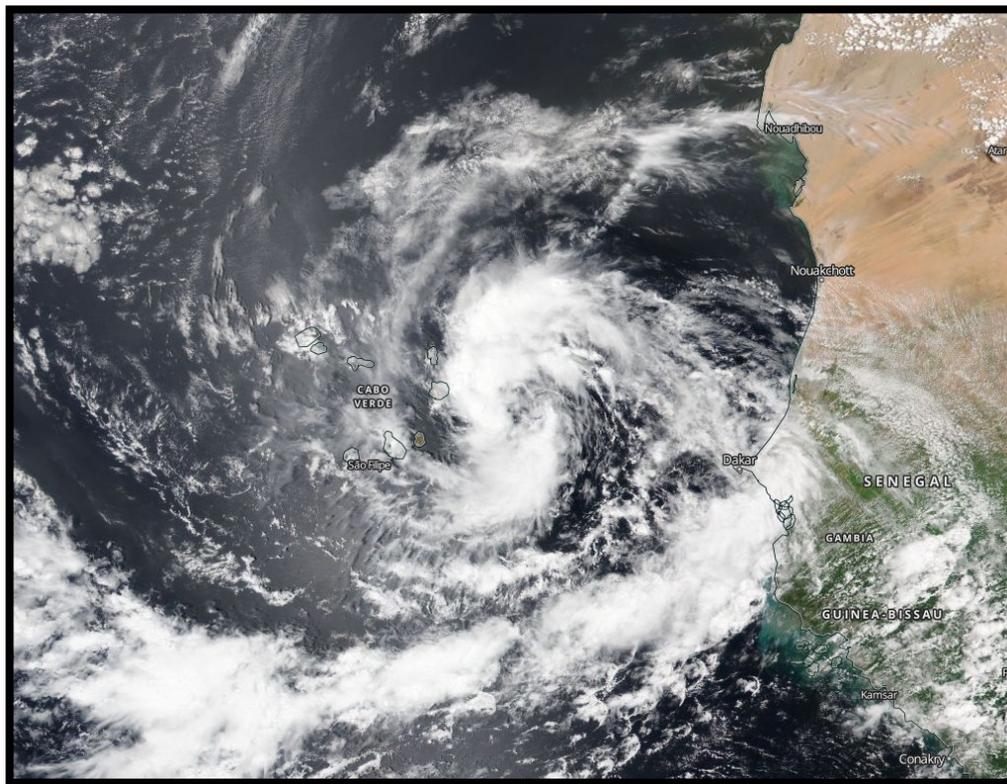# NATIONAL HURRICANE CENTER
TROPICAL CYCLONE REPORT

TROPICAL STORM RENE
(AL182020)
7–14 September 2020

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National Hurricane Center
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GOES-16 GEOCOLOR SATELLITE IMAGE OF TROPICAL STORM RENE AT 1200 UTC 7 SEPTEMBER 2020.

Rene was a tropical storm that formed over the far eastern Atlantic and moved across the Cabo Verde Islands before dissipating several days later over the central Atlantic.

Tropical Storm Rene

7–14 SEPTEMBER 2020

SYNOPTIC HISTORY

The genesis of Rene was associated with a tropical wave that moved off the west coast of Africa on 6 September. The wave that led to the formation of Rene was quite potent, as it caused pressure falls of about 5 mb over a 24 h period when it moved across portions of western Africa. Visible satellite images and surface observations indicate that a well-defined area of low pressure existed along the wave axis when it moved off the coast, but the associated showers and thunderstorms were limited at that time. An area of deep convection formed over the center of the low by 0600 UTC 7 September, marking the formation of a tropical depression when it was located about 175 n mi east of the easternmost 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 formation, deep convection consolidated and became organized into curved bands around the center (cover image). The depression strengthened to a tropical storm by 1800 UTC 7 September when it was located about 90 n mi east-southeast of Sal in the Cabo Verde Islands. Shortly after becoming a tropical storm, however, the convective pattern became more ragged, and the storm changed little in strength during its westward to west-northwestward passage across the island chain. Deep convection decreased further on 8 September due to a combination of marginally warm waters and dry air, and Rene weakened back to a tropical depression by 1800 UTC that day when it was located about 80 n mi west of Santo Antao Island in the westernmost Cabo Verde Islands. During this time, Rene continued westward to west-northwestward on the south side of a narrow mid-level ridge.

Another round of deep convection occurred over the center of Rene early on 9 September, causing the system to strengthen back to a tropical storm by 1200 UTC that day when it was located about 350 n mi west of the northwestern Cabo Verde Islands. This time the convection persisted a little longer, and the cyclone had its best satellite appearance on 10 September. A combination of satellite data suggests that Rene reached its peak intensity of 40 kt at 1200 UTC 10 September over the tropical eastern Atlantic. Deep convection decreased on 11 September, and although the thunderstorms waxed and waned during the following few days, the overall trend was a notable decrease in convection over time due to intrusions of dry air. Meanwhile, Rene turned northwestward as it neared the western periphery of the mid-level ridge. The cyclone weakened to a tropical depression once again by 1200 UTC 12 September when it was located about 1000 n mi east-northeast of the northern Leeward Islands.

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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 forward motion of Rene decreased late on 13 September as the shallow cyclone was steered slowly toward the northwest by light low-level flow. As a low-level ridge built to the north of Rene, the cyclone then turned west-northwestward later that day. Strong westerly shear caused the depression to open into a trough by 1800 UTC 14 September when it was located over the subtropical central Atlantic about 900 n mi northeast of the northern Leeward Islands. The trough turned southwestward and completely dissipated a couple of days later.

METEOROLOGICAL STATISTICS

Observations in Tropical Storm Rene (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. 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 Rene.

The peak intensity of 40 kt at 1200 and 1800 UTC 10 September is based on a blend of ASCAT data and subjective and objective Dvorak estimates. The minimum pressure of 1001 mb is based on surface observations and the Knaff-Zehr-Courtney pressure-wind relationship.

There were no observations from ships or land stations of winds of tropical storm force associated with Rene. The highest sustained wind report was a 10-min average wind speed of 28 kt at Amilcar Cabral International Airport on the island of Sal in the Cabo Verde Islands early on 8 September. This wind value converts to approximately a 31-kt 1-min wind speed.

CASUALTY AND DAMAGE STATISTICS

There were no reports of casualties or damage associated with Tropical Storm Rene.

FORECAST AND WARNING CRITIQUE

The genesis of Tropical Storm Rene was reasonably well forecast, but the storm formed sooner than anticipated (Table 2). The disturbance that became Rene was first included in the Tropical Weather Outlook 96 h before genesis occurred, giving the system a low (<40%) chance of tropical cyclone formation during the next five days. The 5-day probability of genesis reached the medium category (40–60%) 78 h before genesis occurred and the high category 42 h before

the cyclone developed. Regarding the 2-day genesis probabilities, a low chance of genesis was shown 42 h, a medium chance 18 h, and a high chance 12 h before the system developed.

A verification of NHC official track forecasts for Rene is given in Table 3a. Official forecast track errors were a little lower than the mean official errors for the previous 5-yr period from 12–60 h, but above the mean at 72 and 96 h, and well above the mean at 120 h. The official track forecasts during the early portions of Rene's lifecycle had a significant right or north bias, which resulted in the larger-than-normal long-range errors (Fig. 4). The right bias during the early forecasts were likely the result of predicting Rene to be stronger and more vertically deep than what occurred. A homogeneous comparison of the official track errors with selected guidance models is given in Table 3b. Several of the consensus aids had lower track errors than NHC, although most of the models had large errors at 120 h. Among the individual models, CMCI performed best and had lower errors than NHC from 24–120 h.

A verification of NHC official intensity forecasts for Rene is given in Table 4a. Official forecast intensity errors were slightly below the mean official errors for the previous 5-yr period at 12 h, but well above the long-term means at the other forecast times. NHC had a notable high bias and predicted Rene to become a hurricane for many forecasts during the early portion of its lifetime (Fig. 5). However, a combination of unfavorable thermodynamics - marginally warm sea surface temperatures and dry mid-level air - prevented the storm from intensifying significantly while it was in generally low wind shear conditions from 8–11 September. A homogeneous comparison of the official intensity errors with selected guidance models is given in Table 4b. Although many of the models had lower errors than NHC, they also had significant high biases and large errors. The best-performing models were the global models EMXI and GFSI, which beat NHC at most forecast time periods.

Tropical storm warnings issued for Rene are listed in Table 5.

Table 1.   Best track for Tropical Storm Rene, 7–14 September 2020.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
06 / 1800	14.6	18.1	1006	25	low
07 / 0000	14.8	19.0	1005	25	"
07 / 0600	15.2	19.8	1004	30	tropical depression
07 / 1200	15.6	20.7	1003	30	"
07 / 1800	15.9	21.8	1002	35	tropical storm
08 / 0000	16.1	22.9	1001	35	"
08 / 0600	16.3	24.2	1001	35	"
08 / 1200	16.4	25.7	1001	35	"
08 / 1800	16.6	27.1	1003	30	tropical depression
09 / 0000	16.8	28.6	1004	30	"
09 / 0600	17.1	30.0	1004	30	"
09 / 1200	17.3	31.2	1003	35	tropical storm
09 / 1800	17.6	32.4	1003	35	"
10 / 0000	17.9	33.5	1003	35	"
10 / 0600	18.1	34.4	1003	35	"
10 / 1200	18.4	35.3	1002	40	"
10 / 1800	18.8	36.3	1002	40	"
11 / 0000	19.1	37.2	1003	35	"
11 / 0600	19.5	38.2	1003	35	"
11 / 1200	19.9	39.3	1004	35	"
11 / 1800	20.4	40.6	1004	35	"
12 / 0000	21.1	41.8	1004	35	"
12 / 0600	21.9	42.9	1004	35	"
12 / 1200	22.8	44.0	1006	30	tropical depression
12 / 1800	23.7	45.0	1007	30	"
13 / 0000	24.7	46.0	1008	30	"
13 / 0600	25.8	46.9	1009	30	"
13 / 1200	26.7	47.3	1009	30	"
13 / 1800	27.4	47.5	1009	25	"
14 / 0000	27.5	47.8	1009	25	"

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
14 / 0600	27.6	48.0	1009	25	"
14 / 1200	27.5	48.4	1009	25	"
14 / 1800					dissipated
10 / 1200	18.4	35.3	1002	40	maximum wind
08 / 0000	16.1	22.9	1001	35	minimum pressure

Table 2.   Number of hours in advance of formation associated with the first NHC Special 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%)	42	96
Medium (40%-60%)	18	78
High (>60%)	12	42

Table 3a.   NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Tropical Storm Rene, 7–14 September 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	**15.3**	**26.6**	**37.0**	**52.8**	**77.5**	105.6	145.3	237.1
OCD5	26.4	62.3	93.9	119.2	135.5	139.6	170.8	253.5
Forecasts	28	26	24	22	20	18	14	10
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 3b.   Homogeneous comparison of selected track forecast guidance models (in n mi) for Tropical Storm Rene, 7–14 September 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	14.5	26.7	37.0	52.8	77.5	105.6	145.3	268.8
OCD5	24.5	56.7	93.9	119.2	135.5	139.6	170.8	**243.9**
GFSI	**13.5**	27.5	39.4	54.0	80.1	116.2	206.6	381.9
HWFI	21.4	38.4	57.3	78.8	103.1	134.2	194.9	288.6
HMNI	18.6	34.8	54.5	76.8	110.7	145.8	203.4	**237.2**
EGRI	23.0	39.9	51.9	64.9	85.4	116.3	195.9	340.3
EMXI	16.6	30.6	46.2	65.9	90.7	120.4	**136.2**	**249.6**
CMCI	16.2	**25.8**	**35.5**	**45.9**	**59.7**	**78.9**	**136.0**	**136.4**
NVGI	22.1	41.5	65.3	93.1	118.3	143.8	208.5	284.7
CTCI	16.0	31.6	47.1	68.4	92.1	114.5	166.0	345.0
AEMI	15.1	27.0	**36.3**	53.8	**77.2**	120.3	223.9	409.3
HCCA	15.2	**26.0**	**35.2**	**52.2**	**74.3**	**101.0**	**139.0**	**243.3**
TVCA	15.3	**26.3**	**36.5**	**50.9**	**70.0**	**93.8**	**142.5**	281.2
TVCX	15.7	26.8	**36.2**	**51.5**	**70.3**	**96.0**	**141.8**	276.0
TVDG	14.9	26.8	37.0	**50.2**	**69.5**	**95.1**	146.3	295.1
GFEX	**14.3**	**25.5**	**34.9**	**51.7**	**75.7**	107.3	148.6	285.1
TABD	28.6	65.5	115.2	167.8	233.4	319.3	608.5	1058.9
TABM	22.0	51.2	85.6	129.5	184.8	249.5	382.7	535.8
TABS	20.1	37.4	52.3	65.7	94.1	141.6	220.7	**201.3**
Forecasts	26	24	24	22	20	18	14	8

Table 4a.   NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Tropical Storm Rene, 7–14 September 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	**3.9**	9.6	16.5	23.4	28.5	29.4	27.1	24.5
OCD5	4.5	6.9	11.7	15.1	18.5	21.8	30.3	27.2
Forecasts	28	26	24	22	20	18	14	10
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 4b.   Homogeneous comparison of selected intensity forecast guidance models (in kt) for Tropical Storm Rene, 7–14 September 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	4.2	10.4	16.5	23.4	28.5	29.4	27.1	25.6
OCD5	4.7	**7.1**	**11.7**	**15.1**	**18.5**	**21.8**	30.3	26.2
HWFI	4.3	**8.0**	**12.2**	**17.6**	**22.1**	**22.4**	**14.6**	**11.3**
HMNI	8.7	18.0	25.5	34.4	41.6	42.2	33.2	33.1
CTCI	6.8	11.0	**16.0**	**22.3**	28.8	31.8	**23.1**	**15.1**
DSHP	4.8	**8.1**	**12.5**	**17.0**	**20.8**	**22.9**	**24.8**	30.6
LGEM	5.0	**7.7**	**12.2**	**16.4**	**20.6**	**23.5**	**25.6**	27.3
HCCA	5.5	11.4	17.7	27.0	32.9	33.3	27.9	**24.4**
IVCN	5.3	**10.2**	**15.6**	**21.7**	**26.9**	**28.6**	**24.1**	**22.8**
GFSI	4.7	**7.0**	**9.4**	**12.5**	**15.8**	**17.8**	**17.8**	**11.3**
EMXI	**3.4**	**3.3**	**4.2**	**5.2**	**5.3**	**5.9**	**6.8**	**11.2**
Forecasts	26	24	24	22	20	18	14	9

Table 5.   Tropical storm warning summary for Tropical Storm Rene, 7–14 September 2020.

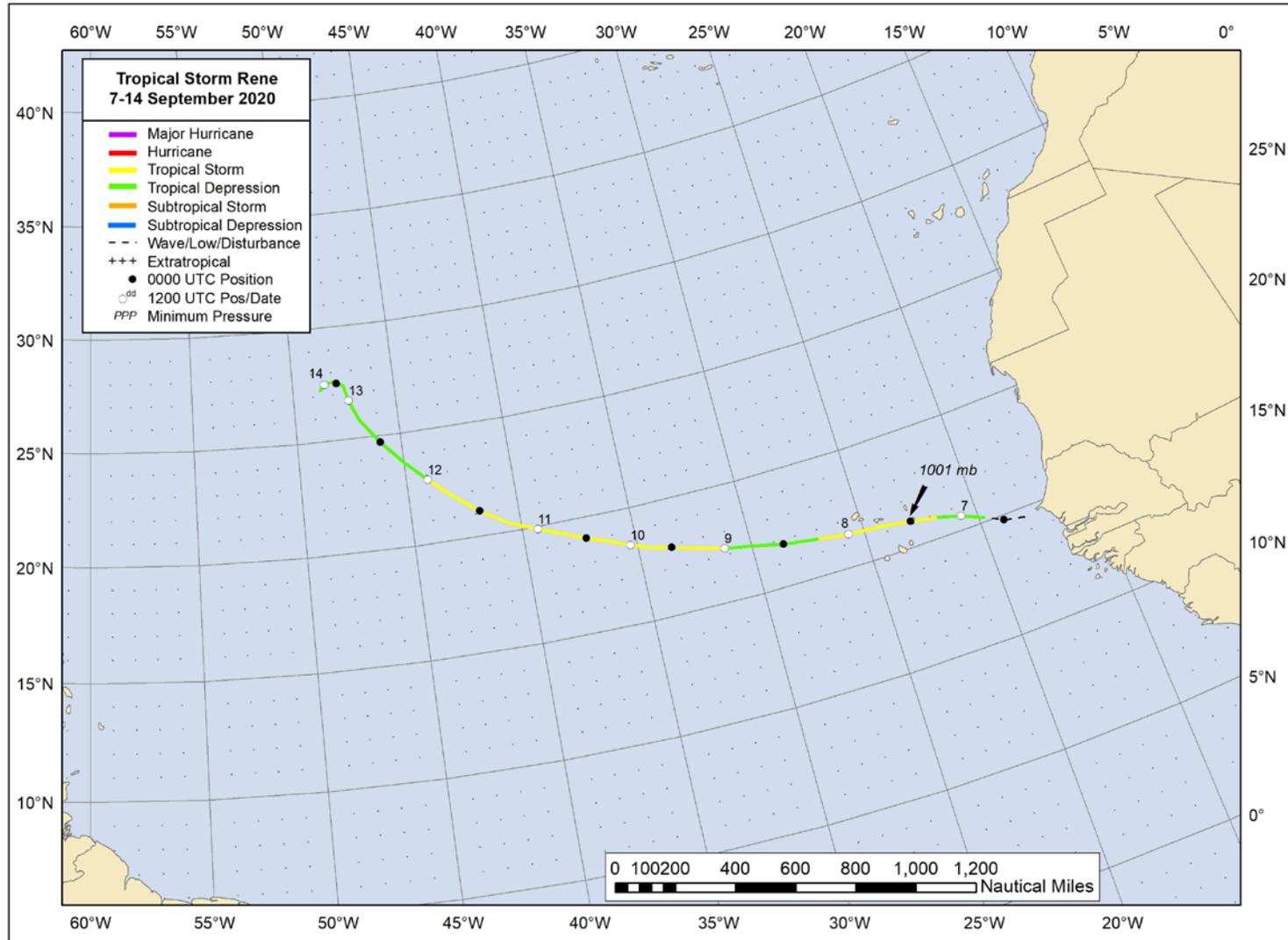| Date/Time (UTC)	Action	Location
7 / 0900	Tropical Storm Warning issued	Cabo Verde Islands
8 / 2100	Tropical Storm Warning discontinued	Cabo Verde Islands

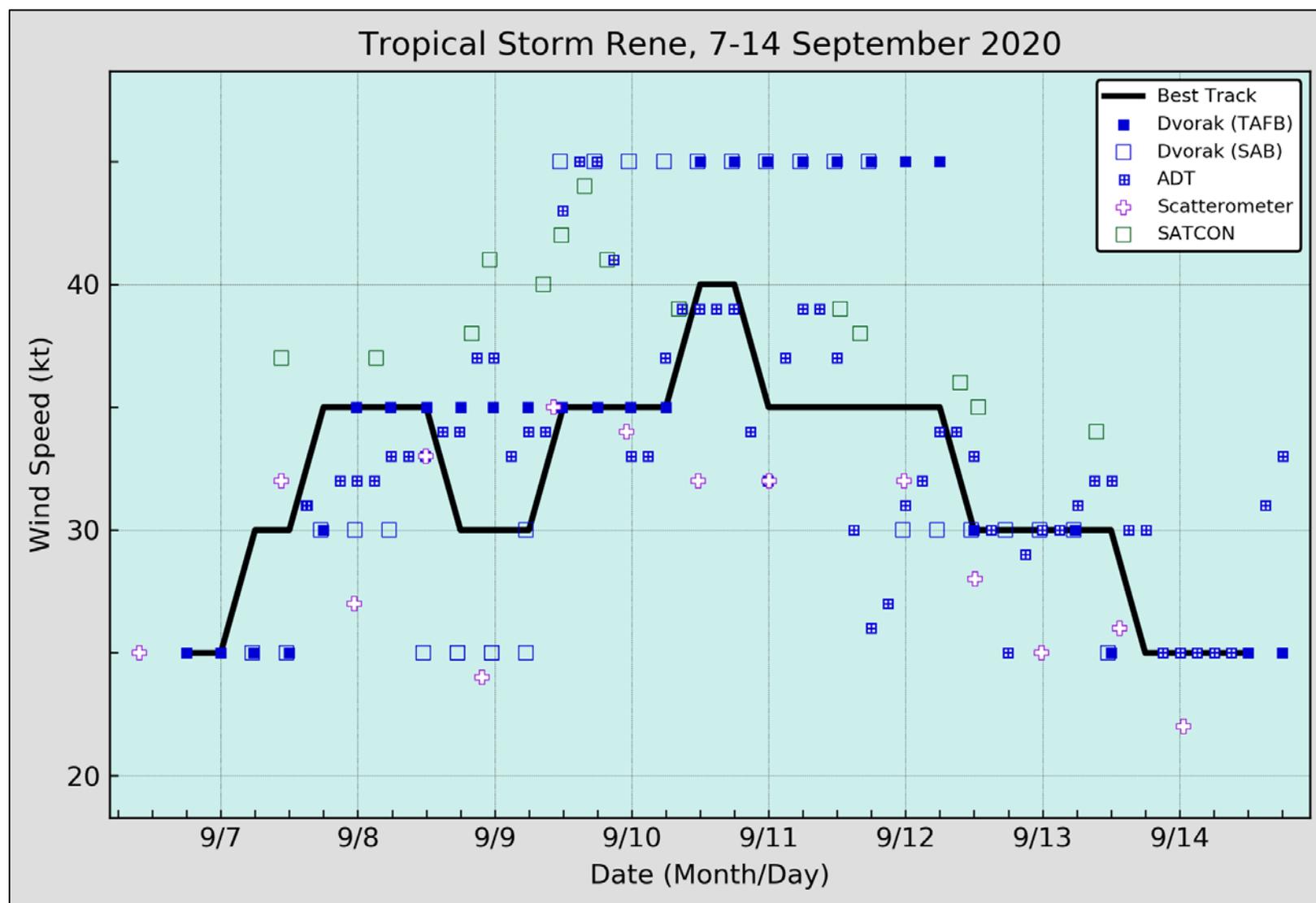Figure 1.   Best track positions for Tropical Storm Rene, 7–14 September 2020.

Figure 2.   Selected wind observations and best track maximum sustained surface wind speed curve for Tropical Storm Rene, 7–14 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. Dashed vertical lines correspond to 0000 UTC.
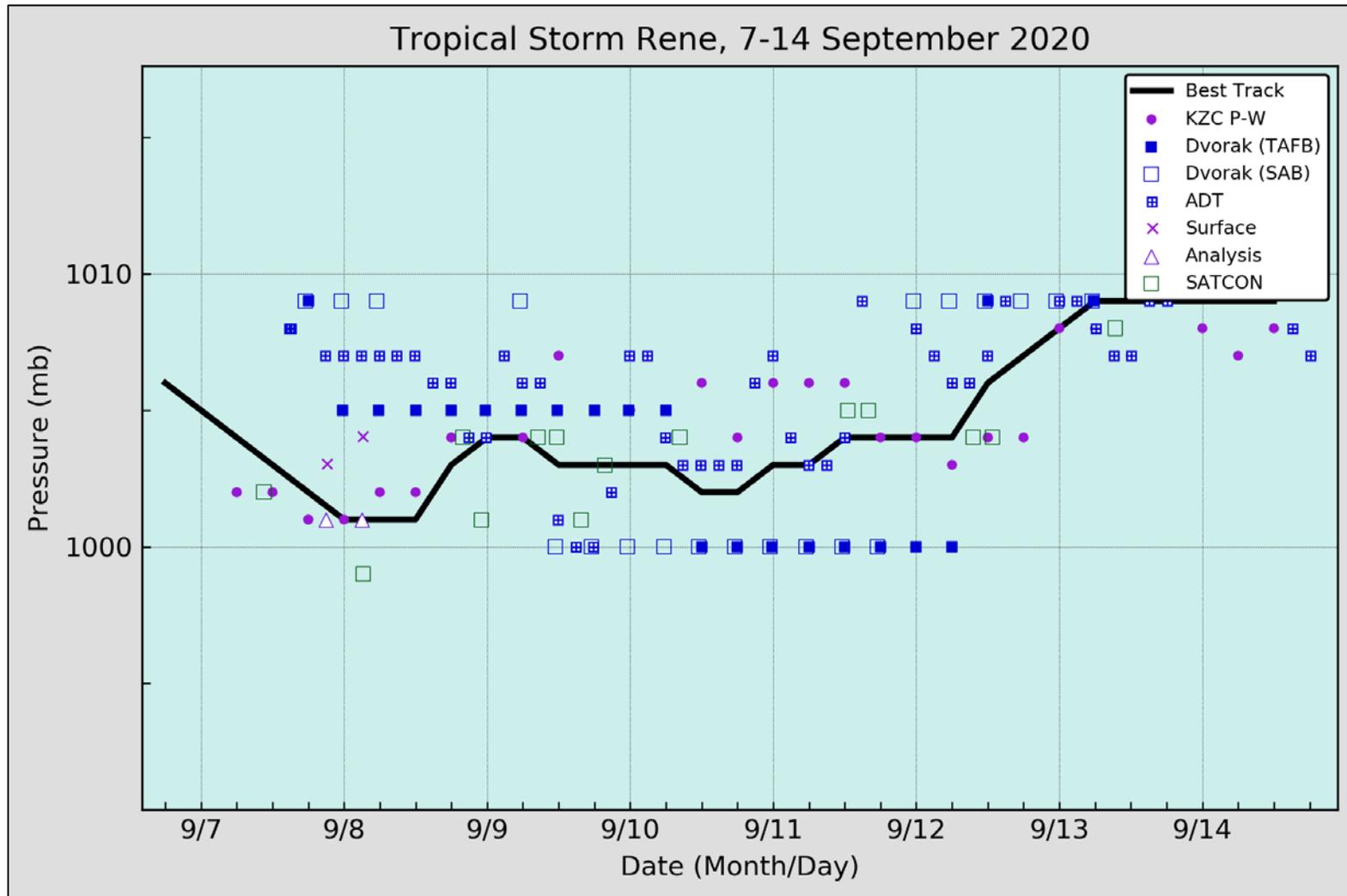
Figure 3.   Selected pressure observations and best track minimum central pressure curve for Tropical Storm Rene, 7–14 September 2020. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for 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.
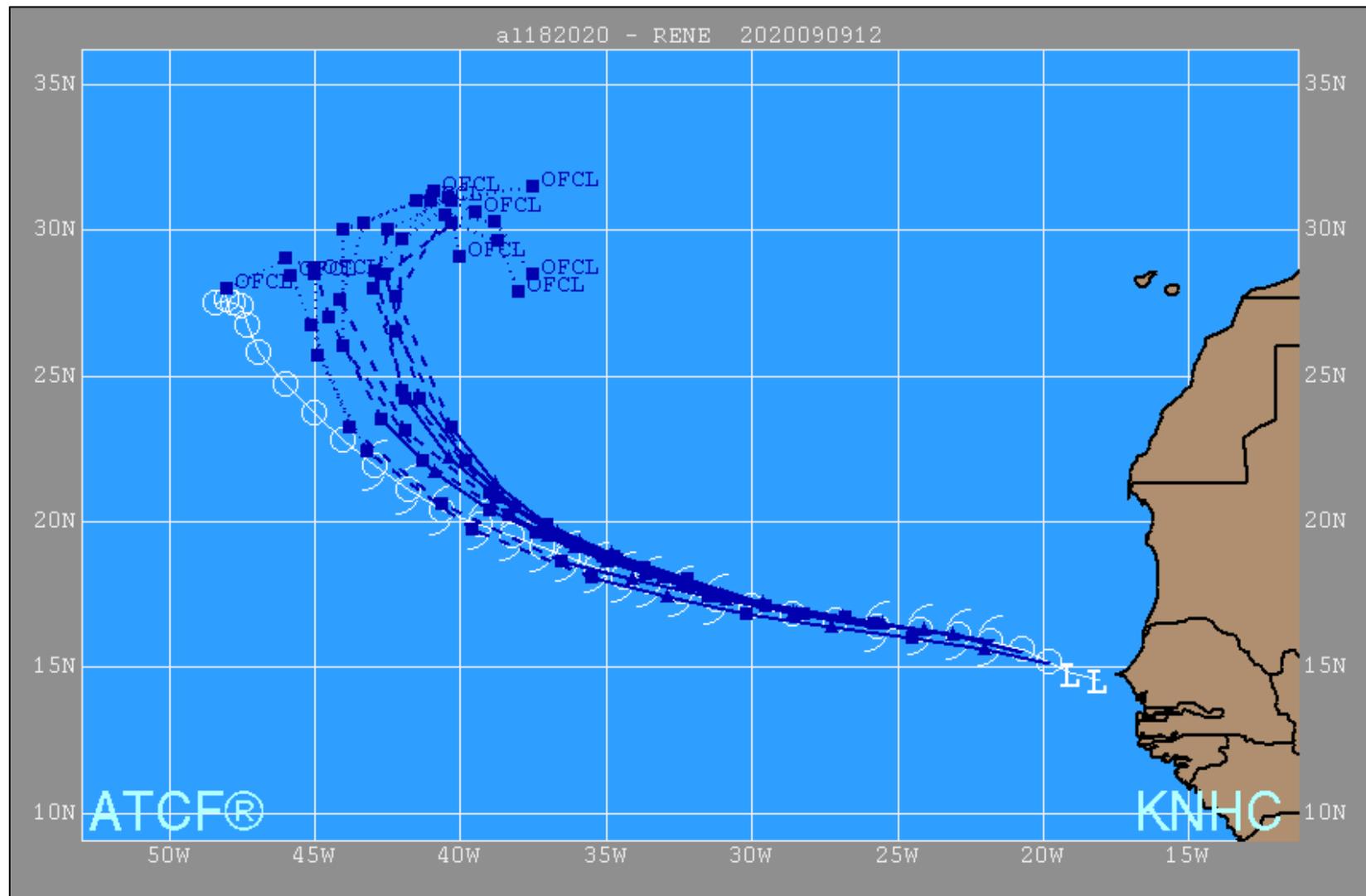
Figure 4.   Official track forecasts (blue lines, with 0, 12, 24, 36, 48, 60, 72, 96, and 120 h positions indicated) for Tropical Storm Rene from 0600 UTC 7 September to 1200 UTC 9 September. The best track is given by the white line with positions shown at 6 h intervals.
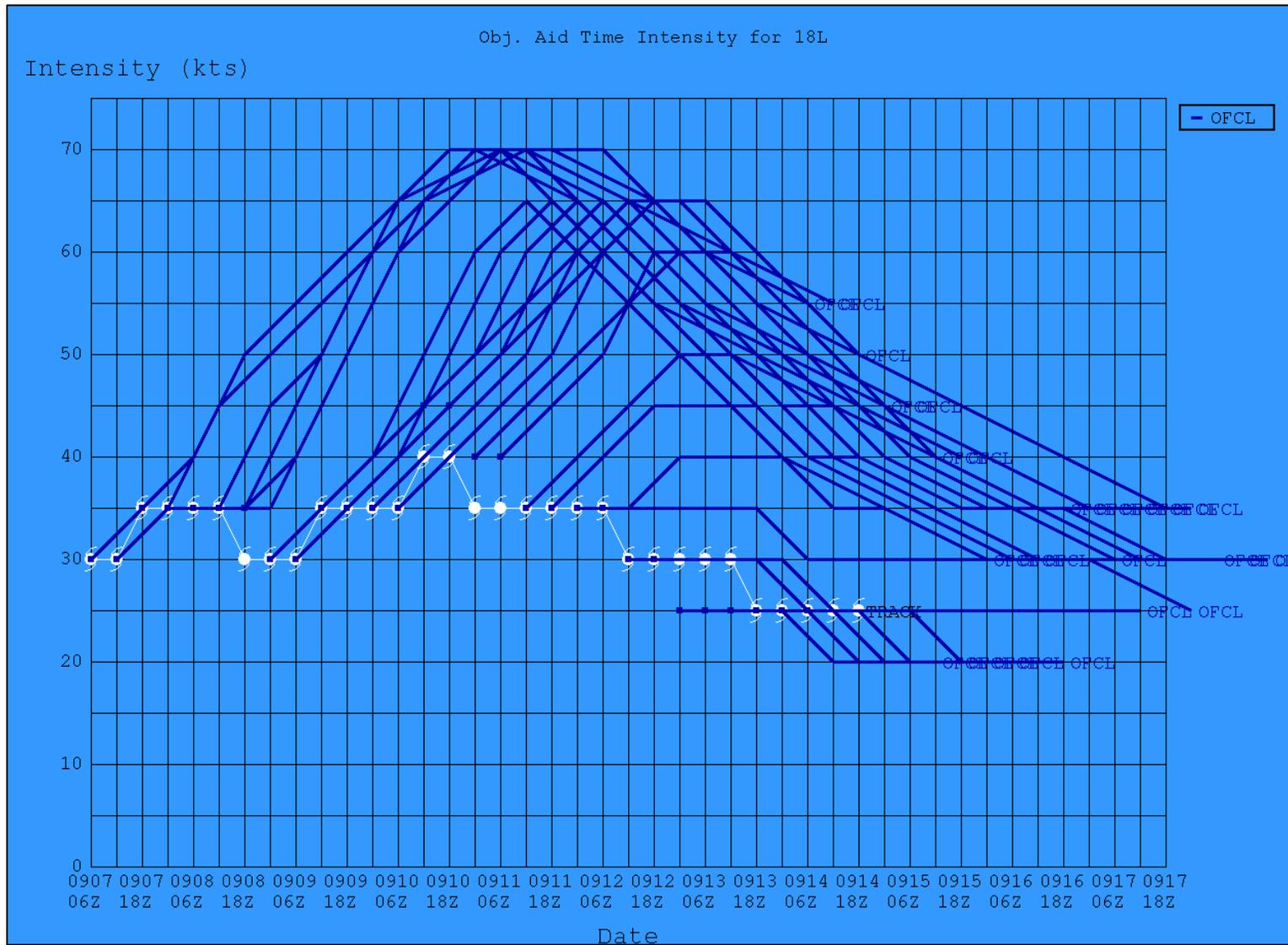
Figure 5.   NHC official intensity forecasts (kt, blue lines) from 0600 UTC 7 September to 1200 UTC 14 September 2020 for Tropical Storm Rene. The verifying intensity (kt) is shown in white.