

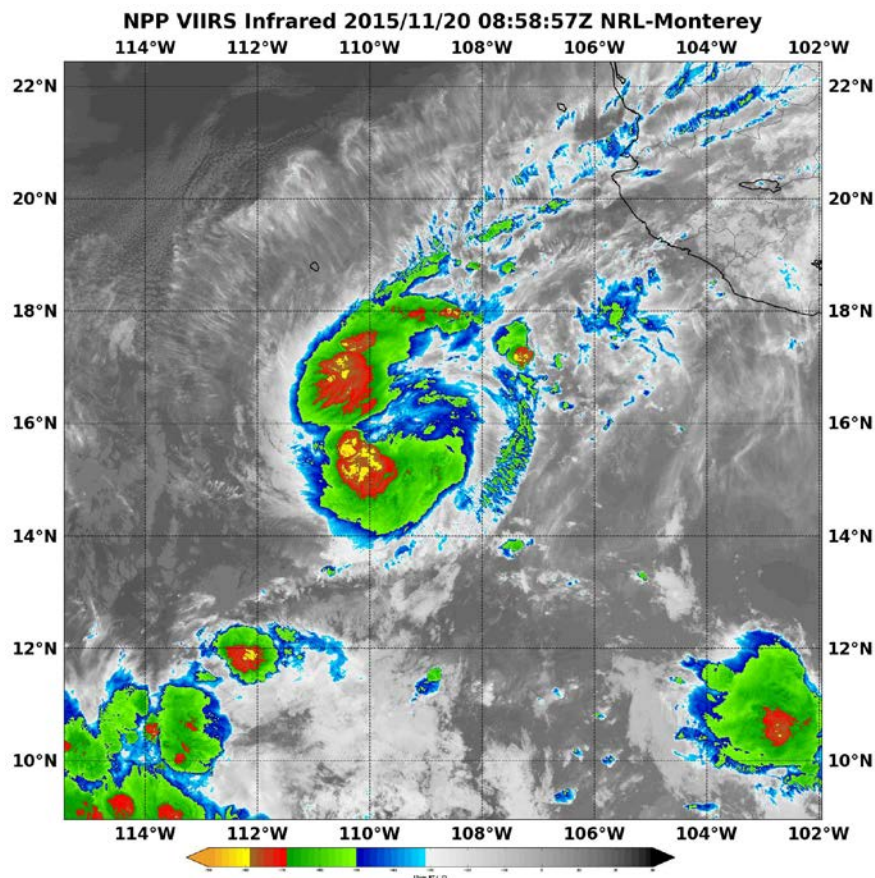


NATIONAL HURRICANE CENTER TROPICAL CYCLONE REPORT

TROPICAL STORM RICK (EP212015)

18 – 22 November 2015

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National Hurricane Center
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SUOMI/NPP VIIRS INFRARED IMAGE OF RICK AT 0859 UTC 20 NOVEMBER. IMAGE COURTESY OF NRL MONTEREY.

Rick was a poorly organized tropical storm that remained far from land.

Tropical Storm Rick

18 – 22 NOVEMBER 2015

SYNOPTIC HISTORY

Rick appears to have formed from a tropical wave that moved westward from the coast of Africa on 3 November. The wave produced episodes of disorganized convection as it crossed the Atlantic Ocean, and it spawned an area of disturbed weather over the Caribbean Sea and the southeastern Gulf of Mexico on 13-15 November. Nothing came of this disturbance, and the tropical wave continued westward into the eastern Pacific. On 16-17 November, the wave encountered the eastern end of a large and persistent area of convection in the Intertropical Convergence Zone, with the resulting interaction leading to the formation of a broad low pressure area. The low became better defined early on 18 November, and it is estimated that a tropical depression formed near 1200 UTC that day about 620 n mi south-southeast of the southern tip of the Baja California Peninsula. 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.

The depression initially moved eastward while embedded in an area of light steering currents. This was followed by a turn toward the north and then the west-northwest on 19 November as a mid-level ridge developed north of the cyclone, and a general west-northwestward motion continued on 20 November. Immediately after genesis, southeasterly vertical wind shear prevented intensification, but when the shear decreased on 19 November, the cyclone strengthened to a tropical storm and to its estimated peak intensity of 35 kt. Dry air entrainment prevented any additional convective organization and strengthening, although Rick would remain a tropical storm until 22 November. The storm turned westward on 21 November, then turned northwestward the next day as it approached a weakness in the ridge. The associated convection dissipated on 22 November due to continuing dry air entrainment, causing Rick to weaken to a depression. This was followed by degeneration to a remnant low near 1800 UTC that day about 585 n mi west-southwest of the southern tip of the Baja California Peninsula.

The remnant low persisted for four days until dissipation on 26 November. It moved generally northwestward on 23-24 November, followed by a southwestward motion on 25 November.

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

METEOROLOGICAL STATISTICS

Observations in Rick (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 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 Tropical Rainfall Measuring Mission (TRMM), 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 Rick.

The analyzed peak intensity of 35 kt is based on Dvorak satellite estimates, as well as ASCAT overpasses on 19 and 20 November. There were no surface observations of tropical-storm-force winds from Rick.

CASUALTY AND DAMAGE STATISTICS

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

FORECAST AND WARNING CRITIQUE

The genesis of Rick was poorly forecast. Rick's precursor disturbance was first noted in the Tropical Weather Outlook (TWO) only 36 h prior to genesis (Table 2), at which time it was given a low chance (<40 %) of development at both the short range (0-48 h) and the medium range (0-120 h). Subsequently, the genesis probabilities increased to medium (40-60 % chance) 18-24 h before genesis. The genesis probability for the medium range was raised to high 18 h before genesis. However, the short range probability was not raised to high until after genesis had occurred in the best track.

A verification of NHC official track forecasts for Rick is given in Table 3a. Official forecast track errors were much greater than the mean official errors for the previous 5-yr period. A homogeneous comparison of the official track errors with selected guidance models is given in Table 3b. Several of the guidance models had lower errors than the official forecast, with the ECMWF (EMXI) and Canadian (CMCI) models being the best overall performers. An examination of the individual forecasts (not shown) suggests the official forecasts indicated a more northward motion for Rick on 21-22 November than actually occurred.

A verification of NHC official intensity forecasts for Rick is given in Table 4a. Official forecast intensity errors were lower than the mean official errors for the previous 5-yr period. However, the errors from the climatology/persistence model (OCD5) were much lower than



normal and were smaller than those of the official forecasts at 12-48 h. Thus, the official forecasts at those times do not meet the National Hurricane Center definition of having skill despite the modest errors. A homogeneous comparison of the official intensity errors with selected guidance models is given in Table 4b. The climatology/persistence, GFS, and ECMWF models had lower errors than the official forecasts at all forecast times in this comparison.

There were no coastal watches or warnings issued for Rick.



Table 1. Best track for Tropical Storm Rick, 18 - 22 November 2015.

| Date/Time (UTC) | Latitude (°N) | Longitude (°W) | Pressure (mb) | Wind Speed (kt) | Stage |
|-----------------|---------------|----------------|---------------|-----------------|---------------------|
| 18 / 0600 | 12.9 | 107.1 | 1007 | 25 | low |
| 18 / 1200 | 12.9 | 106.9 | 1005 | 30 | tropical depression |
| 18 / 1800 | 12.9 | 106.6 | 1004 | 30 | " |
| 19 / 0000 | 13.1 | 106.0 | 1004 | 30 | " |
| 19 / 0600 | 13.7 | 105.8 | 1003 | 30 | " |
| 19 / 1200 | 14.2 | 106.1 | 1002 | 35 | tropical storm |
| 19 / 1800 | 14.7 | 106.8 | 1002 | 35 | " |
| 20 / 0000 | 15.2 | 107.8 | 1002 | 35 | " |
| 20 / 0600 | 15.7 | 109.0 | 1002 | 35 | " |
| 20 / 1200 | 15.9 | 110.1 | 1002 | 35 | " |
| 20 / 1800 | 16.1 | 111.1 | 1002 | 35 | " |
| 21 / 0000 | 16.5 | 112.1 | 1003 | 35 | " |
| 21 / 0600 | 16.8 | 113.3 | 1003 | 35 | " |
| 21 / 1200 | 16.8 | 114.4 | 1003 | 35 | " |
| 21 / 1800 | 16.7 | 115.5 | 1003 | 35 | " |
| 22 / 0000 | 16.8 | 116.5 | 1003 | 35 | " |
| 22 / 0600 | 17.0 | 117.5 | 1004 | 30 | tropical depression |
| 22 / 1200 | 17.4 | 118.2 | 1005 | 30 | " |
| 22 / 1800 | 17.8 | 118.9 | 1005 | 30 | low |
| 23 / 0000 | 18.5 | 119.4 | 1005 | 30 | " |
| 23 / 0600 | 19.1 | 120.0 | 1005 | 30 | " |
| 23 / 1200 | 19.6 | 120.6 | 1006 | 25 | " |
| 23 / 1800 | 20.1 | 121.1 | 1007 | 25 | " |
| 24 / 0000 | 20.6 | 121.7 | 1007 | 25 | " |
| 24 / 0600 | 20.9 | 122.3 | 1007 | 25 | " |
| 24 / 1200 | 21.1 | 123.0 | 1008 | 20 | " |
| 24 / 1800 | 21.4 | 123.7 | 1008 | 20 | " |
| 25 / 0000 | 21.4 | 124.0 | 1008 | 20 | " |
| 25 / 0600 | 21.4 | 124.2 | 1009 | 20 | " |
| 25 / 1200 | 21.3 | 124.6 | 1009 | 20 | " |



| | | | | | |
|-----------|------|-------|------|----|----------------------------------|
| 25 / 1800 | 21.0 | 125.0 | 1009 | 20 | " |
| 26 / 0000 | 20.6 | 125.4 | 1009 | 20 | " |
| 26 / 0600 | 20.2 | 126.0 | 1009 | 20 | " |
| 26 / 1200 | | | | | dissipated |
| 19 / 1200 | 14.2 | 106.1 | 1002 | 35 | maximum wind 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%) | 36 | 36 |
| Medium (40%-60%) | 18 | 24 |
| High (>60%) | - | 18 |



Table 3a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Tropical Storm Rick, 18 – 22 November 2015. 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 | 43.7 | 71.9 | 83.1 | 116.2 | 176.1 | 232.4 | |
| OCD5 | 56.8 | 110.1 | 179.9 | 283.5 | 463.5 | 396.8 | |
| Forecasts | 15 | 13 | 11 | 9 | 5 | 1 | |
| OFCL (2010-14) | 23.4 | 36.4 | 47.2 | 59.4 | 89.0 | 123.6 | 159.5 |
| OCD5 (2010-14) | 36.6 | 74.2 | 116.5 | 159.7 | 245.6 | 331.1 | 427.4 |

Table 3b. Homogeneous comparison of selected track forecast guidance models (in n mi) for Tropical Storm Rick, 18 – 22 November 2015. 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 | 41.1 | 72.4 | 91.0 | 127.2 | 263.3 | | |
| OCD5 | 54.1 | 111.3 | 180.1 | 325.5 | 614.8 | | |
| GFSI | 40.5 | 72.7 | 100.8 | 122.4 | 250.6 | | |
| GHMI | 49.7 | 92.9 | 145.4 | 191.5 | 369.5 | | |
| HWFI | 37.7 | 70.3 | 112.6 | 232.1 | 249.7 | | |
| EMXI | 42.8 | 70.1 | 68.5 | 67.7 | 129.7 | | |
| CMCI | 36.6 | 61.3 | 71.8 | 111.0 | 254.1 | | |
| GFEX | 40.3 | 69.7 | 82.6 | 93.5 | 190.9 | | |
| TVCE | 38.6 | 69.4 | 96.1 | 147.7 | 228.1 | | |
| AEMI | 38.0 | 78.2 | 116.2 | 164.4 | 256.3 | | |
| BAMS | 56.4 | 100.0 | 138.7 | 186.2 | 339.2 | | |
| BAMM | 47.4 | 88.7 | 124.7 | 170.4 | 331.4 | | |
| BAMD | 54.3 | 98.1 | 143.7 | 206.6 | 457.0 | | |
| LBAR | 64.6 | 114.3 | 156.5 | 242.0 | 524.3 | | |
| Forecasts | 13 | 11 | 9 | 5 | 2 | | |

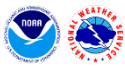


Table 4a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Tropical Storm Rick, 18 – 22 November 2015. Mean errors for the previous 5-yr period are shown for comparison. Official errors that are smaller than the 5-yr means are shown in boldface type.

| | Forecast Period (h) | | | | | | |
|----------------|---------------------|------------|------------|------------|-------------|------------|------|
| | 12 | 24 | 36 | 48 | 72 | 96 | 120 |
| OFCL | 3.3 | 4.6 | 8.2 | 9.4 | 11.0 | 0.0 | |
| OCD5 | 2.3 | 2.8 | 4.9 | 6.3 | 11.8 | 12.0 | |
| Forecasts | 15 | 13 | 11 | 9 | 5 | 1 | |
| OFCL (2010-14) | 5.9 | 9.8 | 12.5 | 14.0 | 15.5 | 16.3 | 14.9 |
| OCD5 (2010-14) | 7.7 | 12.8 | 16.4 | 18.8 | 21.1 | 20.9 | 19.7 |

Table 4b. Homogeneous comparison of selected intensity forecast guidance models (in kt) for Tropical Storm Rick, 18 – 22 November 2015. 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 | 3.6 | 3.3 | 5.7 | 7.0 | | | |
| OCD5 | 1.9 | 2.2 | 3.4 | 4.0 | | | |
| HWFI | 4.2 | 6.9 | 7.1 | 5.0 | | | |
| GHMI | 5.8 | 10.0 | 12.6 | 16.2 | | | |
| DSHP | 3.2 | 4.3 | 5.6 | 8.8 | | | |
| LGEM | 2.4 | 3.4 | 4.4 | 7.8 | | | |
| ICON | 3.5 | 4.4 | 5.3 | 7.2 | | | |
| IVCN | 3.5 | 4.4 | 5.3 | 7.2 | | | |
| GFNI | 3.1 | 8.2 | 12.7 | 14.2 | | | |
| GFSI | 2.0 | 3.2 | 3.9 | 5.0 | | | |
| EMXI | 2.0 | 3.0 | 3.1 | 3.0 | | | |
| Forecasts | 11 | 9 | 7 | 5 | | | |

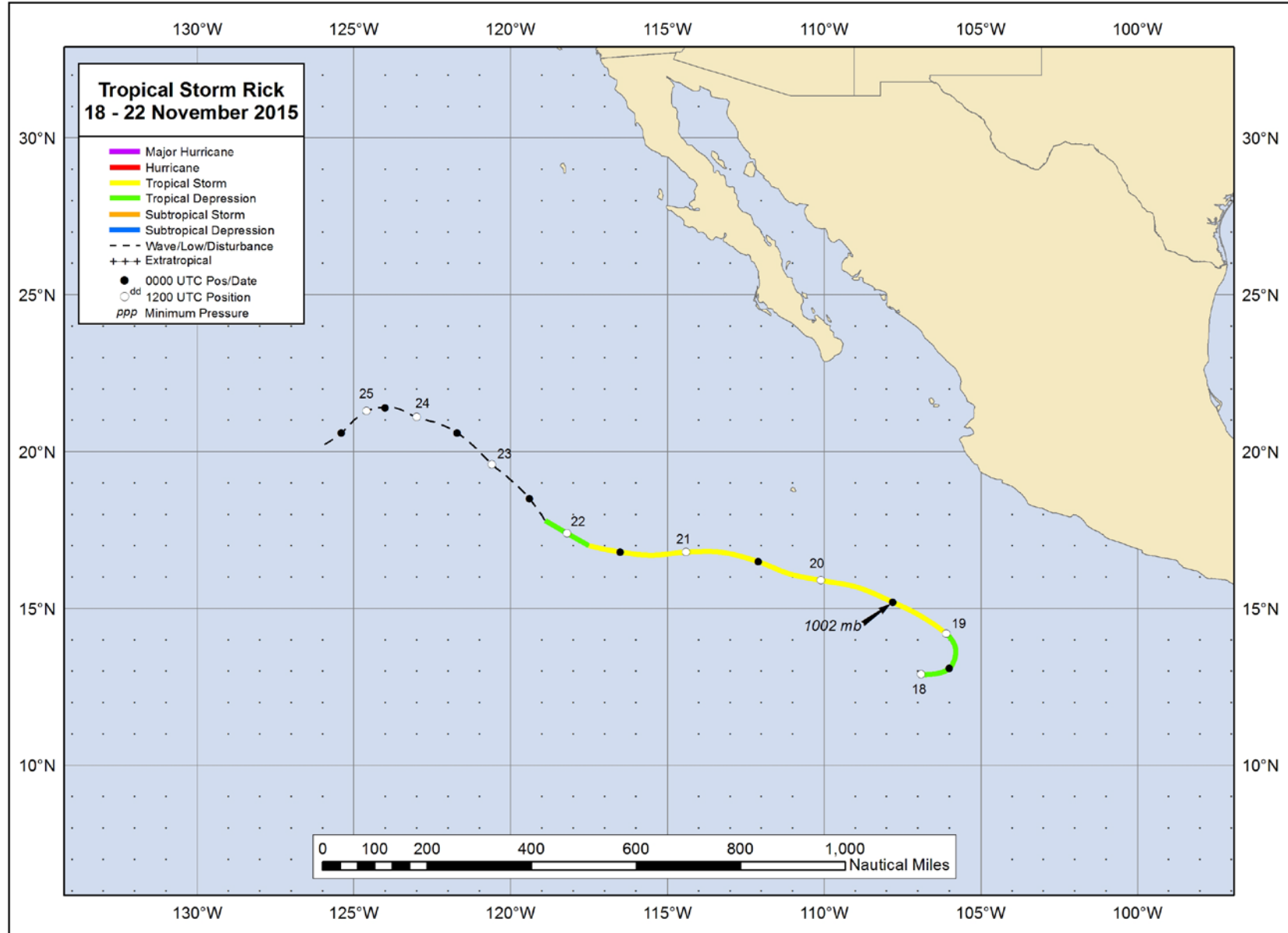


Figure 1. Best track positions for Tropical Storm Rick, 18 – 22 November 2015.

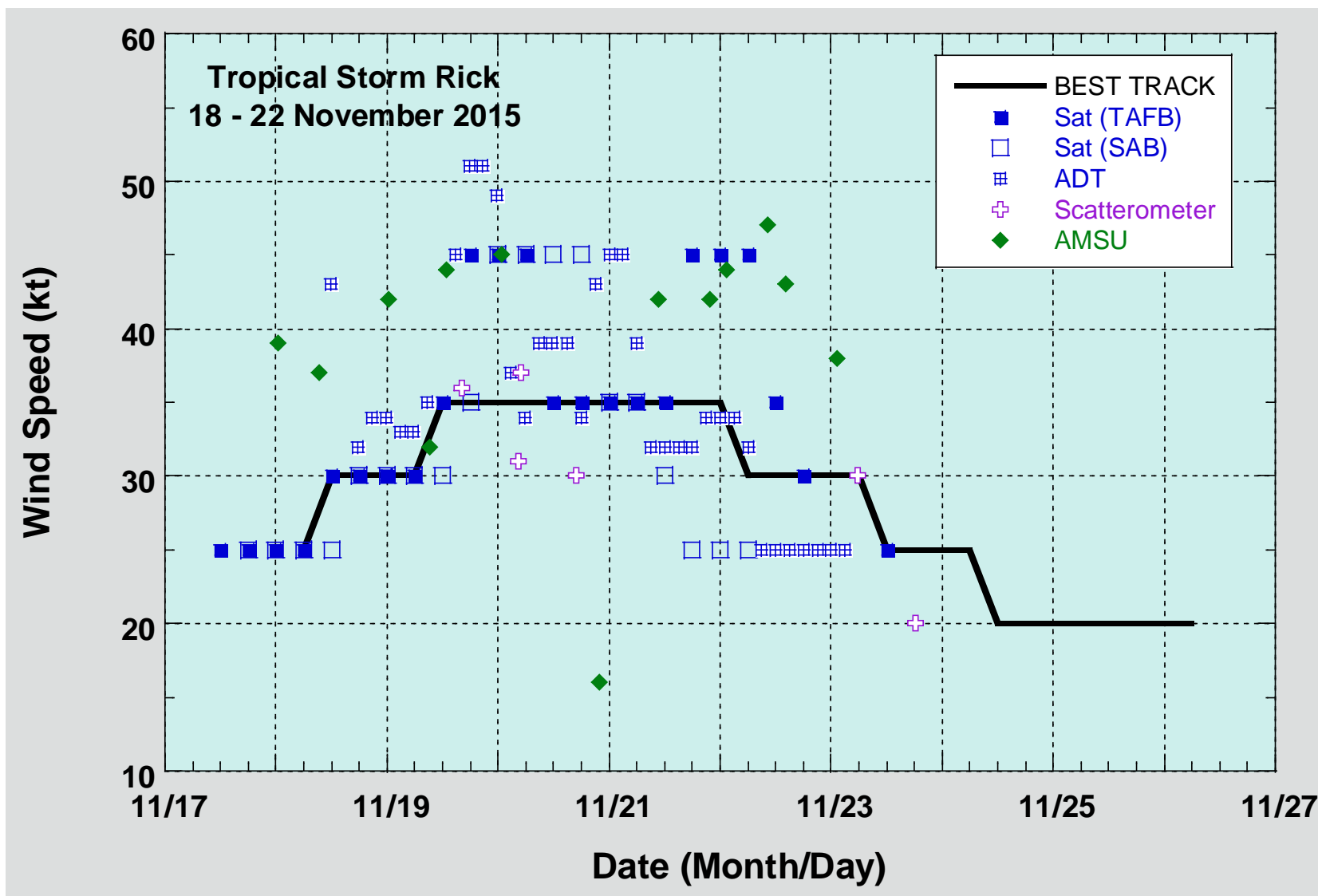


Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Tropical Storm Rick, 18 – 22 November 2015. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. AMSU intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies technique. Dashed vertical lines correspond to 0000 UTC.

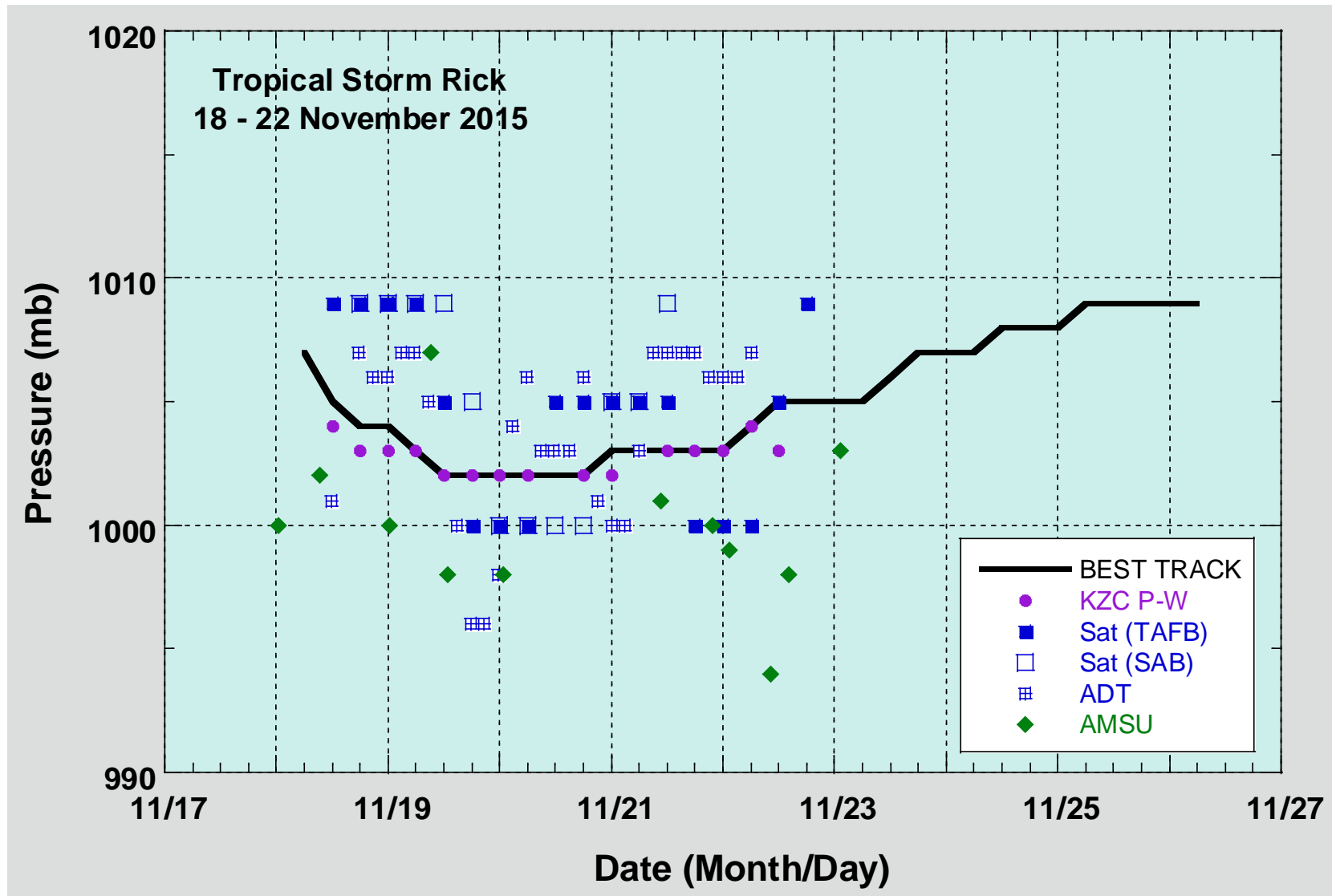


Figure 3. Selected pressure observations and best track minimum central pressure curve for Tropical Storm Rick, 18 – 22 November 2015. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. AMSU intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies technique. KZC P-W refers to pressure estimates derived using the Knaff-Zehr-Courtney pressure-wind relationship. Dashed vertical lines correspond to 0000 UTC.