

Tropical Cyclone Report
Tropical Storm Fernanda
(EP062011)
15-19 August 2011

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Fernanda became a strong tropical storm that crossed into the central Pacific hurricane basin before dissipating as it approached the Hawaiian Islands.

a. Synoptic History

A tropical wave that spawned Atlantic Tropical Storm Emily near the Lesser Antilles on 2 August likely played a role in the genesis of Fernanda. This wave crossed Central America and entered the eastern North Pacific on 6 August, and it produced intermittent, disorganized deep convection as it continued moving slowly westward over the following week. By 13 August there was some evidence of a low-level circulation, and on the following day a well-defined low-cloud circulation became evident. At that time, however, the system lacked sufficient organized deep convection to be designated as a tropical cyclone. By 1800 UTC 15 August, the associated showers and thunderstorms had become more persistent in curved bands over the southern and western portions of the circulation, and it is estimated that a tropical depression formed while centered about 1400 n mi east-southeast of the island of Hawaii. 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. Deep convection then increased and the system strengthened into a tropical storm by 0600 UTC 16 August, although east-northeasterly shear was displacing much of the convection to the west and southwest of the center. Later that day, the shear apparently relaxed, the cloud pattern become better organized into spiral bands, and the cyclone strengthened to an estimated intensity of 45 kt.

Easterly flow associated with a subtropical ridge had been steering the tropical cyclone on a generally westward heading at 7-10 kt, and this regime continued until 17 August, when Fernanda encountered a weakness in the subtropical ridge. The storm turned toward the west-northwest and strengthened some more, having developed a compact, circularly symmetric cloud pattern. Fernanda reached its peak intensity of 60 kt by 0600 UTC 18 August, just before crossing into the central Pacific hurricane Basin. The storm maintained this strength until dry and more stable air caused a weakening trend to commence late on 18 August. Fernanda moved on a generally west-northwestward track for the next couple of days along the southern flank of the ridge while steadily decreasing in strength, due to both unfavorable thermodynamic

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.

conditions and increasing south-southeasterly shear. By 20 August most of the deep convection associated with the cyclone had dissipated, and the system degenerated into a post-tropical remnant low. The low moved westward for a day or so before completely dissipating a couple hundred n mi south of the island of Hawaii on 21 August.

b. Meteorological Statistics

Observations in Fernanda (Figs. 2 and 3) include subjective satellite-based Dvorak technique intensity estimates from the Tropical Analysis and Forecast Branch (TAFB), the Satellite Analysis Branch (SAB), the Central Pacific Hurricane Center (CPHC), 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 Sounder Unit (AMSU), the NASA Tropical Rainfall Measuring Mission (TRMM) and Aqua, 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 Fernanda. Fernanda's peak intensity of 60 kt is based on a blend of subjective and objective Dvorak estimates. Microwave imagery around the time of the storm's peak intensity of 60 kt showed an eye-like feature (Fig. 4) that was not evident in visible or infrared images from the GOES-West geostationary satellite.

No ship reports of winds of tropical storm force associated with Fernanda were received.

c. Casualty and Damage Statistics

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

d. Forecast and Warning Critique

Fernanda's formation was well anticipated. The area of low pressure and disturbed weather that eventually became the tropical cyclone was first mentioned in the National Hurricane Center's (NHC's) Tropical Weather Outlook (TWO) 66 h prior to genesis, and it was given a "low" (10%) chance of development within 48 h. The formation probability was raised to "medium" (30%) 6 h later and changed to "high" (70%) 51 h prior to genesis. A high probability (70 to 80%) was then maintained in the TWOs until the actual time of tropical cyclone formation.

A verification of NHC official track forecasts for Fernanda is given in Table 2a. The official forecast track errors were considerably lower than the mean official errors for the previous 5-yr period, which is not surprising since the climatology and persistence track forecast errors for this storm were also considerably less than the long-term averages. A homogeneous comparison of the official track errors with selected guidance models is given in Table 2b, where it can be seen that, in almost all cases, the official forecasts were comparable to or better than the numerical guidance.

A verification of NHC official intensity forecasts for Fernanda is given in Table 3a. Official forecast intensity errors were smaller than the mean official errors for the previous 5-yr period. In general, the official forecasts, which correctly took into account the marginal atmospheric and oceanic environment, did not indicate significant strengthening. The mean climatology and persistence intensity forecast errors were smaller than the corresponding long-term means except at 96 h, although it should be noted that there was only one case to verify at that forecast interval. A homogeneous comparison of the mean official intensity errors with those for selected guidance models is given in Table 3b. The intensity consensus models, ICON and IVCN, were a little better than the official forecasts at 36 and 48 h. Interestingly, the Decay-SHIPS (DSHP) intensity guidance was better than LGEM for Fernanda whereas the reverse is typically true for those two models.

Acknowledgements.

Jeffrey Powell of the Central Pacific Hurricane Center provided the best track of Fernanda west of 140°W. John Cangialosi and Todd Kimberlain assisted in the production of the figures and tables.

Table 1. Best track for Tropical Storm Fernanda, 15-19 August 2011.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
14 / 1200	12.3	126.5	1008	25	low
14 / 1800	12.3	127.8	1008	25	"
15 / 0000	12.3	129.0	1008	25	"
15 / 0600	12.3	130.1	1007	30	"
15 / 1200	12.2	131.0	1007	30	"
15 / 1800	12.1	131.8	1007	30	tropical depression
16 / 0000	12.2	132.6	1007	30	"
16 / 0600	12.2	133.4	1005	35	tropical storm
16 / 1200	11.9	134.2	1004	40	"
16 / 1800	11.6	135.1	1001	45	"
17 / 0000	11.6	135.9	1000	45	"
17 / 0600	11.6	136.6	1000	45	"
17 / 1200	11.8	137.3	1000	45	"
17 / 1800	12.0	138.0	1000	45	"
18 / 0000	12.4	138.8	997	50	"
18 / 0600	12.9	139.5	992	60	"
18 / 1200	13.5	140.4	992	60	"
18 / 1800	14.0	141.3	994	55	"
19 / 0000	14.5	142.2	994	55	"
19 / 0600	14.8	143.2	997	45	"
19 / 1200	15.1	144.1	1002	35	"
19 / 1800	15.4	145.3	1005	30	tropical depression
20 / 0000	15.5	146.5	1007	25	low
20 / 0600	15.6	147.7	1009	25	"
20 / 1200	15.7	148.8	1010	25	"
20 / 1800	15.8	149.9	1010	25	"
21 / 0000	16.0	151.1	1011	25	"
21 / 0600	16.1	152.4	1011	25	"
21 / 1200	15.9	153.7	1011	25	"
21 / 1800					dissipated
18 / 0600	12.9	139.5	992	60	minimum pressure

Table 2a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Tropical Storm Fernanda, 15-19 August 2011. Mean errors for the 5-yr period 2006-10 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 (Fernanda)	21.1	32.6	35.4	38.2	67.9	123.1	
OCD5 (Fernanda)	35.8	66.1	88.2	102.7	83.9	108.5	
Forecasts	11	11	11	9	5	1	
OFCL (2006-10)	31.0	50.6	69.9	89.5	133.2	174.2	
OCD5 (2006-10)	47.7	98.3	156.4	218.1	323.3	402.2	

Table 2b. Homogeneous comparison of selected track forecast guidance models (in n mi) for Tropical Storm Fernanda, 15-19 August 2011. 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 2a due to the homogeneity requirement.

Model ID	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL	16.9	27.9	32.0	39.3	50.4		
OCD5	34.6	64.9	86.6	108.5	111.3		
GFSI	14.0	32.8	55.8	91.7	174.3		
GHMI	28.9	42.0	43.9	64.9	136.4		
HWFI	28.9	56.6	66.2	90.1	147.5		
NGPI	37.9	50.9	52.6	78.1	280.6		
UKMI	33.1	52.8	67.7	88.3	152.9		
EMXI	26.0	44.6	54.4	50.8	34.5		
CMCI	40.8	60.2	76.3	83.2	141.7		
AEMI	15.5	28.1	39.2	58.8	106.4		
FSSE	16.7	23.0	37.7	63.6	94.2		
TCON	21.0	35.4	31.8	41.2	90.6		
TVCE	19.6	32.7	29.4	33.3	76.8		
GUNA	22.0	30.8	29.7	44.6	119.2		
LBAR	27.5	30.5	41.9	59.1	129.7		
BAMS	29.0	35.9	32.7	31.6	88.5		
BAMM	24.6	37.1	37.5	39.3	70.2		
BAMD	26.1	43.7	59.4	70.9	192.2		
NAMI	42.0	75.1	106.6	157.3	269.1		
Forecasts	6	6	6	5	2		

Table 3a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Tropical Storm Fernanda, 15-19 August 2011. Mean errors for the 5-yr period 2006-10 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 (Fernanda)	5.5	8.2	5.9	9.4	15.0	10.0	
OCD5 (Fernanda)	5.8	8.7	8.7	11.1	18.2	31.0	
Forecasts	11	11	11	9	5	1	
OFCL (2006-10)	6.3	10.5	13.7	15.1	17.1	18.6	
OCD5 (2006-10)	7.3	11.9	15.3	17.6	19.0	20.3	

Table 3b. Homogeneous comparison of selected intensity forecast guidance models (in kt) for Tropical Storm Fernanda, 15-19 August 2011. 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	4.4	7.5	6.3	8.3	12.5		
OCD5	5.8	9.8	10.9	12.3	37.0		
DSHP	6.1	9.5	7.4	6.5	24.0		
LGEM	6.5	10.4	8.9	10.0	26.5		
ICON	4.6	8.4	6.0	7.2	19.0		
IVCN	4.8	7.8	5.3	7.3	19.0		
HWFI	5.1	8.9	8.0	4.3	18.5		
GHMI	5.4	8.0	8.0	11.3	6.5		
FSSE	4.8	7.3	8.5	15.2	20.0		
Forecasts	8	8	8	6	2		

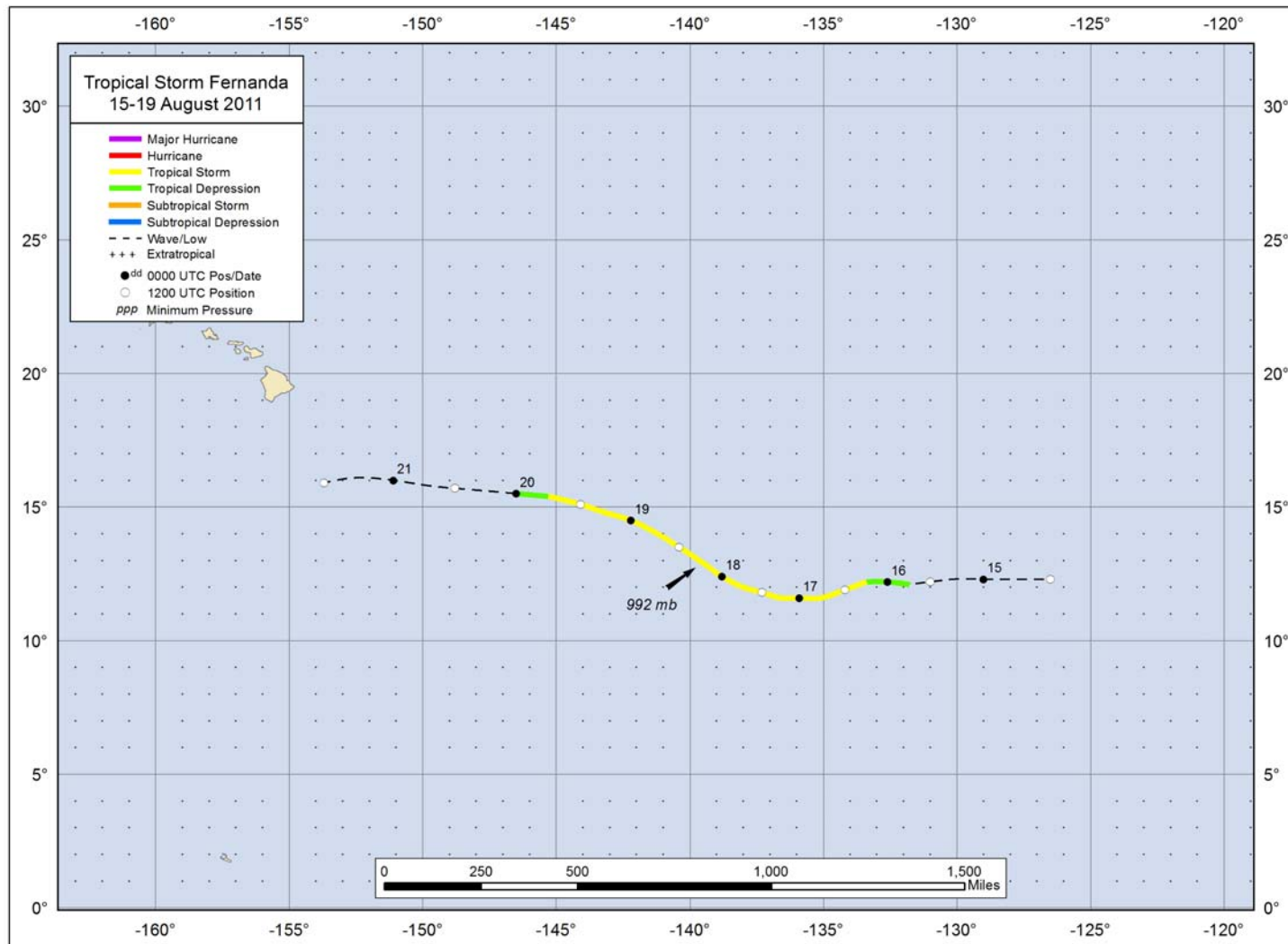


Figure 1. Best track positions for Tropical Storm Fernanda, 15-19 August 2011. Track west of 140°W was produced by the Central Pacific Hurricane Center.

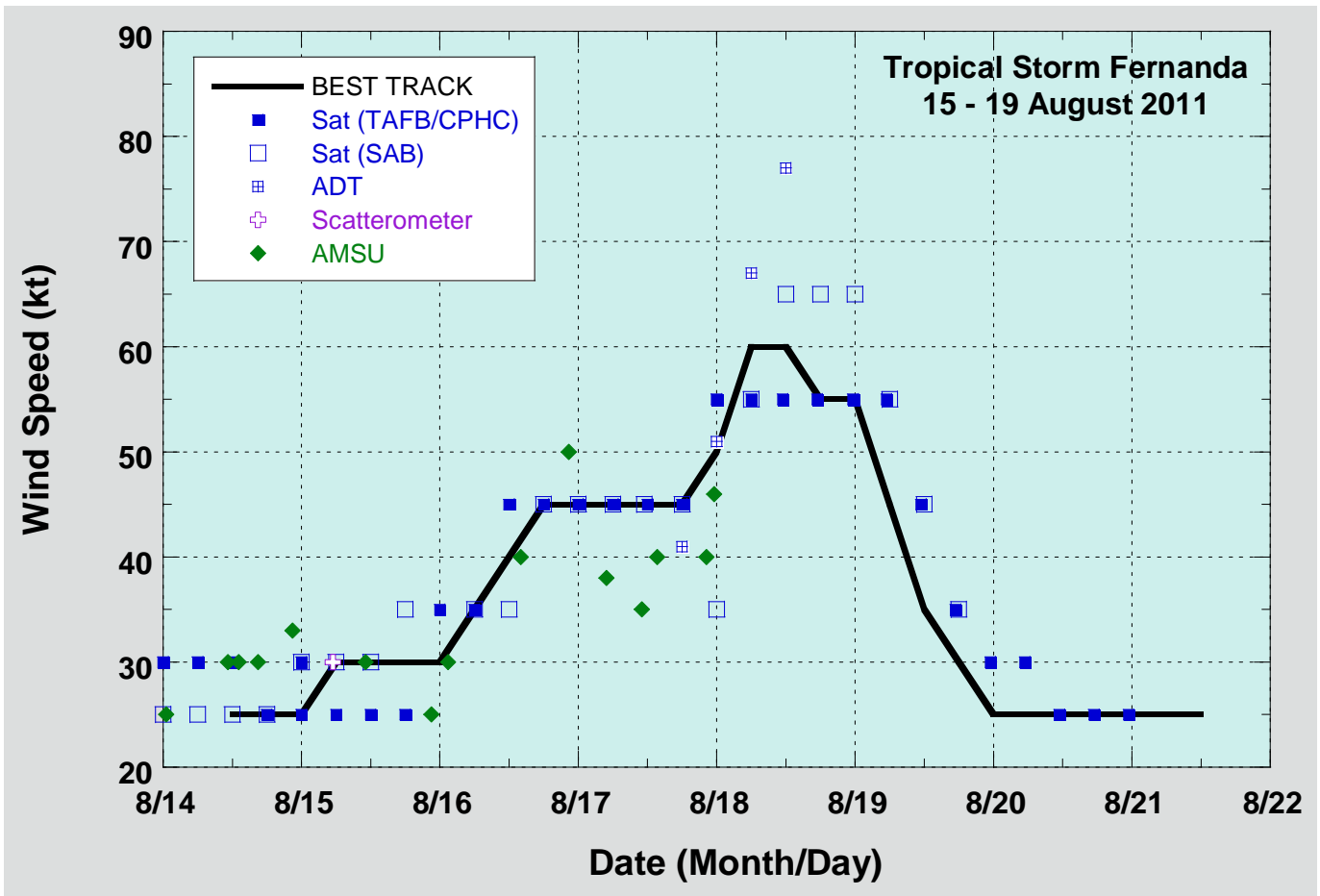


Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Tropical Storm Fernanda, 15-19 August 2011. Advanced Dvorak Technique estimates represent linear averages over a 3-h period centered on the nominal observation time. AMSU intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies technique. Dashed vertical lines correspond to 0000 UTC. Best track data after 0600 UTC 18 August were provided by the Central Pacific Hurricane Center.

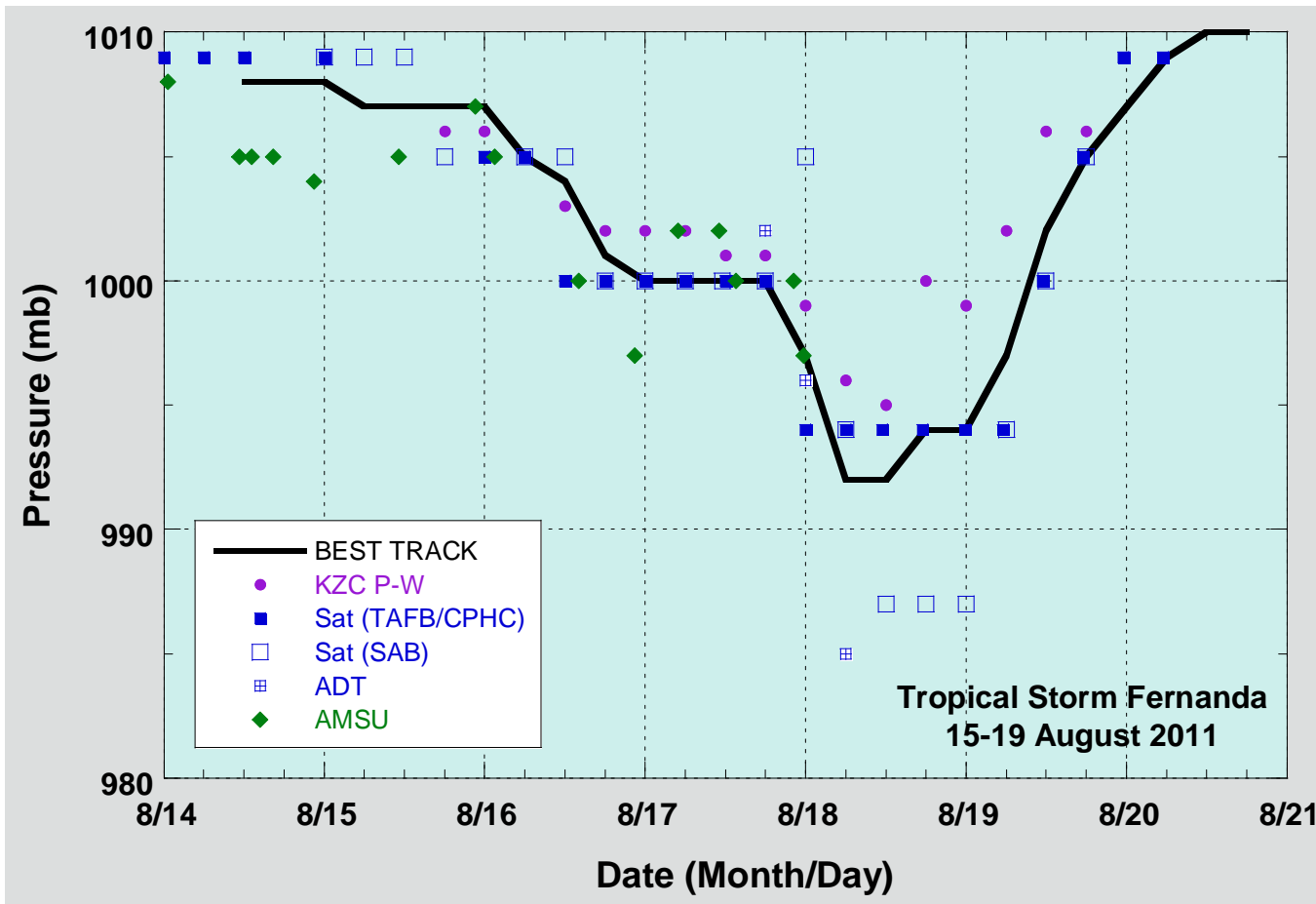


Figure 3. Selected pressure observations and best track minimum central pressure curve for Tropical Storm Fernanda, 15-19 August 2011. Advanced Dvorak Technique estimates represent linear averages over a 3-h period centered on the nominal observation time. AMSU intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies technique. The KZC P-W values are obtained by applying the Knaff-Zehr-Courtney pressure-wind relationship to the best track wind data. Dashed vertical lines correspond to 0000 UTC. Best track data after 0600 UTC 18 August were provided by the Central Pacific Hurricane Center.

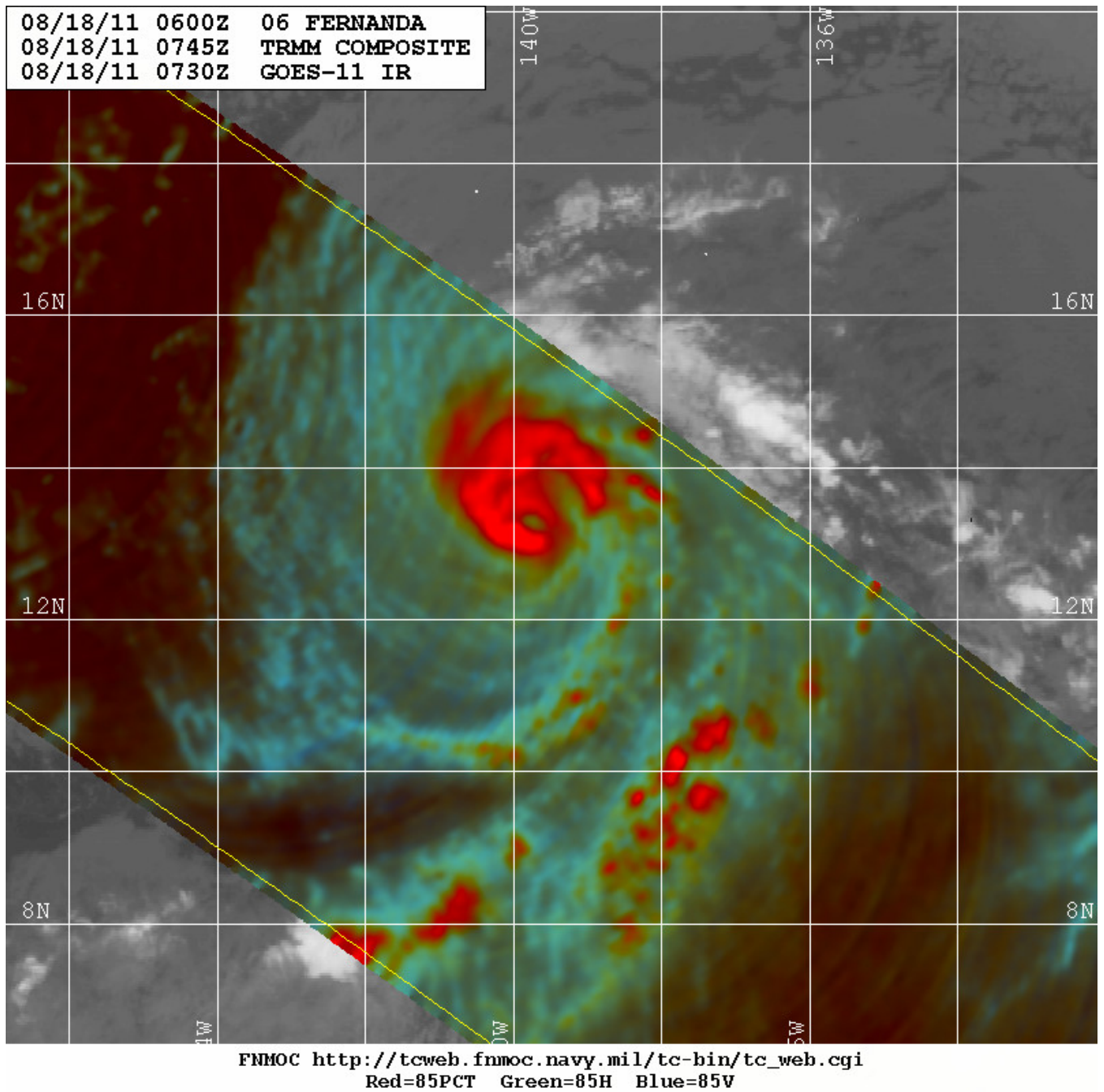


Figure 4. Microwave (85-GHz) color composite image from the TRMM satellite of Tropical Storm Fernanda at 0745 UTC 18 August, at its peak intensity of 60 kt. Image courtesy of the U.S. Navy Fleet Numerical Meteorology and Oceanography Center, Monterey, California