

QC
995
0672
no. 43

e. 3

NOAA TECHNICAL MEMORANDUM NWS NHC 43

ANNUAL DATA AND VERIFICATION TABULATION
EASTERN PACIFIC TROPICAL CYCLONES 1988

Prepared by:

Robert A. Case and Gilbert B. Clark
National Hurricane Center

National Hurricane Center
Coral Gables, Florida
March 1989

2883

UNITED STATES
DEPARTMENT OF COMMERCE
Robert A. Mosbacher, Secretary

National Oceanic and Atmospheric Administration
William E. Evans
Under Secretary and Administrator

National Weather Service
Elbert W. Friday
Assistant Administrator



INTRODUCTION

This is the first report by the National Hurricane Center (NHC) of a continuing annual series to provide a source of summarized data on Eastern Pacific tropical cyclones. It will not duplicate the narrative overview of the hurricane season or the description of 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 Tropical Satellite and Analysis Center of NHC, 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. EPSANBAR (Sanders and Burpee, 1968). A filtered barotropic model using input data derived from the 1000 to 100 mb pressure weighted winds.
2. EPHC81 A statistical-dynamical model.
3. EPCL84 A simulated-analog model based on persistence and climatology.
4. EPANALOG85 (Jarrell, Mauck, and Renard, 1975). An analog model.
5. EPSS87 A statistical-synoptical model

In addition, operational forecasts of tropical cyclone intensity changes in knots at 12-hourly intervals out to 72 hours are generated by a program named SHIFOR (Statistical Hurricane Intensity Forecasts). Generation of the forecast equations was done by multiple screening regression technique using historical tropical cyclone data as input. Results over the past several years have shown that SHIFOR and official intensity forecasts have comparable skill scores.

The National Hurricane Center uses the above models as guidance in the formulation of its forecasts. The hurricane forecaster also makes extensive use of analysis and prognoses produced by NMC and TSAC (Tropical Satellite and Analysis Center) in Miami.

VERIFICATION

Verification statistics for the 1988 season are shown in Table 1. 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 the best-track positions.

DATA SUMMARIES

A summary of the 1988 Eastern Pacific tropical cyclone statistics is given in Table 2. Tracks of the 1988 storms and hurricanes are shown in figure 1.

The best track, initial, and forecast positions for the 1988 systems are in Table 3, along with initial position and forecast errors, and average errors.

Table 4 lists all center fix positions and intensity evaluations used operationally at the National Hurricane Center during the 1988 season. Fixes are in chronological order, and include those obtained by aerial reconnaissance penetrations, satellite (Miami TSAC), and land-based radar. The legend precedes the initial table.

Graphs of the lowest central pressure versus time for the 1988 named tropical cyclones are shown in Figure 2.

ACKNOWLEDGEMENTS

Main contributors were Miles Lawrence, who computed the verification statistics and Joan David, who drafted the track chart and pressure/time graphs.

REFERENCES

- Hope, J. R., and B. I. Miller, 1972: "A Statistical Method of Combining Synoptic and Empirical Cyclone Prediction Systems. NOAA Technical Memorandum NWS SR-63, U.S. Department of Commerce, National Weather Service, Southern Region.
- Jarrell, J.D., and C.M. Mauck, and R.J. Renard, 1975: The Navy's Analog Scheme for Forecasting Tropical Cyclone Motion Over the Northeast Pacific Ocean. Technical Paper No. 6-75, Environmental Prediction Research Facility, Naval Postgraduate School, Monterey, California.
- Leftwich, P.W., 1981: A Statistical-Dynamical Model for Prediction of Tropical Cyclone Motion in the Eastern North Pacific Ocean. NOAA Technical Memorandum NWS WR-169, U.S. Department of Commerce, National Weather Service, Western Region.
- Leftwich, P.W., and C.J. Newman, 1977: Statistical Guidance on the Prediction of Eastern North Pacific Tropical Cyclone Motion. NOAA Technical Memorandum NWS WR-125, U.S. Department of Commerce, National Weather Service, Western Region.
- Neumann, C. J., 1972: "An Alternative to the HURRAN Tropical Cyclone Forecast System," NOAA Technical Memorandum NWS SR-62, 24 pp.
- Neumann, C. J., 1979: "A Guide to Atlantic and Eastern Pacific Models for the Prediction of Tropical Cyclone Motion," NOAA Technical Memorandum NWS NHC-11, 26 pp.
- 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 APPENDICES

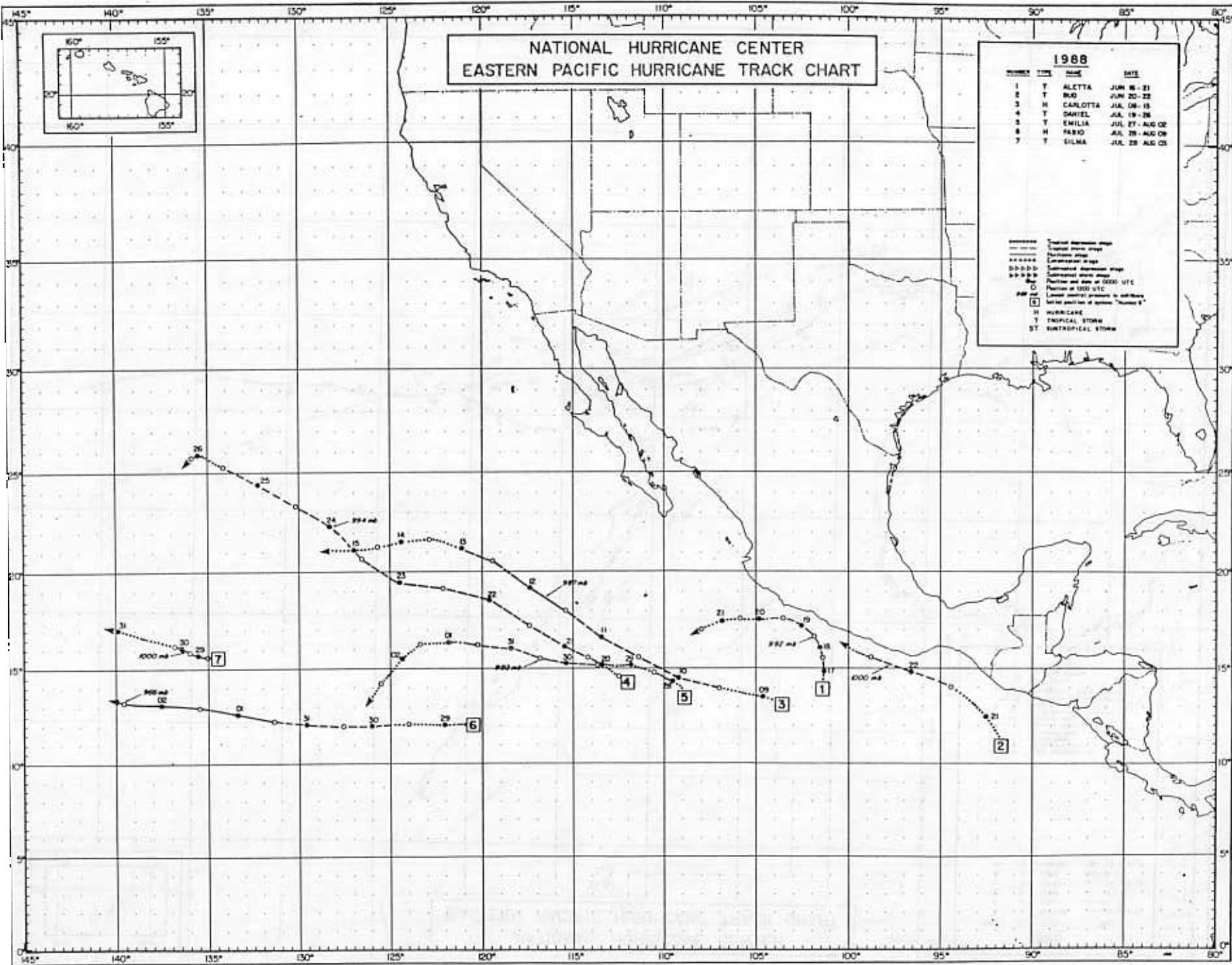
- Figure 1. Tracks of 1988 tropical cyclones
- Figure 2. Lowest pressure vs. time, 1988 tropical cyclones.
- Figure 3. Daily satellite photographs of 1988 tropical cyclones.
- Table 1. Verification of 1988 tropical storm and hurricane forecasts.
Figures in parentheses are the number of cases.
- Table 2. Summary of 1988 tropical cyclone statistics
- Table 3a. Best track, initial and forecast positions, initial position error and forecast errors for 1988 tropical cyclones.
- Table 3b. Best track forecast windspeed verification for 1988 tropical cyclones.
- Table 4. Center fix positions and intensity evaluations for 1988 cyclones.

NATIONAL HURRICANE CENTER EASTERN PACIFIC HURRICANE TRACK CHART

1988

NUMBER	TYPE	NAME	DATE
1	T	ALETTA	JUN 16-21
2	T	RAO	JUN 20-22
3	H	CARLOTTA	JUL 08-15
4	T	DANIEL	JUL 19-26
5	T	EMILIA	JUL 27-AUG 02
6	H	FABIO	AUG 28-AUG 09
7	T	SILMA	JUL 28-AUG 03

----- Tropical depression stage
 - - - - - Tropical storm stage
 - - - - - Hurricane stage
 - - - - - Extratropical depression stage
 - - - - - Extratropical storm stage
 - - - - - Extratropical severe stage
 O Position and date at 0000 UTC
 [] Position at 0000 UTC
 [] Lowest central pressure in mb (hPa)
 [] Intensity at time of max. "Number 1"
 H HURRICANE
 T TROPICAL STORM
 ST SUBTROPICAL STORM



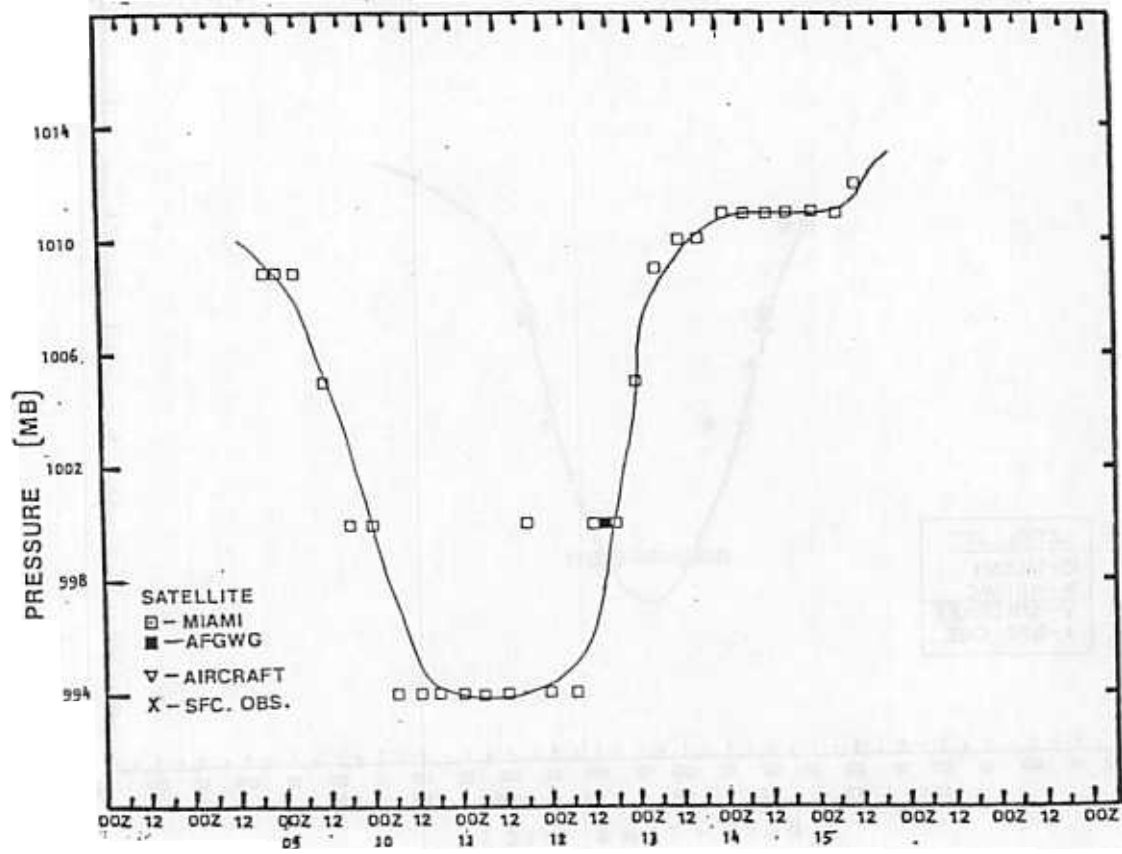


Fig. 2. Minimum central pressure for Tropical Storm Carlotta, 8-15 July 1988.

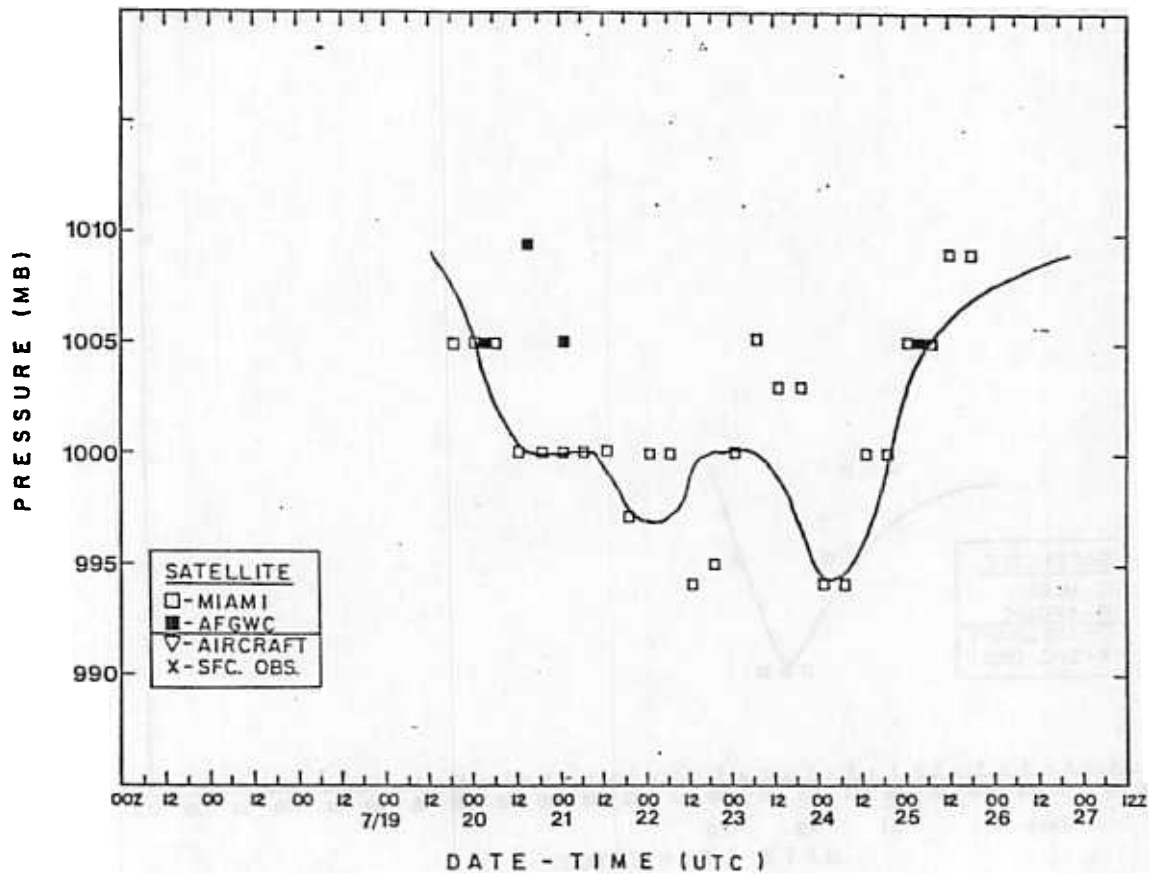


Fig. 2. Minimum central pressure for Tropical Storm Daniel, 19-26 July 1988.

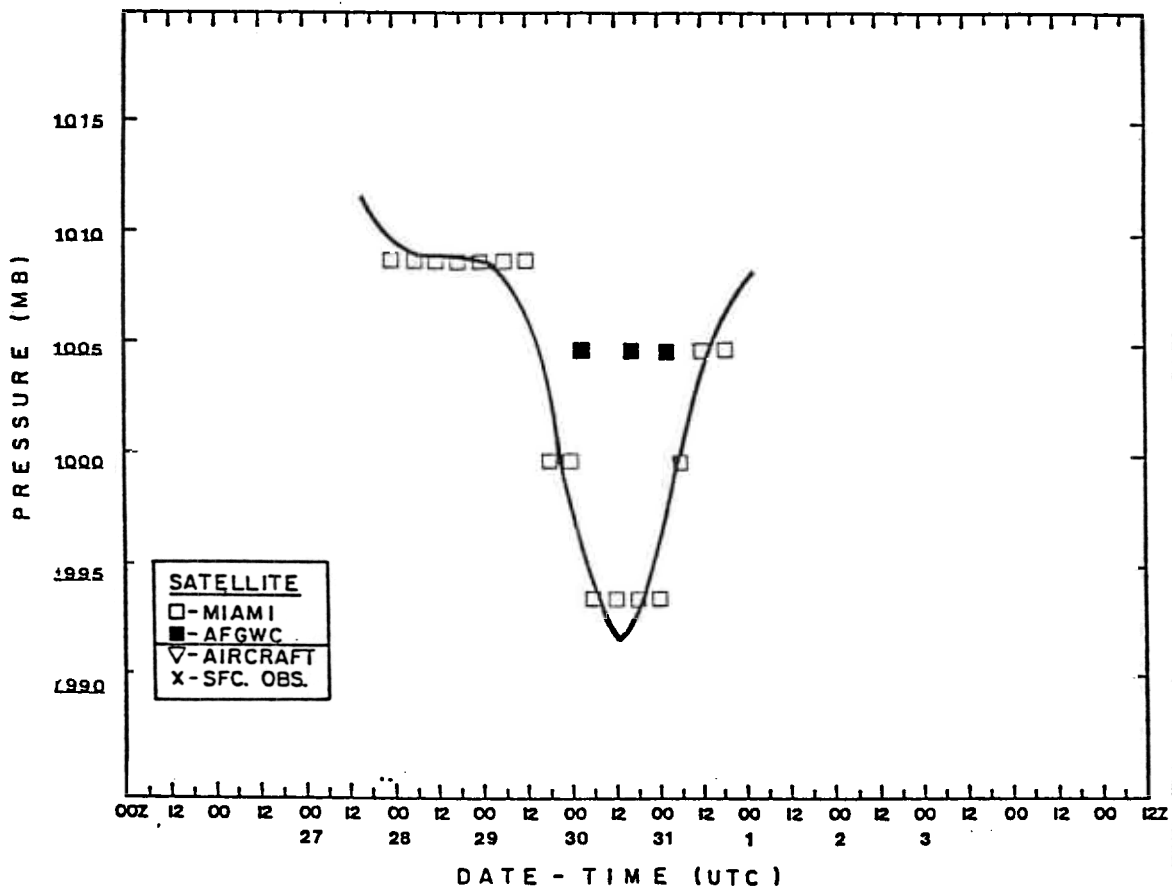


Fig. 2. Best track minimum central pressure curve for Tropical Storm Emilia, 27 July-2 August, 1988.

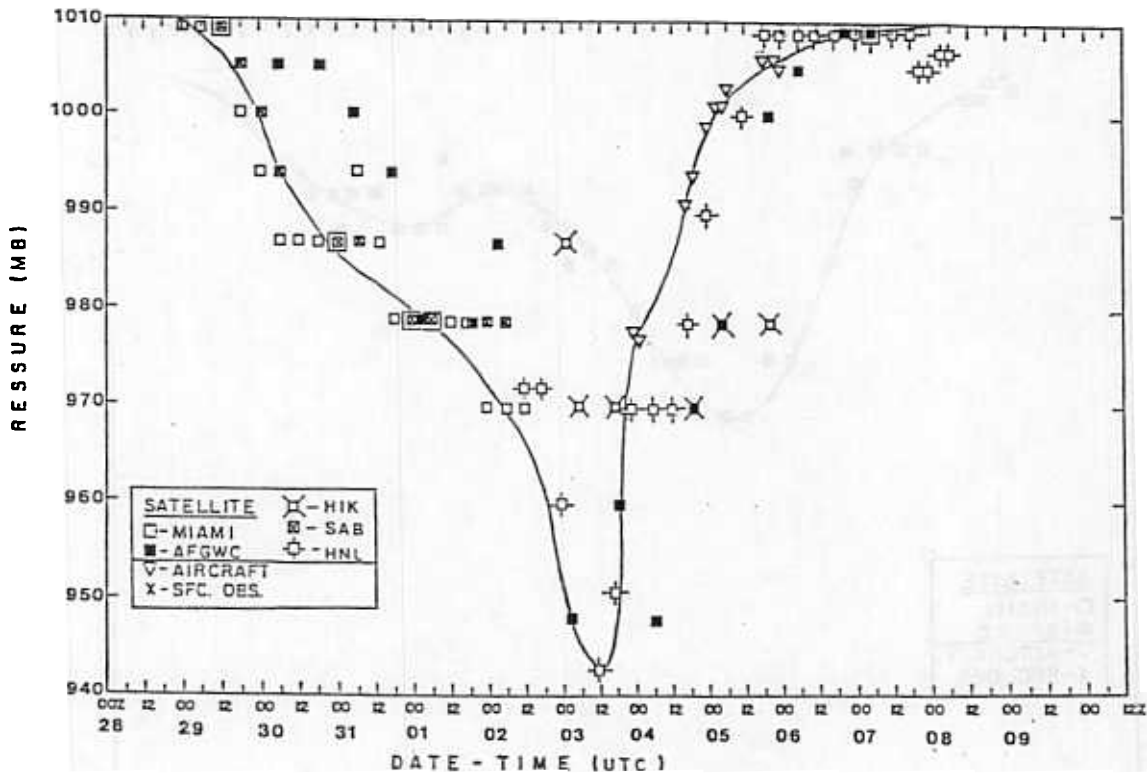


Fig. 2. Best track minimum central pressure curve for Hurricane Fabio, 28 July-9 August, 1988.

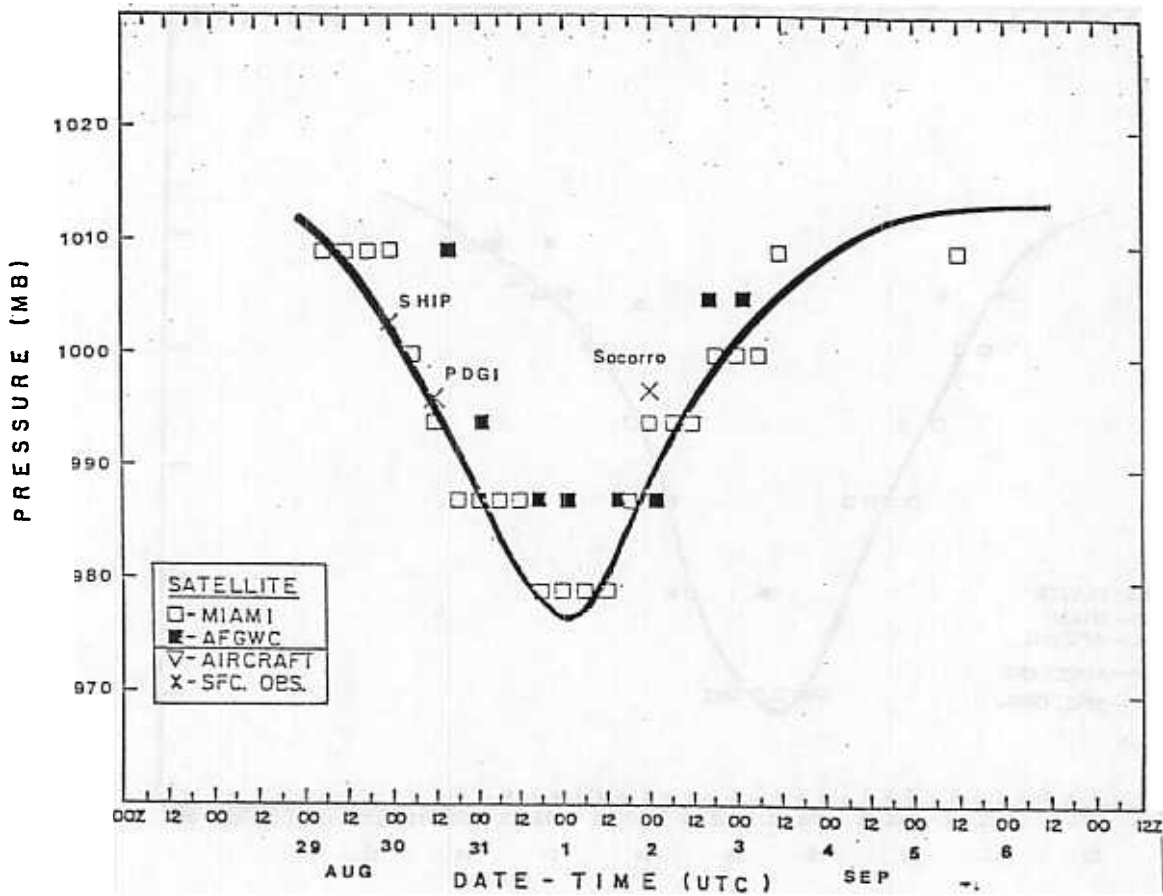


Fig. 2. Best track minimum central pressure curve for Tropical Storm Kristy, 29 August-6 September, 1988.

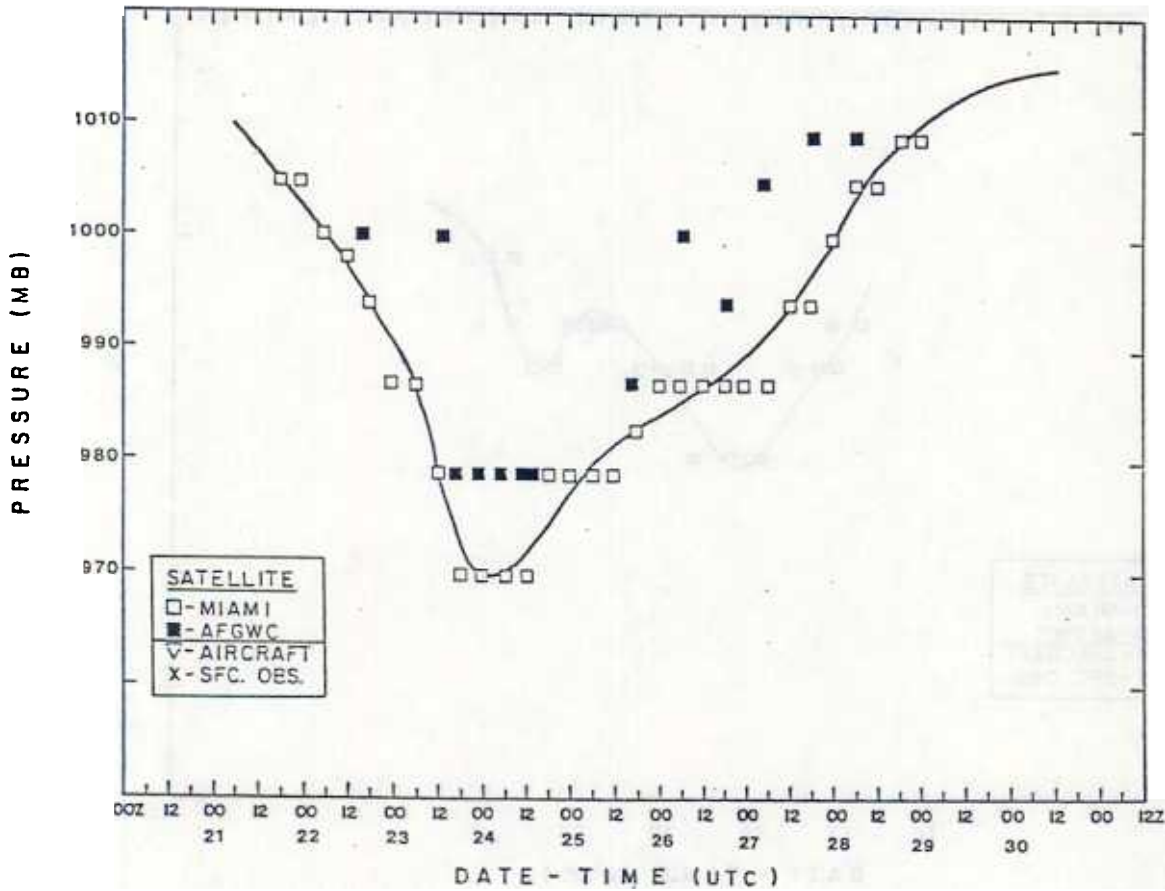


Fig. 2. Best track minimum central pressure curve for Hurricane Lane, 21-30 September, 1988.

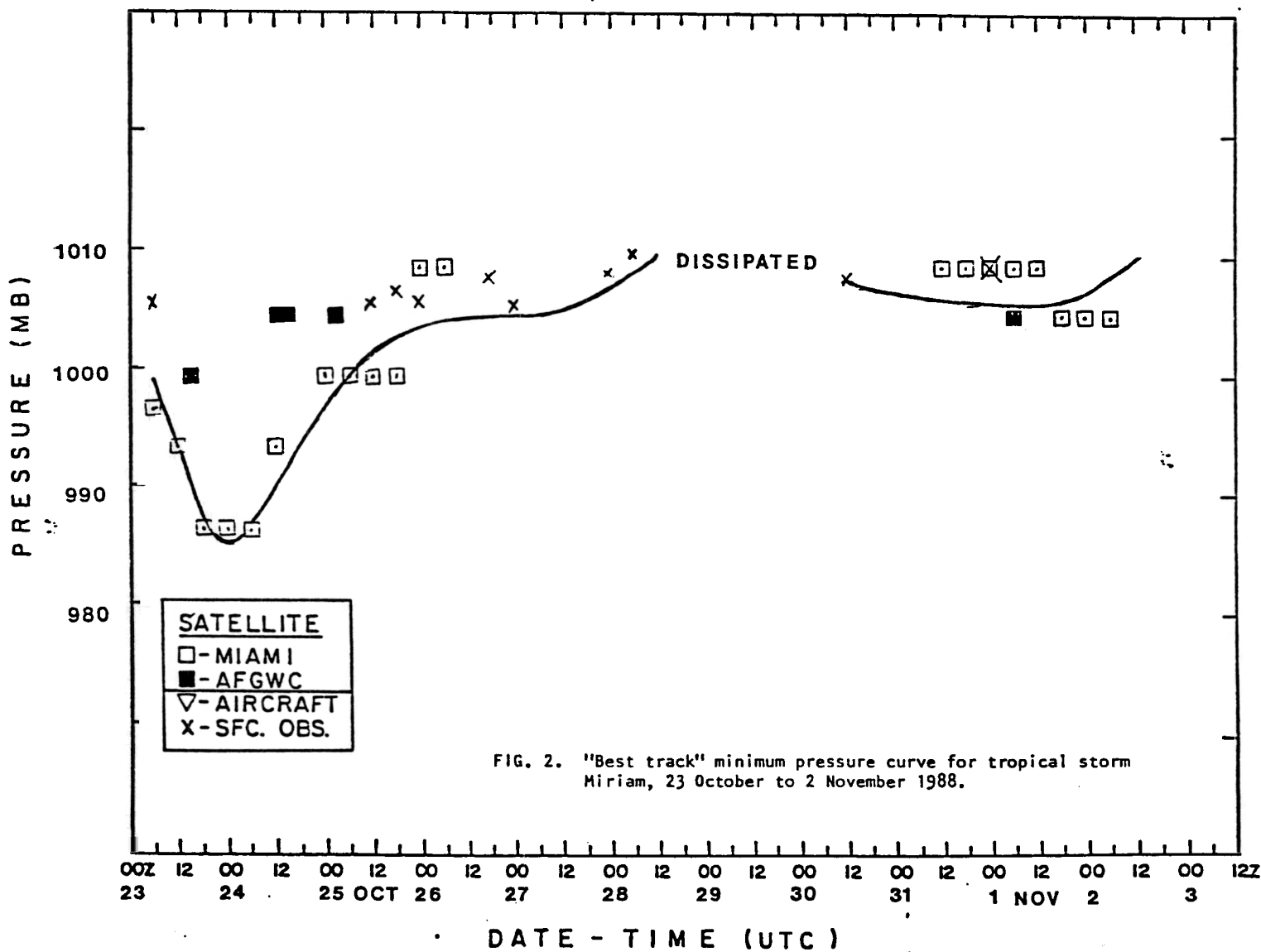
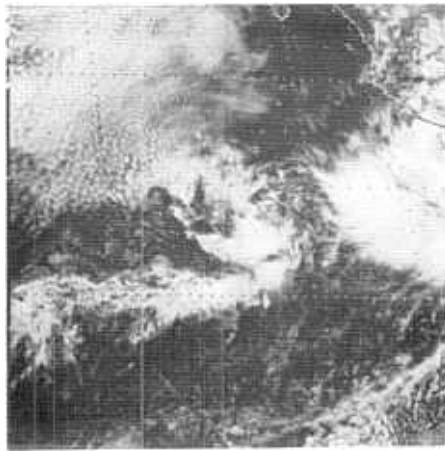


Figure 3. Daily satellite photographs of 1988 Eastern Pacific cyclones.



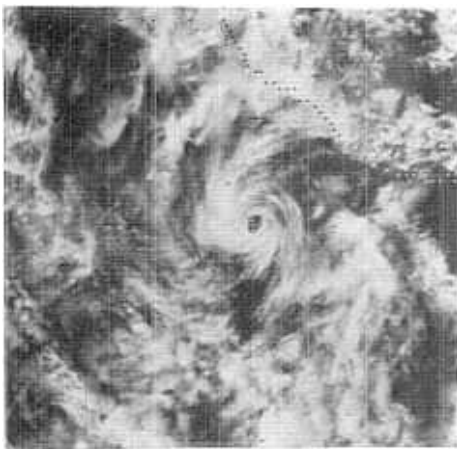
2046 UTC 6/15/88



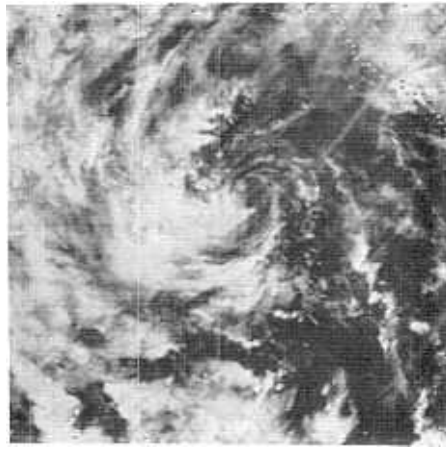
2131 UTC 6/16/88
1007 mb



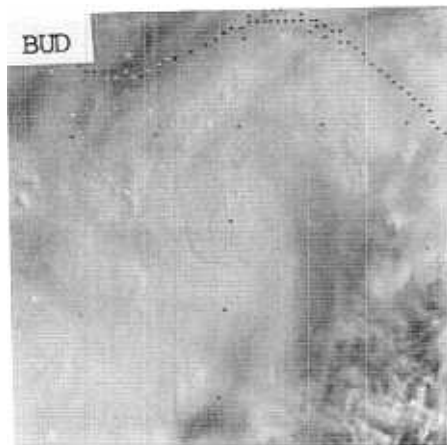
1946 UTC 6/17/88
995 mb



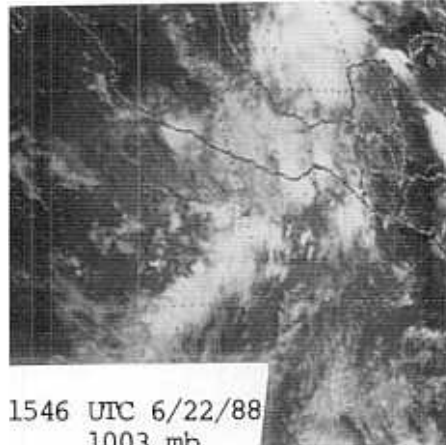
1746 UTC 6/18/88
993 mb



2001 UTC 6/19/88
1007 mb

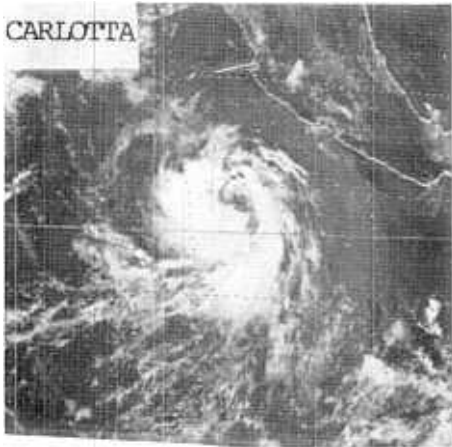


1501 UTC 6/21/88
1004 mb

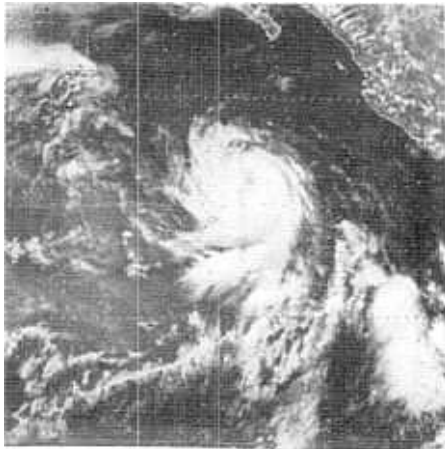


1546 UTC 6/22/88
1003 mb

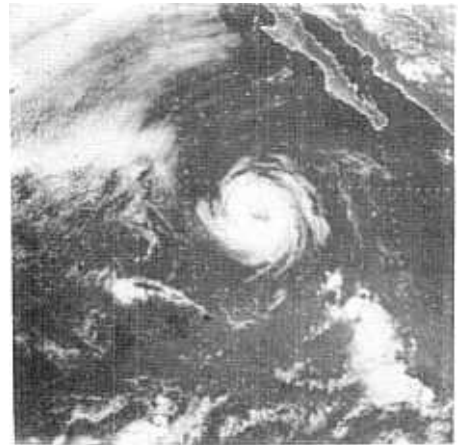
CARLOTTA



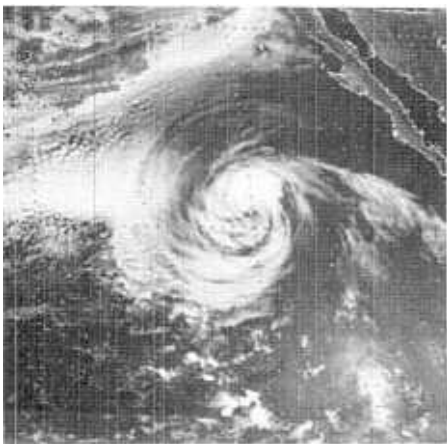
1646 UTC 7/09/88
1003 mb



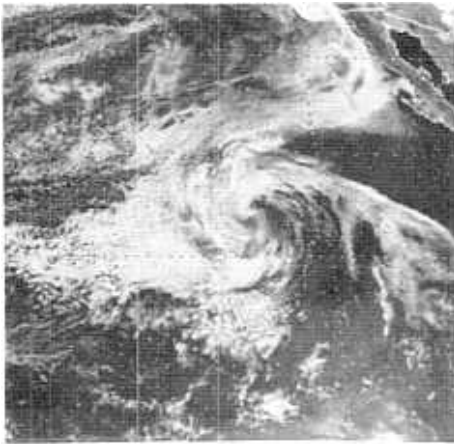
1846 UTC 7/10/88
994



1746 UTC 7/11/88
994 mb



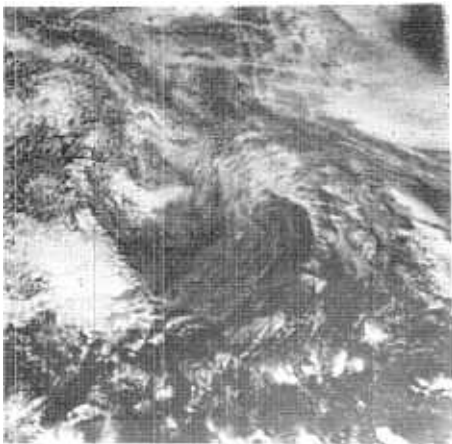
746 UTC 7/12/88
1000



1846 UTC 7/13/88
1010 mb

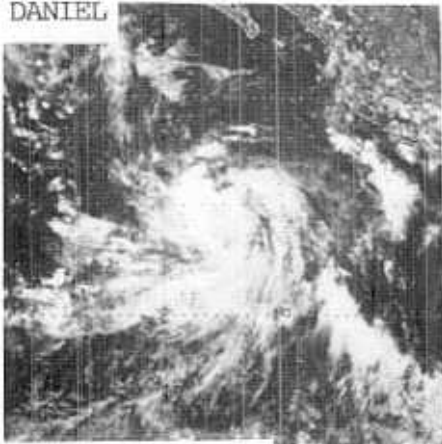


1847 UTC 7/14/88
1011 mb

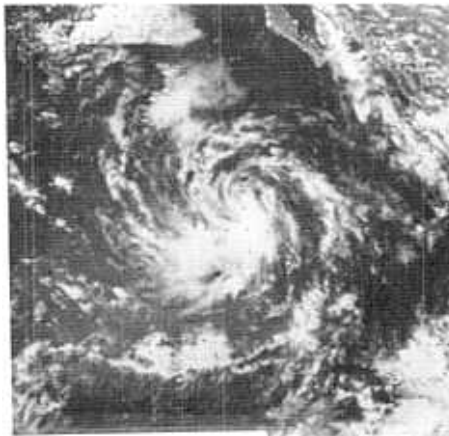


1846 UTC 7/15/88
1012 mb

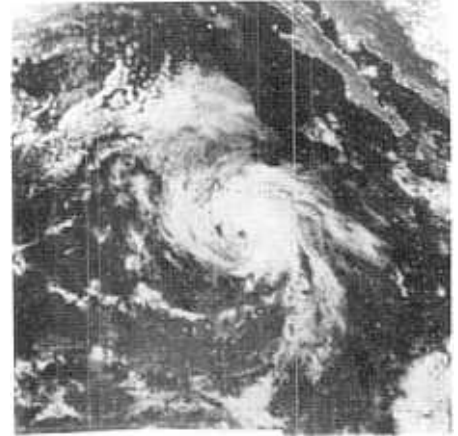
DANIEL



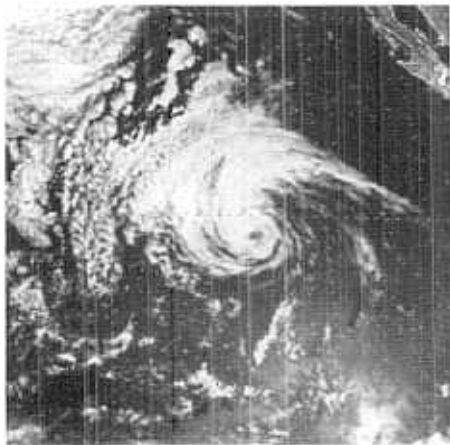
1746 UTC 7/19/88
1007 mb



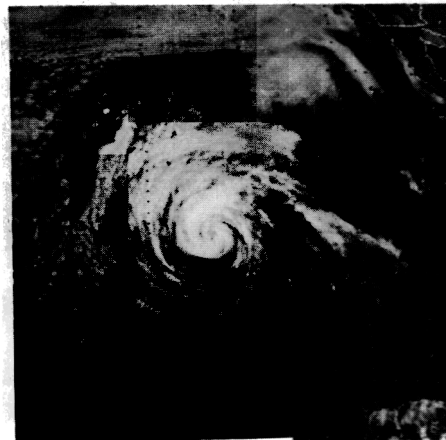
1846 UTC 7/20/88
1000 mb



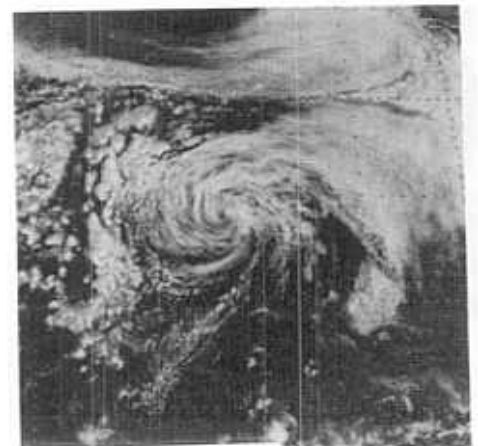
1846 UTC 7/21/88
997 mb



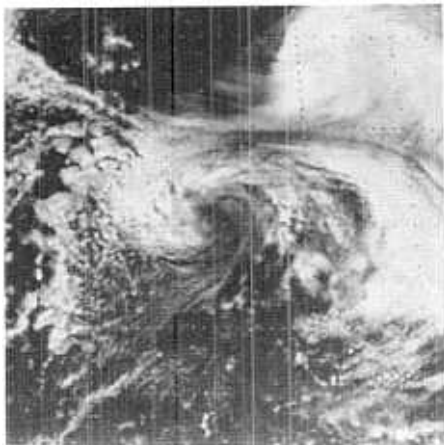
1846 UTC 7/22/88
1000 mb



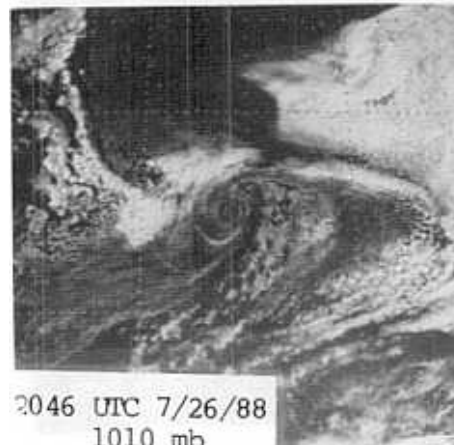
1746 UTC 7/23/88
997 mb



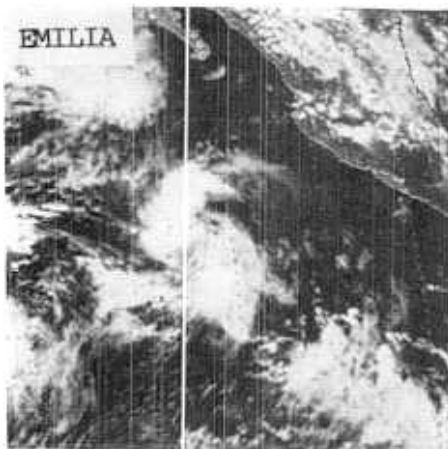
1846 UTC 7/24/88
1000 mb



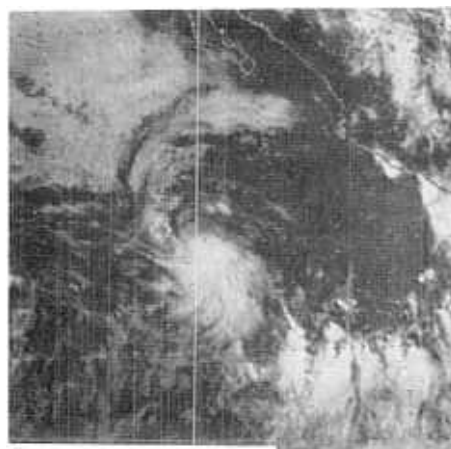
1846 UTC 7/25/88
1007 mb



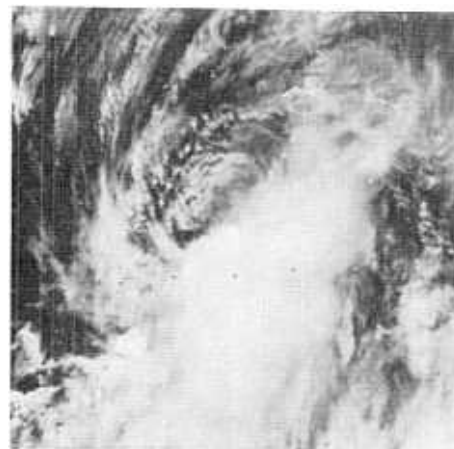
2046 UTC 7/26/88
1010 mb



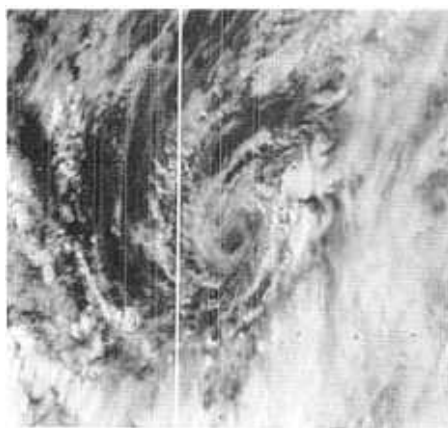
2046 UTC 7/28/88
1009 mb



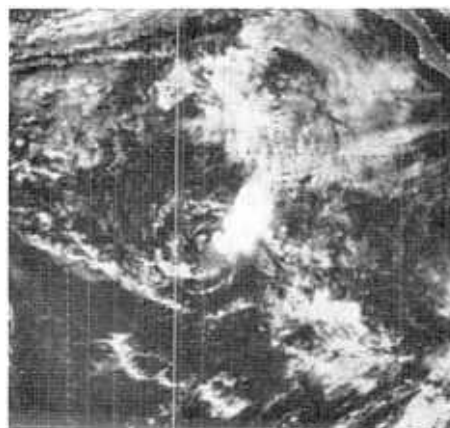
1546 UTC 7/29/88
1003 mb



1901 UTC 7/30/88
1001



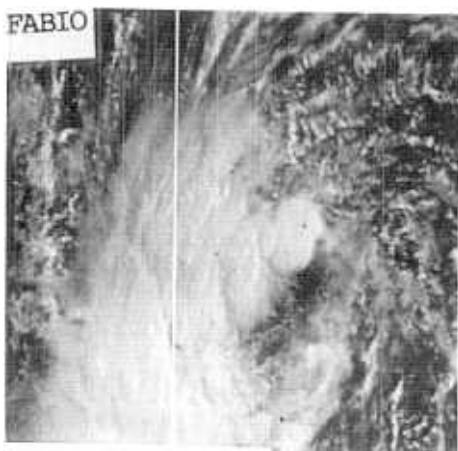
1601 UTC 7/31/88
1008 mb



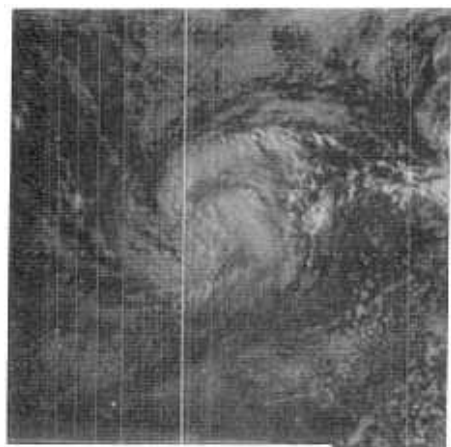
2046 UTC 8/01/88
1011 mb



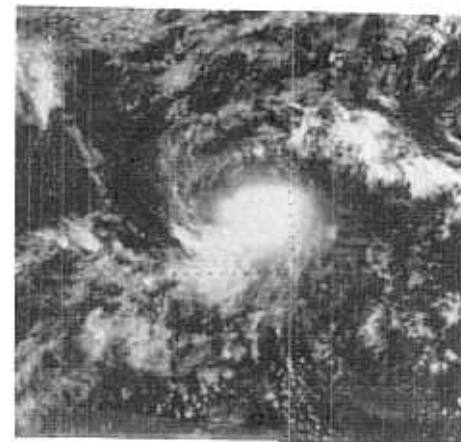
2046 UTC 8/02/88
1013 mb



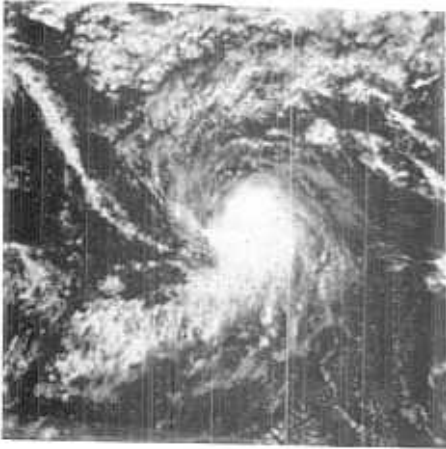
1601 UTC 7/29/88
1003 mb



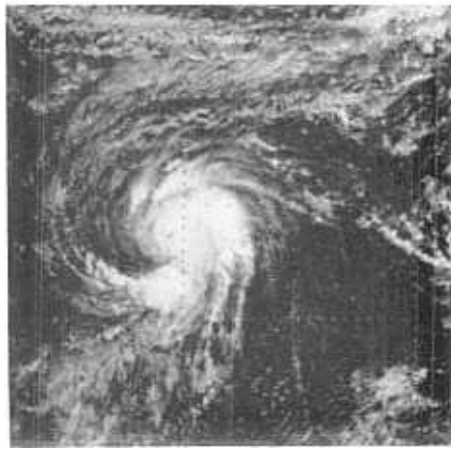
1546 UTC 7/30/88
988 mb



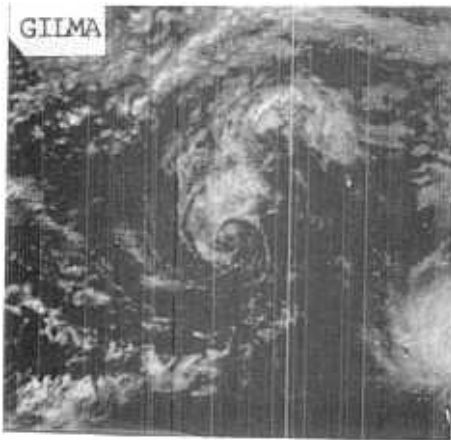
1746 UTC 7/31/88
981 mb



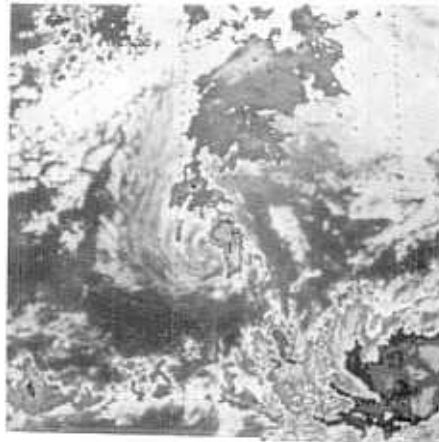
1846 UTC 8/01/88
974 mb



746 UTC 8/02/88
960 mb



0046 UTC 7/30/88
1000 mb



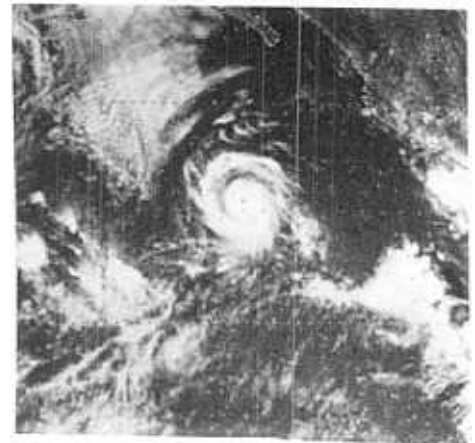
2016 UTC 7/31/88
1009 mb



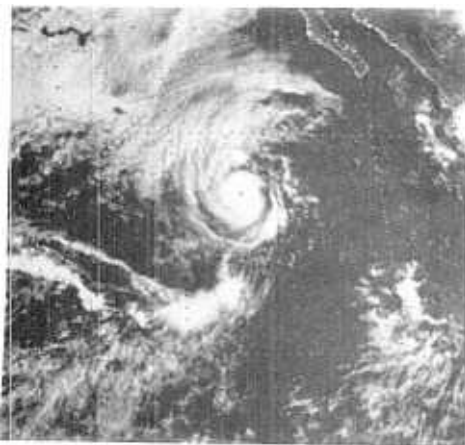
1746 UTC 7/31/88
1006 mb



1846 UTC 8/01/88
993 mb



1746 UTC 8/02/88
948 mb



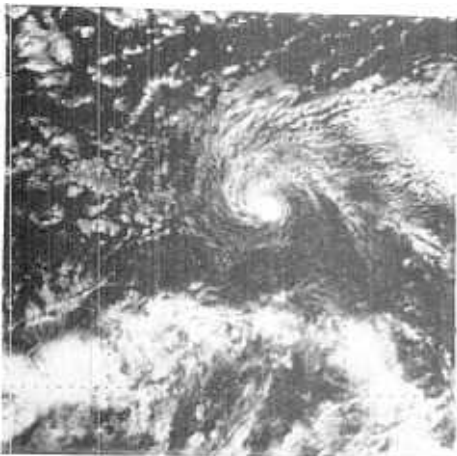
1646 UTC 8/03/88
938 mb



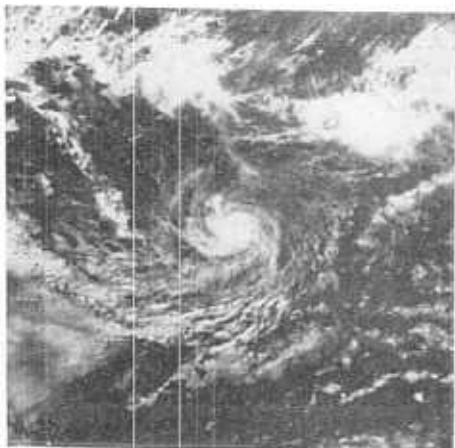
1746 UTC 8/04/88
966 mb



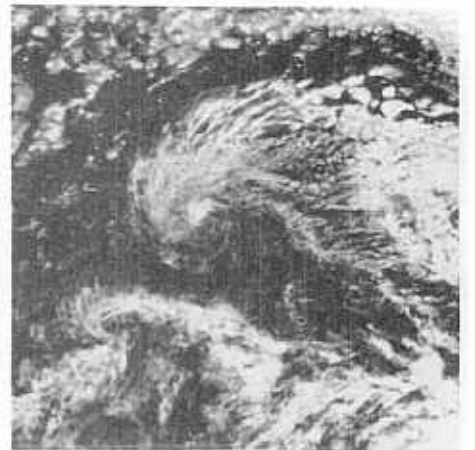
1746 UTC 8/05/88
985 mb



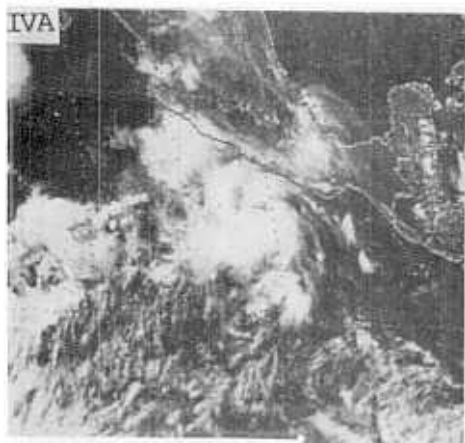
2046 UTC 8/06/88
981 mb



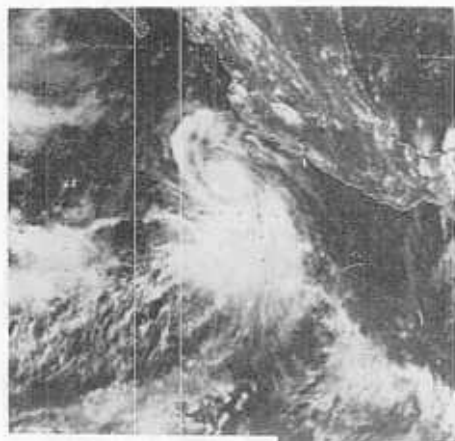
1846 UTC 8/07/88
984 mb



1846 UTC 8/08/88
999 mb



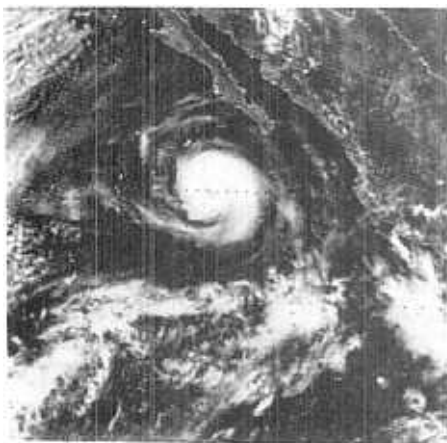
1746 UTC 8/05/88
1009



2046 UTC 8/06/88
994 mb



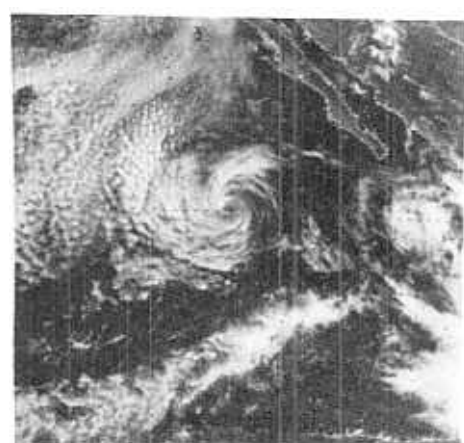
1846 UTC 8/07/88
975 mb



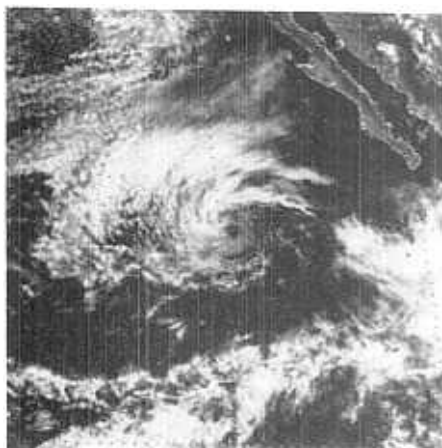
1846 UTC 8/08/88
970 mb



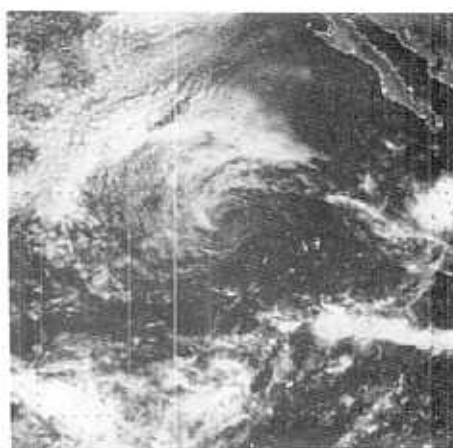
1846 UTC 8/09/88
987 mb



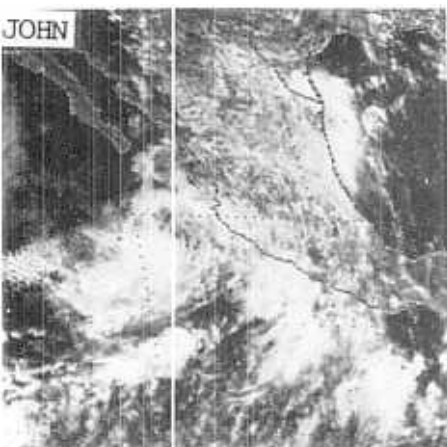
1746 UTC 8/10/88
1002 mb



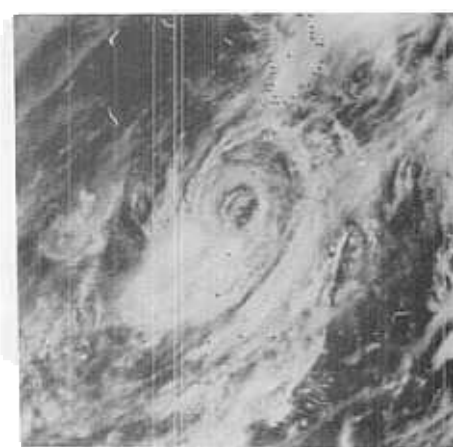
1846 UTC 8/11/88
1009 mb



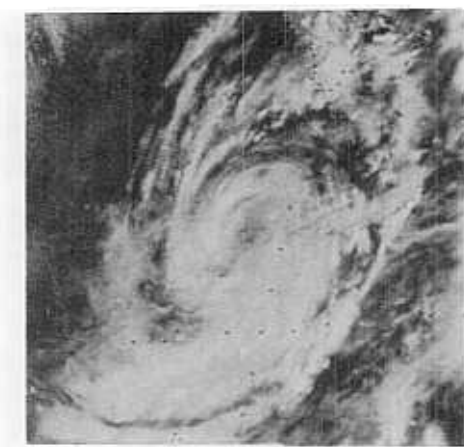
1746 UTC 8/12/88
1011 mb



1846 UTC 8/17/88
1006 mb



2001 UTC 8/18/88
1007 mb

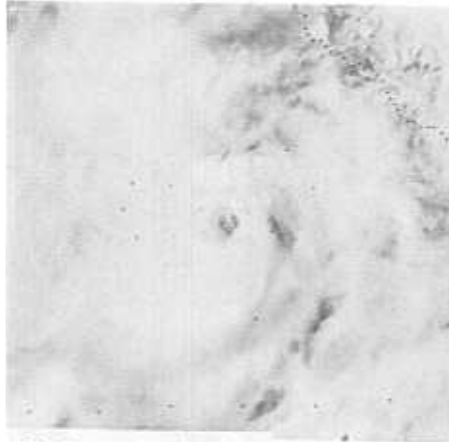


1701 UTC 8/19/88
1012 mb

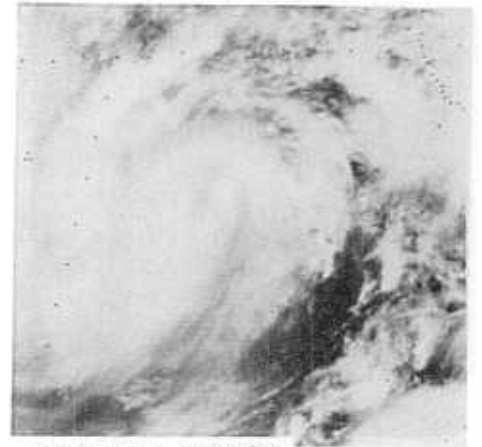
KRISTY



1831 UTC 8/29/88
1007 mb



2031 UTC 8/30/88
994



1701 UTC 8/31/88
978 mb



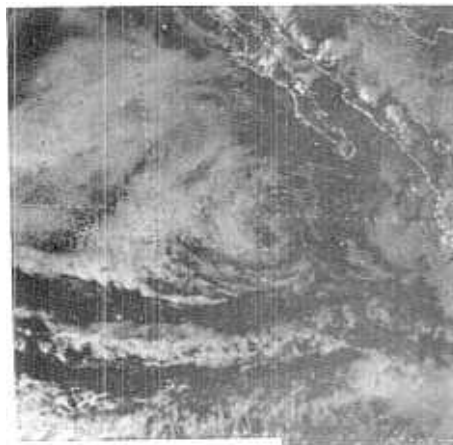
1801 UTC 9/01/88
978 mb



746 UTC 9/02/88
999



1546 UTC 9/03/88
1006 mb

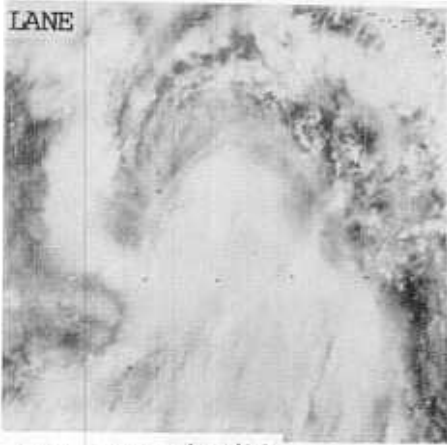


2346 UTC 9/04/88
1012

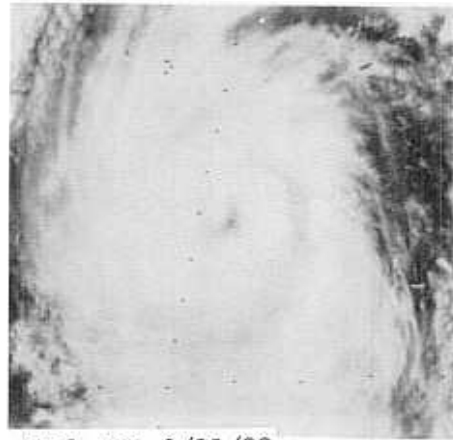


1846 UTC 9/05/88
1013

LANE



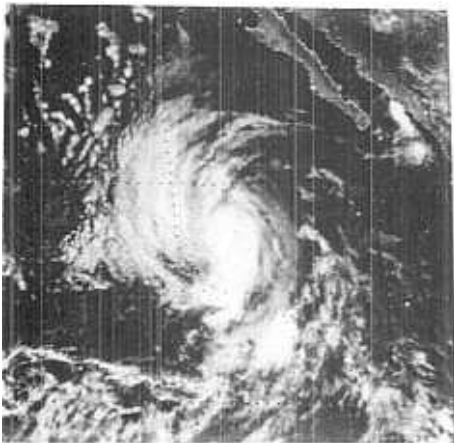
1531 UTC 9/22/88
993



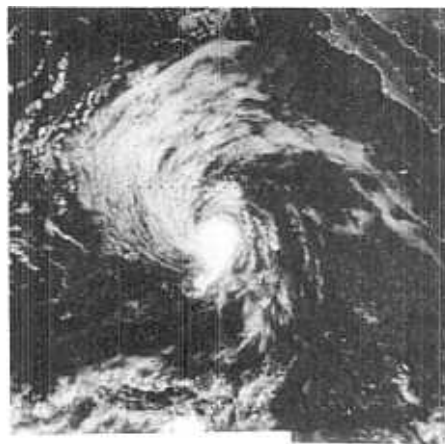
1931 UTC 9/23/88
974 mb



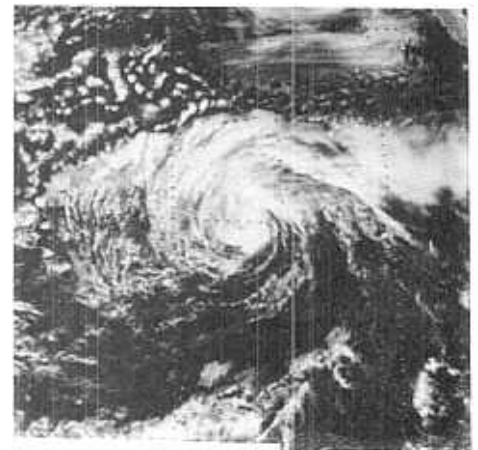
2046 UTC 9/24/88
974



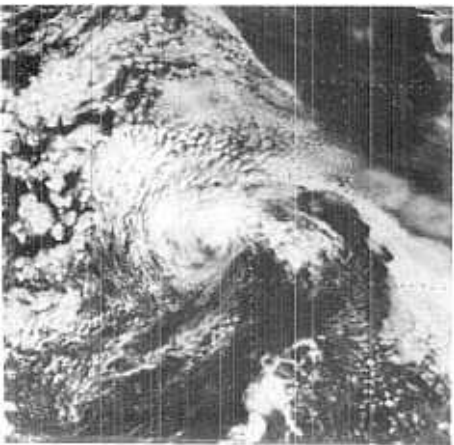
1746 UTC 9/25/88
983 mb



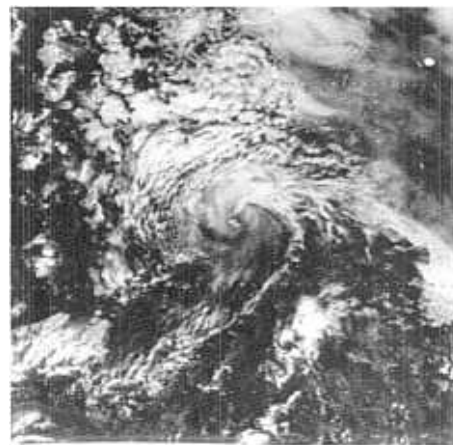
746 UTC 9/26/88
988



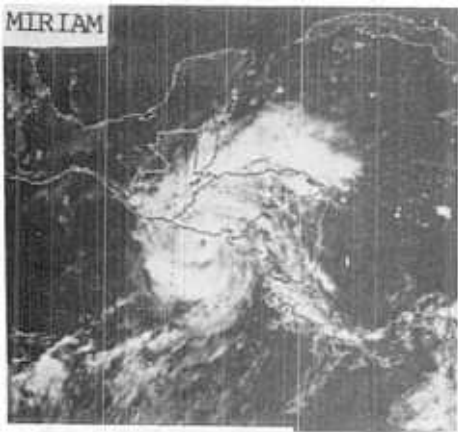
2046 UTC 9/27/88
988 mb



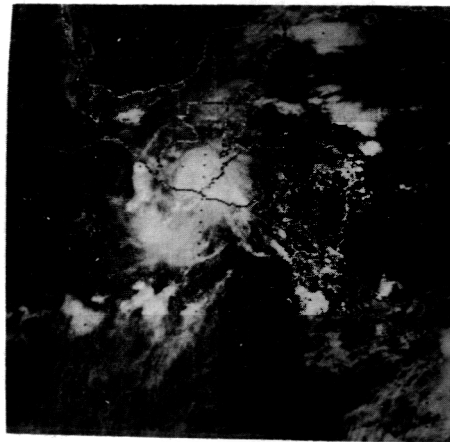
2146 UTC 9/28/88
1008



2046 UTC 9/29/88
1014 mb



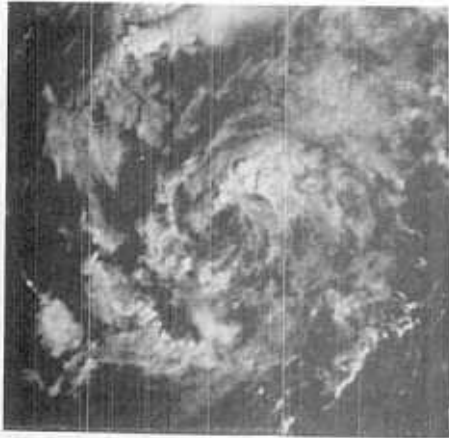
1901 UTC 10/23/88
988 mb



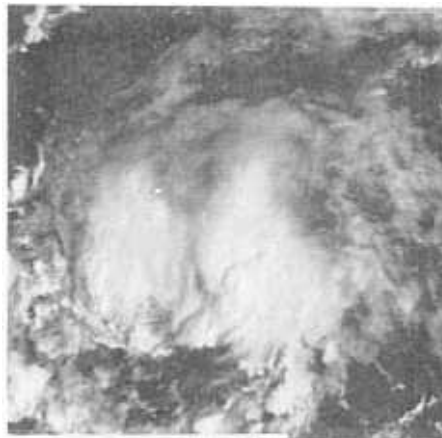
1601 UTC 10/24/88
993 mb



1701 UTC 10/25/88
1003 mb



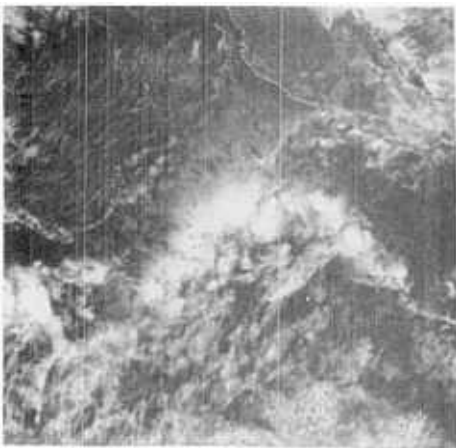
1501 UTC 10/26/88
1005 mb



1501 UTC 10/27/88
1006 mb



1646 UTC 10/28/88
1010 mb



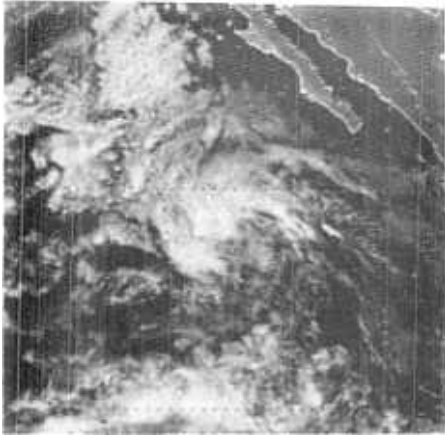
1746 UTC 10/29/88
1010 mb



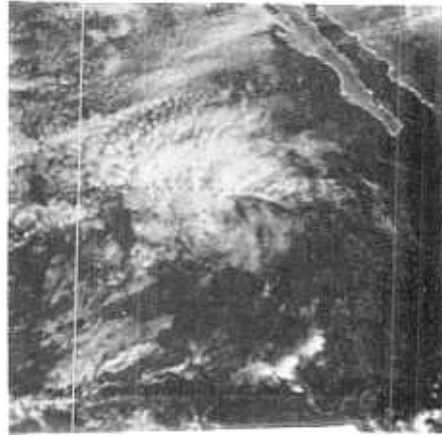
2046 UTC 10/30/88
1007 mb



1846 UTC 10/31/88
1006 mb



2146 UTC 11/01/88
1006 mb



1846 UTC 11/02/88
1010 mb

Table 1. Verification of 1988 tropical storm and hurricane forecasts.
Track model forecast errors (average in nautical miles), eastern Pacific, 1988

model	forecast period (hours)					
	0	12	24	36	48	72
Official (number of cases)	20 (175)	45 (175)	75 (150)	103 (128)	138 (108)	176 (74)
BAM	68 (38)	76 (38)	69 (35)	109 (33)	140 (29)	215 (24)
EPCL84	22 (170)	47 (170)	78 (147)	109 (123)	138 (103)	180 (69)
EPAN85	21 (168)	46 (168)	77 (145)	110 (124)	141 (105)	191 (71)
EPSS87	22 (171)	45 (171)	73 (148)	103 (126)	131 (106)	182 (72)
SANBAR	18 (72)	52 (72)	96 (61)	144 (52)	193 (46)	299 (32)
EPHC81	20 (77)	43 (77)	71 (67)	109 (57)	141 (49)	183 (32)

TABLE 2. 1988 Eastern North Pacific hurricane season statistics

number	name	class*	dates**	maximum sustained wind ms^{-1} (kt)
1	Aletta	T	16-21 Jun	31 (60)
2	Bud	T	20-22 Jun	23 (45)
3	Carlotta	H	08-15 Jul	34
4	Daniel	T	19-26 July	28
5	Emilia	T	27 Jul-02 Aug	31
6	Fabio	H	28 Jul-09 Aug	62 (120)
7	Gilma	T	28 Jul-03 Aug	23
8	Hector	H	30 Jul-09 Aug	64 (125)
9	Iva	H	05-13 Aug	46 (90)
10	John	T	16-21 Aug	18 (35)
11	Kristy	H	29 Aug-06 Sep	41
12	Lane	H	21-30 Sep	46
13	Miriam	T	23-02 Nov	31

* T: tropical storm, wind speed $18-32 \text{ ms}^{-1}$ (34-63 kt).
H: hurricane, wind speed 33 ms^{-1} (64 kt) or higher.

** Dates begin at 0000 UTC and include tropical depression stage.

Table 3b. Best track wind speed verification for 1988 Eastern Pacific tropical cyclones.

VERIFICATION OF OFFICIAL MAX WIND FORECASTS

ERRORS(KTS) FOR STORM ALETTA

	INITIAL	12HR	24HR	36HR	48HR	72HR
FORCAST FROM MDT FROM 061700Z DATA	-5.0	-1.0	-10.0	-1.0	5.0	0.0
FORCAST FROM MDT FROM 061700Z DATA	-10.0	-1.0	-10.0	-1.0	5.0	0.0
FORCAST FROM MDT FROM 061718Z DATA	-10.0	-1.0	-10.0	-1.0	5.0	0.0
FORCAST FROM MDT FROM 061730Z DATA	-10.0	-1.0	-10.0	-1.0	5.0	0.0
FORCAST FROM MDT FROM 061800Z DATA	-10.0	-1.0	-10.0	-1.0	5.0	0.0
FORCAST FROM MDT FROM 061818Z DATA	-10.0	-1.0	-10.0	-1.0	5.0	0.0
FORCAST FROM MDT FROM 061900Z DATA	-5.0	-1.0	-10.0	-1.0	5.0	0.0
FORCAST FROM MDT FROM 061918Z DATA	-5.0	-1.0	-10.0	-1.0	5.0	0.0

SUMMARY: STORM ALETTA

MEAN ERRORS (KTS)	-7.3	-3.6	.0	4.0	3.3	.0
MEAN ABSOLUTE ERROR (KTS)	7.3	5.7	5.7	3.0	5.7	.0
STANDARD ERROR NUMBER OF CASES	2.5	3.3	3.2	3.2	10.5	.0

VERIFICATION OF OFFICIAL MAX WIND FORECASTS

ERRORS(KTS) FOR STORM BUD

	INITIAL	12HR	24HR	36HR	48HR	72HR
FORCAST FROM MDT FROM 030500Z DATA	-5.0	-5.0	-5.0			
FORCAST FROM MDT FROM 030511Z DATA	-5.0	-5.0	-5.0			
FORCAST FROM MDT FROM 030523Z DATA	.0	5.0				
FORCAST FROM MDT FROM 030535Z DATA						
FORCAST FROM MDT FROM 030547Z DATA						

SUMMARY: STORM BUD

MEAN ERRORS (KTS)	-3.5	-1.7	-5.0	.0	.0	.0
MEAN ABSOLUTE ERROR (KTS)	3.5	5.0	5.0	.0	.0	.0
STANDARD ERROR NUMBER OF CASES	2.9	3.3	.0	.0	.0	.0

VERIFICATION OF OFFICIAL MAX WIND FORECASTS

ERRORS(KTS) FOR STORM CAROLTTA

	INITIAL	12HR	24HR	36HR	48HR	72HR
FORCAST FROM MDT FROM 071012Z DATA	5.0	-5.0	-10.0	-1.0	5.0	10.0
FORCAST FROM MDT FROM 071030Z DATA	.0	-5.0	-10.0	-1.0	5.0	10.0
FORCAST FROM MDT FROM 071042Z DATA	.0	-5.0	-10.0	-1.0	5.0	10.0
FORCAST FROM MDT FROM 071100Z DATA	5.0	1.0	15.0	1.0	5.0	10.0
FORCAST FROM MDT FROM 071112Z DATA	5.0	1.0	15.0	1.0	5.0	10.0
FORCAST FROM MDT FROM 071130Z DATA	5.0	1.0	20.0	1.0	5.0	10.0
FORCAST FROM MDT FROM 071142Z DATA	.0	5.0	10.0	1.0	5.0	10.0
FORCAST FROM MDT FROM 071154Z DATA	.0	5.0	10.0	1.0	5.0	10.0
FORCAST FROM MDT FROM 071206Z DATA	.0	5.0	10.0	1.0	5.0	10.0
FORCAST FROM MDT FROM 071218Z DATA	.0	5.0	15.0			
FORCAST FROM MDT FROM 071230Z DATA	-5.0	10.0				
FORCAST FROM MDT FROM 071300Z DATA						

STORM CAROLTTA

MEAN ERRORS (KTS)						
MEAN ABSOLUTE ERROR (KTS)	1.5	4.6	1	1		
STANDARD ERROR NUMBER OF CASES						

VERIFICATION OF OFFICIAL MAX WIND FORECASTS

ERRORS IN FD STOR FARI

FORECAST MADE	FROM	TO	DATA	12H	24H	36H	48H	60H	72H
FORECAST MADE FROM 072206Z DATA				-5.0	-10.0	-5.0			
FORECAST MADE FROM 072306Z DATA				-5.0	-5.0	-5.0			
FORECAST MADE FROM 072312Z DATA				-5.0	-5.0	-5.0			
FORECAST MADE FROM 072318Z DATA				-5.0	-5.0	-5.0			
FORECAST MADE FROM 072400Z DATA				-5.0	-5.0	-5.0			
FORECAST MADE FROM 072406Z DATA				-5.0	-5.0	-5.0			
FORECAST MADE FROM 072412Z DATA				-5.0	-5.0	-5.0			
FORECAST MADE FROM 072418Z DATA				-5.0	-5.0	-5.0			
FORECAST MADE FROM 072500Z DATA				-5.0	-5.0	-5.0			
FORECAST MADE FROM 072506Z DATA				-5.0	-5.0	-5.0			
FORECAST MADE FROM 072512Z DATA				-5.0	-5.0	-5.0			
FORECAST MADE FROM 072518Z DATA				-5.0	-5.0	-5.0			
FORECAST MADE FROM 072600Z DATA				-5.0	-5.0	-5.0			
FORECAST MADE FROM 072606Z DATA				-5.0	-5.0	-5.0			
FORECAST MADE FROM 072612Z DATA				-5.0	-5.0	-5.0			
FORECAST MADE FROM 072618Z DATA				-5.0	-5.0	-5.0			

MEAN ABSOLUTE ERROR (KTS)	12H	24H	36H	48H	60H	72H
MEAN ABSOLUTE ERROR (KTS)	2.5	5.4	5.2	17.0	15.5	10.0
STANDARD ERROR (KTS)	3.2	5.2	2.5	14.5	13.9	11.2
NUMBER OF CASES	14	14	12	13	13	11

VERIFICATION OF OFFICIAL MAX WIND FORECASTS

ERRORS IN FD STOR FARI

FORECAST MADE	FROM	TO	DATA	12H	24H	36H	48H	60H	72H
FORECAST MADE FROM 072206Z DATA				-6.0	-10.0	5.0			
FORECAST MADE FROM 072312Z DATA				-10.0	-10.0	5.0			
FORECAST MADE FROM 072318Z DATA				-5.0	5.0				
FORECAST MADE FROM 072400Z DATA				-10.0	5.0				
FORECAST MADE FROM 072506Z DATA									
FORECAST MADE FROM 072612Z DATA									

MARY: STORM

MEAN ERRORS (K)	12H	24H	36H	48H	60H	72H
MEAN ERRORS (K)	-7.0	-5.0	5.0	0.0	0.0	0.0
STANDARD ERROR (KTS)	3.2	7.5	0.0	0.0	0.0	0.0
NUMBER OF CASES	4	4	2	3	3	3

35

R F OF OFFICIAL MAX WIND FORECASTS

ERRORS KTS FOR STORM

INETA 12HR 24HR 36HR 48HR 72HR

STATION	TIME	ACTUAL	FORECAST	INETA	12HR	24HR	36HR	48HR	72HR
4400	00	00	00	00	00	00	00	00	00
4400	01	00	00	00	00	00	00	00	00
4400	02	00	00	00	00	00	00	00	00
4400	03	00	00	00	00	00	00	00	00
4400	04	00	00	00	00	00	00	00	00
4400	05	00	00	00	00	00	00	00	00
4400	06	00	00	00	00	00	00	00	00
4400	07	00	00	00	00	00	00	00	00
4400	08	00	00	00	00	00	00	00	00
4400	09	00	00	00	00	00	00	00	00
4400	10	00	00	00	00	00	00	00	00
4400	11	00	00	00	00	00	00	00	00
4400	12	00	00	00	00	00	00	00	00
4400	13	00	00	00	00	00	00	00	00
4400	14	00	00	00	00	00	00	00	00
4400	15	00	00	00	00	00	00	00	00
4400	16	00	00	00	00	00	00	00	00
4400	17	00	00	00	00	00	00	00	00
4400	18	00	00	00	00	00	00	00	00
4400	19	00	00	00	00	00	00	00	00
4400	20	00	00	00	00	00	00	00	00
4400	21	00	00	00	00	00	00	00	00
4400	22	00	00	00	00	00	00	00	00
4400	23	00	00	00	00	00	00	00	00
4400	24	00	00	00	00	00	00	00	00
4400	25	00	00	00	00	00	00	00	00
4400	26	00	00	00	00	00	00	00	00
4400	27	00	00	00	00	00	00	00	00
4400	28	00	00	00	00	00	00	00	00
4400	29	00	00	00	00	00	00	00	00
4400	30	00	00	00	00	00	00	00	00
4400	31	00	00	00	00	00	00	00	00

MEAN ABSOLUTE ERROR (KTS) 2.0 3.6 3.5 .0 4.3 2.3

STANDARD ERROR (KTS) 4.6 8.5 12.7 16.5 19.3 20.6

NUMBER OF CASES 21 21 17 17 15 11

VERIFICATION OF OFFICIAL MAX WIND FORECASTS

ERRORS(KTS) FOR STORM JOHV

FOR	4400	FRD	031718Z	DA
FOR	4400	FRD	031800Z	DA
FOR	4400	FRD	031800Z	DA

SUMMARY: STORM JOHV

MEAN ERRORS (KTS) .0 5.0 .0 .0 .0 .0

ERROR (KTS) .0 5.0 .0 .0 .0 .0

STANDARD ERROR (KTS) .0 .0 .0 .0 .0 .0

NUMBER OF CASES 1 1 3 3 3 3

37

Table 3b. continued.

SUMMARY: ALL 12 STORMS

	INITIAL	12HR	24HR	36HR	48HR	72HR
MEAN ERRORS (KTS)	-2.1	-2.7	-3.4	-4.5	-5.0	-2.7
MEAN ABSOLUTE ERROR (KTS)	3.2	5.5	10.2	13.3	16.1	17.5
STANDARD ERROR (KTS)	3.3	3.5	13.5	17.3	20.7	21.1
NUMBER OF CASES	173	173	167	125	103	75

LEGEND FOR TABLE 4.

OBSERVATIONAL UNIT

Satellite

GOES-6 = Geostationary Operational Environmental Satellite

RESOLUTION

Satellite

Classification confidence*, location and confidence**, visible or infrared resolution (km).

- * 1 =completely certain as to current intensity number used.
- 2 =tends to vary up and down by 1/2 T or S number.
- 3 =might vary up or down by one 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

(Example-1,1, Vsbl,1 = classification confidence 1, location confidence 1, visible picture with 1 kilometer resolution.)

(Example-2,5, IR 8 = classification confidence 2, location confidence 5, infrared picture with 8 kilometer resolution.)

Table 4. Center Fix positions and intensity evaluations for 1988 Tropical Cyclones.

CENTER FIXES

TROPICAL STORM ALETTA 17-21 JUNE 1988

FIX NO.	DATE	TIME (UTC)	POSITION		MAX WIND (KT)		MIN. PRES. (MB)	MIN. 700MB HT. (M)	TEMP. C		EYE C=CIR.DIA. E=ELIP. (N.MI.)	CHARACTERISTICS	OBS. UNIT	RESOLUTION	ACFT. ALT.
			LAT.	ION.	SFC.	FLT.LVL.			OUT	IN					
01	17	0000	15.2	101.4	35		1005						GOES 7	2,- VIS 1	
02	17	0530	15.8	102.6	45		1000						GOES 7	2,5 VIS 8	
03	17	1200	15.5	103.0	55		994						GOES 7	2,5 IR 8	
04	17	1637	15.9	102.5	45		1000						SIX DMSP		
05	17	1800	15.8	102.1	55		994						GOES 7	2,3 VIS 1	
06	18	0000	15.7	101.8	55		994						GOES 7	2,3 VIS 1	
07	18	0530	15.9	102.1	55		994						GOES 7	2,5 IR 8	
08	18	1200	16.3	102.7	55		994						GOES 7	2,5 IR 1	
09	18	1500	16.7	103.4									GOES 7	-,5 VIS 1	
10	18	1800	16.7	101.8	55		994						GOES 7	2,3 VIS 1	
11	19	0000	17.0	102.3	55		994						GOES 7	1,3 VIS 1	
12	19	0530	17.2	103.7	55		994						GOES 7	2,5 IR 8	
13	19	1200	17.4	104.1	45		1000						GOES 7	2,5 IR 8	
14	19	1500	17.5	103.8									GOES 7	-, - VIS 1	
15	19	1800	17.5	104.2	35		1005						GOES 7	2,3 VIS 1	
16	20	0000	17.5	105.0									GOES 7	2,3 VIS 1	
17	20	0439	17.8	105.5	25								FIV DMSP		
18	20	0530	17.3	106.8									GOES 7	-,3 IR 8	
19	20	1200	17.5	106.3									GOES 7	-, -	
20	20	1800	17.5	106.4									GOES 7	-, - VIS 1	
21	21	0000	17.3	107.5									GOES 7	-,5 VIS 1	
22	21	1200	16.5	108.0									GOES 7	-,5 IR 4	

CENTER FIXES

TROPICAL STORM BUD 21-23 JUNE 1988

FIX NO.	DATE	TIME (UTC)	POSITION		MAX WIND (KT)		MIN. PRES. (MB)	MIN. 700MB HT. (M)	TEMP. C		EYE C=CIR.DIA. E=ELIP. (N.MI.)	CHARACTERISTICS	OBS. UNIT	RESOLUTION	ACFT. ALT.
			LAT.	Lon.	SFC.	FLT. LVL.			OUT	IN					
01	21	0000	12.0	93.5									GOES 7	2,3 VIS 1	
02	21	0600	13.6	93.1	30		1009						GOES 7	2,5 IR 8	
03	21	1200	13.6	93.5	30		1009						GOES 7	2,5 IR 8	
04	21	1800	14.4	95.3	35		1005						GOES 7	2,3 VIS 8	
05	22	0000	14.5	95.9	45		1000						GOES 7	2,3 VIS 1	
06	22	0600	14.9	97.2	45		1000						GOES 7	-,- IR 8	
07	22	1200	15.6	97.9	45		1000						GOES 7	2,5 IR 8	
08	22	1800	16.0	100.0	35		1005						GOES 7	2,3 VIS 1	
09	23	0000	16.6	99.8	30		1009						GOES 7	2,5 VIS 1	
10	23	1620	17.0	101.4	25								SIX/DMSP		

CENTER FIXES

HURRICANE CARLOTTA 08-15 July 1988

FIX NO.	DATE	TIME (UTC)	POSITION		MAX WIND (KT)		MIN. PRES. (MB)	MIN. 700MB HT. (M)	TEMP. C		EYE C=CIR.DIA. E=ELIP. (N.MI.)	CHARACTERISTICS	OBS. UNIT	RESOLUTION	ACFT. ALT.
			LAT.	ION.	SFC.	FLT.LVL.			OUT	IN					
01	08	0000											GOES 7	- ,5 VIS 1	
02	08	0600											GOES 7	- ,5 IR 8	
03	08	1200											GOES 7	- ,5 IR 8	
04	08	1500			25								GOES 7	2,5 VIS 1	
05	08	1800			30		1009						GOES 7	2,5 VIS 1	
06	09	0000			30		1009						GOES 7	2,3 IR 8	
07	09	0300			30		1009						GOES 7	1,5 IR 8	
08	09	0600			30		1009						GOES 7	2,5 IR 8	
09	09	1200			35		1005						GOES 7	2,5 IR 8	
10	09	1500			35		1005						GOES 7	2,5 VIS 1	
11	09	1800			45		1000						GOES 7	2,5 VIS 1	
12	10	0000			45		1000						GOES 7	2,3 VIS 1	
13	10	0600			55		994						GOES 7	2,5 IR 8	
14	10	1200			55		994						GOES 7	2,5 IR 8	
15	10	1500											GOES 7	- ,5 VIS 1	
16	10	1800			55		994						GOES 7	2,5 VIS 1	
17	11	0000			55		994						GOES 7	2,5 VIS 1	
18	11	0600			55		994						GOES 7	2,5 IR 8	
19	11	1200			55		994						GOES 7	2,5 IR 8	
20	11	1500											GOES 7	- ,5 VIS 1	
21	11	1800			45		1000						GOES 7	2,5 VIS 1	
22	12	0000			55		994						GOES 7	2,3 VIS 1	
23	12	0600			55		994						GOES 7	2,5 IR 8	
24	12	1200			45		1000						GOES 7	2,5 IR 8	
25	12	1650			45		1000						FIV/DMSP		
26	12	1800			45		1000						GOES 6	2,5 VIS 1	
27	13	0000			35		1005						GOES 7	2,3 IR 8	
28	13	0600			30		1009						GOES 7	2,5 IR 8	
29	13	1200			25								GOES 6	2,5 IR 8	
30	13	1800											GOES 6	- ,5 VIS 1	

37

CENTER FIXES

Hurricane CARLOTTA (continued)

FIX NO.	DATE	TIME (UTC)	POSITION		MAX WIND (KT)		MIN. PRES. (MB)	MIN. 700MB HT. (M)	TEMP. C		EYE C=CIR.DIA. E=ELIP. (N.MI.)	CHARACTER- ISTICS	OBS. UNIT	RESOLUTION	ACFT. ALT.	
			LAT.	LON.	SFC.	FLT.LVL.			OUT	IN						
31	14	0000	21.6	124.3												
32	14	0600	21.0	125.0									GOES 7	-,3 VIS 1		
33	14	1200	21.8	127.4									GOES 6	-,5 IR 8		
34	14	1500	21.0	126.5									GOES 6	-,5 IR 8		
35	14	1800	21.5	126.2									GOES 7	-,5 VIS 1		
36	15	0000	21.0	127.1									GOES 7	-,5 VIS 1		
37	15	0600	21.0	127.6									GOES 7	-,3 VIS 1		
38	15	1200	21.0	128.2									GOES 6	-,5 IR 8		
													GOES 6	-,5 IR 8		

Post season analysis of the satellite data indicates that Carlotta reached minimal hurricane strength (65 KTS) at 11/1200Z and maintained minimal hurricane status until 12/0000Z on the 12th.

CENTER FIXES

TROPICAL STORM DANIEL 19-26 July 1988

FIX NO.	DATE	TIME (UTC)	POSITION		MAX WIND (KT)		MIN. PRES. (MB)	MIN. 700MB HT. (M)	TEMP. C		EYE C=CIR. DIA. E=ELIP. (N.MI.)	CHARACTERISTICS	OBS. UNIT	RESOLUTION	ACFT. ALT.
			LAT.	Lon.	SFC.	FLT.LVL.			OUT	IN					
01	19	0000	14.2	111.1									GOES 6	- ,5 VIS 1	
02	19	0600	13.4	112.1	25								GOES 6	2,5 IR 8	
03	19	1200	13.6	112.3	25								GOES 7	2,5 IR 8	
04	19	1613	15.7	112.9	25								FIV/DMSP		
05	19	1800	15.0	113.1	35		1005						GOES 7	2,5 VIS 1	
06	20	0000	15.0	113.2	35		1005						GOES 6	2,3 VIS 1	
07	20	0242	15.6	112.9	35		1005						SIX/DMSP		
08	20	0600	15.7	113.6	35		1005						GOES 6	2,5 IR 8	
09	20	0900	14.9	114.1	45		1000						GOES 6	2,3 IR 8	
10	20	1200	15.0	114.3	45		1000						GOES 7	2,5 IR 8	
11	20	1735	16.3	115.0	30		1009						FIV/DMSP		
12	20	1800	15.7	114.7	45		1000						GOES 7	2,5 VIS 1	
13	21	0000	16.0	115.4	45		1000						GOES 6	2,5 VIS 1	
14	21	0230	16.1	115.5	35		1005						SIX/DMSP		
15	21	0600	16.0	116.5	45		1000						GOES 6	2,5 IR 8	
16	21	1200	17.0	117.4	45		1000						GOES 7	2,5 IR 8	
17	21	1800	17.6	118.6	50		997						GOES 7	2,3 VIS 1	
18	22	0000	18.6	119.5	45		1000						GOES 6	2,3 VIS 1	
19	22	0600	19.0	120.7	45		1000						GOES 6	2,3 IR 8	
20	22	1200	19.0	122.3	40		1003						GOES 7	2,5 IR 8	
21	22	1800	19.2	123.3	40		1003						GOES 7	1,3 VIS 1	
22	23	0000	19.4	124.4	45		1000						GOES 6	2,3 VIS 1	
23	23	0600	19.7	125.5	35		1005						GOES 7	2,5 IR 8	
24	23	1200	20.2	126.2	40		1003						GOES 7	2,5 IR 8	
25	23	1800	21.6	127.1	40		1003						GOES 7	2,3 VIS 1	
26	24	0000	22.3	128.3	55		994						GOES 7	2,3 VIS 1	
27	24	0600	22.6	129.3	55		994						GOES 7	3,5 IR 8	
28	24	1200	23.3	130.6	45		1000						GOES 7	2,5 IR 8	
29	24	1800	23.7	131.1	45		1000						GOES 7	1,3 VIS 1	
30	24	2100	24.1	131.6									GOES 6	- ,2 VIS 1	

54

CENTER FIXES

OPIC DANIEL (continued)

FIX	DATE	TIME	POSITION		MAX WIND (KT)		MIN. 700MB	TEMP. C		EYE C=CIR.DIA. E=ELIP. (N.MI.)	CHARACTER- ISTICS	OBS. UNIT	RESOLUTION	ALT.
			LAT.	LONG.	SFC.	FLT.LVL.		OUT	IN					
31	25	0000	24.4	132.1	35		1005					GOES 7	2,2 VIS 1	
32	25	0300	24.7	131.9								GOES 6	-,5 IR 8	
33	25	0322	24.5	132.5	35							FOR/DMSP		
34	25	0600	25.0	133.5	35							GOES 7	3,5 IR 8	
35	25	1200	25.3	134.2	30							GOES 6	2,5 IR 8	
36	25	1800	25.7	134.9	30							GOES 6	2,5 VIS 1	
37	26	0000	25.8	135.0								GOES 6	-,3 VIS 1	
38	26	0600	26.3	134.2								GOES 7	-,5 IR 8	
39	26	1200	26.3	135.7								GOES 6	-,5 IR 8	

CENTER FIXES

TROPICAL STORM EMILIA 27 July - 02 August 1988

FIX	DATE	TIME	POSITION		MAX WIND (KT) SFC.	MIN. PRES. (MB)	700MB HT. (M)	TEMP. C		EYE C=CIR.DIA. E=ELIP. (N.MI.)	CHARACTER- ISTICS	OBS. UNIT	RESOLUTION	ACFT. ALT.
			LAT.	LONG.				OUT	IN					
01	27	1500	13.5	108.1	25							GOES 6	2,5 VIS 1	
02	27	1800	13.7	108.6	25							GOES 6	2,5 VIS 1	
03	28	0000	14.3	109.5	30	1009						GOES 6	2,5 VIS 1	
04	28	0600	14.3	110.1	30	1009						GOES 7	2,5 IR 8	
05	28	1200	14.6	110.7	30	1009						GOES 6	2,5 IR 8	
06	28	1638	15.7	111.5	25							FIV/DMSP		
07	28	1800	14.9	111.2	30	1009						GOES 6	2,5 VIS 1	
08	28	2100	15.2	111.6								GOES 6	-,2 VIS 1	
09	29	0000	15.0	111.8	30	1009						GOES 6	2,5 VIS 1	
10	29	0232	14.6	113.3	25							FIV/DMSP		
11	29	0300	15.1	112.1								GOES 6	-,5 IR 4	
12	29	0600	15.0	112.6	30	1009						GOES 7	2,5 IR 8	
13	29	1200	15.0	114.0	30	1009						GOES 6	2,5 IR 4	
14	29	1800	15.3	114.3	45	1000						GOES 6	2,5 VIS 1	
15	30	0000	15.0	115.3	45	1000						GOES 6	2,3 VIS 1	
16	30	0220	14.3	115.1	35	1005						SIX/DMSP		
17	30	0600	14.9	115.1	55	994						GOES 7	2,5 IR 8	
18	30	1245	15.5	116.9	55	994						GOES 7	2,5 IR 8	
19	30	1715	15.6	117.4	55	994						GOES 7	2,3 VIS 1	
20	30	1740	15.4	117.1	35	1005						SIX/DMSP		
21	31	0000	16.0	118.4	55	994						GOES 7	2,3 VIS 1	
22	31	0208	16.2	118.7	35	1005						FOR/DMSP		
23	31	0600	16.2	119.7	45	1000						GOES 7	2,3 IR 8	
24	31	1215	16.1	120.2	45	1000						GOES 6	2,5 IR 4	
25	31	1715	16.1	121.2	35	1005						GOES 6	2,3 VIS 1	
26	31	1720	16.2	121.2	25							3 /DMSP		
27	01	0000	16.2	121.9								GOES 7	-,3 VIS 1	
28	01	0155	16.3	122.1	25							SIX/DMSP		
29	01	0600	16.2	122.6								GOES 6	-,5 IR 4	
30	01	1145	16.5	123.3								GOES 6	-,3 IR 1	
31	01	1700	15.4	123.2	25							FOR/DMSP		

47

CENTER FIXES

TROPICAL STORM EMILIA (continued)

FIX NO.	DATE	TIME (GMT)	POSITION		MAX WIND (KT)		MIN. PRES. (MB)	MIN. 700MB HT. (M)	EYE C=CIR.DIA. E=ELIP. (N.MI.)	CHARACTERISTICS	OBS. UNIT	RESOLUTION	ACFT. ALT.
			LAT.	LONG.	SFC.	FLT. LVL.							
32	01	1715	16.0	124.1							GOES 7	-,3 VIS 1	
33	02	0000	15.2	124.2							GOES 7	-, - VIS 1	
34	02	0325	15.0	124.3							SIX/DMSP		
35	02	0600	15.0	124.6							GOES 6	-,5 IR 8	
36	02	1145	14.0	125.3							GOES 6	-,3 IR 8	
37	02	1715	13.5	126.1							GOES 7	-,5 VIS 1	

CENTER FIXES

URRICANE FABIO 28 July - 09 August 1988

FIX	DATE	TIME (UTC)	POSIT LAT.	MAX V SFC.	MIN. PRES	MIN. 700MB HT. (M)	TEMP. C OUT IN	EYE C=CIR.DIA. E=ELIP. (N.MI.)	CHARACTER- ISTICS	OBS. UNIT	RESOLUTION	ACFT. ALT.
01	28	1500	11.9 120.4							GOES 6	2,5 VIS 1	
02	28	1800	12.1 120.9							GOES 6	2,5 VIS 1	
03	28	2100	12.3 121.3							GOES 6	-,2 VIS 1	
04	29	0000	11.7 121.0	30	1009					GOES 6	2,5 VIS 4	
05	29	0300	11.7 121.4							GOES 6	-,5 IR 8	
06	29	0600	11.7 121.4	30						GOES 7	2,5 IR 8	
07	29	1200	12.2 123.0	30						GOES 6	2,5 IR 8	
08	29	1800	11.8 124.6	25						SIX/DMSP		
09	29	1800	13.2 124.5	45	1000					GOES 6	2,5 VIS 1	
10	30	0000	11.5 125.9	55	994					GOES 6	2,- VIS 1	
11	30	0220	12.4 126.5	35	1005					SIX/DMSP		
12	30	0600	11.6 126.7	65	987					GOES 7	2,5 IR 8	
13	30	1215	11.9 127.7	65	987					GOES 6	2,5 IR 8	
14	30	1740	11.9 128.6	35	1005					SIX/DMSP		
15	30	1745	11.9 128.9	65	987					GOES 6	2,5 VIS 1	
16	31	0000	11.9 130.2	65	987					GOES 7	2,3 VIS 1	
17	31	0350	11.8 130.9	45	1000					SIX/DMSP		
18	31	0600	12.0 130.3	55	994					GOES 7	2,5 IR 8	
19	31	1245	12.5 130.9	65	987					GOES 7	2,5 IR 8	
20	31	1720	12.7 131.6	55	994					SIX/DMSP		
21	31	1816	12.2 132.5	77	979					GOES 6	2,5 IR 8	
22	01	0000	12.6 133.2	77	979					GOES 7	2,3 VIS 1	
23	01	0337	13.0 133.3	77	979					TWO/DMSP		
24	01	0600	12.7 134.1	77	979					GOES 6	2,5 IR 8	
25	01	1145	12.9 135.7	77	979					GOES 6	1,5 IR 1	
26	01	1745	12.9 136.1	77	979					GOES 6	1,5 VIS 1	
27	01	1842	13.1 136.2	77	979					SIX/DMSP		
28	02	0000	13.1 137.6	90	970					GOES 7	2,3 VIS 1	
29	02	0325	13.2 138.2	65	987					SIX/DMSP		
30	02	0600	12.8 138.5	90	970					GOES 6	2,3 IR 8	
31	02	1145	13.2 139.6	90	970					GOES 6	2,5 IR 8	
32												

----- ENTERED THE CENTRAL PACIFIC BASIN -----

647

CENTER FIXES

HURRICANE HECTOR 31 July - 09 August 1988

FIX	DATE	TIME	POSITION		SFC.	FLT. LVL.	MIN.	MIN.	TEMP. C		EYE C=CIR. DIA. E=ELIP. (N.MI.)	CHARACTER- ISTICS	OBS. UNIT	RESOLUTION	ACFT. ALT.
			LAT.	ION.			PRES. (MB)	HT. (M)	OUT	IN					
01	30		11.3	98.6	25								SIX/DMSP		
02	31		11.4	99.4	25								GOES 7	2,3 VIS 1	
03	31		11.2	100.4	25								SIX/DMSP		
04	31		11.5	101.9	30-35		1007						GOES 7	3,5 IR 8	
05	31		11.9	103.0	30		1009						GOES 7	2,5 IR 8	
06	31		12.3	103.5	35		1005						FIV/DMSP		
07	31		12.1	104.3	35		1005						GOES 7	2,5 VIS 1	
08	01		13.0	104.8	45		1000						GOES 7	2,3 VIS 1	
09	01		13.4	105.4	35		1005						SIX/DMSP		
10	01		13.1	106.2	55		994						GOES 6	2,3 IR 8	
11	01		13.9	107.5	55		994						GOES 7	1,5 IR 8	
12	01		14.2	108.4	55		994						FIV/DMSP		
13	01		14.1	108.6	55		994						GOES 7	2,3 VIS 1	
14	02		14.6	110.0	65		987						GOES 7	2,3 VIS 1	
15	02		14.8	110.1	55		994						SIX/DMSP		
16	02		14.5	111.0	90		970						GOES 6	1,1 IR 8	
17	02		15.0	112.2	102		960						GOES 7	1,1 IR 8	
18	02		15.4	113.0	115		948						GOES 7	1,1 IR 8	
19	03		16.1	114.2	115		948						GOES 7	2,1 VIS 1	
20	03		16.2	114.5	115		948						ONE/DMSP		
21	03		16.3	115.2	127		935						GOES 6	1,1 IR 8	
22	03		16.8	116.2	127		935						GOES 7	2,1 IR 8	
23	03		17.0	117.2	115		948						ONE/DMSP		
24	03		17.1	117.1	115		948						GOES 7	1,1 IR 8	
25	04		17.7	118.0	115		948						GOES 6	1,3 VIS 1	
26	04		17.9	118.2	115		948						TWO/DMSP		
27	04		18.0	118.9	115		948						GOES 6	1,3 IR 8	
28	04		18.6	119.9	115		948						GOES 6	2,2 IR 8	
29	04		18.7	120.4									GOES 6	-2, IR 8	
30	04		18.9	121.0	90		970						TWO/DMSP		

51

CENTER FIXES

HURRICANE HECTOR (continued)

FIX NO.	DATE	TIME (UTC)	POSITION		MAX WIND (KT)		MIN. PRES. (MB)	MIN. 700MB HT. (M)	TEMP. C		EYE C=CIR. DIA. E=ELIP. (N.MI.)	CHARACTERISTICS	OBS. UNIT	RESOLUTION	ACFT. ALT.
			LAT.	Lon.	SFC.	FLT. LVL.			OUT	IN					
31	04	1800	18.9	121.0	90		970								
32	05	0000	18.9	122.0	85		973						GOES 6	2,2 VIS 1	
33	05	0247	19.0	122.4	90		970						GOES 6	2,3 VIS 1	
34	05	0600	19.2	123.2	77		979						TWO/DMSP		
35	05	1200	18.9	123.9	77		979						GOES 6	2,3 IR 8	
36	05	1723	18.8	124.8	65		987						GOES 6	2,3 IR 8	
37	05	1800	18.8	124.9	65		987						SIX/DMSP		
38	06	0000	18.9	125.9	65		987						GOES 6	2,3 VIS 1	
39	06	0235	18.5	126.3	65		987						GOES 6	2,3 VIS 1	
40	06	0600	18.6	126.8	65		987						TWO/DMSP		
41	06	1200	18.5	127.8	65		987						GOES 6	2,1 IR 8	
42	06	1703	18.3	128.3	55		994						GOES 6	2,3 IR 8	
43	06	1800	18.6	128.6	77		979						SIX/DMSP		
44	07	0000	18.4	129.7	77		979						GOES 7	2,1 IR 8	
45	07	0222	18.3	130.9	77		979						GOES 6	1,3 VIS 1	
46	07	0515	18.4	130.8	77		979						TWO/DMSP		
47	07	1146	18.4	132.0	65		987						GOES 6	2,1 IR 8	
48	07	1800	18.2	133.1	65		987						GOES 6	2,3 IR 8	
49	08	0000	18.0	134.7	65		987						GOES 7	2,3 VIS 1	
50	08	0352	18.3	135.5	35		1005						GOES 7	2,3 VIS 1	
51	08	0615	17.6	136.0	65		987						SIX/DMSP		
52	08	1200	17.8	137.5	55		994						GOES 6	2,5 IR 8	
53	08	1800	18.4	138.5	45		1000						GOES 7	2,3 IR 8	
54	08	1805	18.3	138.4	35		1005						GOES 7	2,3 VIS 1	
55	09	0000	18.6	140.0	35		1005						FOR/DMSP		
													GOES 6	2,3 VIS 1	
----- ENTERED THE CENTRAL PACIFIC BASIN -----															

52

CENTER FIXES

HURRICANE IVA 05 - 13 August 1988

FIX	DATE	TIME (UTC)	POSIT LAT.	MAX WIND (KT)		MIN. PRES. (MB)	MIN. 700MB HT. (M)	TEMP. C		EYE C=CIR.DIA. E=ELIP. (N.MI.)	OBS. UNIT	RESOLUTION	ACFT. ALT.
				SFC.	FLT			OUT	IN				
01	04		13.4 94.8	25							GOES 7	2,2 VIS 1	
02	05		13.1 96.3	25							GOES 7	2,5 VIS 1	
03	05		13.5 98.1	25							GOES 7	2,5 IR 8	
04	05		13.8 99.9	25							GOES 7	2,5 IR 8	
05	05		14.2 101.2	25							SIX/DMSP		
06	05		14.4 101.1	30		1009					GOES 7	2,5 VIS 1	
07	06		15.0 101.8	35							GOES 7		
08	06		14.7 102.8	35		1005					SIX/DMSP		
09	06		15.2 103.2	45		1000					GOES 7	2,5 IR 8	
10	06		15.2 105.5	45		1000					GOES 7	2,5 IR 8	
11	06		16.1 106.2	35		1005					SIX/DMSP		
12	06		16.5 106.1	55		994					GOES 7	2,3 VIS 1	
13	07		16.5 107.1	65		987					GOES 6	1,3 VIS 1	
14	07		16.3 107.5	55		994					FIV/DMSP		
15	07		16.7 108.4	65		987					GOES 7	2,3 IR 8	
16	07		17.2 109.1	65		987					GOES 7	2,3 IR 8	
17	07		17.6 109.9	65		987					GOES 7	2,5 VIS 1	
18	08		18.1 110.5	90		970					GOES 7	- ,3 VIS 1	
19	08		18.1 110.7	90		970					ONE/DMSP		
20	08		18.8 111.7	90		970					GOES 7	2,1 IR 8	
21	08		19.2 112.5	90		970					GOES 7	2,3 IR 8	
22	08		19.8 112.9	77		979					ONE/DMSP		
23	08		20.1 113.3	90		970					GOES 7	2,1 VIS 1	
24	09		20.4 114.2	90		970					GOES 7	2,3 VIS 1	
25	09		20.3 114.6	90		970					FIV/DMSP		
26	09		20.7 115.3	90		970					GOES 7	2,1 IR 8	
27	09		20.9 116.9	77		979					GOES 6	2,3 IR 8	
28	09		20.9 116.9	77		979					SIX/DMSP		
29	09		20.9 117.4	65		987					GOES 6	2,5 VIS 1	
30	10		20.8 117.8	55		994					GOES 6	2,5 VIS 1	

53

CENTER FIXES

HURRICANE IVA inued)

FIX NO.	DATE	TIME (UTC)	POSIT LAT.	MAX WIND (KT)		MIN. PRES. (MB)	MIN. ...	P. C		EYE C=CIR.DIA. E=ELIP. (N.MI.)	CHARACTER- ISTICS	OBS. UNIT	RESOLUTION	ACFT. ALT.
				SFC.	FLT.LVL.			OUT	IN					
31	10	0145	21.6 117.9	30		1009						FIV/DMSP		
32	10	0545	20.0 118.0	55		994						GOES 6	2,5 IR 8	
33	10	1200	20.1 118.3	45		1000						GOES 7	2,5 IR 8	
34	10	1725	20.9 119.8	45		1000						TRE/DMSP		
35	10	1800	20.1 118.2	40-45		1002						GOES 7	1,3 VIS 1	
36	11	0000	20.1 118.3	35		1005						GOES 7	2,3 VIS 1	
37	11	0315	20.1 119.7	30		1009						SIX/DMSP		
38	11	0600	19.8 118.7	35		1005						GOES 6	2,5 IR 8	
39	11	0900	19.7 118.9									GOES 6	-,5 IR 8	
40	11	1200	19.0 119.1	35		1005						GOES 7	2,5 IR 8	
41	11	1706	19.4 119.5	30		1009						TRE/DMSP		
42	11	1800	19.5 119.6	30		1009						GOES 7	2,3 VIS 1	
43	12	0000	19.4 119.8	30		1009						GOES 7	3,3 IR 1	
44	12	0302	19.6 119.8	25								TRE/DMSP		
45	12	0600	19.2 120.0	25		1009						GOES 7	-, - IR 1	
46	12	1200	18.5 120.5	25								GOES 7	2,5 IR 8	
47	12	1800	18.7 121.2	20-25								GOES 7	1,3 VIS 1	
48	13	0000	18.4 121.5									GOES 6	-,3 VIS 1	
49	13	0250	18.2 121.5									FOR/DMSP		
50	13	0600	18.2 122.2									GOES 6	-,5 IR 8	
51	13	1200	17.5 122.5									GOES 7	-,5 IR 8	
52	13	1800	17.6 122.8									GOES 7	-,3 VIS 1	
53	13	1807	17.6 122.8									SIX/DMSP		

54

CENTER FIXES

TROPICAL STORM JOHN 16 - 21 August 1988

FIX NO.	DATE	TIME (UTC)	POSITION		MAX WIND (KT)		MIN. PRES. (MB)	MIN. 700MB HT. (M)	TEMP. C		EYE C=CIR.DIA. E=ELIP. (N.MI.)	CHARACTERISTICS	OBS. UNIT	RESOLUTION	ACFT. ALT.
			LAT.	ION.	SFC.	FLT.LVL.			OUT	IN					
01	16	1500	16.3	106.0	25								GOES 6	2,5 VIS 1	
02	16	1708	17.5	105.4	25								FIV/DMSP		
03	16	1800	17.3	106.0	25								GOES 6	2,3 VIS 1	
04	17	0000	18.1	106.1	30								GOES 6	2,5 IR 8	
05	17	0200	18.2	106.6	25								FIV/DMSP		
06	17	0600	18.1	107.2	30		1009						GOES 7	2,5 IR 8	
07	17	1200	18.7	108.0	30		1009						GOES 7	2,5 IR 8	
08	17	1648	18.6	108.7	35		1005						SIX/DMSP		
09	17	1800	18.8	107.5	35		1005						GOES 6	2,5 VIS 1	
10	18	0000	19.4	108.1	35		1005						GOES 6	2,3 VIS 1	
11	18	0600	19.3	109.2	35		1005						GOES 7	2,5 IR 8	
12	18	1200	20.3	109.5	30		1009						GOES 7	2,5 IR 8	
13	18	1628	21.5	109.7	30		1009						SIX/DMSP		
14	18	1800	21.5	109.8	30		1009						GOES 7	2,3 VIS 1	
15	19	0000	21.6	110.5	25								GOES 7	2,2 VIS 1	
16	19	0135	21.8	110.4	30		1009						FIV/DMSP		
17	19	0600	22.0	110.6	30		1009						GOES 7	2,5 IR 8	
18	19	1200	22.2	111.2	25								GOES 7	2,5 IR 8	
19	19	1609	21.1	110.6	25								TRE/DMSP		
20	19	1800	21.1	110.7	25								GOES 6	2,3 VIS 1	
21	20	0000	21.2	110.5									GOES 7	-,2 VIS 1	
22	20	0123	21.4	110.5	25								FIV/DMSP		
23	20	0600	21.0	111.0	25								GOES 7	2,5 IR 8	
24	20	1215	21.0	110.0	30		1009						GOES 6	2,5 IR 8	
25	20	1549	21.6	110.0	25								FIV/DMSP		
26	20	1745	22.4	109.6	30		1009						GOES 7	2,5 VIS 1	
27	21	0000	22.3	110.3									GOES 7	-,5 VIS 1	
28	21	0600	22.6	110.7									GOES 6	-,5 IR 4	

55

CENTER FIXES

HURRICANE KRISTY

29 August - 06 September 1988

FIX	DATE	POSITION		MAX WIND (KT)		MIN. PRES. (MB)	MIN. 700MB HT. (M)	EYE C=CIR.DIA.	CHARACTERISTICS	OBS. UNIT	RESOLUTION	ACFT. ALT.
		LAT.	Lon.	SFC.	FLT.LVL.							
01	29	14.5	102.5								- ,5 VIS 1	
02	29	14.2	99.8	30		1009					2,5 IR 8	
03	29	14.7	99.7	30		1009					2,5 IR 8	
04	29	15.0	101.0	30		1009					2,5 VIS 1	
05	30	15.7	102.2	30		1009					2,5 VIS 1	
06	30	16.1	103.6	45		1000					2,3 IR 8	
07	30	16.3	104.6	55		994					2,3 IR 8	
08	30	16.8	105.0	30		1009						
09	30	17.2	105.3	65		987					2,3 VIS 1	
10	31	17.5	106.0	65		987					2,3 VIS 1	
11	31	17.4	106.2	55		994						
12	31	17.8	107.0	65		987					1,1 IR 8	
13	31	18.2	108.0	65		987					2,5 IR 8	
14	31	18.3	108.3	65		987						
15	31	18.3	108.4	77		979					2,3 VIS 1	
16	01	18.4	109.5	77		979					1,1 IR 8	
17	01	18.3	109.7	65		987						
18	01	18.5	110.2	77		979					2,3 IR 8	
19	01	18.3	110.6	77		979					2,3 IR 8	
20	01	17.7	110.9	65		987						
21	01	17.6	111.0	65		987						
22	02	17.7	111.0	55		994					2,1 VIS 1	
23	02	18.2	111.1	65		987						
24	02	18.0	111.8	55		994					2,5 IR 8	
25	02	17.8	112.4	55		994					2,5 IR 8	
26	02	18.2	112.4	35		1005						
27	02	18.2	112.8	45		1000					2,3 VIS 1	
28	03	18.3	113.2	45		1000					2,1 VIS 1	
29	03	18.5	113.3	35		1005						
30	03	18.6	113.4	45		1000					2,3 IR 8	

CENTER FIXES

HURRICANE KRISTY (continued)

FIX NO.	DATE	TIME (GMT)	POSITION		MAX WIND (KT)		MIN. PRES. (MB)	MIN. 700MB HT. (M)	TEMP. C		EYE C=CIR.DIA. E=ELIP. (N.MI.)	CHARACTERISTICS	OBS. UNIT	RESOLUTION	ACFT. ALT.
			LAT.	ION.	SFC.	FLT. LVL.			IN	OUT					
31	03	1200	18.7	113.8	30		1009						GOES 6	5,3 IR 8	
32	03	1616	18.9	114.4	25								TRE/DMSP		
33	03	1800	18.6	114.5	25								GOES 6	2,3 VIS 1	
34	04	0000	18.8	114.8									GOES 7	-,3 VIS 1	
35	04	0140	18.8	114.9	25								SIX/DMSP		
36	04	0600	18.7	115.0									GOES 7	-,5 IR 8	
37	04	1200	18.8	114.8	25								GOES 7	2,3 IR 8	
38	04	1738	18.9	115.1	25								TRE/DMSP		
39	04	1800	18.6	115.2	25								GOES 7	2,3 VIS 1	
40	05	0000	18.9	114.8									GOES 7	-,3 VIS 1	
41	05	0128	18.6	115.1	25								SIX/DMSP		
42	05	1200	18.4	114.6	30		1009						GOES 7	2,5 IR 8	
43	05	1718	19.2	114.3									FIV/DMSP		
44	05	1800	18.8	113.9	25								GOES 7	2,3 VIS 1	
45	06	0000	18.7	113.4									GOES 7	-,3 VIS 1	
46	06	0600	19.0	113.0									GOES 7	-,5 IR 8	
47	06	1200	18.9	113.1									GOES 6	-,5 IR 8	

CENTER FIXES

HURRICANE LANE 21-30 SEPTEMBER 1988

FIX	DATE	TIME	STATION LON.	MAX WIND (KT)		MIN. PRES. (MB)	MIN. 700MB HT. (M)	TEMP. C		EYE C=CIR.DIA. E=ELIP. (N.MI.)	CHARACTER- ISTICS	OBS. UNIT	RESOLUTION	ACFT. ALT.
				SFC.	FLT.LVL.			OUT	IN					
01	21	0000										GOES 7	- ,5 VIS 1	
02	21	0600		25								GOES 7	2,5 IR 8	
03	21	1200		25								GOES 6	2,5 IR 8	
04	21	1524		25								SIX/DMSP		
05	21	1730		35		1005						GOES 7	2,5 VIS 1	
06	22	0000		35		1005						GOES 7	2,3 VIS 1	
07	22	0405		25								SIX/DMSP		
08	22	0600		45		1000						GOES 7	2,5 IR 8	
09	22	1200		50		998						GOES 7	2,5 IR 8	
10	22	1646		45		1000						SIX/DMSP		
11	22	1800		55		994						GOES 7	2,3 VIS 1	
12	23	0000		65		987						GOES 7	2,3 VIS 1	
13	23	0600		65		987						GOES 7	2,5 IR 8	
14	23	1200		77		979						GOES 7	2,5 IR 8	
15	23	1353		45		1000						TWO/DMSP		
16	23	1626		77		979						ONE/DMSP		
17	23	1800		90		970						GOES 7	2,3 VIS 1	
18	23	2247		77		979						TWO/NOAA		
19	24	0000		90		970						GOES 6	1,1 VIS 1	
20	24	0237		77		979						ONE/DMSP		
21	24	0507		77		979						ONE/DMSP		
22	24	0600		90		970						GOES 7	2,- IR 8	
23	24	1133		77		979						SIX/NOAA		
24	24	1200		90		970						GOES 7	2,3 VIS 1	
25	24	1340		77		979						SIX/DMSP		
26	24	1606		77		979						ONE/DMSP		
27	24	1800		77		979						GOES 7	2,3 VIS 1	
28	25	0000		77		979						GOES 6	2,3 VIS 1	
29	25	0600		77		979						GOES 6	2,3 IR 8	
30	25	1200		77		979						GOES 7	2,5 IR 8	

CENTER FIXES

HURRICANE LANE (Continued)

FIX NO.	DATE	TIME (UTC)	POSITION		SFC.	WIND (KT)	MIN.	MIN.	TEMP. C		EYE C=CIR.DIA. E=ELIP. (N.MI.)	CHARACTER- ISTICS	OBS. UNIT	RESOLUTION	ACFT. ALT.
			LAT.	LONG.		FLT.LVL.	PRES.	700MB	OUT	IN					
	25	1728	17.6	117.2	65										
	25	1800	17.5	117.4	65-71								SIX/DMSP		
	26	0000	17.8	119.1	65								GOES 7	2,3 VIS 1	
	26	0600	17.6	120.0	65								GOES 6	2,5 IR 8	
	26	0609	17.7	120.2	45								GOES 6	2,5 IR 8	
	26	1200	17.6	120.9	65								SIX/DMSP		
	26	1708	17.7	121.8	55								GOES 7	2,5 IR 8	
	26	1800	17.8	121.9	65								SIX/DMSP		
	27	0000	18.0	122.8	65								GOES 7	2,3 VIS 1	
	27	0549	18.8	123.3	35								GOES 6	2,5 VIS 1	
	27	0600	18.0	123.6	65								SIX/DMSP		
	27	1200	18.7	124.3	55								GOES 6	2,3 IR 8	
	27	1800	19.6	125.8	55								GOES 6	2,3 IR 8	
	27	1830	20.0	126.0	30								GOES 6	1,3 VIS 1	
	28	0000	20.1	127.2	45								SIX/DMSP		
	28	0600	19.8	128.8	35								GOES 6	2,2 VIS 1	
	28	0711	20.2	128.6	30								GOES 6	2,5 IR 8	
	28	1200	20.4	129.6	35								SIX/DMSP		
	28	1800	21.2	131.0	30								GOES 6	2,5 IR 8	
	28	1810	20.9	131.2	25								GOES 6	2,3 VIS 1	
	29	0000	21.5	132.3	25								FOR/DMSP		
	29	0600	22.1	133.7	25								GOES 6	2,3 VIS 1	
	29	0651	21.6	133.7	25								GOES 7	2,5 IR 8	
	29	1200	22.4	135.6	25								FOR/DMSP		
	29	1750	22.9	136.1									GOES 6	2,5 IR 8	
	29	1800	22.9	136.2									FOR/DMSP		
	30	0030	23.1	137.2									GOES 6	-5 VIS 1	
	30	0600	22.8	138.1									GOES 6	-3 VIS 1	
	30	0631	23.6	138.5									GOES 7	-5 IR 8	
	30	1200	23.5	139.1									SIX/DMSP		
													GOES 6	-5 IR 8	

C FIXES

TROPIC L S'

23 SEPTEMBER - 02 NOVEMBER 1988

FIX NO.	DATE	T	TATION ION.		FLT. LVL.	HT. (M)	C IN	EYE C=CIR.DIA.	CHARACTER- ISTICS	OBS. UNIT	RESOLUTION	ACFT. ALT.
01	23	1459	12.7	88.0	45					FIV/ GOES	2,1 VIS 1	
02	23	1800	12.8	88.5	65					FIV/NOAA		
03	23	2222	12.8	88.9	45					SIX/DMSP		
04	23	2347	13.1	89.1	45					GOES 7	2,1 IR 8	
05	24	0000	13.1	89.5	65					GOES 7		
06	24	0600	13.5	90.2	65					GOES 7		
07	24	1200	12.9	90.3	55					GOES 7		
08	24	1232	13.3	90.8	35					FIV/DMSP		
09	24	1439	13.7	90.9	35					FIV/DMSP		
10	24	1800	14.1	91.4						GOES 7		
11	25	0000	14.6	92.4	45	1000				GOES 7	-,5 IR 8	
12	25	0320	14.3	93.7	35	1005				FIV/DMSP		
13	25	0600	14.6	93.1	45	1000				GOES 7		
14	25	1200	14.7	93.8	45	1000				GOES 7	2,5 IR 8	
15	25	1800	13.6	94.0	45	1000				GOES 7	2,3 VIS 1	
16	26	0000	13.3	94.7	30	1009				GOES 7	2,5 IR 8	
17	26	0441	-.-	-.-	35	1005				---/DMSP		
18	26	0600	13.5	95.2	30	1009				GOES 7	IR 8	
19	26	1200	13.3	95.5						GOES 7	IR 8	
20	26	1541	12.3	96.5	25					TRE/DMSP		
21	26	1800	12.1	96.4						GOES 7	-,3 VIS 1	
22	27	0000	11.8	96.8							-,3 IR 8	
23	27	0421	11.6	97.4	25							
24	27	0600	11.9	97.7							- IR 8	
25	27	1521	11.6	97.7	25							
26	27	1800	11.8	97.8						GOES 7	-,5 VIS 1	
27	28	0000	11.7	99.9	25					GOES 7	1,5 VIS 1	
28	28	0402	12.1	99.3	25					FIV/DMSP		
29	28	0600	12.0	100.0						GOES 7	-, - IR 8	
30	30	0000	12.1	108.0						GOES 6	-,5 VIS 1	

CENTER FIXES

TROPICAL STORM MIRIAM (Continued)

FIX NO.	DATE	TIME (UTC)	POSITION		MAX WIND (KT)		MIN. PRES. (MB)	MIN. 700MB HT. (M)	TEMP. C		EYE C=CIR.DIA. E=ELIP. (N.MI.)	CHARACTERISTICS	OBS. UNIT	RESOLUTION	ACFT. ALT.
			LAT.	LN.	SFC.	FLT.LVL.			OUT	IN					
31	30	1200	13.2	108.4									GOES 7	2,5 IR 8	
32	30	1603	13.2	110.4	25								FIV/DMSP		
33	30	1800	13.2	110.4	25								GOES 6	2,3 VIS 1	
34	31	0000	14.0	111.5	25								GOES 7	2,5 --- -	
35	31	0444	14.2	111.1	25								FIV/DMSP		
36	31	0600	14.4	112.5	25								GOES 7	2,5 IR 8	
37	31	1200	15.0	113.3	30								GOES 7	2,5 IR 8	
38	31	1724	15.9	112.8	35		1005						FIV/DMSP		
39	31	1800	15.9	113.7	30		1009						GOES 7	2,3 VIS 1	
40	01	0000	16.5	114.0	30		1009						GOES 6	2,3 VIS 1	
41	01	0600	16.9	114.8	30		1009						GOES 6	2,5 IR 8	
42	01	0605	17.3	113.8	35		1005						FIV/DMSP		
43	01	1200	17.6	115.8	30		1009						GOES 6	2,3 IR 8	
44	01	1705	18.1	116.3	35		1005						FIV/DMSP		
45	01	1800	17.9	117.1	35		1005						GOES 6	2,3 VIS 1	
46	02	0000	18.0	117.0	35		1005						GOES 6	2,5 VIS 1	
47	02	0545	18.4	118.9	35		1005						TRE/DMSP		
48	02	0600	18.0	117.4	35		1005						GOES 7	2,5 IR 8	
49	02	1200	18.4	117.9	25								GOES 6	2,5 IR 8	
50	02	1645	19.0	119.4	25								FOR/DMSP		
51	02	1800	18.7	119.1									GOES 6	-,5 VIS 1	

19