NOAA Technical Report NWS 32

Pertinent Meteorological and Hurricane Tide Data for Hurricane Carla

Silver Spring, Md.
August 1982

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Weather Service

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NWS 13 The March-April 1969 Snowmelt Floods in the Red River of the North, Upper Mississippi, and Missouri Basins. Joseph L. H. Paulhus, Office of Hydrology, October 1970, 92 p. (COM-71-50269)

NWS 14 Weekly Synoptic Analyses, 5-, 2-, and 0.4-Millibar Surfaces for 1968. Staff, Upper Air Branch, National Meteorological Center, May 1971, 169 p. (COM-71-50383)

NWS 15 Some Climatological Characteristics of Hurricanes and Tropical Storms, Gulf and East Coasts of the United States. Francis P. Ho, Richard W. Schwerdt, and Hugo V. Goodyear, May 1975, 87 p. (COM-75-11088)

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U.S. DEPARTMENT OF COMMERCE
Malcolm Baldrige, Secretary

National Oceanic and Atmospheric Administration
John V. Byrne, Administrator

National Weather Service
Richard E. Hallgren, Director

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PERTINENT METEOROLOGICAL AND HURRICANE TIDE DATA FOR HURRICANE CARLA

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ABSTRACT. All available meteorological data have been analyzed to provide information as accurate as possible for use in dynamic storm surge models. Detailed analyses are presented of the storm track, forward speed, central pressure, and radius to maximum wind. Particular attention is given to the period surrounding landfall. Tide gage and high water mark data are presented to give both a time history and geographic depiction of the storm surge.

1. INTRODUCTION

Numerous reports have been prepared describing Hurricane Carla. Each of these reports has been directed toward some specific aspect of the storm, presenting meteorological data, oceanic data, analysis of the wind field, surveys of damages, etc. This report, which combines the meteorological and oceanographic data and the analysis, provides information useful for storm surge modeling. The amount of observed data available from historical hurricanes varies greatly and almost all of it requires further analysis and interpretation before it can be of use to storm surge modelers. An effort has been made for this publication to gather all the pertinent published and unpublished information into one report. The amount of data available for any single storm also varies during different portions of the storm's life, from various geographic regions, and from different sections of the hurricane. Almost all of it is also subject to numerous uncertainties in interpretation. We have attempted to bring this information together to make a comprehensive analysis, to develop an accurate storm track, to prepare a time history of central pressure and radius to maximum winds, and to catalog high-water-mark data.

This report should be viewed as a comprehensive, authoritative source of the information required by storm surge modelers. Our intention is to provide quantitative information with as little ambiguity as possible on the track of the storm, its intensity, and the observed storm surges. Because our purpose is to develop data useful in surge modeling, some minor oscillations in movement, radius of maximum wind, etc., have been smoothed in the analysis. We welcome comments and suggestions on methods of improving the presentation or on additional data which would be useful in the development of storm surge models.

This report is an expansion of similar meteorological and storm surge data for Hurricane Carla, September 1961, published in the U.S. Weather Bureau Technical Paper No. 48 (Harris 1963).

2. PREVIOUS REPORTS

There have been several previous reports on Hurricane Carla, although only one of them was directed specifically toward an evaluation of factors important for storm surge generation. General records and observed high water mark elevations plus miscellaneous meteorological data observed by private industries were compiled and published by the U.S. Army Corps of Engineers, Galveston District (1962). The U.S. Navy reconnaissance flight data on Carla were included in the Navy's annual tropical storm report (U.S. Fleet Weather Facility 1961). The National Weather Service research aircraft reports were summarized by Gray and Shea (1976).

Cooperman and Sumner (1981) and Cry (1961) provided a general description of Carla's history. These reports for the Environmental Data and Information Service's (EDIS) Climatological Data, National Summary were intended to provide a broad view of the storms for climatological records. Selected high water marks, winds and a generalized track were presented in each paper. The Hurricane Season of 1961 (Dunn and Staff 1962) provides a description of significant features of all Atlantic tropical storms that occurred during 1961. Important features mentioned in regard to Carla are the continued increase in intensity from the storm's beginning until it crossed the Texas coast.

Weather Bureau Technical Paper No. 48, Characteristics of the Hurricane Storm Surge, (Harris 1963) provides some tide gage records, plots of high water marks, synoptic weather maps at 12-h intervals from 0600 CST September 7 to 1800 CST September 12, 1961, and a general discussion of the character and extent of coastal flooding. Though concerned with storm surge, the text was mostly descriptive and displayed the tide-gage and high-water-mark data on a scale that does not permit accurate detailed evaluation.

Detailed analyses of wind fields for many major hurricanes are made by the Hydrometeorological Branch of the Water Management Information Division (Office of Hydrology, NWS) for the U.S. Army Corps of Engineers (COE). Available data are used in combination with an empirically derived wind profile to develop a complete wind field analysis for specific times. The study for this storm was included as part of a series of memorandum reports to the COE (U.S. Weather Bureau 1962). Wind charts are given for 6-h intervals from 0600 CST September 9 to 0600 CST September 10, then at 3-h intervals to 0900 CST September 12. It should be noted that many of the relations used to estimate the wind fields in regions of sparse or no data in that study have been revised in subsequent research. (See for example, Schwerdt, et al. 1979.)

Smoothed "best" tracks have been given in several NOAA publications. Cry et al. (1965) combined data from all available sources into a comprehensive report showing the most accurate and consistent locations for all tropical cyclones during their life cycle for the period 1871-1963. These tracks were designed to provide a smoothed track for all storms. Neumann et al. (1978) have extended the period covered and prepared revised tracks where additional data have indicated they were necessary. The objective for these studies was to provide a firm climatological base and dealt with the tropical cyclone solely on the synoptic scale. Positions were given along the smoothed tracks at daily intervals for the earlier years and a 12-h intervals subsequent to 1930.

3. SCOPE OF REPORT

Values of meteorological data we believe pertinent for storm surge models are presented in tabular and graphical form in this report. The time period covered in detail starts at 0000 CST on September 9, 1961, and ends at 1800 CST on September 12, 1961. Since we are concerned with storm surge and not with a comprehensive look at the 3-dimensional structure of tropical storms, the data presented are limited to the surface. Reconnaissance aircraft data and other upper-air data are used, as necessary, in determining surface parameters such as track, central pressure, size, winds, etc. A brief history of the storm is provided from its beginning as a tropical depression just north of the coast of Columbia, South America, until it finally dissipated in Canada nearly two weeks later. Detailed analyses were made for the period most important for storm surge generation along the continental coast of the United States. For this period, data were analyzed to provide a time history of central pressure, radius of maximum wind, and forward speed. This information is tabulated and presented in table 1 at 3-hourly intervals for September 9 and 12 and at hourly intervals for the more crucial times of September 10 and 11.

Continuous tide gage records and observed high water marks have been tabulated. Data are presented on the location, and to the extent possible, the time of high water. Every attempt has been made to provide locations and descriptions of high water marks as accurately as possible. Original records have been reviewed in each case to obtain the maximum available information.

4. SOURCES OF DATA

The reports discussed in section 2 were used to the maximum extent possible in these investigations. To insure the accuracy and completeness of this report and to enable us to provide more detailed information on track positions, speed, central pressure, etc., original records were carefully examined. This permitted us to provide the most comprehensive and detailed analysis yet developed on meteorological factors important for storm surge prediction.

4.1 Meteorological Information

The basic information is obtained from the regular reporting network of weather stations operated by the National Weather Service (NWS), NOAA. These reports are part of the nation's historic weather records and are maintained at the National Climatic Center (NCC), Environmental Data and Information Service. Additional data on Hurricane Carla are stored on microfilm files at the NCC. This latter extensive data file on Hurricane Carla includes the following items for most of the period September 3-16, 1961:

Teletypewriter traffic (circuits 7021 and 7072)
Surface observations from Central America through Canada
Ship weather observations
Weighing rain gage charts
Triple register-wind, rain, and sunshine records
Barograms and temperature records
Radiosonde records
Radar scope photographs
U.S. Navy Weather reconnaissance flight data

In addition, meteorological data were collected by research aircraft of the National Hurricane Research Project (NHRP). The collected data were processed by computer, which produced printouts of flight data, flight-level wind information, and other meteorological information. These listings are stored on microfilm files in the NOAA Hurricane Research Laboratory in Miami, Florida. A detailed description of this meteorological information collected by aircraft, including the instrumentation, its calibrations and reliabilities, were published in the NHRP report No. 52 (Hawkins et al., 1962).

In addition to the network of regular reporting stations, observations are taken by many private individuals and corporations for their own uses. In some cases, this material is filed with NCC as part of NOAA's Cooperative Reporting Network. Additionally, after many severe storms, surveys are made to obtain supplementary data that are not routinely collected by any Federal agency. Many wind records, barographic traces, and individual meteorological observations were obtained by such a survey conducted by the U.S. Army Corps of Engineers. This information is in the files of the Galveston District, Corps of Engineers, and was made available to us for this report.

4.2 Tide Gage Data and Observed High Water Marks

The primary source of tide gage data in the United States is NOAA's National Ocean Survey (NOS). NOS maintains a network of tide gages along the coastal and inland waters of the United States. Tide gage data for this regular reporting network were obtained from the National Ocean Survey, Rockville, Maryland. Additional tide gages are maintained by other Federal agencies, private individuals, and industries for their own uses. This information was obtained in the poststorm survey by the Galveston District, Corps of Engineers, and was used in this report.

Frequently, surveys after major hurricanes obtain "high water marks." These high water levels are determined from marks left on the sides of buildings or inside buildings, from debris lines, and from eyewitness reports. These high water marks are subject to varying degrees of uncertainty. Only the high water marks verified by eyewitnesses who remained during the storm passage contain an indication of the time of highest surge. While these may only be approximate, they provide a more comprehensive documentation of the extent and height of storm surge flooding than the much more sparse recording tide gages. The original records in the files of the Galveston District Corps of Engineers were examined to catalog those high water marks. These data were originally plotted on USGS quadrangle sheets to determine their precise locations. This information is presented in this report in both graphical and tabular form.

5. GENERAL METEOROLOGICAL SITUATION

Hurricane Carla developed initially as a weak perturbation on the Intertropical Convergence Zone (ITCZ). Increased shower activity was noted on September 1 and 2, and a closed circulation was evident on the morning of September 3 (0600 CST). By the morning of September 4, the circulation had intensified and the storm was classified as a tropical depression. The complete storm track is shown in figure 1. The circulation, which had been first noticed along the ITCZ on September 3, had intensified about 150 nmi northwest of the coast of South America (approximately 12.6N 77.0W) and had moved northeastward and was located at 0600 CST about 200 nmi east of the Nicaraguan coast (approximately 14.2N 80.2W). During the 4th

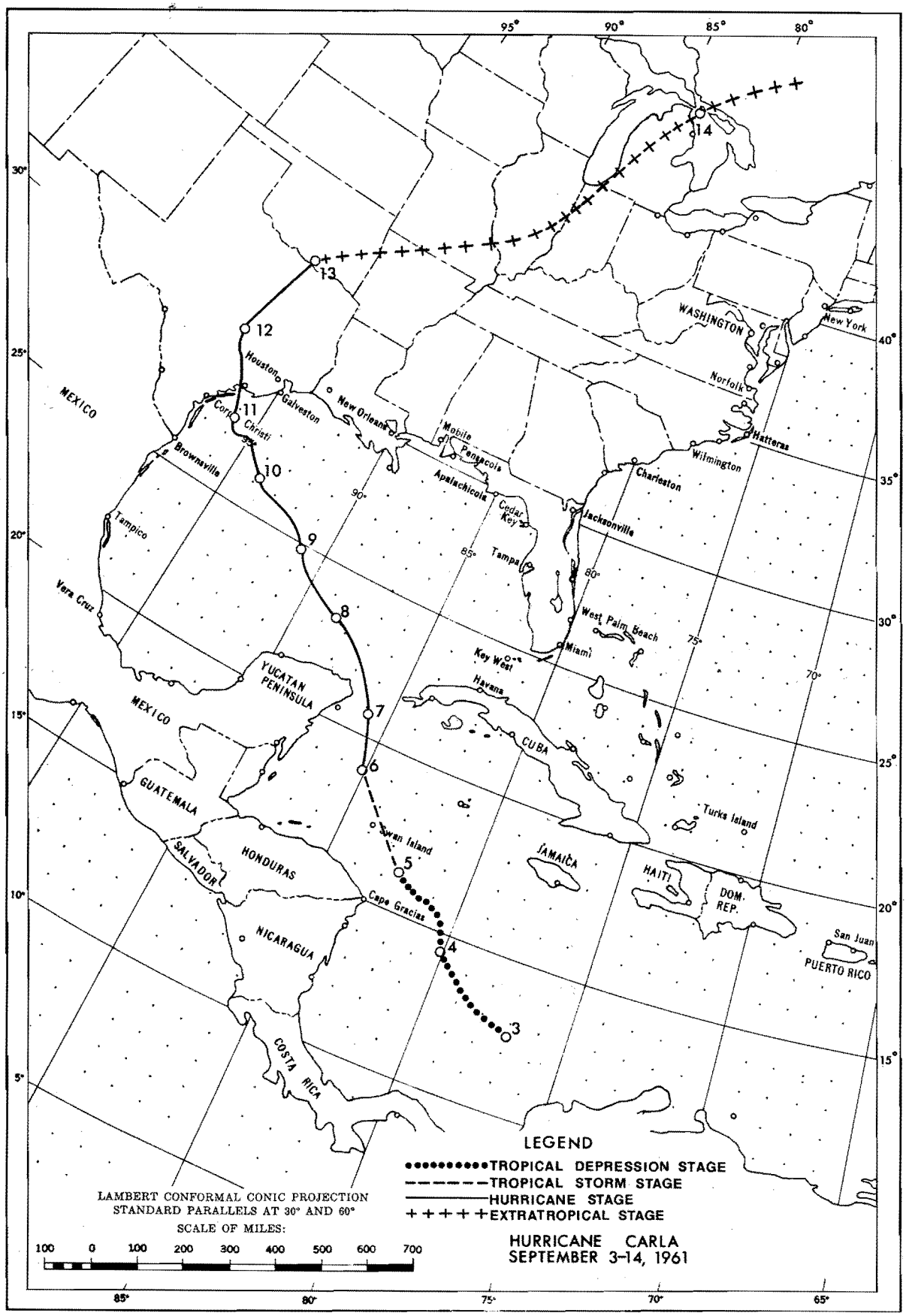


Figure 1.--Hurricane track, September 3-14, 1961, for Hurricane Carla.

through the morning of the 6th, the storm continued to steadily intensify. By 0600 CST on the 6th, the storm was located about 150 nmi from the Yucatan Peninsula (approximately 19.0N 85.1W), and had reached hurricane intensity. The storm turned to a more northerly course on the 6th and early on the 7th as it continued to intensify. This slightly more northerly direction kept the storm over the warm waters of the Yucatan Channel. As it moved through the channel, maximum winds were estimated to have increased to about 110 mph, and gales, extending out several hundred miles, battered both Cuba and the coast of Mexico.

Late on the 7th, after entering the Gulf of Mexico, Carla turned to a more generally west-northwesterly course that continued until the storm had almost reached the Texas coast. A significant feature of Carla was the steady increase in intensity from the time a closed circulation was first observed until the storm had crossed the Texas coast.

Early on the 9th, Carla was a very severe storm with the storm circulation covering the entire Gulf of Mexico (fig. 2). Maximum winds near the center were estimated near 135 mph and fringe effects were being felt by all Gulf Coast States. During the night of the 10/11th, the storm changed direction to a more northwesterly course and crossed the Texas coast during the early afternoon of the 11th. The storm reached its greatest intensity (931 mb) just prior to landfall. After landfall the storm weakened rapidly.

The storm moved nearly due northward across central Texas on the 12th, and, by 0600 CST the 13th, the center was located in south central Oklahoma. During this period, the storm circulation became diffuse and there was no apparent eye north of the Waelder, Texas, region (about 90 nmi inland). From the time the storm crossed the Texas coast until 0600 CST on the 13th, the storm weakened and the central pressure had increased 56 mb, from 931 to 987 mb. Damage across Texas along the path of the storm ranged from severe to moderate.

Carla became extratropical during the 13th and turned more toward the northeast. By noon, the storm had combined with a quasi-stationary front which had been lying with a west-southwest to east-northeast orientation across southern Kansas and northern Oklahoma on the 12th. The combined storm system moved rapidly off to the northeast and was over southern Lake Michigan by midnight of the 13th. The storm continued to the northeast crossing Ontario and Quebec, Canada, on the 14th and 15th.

6. ANALYSIS OF METEOROLOGICAL PARAMETERS

A primary focus of this report is to analyze, objectively and in detail, those meteorological factors of hurricanes used in storm surge models. For this purpose, we began with the raw observational data and then compared our analyses with previous analyses. This permitted an unbiased review of all available information. This section describes the analyses of the present study. The intent of our analysis was to yield specific values of the hurricane's central pressure, the radius of maximum wind, the direction and speed of its forward motion, and the location of its center at various time intervals. We paid particular attention to the period just before and after landfall since this is the time interval most critical for storm surge computation. The basic observational data used in our analyses are given in the appendix.

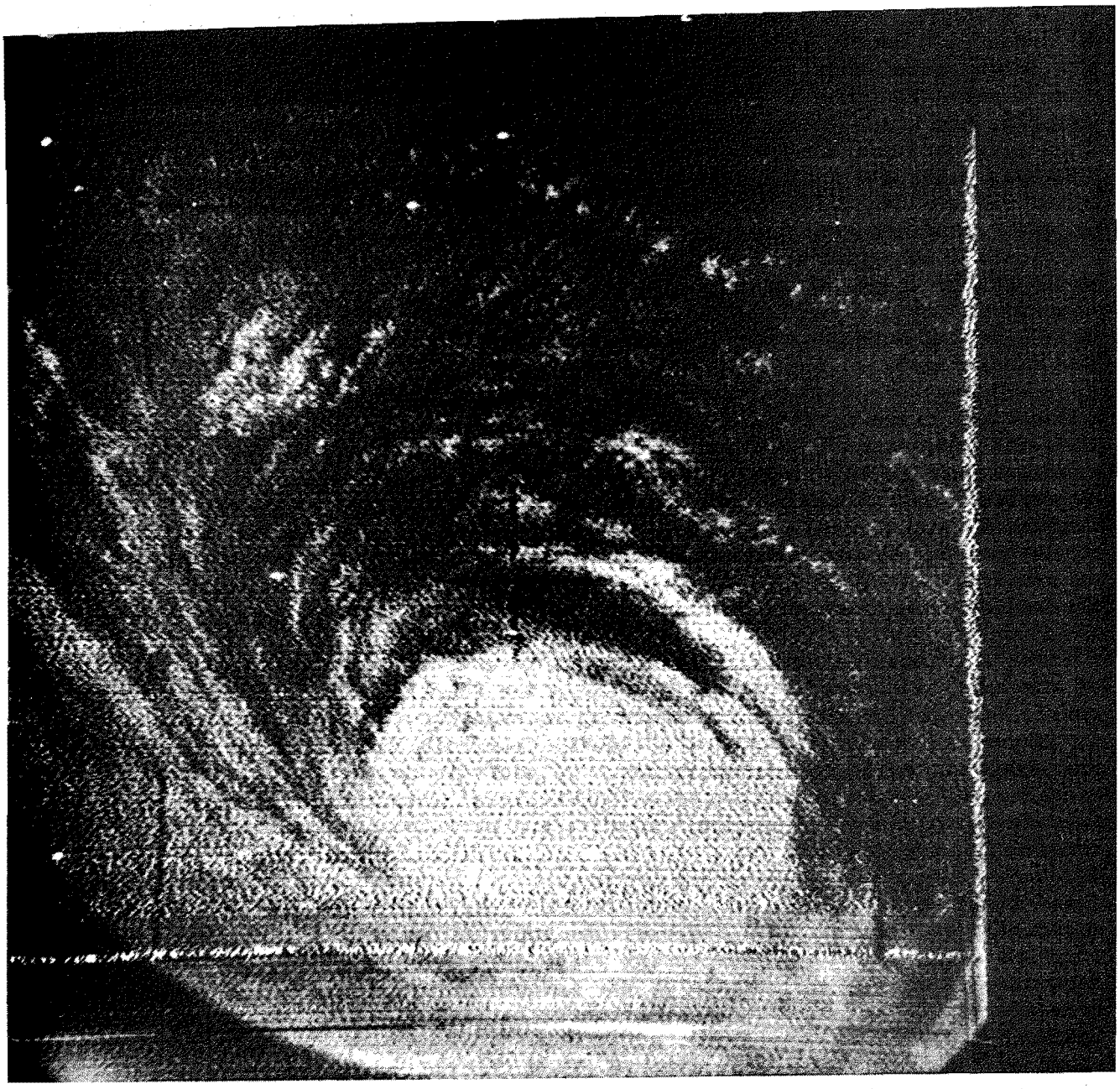


Figure 2.--Satellite photograph for September 10, 1961.

6.1 Storm Track

Generally, the analyses of meteorological data are weighted toward synoptic-scale motions. Such analyses were given in the investigations cited in section 2, except for Harris (1963). The hurricane track obtained is a best estimate of the large-scale storm motion and not a precise location of the eye at discrete time intervals. Such an analysis of the large-scale motion does not precisely describe the track needed for storm modeling. Track differences of a few miles in a large-scale storm motion can be significant for replicating high water on the open coast and inside bays and estuaries. A surge model requires, among other factors, specific information on the precise landfall point, the time of landfall, and accurate positions at closely spaced intervals in time along the hurricane track prior to and after the hurricane's landfall or along the track while the hurricane is near the coast for storms that move along the coast. Therefore, the analysis of this report emphasizes the meteorology in greater detail during September 10-11, when Hurricane Carla was approaching and crossing the Texas coast.

The final track determined for Hurricane Carla from 0000 CST September 9 through 1800 CST September 12 is shown in figure 3, with locations of the meteorological stations used in this report. The stations are either a Weather Service office or military installation, except for Freeport, and regularly report to the National Weather Service. Data from Freeport were obtained from recording instruments maintained by private industry. The positions of the hurricane center are shown at 6-h intervals from 0000 CST September 9 to 12. The central pressure (mb) and the radius of maximum winds (nmi) are plotted to the left of 12-h positions.

Since a primary interest in this report is a detailed determination of the path of the hurricane immediately before and after landfall, the area nearest the coast, enclosed in the box in figure 3, is enlarged for greater clarity in figure 4. The hurricane locations are at hourly intervals with values for the central pressure and radius of maximum winds. In addition to regularly reporting weather stations and weather radar observation stations, observations by personnel of private industries, private individuals, and eyewitnesses were useful aids in determining the storm track.

Any final determination of the track and speed of forward motion of a hurricane, especially over sparse data regions, has inherent uncertainties. The selected track is finalized from a subjective analysis to account for all available information. Figure 5 is an example of the information used in our analysis. Radar from all available land stations, Brownsville and Galveston, Texas and Lake Charles, Louisiana, are shown as solid dots. Aircraft-reconnaissance penetration fixes are shown by the triangles. The selected track, fitted by eye, is shown by the open circles. The times are indicated every 3 h starting with 1500 CST on September 10.

The data from radar fixes and aircraft penetration are the primary resource used in determining the track and speed of forward motion of the hurricane over the open ocean. However, information obtained from all ships operating in the area was considered in determining the final track and speed of motion. The information from each of these sources was carefully evaluated before a final track was selected.

Some characteristics of radar precipitation echoes in Carla and other tropical storms were discussed by Senn and Stevens (1965), who examined the horizontal motion of small radar precipitation echoes in Hurricane Donna and other tropical

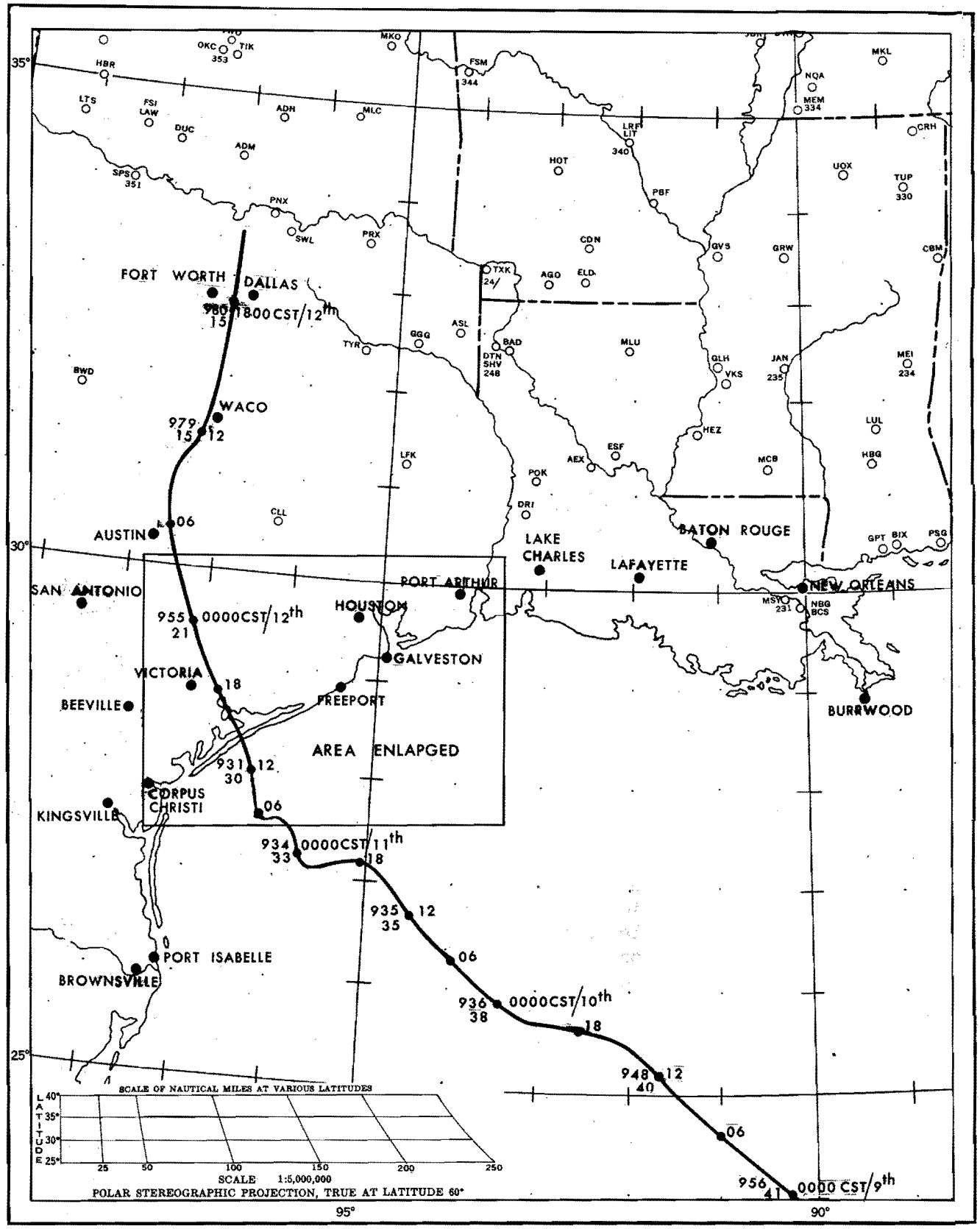


Figure 3.--Hurricane track, 6-hourly positions from September 9 to 12, with central pressure and radius of maximum winds plotted at 12-h intervals.

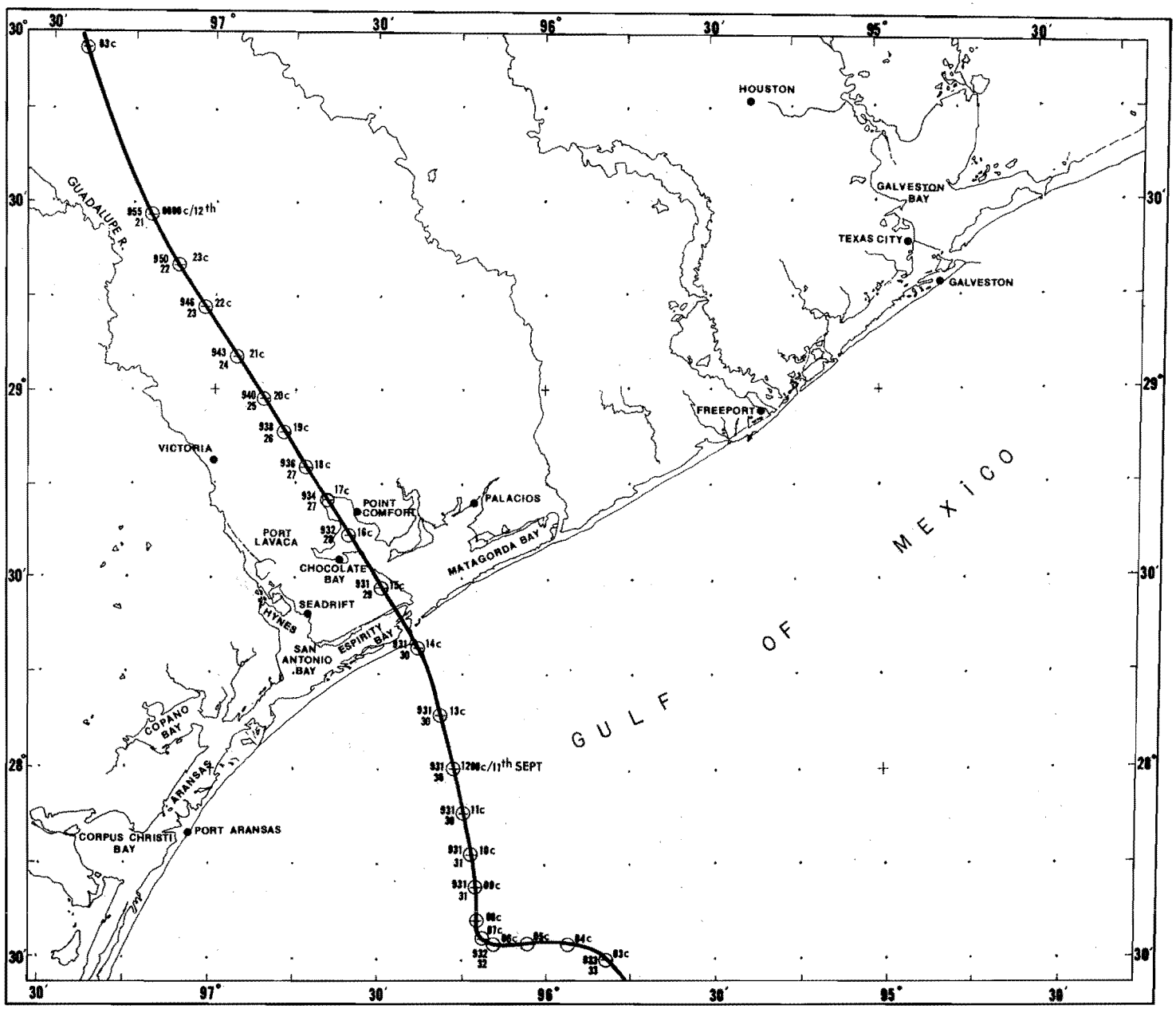


Figure 4.--Hurricane track, hourly positions, 0300-2400 CST on September 11.

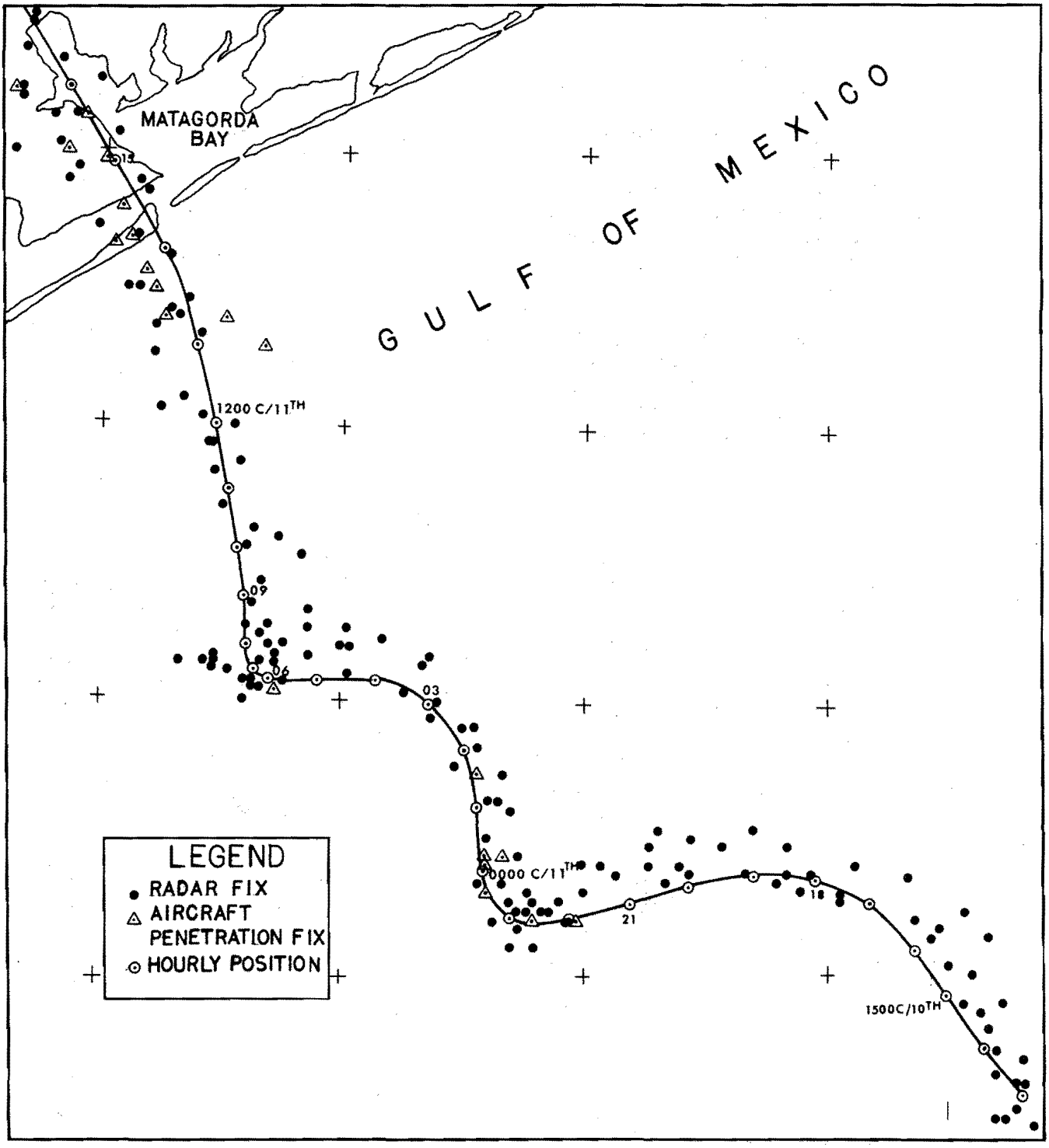


Figure 5.--Hurricane eye center obtained from radar weather observations (.) and aircraft reconnaissance penetration fixes (△) together with positions of hurricane center (⊙) on the selected best track.

storms. They found that considerable differences exist in the motion of echoes under different atmospheric conditions and pointed out that the echoes become more concentrated near the core region when observed over land and at night. Holliday (1966) compared the center fixes of the eyes of several hurricanes determined by reconnaissance aircraft with the best-fit radar track obtained by coastal radars. Results of the comparison indicate that the maximum differences vary from 13 to 37 nmi in individual hurricanes. He also identified the causes of these deviations for each storm. [See table 1 of Holliday (1966).]

The track position selected deviates from the average radar position line for much of the evening of the 10th and early morning of the 11th. We chose to follow a more westerly and southerly track that relies heavily on the aircraft reconnaissance fixes. Radar locations are based upon echoes return from the wall cloud. These have shown some bias in location relative to the pressure and wind center, our primary interest. Pressure, wind, and dropsonde observations obtained by aircraft penetrations are usually more accurate than radar eye fixes from land-based observation points. Center positions determined by aircraft must, of course, be evaluated in terms of possible navigational error. Some published tracks for Hurricane Carla have shown a loop on the 11th between 0500 and 0800 CST. Examination of the data is inconclusive. Our analysis shows a definite slowing of forward speed starting at 0500 and continuing until shortly after daybreak as the storm changed direction, but we have chosen not to depict any loop in the track.

6.2 Forward Speed

The translation speed of the hurricane is another important ingredient for surge determination along the open coast in bays and estuaries. Hourly positions were the basic building blocks for determining this forward speed of translation. First, speeds between successive hours were determined and plotted on a time scale, and a smooth curve was drawn subjectively to minimize abrupt changes. Second, speeds from three successive hours were then averaged and plotted at the midhour, and a smooth curve drawn from these data was used to adjust the hourly locations. The new locations were examined with regard to the observed data and, if necessary, some further adjustments were made. This process was continued in an iterative fashion until the best combination between smooth forward speeds and observed eye positions was obtained. This process helped obtain the best possible estimates of forward speed and hourly locations.

There is a distinct slowing of forward progress on the night of September 9-10 (fig. 6) and then again on the morning of September 11. About daybreak on the 11th, the hurricane had become nearly stationary and available data suggest that Carla was then moving in an aimless, wandering fashion over a very small region. We have interpreted these data as showing a slow movement continuing along the selected track. Between 7:00 a.m. and 8:00 a.m. on the morning of the 11th, the hurricane began to accelerate and reached a peak forward speed (13 mph) at landfall, approximately 1415 CST, September 11. The storm then decelerated rapidly slowing to 6 1/2 kn by 1800 on the 11th. It then began to accelerate and reached a peak of nearly 14 kn on the afternoon of the 12th. By this time, the hurricane was well inland and only minimal wind effects were felt along the coast and in the bays and estuaries.

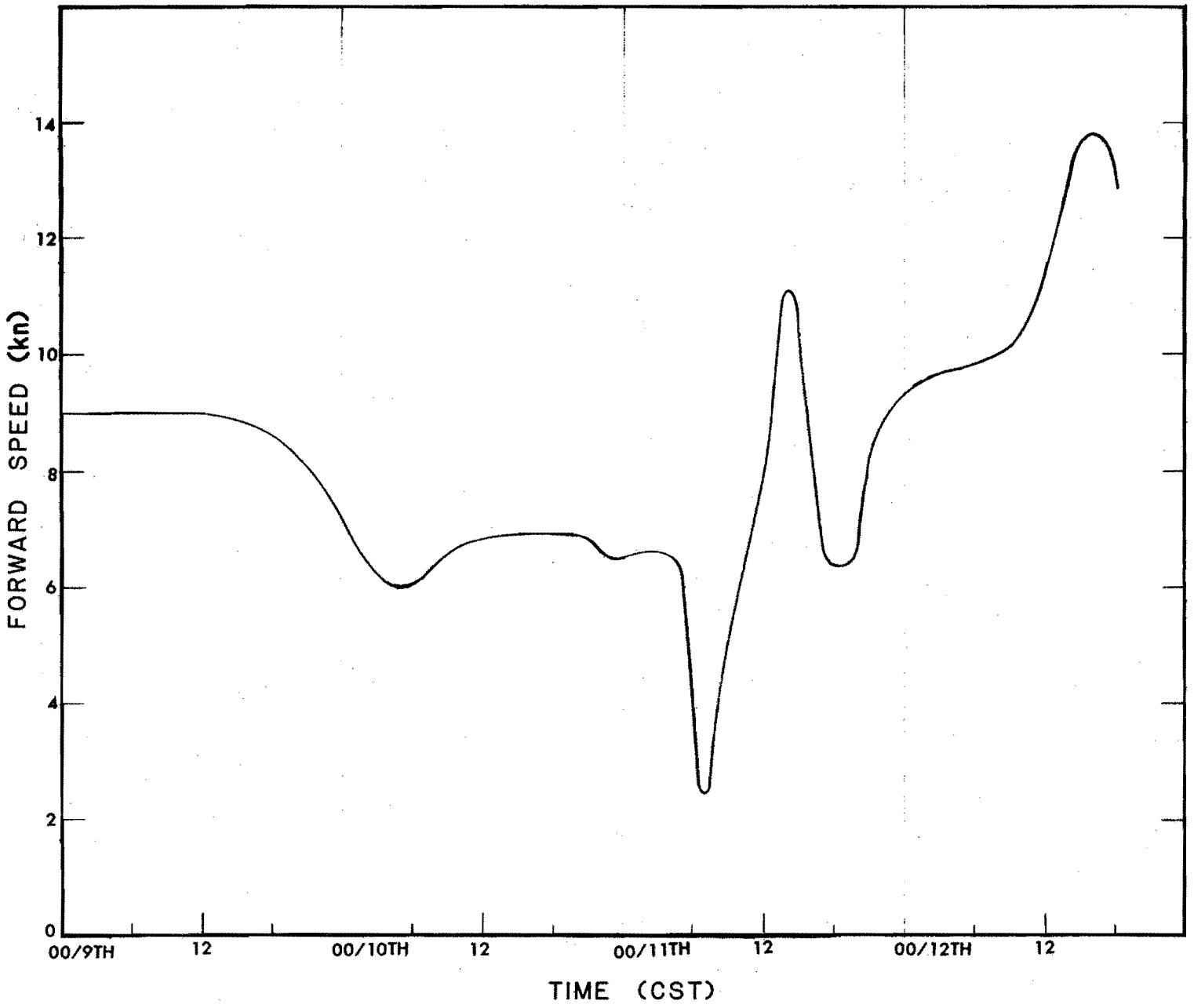


Figure 6.--Variation of forward speed with time, Hurricane Carla, September 9-12, 1961.

6.3 Central Pressure

The most important factor in storm surge modeling is the intensity of the hurricane, which is directly related to it's central pressure. Figure 7 shows the finalized track of Hurricane Carla as the storm crossed the Texas coast. Also shown are minimum pressures observed at regular reporting stations and minimum pressures obtained in poststorm surveys from irregularly reporting stations. These observations were not all obtained at the same time. Since the storm track did not cross any station location, none of the values are equal to the storm's minimum central pressure.

Figure 8 shows our analysis of the pressure information determined from land stations and aircraft reconnaissance flights to obtain a time history of Carla's minimum pressure. The curve drawn is, in general, a curve fitted closely to the data by eye. An exception is the early morning of September 10. There are a series of five observations by Navy reconnaissance aircraft and one by the NOAA research flight facility aircraft collected on the 10th, for which the two higher observations seem to be erroneous or to denote short term fluctuations in the central pressure of the hurricane. It seems more appropriate to draw for the mass of data with central pressures below 940 mb. The point indicated for Victoria, Texas, is for the lowest pressure observed at the station. The station is located at about 13 nmi to the left of the track and could be expected to have a central pressure higher than the minimum observed at the eye. Likewise, Port Lavaca is located slightly to the left of the track. By the time the hurricane had moved inland and was passing Austin and Fort Worth, the storm had become diffuse, there was no readily discernable eye, and lesser differences could be expected between the minimum central pressure observed at the center of the storm and that observed at nearby stations. Although Austin is slightly to the left of the track, no difference is shown between the central pressure at Austin and that in the center.

6.4 Wind Analysis

Supplemental to the minimum pressure reported at stations during hurricane passage, surface winds were recorded at several weather stations operated by the National Weather Service and the military services. Also, anemometer readings recorded by private industries were collected in posthurricane surveys. Numerous reports of wind conditions during the passage of Carla were also collected from cooperative observers and private individuals. These reports were at time of maximum wind occurrences and, in some cases, included additional information on the time and directions of wind shifts and the period of calm wind, if observed. Even though most of these unofficial reports were estimates made by inexperienced observers, they gave good indications of hurricane track positions relative to the observing location. They were used as an aid in the wind analyses as well as in determining the storm track over land.

Figure 9 is an example of wind analysis from a plot of wind data recorded by regularly reporting stations and ships. Flight-level winds reported by reconnaissance aircraft within 3 h of map time were also plotted on the chart as a supplemental aid in the analysis. This streamline analysis for the surface winds shows the flow pattern of the hurricane circulation. The magnitude of the wind is indicated by isotachs, dashed isolines of wind speeds.

The streamline and isotach analysis yielded results that were slightly different from the wind fields prepared for the COE by the Hydrometeorological Branch of the

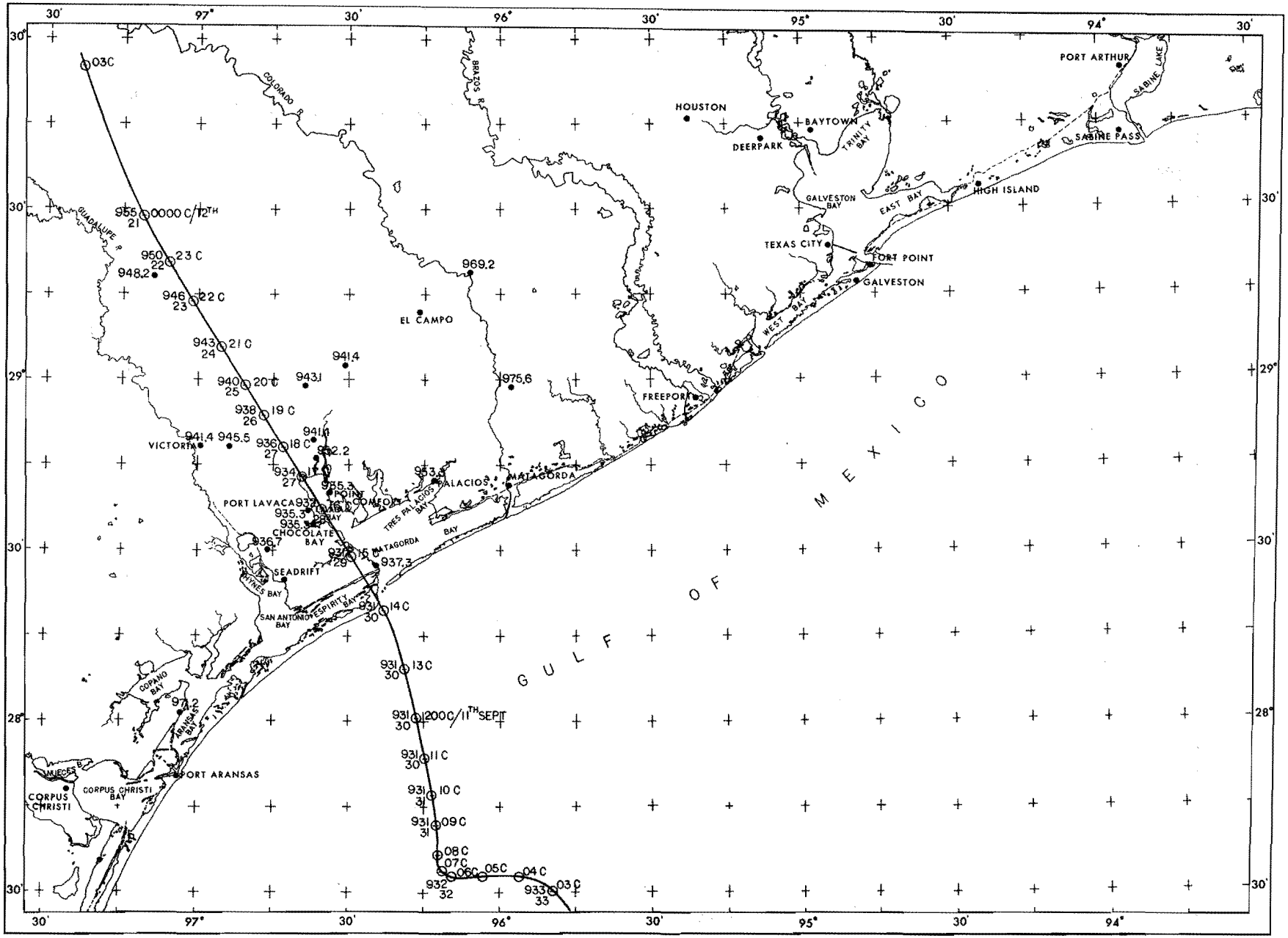


Figure 7.--Minimum pressure observed by land stations during Hurricane Carla.

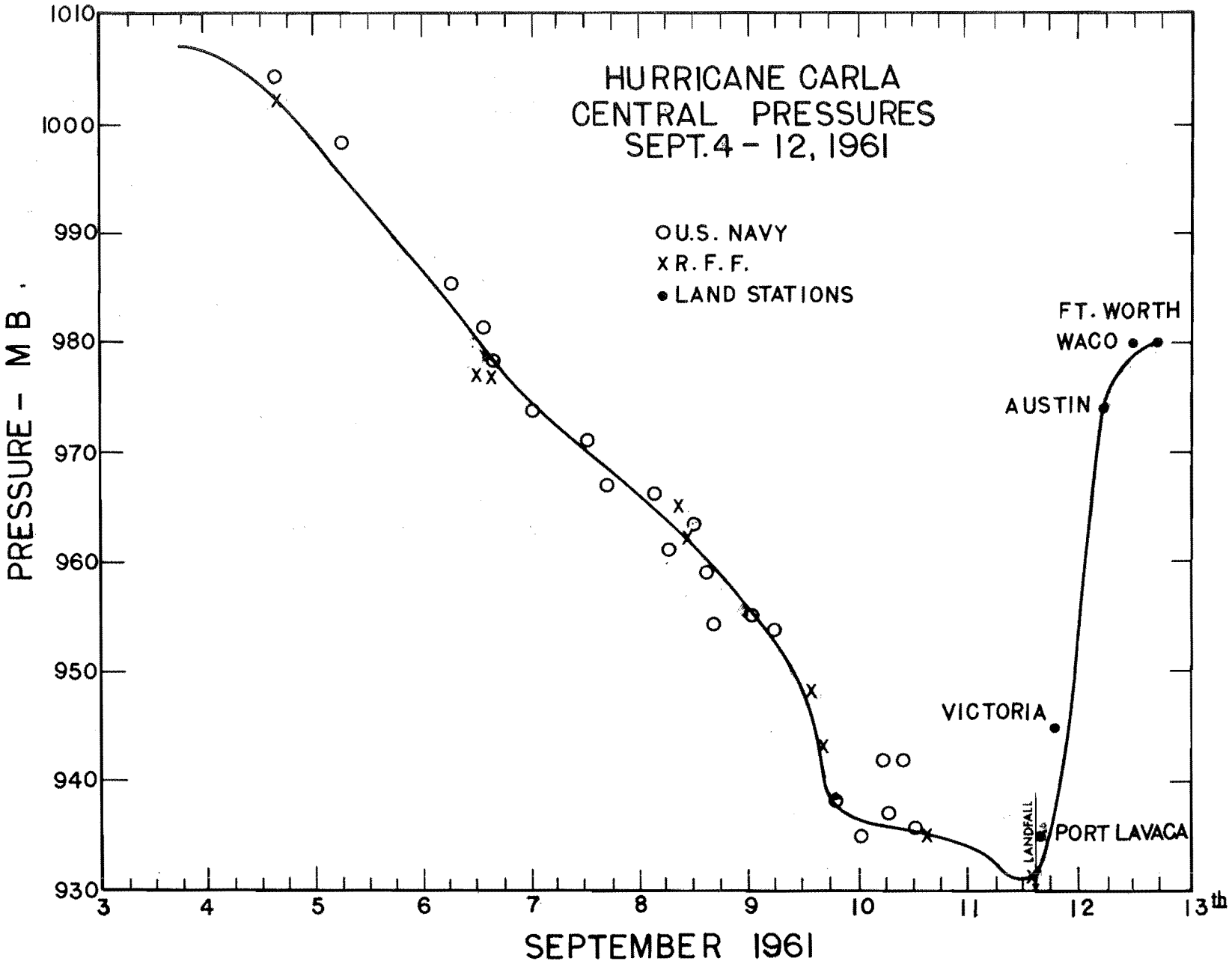


Figure 8.--Variation of central pressure with time, Hurricane Carla, September 4-12, 1961.

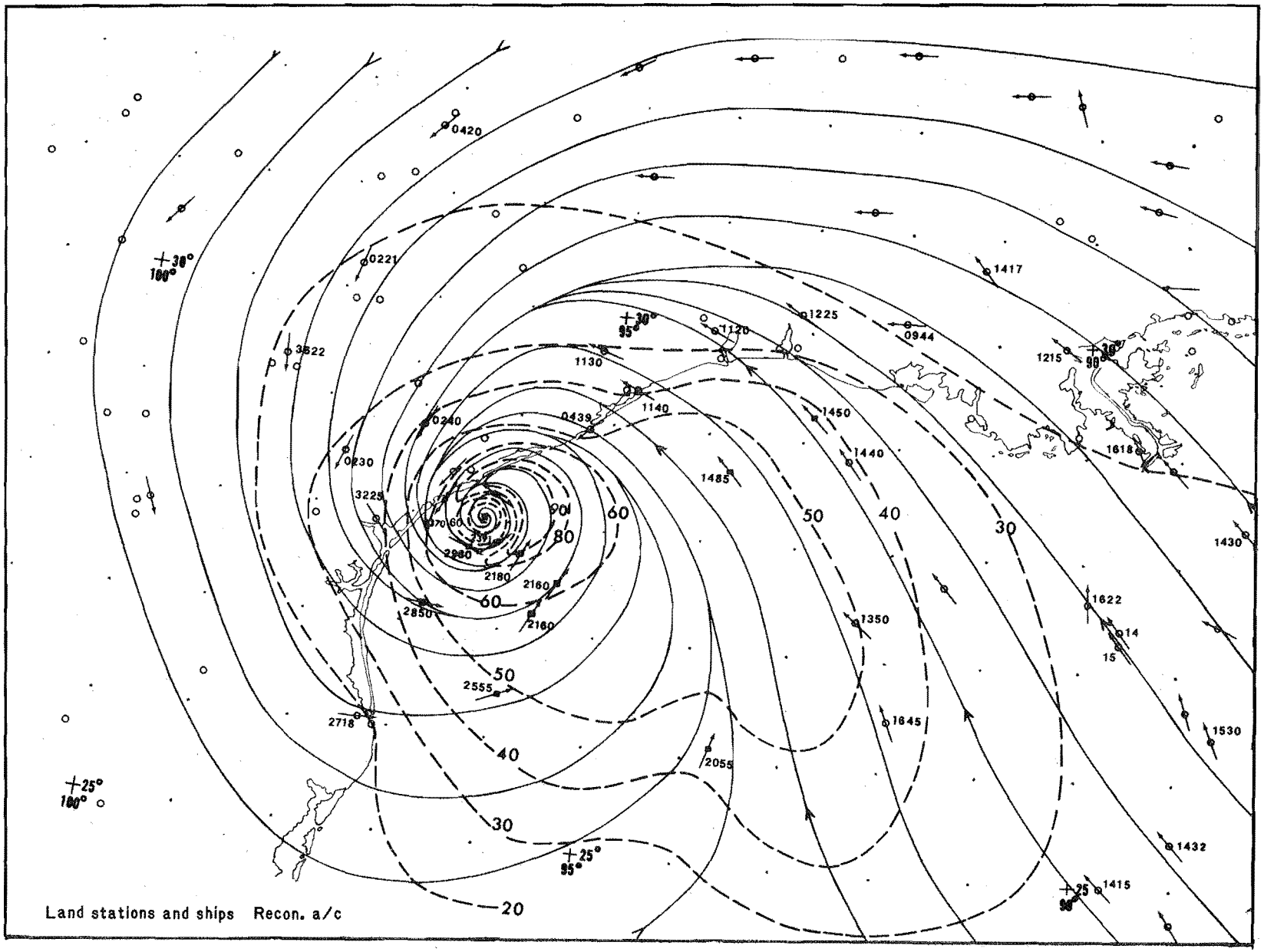


Figure 9.--Example of streamline analysis, 0300 CST, September 11, 1961; isotachs are shown in dashed lines.

NWS (U.S. Weather Bureau 1962). In the earlier analyses, available data were used in conjunction with an empirical wind-pressure profile. Our analysis results from use of actual surface wind observations, supplemented by flight level and surface wind observations made from reconnaissance aircrafts. We did not use any model results to supplement the observed data. Time and space adjustments of aircraft reports were considered in the analysis. The reconnaissance aircraft data were not used in the earlier report.

6.5 Radius to Maximum Winds

The size of a hurricane is denoted by the distance between the lowest central pressure and the bank of highest winds around the center. The radius to maximum winds was determined from all the observations available for this storm. Three different types of observations were available. The first measure includes the maximum flight-level winds and estimated surface winds as reported by reconnaissance aircraft. The second is the radar eye diameter, also reported by reconnaissance aircraft. Some optical reports were used when the reconnaissance aircraft was in the eye of the storm. The third measure, useful only after the hurricane was near shore, estimates the radius from surface wind records at land stations.

Flight-level winds, recorded at one-second (1-s) intervals by the reconnaissance aircraft of the U.S. Weather Bureau Research Flight Facility, were processed and 10-s averages of the 1-s intervals are available on magnetic tapes. The aircraft location for each observation was translated as a relative position to the storm center. From a listing of these wind records, composite maps of flight-level winds at given time intervals were plotted. Analyses of these maps yielded another measure of the radius to maximum winds.

Figure 10 is an example of a composite map of flight-level winds for the period 1750 to 2255 GMT on September 10, 1961. The wind data recorded at an altitude of 13,800 ft (4,200 m) were plotted at translated positions relative to the storm center. The highest wind speed recorded along each leg of penetration of the eye was about 25 nmi from the center. This distance is nearly one half of the eye diameter reported at flight time. We interpret these high wind speeds to be recorded near wall clouds forming the eye of the hurricane. The radial profile of flight-level winds, recorded on the 8th and 10th (fig. 11), shows a lack of concentration of the maximum winds at the eye wall, and the area of extreme high winds is spread over a distance of more than 10 nmi. This led us to place more weight on analyses of the observations rather than use the distance to observed maxima directly.

From the 8th to the 10th, Carla continued its intensification until a minimum central pressure of 931 mb was reached prior to landfall on the 11th. However, Carla's maximum winds increased only slightly during this period. It is of interest to note that a very remarkable feature of Carla was the horizontal extent of the extreme high winds. On the 8th, the maximum observed surface winds were estimated at 110 kn, and the 45-kn winds extended to 100 nmi from the center. Flight level winds over 50 kn extended to the 200 nmi radius (Colon 1963). On the 9th and 10th, the magnitude of maximum surface winds remained at 110 kn, while 80- to 85-kn surface winds extended to 110 nmi from the center. On the 10th, maximum surface winds of 100 kn, extending to 40 nmi from the center in the west quadrant and 100 nmi from the eye in the northwest quadrant, were reported by reconnaissance aircraft at 1900 GMT; 110 kn winds, extending to 70 nmi from the eye, were reported in the north quadrant at 2300 GMT.

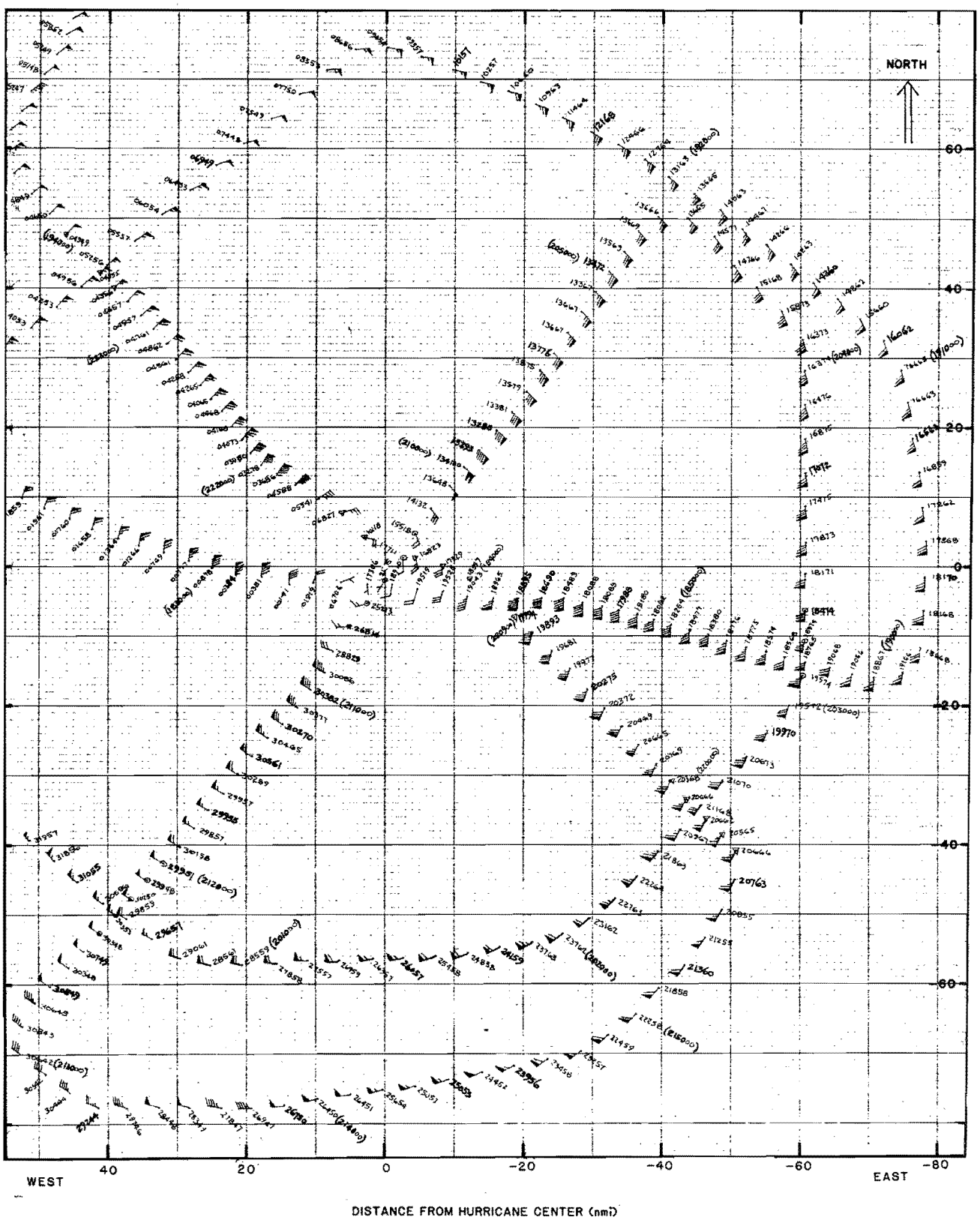


Figure 10.--An example of composite map of flight-level (13,800 ft.) winds 1750 to 2250 GMT (1150-1650 CST), September 10, 1961. Numerals indicate wind direction (in degrees) and wind speeds (in knots). Time of observation is shown in parentheses (in hours, minutes and seconds).

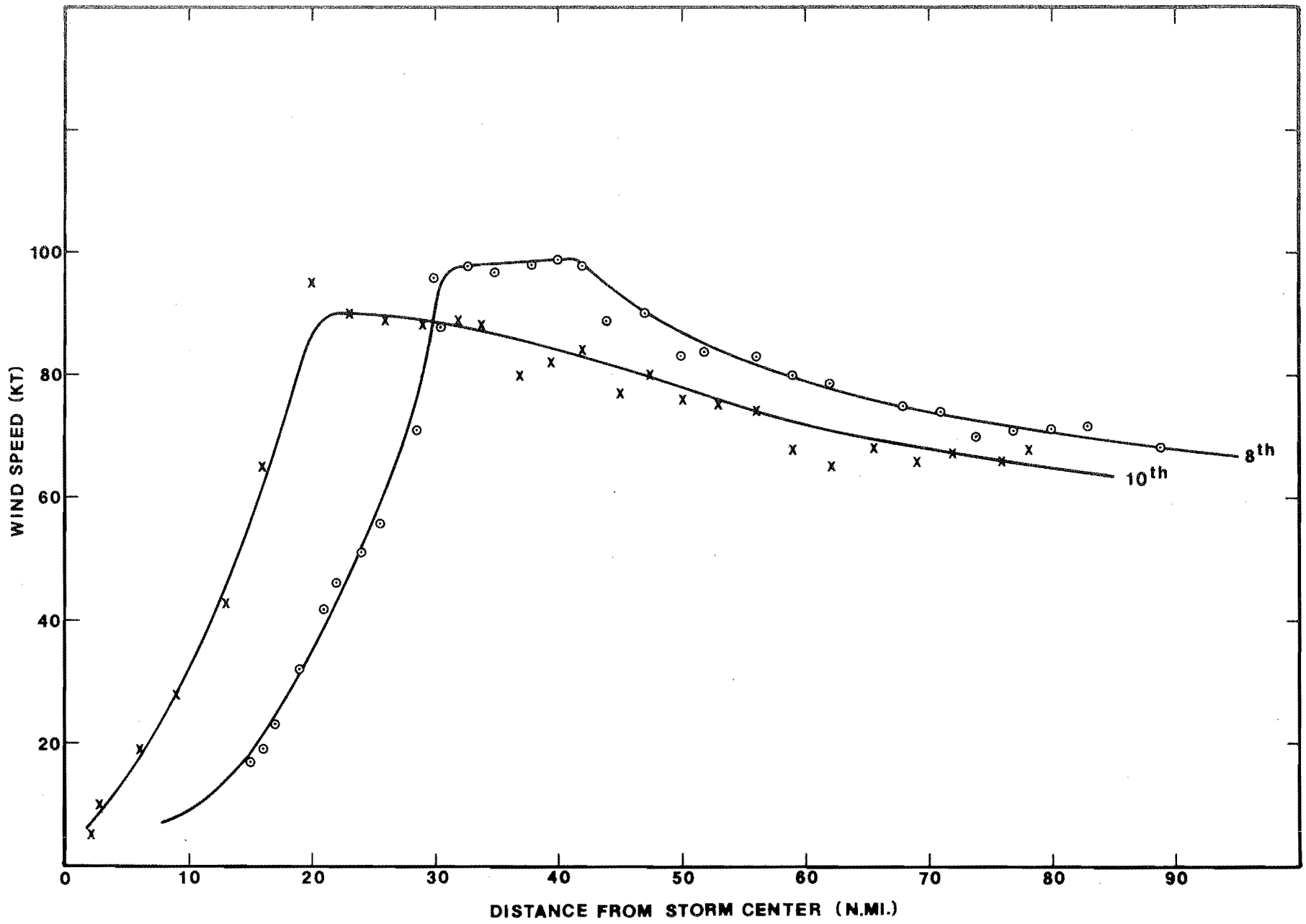


Figure 11.--Radial profile of flight-level winds, Hurricane Carla, September 8 and 10, 1961.

Because of these reconnaissance flight reports of the extent of extreme winds in Carla, our analysis of the radius of maximum winds gives a smooth curve of gradually decreasing radius between the 8th and the 10th. We did not portray a steep drop in radius on the 9th, even though the radial wind profile for that day and the maximum flight-level winds shown on figure 12 suggested a significant reduction in radius. This transitory change in radius of maximum winds was not consistent with the horizontal extent of extreme surface winds in Carla.

Figure 12 provides a curve from which the radius of maximum winds can be determined. It is based on analysis of all available observations just described. Although no specific relation between eye diameter and radius to maximum winds is considered in this report, we qualitatively suggest that they will tend to either increase or decrease together. The eye diameter reports from the reconnaissance aircraft were plotted and further supported the trend for the radius to maximum winds to decrease as the storm approached the Texas coast. In the analyses, the flight level at which winds were recorded has been taken into account. The analyzed results of flight-level winds, yielding an estimated radius of 35 nmi on the 10th at altitudes of 9880 ft (3,010 m) appear to agree fairly well with those obtained from surface winds estimated by reconnaissance aircraft. These surface winds were estimated during low-level penetration of the eye. Reconnaissance flight reports of the 11th show that the aircraft descended to 1,000 ft (310 m) in the eye and observed maximum surface winds of 120 kn, 25 nmi from the center, through a break in clouds.

6.6 Summary of Meteorological Data

The individual parameters from our analysis of Hurricane Carla are listed in table 1. These are listed for locations of the hurricane center at 3-hourly intervals on September 9 and 12 and at hourly intervals on September 10 and 11. For each location, central pressure, speed, direction, and size (both in nautical and statute miles) are listed. The table provides, in convenient form, the information that could be obtained from analysis of the basic data described in the various sections.

7. TIDE GAGE DATA AND HIGH WATER MARK INFORMATION

The abnormally high water levels during Carla were obtained from tide gage records and from high-water-mark elevations obtained by poststorm surveys. For consistency, all water levels must be related to a common datum. The datum for the topographic charts, published by the Geological Survey, is referred to as the National Geodetic Vertical Datum (NGVD). This datum is fixed and does not reflect the changing stance in sea level since it's establishment nor to subsidence along the Texas coast area. In this report, all water level observations have been translated to the NGVD datum as far as possible.

In the region of this study, the local tidal bench marks are tied to the NGVD datum plane from the Geodetic Net. The most recent survey, prior to Carla, to establish tidal bench marks was carried out in 1959.

7.1 Tide Gage Data

Table 2 gives hourly tide heights recorded at tide gages at stations along or just interior to the Gulf Coast for the period of September 9 through September 12, 1961. The water elevations are given in terms of the NGVD datum. Data for

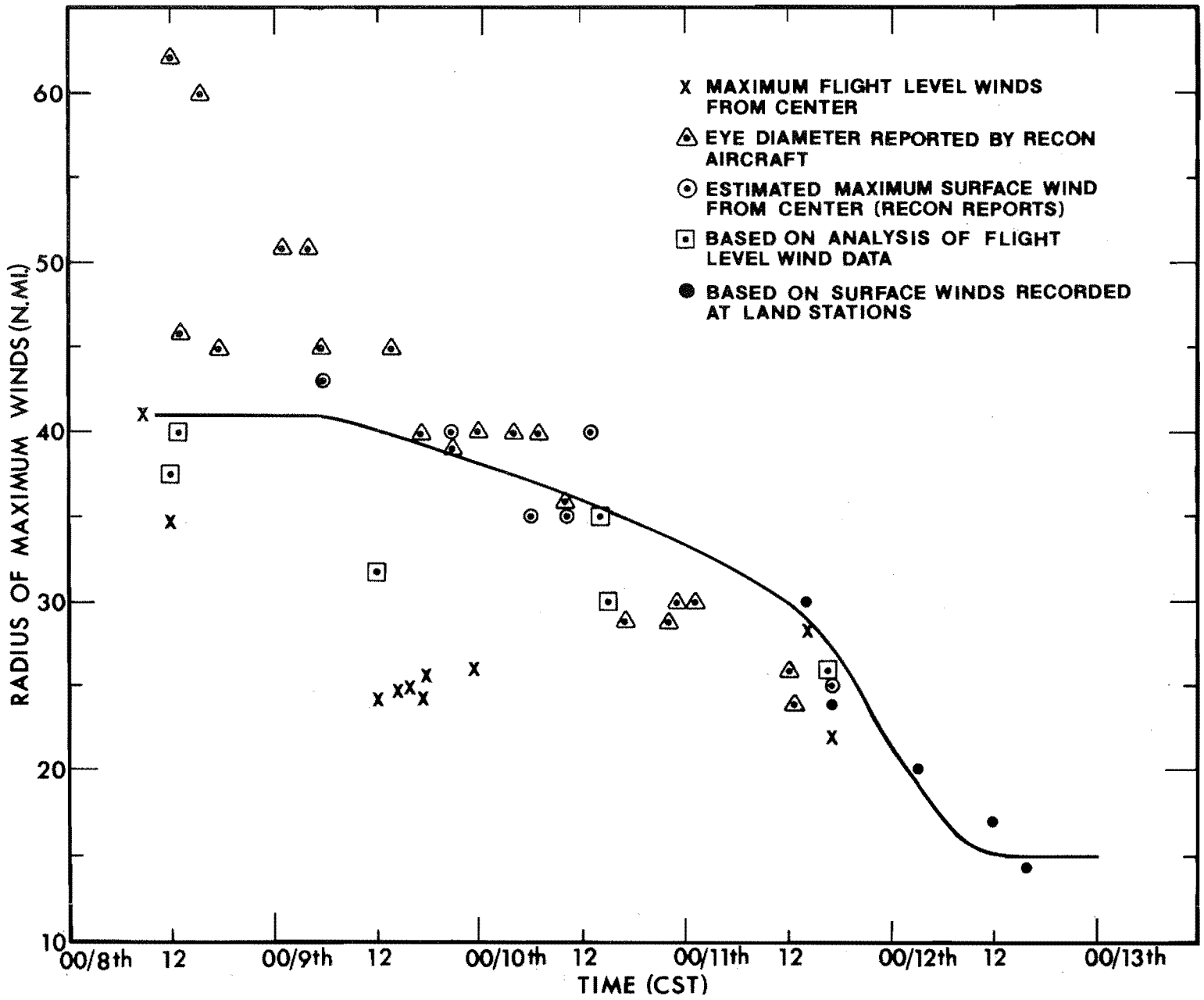


Figure 12.--Variation of radius of maximum winds with time, Hurricane Carla, September 8-12, 1961.

stations inside bays and estuaries are given in table 3. The tide levels are for the NGVD datum against the 1959 surveys. There was no attempt to approximate the changes in local sea level due to subsidence between 1959 and 1961. The data provided are actual gage readings. No effort has been made to remove the predicted astronomical tide. Table 4 gives the predicted astronomical tide for the tide gages at Galveston Pier 21 and at Pleasure Pier.

Only a limited number of tide gage stations are installed and maintained by NOS. Other Federal agencies, state or local agencies, or private corporations have installed and maintained some additional tide gages to provide data for their individual needs. Data from these gages are supplementary to the National network of tide gages maintained by NOS. The organization responsible for maintaining the gage is indicated in the tables. Locations are given in degrees, minutes, and seconds of latitude and longitude. Whether the tide is determined from a continuous graph of a recording gage or by individual observations at selected times on a staff gage, is indicated in this table to give some perspective on the quality of the observations. Where available, the highest tide observed and the time of observation are given as the last line of data for each station in the table.

The tide gage records listed in tables 2 and 3, except for Freeport and Baytown (Humble Docks), are shown in figures 13 to 29. The two stations not plotted have only fragmentary records. Data are plotted only to the nearest 0.2 ft.

7.2 High Water Mark Data

Posthurricane surveys were conducted by field personnel of the U.S. Army Corps of Engineers. Table 5 provides these high-water levels (ft) determined from the high-water marks (H.W.M.). This table also gives the location of the high-water marks in degrees, minutes, and seconds of latitude and longitude and the terrain elevation of the locations (elv) in feet. Double asterisks (**) in the remarks column denote that the high-water level was determined from a debris or drift line. Other measurements which were made inside a house or other structure may be compared to still water levels that would be measured in a stilling well or tide gage house excluding wave action. Since the time of high water is not known, we cannot subtract the effect of normal astronomical tides from these high-water elevations. The high-water marks are in terms of NGVD datum referred to the 1959 survey.

7.3 Geographic Distribution of Storm Surge

In general, the highest surges occurred to the right of the storm track. This can be seen from examination of figure 30. The figure shows tide gage and selected high-water-mark elevations observed in Carla; the precise locations of the data points are given in table 5. It is a generalized representation from detailed charts published by the U.S. Army Corps of Engineers, Galveston District, (1962). The maximum surges along the open coast to the right of the hurricane track were reported as between 10 and 12 feet. Highest reported values of storm tide, between 20 and 22 feet, were observed inside Matagorda Bay.

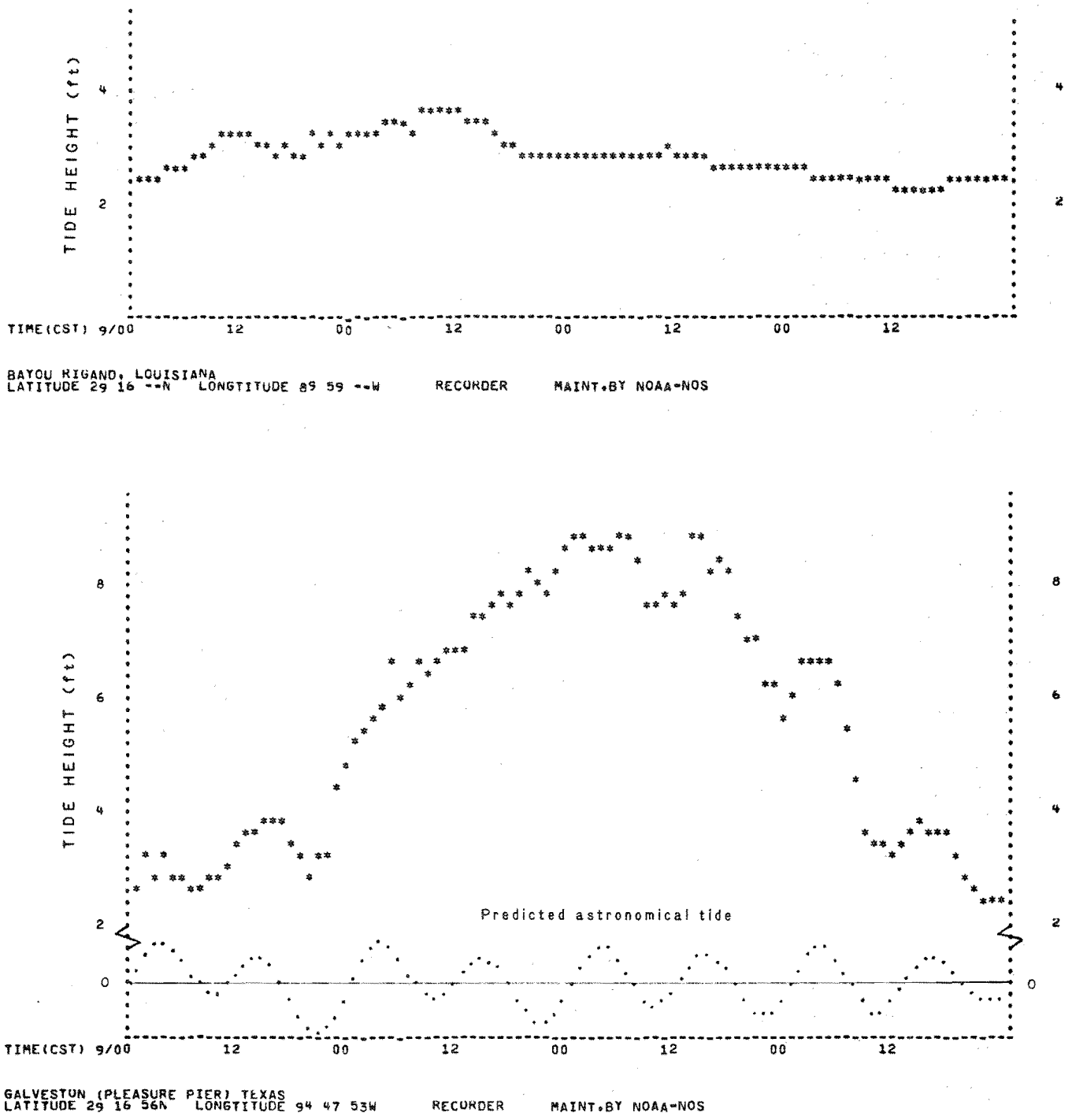
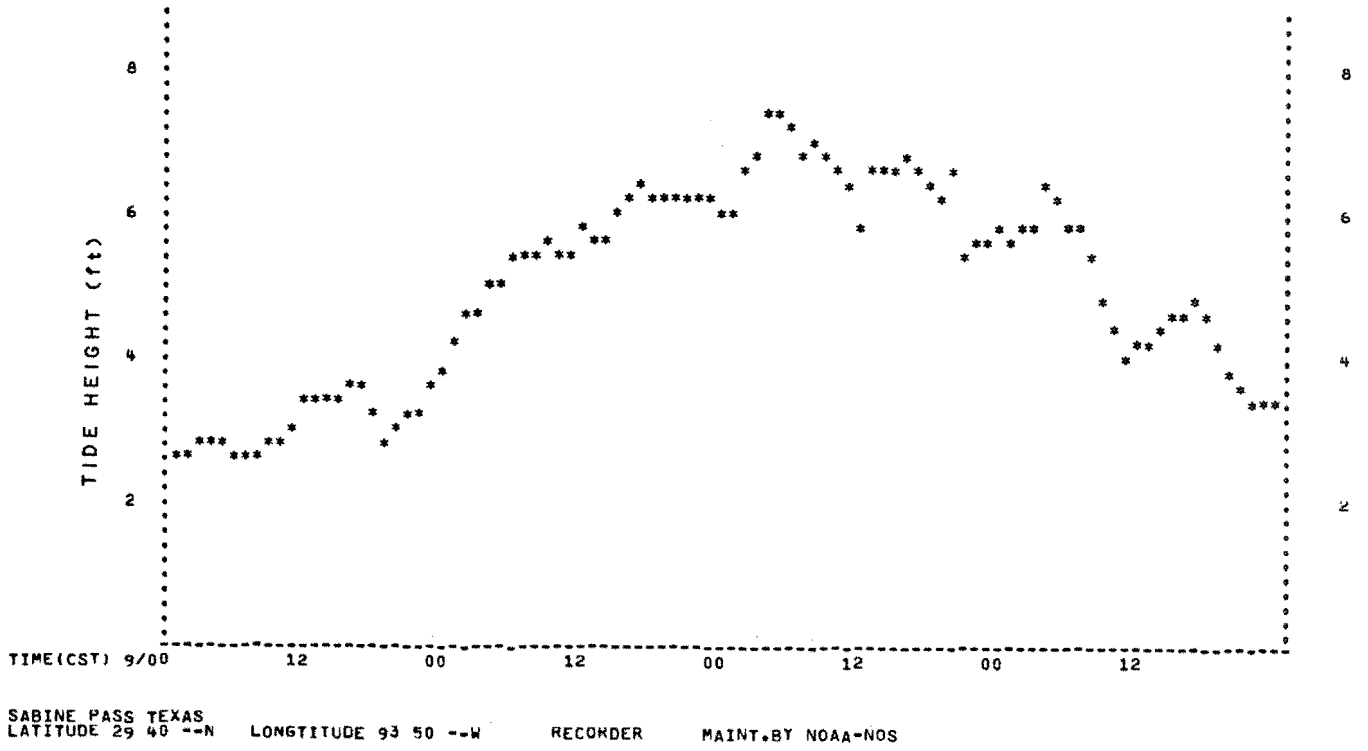


Figure 13.--Tide gage record for Bayou Rigand, Louisiana (top) and Pleasure Pier, Galveston, Texas (bottom) for period from September 8-12, 1961.



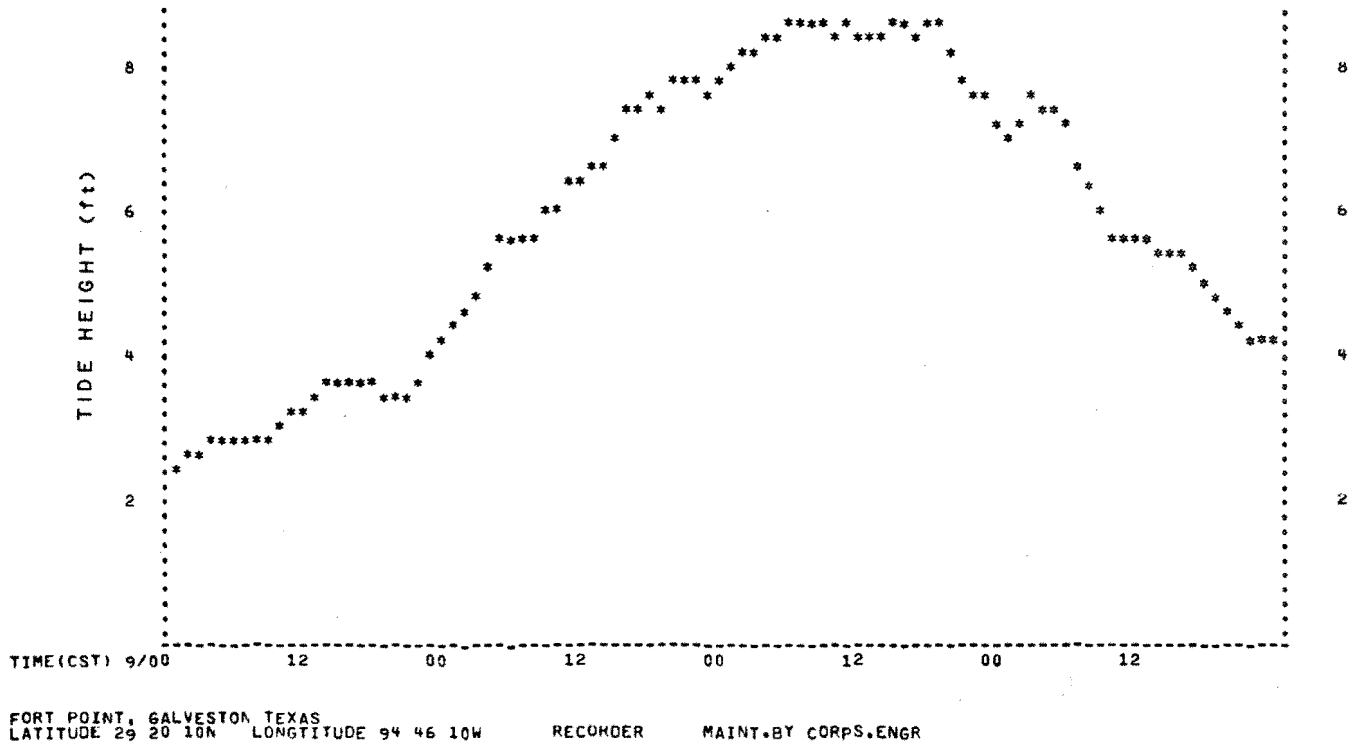


Figure 14.--Tide gage record for Sabine Pass, Texas (top) and Fort Point, Galveston, Texas (bottom).

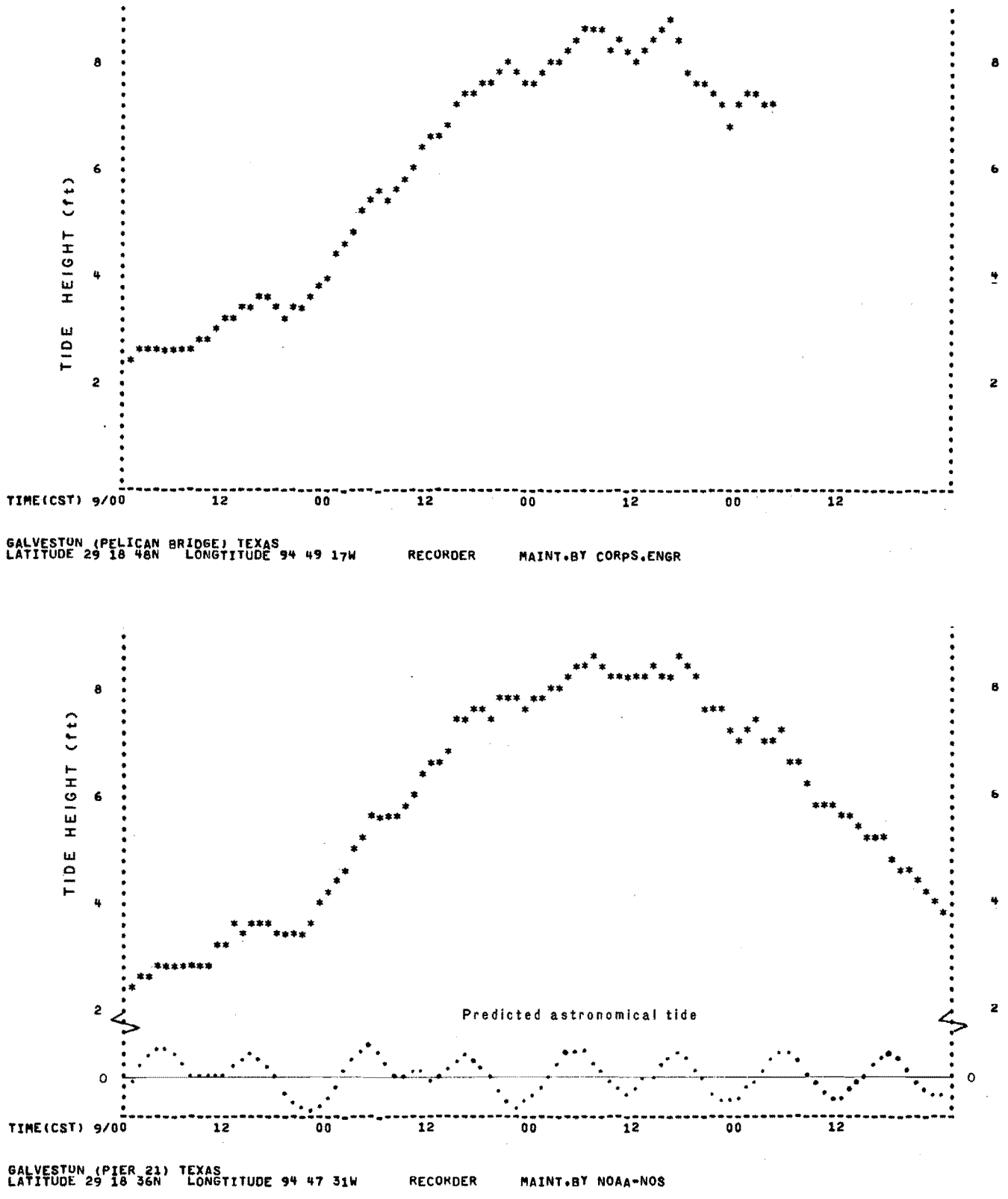


Figure 15.--Tide gage record for Pelican Bridge (top) and Pier 21 (bottom) Galveston, Texas.

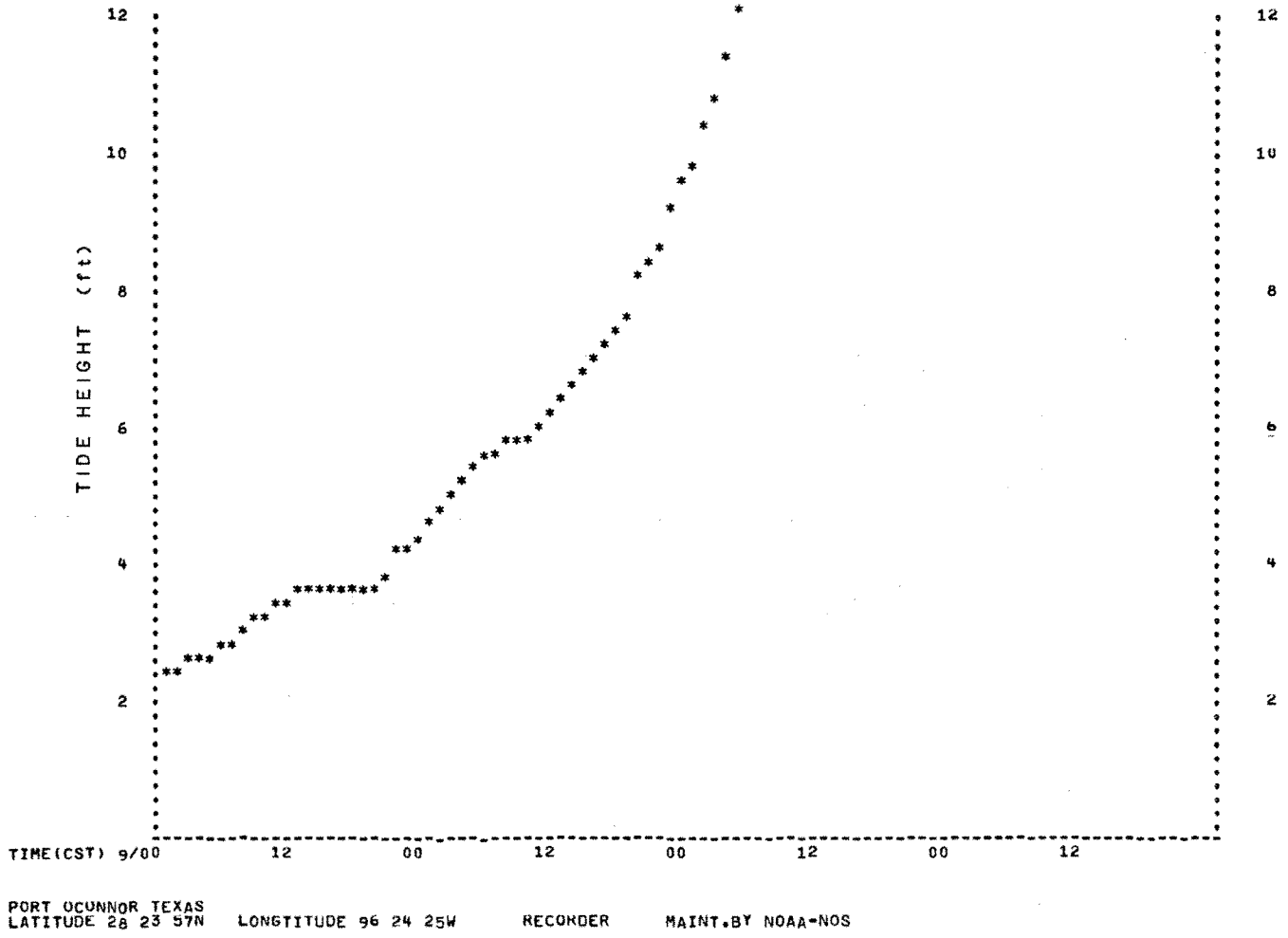


Figure 16.--Tide gage record for Port O'Connor, Texas.

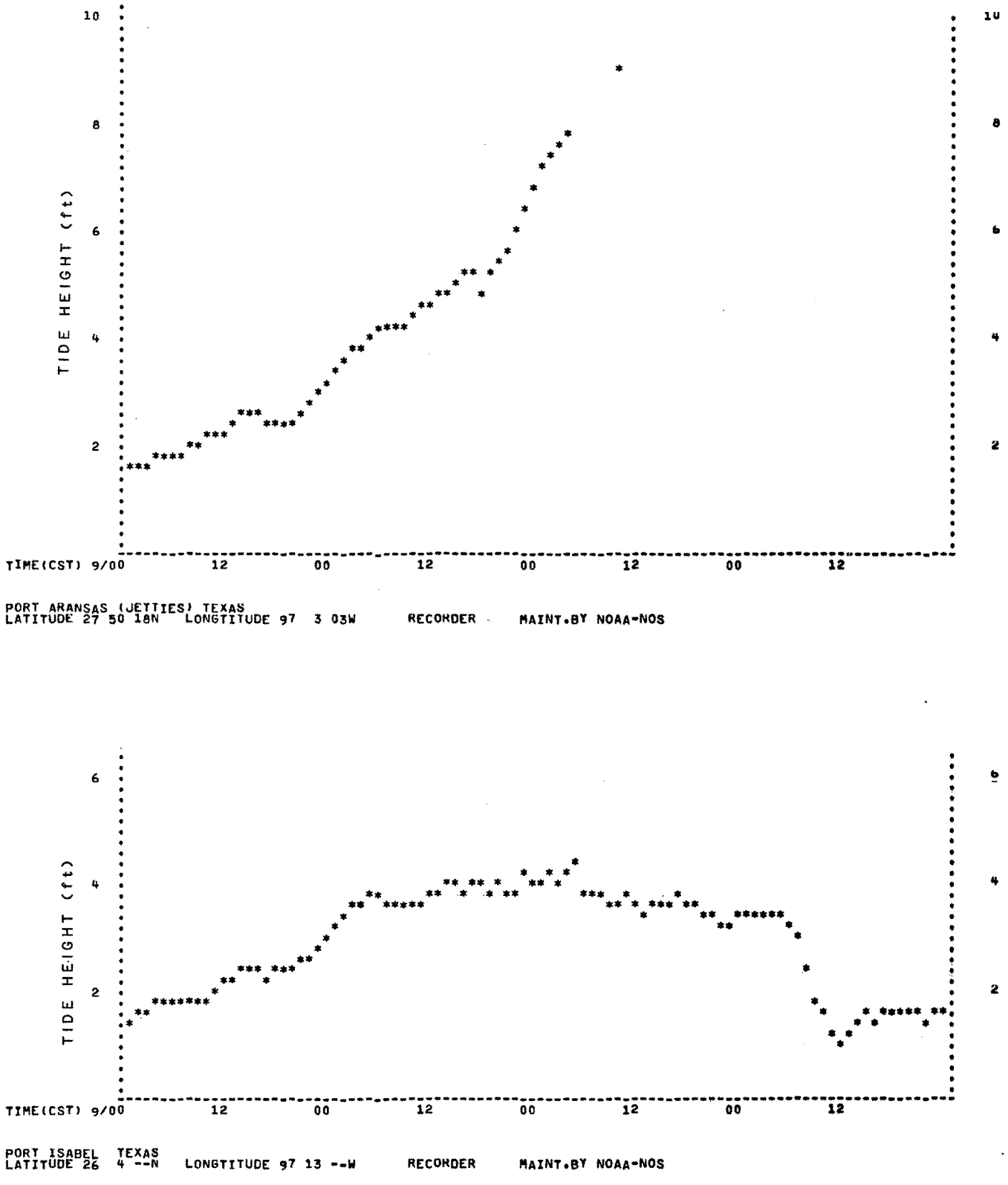
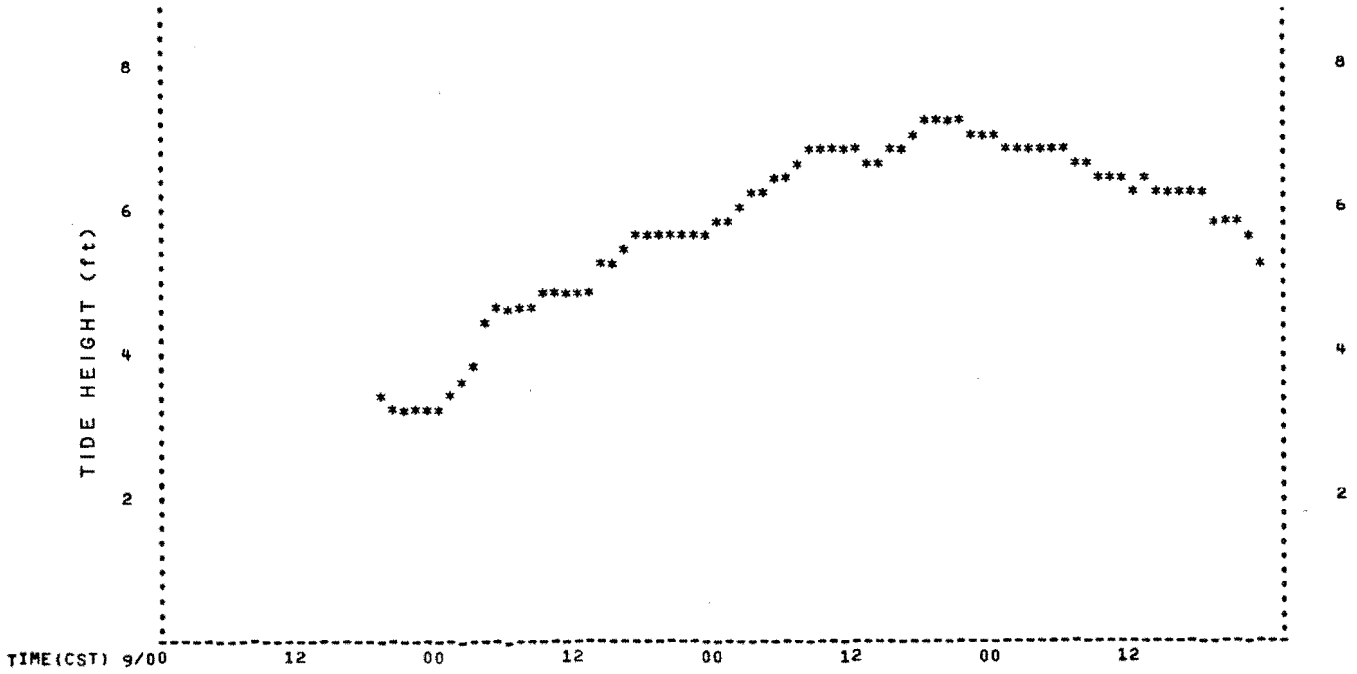


Figure 17.--Tide gage record for Port Aransas, Texas (top) and Port Isabel, Texas (bottom).



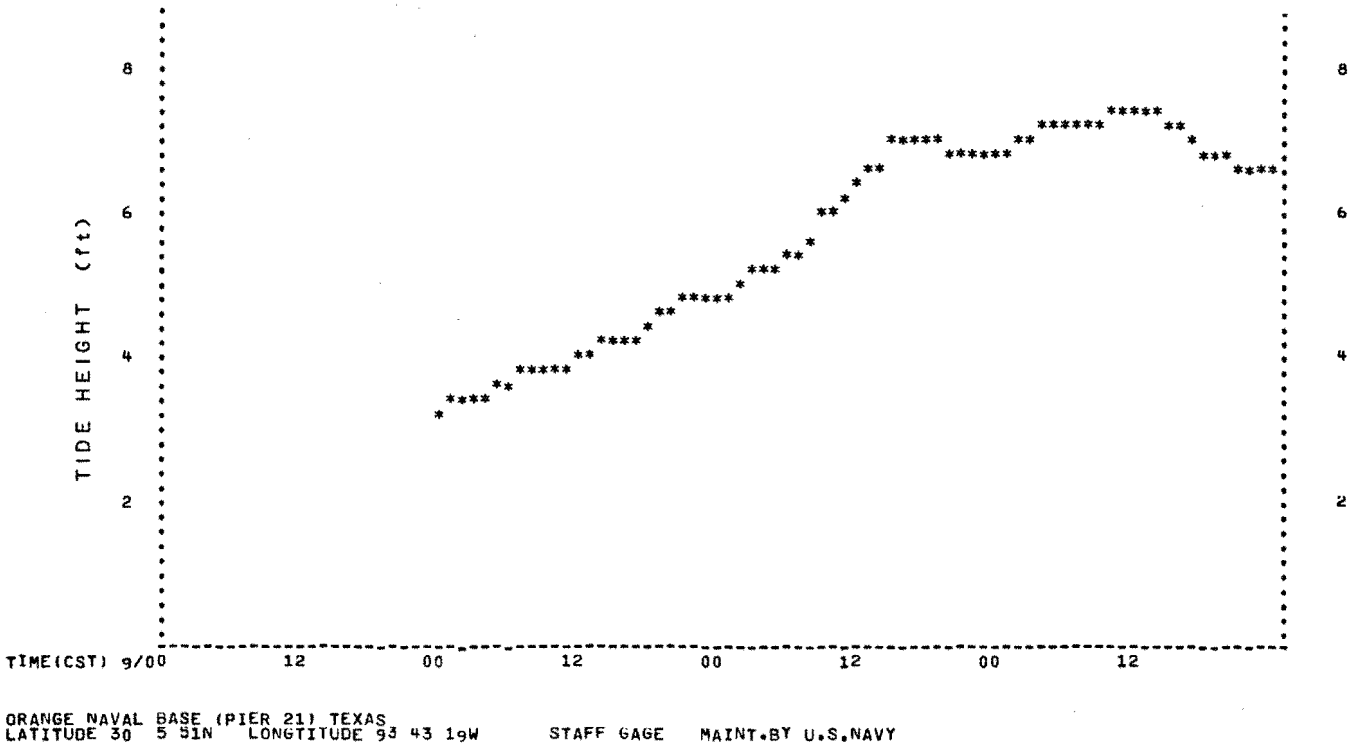
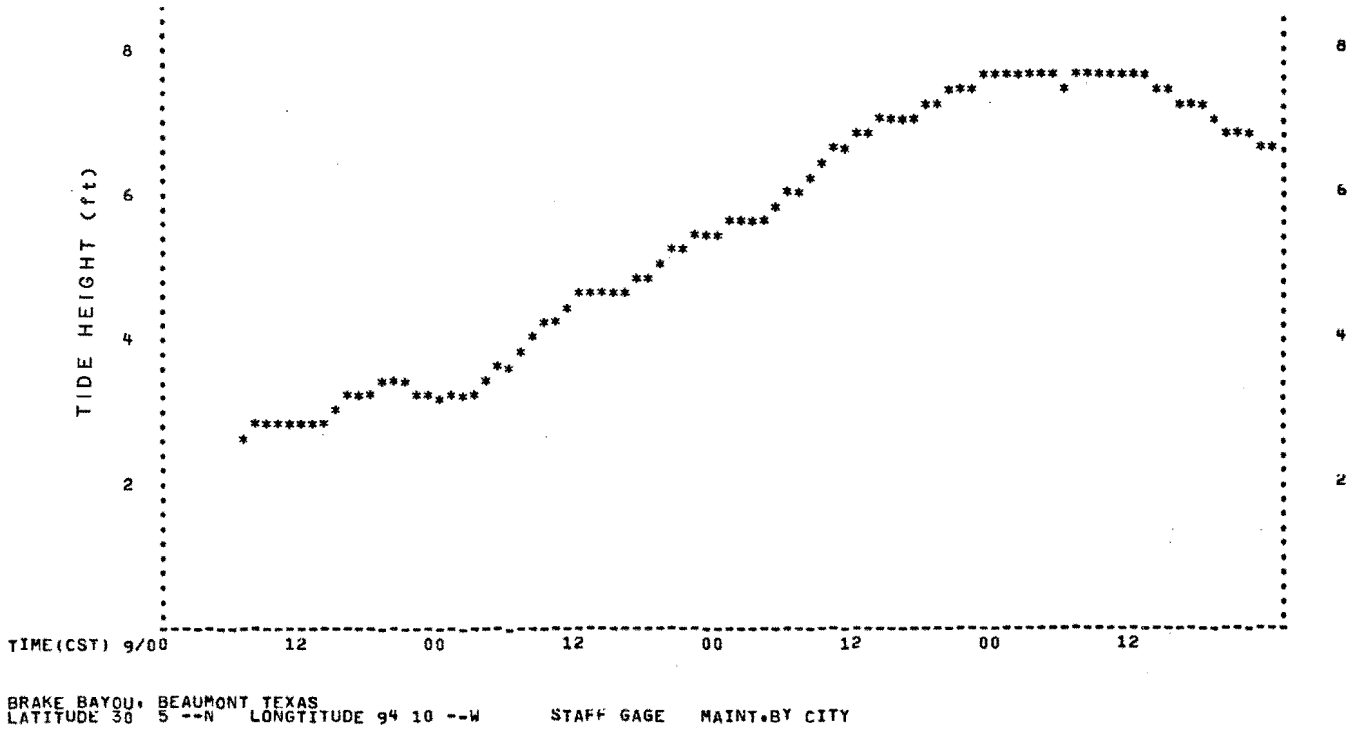


Figure 18.--Tide gage record for Port Arthur, Texas (top) and Orange Naval Base, Texas (bottom).



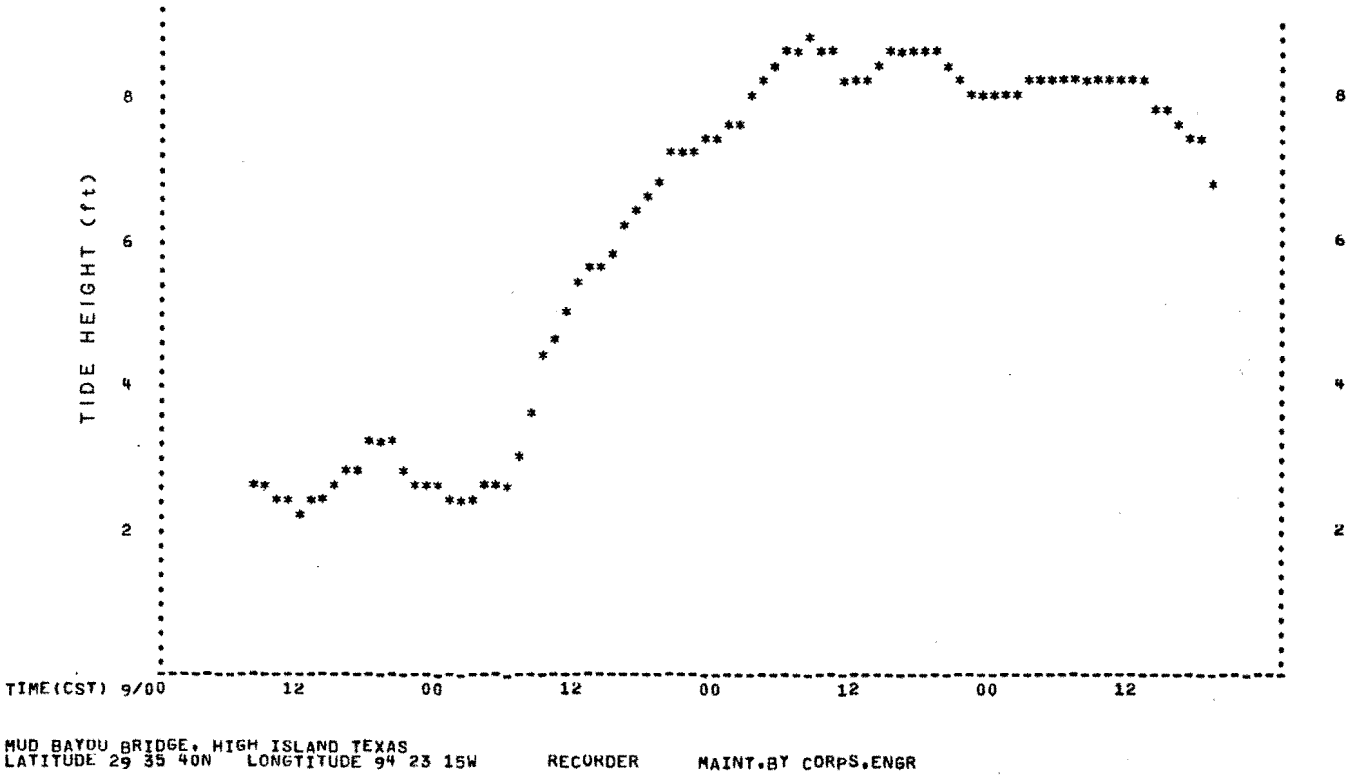


Figure 19.--Tide gage record for Brake Bayou, Beaumont, Texas (top) and Mud Bayou Bridge, High Island, Texas (bottom).

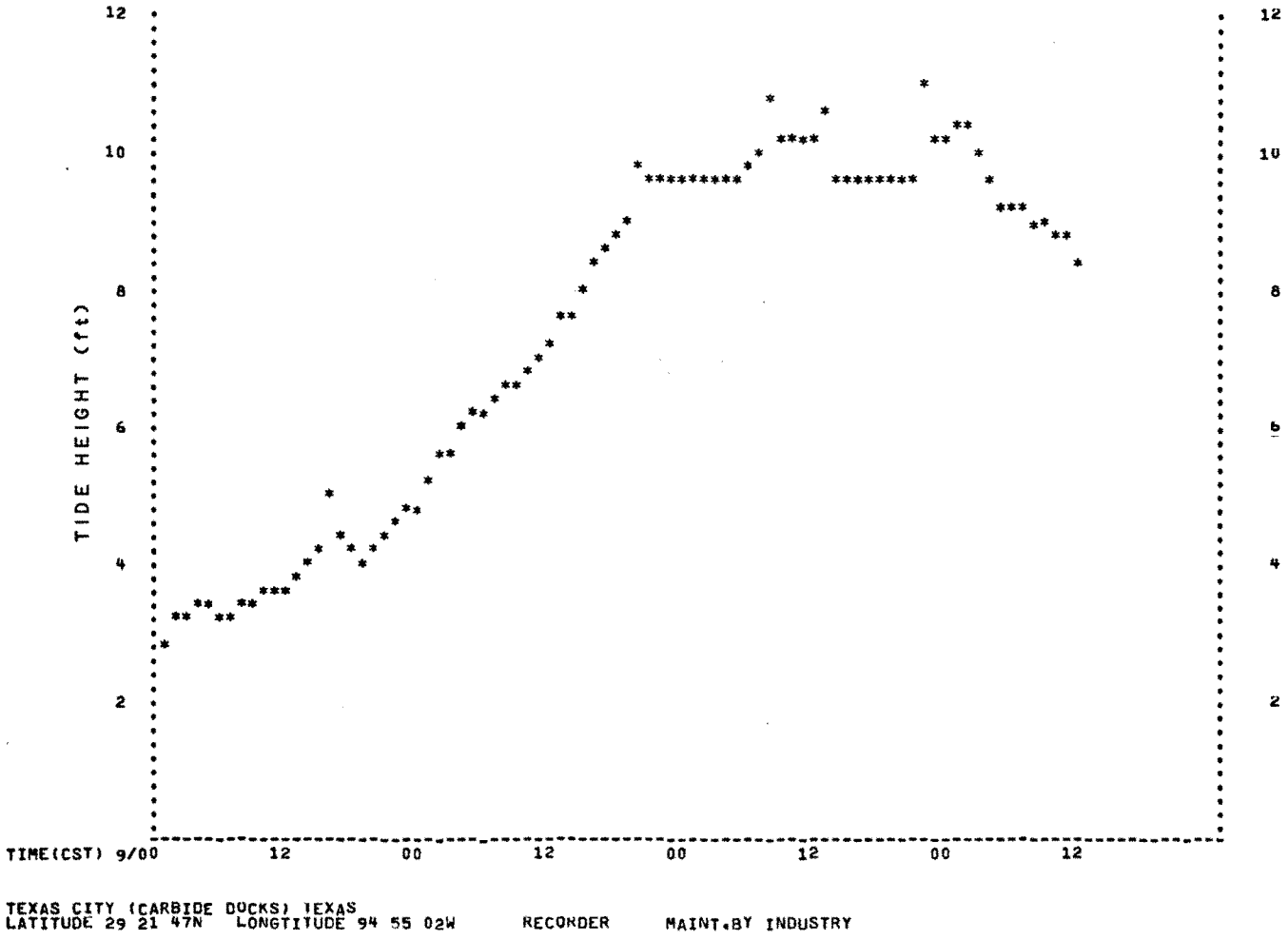


Figure 20.--Tide gage record for Carbide docks, Texas City, Texas.

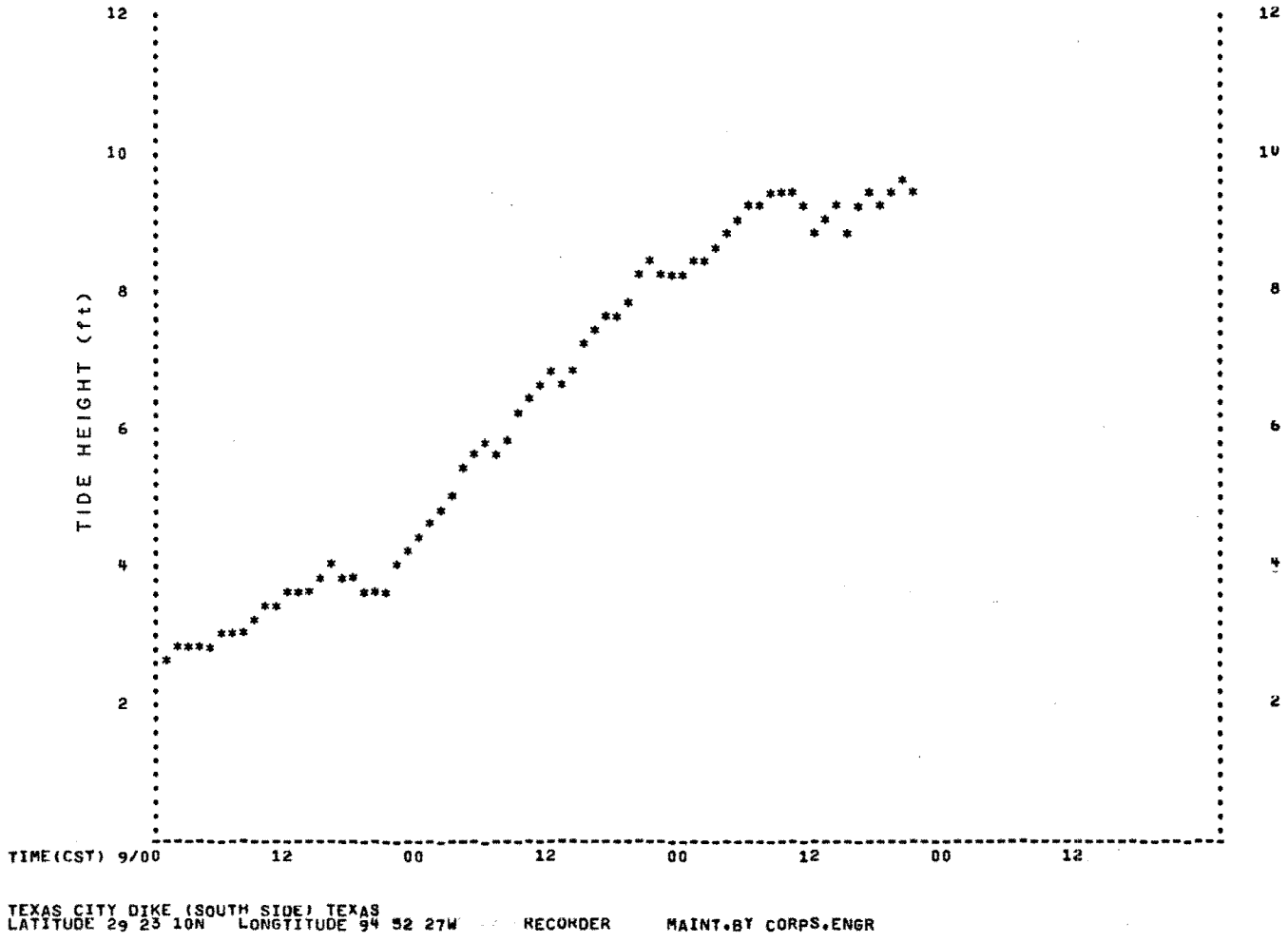


Figure 21.--Tide gage record for Texas City Dike (south side), Texas City, Texas.

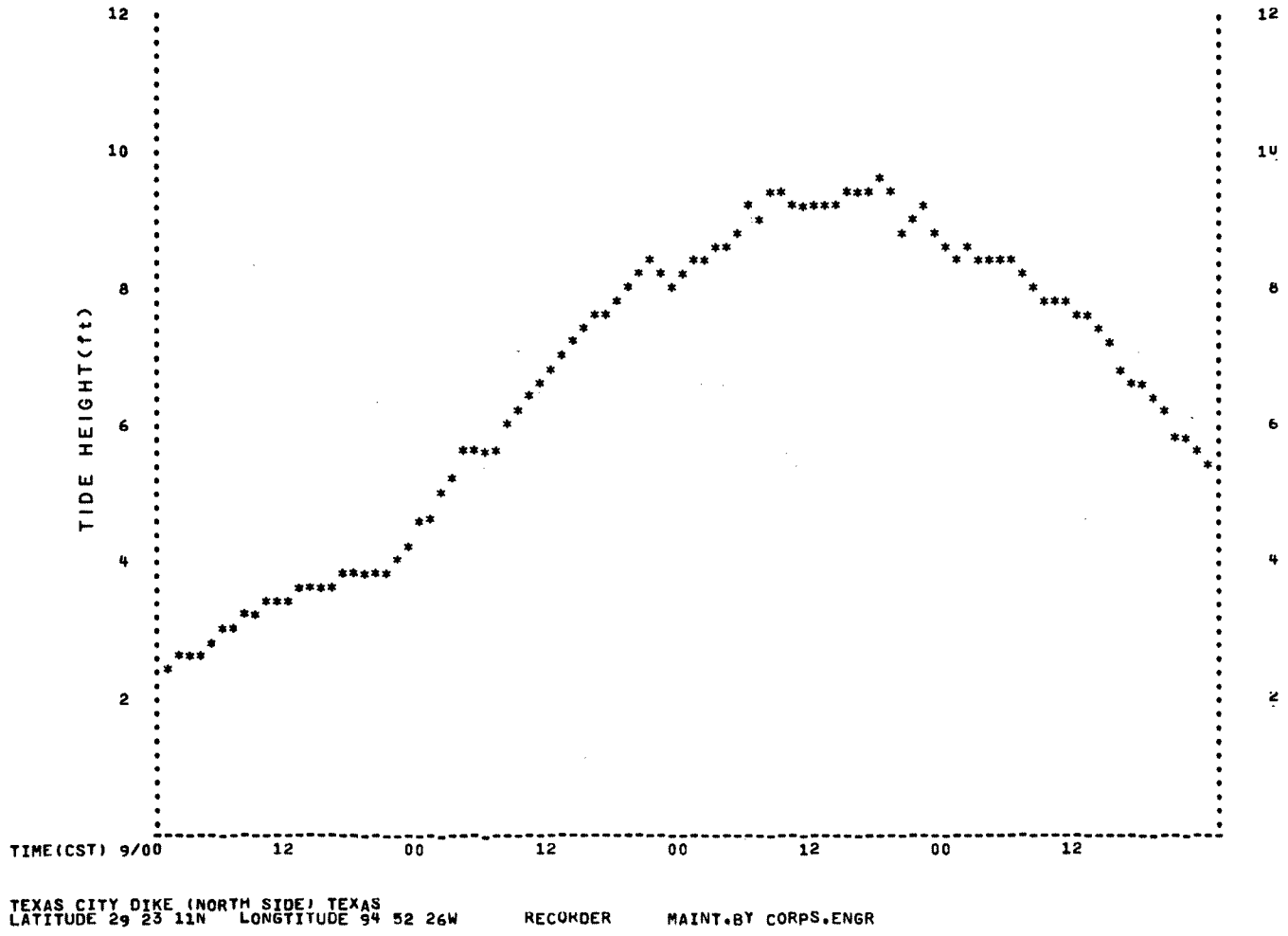


Figure 22.--Tide gage record for Texas City Dike (north side), Texas City, Texas.

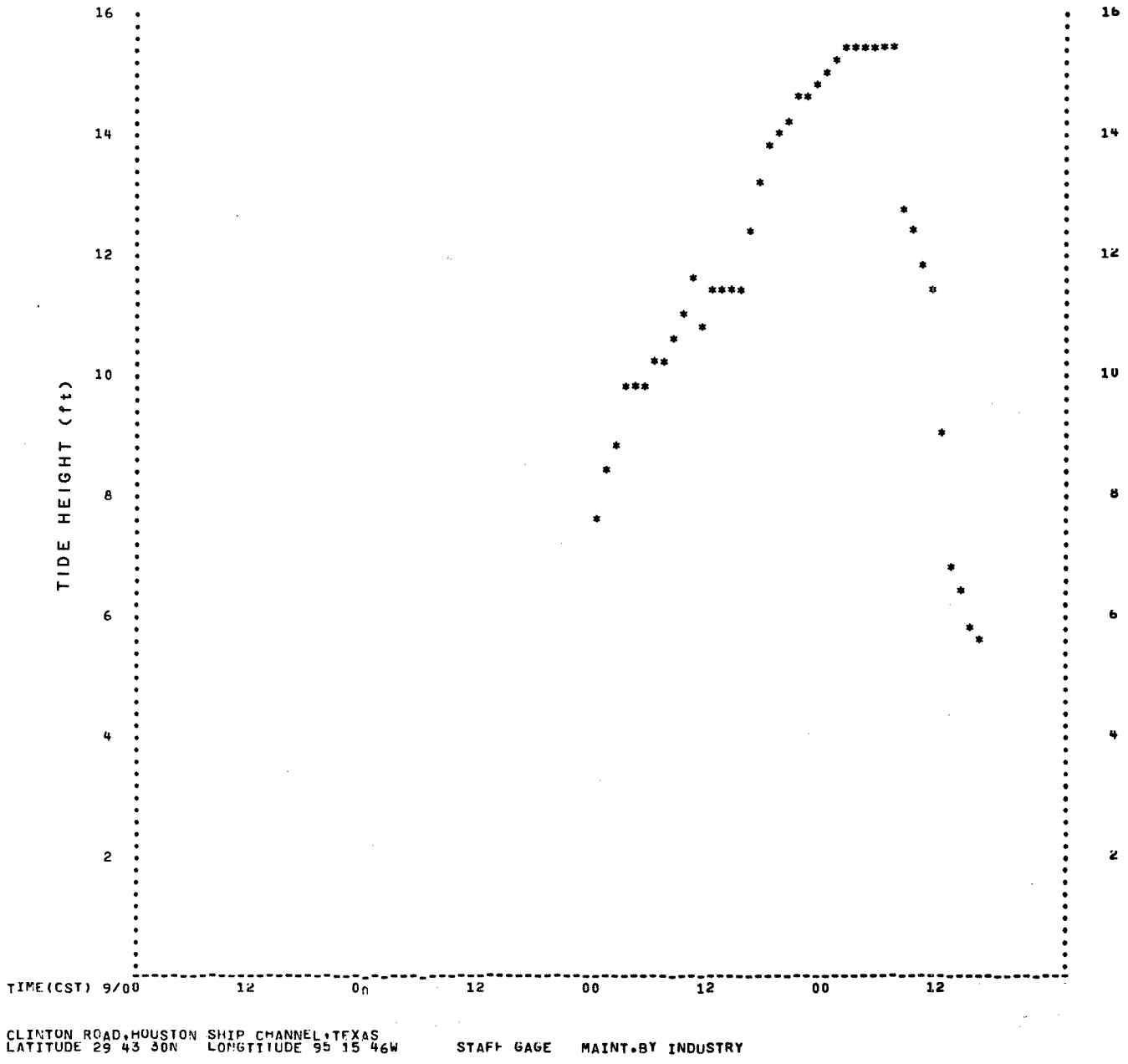


Figure 23.--Tide gage record for Clinton Road, Houston Ship Channel, Texas.

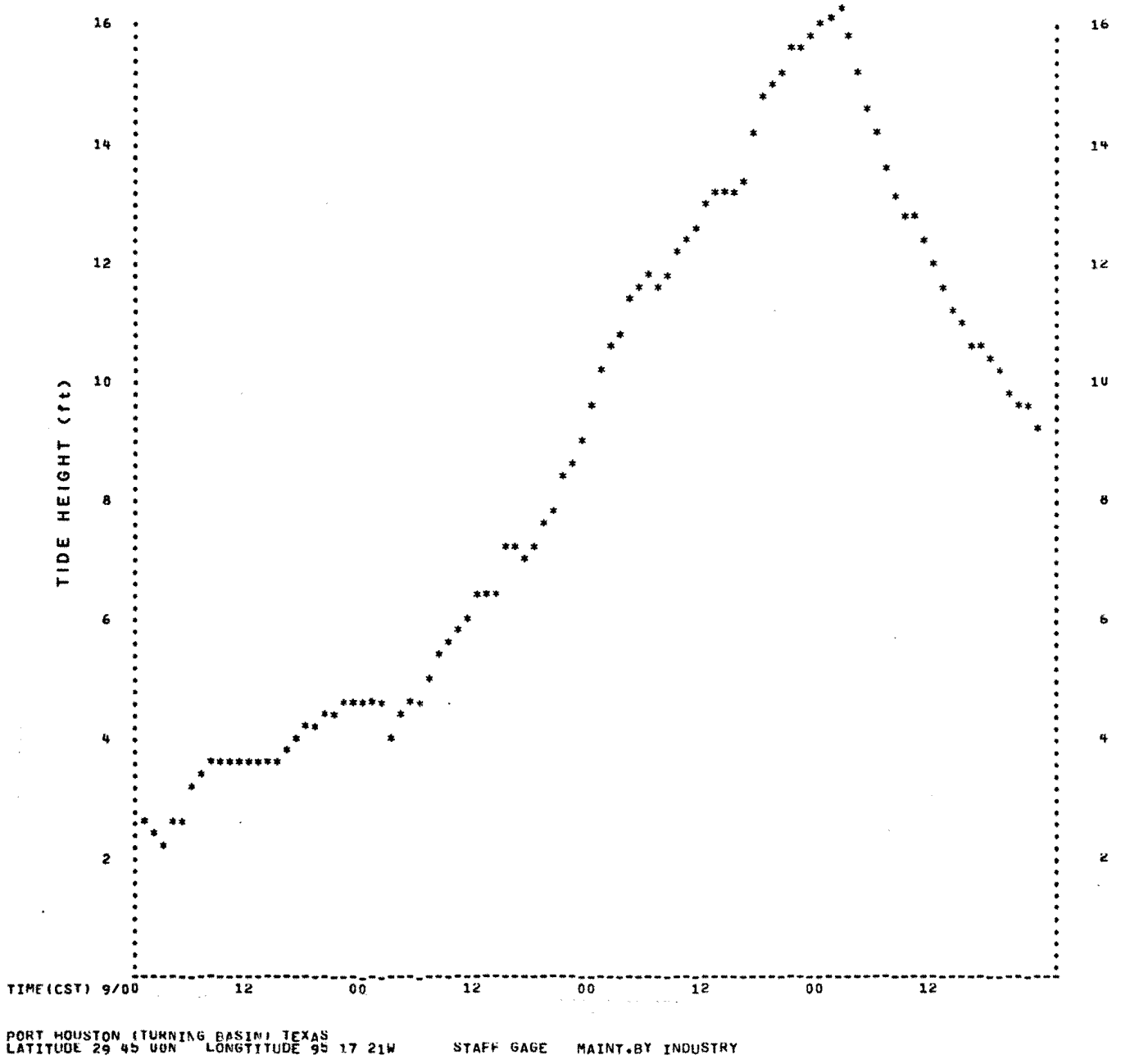


Figure 24.--Tide gage record for Port Houston (Turning Basin), Texas.

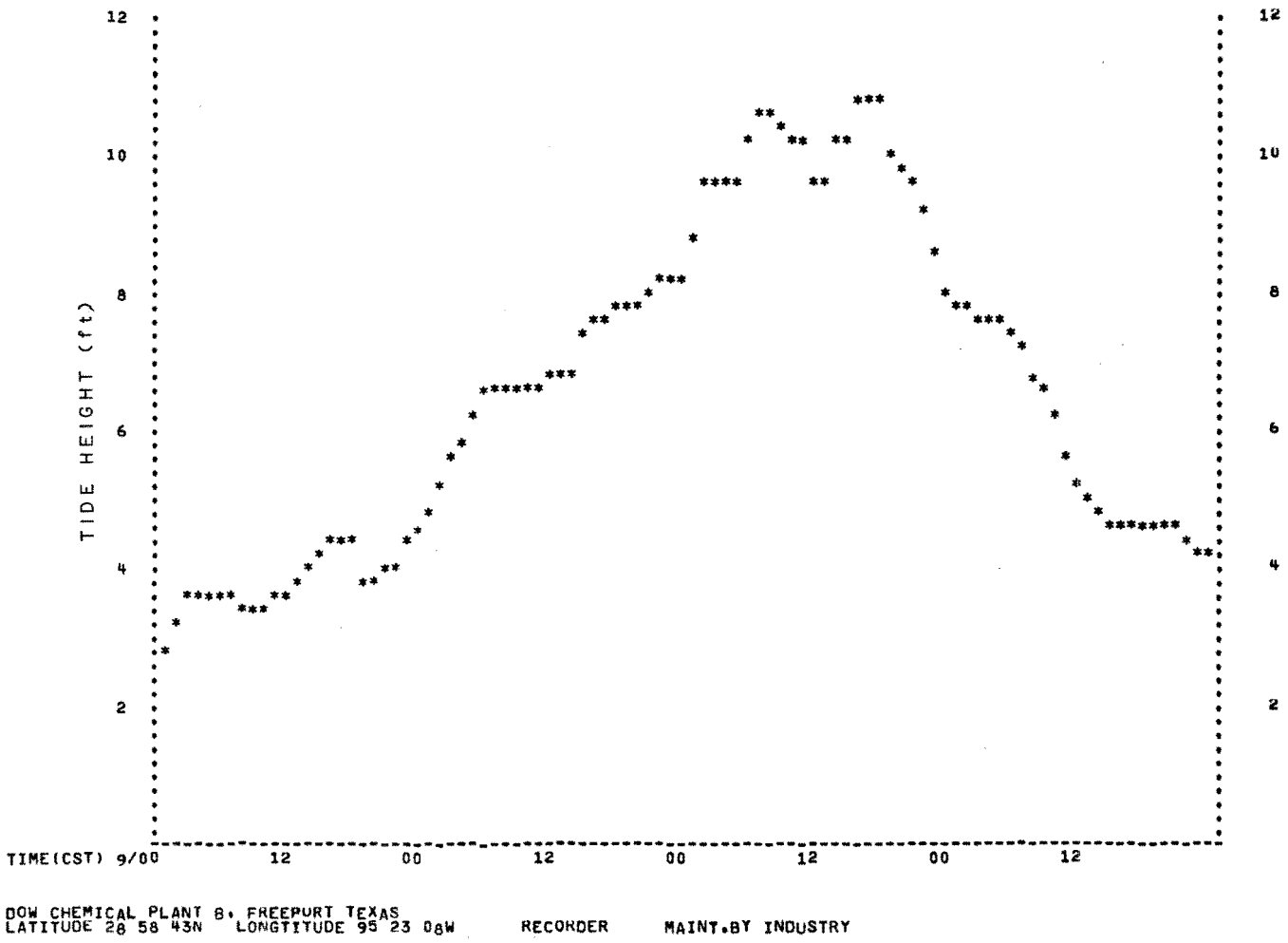


Figure 25.--Tide gage record for Dow Chemical Plant B, Freeport, Texas.

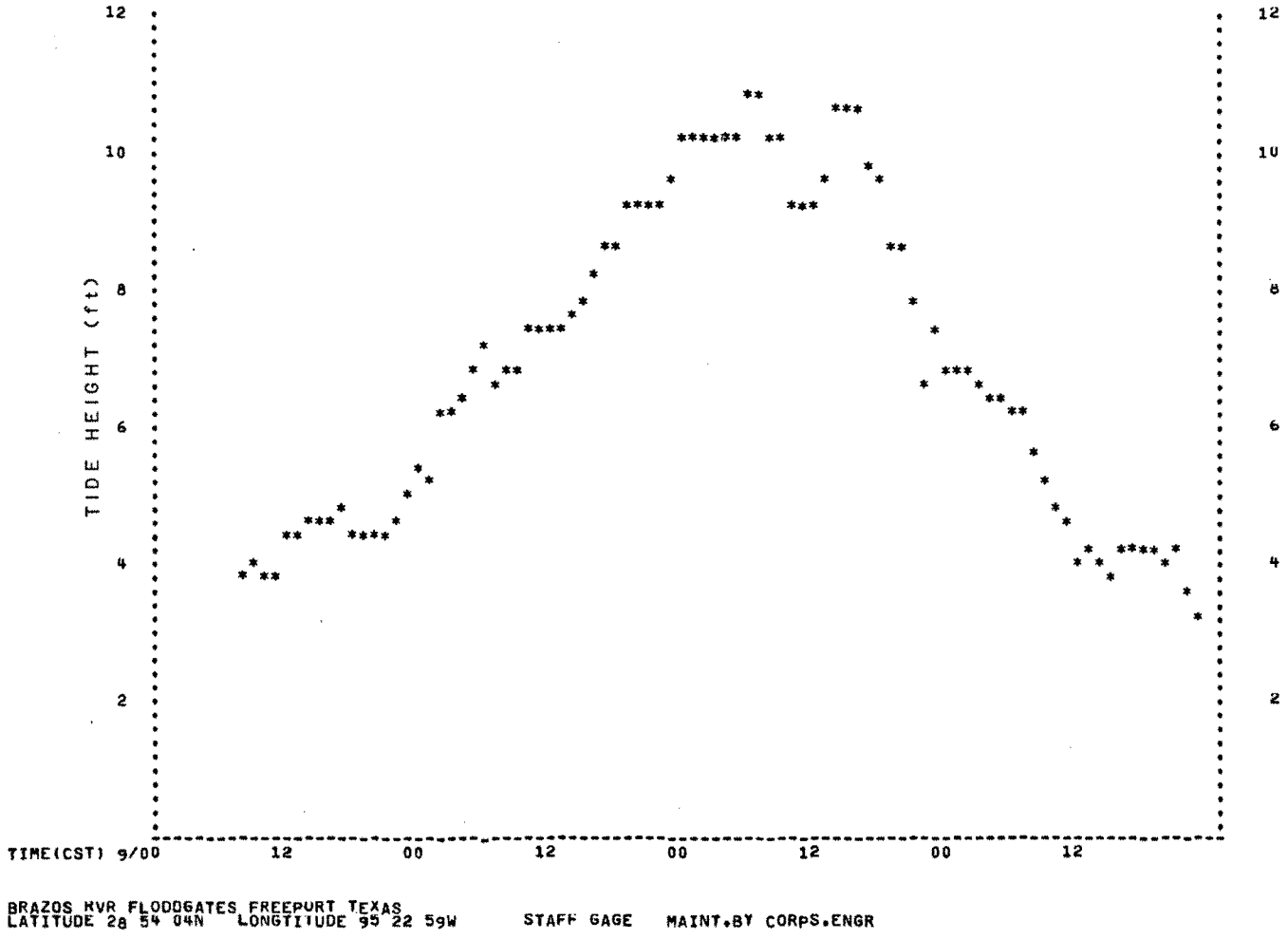


Figure 26.--Tide gage record for Brazos River Floodgate, Freeport, Texas.

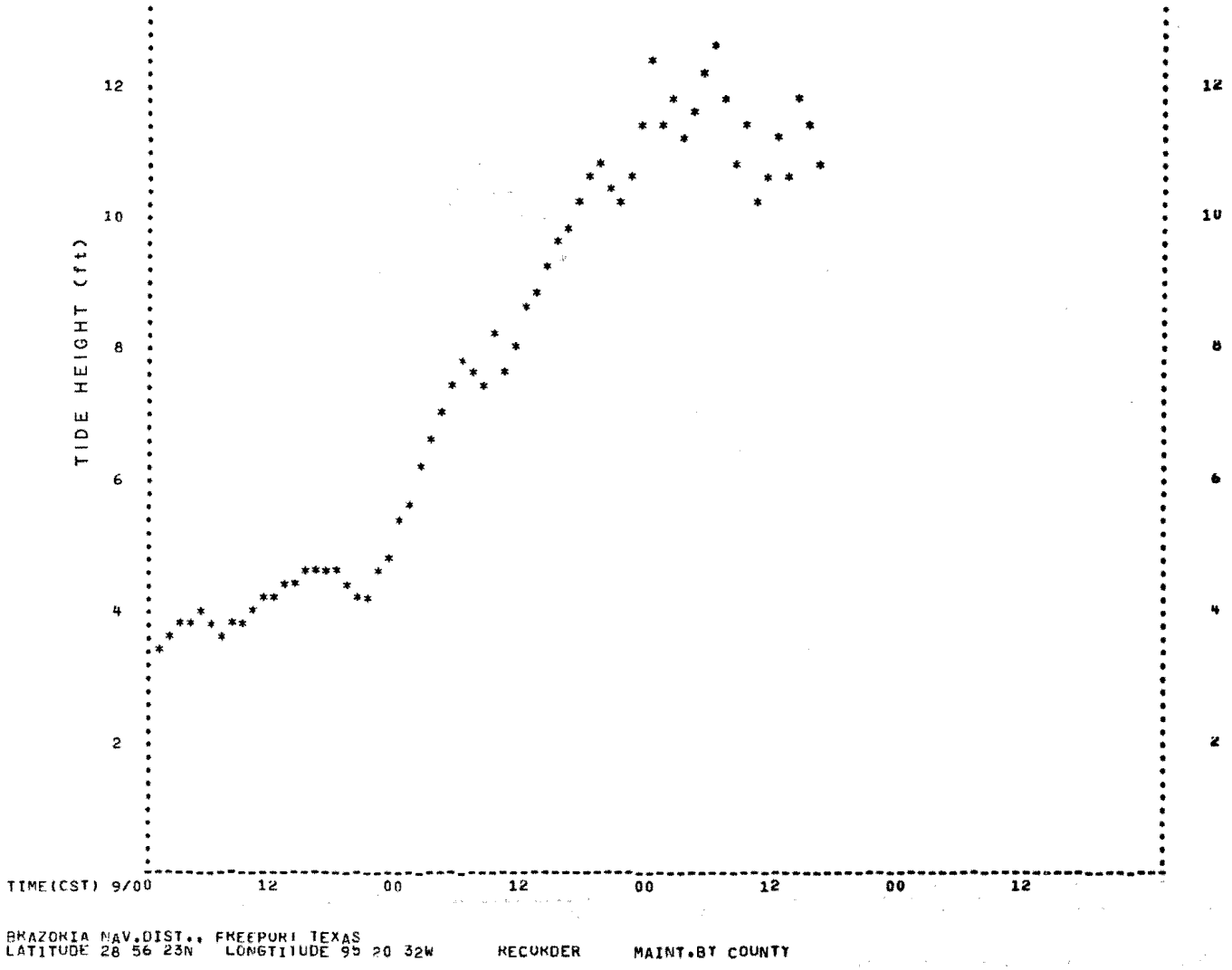


Figure 27.--Tide gage record for Brazoria Navigational District, Freeport, Texas.

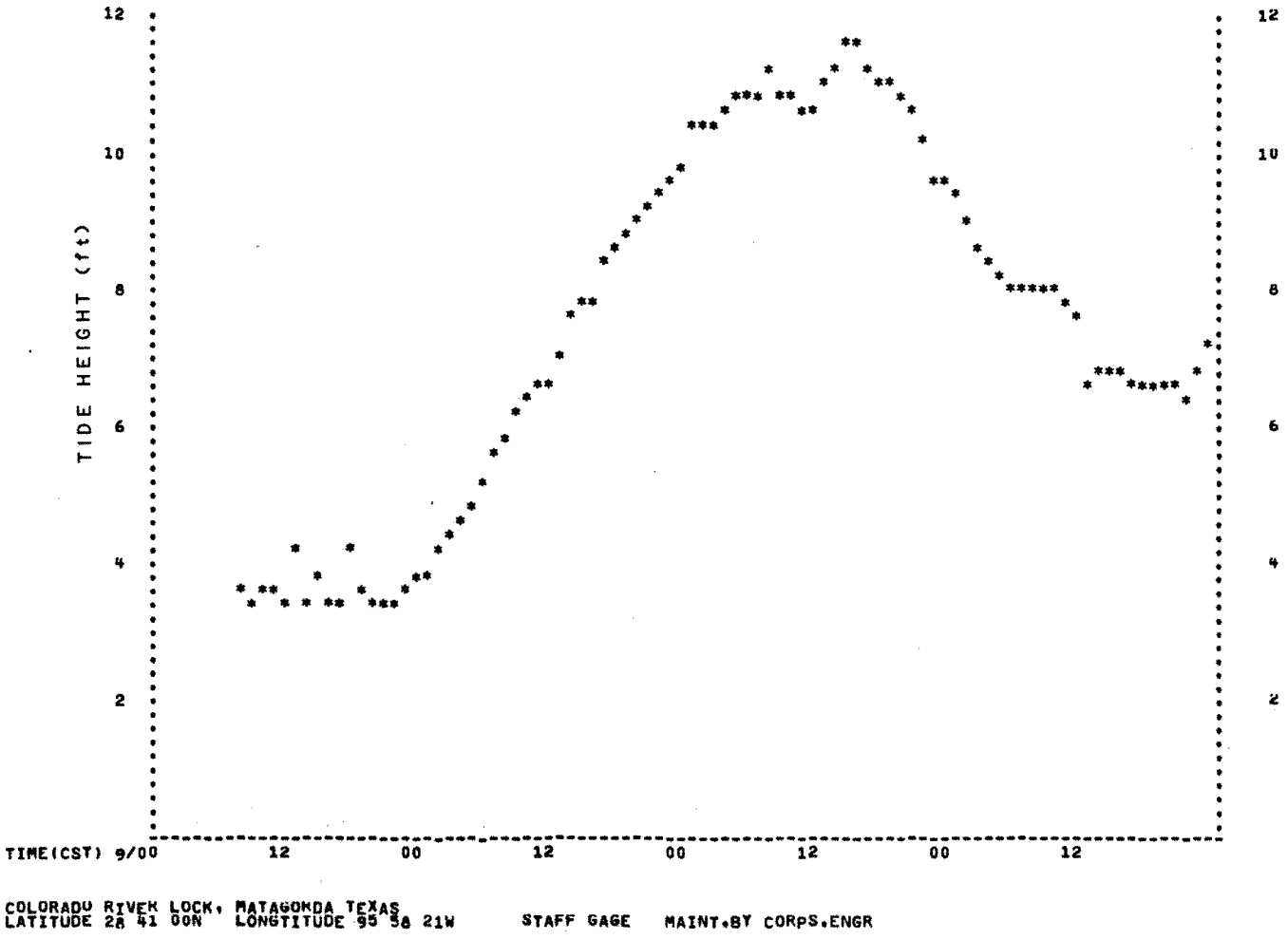


Figure 28.--Tide gage record for Colorado River Lock, Matagorda, Texas.

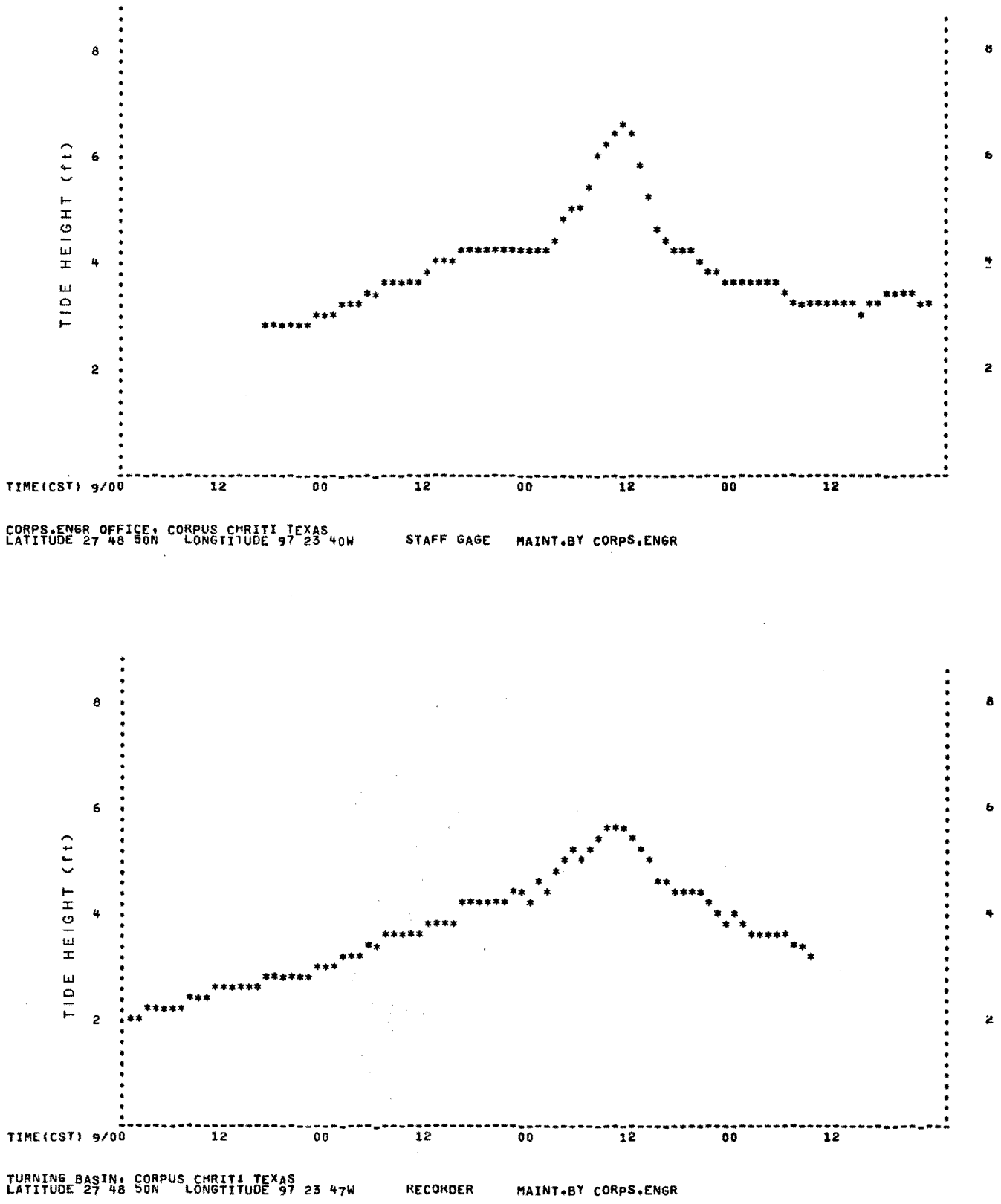


Figure 29.--Tide gage record for Corps of Engineers Office (top) and Turning Basin (bottom), Corpus Christi, Texas.

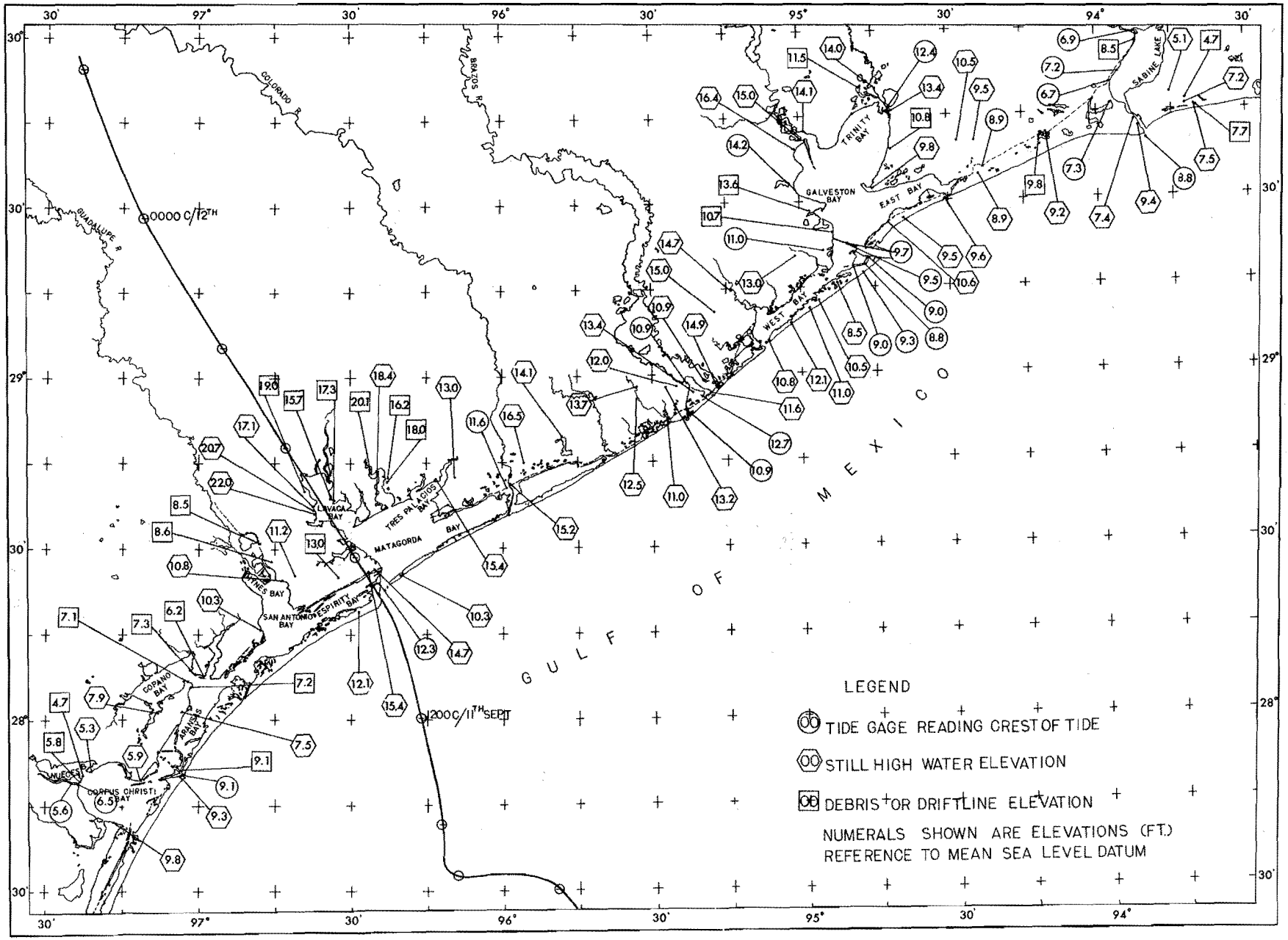


Figure 30.--Maximum water elevation observed during Hurricane Carla.

Table 1.--Location of storm center, forward speed, size and central pressure, Hurricane Carla, September 9-12, 1961

TIME CST	LAT	LONG	P MB	DIR	SPEED KT	SPEED MPH	RADIUS N.MI	RADIUS ST.MI
9TH SEPTEMBER								
0000	24 00	90 12	956	310	9.0	10.4	41	47
0300	24 18	90 36	954	310	9.0	10.4	41	47
0600	24 36	91 00	953	310	9.0	10.4	41	47
0900	24 52	91 20	951	320	9.0	10.4	41	47
1200	25 12	91 40	948	320	9.0	10.4	40	46
1500	25 28	92 03	944	300	9.0	10.4	40	46
1800	25 36	92 36	938	280	10.0	11.5	39	45
2100	25 36	93 12	937	290	11.0	12.7	39	45
10TH SEPTEMBER								
0000	25 55	93 30	936	310	7.5	8.6	38	44
0100	26 00	93 37	936	310	6.4	7.4	38	44
0200	26 03	93 41	936	310	5.1	5.9	38	44
0300	26 07	93 45	936	310	5.0	5.8	38	44
0400	26 10	93 49	936	310	5.0	5.8	37	43
0500	26 15	93 52	936	310	5.0	5.8	37	43
0600	26 18	93 57	936	310	5.5	6.3	37	43
0700	26 22	94 01	936	320	6.0	6.9	37	43
0800	26 27	94 05	936	320	6.0	6.9	37	42
0900	26 31	94 10	936	320	6.0	6.9	37	42
1000	26 35	94 15	936	310	6.5	7.5	36	42
1100	26 39	94 21	936	300	7.8	9.0	36	42
1200	26 42	94 30	935	280	6.6	7.6	35	41
1300	26 43	94 35	935	280	4.6	5.3	35	40
1400	26 45	94 40	935	310	5.5	6.3	35	40
1500	26 51	94 43	935	350	7.0	8.1	35	40
1600	26 59	94 44	935	350	8.0	9.2	35	40
1700	27 05	94 49	935	320	7.3	8.4	35	40
1800	27 09	94 57	935	280	8.0	9.2	35	40
1900	27 11	95 06	934	270	8.5	9.8	34	39
2000	27 10	95 16	934	260	8.1	9.3	34	39
2100	27 08	95 24	934	250	7.2	8.3	34	39
2200	27 06	95 31	934	270	5.7	6.6	34	39
2300	27 06	95 37	934	280	5.4	6.2	34	39
11TH SEPTEMBER								
0000	27 09	95 42	934	310	5.4	6.2	33	38
0100	27 15	95 43	934	350	6.5	7.5	33	38
0200	27 22	95 44	934	350	7.4	8.5	33	38
0300	27 28	95 50	933	300	7.6	8.7	33	38
0400	27 31	95 58	933	290	7.0	8.1	33	38
0500	27 33	96 05	933	290	6.8	7.8	32	37
0600	27 36	96 12	932	300	5.0	5.8	32	37
0700	27 38	96 15	932	310	1.6	1.8	32	37
0800	27 38	96 15	932	310	1.6	1.8	31	36
0900	27 41	96 17	931	330	5.0	5.8	31	36
1000	27 47	96 18	931	350	6.0	6.9	31	35
1100	27 53	96 18	931	360	6.5	7.5	30	35
1200	28 00	96 18	931	360	7.7	8.9	30	35
1300	28 09	96 19	931	350	9.5	10.9	30	34
1400	28 19	96 23	931	330	11.1	12.8	29	33
1500	28 29	96 30	931	330	10.4	12.0	29	33
1600	28 37	96 36	932	330	8.3	9.6	28	32
1700	28 43	96 39	934	330	6.6	7.6	27	31
1800	28 48	96 44	936	330	6.2	7.1	27	31
1900	28 53	96 47	938	330	6.2	7.1	26	30
2000	28 58	96 50	940	330	7.5	8.6	25	29
2100	29 05	96 56	943	330	8.7	10.0	24	28
2200	29 13	97 01	946	330	9.3	10.7	23	27
2300	29 21	97 07	950	330	10.0	11.5	22	25
12TH SEPTEMBER								
0000	29 30	97 13	955	340	10.0	11.5	21	24
0300	29 58	97 25	965	340	10.0	11.5	19	22
0600	30 27	97 35	975	350	9.5	10.9	17	20
0900	30 55	97 34	977	020	9.5	10.9	16	18
1200	31 20	97 25	979	020	10.5	12.1	15	17
1500	31 55	97 17	980	020	12.0	13.8	14	16

Table 2.--Tide gage data from Gulf Coast stations (NGVD Datum) in Hurricane Carla, September 9-12, 1961

LOCATION	TIME (IN HOURS CST) 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
BAYOU RIGAND, LOUISIANA LATITUDE 29 16 --N LONGTITUDE 89 59 --W RECORDER MAINT.BY NOAA-NOS																								
DATE 9TH	2.3	2.4	2.4	2.6	2.6	2.7	2.8	2.8	3.0	3.1	3.2	3.1	3.1	3.0	3.0	2.9	3.0	2.9	2.9	3.1	3.0	3.1	3.0	3.1
DATE 10TH	3.1	3.1	3.2	3.3	3.3	3.3	3.2	3.6	3.6	3.6	3.5	3.5	3.4	3.4	3.3	3.2	3.0	3.0	2.9	2.8	2.8	2.9	2.9	2.9
DATE 11TH	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	3.0	2.9	2.9	2.8	2.8	2.7	2.6	2.6	2.6	2.6	2.6	2.5	2.6	2.5
DATE 12TH	2.6	2.5	2.4	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.1	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.3
HIGHEST OBSERVED TIDE 3.0FT RECORDED AT 1100HRS ON 11TH SEPT.																								
SABINE PASS TEXAS LATITUDE 29 40 --N LONGTITUDE 93 50 --W RECORDER MAINT.BY NOAA-NOS																								
DATE 9TH	2.5	2.7	2.8	2.8	2.8	2.6	2.4	2.7	2.9	2.9	3.0	3.4	3.3	3.3	3.3	3.5	3.5	3.1	2.8	3.0	3.2	3.2	3.7	3.9
DATE 10TH	4.2	4.7	4.7	5.0	5.0	5.3	5.4	5.4	5.5	5.3	5.4	5.8	5.6	5.7	6.0	6.1	6.4	6.2	6.2	6.2	6.1	6.1	6.1	6.0
DATE 11TH	6.0	6.5	6.9	7.4	7.3	7.2	6.9	7.0	6.8	6.5	6.4	5.8	6.5	6.7	6.7	6.8	6.7	6.4	6.1	6.7	5.4	5.7	5.6	5.9
DATE 12TH	5.7	5.8	5.8	6.3	6.2	5.9	5.8	5.3	4.8	4.4	4.0	4.1	4.2	4.4	4.5	4.7	4.8	4.5	4.2	3.9	3.7	3.4	3.3	3.3
HIGHEST OBSERVED TIDE 7.4FT RECORDED AT 0412HRS ON 11TH SEPT.																								
FORT POINT, GALVESTON TEXAS LATITUDE 29 20 10N LONGTITUDE 94 46 10W RECORDER MAINT.BY CORPS.ENGR																								
DATE 9TH	2.5	2.6	2.7	2.9	2.9	2.9	2.9	2.9	2.9	3.0	3.1	3.2	3.4	3.5	3.5	3.6	3.6	3.5	3.4	3.3	3.4	3.6	4.0	4.2
DATE 10TH	4.4	4.6	4.8	5.2	5.6	5.7	5.6	5.7	6.0	6.0	6.3	6.4	6.5	6.7	7.0	7.3	7.4	7.5	7.4	7.8	7.9	7.8	7.6	7.9
DATE 11TH	8.0	8.1	8.2	8.3	8.4	8.5	8.6	8.7	8.5	8.4	8.6	8.4	8.4	8.4	8.6	8.5	8.3	8.7	8.5	8.1	7.9	7.7	7.6	7.2
DATE 12TH	7.0	7.2	7.5	7.3	7.4	7.1	6.7	6.4	6.0	5.7	5.6	5.6	5.5	5.4	5.3	5.3	5.2	5.0	4.8	4.6	4.4	4.2	4.1	4.2
HIGHEST OBSERVED TIDE 8.7FT RECORDED AT 0800HRS AND 8.8FT AT 1801HRS ON 11TH SEPT																								

Table 2.--(continued)

LOCATION	TIME (IN HOURS CST) 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
GALVESTON (PLEASURE PIER) TEXAS LATITUDE 29 16 56N LONGTITUDE 94 47 53W RECORDER MAINT.BY NOAA-NOS																								
DATE 9TH	2.6	3.1	2.9	3.2	2.9	2.8	2.7	2.7	2.8	2.8	3.0	3.4	3.6	3.6	3.8	3.9	3.8	3.3	3.1	2.9	3.2	3.1	4.3	4.8
DATE 10TH	5.2	5.3	5.6	5.9	6.6	6.0	6.1	6.5	6.3	6.6	6.9	6.9	6.8	7.3	7.3	7.5	7.9	7.6	7.9	8.1	8.0	7.9	8.1	8.6
DATE 11TH	8.8	8.8	8.7	8.7	8.6	8.8	8.8	8.4	7.7	7.7	7.8	7.5	7.9	8.8	8.8	8.2	8.4	8.2	7.4	7.0	7.0	6.1	6.2	5.7
DATE 12TH	6.0	6.6	6.7	6.6	6.7	6.1	5.4	4.6	3.7	3.3	3.3	3.2	3.3	3.7	3.8	3.7	3.7	3.5	3.2	2.9	2.6	2.4	2.4	2.3
HIGHEST OBSERVED TIDE 9.1FT RECORDED AT 0630HRS AND 8.8FT AT 1554HRS ON 11TH SEPT																								
GALVESTON (PIER 21) TEXAS LATITUDE 29 18 36N LONGTITUDE 94 47 31W RECORDER MAINT.BY NOAA-NOS																								
DATE 9TH	2.3	2.6	2.6	2.8	2.8	2.8	2.8	2.8	2.9	2.9	3.2	3.2	3.5	3.4	3.6	3.7	3.7	3.4	3.4	3.4	3.4	3.5	4.0	4.1
DATE 10TH	4.4	4.5	5.0	5.1	5.5	5.6	5.5	5.6	5.8	6.0	6.3	6.5	6.6	6.9	7.3	7.4	7.6	7.5	7.4	7.8	7.8	7.9	7.6	7.8
DATE 11TH	7.8	8.0	8.0	8.2	8.3	8.4	8.5	8.4	8.1	8.1	8.1	8.2	8.2	8.3	8.1	8.1	8.6	8.4	8.2	7.5	7.5	7.6	7.1	7.0
DATE 12TH	7.2	7.3	7.0	7.0	7.1	6.7	6.5	6.1	5.9	5.8	5.8	5.6	5.5	5.4	5.2	5.2	5.1	4.9	4.7	4.5	4.3	4.1	4.0	3.9
HIGHEST OBSERVED TIDE 8.6FT RECORDED AT 1706HRS ON 11TH SEPT.																								
FREEPORT TEXAS LATITUDE 28 56 45N LONGTITUDE 95 18 29W RECORDER MAINT.BY NOAA-NOS																								
DATE 9TH	3.0	3.0	3.3	3.2	3.4	3.2	3.1	3.2	3.3	3.3	3.5	3.7	3.7	3.7	3.9	3.9	4.1	3.8	3.5	3.5	3.6	3.7	4.2	4.7
DATE 10TH																								
DATE 11TH																								
DATE 12TH																								
HIGHEST OBSERVED TIDE GAGE FAILED, HIGHWATER MARK 11.7FT REPORTED IN THE FLOAT WELL.																								

Table 2.--(concluded)

LOCATION	TIME (IN HOURS CST) 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
PORT OCONNOR TEXAS LATITUDE 28 25 57N LONGTITUDE 96 24 25W RECORDER MAINT.BY NOAA-NOS																								
DATE 9TH	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.5	3.6	3.7	3.7	3.7	3.7	3.7	3.9	4.1	4.2	4.3
DATE 10TH	4.5	4.8	5.0	5.1	5.3	5.5	5.6	5.9	5.8	5.9	6.0	6.2	6.3	6.6	6.8	7.0	7.2	7.4	7.7	8.1	8.3	8.6	9.2	9.5
DATE 11TH	9.9	10.4	10.9	11.3	12.2																			
DATE 12TH																								
HIGHEST OBSERVED TIDE 12.2FT(NOAA-NOS ADJUSTED ELEV.) REACHED PRIOR TO GAGE FAILURE.																								
PORT ARANSAS (JETTIES) TEXAS LATITUDE 27 50 18N LONGTITUDE 97 3 03W RECORDER MAINT.BY NOAA-NOS																								
DATE 9TH	1.6	1.7	1.7	1.8	1.8	1.9	1.9	2.0	2.0	2.1	2.1	2.2	2.4	2.5	2.6	2.5	2.4	2.3	2.3	2.3	2.7	2.9	3.0	3.2
DATE 10TH	3.4	3.6	3.8	3.9	4.0	4.1	4.1	4.1	4.2	4.3	4.5	4.6	4.8	4.9	5.0	5.1	5.2	4.9	5.1	5.4	5.6	6.0	6.4	6.9
DATE 11TH	7.2	7.4	7.7	7.9						9.0														
DATE 12TH																								
HIGHEST OBSERVED TIDE 9.0FT REPORTED AT 1000HRS AFTER GAGE FAILURE.																								
PORT ISABELL TEXAS LATITUDE 26 4 --N LONGTITUDE 97 13 --W RECORDER MAINT.BY NOAA-NOS																								
DATE 9TH	1.4	1.7	1.7	1.8	1.8	1.9	1.8	1.8	1.8	1.9	2.0	2.1	2.2	2.3	2.3	2.4	2.1	2.3	2.3	2.4	2.5	2.7	2.9	3.0
DATE 10TH	3.1	3.4	3.6	3.7	3.8	3.8	3.7	3.7	3.7	3.7	3.7	3.8	3.8	4.0	4.0	3.9	4.0	4.0	3.9	4.0	3.9	3.9	4.1	4.0
DATE 11TH	4.0	4.1	4.0	4.2	4.3	3.9	3.9	3.9	3.7	3.6	3.8	3.5	3.4	3.7	3.6	3.7	3.8	3.5	3.5	3.4	3.3	3.2	3.2	3.3
DATE 12TH	3.3	3.3	3.3	3.4	3.3	3.1	3.0	2.3	1.9	1.5	1.2	1.0	1.1	1.3	1.5	1.4	1.5	1.6	1.5	1.5	1.5	1.4	1.5	1.5
HIGHEST OBSERVED TIDE 4.3FT RECORDED AT 0506HRS ON 11TH SEPT.																								

Table 3.--Tide gage data from inland stations (NGVD Datum) in Hurricane Carla, September 9-12, 1961

	TIME (IN HOURS CST)																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
LOCATION																								
PORT ARTHUR TEXAS LATITUDE 29 52 00N LONGTITUDE 93 55 48W STAFF GAGE MAINT.BY CORPS.ENGR																								
DATE 9TH																			3.3	3.2	3.2	3.1	3.1	3.2
DATE 10TH	3.4	3.6	3.8	4.4	4.6	4.5	4.6	4.7	4.8	4.8	4.9	4.9	4.8	5.1	5.2	5.3	5.5	5.5	5.5	5.6	5.6	5.7	5.7	5.8
DATE 11TH	5.9	6.0	6.1	6.2	6.4	6.4	6.5	6.8	6.8	6.9	6.8	6.8	6.7	6.7	6.8	6.9	7.0	7.1	7.1	7.1	7.1	7.0	7.0	7.0
DATE 12TH	6.9	6.9	6.9	6.8	6.8	6.8	6.7	6.7	6.3	6.3	6.3	6.2	6.3	6.2	6.2	6.1	6.1	6.1	5.9	5.9	5.8	5.5	5.2	
HIGHEST OBSERVED TIDE 7.1FT REPORTED AT 18-2100HRS ON 11TH SEPT.																								
ORANGE NAVAL BASE (PIER 21) TEXAS LATITUDE 30 5 51N LONGTITUDE 93 43 19W STAFF GAGE MAINT.BY U.S.NAVY																								
DATE 9TH																								3.2
DATE 10TH	3.3	3.4	3.4	3.4	3.5	3.6	3.8	3.8	3.8	3.8	3.9	4.0	4.0	4.1	4.1	4.1	4.2	4.4	4.6	4.7	4.8	4.8	4.8	4.8
DATE 11TH	4.9	5.0	5.1	5.1	5.2	5.4	5.4	5.6	6.0	6.0	6.1	6.4	6.6	6.7	7.0	7.0	7.0	7.0	7.0	6.9	6.9	6.9	6.9	6.9
DATE 12TH	6.9	7.0	7.0	7.1	7.1	7.2	7.2	7.2	7.2	7.3	7.4	7.4	7.4	7.3	7.2	7.1	7.0	6.8	6.8	6.8	6.7	6.7	6.7	6.6
HIGHEST OBSERVED TIDE 7.4FT REPORTED AT 11-1300HRS ON 11TH SEPT																								
BRAKE BAYOU, BEAUMONT TEXAS LATITUDE 30 5 --N LONGTITUDE 94 10 --W STAFF GAGE MAINT.BY CITY																								
DATE 9TH							2.7	2.8	2.8	2.8	2.8	2.9	2.9	2.9	3.0	3.1	3.2	3.2	3.3	3.3	3.3	3.2	3.2	3.1
DATE 10TH	3.1	3.1	3.2	3.4	3.5	3.6	3.8	4.0	4.1	4.2	4.4	4.5	4.5	4.6	4.7	4.7	4.8	4.9	5.0	5.1	5.2	5.3	5.4	5.4
DATE 11TH	5.5	5.6	5.7	5.7	5.8	6.0	6.0	6.2	6.4	6.6	6.7	6.8	6.9	7.0	7.0	7.0	7.0	7.1	7.2	7.3	7.4	7.4	7.5	7.5
DATE 12TH	7.5	7.6	7.6	7.5	7.5	7.4	7.6	7.7	7.7	7.6	7.6	7.6	7.5	7.4	7.3	7.2	7.1	7.1	7.0	6.9	6.8	6.8	6.7	6.7
HIGHEST OBSERVED TIDE 7.7FT REPORTED 08-0900HRS ON 12TH SEPT																								

Table 3.--(continued)

LOCATION	TIME (IN HOURS CST)																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
MUD BAYOU BRIDGE, HIGH ISLAND TEXAS LATITUDE 29 35 40N LONGTITUDE 94 23 15W RECORDER MAINT.BY CORPS.ENGR																								
DATE 9TH								2.5	2.5	2.4	2.4	2.2	2.3	2.4	2.5	2.8	2.9	3.1	3.1	3.1	2.9	2.7	2.6	2.6
DATE 10TH	2.4	2.3	2.4	2.5	2.6	2.6	3.0	3.7	4.3	4.6	5.0	5.4	5.6	5.7	5.9	6.1	6.3	6.7	6.9	7.1	7.2	7.2	7.3	7.3
DATE 11TH	7.5	7.7	8.0	8.2	8.4	8.6	8.7	8.9	8.7	8.5	8.2	8.2	8.2	8.4	8.6	8.6	8.6	8.6	8.5	8.4	8.2	8.0	8.0	8.0
DATE 12TH	8.0	8.0	8.1	8.1	8.2	8.2	8.2	8.1	8.2	8.2	8.2	8.2	8.1	7.9	7.8	7.6	7.4	7.3	6.9					
HIGHEST OBSERVED TIDE 8.9FT RECORDED AT 0800HRS ON 11TH SEPT																								
GALVESTON (PELICAN BRIDGE) TEXAS LATITUDE 29 18 48N LONGTITUDE 94 49 17W RECORDER MAINT.BY CORPS.ENGR																								
DATE 9TH	2.5	2.5	2.6	2.7	2.7	2.7	2.7	2.7	2.8	2.9	3.0	3.1	3.2	3.4	3.4	3.5	3.6	3.4	3.2	3.3	3.4	3.5	3.8	4.0
DATE 10TH	4.3	4.6	4.8	5.1	5.4	5.6	5.4	5.6	5.8	6.0	6.3	6.5	6.7	6.9	7.2	7.3	7.4	7.5	7.7	7.8	8.0	7.8	7.6	7.7
DATE 11TH	7.8	8.0	8.0	8.2	8.4	8.5	8.5	8.6	8.2	8.3	8.2	8.0	8.2	8.4	8.6	8.8	8.4	7.9	7.7	7.5	7.3	7.1	6.9	7.2
DATE 12TH	7.4	7.3	7.2	7.2																				
HIGHEST OBSERVED TIDE 8.6FT RECORDED AT 0805HRS AND 8.8FT AT 1545HRS ON 11TH SEPT.																								
TEXAS CITY (CARBIDE DOCKS) TEXAS LATITUDE 29 21 47N LONGTITUDE 94 55 02W RECORDER MAINT.BY INDUSTRY																								
DATE 9TH	2.9	3.1	3.2	3.3	3.3	3.2	3.2	3.3	3.4	3.5	3.6	3.7	3.9	4.0	4.2	5.0	4.3	4.1	4.0	4.2	4.4	4.6	4.8	4.9
DATE 10TH	5.2	5.5	5.7	6.0	6.2	6.2	6.3	6.5	6.7	6.9	7.0	7.2	7.5	7.7	8.0	8.3	8.5	8.8	9.0	9.9	9.5	9.5	9.5	9.5
DATE 11TH	9.5	9.5	9.5	9.6	9.7	9.9	10.0	10.9	10.2	10.2	10.2	10.2	10.6	9.7	9.7	9.7	9.7	9.6	9.6	9.6	9.6	11.0	10.1	10.2
DATE 12TH	10.3	10.4	10.0	9.6	9.2	9.1	9.1	9.0	9.0	8.9	8.8	8.3												
HIGHEST OBSERVED TIDE 10.9FT RECORDER AT 0800HRS AND 11.0FT AT 2200HRS ON 11TH SEPT																								

Table 3.--(continued)

LOCATION	TIME (IN HOURS CST) 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
TEXAS CITY DIKE (SOUTH SIDE) TEXAS LATITUDE 29 23 10N LONGTITUDE 94 52 27W RECORDER MAINT.BY CORPS.ENGR																								
DATE 9TH	2.6	2.9	2.9	2.9	2.9	3.0	3.0	3.0	3.2	3.3	3.4	3.5	3.6	3.7	3.8	4.0	3.9	3.8	3.6	3.5	3.7	4.0	4.2	4.4
DATE 10TH	4.6	4.8	5.0	5.3	5.5	5.8	5.6	5.9	6.1	6.4	6.6	6.8	6.6	6.9	7.1	7.3	7.5	7.7	7.9	8.1	8.3	8.2	8.1	8.1
DATE 11TH	8.3	8.4	8.6	8.8	9.0	9.2	9.2	9.3	9.3	9.4	9.1	8.9	9.0	9.2	8.9	9.1	9.3	9.2	9.3	9.5	9.3			
DATE 12TH																								
HIGHEST OBSERVED TIDE 9.4FT RECORDED AT 1000HRS AND 9.5FT AT 2000HRS ON 11TH SEPT																								
TEXAS CITY DIKE (NORTH SIDE) TEXAS LATITUDE 29 23 11N LONGTITUDE 94 52 26W RECORDER MAINT.BY CORPS.ENGR																								
DATE 9TH	2.4	2.5	2.6	2.7	2.9	3.0	3.0	3.1	3.2	3.3	3.3	3.4	3.5	3.7	3.7	3.7	3.8	3.8	3.8	3.9	3.9	4.0	4.2	4.5
DATE 10TH	4.7	5.0	5.2	5.5	5.7	5.5	5.7	6.0	6.2	6.4	6.6	6.8	7.0	7.2	7.4	7.5	7.7	7.9	8.0	8.2	8.3	8.2	8.0	8.2
DATE 11TH	8.4	8.4	8.5	8.6	8.8	9.1	9.0	9.3	9.3	9.2	9.2	9.1	9.1	9.2	9.3	9.3	9.3	9.7	9.3	8.9	9.0	9.1	8.8	8.6
DATE 12TH	8.4	8.5	8.4	8.4	8.3	8.3	8.2	8.0	7.9	7.8	7.9	7.7	7.5	7.3	7.1	6.9	6.7	6.5	6.3	6.1	5.9	5.8	5.6	5.4
HIGHEST OBSERVED TIDE 9.7FT RECORDED AT 1745HRS ON 11TH SEPT																								
BAYTOWN (HUMBLE DOCKS) TEXAS LATITUDE 29 41 --N LONGTITUDE 94 56 --W RECORDER MAINT.BY INDUSTRY																								
DATE 9TH																								
DATE 10TH																								
DATE 11TH																12.5	12.7	13.7	13.4	13.7	13.5	13.3	13.1	13.1
DATE 12TH	13.1	13.1	13.1	13.1	12.4	12.3	12.0	11.8	11.6	10.9	10.6	10.1	10.0	9.6	9.9	9.8	9.6	9.4	9.1	8.8	8.6	8.3	7.9	7.8
HIGHEST OBSERVED TIDE 13.7FT REPORTED AT 1800 AND 2000HRS ON 11TH SEPT																								

Table 3.--(continued)

LOCATION	TIME (IN HOURS CST)																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
CLINTON ROAD,HOUSTON SHIP CHANNEL,TEXAS LATITUDE 29 43 30N LONGTITUDE 95 15 46W STAFF GAGE MAINT.BY INDUSTRY																								
DATE 9TH																								
DATE 10TH																								7.7
DATE 11TH	8.3	8.9	9.8	9.9	9.9	10.1	10.2	10.6	11.0	11.6	10.8	11.4	11.4	11.4	11.4	12.4	13.2	13.8	14.0	14.2	14.6	14.7	14.8	15.0
DATE 12TH	15.1	15.3	15.3	15.3	15.3	15.3	15.3	12.8	12.3	11.8	11.3	9.0	6.8	6.4	5.8	5.6								
HIGHEST OBSERVED TIDE 15.3FT REPORTED AT 02-0700HRS ON 12TH SEPT																								
PORT HOUSTON (TURNING BASIN) TEXAS LATITUDE 29 45 00N LONGTITUDE 95 17 21W STAFF GAGE MAINT.BY INDUSTRY																								
DATE 9TH	2.6	2.4	2.2	2.5	2.7	3.1	3.4	3.5	3.5	3.6	3.6	3.6	3.6	3.7	3.7	3.8	4.0	4.2	4.2	4.3	4.4	4.6	4.6	4.6
DATE 10TH	4.6	4.5	4.0	4.3	4.5	4.6	5.0	5.4	5.6	5.8	6.0	6.4	6.4	6.4	7.1	7.1	7.0	7.2	7.6	7.8	8.3	8.6	9.0	9.6
DATE 11TH	10.1	10.6	10.9	11.4	11.6	11.8	11.7	11.9	12.1	12.4	12.7	13.0	13.1	13.1	13.1	13.4	14.2	14.8	15.0	15.2	15.6	15.7	15.8	16.0
DATE 12TH	16.1	16.3	15.8	15.2	14.7	14.1	13.5	13.1	12.8	12.8	12.4	12.0	11.6	11.2	11.0	10.7	10.5	10.3	10.1	9.8	9.6	9.5	9.1	
HIGHEST OBSERVED TIDE 16.3FT(EST'D) AT 0200HRS ON 12TH SEPT (MAX STAFF MARKING-15FT)																								
DOW CHEMICAL PLANT B, FREEPORT TEXAS LATITUDE 28 58 43N LONGTITUDE 95 23 08W RECORDER MAINT.BY INDUSTRY																								
DATE 9TH	2.8	3.1	3.5	3.5	3.6	3.6	3.5	3.4	3.3	3.4	3.5	3.6	3.8	4.0	4.2	4.3	4.4	4.4	3.8	3.9	4.0	4.0	4.3	4.6
DATE 10TH	4.9	5.2	5.6	5.9	6.2	6.5	6.5	6.6	6.6	6.6	6.6	6.9	6.9	6.9	7.3	7.6	7.7	7.9	7.9	7.9	8.0	8.2	8.2	8.1
DATE 11TH	8.8	9.6	9.6	9.7	9.7	10.1	10.5	10.6	10.4	10.1	10.1	9.7	9.7	10.1	10.1	10.9	10.9	10.9	10.0	9.8	9.5	9.2	8.6	8.0
DATE 12TH	7.9	7.8	7.6	7.5	7.5	7.4	7.1	6.8	6.6	6.1	5.6	5.1	5.0	4.8	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.4	4.2	4.1
HIGHEST OBSERVED TIDE 10.9FT RECORDED AT 16-1800HRS ON 11TH SEPT																								

Table 3.--(continued)

LOCATION	TIME (IN HOURS CST) 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
BRAZOS RVR FLUDDGATES FREEPORT TEXAS LATITUDE 28 54 04N LONGTITUDE 95 22 59W STAFF GAGE MAINT.BY CORPS.ENGR																								
DATE 9TH								3.9	4.0	3.8	3.9	4.3	4.3	4.6	4.6	4.5	4.8	4.3	4.3	4.4	4.4	4.7	5.0	5.3
DATE 10TH	5.2	6.1	6.1	6.4	6.8	7.1	6.5	6.9	6.9	7.3	7.3	7.3	7.3	7.7	7.9	8.1	8.6	8.6	9.1	9.1	9.1	9.1	9.6	10.1
DATE 11TH	10.1	10.1	10.1	10.1	10.1	10.8	10.9	10.1	10.1	9.2	9.2	9.2	9.6	10.6	10.6	10.6	9.8	9.6	8.6	8.6	7.9	6.6	7.4	6.8
DATE 12TH	6.8	6.8	6.5	6.3	6.3	6.2	6.1	5.6	5.2	4.9	4.6	4.0	4.1	4.0	3.9	4.1	4.2	4.1	4.2	4.0	4.1	3.6	3.2	
HIGHEST OBSERVED TIDE 10.9FT REPORTED AT 0700HRS ON 11TH SEPT																								
BRAZORIA NAV.DIST., FREEPORT TEXAS LATITUDE 28 56 23N LONGTITUDE 95 20 32W RECORDER MAINT.BY COUNTY																								
DATE 9TH	3.3	3.7	3.8	3.9	4.0	3.8	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.6	4.4	4.2	4.1	4.5	4.9	5.3
DATE 10TH	5.7	6.1	6.6	7.0	7.4	7.9	7.7	7.4	8.1	7.6	8.0	8.5	8.9	9.2	9.6	9.9	10.2	10.5	10.8	10.4	10.1	10.5	11.4	12.3
DATE 11TH	11.4	11.9	11.2	11.7	12.2	12.7	11.8	10.9	11.3	10.1	10.6	11.2	10.5	11.9	11.3	10.8								
DATE 12TH																								
HIGHEST OBSERVED TIDE 12.7FT RECORDED AT 0610HRS GAGE FAILED TO REPORT MAX AFTER 1600HRS																								
COLORADO RIVER LOCK, MATAGORDA TEXAS LATITUDE 28 41 00N LONGTITUDE 95 58 21W STAFF GAGE MAINT.BY CORPS.ENGR																								
DATE 9TH								3.7	3.3	3.6	3.7	3.4	4.1	3.3	3.9	3.4	3.4	4.1	3.6	3.4	3.3	3.4	3.5	3.9
DATE 10TH	3.9	4.1	4.3	4.5	4.8	5.2	5.6	5.9	6.1	6.3	6.5	6.7	7.0	7.6	7.8	7.9	8.4	8.6	8.8	9.0	9.2	9.4	9.6	9.9
DATE 11TH	10.3	10.3	10.3	10.6	10.8	10.9	10.9	11.1	10.8	10.8	10.7	10.7	11.0	11.2	11.6	11.5	11.2	11.0	11.0	10.8	10.7	10.2	9.6	9.5
DATE 12TH	9.3	9.0	8.6	8.4	8.1	8.0	8.0	8.0	8.0	8.0	7.8	7.5	6.7	6.8	6.9	6.9	6.7	6.6	6.5	6.6	6.6	6.4	6.8	7.1
HIGHEST OBSERVED TIDE 11.6FT REPORTED AT 1500HRS ON 11TH SEPT																								

Table 3.--(concluded)

LOCATION	TIME (IN HOURS CST) 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
CORPS.ENGR OFFICE, CORPUS CHRITI TEXAS LATITUDE 27 48 50N LONGTITUDE 97 23 40W STAFF GAGE MAINT.BY CORPS.ENGR																								
DATE 9TH																	2.8	2.8	2.9	2.8	2.9	2.9	3.0	3.0
DATE 10TH	3.0	3.1	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.7	3.7	3.8	4.0	4.0	4.0	4.2	4.2	4.1	4.2	4.2	4.2	4.2	4.2	4.2
DATE 11TH	4.2	4.2	4.3	4.9	5.0	5.0	5.3	6.0	6.2	6.4	6.5	6.4	5.8	5.2	4.6	4.3	4.2	4.2	4.1	4.0	3.9	3.8	3.7	3.7
DATE 12TH	3.6	3.6	3.6	3.5	3.5	3.4	3.2	3.2	3.2	3.2	3.1	3.1	3.1	3.1	3.0	3.2	3.2	3.3	3.3	3.3	3.3	3.2	3.1	
HIGHEST OBSERVED TIDE 6.5FT REPORTED AT 1100HRS ON 11TH SEPT																								
TURNING BASIN, CORPUS CHRITI TEXAS LATITUDE 27 48 50N LONGTITUDE 97 23 47W RECORDER MAINT.BY CORPS.ENGR																								
DATE 9TH	2.0	2.0	2.1	2.1	2.2	2.2	2.2	2.3	2.4	2.4	2.5	2.5	2.6	2.6	2.6	2.7	2.8	2.8	2.8	2.9	2.9	2.9	3.0	3.0
DATE 10TH	3.0	3.1	3.2	3.2	3.4	3.4	3.5	3.5	3.6	3.7	3.7	3.8	3.9	3.9	3.9	4.1	4.2	4.2	4.2	4.2	4.2	4.3	4.3	4.2
DATE 11TH	4.5	4.4	4.9	5.0	5.1	5.0	5.1	5.3	5.5	5.6	5.5	5.4	5.2	5.0	4.7	4.5	4.4	4.3	4.4	4.3	4.2	4.0	3.9	4.0
DATE 12TH	3.8	3.7	3.7	3.7	3.6	3.5	3.4	3.3	3.2															
HIGHEST OBSERVED TIDE 5.6FT RECORDED AT 1000HRS ON 11TH SEPT																								

Table 4.--Predicted astronomical tide at Galveston Pier 21 and at Pleasure Pier (NGVD Datum)

LOCATION	TIME (IN HOURS CST)																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
GALVESTON (PIER 21) TEXAS LATITUDE 29 18 36N LONGTITUDE 94 47 31W REORDER MAINT.BY NOAA-NOS																								
DATE 9TH	-0.1	0.2	0.4	0.5	0.5	0.4	0.2	0.0	0.0	0.0	0.0	0.0	0.2	0.3	0.4	0.3	0.2	0.0	-0.3	-0.5	-0.6	-0.7	-0.6	-0.4
DATE 10TH	-0.2	0.1	0.3	0.4	0.5	0.4	0.2	0.0	0.0	-0.1	-0.1	-0.1	0.0	0.2	0.3	0.4	0.3	0.2	0.0	-0.3	-0.5	-0.6	-0.5	-0.4
DATE 11TH	-0.2	0.0	0.2	0.4	0.4	0.4	0.2	0.1	-0.1	-0.2	-0.3	-0.2	0.0	0.0	0.2	0.3	0.4	0.3	0.1	0.0	-0.3	-0.4	-0.4	-0.4
DATE 12TH	-0.2	-0.1	0.1	0.3	0.4	0.4	0.3	0.0	-0.1	-0.3	-0.4	-0.3	-0.2	-0.1	0.0	0.2	0.3	0.4	0.3	0.1	-0.1	-0.2	-0.3	-0.3
GALVESTON (PLEASURE PIER) TEXAS LATITUDE 29 16 56N LONGTITUDE 94 47 53W REORDER MAINT.BY NOAA-NOS																								
DATE 9TH	0.2	0.5	0.7	0.7	0.6	0.4	0.1	0.0	-0.2	-0.2	0.0	0.1	0.3	0.4	0.4	0.3	0.0	-0.3	-0.6	-0.8	-0.9	-0.8	-0.6	-0.3
DATE 10TH	0.1	0.4	0.6	0.7	0.6	0.4	0.1	0.0	-0.2	-0.3	-0.2	0.0	0.2	0.4	0.5	0.4	0.3	0.0	-0.3	-0.5	-0.7	-0.7	-0.6	-0.3
DATE 11TH	0.0	0.3	0.5	0.6	0.6	0.4	0.2	0.0	-0.3	-0.4	-0.3	-0.2	0.1	0.3	0.5	0.5	0.4	0.3	0.0	-0.3	-0.5	-0.5	-0.5	-0.3
DATE 12TH	0.0	0.2	0.5	0.6	0.6	0.4	0.2	0.0	-0.3	-0.5	-0.5	-0.3	-0.1	0.1	0.3	0.5	0.5	0.4	0.2	0.0	-0.2	-0.3	-0.3	-0.3

Table 5.--Location and elevation of high water marks

STN IDENT.	LATITUDE DEG MM SS	LONGITUDE DEG MM SS	ELV. (FT)	H.W.M. (FT)	REMARKS (WHERE MEASURED)
					ANAHUAC
	29 50 02	94 44 37		14.0	**DRIFT LINE
	29 50 10	94 44 40		12.3	**DRIFT LINE
					ANGLETON
MILL	29 08 36	95 24 30		18.2	**DEBRIS DRIFT LINE AT ANGLETON
					BACLIFF
	29 30 34	94 58 21		16.8	**DRIFT ON BANK
	29 30 35	94 58 22		16.4	**DRIFT ON BANK
					BRAZORIA
	29 01 58	95 36 01	12	14.5	OVER FLOOR IN TWO HOUSES
R.R.BRIDGE	29 03 12	95 33 24		15.1	**AT MISSOURI PAC.RR BRIDGE
					CAPLEN
WASHTERIA	29 28 12	94 36 21	06	8.8	**YELLOW PAINT MARK
PHILLIPS	29 29 21	94 33 20	06	8.8	**SUN OIL COMPANY
					CEDAR LAKE EAST
CABIN	28 52 10	95 26 47	03	11.0	INSIDE ON WALL OF CABIN
					CEDAR LANE
HINKLE	28 58 06	95 33 42		13.7	**AT HINKLE FERRY
ELMER	28 56 11	95 32 58	05	12.5	INSIDE ON WALL OF STORE
BRIDGE	28 56 12	95 32 54		13.4	**ON CHURCHILL BRIDGE
SPORTMAN	28 56 48	95 33 42		13.5	**AT SPORTSMAN SPAN
MCNEEL	29 00 36	95 35 18		14.1	**AT MCNEEL BRIDGE
					COVE
	29 50 03	94 48 08		11.5	**DRIFT LINE
					DANBURY
	29 10 05	95 16 01	10	15.0	4 HOUSES 2-4FT OVER FLOOR
	29 10 30	95 17 00	10	15.0	ON GARAGE WALL
					DICKINSON
PAWLICK	29 27 06	95 03 29	16	16.0	**FENCE CORNER POST
GARAGE	29 27 19	95 03 15	00	12.7	WALL INSIDE GARAGE
DRIFT	29 27 22	95 02 51	00	14.6	**TOP OF BRIDGE
CTYWATERD	29 27 27	95 02 35	12	12.6	INSIDE PUMP HOUSE
CITY WATER	29 27 27	95 03 30	11	12.7	INSIDE PUMP HOUSE
					ELAKE
PORCH	29 25 05	94 41 46	06	08.6	**PORCH
FLETCHER	29 25 54	94 42 30	04	10.6	INSIDE REFRIGERATOR

Table 5.--(continued)

STN IDENT.	LATITUDE DEG MM SS	LONGITUDE DEG MM SS	ELV. (FT)	H.W.M. (FT)	REMARKS (WHERE MEASURED)
STORE	29 26 26	94 40 14	08	09.3	INSIDE GROCERY STORE
ROBINSON	29 26 51	94 39 27	08	09.6	INSIDE SWEDES STORE
					FREEPORT
OLD BRAZOS	28 55 42	95 22 24		12.3	**AT DIVERSION DAM
DOW CHEM	28 56 37	95 18 58	00	14.6	RECORDING GAGE
LIGHTHOISE	28 56 42	95 18 30		11.8	INSIDE BRAZOS RIVER LIGHTHOUSE
GAUGE STN	28 56 48	95 18 30		11.7	INSIDE GAGE HOUSING
OLD BRAZOS	28 57 00	95 20 18		12.9	**OPPOSITE TERMINAL ST
OLD BRAZOS	28 57 12	95 21 12		12.3	**AT BAY STREET BRIDGE
GIRONARD	28 57 14	95 20 57	03	13.3	**UNKNOWN
WESTERN	28 57 15	95 20 59	03	13.4	**AT SEAFOOD RESTRUANT
OLD BRAZOS	28 57 24	95 21 48		12.3	**AT COMMUNITY HOUSE,GOLF COURSE
DIVERS DAM	28 57 48	95 22 24		10.3	**DIVERSION DAM ON ESISTING RIVR
DIVERS DAM	28 57 48	95 22 24		12.3	**IN DEAD END OF OLD RIVER
OYSTER CRK	28 58 30	95 16 48		11.7	**AT JUNCTION WITH INTRACOASTAL
COMMUNITY	28 59 42	95 19 48		10.9	**AT OYSTER CREEK COMMUNITY
GLADNEY	28 59 55	95 19 54	04	10.8	INSIDE OF HOUSE
					FROZEN PT.
TEXACO STN	29 30 22	94 30 23	05	9.6	IN REST ROOM
HEARST	29 30 54	94 30 43	03	8.8	INSIDE OF HOUSE
					GALVESTON
	29 17 50	94 48 44	06	08.6	INSIDE LAUNDERY
SF BLDG	29 18 24	94 47 59	05	08.7	INSIDE LOBBY OF BLDG
MAGNOLIA	29 18 33	94 47 14	05	08.9	INSIDE APARTMENT
BURNETT	29 18 43	94 46 38	08	06.6	INSIDE BUILDING
C G DOCK	29 19 48	94 46 23	04	08.7	INSIDE PAINT HOUSE
C G GARAGE	29 19 59	94 46 14	06	09.0	INSIDE TOOL BOX
					HIGH ISLAND
GULF STN	29 30 52	94 29 01	5	9.2	INSIDE SERVICE STN
MOBILE STN	29 34 17	94 23 53	5	8.9	INSIDE SERVICE STN
					HIGHLANDS
125CROW RD	29 45 04	95 02 28	07	13.8	**ON GUY WIRE IN FRONT OF HOUSE
125CROW RD	29 45 04	95 02 28	07	14.4	**BRICK ON HOUSE
140CROW RD	29 45 05	95 02 33	02	14.7	**BACK DOOR OF HOUSE
S JAC STPK	29 45 12	95 05 07	06	14.7	CARETAKERS HOUSE
SAN JACINN	29 45 56	95 05 21	10	14.4	**ABOVE CONC. FLOOR OF PORCH
TRIUMPH BT	29 47 41	95 04 05	05	13.6	**ABOVE CONCRETE FLOOR
TE MERGER	29 48 18	95 05 41	09	14.4	**TOP 3 IN. PIPE ON FENCE
TEXAS BUTA	29 50 07	95 06 02	12	14.6	**BOAT LIFT BY CLUB HOUSE
BOONEBOATL	29 52 30	95 05 37	05	19.9	**SE CORNER STORAGE HOUSE
					HOSKINS MOUND
PETERSONLG	29 14 31	95 13 45	10	14.7	IN HOUSE
PETERSONLD	29 14 31	95 13 46	05	14.7	INSIDE HOUSE
					JONES CREEK
FLOOD GATE	28 53 48	95 22 54		10.6	**EAST FLOOD GATE
BRIDGE	28 57 30	95 22 36		10.3	**AT STATE HIGHWAY 36
VELASCO	28 58 42	95 23 06		11.0	DOW CHEM(A) WASTE WATER CANAL
DOW CHEM	28 58 43	95 23 08	00	10.9	RECORDING GAGE

Table 5.--(continued)

STN IDENT.	LATITUDE DEG MM SS	LONGITUDE DEG MM SS	ELV. (FT)	H.W.M. (FT)	REMARKS (WHERE MEASURED)
GULF PARK	28 58 48	95 25 00		11.3	**AT NORTH END OF COUNTY ROAD336
DOW CHEM	28 59 42	95 23 12	05	11.8	INSIDE OPERATOR SHACK,B.CANAL
DOW CHEM	28 59 42	95 23 12		12.5	**DRIFT LINE AT BARGE CANAL DOCK
DOW CHEM	28 59 45	95 23 22	00	14.6	**INTAKE PLATFORM
					KAMEY
KAMEY	28 42 33	96 39 40		19.0	**DRIFT LINE ON WEST SHORE
					LAKE AUSTIN
STOCK	28 49 30	95 47 48	12	14.1	INSIDE UTILITY SHED
					LAKE COMO
JAMAICA	29 11 04	94 58 16	08	11.0	INSIDE BUILDING
					LAKE JACKSON
DOW CHEM	29 00 06	95 26 12		11.6	IN FLOAT WELL OF RECORDER GAGE
CLUTE	29 00 54	95 24 00	07	12.0	**DRIFT LINE
BRAZOS OAK	29 01 30	95 25 54	12	12.3	**DRIFT, IN CITY OF LAKE JACKSON
AREA N	29 01 54	95 26 42	10	11.5	**DRIFT LINE IN SECTION 3
AREA N	29 02 06	95 26 54	10	11.5	**DRIFT LINE IN SECTION 1
LAKE BEND	29 02 36	95 24 54		14.1	**DRIFT LINE ON BANKS AT RR BRIG
LAKE BEND	29 02 36	95 24 54		14.1	**DRIFT LINE ON RR BRIDGE BANKS
RICHWOOD	29 03 30	95 24 24	14	16.0	**AT HIGHWAY 288 AND WALNUT
HOSKINS	29 04 36	95 22 48	11	15.0	**END OF COUNTY ROAD 223
HAVENWOOD	29 05 06	95 24 42	12	16.6	**DRIFT AT HIGHWAY 288 CROSSING
GORNOWICZ	29 06 18	95 24 24	10	16.7	INSIDE TWO HOUSES
					LA PORTE
STD OIL LP	29 38 37	95 00 03	10	13.6	**COMPANY SIGN POLE
GARAGE	29 38 37	95 00 50	11	16.4	INSIDE GARAGE
HOUSE	29 38 39	95 00 50	11	18.4	WAVE ACTION INSIDE HOUSE
TUNNEL ENT	29 42 32	95 00 47	10	14.6	**TUNNEL ENTRANCE
INTAKESTRC	29 43 32	95 03 23	00		**4TH RUNG OF LADDER-INTAKE STRC
RADIOTOWER	29 43 33	95 01 09	07	13.8	RADIO TOWER
SANBERTRON	29 43 34	95 03 27	05	14.3	INSIDE STATION
					LEAGUE CITY
PARK	29 33 53	95 03 44		10.4	**DRIFT LINE IN COUNTY PARK
					MATAGORDA
LOCKS	28 40 58	95 58 22	00	11.0	**COLORADO RIVER LOCKS
BRDGETENDR	28 41 14	95 57 56	05	15.2	WALL INSIDE HOUSE
PARKER BRO	28 41 28	95 58 34	05	12.1	TIED TO BENCH MARK ON LEVEE
LLOYDSCLUB	28 43 04	95 53 26	10	13.7	ON WALL
					MORGAN POINT
MARITIME	29 40 51	94 59 00		14.7	**ON PILING BENEATH OFFICE
PRIN GREEN	29 40 51	94 59 52	05	13.9	INSIDE WORKSHOP, YACHT BASIN
HULEN CAMP	29 40 53	94 59 25		15.0	**ON STEPS TO PIER
TRICITY	29 41 21	94 56 04	10	13.5	**MARK AT BASE OF DOUBLE GATE
GRACE OIL	29 42 19	94 58 29		14.1	**MARK ON TRANSFORMER PLATFORM
WEST MAIN	29 43 18	94 59 15	12	14.1	INSIDE DISPOSAL PLANT
CARETAKER	29 43 25	94 56 35	06	11.5	INSIDE CARETAKER'S HOUSE

Table 5.--(continued)

STN IDENT.	LATITUDE DEG MM SS	LONGITUDE DEG MM SS	ELV. (FT)	H.W.M. (FT)	REMARKS (WHERE MEASURED)
KILGORE	29 43 53	94 59 21		13.4	**ON METAL POST
CEDAR BAYU	29 43 55	94 56 15	12	14.1	MARK 30IN.ABOVE FLOOR IN HOUSE
					MUSTANG BAY
FROKANSACK	29 17 12	95 07 41	10	14.3	INSIDE FISHING CAMP CAFE
	29 15 18	95 14 02	10	16.2	**ABOVE NORMAL TIDE REPORTED
					OLIVIA
FM BRAGG	28 38 20	96 27 26	07	15.5	BATHROOM WALL
	28 38 58	96 26 58	10	16.3	WALL INSIDE HOUSE
LEWDLEN	28 40 13	96 24 47	10	18.4	BATHROOM WALL
	28 43 52	96 25 38		14.3	**DRIFT LINE
	28 43 47	96 26 20		20.1	**DRIFT LINE
					ORANGEFIELD
DRIFT LINE	30 02 36	93 49 50	01	6.7	**INSIDE DRIFTLINE
TIDE GAGE	30 02 40	93 49 51	00	6.7	TIDE GAGE
GAGE	30 04 32	93 50 48	00	6.7	GAGE
DRIFT	30 04 36	93 50 50	00	6.8	**DRIFT
					OYSTER BAYOU
WORKSHOP	29 40 27	94 36 02	10	10.9	**WORKSHOP FRONT DOOR POST
					OYSTER CREEK
COMMUNITY	29 00 18	95 20 00		10.9	**AT OYSTER CREEK COMMUNITY
					PALACIOS
BARRETTLBR	28 42 00	96 13 02	11	15.4	INSIDE ON COUNTER
POSTOFFICE	28 42 02	96 12 59	11	13.4	INSIDE ON FILE CABINET
CARETAKER	28 42 15	96 14 38	11	13.1	WALL INSIDE HOUSE
TEXACO STN	28 42 51	96 12 35	06	15.2	WALL INSIDE REST ROOM
	28 42 53	96 09 54	05	13.0	INSIDE HOUSE
					PARK PLACE
MIDDLETON	29 43 23	95 16 38	15	15.2	MACHINE SHOP DOOR
TERMINAL	29 43 30	95 15 46	00	15.2	STAFF GAGE-PORT OF HOUSTON
GLFATLANTC	29 44 12	95 16 45	05	14.8	**WAREHOUSE DOOR AT IS.1118 POST
GLFATLANTC	29 44 16	95 16 46	05	15.3	**1ST POST ON LEFT ISLF
WHARF #3	29 44 49	95 17 14	05	14.8	**ON GATE TO WHARF NO.3
CTYWAREHSE	29 44 50	95 17 28	02	15.4	STEEL COLUMN INSIDE WAREHOUSE4
US CUSTOMS	29 44 52	95 17 13	02	15.4	ON DOOR INSIDE OFFICE
CTYWAREHSE	29 44 53	95 17 14	02	14.9	OFFICE DOOR INSIDE WAREHOUSE 3
					PASADENA
CHAMPION	29 43 04	95 12 49		15.4	**MARK ON TREE
CHAMPION	29 43 13	95 13 10		14.7	**GAURD HOUSE GATE
CHAMPION	29 43 27	95 12 52		14.9	**MARKS ON BARRICADES
SHELL DOCK	29 43 44	95 08 15	05	13.7	**FLOOD LIGHT WEST END OF SLIP
OLD DEPOT	29 44 27	95 09 17		14.5	ON COMPRESSOR HOUSE DOOR
HESS TERML	29 44 32	95 12 00	11	14.2	IN HESS TANK FARM TERMINAL
HESS TERML	29 44 36	95 12 08		14.3	**ON GUARD HOUSE WINDOW
TUDDS YARD	29 44 58	95 10 12	14	15.3	INSIDE MACHINE SHOP

Table 5.--(continued)

STN IDENT.	LATITUDE DEG MM SS	LONGITUDE DEG MM SS	ELV. (FT)	H.W.M. (FT)	REMARKS (WHERE MEASURED)
					POINT COMFORT
ALCOA	28 39 57	96 34 14		15.2	**DRIFT LINE NEAR TURNING BASIN
PLANT	28 44 07	96 33 35		14.1	**DRIFT LINE EAST OF SWAN LAKE
					PORT ACRE
HOUSE	29 53 44	94 02 25	04	4.2	INSIDE HOUSE
HOUSE	29 54 17	94 02 26	05	5.9	INSIDE HOUSE
					PORT ARTHUR S.
GAURDHOUSE	29 51 02	93 58 25	06	7.2	INSIDE GUARD HOUSE
					PORT BOLIVAR
	29 23 04	94 46 07	03	09.3	WALL INSIDE HOUSE
					PORT LAVACA EAST
HOUSE	28 34 15	96 33 45	10	12.8	SHOWER WALL INSIDE BRICK HOUSE
CONC HOUSE	28 34 55	96 34 08	11	17.6	ON WALL INSIDE HOUSE
COLLINS	28 36 01	96 36 58	15	17.2	WALL INSIDE OFFICE
RUEMER	28 36 03	96 36 56	15	22.0	WALL INSIDE HOUSE
CRYERS	28 36 05	96 36 58	15	21.3	ON WALL INSIDE HOUSE
HOUSE	28 36 36	96 37 11	15	20.7	INSIDE HOUSE ON BANK OF BAY
DRIFT	28 36 51	96 37 19		18.7	**DRIFT UNDER HOUSE ON BANK
SHRIMP CO	28 37 15	96 37 29	10	14.3	INSIDE OF SAFE
SHRIMP CO	28 37 15	96 37 29	10	17.1	ON WALL INSIDE HOUSE
					PORT LAVACA W.
HANGER	28 33 59	96 37 58	12	15.7	ON WALL INSIDE CONC BLK HANGER
TURNERS	28 34 15	96 37 58	11	16.2	ON WALL INSIDE HOUSE
	28 35 31	96 38 40	02	13.9	**DRIFT LINE
					PORT OCONNOR
YOUNG	28 25 56	96 27 03	04	15.2	FAINT MARK ON WALL
LEWIS	28 25 56	96 27 05	04	15.4	INSIDE HOUSE
	28 26 54	96 24 33	05	14.7	WALL INSIDE BAPT. CHURCH
	28 26 56	96 24 18	05	15.4	WALL INSIDE CATH CHURCH
					SABINE PASS
BUILDING	29 44 03	95 53 42	02	7.0	INSIDE BUILDING
					SAN LUIS PASS
CAMP SITE	29 05 53	95 06 32	05	10.8	IN ICE BOX IN BUS
					SARGENT
BULLARD	28 50 11	95 39 54	12	13.7	WALL INSIDE STORE

Table 5.--(continued)

STN IDENT.	LATITUDE DEG MM SS	LONGITUDE DEG MM SS	ELV. (FT)	H.W.M. (FT)	REMARKS (WHERE MEASURED)
					SEADRIFT
LAFITTE	28 24 30	96 42 49	07	10.8	INSIDE HOTEL LOBBY
BLANCHARD	28 24 31	96 42 41	07	10.5	**BACK OF STORE (DRIFT)
YBARRA	28 24 42	96 41 57	07	11.2	WALL INSIDE GARAGE
					SEA ISLE
SEA ISLE	29 09 05	95 01 35	08	12.1	**OUTBUILDING
					SETTEGAST
POH INSPBL	29 45 07	95 17 19	05	12.6	**HALF WAY DOWNSTAIRS ON PILING
DISPOSALPL	29 45 24	95 19 12	10	10.3	**CONCRETE WING WALL-BFFLO BAYOU
					SMITH POINT
VANTUUN	29 32 13	95 45 38	05	9.8	INSIDE RESTROOM GROCERY STORE
					STANOLIND RESERVOR
OUTHOUSE	29 40 16	95 29 17	07	10.5	IN OUTHOUSE
SHOP	29 40 24	95 24 37	07	9.5	INSIDE SHOP
					SWEENEY
	29 02 44	95 39 12	15	15.0	**APPROXIMATE
					TERRY
SUN OIL	30 00 25	93 58 57	07	7.0	IN BUILDING
					TEXAS CITY
1ST AVE N	29 23 06	94 57 01	06	10.0	INSIDE HOUSE 146
CORPS ENG	29 23 10	94 52 27	00	9.5	COE TIDE GAGE
CLARIMONT	29 23 26	94 56 22	10	10.5	INSIDE HOUSE
8TH AVE	29 23 30	94 53 36	08	10.6	INSIDE HOUSE
TEXAS C	29 23 40	94 55 40	09	10.3	INSIDE TEXAS C. BOWLING
WEST HAVEN	29 24 10	94 56 16	07	10.5	INSIDE HOUSE
ELEM SCHL	29 24 25	94 55 28	06	10.2	INSIDE SCHOOL
	29 24 59	94 53 27	06	10.2	INSIDE BARN
DRIFT	29 25 02	94 53 32	06	10.7	**DRIFT ON FENCE
BENCH MARK	29 27 22	94 58 21		11.4	**DRIFT RR TRACK
HOUSE	29 28 10	94 58 25	08	13.6	INSIDE HOUSE (GOOD)
					THE JETTIES
	29 22 17	94 44 56	05	9.6	HWM ABOVE BATHROOM FLOOR
					TIVOLI SE
	28 16 31	96 47 52	10	10.3	STORE ROOM WALL
					VIRGINIA POINT
FISH CO	29 19 43	94 56 47	00	11.2	INSIDE BATHROOM
FREDDY	29 19 57	94 57 54	06	11.3	INSIDE CAFE

Table 5.--(concluded)

STN IDENT.	LATITUDE DEG MM SS	LONGITUDE DEG MM SS	ELV. (FT)	H.W.M. (FT)	REMARKS (WHERE MEASURED)
DURO	29 20 16	94 57 40	04	11.0	INSIDE HOUSE
HOUSE	29 20 23	94 59 39	10	12.2	INSIDE HOUSE
PORCH	29 20 25	94 59 45	10	12.6	**ON PORCH
TCT RR	29 20 52	94 56 30	08	10.7	INSIDE TWO FRAME HOUSE
LAZY LANE	29 21 06	94 59 35	10	12.3	INSIDE HOUSE BATHROOM
BRIDGE	29 21 06	94 59 35	00	12.4	**DRIFT LINE TOP OF BRIDGE
CARBIDEDCK	29 21 47	94 55 02	05	11.0	RECORDING GAGE
CARBIDE	29 21 50	94 55 04	05	11.0	IN BARGE DOCK WAREHOUSE
CHURCH	29 22 18	94 58 00	10	11.0	INSIDE CHURCH AT LA MARQUE
					WADSWORTH
	28 45 27	95 55 54	10	16.5	INSIDE HOUSE
					WEST/GREENS BAYOU
TRINITYVAL	29 58 06	93 51 35	04	8.5	INSIDE BUILDING-CONSTRUCTIONCO
DRIFTLINE	29 59 46	93 47 48	01	8.1	**DRIFT LINE
					WHITES RANCH
PORCH	29 40 18	94 21 50	06	9.6	**ON PORCH

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REFERENCES

Colon, Jose' A., 1963: On the evolution of the wind field during the life cycle of tropical cyclones. National Hurricane Research Project Report No. 65, Weather Bureau, U.S. Department of Commerce, Washington, D.C., 36 pp.

Cooperman, A. I., and H. C. Sumner, 1961: North Atlantic tropical cyclones, September 1961. Climatological Data, National Summary, Vol. 12, No. 9, Weather Bureau, U.S. Department of Commerce, pp. 470-475.

Cry, G. W., 1961: North Atlantic tropical cyclones, 1961. Climatological Data, National Summary, Vol. 12, No. 13, Annual 1961, Weather Bureau, U.S. Department of Commerce, pp. 59-72.

Cry, G. W., 1965: Tropical cyclones of the North Atlantic Ocean, 1871-1963. Technical Paper No. 55, Weather Bureau, U.S. Department of Commerce, Washington, D.C., 148 pp.

Dunn, G. E. and Staff, 1962: The hurricane season of 1961. Monthly Weather Review, Vol. 90, No. 3, pp. 107-119.

Gray, William M. and Dennis J. Shea, 1976: Data summary of NOAA's hurricane inner-core radial leg flight penetrations 1957-1967 and 1969. Colorado State University, Fort Collins, Colorado, 219 pp.

Harris, D. Lee, 1963: Characteristics of the hurricane storm surge. Technical Paper No. 48, Weather Bureau, U.S. Department of Commerce, Washington, D.C., 139 pp.

Harris, D. Lee and C. V. Lindsay, 1957: An index of tide gages and tide gage records for the Atlantic and Gulf Coasts of the United States. National Hurricane Research Project Report No. 7, Weather Bureau, U.S. Department of Commerce, Washington, D.C., 104 pp.

Hawkins, H. F., F. E. Christinsen, S. C. Pierce, and Staff, 1962: Inventory use, and availability of National Research Project meteorological data gathered by aircraft. National Hurricane Research Project Report No. 52, Weather Bureau, U.S. Department of Commerce, Washington, D.C., 352 pp.

Holliday, Charles R., 1966: A comparison of hurricane center fixes made by land based radar and reconnaissance aircraft. ESSA Technical Note 31-Radar-1, Environmental Science Services Administration, U.S. Department of Commerce, Washington, D.C., 19 pp.

Neumann, Charles J., G. W. Cry, E. L. Caso, and B. R. Jarvinen, 1978: Tropical cyclones of the North Atlantic Ocean, 1871-1977. National Hurricane Center, Asheville, N.C., National Oceanic and Atmospheric Administration, U.S. Department of Commerce, 170 pp.

Schwerdt, Richard W., F. P. Ho, and R. R. Watkins, 1979: Meteorological criteria for Standard Project Hurricane and Probable Maximum Hurricane wind fields, Gulf and East Coasts of the United States. NOAA Technical Report NWS 23, National Weather Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, Washington, D.C., 317 pp.

Senn, H. V. and J. A. Stevens, 1965: A summary of empirical studies of the horizontal motion of small radar precipitation echoes in Hurricane Donna or other tropical storms. ESSA Technical Note No. 17-NHRL-74, Environmental Science Services Administration, U.S. Department of Commerce, Washington, D.C., 55 pp.

U.S. Army Corps of Engineers, 1962: Report on Hurricane Carla, September 9-12, 1961. U.S. Army Engineer District, Corps of Engineers, Galveston, Texas.

U.S. Fleet Weather Facility, 1961: Annual tropical storm report, 1961. U.S. Fleet Weather Facility, Miami, Fla., 274 pp.

U.S. Weather Bureau, 1962: Preliminary analysis of surface wind and pressure patterns of Hurricane Carla (1961). Memorandum HUR 7-76 Department of Commerce, Washington, D.C.

APPENDIX - METEOROLOGICAL DATA

This Appendix gives the basic meteorological data used to develop the analysis presented in this report. The tables list the observations of sea-level pressure and wind data at land stations and the hourly reports from ships. They also include positions of the hurricane center from reconnaissance aircraft and land-based radar data.

Table A.1 lists the hourly observations of sea-level pressure, wind direction, wind speed, and gustiness obtained at regular reporting stations. These hourly observations are from U.S. Weather Bureau Surface Weather Observations forms (WBAN 10) covering the period September 9 through September 12, 1961. The sea-level pressure is given in units of millibars (mb). The wind direction is given as the direction from which the wind was blowing to the nearest ten degrees, measured clockwise from north. The reported wind directions were, in most instances, in compass points, i.e., N, NNE, NE, ENE, etc., and converted to degrees from north. The observed wind speed is a 5-min average determined from recorded observations. The gustiness is characterized by sudden, intermittent increases in speed where at least 9 kn were indicated between peaks and valleys with a time interval of less than 20 s. The wind speed is determined to the nearest knot.

Similar information is available from observations taken by personnel in private industries or from privately maintained recording instruments (Table A.2). Generally, such stations did not have continuous records during the entire 4-day period of September 9 through 12. Also the data must be considered less reliable since the instruments are not routinely calibrated for accuracy as are those at the National Weather Service, Naval and Air Force installations, or other standard reporting stations. As an example, the anemometer at Sea Drift, Texas, is located at the Union Carbide Company Complex. It is sheltered by tall buildings and the reported wind speeds appear too low. At the same reporting station, the recording pin went off the barograph as the pressure at Sea Drift approached minimum. The lowest pressure was extrapolated down to read 936.7 mb (27.68 in) which may be 1-2 mb too low relative to the minimum pressure values analyzed for all stations. The surface pressure recorded at the Alcoa plant in Point Comfort, Texas, may be too high.

Four locations in the Port Lavaca area, near the path of the hurricane center, had barographs. These records provide the lowest observed barometric pressure as the hurricane center crossed the coast. The lowest pressure was 935.3 mb and was recorded in three of the four reporting stations. Lowest pressure recorded at the fourth station, the Texas Gas processing plant, was 939.7 mb. These pressures were recorded roughly 2 h after the hurricane made landfall, attesting to the intensity of the storm. The data are listed in table A.3.

The complete reconnaissance aircraft reports were considered too voluminous to reproduce entirely in this report. Table A.4 lists those reports that provided the locations of storm center, observed sea-level pressure, estimated surface winds, and/or the diameter of the eye. The majority of the reports came from Navy reconnaissance aircraft. A few additional reports were obtained from the aircraft of the U.S. Weather Bureau Research Flight Facility. These latter reports are indicated by "RFF" in the remarks column. For a few reports, the range and maximum winds from the storm center were obtainable. This information is also presented in the remarks column. The reported position of the storm

center has the same accuracy as the aircraft position determined by radar and the land navigational systems. With some exceptions, the accuracies of these positions is generally within 5 nmi. There was a period (from 1400 CST to 1800 CST on September 10) when one Navy flight apparently had significant navigational errors. Their positions departed approximately 32 nmi to the northeast from other eye locations. This large discrepancy was the result of inaccurate land navigation during the period (Holliday 1966). The Loran fixing (with the existing model at that time) was not considered suitable for navigation purposes in the western Gulf of Mexico due to the fast intersection angle of the radio beams. The central pressure data is given in millibars and is determined by dropsonde or extrapolation from flight-level data.

The National Weather Service maintains a series of radar observing stations along the U.S. coastline from Brownsville, Texas to Eastport, Maine. These radars are used to track hurricanes for use in the hurricane warning system. Three stations in this network were in a position to track Hurricane Carla as it approached the Texas coastline. These stations are at Brownsville and Galveston, Texas and at Lake Charles, Louisiana. The radar eye positions reported by these NWS stations, when the center was within range of the land base radar, are listed in table A.5 by half-hourly intervals.

To obtain weather reports from oceanic areas, the NWS solicits the cooperation of merchant ships of U.S. and foreign registry and of non-military U.S. Government ships. There are about 200 ships that participate in this program. Observations are visual plus barometric and occasionally cyanometric pressure. Most ships report the weather by radio at synoptic time when underway, but all ships, not just those in cooperative ship programs, are asked to send special radio reports when tropical storms or hurricanes are encountered and, especially, upon specific request by the NWS. Data from ships that reported through the regular reporting system and supplemented by those ships submitting weather observations after the arrival at their major destination are listed in table A.6. We have restricted our listing to the location of the reporting ship, its name or identification radio call sign (if available), sea level pressure, and wind data. The data are grouped by the time of observation from 1800 CST, September 8, through 1200 CST, September 12, 1961. This set of data was useful in the analyses of the pressure field and the wind field of the hurricane, especially when its center was located off the coast. The aneroid barometers on ships in the cooperative observing program are calibrated by the NWS when a ship is visting a port in the U.S. where a port meteorological officer is assigned. The calibrations, however, may not be as frequent as desirable.

Table A.1--Surface observations from regularly reporting stations, hourly observations of sea level pressure and wind

AUSTIN, TEXAS

LATITUDE 30 18'N LONGITUDE 97 42'W
ELEVATION 597FT

	TIME (IN HOURS CST)																					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
DATE 9TH SEPTEMBER																								
PRESSURE(MB)	1013.5		1012.5		1012.5		1013.2		1013.5		1013.2		1011.5		1009.8		1009.5		1009.8		1010.2		1010.2	
		1012.9		1012.2		1012.9		1013.5		1013.5		1012.2		1010.8		1009.5		1009.5		1009.8		1010.2		1010
WIND DIR(DEG)	040	020	360	360	020	020	020	020	040	06	060	040	040	040	040	060	040	060	040	040	040	040	020	030
WIND SPD (KT)	6	7	5	7	7	8	10	14	10	12	12	15	14	12	13	13	14	14	8	8	10	10	9	10
GUST (KT)																								
DATE 10TH SEPTEMBER																								
PRESSURE(MB)	1010.2		1009.1		1008.5		1008.8		1008.1		1007.8		1005.8		1003.7		1002.7		1003.1		1003.7		1003.7	
		1009.5		1008.8		1008.1		1008.1		1008.2		1006.8		1005.1		1003.1		1003.1		1003.4		1003.7		1003
WIND DIR(DEG)	030	040	040	030	030	020	020	020	020	020	020	020	040	020	040	040	040	040	040	040	020	040	030	030
WIND SPD (KT)	12	10	10	14	12	12	15	14	18	18	20	17	21	18	24	21	19	26	19	23	23	19	19	17
GUST (KT)													28	26	32	26	25	30	27	31	27	25	27	25
DATE 11TH SEPTEMBER																								
PRESSURE(MB)	1002.4		1001.7		1000.7		1000.3		999.3		999.0		997.0		994.9		992.9		991.2		989.2		985.8	
		1002.0		1001.0		1000.7		999.7		999.3		998.3		995.6		993.9		991.9		990.5		987.5		984
WIND DIR(DEG)	030	030	030	030	030	030	030	030	030	030	030	020	020	020	020	020	020	030	030	030	030	040	020	030
WIND SPD (KT)	20	16	18	18	20	20	21	21	24	22	24	21	26	26	29	22	25	35	35	36	35	42	30	28
GUST (KT)	25	25	26		25	26		29	41	38	35	32	34	34	37	32	34	45	43	52	47	55	48	40
DATE 12TH SEPTEMBER																								
PRESSURE(MB)	981.7		977.0		973.9		977.3		984.1		989.2		992.2		994.2		996.3		998.3		1000.3		1002.0	
		979.3		975.6		974.6		980.4		987.1		990.9		993.2		994.9		997.6		999.3		1001.4		1002
WIND DIR(DEG)	030	030	040	040	020	340	340	270	250	250	230	220	220	220	220	220	240	220	200	200	200	200	200	200
WIND SPD (KT)	32	35	34	28	31	22	18	16	14	15	15	14	11	12	14	11	12	12	12	10	08	06	05	09
GUST (KT)	48	51	44	36	42	28	25	25				21												

Table A.1--(continued)

BEEVILLE TEXAS (NAS)

LATITUDE 28 27'N LONGITUDE 97 42'W
ELEVATION 240FT

	TIME (IN HOURS CST)																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
DATE 9TH SEPTEMBER																								
PRESSURE(MB)	1011.3		1010.3		1009.9		1010.5		1010.3		1010.7		1008.8		1006.8		1006.6		1007.1		1006.8		1006.8	
		1010.6		1010.1		1010.4		1010.3		1010.5		1009.8		1007.7		1006.8		1006.6		1006.9		1006.8		1006
WIND DIR(DEG)	040	020	020	020	020	020	020	020	060	040	060	060	040	060	040	060	060	090	060	060	060	040	040	020
WIND SPD (KT)	07	05	07	08	07	08	08	10	16	16	15	17	18	20	16	16	18	10	12	11	10	13	12	10
GUST (KT)																								
DATE 10TH SEPTEMBER																								
PRESSURE(MB)	1005.6		1004.5		1003.4		1003.1		1002.4		1002.1		999.7		997.2		996.2		994.6		994.0		993.6	
		1004.3		1003.4		1003.3		1002.7		1002.5		1001.0		998.9		996.4		995.3		994.1		993.7		992
WIND DIR(DEG)	020	020	045	020	020	020	020	020	020	02	020	020	020	020	020	020	020	020	020	020	020	020	020	020
WIND SPD (KT)	12	10	12	19	12	14	19	20	22	16	22	21	24	23	23	22	25	25	25	30	30	30	26	24
GUST (KT)	19	18	21		23	26	28	30	32	26	36	33	36	38	40	37	34	46	41	47	47	42	38	36
DATE 11TH SEPTEMBER																								
PRESSURE(MB)	990.6		988.7		986.5		984.7		987.5		984.1		981.4		979.2		977.1		977.9		979.8		982.5	
		990.0		987.4		984.8		984.1		987.5		982.6		980.0		978.1		977.3		978.6		981.2		983
WIND DIR(DEG)	020	020	020	360	360	020	020	020	020	02	020	020	360	360	340	340	340	320	320	290	290	290	270	270
WIND SPD (KT)	30	32	33	30	30	30	35	35	32	31	28	30	32	33	34	35	37	35	35	34	30	30	29	30
GUST (KT)	48	50	47	52	50	49	56	58	51	50	53	49	50	50	49	53	55	50	48	46	47	45	40	43
DATE 12TH SEPTEMBER																								
PRESSURE(MB)	985.1		988.1		990.7		994.1		996.8		999.0		999.8		999.7		1000.0		1000.7		1002.4		1002.8	
		986.4		989.4		992.5		995.5		997.9		999.6		999.8		999.8		1000.3		1001.4		1002.6		1003
WIND DIR(DEG)	250	250	250	250	250	250	250	250	250	25	250	250	250	250	250	250	210	160	160	160	180	200	200	250
WIND SPD (KT)	30	30	25	25	25	25	25	22	21	21	20	22	15	14	13	09	03	06	09	09	13	14	13	12
GUST (KT)	43	42	42	37	41	37	35	32	30	28	26	31												

Table A.1--(continued)

BROWNSVILLE TEXAS (WBAS) LATITUDE 25 54'N LONGITUDE 97 26'W
ELEVATION 20FT

	TIME (IN HOURS CST)																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
DATE 9TH SEPTEMBER																								
PRESSURE(MB)	1009.8	1008.1	1007.5	1008.1	1007.8	1008.5	1007.1	1005.8	1005.4	1004.1	1004.4	1003.7												
	1008.5	1007.8	1007.8	1008.1	1008.5	1007.8	1006.8	1005.4	1004.4	1005.1	1004.1	1002												
WIND DIR(DEG)	320	320	320	320	320	320	320	320	320	320	320	340	340	360	360	360	030	030	340	360	360	360	360	320
WIND SPD (KT)	09	10	10	10	11	12	14	12	15	14	15	10	15	18	15	15	15	15	15	25	15	18	12	15
GUST (KT)								22		20		18	25	23	22	25	30			49	22	23	23	
DATE 10TH SEPTEMBER																								
PRESSURE(MB)	1001.7	1000.3	999.0	999.0	998.3	998.3	996.3	994.2	992.6	991.5	990.9	990.9												
	1000.3	999.7	998.6	998.6	998.6	997.3	995.3	993.2	992.2	991.2	990.9	990												
WIND DIR(DEG)	320	340	340	320	320	320	340	320	320	320	320	320	320	320	300	300	300	300	300	300	300	300	300	300
WIND SPD (KT)	15	18	16	22	24	17	15	15	14	20	22	15	14	25	28	25	25	25	25	25	25	25	25	30
GUST (KT)	23	23	22	26	30	30	20	26	30	3	35	15	32	36	39	38	36	40	40	43	44	46	43	48
DATE 11TH SEPTEMBER																								
PRESSURE(MB)	989.8	989.8	990.2	991.2	992.2	993.6	993.9	994.6	994.9	995.6	998.0	999.7												
	989.8	990.2	990.5	991.9	992.2	993.9	994.2	994.6	994.9	996.3	998.6	1000												
WIND DIR(DEG)	290	290	290	270	270	290	290	270	250	270	270	270	250	250	270	270	270	250	250	250	230	200	230	200
WIND SPD (KT)	30	28	25	28	24	27	25	20	20	28	20	18	20	22	24	18	18	15	15	13	10	15	12	10
GUST (KT)	53	43	40	40	38	45	45	43	40	39	40	32	37	31	35	27								
DATE 12TH SEPTEMBER																								
PRESSURE(MB)	1000.3	1000.0	1000.3	1001.7	1002.4	1003.1	1002.4	1000.7	1001.4	1002.0	1003.7	1004.7												
	1000.0	1000.0	1001.0	1001.0	1003.1	1002.7	1001.4	1001.0	1001.7	1003.1	1004.1	1004												
WIND DIR(DEG)	230	230	230	230	200	160	320	110	130	16	160	160	160	160	140	140	140	120	140	140	140	140	140	160
WIND SPD (KT)	10	10	10	07	05	03	03	03	13	13	14	16	10	08	09	10	13	17	12	10	10	10	10	10
GUST (KT)																								

Table A.1--(continued)

CORPUS CHRISTI TEXAS (WBAS)
LATITUDE 27 46'N LONGITUDE 97 30'W
ELEVATION 40FT

	TIME (IN HOURS CST)																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
DATE 9TH SEPTEMBER																								
PRESSURE(MB)	1011.1		1010.1		1009.8		1010.4		1010.4		1010.2		1008.8		1007.1		1006.7		1006.7		1006.7		1006.0	
		1010.6		1009.8		1010.1		1010.4		1010.8		1009.8		1007.7		1007.1		1006.7		1006.4		1006.4		1005
WIND DIR(DEG)	020	020	360	360	360	360	360	360	360	360	360	020	020	020	020	020	020	020	020	020	020	020	020	020
WIND SPD (KT)	07	08	08	10	10	10	12	11	15	15	18	18	15	15	15	17	18	17	16	17	15	18	15	17
GUST (KT)																								
DATE 10TH SEPTEMBER																								
PRESSURE(MB)	1004.7		1003.3		1002.0		1001.6		1001.0		1000.3		998.4		994.5		993.2		991.5		990.5		988.5	
		1004.0		1002.0		1001.6		1001.3		1000.8		999.3		996.9		994.2		992.5		990.5		990.5		987
WIND DIR(DEG)	020	020	020	340	330	330	330	330	340	34	340	340	340	340	340	340	350	360	360	360	360	340	340	330
WIND SPD (KT)	17	18	18	20	21	18	21	20	22	23	23	23	30	24	25	30	32	35	43	40	40	35	40	38
GUST (KT)	24		24	30	28	29			27	29	30	30	43	32	33	42	52	55	55	56	56	50	53	55
DATE 11TH SEPTEMBER																								
PRESSURE(MB)	984.0		981.7		980.6		979.3		979.6		980.1		979.5		979.0		981.0		983.7		986.1		989.1	
		983.2		981.3		980.3		979.3		980.0		979.6		979.6		980.0		982.3		985.0		988.1		990
WIND DIR(DEG)	340	340	340	320	340	320	320	320	320	32	320	320	320	290	290	290	290	290	270	270	270	240	270	240
WIND SPD (KT)	45	45	50	48	45	50	55	55	55	50	55	25	25	30	30	35	25	30	25	30	30	40	40	35
GUST (KT)	61	53	60E	70E	60E	62E	75E	75E	75E	70E	75E	45E	45E	45E	45E	55E	40E	45E	35E	45E	45E	55E	55E	50
DATE 12TH SEPTEMBER																								
PRESSURE(MB)	991.5		992.8		995.5		997.6		999.9		1001.6		1001.6		1001.0		1001.3		1002.0		1003.7		1004.3	
		992.2		994.2		996.6		998.9		1001.0		1001.6		1001.3		1001.0		1001.3		1003.0		1004.0		1004
WIND DIR(DEG)	240	240	240	240	240	240	230	230	220	220	200	200	230	200	200	180	180	180	180	180	180	180	180	180
WIND SPD (KT)	38	35	33	35	25	25	26	25	20	15	18	20	15	10	07	14	11	10	14	17	08	11	13	10
GUST (KT)	52E	46E	39E	44E	38E	35E	38E	35E	30E	2?E	24E	28E	20E											

Table A.1--(continued)

CORPUS CHRISTI TEXAS (NAS)
LATITUDE 27 46'N LONGITUDE 97 30'W
ELEVATION 44FT

	TIME (IN HOURS CST)																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
DATE 9TH SEPTEMBER																								
PRESSURE(MB)	1010.0	1009.0		1008.8		1009.0		1008.9		1009.3		1008.0		1006.4		1006.1		1005.5		1005.5		1004.8		
		1009.5		1008.6		1009.0		1009.2		1009.3		1008.9		1007.0		1006.2		1005.5		1005.2		1005.1		1003
WIND DIR(DEG)	020	020	020	360	360	360	360	360	020	020	020	020	040	020	040	020	020	020	360	020	020	020	020	020
WIND SPD (KT)	08	10	11	12	14	13	16	15	14	16	15	14	12	15	14	13	13	10	15	15	15	16	18	20
GUST (KT)						18	22	21	22	23	22	21	21	23	20	20		17		23	23	25	28	30
DATE 10TH SEPTEMBER																								
PRESSURE(MB)	100[illegible].5	1001.8		1000.5		1000.3		999.7		998.4		996.6		993.3		991.4		989.0		987.7		985.3		
		1002.5		1000.8		1000.5		999.8		999.1		997.5		995.2		992.3		990.2		987.9		986.6		983
WIND DIR(DEG)	360	020	020	360	360	360	360	360	360	36[illegible]	360	360	360	360	360	360	360	360	360	360	320	320	320	320
WIND SPD (KT)	22	24	22	26	26	26	24	22	25	26	28	28	30	28	30	34	34	40	39	40	40	45	38	42
GUST (KT)	29	34	35	34	33	34	38	33	34	34	40	42	43	41	42	48	48	53	56	56	56	60	45	54
DATE 11TH SEPTEMBER																								
PRESSURE(MB)	981.7	978.0		973.0		975.4		975.2		976.5		976.8		976.8		979.0		982.5		986.4		989.9		
		978.4		977.3		975.5		975.0		976.5		976.3		976.2		977.4		980.6		984.8		988.1		991
WIND DIR(DEG)	320	320	300	320	300	320	320	320	320	290	290	320	320	290	270	160	290	290	270	270	270	270	270	270
WIND SPD (KT)	44	45	47	46	48	48	50	48	45	40	42	40	35	38	30	32	33	34	30	30	30	30	27	26
GUST (KT)	60	67	66	65	64	66	64	60	58	58	60	49	53	52	46	44	45	45	44	44	40	45	38	39
DATE 12TH SEPTEMBER																								
PRESSURE(MB)	991.9	993.5		995.4		997.4		999.7		1001.1		1001.1		1000.4		1000.2		1001.0		1002.8		1003.6		
		992.4		994.6		996.4		998.5		1000.5		1001.2		1000.8		1000.2		1000.5		1002.1		1003.5		1003
WIND DIR(DEG)	270	250	230	230	200	200	200	200	200	200	200	200	200	200	160	160	160	160	160	160	160	160	160	160
WIND SPD (KT)	26	26	17	18	16	15	16	16	14	14	15	14	14	15	15	15	12	12	13	11	12	12	12	12
GUST (KT)	39	39	25	26	24	25	22	22																

Table A.1--(continued)

DALLAS TEXAS (WBAS)

LATITUDE 32 51'N LONGITUDE 96 51'W
ELEVATION 488FT

	TIME (IN HOURS CST)																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
DATE 9TH SEPTEMBER																								
PRESSURE(MB)	1015.2		1014.6		1014.6		1015.2		1015.6		1015.6		1014.2		1012.5		1012.2		1011.9		1012.9		1013.2	
		1014.9		1014.6		1014.6		1015.6		1015.6		1014.9		1013.5		1012.2		1011.9		1012.5		1013.2		1013
WIND DIR(DEG)	110	110	090	070	070	070	070	090	130	130	110	090	090	110	090	090	110	090	110	110	110	090	110	110
WIND SPD (KT)	09	06	06	04	08	07	08	07	10	09	12	12	11	15	12	15	12	14	15	11	13	12	10	12
GUST (KT)																								
DATE 10TH SEPTEMBER																								
PRESSURE(MB)	1013.2		1012.5		1011.9		1012.5		1012.9		1012.5		1009.8		1008.1		1007.1		1007.5		1008.5		1009.5	
		1012.9		1012.2		1011.9		1012.9		1012.9		1011.5		1009.1		1007.5		1007.5		1008.5		1008.8		1009
WIND DIR(DEG)	110	090	090	110	110	070	090	070	070	07	090	090	110	090	070	110	090	110	090	090	110	110	090	090
WIND SPD (KT)	11	11	08	10	09	10	08	10	10	12	13	15	12	14	16	14	16	15	14	13	15	16	10	14
GUST (KT)																								
DATE 11TH SEPTEMBER																								
PRESSURE(MB)	1008.8		1008.5		1008.5		1008.8		1009.5		1009.1		1008.5		1007.1		1006.4		1006.1		1006.4		1005.4	
		1008.5		1008.5		1008.5		1009.1		1009.5		1009.1		1007.8		1006.8		1006.1		1006.1		1005.8		1004
WIND DIR(DEG)	090	090	090	060	060	060	060	060	070	09	120	120	070	070	090	070	070	090	070	070	070	070	070	070
WIND SPD (KT)	15	10	10	10	10	11	10	13	13	12	15	15	15	17	13	14	15	14	14	14	16	15	16	15
GUST (KT)																								
DATE 12TH SEPTEMBER																								
PRESSURE(MB)	1003.4		1007.0		998.6		996.3		993.9		991.9		989.8		986.1		982.7		984.1		988.8		991.5	
		1002.0		999.3		998.0		995.3		993.2		991.2		988.5		984.4		982.4		986.8		989.8		992
WIND DIR(DEG)	070	070	070	070	070	070	070	090	090	110	110	120	120	140	140	140	140	180	230	230	230	250	250	230
WIND SPD (KT)	15	19	23	19	20	22	22	18	22	24	23	21	22	30	28	22	30	28	18	15	15	18	16	16
GUST (KT)	23	26	33	27	28	31	30	30	32	36	35	38	32	40	40	32	42	38	27	25	25	26	24	22

Table A.1--(continued)

DALLAS TEXAS (NAS)

LATITUDE 32 44'N LONGITUDE 96 58'W
ELEVATION 469FT

	TIME (IN HOURS CST)																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
DATE 9TH SEPTEMBER																								
PRESSURE(MB)	1014.1		1013.5		1013.5		1013.9		1014.5		1014.5		1012.9		1011.2		1010.8		1010.8		1011.5		1012.2	
		1013.7		1013.4		1013.5		1014.4		1014.6		1013.8		1012.0		1010.9		1010.8		1011.2		1011.8		1012
WIND DIR(DEG)	000	040	040	000	000	000	000	020	060	090	020	040	090	040	040	060	090	070	070	070	070	070	070	070
WIND SPD (KT)	00	04	02	00	00	00	00	03	08	06	08	10	09	10	09	13	13	09	10	08	09	08	12	12
GUST (KT)																								
DATE 10TH SEPTEMBER																								
PRESSURE(MB)	1011.9		1012.0		1011.2		1012.1		1012.1		1012.1		1009.5		1007.6		1006.6		1006.6		1007.8		1008.1	
		1011.9		1011.4		1010.8		1012.1		1012.1		1010.5		1008.1		1006.9		1006.9		1007.6		1007.9		1008
WIND DIR(DEG)	070	070	070	070	020	040	040	360	040	360	040	360	040	070	040	040	090	040	040	030	030	030	030	030
WIND SPD (KT)	06	08	07	05	04	03	04	03	06	04	10	10	10	17	12	15	12	10	12	16	15	10	15	17
GUST (KT)																								
DATE 11TH SEPTEMBER																								
PRESSURE(MB)	1008.0		1007.7		1007.7		1007.9		1008.0		1007.9		1006.9		1005.7		1004.4		1005.0		1004.8		1003.7	
		1007.8		1007.7		1007.7		1008.0		1008.1		1007.4		1005.9		1005.5		1004.7		1005.1		1004.6		1003
WIND DIR(DEG)	070	050	070	070	050	050	050	030	030	030	030	050	050	050	050	050	050	050	050	050	050	050	050	050
WIND SPD (KT)	14	12	14	12	10	11	09	10	13	14	13	14	12	16	12	11	12	13	15	16	14	13	12	16
GUST (KT)																								
DATE 12TH SEPTEMBER																								
PRESSURE(MB)	1002.2		999.9		997.8		995.4		993.9		991.7		989.3		985.8		981.9		985.4		988.9		991.2	
		1000.6		998.5		996.7		993.8		992.8		990.6		987.8		983.9		982.3		986.8		990.2		992
WIND DIR(DEG)	070	070	040	040	070	070	070	070	090	090	070	090	090	090	090	090	120	120	200	200	200	200	200	200
WIND SPD (KT)	17	20	20	20	18	25	20	26	18	16	19	18	16	20	24	24	22	22	24	22	24	22	20	20
GUST (KT)	23	26	27	26	30	34	30	34	24	31	30	26	24	28	32	40	34	34	30	27	29			

Table A.1--(continued)

FORT WORTH TEXAS (WBAS) LATITUDE 32 50'N LONGITUDE 97 3'W
ELEVATION 576FT

	TIME (IN HOURS CST)																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
DATE 9TH SEPTEMBER																								
PRESSURE(MB)	1014.7		1014.0		1014.0		1015.5		1015.5		1015.2		1013.7		1012.0		1011.3		1011.6		1012.3		1013.0	
		1014.3		1014.0		1014.4		1015.8		1015.5		1014.3		1012.8		1011.6		1011.3		1012.0		1013.0		1013
WIND DIR(DEG)	090	090	070	360	040	050	050	050	090	090	070	110	090	070	070	110	090	070	090	090	090	070	070	090
WIND SPD (KT)	13	08	06	05	09	08	08	10	13	17	12	13	13	18	19	15	20	17	17	13	18	14	12	19
GUST (KT)											20	19												
DATE 10TH SEPTEMBER																								
PRESSURE(MB)	1012.6		1012.0		1011.6		1012.3		1012.5		1012.0		1009.5		1007.8		1006.8		1007.2		1008.6		1008.8	
		1012.3		1012.0		1011.6		1012.7		1012.6		1010.6		1008.8		1006.8		1007.2		1008.2		1008.6		1008
WIND DIR(DEG)	090	090	090	040	070	040	040	040	070	070	070	070	070	090	090	090	090	070	070	070	070	070	070	070
WIND SPD (KT)	16	13	11	07	09	10	10	11	13	12	15	21	16	19	20	20	23	17	20	20	13	15	15	17
GUST (KT)																								
DATE 11TH SEPTEMBER																								
PRESSURE(MB)	1008.5		1008.1		1008.1		1008.6		1008.9		1008.6		1007.5		1006.1		1006.2		1005.5		1006.2		1004.8	
		1008.1		1008.1		1008.5		1008.6		1708.8		1008.6		1006.8		1006.2		1005.9		1005.5		1005.5		1004
WIND DIR(DEG)	070	070	070	050	050	050	050	050	060	060	060	060	060	060	040	040	040	040	060	060	060	060	040	060
WIND SPD (KT)	15	15	12	15	14	11	18	19	20	20	21	20	19	25	18	19	22	20	22	20	20	24	25	26
GUST (KT)									24	29	29	29	30	29	28	26				25	30	30	32	33
DATE 12TH SEPTEMBER																								
PRESSURE(MB)	1002.7		1000.4		998.3		995.8		993.7		991.7		989.6		986.5		981.3		984.8		988.6		991.4	
		1001.5		999.0		997.2		994.4		992.4		991.0		988.2		983.8		981.0		986.8		990.0		992
WIND DIR(DEG)	060	060	060	060	060	060	060	060	060	060	060	090	090	090	090	110	110	200	220	220	220	220	220	240
WIND SPD (KT)	28	27	29	32	30	32	32	32	30	32	32	35	26	33	30	38	40	27	22	22	25	25	20	21
GUST (KT)	47	39	37	40	38	43	48	45	46	46	46	43	40	43	42	50	48	40	30	31	31	32	26	26

Table A.1--(continued)

FORT WORTH TEXAS (CARSWELL AFB)
LATITUDE 32 46'N LONGITUDE 97 27'W
ELEVATION 650FT

	TIME (IN HOURS CST)																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
DATE 9TH SEPTEMBER																								
PRESSURE(MB)	.	1014.5	.	.	.	1014.5	.	.	1015.2	.	.	1014.7	.	.	1012.0	.	.	1011.0	.	.	1012.4	.	.	1012
WIND DIR(DEG)	140	000	000	000	070	070	020	090	140	090	090	110	090	070	090	070	090	090	090	090	090	090	090	090
WIND SPD (KT)	04	00	00	00	03	02	03	03	05	08	07	09	06	11	10	11	08	08	11	08	08	10	08	06
GUST (KT)																								
DATE 10TH SEPTEMBER																								
PRESSURE(MB)	.	1012.0	.	.	.	1011.7	.	.	1012.4	.	.	1011.0	.	.	1007.6	.	.	1006.7	.	.	1008.4	.	.	1008
WIND DIR(DEG)	090	090	090	090	040	040	090	040	040	070	070	040	070	070	090	070	090	110	090	090	090	090	090	090
WIND SPD (KT)	06	06	04	04	04	05	04	08	08	09	10	12	12	14	10	13	11	12	10	13	12	05	07	10
GUST (KT)																								
DATE 11TH SEPTEMBER																								
PRESSURE(MB)	.	1003.0	.	.	.	1008.3	.	.	1008.8	.	.	1008.1	.	.	1006.4	.	.	1005.4	.	.	1005.8	.	.	1004
WIND DIR(DEG)	060	080	060	060	040	040	050	040	050	060	060	070	060	050	060	050	050	040	050	050	050	060	050	050
WIND SPD (KT)	08	09	08	08	09	08	08	10	12	12	11	13	12	13	16	15	13	14	15	13	14	14	15	16
GUST (KT)																								
DATE 12TH SEPTEMBER																								
PRESSURE(MB)	.	999.6	.	.	.	996.6	.	.	993.2	.	.	990.4	.	.	985.4	.	.	983.7	.	.	989.3	.	.	993
WIND DIR(DEG)	050	060	060	050	050	050	050	070	070	060	070	060	080	070	060	050	360	280	260	240	240	250	250	260
WIND SPD (KT)	17	15	20	18	20	23	23	20	22	26	15	15	16	16	17	16	13	15	14	12	13	14	14	12
GUST (KT)	31	22	25	30	32	32	32	38	38	39														

Table A.1--(continued)

GALVESTON TEXAS (WBO)

LATITUDE 29 18'N LONGITUDE 94 48'W
ELEVATION 10FT

	TIME (IN HOURS CST)																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
DATE 9TH SEPTEMBER																								
PRESSURE(MB)	1011.9		1010.5		1009.8		1010.2		1010.5		1010.5		1007.8		1006.4		1006.4		1005.8		1005.1		1004.7	
		1011.2		1010.5		1009.8		1010.8		1010.5		1010.2		1007.1		1006.4		1005.8		1005.1		1005.4		1004
WIND DIR(DEG)	040	040	040	040	040	040	040	040	040	040	040	040	040	040	040	040	040	040	040	040	040	040	040	040
WIND SPD (KT)	12	14	15	14	16	17	17	18	20	20	21	24	20	20	20	19	22	17	24	23	24	29	27	28
GUST (KT)	10	12	13	12	14	15	15	16	17	17	18	21	17	17	17	16	19	15	21	20	21	25	23	24
DATE 10TH SEPTEMBER																								
PRESSURE(MB)	1003.1		1001.4		1000.3		1000.3		999.7		998.7		997.3		994.9		993.9		993.6		993.2		994.2	
		1002.3		1000.3		1000.3		999.7		999.3		998.7		995.6		994.2		993.9		992.6		993.6		994
WIND DIR(DEG)	040	040	040	040	040	040	040	040	040	040	040	040	040	040	040	040	040	040	040	040	040	090	090	090
WIND SPD (KT)	32	29	30	30	35	30	31	32	34	35	34	36	40	42	42	42	43	45	48	48	49	54	49	52
GUST (KT)	28	25	26	26	30	26	27	28	30	30	30	31	35	36	36	36	37	39	42	42	43	47	43	45
DATE 11TH SEPTEMBER																								
PRESSURE(MB)	.		992.9		992.6		993.6		993.2		993.2		992.9		991.3		991.9		991.2		993.6		994.6	
		.		992.6		993.2		993.2		993.2		993.2		992.6		991.3		991.9		992.2		994.6		994
WIND DIR(DEG)			090	090	090	090	110	110	110	110	110	110	110	135	135	135	135	999	999	180	180	160	160	180
WIND SPD (KT)			52	62	59	59	62	60	68	62	63	56	49	42	61	52	52			35	32	35	38	45
GUST (KT)			82	90	87	92	87	80	90	95	97	83	80							51	50	48	51	
DATE 12TH SEPTEMBER																								
PRESSURE(MB)	994.6		994.3		994.6		.		999.7		1001.4		1001.7		1001.7		1002.0		1003.1		1004.1		1004.4	
		995.3		995.3		996.6		999.0		1000.7		1001.4		1001.7		1001.7		1002.4		1003.4		1004.4		1004
WIND DIR(DEG)	180	160	160	200	200	180	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
WIND SPD (KT)	48	43	48	35	45	45	42	34	35	32	28	23	25	25	25	20	28	25	24	20	25	24	25	25
GUST (KT)				61	65	60	55	45	42	4	35	33	33											

Table A.1--(continued)

GALVESTON TEXAS (WBAS)
LATITUDE 29 16'N LONGITUDE 94 51'W
ELEVATION 10FT

	TIME (IN HOURS CST)																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
DATE 9TH SEPTEMBER																								
PRESSURE(MB)	1011.2		1010.2		1009.5		1010.2		1010.2		1010.5		1009.1		1007.1		1007.5		1006.1		1006.4		1005.8	
		1010.5		1009.8		1009.5		1009.8		1010.5		1009.8		1007.8		1007.1		1006.8		1006.4		1006.4		1005
WIND DIR(DEG)	040	040	040	040	030	030	030	030	040	360	040	050	040	020	020	040	050	050	050	050	050	050	050	050
WIND SPD (KT)	13	12	15	16	15	19	16	19	19	19	19	18	18	19	19	22	15	16	17	26	26	23	20	30
GUST (KT)														25		35				30	32	40	32	40
DATE 10TH SEPTEMBER																								
PRESSURE(MB)	1004.1		1002.4		1001.0		1000.7		1000.0		999.9		997.0		994.6		993.9		992.9		994.2		993.6	
		1003.1		1001.4		1001.0		1000.3		1000.0		998.3		995.3		994.2		993.6		993.9		994.2		993
WIND DIR(DEG)	050	050	050	050	030	050	050	050	040	040	040	040	070	040	040	070	070	090	070	070	070	090	070	090
WIND SPD (KT)	24	26	23	27	25	22	27	28	39	35	29	35	30	36	39	40	34	38	35	37	33	45	45	41
GUST (KT)	35	35	35	38	42	42	48	35	41	50	54	48	50	45	45	45	48	50	45	58	61	55	50	65
DATE 11TH SEPTEMBER																								
PRESSURE(MB)	992.9		991.9		991.5		991.9		991.9		992.6		991.5		990.9		990.5		991.2		993.6		994.6	
		992.6		991.5		991.5		991.9		991.9		993.2		991.5		991.2		990.5		992.2		994.6		994
WIND DIR(DEG)	090	090	110	110	090	090	090	090	110	090	090	110	110	090	090	110	110	110	110	180	180	200	200	200
WIND SPD (KT)	45	55	44	45	43	43	40	35	32	35	45	40	38	33	42	50	41	42	40	35	32	35	38	35
GUST (KT)	60	63	55	60	55	60	65	52	48	50	58	58	48	45	61	65	58	63	58	51	50	48	51	47
DATE 12TH SEPTEMBER																								
PRESSURE(MB)	994.2		995.3		994.6		997.3		999.7		1001.4		1001.7		1001.7		1002.0		1003.1		1004.1		1004.4	
		995.6		995.3		996.6		999.0		1000.7		1001.4		1001.7		1001.7		1002.4		1003.4		1004.4		1004
WIND DIR(DEG)	200	200	200	200	200	180	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
WIND SPD (KT)	40	35	48	35	45	45	42	34	30	32	28	25	25	25	25	20	28	25	24	20	25	24	25	25
GUST (KT)	55	45	58	61	55	70	55	45	42	40	35	31	33											

Table A.1--(continued)

HOUSTON TEXAS (WBAS)

LATITUDE 29 39'N LONGITUDE 95 17'W
ELEVATION 62FT

	TIME (IN HOURS CST)																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
DATE 9TH SEPTEMBER																								
PRESSURE(MB)	1011.5		1010.8		1010.5		1010.8		1011.2		1011.2		1009.8		1008.5		1008.1		1007.5		1008.1		1007.5	
		1011.2		1010.5		1010.5		1011.2		1011.2		1010.5		1008.8		1008.5		1007.8		1008.1		1008.1		1007
WIND DIR(DEG)	020	020	020	040	040	040	040	020	040	040	040	050	050	020	040	040	040	040	040	040	040	040	040	030
WIND SPD (KT)	08	10	10	10	10	11	10	12	11	16	13	15	13	18	17	16	13	17	14	15	15	15	15	13
GUST (KT)																								
DATE 10TH SEPTEMBER																								
PRESSURE(MB)	1006.1		1004.7		1003.1		1003.4		1003.1		1002.0		1000.7		998.3		997.6		997.3		997.6		997.6	
		1005.1		1003.7		1003.4		1002.7		1003.1		1001.4		999.5		997.6		998.3		997.3		997.6		997
WIND DIR(DEG)	030	030	030	030	030	040	030	030	030	040	030	040	040	040	040	040	040	040	040	040	040	040	070	080
WIND SPD (KT)	15	15	13	17	17	20	18	15	15	17	18	18	20	18	24	22	24	25	25	25	30	27	28	35
GUST (KT)													32	28	35	31	38	40	40	45	40	42	40	43
DATE 11TH SEPTEMBER																								
PRESSURE(MB)	996.3		994.6		993.6		994.2		993.9		992.9		992.2		990.5		989.5		988.8		990.9		991.5	
		995.9		993.6		993.6		994.2		994.2		992.9		991.5		990.2		989.5		989.5		991.5		992
WIND DIR(DEG)	070	080	080	080	080	080	110	090	090	090	090	110	110	110	110	110	110	110	110	110	110	110	130	140
WIND SPD (KT)	27	30	20	25	30	32	28	25	30	28	32	30	35	35	39	35	40	38	35	36	45	35	33	28
GUST (KT)	40	45	44	35	45	44	40	38	40	50	48	43	47	54	60	61	60	52	52	56	56	49	43	40
DATE 12TH SEPTEMBER																								
PRESSURE(MB)	992.2		992.2		993.2		995.3		997.6		999.7		999.7		1000.3		1000.7		1001.7		1003.4		1003.7	
		992.2		992.2		994.2		996.3		998.6		999.7		1000.0		1000.3		1001.0		1002.4		1003.7		1003
WIND DIR(DEG)	140	160	160	160	180	160	160	180	180	180	180	180	180	180	180	180	180	180	180	200	180	160	180	180
WIND SPD (KT)	35	30	28	25	25	20	16	23	22	17	18	17	19	18	13	18	18	13	16	15	14	13	11	12
GUST (KT)	48	45	42	38	35	32	30	33	30	27	26	25	26	25			29	18						

Table A.1--(continued)

HOUSTON TEXAS (ELLINGTON AFB)
LATITUDE 29 37'N LONGITUDE 95 10'W
ELEVATION 50FT

	TIME (IN HOURS CST)																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
DATE 9TH SEPTEMBER																								
PRESSURE(MB)			1011.2						1010.8						1009.5						1008.1			
						1010.5						1010.8						1008.1						1006
WIND DIR(DEG)	010	010	350	350	350	350	010	010	010	010	040	010	010	010	010	010	010	010	010	010	010	010	350	010
WIND SPD (KT)	04	04	05	06	06	08	08	10	07	08	14	10	10	10	10	12	09	10	12	10	12	12	13	16
GUST (KT)									15	16		16	16	16	18					17		20	20	22
DATE 10TH SEPTEMBER																								
PRESSURE(MB)			1004.1						1002.7						997.3						996.6			
						1000.7						1000.8						996.6						996
WIND DIR(DEG)	010	010	010	350	350	350	010	010	040	350	360	010	010	010	040	040	040	040	040	040	040	040	040	060
WIND SPD (KT)	12	12	13	12	15	15	14	15	12	17	20	20	21	17	25	23	20	24	25	23	25	22	27	29
GUST (KT)	18	18	16	20	20	22		23	22	24	29	28	35	30	35E	34	32	34	35	36	32	34	35	40
DATE 11TH SEPTEMBER																								
PRESSURE(MB)			994.6						993.9						991.4						992.2			
						993.9						993.9						990.5						992
WIND DIR(DEG)	060	060	060	050	030	080	080	080	080	080	080	080	080	130	080	100	100	130	130	130	130	130	130	130
WIND SPD (KT)	27	27	25	25	23	27	25	27	27	32	28	29	25	31	34	30	29	30	36	32	34	29	32	33
GUST (KT)	40	44	42	36	41	40	32	39	40	46	40	44	38	46	48	48	55	42	43	42	47	39	45	49
DATE 12TH SEPTEMBER																								
PRESSURE(MB)			993.9						998.0						1001.0						1003.1			
						995.3						1000.0						1001.4						1004
WIND DIR(DEG)	130	130	130	130	130	170	170	170	170	170	170	170	150	150	150	170	150	170	150	150	150	150	150	150
WIND SPD (KT)	35	31	27	26	22	24	20	22	20	18	18	17	14	16	16	10	16	16	14	13	10	08	10	08
GUST (KT)	51	52	43	42	39	37	28	32	31	26	32	27	27	24	30	22	28	25	24	24	21	19		

Table A.1--(continued)

PORT ARTHUR TEXAS (WBAS) LATITUDE 29 57'N LONGITUDE 94 1'W
ELEVATION 16FT

	TIME (IN HOURS CST)																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
DATE 9TH SEPTEMBER																								
PRESSURE(MB)	1011.3	1010.7	1010.3	1010.2	1010.0	1010.2	1010.8	1010.5	1010.8	1011.1	1010.6	1010.0	1009.3	1008.8	1008.4	1008.2	1008.2	1007.7	1007.3	1007.8	1008.1	1007.9	1007.3	1006
WIND DIR(DEG)	040	040	040	040	020	040	040	040	020	040	040	040	040	020	040	040	040	040	040	040	040	040	040	040
WIND SPD (KT)	08	10	10	14	10	11	12	15	14	16	15	15	14	13	12	12	17	15	14	14	16	19	22	14
GUST (KT)																			22	22	23	28	30	20
DATE 10TH SEPTEMBER																								
PRESSURE(MB)	1005.8	1004.9	1004.3	1003.7	1003.9	1003.6	1003.3	1003.3	1004.0	1004.2	1003.3	1002.9	1002.4	1000.9	1000.0	1000.0	999.8	1000.3	1000.6	1000.8	1001.2	1001.2	1000.9	1000
WIND DIR(DEG)	040	040	040	040	040	040	040	040	040	070	070	050	070	050	050	050	050	070	070	070	070	070	070	070
WIND SPD (KT)	17	20	18	15	18	18	23	25	23	21	28	29	22	29	28	30	28	25	27	30	30	28	29	26
GUST (KT)	27	27	25		25	24	30	32	29	30	39	38	31	37	40	40	39	35	39	36	40	39	37	35
DATE 11TH SEPTEMBER																								
PRESSURE(MB)	999.9	999.4	998.9	998.6	998.1	999.3	999.7	999.9	1000.2	1000.6	1000.3	1000.3	999.8	999.6	999.3	999.3	998.8	998.8	998.8	998.8	999.7	999.9	999.8	999
WIND DIR(DEG)	070	070	070	070	110	090	110	110	110	110	110	110	110	110	110	090	110	110	110	110	110	110	110	110
WIND SPD (KT)	30	28	26	27	25	24	26	30	30	33	22	20	30	28	27	25	30	25	25	31	30	34	33	34
GUST (KT)	38	36	33	39	33	35	34	40	45	46	38	36	41	32	33	32	39	35	38	43	43	47	44	43
DATE 12TH SEPTEMBER																								
PRESSURE(MB)	999.1	999.3	999.3	999.2	998.9	999.8	1000.8	1001.0	1001.6	1002.3	1002.7	1002.4	1002.3	1002.3	1002.1	1002.3	1002.3	1002.8	1003.0	1003.4	1004.2	1004.6	1004.8	1004
WIND DIR(DEG)	130	130	130	130	130	130	130	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	180	180
WIND SPD (KT)	29	28	25	26	29	27	29	25	24	18	25	23	28	28	26	18	19	18	20	21	18	16	12	16
GUST (KT)	38	37	35	38	40	36	36	32	33	27	35	39	36	34	34	25	24		30	31				

Table A.1--(continued)

SAN ANTONIO TEXAS (WBAS) LATITUDE 29 32'N LONGITUDE 98 28'W
ELEVATION 790FT

	TIME (IN HOURS CST)																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
DATE 9TH SEPTEMBER																								
PRESSURE(MB)	1012.9	1012.5	1011.9	1011.9	1011.9	1012.5	1011.9	1012.9	1012.9	1012.9	1012.9	1012.9	1011.9	1010.8	1010.2	1008.8	1008.5	1008.5	1008.1	1008.5	1009.1	1009.1	1009.1	1009
WIND DIR(DEG)	340	340	340	340	340	360	360	020	040	04	040	070	040	070	070	070	070	050	050	050	040	020	040	040
WIND SPD (KT)	06	05	05	06	05	06	06	09	12	12	16	12	13	11	13	14	19	16	12	10	10	10	13	15
GUST (KT)																								
DATE 10TH SEPTEMBER																								
PRESSURE(MB)	1008.5	1008.1	1007.8	1007.1	1006.8	1006.8	1007.1	1006.8	1006.4	1006.4	1006.1	1005.4	1004.1	1003.1	1002.0	1001.4	1001.4	1001.4	1001.4	1001.7	1002.0	1001.7	1001.4	1001
WIND DIR(DEG)	040	040	040	360	020	020	020	020	020	360	040	040	040	020	040	040	020	040	040	040	020	040	020	020
WIND SPD (KT)	15	12	10	10	13	14	13	13	15	20	18	16	18	18	18	21	18	16	20	15	15	18	18	15
GUST (KT)											30	25	25	24	25	38	25	27	28	21	25	28	26	32
DATE 11TH SEPTEMBER																								
PRESSURE(MB)	1000.7	1000.7	999.3	999.0	998.6	998.6	998.3	997.6	997.6	997.3	996.6	995.6	993.9	993.2	992.6	991.5	990.5	989.8	988.8	988.2	987.5	986.5	985.1	983
WIND DIR(DEG)	020	020	020	020	020	020	020	020	360	360	360	360	360	360	020	360	360	360	360	360	360	360	340	340
WIND SPD (KT)	18	15	16	15	19	17	21	20	18	24	22	22	21	20	25	25	25	20	25	30	30	30	30	20
GUST (KT)	26	23	23	22	30	26	32	28	25	32	30	30	30	35	35	36	35	37	38	44	40	48	45	40
DATE 12TH SEPTEMBER																								
PRESSURE(MB)	982.4	982.4	982.4	983.7	984.8	985.4	988.5	990.2	991.9	992.9	994.2	995.3	995.9	996.6	998.0	998.3	999.0	999.0	1000.0	1000.7	1001.4	1002.0	1002.7	1003
WIND DIR(DEG)	340	340	320	320	320	300	270	270	250	25	250	250	250	250	270	250	230	230	180	220	200	220	220	220
WIND SPD (KT)	20	22	22	24	21	16	18	18	18	15	17	16	13	14	09	10	10	08	06	06	06	04	03	04
GUST (KT)	37	36	30	32	30																			

Table A.1--(continued)

SAN ANTONIO TEXAS (KELLY AFB)
LATITUDE 29 23'N LONGITUDE 98 34'W
ELEVATION 683FT

	TIME (IN HOURS CST)																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
DATE 9TH SEPTEMBER																								
PRESSURE(MB)	.		1012.0	.	.	.			1012.3	.	.	.			1008.6	.	.	.			1008.6	.	.	
	.		.	.		1012.0		.	.			1011.3		.	.			1007.9		.	.			1008
WIND DIR(DEG)	340	320	320	310	310	310	310	020	010	360	360	010	030	050	030	020	040	040	030	040	030	030	030	030
WIND SPD (KT)	03	04	03	04	04	03	02	07	07	09	11	10	09	10	13	12	13	12	10	10	09	08	08	07
GUST (KT)																								
DATE 10TH SEPTEMBER																								
PRESSURE(MB)	.		1007.6	.	.	.			1006.2	.	.	.			1001.5	.	.	.			1000.1	.	.	
	.		.	.		1006.6		.	.			1004.5		.	.			1000.1		.	.			1000
WIND DIR(DEG)	020	020	010	360	360	360	360	360	010	360	360	010	020	010	020	020	030	360	360	010	020	360	010	010
WIND SPD (KT)	11	10	09	11	11	12	12	14	15	15	17	15	17	17	17	20	20	15	12	15	14	20	17	24
GUST (KT)												26		28	26	29	29			27	25	32	29	30
DATE 11TH SEPTEMBER																								
PRESSURE(MB)	.		998.8	.	.	.			996.1	.	.	.			992.0	.	.	.			986.9	.	.	
	.		.	.		997.4		.	.			994.7		.	.			998.6		.	.			984
WIND DIR(DEG)	360	360	360	360	360	350	360	350	350	350	350	350	350	350	350	350	350	340	340	340	340	330	330	320
WIND SPD (KT)	16	15	15	20	21	23	22	20	20	22	20	24	20	20	22	25	25	26	27	30	30	31	28	25
GUST (KT)	28	30	23	30	28	38	29	32	30	36	32	34E	30E	30	34	34	34	37	39	40E	41	42	37	37
DATE 12TH SEPTEMBER																								
PRESSURE(MB)	.		983.9	.	.	.			992.0	.	.	.			997.4	.	.	.			1000.9	.	.	
	.		.	.		987.3		.	.			995.4		.	.			998.4		.	.			1002
WIND DIR(DEG)	310	300	290	280	270	270	260	240	250	240	230	230	230	230	240	250	250	180	170	000	150	170	210	150
WIND SPD (KT)	23	22	18	18	17	18	20	18	16	14	13	13	13	12	14	10	09	03	03	00	03	02	02	04
GUST (KT)	31	29	26	26	24	26	30	24	28	19	20	21												

Table A.1--(continued)

SAN ANTONIO TEXAS (RANDOLPH AFB)
LATITUDE 29 32'N LONGITUDE 98 17'W
ELEVATION 771FT

	TIME (IN HOURS CST)																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
DATE 9TH SEPTEMBER																								
PRESSURE(MB)	.		1012.0		.		.		1012.7		.		.		1008.6		.		.		1008.8		.	
		.		.		1011.6		.		.		1011.6		.		.		1008.2		.		.		1008
WIND DIR(DEG)	320	330	330	340	320	320	330	010	010	040	030	030	040	030	030	020	030	040	040	040	030	030	030	020
WIND SPD (KT)	04	02	03	04	04	04	04	05	09	11	12	12	14	14	10	12	12	13	10	08	10	10	07	09
GUST (KT)											20	20	19	20	18	20	20	18						
DATE 10TH SEPTEMBER																								
PRESSURE(MB)	.		1007.8		.		.		1006.3		.		.		1001.7		.		.		1001.5		.	
		.		.		1007.1		.		.		1005.3		.		.		1001.5		.		.		1000
WIND DIR(DEG)	030	020	010	010	360	010	010	010	020	020	020	040	010	030	020	030	030	030	030	020	020	020	020	020
WIND SPD (KT)	12	12	10	10	12	08	10	13	13	14	14	20	19	20	18	23	22	25	21	24	25	25	22	20
GUST (KT)													29	29	30	34	30	31	36	30	35	31	40	30
DATE 11TH SEPTEMBER																								
PRESSURE(MB)	.		999.6		.		.		996.6		.		.		991.2		.		.		985.6		.	
		.		.		998.1		.		.		995.1		.		.		988.3		.		.		981
WIND DIR(DEG)	010	360	030	360	350	360	360	350	360	360	360	360	360	360	360	360	360	360	360	360	360	350	360	360
WIND SPD (KT)	15	15	16	15	15	16	18	20	22	20	24	22	25	26	27	26	28	30	32	30	30	32	30	30
GUST (KT)	32	27	28	27	33	31	31	33	39	29	32	34	35	39	43	38	40	47	42	44	51	55	46	43
DATE 12TH SEPTEMBER																								
PRESSURE(MB)	.		979.9		.		.		990.4		.		.		998.1		.		.		.		.	
		.		.		984.9		.		.		994.6		.		.		999.5		.		.		
WIND DIR(DEG)	330	320	310	290	280	270	260	240	240	240	240	240	240	230	240	220	230	210						
WIND SPD (KT)	29	28	24	26	20	18	17	19	16	14	13	15	14	16	12	08	09	09						
GUST (KT)	53	40	36	33	30	26	26	25	28	22	20	22	22	22	19									

Table A.1--(continued)

VICTORIA TEXAS

LATITUDE 28 51'N LONGITUDE 96 55'W
ELEVATION 117FT

	TIME (IN HOURS CST)																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
DATE 9TH SEPTEMBER																								
PRESSURE(MB)	.	.	.				1010.8		1011.2		1011.2		1009.5		1007.8		1007.5		1007.5		1007.8		1007.1	
	.	.				1010.5		1011.2		1011.2		1010.5		1008.5		1007.8		1007.8		1007.5		1007.5		1006
WIND DIR(DEG)						020	360	020	020	020	040	050	050	020	020	040	040	020	020	020	020	020	020	020
WIND SPD (KT)						1[illegible]	10	13	16	12	19	20	20	20	18	19	18	17	11	12	15	15	20	19
GUST (KT)														26										28
DATE 10TH SEPTEMBER																								
PRESSURE(MB)	1006.1		1004.4		1003.4		1003.4		1002.7		1001.7		999.7		997.0		995.6		994.2		994.2		993.2	
		1005.4		1003.7		1003.4		1002.7		1002.4		1001.0		998.3		996.3		994.6		994.2		993.6		991
WIND DIR(DEG)	020	020	020	020	020	020	020	020	020	02[illegible]	020	020	360	360	360	360	020	020	020	020	020	020	020	020
WIND SPD (KT)	19	20	20	18	20	22	22	24	25	25	24	29	28	24	23	30	32	32	34	33	34	35	32	36
GUST (KT)							28	30	31	32	33	36	35	30		40	40	40	44	40	44	43	40	47
DATE 11TH SEPTEMBER																								
PRESSURE(MB)	989.8		987.8		985.4		984.1		983.1		982.1		977.7		970.2		959.7		945.E		957.4		972.5	
		989.2		986.5		984.8		984.1		982.7		980.0		974.3		964.4		950.6		948.6		966.4		976
WIND DIR(DEG)	020	020	020	020	020	020	020	020	020	020	020	020	020	020	020	020	020	020	020					
WIND SPD (KT)	42	38	40	44	42	41	42	40	42	40	40	40	30	40	40	40	50	65	87					
GUST (KT)	54	53	57	57	55	53	52	50	50	50	48	48	48	52	59	62	70	87	130E					
DATE 12TH SEPTEMBER																								
PRESSURE(MB)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
WIND DIR(DEG)																								
WIND SPD (KT)																								
GUST (KT)																								

Table A.1--(continued)

WACO TEXAS (WBAS)

LATITUDE 31 37'N LONGITUDE 97 13'W
ELEVATION 508FT

	TIME (IN HOURS CST)																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
DATE 9TH SEPTEMBER																								
PRESSURE(MB)	1013.9	1013.5		1013.2		1013.9		1014.2		1014.2		1012.9		1011.5		1010.8		1010.8		1011.9		1011.9		
		1013.9		1013.2		1013.5		1014.2		1014.6		1013.5		1012.2		1010.5		1010.8		1010.8		1011.9		1011
WIND DIR(DEG)	360	045	020	360	360	360	360	045	045	045	020	050	050	050	050	050	030	050	050	070	070	070	040	040
WIND SPD (KT)	04	04	06	09	09	10	08	10	10	08	12	12	16	15	14	12	12	15	16	11	14	15	15	17
GUST (KT)																								
DATE 10TH SEPTEMBER																								
PRESSURE(MB)	1011.9	1011.2		1010.5		1010.8		1010.5		1010.2		1008.1		1006.1		1005.8		1005.8		1006.8		1007.1		
		1011.9		1010.9		1010.5		1010.5		1010.5		1008.8		1007.1		1005.8		1005.8		1006.4		1007.1		1007
WIND DIR(DEG)	040	040	020	020	020	040	030	040	040	03[illegible]	040	030	040	040	040	040	060	050	050	050	050	050	050	050
WIND SPD (KT)	15	13	12	12	12	13	14	16	15	15	20	18	18	22	25	22	17	20	18	18	18	20	17	20
GUST (KT)																								
DATE 11TH SEPTEMBER																								
PRESSURE(MB)	1006.4	1006.1		1005.8		1005.4		1005.4		1005.4		1004.1		1002.4		1002.0		1000.3		1000.3		998.0		
		1006.1		1005.8		1005.8		1005.4		1005.4		1005.4		1003.4		1002.4		1001.4		1000.7		998.6		997
WIND DIR(DEG)	040	040	040	040	040	040	020	040	040	04[illegible]	020	040	040	040	040	040	040	030	040	040	030	030	040	040
WIND SPD (KT)	18	18	18	18	20	20	22	25	25	20	20	20	25	28	25	28	26	25	22	30	30	40	35	30
GUST (KT)																								
DATE 12TH SEPTEMBER																								
PRESSURE(MB)	994.6	991.9		989.2		987.1		985.4		983.1		980.0		985.8		989.2		992.2		995.6		997.6		
		992.9		990.5		988.2		986.5		984.4		980.4		983.7		987.8		990.5		993.9		996.6		998
WIND DIR(DEG)	040	040	060	040	060	030	060	060	060	09[illegible]	090	110	180	230	200	200	200	200	200	230	200	230	200	230
WIND SPD (KT)	30	35	30	25	28	28	28	25	25	20	25	35	35	25	20	22	24	22	18	16	18	18	20	23
GUST (KT)	40	45	38	32	40	38	35	40	30	28	38	46	45	34	25	29								

Table A.1--(continued)

BATON ROUGE LOUISIANA (WB)
LATITUDE 30 32'N LONGITUDE 91 9'W
ELEVATION 60FT

	TIME (IN HOURS CST)																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
DATE 9TH SEPTEMBER																								
PRESSURE(MB)	1012.2		1011.5		1011.5		1011.9		1012.9		1012.5		1011.5		1011.2		1011.2		1010.8		1011.5		1011.5	
		1012.2		1011.5		1011.9		1011.9		1012.9		1011.9		1011.2		1010.8		1010.5		1010.8		1011.9		1010
WIND DIR(DEG)	070	070	070	070	070	070	070	070	040	090	070	090	090	110	090	090	090	090	090	090	090	110	090	070
WIND SPD (KT)	10	10	10	10	13	12	12	12	14	17	17	17	11	12	19	19	15	13	15	15	17	10	10	15
GUST (KT)																								
DATE 10TH SEPTEMBER																								
PRESSURE(MB)	1009.8		1008.8		1009.1		1009.5		1011.2		1010.2		1009.5		1008.5		1008.5		1008.8		1010.2		1009.5	
		1008.8		1009.1		1009.1		1009.5		1010.8		1010.2		1008.8		1008.8		1008.8		1009.8		1010.2		1009
WIND DIR(DEG)	110	090	090	090	090	090	110	090	110	090	090	090	090	110	110	110	110	110	110	110	140	140	090	140
WIND SPD (KT)	12	12	17	15	15	14	14	20	18	14	16	15	25	18	18	20	18	18	16	15	16	14	10	09
GUST (KT)	21	20							30			35	35	33	37	30	35	26	23	23	23	20		
DATE 11TH SEPTEMBER																								
PRESSURE(MB)	1008.8		1003.8		1008.1		1009.5		1010.5		1010.2		1009.5		1008.5		1008.5		1008.8		1009.8		1010.5	
		1008.5		1008.1		1008.8		1009.5		1010.2		1009.8		1008.8		1008.5		1008.5		1009.5		1010.2		1010
WIND DIR(DEG)	110	110	110	110	110	130	110	130	110	110	090	140	110	110	110	110	130	130	130	130	130	130	130	130
WIND SPD (KT)	12	12	12	11	15	13	08	15	15	22	16	17	12	15	20	18	25	15	18	18	18	20	15	15
GUST (KT)				20	20			30		40	34	40	33	30	40	27	43	24	37	28	27	32	25	25
DATE 12TH SEPTEMBER																								
PRESSURE(MB)	1009.5		1003.5		1008.8		1009.1		1010.2		1010.2		1009.1		1008.1		1008.1		1009.1		1009.8		1009.5	
		1008.5		1008.8		1009.1		1009.8		1009.8		1009.8		1008.5		1008.1		1008.5		1009.5		1009.5		1009
WIND DIR(DEG)	130	130	130	130	130	130	130	130	130	130	160	140	140	160	160	160	160	160	140	160	160	160	160	160
WIND SPD (KT)	16	18	20	17	18	20	22	19	23	23	16	12	15	16	22	20	15	17	15	12	14	12	11	15
GUST (KT)										35	38	20	25	30	32	30	22	28						

Table A.1--(continued)

BURRWOOD, LA. (WBO)

LATITUDE 28 58'N LONGITUDE 89 23'W
ELEVATION 10FT

	TIME (IN HOURS CST)																					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
DATE 9TH SEPTEMBER																								
PRESSURE(MB)	1010.2	1009.5	1008.8	1008.8	1008.5	1008.8	1009.1	1008.8	1009.0	1009.8	1010.2	1009.8	1009.1	1008.1	1008.8	1008.5	1008.1	1008.1	1008.8	1008.8	1008.8	1009.5	1009.5	1009
WIND DIR(DEG)	110	110	110	110	110	110	110	110	110	12[illegible]	120	120	120	120	120	120	120	120	140	140	140	140	140	140
WIND SPD (KT)	22	25	23	20	23	22	24	21	16	20	25	25	20	22	30	20	25	25	25	25	23	28	25	30
GUST (KT)	28	31	32	26	34	26	27	28	25	3[illegible]	43	35	30	29	45	30	35	33	36	38		35	31	49
DATE 10TH SEPTEMBER																								
PRESSURE(MB)	1008.5	1008.1	1007.5	1007.8	1007.8	1007.8	10[illegible]8.1	1008.5	1009.1	1009.8	1009.5	1009.5	1009.1	1008.8	1009.5	1009.1	1009.1	1009.1	1009.8	1010.5	1010.5	1010.5	1010.5	1010
WIND DIR(DEG)	140	140	140	140	140	160	160	160	160	160	160	160	160	140	140	160	160	160	160	160	140	160	160	160
WIND SPD (KT)	26	29	21	28	22	23	25	20	20	20	20	21	27	26	24	25	23	25	25	25	19	19	21	20
GUST (KT)	32	34	26	32	29			28	28	40	30	30												
DATE 11TH SEPTEMBER																								
PRESSURE(MB)	1009.8	1009.5	1009.5	1009.8	1010.2	1010.5	1011.2	1011.2	1010.5	1010.2	1010.5	1010.8	1011.9	1011.9	1009.5	1009.5	1010.2	1010.8	1011.5	1010.8	1010.5	1010.5	1011.5	1011.9	1011
WIND DIR(DEG)	160	160	160	160	160	160	160	160	160	160	160	160	160	160	180	160	160	160	160	160	160	160	180	180
WIND SPD (KT)	19	17	18	20	17	20	20	16	20	18	22	18	20	23	21	20	20	17	20	20	17	16	17	15
GUST (KT)																								
DATE 12TH SEPTEMBER																								
PRESSURE(MB)	1011.5	1011.2	1010.5	1010.8	1011.5	1011.9	1012.5	1011.9	1012.9	1012.9	1012.2	1012.9	1011.9	1011.5	1011.5	1011.5	1011.5	1011.5	1011.7	1012.5	1012.5	1012.5	1011.9	1011
WIND DIR(DEG)	180	180	180	180	180	180	180	180	180	180	160	180	180	180	180	180	180	180	180	180	180	180	180	180
WIND SPD (KT)	16	18	24	18	20	18	14	23	24	20	17	19	18	17	15	16	18	17	18	16	16	19	22	18
GUST (KT)																								

Table A.1--(continued)

LAFAYETTE, LA. (FAA)

LATITUDE 30 12'N LONGITUDE 91 59'W
ELEVATION 40FT

	TIME (IN HOURS CST)																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
DATE 9TH SEPTEMBER																								
PRESSURE(MB)	1011.5	1011.2	1010.8	1010.8	1011.2	1011.2	1010.8	1009.8	1009.5	1008.8	1009.1	1009.1												
		1011.2	1010.3	1010.5	1010.8	1011.2	1010.8	1010.2	1009.5	1008.8	1009.1	1009.8	1009											
WIND DIR(DEG)	040	040	040	040	040	040	040	040	040	040	060	060	040	040	040	040	060	060	040	040	070	070	070	070
WIND SPD (KT)	3	9	6	6	8	10	10	11	13	13	15	15	13	10	12	15	20	18	10	15	10	11	11	11
GUST (KT)											25		21											
DATE 10TH SEPTEMBER																								
PRESSURE(MB)	1008.5	1006.8	1006.4	1006.8	1007.1	1007.5	1006.8	1005.8	1005.8	1006.1	1007.8	1007.5												
		1007.5	1006.8	1006.4	1006.8	1007.5	1007.1	1006.4	1005.8	1005.4	1006.8	1007.5	1007											
WIND DIR(DEG)	070	070	070	070	070	070	070	070	070	070	070	020	070	070	070	070	070	070	070	070	070	090	070	070
WIND SPD (KT)	10	10	11	11	11	10	14	17	15	15	20	17	15	15	15	12	12	12	10	15	10	13	18	8
GUST (KT)											30	27	25	25	25	18	25	21						
DATE 11TH SEPTEMBER																								
PRESSURE(MB)	1006.4	1005.8	1005.8	1006.4	1007.1	1007.1	1006.8	1006.1	1006.1	1006.8	1007.5	1007.5												
		1006.1	1005.1	1006.4	1006.8	1007.5	1006.4	1006.1	1006.1	1006.1	1007.5	1007.5	1008											
WIND DIR(DEG)	070	070	090	090	070	070	090	070	070	070	090	090	110	060	090	090	070	090	090	090	090	090	090	090
WIND SPD (KT)	10	10	15	18	10	10	10	13	15	12	11	14	12	13	10	13	10	10	10	10	12	15	20	10
GUST (KT)			25	32											20									
DATE 12TH SEPTEMBER																								
PRESSURE(MB)	1006.8	1006.4	1006.4	1007.5	1007.5	1007.8	1007.5	1006.8	1006.8	1007.8	1008.1	1008.1												
		1006.4	1006.4	1007.1	1007.5	1007.8	1007.8	1007.1	1006.8	1007.1	1008.1	1008.5	1008											
WIND DIR(DEG)	090	090	110	110	110	110	110	110	110	110	110	110	140	140	140	140	140	160	140	140	140	160	140	160
WIND SPD (KT)	15	15	15	15	15	19	15	15	15	18	18	15	20	25	18	16	15	12	14	15	16	13	14	14
GUST (KT)		30	27																	24	24	23		

Table A.1--(continued)

NEW ORLEANS, LA. (WBAS) LATITUDE 29 59'N LONGITUDE 90 15'W
ELEVATION 0FT

	TIME (IN HOURS CST)																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
DATE 9TH SEPTEMBER																								
PRESSURE(MB)	1011.4	1011.1	1010.5	1010.9	1010.5	1010.6	1011.0	1011.3	1011.5	1011.9	1011.6	1011.6	1011.3	1010.5	1010.0	1010.2	1009.7	1009.6	1009.7	1011.2	1011.4	1011.3	1011.0	1010
WIND DIR(DEG)	070	070	070	070	070	070	070	070	070	070	070	070	070	070	070	110	070	070	070	140	110	070	090	070
WIND SPD (KT)	14	11	10	13	12	15	17	15	20	18	17	18	15	14	13	8	17	18	12	23	12	12	12	11
GUST (KT)																								
DATE 10TH SEPTEMBER																								
PRESSURE(MB)	1009.2	1009.3	1008.7	1008.5	1008.5	1008.8	1009.4	1009.2	1009.7	1010.3	1010.2	1010.2	1009.4	1009.3	1009.3	1009.7	1008.9	1009.4	1009.4	1010.4	1010.7	1010.1	1010.0	1009
WIND DIR(DEG)	090	090	090	090	090	090	090	090	090	11	100	100	100	100	100	100	100	100	100	110	110	110	110	110
WIND SPD (KT)	14	15	8	10	15	16	12	11	15	11	14	16	14	14	12	13	12	13	14	15	14	15	14	14
GUST (KT)		30																						
DATE 11TH SEPTEMBER																								
PRESSURE(MB)	1009.5	1009.2	1008.9	1008.6	1009.1	1009.5	1009.9	1010.0	1010.7	1010.9	1010.7	1010.3	1010.3	1009.8	1009.3	1009.3	1009.4	1009.5	1010.0	1010.8	1010.8	1011.1	1011.3	1011
WIND DIR(DEG)	110	110	110	110	110	110	110	090	110	110	120	120	120	120	120	120	120	120	120	120	120	120	120	110
WIND SPD (KT)	12	14	7	13	13	13	13	11	12	12	15	15	15	13	9	12	11	12	12	10	13	11	11	12
GUST (KT)	20			20		19							33											
DATE 12TH SEPTEMBER																								
PRESSURE(MB)	1010.5	1010.2	1009.9	1009.9	1010.2	1010.4	1010.5	1010.8	1011.5	1011.8	1011.6	1011.4	1011.0	1010.4	1010.0	1009.7	1009.9	1010.1	1010.3	1011.0	1011.1	1011.3	1010.6	1010
WIND DIR(DEG)	110	140	120	140	140	140	120	120	140	140	140	160	160	160	160	160	160	160	140	140	140	140	140	140
WIND SPD (KT)	11	10	11	12	10	11	13	15	18	14	17	18	16	19	15	18	18	17	10	11	11	12	16	12
GUST (KT)														24										

Table A.1--(concluded)

LAKE CHARLES, LA. (WBAS) LATITUDE 30 13'N LONGITUDE 93 9'W
ELEVATION 20FT

	TIME (IN HOURS CST)																					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
DATE 9TH SEPTEMBER																								
PRESSURE(MB)	1011.5		1010.8		1010.2		1010.8		1011.2		1010.8		1010.5		1009.5		1008.8		1008.5		1008.8		1008.8	
		1011.2		1010.5		1010.2		1010.8		1011.2		1010.5		1010.2		1009.1		1008.8		1008.5		1009.1		1007
WIND DIR(DEG)	020	020	020	020	050	050	030	030	050	030	030	030	030	030	030	050	030	050	070	070	070	050	050	060
WIND SPD (KT)	6	4	6	7	9	9	8	11	13	12	10	10	14	14	12	18	20	22	18	16	20	20	22	22
GUST (KT)																								
DATE 10TH SEPTEMBER																								
PRESSURE(MB)	1007.8		1005.8		1004.7		1005.6		1005.4		1006.1		1004.4		1003.4		1003.4		1003.5		1004.4		1004.4	
		1006.4		1004.4		1005.4		1005.4		1006.1		1004.7		1003.7		1003.1		1002.7		1004.1		1004.4		1004
WIND DIR(DEG)	040	060	040	060	060	060	040	040	060	060	060	060	060	060	060	060	090	090	060	090	060	060	090	090
WIND SPD (KT)	18	18	18	22	25	25	23	23	28	30	28	37	25	33	30	25	25	25	25	28	25	25	22	25
GUST (KT)	25	28	29	32	30	32	30	34	42	42	35	43	33	39	40	35	35	32	35	38	35	40	30	36
DATE 11TH SEPTEMBER																								
PRESSURE(MB)	1004.1		1002.7		1002.7		1003.4		1004.1		1004.4		1003.4		1003.1		1002.4		1002.7		1003.4		1004.1	
		1003.4		1002.7		1002.7		1003.7		1004.4		1004.4		1003.1		1003.1		1002.7		1003.4		1003.7		1003
WIND DIR(DEG)	090	090	090	090	090	080	110	110	110	120	120	120	120	120	120	120	110	110	120	120	120	120	120	120
WIND SPD (KT)	24	21	27	29	21	23	34	22	23	31	25	25	21	24	24	27	28	25	30	30	31	31	30	34
GUST (KT)	31	34	36	42	36	31	50	35	33	45	41	35	28	30	33						36	36		41
DATE 12TH SEPTEMBER																								
PRESSURE(MB)	1002.7		1002.0		1002.7		1003.4		1003.1		1003.7		1003.4		1003.1		1004.1		1005.1		1005.8		1006.1	
		1002.7		1002.4		1003.1		1003.7		1003.4		1003.7		1003.1		1004.4		1004.4		1005.4		1006.1		1006
WIND DIR(DEG)	120	120	120	120	120	120	120	140	140	140	140	140	140	140	150	150	150	150	150	150	150	150	160	160
WIND SPD (KT)	28	30	34	33	27	30	27	28	28	29	35	36	35	32	28	20	18	17	15	17	16	15	16	14
GUST (KT)	32	35	38			35	34	35	35	36	44	45	44	40	38	30	26	30	25	22	26	21	22	

Table A.2--Surface observations from other land stations

MUD BAYON BRIDGE (HIGH ISLAND) TEXAS
LATITUDE 29 35'N LONGITUDE 94 25'W

	TIME (IN HOURS CST)																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
DATE 9TH SEPTEMBER																								
PRESSURE(MB)	.	.	.	.					1011.9		1012.5		1010.5		1009.1		1008.5		1007.8		1008.5		1007.1	
								1011.9		1012.5		1011.9		1009.5		1008.8		1007.8		1008.5		1008.5		1007
WIND DIR(DEG)								020	040	040	060	040	040	040	040	020	040	040	040	040	040	020	040	040
WIND SPD (KT)								15	16	22	21	30	23	23	19	11	10	13	15	30	23	26	29	32
GUST (KT)																								
DATE 10TH SEPTEMBER																								
PRESSURE(MB)	1005.8		1005.8		1004.7		1002.7		1003.1		1002.0		1000.3		998.7		998.7		998.3		999.3		999.3	
		1005.8		1005.1		1005.1		1003.1		1003.1		1001.7		999.3		998.7		998.3		998.7		999.7		999
WIND DIR(DEG)	040	040	040	040	040	040	040	040	020	040	040	020	040	040	040	060	060	060						
WIND SPD (KT)	23	30	29	35	35	23	30	26	30	35	46	40	35	35	41	43	35	43						
GUST (KT)											50	55	47	52	61	52	52							
DATE 11TH SEPTEMBER																								
PRESSURE(MB)	998.0		997.6		997.3		997.6		997.6		998.3		997.0		996.6		996.6		996.3		998.3		998.7	
		997.3		997.3		997.3		997.6		998.3		997.6		997.0		996.6		995.9		997.6		998.3		998
DATE 12TH SEPTEMBER																								
PRESSURE(MB)	998.7		.		998.7		1001.0		1001.7		1003.4		1003.4		1003.4		1004.7		1006.1		.		.	
		.		.		999.3		1001.7		1002.7		1003.4		1003.4		1003.4		1005.4		.		.		

DATA ENTERED ONLY FOR THOSE TIMES THAT WERE AVAILABLE

Table A.2--(continued)

SHELL CHEMICAL CO., DEER PARK, TEXAS
LATITUDE 29 43'N LONGITUDE 95 8'W

	TIME (IN HOURS CST)																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
DATE 10TH SEPTEMBER																								
PRESSURE(MB)																								
WIND DIR(DEG)									060	050	060	070	070	060	060	060	070	070	070	070	070	080	090	090
WIND SPD (KT)									21	17	23	24	23	23	25	22	23	24	29	30	30	34	35	38
GUST (KT)									30	30	31	39	42	37	37	42	36	40	40	42	40	46	48	52
DATE 11TH SEPTEMBER																								
PRESSURE(MB)																								
WIND DIR(DEG)	080	100	100	100	100	100	100	100	110	110	100	110	120	130	110	120	110	130	120	130	130	130	150	140
WIND SPD (KT)	34	35	40	50	38	39	39	41	38	39	42	41	41	45	46	48	52	43	50	41	43	40	36	43
GUST (KT)	51	43	52	63	57	49	58	55	52	5	60	56	62	68	62	70	68	73	69	70	59	36	61	61
DATE 12TH SEPTEMBER																								
PRESSURE(MB)																								
WIND DIR(DEG)	140	160	170	170	180	180	180	180																
WIND SPD (KT)	43	45	35	36	24	30	23	31																
GUST (KT)	60	68	62	48	43	43	39	44																

DATA ENTERED ONLY FOR THOSE TIMES THAT WERE AVAILABLE

Table A.2--(continued)

DOW CHEMICAL (PLANT B) FREEPORT TEXAS
LATITUDE 28 59'N LONGITUDE 95 24'W

	TIME (IN HOURS CST)																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
DATE 10TH SEPTEMBER																								
PRESSURE(MB)	.		.		.		997.0		996.3		995.6		992.2		989.5		988.2		987.5		988.8		986.1	
		.		.		.		996.8		996.3		993.2		990.5		988.8		987.5		988.5		988.2		986
WIND DIR(DEG)									040	04	040	040	040	040	040	040	040	040	040	040	040	040	040	040
WIND SPD (KT)									22	23	24	25	27	25	29	30	35	34	36	38	36	39	46	46
GUST (KT)									45	43	37	42	47	47	50	63	52	59	59	59	59	63	73	75
DATE 11TH SEPTEMBER																								
PRESSURE(MB)	985.4		983.7		982.7		983.4		983.1		982.7		982.1		979.3		980.4		982.1		985.4		988.1	
		984.8		983.1		982.7		983.4		983.4		982.1		980.4		979.7		981.7		983.7		986.8		988
WIND DIR(DEG)	040	040	040	040	040	040	040	040	040	04	040	040	040	040	040	040	040	040	040	040	040	040	040	040
WIND SPD (KT)	45	43	42	40	40	43	43	43	42	41	39	39	36	35	33	30	31	30	30	29	28	26	25	25
GUST (KT)	71	71	76	69	69	71	70	69	68	67	67	64	60	58	56	54	52	56	52	53	47	50	43	37
DATE 12TH SEPTEMBER																								
PRESSURE(MB)	988.8		989.2		991.2		993.6		995.6		996.6		997.0		998.0		998.7		999.0		1000.0		1000.3	
		988.8		990.2		992.2		995.3		996.3		996.6		997.3		998.3		999.0		999.3		1000.3		1000
WIND DIR(DEG)	040	040	040	040	040	040																		
WIND SPD (KT)	24	24	23	23	23	22																		
GUST (KT)	43	43	35	42	36	33																		

DATA ENTERED ONLY FOR THOSE TIMES THAT WERE AVAILABLE

Table A.2--(continued)

DOW CHEMICAL (PLANT A) FREEPORT TEXAS
LATITUDE 28 47'N LONGITUDE 95 18'W

	TIME (IN HOURS CST)																					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
DATE	10TH SEPTEMBER																							
PRESSURE(MB)	1002.4	1000.7		998.5		996.3		995.6		995.3		993.6		990.9		988.2		985.8		988.5		986.5		
		1001.7		1000.0		997.0		995.9		995.3		994.9		992.2		989.2		986.8		986.1		987.8		985
DATE	11TH SEPTEMBER																							
PRESSURE(MB)	985.0		982.7		982.1		981.7		981.4		981.7		982.1		981.0		979.0		981.4		984.4		985.4	
		984.8		982.1		981.7		981.4		981.4		981.7		982.1		979.3		979.3		982.1		985.1		985
DATE	12TH SEPTEMBER																							
PRESSURE(MB)	987.5		988.5		989.2		990.5		992.5		995.3		996.6		998.0		998.7		999.3		1000.3		1001.0	
		988.2		988.8		989.5		991.5		993.9		996.3		997.6		998.7		999.0		999.7		1000.7		1001

DATA ENTERED ONLY FOR THOSE TIMES THAT WERE AVAILABLE

Table A.2--(continued)

PALACIOS TEXAS (FSS FAA) LATITUDE 28 43'N LONGITUDE 96 15'W

	TIME (IN HOURS CST)																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
DATE 9TH SEPTEMBER																								
PRESSURE(MB)	1010.8	1009.5		1009.1		1009.5		1010.2		1010.2		1008.1		1006.8		1006.8		1006.1		1006.1		1005.1		
		1010.2		1009.1		1009.1		1009.5		1010.2		1009.1		1007.8		1006.8		1006.4		1006.1		1006.1		1004
WIND DIR(DEG)	020	020	020	360	020	020	020	020	040	040	040	040	020	020	040	020	020	020	020	040	020	020	020	020
WIND SPD (KT)	6	8	9	10	12	10	11	11	13	14	15	12	13	11	18	17	18	13	12	13	12	15	18	16
GUST (KT)												20					23						23	
DATE 10TH SEPTEMBER																								
PRESSURE(MB)	1004.1	1002.0		1001.0		1001.0		1000.0		999.0		996.3		993.2		991.5								
		1003.4		1001.4		1001.0		1000.0		1000.0		997.6		994.9		992.6		991.2						
WIND DIR(DEG)	020	020	020	020	020	020	020	360	360	360	020	020	020	020	020	020	020	020						
WIND SPD (KT)	17	18	20	18	19	18	17	17	20	2	25	25	25	30	35	35	36	30						
GUST (KT)	23	25	25	24	26	30	25	25	38	35	35	30	45	45	48	47	46	43						

DATA ENTERED ONLY FOR THOSE TIMES THAT WERE AVAILABLE

Table A.2--(continued)

UNION CARBIDE, SEADRIFT, TEXAS
LATITUDE 28 30'N LONGITUDE 96 46'W

	TIME (IN HOURS CST)																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
DATE 11TH SEPTEMBER																								
PRESSURE(MB)	984.4		981.0		976.6		976.0		975.3		974.3		967.8		951.6		936.7		958.3		971.2		978.7	
		984.8		978.0		976.3		975.3		975.3		974.3		961.1		944.8		947.5		965.8		975.3		982
WIND DIR(DEG)	020	020	020	020	020	020	040	040	040	04	040	040	040	020	020	360	290	270	250	230	200	200	200	200
WIND SPD (KT)	25	28	28	30	32	33	24	23	23	21	24	23	21	24	50	59	47	44	38	35	30	31	38	35
GUST (KT)	67	57	55	58	61	63	62	50	50	48	49	51	50	57	78	88	76	88	76	67	57	52	57	58
DATE 12TH SEPTEMBER																								
PRESSURE(MB)	984.1		987.1		990.9		994.6		997.6		999.0		1000.0		1000.0		1000.3		1001.2		1002.0		1003.1	
		985.1		988.8		992.9		996.3		999.0		999.3		1000.0		1000.0		1000.7		1001.4		1002.7		1003
WIND DIR(DEG)	200	200	200	200	200	200	200	200	200	20	200	200												
WIND SPD (KT)	35	35	30	31	30	25	21	16	17	19	19	20												
GUST (KT)	53	52	52	50	49	45	40	33	31	28	28	29												

DATA ENTERED ONLY FOR THOSE TIMES THAT WERE AVAILABLE

Table A.2--(continued)

ALCOA PLANT, POINT COMFORT, TEXAS
LATITUDE 28 30'N LONGITUDE 96 33'W

	TIME (IN HOURS CST)																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
DATE 10TH SEPTEMBER																								
PRESSURE(MB)	.	.		999.7		999.0		999.0		998.7		996.3		992.2		990.2		989.5		988.8		987.8		
	.		1000.3		999.3		999.0		998.7		997.6		994.2		991.2		991.2		988.5		988.5		984	
WIND DIR(DEG)																								
WIND SPD (KT)				21	21	20	18	22	20	21	22	26	24	24	25	31	32	35	37	41	30	31	35	41
GUST (KT)				30	30	35	36	39	33	36	37	45	41	43	47	52	55	57	61	62	63	53	58	67
DATE 11TH SEPTEMBER																								
PRESSURE(MB)	98 .7		980.7		979.0		976.6		976.6		975.3		972.6		960.4		967.8		980.7		994.6		1002.4	
		982.1		978.7		977.3		977.0		976.3		973.3		965.1		962.4		967.5		989.2		997.6		1003
WIND DIR(DEG)																								
WIND SPD (KT)	51	43	38	41	47	46	46	43	45	45	49	42	47	52	76									
GUST (KT)	82	70	65	64	71	71	67	71	72	63	64	63	69	78	105									

DATA ENTERED ONLY FOR THOSE TIMES THAT WERE AVAILABLE

Table A.2--(continued)

DU POINT PLANT, VICTORIA, TEXAS
LATITUDE 28 44'N LONGITUDE 96 54'W

	TIME (IN HOURS CST)																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
DATE 10TH SEPTEMBER																								
PRESSURE(MB)	1008.1	1007.1		1005.4		1004.7		1004.1		1004.1		1002.4		999.3		997.6		995.9		995.3		994.9		
		1007.8		1005.8		1005.1		1004.4		1004.1		1002.7		1001.4		998.0		996.6		995.3		994.9		992
WIND DIR(DEG)																								
WIND SPD (KT)	19	17	18	16	19	21	22	23	23	23	28	27	25	27	26	31	30	34	36	38	38	34	36	38
GUST (KT)	27	26	23	26	30	30	30	30	31	35	36	39	36	37	43	44	45	50	47	56	51	61	50	55
DATE 11TH SEPTEMBER																								
PRESSURE(MB)	990.5		998.8		996.5		984.8		983.1		982.1		976.6		965.1		951.6		953.6		966.8		976.0	
		990.2		997.1		985.4		984.1		982.7		979.3		971.9		958.3		950.9		961.7		972.9		979
WIND DIR(DEG)												030	020	020	020	020	010	330	290	250	240	230	220	210
WIND SPD (KT)	42	42	40	42	42	41	43	41	40	39	39	39	40	42	46	50	56	60	51	35	40	36	36	39
GUST (KT)	66	63	61	56	58	58	64	62	63	56	56	56	59	59	67	70	86	90	81	75	59	57	53	53
DATE 12TH SEPTEMBER																								
PRESSURE(MB)	982.1		985.8		989.5		993.2		996.6		999.0													
		983.7		988.1		991.5		994.9		997.0		999.3												
WIND DIR(DEG)																								
WIND SPD (KT)	36	33	33	30	30	31	30	26	23	24	21	22												
GUST (KT)	52	51	44	43	41	41	44	38	35	33	31	33												

DATA ENTERED ONLY FOR THOSE TIMES THAT WERE AVAILABLE

Table A.2--(concluded)

USNAAS KINGSVILLE, TEXAS LATITUDE 27 32'N LONGITUDE 97 53'W

	TIME (IN HOURS CST)																					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
DATE 9TH SEPTEMBER																								
PRESSURE(MB)	1010.8	1009.6	1009.1	1009.6	1009.6	1009.4	1008.1	1005.9	1005.7	1005.7	1005.5	1005.5												
	1010.0	1009.1	1009.2	1009.5	1010.0	1008.5	1006.8	1005.7	1005.5	1005.5	1005.7	1004												
DATE 10TH SEPTEMBER																								
PRESSURE(MB)	1004.2	1002.7	1001.9	1001.0	1000.6	999.5	998.0	996.2	994.0	992.2	991.6	991.0												
	1003.3	1001.9	1001.4	1000.7	1000.5	999.4	996.7	994.0	993.1	992.0	991.9	989												
DATE 11TH SEPTEMBER																								
PRESSURE(MB)	986.9	984.7	984.0	984.0	982.9	984.2	984.0	983.9	984.9	985.3	987.9	989.8												
	985.0	984.7	984.2	982.8	983.6	984.1	983.9	984.5	985.4	986.6	988.6	991												
DATE 12TH SEPTEMBER																								
PRESSURE(MB)	992.0	993.2	995.4	997.3	999.5	1000.9	1000.9	999.7	999.9	1000.7	1003.1	1003.3												
	992.4	994.4	996.3	998.3	1000.4	1000.9	1000.7	999.7	999.9	1001.7	1003.6	1002												

DATA ENTERED ONLY FOR THOSE TIMES THAT WERE AVAILABLE

Table A.3--Miscellaneous reports on sea level pressure

POINT COMFORT TEXAS GAS PROC PLANT 28-40'N 96-34'W			POINT COMFORT BAUER DREDGING CO. 28-40'N 96-34'W			PORT LAVACA BAUER DREDGING CO. 28-37'N 96-38'W			CHOCOLATE BAY SCHOONER LUTSA 28-34'N 96-38'W		
DATE/TIME (CST)		P(MB)	DATE/TIME		P(MB)	DATE/TIME		P(MB)	DATE/TIME		P(MB)
11	1345	965.1	11	1000	975.3	11	1325	964.4	11	1315	962.7
11	1404	964.4	11	1045	973.6	11	1342	962.7	11	1350	957.7
11	1423	961.7	11	1100	973.6	11	1348	962.4	11	1430	952.6
11	1430	960.4	11	1200	970.2	11	1400	961.1	11	1445	947.9
11	1440	958.3	11	1300	965.1	11	1405	959.7	11	1600	935.3
11	1449	956.0	11	1400	958.3	11	1417	959.4	11	1700	936.7
11	1452	955.0	11	1400	948.2	11	1427	957.0	11	1745	940.7
11	1500	954.0	11	1520	941.4	11	1430	955.3			
11	1507	952.6	11	1545	935.3	11	1450	950.2			
11	1514	950.9	11	1735	935.3	11	1505	946.8			
11	1518	949.5	11	1830	948.2	11	1522	941.4			
11	1525	948.2	11	2000	949.9	11	1550	937.5			
11	1526	947.5				11	1610	935.3			
11	1530	944.1				11	1830	951.6			
11	1540	942.1				11	1945	961.7			
11	1551	941.7				11	1955	964.4			
11	1554	939.7									
11	1556	939.7									

Table A.4--Pertinent data extracted from reconnaissance flight reports

DATE	TIME (CST)	STORM CENTER LAT	STORM CENTER LONG	SEA LEVEL PRESSURE (MB)	SURFACE WIND (KT)	EYE DIAMETER (N.MI)	REMARKS
8	1200	23 22	89 15	963		65	RFF MAX.WINDS 35-40N.MI.FROM CENTER
8	1300	23 20	89 21			46	
8	1400	23 27	89 19			45	
8	1500	23 35	89 37	959			
8	1533	23 31	89 26			60	RFF
8	1600	23 32	89 40	954			
8	1730	23 36	89 45**		100	45	
9	100	24 06	90 15	955		51	
9	315	24 12	90 54				
9	400	24 24	90 37		110	51	
9	530	24 34	90 46	954	110	45	
9	1240	24 55	92 00				RFF MAX.WINDS(90KT) 90N.MI FROM CENTER
9	1345	25 09	92 08**	948		45	RFF
9	1715	25 22	92 16	943		40	RFF
9	1900	25 38	92 50				
9	2200	26 00	93 11				
10	0	26 11	93 26				
10	406	25 53	93 30	942		40	
10	507	26 20	93 34**			40	
10	540	26 09	93 40**		110		
10	645	26 09	93 49	937	110	40	MAX.WIND 25N.MI FROM CENTER
10	800	26 18	94 00				
10	830	26 24	94 06				
10	900	26 30	94 06				
10	930	26 36	94 06				
10	1000	26 42	94 10	942	110	36	
10	1033	26 40	94 15**				
10	1300	26 58	94 03	936	130		100 KT WIND EXT 40 NMI FROM CENTER
10	1445	27 06	94 06	935			RFF
10	1515	27 08	94 08				
10	1700	27 16	94 30			29	
10	2130	27 06	95 29**				
10	2200	27 05	95 31**			29	
10	2230	27 13	95 40			30	
10	2300	27 12	95 42			30	
10	2330	27 12	95 42				
11	0	27 09	95 42			30	
11	30	27 06	95 36				
11	100	27 13	95 43			30	
11	200	27 22	95 43				
11	830	27 31	96 08**				
11	1045	28 09	96 10**				
11	1210	28 12	96 23	941	120	26	
11	1230	28 12	96 15			24	
11	1300	28 15	96 24				
11	1330	28 17	96 25				
11	1400	28 20	96 29				
11	1430	28 21	96 27				
11	1500	28 24	96 28				
11	1530	28 29	96 30				
11	1600	28 34	96 33				
11	1630	28 36	96 42				
11	1700	28 30	96 35				

** STORM CENTER FIXED BY RADAR

Table A.5--Radar eye positions reported by NWS stations

TIME (CST)	BROWNSVILLE LAT	BROWNSVILLE LONG	GALVESTON LAT	GALVESTON LONG	LAKE CHARLES LAT	LAKE CHARLES LONG
10TH SEPTEMBER						
600			26 07	93 57		
630			26 09	95 59	26 18	93 45
700			26 15	94 01	26 27	93 49
730			26 18	94 04	26 33	93 53
800			26 21	94 03	26 34	93 54
830			26 23	94 04	26 35	93 56
900			26 25	94 07	26 32	94 02
930			26 25	94 07		
1000			26 32	94 14	26 41	94 12
1030	26 29	94 07	26 36	94 19	26 42	94 16
1100	26 29	94 07	26 36	94 25	26 44	94 18
1130	26 32	94 17	26 38	94 28	26 39	94 22
1200			26 39	94 29	26 41	94 28
1230	26 38	94 34	26 39	94 34	26 36	94 30
1300	26 38	94 34	26 39	94 34	26 43	94 34
1330	26 40	94 35	26 39	94 39	26 43	94 35
1400	26 40	94 35	26 39	94 34	26 45	94 37
1430	26 44	94 38	26 44	94 39	26 48	94 37
1500	26 47	94 36	26 52	94 39	26 51	94 36
1530	26 54	94 40	26 56	94 41	26 57	94 38
1600	26 56	94 41	27 00	94 42	27 04	94 40
1630	27 01	94 45	27 04	94 47	27 07	94 43
1700	27 05	94 51	27 06	94 49	27 11	94 50
1730	27 08	94 58			27 12	94 56
1800	27 09	95 03	27 09	94 58	27 16	95 02
1830	27 10	95 06	27 14	95 05	27 16	95 05
1900	27 14	95 13	27 16	95 09	27 16	95 10
1930	27 12	95 18	27 15	95 17	27 11	95 17
2000	27 14	95 22	27 16	95 21	27 10	95 20
2030	27 12	95 22	27 12	95 28	27 11	95 26
2100	27 06	95 32	27 12	95 30	27 09	95 30
2130	27 08	95 33	27 07	95 34	27 08	95 36
2200	27 07	95 35	27 03	95 36	27 09	95 37
2230	27 06	95 36	27 03	95 36	27 07	95 37
2300	27 05	95 38	27 03	95 36	27 07	95 37
2330	27 06	95 36	27 12	95 39	27 10	95 40
11TH SEPTEMBER						
000	27 05	95 38	27 08	95 39	27 10	95 40
030	27 07	95 38			27 10	95 43
100	27 07	95 38	27 08	95 39	27 15	95 42
130	27 13	95 38	27 12	95 39	27 15	95 42
200	27 18	95 39	27 19	95 42	27 19	95 41
230	27 22	95 40	27 23	95 41	27 25	95 43
300	27 27	95 45	27 28	95 44	27 30	95 48
330	27 30	95 49	27 34	95 50	27 35	95 49
400	27 31	95 52	27 37	95 55	27 36	95 59
430	27 33	95 59	27 38	95 59	27 36	96 00
500	27 35	96 04	27 38	96 09	27 35	96 08
530	27 34	96 08	27 38	96 12		
600	27 36	96 14	27 34	96 17	27 35	96 16
630	27 32	96 11	27 34	96 16	27 36	96 11
700	27 32	96 12	27 34	96 20	27 33	96 14
730	27 31	96 10	27 33	96 16	27 31	96 11
800	27 31	96 10	27 30	96 13	27 32	96 07
830	27 36	96 07	27 34	96 10	27 38	96 04
900	27 37	96 11	27 35	96 10	27 40	96 04
930	27 41	96 11	27 37	96 10	27 46	96 05
1000	27 43	96 10	27 37	96 10	27 48	96 08
1030	27 47	96 12	27 51	96 15	27 49	96 11
1100	27 49	96 11	27 55	96 16	27 56	96 13
1130	27 55	96 15	27 58	96 16	28 00	96 14
1200	27 58	96 17	28 01	96 18	28 00	96 16
1230	28 02	96 23	28 03	96 20	28 07	96 18
1300	28 08	96 24	28 12	96 21	28 10	96 18
1330	28 11	96 24	28 13	96 22	28 14	96 20
1400	28 15	96 26	28 15	96 28	28 19	96 22
1430	28 22	96 13	28 21	96 27	28 26	96 25
1500	28 27	96 35	28 21	96 27	28 27	96 26
1530	28 31	96 36	28 28	96 34	28 32	96 29
1600	28 34	96 37	28 34	96 34		
1630	28 37	96 41	28 38	96 31	28 38	96 36
1700	28 36	96 41	28 40	96 36	28 41	96 41
1730	28 37	96 48	28 40	96 36	28 45	96 40
1800	28 46	96 54			28 44	96 40
1830	28 46	96 42	28 45	96 48	28 48	96 41
1900	28 49	96 53	28 45	96 48	28 53	96 43
1930			28 54	96 51	28 58	96 43
2000			28 57	96 54	28 59	96 47
2030			29 00	96 54	29 03	96 46
2100			29 04	97 00	29 07	96 46
2130			29 08	97 03		
2200			29 10	97 06		
2230			29 14	97 06		
2300			29 18	97 06		
2330			29 26	97 17		

Table A.6--Sea level pressure and wind data from ship reports

SHIP IDENT	LAT	LONG	WIND DIR (DEG)	WIND SPD (KT)	PRESSURE (MB)
1800CST 8TH SEPTEMBER					
PJRAUS	19 0	86 6	170	24	1006.4
WBCW	20 42	95 24	290	22	1003.6
CRISTOBAL	21 42	85 6	160	25	1007.8
WCOQ	21 42	85 6	160	25	1007.8
	21 42	85 36	150	20	1006.4
SS J LOUIS	21 48	85 12	180	7	1008.1
GLIK	22 6	86 18	160	38	1003.1
MANAQUI	22 18	85 6	150	30	1005.4
	22 18	87 0	150	42	1001.6
BALAO	23 18	87 0	150	42	1001.6
DEL ORO	23 42	85 18	110	27	1008.6
JBCW	23 42	94 36	220	21	1004.1
GULFASAL	23 48	93 42	360	33	1000.1
KCSX	24 18	93 48	10	30	1003.4
	24 24	82 24	90	30	1011.6
DIONE	24 24	97 30	20	20	1007.1
	24 30	81 18	100	20	1012.9
KYOEI MARU	24 36	93 24	20	25	1003.6
	24 24	82 24	90	30	1011.6
KQTF	24 42	80 48	100	20	1012.6
WFOH	24 42	86 0	140	38	1006.4
	24 48	83 42	140	30	1010.6
ML GOSNEY	24 48	83 48	140	30	1010.2
EWSINCLAIR	24 48	93 0	10	38	1002.4
DEL SOL	25 0	94 54	30	25	1005.1
AMERTRADER	25 0	84 54	140	20	1010.2
MOBILPOWER	25 42	85 6	140	33	1010.2
	25 42	85 18	140	33	1010.2
AN KEMP	25 48	88 54	90	37	1001.4
PENN SUN	26 36	90 48	80	41	1002.1
KESE	26 36	93 54	50	35	1005.8
J E DYER	26 48	93 54	50	30	1006.8
NWFE	27 12	83 12	150	18	1013.2
TEXICO CON	27 12	87 42	80	35	1006.4
KRRJ	27 18	85 54	110	40	1010.8
CLARKESWHF	27 24	88 36	100	35	1006.8
TEXACOMONT	27 30	93 30	40	30	1009.1
KOFZ	27 36	87 24	110	35	1009.8
KYMU	28 12	90 48	90	45	
NKGL	28 12	91 36	90	35	1008.6
SSFLYING	28 36	93 54	60	25	1009.8
KWTK	28 42	87 18	90	30	1009.6
	28 42	87 18			1010.2
KSOE	28 42	87 24	130	27	1011.2
	28 42	87 24	130	27	1011.2
KRQW	23 54	92 24	60	27	1009.8
FLYINGWASH	29 0	92 54	80	25	1010.2
	29 48	80 24	90	11	1016.2
KAEO	29 48	89 48	100	25	1007.6
PCUO	29 54	87 30	100	25	1012.1

Table A.6--(continued)

SHIP IDENT	LAT	LONG	WIND DIR (DEG)	WIND SPD (KT)	PRESSURE (MB)
2100CST 8TH SEPTEMBER					
MANAQUI	22 0	85 0	170	30	1006.4
CRISTOBAL	22 24	85 24	120	25	1008.6
WCOQ	22 24	85 24	120	25	1008.6
NCSK	23 12	94 54	40	24	1004.8
TEXACO FLA	23 18	94 24	350	35	1003.7
DEL ORO	24 18	85 42	110	22	1009.1
WFOH	24 36	86 18	140	35	1006.8
AN KEMP	25 42	88 24	100	40	1003.1
PENNSYLSUN	26 36	90 18	80	45	1001.4
SABINE SUN	26 36	93 24	70	34	1005.8
DEL MUNDO	28 30	87 24	90	60	1011.2
JE DYER	26 48	93 0	50	22	1006.1
KIMA	28 30	92 30	50	30	1009.8
SS FLYING	28 30	93 6	70	26	1010.2
GULF LUBE	28 36	91 48	60	30	1009.8
PCUO	29 30	86 42	100	24	1013.1
SHIP	29 30	86 42	100	24	1013.1
0000CST 9TH SEPTEMBER					
GLFSHIPPER	19 54	84 12	140	22	1011.2
HBFH	20 42	95 6	310	33	1004.4
	21 48	84 48	170	25	1007.6
MANAQUI	21 54	85 6	160	25	1006.4
	22 24	86 36	160	25	1005.8
BALAO	23 0	87 36	140	55	1001.6
CRISTOBAL	23 18	85 18	120	25	1008.6
WCOQ	23 18	85 18	120	25	1008.6
WLCI	23 18	95 30	320	20	1005.8
JOHF	23 42	93 42	350	18	1002.1
	24 36	86 42	120	38	1006.1
DEL ORO	24 48	86 6	110	22	1009.1
DIONE	24 54	97 18	20	18	1007.8
ESSONEWARK	25 0	84 0	120	28	1012.9
NOMAD	25 0	90 0	90	43	
	25 6	84 0	130	30	1010.2
ATL NAVIG	25 12	84 6	140	21	1012.9
AN KEMP	25 36	88 0	100	40	1003.1
	25 36	84 48	140	25	1010.8
AMERTRADER	25 54	85 48	140	20	1010.2
	26 12	84 48	130	35	1011.9
MOBILPOWER	26 30	86 54	120	38	1008.8
PENNSYLSUN	26 42	89 48	90	45	1000.3
	26 42	86 0	120	27	1009.6
	27 12	87 0	30	42	1007.1
	27 24	89 36	80	45	1005.8
DEL MUNDO	28 0	86 54	90	35	1009.8
WKIM	28 18	91 18	90	30	1010.8
KSOE	28 24	86 30	70	20	1011.7
PCUO	29 12	86 6	100	23	1012.1

Table A.6--(continued)

SHIP IDENT	LAT	LONG	WIND DIR (DEG)	WIND SPD (KT)	PRESSURE (MB)
0300CST 9TH SEPTEMBER					
JBCW	21 30	95 6	300	21	1002.8
TAIYUMARU	21 48	92 54	310	34	998.3
KYOEI MARU	22 54	93 54	330	26	1000.1
CRISTOBAL	24 24	85 12	90	25	1009.1
	24 24	85 12	100	49	1009.1
NOMAD	25 0	90 0	80	42	
DEL ORO	25 18	86 18	110	22	1009.1
SABINE SUN	26 36	92 30	70	45	998.3
PENNSYLSUN	26 48	89 12	90	50	999.7
JE DYER	26 48	91 12	70	30	999.7
KEMA	23 18	91 18	80	34	1005.4
PCUP	28 48	85 12	100	23	1011.6
0600CST 9TH SEPTEMBER					
CAMPATVES	19 6	91 24	240	30	999.1
GLFSHIPPER	21 12	85 0	150	30	1009.8
MANAQUI	21 36	84 54	150	27	1006.8
TAIYUMARU	22 0	92 24	290	32	997.6
HBFH	22 0	95 30	290	40	1002.1
KEHS	22 18	94 30	330	40	1001.4
KDEL MARU	22 48	93 36	300	34	998.6
EWSINCLAIR	23 0	94 0	320	45	1000.1
	23 6	87 30	150	25	1005.1
GULFASAL	23 24	94 0	290	30	999.1
BALAO	23 36	87 36	140	45	1003.7
SSHARSINAI	24 0	87 30	160	32	1008.1
	24 42	87 18	130	40	1003.1
NOMAD	25 0	90 0	110	43	
	25 12	84 42	140	15	1010.8
AN KEMP	25 18	87 18	140	40	1003.1
CRISTOBAL	25 30	85 6	140	27	1009.8
DEL ORO	25 30	86 36	140	21	1008.6
	25 36	84 6	140	27	1011.6
	25 36	85 24	120	30	1009.1
ACHILLES	25 36	85 18	160	40	1009.1
NRGV	25 36	96 54	60	21	1004.4
ESSONEWARK	25 42	85 36	140	34	1011.2
TILLAMOOK	26 6	84 36	140	21	1011.2
AL E WATTS	26 12	85 42	140	40	1008.6
ML GOSNEY	26 18	86 12	150	40	1007.8
	26 36	86 0	130	30	1006.6
SABINE SUN	26 42	91 36	70	50	995.6
	26 54	86 18	140	30	1009.6
PENNSYLSUN	26 54	88 36	110	45	1002.7
JE DYER	26 54	90 30	80	40	997.6
AMERTRADER	27 0	86 54	140	25	1008.8
MOBILPOWER	27 18	88 24	140	40	1006.4
	27 30	84 18	110	35	1012.9
	27 30	88 54	110	40	1005.8
CLARKESMHF	27 42	87 42	110	35	1008.6
KCVE	27 42	95 0	30	50	1007.4

Table A.6--(continued)

SHIP IDENT	LAT	LONG	WIND DIR (DEG)	WIND SPD (KT)	PRESSURE (MB)
0600CST 9TH SEPTEMBER					
WKIM	27 54	90 12	90	30	1008.6
	28 12	91 6	90	40	1005.1
TEXACO MD	28 18	93 24	70	35	1005.8
	28 30	94 30	100	23	1011.8
RIO MANAMO	29 0	87 42	100	33	1010.1
MS OKERTAL	29 18	87 42	100	24	1010.6
0900CST 9TH SEPTEMBER					
	21 12	94 36	280	31	1003.6
KEHS	22 24	93 54	310	40	1000.3
KYOEI MARU	22 54	92 54	310	35	997.1
GULFASAL	23 0	93 48	270	35	999.1
RC TUTTLE	24 36	87 12	140	40	1005.8
ANKEMP	25 0	87 6	140	40	1004.1
SABINE SUN	25 30	91 12	70	50	992.2
DEL ORO	26 12	87 6	130	21	1009.1
JE DYER	26 30	91 30	90	60	995.6
DEL MUNDO	26 42	95 30	90	45	1011.3
PENNSYLSUN	26 42	88 6	120	45	1003.7
CLARKESWHF	27 36	97 36	110	35	1003.8
WKIM	27 48	90 6	110	34	1005.1
GULF LUBE	27 48	90 24	100	40	1003.7
KEMA	28 0	90 24	100	45	1004.4
	28 18	92 54	90	40	1005.8
ALCOAROAMR	28 36	96 36	140	25	1013.2
RIOMANAMO	28 36	87 42	120	33	1010.1
TEXACOMONT	29 30	92 36	60	35	1004.4
1200CST 9TH SEPTEMBER					
	20 48	86 36	120	24	1009.1
MANAQUI	21 24	84 36	140	25	1003.8
	21 24	94 0	270	33	1002.8
DEL SOL	21 42	94 18	320	35	1003.1
TAIYU MARU	22 0	91 0	250	30	999.1
MARIESKOU	22 12	90 54	150	30	998.6
TEXACO FLA	22 24	93 30	290	40	997.6
GLFSHIPPER	22 30	85 42	140	35	1010.6
	22 48	78 24	90	10	1016.1
KYOEI MARU	23 0	92 6	260	38	994.1
GULFASAL	23 18	93 42	270	35	997.3
	23 30	87 48	150	30	1005.4
BALAO	23 48	87 12	140	40	1006.6
	23 54	89 54	290	45	995.9
HAR SINAI	24 12	87 12	150	35	1007.6
	24 36	86 54	140	35	1007.1
	24 42	85 18	130	27	1009.8
AN KEMP	24 42	86 48	140	40	1005.3
NOMAD	25 0	90 0	150	43	

Table A.6--(continued)

SHIP IDENT	LAT	LONG	WIND DIR (DEG)	WIND SPD (KT)	PRESSURE (MB)
1200CST 9TH SEPTEMBER					
GULFCREST	25 6	84 0	120	20	1012.6
	25 6	84 42	140	27	1013.2
	25 30	84 0	140	28	1011.9
ML GOSNEY	25 30	86 6	140	40	1009.1
SABINE SUN	25 30	91 6	70	50	992.6
TILLAMOOK	25 36	85 30	130	25	1012.2
ESSONEWARK	26 0	86 24	150	28	1011.9
ACHILLES	26 0	86 24	140	30	1009.8
	26 30	84 42	110	35	1013.6
DEL ORO	26 30	87 6	130	38	1009.2
PENNSYLSUN	26 36	87 30	120	40	1006.8
ATL MAVIG	26 42	87 12	140	30	1009.3
	26 54	85 0	110	25	1013.2
JE DYER	26 54	91 6	90	60	995.6
CRISTOBAL	27 6	86 0	110	30	1012.6
	27 24	88 12	130	42	1008.6
MOBILELUBE	27 42	90 0	110	34	1001.1
MOBILPOWER	27 48	89 24	110	40	1007.1
	27 48	89 54	110	42	1003.7
	27 54	89 36	90	40	1006.4
FLUING A	28 6	90 24	90	50	1003.7
RIOMANAMO	28 18	87 12	120	33	1010.6
MS OKERTAL	28 24	87 0	100	30	1011.4
TEXACO MD	28 48	92 24	60	40	1004.4
	29 12	87 6	140	28	1013.9
	29 54	77 24	120	6	1015.6
	29 54	80 24	90	9	1018.2
	30 36	88 36	80	31	1012.2
1500CST 9TH SEPTEMBER					
KYOEI MARU	23 6	91 30	220	35	993.1
	24 36	86 36	150	22	1009.1
NOMAD	25 0	90 0	150	43	
ML GOSNEY	25 24	86 48	150	40	1008.1
	25 24	94 12	20	45	993.6
PENNSYLSUN	26 18	87 6	110	35	1005.8
DEL ORO	26 54	86 54	140	27	1008.8
JE DYER	26 54	90 42	100	60	995.3
CRISTOBAL	27 0	86 12	110	30	1010.6
TEXACOMONT	27 24	93 48	50	50	1000.3
WKIM	27 30	89 42	110	45	1003.4
RIOMANAMO	27 36	86 54	140	37	1008.7
	27 36	89 42	110	42	1001.7
	28 0	95 0	30	30	1004.4
LEADER	28 36	93 48	50	35	1002.6

Table A.6--(continued)

SHIP IDENT	LAT	LONG	WIND DIR (DEG)	WIND SPD (KT)	PRESSURE (MB)
1800CST 9TH SEPTEMBER					
HIYEHARUMR	20 0	92 42	250	33	1004.1
TAIYUMARU	22 12	98 30	190	30	1003.1
DEL SOL	22 18	92 18	250	35	993.3
	22 30	87 0	140	30	1008.1
KEHS	23 0	92 0	260	45	993.9
GULFASAL	23 12	93 48	270	41	994.6
MARU	23 30	90 30	130	42	996.6
EWSINCLAIR	23 42	93 36	290	65	991.6
J LOUIS	23 54	87 48	170	8	987.3
	24 0	89 18	160	38	998.6
	24 6	88 36	140	30	1003.4
BALAO	24 6	88 36	140	46	1003.6
HARSINAI	24 18	87 54	150	38	1005.7
ROBTTUTTLE	24 36	87 18	170	27	1008.1
	25 18	87 0	150	34	1009.1
AL E WATTS	26 0	85 48	140	30	1010.6
ATL NAVIG	26 18	87 18	150	35	1007.1
ACHILLES	26 18	87 24	140	36	1007.8
DEL ORO	26 30	87 0	130	40	1008.6
ESSONEWARK	26 30	87 30	130	38	1009.1
	26 48	86 36	110	33	1009.8
JE DYER	26 48	90 18	110	60	997.3
SABINE SUN	26 54	90 54	110	50	987.3
KFYM	27 6	94 12	50	50	997.3
	27 18	87 24	120	40	1007.8
CLARKS WHF	27 24	86 54	140	30	1010.2
IRIS	27 24	95 12	30	36	1002.1
GULF LUBE	27 30	89 30	110	46	1002.4
SPIRIT LIB	27 36	91 42	90	50	997.1
	27 48	89 48	120	56	1001.7
FLYING A	27 48	89 48	120	56	1001.7
MOBILPOWER	28 6	90 6	110	40	1005.1
	28 30	88 30	140	16	1012.2
LEADER	28 30	93 24	60	32	1001.1
	30 6	88 18	80	32	1012.6
	30 6	88 30	90	30	1012.2
	30 30	87 6	80	30	1013.9
2100CST 9TH SEPTEMBER					
TAIYU MARU	22 18	88 42	150	27	1007.1
KEHS	23 6	91 36	220	45	994.9
ML GOSNEY	25 18	87 12	140	40	1008.6
SABINE SUN	26 42	90 36	110	50	993.9
IRIS	26 54	95 24	20	40	999.7
0000CST 10TH SEPTEMBER					
MARIE SKOU	22 18	87 42	150	25	1009.6
HIYEHARUMR	22 36	91 12	180	33	1001.3

Table A.6--(continued)

SHIP IDENT	LAT	LONG	WIND DIR (DEG)	WIND SPD (KT)	PRESSURE (MB)
0000CST 10TH SEPTEMBER					
HIYEHARUMA	22 36	91 12	180	33	1001.3
GULFASAL	23 0	94 0	230	41	994.6
DEL SOL	23 6	90 12	160	40	1002.4
	24 6	87 30	140	24	1009.1
	24 6	88 12	160	33	1004.7
	24 24	89 18	160	30	1005.1
	24 48	88 18	160	35	1008.6
ML GOSNEY	25 12	87 30	160	40	1008.6
TILLAMOOK	25 30	87 24	130	36	1009.1
ATL NAVIG	26 6	88 6	140	35	1009.1
	26 18	85 30	360	40	995.3
ACHILLES	26 36	88 0	140	30	1007.1
ESSONEWARK	26 42	88 18	130	40	1009.1
	26 54	87 54	150	32	1009.1
	27 0	87 36	140	20	1008.8
	27 18	89 0	120	45	1006.4
MOBIL LUBE	27 18	89 12	120	45	1006.8
	27 18	89 24	120	50	1005.1
	27 48	88 54	90	35	1007.6
MOBILPOWER	28 0	87 30	110	40	1006.4
AMERTRADER	28 0	88 24	140	40	1009.6
	28 0	86 30	40	40	1003.1
	30 6	88 30	30	31	1014.6
0300CST 10TH SEPTEMBER					
NODN	25 54	95 36	360	40	992.2
JE DYER	26 24	88 48	140	45	1003.1
CRISTOBAL	27 0	87 24	140	30	1009.6
0600CST 10TH SEPTEMBER					
HIYEHARUMR	23 0	89 36	160	33	1005.2
OEGANYA	23 54	87 6	150	22	1008.3
DEL SOL	24 0	88 42	160	30	1005.8
	24 48	89 12	170	30	1007.1
NEHS	24 0	90 0	180	50	1002.4
IKE	24 0	93 30	230	45	993.9
SINAI	24 30	89 0	150	35	1005.6
EWSINCLAIR	24 54	93 30	250	70	992.2
BALAO	25 0	90 48	150	45	1000.7
	25 6	85 30	310	40	999.1
ML GOSNEY	25 24	88 12	150	35	1007.8
TILLAMOOK	25 30	88 0	170	35	1004.6
	25 36	86 0	150	30	1009.1
	25 48	88 6	170	26	1003.6
JE DYER	26 18	89 6	160	42	1005.8
ATL NAVIG	26 36	88 48	150	35	1007.6
SABINE SUN	26 42	90 18	140	40	999.7
ACHILLES	26 48	88 42	140	40	1006.4

Table A.6--(continued)

SHIP IDENT	LAT	LONG	WIND DIR (DEG)	WIND SPD (KT)	PRESSURE (MB)
0600CST 10TH SEPTEMBER					
	26 54	88 0	140	27	1008.8
	27 0	88 24	120	30	1007.8
	27 6	88 12	150	25	1008.1
GULFCREST	27 6	88 12	120	20	1007.6
MOBIL LUBE	27 6	88 30	140	30	1008.6
ESSONEWARK	27 12	88 48	150	32	1008.6
CRISTOBAL	27 24	87 48	140	27	1010.2
AL E WATTS	27 42	87 54	140	35	1009.1
MOBILPOWER	27 54	89 18	160	40	1006.1
HOEU	28 24	93 6	90	58	993.6
0900CST 10TH SEPTEMBER					
	21 48	93 18	230	30	1004.1
IRIS	24 30	96 6	290	50	994.9
TEXACO MT	25 6	95 6	310	60	988.2
ML GOSNEY	25 36	88 30	160	35	1009.1
DAPO	26 30	88 12	170	24	1010.1
CRISTOBAL	27 48	88 12	150	30	1011.2
LEADER	28 24	93 6	110	70	993.1
1200CST 10TH SEPTEMBER					
	22 42	88 12	130	27	1009.6
	23 0	89 6	160	25	1008.6
GULFASAL	23 18	92 18	160	28	1002.4
DEL SOL	24 0	87 0	110	30	1010.6
IRIS	24 0	95 54	270	40	997.6
ALMIRANTE	24 30	87 0	160	20	1012.6
SCHROEDER	24 30	88 42	170	28	1008.7
EWSINCLAIR	24 30	93 18	200	65	999.9
	24 36	87 18	140	28	1012.2
J LOUIS	24 42	89 36	170	33	1008.1
	25 0	89 30	160	45	1006.4
NOMAD	25 0	90 0	150	43	973.9
BALAO	25 12	91 6	150	50	1001.6
ALLOBROGIA	25 24	96 30	300	45	995.1
DEGANYA	25 30	87 54	150	34	1009.3
TILLAMOOK	25 36	88 42	160	35	1007.6
ML GOSNEY	26 0	88 48	160	30	1007.6
MOBIL LUBE	26 24	87 18	150	30	1010.0
	26 24	89 48	140	40	1000.3
	26 30	87 6	140	22	1011.9
	27 12	88 42	160	24	1009.1
	27 18	87 12	140	30	1011.9
ACHILLES	27 18	89 12	140	40	1007.1
ATL NAVIG	27 18	89 30	160	35	1007.1
DEL ORO	27 24	87 54	170	25	1011.2
ESSONEWARK	27 30	89 36	170	35	1008.1
AMERICASUN	27 36	89 0	190	25	1008.8

Table A.6--(continued)

SHIP IDENT	LAT	LONG	WIND DIR (DEG)	WIND SPD (KT)	PRESSURE (MB)
1200CST 10TH SEPTEMBER					
GULFCREST	27 36	89 36	160	40	1006.4
MOBILPOWER	28 0	89 18	160	30	1009.1
CRISTOBAL	28 12	88 30	150	30	1010.2
LEADER	23 24	93 18	110	70	989.6
1500CST 10TH SEPTEMBER					
HIYEHARUNR	22 18	87 24	140	20	1008.6
LEONHAROT	22 48	92 12	180	37	1001.8
TEXACO FLA	24 12	88 48	170	40	1006.4
HARSINAI	25 12	90 0	150	30	1004.6
JE DYER	25 54	88 6	160	30	1008.6
ML GOSNEY	26 12	89 12	150	35	1007.1
ESSOBOSTON	26 24	87 30	150	27	1010.8
LEADER	28 24	93 30	110	70	986.6
1800CST 10TH SEPTEMBER					
MOBILPOWER	20 6	90 12	160	33	1006.8
ALLOBROGIA	22 12	97 42	140	15	1001.1
LEONHAROT	23 0	91 42	180	30	1003.1
GULFASAL	23 36	90 42	150	21	1004.7
IRIS	23 42	94 36	250	35	998.6
EWSINCLAIR	24 24	91 42	230	50	1002.4
BALAO	24 48	91 24	150	45	1001.6
TEXACOMONT	24 48	93 36	230	60	993.6
J LOUIS	25 18	89 54	170	9	1007.1
ALLOBOOBIA	25 30	96 6	260	46	990.6
ATL NAVIG	27 42	90 0	150	35	1007.1
ESSONEWARK	27 42	90 24	160	38	1006.8
GULFCREST	28 0	90 36	160	40	1004.1
LEADER	28 24	93 30	110	75	980.7
2100CST 10TH SEPTEMBER					
IRIS	23 18	94 30	240	27	1001.4
SSOVERO	24 42	91 6	130	37	1006.6
ALLOBROGIA	25 24	95 48	210	40	993.6
DAON	23 30	90 18	140	28	1006.2
SS OVERO	24 42	91 6	130	37	1006.6
0000CST 11TH SEPTEMBER					
EWSINCLAIR	24 36	91 0	150	35	1005.8
BALAO	25 0	91 36	150	40	1003.6
SSOVERO	25 6	90 48	100	30	1007.2

Table A.6--(continued)

SHIP IDENT	LAT	LONG	WIND DIR (DEG)	WIND SPD (KT)	PRESSURE (MB)
0000CST 11TH SEPTEMBER					
ALLOBROGIA	25 18	95 30	210	40	996.6
TILLAMOOK	26 36	90 12	140	30	1006.4
GULFCREST	27 54	90 36	160	40	1005.4
ATL NAVIG	28 12	90 54	140	30	1007.6
MOBILPOWER	28 18	91 6	140	33	1007.1
0300CST 11TH SEPTEMBER					
MOON	23 54	93 48	190	32	1000.1
0600CST 11TH SEPTEMBER					
SS TOTECO	20 30	96 36	140	15	1000.7
HARSINAI	25 0	90 0	140	30	1006.6
BALAO	25 48	92 18	150	45	1001.6
TILLAMOOK	27 0	90 48	170	35	1005.8
ML GOSNEY	27 54	90 12	130	35	1007.6
ESSONEWARK	28 0	91 42	160	42	1005.8
GULFCREST	28 12	90 42	160	40	1006.4
MOBILPOWER	28 36	92 0	140	35	1004.1
0900CST 11TH SEPTEMBER					
SCHROEDER	27 24	90 42	140	30	1007.6
ALOHASTATE	27 24	91 0	160	28	1007.1
ML GOSNEY	27 48	90 12	140	30	1007.8
1200CST 11TH SEPTEMBER					
NOMAD	25 0	90 0	140	43	978.7
J LOUIS	26 0	91 6	140	32	1008.1
BALAO	26 12	93 12	150	50	1001.6
	27 30	90 0	140	22	1008.8
ALOHASTATE	27 36	91 24	160	33	1007.1
ML GOSNEY	27 42	90 12	140	30	1007.8
TILLAMOOK	27 42	91 24	130	37	1007.1
SCHROEDER	28 0	91 0	140	32	1007.1
AMERICASUN	28 0	91 42	140	25	1006.4
ESSONEWARK	28 18	92 18	170	38	1005.1
GULFCREST	28 24	91 24	160	33	1005.4
MOBILPOWER	28 48	92 30	140	40	1003.4

Table A.6--(continued)

SHIP IDENT	LAT	LONG	WIND DIR (DEG)	WIND SPD (KT)	PRESSURE (MB)
1500CST 11TH SEPTEMBER					
IRIS	24 18	92 12	150	24	1002.4
TUTTLE	25 30	92 48	150	25	1004.1
1800CST 11TH SEPTEMBER					
IRIS	25 18	91 24	160	22	1003.4
ATLANTICLN	25 36	90 0	130	45	1008.1
SYLVALYKES	25 42	90 24	140	30	1006.8
	26 0	90 0	160	25	1010.2
J LOUIS	26 6	91 42	270	8	1005.6
HARSINAI	26 30	90 54	150	35	1006.6
AL E WATTS	27 36	90 24	140	35	1008.1
BALAO	27 36	92 18	150	50	1001.6
DIAN	28 0	91 30	140	36	1004.1
GULFCREST	28 6	91 36	160	40	1004.7
TILLAMOOK	28 12	92 6	150	40	1005.1
LEADER	28 12	94 12	170	65	994.1
ESSONEWARK	28 18	92 18	150	34	1005.1
MOBILPOWER	25 36	92 6	160	40	1003.4
0000CST 12TH SEPTEMBER					
ATLANTICLN	25 42	90 48	140	30	1008.1
SYLVALYKES	26 18	91 6	140	33	1007.1
ESSO LIMA	27 24	90 0	160	27	1010.2
BALAO	27 48	91 30	150	50	1001.6
GULFCREST	27 48	91 48	160	35	1005.8
ML GOSNEY	27 54	91 30	160	30	1007.6
ACHILLES	28 0	91 36	150	30	1007.8
MOBILPOWER	28 36	92 12	140	30	1007.1
TILLAMOOK	28 42	93 12	130	42	1003.1
ESSONEWARK	28 42	93 36	150	40	1003.7
0600CST 12TH SEPTEMBER					
MAMOS	25 0	90 0	140	43	979.2
NODN	25 48	92 42	150	23	1004.4
SYLVALYKES	27 18	92 12	150	33	1006.1
ESSO LIMA	27 48	91 0	160	35	1008.6
TILLAMOOK	28 0	93 54	150	40	1001.1
MOBIL OIL	28 12	91 18	160	22	1009.1
ML GOSNEY	28 18	92 30	160	35	1006.1
AL E WATTS	28 24	92 6	160	40	1006.1
GULFCREST	28 36	92 30	160	35	1007.1
ACHILLES	28 36	93 18	170	36	1003.7

Table A.6--(concluded)

SHIP IDENT	LAT	LONG	WIND DIR (DEG)	WIND SPD (KT)	PRESSURE (MB)
1200CST 12TH SEPTEMBER					
ATLANTICLN	26 12	93 48	140	22	1006.4
	27 48	90 42	140	32	1009.1
ESSO LIMA	28 0	91 18	160	35	1010.2
ML GOSNEY	28 30	92 54	160	35	1006.4
GULFCREST	29 0	92 54	160	30	1005.8
MOBIL OIL	29 18	92 36	150	27	1008.1

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