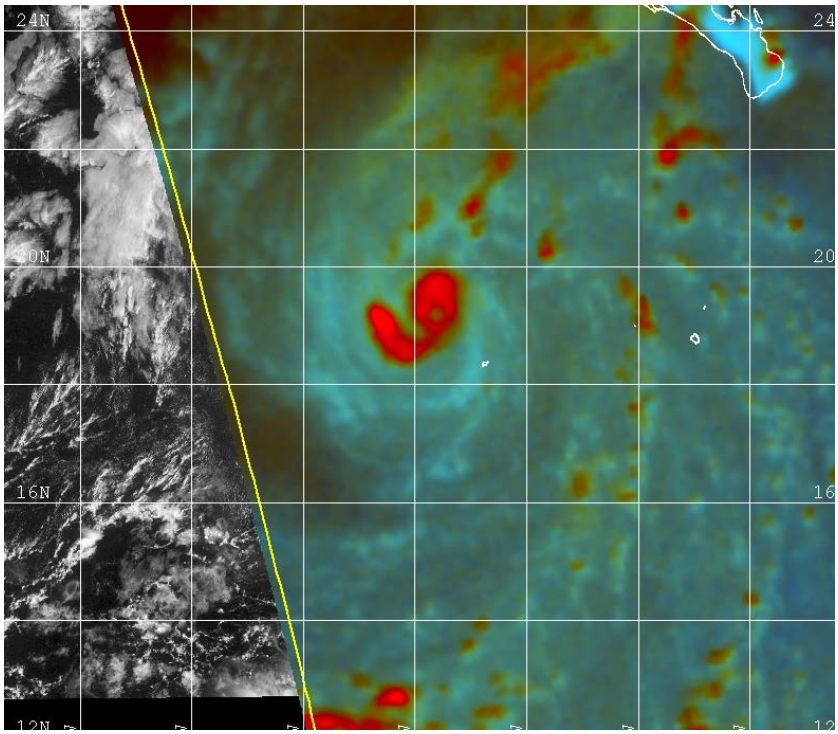
# NATIONAL HURRICANE CENTER
# TROPICAL CYCLONE REPORT

## TROPICAL STORM KEVIN

(EP142015)

31 August – 5 September 2015

Todd B. Kimberlain
National Hurricane Center
28 November 2015




**SSMI 85-GHZ MICROWAVE IMAGE OF TROPICAL STORM KEVIN NEAR PEAK INTENSITY AT 2200 UTC 3 SEPTEMBER**

Kevin was a storm that formed well south-southwest of the southern tip of the Baja California peninsula and moved generally northward. The cyclone reached a peak intensity when it recurved, and then weakened in a high-shear environment, dissipating a few hundred miles west of Baja California Sur.

# TROPICAL STORM KEVIN

**31 AUGUST – 5 SEPTEMBER 2015**

## SYNOPTIC HISTORY

Kevin appears to have originated from a tropical wave that crossed Central America on 25 August, and it is possible that this was the same wave that emerged from the west coast of Africa on 14 August and spawned Atlantic Hurricane Danny. After reaching the eastern Pacific basin, the wave moved westward for several days with only transient bursts of deep convection. A significant increase in deep convection occurred on 29 August, and an elongated area of low pressure formed by the following day at a relatively low latitude between 105ºW and 110ºW. By early on 31 August, a burst of convection developed on the northwestern periphery of a mid-level cyclonic circulation that had formed the day before, and a surface low pressure system formed underneath the northwestern edge of this convective mass by 1800 UTC. Visible satellite imagery indicated that the circulation of the low was already well defined, even though it contained multiple swirls rotating around a mean center, and a tropical depression formed about 650 n mi south of the southern tip of the Baja California peninsula. The "best track" chart of 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].

The depression was not in an ideal environment, with southerly shear and convergent upper-level flow associated with a mid- to upper-level trough to the northwest impeding significant intensification. During the next couple of days, the cyclone moved northwestward and then north-northwestward between the flow on the southwestern periphery of a mid-level subtropical ridge near southern Mexico and the trough to the west. The depression reached tropical storm strength at 1800 UTC 1 September while centered about 630 n mi south-southwest of the southern tip of Baja California, but there was little change in intensity during the next day or so. Moderate southerly shear continued to affect Kevin on 3 September when the cyclone turned northward, but the upper-level flow was becoming more divergent. Kevin's cloud pattern became better organized around this time, and a microwave pass over the cyclone showed a mid-level eye late on 3 September about 20 n mi north of the low-level center. Kevin is estimated from satellite imagery to have reached a peak intensity of 50 kt around 1800 UTC that day at its point of recurvature.

The shear increased on 4 September, which caused slow weakening to begin while Kevin moved north-northeastward. Southwesterly shear increased further later that day, and the mid-level circulation began to separate from the low-level center after 2100 UTC. By 0600 UTC 5 September, the low- and mid-level centers of the cyclone were several hundred n mi apart. Kevin became a remnant low about 240 n mi west of the southern tip of the Baja California peninsula

[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.

around 1200 UTC when it lost all of its deep convection, and its forward speed then abruptly decreased. The low drifted northwestward until dissipating early the next day.

## METEOROLOGICAL STATISTICS

Observations in Kevin (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 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 Kevin.

Kevin's estimated peak intensity of 50 kt is based on a blend of TAFB and SAB Dvorak satellite classifications at 1800 UTC 3 September, around the time microwave imagery indicated the presence of a small and well-defined mid-level eye.

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

## CASUALTY AND DAMAGE STATISTICS

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

## FORECAST AND WARNING CRITIQUE

Kevin's genesis was reasonably well forecast (Table 2). The system from which the cyclone developed was introduced in the Tropical Weather Outlook (TWO) with a low chance (< 40 %) of development 102 h prior to genesis, but did not reach the medium (40-60%) and high (70% or greater) categories until 48 h and 30 h before genesis, respectively. The system from which Kevin formed was included in the 48-h portion of the TWO about 42 h before tropical cyclone formation, however, it only reached the high category 18 h prior to tropical cyclone formation.

A verification of NHC official track forecasts for Kevin is given in Table 3a. Official forecast track errors were greater than the mean official errors for the previous 5-yr period through 48 h but lower than the 5-yr mean track errors at 72 h and 96 h. However, the sample size by 96 h is too low to draw any meaningful conclusions. The greater-than-normal track errors through 48 h are generally due to a westward shift in the track beginning on 3 September, with the expectation that Kevin would become a weaker and shallower system and turn toward the northwest much

sooner. A homogeneous comparison of the official track errors with selected guidance models is given in Table 3b. The official track forecasts bested most of the guidance, with the European model (EMXI), a couple of consensus aids, and the GFS ensemble mean (AEMI) occasionally slightly outperforming the official forecasts at various forecast times.

A verification of NHC official intensity forecasts for Kevin is given in Table 4a. Official forecast intensity errors were lower than for the previous 5-yr period at all times through 96 h. The official forecasts correctly anticipated that Kevin would not intensify much as a result of the only marginally conducive environment. A homogeneous comparison of the official intensity errors with selected guidance models is given in Table 4b. In general, the official intensity forecast bested the guidance, with the GFDL model (GHMI) the only other competitive model.

There were no coastal watches or warnings associated with Kevin.

Table 1. Best track for Tropical Storm Kevin, 31 August – 5 September 2015.

| Date/Time (UTC) | Latitude (°N) | Longitude (°W) | Pressure (mb) | Wind Speed (kt) | Stage |
|---|---|---|---|---|---|
| 31 / 1800 | 11.8 | 111.7 | 1006 | 30 | tropical depression |
| 01 / 0000 | 12.0 | 112.4 | 1006 | 30 | " |
| 01 / 0600 | 12.2 | 113.1 | 1006 | 30 | " |
| 01 / 1200 | 12.6 | 113.5 | 1006 | 30 | " |
| 01 / 1800 | 13.1 | 113.9 | 1006 | 35 | tropical storm |
| 02 / 0000 | 13.8 | 114.2 | 1006 | 35 | " |
| 02 / 0600 | 14.7 | 114.4 | 1005 | 35 | " |
| 02 / 1200 | 15.6 | 114.7 | 1005 | 35 | " |
| 02 / 1800 | 16.2 | 114.9 | 1005 | 35 | " |
| 03 / 0000 | 16.7 | 115.1 | 1003 | 40 | " |
| 03 / 0600 | 17.2 | 115.4 | 1001 | 45 | " |
| 03 / 1200 | 17.7 | 115.6 | 1000 | 45 | " |
| 03 / 1800 | 18.5 | 115.8 | 998 | 50 | " |
| 04 / 0000 | 19.4 | 115.7 | 999 | 45 | " |
| 04 / 0600 | 20.2 | 115.5 | 1000 | 45 | " |
| 04 / 1200 | 20.9 | 115.3 | 1001 | 45 | " |
| 04 / 1800 | 21.6 | 115.1 | 1002 | 40 | " |
| 05 / 0000 | 22.3 | 114.8 | 1003 | 35 | " |
| 05 / 0600 | 22.8 | 114.6 | 1005 | 30 | tropical depression |
| 05 / 1200 | 23.2 | 114.3 | 1008 | 25 | low |
| 05 / 1800 | 23.7 | 114.5 | 1010 | 20 | " |
| 06 / 0000 | 24.0 | 114.7 | 1012 | 15 | " |
| 06 / 0600 | 24.1 | 114.8 | 1013 | 15 | " |
| 06 / 1200 | | | | | dissipated |
| 03 / 1800 | 18.5 | 115.8 | 998 | 50 | maximum winds 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%) | 42 | 108 |
| Medium (40%-60%) | 24 | 48 |
| High (>70%) | 18 | 30 |

Table 3a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Tropical Storm Kevin, 31 August – 5 September 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 | 35.1 | 54.0 | 64.8 | 72.8 | **78.7** | **65.2** | |
| OCD5 | 41.3 | 81.7 | 126.6 | 186.9 | 383.5 | 587.2 | |
| Forecasts | 17 | 15 | 13 | 11 | 7 | 3 | |
| OFCL (2010-14) | 23.4 | 36.4 | 47.2 | 59.4 | 89.0 | 123.6 | |
| OCD5 (2010-14) | 36.6 | 74.2 | 116.5 | 159.7 | 245.6 | 331.1 | |

Table 3b. Homogeneous comparison of selected track forecast guidance models (in n mi) for Tropical Storm Kevin, 31 August – 5 September 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 | 31.0 | 45.6 | 61.6 | 63.7 | 60.6 | 58.4 | |
| OCD5 | 42.4 | 85.8 | 126.9 | 187.5 | 410.9 | 664.8 | |
| GFSI | 39.3 | 62.4 | 84.7 | 92.2 | 99.8 | 93.6 | |
| GHMI | 35.9 | 49.9 | 69.7 | 82.6 | 106.2 | 123.8 | |
| HWFI | 40.4 | 48.6 | 67.5 | 77.7 | 126.9 | 162.4 | |
| EGRI | 40.8 | 57.1 | 77.8 | 85.7 | 137.2 | 226.1 | |
| EMXI | 31.4 | **42.7** | 65.1 | 83.2 | 62.2 | 95.8 | |
| NVGI | 36.3 | 52.9 | 81.3 | 123.5 | 339.1 | 581.0 | |
| CMCI | 36.7 | 55.0 | 79.6 | 106.6 | 170.0 | 428.7 | |
| TCON | 34.3 | **44.3** | 63.8 | 67.3 | 81.7 | 83.2 | |
| TVCE | 32.2 | **42.6** | **59.6** | 64.3 | 73.9 | 60.4 | |
| AEMI | 32.8 | 47.1 | 62.9 | **59.7** | 69.4 | 77.8 | |
| BAMS | 42.0 | 66.7 | 83.6 | 97.5 | 183.9 | 435.0 | |
| BAMM | 40.5 | 63.5 | 80.6 | 89.3 | 137.1 | 333.7 | |
| BAMD | 47.5 | 78.5 | 132.7 | 181.1 | 277.6 | 277.3 | |
| Forecasts | 12 | 11 | 11 | 9 | 5 | 1 | |

Table 4a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Tropical Storm Kevin, 31 August – 5 September 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 | **5.3** | **7.3** | **9.6** | **8.2** | **11.4** | **6.7** | |
| OCD5 | 7.5 | 9.8 | 11.2 | 8.9 | 17.9 | 28.3 | |
| Forecasts | 17 | 15 | 13 | 11 | 7 | 3 | |
| OFCL (2010-14) | 5.9 | 9.8 | 12.5 | 14.0 | 15.5 | 16.3 | |
| OCD5 (2010-14) | 7.7 | 12.8 | 16.4 | 18.8 | 21.1 | 20.9 | |

Table 4b. Homogeneous comparison of selected intensity forecast guidance models (in kt) for Tropical Storm Kevin, 31 August – 5 September 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 5a due to the homogeneity requirement.

| Model ID | Forecast Period (h) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 12 | 24 | 36 | 48 | 72 | 96 | 120 |
| OFCL | **5.3** | 7.3 | 9.6 | 8.2 | 11.4 | 6.7 | |
| OCD5 | 7.5 | 9.8 | 11.2 | 8.9 | 17.9 | 28.3 | |
| HWFI | 5.9 | 8.7 | 11.8 | 13.2 | 18.6 | 15.7 | |
| GHMI | 5.5 | **6.6** | **7.5** | **3.5** | **9.1** | 13.7 | |
| DSHP | 7.4 | 8.5 | **9.5** | 8.7 | 12.3 | 16.7 | |
| LGEM | 8.4 | 9.6 | 12.3 | 13.9 | 17.3 | 14.3 | |
| ICON | 6.4 | 7.8 | **9.2** | 8.5 | 13.7 | 15.0 | |
| GFSI | 8.2 | 10.5 | 12.1 | 14.1 | 18.1 | 12.0 | |
| EMXI | 8.7 | 10.1 | 11.2 | 12.1 | **10.6** | **3.7** | |
| Forecasts | 17 | 15 | 13 | 11 | 7 | 3 | |

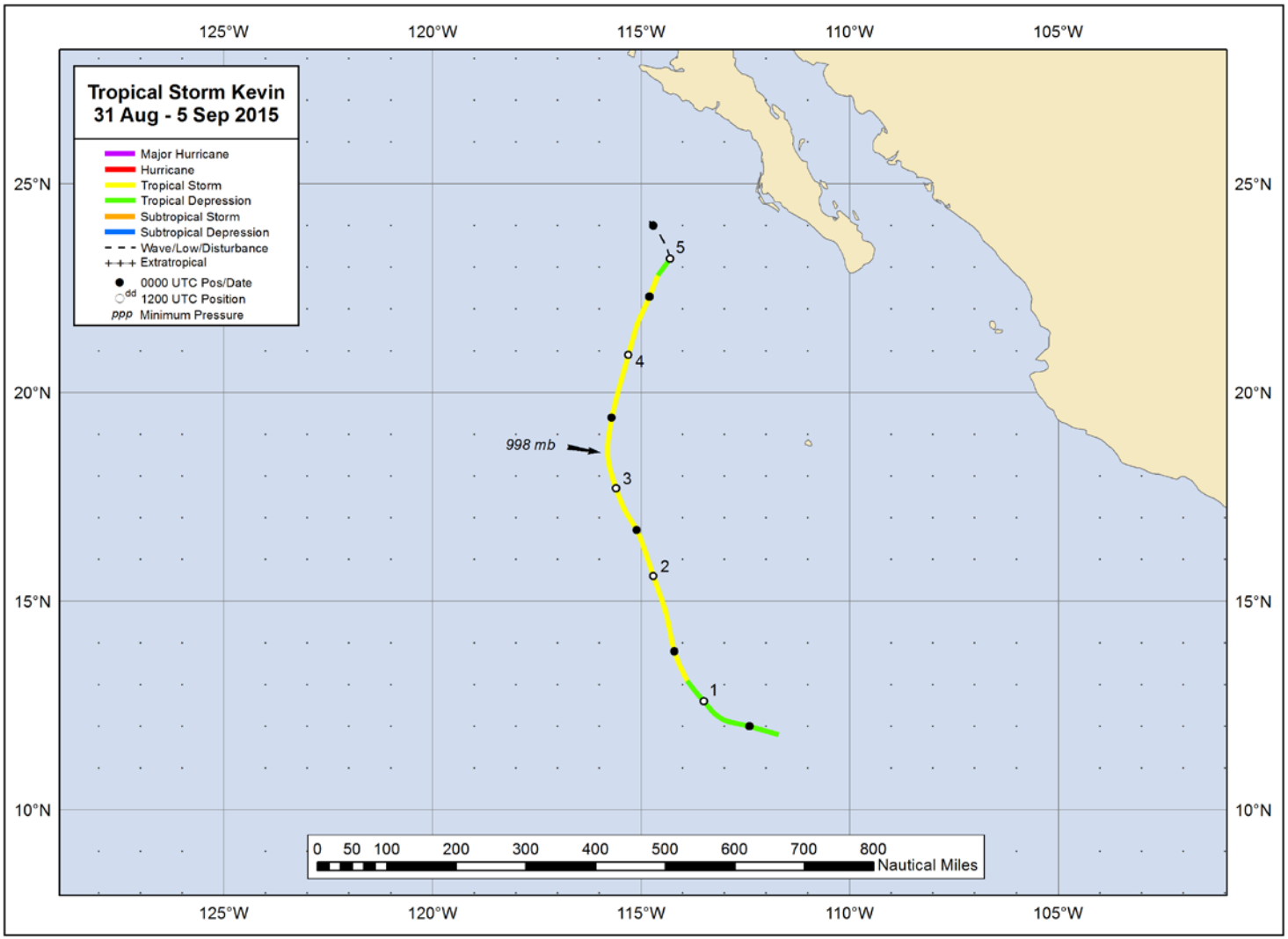



Figure 1. Best track positions for Tropical Storm Kevin, 31 August – 5 September 2015.

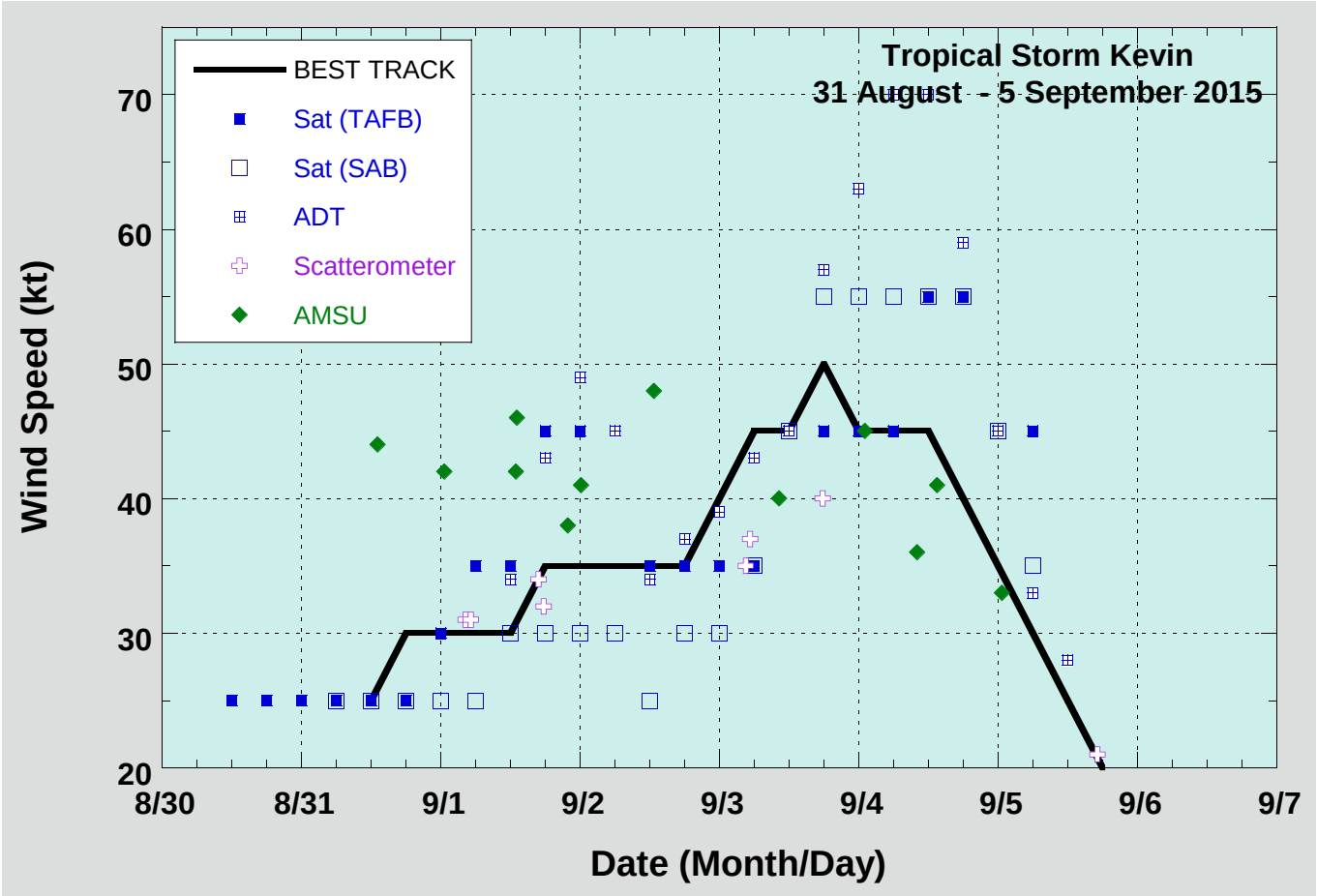



Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Tropical Storm Kevin, 31 August – 5 September 2015. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. AMSU intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies technique. Dashed vertical lines correspond to 0000 UTC.

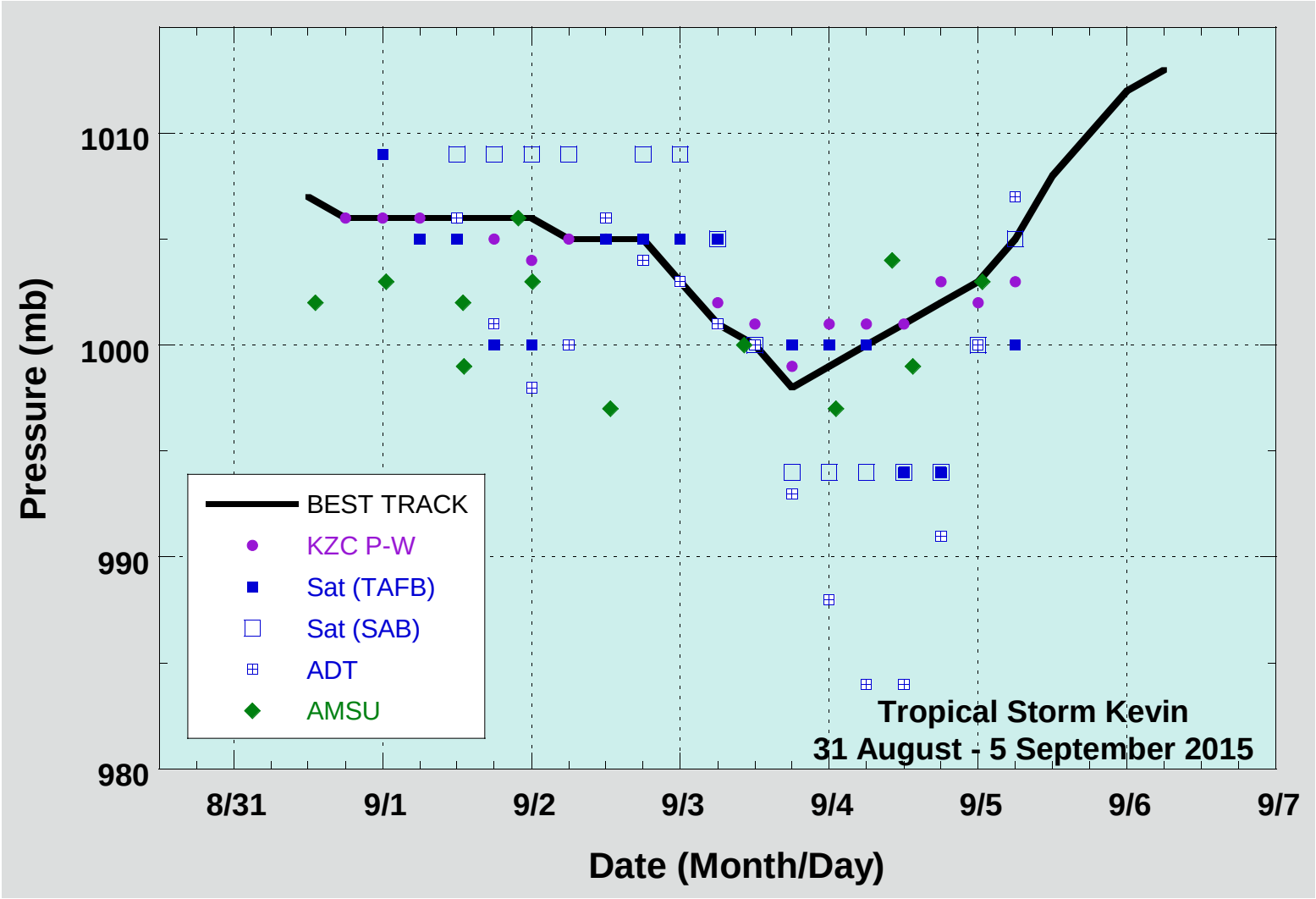



Figure 3. Selected pressure observations and best track minimum central pressure curve for Tropical Storm Kevin, 31 August – 5 September 2015. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. AMSU intensity estimates are from the Cooperative Institute 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.