

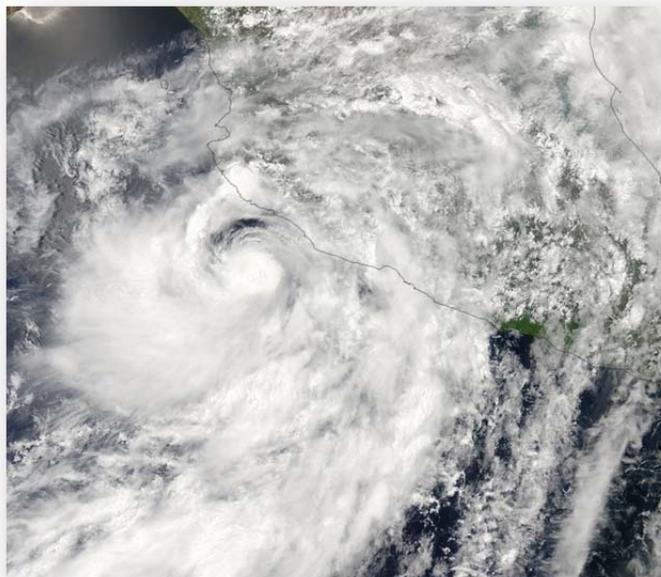
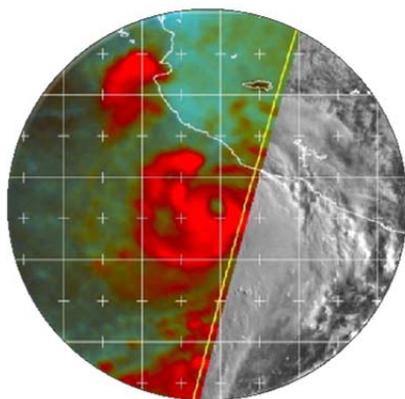


# NATIONAL HURRICANE CENTER TROPICAL CYCLONE REPORT

## HURRICANE ERICK (EP052013)

4 – 9 July 2013

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COMPOSITE 91GHZ MICROWAVE IMAGE AT 1327 UTC 6 JULY, 2013 (COURTESY OF NRL/MONTEREY) AND NASA AQUA SATELLITE (MODIS) IMAGE AT 2030 UTC 6 JULY 2013 OF HURRICANE ERICK.

Erick was a category 1 hurricane (on the Saffir-Simpson Hurricane Wind Scale) that brushed the southwestern coast of Mexico with gusty winds and heavy rains.

# Hurricane Erick

4 – 9 July 2013

## SYNOPTIC HISTORY

Erick originated from a tropical wave that moved off the west coast of Africa on 18 June with some signs of a cyclonic circulation in the low clouds but limited thunderstorm activity. The wave continued westward across the tropical Atlantic, and when it approached the Lesser Antilles on 24 June a small but organized area of convection formed along the axis of the wave. Strong upper-level westerly winds sheared the convection away, however. The wave continued across the Caribbean Sea with intermittent shower activity crossing Central America on 29 June. After moving into the eastern Pacific basin, the amount and organization of the shower activity increased. The wave then interacted with a much larger low-level cyclonic gyre south of Mexico and the area of disturbed weather increased in size. An area of low pressure became better defined near the Gulf of Tehuantepec on 2 July while the wave continued westward. The low then moved very slowly westward and developed a well-defined circulation center with enough organized deep convection to be classified as a tropical depression at 1200 UTC 4 July about 180 n mi southeast of Acapulco, Mexico. 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<sup>1</sup>.

The depression moved toward the west-northwest, and the influence of moderate easterly wind shear initially kept the center exposed to the east of the main convective mass. The shear relaxed a little and the convective banding features began to gain more cyclonic curvature, and the depression became a tropical storm at 0000 UTC 5 July just south of Acapulco. A sequence of microwave images on 5 July showed that the low and mid-level centers gradually became vertically aligned within the convection, suggesting strengthening. It is estimated that Erick became a hurricane at 0600 UTC 6 July, and that it reached a peak intensity of 70 knots and a minimum central pressure of 983 mb 6 h later while the northeastern portion of the circulation was brushing the coast of Mexico. Erick maintained that intensity for about 24 h, but as the circulation began to feel the effects of cool waters, the convection decreased and Erick weakened to a tropical storm at 1800 UTC 7 July. The tropical storm continued moving west-northwestward with the center moving near the southwest coast of the Baja California Peninsula on 8-9 July. Erick became a remnant low at 0600 UTC 9 July and then dissipated later that day when the low moved to an area of even cooler waters.

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<sup>1</sup> 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 Erick (Figs. 2 and 3) include subjective satellite-based Dvorak technique intensity from the Tropical Analysis and Forecast Branch (TAFB), 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 Erick.

The 70-kt peak analyzed intensity of Erick at 1200 UTC 6 July was based on a blend of Dvorak estimates of 77 and 55 kt from TAFB and SAB, respectively, and the presence of a ragged eye on satellite images. In addition, microwave imagery showed that the eye feature became vertically aligned, suggesting that the cyclone was better organized at that time. The ADT-estimated intensity was 72 kt at that time.

A Mexican automated station *Chamelacuixmala* in the state of Jalisco, located at 19.5°N and 105.1°W, reported strong wind gusts for a few hours, reaching 46 knots at 0010 UTC 7 July when Erick was passing nearby. There were no ship reports of winds of tropical storm force associated with Hurricane Erick.

## CASUALTY AND DAMAGE STATISTICS

Two direct deaths<sup>2</sup> have been attributed to Erick according to press reports. The body of a 44-year-old man was found after he was apparently swept away by the Indio River, according to the state civil protection director. A second body was found amid the rubble that was swept by a river in the town of Jalisco. In addition, two people remained missing after Erick grazed Mexico's Pacific southwest coast. Erick forced 5,000 people to flee to shelters in the western state of Nayarit, Jalisco which has a population of 40,000. This town was hardest hit as the river swelled to as much as six meters (20 feet) higher than its normal level.

## FORECAST AND WARNING CRITIQUE

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<sup>2</sup> Deaths occurring as a direct result of the forces of the tropical cyclone are referred to as "direct" deaths. These would include those persons who drowned in storm surge, rough seas, rip currents, and freshwater floods. Direct deaths also include casualties resulting from lightning and wind-related events (e.g., collapsing structures). Deaths occurring from such factors as heart attacks, house fires, electrocutions from downed power lines, vehicle accidents on wet roads, etc., are considered indirect" deaths.



The genesis of Eric was predicted quite well within the 48 h Tropical Weather Outlook. The disturbance from which Erick developed was introduced with a 10% chance of formation at 0000 2 July, about 54 h before genesis occurred. The chances of development were increased to 70% at 1800 UTC 3 July about 18 h before Erick formed.

A verification of NHC official track forecasts for Erick is given in Table 2a. Official forecast track errors were much lower than the mean official errors for the previous 5-yr period for the 12- to 72- h period. A homogeneous comparison of the official track errors with selected guidance models is given in Table 2b. The official forecast had lower mean errors than most of the models, with the exception of the multi-model consensus TVCE for the 12- and 24- h periods.

Figure 4 shows that when genesis occurred, most of the guidance and the official forecast had a leftward bias. It appears that most of the models overestimated the strength of the high pressure system over Mexico.

A verification of NHC official intensity forecasts for Hurricane Erick is given in Table 3a, and a homogeneous comparison of the official intensity errors with selected guidance models is given in Table 3b. Official forecast intensity errors were lower than the mean official errors for the previous 5-yr period at all times. The NHC official intensity forecast had errors lower than all the models out through 72 h. Given the prevailing strong easterly wind shear, Erick was not forecast initially to become a hurricane. However, the cyclone strengthened faster than anticipated and also weakened earlier than forecast.

Although the center of Erick remained offshore, the proximity to the coast prompted watches and warnings for Mexico. These are summarized in Table 4.



Table 1. Best track for Hurricane Erick, 4-9 July 2013.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
04 / 1200	13.2	98.2	1006	30	tropical depression
04 / 1800	13.8	98.9	1006	30	"
05 / 0000	14.4	99.8	1005	35	tropical storm
05 / 0600	15.0	100.8	1003	40	"
05 / 1200	15.5	101.6	998	50	"
05 / 1800	16.0	102.2	996	55	"
06 / 0000	16.4	102.7	991	60	"
06 / 0600	16.9	103.3	987	65	hurricane
06 / 1200	17.4	104.0	983	70	"
06 / 1800	17.9	104.6	984	70	"
07 / 0000	18.5	105.3	984	70	"
07 / 0600	19.1	106.1	984	70	"
07 / 1200	19.7	106.9	986	65	"
07 / 1800	20.1	107.7	993	55	tropical storm
08 / 0000	20.6	108.4	996	50	"
08 / 0600	21.1	109.0	998	45	"
08 / 1200	21.7	109.7	1001	40	"
08 / 1800	22.3	110.5	1001	40	"
09 / 0000	22.9	111.2	1003	35	"
09 / 0600	23.6	112.0	1007	30	low
09 / 1200	24.1	112.8	1011	25	"
09 / 1800	24.7	113.5	1013	25	"
10 / 0000					dissipated
06 / 1200	17.4	104.0	983	70	minimum pressure



Table 2a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Hurricane Erick. 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	<b>15.6</b>	<b>25.1</b>	<b>25.4</b>	<b>37.2</b>	<b>94.5</b>	140.2	
OCD5	23.7	43.3	59.3	83.5	132.2	165.0	
Forecasts	16	14	12	10	6	2	
OFCL (2008-12)	27.0	43.1	57.8	71.9	101.7	137.2	165.9
OCD5 (2008-12)	37.4	73.0	114.9	158.3	238.4	313.5	389.1



Table 2b. Homogeneous comparison of selected track forecast guidance models (in n mi) for Hurricane Erick. 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	14.5	23.5	28.1	42.0	91.5		
OCD5	23.6	44.1	66.7	104.9	156.4		
GFSI	30.6	58.7	90.8	128.3	193.1		
GHMI	20.3	45.4	77.6	80.2	115.2		
HWFI	22.7	34.5	44.1	69.8	136.3		
EGRI	20.3	40.1	55.2	77.7	<b>41.3</b>		
EMXI	19.2	32.6	39.5	<b>33.9</b>	<b>56.3</b>		
CMCI	28.0	58.3	90.5	89.0	<b>78.6</b>		
AEMI	24.7	48.9	62.0	106.0	183.0		
FSSE	<b>13.3</b>	25.1	37.7	49.6	<b>89.7</b>		
TVCE	<b>10.8</b>	<b>21.1</b>	31.1	47.8	<b>73.0</b>		
LBAR	20.5	60.6	113.5	181.8	310.2		
BAMD	18.0	30.0	40.8	75.0	177.4		
BAMM	16.7	28.5	44.8	69.3	160.7		
BAMS	22.2	34.7	44.9	<b>41.4</b>	<b>65.7</b>		
NAMI	33.1	75.3	122.8	204.9	262.2		
Forecast	13	11	10	4	1		

Table 3a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Hurricane Erick. 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	<b>2.2</b>	<b>6.8</b>	<b>11.3</b>	<b>11.0</b>	<b>9.2</b>	<b>2.5</b>	
OCD5	3.8	7.8	11.8	14.7	14.8	9.0	
Forecasts	16	14	12	10	6	2	
OFCL (2008-12)	6.3	10.5	13.4	14.5	15.3	17.0	17.3
OCD5 (2008-12)	7.6	12.5	16.5	18.8	20.4	20.3	20.6

Table 3b. Homogeneous comparison of selected intensity forecast guidance models (in kt) for Hurricane Erick. 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	2.2	6.8	11.3	11.0	9.2	0.0	
OCD5	3.8	7.8	11.8	14.7	14.8	11.0	
GHMI	5.2	12.9	20.0	20.9	20.0	11.0	
HWFI	4.0	8.5	10.4	13.9	13.0	12.0	
DSHP	4.0	9.4	13.5	16.5	15.3	10.0	
LGEM	3.9	8.6	12.6	15.8	12.5	11.0	
IVCN	3.6	9.0	12.9	15.1	11.7	0.0	
Forecasts	16	14	12	10	6	1	

Table 4. Watch and warning summary for Hurricane Erick, 4 - 9 July 2013.

Date/Time (UTC)	Action	Location
5 / 0300	Tropical Storm Watch modified to	Acapulco to Lazaro Cardenas
5 / 0300	Tropical Storm Warning issued	Lazaro Cardenas to Manzanillo
5 / 1500	Tropical Storm Watch discontinued	Acapulco to Lazaro Cardenas
5 / 1500	Tropical Storm Watch modified to	La Fortuna to Cabo Corrientes
5 / 1500	Tropical Storm Warning discontinued	Lazaro Cardenas to Manzanillo
5 / 1500	Tropical Storm Warning issued	Zihuatanejo to La Fortuna
6 / 0300	Tropical Storm Watch discontinued	All
6 / 0300	Tropical Storm Warning modified to	Zihuatanejo to Cabo Corrientes
6 / 0900	Hurricane Watch issued	Punta San Telmo to Cabo Corrientes
6 / 1500	Tropical Storm Watch issued	Santa Fe to La Paz
7 / 0300	Tropical Storm Watch changed to Tropical Storm Warning	Santa Fe to La Paz
7 / 0300	Tropical Storm Warning modified to	Punta San Telmo to Cabo Corrientes
7 / 0300	Hurricane Watch modified to	Manzanillo to Cabo Corrientes
7 / 0900	Tropical Storm Warning modified to	Manzanillo to Cabo Corrientes
7 / 0900	Hurricane Watch discontinued	All
7 / 1500	Tropical Storm Warning discontinued	Manzanillo to Cabo Corrientes
9 / 0300	Tropical Storm Warning discontinued	All

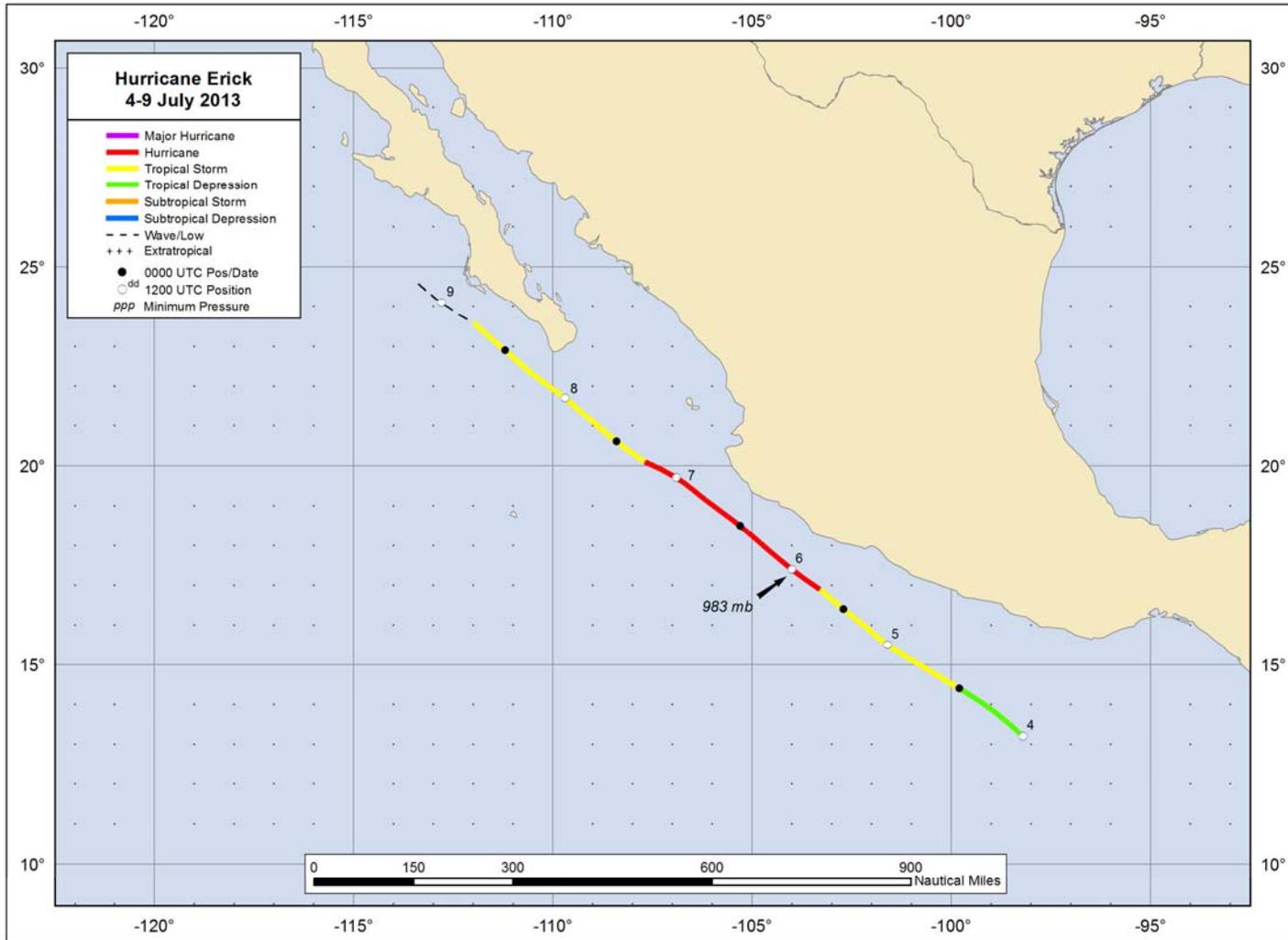


Figure 1. Best track positions for Hurricane Erick, 4-9 July 2013.

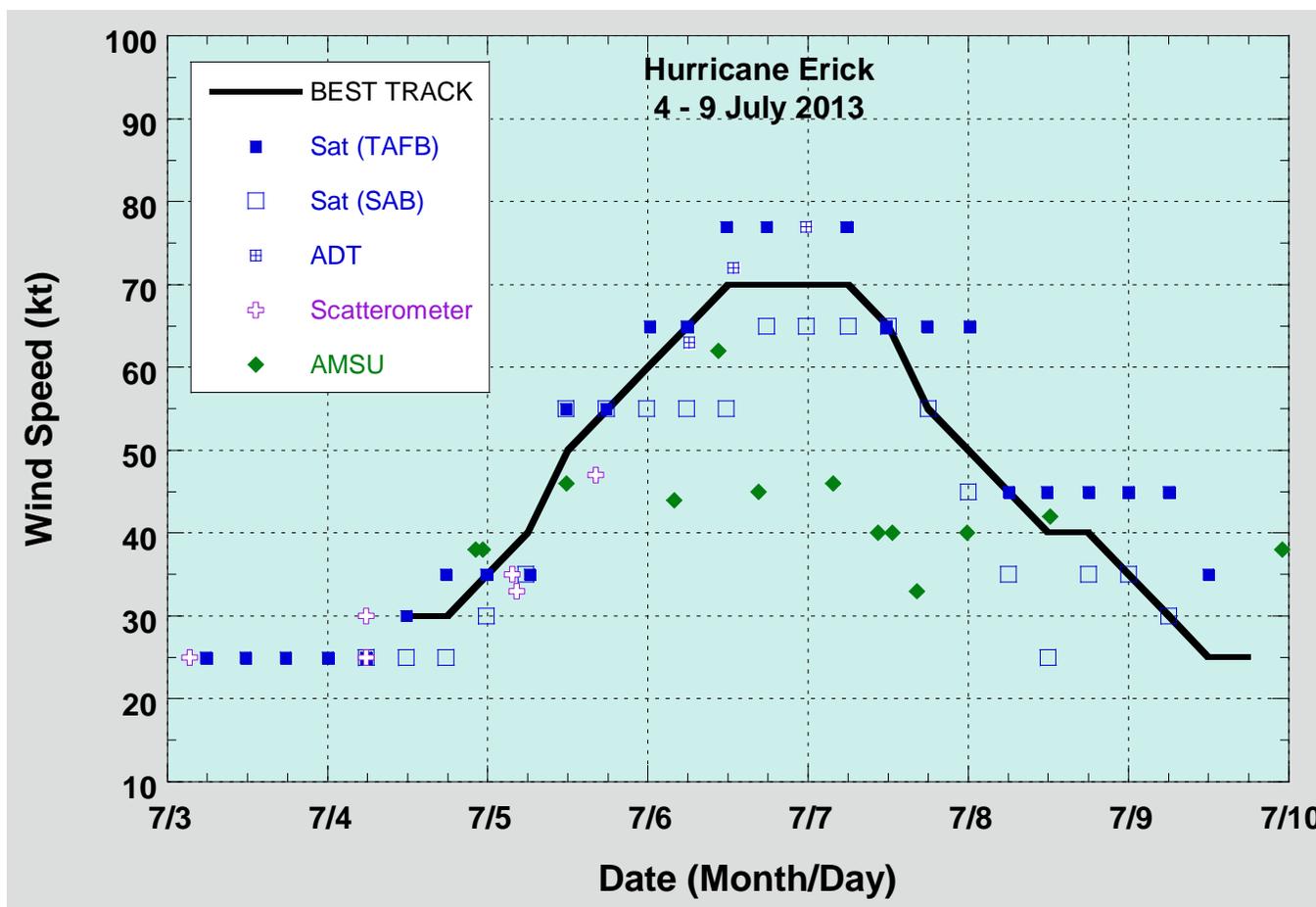


Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Hurricane Erick, 4 -9 July 2013. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. AMSU intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies technique.

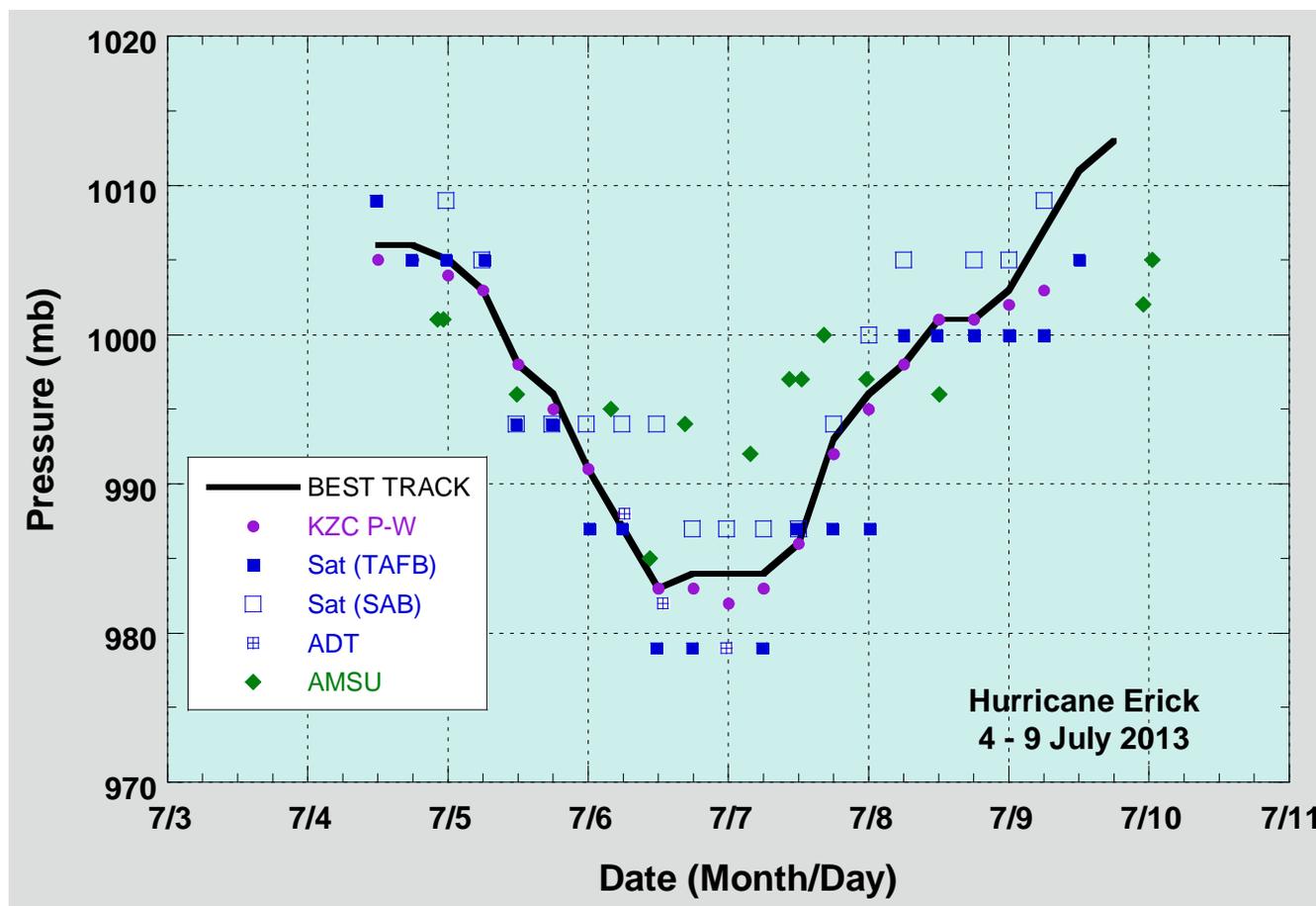


Figure 3. Selected pressure observations and best track minimum central pressure curve for Hurricane Erick, 4-9 July 2013. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. AMSU intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies technique. KZC P-W refers to pressure estimates derived using the Knaff-Zehr-Courtney pressure-wind relationship.

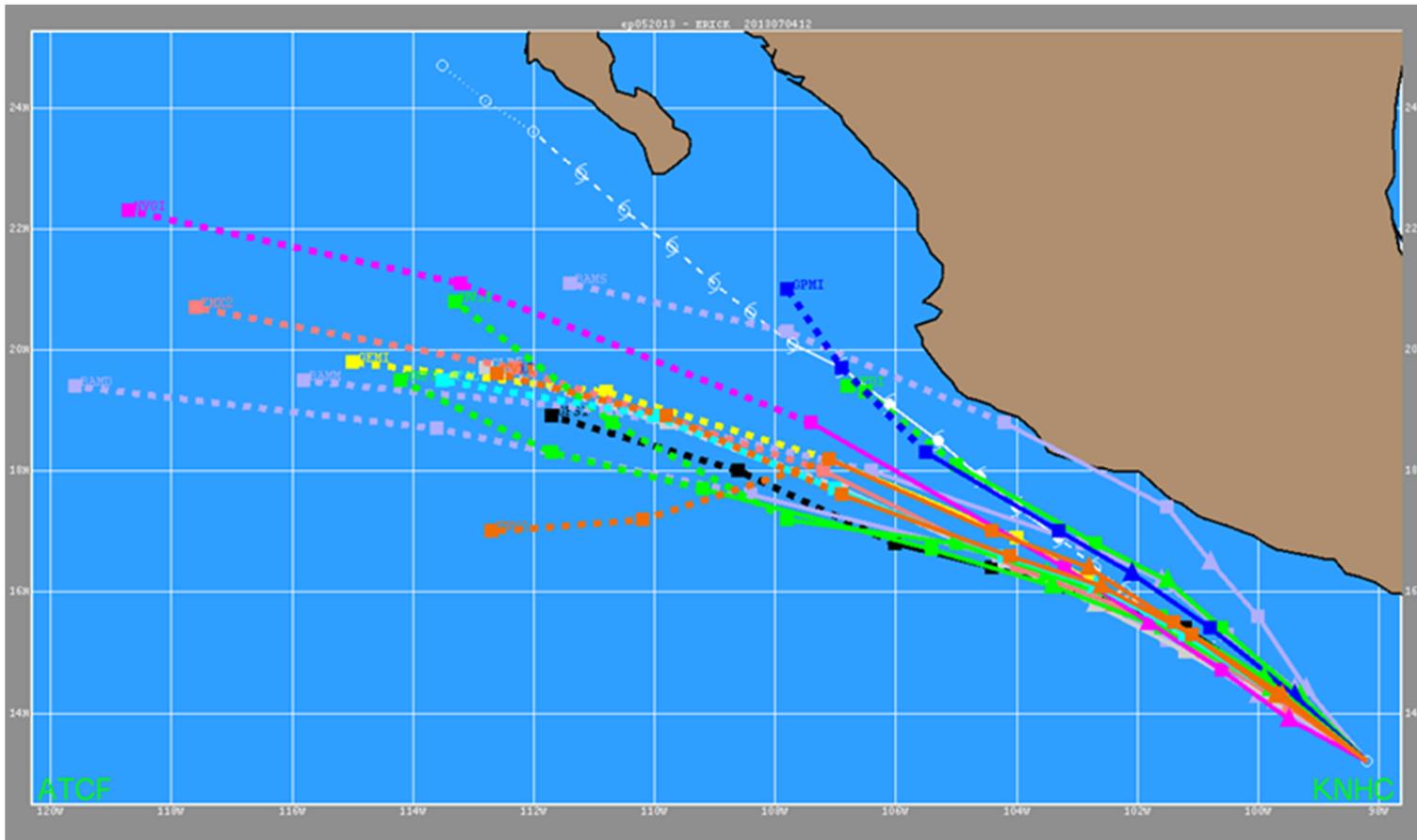


Figure 4. Track Guidance (lines in color) for Hurricane Erick at 1200 UTC 4 July 2013. The best track is the white line with positions given at 6- h intervals. Dashed lines indicate the four- and five- day track predictions.