

Tropical Cyclone Report  
Hurricane Lorenzo  
(AL132007)  
25-28 September 2007

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Hurricane Lorenzo was a category 1 hurricane (on the Saffir-Simpson Hurricane Scale) that made landfall in Mexico south of Tuxpan - in virtually the same location that Hurricane Dean had struck a month earlier.

a. Synoptic History

Lorenzo formed from a tropical wave that moved across the west coast of Africa around 11 September. Convection associated with the wave increased in the western Caribbean on 21 September, and the northern portion of the wave crossed the Yucatan Peninsula and entered the southern Gulf of Mexico. On 24 September, the wave spawned a small surface low in the southwestern Gulf of Mexico, and convection with the system increased. Strong upper-level winds initially inhibited development, but the upper flow began to relax the following day and a tropical depression formed around 1800 UTC 25 September, when the system was centered about 150 n mi east-northeast of Tuxpan, 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. Steering currents surrounding the cyclone were weak initially, and the depression made a small cyclonic loop over the next 30 hours or so. There was little development during this period, due to upper-level southwesterlies associated with a trough near the Texas coast. As the trough moved westward, however, the southwesterly upper flow gave way to an anticyclone above the depression, and the system became a tropical storm at 1200 UTC 27 September, when it was about 130 n mi east of Tuxpan. At about this time, a mid-level ridge built eastward across the northern Gulf of Mexico, providing a more-definite steering flow. Moving westward, Lorenzo strengthened rapidly as it approached the coast, becoming a hurricane less than 12 h after becoming a tropical storm. Lorenzo reached its peak intensity of 70 kt at 0000 UTC 28 September, then weakened slightly, to 65 kt, before making landfall at 0500 UTC near Tecolutla, Mexico, about 35 n mi south-southeast of Tuxpan. The small circulation weakened very rapidly after landfall, with the system decaying to a tropical depression by 1200 UTC that day, and dissipating less than 12 h later.

b. Meteorological Statistics

Observations in Lorenzo (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 and Stepped Frequency Microwave Radiometer (SFMR) surface observations from flights of the 53<sup>rd</sup> 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), the NASA QuikSCAT, and Defense Meteorological Satellite Program (DMSP) satellites, among others, were also useful in tracking Lorenzo.

Lorenzo may have reached hurricane strength a little earlier than indicated in the best track. The SFMR reported a spot wind of 74 kt at 1917 UTC 27 September (Fig. 2), and there was another stretch of hurricane-force winds from 1731-1733 UTC to the southwest of the center. However, neither the central pressure (~1000 mb) nor the flight-level winds (64 kt at 1500 ft) supported hurricane strength at this time. While the SFMR winds do not appear to be in error, it is judged that they were not representative of the cyclone-scale circulation. A peak intensity of 70 kt has been assigned at 0000 UTC 28 September, about the time that a closed eyewall became well-defined on the Alvarado, Mexico radar. The radar presentation of the center had degraded by the time of landfall, and therefore a slightly lower intensity of 65 kt is estimated to be the landfall intensity.

There were no official land-based or ship reports of winds of tropical storm force associated with Lorenzo. Selected rainfall observations from land stations are given in Table 2. The highest rainfall report was 12.83 inches from El Raudal, Veracruz.

#### c. Casualty and Damage Statistics

The government of Mexico reports six deaths attributable to Lorenzo: one in the state of Veracruz and five in Puebla. At least four of the deaths were caused by flash floods or mud slides. Damage in the two states included downed trees and power lines, as well as washed out roads and flooded homes. Media reports indicate that high winds peeled the roofs off of a number of homes in the seaside town of Nautla, to the south of where the center of Lorenzo made landfall. In Puebla, 169 homes were reported damaged and landslides made many roadways impassible. In the state of Hidalgo the San Lorenzo River overflowed its banks, forcing the evacuation of over 200 people.

#### d. Forecast and Warning Critique

The genesis of Lorenzo was well anticipated beginning about 24 h prior to genesis, when the possibility of tropical cyclone formation was first mentioned in the Tropical Weather Outlook.

A verification of official and guidance model track forecasts is given in Table 3. Average official track errors for Lorenzo were 31, 45, 51, 68, and 180 n mi for the 12, 24, 36, 48, and 72 h

forecasts, respectively. The number of forecasts ranged from 13 at 12 h to 1 at 72 h. These errors were generally lower than the average long-term official track errors (Table 4), due in part to the cyclone's slow motion, but were also superior to the objective guidance models.

Average official intensity errors were 13, 11, 19, 24, and 35 kt for the 12, 24, 36, 48, and 72 h forecasts, respectively. For comparison, the average long-term official intensity errors are 6, 10, 12, 14, and 18 kt, respectively, although interpretation is complicated by the timing of landfall and the small number of forecasts. The strengthening of Lorenzo to a hurricane was not anticipated (by either the guidance or the official forecasts) until about 9 h prior to landfall.

Watches and warnings issued by the government of Mexico in association with Lorenzo are summarized in Table 5.

Table 1. Best track for Hurricane Lorenzo, 25-28 September 2007.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
25 / 1800	21.8	94.8	1009	25	tropical depression
26 / 0000	21.7	95.2	1008	25	"
26 / 0600	21.2	95.0	1007	25	"
26 / 1200	21.0	94.7	1008	30	"
26 / 1800	21.2	94.4	1009	30	"
27 / 0000	21.2	94.7	1008	30	"
27 / 0600	20.8	94.8	1009	30	"
27 / 1200	20.6	95.1	1006	45	tropical storm
27 / 1800	20.5	95.7	1001	60	"
28 / 0000	20.5	96.3	990	70	hurricane
28 / 0600	20.5	97.1	993	65	"
28 / 1200	20.5	98.0	1002	30	tropical depression
28 / 1800	20.7	98.7	1008	20	"
29 / 0000					dissipated
28 / 0500	20.5	97.0	993	65	landfall near Tecolutla, Mexico
28 / 0000	20.5	96.3	990	70	minimum pressure

Table 2. Selected surface observations for Hurricane Lorenzo, 25-28 September 2007.

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft) <sup>c</sup>	Storm tide (ft) <sup>d</sup>	Total rain (in)
	Date/time (UTC)	Press. (mb)	Date/time (UTC) <sup>a</sup>	Sustained (kt) <sup>b</sup>	Gust (kt)			
El Raudal								12.83
Xicotepec								11.83
Zaculatipan								4.33
Jicotepec								3.96
Requetemu								3.53
El Naranjillo								4.51
Coyutla								6.81
Banderilla								5.04
Temazcal								3.94
Actopan								5.63
Tenochtitlán								4.83
Rinconada								4.80
Martinez de la Torre								4.50
Misantla								4.61
Poza Rica								6.28
Tuxpan								6.52
Patla								9.45
Cuetzalan								5.40
Ahuazotepec								5.04
Zacapuaxtla								4.06
P. La Soledad								4.32
Huauchingo								7.11
Nexapa								8.87
N. Necaxa								8.83
Tenango								8.27
Los Reyes								7.64

<sup>a</sup> Date/time is for sustained wind when both sustained and gust are listed.

<sup>b</sup> Except as noted, sustained wind averaging periods for C-MAN and land-based ASOS reports are 2 min; buoy averaging periods are 8 min.

<sup>c</sup> Storm surge is water height above normal astronomical tide level.

<sup>d</sup> Storm tide is water height above National Geodetic Vertical Datum (1929 mean sea level).

Table 3. Preliminary track forecast evaluation (heterogeneous sample) for Hurricane Lorenzo, 25-28 September 2007. Forecast errors (n mi) are followed by the number of forecasts in parentheses. Errors smaller than the NHC official forecast are shown in bold-face type.

Forecast Technique	Forecast Period (h)						
	12	24	36	48	72	96	120
CLP5	41 (11)	81 (9)	124 (7)	172 (5)	238 (1)		
GFNI	65 (6)	94 (3)	150 (2)				
GFDI	46 (11)	62 (9)	70 (7)	103 (5)	<b>71 (1)</b>		
HWFI	33 (11)	55 (9)	61 (7)	131 (5)			
GFSI	36 (8)	63 (5)	94 (4)	105 (2)	<b>177 (1)</b>		
AEMI	42 (1)	64 (1)	67 (1)	70 (1)	185 (1)		
NGPI	33 (8)	<b>43 (6)</b>	52 (4)	85 (2)	204 (1)		
UKMI	37 (8)	63 (6)	85 (4)	100 (3)			
BAMD	42 (11)	80 (9)	125 (7)	182 (5)	276 (1)		
BAMM	44 (11)	84 (9)	118 (7)	181 (5)	299 (1)		
BAMS	41 (11)	71 (9)	97 (7)	147 (5)	198 (1)		
CONU	38 (11)	51 (9)	65 (7)	73 (5)	<b>147 (1)</b>		
GUNA	32 (6)	65 (3)	83 (2)				
FSSE	41 (3)	72 (1)					
OFCL	31 (11)	45 (9)	51 (7)	68 (5)	180 (1)		
NHC Official (2002-2006 mean)	35 (1852)	61 (1686)	86 (1519)	112 (1362)	162 (1100)	221 (885)	290 (723)

Table 4. Preliminary intensity forecast evaluation (heterogeneous sample) for Hurricane Lorenzo, 25-28 September 2007. Forecast errors (kt) are followed by the number of forecasts in parentheses. Errors smaller than the NHC official forecast are shown in bold-face type.

Forecast Technique	Forecast Period (h)						
	12	24	36	48	72	96	120
SHF5	17.4 (11)	17.6 (9)	<b>15.1 (7)</b>	<b>21.8 (5)</b>	30.0 (1)		
GHMI	13.7 (11)	<b>10.9 (9)</b>	<b>17.1 (7)</b>	<b>18.4 (5)</b>	<b>5.0 (1)</b>		
HWFI	<b>10.8 (11)</b>	15.1 (9)	<b>17.3 (7)</b>	<b>21.0 (5)</b>			
SHIP	17.2 (11)	16.3 (9)	<b>15.7 (7)</b>	<b>21.6 (5)</b>	43.0 (1)		
DSHP	13.2 (11)	13.2 (9)	<b>16.9 (7)</b>	29.0 (5)	<b>7.0 (1)</b>		
FSSE	17.3 (3)	22.0 (1)					
ICON	<b>12.7 (11)</b>	12.3 (9)	<b>16.6 (7)</b>	<b>21.2 (5)</b>	<b>6.0 (1)</b>		
OFCL	13.2 (11)	11.1 (9)	18.6 (7)	24.0 (5)	35.0 (1)		
NHC Official (2002-2006 mean)	6.4 (1852)	9.8 (1686)	12.0 (1519)	14.1 (1362)	18.3 (1100)	19.8 (885)	21.8 (723)



Table 5. Watch and warning summary for Hurricane Lorenzo, 25-28 September 2007. All locations are in Mexico.

Date/Time (UTC)	Action	Location
27 / 0300	Tropical Storm Watch issued	Palma Sola to La Cruz
27 / 1500	Tropical Storm Watch modified to	Cabo Rojo to La Cruz
27 / 1500	Tropical Storm Warning issued	Palma Sola to Cabo Rojo
27 / 2100	Tropical Storm Warning changed to Hurricane Warning	Palma Sola to Cabo Rojo
27 / 2100	Tropical Storm Warning issued	Palma Sola to Veracruz
28 / 0900	Tropical Storm Watch discontinued	All
28 / 0900	Tropical Storm Warning modified to	Cabo Rojo to Veracruz
28 / 0900	Hurricane Warning discontinued	All
28 / 1500	Tropical Storm Warning discontinued	All

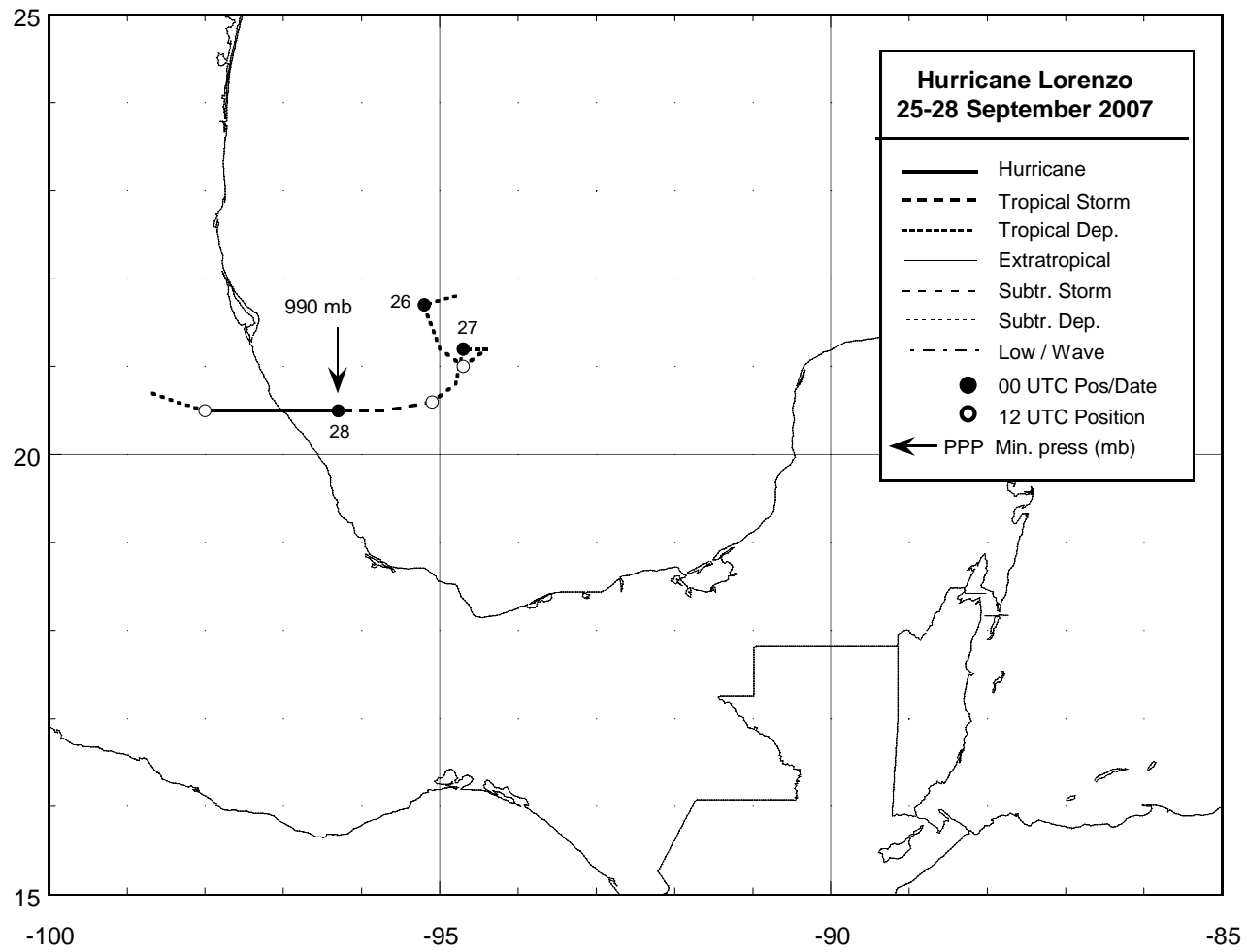


Figure 1. Best track positions for Hurricane Lorenzo, 25-28 September 2007.

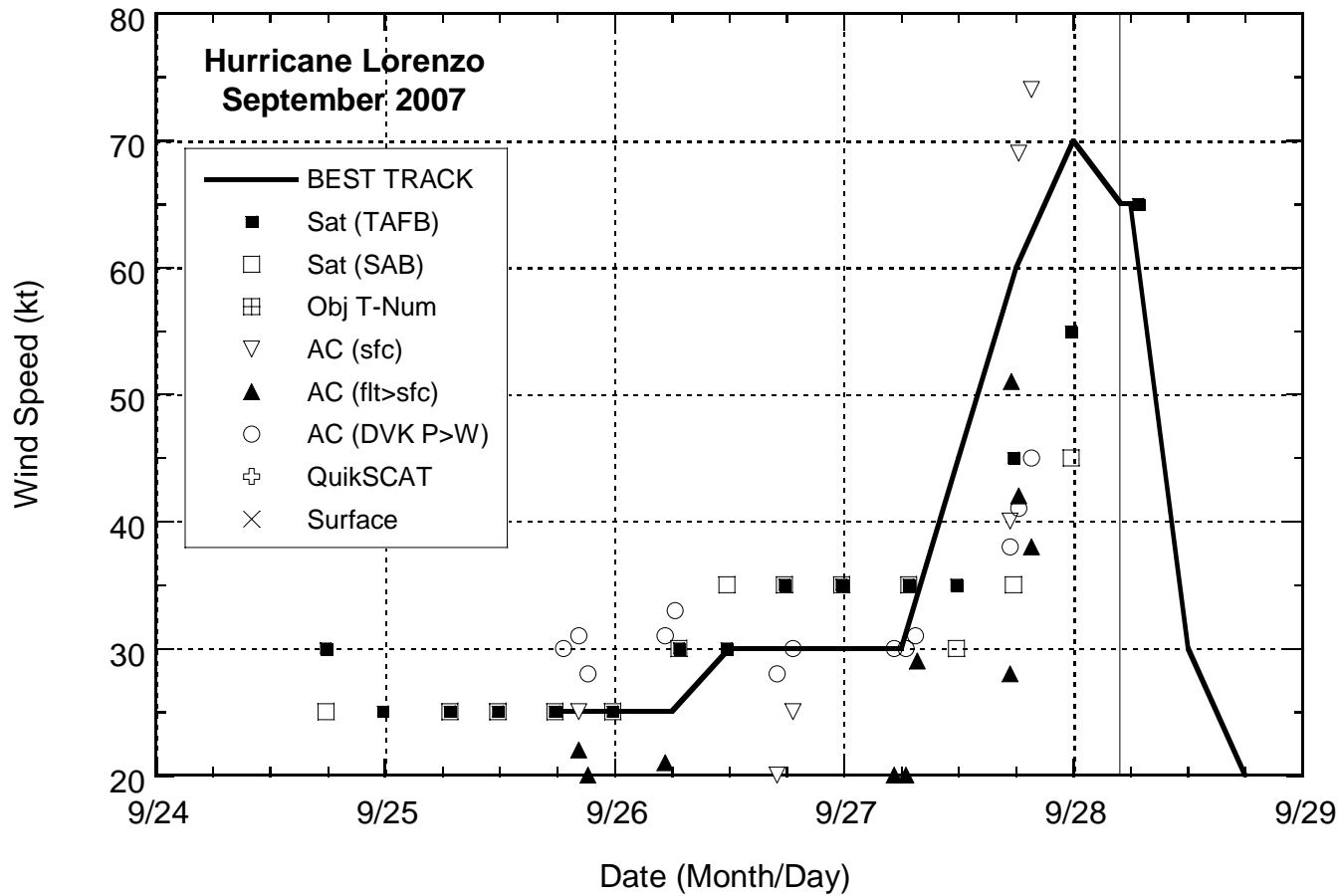


Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Hurricane Lorenzo, 25-28 September 2007. Aircraft observations have been adjusted for elevation using 90%, 80%, and 80% reduction factors for observations from 700 mb, 850 mb, and 1500 ft, respectively. Time of landfall is indicated by the thin solid vertical line.

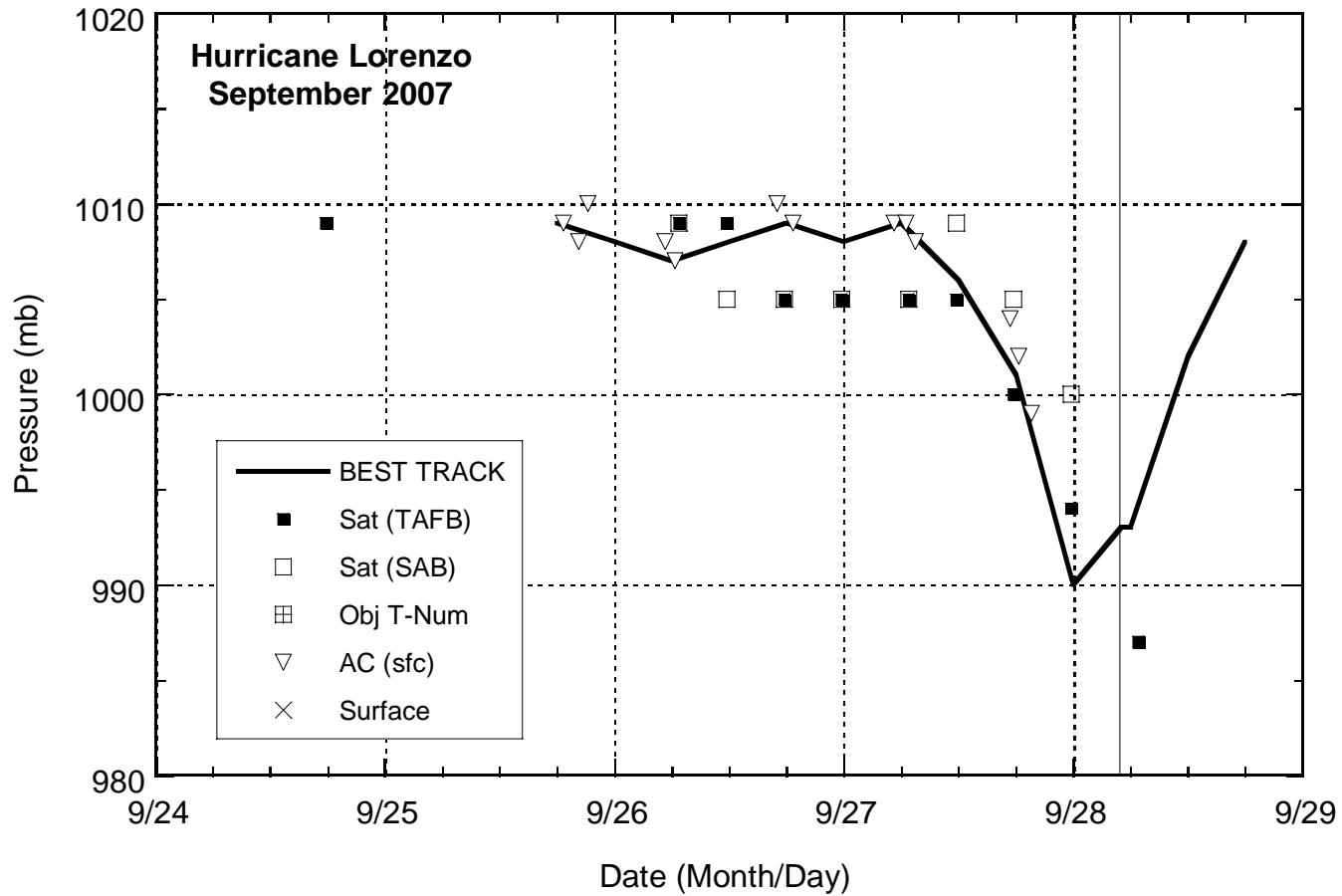


Figure 3. Selected pressure observations and best track minimum central pressure curve for Hurricane Lorenzo, 25-28 September 2007. Time of landfall is indicated by the thin solid vertical line.