ANNUAL TYPHOON REPORT

1963

FLEET WEATHER CENTRAL / JOINT TYPHOON WARNING CENTER
Guam, Mariana Islands

U. S. FLEET WEATHER CENTRAL/
JOINT TYPHOON WARNING CENTER
COMNAVMARIANAS BOX 12
SAN FRANCISCO, CALIFORNIA

RICHARD M. CASSIDY
Captain, U.S. Navy

COMMANDING

ROLAND C. LAME
Lieutenant Colonel, USAF

DIRECTOR, JOINT TYPHOON WARNING CENTER

STAFF

Capt William D. Roper, USAF
Lt Thomas D. Deagan, USN
CHAERO J. M. Podbielski, USN
SMSGT Donald N. Seay, USAF
Raymond F. Martinson, AGCA, USN
TSGT Robert H. Lajoie, USAF
SSGT Robert M. McGill, USAF
SSGT Kenneth P. Hartless, USAF
Thomas J. Clemmer, AG3, USN
Robert J. Shannon, AG3, USN
Benjamin E. Taylor, AGAN, USN
Mrs Gail Upton, Secretary

1963

ANNUAL TYPHOON REPORT

U. S. FLEET WEATHER CENTRAL/
JOINT TYPHOON WARNING CENTER
COMNAVMARIANAS BOX 12
SAN FRANCISCO, CALIFORNIA

FWC/JTWC:RMC:gu
3140
Ser: 19
14 January 1963

From: Commanding Officer, U. S. Fleet Weather Central/ Joint Typhoon Warning Center, Guam, M. I.
To: Chief of Naval Operations
Via: Commander in Chief, U. S. Pacific Fleet

Subj: Annual Typhoon Report, 1963; submission of

Ref: (a) OPNAV INSTRUCTION 3140.17D

1. The Annual Typhoon Report, 1963, is submitted herewith in accordance with paragraph 4.a. of reference (a).

2. During calendar year 1963, a total of nineteen destructive typhoons, six tropical storms and three tropical depressions threatened the Western Pacific area, necessitating the issuance of 663 individual warnings and the placement of the FWC/JTWC, Guam, in "warning status" for 146 calendar days.

3. In comparison with past years, 1963 was an "average" year in numbers, although the intensity of certain typhoons continued to equal and in some cases surpass the so called "super-typhoons" of prior years.

R. M. CASSIDY

Copy to:

CNO (2)
COMSTS (2)
CINCPAC (1)
CINCPACFLT (2)
NAVOCEANO (2)
CINCLANTFLT (1)
OFFNAVWEASERV (50)
COMNAVMARIANAS (1)
COMTAIWANPATFOR/
COMFAIRWING ONE (1)
COMNAVPHIL (1)
COMNAVFORJAPAN (1)
COMNAVFOR KOREA (1)
COMSEVENTHFLT (10)
COMFIRSTFLT (1)
COMASWFORPAC (1)
COMSERVPAC (2)
COMNAVAIRPAC (17)
COMPHIBPAC (2)
COMWESTSEAFRON (1)
COMCRUDESPAC (1)
COMINPAC (1)
FLEWEACEN PEARL HARBOR (1)
FLEWEACEN ALAMEDA (1)
FLEWEACEN PORT LYAUTEY (1)
FLEWEACEN KODIAK (1)
FLEWEACEN SUITLAND (1)
FLEWEAFAC SANGLEY POINT (2)
FLEWEAFAC YOKOSUKA (2)
FLEWEAFAC MIAMI (1)
FLEWEAFAC SAN DIEGO (1)
NAVWEARSCHFAC (2)
FLENUMWEAFAC (2)
NAVREP, NWRC, ASHEVILLE (1)
SUPT, NAVPGSCOL (2)
AEWRON ONE (15)
AEWRON FOUR (1)
NAS BARBERS POINT (1)
NAS CUBI POINT (1)
NAS ATSUGI (1)
NAS AGANA (1)
MCAS KANEOHE BAY (1)
MCAS IWAKUNI (1)
HQ, AWS, SCOTT AFB (5)
HQ, 1WW (40)
HQ, 9TH WEA GRP (2)
55WRS (1)
56WRS (2)
54WRS (10)
HQ, THIRD AIR DIV (8)
HQ, 315TH AIR DIV (1)
HQ, 313TH AIR FIV (1)
3345TH TECH SCHOOL CHANUTE (3)
AFHLO, JHWC MIAMI (1)
CHIEF, JUSMAG THAILAND (2)
CHIEF, JUSMAG PHILIPPINES (2)
CHIEF, MAAG JAPAN (2)
CHIEF, MAAG TAIWAN (2)
CHIEF, MAAG KOREA (2)
CHINESE AF WEACEN TAIWAN (1)
FILE (15)

FOREWORD

This report is published annually and summarizes Western and Central North Pacific typhoons. During 1963, no typhoons or tropical storms were reported in the Central North Pacific.

The Joint Meteorological Group, Pacific Command, through CINCPACFLT, as executive agent, redesignated Fleet Weather Central, Guam as Fleet Weather Central/Joint Typhoon Warning Center (FWC/JTWC), Guam, effective 1 May 1959, with the following additional responsibilities:

1. To provide warnings to U. S. Government agencies for all tropical cyclones west of 180 degrees longitude north of the equator to the Asiatic coast and Malayan Peninsula.

2. To determine tropical cyclone reconnaissance requirements and assign priorities.

3. To conduct investigative and post analysis programs including preparation of the Annual Typhoon Report.

4. To conduct tropical cyclone forecasting and detection research as practicable.

Fuchu Air Force Weather Central, assisted as necessary by Fleet Weather Facility, Yokosuka, was designated as alternate JTWC in case of failure of FWC/JTWC, Guam.

The JTWC, which is an integral section of FWC/JTWC, Guam, is staffed by three Air Force and three Navy meteorologists and three enlisted men from each service. The senior Air Force officer has been designated as the Director, JTWC.

The Joint Hurricane Warning Center in Hawaii, a coordinated agency composed of the U. S. Weather Bureau, Honolulu, the Air Force Kunia Weather Center, and Fleet Weather Central, Pearl Harbor, is responsible for surveillance and issuance of warnings in the Central North Pacific area

TABLE OF CONTENTS

Chapter I		Operational Procedures	1
	A.	General	3
	B.	Analysis - FWC/JTWC	3
	C.	Forecast Aids	3
	D.	Warnings	8
Chapter II		Evaluation of Observational and Forecast Techniques	20
	A.	General	22
	B.	Surveillance Methods	22
	C.	Evaluation of the 1963 Season	23
	D.	Evaluation of Data	25
		1. Aerial Reconnaissance Data	25
		2. Land Radar	27
	E.	Communications	27
	F.	Evaluation of Numerical Weather Products for Typhoon Forecasting & Typhoon Tracks 1953-1963	29
Chapter III		Summary of Tropical Cyclones of 1963	47
Chapter IV		Individual Typhoons of 1963	71
	A.	OLIVE	73
	B.	POLLY	82
	C.	SHIRLEY	88
	D.	TRIX	96
	E.	WENDY	101
	F.	AGNES	109
	G.	BESS	114
	H.	CARMEN	124
	I.	DELLA	131
	J.	ELAINE	137
	K.	FAYE	142
	L.	GLORIA	148
	M.	JUDY	157
	N.	KIT	163
	O.	LOLA	169
	P.	MAMIE	179
	Q.	ORA	184
	R.	PHYLLIS	189
	S.	SUSAN	194
Appendix A		Abbreviations and Definitions	202
Appendix B		List of Illustrations, Charts and Data	207

CHAPTER I

OPERATIONAL PROCEDURES

A. GENERAL

Operational procedures involve the use of analysis and forecast aids, in the preparation sequence prior to issuing the warning. Within the Fleet Weather Central/ Joint Typhoon Warning Center (FWC/JTWC), the basic analysis is the responsibility of the Fleet Weather Central (FWC). Micro-analysis, forecast aid evaluation and the warnings as described below are the functions of the Joint Typhoon Warning Center (JTWC).

B. ANALYSIS - FWC/JTWC

1. Types of contour and/or streamline charts with standard times:

a. Surface, 0000Z, 0600Z, 1200Z and 1800Z.
b. Gradient level (2000 to 3000 ft above ground) 0000Z and 1200Z.
c. 850mb, 0000Z and 1200Z.
d. 700mb, 0000Z and 1200Z.
e. 500mb, 0000Z and 1200Z.
f. 300mb, 0000Z and 1200Z.
g. 200mb, 0000Z and 1200Z.

2. Cross Sections:

a. Checkerboards or Stidd Diagram.
b. Time Cross Sections analyzed for θe.
c. Space Cross Sections.

3. Micro-Analysis:

a. Sectional charts, hourly and 3-hourly as required.
b. Reconnaissance reports.

4. Easterly Wave Continuity Graph.

C. FORECAST AIDS

These are listed in alphabetical order and priority of importance is not indicated.

1. Climatology

Upon detection of a tropical cyclone and in preparation for issuance of the initial warning, a track based on climatology is developed. This track is prepared for a time interval of 4 or 5 days at the speed indicated by climatology. The following climatological publications are utilized when constructing the original forecast track for each cyclone:

a. Climatological Aid to Forecasting Typhoon Movement (1st Weather Wing)

b. Western Pacific Typhoon Tracks 1950-1959 (FWC/JTWC)

c. Far East Climatic Atlas (1st Weather Wing - February 1963)

d. Tropical Cyclones in the Western Pacific and China Sea Area (Royal Observatory, Hong Kong). This comprehensive publication covers 78 years of typhoon tracks.

Next, the track is modified in accordance with the existing and forecast upper air pattern, after which the initial warning is prepared and issued. The forecast track is extended and modified with time, as reconnaissance fixes are received and the synoptic upper air pattern changes.

2. Computer Products

During the 1963 Typhoon Season the following computer products were received and used extensively by JTWC:

a. From FNWF Monterey

(1) Steering Computations, or forecast positions, for 6, 12, 18, 24, 36, 48 and 72 hours for TD's, TS's and Typhoons (as requested by JTWC). These computations are prepared at 0000Z, 0600Z, 1200Z and 1800Z daily.

(2) 700mb, 500mb, 300mb and 200mb height and wind analysis

(3) 700mb, 500mb, 300mb and 200mb 24-hour prog

(4) 700mb, 500mb, 300mb and 200mb 36-hour prog

(5) 48-hour 500mb height and wind prog

(6) 72-hour 500mb height and wind prog.
(7) 500mb Long Wave Analysis and 48-hour prog.

All of the Monterey products are based on a Barotropic model. Items (2) and (7) are received twice daily for the synoptic times 0000Z and 1200Z.

b. From NMC Suitland

(1) 12-hour 500mb height, wind and vorticity prog.
(2) 24-hour 500mb height, wind and vorticity prog.
(3) 36-hour 500mb height, wind and vorticity prog.
(4) 48-hour 500mb height and wind prog.
(5) 72-hour 500mb height and wind prog.
(6) NWP Barotropic prog positions for typhoons for 12, 24, 36, 48, 60 and 72 hours.

All NMC items are received twice daily for the synoptic times 0000Z and 1200Z. All items are based on a Barotropic Model with the exception of items (4) and (5) which are based on a Baroclinic Model.

c. JTWC utilized computer steering computations, computer prognostic constant pressure charts and synoptic analyses as the main tools for forecasting typhoon movement during the 1963 season. (See Chapter II for an explanation and evaluation of techniques).

3. Coordination

Routine coordination with other U. S. agencies is obtained prior to issuance of a warning. When a circulation for which warnings are being issued is north of 25N, Fuchu Air Force Weather Central transmits coordination forecasts twice daily to JTWC. Coordination with other Air Force and Navy activities is on an "as required" basis, depending upon the location of a particular tropical cyclone.

4. Statistical Methods

The Miller-Moore and the Arakawa methods were used by JTWC early in the 1963 season, but as computer products became more numerous, these statistical methods were eliminated because of limited time and personnel.

5. Surveillance Systems

See Chapter II for evaluations of aerial reconnaissance, land radar and satellites.

6. Seay Graph

A hydrostatic graph was computed to check the eye data pressure reports from reconnaissance aircraft penetration. It was found that quite often the transmitted sea level pressure (SLP) was in error in excess of 10mb.

The graph for finding maximum surface winds was based on seven years of reconnaissance data. The data, 1956 through 1962, was used to modify the equation of Captain Limon E. Fortner, Jr. (1956), Typhoon Sara, Bulletin of the American Meteorological Society, Vol. 39, pp. 633-639.

The equation, $V_{max} = (19 - \frac{\theta}{5}) \sqrt{372 - \frac{H7\,(ft)}{28}}$

was obtained from a best fit basis.

Where: V_{max} = maximum surface winds
θ = latitude of cyclone
$H7$ = minimum 700mb height

The equation, $V_{max} = -100 + \sqrt{500V_7}$

Where: V_{max} = maximum surface wind within the cyclone
V_7 = maximum 700mb wind at penetration

for converting maximum 700mb wind at penetration to maximum surface winds within the cyclone was derived from the seven years of data. The equation is not defined when the 700mb wind is less than 20 kts.

A straight line correlation between the 700mb height and the SLP does not always exist. The temperature at the 700mb level can vary with the same 700mb height and this varies the SLP. To correlate the maximum surface wind with the minimum SLP, the temperature at the 700mb level (Tropical Storm 14°C, Typhoon 17°C, Super Typhoon 22°C) must be used for accuracy.

7. Work Chart

This is an operational and recording tool used in preparing tropical cyclone warnings. The basic chart is one of the Pacific Air Ways Plotting Chart series, plus 3 acetate overlays. All aircraft and land radar fixes are plotted on the basic chart. Twenty-four hour forecast positions are plotted on the bottom overlay, warning positions are plotted on the second overlay and the top overlay is utilized as a worksheet. Green, red and black china marking pencils are used on the three acetates for instantaneous visual reference.

8. Decay Graph

The decay of typhoon winds over land for Japan, Korea and Taiwan was developed from four years of data (1959-1962) based on best tracks prepared by JTWC. The following equation was used to fit the best track data to a family of curves:

$$V = C_1 \sum_{n=1}^{\infty} \left[Vn \left(e^{-C_2 Vn \bar{Z}} + e^{-C_3 t} + e^{-C_4 \frac{\sin \varphi}{r}} \frac{\overline{\partial P}}{\partial t} \right) \right]$$

Where:

V = Maximum wind speed in meters/second at any given time period

$\bar{Z}$ = Mean altitude of land mass above sea-level in meters

t = Time in seconds using a time period for each calculation of three hours and t=0 when wall cloud strikes land

φ = Latitude of land strike

r = Radius of curvature of storm in meters measured from storm center to last closed isobar.

$\overline{\frac{\partial P}{\partial t}}$ = Mean central pressure change with time such that at $t=0$, $\frac{\partial P}{\partial t} = 0$. $C_1 = .33$, $C_2 = C_3 = 10^{-5}$, $C_4 = 5X10^8$

D. WARNINGS

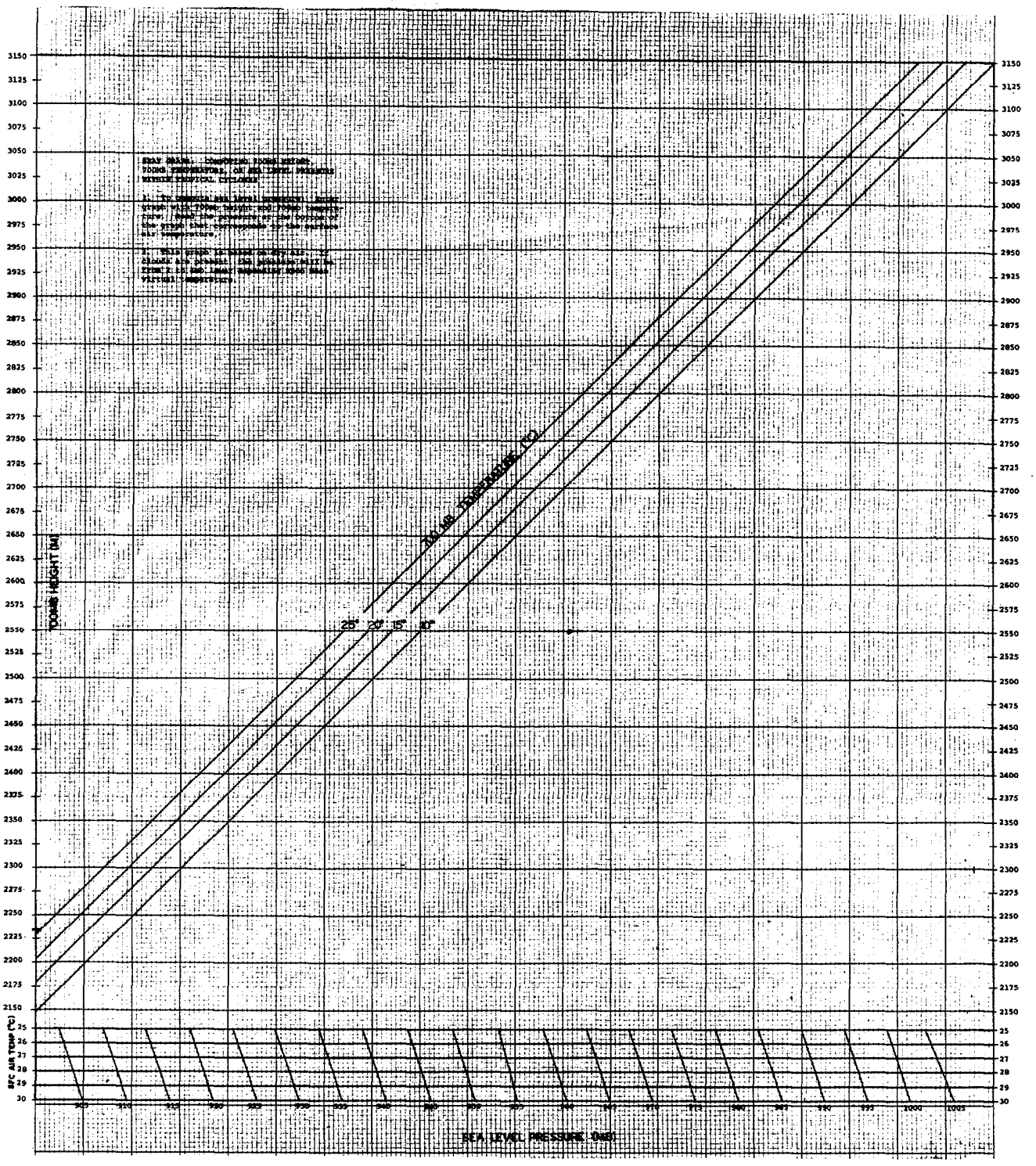
Warnings are filed and transmitted every six hours at synoptic times of 0000Z, 0600Z, 1200Z, and 1800Z. In accordance with CINCPAC INST 3140.1E, the message contains the present warning position of the tropical cyclone which is valid for the scheduled transmission time. This connotes that the 24 and 48 hour warning forecast positions are actually 30 and 54 hour forecasts from the last synoptic time.

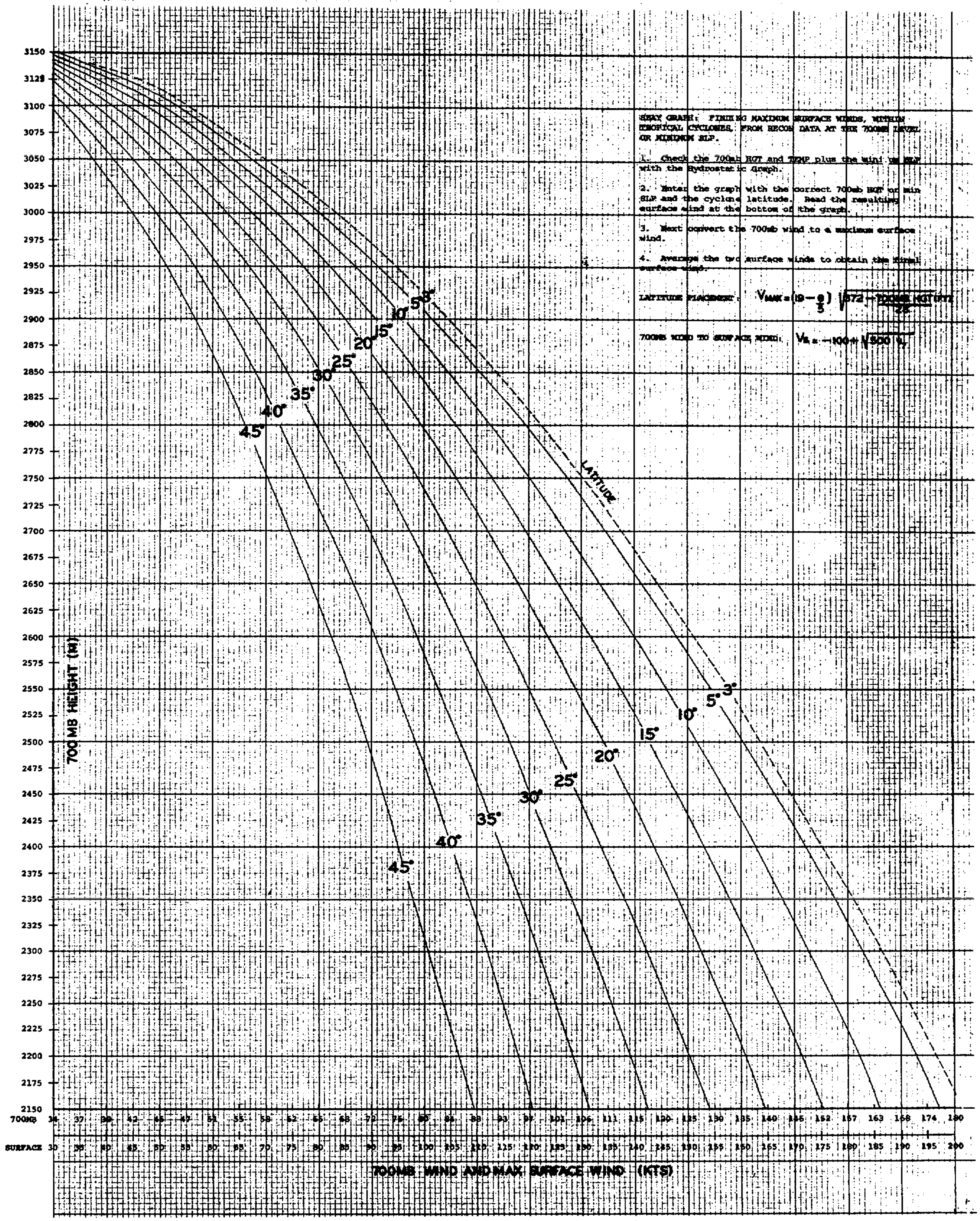
The warning position of a tropical cyclone is actually a short range forecast from the last "best" position. The last "best" position is usually about 2 hours old based on land radar, 2 to 3 hours old based on reconnaissance fixes, 3 to 6 hours old based on surface synoptic reports or 6 to 12 hours old based on upper-air synoptic reports. It is for this reason that the 0600Z warning, for example, may not agree with the position of the tropical cyclone as indicated by the 0600Z analysis. Amendments are issued when this difference is significant.

The numbers of tropical warnings run consecutively regardless of whether the cyclone is upgraded or downgraded from tropical depression, tropical storm or typhoon. If warnings are discontinued and the circulation regenerates, the new series of warnings are numbered consecutively from the number of the last warning of the previous series. As required, amendments and corrections are issued, and these are numbered the same as the warning which they amend or correct.

The 1963 Verification Summary is contained in Chapter III.

All 24, 48 and 72-hour forecasts made when a tropical cyclone is of tropical storm or typhoon intensity are verified against the "best" tracks at all latitudes through the last warning issued.


TOWER HEIGHT (M)
25°
20°
15°
10°
SEA LEVEL PRESSURE (MB)


FINDING MAXIMUM SURFACE WINDS, WITHIN TROPICAL CYCLONES, FROM RECON DATA AT THE 700MB LEVEL OR MINIMUM SLP.
1. Check the 700mb HGT and TEMP plus the wind with the Hydrostatic Graph.
2. Enter the graph with the correct 700mb HGT or min SLP and the cyclone latitude. Read the resulting surface wind at the bottom of the graph.
3. Next convert the 700mb wind to a maximum surface wind.
4. Average the two surface winds to obtain the final surface wind.
LATITUDE
700MB HEIGHT (M)
700MB WIND AND MAX SURFACE WIND (KTS)
700MB
SURFACE

$$V = C_1 \left[\sum_{n=1}^{\infty} Vn \left(e^{-C_2 Vn \bar{Z}} + e^{-C_3 t} + e^{-C_4 \frac{\sin \varphi}{r} \frac{\partial \bar{P}}{\partial t}} \right) \right]$$

Where:

V = Maximum wind speed in meters/second at any given time period

$\bar{Z}$ = Mean altitude of land mass above sea-level in meters

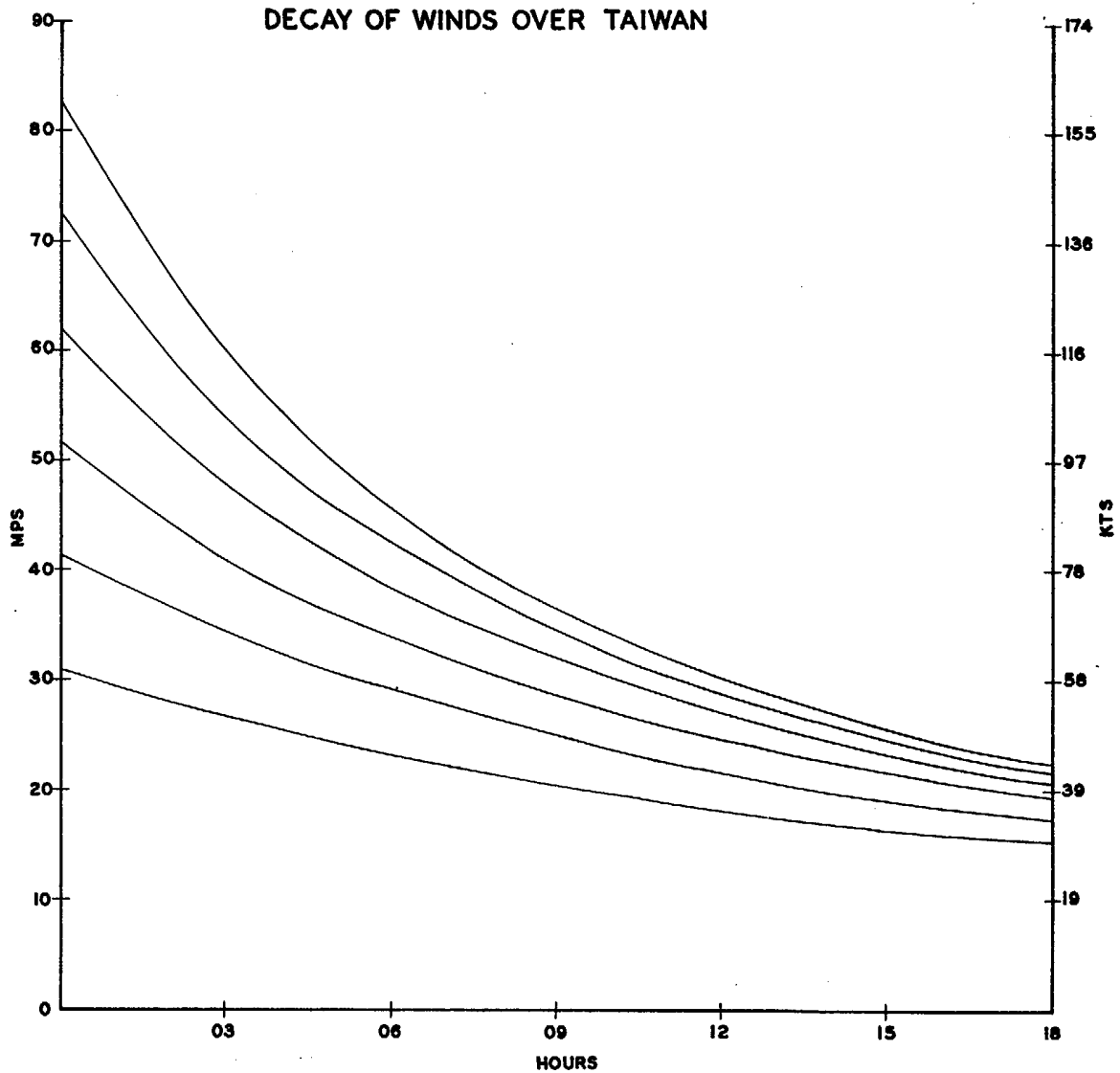
t = Time in seconds using a time period for each calculation of three hours and t=0 when wall cloud strikes land

φ = Latitude of land strike

r = Radius of curvature of storm in meters measured from storm center to last closed isobar

$\frac{\partial \bar{P}}{\partial t}$ = Mean central pressure change with time such that at t=0, $\frac{\partial P}{\partial t} = 0$. $C_1 = .33$,

$C_2 = C_3 = 10^{-5}$, $C_4 = 5 \times 10^8$



$$V = C_1 \left[\sum_{n=1}^{\infty} Vn \left(e^{-C_2 Vn \bar{Z}} + e^{-C_3 t} + e^{-C_4 \frac{\sin \varphi}{r} \frac{\overline{\partial P}}{\partial t}} \right) \right]$$

Where:

V = Maximum wind speed in meters/second at any given time period

$\bar{Z}$ = Mean altitude of land mass above sea-level in meters

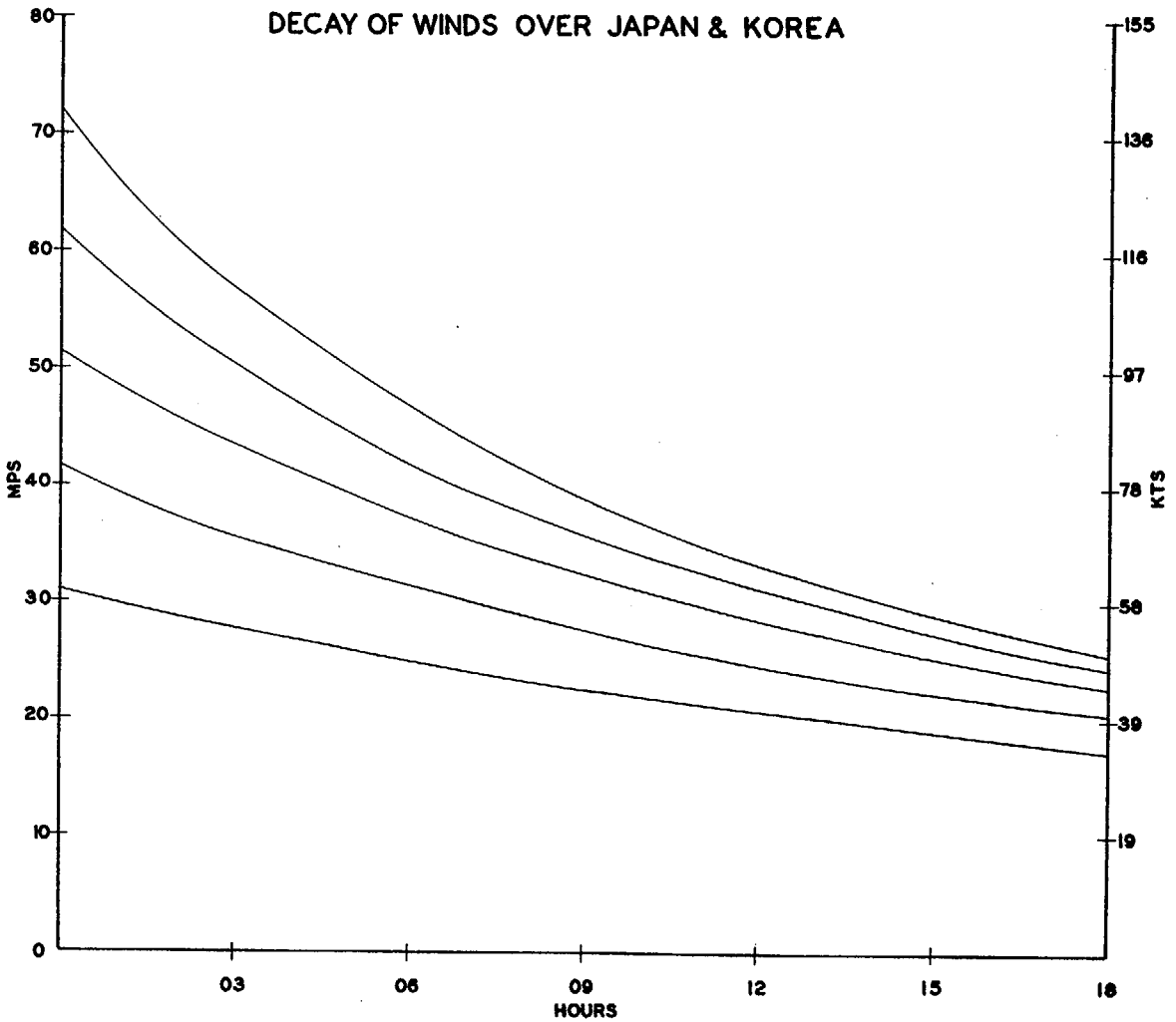
t = Time in seconds using a time period for each calculation of three hours and t=0 when wall cloud strikes land

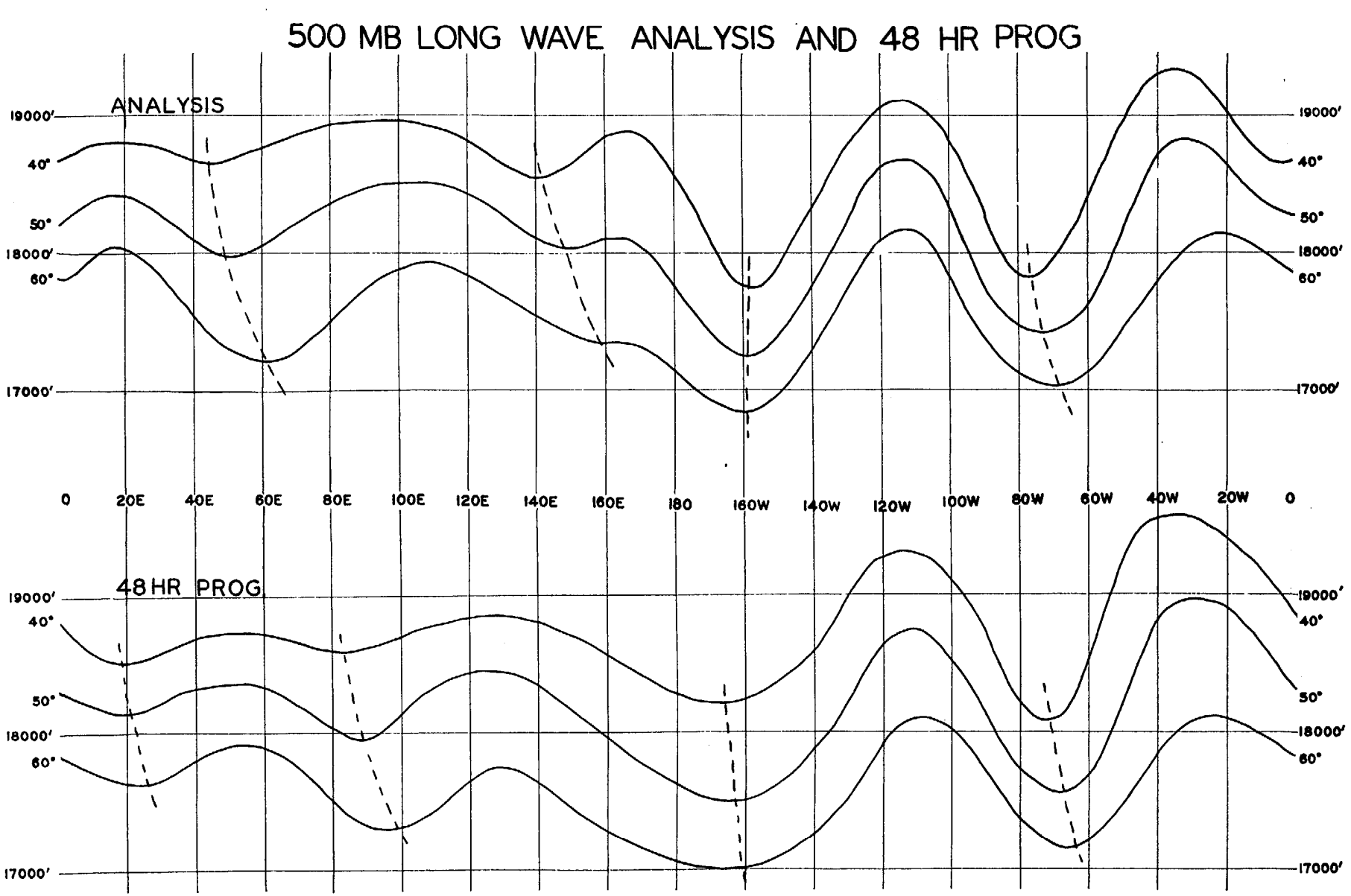
φ = Latitude of land strike

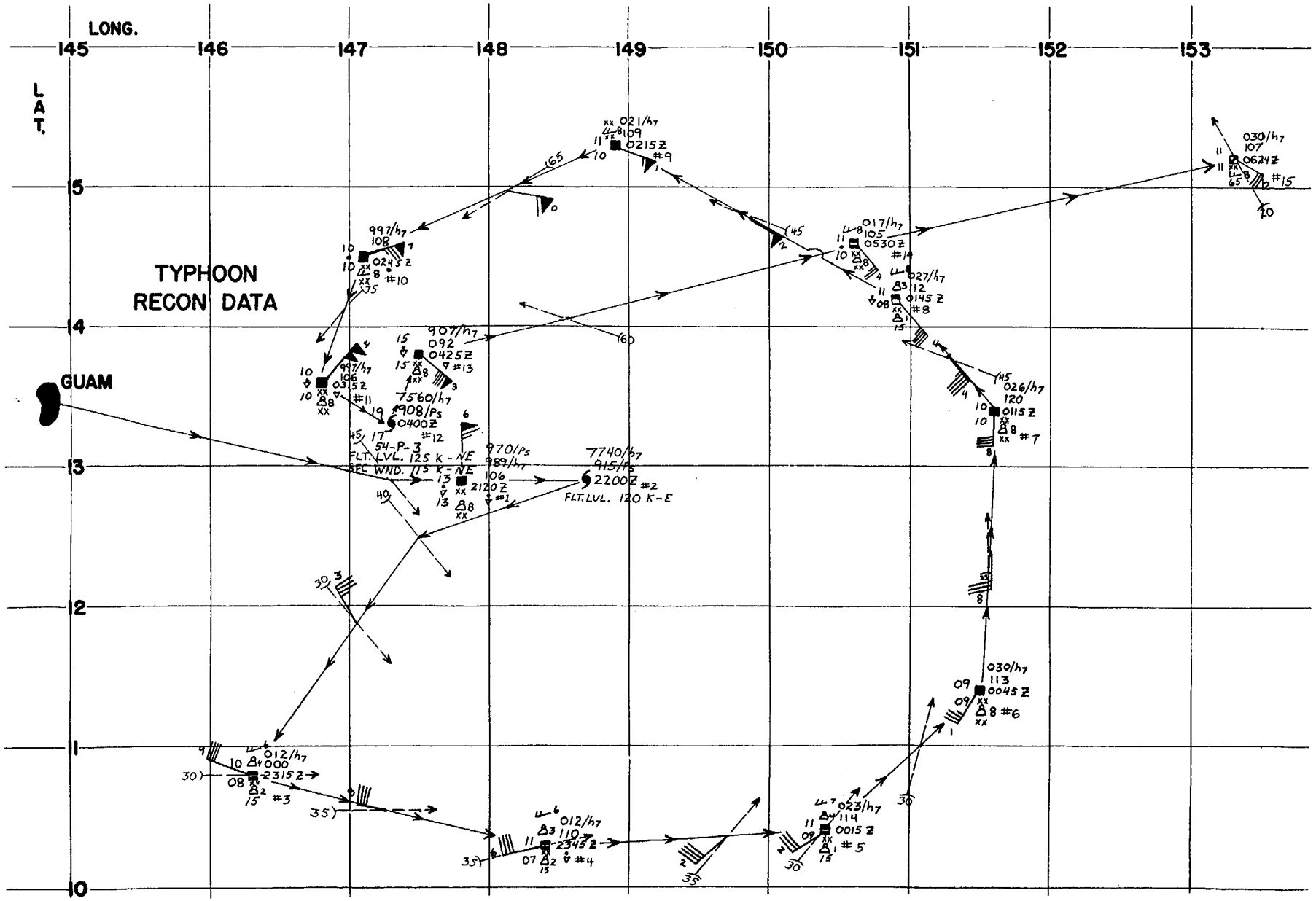
r = Radius of curvature of storm in meters measured from storm center to last closed isobar

$\frac{\overline{\partial P}}{\partial t}$ = Mean central pressure change with time such that at t=0, $\frac{\partial P}{\partial t} = 0$. $C_1 = .33$,

$C_2 = C_3 = 10^{-5}$, $C_4 = 5 \times 10^8$

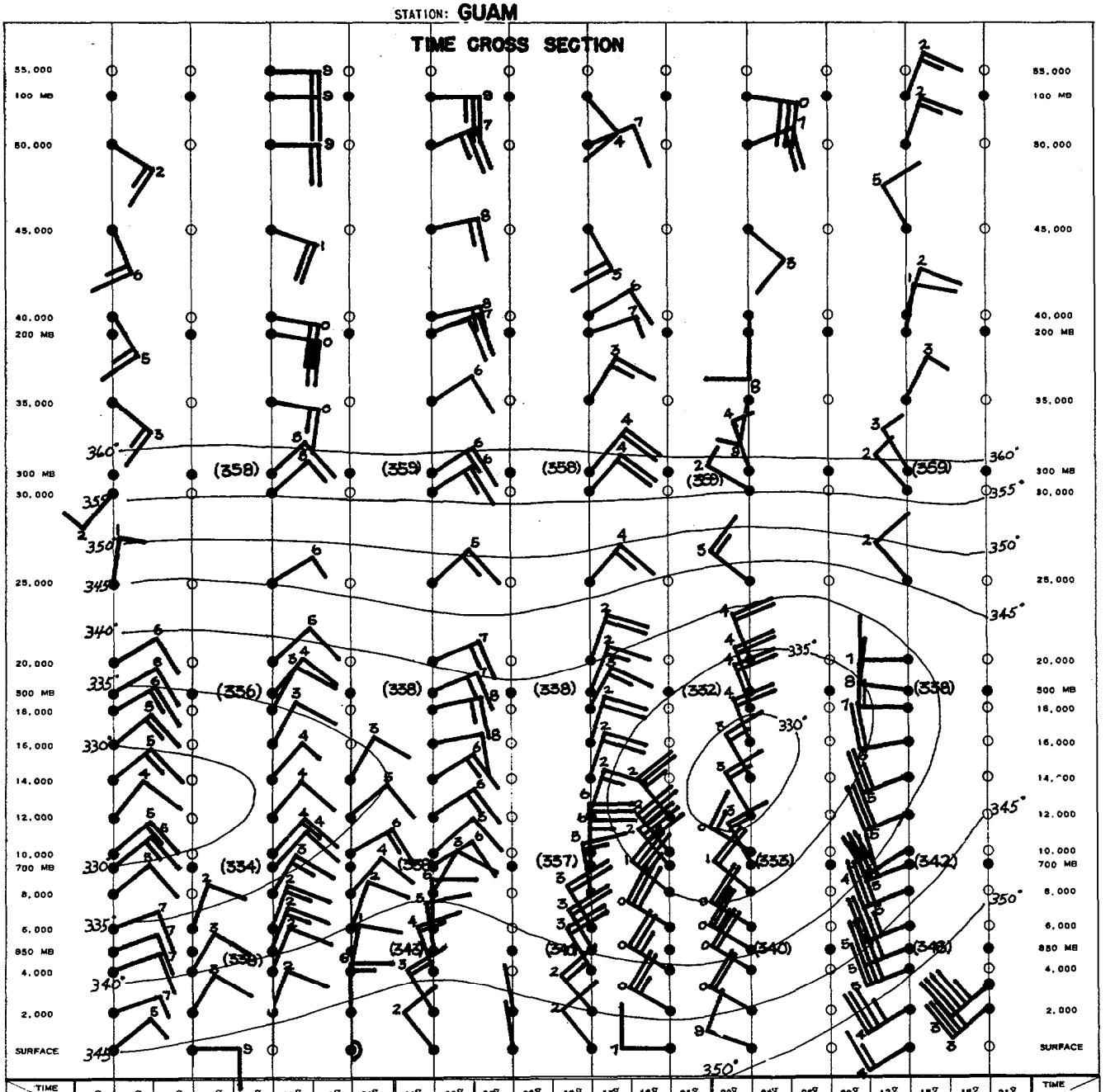



500 MB LONG WAVE ANALYSIS AND 48 HR PROG
ANALYSIS
19000'
40°
50°
18000'
60°
17000'
0
20E
40E
60E
80E
100E
120E
140E
160E
180
160W
140W
120W
100W
80W
60W
40W
20W
0
48 HR PROG
19000'
40°
50°
18000'
60°
17000'

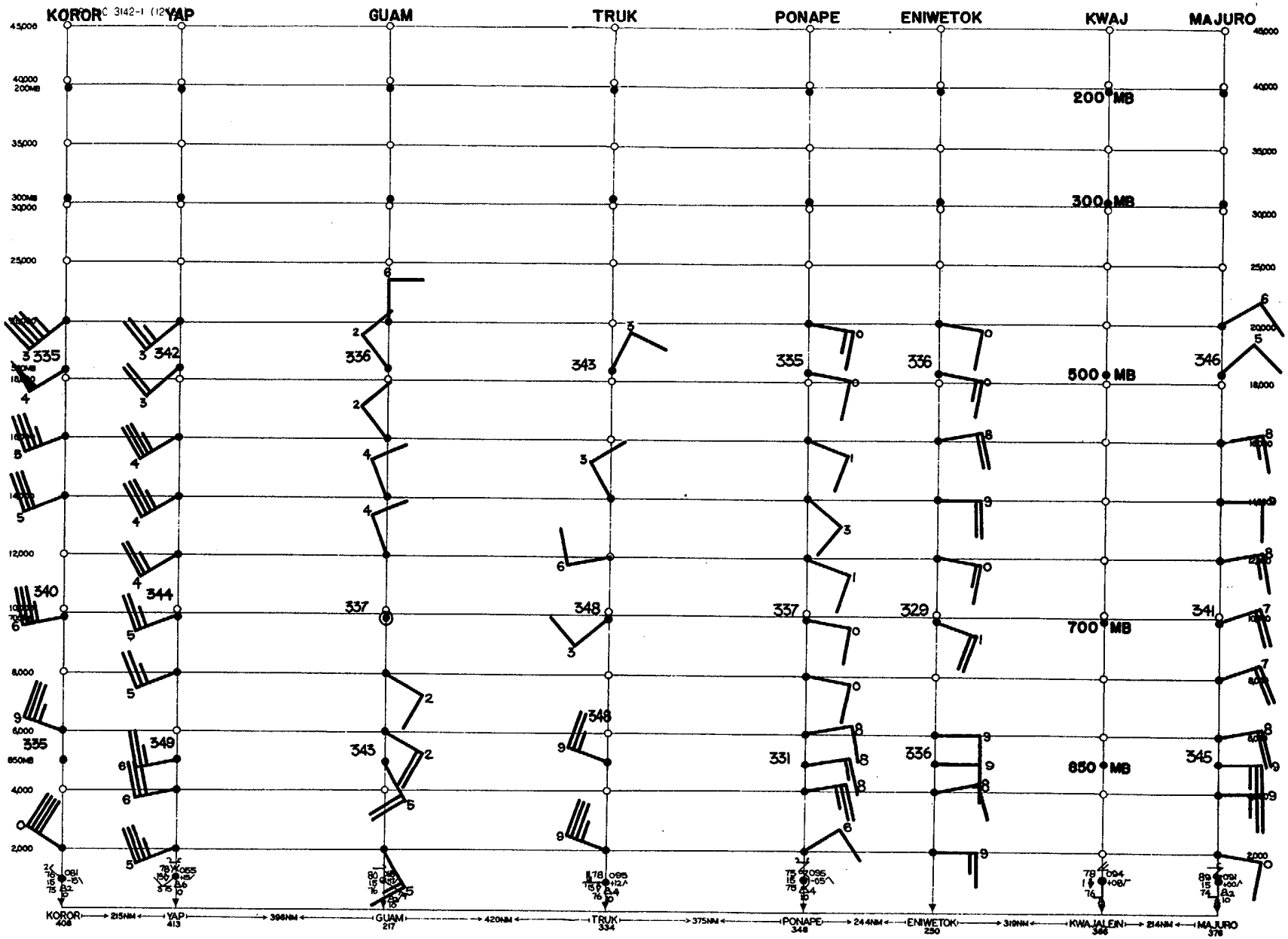

LONG.
145
146
147
148
149
150
151
152
153
LAT.
15
14
13
12
11
10
TYPHOON
RECON DATA
GUAM
021/h7
0215Z #9
997/h7
0243Z #10
907/h7
092
0425Z #13
997/h7
0315Z #11
7560/h7
1908/Ps
0400Z #12
54-P-3
FLT. LVL. 125 K - NE
SEC WND. 115 K - NE
970/Ps
989/h7
2120Z #1
7740/h7
915/Ps
2200Z #2
FLT. LVL. 120 K-E
017/h7
0530Z #14
027/h7
0145Z #8
026/h7
120
0115Z #7
030/h7
107
0624Z #15
030/h7
113
0045Z #6
023/h7
114
0015Z #5
012/h7
2345Z #4
012/h7
2315Z #3

STATION: **GUAM**

TIME CROSS SECTION



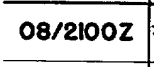
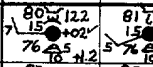
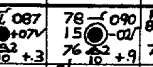
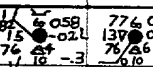
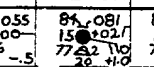
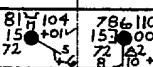
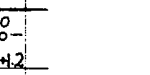
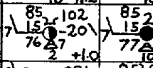
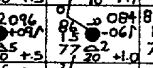
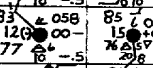
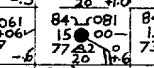
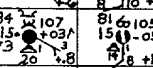
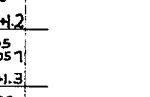
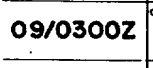
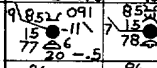
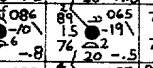
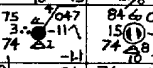
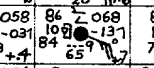
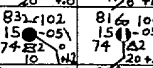
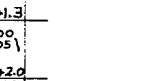
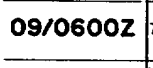
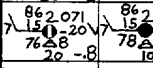
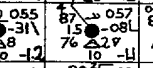
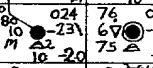
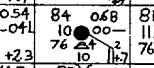
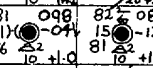
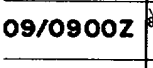
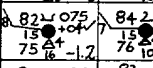
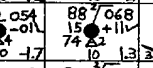
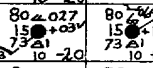
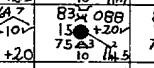
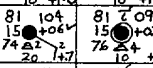
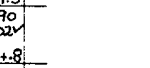
TIME / SFC DATA	00Z	03Z	06Z	09Z	12Z	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z	15Z	18Z	21Z	TIME / SFC DATA
Ch																									Ch
Cm																									Cm
CL																									CL
N																									N
W																									W
ww																									ww
PPP	1010.5	1010.1	1008.9	1008.4	1010.4	1009.8	1008.0	1009.0	1008.3	1007.7	1006.0	1006.5	1007.0	1005.7	1004.4	1004.8	1005.8	1004.3	1003.7	1004.7	1006.9	1005.7	1004.9	1006.2	PPP
app	+03	-02	-08	+05	+10	-07	-19	+12	-02	-12	-17	+05	+05	-1.9	-1.4	+05	+07	-1.2	-07	+10	+1.2	-02	-08	+1.4	app
RR																.61	.24				.41				RR
24 HR Δ P	-0.2	-0.2	-0.5	-0.6	-0.6	-0.2	-1.9	MISG	-1.6	-2.8	-2.9	-2.9	-3.4	-4.3	-3.6	-4.2	—	-2.4	-2.3	—	-1.1	±0.0	+0.5	+0.4	24 HR Δ P
Δ p̄																									Δ p̄

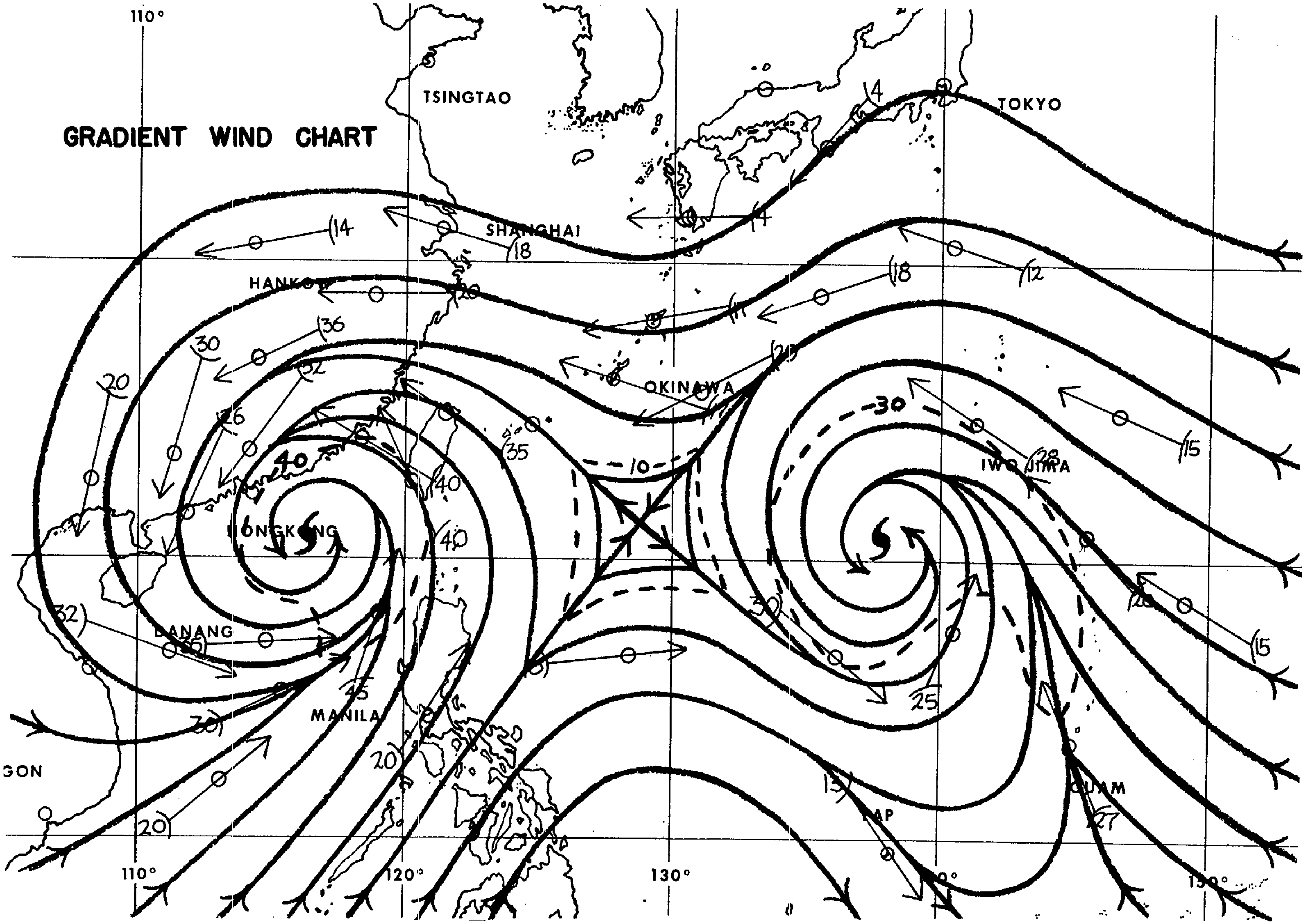


SPACE CROSS SECTION (KOROR-MAJURO)

SCALE: 1" = 110NM
FWC/JTWC DEC 1960

STIDD DIAGRAM

TIME Z / DATE	KOROR	YAP	GUAM	TRUK	PONAPE	ENI-WETOK	KWAJ.	MAJURO
08/2100Z								
09/0000Z								
09/0300Z								
09/0600Z								
09/0900Z								
09/1200Z								
09/1500Z								
09/1800Z								
09/2100Z								
10/0000Z								
10/0300Z								
10/0600Z								
10/0900Z								
10/1200Z								
10/1500Z								
10/1800Z								
10/2100Z								
11/0000Z								
11/0300Z								
11/0600Z								
11/0900Z								
11/1200Z								
11/1500Z								
11/1800Z								
11/2100Z								
12/0000Z								
12/0300Z								
12/0600Z								


GRADIENT WIND CHART
110°
TSINGTAO
TOKYO
SHANGHAI
HANKOW
OKINAWA
IWO JIMA
HONGKONG
DANANG
MANILA
GON
GUAM
110°
120°
130°

CHAPTER II

EVALUATION OF OBSERVATIONAL AND FORECAST TECHNIQUES

A. GENERAL

Aerial reconnaissance is the only method available to obtain complete data for the proper analysis of a tropical system. Aerial reconnaissance, being mobile, provides the position, intensity, indications of past movement, changes as they occur, and significant features including eye shape, size and slope. In addition, it provides both surface and upper air data. By using dropsondes, the reconnaissance aircraft is able to obtain the lapse rate profile to the surface, sea level pressure, surface temperature and dew-point at any point of the tropical system.

The accuracy of warnings is directly related to the quality and quantity of aircraft reconnaissance of tropical systems. Continuous surveillance is required on all tropical systems so that initial warning may be promulgated at the earliest possible moment to insure proper preparation for safeguarding property and life.

B. SURVEILLANCE METHODS

During 1963, two aircraft squadrons were assigned the primary responsibility of tropical reconnaissance under requirements of the Joint Typhoon Warning Center, Guam. These units were the U. S. Navy Airborne Early Warning Squadron One (VW-1) which is based at Naval Air Station, Agana, Guam, and the U. S. Air Force 54th Weather Reconnaissance Squadron (54WRS) which is based at Andersen AFB, Guam.

The U. S. Air Force 56th Weather Reconnaissance Squadron based at Yokota Air Base, Japan is the primary backup for the 54WRS. After August and until December 1963, the 56WRS fulfilled all reconnaissance requirements in connection with tropical storm and typhoon fixes which were levied upon the 54WRS. In December, in connection with Typhoon SUSAN, the 54WRS made high level fixes at the 300mb level in conjunction with lower level fixes by the 56WRS during nine scheduled fixes.

The U. S. Air Force 315th Air Division based at Tachikawa Air Base, Japan was the normal CINCPACAF theater air backup.

The various aircraft used by the squadrons are the WB-50 by the 56WRS and by the 54WRS until late August 1963. VW-1 used the EC121K Warning Star and the 315th Air Division used the C-130 aircraft.

During 1963, the 54WRS commenced replacing the WB-50 aircraft with the WB-47 (jet) aircraft and by early September, the transition was complete. The 54WRS first employed the WB-47 to make four fixes on Typhoon ORA during late October. These were considered to be training flights.

Land radar, in conjunction with aerial reconnaissance, was utilized operationally when the tropical system was within radar range. This information was available from various sites using weather radar or tactical radar.

The TIROS weather surveillance satellite offered fixes a number of times during 1963 but did not observe any disturbance in the Western Pacific prior to aircraft reconnaissance or prior to being analyzed on a synoptic chart.

C. EVALUATION OF THE 1963 SEASON

Until the end of August 1963, aerial reconnaissance was divided between the 54WRS and VW-1. After August 1963 and until Typhoon SUSAN in December, the 54WRS placed the JTWC requirements entirely on the Air Force backup squadron, the 56WRS. The only requirements accepted by the 56WRS were on tropical systems of storm intensity or on those forecast to be of storm intensity at the time of the requested fix. After August 1963, with the exception of one fix on a tropical depression, VW-1 was required to make all investigations and tropical depression fixes as well as some daylight storm fixes.

In December, in connection with Typhoon SUSAN, the 54WRS using WB-47 aircraft was requested to make high level fixes. Of the requested fixes, nine were in conjunction with lower level fixes made by the 56WRS for purposes of correlation and compatability. By the time that Typhoon SUSAN reached its maximum intensity, the 54WRS was able to fix the storm very accurately. Several penetrations were made by flying over or through the top of the wall cloud. It is interesting to note that in one case during the early stages of

Typhoon SUSAN the 54WRS reported a "pressure cap" at an altitude of 36000 feet over the storm. A "pressure cap" is defined as an increase in pressure after entering the area over the eye of the storm.

During normal warning status, fixes were scheduled 4 times daily on each typhoon and twice daily on each tropical storm. On many occasions 4 fixes were made daily on tropical systems of storm intensity as well. One daily investigation was scheduled on each tropical depression and as required on each cyclone. Synoptic weather flights which supplement the surface and upper air reporting stations of the U. S. Trust Territories were made as often as aircraft were available. Synoptic flights were quite frequent during the 1963 season. The number of investigation flights were held to a minimum whenever synoptic flights were being made on a routine basis. During 1963, only 5 suspect cyclones were investigated which failed to develop as opposed to 17 in 1962 and 27 in 1961. Synoptic flights were made by the 54WRS and VW-1.

The policy of the JTWC for levying fix requirements on the squadrons were as follows: For typhoon fixes, the 54WRS was requested to make the 2200Z and 0400Z daylight fixes, and the night radar fixes were requested of VW-1 at 1000Z and 1600Z. On some occasions because of time zone considerations, i.e. in the South China Sea and Western Philippine Sea, the 54WRS was requested to make the 0400Z and 1000Z fixes and VW-1 was requested to make the 1600Z and 2200Z fixes. Tropical depressions and cyclone investigations were scheduled for daylight hours by a single squadron. If rapid development was indicated of any tropical depression, then more than one daylight fix of the tropical depression would be requested. The scheduled times for the fixes were within two hours of warning time which provides increased accuracy in the bulletin position. The two hours are considered necessary due to communication difficulties and to allow for proper analyses. With few exceptions, this procedure enabled the Joint Typhoon Warning Center to publish all warnings with the maximum amount of data on hand.

During 1963, the only difficulty encountered occurred after August when all requirements levied upon the 54WRS were transferred to the 56WRS. In order to make the first

fix on any tropical system, the 56WRS usually needed 24 hours lead time. Because of other commitments the 56WRS would only make fixes on tropical systems that were of storm intensity or were forecast to be of storm intensity at the time of the requested fix. This situation placed the burden of fixing tropical depressions and investigative type flights on VW-1. VW-1 accepted all JTWC requests for daylight fixes on tropical depressions and investigations as well as all night radar fixes. On some occasions after rapid development, VW-1 also made daylight fixes on named storms. It is worthy to note that VW-1 made over 50 per cent of all fixes and during Typhoon BESS, a total of 25 fixes were made by this indefatigable squadron.

D. EVALUATION OF DATA

1. Aerial Reconnaissance Data

Data received from reconnaissance can be divided into three categories, peripheral, eye data from penetration and eye data from radar.

Peripheral data is all information reported by reconnaissance aircraft enroute and around a tropical system. Eye data from penetration is that data which is reported by the aircraft while in the center of the system. Eye data from radar is a picture description of the eye of the system as it appears on a radar scope at a distance from the center.

Peripheral data includes weather, clouds, flight altitude, wind, temperature, and dew point in addition to surface pressure and estimated surface winds. Dropsondes are released at selected points throughout the tropical system as well as in the center to obtain the lapse rate profile, surface pressure and surface temperature. Dropsondes were made by all WB-50 aircraft and by some EC121K aircraft that had dropsonde chambers installed during 1963. Data from synoptic flights was the same as data received from peripheral flights made in a tropical system. On most synoptic flights, two levels were flown, usually a portion of the flight at 1500 feet MSL and at 700mb level.

The eye data obtained from penetration includes the

location of the pressure center as found by radar altimeter. The location was given in degrees and minutes of latitude and longitude during 1963 vice degrees and tenths of degrees during 1962. This method allowed for a more accurate determination of movement of the tropical system. In addition, the flight level wind, 700mb height, maximum 700mb temperature and maximum observed surface wind were reported. Eye characteristics such as size, slope, shape and the extent of cloudiness were reported when possible. During 1963 the geographic center in direction and miles from the pressure center was also reported.

The eye data obtained from radar provides the center of the radar eye and a description of the radar presentation which includes the spiral bands and wall cloud condition. When possible the height of the wall clouds is reported. Frequently the description of spiral bands is used as a parameter for forecasting intensification.

During 1963, daylight penetration of typhoons was scheduled for WB-50 aircraft. EC121K aircraft were not scheduled for penetration due to airframe limitations. However, during some daylight fixes made by the EC121K, penetration was accomplished at the discretion of the aircraft commander. It is interesting to note that on most occasions when turbulence was deemed to be severe was when the tropical system was becoming extratropical. This includes clear air turbulence.

The data obtained by the various squadrons was good with few exceptions. During 1963, crew member experience was extremely good since most members had by this time considerable experience during 1962. The quality of the observations was directly proportional to the experience of the observer. Fixes made at great distances from loran stations or other points of reference did not appear to be as accurate as those made where loran stations or other points were available for navigation purposes. Every effort was made in obtaining radar fixes from as close to the center of the tropical system as possible by the aircraft.

The information received from all reconnaissance aircraft was continually checked for consistency and accuracy. Each piece of information was immediately plotted on the SEAY Graph for continuity with previous data and for con-

sistency with data in the same report. Discrepancies or apparent discrepancies were rechecked with the observing aircraft whenever possible.

2. Land Radar

Land radar was employed in conjunction with aircraft reconnaissance whenever possible. The information which land radar provides includes the position, usually range and bearing and eye characteristics when they can be determined.

Generally, the first few hours of land radar operation led to reports which were not considered to be very accurate. Accuracy generally improved with time and was directly proportional to the experience of the observer. At times land radar reports would indicate that the storm's behavior was very erratic and not consistent with aircraft reconnaissance; this was frequently attributed to inexperienced weather radar observers. In the case of land radar reports made by the Guam tactical radar set, the positions were most frequently excellent and this was attributed to qualified weather radar observers from VW-1 assisting the radar operators.

3. TIROS did not contribute toward discovery of tropical systems, although storms already under surveillance were detected. In 1964, the orbiting TIROS VIII will be followed with great interest because of recently acquired APT capability at FWC Guam.

E. COMMUNICATIONS

Radiotelegraph (CW) is the primary means of communications between the ground and aircraft. AIE2. Andersen AFB, Guam is the primary air-ground contact for aircraft; AIF-8, Yokota AB, Japan is secondary; and AIC2, Clark AB, Philippine Islands is the tertiary contact.

AIE2, Andersen AFB, Guam is responsible for getting reports to JTWC via the local circuit 3L28. This circuit also serves VW-1 and the 54WRS.

When aircraft were in communication with AIE2, all

reports were received in JTWC in more than sufficient time, and this enabled the forecaster to make a more comprehensive study of the received data. When the aircraft was in contact with secondary or tertiary contacts quite frequently the reports reached JTWC will little time to spare. This situation arose whenever atmospheric conditions prohibited good communication.

In 1964, it is expected that much use will be made of voice communications on single side band frequencies. The necessary communication equipment has already been installed in JTWC spaces. Reports have been received directly from the aircraft in JTWC spaces, but frequencies for transmission from JTWC to the aircraft have not yet been assigned.

1963 AIRCRAFT RECONNAISSANCE DATA

UNIT	TROPICAL CYCLONES (35)			SYNOPTIC TRACKS
	NO. OF SORTIES	NO. OF FIXES/ INVESTIGATIONS	BONUS	NO. OF SORTIES
VW-1	198	246	1	75
54WRS				
(WB-50)	52	71	-	47
(WB-47)	16	14	-	47
56WRS	89	133	1	1
315AD	1	1	-	--
OTHER USAF	-	-	3	--
OTHER USN	-	-	2	--
CIVILIAN	-	-	1	--
TOTALS				
1963	356	465	8	170
1962	373	496	10	126
1961	304	350	27	---

F. EVALUATION OF NUMERICAL WEATHER PRODUCTS FOR TYPHOON FORECASTING

Beginning with Typhoon BESS in July 1963, JTWC began utilizing the Barotropic 12, 24, and 36-hour 500mb prognostic charts prepared by NWP Suitland, and beginning with Typhoon DELLA in August, the 24, 36, 48 and 72-hour Barotropic 500mb prognostic charts and steering computations from FNWF Monterey were added as aids to typhoon forecasting. Previously, the JTWC used techniques based primarily on current analyses which were man-produced with limited data. There were three reasons for changing over to numerical products as aids to forecasts, and they are as follows:

1. The numerical products offered greater opportunities for future progress.
2. From one synoptic time to another, there is better continuity than man-produced analysis.
3. It adds predicted upper-air circulation patterns as an aid, rather than having all conclusions based upon objective techniques applied to past circulation patterns.

During this season, no attempt was made to develop objective techniques utilizing numerical prognosis. The numerical products were used for their large-scale circulation patterns rather than the detail circulation patterns. Such things as the predicted movement and intensification of ridges, troughs, highs, and lows at 500mb were utilized as aids in determining the paths of typhoons. No attempt will be made to evaluate the numerical prognostic charts numerically, but they will be discussed in terms of their prediction of large-scale features which were used as aids to forecasting typhoons.

In general, the numerical prognostic charts from both Suitland and Monterey were very good aids to forecasting typhoons. Monterey's prognostic charts on a whole were superior to Suitland's for JTWC's purpose for the following reasons:

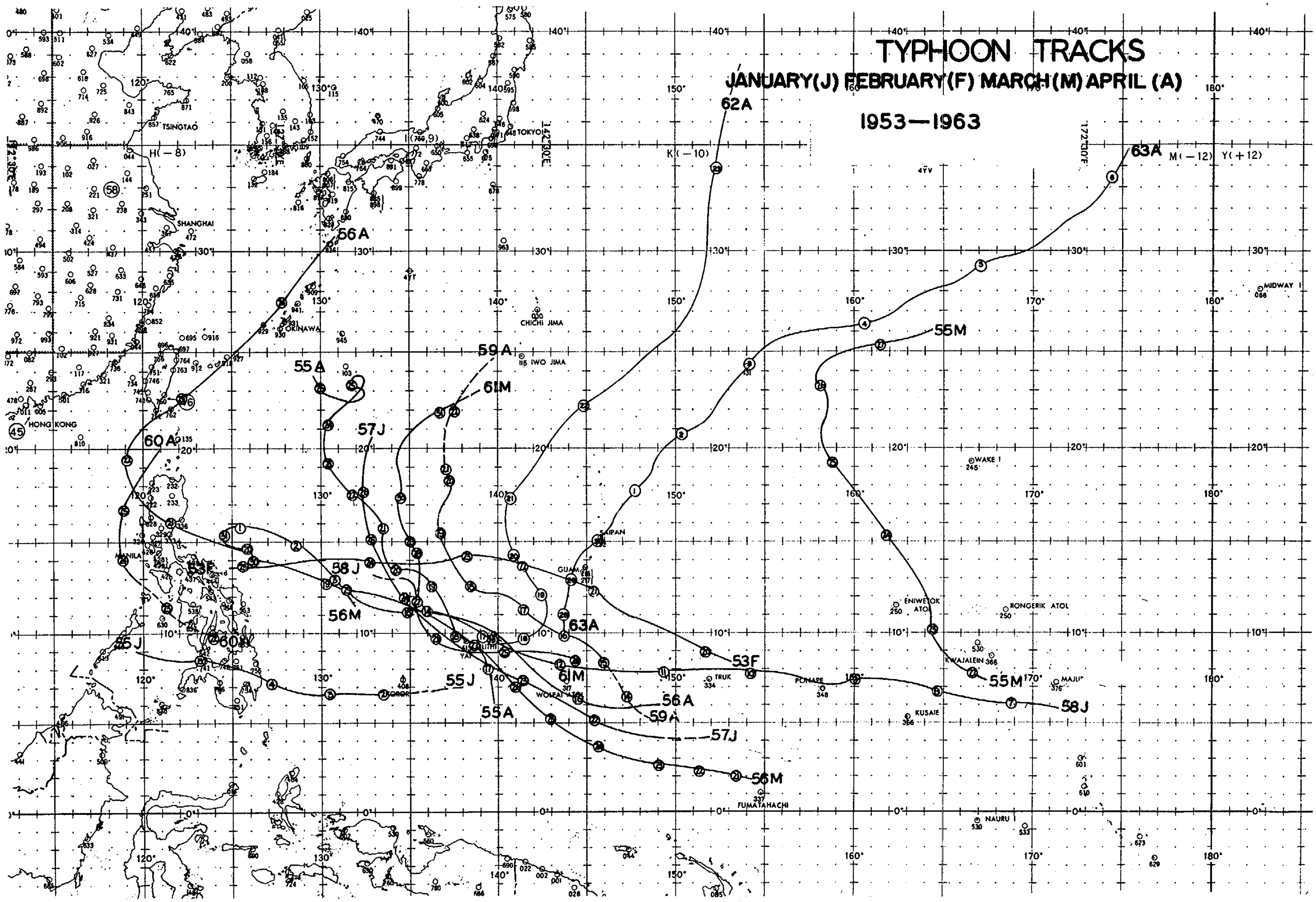
1. Comparing Suitland's 12-hour prognostic charts and Monterey's analysis (JTWC did not have Suitland's analysis), it was evident that Monterey had more data available at the time of prognosis than Suitland did.

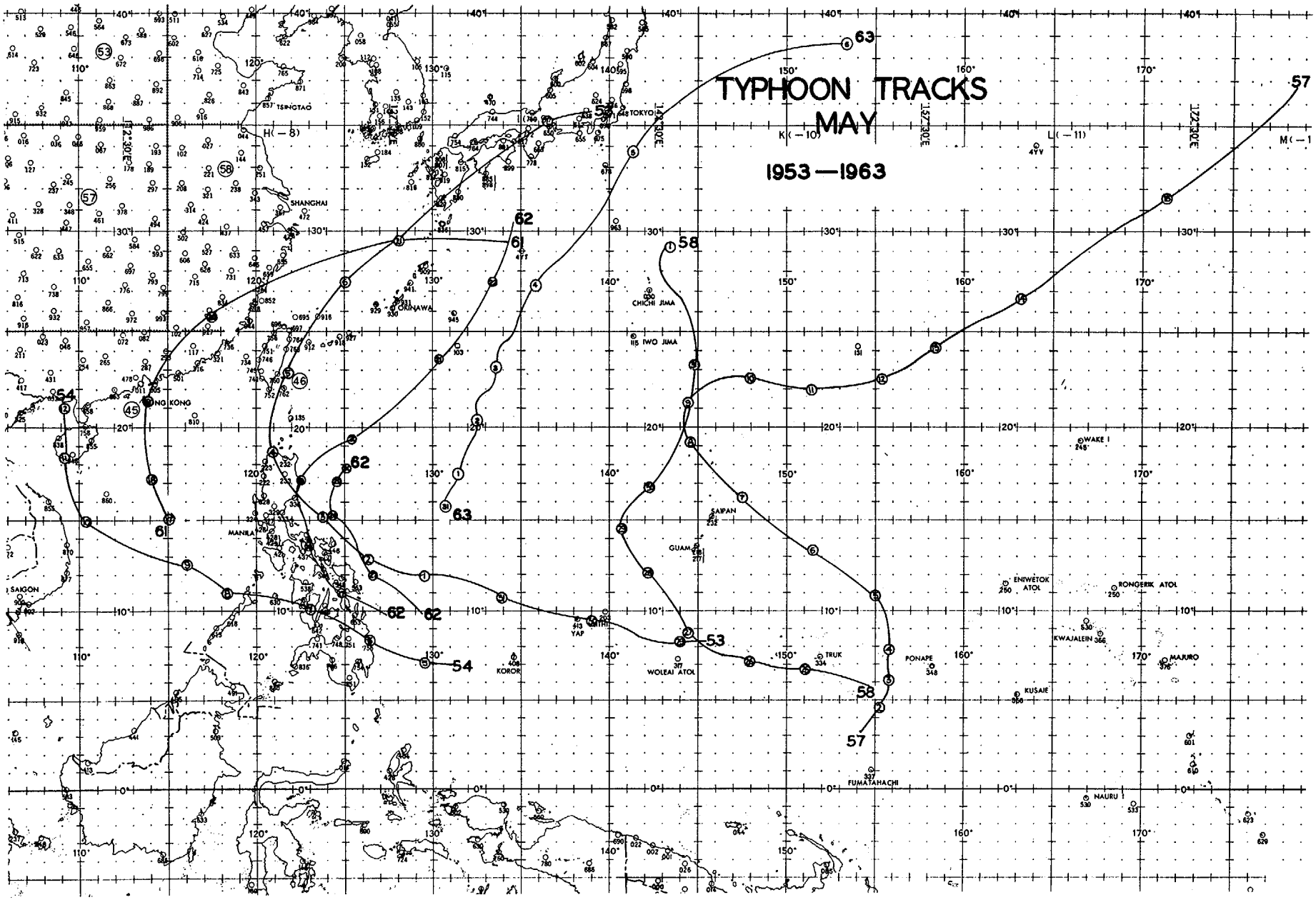
2. Suitland's prognostic charts tended to expand the typhoon circulation beyond reason; whereas the Monterey prognostic charts tended to dampen this circulation. Therefore, Monterey's prognostic charts better defined the large-scale circulation patterns.

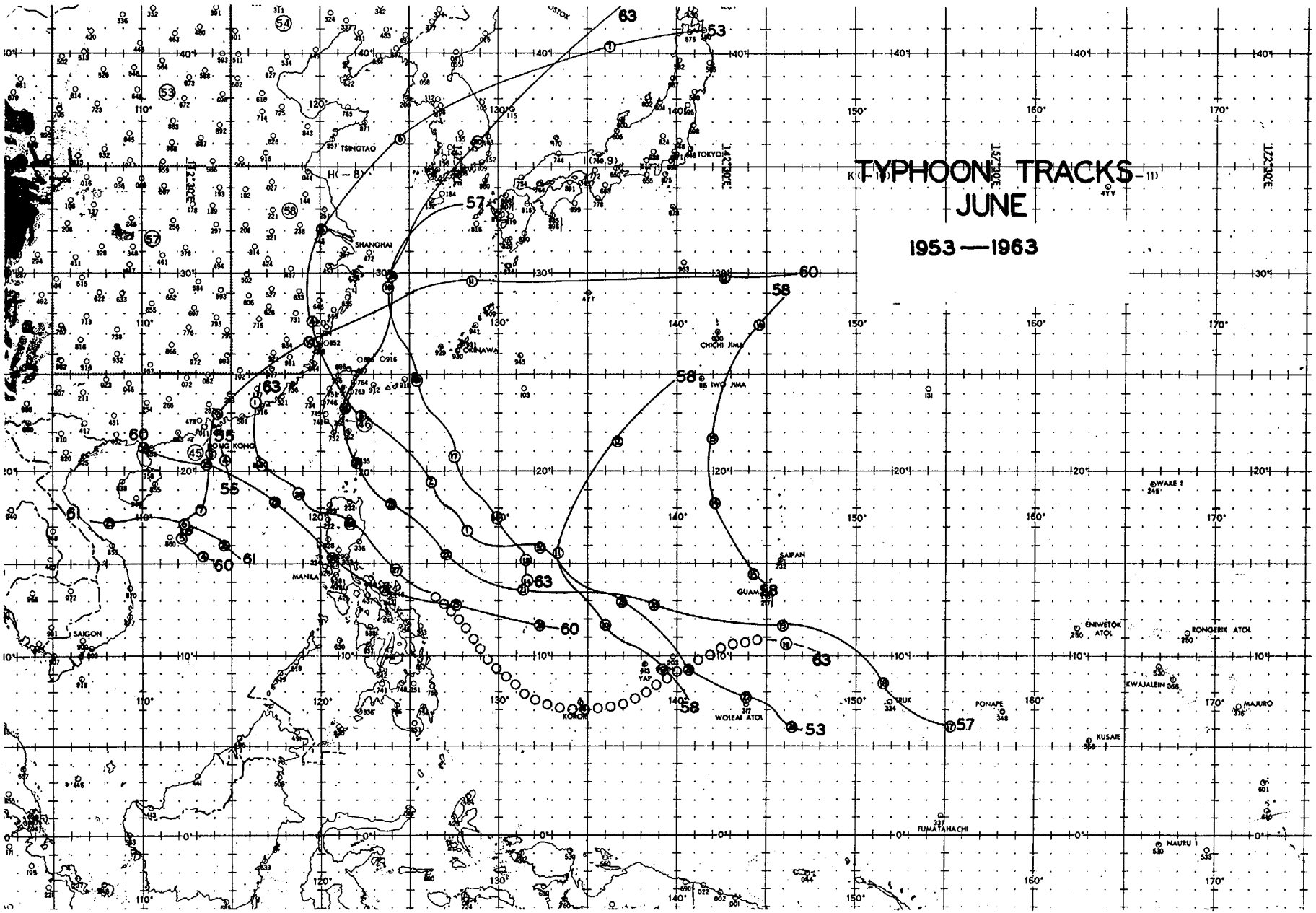
Postanalysis indicated that when the prognostic charts were of little value, it was mainly the fault of the initial analysis used in preparing the prognostic charts. This was quite evident in the steering computations received from Monterey during the first half of Typhoon SUSAN. Monterey's analysis showed the trough aloft associated with SUSAN always to the east of the storm. In actuality, this was not the case.

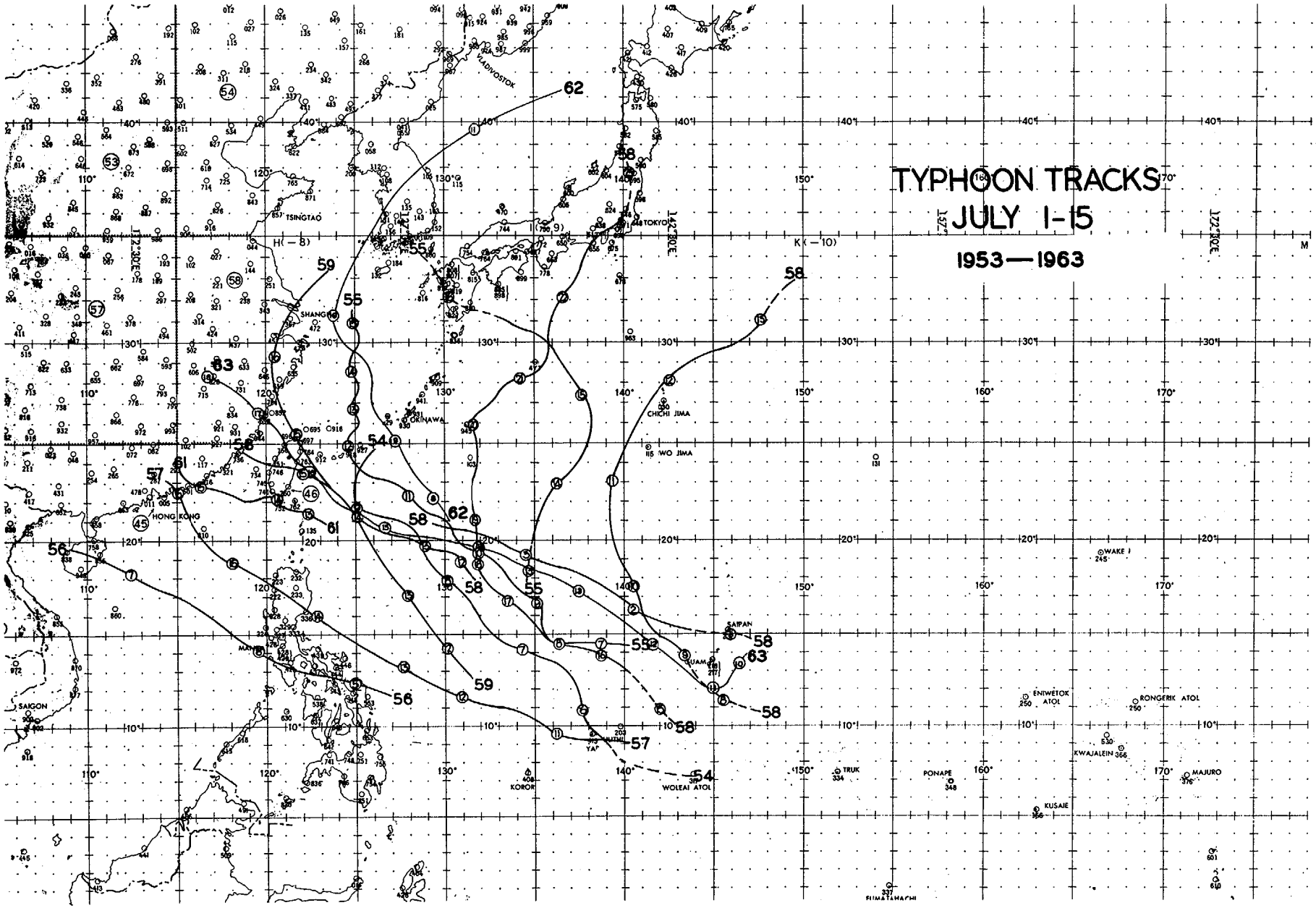
In conclusion, the prognostic charts generally were outstanding in forecasting the ridge line north of the storm and showing weaknesses in the ridge line indicating recurvature. These features aided considerably in forecasting typhoons. The results from utilizing the numerical prognostic charts this season are encouraging and would indicate that JTWC now has a good foundation upon which to build a better typhoon forecasting system.

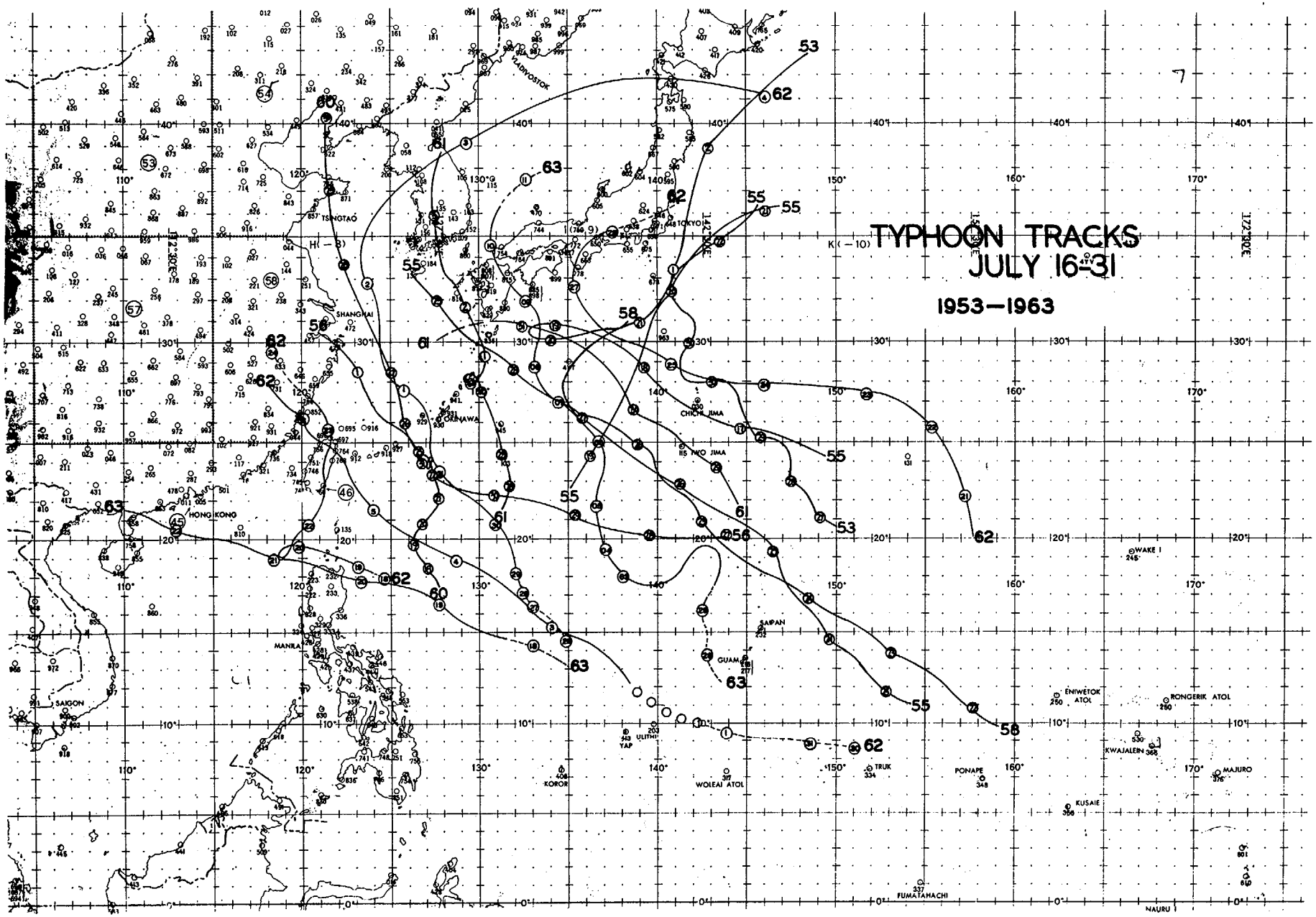
TYPHOON TRACKS, 1953-1963

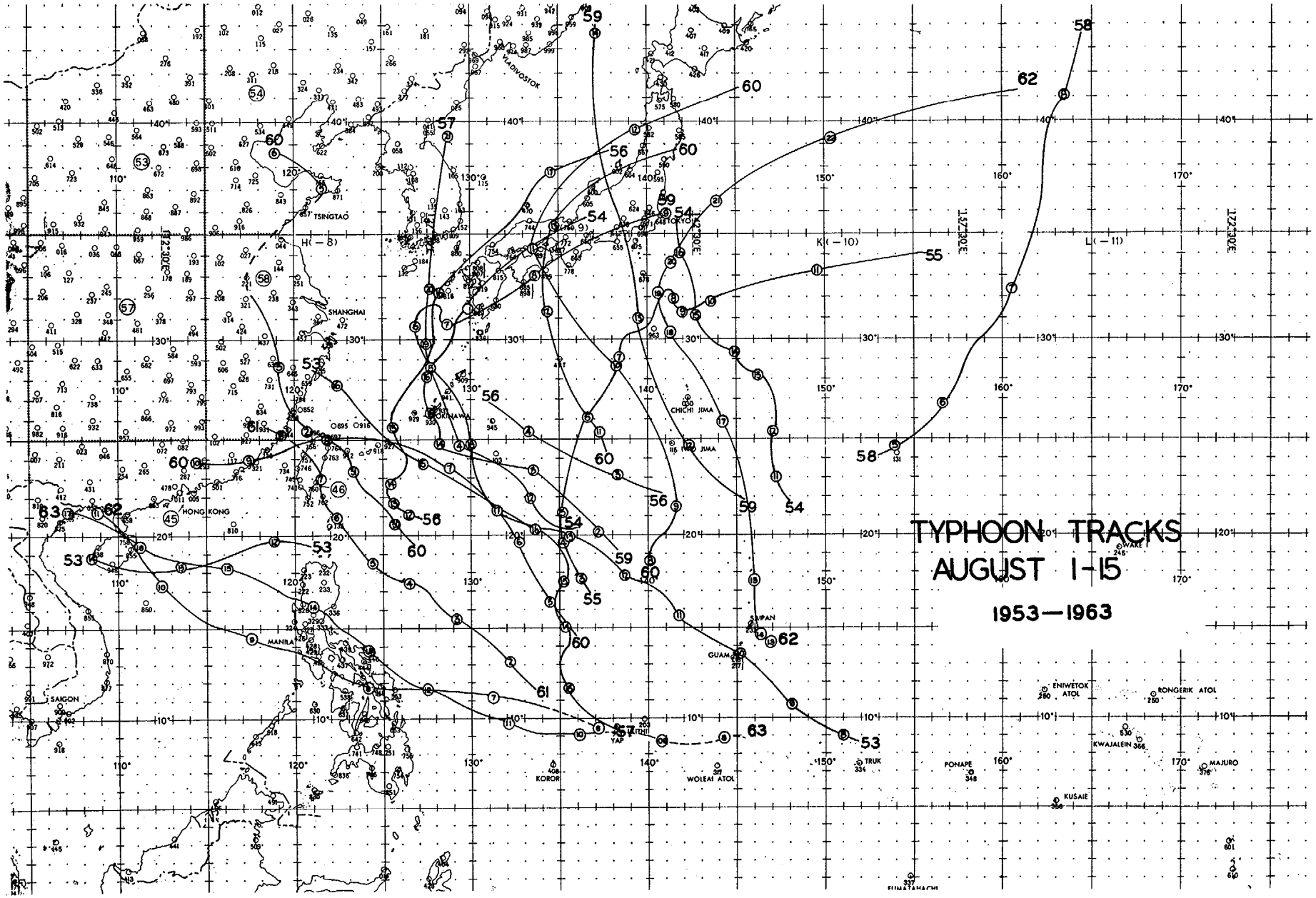

TYPHOON TRACKS
JANUARY(J) FEBRUARY(F) MARCH(M) APRIL (A)
1953—1963
62A
63A
56A
55M
59A
61M
55A
57J
60A
58J
53F
56M
63A
55J
60A
61M
56A
55A
59A
57J
55M
58J
56M
53F
SHANGHAI
TSINGTAO
TOKYO
HONG KONG
MANILA
OKINAWA
CHICHI JIMA
IWO JIMA
SAIPAN
GUAM
WAKE I
ENIWETOK ATOL
RONGERIK ATOL
KWAJALEIN
MIDWAY I
TRUK
PONAPE
KUSAIE
MAJURO
NAURU I
FUMATAHACHI
WOLEAI
YAP
H(−8)
K(−10)
M(−12) Y(+12)

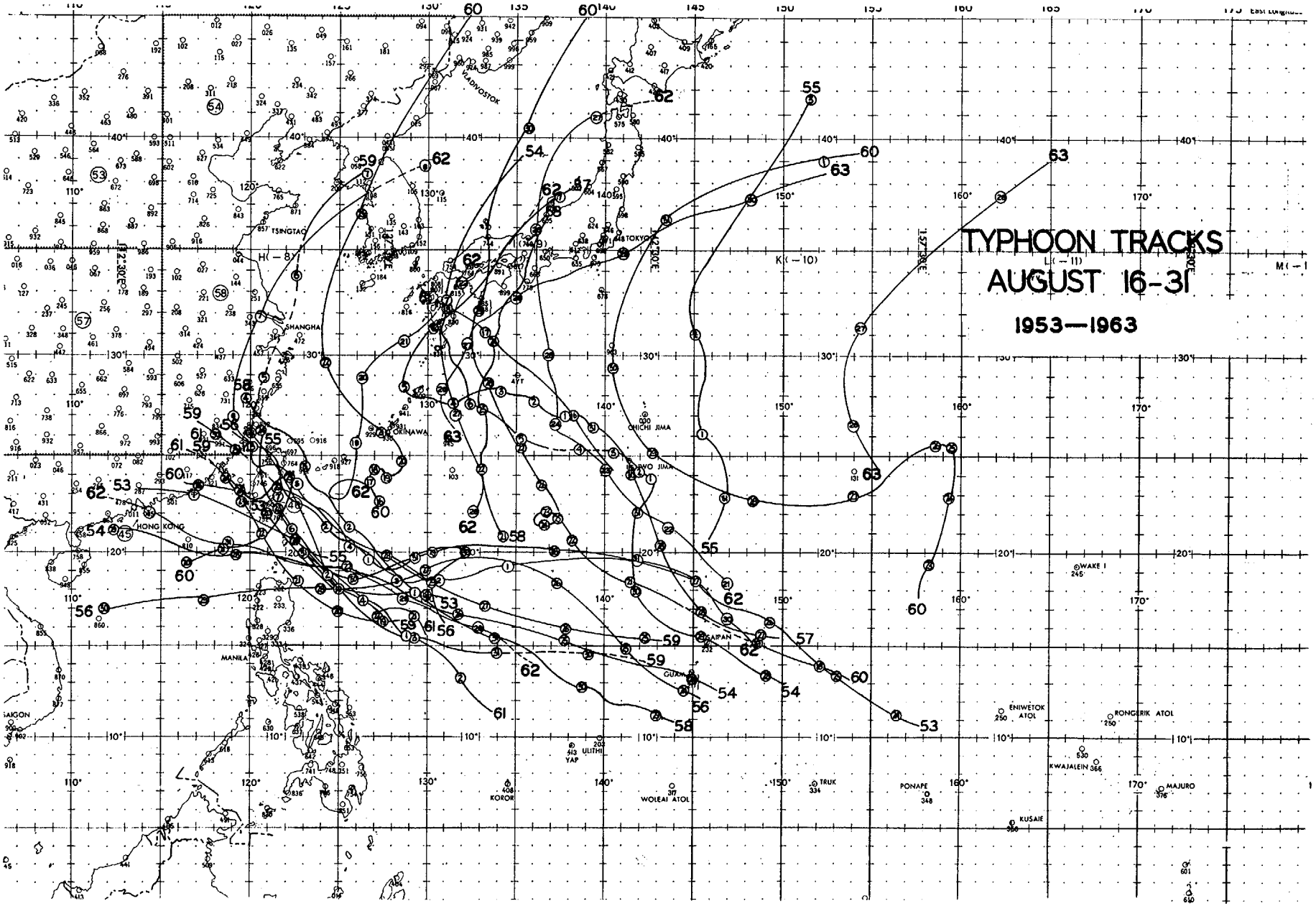

TYPHOON TRACKS
MAY
1953—1963
TOKYO
TSINGTAO
SHANGHAI
OKINAWA
CHICHI JIMA
IWO JIMA
HONG KONG
MANILA
SAIGON
YAP
GUAM
SAIPAN
WOLEAI ATOL
KOROR
TRUK
PONAPE
KUSAIE
ENIWETOK ATOL
KWAJALEIN
RONGERIK ATOL
MAJURO
WAKE I
NAURU
FUMATAHACHI

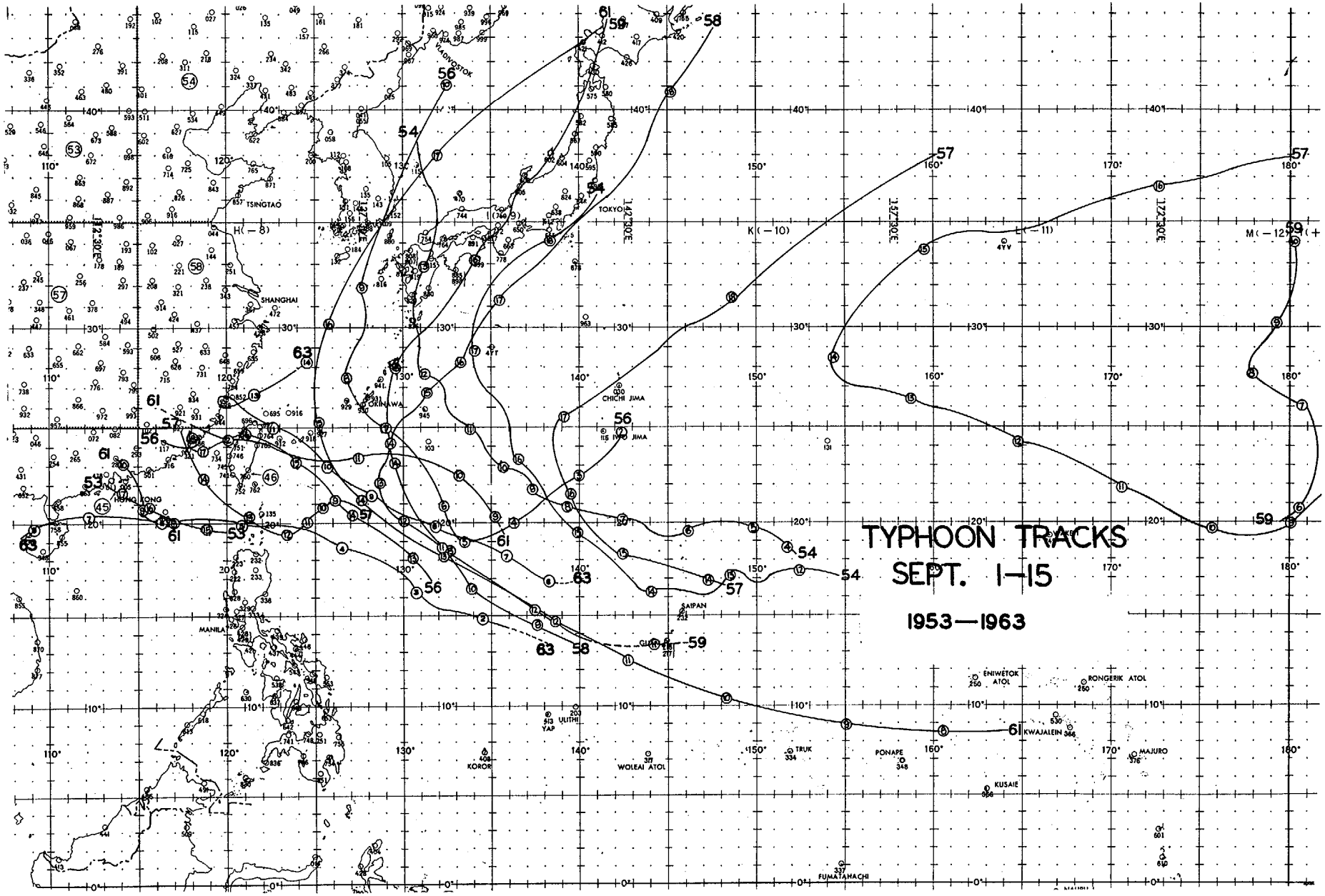

TYPHOON TRACKS
JUNE
1953—1963
TSINGTAO
SHANGHAI
OKINAWA
CHICHI JIMA
IWO JIMA
TOKYO
HONG KONG
MANILA
SAIGON
SAIPAN
GUAM
YAP
KOROR
WOLEAI ATOL
TRUK
PONAPE
ENIWETOK ATOL
KWAJALEIN
RONGERIK ATOL
MAJURO
WAKE I
KUSAIE
FUMATAMACHI
NAURU I
142.5°E
122.5°E

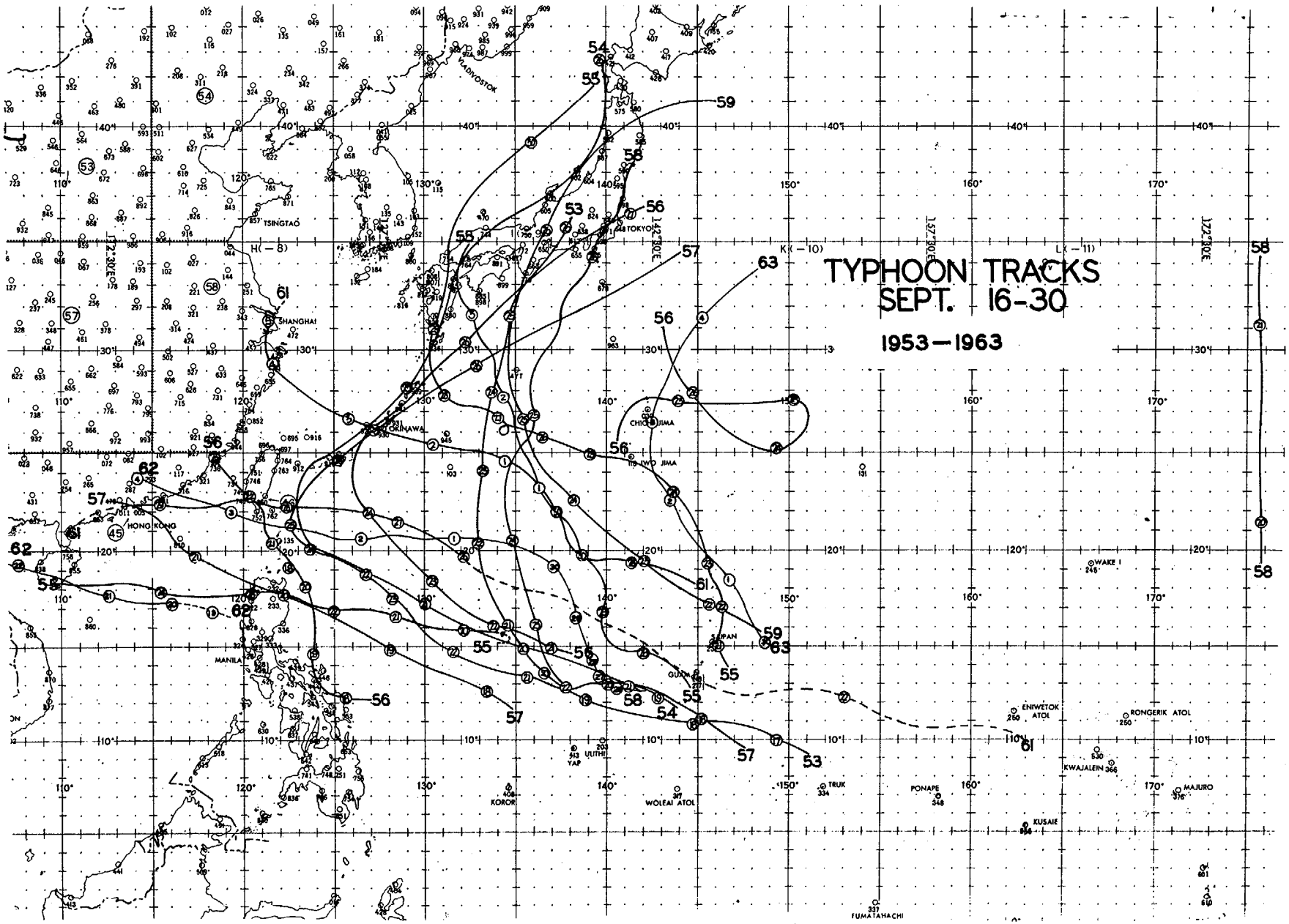

TYPHOON TRACKS
JULY 1-15
1953—1963
VLADIVOSTOK
TSINGTAO
SHANGHAI
TOKYO
OKINAWA
CHICHI JIMA
IWO JIMA
HONG KONG
SAIPAN
GUAM
WAKE I
ENIWETOK ATOL
RONGERIK ATOL
KWAJALEIN
MAJURO
TRUK
PONAPE
KUSAIE
KOROR
WOLEAI ATOL
SAIGON
HIMATAHACHI

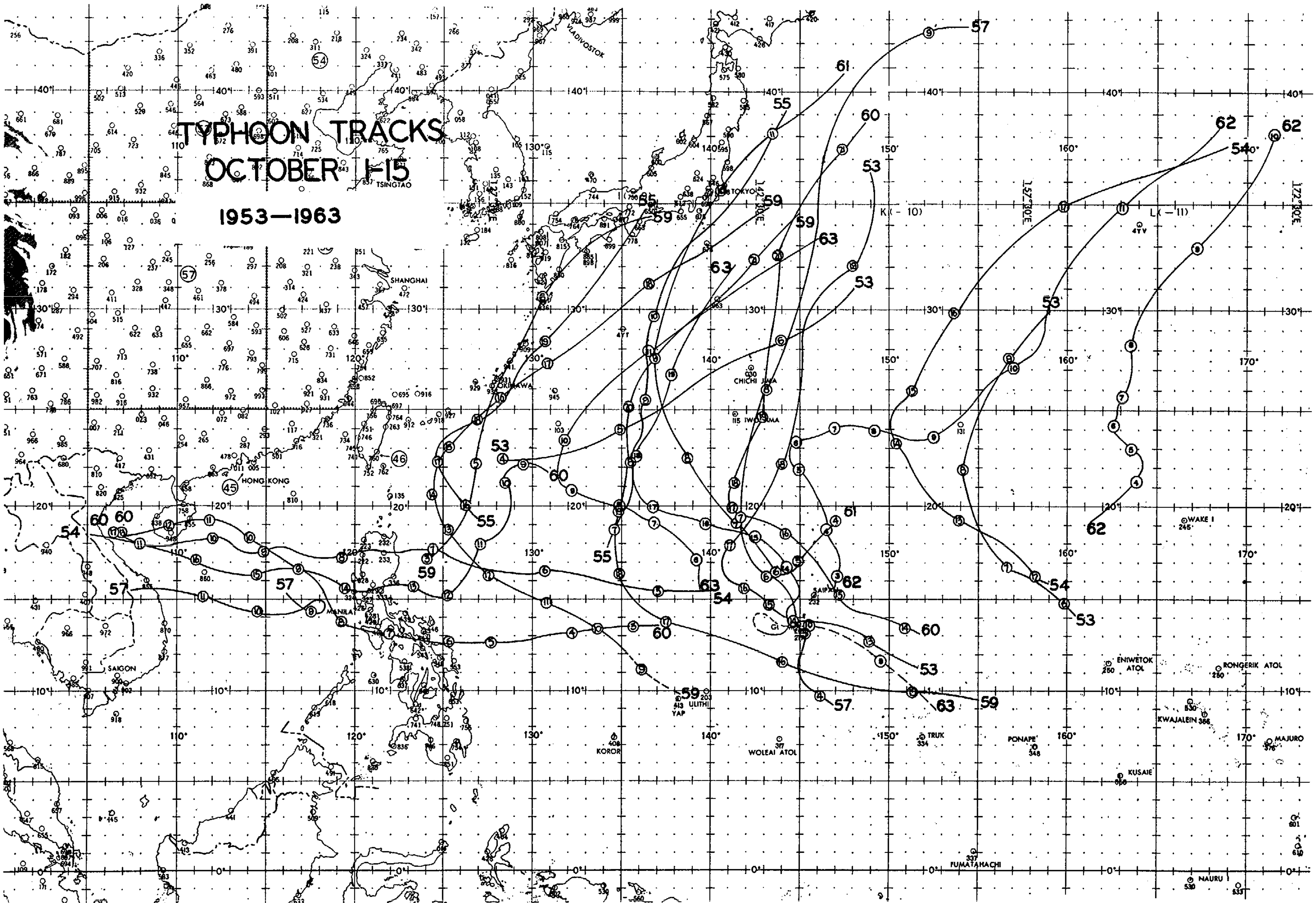

TYPHOON TRACKS
JULY 16-31
1953—1963
VLADIVOSTOK
TSINGTAO
SHANGHAI
TOKYO
OKINAWA
CHICHI JIMA
IWO JIMA
HONG KONG
MANILA
SAIGON
SAIPAN
GUAM
YAP
ULITHI
WOLEAI ATOL
KOROR
TRUK
PONAPE
KUSAIE
ENIWETOK ATOL
RONGERIK ATOL
KWAJALEIN
MAJURO
WAKE I
FUMATAMACHI
NAURU I

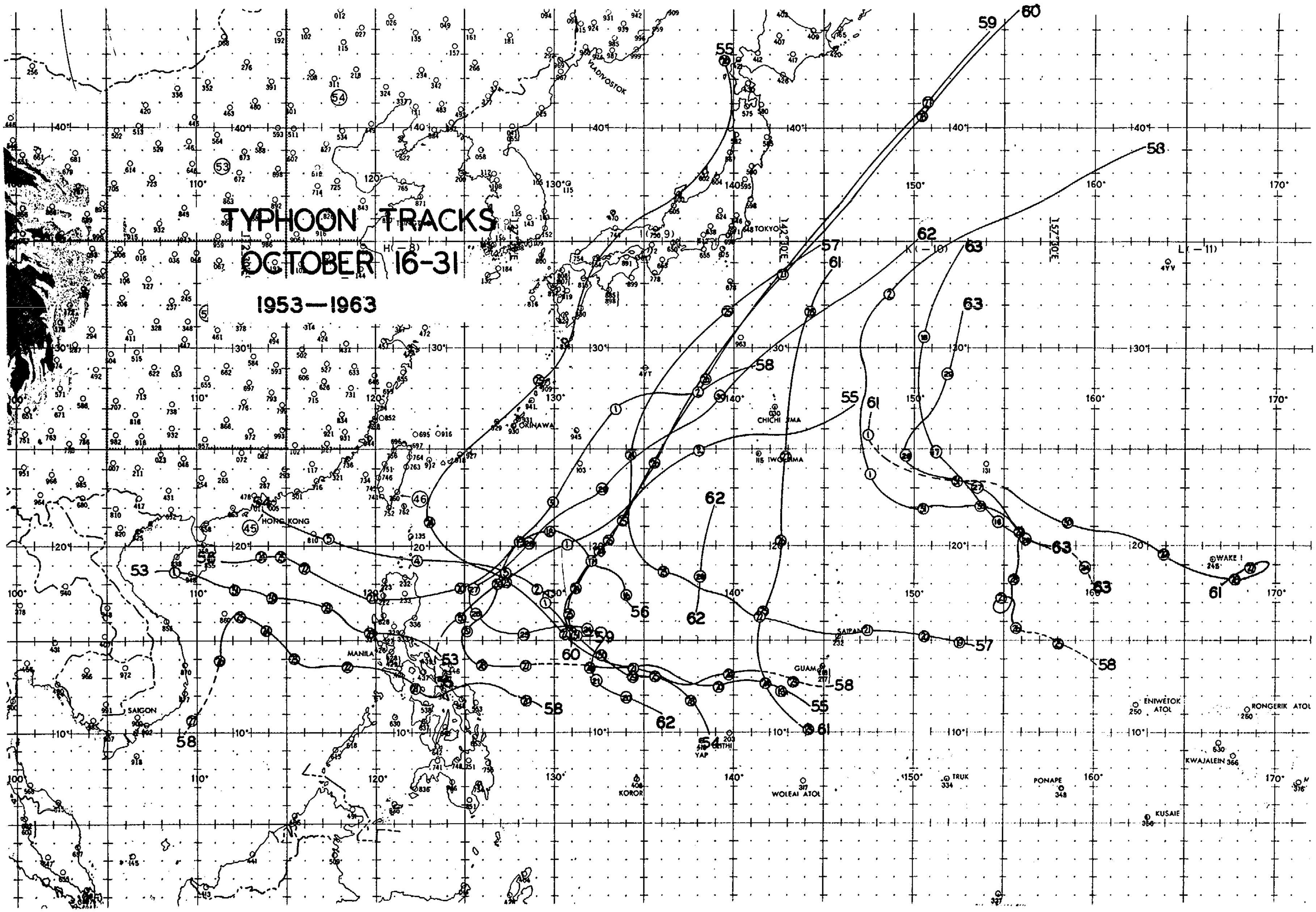

TYPHOON TRACKS
AUGUST 1-15
1953—1963
VLADIVOSTOK
TSINGTAO
SHANGHAI
OKINAWA
CHICHI JIMA
HAHA JIMA
TOKYO
HONG KONG
MANILA
SAIGON
GUAM
SAIPAN
YAP
TRUK
KOROR
WOLEAI ATOL
PONAPE
KUSAIE
ENIWETOK ATOL
RONGERIK ATOL
KWAJALEIN
MAJURO
WAKE
H(−8)
K(−10)
L(−11)
157°30'E
172°30'E

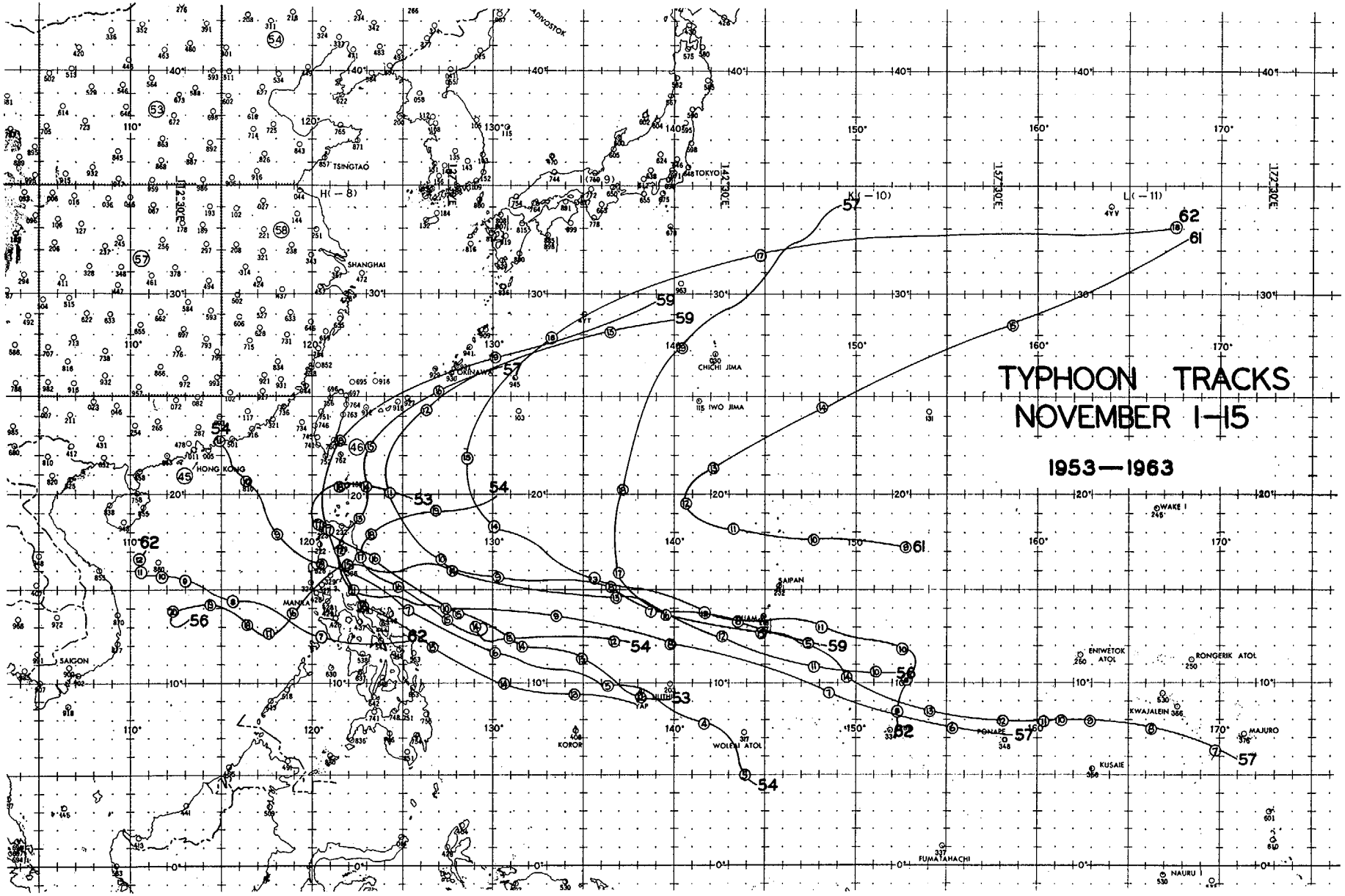

TYPHOON TRACKS
AUGUST 16-31
1953—1963
TSINGTAO
SHANGHAI
VLADIVOSTOK
TOKYO
OKINAWA
CHICHI JIMA
IWO JIMA
HONG KONG
MANILA
SAIGON
SAIPAN
GUAM
YAP
ULITHI
KOROR
WOLEAI ATOL
TRUK
PONAPE
KUSAIE
ENIWETOK ATOL
RONGERIK ATOL
KWAJALEIN
MAJURO
WAKE I

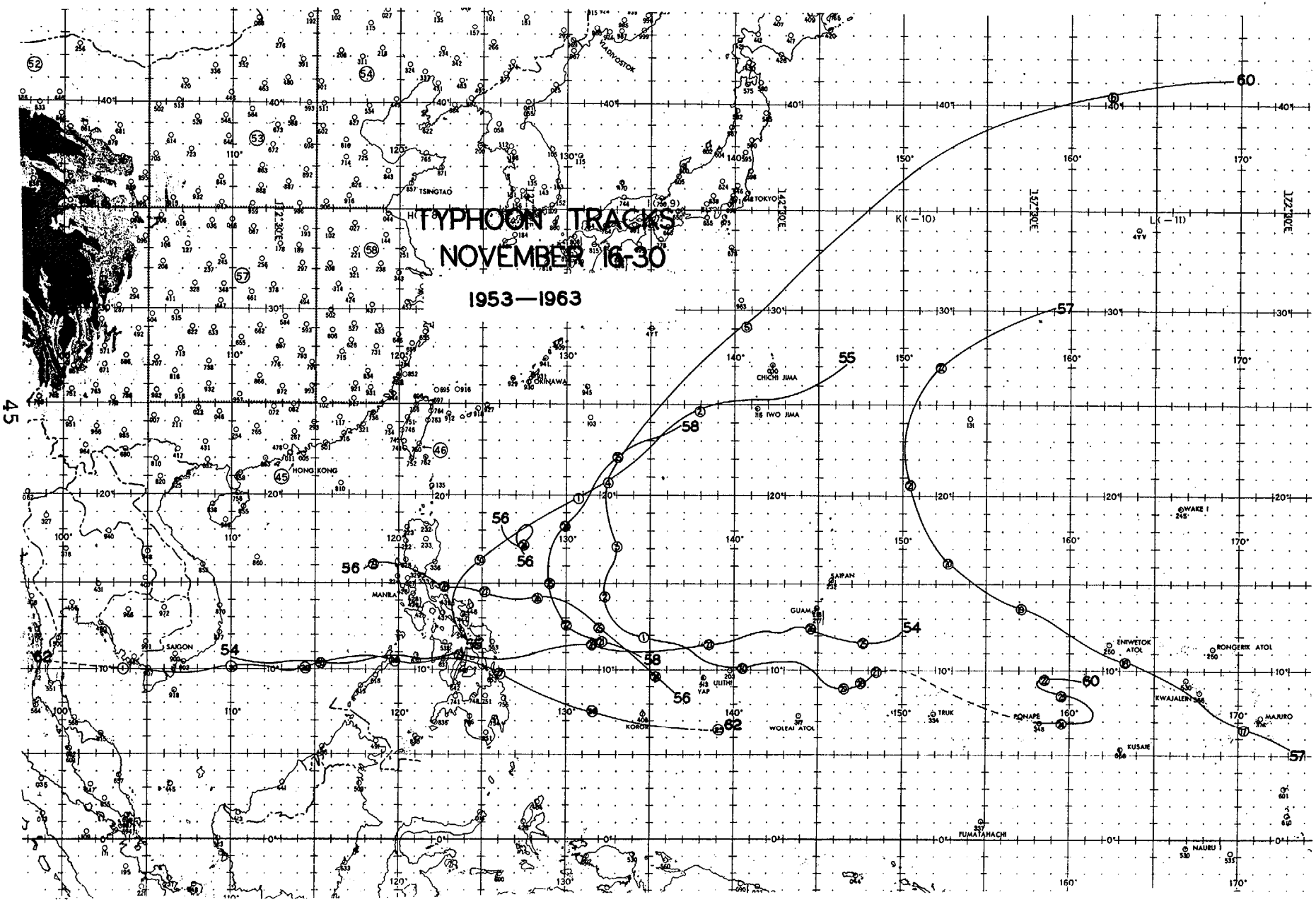

TYPHOON TRACKS
SEPT. 1–15
1953—1963
TSINGTAO
SHANGHAI
VLADIVOSTOK
TOKYO
OKINAWA
CHICHI JIMA
HONG KONG
MANILA
SAIPAN
GUAM
YAP
ULITHI
KOROR
WOLEAI ATOL
TRUK
PONAPE
KUSAIE
ENIWETOK ATOL
RONGERIK ATOL
KWAJALEIN
MAJURO
FUMATAMACHI
H(−8)
K(−10)
L(−11)
M(−12)
142.30°E
157.30°E


TYPHOON TRACKS
SEPT. 16-30
1953—1963
H(−8)
K(−10)
L(−11)
127.30E
142.30E
122.30E
VLADIVOSTOK
TSINGTAO
SHANGHAI
TOKYO
OKINAWA
CHICHI JIMA
IWO JIMA
HONG KONG
MANILA
GUAM
SAIPAN
WAKE I
ENIWETOK ATOL
RONGERIK ATOL
KWAJALEIN
MAJURO
PONAPE
TRUK
KUSAIE
WOLEAI ATOL
KOROR
YAP
ULITHI
FUMATAHACHI

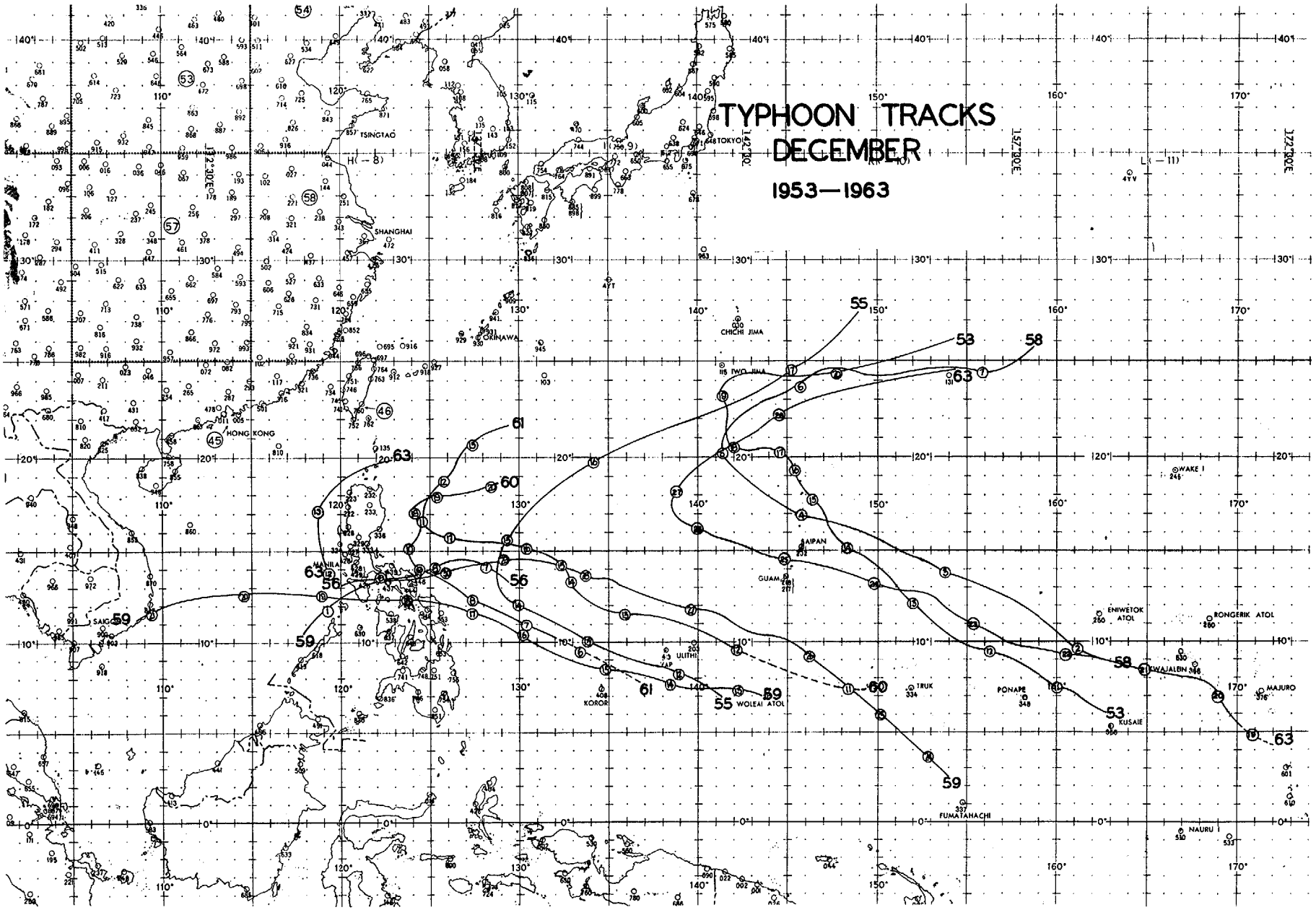

TYPHOON TRACKS
OCTOBER 1-15
1953—1963
VLADIVOSTOK
TSINGTAO
SHANGHAI
HONG KONG
MANILA
SAIGON
TOKYO
OKINAWA
CHICHI JIMA
IWO JIMA
SAIPAN
GUAM
YAP
ULITHI
KOROR
WOLEAI ATOL
TRUK
PONAPE
KUSAIE
WAKE I
ENIWETOK ATOL
RONGERIK ATOL
KWAJALEIN
MAJURO
NAURU
FUMATAHACHI


TYPHOON TRACKS
OCTOBER 16-31
1953—1963
VLADIVOSTOK
TOKYO
OKINAWA
CHICHI JIMA
IWO JIMA
HONG KONG
MANILA
SAIGON
GUAM
SAIPAN
YAP
ULITHI
KOROR
WOLEAI ATOL
TRUK
PONAPE
KUSAIE
KWAJALEIN
ENIWETOK ATOL
RONGERIK ATOL
WAKE I
142°30'E
157°30'E
H(-8)
I(-9)
K(-10)
L(-11)
53
54
55
56
57
58
59
60
61
62
63


TYPHOON TRACKS
NOVEMBER 1–15
1953—1963
TSINGTAO
SHANGHAI
TOKYO
CHICHI JIMA
IWO JIMA
OKINAWA
HONG KONG
MANILA
SAIGON
SAIPAN
GUAM
WAKE I
ENIWETOK ATOL
RONGERIK ATOL
KWAJALEIN
MAJURO
PONAPE
KOROR
WOLEAI ATOL
KUSAIE
NAURU
FUMATAHACHI


TYPHOON TRACKS
NOVEMBER 16-30
1953—1963
TSINGTAO
VLADIVOSTOK
TOKYO
OKINAWA
CHICHI JIMA
IWO JIMA
HONG KONG
MANILA
SAIGON
GUAM
SAIPAN
YAP
ULITHI
WOLEAI ATOL
TRUK
PONAPE
KUSAIE
KWAJALEIN
ENIWETOK ATOL
RONGERIK ATOL
WAKE I.
MAJURO
NAURU I.
FUMATAHACHI
KOROR

45


TYPHOON TRACKS
DECEMBER
1953—1963
TSINGTAO
SHANGHAI
HONG KONG
SAIGON
MANILA
OKINAWA
CHICHI JIMA
IWO JIMA
TOKYO
SAIPAN
GUAM
WAKE I
ENIWETOK ATOL
RONGERIK ATOL
KWAJALEIN
MAJURO
KUSAIE
PONAPE
TRUK
WOLEAI ATOL
ULITHI
KOROR
FUMATAHACHI
NAURU I
122°30'E
127°30'E
142°30'E
157°30'E

CHAPTER III

SUMMARY OF TROPICAL CYCLONES OF 1963

The JTWC issued a total of 663 tropical warnings on 19 typhoons, 6 tropical storms, and 3 tropical depressions in the Western Pacific Ocean in 1963. Five additional tropical cyclones were investigated by weather reconnaissance but did not develop significantly to substantiate the issuance of warnings. The spawning of 19 typhoons in the Western Pacific Ocean during 1963 may be considered a normal occurrence as the annual average from 1952-1962 was 18.9.

The following data for the JTWC area of responsibility is presented for comparison:

COMPARATIVE WESTERN PACIFIC TROPICAL CYCLONE DATA

	1959	1960	1961	1962	1963
TOTAL NUMBER OF WARNINGS	583	776	738	815	663
CALENDAR DAYS OF WARNINGS	137	157	165	154	146
SUSPECT CYCLONES	32	26	27	17	5
TROPICAL DEPRESSIONS	7	3	11	9	3
TROPICAL STORMS	9	8	11	6	6
TYPHOONS	17	19	20	24	19
TOTAL TROPICAL CYCLONES	65	56	69	56	33

In the area of responsibility of the Joint Hurricane Warning Center, Hawaii, (North Pacific Ocean between 140W and 180°) there were two cyclones which required tropical depression warnings.

The most intense typhoon of 1963 was Typhoon JUDY (30 Sep-04 Oct). JUDY developed a maximum sustained wind of 150 kts and had a minimum observed sea level pressure of 917mb, minimum 700mb height of 2384 meters and a maximum 700mb temperature of 24°C. In the past, super typhoons, ones with sustained wind speeds in excess of 130 kts, have been observed to have concentric eyes, and JUDY was no exception. At one time, JUDY had two closed rings of wall clouds with a third ring in partial existence. The same features were present with Typhoon KAREN of the 1962 season which obtained a maximum sustained wind speed of 160 kts.

The circulation area of a tropical cyclone will differ from system to system. As evidence of this fact, Typhoons DELLA (25 Aug-30 Aug) and GLORIA (05 Sep-14 Sep) are depicted. DELLA's counterpart may be found in VERA (25 Aug-

28 Aug) of 1962. Both typhoons were approximately the same size, formed in the same area, ESE of Okinawa, and the first warning on each was issued by the JTWC on the same day of the same month.

Typhoon KIT (05 Oct-11 Oct) had the largest surface cyclonic circulation with a maximum radius of curvature of 700 mi. PHYLLIS (12 Dec-13 Dec), a South China Sea cyclone, was the smallest typhoon of 1963 when considering size of circulation area and also had the shortest life of any typhoon during the year. PHYLLIS is the only tropical cyclone on record (1884-1963) which developed and reached typhoon intensity in the South China Sea during the month of December. The persistent northeast monsoons in this area during December account for the non-development of typhoons.

Typhoons GLORIA and LOLA performed cyclonic loops, with GLORIA looping along the Asiatic mainland NW of Taiwan and LOLA W of Guam. Typhoon BESS (27 Jul-11 Aug), even though it did not perform a loop, was considered by JTWC to have the most erratic movement of any of the typhoons of 1963. BESS established an all-time record for the most tropical warnings issued by JTWC with a total of 61 issued over a period of 15 days.

The Fujiwhara effect between LOLA and MAMIE was observed. Both typhoons recurved within the same six-hour time period, MAMIE recurving 300 mi NW of Marcus Island and LOLA recurving 375 mi SW of Iwo Jima.

Typhoon SUSAN (18 Dec-28 Dec) began its development S of 5N and was the only typhoon to begin this far south during the year. Strong surface winds on occasions have been reported to JTWC by island stations near the equator while tropical cyclones are developing. As SUSAN began to develop, Nauru Island, 32 min S 166 deg 55 min E, reported the following surface wind:

180000Z	270 deg 45 kts	190600Z	270 deg 30 kts
180600Z	270 deg 52 kts	191200Z	NO REPORT RECEIVED
181200Z	NO REPORT RECEIVED	191800Z	NO REPORT RECEIVED
181800Z	NO REPORT RECEIVED	200000Z	270 deg 35 kts
190000Z	270 deg 50 kts	200600Z	270 deg 25 kts

Reports were received from Ocean Island, located at 52 min S 169 deg 30 min E, with surface winds reported WNW at 25-35 kts for a time period in excess of 24 hours.

Of the 19 typhoons during 1963, 15 recurved into the westerlies and 4 dissipated over land prior to recurving. Fourteen of the recurving typhoons became extratropical cyclones. Once the tropical cyclone has moved into the westerlies and begins to become extratropical, some or all of the following characteristics may be found:

1. Absence of or dissipating wall clouds
2. No visible eye or precipitation in eye
3. Elongation of circulation pattern or the existence of a cold front in the immediate vicinity of the eye. This situation normally produces thunderstorm activity in the north semicircle of the cyclone with the strongest winds found in the south semicircle.
4. Absence of Cs or As cloud shield
5. Absence of pronounced feeder bands
6. No warm core at 700mb level
7. Clear Air Turbulence in the vicinity of the cyclone. Weather reconnaissance aircraft have reported severe to extreme turbulence on penetrating tropical cyclones as they become extratropical. On several occasions, wind speed has increased for an approximate period of 6 hours and then decreased rapidly thereafter.

It is difficult and many times impossible to say just when a tropical cyclone has become extratropical, but in general, several of the above criteria exist before JTWC declares a tropical cyclone extratropical.

Land areas affected by typhoons during 1963 are listed below:

1. Asiatic Mainland - Typhoons **TRIX, WENDY, AGNES, CARMEN, FAYE** and **GLORIA**
2. Babuyan Islands - Typhoons **AGNES, FAYE** and **PHYLLIS**
3. Batan Island - Typhoon **FAYE**
4. Bonin Islands - Typhoons **POLLY, DELLA, JUDY, KIT** and **LOLA**
5. Caroline Islands - Typhoon **CARMEN**
6. Hainan Islands - Typhoons **AGNES, CARMEN** and **FAYE**

7. Japan - Typhoons POLLY, SHIRLEY, BESS and DELLA
8. Korea - Typhoons SHIRLEY and BESS
9. Marcus Island - Typhoons OLIVE, ELAINE, MAMIE, ORA and SUSAN
10. Mariana Islands - Typhoons OLIVE, WENDY, JUDY, LOLA and SUSAN
11. Marshall Islands - Typhoon SUSAN
12. Palau Island - Typhoon CARMEN
13. Philippine Islands - Typhoons TRIX, AGNES, FAYE, GLORIA and PHYLLIS
14. Ryukyu Islands - Typhoons SHIRLEY, BESS, DELLA, GLORIA and KIT
15. Taiwan - Typhoons SHIRLEY, WENDY, FAYE and GLORIA
16. Vietnam - Typhoons CARMEN and FAYE

The 24, 48 and 72-hour mean forecast error for each typhoon was computed by two methods. The standard vector error is complemented by a closest-distance error from best track without regard to a given time. It is possible that an error computation giving closest distance from best track will give the user a better understanding of JTWC's capability of forecasting a typhoon to affect a particular area.

The tabulation of the forecast vector error is given for comparison.

FORECAST VERIFICATION
AVERAGE ERROR NAUTICAL MILES

	24 HR	48 HR	72 HR
1950-58	170	--	--
1959	117	267	--
1960	177	354	--
1961	136	274	--
1962	144	287	476
1963	127	246	374

1963 TYPHOON FORECAST VECTOR ERRORS
(IN MI)

TYPHOON	24 HR FORECASTS NO. OF CASES	24 HR FORECASTS MEAN ERROR	48 HR FORECASTS NO. OF CASES	48 HR FORECASTS MEAN ERROR	72 HR FORECASTS NO. OF CASES	72 HR FORECASTS MEAN ERROR
OLIVE	34	119	27	288	-	--
POLLY	17	146	12	221	1	320
SHIRLEY	27	158	23	248	3	353
TRIX	17	99	13	198	-	--
WENDY	28	109	24	210	4	362
AGNES	15	136	11	289	-	--
BESS	42	135	38	278	3	364
CARMEN	26	89	21	121	3	143
DELLA	18	109	11	203	1	157
ELAINE	8	130	2	240	-	--
FAYE	23	76	19	131	3	216
GLORIA	28	97	22	181	4	210
JUDY	15	126	11	339	2	337
KIT	23	144	19	400	3	865
LOLA	28	146	23	244	1	840
MAMIE	10	239	6	461	-	--
ORA	11	180	7	222	-	--
PHYLLIS	2	242	--	--	-	--
SUSAN	35	127	28	266	6	433

AVERAGE ERROR - 24 HR FORECASTS (407 CASES).... 127
AVERAGE ERROR - 48 HR FORECASTS (317 CASES).... 246
AVERAGE ERROR - 72 HR FORECASTS (34 CASES).... 374

1963 TYPHOON FORECAST ERRORS (IN MI)
(IN TERMS OF CLOSEST DISTANCE TO BEST TRACK)

	24 HR FORECASTS		48 HR FORECASTS		72 HR FORECASTS	
TYPHOON	NO. OF CASES	MEAN ERROR	NO. OF CASES	MEAN ERROR	NO. OF CASES	MEAN ERROR
OLIVE	34	82	27	167	-	--
POLLY	17	99	12	81	1	334
SHIRLEY	27	73	23	158	3	254
TRIX	17	53	13	140	-	--
WENDY	28	72	24	146	4	274
AGNES	15	104	11	263	-	--
BESS	42	88	38	176	3	262
CARMEN	26	65	21	96	3	48
DELLA	18	39	11	28	1	95
ELAINE	8	58	2	43	-	--
FAYE	23	49	19	80	3	161
GLORIA	28	61	22	116	4	161
JUDY	15	80	11	245	2	175
KIT	23	102	19	142	3	70
LOLA	28	99	23	155	1	428
MAMIE	10	133	6	216	-	--
ORA	11	102	7	149	-	--
PHYLLIS	2	00	--	--	-	--
SUSAN	35	82	28	102	6	122

AVERAGE ERROR - 24 HR FORECASTS (407 CASES).... 79
AVERAGE ERROR - 48 HR FORECASTS (317 CASES).... 141
AVERAGE ERROR - 72 HR FORECASTS (34 CASES).... 178

1963 TYPHOON DATA SUMMARY

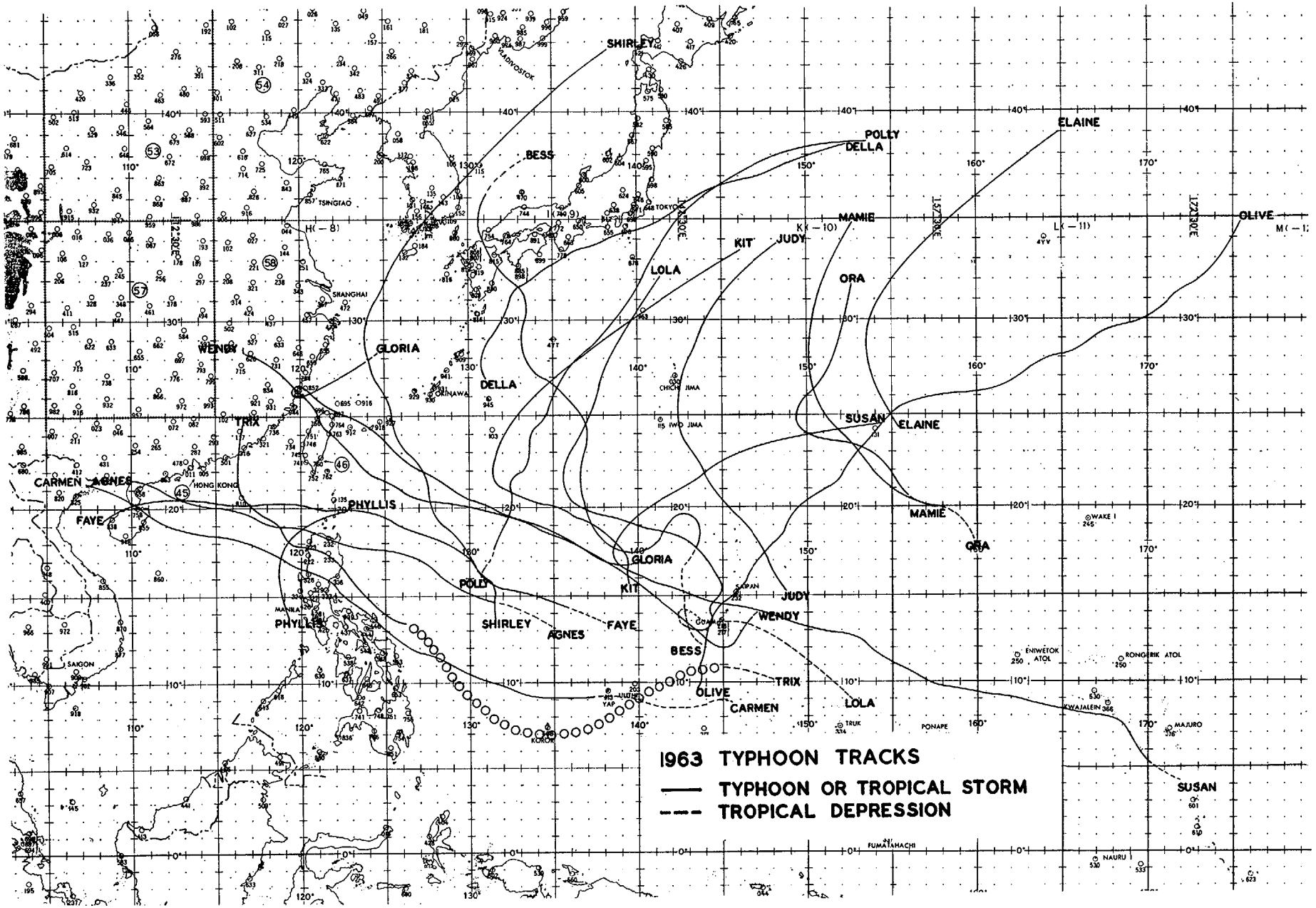
TYPHOON	MONTH	MAX SFC WND SPD	CALENDAR DAYS OF WARNINGS/TYPHOON		DISTANCE TRAVELED WARNING STATUS
OLIVE	APR	125	9.50	8.50	2436
POLLY	MAY	70	6.00	3.25	1950
SHIRLEY	JUN	140	7.75	6.50	2148
TRIX	JUN	70	6.25	2.00	1146
WENDY	JUL	135	9.25	6.25	2100
AGNES	JUL	85	5.50	3.00	1554
BESS	JUL	130	15.25	6.50	2244
CARMEN	AUG	125	9.75	5.75	2430
DELLA	AUG	100	5.75	4.00	1410
ELAINE	AUG	100	3.50	2.25	1128
FAYE	SEP	110	7.50	5.25	1812
GLORIA	SEP	135	9.00	5.75	1638
JUDY	SEP	150	5.00	4.25	1326
KIT	OCT	135	6.75	5.25	1674
LOLA	OCT	130	11.75	5.25	2376
MAMIE	OCT	100	3.50	3.00	1116
ORA	OCT	80	6.25	2.25	1194
PHYLLIS	DEC	75	2.00	1.25	486
SUSAN	DEC	135	10.50	8.00	3204
TYPHOON	AVG	112	7.41	4.65	1756

1963 TYPHOON DATA SUMMARY

			FROM RECONNAISSANCE		
TYPHOON	MONTH	MAX RAD SFC CIRC	MAX 700 MB TEMP (C)	MIN 700 MB HGT	MIN SLP (MB)
OLIVE	APR	450	21	2400	922
POLLY	MAY	450	15	2896	980
SHIRLEY	JUN	300	21	2493	935
TRIX	JUN	250	16	2890	980
WENDY	JUL	350	21	2441	928
AGNES	JUL	250	15	2970	992
BESS	JUL	350	21	2475	930
CARMEN	AUG	250	23	2539	936
DELLA	AUG	250	22	2847	970
ELAINE	AUG	250	15	2768	967
FAYE	SEP	450	17	2722	957
GLORIA	SEP	550	19	2384	921
JUDY	SEP	400	24	2341	917
KIT	OCT	700	19	2451	929
LOLA	OCT	300	19	2609	945
MAMIE	OCT	500	21	2819	971
ORA	OCT	300	19	2929	984
PHYLLIS	DEC	210	15	2940	986
SUSAN	DEC	500	21	2478	932
TYPHOON	AVG	372	19	2652	952

1963 TYPHOON DATA SUMMARY

TYPHOON	MONTH	FROM WARNINGS MAX RADIUS 100 KT WND	MAX RADIUS 50 KT WND	MAX RADIUS 30 KT WND
OLIVE	APR	40	125	450
POLLY	MAY	--	200	350
SHIRLEY	JUN	75	200	300
TRIX	JUN	--	100	250
WENDY	JUL	80	200	350
AGNES	JUL	--	100	250
BESS	JUL	30	200	350
CARMEN	AUG	40	150	250
DELLA	AUG	15	75	250
ELAINE	AUG	30	150	250
FAYE	SEP	40	125	450
GLORIA	SEP	90	250	550
JUDY	SEP	100	225	400
KIT	OCT	70	250	850
LOLA	OCT	70	200	600
MAMIE	OCT	--	150	500
ORA	OCT	--	150	300
PHYLLIS	DEC	--	50	250
SUSAN	DEC	60	225	450

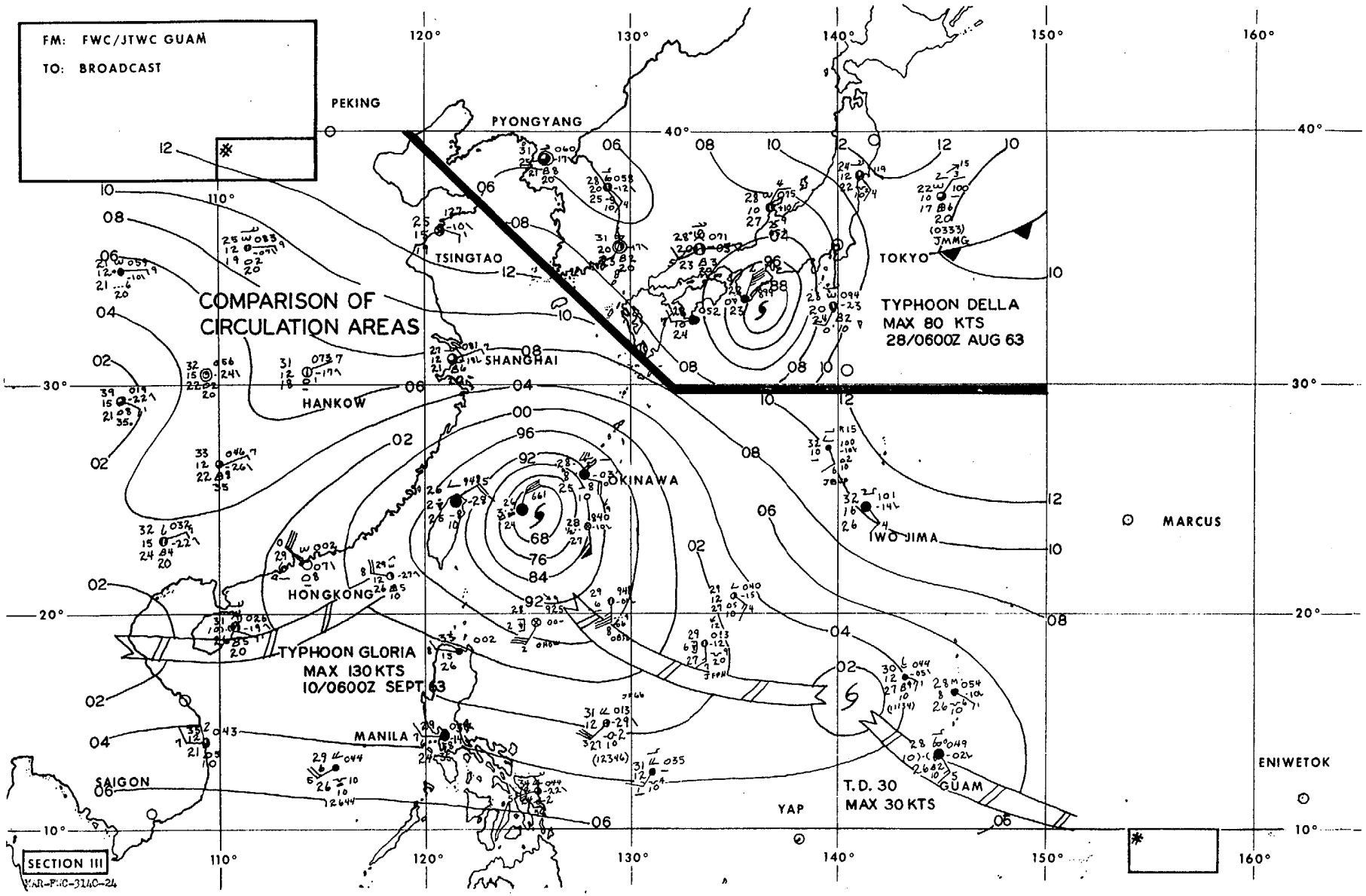

1963 TYPHOON TRACKS
TYPHOON OR TROPICAL STORM
TROPICAL DEPRESSION
SHIRLEY
BESS
POLLY
DELLA
ELAINE
MAMIE
OLIVE
KIT
JUDY
LOLA
ORA
GLORIA
WENDY
TRIX
SUSAN
CARMEN
AGNES
FAYE
PHYLLIS
HONG KONG
SAIGON
MANILA
TSINGTAO
SHANGHAI
OKINAWA
TOKYO
IWO JIMA
CHICHI JIMA
WAKE I
SAIPAN
YAP
TRUK
PONAPE
KOROR
ENIWETOK ATOL
RONGERIK ATOL
KWAJALEIN
MAJURO
NAURU
FUMATAHACHI

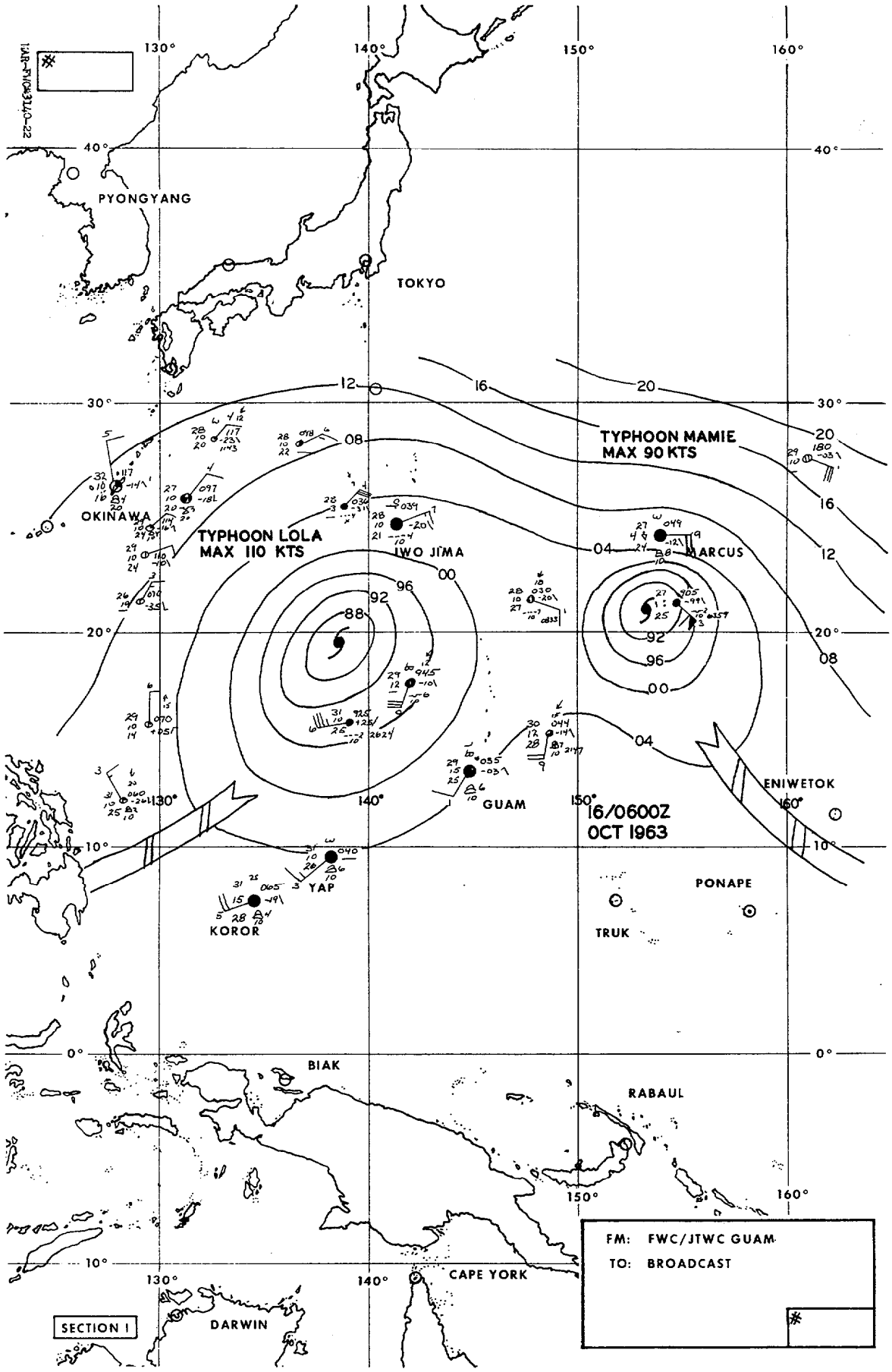
1963 TYPHOON TRACKS

TYPHOON OLIVE	27 APR - 06 MAY
TYPHOON POLLY	31 MAY - 06 JUN
TYPHOON SHIRLEY	13 JUN - 20 JUN
TYPHOON TRIX	18 JUN - 19 JUN
	26 JUN - 01 JUL
TYPHOON WENDY	09 JUL - 18 JUL
TYPHOON AGNES	17 JUL - 22 JUL
TYPHOON BESS	27 JUL - 11 AUG
TYPHOON CARMEN	07 AUG - 17 AUG
TYPHOON DELLA	25 AUG - 30 AUG
TYPHOON ELAINE	25 AUG - 28 AUG
TYPHOON FAYE	01 SEP - 08 SEP
TYPHOON GLORIA	05 SEP - 14 SEP
TYPHOON JUDY	30 SEP - 04 OCT
TYPHOON KIT	05 OCT - 11 OCT
TYPHOON LOLA	08 OCT - 19 OCT
TYPHOON MAMIE	15 OCT - 18 OCT
TYPHOON ORA	23 OCT - 29 OCT
TYPHOON PHYLLIS	12 DEC - 13 DEC
TYPHOON SUSAN	18 DEC - 28 DEC

TYPHOON DISTRIBUTION BY MONTH

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOT
1952						3	1	3	3	5	3	3	21
1953		1			1	1	1	5	2	4	1	1	17
1954					1		1	4	4	2	3		15
1955	1		1	1		1	5	3	3	2	1	1	19
1956			1	1			2	4	5	1	3	1	18
1957	1			1	1	1	1	2	5	3	3		18
1958	1				1	2	5	3	3	3	1	1	20
1959				1			1	5	3	3	2	2	17
1960				1		2	2	8		4	1	1	19
1961			1		2	1	3	3	5	3	1	1	20
1962				1	2		5	7	2	4	3		24
1963				1	1	2	3	3	3	4		2	19
AVG.	.25	.08	.25	.6	.75	1.1	2.5	4.2	3.2	3.2	1.8	1.1	18.9


FM: FWC/JTWC GUAM
TO: BROADCAST
COMPARISON OF CIRCULATION AREAS
PEKING
PYONGYANG
TSINGTAO
SHANGHAI
HANKOW
HONGKONG
OKINAWA
TOKYO
MARCUS
IWO JIMA
ENIWETOK
GUAM
YAP
MANILA
SAIGON
TYPHOON DELLA
MAX 80 KTS
28/0600Z AUG 63
TYPHOON GLORIA
MAX 130 KTS
10/0600Z SEPT 63
T.D. 30
MAX 30 KTS
SECTION III
NAVAER-FWC-3140-24


PYONGYANG
TOKYO
OKINAWA
IWO JIMA
MARCUS
GUAM
ENIWETOK
PONAPE
TRUK
YAP
KOROR
BIAK
RABAUL
CAPE YORK
DARWIN
TYPHOON LOLA
MAX 110 KTS
TYPHOON MAMIE
MAX 90 KTS
16/0600Z
OCT 1963
FM: FWC/JTWC GUAM
TO: BROADCAST
SECTION I

TROPICAL CYCLONES OF 1963

	CYCLONE	*PERIOD
03.	Tropical Depression 03	25 MAR - 26 MAR
04.	Investigation	30 MAR - 03 APR
05.	Typhoon OLIVE	27 APR - 06 MAY
07.	Investigation	19 MAY - 21 MAY
08.	Investigation	20 MAY - 21 MAY
09.	Typhoon POLLY	31 MAY - 06 JUN
10.	Tropical Storm ROSE	08 JUN - 13 JUN
11.	Typhoon SHIRLEY	13 JUN - 20 JUN
12.	Typhoon TRIX	18 JUN - 19 JUN
		26 JUN - 01 JUL
15.	Tropical Storm VIRGINIA	04 JUL - 09 JUL
16.	Typhoon WENDY	09 JUL - 18 JUL
17.	Investigation	12 JUL - 13 JUL
18.	Typhoon AGNES	17 JUL - 22 JUL
19.	Tropical Depression 19**	26 JUL - 29 JUL
20.	Typhoon BESS	27 JUL - 11 AUG
21.	Tropical Depression 21	29 JUL - 30 JUL
23.	Typhoon CARMEN	07 AUG - 17 AUG
25.	Typhoon DELLA	25 AUG - 30 AUG
26.	Tropical Depression 26	26 AUG - 27 AUG
27.	Typhoon ELAINE	25 AUG - 28 AUG
28.	Typhoon FAYE	01 SEP - 08 SEP
29.	Typhoon GLORIA	05 SEP - 14 SEP
30.	Tropical Storm HESTER	08 SEP - 12 SEP
31.	Tropical Depression 31***	16 SEP - 20 SEP
32.	Tropical Storm IRMA	17 SEP - 19 SEP
34.	Typhoon JUDY	30 SEP - 04 OCT
35.	Typhoon KIT	05 OCT - 11 OCT
36.	Typhoon LOLA	08 OCT - 19 OCT
37.	Typhoon MAMIE	15 OCT - 18 OCT
38.	Tropical Storm NINA	18 OCT - 19 OCT

TROPICAL CYCLONES OF 1963 (CONT'D)

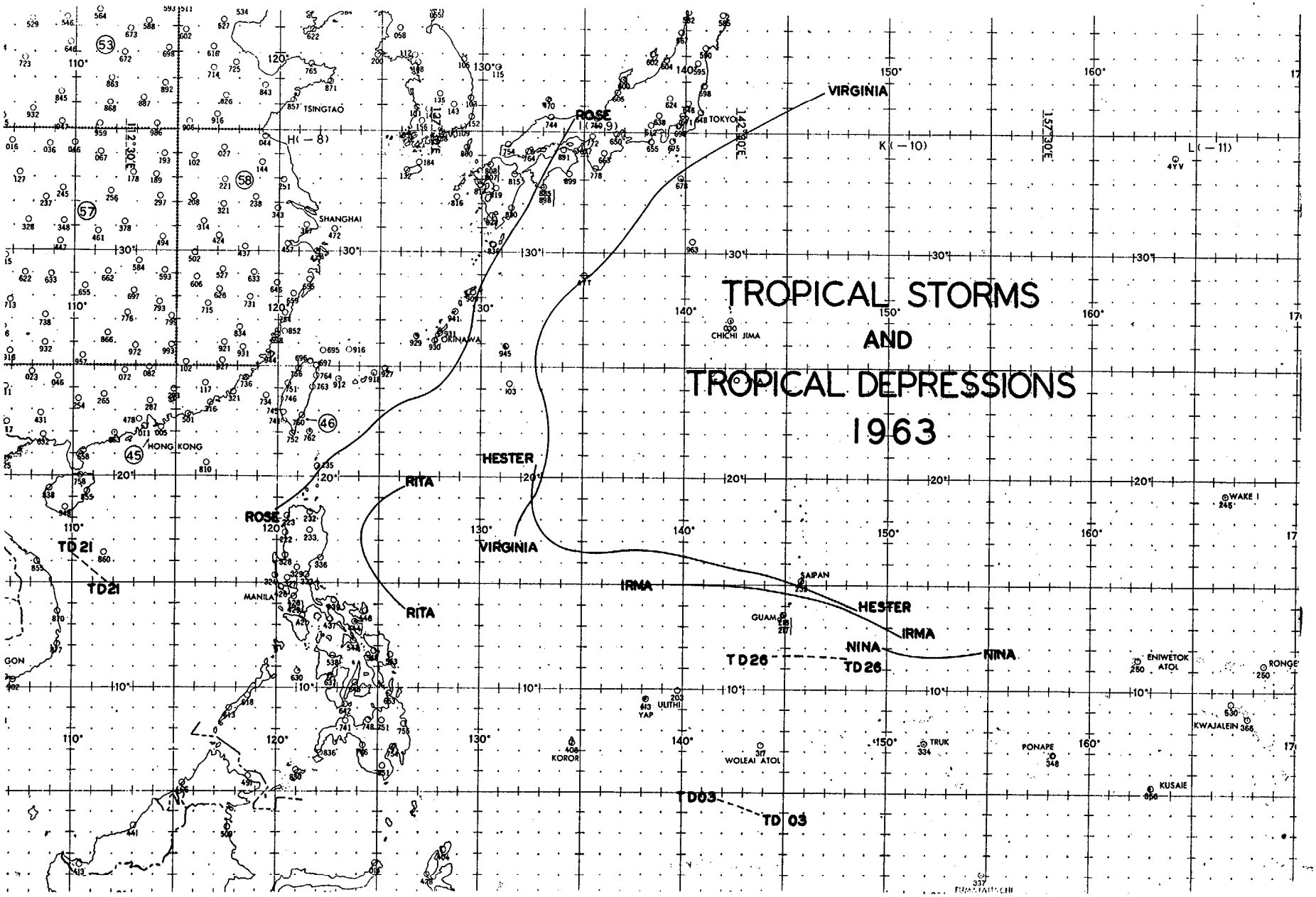
	CYCLONE	*PERIOD
39.	Typhoon ORA	23 OCT - 29 OCT
40.	Investigation	01 DEC - 02 DEC
41.	Typhoon PHYLLIS	12 DEC - 13 DEC
42.	Tropical Storm RITA	16 DEC - 18 DEC
43.	Typhoon SUSAN	18 DEC - 28 DEC

* The period shown covers the period from the date the cyclone was first assigned a cyclone number until the final warning was issued, or if no warnings were issued, the date the cyclone dissipated.

** JHWC Hawaii

*** JHWC Hawaii (Cyclone 09 for FWC Alameda)

Note: The missing numbers were assigned to major easterly waves that did not reach the cyclone stage.


TROPICAL STORMS
AND
TROPICAL DEPRESSIONS
1963
VIRGINIA
ROSE
TOKYO
SHANGHAI
TSINGTAO
HONG KONG
CHICHI JIMA
OKINAWA
HESTER
RITA
ROSE
VIRGINIA
TD 21
TD21
MANILA
IRMA
SAIPAN
HESTER
GUAM
IRMA
NINA
NINA
TD 26
TD26
ENIWETOK ATOL
RONGE
WAKE I
ULITHI
YAP
KOROR
WOLEAI ATOL
TRUK
PONAPE
KWAJALEIN
KUSAIE
TD03
TD 03
H(−8)
K(−10)
L(−11)
127.5°E
142.5°E
157.5°E

TROPICAL STORMS 1963
POSITION DATA

TROPICAL STORM ROSE
08 JUN-13 JUN

DTG	LAT	LONG	DTG	LAT	LONG
080000Z	18.5N	119.8E	110000Z	22.9N	125.3E
080600Z	18.7N	120.1E	110600Z	23.4N	126.1E
081200Z	18.8N	120.5E	111200Z	23.5N	126.7E
081800Z	19.0N	120.8E	111800Z	23.7N	127.3E
090000Z	19.3N	121.0E	120000Z	23.9N	127.6E
090600Z	19.6N	121.3E	120600Z	24.4N	127.9E
091200Z	19.9N	121.7E	121200Z	25.0N	128.7E
091800Z	20.4N	122.1E	121800Z	26.3N	129.5E
100000Z	20.9N	122.6E	130000Z	28.0N	129.8E
100600Z	21.4N	123.4E	130600Z	29.9N	130.9E
101200Z	21.8N	124.1E	131200Z	32.3N	132.5E
101800Z	22.4N	124.7E	131800Z	35.5N	134.5E

TROPICAL STORM VIRGINIA
04 JUL-09 JUL

DTG	LAT	LONG	DTG	LAT	LONG
040600Z	17.2N	131.8E	070000Z	24.4N	132.9E
041200Z	17.8N	131.9E	070600Z	25.1N	132.9E
041800Z	18.3N	132.2E	071200Z	25.8N	132.9E
050000Z	18.9N	132.5E	071800Z	26.5N	133.0E
050600Z	19.6N	132.8E	080000Z	27.1N	133.3E
051200Z	20.3N	133.0E	080600Z	27.7N	133.7E
051800Z	20.9N	133.2E	081200Z	28.4N	134.4E
060000Z	21.6N	133.2E	081800Z	30.2N	136.3E
060600Z	22.3N	133.3E	090000Z	32.9N	139.0E
061200Z	23.0N	133.2E	090600Z	34.9N	142.8E
061800Z	23.7N	133.1E	091200Z	36.5N	146.8E

TROPICAL STORM HESTER
08 SEP-12 SEP

DTG	LAT	LONG	DTG	LAT	LONG
081200Z	13.8N	148.4E	090000Z	14.5N	146.5E
081800Z	14.2N	147.5E	090600Z	14.9N	145.5E

(continued)

TROPICAL STORM HESTER (CONT'D)
08 SEP-12 SEP

DTG	LAT	LONG	DTG	LAT	LONG
091200Z	15.3N	144.5E	110000Z	16.2N	139.9E
091800Z	15.6N	143.5E	110600Z	16.3N	138.8E
100000Z	15.8N	142.5E	111200Z	16.3N	136.7E
100600Z	15.9N	141.7E	111800Z	16.9N	134.3E
101200Z	16.0N	141.1E	120000Z	19.1N	132.7E
101800Z	16.1N	140.6E	120600Z	21.6N	132.8E

TROPICAL STORM IRMA
17 SEP-19 SEP

DTG	LAT	LONG	DTG	LAT	LONG
170600Z	12.5N	150.7E	181200Z	14.8N	143.9E
171200Z	13.2N	149.5E	181800Z	15.0N	142.1E
171800Z	13.7N	148.3E	190000Z	15.0N	140.2E
180000Z	14.1N	147.0E	190600Z	15.0N	138.3E
180600Z	14.5N	145.6E			

TROPICAL STORM NINA
18 OCT-19 OCT

DTG	LAT	LONG	DTG	LAT	LONG
180600Z	11.8N	154.7E	190600Z	11.8N	151.2E
181200Z	11.6N	153.5E	191200Z	11.8N	150.5E
181800Z	11.6N	152.5E	191800Z	12.0N	149.8E
190000Z	11.6N	151.8E			

TROPICAL STORM RITA
16 DEC-18 DEC

DTG	LAT	LONG	DTG	LAT	LONG
160600Z	13.8N	126.2E	171200Z	17.5N	124.2E
161200Z	14.5N	125.5E	171800Z	18.1N	124.4E
161800Z	15.1N	124.9E	180000Z	18.6N	124.8E
170000Z	15.8N	124.4E	180600Z	19.1N	125.3E
170600Z	16.5N	124.1E	181200Z	19.5N	126.2E

TROPICAL DEPRESSIONS 1963
POSITION DATA

TROPICAL DEPRESSION ZERO THREE
25 MAR-26 MAR

DTG	LAT	LONG	DTG	LAT	LONG
250600Z	03.9N	149.3E	251800Z	04.4N	147.7E
251200Z	04.2N	148.5E	260000Z	04.6N	146.9E

TROPICAL DEPRESSION TWO ONE
29 JUL-30 JUL

DTG	LAT	LONG	DTG	LAT	LONG
291800Z	15.0N	111.5E	300600Z	15.8N	110.5E
300000Z	15.4N	111.1E	301200Z	16.3N	110.0E

TROPICAL DEPRESSION TWO SIX
26 AUG-27 AUG

DTG	LAT	LONG	DTG	LAT	LONG
260600Z	11.5N	148.0E	261800Z	11.6N	145.5E
261200Z	11.6N	146.7E	270000Z	11.6N	144.2E

POSITION DATA FOR TROPICAL DEPRESSION WARNINGS ISSUED BY
JOINT HURRICANE WARNING CENTER, HAWAII

TROPICAL DEPRESSION ONE NINE
26 JUL-29 JUL

DTG	LAT	LONG	DTG	LAT	LONG
260000Z	06.0N	163.0W	271800Z	06.0N	172.2W
260600Z	06.0N	164.0W	280000Z	06.0N	173.3W
261200Z	06.0N	165.3W	280600Z	06.0N	174.5W
261800Z	06.0N	167.3W	281200Z	06.0N	175.7W
270000Z	06.0N	168.5W	281800Z	06.0N	176.7W
270600Z	06.0N	169.6W	290000Z	06.0N	177.9W
271200Z	06.0N	170.6W			

TROPICAL DEPRESSION THREE ONE*
16 SEP-20 SEP

DTG	LAT	LONG	DTG	LAT	LONG
160900Z	23.7N	150.7W	180900Z	19.8N	162.2W
161500Z	23.2N	152.3W	181500Z	19.5N	163.5W
162100Z	23.0N	154.1W	182100Z	19.0N	167.0W
170300Z	23.2N	155.7W	190300Z	20.0N	166.0W
170900Z	22.2N	157.0W	190900Z	20.0N	167.3W
171500Z	20.8N	158.8W	191500Z	20.0N	169.2W
172100Z	20.4N	159.6W	192100Z	20.0N	174.0W
180300Z	20.2N	161.0W	200300Z	19.0N	179.0W

*Cyclone 09 for FWC Alameda

CHAPTER IV

INDIVIDUAL TYPHOONS OF 1963

TYPHOON OLIVE - 270000Z APR to 060600Z MAY

I. DATA

A. Statistics

1. Calendar days of tropical warning - 9½
2. Calendar days of typhoon intensity - 8½
3. Total distance traveled during tropical warning period - 2436 mi.

B. Characteristics as a typhoon

1. Minimum observed SLP - 922mb, 282315Z
2. Minimum observed 700mb height - 2400m, 282315Z
3. Max radius of SFC circulation - 450 mi
4. Max surface winds - 125 kts

II. DEVELOPMENT

A. Initial impetus - Juxtaposition of polar trough with subsequent fracture and intensification of outdraft at 200mb.

B. Initial surface vortex

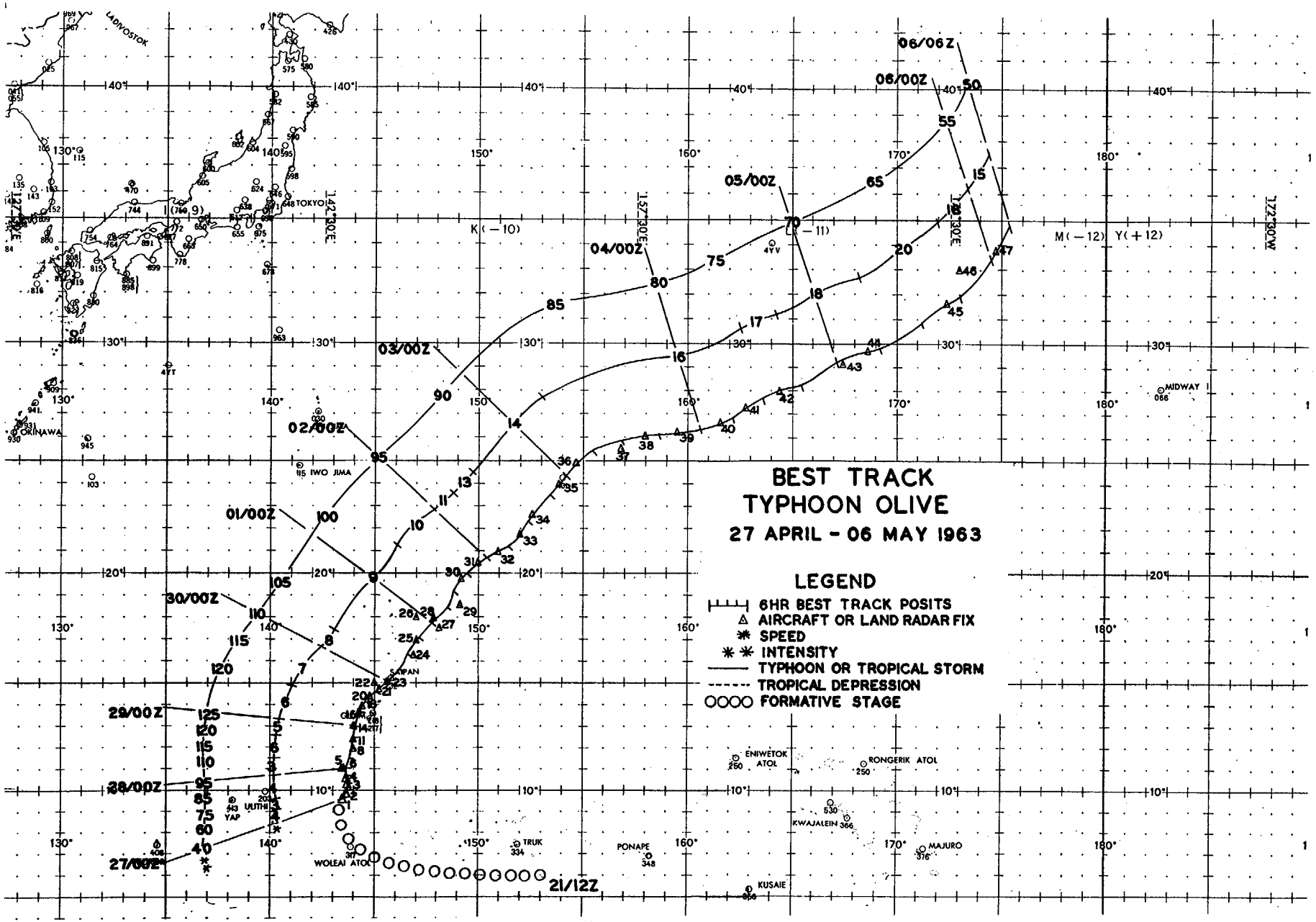
1. Embedded vortex at 211200Z
2. Surface pressure less than 1007mb

C. Zenith flow at 200mb

1. Relative position surface vortex - SW quadrant of anticyclone.
2. Wind direction over vortex - ESE

III. FINAL DISPOSITION

A. Became extratropical.


BEST TRACK
TYPHOON OLIVE
27 APRIL - 06 MAY 1963
LEGEND
6HR BEST TRACK POSITS
AIRCRAFT OR LAND RADAR FIX
SPEED
INTENSITY
TYPHOON OR TROPICAL STORM
TROPICAL DEPRESSION
FORMATIVE STAGE
06/06Z
06/00Z
05/00Z
04/00Z
03/00Z
02/00Z
01/00Z
30/00Z
29/00Z
28/00Z
27/00Z
21/12Z
K(−10)
L(−11)
M(−12)
Y(+12)
142.5°E
157.5°E
172.5°W
TOKYO
OKINAWA
IWO JIMA
SAIPAN
YAP
ULITHI
WOLEAI ATOL
TRUK
PONAPE
KUSAIE
ENIWETOK ATOL
RONGERIK ATOL
KWAJALEIN
MAJURO
MIDWAY

LAND RADAR AND AIRCRAFT FIXES - TYPHOON OLIVE

FIX NO/TIME	LAT.	LONG.	UNIT METHOD & ACCY	MAX SFC WND	MAX 700MB WND	MIN 700MB HGT	RECON MIN SLP MBS	JTWC MIN SLP *MBS	700MB T/Td (°C)	EYE CHARACTERISTICS
1 262300Z	09.7N	143.5E	VW1-R-03	-	-	-	-	-	- -	CIRC 34 MI DIA,HVY WALL CLDS 20 MI WIDE
2 270400Z	09.9N	143.7E	VW1-R-03	60	-	-	974	-	- -	CIRC 30 MI DIA,OPEN S QUAD
3 271130Z	10.3N	143.8E	VW1-R-03	-	-	-	-	-	- -	CIRC 30 MI DIA,WELL DEV SPIRAL BANDS
4 271600Z	10.6N	143.7E	VW1-R-03	-	-	-	-	-	- -	CIRC 22 MI DIA CLOSED 8 MI WALL CLDS,SPIRAL BANDS ,200 MI
5 272200Z	11.1N	143.6E	54-P-05	70	95	2630	950	950	19/01	CIRC 30 MI DIA,WALL CLDS ALL QUADS
6 280050Z	11.0N	143.6E	LND/RDR	-	-	-	-	-	- -	CIRC 21 MI DIA
7 280340Z	11.1N	143.6E	54-P-05	80	110	2572	940	940	21/06	CIRC 20 MI DIA,WALL CLDS ALL QUADS
8 280935Z	11.9N	144.0E	VW1-R-03	-	-	-	-	-	- -	CIRC 15 MI DIA,OPEN S&W, WALL CLD WIDTH 10 MI
9 281450Z	12.4N	143.9E	VW1-R-01	-	-	-	-	-	- -	OPEN S
10 281645Z	12.3N	143.9E	LND/RDR	-	-	-	-	-	- -	CONCENTRIC CIRCLE
11 281915Z	12.5N	143.9E	LND/RDR	-	-	-	-	-	- -	---
12 282030Z	12.6N	144.0E	LND/RDR	-	-	-	-	-	- -	---
13 282145Z	12.8N	144.1E	LND/RDR	-	-	-	-	-	- -	---
14 282315Z	13.0N	144.0E	54-P-02	110	125	2400	932	922	21/15	ELLIP,BLUE SKY VISIBLE THRU THIN CI IN EYE
15 290415Z	13.5N	144.1E	LND/RDR	-	-	-	-	-	- -	---

*Computed

LAND RADAR AND AIRCRAFT FIXES - TYPHOON OLIVE (CONT'D)

FIX NO/TIME	LAT.	LONG.	UNIT METHOD & ACCY	MAX SFC WND	MAX 700MB WND	MIN 700MB HGT	RECON MIN SLP MBS	JTWC MIN SLP *MBS	700MB T/Td (°C)	EYE CHARACTERISTICS
16 290636Z	13.7N	144.2E	LND/RDR	-	-	-	-	-	- -	---
17 290835Z	13.9N	144.3E	LND/RDR	-	-	-	-	-	- -	---
18 291000Z	13.9N	144.5E	VW1-R-02	-	-	-	-	-	- -	OVAL,18 MI E/W, 13 MI N/S MAIN FEEDER BAND OVER GUAM
19 291300Z	14.3N	144.7E	LND/RDR	-	-	-	-	-	- -	---
20 291545Z	14.4N	144.8E	VW1-R-05	-	-	-	-	-	- -	CIRC 18 MI DIA,OPEN SE, HEAVY FEEDER BANDS NW
21 291900Z	14.7N	145.1E	LND/RDR	-	-	-	-	-	- -	---
22 292158Z	15.0N	145.0E	TIROS	-	-	-	-	-	- -	BANDING S & E
23 292218Z	15.0N	145.4E	54-P-01	60	90	2661	-	955	14/14	EYE POORLY DEFINED,OPEN S
24 301000Z	16.3N	146.9E	VW1-R-03	-	-	-	-	-	- -	CIRC 20 MI DIA,WALL CLDS 6 MI THICK
25 301600Z	16.8N	146.9E	VW1-R-05	-	-	-	-	-	- -	DIFFUSE SPIRAL BAND N, OPEN S
26 302146Z	18.0N	147.0E	TIROS	-	-	-	-	-	- -	OVERCAST,6 DEG DIA, MAJOR BAND NE
27 302200Z	17.6N	148.1E	54-P-20	75	-	2743	965	960	20/14	CIRC POORLY DEFINED
28 010310Z	18.0N	147.9E	54-P-10	65	-	2783	968	968	15/13	CIRC 40 MI DIA
29 010930Z	18.5N	149.1E	VW1-R-10	-	-	-	-	-	- -	OVAL 28 MI (NW/SE,17 MI NE/SW)
30 011540Z	19.7N	149.2E	VW1-R-10	-	-	-	-	-	- -	ELLIP 68 MI (E/W),44 MI (N/S),HVY WALL CLD N SEMI

*Computed

LAND RADAR AND AIRCRAFT FIXES - TYPHOON OLIVE (CONT'D)

FIX NO/TIME	LAT°	LONG°	UNIT METHOD & ACCY	MAX SFC WND	MAX 700MB WND	MIN 700MB HGT	RECON MIN SLP MBS	JTWC MIN SLP *MBS	700MB T/Td (°C)	EYE CHARACTERISTICS
31 012200Z	20.4N	150.0E	54-P-07	50	60	2861	971	976	14/14	OVAL,50 MI (NE/SW),20 MI (NW/SE)
32 020330Z	21.0N	150.9E	54-P-08	60	80	2835	955	972	17/12	CIRC 30 MI DIA
33 020930Z	21.8N	152.0E	VW1-R-15	-	-	-	-	-	- -	CIRC 30 MI DIA,OPEN SW, WALL CLDS 10 MI THICK
34 021300Z	22.4N	152.4E	VW1-R-10	-	-	-	-	-	- -	CIRC 27 MI DIA,WALL CLDS 10 MI THICK
35 022200Z	23.9N	153.9E	54-P-01	70	75	2853	971	971	19/-	CIRC 20 MI DIA
36 030300Z	24.9N	154.6E	54-P-01	75	110	2832	948	972	18/-	ELLIP,40 MI (NE/SW),30 MI (NW/SE)
37 030942Z	25.5N	156.9E	VW1-R-10	-	-	-	-	-	- -	LGE FEEDER BAND,CENTER POORLY DEFINED
38 031530Z	26.1N	158.0E	VW1-R-05	-	-	-	-	-	- -	ELLIP,45 MI NE/SW,35 MI NW/SE, OPEN S
39 032200Z	26.1N	159.5E	54-P-10	55	73	2883	969	982	09/09	OVAL 30 X 20 MI
40 040400Z	26.5N	161.6E	56-P-10	80	-	2908	973	986	09/-	EYE NOT WELL DEF & FILLING
41 040945Z	27.4N	162.9E	VW1-R-10	-	-	-	-	-	- -	CENTER POORLY DEFINED
42 041530Z	27.9N	164.4E	VW1-R-10	-	-	-	-	-	- -	CENTER POORLY DEF,FEEDER BAND E-S
43 042130Z	29.1N	167.3E	VW1-R-15	60	-	-	-	-	- -	CIRC 50 MI DIA,CENTER DIFFUSED

*Computed

LAND RADAR AND AIRCRAFT FIXES - TYPHOON OLIVE (CONT'D)

FIX NO/TIME	LAT.	LONG.	UNIT METHOD & ACCY	MAX SFC WND	MAX 700MB WND	MIN 700MB HGT	RECON MIN SLP MBS	JTWC MIN SLP *MBS	700MB T/Td (°C)	EYE CHARACTERISTICS
44 050430Z	29.6N	168.6E	54-P-03	75	60	2957	980	990	11/9	OPEN EXCEPT AC SHIELD
45 051530Z	31.7N	172.6E	VW1-R-10	-	-	-	-	-	- -	CENTER POORLY DEFINED
46 052200Z	33.0N	173.0E	56-P-15	40	70	2917	990	986	- -	EYE FILLED WITH FRONTAL CLDS
47 060430Z	33.7N	174.8E	VW1-P-10	50	-	-	996	996	- -	CENTER OPEN

*Computed

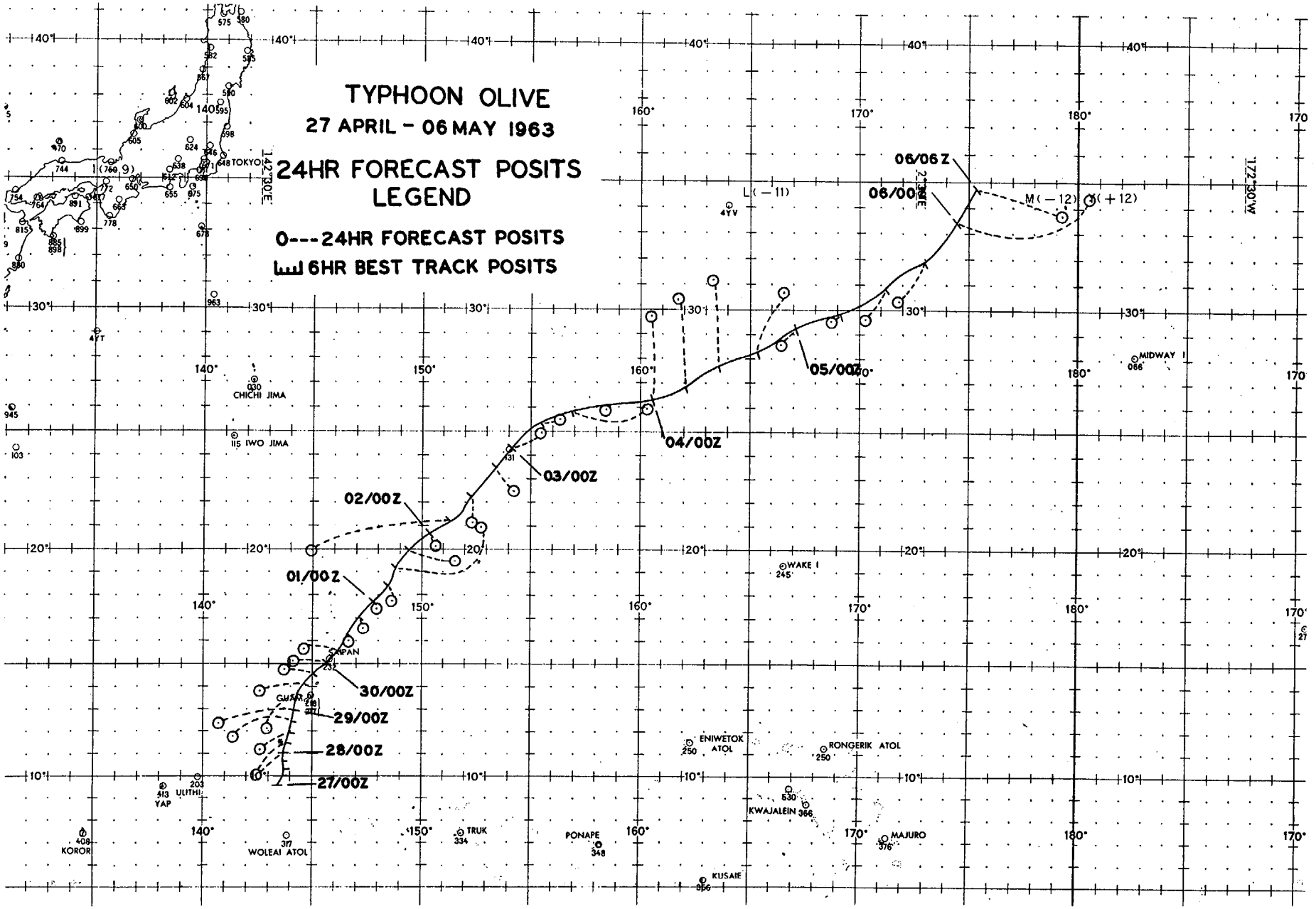
TYPHOON OLIVE 27 APR-05 MAY 1963
POSITION AND FORECAST VERIFICATION DATA

DTG	STORM POSITION LAT.	LONG.	24 HOUR ERROR DEG. DISTANCE	48 HOUR ERROR DEG. DISTANCE
270000Z	09.7N	143.5E	------	------
270600Z	10.0N	143.7E	------	------
271200Z	10.3N	143.8E	------	------
271800Z	10.6N	143.6E	------	------
280000Z	11.1N	143.7E	231-87	------
280600Z	11.4N	143.8E	225-104	------
281200Z	11.9N	143.9E	238-92	------
281800Z	12.5N	143.9E	253-160	------
290000Z	13.0N	144.0E	257-197	247-279
290600Z	13.6N	144.2E	217-115	242-305
291200Z	14.1N	144.5E	260-112	250-288
291800Z	14.6N	145.0E	282-72	258-447
300000Z	15.1N	145.5E	272-86	261-528
300600Z	15.6N	146.1E	271-86	252-380
301200Z	16.4N	146.5E	134-26	260-463
301800Z	17.1N	147.1E	157-30	265-106
010000Z	17.8N	147.8E	144-25	252-167
010600Z	18.4N	148.5E	171-34	255-210
011200Z	19.2N	148.9E	064-252	161-70
011800Z	20.0N	149.5E	105-129	208-120
020000Z	20.7N	150.3E	135-41	108-96
020600Z	21.2N	151.3E	258-365	019-114
021200Z	22.3N	152.3E	180-62	054-724
021800Z	23.3N	153.3E	131-71	101-220
030000Z	24.4N	154.2E	064-75	------
030600Z	25.3N	155.3E	083-51	276-340
031200Z	25.9N	156.9E	087-182	154-125
031800Z	26.1N	158.7E	101-44	154-161
040000Z	26.2N	160.5E	001-223	057-283
040600Z	26.8N	162.1E	355-219	------
041200Z	27.6N	163.6E	356-214	------
041800Z	28.2N	165.4E	024-155	019-19

TYPHOON OLIVE 27 APR-05 MAY 1963
POSITION AND FORECAST VERIFICATION DATA (CONT'D)

	STORM POSITION		24 HOUR ERROR	48 HOUR ERROR
DTG	LAT.	LONG.	DEG. DISTANCE	DEG. DISTANCE
050000Z	29.2N	167.1E	244-59	035-451
050600Z	29.7N	169.1E	255-23	041-510
051200Z	30.8N	171.1E	210-81	044-645
051800Z	31.9N	173.0E	211-117	062-348

AVERAGE 24 HOUR ERROR 112.2 MI
AVERAGE 48 HOUR ERROR 296.0 MI


TYPHOON OLIVE
27 APRIL - 06 MAY 1963
24HR FORECAST POSITS
LEGEND
0---24HR FORECAST POSITS
6HR BEST TRACK POSITS
06/06Z
06/00Z
05/00Z
04/00Z
03/00Z
02/00Z
01/00Z
30/00Z
29/00Z
28/00Z
27/00Z
L(-11)
M(-12)
I(+12)
TOKYO
CHICHI JIMA
IWO JIMA
SAIPAN
GUAM
YAP
ULITHI
KOROR
WOLEAI ATOL
TRUK
PONAPE
KUSAIE
ENIWETOK ATOL
KWAJALEIN
RONGERIK ATOL
MAJURO
WAKE I
MIDWAY I
140°
150°
160°
170°
180°
10°
20°
30°
40°

TYPHOON POLLY - 310600Z MAY to 060000Z JUNE

I. DATA

A. Statistics

1. Calendar days of tropical warning - 6
2. Calendar days of typhoon intensity - 3¼
3. Total distance traveled during tropical warning period - 1950 mi.

B. Characteristics as a typhoon

1. Minimum observed SLP - 980mb, 030330Z
2. Minimum observed 700mb height - 2896m, 030330Z
3. Max radius of SFC circulation - 450 mi
4. Max surface winds - 70 kts

II. DEVELOPMENT

A. Initial impetus - Fracture of MPT with subsequent surge from westerlies.

B. Initial surface vortex

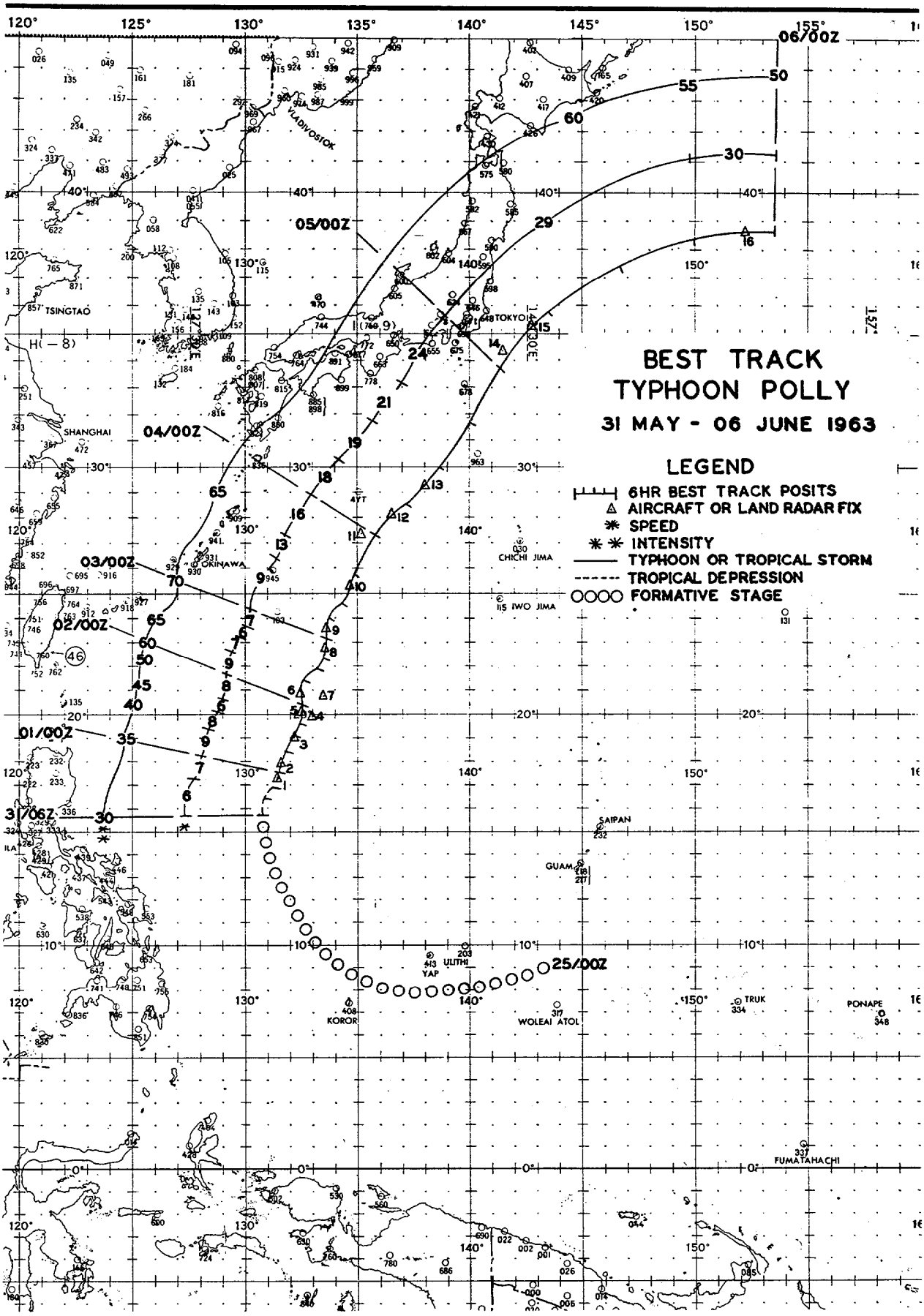
1. Junction vortex at 281200Z
2. Surface pressure less than 1006mb

C. Zenith flow at 200mb

1. Relative position surface vortex - SE quadrant of anticyclone centered W of Formosa.
2. Wind direction over vortex - NNE

III. FINAL DISPOSITION

A. Became extratropical


BEST TRACK
TYPHOON POLLY
31 MAY - 06 JUNE 1963
LEGEND
6HR BEST TRACK POSITS
AIRCRAFT OR LAND RADAR FIX
SPEED
INTENSITY
TYPHOON OR TROPICAL STORM
TROPICAL DEPRESSION
FORMATIVE STAGE
06/00Z
05/00Z
04/00Z
03/00Z
02/00Z
01/00Z
31/06Z
25/00Z
VLADIVOSTOK
TSINGTAO
SHANGHAI
OKINAWA
TOKYO
CHICHI JIMA
IWO JIMA
SAIPAN
GUAM
YAP
ULITHI
KOROR
WOLEAI ATOL
TRUK
PONAPE
FUMATAHACHI

LAND RADAR AND AIRCRAFT FIXES - TYPHOON POLLY

FIX NO/TIME	LAT.	LONG.	UNIT METHOD & ACCY	MAX SFC WND	MAX 700MB WND	MIN 700MB HGT	RECON MIN SLP MBS	JTWC MIN SLP *MBS	700MB T/Td (°C)	EYE CHARACTERISTICS
1 312140Z	17.3N	131.3E	54-P-05	30	38	3055	994	1000	- -	ELLIP 50 MI E-W,30 MI N-S OPEN S
2 010330Z	17.9N	131.8E	54-P-03	40	48	3037	998	997	- -	ELLIP 70 MI E-W,50 MI N-S, WALL CLD WNW-ENE
3 011000Z	19.0N	132.2E	VW1-P-05	40	-	2979	985	990	- -	ELLIP 120 MI N-S,70 MI E-W
4 011600Z	19.9N	133.0E	VW1-P-10	-	-	-	-	-	- -	ELLIP 100 MI NE-SW,50 MI NW-SE,GEOG CNTR 230° 25 MI FROM PRESSURE CNTR
5 012200Z	20.1N	132.5E	54-P-04	45	50	2960	982	988	13/09	CIRC 60 MI DIA,GEOG CNTR SAME AS PRESSURE CNTR
6 020300Z	20.8N	132.5E	54-P-05	65	65	2954	984	987	13/11	ELLIP 90 MI N-S,60 MI E-W, WALL CLD S & W
7 020918Z	20.7N	133.4E	VW1-R-20	-	-	-	-	-	- -	CNTR WEAK & DIFFUSE
8 022150Z	22.8N	133.5E	54-P-08	60	68	2929	974	984	14/13	WALL CLD S & SE
9 030330Z	23.6N	133.6E	54-P-03	55	55	2896	-	980	14/12	CNTR WEAK & SLOPING N,NO WALL CLD
10 031530Z	25.3N	134.7E	VW1-R-02	-	-	-	-	-	- -	CIRC 55 MI DIA,OPEN N-E
11 032205Z	27.3N	135.2E	56-P-02	50	30	2957	989	987	15/11	NO DISTINCT CNTR
12 040345Z	28.1N	136.6E	56-P-10	50	40	2929	980	984	13/12	NO DEF CNTR,SPIRALS SE QUAD
13 040930Z	29.4N	138.0E	VW1-R-10	40	-	-	978	-	- -	CIRC 6 MI DIA,OPEN N

*Computed

LAND RADAR AND AIRCRAFT FIXES - TYPHOON POLLY (CONT'D)

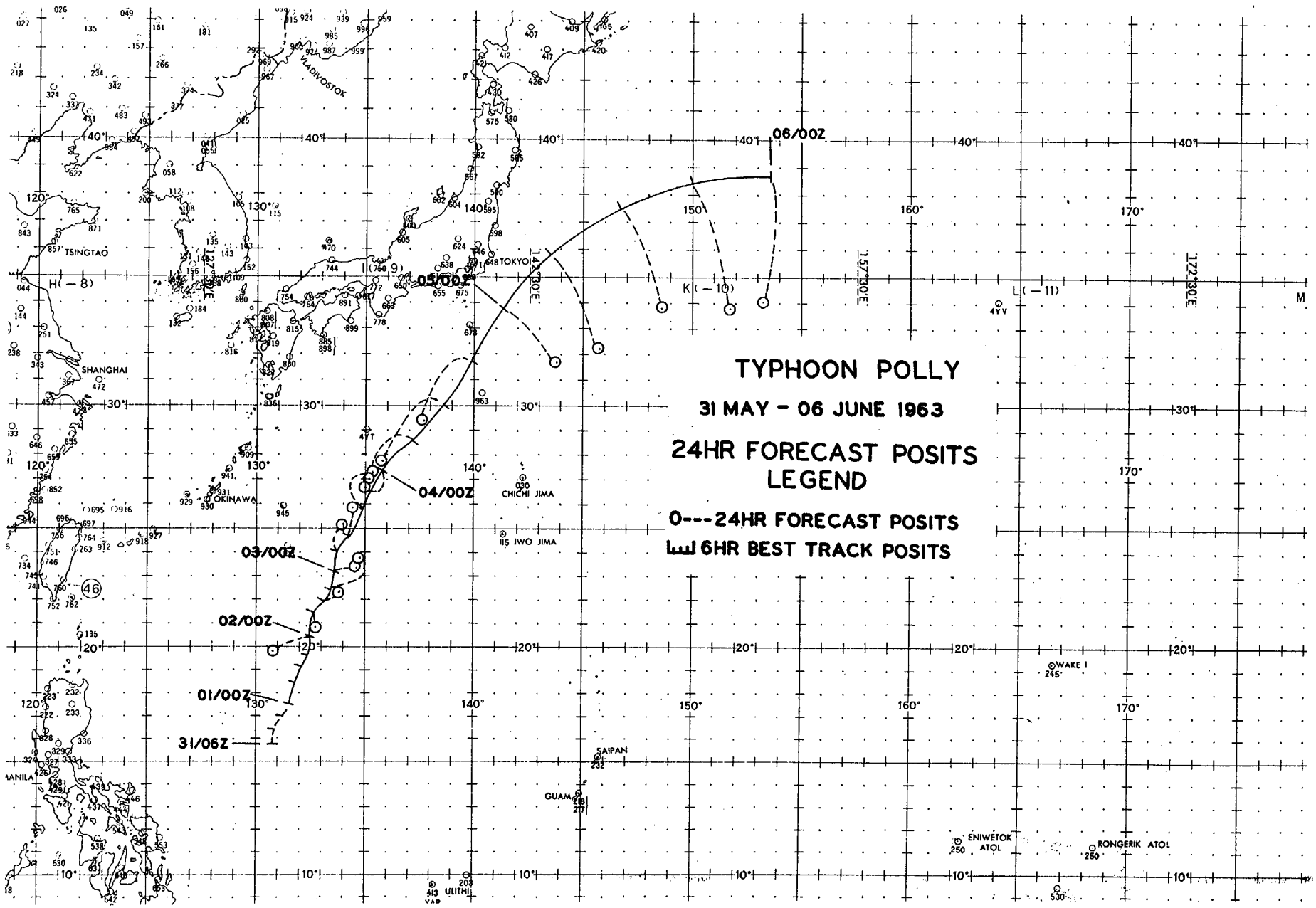
FIX NO/TIME	LAT.	LONG.	UNIT METHOD & ACCY	MAX SFC WND	MAX 700MB WND	MIN 700MB HGT	RECON MIN SLP MBS	JTWC MIN SLP *MBS	700MB T/Td (°C)	EYE CHARACTERISTICS
14 050008Z	34.3N	141.5E	56-P-04	50	50	-	-	-	13/11	CIRC 150 MI DIA,OPEN W
15 050401Z	35.3N	142.9E	56-P-04	75	-	2941	975	986	13/12	CIRC 60 MI DIA,OPEN W
16 052154Z	38.6N	152.2E	56-P-05	50	30	2957	987	988	13/04	NO DISTINCT CNTR,NO WALL CLD

*Computed

TYPHOON POLLY 31 MAY-06 JUN 1963
POSITION AND FORECAST VERIFICATION DATA

DTG	STORM POSITION LAT.	LONG.	24 HOUR ERROR DEG. DISTANCE	48 HOUR ERROR DEG. DISTANCE
310600Z	15.7N	130.8E	------	------
311200Z	16.4N	130.9E	------	------
311800Z	16.9N	131.2E	------	------
010000Z	17.5N	131.5E	------	------
010600Z	18.3N	131.9E	------	------
011200Z	19.1N	132.2E	------	------
011800Z	19.6N	132.4E	------	------
020000Z	20.4N	132.5E	248-103	------
020600Z	21.3N	132.6E	177-42	------
021200Z	21.9N	133.1E	055-51	------
021800Z	22.4N	133.4E	046-116	------
030000Z	23.1N	133.6E	073-56	------
030600Z	24.0N	133.8E	014-74	108-55
031200Z	24.7N	134.3E	008-75	052-155
031800Z	25.8N	134.9E	013-68	053-188
040000Z	27.3N	135.9E	235-56	086-82
040600Z	28.6N	137.1E	227-131	042-60
041200Z	30.0N	138.6E	225-208	198-25
041800Z	31.7N	140.0E	219-186	171-73
050000Z	33.8N	141.4E	135-180	202-225
050600Z	35.9N	143.6E	155-253	208-357
051200Z	37.4N	146.7E	162-308	216-492
051800Z	38.3N	150.0E	163-290	220-583
060000Z	38.7N	153.6E	185-286	169-362

AVERAGE 24 HOUR ERROR 146 MI
AVERAGE 48 HOUR ERROR 221 MI


TYPHOON POLLY
31 MAY - 06 JUNE 1963
24HR FORECAST POSITS
LEGEND
0---24HR FORECAST POSITS
6HR BEST TRACK POSITS
06/00Z
05/00Z
04/00Z
03/00Z
02/00Z
01/00Z
31/06Z
TSINGTAO
SHANGHAI
OKINAWA
CHICHI JIMA
IWO JIMA
TOKYO
VLADIVOSTOK
SAIPAN
GUAM
WAKE I
ENIWETOK ATOL
RONGERIK ATOL
ULITHI
MANILA
H(-8)
K(-10)
L(-11)
M
157°30'E
172°30'E

TYPHOON SHIRLEY - 130600Z to 201800Z JUNE

I. DATA

A. Statistics

1. Calendar days of tropical warning - 7 3/4
2. Calendar days of typhoon intensity - 6½
3. Total distance traveled during tropical warning period - 2148 mi

B. Characteristics as a typhoon

1. Minimum observed SLP - 935mb, 152212Z
2. Minimum observed 700mb height - 2493m, 152212Z
3. Max radius of SFC circulation - 300 mi
4. Max surface winds - 140 kts

II. DEVELOPMENT

A. Initial impetus - Fracture of MPT and divergent flow from Asian anticyclone at 200mb.

B. Initial surface vortex

1. Junction vortex at 091800Z
2. Surface pressure less than 1010mb

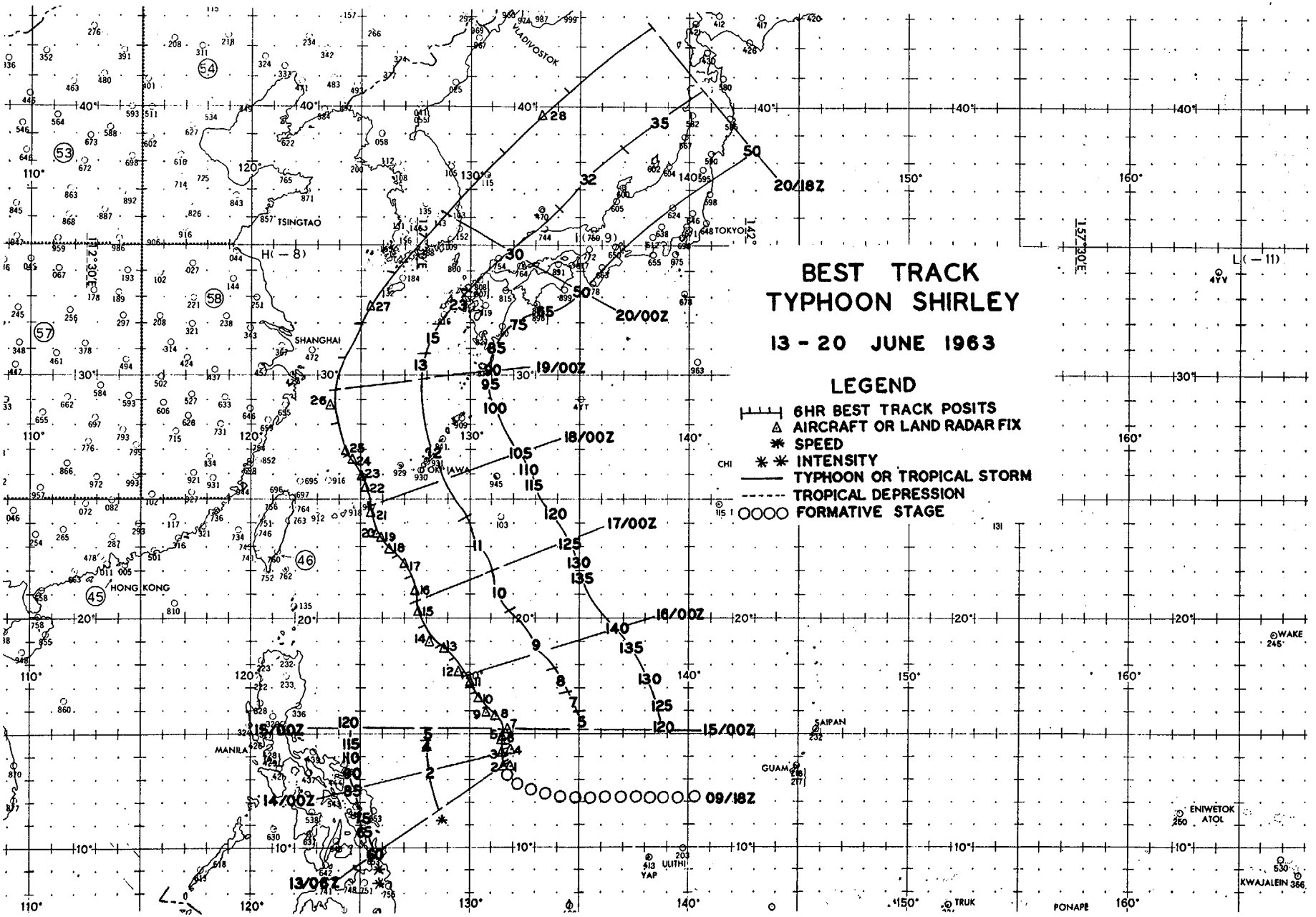
C. Zenith flow at 200mb

1. Relative position surface vortex - SE quadrant of Asian anticyclone

2. Wind direction over vortex - NNE

III. FINAL DISPOSITION

A. Became extratropical


BEST TRACK
TYPHOON SHIRLEY
13 - 20 JUNE 1963
LEGEND
6HR BEST TRACK POSITS
AIRCRAFT OR LAND RADAR FIX
SPEED
INTENSITY
TYPHOON OR TROPICAL STORM
TROPICAL DEPRESSION
FORMATIVE STAGE
VLADIVOSTOK
TSINGTAO
SHANGHAI
HONG KONG
MANILA
TOKYO
IWAJIMA
SAIPAN
GUAM
YAP
ULITHI
TRUK
PONAPE
ENIWETOK ATOL
KWAJALEIN
WAKE
20/18Z
19/00Z
18/00Z
17/00Z
16/00Z
15/00Z
14/00Z
13/06Z
09/18Z

LAND RADAR AND AIRCRAFT FIXES - TYPHOON SHIRLEY

FIX NO/TIME	LAT.	LONG.	UNIT METHOD & ACCY	MAX SFC WND	MAX 700MB WND	MIN 700MB HGT	RECON MIN SLP MBS	JTWC MIN SLP *MBS	700MB T/Td (°C)	EYE CHARACTERISTICS
1 130400Z	13.5N	131.9E	VW1-P-05	60	-	-	-	-	- -	CIRC 20 MI DIA,WELL DEV SPIRAL BNDS ALL QUADS
2 130600Z	13.6N	131.7E	VW1-R-10	-	-	-	-	-	- -	CIRC 25 MI DIA,WALL CLD 8 MI THICK,MAX TOPS 40,000 FT
3 132210Z	14.0N	131.6E	54-P-06	-	80	2762	965	962	18/11	CIRC 18 MI DIA,CLSD WALL CLD 3 MI THICK,GEOG CNTR 170° 5 MI FROM PRESSURE CNTR
4 140413Z	14.3N	131.9E	54-P-03	85	80	2664	958	952	18/08	CIRC 28 MI DIA,CLSD WALL CLD 5 MI THICK,GEOG CNTR 270° 8 MI FROM PRESSURE CNTR
5 141030Z	14.8N	131.7E	VW1-R-05	-	-	-	-	-	- -	CIRC 29 MI DIA,CLSD WALL CLD 8 MI THICK
6 141600Z	14.7N	131.7E	VW1-R-05	-	-	-	-	-	- -	CIRC 30 MI DIA CLOSED
7 142130Z	15.1N	131.8E	54-P-06	-	-	2600	944	946	16/16	CIRC 30 MI DIA,CLSD,SLOPING NW,GEOG CNTR 290° 8 MI FROM PRESSURE CNTR
8 150335Z	15.5N	131.5E	54-P-04	130	-	2590	-	944	16/11	CIRC 25 MI DIA,CLSD,GEOG CNTR 270° 3 MI FROM PRESSURE CNTR
9 151000Z	15.8N	130.9E	VW1-R-10	-	-	-	-	-	- -	CIRC 23 MI DIA,CLSD,WEAK W QUD
10 151600Z	16.6N	130.6E	VW1-R-05	-	-	-	-	-	- -	CIRC 24 MI DIA,LGE BRK IN WALL CLD W QUAD
11 152212Z	17.3N	130.1E	54-P-05	80	125	2493	-	935	16/14	CIRC 20 MI DIA,CLSD,WEAK SE QUAD

*Computed

LAND RADAR AND AIRCRAFT FIXES - TYPHOON SHIRLEY (CONT'D)

FIX NO/TIME	LAT.	LONG.	UNIT METHOD & ACCY	MAX SFC WND	MAX 700MB WND	MIN 700MB HGT	RECON MIN SLP MBS	JTWC MIN SLP *MBS	700MB T/Td (°C)	EYE CHARACTERISTICS
12 160350Z	17.7N	129.7E	54-P-03	100	120	2499	-	935	17/12	CIRC 30 MI DIA, CLOSED
13 161000Z	18.7N	128.9E	VW1-R-08	-	-	-	-	-	- -	ELLIP 23 MI E-W,18 MI N-S HVY SPIRAL BNDS
14 161540Z	18.9N	128.3E	VW1-R-08	-	-	-	-	-	- -	CONCENTRIC,INNER EYE ELLIP 24 MI NE-SW,15 MI NW-SE,OUTER EYE CIRC 56 MI DIA,WALL 12 MI THIK
15 162210Z	20.3N	127.7E	54-P-03	85	90	2615	955	945	21/18	ELLIP 20 MI E-W,15 MI N-S, OPEN W&N,EYE NOT WELL DEF
16 170330Z	21.2N	127.4E	54-P-03	85	118	2627	960	948	19/15	CIRC 35 MI DIA,WALL CLD SE QUAD,GEOG CNTR 360° 10 MI FROM PRESSURE CNTR
17 170945Z	22.4N	127.0E	VW1-R-10	-	-	-	-	-	- -	CIRC 27 MI DIA,OPEN W SEMI
18 171340Z	22.9N	126.2E	LND/RDR	-	-	-	-	-	- -	---
19 171600Z	23.4N	126.1E	VW1-R-02	-	-	-	-	-	- -	CIRC 30 MI DIA,OPEN W SEMI
20 171921Z	23.6N	125.9E	LND/RDR	-	-	-	-	-	- -	---
21 172225Z	24.5N	125.5E	54-P-01	-	100	2743	962	962	15/14	CIRC 30 MI DIA,OPEN S
22 180330Z	25.6N	125.2E	LND/RDR	-	-	-	-	-	- -	---
23 180630Z	25.8N	125.1E	LND/RDR	-	-	-	-	-	- -	---
24 180945Z	26.6N	124.6E	VW1-R-03	-	-	-	-	-	- -	CIRC 90 MI DIA,OPEN W SEMI, WALL CLD 15-30 MI THICK
25 181530Z	27.0N	124.4E	VW1-R-02	-	-	-	-	-	- -	CIRC 68 MI DIA,OPEN SW QUAD, WALL CLD 25 MI THICK

*Computed

LAND RADAR AND AIRCRAFT FIXES - TYPHOON SHIRLEY (CONT'D)

FIX NO/TIME	LAT.	LONG.	UNIT METHOD & ACCY	MAX SFC WND	MAX 700MB WND	MIN 700MB HGT	RECON MIN SLP MBS	JTWC MIN SLP *MBS	700MB T/Td (°C)	EYE CHARACTERISTICS
26 182335Z	28.8N	123.6E	315-U-U	75	-	-	-	-	- -	---
27 191555Z	32.6N	125.5E	VW1-R-10	-	-	-	-	-	- -	EYE NOT DISCERNIBLE
28 200944Z	39.7N	133.2E	VW1-R-10	45	-	-	-	-	- -	CNTR POORLY DEF,FEEDER BND MOSTLY STRATIFIED

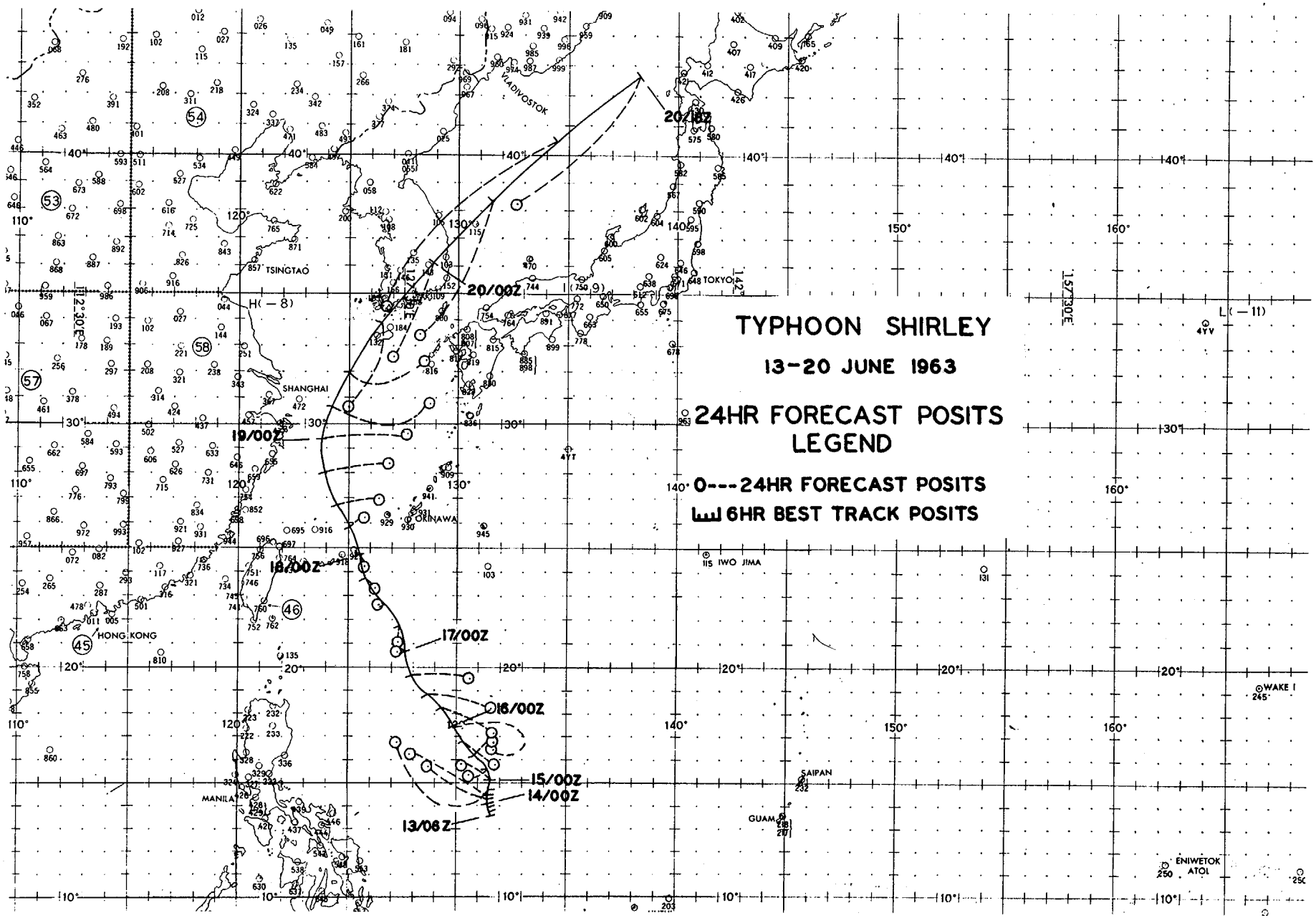
*Computed

TYPHOON SHIRLEY 13 JUN-20 JUN 1963
POSITION AND FORECAST VERIFICATION DATA

DTG	STORM POSITION LAT.	LONG.	24 HOUR ERROR DEG. DISTANCE	48 HOUR ERROR DEG. DISTANCE
130600Z	13.7N	131.6E	------	------
131200Z	13.8N	131.6E	------	------
131800Z	13.9N	131.6E	------	------
140000Z	14.1N	131.6E	------	------
140600Z	14.3N	131.6E	300-195	------
141200Z	14.5N	131.6E	298-244	------
141800Z	14.8N	131.7E	296-286	------
150000Z	15.2N	131.6E	253-83	------
150600Z	15.7N	131.4E	255-62	293-351
151200Z	16.3N	130.9E	053-60	295-360
151800Z	16.8N	130.4E	125-92	295-348
160000Z	17.6N	129.9E	132-140	230-125
160600Z	18.3N	129.3E	116-145	209-95
161200Z	18.9N	128.6E	105-180	103-179
161800Z	19.7N	128.0E	093-138	112-214
170000Z	20.7N	127.5E	272-10	124-275
170600Z	21.8N	127.3E	190-41	121-290
171200Z	22.8N	126.7E	252-24	113-295
171800Z	23.8N	125.8E	156-35	111-259
180000Z	24.8N	125.5E	158-50	151-111
180600Z	25.9N	125.0E	064-46	134-169
181200Z	26.9N	124.4E	088-47	055-152
181800Z	28.1N	124.0E	084-153	075-176
190000Z	29.4N	123.9E	085-205	094-180
190600Z	30.6N	124.3E	087-230	097-210
191200Z	31.9N	125.1E	079-173	092-265
191800Z	33.9N	126.5E	202-203	098-303
200000Z	36.1N	128.9E	204-234	110-299
200600Z	38.3N	131.5E	209-330	131-303
201200Z	40.5N	134.4E	225-513	158-262
201800Z	42.6N	138.1E	225-360	211-477

TYPHOON SHIRLEY 13 JUN-20 JUN 1963
POSITION AND FORECAST VERIFICATION DATA (CONT'D)

AVERAGE 24 HOUR ERROR 158 MI
AVERAGE 48 HOUR ERROR 248 MI


TYPHOON SHIRLEY
13-20 JUNE 1963
24HR FORECAST POSITS
LEGEND
0---24HR FORECAST POSITS
6HR BEST TRACK POSITS
20/00Z
19/00Z
18/00Z
17/00Z
16/00Z
15/00Z
14/00Z
13/06Z
H(-8)
L(-11)
TSINGTAO
SHANGHAI
OKINAWA
HONG KONG
MANILA
TOKYO
VLADIVOSTOK
IWO JIMA
SAIPAN
GUAM
WAKE I
ENIWETOK ATOL

TYPHOON TRIX - 181200Z to 190600Z JUNE and
260600Z JUNE to 010600Z JULY

I. DATA

A. Statistics

1. Calendar days of tropical warning - 6¼
2. Calendar days of typhoon intensity - 2
3. Total distance traveled during tropical warning period - 1146 mi.

B. Characteristics as a typhoon

1. Minimum observed SLP - 980mb, 271022Z
2. Minimum observed 700mb height - 2890m, 271022Z
3. Max radius of SFC circulation - 250 mi
4. Max surface winds - 70 kts

II. DEVELOPMENT

A. Initial impetus - Outdraft at 200mb developed to W of surface vortex increasing divergent flow.

B. Initial surface vortex

1. Junction vortex at 111800Z
2. Surface pressure less than 1009mb

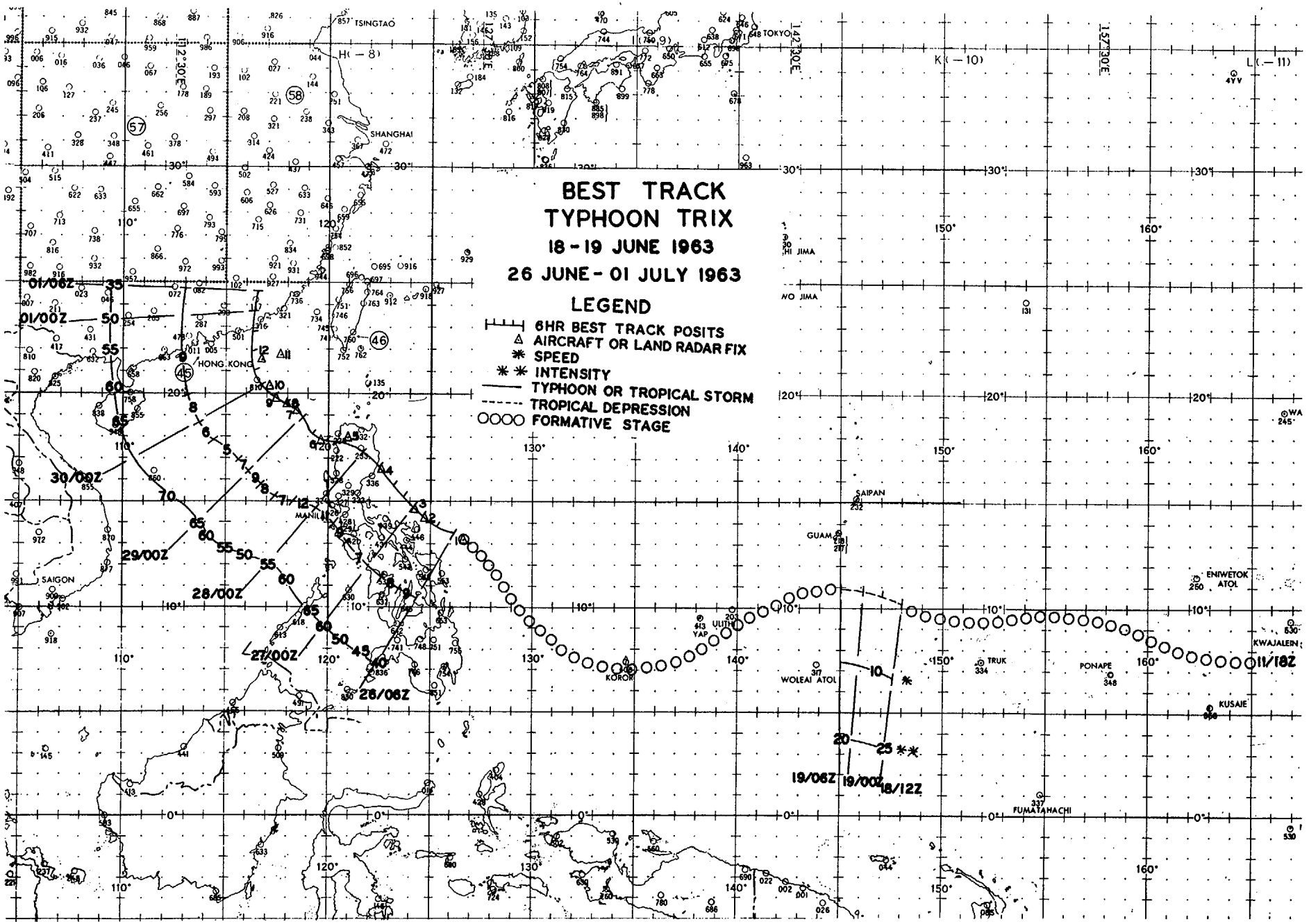
C. Zenith flow at 200mb

1. Relative position surface vortex - SE quadrant of anticyclone.
2. Wind direction over vortex - NE

III. FINAL DISPOSITION

A. Dissipated over land.

IV. REMARKS - Tropical Depression warnings issued 181200Z to 190600Z, then weakened to tropical low with regeneration occuring at 260600Z June.


BEST TRACK
TYPHOON TRIX
18 - 19 JUNE 1963
26 JUNE - 01 JULY 1963
LEGEND
6HR BEST TRACK POSITS
AIRCRAFT OR LAND RADAR FIX
SPEED
INTENSITY
TYPHOON OR TROPICAL STORM
TROPICAL DEPRESSION
FORMATIVE STAGE
TSINGTAO
SHANGHAI
TOKYO
HONG KONG
MANILA
SAIGON
SAIPAN
GUAM
KOROR
WOLEAI ATOL
YAP
ULITHI
TRUK
PONAPE
ENIWETOK ATOL
KWAJALEIN
KUSAJE
FUMATAHACHI
01/06Z
01/00Z
30/00Z
29/00Z
28/00Z
27/00Z
26/06Z
19/06Z
19/00Z
18/12Z
11/18Z

LAND RADAR AND AIRCRAFT FIXES - TYPHOON TRIX

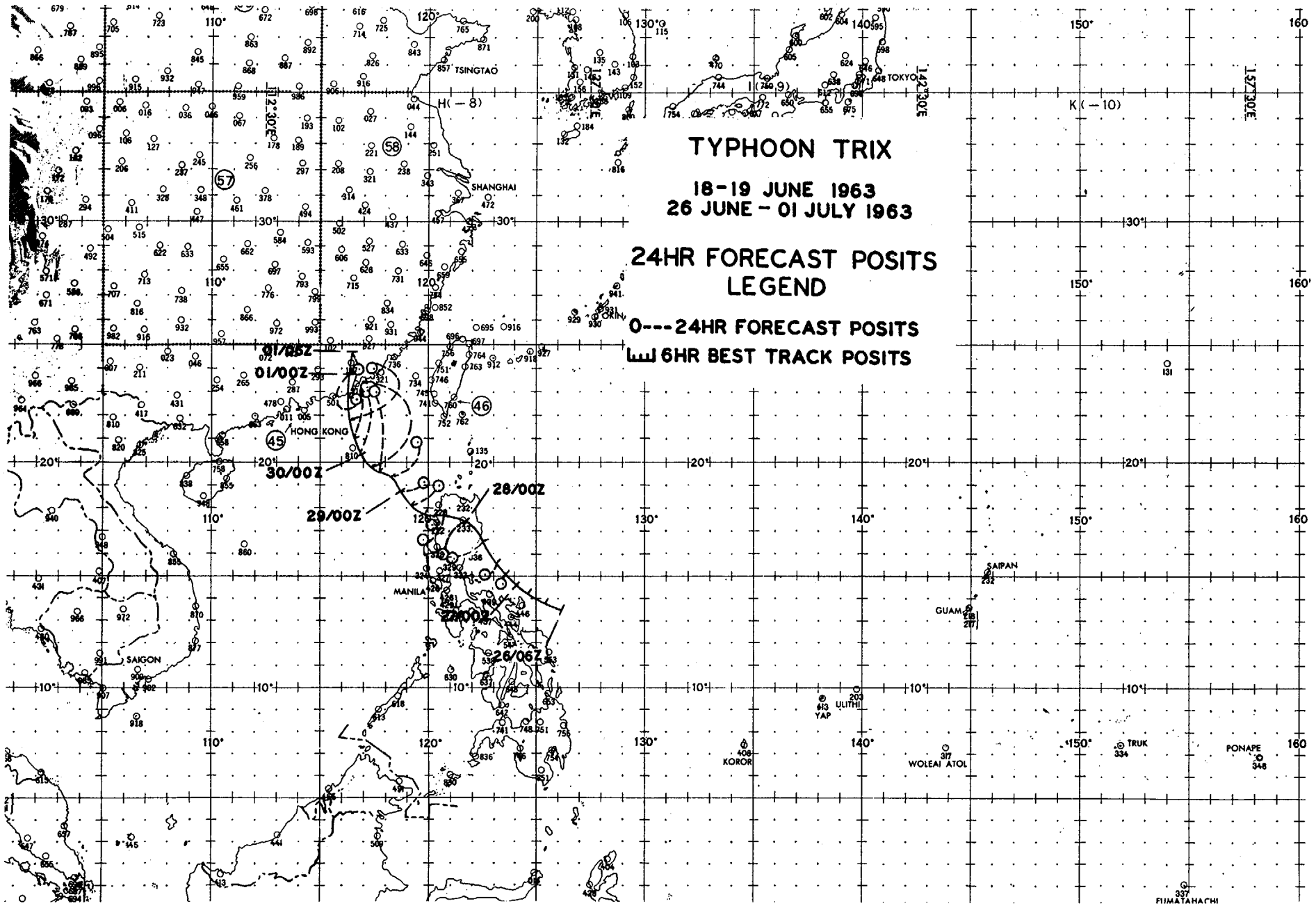
FIX NO/TIME	LAT.	LONG.	UNIT METHOD & ACCY	MAX SFC WND	MAX 700MB WND	MIN 700MB HGT	RECON MIN SLP MBS	JTWC MIN SLP *MBS	700MB T/Td (°C)	EYE CHARACTERISTICS
1 260300Z	13.2N	126.7E	VW1-P-03	40	-	3052	997	997	15/9	CIRC 40 MI DIA,WELL DEV SPIRAL BNDS ALL QUADS
2 261700Z	14.3N	124.8E	VW1-P-05	-	-	-	-	-	- -	BRKN E SEMI,OPEN W SEMI
3 262120Z	14.5N	124.3E	54-P-01	-	55	2969	988	988	16/10	---
4 271022Z	15.6N	123.2E	VW1-P-05	60	-	2890	-	980	13/11	CIRC 31 MI DIA,WALL CLD FORMING ALL QUADS,GEOG CNTR 330° 7 MI FROM PRESSURE CNTR
5 280358Z	18.0N	121.0E	TIROS	-	-	-	-	-	- -	---
6 281550Z	17.8N	119.6E	VW1-P-05	-	-	3040	-	996	13/07	ELLIP 90 MI NW-SE,52 MI NE-SW BRKN WALL CLD S QUAD
7 290400Z	19.3N	118.5E	54-P-0	50	60	3060	996	998	13/07	CIRC 50 MI DIA,WALL CLD NW
8 290900Z	19.5N	118.0E	54-P-02	50	55	3045	992	998	12/09	ELLIP 50 MI E-W,30 MI N-S, WALL CLD N THRU E
9 291554Z	19.7N	117.5E	VW1-R-05	-	-	-	-	-	- -	ELLIP 53 MI N-S,38 MI E-W, NO WALL CLD
10 292220Z	20.3N	117.1E	VW1-P-05	60	-	2985	-	991	13/08	NO WALL CLD
11 300000Z	21.7N	117.7E	LND/RDR	-	-	-	-	-	- -	WEAK CNTR
12 300444Z	21.5N	116.7E	VW1-P-10	-	-	-	981	-	- -	CIRC 15 MI DIA,NO WALL CLD

*Computed

TYPHOON TRIX 18 JUN-01 JUL 1963
POSITION AND FORECAST VERIFICATION DATA

DTG	STORM POSITION LAT.	LONG.	24 HOUR ERROR DEG. DISTANCE	48 HOUR ERROR DEG. DISTANCE
181200Z	10.2N	148.0E	------	------
181800Z	10.5N	147.0E	------	------
190000Z	10.8N	146.1E	------	------
190600Z	10.9N	145.0E	------	------
260600Z	13.5N	126.2E	------	------
261200Z	13.9N	125.4E	------	------
261800Z	14.3N	124.6E	------	------
270000Z	14.7N	124.1E	------	------
270600Z	15.2N	123.6E	200-32	------
271200Z	15.7N	123.1E	218-47	------
271800Z	16.5N	122.5E	244-89	------
280000Z	17.3N	121.8E	222-90	------
280600Z	17.8N	120.6E	213-82	184-92
281200Z	17.8N	119.9E	163-34	220-52
281800Z	18.1N	119.2E	056-93	252-36
290000Z	18.9N	118.8E	047-78	273-73
290600Z	19.4N	118.3E	038-113	288-73
291200Z	19.6N	117.7E	359-204	311-48
291800Z	19.9N	117.3E	000-204	028-183
300000Z	20.3N	116.9E	008-169	025-223
300600Z	21.1N	116.5E	018-143	038-310
301200Z	21.9N	116.3E	028-136	030-463
301800Z	22.8N	116.3E	020-76	034-420
010000Z	23.7N	116.4E	170-58	038-335
010600Z	24.6N	116.5E	158-40	045-267

AVERAGE 24 HOUR ERROR 99 MI
AVERAGE 48 HOUR ERROR 198 MI


TYPHOON TRIX
18-19 JUNE 1963
26 JUNE - 01 JULY 1963
24HR FORECAST POSITS
LEGEND
0---24HR FORECAST POSITS
6HR BEST TRACK POSITS
01/06Z
01/00Z
30/00Z
29/00Z
28/00Z
27/00Z
26/06Z
H(-8)
I(-9)
K(-10)
TSINGTAO
SHANGHAI
TOKYO
ORIN
HONG KONG
MANILA
SAIGON
SAIPAN
GUAM
YAP
ULITHI
KOROR
WOLEAI ATOL
TRUK
PONAPE
FUMATAHACHI
120°30'E
142°30'E
157°30'E

TYPHOON WENDY - 091800Z to 180600Z JULY

I. DATA

A. Statistics

1. Calendar days of tropical warning - 9¼
2. Calendar days of typhoon intensity - 6¼
3. Total distance traveled during tropical warning period - 2100 mi.

B. Characteristics as a typhoon

1. Minimum observed SLP - 928mb, 130300Z
2. Minimum observed 700mb height - 2441m, 130300Z
3. Max radius of SFC circulation - 350 mi
4. Max surface winds - 135 kts

II. DEVELOPMENT

A. Initial impetus - Moderate inflow at surface from outdraft centered SW of initial vortex and strong divergent flow at 200mb.

B. Initial surface vortex

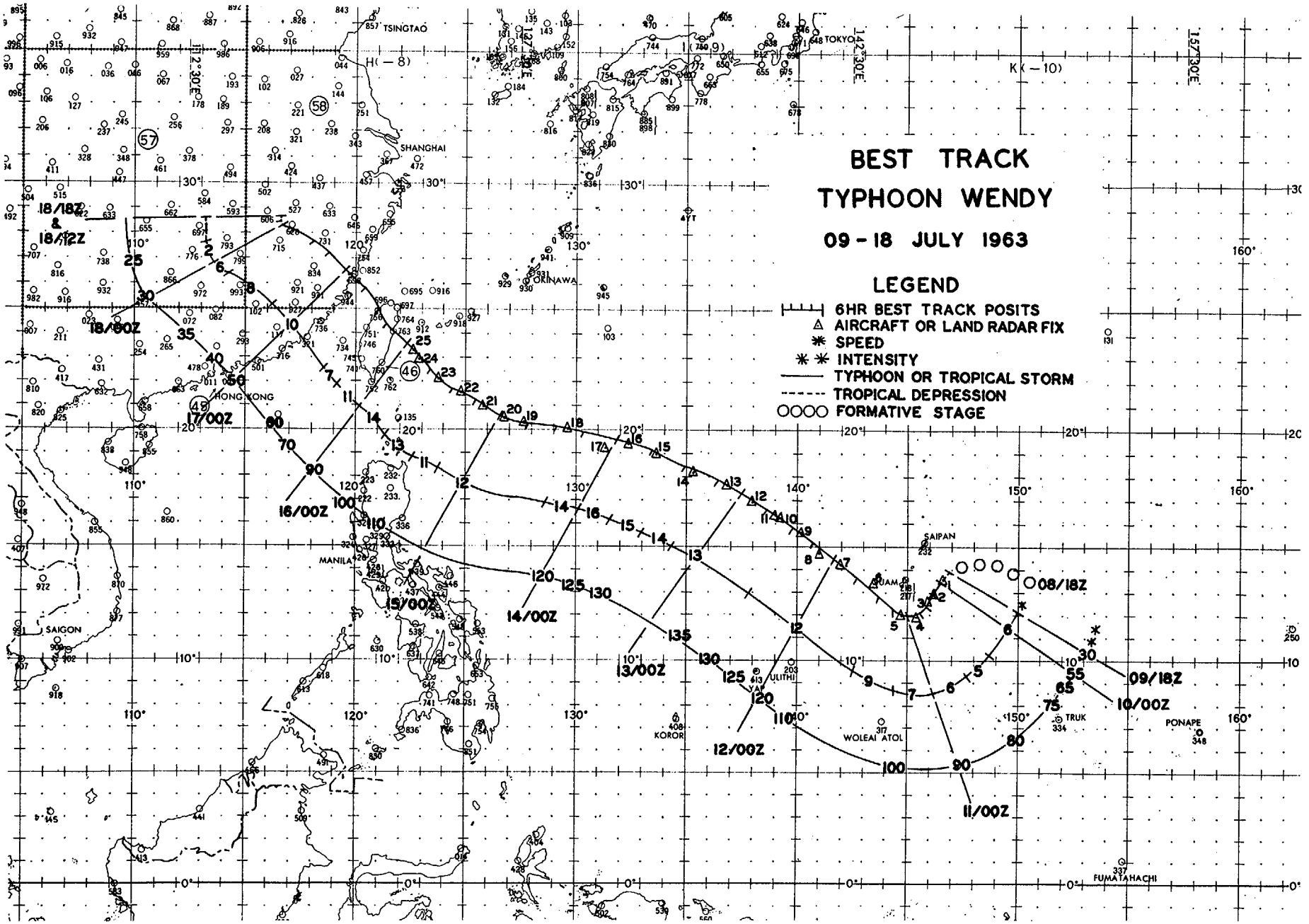
1. Junction vortex at 081800Z
2. Surface pressure less than 1010mb

C. Zenith flow at 200mb

1. Relative position surface vortex - SE quadrant of huge anticyclone.
2. Wind direction over vortex - NE

III. FINAL DISPOSITION

A. Dissipated over land.


BEST TRACK
TYPHOON WENDY
09 - 18 JULY 1963
LEGEND
6HR BEST TRACK POSITS
AIRCRAFT OR LAND RADAR FIX
SPEED
INTENSITY
TYPHOON OR TROPICAL STORM
TROPICAL DEPRESSION
FORMATIVE STAGE
18/18Z & 18/12Z
18/00Z
17/00Z
16/00Z
15/00Z
14/00Z
13/00Z
12/00Z
11/00Z
08/18Z
09/18Z
10/00Z
TSINGTAO
SHANGHAI
OKINAWA
TOKYO
HONG KONG
MANILA
SAIGON
SAIPAN
GUAM
ULITHI
WOLEAI ATOL
KOROR
TRUK
PONAPE
FUMATAHACHI

LAND RADAR AND AIRCRAFT FIXES - TYPHOON WENDY

FIX NO/TIME	LAT.	LONG.	UNIT METHOD & ACCY	MAX SFC WND	MAX 700MB WND	MIN 700MB HGT	RECON MIN SLP MBS	JTWC MIN SLP *MBS	700MB T/Td (°C)	EYE CHARACTERISTICS
1 092230Z	13.6N	146.6E	54-P-0	55	52	3121	1005	1003	18/13	ELLIP 25 MI E-W, 9 MI N-S, OPEN N, GEOG CENT 260°, 9 MI FROM PRESSURE CENT
2 100400Z	12.9N	146.3E	54-P-02	50	50	3036	995	994	17/13	ELLIP 40 MI NW-SE, 20 MI NE-SW, OPEN W&N QUADS
3 100930Z	12.5N	146.1E	VW1-R-03	-	-	-	-	-	- -	CIRC 30 MI DIA, OPEN W QUAD
4 102230Z	11.8N	145.1E	54-P-01	90	-	2792	964	968	15/12	ELLIP 15 MI N-S, 10 MI E-W, CLSD
5 110400Z	12.0N	144.5E	54-P-02	80	105	2630	942	948	18/09	CIRC 10 MI DIA
6 111555Z	13.4N	143.4E	VW1-R-05	-	-	-	-	-	- -	CIRC 12 MI DIA, CLSD, WALL CLD 4 MI THICK
7 112230Z	14.1N	141.9E	56-P-05	100	85	2790	946	965	18/12	CIRC 40 MI DIA, LIGHTNING IN EYE
8 120345Z	14.7N	141.0E	54-P-03	125	90	2658	954	949	21/18	CIRC 25 MI DIA, WEAK SE, GEOG & PRESSURE CNTR SAME
9 121000Z	15.7N	140.2E	VW1-R-10	-	-	-	-	-	- -	ELLIP 19 MI NE-SW, 14 MI NW-SE CLOSED
10 121352Z	16.3N	139.2E	USAF-R-U	-	-	-	-	-	- -	CIRC 40 MI DIA
11 121600Z	16.4N	139.0E	VW1-R-05	-	-	-	-	-	- -	CIRC 28 MI DIA, CLSD WALL CLD 5 MI THICK
12 122200Z	17.0N	137.8E	56-P-05	135	90	2520	930	938	17/11	CIRC 30 MI DIA, CLSD
13 130300Z	17.6N	136.8E	56-P-05	135	110	2441	925	928	17/13	CIRC 35 MI DIA, CLSD, GEOG CNTR 5 MI N OF PRESSURE CNTR

*Computed

LAND RADAR AND AIRCRAFT FIXES - TYPHOON WENDY (CONT'D)

FIX NO/TIME	LAT.	LONG.	UNIT METHOD & ACCY	MAX SFC WND	MAX 700MB WND	MIN 700MB HGT	RECON MIN SLP MBS	JTWC MIN SLP *MBS	700MB T/Td (°C)	EYE CHARACTERISTICS
14 131032Z	18.2N	135.2E	VW1-R-10	-	-	-	-	-	- -	CIRC 25 MI DIA,CLSD WALL CLD 9 MI THICK,MAX CLD TOPS 100 MI FROM CNTR EXCEPT 50 MI NE QUAD
15 131530Z	19.0N	133.5E	VW1-R-05	-	-	-	-	-	- -	CIRC 23 MI DIA,CLSD WALL CLD 4-6 MI THICK,CLD TOPS ABOVE 50,000 FT
16 132141Z	19.3N	132.4E	56-P-05	120	110	2493	927	935	16/11	CIRC 35 MI DIA, CLOSED
17 140400Z	19.2N	131.3E	54-E-U	80	100	-	-	-	- -	100 KT WND BND 100 MI E SEMI
18 140930Z	20.1N	129.6E	VW1-R-03	-	-	-	-	-	- -	CIRC 20 MI DIA,CLSD WALL CLD 9 MI THICK SW SEMI & 2-4 MI THICK NE SEMI
19 141559Z	20.3N	127.8E	VW1-R-03	-	-	-	-	-	- -	CONCENTRIC,INNER EYE ELLIP 14 MI N-S,17 MI E-W,CLSD WALL CLD 3 MI THICK,OUTER EYE CIRC 95 MI DIA
20 142200Z	20.3N	126.8E	56-P-04	65	110	2485	930	933	18/14	CIRC 15 MI DIA,CLSD
21 150400Z	20.9N	125.7E	54-P-03	120	95	2454	928	928	18/18	CIRC 10 MI DIA CLSD,GEOG & PRESSURE CNTR SAME
22 150915Z	21.4N	124.8E	VW1-R-03	-	-	-	-	-	- -	WALL CLD 7 MI THICK S SEMI, OPEN N
23 151600Z	22.2N	123.8E	VW1-R-03	-	-	-	-	-	- -	ELLIP 20 MI N-S,14 MI E-W, CLSD WALL CLD 4 MI THICK

*Computed

LAND RADAR AND AIRCRAFT FIXES - TYPHOON WENDY (CONT'D)

FIX NO/TIME	LAT.	LONG.	UNIT METHOD & ACCY	MAX SFC WND	MAX 700MB WND	MIN 700MB HGT	RECON MIN SLP MBS	JTWC MIN SLP *MBS	700MB T/Td (°C)	EYE CHARACTERISTICS
24 152000Z	22.8N	122.9E	LND/RDR	-	-	-	-	-	- -	---
25 152200Z	23.2N	122.6E	56-P-05	75	80	2648	943	950	17/15	CIRC 10 MI DIA, CLSD WALL CLD WEAK ALL QUADS

*Computed

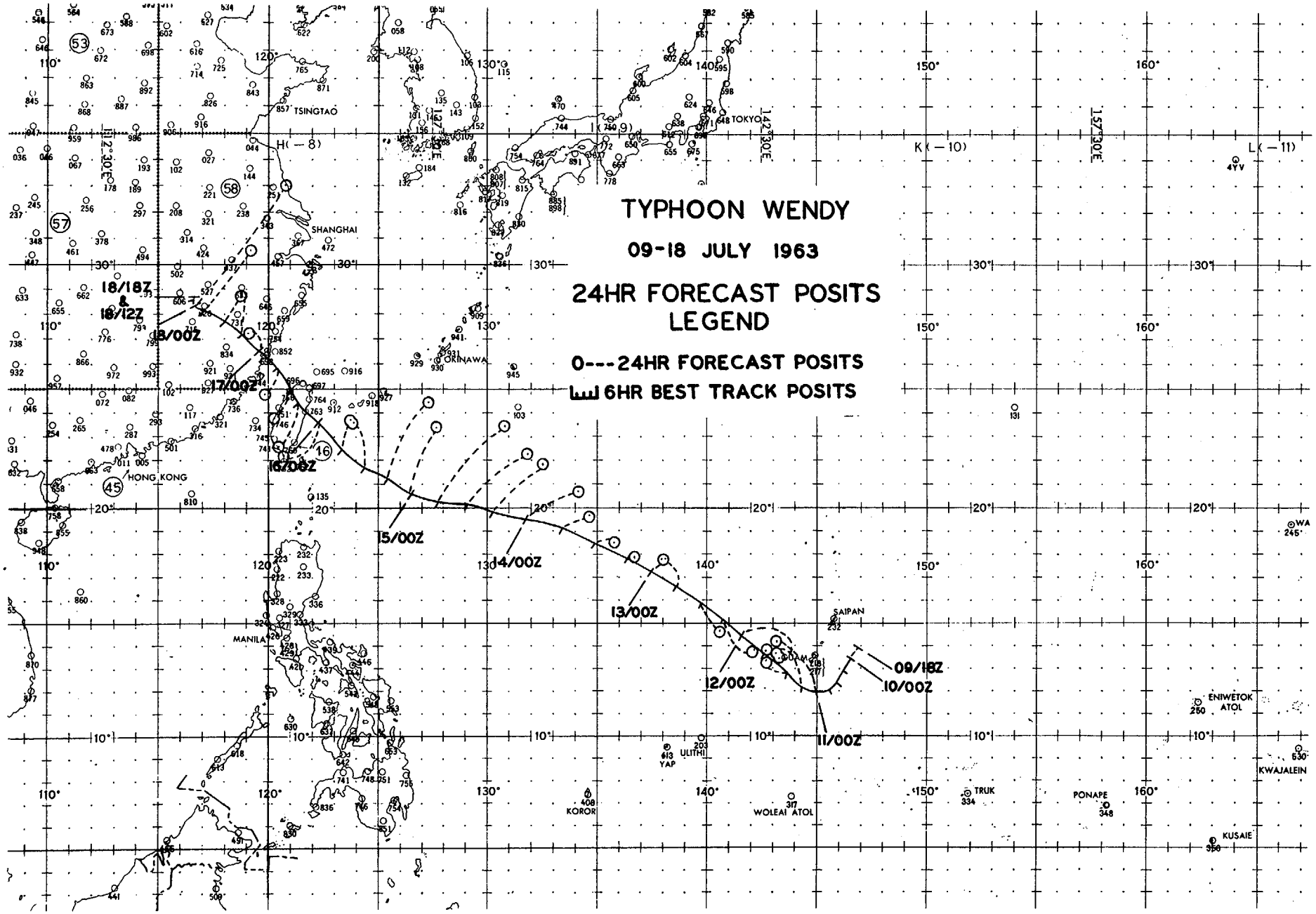
TYPHOON WENDY 09 JUL-18 JUL 1963
POSITION AND FORECAST VERIFICATION DATA

DTG	STORM POSITION LAT.	LONG.	24 HOUR ERROR DEG. DISTANCE	48 HOUR ERROR DEG. DISTANCE
091800Z	13.9N	146.9E	------	------
100000Z	13.4N	146.6E	------	------
100600Z	12.8N	146.2E	------	------
101200Z	12.3N	145.9E	------	------
101800Z	11.9N	145.5E	------	------
110000Z	11.8N	145.0E	320-175	------
110600Z	12.1N	144.3E	323-115	------
111200Z	12.8N	143.6E	311-69	------
111800Z	13.6N	142.6E	090-6	------
120000Z	14.3N	141.6E	125-105	282-148
120600Z	15.1N	140.7E	132-105	252-93
121200Z	15.9N	139.8E	152-92	255-89
121800Z	16.6N	138.6E	292-38	270-76
130000Z	17.2N	137.5E	122-40	237-213
130600Z	17.8N	136.3E	081-25	134-175
131200Z	18.4N	134.9E	090-55	106-39
131800Z	19.1N	133.4E	067-77	360-165
140000Z	19.5N	131.8E	065-150	092-172
140600Z	19.9N	130.3E	047-166	070-208
141200Z	20.1N	129.1E	052-203	072-270
141800Z	20.1N	127.8E	044-260	062-365
150000Z	20.5N	126.5E	023-188	057-450
150600Z	21.1N	125.4E	029-224	045-457
151200Z	21.6N	124.4E	345-117	056-402
151800Z	22.5N	123.4E	015-73	049-453
160000Z	23.5N	122.2E	226-111	040-356
160600Z	24.4N	121.4E	209-129	052-353
161200Z	25.0N	121.0E	206-90	330-160
161800Z	25.8N	120.3E	203-64	330-113

TYPHOON WENDY 09 JUL-18 JUL 1963
POSITION AND FORECAST VERIFICATION DATA (CONT'D)

DTG	STORM POSITION LAT.	LONG.	24 HOUR ERROR DEG. DISTANCE	48 HOUR ERROR DEG. DISTANCE
170000Z	26.5N	119.5E	323-50	250-103
170600Z	27.2N	118.8E	360-82	211-105
171200Z	27.7N	118.0E	034-82	200-60
171800Z	28.1N	117.1E	037-174	170-13
180000Z	28.3N	116.5E	------	------
180600Z	28.4N	116.5E	------	------
181200Z	28.5N	116.5E	------	------
181800Z	28.5N	116.5E	------	------

AVERAGE 24 HOUR ERROR 109 MI
AVERAGE 48 HOUR ERROR 210 MI


TYPHOON WENDY
09-18 JULY 1963
24HR FORECAST POSITS
LEGEND
0---24HR FORECAST POSITS
6HR BEST TRACK POSITS
18/18Z
&
18/12Z
18/00Z
17/00Z
16/00Z
15/00Z
14/00Z
13/00Z
12/00Z
11/00Z
10/00Z
09/18Z
TSINGTAO
SHANGHAI
OKINAWA
TOKYO
HONG KONG
MANILA
SAIPAN
YAP
ULITHI
KOROR
WOLEAI ATOL
TRUK
PONAPE
ENIWETOK ATOL
KWAJALEIN
KUSAIE
H(−8)
I(−9)
K(−10)
L(−11)
127°30'E
142°30'E
157°30'E

108

TYPHOON AGNES - 171200Z to 221800Z JULY

I. DATA

A. Statistics

1. Calendar days of tropical warning - 5½
2. Calendar days of typhoon intensity - 3
3. Total distance traveled during tropical warning period - 1554 mi.

B. Characteristics as a typhoon

1. Minimum observed SLP - 992mb, 210300Z
2. Minimum observed 700mb height - 2970m, 210300Z
3. Max radius of SFC circulation - 250 mi
4. Max surface winds - 85 kts

II. DEVELOPMENT

A. Initial impetus - Fracture of MPT with subsequent strong outflow from anticyclone at 200mb.

B. Initial surface vortex

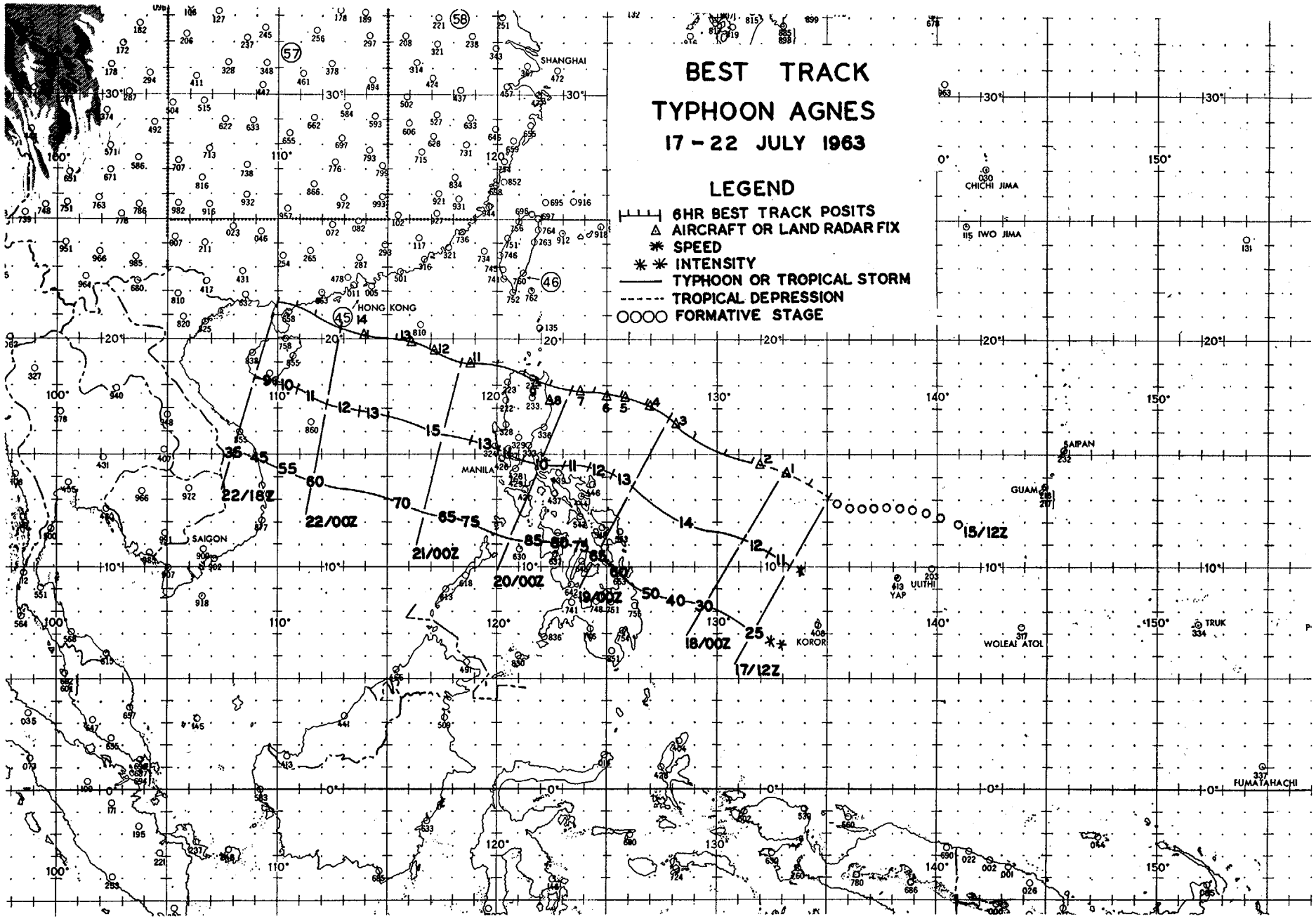
1. Junction vortex at 151200Z
2. Surface pressure less than 1009mb

C. Zenith flow at 200mb

1. Relative position surface vortex - S quadrant of anticyclone.
2. Wind direction over vortex - E

III. FINAL DISPOSITION

A. Dissipated over land.


BEST TRACK
TYPHOON AGNES
17 - 22 JULY 1963
LEGEND
6HR BEST TRACK POSITS
AIRCRAFT OR LAND RADAR FIX
SPEED
INTENSITY
TYPHOON OR TROPICAL STORM
TROPICAL DEPRESSION
FORMATIVE STAGE
SHANGHAI
HONG KONG
MANILA
SAIGON
CHICHI JIMA
IWO JIMA
SAIPAN
GUAM
YAP
ULITHI
KOROR
WOLEAI ATOL
TRUK
FUMATAHACHI
22/18Z
22/00Z
21/00Z
20/00Z
19/00Z
18/00Z
17/12Z
15/12Z

LAND RADAR AND AIRCRAFT FIXES - TYPHOON AGNES

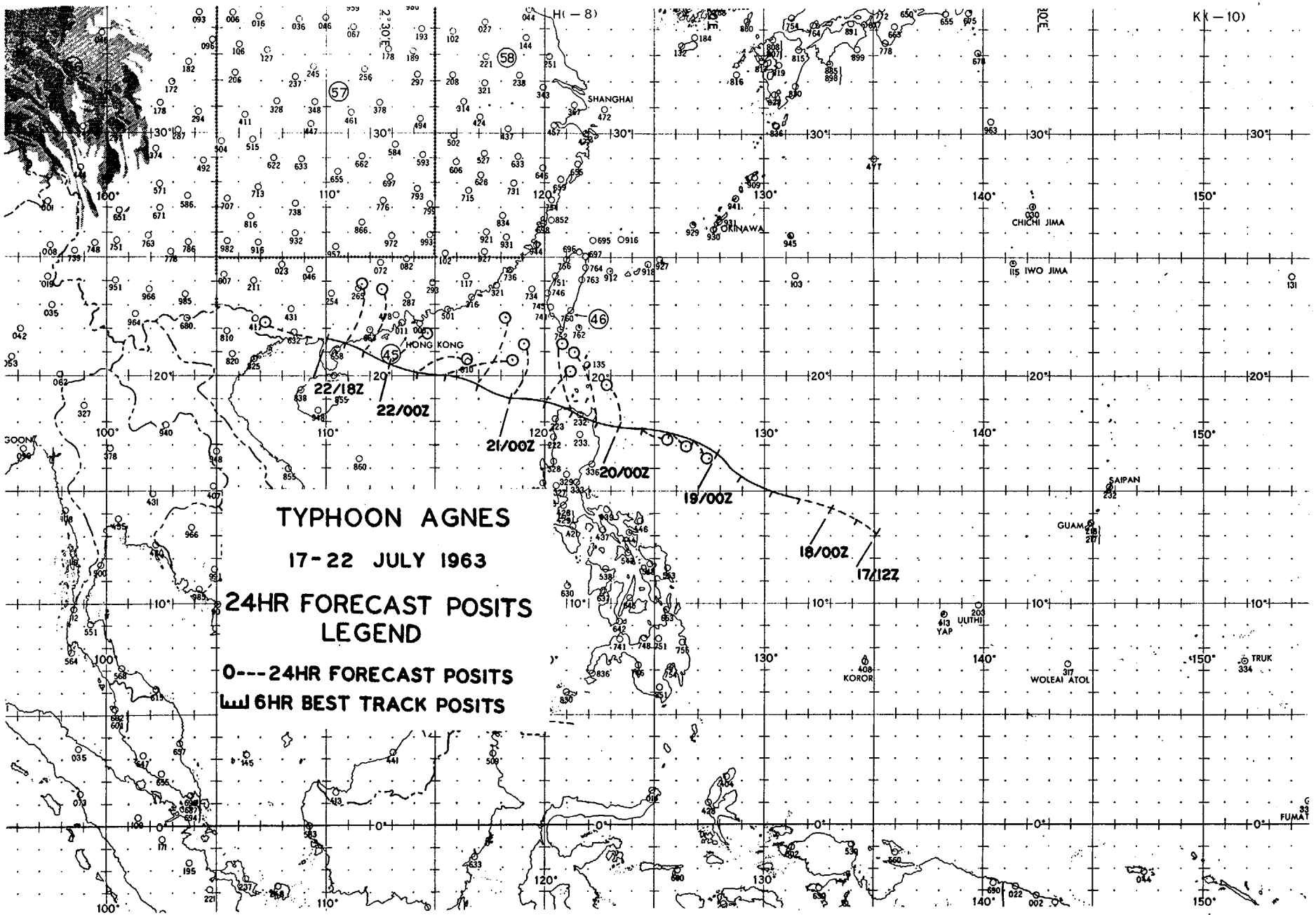
FIX NO/TIME	LAT.	LONG.	UNIT METHOD & ACCY	MAX SFC WND	MAX 700MB WND	MIN 700MB HGT	RECON MIN SLP MBS	JTWC MIN SLP *MBS	700MB T/Td (°C)	EYE CHARACTERISTICS
1 172320Z	14.2N	133.1E	54-P-03	25	28	-	999	-	- -	CIRC 15 MI DIA,NO WALL CLD
2 180400Z	14.5N	132.0E	54-P-06	40	39	3072	996	1003	09/09	WND CNTR LESS THAN 5 MI DIA, NO WALL CLD
3 182213Z	16.4N	128.2E	56-P-05	65	50	-	994	-	11/10	WALL CLD SSW-WNW
4 190307Z	17.1N	127.0E	56-P- -	-	-	-	988	-	10/08	RAIN IN EYE,MULT 700MB CNTRS
5 190945Z	17.5N	125.8E	VW1-P-03	-	-	3046	-	996	15/06	CIRC 20 MI DIA,NO WALL CLD
6 191600Z	17.6N	125.0E	VW1-R-05	-	-	-	-	-	- -	ELLIP 24 MI E-W,20 MI N-S,WEAK
7 192200Z	17.8N	123.7E	54-P-03	85	50	3060	1002	997	15/05	CIRC 20 MI DIA,OPEN NE SEMI
8 200809Z	17.3N	122.3E	USAF-R- -	-	-	-	-	-	- -	---
9 200950Z	18.1N	121.9E	VW1-R-05	65	-	-	-	-	- -	CIRC 25 MI DIA,POORLY DEF
10 201530Z	-	120.5E	VW1 - -	-	-	-	-	-	- -	---
11 202200Z	18.9N	118.9E	56-R-10	50	60	2997	992	994	10/10	CNTR FILLED WITH CLDS,NO WALL CLD
12 210300Z	19.5N	117.1E	56-P-25	60	50	2970	987	992	10/10	CNTR FILLED WITH CLDS,NO WALL CLD
13 210930Z	19.9N	116.1E	VW1-P-05	70	-	-	988	-	- -	CIRC 30 MI DIA,WALL CLD S SEMI
14 211600Z	20.2N	114.0E	VW1-R-02	-	-	-	-	-	- -	CIRC 40 MI DIA,WALL CLD S & W 8 MI THICK

*Computed

TYPHOON AGNES 17 JUL-22 JUL 1963
POSITION AND FORECAST VERIFICATION DATA

DTG	STORM POSITION LAT.	LONG.	24 HOUR ERROR DEG. DISTANCE	48 HOUR ERROR DEG. DISTANCE
171200Z	13.1N	135.1E	------	------
171800Z	13.6N	134.1E	------	------
180000Z	14.2N	133.0E	------	------
180600Z	14.6N	131.6E	------	------
181200Z	15.0N	130.3E	------	------
181800Z	15.7N	129.0E	------	------
190000Z	16.6N	127.9E	------	------
190600Z	17.2N	126.7E	132-69	------
191200Z	17.5N	125.5E	121-60	------
191800Z	17.7N	124.4E	106-72	------
200000Z	17.8N	123.3E	344-123	------
200600Z	18.0N	122.3E	340-194	079-102
201200Z	18.4N	121.2E	352-181	073-104
201800Z	18.8N	120.0E	035-103	071-134
210000Z	19.0N	118.4E	015-135	005-294
210600Z	19.6N	117.0E	020-186	007-395
211200Z	20.0N	115.5E	078-174	018-385
211800Z	20.2N	114.1E	076-134	036-373
220000Z	20.5N	112.9E	050-122	024-393
220600Z	21.0N	111.8E	019-168	027-440
221200Z	21.4N	110.9E	009-156	055-363
221800Z	21.5N	110.0E	285-160	039-191

AVERAGE 24 HOUR ERROR 136 MI
AVERAGE 48 HOUR ERROR 289 MI


TYPHOON AGNES
17-22 JULY 1963
24HR FORECAST POSITS
LEGEND
0---24HR FORECAST POSITS
6HR BEST TRACK POSITS
22/18Z
22/00Z
21/00Z
20/00Z
19/00Z
18/00Z
17/12Z
SHANGHAI
OKINAWA
HONG KONG
CHICHI JIMA
IWO JIMA
SAIPAN
GUAM
YAP
ULITHI
KOROR
WOLEAI ATOL
TRUK
FUMA

TYPHOON BESS - 270600Z JULY to 110600Z AUG

I. DATA

A. Statistics

1. Calendar days of tropical warning - 15¼
2. Calendar days of typhoon intensity - 6½
3. Total distance traveled during tropical warning period - 2244 mi.

B. Characteristics as a typhoon

1. Minimum observed SLP - 930mb, 040430Z
2. Minimum observed 700mb height - 2475m, 040430Z
3. Max radius of SFC circulation - 350 mi
4. Max surface winds - 130 kts

II. DEVELOPMENT

A. Initial impetus - Development of outdraft at 200mb over surface vortex.

B. Initial surface vortex

1. Junction vortex at 240600Z
2. Surface pressure less than 1006mb

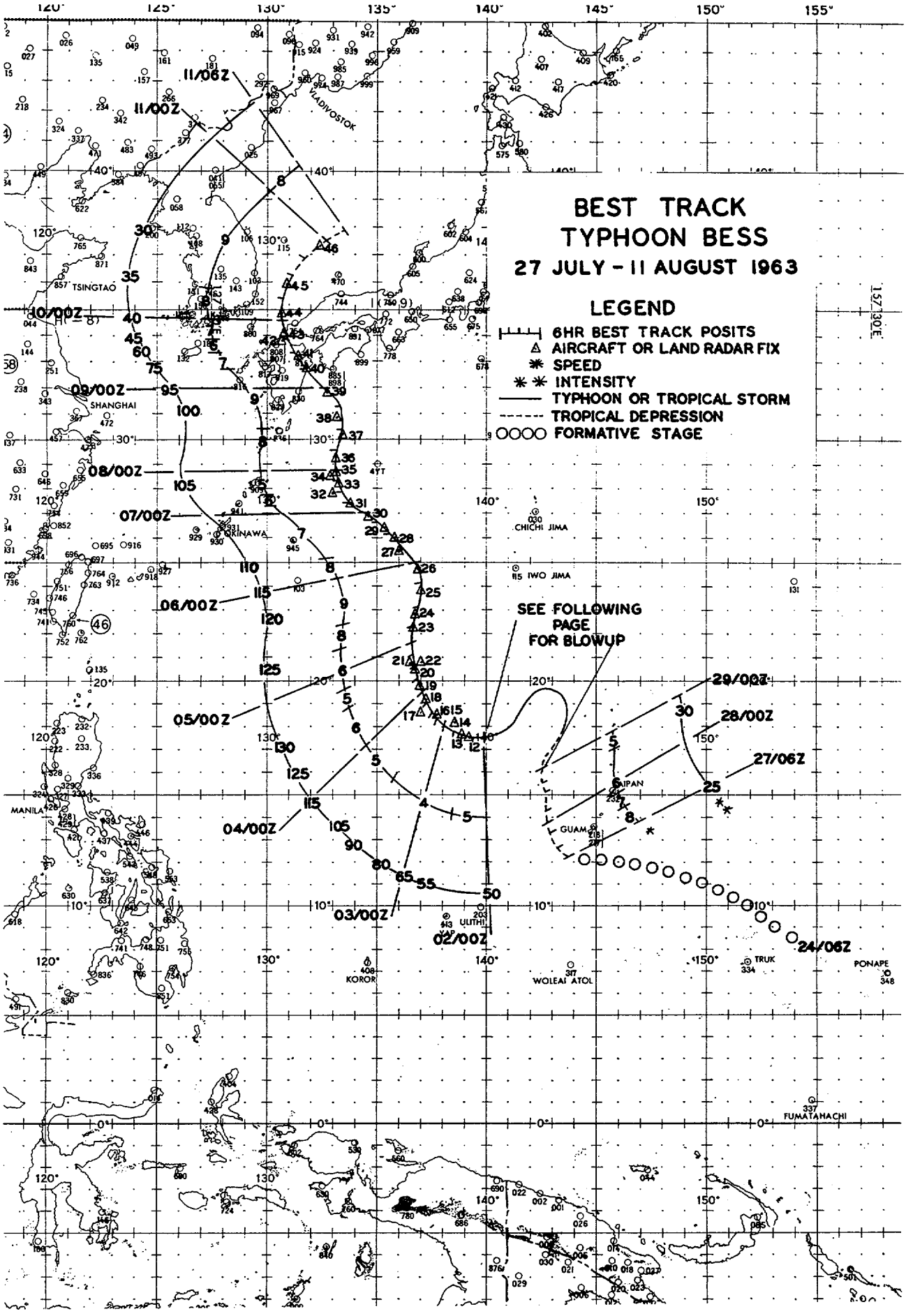
C. Zenith flow at 200mb

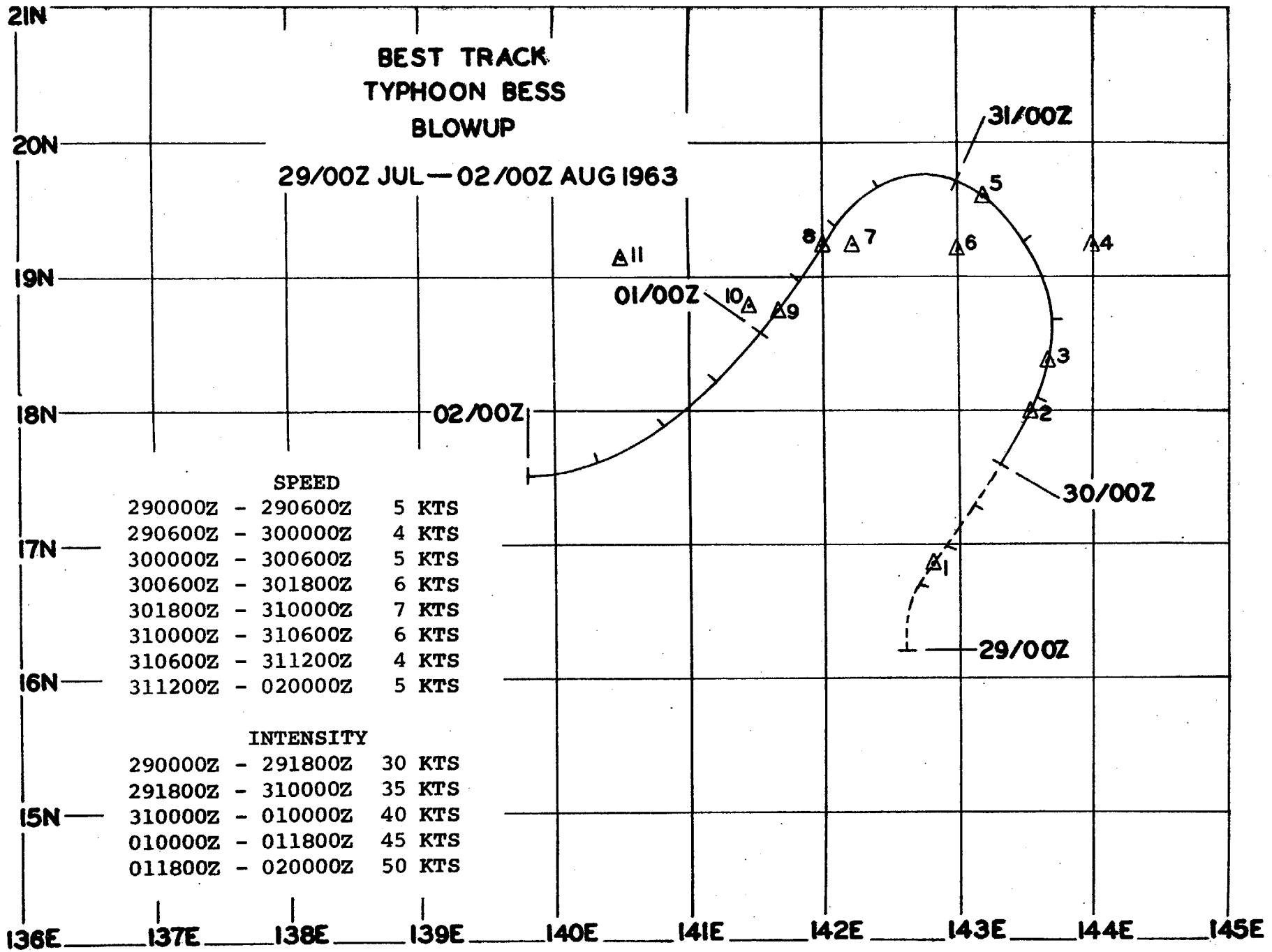
1. Relative position surface vortex - SE quadrant of anticyclone.
2. Wind direction over vortex - NE

III. Final Disposition

A. Extratropical

IV. REMARKS - An all-time record was established on this storm for most warnings issued.


BEST TRACK
TYPHOON BESS
27 JULY - 11 AUGUST 1963
LEGEND
6HR BEST TRACK POSITS
AIRCRAFT OR LAND RADAR FIX
SPEED
INTENSITY
TYPHOON OR TROPICAL STORM
TROPICAL DEPRESSION
FORMATIVE STAGE
SEE FOLLOWING PAGE FOR BLOWUP
11/06Z
11/00Z
10/00Z
09/00Z
08/00Z
07/00Z
06/00Z
05/00Z
04/00Z
03/00Z
02/00Z
29/00Z
28/00Z
27/06Z
24/06Z
VLADIVOSTOK
TSINGTAO
SHANGHAI
OKINAWA
CHICHI JIMA
IWO JIMA
SAIPAN
GUAM
MANILA
KOROR
ULITHI
WOLEAI ATOL
TRUK
PONAPE
FUMATAHACHI


BEST TRACK
TYPHOON BESS
BLOWUP
29/00Z JUL — 02/00Z AUG 1963
21N
20N
19N
18N
17N
16N
15N
136E
137E
138E
139E
140E
141E
142E
143E
144E
145E
31/00Z
30/00Z
29/00Z
02/00Z
01/00Z
1
2
3
4
5
6
7
8
9
10
11
SPEED
290000Z - 290600Z 5 KTS
290600Z - 300000Z 4 KTS
300000Z - 300600Z 5 KTS
300600Z - 301800Z 6 KTS
301800Z - 310000Z 7 KTS
310000Z - 310600Z 6 KTS
310600Z - 311200Z 4 KTS
311200Z - 020000Z 5 KTS
INTENSITY
290000Z - 291800Z 30 KTS
291800Z - 310000Z 35 KTS
310000Z - 010000Z 40 KTS
010000Z - 011800Z 45 KTS
011800Z - 020000Z 50 KTS

LAND RADAR AND AIRCRAFT FIXES - TYPHOON BESS

FIX NO/TIME	LAT.	LONG.	UNIT METHOD & ACCY	MAX SFC WND	MAX 700MB WND	MIN 700MB HGT	RECON MIN SLP MBS	JTWC MIN SLP *MBS	700MB T/Td (°C)	EYE CHARACTERISTICS
1 292210Z	16.8N	142.8E	VW1-P-05	25	-	3120	1001	1005	15/-	CIRC 60 MI DIA,OPEN N SEMI
2 300420Z	18.0N	143.5E	VW1-P-10	25	-	-	999	-	- -	WEAK RDR PIC OF CNTR
3 300955Z	18.4N	143.7E	VW1-P-05	15	-	3094	-	1003	14/-	OVAL 68 MI NE/SW,46 MI NW/SE, SEVERAL WEAK FEEDER BNDS
4 301900Z	19.3N	144.0E	VW1-R-20	-	-	3121	-	-	- -	CNTR HOURGLASS SHAPE & WEAK, 200 MI N/S,110 MI E/W
5 302200Z	19.6N	143.2E	54-P-04	30	-	3134	1004	1007	12/09	CIRC 50 MI DIA, VERY DISORG.
6 310040Z	19.3N	143.0E	54-P-04	30	30	3143	1008	1008	13/08	CIRC 40 MI DIA,ILL DEF, GEOG & PRESSURE CNTR SAME
7 310411Z	19.3N	142.2E	54-P-05	30	30	3149	1007	1008	13/07	CIRC 40 MI DIA,WALL CLDS S QD
8 310900Z	19.3N	142.0E	VW1-P-05	30	-	-	999	-	- -	CNTR NOT DISCERNIBLE
9 312200Z	18.7N	141.6E	54-P-03	25	-	-	1002	-	- -	CIRC 30 MI DIA, DISORGANIZED
10 010410Z	18.8N	141.4E	54-P-03	45	30	3039	1010	997	13/13	CIRC 10 MI DIA,OPEN W & SW
11 010945Z	19.3N	140.5E	VW1-P-03	40	-	-	998	-	- -	CIRC 13 MI DIA,WALL CLDS NE-SW,4 MI THICK
12 020345Z	17.6N	139.3E	54-P-04	35	40	3042	998	998	11/11	CIRC 30 MI DIA,WEAK WALL CLDS NW-E-SW
13 020930Z	17.6N	138.9E	VW1-P-02	45	-	-	986	-	- -	ELLIP 33 MI E/W,39 MI N/S, OPEN E
14 022200Z	18.2N	138.5E	54-P-03	40	40	2969	992	988	17/13	CIRC 40 MI DIA, CLOSED

*Computed

LAND RADAR AND AIRCRAFT FIXES - TYPHOON BESS (CONT'D)

FIX NO/TIME	LAT.	LONG.	UNIT METHOD & ACCY	MAX SFC WND	MAX 700MB WND	MIN 700MB HGT	RECON MIN SLP MBS	JTWC MIN SLP *MBS	700MB T/Td (°C)	EYE CHARACTERISTICS
15 030320Z	18.5N	137.7E	VW1-P-05	65	-	3000	975	-	14/09	CIRC 25 MI DIA,OPEN NE QUAD, WALL CLDS 5 MI THICK
16 031000Z	18.5N	137.7E	VW1-R-03	-	-	-	-	-	- -	CIRC 25 MI DIA,CLSD WALL CLDS 8 MI THICK
17 031600Z	18.6N	137.0E	VW1-R-03	-	-	-	-	-	- -	CONCENTRIC INNER EYE ELLIP 23 MI N/S,20 MI E/W, OUTER EYE CIRC 70 MI DIA
18 032200Z	19.2N	137.3E	56-P-04	90	90	2600	932	944	18/11	CIRC 17 MI DIA CLOSED
19 040430Z	19.8N	137.0E	54-P-03	65	100	2475	922	930	21/14	CIRC 20 MI DIA,SLOPES NW,OPEN S,GEOG CNTR 10 MI N OF PRESSURE CNTR
20 041000Z	20.5N	136.8E	VW1-R-01	-	-	-	-	-	- -	CONCENTRIC,INNER EYE CIRC 11 MI DIA,OUTER EYE CIRC 42 MI DIA,WALL CLDS 7 MI THICK
21 041530Z	20.8N	136.6E	VW1-R-05	-	-	-	-	-	- -	CONCENTRIC,INNER EYE 17 MI DIA,WALL CLDS 3 MI THICK & WEAKENING,OUTER EYE 38 MI DIA,WALL CLDS 9 MI THICK
22 042215Z	20.9N	137.0E	56-P-10	100	90	2502	940	937	16/10	WALL CLDS IN E QUAD
23 050400Z	22.3N	136.8E	56-P-03	75	85	2560	940	943	14/14	ELLIP 40 MI N/S,20 MI E/W, WALL CLDS E SEMI, GEOG CNTR 15 MI S OF PRESSURE CNTR

*Computed

LAND RADAR AND AIRCRAFT FIXES - TYPHOON BESS (CONT'D)

FIX NO/TIME	LAT.	LONG.	UNIT METHOD & ACCY	MAX SFC WND	MAX 700MB WND	MIN 700MB HGT	RECON MIN SLP MBS	JTWC MIN SLP *MBS	700MB T/Td (°C)	EYE CHARACTERISTICS
24 050930Z	22.8N	136.8E	VW1-R-05	-	-	-	-	-	- -	CIRC 55 MI DIA,OPEN W
25 051530Z	23.7N	137.0E	VW1-R-03	-	-	-	-	-	- -	WALL CLDS 10 MI THICK,OPEN E
26 052157Z	24.7N	136.8E	56-P-01	80	90	2694	947	936	15/15	OPEN SW & NE
27 060400Z	25.5N	136.0E	54-P-02	75	75	2682	952	953	18/18	ELLIP 50 MI ENE/WSW,30 MI NNW/SSE,EYE FILLING RAPIDLY
28 061000Z	26.0N	135.8E	VW1-R-05	-	-	-	-	-	- -	CONCENTRIC,INNER EYE CIRC 15 MI DIA,OPEN SW SEMI,OUTER EYE CIRC 70 MI DIA
29 061530Z	26.4N	135.3E	VW1-R-03	-	-	-	-	-	- -	CONCENTRIC,INNER EYE CIRC 9 MI DIA,WALL CLDS 3 MI THICK, OUTER EYE CIRC 77 MI DIA,WALL CLDS 10 MI THICK
30 062200Z	26.9N	134.4E	56-P-03	105	75	2679	955	956	15/13	---
31 070400Z	27.3N	133.9E	56-P-03	75	65	2655	948	953	16/13	CIRC 60 MI DIA,OPEN W
32 071145Z	27.8N	133.0E	VW1-R-05	-	-	-	-	-	- -	ELLIP 56 MI N/S,50 MI E/W, CLSD WALL CLDS 11 MI THICK
33 071545Z	28.1N	133.2E	VW1-R-03	-	-	-	-	-	10/06	ELLIP 36 MI N/S,31 MI E/W, OPEN SW, WALL CLDS 9 MI THICK
34 072130Z	28.5N	132.9E	SHIP-R-U	-	-	-	-	-	- -	---
35 072202Z	28.7N	133.2E	56-P-02	-	70	2704	957	958	16/13	CIRC 50 MI DIA,OPEN NW,GEOG EYE 15 MI N OF PRESSURE EYE

*Computed

LAND RADAR AND AIRCRAFT FIXES - TYPHOON BESS (CONT'D)

FIX NO/TIME	LAT.	LONG.	UNIT METHOD & ACCY	MAX SFC WND	MAX 700MB WND	MIN 700MB HGT	RECON MIN SLP MBS	JTWC MIN SLP *MBS	700MB T/Td (°C)	EYE CHARACTERISTICS
36 080400Z	29.3N	133.1E	56-P-02	-	75	2743	969	962	15/13	CIRC 45 MI DIA,OPEN W & NW
37 081010Z	30.2N	133.4E	VW1-R-05	-	-	-	-	-	- -	CIRC 50 MI DIA,OPEN SW SEMI
38 081530Z	30.7N	133.1E	VW1-R-03	-	-	-	-	-	- -	CIRC 35 MI DIA,WALL CLDS SE
39 082200Z	31.8N	132.6E	56-P-01	50	80	2780	964	966	15/15	CIRC 70 MI DIA,OPEN W
40 090355Z	32.6N	131.9E	56-P-05	60	-	-	-	-	- -	ELLIP
41 091030Z	33.3N	131.4E	VW1-P-03	-	-	2920	-	984	12/10	CIRC 55 MI DIA,WALL CLDS E SEMI
42 091533Z	33.9N	130.8E	VW1-R-20	-	-	-	-	-	- -	CIRC 36 MI DIA,CNTR VERY DIF
43 092215Z	34.2N	130.8E	56-P-01	-	57	2984	990	993	10/10	ELLIP
44 100400Z	34.9N	130.6E	56-P-01	-	40	2990	996	994	10/09	ELLIP OPEN E,WALL CLDS 5 MI THICK
45 101000Z	36.0N	130.9E	VW1-P-15	-	25	2996	-	995	- -	CNTR VERY DIFFUSED
46 102200Z	37.3N	132.3E	56-P-10	30	30	3008	994	996	12/11	EYE NOT DISCERNIBLE

*Computed

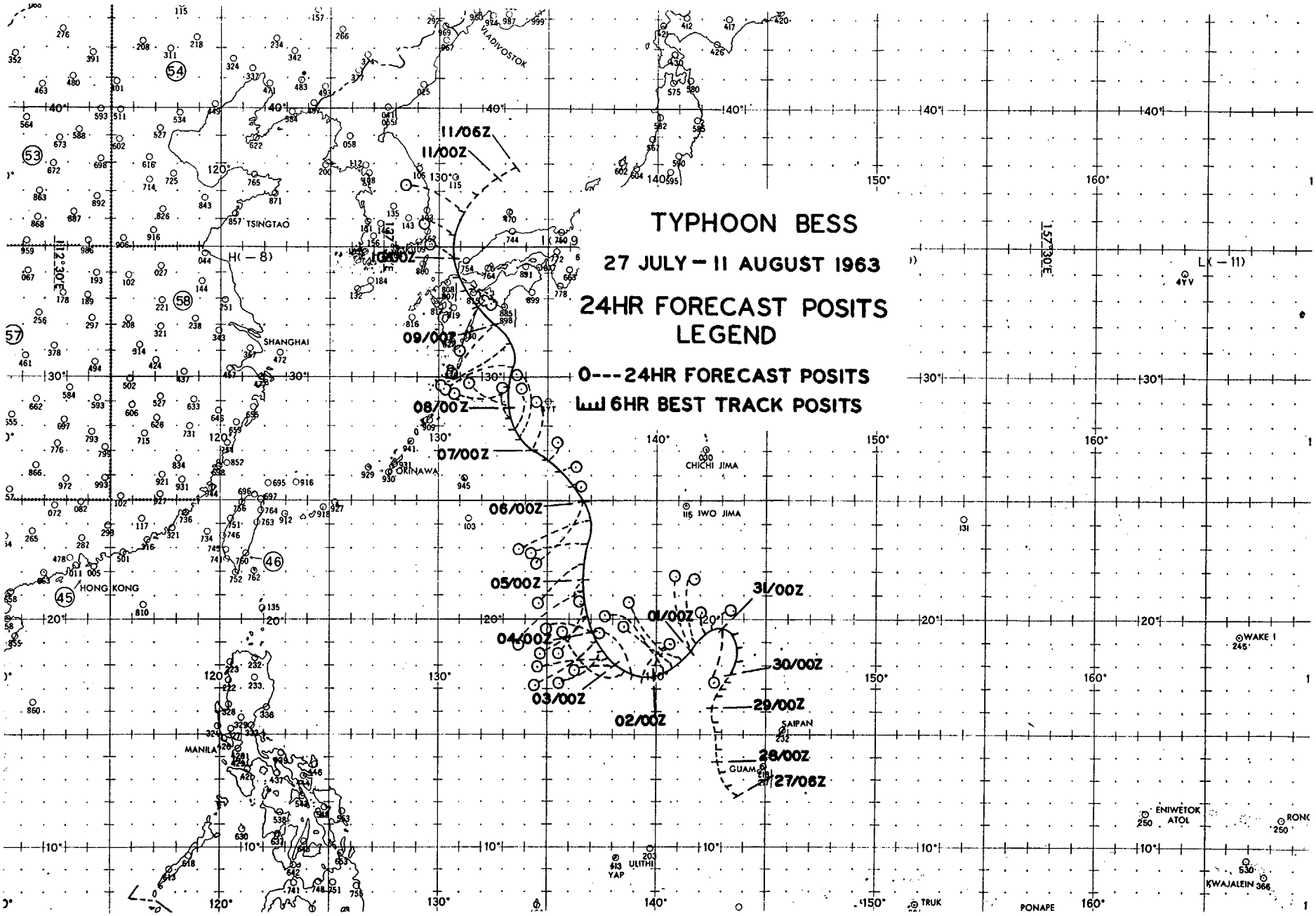
TYPHOON BESS 27 JUL-11 AUG
POSITION AND FORECAST VERIFICATION DATA

DTG	STORM POSITION LAT.	LONG.	24 HOUR ERROR DEG.	DISTANCE	48 HOUR ERROR DEG.	DISTANCE
270600Z	12.2N	143.8E	------		------	
271200Z	12.6N	143.1E	------		------	
271800Z	13.2N	142.8E	------		------	
280000Z	13.8N	142.7E	------		------	
280600Z	14.4N	142.7E	------		------	
281200Z	15.1N	142.7E	------		------	
281800Z	15.6N	142.5E	------		------	
290000Z	16.2N	142.6E	------		------	
290600Z	16.7N	142.7E	------		------	
291200Z	17.0N	142.9E	------		------	
291800Z	17.3N	143.1E	------		------	
300000Z	17.6N	143.3E	------		------	
300600Z	18.1N	143.6E	------		------	
301200Z	18.7N	143.7E	------		------	
301800Z	19.3N	143.5E	------		------	
310000Z	19.7N	143.0E	194-148		------	
310600Z	19.7N	142.4E	052-61		------	
311200Z	19.4N	142.1E	356-53		------	
311800Z	19.0N	141.8E	360-164		------	
010000Z	18.6N	141.5E	154-197		345-47	
010600Z	18.2N	141.2E	317-202		314-237	
011200Z	17.9N	140.8E	312-173		318-249	
011800Z	17.6N	140.3E	315-215		335-326	
020000Z	17.5N	139.8E	028-104		325-375	
020600Z	17.5N	139.3E	040-107		317-372	
021200Z	17.6N	138.8E	323-138		312-300	
021800Z	17.8N	138.4E	304-190		310-340	
030000Z	18.1N	138.1E	301-205		346-119	
030600Z	18.3N	137.8E	265-237		333-79	
031200Z	18.7N	137.6E	232-134		289-262	
031800Z	19.1N	137.4E	234-205		283-383	

TYPHOON BESS 27 JUL-11 AUG
POSITION AND FORECAST VERIFICATION DATA (CONT'D)

DTG	STORM POSITION LAT.	LONG.	24 HOUR ERROR DEG. DISTANCE	48 HOUR ERROR DEG. DISTANCE
040000Z	19.5N	137.1E	209-113	283-363
040600Z	20.1N	136.9E	234-160	253-428
041200Z	20.7N	136.8E	212-139	238-287
041800Z	21.2N	136.7E	231-221	243-428
050000Z	21.8N	136.7E	191-34	220-301
050600Z	22.4N	136.7E	230-153	238-406
051200Z	23.2N	136.9E	261-154	235-324
051800Z	24.1N	137.0E	250-188	234-482
060000Z	25.0N	136.6E	217-190	209-344
060600Z	25.6N	136.1E	115-14	229-405
061200Z	26.1N	135.5E	070-29	253-272
061800Z	26.6N	135.0E	034-47	249-260
070000Z	27.0N	134.4E	360-120	230-222
070600Z	27.4N	133.7E	349-167	019-113
071200Z	27.9N	133.4E	014-97	014-110
071800Z	28.4N	133.2E	353-78	358-137
080000Z	28.8N	133.1E	303-117	347-318
080600Z	29.6N	133.2E	264-129	333-382
081200Z	30.4N	133.4E	252-175	327-220
081800Z	31.3N	133.0E	239-181	319-207
090000Z	32.0N	132.4E	218-145	289-201
090600Z	32.8N	131.8E	202-113	252-265
091200Z	33.4N	131.4E	130-71	244-275
091800Z	33.9N	131.0E	138-75	237-272
100000Z	34.6N	130.6E	304-49	215-220
100600Z	35.4N	130.6E	293-77	220-230
101200Z	36.2N	131.1E	------	------
101800Z	36.9N	131.7E	------	------
110000Z	37.5N	132.6E	------	------
110600Z	37.9N	133.5E	------	------

AVERAGE 24 HOUR ERROR 135 MI
AVERAGE 48 HOUR ERROR 278 MI


TYPHOON BESS
27 JULY – 11 AUGUST 1963
24HR FORECAST POSITS
LEGEND
0---24HR FORECAST POSITS
6HR BEST TRACK POSITS
11/06Z
11/00Z
10/00Z
09/00Z
08/00Z
07/00Z
06/00Z
05/00Z
04/00Z
03/00Z
02/00Z
01/00Z
31/00Z
30/00Z
29/00Z
28/00Z
27/06Z
VLADIVOSTOK
TSINGTAO
SHANGHAI
OKINAWA
CHICHI JIMA
IWO JIMA
HONG KONG
MANILA
SAIPAN
GUAM
YAP
ULITHI
TRUK
PONAPE
WAKE I
ENIWETOK ATOL
KWAJALEIN
H(–8)
L(–11)

TYPHOON CARMEN - 071200Z to 170000Z AUG

I. DATA

A. Statistics

1. Calendar days of tropical warning - 9 3/4
2. Calendar days of typhoon intensity - 5 3/4
3. Total distance traveled during tropical warning period - 2430 mi

B. Characteristics as a typhoon

1. Minimum observed SLP - 936mb, 120400Z
2. Minimum observed 700mb height - 2539m, 120400Z
3. Max radius of SFC circulation - 250 mi
4. Max surface winds - 125 kts

II. DEVELOPMENT

A. Initial impetus - Juxtaposition of MPT and subsequent fracture. Development of outdraft over storm.

B. Initial surface vortex

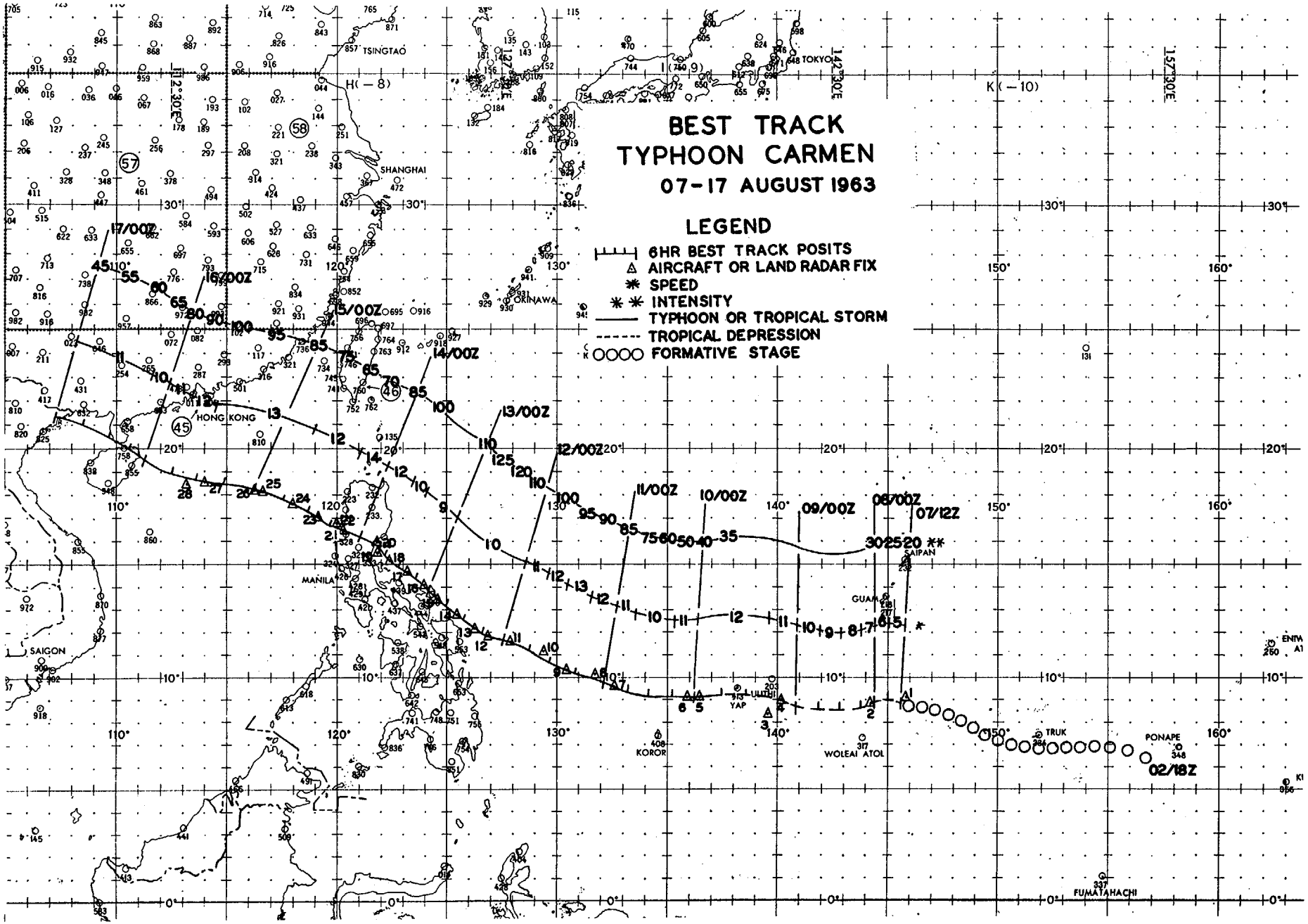
1. Junction vortex at 021800Z
2. Surface pressure less than 1006mb

C. Zenith flow at 200mb

1. Relative position surface vortex - SW quadrant of anticyclone
2. Wind direction over vortex - SE

III. FINAL DISPOSITION

A. Dissipated over land.


BEST TRACK
TYPHOON CARMEN
07-17 AUGUST 1963
LEGEND
6HR BEST TRACK POSITS
AIRCRAFT OR LAND RADAR FIX
SPEED
INTENSITY
TYPHOON OR TROPICAL STORM
TROPICAL DEPRESSION
FORMATIVE STAGE
TSINGTAO
SHANGHAI
OKINAWA
TOKYO
HONG KONG
MANILA
SAIGON
SAIPAN
GUAM
YAP
KOROR
WOLEAI ATOL
TRUK
PONAPE
FUMATAHACHI
17/00Z
16/00Z
15/00Z
14/00Z
13/00Z
12/00Z
11/00Z
10/00Z
09/00Z
08/00Z
07/12Z
02/18Z
112°30E
127°30E
142°30E
157°30E

LAND RADAR AND AIRCRAFT FIXES - TYPHOON CARMEN

FIX NO/TIME	LAT.	LONG.	UNIT METHOD & ACCY	MAX SFC WND	MAX 700MB WND	MIN 700MB HGT	RECON MIN SLP MBS	JTWC MIN SLP *MBS	700MB T/Td (°C)	EYE CHARACTERISTICS
1 070400Z	09.1N	145.8E	54-P-U	23	-	-	1003	-	- -	---
2 080256Z	08.9N	144.2E	54-P-03	30	-	-	1003	-	- -	---
3 082325Z	08.3N	139.6E	54-P-07	20	-	-	1007	-	- -	CIRC 15 MI DIA,WALL CLDS ALL QUADS
4 090425Z	09.1N	140.0E	54-P-05	30	-	-	1004	-	- -	CIRC 15 MI DIA,OPEN SE
5 092330Z	09.1N	136.3E	VW1-P-05	40	-	-	999	-	- -	WIND EYE CIRC 10 MI DIA, EXCELLENT RDR PIC
6 100245Z	09.1N	135.9E	VW1-R-05	45	-	-	994	-	- -	WIND EYE CIRC 10 MI DIA,CLD EYE CIRC 40 MI DIA
7 102200Z	09.7N	132.5E	54-P-03	85	55	2957	980	987	17/07	OVAL 30 MI NE/SW,20 MI NW/SE, OPEN SE
8 110400Z	10.1N	131.8E	54-P-03	70	60	2926	992	984	16/09	GEOG CNTR 4 MI W OF PRES CNTR
9 111008Z	10.6N	130.4E	VW1-R-03	-	-	-	-	-	- -	OVAL 30 MI N/S,25 MI E/W, WEAK WALL CLDS
10 111530Z	11.3N	129.5E	VW1-R-03	-	-	-	-	-	- -	CLSD WALL CLDS 3 MI THICK
11 112200Z	11.6N	127.9E	56-P-03	100	90	2762	955	963	19/11	CIRC 25 MI DIA CLOSED
12 120400Z	11.9N	126.9E	56-P-01	80	105	2539	934	936	23/16	CIRC 20 MI DIA,CLSD WALL CLDS 5 MI THICK
13 121000Z	12.3N	126.3E	VW1-R-02	-	-	-	-	-	- -	ELLIP 15 MI N/S,10 MI E/W, CLSD WALL CLDS 8 MI THICK

*Computed

LAND RADAR AND AIRCRAFT FIXES - TYPHOON CARMEN (CONT'D)

FIX NO/TIME	LAT.	LONG.	UNIT METHOD & ACCY	MAX SFC WND	MAX 700MB WND	MIN 700MB HGT	RECON MIN SLP MBS	JTWC MIN SLP *MBS	700MB T/Td (°C)	EYE CHARACTERISTICS
14 121530Z	12.8N	125.5E	VW1-R-02	-	-	-	-	-	- -	CIRC 13 MI DIA CLOSED
15 122145Z	13.4N	124.7E	54-P-02	125	115	2560	898	942	17/16	CIRC 35 MI DIA,CLSD,GEOG CNTR 8 MI E OF PRES CNTR
16 130600Z	14.2N	124.0E	56-P-½	-	-	-	-	-	- -	CLOSED
17 131000Z	14.8N	123.2E	VW1-R-02	-	-	-	-	-	- -	CIRC 25 MI DIA,WALL CLDS 3 MI THICK,TOPS 45000 FT
18 131600Z	15.2N	122.4E	VW1-R-02	-	-	-	-	-	- -	CIRC 20 MI DIA,CLSD WALL CLDS 3 MI THICK
19 131830Z	15.5N	121.9E	LND/RDR	-	-	-	-	-	- -	---
20 132200Z	16.1N	121.6E	56-P-01	75	-	-	-	-	- -	CIRC
21 140300Z	16.3N	120.2E	56-P-01	70	-	-	992	-	- -	ELLIP WALL CLDS NE & W QUAD
22 140630Z	16.7N	120.0E	LND/RDR	-	-	-	-	-	- -	---
23 141008Z	17.1N	119.1E	VW1-P-03	45	-	-	-	-	- -	CNTR POORLY DEFINED
24 141530Z	17.6N	118.0E	VW1-R-10	-	-	-	-	-	- -	CNTR DIFFUSED
25 142143Z	18.2N	116.6E	56-P-01	-	62	2917	987	984	17/06	CIRC 80 MI DIA,OPEN E
26 150400Z	18.2N	116.2E	56-P-01	85	78	2920	-	984	15/-	CIRC 100 MI DIA
27 151015Z	18.5N	114.0E	VW1-P-02	120	-	2896	973	978	17/-	CIRC 75 MI DIA,CLSD WALL CLDS 10 MI THICK
28 151300Z	18.5N	113.2E	VW1-P-05	-	-	-	-	-	- -	ELLIP 81 MI NW/SE,53 MI NE/SW,OPEN N

*Computed

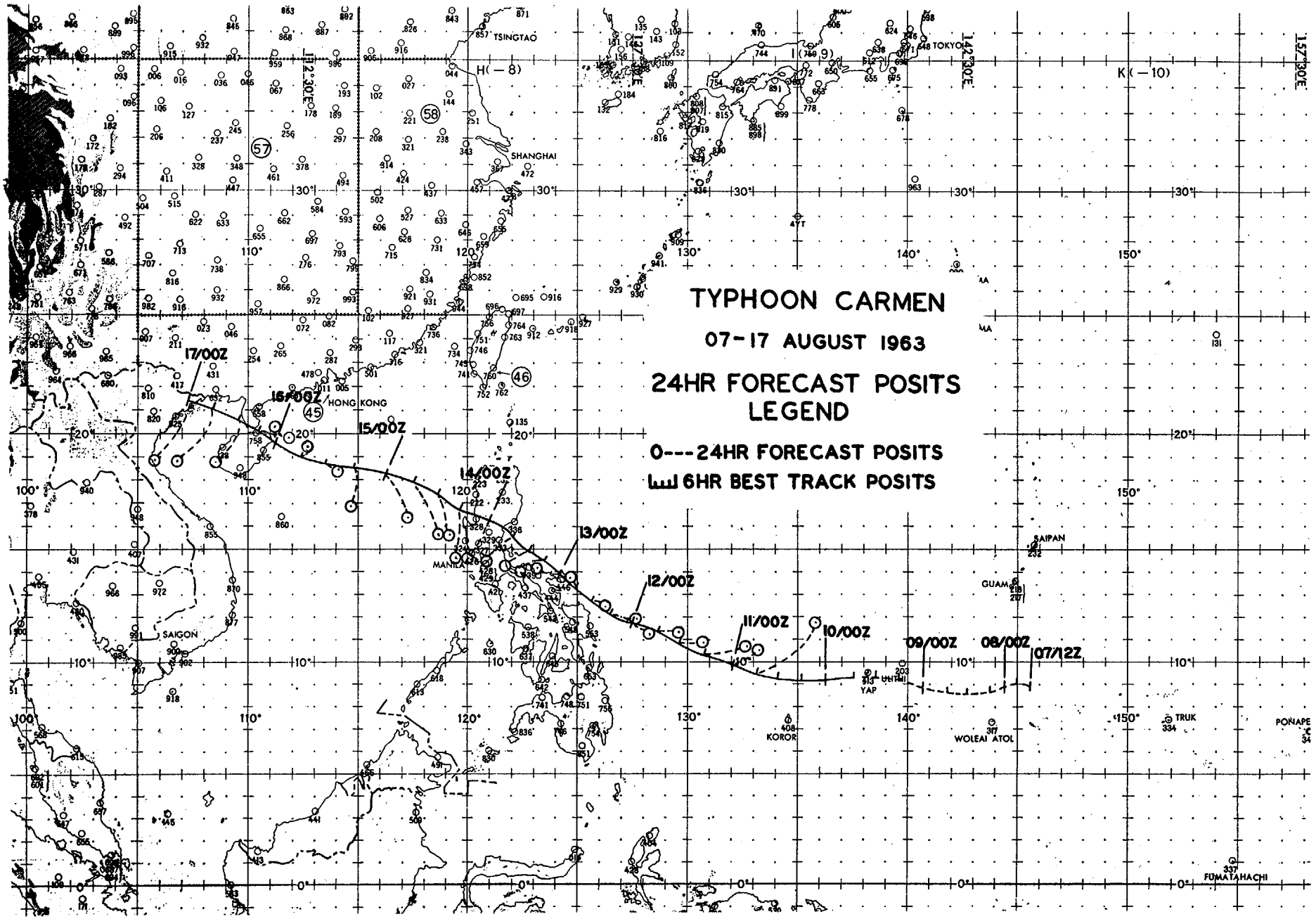
TYPHOON CARMEN 07 AUG-17 AUG 1963
POSITION AND FORECAST VERIFICATION DATA

DTG	STORM POSITION LAT.	LONG.	24 HOUR ERROR DEG. DISTANCE	48 HOUR ERROR DEG. DISTANCE
071200Z	08.9N	145.5E	------	------
071800Z	09.0N	145.0E	------	------
080000Z	08.9N	144.4E	------	------
080600Z	08.8N	143.7E	------	------
081200Z	08.8N	142.8E	------	------
081800Z	08.8N	141.9E	------	------
090000Z	08.9N	140.9E	------	------
090600Z	09.1N	139.8E	------	------
091200Z	09.2N	138.6E	------	------
091800Z	09.2N	137.4E	------	------
100000Z	09.1N	136.2E	------	------
100600Z	09.1N	135.1E	------	------
101200Z	09.2N	134.1E	------	------
101800Z	09.4N	133.1E	047-214	------
110000Z	09.8N	132.1E	058-72	------
110600Z	10.2N	130.9E	076-102	------
111200Z	10.8N	129.7E	084-59	------
111800Z	11.3N	128.6E	090-53	------
120000Z	11.7N	127.5E	118-40	084-137
120600Z	12.0N	126.7E	112-47	094-180
121200Z	12.6N	125.8E	127-23	106-73
121800Z	13.1N	125.0E	332-41	109-52
130000Z	13.8N	124.2E	288-68	174-52
130600Z	14.4N	123.6E	252-84	171-72
131200Z	14.9N	122.9E	233-72	214-76
131800Z	15.6N	122.1E	222-93	235-126
140000Z	16.2N	121.0E	212-117	237-172
140600Z	16.7N	119.7E	186-118	231-168
141200Z	17.3N	118.6E	166-106	213-167
141800Z	17.8N	117.5E	156-146	208-180

TYPHOON CARMEN 07 AUG-17 AUG 1963
POSITION AND FORECAST VERIFICATION DATA (CONT'D)

DTG	STORM POSITION LAT.	LONG.	24 HOUR ERROR DEG. DISTANCE	48 HOUR ERROR DEG. DISTANCE
150000Z	18.3N	116.2E	154-128	199-186
150600Z	18.4N	114.9E	191-95	169-194
151200Z	18.6N	113.5E	112-30	148-160
151800Z	19.0N	112.3E	053-32	140-200
160000Z	19.5N	111.3E	342-45	139-170
160600Z	20.1N	110.5E	101-78	202-117
161200Z	20.5N	109.4E	208-118	198-29
161800Z	21.0N	108.3E	213-150	350-18
170000Z	21.4N	107.3E	210-175	340-20

AVERAGE 24 HOUR ERROR 89 MI
AVERAGE 48 HOUR ERROR 121 MI


TYPHOON CARMEN
07-17 AUGUST 1963
24HR FORECAST POSITS
LEGEND
0---24HR FORECAST POSITS
6HR BEST TRACK POSITS
17/00Z
16/00Z
15/00Z
14/00Z
13/00Z
12/00Z
11/00Z
10/00Z
09/00Z
08/00Z
07/12Z
TSINGTAO
SHANGHAI
HONG KONG
MANILA
SAIGON
TOKYO
SAIPAN
GUAM
YAP
KOROR
WOLEAI ATOL
TRUK
PONAPE
FUMATAHACHI
H(-8)
I(-9)
K(-10)

TYPHOON DELLA - 250000Z to 301200Z AUGUST

I. DATA

A. Statistics

1. Calendar days of tropical warning - 5 3/4
2. Calendar days of typhoon intensity - 4
3. Total distance traveled during tropical warning period - 1410 mi

B. Characteristics as a typhoon

1. Minimum observed SLP - 970mb, 252200Z
2. Minimum observed 700mb height - 2847m, 252200Z
3. Max radius of SFC circulation - 250 mi
4. Max surface winds - 100 kts

II. DEVELOPMENT

A. Initial impetus - Development and intensification of outdraft at 200 mb NE of surface vortex

B. Initial surface vortex

1. Embedded vortex at 230000Z
2. Surface pressure less than 1009 mb

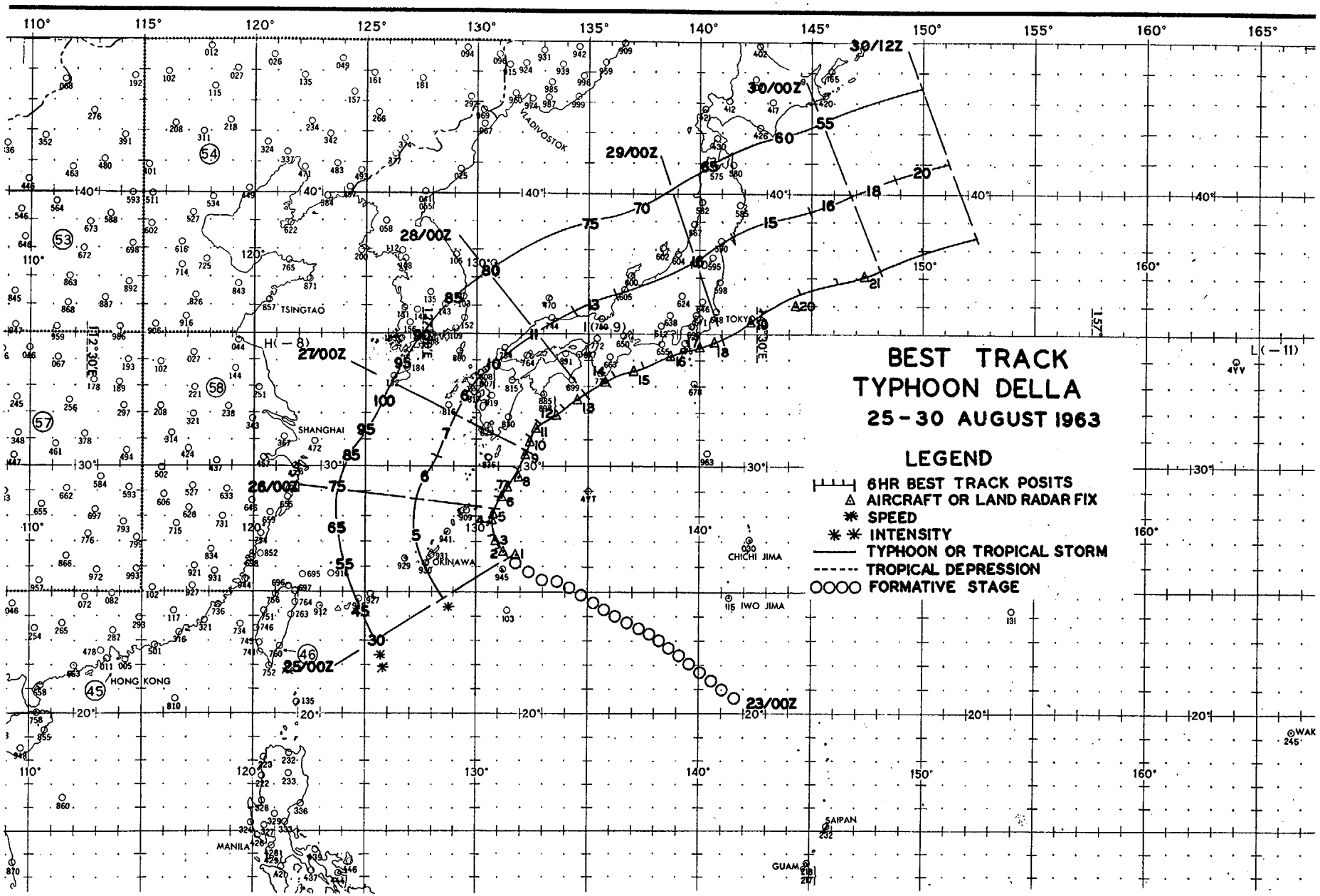
C. Zenith flow at 200mb

1. Relative position surface vortex - SW quadrant of anticyclone
2. Wind direction over vortex - SE

III. FINAL DISPOSITION

A. Became extratropical

TROPICAL WEATHER PLOTTING CHART—WESTERN PACIFIC AR



LAND RADAR AND AIRCRAFT FIXES - TYPHOON DELLA

FIX NO/TIME	LAT.	LONG.	UNIT METHOD & ACCY	MAX SFC WND	MAX 700MB WND	MIN 700MB HGT	RECON MIN SLP MBS	JTWC MIN SLP *MBS	700MB T/Td (°C)	EYE CHARACTERISTICS
1 242350Z	26.3N	131.8E	LND/RDR	-	-	-	-	-	- -	---
2 250351Z	26.6N	131.3E	UNK	32	-	-	-	-	- -	---
3 251030Z	27.1N	130.9E	LND/RDR	-	-	-	-	-	- -	TOPS 30000 FT
4 251600Z	27.8N	130.8E	LND/RDR	-	-	-	-	-	- -	---
5 252200Z	28.1N	130.9E	56-P-05	75	65	2847	970	970	22/15	ELLIP 13 MI N-S,10 MI E-W, OPEN NW SEMI
6 260400Z	28.7N	131.1E	56-P-01	70	90	2850	975	971	21/16	CIRC 25 MI DIA,WALL CLDS N-E-SE, 2 MI THICK
7 261000Z	29.2N	131.3E	VW1-R-03	-	-	-	-	-	- -	CIRC 10 MI DIA,OPEN SW
8 261530Z	29.6N	131.9E	VW1-R-03	-	-	-	-	-	- -	CIRC 11 MI DIA
9 262200Z	30.4N	132.1E	56-P-02	65	85	2929	969	979	22/15	CIRC 50 MI DIA,OPEN S
10 270400Z	30.9N	132.2E	56-P-02	65	62	2890	988	978	17/11	CIRC 12 MI DIA,OPEN S
11 270930Z	31.3N	132.7E	VW1-P-03	75	-	-	979	-	- -	CIRC 25 MI DIA,OPEN W, 50 KT WIND BAND 26 MI FROM EYE
12 271530Z	31.8N	133.6E	VW1-R-03	-	-	-	-	-	- -	CIRC 23 MI DIA,OPEN SW
13 272158Z	32.5N	134.7E	56-P-01	75	-	-	-	-	- -	CIRC 35 MI DIA,CLSD WALL CLDS 10 MI THICK
14 280400Z	33.1N	135.6E	56-P-01	80	-	-	-	-	- -	CIRC 33 MI DIA,CLSD WALL CLDS 5 MI THICK,GEOG CNTR 3 MI W OF PRESSURE CNTR

*Computed

LAND RADAR AND AIRCRAFT FIXES - TYPHOON DELLA (CONT'D)

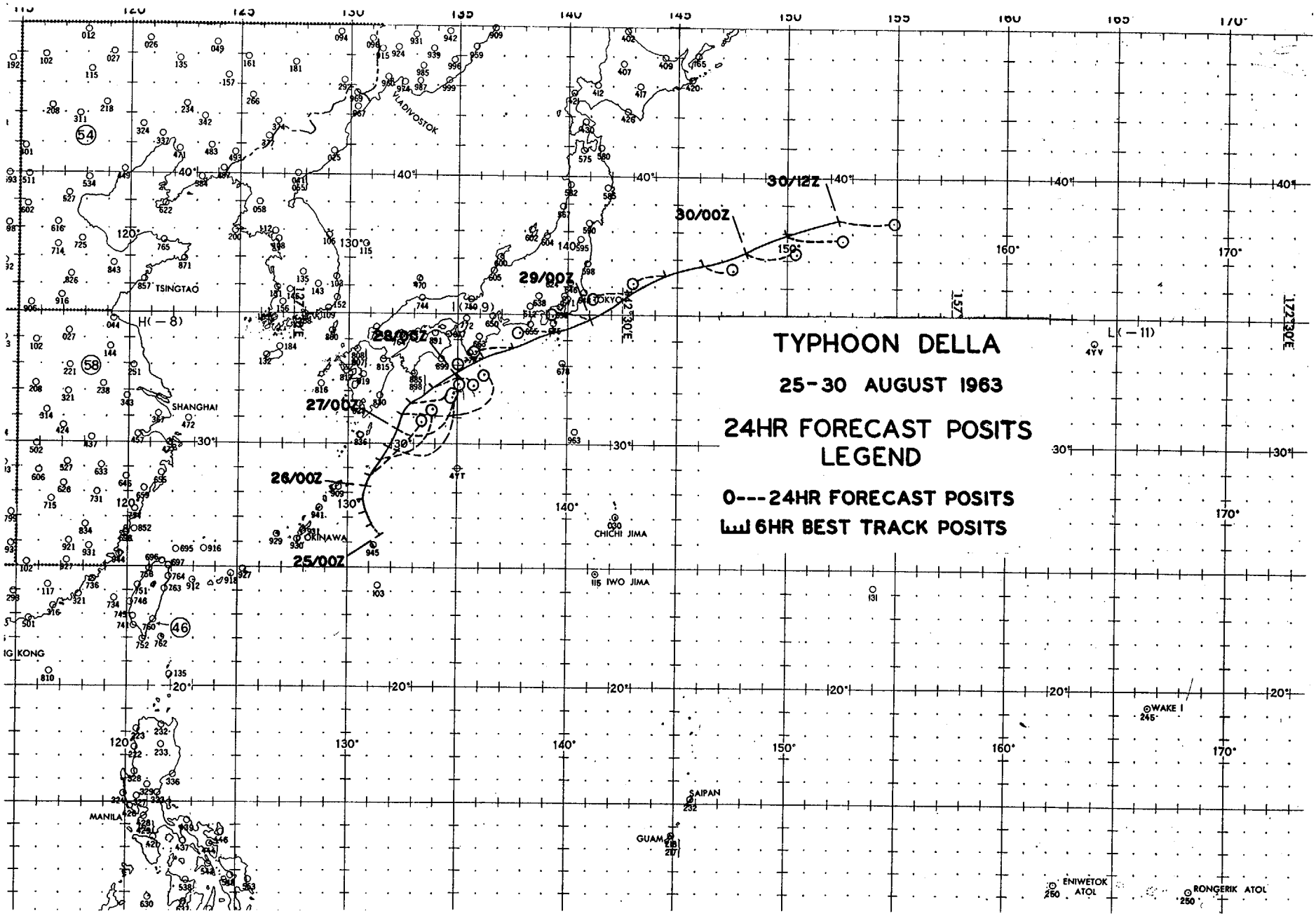
FIX NO/TIME	LAT.	LONG.	UNIT METHOD & ACCY	MAX SFC WND	MAX 700MB WND	MIN 700MB HGT	RECON MIN SLP MBS	JTWC MIN SLP *MBS	700MB T/Td (°C)	EYE CHARACTERISTICS
15 281000Z	33.6N	137.0E	VW1-R-03	-	-	-	-	-	- -	CIRC 21 MI DIA
16 281530Z	34.2N	138.6E	VW1-R-03	-	-	-	-	-	- -	CIRC 32 MI DIA,WEAKENING
17 282030Z	34.5N	140.0E	LND/RDR	-	-	-	-	-	- -	---
18 282210Z	34.7N	140.6E	56-P-01	50	-	-	972	-	- -	CIRC 12 MI DIA,OPEN E
19 290400Z	35.4N	142.2E	56-P-01	90	60	2862	976	978	10/10	OVAL 12 MI E-W,8 MI N-S,WALL CLDS NW-NE, EYE FILLING
20 290930Z	36.0N	144.2E	VW1-P-15	50	-	-	981	-	- -	CIRC 32 MI DIA,POOR RDR PRES
21 292200Z	37.1N	147.3E	56-P-02	120	-	3002	988	992	16/10	NO EYE,WALL CLDS OR SPIRAL BANDS

*Computed

TYPHOON DELLA 25 AUG-30 AUG 1963
POSITION AND FORECAST VERIFICATION DATA

DTG	STORM POSITION LAT.	LONG.	24 HOUR ERROR DEG. DISTANCE	48 HOUR ERROR DEG. DISTANCE
250000Z	26.4N	131.4E	------	------
250600Z	26.8N	131.1E	------	------
251200Z	27.3N	130.9E	------	------
251800Z	27.8N	130.8E	------	------
260000Z	28.3N	130.9E	------	------
260600Z	28.8N	131.1E	043-161	------
261200Z	29.3N	131.5E	046-167	------
261800Z	29.9N	131.9E	053-187	------
270000Z	30.6N	132.2E	061-156	------
270600Z	31.1N	132.4E	066-209	------
271200Z	31.5N	132.9E	073-97	------
271800Z	32.1N	133.9E	082-94	------
280000Z	32.8N	134.9E	169-26	067-454
280600Z	33.3N	136.1E	259-55	073-524
281200Z	33.8N	137.4E	261-87	076-214
281800Z	34.3N	139.3E	272-72	076-160
290000Z	34.8N	141.0E	273-84	246-126
290600Z	35.7N	142.7E	262-78	257-134
291200Z	36.4N	144.5E	259-73	255-133
291800Z	36.8N	146.1E	095-70	256-92
300000Z	37.3N	148.0E	092-111	252-110
300600Z	37.9N	150.0E	096-120	239-143
301200Z	38.6N	152.3E	196-120	222-144

AVERAGE 24 HOUR ERROR 109 MI
AVERAGE 48 HOUR ERROR 203 MI


TYPHOON DELLA
25-30 AUGUST 1963
24HR FORECAST POSITS
LEGEND
0---24HR FORECAST POSITS
6HR BEST TRACK POSITS
30/12Z
30/00Z
29/00Z
28/00Z
27/00Z
26/00Z
25/00Z
VLADIVOSTOK
TSINGTAO
SHANGHAI
TOKYO
OKINAWA
CHICHI JIMA
IWO JIMA
SAIPAN
GUAM
MANILA
WAKE I
ENIWETOK ATOL
RONGERIK ATOL

TYPHOON ELAINE - 251200Z to 280600Z AUGUST

I. DATA

A. Statistics

1. Calendar days of tropical warning - 3½
2. Calendar days of typhoon intensity - 2¼
3. Total distance traveled during tropical warning period - 1128 mi

B. Characteristics as a typhoon

1. Minimum observed SLP - 967mb, 270400Z
2. Minimum observed 700mb height - 2768m, 270400Z
3. Max radius of SFC circulation - 250 mi
4. Max surface winds - 100 kts

II. DEVELOPMENT

A. Initial impetus - Superposition of MPT with easterly wave with subsequent fracture

B. Initial surface vortex

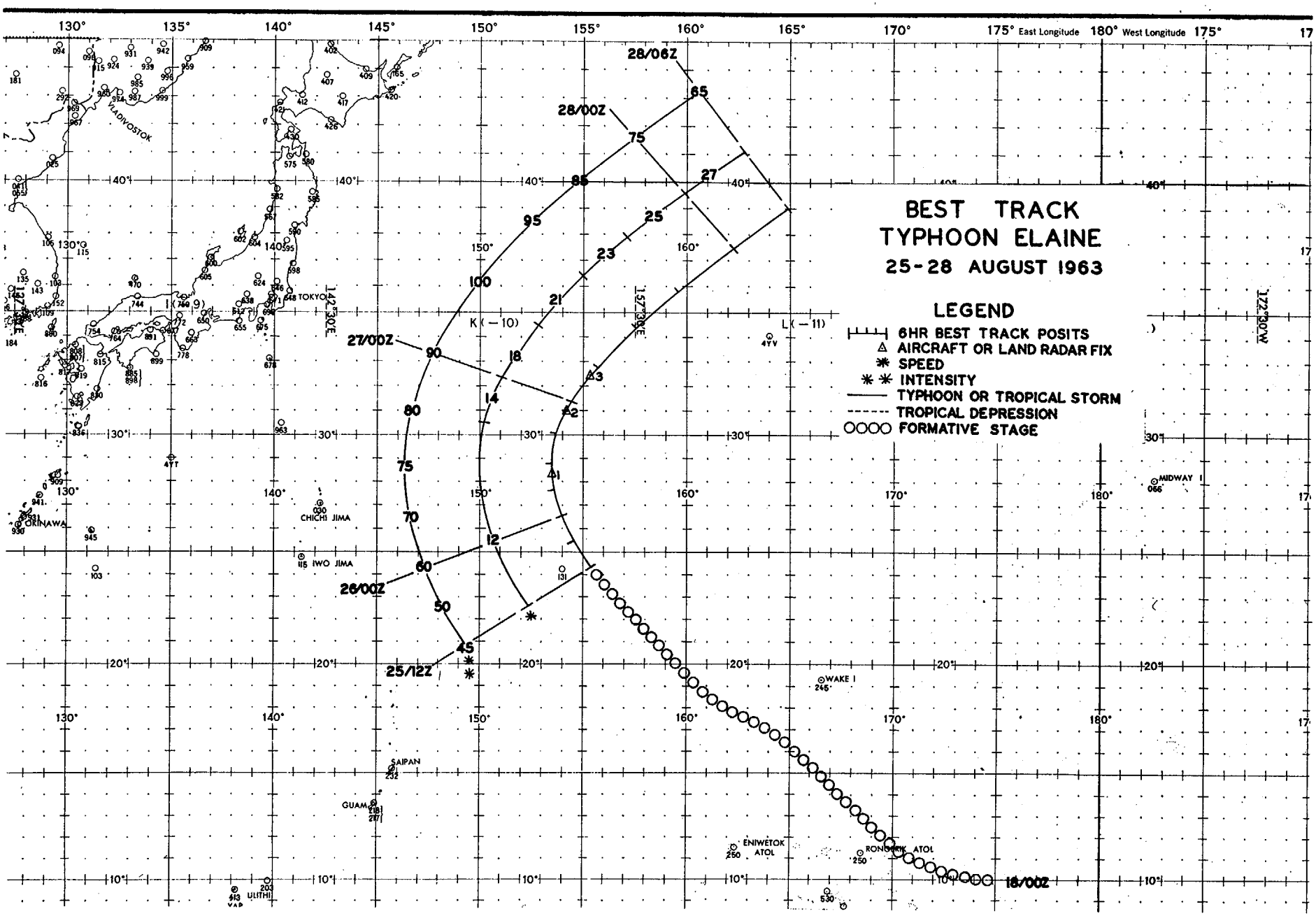
1. Embedded vortex at 180000Z
2. Surface pressure less than 1009mb

C. Zenith flow at 200mb

1. Relative position surface vortex - SE quadrant of anticyclone
2. Wind direction over vortex - NE

III. FINAL DISPOSITION

A. Became extratropical


BEST TRACK
TYPHOON ELAINE
25-28 AUGUST 1963
LEGEND
6HR BEST TRACK POSITS
AIRCRAFT OR LAND RADAR FIX
SPEED
INTENSITY
TYPHOON OR TROPICAL STORM
TROPICAL DEPRESSION
FORMATIVE STAGE
28/06Z
28/00Z
27/00Z
26/00Z
25/12Z
18/00Z
K (-10)
L (-11)
130° 135° 140° 145° 150° 155° 160° 165° 170° 175° East Longitude 180° West Longitude 175°
40° 30° 20° 10°
VLADIVOSTOK
TOKYO
CHICHI JIMA
IWO JIMA
OKINAWA
MIDWAY I
WAKE I
SAIPAN
GUAM
ULITHI
ENIWETOK ATOL
RONGERIK ATOL

LAND RADAR AND AIRCRAFT FIXES - TYPHOON ELAINE

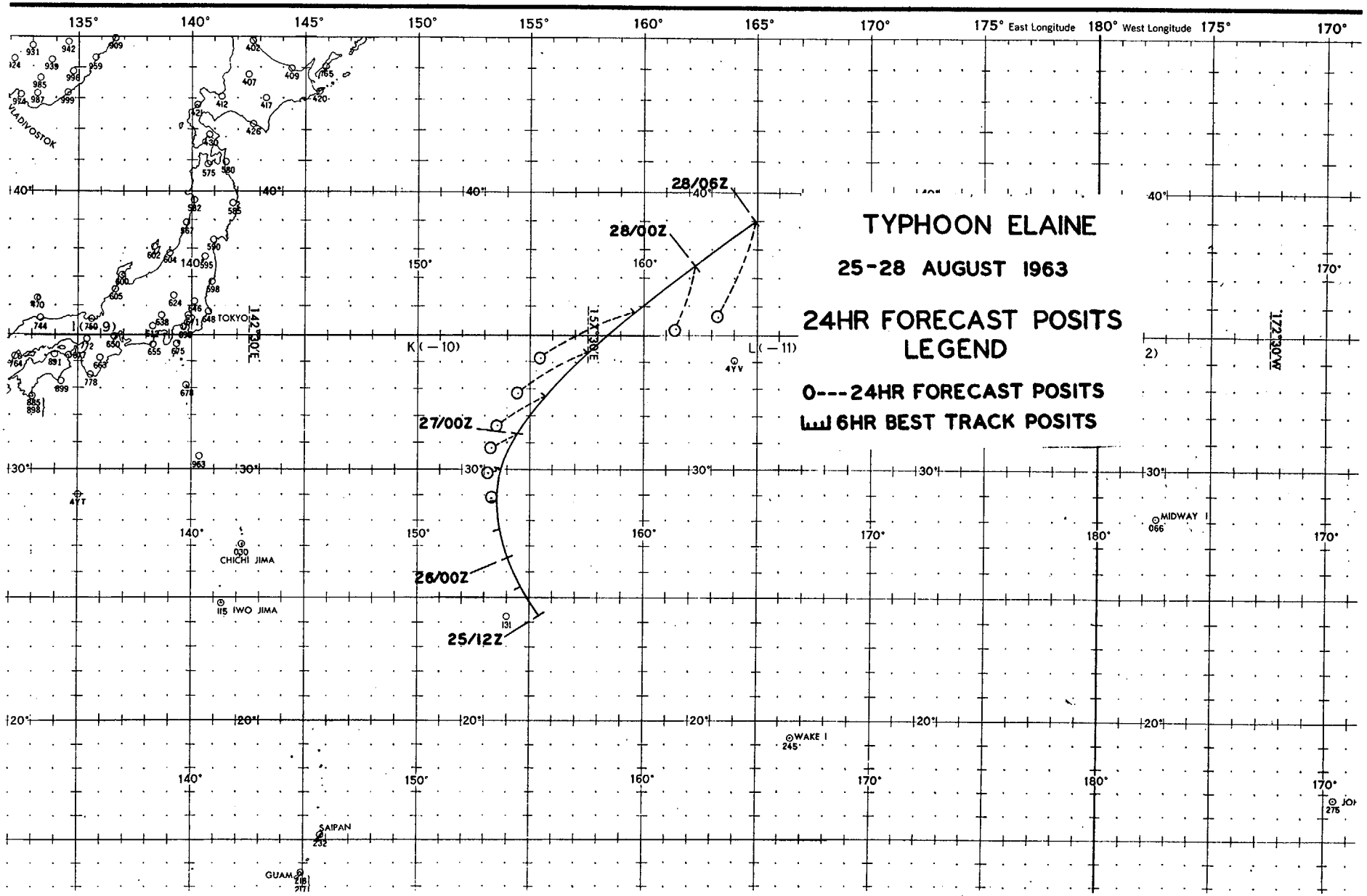
FIX NO/TIME	LAT.	LONG.	UNIT METHOD & ACCY	MAX SFC WND	MAX 700MB WND	MIN 700MB HGT	RECON MIN SLP MBS	JTWC MIN SLP *MBS	700MB T/Td (°C)	EYE CHARACTERISTICS
1 260950Z	28.4N	153.6E	VW1-P-03	45	-	2941	971	985	15/11	CIRC 42 MI DIA,OPEN W,WALL CLDS 8 MI THICK
2 262229Z	31.0N	154.2E	56-P-12	65	50	2792	968	968	13/12	WALL CLDS NW QUAD
3 270400Z	32.3N	155.4E	56-P-15	80	88	2768	-	967	12/12	EYE FILLED WITH NIMBUS-STRATUS CLDS

*Computed

TYPHOON ELAINE 25 AUG-28 AUG 1963
POSITION AND FORECAST VERIFICATION DATA

DTG	STORM POSITION LAT.	LONG	24 HOUR ERROR DEG. DISTANCE	48 HOUR ERROR DEG. DISTANCE
251200Z	24.3N	155.3E	------	------
251800Z	25.4N	154.6E	------	------
260000Z	26.5N	154.0E	------	------
260600Z	27.7N	153.7E	------	------
261200Z	28.9N	153.6E	255-17	------
261800Z	30.1N	153.8E	258-39	------
270000Z	31.3N	154.5E	245-73	------
270600Z	32.7N	155.9E	242-138	------
271200Z	34.3N	157.6E	243-182	------
271800Z	35.8N	159.7E	246-246	------
280000Z	37.3N	162.3E	204-135	250-210
280600Z	39.0N	165.0E	202-210	238-270

AVERAGE 24 HOUR ERROR 130 MI
AVERAGE 48 HOUR ERROR 240 MI


TYPHOON ELAINE
25-28 AUGUST 1963
24HR FORECAST POSITS
LEGEND
0---24HR FORECAST POSITS
6HR BEST TRACK POSITS
28/06Z
28/00Z
27/00Z
26/00Z
25/12Z
135° 140° 145° 150° 155° 160° 165° 170° 175° East Longitude 180° West Longitude 175° 170°
40° 30° 20°
VLADIVOSTOK
TOKYO
CHICHI JIMA
IWO JIMA
SAIPAN
GUAM
MIDWAY I
WAKE I
142°30'E
157°30'E
172°30'W
K (−10)
L (−11)

TYPHOON FAYE - 010600Z to 081200Z SEPTEMBER

I. DATA

A. Statistics

1. Calendar days of tropical warning - 7½
2. Calendar days of typhoon intensity - 5¼
3. Total distance traveled during tropical warning period - 1812 mi

B. Characteristics as a typhoon

1. Minimum observed SLP - 957mb, 060405Z
2. Minimum observed 700mb height - 2722m, 060405Z
3. Max radius of SFC circulation - 450 mi
4. Max surface winds - 110 kts

II. DEVELOPMENT

A. Initial impetus - Juxtaposition of MPT and subsequent fracture at 200mb

B. Initial surface vortex

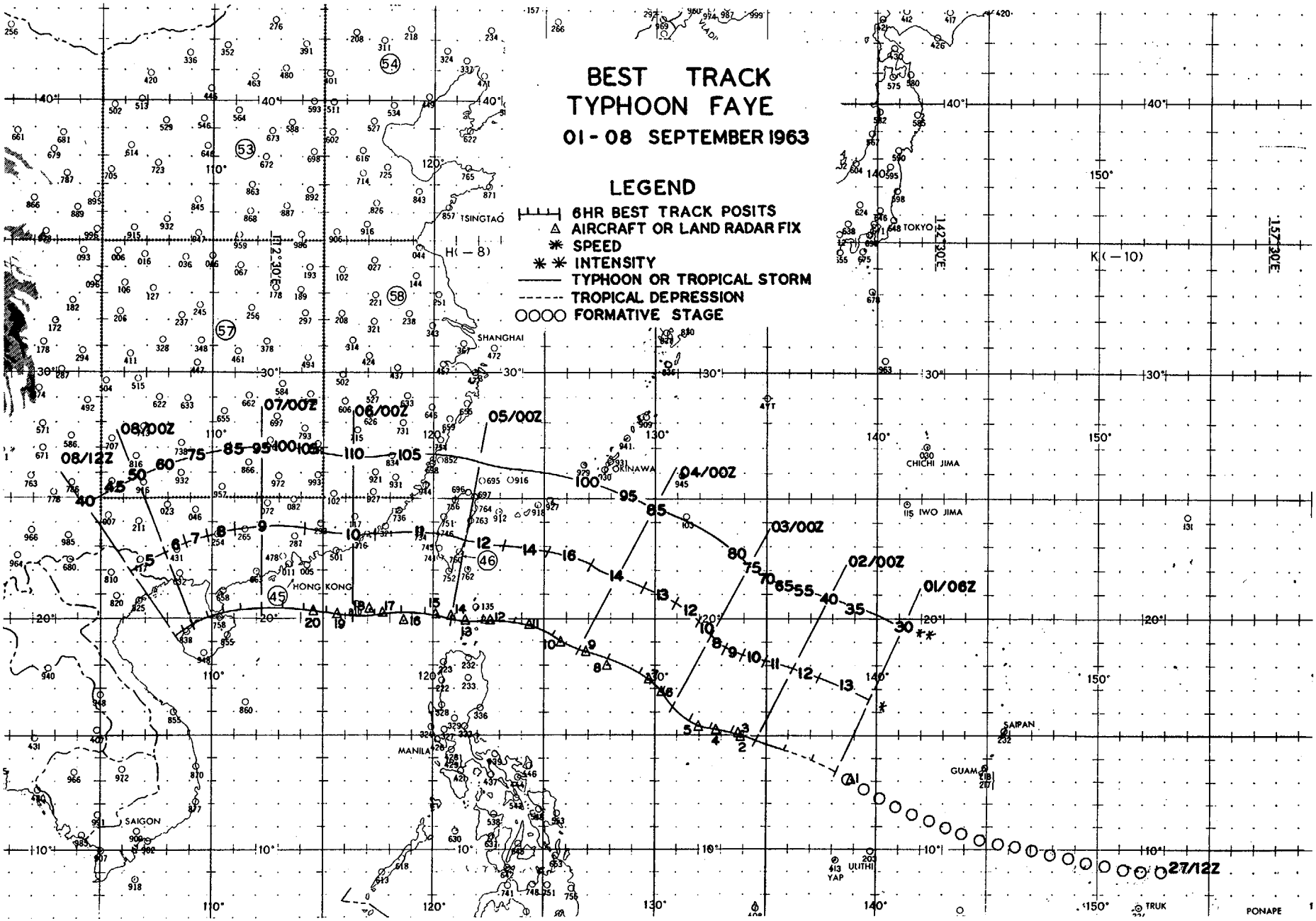
1. Junction vortex at 271200Z
2. Surface pressure less than 1006mb

C. Zenith flow at 200mb

1. Relative position surface vortex - West side of trough in the easterlies
2. Wind direction over vortex - NE

III. FINAL DISPOSITION

A. Dissipated over land


BEST TRACK
TYPHOON FAYE
01 - 08 SEPTEMBER 1963
LEGEND
6HR BEST TRACK POSITS
AIRCRAFT OR LAND RADAR FIX
SPEED
INTENSITY
TYPHOON OR TROPICAL STORM
TROPICAL DEPRESSION
FORMATIVE STAGE
H(-8)
K(-10)
142°30'E
157°30'E
TSINGTAO
SHANGHAI
TOKYO
OKINAWA
CHICHI JIMA
IWO JIMA
HONG KONG
MANILA
SAIGON
SAIPAN
GUAM
YAP
ULITHI
TRUK
PONAPE
08/00Z
07/00Z
06/00Z
05/00Z
04/00Z
03/00Z
02/00Z
01/06Z
08/12Z
27/12Z

LAND RADAR AND AIRCRAFT FIXES - TYPHOON FAYE

FIX NO/TIME	LAT.	LONG.	UNIT METHOD & ACCY	MAX SFC WND	MAX 700MB WND	MIN 700MB HGT	RECON MIN SLP MBS	JTWC MIN SLP *MBS	700MB T/Td (°C)	EYE CHARACTERISTICS
1 010225Z	13.1N	138.9E	VW1-P-10	25	-	3078	996	1001	14/-	CIRC 60 MI DIA,POORLY DEF
2 012250Z	14.8N	133.9E	VW1-P-02	45	-	3021	992	996	12/08	CIRC 20 MI DIA,WELL DEF
3 020355Z	14.9N	133.7E	56-P-05	20	30	2993	990	992	13/12	OPEN ALL QUADS
4 020945Z	15.3N	132.8E	VW1-P-05	45	-	-	985	-	- -	CIRC 16 MI DIA,WALL CLDS 10 MI THICK
5 021500Z	15.5N	132.0E	VW1-R-05	-	-	-	-	-	- -	CIRC 25 MI DIA,OPEN N,WALL CLDS 6 MI THICK,INTENSIFYING
6 030600Z	16.9N	130.2E	56-P-10	70	45	2975	974	988	16/13	CIRC 10-15 MI DIA,WALL CLDS NW,OCNL RAIN IN EYE
7 030954Z	17.5N	129.5E	VW1-R-05	-	-	-	-	-	- -	CIRC 50 MI DIA,OPEN W
8 031530Z	18.0N	127.9E	VW1-R-05	-	-	-	-	-	- -	CIRC 82 MI DIA,OPEN N
9 032235Z	18.6N	126.9E	56-P-10	75	70	2911	974	982	17/17	CIRC 60 MI DIA,OPEN NW
10 040347Z	19.0N	125.7E	56-P-10	100	75	2887	976	979	13/13	OVAL,WALL CLDS NOT DISCERNIBLE BECAUSE OF RAIN & CLDS IN EYE
11 040930Z	19.6N	124.3E	VW1-R-03	-	-	-	-	-	- -	CIRC 26 MI DIA,OPEN S,WALL CLDS 6 MI THICK
12 041530Z	19.9N	122.5E	VW1-R-¼	-	-	-	-	-	- -	CIRC 28 MI DIA
13 042210Z	19.9N	121.4E	56-P-02	100	90	2780	987	968	12/09	CIRC 40 MI DIA,OPEN N
14 050125Z	20.1N	120.9E	LND/RDR	-	-	-	-	-	- -	---

*Computed

LAND RADAR AND AIRCRAFT FIXES - TYPHOON FAYE (CONT'D)

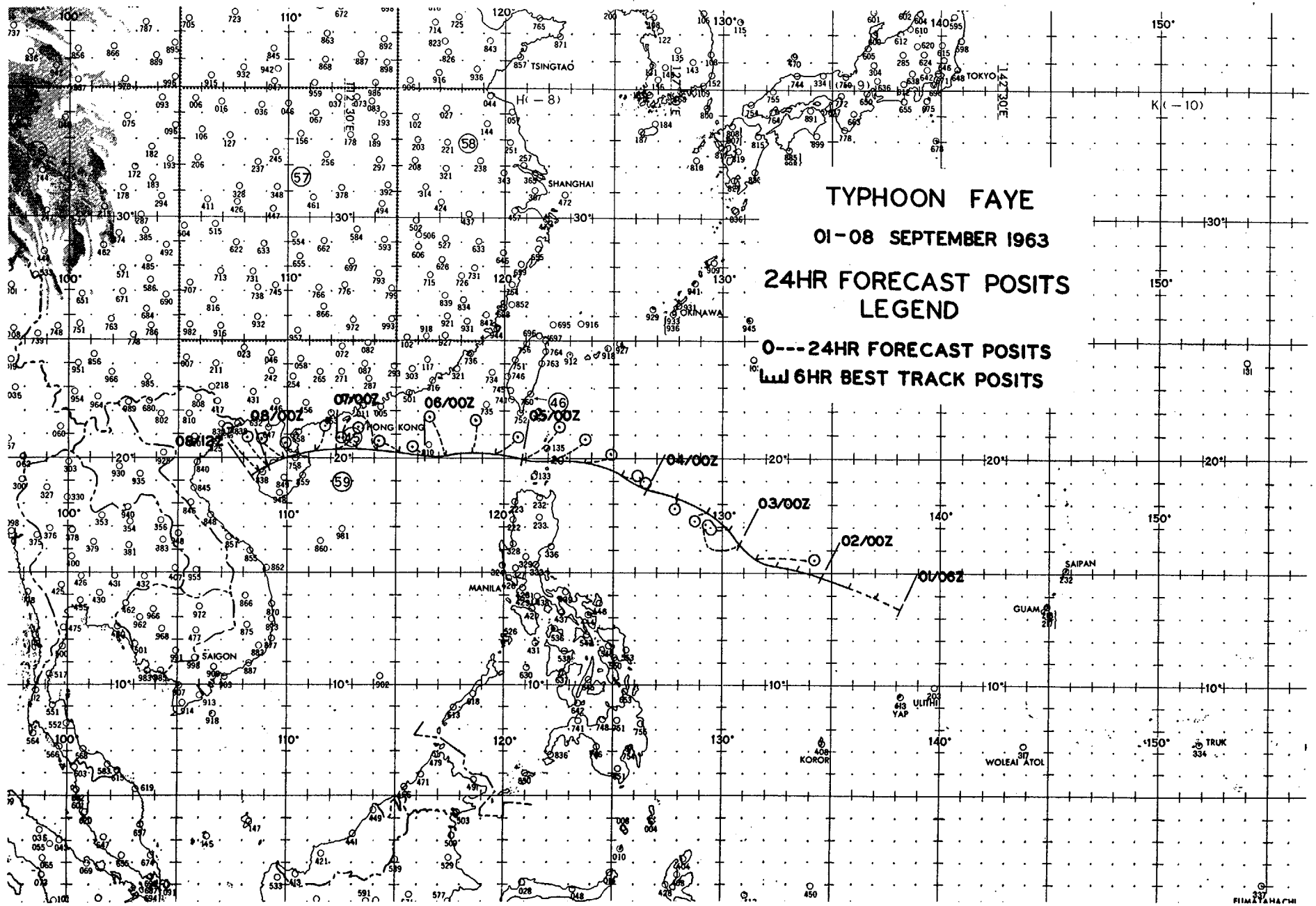
FIX NO/TIME	LAT.	LONG.	UNIT METHOD & ACCY	MAX SFC WND	MAX 700MB WND	MIN 700MB HGT	RECON MIN SLP MBS	JTWC MIN SLP *MBS	700MB T/Td (°C)	EYE CHARACTERISTICS
15 050350Z	20.2N	120.1E	56-P-02	70	75	2795	965	968	11/10	CIRC 25 MI DIA,OPEN N,EYE FILLING WITH CLDS
16 051000Z	19.9N	118.6E	VW1-R-02	-	-	-	-	-	- -	CIRC 24 MI DIA,DIFFUSE
17 051530Z	20.1N	117.7E	VW1-R-02	-	-	-	-	-	- -	CIRC 23 MI DIA,OPEN N & W
18 052230Z	20.3N	117.1E	56-P-15	60	80	2737	952	961	17/14	POORLY DEFINED
19 060405Z	20.2N	115.6E	56-P-10	130	80	2722	958	957	17/14	CIRC 80 MI DIA,WALL CLDS E & S
20 061004Z	20.3N	114.5E	VW1-R-05	-	-	-	-	-	- -	CIRC 36 MI DIA,WALL CLDS E & S, 6 MI THICK

*Computed

TYPHOON FAYE 01 SEP-08 SEP 1963
POSITION AND FORECAST VERIFICATION DATA

DTG	STORM POSITION LAT.	LONG.	24 HOUR ERROR DEG. DISTANCE	48 HOUR ERROR DEG. DISTANCE
010600Z	13.4N	138.2E	------	------
011200Z	13.9N	137.0E	------	------
011800Z	14.3N	135.7E	------	------
020000Z	14.7N	134.5E	------	------
020600Z	15.1N	133.4E	------	------
021200Z	15.3N	132.4E	------	------
021800Z	15.7N	131.7E	095-147	------
030000Z	16.2N	130.9E	298-115	------
030600Z	16.9N	130.2E	275-48	------
031200Z	17.6N	129.2E	230-29	------
031800Z	18.2N	127.9E	190-24	111-173
040000Z	18.8N	126.5E	340-16	298-90
040600Z	19.2N	125.2E	093-55	113-12
041200Z	19.8N	123.6E	073-77	074-120
041800Z	19.9N	122.1E	063-102	066-180
050000Z	20.0N	120.9E	050-117	053-183
050600Z	20.2N	119.8E	044-62	067-227
051200Z	20.2N	118.6E	003-70	049-144
051800Z	20.1N	117.4E	330-107	015-119
060000Z	20.1N	116.3E	305-35	027-138
060600Z	20.2N	115.2E	300-65	013-100
061200Z	20.4N	114.1E	288-104	340-106
061800Z	20.5N	113.2E	300-58	300-126
070000Z	20.5N	112.2E	042-75	292-97
070600Z	20.3N	111.3E	016-83	289-155
071200Z	20.2N	110.5E	309-42	289-174
071800Z	20.0N	109.8E	312-75	308-119
080000Z	19.7N	109.3E	317-95	349-101
080600Z	19.5N	108.8E	317-140	345-129
081200Z	19.3N	108.2E	------	------

AVERAGE 24 HOUR ERROR 76 MI
AVERAGE 48 HOUR ERROR 131 MI


TYPHOON FAYE
01-08 SEPTEMBER 1963
24HR FORECAST POSITS
LEGEND
0---24HR FORECAST POSITS
6HR BEST TRACK POSITS
H(-8)
K(-10)
TSINGTAO
SHANGHAI
OKINAWA
TOKYO
HONG KONG
MANILA
SAIGON
SAIPAN
GUAM
YAP
ULITHI
KOROR
WOLEAI ATOL
TRUK
08/00Z
07/00Z
06/00Z
05/00Z
04/00Z
03/00Z
02/00Z
01/06Z

TYPHOON GLORIA - 051200Z to 140600Z SEPTEMBER

I. DATA

A. Statistics

1. Calendar days of tropical warning - 9
2. Calendar days of typhoon intensity - 5 3/4
3. Total distance traveled during tropical warning period - 1638 mi.

B. Characteristics as a typhoon

1. Minimum observed SLP - 921mb, 100600Z
2. Minimum observed 700mb height - 2384m, 100600Z
3. Max radius of SFC circulation - 550 mi
4. Max surface winds - 135 kts

II. DEVELOPMENT

A. Initial impetus - Surge from westerlies into easterlies after fracture of polar trough at 200mb.

B. Initial surface vortex

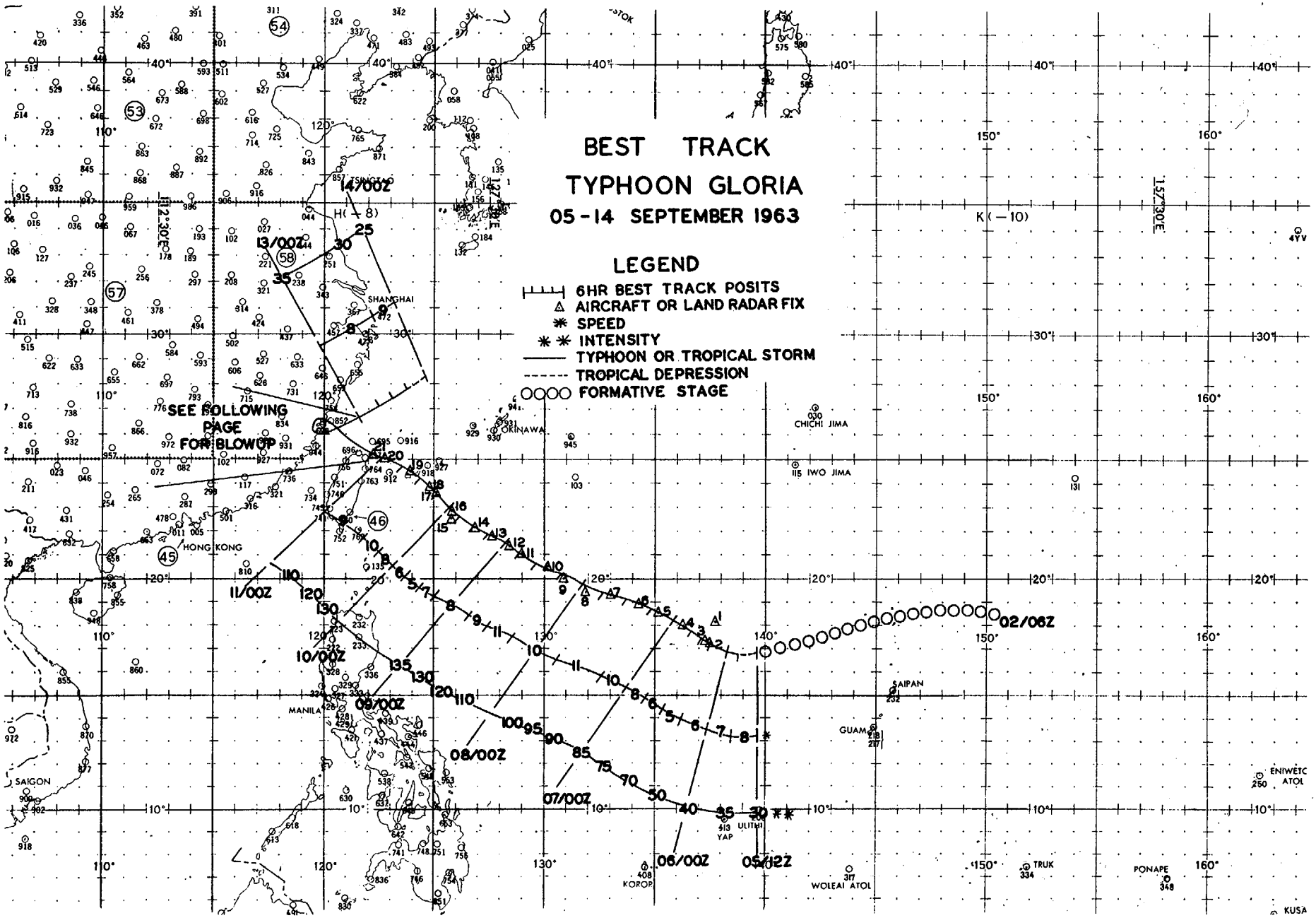
1. Embedded vortex at 020600Z
2. Surface pressure less than 1006mb

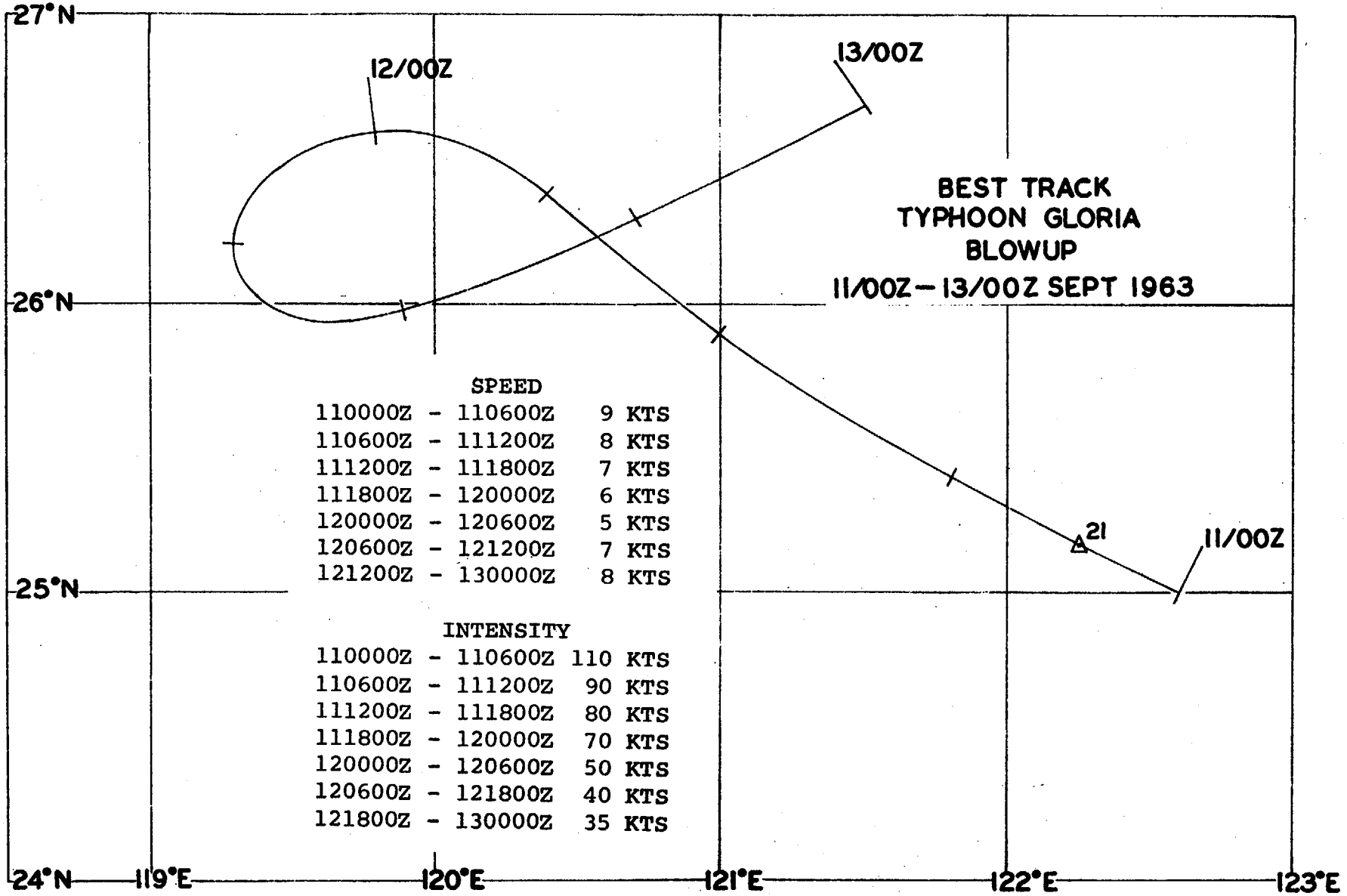
C. Zenith flow at 200 mb

1. Relative position surface vortex - Southeast quadrant of anticyclone
2. Wind direction over vortex - ENE

III. Final Disposition

A. Became extratropical


BEST TRACK
TYPHOON GLORIA
05 - 14 SEPTEMBER 1963
LEGEND
6HR BEST TRACK POSITS
AIRCRAFT OR LAND RADAR FIX
SPEED
INTENSITY
TYPHOON OR TROPICAL STORM
TROPICAL DEPRESSION
FORMATIVE STAGE
SEE FOLLOWING PAGE FOR BLOWUP
14/00Z
13/00Z
11/00Z
10/00Z
09/00Z
08/00Z
07/00Z
06/00Z
05/12Z
02/06Z
H(-8)
K(-10)
SHANGHAI
OKINAWA
CHICHI JIMA
IWO JIMA
HONG KONG
MANILA
SAIGON
SAIPAN
GUAM
YAP
ULITHI
KOROR
WOLEAI ATOL
TRUK
PONAPE
ENIWETC ATOL
KUSA


27°N
26°N
25°N
24°N
119°E
120°E
121°E
122°E
123°E
12/00Z
13/00Z
11/00Z
21
BEST TRACK
TYPHOON GLORIA
BLOWUP
11/00Z – 13/00Z SEPT 1963
SPEED
110000Z - 110600Z 9 KTS
110600Z - 111200Z 8 KTS
111200Z - 111800Z 7 KTS
111800Z - 120000Z 6 KTS
120000Z - 120600Z 5 KTS
120600Z - 121200Z 7 KTS
121200Z - 130000Z 8 KTS
INTENSITY
110000Z - 110600Z 110 KTS
110600Z - 111200Z 90 KTS
111200Z - 111800Z 80 KTS
111800Z - 120000Z 70 KTS
120000Z - 120600Z 50 KTS
120600Z - 121800Z 40 KTS
121800Z - 130000Z 35 KTS

LAND RADAR AND AIRCRAFT FIXES - TYPHOON GLORIA

FIX NO/TIME	LAT.	LONG.	UNIT METHOD & ACCY	MAX SFC WND	MAX 700MB WND	MIN 700MB HGT	RECON MIN SLP MBS	JTWC MIN SLP *MBS	700MB T/Td (°C)	EYE CHARACTERISTICS
1 060000Z	18.2N	137.8E	VW1-R-05	-	-	-	-	-	- -	CIRC 22 MI DIA,OPEN S
2 060600Z	17.1N	137.5E	VW1-P-10	45	-	-	983	-	- -	CIRC 38 MI DIA,OPEN N, POORLY ORGANIZED
3 061000Z	17.3N	137.3E	VW1-P-10	50	-	2970	980	990	13/-	CIRC 30 MI DIA,OPEN E, POORLY ORGANIZED
4 062200Z	18.0N	136.3E	56-P-05	60	60	2932	979	983	17/13	CIRC 50 MI DIA,CLSD
5 070330Z	18.6N	135.2E	56-P-05	70	60	2911	985	980	17/12	CIRC 30 MI DIA,OPEN S
6 071000Z	18.9N	134.3E	VW1-R-10	-	-	-	-	-	- -	HVY WALL CLD E
7 071530Z	19.3N	133.0E	VW1-R-10	-	-	-	-	-	- -	CIRC 28 MI DIA,WEAK WALL CLDS ALL QUADS
8 072156Z	19.4N	131.9E	56-P-10	65	90	2731	960	962	16/13	OVAL 60 MI NW-SE,30 MI NE-SW,CLSD
9 080437Z	20.0N	130.9E	56-P-¼	100	70	2722	942	959	16/12	CIRC 30 MI DIA,WALL CLDS NW-N
10 080920Z	20.5N	130.3E	VW1-R-05	-	-	-	-	-	- -	CIRC 48 MI DIA,CLSD,17 MI THICK SW SEMI,10 MI THICK NE SEMI
11 081600Z	21.1N	129.0E	VW1-R-03	-	-	-	-	-	- -	CONCENTRIC,INNER DIA 42 MI, OUTER DIA 165 MI,INNER WALL CLDS 6 MI THICK
12 082200Z	21.3N	128.4E	56-P-05	105	98	2539	954	938	18/14	ELLIP 45 MI NW-SE,30 MI NE-SW,CLSD,WALL CLD TOPS 45000'

*Computed

LAND RADAR AND AIRCRAFT FIXES - TYPHOON GLORIA (CONT'D)

FIX NO/TIME	LAT.	LONG.	UNIT METHOD & ACCY	MAX SFC WND	MAX 700MB WND	MIN 700MB HGT	RECON MIN SLP MBS	JTWC MIN SLP *MBS	700MB T/Td (°C)	EYE CHARACTERISTICS
13 090345Z	21.8N	127.6E	56-P-02	95	85	2447	935	928	18/16	CIRC 20 MI DIA,CLSD WALL CLDS 10 MI THICK
14 091000Z	22.3N	126.8E	VW1-R-05	-	-	-	-	-	- -	CIRC 40 MI DIA,HVY FEEDER BANDS ALL QUADS
15 091530Z	22.4N	125.8E	VW1-R-03	-	-	-	-	-	- -	CIRC 38 MI DIA,NUMEROUS FEEDER BANDS
16 092206Z	22.7N	125.8E	56-P-03	50	110	2414	912	924	19/17	CIRC 80 MI DIA,CLSD
17 100600Z	23.6N	125.1E	56-P-02	65	92	2384	925	921	- -	CIRC 36 MI DIA,CLSD
18 101000Z	23.8N	124.8E	VW1-R-05	-	-	-	-	-	- -	CIRC 30 MI DIA,CLSD WALL CLDS 6 MI THICK
19 101530Z	24.5N	123.9E	VW1-R-01	-	-	-	-	-	- -	OVAL 32 MI NW-SE,27 MI NE-SW,CLSD WALL CLDS 10 MI THICK
20 102225Z	25.0N	122.6E	56-P-01	100	85	2512	932	936	17/16	CIRC 10 MI DIA,CLSD,EYE FILLING WITH CLDS
21 110400Z	25.1N	122.2E	56-P-01	110	80	2528	920	938	18/16	CIRC 10 MI DIA,CLSD,STRONG WALL CLDS S

*Computed

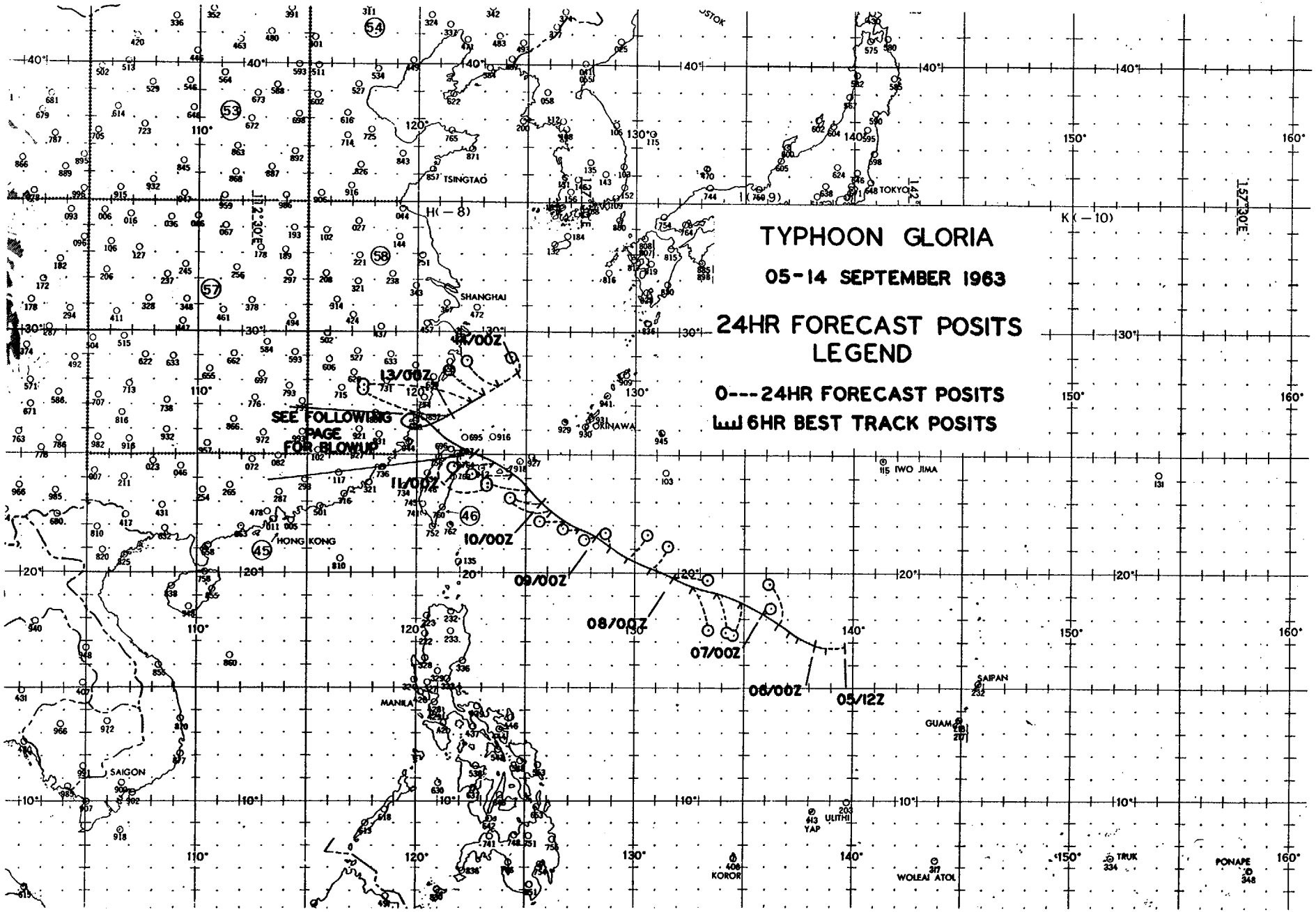
TYPHOON GLORIA 05 SEP-14 SEP 1963
POSITION AND FORECAST VERIFICATION DATA

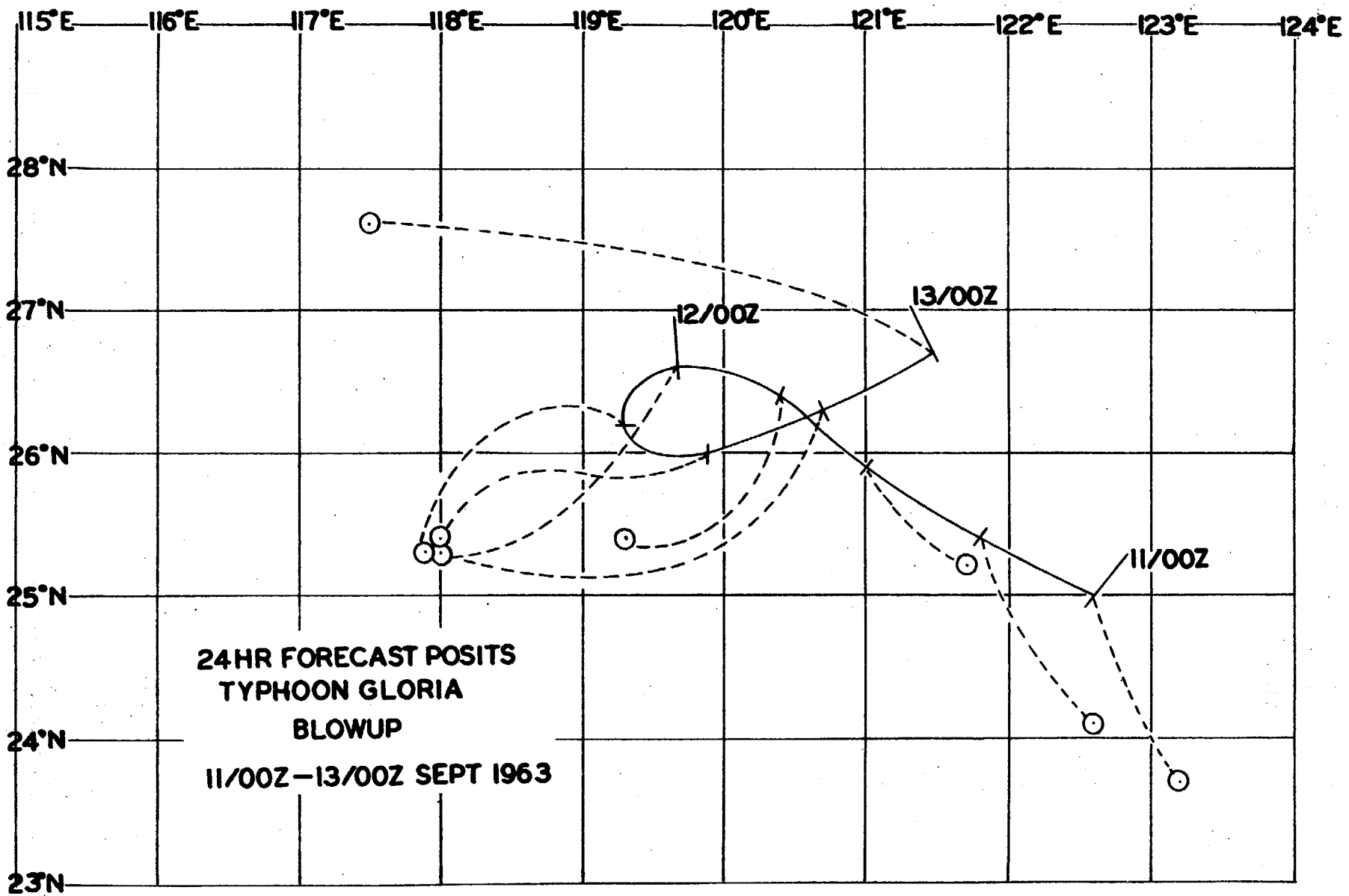
DTG	STORM POSITION LAT.	LONG.	24 HOUR ERROR DEG. DISTANCE	48 HOUR ERROR DEG. DISTANCE
051200Z	16.8N	139.7E	------	------
051800Z	16.7N	138.8E	------	------
060000Z	16.9N	138.1E	------	------
060600Z	17.1N	137.5E	------	------
061200Z	17.4N	137.1E	------	------
061800Z	17.8N	136.6E	346-111	------
070000Z	18.2N	135.9E	063-18	------
070600Z	18.7N	134.9E	192-86	------
071200Z	19.1N	133.8E	169-103	------
071800Z	19.4N	132.7E	162-121	------
080000Z	19.8N	131.7E	094-87	------
080600Z	20.2N	130.8E	043-71	158-154
081200Z	20.7N	129.7E	039-80	153-195
081800Z	21.1N	128.9E	343-36	150-206
090000Z	21.5N	128.2E	268-21	103-115
090600Z	21.9N	127.4E	266-35	339-65
091200Z	22.3N	126.7E	264-60	002-37
091800Z	22.6N	126.2E	293-114	387-48
100000Z	22.9N	125.7E	287-74	267-98
100600Z	23.5N	125.1E	280-105	226-216
101200Z	24.2N	124.4E	287-102	246-240
101800Z	24.7N	123.5E	264-92	098-187
110000Z	25.0N	122.6E	157-87	268-117
110600Z	25.4N	121.8E	148-92	265-138
111200Z	25.9N	121.0E	140-54	248-106
111800Z	26.4N	120.4E	227-83	240-72
120000Z	26.6N	119.7E	232-122	190-168
120600Z	26.2N	119.3E	234-96	215-155
121200Z	26.0N	119.9E	250-112	252-148
121800Z	26.3N	120.7E	248-157	255-276
130000Z	26.7N	121.5E	285-224	258-373
130600Z	27.1N	122.3E	280-260	255-419

TYPHOON GLORIA 05 SEP-14 SEP 1963
POSITION AND FORECAST VERIFICATION DATA (CONT'D)

DTG	STORM POSITION LAT.	LONG.	24 HOUR ERROR DEG. DISTANCE	48 HOUR ERROR DEG. DISTANCE
131200Z	27.5N	123.0E	306-101	251-442

AVERAGE 24 HOUR ERROR 97 MI
AVERAGE 48 HOUR ERROR 181 MI


TYPHOON GLORIA
05-14 SEPTEMBER 1963
24HR FORECAST POSITS
LEGEND
0---24HR FORECAST POSITS
6HR BEST TRACK POSITS
SEE FOLLOWING PAGE FOR BLOWUP
14/00Z
13/00Z
11/00Z
10/00Z
09/00Z
08/00Z
07/00Z
06/00Z
05/12Z
TSINGTAO
SHANGHAI
OKINAWA
HONG KONG
MANILA
SAIGON
IWO JIMA
SAIPAN
GUAM
YAP
ULITHI
KOROR
WOLEAI ATOL
TRUK
PONAPE
TOKYO


115°E
116°E
117°E
118°E
119°E
120°E
121°E
122°E
123°E
124°E
28°N
27°N
26°N
25°N
24°N
23°N
12/00Z
13/00Z
11/00Z
24HR FORECAST POSITS
TYPHOON GLORIA
BLOWUP
11/00Z–13/00Z SEPT 1963

TYPHOON JUDY - 300000 SEPTEMBER to 041200Z OCTOBER

I. DATA

A. Statistics

1. Calendar days of tropical warning - 5
2. Calendar days of typhoon intensity - 4¼
3. Total distance traveled during tropical warning period - 1326 mi.

B. Characteristics as a typhoon

1. Minimum observed SLP - 917mb, 030405Z
2. Minimum observed 700mb height 2341m, 030405Z
3. Max radius of SFC circulation - 400 mi
4. Max surface winds - 150 kts

II. DEVELOPMENT

A. Initial impetus - Juxtaposition of polar trough with subsequent fracture and formation of anticyclone over vortex at 200mb

B. Initial surface vortex

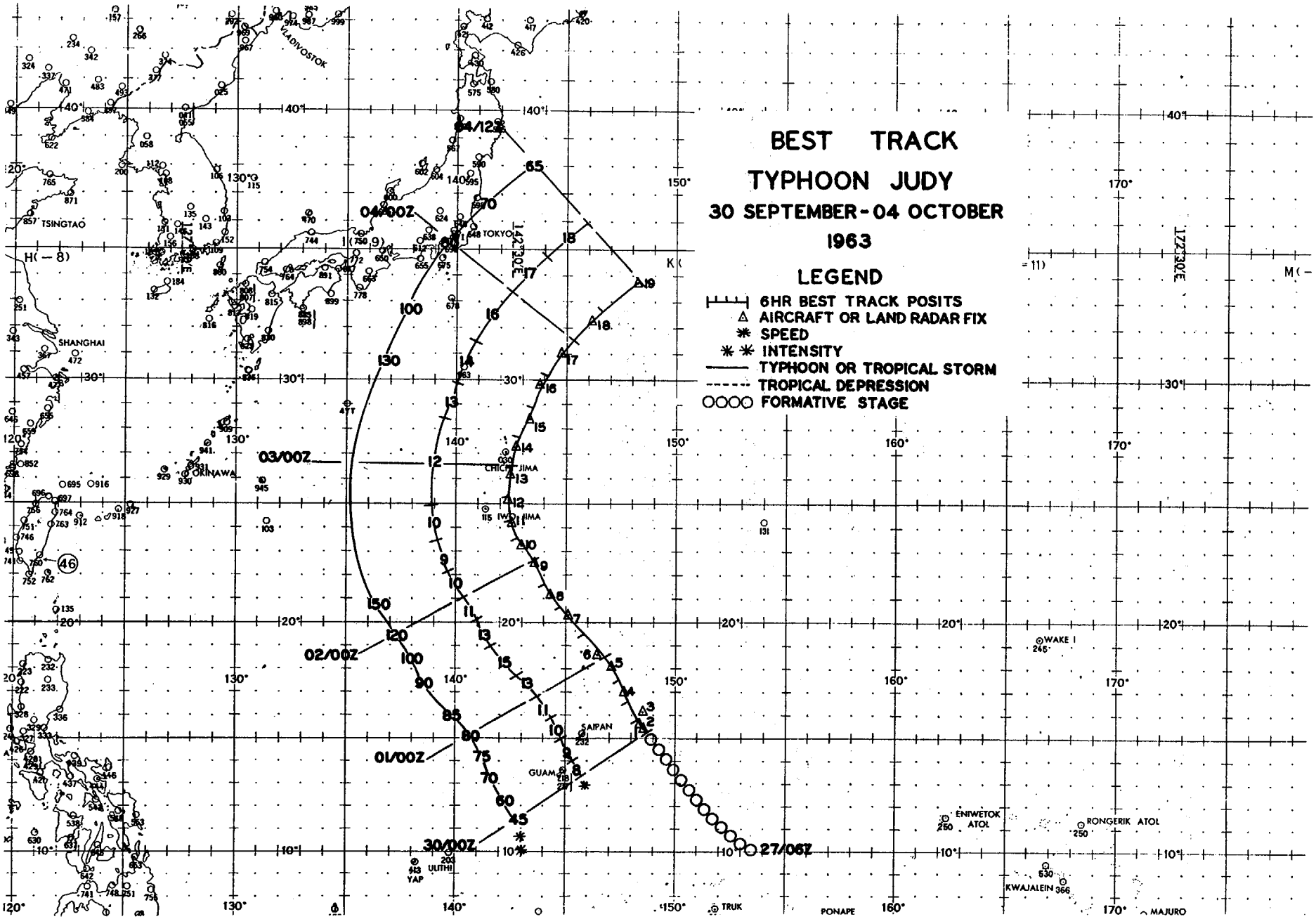
1. Junction vortex at 270600Z
2. Surface pressure less than 1008mb

C. Zenity flow at 200mb

1. Relative position surface vortex South quadrant of anticyclone
2. Wind direction over vortex - E

III. FINAL DISPOSITION

A. Became extratropical


BEST TRACK
TYPHOON JUDY
30 SEPTEMBER - 04 OCTOBER
1963
LEGEND
6HR BEST TRACK POSITS
AIRCRAFT OR LAND RADAR FIX
SPEED
INTENSITY
TYPHOON OR TROPICAL STORM
TROPICAL DEPRESSION
FORMATIVE STAGE
04/12Z
04/00Z
03/00Z
02/00Z
01/00Z
30/00Z
27/06Z
VLADIVOSTOK
TSINGTAO
SHANGHAI
OKINAWA
TOKYO
CHICHI JIMA
IWO JIMA
SAIPAN
GUAM
YAP
ULITHI
TRUK
PONAPE
MAJURO
WAKE I
ENIWETOK ATOL
RONGERIK ATOL
KWAJALEIN
142.3°E
127.3°E

LAND RADAR AND AIRCRAFT FIXES - TYPHOON JUDY

FIX NO	TIME	LAT.	LONG.	UNIT METHOD & ACCY	MAX SFC WND	MAX 700MB WND	MIN 700MB HGT	RECON MIN SLP MBS	JTWC MIN SLP *MBS	700MB T/Td (°C)	EYE CHARACTERISTICS
1	300130Z	15.4N	148.6E	VW1-P-10	50	-	-	994	-	- -	CIRC 12 MI DIA
2	300345Z	15.7N	148.5E	VW1-R-10	-	-	-	-	-	- -	CIRC 13 MI DIA,EXTREMELY RAPID CLD DEVELOPMENT
3	300945Z	16.2N	148.5E	VW1-P-05	70	-	-	984	-	- -	ELLIP 30 MI N-S,20 MI E-W, CLSD,WEAK S
4	301545Z	17.0N	147.8E	VW1-R-05	-	-	-	-	-	- -	CIRC 28 MI DIA,OPEN W,WALL CLDS 12 MI THICK
5	302200Z	18.2N	147.1E	56-P-05	65	40	2929	980	983	- -	CIRC 15 MI DIA,CLSD
6	010400Z	18.5N	146.5E	56-P-02	85	60	2899	978	978	17/-	CIRC 60 MI DIA,OPEN SW SEMI
7	011015Z	20.4N	145.1E	VW1-R-01	-	-	-	-	-	- -	CIRC 21 MI DIA,OPEN SW, WALL CLDS 5 MI THICK
8	011545Z	21.1N	144.4E	VW1-R-03	-	-	-	-	-	- -	CIRC 21 MI DIA,OPEN NW, WALL CLDS 6 MI THICK
9	012215Z	22.6N	143.5E	56-P-05	100	60	2615	958	947	17/15	CIRC 15 MI DIA,OPEN S & SE, LGT RW IN EYE
10	020400Z	23.2N	142.9E	56-P-03	150	120	2411	935	923	21/17	CIRC 10 MI DIA,CLSD,STRONG, GREEN CHURNING SCUM UNDER CLD
11	021000Z	24.1N	142.4E	VW1-R-02	-	-	-	-	-	- -	CIRC 8 MI DIA,CLSD WALL CLDS 6 MI THICK
12	021600Z	25.2N	142.3E	VW1-R-02	-	-	-	-	-	- -	CIRC 7 MI DIA,CLSD WALL CLDS 6 MI THICK

*Computed

LAND RADAR AND AIRCRAFT FIXES - TYPHOON JUDY (CONT'D)

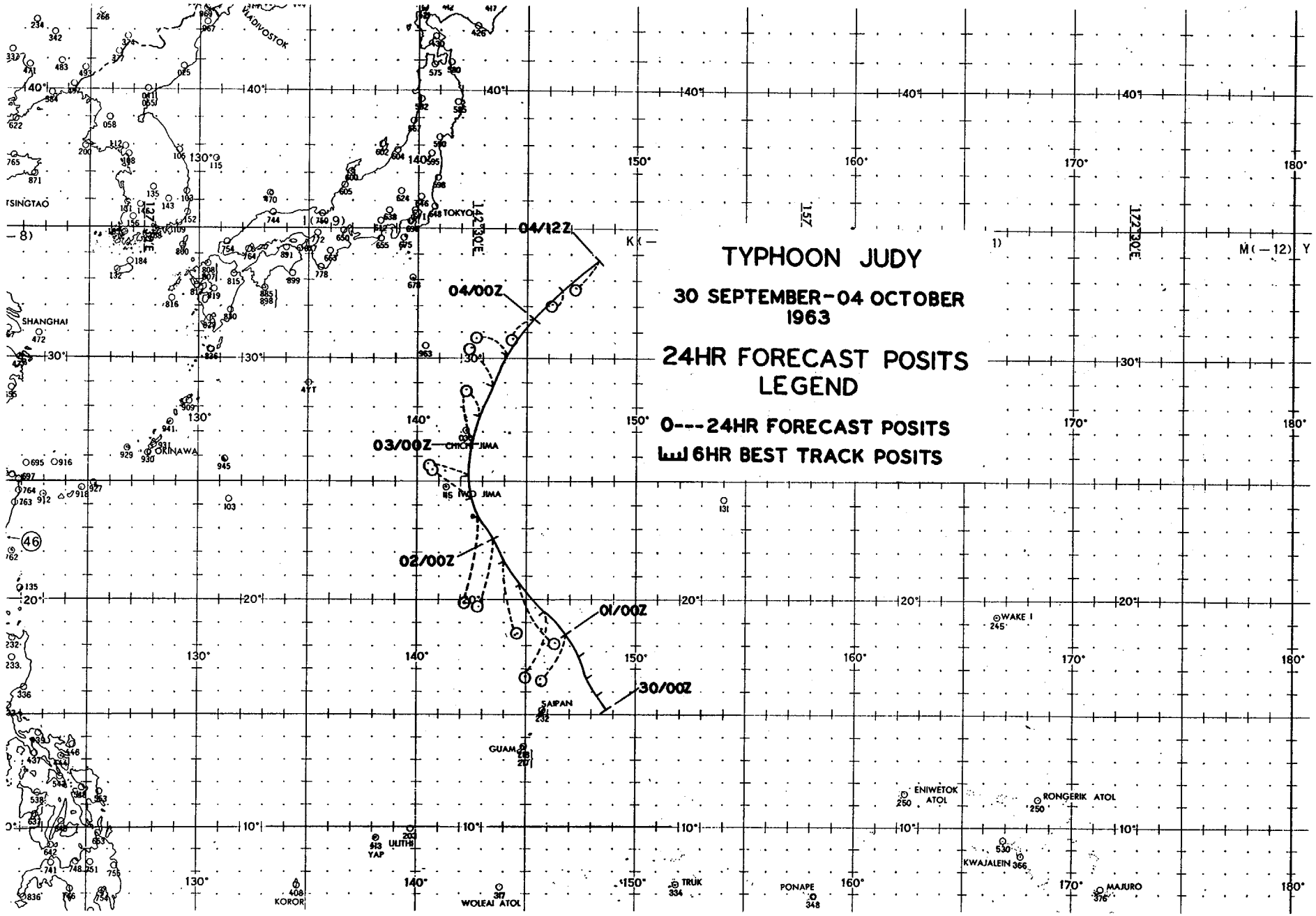
FIX NO/TIME	LAT.	LONG.	UNIT METHOD & ACCY	MAX SFC WND	MAX 700MB WND	MIN 700MB HGT	RECON MIN SLP MBS	JTWC MIN SLP *MBS	700MB T/Td (°C)	EYE CHARACTERISTICS
13 022200Z	26.2N	142.5E	56-P-03	150	110	2377	918	922	17/13	CIRC 10 MI DIA,CLSD,SVR TURBC IN EYE AT 700MB LVL
14 030405Z	27.3N	142.7E	56-P-03	150	95	2341	904	917	18/17	CIRC 8 MI DIA,CLSD WALL CLDS 10 MI THICK
15 031000Z	28.4N	143.4E	VW1-R-01	140	-	-	-	-	- -	CONCENTRIC,INNER EYE 6 MI DIA,OUTER EYE 25 MI DIA
16 031520Z	29.8N	143.8E	VW1-R-05	-	-	-	-	-	- -	CIRC 8 MI DIA,WALL CLDS 2-6 MI THICK
17 032210Z	31.0N	144.7E	56-P-03	75	60	2588	948	936	21/19	CIRC,POORLY DEFINED
18 040400Z	32.3N	146.1E	56-P-05	75	82	2664	949	948	24/20	CIRC,POORLY DEFINED
19 041145Z	33.9N	148.1E	VW1-P-10	-	67	2822	-	968	21/14	NO WALL CLDS,ALL CLDS STRATIFORM

*Computed

TYPHOON JUDY 30 SEP-04 OCT 1963
POSITION AND FORECAST VERIFICATION DATA

DTG	STORM POSITION LAT.	LONG.	24 HOUR ERROR DEG.	DISTANCE	48 HOUR ERROR DEG.	DISTANCE
300000Z	15.2N	148.7E	------		------	
300600Z	15.9N	148.3E	------		------	
301200Z	16.7N	147.9E	------		------	
301800Z	17.6N	147.5E	------		------	
010000Z	18.5N	146.8E	209	130	------	
010600Z	19.5N	145.9E	199	174	------	
011200Z	20.7N	144.8E	152	171	------	
011800Z	21.7N	144.0E	169	187	------	
020000Z	22.6N	143.4E	191	174	190	306
020600Z	23.5N	142.7E	189	214	190	344
021200Z	24.5N	142.4E	308	115	173	320
021800Z	25.3N	142.3E	283	98	196	367
030000Z	26.5N	142.5E	352	143	214	458
030600Z	27.6N	142.9E	329	84	215	529
031200Z	28.8N	143.5E	331	108	284	167
031800Z	30.1N	144.2E	299	90	261	197
040000Z	31.5N	145.3E	223	63	018	387
040600Z	32.7N	146.6E	216	46	012	312
041200Z	33.9N	148.2E	221	86	010	342

AVERAGE 24 HOUR ERROR 126 MI
AVERAGE 48 HOUR ERROR 339 MI


TYPHOON JUDY
30 SEPTEMBER-04 OCTOBER
1963
24HR FORECAST POSITS
LEGEND
0---24HR FORECAST POSITS
6HR BEST TRACK POSITS
04/12Z
04/00Z
03/00Z
02/00Z
01/00Z
30/00Z
VLADIVOSTOK
TSINGTAO
SHANGHAI
TOKYO
OKINAWA
CHICHI JIMA
IWO JIMA
SAIPAN
GUAM
YAP
ULITHI
WOLEAI ATOL
KOROR
TRUK
PONAPE
ENIWETOK ATOL
WAKE I
RONGERIK ATOL
KWAJALEIN
MAJURO
127°E
142°30'E
157
172°30'E

TYPHOON KIT - 050600Z to 111800Z OCTOBER

I. DATA

A. Statistics

1. Calendar days of tropical warning - 6 3/4
2. Calendar days of typhoon intensity - 5¼
3. Total distance traveled during tropical warning period - 1674 mi.

B. Characteristics as a typhoon

1. Minimum observed SLP - 929mb, 100400Z
2. Minimum observed 700mb height 2451m, 100400Z
3. Max radius of SFC circulation - 700 mi.
4. Max surface winds - 135 kts

II. DEVELOPMENT

A. Initial impetus - Fracture of polar trough with subsequent formation of outdraft at 200mb level

B. Initial surface vortex

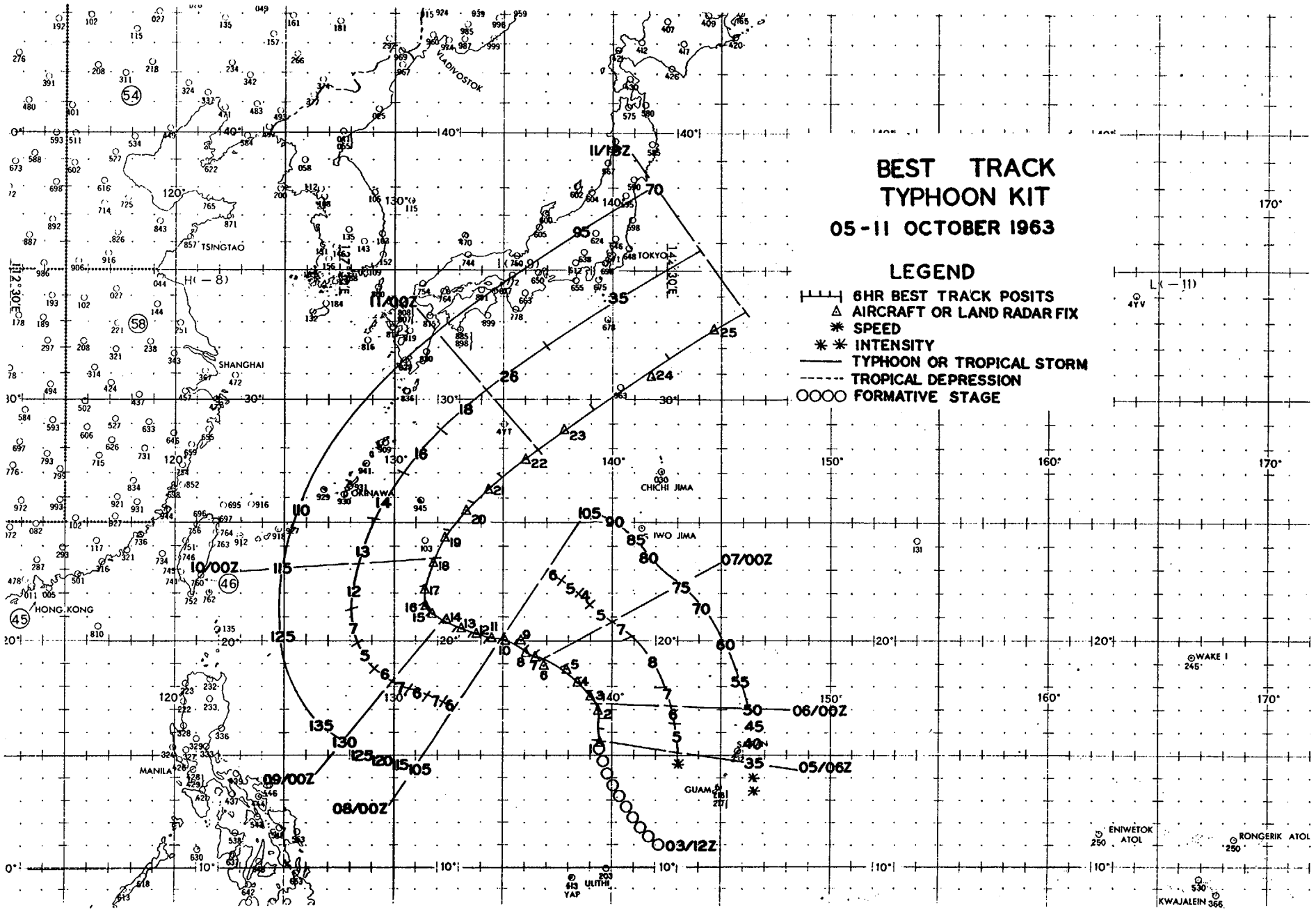
1. Junction vortex at 031200Z
2. Surface pressure less than 1008mb

C. Zenith flow at 200 mb

1. Relative position surface vortex SE quadrant of anticyclone
2. Wind direction over vortex ENE

III. FINAL DISPOSITION

A. Became extratropical


BEST TRACK
TYPHOON KIT
05-11 OCTOBER 1963
LEGEND
6HR BEST TRACK POSITS
AIRCRAFT OR LAND RADAR FIX
SPEED
INTENSITY
TYPHOON OR TROPICAL STORM
TROPICAL DEPRESSION
FORMATIVE STAGE
11/18Z
11/00Z
10/00Z
09/00Z
08/00Z
07/00Z
06/00Z
05/06Z
03/12Z
VLADIVOSTOK
TSINGTAO
SHANGHAI
OKINAWA
HONG KONG
MANILA
TOKYO
CHICHI JIMA
IWO JIMA
GUAM
WAKE I
ENIWETOK ATOL
RONGERIK ATOL
KWAJALEIN
ULITHI
YAP

LAND RADAR AND AIRCRAFT FIXES - TYPHOON KIT

FIX NO/TIME	LAT.	LONG.	UNIT METHOD & ACCY	MAX SFC WND	MAX 700MB WND	MIN 700MB HGT	RECON MIN SLP MBS	JTWC MIN SLP *MBS	700MB T/Td (°C)	EYE CHARACTERISTICS
1 050320Z	15.5N	139.5E	VW1-P-U	32	-	-	1003	-	- -	POORLY ORGANIZED
2 052200Z	17.0N	139.3E	56-P-15	18	30	3027	-	-	15/12	NO VISUAL EYE
3 060400Z	17.7N	139.0E	56-P-03	55	45	3072	1001	1001	11/05	CIRC 30 MI DIA,CLSD,WALL CLDS 5 MI THICK
4 060930Z	18.2N	138.4E	VW1-P-03	45	-	2926	991	994	14/05	CIRC 36 MI DIA,CLSD
5 061635Z	18.8N	137.9E	VW1-R-15	-	-	2990	1008	993	- -	NO DEFINITE RDR CNTR
6 062200Z	18.9N	136.9E	56-P-05	50	52	2975	992	989	13/12	HVY RDR RETURNS NE QUAD
7 070400Z	19.4N	136.4E	56-P-03	50	60	2932	991	984	15/10	ELLIP 40 MI N-S,35 MI E-W,CLSD WALL CLDS 10 MI THICK
8 071030Z	19.6N	136.2E	VW1-R-10	-	-	-	-	-	- -	CIRC 40 MI DIA,CLSD
9 071530Z	20.0N	135.8E	VW1-R-05	-	-	-	-	-	- -	OVAL 42 MI NW-SE,35 MI NE-SW,OPEN S,CLDS 10 MI THICK
10 072200Z	20.0N	135.1E	56-P-01	130	90	2749	957	961	18/05	CIRC 50 MI DIA,CLSD
11 080400Z	20.1N	134.4E	56-P-05	130	90	2688	953	955	18/08	CIRC 30 MI DIA,CLSD, STRONG E
12 081000Z	20.3N	133.7E	VW1-R-05	-	-	-	-	-	- -	CIRC 31 MI DIA,CLSD,EXTREMELY STRONG FEEDER BANDS
13 081530Z	20.6N	133.1E	VW1-R-05	-	-	-	-	-	- -	CIRC 27 MI DIA,WELL DEVELOP
14 082200Z	20.9N	132.4E	56-P-01	120	115	2533	939	940	16/14	CIRC 25 MI DIA,CLSD
15 090400Z	21.2N	131.6E	56-P-03	130	110	2509	937	936	18/17	CIRC 20 MI DIA,CLSD

*Computed

LAND RADAR AND AIRCRAFT FIXES - TYPHOON KIT (CONT'D)

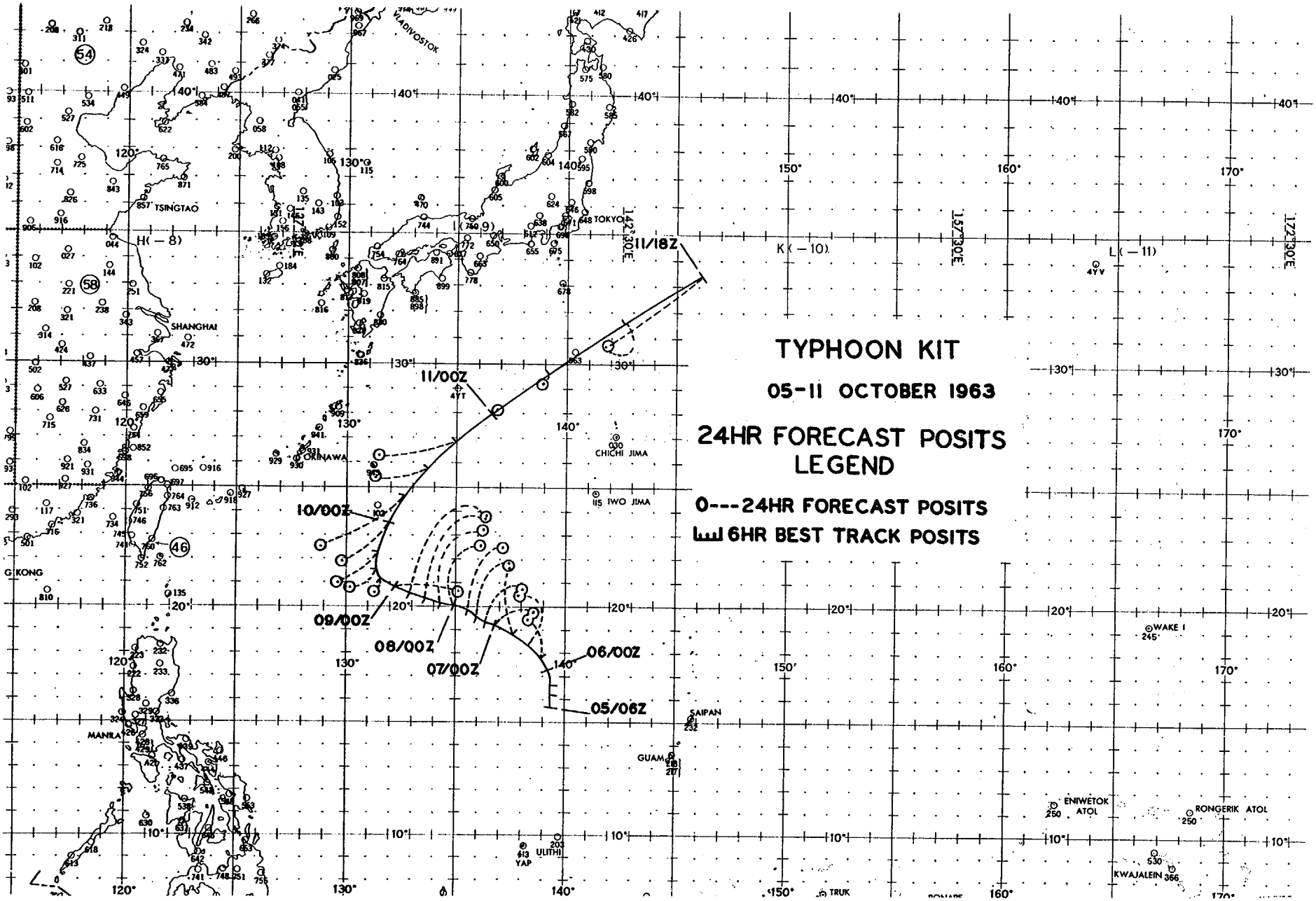
FIX NO/TIME	LAT.	LONG.	UNIT METHOD & ACCY	MAX SFC WND	MAX 700MB WND	MIN 700MB HGT	RECON MIN SLP MBS	JTWC MIN SLP *MBS	700MB T/Td (°C)	EYE CHARACTERISTICS
16 090930Z	21.5N	131.4E	VW1-R-10	-	-	-	-	-	- -	CIRC 26 MI DIA,CLSD,WALL CLDS 9 MI THICK
17 091540Z	22.2N	131.5E	VW1-R-05	-	-	-	-	-	- -	CIRC 31 MI DIA,CLSD,WALL CLDS 10 MI THICK
18 092245Z	23.3N	131.9E	56-R-05	60	83	2545	944	940	17/13	CIRC 40 MI DIA,CLSD,WALL CLDS 7 MI THICK
19 100400Z	24.4N	132.5E	56-P-05	75	85	2451	930	929	18/14	CIRC 30 MI DIA,CLSD,WALL CLDS 7 MI THICK
20 101000Z	25.5N	133.3E	VW1-R-05	-	-	-	-	-	- -	CIRC 32 MI DIA,CLSD,WALL CLDS 6 MI THICK
21 101545Z	26.5N	134.3E	VW1-R-05	-	-	-	-	-	- -	CIRC 24 MI DIA,CLSD,WALL CLDS 5 MI THICK
22 102200Z	27.5N	136.0E	56-P-03	130	120	2637	949	950	18/13	CIRC 30 MI DIA,CLSD,WALL CLDS 10 MI THICK
23 110400Z	28.7N	137.8E	56-P-05	150	90	2661	954	953	19/13	CIRC 35 MI DIA,CLSD,WALL CLDS 10 MI THICK
24 111000Z	30.8N	141.8E	VW1-R-10	-	-	-	-	-	- -	OPEN ALL QUADS,DISORG
25 111600Z	32.6N	144.7E	VW1-R-20	-	-	-	-	-	- -	CNTR COMPLETELY DIFFUSED

*Computed

TYPHOON KIT 05 OCT-11 OCT 1963
POSITION AND FORECAST VERIFICATION DATA

DTG	STORM POSITION LAT.	LONG.	24 HOUR ERROR DEG. DISTANCE	48 HOUR ERROR DEG. DISTANCE
050600Z	15.7N	139.4E	------	------
051200Z	16.2N	139.3E	------	------
051800Z	16.7N	139.3E	------	------
060000Z	17.3N	139.2E	------	------
060600Z	17.9N	138.8E	339-97	------
061200Z	18.4N	138.1E	352-120	------
061800Z	18.8N	137.4E	360-173	------
070000Z	19.2N	136.8E	075-98	------
070600Z	19.4N	136.3E	050-121	012-292
071200Z	19.7N	136.0E	030-150	015-336
071800Z	19.9N	135.5E	030-175	014-392
080000Z	20.0N	134.9E	024-170	036-215
080600Z	20.2N	134.3E	030-210	029-304
081200Z	20.3N	133.5E	039-250	034-450
081800Z	20.6N	132.9E	043-268	038-492
090000Z	20.9N	132.1E	097-167	043-542
090600Z	21.2N	131.5E	208-47	047-567
091200Z	21.7N	131.4E	231-89	066-293
091800Z	22.4N	131.5E	231-137	049-623
100000Z	23.5N	132.0E	233-163	116-124
100600Z	24.7N	132.7E	239-252	230-304
101200Z	25.8N	133.7E	257-137	237-360
101800Z	26.9N	135.0E	256-140	236-455
110000Z	28.0N	136.6E	053-15	239-517
110600Z	29.6N	139.1E	030-18	239-618
111200Z	31.4N	142.6E	230-67	250-310
111800Z	33.3N	146.0E	235-250	246-405

AVERAGE 24 HOUR ERROR 144 MI
AVERAGE 48 HOUR ERROR 400 MI


TYPHOON KIT
05-11 OCTOBER 1963
24HR FORECAST POSITS
LEGEND
0---24HR FORECAST POSITS
6HR BEST TRACK POSITS
11/18Z
11/00Z
10/00Z
09/00Z
08/00Z
07/00Z
06/00Z
05/06Z
H(-8)
J(-9)
K(-10)
L(-11)
142.5°E
157.5°E
172.5°E
VLADIVOSTOK
TSINGTAO
SHANGHAI
TOKYO
OKINAWA
CHICHI JIMA
IWO JIMA
G KONG
MANILA
YAP
ULITHI
GUAM
SAIPAN
TRUK
WAKE I
ENIWETOK ATOL
RONGERIK ATOL
KWAJALEIN

TYPHOON LOLA - 080600Z to 191800Z OCTOBER

I. DATA

A. Statistics

1. Calendar days of tropical warning - 11 3/4
2. Calendar days of typhoon intensity - 5¼
3. Total distance traveled during tropical warning period - 2376 mi.

B. Characteristics as a typhoon

1. Minimum observed SLP - 945mb, 170400Z
2. Minimum observed 700mb height - 2609m, 170400Z
3. Max radius of SFC circulation - 300 mi.
4. Max surface winds - 130 kts

II. DEVELOPMENT

A. Initial impetus - Fracture of polar trough with subsequent intensification of outdraft at 200mb over surface vortex

B. Initial surface vortex

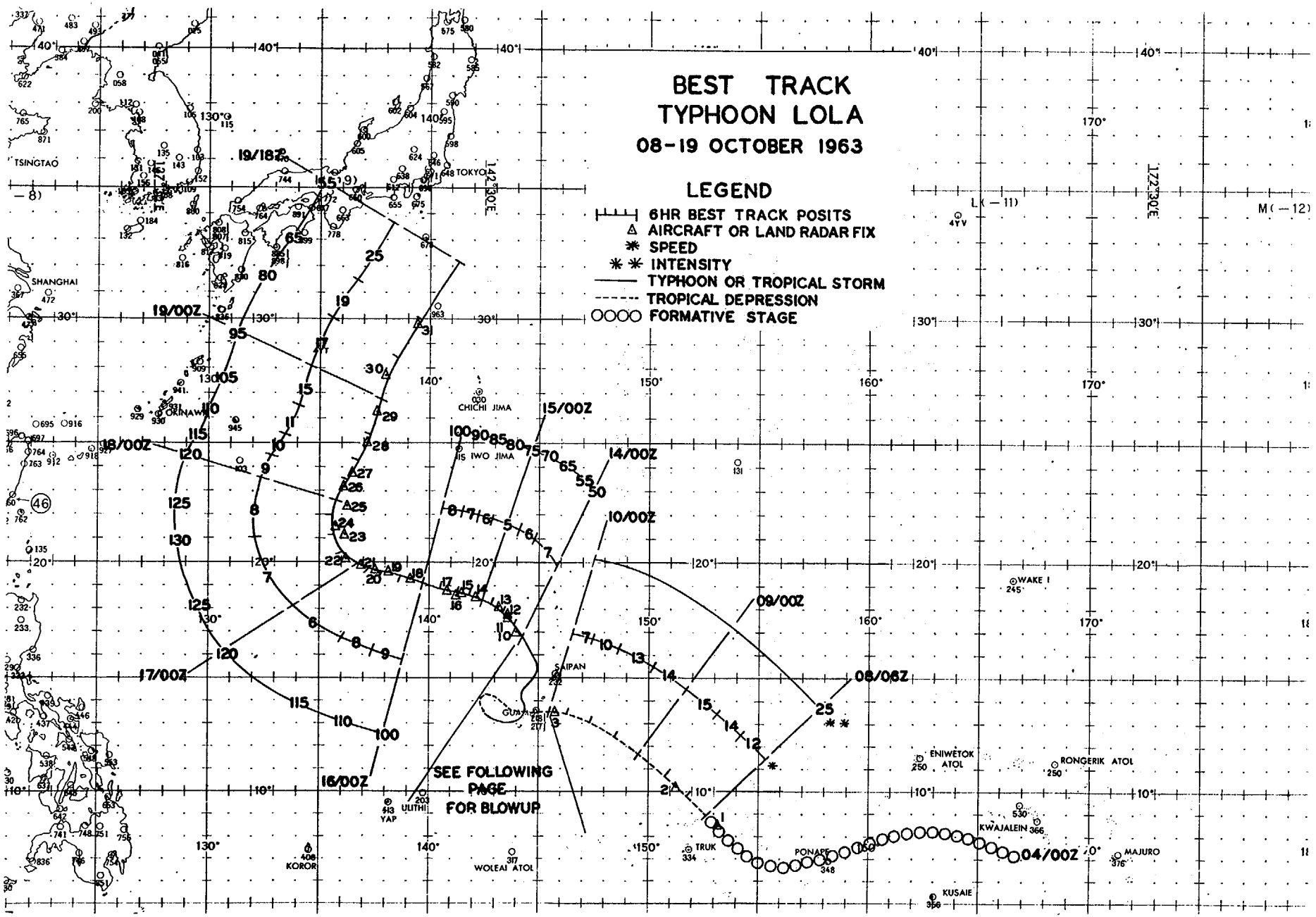
1. Junction vortex at 040000Z
2. Surface pressure less than 1008mb

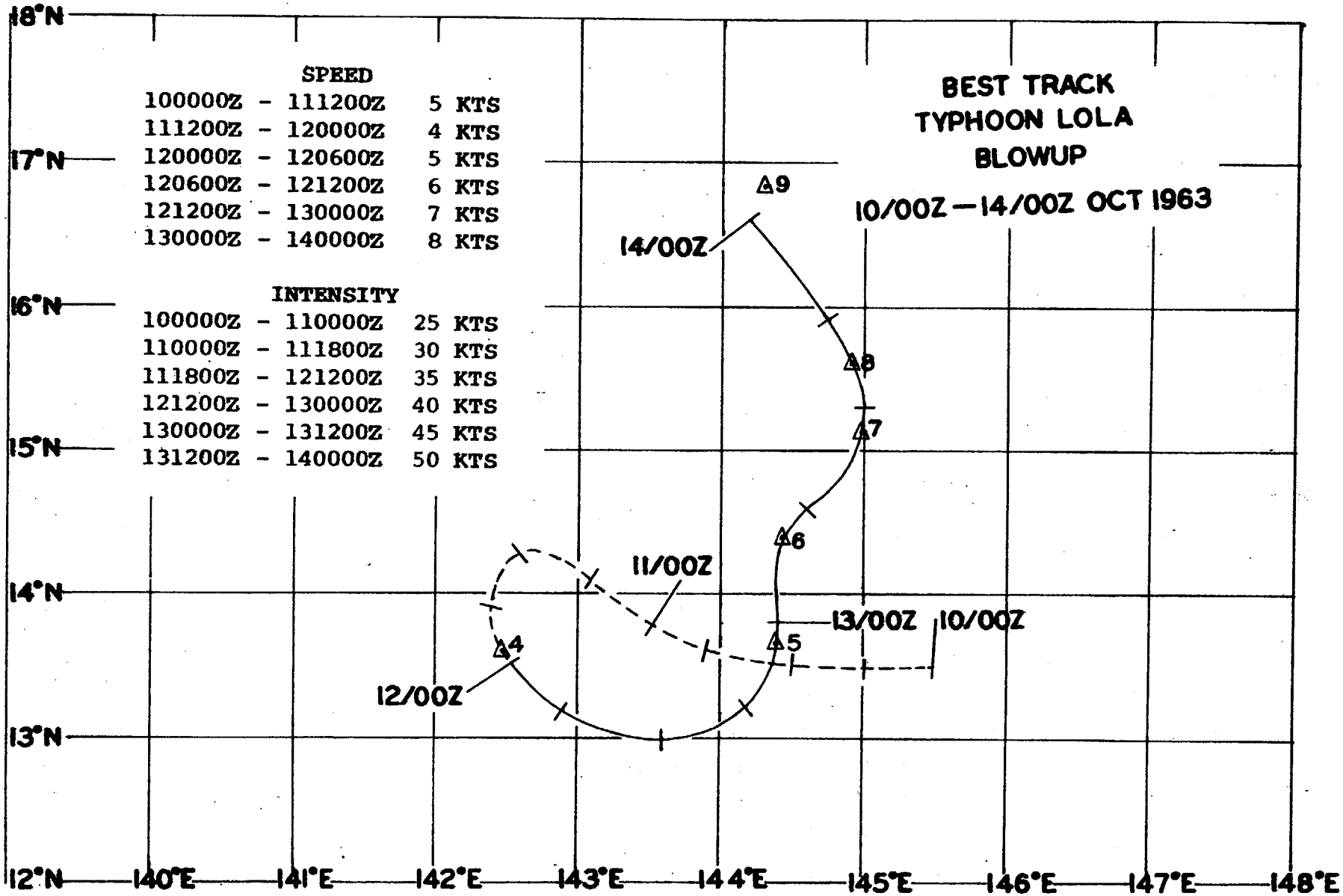
C. Zenith flow at 200mb

1. Relative position surface vortex - SE quadrant of anticyclone
2. Wind direction over vortex - ENE

III. FINAL DISPOSITION

A. Became extratropical


BEST TRACK
TYPHOON LOLA
08-19 OCTOBER 1963
LEGEND
6HR BEST TRACK POSITS
AIRCRAFT OR LAND RADAR FIX
SPEED
INTENSITY
TYPHOON OR TROPICAL STORM
TROPICAL DEPRESSION
FORMATIVE STAGE
SEE FOLLOWING PAGE FOR BLOWUP
19/18Z
19/00Z
18/00Z
17/00Z
16/00Z
15/00Z
14/00Z
10/00Z
09/00Z
08/06Z
04/00Z
TSINGTAO
SHANGHAI
OKINAWA
CHICHI JIMA
IWO JIMA
TOKYO
SAIPAN
GUAM
YAP
ULITHI
KOROR
WOLEAI ATOL
TRUK
PONAPE
KUSAIE
KWAJALEIN
ENIWETOK ATOL
RONGERIK ATOL
WAKE I
MAJURO


BEST TRACK
TYPHOON LOLA
BLOWUP
10/00Z — 14/00Z OCT 1963
SPEED
100000Z - 111200Z 5 KTS
111200Z - 120000Z 4 KTS
120000Z - 120600Z 5 KTS
120600Z - 121200Z 6 KTS
121200Z - 130000Z 7 KTS
130000Z - 140000Z 8 KTS
INTENSITY
100000Z - 110000Z 25 KTS
110000Z - 111800Z 30 KTS
111800Z - 121200Z 35 KTS
121200Z - 130000Z 40 KTS
130000Z - 131200Z 45 KTS
131200Z - 140000Z 50 KTS
18°N
17°N
16°N
15°N
14°N
13°N
12°N
140°E
141°E
142°E
143°E
144°E
145°E
146°E
147°E
148°E
14/00Z
11/00Z
13/00Z
10/00Z
12/00Z
9
8
7
6
5
4

LAND RADAR AND AIRCRAFT FIXES - TYPHOON LOLA

FIX NO/TIME	LAT.	LONG.	UNIT METHOD & ACCY	MAX SFC WND	MAX 700MB WND	MIN 700MB HGT	RECON MIN SLP MBS	JTWC MIN SLP *MBS	700MB T/Td (°C)	EYE CHARACTERISTICS
1 080255Z	08.5N	153.1E	VW1-P-05	25	-	-	998	-	- -	HVY WEA ALL QUADS
2 082320Z	10.2N	151.2E	VW1-P-U	17	-	-	1003	-	- -	NO RDR PRESENTATION
3 092210Z	13.5N	145.7E	VW1-P-U	-	-	-	-	-	- -	---
4 112300Z	13.4N	142.5E	VW1-P-U	30	-	-	1000	-	- -	---
5 122235Z	13.6N	144.4E	VW1-P-05	35	-	-	994	-	- -	ELLIP 100 MI N-S,60 MI E-W
6 130400Z	14.5N	144.4E	56-P-02	45	40	3051	998	1000	10/08	FEEDER BAND N
7 131100Z	15.1N	145.0E	VW1-P-10	-	-	-	-	-	- -	---
8 131530Z	15.6N	144.9E	VW1-P-U	-	-	-	-	-	- -	---
9 132224Z	16.8N	144.3E	56-P-03	45	32	3005	1004	994	13/11	DIFFUSE CNTR 80-100 MI DIA
10 140400Z	17.0N	143.9E	56-P-03	50	43	2954	987	985	16/12	DIFFUSE CNTR 80 MI DIA
11 140930Z	17.5N	143.5E	VW1-P-02	-	-	3002	984	-	15/09	CIRC 56 MI DIA,OPEN E, WALL CLDS 4 MI THICK
12 141530Z	17.6N	143.5E	VW1-P-15	-	-	2692	-	-	14/-	ELLIP 80 MI N-S,30 MI E-W
13 142200Z	18.1N	143.2E	56-P-02	50	62	2941	984	986	12/11	LGT OCNL MOD RAIN IN EYE
14 150400Z	18.5N	142.2E	56-P-05	65	53	2890	979	979	14/12	CIRC 15 MI DIA,CLSD,MOD RAIN IN EYE
15 150935Z	18.7N	141.5E	VW1-R-05	-	-	-	-	-	- -	CIRC 9 MI DIA,HVY WALL CLDS ALL QUADS

*Computed

LAND RADAR AND AIRCRAFT FIXES - TYPHOON LOLA (CONT'D)

FIX NO/TIME	LAT.	LONG.	UNIT METHOD & ACCY	MAX SFC WND	MAX 700MB WND	MIN 700MB HGT	RECON MIN SLP MBS	JTWC MIN SLP *MBS	700MB T/Td (°C)	EYE CHARACTERISTICS
16 151530Z	18.6N	141.2E	VW1-R-03	-	-	-	-	-	- -	CIRC 36 MI DIA,FEEDER BANDS ALL QUADS
17 152200Z	18.8N	140.8E	56-P-05	80	90	2798	958	968	17/14	CIRC 50 MI DIA,OPEN N,WALL CLDS 10 MI THICK,WND EYE 10 MI DIA
18 160400Z	19.3N	139.1E	56-P-10	85	80	2728	958	958	18/14	CIRC 40 MI DIA,CLSD,WND EYE 15 MI DIA
19 161000Z	19.6N	138.2E	VW1-R-05	-	-	-	-	-	- -	CIRC 38 MI DIA,CLSD
20 161530Z	19.7N	137.5E	VW1-R-05	-	-	-	-	-	- -	OVAL 36 MI NW-SE,33 MI NE-SW
21 162200Z	19.9N	136.9E	56-P-02	115	-	2643	-	948	19/18	CIRC 30 MI DIA,OPEN N & S
22 170400Z	20.2N	136.2E	56-P-12	150	-	2609	-	945	19/16	CIRC 40 MI DIA,CLSD
23 171020Z	21.1N	136.2E	VW1-R-10	-	-	-	-	-	- -	CIRC 60 MI DIA,OPEN E
24 171535Z	21.5N	135.7E	VW1-R-10	-	-	-	-	-	- -	ELLIP 64 MI N-S,51 MI E-W
25 172200Z	22.3N	136.1E	56-P-01	50	80	2621	954	948	16/14	CIRC 70 MI DIA,CLSD
26 180400Z	23.1N	136.1E	56-P-03	125	110	2624	956	949	16/13	CIRC 70 MI DIA,CLSD
27 181000Z	23.7N	136.6E	VW1-R-10	-	-	-	-	-	- -	ELLIP 66 MI N-S,41 MI E-W, INTENSE FEEDER BANDS N & W
28 181530Z	25.0N	137.1E	VW1-R-10	-	-	-	-	-	- -	CIRC 53 MI DIA
29 182200Z	26.3N	137.7E	56-P-02	95	-	2707	965	956	17/14	ELLIP 55 MI ENE-WSW,40 MI SSE-NNW

*Computed

LAND RADAR AND AIRCRAFT FIXES - TYPHOON LOLA (CONT'D)

FIX NO/TIME	LAT.	LONG.	UNIT METHOD & ACCY	MAX SFC WND	MAX 700MB WND	MIN 700MB HGT	RECON MIN SLP MBS	JTWC MIN SLP *MBS	700MB T/Td (°C)	EYE CHARACTERISTICS
30 190400Z	27.8N	138.0E	56-P-02	90	-	2734	963	960	17/12	CIRC,WALL CLDS NW QUAD
31 191000Z	29.8N	139.6E	VW1-R-10	-	-	-	-	-	- -	CNTR VERY DIFFUSED,NO RDR EYE

*Computed

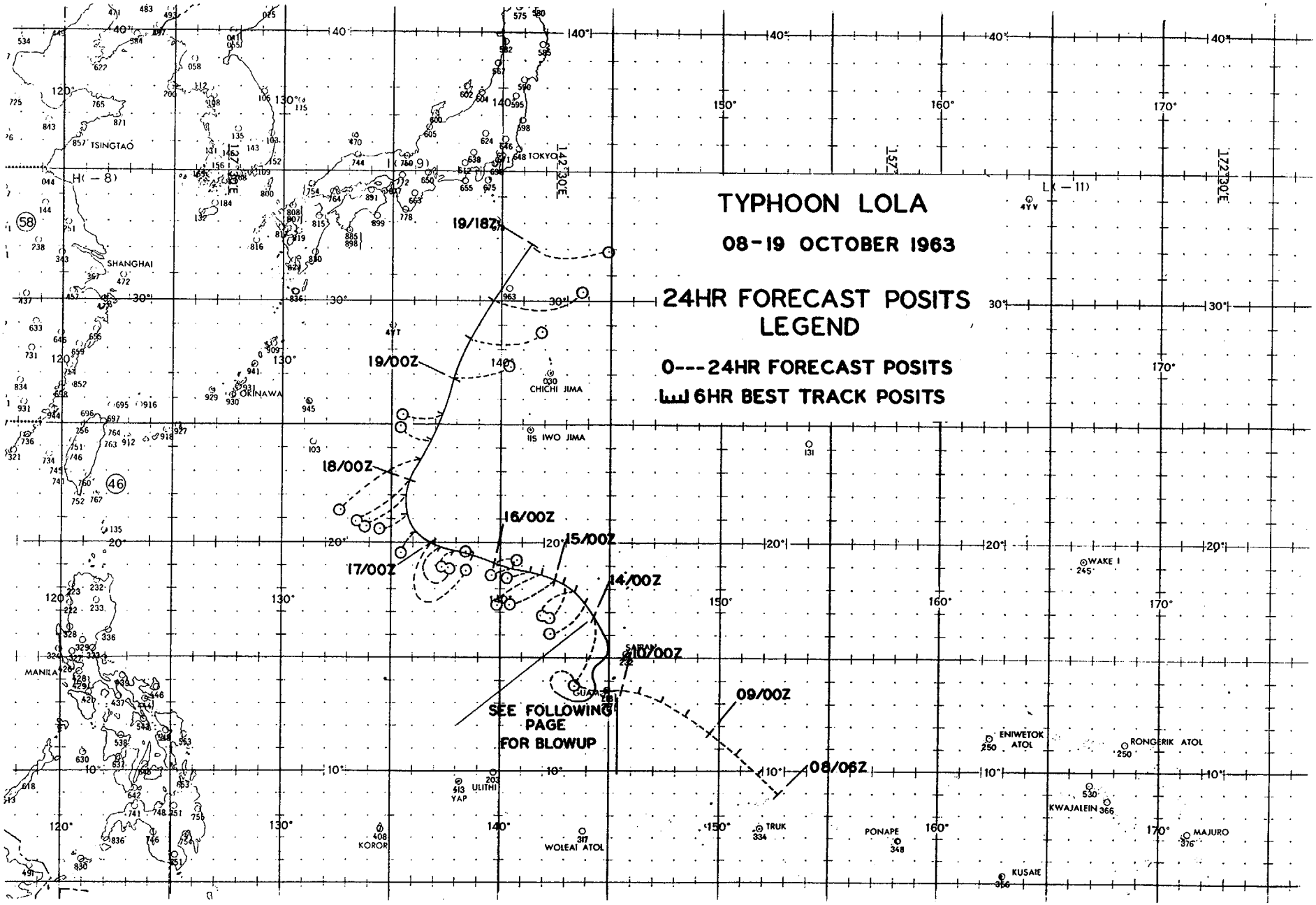
TYPHOON LOLA 08 OCT-19 OCT 1963
POSITION AND FORECAST VERIFICATION DATA

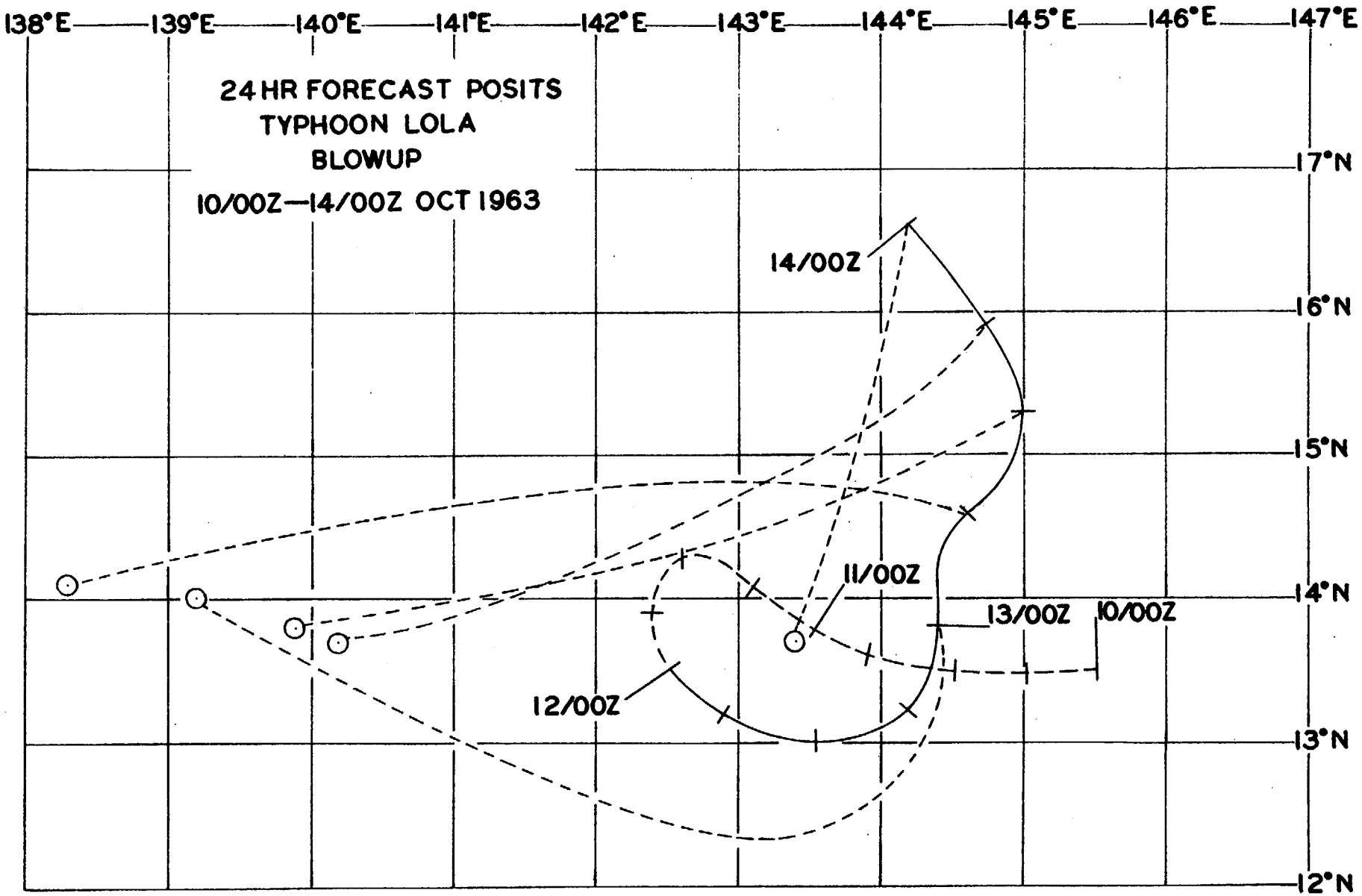
DTG	STORM POSITION LAT.	LONG	24 HOUR ERROR DEG. DISTANCE	48 HOUR ERROR DEG. DISTANCE
080600Z	08.9N	152.7E	------	------
081200Z	09.8N	151.8E	------	------
081800Z	10.7N	150.7E	------	------
090000Z	11.6N	149.5E	------	------
090600Z	12.4N	148.4E	------	------
091200Z	13.0N	147.2E	------	------
091800Z	13.4N	146.2E	------	------
100000Z	13.5N	145.5E	------	------
100600Z	13.5N	145.0E	------	------
101200Z	13.5N	144.5E	------	------
101800Z	13.6N	143.9E	------	------
110000Z	13.8N	143.5E	------	------
110600Z	14.1N	143.1E	------	------
111200Z	14.3N	142.6E	------	------
111800Z	13.9N	142.4E	------	------
120000Z	13.5N	142.5E	------	------
120600Z	13.2N	142.9E	------	------
121200Z	13.0N	143.5E	------	------
121800Z	13.2N	144.2E	------	------
130000Z	13.8N	144.4E	272-307	------
130600Z	14.6N	144.6E	265-370	------
131200Z	15.3N	145.0E	253-318	------
131800Z	15.9N	144.7E	242-299	------
140000Z	16.6N	144.2E	196-180	------
140600Z	17.2N	143.8E	231-114	254-520
141200Z	17.8N	143.4E	236-102	230-347
141800Z	18.2N	142.9E	203-96	228-368
150000Z	18.4N	142.4E	240-130	202-268
150600Z	18.6N	141.9E	234-137	233-209
151200Z	18.7N	141.3E	250-60	240-228
151800Z	18.9N	140.5E	248-55	236-171

TYPHOON LOLA 08 OCT-19 OCT 1963
POSITION AND FORECAST VERIFICATION DATA (CONT'D)

DTG	STORM POSITION LAT.	LONG.	24 HOUR ERROR DEG. DISTANCE	48 HOUR ERROR DEG. DISTANCE
160000Z	19.1N	139.7E	079-56	257-192
160600Z	19.4N	138.7E	281-17	247-170
161200Z	19.7N	137.9E	220-61	241-110
161800Z	19.8N	137.3E	170-51	246-105
170000Z	19.9N	136.7E	124-124	160-28
170600Z	20.4N	136.1E	214-66	252-100
171200Z	21.1N	135.8E	238-78	246-150
171800Z	21.9N	135.8E	233-128	229-168
180000Z	22.7N	135.9E	233-186	175-208
180600Z	23.5N	136.3E	237-240	243-355
181200Z	24.4N	136.8E	290-87	238-358
181800Z	25.4N	137.3E	267-104	238-435
190000Z	26.8N	137.8E	076-135	235-462
190600Z	28.4N	138.5E	083-180	239-500
191200Z	29.9N	139.7E	082-210	280-26
191800Z	32.1N	141.2E	093-186	218-145

AVERAGE 24 HOUR ERROR 146 MI
AVERAGE 48 HOUR ERROR 244 MI


TYPHOON LOLA
08-19 OCTOBER 1963
24HR FORECAST POSITS
LEGEND
0---24HR FORECAST POSITS
6HR BEST TRACK POSITS
19/18Z
19/00Z
18/00Z
17/00Z
16/00Z
15/00Z
14/00Z
10/00Z
09/00Z
08/06Z
SEE FOLLOWING PAGE FOR BLOWUP
TSINGTAO
SHANGHAI
OKINAWA
CHICHI JIMA
IIS IWO JIMA
TOKYO
MANILA
SAIPAN
GUAM
YAP
ULITHI
KOROR
WOLEAI ATOL
TRUK
PONAPE
KUSAIE
ENIWETOK ATOL
WAKE I
RONGERIK ATOL
KWAJALEIN
MAJURO
H(-8)
I(-9)
J(-10)
K(-11)
142.5°E
157.5°E
172.5°E


24 HR FORECAST POSITS
TYPHOON LOLA
BLOWUP
10/00Z—14/00Z OCT 1963
138°E
139°E
140°E
141°E
142°E
143°E
144°E
145°E
146°E
147°E
17°N
16°N
15°N
14°N
13°N
12°N
14/00Z
11/00Z
13/00Z
10/00Z
12/00Z

TYPHOON MAMIE - 150600Z to 181200Z OCTOBER

I. DATA

A. Statistics

1. Calendar days of tropical warning - 3½
2. Calendar days of typhoon intensity - 3
3. Total distance traveled during tropical warning period - 1116 mi

B. Characteristics as a typhoon

1. Minimum observed SLP - 971mb, 170400Z
2. Minimum observed 700mb height 2819m, 170400Z
3. Max radius of SFC circulation - 500 mi
4. Max surface winds - 100 kts

II. DEVELOPMENT

A. Initial impetus - Northeastward movement of intensifying anticyclone at 200mb placing surface vortex under favorable divergent flow

B. Initial surface vortex

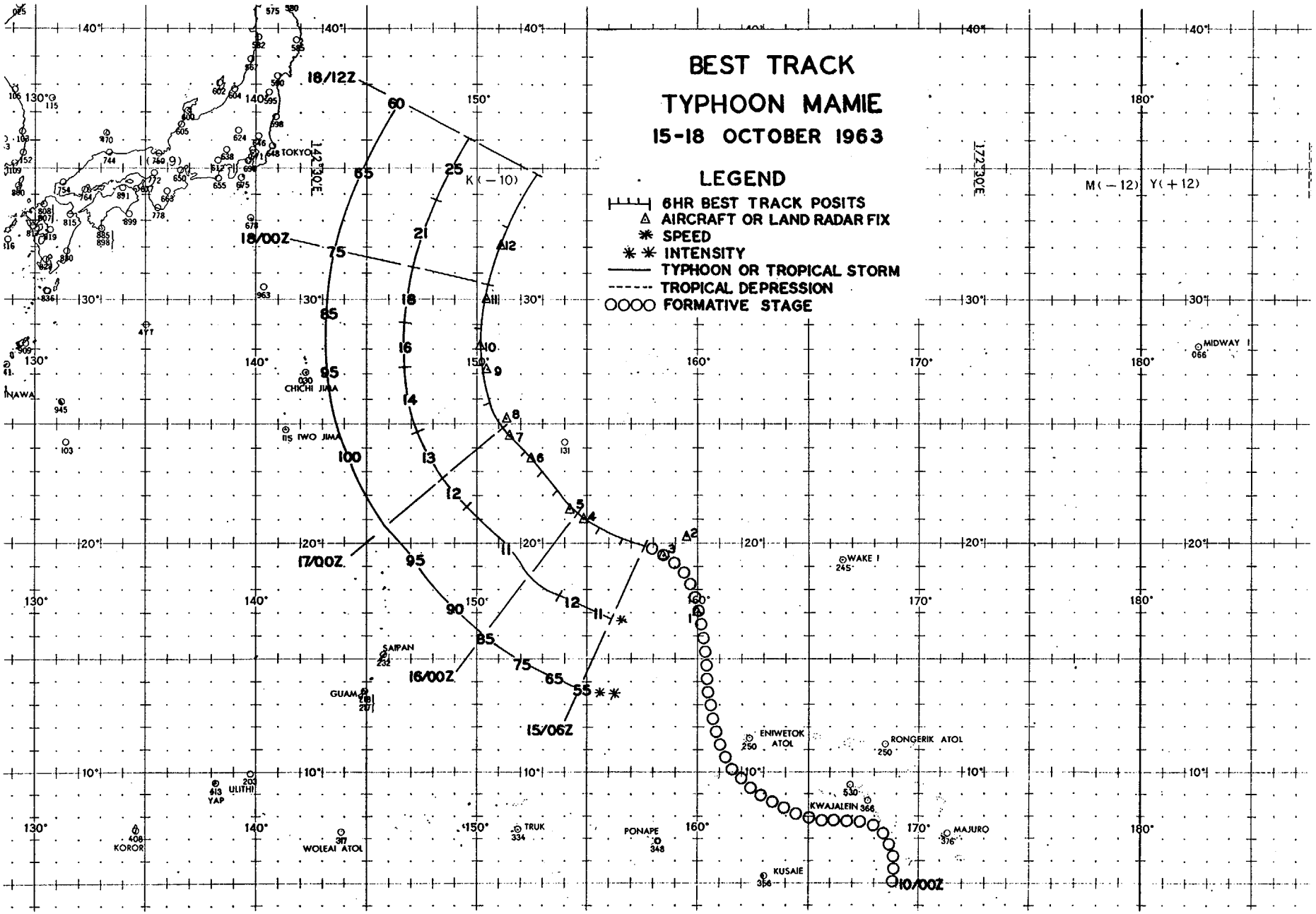
1. Junction vortex at 100000Z
2. Surface pressure less than 1008mb

C. Zenith flow at 200mb

1. Relative position surface vortex - SW quadrant of anticyclone
2. Wind direction over vortex - ESE

III. FINAL DISPOSITION

A. Became extratropical


BEST TRACK
TYPHOON MAMIE
15-18 OCTOBER 1963
LEGEND
6HR BEST TRACK POSITS
AIRCRAFT OR LAND RADAR FIX
SPEED
INTENSITY
TYPHOON OR TROPICAL STORM
TROPICAL DEPRESSION
FORMATIVE STAGE
18/12Z
18/00Z
17/00Z
16/00Z
15/06Z
10/00Z
142.5°E
172.5°E
K(-10)
M(-12) Y(+12)
TOKYO
CHICHI JIMA
IWO JIMA
SAIPAN
GUAM
WAKE I
MIDWAY I
ENIWETOK ATOL
RONGERIK ATOL
KWAJALEIN
MAJURO
KUSAIE
PONAPE
TRUK
WOLEAI ATOL
ULITHI
YAP
KOROR

180

LAND RADAR AND AIRCRAFT FIXES - TYPHOON MAMIE

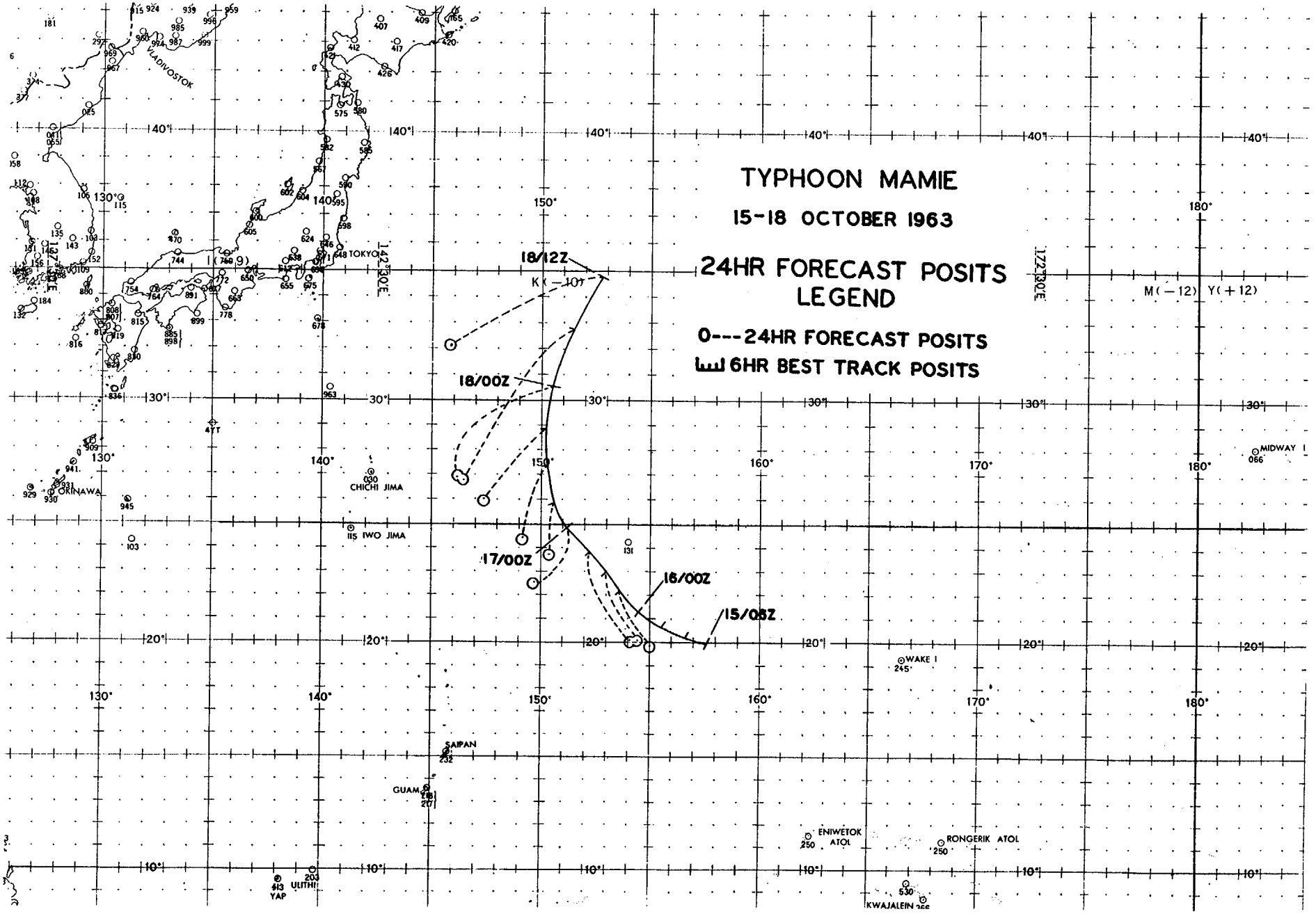
FIX NO/TIME	LAT.	LONG.	UNIT METHOD & ACCY	MAX SFC WND	MAX 700MB WND	MIN 700MB HGT	RECON MIN SLP MBS	JTWC MIN SLP *MBS	700MB T/Td (°C)	EYE CHARACTERISTICS
1 131335Z	17.0N	160.0E	PAA-R-U	-	-	-	-	-	- -	---
2 140650Z	20.3N	159.5E	VW1-P-15	20	-	-	999	-	- -	ELLIP 100 MI N-S,60 MI E-W
3 150120Z	19.5N	158.6E	VW1-P-05	45	-	-	992	-	- -	2ND VORTEX LOCATED 19.5N 157.1E
4 152130Z	21.0N	154.8E	VW1-P-10	80	-	2830	982	972	18/12	ELLIP 24 MI N-S,18 MI E-W
5 160400Z	21.4N	154.2E	56-P-08	85	54	2923	984	982	16/16	CIRC
6 161530Z	23.6N	152.5E	VW1-R-05	-	-	-	-	-	- -	ELLIP 47MI NE-SW,35MI NW-SE, OPEN W,WALL CLDS 4MI THICK
7 162200Z	24.4N	151.5E	56-P-10	90	75	2850	971	974	18/11	CIRC 35 MI DIA,CLSD
8 170400Z	25.1N	151.3E	56-P-10	120	75	2819	967	971	15/13	CIRC 35 MI DIA,CLSD
9 171030Z	27.2N	150.4E	VW1-R-10	-	-	-	-	-	- -	CIRC 23MI DIA,OPEN W,WALL CLDS 13MI THICK E SEMICIRC
10 171530Z	28.2N	150.2E	VW1-R-05	-	-	-	-	-	- -	WALL CLDS NE QUAD,6-9MI THICK
11 172200Z	30.0N	150.5E	56-P-07	50	65	2899	980	977	20/16	WALL CLDS E QUAD
12 180400Z	32.0N	151.1E	56-P-05	85	78	2947	984	982	21/16	NO RDR EYE,SYSTEM STRATIFYING

*Computed

TYPHOON MAMIE 15 OCT-18 OCT 1963
POSITION AND FORECAST VERIFICATION DATA

	STORM POSITION		24 HOUR ERROR		48 HOUR ERROR	
DTG	LAT.	LONG.	DEG.	DISTANCE	DEG.	DISTANCE
150600Z	19.9N	157.7E	------		------	
151200Z	20.2N	156.6E	------		------	
151800Z	20.7N	155.4E	------		------	
160000Z	21.3N	154.5E	------		------	
160600Z	22.2N	153.7E	152	156	------	
161200Z	23.0N	153.0E	155	187	------	
161800Z	23.9N	152.1E	154	246	------	
170000Z	24.8N	151.2E	210	150	------	
170600Z	25.9N	150.6E	188	125	163	325
171200Z	27.3N	150.2E	198	177	170	384
171800Z	28.9N	150.2E	222	225	173	468
180000Z	30.6N	150.6E	227	322	218	483
180600Z	32.7N	151.4E	216	417	219	480
181200Z	34.8N	152.9E	244	382	222	625

AVERAGE 24 HOUR ERROR 239 MI
AVERAGE 48 HOUR ERROR 461 MI


TYPHOON MAMIE
15-18 OCTOBER 1963
24HR FORECAST POSITS
LEGEND
0---24HR FORECAST POSITS
6HR BEST TRACK POSITS
18/12Z
18/00Z
17/00Z
16/00Z
15/08Z
K(-10)
M(-12)
Y(+12)
TOKYO
CHICHI JIMA
IWO JIMA
OKINAWA
MIDWAY I
WAKE I
SAIPAN
GUAM
YAP
ULITHI
ENIWETOK ATOL
RONGERIK ATOL
KWAJALEIN
VLADIVOSTOK

TYPHOON ORA - 231200Z to 291200Z OCTOBER

I. DATA

A. Statistics

1. Calendar days of tropical warning - 6¼
2. Calendar days of typhoon intensity - 2¼
3. Total distance traveled during tropical warning period - 1194 mi

B. Characteristics as a typhoon

1. Minimum observed SLP - 984mb, 280400Z
2. Minimum observed 700mb height - 2929m, 280400Z
3. Max radius of SFC circulation - 300 mi
4. Max surface winds - 80 kts

II. DEVELOPMENT

A. Initial impetus - Northeastward movement of intensifying anticyclone at 200mb placing surface vortex under favorable divergent flow

B. Initial surface vortex

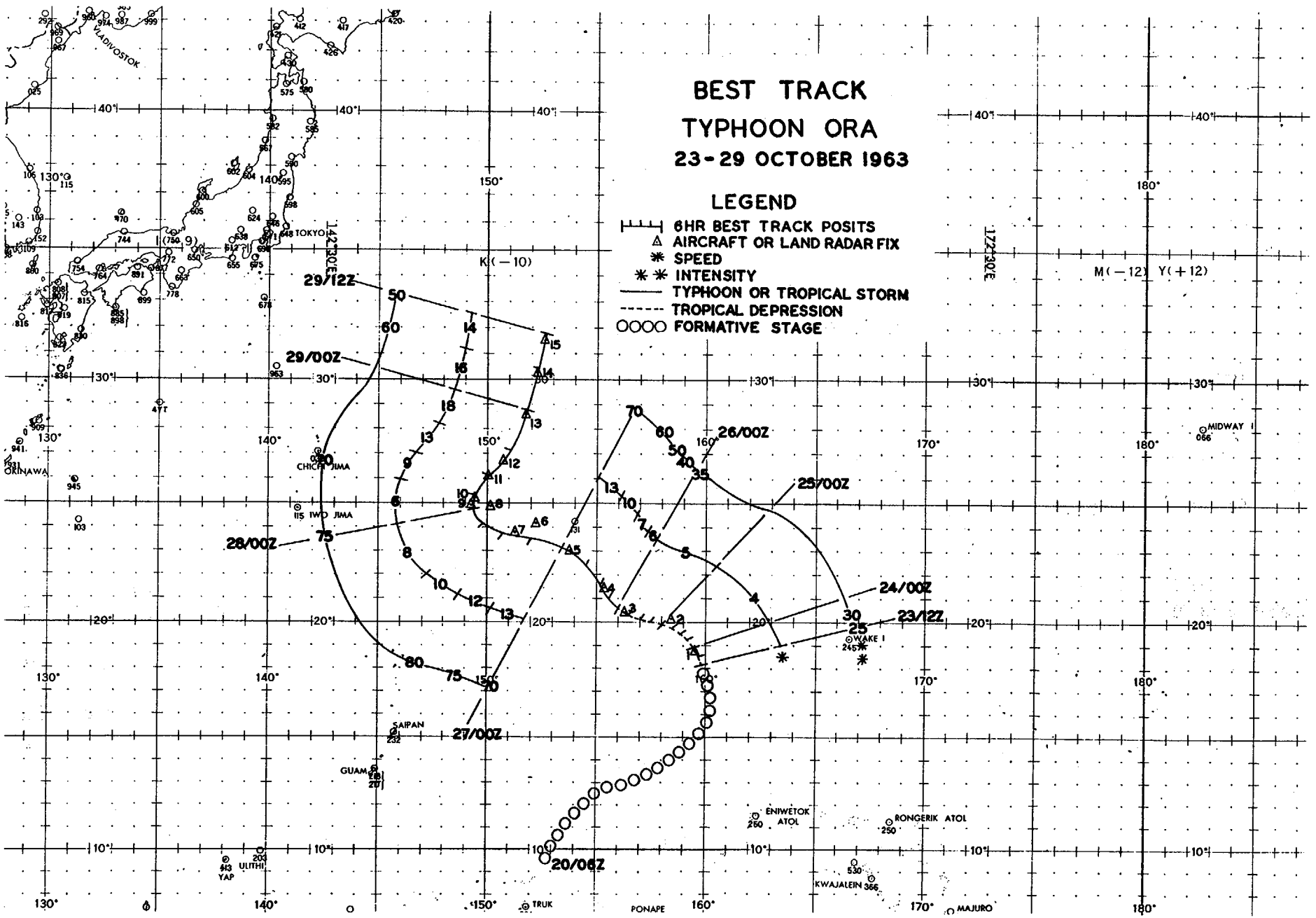
1. Junction vortex at 200600Z
2. Surface pressure less than 1005mb

C. Zenith flow at 200mb

1. Relative position surface vortex - SW quadrant of anticyclone
2. Wind direction over vortex - SE

III. FINAL DISPOSITION

A. Became extratropical


BEST TRACK
TYPHOON ORA
23-29 OCTOBER 1963
LEGEND
6HR BEST TRACK POSITS
AIRCRAFT OR LAND RADAR FIX
SPEED
INTENSITY
TYPHOON OR TROPICAL STORM
TROPICAL DEPRESSION
FORMATIVE STAGE
29/12Z
29/00Z
28/00Z
27/00Z
26/00Z
25/00Z
24/00Z
23/12Z
20/06Z
K(−10)
M(−12) Y(+12)
142°30'E
172°30'E
TOKYO
CHICHI JIMA
IWO JIMA
OKINAWA
SAIPAN
GUAM
YAP
ULITHI
TRUK
PONAPE
ENIWETOK ATOL
RONGERIK ATOL
KWAJALEIN
MAJURO
WAKE I
MIDWAY I
VLADIVOSTOK

LAND RADAR AND AIRCRAFT FIXES - TYPHOON ORA

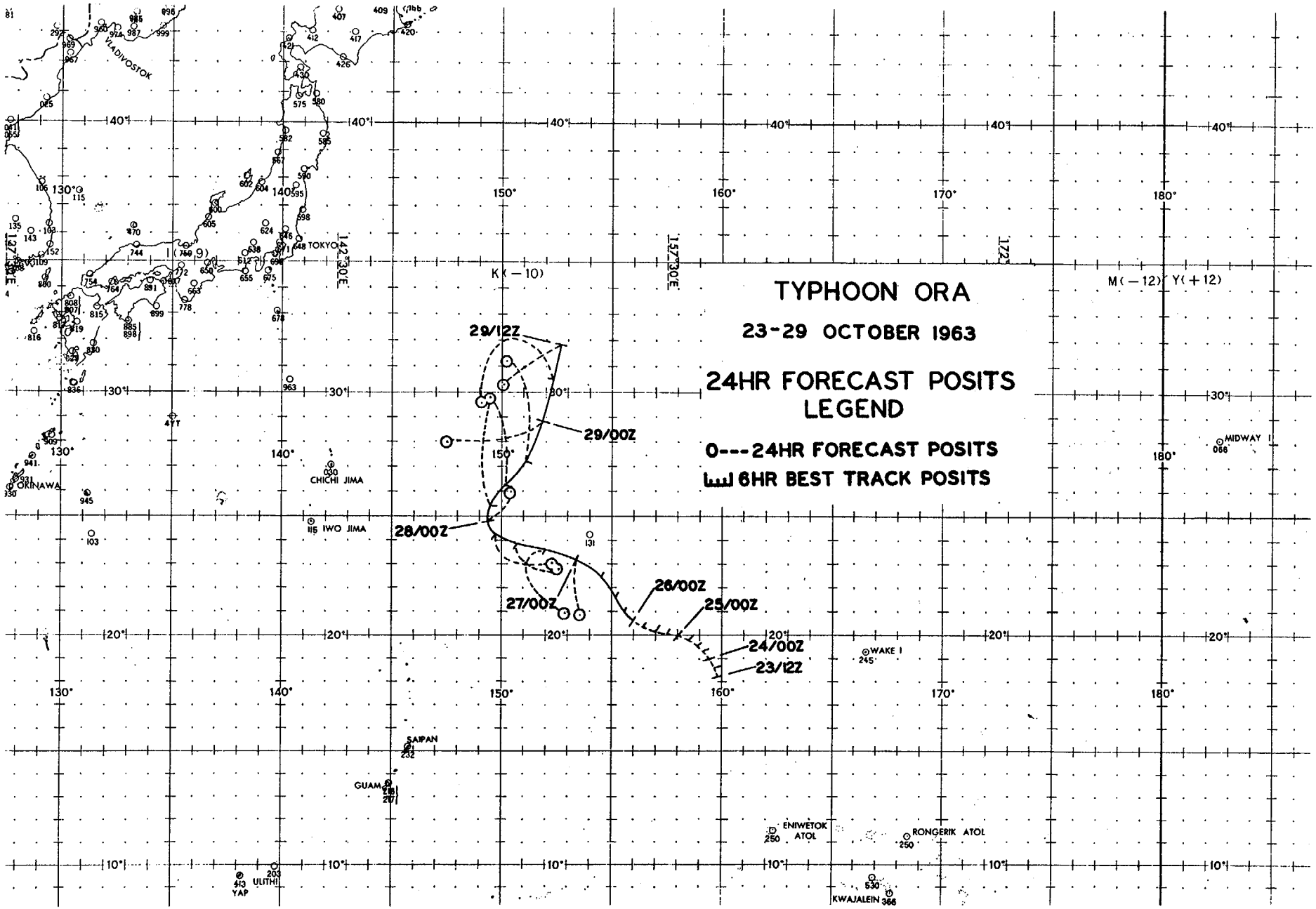
FIX NO/TIME	LAT.	LONG.	UNIT METHOD & ACCY	MAX SFC WND	MAX 700MB WND	MIN 700MB HGT	RECON MIN SLP MBS	JTWC MIN SLP *MBS	700MB T/Td (°C)	EYE CHARACTERISTICS
1 232248Z	18.9N	159.5E	VW1-P-10	08	-	-	997	-	- -	NO ORGANIZATION
2 250005Z	20.1N	158.3E	VW1-P-U	-	-	-	999	-	- -	WND CNTR 42MI DIA,POOR RDR PRES
3 252115Z	20.4N	156.3E	VW1-P-10	35	-	-	991	-	- -	WND EYE 4MI DIA,WELL DEV FEEDER BANDS
4 260930Z	21.5N	155.4E	VW1-P-05	20	-	3018	991	994	15/-	CIRC 20MI DIA,OPEN NW SEMI, WALL CLDS 5MI THICK
5 262200Z	23.0N	153.8E	56-P-05	70	40	3054	980	989	14/13	CIRC 30MI DIA,OPEN S QUAD
6 270400Z	24.1N	152.2E	56-P-05	75	50	2951	990	986	16/14	CIRC 20 MI DIA,CLSD
7 270945Z	23.9N	151.2E	VW1-R-10	-	-	-	-	-	- -	CIRC 20 MI DIA,OPEN SW QUAD
8 271530Z	24.8N	150.1E	VW1-R-10	-	-	-	-	-	- -	CNTR POORLY DEFINED
9 272200Z	24.8N	149.2E	56-P-05	40	40	2947	992	986	16/13	NO VISIBLE EYE
10 280400Z	25.3N	149.5E	56-P-08	50	50	2929	981	984	14/11	CIRC 30 MI DIA
11 281100Z	26.1N	150.0E	VW1-R-05	-	-	-	-	-	- -	OVAL 36MI NE/SW,28MI NW/SE, OPEN E,CLDS FORMING IN EYE
12 281530Z	26.7N	150.6E	VW1-R-10	-	-	-	-	-	- -	DISSIPATING RAPIDLY
13 282239Z	28.6N	151.8E	56-P-05	75	50	2963	981	984	19/15	WALL CLDS N QUAD
14 290515Z	30.3N	152.3E	56-P-15	60	-	2947	984	987	12/08	NO VISIBLE EYE
15 291100Z	31.6N	152.8E	VW1-R-10	-	-	-	-	-	- -	NO RADAR EYE

*Computed

TYPHOON ORA 23 OCT-29 OCT 1963
POSITION AND FORECAST VERIFICATION DATA

DTG	STORM POSITION LAT.	LONG.	24 HOUR ERROR DEG. DISTANCE	48 HOUR ERROR DEG. DISTANCE
231200Z	18.2N	159.9E	------	------
231800Z	18.6N	159.7E	------	------
240000Z	18.9N	159.4E	------	------
240600Z	19.2N	159.2E	------	------
241200Z	19.5N	158.9E	------	------
241800Z	19.7N	158.4E	------	------
250000Z	19.9N	158.0E	------	------
250600Z	20.0N	157.5E	------	------
251200Z	20.2N	157.0E	------	------
251800Z	20.3N	156.5E	------	------
260000Z	20.6N	156.0E	------	------
260600Z	21.0N	155.6E	------	------
261200Z	21.6N	155.2E	------	------
261800Z	22.3N	154.5E	------	------
270000Z	23.1N	153.3E	173-141	------
270600Z	23.6N	152.0E	163-165	------
271200Z	23.9N	150.8E	120-125	------
271800Z	24.2N	149.7E	118-161	------
280000Z	24.9N	149.3E	046-87	154-244
280600Z	25.4N	149.6E	001-272	170-255
281200Z	26.2N	150.1E	351-227	178-111
281800Z	27.2N	151.1E	348-247	204-161
290000Z	28.9N	151.9E	257-231	280-174
290600Z	30.5N	152.3E	254-161	016-278
291200Z	31.8N	152.9E	238-167	026-333

AVERAGE 24 HOUR ERROR 180 MI
AVERAGE 48 HOUR ERROR 222 MI


TYPHOON ORA
23-29 OCTOBER 1963
24HR FORECAST POSITS
LEGEND
0---24HR FORECAST POSITS
6HR BEST TRACK POSITS
29/12Z
29/00Z
28/00Z
27/00Z
26/00Z
25/00Z
24/00Z
23/12Z
K(-10)
M(-12)
Y(+12)
142°30'E
157°30'E
VLADIVOSTOK
TOKYO
OKINAWA
CHICHI JIMA
IWO JIMA
MIDWAY I
WAKE I
SAIPAN
GUAM
YAP
ULITHI
ENIWETOK ATOL
RONGERIK ATOL
KWAJALEIN

TYPHOON PHYLLIS - 120600Z to 140000Z DECEMBER

I. DATA

A. Statistics

1. Calendar days of tropical warning - 2
2. Calendar days of typhoon intensity - 1¼
3. Total distance traveled during tropical warning period - 486 mi.

B. Characteristics as a typhoon

1. Minimum observed SLP - 986mb, 122245Z
2. Minimum observed 700mb height - 2940m, 122245Z
3. Max radius of SFC circulation - 210 mi
4. Max surface winds - 75 kts

II. DEVELOPMENT

A. Initial impetus - Juxtaposition of long wave trough with subsequent fracture. Outdraft at 200mb level moved over surface vortex.

B. Initial surface vortex

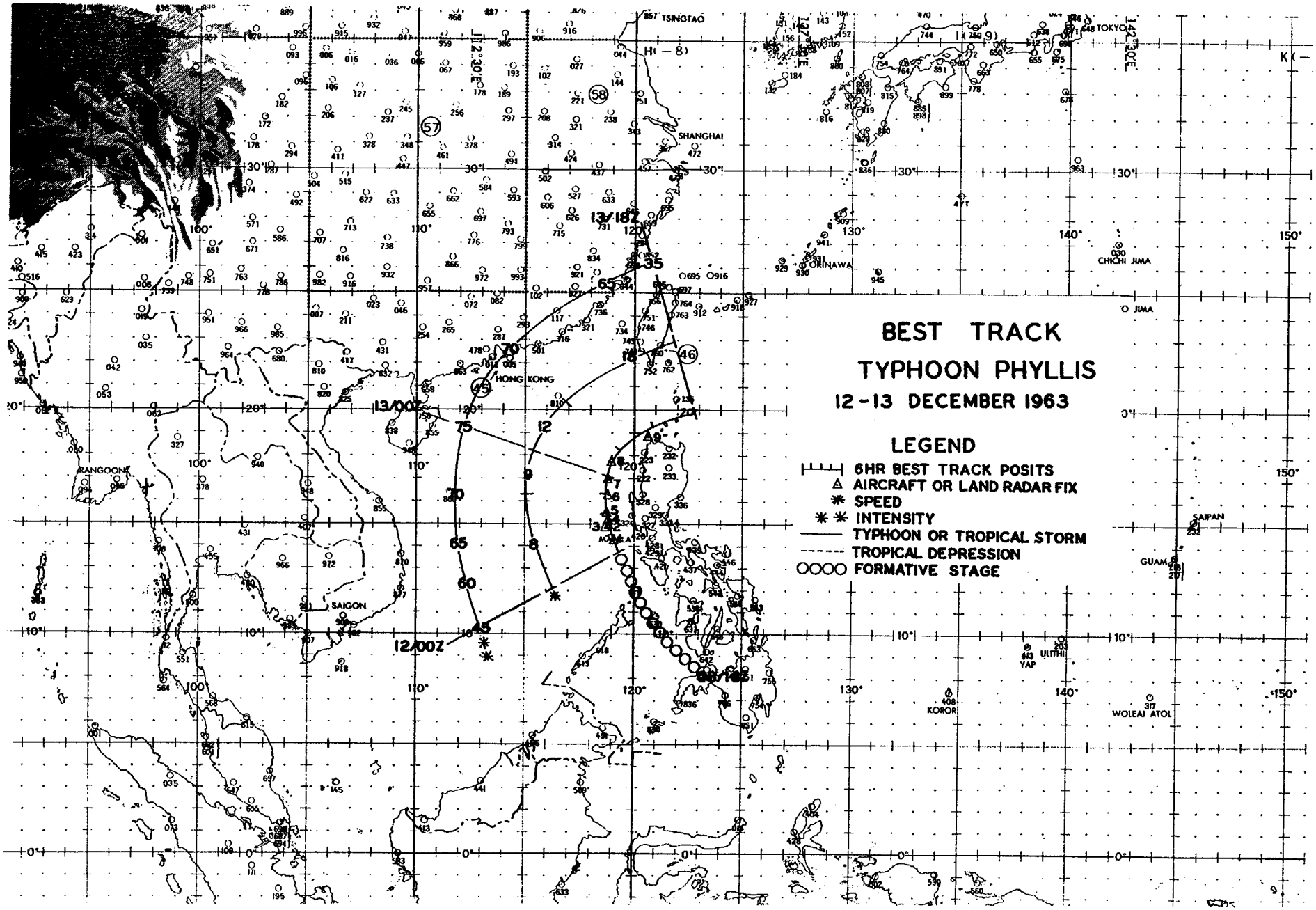
1. Junction vortex at 081800Z
2. Surface pressure less than 1010mb

C. Zenith flow at 200mb

1. Relative position surface vortex - Center of outdraft.
2. Wind direction over vortex - variable

III. FINAL DISPOSITION

A. Dissipated over water.


BEST TRACK
TYPHOON PHYLLIS
12-13 DECEMBER 1963
LEGEND
6HR BEST TRACK POSITS
AIRCRAFT OR LAND RADAR FIX
SPEED
INTENSITY
TYPHOON OR TROPICAL STORM
TROPICAL DEPRESSION
FORMATIVE STAGE
TSINGTAO
SHANGHAI
HONG KONG
OKINAWA
CHICHI JIMA
O JIMA
TOKYO
RANGOON
SAIGON
MANILA
SAIPAN
GUAM
YAP
ULITHI
KOROR
WOLEAI ATOL
13/18Z
13/00Z
12/00Z

LAND RADAR AND AIRCRAFT FIXES - TYPHOON PHYLLIS

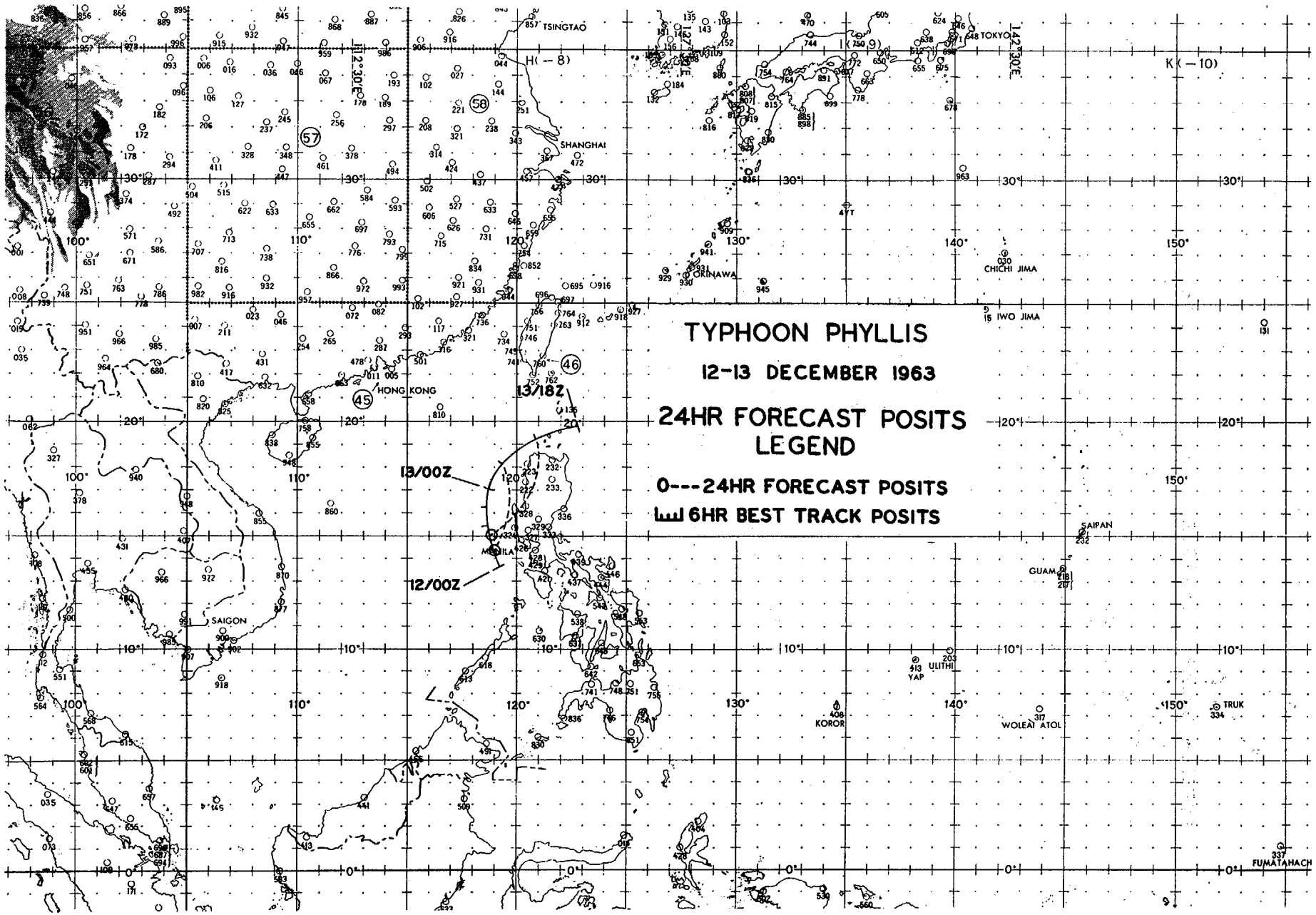
FIX NO/TIME	LAT.	LONG.	UNIT METHOD & ACCY	MAX SFC WND	MAX 700MB WND	MIN 700MB HGT	RECON MIN SLP MBS	JTWC MIN SLP *MBS	700MB T/Td (°C)	EYE CHARACTERISTICS
1 120315Z	14.2N	119.2E	SHP/RDR	-	-	-	-	-	- -	80 MI DIA
2 120640Z	15.0N	118.9E	SHP/RDR	-	-	-	-	-	- -	---
3 120815Z	14.9N	118.8E	LND/RDR	-	-	-	-	-	- -	---
4 121000Z	15.1N	118.8E	LND/RDR	-	-	-	-	-	- -	---
5 121500Z	15.4N	118.7E	SHP/RDR	-	-	-	-	-	- -	---
6 121805Z	16.3N	118.9E	LND/RDR	-	-	-	-	-	- -	---
7 122245Z	16.8N	118.9E	VW1-P-02	75	-	2940	992	986	15/09	30 MI DIA,OPEN E-N,WALL CLD 5-10 MI THICK
8 130400Z	17.7N	118.9E	56-P-½	50	50	3060	996	998	13/09	FLT LVL WND AT 500MB, CIRC 30 MI DIA,WALL CLD 15 MI THICK
9 131045Z	18.8N	120.5E	LND/RDR	75	-	-	-	-	- -	---

*Computed

TYPHOON PHYLLIS 12 DEC-14 DEC 1963
POSITION AND FORECAST VERIFICATION DATA

	STORM POSITION		24 HOUR ERROR		48 HOUR ERROR	
DTG	LAT.	LONG.	DEG.	DISTANCE	DEG.	DISTANCE
120000Z	13.8N	119.3E	------		------	
120600Z	14.6N	119.0E	------		------	
121200Z	15.4N	118.8E	------		------	
121800Z	16.2N	118.8E	------		------	
130000Z	17.0N	118.8E	------		------	
130600Z	18.1N	119.3E	184-219		------	
131200Z	19.1N	120.9E	206-264		------	
131800Z	19.8N	122.7E	------		------	

AVERAGE 24 HOUR ERROR 242 MI


TYPHOON PHYLLIS
12-13 DECEMBER 1963
24HR FORECAST POSITS
LEGEND
0---24HR FORECAST POSITS
6HR BEST TRACK POSITS
13/18Z
13/00Z
12/00Z
TSINGTAO
SHANGHAI
TOKYO
OKINAWA
CHICHI JIMA
IWO JIMA
HONG KONG
MANILA
SAIGON
SAIPAN
GUAM
YAP
ULITHI
KOROR
WOLEAI ATOL
TRUK
FUMATAHACH
H(-8)
I(-9)
K(-10)
142°30'E
112°30'E

TYPHOON SUSAN - 181200Z to 281800Z DECEMBER

I. DATA

A. Statistics

1. Calendar days of tropical warning - 10½
2. Calendar days of typhoon intensity - 8
3. Total distance traveled during tropical warning period - 3204 mi.

B. Characteristics as a typhoon

1. Minimum observed SLP - 932mb, 262200Z
2. Minimum observed 700mb height - 2478m, 262200Z
3. Max radius of SFC circulation - 500 mi
4. Max surface winds - 135 kts

II. DEVELOPMENT

A. Initial impetus - Superposition of deep polar trough with subsequent fracture.

B. Initial surface vortex

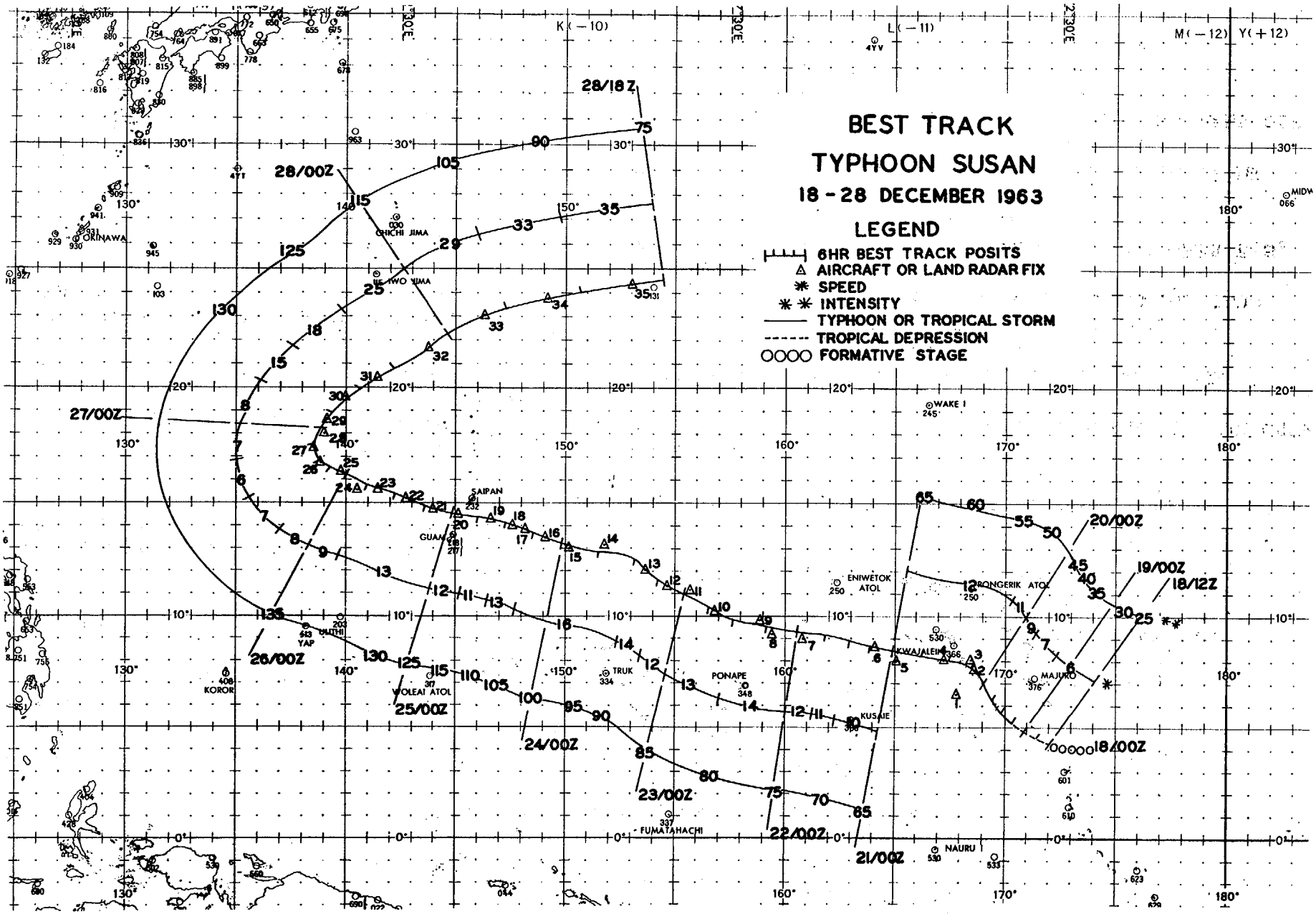
1. Junction vortex at 180000Z
2. Surface pressure less than 1007mb

C. Zenith flow at 200mb

1. Relative position surface vortex - SW quadrant of outdraft.
2. Wind direction over vortex - SE

III. FINAL DISPOSITION

A. Extratropical


BEST TRACK
TYPHOON SUSAN
18 - 28 DECEMBER 1963
LEGEND
6HR BEST TRACK POSITS
AIRCRAFT OR LAND RADAR FIX
SPEED
INTENSITY
TYPHOON OR TROPICAL STORM
TROPICAL DEPRESSION
FORMATIVE STAGE
K(−10)
L(−11)
M(−12) Y(+12)
28/18Z
28/00Z
27/00Z
26/00Z
25/00Z
24/00Z
23/00Z
22/00Z
21/00Z
20/00Z
19/00Z
18/12Z
18/00Z
OKINAWA
CHICHI JIMA
IWO JIMA
SAIPAN
GUAM
YAP
WOLEAI ATOL
KOROR
TRUK
PONAPE
KUSAIE
ENIWETOK ATOL
KWAJALEIN
RONGERIK ATOL
MAJURO
WAKE I
NAURU
FUMATAHACHI
MIDWAY

LAND RADAR AND AIRCRAFT FIXES - TYPHOON SUSAN

FIX NO/TIME	LAT.	LONG.	UNIT METHOD & ACCY	MAX SFC WND	MAX 700MB WND	MIN 700MB HGT	RECON MIN SLP MBS	JTWC MIN SLP *MBS	700MB T/Td (°C)	EYE CHARACTERISTICS
1 192155Z	06.5N	167.8E	54-P-00	-	-	-	-	-	- -	FLT LVL 225MB,25 MI DIA
2 200430Z	07.6N	168.7E	VW1-P-10	45	-	-	1001	-	- -	NO CLD CIRC
3 200835Z	08.1N	168.3E	LND/RDR	-	-	-	-	-	- -	---
4 201600Z	08.2N	167.2E	LND/RDR	-	-	-	-	-	- -	---
5 202200Z	08.0N	165.0E	56-P-05	40	40	3085	1004	1004	11/08	NO SHAPE OR WALL CLDS
6 210410Z	08.6N	164.2E	56-P-03	45	40	3045	982	996	16/-	CIRC,CLSD
7 212230Z	09.0N	160.9E	56-P-01	50	52	3060	-	998	14/07	NO VISUAL WALL CLD,NO RDR CNTR
8 220419Z	09.2N	159.4E	56-P-04	45	50	2990	986	993	12/11	CIRC 20 MI DIA,WALL CLDS 8 MI THICK
9 220930Z	09.8N	158.9E	VW1-R-10	-	-	-	-	-	- -	NO WALL CLDS OR EYE
10 221530Z	10.2N	156.9E	VW1-R-10	-	-	-	-	-	- -	RAGGED 35 MI DIA,WALL CLDS NOT DEF
11 222140Z	11.2N	155.6E	56-P-05	55	60	2954	982	987	14/11	15 MI DIA,WALL CLD OPEN E-S, 5 MI THICK
12 230400Z	11.3N	154.6E	56-P-05	65	60	2935	974	983	16/12	18 MI DIA,WALL CLD 8-12 MI THICK,RDR EYE 10 MI
13 230935Z	12.0N	153.7E	VW1-R-10	-	-	-	-	-	- -	DIFFUSE 50 MI DIA,NO WALL CLD
14 231535Z	13.1N	151.8E	VW1-R-05	-	-	-	-	-	- -	CIRC 52 MI DIA
15 232200Z	12.9N	150.2E	56-P-40	75	-	2902	983	983	12/12	CIRC 40 MI DIA

*Computed

LAND RADAR AND AIRCRAFT FIXES - TYPHOON SUSAN (CONT'D)

FIX NO/TIME	LAT.	LONG.	UNIT METHOD & ACCY	MAX SFC WND	MAX 700MB WND	MIN 700MB HGT	RECON MIN SLP MBS	JTWC MIN SLP *MBS	700MB T/Td (°C)	EYE CHARACTERISTICS
16 240300Z	13.6N	149.1E	56-P-05	110	70	2838	970	974	14/12	OVAL N-S,30X20 MI
17 240730Z	13.8N	148.1E	VW1-P-05	120	-	-	968	-	- -	CIRC 22 MI DIA,FLT LVL 600FT
18 241030Z	14.0N	147.5E	VW1-R- -	-	-	-	-	-	- -	---
19 241530Z	14.2N	146.6E	VW1-R-03	-	-	-	-	-	- -	OVAL NW-SE,30X27 MI,WELL DEF
20 242200Z	14.5N	145.2E	56-P-00	120	107	2643	942	948	18/14	ELLIP E-W,17X15 MI, WALL CLD 5 MI THICK
21 250354Z	14.8N	144.0E	56-P-01	120	78	2597	938	946	15/14	OVAL WNW-ESE,25X15 MI
22 250930Z	15.2N	142.8E	VW1-R-05	-	-	-	-	-	- -	CIRC 42 MI DIA,WALL CLDS S-NW 8 MI THICK
23 251530Z	15.6N	141.4E	VW1-R-05	-	-	-	-	-	- -	WALL CLD SW SEMI 10 MI THICK, 2ND WALL CLD CIRC 54 MI DIA, 15-25 MI THICK
24 252200Z	15.6N	140.5E	56-P-44	75	105	2737	970	964	13/12	NO RDR EYE,RAIN-CLDS IN EYE
25 260350Z	16.3N	139.8E	56-P-05	100	120	2563	945	940	21/17	CIRC 30 MI DIA
26 261000Z	16.8N	138.8E	VW1-R-05	-	-	-	-	-	- -	ROUND 37 MI DIA
27 261530Z	17.4N	138.5E	VW1-R-10	-	-	-	-	-	- -	OVAL NNW-SSE,40X30 MI,WALL CLD 7 MI THICK
28 262200Z	18.0N	139.0E	56-P-03	-	100	2478	938	932	18/16	CIRC
29 270400Z	18.5N	139.1E	56-P-05	100	100	2496	934	936	15/15	CIRC 40 MI DIA
30 271000Z	19.7N	140.0E	VW1-R-02	-	-	-	-	-	- -	ELLIP NE-SW,40X30 MI

*Computed

LAND RADAR AND AIRCRAFT FIXES - TYPHOON SUSAN (CONT'D)

FIX NO/TIME	LAT.	LONG.	UNIT METHOD & ACCY	MAX SFC WND	MAX 700MB WND	MIN 700MB HGT	RECON MIN SLP MBS	JTWC MIN SLP *MBS	700MB T/Td (°C)	EYE CHARACTERISTICS
31 271530Z	20.4N	141.3E	VW1-R-05	-	-	-	-	-	- -	ELLIP N-S, 24X19 MI
32 272200Z	21.7N	143.7E	56-P-03	115	110	2646	952	952	18/18	CIRC 25 MI DIA
33 280400Z	23.1N	146.1E	56-P-04	125	115	2661	936	954	17/17	RAGGED, CIRC 10 MI DIA, RAIN-CLDS IN EYE
34 280930Z	23.7N	149.2E	VW1-R-10	-	-	-	-	-	- -	CIRC 20 MI DIA, OPEN E & SE
35 281550Z	24.4N	153.0E	VW1-R-03	-	-	-	-	-	- -	RAGGED, CIRC 45 MI DIA, NO WALL CLDS

*Computed

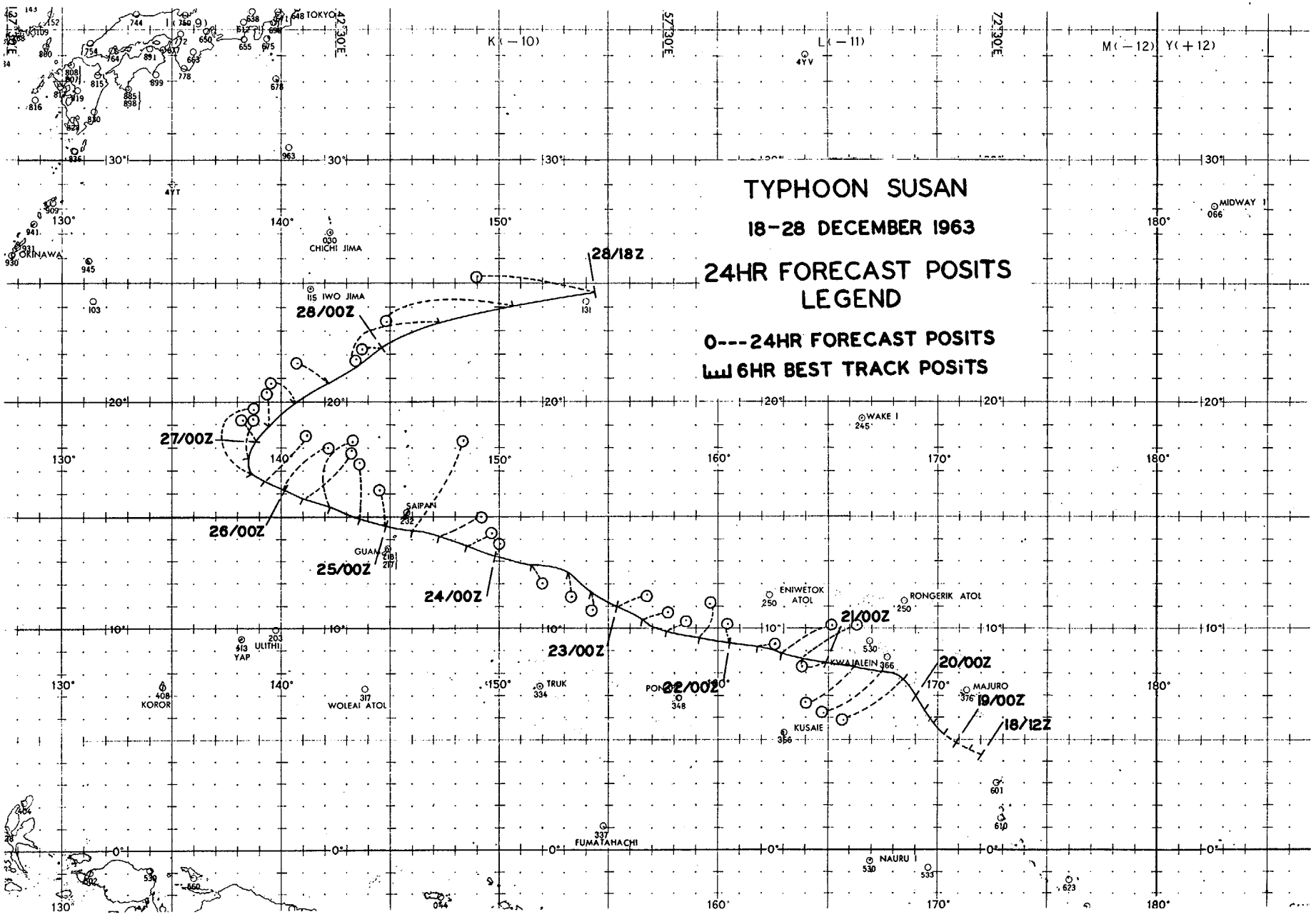
TYPHOON SUSAN 18 DEC-28 DEC 1963
POSITION AND FORECAST VERIFICATION DATA

DTG	STORM POSITION LAT.	LONG.	24 HOUR ERROR DEG. DISTANCE	48 HOUR ERROR DEG. DISTANCE
181200Z	04.3N	172.0E	------	------
181800Z	04.6N	171.5E	------	------
190000Z	04.8N	170.9E	------	------
190600Z	05.2N	170.3E	------	------
191200Z	05.7N	169.8E	------	------
191800Z	06.3N	169.5E	------	------
200000Z	07.0N	169.0E	------	------
200600Z	07.8N	168.5E	237-208	------
201200Z	08.0N	167.3E	232-172	------
201800Z	08.1N	166.1E	228-121	------
210000Z	08.4N	164.8E	266-65	------
210600Z	08.7N	163.9E	059-166	------
211200Z	08.9N	162.9E	060-153	------
211800Z	09.1N	161.8E	085-55	------
220000Z	09.2N	160.5E	346-58	332-55
220600Z	09.5N	159.1E	018-115	062-135
221200Z	09.9N	157.7E	054-55	067-150
221800Z	10.4N	156.4E	070-78	055-114
230000Z	11.0N	155.3E	074-94	031-104
230600Z	11.6N	154.2E	192-47	034-147
231200Z	12.4N	153.1E	174-63	069-95
231800Z	12.8N	151.4E	145-59	077-167
240000Z	13.1N	149.8E	056-80	072-212
240600Z	13.8N	148.4E	067-78	097-109
241200Z	14.1N	147.1E	066-130	079-145
241800Z	14.3N	146.0E	031-268	066-199
250000Z	14.6N	144.8E	348-98	043-303
250600Z	14.9N	143.5E	359-136	050-360
251200Z	15.4N	142.2E	016-176	057-430
251800Z	15.8N	140.9E	045-174	055-740

TYPHOON SUSAN 18 DEC-28 DEC 1963
POSITION AND FORECAST VERIFICATION DATA (CONT'D)

DTG	STORM POSITION LAT.	LONG	24 HOUR ERROR DEG. DISTANCE	48 HOUR ERROR DEG. DISTANCE
260000Z	16.2N	140.1E	046-158	033-318
260600Z	16.5N	139.3E	042-159	038-410
261200Z	16.9N	138.7E	360-164	055-547
261800Z	17.5N	138.6E	003-113	058-510
270000Z	18.2N	138.9E	228-73	060-445
270600Z	18.9N	139.3E	360-83	063-395
271200Z	20.0N	140.4E	308-65	001-90
271800Z	20.8N	142.1E	297-96	014-145
280000Z	22.2N	144.4E	271-40	292-126
280600Z	23.4N	147.2E	248-235	280-209
281200Z	24.0N	150.6E	262-330	276-345
281800Z	24.6N	154.4E	278-295	279-448

AVERAGE 24 HOUR ERROR 127 MI
AVERAGE 48 HOUR ERROR 266 MI


TYPHOON SUSAN
18-28 DECEMBER 1963
24HR FORECAST POSITS
LEGEND
0---24HR FORECAST POSITS
6HR BEST TRACK POSITS
28/18Z
28/00Z
27/00Z
26/00Z
25/00Z
24/00Z
23/00Z
22/00Z
21/00Z
20/00Z
19/00Z
18/12Z
TOKYO
CHICHI JIMA
IWO JIMA
OKINAWA
SAIPAN
GUAM
YAP
ULITHI
WOLEAI ATOL
KOROR
TRUK
PONAPE
ENIWETOK ATOL
RONGERIK ATOL
KWAJALEIN
MAJURO
KUSAIE
WAKE I
MIDWAY I
FUMATAHACHI
NAURU I
K(-10)
L(-11)
M(-12)
Y(+12)

APPENDIX A

APPREVIATIONS AND DEFINITIONS

1. Certain words that appear frequently in this report are abbreviated as follows:

CINCPAC	Commander in Chief, Pacific
CINCPACAF	Commander in Chief, Pacific Air Force
CIRC	circular
CLD(S)	cloud(s)
CNTR	center
DEF	defined
DEG	degree
DIA	diameter
DIV	divergence
ELLIP	elliptical
ELONG	elongated
FAFWC	Fuchu Air Force Weather Central, Fuchu Air Station, Japan
54WRS	54th Weather Reconnaissance Squadron, Andersen Air Force Base, Guam, M. I.
56WRS	56th Weather Reconnaissance Squadron, Yokota Air Base, Japan
FNWF	Fleet Numerical Weather Facility, Monterey, California
FT, ft	feet
FWC/JTWC	Fleet Weather Central/Joint Typhoon Warning Center, Guam, M. I.
INDEF	indefinite
ITC	Intertropical Zone of Convergence
JMA	Japan Meteorological Agency
JMG/PACOM	Joint Meteorological Group, Pacific Command
K(KILO) Time	Mariana Islands local time
KT(S), kt(s)	knot(s)
MI, mi	nautical miles
MB(S), mb(s)	millibar(s)
MPT	Mid-Pacific trough
NA	not applicable
NMC	National Meteorological Center (formerly JNWP, Joint Numerical Weather Prediction)
NWSC	National Weather Satellite Center (formerly METSATLAB)
ORIEN	oriented

QUAD(S)	quadrant(s)
RAD	radius
SFC	surface
θe	Equivalent Potential Temperature
VW-1	Airborne Early Warning Squadron One, NAS Agana, Guam
WESTPAC	Western North Pacific Area
WND	wind
Z(ZULU) Time	Greenwich mean time

2. Points of the compass are abbreviated: N, SE, WNW, etc.

3. Latitude and longitude are abbreviated: 30N 140E, etc.

4. The following define and clarify certain words and phrases that appear in the tables, "Land Radar and Aircraft Fixes," Chapter IV.

A. FIX NO. - This number corresponds to the number of the fix plotted on the "Best Track Chart."

B. TIME - The date-time group of the fix

C. LAT. - Latitude of the fix

D. LONG. - Longitude of the fix.

E. UNIT, METHOD & ACCY -

(1) UNIT - The unit that made the fix: 54 - 54WRS, 56 - 56WRS, 315 - 315th Air Division

(2) METHOD - The method used to make the fix: P - penetration, R - radar, T - triangulation, LND/RDR - land radar

(3) ACCY - The estimated accuracy of the fix in nautical miles

F. RECON MIN SLP MB - The minimum sea level pressure in millibars reported by aircraft.

G. JTWC MIN SLP MB - The minimum sea level pressure in millibars computed by JTWC

H. MAX SFC WND - The maximum observed surface wind in knots

I. MIN 700MB HGT - The minimum 700mb height in feet

J. MAX 700MB WND - The maximum 700mb wind in knots

K. 700MB T/Td (°C) - The maximum 700mb temperature and dewpoint in degrees centigrade

5. Synoptic tracks in the JTWC tropic area are:

A. Round Robin to two coordinates and flight time

10 plus hours with synoptic reports normally every hour. Legs are flown at 1500 ft, 700mb and 500mb at JTWC request.

B. TRANSPAC diversion to one coordinate not less than 5 DEG off course. Flight altitude will normally be 700mb or 500mb.

6. An investigation is the traverse of a reconnaissance aircraft over an area containing a suspected circulation that has been assigned a cyclone number.

7. A fix is the determination of the position of a tropical cyclone at a precise time. Generally, the term "fix" is used when the position of the cyclone has been determined by a reconnaissance aircraft penetration or by airborne, land or ship radar. In the case of a reconnaissance aircraft penetration, the actual fix may be based on one or all of the following: visual observation, radar, surface pressure, surface or upper level winds, constant pressure height, and temperature/dew point.

8. A sortie is defined as a flight by one aircraft with one or more objectives; i.e., it may make one or more fixes and/or one or more investigations on one or more tropical cyclones.

9. The term "tropical cyclone" or "cyclone" as used in this publication has two definitions dependent upon usage.

A. "Tropical cyclone" or "cyclone" is used to describe a suspected tropical cyclonic circulation which appears capable of intensification, and to which has been assigned a "cyclone number" for the purposes of reconnaissance and to assure that records regarding it are not confused with those of another circulation.

B. "Tropical cyclone" or "cyclone" is used in the general sense, e.g., "Typhoon JOAN was the most intense tropical cyclone of 1959," or "Tropical cyclones more frequently develop during August and September."

(1) A "Tropical Depression" as used by JTWC is a tropical cyclone with a confirmed cyclonic circulation for which warnings are being issued and whose surface wind speeds do not exceed 33 kts. Tropical depressions are numbered and often abbreviated TD.

(2) A "Tropical Storm" is a tropical cyclone in which the maximum surface wind speed is no more than 63 kts

but greater than 33 kts in warning status. Tropical storms are named and sometimes abbreviated TS.

(3) A "Typhoon" is a tropical cyclone located W of 180 DEG longitude in which the maximum surface wind speed is 64 kts or greater in warning status. Typhoons are named.

10. A "Stidd Diagram" or "checkerboard" is a chart on which a continuous plot of surface observations is maintained for a series of stations. The observations for each individual station are plotted in either a horizontal or vertical line.

11. Recurvature - that point at which the cyclone ceases movement to the W of N and commences moving to the E of N.

12. Vortices:

A. Embedded vortex of easterly wave - closed cyclonic circulation along easterly wave and separated from ITC.

B. Junction vortex - closed cyclonic circulation at the junction of easterly wave and ITC.

C. Embedded vortex of ITC - closed cyclonic circulation along ITC with absence of easterly wave

APPENDIX B

LIST OF ILLUSTRATIONS, CHARTS AND DATA

Operational

SEAY Graph ---------- 10
Decay Graph ---------- 12
500mb Long Wave Analysis & 48 Hour Prog ---------- 14
Typhoon Reconnaissance Data ---------- 15
Time Cross Section ---------- 16
Space Cross Section ---------- 17
Checkerboard/Stidd Diagram ---------- 18
Gradient Wind Chart ---------- 19

Evaluation of Observational and Forecast Techniques

1963 Aircraft Reconnaissance Data ---------- 28
Typhoon Tracks, 1953-1963 ---------- 31

Summary of Tropical Cyclones of 1963

Comparative Western Pacific Tropical Cyclone Data -- 49
Land areas affected by Typhoons during 1963 -------- 51
Forecast Verification Error, 1950-1963 ---------- 52
1963 Typhoon Forecast Vector Errors ---------- 53
1963 Typhoon Forecast Errors (in terms of closest distance to best track) ---------- 54
Typhoon Data Summaries ---------- 55
1963 Typhoon Tracks ---------- 58
Typhoon Distribution by Month ---------- 60
Comparison of Circulation Areas ---------- 61
LOLA and MAMIE Fujiwhara Effect ---------- 62
Tropical Cyclones of 1963 ---------- 63
Tropical Storms and Tropical Depressions, 1963 ----- 65

OLIVE

Best Track ---------- 74
Radar and Reconnaissance Fixes ---------- 75
Position and Forecast Verification Data ---------- 79
24 Hour Forecast Posits ---------- 81

POLLY

Best Track ---------- 83
Radar and Reconnaissance Fixes ---------- 84
Position and Forecast Verification Data ---------- 86
24 Hour Forecast Posits ---------- 87

SHIRLEY
Best Track ---------- 89
Radar and Reconnaissance Fixes ---------- 90
Position and Forecast Verification Data ---------- 93
24 Hour Forecast Posits ---------- 95

TRIX
Best Track ---------- 97
Radar and Reconnaissance Fixes ---------- 98
Position and Forecast Verification Data ---------- 99
24 Hour Forecast Posits ---------- 100

WENDY
Best Track ---------- 102
Radar and Reconnaissance Fixes ---------- 103
Position and Forecast Verification Data ---------- 106
24 Hour Forecast Posits ---------- 108

AGNES
Best Track ---------- 110
Radar and Reconnaissance Fixes ---------- 111
Position and Forecast Verification Data ---------- 112
24 Hour Forecast Posits ---------- 113

BESS
Best Track ---------- 115
Best Track Blowup ---------- 116
Radar and Reconnaissance Fixes ---------- 117
Position and Forecast Verification Data ---------- 121
24 Hour Forecast Posits ---------- 123

CARMEN
Best Track ---------- 125
Radar and Reconnaissance Fixes ---------- 126
Position and Forecast Verification Data ---------- 128
24 Hour Forecast Posits ---------- 130

DELLA
Best Track ---------- 132
Radar and Reconnaissance Fixes ---------- 133
Position and Forecast Verification Data ---------- 135
24 Hour Forecast Posits ---------- 136

ELAINE
Best Track ---------- 138
Radar and Reconnaissance Fixes ---------- 139
Position and Forecast Verification Data ---------- 140
24 Hour Forecast Posits ---------- 141

FAYE
Best Track ---------- 143
Radar and Reconnaissance Fixes ---------- 144
Position and Forecast Verification Data ---------- 146
24 Hour Forecast Posits ---------- 147

GLORIA
Best Track ---------- 149
Best Track Blowup ---------- 150
Radar and Reconnaissance Fixes ---------- 151
Position and Forecast Verification Data ---------- 153
24 Hour Forecast Posits ---------- 155
24 Hour Forecast Posits Blowup ---------- 156

JUDY
Best Track ---------- 158
Radar and Reconnaissance Fixes ---------- 159
Position and Forecast Verification Data ---------- 161
24 Hour Forecast Posits ---------- 162

KIT
Best Track ---------- 164
Radar and Reconnaissance Fixes ---------- 165
Position and Forecast Verification Data ---------- 167
24 Hour Forecast Posits ---------- 168

LOLA
Best Track ---------- 170
Best Track Blowup ---------- 171
Radar and Reconnaissance Fixes ---------- 172
Position and Forecast Verification Data ---------- 175
24 Hour Forecast Posits ---------- 177
24 Hour Forecast Posits Blowup ---------- 178
Fujiwhara Effect ---------- 62

MAMIE
Best Track ---------- 180
Radar and Reconnaissance Fixes ---------- 181

MAMIE (cont'd)
Position and Forecast Verification Data ---------- 182
24 Hour Forecast Posits ---------- 183
Fujiwhara Effect ---------- 62

ORA
Best Track ---------- 185
Radar and Reconnaissance Fixes ---------- 186
Position and Forecast Verification Data ---------- 187
24 Hour Forecast Posits ---------- 188

PHYLLIS
Best Track ---------- 190
Radar and Reconnaissance Fixes ---------- 191
Position and Forecast Verification Data ---------- 192
24 Hour Forecast Posits ---------- 193

SUSAN
Best Track ---------- 195
Radar and Reconnaissance Fixes ---------- 196
Position and Forecast Verification Data ---------- 199
24 Hour Forecast Posits ---------- 201