PRELIMINARY REPORT

TROPICAL STORM DOROTHY - AUGUST 13-23, 1970

Tropical Storm Dorothy, initially located by ATS-3 satellite as a disturbance moving off the African coast on the 13th of August, appeared to be in a favored climatological area for rapid development into a hurricane when it was first investigated by reconnaissance aircraft about 500 miles east of the Windward Islands on August 19th. However, her destiny was decided ultimately by the combination of a persistent cold upper tropospheric trough over the central and eastern Caribbean and the persistence of strong easterly winds over the northeastern South American coast, which simultaneously entrapped the storm system as it entered the Caribbean Sea. Satellite pictures and ATS-3 film loops from the National Hurricane Center confirmed the lack of real organization showing an east-west band of cloudiness extending well to either side of the surface center during the entire period Dorothy was of tropical storm intensity.

Dorothy's highest sustained winds were around 60 mph as the storm moved into the French West Indies Islands of Martinique, Dominica, and Guadeloupe around midday of August 20th. The lowest pressure was never much below 1000 mb and generally hovered between 1000 and 1005 mb from the 19th through the 21st. By August 22nd the storm became even more disorganized and finally degenerated into a tropical wave in the central Caribbean on August 23rd.

There were 50 deaths on Martinique and 1 on Dominica, all produced by flooding and land slides from excessive rains which followed the passage

of the storm center into the Caribbean. Fort-de-France, Martinique, measured more than 12 inches in the nine hour period following the passage of the storm center almost directly over the Island. There were reports of extensive damage to crops and roads from flooding on Martinique and Dominica. At this time, however, no damage estimates have been received. None of the other islands through the eastern Caribbean have reported significant damage from heavy rains.

The lack of a tightly organized center was the only tracking problem as almost continuous coverage was maintained by Air Force, Navy, and ESSA aircraft. Movie film loops were made from ATS-3 satellite pictures developed as frequently as 13 minute intervals at the National Hurricane Center. This gave the hurricane forecaster a chance to feel the pulse of Dorothy as she went through numerous cycles of attempted organization.

Outside of a trend to turn the storm too much to the north in the longer range forecasts because of a persistent weakness in the pressure field over the Atlantic well to the north of the Greater Antilles, the forecasts for Dorothy were satisfactory. (See verification table attached.) The intensification which was continually forecast did not eventuate; however, the storm originated in an area normally conducive to rapid development, and the imminence of many vulnerable islands in the Lesser Antilles was conducive to this kind of over forecasting.

major damage occurred to well-constructed hangars and other buildings at the airport (fig. 4), and trailers in an adjacent mobile-home park were almost completely demolished. These high-energy wind bursts produced streaky damage across the city of Corpus Christi with debris from the most heavily damaged structures being carried, in some instances, more than 1,000 yd downwind without evidence of any rotary character associated with the transport. Between these long streaks of major damage, there were areas of only minor damage, confined mostly to trees and ornamentals.

In the areas over which the eye or right semicircle of the storm passed, there were less-pronounced debris patterns. However, in cases where structures were badly ruptured, there was evidence that the damage was caused by winds from the south-southeast to southwest and occurred after the passage of the eye.

The damage due to storm surge was confined mostly to the areas around Port Aransas, Aransas Pass, and Rockport. The highest measured tide values were 9.2 and 9.0 ft that occurred at Port Aransas Beach and Port Aransas jetty, respectively. Even around these areas, the greatest damage appeared to come from southerly winds and was mainly to roofs and second floors of structures. At Port Aransas, many structures had the roof and entire second floor swept away with little evidence of damage to the lower floor other than from rain and sea water.

More attention is given here to the pattern of damage in Celia because it is believed that this is indeed a unique phenomenon deserving further study, regarding both the implications for building codes and protective measures during hurricanes and because of its importance in the understanding of nonsteady-state [illegible] and the distribution of wind patterns. Celia clearly demonstrated that the sustained wind, at least under the present definition, is not the relevant parameter upon which engineering design of structures should be based. The rupture of buildings due to wind forces and the hydrodynamical effect of wind moving over rough objects suggests that the definition of sustained wind needs to be revised to reflect the period of time that a given wind speed must prevail to maximize the hydrodynamical forces that, potentially, may be established on a structure due to the movement of the wind over and about it.

Regarding prediction of the track and the timing of landfall, Celia offered few problems. The average displacement error of all 24-hr forecasts of this storm was only 34 n.mi., which is about 60 percent of the long-term average error for storms in this geographical area.

In summary, Celia was meteorologically a unique hurricane: (1) because of the two periods of very rapid development and (2) because of the very unusual winds in the left semicircle—short-period high energy bursts lasting but a few seconds but exceeding the prevailing sustained wind speed by a factor of 2 to 3 or more.

Fortunately, the city of Corpus Christi and its disaster prevention agencies were well prepared for the action called for in the warnings issued on Celia; and by daybreak on August 3, 10 hr before arrival of the storm center, nearly all preparedness measures were complete, and little more could have been done regardless of the gravity of the emergency with which the city was confronted. The effectiveness of these measures was evident in the low casualty figures. A total of 16 lives were lost due to Celia, including the five in Cuba and five in the immediate Corpus Christi metropolitan area. This is the more spectacular because of the fact that property losses in Celia rose to a record for Texas of $444.9 million with an additional $8.8 million in crop damage. In terms of dollar damage, Celia ranks behind the following hurricanes (in order): Camille (1969), Betsy (1965), Diane (1955), and Carol (1954). Meteorologically however, Celia's intensity, in terms of lowest central pressure, ranks below such Texas storms as Carla (1961) and Beulah (1967) and at least 10 other storms that affected the U.S. coastline. A summary of meteorological data pertaining to Celia is given in table 1.

TROPICAL STORM DOROTHY, AUGUST 13–23

Dorothy formed from an African seedling disturbance that emerged from the coast on August 13. The storm was named on August 19 about 500 mi east of the Lesser Antilles, upon receipt of a reconnaissance report of 50-kt winds and a 1000-mb (29.53-in.) pressure center.

The storm reached its maximum intensity, with lowest pressure of 996 mb (29.41 in.) and highest winds around 60 kt, as it approached the French West Indies early on the 20th. The center passed over the island of Martinique where a low-pressure reading of 999.7 mb (29.52 in.) and winds of 58 kt with gusts to 86 kt were recorded at the town of Caravelle. Fifty persons were reported dead or missing as a result of floods and landslides caused by heavy rains on Martinique, and there was one fatality on Dominica.

The storm moved under an upper level cold trough in the eastern Caribbean and gradually weakened, dropping below tropical storm force on August 22.

During its entire life including its traverse of the Atlantic as a disturbance, Dorothy followed a remarkably straight west-northwestward track. The average displacement error of all 24-hr forecasts was only 46.3 n.mi., less than half the long-term average.

HURRICANE ELLA, SEPTEMBER 7–13

Ella resulted from a depression that formed initially on a sharp surface trough which extended from San Andres to southern Florida on September 8. The depression formed near Swan Island and headed northwestward, becoming a tropical storm in the Gulf of Mexico after crossing the northeast corner of the Yucatan Peninsula. From this