NOAA TECHNICAL MEMORANDUM NWSTM PR-41

1994 TROPICAL CYCLONES - CENTRAL NORTH PACIFIC

HONOLULU, HI
JANUARY 1995

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

NOAA TECHNICAL MEMORANDA
National Weather Service, Pacific Region Subseries

The Technical Memoranda series provides an informal medium for the documentation and quick dissemination of results not appropriate, or not yet ready, for formal publication in the standard journals. The series is used to report on work in progress, to describe technical procedures and practices, or to report on investigations devoted primarily to regional and local problems of interest mainly to Pacific Region personnel and, hence, will not be widely distributed.

Papers 1 and 2 are in the former series, ESSA Technical Memoranda, Pacific Region Technical Memoranda (PRTM); papers 3-8 are in the former series, ESSA Technical Memoranda, Weather Bureau Technical Memoranda (WBTM); and papers 9-40 are part of the series, NOAA Technical Memoranda NWS.

Papers 1-3 are available from the Pacific Region Headquarters, Attention: TSD, P. O. Box 50027, Honolulu, HI 96850. Beginning with 4, the papers are available from the National Technical Information Service, U. S. Department of Commerce, 5285 Port Royal Road, Springfield, VA 22151. Prices vary for paper copy and microfiche. Order by accession number, when given, in parentheses at the end of each entry.

No. 1 The Trade Wind Regime of Central and Western Maui. C. M. Peterson. January 1966.

No. 2 A Meteorological Glossary of Terms Used by Forecasters in Hawaii (Revised). R. F. Shaw. November 1967.

No. 3 Utilization of Aircraft Meteorological Reports at WBFC Honolulu. E. M. Chadsey, P. R. Moore, R. E. Rush, J. E. Smith, J. Vederman. June 1967.

No. 4 Tropical Numerical Weather Prediction in Hawaii - A Status Report. E. M. Carlstead. November 1967. (PB-183-621)

No. 5 A Computer Method to Generate and Plot Streamlines. Roger A. Davis. February 1969. (PB-183-622)

No. 6 Verification of an Objective Method to Forecast Frontal Passages in the Hawaiian Islands. E. M. Carlstead. September 1969.

No. 7 Meteorological Characteristics of the Cold January 1969 in Hawaii. Richard I. Sasaki. November 1969. (PB-188-040)

No. 8 Giant Waves Hit Hawaii. Jack D. Bottoms. September 1970. (COM-71-00021)

No. 9 Tropical Numerical Weather Prediction in Hawaii - 1971. E. M. Carlstead. March 1971. (COM-71-00494)

No. 10 Climatology of Rainfall Probabilities for Oahu, Hawaii. A. N. Hull and Jon Pitko. April 1972. (COM-73-10242)

No. 11 A Cirrus Climatology for Honolulu. Clarence B. H. Lee and Wesley Young. April 1974. (COM-74-11244)

No. 12 Straight Line Wind Variability Over Selected Stations on Leeward Oahu. M. J. Morrow. July 1974. (COM-74-11669)

No. 13 Forecasting Hurricanes in the Central Pacific. Paul Haraguchi. October 1975. (PB-248-371)

No. 14 Trade Wind Speed Estimation at Selected Stations on Oahu Using Honolulu Wind Observations, A Pilot Study. M. J. Morrow. February 1976. (PB-251-685)

No. 15 An Experiment in the Production of "POP" Forecasts Using a Statistical Model. G. Hirata. September 1976. (PB-260-926)

No. 16 Forecasting Floods in Hawaii (Excluding Hawaii Island). Paul Haraguchi. January 1977. (PB-265-939)

No. 17 An Operational Swell and Surf Program Using the N.W.S. Automatic Data Acquisition System (ADAS) Computer System. E. M. Carlstead. May 1977. (PB-269-650)

(Continued on inside back cover)

hiu

NOAA TECHNICAL MEMORANDUM NWSTM PR-41

1994 TROPICAL CYCLONES - CENTRAL NORTH PACIFIC

Armando L. Garza
Glenn H. Trapp
Benjamin Hablutzel
Hans E. Rosendal
Robert Farrell
Roy Matsuda
Jonathan Hoag

Honolulu, Hawaii

TABLE OF CONTENTS

Preface i

1994 Central Pacific Tropical Cyclone Season Tracks ii

- July 1994 tracks iii
- August 1994 tracks iv
- September 1994 tracks v
- October 1994 track vi

1994 Central North Pacific Tropical Cyclone Data vii

Introduction 1

Tropical Storm Daniel 2

Hurricane Emilia 9

Tropical Depression Fabio 17

Hurricane Gilma 22

Hurricane Li 29

Tropical Depression ONE-C 36

Hurricane John 42

Hurricane Kristy 50

Tropical Storm Mele 56

Tropical Depression Lane 62

Tropical Storm Nona 65

1994 Tropical Cyclone Genesis Areas 69

1994 Hurricane Verification Statistics 70

Hurricane Emilia 73

Hurricane Gilma 80

Hurricane Li 87

Hurricane John 91

Hurricane Kristy 98

Acknowledgements 102

Acronyms 103

PREFACE

The 1994 tropical cyclone season in the Central Pacific provided an excellent opportunity for hurricane forecasters to use technologies which had not been available in previous years.

The Automated Tropical Cyclone Forecasting (ATCF) system was used as the primary computer software to track, ingest model data, and forecast motion of all of the tropical cyclones.

An IBM RISC-6000 system running NMC's GEMPAK/NTRANS software made available to the forecasters the gridded model data that was used to produce deep layer mean forecast products.

This technical memorandum is divided into several distinct sections.

- The first section provides a map showing the best tracks of all of the 1994 tropical cyclones.

  Additionally, it provides individual maps showing the storms which developed or moved into the Central North Pacific area during each month (July, August, September, and October).

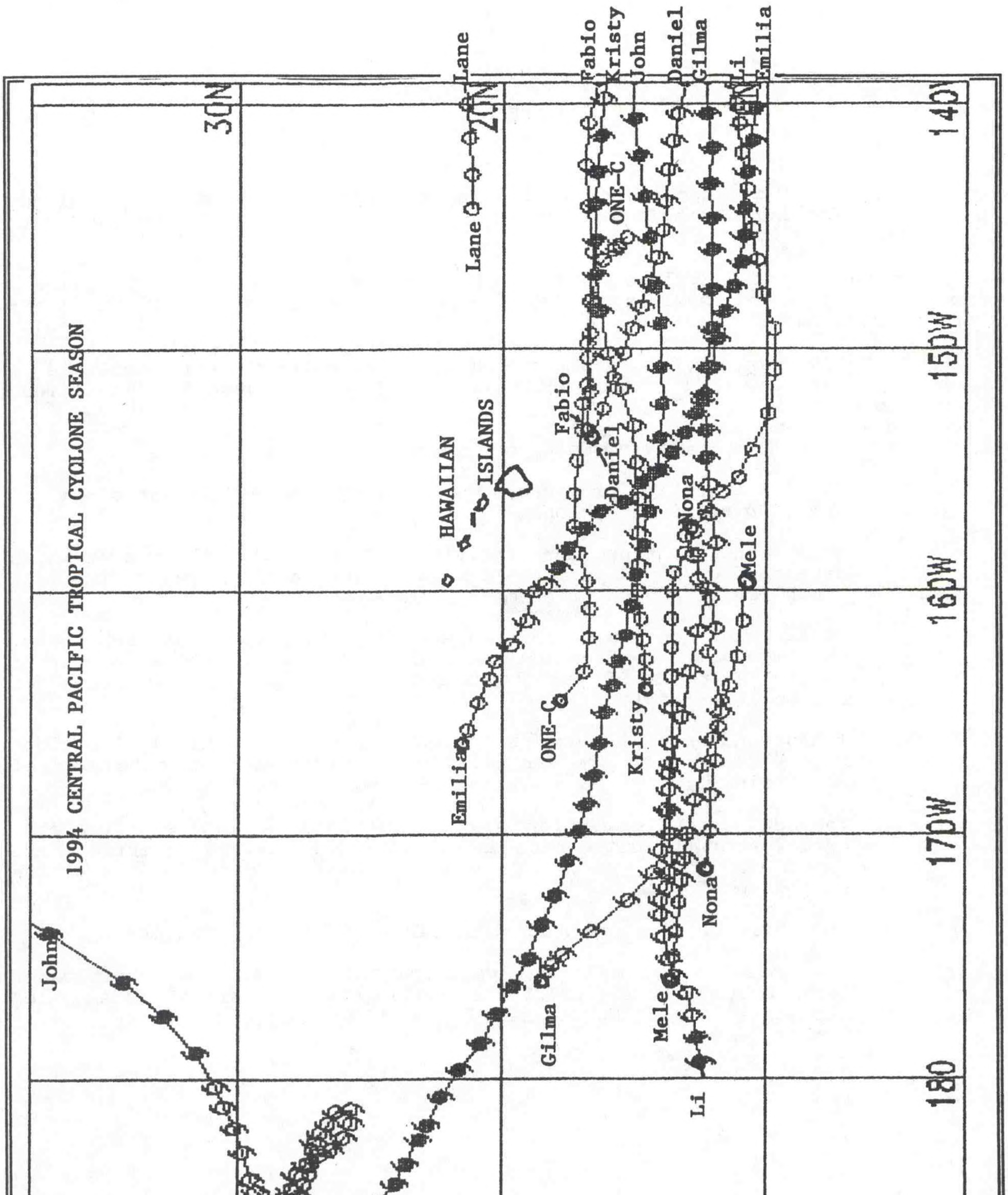
  It also has some quick reference data showing dates of each storm, the highest classification, maximum winds, and the total number of hours that the storm was classified a hurricane, tropical storm, or tropical depression.

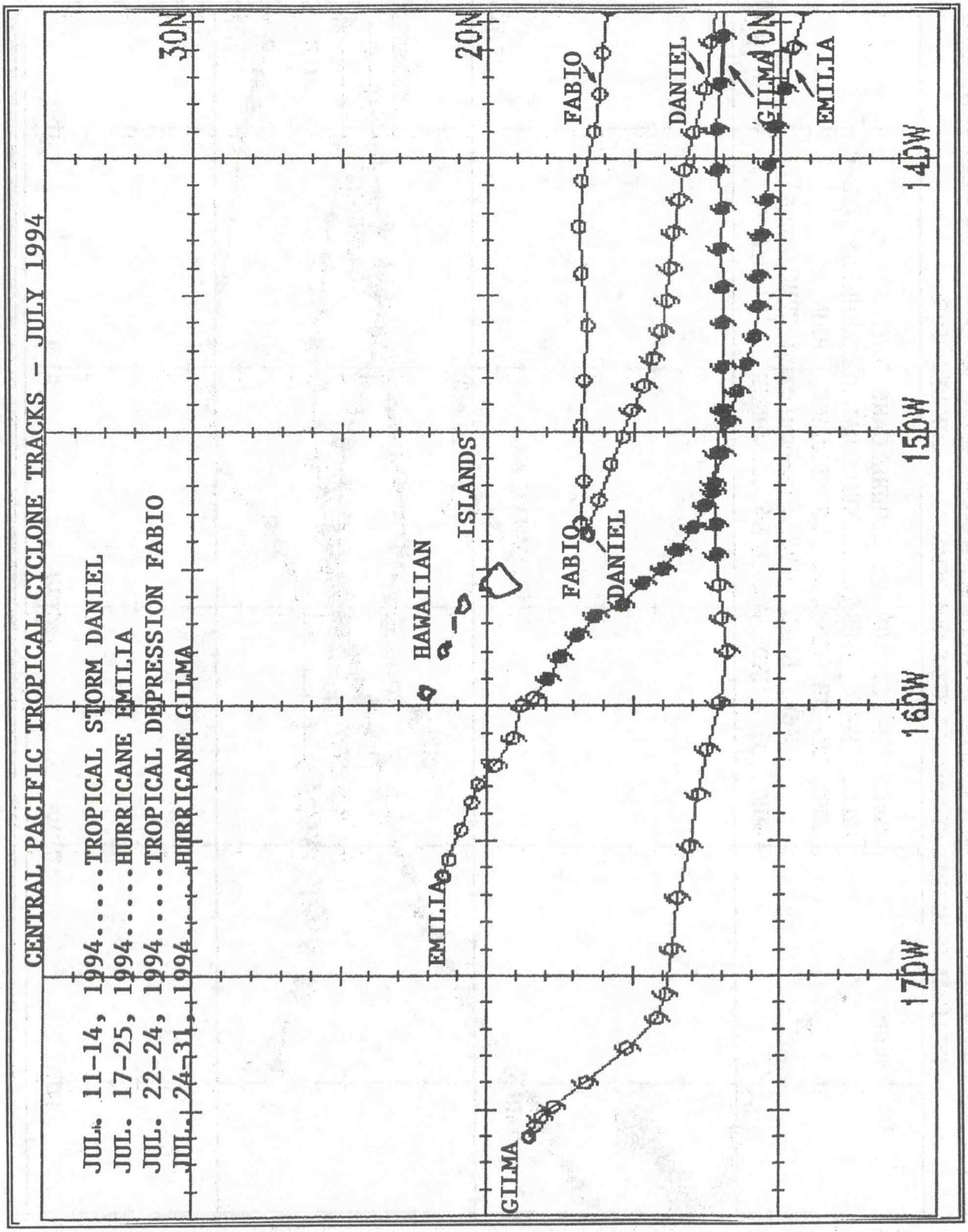
- The second section contains the summaries of each tropical cyclone that crossed into the Central Pacific Hurricane Center's area of responsibility, or formed within its boundaries.

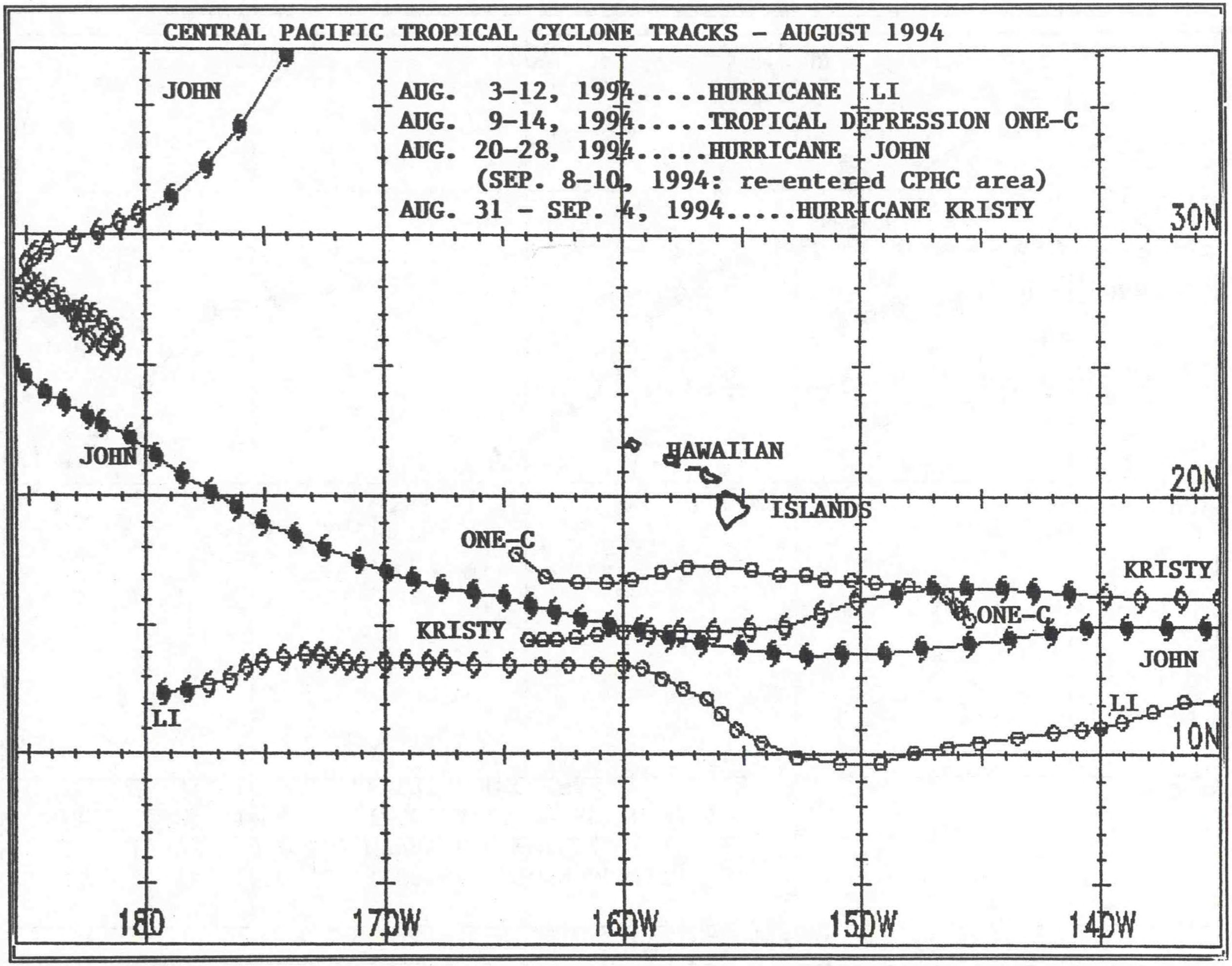
  Included in this section are the best track tables and plots, examples of objective aids data, and short reviews of surface and upper air data. An attempt has been made to provide a satellite photograph for each.

- The third section contains data tables on genesis regions.

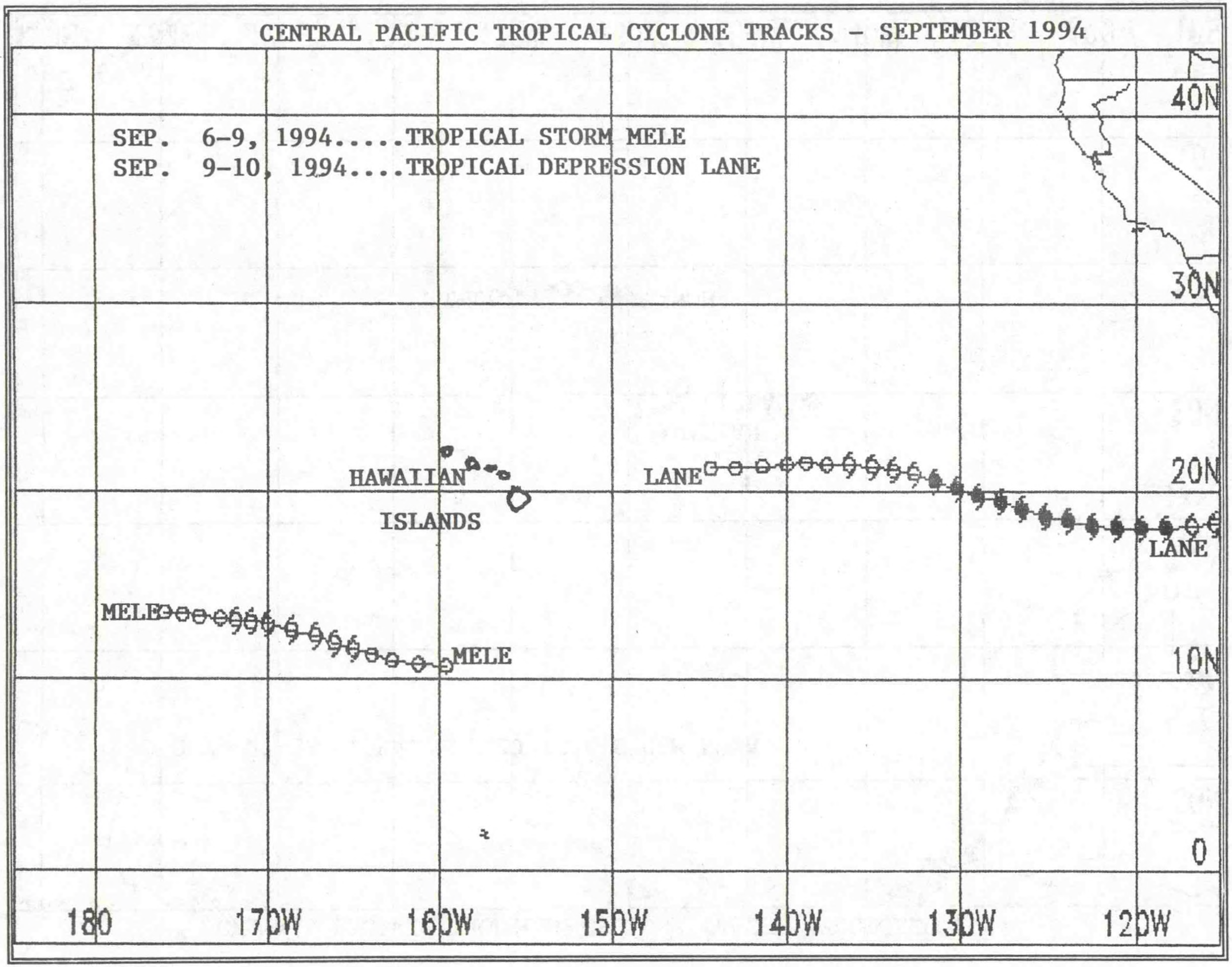
- The fourth section is the verification data for each hurricane. This includes: (a) Hurricane Emilia, (b) Hurricane Gilma, (c) Hurricane Li, (d) Hurricane John, and (e) Hurricane Kristy.

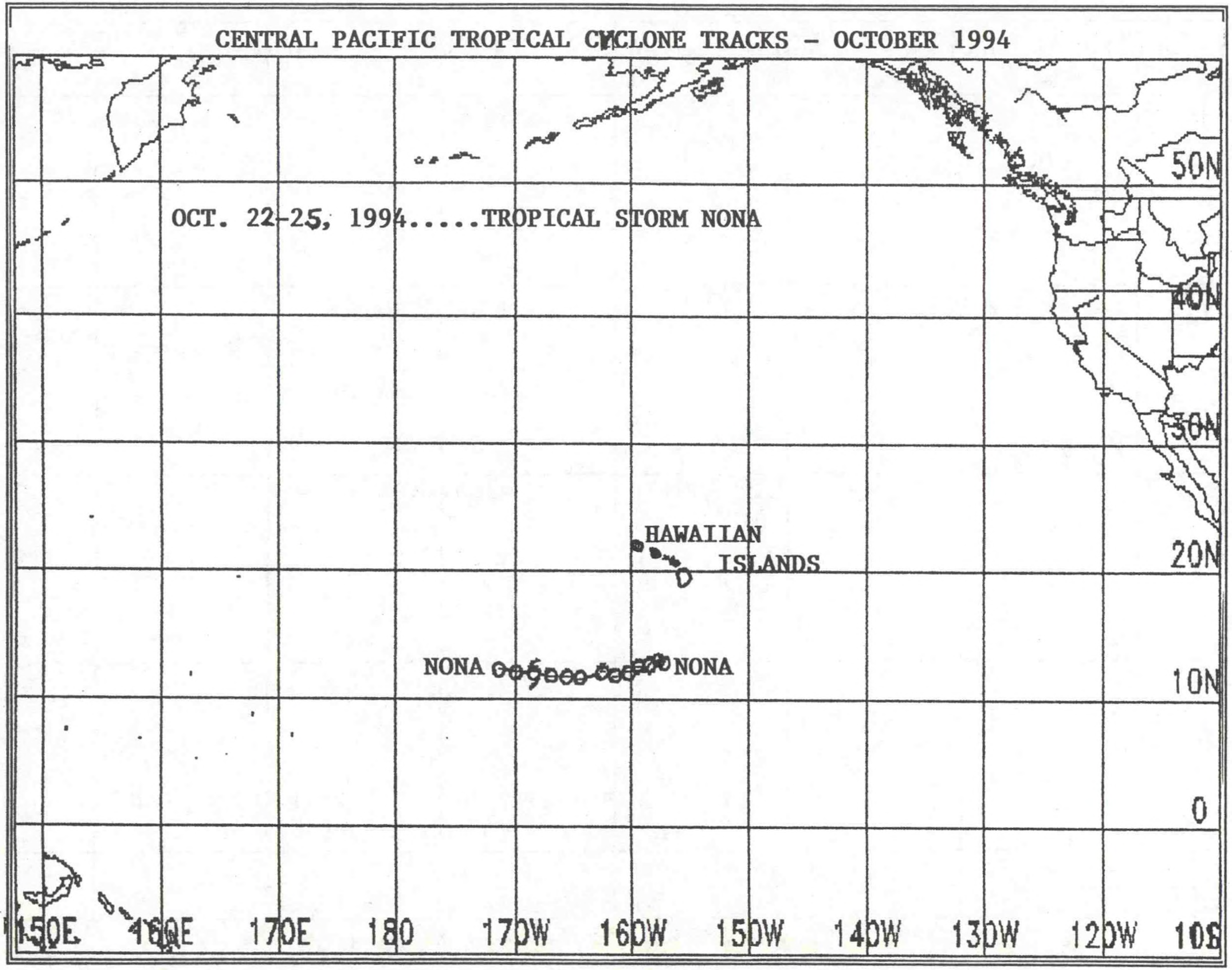

1994 CENTRAL PACIFIC TROPICAL CYCLONE SEASON
HAWAIIAN ISLANDS
30N
20N
140W
150W
160W
170W
180
170E
John
Gilma
Li
Mele
Nona
Emilia
ONE-C
Kristy
Daniel
Fabio
Lane


CENTRAL PACIFIC TROPICAL CYCLONE TRACKS - JULY 1994
JUL. 11-14, 1994......TROPICAL STORM DANIEL
JUL. 17-25, 1994......HURRICANE EMILIA
JUL. 22-24, 1994......TROPICAL DEPRESSION FABIO
JUL. 24-31, 1994......HURRICANE GILMA
HAWAIIAN ISLANDS
FABIO
DANIEL
EMILIA
GILMA
30N
20N
10N
170W
160W
150W
140W



CENTRAL PACIFIC TROPICAL CYCLONE TRACKS - AUGUST 1994
AUG. 3-12, 1994.....HURRICANE LI
AUG. 9-14, 1994.....TROPICAL DEPRESSION ONE-C
AUG. 20-28, 1994.....HURRICANE JOHN
(SEP. 8-10, 1994: re-entered CPHC area)
AUG. 31 - SEP. 4, 1994.....HURRICANE KRISTY
JOHN
JOHN
HAWAIIAN
ISLANDS
ONE-C
ONE-C
KRISTY
KRISTY
JOHN
LI
LI
30N
20N
10N
180
170W
160W
150W
140W


CENTRAL PACIFIC TROPICAL CYCLONE TRACKS - SEPTEMBER 1994
SEP. 6-9, 1994.....TROPICAL STORM MELE
SEP. 9-10, 1994....TROPICAL DEPRESSION LANE
HAWAIIAN
ISLANDS
LANE
LANE
MELE
MELE
40N
30N
20N
10N
0
180
170W
160W
150W
140W
130W
120W


CENTRAL PACIFIC TROPICAL CYCLONE TRACKS - OCTOBER 1994
OCT. 22-25, 1994.....TROPICAL STORM NONA
HAWAIIAN
ISLANDS
NONA
NONA
50N
40N
30N
20N
10N
0
10S
150E
160E
170E
180
170W
160W
150W
140W
130W
120W

1994 CENTRAL NORTH PACIFIC TROPICAL CYCLONE DATA SUMMARY Data pertains only to period when tropical cyclone in Central Pacific					
NAME	**DATES** **(140W - 180)**	**CLASS CENTRAL PACIFIC**	**LOWEST PRESSURE (MB)**	**MAXIMUM SUSTAINED WINDS (KT)**	**HOURS OBSERVED PER CLASS**
1. DANIEL	JUL. 11-14	T.S.	994	55	HUR. = 0 T.S. = 76 T.D. = 18
2. EMILIA	JUL. 17-25	HUR.	925	140	HUR. = 126 T.S. = 24 T.D. = 24
3. FABIO	JUL. 22-24	T.D.	1006	25	HUR. = 0 T.S. = 0 T.D. = 42
4. GILMA	JUL. 24-31	HUR.	925	140	HUR. = 66 T.S. = 90 T.D. = 6
5. LI	AUG. 3-12	HUR.	992	65	HUR. = 6 T.S. = 96 T.D. = 126
6. ONE-C	AUG. 9-14	T.D.	1008	30	HUR. = 0 T.S. = 0 T.D. = 120
7. JOHN	AUG. 20-28 SEP. 8-10	HUR.	920	150	HUR. = 210 T.S. = 0 T.D. = 0
8. KRISTY	AUG. 31 - SEP. 4	HUR.	970	90	HUR. = 36 T.S. = 48 T.D. = 30
9. MELE	SEP. 6- 9	T.S.	1006	35	HUR. = 0 T.S. = 48 T.D. = 36
10. LANE	SEP. 9-10	T.D.	1006	25	HUR. = 0 T.S. = 0 T.D. = 18
11. NONA	OCT. 22-25	T.S.	1006	35	HUR. = 0 T.S. = 6 T.D. = 114

Class: refers to highest classification reached in Central Pacific

HURRICANE (HUR.) = > 64 KNOTS
TROPICAL STORM (T.S.) = 34 - 63 KNOTS
TROPICAL DEPRESSION (T.D.) = < 33 KNOTS

Lowest pressure: estimated lowest pressure during six hourly fix.

INTRODUCTION

The 1994 Central Pacific tropical cyclone season was a near record year for the Central Pacific Hurricane Center (CPHC). A total of 11 tropical cyclones were observed in the Central Pacific. This total included five hurricanes (Emilia, Gilma, Li, John, and Kristy), three tropical storms (Daniel, Mele, and Nona), and three tropical depressions (Fabio, ONE-C, and Lane), that were observed in the Honolulu CPHC's area of responsibility.

The total of eleven tropical cyclones during 1994 ties the record for the greatest number of systems ever recorded in the Central Pacific area. Only the 1992 season experienced as many systems. The statistics are based on the period of record from 1961 through 1994. This period of record is considered to be representative since satellite data was available through much of the period. During a normal season, about five tropical cyclones are observed in the Central Pacific. The only season with more hurricanes was the 1967 season when six hurricanes were recorded.

The 1994 season established a record for the most intense hurricanes ever recorded in the Central Pacific. Three of the hurricanes (Emilia, Gilma, and John) were accompanied by wind speeds of 135 knots or more, placing them in Category Five on the Saffir Simpson scale. This was the first time a category five had ever been observed in the Central Pacific area.

A positive sea surface temperature anomaly is suspected to be one of the major contributing factors to the above normal number of tropical cyclones in the Central Pacific this season. Sea surface temperatures in the area between latitudes 8N and 18N and from longitudes 120W to 150W were a couple of degrees Celsius above normal during much of the season. The three most intense storms were generated and intensified rapidly in this area with above normal water temperatures. Normal sea surface temperatures in this region are usually just below the threshold for supporting the generation of hurricanes. A stronger than normal subtropical high pressure area over the northeast Pacific also contributed to the intensity and movement of the storms.

The season began in July with two hurricanes, one tropical storm, and one tropical depression. The season continued active in August with three hurricanes and one tropical depression. In September, one tropical storm and one depression were observed. The season extended into October as a late season tropical storm developed in the Central Pacific.

Although none of the tropical cyclones affected the Hawaiian Islands with strong winds, the decaying stages of some of the storms did produce some significant rainfall and some high surf, mainly over the windward sections of the Big Island of Hawaii.

This summary will provide a quick look at each tropical cyclone by providing a short history, followed by the synoptic situation present at the time that each storm tracked across the Central Pacific between 140W and 180. It additionally includes at least one satellite photograph of the tropical cyclone, an example of how the objective aids handled the storms, and best track tables and plots for each storm.

The verification data for each hurricane can be found in the last section of this technical memorandum.

TROPICAL STORM DANIEL
JULY 11 - JULY 14, 1994

HISTORY: Daniel initially developed as a disturbance near 8.0N 99.0W on July 6, 1994. It continued on a westerly track and became Tropical Depression Four-E and Tropical Storm Daniel on July 8th. The Central Pacific Hurricane Center commenced issuing advisories after the storm crossed 140W near 13N on July 11th.

After crossing 140W, Daniel moved toward the Hawaiian Islands with maximum winds estimated at 55 knots. This was Tropical Storm Daniel's peak intensity. It slowly weakened on July 12th in a shearing environment and was downgraded to a tropical depression on July 13th.

Daniel crossed 140W moving at close to 17 knots, but slowed its forward speed to just under 14 knots as it approached 145W. It eventually began a steady west northwest track near 10 knots.

The final advisory was issued on July 14th as the system continued to dissipate just south of the Big Island of Hawaii. Remnants of Daniel passed about 100 miles south of South Point on the Big Island of Hawaii on July 15th.

SYNOPTIC SITUATION (July 11 - July 14, 1994)

SURFACE. A high pressure center of 1028 mb to 1030 mb was located near latitude 38N longitude 138W as Tropical Storm Daniel tracked west from 140W to near 158W. The surface ridge of high pressure remained strong throughout Daniel's life cycle, thereby providing resistance to any attempts of the system to move north and instead favored a movement toward the west northwest.

Surface temperatures as the storm tracked westward across the Central Pacific were between 26 and 27 degrees Celsius.

Sea surface temperature at latitude 15N was near 28 degrees Celsius in the vicinity of 140W and lowered to near 26 degrees Celsius near 160W. Therefore, Daniel tracked westward into an "unfavorable" area with lower sea surface temperatures.

700 MB. Tropical Storm Daniel was analyzed at this level as an inverted trough moving west. Strongest winds were initially seen as it crossed into the Central Pacific at 140W on July 11th. East of the center, winds were southeast at 20 knots. West of the center, winds were northeast at 20 knots. Tightening of the gradient to the north of the center resulted in easterly winds of 30 knots near 16N 140W.

By July 12th, the amplitude of the inverted trough had increased, extending to about 22N. However, winds had decreased and were now southeast 10-15 knots east of the center and northeast near 15 knots west of the center.

Tightening of the gradient continued over the northwest portion of the system on July 13th. Winds near the center (15N 149W) were northeast 15 knots and increased steadily to northeast 30 knots over the Big Island and northeast 30-40 knots near Kauai.

By July 14th, the dissipating system only had easterly winds 10-15 knots across its center (16N 154W) and the gradient to the northwest had relaxed. At this time, winds over the Hawaiian Islands were only 15-20 knots.

Temperatures at the 700 mb level on the Big Island were 10 degrees Celsius on July 11th, and fluctuated between 8 and 9 degrees from July 12th through July 14th.

500 MB. As Tropical Storm Daniel moved west across 140W, the system was reflected at the 18,000 foot level as an inverted trough extending from near 10N 140W to 20N 147W. On July 11th, winds east of 140W were easterly 15-25 knots, and west of 140W they were east and northeast near 25 knots. By July 12th, the inverted trough had become sharper, but the winds had decreased as the gradient relaxed. Winds east of the center were southeast near 10 knots, becoming northeast near 15 knots west of the center. No significant change in this wind flow pattern occurred on July 13th. However, on July 14th, the winds at the 500 mb level became variable and weakened to near 5 knots.

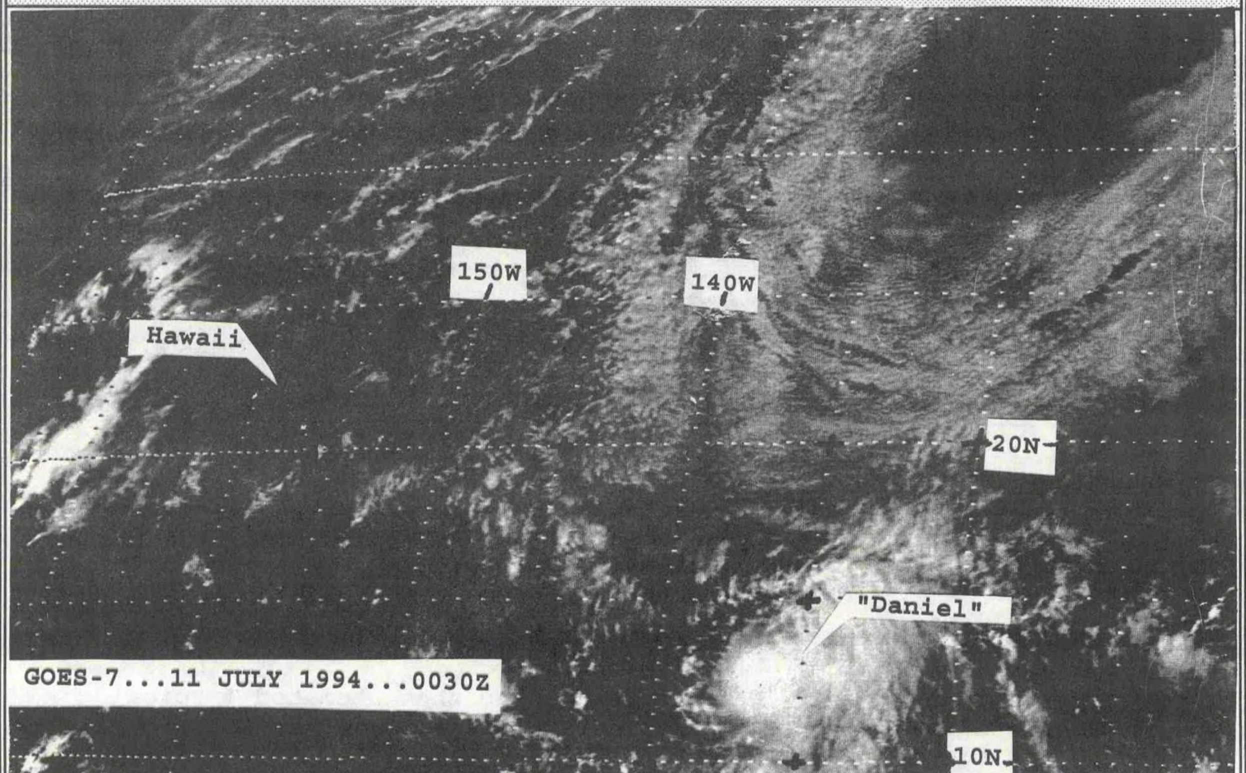
Temperatures on the Big Island of Hawaii at 18,000 feet were near -5 degrees Celsius on July 11th and -6 degrees Celsius on July 12th through the 14th.

250 MB. Tropical Storm Daniel was moving through an environment where the winds at the higher levels were rather weak and confused. A well defined anticyclonic circulation was found west of 150W with a center near 10N 150W. As Daniel moved west to near 150W on July 13th, it began to encounter stronger northwest winds, which were recurving to the southwest at the bottom of a weak trough. The system eventually came under the influence of southwest winds of 35-45 knots, resulting in shearing of the system as it moved west of 150W.

SATELLITE DATA.

Tropical Storm Daniel moved into the Central Pacific and produced an area of layered cloudiness that extended southwest through northeast across the storm.

GOES-7 SATELLITE

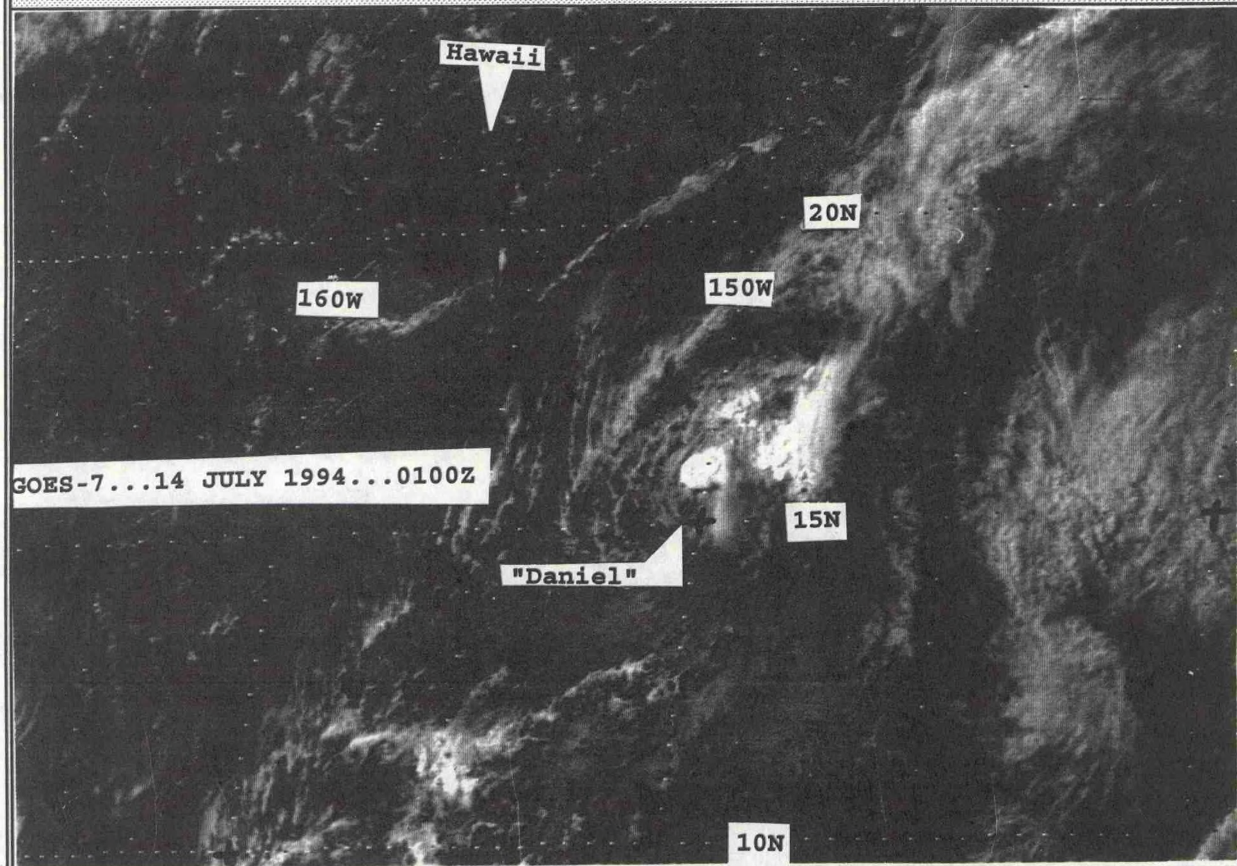


0030Z.....11 JULY 1994
"Daniel" vicinity of 12.5N 135W

Cumulonimbus (CB) development to the southwest of the center was initially seen late on July 11th into early July 12th. By near 1800Z on July 12th, CBs were embedded in an area from southwest to south to east within 2-4 degrees of the center.

By midday on July 14th, only an isolated CB was seen to the immediate northeast of the weak center, while broken layered cloudiness extended to the northeast to about 30N 140W.

GOES-7 SATELLITE



0100Z.....14 JULY 1994
"Daniel" vicinity of 15.5N 150.5W

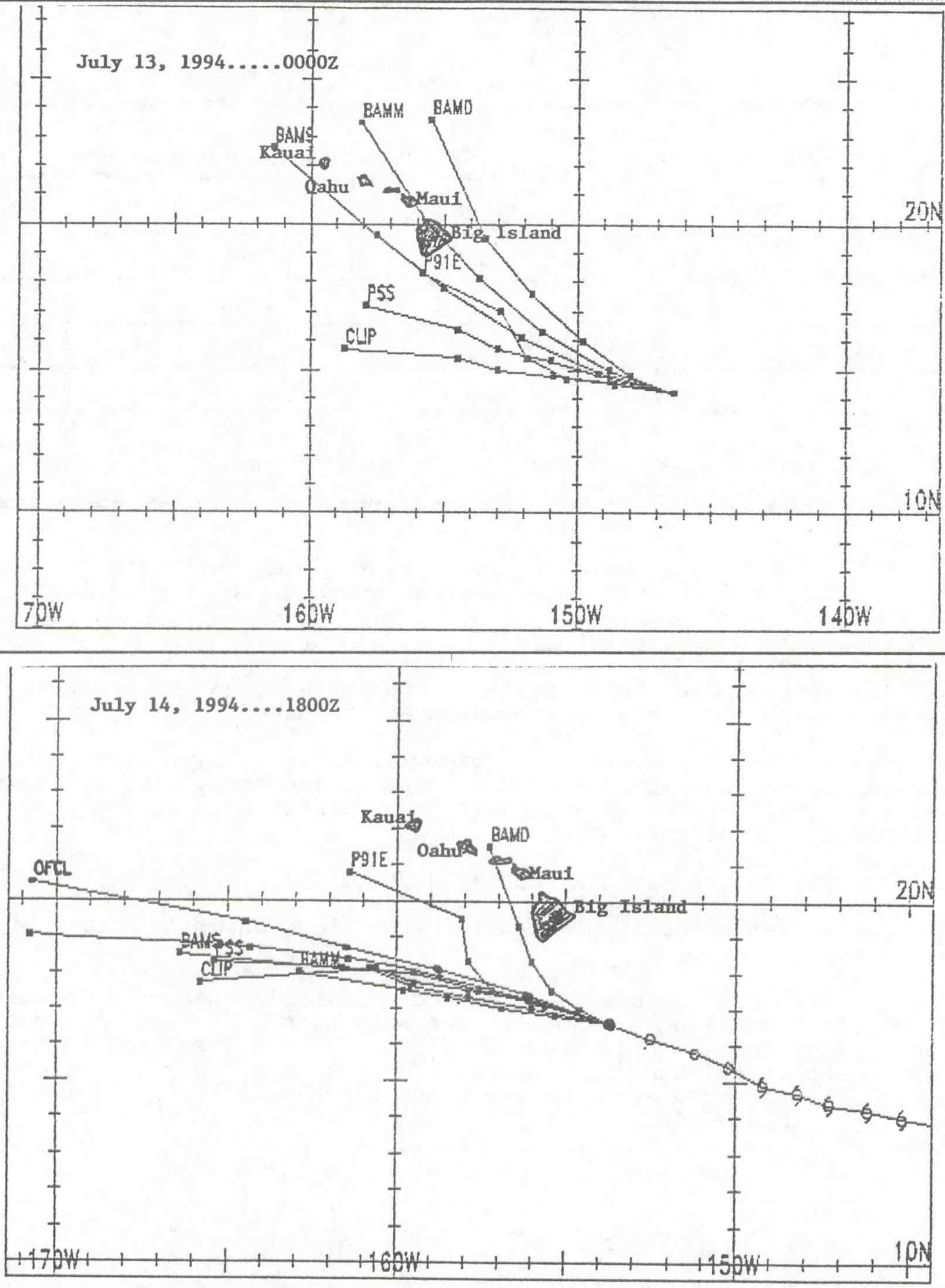
DISCUSSION

Daniel was a well defined tropical storm when it entered the Central Pacific with maximum winds of 55 knots.

The Central Pacific Hurricane Center (CPHC) used the Automated Tropical Cyclone Forecasting (ATCF) system to provide forecasts. On July 12th, with the initial position of Daniel being near 14.5N and 146W, the objective aids all indicated a westerly track through the first 24 hours, but then fanned out with the Beta Advection Models (BAM) tracking northwest across the Hawaiian Islands. This same scenario continued on July 13th and to a lesser extent on July 14th. The CPHC utilized the layered mean products to provide forecasts for tracks of the storm and maintained a west northwest track.

Figure 1 shows the objective guidance forecasts when Daniel was approaching 147W (July 13, 1994), and when it was near 16.5N 154W (July 14, 1994).

Figure 1
Objective Aids for "Daniel"



Top: July 13, 1994...0000Z **Bottom: July 14, 1994...1800Z**

The following table provides estimated upper level wind vectors for Daniel at specific time periods.

TROPICAL STORM DANIEL JULY 11-14, 1994					
Date/Time JULY	LAT.	LON.	Est. WIND from Grid Point values		
			700MB	500MB	250MB
11/12Z	13.0N	139.0W	09025	08015	04010
12/12Z	13.8N	144.0W	08015	05005	02015
13/12Z	14.7N	148.3W	07015	08010	34010
14/12Z	16.2N	152.5W	09010	10005	34015
Data from analysis charts at specified times.					

Several factors came together and are seen as providing the basis for the weakening of the system as it tracked west to south of the Big Island.

Those factors were:

(a) the system moved into an area where sea surface temperatures were slightly lower than those which nurtured it east of 140W;

(b) deep convection decreased rapidly after it crossed 140W. There was no significant convection that developed subsequently with the system when the normal diurnal maximum existed, indicating that deep instability was absent;

(c) entrainment of slightly cooler and drier air; and

(d) the system moved into an environment where shearing aloft increased.

By July 14th, the storm further weakened and appeared to become an open wave southeast of the Big Island of Hawaii. The only effect on land was some locally heavy showers over the windward slopes of the Big Island. Rainfall totals were about five inches in 5 hours on July 15th. Moderate surf between 4 and 6 feet also affected east and southeast facing shorelines of the Big Island on July 13th and 14th.

Table 1 provides the best track data for Tropical Storm Daniel for each 6-hour synoptic time period. Also provided in the table are the maximum sustained winds for each time period.

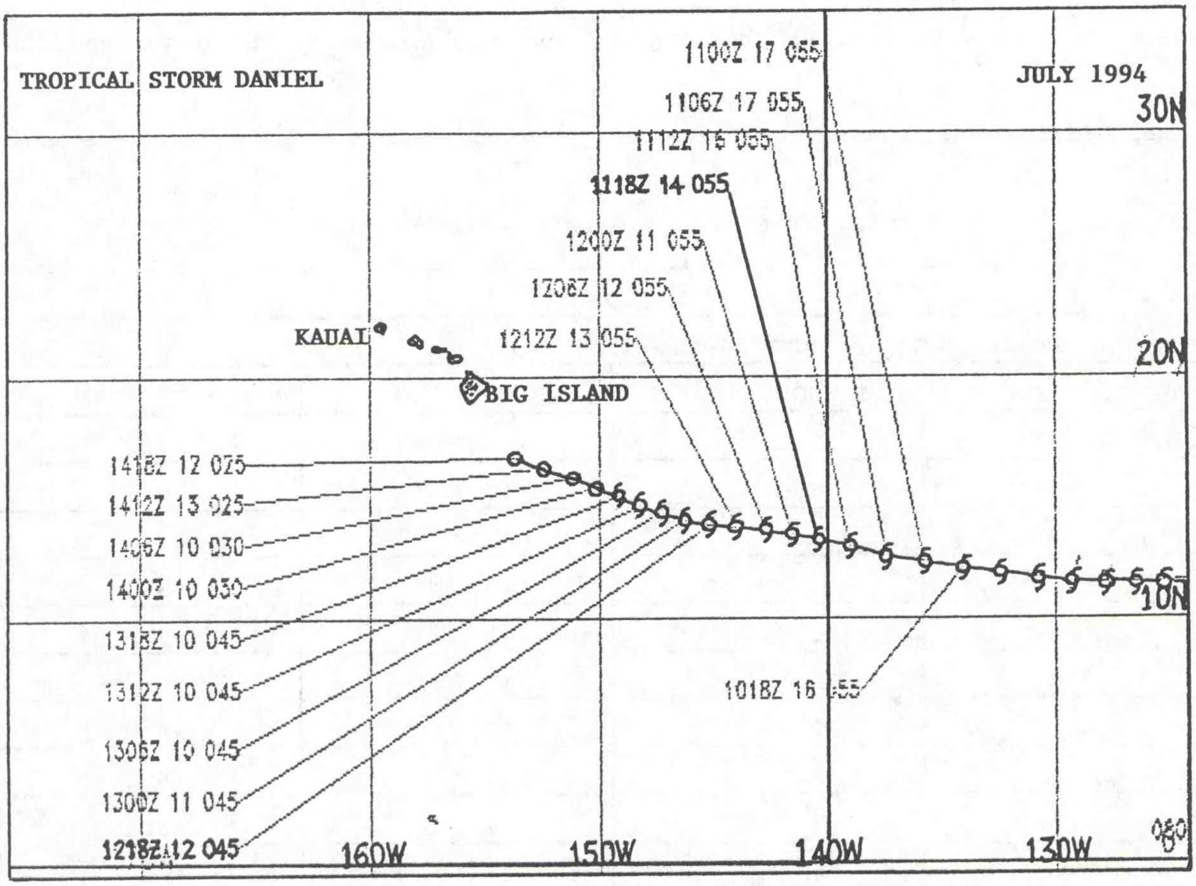
The Central Pacific Hurricane Center (CPHC) assumes responsibility for issuance of advisories after the tropical cyclone tracks westward across 140W.

TABLE 1
BEST TRACK FOR TROPICAL STORM DANIEL

TROPICAL STORM DANIEL - JULY 11-14, 1994 (HST)

DATE/TIME(Z)	LATITUDE (N)	LONGITUDE (W)	MAX WINDS (KT)
JUL. 11/0000	12.4	135.7	55
/0600	12.6	137.4	55
/1200	13.0	139.0	55
/1800	13.3	140.4	55
JUL. 12/0000	13.5	141.5	55
/0600	13.7	142.7	55
/1200	13.8	144.0	55
/1800	13.9	145.2	45
JUL. 13/0000	14.1	146.3	45
/0600	14.4	147.3	45
/1200	14.7	148.3	45
/1800	15.1	149.2	45
JUL. 14/0000	15.4	150.2	30
/0600	15.8	151.2	30
/1200	16.2	152.5	25
/1800	16.6	153.7	25

FIGURE 2
BEST TRACK PLOT FOR TROPICAL STORM DANIEL



For positions provided, the first figure is the date and time group, followed by the speed of the system, and then by the maximum winds of the storm.

For example, the first position shown after Daniel crossed 140W gives the following information: 1118Z 14 055, which is the position on July 11, 1994 at 1800Z. The system was moving at 14 knots and had maximum sustained winds of 55 knots.

HURRICANE EMILIA
JULY 17 - JULY 25, 1994

HISTORY. The National Hurricane Center in Miami began tracking Emilia after it formed in the eastern Pacific Ocean near 8.2N 125.9W on July 15, 1994. It was one of the relatively few storms that has ever formed south of 10N. Emilia was initially identified as an area of disturbed weather in the intertropical convergence zone near 125W on July 14th.

By the time that Emilia crossed 140W and into the Central Pacific on July 17th, it was already a well developed hurricane with estimated winds of 85 knots. Emilia grew rapidly in intensity to become one of the most powerful hurricanes on record in the Central Pacific. Maximum sustained winds increased to 140 knots as it approached 150W and winds were estimated to be 135-140 knots until it reached 155W.

In the Eastern Pacific, Emilia moved rapidly west at 15-20 knots after it developed, then settled to an average forward speed of 10-15 knots as it approached 140W. It continued to track to the west northwest at this same speed until reaching 150W, at which time it slowed to a steady 8-10 knots as it began to take a more northwesterly track.

On its closest approach, Emilia passed about 150 miles southwest of the Big Island of Hawaii at 06Z on July 22nd. Maximum sustained winds at that time were 85 knots. Emilia continued to weaken, passing about 200 miles southwest of Oahu and Kauai as a tropical storm on July 23rd. The following day, Emilia was downgraded to a tropical depression.

The last advisory was issued on July 25th at 0300Z as the remnant circulation was dissipating to the west of Kauai.

SYNOPTIC SITUATION (July 17 - July 25, 1994)

SURFACE. A double barrel high pressure system with centers near 1030 mb were located near 35N 172W and 38N 142W as Hurricane Emilia moved west from 126W to near 152W. The east-west coupling of this ridge maintained a formidable barrier which prevented even a very strong hurricane such as Emilia from penetrating north too quickly.

Ship observations indicated that south of 20N, surface temperatures were between 26 and 27 degrees Celsius as Emilia tracked westward.

Sea surface temperature in the genesis area was near 27 degrees Celsius. A significant warmer pocket of water (28-29 degrees Celsius) was however found west of 145W, which is the area where rapid intensification occurred. The sea surface temperature along latitude 20N decreased to below 27 degrees Celsius west of 160W.

700 MB. Hurricane Emilia was identified at the 10 thousand foot level as an inverted trough. As it crossed 140W (July 17th) winds were southeast at 20 knots east of the center and northeast at 20 knots west of the center. By July 18th, the only noticeable change on NMC analysis charts was the decrease in the winds to 10-15 knots. The validity of these winds are suspect, since reconnaissance aircraft measured rotating winds at 30-35 knots on July 20th through July 21st, then decreasing to near 20 knots through July 24th.

Temperatures at the 700 mb level on the Big Island were between 8 and 10 degrees Celsius as Hurricane Emilia moved from 140W through 160W.

Model relative humidity values depicted on the chart indicated a circular 70 percent value associated with Emilia as it moved from 150W northwest to 160W.

500 MB. Emilia crossed 140W in an easterly wind flow regime at this level. Speeds indicated by the NMC charts were 10-15 knots. As the hurricane crossed 150W, winds increased to 30-40 knots and showed a more cyclonic twist around the center. However, by July 21st at 12Z, winds decreased, becoming weakly cyclonic 10-15 knots within a 5 degree (300 nm) radius of the center, through 12Z on July 23rd. On July 24th, Emilia was dissipating rapidly with two cyclonic circulations analyzed east and west of its location. West and northwest winds of 15-25 knots were located to its northwest side.

Temperatures on the Big Island of Hawaii at 18,000 feet were between -5 and -6 degrees Celsius throughout the entire life of Hurricane Emilia.

250 MB. The wind flow at this level was southeast and east at 15-25 knots from July 17-21. An upper level trough extended northeast to southwest from near 40N 140W to 20N 170W during that same period with winds just north of 20N and between 140W and 160W being mostly westerly at 45-55 knots.

On July 21st, the stronger winds on the south side of the trough began to affect the hurricane. The trough in the upper westerlies created a significant shearing environment, which essentially cut off the top of the system and resulted in rapid dissipation through the next 48 hour period. By July 24th, westerly winds of 55-70 knots were occurring over the top of Emilia.

SATELLITE DATA.

The CPHC satellite meteorologists used GOES-7 and polar orbiter data to track Hurricane Emilia. Emilia moved into the Central Pacific with a well defined eye and a large area of wrap around convection. This convection was most prominent in the banding, which was visible from the southwest to northeast quadrant of the system. The cloudiness associated with the hurricane extended outward about 4-5 degrees from the eye.

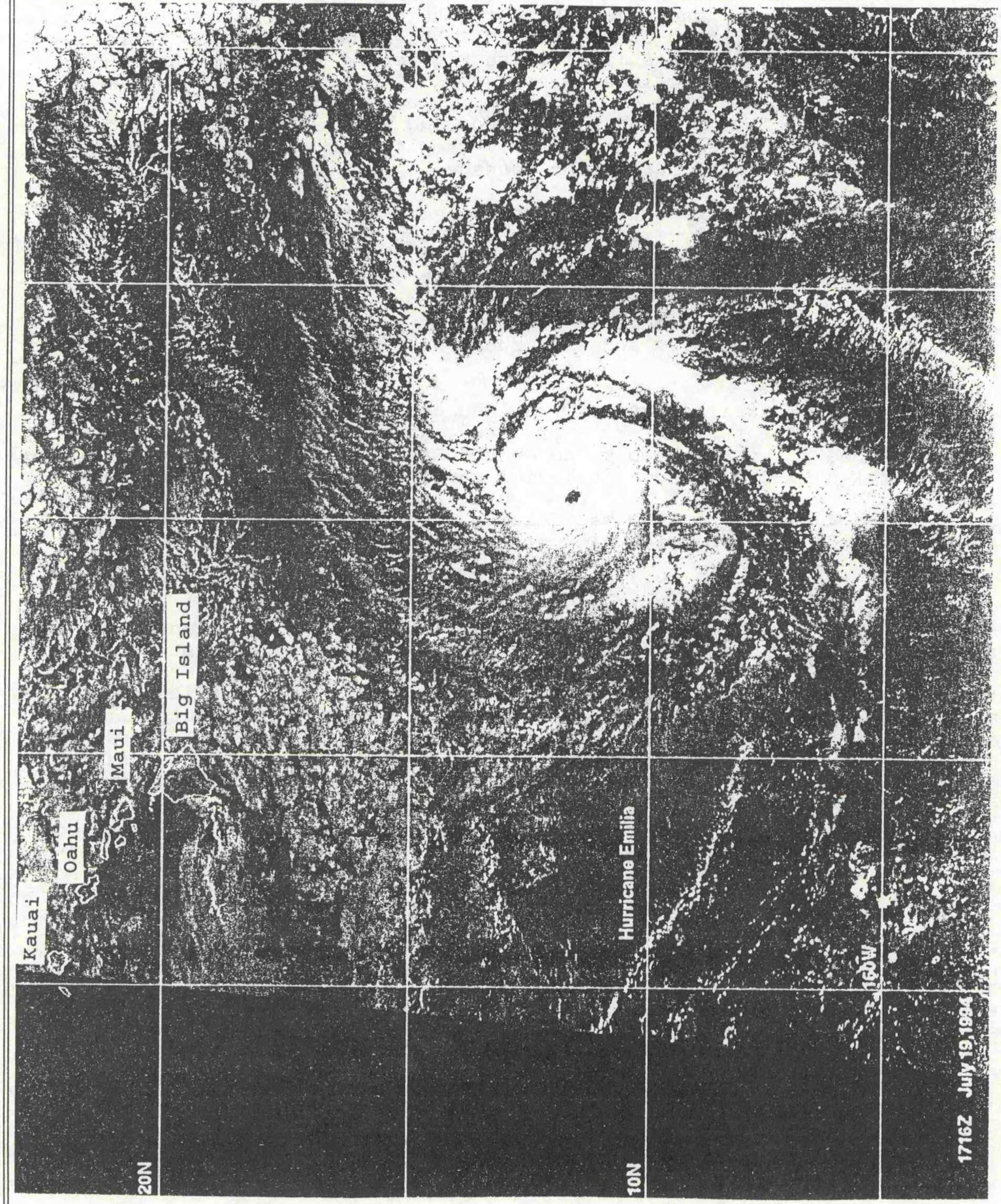
By July 18th, the eye darkened and became circular. Satellite imagery indicated a well defined warm eye with a steady forward speed of near 10 knots.

As it crossed 150W at around 2100Z on July 19th, it continued to show a good eye with convection embedded in the cloudiness to the west and southwest. Stronger convection was seen in the banding which was to the east of the eye.

By the end of the day on July 21st, the hurricane lost its eye and evidence of shearing was visible as cloudiness started to stream off to the northeast from the western portion of the storm.

On July 24th, evidence of low level circulation was still visible on satellite photographs, but upper level shearing was dominant.

POLAR ORBITER SATELLITE.....NOAA-11



Hurricane Emilia

DISCUSSION

The effects of the powerful hurricane "Emilia" on the Hawaiian Islands were minimal. There was the usual high surf of 6 to 10 feet along the Puna and Kau shorelines of the Big Island of Hawaii. Slightly lower surf was reported along the Kona and Kohala coastline of the Big Island and along the south facing shores of the smaller islands.

Emilia passed very close to NOAA Buoys 51002 and 51003. Observations from these two platforms provided a good hourly sampling of atmospheric pressure, as well as winds and waves during the passage.

Locally on land, winds were strong and gusty across the state where terrain brought the strong easterly winds at mountain top level down to the lower elevations. Only minor wind damage to roofs occurred and a few trees were uprooted or branches broken. Rainfall was mostly light to moderate.

No hurricane watches or warnings were issued as the confidences in the weakening effects of shearing and subsequent westward movement of the storm were high.

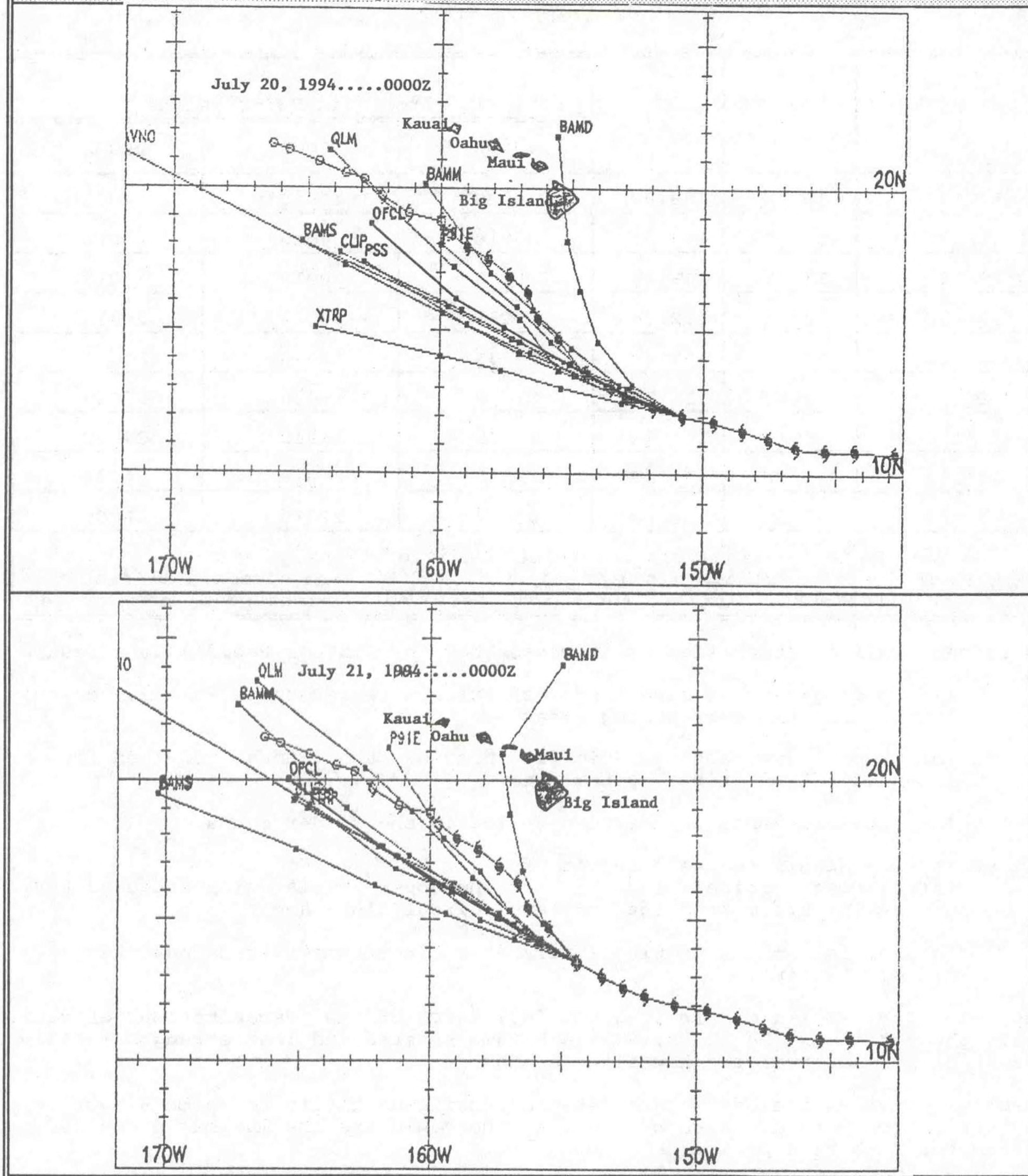
Some of the problems which surfaced resulted due to the perceived forecast track of Emilia. The forecast by a private weather forecasting service on July 21st placed an enormous workload on the CPHC. That forecast was released to the general public by a local television station, which indicated that Emilia would move north northeast on a path that would be between the islands of Molokai and Kauai. The CPHC was deluged with telephone calls and questioned on why the NWS track was different than the private firm track.

On July 19th, it was noted that the deep layer mean winds indicated easterlies persisting in the 1000-500 mb layer, and was consistent with the Beta Advection Model Medium Layer (BAMM) forecast track. This solution seemed reasonable as the upper level trough weakened and lifted northeast.

Since Hurricane Emilia was a well developed storm, the CPHC utilized the deep layer mean product to forecast movement and used shear product information to forecast storm dissipation. Forecaster confidence in use of the deep layer mean products increased during Emilia. It was used effectively to assist the forecasters whenever objective guidance forecast models indicated very divergent and different tracks as is shown in Figure 3.

Figure 3 shows the objective guidance forecasts when Emilia was near 12N 151W (July 20, 1994), and when it was near 13.8N 154.5W (July 21, 1994).

Figure 3
Objective Aids for "Emilia"



Top: July 20, 1994...00Z Bottom: July 21, 1994...00Z

The following table provides estimated upper level wind vectors for Emilia at specific time periods.

HURRICANE EMILIA JULY 17-25, 1994					
Date/Time	LAT.	LON.	Est. WIND from Grid Point values		
JULY			700MB	500MB	250MB
17/12Z	10.2N	138.8W	10020	10010	14020
18/12Z	10.8N	144.3W	06010	08010	13015
19/12Z	11.5N	148.5W	10010	10010	12015
20/12Z	12.6N	152.7W	CYC35	08025	ACC15
21/12Z	14.7N	155.5W	CYC35	14010	ACC25
22/12Z	17.5N	158.2W	CYC20	18020	ACC25
23/12Z	19.1N	161.2W	13020	18015	27020
24/12Z	20.9N	164.6W	13015	24010	26045
25/00Z	21.5N	166.3W	09010	29010	28060
Data from analysis charts at specified times. CYC indicates cyclonic circulation, followed by wind speeds near center ACC indicates anticyclonic circulation, followed by wind speeds near center					

Hurricane Emilia intensified as it moved into the Central Pacific as a result of:

(a) moving into an area where sea surface temperatures were 2-3 degrees higher than the surrounding areas;

(b) upper level anticyclonic flow provided the exhaust required for intensification of the system; and

(c) the existence of deep convection in the feeder bands.

It eventually dissipated as a result of:

(a) strong vertical wind shear at the upper levels which detached the top of the storm from the low level circulation; and

(b) moving into area with lower sea surface temperatures near 26 degrees Celsius.

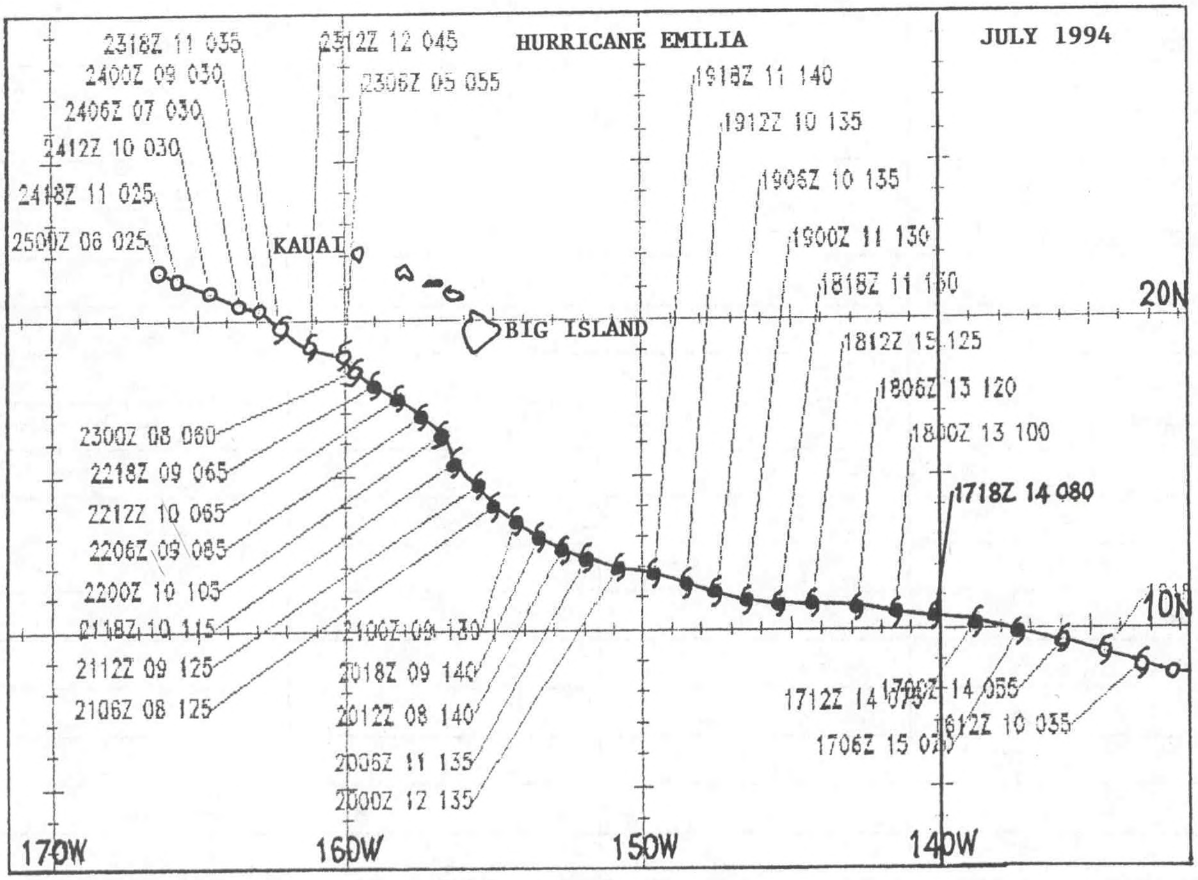
By July 21th, Emilia was feeling the full force of the "decapitation" effects. Throughout the next 24 hours, Emilia became sheared and lost strength rapidly as it passed south of the Hawaiian Islands.

Table 2 provides the best track data for Hurricane Emilia for each 6-hour synoptic time period. Also provided in the table are the maximum sustained winds for each time period.

The CPHC assumes responsibility for issuance of advisories after the tropical cyclone tracks westward across 140W.

TABLE 2 BEST TRACK FOR HURRICANE EMILIA			
HURRICANE EMILIA - JULY 17-25, 1994 (HST)			
DATE/TIME(Z)	LATITUDE (N)	LONGITUDE (W)	MAX WINDS (KT)
JUL. 17/1800	10.4	140.2	80
JUL. 18/0000	10.5	141.5	100
/0600	10.7	142.8	120
/1200	10.8	144.3	125
/1800	10.8	145.4	130
JUL. 19/0000	10.9	146.5	130
/0600	11.2	147.5	135
/1200	11.5	148.5	135
/1800	11.8	149.6	140
JUL. 20/0000	12.0	150.8	135
/0600	12.3	151.9	135
/1200	12.6	152.7	140
/1800	13.0	153.5	140
JUL. 21/0000	13.5	154.3	130
/0600	14.0	155.0	125
/1200	14.7	155.5	125
/1800	15.4	156.3	115
JUL. 22/0000	16.3	156.7	105
/0600	16.9	157.4	85
/1200	17.5	158.2	65
/1800	17.9	159.0	65
JUL. 23/0000	18.4	159.7	60
/0600	18.8	160.0	55
/1200	19.1	161.2	45
/1800	19.7	162.2	35
JUL. 24/0000	20.3	162.9	30
/0600	20.5	163.6	30
/1200	20.9	164.6	30
/1800	21.3	165.7	25
JUL. 25/0000	21.5	166.3	25

FIGURE 4
BEST TRACK PLOT FOR HURRICANE EMILIA



For positions provided, the first figure is the date and time group, followed by the speed of the system, and then by the maximum sustained winds of the storm.

For example, the first position shown after Emilia crossed 140W gives the following information: 1718Z 14 080, which is the position on July 17, 1994 at 1800Z. The system was moving at 14 knots and had maximum sustained winds of 80 knots.

TROPICAL DEPRESSION FABIO
JULY 22 - JULY 24, 1994

HISTORY. Tropical Depression Fabio had its beginnings in the eastern Pacific Ocean. It formed on July 19th at 0000Z as Tropical Depression SIX-E out of an area of disturbed weather that had been monitored by the National Hurricane Center (NHC) in Miami for several days. The NHC indicated that the tropical depression's deep convective banding increased and then quickly strengthened into Tropical Storm Fabio by 1200Z on July 19th. Tropical Storm Fabio's organized convective banding did not last long. The storm began to weaken quickly by 1800Z on July 19th and was again a tropical depression by 1800Z on July 20th, still in NHCs area of responsibility.

Fabio had already weakened to Tropical Depression strength as it entered the Central Pacific on July 22nd. It travelled west, moving at 16-18 knots along 17N. Maximum sustained winds were 25 knots throughout its journey as it approached the area south of the Hawaiian Islands. The last advisory on Fabio was issued at 00Z on July 24, 1994.

SYNOPTIC SITUATION (July 22 - July 24, 1994)

SURFACE. The most important surface features which existed as Tropical Depression Fabio passed 140W were Hurricane Emilia to the west and Tropical Storm Gilma to the east.

Hurricane Emilia was ahead of Fabio by approximately 17 degrees of longitude while the rapidly intensifying Tropical Storm Gilma was to the south and behind by about 12 degrees of longitude. On July 22nd, all three tropical cyclones were between 10N and 20N and 130W and 160W. By July 24th, Fabio had moved to within 10 degrees of Emilia. Both systems were decreasing in intensity.

Ship observations indicated that south of 20N, surface temperatures were between 26 and 27 degrees Celsius as all three tropical cyclones tracked westward. Sea surface temperature had changed little from the beginning of the month which showed temperatures in the south Central Pacific were near 28 degrees Celsius. Sea surface temperature along latitude 20N decreased to below 27 degrees Celsius west of 160W.

700 MB. Although weak, Fabio still influenced the flow at the 700 mb level and was analyzed as an inverted trough as it crossed 140W. Winds to the east were southeast 10-15 knots and ahead (to the west) were northeast near 10 knots but quickly turned to southeast as a result of Emilia's influence. By July 24th, Fabio was quickly being lost in the general easterly flow of 10-20 knots at this level.

Temperatures at the 700 mb level on the Big Island were between 8 and 10 degrees Celsius as Fabio approached from the southeast. Model relative humidity values depicted on the chart indicated a circular 70 percent value associated with Fabio as it moved west. The analyzed position of the Low associated with Fabio was plotted within 2-3 degrees of the actual position.

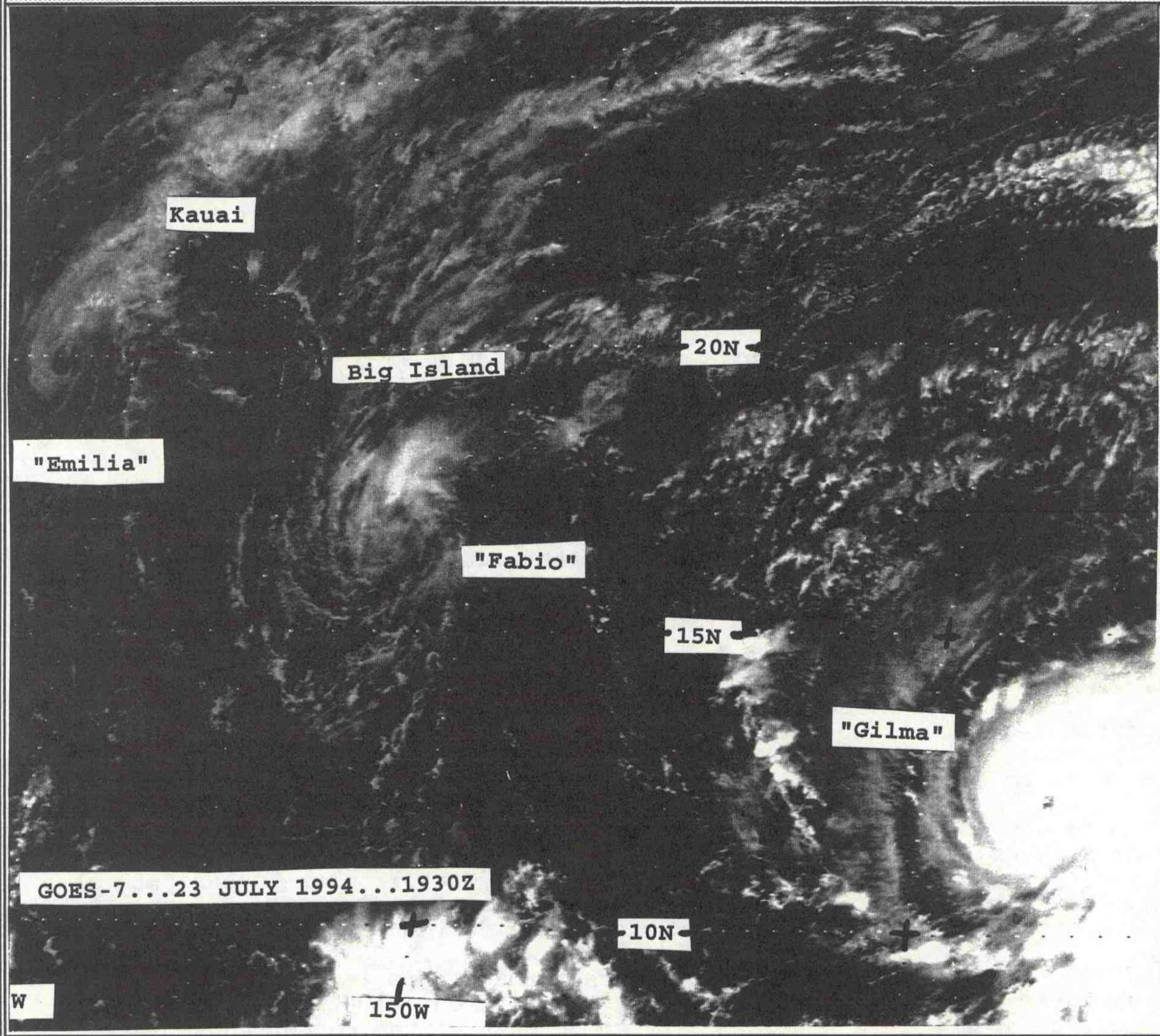
500 MB. Fabio maintained its influence through this level as indicated by a weak inverted trough which persisted until 00Z on July 23rd. Winds around the immediate area were southeast 15-20 knots east of the center and northeast 10-15 knots west of the center. By 1200Z on July 23rd, winds were light and variable. Temperatures on the Big Island of Hawaii at 18,000 feet were -6 degrees Celsius as Fabio approached from the southeast.

250 MB. Fabio was found on the western portion of a tight anticyclonic circulation. Winds were east to southeast at 15-20 knots. Stronger winds of 50-70 knots were located 10 degrees to the northwest and north of Fabio.

SATELLITE DATA.

Tropical Depression Fabio crossed 140W with an area of cloudiness that extended from west through north through southeast for about 4-6 degrees. Throughout its track west, most of the cumulus and stratocumulus clouds remained over the northern half of the storm. There was a definite absence of any significant cloudiness to its south.

GOES-7 SATELLITE PHOTOGRAPH



Tropical Depression Fabio

DISCUSSION

Fabio never developed past the depression stage in the Central Pacific. The remnant circulation moved south of the Big Island on July 24th with the center passing about 100 miles south of South Point.

Most of the convective activity associated with Fabio occurred over open waters south of the Hawaiian Islands. However, moisture along the northern fringes of the circulation brought some locally heavy showers to the Big Island. Additionally, pockets of moisture affected some of the other islands. Some windward areas of Oahu received as much as 3-4 inches of rainfall on July 24th.

Some of the more obvious explanations for Tropical Depression Fabio's inability to develop were:

(a) Fabio moved west at a more northern latitude than both Emilia and Gilma. At this latitude, sea surface temperatures were 1-2 degrees Celsius lower than at the more southern latitudes.

(b) Fabio was closer initially to tremendous upper level shearing effects which did not provide a favorable environment for development.

The following table provides estimated upper level wind vectors for Fabio at specific time periods.

TROPICAL DEPRESSION FABIO
JULY 22-24, 1994

Date/Time	LAT.	LON.	Est. WIND from Grid Point values		
			700MB	500MB	250MB
22/12Z	13.0N	139.0W	11010	13015	10020
23/12Z	13.8N	144.0W	07015	LGT/VBL	14015

Data from analysis charts at specified times.

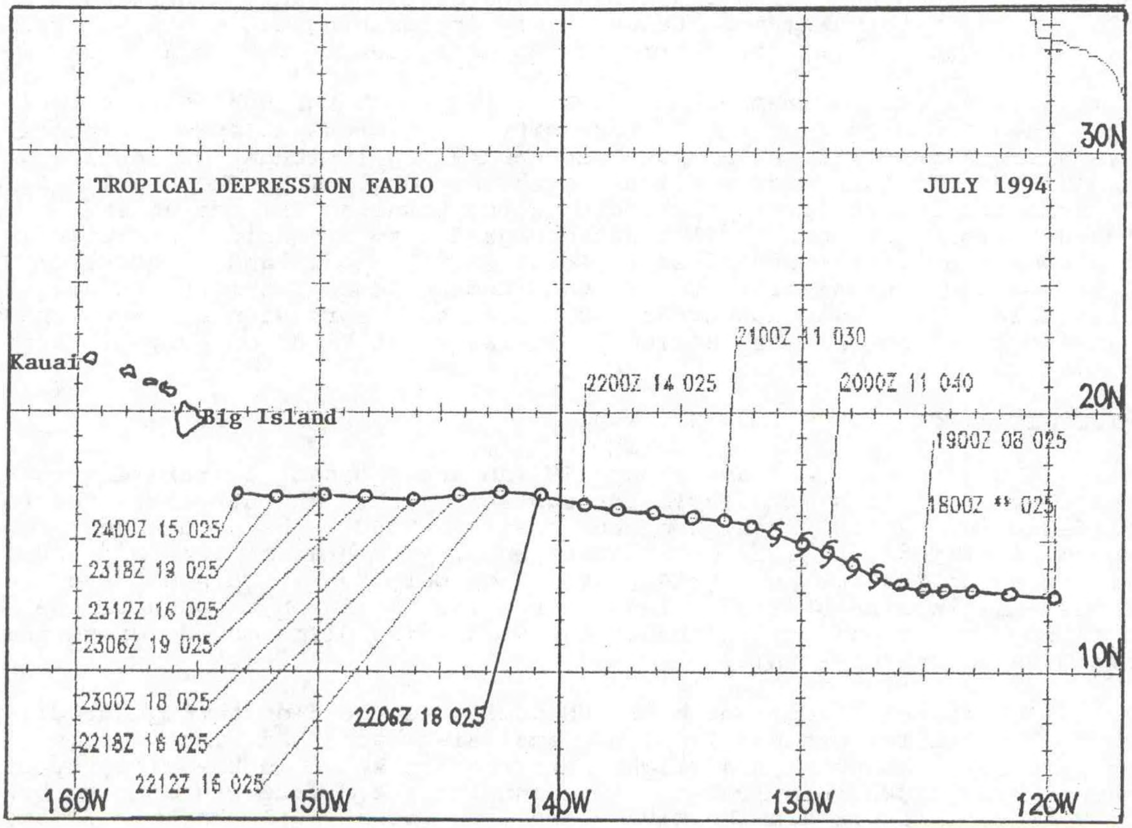
Table 3 provides the best track data for Tropical Depression Fabio for each 6-hour synoptic time period. Also provided in the table are the maximum sustained winds for each time period.

The Central Pacific Hurricane Center (CPHC) assumes responsibility for issuance of advisories after the tropical cyclone tracks westward across 140W.

TABLE 3
BEST TRACK FOR TROPICAL DEPRESSION FABIO

TROPICAL DEPRESSION FABIO - JULY 22-24, 1994 (HST)			
DATE/TIME(Z)	LATITUDE (N)	LONGITUDE (W)	MAX WINDS (KT)
JUL. 22/0600	16.8	140.8	25
/1200	16.8	142.5	25
/1800	16.8	144.2	25
JUL. 23/0000	16.6	146.1	25
/0600	16.7	148.1	25
/1200	16.8	149.8	25
/1800	16.7	151.8	25
JUL. 24/0000	16.8	153.4	25

FIGURE 5
BEST TRACK PLOT FOR TROPICAL DEPRESSION FABIO



For positions provided, the first figure is the date and time group, followed by the speed of the system, and then by the maximum winds sustained of the storm.

For example, the first position shown after Fabio crossed 140W gives the following information: 2206Z 18 025, which is the position on July 22, 1994 at 0600Z. The system was moving at 18 knots and had maximum sustained winds of 25 knots.

HURRICANE GILMA
JULY 24 - JULY 31, 1994

HISTORY. Hurricane Gilma originally formed in the Eastern Pacific Ocean near 18N 119W on July 20, 1994. The National Hurricane Center (NHC) in Miami tracked Gilma almost due west between 10.2N and 12.2N. This track was parallel to the track which Hurricane Emilia took earlier in the month, but was some 2 to 3 degrees farther north. Gilma developed into a hurricane on July 23, 1994. With maximum sustained winds approaching 140 knots, it crossed 140W into the Central Pacific Hurricane Center's (CPHC) area on July 24.

Gilma maintained its maximum winds close to 140 knots through 0600Z on July 25th and then began to decrease in intensity as it crossed 146W. It continued to move along a rather straight path westward along latitude 12N until reaching 160W. It then made a slight northwest turn. The CPHC tracked Gilma on its westward course far to the south of the Hawaiian Islands as it continued to lose strength. Gilma was downgraded to a tropical storm while passing some 400 miles south of South Point on the Big Island at 0000Z on July 27. It remained a tropical storm as it turned northwest at 1800Z on July 29 near 15N 173W. Gilma was downgraded to a tropical depression at 1800Z on July 30 near 18N 176W and the last advisory was issued at 0300Z on July 31.

SYNOPTIC SITUATION (July 24-31, 1994)

SURFACE. A high pressure ridge along 35N was the dominant feature during the early stages of Gilma's life cycle through July 26th. At that time, the ridge consolidated into a 1027 mb high center near 37N 155W. The high then strengthened slightly to 1029 mb at 0600Z on July 29th as it drifted east, finally reaching 1030 mb at 39N 145W at 12Z on July 30th. This pattern maintained east-northeast trade winds in the 15N to 25N belt south of the ridge through the remainder of the time period while Gilma moved across the Pacific Ocean south of Hawaii.

700 MB. A persistent ridge north of 20N dominated the flow throughout Gilma's life cycle. As Gilma crossed 140W, NMC analysis charts had winds mostly easterly at 15-20 knots with a slight perturbation shown in the vicinity of the center. By 1200Z on July 25th, a reconnaissance flight was able to better identify a cyclonic circulation with winds measured at 40-50 knots. Twenty-four hours later, the winds had decreased to 25-40 knots at this level, but continued to have a well defined circulation center. As Gilma approached 160W on July 27th, and throughout the remainder of its journey west, an inverted trough was evident at the 10,000 foot level and winds decreased to 15-25 knots.

500 MB. Gilma formed under the southern extremity of a 500 mb ridge that extended east to west along 20N. As Gilma moved west along 12N, this ridge continued to persist to the north. After crossing 140W, the ridge began to extend west along with the hurricane's movement.

At 0000Z on July 27th, a trough north of the ridge broke through, splitting the ridge into two anticyclonic circulations. The trough extended from 30N 146W to 18N 158W. At this time, Gilma was dropping below hurricane strength at 12N 155W. The effect of this trough was in providing a greater amplitude to the inverted trough that identified Gilma at 18,000 feet. The inverted trough moved west at about the same speed as Gilma through 1200Z on July 29th. At this time, an upper cyclonic circulation formed in the vicinity of 10N 174W. Gilma spent its last 36 hours moving northwest under the northeast quadrant of this weak cyclonic circulation, finally dissipating at 0000Z on July 31 near 19N 176W.

After Gilma crossed 140W, winds were easterly at 15-40 knots. After crossing 150W, winds were showing significant cyclonic circulation at 10-25 knots. Winds then became southeast 10-20 knots east of the center and northeast 10-20 knots west of the center as Gilma tracked west until 24 hours before it dissipated. During the last 24 hours, winds at 500 mb were light and variable.

Temperatures between the equator and 20N, which included the environmental temperature around Gilma, remained at a fairly constant -5 degrees Celsius through the tropical cyclone's life cycle.

250 MB. As Gilma was nearing 140W at 00Z on July 24, a ridge joined two anticyclones and extended between 10N and 20N and 130W and 165W. On the north part of the ridge, a band of strong westerlies (40-60 knots) persisted ahead of a trough that was located just west of 180.

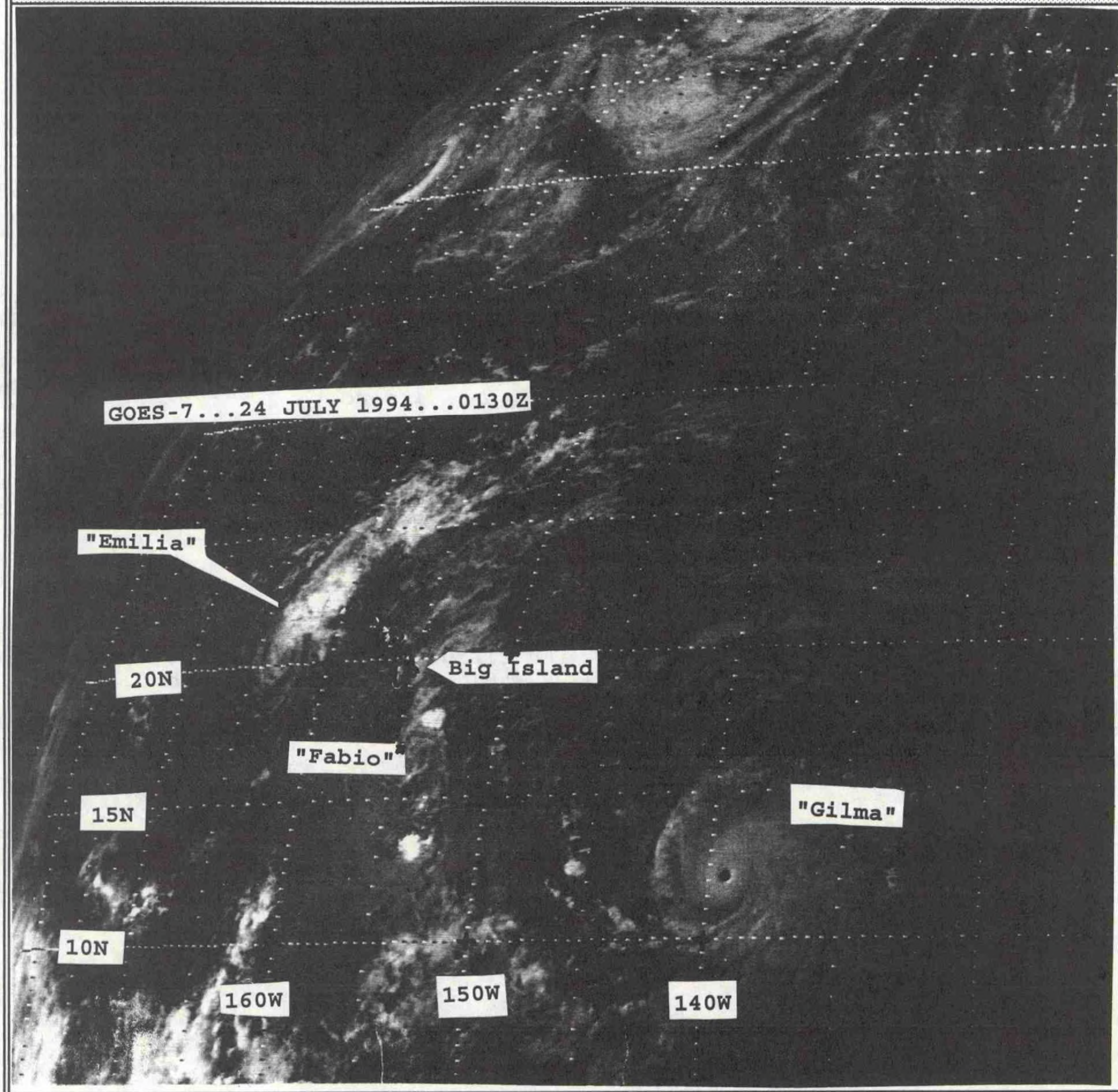
After 00Z on July 26, conditions changed. Gilma's outflow channels became blocked as the ridge was split in two by a short wave trough digging down from the north. Gilma was then surrounded by ridges, one to its northeast, another to its west northwest, and a third just across the equator to its south. Gilma's only remaining outflow channel at this level was to the northeast, joining the divergent flow east of the trough to its north.

Beyond that time period, Gilma moved beneath the ridge, now centered along about 15N. At 1200Z on July 30, Gilma was located near 18N 175W, just emerging from underneath the ridge and below the divergent flow along the southeast fringes of another trough. The 250 mb jet stream moved over Gilma by 0000Z on July 31.

SATELLITE DATA.

Shortly after moving west across 140W, satellite photographs showed warming of tops and Gilma's eye becoming covered with cirrus. The eye did not become visible again until around 0000Z on July 28th. At this time, convection appeared to be increasing as it approached Johnston Island on its westerly track.

GOES-7 SATELLITE PHOTOGRAPH



Hurricane Gilma

DISCUSSION.

Hurricane Gilma, at its closest approach to the Hawaiian Islands, was about 510 miles south of South Point on the Big Island of Hawaii around noon on July 26, 1994, with maximum sustained winds of about 70 knots.

It continued to move west from this position until it neared 160W with the winds steadily decreasing to below hurricane force by 0000Z on July 27, 1994. The maximum sustained winds were down to 50 knots before Gilma reached 160W.

After passing 160W, Gilma continued to slowly lose energy as it moved toward the west northwest, but remained a tropical storm as it passed some 200 miles south of Johnston Island shortly after 0000Z on July 29th. Gilma's winds finally dropped below tropical storm force at 1800Z on July 30th. It was dropped as a tropical depression at 0000Z July 31, 1994 when it was near 19N 176W.

Gilma remained deeply embedded in an easterly deep layer mean flow from the time it crossed 140W on July 24th at approximately 0000Z through 0000Z on July 30th.

The following table provides estimated upper level wind vectors for Gilma at specific time periods.

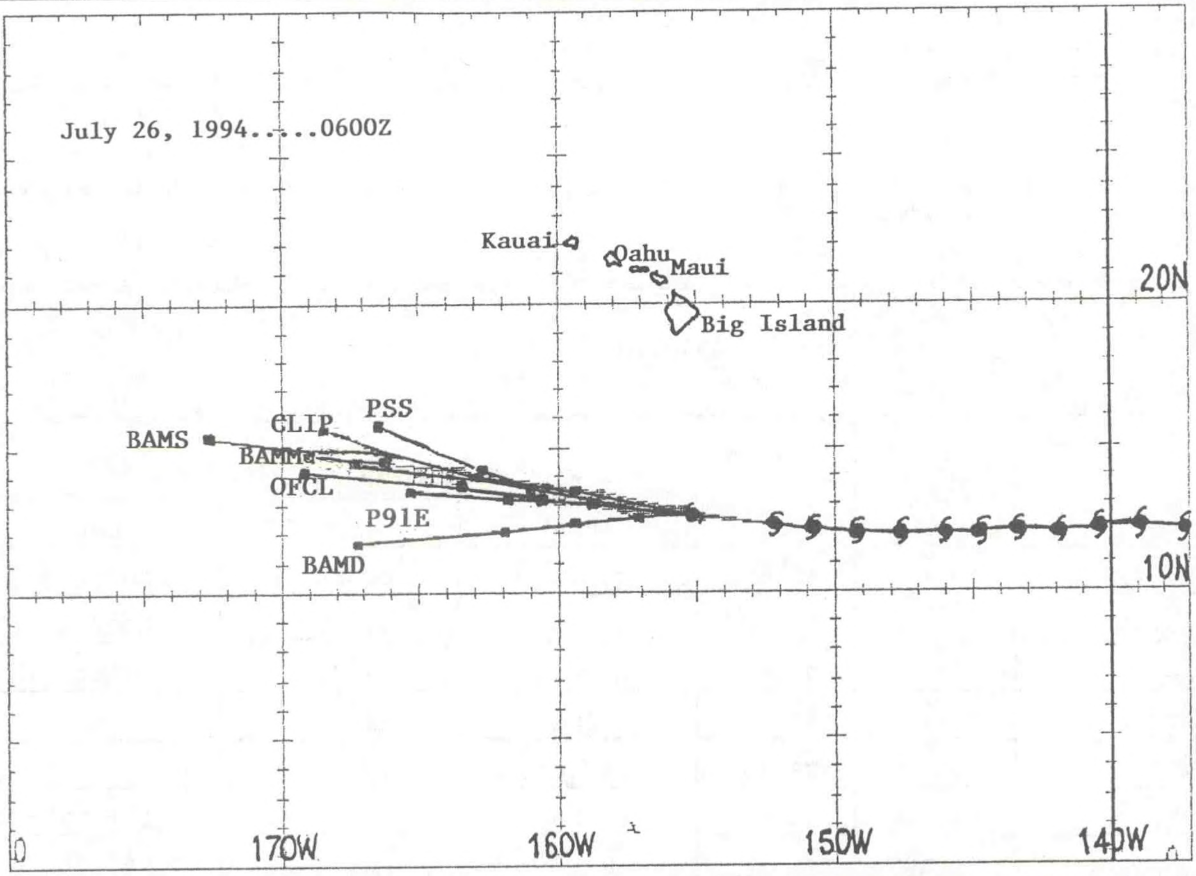
HURRICANE GILMA
JULY 24-31, 1994

Date/Time	LAT.	LON.	Est. WIND from Grid Point values		
			700MB	500MB	250MB
24/12Z	12.0N	141.8W	09015	08015	ACC10
25/12Z	12.0N	147.6W	CYC45	07040	LGT/VRBL
26/12Z	12.2N	153.4W	CYC40	04030	04015
27/12Z	11.8N	158.0W	CYC25	01010	27010
28/12Z	13.1N	165.2W	CYC20	12015	04015
29/12Z	14.2N	171.6W	07020	12015	LGT/VRBL
30/12Z	18.1N	175.3W	12010	LGT/VRBL	29035
31/00Z	18.5N	176.0W	12010	LGT/VRBL	30040

Data from analysis charts at specified times.
CYC indicates cyclonic circulation, followed by wind speeds near center
ACC indicates anticyclonic circulation, followed by wind speeds near center

Figure 6 shows the objective guidance forecast for Gilma when it was near 153W. Throughout the life of Hurricane Gilma, the models were all in good agreement in keeping a movement due west. No major deviations in forecast tracks were observed during this event as was the case with the previous storms.

Figure 6
Objective Aids for "Gilma"



July 26, 1994.....0600Z

Once the upper level trough moved east, forecasting the track of Hurricane Gilma was more certain. With no major synoptic scale influence, the storm was guided on track by the mean easterly flow. Confidence remained high that Gilma would not make any sudden turns and adversely impact the Hawaiian Islands.

Table 4 provides the best track for Hurricane Gilma for each 6-hour synoptic time period. Also provided in the table are the maximum sustained winds for each time period.

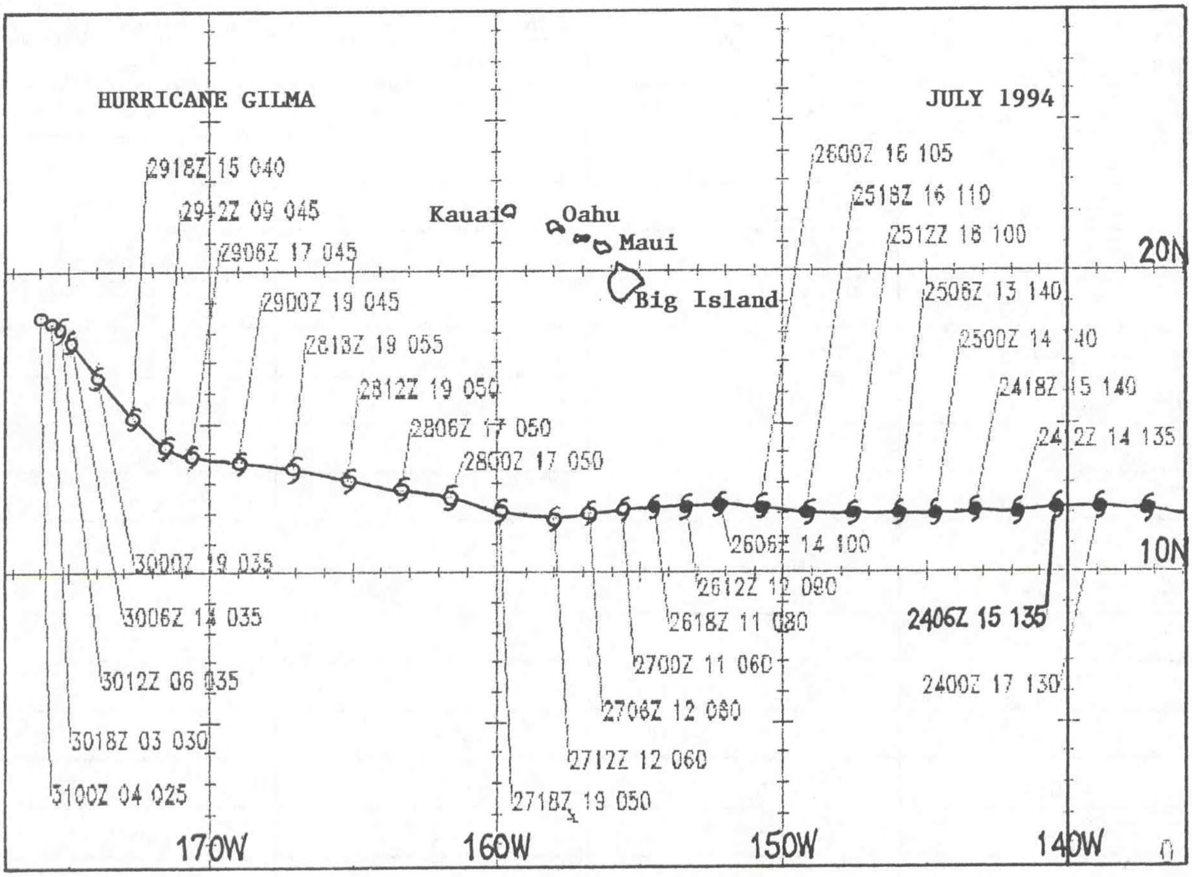
The CPHC assumes responsibility for issuance of advisories after the tropical cyclone tracks westward across 140W.

TABLE 4
BEST TRACK FOR HURRICANE GILMA

HURRICANE GILMA - JULY 24-31, 1994 (HST)

DATE/TIME(Z)	LATITUDE (N)	LONGITUDE (W)	MAX WINDS (KT)
JUL. 24/0600	12.2	140.4	135
/1200	12.0	141.8	135
/1800	12.1	143.3	140
JUL. 25/0000	12.0	144.7	140
/0600	12.0	146.0	140
/1200	12.0	147.6	100
/1800	12.0	149.2	110
JUL. 26/0000	12.2	150.8	105
/0600	12.3	152.2	100
/1200	12.2	153.4	90
/1800	12.2	154.5	80
JUL. 27/0000	12.1	155.6	60
/0600	12.0	156.8	60
/1200	11.8	158.0	60
/1800	12.1	159.9	50
JUL. 28/0000	12.5	161.6	50
/0600	12.8	163.3	50
/1200	13.1	165.2	50
/1800	13.5	167.1	55
JUL. 29/0000	13.7	169.0	45
/0600	13.9	170.7	45
/1200	14.2	171.6	45
/1800	15.2	172.7	40
JUL. 30/0000	16.6	174.0	35
/0600	17.7	174.9	35
/1200	18.1	175.3	35
/1800	18.3	175.6	30
JUL. 31/0000	18.5	176.0	25

FIGURE 7
BEST TRACK PLOT FOR HURRICANE GILMA



For positions provided, the first figure is the date and time group, followed by the speed of the system, and then by the maximum sustained winds of the storm.

For example, the first position shown after Gilma crossed 140W gives the following information: 2406Z 15 135, which is the position on July 24, 1994 at 0600Z. The system was moving at 15 knots and had maximum sustained winds of 135 knots.

HURRICANE LI
AUGUST 3 - AUGUST 12, 1994

HISTORY. Li (Hawaiian for Lee and pronounced the same way) was initially recognized as a tropical disturbance near 11N 120W on July 30th. It moved west and strengthened into a tropical depression near 12N 138W on August 2nd and the Central Pacific Hurricane Center began issuing advisories a day later.

Li remained a depression and appeared to be weakening as it moved south of the Hawaiian Islands on August 6th. However, the system regenerated on August 7th and became Tropical Storm Li near 14N 165W on August 8th.

Li became the first storm named in the Central Pacific during the 1994 season. Li continued to move west and passed about 180 miles south of Johnston Island on August 9th.

On August 11th, the storm curved slightly southwest and further intensified before becoming a hurricane on August 12th when it was within 120 miles of the International Dateline. Afterwards, Li weakened and moved west northwest in the general direction of Wake Island.

SYNOPTIC SITUATION (August 3 - August 12, 1994)

SURFACE. A strong surface high pressure system with a 1030 mb center located near 38N 155W at the beginning of August, drifted east to near 35N 140W by August 5th and then north to near 45N 155W by August 12th.

Over the tropical latitudes, Li had initially been tracked from a disturbed area near 11N 120W and was Tropical Depression Eight-E when it crossed 140W. Li was caught in the easterly flow on the south side of the surface high and in the similar flow just to the north of the Intertropical Convergence Zone (ITCZ). Hurricane Li remained in the vicinity of the ITCZ and was never too well organized.

Sea surface temperatures west of 140W in the vicinity of 10N were close to 29 degrees Celsius and were only lower by about a degree at 15N. This temperature changed little throughout the life cycle of Li as it tracked west between 10N and 15N. However, as the storm approached 175W, sea surface temperatures increased by several degrees. This helped to intensify Li, which rapidly increased to hurricane strength by the time it reached the International Dateline.

700 MB. Ridging at this level persisted to the north of the storm with the easterly flow in the vicinity of the storm throughout the North Central Pacific. As Li crossed 140W, it was creating a perturbation at this level which was seen as an inverted trough with winds turning from southeast to northeast near 15 knots across its center location.

No significant change occurred in this flow pattern until 1200Z on August 5th, when the storm became part of a closed cyclonic circulation with winds of 10-20 knots. The surface position for Li remained on the northern part of this closed circulation throughout its journey west, showing a slight increase to 25 knots by August 12th.

Temperatures at this level were 8-11 degrees Celsius along the track of Li.

500 MB. An elongated east-west ridge north of 15N and east of 170W persisted at this level and provided a predominant easterly steering effect over the area between 15N and the equator through August 5th. On August 6th, Li came under the southern flank of a small anticyclonic circulation that extended between 8N-22N and 150W-168W. By August 8th, when Li was approaching 165W, the analysis indicated a cyclonic circulation at this level above the storm. Li remained on the northern edge of this circulation as it moved across the International Dateline.

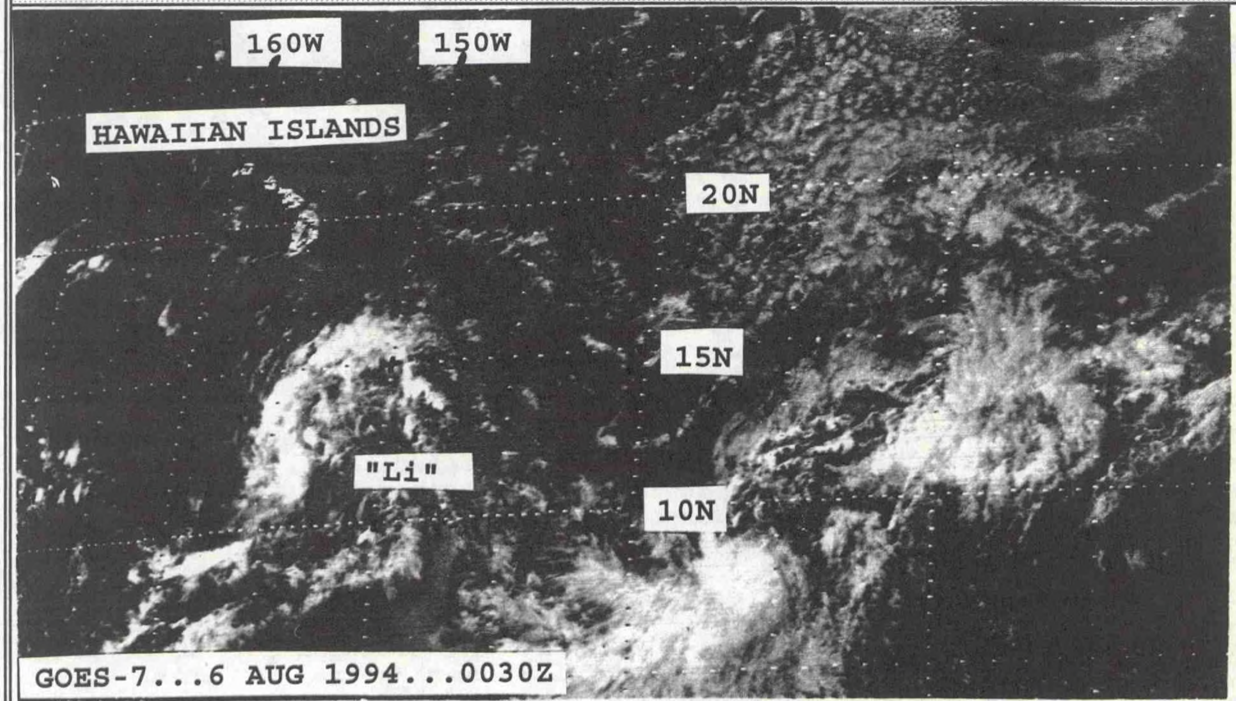
Winds in the vicinity of Li at this level throughout its track west were generally 10-20 knots.

Temperatures over the Big Island of Hawaii at this level were around -7 degrees Celsius as Li moved from 140W to near 155W. After that time, the temperatures were generally -4 to -5 degrees Celsius over the storm as it moved west.

250 MB. Just north of 20N, a band of strong westerlies (40-60 knots) were analyzed throughout the period that Li moved west. In the immediate vicinity of Li, however, weak anticyclonic flow was the general rule, and winds over the storm were 5-15 knots.

SATELLITE DATA.

GOES-7 SATELLITE PHOTOGRAPH



Hurricane Li

Li moved across 140W with an isolated CB to the east and broken to overcast layered cloudiness. Initially, the actual position was very difficult to pinpoint as most convection dissipated. Multiple centers were visible on August 4th. It was not until August 7th that the system became better organized with convective tops showing significant cooling. However, by the following day, satellite imagery indicated evidence of shearing.

By August 9th, it was still difficult to maintain a good fix as the system again showed evidence of possibly containing two centers.

This storm did not provide an easy satellite signature. The cloud mass was indicative of a well formed circulation, but positioning a center throughout its life cycle was extremely difficult.

DISCUSSION.

The storm remained a tropical depression far enough south to be influenced by the Intertropical Convergence Zone. In addition, upper level divergence was weak enough to retard any intensification. By August 5, the system was nearly void of deep convection and advisories were discontinued. However, convection began to increase a day later and the system continued to reintensify and become Tropical Storm Li on August 8. It passed about 180 miles south of Johnston Island on August 9. However, the atoll experienced little effect either in winds or waves.

Just before crossing the International Dateline on August 12, the storm intensified and became Hurricane Li. Afterwards, it weakened and moved in the general direction of Wake Island where there were some showers and only light winds.

The following table provides estimated upper level wind vectors for Li at specific time periods.

HURRICANE LI AUGUST 3-12, 1994					
Date/Time	LAT.	LON.	Est. WIND from Grid Point values		
AUGUST			700MB	500MB	250MB
3/12Z	11.0N	140.8W	10015	11020	12015
4/12Z	10.3N	146.4W	09015	10020	ACC10
5/12Z	9.9N	152.7W	CYC20	09020	ACC15
6/12Z	12.2N	156.5W	CYC15	14015	ACC10
7/12Z	13.5N	160.0W	CYC10	10015	ACC05
8/12Z	13.5N	164.8W	CYC20	CYC20	ACC05
9/12Z	13.6N	169.5W	CYC15	CYC15	ACC05
10/12Z	13.7N	172.2W	CYC15	CYC15	ACC10
11/12Z	13.6N	175.1W	CYC15	CYC15	ACC05
12/12Z	12.5N	178.3W	CYC20	CYC15	ACC15
Data from analysis charts at specified times. CYC indicates cyclonic circulation, followed by wind speeds near center ACC indicates anticyclonic circulation, followed by wind speeds near center					

Table 5 provides the Best Track data for Hurricane Li for each 6-hour synoptic time period. Also provided in the table are the maximum sustained winds for each time period.

The CPHC assumes responsibility for issuance of advisories after the tropical cyclone tracks westward across 140W.

TABLE 5
BEST TRACK FOR HURRICANE LI

HURRICANE LI - AUGUST 3-12, 1994 (HST)

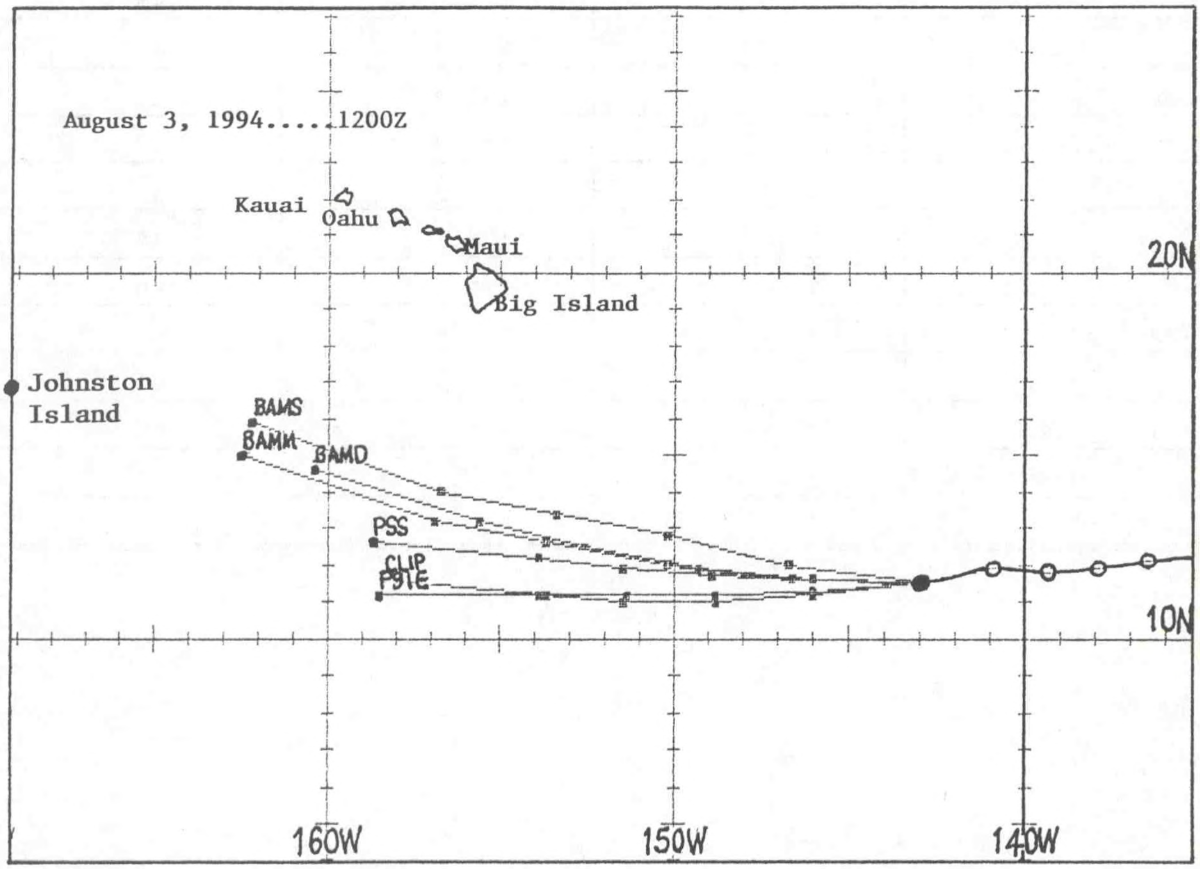
DATE/TIME(Z)	LATITUDE (N)	LONGITUDE (W)	MAX WINDS (KT)
AUG. 3/0600	11.1	140.0	25
/1200	11.0	140.8	30
/1800	10.9	142.0	25
AUG. 4/0000	10.7	143.5	25
/0600	10.5	145.1	25
/1200	10.3	146.4	25
/1800	10.1	147.8	25
AUG. 5/0000	9.7	149.2	25
/0600	9.7	150.9	25
/1200	9.9	152.7	20
/1800	10.5	154.2	25
AUG. 6/0000	11.0	155.3	25
/0600	11.6	155.9	25
/1200	12.2	156.5	25
/1800	12.6	157.5	25
AUG. 7/0000	13.0	158.4	25
/0600	13.4	159.2	25
/1200	13.5	160.0	25
/1800	13.5	161.1	25
AUG. 8/0000	13.5	162.3	25
/0600	13.5	163.5	30
/1200	13.5	164.8	40
/1800	13.5	166.3	45
AUG. 9/0000	13.6	167.5	50
/0600	13.6	168.2	50
/1200	13.6	169.1	45
/1800	13.6	170.0	45

TABLE 5 (CONTINUED) BEST TRACK FOR HURRICANE LI			
HURRICANE LI - AUGUST 3-12, 1994 (HST)			
DATE/TIME(Z)	LATITUDE (N)	LONGITUDE (W)	MAX WINDS (KT)
AUG. 10/0000	13.5	171.0	45
/0600	13.6	171.6	45
/1200	13.7	172.2	45
/1800	13.9	172.7	50
AUG. 11/0000	13.9	173.3	50
/0600	13.8	174.2	45
/1200	13.6	175.1	45
/1800	13.4	175.8	50
AUG. 12/0000	12.9	176.5	55
/0600	12.7	177.4	60
/1200	12.5	178.3	65
/1800	12.4	179.3	65

Figure 8 shows the objective guidance forecast for Li when it was near 143W. It's interesting to note that Li took a path very similar to that of Gilma the previous week.

The objective aids throughout the period all kept a westerly track and at no time was there an indication that the Hawaiian Islands would be affected. Meteorologists instead focused their attention on Johnston Island which was in the path of the storm.

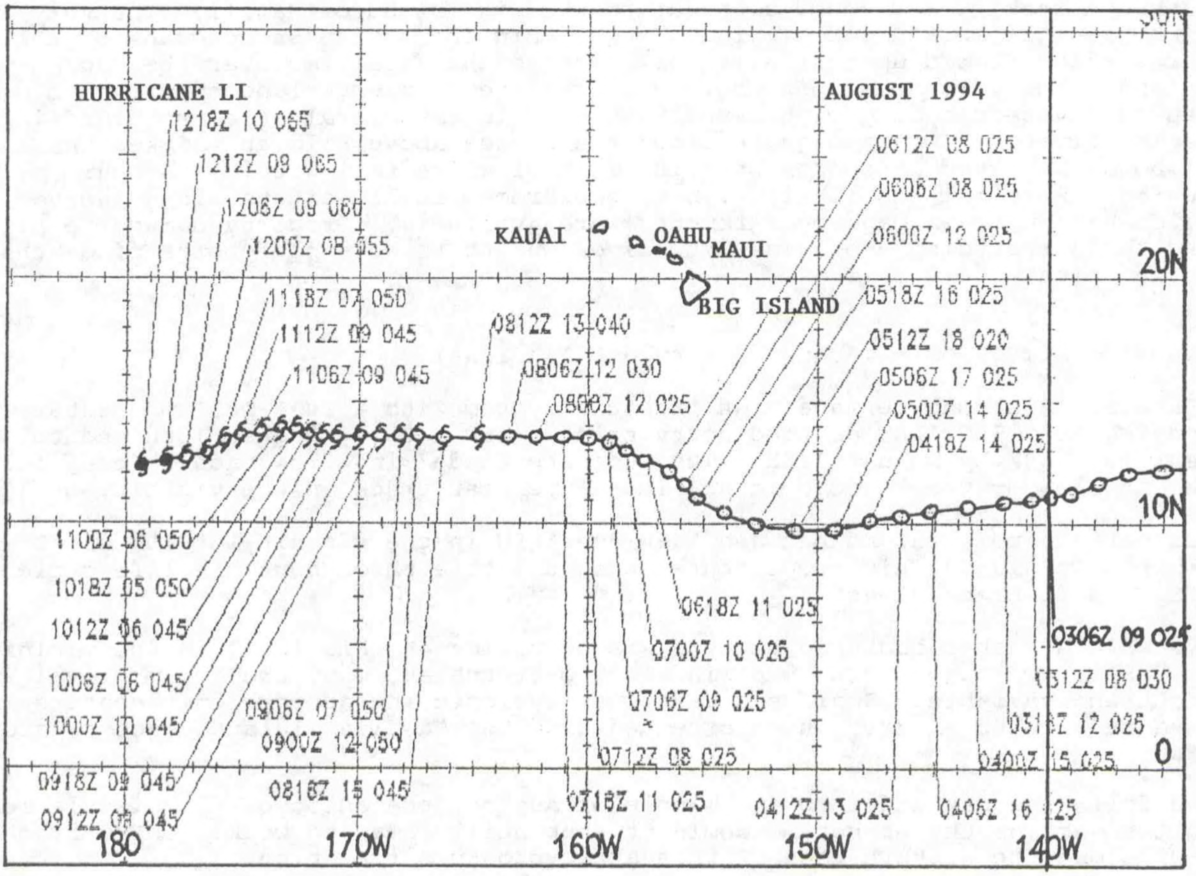
Figure 8
Objective Aids for "Li"



August 3, 1994.....1200Z

Figure 9 provides the best track plot for Hurricane Li.

FIGURE 9
BEST TRACK PLOT FOR HURRICANE LI



For positions provided, the first figure is the date and time group, followed by the speed of the system, and then by the maximum sustained winds of the storm.

For example, the first position shown after Li crossed 140W gives the following information: 0306Z 09 025, which is the position on August 3, 1994 at 0600Z. The system was moving at 9 knots and had maximum sustained winds of 25 knots.

TROPICAL DEPRESSION ONE-C
AUGUST 9 - AUGUST 14, 1994

HISTORY. Tropical Depression ONE-C developed on August 9th within an area of disturbed weather that had been present for several days near 15N 145W. Once formed, it moved in a westerly direction at an average speed of 12 knots. This forward motion increased only during its dissipation stages.

Although weak, ONE-C posed a threat to the Big Island of Hawaii. The very rich tropical moisture following along within the northeast quadrant of the circulation flared up into some very intense thunderstorms over the Big Island. The volcano slopes above Hilo received torrential downpours that caused severe flooding within the town of Hilo as several streets turned into raging rivers. Two rain gages along the slopes above Hilo at Waiakea Uka and Piihonua reported 15 inches of rain, much of which fell within a 6 hour period. Rainfall was likely even more extreme locally on the slopes above Hilo where no rain gage measurements were available. Property damage to Hilo and the surrounding areas was extensive, but there were no reports of deaths or injuries.

SYNOPTIC SITUATION (August 9 - August 14, 1994)

SURFACE. A strong surface high pressure system with a 1030-1035 mb center located near 35N 140W drifted north to near 45N 155W by August 12th and to near 40N 160W by August 14th. The moderate trade wind flow made it easy for the shallow system to move in an almost due west track in the vicinity of 17N.

Sea surface temperature between 145W and 165W in the vicinity of 15N was 27-28 degrees Celsius. This temperature changed little throughout the life cycle of ONE-C as it tracked west.

700 MB. A rather confused pattern was occurring at this level in the vicinity of ONE-C. On August 9th, the wind flow over the storm at the 700 mb level was light and variable. Small and very weak cyclonic and anticyclonic centers wandered around an area which extended from the Hawaiian Islands east to about 130W.

The following day and into the middle of August, the anticyclonic circulation to the east-northeast became dominant, but still remained weak. ONE-C tracked west along the western edge of this anticyclonic circulation.

Temperatures at Hilo as ONE-C approached and moved through the area were initially 10-11 degrees Celsius. As the storm crossed 150W, the temperature at Hilo dropped to 8-9 degrees Celsius and did not increase to 10 degrees again until the system crossed 160W.

500 MB. A weak anticyclonic circulation dominated the area of ONE-C at this level. Winds to the north were westerly at 20-30 knots and to the south they were easterly 10-15 knots. Over the center of ONE-C, winds were generally variable and less than 10 knots.

Temperatures over the Big Island of Hawaii were -6 to -8 degrees Celsius throughout the entire period of ONE-C's life cycle.

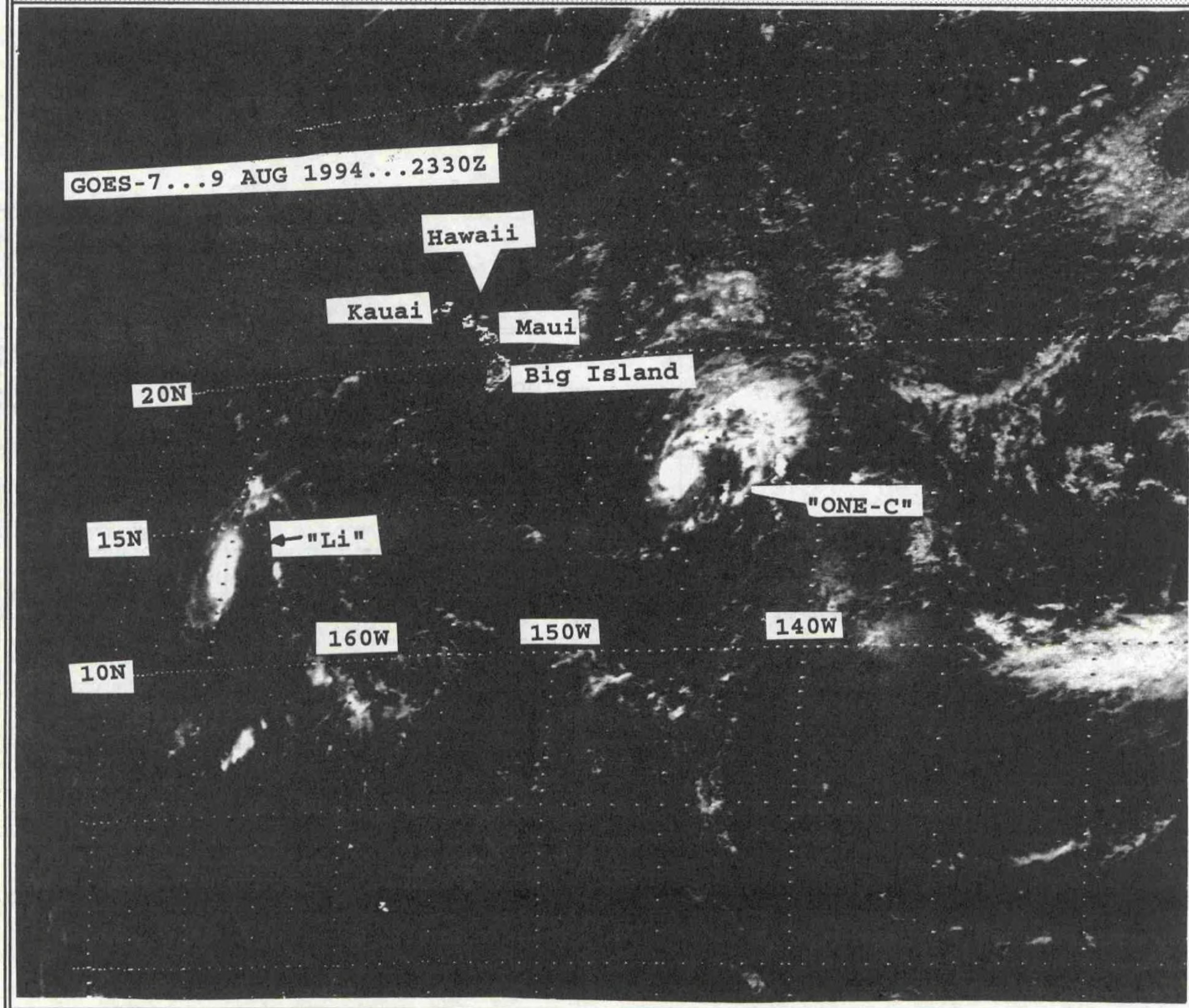
250 MB. Just north of 20N, a band of strong westerlies (40-60 knots) were analyzed throughout the period. On the initial day (August 9th), ONE-C was under a weak trough that was moving east along the westerly flow. By the following day, it was under a weak anticyclonic circulation which persisted through August 14th.

SATELLITE DATA.

An isolated cumulonimbus cloud developed near the center of the circulation and within the northeast quadrant as tropical depression ONE-C moved west along 17N. By the time it reached 146W, satellite images showed that there was some good banding associated with the system. Additionally, the system had become more compact.

By August 10th, as it approached 149W, a low level circulation center appeared and emerged from the higher clouds, which had obscured it earlier. At this time, however, the cloud tops were warming and convection was weakening. An "eye" was noted at 2330Z with CB development to the northeast of the center. ONE-C maintained a well defined low level circulation center as it tracked to the south of the Hawaiian Islands.

GOES-7 SATELLITE PHOTOGRAPH



Tropical Depression ONE-C

DISCUSSION

Tropical Depression ONE-C had sustained winds of 30 knots as it moved steadily west at a speed averaging 10 knots. At its nearest point to the Hawaiian Islands, ONE-C passed about 100 miles south of South Point on August 12th. ONE-C came very close to being upgraded to a tropical storm as the buoy data indicated winds near 40 knots for a very short period of time.

Although no significant threat was ever posed by the winds of the depression, it was the rich moisture which produced very heavy rainfall that ultimately affected the Big Island of Hawaii. Copious rains resulted in flash flooding of the major downtown and neighborhood areas of Hilo.

ONE-C was never able to find an area where it could develop. It initially came in contact with an upper level trough and was too close to strong upper level wind shear to its north throughout its life cycle. In addition, its track took it across sea surface temperatures that were marginal for development.

The following table provides estimated upper level wind vectors for Tropical Depression ONE-C at specific time periods.

TROPICAL DEPRESSION ONE-C
AUGUST 9-14, 1994

Date/Time	LAT.	LON.	Est. WIND from Grid Point values		
			700MB	500MB	250MB
9/12Z	15.6N	145.8W	LGT/VRBL	LGT/VRBL	CYC10
10/12Z	16.5N	147.0W	10010	ACC05	ACC10
11/12Z	16.8N	151.5W	10005	ACC15	ACC15
12/12Z	17.3N	156.0W	14015	ACC10	ACC10
13/12Z	16.7N	160.7W	10010	09005	ACC05

Data from analysis charts at specified times.
CYC indicates cyclonic circulation, followed by wind speeds near center
ACC indicates anticyclonic circulation, followed by wind speeds near center

Table 6 provides the best track data for Tropical Depression ONE-C for each 6-hour synoptic time period. Also provided in the table are the maximum sustained winds for each time period.

The CPHC assumes responsibility for issuance of advisories after the tropical cyclone tracks westward across 140W.

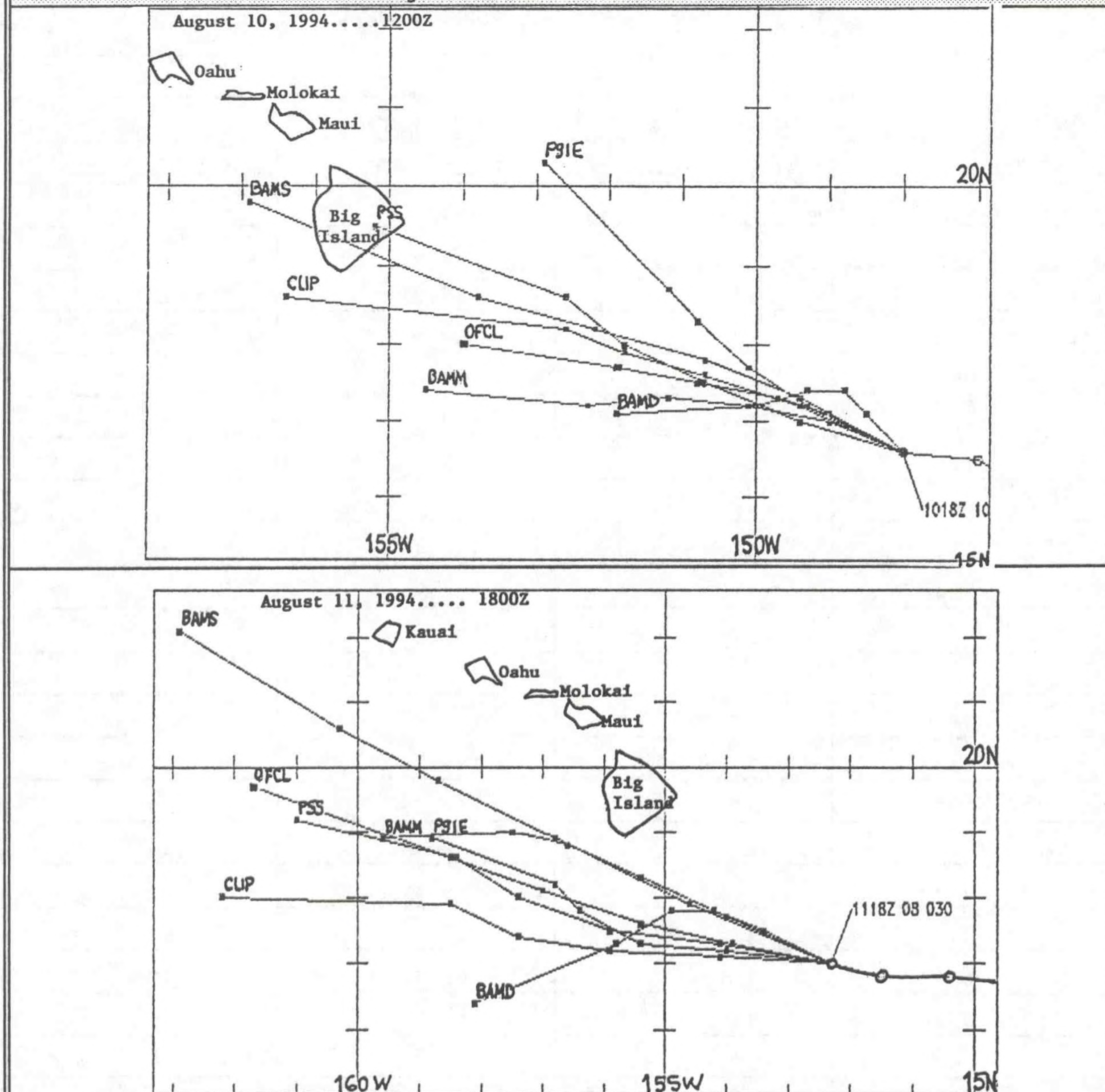
TABLE 6
BEST TRACK FOR TROPICAL DEPRESSION ONE-C

TROPICAL DEPRESSION ONE-C - AUGUST 9-14, 1994 (HST)			
DATE/TIME(Z)	LATITUDE (N)	LONGITUDE (W)	MAX WINDS (KT)
AUG. 9/0600	15.3	145.5	25
/1200	15.6	145.8	30
/1800	15.6	145.9	30
AUG. 10/0000	15.8	146.0	30
/0600	16.2	146.4	30
/1200	16.5	147.0	30
/1800	16.6	148.0	30
AUG. 11/0000	16.7	149.4	30
/0600	16.8	150.4	30
/1200	16.8	151.5	30
/1800	17.0	152.3	30
AUG. 12/0000	17.0	153.4	30
/0600	17.2	154.6	30
/1200	17.3	156.0	30
/1800	17.3	157.3	30
AUG. 13/0000	17.1	158.4	25
/0600	16.8	159.6	25
/1200	16.7	160.7	25
/1800	16.7	161.9	25
AUG. 14/0000	16.9	163.3	25
/0600	17.8	164.5	25

Figure 10 shows a couple of the objective guidance forecasts for ONE-C when it was still southeast of the Hawaiian Islands.

In initially picking up ONE-C, the objective aids had a tendency to bring the storm across the Big Island as is shown in the August 10th depiction below. However, subsequent model runs on August 11th provided for more reasonable tracks, keeping ONE-C on a course just south of the island of Hawaii.

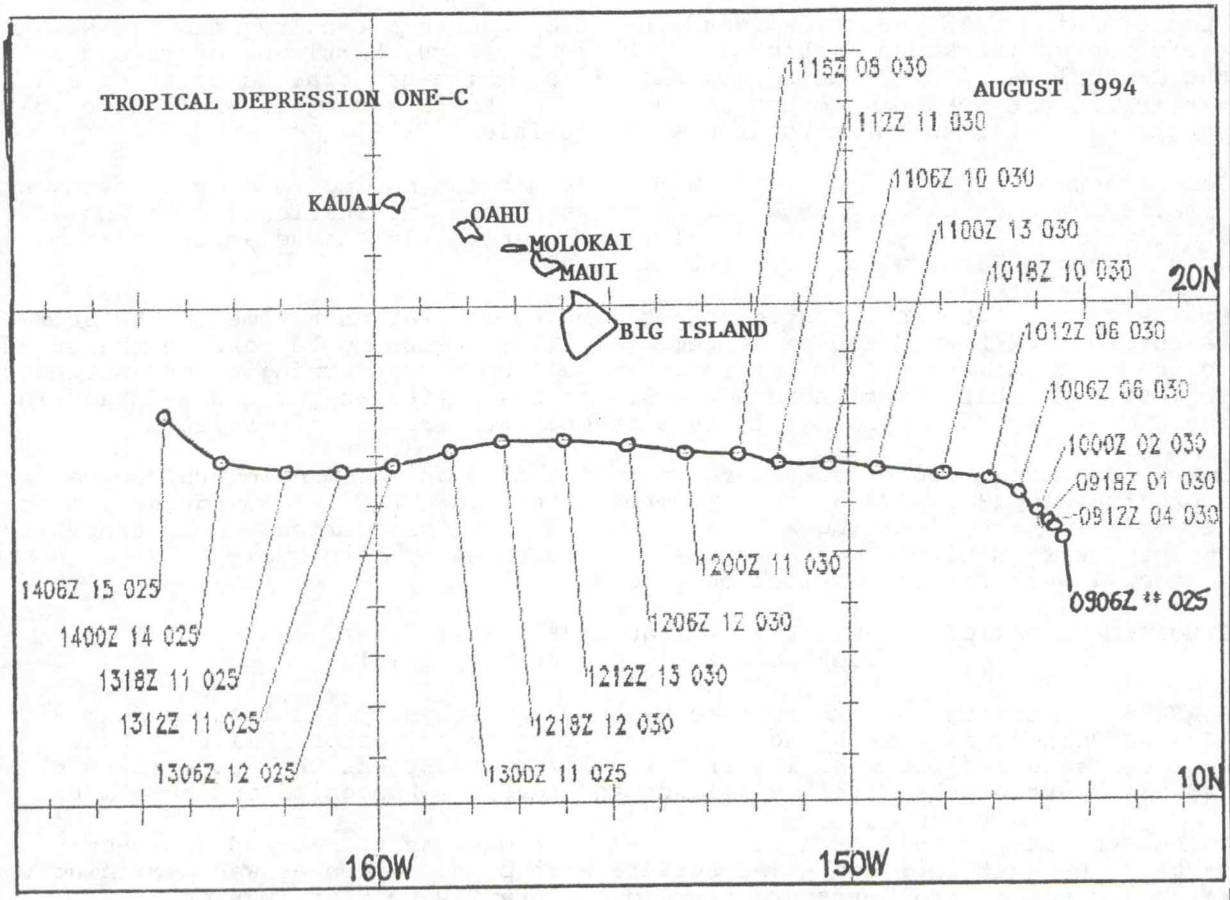
Figure 10
Objective Aids for "ONE-C"



Top: August 10, 1994.....1200Z   Bottom: August 11, 1994.....1800Z

Figure 11 provides the best track plot for Tropical Depression ONE-C.

FIGURE 11
BEST TRACK PLOT FOR TROPICAL DEPRESSION ONE-C



For positions provided, the first figure is the date and time group, followed by the speed of the system, and then by the maximum sustained winds of the storm.

For example, the first position shown for ONE-C 140W gives the following information: 0906Z ** 025, which is the position on August 9, 1994 at 0600Z. Since this was the very first position, the ** indicates that there is no previous record to calculate a movement. The storm had maximum sustained winds of 25 knots.

HURRICANE JOHN
AUGUST 20 - AUGUST 28, 1994
SEPTEMBER 8 - SEPTEMBER 10, 1994

HISTORY. Hurricane John was 10 days old and a well developed hurricane with 100 knot winds when it entered the Central Pacific from the eastern Pacific on August 20th. John moved westward along 15N at a steady 12-15 knots, dipping south slightly to 14N on August 22nd and 23rd. The storm continued to gain strength as it approached the longitude of the Hawaiian Islands.

Upon crossing 155W, sustained winds based on Dvorak intensity analysis were estimated at 150 knots, making John the most intense hurricane of record in the Central Pacific. Even Emilia and Gilma, which had tracked south of Hawaii earlier in the season were not as intense, as their strongest winds were only estimated at 140 knots at their peak intensities.

John tracked west, well south of Hawaii, and began moving in a more northwest direction after reaching 160W. Upon crossing the International Dateline, shortly after 0600Z on August 28, 1994, the storm was "handed over" to the Joint Typhoon Warning Center (JTWC) in Guam.

However, the JTWC was not able to put John to rest at that time as the storm re-curved back toward 180 on September 1, 1994. John moved east-southeast and reached approximately 179E before making a loop and returning to the northwest to 175E. At that point it turned again to the northeast and crossed back into the CPHC area of responsibility on September 8th shortly after 1200Z.

Hurricane John moved northeast for a couple of days becoming extratropical at approximately 42.5N 170.3W on September 10th. The CPHC issued advisory number 120 at this time, denoting a lifetime of 30 days for Hurricane John since its inception off Mexico a month earlier. This extended life cycle makes John the longest-lived tropical cyclone on record.

SYNOPTIC SITUATION (August 20 - August 28, 1994)
(September 8 - September 10, 1994)

SURFACE. A strong 1032 mb surface high pressure system was located near 38N 150W as John crossed 140W and into the CPHC area of responsibility. This surface feature maintained itself through August 25th as the storm moved along 14N-15N south of the Hawaiian Islands and across Johnston Island near 170W.

On August 26th, John took a turn to the northwest as it reached the western part of the surface ridge. The surface high pressure center was beginning to relax and the central pressure dropped temporarily to near 1028 mb.

When John re-entered the area to the east of longitude 180 degrees, a 992 mb surface low was located due north at 47N with a weak frontal system extending to the southwest. John eventually was entrained into this system and accelerated to the northeast on September 9th.

Sea surface temperatures along 15N between 140W and 165W were approximately 28 degrees Celsius. The 28 degree line then pushed north to 20N between 165W and 180. In the area that Hurricane John re-entered the CPHC (31N 180), the sea surface temperature was 27 degrees Celsius and decreased rapidly to 25 degrees Celsius at latitude 35N.

700 MB. John was located on the southwest portion of an anticyclone which was centered near 30N 150W. The National Meteorological Center (NMC) analyses did not indicate a significant feature at this level above the hurricane until aircraft reconnaissance provided data on the existence of a cyclonic circulation center with winds of 35-45 knots.

Aircraft reconnaissance indicated that temperatures in the immediate vicinity of the hurricane were 9-10 degrees Celsius, which were very similar to what the two upper air sites on the Hawaiian Islands were reporting as John moved south of the Big Island.

A trough extended south from a low centered near 45N 180. There were southwest winds near 30 knots along and east of 180 throughout the period when John crossed 180 and moved northeast on September 8-10, 1994.

500 MB. An anticyclonic center near 30N 150W was also a dominant feature. However, by 0000Z on August 23rd, it was evident that the strong low level cyclonic circulation extended up through this level. As the storm moved west of 170W, the flow above the storm became more easterly, again becoming part of the general large scale anticyclonic circulation.

Aircraft reconnaissance indicated that temperatures at this level were generally in the -4 to -5 degree range, but did register a temporary lowering to -6 to -8 degrees Celsius as the storm was crossing 160W.

As with the lower level, after John re-entered 180 from the west on September 8th, the feature most prominent to the north of the system was a trough with southwest winds 30-40 knots east of 180.

250 MB. During its life cycle, John was underneath a strong anticyclonic circulation at this level, which provided an efficient exhaust mechanism for the hurricane. This high level outflow channel became less prominent only after the hurricane moved west of 170W.

When John recurved and moved across 180 on its journey northeastward, strong winds of 40-60 knots were occurring at this level between 180 and 160W and 30N-35N, increasing to 60-70 knots north of 35N.

SATELLITE DATA.

As Hurricane John moved across 140W, satellite infrared data were used in conjunction with visible data to derive its tropical classification number (T-number).

Satellite photographs on August 21st indicated that the tops had cooled and the eye of John was well defined and had a diameter of approximately 20 nautical miles. In addition, there was evidence of strong outflow to the northwest and increased inflow over the southeast quadrant.

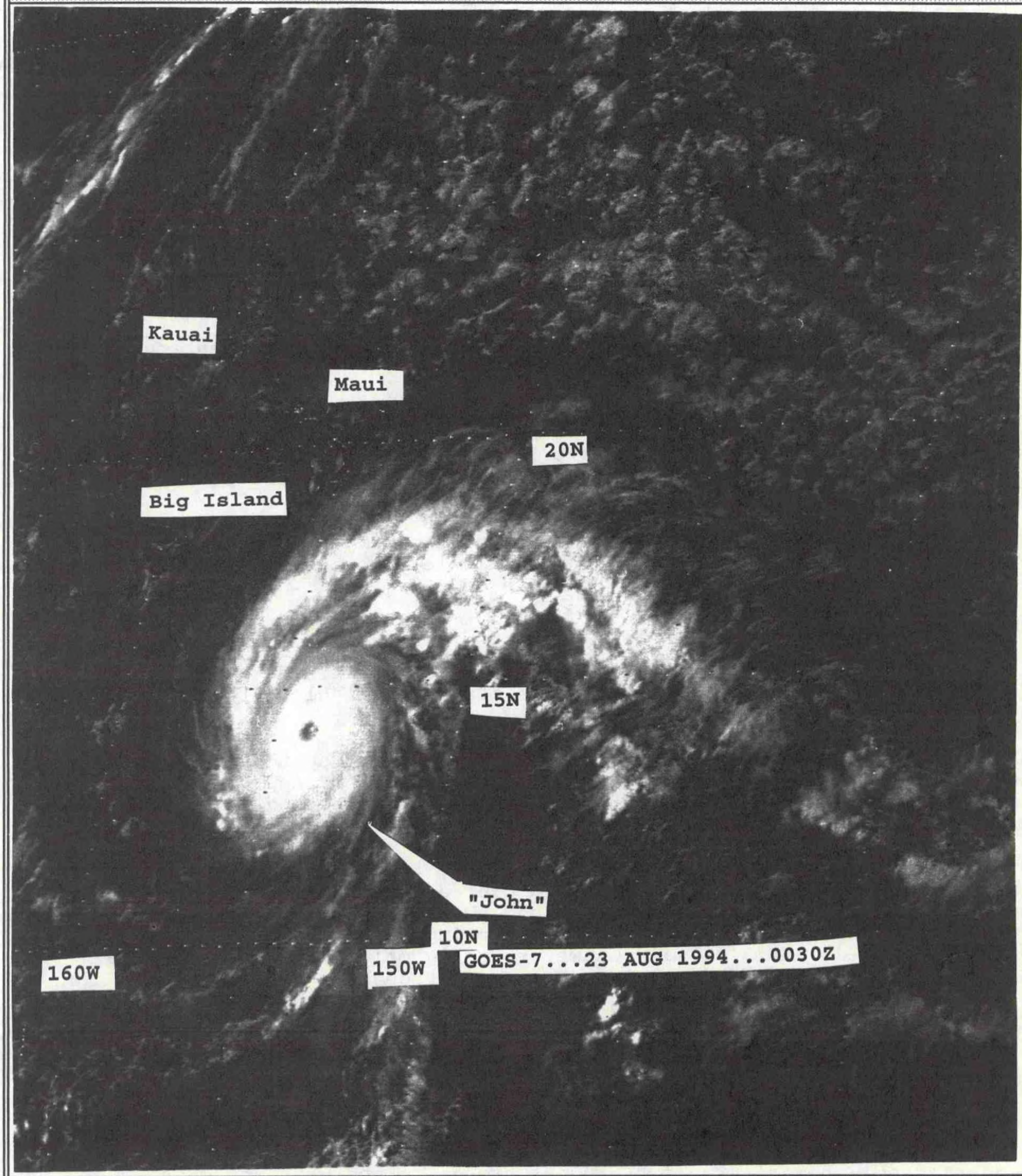
By August 22nd, John became less symmetrical, taking on a tear drop shape rather than round. The amount of cold overcast decreased for a short period of time. Six hours later, the storm had again become symmetrical and the cold overcast had increased rapidly. The following day, there was evidence of a well rounded, 35 nautical mile diameter, well defined eye on satellite photographs. A significant feeder band more than one degree wide was also visible.

During the period from 1200Z on August 22nd through 0600Z on August 24th, satellite images showed fluctuation in intensity (mainly due to diurnal effects), but it was during this period of time that John maintained its strongest sustained winds between 140-150 knots.

By August 25th, outflow was increasing over the north quadrant as the storm began to feel the effects of the upper trough to the west northwest. By 0600Z, the eye had disappeared, but a well defined circulation still existed.

As it moved west of 170W, the storm was approaching the "horizon" of the satellite photographs and positioning became more difficult.

GOES-7 SATELLITE PHOTOGRAPH



Hurricane John

DISCUSSION.

John gave the Hawaiian Islands a wide berth, passing almost 300 miles south of South Point late on August 22nd. The only effects felt on the islands were stronger trade winds and rough surf. The rough surf was mainly along the southeast and south facing shores, but briefly spread into west facing shores. Heavy rains over the Kau and South Kona slopes of the Big Island of Hawaii caused some localized minor flooding, which temporarily closed some roads.

Hurricane John took its aim at Johnston Island located near 17N 170W. Fortunately, the storm started to weaken on approaching the island and passed about 15 miles to the north at 0400Z on August 26th. Maximum sustained winds were 80 knots.

Moving north of Johnston Island placed the islet in the benign semicircle of the tropical cyclone. The 1100 personnel of Johnston Island had been evacuated to Honolulu as a precautionary measure. A remote readout anemometer on the atoll reported sustained winds between 40-50 knots for about six hours with gusts as high as 67 knots. Damage to Johnston Island was estimated at $15 million.

The following table provides estimated upper level wind vectors for Hurricane John at specific time periods.

HURRICANE JOHN
AUGUST 20-28, 1994
September 8-10, 1994

Date/Time	LAT.	LON.	Est. WIND from Grid Point values		
AUG.			700MB	500MB	250MB
21/12Z	14.6N	143.8W	CYC20	ACC20	ACC30
22/12Z	14.0N	150.8W	CYC30	ACC20	ACC20
23/12Z	14.4N	156.7W	CYC20	CYC40	ACC20
24/12Z	15.3N	161.8W	CYC45	CYC35	ACC20
25/12Z	16.3N	166.3W	CYC40	CYC25	18020
26/12Z	17.5N	171.1W	12020	08010	LGT/VRBL
27/12Z	19.6N	176.2W	12020	10010	ACC35
SEP.					
8/12Z	30.8N	179.7E	24025	24030	24040
9/12Z	37.0N	174.0W	24030	24040	24050
10/00Z	41.5N	171.0W	23035	23035	20065

Data from analysis charts at specified times.
CYC indicates cyclonic circulation, followed by wind speeds near center
ACC indicates anticyclonic circulation, followed by wind speeds near center

Table 7 provides the best track data for Hurricane John for each 6-hour synoptic time period. Also provided in the table are the maximum sustained winds for each time period.

The CPHC assumes responsibility for issuance of advisories after the tropical cyclone tracks westward across 140W.

TABLE 7
BEST TRACK FOR HURRICANE JOHN

HURRICANE JOHN - AUGUST 20-28, 1994 (HST)

DATE/TIME(Z)	LATITUDE (N)	LONGITUDE (W)	MAX WINDS (KT)
AUG. 21/0000	15.0	140.6	100
/0600	14.8	142.1	115
/1200	14.6	143.8	120
/1800	14.4	145.5	125
AUG. 22/0000	14.2	147.5	130
/0600	14.0	149.0	130
/1200	14.0	150.8	130
/1800	13.9	152.3	140
AUG. 23/0000	14.0	153.7	140
/0600	14.2	155.1	150
/1200	14.4	156.7	150
/1800	14.6	158.1	145
AUG. 24/0000	14.9	159.3	140
/0600	15.1	160.6	140
/1200	15.3	161.8	125
/1800	15.6	162.9	125
AUG. 25/0000	15.8	163.9	120
/0600	16.1	165.0	105
/1200	16.3	166.3	100
/1800	16.5	167.6	100

TABLE 7 (CONTINUED)
BEST TRACK FOR HURRICANE JOHN

HURRICANE JOHN - AUGUST 20-28, 1994 (HST)

DATE/TIME(Z)	LATITUDE (N)	LONGITUDE (W)	MAX WINDS (KT)
AUG. 26/0000	16.8	168.8	85
/0600	17.1	169.9	80
/1200	17.5	171.1	75
/1800	18.0	172.5	70
AUG. 27/0000	18.5	173.7	85
/0600	19.0	175.1	90
/1200	19.6	176.2	100
/1800	20.2	177.3	110
AUG. 28/0000	20.8	178.5	115
/0600	21.6	179.6	100

HURRICANE JOHN - SEPTEMBER 8-10, 1994 (HST)
(JOHN recurved and crossed from west to east across 180)

DATE/TIME(Z)	LATITUDE (N)	LONGITUDE (W)	MAX WINDS (KT)
SEP. 08/1800	31.5	178.9	70
SEP. 09/0000	32.7	177.4	80
/0600	34.2	176.0	65
/1200	37.0	174.0	65
/1800	39.5	172.3	75
SEP. 10/0000	41.5	171.0	60

This was not the first time a tropical cyclone reentered the Central Pacific from the western Pacific. Other recorded events include:

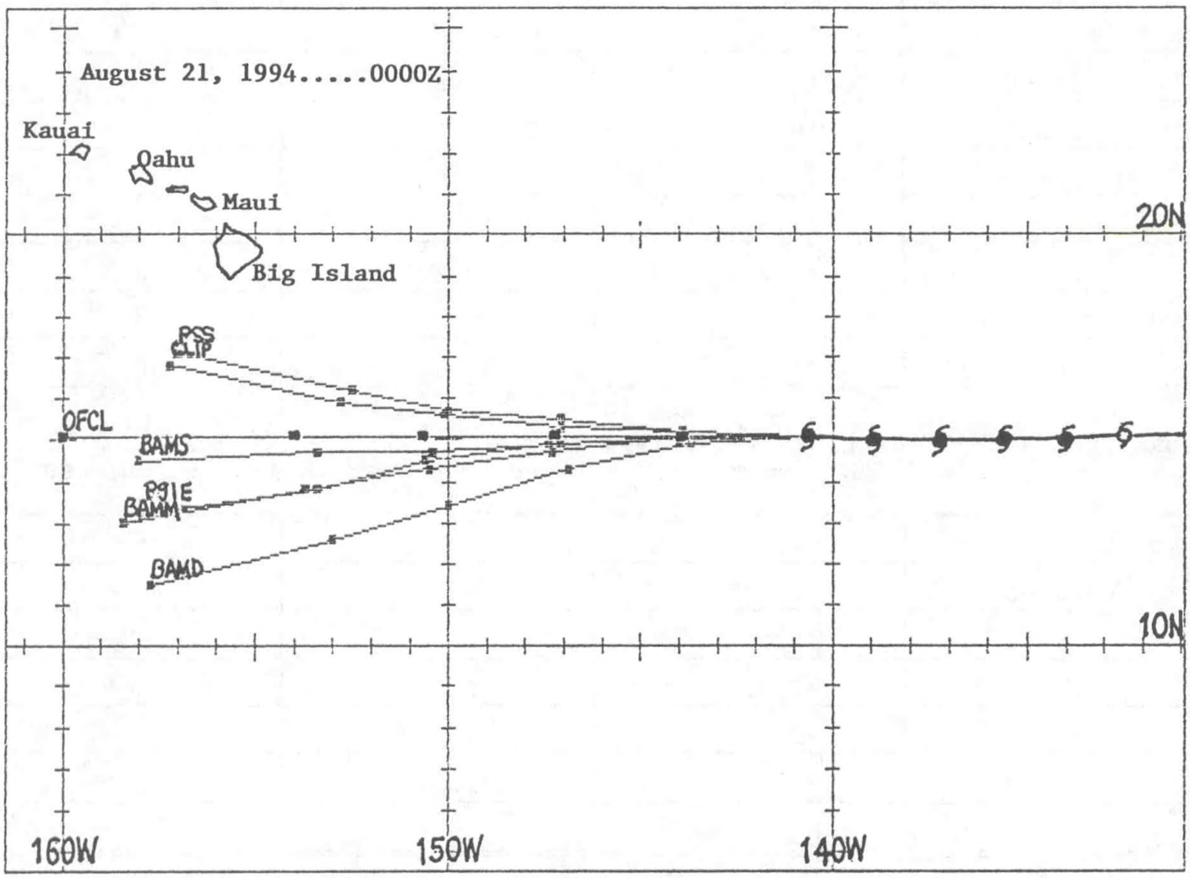
- Tropical Storm Carmen.....entered the Central Pacific from the southwest on April 7, 1980 and became a depression the following day.

- Tropical Storm Skip.....moved into the Central Pacific from the southwest on September 7, 1985 and became extratropical the following day.

Figure 12 shows a typical output of the objective guidance forecasts for Hurricane John after it had crossed 140W.

Throughout the history of Hurricane John, the objective aids all showed a westerly track. This continued until the storm reached 165W, at which point a tendency to begin a turn to the northwest occurred.

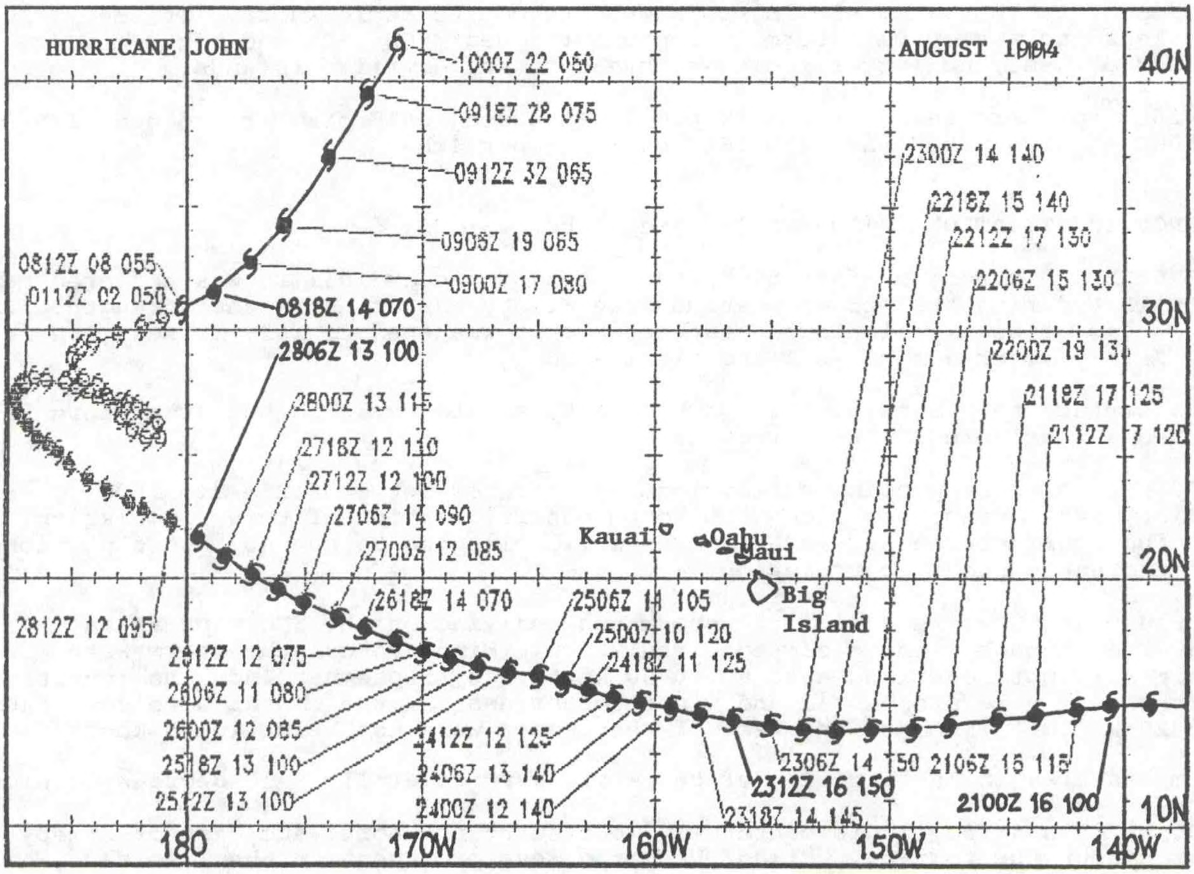
Figure 12
Objective Aids for "JOHN"



August 21, 1994.....0000Z

Figure 13 provides the best track plot for Hurricane John.

FIGURE 13
BEST TRACK PLOT FOR HURRICANE JOHN



For positions provided, the first figure is the date and time group, followed by the speed of the system, and then by the maximum sustained winds of the storm.

For example, the first position shown for JOHN after crossing 140W gives the following information: 2100Z 16 100, which is the position on August 21, 1994 at 0000Z. The system was moving at 16 knots and the maximum sustained winds of the storm at this location were 100 knots.

John moved out of the CPHC area of responsibility on August 28, 1994, after the 0600Z position, and recurved and re-entered the area north of 30N on September 8, 1994 very shortly after 1800Z.

HURRICANE KRISTY
AUGUST 31 - SEPTEMBER 4, 1994

HISTORY. Kristy was initially recognized as a disturbance near 13N 117W on August 27th. It strengthened into a tropical storm two-and-a-half days later near 16N 133W moving just north of west with an average movement of 16 knots. Hurricane intensity was reached 30 hours later near 16N 141W.

Kristy existed as a hurricane for another 30 hours, reaching maximum sustained winds of 90 knots and slowing to a western course at 14 knots. It then weakened to a tropical storm on September 1 near 16N 150W and began moving south of west, no longer posing a threat to the Hawaiian Islands.

Kristy further weakened to a tropical depression on September 3rd near 15N 160W and dissipated near 15N 164W on September 4th.

SYNOPTIC SITUATION (August 31 - September 4, 1994)

SURFACE. A strong surface high pressure system near 1031 mb was centered near 38N 155W during the period of time when Kristy was at hurricane strength. The high was gradually displaced east and slowly weakened to 1028 mb near 38N 140W as Kristy moved across 160W and dissipated.

Sea surface temperatures throughout Kristy's life cycle in the area where it moved across were 27-28 degrees Celsius.

700 MB. A corresponding anticyclone was located between 125W and 160W. Kristy was moving west along the south central portion of this circulation. As the storm approached 160W, it was still clinging to the southwest portion of the anticyclonic circulation.

Throughout its life cycle, the storm was analyzed on the NMC maps as an inverted trough with no closed circulation. Winds across the storm were initially northeast and east at 10-20 knots. By September 2nd, the inverted trough was more pronounced and winds to the east of the center were southeast 10-20 knots. Winds to the west of the center were northeast 10-15 knots.

Temperatures in the vicinity of the storm were generally 9-10 degrees Celsius.

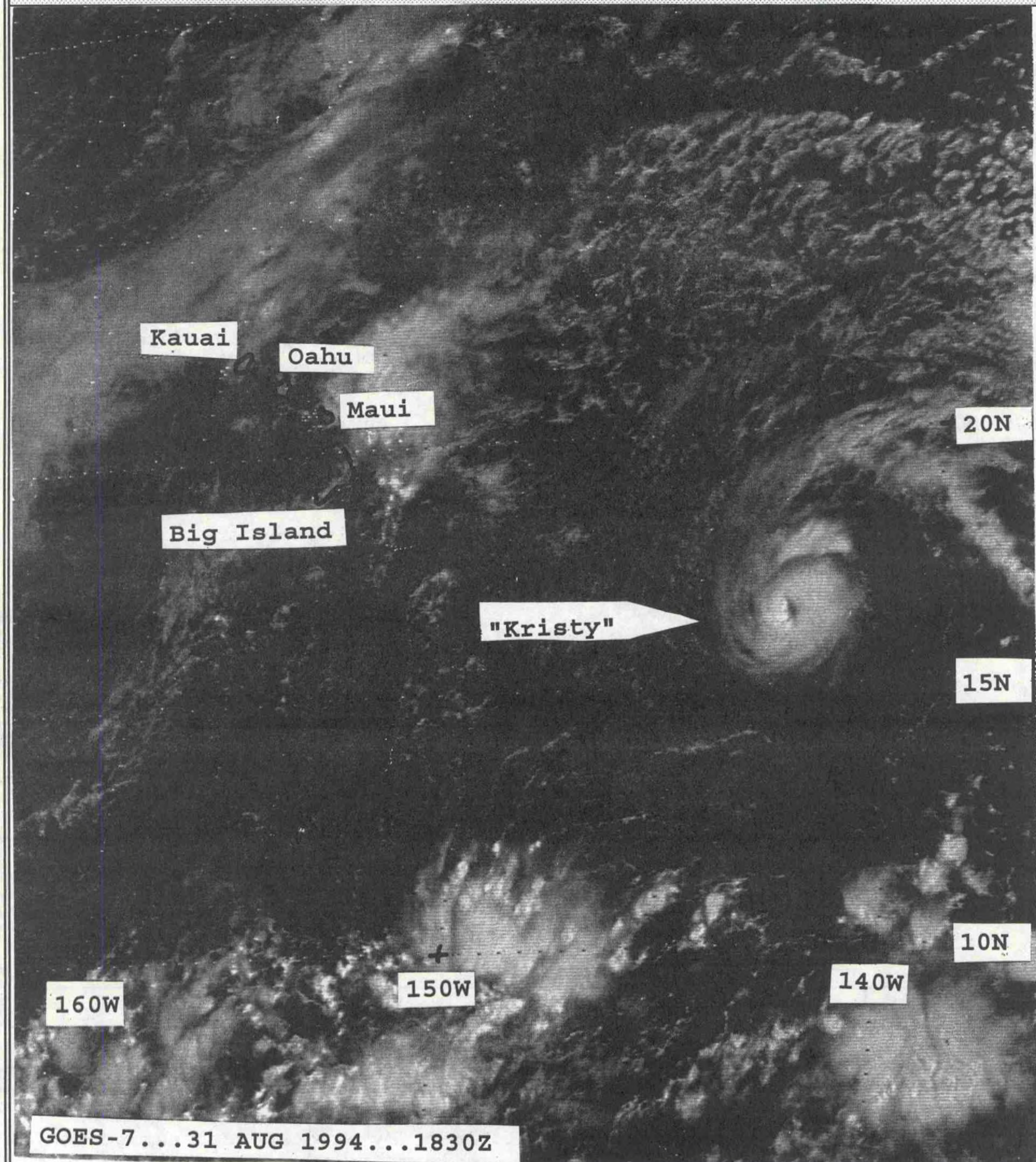
500 MB. An anticyclonic center was located to the north and east of Kristy throughout the four-day period, becoming less prominent on the last day (September 4th).

On August 31st, winds to the north of the anticyclonic center (north of 25N) were southwest and west 20-30 knots. South of the center and in the vicinity of the storm, winds were generally southeast 10-15 knots.

During the first couple of days of September, a smaller anticyclonic center formed to the west northwest of the storm. This feature weakened as the storm dissipated upon approaching 163W.

250 MB. A strong westerly flow with winds 40-50 knots was found north of 20N throughout the life cycle of Kristy. In the immediate area of the storm, an anticyclonic circulation dominated the area. This initially provided strong outflow for Kristy, but then weakened as the anticyclone dissipated by September 4th.

GOES-7 SATELLITE PHOTOGRAPH



Hurricane Kristy

SATELLITE DATA

As Kristy crossed 140W, satellite imagery showed signs of continued intensification with an elongated northeast to southwest oriented eye. In addition, there was evidence of good outflow from all quadrants.

By September 1st, there was evidence of a central dense overcast embedded center. A temporary weakening had occurred. However, within 24 hours, convection had increased in the northeast quadrant. On September 3rd, the center of Kristy was obscured by very large CB development to the immediate east and south.

DISCUSSION

Kristy was a tightly wound storm with thunderstorms mostly within a 60 nautical mile radius of its relatively small eye. Its minimum pressure was estimated to be 970MB. Most numerical models suggested a much closer passage than the actual 290 miles south of South Point. Some models even took it through the islands. Eventual shearing action with opposing winds at the top and bottom of the storm weakened Kristy with the bottom layers dictating its return to a mostly due westward and faraway path.

A High Surf Advisory was issued for 6 to 10 foot surf along the southeast coast of the Big Island only on September 2. A high wind watch for the Big Island was short lived and went unverified.

The following table provides estimated upper level wind vectors for Hurricane Kristy at specific time periods.

HURRICANE KRISTY
August 21 - September 4, 1994

Date/Time	LAT.	LON.	Est. WIND from Grid Point values		
AUG.			700MB	500MB	250MB
31/12Z	16.3N	141.3W	12010	12015	ACC20
SEP.					
1/12Z	16.5N	147.0W	08015	ACC12	ACC20
2/12Z	15.0N	153.2W	08020	ACC15	ACC15
3/12Z	14.8N	158.9W	10020	ACC10	ACC15
4/12Z	14.5N	162.8W	12010	LGT/VRBL	ACC10

Data from analysis charts at specified times.
CYC indicates cyclonic circulation, followed by wind speeds near center
ACC indicates anticyclonic circulation, followed by wind speeds near center

Table 8 provides the best track data for Hurricane Kristy for each 6-hour synoptic time period. Also provided in the table are the maximum sustained winds for each time period.

The CPHC assumes responsibility for issuance of advisories after the tropical cyclone tracks westward across 140W.

TABLE 8
BEST TRACK FOR HURRICANE KRISTY

HURRICANE KRISTY - AUGUST 31 - SEPTEMBER 4, 1994 (HST)

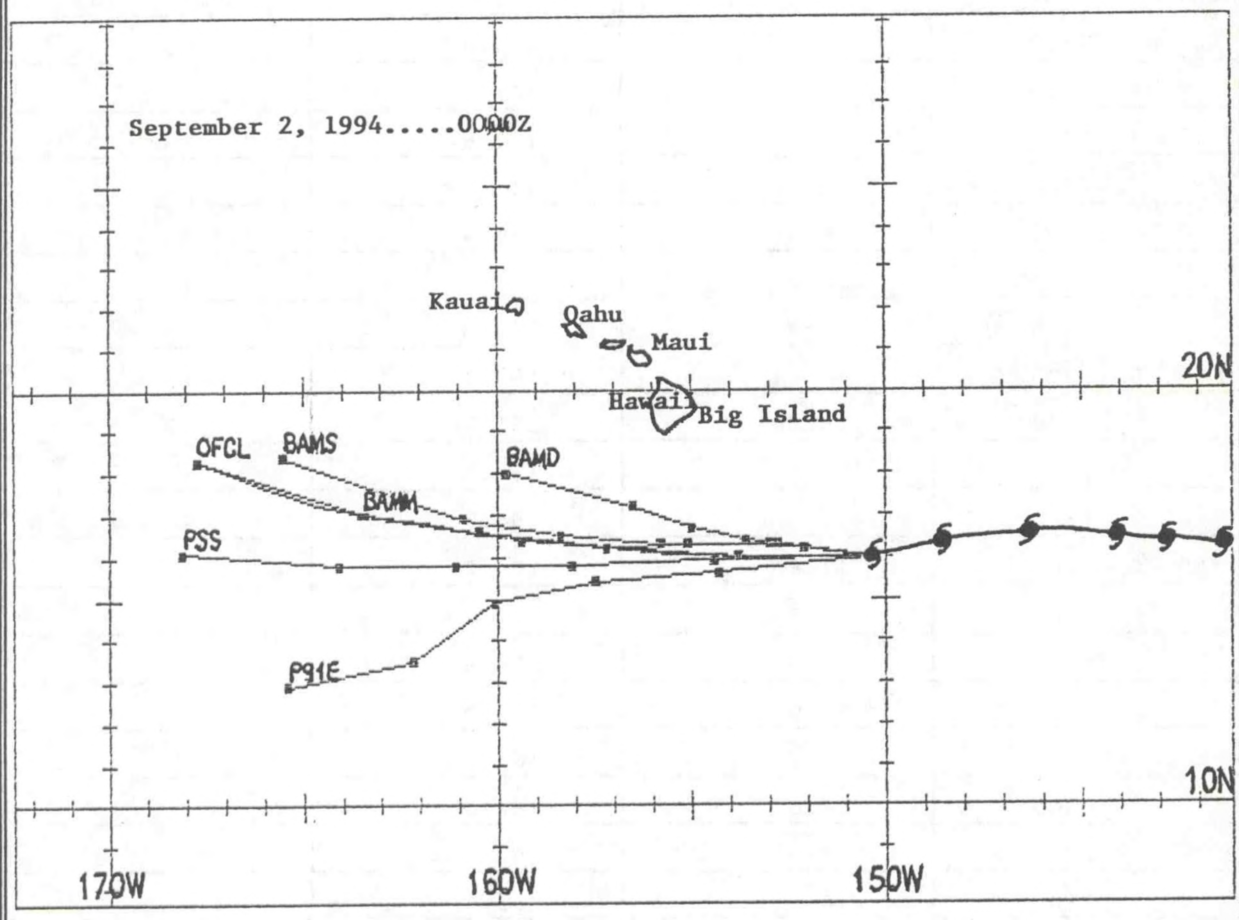
DATE/TIME(Z)	LATITUDE (N)	LONGITUDE (W)	MAX WINDS (KT)
AUG. 31/0600	16.2	139.8	65
/1200	16.3	141.3	75
/1800	16.4	142.8	85
SEP. 01/0000	16.5	144.1	90
/0600	16.5	145.6	90
/1200	16.5	147.0	80
/1800	16.3	148.5	70
SEP. 02/0000	16.0	150.2	60
/0600	15.5	151.7	50
/1200	15.0	153.2	45
/1800	14.9	154.7	35
SEP. 03/0000	14.8	156.2	35
/0600	14.8	157.6	35
/1200	14.8	158.9	35
/1800	14.8	160.0	30
SEP. 04/0000	14.7	161.1	30
/0600	14.6	162.0	30
/1200	14.5	162.8	30
/1800	14.5	163.4	30
SEP. 05/0000	14.5	164.0	25

Figure 14 shows a typical output of the objective guidance forecasts for Hurricane Kristy.

Initially, the objective aids all showed a west northwest track with several models indicating a possible track across the Big Island.

As Kristy crossed 150W (Figure 14), most solutions kept the storm south of the Hawaiian Islands.

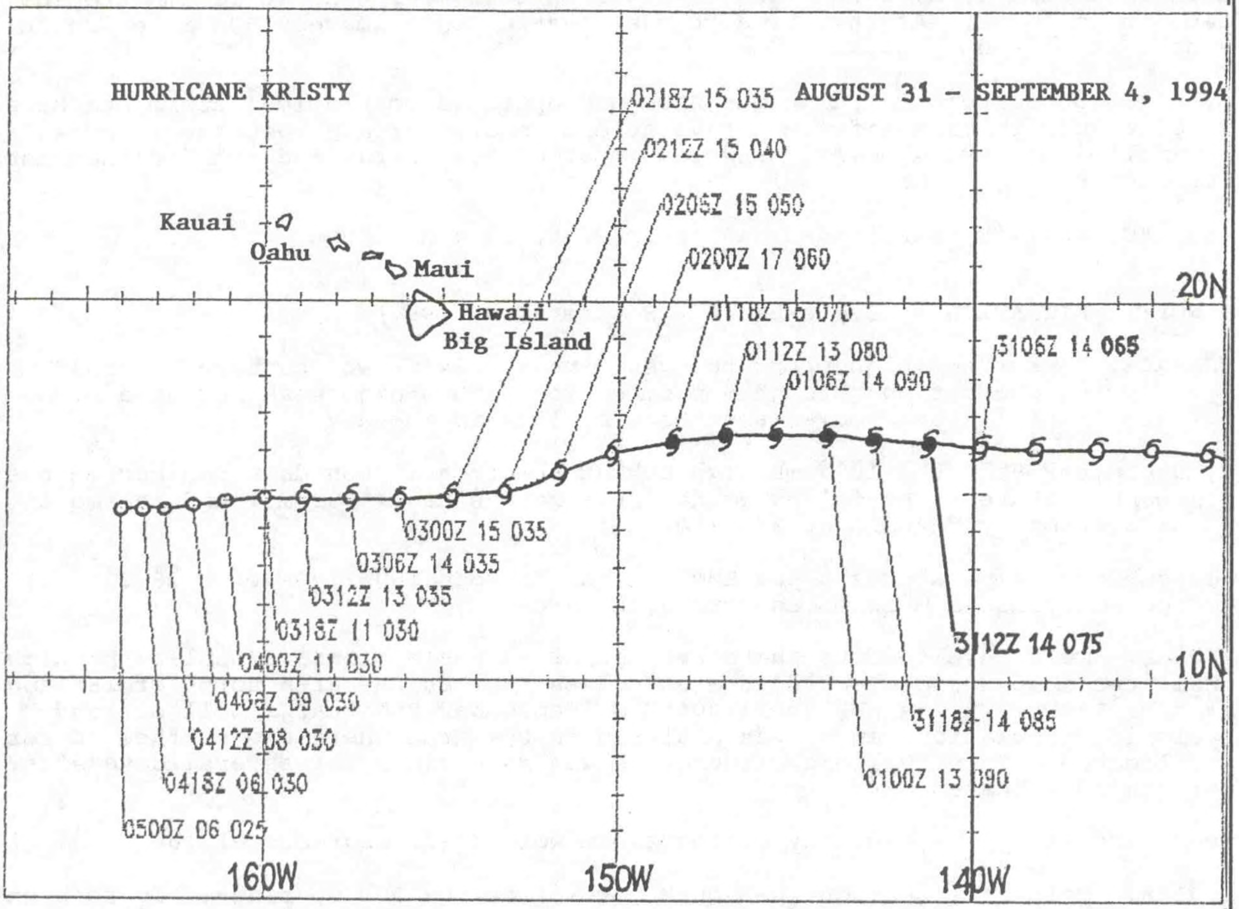
Figure 14
Objective Aids for "KRISTY"



September 2, 1994.....0000Z

Figure 15 provides the best track plot for Hurricane Kristy.

FIGURE 15
BEST TRACK PLOT FOR HURRICANE KRISTY



For positions provided, the first figure is the date and time group, followed by the speed of the system, and then by the maximum sustained winds of the storm.

For example, the first position shown for KRISTY after crossing 140W gives the following information: 3112Z 14 075, which is the position on August 31, 1994 at 1200Z. The system was moving at 16 knots and the maximum sustained winds of the storm at this location were 75 knots.

TROPICAL STORM MELE
SEPTEMBER 6 - SEPTEMBER 9, 1994

HISTORY. Mele was the second tropical cyclone that developed within the boundaries of the CPHC area of responsibility during the 1994 season. It developed rapidly overnight and at 2100Z on September 6th, it became tropical depression TWO-C. At that time it was located approximately 800 miles south southwest of Lihue, Kauai.

By 0300Z on September 7th, the system was upgraded to tropical storm status as it continued to intensify in a favorable warm sea surface temperature area. The following day, however, Mele lost most of its energy and transitioned into its dissipation stage.

The last advisory was issued on September 9, 1994 at 1500Z.

SYNOPTIC SITUATION (September 6 - September 9, 1994)

SURFACE. A surface high pressure system near 1024 mb was centered near 32N 142W during the period through September 7th. This high weakened as a weak surface frontal system moved southeast by late in the day.

By September 8th, the 1024 mb high behind the frontal boundary had become the dominant feature. The following day it strengthened (1030 mb) and became a quasi-stationary feature at 38N 150W.

Sea surface temperatures along 10N-14N and between 160W-170W were 28-29 degrees Celsius as Mele moved across the area.

700 MB. Mele developed to the southwest of an anticyclonic circulation which indicated that a ridge extended east to west across the area north of 15N and east of 170W. It was not until 0000Z on September 8th that a well defined cyclonic circulation center was analyzed in the area where the surface center was located. This cyclonic circulation was maintained for several days after Mele had dissipated.

Temperatures in the vicinity of the storm were 11-12 degrees Celsius.

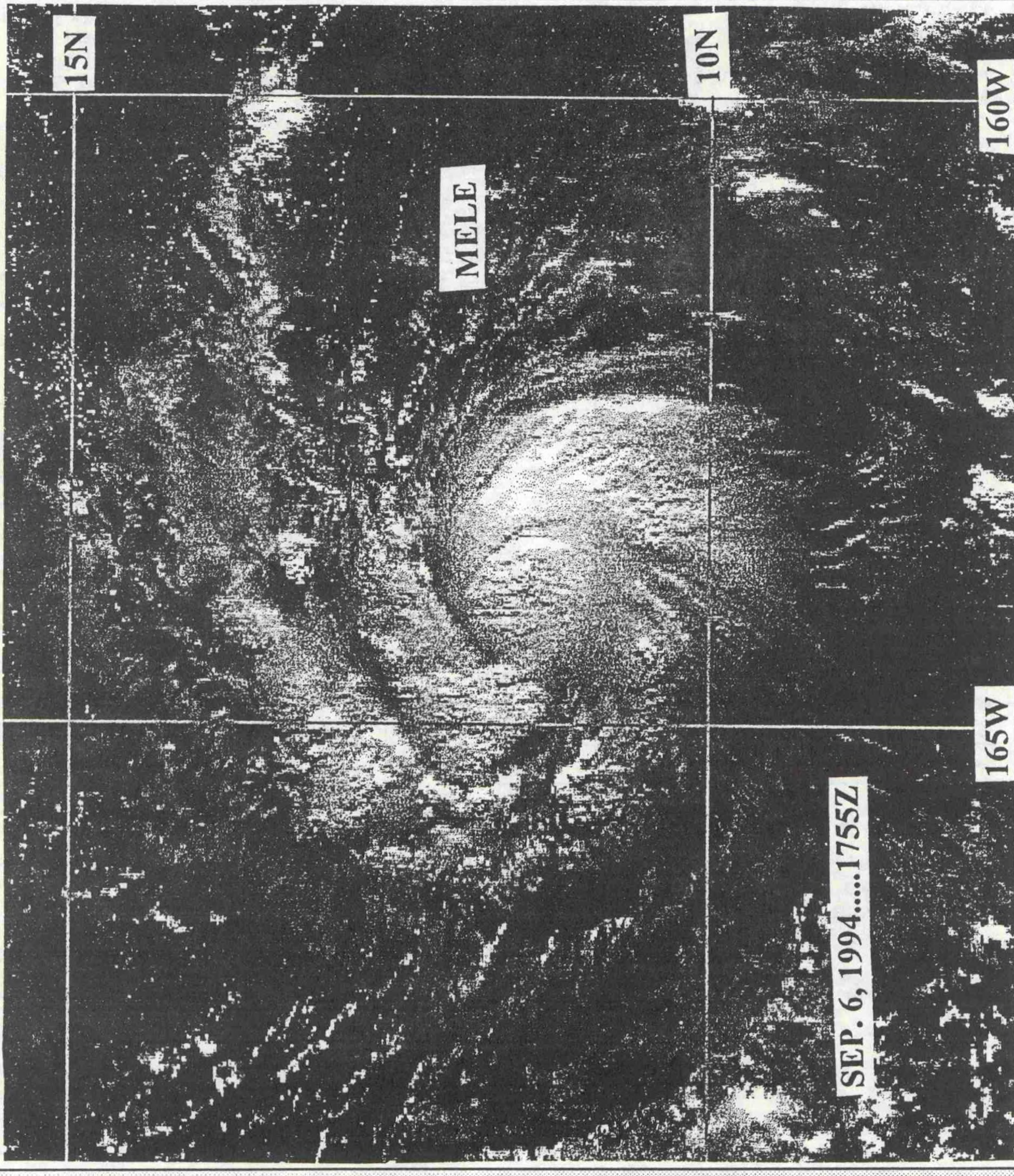
500 MB. Mele developed on the south portion of the 500 mb ridge. It took on a more inverted trough feature after September 7th, with winds east of the center mostly southeast 10-15 knots and west of the center northeast 10-20 knots.

Temperatures were near -5 degrees Celsius.

250 MB. Mele formed under an anticyclonic circulation at this level. This circulation was maintained for a couple of days above the storm.

On September 8th, the storm detached itself from this outflow and was no longer supported at the higher levels. Winds over the storm after this date became light and variable.

NOAA-11.....SATELLITE PHOTOGRAPH



Tropical Storm Mele

SATELLITE DATA

Satellite imagery showed a decrease in deep convection in the vicinity of the storm on September 7th. The system, which had become a tropical storm by this date, was maintained at that intensity as the Dvorak estimates continued to support tropical storm classification. By September 8th, Mele was very difficult to find, due to its being on the horizon of both the GOES and GMS satellites.

DISCUSSION

Tropical Storm Mele developed in an area well south of any land mass and was never a threat to any of the islands of the Pacific. It was initially in a favorable development area, as warm sea surface temperatures and an upper level anticyclone existed.

Its westward track carried it over cooler waters, however, and it lost the anticyclonic circulation aloft. It therefore dissipated rapidly on September 12, 1994.

The following table provides estimated upper level wind vectors for Tropical Storm Mele at specific time periods.

TROPICAL STORM MELE
September 6 - September 9, 1994

Date/Time	LAT.	LON.	Est. WIND from Grid Point values		
SEP.			700MB	500MB	250MB
6/12Z	11.0N	162.7W	12015	12010	ACC10
7/12Z	12.3N	167.2W	CYC15	CYC15	ACC10
8/12Z	13.1N	171.9W	CYC15	CYC10	LGT/VRBL
9/12Z	13.5N	176.0W	10020	CYC15	LGT/VRBL

Data from analysis charts at specified times.
CYC indicates cyclonic circulation, followed by wind speeds near center
ACC indicates anticyclonic circulation, followed by wind speeds near center

Table 9 provides the best track data for Tropical Storm Mele for each 6-hour synoptic time period. Also provided in the table are the maximum sustained winds for each time period.

The CPHC assumes responsibility for issuance of advisories after the tropical cyclone tracks westward across 140W.

TABLE 9
BEST TRACK FOR TROPICAL STORM MELE

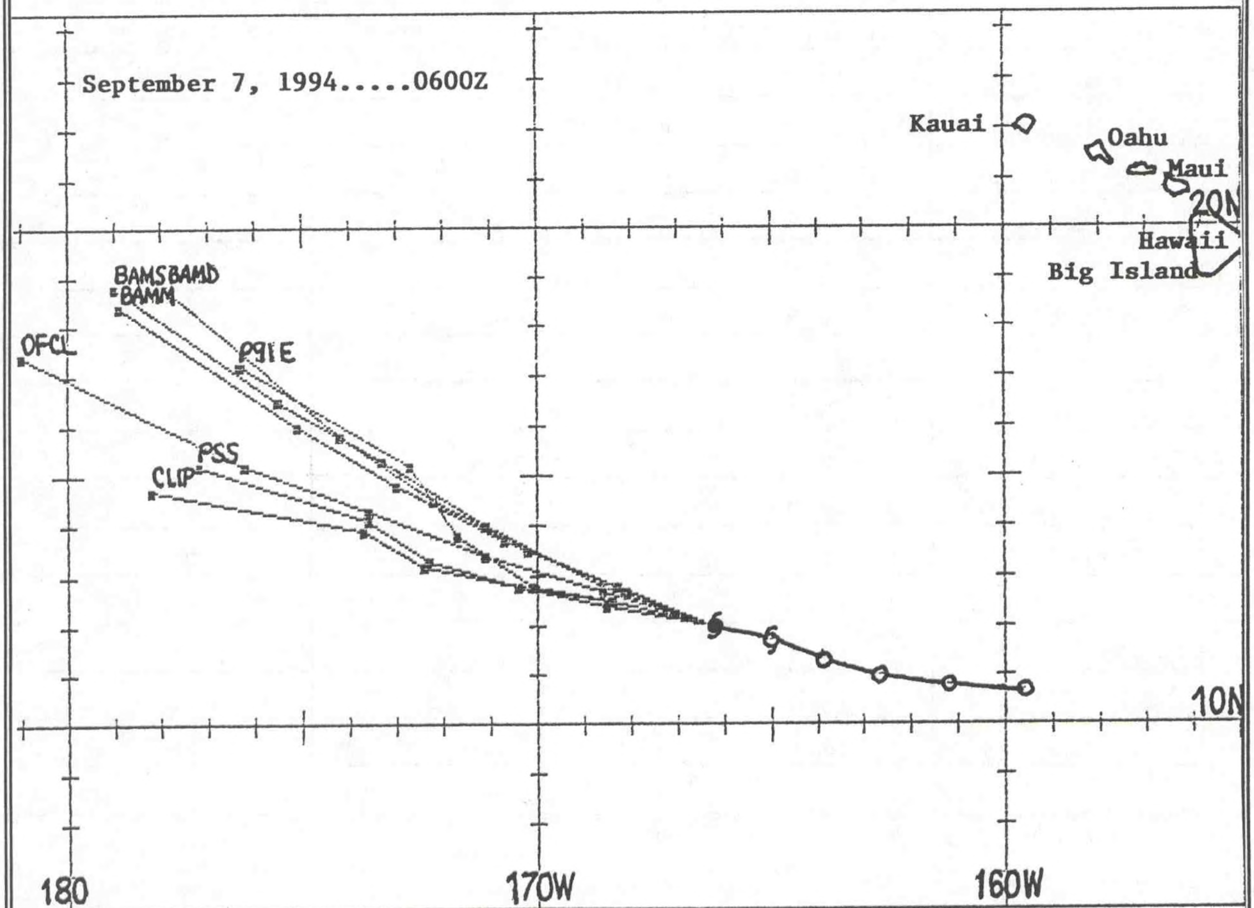
TROPICAL STORM MELE - SEPTEMBER 6 - SEPTEMBER 9, 1994 (HST)

DATE/TIME(Z)	LATITUDE (N)	LONGITUDE (W)	MAX WINDS (KT)
SEP. 6/0000	10.7	159.6	25
/0600	10.8	161.2	25
/1200	11.0	162.7	30
/1800	11.3	163.9	30
SEP. 7/0000	11.6	165.0	35
/0600	11.9	166.1	35
/1200	12.3	167.2	35
/1800	12.6	168.6	35
SEP. 8/0000	12.9	170.0	35
/0600	13.0	171.0	35
/1200	13.1	171.9	35
/1800	13.2	172.8	35
SEP. 9/0000	13.3	174.0	30
/0600	13.4	175.0	30
/1200	13.5	176.0	25

Figure 16 shows a typical output of the objective guidance forecasts for Tropical Storm Mele.

In all cases, the models attempted to pull Mele on a track north of its actual track.

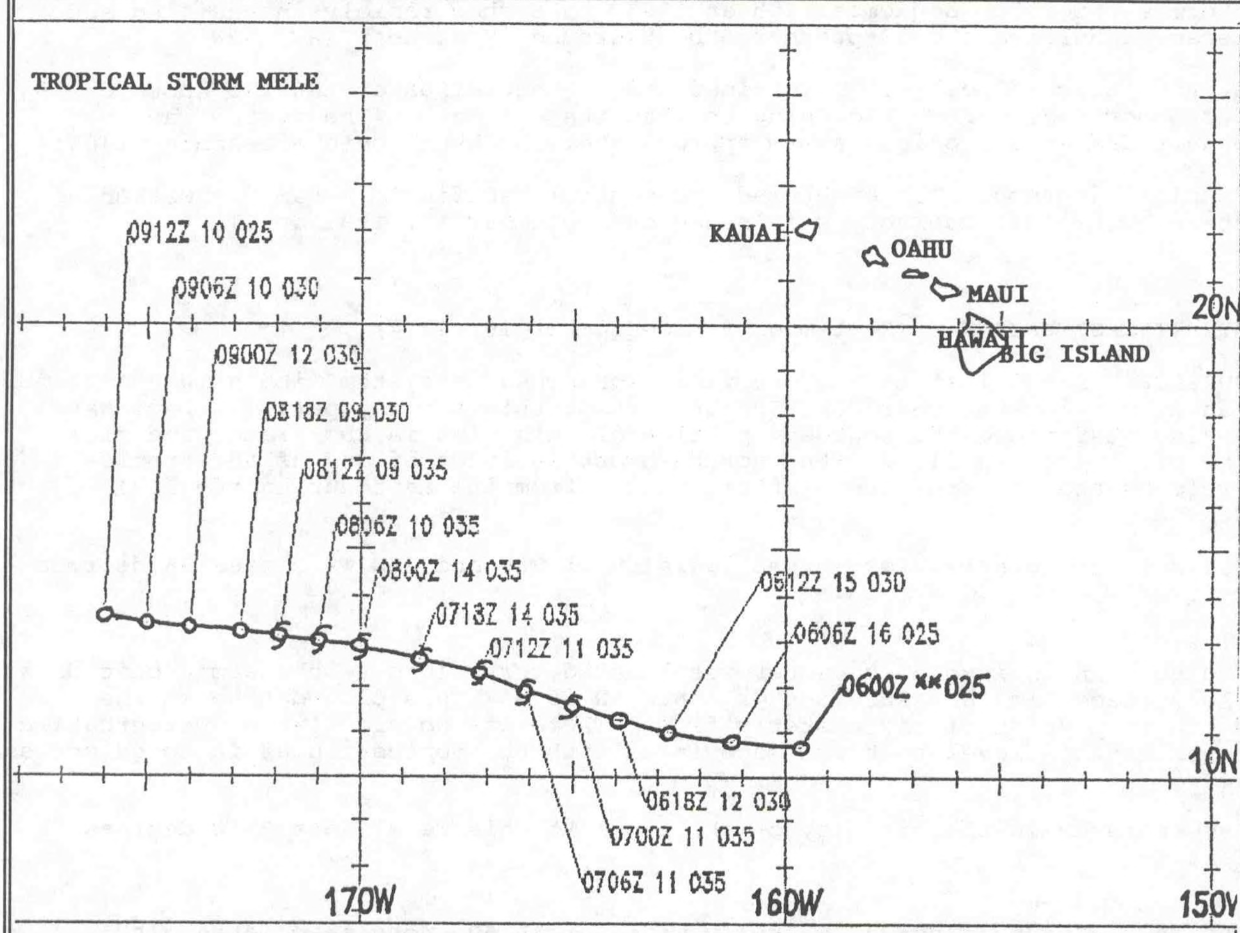
Figure 16
Objective Aids for "MELE"



September 7, 1994.....0600Z

Figure 17 provides the best track plot for Tropical Storm Mele.

FIGURE 17
BEST TRACK PLOT FOR TROPICAL STORM MELE



For positions provided, the first figure is the date and time group, followed by the speed of the system, and then by the maximum sustained winds of the storm.

For example, the first position shown for MELE gives the following information: 0600Z ** 025, which is the position on September 6, 1994 at 0600Z. The system had just developed and therefore the ** indicates that the forward speed was not yet known. The maximum sustained winds of the storm at this location were 25 knots.

TROPICAL DEPRESSION LANE
SEPTEMBER 9 - SEPTEMBER 10, 1994

HISTORY. Lane developed as a tropical depression on September 3, 1994 at 0000Z near 17N 105W. It moved west at 10-15 knots and increased to tropical storm strength on September 4th at 1200Z. It then rapidly intensified and became a hurricane on September 5th at around 1800Z near 18N 118W.

As Lane tracked west, it maintained its highest winds of 100-115 knots during September 6-7, before beginning to lose its strength. The system was downgraded to a tropical storm approximately 18 hours before reaching 140W.

Tropical depression Lane entered the Central Pacific in a rapidly weakening stage. The last advisory was issued on September 10, 1994 at 2100Z.

SYNOPTIC SITUATION (September 9 - September 10, 1994)

SURFACE. A quasi-stationary surface high pressure system with a 1028-1031 mb center was located near 38N 150W throughout this two day period. Lane was moving west along the southern portion of this high in the trade wind flow. The storm crossed 140W at the northernmost latitude of any of the tropical cyclones that entered the Central Pacific from the east during the 1994 season.

Sea surface temperatures in the vicinity of 20N and 25N were near 25 degrees Celsius.

700 MB. An anticyclonic center was located very close to the same location as the surface high pressure center near 35N 150W. This placed Lane in the southern portion of the easterly flow. There was no significant perturbation noted at this level that was associated with the depression as it moved across 140W.

Temperatures in the vicinity of the storm at this level were 8-10 degrees Celsius.

500 MB. A band of strong westerly winds of 40-60 knots associated with a short wave trough was tracking east to the north of 30N. However, over the center of Lane, winds were light and variable at this level.

Temperatures were near -6 degrees Celsius at this level.

250 MB. The bottom portion of a short wave trough was beginning to impact the Hawaiian Islands on September 9th and winds over the center of Lane at this time were southwest at 20 knots. By the following day, the winds had become stronger. Hilo and Lihue were both indicating westerly winds of 50-55 knots.

SATELLITE DATA

Aside from a few flareups of convection after crossing 140W, Lane was seen on the satellite imagery as a system that was dissipating very rapidly. No photographs are included for Lane's track in the Central Pacific.

DISCUSSION

Lane was unable to maintain itself as a tropical cyclone once it approached 140W and continued to move west. The two main meteorological conditions that inhibited it from intensifying were:

- The sea surface temperature environment into which it was moving was 25 degrees Celsius. Tropical cyclones require warmer sea surfaces.

- Aloft, Lane was encountering strong westerly winds, which provided for shearing effects that the storm could not overcome.

The following table provides estimated upper level wind vectors for Tropical Depression Lane at specific time periods.

TROPICAL DEPRESSION LANE September 9 - September 10, 1994					
Date/Time	LAT.	LON.	Est. WIND from Grid Point values		
SEP.			700MB	500MB	250MB
9/12Z	21.4N	137.7W	09010	LGT/VRBL	24020
10/12Z	21.2N	142.9W	08010	LGT/VRBL	26025
Data from analysis charts at specified times. CYC indicates cyclonic circulation, followed by wind speeds near center ACC indicates anticyclonic circulation, followed by wind speeds near center					

Table 10 provides the best track data for Tropical Depression Lane for each 6-hour synoptic time period. The CPHC assumes responsibility for issuance of advisories after the tropical cyclone tracks westward across 140W.

Also provided in the table are the maximum sustained winds for each time period.

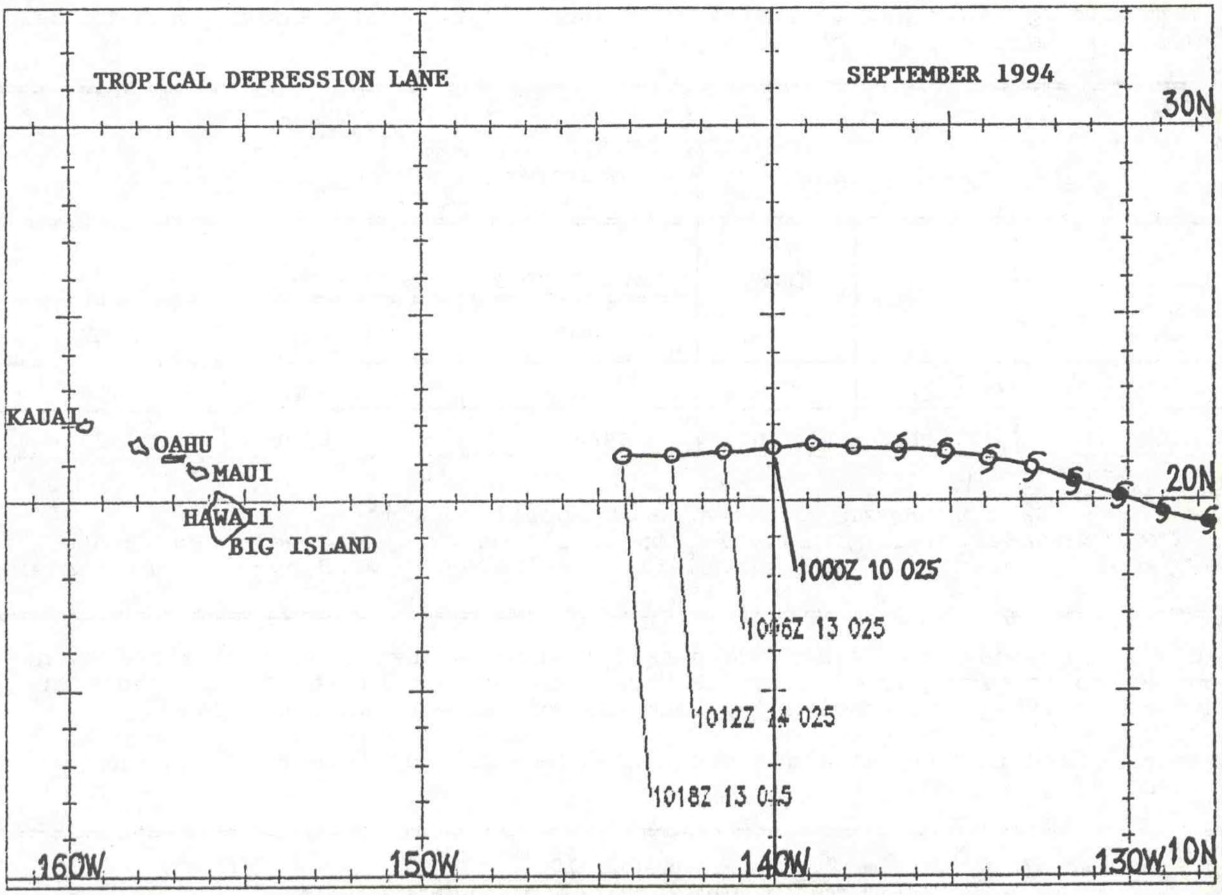
TABLE 10 BEST TRACK FOR TROPICAL DEPRESSION LANE			
TROPICAL DEPRESSION LANE - SEPTEMBER 9 - SEPTEMBER 10, 1994 (HST)			
DATE/TIME(Z)	LATITUDE (N)	LONGITUDE (W)	MAX WINDS (KT)
SEP. 10/0000	21.4	140.0	25
/0600	21.3	141.4	25
/1200	21.2	142.9	25
/1800	21.2	144.3	25

Since Lane was a tropical depression for a very short period of time in the Central Pacific, no examples of objective guidance forecasts are provided.

The models were all in agreement with a continued due west track.

Figure 18 provides the best track plot for tropical depression Lane.

FIGURE 18
BEST TRACK PLOT FOR TROPICAL DEPRESSION LANE



For positions provided, the first figure is the date and time group, followed by the speed of the system, and then by the maximum sustained winds of the storm.

For example, the first position shown for LANE as it crossed 140W gives the following information: 1000Z 10 025, which is the position on September 10, 1994 at 0000Z. The system was moving at a forward speed of 10 knots and the maximum sustained winds of the storm at this location were 25 knots.

TROPICAL STORM NONA
OCTOBER 22 - OCTOBER 25, 1994

HISTORY. The last tropical cyclone for the 1994 season developed on October 22, 1994 at 2100Z as tropical depression THREE-C near 13N 157W. Although it was initially in an environment favorable for intensification, the depression was only able to achieve minimal tropical storm classification on October 25th.

Tropical storm Nona quickly decreased in intensity during the morning on October 25th and by afternoon was again merely a tropical depression. It continued to dissipate rapidly and lost all of its cyclonic characteristics by late afternoon.

The last advisory was issued on October 26, 1994 at 0300Z.

SYNOPTIC SITUATION (October 22 - October 25, 1994)

SURFACE. A surface high pressure (1030 mb) center was located near 35N 140W throughout the period. The storm moved west along the southern extremity of this system, embedded in the trade wind flow.

Sea surface temperatures along 12N between 155W - 170W were 27-28 degrees Celsius.

700 MB. An anticyclonic center was located north of 20N and west of 158W during the time when Nona tracked west in the vicinity of 12N. The system was analyzed as an inverted trough at this level. Winds were variable from northeast to southeast at 10-20 knots and were being driven by the main cyclonic circulation center located to the southwest of the tropical cyclone center. By the end of the three day period of the event, winds had become mostly easterly at 10-15 knots.

Temperatures in the vicinity of the storm at this level were 8-10 degrees Celsius.

500 MB. Nona had its beginnings under an anticyclonic circulation at this level. By October 23rd, however, the anticyclone center had moved to near 20N 170W and then to near 30N 170W by October 25th. Winds were influenced by this main circulation feature. The light and variable winds during its early life cycle become southeast and east at 10-20 knots by October 23rd.

Temperatures were near -6 degrees Celsius at this level.

250 MB. A trough was located close to the International Dateline and had forced an anticyclonic circulation ahead of it in the area where Nona was beginning to develop on October 22nd. The storm remained under the influence of ridging for another 24 hours but by October 24th, the trough had moved east and was creating shearing over the storm. Winds during the last two days of Nona shifted from southwest to northwest and were generally in the 25-35 knot range.

SATELLITE DATA

Satellite imagery never did show a very organized system and moved out of the area of good coverage when it increased strength before quickly dissipating.

DISCUSSION

Nona was seen as having the right environment for possible intensification when it first developed. However, the upper level trough that moved across the top of the storm contributed to the major shearing effect that ended the life of the storm.

The following table provides estimated upper level wind vectors for Tropical Depression Nona at specific time periods.

TROPICAL STORM NONA October 22 - October 25, 1994					
Date/Time	LAT.	LON.	Est. WIND from Grid Point values		
OCT.			700MB	500MB	250MB
22/12Z	12.8N	157.3W	10015	LGT/VRBL	ACC05
23/12Z	12.5N	158.5W	07020	07010	24025
24/12Z	12.1N	162.5W	10015	07015	30030
25/12Z	12.0N	168.4W	12010	09015	27025
Data from analysis charts at specified times. CYC indicates cyclonic circulation, followed by wind speeds near center ACC indicates anticyclonic circulation, followed by wind speeds near center					

Table 11 provides the best track data for Tropical Storm Nona for each 6-hour synoptic time period. Also provided in the table are the maximum sustained winds for each time period.

The CPHC assumes responsibility for issuance of advisories after the tropical cyclone tracks westward across 140W.

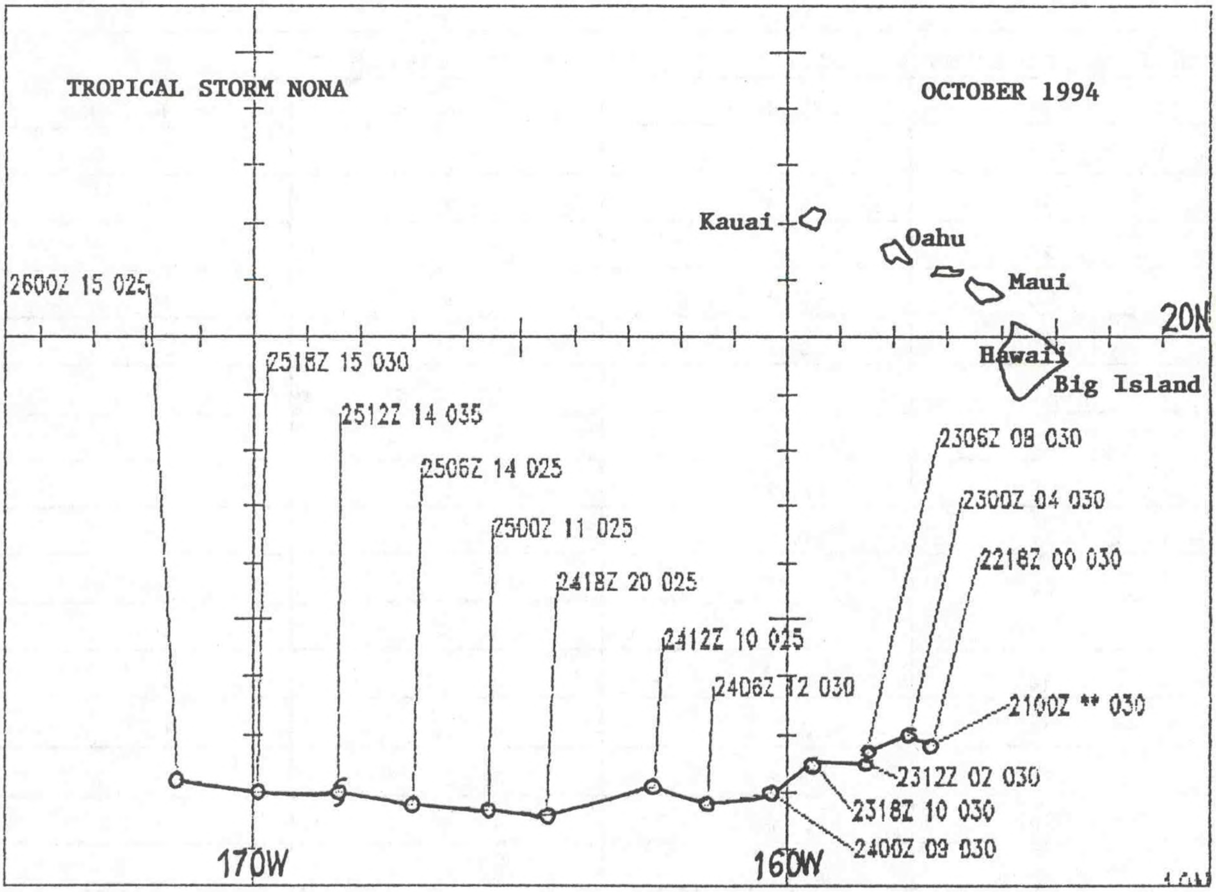
TABLE 11
BEST TRACK FOR TROPICAL STORM NONA

TROPICAL STORM NONA - OCTOBER 22 - OCTOBER 25, 1994 (HST)			
DATE/TIME(Z)	LATITUDE (N)	LONGITUDE (W)	MAX WINDS (KT)
OCT. 21/0000	12.8	157.3	30
/0600	12.8	157.3	30
/1200	12.8	157.3	30
/1800	12.8	157.3	30
OCT. 22/0000	12.8	157.3	30
/0600	12.8	157.3	30
/1200	12.8	157.3	30
/1800	12.8	157.3	30
OCT. 23/0000	12.8	157.7	30
/0600	12.7	158.5	30
/1200	12.5	158.5	30
/1800	12.5	159.5	30
OCT. 24/0000	12.0	160.3	30
/0600	11.8	161.5	30
/1200	12.1	162.5	25
/1800	11.6	164.5	25
OCT. 25/0000	11.7	165.6	25
/0600	11.8	167.0	25
/1200	12.0	168.4	35
/1800	12.0	169.9	30
OCT. 26/0000	12.2	171.4	25

The objective guidance forecasts all indicated a westerly track during the initial 24 hours but attempted to turn the storm to the northwest. This turn never materialized.

Figure 19 provides the best track plot for Tropical Storm Nona.

FIGURE 19
BEST TRACK PLOT FOR TROPICAL STORM NONA



For positions provided, the first figure is the date and time group, followed by the speed of the system, and then by the maximum sustained winds of the storm.

For example, the first position shown for NONA near 13N and 157W gives the following information: 2100Z ** 025, which is the position on October 21, 1994 at 0000Z. The system had just developed and the ** indicates that the forward movement was not yet known. The maximum sustained winds of the storm at this location were 25 knots.

GENESIS REGIONS

The following table provides information on the genesis area, latitude upon entry into the CPHC area of responsibility (140W), and the location of dissipation stage for each tropical cyclone.

1994 CENTRAL NORTH PACIFIC TROPICAL CYCLONES
GENESIS REGION, POSITION AT 140 DEG. W, DISSIPATION REGION

STORM NAME	DATES (Z) BEGIN - END	GENESIS AREA	LAT. POS. at 140W	DISSIPATION AREA
DANIEL	7/05 - 7/14	Lat. 7.8N Lon. 99.1W	13.3N	Lat. 16.6N Lon. 153.7W
EMILIA	7/15 - 7/25	Lat. 8.2N Lon. 125.9W	10.4N	Lat. 21.5N Lon. 166.3W
FABIO	7/18 - 7/24	Lat. 12.8N Lon. 119.7W	16.8N	Lat. 16.8N Lon. 153.4W
GILMA	7/20 - 7/31	Lat. 10.2N Lon. 176.0W	12.2N	Lat. 18.5N Lon. 176.0W
LI	7/30 - 8/12	Lat. 11.4N Lon. 120.4W	11.1N	Lat. 12.4N Lon. 179.3W
ONE-C	9/09 - 8/14	Lat. 15.3N Lon. 145.5W	Developed at 145.5W	Lat. 17.8N Lon. 164.5W
JOHN	8/15 - 9/10	Lat. 13.8N Lon. 110.2W	15.0N	Lat. 41.5N Lon. 171.0W
KRISTY	8/27 - 9/05	Lat. 13.3N Lon. 117.3W	16.3N	Lat. 14.5N Lon. 164.0W
MELE	9/06 - 9/09	Lat. 10.7N Lon. 159.6W	Developed at 159.6W	Lat. 13.5N Lon. 176.0W
LANE	9/03 - 9/10	Lat. 17.0N Lon. 105.5W	21.4N	Lat. 21.2N Lon. 144.3W
NONA	10/21 - 10/26	Lat. 12.8N Lon. 157.3W	Developed at 157.3W	Lat. 12.2N Lon. 171.4W

VERIFICATION

The final section of this technical memorandum contains the verification statistics for each hurricane. A quick look at how the CPHC forecaster performed in comparison with each model on the average is presented below.

HURRICANE EMILIA

The P91E was the model that showed the best skill for this storm. Even in the extended period, the average error was less than 100 nautical miles. With the exception of the P91E which did remarkably well for Emilia, the CPHC forecaster showed greater skill in forecasting the extended postions (36H, 48H, 72H).

VERIFICATION - HURRICANE EMILIA
AVERAGE POSITION ERRORS FOR EACH PERIOD (NAUTICAL MILES)

FORECASTER/MODEL	12	24	36	48	72
CPHC	28	48	73	94	132
CLIP	25	44	69	101	188
BAMD	28	49	78	105	163
BAMM	35	64	94	122	161
BAMS	39	79	125	175	251
P91E	24	38	59	65	90
PSS	25	44	69	95	159

HURRICANE GILMA

For the initial 12 hour forecast period, the CPHC forecaster is seen as being better than all of the models. This is also true for the remainder of the forecast periods when comparing the CPHC forecaster with CLIP, BAMS, P91E, and PSS. However, the BAMD and BAMM average errors for the 24, 36, 48, and 72 hour period show slightly less errors than the CPHC forecaster.

VERIFICATION - HURRICANE GILMA
AVERAGE POSITION ERRORS FOR EACH PERIOD (NAUTICAL MILES)

FORECASTER/MODEL	12	24	36	48	72
CPHC	40	80	103	125	196
CLIP	44	89	122	167	240
BAMD	45	76	95	115	189
BAMM	48	75	98	121	185
BAMS	59	96	128	157	239
P91E	45	87	114	164	259
PSS	46	91	124	177	300

HURRICANE LI

For Hurricane Li, the best models were the CLIP and the P91E. Both showed the smallest error. The rest of the models and the CPHC forecasters showed about a 40-50 nautical mile error for the 12 hour forecast, then the error increased to nearly 100 nautical miles by 24 hours. The error showed a substantial increase with time.

VERIFICATION - HURRICANE LI
AVERAGE POSITION ERRORS FOR EACH PERIOD (NAUTICAL MILES)

FORECASTER/MODEL	12	24	36	48	72
CPHC	51	98	168	242	403
CLIP	43	69	109	119	206
BAMD	51	103	165	223	351
BAMM	56	115	189	256	395
BAMS	63	129	202	277	441
P91E	41	63	105	134	211
PSS	47	80	121	144	217

HURRICANE JOHN

For Hurricane John there was very little deviation and the CPHC forecaster as well as all of the models were close throughout the entire 72 hour period. The CPHC forecaster did show more skill in the long term for this storm.

VERIFICATION - HURRICANE JOHN
AVERAGE POSITION ERRORS FOR EACH PERIOD (NAUTICAL MILES)

FORECASTER/MODEL	12	24	36	48	72
CPHC	31	60	82	104	160
CLIP	37	69	94	116	193
BAMD	33	58	80	103	175
BAMM	37	67	93	115	180
BAMS	44	84	114	137	200
P91E	35	60	78	102	187
PSS	38	69	91	115	191

HURRICANE KRISTY

For Hurricane Kristy, the initial three forecast period errors for all of the models were very close to each other and to the CPHC forecaster. However, by the 48 hour and 72 hour forecast periods, the CPHC forecaster showed a better score than the majority of the models.

VERIFICATION - HURRICANE KRISTY AVERAGE POSITION ERRORS FOR EACH PERIOD (NAUTICAL MILES)					
FORECASTER/MODEL	**12**	**24**	**36**	**48**	**72**
CPHC	38	74	114	124	179
CLIP	38	75	112	145	225
BAMD	53	101	154	189	252
BAMM	41	75	105	129	189
BAMS	49	84	107	142	210
P91E	38	70	105	132	146
PSS	39	77	119	159	237

The complete set of verification statistics for each hurricane are provided in the following pages.

VERIFICATION STATISTICS FOR HURRICANE EMILIA

STATISTICS FOR CPHC VS. BEST TRACK

DTG	WRN NO.	BEST TRACK LAT	LONG	WIND	POSITION ERRORS 00	12	24	36	48	72
94071612	1	8.8N	133.3W	35	17	46	84	86	86	99
94071618	2	9.2N	134.5W	45	18	30	60	58	55	26
94071700	3	9.6N	135.9W	55	5	18	18	39	55	61
94071706	4	9.9N	137.4W	70	13	13	21	54	78	104
94071712	5	10.2N	138.8W	75	0	29	51	85	94	120
94071718	6	10.4N	140.2W	80	0	29	61	92	113	182
94071800	7	10.5N	141.5W	100	0	5	21	47	46	107
94071806	8	10.7N	142.8W	120	0	18	29	42	59	136
94071812	9	10.8N	144.3W	125	0	55	100	105	116	156
94071818	10	10.8N	145.4W	130	0	13	24	34	78	161
94071900	11	10.9N	146.5W	130	0	35	65	115	178	259
94071906	12	11.2N	147.5W	135	5	11	21	16	52	155
94071912	13	11.5N	148.5W	135	0	23	18	16	21	75
94071918	14	11.8N	149.6W	140	0	13	16	34	73	128
94072000	15	12.0N	150.8W	135	0	26	63	124	156	165
94072006	16	12.3N	151.9W	135	0	29	76	144	184	159
94072012	17	12.6N	152.7W	140	0	24	68	106	108	119
94072018	18	13.0N	153.5W	140	0	25	79	132	140	164
94072100	19	13.5N	154.3W	130	5	52	112	121	129	
94072106	20	14.0N	155.0W	125	8	13	61	77	117	
94072112	21	14.7N	155.5W	125	0	13	23	45	72	
94072118	22	15.4N	156.3W	115	0	11	21	57	66	
94072200	23	16.3N	156.7W	105	0	6	30	58		
94072206	24	16.9N	157.4W	85	12	46	53	58		
94072212	25	17.5N	158.2W	65	6	29	46			
94072218	26	17.9N	159.0W	65	0	46	34			
94072300	27	18.4N	159.7W	60	0	20				
94072306	28	18.8N	160.0W	55	0	61				
94072312	29	19.1N	161.2W	45	0					
94072318	30	19.7N	162.2W	35	12					
		AVERAGE			3	26	48	73	94	132
		# CASES			30	28	26	24	22	18

VERIFICATION STATISTICS FOR HURRICANE EMILIA

STATISTICS FOR CLIP VS. BEST TRACK

	WRN	BEST TRACK			POSITION ERRORS					
DTG	NO.	LAT	LONG	WIND	00	12	24	36	48	72
94071612	1	8.8N	133.3W	35	17	59	119	144	196	270
94071618	2	9.2N	134.5W	45	18	29	76	94	144	203
94071700	3	9.6N	135.9W	55	5	30	65	84	111	161
94071706	4	9.9N	137.4W	70	13	8	18	42	68	78
94071712	5	10.2N	138.8W	75	0	21	24	75	109	127
94071718	6	10.4N	140.2W	80	0	13	36	71	92	125
94071800	7	10.5N	141.5W	100	0	11	48	90	113	177
94071806	8	10.7N	142.8W	120	0	24	45	71	101	193
94071812	9	10.8N	144.3W	125	0	21	47	71	96	213
94071818	10	10.8N	145.4W	130	0	24	47	66	115	237
94071900	11	10.9N	146.5W	130	0	25	21	47	77	226
94071906	12	11.2N	147.5W	135	5	24	53	37	24	149
94071912	13	11.5N	148.5W	135	0	29	34	32	47	178
94071918	14	11.8N	149.6W	140	0	13	18	55	99	217
94072000	15	12.0N	150.8W	135	0	11	29	87	148	237
94072006	16	12.3N	151.9W	135	0	24	55	110	171	273
94072012	17	12.6N	152.7W	140	0	21	58	108	134	189
94072018	18	13.0N	153.5W	140	0	18	49	82	95	130
94072100	19	13.5N	154.3W	130	5	37	77	88	112	
94072106	20	14.0N	155.0W	125	8	18	47	37	101	
94072112	21	14.7N	155.5W	125	0	32	30	11	51	
94072118	22	15.4N	156.3W	115	0	21	8	12	22	
94072200	23	16.3N	156.7W	105	0	12	33	54		
94072206	24	16.9N	157.4W	85	12	41	50	99		
94072212	25	17.5N	158.2W	65	6	16	37			
94072218	26	17.9N	159.0W	65	0	39	18			
94072300	27	18.4N	159.7W	60	0	12				
94072306	28	18.8N	160.0W	55	0	62				
94072312	29	19.1N	161.2W	45	0					
94072318	30	19.7N	162.2W	35	12					
			AVERAGE		3	25	44	69	101	188
			# CASES		30	28	26	24	22	18

VERIFICATION STATISTICS FOR HURRICANE EMILIA

STATISTICS FOR BAMD VS. BEST TRACK

DTG	WRN NO.	BEST TRACK LAT	LONG	WIND	POSITION ERRORS 00	12	24	36	48	72
94071612	1	8.8N	133.3W	35	17	68	129	163	181	220
94071618	2	9.2N	134.5W	45	18	30	55	66	51	74
94071700	3	9.6N	135.9W	55	5	30	48	46	61	124
94071706	4	9.9N	137.4W	70	13	5	26	70	91	141
94071712	5	10.2N	138.8W	75	0	8	34	74	84	156
94071718	6	10.4N	140.2W	80	0	16	36	48	46	77
94071800	7	10.5N	141.5W	100	0	0	24	67	82	95
94071806	8	10.7N	142.8W	120	0	18	39	61	67	121
94071812	9	10.8N	144.3W	125	0	33	63	73	92	91
94071818	10	10.8N	145.4W	130	0	31	55	59	75	69
94071900	11	10.9N	146.5W	130	0	30	44	58	66	58
94071906	12	11.2N	147.5W	135	5	26	25	40	50	93
94071912	13	11.5N	148.5W	135	0	5	18	49	81	163
94071918	14	11.8N	149.6W	140	0	21	61	109	152	279
94072000	15	12.0N	150.8W	135	0	30	68	111	138	308
94072006	16	12.3N	151.9W	135	0	42	55	54	66	199
94072012	17	12.6N	152.7W	140	0	26	42	42	66	265
94072018	18	13.0N	153.5W	140	0	18	32	69	158	405
94072100	19	13.5N	154.3W	130	5	16	26	103	202	
94072106	20	14.0N	155.0W	125	8	26	56	120	185	
94072112	21	14.7N	155.5W	125	0	13	39	103	201	
94072118	22	15.4N	156.3W	115	0	33	42	48	108	
94072200	23	16.3N	156.7W	105	0	26	57	110		
94072206	24	16.9N	157.4W	85	12	41	54	141		
94072212	25	17.5N	158.2W	65	6	21	57			
94072218	26	17.9N	159.0W	65	0	45	88			
94072300	27	18.4N	159.7W	60	0	53				
94072306	28	18.8N	160.0W	55	0	79				
94072312	29	19.1N	161.2W	45	0					
94072318	30	19.7N	162.2W	35	12					
			AVERAGE		3	28	49	78	105	163
			# CASES		30	28	26	24	22	18

VERIFICATION STATISTICS FOR HURRICANE EMILIA

STATISTICS FOR BAMM VS. BEST TRACK

DTG	WRN NO.	BEST TRACK LAT	LONG	WIND	POSITION ERRORS 00	12	24	36	48	72
94071612	1	8.8N	133.3W	35	17	42	76	103	110	159
94071618	2	9.2N	134.5W	45	18	5	0	25	55	96
94071700	3	9.6N	135.9W	55	5	13	23	37	77	142
94071706	4	9.9N	137.4W	70	13	0	26	72	103	156
94071712	5	10.2N	138.8W	75	0	11	49	90	108	173
94071718	6	10.4N	140.2W	80	0	29	53	72	75	104
94071800	7	10.5N	141.5W	100	0	13	42	61	59	64
94071806	8	10.7N	142.8W	120	0	25	74	110	122	142
94071812	9	10.8N	144.3W	125	0	55	97	124	159	179
94071818	10	10.8N	145.4W	130	0	50	89	113	134	119
94071900	11	10.9N	146.5W	130	0	48	76	100	113	99
94071906	12	11.2N	147.5W	135	5	29	47	83	107	213
94071912	13	11.5N	148.5W	135	0	13	51	75	112	189
94071918	14	11.8N	149.6W	140	0	24	72	85	87	109
94072000	15	12.0N	150.8W	135	0	41	67	83	90	114
94072006	16	12.3N	151.9W	135	0	71	107	138	189	307
94072012	17	12.6N	152.7W	140	0	52	98	146	183	313
94072018	18	13.0N	153.5W	140	0	40	76	120	137	229
94072100	19	13.5N	154.3W	130	5	64	117	149	202	
94072106	20	14.0N	155.0W	125	8	47	103	140	206	
94072112	21	14.7N	155.5W	125	0	51	85	119	164	
94072118	22	15.4N	156.3W	115	0	57	86	139	104	
94072200	23	16.3N	156.7W	105	0	23	38	45		
94072206	24	16.9N	157.4W	85	12	13	33	17		
94072212	25	17.5N	158.2W	65	6	21	37			
94072218	26	17.9N	159.0W	65	0	64	55			
94072300	27	18.4N	159.7W	60	0	41				
94072306	28	18.8N	160.0W	55	0	41				
94072312	29	19.1N	161.2W	45	0					
94072318	30	19.7N	162.2W	35	12					
			AVERAGE		3	35	64	94	122	161
			# CASES		30	28	26	24	22	18

VERIFICATION STATISTICS FOR HURRICANE EMILIA

STATISTICS FOR BAMS VS. BEST TRACK

DTG	WRN NO.	BEST TRACK LAT	LONG	WIND	POSITION ERRORS 00	12	24	36	48	72
94071612	1	8.8N	133.3W	35	17	56	84	100	110	157
94071618	2	9.2N	134.5W	45	18	13	43	85	126	170
94071700	3	9.6N	135.9W	55	5	13	48	79	125	158
94071706	4	9.9N	137.4W	70	13	13	61	113	156	210
94071712	5	10.2N	138.8W	75	0	26	66	110	125	188
94071718	6	10.4N	140.2W	80	0	33	74	99	102	135
94071800	7	10.5N	141.5W	100	0	26	58	76	68	76
94071806	8	10.7N	142.8W	120	0	50	106	144	163	209
94071812	9	10.8N	144.3W	125	0	77	132	172	217	317
94071818	10	10.8N	145.4W	130	0	63	105	135	176	240
94071900	11	10.9N	146.5W	130	0	52	83	121	153	218
94071906	12	11.2N	147.5W	135	5	29	42	81	131	287
94071912	13	11.5N	148.5W	135	0	26	46	73	142	297
94071918	14	11.8N	149.6W	140	0	30	45	68	127	285
94072000	15	12.0N	150.8W	135	0	26	44	104	175	313
94072006	16	12.3N	151.9W	135	0	52	106	182	286	459
94072012	17	12.6N	152.7W	140	0	47	114	197	278	432
94072018	18	13.0N	153.5W	140	0	42	112	197	258	373
94072100	19	13.5N	154.3W	130	5	79	169	237	312	
94072106	20	14.0N	155.0W	125	8	52	120	169	250	
94072112	21	14.7N	155.5W	125	0	63	108	163	212	
94072118	22	15.4N	156.3W	115	0	65	97	159	165	
94072200	23	16.3N	156.7W	105	0	31	52	80		
94072206	24	16.9N	157.4W	85	12	8	62	59		
94072212	25	17.5N	158.2W	65	6	24	33			
94072218	26	17.9N	159.0W	65	0	56	45			
94072300	27	18.4N	159.7W	60	0	36				
94072306	28	18.8N	160.0W	55	0	17				
94072312	29	19.1N	161.2W	45	0					
94072318	30	19.7N	162.2W	35	12					
			AVERAGE		3	39	79	125	175	251
			# CASES		30	28	26	24	22	18

VERIFICATION STATISTICS FOR HURRICANE EMILIA

STATISTICS FOR P91E VS. BEST TRACK

DTG	WRN NO.	BEST TRACK LAT	LONG	WIND	POSITION ERRORS 00	12	24	36	48	72
94071612	1	8.8N	133.3W	35	17	63	132	168	217	285
94071618	2	9.2N	134.5W	45	18	24	76	106	180	243
94071700	3	9.6N	135.9W	55	5	37	66	96	124	176
94071706	4	9.9N	137.4W	70	13	5	8	50	71	134
94071712	5	10.2N	138.8W	75	0	13	0	25	21	50
94071718	6	10.4N	140.2W	80	0	8	23	38	30	42
94071800	7	10.5N	141.5W	100	0	8	21	41	26	64
94071806	8	10.7N	142.8W	120	0	24	36	43	58	43
94071812	9	10.8N	144.3W	125	0	18	35	29	32	44
94071818	10	10.8N	145.4W	130	0	24	35	34	33	45
94071900	11	10.9N	146.5W	130	0	25	11	8	18	102
94071906	12	11.2N	147.5W	135	5	26	64	68	78	17
94071912	13	11.5N	148.5W	135	0	29	41	42	31	25
94071918	14	11.8N	149.6W	140	0	18	25	45	53	42
94072000	15	12.0N	150.8W	135	0	0	6	18	37	29
94072006	16	12.3N	151.9W	135	0	24	29	47	65	105
94072012	17	12.6N	152.7W	140	0	24	53	77	77	63
94072018	18	13.0N	153.5W	140	0	18	39	34	39	119
94072100	19	13.5N	154.3W	130	5	29	62	48	32	
94072106	20	14.0N	155.0W	125	8	11	18	41	72	
94072112	21	14.7N	155.5W	125	0	32	26	36	47	
94072118	22	15.4N	156.3W	115	0	16	16	49	90	
94072200	23	16.3N	156.7W	105	0	18	59	120		
94072206	24	16.9N	157.4W	85	12	46	56	158		
94072212	25	17.5N	158.2W	65	6	16	41			
94072218	26	17.9N	159.0W	65	0	34	17			
94072300	27	18.4N	159.7W	60	0	12				
94072306	28	18.8N	160.0W	55	0	62				
94072312	29	19.1N	161.2W	45	0					
94072318	30	19.7N	162.2W	35	12					
			AVERAGE		3	24	38	59	65	90
			# CASES		30	28	26	24	22	18

VERIFICATION STATISTICS FOR HURRICANE EMILIA

STATISTICS FOR PSS VS. BEST TRACK

DTG	WRN NO.	BEST TRACK LAT	LONG	WIND	POSITION ERRORS 00	12	24	36	48	72
94071612	1	8.8N	133.3W	35	17	54	117	138	185	247
94071618	2	9.2N	134.5W	45	18	24	73	94	137	198
94071700	3	9.6N	135.9W	55	5	30	59	91	121	200
94071706	4	9.9N	137.4W	70	13	11	8	30	48	97
94071712	5	10.2N	138.8W	75	0	18	18	54	67	97
94071718	6	10.4N	140.2W	80	0	16	37	67	76	104
94071800	7	10.5N	141.5W	100	0	18	53	75	84	126
94071806	8	10.7N	142.8W	120	0	24	45	63	80	145
94071812	9	10.8N	144.3W	125	0	29	52	73	92	172
94071818	10	10.8N	145.4W	130	0	29	47	59	85	173
94071900	11	10.9N	146.5W	130	0	21	18	47	64	171
94071906	12	11.2N	147.5W	135	5	21	47	23	6	129
94071912	13	11.5N	148.5W	135	0	24	31	13	42	140
94071918	14	11.8N	149.6W	140	0	11	5	41	83	137
94072000	15	12.0N	150.8W	135	0	11	35	92	148	192
94072006	16	12.3N	151.9W	135	0	31	65	123	189	247
94072012	17	12.6N	152.7W	140	0	21	66	124	153	159
94072018	18	13.0N	153.5W	140	0	24	62	109	126	137
94072100	19	13.5N	154.3W	130	5	41	85	106	132	
94072106	20	14.0N	155.0W	125	8	18	47	41	103	
94072112	21	14.7N	155.5W	125	0	32	30	12	28	
94072118	22	15.4N	156.3W	115	0	34	18	23	33	
94072200	23	16.3N	156.7W	105	0	11	36	61		
94072206	24	16.9N	157.4W	85	12	38	42	92		
94072212	25	17.5N	158.2W	65	6	12	37			
94072218	26	17.9N	159.0W	65	0	40	13			
94072300	27	18.4N	159.7W	60	0	11				
94072306	28	18.8N	160.0W	55	0	56				
94072312	29	19.1N	161.2W	45	0					
94072318	30	19.7N	162.2W	35	12					
			AVERAGE		3	25	44	69	95	159
			# CASES		30	28	26	24	22	18

VERIFICATION STATISTICS FOR HURRICANE GILMA

STATISTICS FOR CPHC VS. BEST TRACK

DTG	WRN NO.	BEST TRACK LAT	LONG	WIND	POSITION ERRORS 00	12	24	36	48	72
94072200	1	11.4N	126.6W	35	24	55	66	83	135	262
94072206	2	11.3N	127.7W	45	24	48	76	108	141	171
94072212	3	11.2N	129.2W	50	6	29	52	85	76	88
94072218	4	11.5N	130.8W	60	6	8	5	21	61	157
94072300	5	11.7N	132.4W	65	11	11	29	62	90	145
94072306	6	11.9N	133.9W	75	6	16	42	67	90	132
94072312	7	12.0N	135.5W	90	5	13	42	68	97	142
94072318	8	12.1N	137.2W	110	0	11	45	90	112	180
94072400	9	12.2N	138.9W	130	0	25	42	60	44	150
94072406	10	12.2N	140.4W	135	0	16	50	66	72	188
94072412	11	12.0N	141.8W	135	21	54	109	163	259	481
94072418	12	12.1N	143.3W	140	0	18	60	100	118	206
94072500	13	12.0N	144.7W	140	0	18	47	55	72	177
94072506	14	12.0N	146.0W	140	0	17	34	11	51	58
94072512	15	12.0N	147.6W	100	6	24	54	72	108	108
94072518	16	12.0N	149.2W	110	0	8	37	81	67	86
94072600	17	12.2N	150.8W	105	0	16	60	92	45	186
94072606	18	12.3N	152.2W	100	0	37	79	77	49	89
94072612	19	12.2N	153.4W	90	13	46	82	56	109	203
94072618	20	12.2N	154.5W	80	0	25	60	117	223	322
94072700	21	12.1N	155.6W	60	5	13	108	199	295	370
94072706	22	12.0N	156.8W	60	0	42	103	170	213	266
94072712	23	11.8N	158.0W	60	0	92	173	255	260	328
94072718	24	12.1N	159.9W	50	0	46	113	166	162	
94072800	25	12.5N	161.6W	50	0	31	72	65	125	
94072806	26	12.8N	163.3W	50	5	42	73	23	91	
94072812	27	13.1N	165.2W	50	18	18	41	131	224	
94072818	28	13.5N	167.1W	55	0	33	55	149		
94072900	29	13.7N	169.0W	45	18	81	159	297		
94072906	30	13.9N	170.7W	45	29	93	183			
94072912	31	14.2N	171.6W	45	81	189	335			
94072918	32	15.2N	172.7W	40	25	111				
94073000	33	16.6N	174.0W	35	0	30				
94073006	34	17.7N	174.9W	35	18					
94073012	35	18.1N	175.3W	35	8					
			AVERAGE		9	40	80	103	125	196
			# CASES		35	33	31	29	27	23

VERIFICATION STATISTICS FOR HURRICANE GILMA

STATISTICS FOR CLIP VS. BEST TRACK

DTG	WRN NO.	BEST TRACK LAT	LONG	WIND	POSITION ERRORS 00	12	24	36	48	72
94072200	1	11.4N	126.6W	35	24	62	58	88	152	271
94072206	2	11.3N	127.7W	45	24	52	94	152	212	313
94072212	3	11.2N	129.2W	50	6	35	70	129	170	281
94072218	4	11.5N	130.8W	60	6	13	41	72	108	202
94072300	5	11.7N	132.4W	65	11	30	63	102	143	251
94072306	6	11.9N	133.9W	75	6	30	56	87	129	216
94072312	7	12.0N	135.5W	90	5	8	42	68	113	189
94072318	8	12.1N	137.2W	110	0	11	49	91	131	210
94072400	9	12.2N	138.9W	130	0	34	64	100	138	234
94072406	10	12.2N	140.4W	135	0	34	74	104	132	238
94072412	11	12.0N	141.8W	135	21	39	54	64	115	232
94072418	12	12.1N	143.3W	140	0	11	50	79	133	228
94072500	13	12.0N	144.7W	140	0	8	44	72	125	187
94072506	14	12.0N	146.0W	140	0	24	48	70	128	181
94072512	15	12.0N	147.6W	100	6	23	25	67	132	192
94072518	16	12.0N	149.2W	110	0	11	42	98	101	121
94072600	17	12.2N	150.8W	105	0	42	103	164	123	115
94072606	18	12.3N	152.2W	100	0	47	96	105	84	164
94072612	19	12.2N	153.4W	90	13	54	92	48	93	189
94072618	20	12.2N	154.5W	80	0	18	39	81	192	272
94072700	21	12.1N	155.6W	60	5	21	104	170	290	396
94072706	22	12.0N	156.8W	60	0	54	134	224	334	426
94072712	23	11.8N	158.0W	60	0	95	189	271	331	412
94072718	24	12.1N	159.9W	50	0	50	135	199	239	
94072800	25	12.5N	161.6W	50	0	34	99	109	221	
94072806	26	12.8N	163.3W	50	5	34	77	94	203	
94072812	27	13.1N	165.2W	50	18	42	43	174	231	
94072818	28	13.5N	167.1W	55	0	8	83	226		
94072900	29	13.7N	169.0W	45	18	63	124	224		
94072906	30	13.9N	170.7W	45	29	119	249			
94072912	31	14.2N	171.6W	45	81	184	317			
94072918	32	15.2N	172.7W	40	25	127				
94073000	33	16.6N	174.0W	35	0	45				
94073006	34	17.7N	174.9W	35	18					
94073012	35	18.1N	175.3W	35	8					
			AVERAGE		9	44	89	122	167	240
			# CASES		35	33	31	29	27	23

VERIFICATION STATISTICS FOR HURRICANE GILMA

STATISTICS FOR BAMD VS. BEST TRACK

DTG	WRN NO.	BEST TRACK LAT	LONG	WIND	POSITION ERRORS 00	12	24	36	48	72
94072200	1	11.4N	126.6W	35	24	93	106	140	180	317
94072206	2	11.3N	127.7W	45	24	31	29	16	21	78
94072212	3	11.2N	129.2W	50	6	21	30	13	30	54
94072218	4	11.5N	130.8W	60	6	21	41	65	96	117
94072300	5	11.7N	132.4W	65	11	33	53	110	144	200
94072306	6	11.9N	133.9W	75	6	30	66	102	139	165
94072312	7	12.0N	135.5W	90	5	21	67	92	105	118
94072318	8	12.1N	137.2W	110	0	21	51	76	82	134
94072400	9	12.2N	138.9W	130	0	42	63	71	71	171
94072406	10	12.2N	140.4W	135	0	11	26	16	37	206
94072412	11	12.0N	141.8W	135	21	21	23	25	67	237
94072418	12	12.1N	143.3W	140	0	18	41	42	8	82
94072500	13	12.0N	144.7W	140	0	16	35	17	46	104
94072506	14	12.0N	146.0W	140	0	58	101	100	82	161
94072512	15	12.0N	147.6W	100	6	53	70	53	48	160
94072518	16	12.0N	149.2W	110	0	13	17	42	13	129
94072600	17	12.2N	150.8W	105	0	13	44	60	13	168
94072606	18	12.3N	152.2W	100	0	29	40	34	92	243
94072612	19	12.2N	153.4W	90	13	34	41	72	152	254
94072618	20	12.2N	154.5W	80	0	32	34	86	165	231
94072700	21	12.1N	155.6W	60	5	32	89	163	239	325
94072706	22	12.0N	156.8W	60	0	63	136	222	286	363
94072712	23	11.8N	158.0W	60	0	97	173	250	268	340
94072718	24	12.1N	159.9W	50	0	80	165	214	196	
94072800	25	12.5N	161.6W	50	0	85	154	152	208	
94072806	26	12.8N	163.3W	50	5	95	163	156	194	
94072812	27	13.1N	165.2W	50	18	90	104	144	132	
94072818	28	13.5N	167.1W	55	0	76	70	128		
94072900	29	13.7N	169.0W	45	18	18	75	84		
94072906	30	13.9N	170.7W	45	29	21	102			
94072912	31	14.2N	171.6W	45	81	104	138			
94072918	32	15.2N	172.7W	40	25	85				
94073000	33	16.6N	174.0W	35	0	16				
94073006	34	17.7N	174.9W	35	18					
94073012	35	18.1N	175.3W	35	8					
			AVERAGE		9	45	76	95	115	189
			# CASES		35	33	31	29	27	23

VERIFICATION STATISTICS FOR HURRICANE GILMA

STATISTICS FOR BAMM VS. BEST TRACK

DTG	WRN NO.	BEST TRACK LAT	LONG	WIND	POSITION ERRORS 00	12	24	36	48	72
94072200	1	11.4N	126.6W	35	24	120	157	200	250	392
94072206	2	11.3N	127.7W	45	24	21	8	11	37	97
94072212	3	11.2N	129.2W	50	6	13	11	8	29	58
94072218	4	11.5N	130.8W	60	6	13	31	67	104	148
94072300	5	11.7N	132.4W	65	11	29	54	105	139	146
94072306	6	11.9N	133.9W	75	6	30	67	107	152	189
94072312	7	12.0N	135.5W	90	5	21	84	121	150	213
94072318	8	12.1N	137.2W	110	0	46	98	160	192	312
94072400	9	12.2N	138.9W	130	0	67	116	163	194	343
94072406	10	12.2N	140.4W	135	0	25	58	64	75	240
94072412	11	12.0N	141.8W	135	21	44	66	82	153	334
94072418	12	12.1N	143.3W	140	0	41	53	54	118	213
94072500	13	12.0N	144.7W	140	0	29	29	71	150	195
94072506	14	12.0N	146.0W	140	0	29	35	32	68	80
94072512	15	12.0N	147.6W	100	6	18	24	61	106	102
94072518	16	12.0N	149.2W	110	0	23	81	137	138	60
94072600	17	12.2N	150.8W	105	0	44	108	163	117	83
94072606	18	12.3N	152.2W	100	0	68	130	122	80	104
94072612	19	12.2N	153.4W	90	13	83	127	79	69	141
94072618	20	12.2N	154.5W	80	0	75	80	51	55	121
94072700	21	12.1N	155.6W	60	5	66	45	76	146	227
94072706	22	12.0N	156.8W	60	0	26	72	141	204	242
94072712	23	11.8N	158.0W	60	0	59	113	188	207	221
94072718	24	12.1N	159.9W	50	0	46	89	123	95	
94072800	25	12.5N	161.6W	50	0	44	94	96	114	
94072806	26	12.8N	163.3W	50	5	64	120	99	87	
94072812	27	13.1N	165.2W	50	18	64	75	83	49	
94072818	28	13.5N	167.1W	55	0	65	39	64		
94072900	29	13.7N	169.0W	45	18	47	50	101		
94072906	30	13.9N	170.7W	45	29	52	79			
94072912	31	14.2N	171.6W	45	81	103	137			
94072918	32	15.2N	172.7W	40	25	72				
94073000	33	16.6N	174.0W	35	0	47				
94073006	34	17.7N	174.9W	35	18					
94073012	35	18.1N	175.3W	35	8					
			AVERAGE		9	48	75	98	121	185
			# CASES		35	33	31	29	27	23

VERIFICATION STATISTICS FOR HURRICANE GILMA

STATISTICS FOR BAMS VS. BEST TRACK

DTG	WRN NO.	BEST TRACK LAT	LONG	WIND	POSITION ERRORS 00	12	24	36	48	72
94072200	1	11.4N	126.6W	35	24	166	246	314	385	564
94072206	2	11.3N	127.7W	45	24	26	64	100	141	210
94072212	3	11.2N	129.2W	50	6	29	70	99	148	171
94072218	4	11.5N	130.8W	60	6	24	48	81	130	198
94072300	5	11.7N	132.4W	65	11	29	58	117	155	203
94072306	6	11.9N	133.9W	75	6	35	66	91	123	178
94072312	7	12.0N	135.5W	90	5	29	80	109	142	234
94072318	8	12.1N	137.2W	110	0	50	103	160	197	367
94072400	9	12.2N	138.9W	130	0	72	113	165	207	418
94072406	10	12.2N	140.4W	135	0	41	76	83	121	323
94072412	11	12.0N	141.8W	135	21	41	54	68	134	346
94072418	12	12.1N	143.3W	140	0	53	78	83	134	214
94072500	13	12.0N	144.7W	140	0	37	49	83	153	194
94072506	14	12.0N	146.0W	140	0	13	38	84	147	153
94072512	15	12.0N	147.6W	100	6	13	53	118	185	126
94072518	16	12.0N	149.2W	110	0	54	146	238	263	239
94072600	17	12.2N	150.8W	105	0	66	150	229	205	149
94072606	18	12.3N	152.2W	100	0	89	181	207	197	146
94072612	19	12.2N	153.4W	90	13	121	215	202	205	238
94072618	20	12.2N	154.5W	80	0	118	165	172	159	197
94072700	21	12.1N	155.6W	60	5	103	105	105	87	188
94072706	22	12.0N	156.8W	60	0	31	56	104	128	246
94072712	23	11.8N	158.0W	60	0	37	76	129	112	204
94072718	24	12.1N	159.9W	50	0	33	88	103	91	
94072800	25	12.5N	161.6W	50	0	41	88	63	130	
94072806	26	12.8N	163.3W	50	5	52	76	46	69	
94072812	27	13.1N	165.2W	50	18	60	46	98	90	
94072818	28	13.5N	167.1W	55	0	39	18	78		
94072900	29	13.7N	169.0W	45	18	70	93	171		
94072906	30	13.9N	170.7W	45	29	92	121			
94072912	31	14.2N	171.6W	45	81	119	145			
94072918	32	15.2N	172.7W	40	25	79				
94073000	33	16.6N	174.0W	35	0	77				
94073006	34	17.7N	174.9W	35	18					
94073012	35	18.1N	175.3W	35	8					
			AVERAGE		9	59	96	128	157	239
			# CASES		35	33	31	29	27	23

VERIFICATION STATISTICS FOR HURRICANE GILMA

STATISTICS FOR P91E VS. BEST TRACK

DTG	WRN NO.	BEST TRACK LAT	LONG	WIND	POSITION ERRORS 00	12	24	36	48	72
94072200	1	11.4N	126.6W	35	24	62	43	59	109	190
94072206	2	11.3N	127.7W	45	24	52	93	158	229	311
94072212	3	11.2N	129.2W	50	6	37	67	121	153	234
94072218	4	11.5N	130.8W	60	6	13	46	95	146	254
94072300	5	11.7N	132.4W	65	11	24	50	75	113	204
94072306	6	11.9N	133.9W	75	6	32	61	101	138	245
94072312	7	12.0N	135.5W	90	5	8	30	48	87	154
94072318	8	12.1N	137.2W	110	0	11	41	71	117	159
94072400	9	12.2N	138.9W	130	0	32	45	56	61	87
94072406	10	12.2N	140.4W	135	0	26	58	79	110	137
94072412	11	12.0N	141.8W	135	21	31	39	21	32	71
94072418	12	12.1N	143.3W	140	0	11	55	97	134	179
94072500	13	12.0N	144.7W	140	0	13	48	57	60	111
94072506	14	12.0N	146.0W	140	0	29	65	89	152	290
94072512	15	12.0N	147.6W	100	6	29	41	37	88	280
94072518	16	12.0N	149.2W	110	0	13	21	61	82	227
94072600	17	12.2N	150.8W	105	0	34	71	90	13	198
94072606	18	12.3N	152.2W	100	0	37	67	60	90	315
94072612	19	12.2N	153.4W	90	13	41	54	35	152	333
94072618	20	12.2N	154.5W	80	0	18	61	123	253	417
94072700	21	12.1N	155.6W	60	5	24	126	208	342	519
94072706	22	12.0N	156.8W	60	0	59	152	257	390	518
94072712	23	11.8N	158.0W	60	0	103	203	313	381	529
94072718	24	12.1N	159.9W	50	0	58	153	229	273	
94072800	25	12.5N	161.6W	50	0	46	130	155	263	
94072806	26	12.8N	163.3W	50	5	36	99	125	218	
94072812	27	13.1N	165.2W	50	18	47	66	194	234	
94072818	28	13.5N	167.1W	55	0					
94072900	29	13.7N	169.0W	45	18	55	120	181		
94072906	30	13.9N	170.7W	45	29	108	213			
94072912	31	14.2N	171.6W	45	81	175	282			
94072918	32	15.2N	172.7W	40	25	135				
94073000	33	16.6N	174.0W	35	0	34				
94073006	34	17.7N	174.9W	35	18					
94073012	35	18.1N	175.3W	35	8					
			AVERAGE		9	45	87	114	164	259
			# CASES		35	32	30	28	27	23

VERIFICATION STATISTICS FOR HURRICANE GILMA

STATISTICS FOR PSS VS. BEST TRACK

DTG	WRN NO.	BEST TRACK LAT	LONG	WIND	POSITION ERRORS 00	12	24	36	48	72
94072200	1	11.4N	126.6W	35	24	67	77	113	196	372
94072206	2	11.3N	127.7W	45	24	53	94	155	230	373
94072212	3	11.2N	129.2W	50	6	35	70	136	200	356
94072218	4	11.5N	130.8W	60	6	13	46	101	156	333
94072300	5	11.7N	132.4W	65	11					
94072306	6	11.9N	133.9W	75	6	30	58	96	144	280
94072312	7	12.0N	135.5W	90	5	13	48	78	123	232
94072318	8	12.1N	137.2W	110	0	18	55	91	141	236
94072400	9	12.2N	138.9W	130	0	40	70	103	136	245
94072406	10	12.2N	140.4W	135	0	29	69	90	119	232
94072412	11	12.0N	141.8W	135	21	42	54	60	104	233
94072418	12	12.1N	143.3W	140	0	18	59	100	151	290
94072500	13	12.0N	144.7W	140	0	16	52	83	137	275
94072506	14	12.0N	146.0W	140	0	26	50	67	130	261
94072512	15	12.0N	147.6W	100	6	24	38	66	136	286
94072518	16	12.0N	149.2W	110	0	6	39	79	90	196
94072600	17	12.2N	150.8W	105	0	42	98	142	104	216
94072606	18	12.3N	152.2W	100	0	50	96	93	91	268
94072612	19	12.2N	153.4W	90	13	58	99	67	127	294
94072618	20	12.2N	154.5W	80	0	24	54	96	211	341
94072700	21	12.1N	155.6W	60	5	34	93	169	297	422
94072706	22	12.0N	156.8W	60	0	53	128	218	335	439
94072712	23	11.8N	158.0W	60	0	89	174	263	323	420
94072718	24	12.1N	159.9W	50	0	50	132	202	244	
94072800	25	12.5N	161.6W	50	0	34	102	120	221	
94072806	26	12.8N	163.3W	50	5	29	87	125	237	
94072812	27	13.1N	165.2W	50	18	46	53	176	222	
94072818	28	13.5N	167.1W	55	0	13	71	190		
94072900	29	13.7N	169.0W	45	18	57	123	200		
94072906	30	13.9N	170.7W	45	29	119	232			
94072912	31	14.2N	171.6W	45	81	180	308			
94072918	32	15.2N	172.7W	40	25	121				
94073000	33	16.6N	174.0W	35	0	45				
94073006	34	17.7N	174.9W	35	18					
94073012	35	18.1N	175.3W	35	8					
			AVERAGE		9	46	91	124	177	300
			# CASES		35	32	30	28	26	22

VERIFICATION STATISTICS FOR HURRICANE LI

STATISTICS FOR CPHC VS. BEST TRACK

DTG	WRN NO.	BEST TRACK LAT	LONG	WIND	POSITION ERRORS 00	12	24	36	48	72
94080812	1	13.5N	164.8W	40	29					
94080818	2	13.5N	166.3W	45	6	36	78	148	238	407
94080900	3	13.6N	167.5W	50	5	57	104	182	263	442
94080906	4	13.6N	168.2W	50	8	21	75	143	216	417
94080912	5	13.6N	169.1W	45	5	24	54	109	167	338
94080918	6	13.6N	170.0W	45	0	37	88	159	239	410
94081000	7	13.5N	171.0W	45	6	52	115	169	269	
94081006	8	13.6N	171.6W	45	23	81	123	180	258	
94081012	9	13.7N	172.2W	45	13	52	89	175	265	
94081018	10	13.9N	172.7W	50	0	30	90	180	264	
94081100	11	13.9N	173.3W	50	11	67	141	213		
94081106	12	13.8N	174.2W	45	13	61	124	193		
94081112	13	13.6N	175.1W	45	26	90	134			
94081118	14	13.4N	175.8W	50	16	49	58			
94081200	15	12.9N	176.5W	55	41	67				
94081206	16	12.7N	177.4W	60	11	41				
94081212	17	12.5N	178.3W	65	11					
94081218	18	12.4N	179.3W	65	6					
			AVERAGE		13	51	98	168	242	403
			# CASES		18	15	13	11	9	5

VERIFICATION STATISTICS FOR HURRICANE LI

STATISTICS FOR CLIP VS. BEST TRACK

DTG	WRN NO.	BEST TRACK LAT	LONG	WIND	POSITION ERRORS 00	12	24	36	48	72
94080812	1	13.5N	164.8W	40	29	34	81	105	116	228
94080818	2	13.5N	166.3W	45	6	40	64	99	110	202
94080900	3	13.6N	167.5W	50	5	44	65	116	141	259
94080906	4	13.6N	168.2W	50	8	8	8	58	67	183
94080912	5	13.6N	169.1W	45	5	16	17	64	51	177
94080918	6	13.6N	170.0W	45	0	13	48	70	74	189
94081000	7	13.5N	171.0W	45	6	34	70	79	106	
94081006	8	13.6N	171.6W	45	23	76	99	127	138	
94081012	9	13.7N	172.2W	45	13	41	37	102	156	
94081018	10	13.9N	172.7W	50	0	29	72	144	227	
94081100	11	13.9N	173.3W	50	11	68	130	199		
94081106	12	13.8N	174.2W	45	13	54	104	149		
94081112	13	13.6N	175.1W	45	26	76	96			
94081118	14	13.4N	175.8W	50	16	58	74			
94081200	15	12.9N	176.5W	55	41	51				
94081206	16	12.7N	177.4W	60	11	53				
94081212	17	12.5N	178.3W	65	11					
94081218	18	12.4N	179.3W	65	6					
			AVERAGE		13	43	69	109	119	206
			# CASES		18	16	14	12	10	6

VERIFICATION STATISTICS FOR HURRICANE LI

STATISTICS FOR BAMD VS. BEST TRACK

DTG	WRN NO.	BEST TRACK LAT	LONG	WIND	POSITION ERRORS 00	12	24	36	48	72
94080812	1	13.5N	164.8W	40	29	34	66	114	174	363
94080818	2	13.5N	166.3W	45	6	33	54	90	131	290
94080900	3	13.6N	167.5W	50	5	42	64	109	158	349
94080906	4	13.6N	168.2W	50	8	24	62	107	167	323
94080912	5	13.6N	169.1W	45	5	36	85	146	191	363
94080918	6	13.6N	170.0W	45	0	34	96	169	247	419
94081000	7	13.5N	171.0W	45	6	58	125	187	290	
94081006	8	13.6N	171.6W	45	23	65	101	160	266	
94081012	9	13.7N	172.2W	45	13	63	112	216	306	
94081018	10	13.9N	172.7W	50	0	43	106	209	296	
94081100	11	13.9N	173.3W	50	11	68	168	276		
94081106	12	13.8N	174.2W	45	13	54	123	195		
94081112	13	13.6N	175.1W	45	26	66	134			
94081118	14	13.4N	175.8W	50	16	94	142			
94081200	15	12.9N	176.5W	55	41	91				
94081206	16	12.7N	177.4W	60	11	13				
94081212	17	12.5N	178.3W	65	11					
94081218	18	12.4N	179.3W	65	6					
			AVERAGE		13	51	103	165	223	351
			# CASES		18	16	14	12	10	6

VERIFICATION STATISTICS FOR HURRICANE LI

STATISTICS FOR BAMM VS. BEST TRACK

DTG	WRN NO.	BEST TRACK LAT	LONG	WIND	POSITION ERRORS 00	12	24	36	48	72
94080812	1	13.5N	164.8W	40	29	36	89	156	238	432
94080818	2	13.5N	166.3W	45	6	47	105	167	225	351
94080900	3	13.6N	167.5W	50	5	68	121	191	254	397
94080906	4	13.6N	168.2W	50	8	40	98	155	212	364
94080912	5	13.6N	169.1W	45	5	51	122	184	231	410
94080918	6	13.6N	170.0W	45	0	50	117	188	263	413
94081000	7	13.5N	171.0W	45	6	71	143	206	301	
94081006	8	13.6N	171.6W	45	23	70	102	163	261	
94081012	9	13.7N	172.2W	45	13	73	113	213	289	
94081018	10	13.9N	172.7W	50	0	40	100	200	288	
94081100	11	13.9N	173.3W	50	11	61	162	263		
94081106	12	13.8N	174.2W	45	13	46	112	178		
94081112	13	13.6N	175.1W	45	26	54	109			
94081118	14	13.4N	175.8W	50	16	80	112			
94081200	15	12.9N	176.5W	55	41	79				
94081206	16	12.7N	177.4W	60	11	25				
94081212	17	12.5N	178.3W	65	11					
94081218	18	12.4N	179.3W	65	6					
			AVERAGE		13	56	115	189	256	395
			# CASES		18	16	14	12	10	6

VERIFICATION STATISTICS FOR HURRICANE LI

STATISTICS FOR BAMS VS. BEST TRACK

	WRN	BEST TRACK			POSITION ERRORS					
DTG	NO.	LAT	LONG	WIND	00	12	24	36	48	72
94080812	1	13.5N	164.8W	40	29	45	112	187	285	470
94080818	2	13.5N	166.3W	45	6	66	146	229	303	439
94080900	3	13.6N	167.5W	50	5	87	172	250	324	460
94080906	4	13.6N	168.2W	50	8	64	143	199	259	418
94080912	5	13.6N	169.1W	45	5	75	146	212	271	455
94080918	6	13.6N	170.0W	45	0	66	125	177	253	402
94081000	7	13.5N	171.0W	45	6	75	134	191	296	
94081006	8	13.6N	171.6W	45	23	66	96	156	245	
94081012	9	13.7N	172.2W	45	13	63	104	197	272	
94081018	10	13.9N	172.7W	50	0	32	91	193	264	
94081100	11	13.9N	173.3W	50	11	58	156	246		
94081106	12	13.8N	174.2W	45	13	62	128	184		
94081112	13	13.6N	175.1W	45	26	62	120			
94081118	14	13.4N	175.8W	50	16	93	130			
94081200	15	12.9N	176.5W	55	41	85				
94081206	16	12.7N	177.4W	60	11	13				
94081212	17	12.5N	178.3W	65	11					
94081218	18	12.4N	179.3W	65	6					
			AVERAGE		13	63	129	202	277	441
			# CASES		18	16	14	12	10	6

VERIFICATION STATISTICS FOR HURRICANE LI

STATISTICS FOR P91E VS. BEST TRACK

	WRN	BEST TRACK			POSITION ERRORS					
DTG	NO.	LAT	LONG	WIND	00	12	24	36	48	72
94080812	1	13.5N	164.8W	40	29	24	55	46	52	142
94080818	2	13.5N	166.3W	45	6	29	41	50	75	187
94080900	3	13.6N	167.5W	50	5	39	42	78	83	203
94080906	4	13.6N	168.2W	50	8	21	29	56	126	271
94080912	5	13.6N	169.1W	45	5	21	11	52	83	198
94080918	6	13.6N	170.0W	45	0	8	35	79	151	265
94081000	7	13.5N	171.0W	45	6	29	65	71	126	
94081006	8	13.6N	171.6W	45	23	70	81	109	170	
94081012	9	13.7N	172.2W	45	13	35	34	110	186	
94081018	10	13.9N	172.7W	50	0	25	69	174	291	
94081100	11	13.9N	173.3W	50	11	71	140	234		
94081106	12	13.8N	174.2W	45	13	58	122	204		
94081112	13	13.6N	175.1W	45	26	67	72			
94081118	14	13.4N	175.8W	50	16	56	90			
94081200	15	12.9N	176.5W	55	41	48				
94081206	16	12.7N	177.4W	60	11	52				
94081212	17	12.5N	178.3W	65	11					
94081218	18	12.4N	179.3W	65	6					
			AVERAGE		13	41	63	105	134	211
			# CASES		18	16	14	12	10	6

VERIFICATION STATISTICS FOR HURRICANE LI

STATISTICS FOR PSS VS. BEST TRACK

DTG	WRN NO.	BEST TRACK LAT	LONG	WIND	POSITION ERRORS 00	12	24	36	48	72
94080812	1	13.5N	164.8W	40	29	36	86	107	127	192
94080818	2	13.5N	166.3W	45	6	41	66	99	104	159
94080900	3	13.6N	167.5W	50	5	52	75	120	142	245
94080906	4	13.6N	168.2W	50	8	18	32	71	94	222
94080912	5	13.6N	169.1W	45	5	26	37	79	108	248
94080918	6	13.6N	170.0W	45	0	16	53	81	111	235
94081000	7	13.5N	171.0W	45	6	35	76	92	149	
94081006	8	13.6N	171.6W	45	23	75	99	125	157	
94081012	9	13.7N	172.2W	45	13	42	61	136	205	
94081018	10	13.9N	172.7W	50	0	29	82	164	248	
94081100	11	13.9N	173.3W	50	11	71	136	208		
94081106	12	13.8N	174.2W	45	13	51	112	170		
94081112	13	13.6N	175.1W	45	26	79	106			
94081118	14	13.4N	175.8W	50	16	70	103			
94081200	15	12.9N	176.5W	55	41	66				
94081206	16	12.7N	177.4W	60	11	50				
94081212	17	12.5N	178.3W	65	11					
94081218	18	12.4N	179.3W	65	6					
			AVERAGE		13	47	80	121	144	217
			# CASES		18	16	14	12	10	6

VERIFICATION STATISTICS FOR HURRICANE JOHN

STATISTICS FOR CPHC VS. BEST TRACK

	WRN	BEST TRACK			POSITION ERRORS					
DTG	NO.	LAT	LONG	WIND	00	12	24	36	48	72
94081500	1	13.8N	110.2W	45	29	25	41	66	90	85
94081506	2	13.8N	111.0W	50	5	26	58	104	130	162
94081512	3	13.7N	111.9W	45	8	21	49	96	141	157
94081518	4	13.6N	112.8W	45	52	73	116	177	237	162
94081600	5	13.6N	113.8W	45	55	8	21	88	144	117
94081606	6	13.6N	114.7W	45	23	18	29	83	92	144
94081612	7	13.7N	115.6W	45	16	44	97	128	94	174
94081618	8	13.6N	116.4W	45	6	42	96	109	62	88
94081700	9	13.8N	117.2W	50	8	58	100	66	29	90
94081706	10	14.2N	118.0W	50	5	23	11	39	99	216
94081712	11	14.6N	118.8W	50	30	25	41	77	151	287
94081718	12	15.0N	119.8W	45	13	30	88	170	245	348
94081800	13	15.3N	120.9W	45	8	66	134	204	262	378
94081806	14	15.3N	122.3W	40	16	49	112	158	199	284
94081812	15	15.3N	124.0W	40	5	57	110	142	166	237
94081818	16	15.3N	125.7W	40	18	42	78	97	151	238
94081900	17	15.3N	127.5W	45	18	41	58	47	50	216
94081906	18	15.1N	129.2W	50	13	13	11	21	45	146
94081912	19	15.1N	130.8W	55	5	21	26	16	42	117
94081918	20	15.1N	132.5W	60	5	29	34	36	36	80
94082000	21	15.0N	134.0W	65	6	11	34	52	75	91
94082006	22	15.0N	135.6W	75	6	5	16	46	83	79
94082012	23	15.0N	137.2W	85	8	6	32	56	75	105
94082018	24	15.0N	138.9W	100	0	13	36	66	80	95
94082100	25	15.0N	140.6W	100	6	32	55	66	68	42
94082106	26	14.8N	142.1W	115	21	51	91	117	94	72
94082112	27	14.6N	143.8W	120	11	17	29	25	16	44
94082118	28	14.4N	145.5W	125	0	21	40	30	24	80
94082200	29	14.2N	147.5W	130	0	25	30	24	23	115
94082206	30	14.0N	149.0W	130	0					
94082212	31	14.0N	150.8W	130	6	24	33	63	94	146
94082218	32	13.9N	152.3W	140	0	29	37	70	108	180
94082300	33	14.0N	153.7W	140	0	21	30	39	71	124
94082306	34	14.2N	155.1W	150	0	11	13	46	87	133
94082312	35	14.4N	156.7W	150	5	16	28	75	99	123
94082318	36	14.6N	158.1W	145	0	18	54	102	130	178
94082400	37	14.9N	159.3W	140	0	13	35	54	80	84
94082406	38	15.1N	160.6W	140	0	23	49	72	95	117
94082412	39	15.3N	161.8W	125	0	26	54	90	130	105
94082418	40	15.6N	162.9W	125	12	13	24	24	33	20
94082500	41	15.8N	163.9W	120	5	13	41	45	49	30
94082506	42	16.1N	165.0W	105	6	23	38	62	95	148
94082512	43	16.3N	166.3W	100	11	16	29	56	90	219
94082518	44	16.5N	167.6W	100	0	5	23	42	72	132
94082600	45	16.8N	168.8W	85	0	12	30	54	90	143
94082606	46	17.1N	169.9W	80	0	34	67	98	131	156
94082612	47	17.5N	171.1W	75	13	45	75	103	143	162
94082618	48	18.0N	172.5W	70	0	17	50	90	118	168
94082700	49	18.5N	173.7W	85	6	11	26	76	102	179
94082706	50	19.0N	175.1W	90	8	28	36	63	93	188
94082712	51	19.6N	176.2W	100	18	43	73	95	132	281
94082718	52	20.2N	177.3W	110	5	28	53	69	112	275
94082800	53	20.8N	178.5W	115	0	8	48	93	160	352
94082806	54	21.6N	179.6W	100	0	12	50	97	180	373
94090812	55	30.8N	179.7E	55	15	66	207	328		
94090818	56	31.5N	178.9W	70	19	64	258			
94090900	57	32.7N	177.4W	80	0	120	228			
94090906	58	34.2N	176.0W	65	0	143				
94090912	59	37.0N	174.0W	65	0					
94090918	60	39.5N	172.3W	75	9					
94091000	61	41.5N	171.0W	60	0					
			AVERAGE		9	31	60	82	104	160
			# CASES		61	57	56	54	53	53

VERIFICATION STATISTICS FOR HURRICANE JOHN

STATISTICS FOR CLIP VS. BEST TRACK

DTG	WRN NO.	BEST TRACK LAT	LONG	WIND	POSITION ERRORS 00	12	24	36	48	72
94081500	1	13.8N	110.2W	45	29	41	63	71	79	78
94081506	2	13.8N	111.0W	50	5	17	41	81	92	110
94081512	3	13.7N	111.9W	45	8	25	50	92	117	108
94081518	4	13.6N	112.8W	45	52	78	109	151	208	139
94081600	5	13.6N	113.8W	45	55	84	102	99	113	306
94081606	6	13.6N	114.7W	45	23	24	18	21	35	226
94081612	7	13.7N	115.6W	45	16	42	78	84	25	143
94081618	8	13.6N	116.4W	45	6	40	64	48	84	245
94081700	9	13.8N	117.2W	50	8	42	55	55	139	297
94081706	10	14.2N	118.0W	50	5	25	63	160	273	444
94081712	11	14.6N	118.8W	50	30	50	145	258	374	556
94081718	12	15.0N	119.8W	45	13	75	187	317	427	612
94081800	13	15.3N	120.9W	45	8	75	166	255	340	481
94081806	14	15.3N	122.3W	40	16	58	133	200	262	387
94081812	15	15.3N	124.0W	40	5	66	125	187	247	395
94081818	16	15.3N	125.7W	40	18	21	42	71	112	231
94081900	17	15.3N	127.5W	45	18	39	54	50	43	160
94081906	18	15.1N	129.2W	50	13	21	30	54	95	296
94081912	19	15.1N	130.8W	55	5	18	30	58	100	271
94081918	20	15.1N	132.5W	60	5	31	37	43	72	209
94082000	21	15.0N	134.0W	65	6	13	37	83	155	284
94082006	22	15.0N	135.6W	75	6	11	30	69	128	208
94082012	23	15.0N	137.2W	85	8	16	53	112	162	255
94082018	24	15.0N	138.9W	100	0	18	54	102	135	187
94082100	25	15.0N	140.6W	100	6	36	69	104	125	166
94082106	26	14.8N	142.1W	115	21					
94082112	27	14.6N	143.8W	120	11	21	37	42	63	93
94082118	28	14.4N	145.5W	125	0	21	33	29	52	52
94082200	29	14.2N	147.5W	130	0	23	58	75	93	114
94082206	30	14.0N	149.0W	130	0					
94082212	31	14.0N	150.8W	130	6	34	58	84	89	126
94082218	32	13.9N	152.3W	140	0	34	48	59	59	72
94082300	33	14.0N	153.7W	140	0	18	24	16	28	45
94082306	34	14.2N	155.1W	150	0	24	23	37	39	17
94082312	35	14.4N	156.7W	150	5	18	0	26	36	11
94082318	36	14.6N	158.1W	145	0	8	21	53	74	37
94082400	37	14.9N	159.3W	140	0	13	37	61	77	16
94082406	38	15.1N	160.6W	140	0	5	21	55	60	51
94082412	39	15.3N	161.8W	125	0	11	13	42	45	84
94082418	40	15.6N	162.9W	125	12	16	18	37	46	103
94082500	41	15.8N	163.9W	120	5	21	59	93	108	141
94082506	42	16.1N	165.0W	105	6	29	49	87	113	156
94082512	43	16.3N	166.3W	100	11	24	37	70	107	205
94082518	44	16.5N	167.6W	100	0	8	32	58	82	197
94082600	45	16.8N	168.8W	85	0	18	49	75	113	194
94082606	46	17.1N	169.9W	80	0	24	57	91	141	175
94082612	47	17.5N	171.1W	75	13	37	71	111	166	181
94082618	48	18.0N	172.5W	70	0	20	55	100	139	143
94082700	49	18.5N	173.7W	85	6	8	25	65	52	96
94082706	50	19.0N	175.1W	90	8	22	29	31	34	172
94082712	51	19.6N	176.2W	100	18	46	79	89	126	263
94082718	52	20.2N	177.3W	110	5	25	62	75	28	109
94082800	53	20.8N	178.5W	115	0	24	25	64	32	137
94082806	54	21.6N	179.6W	100	0	16	48	88	107	271
94090812	55	30.8N	179.7E	55	15	64	237	445		
94090818	56	31.5N	178.9W	70	19	126	347			
94090900	57	32.7N	177.4W	80	0	156	291			
94090906	58	34.2N	176.0W	65	0	200				
94090912	59	37.0N	174.0W	65	0	31				
94090918	60	39.5N	172.3W	75	9					
94091000	61	41.5N	171.0W	60	0					
			AVERAGE		9	37	69	94	116	193
			# CASES		61	57	55	53	52	52

VERIFICATION STATISTICS FOR HURRICANE JOHN

STATISTICS FOR BAMD VS. BEST TRACK

DTG	WRN NO.	BEST TRACK LAT	LONG	WIND	POSITION ERRORS 00	12	24	36	48	72
94081500	1	13.8N	110.2W	45	29	35	58	72	71	92
94081506	2	13.8N	111.0W	50	5	21	29	71	126	267
94081512	3	13.7N	111.9W	45	8	24	47	108	167	328
94081518	4	13.6N	112.8W	45	52	81	119	185	244	225
94081600	5	13.6N	113.8W	45	55	42	72	113	160	256
94081606	6	13.6N	114.7W	45	23	25	29	81	139	361
94081612	7	13.7N	115.6W	45	16	29	79	110	107	246
94081618	8	13.6N	116.4W	45	6	82	174	219	224	233
94081700	9	13.8N	117.2W	50	8	99	173	189	189	253
94081706	10	14.2N	118.0W	50	5	35	44	61	129	281
94081712	11	14.6N	118.8W	50	30	37	91	162	245	411
94081718	12	15.0N	119.8W	45	13	61	145	232	303	425
94081800	13	15.3N	120.9W	45	8	62	124	178	224	296
94081806	14	15.3N	122.3W	40	16	51	106	141	172	221
94081812	15	15.3N	124.0W	40	5	50	98	134	162	211
94081818	16	15.3N	125.7W	40	18	24	34	41	60	134
94081900	17	15.3N	127.5W	45	18	24	37	41	70	172
94081906	18	15.1N	129.2W	50	13	18	30	26	25	46
94081912	19	15.1N	130.8W	55	5	18	18	34	52	116
94081918	20	15.1N	132.5W	60	5	6	5	13	25	65
94082000	21	15.0N	134.0W	65	6	8	26	26	55	86
94082006	22	15.0N	135.6W	75	6	17	26	44	70	133
94082012	23	15.0N	137.2W	85	8	16	25	55	83	147
94082018	24	15.0N	138.9W	100	0	5	11	29	81	203
94082100	25	15.0N	140.6W	100	6	18	35	58	93	224
94082106	26	14.8N	142.1W	115	21	29	42	66	92	208
94082112	27	14.6N	143.8W	120	11	26	50	82	136	246
94082118	28	14.4N	145.5W	125	0	13	16	21	66	170
94082200	29	14.2N	147.5W	130	0	0	8	43	83	200
94082206	30	14.0N	149.0W	130	0					
94082212	31	14.0N	150.8W	130	6	13	43	83	119	184
94082218	32	13.9N	152.3W	140	0	11	39	65	91	142
94082300	33	14.0N	153.7W	140	0	26	47	78	95	163
94082306	34	14.2N	155.1W	150	0	41	52	60	46	41
94082312	35	14.4N	156.7W	150	5	26	37	42	29	40
94082318	36	14.6N	158.1W	145	0	47	78	84	86	69
94082400	37	14.9N	159.3W	140	0	47	75	83	72	48
94082406	38	15.1N	160.6W	140	0	34	51	82	85	103
94082412	39	15.3N	161.8W	125	0	13	33	62	83	115
94082418	40	15.6N	162.9W	125	12	12	23	22	29	38
94082500	41	15.8N	163.9W	120	5	21	33	33	33	23
94082506	42	16.1N	165.0W	105	6	25	24	16	18	62
94082512	43	16.3N	166.3W	100	11	17	5	8	30	101
94082518	44	16.5N	167.6W	100	0	13	11	18	24	85
94082600	45	16.8N	168.8W	85	0	5	21	26	41	84
94082606	46	17.1N	169.9W	80	0	23	30	53	77	134
94082612	47	17.5N	171.1W	75	13	30	43	56	92	132
94082618	48	18.0N	172.5W	70	0	13	24	54	90	150
94082700	49	18.5N	173.7W	85	6	8	24	66	83	162
94082706	50	19.0N	175.1W	90	8	22	36	58	89	165
94082712	51	19.6N	176.2W	100	18	24	64	81	113	202
94082718	52	20.2N	177.3W	110	5	18	36	48	85	201
94082800	53	20.8N	178.5W	115	0	30	36	60	113	242
94082806	54	21.6N	179.6W	100	0	8	54	101	188	344
94090812	55	30.8N	179.7E	55	15	66	228	345		
94090818	56	31.5N	178.9W	70	19	67	198			
94090900	57	32.7N	177.4W	80	0	108	139			
94090906	58	34.2N	176.0W	65	0	126				
94090912	59	37.0N	174.0W	65	0	75				
94090918	60	39.5N	172.3W	75	9					
94091000	61	41.5N	171.0W	60	0					
			AVERAGE		9	33	58	80	103	175
			# CASES		61	58	56	54	53	53

VERIFICATION STATISTICS FOR HURRICANE JOHN

STATISTICS FOR BAMM VS. BEST TRACK

DTG	WRN NO.	BEST TRACK LAT	LONG	WIND	POSITION ERRORS 00	12	24	36	48	72
94081500	1	13.8N	110.2W	45	29	29	39	51	84	163
94081506	2	13.8N	111.0W	50	5	29	70	136	208	342
94081512	3	13.7N	111.9W	45	8	44	96	175	247	381
94081518	4	13.6N	112.8W	45	52	98	168	270	382	447
94081600	5	13.6N	113.8W	45	55	30	102	203	295	365
94081606	6	13.6N	114.7W	45	23	16	29	81	131	288
94081612	7	13.7N	115.6W	45	16	35	86	118	112	247
94081618	8	13.6N	116.4W	45	6	94	194	273	300	333
94081700	9	13.8N	117.2W	50	8	112	206	248	273	324
94081706	10	14.2N	118.0W	50	5	39	57	58	113	252
94081712	11	14.6N	118.8W	50	30	34	71	117	193	337
94081718	12	15.0N	119.8W	45	13	53	125	209	275	402
94081800	13	15.3N	120.9W	45	8	67	129	193	249	366
94081806	14	15.3N	122.3W	40	16	37	88	120	156	196
94081812	15	15.3N	124.0W	40	5	46	93	125	149	185
94081818	16	15.3N	125.7W	40	18	30	42	60	60	81
94081900	17	15.3N	127.5W	45	18	29	42	50	34	54
94081906	18	15.1N	129.2W	50	13	17	37	46	54	90
94081912	19	15.1N	130.8W	55	5	13	29	26	34	79
94081918	20	15.1N	132.5W	60	5	21	29	59	70	77
94082000	21	15.0N	134.0W	65	6	23	53	81	76	107
94082006	22	15.0N	135.6W	75	6	8	5	21	44	76
94082012	23	15.0N	137.2W	85	8	0	5	36	52	103
94082018	24	15.0N	138.9W	100	0	21	30	30	18	85
94082100	25	15.0N	140.6W	100	6	30	32	25	11	125
94082106	26	14.8N	142.1W	115	21	32	50	53	52	155
94082112	27	14.6N	143.8W	120	11	24	41	47	87	201
94082118	28	14.4N	145.5W	125	0	37	59	54	87	153
94082200	29	14.2N	147.5W	130	0	24	36	39	64	154
94082206	30	14.0N	149.0W	130	0					
94082212	31	14.0N	150.8W	130	6	18	23	55	85	143
94082218	32	13.9N	152.3W	140	0	18	8	29	61	117
94082300	33	14.0N	153.7W	140	0	11	23	52	69	138
94082306	34	14.2N	155.1W	150	0	24	26	47	61	53
94082312	35	14.4N	156.7W	150	5	17	24	36	32	51
94082318	36	14.6N	158.1W	145	0	42	71	79	77	49
94082400	37	14.9N	159.3W	140	0	36	54	62	54	33
94082406	38	15.1N	160.6W	140	0					
94082412	39	15.3N	161.8W	125	0	11	30	54	72	101
94082418	40	15.6N	162.9W	125	12	17	18	33	18	22
94082500	41	15.8N	163.9W	120	5	18	30	37	33	34
94082506	42	16.1N	165.0W	105	6	11	5	30	52	135
94082512	43	16.3N	166.3W	100	11	5	29	54	79	162
94082518	44	16.5N	167.6W	100	0	12	29	46	81	135
94082600	45	16.8N	168.8W	85	0	20	49	62	84	126
94082606	46	17.1N	169.9W	80	0	30	55	85	114	144
94082612	47	17.5N	171.1W	75	13	36	49	64	96	81
94082618	48	18.0N	172.5W	70	0	23	58	98	122	177
94082700	49	18.5N	173.7W	85	6	18	45	88	103	171
94082706	50	19.0N	175.1W	90	8	28	58	85	123	201
94082712	51	19.6N	176.2W	100	18	41	87	118	144	232
94082718	52	20.2N	177.3W	110	5	24	50	67	104	209
94082800	53	20.8N	178.5W	115	0	39	60	84	134	227
94082806	54	21.6N	179.6W	100	0	11	73	140	255	434
94090812	55	30.8N	179.7E	55	15	91	274	442		
94090818	56	31.5N	178.9W	70	19	66	223			
94090900	57	32.7N	177.4W	80	0	126	198			
94090906	58	34.2N	176.0W	65	0	144				
94090912	59	37.0N	174.0W	65	0	84				
94090918	60	39.5N	172.3W	75	9					
94091000	61	41.5N	171.0W	60	0					
			AVERAGE		9	37	67	93	115	180
			# CASES		61	57	55	53	52	52

VERIFICATION STATISTICS FOR HURRICANE JOHN

STATISTICS FOR BAMS VS. BEST TRACK

DTG	WRN NO.	BEST TRACK LAT	LONG	WIND	POSITION ERRORS 00	12	24	36	48	72
94081500	1	13.8N	110.2W	45	29	16	65	107	151	208
94081506	2	13.8N	111.0W	50	5	42	94	178	254	393
94081512	3	13.7N	111.9W	45	8	57	123	214	299	436
94081518	4	13.6N	112.8W	45	52	122	210	322	430	520
94081600	5	13.6N	113.8W	45	55	42	142	261	372	475
94081606	6	13.6N	114.7W	45	23	17	52	111	171	262
94081612	7	13.7N	115.6W	45	16	40	100	157	163	224
94081618	8	13.6N	116.4W	45	6	106	215	313	352	411
94081700	9	13.8N	117.2W	50	8	124	232	292	325	412
94081706	10	14.2N	118.0W	50	5	36	63	66	107	217
94081712	11	14.6N	118.8W	50	30	41	74	114	174	285
94081718	12	15.0N	119.8W	45	13	56	120	205	272	404
94081800	13	15.3N	120.9W	45	8					
94081806	14	15.3N	122.3W	40	16	55	115	155	198	265
94081812	15	15.3N	124.0W	40	5	37	72	96	103	114
94081818	16	15.3N	125.7W	40	18	23	24	53	75	139
94081900	17	15.3N	127.5W	45	18	26	49	73	73	95
94081906	18	15.1N	129.2W	50	13	13	45	62	75	156
94081912	19	15.1N	130.8W	55	5	23	58	58	62	132
94081918	20	15.1N	132.5W	60	5	34	63	87	108	174
94082000	21	15.0N	134.0W	65	6	46	86	122	132	207
94082006	22	15.0N	135.6W	75	6	18	30	47	64	67
94082012	23	15.0N	137.2W	85	8	13	32	62	79	114
94082018	24	15.0N	138.9W	100	0	23	36	41	30	25
94082100	25	15.0N	140.6W	100	6	30	47	48	45	79
94082106	26	14.8N	142.1W	115	21	36	58	59	50	84
94082112	27	14.6N	143.8W	120	11	29	52	58	89	177
94082118	28	14.4N	145.5W	125	0	61	102	112	125	114
94082200	29	14.2N	147.5W	130	0	49	79	90	99	69
94082206	30	14.0N	149.0W	130	0					
94082212	31	14.0N	150.8W	130	6	24	37	44	70	82
94082218	32	13.9N	152.3W	140	0	6	30	39	18	51
94082300	33	14.0N	153.7W	140	0	21	32	37	18	52
94082306	34	14.2N	155.1W	150	0	44	73	77	67	103
94082312	35	14.4N	156.7W	150	5	18	42	23	29	96
94082318	36	14.6N	158.1W	145	0	62	110	131	150	133
94082400	37	14.9N	159.3W	140	0	57	87	111	120	85
94082406	38	15.1N	160.6W	140	0	46	67	101	104	138
94082412	39	15.3N	161.8W	125	0	34	74	113	136	208
94082418	40	15.6N	162.9W	125	12	5	12	41	45	84
94082500	41	15.8N	163.9W	120	5	13	33	59	66	110
94082506	42	16.1N	165.0W	105	6	5	23	43	69	156
94082512	43	16.3N	166.3W	100	11	20	60	90	126	227
94082518	44	16.5N	167.6W	100	0	31	62	91	130	183
94082600	45	16.8N	168.8W	85	0	41	78	104	125	198
94082606	46	17.1N	169.9W	80	0	30	47	73	97	111
94082612	47	17.5N	171.1W	75	13	42	60	78	110	103
94082618	48	18.0N	172.5W	70	0	42	86	127	169	225
94082700	49	18.5N	173.7W	85	6	36	78	133	150	237
94082706	50	19.0N	175.1W	90	8	33	53	80	123	219
94082712	51	19.6N	176.2W	100	18	38	81	113	145	246
94082718	52	20.2N	177.3W	110	5	23	39	63	109	243
94082800	53	20.8N	178.5W	115	0	42	70	109	174	305
94082806	54	21.6N	179.6W	100	0	8	81	180	315	539
94090812	55	30.8N	179.7E	55	15	81	246	419		
94090818	56	31.5N	178.9W	70	19	72	248			
94090900	57	32.7N	177.4W	80	0	139	246			
94090906	58	34.2N	176.0W	65	0	164				
94090912	59	37.0N	174.0W	65	0	104				
94090918	60	39.5N	172.3W	75	9					
94091000	61	41.5N	171.0W	60	0					
			AVERAGE		9	44	84	114	137	200
			# CASES		61	57	55	53	52	52

VERIFICATION STATISTICS FOR HURRICANE JOHN

STATISTICS FOR P91E VS. BEST TRACK

DTG	WRN NO.	BEST TRACK LAT	BEST TRACK LONG	BEST TRACK WIND	POSITION ERRORS 00	12	24	36	48	72
94081500	1	13.8N	110.2W	45	29	40	73	107	135	183
94081506	2	13.8N	111.0W	50	5	17	32	79	96	162
94081512	3	13.7N	111.9W	45	8	21	37	81	111	180
94081518	4	13.6N	112.8W	45	52	81	98	133	169	111
94081600	5	13.6N	113.8W	45	55	90	105	107	117	279
94081606	6	13.6N	114.7W	45	23	29	24	32	97	269
94081612	7	13.7N	115.6W	45	16	35	57	52	74	223
94081618	8	13.6N	116.4W	45	6	34	56	21	37	143
94081700	9	13.8N	117.2W	50	8	42	37	29	84	202
94081706	10	14.2N	118.0W	50	5	21	40	119	182	286
94081712	11	14.6N	118.8W	50	30	47	129	220	298	446
94081718	12	15.0N	119.8W	45	13	66	167	267	337	430
94081800	13	15.3N	120.9W	45	8	75	155	222	264	340
94081806	14	15.3N	122.3W	40	16	54	125	183	199	232
94081812	15	15.3N	124.0W	40	5	60	112	152	161	215
94081818	16	15.3N	125.7W	40	18	18	46	82	87	151
94081900	17	15.3N	127.5W	45	18	39	54	47	8	95
94081906	18	15.1N	129.2W	50	13	18	41	53	50	177
94081912	19	15.1N	130.8W	55	5	18	23	31	46	168
94081918	20	15.1N	132.5W	60	5	31	37	42	24	110
94082000	21	15.0N	134.0W	65	6	13	26	36	93	157
94082006	22	15.0N	135.6W	75	6	13	26	48	54	105
94082012	23	15.0N	137.2W	85	8	13	18	44	70	147
94082018	24	15.0N	138.9W	100	0	16	43	66	46	110
94082100	25	15.0N	140.6W	100	6	26	42	32	21	130
94082106	26	14.8N	142.1W	115	21	42	66	75	46	105
94082112	27	14.6N	143.8W	120	11	13	13	26	120	235
94082118	28	14.4N	145.5W	125	0	16	29	21	66	143
94082200	29	14.2N	147.5W	130	0	24	58	71	120	219
94082206	30	14.0N	149.0W	130	0					
94082212	31	14.0N	150.8W	130	6	34	62	112	151	236
94082218	32	13.9N	152.3W	140	0	34	43	51	67	128
94082300	33	14.0N	153.7W	140	0	18	36	61	102	191
94082306	34	14.2N	155.1W	150	0	24	29	29	30	57
94082312	35	14.4N	156.7W	150	5	24	24	37	62	151
94082318	36	14.6N	158.1W	145	0	5	21	49	62	125
94082400	37	14.9N	159.3W	140	0	11	35	46	73	183
94082406	38	15.1N	160.6W	140	0	5	26	66	75	75
94082412	39	15.3N	161.8W	125	0	11	13	49	66	70
94082418	40	15.6N	162.9W	125	12	13	30	66	60	75
94082500	41	15.8N	163.9W	120	5	21	53	72	53	50
94082506	42	16.1N	165.0W	105	6	31	54	70	42	85
94082512	43	16.3N	166.3W	100	11	20	20	29	55	157
94082518	44	16.5N	167.6W	100	0	8	21	33	60	171
94082600	45	16.8N	168.8W	85	0	18	54	84	126	226
94082606	46	17.1N	169.9W	80	0	24	49	71	103	167
94082612	47	17.5N	171.1W	75	13					
94082618	48	18.0N	172.5W	70	0	20	50	88	122	179
94082700	49	18.5N	173.7W	85	6	5	30	78	114	212
94082706	50	19.0N	175.1W	90	8	28	33	32	100	261
94082712	51	19.6N	176.2W	100	18	49	102	130	189	338
94082718	52	20.2N	177.3W	110	5	25	40	20	65	221
94082800	53	20.8N	178.5W	115	0	21	8	13	106	236
94082806	54	21.6N	179.6W	100	0	13	47	84	202	400
94090812	55	30.8N	179.7E	55	15	67	225	304		
94090818	56	31.5N	178.9W	70	19	113	257			
94090900	57	32.7N	177.4W	80	0	133	188			
94090906	58	34.2N	176.0W	65	0	165				
94090912	59	37.0N	174.0W	65	0	50				
94090918	60	39.5N	172.3W	75	9					
94091000	61	41.5N	171.0W	60	0					
			AVERAGE		9	35	60	78	102	187
			# CASES		61	57	55	53	52	52

VERIFICATION STATISTICS FOR HURRICANE JOHN

STATISTICS FOR PSS VS. BEST TRACK

	WRN	BEST TRACK			POSITION ERRORS					
DTG	NO.	LAT	LONG	WIND	00	12	24	36	48	72
94081500	1	13.8N	110.2W	45	29	36	62	74	90	84
94081506	2	13.8N	111.0W	50	5	23	49	85	104	110
94081512	3	13.7N	111.9W	45	8	29	58	100	125	101
94081518	4	13.6N	112.8W	45	52	74	110	152	189	89
94081600	5	13.6N	113.8W	45	55	89	104	87	91	269
94081606	6	13.6N	114.7W	45	23	26	8	18	18	208
94081612	7	13.7N	115.6W	45	16	42	81	92	33	151
94081618	8	13.6N	116.4W	45	6	25	46	21	66	252
94081700	9	13.8N	117.2W	50	8	42	53	36	111	257
94081706	10	14.2N	118.0W	50	5	21	52	137	237	391
94081712	11	14.6N	118.8W	50	30	47	137	245	332	450
94081718	12	15.0N	119.8W	45	13	70	176	288	373	491
94081800	13	15.3N	120.9W	45	8	71	157	236	311	422
94081806	14	15.3N	122.3W	40	16	54	134	194	249	358
94081812	15	15.3N	124.0W	40	5	62	125	183	242	365
94081818	16	15.3N	125.7W	40	18	30	50	84	124	232
94081900	17	15.3N	127.5W	45	18	45	62	68	84	213
94081906	18	15.1N	129.2W	50	13	32	54	82	136	328
94081912	19	15.1N	130.8W	55	5	30	48	82	141	312
94081918	20	15.1N	132.5W	60	5	34	41	60	107	251
94082000	21	15.0N	134.0W	65	6	24	50	102	183	303
94082006	22	15.0N	135.6W	75	6	18	41	90	154	245
94082012	23	15.0N	137.2W	85	8	21	56	122	179	262
94082018	24	15.0N	138.9W	100	0	24	60	109	160	220
94082100	25	15.0N	140.6W	100	6	36	81	112	149	187
94082106	26	14.8N	142.1W	115	21	48	85	115	133	158
94082112	27	14.6N	143.8W	120	11	25	40	56	79	93
94082118	28	14.4N	145.5W	125	0	34	53	56	87	104
94082200	29	14.2N	147.5W	130	0	29	65	57	57	36
94082206	30	14.0N	149.0W	130	0					
94082212	31	14.0N	150.8W	130	6	29	46	53	46	25
94082218	32	13.9N	152.3W	140	0	21	29	29	18	33
94082300	33	14.0N	153.7W	140	0	8	13	5	16	87
94082306	34	14.2N	155.1W	150	0	23	31	52	67	134
94082312	35	14.4N	156.7W	150	5	11	5	13	37	89
94082318	36	14.6N	158.1W	145	0	8	13	13	24	51
94082400	37	14.9N	159.3W	140	0	13	29	17	13	51
94082406	38	15.1N	160.6W	140	0	8	11	24	37	107
94082412	39	15.3N	161.8W	125	0	11	8	33	43	126
94082418	40	15.6N	162.9W	125	12	16	11	31	51	130
94082500	41	15.8N	163.9W	120	5	18	54	78	102	168
94082506	42	16.1N	165.0W	105	6	28	45	80	112	172
94082512	43	16.3N	166.3W	100	11	24	37	70	107	195
94082518	44	16.5N	167.6W	100	0	13	37	66	96	188
94082600	45	16.8N	168.8W	85	0	13	37	69	103	165
94082606	46	17.1N	169.9W	80	0	29	62	98	145	169
94082612	47	17.5N	171.1W	75	13					
94082618	48	18.0N	172.5W	70	0	24	53	100	137	140
94082700	49	18.5N	173.7W	85	6	13	34	84	79	97
94082706	50	19.0N	175.1W	90	8	28	56	78	78	146
94082712	51	19.6N	176.2W	100	18	53	89	103	130	220
94082718	52	20.2N	177.3W	110	5	32	74	72	52	131
94082800	53	20.8N	178.5W	115	0	26	22	42	10	80
94082806	54	21.6N	179.6W	100	0	5	34	58	140	259
94090812	55	30.8N	179.7E	55	15	50	222	394		
94090818	56	31.5N	178.9W	70	19	131	348			
94090900	57	32.7N	177.4W	80	0	132	264			
94090906	58	34.2N	176.0W	65	0	176				
94090912	59	37.0N	174.0W	65	0	60				
94090918	60	39.5N	172.3W	75	9					
94091000	61	41.5N	171.0W	60	0					
			AVERAGE		9	38	69	91	115	191
			# CASES		61	57	55	53	52	52

VERIFICATION STATISTICS FOR HURRICANE KRISTY

STATISTICS FOR CPHC VS. BEST TRACK

DTG	WRN NO.	BEST TRACK LAT	BEST TRACK LONG	BEST TRACK WIND	POSITION ERRORS 00	12	24	36	48	72
94083006	1	16.0N	133.4W	35	0	8	33	71	93	205
94083012	2	16.1N	135.0W	40	6	26	45	64	102	270
94083018	3	16.1N	136.6W	45	0	13	29	37	23	118
94083100	4	16.1N	138.3W	50	0	21	46	51	16	102
94083106	5	16.2N	139.8W	60	6					
94083112	6	16.3N	141.3W	65	17	52	57	62	128	202
94083118	7	16.4N	142.8W	85	0	20	50	133	181	
94090100	8	16.5N	144.1W	90	6	18	75	162	204	
94090106	9	16.5N	145.6W	90	5	29	101	151	179	
94090112	10	16.5N	147.0W	80	18	71	133	165	191	
94090118	11	16.3N	148.5W	70	44	120	183	212		
94090200	12	16.0N	150.2W	60	5	69	101	142		
94090206	13	15.5N	151.7W	50	6	54	87			
94090212	14	15.0N	153.2W	40	0	16	23			
94090218	15	14.9N	154.7W	35	0	13				
94090300	16	14.8N	156.2W	35	23	46				
94090306	17	14.8N	157.6W	35	5					
94090312	18	14.8N	158.9W	35	6					
			AVERAGE		8	38	74	114	124	179
			# CASES		18	15	13	11	9	5

VERIFICATION STATISTICS FOR HURRICANE KRISTY

STATISTICS FOR CLIP VS. BEST TRACK

DTG	WRN NO.	BEST TRACK LAT	BEST TRACK LONG	BEST TRACK WIND	POSITION ERRORS 00	12	24	36	48	72
94083006	1	16.0N	133.4W	35	0	24	54	83	121	267
94083012	2	16.1N	135.0W	40	6	37	53	79	121	290
94083018	3	16.1N	136.6W	45	0	13	21	29	46	171
94083100	4	16.1N	138.3W	50	0	21	37	33	18	157
94083106	5	16.2N	139.8W	60	6	18	21	6	80	212
94083112	6	16.3N	141.3W	65	17	40	54	74	150	252
94083118	7	16.4N	142.8W	85	0	12	49	125	199	
94090100	8	16.5N	144.1W	90	6	13	71	160	204	
94090106	9	16.5N	145.6W	90	5	37	120	184	239	
94090112	10	16.5N	147.0W	80	18	83	164	225	274	
94090118	11	16.3N	148.5W	70	44	116	183	232		
94090200	12	16.0N	150.2W	60	5					
94090206	13	15.5N	151.7W	50	6	36	82			
94090212	14	15.0N	153.2W	40	0	32	69			
94090218	15	14.9N	154.7W	35	0	30				
94090300	16	14.8N	156.2W	35	23	52				
94090306	17	14.8N	157.6W	35	5					
94090312	18	14.8N	158.9W	35	6					
			AVERAGE		8	38	75	112	145	225
			# CASES		18	15	13	11	10	6

VERIFICATION STATISTICS FOR HURRICANE KRISTY

STATISTICS FOR BAMD VS. BEST TRACK

DTG	WRN NO.	BEST TRACK LAT	LONG	WIND	POSITION ERRORS 00	12	24	36	48	72
94083006	1	16.0N	133.4W	35	0	36	84	139	190	386
94083012	2	16.1N	135.0W	40	6	49	87	132	201	394
94083018	3	16.1N	136.6W	45	0	21	34	46	69	127
94083100	4	16.1N	138.3W	50	0	23	40	69	122	200
94083106	5	16.2N	139.8W	60	6	29	29	35	100	215
94083112	6	16.3N	141.3W	65	17	16	12	37	106	187
94083118	7	16.4N	142.8W	85	0	38	90	175	253	
94090100	8	16.5N	144.1W	90	6	47	116	199	270	
94090106	9	16.5N	145.6W	90	5	53	140	215	278	
94090112	10	16.5N	147.0W	80	18	96	180	246	301	
94090118	11	16.3N	148.5W	70	44	142	222	300		
94090200	12	16.0N	150.2W	60	5	96	178	252		
94090206	13	15.5N	151.7W	50	6	74	117			
94090212	14	15.0N	153.2W	40	0	49	81			
94090218	15	14.9N	154.7W	35	0	52				
94090300	16	14.8N	156.2W	35	23	26				
94090306	17	14.8N	157.6W	35	5					
94090312	18	14.8N	158.9W	35	6					
			AVERAGE		8	53	101	154	189	252
			# CASES		18	16	14	12	10	6

VERIFICATION STATISTICS FOR HURRICANE KRISTY

STATISTICS FOR BAMM VS. BEST TRACK

DTG	WRN NO.	BEST TRACK LAT	LONG	WIND	POSITION ERRORS 00	12	24	36	48	72
94083006	1	16.0N	133.4W	35	0	36	73	98	121	252
94083012	2	16.1N	135.0W	40	6	46	71	86	127	262
94083018	3	16.1N	136.6W	45	0	17	18	26	30	114
94083100	4	16.1N	138.3W	50	0	13	23	25	36	108
94083106	5	16.2N	139.8W	60	6	18	8	18	90	204
94083112	6	16.3N	141.3W	65	17	23	23	30	102	197
94083118	7	16.4N	142.8W	85	0	24	62	142	205	
94090100	8	16.5N	144.1W	90	6	17	67	121	152	
94090106	9	16.5N	145.6W	90	5	44	124	182	216	
94090112	10	16.5N	147.0W	80	18	75	154	187	212	
94090118	11	16.3N	148.5W	70	44	120	179	220		
94090200	12	16.0N	150.2W	60	5	81	110	129		
94090206	13	15.5N	151.7W	50	6	72	109			
94090212	14	15.0N	153.2W	40	0	23	36			
94090218	15	14.9N	154.7W	35	0	18				
94090300	16	14.8N	156.2W	35	23	31				
94090306	17	14.8N	157.6W	35	5					
94090312	18	14.8N	158.9W	35	6					
			AVERAGE		8	41	75	105	129	189
			# CASES		18	16	14	12	10	6

VERIFICATION STATISTICS FOR HURRICANE KRISTY

STATISTICS FOR BAMS VS. BEST TRACK

DTG	WRN NO.	BEST TRACK LAT	LONG	WIND	POSITION ERRORS 00	12	24	36	48	72
94083006	1	16.0N	133.4W	35	0	46	83	109	140	263
94083012	2	16.1N	135.0W	40	6	46	66	80	119	236
94083018	3	16.1N	136.6W	45	0	23	42	54	66	162
94083100	4	16.1N	138.3W	50	0	21	42	45	72	162
94083106	5	16.2N	139.8W	60	6	5	18	48	120	223
94083112	6	16.3N	141.3W	65	17	31	29	60	137	217
94083118	7	16.4N	142.8W	85	0	24	58	134	178	
94090100	8	16.5N	144.1W	90	6	31	87	157	188	
94090106	9	16.5N	145.6W	90	5	38	125	165	186	
94090112	10	16.5N	147.0W	80	18	83	165	188	217	
94090118	11	16.3N	148.5W	70	44	106	130	136		
94090200	12	16.0N	150.2W	60	5	78	92	106		
94090206	13	15.5N	151.7W	50	6	85	149			
94090212	14	15.0N	153.2W	40	0	54	95			
94090218	15	14.9N	154.7W	35	0	46				
94090300	16	14.8N	156.2W	35	23	64				
94090306	17	14.8N	157.6W	35	5					
94090312	18	14.8N	158.9W	35	6					
			AVERAGE		8	49	84	107	142	210
			# CASES		18	16	14	12	10	6

VERIFICATION STATISTICS FOR HURRICANE KRISTY

STATISTICS FOR P91E VS. BEST TRACK

DTG	WRN NO.	BEST TRACK LAT	LONG	WIND	POSITION ERRORS 00	12	24	36	48	72
94083006	1	16.0N	133.4W	35	0	23	34	66	95	196
94083012	2	16.1N	135.0W	40	6	30	29	36	69	178
94083018	3	16.1N	136.6W	45	0	13	18	13	29	125
94083100	4	16.1N	138.3W	50	0	21	45	45	26	74
94083106	5	16.2N	139.8W	60	6	18	24	13	53	149
94083112	6	16.3N	141.3W	65	17	40	60	59	97	155
94083118	7	16.4N	142.8W	85	0	12	48	145	242	
94090100	8	16.5N	144.1W	90	6	12	64	145	188	
94090106	9	16.5N	145.6W	90	5	37	117	202	268	
94090112	10	16.5N	147.0W	80	18	79	156	208	254	
94090118	11	16.3N	148.5W	70	44	116	188	262		
94090200	12	16.0N	150.2W	60	5	73	83	69		
94090206	13	15.5N	151.7W	50	6	31	52			
94090212	14	15.0N	153.2W	40	0	30	64			
94090218	15	14.9N	154.7W	35	0	30				
94090300	16	14.8N	156.2W	35	23	46				
94090306	17	14.8N	157.6W	35	5					
94090312	18	14.8N	158.9W	35	6					
			AVERAGE		8	38	70	105	132	146
			# CASES		18	16	14	12	10	6

VERIFICATION STATISTICS FOR HURRICANE KRISTY

STATISTICS FOR PSS VS. BEST TRACK

DTG	WRN NO.	BEST TRACK LAT	LONG	WIND	POSITION ERRORS 00	12	24	36	48	72
94083006	1	16.0N	133.4W	35	0	24	54	91	138	294
94083012	2	16.1N	135.0W	40	6	37	53	79	128	316
94083018	3	16.1N	136.6W	45	0	13	13	26	72	213
94083100	4	16.1N	138.3W	50	0	18	35	29	53	173
94083106	5	16.2N	139.8W	60	6	8	23	29	98	190
94083112	6	16.3N	141.3W	65	17	46	57	81	162	233
94083118	7	16.4N	142.8W	85	0	17	60	139	213	
94090100	8	16.5N	144.1W	90	6	12	69	158	210	
94090106	9	16.5N	145.6W	90	5	34	114	186	235	
94090112	10	16.5N	147.0W	80	18	78	165	225	279	
94090118	11	16.3N	148.5W	70	44	120	189	242		
94090200	12	16.0N	150.2W	60	5	87	125	140		
94090206	13	15.5N	151.7W	50	6	54	94			
94090212	14	15.0N	153.2W	40	0	11	34			
94090218	15	14.9N	154.7W	35	0	13				
94090300	16	14.8N	156.2W	35	23	52				
94090306	17	14.8N	157.6W	35	5					
94090312	18	14.8N	158.9W	35	6					
			AVERAGE		8	39	77	119	159	237
			# CASES		18	16	14	12	10	6

ACKNOWLEDGEMENTS

We would like to thank the Honolulu PRC contract staff, Daniel Eum and Jayne Hirakawa, for their help with the retrieval of archived satellite imagery that was used in this technical memorandum.

Also, several of the NHC staff, Max Mayfield and Jim Gross, were extremely valuable resources who willingly assisted the WSFO Honolulu personnel during the learning process of retrieving verification data from the ATCF for the 1994 hurricane season.

And finally, we appreciate the review of James L. Partain Jr., Regional Scientist for the Pacific Region Headquarters. His timely review has resulted in this tropical cyclone summary being published approximately five months sooner than previous summaries.

ACRONYMS

NHC/NMC MODELS

CPHC	Central Pacific Hurricane Center (forecaster)
CLIP	Climatology and Persistence (formerly EPCL84)
BAMD	Beta-Advection Model Deep Layer (mean layer averaged between 850MB and 250MB)
BAMM	Beta-Advection Model Medium Layer (mean layer averaged between 850MB and 400MB)
BAMS	Beta-Advection Model Shallow Layer (mean layer averaged between 850MB and 700MB)
P91E	Pacific Statistical Dynamic Model (adapted from NHC90 for East Pacific)
PSS	Pacific Statistical Synoptic (formerly EPSS87)
OFCL	Official forecast issued by the CPHC forecaster

No. 18 An Operational Message Composition System Using the N.W.S. Automatic Data Acquisition System (ADAS) Computer System. G. H. Hirata. April 1978. (PB-283-088)

No. 19 A Program to Compute Turbulence in the vicinity of Lee Waves Downstream of Selected Mountains in the Hawaiian Islands. Lawrence D. Burroughs. October 1978. (PB-289-792)

No. 20 Application of the Zero Relative Vorticity Line in Synoptic Forecasting. Hans E. Rosendal. August 1979. (PB-300-790)

No. 21 The Estimation of Cirrus Cloud Over Oahu. Michael J. Morrow. August 1980. (PB81-108-086)

No. 22 1980 Tropical Cyclones - Central Pacific. Andrew K. T. Chun. March 1981. (PB81-198-699)

No. 23 Some Mean Characteristics of Central North Pacific Tropical Cyclones. Hans E. Rosendal. June 1981. (PB81-230-492)

No. 24 Relationship of Maximum Sustained Winds to Minimum Sea Level Pressure in Central North Pacific Tropical Cyclones. H. E. Rosendal & S. L. Shaw. Feb. 1982. (PB82-193-160)

No. 25 1981 Tropical Cyclones - Central Pacific. Andrew K. T. Chun. February 1982. (PB82-195-306)

No. 26 A Statistical Analysis of Ala Moana Surf Heights. R. Y. G. Lee. May 1982. (PB82-229-196)

No. 27 1982 Tropical Cyclones - Central Pacific. Andrew K. T. Chun. March 1984. (PB84-175-512)

No. 28 Skywarn * Hawaii. M. J. Morrow. December 1984. (PB86-107-505)

No. 29 1983 Tropical Cyclones - Central North Pacific. W. Au, A. Chun, A. Inouye, H. Rosendal, T. Yamashiroya. Dec. 1985. (PB86-158-185/AS)

No. 30 1984 Tropical Cyclones - Central North Pacific. W. Au, A. Chun, A. Inouye, L. Iwai, H. Rosendal, T. Yamashiroya. March 1986. (PB86-183-951/AS)

No. 31 1985 Tropical Cyclones - Central North Pacific. W. Au, A. Chun, L. Iwai, H. Rosendal, T. Yamashiroya. May 1986. (PB86-202-215/AS)

No. 32 1986 Tropical Cyclones - Central North Pacific. W. Au, A. Chun, H. Rosendal, R. Sewake. April 1987. (PB87-187-209/AS)

No. 33 1987 Tropical Cyclones - Central North Pacific. W. Au, A. Chun, H. Rosendal. April 1988. (PB88-188-081/AS)

No. 34 1988 Tropical Cyclones - Central North Pacific. W. Au. A. Chun, H. Rosendal. May 1989. (PB89-195-945/AS)

No. 35 1989 Tropical Cyclones - Central North Pacific. A. Chun, R. Martin, H. Rosendal. February 1990. (PB90-182-536/AS)

No. 36 1990 Tropical Cyclones - Central North Pacific. A. Chun, R. Martin, H. Rosendal. April 1991. (PB91-184-564/AS)

No. 37 1991 Tropical Cyclones - Central North Pacific. A. Chun, R. Martin, H. Rosendal, G. Trapp. April 1992. (PB92-167-345/AS)

No. 38 1992 Tropical Cyclones - Central North Pacific. A. Chun, R. Martin, H. Rosendal, G. Trapp. June 1993. (PB93-208-940)

No. 39 1993 Tropical Cyclones - Central North Pacific. G. Trapp, A. Garza, H. Rosendal, B. Hablutzel, A. Chun, R. Martin. July 1994. (PB94-203080)

No. 40 A Comparison of Two Winter-Type Heavy Rainfall Events in Hawaii Kona Storm and Upper-Tropospheric Trough Flash Flood Producers. Armando L. Garza. January 1995. (PB95-166013)

NOAA SCIENTIFIC AND TECHNICAL PUBLICATIONS

The National Oceanic and Atmospheric Administration was established as part of the Department of Commerce on October 3, 1970. The mission responsibilities of NOAA are to assess the socioeconomic impact of natural and technological changes in the environment and to monitor and predict the state of the solid Earth, the oceans and their living resources, the atmosphere, and the space environment of the Earth.

The major components of NOAA regularly produce various types of scientific and technical information in the following kinds of publications:

PROFESSIONAL PAPERS—Important definitive research results, major techniques, and special investigations.

CONTRACT AND GRANT REPORTS—Reports prepared by contractors or grantees under NOAA sponsorship.

ATLAS—Presentation of analyzed data generally in the form of maps showing distribution of rainfall, chemical and physical conditions of oceans and atmosphere, distribution of fishes and marine mammals, ionospheric conditions, etc.

TECHNICAL SERVICE PUBLICATIONS—Reports containing data, observations, instructions, etc. A partial listing includes data serials; prediction and outlook periodicals; technical manuals, training papers, planning reports, and information serials; and miscellaneous technical publications.

TECHNICAL REPORTS—Journal quality with extensive details, mathematical developments, or data listings.

TECHNICAL MEMORANDUMS—Reports of preliminary, partial, or negative research or technology results, interim instructions, and the like.

Information on availability of NOAA publications can be obtained from:

PUBLICATION SERVICES BRANCH (E/AI13)
NATIONAL ENVIRONMENTAL SATELLITE, DATA, AND INFORMATION SERVICE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE

Washington, DC 20235