

Tropical Cyclone Report
Tropical Storm Hermine
(AL102010)
5-9 September 2010

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22 November 2010

Updated 29 November to include insured losses.

Tropical Storm Hermine made landfall on the northeastern coast of Mexico. It brought tropical-storm-force winds and very heavy rains to a large portion of southern Texas.

a. Synoptic History

Eastern North Pacific Tropical Depression Eleven-E moved northward across the Mexican states of Oaxaca and Chiapas early on 4 September, and degenerated into a remnant low over the high terrain. The middle-level circulation accompanied by the weak surface low continued northward and moved over the southern Bay of Campeche later that day. Once over water, deep convection began to form near the low and the thunderstorm activity became organized with some cyclonically curved bands. It is estimated that a tropical depression formed at 1800 UTC 5 September when the system was in the southern Bay of Campeche. The depression moved northward away from land gaining organization, and it estimated that it became a tropical storm at 0600 UTC 6 September, around the time when a nearby NOAA buoy (42055) reported tropical-storm-force winds. 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.

Very deep convection developed near the center and Hermine strengthened. The cyclone moved between north and north-northwest at an average speed of 12 knots over the western Gulf of Mexico on 6 September. Hermine made landfall on the coast of northeastern Mexico about 25 n mi south of Brownsville, Texas at its peak intensity of 60 knots and a minimum pressure of 989 mb at 0200 UTC 7 September. Hermine was strengthening when it crossed the coast, and remained a tropical storm for about 16 hours after landfall while moving northward over Texas. The cyclone produced tropical-storm-force winds over a large area to the east of the center. In fact, these tropical-storm-force winds extended eastward to the coast as indicated by marine observations (Table 3). The cyclone weakened to a tropical depression over central Texas by 0000 UTC 8 September, and then continued northward and northeastward over Oklahoma. It became a remnant low and dissipated at 0000 UTC 10 September over southeastern Kansas.

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.

b. Meteorological Statistics

Observations in Tropical Storm Hermine (Figs. 2 and 3) include satellite-based Dvorak technique intensity estimates from the Tropical Analysis and Forecast Branch (TAFB) and the Satellite Analysis Branch (SAB), as well as flight-level, stepped frequency microwave radiometer (SFMR) from flights of the 53rd Weather Reconnaissance Squadron of the U. S. Air Force Reserve Command. Data and imagery from NOAA polar-orbiting satellites, the NASA Tropical Rainfall Measuring Mission (TRMM) and Aqua, the European Space Agency's Advanced Scatterometer (ASCAT), Defense Meteorological Satellite Program (DMSP) satellites, among others, were also useful in constructing the best track of Hermine.

There was only one Air Force aircraft reconnaissance mission to Hermine. Fortunately, there were several microwave passes over Hermine that were vital in determining the location and the structure of the cyclone. These microwave data were used operationally to relocate the initial position of the cyclone during the early phases of development (Fig. 4a). The radar from Alvarado, Mexico was also extremely useful in observing the evolution of the incipient Hermine in the southern Bay of Campeche (Fig. 4b). Both buoy and ASCAT data were used to upgrade Hermine to tropical storm status. The NWS Doppler Radar from Brownsville and reconnaissance aircraft data were crucial in determining the structure of Hermine and the timing of landfall. Inland and marine observations were used to maintain Hermine with tropical storm intensity several hours after landfall. The peak intensity of 60 knots was based on an observation of sustained winds of 51 knots at Harlingen, Texas four hours after landfall. Storm surge values of 1.5 to 3.4 feet were experienced along the southeast Texas coast when Hermine made landfall. Selected surface observations from land stations and data buoys are given in Table 2.

c. Casualty and Damage Statistics

There were five confirmed deaths associated with Hermine in Texas and one in Oklahoma. One person drowned when caught in strong rip currents. Two others died while swimming in a flooded river. The other three persons were washed off the road while driving around barricades. Reports from the U.S. National Weather Service forecast offices indicate that the tropical-storm-force winds brought down numerous trees and power lines in portions of southeastern Texas. As Hermine moved across Texas it spawned tornadic activity. One tornado touched down about 1 mile south of the town of Moulton on 7 September, causing minor damage but no deaths or injuries. Another tornado was reported near downtown Dallas on 8 September. The tornado tore through the area southeast of downtown, heavily damaging one building. It also damaged warehouses near Dallas Love Field. At least one person was injured and taken to a hospital.

Hermine produced torrential rains over portions of Texas and Oklahoma as indicated in Table 3. The highest rainfall amount was 16.37 inches from 7 to 9 September in the area of Georgetown Lake, Texas. Many houses were flooded due to the rising water. Hermine produced an estimated \$120 million in insured losses according to the Property Claim Services of the Insurance Services Office, Inc. Using a doubling of insured losses to obtain the total damage gives an estimate of \$240 million in damage.

d. Forecast and Warning Critique

The disturbance that spawned Hermine was first mentioned in the Tropical Weather Outlook (TWO) 30 hours before genesis with a low probability of formation (10%). The probability gradually increased and reached 50% about 6 hours before the depression formed.

Hermine lasted only 72 hours and the official forecasts errors are shown in Table 3a. Official forecast track errors were greater than the mean official errors for the previous five-year period, but the climatology and persistence model (OCD5) errors were also greater than the previous five-year OCD5 average. This implies that Hermine was relatively difficult to forecast.

A homogeneous comparison of the official track errors with selected guidance models is given in Table 3b. Both the GFS and the ECMWF were generally better than the official forecast. This comparison is not very meaningful due to the small number of forecasts.

A verification of NHC official intensity forecasts for Hermine is given in Table 4a. Official forecast intensity errors were much lower than the mean official errors for the previous five-year period. In fact, there was zero error for the 72-h period. However, these numbers are low, because for most periods, Hermine was a weakening cyclone over land and was forecast to be a 20 to 25 kt depression. A homogeneous comparison of the official intensity errors with selected guidance models is given in Table 4b.

Watches and warnings associated with Hermine are given in Table 5.

Table 1. Best track for Tropical Storm Hermine, 5-9 September, 2010.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
04 / 1800	17.5	95.6	1006	20	low
05 / 0000	18.3	95.6	1006	20	"
05 / 0600	19.0	95.6	1006	20	"
05 / 1200	19.5	95.6	1006	20	"
05 / 1800	20.0	95.5	1004	25	tropical depression
06 / 0000	20.7	95.0	1002	30	"
06 / 0600	21.8	95.1	1001	40	tropical storm
06 / 1200	23.0	95.6	998	45	"
06 / 1800	24.0	96.5	995	50	"
07 / 0000	24.9	97.2	991	55	"
07 / 0200	25.3	97.4	989	60	"
07 / 0600	26.2	97.7	990	55	"
07 / 1200	27.7	98.1	991	45	"
07 / 1800	29.4	98.6	996	40	"
08 / 0000	30.6	99.1	1003	30	tropical depression
08 / 0600	31.6	99.5	1004	25	"
08 / 1200	32.7	99.5	1005	20	"
08 / 1800	33.7	98.7	1005	20	"
09 / 0000	34.7	97.9	1005	20	"
09 / 0600	35.5	97.2	1005	20	"
09 / 1200	36.3	96.4	1005	20	"
09 / 1800	37.0	95.5	1005	20	post tropical
10 / 0000	37.5	95.0	1005	20	remnant low
10 / 0600					dissipated
07 / 0200	25.3	97.4	989	60	landfall near Matamoros, MX.
07 / 0200	25.3	97.4	989	60	minimum pressure

Table 2. Selected surface observations for Tropical Storm Hermine, 5-9 September, 2010.

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft) ^c	Storm tide (ft) ^d	Total rain (in)
	Date/time (UTC)	Press (mb)	Date/time (UTC) ^a	Sustained (kt) ^b	Gust (kt)			
Mexico								
Matamoros (Mex. Navy)			07/0345	46	58			
United States								
Texas								
International Civil Aviation Organization (ICAO) Sites								
Brownsville (KBRO)	07/0419	999	07/0421	42	60			2.96
Harlingen (KHRL)	07/0556	990	07/0559	51	63			1.43
Mcallen Miller (KMFE)	07/0637	1003	07/0526	19	25			0.17
Port Isabel (KPIL)	07/0556	1002	07/0456	41	51			2.73
Weslaco (KT65)	07/0605	998	07/0545	25	33			0.52
Edinburg (KEBG)	07/0705	1000	07/0725	26	33			0.72
Brooks County (KBKS)	07/0945	994	07/0845	25	34			1.32
Hebbronville Jim Hogg (KHBV)	07/1005	1005	07/1005	15	21			0.29
Kingsville (KNQI)	07/1056	998	07/1141	37	55			
South Padre Island (KSPL)	07/0435	1004	07/0515	45	54			4.68
Alice (KALI)	07/1153	993	07/1153	34	47			3.06
Corpus Christi (KCPR)	07/1051	1004	07/1056	35	48			2.35
Victoria Regional (KVCT)	07/1251	1009	07/1345	29	39			6.68
Corpus Christi (KNGP)	07/1056	1005	07/1141	29	45			3.24
Rockport (KRKP)	07/1153	1006	07/0936	34	45			3.52
San Antonio (KSAT)	07/1753	998	07/1823	42	56			6.52
Stinson field (KSSF)	07/1753	997	07/1754	30	40			6.73
Fredericksburg (KT82)			08/0300	25	38			3.23
Kerrville (KERV)			07/2200	19	32			3.09
Beeville (KBEA)	07/1400	1003	07/1400	30	43			
Robstown (KRBO)	07/1125	1002	07/1205	32	45			

Port Lavaca (KPKV)	07/1027	1009	07/1045	25	33		
Orange Grove (KNOG)	07/1228	992	07/1159	36	47		
Cabinass Field (KNGW)	07/1122	1003	07/1051	31	41		
Waldron Field (KNVT)	07/1033	1004	07/1225	29	41		
Marine Observations							
Port Isabel (PTIT2)	07/0512	1003	07/0506	46	55		
Rincon Del San Jose (RSJT2)	07/0700	1003	07/0700	42	50		
Buoy 42020	07/0950	1004	07/0620	35	51		
Buoy 44055	06/0834	1004. 5	06/1117	37	41		
Buoy 42002	05/1950	1008. 6		28	33		
Baffin Bay (BABT2)			07/0924	38	48		
42045	07/0100	1006	07/0500	27	33		
Realp - Realitos peninsula			07/0524	45	55		
South Padre Island						1.50	1.54
Port Isabel						1.61	1.73
San Jose Rincon						2.43	6.22 °
Bob Hall pier NOS	07/1024	1003	07/1024	39	47	2.63	4.13
South Bird Island TCOON	07/0942	1004	07/0906	34	48		
Port Aransas TCOON			07/0948	27	40		
Packery Channel TCOON			07/0848	23	34		
Ingleside TCOON	07/1000	1007	07/1236	25	36		
Nueces delta watershed TCOON	07/1054	1003	07/1054	30	39		
Rockport NOS	07/1212	1006	07/1124	35	42	1.93	2.36
Sea drift TCOON	07/1230	1008	07/1312	32	41	1.93	2.36
Port O'Connor TCOON			07/1118	39	55	1.77	2.85
Ingleside						1.89	2.47
Texas State Aquarium						1.93	2.76
White Point						2.64	3.17
SeaDrift						2.80	3.09
Port Lavaca						3.40	4.20
Public/Other							
Georgetown Lake (GGLT) 30.64 N -97.69 W							16.37
Florence (FLOT2) 30.83 N -97.79 W							14.56
Cedar Park (TX-WM-4) 30.50 N -97.81 W							13.77

Jollyville (TX-TV-7) 30.42 N -97.76 W								13.14
Timberwood Park (TX-BXR) 29.66 N -98.46 W								11.15
Spring Branch (TX-CML) 29.79 N -98.37 W								10.55
Wimberley (TX-HYS) 29.99 N -98.03 W								9.60
Johnson City (JCYT2) 30.31 N -98.42 W								8.79
Boerne (BONT2) 29.81 N -98.74 W								8.71
Rio Hondo (TXCMR35) 26.32 n -97.47 w								7.73
Austwell (ARNT2) 28.30 n -96.80 w								7.51
Victoria (VRAT2) 28.84 n -96.92 w								7.34
Bloomington (TX-VC-1) 28.65 n -96.90 w								7.21
Telferner (TX-VC-1) 28.87 n -96.84 w								6.84
Fannin (TX-VC-2) 28.65 n -97.12 w								6.56
Seadrift (TX-CLH-) 28.41 n -96.70 w								6.25
Rockport (TX-AR-5) 28.04 n -97.05 w								6.07
Nursery (TX-VC-1) 28.91 n -97.18 w								6.00
Fulton (TX-AR-3) 28.06 n -97.06 w								5.98
Schroeder (TX-GD-1) 28.81 n -97.20 w								5.57
Goliad (TX-GD-5) 28.67 n -97.40 w								5.51
Port Lavaca (PVAT2) 28.60 n -96.67 w								4.93
Weesatche (TX-GD-1) 28.83 n -97.41 w								4.52
Flour Bluff (TX-NU-3) 27.61 n -97.23 w								4.46
Port Aransas (PSMT2) 27.78 n -97.07 w								4.46
Orange Grove (TX-JW-4) 27.98 n -97.96 w								4.15
St. Paul (TX-SP-7) 28.06 n -97.56 w								4.00
Brownsville (TXCMR17) 25.96 n -97.42 w								3.92
Aransas Pass (TX-SP-1) 27.91 n -97.17 w								3.74
Orange Grove (TX-JW-3) 27.99 n -98.06 w								3.53

Corpus Christi (TX-NU-2) 27.75 n -97.40 w								3.38
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- ^a Date/time is for sustained wind when both sustained and gust are listed.
- ^b Except as noted, sustained wind averaging periods for land-based reports are 10 min; buoy averaging periods are 8 min.
- ^c Storm surge is water height above normal astronomical tide level.
- ^d Storm tide is water height above mean lower low water.
- ^e Storm tide is water height above mean sea level.

Table 3a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Tropical Storm Hermine, 5-9 September, 2010. Mean errors for the five-year period 2005-9 are shown for comparison. Official errors that are smaller than the five-year means are shown in boldface type.

	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL	43.2	64.1	99.9	126.6	179.1		
OCD5	77.0	139.1	194.1	250.8	404.5		
Forecasts	9	9	9	9	5		
OFCL (2005-9)	31.8	53.4	75.4	96.8	143.8		
OCD5 (2005-9)	46.9	97.3	155.4	211.6	304.8		

Table 3b. Homogeneous comparison of selected track forecast guidance models (in n mi) for Tropical Storm Hermine, 5-9 September, 2010. 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	49.5	66.0	93.7	115.7			
OCD5	84.2	142.5	188.6	281.1			
NAMI	47.8	100.7	118.7	96.6			
BAMS	71.0	125.1	182.1	210.9			
BAMM	66.6	111.2	150.1	189.1			
BAMD	73.1	108.3	152.4	176.6			
LBAR	70.4	85.3	94.1	109.0			
TVCN	62.4	76.9	114.4	157.8			
AEMI	50.5	76.8	112.6	148.8			
EMXI	55.6	61.4	83.8	97.8			
UKMI	106.5	189.9	294.5	504.7			
NGPI	52.1	67.0	106.0	116.5			
HWFI	50.7	94.1	149.9	194.7			
GHMI	64.7	108.1	148.4	167.7			
GFSI	44.2	57.6	88.3	93.4			
NF	5	5	5	3			

Table 4a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Tropical Storm Hermine, 5-9 September, 2010. Mean errors for the five-year period 2005-9 are shown for comparison. Official errors that are smaller than the five-year means are shown in boldface type.

	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL	3.9	4.4	3.3	2.2	0		
OCD5	5.8	8.0	12.0	17.7	20.6		
Forecasts	9	9	9	9	5		
OFCL (2005-9)	7.0	10.7	13.1	15.2	18.6		
OCD5 (2005-9)	8.6	12.5	15.8	18.2	21.0		

Table 4b. Homogeneous comparison of selected intensity forecast guidance models (in kt) for Tropical Storm Hermine, 5-9 September, 2010. Errors smaller than the NHC official forecast are shown in boldface type.

Model ID	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL	3.9	4.4	3.3	2.2	0.0		
OCD5	5.8	8.0	12.0	17.7	20.6		
LGEM	7.0	6.6	6.6	6.8	7.2		
DSHP	6.2	5.9	6.1	6.6	7.2		
GHMI	6.6	6.2	5.7	6.3	7.8		
HWFI	7.0	8.9	6.8	5.0	3.8		
NF	9	9	9	9	5		

Table 5. Watch and warning summary for Tropical Storm Hermine, 5-9 September, 2010.

Date/Time (UTC)	Action	Location
6 / 0300	Tropical Storm Warning issued	Tampico to TX/MEX border
6 / 0900	Tropical Storm Warning modified to	Tampico to Baffin Bay
6 / 1500	Tropical Storm Warning discontinued	Tampico to Baffin Bay
6 / 1500	Tropical Storm Warning issued	La Cruz to Port OConnor
6 / 1500	Hurricane Watch issued	Rio San Fernando to Baffin Bay
7 / 0300	Tropical Storm Warning modified to	Bahia Algodones to Port OConnor
7 / 0300	Hurricane Watch discontinued	All
7 / 0600	Tropical Storm Warning modified to	Rio San Fernando to Port OConnor
7 / 0900	Tropical Storm Warning modified to	TX/MEX border to Port OConnor
7 / 1500	Tropical Storm Warning modified to	Baffin Bay to Port OConnor
7 / 1800	Tropical Storm Warning discontinued	All

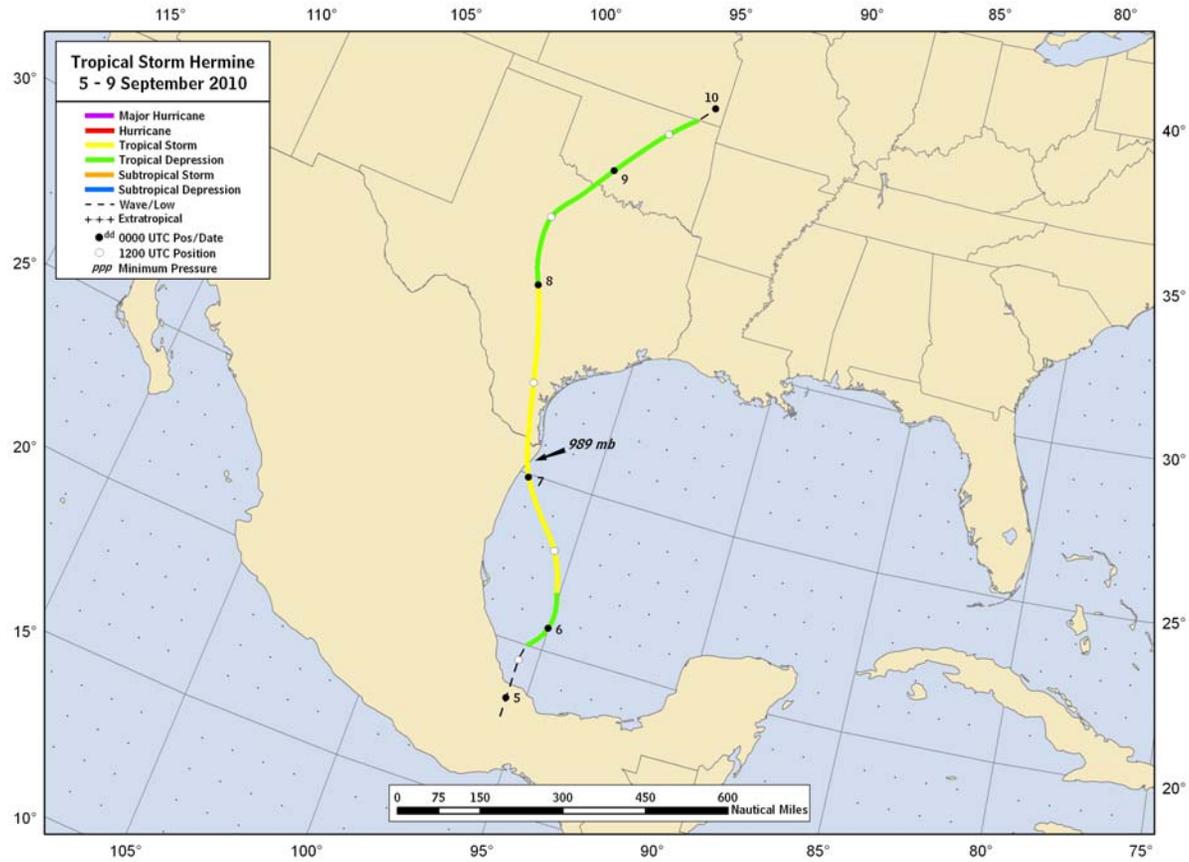


Figure 1. Best track positions for Tropical Storm Hermine, 5-9 September 2010.

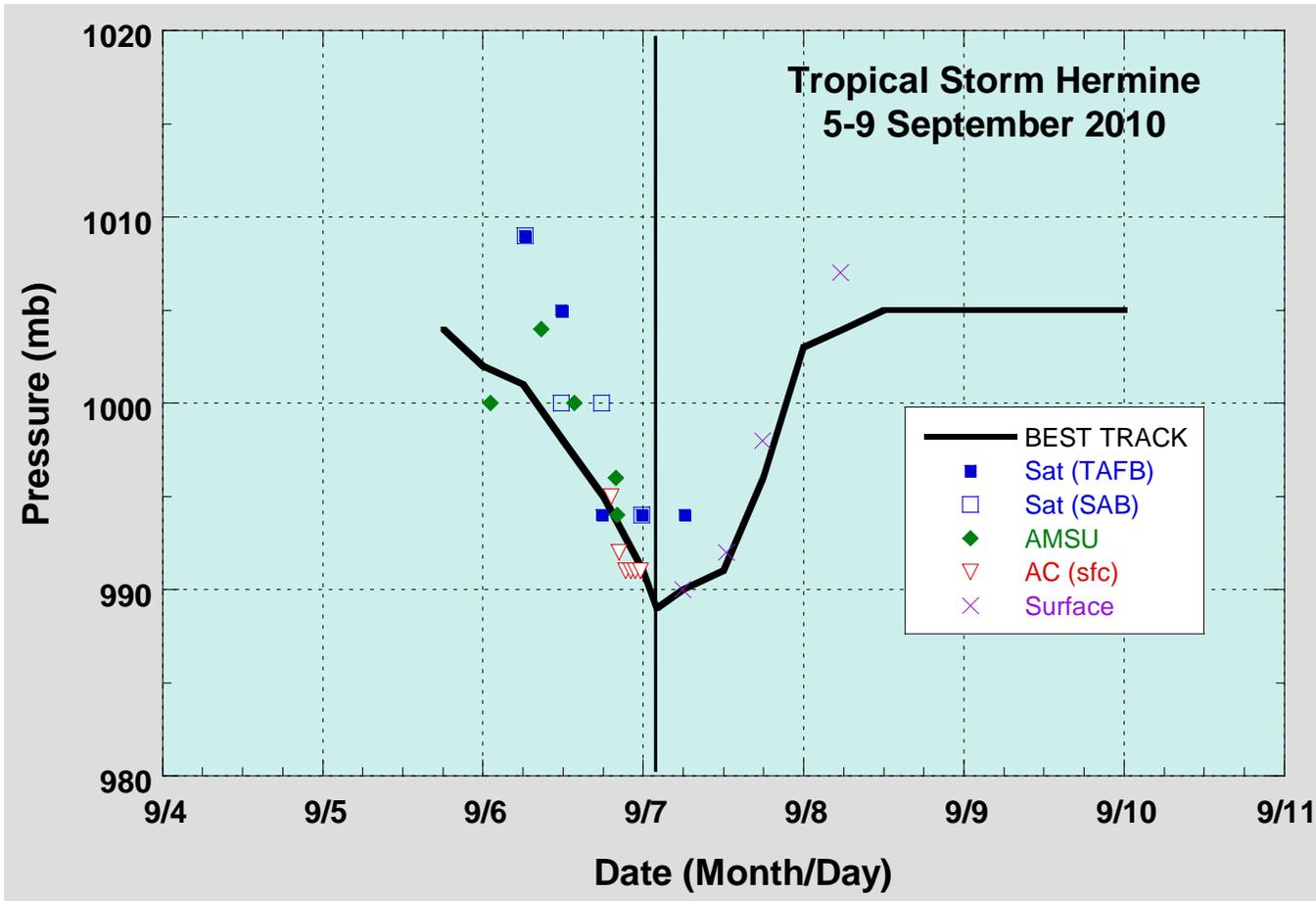


Figure 3. Selected pressure observations and best track minimum central pressure curve for Tropical Storm Hermine, 5-9 September 2010. Dashed vertical lines correspond to 0000 UTC. Solid black line corresponds to the time of landfall.

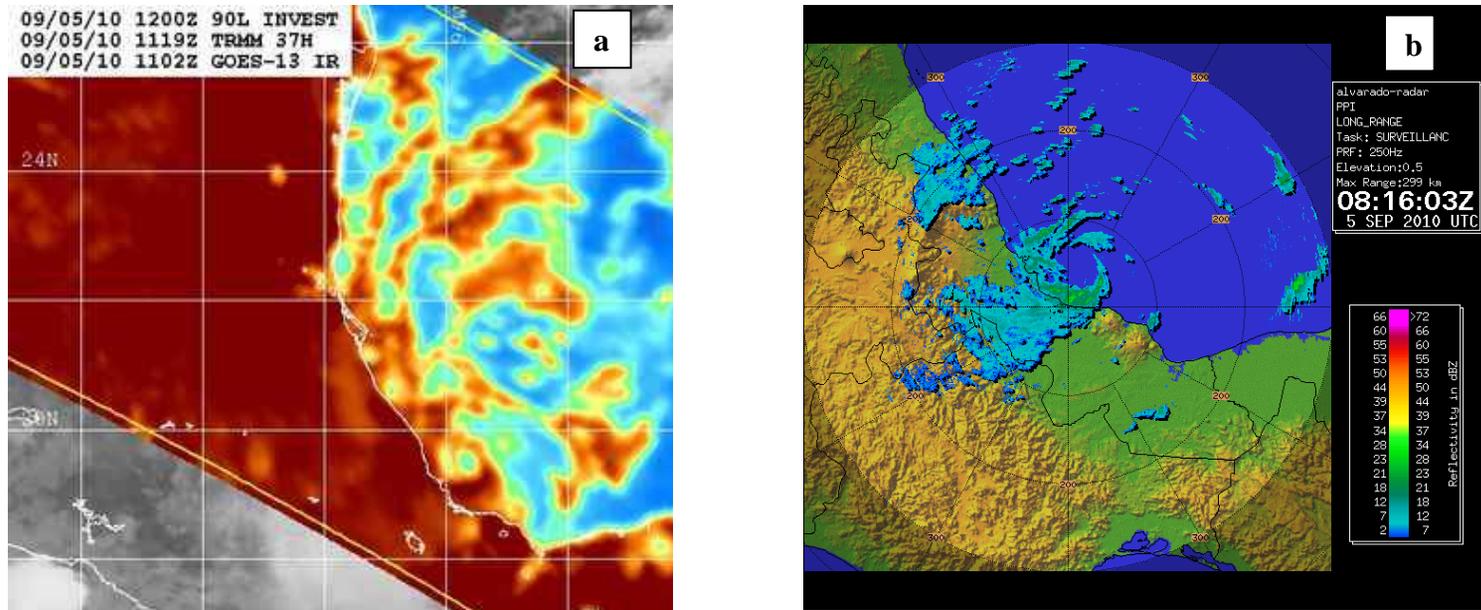


Figure 4. (a) 1119 UTC 5 September TRMM data and (b) radar image from Alvarado, Mexico at 0816 UTC 5 September, during the genesis stage. TRMM image courtesy of the Naval Research Laboratory in Monterey, CA and radar image courtesy of the Servicio Meteorologico Nacional, Mexico.