

Preliminary Report
Hurricane Hernan
30 September – 4 October 1996

Richard J. Pasch
National Hurricane Center
17 January 1997

Hernan made landfall on the coast of Mexico, between Manzanillo and Puerto Vallarta, as a category one hurricane on the Saffir/Simpson Hurricane Scale.

a. Synoptic History

A tropical wave that emerged from the coast of western Africa in mid-September moved westward across the Atlantic basin during the latter half of the month. Convection associated with the system temporarily increased near the Lesser Antilles on 22 September, and again on 25-27 September, as the wave moved across the western Caribbean Sea and Central America. Deep convection associated with the wave became a little more consolidated near the Gulf of Tehuantepec on the 28th. By 1800 UTC on the 29th, when the wave axis was near 97°W longitude, the cloud pattern was sufficiently well-organized that Dvorak classifications on the system were being given by the Tropical Analysis and Forecast Branch (TAFB). Satellite data indicate that Tropical Depression Eleven-E developed from this disturbance a little over 250 n mi south-southeast of Acapulco around 0600 UTC 30 September, as shown in Table 1, which lists the post-analysis "best track". Gradual development continued, and the cyclone became Tropical Storm Hernan about 12 hours later.

Initially, the cyclone was moving westward, but the motion soon became west-northwestward and then northwestward. Early on October 1, Hernan shifted northward, and then north-northeastward. The storm was still in the developing stage and not yet well-organized; thus, part of this displacement was probably related to a reformation of the center. Later on the 1st, Hernan, then better-organized, turned back toward the north-northwest and, on the 2nd, toward the northwest. By 0600 on the 2nd, when the center was nearing the coast and located about 60 n mi south of Lazaro Cardenas, Mexico, Hernan strengthened into a hurricane. Reflectivity presentations from the Mexican weather service radar located at Cuyutlan (central coast of the Mexican state of Colima), at around 1000 UTC on the 2nd, revealed a well-defined, closed eyewall. The maximum intensity of Hernan, 75 knots, is estimated to have occurred around that time.

From 1200 UTC on the 2nd through 0000 UTC on the 3rd, the hurricane moved parallel, but very near, to the coastline. Early on the 3rd, the forward motion slowed to a crawl and the center moved in a small counter-clockwise loop, just offshore. Hernan then responded to a mid- to upper-tropospheric trough over the southwestern United States and moved northward, making landfall near Barra de Navidad, at 1000 UTC 3 October. Since the center had been moving very near to the mountainous landmass of Mexico for about 24 hours prior to landfall, the hurricane had

weakened somewhat before the center finally crossed the coast. Hernan weakened to a tropical storm just after landfall. The cyclone moved mostly northward over land, passing just east of Puerto Vallarta while weakening below storm strength by 0000 UTC on the 4th. Although the center briefly moved back out over the waters north of Puerto Vallarta, the system had become so disorganized that it dissipated around 0000 UTC 5 October.

Figure 1 depicts the best track of Hernan.

b. Meteorological Statistics

Figures 2 and 3 are the curves of minimum central sea-level pressure and maximum one-minute average "surface" (10 meters above ground level) wind speed, respectively, as functions of time. Also plotted are the observations on which the curves are based, consisting of Dvorak-technique estimates (from the Tropical Analysis and Forecast Branch, the Synoptic Analysis Branch, and the U.S. Air Force Global Weather Center) using satellite imagery.

There were three ship reports of tropical storm force winds associated with Hernan. The first, at 0600 UTC 1 October, a vessel with unknown call sign, location 15.2°N 100.2°W, wind 090/35 knots, pressure 1008.3 mb. The second, at 1200 UTC 1 October, call sign KLHZ, location 14.7°N 97.1°W, wind 150/35 knots, pressure 1007.8 mb. The third, at 1800 UTC 1 October, call sign MQWA5, location 15.4°N 100.7°W, wind 160/40 knots, pressure 999.1 mb.

No actual measurements of strong winds from land have been received. Local press reports indicate that waves along the coasts of the states of Colima and Jalisco reached 13 feet.

c. Casualty and Damage Statistics

Hernan struck a relatively sparsely populated area of Mexico. Local press reported at least 100 injuries with 1,000 homes damaged. There was flooding in the coastal town of Melaque, Jalisco. Washouts were reported on Mexico Route 200, the coastal road between Puerto Vallarta and Manzanillo, and on Mexico Route 80, which runs between Melaque and Guadalajara. Telephone service and electricity were disrupted in various locations.

d. Forecast and Warning Critique

Table 2 is a listing of track forecast error statistics for Hernan. Although, the sample size is very small, one can see that the official and model forecasts were generally larger than the NHC's long-term averages for the eastern Pacific. This is typically the case for landfalling storms in that basin. Hernan was correctly forecast to become a hurricane. However, in most cases, the intensity of this tropical cyclone was somewhat underforecast in the NHC advisories.

A tropical storm warning was issued for Mexico from Acapulco to Manzanillo at 1800 UTC 1 October. A hurricane watch was put into effect from Zihuatanejo to Manzanillo at 0300 UTC 2 October. This was changed to a hurricane warning at 0900 UTC 2 October. A tropical

storm warning was issued north of Manzanillo to San Blas at 1500 UTC 2 October, and the hurricane warning was extended north of Manzanillo to Cabo Corrientes at 2100 UTC 2 October. Hurricane warnings were extended north of Cabo Corrientes to San Blas and tropical storm warnings were extended north of San Blas to Mazatlan at 0300 UTC 3 October. There was a relatively short lead time, roughly six hours, between the issuance of hurricane warnings and the arrival of the eyewall (not the center) on the coast on 2 October. Hernan's center ultimately crossed the coast (on 3 October) about 13 hours after the issuance of hurricane warnings for the landfall area.

Table 1. Best track, Hurricane Hernan. 30 September – 4 October 1996.

| Date/Time (UTC) | Latitude (°N) | Longitude (°W) | Pressure (mb) | Wind Speed (kt) | Stage |
|-----------------|---------------|----------------|---------------|-----------------|--------------------------------|
| 30/0600 | 12.6 | 98.7 | 1004 | 30 | tropical depression |
| 1200 | 12.6 | 99.7 | 1003 | 30 | " |
| 1800 | 12.9 | 100.7 | 1003 | 35 | tropical storm |
| 1/0000 | 13.4 | 101.5 | 1002 | 35 | " |
| 0600 | 14.1 | 101.4 | 1001 | 35 | " |
| 1200 | 14.7 | 101.1 | 999 | 45 | " |
| 1800 | 15.5 | 101.3 | 995 | 50 | " |
| 2/0000 | 16.1 | 101.7 | 992 | 55 | " |
| 0600 | 16.9 | 102.3 | 987 | 65 | hurricane |
| 1200 | 17.9 | 103.1 | 980 | 75 | " |
| 1800 | 18.5 | 103.9 | 981 | 70 | " |
| 3/0000 | 18.9 | 104.6 | 985 | 65 | " |
| 0600 | 18.7 | 104.9 | 987 | 65 | " |
| 1200 | 19.5 | 104.9 | 989 | 60 | tropical storm |
| 1800 | 20.1 | 105.0 | 991 | 40 | " |
| 4/0000 | 20.7 | 105.1 | 994 | 30 | tropical depression |
| 0600 | 21.1 | 105.6 | 998 | 30 | " |
| 1200 | 21.7 | 105.6 | 1002 | 25 | " |
| 1800 | 22.0 | 105.5 | 1003 | 25 | " |
| 5/0000 | | | | | dissipated |
| | | | | | |
| 2/1200 | 17.9 | 103.1 | 980 | 75 | minimum pressure |
| 3/1000 | 18.8 | 104.9 | 987 | 65 | landfall near Barra de Navidad |

Table 2. Preliminary forecast evaluation of Hurricane Hernan, heterogeneous sample (Errors in nautical miles for tropical storm and hurricane stages with number of forecasts in parenthesis).

| Forecast Technique | Forecast Period (h) | | | | |
|--|---------------------|-----------|------------|------------|------------|
| | 12 | 24 | 36 | 48 | 72 |
| CLIP | 90 (11) | 156 (9) | 184 (7) | 260 (5) | 429 (1) |
| GFDI | 73 (9) | 103 (7) | 117 (6) | 125 (5) | 112 (1) |
| GFDL * | 112 (4) | 136 (3) | 144 (2) | 162 (2) | - (0) |
| LBAR | 79 (11) | 126 (9) | 164 (7) | 233 (5) | 345 (1) |
| AVNI | 94 (10) | 126 (8) | 161 (6) | 166 (4) | 174 (1) |
| BAMD | 83 (11) | 143 (9) | 216 (7) | 276 (5) | 406 (1) |
| BAMM | 75 (11) | 123 (9) | 174 (7) | 220 (5) | 258 (1) |
| BAMS | 81 (11) | 143 (9) | 200 (7) | 239 (5) | 329 (1) |
| P91E | 93 (11) | 151 (9) | 198 (7) | 304 (5) | 536 (1) |
| NGPI | 76 (8) | 108 (7) | 120 (5) | 181 (3) | - (0) |
| UKMI | 80 (9) | 114 (7) | 159 (5) | 260 (3) | - (0) |
| NHC OFFICIAL | 66 (11) | 111 (9) | 143 (7) | 176 (5) | 252 (1) |
| NHC OFFICIAL 1988-1995 8- year average | 39 (2180) | 71 (1970) | 105 (1752) | 139 (1553) | 196 (1189) |

* GFDL output not available until after forecast issued.

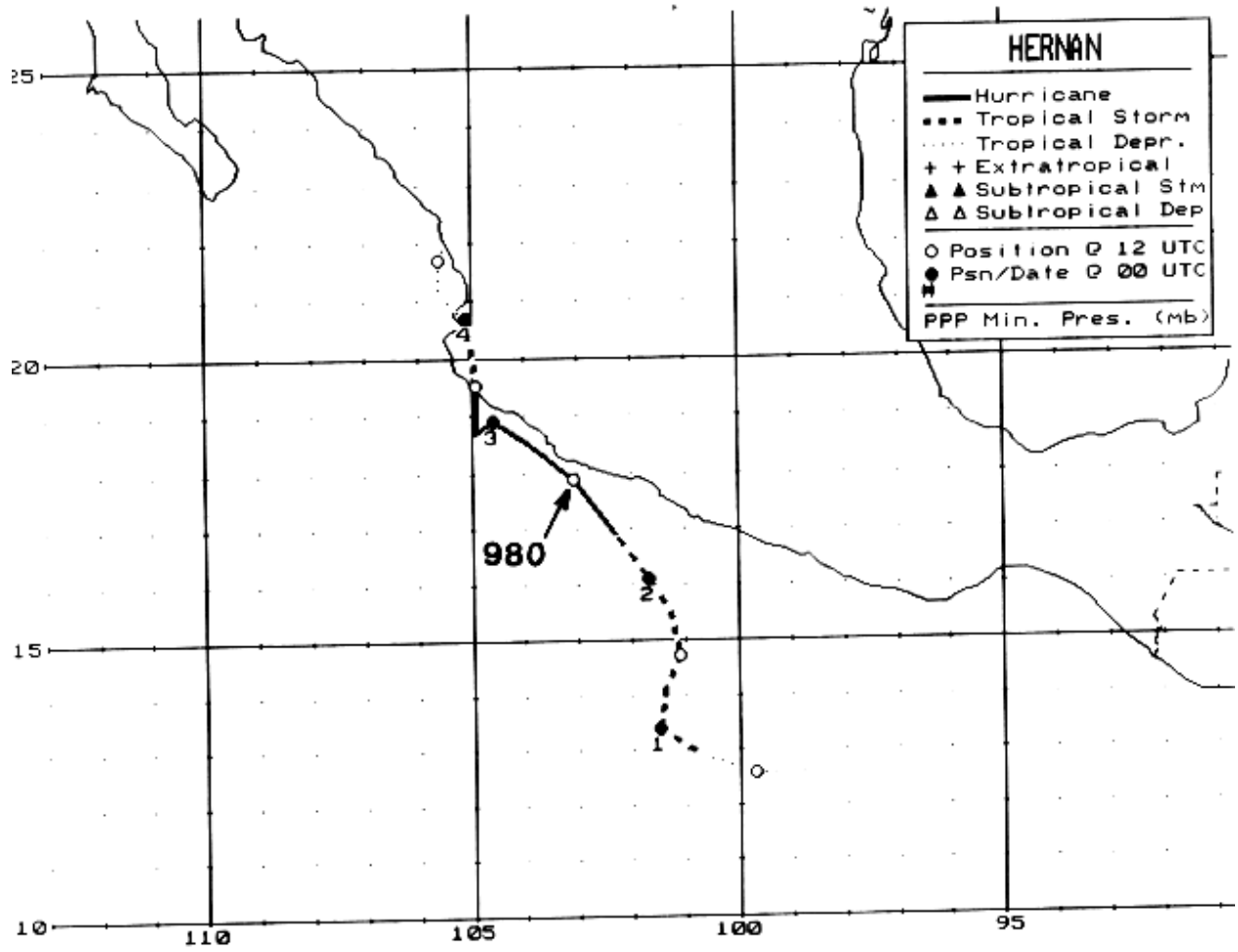


Figure 1. Best track positions for Hurricane Hernan, September/October, 1996.

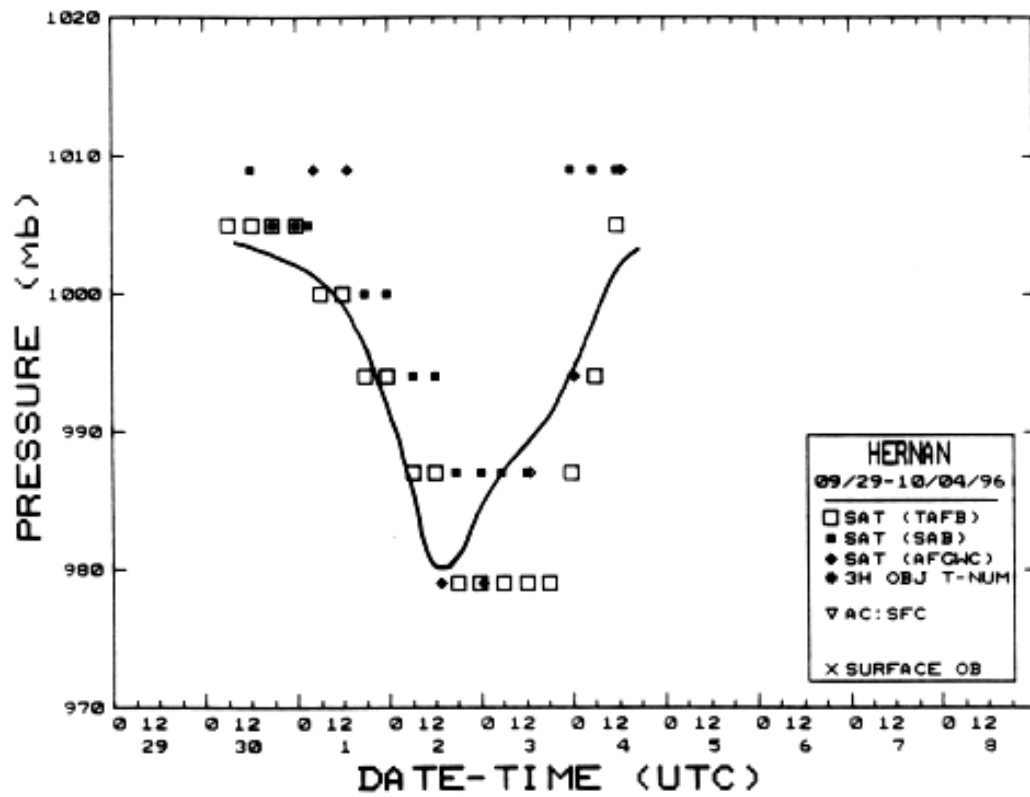


Figure 2. Best track central pressure curve for Hurricane Hernan, September/October, 1996.

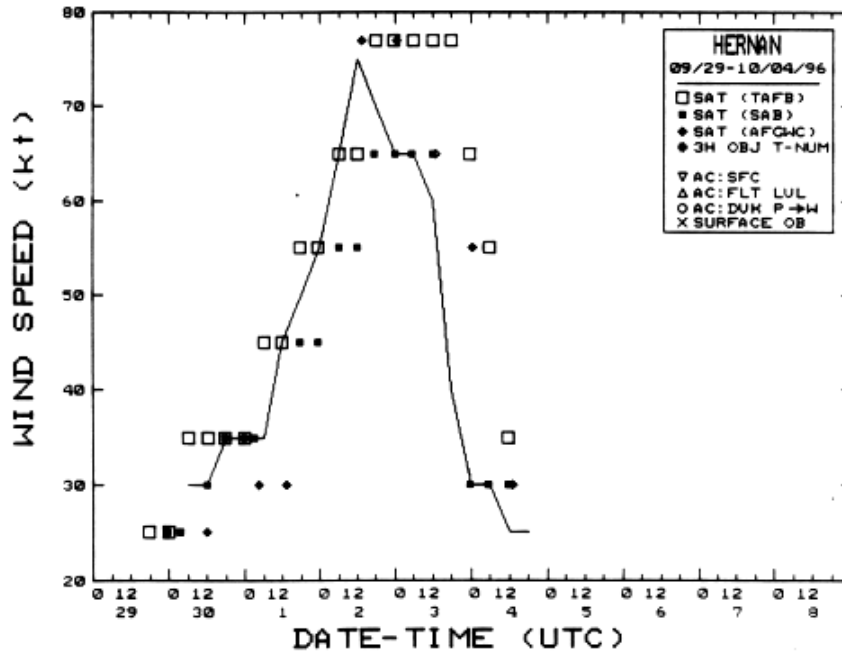


Figure 3. Best track maximum one-minute wind speed curve for Hurricane Hernan, September/October, 1996.