

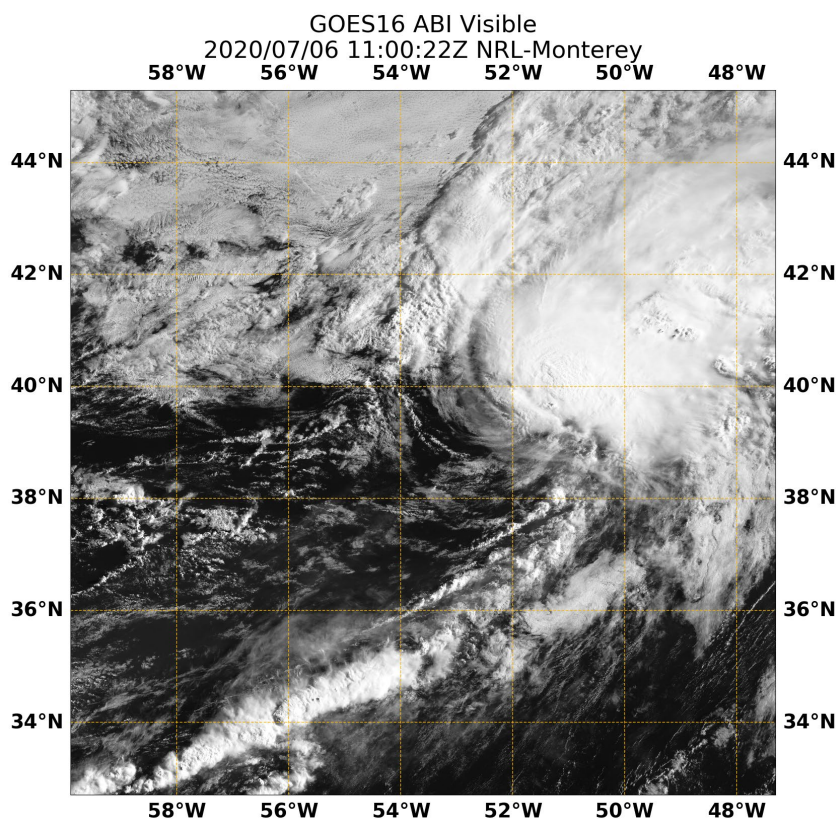


NATIONAL HURRICANE CENTER TROPICAL CYCLONE REPORT

TROPICAL STORM EDOUARD (AL052020)

4–6 July 2020

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National Hurricane Center
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GOES-16 VISIBLE SATELLITE IMAGE OF TROPICAL STORM EDOUARD AT 1100 UTC 6 JULY 2020. IMAGE COURTESY OF THE NAVAL RESEARCH LABORATORY.

Edouard was a relatively weak, short-lived tropical storm over the subtropical waters of the North Atlantic. It was the earliest fifth-named storm on record for the Atlantic basin in the satellite era (1966-present), breaking the record that had been set by Emily on 12 July 2005.

Tropical Storm Edouard

4–6 JULY 2020

SYNOPTIC HISTORY

Edouard was of non-tropical origin. A weak frontal system moved off the U.S. mid-Atlantic coast during the first couple of days of July, and a low-pressure area formed over the southern portion of the frontal zone on 3 July a few hundred miles east of the northeast Florida coast. The associated deep convection gradually increased and by 1200 UTC 4 July, convection became sufficiently well-organized near the low center to designate the formation of a tropical depression while centered about 250 n mi west-southwest of Bermuda. 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 1¹.

Initially, the cyclone was moving east-northeastward, but it soon turned to a northeastward heading, and it would maintain that direction of motion for the next few days along the northern side of a large mid-level ridge. The depression passed about 60 n mi northwest of Bermuda around 0800 UTC 5 July, with no significant increase in organization since the previous day. Most of the showers and thunderstorms were situated south and east of the center, due to westerly vertical shear and some dry mid-level air over the northwestern portion of the circulation. By late on 5 July, a large burst of deep convection occurred near and east of the center, and the system strengthened into a tropical storm around 0000 UTC 6 July. In an environment of moderate to strong southwesterly shear and marginal sea-surface temperatures, Edouard strengthened only a little more, and it reached its peak intensity of 40 kt by 1200 UTC 6 July. Around 0000 UTC 7 July, the cyclone’s cloud pattern showed that Edouard had merged with a frontal system, and consequently it became an extratropical low while centered about 425 n mi east-southeast of Cape Race, Newfoundland. On 8 July, the low turned eastward while continuing to move rapidly within the strong mid-latitude westerlies. The weakening cyclone moved over southern Ireland and the southern United Kingdom on 9 July and dissipated soon thereafter.

METEOROLOGICAL STATISTICS

Observations in Edouard (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

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 *bt*k directory, while previous years’ data are located in the *archive* directory.

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 Edouard.

The storm's estimated maximum intensity of 40 kt is based on ASCAT data and a blend of subjective and objective Dvorak estimates. The minimum pressure estimate of 1005 mb is based on a blend of Dvorak estimates, Knaff-Zehr-Courtney pressure-wind relationship values, and nearby surface reports from Bermuda and ship observations.

Edouard produced gusty winds and heavy rain at Bermuda while its center passed to the north of the island early on 5 July. An automated weather station just northwest of Bermuda reported a wind gust of 37 kt.

There were no ship reports of winds of tropical storm force associated with Edouard.

CASUALTY AND DAMAGE STATISTICS

There were no reports of damage or casualties associated with Edouard.

FORECAST AND WARNING CRITIQUE

The genesis of Edouard was not well anticipated. The disturbance from which the cyclone formed was first mentioned in the Tropical Weather Outlook (TWO) just 12 h before formation with a low (<40%) probability of genesis (Table 2). The formation probability was raised to the medium (40%–60%) category, in a Special TWO, only 8 h prior to formation, and was never raised to the high (>60%) category before genesis. One factor that likely contributed to the very short lead times of the genesis forecasts was the non-tropical nature of Edouard's formation.

A verification of NHC official track forecasts for Edouard is given in Table 3a. Official track forecast errors were higher than the mean official errors for the previous 5-yr period for the 12- through 48-h forecast intervals. A homogeneous comparison of the official track errors with selected guidance models is given in Table 3b. There is only one case in this sample at 24 h and beyond, so there is little meaning to these comparisons.

A verification of NHC official intensity forecasts for Edouard is given in Table 4a. Official intensity forecast errors were lower than the mean official errors for the previous 5-yr period for the 12- through 48-h forecast intervals. A homogeneous comparison of the official intensity errors with selected guidance models is given in Table 4b. Although the sample is very small, the model guidance errors were comparable to the official intensity forecasts. Given its organization and the large-scale environment, Edouard was not expected to strengthen significantly in the NHC forecasts, and this turned out to be correct.



There were no watches or warnings issued for any land areas for Edouard, but a gale warning was in effect for the waters surrounding Bermuda on 4–5 July when the system passed to the northwest of that island.



Table 1. Best track for Tropical Storm Edouard, 4–6 July 2020.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
04 / 0600	30.4	71.2	1009	30	low
04 / 1200	30.9	69.4	1009	30	tropical depression
04 / 1800	31.5	68.0	1007	30	"
05 / 0000	32.1	67.0	1007	30	"
05 / 0600	32.9	65.8	1007	30	"
05 / 1200	33.8	64.2	1007	30	"
05 / 1800	35.0	61.9	1007	30	"
06 / 0000	36.4	58.5	1006	35	tropical storm
06 / 0600	38.1	55.3	1006	35	"
06 / 1200	39.9	51.7	1006	40	"
06 / 1800	41.7	47.8	1005	40	"
07 / 0000	43.6	44.1	1005	40	extratropical
07 / 0600	45.5	40.3	1006	40	"
07 / 1200	47.6	36.6	1006	40	"
07 / 1800	49.5	32.5	1006	40	"
08 / 0000	51.0	28.0	1007	35	"
08 / 0600	52.0	23.5	1008	30	"
08 / 1200	52.0	19.0	1008	30	"
08 / 1800	52.0	14.0	1008	30	"
09 / 0000	52.0	9.0	1009	30	"
09 / 0600	52.0	4.0	1009	30	"
09 / 1200	52.0	0.0	1010	25	"
09 / 1800					dissipated
06 / 1800	41.7	47.8	1005	40	maximum wind and minimum pressure

Table 2. 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%)	12	12
Medium (40%-60%)	8	8
High (>60%)		

Table 3a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Tropical Storm Edouard, 4–6 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	29.5	44.9	63.6	85.1				
OCD5	78.1	213.1	348.5	455.5				
Forecasts	8	6	4	2				
OFCL (2015-19)	24.1	36.9	49.6	65.1				
OCD5 (2015-19)	44.7	96.1	156.3	217.4				



Table 3b. Homogeneous comparison of selected track forecast guidance models (in n mi) for Tropical Storm Edouard, 4–6 July 2020. 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 3a due to the homogeneity requirement.

Model ID	Forecast Period (h)							
	12	24	36	48	60	72	96	120
OFCL	29.0	36.9	43.5	62.5				
OCD5	54.6	69.3	133.3	376.5				
HWFI	41.2	43.7	31.5	33.3				
HMNI	31.0	45.9	41.4	80.7				
CMCI	6.9	5.0	72.6	118.7				
TVCA	15.6	15.6	73.5	84.4				
HCCA	22.1	29.9	14.5	40.8				
TABS	35.0	39.3	67.9	211.2				
TABM	46.6	75.8	46.3	140.0				
TABD	59.9	119.9	123.4	159.1				
Forecasts	2	1	1	1				

Table 4a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Tropical Storm Edouard, 4–6 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	2.5	3.3	2.5	5.0				
OCD5	2.2	3.5	1.8	1.0				
Forecasts	8	6	4	2				
OFCL (2015-19)	5.2	7.7	9.4	10.7				
OCD5 (2015-19)	6.8	10.8	14.1	17.0				

Table 4b. Homogeneous comparison of selected intensity forecast guidance models (in kt) for Tropical Storm Edouard, 4–6 July 2020. 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 4a due to the homogeneity requirement.

Model ID	Forecast Period (h)							
	12	24	36	48	60	72	96	120
OFCL	3.3	3.0	3.3	5.0				
OCD5	2.5	3.2	2.0	1.0				
HWFI	2.7	4.0	5.0	8.0				
HMNI	3.3	8.0	3.7	1.0				
DSHP	2.7	4.6	4.7	5.0				
LGEM	1.8	4.0	4.3	1.0				
ICON	2.3	4.2	1.7	0.0				
IVCN	2.5	4.2	1.7	0.0				
HCCA	2.5	5.8	3.7	2.0				
Forecasts	6	5	3	1				

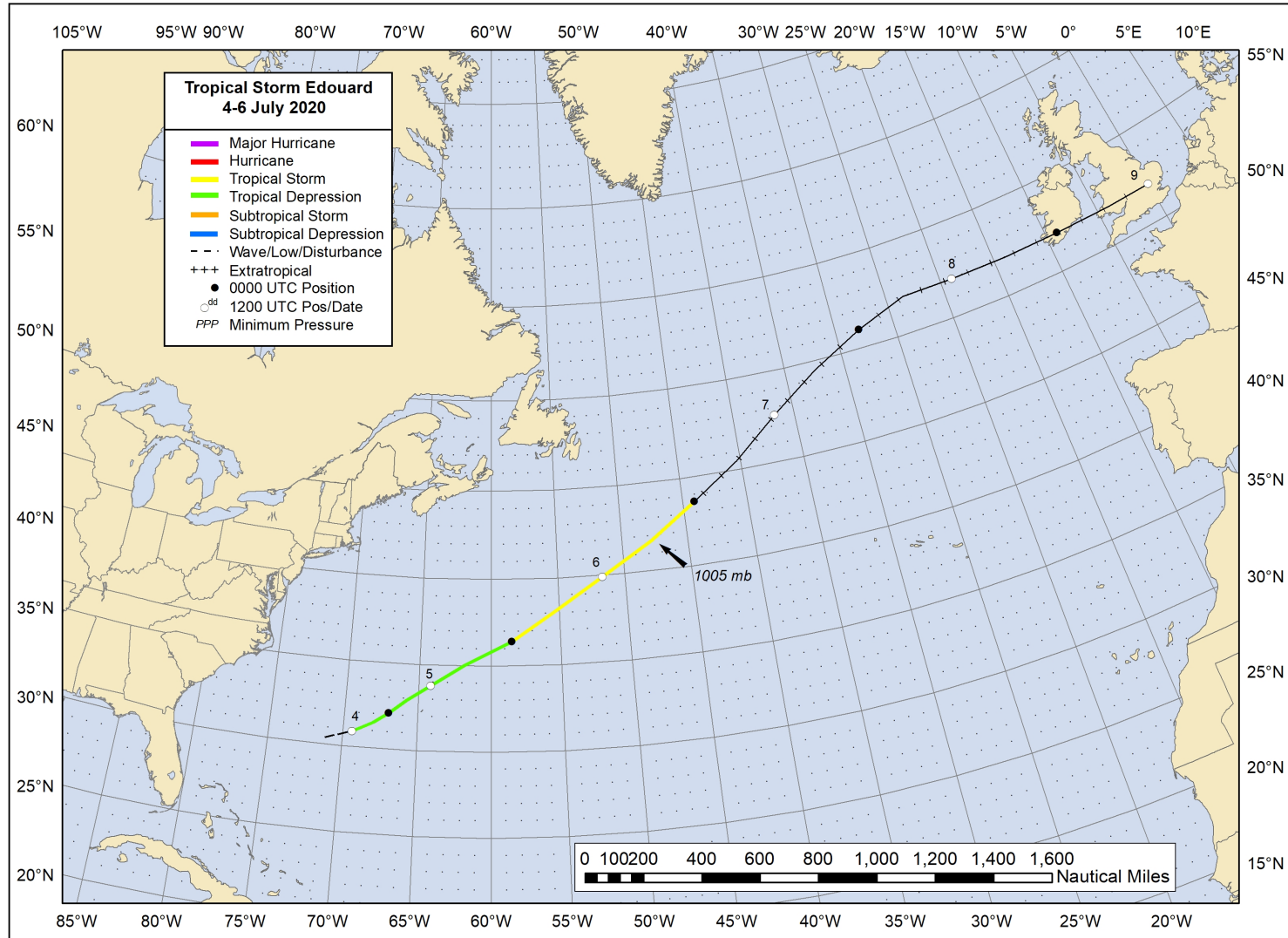


Figure 1. Best track positions for Tropical Storm Edouard, 4–6 July 2020. Track during the extratropical stage is partially based on analyses from the NOAA Ocean Prediction Center.

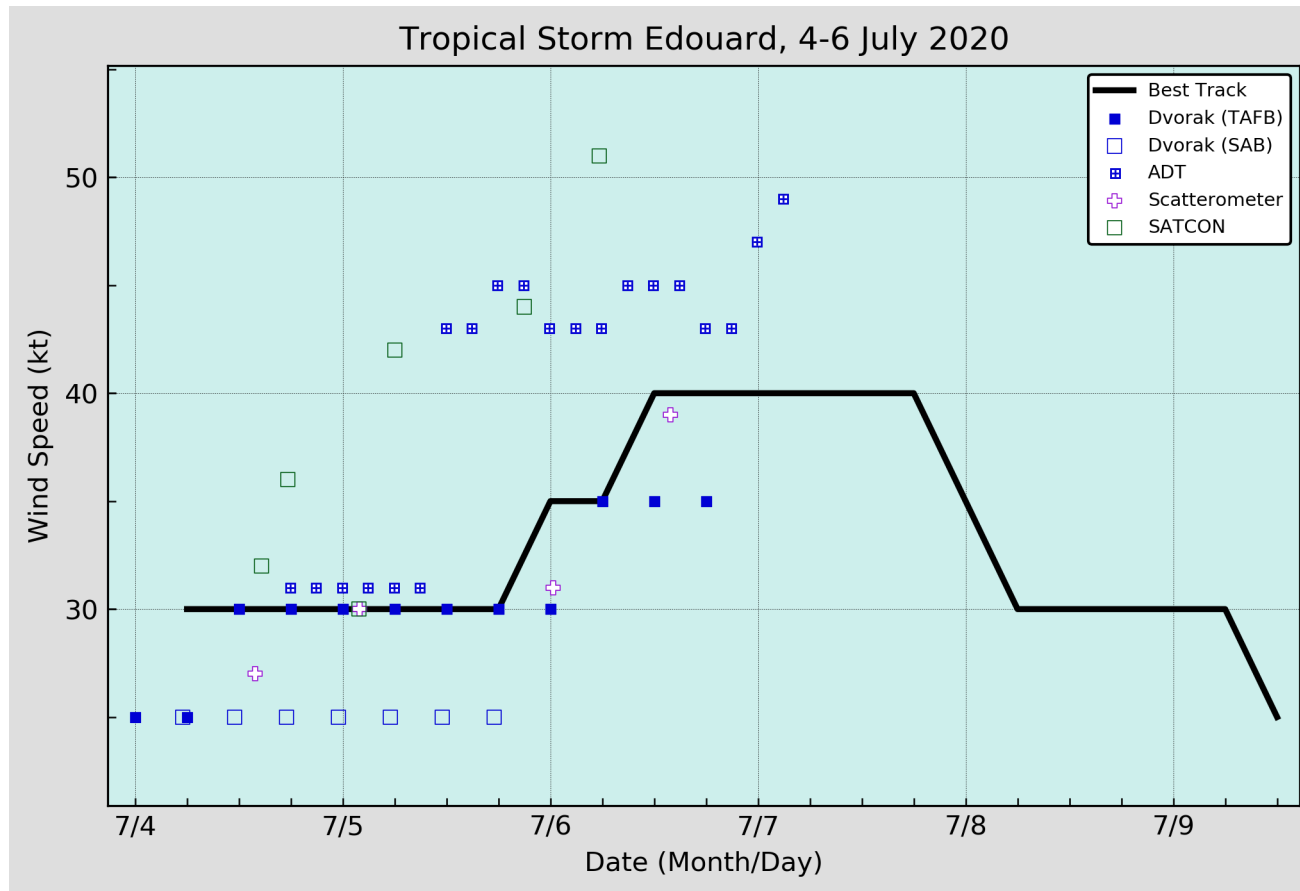


Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Tropical Storm Edouard, 4–6 July 2020. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies. Dashed vertical lines correspond to 0000 UTC.

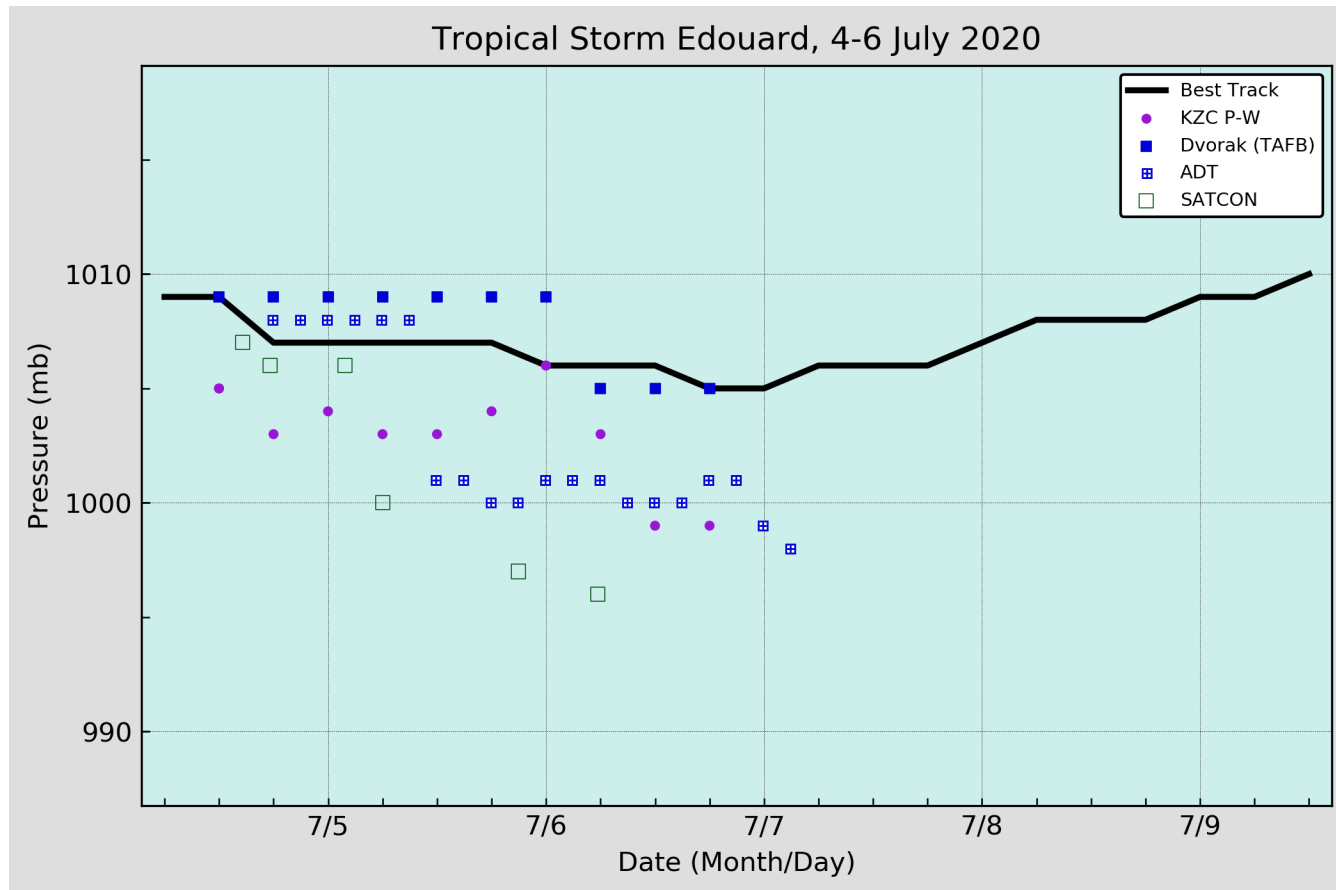


Figure 3. Selected pressure observations and best track minimum central pressure curve for Tropical Storm Edouard, 4–6 July 2020. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for Meteorological 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.