations from 700 mb and 850 mb, respectively. Dropsonde observations 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 and the solid vertical line corresponds to landfall.

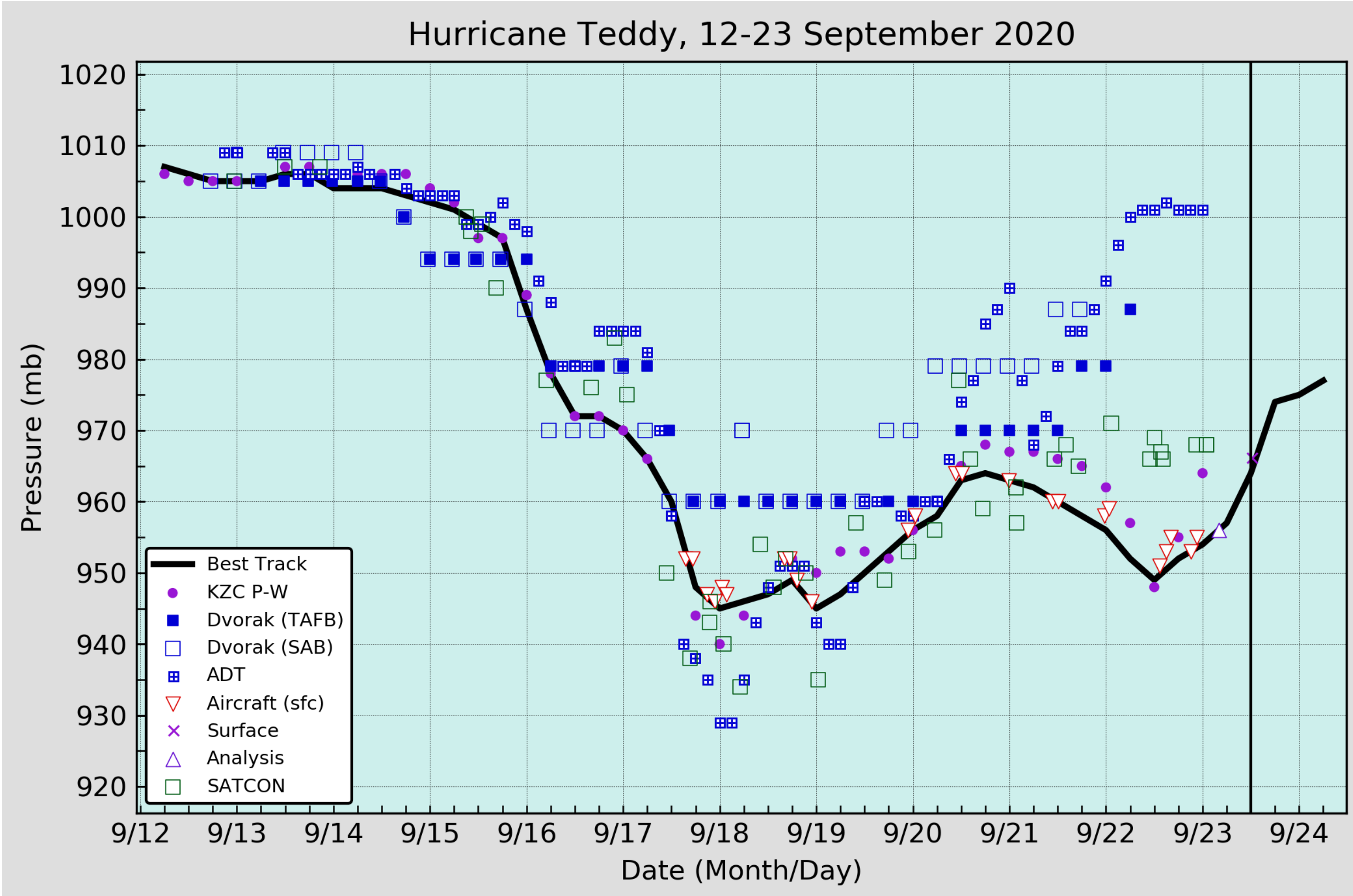

Figure 3. Selected pressure observations and best track minimum central pressure curve for Hurricane Teddy, 12–23 September 2020. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies. KZC P-W refers to pressure estimates derived using the Knaff-Zehr-Courtney pressure-wind relationship. Dashed vertical lines correspond to 0000 UTC and the solid vertical lines corresponds to landfall.

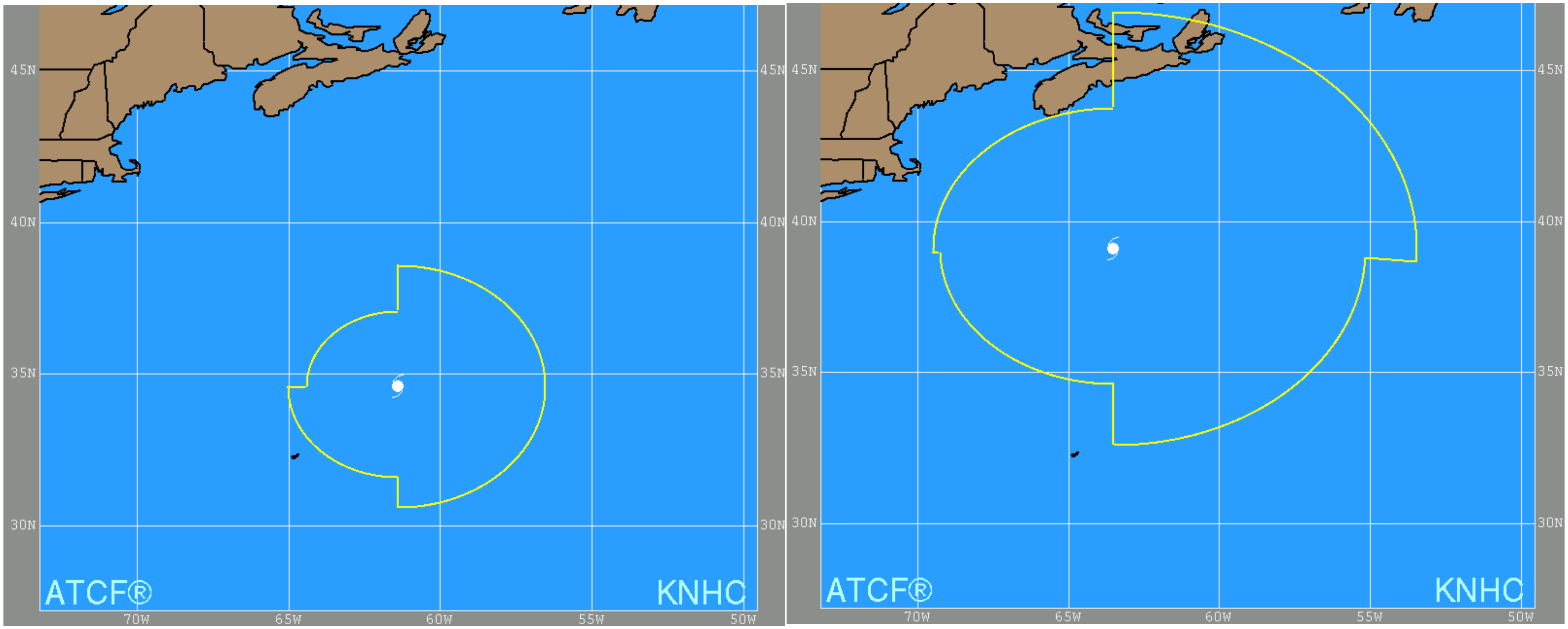

Figure 4. Teddy's best-track 34-kt wind radii (yellow) at 0000 UTC 22 September (left) and only 12 hours later at 1200 UTC 22 September (right), showing an expansion of the 34-kt wind field due to a trough interaction.

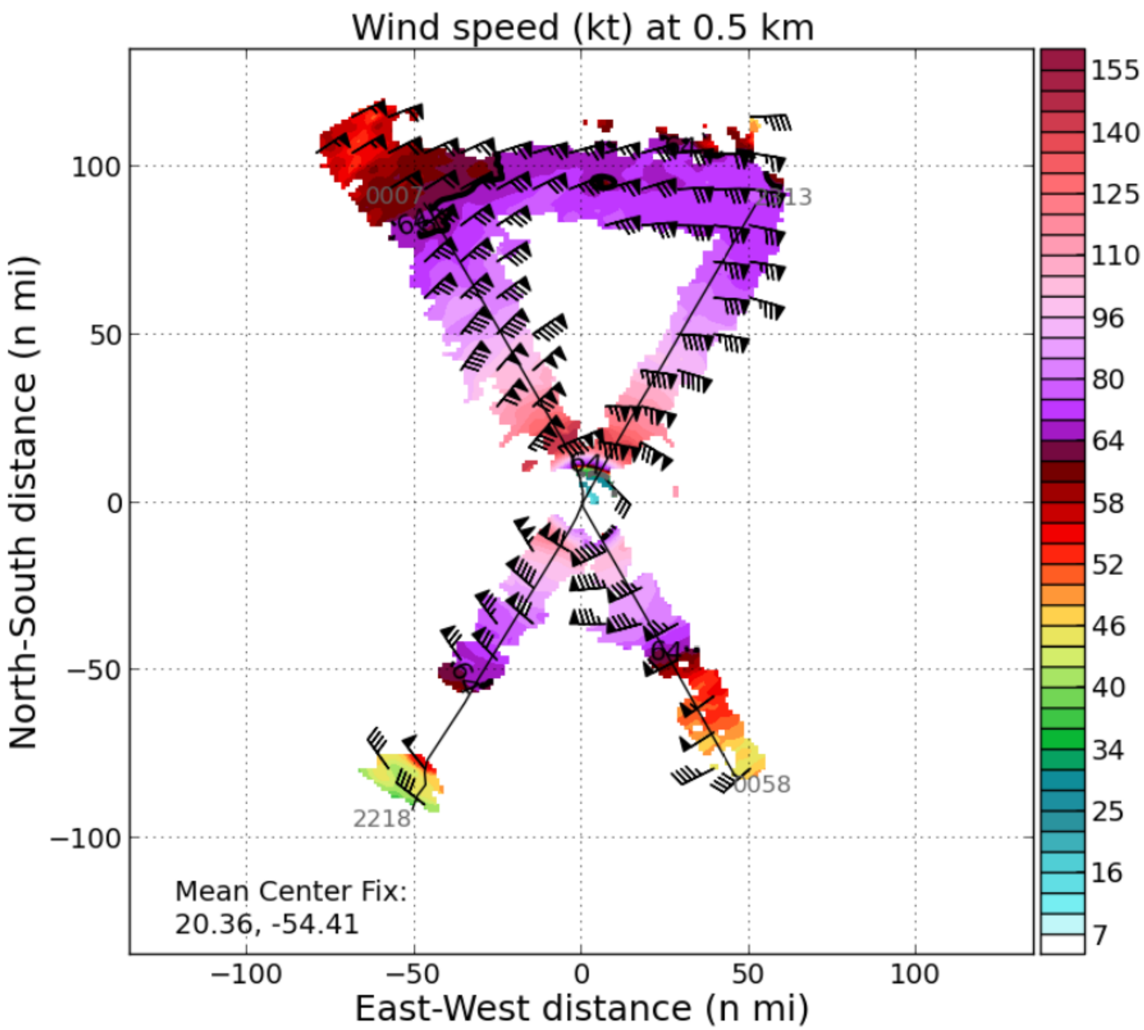

Figure 5. A radar analysis of Teddy's wind field (kt) at 0.5 km near 0000 UTC 18 September (courtesy Sim Aberson, NOAA Hurricane Research Division)

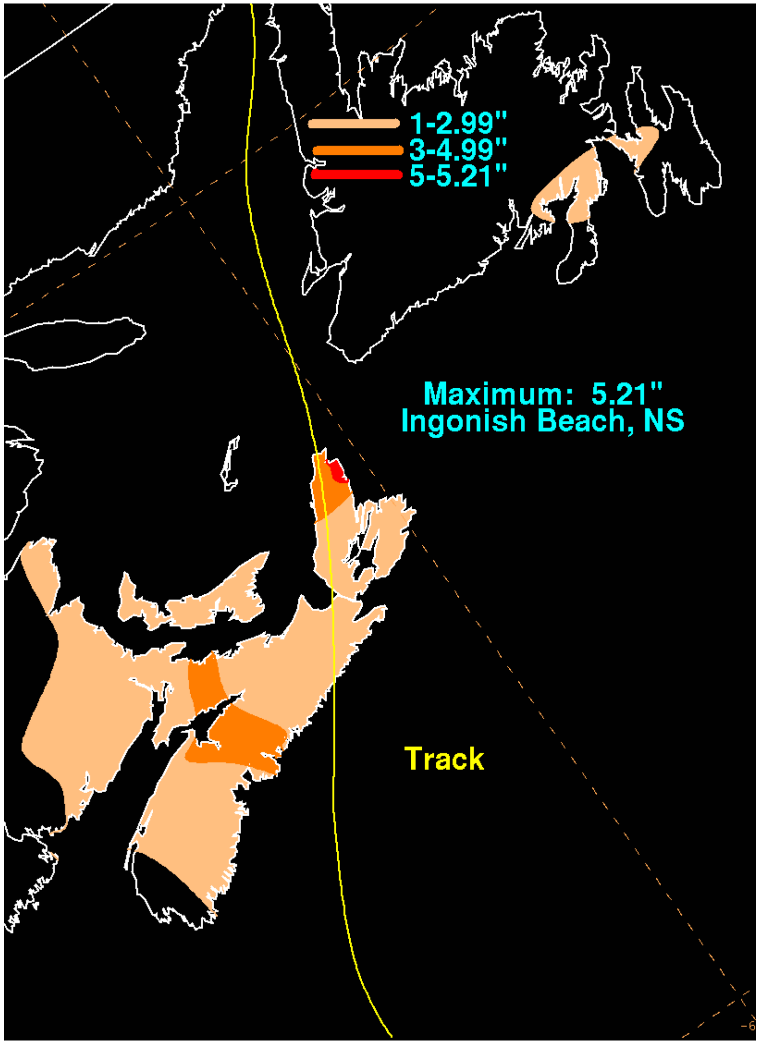

Figure 6. Rainfall (inches) over Atlantic Canada during Teddy. Map courtesy David Roth, NOAA Weather Prediction Center.

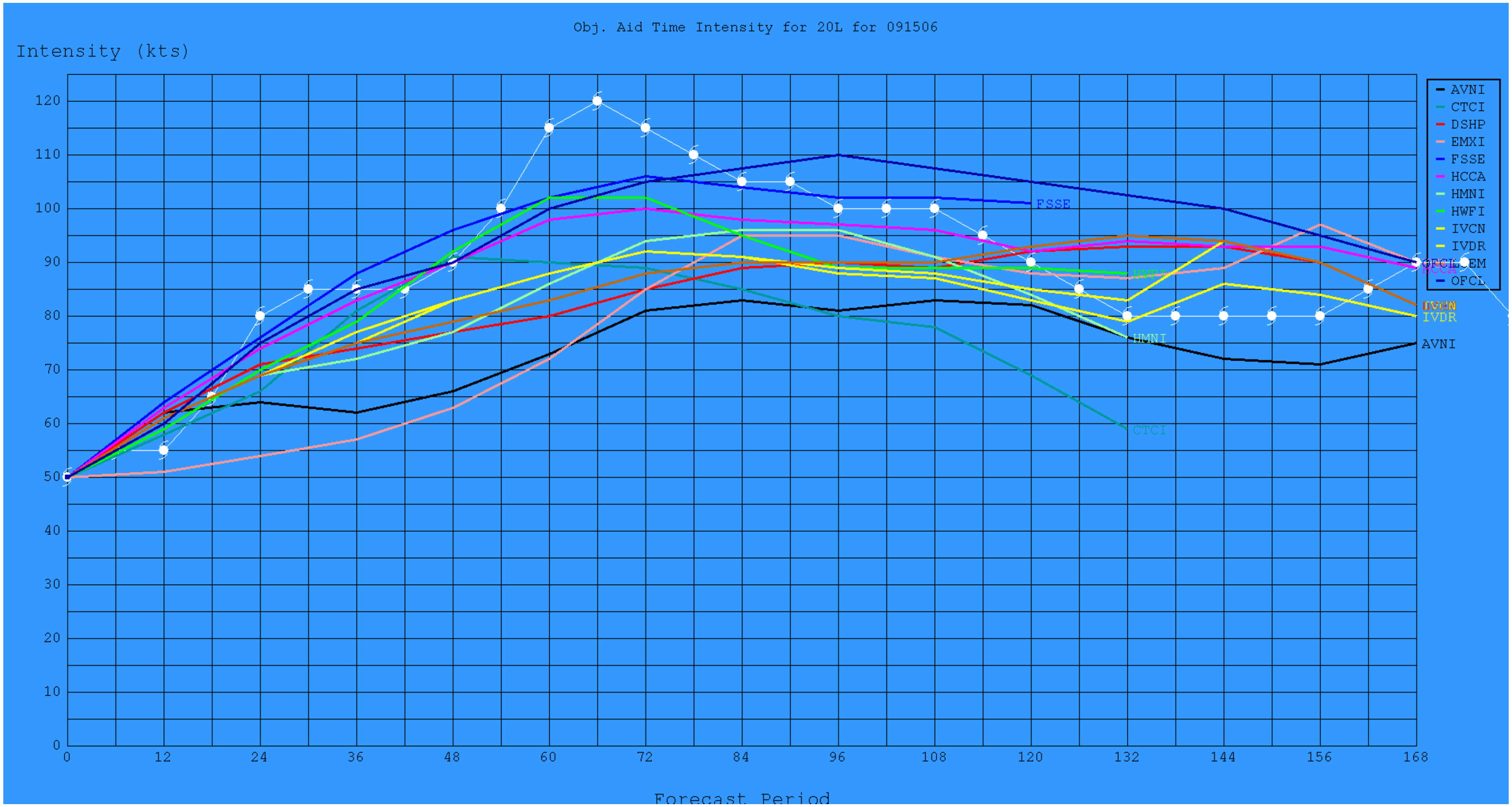

Figure 7. NHC intensity guidance (kt, colored lines) and official forecast (navy) for Teddy at 0600 UTC 15 September. The best track intensity (kt) is given by the white line and hurricane symbols. Note the good forecast by many of the aids during the first 48 hours of the forecast, even during a RI episode.

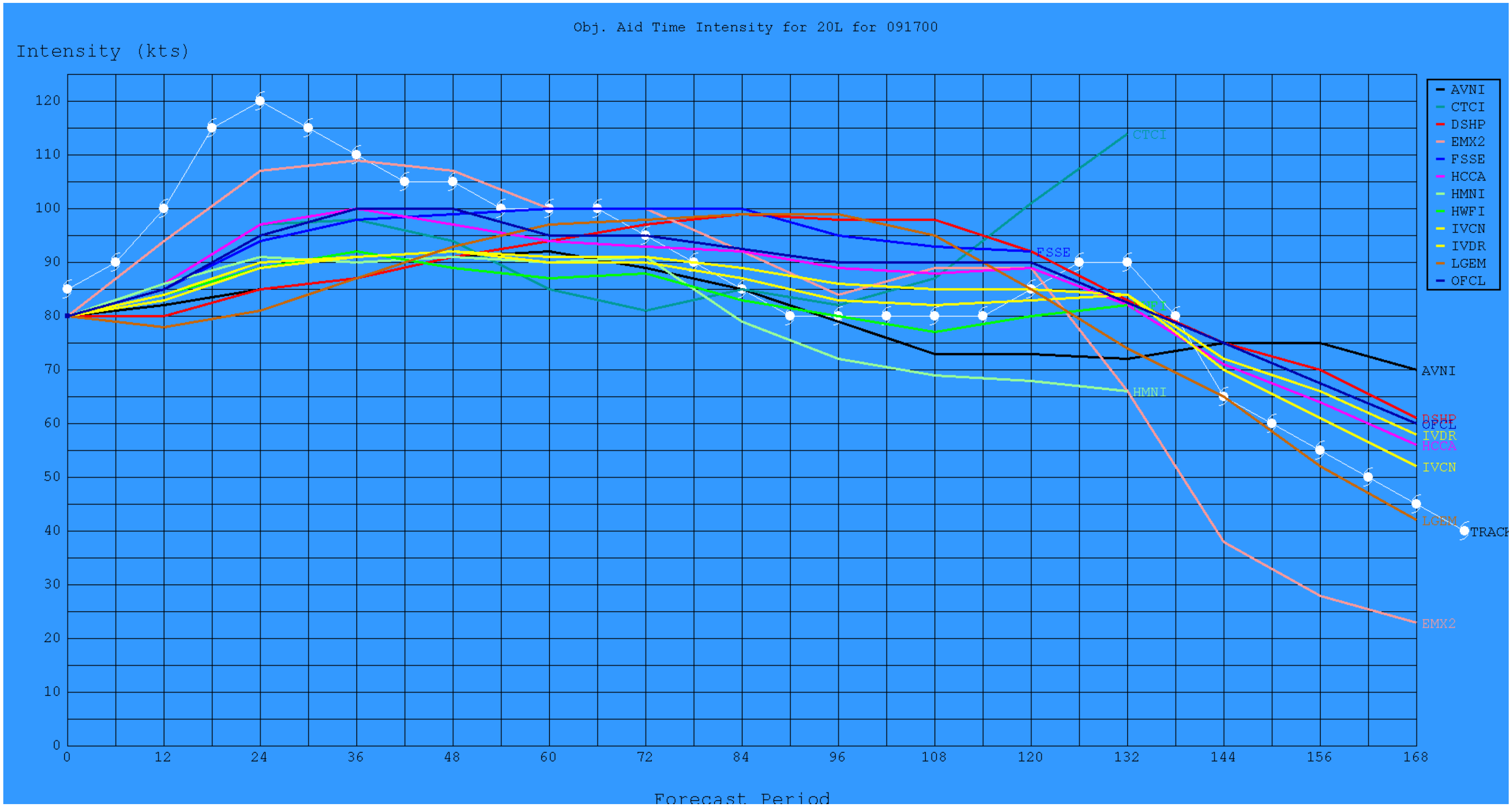

Figure 8. As in Figure 7, except forecast valid 0000 UTC 17 September. The best track intensity (kt) is given by the white line and hurricane symbols. Note the poor forecast by most of the aids during the first 24 hours of the forecast.