

QC  
995  
4672  
no. 8  
1977

NOAA Technical Memorandum NWS NHC - 8

ANNUAL DATA AND VERIFICATION TABULATION  
ATLANTIC TROPICAL CYCLONES 1977

Miles B. Lawrence, Paul J. Hebert and Staff, NHC

National Hurricane Center  
Miami, Florida  
March 1979

UNITED STATES  
DEPARTMENT OF COMMERCE  
Juanita M. Kreps, Secretary

NATIONAL OCEANIC AND  
ATMOSPHERIC ADMINISTRATION  
Richard A. Frank, Administrator

National Weather  
Service  
George P. Cressman, Director



Property of  
NOAA Coral Gables Library  
Gables One Tower  
1320 South Dixie Highway, Room 520  
Coral Gables, Florida 33145

4673

# NOAA TECHNICAL MEMORANDA

## NATIONAL WEATHER SERVICE, NATIONAL HURRICANE CENTER SUBSERIES

- The National Weather Service National Hurricane Center (NHC) subseries provides an informal medium for the documentation and quick dissemination of results not appropriate, or not yet ready, for formal publication. The series is used to report on work in progress, to describe technical procedures and practices, or to relate progress to a limited audience and hence will not be widely distributed.

Technical Memoranda originated at the National Hurricane Center prior to the establishment of this series are listed below. They were published as ESSA Technical Memoranda, Southern Region (SRTM); ESSA Technical Memoranda, WBTM; or NOAA Technical Memoranda, NWS.

Beginning with WBTM SR 38, the papers are available from the National Technical Information Service, U. S. Department of Commerce, 5285 Port Royal Road, Springfield, VA 22161. Prices vary; \$3.00 microfiche. Order by accession number shown in parenthesis at end of each entry.

### ESSA Technical Memoranda

- SRTM 28 The Weather Distribution with Upper Tropospheric Cold Lows in the Tropics. Neil L. Frank - September 1966
- WBTM SR 38 Florida Hurricanes. Gordon E. Dunn and Staff NHC - November 1967 (PB 182 220)
- WBTM SR 42 Memorable Hurricanes of the United States Since 1873. Arnold L. Sugg and Robert L. Carrodus - January 1969 (PB 182 228)
- WBTM SR 44 Climatology of Atlantic Tropical Cyclones by Two and One-Half Degree Latitude-Longitude Boxes. John R. Hope and Charles J. Neumann - February 1969 (PB 183 308)
- WBTM SR 45 On the Maximum Sustained Winds Occurring in Atlantic Hurricanes. Charles Holliday - May 1969 (PB 184 609)
- WBTM SR 46 Hemispheric Circulation and Anomaly Patterns Observed When Tropical Storms Reach Hurricane Intensity. Paul J. Hebert, NHC and Banner I. Miller, NHRL - May 1969 (PB 184 610)
- WBTM SR 47 Disturbances in the Tropical and Equatorial Atlantic. R. H. Simpson - June 1969 (PB 184 740)
- WBTM SR 49 A Mean Storm Surge Profile. Arnold L. Sugg - December 1969 (PB 188 422)
- WBTM SR 50 A Reassessment of the Hurricane Prediction Problem. Robert H. Simpson - February 1970 (PB 189 846)
- WBTM SR 51 The Satellite Applications Section of the National Hurricane Center. R. H. Simpson and D. C. Gaby - September 1970 (COM 71 00005)

### NOAA Technical Memoranda NWS

- NWS SR 53 The Decision Process in Hurricane Forecasting. R. H. Simpson - January 1971 (COM 71 00336)
- NWS SR 55 Digitized Atlantic Tropical Cyclone Tracks. John R. Hope and Charles J. Neumann - February 1971 (COM 71 00984)
- NWS SR 56 Memorable Hurricanes of the United States Since 1873. Arnold Sugg, Leonard G. Pardue and Robert L. Carrodus - April 1971 (COM 71 00610)
- NWS SR 58 Atlantic Hurricane Frequencies Along the U. S. Coastline. R. H. Simpson and Miles B. Lawrence - June 1971 (COM 71 00796)
- NWS SR 62 An Alternate to the HURRAN (Hurricane Analog) Tropical Cyclone Forecast System. Charles J. Neumann - January 1972 (COM 72 10351)
- NWS SR 63 A Statistical Method of Combining Synoptic and Empirical Tropical Cyclone Prediction Systems. Charles J. Neumann, John R. Hope and Banner I. Miller - May 1972 (COM 72 10553)
- NWS SR 69 Statistical-Dynamical Prediction of Tropical Cyclone Motion. Charles J. Neumann and Miles B. Lawrence - April 1973 (COM 73 10728)
- NWS SR 71 A Decision Procedure for Application in Predicting the Landfall of Hurricanes. R. H. Simpson and Brian R. Jarvinen - August 1973 (COM 73-11663/AS)
- NWS SR 72 Objective Analysis of the Sea Surface Temperature. Brian R. Jarvinen - August 1973 (COM 73-11643)
- NWS SR 81 The Effect of Initial Data Uncertainties on the Performance of Statistical Tropical Cyclone Prediction Models. Charles J. Neumann - March 1975 (COM 75-10483/AS)
- NWS SR 82 A Statistical Study of Tropical Cyclone Positioning Errors with Economic Applications. Charles J. Neumann - March 1975 (COM 75-11362/AS)
- NWS SR 83 A Satellite Classification Technique for Subtropical Cyclones. Paul J. Hebert and Kenneth O. Poteat - July 1975 (COM 75-11220/AS)
- NWS NHC 1 Annual Data and Verification Tabulation of Atlantic Tropical Cyclones 1974. John R. Hope and Staff, NHC - January 1976 (PB285261/AS)
- NWS NHC 2 Annual Data and Verification Tabulation - Atlantic Tropical Cyclones 1975. Paul J. Hebert and Staff, NHC - January 1977 (PB285263/AS)
- NWS NHC 3 Intensification Criteria for Tropical Depressions in the Western North Atlantic. Paul J. Hebert - April 1977 (PB285415/AS)
- NWS NHC 4 Annual Data and Verification Tabulation of Atlantic Tropical Cyclones 1976. Paul J. Hebert and Staff, NHC - May 1977 (PB285262/AS)
- NWS NHC 5 Atlantic Tropical Cyclone Tracks by 5-, 10-, 15-, and 30-Day Periods. Brian J. Jarvinen and Charles J. Neumann - May 1978 (PB284009/AS)

## INTRODUCTION

This is the fourth report of an annual series prepared by the National Hurricane Center (NHC) to provide a source of summarized data on Atlantic tropical cyclones. It will not duplicate the narrative overview of the hurricane season and the description of the individual storms, which will continue to be published in the Monthly Weather Review.

In addition to data supplied by the National Weather Service, materials have been furnished by the NOAA National Environmental Satellite Services (NESS) Miami office, and the CARCAH (Chief Aerial Reconnaissance Coordination, all Hurricanes).

## OBJECTIVE FORECAST TECHNIQUES

The following tropical cyclone prediction models were used at the National Hurricane Center for forecasting motion on an operational basis:

1. NHC-67 (Miller, Hill, Chase, 1968) A stepwise screening regression model using predictors derived from the current and 24-hour old 1000, 700, and 500 mb data, and includes persistence during the early forecast periods.
2. SANBAR (Sanders and Burpee, 1968). A filtered barotropic model using input data derived from the 1000 to 100 mb pressure weighted winds. The model requires the use of "bogus" data in data-void areas. The system was modified by Pike (1972) so that the initial wind field near the storm would conform to the current storm motion.
3. HURRAN (Hope and Neumann, 1970). An analog system using as a data base the tracks of all Atlantic tropical storms and hurricanes dating back to 1886
4. CLIPER (Neumann, 1972). Stepwise multiple screening regression using the predictors derived from climatology and persistence

5. NHC-72 (Neumann, Hope, Miller, 1972). A modified stepwise multiple screening regression system which combines the NHC-67 concept and the CLIPER system into a single model
6. NHC-73 (Neumann and Lawrence, 1973). Similar in concept to the NHC-72 except it also uses the "perfect prog" and MOS (model output statistics) methods to introduce NMC (National Meteorological Center numerical prognostic data into the prediction equations.
7. NMC MFM MODEL (Hovermale, 1975). A ten-level baroclinic model which uses a moving fine mesh (MFM) grid nested within the coarser (NMC) fixed grid primitive equation (PE) model. It is capable of predicting both track and intensity changes.

The National Hurricane Center uses the above models as guidance in the formulation of its forecasts. The hurricane forecaster also makes extensive use of analyses and prognoses produced by NMC and RCTM (Regional Center for Tropical Meteorology) in Miami.

#### VERIFICATION

Verification statistics for the 1977 season are shown in Table 1 (Pelissier, 1977). The initial position error in Table 1 is the difference between the operational initial position and that determined during post analysis (best track position). The forecast displacement error is the vector difference between the forecast displacement and the actual displacement computed from best-track positions. The landfall prediction error for the official forecast is given in Table 2. It is defined as the distance from the predicted landfall point, made 24 hours prior to actual landfall, to the actual landfall point. In cases where a storm either crossed an island or made landfall when predicted to remain offshore, the error was designated as the distance from the landfall point to the nearest point on the forecast track.

A new verification statistic included in this year's data tabulation is tropical cyclone warning lead times. Table 3 lists the warning times for United States landfalling tropical storms and hurricanes during the period 1970-1977 together with the average warning lead time for the 15 cases during the same period. These figures, together with the discussion of the method employed which is presented in the following paragraphs, were prepared by Joseph Pelissier of NHC.

There are four factors which make it difficult to obtain an accurate appraisal of the timeliness of tropical cyclone warnings. First, the density of coastal observations is invariably insufficient to resolve either the time of onset or the areal extent of gale-force and hurricane-force winds. Second, coastal reports usually represents an underestimate of the maximum wind speed due to exposure and terrain effects. Third, since warnings cover an expanse of the coast, certain segments will feel the effects of the storm before others. If the storm approaches the coast at an acute angle, this difference may be great. Fourth, when a hurricane makes landfall, it is frequently preceded by a sequence of warning issuances as the forecast is continuously refined. Accordingly, gale warnings may be superseded by hurricane warnings, warnings may be adjusted as a storm's track changes

As a first approximation to determining the average lead-time, the times of warning issuance were examined for all storms which crossed the United States coastline during the period 1970-1977. These times were then compared with the respective times of actual landfall as determined from 'best tracks'. In a case in which a sequence of warnings was issued, the warning time chosen was that at which the appropriate warning was issued for the actual landfall point, e.g. if gale warnings were upgraded to hurricane warnings, the time that they were upgraded was the one chosen for verification.

The length of time between the issuance of the warnings and the time that the center crossed the coast, as determined from the 'best track' was taken as the warning lead-time. This represents an overestimate of the lead-time at the landfall point, since hurricane-force winds arrive on the coast before the passage of the eye. In the case of hurricane-force winds, this time difference is usually small, but in the case of a large, slow-moving storm the onset of gales on the coast may precede the eye by several hours

#### DATA SUMMARIES

A summary of 1977 North Atlantic tropical cyclone statistics is given in Table 4. Tracks of 1977 named storms are shown in Figure

The best track, initial, and forecast positions for 1977 named storms are in Table 5, along with initial position and forecast errors. Individual storm average errors are included this year for the first time.

Table 6 lists all center fix positions and intensity evaluations used operationally at the National Hurricane Center during 1977. Fixes are in chronological order, and include those obtained by aerial reconnaissance penetrations and radar, satellite (Miami SFSS), and land-based radar.

Vortex profiles presented in the previous data tabulations have been discontinued because of the difficulty of reproducing available graphics. However, in order to make the data available, the Supplementary Vortex Data Messages from which the graphics were produced are included in Table 7. A diagram of the paths flown in obtaining these Data Messages is given in Figure 2. The symbolic code for interpreting the Data Messages is given in Appendix

Table 8 is an aerial reconnaissance summary for the 1977 season.

Graphs of the lowest central pressure versus time for 1977 tropical cyclones are in Figure 3

Daily GOES-2 satellite photographs of 1977 named tropical cyclones are in Figure 4.

Selected radar photographs of hurricane Anita are in Figure 5

#### ACKNOWLEDGMENTS

Main contributors were: Ms Dorothy Mixon, who listed the center fixes in chronological order; Ms Mary Watson, who did the pressure-time graphs; Dr. Joseph Pelissier, who computed the verification statistics; Mrs. Charlotte M. Hinderliter, who typed the tables and manuscript

## REFERENCES

- Hope, J. R. and C. J. Neumann, 1970: "An Operational Technique for Relating the Movement of Existing Tropical Cyclones to Past Tracks", Monthly Weather Review, Vol. 98, No. 23, pp. 925-933.
- Hovermale, J. B., 1975: First season storm movement characteristics of the NMC objective hurricane forecast model. Minutes of the NOAA Hurricane Warning Conference, National Hurricane Center, Coral Gables, Florida.
- Miller, B. I., E. C. Hill and P. P. Chase, 1968: "Revised Technique for Forecasting Hurricane Motion by Statistical Methods", Monthly Weather Review, Vol. 96, No. 8, pp. 540-548.
- Neumann, C. J., 1972: "An Alternate to the HURRAN Tropical Cyclone Forecast System", NOAA Technical Memorandum NWS SR-62, 24 pp.
- J. R. Hope and B. I. Miller, 1972: "A Statistical Method of Combining Synoptic and Empirical Tropical Cyclone Prediction Systems", NOAA Technical Memorandum NWS SR-63, 32 pp.
- and M. B. Lawrence, 1973: "Statistical-Dynamical Prediction of Tropical Cyclone Motion (NHC-73)", NOAA Technical Memorandum NWS SR-69, 34 pp.
- Pelissier, J. M., 1977: Minutes of the NOAA Hurricane Warning Conference, National Hurricane Center, Coral Gables, Florida.
- Pike, A. C., 1972: "Improved Barotropic Hurricane Track Prediction by Adjustment of the Initial Wind Field", NOAA Technical Memorandum NWS SR-66, 16 pp.
- Sanders, F., and R. W. Burpee, 1968: "Experiments in Barotropic Hurricane Track Forecasting", Journal of Applied Meteorology, Vol. 7, No. 3, pp. 313-323.



LIST OF FIGURES, TABLES, AND APPENDIXES

PAGE NO.

8	Figure 1. Tracks of 1977 tropical cyclones
9	Figure 2. Flight pattern flown in obtaining Supplementary Vortex Data Messages.
10	Figure 3. Lowest pressure vs time, 1977 tropical cyclones
13	Figure 4. Daily GOES-2 satellite photographs of 1977 named tropical cyclones.
15	Figure 5. Selected radar photographs of hurricane Anita.
16	Appendix 1. Code for Supplementary Vortex Data Messages of Figure 7.
17	Table 1. Verification of 1977 tropical storm and hurricane forecasts. Figures in parenthesis are the number of cases.
17	Table 2. Landfall errors of 1977 tropical storms and hurricanes.
18	Table 3. Warning lead times for landfalling United States tropical storms and hurricanes during the period 1970-77.
19	Table 4. Summary of 1977 tropical cyclone statistics
20	Table 5. Best track, initial and forecast positions, initial position error and forecast errors for 1977 tropical cyclones.
24	Table 6. Center fix positions and intensity evaluations for 1977 tropical cyclones.
38	Table 7. Supplementary Vortex Data Messages, 1977 Atlantic tropical cyclones.
46	Table 8. Aerial weather reconnaissance summary for 1977 hurricane season.

NORTH ATLANTIC TROPICAL STORMS

ORIGINATING IN THE PERIOD

1977

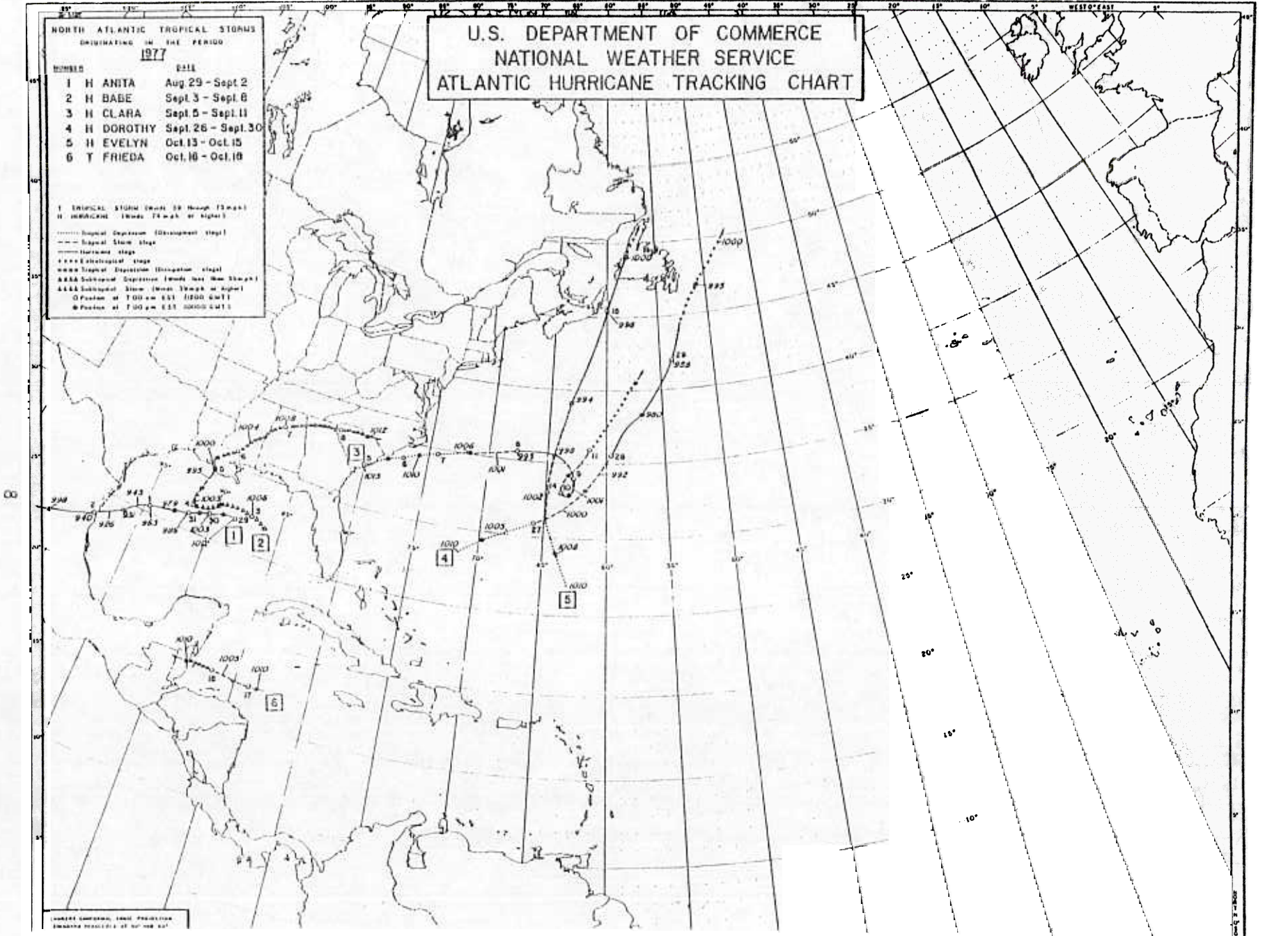
NUMBER	NAME	PERIOD
1	H ANITA	Aug 29 - Sept 2
2	H BABE	Sept 3 - Sept 6
3	H CLARA	Sept 5 - Sept 11
4	H DOROTHY	Sept 26 - Sept 30
5	H EVELYN	Oct 13 - Oct 15
6	T FRIEDA	Oct 16 - Oct 18

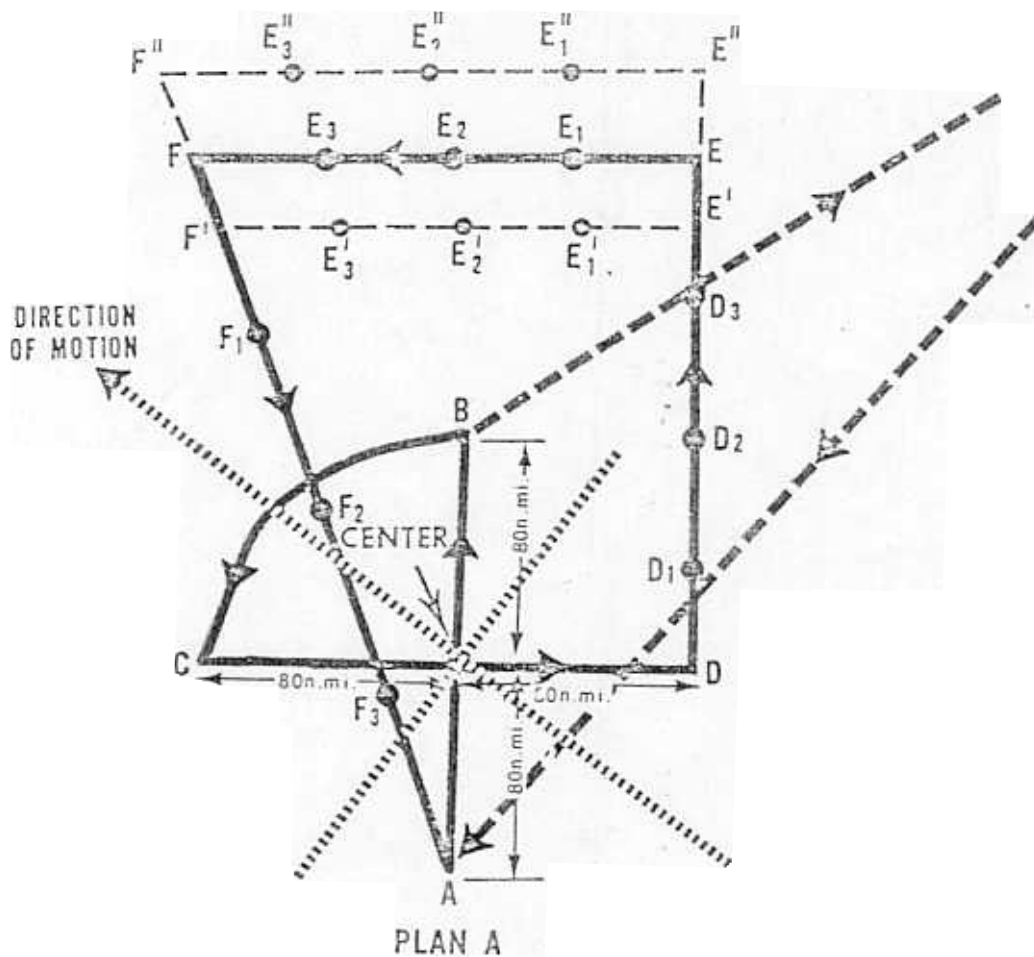
1 TROPICAL STORM (WINDS 39 THROUGH 73 MPH)  
 2 HURRICANE (WINDS 74 MPH OR HIGHER)

..... Tropical Depression (Development stage)  
 --- Tropical Storm stage  
 - - - Hurricane stage  
 - - - - Subtropical stage  
 - - - - Tropical Depression (Disruption stage)  
 - - - - Subtropical Depression (Winds less than 39 MPH)  
 - - - - Subtropical Storm (Winds 39 MPH or higher)

○ Position at 7:00 am EST (1800 GMT)  
 ⊙ Position at 7:00 pm EST (0000 GMT)

U.S. DEPARTMENT OF COMMERCE  
 NATIONAL WEATHER SERVICE  
 ATLANTIC HURRICANE TRACKING CHART





FLIGHT ALTITUDES	
A B C D	-- 10,000 FEET
D E F A	-- 1,500 FEET

Figure 2. Flight pattern flown in obtaining Supplementary Vortex Data Messages.

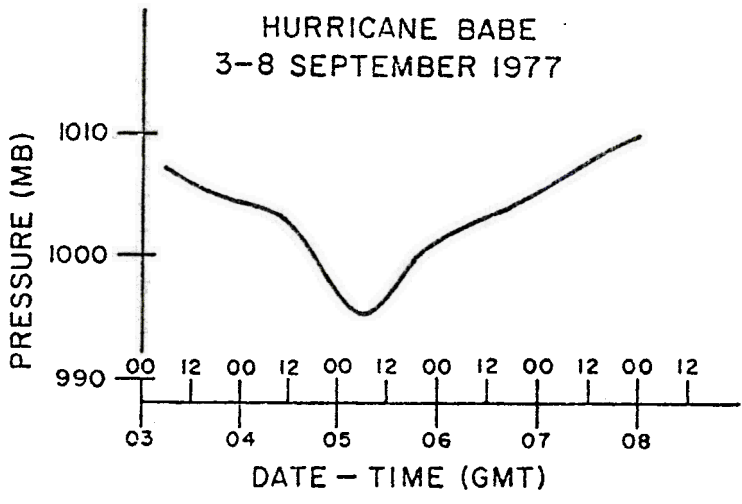
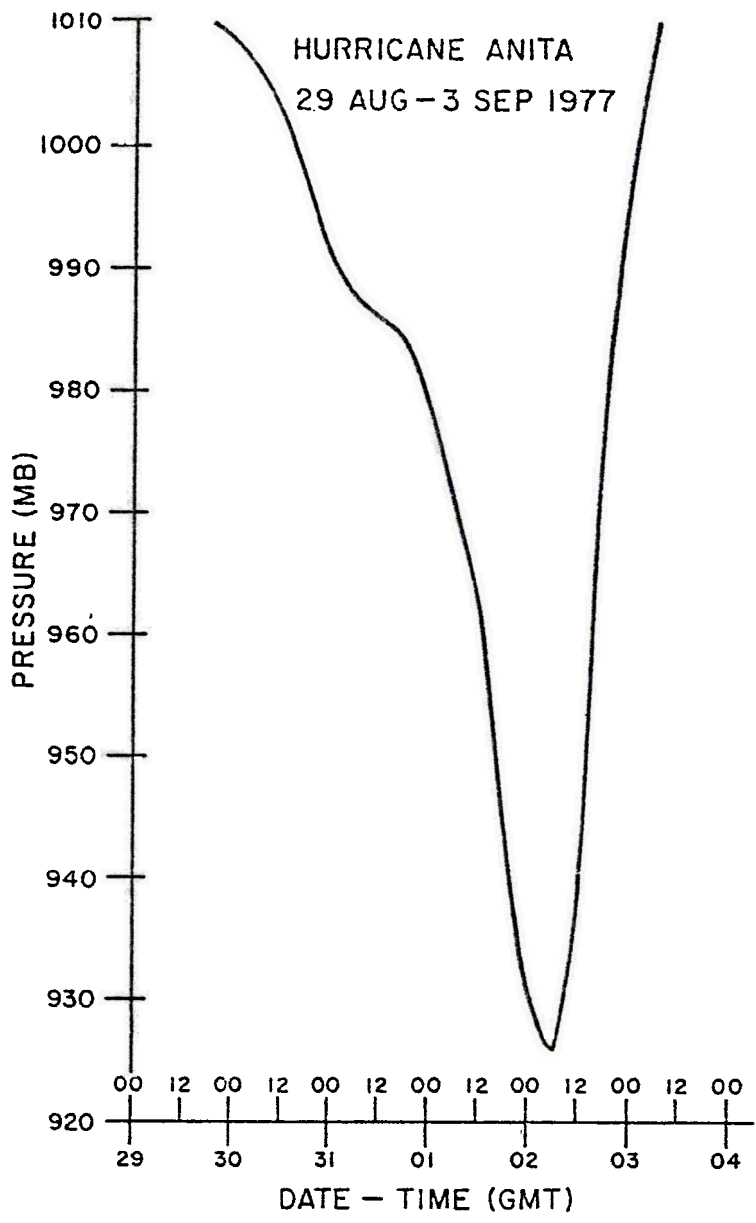


Figure 3. Lowest pressure vs time, 1977 Atlantic tropical cyclones

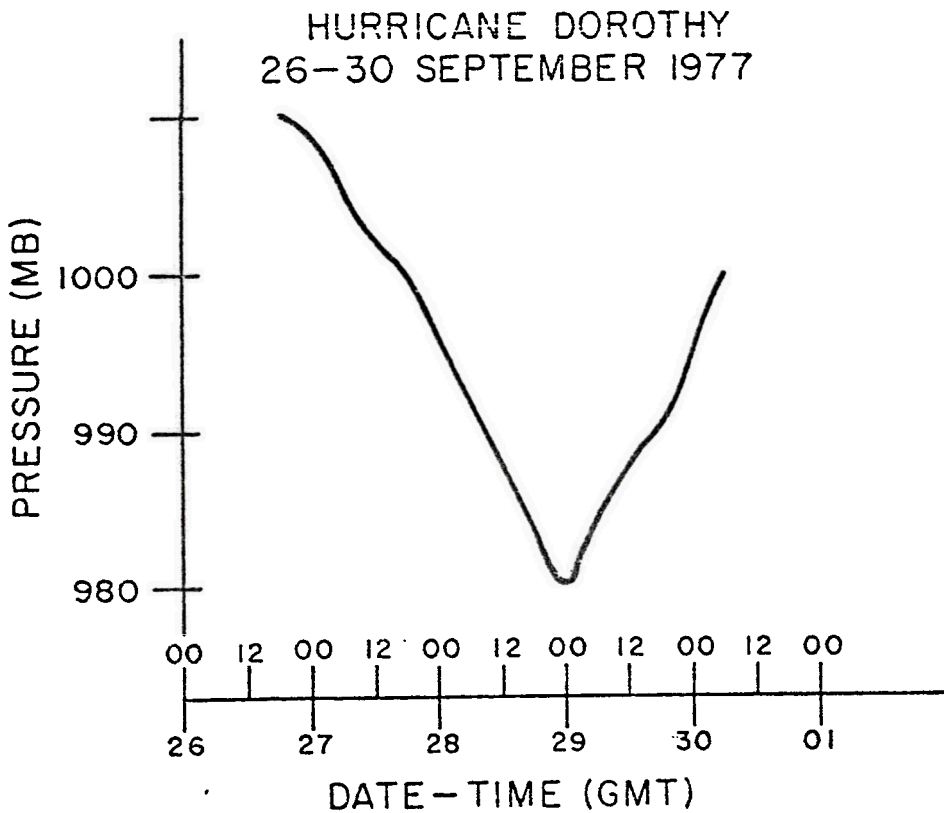
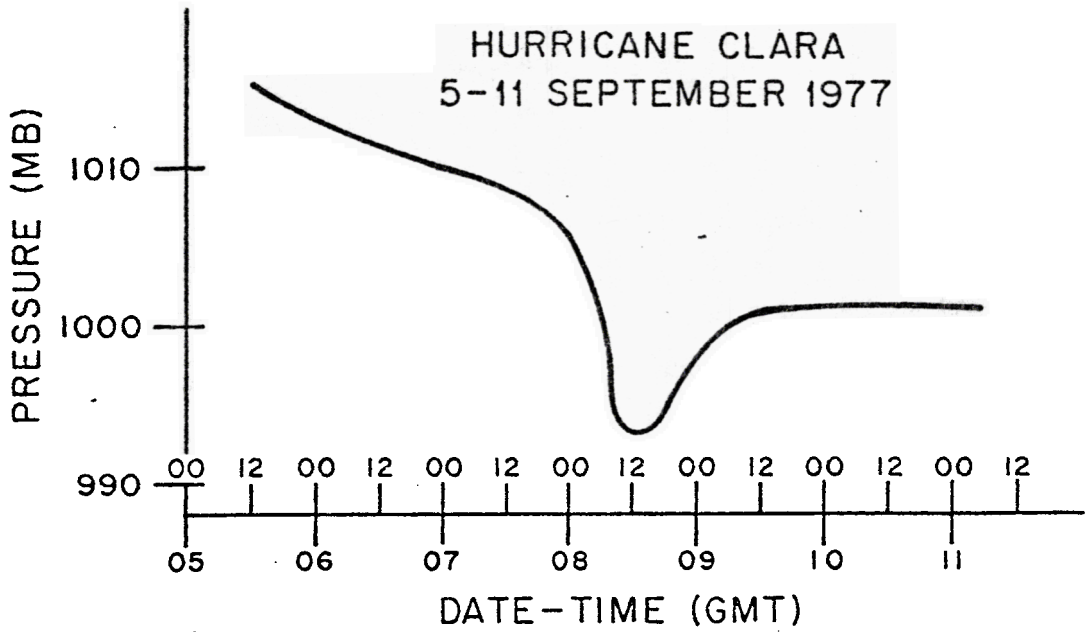


Figure 3 continued.

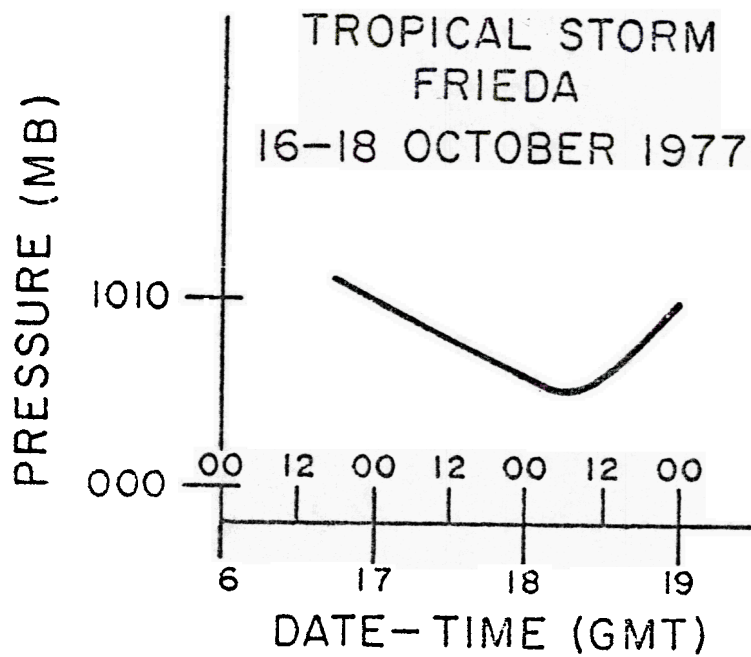
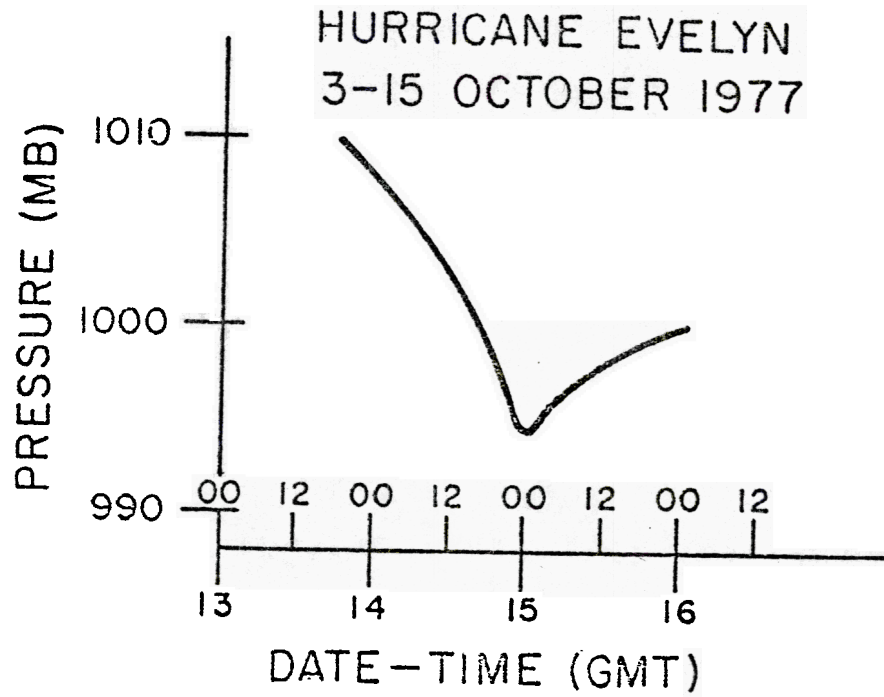


Figure 3 continued





1600 GMT 8/30/77  
1000 MB



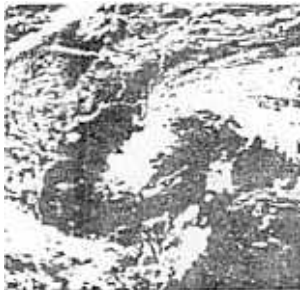
1500 GMT 8/31/77  
985 MB



1601 GMT 9/1/77  
957 MB



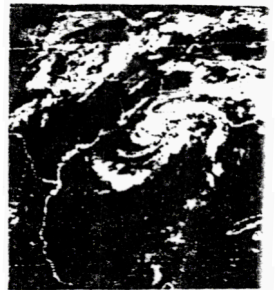
1500 GMT 9/2/77  
955 MB



1900 GMT 9/3/77  
1005 MB



2000 GMT 9/4/77  
999 MB



1400 GMT 9/5/77  
998 MB



1200 GMT 9/8/77  
993 MB



1700 GMT 9/9/77  
1001 MB

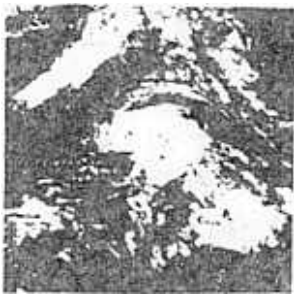


1700 GMT 9/10/77  
1001 MB

CLARA

Figure 4 Daily GOES-2 satellite photographs of 1977 named tropical cyclones.

DOROTHY



1401 GMT 9/27/77  
1001 MB



1501 GMT 9/28/77  
986 MB



1401 GMT 9/29/77  
989 MB

---

EVELYN



1401 GMT 10/14/77  
1001 MB



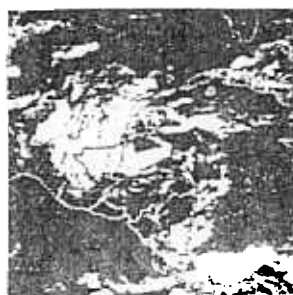
1301 GMT 10/15/77  
998 MB

---

FRIEDA



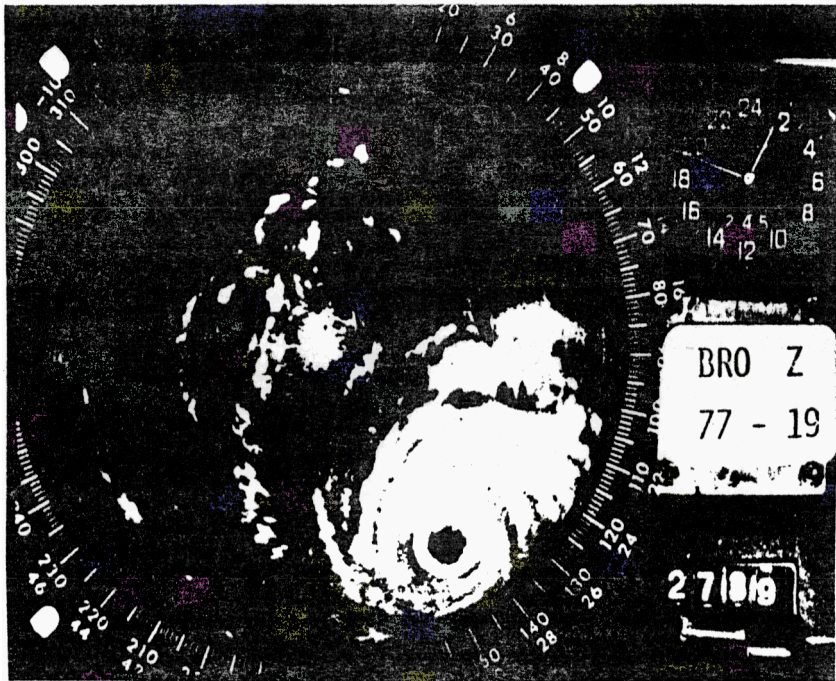
1501 GMT 10/17/77  
1007 MB



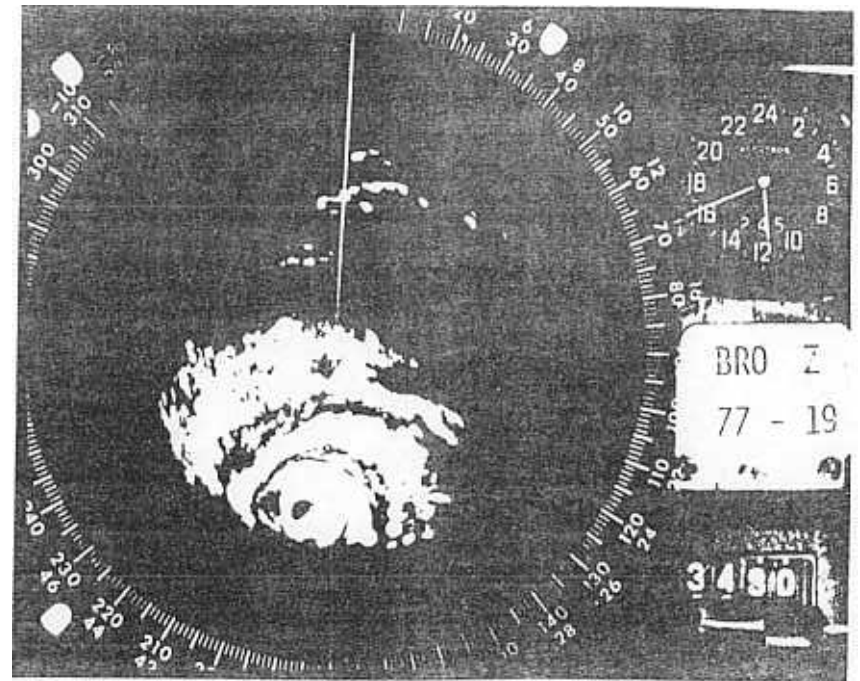
1601 GMT 10/18/77  
1007 MB

Figure 4 continued.





0147 GMT 9/2/77  
 BROWNSVILLE RADAR  
 125 N. MI. RANGE



1141 GMT 9/2/77  
 BROWNSVILLE RADAR  
 250 N. MI. RANGE

Figure 5. Selected radar photographs of hurricane Anita.

APPENDIX A  
CODE FOR SUPPLEMENTARY VORTEX DATA MESSAGE

DATE	AIRCRAFT NUMBER	ARWO					
MANOP HEADING (PRECEDENCE IMMEDIATE)							
MISSION IDENTIFIER AND OBSERVATION NUMBER							
<b>SUPPLEMENTARY VORTEX DATA MESSAGE</b>							
1 AZIMUTH	2 dd DEG	3 FL ZZZ					
4 LEFT RIGHT	5 FRONT REAR	6 QUAD					
7 DjHHH	8 DTTQQ	9 DjHHH	10 DTTQQ	11 DjHHH	12 DTTQQ	13 DjHHH	14 DTTQQ
8	8	4	4	3	3	1	1
15 DjHHH	16 DTTQQ	17 64RRR	18 50RRR	19 34RRR	20 MXFFF	21 BBBRR	22 hhhhh
Ø	Ø	64	50	34	MX		
23 LEFT RIGHT	24 FRONT REAR	25 QUAD					
26 DjHHH	27 DTTQQ	28 DjHHH	29 DTTQQ	30 DjHHH	31 DTTQQ	32 DjHHH	33 DTTQQ
8	8	4	4	3	3	1	1
34 DjHHH	35 DTTQQ	36 64RRR	37 50RRR	38 34RRR	39 MXFFF	40 BBBRR	41 hhhhh
Ø	Ø	64	50	34	MX		
42 LEFT RIGHT	43 FRONT REAR	44 QUAD					
45 DjHHH	46 DTTQQ	47 DjHHH	48 DTTQQ	49 DjHHH	50 DTTQQ	51 DjHHH	52 DTTQQ
8	8	4	4	3	3	1	1
53 DjHHH	54 DTTQQ	55 64RRR	56 50RRR	57 34RRR	58 MXFFF	59 BBBRR	60 hhhhh
Ø	Ø	64	50	34	MX		
61 LEFT RIGHT	62 FRONT REAR	63 QUAD					
64 DjHHH	65 DTTQQ	66 DjHHH	67 DTTQQ	68 DjHHH	69 DTTQQ	70 DjHHH	71 DTTQQ
8	8	4	4	3	3	1	1
72 DjHHH	73 DTTQQ	74 64RRR	75 50RRR	76 34RRR	77 MXFFF	78 BBBRR	
Ø	Ø	64	50	34	MX		
Remarks							
CODE FIGURES	dd - True direction in tens of degrees (pattern orientation based on direction of storm motion). zzz - Flight level in hundreds of feet (absolute altitude below 5500 feet). D - Group indicator designating the distance from the center in nautical miles (8-80, 4-45, 3-30, 1-15, Ø-center) hhhhh - Height of the eyewall in feet. jHHH - Pressure height data in RECCO format. TTQQ - Temperature/dewpoint in degrees Celsius. Add 50 for negative values.						

Table 1. Verification of 1977 tropical storm and hurricane forecasts,  
 Figures in parenthesis are number of cases.

METHOD	INITIAL	FORECAST DISPLACEMENT ERRORS (N.MI.)			
	POSITION ERROR (N.MI.)	12 HR	24 HR	48 HR	72 HR
OFFICIAL	12 (38)	54 (37)	134 (27)	355 (11)	730 (2)
NHC-67	12 (40)	71 (40)	170 (28)	492 (12)	881 (3)
NHC-72	12 (40)	63 (40)	150 (28)	388 (12)	741 (3)
HURRAN	13 (21)	66 (21)	199 (15)	652 (5)	890 (2)
CLIPER	12 (40)	62 (40)	159 (28)	371 (12)	633 (3)
NHC-73	11 (19)	77 (19)	184 (13)	369 (6)	768 (1)
SANBAR	11 (18)	66 (18)	144 (12)	278 (6)	--- (0)
MFM	5 (6)	40 (6)	86 (4)	153 (2)	--- (0)

Table 2. Landfall errors of 1977 tropical storms and hurricanes.

<u>STORM NAME</u>	<u>LANDFALL DAY</u>	<u>FORECAST ERROR</u>	<u>LOCATION AND REMARKS</u>
Anita	September 2	130	Soto la Marina, Mexico
Babe	September 5	<u>0</u>	Grand Isle, Louisiana
1977 Average		= 65	

Table 3. Individual Tropical Cyclone Warning Lead Times 1970-77  
Together with Eight Year Average.

YEAR	STORM NAME	INTENSITY AT LANDFALL	DATE/TIME OF LANDFALL	TIME AND TYPE OF WARNINGS ISSUED	WARNING LEAD-TIME
	Becky	T.S.	07/22/0600Z	Hurricane warnings Fort Walton Beach to Port St. Joe, FL 07/21/1430Z	15.5 hr
	Celia	H	08/04/0000Z	Hurricane warnings Corpus Christi to Port Arthur, TX 08/03/1000Z	14 hr
	Felice	T.S.	09/16/0100Z	Gale warnings Miss River to Galveston, TX 09/15/1600Z	9 hr
1971	Doria	T.S.	08/27/1800Z	Gale warnings Nag's Head, NC to the SC border 08/26/1900Z	23 hr
1971	Edith	H	09/16/1400Z	Hurricane warnings Camerof to Morgan City, LA 09/15/1930Z	18.5 hr
	ern	T.S.	09/11/0000Z	Gale warnings Corpus Christi to Port Arthur, TX 09/10/1600Z	8 hr
1971	Ginger	T.S.	10/01/0000Z	Hurricane warnings Cape Lookout, NC to Virginia Beach, VA 09/29/1600Z	30 hr
1972	Agnes (1)	H	06/19/2200Z	Hurricane warnings St. Marks to Panama City Beach, FL 06/18/2200Z	24 hr
	Agnes (2)	T.S.	06/22/1800Z	Gale warnings Savannah, GA to Block Island, RI 06/21/2200Z	22 hr
	Delia	T.S.	09/06/0600Z	Gale warnings Lake Charles, LA to Port Arthur, TX 09/05/2200Z	30+ hr (80 hr)

3 continued

	Carmen	H	09/08/0600Z	Hurricane warnings Grand Isle, LA to Mobile, AL 09/07/0700Z	23 hr
	Eloise	H	09/23/1200Z	Hurricane warnings Grand Isle, LA to Apalachicola, FL 09/22/1200Z	24 hr
	Belle	H	08/10/0500Z	Hurricane warnings Merrimack, MA to N. of Cape Henlopen, DE 08/08/1000Z	19 hr
	Dottie	T.S.	08/20/2200Z	Gale warnings Jacksonville, FL to Virginia Beach, VA 08/19/2200Z	24 hr
1977	Babe	H	09/05/1000Z	Hurricane warnings Vermilion Bay, LA to Mississippi River 09/05/0100Z	9 hr
			1970-1977	Average warning lead-time Standard deviation Number of cases	19.4 hr 7.1 hr 15

Table 4. Summary of 1977 Tropical Cyclone Statistics.

NO.	NAME	CLASS	DATES	MAXIMUM SUSTAINED WINDS (KT)	LOWEST PRESSURE (MB)	U. S. DAMAGE (\$ MILLION)	DEATHS
1.	ANITA	H	29 AUG. - 2 SEPT.	150	926	MINOR	MEXICO, 10
2	BABE	H	3-8 SEPT	65	995	10	
	CLARA	H	5-11 SEPT.	65	993		
4.	DOROTHY	H	26-30 SEPT.	75	980		
5.	EVELYN	H	13-15 OCT	70			
6	FRIEDA	T	16-18 OCT.	50	1005		

Table 5. Best track, initial and forecast positions, initial position error and forecast errors for 1977 tropical cyclones.

HURRICANE ANITA 29 AUGUST 3 SEPTEMBER 1977

DATE/TIME (GMT)	BEST TRACK		OPERATIONAL POSITION		POSITION ERROR (N.MI.)	12 HOUR FORECAST			24 HOUR FORECAST			48 HOUR FORECAST			72 HOUR FORECAST		
	LAT.	LONG.	LAT.	LONG.		LAT.	LONG.	ERROR (N.MI.)	LAT.	LONG.	ERROR (N.MI.)	LAT.	LONG.	ERROR (N.MI.)	LAT.	LONG.	ERROR (N.MI.)
3006	26.8	89.8	26.8	89.9	5	27.3	91.0	51	28.0	92.5	115	29.5	94.5	225	31.5	95.5	447
3012	26.7	90.3	26.6	90.3	6	27.0	91.5	50	27.5	92.5	92	28.0	94.5	156	28.5	95.5	323
3018	26.5	90.6	26.8	90.5	19	26.5	91.8	28	26.8	93.0	49	27.5	96.0	124	28.0	99.0	276
3100	26.4	91.0	26.3	90.9	8	26.5	91.8	25	26.7	93.0	56	27.5	96.0	180	28.0	99.0	352
3106	26.3	91.4	26.2	91.3	8	26.1	92.2	6	26.4	93.8	43	27.5	97.0	204	27.0	100.0	
3112	26.2	91.8	26.2	91.8	0	26.3	92.5	29	26.5	93.5	88	27.5	97.5	230	27.5	101.0	
3118	26.1	92.3	26.2	92.2	8	26.2	93.0	37	26.4	94.0	100	27.3	97.0	271	27.0	101.0	
0100	25.9	92.8	26.1	92.8	12	26.1	94.8	25	26.2	97.0	95	26.0	100.0	205			
0106	25.8	93.7	25.8	93.8	5	25.9	95.5	42	26.0	97.5	109	26.0	101.0				
0112	25.5	94.7	25.6	94.7	6	25.5	96.5	51	25.4	98.0	96	25.0	101.0				
0118	25.2	95.5	25.2	95.6	5	24.5	97.8	37	23.0	100.0	39	22.0	104.0				
0200	24.6	96.2	24.6	96.3	6	23.7	97.8	17	23.2	99.5	98						
0206	24.2	97.1	24.1	97.1	6	23.8	99.2	48	23.5	101.0							
0212	23.7	98.0															
0218	23.1	99.2															
0300	22.5	101.0															

HURRICANE BABE 3-8 SEPTEMBER 1977

DATE/TIME (GMT)	BEST TRACK		OPERATIONAL POSITION		POSITION ERROR (N.MI.)	12 HOUR FORECAST			24 HOUR FORECAST			48 HOUR FORECAST			72 HOUR FORECAST		
	LAT.	LONG.	LAT.	LONG.		LAT.	LONG.	ERROR (N.MI.)	LAT.	LONG.	ERROR (N.MI.)	LAT.	LONG.	ERROR (N.MI.)	LAT.	LONG.	ERROR (N.MI.)
0418	27.5	91.7	27.5	91.5	11	28.5			29.5	91.5	19	10.5	91.5		31.0	92.0	
0500	28.0	91.6	28.0	91.6	0	29.5			30.5	91.5		11.5	90.5				
0506	28.7	91.4	28.7	91.3	5	29.5			30.5	90.5							
0512	29.5	91.2	29.5	91.1		31.0			32.0	92.0							
0518	29.8	91.6															



Table 5 continued.

## HURRICANE CLARA 5-11 SEPTEMBER 1977

DATE/TIME (GMT)	BEST TRACK		OPERATIONAL POSITION		POSITION ERROR (N.MI.)	12 HOUR FORECAST			24 HOUR FORECAST			48 HOUR FORECAST			72 HOUR FORECAST			
	LAT.	LONG.	LAT.	LONG.		LAT.	LONG.	ERROR (N.MI.)	LAT.	LONG.	ERROR (N.MI.)	LAT.	LONG.	ERROR (N.MI.)	LAT.	LONG.	ERROR (N.MI.)	
0800	35.1	71.7	35.1	71.6	5				35.5	66.0	73							
0806	35.3	69.7	35.3	69.6	5	36.0	66.0	25	37.0	62.0	149	40.0	53.0	665	44.0	44.0	1013	
0812	35.5	67.7	35.5	67.7	0	36.5	63.5	80	38.0	58.5	318	41.0	54.0	671	45.0	50.0		
0818	35.6	66.2	35.7	66.4	11	35.9	64.5	72	36.0	63.0	150	37.5	61.5	262	41.0	63.0		
0900	35.5	64.6	35.6	64.6	6	35.0	61.0	104	35.0	58.0	288	36.0	53.0	510	38.0	48.0		
0906	34.8	63.5	35.3	63.5	30	34.8	60.5	126	34.5	57.5	312	34.0	53.0	475	34.0	48.0		
0912	34.0	62.8	34.0	63.0	10	33.5	63.0	47	33.5	63.0	59	35.0	59.0		38.0	54.0		
0918	33.4	62.8	33.5	62.9	8	33.0	63.0	36	33.0	63.0	54	35.0	59.0		38.0	54.0		
1000	32.8	63.2	32.9	63.1	8	32.2	64.0	56	32.0	65.5	183	34.0	68.0		38.0	65.0		
1006	32.8	63.6	32.8	63.9	15	33.0	65.5	81	34.0	66.0	158	39.0	61.0		42.0	54.0		
1012	33.0	63.8	33.0	63.7	5	33.0	64.0	85	35.0	64.0		39.0	60.0		42.0	54.0		
1018	33.5	63.7	33.2	63.9	21	33.0	64.0	111	35.0	64.0		39.0	60.0		42.0	54.0		
1100	34.2	63.2	34.0	63.0		36.0	61.0		39.0	58.0		45.0	48.0					
1106	34.8	62.5	34.8	62.6		37.0	60.0		40.0	56.0		45.0	45.0					

## HURRICANE DOROTHY 26-30 SEPTEMBER 1977

DATE/TIME (GMT)	BEST TRACK		OPERATIONAL POSITION		POSITION ERROR (N.MI.)	12 HOUR FORECAST			24 HOUR FORECAST			48 HOUR FORECAST			72 HOUR FORECAST			
	LAT.	LONG.	LAT.	LONG.		LAT.	LONG.	ERROR (N.MI.)	LAT.	LONG.	ERROR (N.MI.)	LAT.	LONG.	ERROR (N.MI.)	LAT.	LONG.	ERROR (N.MI.)	
2712	30.9	65.8	31.0	65.0	42	31.8	61.0	90	32.5	57.0	209	35.0	52.0	430	40.0	47.0		
2718	31.9	63.6	31.5	63.5	25	33.4	60.5	37	35.0	57.5	112	38.0	51.0		42.0	46.0		
2800	33.2	61.8	33.4	61.6	16	36.0	57.0	123	39.0	52.5	203	43.0	45.0		46.0	39.0		
2806	34.4	60.8	34.7	60.0	43	37.2	56.2	86	40.0	52.0	125	45.0	44.0		50.0	36.0		
2812	35.5	59.7	35.0	59.0	46	37.0	56.5	49	39.5	51.5	145	45.0	42.5		52.0	37.0		
2818	37.0	58.8	36.9	58.7	8	40.0	56.0	28	43.5	43.5		51.0	48.0					
2900	38.3	57.0	38.5	57.0	12	42.0	54.5	25	46.0	51.0		52.0	42.0					
2906	40.0	55.5	40.0	55.5		43.0	53.0		47.0	51.0		55.0	46.0					
2912	42.0	54.0	41.0	53.5		45.5	49.0		50.0	45.0								

Table 5 continued.

## HURRICANE EVELYN 13-15 OCTOBER 1977

DATE/TIME (GMT)	BEST TRACK		OPERATIONAL POSITION		POSITION ERROR (N.MI.)	12 HOUR FORECAST ERROR			24 HOUR FORECAST ERROR			48 HOUR FORECAST ERROR		72 HOUR FORECAST ERROR			
	LAT.	LONG.	LAT.	LONG.		LAT.	LONG.	(N.MI.)	LAT.	LONG.	(N.MI.)	LAT.	LONG.	(N.MI.)	LAT.	LONG.	(N.MI.)
1406	30.9	64.9															
1412	33.0	64.9	33.0	64.8	5	37.3	63.7	116	41.0	60.0	270	46.0	52.0				
1418	35.9	64.4	36.0	64.4	6	41.5	62.0	64	47.0	59.0	31						
1500	39.2	63.3	39.3	63.3	6	45.0	60.0	36	48.0	58.5							
1506	42.4	61.5	42.5	61.5	6	48.0	59.0	31	50.0	54.0							
1512	45.5	60.1															
1518	47.4	59.2															

## TROPICAL STORM FRIEDA 16-18 OCTOBER 1977

DATE/TIME (GMT)	BEST TRACK		OPERATIONAL POSITION		POSITION ERROR (N.MI.)	12 HOUR FORECAST ERROR			24 HOUR FORECAST ERROR			48 HOUR FORECAST ERROR		72 HOUR FORECAST ERROR			
	LAT.	LONG.	LAT.	LONG.		LAT.	LONG.	(N.MI.)	LAT.	LONG.	(N.MI.)	LAT.	LONG.	(N.MI.)	LAT.	LONG.	(N.MI.)
1712	17.2	83.9	17.2	84.1					17.0	84.0							
1718	17.2	84.4	17.3	84.5	8	17.5	85.0	52	18.0	85.7							
1800	17.3	85.0	17.4	84.8		17.8	85.4		18.8	86.1				19.5	86.5		22.5 86.0
1806	17.4	85.8	17.3	86.3		17.5	87.5		18.0	89.0				20.5	86.5		23.5 85.0



LEGEND FOR TABLE 6

Key to fix characteristics

SATELLITE:

Classification confidence\*, location and confidence\*\*, visible or infrared, resolution (Km)

\*1 = completely certain as to current intensity number used

2 = tempted to vary up or down by  $\frac{1}{2}$  T or S number

3 = might vary up or down by 1 T or S number, or more.

\*\*1 = well defined eye with certain picture registration.

2 = well defined eye with uncertain picture registration.

3 = well defined circulation center with certain picture registration.

4 = well defined circulation center with uncertain picture registration

5 = poorly defined circulation center with certain picture registration.

6 = poorly defined circulation center with uncertain picture registration.

RECONNAISSANCE:

Navigational Accuracy/Meteorology Accuracy.

RADAR:

U. S. radar station identifiers.

BRO = Brownsville, TX

CRP = Corpus Christi, TX

GLSC = Galveston, TX

LCH = Lake Charles, LA

BTR = Baton Rouge, LA

SIL = Slidell, LA

Table 6. Center fix positions and intensity evaluations for 1977 tropical cyclones.

HURRICANE ANITA  
29 AUGUST - 2 SEPTEMBER 1977

CENTER FIXES

FIX NO.	DATE	TIME (GMT)	POSITION		UNIT	CHARACTER.	MAX. WIND (KT)		ACFT. ALT.	MIN. PRESS. (MB)	MIN. 700MB HT. (M)	TEMP. (°C)		EYE		REMARKS
			LAT. °N	°W			FLT. LVL.	SFC.				IN.	OUT.	C=CIR. DIA.	E=ELIP. (N.MI.)	
1	29	1230	26.5	88.0	GOES 2	2,5,VSBL 2		25								
2	29	1640	27.1	88.7	AF	5/5	25	20	226M	1011		24	25			
3	29	1750	27.1	88.8	AF	5/5	25	25	226M	1010		24	25			
4	29	1830	26.9	88.3	GOES 2	2,5,VSBL 2		25								
5	29	2330	26.5	89.0	GOES 2	5,VSBL 2										
6	30	0030	26.3	89.5	GOES 2	2,5, IR 8		25								
7	30	0204	26.9	89.8	AF	3/10	33		454M	1006		27	24			
8	30	0334	26.8	89.7	AF	3/10	16			1006		28	23			
9	30	0525	26.7	89.9	AF	3/10	39		466M	1006		24	24			
10	30	0600	25.9	89.6	GOES 2	5, IR 8										
11	30	0630	25.9	89.6	GOES 2	2,5, IR 8		32								
12	30	0801	26.9	90.0	AF	3/10	23		472M	1005		27	24			
13	30	1150	26.6	90.3	NOAA	2/5	54	40	490M	1004		24	21			
14	30	1230	27.2	90.6	GOES 2	2,3,VSBL 2		35								
15	30	1430	26.6	90.4	NOAA	2/5	60	65	472M	1003		24	21			OPEN WEST.
16	30	1715	26.6	90.5	NOAA	2/5	60	70	508M	1000		25	22			POORLY DEFINED.
17	30	1830	26.7	91.1	GOES 2	2,3,VSBL 2		45								
18	30	1918	26.4	90.8	NOAA		107	100		994						
19	30	2046	26.3	90.8	NOAA	0/0	107	100	300M	992		24	22			BANDS TO SOUTH AND EAST.
20	30	2330	26.5	91.1	GOES 2	3,VSBL 2										
21	30	2355	26.2	90.8	AF	10/10	60	80	700MB	989	2990	12	10			OPEN SOUTHWEST.
22	31	0030	26.4	91.1	GOES 2	1,3, IR 8		55								
23	31	0239	26.4	91.0	AF	10/10	40		700MB	991	2995	11	16	C	30	POORLY DEFINED.
24	31	0330	26.3	91.1	GOES 2	1,5, IR 8		55								
25	31	0545	26.2	91.2	AF	10/10	46		700MB	984	2972	14	12		30	OPEN WEST. POORLY DEFINED.
26	31	0630	26.1	91.3	GOES 2	2,5, IR 8		65								
27	31	0840	26.2	91.7	AF	10/10	62		700MB	987	2968	14	9			POORLY DEFINED.
28	31	0930	26.1	91.4	GOES 2	2,5, IR 8		65								
29	31	1012	26.2	91.8	AF		30		700MB		2960					
30	31	1200	26.2	91.8	GOES 2	3, IR 8										
31	31	1205	26.3	91.8	AF	5/5	68	65	700MB	983	2939	14	11			POORLY DEFINED.
32	31	1230	26.2	91.8	GOES 2	1,3,VSBL 2		70								
33	31	1440	26.1	92.1	NOAA	2/4		90		988					35	OPEN WEST.
34	31	1720	26.2	92.2	NOAA	2/4		05		987					XX/45/30	OPEN NORTHWEST.
35	31	1800	26.1	92.2	GOES 2	1,VSBL 2										

24

Table 6 continued.

## HURRICANE ANITA CONTINUED

## CENTER FIXES

FIX NO.	DATE	TIME (GMT)	POSITION		UNIT	CHARACTER.	MAX. WIND (KT)		MIN. PRESS. (MB)	MIN. HT. (M)	TEMP. (°C)		EYE		REMARKS
			LAT. °N	LON. °W			FLT. LVL.	ACFT. SFC.			IN.	OUT.	C=CIR. DIA.	E=ELIP. (N.MI.)	
36	31	1830	26.1	92.3	GOES 2	2,1,VSBL 2		77							
37	31	2027	26.1	92.4	NOAA	0/0	85	85	300M	983		24	24	E29/40/30	CLOSED.
38	31	2320	25.8	92.8	AF	5/3	60	65	700MB	979	2871	13	11	C 35	OPEN SOUTH.
39	31	2330	25.9	92.8	GOES 2	3,VSBL 1									
40	1	0030	25.7	92.8	GOES 2	1,3, IR 8		77							
41	1	0220	25.8	93.2	AF	5/5	75		700MB	975	2889	12	11	C 35	OPEN NORTHEAST.
42	1	0330	25.7	93.2	GOES 2	1,3, IR 8		77							
43	1	0430	25.8	93.5	AF		64		700MB		2885				
44	1	0535	25.8	93.6	AF		75		700MB		2858				
45	1	0555	25.8	93.8	AF	5/5	75		700MB	973	2858	14	10	C 35	POORLY DEFINED.
46	1	0600	25.6	93.7	GOES 2	3, IR 8									
47	1	0606	25.8	93.8	AF				700MB		2857				
48	1	0630	25.7	93.7	GOES 2	2,4, IR 8		77							
49	1	0808	25.9	94.1	AF	5/1	68		700MB	968	2828	15	10		15
50	1	0930	25.6	94.3	GOES 2	2,3, IR 8		83							
51	1	1117	25.6	94.6	AF	5/1	85		700MB	962	2774	15	13		15
52	1	1131	25.6	94.5	RADAR	GLSC									POOR FIX. 20° SPIRAL OVERLAY.
53	1	1146	25.6	94.6	AF	5/1	85	75	700MB	962	2774	15	13	C 20	CLOSED WALL.
54	1	1200	25.5	94.7	GOES 2	4, IR 8									
55	1	1204	25.5	94.6	RADAR	GLSC									POSSIBLE EYE. FAIR FIX.
56	1	1205	25.5	94.6	RADAR	BRO									20 GOOD FIX.
57	1	1230	25.5	94.7	GOES 2	2,1,VSBL 2		90							
58	1	1233	25.5	94.7	RADAR	BRO									18 GOOD FIX.
59	1	1235	25.5	94.6	RADAR	GLSC									POSSIBLE EYE. POOR FIX.
60	1	1305	25.5	94.7	RADAR	BRO									18 GOOD FIX.
61	1	1330	25.5	94.8	RADAR	BRO									20 GOOD FIX.
62	1	1408	25.5	95.0	RADAR	BRO									20 GOOD FIX.
63	1	1440	25.5	95.0	RADAR	BRO									18 FAIR FIX.
64	1	1500	25.4	95.1	AF	1/1	85	90	700MB	960	2749	18	13	C 20	OPEN WALL EAST-SOUTH.
65	1	1505	25.5	95.1	RADAR	BRO									14 GOOD FIX.
66	1	1530	25.4	95.2	GOES 2	1,1,VSBL 2		95							
67	1	1533	25.4	95.2	RADAR	BRO									18 GOOD FIX.
68	1	1606	25.4	95.3	RADAR	BRO									14 GOOD FIX.
69	1	1630	25.1	95.3	RADAR	CRP									15° OVERLAY. FAIR FIX.
70	1	1633	25.3	95.4	RADAR	BRO									14 GOOD FIX.

Table 6 continued.

## HURRICANE ANITA CONTINUED

## CENTER FIXES

FIX NO.	DATE	TIME (GMT)	POSITION		UNIT	CHARACTER.	MAX. WIND (KT)			MIN. PRESS. (MB)	MIN. HT. (M)	TEMP. (°C)		EYE C=CIR. DIA. E=ELIP. (N.MI.)	REMARKS	
			LAT. °N	LON. °W			FLT. LVL.	ACFT. SFC.	ALT.			IN.	OUT.			
71	1	1707	25.2	95.5	RADAR	BRO								12	GOOD FIX.	
72	1	1723	25.2	95.5	AF	1/1	90	110	700MB	948	2670	20	13	C	15	CLOSED WALL.
73	1	1731	25.2	95.6	RADAR	BRO									13	GOOD FIX..
74	1	1800	25.2	95.6	GOES 2	1,VSBL 2										
75	1	1805	25.1	95.6	RADAR	BRO									12	GOOD FIX.
76	1	1805	25.1	95.6	RADAR	CRP									15°	OVERLAY. GOOD FIX.
77	1	1830	25.1	95.7	GOES 2	1,1,VSBL 2		102								
78	1	1831	25.1	95.7	RADAR	BRO									12	GOOD FIX.
79	1	1837	24.9	95.7	AF		117	110	700MB		2625					
80	1	1909	25.0	95.8	RADAR	CRP										GOOD FIX.
81	1	1910	25.0	95.7	RADAR	BRO									10	GOOD FIX.
82	1	1936	24.8	95.8	AF		107	100	700MB		2580					
83	1	1938	25.0	95.8	RADAR	BRO									12	GOOD FIX.
84	1	2006	24.9	95.8	RADAR	BRO									12	GOOD FIX.
85	1	2010	24.9	95.8	RADAR	CRP										GOOD FIX.
86	1	2035	24.9	95.8	AF	1/1	115	115	700MB	936	2549	22	12	C	15	WELL DEFINED. CLOSED WALL.
87	1	2036	24.9	95.8	RADAR	BRO									12	GOOD FIX.
88	1	2110	24.8	95.9	RADAR	CRP										GOOD FIX.
89	1	2126	24.9	95.9	RADAR	BRO									10	GOOD FIX.
90	1	2130	24.9	95.9	GOES 2	1,1,VSBL 2	(109)									
91	1	2135	24.9	95.9	RADAR	BRO									10	GOOD FIX.
92	1	2210	24.8	95.9	RADAR	CRP										GOOD FIX.
93	1	2211	24.8	96.0	RADAR	BRO									14	GOOD FIX.
94	1	2230	24.8	96.0	RADAR	BRO									12	GOOD FIX.
95	1	2307	24.7	96.1	RADAR	BRO									12	GOOD FIX.
96	1	2308	24.7	96.1	RADAR	CRP										
97	1	2333	24.7	96.1	RADAR	BRO									10	GOOD FIX.
98	1	2345	24.7	96.1	RADAR	CRP										POOR FIX. 15° SPIRAL OVERLAY.
99	2	0000	24.5	96.1	GOES 2	2, IR 8										
100	2	0008	24.8	96.2	RADAR	CRP										POOR FIX. 15° SPIRAL OVERLAY.
101	2	0008	24.6	96.2	RADAR	BRO									15	GOOD FIX.
102	2	0030	24.6	96.3	RADAR	BRO									15	GOOD FIX.
103	2	0030	24.4	96.3	GOES 2	1,2, IR 8	(121)									
104	2	0033	24.8	96.3	RADAR	CRP										POOR FIX. 15° SPIRAL OVERLAY.
105	2	0050	24.6	96.3	NOAA	2/4	125		700MB	930	2512	18	10	C	20	CLOSED WALL.

Table 6 continued.

## HURRICANE ANITA CONTINUED

## CENTER FIXES

FIX NO.	DATE	TIME (GMT)	POSITION		UNIT	CHARACTER.	MAX. WIND (KT)		MIN. PRESS. (MB)	MIN. HT. (M)	TEMP. (°C)		EYE DIA. (N.MI.)	REMARKS	
			LAT. °N	LONG. °W			FLT. LVL.	ACFT. SFC.			IN.	OUT.			
106	2	0105	24.6	96.3	RADAR	BRO							15	GOOD FIX.	
107	2	0110	24.5	96.3	RADAR	CRP								POOR FIX. 15° SPIRAL OVERLAY.	
108	2	0125	24.6	96.3	RADAR	BRO							15	GOOD FIX.	
109	2	0135	24.5	96.4	RADAR	CRP								FAIR FIX. 15° SPIRAL OVERLAY.	
110	2	0202	24.5	96.4	RADAR	BRO							17	GOOD FIX.	
111	2	0231	24.5	96.5	RADAR	BRO							16	GOOD FIX.	
112	2	0232	24.5	96.5	RADAR	CRP								GOOD FIX.	
113	2	0304	24.5	96.6	RADAR	BRO							18	GOOD FIX.	
114	2	0305	24.4	96.6	NOAA	2/4	150	700MB	929	2511	18	10	C	8	CLOSED WALL.
115	2	0310	24.4	96.6	RADAR	CRP									GOOD FIX.
116	2	0330	24.4	96.8	GOES 2	1,1, IR 8			127						
117	2	0331	24.5	96.7	RADAR	BRO								18	GOOD FIX.
118	2	0332	24.4	96.8	RADAR	CRP									GOOD FIX.
119	2	0402	24.4	96.8	RADAR	BRO								16	GOOD FIX.
120	2	0408	24.4	96.9	RADAR	CRP									GOOD FIX.
121	2	0430	24.4	96.9	RADAR	BRO								15	GOOD FIX.
122	2	0434	24.3	97.0	RADAR	CRP									GOOD FIX.
123	2	0508	24.2	97.1	RADAR	CRP									GOOD FIX.
124	2	0514	24.2	97.0	RADAR	BRO								15	GOOD FIX.
125	2	0530	24.2	97.0	RADAR	BRO								15	GOOD FIX.
126	2	0533	24.2	97.1	RADAR	CRP									GOOD FIX.
127	2	0542	24.2	97.0	NOAA	2/4	150	700MB	927	2482	19	9	C	17	CLOSED WALL.
128	2	0600	24.2	97.2	GOES 2	1, IR 8									
129	2	0610	24.1	97.2	RADAR	CRP									GOOD FIX.
130	2	0612	24.2	97.1	RADAR	BRO									GOOD FIX.
131	2	0618	24.1	97.1	NOAA		150		926					15	GOOD FIX.
132	2	0630	24.2	97.3	GOES 2	1,1, IR 8			127						
133	2	0630	24.2	97.2	RADAR	BRO								15	GOOD FIX.
134	2	0634	24.0	97.2	RADAR	CRP									GOOD FIX.
135	2	0705	24.1	97.3	RADAR	BRO								18	FAIR FIX.
136	2	0710	24.0	97.3	RADAR	CRP									GOOD FIX.
137	2	0730	24.1	97.4	RADAR	BRO								15	FAIR FIX.
138	2	0732	24.0	97.2	RADAR	CRP									FAIR FIX.
139	2	0810	24.0	97.4	RADAR	BRO								17	FAIR FIX.
140	2	0830	24.0	97.5	RADAR	BRO								17	FAIR FIX.

Table 6 continued.

HURRICANE ANITA CONTINUED

FIX NO.	DATE	TIME (GMT)	POSITION		UNIT	CHARACTER	CENTER FIXES				TEMP. (°C)		EYE		REMARKS	
			LAT. °N	LON °W			MAX. WIND (KT) FLT.	ACFT.	MIN. PRESS. (MB)	MIN. 700MB HT. (M)	IN.	OUT.	C=CIR. E-ELIP. (N.MI)	DIA.		
141	2	0904	24.0	97.7	RADAR	BRO							20		GOOD FIX.	
142	2	0925	23.9	97.2	AF	5/2			700MB	931	2475	10	12		CLOSED.	
143	2	0935	23.9	97.7	RADAR	BRO							20		GOOD FIX.	
144	2	1005	23.8	97.8	RADAR	BRO							22		FAIR FIX.	
145	2	1035	23.7	97.8	RADAR	BRO							18		GOOD FIX.	
146	2	1104	23.7	97.8	RADAR	BRO							18		FAIR FIX.	
147	2	1130	23.7	97.9	RADAR	BRO							17		POOR FIX.	
148	2	1208	23.6	98.5	RADAR	BRO							16		POOR FIX.	
149	2	1233	23.6	98.5	RADAR	BRO									POOR FIX.	
150	2	1308	23.6	98.2	RADAR	BRO									POSSIBLE EYE.	POOR FIX.
151	2	1330	23.6	98.2	RADAR	BRO									DIFFUSE.	

Table 6 continued.

 HURRICANE BABE  
 3-8 SEPTEMBER 1977

CENTER FIXES

FIX NO.	DATE	TIME (GMT)	POSITION		UNIT	CHARACTER.	MAX. WIND (KT)		MIN. PRESS. 700MB	TEMP. (°C)		EYE		REMARKS		
			LAT. N	LONG. W			FLT. LVL.	ACFT. SFC. ALT.		IN.	OUT.	C=CIR. DIA.	E=ELIP. (N.MI.)			
1	3	1430	27.6	87.8	GOES 2	2,5, VSBL 2		30								
2	3	1543	28.0	87.9	AF	5/5	30	40	1007		24	23		POORLY DEFINED.		
3	3	1750	27.5	88.8	NOAA	5/5	35	35	300M	1005	25	24		POORLY DEFINED.		
4	3	1800	27.9	87.9	GOES 2	5, VSBL 1										
5	3	1830	27.8	88.3	GOES 2	2,5, VSBL 2		35								
6	3	1907	27.5	89.0	NOAA				1005							
7	3	2130	27.4	89.4	AF	2/2	20	15	296M	1006	24	24	C	10	POORLY DEFINED.	
8	3	2322	27.5	90.0	AF	2/2	20	30	390M	1006	24	24	C	10	POORLY DEFINED.	
9	4	0030	28.1	89.5	GOES 2	2,5, IR 8		35								
10	4	0200	27.3	90.4	AF	2/2	20		405M	1006	24	22	C	15	POORLY DEFINED.	
11	4	0608	26.6	91.2	AF	3/4	30		445M	1005	23	23	C	6	OPEN NORTHEAST.	
12	4	0630	27.3	90.2	GOES 2	5,2, IR 8		35								
13	4	0804	26.7	91.5	AF	3/5	33		448M	1003	24	23	C	9	OPEN NORTH/NORTHWEST-EAST.	
14	4	1102	26.4	91.6	AF	3/3	38		469M	1004	25	24	C	9	OPEN NORTHWEST-NORTHEAST.	
15	4	1230	27.0	91.4	GOES 1	3,1, VSBL 2		35								
16	4	1434	27.4	91.7	AF	5/5	50	50		1003	25	23	C	20	EASILY DEFINED.	
17	4	1703	27.5	91.5	AF	5/5	28	40		1003	26	25	C	30	EASILY DEFINED.	
18	4	1800	27.6	91.5	GOES 1	3, VSBL 2										
19	4	1830	27.6	91.5	GOES 1	1,3, VSBL 2		55								
20	4	1903	27.7	91.7	AF	5/5	70	70		1000	26	25	C	30		
21	4	2011	27.8	91.7	AF	5/5	20	25		999	26	25	C	30		
22	5	0006	28.0	91.6	AF	2/2	40	45	700MB	1000	3060	10	9	C	20	CLOSED WALL.
23	5	0030	28.1	91.5	GOES 2	2,3, IR 8		55								
24	5	0132	27.9	90.8	RADAR	SIL									POOR FIX. POSSIBLE CENTER	
25	5	0231	28.3	91.3	RADAR	LCH									POSSIBLE CENTER.	
26	5	0304	28.5	91.5	AF	3/3	40		700MB	999	3050	10	10	C	15	OPEN WEST.
27	5	0330	28.3	91.2	RADAR	LCH									POSSIBLE CENTER.	
28	5	0431	28.6	91.3	RADAR	LCH									15° OVERLAY. POOR FIX.	
29	5	0434	28.3	91.0	RADAR	SIL							50		FAIR FIX.	
30	5	0502	28.5	91.3	RADAR	SIL									15° OVERLAY. POOR FIX.	
31	5	0513	28.5	91.5	AF	4/5	25		700MB	996	3053	12	11	C	15	POORLY DEFINED.
32	5	0530	28.7	90.9	RADAR	LCH									POSSIBLE CENTER.	
33	5	0532	28.5	91.3	RADAR	SIL									15° OVERLAY. FAIR FIX.	
34	5	0605	28.8	91.1	RADAR	LCH									POSSIBLE CENTER.	
35	5	0630	28.6	91.5	GOES 2	2,5, IR 8										

Table 6 continued

HURRICANE BABE CONTINUED

CENTER FIXES

FIX NO.	DATE	TIME (GMT)	POSITION		UNIT	CHARACTER.	MAX. WIND (KT)			MIN. PRESS. (MB)	TEMP. (°C)		EYE C=CIR, DIA. E=ELIP. (N.M.I.)	REMARKS
			LAT. °N	°W			FLT. LVL.	SFC. ALT.	ACFT. PRESS.		700MB HT. (M)	IN.		
36		0630	28.8	91.0	RADAR	LCH								POSSIBLE CENTER.
37		0632	28.7	91.0	RADAR	SIL								GOOD FIX.
38		0641	28.7	91.3	RADAR	SIL								GOOD FIX.
39		0650	28.7	91.1	RADAR									FAIR FIX.
40		0700	28.7	91.1	RADAR	SIL								GOOD FIX.
41		0732	28.9	91.1	RADAR	LCH								POSSIBLE CENTER.
42		0735	28.8	91.2	RADAR	SIL								POSSIBLE CENTER. POOR FIX.
43		0800	28.8	91.2	RADAR	SIL								GOOD FIX.
44	5	0805	28.8	91.2	AF	1/6	46	700MB	995		11	0		
45	5	0810	28.8	90.9	RADAR	LCH								POSSIBLE CENTER.
46	5	0830	29.0	91.2	RADAR	BTR								15° OVERLAY. POOR FIX.
47	5	0831	28.8	91.0	RADAR	LCH								POSSIBLE CENTER.
48	5	0833	29.1	91.3	RADAR	SIL								15° OVERLAY. FAIR FIX.
49	5	0859	29.1	91.4	RADAR	SIL								POSSIBLE CENTER. FAIR FIX.
50	5	0905	29.2	90.9	RADAR	LCH								POSSIBLE CENTER.
51	5	0932	29.2	91.4	RADAR	SIL								POSSIBLE CENTER. FAIR FIX.
52	5	0934	29.2	91.0	RADAR	LCH								POSSIBLE CENTER.
53	5	0934	29.1	91.2	RADAR	BTR								15° OVERLAY. FAIR FIX.
54	5	1002	29.3	91.4	RADAR	SIL								15° OVERLAY. FAIR FIX.
55	5	1010	29.3	90.9	RADAR	LCH						9		POSSIBLE CENTER.
56	5	1032	29.4	91.2	RADAR	SIL								GOOD FIX. RELOCATED.
57	5	1034	29.3	91.2	RADAR	LCH						8		FAIR FIX.
58	5	1036	29.3	91.4	RADAR	BTR								GOOD FIX. 10° OVERLAY.
59	5	1057	29.4	91.2	RADAR	SIL								GOOD FIX.
60	5	1058	29.3	91.1	RADAR	BTR								10° OVERLAY. FAIR FIX.
61	5	1100	29.4	91.3	AF	1/3	26	00MB			14	11	12	OPEN TO EAST. OVER LAND.
62		1106	29.3	91.1	RADAR	LCH							9	GOOD FIX.
63		1130	29.6	91.2	RADAR	LCH							10	
64		1133	29.4	91.1	RADAR	SIL							8	
65		1201	29.5	91.2	RADAR	BTR								GOOD FIX.
66		1208	29.5	91.1	RADAR	SIL								10° OVERLAY.
67		1212	29.7	91.3	RADAR	LCH								POSSIBLE CENTER.
68		1236	29.5	91.1	RADAR	SIL								POSSIBLE CENTER.
69		1246	29.9	91.9	RADAR	LCH								POSSIBLE CENTER.
70		1307	29.7	91.1	RADAR	SIL								POSSIBLE CENTER.

30



Table 6 continued.

HURRICANE BABE CONTINUED

CENTER FIXES

FIX NO.	DATE	TIME (GMT)	POSITION		UNIT	CHARACTER.	MAX. WIND (KT)		MIN. MIN. PRESS. 700MB	TEMP. (°C)		EYE C=CIR. DIA. E=ELIP. (N.MI.)	REMARKS
			LAT. ON	LONG. OW			FLT. LVL.	ACFT. SFC.		ALT. (MB)	HT. (M)		
71	5	1310	29.9	91.2	RADAR	BTR							
72	5	1331	29.9	91.3	RADAR	LCH							POSSIBLE CENTER.
73	5	1340	29.8	91.3	RADAR	SIL							POSSIBLE CENTER.
74	5	1405	29.8	91.4	RADAR	SIL							POSSIBLE CENTER.
75	5	1434	29.8	91.4	RADAR	SIL							FAIR FIX.
76	5	1505	29.8	91.6	RADAR	BTR							
77	5	1508	29.8	91.4	RADAR	SIL							POSSIBLE CENTER.
78	5	1530	29.7	91.5	RADAR	BTR							GOOD FIX. 15° OVERLAY.
79	5	1535	29.7	91.4	RADAR	SIL							GOOD FIX.
80	5	1635	29.8	91.5	RADAR	SIL							GOOD FIX.
81	5	1702	29.8	91.6	RADAR	SIL							GOOD FIX.
82	5	1736	29.8	91.6	RADAR	SIL							GOOD FIX.
83	5	1800	29.8	91.5	RADAR	SIL							FAIR FIX.
84	5	1834	29.8	91.5	RADAR	SIL							FAIR FIX.
85	5	1907	30.0	91.5	RADAR	SIL							POSSIBLE CENTER.
86	5	1937	30.0	91.6	RADAR	SIL							GOOD FIX. OPEN SOUTHEAST.
87	5	2001	30.1	91.3	RADAR	SIL					15		GOOD FIX. OPEN WEST.
88	5	2032	29.9	91.6	RADAR	SIL					10		FAIR FIX. OPEN WEST.
89	5	2100	29.8	91.4	RADAR	SIL					15		GOOD FIX. OPEN WEST.
90	5	2133	29.9	91.4	RADAR	SIL					12		FAIR FIX. OPEN WEST.
91	5	2205	29.8	91.3	RADAR	SIL							POOR FIX.
92	5	2231	29.9	91.4	RADAR	SIL							POSSIBLE CENTER.
93	5	2300	29.9	91.5	RADAR	SIL							POSSIBLE CENTER.
94	5	2332	30.0	91.5	RADAR	SIL							POSSIBLE CENTER.
95	6	0001	30.0	91.5	RADAR	SIL							POSSIBLE CENTER.
96	6	0234	30.2	91.3	RADAR	BTR							GOOD FIX. 15° OVERLAY.
97	6	0701	30.6	91.0	RADAR	SIL							GOOD FIX.
98	6	0731	30.7	90.9	RADAR	SIL							GOOD FIX.
99	6	0802	30.7	90.8	RADAR	SIL							GOOD FIX.
100	6	0832	30.7	90.7	RADAR	SIL							GOOD FIX.
101	6	0913	30.7	90.6	RADAR	SIL							POOR FIX.
102	6	0932	30.7	90.6	RADAR	SIL							GOOD FIX. 15° OVERLAY.
103	6	1007	30.9	90.5	RADAR	SIL							FAIR FIX.
104	6	1035	30.9	90.3	RADAR	SIL							POOR FIX.
105	6	1101	31.0	90.1	RADAR	SIL							POOR FIX.

31

Table 6 continued.

HURRICANE BABE CONTINUED

CENTER FIXES

FIX NO.	DATE	TIME (GMT)	POSITION		UNIT	CHARACTER.	MAX. WIND (KT)		MIN. PRESS. (MB)	MIN. HT. (M)	TEMP. (°C)		EYE C=CIR. DIA. E=ELIP. (N.M)
			LAT. °N	°W			FLT. LVL.	ACFT. SFC. ALT.			IN.	OUT.	
106	6	1131	31.1	90.0	RADAR	SIL							
107	6	1135	31.4	90.1	RADAR	BTR							
108	6	1209	31.1	89.9	RADAR	SIL							
109	6	1214	31.3	90.1	RADAR	BTR							
110	6	1235	31.2	90.1	RADAR	BTR							
111	6	1235	31.1	89.8	RADAR	SIL							
112	6	1300	31.4	90.0	RADAR	BTR							
113	6	1310	31.3	89.8	RADAR	SIL							
114	6	1335	31.3	89.8	RADAR	SIL							
115	6	1335	31.6	90.0	RADAR	BTR							
116	6	1400	31.6	90.1	RADAR	BTR							
117	6	1435	31.6	90.1	RADAR	BTR							
118	6	1505	31.9	90.0	RADAR	BTR							
119	6	1535	31.9	89.9	RADAR	BTR							

MEM S

GOOD FIX.  
 FAIR FIX.  
 FAIR FIX.  
 FAIR FIX.  
 FAIR FIX. 15° OVERLAY.  
 POSSIBLE CENTER.  
 FAIR FIX. 15° OVERLAY.  
 POSSIBLE CENTER.  
 POSSIBLE CENTER.  
 FAIR FIX. 15° OVERLAY.  
 FAIR FIX. 15° OVERLAY.  
 FAIR FIX. 15° OVERLAY.  
 FAIR FIX. 15° OVERLAY.  
 POOR FIX. 15° OVERLAY.

Table 6 continued.

HURRICANE CLARA  
5-11 SEPTEMBER 1977

CENTER FIXES

FIX NO.	DATE	TIME (GMT)	POSITION		UNIT	CHARACTER.	MAX. WIND (KT)			MIN. 700 MB HT. (M)	TEMP. (°C)		EYE		REMARKS
			LAT. N	LONG. W			FLT. LVL.	ACFT. SEC.	PRESS. ALT. (MB)		IN.	OUT.	C=CIR. DIA. E=ELIP. (N.MI.)		
1	7	1230	34.6	74.4	GOES 2	2,3,VSBL 2			30						
2	7	1800	34.6	73.3	GOES 2	3,VSBL 4									
3	7	1830	34.5	73.2	GOES 2	2,3,VSBL 2									
4	7	2003	34.9	72.5	AF	5/5	25	25	347M	1010	25	25	C	20	OPEN EXCEPT EAST.
5	7	2300	35.0	71.9	AF	5/5	30	25	238M	1007	25	25	C	20	POORLY DEFINED.
6	7	2330	34.5	72.2	GOES 2	3, IR 8									
7	8	0030	34.8	72.2	GOES 2	3,2, IR 8									
8	8	0600	35.4	70.2	GOES 2	3, IR 8									
9	8	0610	35.2	69.6	AF	2/8	43		411M	1001	25	25			POORLY DEFINED.
10	8	0630	35.5	69.9	GOES 2	2,3, IR 8									
11	8	1200	35.6	67.7	GOES 2	4,VSBL 2									
12	8	1230	35.8	67.4	GOES 2	2,5,VSBL 2									
13	8	1318	35.6	67.3	AF	2/5	80	70		993	25	22			POORLY DEFINED.
14	8	1613	35.7	66.7	AF		45	50		993					
15	8	1702	35.7	66.5	AF	2/8	45	50		994	25	24			POORLY DEFINED.
16	8	1800	35.6	66.4	GOES 2	5,VSBL 4									
17	8	1830	35.6	66.2	GOES 2	2,3,VSBL 2									
18	8	2330	35.8	64.7	GOES 2	3, IR 8									
19	9	0025	35.1	64.6	AF	10/5	40		700MB	998	3104	13			
20	9	0030	35.7	64.6	GOES 2	2,3, IR 8		45							
21	9	0225	35.3	64.3	AF	5/5	68			1001	25				
22	9	0630	34.8	63.5	GOES 2	2,3, IR 8		50							
23	9	1200	33.9	63.0	GOES 2	3,VSBL 2									
24	9	1205	34.0	63.0	AF	2/10	56	70	700MB	999	3089	17	14		
25	9	1230	33.9	62.8	GOES 2	1,3,VSBL 2		50							
26	9	1345	33.8	62.9	AF	2/8	37	40	491M	1000	25	24			
27	9	1522	33.6	62.9	AF	2/10	40	40	433M	1002	25	23			
28	9	1800	33.5	62.8	GOES 2	3,VSBL 1									
29	9	1830	33.3	62.9	GOES 2	1,3,VSBL 2		45							
30	9	2310	32.9	63.1	AF	2/10	35	35		999	25	24			
31	10	0000	32.9	63.1	GOES 2	3, IR 8									
32	10	0030	32.9	63.2	GOES 2	1,3, IR 8		40							
33	10	0119	32.9	63.3	AF		33			1000					
34	10	0600	32.8	63.8	GOES 2	3, IR 8									
35	10	0600	32.8	63.8	GOES 2	1,3, IR 8		35							

Property of  
NOAA Coral Gables Library  
Gables One Tower  
1320 South Dixie Highway, Room 520  
Coral Gables, Florida 33145

Table 6 continued.

HURRICANE CLARA CONTINUED

CENTER FIXES

FIX NO.	DATE	TIME (GMT)	POSITION		UNIT	CHARACTER.	MAX. WIND (KT)			MIN. PRESS. (MB)	MIN. 700 MB HT. (M)	TEMP. (°C)		EYE C-CIR. DIA. (N.MI.)	REMARKS
			LAT. ° N	° W			FLT. LVL.	SFC.	ACFT. ALT.			IN.	OUT.		
36	10	1104	32.9	63.8	AF	3/5	35	35	247M	1001	26	26		POORLY DEFINED.	
37	10	1200	33.0	63.6	GOES 2	3, IR 8									
38	10	1230	33.1	63.7	GOES 2	3, VSBL 2			40						
39	10	1410	32.8	63.7	AF	3/5	40	40	341M	1001	25	25		POORLY DEFINED.	
40	10	1800	33.5	63.9	GOES 2	5, VSBL 1									
41	10	1830	33.4	63.8	GOES 2	2, 5, VSBL 2			40						
42	11	0000	33.2	63.5	GOES 2	5, IR 8									
43	11	0014	34.2	62.9	AF	3/10	25	15	344M	1002	25				
44	11	0030	33.4	63.4	GOES 2	2, 5, IR 8			40						
45	11	0600	34.6	62.8	GOES 2	5, IR 8									
46	11	0630	34.7	62.7	GOES 2	1, 5, IR 8			45						
47	11	1200	36.0	61.5	GOES 2	5, VSBL 2									
48	11	1230	32.8	61.7	GOES 2	2, 5, VSBL 2			45						
49	11	1800	36.5	59.5	GOES 2	5, VSBL 2									
50	11	1830	36.3	59.7	GOES 2	2, 5, VSBL 2			45						

DATA FROM REPORT OF HURRICANE CLARA  
 1961-10-31 0000Z  
 1961-11-01 0000Z  
 1961-11-02 0000Z  
 1961-11-03 0000Z  
 1961-11-04 0000Z  
 1961-11-05 0000Z  
 1961-11-06 0000Z  
 1961-11-07 0000Z  
 1961-11-08 0000Z  
 1961-11-09 0000Z  
 1961-11-10 0000Z  
 1961-11-11 0000Z  
 1961-11-12 0000Z  
 1961-11-13 0000Z  
 1961-11-14 0000Z  
 1961-11-15 0000Z  
 1961-11-16 0000Z  
 1961-11-17 0000Z  
 1961-11-18 0000Z  
 1961-11-19 0000Z  
 1961-11-20 0000Z  
 1961-11-21 0000Z  
 1961-11-22 0000Z  
 1961-11-23 0000Z  
 1961-11-24 0000Z  
 1961-11-25 0000Z  
 1961-11-26 0000Z  
 1961-11-27 0000Z  
 1961-11-28 0000Z  
 1961-11-29 0000Z  
 1961-11-30 0000Z

Table 6 continued.

HURRICANE DOROTHY  
26-30 SEPTEMBER 1977

## CENTER FIXES

FIX NO.	DATE	TIME (GMT)	POSITION		UNIT	CHARACTER.	MAX. WIND(KT)		MIN. PRESS. (MB)	MIN. HT. (M)	TEMP. (°C)		EYE		REMARKS
			LAT. °N	LONG. °W			FLT. LVL.	ACFT. SFC.			IN.	OUT.	C=CIR.	DIA. E=ELIP. (N.MI.)	
1	25	1830	26.9	73.2	GOES 2	1,5,VSBL 2									
2	26	2152	28.9	70.7	AF	3/5	20			1009					
3	27	0630	29.5	69.0	GOES 2	2,5, IR 8				25					
4	27	1200	30.7	65.9	GOES 2	5,VSBL 1									
5	27	1230	30.8	65.7	GOES 2	2,5,VSBL 2				25					
6	27	1326	31.1	64.8	AF	5/5	44	45	299M	1000	25	24	C	20	OPEN SOUTHWEST.
7	27	1503	31.4	64.3	AF	5/5	40	45	317M	1000	25	24	C	20	OPEN WEST-SOUTHWEST.
8	27	1800	31.8	63.8	GOES 2	5,VSBL 4									
9	27	1830	31.9	63.7	GOES 2	2,5,VSBL 2				30					
10	28	0000	33.4	61.6	GOES 2	5, IR 8									
11	28	0030	33.5	61.3	GOES 2	2,5, IR 8				33					
12	28	0600	34.5	59.7	GOES 2	5, IR 8									
13	28	0630	34.4	60.0	GOES 2	2,5, IR 8				35					
14	28	1200	34.6	59.0	GOES 2	5,VSBL 2									
15	28	1230	35.0	58.9	GOES 2	2,3,VSBL 2				45					
16	28	1719	36.7	58.8	AF	5/3	60	65	184M	984	22	21	C	25	POORLY DEFINED.
17	28	1800	36.9	58.8	GOES 2	3,VSBL 4									
18	28	1830	37.0	58.6	GOES 2	2,3,VSBL 2				50					
19	29	0000	38.4	56.9	GOES 2	3, IR 8									
20	29	0030	38.6	56.8	GOES 2	2,3, IR 8				55					
21	29	0600	40.0	55.5	GOES 2	5, IR 8									
22	29	0630	40.0	55.5	GOES 2	3,5, IR 8				55					
23	29	1200	41.6	52.9	GOES 2	5,VSBL 2									
24	29	1230	41.6	52.8	GOES 2	2,3,VSBL 2				55					
25	29	1700	44.0	53.1	AF	5/3	45	35	323M	988	20	7	E/36/XX		
26	29	1800	44.1	52.5	GOES 2	5,VSBL 2									
27	29	1800	44.1	52.5	GOES 2	2,5,VSBL 4				45					
28	30	0000	48.0	47.0	GOES 2	5, IR 8									

Table 6 continued.

HURRICANE EVELYN  
13-15 OCTOBER 1977

CENTER FIXES

FIX NO.	DATE	TIME (GMT)	POSITION		UNIT	CHARACTER.	MAX. WIND (KT)		MIN. PRESS. 700MB	MIN. HT. (M)	TEMP. (°C)		EYE		REMARKS		
			LAT. °N	LONG. °W			FLT. LVL.	ACFT. SFC.			IN.	OUT.	C=CIR. E=ELIP.	DIA. (N.MI.)			
1	13	1830	27.0	63.0	GOES 2	2,5,VSBL 2											
2	14	0030	29.0	64.0	GOES 2	2,5, IR 8											
3	14	0600	31.0	65.0	GOES 2	5, IR 8											
4	14	0630	31.0	65.0	GOES 2	5,2, IR 8				30							
5	14	1201	33.0	64.6	GOES 2	3,VSBL 2											
6	14	1231	33.3	64.6	GOES 2	1,3,VSBL 2				35							
7	14	1423	34.2	65.0	AF	10/50				45	302M	1007	22	23			
8	14	1604	35.1	64.5	AF	4/10	70	60	332M	1004			23	23			
9	14	1801	36.0	64.4	GOES 2	3,VSBL 1											
10	14	1830	36.1	64.4	GOES 2	3,VSBL 2				50							
11	14	2350	39.2	63.3	AF		55		445M	994			23	22	C	24	OPEN NORTHWEST.
12	15	0000	39.2	63.4	GOES 2	3, IR 8											
13	15	0030	39.3	63.2	GOES 2	1,3, IR 8				65							
14	15	0600	42.5	61.5	GOES 2	3, IR 8											
15	15	0630	42.5	61.5	GOES 2	1,3, IR 8				77							
16	15	1231	46.0	58.8	GOES 2	2,3,VSBL 2				77							
17	15	1315	45.7	60.2	AF					55		998					CENTER MOVING ON SHORE.

Table 6 continued.

TROPICAL STORM FRIEDA  
16-18 OCTOBER 1977

CENTER FIXES

FIX NO.	DATE	TIME (GMT)	POSITION		UNIT	CHARACTER.	MAX. WIND (KT)			MIN. PRESS. (MB)	MIN. 700MB HT. (M)	TEMP. (°C)		EYE		REMARKS
			LAT. °N	°W			FLT. LVL.	SFC.	ACFT. ALT.			IN.	OUT.	C=CIR. DIA. E=ELIP. (N.MI.)		
1	16	1947	17.3	83.5	AF	5/5	17	35								
2	17	1324	17.2	84.1	AF		38	40				22	20	5		CALM WIND CENTER
3	17	1401	17.2	84.3	GOES 2	3, VSBL 2										
4	17	1550	17.2	84.2	AF	5/5	25	25				24	21			
5	17	1831	17.3	84.6	GOES 2	3, VSBL 2										
6	17	2000	17.3	84.6	AF	2/5	20	25								
7	17	2105	17.3	84.7	AF	2/5	60	50	300M			25				
8	18	0030	17.5	85.0	GOES 2	5, IR 8										
9	18	0619	17.3	86.3	AF	5/5	32					24	24			
10	18	0811	17.3	86.6	AF		50									
11	18	0924	17.5	86.5	AF		28									
12	18	1100	17.3	86.5	AF	5/5	32					24	23			
13	18	1231	17.5	86.8	GOES 2	2, 3, VSBL 2		25								
14	18	1531	17.5	87.3	GOES 2	1, 3, VSBL 2		25								
15	18	1806	17.7	87.4	AF	3/5	17	15	314M			26	27			
16	18	1831	17.7	87.6	GOES 2	1, 5, VSBL 2		25								
17	18	2042	17.6	87.7	AF		16	25	308M			26	22			

Table 7. Supplementary vortex data messages, 1977 Atlantic tropical cyclo

ANITA

URNT12 KMIA 310610  
 AF977 0501 ANITA OB 14  
 SUPPLEMENTARY VORTEX DATA MESSAGE  
 AZIMUTH 250 DEG FL100  
 LEFT REAR QUAD  
 83083 80909 43069 40909 33057 31008 13024 10808  
 03990 01210 64/// 50/// 34015 MX035 14015 /////  
 RIGHT FRONT QUAD  
 83089 81205 43064 41207 33030 31605 13004 11508  
 03995 01111 64/// 50/// 34055 MX040 31045 /////  
 RIGHT REAR QUAD  
 83091 81103 43074 41205 33065 31008 13035 11111  
 03995 01111 64/// 50/// 34070 MX042 04035 /////  
 LEFT FRONT QUAD  
 83078 81204 43052 41305 33026 31207 13982 11210  
 03972 01411 64/// 50/// 34090 MX046 21030 /////

URNT12 KMIA 311655 COR  
 AF980 0601 ANITA OB 16 COR  
 SUPPLEMENTARY VORTEX DATA MESSAGE  
 AZIMUTH 270 DEG FL100  
 RIGHT REAR QUAD  
 83099 81007 43083 41008 33067 31010 13037 10909  
 03968 01411 64020 50040 34050 MX065 05020 /////  
 RIGHT FRONT QUAD  
 83083 81107 43069 41107 33045 30909 13018 11111  
 03968 01411 64/// 50025 34045 MX050 32020 /////  
 LEFT FRONT QUAD  
 83072 80909 43036 41206 33980 31310 13960 11510  
 03960 01510 64015 50035 34045 MX065 22020 /////  
 RIGHT REAR QUAD  
 83087 81008 43067 40909 33039 31008 13975 11110  
 03939 01410 64020 50040 34045 MX065 05020 /////



Table 7 continued.

URNT12 KMIA 010720  
AF976 0901 ANITA OB 21  
SUPPLEMENTARY VORTEX DATA MESSAGE  
AZIMUTH 270DEG FL100  
RIGHT REAR QUAD  
83101 80906 43071 40906 33065 30909 13998 11110  
03916 01311 64/// 50020 34100 MX060 06012 /////  
LEFT REAR QUAD  
83080 81008 43065 41005 33032 31106 13987 11110  
03916 01311 64/// 50025 34045 MX055 14020 /////  
RIGHT FRONT QUAD  
83095 81104 43060 41009 33052 31204 13027 11108  
03889 01210 64040 50065 34100 MX075 30020 /////  
LEFT FRONT QUAD  
83093 81005 43029 40909 33011 30808 13981 11310  
03889 01210 64/// 50/// 34030 MX045 23040 /////

URNT12 KMIA 010725 COR  
AF976 0901 ANITA OB 22 COR  
SUPPLEMENTARY VORTEX DATA MESSAGE  
AZIMUTH 270DEG FL100  
LEFT REAR QUAD  
83097 81107 43072 41006 33052 31010 13018 11010  
03885 01311 64020 50060 34080 MX064 13030 /////  
RIGHT REAR QUAD  
83084 81104 43073 41106 3///// 3///// 13018 11009  
03857 01411 64030 50050 34100 MX075 04020 /////  
LAST REPORT ETA KBIX 01/0720Z OBS 1-22 TO KMIA

Table 7 continued

URNT12 KMIA 011340  
AF964 1001 ANITA OB 15  
SUPPLEMENTARY VORTEX DATA MESSAGE  
AZIMUTH 260DEG FL100  
RIGHT REAR QUAD  
83067 81108 43035 40909 33035 31010 13013 11010  
03828 01510 64022 50100 34135 MX068 10820 /////  
LEFT REAR QUAD  
83059 81007 43024 41010 33003 31010 13950 10909  
03828 01510 64025 50030 34042 MX068 13523 /////  
RIGHT FRONT QUAD  
83068 81207 43023 41110 33989 31010 13917 11312  
03774 01512 64024 50040 34100 MX085 30010 /////  
LEFT FRONT QUAD  
NOT OBSERVED

URNT12 KMIA 012130 COR  
AF492 1101 ANITA OB 10 COR  
SUPPLEMENTARY VORTEX DATA MESSAGE  
AZIMUTH 270DEG FL098  
RIGHT REAR QUAD  
83124 80907 43123 41106 33036 31111 13903 11312  
03749 01811 64040 50080 34120 MX090 02020 18000  
LEFT FRONT QUAD  
83111 81106 43063 40909 33014 31009 13927 11111  
03749 01811 64038 50053 34100 MX088 24015 20000  
LEFT REAR QUAD  
83114 80909 43062 40909 33010 31009 13803 11311  
03670 02010 64030 50085 34100 MX090 12015 30000  
RIGHT FRONT QUAD  
83097 80907 43055 40909 33960 31208 13792 11211  
03549 02210 64050 50080 34/// MX115 30015 30000

Table 7 continued.

URNT12 KMIA 021300  
AF972 1401 ANITA OB 8  
SUPPLEMENTARY VORTEX DATA MESSAGE  
AZIMUTH 230DEG FL100  
RIGHT REAR QUAD  
83067 80909 43038 41007 33011 30909 1///// 10909  
03475 01812 64/// 50050 34/// MX/// ///// 32000  
LEFT FRONT QUAD  
83058 80808 43025 40907 33990 30909 13886 11010  
03475 01812 64015 50030 34080 MX096 09510 32000  
RIGHT FRONT AND LEFT FRONT QUADS NOT OBSERVED

---

BABE

URNT12 KMIA 042105  
AF964 0602 BABE OB 12  
SUPPLEMENTARY VORTEX DATA MESSAGE  
AZIMUTH 340DEG FL010  
LEFT FRONT QUAD  
80008 82523 40007 32523 30006 32423 10004 12424  
00003 02524 64/// 50/// 34/// MX020 32050 500  
LEFT REAR QUAD  
80007 82525 40005 42625 30005 32623 10003 12523  
00003 02624 64/// 50/// 34/// MX028 24045 5000  
RIGHT REAR QUAD  
80007 82222 40004 42222 30002 32625 10002 12624  
00000 02624 64075 50/// 34/// MX070 14055 15000  
RIGHT FRONT QUAD  
80007 82521 40004 42422 30002 32424 10000 12626  
00000 02624 64/// 50045 34080 MX060 04035 15000  
LAST REPORT ETA KBIX 04/2125Z OBS 1 THRU 12 TO  
KMIA

Table 7 continued

URNT12 KMIA 050615  
AF967 0702 BABE OB 17  
SUPPLEMENTARY VORTEX DATA MESSAGE  
AZIMUTH 020 DEG FL 100  
LEFT FRONT QUAD  
83071 80906 43075 40907 33083 30909 13039 11008  
03060 01005 64/// 50/// 34/// MX030 07045 06000  
RIGHT REAR QUAD  
83094 81008 43076 41104 33083 31104 13067 11104  
03050 01008 64/// 50/// 34010 MX240 16010 /////  
LEFT FRONT QUAD  
8//// 8//// 4//// 4//// 33075 30906 13065 11107  
03050 01008 64/// 50/// 34/// MX015 35015 /////  
LEFT REAR QUAD  
83088 81103 43076 41005 33065 31105 13062 11106  
03053 01206 64/// 50/// 34/// MX025 22030 /////  
LAST REPORT ETA KBIX 05/0630Z OBS 1-17 KMIA

URNT12 KMIA 051120 COR  
AF365 0802 BABE OB 09 COR  
SUPPLEMENTARY VORTEX DATA MESSAGE  
AZIMUTH 360 DEG FL 100  
RIGHT FRONT QUAD  
89/// 80908 43065 41006 33052 31010 13047 11010  
03041 01110 64/// 50/// 34090 MX046 13063 /////  
RIGHT FRONT QUAD  
89/// 81007 43061 41106 33051 31206 13045 11308  
03041 01110 64/// 50/// 34/// MX019 30080 /////  
RIGHT REAR QUAD  
83087 81104 43078 41005 33065 31007 13055 11009  
09/// 01410 64/// 50/// 34/// MX026 18036 /////  
DATA IN RIGHT FRONT QUAD QUESTIONABLE

Table 7 continued.

CLARA

URNT12 KMIA 081830  
AF972 0303 CLARA OB 14  
SUPPLEMENTARY VORTEX DATA MESSAGE  
AZIMUTH 080 DEG FL 015  
LEFT REAR QUAD  
80008 82220 40007 42222 30005 32422 10002 12222  
00993 02522 64/// 50/// 34010 MX080 18015 /////  
RIGHT FRONT QUAD  
80007 82422 40004 42322 30002 32422 10998 12322  
00993 82522 64/// 50015 34035 MX045 01010 /////  
LEFT FRONT QUAD  
///// ///// 40004 42422 30003 32521 10001 12423  
00993 02522 64/// 50/// 34010 MX040 03008 /////  
RIGHT REAR QUAD N/A

URNT12 KMIA 090400  
AF969 0403 CLARA OB 12  
SUPPLEMENTARY VORTEX DATA MESSAGE  
AZIMUTH 075 DEG FL 100  
RIGHT FRONT QUAD  
83134 80806 4///// 40906 33115 31006 1///// 1/////  
03104 01306 64/// 50/// 34/// MX020 12015 /////  
LEFT REAR QUAD  
83140 80902 43130 41004 33124 31104 13113 11204  
03101 01405 64/// 50/// 34015 MX034 35015 /////  
RIGHT REAR QUAD N/A  
LEFT FRONT QUAD N/A

URNT12 KMIA 100205  
AF972 0603 CLARA OB 10 COR 2  
SUPPLEMENTARY VORTEX DATA MESSAGE  
AZIMUTH 180 DEG FL 015  
RIGHT FRONT QUAD  
80007 82423 40004 42423 30003 32424 10000 12524  
00999 02524 64/// 50/// 34/// MX028 23030 /////  
LEFT FRONT QUAD  
80008 82422 40005 42422 30004 32423 10001 12424  
00000 02424 64/// 50/// 34/// MX033 13030 /////  
RIGHT AND LEFT REAR QUAD NA.

Table 7 continued.

URNT12 KMIA 101455  
AF980 0703 CLARA OB 12  
SUPPLEMENTARY VORTEX DATA MESSAGE  
AZIMUTH 200 DEG FL 010  
LEFT REAR QUAD  
80008 82323 40006 42525 30005 32525 10002 12525  
80001 02626 64/// 50/// 34/// MX030 03015 /////  
LEFT FRONT QUAD  
80008 82424 40007 42424 30006 32525 10004 12525  
00001 02525 64/// 50/// 34060 MX040 16045 /////

---

EVELYN

URNT12 KMIA 150145  
AF365 0207 EVELYN OB 9  
SUPPLEMENTARY VORTEX DATA MESSAGE  
AZIMUTH 010DEG FL140  
LEFT REAR QUAD  
80007 82222 40004 42121 30003 32222 10999 12222  
00994 02323 64/// 50/// 34075 MX055 24045 /////  
RIGHT REAR QUAD  
80009 82222 40005 42121 30003 32020 10999 12121  
00994 02323 64040 50085 34/// MX072 12015 /////

---

FRIEDA

URNT12 KMIA 171645  
AF967 0208 CYCLONE OB 11 (FRIEDA)  
SUPPLEMENTARY VORTEX DATA MESSAGE  
AZIMUTH 270DEG FL100  
RIGHT FRONT QUAD  
80013 82121 40013 42121 30011 32020 10008 12222  
00007 02121 64/// 50/// 34/// MX038 02020 /////  
LEFT FRONT QUAD  
80014 82116 40013 41919 30012 32018 10010 12120  
0//// 0//// 64/// 50/// 34050 MX035 24050 /////  
LEFT REAR QUAD  
80014 82119 40014 41919 30014 31919 10013 12121  
00008 02423 64/// 50/// 34/// MX025 14025 /////  
  
STRONG EW ORIENTED FEEDERBAND 100NMI NW OF CNTR.

Table 8. Tropical Cyclone Reconnaissance Summary for 1977.

<hr/>		
1. Requirements	Atlantic	Eastern & Central Paci
Storm Fixes	66	4
Invest	<u>46</u>	<u>0</u>
TOTAL	112	4
2. Requirements Accomplished	Atlantic	Eastern & Central Pac:
53 WRS	29	1
920 WRG	65	3
RFC	<u>18</u>	<u>0</u>
TOTAL	112	4
3. Missions Flown	Atlantic	Eastern & Central Pac
53 WRS	18	1
920 WRG	47	3
RFC	<u>11</u>	<u>0</u>
TOTAL	76	4
4. Flying Time (Hours)	Atlantic	Eastern & Central Pac
53 WRS	159.6	10.0
920 WRG	473.1	32.7
RFC	<u>91.3</u>	<u>0.0</u>
TOTAL	724.0	42.7
	+ <u>42.7</u>	

GRAND TOTAL