

Tropical Cyclone Report  
Tropical Storm Norman  
20-22 September 2000

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Norman made landfall as a tropical storm over southwestern Mexico producing torrential rains.

a. Synoptic history

The southern extension of the tropical wave which triggered Hurricane Gordon in the Gulf of Mexico continued moving westward over central America and Mexico from 14 to 16 September. The interaction of the tropical wave with a large cyclonic low-level gyre which had persisted over the eastern Pacific for a few days produced a large area of disturbed weather. Initially, the shower activity was widely-scattered and did not become concentrated until 18 September when the disturbance was located about 180 n mi south-southwest of Acapulco, Mexico. The cloud pattern gradually became organized and developed a circular mass of deep convection with a well-defined outflow. It is estimated that a tropical depression formed at 0000 UTC 20 September about 180 n mi south-southeast of Manzanillo.

The depression drifted northward while embedded within a weak steering flow. It slowly improved in organization and became a tropical storm by 1200 UTC 20 September. Ships in the area suggested strengthening and Norman reached its peak intensity of 45 knots and minimum pressure of 998 mb at 1800 UTC. A couple of hours later, Norman made landfall between Lazaro Cardenas and Colima and began to weaken.

The depression center moved slowly northwestward over the high terrain of southwestern Mexico while maintaining an area of very deep convection primarily within bands over water. The poorly-defined center of the depression moved back over water just to the north of Puerto Vallarta and turned northward. The depression never recovered from its passage over the mountains and Norman made its second landfall as a tropical depression in the vicinity of Mazatlan near 1500 UTC 22 August. It then dissipated over land shortly thereafter. The best track is listed in Table 1 and is plotted in Fig. 1.

b. Meteorological statistics

Figure 2 shows the best track curves for maximum sustained 1-min surface winds and minimum central pressure data, respectively, as functions of time. These plots include Dvorak satellite classification estimates and surface observations. Norman was upgraded to tropical storm status based on two ship reports: The "*Imwanuma Maru*" reported 38-knot winds and a pressure of 1001.5 mb at 1200 UTC on the 20<sup>th</sup> and the "*Star Grip*"

reported 39 knots and 1003 mb pressure at 1300 UTC on the same day. Both ships were just to the west of the center. Large amounts of rain occurred over southwestern Mexico. Official reports from the Servicio Meteorologico Nacional de Mexico show a maximum of 14.0 inches in Callejones, Colima and 9.5 inches in La Villita, Michoacan.

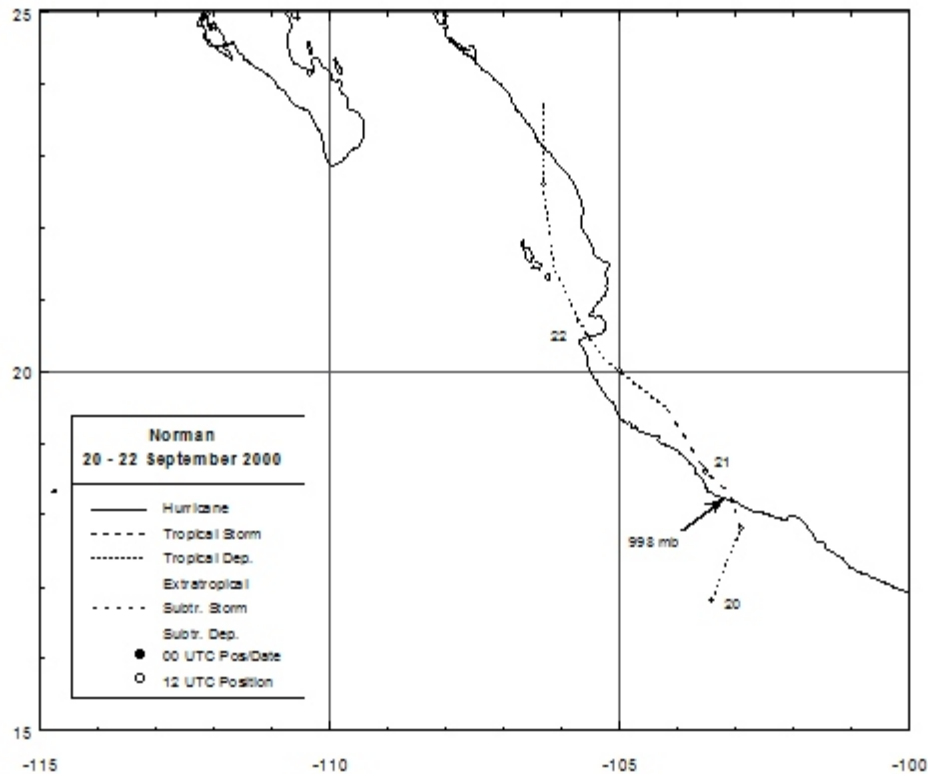


Fig. 1. Best track positions for Tropical Storm Norman, 20-22 September 2000.

### c. Casualties and damages

Despite the heavy rains, no reports of deaths or damage were received at the National Hurricane Center associated with Norman.

### d. Forecast and warning critique

Norman was a short-lived tropical storm, so there are no meaningful forecast verification statistics. However, since the early stages of the development of Norman, it was emphasized in the public tropical cyclone advisories that torrential rains were expected over portions of southwestern Mexico. In addition, once the system consolidated and became a tropical depression, a tropical storm warning was issued for a portion of the coast of Mexico from Zihuatanejo to Manzanillo at 0300 UTC 20 September and was discontinued 24 hour later after the system moved inland. Norman was forecast to remain as a tropical depression after it moved back over water. Therefore, a tropical storm

warning was not necessary for the area of Mazatlan, but the potential for heavy rains continued to be emphasized.

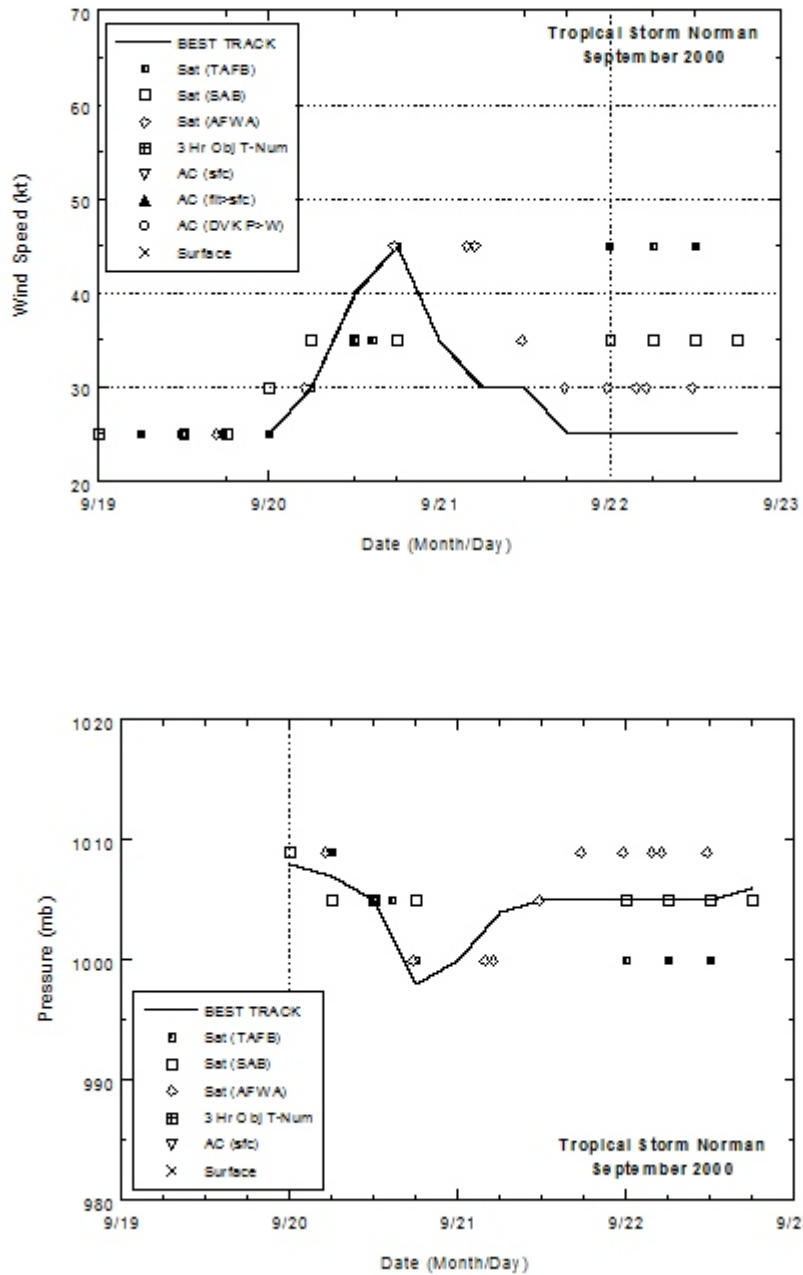


Fig. 2. Best track maximum sustained wind speed and minimum central pressure curves for Tropical Storm Norman.

Table 1. Best track for Tropical Storm Norman , 20-22 September, 2000.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
20/0000	16.8	103.4	1008	25	tropical depression
0600	17.2	103.2	1007	30	“
1200	17.8	102.9	1005	40	tropical storm
1800	18.3	103.1	998	45	“
21/0000	18.6	103.5	1000	35	“
0600	19.5	104.2	1004	30	tropical depression
1200	20.0	105.0	1005	30	“
1800	20.2	105.3	1005	25	“
22/0000	20.7	105.7	1005	25	“
0600	21.4	106.1	1005	25	“
1200	22.6	106.3	1005	25	“
1800	23.7	106.3	1006	25	“
20/1800	18.3	103.1	998	45	minimum pressure
20/2000	18.4	103.2	1000	45	landfall west of Lazaro Cardenas
22/1500	23.1	106.3	1006	25	landfall near Mazatlan