NATIONAL HURRICANE CENTER TROPICAL CYCLONE REPORT

HURRICANE OSCAR

(AL162018)

26–31 October 2018

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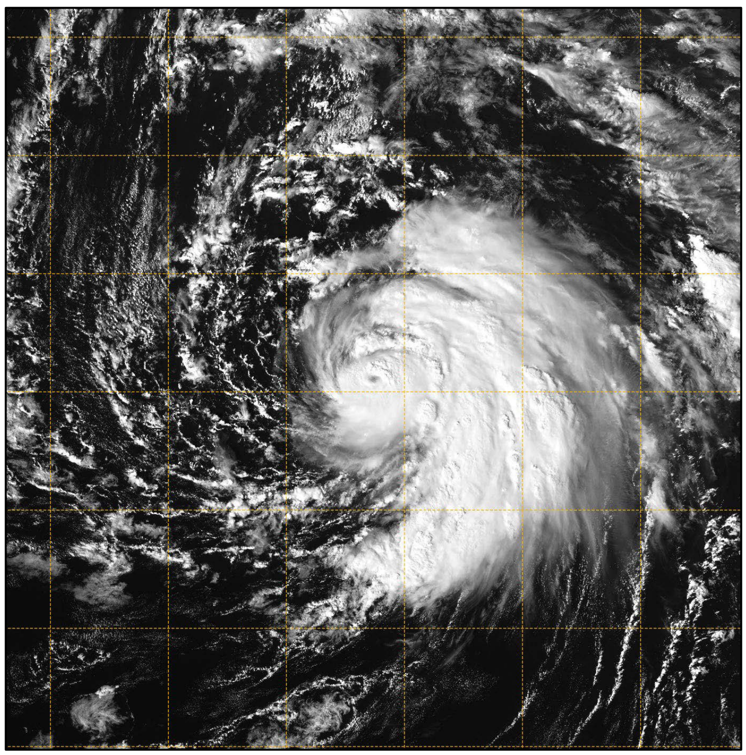

GOES-16 VISIBLE SATELLITE IMAGE OF OSCAR AT 1830 UTC 29 OCTOBER 2018, JUST PRIOR TO ITS ESTIMATED PEAK INTENSITY. IMAGE COURTESY OF THE NAVAL RESEARCH LABORATORY (NRL).

Oscar was a late-season category 2 hurricane (on the Saffir-Simpson Hurricane Wind Scale) that originated as a subtropical storm over the central Atlantic. Oscar passed well east of Bermuda before becoming a large and powerful extratropical low over the north Atlantic in early November.

Hurricane Oscar

26–31 OCTOBER 2018

SYNOPTIC HISTORY

Although Oscar's subtropical development was the result of a mid- to upper-level trough that cut off over the central Atlantic, the initial disturbance from which Oscar formed was a tropical wave that departed the west coast of Africa around 18 October. The wave moved westward across the eastern tropical Atlantic over the next several days, and when the system passed 40°W longitude on 23 October, shower and thunderstorm activity increased as the disturbance interacted with a mid- to upper-level trough that was located several hundred n mi east-northeast of the Leeward Islands. Although the tropical wave continued westward, the interaction of the wave with the upper-level trough resulted in the formation of a surface trough about 750 n mi east-northeast of the Leeward Islands early the next day. By late on 24 October, a broad area of low pressure formed in association with the system, and it began drifting northward. Another shortwave trough approached the broad low pressure area from the northwest the next day, which resulted in an increase in convection, with the low gradually becoming better defined. Late on 26 October, the trough cut off over the south-central Atlantic and the now co-located surface low became sufficiently well-defined. Deep convection associated the system became organized in bands over the eastern portion of the circulation and scatteromter data indicated that the low was already producing winds of gale force by that time. As a result, it is estimated that a subtropical storm formed by 1800 UTC 26 October, about 1025 n mi east-northeast of the Leeward Islands. The "best track" chart of Oscar'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].

Oscar initially moved northward but it turned northwestward, and then west-northwestward about 12 h after formation as it moved around the northern portion of the upper-level low. During this time the storm gradually strengthened, reaching an intensity of 50 kt by 1200 UTC 27 October. Shortly thereafter, the upper-level low began to fill while the larger outer convective band associated with Oscar began to weaken. Oscar's radius of maximum winds steadily decreased, and the system completed the transition into a 50-kt tropical storm by 1800 UTC that day (Fig 4). After the upper-level low weakened, Oscar turned west-southwestward, then westward while being steered by a low- to mid-level ridge centered over the central Atlantic. Although deep convection briefly waned early on 28 October, the convection re-developed and became significantly better organized in bands around the center later that day. The storm strengthened and became a hurricane by 1800 UTC 28 October when a small eye became apparent in visible satellite imagery. Oscar steadily strengthened over the next 24 h while it was located over sufficiently warm waters and remained within an area of low vertical

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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.

wind shear. During this time, the ridge to the north of the hurricane began to shift eastward, and Oscar turned west-northwestward, and then northwestward.

Oscar reached its estimated peak intensity of 95 kt (cover photo, Fig. 5) at 0000 UTC 30 October while moving northward around the western portion of the aforementioned ridge. Shortly thereafter, a deep-layer trough moving eastward over the western Atlantic caused Oscar to turn north-northeastward at a faster forward speed, and increasing south-southwesterly vertical wind shear caused the storm to weaken. Oscar continued to accelerate northeastward and it passed about 450 n mi east of Bermuda around 0000 UTC 31 October as a 70-kt hurricane. Shortly after that time, the hurricane began interacting with the aforementioned deep-layer trough and began its transformation into an extratropical cyclone. The storm maintained its intensity as it completed this process, and became a 70-kt extratropical low by 1800 UTC 31 October while passing about 525 n mi south-southeast of Cape Race, Newfoundland. The extratropical low strengthened slightly while it moved northeastward at about 30 kt over the north-central Atlantic. By 1800 UTC 1 November, the low weakened below hurricane-force, but a second mid- to upper-level trough caused the post-tropical cyclone to re-strengthen and slow down late on 2 November, when it was located about 650 n mi south-southwest of Reykjavik, Iceland. The system attained an intensity of 65 kt at 1800 UTC 2 November and maintained hurricane-force winds until about 1200 UTC the next day. The extratropical cyclone gradually weakened while passing between Iceland and the British Isles early on 4 November, and the cyclone was finally absorbed by a larger extratropical low and frontal system by 1800 UTC that day when it was located northwest of the Faroe Islands.

METEOROLOGICAL STATISTICS

Observations in Oscar (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 Oscar.

Oscar's peak intensity of 95 kt is based on a blend of subjective Dvorak estimates of 102 kt (T5.5) from TAFB and SAB, and ADT estimates that peaked around 80 kt. Due to the relatively small size of Oscar, and the pinhole eye that the storm exhibited around the time of its peak intensity, the objective ADT had difficulty detecting the eye and did not consistently use the appropriate "eye" scene type. As a result, objective estimates from this technique were lower than subjective estimates provided by TAFB and SAB. SAB provided a pair of Dvorak estimates around 0000 UTC 30 October, one in real-time that estimated the intensity at T5.0 (90 kt) and a post-analysis fix of T5.5 (102 kt). The system exhibited a small, fairly warm eye on a few satellite images around 0000 UTC 30 October (Fig. 5), which led to the higher (T5.5)

Dvorak estimates; however, since the warm eye was only briefly evident, the best-track intensity is estimated to be slightly lower than the peak Dvorak estimates.

There were no ship reports of winds of tropical storm force or greater in associated with Oscar while it was a tropical cyclone.

Several ships and oil platforms over the north Atlantic and the North Sea reported gale-force winds in association with the post-tropical cyclone. Wind gusts of gale force also occurred over much of Ireland, and the central and northern portions of the United Kingdom on 3–4 November. A buoy operated by the UK Met Office reported a minimum pressure of 974.0 mb with 28 kt winds shortly after 0000 UTC 4 November, which was used to estimate the cyclone's minimum pressure around that time.

CASUALTY AND DAMAGE STATISTICS

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

FORECAST AND WARNING CRITIQUE

The genesis of Oscar was fairly well forecast. The potential for tropical or subtropical cyclone formation was first mentioned in the 5-day NHC Tropical Weather Outlook at 0600 UTC 23 October, about 84 h (3.5 days) before formation occurred (Table 2). At that time the system was assessed to have a low (<40%) chance of development. The 5-day probabilities were raised to the medium (40–60%) category a little less than 3 days before development, and to the high (>60%) category 42 h before formation occurred. The system was assigned a low chance of formation in the short-range (48 h) 60 h before it became a subtropical cyclone. The short-range probabilities were raised to the medium and high categories 42 h and 30 h before formation, respectively.

A verification of NHC official track forecasts for Oscar is given in Table 3a. Official forecast track errors were a little above the long-term mean at 12 h, and close to the mean at 24 and 96 h, but much lower than the 5-year average from 36 to 72 h. The OCD5 errors were much larger than their long-term means, suggesting that the forecasts for Oscar were more difficult than normal. The official forecast (OFCL) outperformed the GFS (GFSI), ECMWF (EMXI), HMON (HMNI), and HWRF (HWFI) models at every verifying forecast time (Table 3b). The UKMET (EGRI) and Canadian (CMCI) models had lower mean errors at 12 and 24 h, whereas the Navy NAVGEM (NVGI) model exhibited lower average errors at 72 and 96 h. Several of the consensus aids also had lower errors than the NHC forecasts at various lead times, with the Florida State Super Ensemble (FSSE) and TVCX consensus models besting the official forecast at most verifying lead times.

A verification of NHC official intensity forecasts for Oscar is given in Table 4a. Official forecast intensity errors were near the previous 5-year mean, except at 96 h where the error was much lower than the long-term average, albeit for only three verifying forecasts. A homogeneous comparison of the official intensity errors with selected guidance models is given in Table 4b. The NHC intensity forecasts outperformed most of the intensity models, with the exception of the LGEM statistical guidance which had slightly lower mean errors at 36-, 48-, and 72-h.

There were no coastal watches or warnings issued in association with Oscar.

Table 1. Best track for Hurricane Oscar, 26–31 October 2018.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
26 / 1800	25.4	45.3	1006	35	subtropical storm
27 / 0000	26.4	45.3	1005	40	"
27 / 0600	27.1	46.5	998	45	"
27 / 1200	27.4	48.0	995	50	"
27 / 1800	27.1	49.9	995	50	tropical storm
28 / 0000	25.9	51.1	994	55	“
28 / 0600	25.4	52.0	994	55	"
28 / 1200	25.4	53.1	990	60	"
28 / 1800	25.7	54.8	988	65	hurricane
29 / 0000	25.5	56.4	988	65	"
29 / 0600	25.5	57.5	986	70	"
29 / 1200	25.7	58.1	981	75	"
29 / 1800	26.2	58.5	974	85	"
30 / 0000	27.0	58.5	966	95	"
30 / 0600	28.0	58.4	970	90	"
30 / 1200	29.0	58.0	971	85	"
30 / 1800	30.3	57.3	977	75	"
31 / 0000	31.7	56.0	977	70	"
31 / 0600	33.0	54.6	977	70	"
31 / 1200	35.4	52.4	974	70	"
31 / 1800	38.0	50.5	972	70	extratropical
01 / 0000	40.7	48.7	968	75	"
01 / 0600	43.4	46.9	965	75	"
01 / 1200	46.0	44.7	965	65	"
01 / 1800	48.2	41.8	965	60	"

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
02 / 0000	50.3	38.6	965	60	"
02 / 0600	52.3	35.5	961	60	"
02 / 1200	53.4	33.1	957	60	"
02 / 1800	54.2	30.4	954	65	"
03 / 0000	55.3	26.8	952	70	"
03 / 0600	56.6	23.1	956	65	"
03 / 1200	57.9	19.6	960	55	"
03 / 1800	58.9	17.1	964	50	"
04 / 0000	59.8	14.5	968	45	"
04 / 0600	60.8	12.1	973	40	"
04 / 1200	62.4	9.1	977	40	"
04 / 1800					dissipated
30 / 0000	27.0	58.5	966	95	minimum pressure and maximum winds

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%)	60	84
Medium (40%-60%)	42	66
High (>60%)	30	42

Table 3a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Hurricane Oscar, 26–31 October 2018. 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	72	96	120
OFCL	33.3	**36.9**	**17.9**	**31.3**	**72.4**	144.1	
OCD5	80.7	175.5	289.2	427.4	563.6	517.3	
Forecasts	17	15	13	11	7	3	
OFCL (2013-17)	24.1	37.4	50.5	66.6	98.4	137.4	180.7
OCD5 (2013-17)	44.7	95.8	153.2	211.2	318.7	416.2	490.6

Table 3b. Homogeneous comparison of selected track forecast guidance models (in n mi) for Hurricane Oscar, 26–31 October 2018. 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	72	96	120
OFCL	32.3	36.9	17.9	31.3	74.2	163.6	
OCD5	82.2	175.5	289.2	427.4	483.3	306.4	
GFSI	33.1	42.4	40.7	62.5	143.2	264.3	
HMNI	35.7	56.1	55.4	75.0	142.9	346.4	
HWFI	39.3	58.1	43.1	37.2	79.3	190.4	
EGRI	**26.4**	**28.9**	32.9	45.8	86.4	185.2	
EMXI	33.0	43.4	43.8	65.6	92.5	163.7	
CMCI	**22.6**	**31.4**	32.5	38.8	**69.9**	197.2	
NVGI	38.7	41.9	30.3	56.2	**69.6**	**132.6**	
AEMI	**31.0**	37.2	37.0	52.7	88.5	273.9	
HCCA	**29.2**	**36.1**	23.2	**26.5**	82.5	202.3	
FSSE	**29.3**	37.4	25.4	**26.8**	**38.4**	**120.7**	
TVCX	**29.2**	**34.3**	18.5	**29.0**	**63.9**	**153.8**	
GFEX	**28.3**	**31.9**	20.9	33.9	**50.6**	176.9	
TCON	**29.2**	**36.2**	21.2	34.8	86.7	**149.7**	
TVCA	**29.7**	**35.4**	**17.4**	32.8	85.7	**160.2**	
TABD	49.6	83.5	105.2	137.3	312.1	355.1	
TABM	51.2	80.6	88.8	94.6	158.4	312.8	
TABS	62.5	107.3	139.6	152.2	147.8	361.9	
Forecasts	16	15	13	11	6	2	

Table 4a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Hurricane Oscar, 26–31 October 2018. 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	72	96	120
OFCL	**4.4**	8.3	11.1	13.6	14.3	**3.3**	
OCD5	7.6	11.3	14.0	14.6	17.4	12.7	
Forecasts	17	15	13	11	7	3	
OFCL (2013-17)	5.5	8.0	10.1	11.4	12.7	14.5	15.0
OCD5 (2013-17)	7.1	11.1	14.4	17.4	20.6	22.3	23.7

Table 4b. Homogeneous comparison of selected intensity forecast guidance models (in kt) for Hurricane Oscar, 26–31 October 2018. 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	72	96	120
OFCL	4.7	8.3	11.2	13.6	10.8	0.0	
OCD5	7.8	11.3	14.0	14.6	13.7	10.0	
GFSI	9.1	16.2	21.5	23.6	18.0	19.0	
HMNI	7.2	10.9	15.9	18.7	15.5	11.0	
HWFI	6.6	10.9	13.5	18.3	21.8	10.0	
EMXI	11.4	17.7	20.7	21.7	20.8	13.0	
HCCA	5.7	8.8	11.7	15.3	15.5	7.5	
FSSE	5.2	**8.2**	11.5	14.7	15.2	0.0	
DSHP	7.3	10.5	12.6	14.1	**10.7**	10.0	
LGEM	6.8	9.4	**10.3**	**10.7**	**8.5**	4.0	
ICON	6.3	9.4	11.5	15.0	13.0	6.0	
IVCN	6.5	9.5	11.4	15.0	11.7	5.5	
Forecasts	16	15	13	11	6	2	

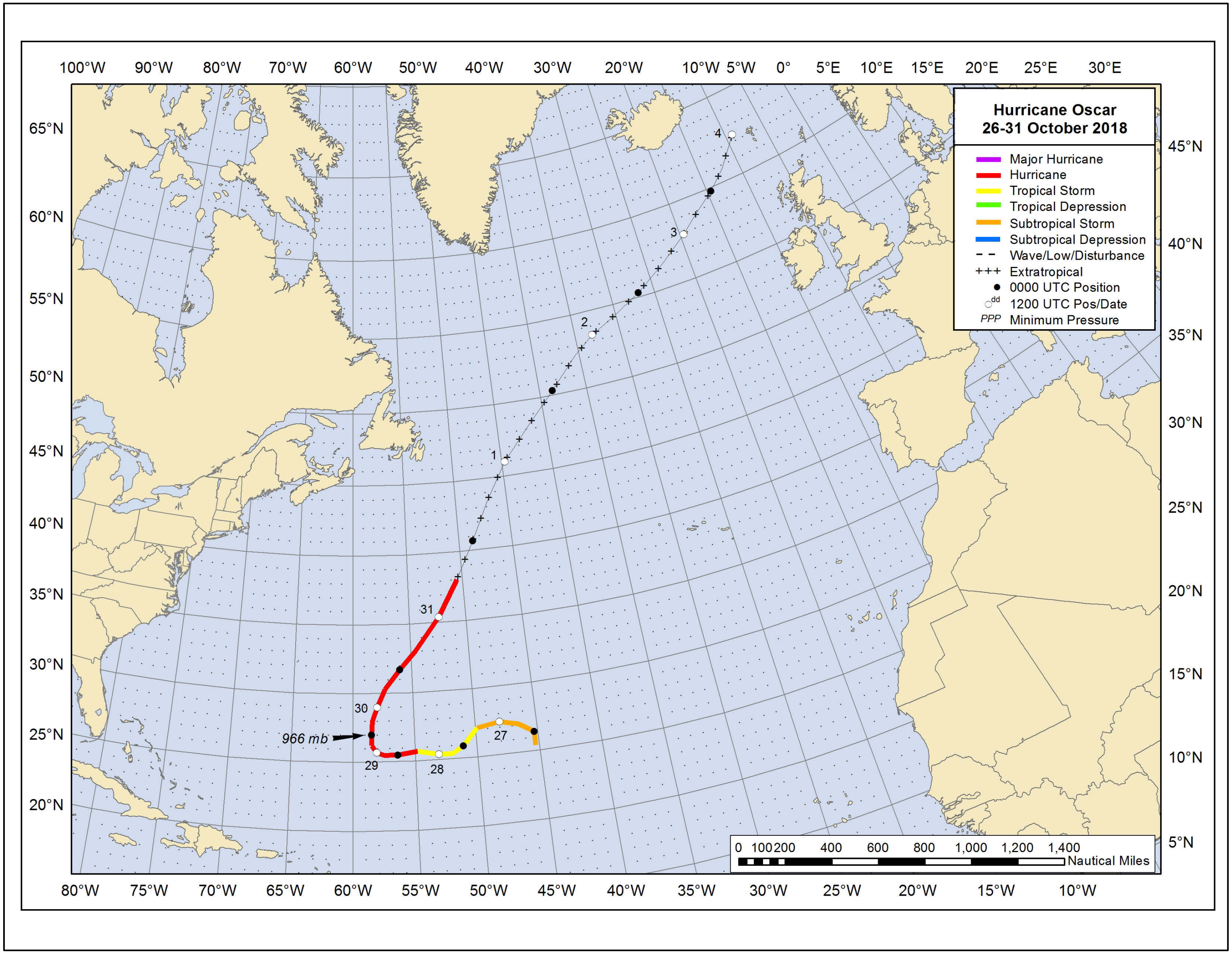

Figure 1. Best track positions for Hurricane Oscar, 26–31 October 2018. Tracks during the extratropical stage are partially based on analyses from the NOAA Ocean Prediction Center.

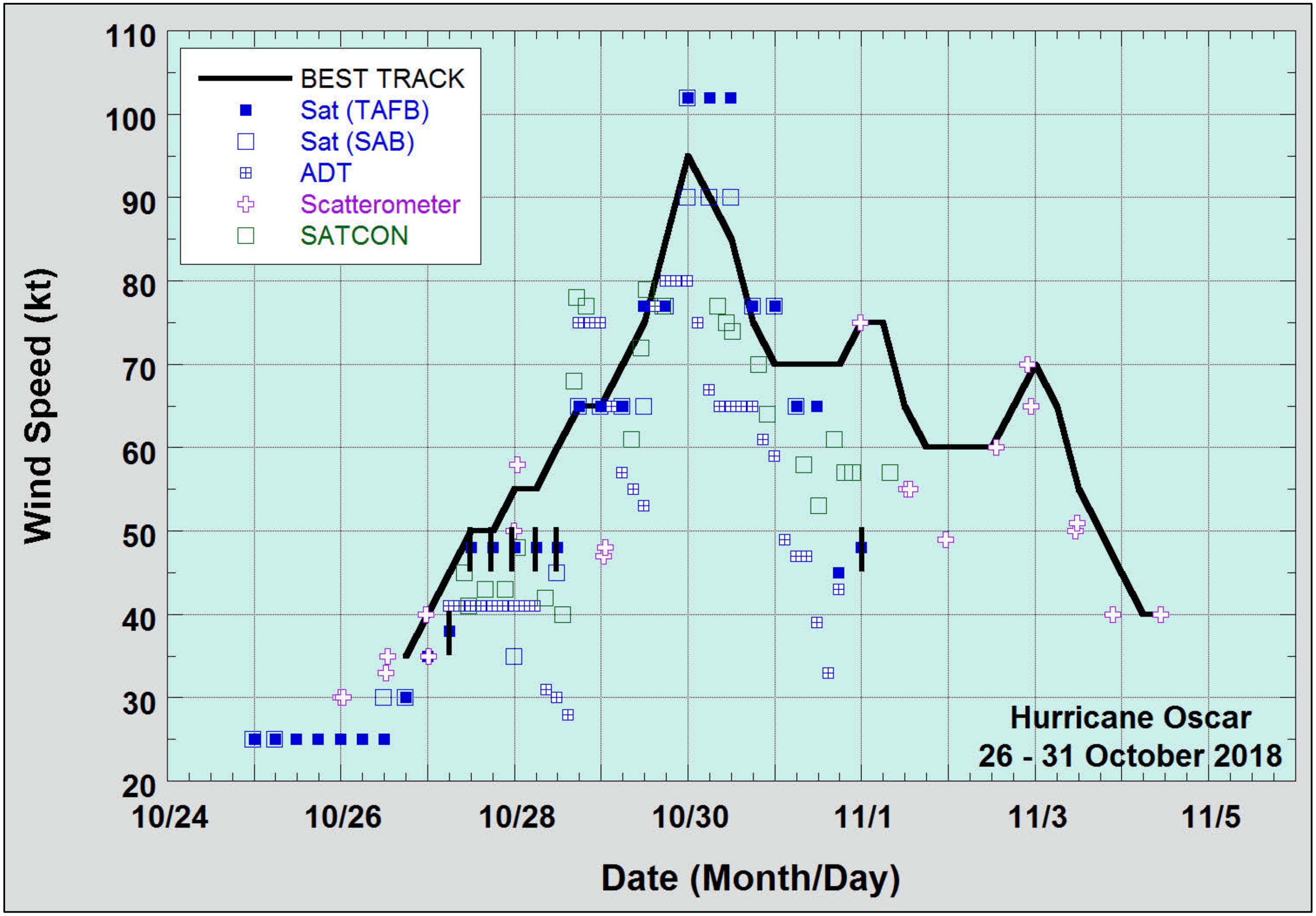

Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Hurricane Oscar, 26–31 October 2018. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies. Dashed vertical lines correspond to 0000 UTC. Solid lines with TAFB classifications indicate the range of wind speed associated Hebert-Poteat subtropical classifications

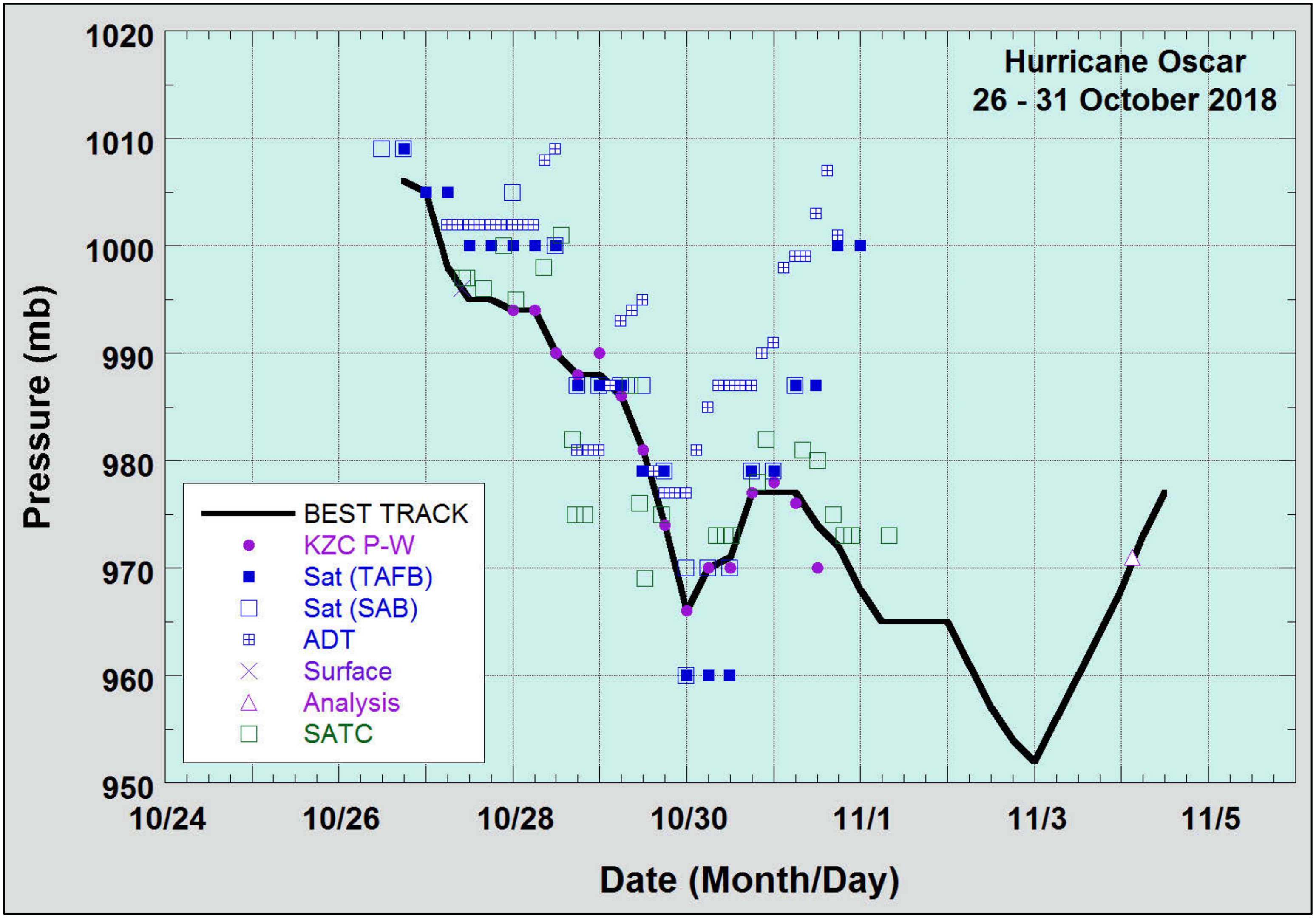

Figure 3. Selected pressure observations and best track minimum central pressure curve for Hurricane Oscar, 26–31 October 2018. SATCON intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies. KZC P-W refers to pressure estimates derived using the Knaff-Zehr-Courtney pressure-wind relationship. Dashed vertical lines correspond to 0000 UTC.

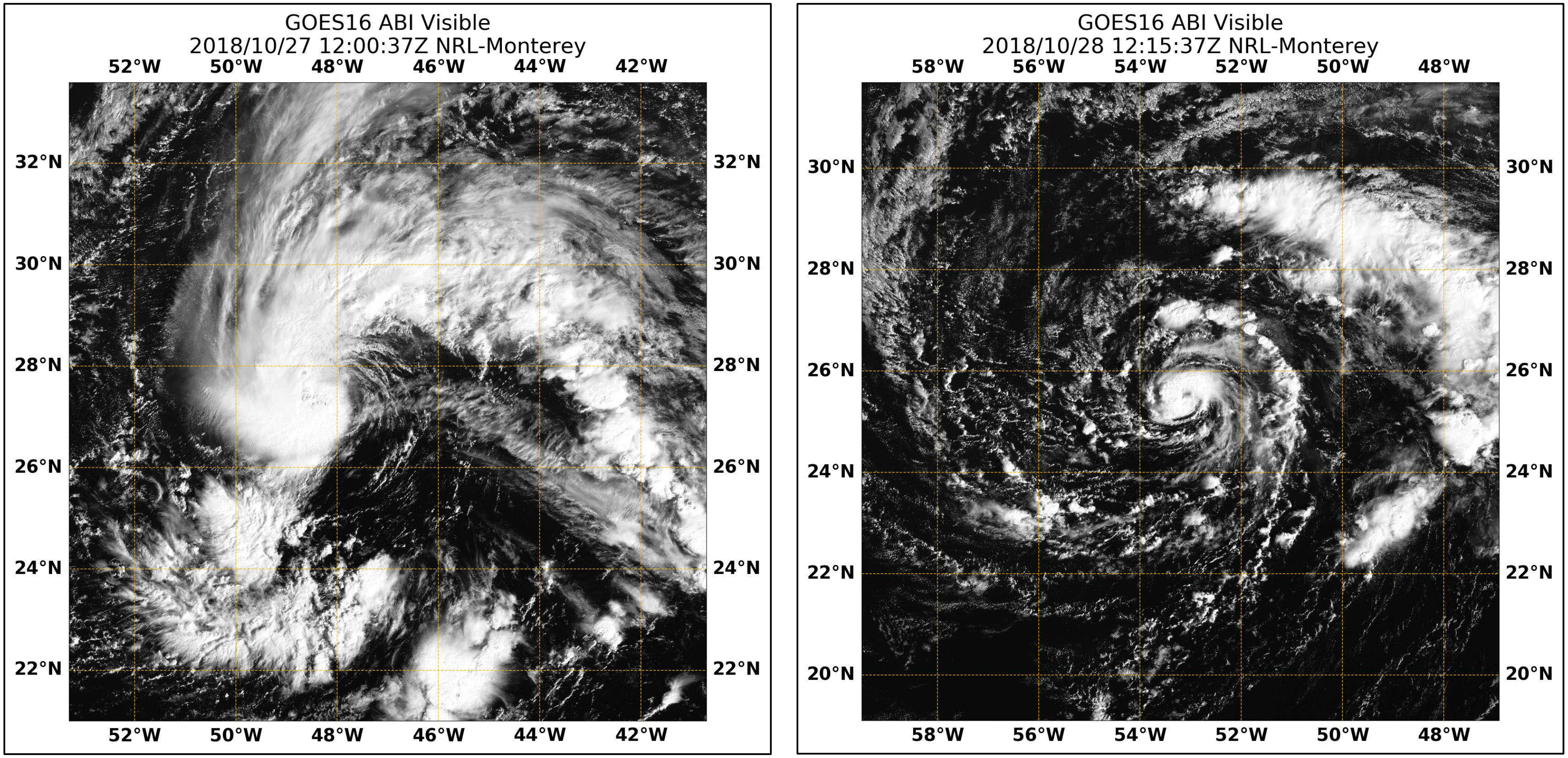

Figure 4. GOES-16 visible satellite images of Oscar at 1200 UTC 27 October (left) while the system was a subtropical storm and 24 h later at 1215 UTC 28 October (right) after Oscar had become a tropical storm. Note the reduction in the outer convective banding, and the smaller overall size of the area of deep convection after Oscar became a tropical cyclone.

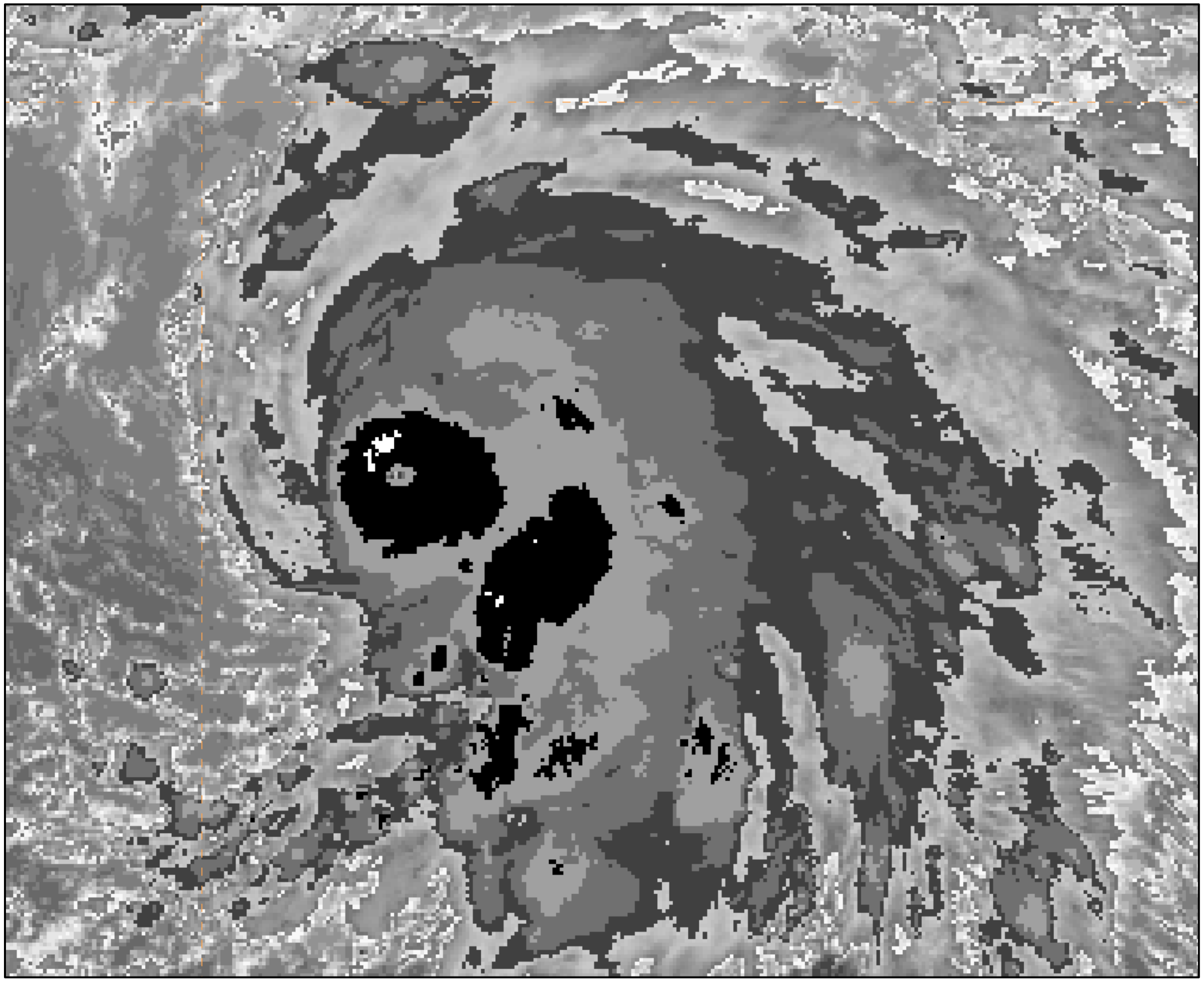

Figure 5. GOES-16 infrared satellite image of Oscar with the Dvorak BD enhancement at the time of its estimated peak intensity of 95 kt at 0000 UTC 30 October 2018.