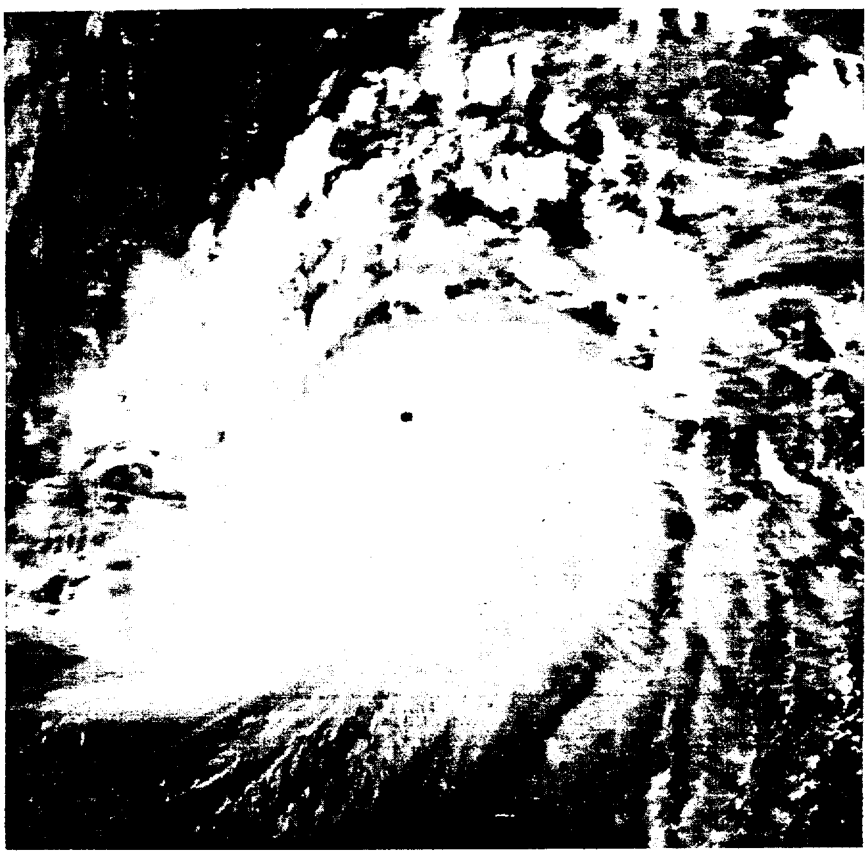
"BEST TRACK" _ DEAN SPENCER

ANNUAL TYPHOON Report



Paul R

1973

NAVAL WEATHER SERVICE

AIR WEATHER SERVICE

FLEET WEATHER CENTRAL/JOINT TYPHOON WARNING CENTER

Guam, Mariana Islands

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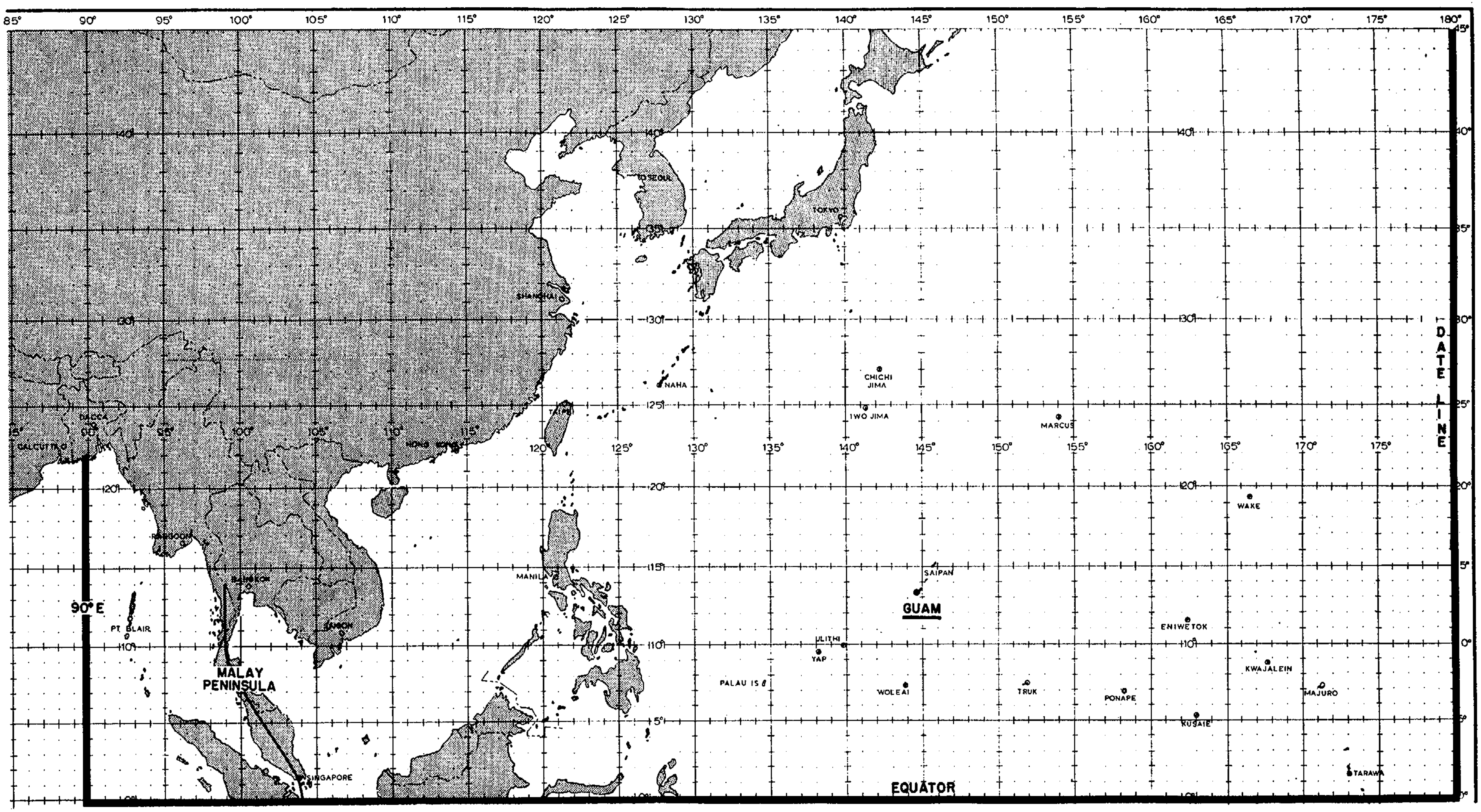

Area of Responsibility - Joint Typhoon Warning Center, Guam

Primary (180° West to Malay Peninsula) Secondary (Malay Peninsula West to 90°E)

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JOINT TYPHOON WARNING CENTER
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1973
ANNUAL TYPHOON REPORT

FOREWORD

The body of this annual report summarizes western North Pacific tropical cyclones. Annex A summarizes tropical cyclones in the central North Pacific from 180° eastward to 140°W, and Annex B summarizes tropical cyclones in the Bay of Bengal. The eastern North Pacific tropical cyclone summary has been discontinued beginning with the 1973 season; the U.S. National Weather Service will assume responsibility for publication of this summary in Mariner's Weather Log and Pilot Charts.

Fleet Weather Central/Joint Typhoon Warning Center (FLEWEACEN/JTWC), Guam has the responsibility to:

1. Provide warnings to U.S. Government agencies for all tropical cyclones north of the equator and west of 180° longitude to the coast of Asia and the Malay Peninsula;

2. Provide warnings for the area north of the equator from the Malay Peninsula west to 90°E;

3. Determine tropical cyclone reconnaissance requirements and assign priorities;

4. Conduct investigative and post-analysis programs including preparation of the Annual Typhoon Report; and

5. Conduct tropical cyclone analysis and forecasting research.

Asian Tactical Forecast Center, Fuchu (formerly Air Force Asian Weather Central), coordinating with the Naval Weather Service Environmental Detachment, Yokosuka, is designated as the alternate JTWC in case of the incapacitation of FLEWEACEN/JTWC Guam.

The JTWC is an integral part of FLEWEACEN Guam and is manned by four officers and five enlisted men each from the Navy and Air Force. The senior Air Force officer is designated as Director, JTWC.

The western North Pacific Tropical Cyclone Warning System consists of the Joint Typhoon Warning Center and the U.S. Air Force 54th Weather Reconnaissance Squadron stationed at Andersen Air Force Base, Guam.

The Central Pacific Hurricane Center, Honolulu, is responsible for the area from 180° eastward to 140°W and north of the equator. Warnings are issued in coordination with FLEWEACEN Pearl Harbor and the Air Force Central Pacific Forecast Center, Hickam Air Force Base, Hawaii.

CINCPACFLT, CINCUSARPAC, and CINCPACAF are responsible for further dissemination and, if necessary, local modification of tropical cyclone warnings to U.S. military agencies.

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CHAPTER I — OPERATIONAL PROCEDURES

1. GENERAL

Services provided by the Joint Typhoon Warning Center (JTWC) include forecasts of tropical cyclone formation, location, intensity, direction and speed of movement, and horizontal extent of critical wind speeds. This information was disseminated in 1973 by: (1) Tropical Cyclone Formation Alerts issued when formation of a tropical cyclone was anticipated; (2) Tropical Cyclone Warnings issued four times daily whenever a significant tropical cyclone was observed in the JTWC primary area; and (3) Tropical Cyclone Warnings issued twice daily whenever a significant tropical cyclone was observed in the JTWC secondary area.

FLEWEACEN Guam provides manual and computerized meteorological/oceanographic products for the JTWC. Communications support is furnished by the Nimitz Hill Message Center of the Naval Communications Station, Guam.

2. ANALYSES AND DATA SOURCES

a. FLEWEACEN GUAM ANALYSES:

(1) Surface mercator analysis, Northern and Southern Hemispheres, western Pacific and Indian Ocean areas; 0000Z, 0600Z, 1200Z, and 1800Z.

(2) Gradient streamline analysis of Asia and the western Pacific; 0000Z and 1200Z.

(3) Surface meso-analysis of the South China Sea region; 0000Z and 1200Z.

(4) Composite surface analysis of the Indian Ocean area; twice daily.

(5) Sea surface temperature charts; daily.

b. JTWC ANALYSES:

(1) Gradient level (3,000 feet) streamline analysis (south of 20°N) and isobaric analysis (north of 20°N); 0000Z and 1200Z.

(2) 700-mb and 500-mb, contour and streamline analysis; 0000Z and 1200Z.

(3) A composite upper tropospheric streamline analysis utilizing rawinsonde data from 250-mb to 150-mb and AIREPS at or above 29,000 feet; 0000Z and 1200Z.

(4) Reconnaissance data. Observations from weather reconnaissance aircraft are plotted on large-scale sectional charts.

(5) Time cross sections of selected tropical stations.

(6) Additional and more frequent sectional analyses similar to those above during periods of tropical cyclone activity.

c. SATELLITE DATA:

Satellite data, especially DMSP (formerly DAPP) satellite imagery, played a major role in the early detection of tropical cyclones in 1973. This aspect, as well as applications of satellite data to tropical cyclone tracking, is discussed in Chapter II.

d. RADAR:

Land radar reports, when available, were used for tracking tropical cyclones during the 1973 season. Once a storm moved within range of a land radar site, reports were usually received hourly. Use of radar during 1973 is treated in Chapter II.

e. COMPUTER PRODUCTS:

Use of the varian plotter by the FLEWEACEN Guam computer center during 1973 eliminated a significant portion of the JTWC hand plotting effort. Varian charts are produced routinely at synoptic times for the surface, 850-mb, 700-mb, and 500-mb levels. Additionally, a chart of the upper tropospheric circulation is produced. This chart uses 200-mb rawinsonde data and AIREPS above 33,000 feet and within six hours of the 0000Z and 1200Z synoptic times. Data not in the proper format for the computer are hand plotted on the charts. These include pibal gradient level winds, low cloud movement, and missing or late synoptic reports necessary for a detailed analysis.

In addition, the standard array of synoptic-scale computer analyses and prognostic charts from the Fleet Numerical Weather Central at Monterey, California are available.

JTWC utilized extensively the FLEWEACEN Guam computer center for objective typhoon forecasts and for statistical post analysis.

3. FORECAST AIDS

a. CLIMATOLOGY:

Various climatological publications listed in the Annual Typhoon Report, 1972 (FWC/JTWC) were utilized in addition to those received recently which include:

(1) Tropical Cyclone Climatology for the China Seas and Western Pacific from 1884 to 1970 (Royal Observatory, Hong Kong, 1972).

(2) North Pacific Tropical Cyclone Vector Mean Charts (Crutcher, H. L., 1973).

(3) North Indian Tropical Cyclone Vector Mean Charts (Crutcher, H. L. and Nicodemus, M. L., 1973).

(4) A Climatology of Typhoon and Tropical Storm Tracks Arranged by Month and Point of Origin (Ocean Data Systems, Incorporated, 1973).

(5) Tropical Cyclones of the North Indian Ocean (Sadler and Gidley, 1973) ENVPREDRSCHFAC Tech Paper No. 2-73.

(6) The Typhoon Analog Computer Program (TYFOON) described in the 1972 Typhoon Analog Program (TYFOON-72).

b. EXTRAPOLATION:

Extrapolation of storm movement using 12-hour mean speed and direction was the most reliable objective method for both 24- and 48-hour forecasts. Forecasts are determined by simple linear extrapolation using the 12-hour old best track position and the current warning position.

c. OBJECTIVE TECHNIQUES:

During 1973, the following objective forecasting methods were employed:

(1) ARAKAWA - Regression forecasts derived from surface pressure grid values.

(2) MOHATT (Modified HATRACK) - Steering by geostrophic winds derived from smoothed height fields at 850-mb and 700-mb levels modified by 12-hour history inputs.

(3) TYMOD - Program selects best steering level using global band upper air fields (GBUA) from FLENUMWEACEN Monterey modified by 12- or 24-hour history inputs.

(4) TYFOON - Analog weighted mean track.

4. FORECASTING PROCEDURES

a. TRACK FORECASTING:

An initial track based on persistence blended subjectively with climatology is developed for a 3-day period. This initial track is subjectively modified by the following:

(1) Recent steering is evaluated by considering the latest upper air analyses as representative of the average upper air flow over the past 24 hours. (The latest upper air analyses are about 12 hours old, thus roughly representing the mid-point of the last 24-hour time interval). By this technique, actual past 24-hour movement serves to indicate the best steering level as well as the effectiveness of steering.

(2) Objective techniques are considered, with the techniques being ranked according to their past performance on similar storms.

(3) Twenty-four hour height change analyses are evaluated for forecast track/speed changes (Hoover, Devices for Forecasting Movement of Hurricances, Manuscript of U.S. Weather Bureau, 1957).

(4) The prospects of recurvature are evaluated for all westward moving storms. The basic requisites for this evaluation are accurate continuity on mid-latitude troughs and numerical progs to indicate changes in amplitude or movement. Relative position and strength of the subtropical ridge and northward tendency due to internal forces are also important considerations.

(5) Finally, a check is made against climatology to ascertain the likelihood of the forecast. If the forecast track is climatologically unusual, a reappraisal of the forecast rationale is conducted and adjustment made if warranted.

b. INTENSITY FORECASTING:

For intensity forecasting, heavy reliance is placed on short term trends, climatology, and the satellite interpretation model developed by Mr. Vernon Dvorak of the National Environmental Satellite Service. After these initial inputs, further factors considered are upper tropospheric evacuation and possible terrain influence.

5. WARNINGS

Tropical cyclone warnings are numbered sequentially. If warnings are discontinued and the storm reintensifies, as Typhoons Dot, Ellen, and Patsy did this year, warnings are numbered consecutively from the last warning issued. Amended or corrected warnings are given the same number as the warnings they modify plus a sequential alphabetical designator to indicate it is an amended warning. Forecast positions are issued at 0000Z, 0600Z, 1200Z, and 1800Z. The forecast periods are 12-hr and 24-hr for tropical depressions and 12-hr, 24-hr, 48-hr, and 72-hr for typhoons and tropical storms.

Forecast periods are stated with respect to warning time. Thus, a 24-hour forecast verified 26 1/2 hour after the aircraft fix data, 30 hours after the latest surface synoptic chart, and 30 or 36 hours after the latest upper air charts.

Warning forecast positions are verified against the corresponding post analysis "best track" positions. A summary of results from 1973 is presented in Chapter V.

6. PROGNOSTIC REASONING MESSAGE

Whenever warnings on typhoons and tropical storms are being issued, a prognostic reasoning message is released at 0000Z and 1200Z. This message is intended to provide the field meteorologist with the reasoning behind the latest JTWC forecasts.

7. TROPICAL WEATHER SUMMARY

This message is issued daily from 1 May through 31 December and otherwise when tropical cyclone formation is forecast or observed. It is issued at 0600Z and describes the location, intensity, and likelihood of development of all tropical low pressure areas including upper tropospheric lows and significant cloud masses detected by satellite.

8. TROPICAL CYCLONE FORMATION ALERT

Alerts are issued when the formation of a tropical cyclone is anticipated. These messages are issued as required and are valid for up to 24 hours unless cancelled, superseded, or extended.

CHAPTER II — RECONNAISSANCE & COMMUNICATION

1. GENERAL

The Tropical Cyclone Warning Service depends on reconnaissance to fix the location and determine the intensity of tropical cyclones. Due to the vastness of the warning area and the scarcity of reporting stations, land and ship reports are not sufficient for these determinations. In the past, aircraft reconnaissance was used almost exclusively to determine position and intensity. With the increasing satellite capability during the last several years, satellite derived data have assumed greater importance. During the past season Defense Meteorological Satellite Program (DMSP) data were used for positioning and intensity estimates approximately one-fourth of the time.

2. RECONNAISSANCE RESPONSIBILITY AND SCHEDULING

Aircraft weather reconnaissance is performed in the JTWC area of responsibility by the 54th Weather Reconnaissance Squadron (54 WRS). The squadron, equipped with nine WC-130 aircraft, is located at Andersen Air Force Base, Guam. The JTWC reconnaissance requirements are sent daily to the Tropical Cyclone Reconnaissance Coordinator. These requirements include areas to be investigated, forecast position of cyclones to be fixed, and standard synoptic tracks to be flown.

Four fixes per day, at six-hourly intervals, are required (CINCPACINST 3140.1L) on all significant tropical cyclones in the JTWC primary area of responsibility (see inside front cover). Two fixes per day are required in the secondary area. During the past season, extensive use was made of the Selective Reconnaissance Program (SRP) to fulfill these requirements.

The SRP was implemented in 1972 to alleviate pressure on overtaxed aircraft reconnaissance assets. The SRP attempts to optimize the entire reconnaissance system by using each reconnaissance platform (aircraft, satellite, and surface radar) under optimum conditions whenever possible. Various factors are considered in selecting which reconnaissance platform to use for any warning, e.g., the cyclone's location and stage of development, the DMSP satellite times and areal coverage, availability of land radar reports, the cyclone's threat to specific U.S. interests, aircraft operational limitations (e.g., one fix versus two fix missions), etc.

Aircraft reconnaissance continues to be the best method for determining tropical cyclone position, intensity, and structure (i.e., radius of wind speeds of various intensities). Only the aircraft can provide direct measurements of height, temperature, and wind at flight altitude, sea level pressure, and other parameters. The aircraft also provides much greater flexibility in time and space compared to the other platforms. DMSP satellites provide day and night coverage of the JTWC area of responsibility. DMSP satellite imagery provides estimates of cyclone positions and, for daytime passes, estimates of intensities using the Dvorak technique (NOAA TECHNICAL MEMORANDUM, NESS-45). In addition, satellite data used in conjunction with conventional data can provide estimates of the radii of various wind speeds. The primary disadvantages of satellites is that the coverage is often not timely for warning purposes and the satellite provides no direct measurements of parameters closely related to tropical cyclone intensity. Land radar provides useful positioning data when tropical cyclones are located near the Republic of the Philippines, Hong Kong, Taiwan, or Japan (including the Ryukyus or other islands). It does not, however, provide measurements or estimates of tropical cyclone intensity or structure. The following sections summarize the JTWC utilization of the various reconnaissance platforms during 1973.

3. AIRCRAFT RECONNAISSANCE EVALUATION CRITERIA

The following criteria are used to evaluate aircraft reconnaissance support to the JTWC.

a. Six-Hourly fixes - To be counted as made on time, a fix must satisfy the following criteria:

(1) Made not earlier than 1/2 hour before to 1 hour after scheduled fix time.

(2) Aircraft in area requested by scheduled fix time, but unable to locate a center due to:

(a) Cyclone dissipation; or

(b) rapid acceleration of the cyclone away from the forecast position.

(3) If penetration not possible due to geographic or other flight restriction, radar fixes are acceptable.

b. Levied 6-Hourly fixes made outside the above limits are scored as follows:

(1) Early - fix made within the interval from 3 hours to 1/2 hour prior to levied fix time. No credit given for early fixes made within 1 1/2 hours of the previous fix.

(2) Late - fix made within the interval from 1 hour to 3 hours after levied fix time.

c. When 3-Hourly fixes are levied, they must satisfy the time criteria of paragraph one in order to be classified as made on time. Three-Hourly fixes made that do not meet the above criteria are classified as follows:

(1) Early - fix made within the interval from 1 1/2 hours to 1/2 hour prior to levied fix time.

(2) Late - fix made within the interval from 1 hour to 1 1/2 hours after levied fix time.

d. Fixes not meeting the criteria of paragraphs one, two, and three are scored as missed. Requirements levied with less than 24 hours notification, if missed, are counted as unfulfilled. If the squadron is in an alert posture, the fix is scored as missed vice unfulfilled.

e. Levied fix time on an "as soon as possible" fix is considered to be:

(1) Sixteen hours plus estimated time enroute after an alert aircraft and crew are levied; or

(2) Four hours plus estimated time enroute after the DTG of the message levying an ASAP fix if an aircraft and crew, previously alerted, are available for duty.

f. Investigatives - To be counted as made on time, investigatives must satisfy the following criteria:

(1) Aircraft must be within 250nm of the levied investigative point by the specified time.

(2) The specified flight level must be flown.

(3) Reconnaissance observations are required every half-hour in accordance with AWSM 105-1. Turn and mid-point winds shall be reported on each full observation when within 250nm of the investigative point.

(4) Observations are required in all quadrants unless a concentrated investigation in one or more quadrants has been specified.

(5) Specified investigative track must be flown.

(6) Aircraft must contact JTWC before terminating the investigative.

g. Investigatives not meeting the time criteria of paragraph f. will be classified as follows:

(1) Late - aircraft is within 250nm of the investigative point after the specified time, but prior to the specified time plus 2 hours.

(2) Missed - aircraft fails to be within 250nm of the investigative point by the specified time plus 2 hours.

h. Requirements levied as "resources permitting" are not evaluated.

4. AIRCRAFT RECONNAISSANCE SUMMARY

There were 362 required six-hourly fixes in 1973, representing a record low since establishment of the JTWC. Of the 362 required fixes, 227 or 62.4% were levied upon aircraft. The remaining required fixes were satisfied by satellite, radar, extrapolation, or synoptic data. The SRP made it possible, when there was a choice between aircraft, radar, or satellite, to reduce the aircraft levy. By employing SRP, 45 fixes were levied upon satellite or radar, a savings of 16.5% in the use of aircraft. In addition to the 227 fixes, 28 investigatives were also levied on aircraft. This total aircraft levy is only 38% of the average levy from 1965 through 1973. The mean deviation from the best track for all aircraft fixes was 16nm. This is a 2nm decrease from the average deviation for the past 3 years.

The total of 227 fixes levied does not include intermediate fixes, which averaged 131 for the past two years. The decrease in the number of intermediate fixes -- 182 in 1971, 81 in 1972, and none in 1973 -- and investigatives -- 179 in 1971, 81 in 1972, and 28 in 1973 -- during the past three years resulted from a CINCPAC request to reduce intermediate fixes and the application of the DMSP satellite data (Section 6).

Table 2-1 summarizes reconnaissance effectiveness. Using the scoring criteria in Section 3, the 13 missed plus unfulfilled fixes, or 5.7% of the total levied fixes, represent a significant decrease from the previous two year average of 13.9%. The percentage of late and early fixes rose from 10.6% in 1972 to 15.3% in 1973.

TABLE 2-1. AIRCRAFT RECONNAISSANCE EFFECTIVENESS

	NUMBER OF LEVIED FIXES	PERCENT
Completed on time	179	79.0
Early	4	1.7
Late	31	13.6
Missed	11	4.8
Unfulfilled	2	0.9
	227	100.0

LEVIED vs. MISSED FIXES

	LEVIED	MISSED	PERCENT
AVERAGE 1965 - 1970	507	10	2.0
1971	802	61	7.6
1972	624	126	20.2
1973	227	13	5.7

Figure 2-1 relates the number of fixes missed/unfulfilled to the monthly fix requirements and multiple-storm days, i.e., a day when two or more storms were active at the same time. The 82 levied fixes in October account for 36% of the total levied fixes. October also included 42% of the multiple storm days and 30% of the missed fixes as compared to August which had 22% of the storm days, but 46% of the missed fixes. August, however, had only 21% of the levied fix requirements.

Figure 2-2 compares the percentage of fixes and investigatives missed/late versus the number of storms per day. The 26 days with 2 or more storms represents only 35% of the calendar days of warning; however, they encompass 75% of the missed/late fixes and investigatives. This indicates, that even in a light season, concurrent storms can overtax current aircraft reconnaissance capabilities.

5. RADAR RECONNAISSANCE SUMMARY

A total of 419 radar reports of tropical cyclones were received during the 1973 season, 409 from land stations, 3 from ships, and 7 from aircraft. This is a significant decrease from 1972 when over 700 radar reports were received. There are two primary reasons for this decrease, the large decrease in tropical cyclone activity from 1972 to 1973 and the significant reduction of military activities in the western North Pacific and South China Sea areas.

To evaluate the 1973 data in terms of quality, the land radar reports received were grouped into three accuracy categories, a method provided for in the WMO code. The categories used are defined as good (less than 6nm), fair (6-20nm), and poor (greater than 20nm). Using this stratification, 32% of the reports were classified as good, 40% as fair, and 28% as poor. In addition to the above accuracy classifications which are derived from the radar operations, all land radar reports were compared to the JTWC best track positions and deviations computed. The mean deviation was 12nm, a 29% decrease from the average of 17nm for the previous three years.

The radar sites that provide some of the most significant coverage to JTWC are those whose surveillance borders within the Air Weather Service no-fly zone. The Royal Observatory at Hong Kong provided valuable positioning information on 7 tropical cy-cyclones during 1973 in which geographical restrictions existed to reconnaissance aircraft. Other locations which play similar roles are those situated on western Taiwan and Korea, although by the time a tropical cyclone reaches the latitude of Korea its radar presentation is often quite deteriorated. A key station for tracking tropical cyclones in the northwestern South China Sea during the Vietnam conflict was the Monkey Mountain site at Danang. The loss of observations from this site last season proved quite critical during typhoon Anita's trek into the Gulf of Tonkin this past July, adversely affecting units of the 7th Fleet.

The receipt of land radar reports from national meteorological and AC&W sites in the Republic of the Philippines was greatly improved in 1973 compared to previous years. This improvement is attributed to recent improvements in the radar network, better communications, and closer liaison between U.S. military and Philippine officials.

Of 17 tropical cyclones which came within the surveillance range of the Far East radar networks, four typhoons Ellen, Billie, Nora, and Dot accounted for the majority of radar reports. Each of these storms was characterized during periods of observation by slow movement allowing for numerous position reports. Billie while passing through the southern Ryukyus was under coverage of 6 radars simultaneously for a 12 hour period. Radars of National Meteorological Services accounted for 70% of the 419 observations received at the JTWC for tropical cyclones during 1973. AC&W sites furnished 23% and Air Weather Service radars, contributed 8%.

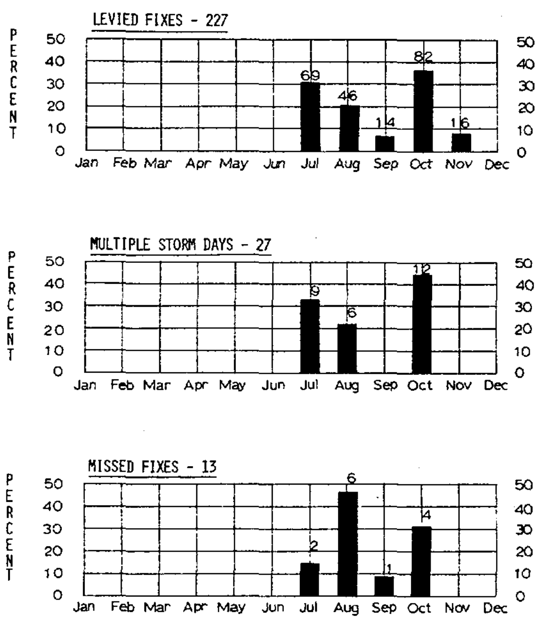


FIGURE 2-1. *Missed fixes for 1973 compared to monthly fix requirements and multiple storm days.*

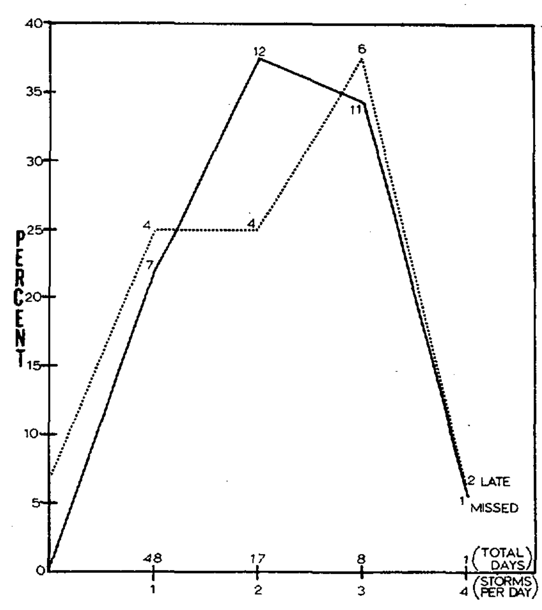


FIGURE 2-2. *Percentage of fixes and investigatives missed/late vs. storms per day.*

6. SATELLITE RECONNAISSANCE SUMMARY

Satellite reconnaissance information is provided to the JTWC by the Air Force Defense Meteorological Satellite Program (DMSP) site collocated with the JTWC. This site was established in May 1971. During the 1971 storm season, DMSP data were available to the JTWC forecasters but were not authorized by CINCPAC as a substitute for aircraft fixes. Coincident with the site's establishment was the implementation of a Technique Development Program (TDP) designed to determine the potential of DMSP data as an alternative reconnaissance platform. This was necessary as aircraft resources were being reduced and it was possible that the remaining reconnaissance fleet would be subject to further reductions. Hence the SRP concept was introduced. Under the SRP, the JTWC would selectively levy reconnaissance requirements on aircraft, high resolution satellites and land radar with the satellites expected to fulfill an increasingly important role.

By the end of 1971, the TDP had established the viability of satellite derived storm positions and intensity estimates. Plans were then made to implement the SRP. During 1972, techniques used to position tropical cyclones and estimate their intensities from DMSP data were further refined. An organized approach to daily decision making on the use of DMSP data in lieu of aircraft was implemented beginning with Typhoon Phyllis in July 1972. Factors such as satellite coverage of the storm, timeliness of the DMSP data, and quality of the position were considered in this decision process. During the remainder of 1972, satellite fixes were levied in lieu of aircraft 12% of the time. During 1972, the Guam site provided the majority of satellite data used operationally by the JTWC. Data were received from other Pacific DMSP sites and the Air Force Global Weather Central (AFGWC) but there was no formal program to rely on these data.

Prior to the start of the 1973 season, an SRP network was established consisting of Guam; Fuchu, Japan; and Nakon Phanom (NKP), Thailand (primary sites); and Kadena, Okinawa; Osan, Korea; and AFGWC serving as backup sites. The network was designed to provide timely DMSP data to the JTWC through the Guam site which served as clearing house and quality control monitor. The Guam site was also responsible to the JTWC for forecasting which of the primary sites or combination of sites would receive usable fixes. Regardless of whether such fixes were levied in lieu of aircraft, the sites affected would be notified by message to pass the required information to the JTWC. As the data were received, processed, and analysed, data were first passed by phone to the Guam site and followed up by message to the JTWC.

There are six position classes referred to by Position Code Numbers (PCN). The PCN identifies the method of gridding and the type of circulation center; it also has associated with it a set of statistics related to its accuracy. Table 2-2 provides the methods of center determination and gridding for each PCN. The mean error, standard vector deviation, and sample size are given for the 3 major classes i.e. eye, well-defined circulation center, and poorly-defined circulation center. While no statistically significant difference presently exists between geographical and ephemeris gridded positions, it was decided to retain the gridding method as part of the PCN stratification to provide a check on the accuracy of ephemeris gridding and to isolate any problems growing out of either geographical or ephemeris gridding in the future.

TABLE 2-2. GUAM DMSP SITE TROPICAL CYCLONE POSITIONING STATISTICS, 1973 (1972)

PCN	METHOD OF CENTER DETERMINATION/GRIDDING	MEAN ERROR (NM)	STANDARD VECTOR DEVIATION (NM)	SAMPLE SIZE
1	Eye/Geography	15.5 (14.7)	17.8 (17.3)	40 (157)
2	Eye/Ephemeris			
3	Well Defined CC/Geography	18.9 (21.0)	22.9 (26.3)	86 (139)
4	Well Defined CC/Geography			
5	Poorly Defined CC/Geography	39.8 (30.2)	54.2 (36.6)	46 (294)
6	Poorly Defined CC/Geography			

NM = Nautical Miles
CC = Circulation Center

The 1972 figures which serve as the standard are given in parentheses. Table 2-3 shows corresponding 1973 figures for NKP and Fuchu respectively. Only PCN's of 1 through 4 are considered as quality fixes, i.e. location accuracy comparable on the average to that expected from the aircraft. It should be noted that only 31% of the positions made during 1973 by the primary DMSP sites were of PCN's 5 or 6, a significant reduction from 1972 when 50% of the positions were classified in the poorly defined category.

With only one operational satellite during the early part of the 1973 season (July and August), satellite coverage during the period 5 1/2 hours before to 1/2 hour after warning time was available for 52% of the warnings. However, during the last part of the season (September, October, and November) with two functional satellites, 87% of the warnings had satellite coverage available during the same time

TABLE 2-3. DMSP TROPICAL CYCLONE POSITIONING STATISTICS 1973

NAKON PHANOM, THAILAND

PCN	MEAN ERROR (NM)	STANDARD VECTOR DEVIATION (NM)	SAMPLE SIZE
1&2	16.8	20.0	47
3&4	19.1	25.4	62
5&6	48.1	66.3	85

FUCHU, JAPAN

PCN	MEAN ERROR (NM)	STANDARD VECTOR DEVIATION (NM)	SAMPLE SIZE
1&2	15.4	17.7	37
3&4	20.9	25.0	75
5&6	36.2	51.4	26

period. For 24% of the 390 warnings issued by the JTWC, both satellite coverage and timeliness of the data were met simultaneously. In this context, timeliness is defined as having DMSP satellite data with nodal times of 1 1/2 to 3 hours (descending node) or 1 3/4 to 3 hours (ascending node) prior to warning time. When quality PCN's are also stipulated, it was found that for only 14% of the warnings were coverage, timeliness, and quality PCN forecast to occur. When the three criteria given above are anticipated, the forecast is referred to as SRP quality. The verification rate for SRP quality forecasts during the season was 90%. The actual use rate of satellite as the basis for warnings was considerably larger than the 14% which were forecast to be of SRP quality. Altogether, 27% of the JTWC warnings were based on satellite data. Of the forecast SRP quality fixes, 25% were levied equating to 13% of the satellite fixes used for warnings. The remaining 87% of the satellite fixes for warnings consisted of non-SRP quality and some additional SRP quality which were forecast, not levied, but subsequently used. A summary of these SRP statistics is given in Table 2-4.

There were a wide variety of satellite products available from the SRP network during the 1973 season both for real-time analysis by the individual sites and post-analysis conducted by the Guam site and the JTWC. Historically, the types of data from the DMSP satellites have remained essentially unchanged during the past three years. Satellite meteorologists at the SRP network sites had available Very High Resolution daytime and nighttime infrared (WHR), and High Resolution daytime and nighttime visual (HR) and infrared (IR). Table 2-5 provides the imagery data characteristics.

During daytime, VHR along with IR are the primary data used for positioning and intensity analysis. In addition, visual and IR data enhancement techniques have been developed which often permit the analyst to locate the circulation center when the primary data alone would result in a poorly defined center. Likewise, nighttime position can often be classified as eye fixes or well defined centers as a result of having HR data from moonlight available. Marginal eye centers or well defined centers not visible on WHR can frequently be determined with as little illumination as that provided by a half-moon.

Satellite data are playing an increasingly larger role in tropical cyclone reconnaissance. For example, the operational use of DMSP data has produced a significant decrease in the number of aircraft investigative flights flown. For the two years preceeding the establishment of the SRP network (1970 - 1971), the ratio of investigative flights flown to the number of storms was 5.5:1, while for 1973 this ratio was reduced to 1.2:1.

TABLE 2-4. SELECTIVE RECONNAISSANCE PROGRAM SUMMARY

PARAMETERS	RATIO	PERCENT
Number of cases where there was DMSP coverage of storm and timeliness for use in warning/total number of warnings issued	95/390	24
Number of cases where there was coverage of storm, timeliness of data, and PCN ≤ 4 (SRP Quality forecasts made)/total number of warning issued	56/390	14
Number of SRP quality forecasts levied/number of SRP quality forecasts made	14/56	25
Number of SRP quality forecasts used as basis for warnings/number of warnings based on satellite	14/107	13
Number of warnings based on satellite/total number of warnings issued	107/390	27

TABLE 2-5. DMSP IMAGERY DATA CHARACTERISTICS

PARAMETER	VISUAL		INFRARED	
	VHR	HR	WHR	IR
Resolution (nautical miles)	0.33	2.0	0.5	2.0
Bandwidth (micrometers)	0.4-1.1	0.4-1.1	8.0-13.0	8.0-13.0
Equivalent blackbody temperature (°Kelvin)			217-307	210-310

7. COMMUNICATIONS

a. AIR TO GROUND

Aircraft reconnaissance data are normally received by the JTWC via direct phone patch through Andersen, Clark, or Fuchu aeronautical stations. Under degraded propagation conditions, data can be intercepted by a weather monitor located near these stations and relayed by AUTOVON or teletype to the JTWC.

Average communications delays for the preliminary and complete center data messages for past years are compared with 1973 delays in Figure 2-3. Delay times are defined here as the difference between the fix time and the time of message receipt at the JTWC. The preliminary fix message was introduced in 1972 to reduce delays in the receipt by the JTWC of vital position and intensity information. After two years of use, it has proved its effectiveness and permits a significant amount of extra time to be spent in forecast preparation. The 48 minute average delay in the complete center data message during 1973 shows an increase of about 14 minutes over 1972. This increase is attributed to several circumstances which prevailed during the 1973 season: (a) more emphasis was placed upon receipt of the preliminary message during 1973, lessening the need for passing the complete center message to the JTWC as quickly as before, (b) messages were more carefully prepared, and (c) a larger share of the messages were passed through Clark aeronautical station than in previous years due to location of cyclone tracks. This routing of phone patches through Clark places more stringent requirements on radio-telephone quality and has been

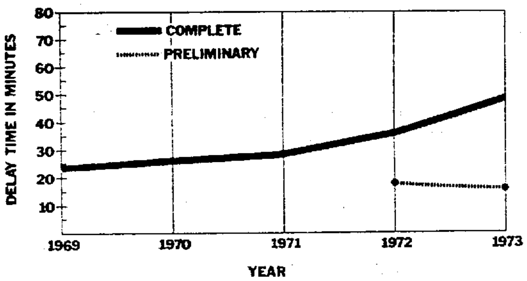


FIGURE 2-3. *DELAY TIMES - Receipt of eye data message.*

noted in previous years to result in longer delays than a direct phone patch through Andersen aeronautical station.

Table 2-6 depicts the complete center data messages received over one hour after fix time and after warning time. The growth of the percentages in 1973 can be partially attributed to the above mentioned reasons and the increase in the percentage of late fixes (section 4). Nevertheless, only 3% of the messages were delayed more than 80 minutes.

TABLE 2-6. 1973 AIR/GROUND DELAY STATISTICS FOR AIRCRAFT RECONNAISSANCE COMPARED WITH PREVIOUS YEARS

	1967	1968	1969	1970	1971	1972	1973
% COMPLETE FIX MESSAGES DELAYED OVER ONE HOUR	16	4	3	5	6	6	20
% COMPLETE FIX MESSAGES RECEIVED AFTER WARNING TIME	3.1	0.7	0.6	0.9	2.1	5.5	10.1

b. SELECTIVE RECONNAISSANCE PROGRAM

With the advent of the SRP, the importance of radar and satellite fix data has increased from previous years; therefore, a review of the associated communications delays follows. A sampling of radar messages resulted in a considerable variation of receipt delays. Delay times are defined as the differences between the observation time and the time of message entry into the AWN. Several sources were consistently associated with small delay times, while the receipt time of others were highly erratic. AC&W radar site data from the Republic of the Philippines were normally received within 35 minutes. Data from nationally operated radars of the Republic of China, Hong Kong, Japan, and Republic of the Philippines were delayed 20 to 50 minutes depending on country of origin. In the worst cases, the JTWC still received the messages within 90 minutes of observation time. Tropical cyclone radar data is routed to the JTWC over the AWN through the use of a special high precedence collective indicator. Additionally, the AC&W radar messages were phoned to the JTWC from Clark AB, thus providing the information somewhat earlier than indicated.

Over 750 position and intensity estimates were derived from Air Weather Service (AWS) DMSP sites and the aircraft carrier CONSTELLATION during 1973. The data from the AWS DMSP sites were immediately passed by AUTOVON followed by an AWN message. AUTOVON provided rapid communication of the essentials and a brief two-way discussion of the data (a benefit not possible with message). Average delay times of 51 minutes for telephone and 83 minutes for message resulted from a sampling of the last six storms. These delay times are the difference between satellite equator-crossing time and the time of the telephone call or entry of the message into the AWN. Systematic differences in data processing time among the DMSP sites introduces small variations in the above figures which are independent of communications and analysis time. However, it is important to note, that on the average, the data were available to the JTWC within one hour after equator-crossing time.

c. OUTGOING COMMUNICATIONS

Messages originating at the JTWC are handled by the Nimitz Hill Message Center Naval Communications Station, Guam (NHMC). By special agreement, typhoon and tropical storm warnings are placed in the communications system before pending immediate precedence traffic. Manual processing is accomplished as though the warning had flash precedence. Tropical depression warnings are normally handled as immediate messages. Warnings were delivered to the message center an average of 23 minutes before warning time (Figure 2-4). Yearly averages of the parameters described are plotted relative to warning time. The length of the vertical bars represents the average difference between the time typhoon and tropical storm warnings were passed to the NHMC and the time of transmission. Note that the handling time decreased from 31 minutes in 1972 to 15 minutes in 1973. Handling times for tropical depression warning (not shown) were reduced from 51 minutes in 1972 to 25 minutes in 1973.

The dramatic improvement in handling time during 1973 allowed the average message to be placed in the circuits before the established warning time. This was a major improvement over the previous two years when the average message left Guam more than 10 minutes after warning time. The reduced handling time can be attributed primarily to rectification of problems within the NHMC itself. The time of receipt of a warning at a particular station depends on factors beyond the control of both the JTWC and the NHMC.

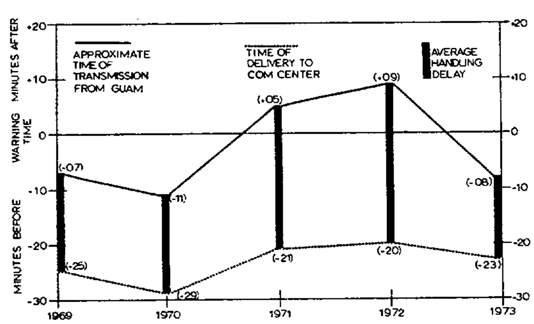


FIGURE 2-4. *AUTODIN handling time data for typhoon and tropical storm warnings.*

CHAPTER III — RESEARCH SUMMARY

1. GENERAL

In past years, technical notes summarizing research studies made by the JTWC personnel were included in the Annual Typhoon Reports (ATRs). In this and future ATRs, however, only brief synopses of these studies will be given. The complete studies will be published separately as FLEWEACEN/JTWC Technical Notes. It is felt that this procedure offers several advantages. First, it allows the administrative workload associated with publication preparation to be distributed throughout the year rather than concentrated within a few months during preparation of the ATR. Second, it allows authors to include more technical details of their studies than would be appropriate for inclusion in the ATR.

2. INVESTIGATION OF GUST FACTORS IN TROPICAL CYCLONES

(Reference: Atkinson, G.D., FLEWEACEN/JTWC Technical Note 74-1).

The 1972 Tropical Cyclone Conference requested that FLEWEACEN/JTWC include peak gusts in the warnings when sustained surface wind speeds equal or exceed 50 kts. During 1972, a sustained wind/peak gust graph derived by former JTWC personnel was used. Details on how this graph was derived were not available and there was a general feeling among JTWC forecasters that the gust factors derived from this graph were too high for open water conditions. Therefore, at the 1973 Tropical Cyclone Conference, FLEWEACEN/JTWC requested that all 7th Fleet ships equipped with anemometers include peak gusts as well as sustained winds in their weather reports during strong wind conditions. These ship observations and a comprehensive literature survey led to the derivation of a new sustained wind/peak gust relationship which was introduced into operational use by the JTWC during the 1973 season. This study showed that for strong wind conditions, gust factors (i.e., ratio of peak gusts to one-minute average sustained wind speeds) over open water should fall in the range of 1.20 to 1.25. Based on these results, the sustained wind/peak gust relationships shown in Table 3-1 are now used operationally by the JTWC.

TABLE 3-1. JTWC SUSTAINED 1-MINUTE WIND-PEAK GUST (KNOTS) RELATIONSHIPS

WIND(GUST)	WIND(GUST)	WIND(GUST)
50(65)	95(115)	140(170)
55(70)	100(125)	145(175)
60(75)	105(130)	150(180)
65(80)	110(135)	155(190)
70(85)	115(140)	160(195)
75(90)	120(145)	165(200)
80(100)	125(150)	170(205)
85(105)	130(160)	175(210)
90(110)	135(165)	180(220)

3. INTENSITY FORECASTING USING THE TYFOON ANALOG COMPUTER PROGRAM

(Reference: Craiglow, L.H., Jr., FLEWEACEN/JTWC Technical Note 74-2).

The computerized TYFOON analog program has been used by the JTWC as an aid in forecasting tropical cyclone movement since 1970. This study investigated the usefulness of the TYFOON program for forecasting tropical cyclone intensities at 24-, 48-, and 72-hours. It modified and extended a previous study on this subject by former JTWC personnel. Three parameters which are available on the basic climatological data tape used in the TYFOON program were selected to determine their usefulness in intensity forecasting. These are the minimum sea level pressure, the 12-hour change in minimum sea level pressure, and the maximum sustained surface wind speed. Based on selected values of these criteria, current and analog tropical cyclones were separated into two classes (deepening or weakening) and analog forecasts were computed. During the testing, several changes were made to the classification criteria to obtain better results. Also, it was determined that intensity forecasts computed independently for the various time periods were not consistent. Therefore, the program was modified so that each succeeding intensity forecast used the previous intensity forecast as an input, i.e., initial conditions for the 48-hour forecast would depend on the 24-hour forecast, etc. Verification results based on selected cases from the 1972 tropical cyclone season showed the analog program produced intensity forecasts that were slightly better than the official JTWC forecasts for the 24-hour period but were slightly worse than the official forecasts at 48 and 72 hours. Nevertheless, these preliminary results indicate that further testing of this program is warranted to provide another objective forecast aid to JTWC forecasts.

4. EVALUATION OF THE EXTRAPOLATION FEATURE OF THE TYFOON ANALOG COMPUTER PROGRAM

(Reference: Craiglow, L.H., Jr., FLEWEACEN/JTWC Technical Note 74-3).

The original version of the TYFOON analog program, first used operationally by the JTWC in 1970 has been modified several times to improve its performance. In the TYFOON-72 version of the program, if a selected analog storm had insufficient positions to provide a forecast out to 72 hours, the program extrapolated up to four additional six-hourly positions. This extrapolation feature was necessary because of premature termination of many tropical cyclones on the original data tape (1945-1969). During 1972, tropical cyclone data for 1970 and 1971 were added to the basic climatological data tape and tracks for all tropical cyclones for the entire period of record (1945-1971) were extended. These modifications to the data tape and reductions of the basic time interval for selection of analog cases from ±50 days to ±35 days resulted in the version of the TYFOON program known as TYFN 73. Since the original tropical cyclone tracks were subsequently extended, it was felt that the extrapolation feature of TYFOON-72 was no longer required. To test this hypothesis, 15 cases from 1972 were selected and 24-, 48-, and 72-hour position forecasts were prepared using both TYFOON-72 and TYFN 73. The overall results showed the average forecast errors for TYFN 73 were slightly lower than TYFOON-72 at all time periods. The most significant fact, however, was that TYFN 73 required 46% less computer time on the average than TYFOON-72. Considering that the JTWC requires hundreds of analog forecasts each year, the savings in computer time will be significant. The JTWC will use the TYFN 73 version of the analog program during the 1974 tropical cyclone season.

5. A COMPARISON OF THE SENSITIVITY OF TWO SIMILAR OBJECTIVE FORECAST TECHNIQUES

(Reference: Craiglow, L.H.,Jr., FLEWEACEN /JTWC Technical Note 74-4).

A number of computerized objective forecast techniques are available to assist the JTWC in the preparation of warnings. Of concern is the sensitivity of these techniques to errors in the warning and history positions. Two techniques; TSGLOB, developed by FLEWEACEN Pearl Harbor, and it's successor, TYMOD, developed by FLEWEACEN/ JTWC Guam, were chosen for testing. Both techniques utilize the 24-hour global band upper air progs (GBUA) provided by FLENUMWEACEN Monterey. The 03/0000 GMT January 1973 GBUA fields were chosen and a control forecast for each technique was run on Guam's CDC 3100 computer. Errors of six and 12nm were introduced into the warning and history positions, both individually and collectively. Thirty-six cases were run for TYMOD and 20 for TSGLOB the difference being due to TYMOD having a 24-hour history position. The results showed that TYMOD was less sensitive to positioning errors than TSGLOB. In addition, the TYMOD errors tended to reach a maximum about +48 hours and then decrease in magnitude thereafter. Finally, the test results suggest that as much as 30% of the 24-hour forecast error may be caused by warning position errors.

6. INTERANNUAL VARIABILITY OF RAINFALL AND TROPICAL CYCLONE ACTIVITY IN THE WESTERN NORTH PACIFIC

(Reference: Pratte, J.F., FLEWEACEN/JTWC Technical Note 74-5).

In this study, rainfall amounts at various stations in the tropical North Pacific during the dry season (January-April) were correlated with the number of tropical cyclones occurring in the western North Pacific area during the same year. The period of record used was 1959-1973. This period was selected because the JTWC was established in 1959 and satellite coverage of the tropics was available for most of this period. Therefore, it was felt that statistics on the number of tropical cyclones would be highly reliable for this recent period. Correlations were made for each rainfall station individually and for various groups of stations. Results indicate that the best correlation was shown with rainfall on Guam (average of three Guam stations), however, the relationship was poor (correlation coefficient of 0.24) and not sufficient for long-range forecasting purposes. The study also provides a survey of various articles relating tropical circulation patterns and rainfall to sea surface temperature anomalies and other large scale influences.

CHAPTER IV — SUMMARY OF TROPICAL CYCLONES

1. GENERAL RÉSUMÉ

The western North Pacific remained quiescent for the first six months of 1973 before the first tropical cyclone developed. Since World War II, only in 1952, when five months passed without a single tropical cyclone, has this area experienced such a late start of the tropical cyclone season (Table 4-1). According to statistics compiled by the Royal Observatory of Hong Kong, this dearth of tropical cyclone activity during the first six months of the year has not occurred since 1917. Interestingly, on the average, five tropical cyclones form during the first six months of the year of which three became typhoons.

The development of Tropical Storm Wilda on 1 July marked the beginning of the 1973 season. Within a span of 5 months, a total of only 21 named tropical cyclones developed, with 12 of these reaching typhoon intensity. Additionally, warnings were issued on two numbered tropical depressions. Typhoon frequency in 1973 was significantly lower than the yearly average of 19 since the establishment of the JTWC in 1959. Only 1969 and 1970 experienced a similar low frequency of typhoons during this period (Table 4-2).

In 1973, warnings were issued on only 77 calendar days, approximately one half of the 14-year average of 145 days. The JTWC remained in warning status 62 days less in 1973 than in 1972, an active tropical cyclone year.

Typhoon days for 1973 dipped to a record low of 42 compared to 121 in 1972 (Table 4-3). Based on the past 15 years, 1973 was 54 days below the average and 20 days below 1969 the next lowest. These facts indicate that there was not only a

TABLE 4-1. FREQUENCY OF TROPICAL STORMS (INCLUDING TYPHOONS) BY MONTHS AND YEARS

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1945	0	0	0	1	1	2	5	7	6	1	3	0	26
1946	0	0	1	0	1	2	3	2	3	1	2	0	15
1947	0	0	1	0	1	1	3	3	5	6	6	1	27
1948	1	0	0	0	2	2	2	5	5	4	3	2	26
1949	1	0	0	0	0	1	5	3	6	1	3	2	22
1950	0	0	0	0	1	2	3	2	3	3	3	1	18
1951	0	0	1	2	1	1	1	2	2	4	1	2	17
1952	0	0	0	0	0	3	3	4	5	6	3	4	28
1953	0	1	0	0	1	2	2	6	3	4	3	1	23
1954	0	0	1	0	1	0	1	6	4	3	3	0	19
1955	1	0	1	1	0	1	6	3	3	4	1	1	22
1956	0	0	1	2	0	1	2	5	5	2	3	1	22
1957	2	0	0	1	1	1	1	3	5	4	3	0	21
1958	1	0	0	0	1	3	5	3	3	3	2	1	22
1959	0	1	1	1	0	0	3	6	6	4	2	2	26
1960	0	0	0	1	1	3	3	10	3	4	1	1	27
1961	1	1	1	1	3	2	5	4	6	5	1	1	31
1962	0	1	0	1	2	0	6	7	3	5	3	2	30
1963	0	0	0	1	1	3	4	3	5	5	0	3	25
1964	0	0	0	0	2	2	7	9	7	6	6	1	40
1965	2	2	1	1	2	3	5	6	7	2	2	1	34
1966	0	0	0	1	2	1	5	8	7	3	2	1	30
1967	1	0	2	1	1	1	6	8	7	4	3	1	35
1968	0	0	0	1	1	1	3	8	3	6	4	0	27
1969	1	0	1	1	0	0	3	4	3	3	2	1	19
1970	0	1	0	0	0	2	2	6	4	5	4	0	24
1971	1	0	1	3	4	2	8	4	6	4	2	0	35
1972	1	0	0	0	1	3	6	5	4	5	2	3	30
1973	0	0	0	0	0	0	7	5	2	4	3	0	21
Totals	13	7	13	20	31	45	115	147	131	111	76	33	742
Average	.45	.24	.45	.69	1.07	1.55	3.97	5.07	4.52	3.83	2.62	1.14	25.59

TABLE 4-2. FREQUENCY OF TROPICAL STORMS REACHING TYPHOON INTENSITY BY MONTHS AND YEARS

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1945	0	0	0	0	0	1	2	5	3	1	1	0	13
1946	0	0	1	0	1	1	3	1	3	1	2	0	13
1947	0	0	0	0	1	1	0	3	4	5	4	1	19
1948	1	0	0	0	2	0	2	2	4	1	2	1	15
1949	1	0	0	0	0	1	3	3	3	1	1	1	14
1950	0	0	0	0	1	1	1	2	1	3	2	1	12
1951	0	0	1	2	1	1	1	2	2	3	1	2	16
1952	0	0	0	0	0	3	1	3	3	4	3	2	19
1953	0	1	0	0	1	1	2	4	2	4	1	1	17
1954	0	0	0	0	1	0	1	4	4	2	3	0	15
1955	1	0	1	1	0	1	5	3	3	2	1	1	19
1956	0	0	1	1	0	0	2	4	5	1	3	1	18
1957	1	0	0	1	1	1	1	2	5	3	3	0	18
1958	1	0	0	0	1	3	4	3	3	3	1	1	20
1959	0	0	0	1	0	0	1	5	3	3	2	2	17
1960	0	0	0	1	0	2	2	8	0	4	1	1	19
1961	0	0	1	0	2	1	3	3	5	3	1	1	20
1962	0	0	0	1	2	0	5	7	2	4	3	0	24
1963	0	0	0	1	1	2	3	3	3	4	0	2	19
1964	0	0	0	0	2	2	6	3	5	3	4	1	26
1965	1	0	0	1	2	2	4	3	5	2	1	0	21
1966	0	0	0	1	2	1	3	6	4	2	0	1	20
1967	0	0	1	1	0	1	3	4	4	3	3	0	20
1968	0	0	0	1	1	1	1	4	3	5	4	0	20
1969	1	0	0	1	0	0	2	3	2	3	1	0	13
1970	0	1	0	0	0	1	0	4	2	3	1	0	12
1971	0	0	0	3	1	2	6	3	5	3	1	0	24
1972	1	0	0	0	1	1	4	4	3	4	2	2	22
1973	0	0	0	0	0	0	4	2	2	4	0	0	12
Totals	8	2	6	17	24	31	75	103	93	84	52	22	517
Avg	.28	.07	.21	.59	.83	1.07	2.59	3.55	3.21	2.90	1.79	.76	17.83

short period of typhoon activity (July to October) but also the short duration of typhoons notably in August and September. The number of warnings issued totaled only 390 which is 55% of the average over the past 15 years. 1971 and 1972 could be considered "normal" years compared to 1973 since they were only slightly above the average with total number of warnings of 747 and 739, respectively. 1973 was not without multiple storm occurrences with 27 days with two or more cyclones and 9 days with three or more cyclones occurring simultaneously (Table 4-4).

There were only three super typhoons during 1973, Billie, Nora, and Patsy, which is half of the climatological mean of six based on the past 15 years. This is not surprising since most of the tropical cyclones developed outside of the favorable areas for super typhoon occurrence delineated by Holliday (1970).

The 1973 season was marked by another peculiarity. There was a pronounced absence of tropical cyclone activity in the area south of 20°N and east of 135°E which is normally a favorable area for tropical cyclone development. Except for brief periods during the summer months, the eastward extension of the monsoon trough over the western North Pacific Ocean was noticeably missing. It was not until the latter half of the season that the monsoon trough became firmly established in the area to the south of Guam when 3 successive typhoons were spawned during the first half of October.

The Tropical Upper Tropospheric Trough (TUTT) was well established by mid-May. It initiated the development of Tropical Storm Clara in July and Tropical Storm Hope and Tropical Depression No. 11 in August. Although the TUTT was in evidence throughout the typhoon season, the near-equatorial ridge which normally forms to the south of the TUTT was absent except for brief periods. Consequently, upper level westerlies prevailed over the Caroline and Marshall Islands, an area which would normally be under deep tropospheric easterlies during the primary tropical cyclone season. The resulting strong vertical wind shear over the eastern Trust Territory was unfavorable for tropical cyclone development.

TABLE 4-3. TYPHOON DAYS 1959-1973

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL PER YEAR
1959	---	---	---	8	---	---	3	18	19	18*	10	18	94
1960	---	---	---	2	---	10	13	36*	---	23*	2*	12	98
1961	---	---	8	---	8	2	10*	15	23*	17*	6	6	95
1962	---	---	---	7	4	---	14*	37*	8	30*	19*	---	119
1963	---	---	---	4	5	15	11	23*	14*	24*	---	11	107
1964	---	---	---	---	7	5*	22*	18*	28*	14	11*	6	111
1965	2	---	---	2	5	12*	19*	23*	25*	14	6	---	108
1966	---	---	---	5	11	6	7*	16*	23*	11	4	3	86
1967	---	---	2	7	---	4	14*	10	32*	21*	21*	---	111
1968	---	---	---	6	1	7	6	8	32*	19	18*	---	97
1969	5	---	---	5	---	---	8	6	10	18	10*	---	62
1970	---	5	---	---	---	2	5	24*	16	21*	6	---	79
1971	---	---	---	4	13*	8	20*	27*	21*	11	7	---	111
1972	2	---	---	---	1	6	39*	16	16*	21	9	11	121
1973	---	---	---	---	---	---	11*	7*	4	20*	---	---	42
TOTAL	9	5	10	50	55	77	202	284	271	282	129	67	1441
MEAN	.6	.3	.7	4.0	3.7	5.1	13.5	18.9	18.1	18.8	8.6	4.5	96.1

*Two typhoons occurring on the same day are counted as two typhoon days.

TABLE 4-4. SUMMARY OF JTWC WARNINGS 1969-1973

	1960-1973 (AVG)	1970	1971	1972	1973
TOTAL NUMBER OF WARNINGS	707	533	747	739	390
CALENDAR DAYS OF WARNING	146	127	163	139	77
NUMBER OF WARNING DAYS WITH TWO OR MORE CYCLONES	52	29	54	46	27
NUMBER OF WARNINGS DAYS WITH THREE OR MORE CYCLONES	12	0	6	13	9

Based on available casualty reports, typhoons Nora and Ruth and tropical storms Sarah and Vera accounted for the majority of the tropical cyclone related casualties. Taiwan, South Vietnam, and the Republic of the Philippines bore the brunt of the storm damages and casualties. The Republic of the Philippines was again, as in 1972, particularly hard hit by the passage of Nora, Ruth, and Vera. The main Japanese islands, interestingly, did not experience coastal crossing of a typhoon during 1973 which is a first according to available records since 1945.

Much of the pertinent meteorological data and tropical cyclone damage statistics in this chapter were based on information received from the following sources: Weather Bureau of the Republic of China; Royal Observatory of Hong Kong; Japan Meteorological Agency; National Weather Service of the Republic of the Philippines; the Environmental Data Service, National Oceanic and Atmospheric Administration and Casualty Returns, Liverpool Underwriters Association.

TABLE 4-5. LIST OF ESTIMATED CASUALTIES FOR THE 1973 SEASON

TYPE	NAME	DEATHS	MISSING
T	DOT	1	--
T	IRIS	2	3
T	NORA	22	48
T	RUTH	27	23
TS	SARAH	50	--
TS	VERA	75	58
	total	177	132

NOTE: Only cyclones for which data are available are listed.

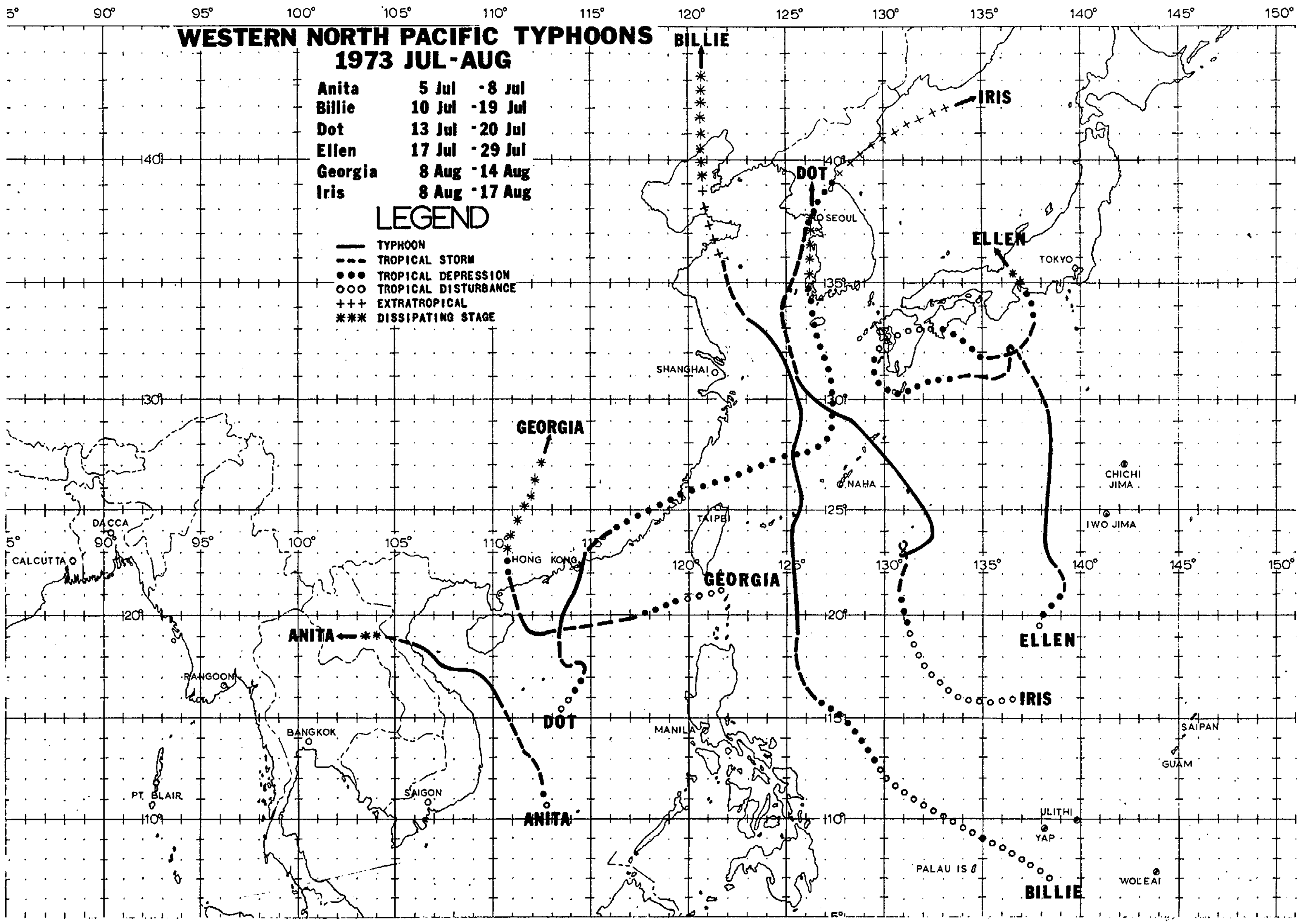
TABLE 4-6. 1973 TROPICAL CYCLONES

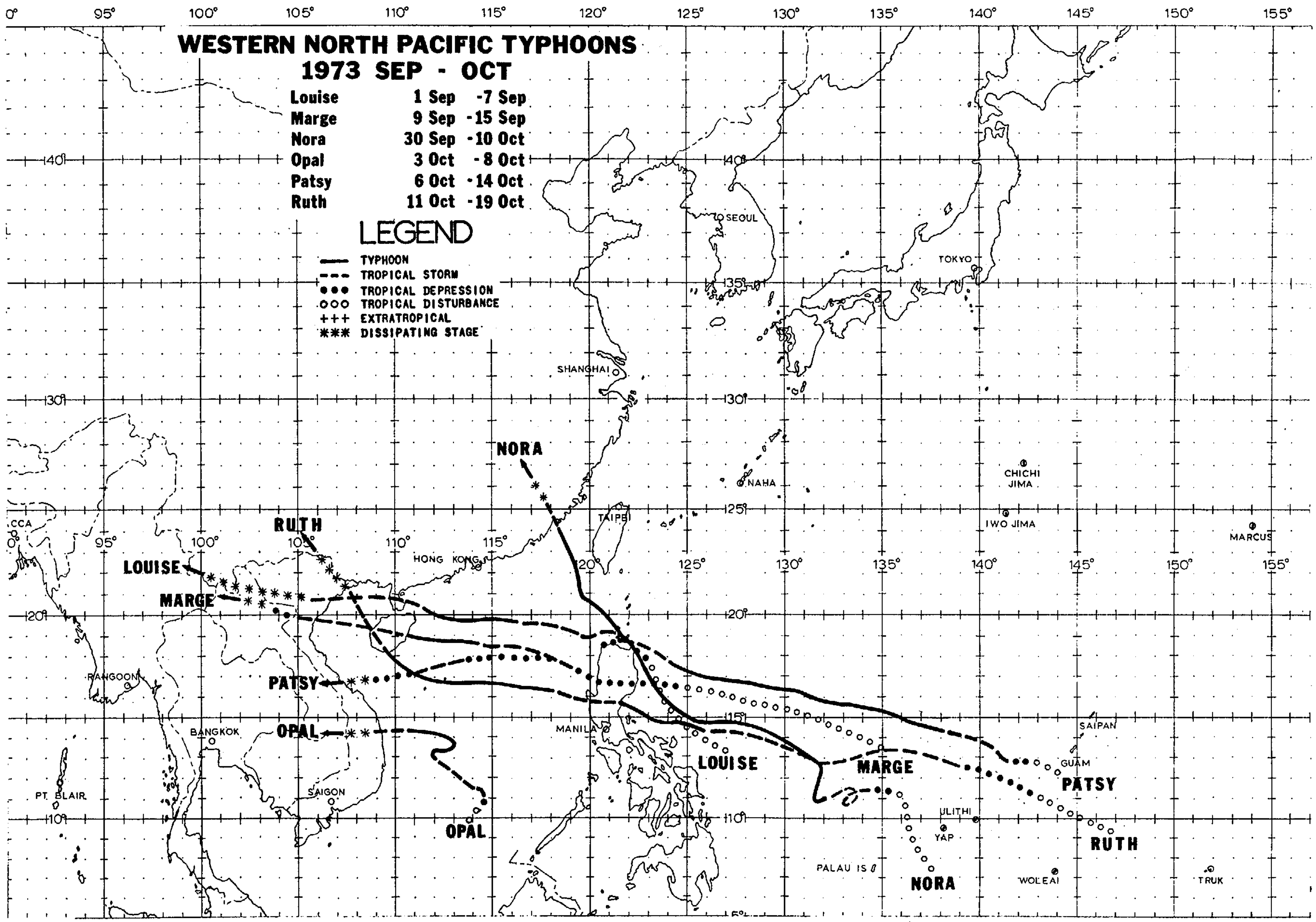
CYCLONE	TYPE	NAME	(PRD OF WRNG)	CALENDAR DAYS OF WARNING	MAX SFC WIND†	MIN OBS SLP	WARNINGS ISSUED TOTAL	NO. AS TYPHOONS	DISTANCE TRAVELED
01	TS	WILDA	01 JUL-03 JUL	3	60	982	9	--	384
02	TY	ANITA	05 JUL-08 JUL	4	70	980	13	6	720
03	TS	CLARA	12 JUL-14 JUL	3	50	998	7	--	324
04	TY	BILLIE	13 JUL-19 JUL	7	130	916	27	18	1560
05	TY	DOT	*	6	85	978	19	4	1020
06	TY	ELLEN	*	10	105	941	29	8	1092
07	TS	FRAN	29 JUL-30 JUL	2	40	1002	6	--	330
08	TY	GEORGIA	09 AUG-12 AUG	4	70	976	15	9	504
09	TS	HOPE	09 AUG-12 AUG	4	45	996	15	--	756
10	TY	IRIS	10 AUG-17 AUG	8	85	972	30	16	1218
11	TD	TD-11	13 AUG-14 AUG	2	30	1005	6	--	270
12	TS	JOAN	18 AUG-20 AUG	3	45	990	10	--	648
13	TS	KATE	24 AUG-26 AUG	2	60	983	8	--	294
14	TD	TD-14	01 SEP-02 SEP	2	30	NA	4	--	90
15	TY	LOUISE	03 SEP-07 SEP	5	75	974	18	6	816
16	TY	MARGE	12 SEP-14 SEP	3	80	964	12	4	792
17	TY	NORA	02 OCT-10 OCT	9	160	877	34	25	1584
18	TY	OPAL	04 OCT-08 OCT	5	75	968	16	9	540
19	TY	PATSY	*	10	140	893	34	14	1920
20	TY	RUTH	11 OCT-19 OCT	9	90	957	33	23	2112
21	TS	SARAH	10 NOV-10 NOV	1	55	984	4	--	180
22	TS	THELMA	*	4	55	991	13	--	660
23	TS	VERA	19 NOV-26 NOV	8	50	990	28	--	1134
		1973 TOTALS		77**			390	142	

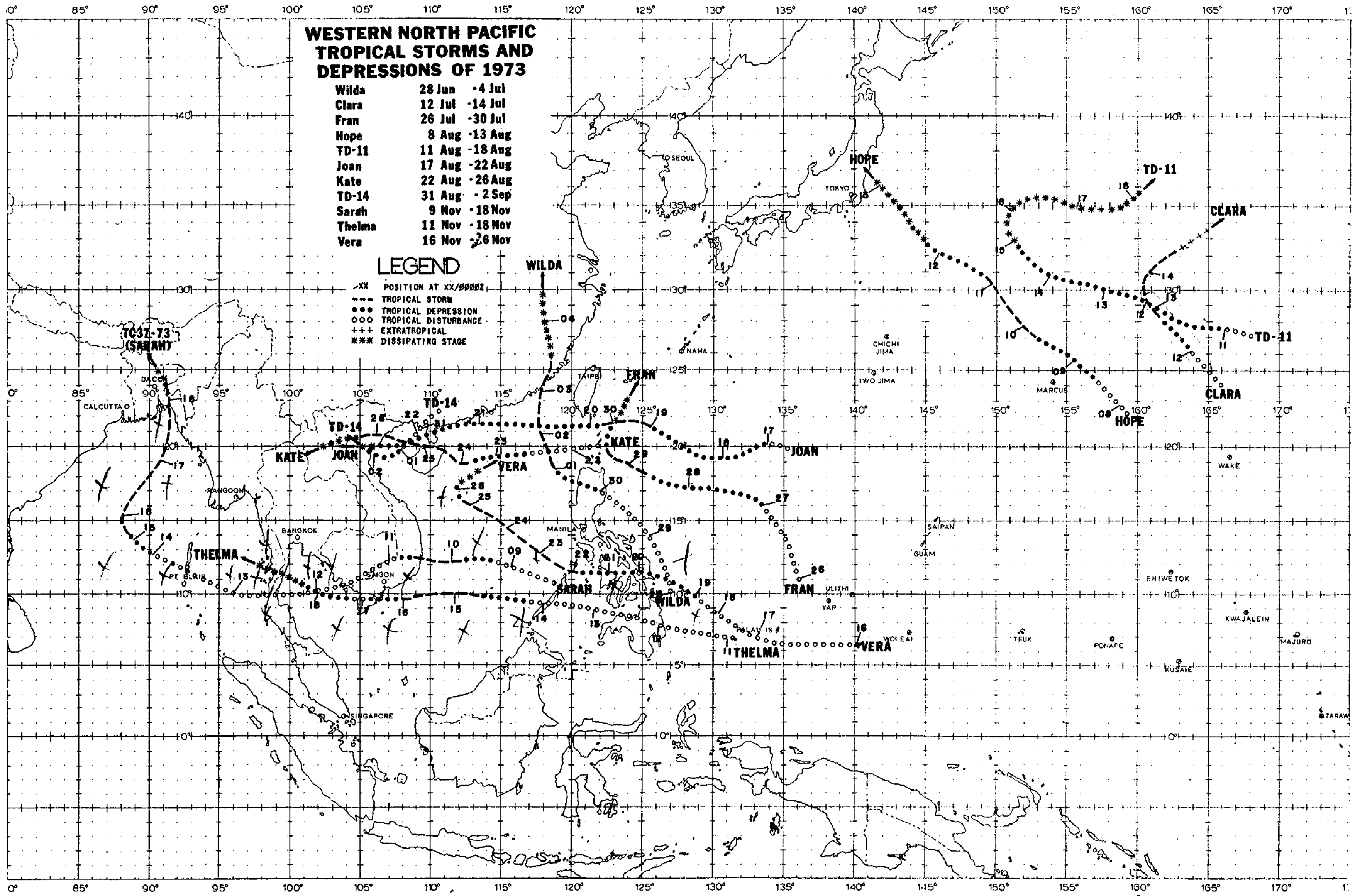
*Dot 14/06Z - 17/06Z and 19/00Z - 20/06Z JUL
Ellen 17/18Z - 21/06Z and 23/06Z - 25/06Z and 28/00Z - 29/06Z JUL
Patsy 06/06Z - 12/12Z and 13/12Z - 15/06Z OCT
Thelma 15/00Z - 17/06Z and 18/06Z - 18/18Z NOV

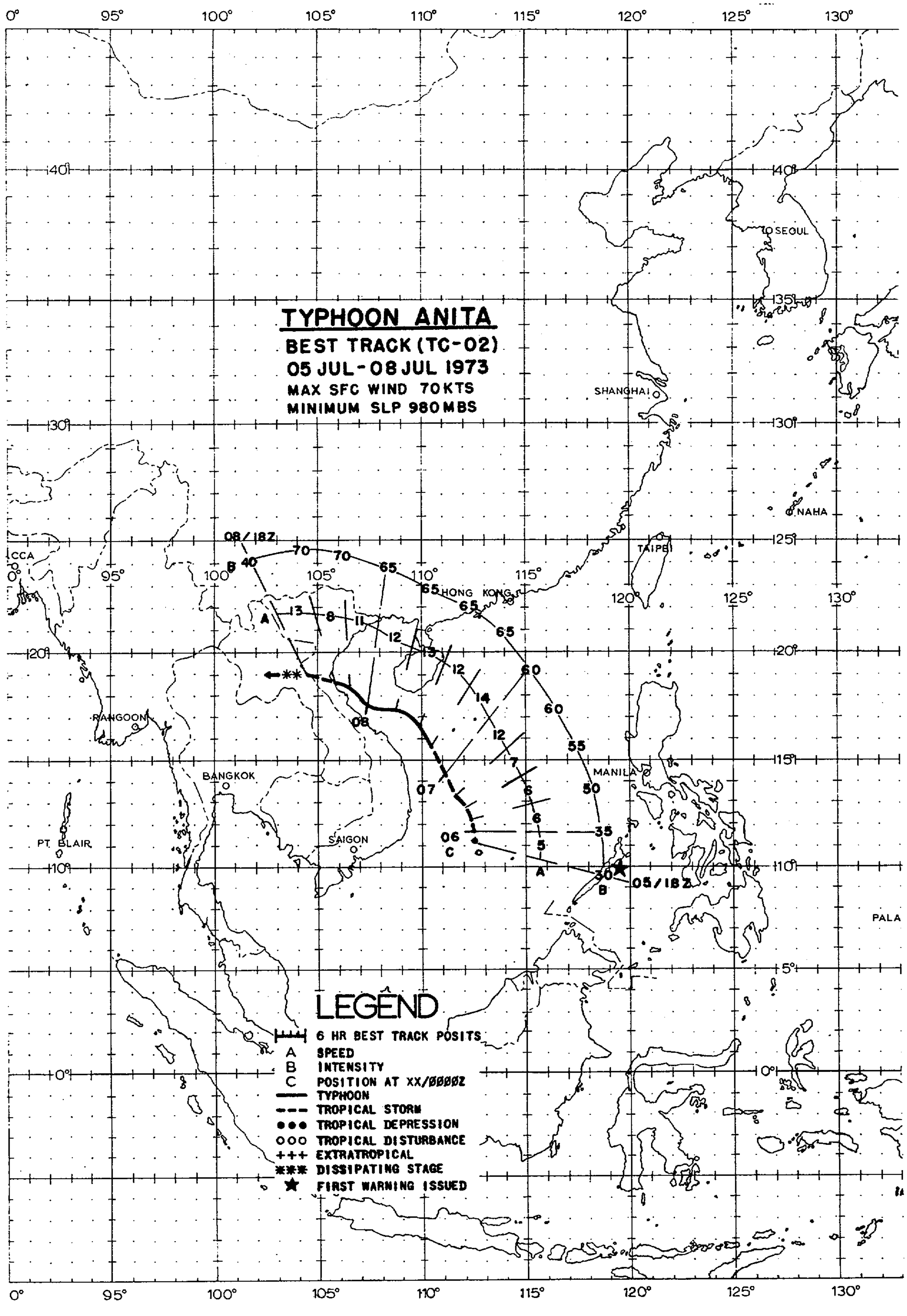
**Overlapping days included only once in sum
† Over water estimate (one-minute averaging period)

DATA TAKEN FROM BEST TRACK


WESTERN NORTH PACIFIC TYPHOONS
1973 JUL-AUG
Anita 5 Jul - 8 Jul
Billie 10 Jul - 19 Jul
Dot 13 Jul - 20 Jul
Ellen 17 Jul - 29 Jul
Georgia 8 Aug - 14 Aug
Iris 8 Aug - 17 Aug
LEGEND
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
BILLIE
IRIS
DOT
ELLEN
GEORGIA
ANITA
SEOUL
TOKYO
SHANGHAI
NAHA
TAIPEI
HONG KONG
CHICHI JIMA
IWO JIMA
DACCA
CALCUTTA
RANGOON
BANGKOK
SAIGON
MANILA
PT. BLAIR
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
WOLEAI
5° 90° 95° 100° 105° 110° 115° 120° 125° 130° 135° 140° 145° 150°
40° 35° 30° 25° 20° 15° 10° 5°


WESTERN NORTH PACIFIC TYPHOONS
1973 SEP - OCT
Louise 1 Sep -7 Sep
Marge 9 Sep -15 Sep
Nora 30 Sep -10 Oct
Opal 3 Oct -8 Oct
Patsy 6 Oct -14 Oct
Ruth 11 Oct -19 Oct
LEGEND
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
SEOUL
TOKYO
SHANGHAI
NAHA
CHICHI JIMA
IWO JIMA
MARCUS
TAIPEI
HONG KONG
RANGOON
BANGKOK
MANILA
SAIGON
PT. BLAIR
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
WOLEAI
TRUK
NORA
RUTH
LOUISE
MARGE
PATSY
OPAL


WESTERN NORTH PACIFIC
TROPICAL STORMS AND
DEPRESSIONS OF 1973
Wilda 28 Jun -4 Jul
Clara 12 Jul -14 Jul
Fran 26 Jul -30 Jul
Hope 8 Aug -13 Aug
TD-11 11 Aug -18 Aug
Joan 17 Aug -22 Aug
Kate 22 Aug -26 Aug
TD-14 31 Aug - 2 Sep
Sarah 9 Nov -18 Nov
Thelma 11 Nov -18 Nov
Vera 16 Nov -26 Nov
LEGEND
XX POSITION AT XX/0000Z
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
WILDA
CLARA
FRAN
HOPE
TD-11
JOAN
KATE
TD-14
TC37-73 (SARAH)
SARAH
THELMA
VERA
SEOUL
TOKYO
NAHA
TAIPEI
CHICHI JIMA
IWO JIMA
MARCUS
WAKE
CALCUTTA
DACCA
RANGOON
BANGKOK
SAIGON
MANILA
PT BLAIR
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
WOLEAI
TRUK
PONAPE
KUSAIE
ENIWETOK
KWAJALEIN
MAJURO
TARAWA
SINGAPORE


TYPHOON ANITA
BEST TRACK (TC-02)
05 JUL - 08 JUL 1973
MAX SFC WIND 70KTS
MINIMUM SLP 980MBS
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
C POSITION AT XX/0000Z
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
SEOUL
SHANGHAI
NAHA
TAIPEI
HONG KONG
MANILA
RANGOON
BANGKOK
SAIGON
PT. BLAIR
08/18Z
05/18Z

ANITA

Anita, the season's first typhoon developed in the monsoon trough late on 5 July under conditions quite similar to those discussed by Ramage (1971). Several days prior to the initial development of Anita, the low level southwesterly flow throughout Indochina, the Malaysian Peninsula, and southern India increased from an average of 10 to 20 knots to speeds of 25 to 35 knots. The satellite mosaic on 4 July revealed that a band of cloudiness extending from the Arabian Sea to the South China Sea had increased markedly in response to the intensifying southwesterly flow (Figure 4-1).

Of particular interest during Anita's initial development were the strong winds (25 to 30 knots) extending more than 400nm from her center to the south with lighter winds (10 to 15 knots) near the large and diffuse center. These strong winds were primarily associated with the increased monsoon flow and not the storm itself, since Anita had not intensified sufficiently to produce the necessary pressure gradient to support such winds. Anita continued to exhibit this unusual wind structure as she intensified to typhoon strength (Figure 4-2). The USNS Washoe County reported winds in excess of 35 knots and mountainous seas over 150nm to the south of Anita (06/0900 GMT). Early on the 7th, a reconnaissance aircraft reported Anita's sea level pressure had dropped to 983mb with flight level and surface winds of 50 to 80 knots within a band 30 to 60nm from the storm center, while winds within a 30nm radius of her center were 30 knots or less.

The storm initially drifted northnorthwest in response to a weakness in the subtropical ridge to the north caused by the remains of Tropical Storm Wilda. However, by 1200 GMT, 7 July, significant height rises at 500mb indicated the ridge was reforming over southern China. As a result, Anita assumed a more westerly track.

The USS OGDEN (LPD-5) reported eye passage and greater than 60 knot winds (08/0000 GMT) near 17.5N 107.4E as her barometer registered 981mb. The barograph aboard the USS TRIPOLI (LPH-10) recorded eye passage (08/0100 GMT) as the ship steamed near 17.6N 107.2E (Figure 4-3).

A reconnaissance aircraft observed a minimum sea level pressure of 980mb and a well defined closed wall cloud indicating continued intensification as the storm neared the North Vietnamese coast(08/1010 GMT). Anita reached peak intensity of 70 knots prior to going ashore near Vinh, North Vietnam and quickly dissipated over land (Figure 4-4).

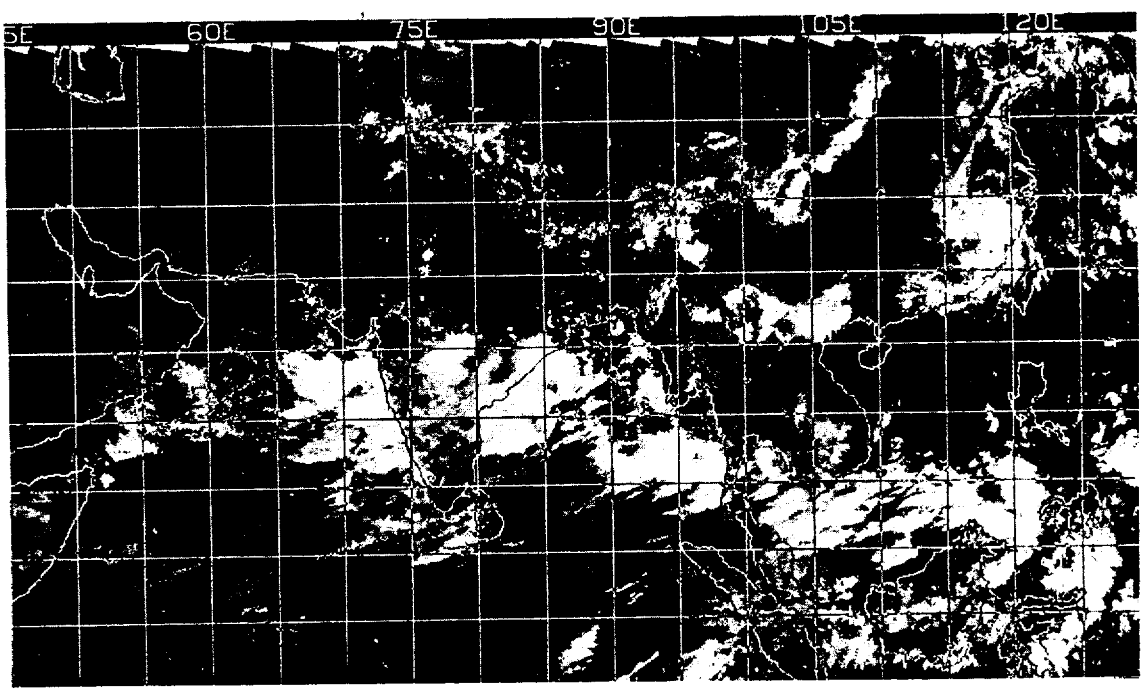


FIGURE 4-1. *NOAA-2 satellite mosaic for 3 July 1973 showing cloud band associated with the southwest monsoon extending from the Arabian Sea to the South China Sea. Remnants of Wilda (A).*

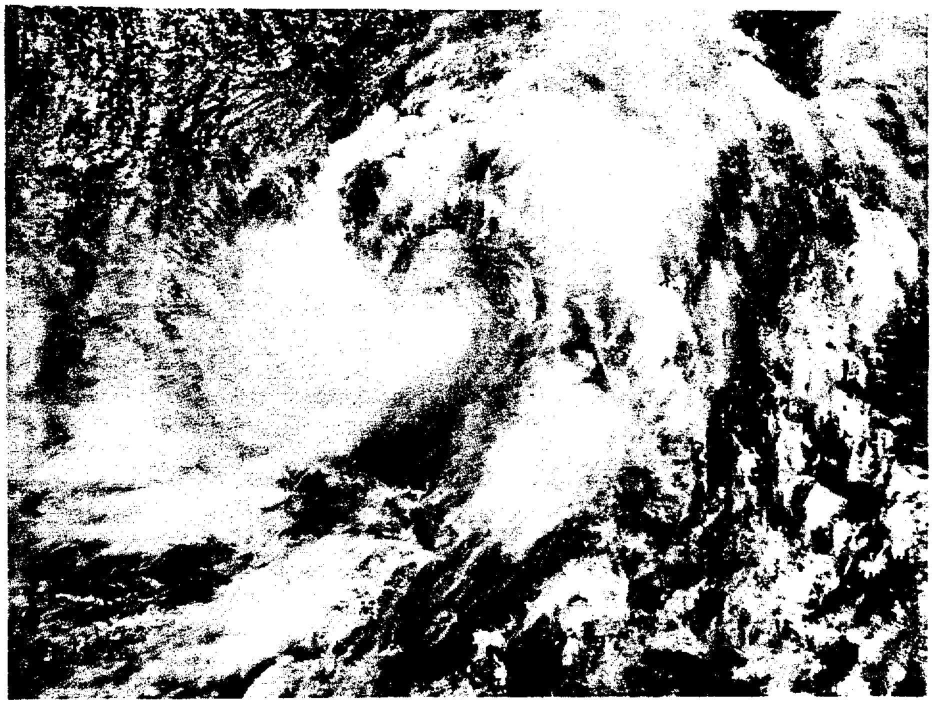


FIGURE 4-2. *Tropical Storm Anita near typhoon intensity 110 nm off the coast of the Republic of Vietnam, 7 July 1973, 0444 GMT. (DMSP imagery)*

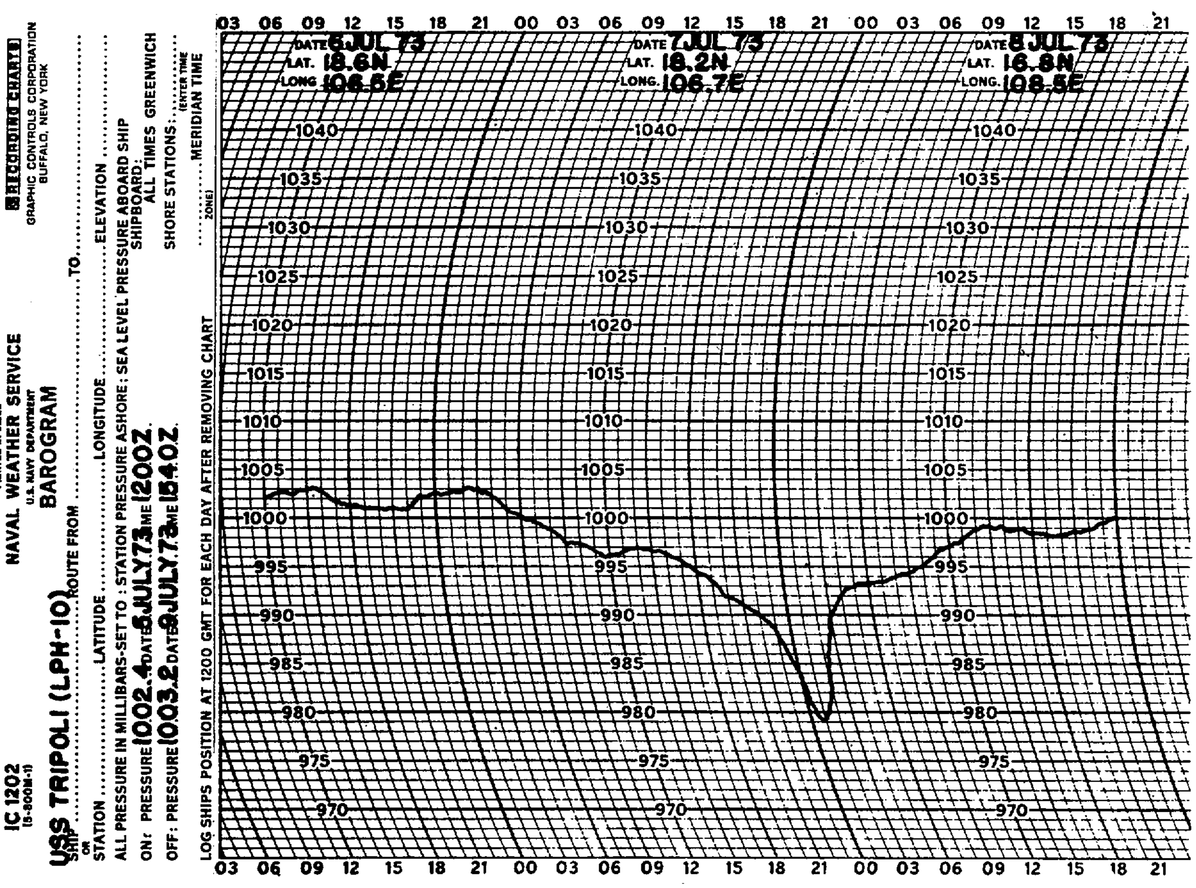


FIGURE 4-3. *Reproduction of Barograph trace from the USS Tripoli (LPH-10) as she passed through the eye of Typhoon Anita.*

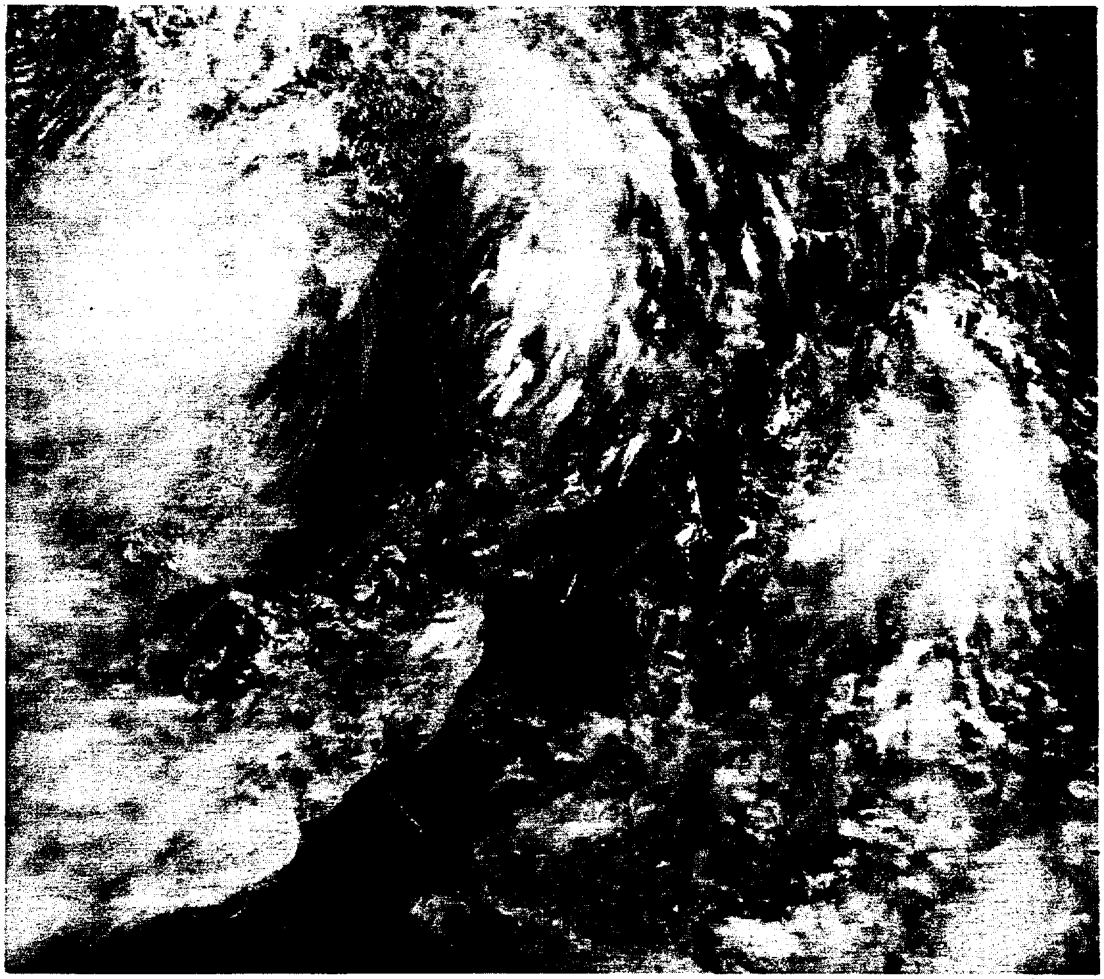
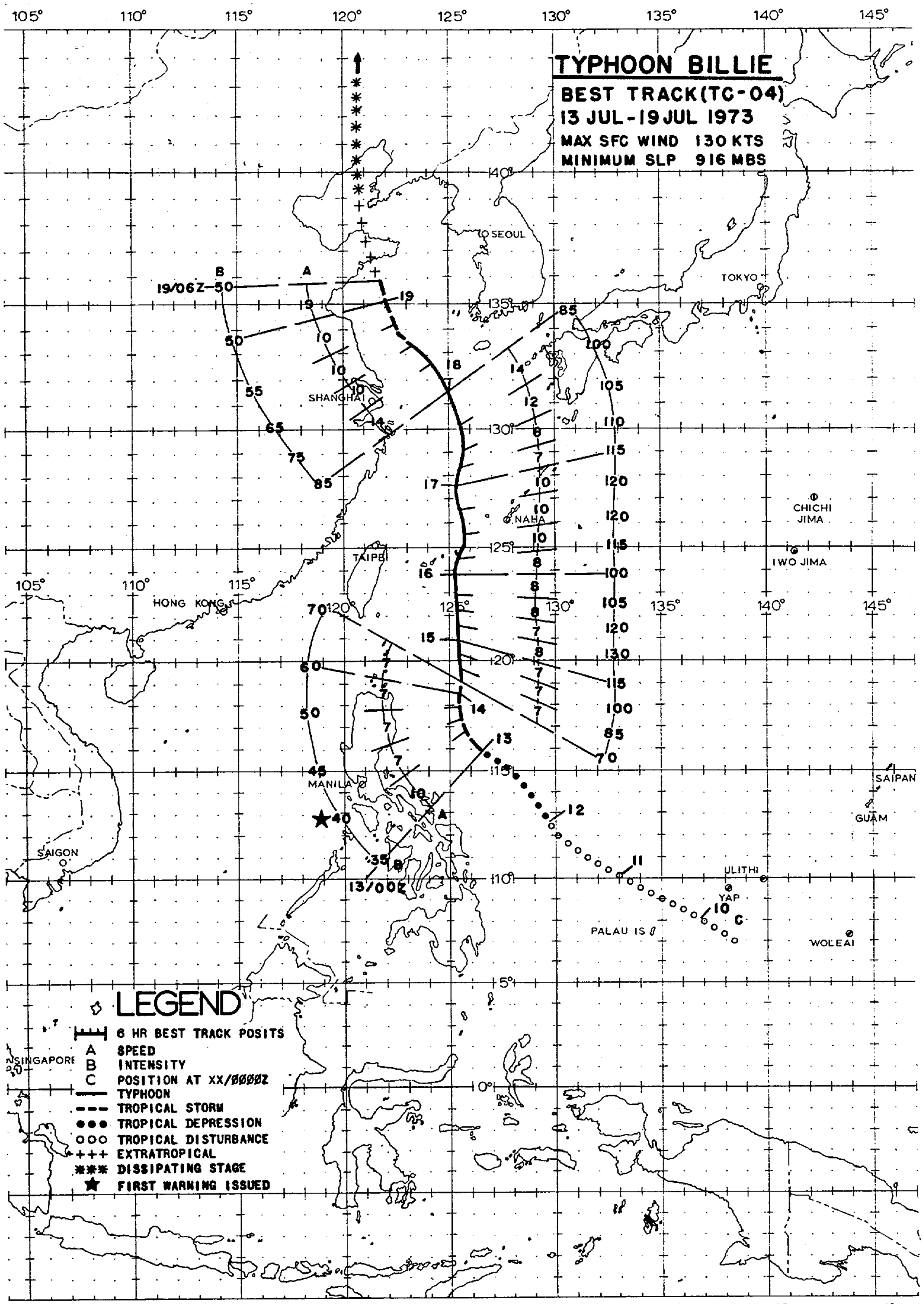


FIGURE 4-4. *Typhoon Anita in the Gulf of Tonkin near peak intensity, 8 July 1973, 0432 GMT. (DMSP imagery)*


TYPHOON BILLIE
BEST TRACK (TC-04)
13 JUL - 19 JUL 1973
MAX SFC WIND 130 KTS
MINIMUM SLP 916 MBS
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
C POSITION AT XX/0000Z
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
SEOUL
TOKYO
SHANGHAI
NAHA
TAIPEI
HONG KONG
MANILA
SAIGON
CHICHI JIMA
IWO JIMA
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
WOLEAI
SINGAPORE
19/06Z
13/00Z

Billie, the season's first super typhoon, became a tropical depression in the western Philippine Sea some 250nm east of Luzon on 12 July. Her early history can be traced to the Yap-Palau area on 10 July as a weak circulation in the monsoon trough.

Billie initially tracked westward, gradually shifting to the northwest in response to a long wave, mid-tropospheric trough over eastern China. Reaching tropical storm force late on the 13th, Billie assumed a northerly course at a speed of 7 kts.

The long wave trough remained stationary, influencing Billie to maintain a meridional track at about 8 kts. Her center never deviated more than 30nm either side of 125.5E for 4 days, covering a distance of 720nm. This steadiness in direction for such an extended period of time sets Billie apart from any other northward moving typhoon during the period 1947-1972.

Rapid deepening occurred once typhoon force was attained early on the 14th as Billie's central pressure fell 50mb in 24 hours. At 15/0330 GMT, aircraft reconnaissance indicated that the central pressure had dropped to 916mb within a tightly organized eye 8nm in diameter (Figure 4-5).

Billie's central pressure rose to 954mb during the next 18 hours as she approached the Ryukyus. Commencing an unusual second deepening as she crossed through the island chain, Billie's central pressure dropped to 917mb in the East China Sea (16/1154 GMT).

Billie passed just east of Miyako Jima, where maximum sustained winds of 65 kts with gusts to 104 kts were recorded (16/0700 GMT). The lowest pressure reading at the Japanese Meteorological Agency Station was 947.5mb (16/0650 GMT).

The island of Okinawa experienced gale force winds as Billie transited northward through the East China Sea. Naha registered maximum sustained winds of 35 kts with gusts to 58 kts (16/1700 GMT) while White Beach Naval Port Facility recorded 45 kts sustained with gusts to 55 kts (16/1900 GMT). Kadena AFB reported lesser winds of 28 kts (16/1640 GMT) with gusts of 43 kts (16/1354 GMT). Based on land radar, Billie's eye passed 105nm west of Okinawa at 16/1800 GMT.

On the 17th, a short wave deepened the northern portion of the long wave trough situated in the Lake Baikal region of Siberia, causing increased ridging over Manchuria and the Sea of Japan. This ridging prevented Billie from recurving. On the 18th, Billie shifted to a northwest course 120nm southsouthwest of Cheju-do Island. Satellite imagery indicated drier air off the Asian Mainland was entering Billie's circulation at this time. She weakened significantly during the 18th, dropping to tropical storm strength late that day while tracking into the Yellow Sea.

Approaching the Gulf of Chihli on the 19th, Billie acquired extratropical characteristics and accelerated to a forward speed greater than 20 kts. Billie finally moved inland near Chin-Chow China and dissipated on the 20th.

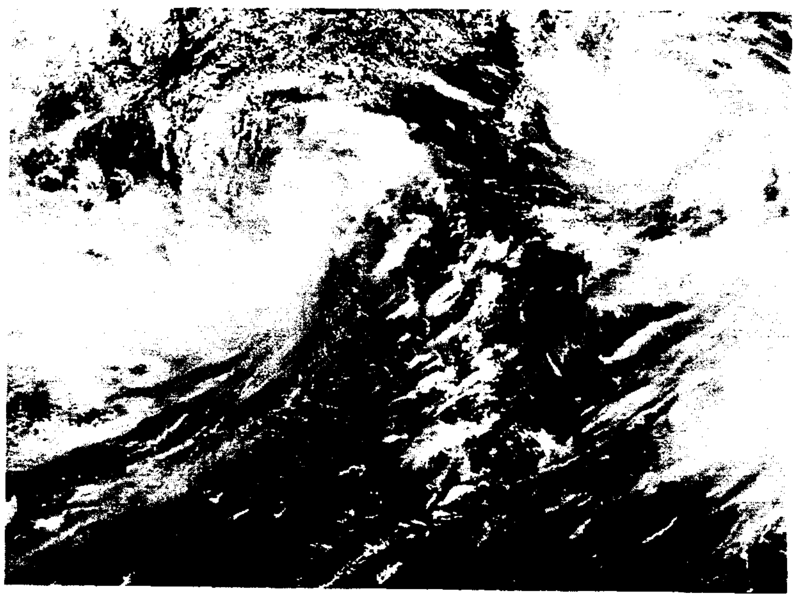
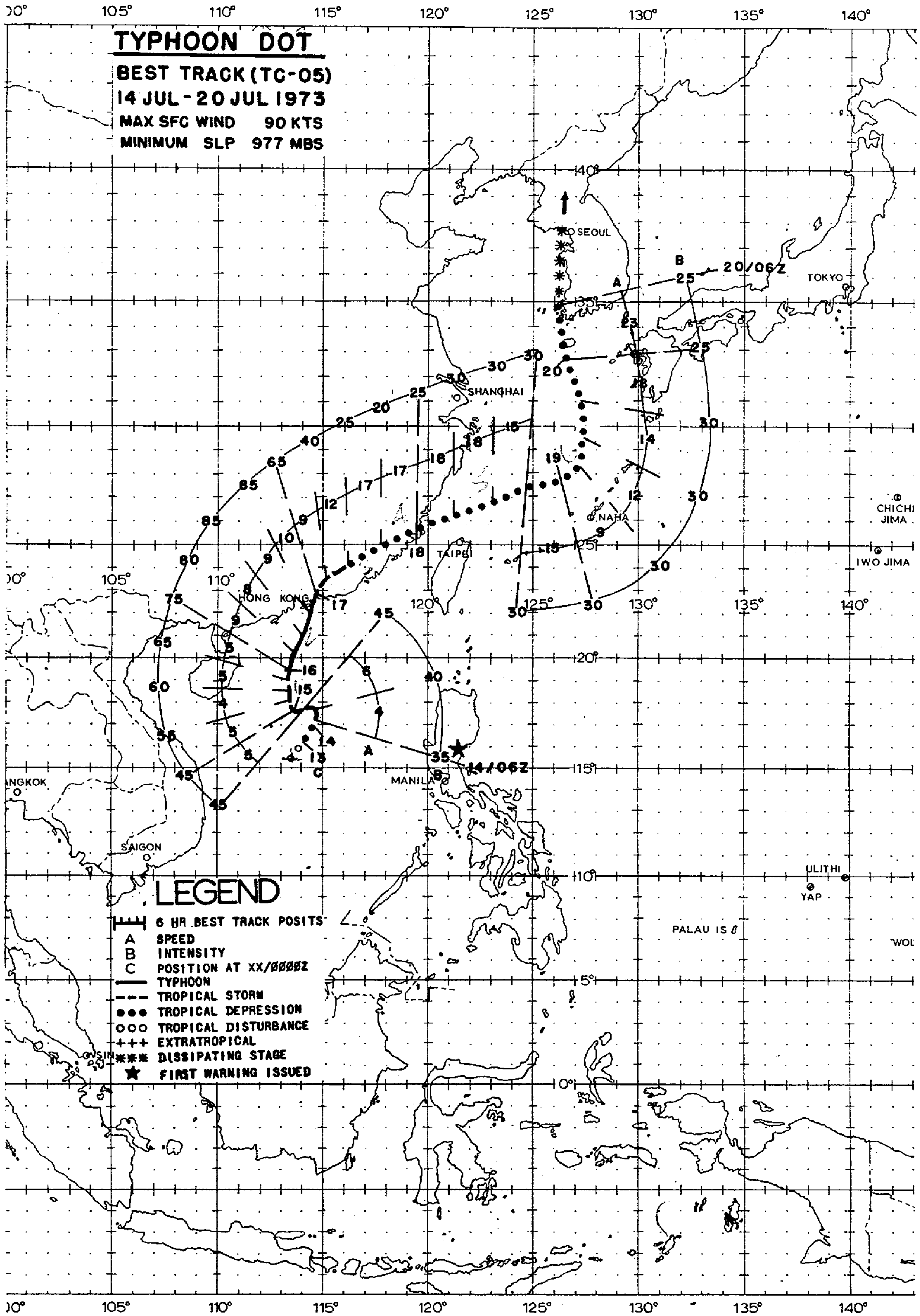


FIGURE 4-5. *Typhoon Billie (right) 7 hours prior to an unusual second deepening 190 nm east of Taiwan. Typhoon Dot (left) in the South China Sea, 16 July 1973, 0416 GMT. (DMSP imagery)*


TYPHOON DOT
BEST TRACK (TC-05)
14 JUL - 20 JUL 1973
MAX SFC WIND 90 KTS
MINIMUM SLP 977 MBS
SEOUL
20/06Z
TOKYO
SHANGHAI
TAIPEI
NAHA
CHICHI JIMA
IWO JIMA
HONG KONG
14/06Z
MANILA
BANGKOK
SAIGON
ULITHI
YAP
PALAU IS
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
C POSITION AT XX/0000Z
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED

The South China Sea spawned its second typhoon of the 1973 season on 13 July with the genesis of Dot. Her development was quite similar to Anita's. A surge in the low level southwesterlies preceded her formation in the monsoonal trough.

Dot formed a few days after Billie. While Billie intensified rapidly in the Philippine Sea to dominate the synoptic situation in the vicinity of both tropical cyclones, Dot drifted slowly northward remaining poorly organized (Figure 4-6). Billie's strong mass divergence aloft effectively blocked Dot's outflow to the subtropical westerlies leaving a good outflow channel only in the southwest semicircle. This may have been a critical factor in explaining Dot's slow rate of intensification during the first three days of her existence.

Late on the 15th, Dot began to increase her rate of intensification. The United Kingdom ship HYRIA, located 60 nautical miles southeast of Dot's center, observed 55 knots of wind and a pressure of 989.3mb (15/0600 GMT). She reached typhoon strength late that evening as she accelerated to a speed of 9 knots towards Hong Kong. During this period, the separation between Dot and Billie began to increase and Billie had reached peak intensity and was starting to weaken. This apparently allowed Dot to intensify at a faster rate.

Besides intensity interaction between Dot and Billie, both storms also experienced the Fujiwhara interaction (Figure 4-7). By subtracting the steering flow from the resultant movement of both storms the interaction is quite pronounced (Brand, 1968). Throughout the period of the interaction Billie remained the stronger of the

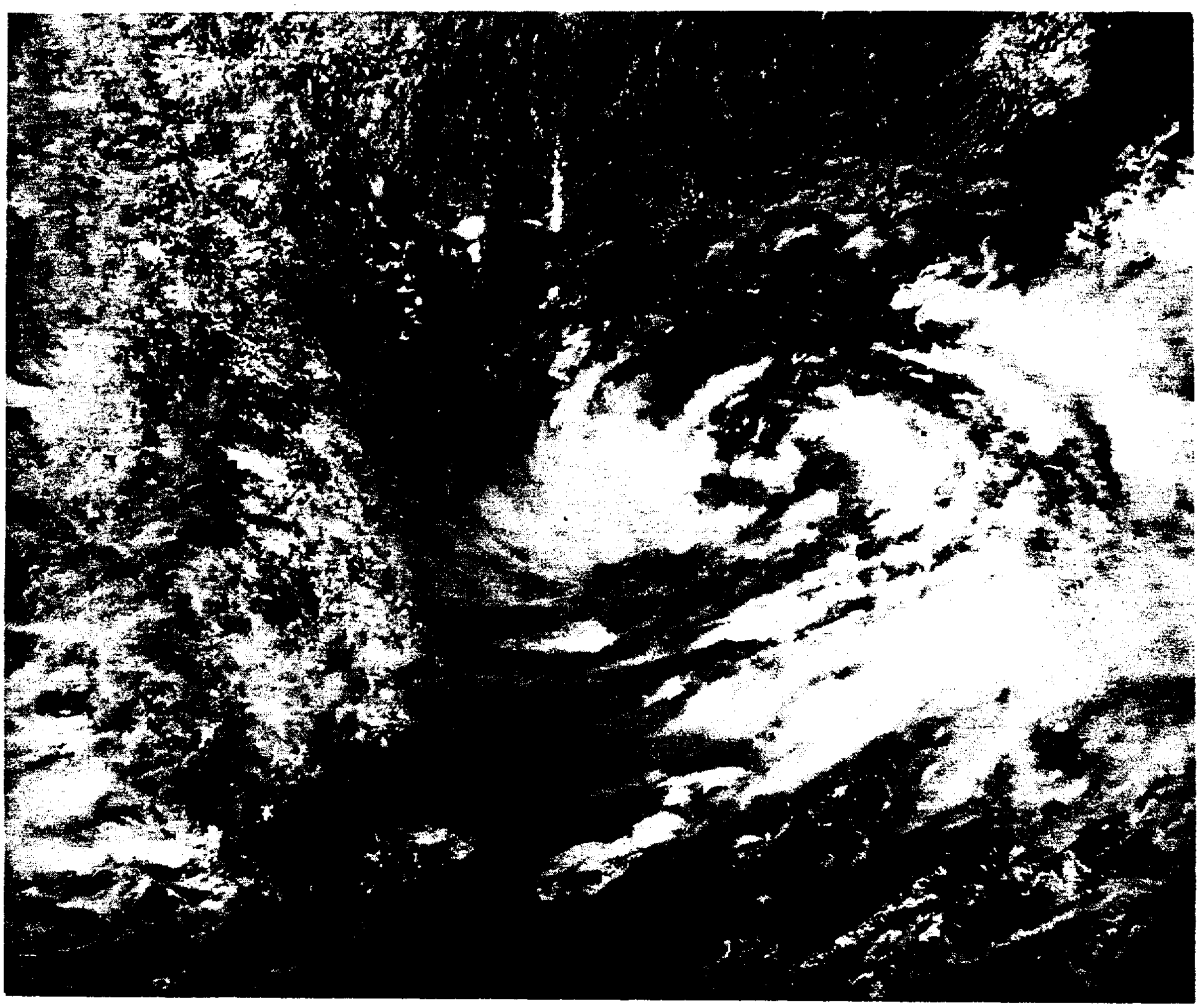


FIGURE 4-6. *Dot as a tropical depression in the South China Sea, 14 July 1973, 0446 GMT. (DMSP imagery)*

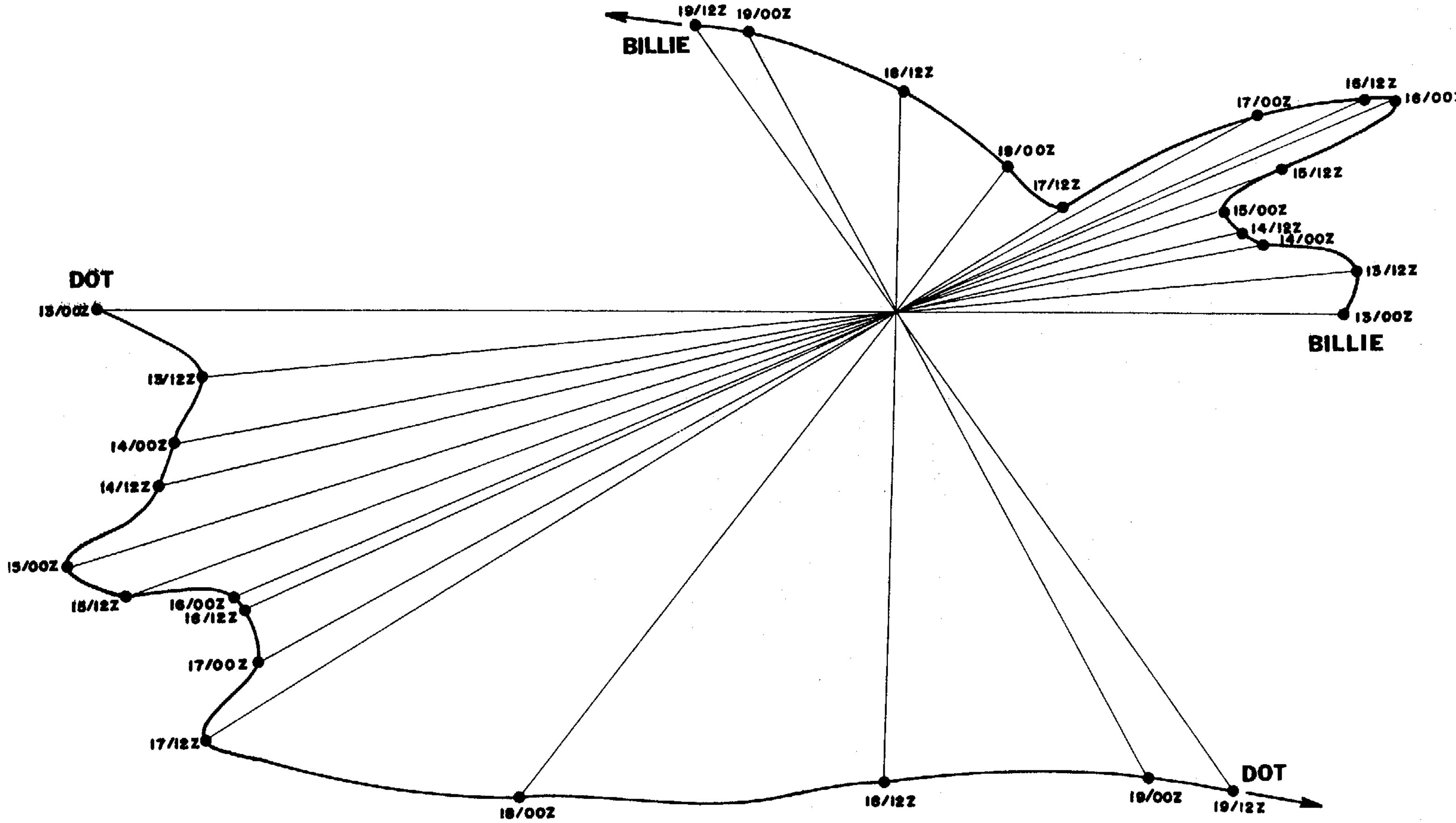


FIGURE 4-7. *Depicts Fujiwhara interaction between Typhoon Dot and Typhoon Billie over a period of approximately 6 1/2 days.*

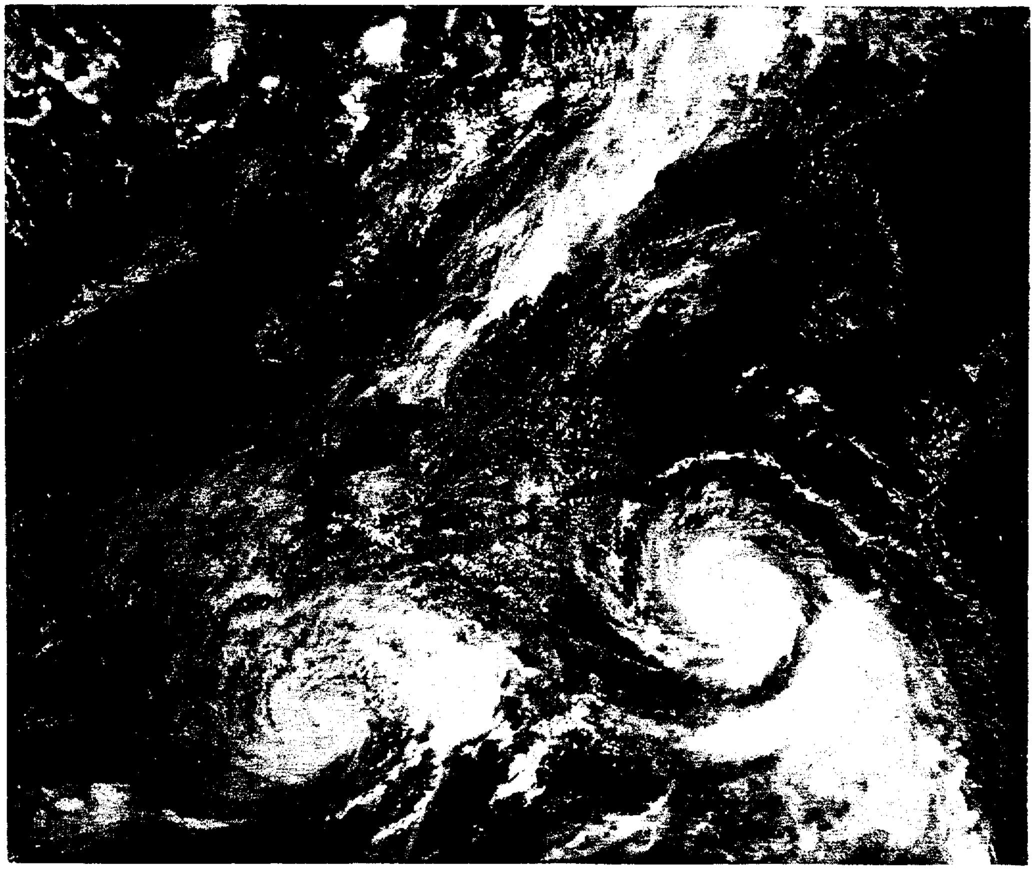


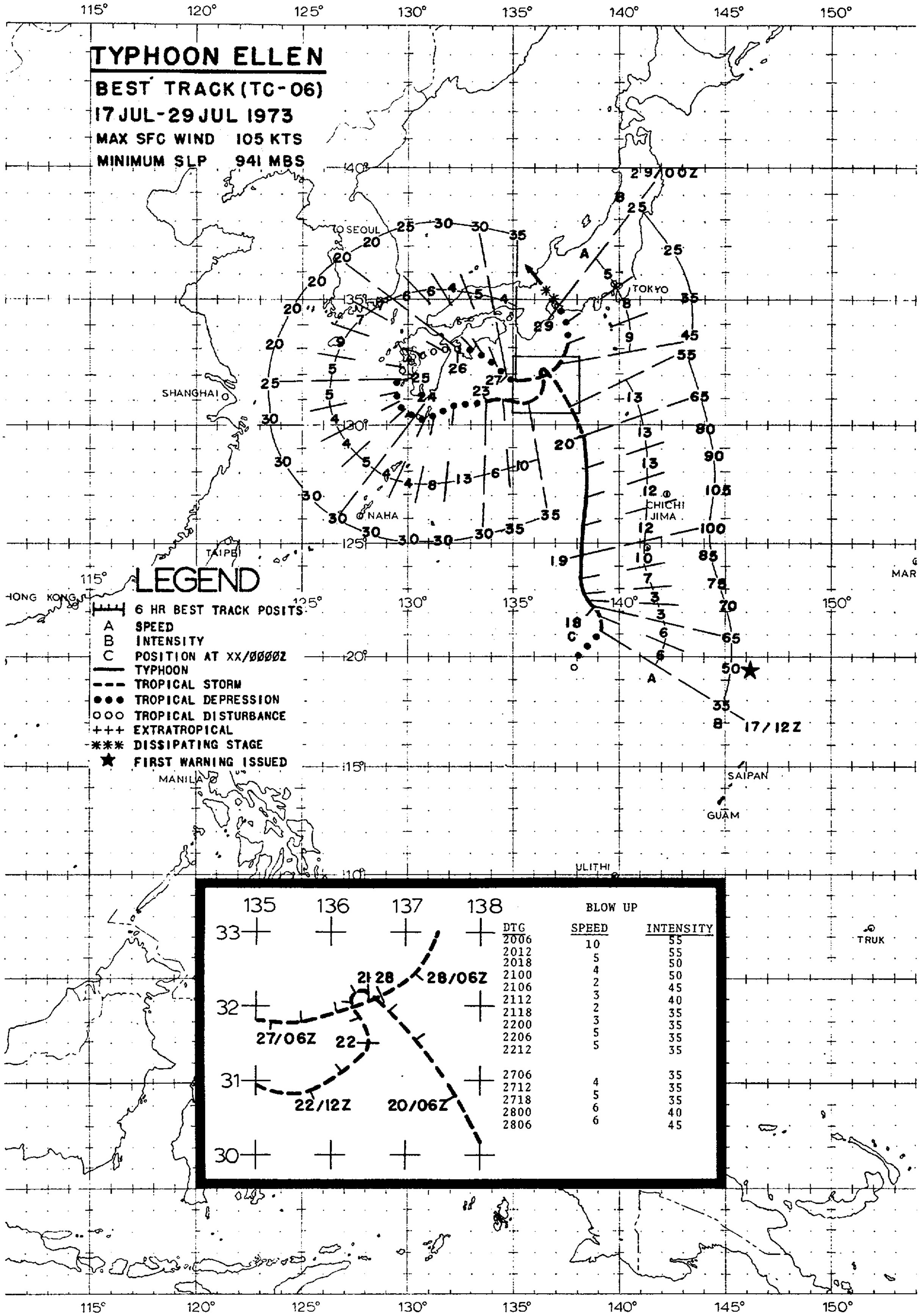
FIGURE 4-8. *Dot (left) overland 70 nm northeast of Hong Kong and Typhoon Billie (right) in the East China Sea, 17 July 1973, 0402 GMT. (DMSP imagery)*

two. As a result, Dot's resultant movement was affected much more significantly. Both storms rotated 124 degrees around the common center of rotation.

Dot reached her peak intensity of 85 knots on the 16th, about 80nm south of Hong Kong. She passed within 12 miles of the Royal Observatory in Hong Kong which experienced maximum sustained winds of 32 knots with a peak gust of 76 knots. Tate's Cairn in the Colony reported the strongest sustained winds of 57 knots with peak gusts of 97 knots.

Dot weakened considerably upon making landfall on the northeastern side of Mirs Bay (Figure 4-8). She tracked toward the eastnortheast over eastern Kwangtung during the night of the 17th as a low pressure area and entered the East China Sea near Foochow as a tropical depression on the morning of the 18th. As Dot approached within 120nm northnorthwest of Okinawa, she took an abrupt change of course due north in response to a building ridge to the east and accelerated rapidly, following in the wake of Billie. Dot dissipated over the Yellow Sea on the 20th.

Damage reports from Hong Kong indicated many low-lying areas in the New Territories were flooded. Hong Kong experienced heavy losses to garden crops, fruit trees, livestock, and farm houses. A landslide killed one person and injured 38 others. Two freighters were beached and six others dragged anchor.


TYPHOON ELLEN
BEST TRACK (TC-06)
17 JUL-29 JUL 1973
MAX SFC WIND 105 KTS
MINIMUM SLP 941 MBS
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
C POSITION AT XX/0000Z
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
SEOUL
TOKYO
SHANGHAI
NAHA
TAIPEI
HONG KONG
MANILA
CHICHI JIMA
SAIPAN
GUAM
ULITHI
TRUK
29/00Z
17/12Z
BLOW UP
DTG SPEED INTENSITY
2006 55
10
2012 55
5
2018 50
4
2100 50
2
2106 45
3
2112 40
2
2118 35
3
2200 35
5
2206 35
5
2212 35
2706 35
4
2712 35
5
2718 35
6
2800 40
6
2806 45
28/06Z
27/06Z
22/12Z
20/06Z

The first indication of what was to become Ellen appeared in the surface data on 15 July as an increased troughing in the extensive convergence zone southeast of Typhoon Billie. By 17 July, high resolution DMSP satellite imagery confirmed the existence of a closed circulation in the trough near 20°N 138°E (Figure 4-9).

Ellen evolved unusually far north in the trailing convergence area of Typhoon Billie. Furthermore, in the early stages of development, the upper tropospheric outflow was most obviously influenced by the TUTT. Post-analysis of 200mb synoptic charts and satellite data indicates that the formation was assisted by a small, but pronounced, ridging induced on the east side of a westward moving cell in the upper tropospheric trough.

Ellen intensified rapidly, reaching typhoon strength by the 18th. Iwo Jima (Japanese Maritime Self Defense Force) reported southeasterlies with maximum gust of 44 knots as she passed to the west within 165nm (19/0200 GMT). Ellen achieved peak intensity as a reconnaissance aircraft observed maximum winds of 105 knots and a central pressure of 941mb (19/0420 GMT).

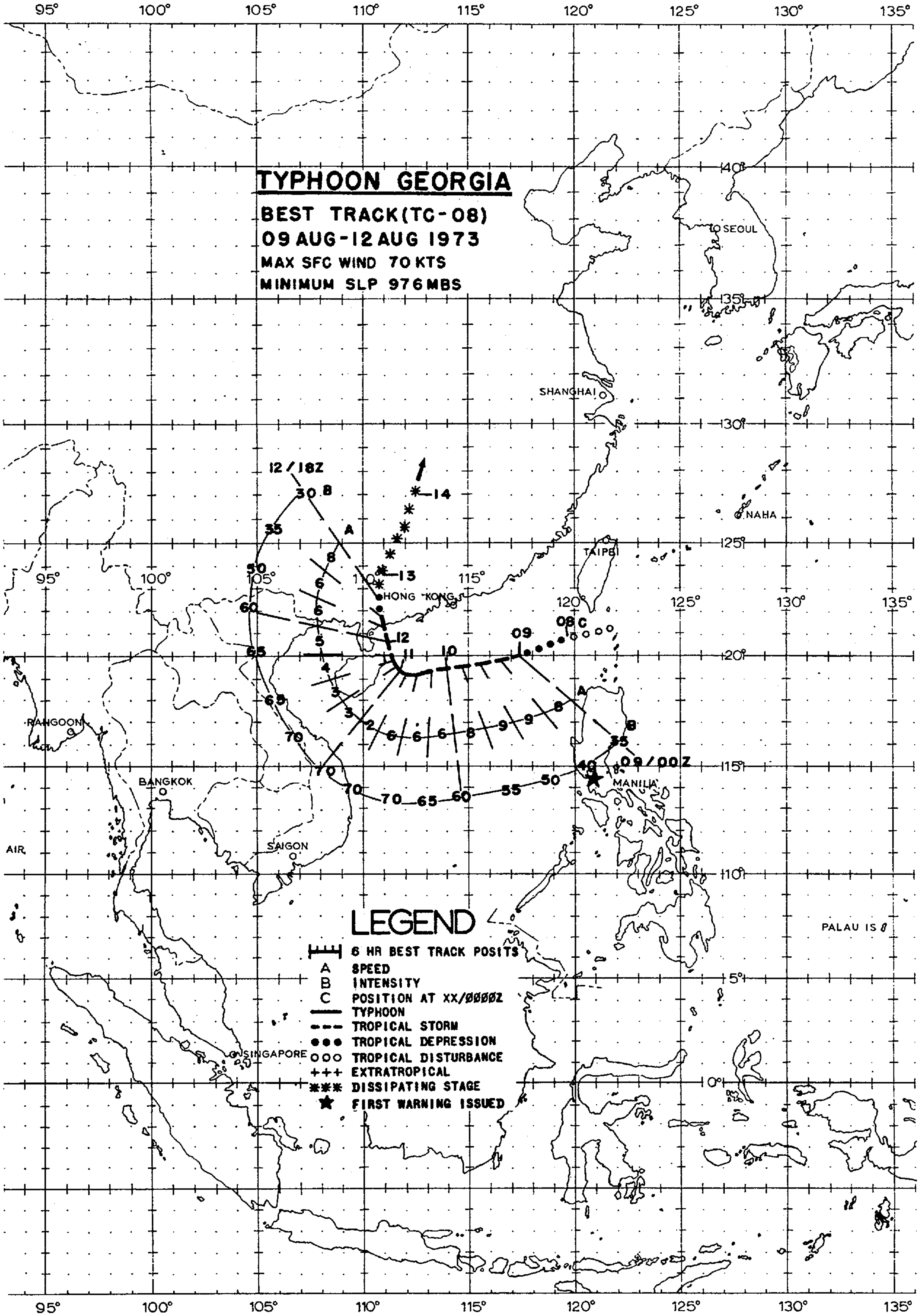
During the early portion of her life, Ellen tracked almost due north as Billie had done. She moved to the north beneath upper tropospheric northerly flow (35-40 knots). By late on the 19th, the strong vertical shearing environment caused her to deteriorate rapidly over open water (Figure 4-10). By the 20th, the upper level anticyclone over Ellen had sheared off exposing her low level circulation. Convective activity at this time was confined to convergence areas well south and southeast of the center.

As a weak low-level circulation, the remains of Ellen drifted westward under the influence of the troughing left by Billie and Dot and a quasi-stationary anticyclone over the Sea of Japan. Satellite imagery on 23 July indicated a rejuvenation of convection over the circulation which then persisted through 28 July with varying degrees of intensity. Reconnaissance aircraft on 24 July confirmed the presence of a warm core, closed circulation. As a result of the weak steering flow, Ellen's movement was erratic during the period from the 21st to the 28th.

On the 28th, she reintensified once more 90nm from the south coast of Honshu. The Japanese weather ship OJIKA and two other ships reported winds of 30 to 35 knots around Ellen (28/0000Z). She reached a peak of 45 knots as a shortwave trough over the Sea of Japan caused her to move on a northward course over south central Japan dissipating over land on the 29th.

FIGURE 4-9. *Formative stages of Ellen centered 300 nm southwest of Iwo Jima, 17 July 1973, 0221 GMT. (DMSP imagery)*

FIGURE 4-10. *Typhoon Ellen (right) at peak intensity. Dot (left) as a tropical depression, 19 July 1973, 0333 GMT. (DMSP imagery)*


TYPHOON GEORGIA
BEST TRACK (TC-08)
09 AUG-12 AUG 1973
MAX SFC WIND 70 KTS
MINIMUM SLP 976 MBS
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
C POSITION AT XX/0000Z
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
12/18Z
09/00Z
SEOUL
SHANGHAI
NAHA
TAIPEI
HONG KONG
RANGOON
BANGKOK
SAIGON
MANILA
SINGAPORE
PALAU IS
95°
100°
105°
110°
115°
120°
125°
130°
135°

During early August, the tropical upper tropospheric trough (TUTT) remained to the north of and in close proximity to the monsoon trough in the South China Sea. As a result, Georgia's formation and subsequent development cannot be easily attributed to the monsoon trough or the TUTT independently, but more as an interaction between the two. Sadler (1973) suggests that westward moving cells in the TUTT provide an upper level westerly outflow channel which enhances development of disturbances in the monsoon trough. This type of influence was apparent during the development of Georgia.

Georgia reached minimum tropical storm intensity on 9 August as she transited on a westsouthwest course across the South China Sea at a moderate speed. She passed within 170nm of Hong Kong late on the 9th. Maximum sustained winds experienced at Hong Kong were 41 knots with a peak gust of 73 knots. Georgia reached typhoon intensity on 10 August (Figure 4-11).

Maintaining her westerly track at 8 knots until early on the 11th, Georgia then turned north in response to a weakness in the high cell over eastern China. She made landfall north of Hainan Island on 12 August and dissipated over China. Georgia was the third tropical cyclone originating in the South China Sea to reach typhoon intensity in 1973.

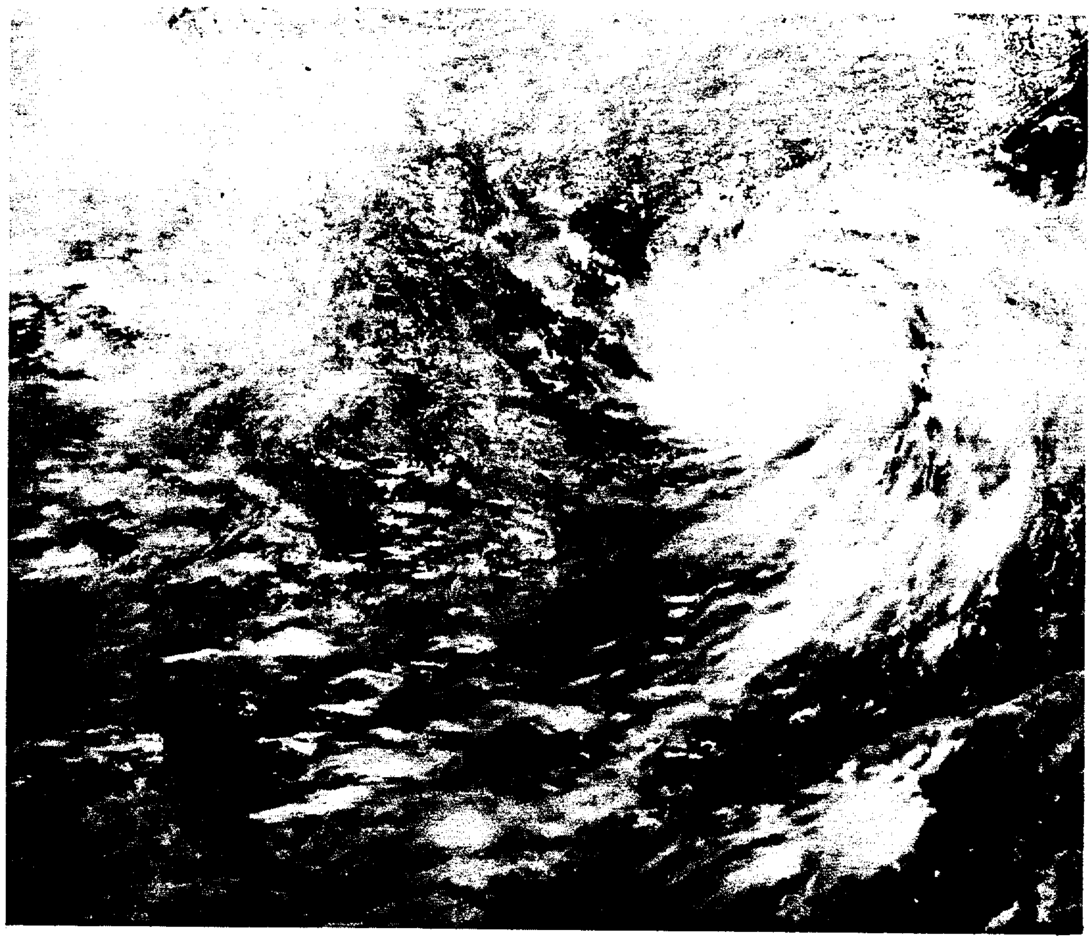
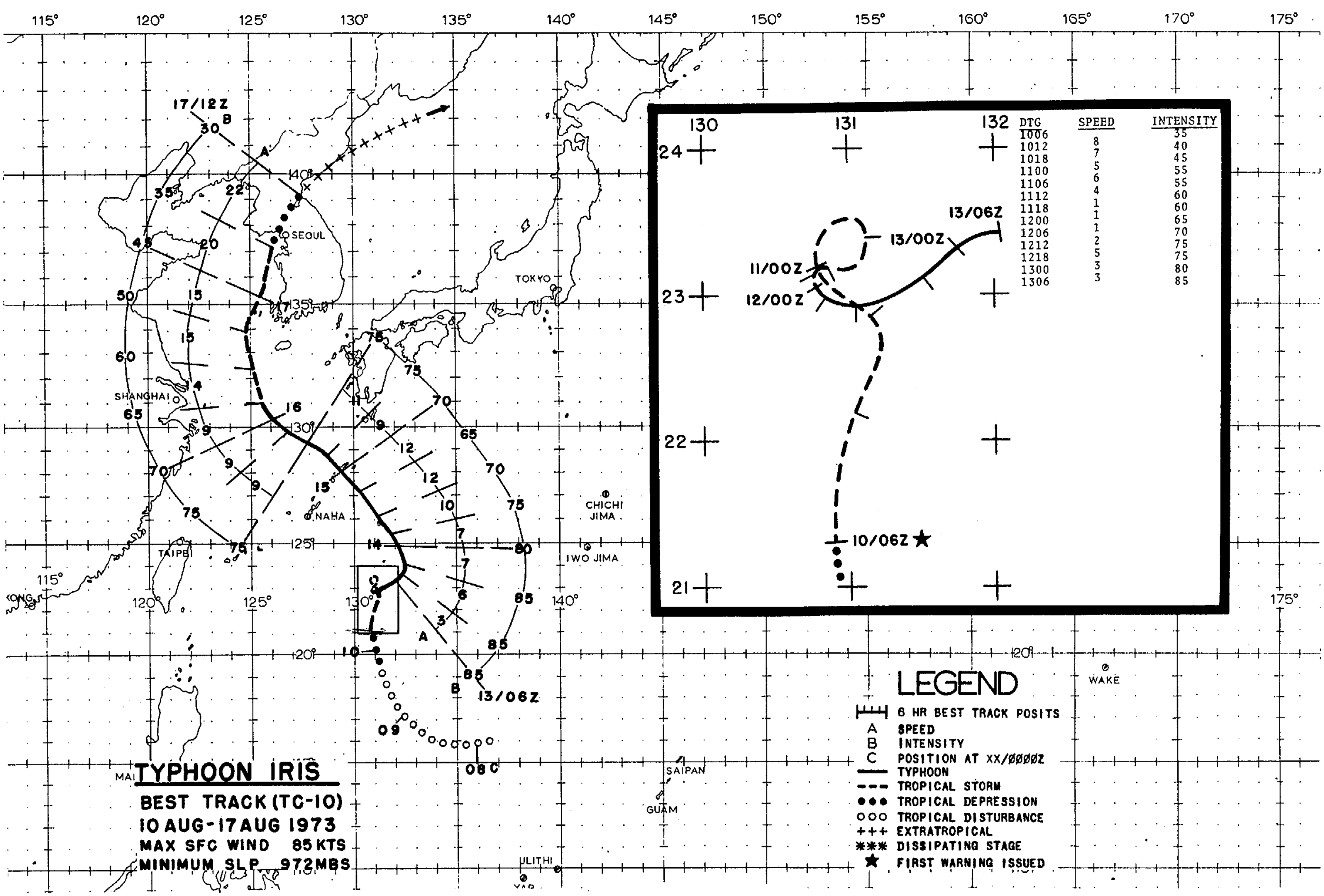


FIGURE 4-11. *Typhoon Georgia in the South China Sea 140 nm east of Hainan Island, 10 August 1973, 0500 GMT. (DMSP imagery)*


TYPHOON IRIS
BEST TRACK (TC-10)
10 AUG - 17 AUG 1973
MAX SFC WIND 85 KTS
MINIMUM SLP 972 MBS
17/12Z
13/06Z
SEOUL
TOKYO
SHANGHAI
NAHA
TAIPEI
CHICHI JIMA
IWO JIMA
WAKE
SAIPAN
GUAM
ULITHI
130 131 132
24 23 22 21
13/06Z
13/00Z
11/00Z
12/00Z
10/06Z
DTG SPEED INTENSITY
1006 1012 1018 1100 1106 1112 1118 1200 1206 1212 1218 1300 1306
8 7 5 6 4 1 1 1 2 5 3 3
35 40 45 55 55 60 60 65 70 75 75 80 85
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
C POSITION AT XX/ØØØØZ
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED

On the 8th of August, the monsoon trough extended 1500 nautical miles southeast from the Luzon Strait to a position just west of Truk with a weak surface cyclonic circulation imbedded in the trough 420 nautical miles north of Yap. Only 24 hours previously, its eastward extent had been restricted to the northern part of the South China Sea.

During the next two days, the disturbance drifted northwestward with little development. By the 10th, the disturbance had intensified to Tropical Storm Iris. She continued to move northward at 8 knots.

On the morning of the 11th, the complex upper air and weak steering flow patterns resulting from the presence of the subtropical ridge to the north and the near equatorial ridge to the south of Iris forced her to remain essentially quasi-stationary for the next 48 hours. However, she continued to intensify during this period and by early on the 12th, developed typhoon strength winds.

Early on the 13th, Iris began to move toward the northeast under the influence of the near equatorial ridge reaching her maximum intensity of 85 knots that afternoon (Figure 4-12).

As Hope dissipated to the east, the subtropical ridge returned to its climatological position and the near equatorial ridge weakened. This forced Iris to alter her course to the northwest on the 14th in response to the change in the steering flow. The Japanese meteorological station at Minami Daito Jima measured a minimum pressure of 974.7mb during the passage of Iris (14/0707 GMT). Approximately 11 1/2 hours (1830 GMT) after passage of the surface center, the station reported peak gusts of 63 knots out of the southwest. She gradually weakened to minimum typhoon intensity prior to crossing the island of Amami O-Shima. Two fishing vessels were reported lost in the vicinity of the island during her passage.

After crossing the island she reintensified briefly to 75 knots. By the 16th, Iris weakened to tropical storm force and took a more northerly course (Figure 4-13).

On the morning of the 17th, Iris began recurving. Kunsan Air Base in the Republic of Korea experienced maximum sustained winds of 46 knots with a peak gust of 64 knots as Iris passed within 25nm (17/0646 GMT). She made landfall near Kaesong, Korea about 17/0800 GMT with maximum winds of 35 knots. Iris continued across Korea, entering the Sea of Japan near Wonsan where the maximum winds were still 30 knots. She became extrotropical over the Sea of Japan as she merged with a front moving off Manchuria.

Initial reports from Korea indicated two persons were killed, three missing and hundreds were left homeless. A barge carrying six persons sank in the sea off Kijang - Myon, Yangsangun; 3 were rescued.

FIGURE 4-12. *Typhoon Iris (left) near peak intensity 285 nm southeast of Okinawa. Remnants of Hope (right) just off the coast of Honshu, 13 August 1973, 0234 GMT. (DMSP imagery)*

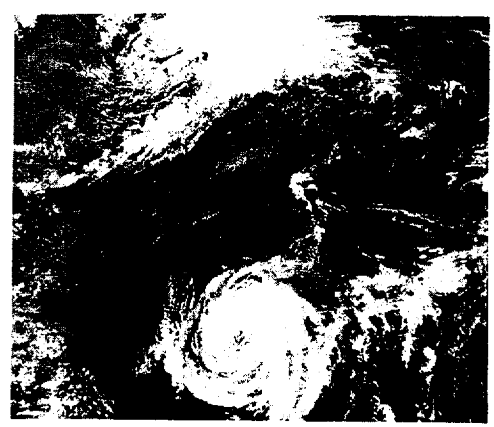
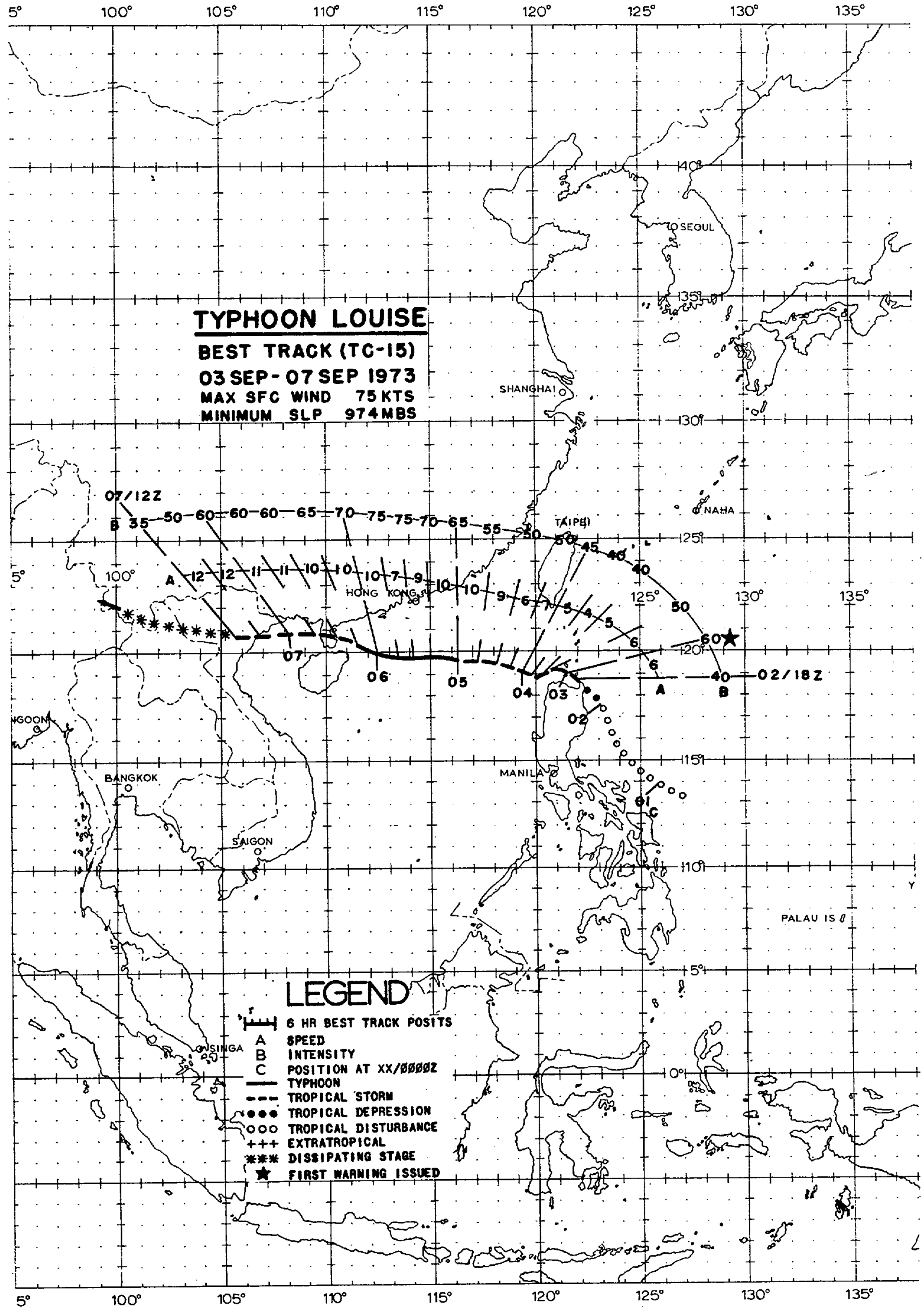


FIGURE 4-13. *Typhoon Iris 165 nm south of Cheju Do, 16 August 1973, 0332 GMT. (DMSP imagery)*



TYPHOON LOUISE
BEST TRACK (TC-15)
03 SEP - 07 SEP 1973
MAX SFC WIND 75 KTS
MINIMUM SLP 974 MBS
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
C POSITION AT XX/0000Z
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
07/12Z
02/18Z
SEOUL
SHANGHAI
TAIPEI
NAHA
HONG KONG
MANILA
BANGKOK
SAIGON
PALAU IS
SINGA

Louise began as a low level circulation in the monsoon trough first noted on 30 August in the Philippine Sea to the east of Catanduanes Island. An organized cloud pattern became apparent the next day but the surface circulation remained weak. The weak surface low drifted towards the northwest for the next 72 hours.

By 3 September, an aircraft investigative mission reported a narrow band of 65 to 75 knot surface winds north of the low center although the minimum sea level pressure was only 998mb (03/0350 GMT). A 60 knot wind report from the United Kingdom ship SHEAF TYNE 30nm to the north of Louise confirmed the aircraft observation. Satellite imagery at approximately the same time showed Louise to be poorly organized. The near-typhoon force winds appear to have been a transitory phenomenon induced by the channeling effect of the Luzon Strait. By the evening of the 3rd, a reconnaissance aircraft reported maximum winds of only 40 knots as Louise entered the South China Sea.

On the 4th, Louise had become a better organized tropical storm well on her way to becoming a typhoon (Figure 4-14). The mid-tropospheric ridge to the north of Louise kept her on a westerly course at 10 kts across the South China Sea.

She passed 150nm to the south of Hong Kong late on the 5th just as she reached peak intensity of 75 kts. Throughout her life, Louise remained a relatively small typhoon. Louise crossed the Luichow Peninsula during the night of the 6th. Eighteen hours later she made landfall and dissipated rapidly over North Vietnam.

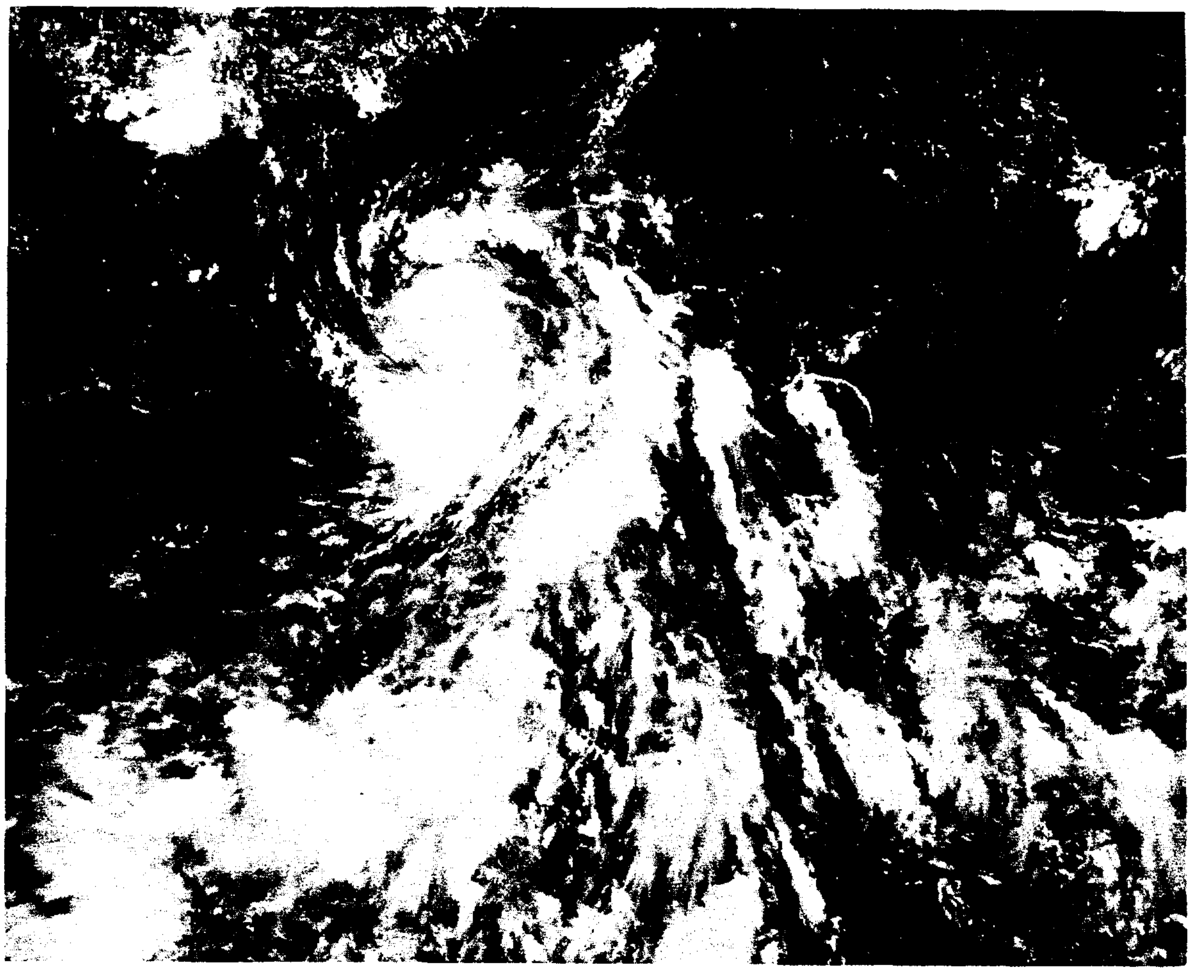
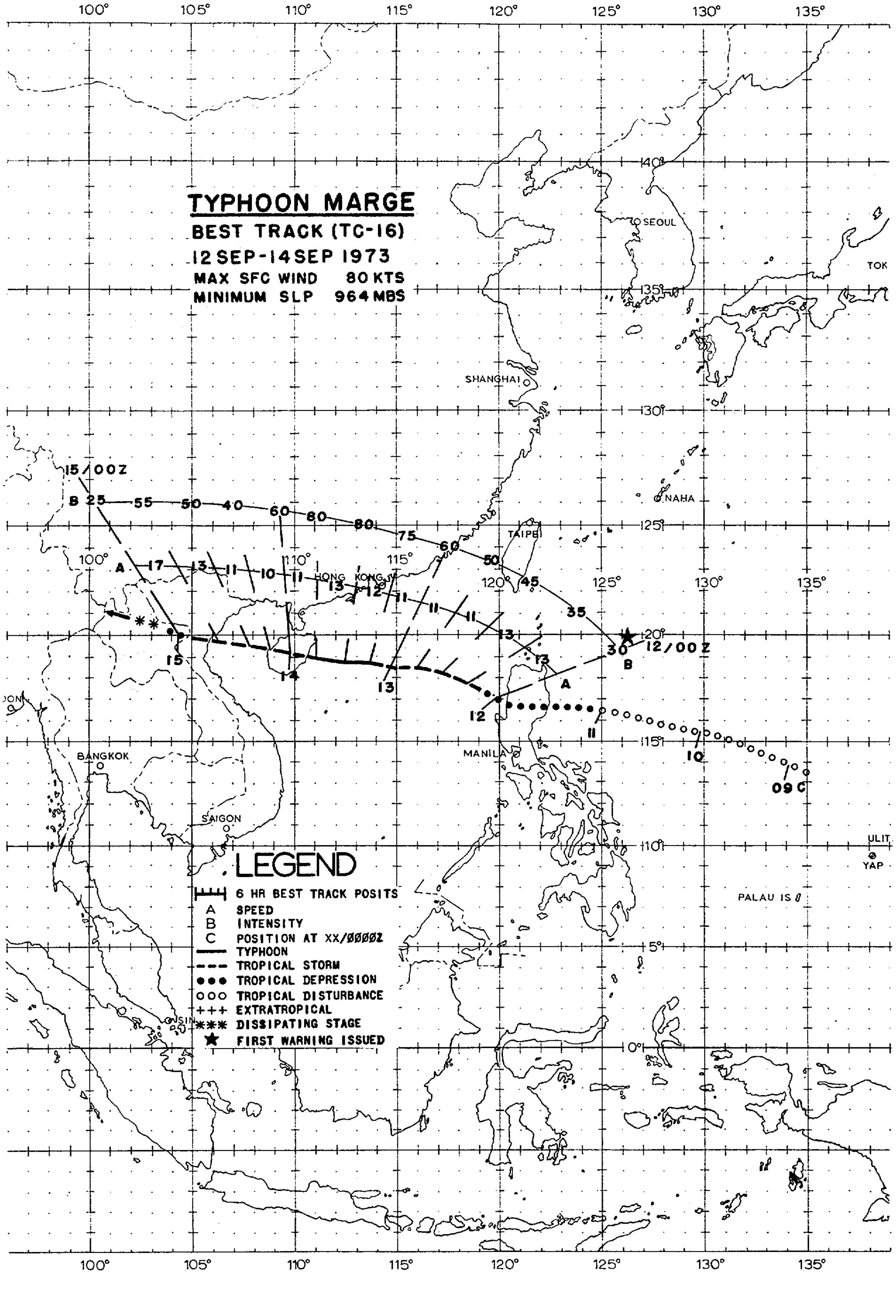


FIGURE 4-14. *Tropical Storm Louise 105 nm northwest of Luzon, 4 September 1973, 0401 GMT. (DMSP imagery)*


TYPHOON MARGE
BEST TRACK (TC-16)
12 SEP-14 SEP 1973
MAX SFC WIND 80 KTS
MINIMUM SLP 964 MBS
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
C POSITION AT XX/0000Z
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
15/00Z
12/00Z
SEOUL
SHANGHAI
TAIPEI
NAHA
HONG KONG
MANILA
BANGKOK
SAIGON
PALAU IS
YAP
ULIT
TOK

Marge entered the South China Sea on 12 September as a tropical depression, after crossing northern Luzon (Figure 4-15). She quickly developed to tropical storm strength 125 nm northwest of Cape Bolinao. The early stages of Marge can be traced to a weak circulation in the monsoon trough appearing on the synoptic surface analysis 750 miles eastsoutheast of Luzon (08/0000 GMT). This system tracked westward during the next four days as it accelerated to a speed of 11 to 12 knots before making landfall on northern Luzon.

A narrow, mid-tropospheric, subtropical ridge was positioned over southern China as Marge emerged into the South China Sea. Little change in intensity or orientation of the ridge occurred during the next few days, dictating a westerly course which eventually caused Marge to strike North Vietnam 2 1/2 days later.

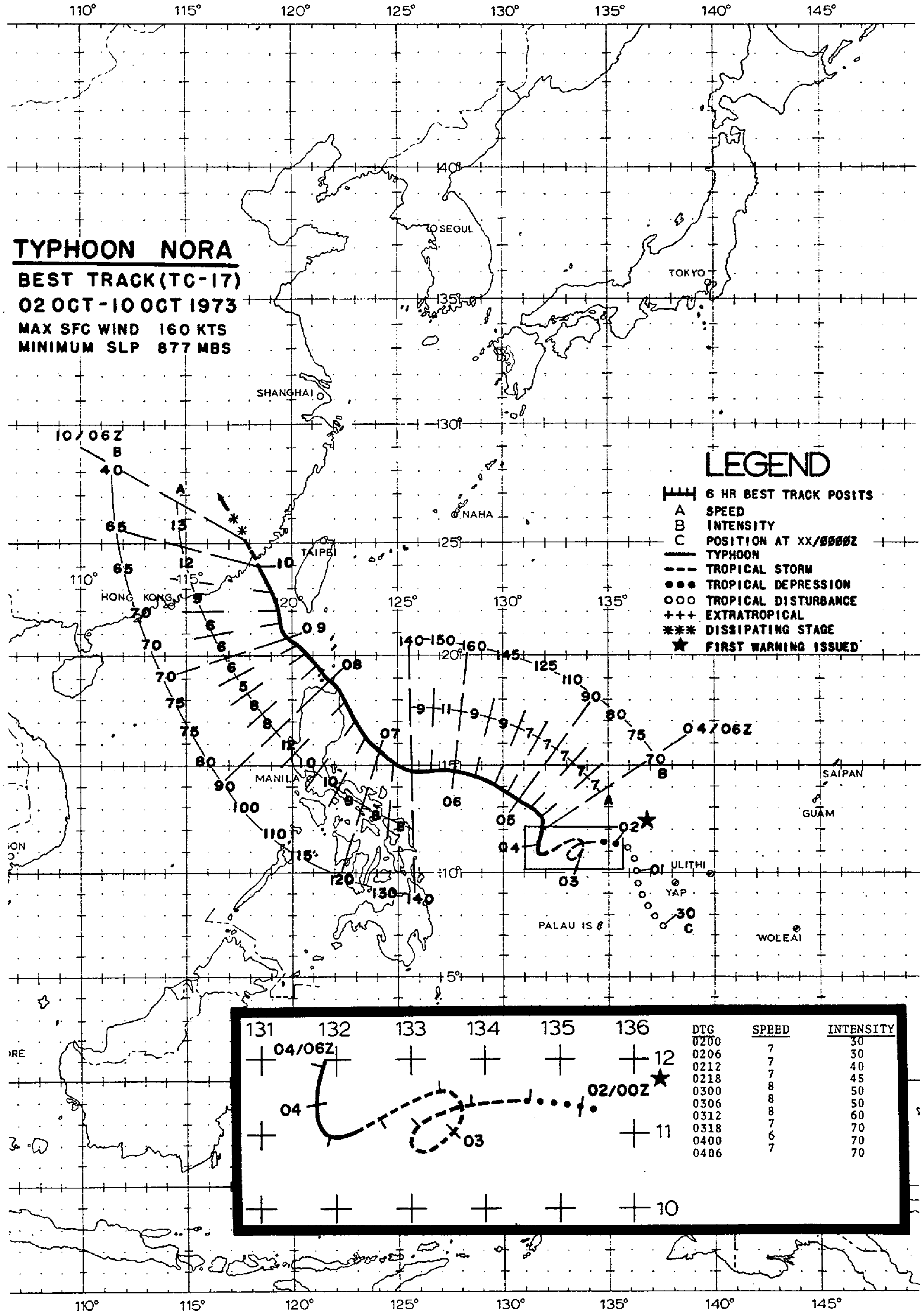
Maintaining a forward speed of 11 knots, Marge intensified steadily after entering the open waters of the South China Sea, reaching typhoon force as she passed 200 nm south of Hong Kong on the morning of the 13th (Figure 4-16). The minimum measured central pressure by aircraft reconnaissance, prior to the typhoon crossing the no-fly line, was 964 mb early in the evening of 13 September.

Striking central Hainan Island early on the morning of the 14th with sustained winds estimated near 80 knots, Marge emerged into the Gulf of Tonkin with tropical storm force some 12 hours later. Eventual landfall was made 60 nm north of Vinh, North Vietnam during the early morning hours of the 15th. Subsequently, Marge dissipated rapidly inland over the highlands of Laos.

One interesting feature of Marge during her transit of the South China Sea was her small size. Similar to Louise, as a typhoon, her circulation did not appear to exceed 150 miles in diameter as evidenced by ship and aircraft reconnaissance data. Typhoon strength winds were probably confined to the wall cloud region.

FIGURE 4-15. *Marge as a tropical depression 20 nm west of Luzon, 11 September 1973, 2342 GMT. (DMSP imagery)*

FIGURE 4-16. *Tropical Storm Marge near typhoon strength 225 nm south of Hong Kong, 13 September 1973, 0106 GMT. (DMSP imagery)*


TYPHOON NORA
BEST TRACK (TC-17)
02 OCT - 10 OCT 1973
MAX SFC WIND 160 KTS
MINIMUM SLP 877 MBS
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
C POSITION AT XX/0000Z
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
SEOUL
TOKYO
SHANGHAI
NAHA
TAIPEI
HONG KONG
MANILA
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
WOLEAI
10/06Z
04/06Z
04/06Z
02/00Z
DTG SPEED INTENSITY
0200 30
0206 7 30
0212 7 40
0218 7 45
0300 8 50
0306 8 50
0312 8 60
0318 7 70
0400 6 70
0406 7 70

A weak surface low formed in the monsoon trough, 120 miles south of Yap, on 30 September, and drifted northwest for the next two days. By the evening of 2 October, the tropical disturbance had intensified to Tropical Storm Nora. Reconnaissance aircraft reported maximum flight level winds of 45 kts and a minimum sea level pressure of 987 mb.

Nora continued a gradual intensification until early on the afternoon of the 5th when her winds exceeded 100 kts. During the next 20 hours, as she moved westward at 9 kts toward the Republic of the Philippines, Nora's central pressure plummeted 66mb to 877mb with maximum surface winds of 160 kts (Figure 4-17). Her central pressure ranked among the lowest on record (Jordon, 1961).

On the evening of the 6th, the high resolution DMSP infrared imagery revealed the typical anticyclonic outflow pattern in the cirrus. The infrared data was then "threshholded" to display only the colder portion of the infrared spectrum sensed by the radiometer (Figure 4-18). It revealed what appeared to be a tightly wound band spiraling out from the eye wall. Nora was a super typhoon at this time with estimated maximum winds of 140 kts.

When Nora was 225 miles east of Manila on the morning of the 6th, she took a more northwesterly track in response to an

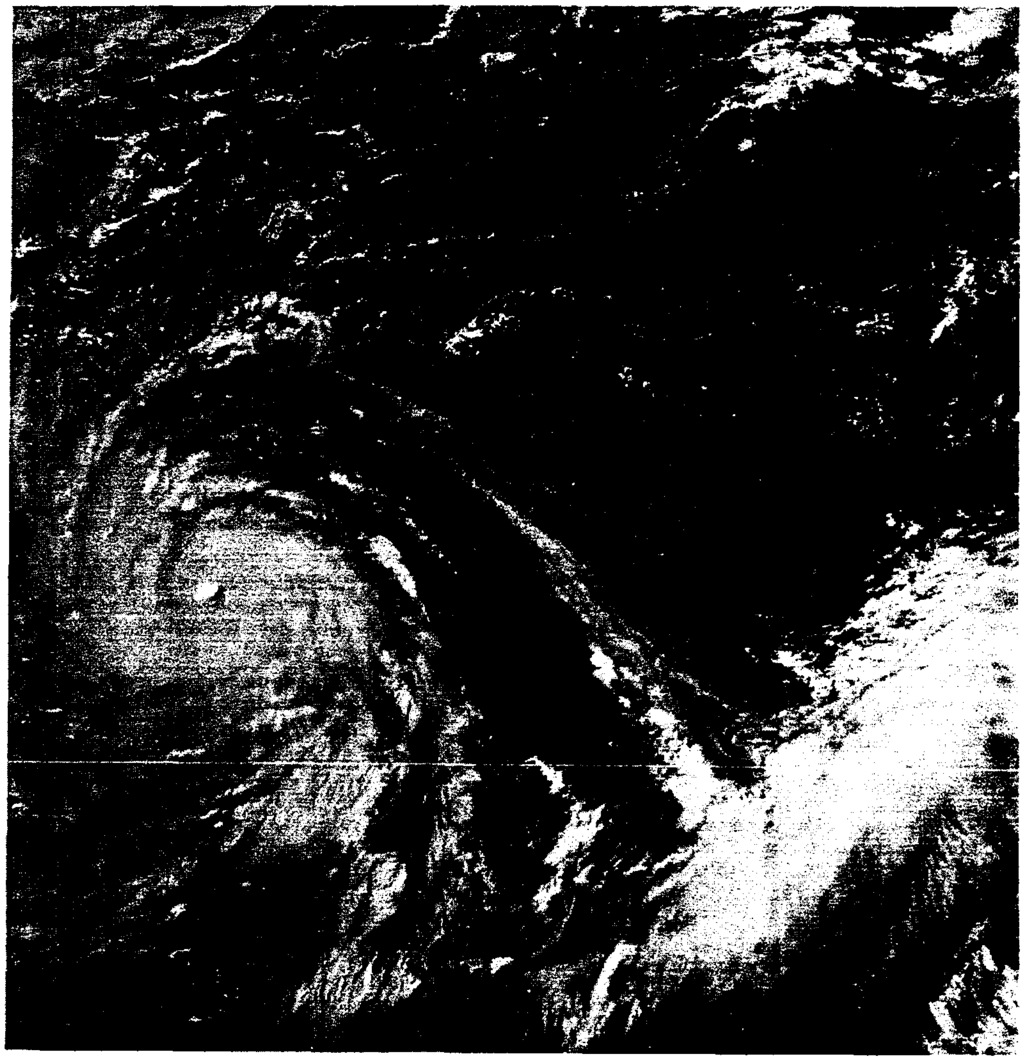


FIGURE 4-17. *Super Typhoon Nora (left) at peak intensity 200 nm eastnortheast of Catanduanes Island. Formative stages of Patsy (right) with low level circulation center exposed, 5 October 1973, 2312 GMT. (DMSP imagery)*

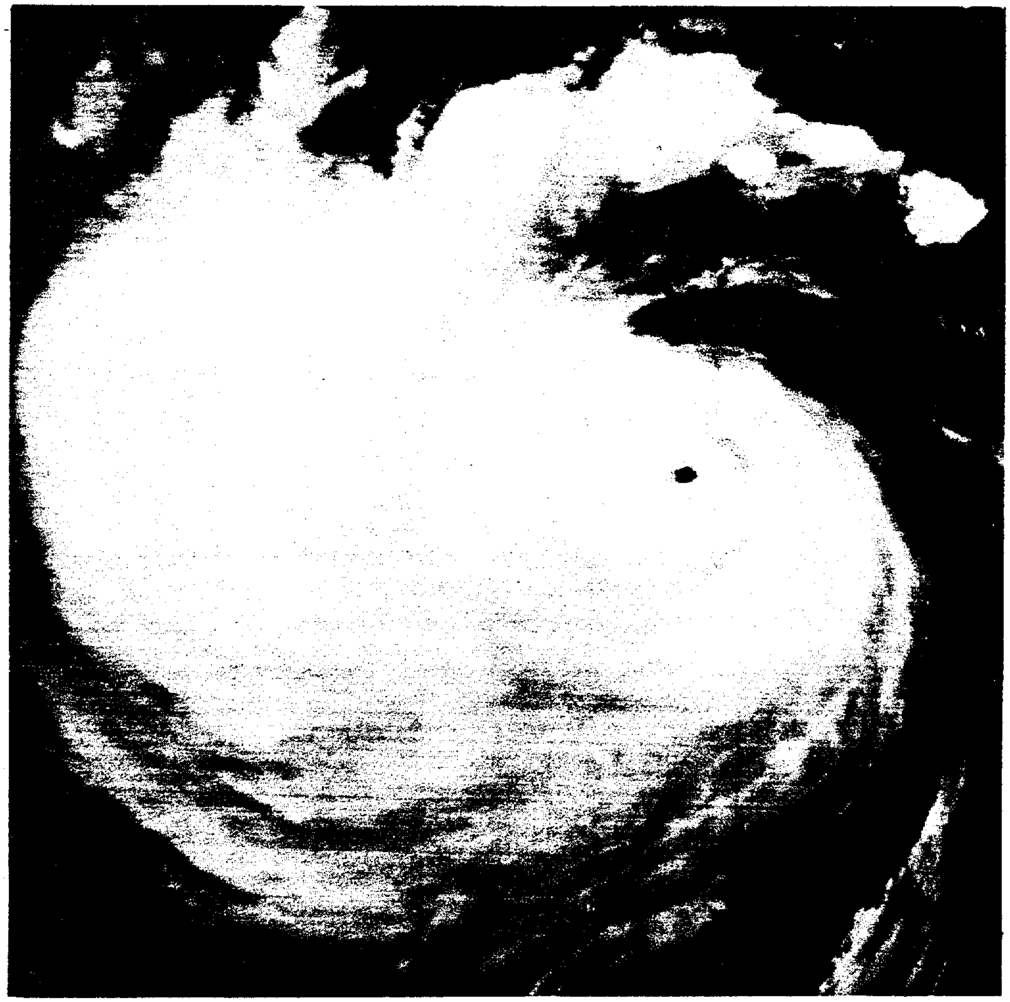


FIGURE 4-18. *Thresholded infrared imagery of Nora displaying only the colder portion of the infrared spectrum sensed by the radiometer, 6 October 1973, 1153 GMT. (DMSP imagery)*

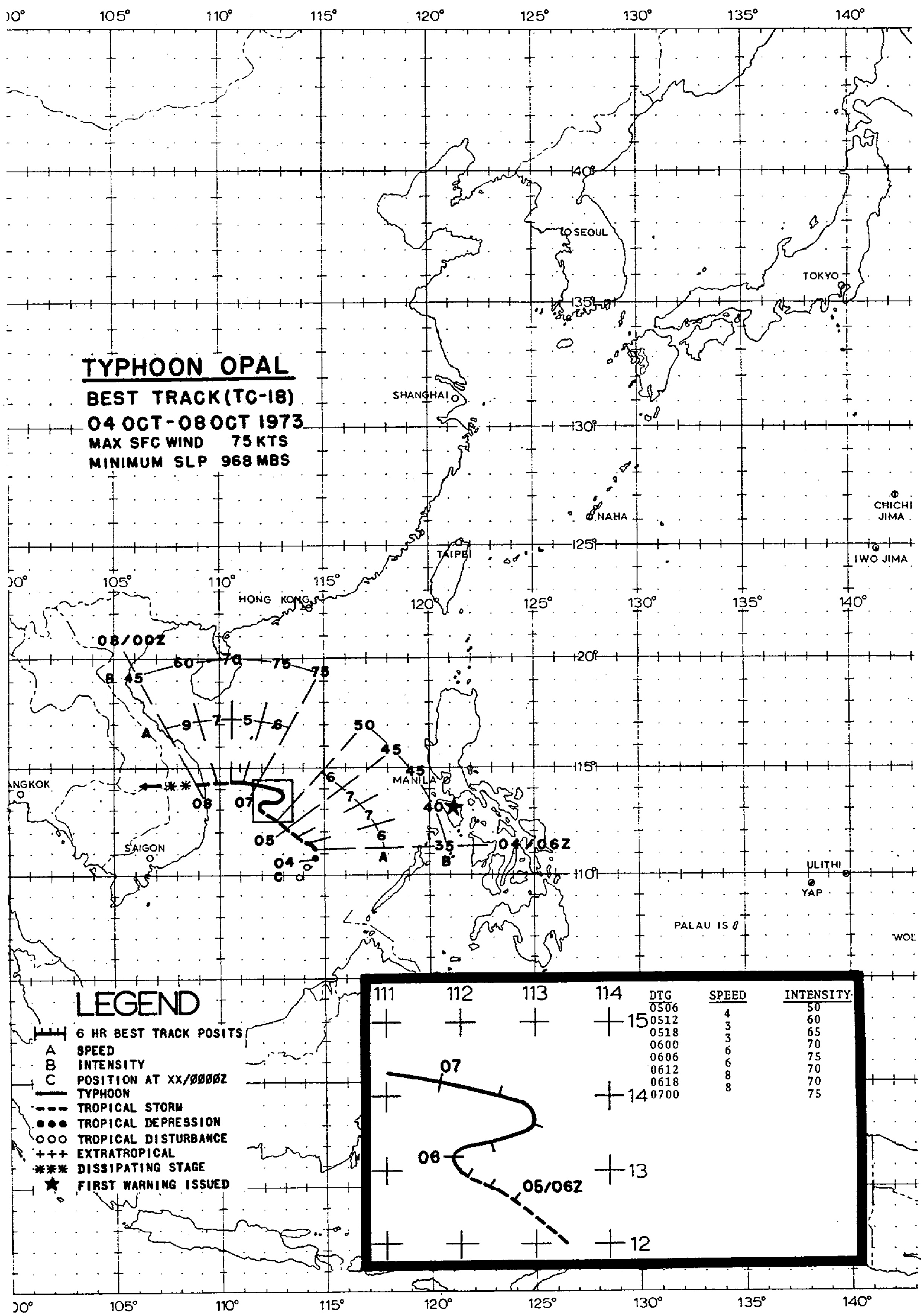
approaching shortwave trough over China. Nora skirted the northeast tip of Luzon with maximum sustained winds of 100 kts and weakening.

As she transited the Luzon Strait on the 8th a dramatic rescue operation was occurring in the Taiwan Strait. In thirty foot seas and 50 kt winds, the Missile Frigate USS WORDEN rescued seven fishermen aboard the Taiwanese fishing vessel JAI TAI NR3 from the approaching typhoon. One Taiwanese crewman was lost at sea. The fishing vessel had been floundering in heavy seas with the forward section split lengthwise (Figure 4-19).

Nora passed within 60nm of Kaohsiung, Taiwan as she accelerated to a speed of 12 kts toward the northwest. She made landfall near Amoy in southern China on the morning of the 10th and degenerated into a low pressure area.

Luzon in the Republic of the Philippines suffered considerable damage. It was reported that 6 persons were killed and over a hundred thousand people were left homeless. Estimates of over $2 million in damage to crops, public and private property were reported. A Philippine freighter ASIAN MARINER was reported sunk by Typhoon Nora in the Taiwan Straits. All 38 crew members were rescued. The Greek freighter BALTIC KLIF was also capsized and sunk by Nora some 80nm southwest of the Pescadores. Three of the crew were drowned with several missing and presumed lost. Taiwan also suffered extensive damage from Nora. Twelve persons were reported dead and 28 unaccounted for. Nearly 8,000 people were left homeless with Nora destroying over a thousand houses and damaging hundreds of others.

FIGURE 4-19. *Fishing trawler JAI TAI NR.3 floundering in high winds and heavy seas generated by Typhoon Nora. -- U.S. Navy photo*


TYPHOON OPAL
BEST TRACK (TC-18)
04 OCT - 08 OCT 1973
MAX SFC WIND 75 KTS
MINIMUM SLP 968 MBS
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
C POSITION AT XX/0000Z
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
DTG SPEED INTENSITY
0506 4 50
0512 3 60
0518 3 65
0600 6 70
0606 6 75
0612 8 70
0618 8 70
0700 75
SEOUL
TOKYO
SHANGHAI
NAHA
CHICHI JIMA
IWO JIMA
TAIPEI
HONG KONG
MANILA
SAIGON
ULITHI
YAP
PALAU IS
08/00Z
04/06Z
05/06Z

Opal formed in an active monsoon trough in the South China Sea. The first evidence of a weak surface low appeared in the trough on the 1st of October. However, it wasn't until late on the 3rd that significant cloudiness associated with the incipient storm became apparent.

Early on 4 October, Opal reached minimal tropical storm intensity about 75 nm northwest of Nanshan Island. She moved to the northwest at 6 to 7 knots in response to the high pressure cell over eastern China. By the 5th, she had developed typhoon strength winds (Figure 4-20).

On the morning of the 6th, Opal abruptly changed her course and moved northeastward. She remained on this course for the next 12 hours before resuming a westnorthwesterly heading. A reasonable explanation for the temporary eastward movement may rest in a Fujiwhara interaction with typhoon Nora. Nora was positioned in the Philippine Sea about 750 nautical miles from Opal and reached maximum intensity almost coincidently with the eastward shift in Opal. Also, Nora turned to a more northerly track at this time. Brand (1968) reports a maximum distance for interaction of about 750 nautical miles. He demonstrates that the angularchange rate of a line connecting the storms at this distance should be very small, only 3 degrees per 12 hours. The actual change was somewhat smaller, indicating the weakness of the interaction. The short period of the interaction may be due to the terrain effects of the intervening Republic of the Philippines, among other factors, as Brand suggests that the binary rotation is due to the circulation of the inflow layer which occupies only the lowest few thousand feet.

Maximum winds of 70 to 75 knots were observed during the 6th and early on the 7th as Opal resumed her westnorthwest movement. Opal moved ashore north of Qui Nhon, Republic of Vietnam late on 7 October and rapidly dissipated.

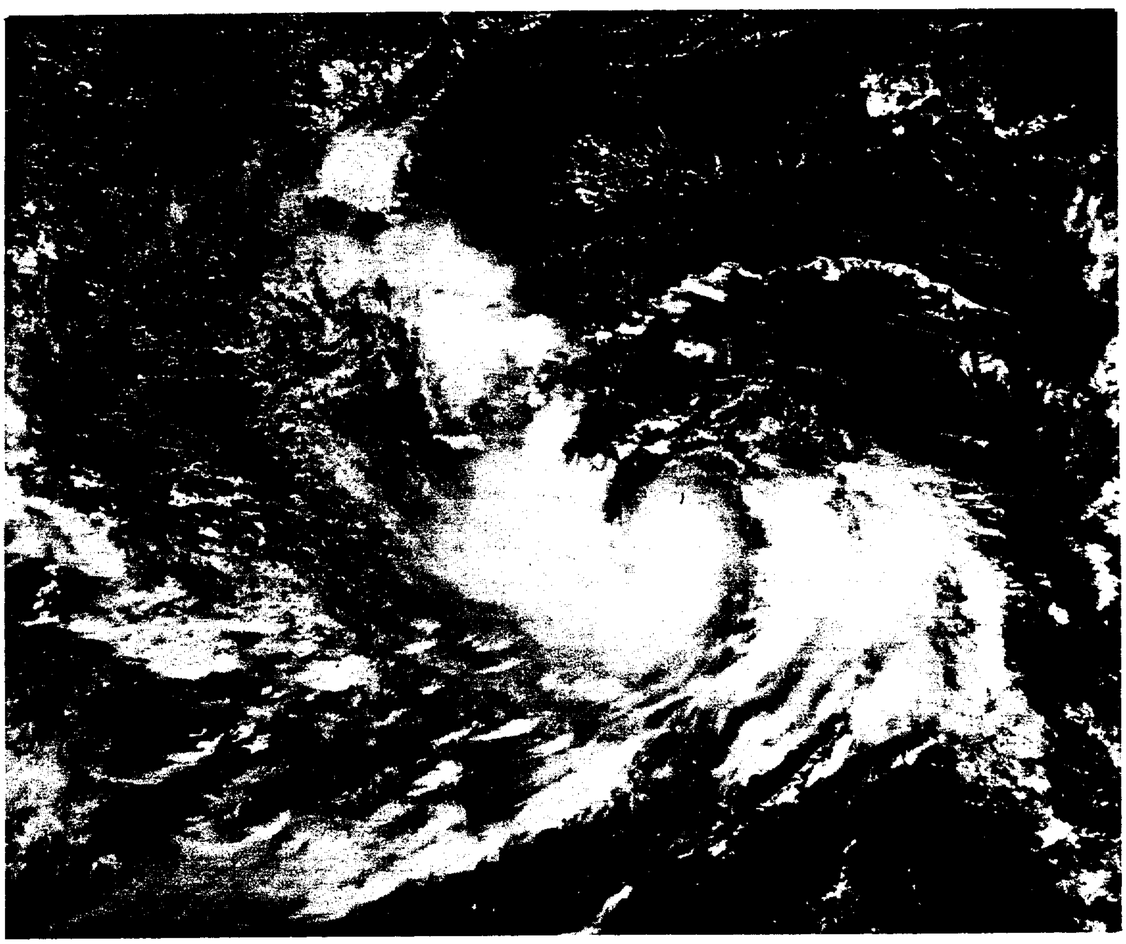
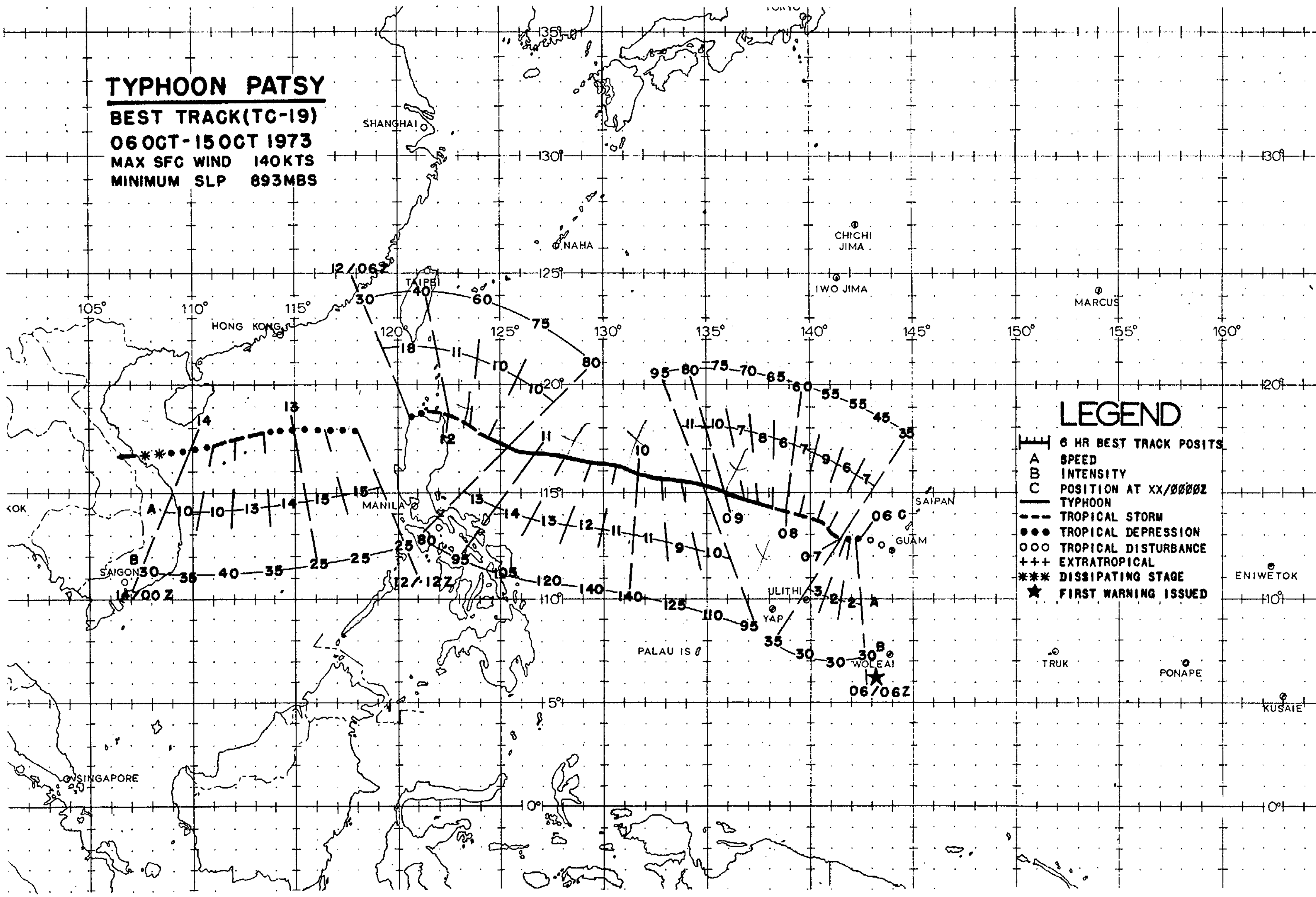


FIGURE 4-20. *Tropical Storm Opal in the South China Sea 225 nm southeast of Qui Nhon, 5 October 1973, 0458 GMT. (DMSP imagery)*


TYPHOON PATSY
BEST TRACK(TC-19)
06 OCT - 15 OCT 1973
MAX SFC WIND 140KTS
MINIMUM SLP 893MBS
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
C POSITION AT XX/0000Z
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
SHANGHAI
HONG KONG
TAIPEI
MANILA
SAIGON
SINGAPORE
NAHA
CHICHI JIMA
IWO JIMA
MARCUS
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
WOLEAI
TRUK
PONAPE
KUSAIE
ENIWETOK
12/06Z
12/12Z
14/00Z
06/06Z

A weak disturbance formed in the monsoon trough 300nm south of Guam on the 3rd of October. The weak vortex drifted westward in the wake of Nora. Until the 6th, it underwent only minor development due to the strong vertical shear caused by Nora's vigorous upper tropospheric outflow. Reconnaissance aircraft, investigating the disturbance on that day, reported maximum surface winds of 35 kts, heralding the arrival of Tropical Storm Patsy.

For the next two days she followed a westnorthwest course at 6-8 kts under the influence of the steering flow of the midtropospheric ridge to the north. Patsy was characteristically a small storm throughout her life. By the 8th she had developed typhoon force winds as she began to accelerate to a speed of 10-12 kts.

A reconnaissance aircraft reported that Patsy had rapidly intensified into a super typhoon with estimated maximum surface winds of 150 kts and a central pressure of 893mb (10/0020 GMT). Her central pressure had dropped 57mb in a span of 22 hours (Figure 4-21).

Patsy continued unerringly toward the northern tip of Luzon as she began to weaken late on the 10th. Interestingly, on the evening of the 11th, DMSP satellite imagery revealed that Patsy's low level circulation had separated from the upper level portion of the cyclone (Figure 4-22). The low level portion took a more northwesterly course and weakened to a tropical disturbance as it crossed the southern Luzon Strait. Meanwhile, a radar site in the Republic of the Philippines continued to follow the upper level cloudiness as it tracked due west towards Luzon. A similar situation occured with Susan in 1972.

The upper level circulation drifted over Luzon and out into the South China Sea. It apparently became superimposed over a low level vortex that had been situated in the South China Sea for several days. This system developed to tropical storm intensity as it passed to the north of the Paracel Islands. It weakened to a tropical depression just prior to making landfall in the Republic of Vietnam.

Patsy was the 3rd and final super typhoon of the year. She was only the 2nd storm to form in the western Caroline Islands area in the 1973 season.

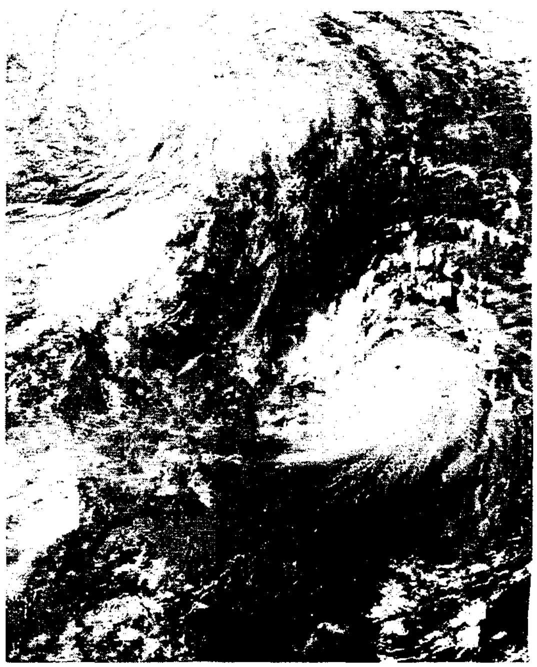


FIGURE 4-21. *Super Typhoon Patsy (right) at peak intensity. Typhoon Nora (left) in the Taiwan Strait, 9 October 1973, 2341 GMT. (DMSP imagery)*

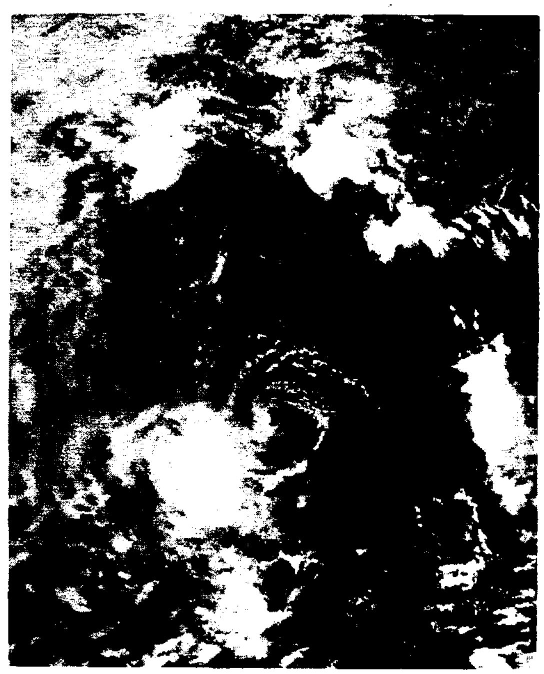
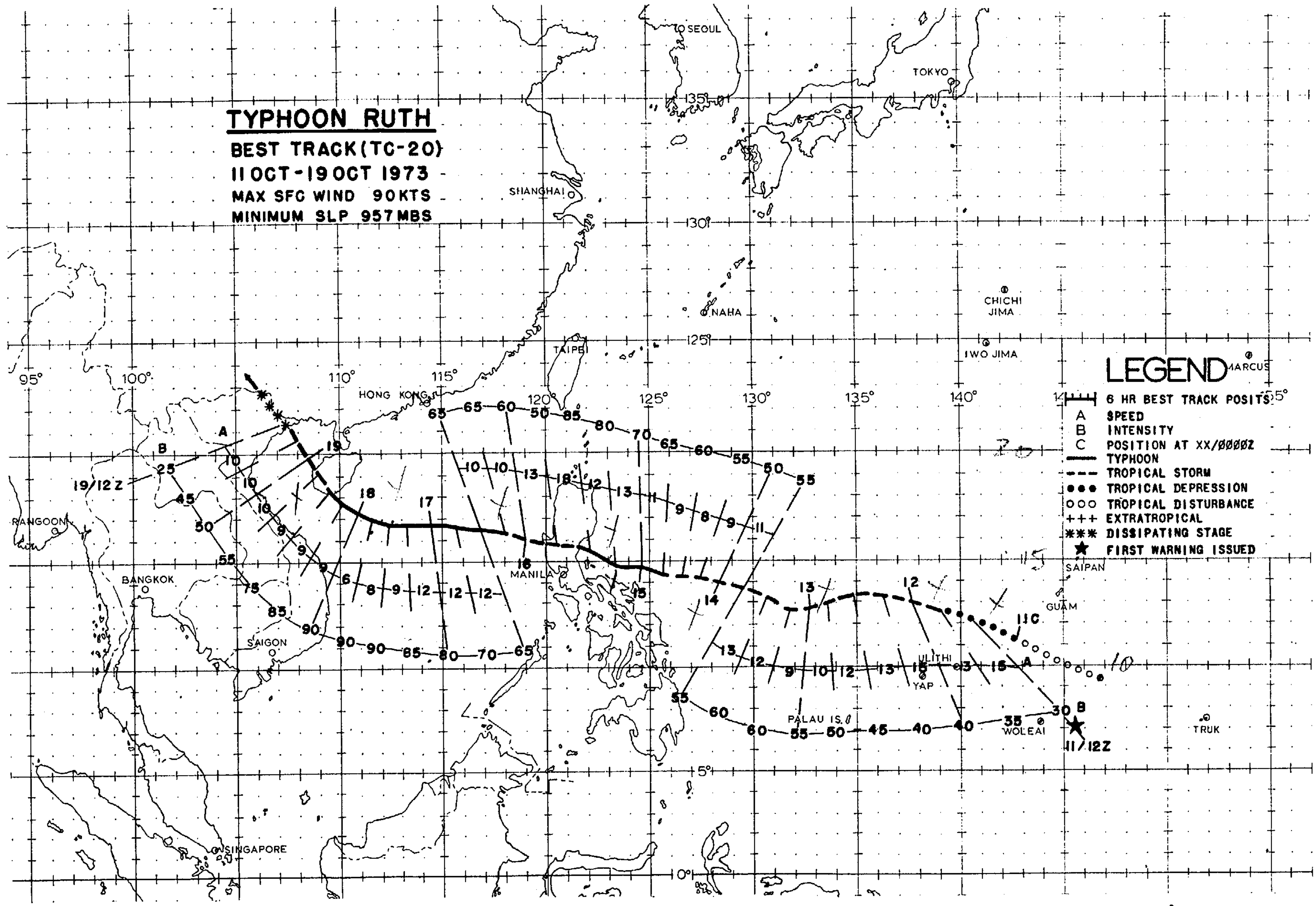


FIGURE 4-22. *Moonlight visual of Tropical Storm Patsy. Spiral cumulus pattern depicts the low level circulation with the cirrus canopy displaced to the southwest, 11 October 1973, 1613 GMT. (DMSP imagery)*


TYPHOON RUTH
BEST TRACK (TC-20)
11 OCT - 19 OCT 1973
MAX SFC WIND 90 KTS
MINIMUM SLP 957 MBS
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
C POSITION AT XX/0000Z
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
SEOUL
TOKYO
SHANGHAI
NAHA
CHICHI JIMA
IWO JIMA
MARCUS
TAIPEI
HONG KONG
RANGOON
BANGKOK
SAIGON
MANILA
SAIPAN
GUAM
ULITHI
YAP
PALAU IS.
WOLEAI
TRUK
SINGAPORE
19/12Z
11/12Z

The formative stage of Ruth appeared early on 10 October as a weak circulation in the monsoon trough in the western Caroline Islands. By the 11th, an area of enhanced convective activity associated with the cyclonic circulation became evident from satellite imagery. Ship reports on the afternoon of the 11th located Tropical Storm Ruth about 250nm westsouthwest of Guam with maximum winds of 35 kts.

Ruth followed 3 days behind Patsy. She tracked approximately 120nm to the south of but parallel to Patsy's track across the Philippine Sea. It is interesting to note that although Patsy intensified rapidly to super typhoon strength, Ruth developed slowly and reached typhoon intensity three days after she became a tropical storm. (Figure 4-23). The satellite data for this period showed little or no convective activity on the north side of Ruth. The strong upper tropospheric northeast flow from the subtropical ridge may have contributed to suppressing the outflow from Ruth on the north side and thereby inhibiting her development.

She continued her westerly movement with slow intensification until landfall on Luzon on the 15th, with maximum sustained wind speeds of 85 kts. Rapid weakening then occurred as the low level inflow was disrupted by terrain effects. Her maximum sustained wind had decreased to 50 kts by the time she reached central Luzon.

Ruth passed 42 miles north of Clark AB late on the night of the 15th where maximum sustained winds of 30 kts and peak gusts of 43 kts were recorded. Only minor damage was reported at Clark AB. Baler recorded maximum peak gust of 95 kts from the north (15/1355 GMT) while Casiguran 50 nm further north on the coast experienced a gust to 98 kts three hours later (15/1700 GMT).

On the 16th Ruth entered the South China Sea and tracked westward toward the Paracel Islands, still under the steering influence of the subtropical ridge (Figure 4-24). A Japanese ship IDEMITSU MARU reported 50 kts of wind and a surface pressure of 995mb as she passed 90nm northwest of Ruth (16/0000 GMT). She reintensified on her sojourn across the South China Sea reaching a maximum intensity of 90 kts on the afternoon of the 17th just east of the Paracels. Shortly after attaining her maximum intensity, Ruth turned to a northwesterly course in response to a weakness in the subtropical ridge. She then crossed Hainan Island and entered the Tonkin Gulf with maximum sustained winds of 50 kts. Ruth continued to weaken rapidly as upper tropospheric support waned, and dissipated completely as she moved inland along the North Vietnam coast on the afternoon of the 19th.

Damage reports indicate that while Ruth was crossing Luzon, 27 people were killed, 30 people were injured and 23 people were missing. Property damage amounted to more than five million dollars (U.S.) with thousands of homes destroyed.

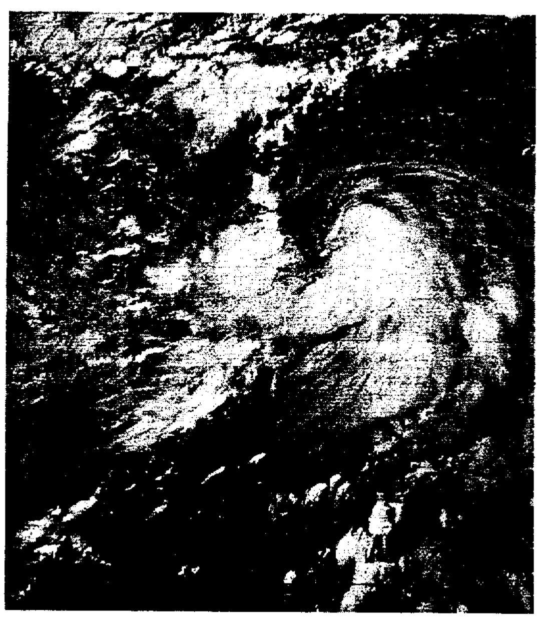


FIGURE 4-23. *Tropical Storm Ruth in the Philippine Sea 225 nm east of Catanduanes Island, 14 October 1973, 0009 GMT. (DMSP imagery)*

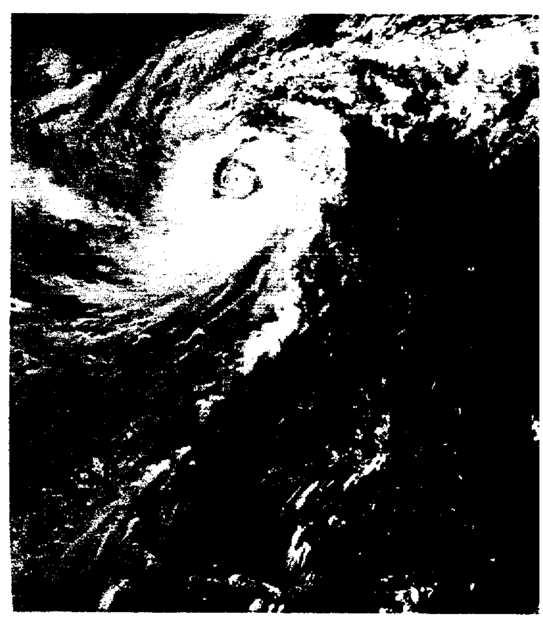


FIGURE 4-24. *Tropical Storm Ruth reintensifying after crossing Luzon, 16 October 1973, 0359 GMT. (DMSP imagery)*

3. TROPICAL CYCLONE CENTER FIX DATA

a. DISCUSSION OF DATA:

Fix data from all sources are included for each tropical cyclone. The first four columns of the print-out list the same information regardless of platform.

FIX NO.- Fixes are numbered sequentially.
TIME - GMT time in day, hour, and minutes of fix.
POSIT - Position of the storm in degrees and tenths.
FIX CAT- Fix platform used (SAT - satellite, P - penetration, LRDR - land radar, AC R - aircraft radar, SRDR - ship radar, CPA - station experiencing center passage, SCF - synoptic chart fix).

The format of the remainder of the print-out varies with the platform.

(1) SATELLITE - These data were derived from bulletins received from FLEWEAFAC and NESS Suitland, Maryland (NOAA-2), the APT site at U-Tapao, Thailand (ESSA-8), or DMSP (formerly DAPP) data from various sites (Chapter II). Intensity estimates (when available) are listed using the NESS classification system (NOAA Technical Memorandum NESS 45). If the source were DMSP (DAPP) data, the PCN (Position Code Number) appears followed by the name DMSP. If the platform were NOAA-2 or ESSA-8, that name will appear after the intensity information along with the site name and location confidence number (NOAA-2 only), (NHOP, 1973). NOAA-2 fixes without a site name will be assumed to be FLEWEAFAC Suitland fixes.

(2) RADAR - The latitude and longitude of land-based radars are given in the POSIT OF RADAR column. The position of mobile radar platforms are included if available. Plain language remarks appear after AC&W radar reports regarding tropical cyclone characteristics, size, and accuracy of fix (CINCPACINST 3140.1L, 1973). All other land radar reports contain a 5-digit code group identical to the WMO radar code for reporting tropical cyclone characteristics as regards to size, development, and accuracy of location of the center or the eye. A list of land-based radars providing data in the fix print-out is given in Table 4-7.

(3) CPA - If a station experiences center passage, maximum surface wind observed and minimum sea level pressure recorded are listed.

(4) SCF - If synoptic data is dense and consistent enough to provide accurate fix information, the derived storm position is listed. Maximum surface wind and minimum sea level pressure values are included, if possible.

(5) AIRCRAFT PENETRATION - These data were normally obtained at scheduled fix times. Additional reconnaissance aircraft fixes are made during the peripheral data gathering legs between scheduled fixes. These fixes normally provide date, time, and position data only.

The categories containing information from reconnaissance aircraft fixes are:

(a) ACCRY (Accuracy)

The estimated navigation (first number) and meteorological (second number) accuracies are expressed in nautical miles.

(b) FIX LVL (Fix Level)

A constant-pressure-surface flight level (listed in millibars) is normally maintained during a tropical cyclone fix mission. Low-level missions (1500 feet) are conducted at a constant, true altitude.

(c) MAX OBS FLT LVL WND

Wind speed (kt) at flight level is measured by the AN/APN-82 doppler radar system aboard the WC-130 aircraft. The values entered in this category represent the maximum wind measured prior to obtaining a scheduled fix. This measurement may not represent the maximum wind because the aircraft samples only those portions of the central core region along the flight path. For this reason, the maximum observed may be significantly lower than the true maximum wind in the circulation (i.e., penetration through weak semicircle on first fix).

A limitation of the doppler radar system occasionally prevents the measurement of the maximum wind in intense typhoons. In areas of heavy rainfall, the radar may track energy reflected from precipitation rather than the sea surface, preventing accurate wind measurement. Also, the doppler radar mount on the WC-130 restricts wind measurements to drift angles $\leq 27°$ if wind is normal to heading of aircraft.

(d) MAX OBS SFC WND

The maximum surface wind (kt) observed from flight level is entered in this column. The observation is an estimate based on the state of the sea (refer to 9WRWGM 105-1, Vol II, pp 2-27-28). The sampling limitation noted in paragraph (c) also exists for this category. In addition, availability of these data is dependent on the absence of undercast conditions. The position relative to the vortex center of items (c) and (d) need not coincide.

(e) OBS MIN SLP

The minimum observed sea level pressure is normally obtained from a dropsonde released in the vortex center. If the ocean surface is visible, the dropsonde will be released over the center of the area of calm seas; otherwise it is released at the flight level wind center. If the fix is made at 1500 feet, the sea level pressure is extrapolated from that level.

(f) MIN 700 MB HT

The minimum height of the 700mb surface in the vortex center is recorded in decameters.

(g) FLT LVL T_i/T_o

This denotes maximum temperature measured in the center (T_i) and ambient temperature outside the center (T_o). Ambient temperature is measured just prior to entering the wall cloud. Both temperature observations are in degrees celsius and are made at a flight level of constant pressure surface (700, 500-mb).

Reconnaissance aircraft seldom penetrate on the same azimuth from one fix to another. Thus, the position of T_o normally varies from the center, both in bearing and range. The distance is directly dependent on radar definition of the storm.

(h) EYE FORM/ORIENTATION/DIA

The shape and diameter (nautical miles) of the eye are determined by radar. This is reported only if the center is 50% or more surrounded by wall cloud (see definition in Appendix). The orientation of the major axis is for elliptical cases. Abbreviations for the eye form are:

CIRC - Circular
ELIP - Elliptical
CONC - Concentric

REFERENCES:

Brand, S., "Interaction of Binary Tropical Cyclones of the Western North Pacific Ocean," NAVWEARSCHFAC Tech. Paper No. 26-68, September 1968.

CINCPACINST 3140.1L, "Tropical Cyclone Operations Manual," June 1973.

FLEWEACEN/JTWC, Annual Typhoon Report, Guam, Marianas Islands, 1970.

Ramage, C.S., Monsoon Meteorology, Academic Press, New York and London, 1971, pp. 189-190.

Sadler, J.C., "The Role of the Upper Tropospheric Trough (TUTT) in Early Season Development," ENVPREDRSCHFAC Tech. Paper, 1973 (in press).

U.S. Dept. of Commerce, NOAA, Federal Coordinator for Meteorological Services and Supporting Research, "National Hurricane Operations Plan," May 1973.

TABLE 4-7. LAND RADAR SITES

Location	Station No.	ICAO	Station Name
10.3N 124.0E	98646	RPMT	Mactan
	98440		
14.4N 120.6E	98425		Manila
16.4N 120.6E	98328		Baguio
17.4N 104.7E	48357	VTUW	Nakhon Phanom West (USAF)
26.1N 127.8E	47937		Itokau
26.4N 127.8E		RODN	Kadena AB (USAF)
26.2N 127.7E		ROAHJ	Naha AB (JASDF)
24.3N 124.2E	47918		Ishigakijima
28.4N 129.5E	47909		Naze
33.3N 134.2E	47899		Murotomisaki
30.6N 131.0E	47869		Tanegashima/Naka
33.6N 130.5E		RJFFJ	Itazuke Airport (JASDF)
33.4N 130.4E	47806		Fukuoka/Sefurisan
35.9N 126.6E	47141	RKJK	Kunsan AB (USAF)
37.5N 127.0E	47116		Kwanaksan Myn
34.6N 135.7E	47773		Osaka/Takayasuyama
24.3N 120.6E	46770	RCMQ	CCK AB/Taiwan
22.6N 120.3E	46744		Kaohsiung
23.0N 120.2E		RCNN	Tainan (AC&W)
22.6N 120.4E		RCKH	Kaohsiung Int'l Airport (AC&W)
23.5N 119.6E		RCQC	Makung (AC&W)
24.0N 121.6E	46699		Hwalien
22.3N 114.2E	45005		Hong Kong Obsr.
18.1N 120.5E			Paredes (AC&W)
16.6N 120.3E			Wallace AS (AC&W)
14.4N 122.6E			Paranal AS (AC&W)

b. FIX DATA PRINTOUT:

TROPICAL STORM WILDA
FIX POSITIONS FOR CYCLONE NO. 1
01 JUL TO 03 JUL

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR VEL BRG RNG	MAX OBS SFC WIND VEL BRG RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT/TD	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSN NMBR
1	280124Z	11.0N 124.5E	SAT	(T1.5/1.5 / /24HRS)			NOAA 2 (NESS)	(CONF 02)							
2	280124Z	11.0N 124.5E	SAT	(T1.5/1.5 /D0.5/23HRS)			NOAA 2	(CONF 01)							
3	290024Z	15.0N 125.0E	SAT	(T1.5/1.5 /S /23HRS)			NOAA 2	(CONF 02)							
4	290319Z	15.2N 124.9E	SAT	(T1.5/1.5 / / HRS)			PCN 5 DMSP								
5	290319Z	16.4N 124.2E	SAT	(T1.5/1.5 /D / HRS)			PCN 5 DMSP								
6	291603Z	15.3N 122.4E	SAT				PCN 5 DMSP								
7	291603Z	15.8N 123.7E	SAT				PCN 5 DMSP								
8	291603Z	15.5N 123.5E	SAT				PCN 5 DMSP								
9	300117Z	17.5N 121.8E	SAT	(T2.0/2.0 /D0.5/25HRS)			NOAA 2 (NESS)	(CONF 01)							
10	300118Z	17.5N 121.5E	SAT	(T2.0/2.0 /D0.5/25HRS)			NOAA 2	(CONF 02)							
11	300440Z	17.5N 121.5E	SAT	(T2.0/1.5 / / HRS)			PCN 3 DMSP								
12	300447Z	17.8N 122.2E	SAT	(T1.0/1.5 /W0.5/25HRS)			PCN 5 DMSP								
13	300447Z	17.5N 121.2E	SAT	(T2.0/2.0 /S / HRS)			PCN 5 DMSP								
14	301548Z	17.8N 119.6E	SAT				PCN 5 DMSP								
15	301548Z	16.5N 120.4E	SAT				PCN 6 DMSP								
16	010155Z	18.6N 118.7E	P	5 25	-	- - - -	35 100 100	-	-	25 25	-	- -	-		2
17	010213Z	18.0N 117.5E	SAT	(T2.5/2.5 /D0.5/25HRS)			NOAA 2	(CONF 02)							
18	010432Z	18.8N 118.3E	SAT	(T2.0/2.0 /S /25HRS)			PCN 5 DMSP								
19	010432Z	18.9N 118.9E	SAT	(T1.5/1.5 /D0.5/24HRS)			PCN 5 DMSP								
20	010908Z	19.2N 118.4E	P	1 4	-	300 30 240 40	40 30 35	997	305	- -	CIRC	- -	-		3
21	011503Z	20.0N 118.3E	P	2 2	-	130 55 30 100	- - -	991	300	- -			6		3
22	011710Z	20.5N 118.2E	SAT				PCN 5 DMSP								
23	011710Z	20.5N 118.0E	SAT				PCN 5 DMSP								
24	012133Z	20.9N 117.9E	P	5 2	700	- - - -	35 240 20	982	295	10 10	-	- -	-		4
25	020113Z	21.2N 117.4E	SAT	(T3.5/3.5 /D1.0/23HRS)			NOAA 2	(CONF 01)							
26	020220Z	20.7N 117.7E	SAT	(T4.0/4.0 /D /24HRS)			ESSA 8 (VTBU)								
27	020300Z	21.2N 117.8E	P	5 5	700	220 55 90 25	50 90 45	985	295	13 10	-	- -	-		4
28	020417Z	21.1N 117.1E	SAT	(T3.5/3.5 /D1.5/24HRS)			PCN 3 DMSP								
29	020417Z	21.2N 117.2E	SAT	(T3.0/2.0 / / HRS)			PCN 3 DMSP								
30	020417Z	21.0N 117.6E	SAT	(T3.0/3.0 /D2.5/24HRS)			PCN 1 DMSP								
31	020417Z	21.5N 117.3E	SAT	(T3.0/3.0 /D1.5/49HRS)			PCN 3 DMSP								
32	020630Z	21.7N 117.6E	LRDR	- 30912										22.3N 114.2E	-
33	020900Z	21.8N 117.9E	AC R	-							-	- -	-	20.9N 117.0E	5
34	020922Z	21.8N 117.8E	AC R	-							-	- -	-	21.4N 115.7E	5
35	021200Z	22.0N 117.7E	LRDR	- 3////										22.3N 114.2E	-
36	021500Z	22.3N 117.8E	LRDR	- 3////										22.3N 114.2E	-
37	021500Z	22.5N 117.6E	AC R	-							-	- -	-	21.9N 118.5E	5
38	021701Z	22.5N 117.7E	SAT				PCN 1 DMSP								
39	021701Z	22.4N 117.8E	SAT				PCN 1 DMSP								
40	021701Z	21.7N 117.5E	SAT				PCN 2 DMSP								
41	021701Z	22.5N 117.9E	SAT				PCN 1 DMSP								
42	021820Z	22.7N 117.8E	LRDR	- 30///										22.3N 114.2E	-
43	022100Z	23.1N 118.0E	LRDR	- 30/47										22.3N 114.2E	-
44	030020Z	23.6N 117.9E	LRDR	- 30947										22.3N 114.2E	-
45	030110Z	23.1N 117.1E	LRDR	- POSSIBLE CENTER, 10 DEG OVERLAY, FAIR FIX										24.3N 120.6E	-
46	030140Z	23.9N 118.0E	LRDR	- POSSIBLE CENTER, 10 DEG OVERLAY, FAIR FIX										24.3N 120.6E	-
47	030200Z	23.9N 117.5E	SAT	(T4.0/4.0 /D0.5/25HRS)			NOAA 2	(CONF 01)							
48	030300Z	24.3N 118.3E	LRDR	- POSSIBLE CENTER, 10 DEG OVERLAY, FAIR FIX										24.3N 120.6E	-
49	030310Z	24.5N 117.8E	LRDR	- POSSIBLE CENTER, 10 DEG OVERLAY, FAIR FIX										24.3N 120.6E	-
50	030340Z	24.3N 118.3E	LRDR	- POSSIBLE CENTER, 10 DEG OVERLAY, FAIR FIX										24.3N 120.6E	-
51	030400Z	24.3N 118.0E	LRDR	- POSSIBLE CENTER, 10 DEG OVERLAY, FAIR FIX										24.3N 120.6E	-
52	030403Z	24.2N 118.0E	SAT	(T3.5/4.0 /W / HRS)			PCN 1 DMSP								
53	030403Z	24.1N 118.1E	SAT	(T5.0/5.0 /D2.0/24HRS)			PCN 1 DMSP								
54	030410Z	24.3N 118.0E	LRDR	- POSSIBLE CENTER, 10 DEG OVERLAY, FAIR FIX										24.3N 120.6E	
55	030440Z	24.5N 118.0E	LRDR	- POSSIBLE CENTER, 10 DEG OVERLAY, FAIR FIX										24.3N 120.6E	
56	030510Z	24.5N 117.8E	LRDR	- POSSIBLE CENTER, 10 DEG OVERLAY, FAIR FIX										24.3N 120.6E	
57	030540Z	24.6N 118.3E	LRDR	- POSSIBLE CENTER, 10 DEG OVERLAY, FAIR FIX										24.3N 120.6E	
58	030610Z	24.6N 118.3E	LRDR	- POSSIBLE CENTER, 10 DEG OVERLAY, FAIR FIX										24.3N 120.6E	
59	030640Z	24.7N 118.3E	LRDR	- POSSIBLE CENTER, 10 DEG OVERLAY, FAIR FIX										24.3N 120.6E	
60	030710Z	24.7N 118.3E	LRDR	- POSSIBLE CENTER, 10 DEG OVERLAY, FAIR FIX										24.3N 120.6E	
61	030740Z	24.6N 118.4E	LRDR	- POSSIBLE CENTER, 10 DEG OVERLAY, FAIR FIX										24.3N 120.6E	
62	030800Z	25.0N 118.2E	LRDR	- POSSIBLE CENTER, 10 DEG OVERLAY, FAIR FIX										24.3N 120.6E	
63	030810Z	25.0N 118.2E	LRDR	- POSSIBLE CENTER, 10 DEG OVERLAY, FAIR FIX										24.3N 120.6E	
64	030840Z	25.1N 118.2E	LRDR	- POSSIBLE CENTER, 10 DEG OVERLAY, FAIR FIX										24.3N 120.6E	
65	030940Z	25.0N 118.2E	LRDR	- POSSIBLE CENTER, 10 DEG OVERLAY, POOR FIX											
66	031047Z	25.2N 118.8E	SAT				PCN 5 DMSP								
67	031047Z	24.4N 119.4E	SAT				PCN 3 DMSP								
68	010600Z	18.9N 118.9E	SCF				30								
69	020600Z	21.8N 117.5E	SCF				30								
70	030000Z	23.8N 118.5E	SCF				30								
71	031200Z	25.6N 118.7E	SCF				30								

TYPHOON ANITA

FIX POSITIONS FOR CYCLONE NO. 2
05 JUL TO 08 JUL

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR VEL BRG RNG	MAX OBS SFC WIND VEL BRG RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TI/TO	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSG NMBR
1	050207Z	10.5N 111.0E	SAT	(11.5/1.5 /D0.5/25HRS)			NOAA 2	(CONF 03)							
2	050613Z	12.0N 111.0E	SAT	(11.5/1.5 /D0.5/24HRS)			NOAA 2 (NESS)								
3	050516Z	9.2N 113.0E	SAT	(11.0/1.0 /S /24HRS)			PCN 5 UMSP								
4	060103Z	11.5N 112.5E	SAT	(12.0/2.0 /D0.5/23HRS)			NOAA 2 (NESS)	(CONF 03)							
5	060107Z	11.5N 112.5E	SAT	(12.0/2.0 /D0.5/23HRS)			NOAA 2	(CONF 03)							
6	060230Z	12.3N 112.8E	P	4 15	700	200 40 120 20	55 140 30	996	305	12 -	-	- -	-		1
7	060500Z	12.3N 111.2E	SAT	(12.5/2.5 /D / HRS)			PCN 3 UMSP								
8	060501Z	11.8N 111.2E	SAT	(12.5/2.5-/D1.5/24HRS)			PCN 3 UMSP								
9	060915Z	12.5N 112.3E	P	3 10	700	170 50 70 80	50 70 75	991	300	13 -	-	- -	-		
10	061715Z	13.3N 111.8E	P	5 15	700	180 60 40 20	- - -	992	299	14 12	-	- -	-		2
11	061740Z	13.2N 111.7E	SAT				PCN 4 UMSP								3
12	062130Z	14.0N 111.4E	P	5 10	700	160 60 50 30	- - -	983	295	14 13	-	- -	-		
13	070159Z	15.3N 110.2E	SAT	(13.0/3.0 /D1.0/23HRS)			NOAA 2 (NESS)	(CONF 02)							3
14	070201Z	15.3N 110.2E	SAT	(13.0/3.0 /D1.0/25HRS)			NOAA 2	(CONF 01)							
15	070245Z	15.0N 110.4E	SAT	(14.0/4.0 /D /24HRS)			ESSA 8 (VTBU)								
16	070350Z	15.4N 110.3E	P	10 20	700	230 50 140 40	80 130 30	984	295	12 -	-	- -	-		
17	070444Z	14.5N 110.0E	SAT	(12.5/2.5 /S /24HRS)			PCN 5 UMSP								4
18	070650Z	15.5N 110.4E	SAT	(13.5/3.5 /S / HRS)			PCN 3 UMSP								
19	070845Z	16.1N 110.2E	P	5 5	700	160 47 60 40	80 210 50	983	293	15 -	-	- -	-		4
20	071730Z	17.4N 108.7E	SAT				PCN 4 UMSP								
21	071730Z	17.3N 108.8E	SAT				PCN 3 UMSP								
22	072330Z	17.8N 107.7E	SHOR	-							-	- -	-		
23	080255Z	18.7N 106.0E	SAT	(14.0/4.0 /D1.0/25HRS)			NOAA 2	(CONF 01)							-
24	080337Z	19.0N 107.2E	SAT	(14.0/4.0-/S /25HRS)			ESSA 8 (VTBU)								
25	080425Z	18.2N 106.5E	SAT	(13.5/3.5-/D1.0/25HRS)			PCN 1 UMSP								
26	080432Z	18.1N 106.5E	SAT	(13.5/3.5-/D1.0/25HRS)			PCN 1 UMSP								
27	081010Z	18.5N 106.2E	P	1 5	700	120 60 30 30	60 - -	960	292	14 -	CIRC		30		7
28	081242Z	18.8N 105.8E	LRDR	- POSSIBLE EYE,15 DEG OVERLAY, GOOD FIX											
29	081335Z	18.8N 105.5E	LRDR	- POSSIBLE EYE,15 DEG OVERLAY, GOOD FIX										17.4N 104.7E	
30	081435Z	18.8N 105.2E	LRDR	- SPIRAL OVERLAY EYE, GOOD FIX										17.4N 104.7E	
31	081535Z	18.9N 105.0E	LRDR	- CIRC EYE, GOOD FIX, 70 PCT, DIAMETER 20										17.4N 104.7E	
32	081635Z	19.0N 104.7E	LRDR	- CIRC EYE, GOOD FIX, 50 PCT, DIAMETER 15										17.4N 104.7E	
33	081710Z	19.0N 104.1E	SAT				PCN 3 UMSP							17.4N 104.7E	
34	081740Z	19.0N 104.5E	LRDR	- CIRC EYE, FAIR FIX, EYE FILLING, DIAMETER 10										17.4N 104.7E	
35	081810Z	19.1N 104.2E	LRDR	- CIRC EYE, GOOD FIX, DIAMETER 10											
36	081833Z	19.1N 104.1E	LRDR	- CIRC EYE, GOOD FIX, DIAMETER 10										17.4N 104.7E	
37	081910Z	19.1N 103.9E	LRDR	- CIRC EYE, FAIR FIX, DIAMETER 10										17.4N 104.7E	
38	082010Z	18.9N 103.7E	LRDR	- NO WELL DEFINED EYE, POOR FIX										17.4N 104.7E 17.4N 104.7E	
39	080100Z	17.6N 107.2E	CPA	EYE PASSAGE-USS OGDEN(LPD-5)			60	982							
40	080230Z	17.5N 107.5E	CPA				47	986							

TROPICAL STORM CLARA

FIX POSITIONS FOR CYCLONE NO. 3
12 JUL TO 14 JUL

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR VEL BRG RNG	MAX OBS SFC WIND VEL BRG RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TI/TO	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSG NMBR
1	120152Z	27.0N 165.7E	SAT	(1 0/2.0 / / HRS)			PCN 6 UMSP								
2	120152Z	26.5N 163.7E	SAT	(12.0/2.0 / / HRS)			PCN 3 UMSP								
3	120152Z	25.8N 164.1E	SAT	(11.5/1.5 / / HRS)			PCN 5 UMSP								
4	121435Z	27.5N 162.3E	SAT				PCN 4 UMSP								
5	121435Z	26.9N 162.1E	SAT				PCN 4 UMSP								
6	122150Z	29.2N 161.0E	SAT	(12.5/2.5 /D1.5/24HRS)			NOAA 2 (NESS)								
7	122151Z	29.2N 161.0E	SAT	(13.0/3.0 /D1.5/24HRS)			NOAA 2	(CONF 02)							
8	130137Z	29.1N 160.9E	SAT	(13.0/3.0 /D / HRS)			PCN 6 UMSP								
9	130137Z	29.5N 160.5E	SAT	(14.0/4.0 /D2.0/24HRS)			PCN 4 UMSP								
10	130137Z	28.8N 160.2E	SAT	(13.0/3.0 /D / HRS)			PCN 3 UMSP								
11	130455Z	29.0N 160.4E	P	5 10	-	350 40 270 35	45 280 25	998	-	25 22	-	- -	-		1
12	131421Z	29.9N 160.2E	SAT				PCN 4 UMSP								
13	131421Z	30.0N 160.4E	SAT				PCN 4 UMSP								
14	132245Z	31.3N 160.9E	SAT	(12.5/3.0 /W0.5/25HRS)			NOAA 2	(CONF 01)							
15	132325Z	31.3N 159.8E	P	15 15	700	- - - -	35 240 35	1001	308	13 -	-	- -	-		1
16	140122Z	31.2N 160.9E	SAT	(12.0/3.0 /W1.0/24HRS)			PCN 4 UMSP								
17	140122Z	31.0N 162.0E	SAT	(12.5/3.0-/W0.5/24HRS)			PCN 6 UMSP								
18	140122Z	31.3N 161.7E	SAT	(12.5/3.5 /W2.0/24HRS)			PCN 3 UMSP								
19	141406Z	32.0N 163.1E	SAT				PCN 5 UMSP								

TYPHOON BILLIE
FIX POSITIONS FOR CYCLONE NO. 4
13 JUL TO 19 JUL

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR	VEL	BRG	RNG	MAX OBS SFC WIND VEL	BRG	RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT/TD	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSN NMBR
1	120333Z	13.7N 129.7E	SAT	(T1.5/1.5 / / HRS)						PCN 5 DMSP										
2	121617Z	15.2N 126.8E	SAT							PCN 4 DMSP										
3	121617Z	15.0N 126.8E	SAT							PCN 6 DMSP										
4	121617Z	15.6N 127.7E	SAT							PCN 5 DMSP										
5	130140Z	17.0N 124.5E	SAT	(T2.0/2.0 /D1.0/25HRS)						NOAA 2			(CONF 02)							
6	130319Z	16.2N 125.5E	SAT	(T3.5/3.5 /D1.0/11HRS)						PCN 3 DMSP										
7	130319Z	16.4N 125.4E	SAT	(T3.0/3.0 /D / HRS)						PCN 1 DMSP										
8	130319Z	16.2N 125.5E	SAT	(T2.5/2.5 /D / HRS)						PCN 3 DMSP										
9	130319Z	16.4N 125.7E	SAT	(T3.5/3.5 / / HRS)						PCN 3 DMSP										
10	130400Z	16.7N 125.7E	P	5 2	-	320	45	250	25	35	250	40	-	-	- -	ELIP	F-W	20X15		1
11	131000Z	17.2N 125.5E	P	3 2	700	10	45	240	15	40	240	10	991	300	14 11	CIRC		20		2
12	131510Z	17.5N 125.3E	P	5 5	700	70	45	10	20	-	-	-	986	298	17 12	CIRC		16		2
13	131603Z	17.4N 125.4E	SAT							PCN 3 DMSP										
14	131603Z	17.2N 125.7E	SAT							PCN 3 DMSP										
15	131603Z	17.5N 125.5E	SAT							PCN 3 DMSP										
16	131603Z	17.3N 125.4E	SAT							PCN 3 DMSP										
17	132230Z	18.4N 125.3E	P	5 2	700	250	58	120	10	65	140	8	986	294	15 11	CIRC		10		3
18	140044Z	19.0N 125.0E	SAT	(T3.5/3.5 /D1.5/23HRS)						NOAA 2			(CONF 01)							
19	140044Z	19.0N 125.0E	SAT	(T3.5/3.5 /D1.5/24HRS)						NOAA 2 (NESS)			(CONF 02)							
20	140304Z	18.9N 125.2E	SAT	(T4.0/4.0 /D1.0/24HRS)						PCN 3 DMSP										
21	140304Z	18.7N 125.0E	SAT	(T3.5/3.5 /W /24HRS)						PCN 5 DMSP										
22	140304Z	18.7N 124.9E	SAT	(T4.0/4.0 /D / HRS)						PCN 3 DMSP										
23	140320Z	18.8N 125.7E	P	5 5	700	250	65	120	10	60	120	10	976	291	16 10	CIRC		5		3
24	141005Z	19.4N 125.6E	P	5 5	700	300	80	200	15	65	200	20	967	281	16 13	CIRC		10		4
25	141501Z	20.1N 125.5E	P	5 5	700	100	80	10	20	-	-	-	957	272	16 -	CIRC		15		4
26	141540Z	20.0N 125.3E	SAT							PCN 3 DMSP										
27	141540Z	20.1N 125.4E	SAT							PCN 3 DMSP										
28	141540Z	19.9N 125.5E	SAT							PCN 1 DMSP										
29	142200Z	20.8N 125.3E	P	5 1	700	-	-	-	-	130	220	7	921	240	22 11	CIRC		10		4
30	150130Z	21.5N 125.0E	SAT	(T5.0/5.0 /D1.5/24HRS)						NOAA 2 (NESS)			(CONF 02)							
31	150139Z	21.5N 125.0E	SAT	(T5.0/5.0 /D1.5/25HRS)						NOAA 2			(CONF 02)							
32	150250Z	21.1N 125.1E	SAT	(T5.5/5.5+/D2.0/24HRS)						PCN 1 DMSP										
33	150250Z	21.1N 125.0E	SAT	(T6.0/6.0 /D2.0/24HRS)						PCN 1 DMSP										
34	150330Z	21.3N 125.3E	P	5 1	700	90	110	30	10	130	220	7	916	236	21 12	CIRC		8		5
35	150432Z	21.5N 125.0E	SAT	(T5.0/5.0 /D / HRS)						PCN 3 DMSP										
36	150432Z	21.5N 125.5E	SAT	(T7.0/7.0 /D / HRS)						PCN 1 DMSP										
37	150432Z	21.6N 125.7E	SAT	(T5.0/5.0 /D1.0/24HRS)						PCN 1 DMSP										
38	150500Z	21.4N 125.4E	LRDR	- 2//13															24.3N 124.2E	
39	150600Z	21.6N 125.4E	LRDR	- 2//13															24.3N 124.2E	
40	150700Z	21.7N 125.4E	LRDR	- 2//13															24.3N 124.2E	
41	150800Z	21.9N 125.4E	LRDR	- 2//13															24.3N 124.2E	
42	150900Z	21.9N 125.3E	LRDR	- 20412															24.3N 124.2E	
43	151000Z	22.0N 125.2E	LRDR	- 20412															24.3N 124.2E	
44	151029Z	22.4N 125.2E	P	5 5	700	270	112	180	10	100	180	10	938	255	16 15	CIRC		7		6
45	151200Z	22.3N 125.3E	LRDR	- 4///3															24.3N 124.2E	
46	151300Z	22.3N 125.3E	LRDR	- 11253															24.3N 124.2E	
47	151300Z	22.6N 125.4E	LRDR	- 25413															24.0N 121.6E	
48	151350Z	22.7N 125.4E	LRDR	- 25413															24.0N 121.6E	
49	151400Z	22.5N 125.2E	LRDR	- 10803															24.3N 124.2E	
50	151450Z	22.8N 125.4E	LRDR	- 25414															24.0N 121.6E	
51	151500Z	22.6N 125.3E	LRDR	- 10803															24.3N 124.2E	
52	151520Z	22.8N 125.1E	P	10 5	700	260	99	180	15	-	-	-	947	265	17 13	CIRC		8		6
53	151534Z	23.0N 125.2E	SAT							PCN 3 DMSP										
54	151534Z	22.6N 125.1E	SAT							PCN 3 DMSP										
55	151534Z	23.3N 125.1E	SAT							PCN 3 DMSP										
56	151600Z	22.8N 125.3E	LRDR	- 116/2															24.3N 124.2E	
57	151700Z	22.9N 125.2E	LRDR	- 25//2															24.3N 124.2E	
58	151715Z	22.7N 125.6E	SAT							PCN 3 DMSP										
59	151715Z	23.3N 125.1E	SAT							PCN 3 DMSP										
60	151715Z	22.5N 125.5E	SAT							PCN 3 DMSP										
61	151750Z	23.2N 125.3E	LRDR	- 14413															24.0N 121.6E	
62	151800Z	23.1N 125.2E	LRDR	- 25//2															24.3N 124.2E	
63	151900Z	23.3N 125.2E	LRDR	- 11872															24.3N 124.2E	
64	152000Z	23.4N 125.2E	LRDR	- 11813															24.3N 124.2E	
65	152100Z	23.5N 125.2E	LRDR	- 11722															24.3N 124.2E	
66	152100Z	23.5N 125.2E	LRDR	- 14633															24.0N 121.6E	
67	152200Z	23.6N 125.2E	LRDR	- 11622															24.3N 124.2E	
68	152215Z	23.7N 125.1E	P	10 5	700	180	60	270	30	80	180	15	954	269	17 -	CIRC		20		7
69	152300Z	23.7N 125.3E	LRDR	- 10582															24.3N 124.2E	
70	160000Z	23.9N 125.2E	LRDR	- 10512															24.3N 124.2E	
71	160037Z	24.0N 125.0E	SAT	(T6.0/6.0 /D1.0/24HRS)						NOAA 2 (NESS)			(CONF 01)							
72	160040Z	24.2N 124.8E	SAT	(T6.0/6.0 /D1.0/23HRS)						NOAA 2			(CONF 01)							
73	160200Z	24.1N 125.2E	LRDR	- 10512															24.3N 124.2E	
74	160300Z	24.2N 125.3E	LRDR	- 20803															26.1N 127.8E	
75	160300Z	24.2N 125.2E	P	10 5	700	190	100	240	15	90	240	10	937	256	19 15	CIRC		20		7
76	160300Z	24.2N 125.3E	LRDR	- 10412															24.3N 124.2E	
77	160400Z	24.3N 125.4E	LRDR	- 116/2															26.1N 127.8E	
78	160400Z	24.3N 125.4E	LRDR	- 11413															24.3N 124.2E	
79	160417Z	24.3N 125.6E	SAT	(T5.5/5.5 /D /24HRS)						PCN 1 DMSP										
80	160417Z	24.5N 125.5E	SAT	(T6.5/6.5 /D2.0/25HRS)						PCN 1 DMSP										
81	160417Z	24.3N 125.3E	SAT	(T5.5/5.5 /S / HRS)						PCN 1 DMSP										
82	160417Z	24.4N 125.1E	SAT	(T5.5/5.5 /D0.5/24HRS)						PCN 1 DMSP										
83	160500Z	24.6N 125.5E	LRDR	- 11513															26.1N 127.8E	
84	160500Z	24.6N 125.4E	LRDR	- 10412															24.3N 124.2E	
85	160600Z	24.6N 125.5E	LRDR	- 10522															26.1N 127.8E	
86	160600Z	24.7N 125.5E	LRDR	- 10412															24.3N 124.2E	
87	160700Z	24.8N 125.5E	LRDR	- 10473															26.1N 127.8E	
88	160700Z	24.8N 125.4E	LRDR	- 10312															24.3N 124.2E	
89	160800Z	24.9N 125.5E	LRDR	- 1042/															24.3N 124.2E	
90	160800Z	24.8N 125.6E	LRDR	- 10413															26.1N 127.8E	
91	160900Z	25.0N 125.6E	LRDR	- 10412															24.3N 124.2E	
92	160900Z	25.0N 125.7E	LRDR	- 10412															26.1N 127.8E	
93	161000Z	25.1N 125.8E	LRDR	- 11412															26.1N 127.8E	
94	161000Z	25.2N 125.7E	LRDR	- 10413															24.3N 124.2E	
95	161100Z	25.3N 125.7E	LRDR	- 10413															24.3N 124.2E	
96	161100Z	25.3N 125.7E	LRDR	- 7045-															26.1N 127.8E	
97	161154Z	25.5N 125.7E	P	1 1	700	330	65	240	8	-	-	-	917	238	25 14	CIRC		12		8
98	161200Z	25.5N 125.7E	LRDR	- 10413															24.3N 124.2E	
99	161200Z	25.5N 125.7E	LRDR	- 10413															26.1N 127.8E	
100	161300Z	25.7N 125.8E	LRDR	- 70413															26.1N 127.8E	

TYPHOON BILLIE
FIX POSITIONS FOR CYCLONE NO. 4
13 JUL TO 19 JUL

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR VEL BRG RNG	MAX OBS SFC WIND VEL BRG RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TI/TO	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSG NMBR
101	161300Z	25.7N 125.7E	LRDR	- 10413										24.3N 124.3E	
102	161400Z	25.9N 125.8E	LRDR	-							-	- -	-	26.1N 127.8E	
103	161400Z	26.0N 125.7E	LRDR	- 10412										24.3N 124.2E	
104	161500Z	26.2N 125.6E	LRDR	- 11413										26.1N 127.8E	
105	161600Z	26.3N 125.5E	LRDR	- 21447										26.1N 127.8E	
106	161600Z	26.4N 125.6E	P	3 1	700	220 119 120 15	- - -	929	249	23 11	CIRC		12		6
107	161600Z	26.3N 125.5E	LRDR	- 15443										24.3N 124.2E	
108	161700Z	26.5N 125.5E	LRDR	- 25743										24.3N 124.2E	
109	161701Z	26.6N 125.7E	SAT				PCN 1 DMSP								
110	161701Z	26.4N 125.3E	SAT				PCN 1 DMSP								
111	161701Z	26.6N 125.7E	SAT				PCN 1 DMSP								
112	161800Z	26.7N 125.5E	LRDR	- 25743										24.3N 124.2E	
113	161800Z	26.0N 125.4E	LRDR	- 15533										26.1N 127.8E	
114	161900Z	26.8N 125.2E	LRDR	- 25543										26.1N 127.8E	
115	162000Z	27.0N 125.2E	LRDR	- 25723										26.1N 127.8E	
116	162100Z	27.1N 125.1E	LRDR	- 25634										26.1N 127.8E	
117	162200Z	27.2N 125.0E	LRDR	- 37534										26.1N 127.8E	
118	162200Z	27.5N 125.5E	P	4 6	700	- - - -	130 190 13	944	262	19 13	CIRC		10		10
119	162300Z	27.3N 125.1E	LRDR	- 37544										26.1N 127.8E	
120	170131Z	28.0N 124.5E	SAT	(T5.0/6.0 /W1.0/24HRS)			NOAA 2 (NESS)	(CONF 01)							
121	170132Z	28.0N 124.5E	SAT	(T5.5/6.0 /W0.5/23HRS)			NOAA 2	(CONF 01)							
122	170300Z	28.0N 125.1E	P	2 2	700	- - - -	100 - -	951	266	10 14	CIRC		10		10
123	170402Z	28.0N 125.4E	SAT	(T4.0/5.0 /W1.5/24HRS)			PCN 1 DMSP								
124	170402Z	27.8N 125.3E	SAT	(T4.5/5.5 /W2.0/24HRS)			PCN 1 DMSP								
125	170402Z	28.0N 125.0E	SAT	(T6.0/6.0 /D0.5/24HRS)			PCN 1 DMSP								
126	171100Z	28.9N 125.4E	P	5 1	700	290 73 180 15	- - -	953	267	18 14	CIRC	- -	15		11
127	171815Z	29.9N 125.4E	P	15 5	700	290 100 180 30	- - -	960	275	18 12	-		-		12
128	171640Z	29.2N 125.7E	SAT				PCN 1 DMSP								
129	171646Z	29.6N 125.6E	SAT				PCN 1 DMSP								
130	171640Z	29.6N 125.7E	SAT				PCN 1 DMSP								
131	172125Z	31.0N 125.3E	P	10 5	700	70 60 360 30	- - -	966	280	17 -	-	- -	-		12
132	180029Z	32.0N 124.5E	SAT	(T4.0/5.0 /W1.0/24HRS)			NOAA 2 (NESS)	(CONF 01)							
133	180031Z	32.2N 124.7E	SAT	(T4.0/5.5 /W1.5/23HRS)			NOAA 2	(CONF 01)							
134	180340Z	32.4N 124.2E	SAT	(T4.0/5.0 /W2.0/24HRS)			PCN 3 DMSP								
135	180340Z	32.5N 124.6E	SAT	(T3.0/3.5 /W1.0/24HRS)			PCN 3 DMSP								
136	180340Z	32.6N 124.5E	SAT	(T2.5/3.5 /W2.0/24HRS)			PCN 3 DMSP								
137	181631Z	34.0N 122.5E	SAT				PCN 3 DMSP								
138	181632Z	34.0N 122.3E	SAT				PCN 3 DMSP								
139	181632Z	34.0N 122.5E	SAT				PCN 3 DMSP								
140	190123Z	35.2N 121.2E	SAT	(T3.0/4.0 /D0.5/24HRS)			NOAA 2 (NESS)								
141	190125Z	35.4N 121.6E	SAT	(T3.0/4.0 /W1.0/24HRS)			NOAA 2	(CONF 02)							
142	190333Z	35.5N 121.6E	SAT	(T1.5/2.5 /W1.5/24HRS)			PCN 3 DMSP								
143	190333Z	35.5N 122.1E	SAT	(T2.5/3.0 /D0.5/25HRS)			PCN 3 DMSP								
144	190333Z	35.6N 121.8E	SAT	(T1.5/2.5 /W1.0/24HRS)			PCN 3 DMSP								
145	191200Z	37.0N 121.6E	SCF				50	984							

TYPHOON DOT
FIX POSITIONS FOR CYCLONE NO. 5
14 JUL TO 20 JUL

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR VEL BRG RNG	MAX OBS SFC WIND VEL BRG RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TI/TO	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSG NMBR
1	130501Z	16.2N 114.7E	SAT	(T1.5/1.5+/ / HRS)			PCN 5 DMSP								
2	130501Z	16.2N 113.3E	SAT	(T2.5/2.5 /D1.5/24HRS)			PCN 5 DMSP								
3	140044Z	18.5N 115.5E	SAT	(T2.0/2.0 /D1.0/24HRS)			NOAA 2 (NESS)	(CONF 02)							
4	140045Z	17.4N 110.2E	SAT	(T2.0/2.0 /D0.5/24HRS)			NOAA 2	(CONF 01)							
5	140446Z	16.7N 112.5E	SAT	(T1.5/1.5 /S /24HRS)			PCN 5 DMSP								
6	140446Z	18.0N 115.0E	SAT	(T1.5/1.5 /S / HRS)			PCN 5 DMSP								
7	140440Z	17.3N 112.8E	SAT	(T3.0/3.0 /D0.5/24HRS)			PCN 5 DMSP								
8	141250Z	17.7N 114.5E	P	10 2	-	150 29 50 20	- - -	990	303	- -	-	- -	-		2
9	141511Z	17.9N 114.3E	P	5 2	-	120 25 330 30	- - -	992	303	- -	-	- -	-		2
10	141729Z	18.1N 114.2E	SAT				PCN 3 DMSP								
11	141730Z	17.8N 113.3E	SAT				PCN 6 DMSP								
12	141730Z	17.5N 114.0E	SAT				PCN 3 DMSP								
13	142326Z	17.5N 113.8E	P	5 5	-	240 42 230 30	40 230 30	-	-	14 11	-	- -	-		3
14	150139Z	18.0N 113.0E	SAT	(T3.0/3.0 /D1.0/24HRS)			NOAA 2 (NESS)	(CONF 02)							
15	150139Z	18.0N 114.0E	SAT	(T3.5/3.5 /D1.5/25HRS)			NOAA 2	(CONF 01)							
16	150303Z	17.9N 113.6E	P	2 5	-	240 50 190 120	50 190 120	-	-	19 14	-	- -	-		3
17	150432Z	18.7N 113.9E	SAT	(T3.0/3.0 /D1.5/24HRS)			PCN 3 DMSP								
18	150432Z	17.7N 113.4E	SAT	(T3.5/3.5 /D / HRS)			PCN 3 DMSP								
19	150432Z	17.3N 113.4E	SAT	(T4.0/4.0 /D1.0/24HRS)			PCN 5 DMSP								
20	151050Z	16.4N 113.6E	P	10 10	-	210 50 90 30	65 90 30	-	-	15 -	-	- -	-		4
21	151500Z	18.7N 113.5E	P	10 10	-	160 60 60 60	- - -	-	-	15 -	-	- -	-		4
22	151715Z	18.7N 113.8E	SAT				PCN 3 DMSP								
23	151715Z	17.5N 113.7E	SAT				PCN 5 DMSP								
24	152050Z	18.9N 114.1E	LRDR	- 15///										22.3N 114.2E	
25	152310Z	19.1N 113.3E	P	2 2	700	240 80 130 85	65 130 120	978	292	15 13	-	- -	-		6
26	160038Z	20.0N 113.5E	SAT	(T3.5/3.5 /D0.5/24HRS)			NOAA 2 (NESS)								
27	160047Z	19.8N 113.8E	SAT	(T4.0/4.0 /D0.5/25HRS)			NOAA 2	(CONF 02)							
28	160320Z	19.9N 113.4E	P	5 5	-	- - - -	- - -	978	290	15 -	-	- -	-		6
29	160417Z	20.4N 113.6E	SAT	(T4.5/4.5 /D0.5/24HRS)			PCN 1 DMSP								
30	160417Z	20.2N 113.7E	SAT	(T5.0/5.0 /D / HRS)			PCN 1 DMSP								
31	160417Z	20.5N 113.6E	SAT	(T5.0/5.0 / / HRS)			PCN 1 DMSP								
32	160417Z	20.3N 113.7E	SAT	(T3.5/3.5 /D / HRS)			PCN 1 DMSP								
33	160500Z	20.0N 113.9E	LRDR	-							-	- -	-	22.3N 114.2E	
34	160600Z	20.4N 113.8E	LRDR	-							-	- -	-	22.3N 114.2E	
35	160700Z	20.5N 113.7E	LRDR	-							-	- -	-	22.3N 114.2E	
36	160900Z	20.6N 113.6E	LRDR	-							-	- -	-	22.3N 114.2E	
37	161000Z	20.6N 113.9E	LRDR	-							-	- -	-	22.3N 114.2E	
38	161100Z	20.7N 114.1E	LRDR	-							-	- -	-	22.3N 114.2E	
39	161210Z	21.0N 114.2E	LRDR	-							-	- -	-	22.3N 114.2E	
40	161300Z	21.1N 114.0E	LRDR	-							-	- -	-	22.3N 114.2E	
41	161400Z	21.2N 114.1E	LRDR	-							-	- -	-	22.3N 114.2E	
42	161500Z	21.4N 114.3E	LRDR	-							-	- -	-	22.3N 114.2E	
43	161600Z	21.6N 114.1E	LRDR	-							-	- -	-	22.3N 114.2E	
44	161700Z	21.6N 114.2E	LRDR	-							-	- -	-	22.3N 114.2E	
45	161700Z	21.6N 114.0E	SAT				PCN 2 DMSP								
46	161701Z	21.4N 114.0E	SAT				PCN 3 DMSP								
47	161701Z	21.6N 114.2E	SAT				PCN 1 DMSP								
48	161701Z	21.7N 114.1E	SAT				PCN 1 DMSP								
49	161800Z	21.7N 114.2E	LRDR	-							-	- -	-	22.3N 114.2E	
50	161900Z	22.0N 114.3E	LRDR	-							-	- -	-	22.3N 114.2E	

TYPHOON DOT
FIX POSITIONS FOR CYCLONE NO. 5
14 JUL TO 20 JUL

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR VEL BRG RNG	MAX OBS SFC WIND VEL BRG RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT/TD	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSN NMBR
51	162000Z	22.2N 114.4E	LRDR	-							-	- -	-	22.3N 114.2E	
52	162100Z	22.3N 114.4E	LRDR	-							-	- -	-	22.3N 114.2E	
53	162300Z	22.6N 114.5E	LRDR	-							-	- -	-	22.3N 114.2E	
54	170000Z	22.7N 114.6E	LRDR	-							-	- -	-	22.3N 114.2E	
55	170100Z	22.7N 114.8E	LRDR	-							-	- -	-	22.3N 114.2E	
56	170200Z	23.0N 114.8E	LRDR	-							-	- -	-	22.3N 114.2E	
57	170300Z	23.3N 115.0E	LRDR	-							-	- -	-	22.3N 114.2E	
58	170402Z	23.2N 115.4E	SAT	(T3.0/3.5 /W0.5/24HRS)			PCN 3 DMSP								
59	170402Z	23.4N 114.9E	SAT	(T2.5/3.5-/W2.0/24HRS)			PCN 3 DMSP								
60	170402Z	22.9N 115.1E	SAT	(T4.0/4.0 /S /24HRS)			PCN 3 DMSP								
61	171646Z	25.0N 116.9E	SAT				PCN 5 DMSP								
62	171646Z	25.0N 116.7E	SAT				PCN 5 DMSP								
63	181032Z	27.9N 125.7E	SAT				PCN 5 DMSP								
64	181033Z	27.2N 125.0E	SAT				PCN 5 DMSP								
65	190129Z	28.0N 126.0E	SAT	(T2.0/2.0 /D0.5/24HRS)			NOAA 2 (NESS)								
66	190130Z	28.0N 125.8E	SAT	(T2.0/2.0 /D0.5/24HRS)			NOAA 2	(CCNF 02)							
67	190333Z	28.2N 127.1E	SAT	(T2.0/2.0 /D / HRS)			PCN 5 DMSP								
68	190333Z	28.5N 126.4E	SAT	(T2.0/2.0 /D1.0/24HRS)			PCN 5 DMSP								
69	190333Z	28.4N 127.8E	SAT	(T2.0/2.0 /D /24HRS)			PCN 3 DMSP								
70	190333Z	28.7N 126.6E	SAT	(T1.5/1.5 /D /24HRS)			PCN 5 DMSP								
71	190400Z	28.0N 126.8E	ERDR	- 20 DFG SPIRAL OVERLAY EYE. FAIR FIX										26.4N 127.8E	
72	190510Z	27.8N 126.9E	LRDR	- FAIR FIX										26.4N 127.8E	
73	190540Z	28.3N 127.3E	LRDR	- 20 DFG SPIRAL OVERLAY EYE, POOR FIX										26.4N 127.8E	
74	190610Z	28.4N 127.3E	LRDR	- 20 DFG SPIRAL OVERLAY EYE										26.4N 127.8E	
75	191550Z	30.7N 127.1E	P	20 10	700	150 30 50 15	- - -	994	303	14 -	-	- -	-		7
76	191617Z	31.4N 127.0E	SAT				PCN 5 DMSP								
77	191617Z	30.6N 126.3E	SAT				PCN 3 DMSP								
78	191617Z	31.0N 127.1E	SAT				PCN 5 DMSP								
79	192000Z	31.3N 127.1E	ERDR	- 30l/l										33.4N 130.4E	
80	192100Z	31.5N 127.2E	LRDR	- 35/12										33.4N 130.4E	
81	192200Z	32.1N 127.0E	LRDR	- 35/11										33.4N 130.4E	
82	192300Z	32.4N 127.0E	LRDR	- 35/11										33.4N 130.4E	
83	200024Z	33.2N 126.2E	SAT	(T2.0/2.0 /W /24HRS)			NOAA 2 (NESS)								
84	200026Z	33.8N 126.3E	SAT	(T2.0/2.0 /S /23HRS)			NOAA 2	(CCNF 01)							
85	200319Z	33.8N 126.3E	SAT	(T1.5/2.0 /W /24HRS)			PCN 3 DMSP								
86	201602Z	37.4N 126.3E	SAT				PCN 3 DMSP								
87	162300Z	22.2N 114.3E	CPA	WAGLAND ISLAND			57 MAX GUST 87KT								
88	171200Z	23.8N 116.4E	SCF				30								
89	180000Z	25.8N 118.8E	SCF				35								

TYPHOON ELLEN
FIX POSITIONS FOR CYCLONE NO. 6
17 JUL TO 29 JUL

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR VEL BRG RNG	MAX OBS SFC WIND VEL BRG RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT/TD	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSN NMBR
1	162330Z	20.5N 138.0E	SAT	(T2.0/2.0 /D1.0/24HRS)			NOAA 2 (NESS)	(CCNF 01)							
2	162340Z	20.0N 138.0E	SAT	(T2.0/2.0 /D1.0/23HRS)			NOAA 2	(CCNF 01)							
3	170221Z	20.5N 138.3E	SAT	(T1.5/1.5 /D0.5/24HRS)			PCN 3 DMSP								
4	170221Z	20.3N 138.3E	SAT	(T2.5/2.5 / / HRS)			PCN 3 DMSP								
5	171504Z	21.0N 139.0E	SAT				PCN 3 DMSP								
6	171504Z	21.0N 139.3E	SAT				PCN 3 DMSP								
7	172210Z	22.2N 139.0E	P	5 3	700	280 70 180 20	55 180 10	978	290	16 9	CIRC		10		1
8	180033Z	22.2N 138.2E	SAT	(T3.5/3.5 /D1.5/24HRS)			NOAA 2 (NESS)								
9	180034Z	22.2N 138.2E	SAT	(T3.5/3.5 /D1.5/25HRS)			NOAA 2	(CCNF 01)							
10	180200Z	22.4N 138.6E	SAT	(T3.5/3.5 /D2.5/24HRS)			PCN 1 DMSP								
11	180200Z	22.2N 138.8E	SAT	(T4.0/4.0 /D / HRS)			PCN 1 DMSP								
12	180200Z	22.5N 138.8E	SAT	(T4.5/4.5 /D2.0/23HRS)			PCN 3 DMSP								
13	180315Z	22.4N 138.3E	P	5 4	700	260 70 180 18	65 180 10	978	288	15 9	CIRC		20		1
14	180340Z	22.5N 138.4E	SAT	(T4.5/4.5 / / HRS)			PCN 1 DMSP								
15	180348Z	22.5N 138.2E	SAT	(T3.5/3.5 /D2.5/24HRS)			PCN 1 DMSP								
16	180935Z	22.7N 138.4E	P	5 5	700	- 65 310 10	50 310 30	969	284	15 11	CIRC		20		2
17	181450Z	23.0N 137.9E	SAT				PCN 2 DMSP								
18	181450Z	23.0N 138.1E	SAT				PCN 2 DMSP								
19	181450Z	22.9N 138.0E	SAT				PCN 2 DMSP								
20	181032Z	23.1N 138.4E	SAT				PCN 1 DMSP								
21	181032Z	23.1N 137.8E	SAT				PCN 1 DMSP								
22	181032Z	23.1N 138.0E	SAT				PCN 1 DMSP								
23	182100Z	24.0N 138.2E	P	5 3	700	150 100 170 10	110 50 8	944	262	2. 12	CIRC		17		3
24	182332Z	24.8N 138.0E	SAT	(T4.0/4.0 /D0.5/24HRS)			NOAA 2 (NESS)								
25	182333Z	24.8N 138.0E	SAT	(T5.5/5.5 /D2.0/23HRS)			NOAA 2	(CCNF 01)							
26	190040Z	24.7N 138.2E	AC R								-	- -	-		-
27	190151Z	25.1N 138.1E	SAT	(T3.5/3.5 /D2.5/24HRS)			PCN 1 DMSP								
28	190151Z	24.8N 138.0E	SAT	(T5.5/5.5 /D1.0/24HRS)			PCN 1 DMSP								
29	190333Z	25.3N 138.2E	SAT	(T5.0/5.0 /D1.5/24HRS)			PCN 1 DMSP								
30	190333Z	25.2N 138.0E	SAT	(T4.5/4.5 /D1.0/24HRS)			PCN 1 DMSP								
31	190333Z	25.2N 138.5E	SAT	(T5.0/5.0 /D1.0/25HRS)			PCN 1 DMSP								
32	190333Z	25.3N 138.3E	SAT	(T5.5/5.5 /D1.0/24HRS)			PCN 1 DMSP								
33	190420Z	25.6N 138.2E	P	5 1	700	270 105 290 5	100 300 8	941	257	25 11	CIRC		12		4
34	191030Z	26.5N 138.4E	P	10 5	700	280 80 230 25	- - -	952	269	2. 13	ELIP	--NE	20x15		4
35	191617Z	27.0N 138.5E	SAT				PCN 3 DMSP								
36	191617Z	27.8N 138.3E	SAT				PCN 1 DMSP								
37	191617Z	27.7N 138.5E	SAT				PCN 3 DMSP								
38	191625Z	28.0N 138.4E	P	- 5	700	30 45 300 30	- - -	962	277	2 -	-	- -	-		5
39	192105Z	28.8N 138.3E	P	3 10	700	120 55 20 30	50 350 15	973	286	2 16	-	- -	-		6
40	200025Z	29.9N 138.0E	SAT	(T2.5/3.5 /W1.5/24HRS)			NOAA 2 (NESS)								
41	200027Z	29.9N 138.0E	SAT	(T3.0/4.0 /W2.5/25HRS)			NOAA 2	(CCNF 01)							
42	200319Z	30.2N 137.9E	SAT	(T3.5/4.5 /W1.0/24HRS)			PCN 3 DMSP								
43	200319Z	30.2N 138.1E	SAT	(T3.5/4.5 /W1.5/24HRS)			PCN 3 DMSP								
44	200319Z	30.2N 137.6E	SAT	(T3.0/4.0-/W1.5/24HRS)			PCN 3 DMSP								
45	200451Z	30.4N 137.9E	P	4 5	-	250 40 160 50	30 180 70	981	294	18 8	-	- -	-		7
46	200900Z	31.1N 137.6E	P	5 5	-	110 45 360 25	30 360 35	985	297	18 10	-	- -	-		7
47	201602Z	32.1N 136.7E	SAT				PCN 3 DMSP								
48	201602Z	32.1N 136.6E	SAT				PCN 3 DMSP								
49	201020Z	32.0N 136.3E	P	3 5	700	210 45 100 45	- - -	990	300	15 11	-	- -	-		8
50	202100Z	32.3N 136.5E	P	5 5	700	200 40 100 40	20 110 60	989	300	14 12	-	- -	-		8

TYPHOON ELLEN
FIX POSITIONS FOR CYCLONE NO. 6
17 JUL TO 29 JUL

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR VEL BRG RNG	MAX OBS SFC WIND VEL BRG RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TI/TO	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSN NMBR
51	210121Z	32.0N 135.0E	SAT	(T2.0/3.0 /W1.0/25HRS)			NOAA 2	(CONF 02)							
52	210304Z	32.1N 136.2E	SAT	(T2.0/3.0 /W1.5/24HRS)			PCN 3 DMSP								
53	210304Z	31.9N 136.2E	SAT	(T2.0/3.0-/W1.0/24HRS)			PCN 3 DMSP								
54	210315Z	32.0N 136.5E	P	5 5	-	40 20 310 33	15 340 50	994	304	15 -	-	- -	-		9
55	211546Z	31.9N 136.6E	SAT				PCN 3 DMSP								
56	212324Z	32.2N 135.0E	SAT	(T1.5/2.5 /W1.0/24HRS)			NOAA 2 (NESS)								
57	220022Z	31.2N 136.0E	SAT	(T2.5/2.5 /D0.5/23HRS)			NOAA 2	(CONF 01)							
58	220249Z	31.4N 136.4E	SAT	(T2.0/2.0 /0 /24HRS)			PCN 3 DMSP								
59	220249Z	31.5N 136.3E	SAT	(T2.0/2.0 /W /24HRS)			PCN 3 DMSP								
60	221533Z	30.8N 135.7E	SAT				PCN 3 DMSP								
61	221533Z	30.8N 135.5E	SAT				PCN 3 DMSP								
62	230032Z	31.1N 133.9E	P	5 5	-	320 35 220 20	30 220 30	997	308	12 -	-	- -	-		10
63	230110Z	31.1N 131.8E	SAT	(T3.0/3.0 /D1.0/24HRS)			NOAA 2 (NESS)	(CONF 01)							
64	230115Z	31.2N 131.5E	SAT	(T3.0/3.0 /D0.5/25HRS)			NOAA 2	(CONF 01)							
65	230235Z	30.7N 132.6E	SAT	(T3.0/3.0 /D1.0/24HRS)			PCN 5 DMSP								
66	230235Z	30.7N 132.5E	SAT	(T3.5/3.5 /D1.5/24HRS)			PCN 3 DMSP								
67	230235Z	31.0N 132.3E	SAT	(T3.0/3.0 /D1.0/24HRS)			PCN 5 DMSP								
68	230300Z	30.8N 132.9E	LRDR	- 25411										30.6N 131.0E	
69	230300Z	30.8N 132.5E	LRDR	- 35//1										33.4N 130.4E	
70	230400Z	30.9N 132.4E	LRDR	- 35//1										33.4N 130.4E	
71	230500Z	30.9N 132.4E	LRDR	- 35//1										33.4N 130.4E	
72	230600Z	30.8N 132.3E	LRDR	- 303//										30.6N 131.0E	
73	230600Z	30.9N 132.2E	LRDR	- 357/1										33.4N 130.4E	
74	230700Z	30.8N 132.1E	LRDR	- 303//										30.6N 131.0E	
75	230700Z	30.9N 132.0E	LRDR	- 35//1										33.4N 130.4E	
76	230800Z	30.8N 131.8E	LRDR	- 35//1										33.4N 130.4E	
77	230800Z	30.8N 131.8E	LRDR	- 303/1										30.6N 131.0E	
78	230900Z	30.7N 131.6E	LRDR	- 303//										30.6N 131.0E	
79	230900Z	30.5N 131.7E	LRDR	- 35//										33.4N 130.4E	
80	231000Z	30.7N 131.8E	LRDR	- 35//0										33.4N 130.4E	
81	231200Z	30.4N 131.2E	LRDR	- 25890										33.4N 130.4E	
82	231300Z	30.1N 130.8E	LRDR	- 35//1										33.4N 130.4E	
83	231500Z	30.1N 131.4E	LRDR	- 10101										30.6N 131.0E	
84	231500Z	29.8N 130.8E	LRDR	- 35//0										33.4N 130.4E	
85	231519Z	30.1N 130.9E	SAT				PCN 5 DMSP								
86	231519Z	29.9N 130.9E	SAT				PCN 5 DMSP								
87	231519Z	30.0N 131.5E	SAT				PCN 5 DMSP								
88	231600Z	30.1N 131.2E	LRDR	- 10172										30.6N 131.0E	
89	231700Z	30.1N 131.0E	LRDR	- 10232										30.6N 131.0E	
90	231700Z	30.1N 131.0E	LRDR	- 203/1										28.4N 129.5E	
91	231701Z	29.9N 131.2E	SAT				PCN 5 DMSP								
92	231701Z	29.9N 130.9E	SAT				PCN 5 DMSP								
93	231800Z	30.2N 130.9E	LRDR	- 10332										30.6N 131.0E	
94	231800Z	30.1N 130.9E	LRDR	- 20321										28.4N 129.5E	
95	231900Z	30.2N 130.8E	LRDR	- 30341										28.4N 129.5E	
96	231900Z	30.3N 130.8E	LRDR	- 10312										30.6N 131.0E	
97	232000Z	30.2N 130.7E	LRDR	- 10312										30.6N 131.0E	
98	232000Z	30.2N 130.7E	LRDR	- 20311										28.4N 129.5E	
99	232100Z	30.2N 130.6E	LRDR	- 30341										28.4N 129.5E	
100	232100Z	30.2N 130.7E	LRDR	- 10312										30.6N 131.0E	
101	232200Z	30.3N 130.6E	LRDR	- 10312										30.6N 131.0E	
102	232200Z	30.3N 130.6E	LRDR	- 30421										28.4N 129.5E	
103	232300Z	30.3N 130.6E	LRDR	- 30411										28.4N 129.5E	
104	232300Z	30.3N 130.4E	LRDR	- 20342										30.6N 131.0E	
105	240000Z	30.4N 130.2E	LRDR	- 25761										28.4N 129.5E	
106	240000Z	30.4N 130.3E	LRDR	- 20312										30.6N 131.0E	
107	240011Z	30.1N 129.1E	SAT	(T2.5/3.0 /W0.5/24HRS)			NOAA 2 (NESS)	(CONF 01)							
108	240016Z	30.1N 129.0E	SAT	(T2.0/3.0 /W1.0/24HRS)			NOAA 2	(CONF 01)							
109	240100Z	30.5N 130.1E	LRDR	- 65/61										28.4N 129.5E	
110	240100Z	30.5N 130.3E	LRDR	- 30342										30.6N 131.0E	
111	240200Z	30.5N 129.8E	LRDR	- 20312										30.6N 131.0E	
112	240200Z	30.5N 130.0E	LRDR	- 20871										28.4N 129.5E	
113	240220Z	29.7N 129.5E	SAT	(T3.0/3.0 /W /24HRS)			PCN 5 DMSP								
114	240220Z	30.1N 130.0E	SAT	(T2.0/3.0 /W1.0/24HRS)			PCN 5 DMSP								
115	240220Z	30.0N 129.9E	SAT	(T3.0/3.0 /W0.5/24HRS)			PCN 3 DMSP								
116	240300Z	30.5N 129.9E	LRDR	- 55712										33.4N 130.4E	
117	240300Z	30.5N 129.8E	LRDR	- 21961										28.4N 129.5E	
118	240310Z	30.5N 129.8E	P	2 5	-	250 30 190 30	35 250 28	1001	307	10 -	-	- -	-		12
119	240400Z	30.5N 129.8E	LRDR	- 20811										28.4N 129.5E	
120	240402Z	30.5N 129.8E	SAT	(T3.0/3.0 /W /24HRS)			PCN 5 DMSP								
121	240402Z	30.3N 129.8E	SAT	(T3.5/3.5 / / HRS)			PCN 3 DMSP								
122	240402Z	30.3N 129.9E	SAT	(T2.0/3.0 /W1.0/25HRS)			PCN 3 DMSP								
123	240700Z	30.6N 129.8E	LRDR	- 6///1										28.4N 129.6E	
124	240700Z	30.7N 129.7E	LRDR	- 55812										33.4N 130.4E	
125	240800Z	30.7N 129.7E	LRDR	- 5////										28.4N 129.6E	
126	240900Z	30.7N 129.6E	LRDR	- 55/1										28.4N 129.5E	
127	241000Z	30.7N 129.6E	LRDR	- 10561										33.4N 130.4E	
128	241022Z	30.8N 129.5E	P	3 5	700	270 15 210 40	35 330 10	998	307	13 9	-	- -	-		13
129	241100Z	30.8N 129.6E	LRDR	- 10501										33.4N 130.4E	
130	241100Z	30.7N 129.4E	LRDR	- 55/11										28.4N 129.5E	
131	241200Z	30.7N 129.5E	LRDR	- 55/11										28.4N 129.5E	
132	241200Z	30.9N 129.6E	LRDR	- 10581										33.4N 130.4E	
133	241300Z	30.9N 129.6E	LRDR	- 11801										33.4N 130.4E	
134	241300Z	30.8N 129.6E	LRDR	- 22911										28.4N 129.5E	
135	241400Z	30.9N 129.5E	LRDR	- 5//61										33.4N 130.4E	
136	241400Z	31.0N 129.6E	LRDR	- 65/41										28.4N 129.5E	
137	241500Z	31.1N 129.6E	LRDR	- 20302										33.4N 130.4E	
138	241500Z	31.2N 129.4E	P	3 5	700	250 25 190 20	- - -	1002	309	14 12	-	- -	-		13
139	241600Z	31.3N 129.5E	LRDR	- 20712										33.4N 130.4E	
140	241640Z	31.4N 129.6E	SAT				PCN 3 DMSP								
141	241640Z	31.0N 129.3E	SAT				PCN 3 DMSP								
142	241700Z	31.3N 129.5E	LRDR	- 21932										33.4N 130.4E	
143	242000Z	31.4N 129.5E	LRDR	- 21952										33.4N 130.4E	
144	242000Z	30.8N 129.4E	LRDR	- 55/10										28.4N 129.5E	
145	242100Z	31.5N 129.5E	LRDR	- 21603										33.4N 130.4E	
146	242200Z	31.6N 129.5E	LRDR	- 11612										33.4N 130.4E	
147	242220Z	31.8N 129.5E	P	- 10	850	210 35 120 35	15 120 20	-	437	2 -	CIRC		20		14
148	242300Z	31.7N 129.5E	LRDR	- 10612										33.4N 130.4E	
149	250000Z	31.8N 129.6E	LRDR	- 10612										33.4N 130.4E	
150	250100Z	31.9N 129.5E	LRDR	- 10412										33.4N 130.4E	

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TYPHOON ELLEN
FIX POSITIONS FOR CYCLONE NO. 6
17 JUL TO 29 JUL

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR VEL BRG RNG	MAX OBS SFC WIND VEL BRG RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT/TD	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSN NMBR
151	250110Z	32.2N 128.9E	SAT	(T2.0/2.5 /W0.5/24HRS)			NOAA 2 (NESS)	(CONF 01)							
152	250111Z	32.2N 129.0E	SAT	(T2.0/2.0 /S /26HRS)			NOAA 2	(CONF 01)							
153	250347Z	32.1N 129.6E	SAT	(T3.0/3.0 /W /24HRS)			PCN 3 DMSP								
154	250348Z	32.1N 129.6E	SAT	(T3.5/3.5 /S /24HRS)			PCN 3 DMSP								
155	250500Z	32.2N 129.8E	LRDR	- 10402										33.4N 130.4E	
156	250600Z	32.3N 129.9E	LRDR	- 10412										33.4N 130.4E	
157	250700Z	32.3N 130.1E	LRDR	- 10223										33.4N 130.4E	
158	250800Z	32.5N 130.2E	LRDR	- 20312										33.4N 130.4E	
159	250900Z	32.6N 130.3E	LRDR	- 11211										33.4N 130.4E	
160	251000Z	32.6N 130.4E	LRDR	- 45/51										33.4N 130.4E	
161	251100Z	32.6N 130.6E	LRDR	- 45/71										33.4N 130.4E	
162	251200Z	32.7N 130.8E	LRDR	- 45//1										33.4N 130.4E	
163	251300Z	32.8N 130.9E	LRDR	- 45//1										33.4N 130.4E	
164	251400Z	32.9N 131.0E	LRDR	- 45//0										33.4N 130.4E	
165	251500Z	32.9N 131.1E	LRDR	- 55//0										33.3N 134.2E	
166	251500Z	32.9N 131.1E	LRDR	- 45//0										33.4N 130.4E	
167	251600Z	32.9N 131.8E	LRDR	-							-	- -	-	33.3N 134.2E	
168	251600Z	32.9N 131.2E	LRDR	- 45//0										33.4N 130.4E	
169	251700Z	32.9N 131.4E	LRDR	- 55//0										33.3N 134.2E	
170	251800Z	33.0N 131.8E	LRDR	- 55//1										33.3N 134.2E	
171	251800Z	32.9N 131.5E	LRDR	- 52201										30.6N 131.0E	
172	251900Z	32.9N 131.8E	LRDR	- 35/17										30.6N 131.0E	
173	260000Z	33.0N 132.3E	LRDR	-							-	- -	-	33.3N 134.2E	
174	260010Z	32.4N 132.0E	SAT	(T2.5/2.5 /D0.5/23HRS)			NOAA 2 (NESS)								
175	260011Z	33.5N 132.5E	SAT	(T2.5/2.5 /D0.5/23HRS)			NOAA 2	(CONF 01)							
176	260100Z	33.0N 132.4E	LRDR	-							-	- -	-	33.3N 134.2E	
177	260200Z	33.0N 132.6E	LRDR	-							-	- -	-	33.3N 134.2E	
178	260300Z	33.0N 132.7E	LRDR	-							-	- -	-	33.3N 134.2E	
179	260400Z	32.9N 132.9E	LRDR	-							-	- -	-	33.3N 134.2E	
180	260500Z	33.0N 133.0E	LRDR	-							-	- -	-	33.3N 134.2E	
181	260550Z	33.0N 133.1E	LRDR	-							-	- -	-	33.3N 134.2E	
182	260600Z	32.9N 133.5E	LRDR	-							-	- -	-	33.3N 134.2E	
183	261040Z	32.6N 133.7E	LRDR	-							-	- -	-	33.3N 134.2E	
184	261400Z	32.5N 133.8E	LRDR	-							-	- -	-	33.3N 134.2E	
185	261450Z	32.6N 133.9E	LRDR	-							-	- -	-	33.3N 134.2E	
186	262100Z	32.1N 134.5E	LRDR	-							-	- -	-	33.3N 134.2E	
187	262300Z	32.0N 134.6E	LRDR	-							-	- -	-	33.3N 134.2E	
188	270000Z	31.9N 134.7E	LRDR	- 5////										33.3N 134.2E	
189	270100Z	31.9N 134.6E	LRDR	- 5////										33.3N 134.2E	
190	270105Z	32.6N 135.0E	SAT	(T2.5/2.5 /S /24HRS)			NOAA 2 (NESS)								
191	270106Z	32.6N 135.0E	SAT	(T2.0/2.5 /W0.5/23HRS)			NOAA 2	(CONF 01)							
192	270200Z	31.9N 134.8E	LRDR	- 5////										33.3N 134.2E	
193	270300Z	31.9N 134.8E	LRDR	- 5////										33.3N 134.2E	
194	280005Z	32.0N 136.0E	SAT	(T2.5/2.5 /S /24HRS)			NOAA 2 (NESS)								
195	280006Z	32.5N 136.2E	SAT	(T2.0/2.0-/S /23HRS)			NOAA 2	(CONF 01)							
196	280300Z	32.1N 136.9E	LRDR	- 20911										35.4N 135.7E	
197	280304Z	32.2N 136.6E	SAT	(T2.0/3.0 /W1.0/24HRS)			PCN 3 DMSP								
198	280304Z	32.4N 136.5E	SAT	(T1.5/1.5 / / HRS)			PCN 3 DMSP								
199	280500Z	32.3N 137.1E	LRDR	- 20911										35.4N 135.7E	
200	280600Z	32.5N 137.2E	LRDR	- 10811										35.4N 135.7E	
201	280700Z	32.6N 137.4E	LRDR	- 20711										35.4N 135.7E	
202	280800Z	32.7N 137.3E	LRDR	- 20811										35.4N 135.7E	
203	281100Z	33.1N 137.4E	LRDR	- 20961										35.4N 135.7E	
204	281200Z	33.3N 137.4E	LRDR	- 20552										35.4N 135.7E	
205	281300Z	33.5N 137.4E	LRDR	- 20542										35.4N 135.7E	
206	281400Z	33.6N 137.4E	LRDR	- 10372										35.4N 135.7E	
207	281500Z	33.7N 137.4E	LRDR	- 20772										35.4N 135.7E	
208	281540Z	33.6N 137.3E	SAT				PCN 3 DMSP								
209	281548Z	33.7N 137.2E	SAT				PCN 3 DMSP								
210	281900Z	34.3N 137.6E	LRDR	- 11374										34.6N 135.7E	
211	282100Z	34.4N 137.4E	LRDR	-							-	- -	-	34.6N 135.7E	
212	282300Z	34.5N 137.1E	LRDR	- 10272										35.2N 137.0E	
213	290102Z	32.7N 136.0E	SAT	(T2.0/2.0-/S /25HRS)			NOAA 2	(CONF 01)							
214	290200Z	34.8N 136.8E	LRDR	- 21452										35.2N 137.0E	
215	290249Z	35.4N 137.1E	SAT	(T1.5/2.0 /W0.5/24HRS)			PCN 5 DMSP								
216	290249Z	32.5N 136.0E	SAT	(T1.5/1.5 / / HRS)			PCN 3 DMSP								
217	290300Z	34.8N 136.7E	LRDR	- 25452										35.2N 137.0E	
218	280000Z	32.1N 136.5E	SCF				35								
219	280600Z	32.7N 137.2E	SCF				50								

TROPICAL STORM FRAN
FIX POSITIONS FOR CYCLONE NO. 7
29 JUL TO 30 JUL

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR VEL BRG RNG	MAX OBS SFC WIND VEL BRG RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TI/TO	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSN NMBR
1	242322Z	12.0N 136.0E	SAT	(T1.5/1.5 /D0.5/24HRS)			NOAA 2 (NESS)	(CONF 02)							
2	250349Z	11.4N 136.0E	SAT	(T1.5/1.5 /D / HRS)			PCN 5 DMSP								
3	250248Z	11.2N 135.6E	SAT	(T2.0/2.0 /D1.0/24HRS)			PCN 5 DMSP								
4	260018Z	11.5N 130.5E	SAT	(T1.5/1.5 /D0.5/23HRS)			NOAA 2	(CONF 01)							
5	260333Z	11.3N 136.0E	SAT	(T1.5/1.5 /S / HRS)			PCN 5 DMSP								
6	270112Z	16.3N 132.3E	SAT	(T2.0/2.0 /D0.5/25HRS)			NOAA 2	(CONF 01)							
7	270318Z	16.7N 132.8E	SAT	(T2.0/2.0 / / HRS)			PCN 3 DMSP								
8	270318Z	16.7N 132.5E	SAT	(T1.5/1.5 /S /24HRS)			PCN 3 DMSP								
9	271002Z	17.2N 130.1E	SAT				PCN 5 DMSP								
10	280010Z	19.0N 127.5E	SAT	(T2.0/2.0 /S /24HRS)			NOAA 2 (NESS)	(CONF 02)							
11	280011Z	19.0N 127.5E	SAT	(T2.0/2.0 /S /23HRS)			NOAA 2	(CONF 02)							
12	280304Z	17.1N 127.5E	SAT	(T2.0/2.0 /S /24HRS)			PCN 3 DMSP								
13	280304Z	17.5N 127.3E	SAT	(T1.5/1.5 /S /24HRS)			PCN 5 DMSP								
14	281540Z	19.0N 124.7E	SAT				PCN 6 DMSP								
15	281540Z	18.1N 124.7E	SAT				PCN 5 DMSP								
16	282350Z	19.2N 123.5E	P	5 6	-	110 30 30 50	25 40 40	1004	312	14 13	-	- -	-		4
17	290106Z	19.7N 124.0E	SAT	(T2.5/2.5 /D0.5/25HRS)			NOAA 2	(CONF 01)							
18	290300Z	19.2N 123.7E	P	6 10	-	220 40 150 20	40 140 23	1002	311	12 -	-	- -	-		4
19	290431Z	19.4N 122.9E	SAT	(T3.0/3.0 /D / HRS)			PCN 5 DMSP								
20	291145Z	19.3N 122.8E	P	5 15	700	140 15 50 20	- - -	1004	312	11 -	-	- -	-		5
21	291518Z	19.3N 122.3E	P	5 10	700	60 30 340 90	- - -	1005	313	11 -	-	- -	-		5
22	291715Z	20.4N 120.6E	SAT				PCN 5 DMSP								
23	292221Z	19.7N 122.3E	P	- 10	700	210 25 150 15	15 220 10	1008	314	9 -	-	- -	-		6
24	300000Z	22.0N 124.0E	SAT	(T1.5/1.5 /W1.0/23HRS)			NOAA 2	(CONF 01)							
25	300400Z	22.1N 121.6E	P	3 15	-	350 25 190 15	15 160 40	1008	316	11 -	-	- -	-		7
26	300410Z	19.5N 119.3E	SAT	(T1.0/2.0 /W2.0/24HRS)			PCN 5 DMSP								

TYPHOON GEORGIA
FIX POSITIONS FOR CYCLONE NO. 8
09 AUG TO 12 AUG

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR VEL BRG RNG	MAX OBS SFC WIND VEL BRG RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TI/TO	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSN NMBR
1	080040Z	20.0N 119.0E	SAT	(T2.0/2.0 /D1.0/24HRS)			NOAA 2 (NESS)	(CONF 01)							
2	080041Z	20.0N 119.0E	SAT	(T2.0/2.0 /D0.5/24HRS)			NOAA 2	(CONF 01)							
3	080310Z	21.9N 117.6E	SAT	(T1.5/1.5 /D / HRS)			ESSA 8 (VTBU)								
4	080347Z	20.8N 119.4E	SAT	(T1.5/1.5 /D0.5/24HRS)			PCN 5 DMSP								
5	081031Z	20.2N 117.7E	SAT				PCN 6 DMSP								
6	081031Z	20.5N 118.6E	SAT				PCN 5 DMSP								
7	090135Z	20.0N 117.0E	SAT	(T3.0/3.0 /D1.0/24HRS)			NOAA 2 (NESS)								
8	090137Z	20.0N 117.0E	SAT	(T3.0/3.0 /D1.0/25HRS)			NOAA 2	(CONF 01)							
9	090210Z	19.8N 117.3E	P	10 5	-	50 35 340 35	30 340 35	992	302	12 -	-	- -	-		1
10	090214Z	20.2N 118.8E	SAT	(T2.0/2.0 /D0.5/23HRS)			ESSA 8 (VTBU)								
11	090300Z	19.8N 117.1E	SRDR	-							-	- -	-	19.1N 117.1E	-
12	090332Z	19.9N 116.7E	SAT	(T2.5/2.5 /D1.0/24HRS)			PCN 3 DMSP								
13	090332Z	19.9N 117.0E	SAT	(T3.0/3.0 /D / HRS)			PCN 3 DMSP								
14	090332Z	20.0N 116.8E	SAT	(T2.5/2.5 /D /24HRS)			PCN 3 DMSP								
15	090332Z	19.7N 117.0E	SAT	(T2.0/2.0 /D1.0/24HRS)			PCN 3 DMSP								
16	090514Z	19.7N 116.6E	SAT	(T2.0/2.0 / / HRS)			PCN 3 DMSP								
17	090600Z	19.9N 116.8E	SRDR	-							-	- -	-	22.3N 114.2E	-
18	090710Z	19.8N 116.5E	LRDR	- 25/1/										22.3N 114.2E	-
19	090900Z	19.8N 116.3E	LRDR	- 25///											
20	090947Z	20.0N 116.3E	P	1 1	700	220 35 340 15	50 340 40	989	299	13 10	-	- -	-		2
21	091200Z	19.7N 115.6E	LRDR	-							-	- -	-	22.3N 114.2E	-
22	091500Z	19.6N 115.1E	LRDR	-							-	- -	-	22.3N 114.2E	-
23	091510Z	19.6N 115.3E	P	1 1	700	230 45 150 10	- - -	980	294	15 10	CIRC	- -	5		2
24	091610Z	19.5N 115.1E	SAT				PCN 3 DMSP								
25	091610Z	19.5N 115.3E	SAT				PCN 1 DMSP								
26	091610Z	19.2N 115.2E	SAT				PCN 4 DMSP								
27	091610Z	19.5N 114.7E	SAT				PCN 3 DMSP								
28	091610Z	19.4N 114.9E	SAT				PCN 5 DMSP								
29	091800Z	19.6N 114.7E	LRDR	-							-	- -	-	2.3N 114.2E	-
30	092100Z	19.4N 114.3E	LRDR	- 45///										2.3N 114.2E	-
31	092214Z	19.5N 114.5E	P	1 3	700	130 50 40 15	50 140 10	978	291	16 -	-	- -	-		3
32	100000Z	19.5N 113.9E	LRDR	- 55///										22.3N 114.2E	-
33	100230Z	20.0N 113.5E	SAT	(T4.0/4.0 /D1.0/25HRS)			NOAA 2	(CONF 02)							
34	100230Z	20.0N 113.5E	SAT	(T4.0/4.0 /D1.0/24HRS)			NOAA 2 (NESS)								
35	100304Z	19.0N 113.0E	SAT	(T4.0/4.0 /D2.0/24HRS)			ESSA 8 (VTBU)								
36	100350Z	19.5N 113.7E	P	5 2	-	160 55 30 20	65 180 10	978	290	17 -	CIRC		15		4
37	100500Z	19.5N 113.4E	SAT	(T4.0/4.0 /D2.0/24HRS)			PCN 3 DMSP								
38	100500Z	19.5N 113.1E	SAT	(T4.0/4.0+/D1.0/25HRS)			PCN 1 DMSP								
39	100600Z	19.5N 113.1E	LRDR	- 55///										22.3N 114.2E	
40	100645Z	19.5N 113.3E	P	- -	-	170 40 - -	- - -	976	288	17 -	-	- -	-		4
41	100850Z	19.3N 112.8E	LRDR	- 1061/										22.3N 114.2E	
42	101230Z	19.2N 112.7E	LRDR	- 1061/										22.3N 114.2E	
43	101500Z	19.1N 112.3E	LRDR	- 1061/										22.3N 114.2E	
44	101744Z	19.0N 112.2E	SAT				PCN 5 DMSP								
45	101744Z	19.0N 111.5E	SAT				PCN 1 DMSP								
46	101744Z	19.3N 112.5E	SAT				PCN 2 DMSP								
47	101600Z	19.1N 112.1E	LRDR	- 35///										22.3N 114.2E	
48	102100Z	19.1N 111.2E	LRDR	- 6////										22.3N 114.2E	
49	110000Z	19.1N 111.9E	LRDR	-							-	- -	-	22.3N 114.2E	
50	110131Z	19.0N 111.8E	SAT	(T4.0/4.0 /S /24HRS)			NOAA 2 (NESS)								
51	110132Z	19.0N 112.0E	SAT	(T4.5/4.5 /D0.5/23HRS)			NOAA 2	(CONF 01)							
52	110445Z	19.1N 111.6E	SAT	(T4.5/4.5-/D0.5/24HRS)			PCN 1 DMSP								
53	110445Z	19.3N 111.6E	SAT	(T4.5/4.5 /D0.5/24HRS)			PCN 1 DMSP								
54	110445Z	19.0N 111.7E	SAT	(T4.0/4.0 /S /24HRS)			PCN 1 DMSP								
55	111729Z	20.0N 111.7E	SAT				PCN 2 DMSP								
56	111729Z	20.1N 111.6E	SAT				PCN 1 DMSP								
57	111729Z	19.9N 111.3E	SAT				PCN 2 DMSP								
58	120000Z	20.3N 111.1E	LRDR	-							-	- -	-	22.3N 114.2E	
59	120029Z	20.8N 111.0E	SAT	(T5.0/5.0 /D0.5/23HRS)			NOAA 2	(CONF 02)							
60	120100Z	20.5N 111.1E	LRDR	-							-	- -	-	22.3N 114.2E	
61	120240Z	21.3N 111.8E	SAT	(T4.5/4.5 /D /23HRS)			ESSA 8 (VTBU)								
62	120410Z	21.0N 111.0E	LRDR	-							-	- -	-	22.3N 114.2E	
63	120430Z	20.9N 111.2E	SAT	(T4.5/4.5+/D0.5/24HRS)			PCN 1 DMSP								
64	120430Z	20.9N 111.1E	SAT	(T4.5/4.5-/S /24HRS)			PCN 1 DMSP								
65	120435Z	20.9N 111.1E	SAT	(T4.5/4.5 /S /24HRS)			PCN 1 DMSP								
66	121140Z	21.8N 110.8E	LRDR	-							-	- -	-	22.3N 114.2E	
67	121714Z	22.4N 110.7E	SAT				PCN 3 DMSP								
68	121714Z	22.4N 110.7E	SAT				PCN 5 DMSP								
69	121720Z	21.9N 110.6E	SAT				PCN 3 DMSP								
70	121800Z	22.0N 110.7E	SCF				25	990							

TROPICAL STORM HOPE
FIX POSITIONS FOR CYCLONE NO. 9
09 AUG TO 12 AUG

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV	ACCRY MET	FIX LVL	MAX OBS FLT LVL WIND DIR	VEL	BRG	RNG	MAX OBS SFC WIND VEL	BRG	RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT/TD	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSN NMBR
1	080205Z	23.0N 158.3E	SAT	(T1.0/1.0 / / HRS)							PCN 5 DMSP										
2	082339Z	25.0N 156.0E	SAT	(T2.0/2.0 /D1.0/24HRS)							NOAA 2 (NESS)										
3	082340Z	25.0N 156.0E	SAT	(T2.0/2.0 /D1.0/24HRS)							NOAA 2			(CONF 03)							
4	090151Z	25.9N 155.1E	SAT	(T2.0/2.0 /D1.0/24HRS)							PCN 3 DMSP										
5	090151Z	25.8N 155.4E	SAT	(T2.0/2.0 /D /24HRS)							PCN 3 DMSP										
6	091435Z	27.0N 153.2E	SAT								PCN 4 DMSP										
7	091435Z	26.8N 153.1E	SAT								PCN 6 DMSP										
8	092229Z	27.3N 152.2E	P	20	5	700	180	35	90	10	45	180	20	996	305	13 -	-	- -	-		
9	092238Z	27.5N 152.0E	SAT	(T3.0/3.0 /D1.0/24HRS)							NOAA 2 (NESS)			(CONF 03)							
10	092238Z	27.5N 152.0E	SAT	(T3.0/3.0 /D1.0/23HRS)							NOAA 2			(CONF 03)							
11	100136Z	28.2N 151.7E	SAT	(T3.0/3.0 /D1.0/24HRS)							PCN 3 DMSP										
12	100136Z	27.7N 151.7E	SAT	(T3.5/3.5 /D /11HRS)							PCN 3 DMSP										
13	101229Z	28.9N 150.9E	P	15	10	-	300	40	180	50	-	-	-	1006	310	- -	-	- -	-		2
14	101420Z	29.4N 150.3E	SAT								PCN 3 DMSP										
15	101420Z	29.4N 150.6E	SAT								PCN 4 DMSP										
16	102130Z	30.0N 150.1E	P	5	5	700	150	35	50	25	20	180	15	1001	309	10 12	-	- -	-		3
17	102332Z	30.0N 149.5E	SAT	(T3.0/3.0 /S /24HRS)							NOAA 2 (NESS)			(CONF 01)							
18	102334Z	30.0N 150.0E	SAT	(T2.0/3.0 /W1.0/24HRS)							NOAA 2			(CONF 01)							
19	110121Z	30.3N 149.4E	SAT	(T3.5/3.5 /S /24HRS)							PCN 4 DMSP										
20	110121Z	30.5N 149.3E	SAT	(T4.0/4.0-/D1.0/24HRS)							PCN 4 DMSP										
21	110923Z	30.9N 148.5E	P	5	10	-	210	26	120	30	25	120	40	999	305	11 -	-	- -	-		4
22	111405Z	31.9N 148.3E	SAT								PCN 4 DMSP										
23	111405Z	32.0N 148.4E	SAT								PCN 4 DMSP										
24	111547Z	32.1N 148.6E	SAT								PCN 3 DMSP										
25	112233Z	31.5N 146.0E	SAT	(T2.0/2.0 /S /23HRS)							NOAA 2			(CONF 02)							
26	120249Z	32.5N 145.6E	SAT	(T3.0/3.0 /S /25HRS)							PCN 3 DMSP										
27	120249Z	32.2N 145.5E	SAT	(T3.0/3.0 /S / HRS)							PCN 3 DMSP										
28	120249Z	32.3N 145.6E	SAT	(T4.0/4.0-/S /24HRS)							PCN 5 DMSP										
29	121020Z	32.4N 144.0E	P	5	10	-	200	29	140	30	-	-	-	1008	313	- -	-	- -	-		5
30	121200Z	32.8N 142.1E	LRDR																		
31	121533Z	34.1N 144.0E	SAT								PCN 3 DMSP										
32	121533Z	34.2N 143.8E	SAT								PCN 3 DMSP										
33	121533Z	34.1N 143.6E	SAT								PCN 3 DMSP										

TYPHOON IRIS
FIX POSITIONS FOR CYCLONE NO. 10
10 AUG TO 17 AUG

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV	ACCRY MET	FIX LVL	MAX OBS FLT LVL WIND DIR	VEL	BRG	RNG	MAX OBS SFC WIND VEL	BRG	RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT/TD	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSN NMBR
1	082342Z	18.5N 132.0E	SAT	(T1.5/1.5 /D0.5/24HRS)							NOAA 2			(CONF 01)							
2	090332Z	17.3N 132.9E	SAT	(T1.5/1.5 /D / HRS)							PCN 3 DMSP										
3	090332Z	17.4N 132.4E	SAT	(T1.5/1.5 /D0.5/24HRS)							PCN 3 DMSP										
4	090332Z	17.2N 132.3E	SAT	(T2.0/2.0 /D /24HRS)							PCN 3 DMSP										
5	090332Z	17.5N 132.3E	SAT	(T2.0/2.0 /D1.0/24HRS)							PCN 3 DMSP										
6	090332Z	17.2N 132.0E	SAT	(T2.0/2.0 / / HRS)							PCN 5 DMSP										
7	091816Z	18.0N 131.7E	SAT								PCN 5 DMSP										
8	091816Z	17.8N 132.1E	SAT								PCN 5 DMSP										
9	091816Z	18.3N 131.8E	SAT								PCN 5 DMSP										
10	091816Z	18.5N 131.6E	SAT								PCN 5 DMSP										
11	100034Z	24.0N 130.0E	SAT	(T1.5/1.5 /S /25HRS)							NOAA 2			(CONF 03)							
12	100318Z	22.4N 131.8E	SAT	(T2.5/2.5 / /24HRS)							PCN 5 DMSP										
13	100318Z	21.3N 130.6E	SAT	(T2.5/2.5 /D0.5/24HRS)							PCN 3 DMSP										
14	100318Z	21.1N 131.1E	SAT	(T2.5/2.5 /D1.0/24HRS)							PCN 3 DMSP										
15	100318Z	21.2N 131.0E	SAT	(T2.0/2.0+/D0.5/24HRS)							PCN 3 DMSP										
16	101123Z	21.7N 130.9E	P	3	8	700	210	55	120	300	-	-	-	1002	307	10 14	-	- -	-		4
17	101555Z	22.8N 131.2E	P	5	10	700	240	50	150	120	-	-	-	999	306	14 -	-	- -	-		4
18	101602Z	23.0N 131.5E	SAT								PCN 3 DMSP										
19	101802Z	22.9N 131.2E	SAT								PCN 3 DMSP										
20	101802Z	23.3N 132.0E	SAT								PCN 3 DMSP										
21	102210Z	23.1N 130.8E	P	1	5	700	320	25	230	15	30	230	15	987	299	13 11	-	- -	-		5
22	102335Z	24.0N 131.3E	SAT	(T3.0/3.0 /D1.5/23HRS)							NOAA 2			(CONF 02)							
23	110300Z	23.5N 131.1E	P	1	5	700	90	40	90	60	35	10	60	989	300	10 12	-	- -	-		5
24	110303Z	23.5N 130.3E	SAT	(T4.0/4.0+/D2.0/24HRS)							PCN 3 DMSP										
25	110304Z	23.6N 130.4E	SAT	(T4.0/4.0 /D1.5/24HRS)							PCN 3 DMSP										
26	110303Z	23.4N 130.3E	SAT	(T5.5/5.5 /D1.5/24HRS)							PCN 1 DMSP										
27	110303Z	23.5N 130.1E	SAT	(T4.0/4.0 /D1.5/24HRS)							PCN 1 DMSP										
28	111000Z	23.1N 130.9E	P	2	15	700	310	40	200	40	30	200	40	984	295	14 -	-	- -	-		6
29	111226Z	23.2N 130.8E	P	2	10	700	280	50	200	100	-	-	-	982	294	10 -	-	- -	-		6
30	111547Z	22.8N 131.2E	SAT								PCN 3 DMSP										
31	111547Z	23.1N 131.0E	SAT								PCN 3 DMSP										
32	111547Z	22.8N 131.0E	SAT								PCN 3 DMSP										
33	120031Z	23.0N 131.5E	SAT	(T4.0/4.0 /D1.0/25HRS)							NOAA 2			(CONF 01)							
34	120249Z	22.6N 131.4E	SAT	(T5.0/5.0 /D /24HRS)							PCN 3 DMSP										
35	120249Z	22.6N 130.9E	SAT	(T4.5/4.5 /D0.5/24HRS)							PCN 3 DMSP										
36	120249Z	22.8N 131.1E	SAT	(T4.0/4.0 /D /24HRS)							PCN 3 DMSP										
37	120802Z	23.0N 130.9E	P	2	5	700	310	55	230	12	55	240	20	976	288	14 15	-	- -	-		8
38	120956Z	23.0N 130.9E	P	2	5	700	320	85	300	60	70	330	90	973	285	14 13	-	- -	-		8
39	121533Z	22.9N 131.1E	SAT								PCN 3 DMSP										
40	121533Z	22.8N 131.4E	SAT								PCN 3 DMSP										
41	121533Z	22.6N 131.4E	SAT								PCN 1 DMSP										
42	121040Z	23.1N 131.5E	P	5	3	700	210	62	130	103	-	-	-	974	287	10 -	-	- -	-		9
43	122114Z	23.3N 131.7E	P	5	2	700	240	60	160	10	-	-	-	974	286	14 -	-	- -	-		9
44	122346Z	23.0N 130.0E	SAT	(T5.0/5.0 /D1.0/23HRS)							NOAA 2			(CONF 02)							
45	130234Z	23.0N 131.7E	SAT	(T6.0/6.0 /D1.0/24HRS)							PCN 1 DMSP										
46	130234Z	22.8N 131.6E	SAT	(T5.0/5.0 /D0.5/24HRS)							PCN 1 DMSP										
47	130234Z	23.1N 132.1E	SAT	(T5.0/5.0+/D0.5/ HRS)							PCN 3 DMSP										
48	131143Z	23.5N 132.3E	P	2	15	700	360	69	260	60	-	-	-	972	285	1[illegible] -	-	- -	-		10
49	131518Z	23.7N 131.6E	SAT								PCN 3 DMSP										
50	131518Z	23.7N 132.7E	SAT								PCN 3 DMSP										

TYPHOON IRIS
FIX POSITIONS FOR CYCLONE NO. 10
10 AUG TO 17 AUG

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR VEL BRG RNG	MAX OBS SFC WIND VEL BRG RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TI/TO	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSN NMBR
51	131518Z	23.6N 132.3E	SAT				PCN 3 DMSP								
52	131755Z	24.6N 132.1E	P	10 10	-	330 60 240 30	- - -	974	287	14 -	-	- -	-		11
53	132107Z	24.5N 132.3E	P	10 10	-	60 85 310 75	- - -	974	286	14 -	-	- -	-		11
54	140027Z	24.9N 132.0E	SAT	(T5.0/5.0 /S /25HRS)			NOAA 2	(CONF 01)							
55	140220Z	24.9N 132.1E	SAT	(T5.0/5.0 /S /24HRS)			PCN 3 DMSP								
56	140220Z	25.0N 132.3E	SAT	(T4.0/5.0 /W1.0/24HRS)			PCN 3 DMSP								
57	140220Z	25.2N 132.0E	SAT	(T6.0/6.0 /W /24HRS)			PCN 1 DMSP								
58	140401Z	25.9N 131.8E	SAT	(T4.5/5.0 /W0.5/24HRS)			PCN 1 DMSP								
59	140401Z	25.1N 132.1E	SAT	(T5.0/5.0 /S /25HRS)			PCN 3 DMSP								
60	140401Z	25.2N 131.8E	SAT	(T5.0/6.0 /W1.0/24HRS)			PCN 1 DMSP								
61	140401Z	25.1N 132.2E	SAT	(T4.0/5.0 /W1.0/24HRS)			PCN 3 DMSP								
62	140401Z	24.9N 132.0E	SAT	(T5.0/5.0 /S /25HRS)			PCN 3 DMSP								
63	140903Z	25.0N 131.5E	P	2 10	700	240 65 130 100	50 130 120	972	286	13 13	-	- -	-		12
64	141030Z	27.0N 130.6E	P	5 10	700	140 60 60 80	- - -	979	291	14 14	-	- -	-		13
65	141645Z	26.8N 131.1E	SAT				PCN 3 DMSP								
66	141645Z	27.0N 130.6E	SAT				PCN 3 DMSP								
67	141645Z	26.8N 130.9E	SAT				PCN 2 DMSP								
68	141645Z	26.8N 130.9E	SAT				PCN 3 DMSP								
69	141645Z	26.6N 130.3E	SAT				PCN 3 DMSP								
70	141800Z	27.9N 131.3E	LRDR	- 54904										28.4N 129.5E	
71	141900Z	28.2N 130.8E	LRDR	- 54914										28.4N 129.5E	
72	142000Z	28.4N 130.0E	LRDR	- 04/43										28.4N 129.5E	
73	142210Z	27.8N 129.7E	P	5 20	700	220 50 130 135	60 130 135	980	291	13 12	-	- -	-		14
74	150120Z	28.9N 129.8E	LRDR	- EYE, GOOD FIX										33.6N 130.5E	
75	150120Z	28.5N 129.4E	SAT	(T4.0/5.0 /W1.0/25HRS)			NOAA 2	(CONF 01)							
76	150200Z	28.2N 129.4E	LRDR	- 65/72										28.4N 129.5E	
77	150300Z	27.9N 129.1E	LRDR	- 10 DEG OVERLAY										26.4N 127.8E	
78	150347Z	28.2N 128.8E	SAT	(T3.5/4.5 /W0.5/24HRS)			PCN 1 DMSP								
79	150347Z	28.2N 129.0E	SAT	(T4.0/5.0 /W / HRS)			PCN 3 DMSP								
80	150347Z	28.2N 129.0E	SAT	(T5.0/5.0 /D /24HRS)			PCN 1 DMSP								
81	150347Z	28.4N 128.7E	SAT	(T3.5/4.5 /W1.5/24HRS)			PCN 3 DMSP								
82	150347Z	28.3N 129.1E	SAT	(T4.0/4.5 /W0.5/24HRS)			PCN 3 DMSP								
83	150400Z	28.4N 129.0E	LRDR	- 65//?										28.4N 129.5E	
84	150415Z	28.5N 129.0E	P	1 15	700	230 30 160 90	45 150 110	978	289	14 -	-	- -	-		15
85	150600Z	29.3N 129.3E	LRDR	-							-	- -	-	33.6N 130.5E	
86	150700Z	29.7N 129.3E	LRDR	-							-	- -	-	33.6N 130.5E	
87	150600Z	28.9N 128.0E	LRDR	- ////?										28.4N 129.5E	
88	150900Z	29.1N 128.2E	LRDR	- ////?										28.4N 129.5E	
89	150955Z	28.9N 128.7E	P	10 15	-	220 35 170 30	- - -	977	291	15 -	-	- -	-		16
90	151000Z	29.2N 128.2E	LRDR	- ////?										28.4N 129.5E	
91	151200Z	29.5N 128.6E	LRDR	-							-	- -	-	33.6N 130.5E	
92	151200Z	29.3N 128.0E	LRDR	- ////?										28.4N 129.5E	
93	151300Z	29.9N 128.1E	LRDR	-							-	- -	-	33.6N 130.5E	
94	151300Z	29.3N 127.9E	LRDR	- ////?										28.4N 129.5E	
95	151400Z	30.1N 127.8E	LRDR	-							-	- -	-	33.6N 130.5E	
96	151500Z	30.3N 127.3E	LRDR	-							-	- -	-	33.6N 130.5E	
97	151552Z	29.4N 127.4E	P	1 30	700	330 40 240 45	- - -	975	288	15 -	-	- -	-		17
98	151631Z	29.7N 127.0E	SAT				PCN 3 DMSP								
99	151631Z	29.5N 126.8E	SAT				PCN 3 DMSP								
100	152112Z	30.0N 126.6E	P	1 15	700	250 62 140 60	35 140 85	972	286	15 14	-	- -	-		17
101	160018Z	30.1N 126.5E	SAT	(T4.0/4.0 /S /23HRS)			NOAA 2	(CONF 01)							
102	160315Z	30.8N 125.8E	P	5 5	700	280 50 180 90	40 180 120	975	289	15 14	-	- -	-		18
103	160332Z	31.1N 125.8E	SAT	(T2.5/2.5 /D / HRS)			PCN 5 DMSP								
104	160332Z	31.1N 125.6E	SAT	(T3.0/4.0 /W1.0/24HRS)			PCN 3 DMSP								
105	160332Z	31.1N 125.4E	SAT	(T3.5/3.5 /W0.5/24HRS)			PCN 3 DMSP								
106	160332Z	30.9N 126.3E	SAT	(T5.0/5.0 /W /24HRS)			PCN 3 DMSP								
107	160332Z	30.8N 126.5E	SAT	(T4.0/4.0 /S /24HRS)			PCN 3 DMSP								
108	160714Z	31.3N 125.1E	P	5 5	700	140 65 50 63	- - -	976	287	15 -	CIRC		50		18
109	161018Z	33.1N 125.9E	SAT				PCN 3 DMSP								
110	161018Z	32.3N 125.1E	SAT				PCN 1 DMSP								
111	161041Z	34.3N 124.8E	LRDR	- 20 DEG OVERLAY, FAIR FIX										35.9N 126.6E	
112	161747Z	34.7N 124.6E	LRDR	- 20 DEG OVERLAY, FAIR FIX										35.9N 126.6E	
113	162240Z	35.7N 124.5E	LRDR	- 20 DEG OVERLAY, FAIR FIX										35.9N 126.6E	
114	170112Z	35.4N 125.1E	SAT	(T3.0/3.0 /W1.0/25HRS)			NOAA 2	(CONF 01)							
115	170240Z	35.8N 126.0E	LRDR	- APPARENT EYE										35.9N 126.6E	
116	170300Z	35.9N 126.1E	LRDR	- 21504										37.5N 127.0E	
117	170318Z	36.3N 126.8E	SAT	(T1.0/1.0 /D /24HRS)			PCN 5 DMSP								
118	170318Z	36.1N 125.7E	SAT	(T3.5/4.5 /W1.5/24HRS)			PCN 3 DMSP								
119	170400Z	36.1N 126.1E	LRDR	- 24544										37.5N 127.0E	
120	171601Z	39.9N 130.1E	SAT				PCN 5 DMSP								

TROPICAL DEPRESSION 11
FIX POSITIONS FOR CYCLONE NO. 11
13 AUG TO 14 AUG

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR VEL BRG RNG	MAX OBS SFC WIND VEL BRG RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TI/TO	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSN NMBR
1	102138Z	28.0N 167.0E	SAT	(T1.5/1.5 /D0.5/24HRS)			NOAA 2 (NESS)								
2	102137Z	28.0N 167.5E	SAT	(T1.5/1.5 /D0.5/24HRS)			NOAA 2	(CONF 01)							
3	110121Z	27.6N 165.8E	SAT	(T2.5/2.5 / / HRS)			PCN 6 DMSP								
4	110121Z	27.5N 165.4E	SAT	(T1.5/1.5 / / HRS)			PCN 6 DMSP								
5	110121Z	27.5N 165.5E	SAT	(T1.5/1.5 / / HRS)			PCN 6 DMSP								
6	111405Z	28.0N 162.7E	SAT				PCN 6 DMSP								
7	111405Z	28.0N 162.3E	SAT				PCN 6 DMSP								
8	112632Z	29.6N 161.0E	SAT	(T2.0/2.0 /D0.5/24HRS)			NOAA 2 (NESS)	(CONF 01)							
9	120107Z	29.1N 160.1E	SAT	(T2.0/2.0 /D0.5/24HRS)			PCN 3 DMSP								
10	120107Z	29.2N 160.4E	SAT	(T2.5/2.5 /D0.5/24HRS)			PCN 4 DMSP								
11	120107Z	29.4N 161.3E	SAT	(T2.5/2.5 /S /24HRS)			PCN 4 DMSP								
12	121351Z	29.8N 158.9E	SAT				PCN 3 DMSP								
13	122136Z	29.9N 158.8E	SAT	(T2.0/2.0 /D1.0/24HRS)			NOAA 2	(CONF 02)							
14	130052Z	29.8N 157.4E	SAT	(T2.0/2.5 /W0.5/24HRS)			PCN 4 DMSP								
15	130052Z	30.1N 158.1E	SAT	(T3.0/3.0 /D1.0/24HRS)			PCN 3 DMSP								
16	130930Z	30.3N 156.4E	P	5 5	-	70 30 360 10	- - -	1007	311	- 11	-	- -	-		1
17	131518Z	30.4N 155.0E	SAT				PCN 3 DMSP								
18	131518Z	30.5N 155.1E	SAT				PCN 3 DMSP								
19	132205Z	30.6N 154.1E	P	5 8	-	190 20 120 40	25 270 10	1005	312	12 -	-	- -	-		2
20	132259Z	30.6N 153.6E	SAT	(T2.0/2.0 /S /25HRS)			NOAA 2	(CONF 01)							
21	140220Z	31.2N 153.3E	SAT	(T2.0/2.0 /W /24HRS)			PCN 3 DMSP								
22	140220Z	30.8N 153.3E	SAT	(T2.0/2.0 /S / HRS)			PCN 3 DMSP								
23	140220Z	31.0N 153.2E	SAT	(T1.5/2.5 /W1.5/24HRS)			PCN 3 DMSP								
24	141503Z	32.4N 151.9E	SAT				PCN 3 DMSP								
25	142320Z	32.2N 151.0E	SAT	(T1.0/2.0 /W1.0/25HRS)			NOAA 2	(CONF 01)							
26	162917Z	35.0N 155.5E	SAT	(T1.5/1.5 /D0.5/24HRS)			NOAA 2	(CONF 01)							

TROPICAL STORM JOAN

FIX POSITIONS FOR CYCLONE NO. 12
18 AUG TO 20 AUG

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR VEL BRG RNG	MAX OBS SFC WIND VEL BRG RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TI/TO	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSN NMBR
1	170117Z	20.1N 133.1E	SAT	(T1.5/1.5 /D1.0/24HRS)			NOAA 2	(CONF 02)							
2	170318Z	20.0N 134.3E	SAT	(T1.5/1.5 /D0.5/24HRS)			PCN 5 DMSP								
3	170318Z	19.9N 134.2E	SAT	(T1.5/1.5 /D /24HRS)			PCN 5 DMSP								
4	171601Z	20.3N 132.9E	SAT				PCN 5 DMSP								
5	180016Z	21.0N 131.0E	SAT	(T1.5/1.5 /S /24HRS)			NOAA 2 (NESS)	(CONF 02)							
6	180017Z	21.0N 131.0E	SAT	(T1.5/1.5 /S /23HRS)			NOAA 2	(CONF 01)							
7	180303Z	19.3N 130.4E	SAT	(T2.0/2.0 /D0.5/24HRS)			PCN 3 DMSP								
8	180303Z	19.3N 131.0E	SAT	(T2.5/2.5 /D1.0/24HRS)			PCN 3 DMSP								
9	181547Z	18.5N 130.0E	SAT				PCN 5 DMSP								
10	181547Z	18.5N 129.9E	SAT				PCN 5 DMSP								
11	182224Z	18.4N 127.7E	P	3 10	700	270 18 200 30	15 200 35	1001	308	12 10	-	- -	-		3
12	190111Z	22.0N 124.2E	SAT	(T2.0/2.0 /D0.5/24HRS)			NOAA 2	(CONF 01)							
13	190248Z	21.9N 125.9E	SAT	(T2.0/2.0 / / HRS)			PCN 5 DMSP								
14	190430Z	21.7N 123.9E	SAT	(T2.0/2.0 / / HRS)			PCN 3 DMSP								
15	191714Z	21.8N 122.4E	SAT				PCN 5 DMSP								
16	191714Z	23.0N 123.7E	SAT				PCN 6 DMSP								
17	192116Z	20.8N 121.3E	P	10 15	-	120 38 50 157	- - -	990	302	- -	-	- -	-		5
18	200013Z	20.5N 121.0E	SAT	(T1.5/2.0 /W0.5/23HRS)			NOAA 2	(CONF 01)							
19	200017Z	20.5N 121.0E	SAT	(T1.5/2.0 /W0.5/24HRS)			NOAA 2 (NESS)								
20	200416Z	21.9N 119.0E	SAT	(T1.5/1.5 / / HRS)			PCN 5 DMSP								
21	200416Z	21.2N 120.6E	SAT	(T2.0/2.0 / / HRS)			PCN 5 DMSP								
22	200430Z	20.5N 118.8E	SAT	(T2.0/2.0-/W0.5/35HRS)			PCN 5 DMSP								
23	201050Z	20.8N 122.5E	P	- -	-	- - - -	- - -	-	312	- -	-	- -	-	22.3N 114.2E	7
24	210130Z	21.4N 113.2E	LRDR	-							-	- -	-	22.3N 114.2E	
25	210430Z	21.4N 112.4E	LRDR	-							-	- -	-	22.3N 114.2E	
26	210600Z	21.5N 111.9E	LRDR	-							-	- -	-	22.3N 114.2E	

TROPICAL STORM KATE

FIX POSITIONS FOR CYCLONE NO. 13
24 AUG TO 26 AUG

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR VEL BRG RNG	MAX OBS SFC WIND VEL BRG RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TI/TO	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSN NMBR
1	221400Z	19.9N 116.4E	LRDR	- 20701										22.3N 114.2E	
2	221640Z	19.6N 115.0E	LRDR	- 207//							-	- -	-	22.3N 114.2E	
3	222030Z	19.4N 114.2E	LRDR	-										22.3N 114.2E	
4	230103Z	19.5N 114.0E	SAT	(T2.0/2.0 /D1.0/25HRS)			NOAA 2	(CONF 01)							
5	230514Z	19.2N 114.3E	SAT	(T1.5/1.5 /S /13HRS)			PCN 5 DMSP								
6	230540Z	19.4N 114.2E	LRDR	-							-	- -	-	22.3N 114.2E	
7	231200Z	19.2N 113.1E	LRDR	- 65///										22.3N 114.2E	
8	240023Z	18.4N 112.2E	SAT	(T3.0/3.0 /D1.0/24HRS)			PCN 3 DMSP								
9	240054Z	18.8N 112.5E	SAT	(T3.0/3.0 /D1.0/24HRS)			NOAA 2	(CONF 01)							
10	240153Z	18.8N 112.5E	SAT	(T3.0/3.0 /D1.0/24HRS)			NOAA 2 (NESS)	(CONF 01)							
11	240459Z	18.9N 112.0E	SAT	(T3.0/3.0 /D /24HRS)			PCN 3 DMSP								
12	240459Z	18.5N 111.9E	SAT	(T2.0/2.0 /D1.0/24HRS)			PCN 4 DMSP								
13	240459Z	18.4N 112.0E	SAT	(T3.5/3.5 /D2.0/24HRS)			PCN 3 DMSP								
14	241247Z	20.0N 107.3E	SAT				PCN 5 DMSP								
15	241305Z	19.1N 111.3E	SAT				PCN 4 DMSP								
16	241742Z	18.9N 109.9E	SAT				PCN 6 DMSP								
17	250005Z	19.8N 109.4E	SAT	(T3.5/3.5 /D2.0/ HRS)			PCN 3 DMSP								
18	250005Z	20.0N 109.6E	SAT	(T4.0/4.0 / / HRS)			PCN 3 DMSP								
19	250226Z	20.1N 108.0E	SAT	(T3.0/3.0 /D /23HRS)			ESSA 8 (VTBU)								
20	250300Z	20.5N 109.0E	SAT	(T2.0/3.0 /W1.0/27HRS)			NOAA 2	(CONF 01)							
21	250445Z	20.2N 109.1E	SAT	(T4.0/4.0 /D2.0/24HRS)			PCN 2 DMSP								
22	250445Z	21.0N 109.0E	SAT	(T3.0/3.5-/W0.5/24HRS)			PCN 3 DMSP								
23	251247Z	20.2N 107.4E	SAT				PCN 3 DMSP								
24	251247Z	20.5N 107.6E	SAT				PCN 1 DMSP								

TROPICAL DEPRESSION 14

FIX POSITIONS FOR CYCLONE NO. 14
01 SEP TO 02 SEP

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR VEL BRG RNG	MAX OBS SFC WIND VEL BRG RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TI/TO	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSN NMBR
1	300137Z	19.3N 114.1E	SAT	(T1.5/1.5 /D0.5/24HRS)			NOAA 2	(CONF 01)							
2	310227Z	20.5N 111.0E	SAT	(T1.5/1.5 /S /24HRS)			NOAA 2 (NESS)	(CONF 02)							
3	310233Z	20.5N 111.5E	SAT	(T1.5/1.5 /S /25HRS)			NOAA 2	(CONF 02)							
4	020103Z	19.7N 106.5E	SAT	(T1.5/1.5 / / HRS)			PCN 5 DMSP								
5	020430Z	19.6N 105.7E	SAT	(T1.2/2.0 /D1.0/24HRS)			PCN 3 DMSP								

TYPHOON LOUISE
FIX POSITIONS FOR CYCLONE NO. 15
03 SEP TO 07 SEP

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR	VEL	BRG	RNG	MAX OBS SFC WIND VEL	BRG	RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT/TD	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSG NMBR
1	010106Z	13.8N 125.6E	SAT	(T1.5/1.5 /D1.0/24HRS)						NOAA 2 (CONF 01)										
2	010130Z	12.0N 124.0E	SAT	(T1.5/1.5 /D0.5/24HRS)						NOAA 2 (NESS) (CONF 02)										
3	012321Z	17.5N 122.7E	SAT	(T1.0/1.0 / / HRS)						PCN 5 DMSP										
4	012521Z	17.9N 122.9E	SAT	(T1.0/1.0 / / HRS)						PCN 5 DMSP										
5	020033Z	18.0N 122.4E	SAT	(T2.0/2.0 /D0.5/24HRS)						NOAA 2 (CONF 01)										
6	020035Z	17.8N 122.5E	SAT	(T2.0/2.0 /D0.5/24HRS)						NOAA 2 (NESS) (CONF 01)										
7	020430Z	17.8N 123.0E	SAT	(T2.0/2.0+/D1.0/24HRS)						PCN 3 DMSP										
8	021203Z	18.0N 122.9E	SAT							PCN 5 DMSP										
9	021203Z	18.0N 123.0E	SAT							PCN 5 DMSP										
10	021203Z	17.9N 122.7E	SAT							PCN 5 DMSP										
11	021730Z	18.7N 121.8E	SAT							PCN 5 DMSP										
12	030045Z	18.7N 120.3E	SAT	(T1.0/1.0 /S /24HRS)						PCN 5 DMSP										
13	030045Z	18.8N 121.0E	SAT	(T2.0/2.0+/D1.0/24HRS)						PCN 5 DMSP										
14	030055Z	19.4N 120.9E	P	1 3	700	30	45	290	15	75	290	15	998	309	18 9	-	- -	-		1
15	030059Z	19.4N 120.8E	SAT	(T3.5/3.5 /D1.5/25HRS)						NOAA 2 (CONF 01)										
16	030130Z	19.3N 120.5E	SAT	(T2.0/2.0+/S /24HRS)						NOAA 2 (NESS) (CONF 01)										
17	030350Z	19.4N 120.5E	P	2 2	700	100	45	360	15	70	10	15	998	310	16 10	CIRC		10		1
18	030415Z	19.0N 121.0E	SAT	(T1.0/1.0 /S /24HRS)						PCN 5 DMSP										
19	030415Z	19.2N 120.9E	SAT	(T2.5/2.5 /D1.0/24HRS)						PCN 5 DMSP										
20	030415Z	19.3N 120.6E	SAT	(T3.0/3.0 /D1.0/24HRS)						PCN 5 DMSP										
21	030615Z	18.8N 120.6E	LRDR	- POSSIBLE EYE																
22	030845Z	19.0N 120.2E	LRDR	- POSSIBLE EYE,ELLIPTICAL, AXIS 48X22															18.1N 120.5E	-
23	031220Z	18.6N 120.2E	LRDR	-												-	- -	.	18.1N 120.5E	-
24	031326Z	18.6N 120.3E	SAT							PCN 5 DMSP										
25	031326Z	19.0N 120.7E	SAT							PCN 5 DMSP										
26	031610Z	19.0N 119.9E	P	5 10	700	130	40	50	20	-	-	-	996	306	14 -	-	- -	-		2
27	031659Z	18.6N 119.9E	SAT							PCN 5 DMSP										
28	032203Z	19.2N 119.3E	P	1 5	700	50	30	320	10	25	320	10	999	306	15 12	-	- -	-		3
29	040026Z	18.4N 119.1E	SAT	(T3.0/3.0 /D1.0/24HRS)						PCN 1 DMSP										
30	040026Z	19.0N 120.2E	SAT	(T2.5/2.5+/D1.5/24HRS)						PCN 3 DMSP										
31	040030Z	18.7N 119.1E	SAT	(T2.5/2.5 /D0.5/24HRS)						NOAA 2 (NESS) (CONF 01)										
32	040037Z	18.8N 119.2E	SAT	(T3.5/3.5 /S /24HRS)						NOAA 2 (CONF 01)										
33	040330Z	19.4N 118.9E	P	2 3	700	290	40	210	30	30	210	30	997	307	15 10	-	- -	-		4
34	040401Z	19.2N 118.8E	SAT	(T3.0/3.0 /S /24HRS)						PCN 3 DMSP										
35	040401Z	19.3N 118.8E	SAT	(T3.5/3.5 /D1.0/24HRS)						PCN 3 DMSP										
36	040401Z	19.1N 118.8E	SAT	(T3.5/3.5 /D / HRS)						PCN 3 DMSP										
37	040401Z	19.0N 119.3E	SAT	(T3.5/3.5 /D / HRS)						PCN 3 DMSP										
38	040735Z	19.7N 118.4E	P	2 4	700	250	40	180	50	50	330	15	993	303	16 11	-	- -	-		4
39	041308Z	19.5N 118.1E	SAT							PCN 5 DMSP										
40	041315Z	19.4N 117.8E	AC R	-												-	- -	-		
41	041908Z	19.8N 117.4E	P	5 3	700	240	45	150	25	-	-	-	989	300	15 -	CIRC		15		8
42	041944Z	19.5N 117.8E	SAT							PCN 5 DMSP										
43	041944Z	19.6N 117.8E	SAT							PCN 5 DMSP										
44	041944Z	19.2N 117.4E	SAT							PCN 5 DMSP										
45	042010Z	19.7N 116.8E	LRDR	- 10///															22.3N 114.2E	=
46	042100Z	20.2N 116.6E	P	5 3	700	230	35	170	10	55	-	-	986	298	14 10	CIRC		20		
47	042100Z	19.7N 116.6E	LRDR	-												-	- -	-	22.3N 114.2E	-
48	042300Z	19.7N 116.4E	LRDR	-												-	- -	-	22.3N 114.2E	-
49	042350Z	19.8N 116.2E	LRDR	- 20611															22.3N 114.2E	-
50	050000Z	20.0N 116.3E	SAT	(T4.5/4.5 /D1.0/24HRS)						PCN 3 DMSP										
51	050008Z	19.9N 116.7E	SAT	(T4.5/4.5 /D1.0/20HRS)						PCN 3 DMSP										
52	050100Z	19.9N 115.9E	LRDR	-												-	- -	-	22.3N 114.2E	-
53	050121Z	19.9N 115.6E	SAT	(T4.0/4.0 /D0.5/25HRS)						NOAA 2 (CONF 02)										
54	050125Z	20.0N 115.6E	SAT	(T3.5/3.5 /D1.0/24HRS)						NOAA 2 (NESS) (CONF 02)										
55	050200Z	19.9N 115.7E	LRDR	-												-	- -	-	22.3N 114.2E	-
56	050213Z	20.0N 115.4E	SAT	(T4.5/4.5 /D / HRS)						ESSA 8 (VTBU)										
57	050300Z	19.9N 115.5E	LRDR	- 10710															22.3N 114.2E	-
58	050346Z	19.8N 115.2E	SAT	(T4.5/4.5 /D1.0/ HRS)						PCN 1 DMSP										
59	050346Z	19.8N 115.2E	SAT	(T4.0/4.0 /D1.0/24HRS)						PCN 1 DMSP										
60	050346Z	19.9N 115.1E	SAT	(T4.5/4.5 /D1.0/20HRS)						PCN 1 DMSP										
61	050400Z	19.9N 115.3E	LRDR	- 1071/															22.3N 114.2E	-
62	050700Z	19.9N 114.8E	LRDR	-												-	- -	-	22.3N 114.2E	-
63	050800Z	19.9N 114.7E	LRDR	- 1081/															22.3N 114.2E	-
64	050900Z	19.9N 114.6E	LRDR	- 1081/															22.3N 114.2E	=
65	051000Z	19.9N 114.7E	P	2 3	700	200	60	110	20	50	360	10	974	287	15 10	CIRC		12		6
66	051000Z	19.9N 114.5E	LRDR	-												-	- -	-	22.3N 114.2E	-
67	051100Z	19.9N 114.4E	LRDR	-												-	- -	-	22.3N 114.2E	-
68	051200Z	19.8N 114.1E	LRDR	-												-	- -	-	22.3N 114.2E	-
69	051250Z	19.8N 114.0E	SAT							PCN 1 DMSP										
70	051250Z	19.8N 114.2E	SAT							PCN 3 DMSP										
71	051500Z	19.8N 113.7E	LRDR	-												-	- -	-	22.3N 114.2E	-
72	051630Z	19.8N 113.6E	SAT							PCN 5 DMSP										
73	051630Z	19.8N 113.5E	SAT							PCN 3 DMSP										
74	051630Z	19.5N 112.9E	SAT							PCN 5 DMSP										
75	051800Z	19.9N 113.3E	LRDR	-												-	- -	-	22.3N 114.2E	-
76	052100Z	20.0N 112.9E	LRDR	- 2////															22.3N 114.2E	-
77	052200Z	20.1N 112.7E	LRDR	- 2////															22.3N 114.2E	-
78	052300Z	20.2N 112.5E	LRDR	-												-	- -	-	22.3N 114.2E	-
79	052350Z	19.9N 112.2E	SAT	(T4.5/4.5 /D1.0/20HRS)						PCN 3 DMSP										
80	052350Z	19.8N 112.3E	SAT	(T3.5/4.5 /W1.0/24HRS)						PCN 3 DMSP										
81	052350Z	20.0N 112.4E	SAT	(T4.0/4.0 / / HRS)						PCN 3 DMSP										
82	060000Z	20.2N 112.3E	LRDR	- 1091/															22.3N 114.2E	-
83	060100Z	20.1N 112.1E	LRDR	-												-	- -	-	22.3N 114.2E	-
84	060132Z	20.1N 112.0E	SAT	(T4.0/4.0 /D1.0/24HRS)						PCN 3 DMSP										
85	060200Z	20.2N 112.0E	LRDR	-												-	- -	-	22.3N 114.2E	-
86	060220Z	20.0N 111.5E	SAT	(T4.0/4.0-/D0.5/24HRS)						NOAA 2 (NESS) (CONF 01)										
87	060220Z	19.5N 111.2E	SAT	(T4.5/4.5-/D0.5/25HRS)						NOAA 2 (CONF 02)										
88	060250Z	20.2N 111.9E	LRDR	-												: -	- -	-	22.3N 114.2E	-
89	060503Z	19.8N 111.7E	SAT	(T4.0/4.5 /W0.5/25HRS)						ESSA 8 (VTBU)										
90	060513Z	20.2N 112.0E	SAT	(T4.5/4.5 /D0.5/24HRS)						PCN 3 DMSP										
91	061232Z	20.5N 110.4E	SAT							PCN 5 DMSP										
92	061413Z	21.0N 109.8E	SAT							PCN 1 DMSP										
93	061757Z	20.0N 109.4E	SAT							PCN 5 DMSP										
94	070119Z	21.0N 108.0E	SAT	(T3.5/4.5 /W1.0/24HRS)						NOAA 2 (CONF 01)										
95	070119Z	21.1N 107.8E	SAT	(T3.5/4.0 /W0.5/24HRS)						NOAA 2 (NESS) (CONF 01)										
96	070459Z	20.8N 107.2E	SAT	(T5.0/5.0-/D0.5/24HRS)						PCN 5 DMSP										

TYPHOON MARGE

FIX POSITIONS FOR CYCLONE NO. 16
12 SEP TO 14 SEP

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR	VEL	BRG	RNG	MAX OBS SFC WIND VEL	BRG	RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TI/TO	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSG NMBR
1	082555Z	13.8N 134.5E	SAT	(T1.0/1.0 / / HRS)						PCN 5 DMSP										
2	082555Z	14.0N 134.0E	SAT	(T1.0/1.0 / / HRS)						PCN 6 DMSP										
3	090248Z	13.8N 134.2E	SAT	(T1.0/1.0 /S / 4HRS)						PCN 5 DMSP										
4	092237Z	15.3N 130.8E	SAT	(T1.0/1.0 / / HRS)						PCN 5 DMSP										
5	110001Z	16.9N 125.0E	SAT	(T1.5/1.5 /D0.5/24HRS)						PCN 5 DMSP										
6	110001Z	16.1N 125.8E	SAT	(T1.0/1.0 / / HRS)						PCN 5 DMSP										
7	110109Z	16.5N 124.5E	SAT	(T1.5/1.5 /D0.5/24HRS)						NOAA 2			(CONF 01)							
8	110400Z	16.7N 123.6E	SAT	(T1.0/1.0 / / HRS)						PCN 5 DMSP										
9	110400Z	17.0N 124.3E	SAT	(T1.5/1.5 /D0.5/24HRS)						PCN 5 DMSP										
10	111242Z	16.9N 122.3E	SAT							PCN 6 DMSP										
11	111242Z	16.9N 122.5E	SAT							PCN 6 DMSP										
12	111242Z	17.4N 122.5E	SAT							PCN 6 DMSP										
13	111044Z	16.8N 121.8E	SAT							PCN 6 DMSP										
14	111044Z	17.0N 121.9E	SAT							PCN 5 DMSP										
15	112342Z	17.0N 119.5E	SAT	(T2.0/2.0+/D0.5/24HRS)						PCN 3 DMSP										
16	112342Z	16.5N 119.8E	SAT	(T2.5/2.5 /D1.5/24HRS)						PCN 5 DMSP										
17	112342Z	16.9N 119.5E	SAT	(T2.0/2.0 /D0.5/24HRS)						PCN 3 DMSP										
18	120008Z	16.8N 119.0E	SAT	(T1.5/1.5+/S /24HRS)						NOAA 2			(CONF 02)							
19	120231Z	17.9N 119.3E	SAT	(T2.0/2.0 /D / HRS)						ESSA 8 (VTBU)										
20	120328Z	17.3N 118.8E	P	5 5	-	120	31	40	10	35	240	18	1003	309	- -	-	- -	-		1
21	120346Z	17.7N 118.9E	SAT	(T2.0/2.0+/D0.5/ HRS)						PCN 3 DMSP										
22	120340Z	17.6N 118.8E	SAT	(T2.5/2.5 /D1.5/24HRS)						PCN 3 DMSP										
23	120346Z	17.6N 118.8E	SAT	(T2.5/2.5 /D1.0/24HRS)						PCN 3 DMSP										
24	120440Z	17.8N 119.0E	LRDR	- POSSIBLE CENTER, 90 PCT, ELLIPTICAL, AXIS 125X85																
25	121030Z	16.3N 117.4E	P	10 8	700	50	45	30	15	-	-	-	998	305	11 10	-	- -	-		2
26	121224Z	18.1N 117.0E	SAT							PCN 4 DMSP										
27	121224Z	18.3N 116.9E	SAT							PCN 4 DMSP										
28	121224Z	18.2N 117.0E	SAT							PCN 6 DMSP										
29	121500Z	18.2N 117.0E	P	5 3	700	130	65	20	25	-	-	-	990	299	13 11	CIRC		15		2
30	121629Z	18.3N 116.2E	SAT							PCN 5 DMSP										
31	121629Z	18.3N 116.4E	SAT							PCN 6 DMSP										
32	121629Z	18.6N 116.4E	SAT							PCN 6 DMSP										
33	122210Z	18.4N 115.0E	P	30 5	700	150	60	90	25	-	-	-	987	297	13 -	CIRC		22		3
34	122330Z	18.5N 114.8E	LRDR	- 205// EYE OPEN TO SOUTH															22.3N 114.2E	
35	130000Z	18.6N 114.7E	LRDR	-												-	- -	-	22.3N 114.2E	
36	130103Z	18.7N 114.7E	SAT	(T4.5/4.5 /D3.0/23HRS)						NOAA 2			(CONF 01)							
37	130106Z	18.7N 114.6E	SAT	(T4.5/4.5 /D1.5/24HRS)						NOAA 2 (NESS)			(CONF 01)							
38	130106Z	18.7N 114.7E	SAT	(T2.5/2.5 /D1.0/24HRS)						PCN 1 DMSP										
39	130100Z	18.7N 114.6E	SAT	(T4.0/4.0+/D2.0/25HRS)						PCN 1 DMSP										
40	130150Z	18.6N 114.4E	LRDR	- 2051/															22.3N 114.2E	
41	130300Z	18.6N 114.1E	LRDR	- 2051/															22.3N 114.2E	
42	130321Z	18.7N 114.3E	SAT	(T3.0/3.0 /D1.0/25HRS)						ESSA 8 (VTBU)										
43	130513Z	18.8N 113.8E	SAT	(T4.5/4.5 /D2.0/24HRS)						PCN 1 DMSP										
44	130513Z	18.8N 113.7E	SAT	(T4.0/4.0+/D2.0/ HRS)						PCN 1 DMSP										
45	130600Z	18.7N 113.5E	LRDR	-												-	- -	-	22.3N 114.2E	
46	130900Z	18.9N 113.1E	P	5 3	700	170	80	90	10	100	90	20	964	281	2 12	CIRC		13		4
47	130900Z	18.9N 112.9E	LRDR	-												-	- -	-	22.3N 114.2E	
48	131200Z	18.9N 112.3E	LRDR	-												-	- -	-	22.3N 114.2E	
49	131347Z	18.8N 111.6E	SAT							PCN 2 DMSP										
50	131347Z	19.2N 112.4E	SAT							PCN 2 DMSP										
51	131510Z	18.9N 111.7E	LRDR	-												-	- -	-	22.3N 114.2E	
52	131756Z	18.9N 111.8E	SAT							PCN 2 DMSP										
53	131756Z	19.2N 111.6E	SAT							PCN 2 DMSP										
54	140047Z	18.9N 109.3E	SAT	(T4.0/4.5 /W /24HRS)						PCN 3 DMSP										
55	140156Z	19.1N 109.1E	SAT	(T3.5/4.5 /W1.0/25HRS)						NOAA 2			(CONF 01)							
56	140459Z	19.3N 108.5E	SAT	(T4.0/4.5 /W /24HRS)						PCN 3 DMSP										
57	140459Z	19.3N 108.5E	SAT	(T5.0/5.0 /S0.5/24HRS)						PCN 3 DMSP										
58	141329Z	19.1N 107.6E	SAT							PCN 6 DMSP										
59	141742Z	19.2N 106.9E	SAT							PCN 6 DMSP										
60	150444Z	19.1N 102.4E	SAT	(T5.0/5.0 / / HRS)						PCN 5 DMSP										

TYPHOON NORA
FIX POSITIONS FOR CYCLONE NO. 17
02 OCT TO 10 OCT

FIX NO.	TIME	POSIT	FIX CAT	ACCRY. NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR	VEL	BRG	RNG	MAX OBS SFC WIND VEL	BRG	RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT/TO	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSG NMBR
1	292329Z	7.6N 137.9E	SAT	(T1.5/1.5 /D0.5/23HRS)						NOAA 2			(CONF 01)							
2	292331Z	7.0N 137.0E	SAT	(T1.5/1.5 /D0.5/24HRS)						NOAA 2 (NESS)										
3	302301Z	10.0N 136.3E	SAT	(T1.0/1.0 /D /24HRS)						PCN 5 DMSP										
4	010233Z	10.0N 136.1E	SAT	(T1.0/1.0 /D / HRS)						PCN 5 DMSP										
5	011510Z	10.3N 136.3E	SAT							PCN 6 DMSP										
6	012243Z	11.0N 136.6E	SAT	(T2.5/2.5 /D1.5/24HRS)						PCN 5 DMSP										
7	012324Z	11.5N 136.5E	SAT	(T1.5/1.5 /D0.5/24HRS)						NOAA 2			(CONF 02)							
8	020130Z	11.4N 135.1E	P	5 12	-	70	30	310	80	40	30	60	-	-	16 11	-	- -	-		1
9	020320Z	11.4N 134.9E	P	5 15	-	20	30	280	50	30	290	40	1001	-	25 24	-	- -	-		2
10	020400Z	11.5N 134.9E	SAT	(T1.5/1.5 /D0.5/ HRS)						PCN 5 DMSP										
11	020400Z	11.5N 135.6E	SAT	(T2.5/2.5 /D1.5/ HRS)						PCN 3 DMSP										
12	021125Z	12.0N 133.7E	SAT							PCN 5 DMSP										
13	021135Z	11.5N 133.9E	P	5 5	700	130	45	90	15	-	-	-	987	298	15 9	-	- -	-		3
14	021501Z	12.3N 133.4E	SAT							PCN 5 DMSP										
15	021626Z	11.2N 133.3E	P	5 5	700	10	45	350	20	-	-	-	989	299	14 13	CIRC		15		3
16	022155Z	10.8N 133.1E	P	2 5	700	110	30	60	100	45	30	60	991	302	14 -	-	- -	-		4
17	022326Z	11.1N 133.5E	SAT	(T3.0/3.0 /D1.5/24HRS)						NOAA 2 (NESS)			(CONF 01)							
18	030000Z	11.5N 133.9E	SAT	(T3.5/3.5 /D1.0/24HRS)						PCN 5 DMSP										
19	030006Z	11.1N 134.4E	SAT	(T1.5/1.5 /D0.5/ HRS)						PCN 5 DMSP										
20	030019Z	11.4N 133.6E	SAT	(T3.0/3.0 /D1.5/24HRS)						NOAA 2			(CONF 01)							
21	030345Z	11.9N 133.8E	SAT	(T3.0/3.0+/D1.5/24HRS)						PCN 1 DMSP										
22	030345Z	11.0N 133.5E	SAT	(T3.5/3.5 /D1.0/ HRS)						PCN 3 DMSP										
23	031030Z	11.1N 133.2E	P	10 10	700	180	50	160	10	-	-	-	978	292	18 12	CIRC		20		5
24	031100Z	11.8N 132.5E	SAT							PCN 1 DMSP										
25	031550Z	11.1N 132.4E	P	5 5	700	160	45	70	25	-	-	-	978	293	15 -	-	- -	-		6
26	031828Z	11.5N 132.3E	SAT							PCN 5 DMSP										
27	031828Z	11.7N 132.8E	SAT							PCN 3 DMSP										
28	032400Z	11.1N 131.5E	P	5 5	700	330	70	250	20	80	360	30	976	293	18 14	CIRC		20		7
29	032319Z	11.9N 131.2E	SAT	(T4.5/4.5 /D1.5/23HRS)						NOAA 2			(CONF 01)							
30	032320Z	11.2N 131.7E	SAT	(T4.0/4.0 /D1.0/24HRS)						NOAA 2 (NESS)			(OCNF 02)							
31	032348Z	11.9N 131.9E	SAT	(T3.0/3.0+/D1.5/24HRS)						PCN 3 DMSP										
32	032348Z	12.0N 131.2E	SAT	(T4.5/4.5 /D1.0/24HRS)						PCN 3 DMSP										
33	040056Z	11.3N 132.0E	P	- -	-	-	-	-	-	90	-	-	978	290	- -	-	- -	-		7
34	040331Z	11.9N 132.0E	SAT	(T4.5/4.5 /D1.5/24HRS)						PCN 1 DMSP										
35	040331Z	12.0N 131.8E	SAT	(T4.5/4.5 /D1.0/24HRS)						PCN 1 DMSP										
36	041020Z	12.3N 131.8E	P	5 3	700	240	55	160	30	-	-	-	969	284	17 14	CIRC		10		8
37	041230Z	12.9N 132.1E	SAT							PCN 1 DMSP										
38	041630Z	12.9N 132.3E	SAT							PCN 1 DMSP										
39	041500Z	12.7N 131.4E	P	5 2	700	210	65	180	40	-	-	-	964	279	17 14	ELIP	F-NW	30X1		8
40	041814Z	12.9N 131.6E	SAT							PCN 1 DMSP										
41	041814Z	12.4N 131.3E	SAT							PCN 5 DMSP										
42	042330Z	13.3N 130.7E	SAT	(T4.5/4.5 /S /24HRS)						PCN 1 DMSP										
43	042350Z	13.3N 130.7E	P	5 10	700	90	90	360	20	70	90	20	949	267	16 12	CIRC		20		9
44	050018Z	13.4N 130.9E	SAT	(T5.5/5.5 /D1.0/24HRS)						NOAA 2			(CONF 01)							
45	050019Z	13.7N 130.8E	SAT	(T5.5/5.5 /D1.5/24HRS)						NOAA 2 (NESS)			(CONF 01)							
46	050316Z	13.8N 130.2E	SAT	(T4.5/4.5 /S /24HRS)						PCN 1 DMSP										
47	050340Z	13.7N 130.2E	P	5 5	700	90	115	360	30	100	360	10	940	259	17 12	CIRC		20		9
48	050925Z	14.0N 129.9E	P	5 5	700	180	65	80	30	90	90	5	910	230	25 16	CIRC		12		10
49	051211Z	14.2N 129.5E	SAT							PCN 1 DMSP										
50	051520Z	14.4N 129.2E	P	5 5	700	60	119	30	15	-	-	-	893	209	28 14	CIRC		10		10
51	051559Z	14.0N 128.8E	SAT							PCN 1 DMSP										
52	052312Z	14.7N 127.4E	SAT	(T7.0/7.0 /D /24HRS)						PCN 2 DMSP										
53	052312Z	14.7N 127.4E	SAT	(T6.5/6.5 /D2.0/ HRS)						PCN 1 DMSP										
54	060020Z	14.8N 128.2E	P	5 5	700	110	150	20	40	140	20	15	877	201	30 16	CIRC		8		11
55	060107Z	14.9N 127.3E	SAT	(T6.5/6.5 /D1.0/25HRS)						NOAA 2			(CONF 01)							
56	060100Z	14.8N 127.4E	SAT	(T7.0/7.0-/D1.5/24HRS)						NOAA 2 (NESS)			(CONF 01)							
57	060301Z	14.7N 126.6E	SAT	(T7.0/7.0 /D /24HRS)						PCN 1 DMSP										
58	060301Z	14.7N 126.8E	SAT	(T6.5/6.5 /D2.0/24HRS)						PCN 1 DMSP										
59	060329Z	14.8N 127.7E	P	5 5	-	-	-	-	-	85	300	160	878	201	27 -	CIRC		8		11
60	061020Z	14.9N 125.9E	P	5 3	700	350	90	270	30	-	-	-	894	214	19 13	CIRC		12		12
61	061153Z	14.9N 125.4E	SAT							PCN 1 DMSP										
62	061230Z	14.8N 125.5E	LRDR	- APPARENT EYE, SOLID															14.4N 122.6E	-
63	061400Z	14.9N 125.2E	LRDR	-												-	- -	-	15.0N 120.5E	-
64	061410Z	14.9N 125.4E	LRDR	-												-	- -	-	14.4N 122.6E	-
65	061500Z	14.8N 125.1E	P	5 2	700	190	109	100	47	-	-	-	903	224	19 12	CIRC		12		12
66	061545Z	14.9N 125.2E	SAT							PCN 3 DMSP										
67	061700Z	15.0N 125.0E	LRDR	- WELL DEFINED EYE, D20												-	- -	-	15.0N 120.5E	-
68	061800Z	15.1N 124.8E	LRDR	-															15.0N 120.5E	-
69	061900Z	15.2N 124.7E	LRDR	- EYE; D12															15.0N 120.5E	-
70	062100Z	15.2N 124.5E	LRDR	- EYE; 100 PCT, D5																
71	062200Z	15.3N 124.5E	LRDR	- EYE															14.4N 122.6E	-
72	062300Z	15.5N 124.4E	LRDR	- EYE, CIRCULAR, D15															14.4N 122.6E	-
73	070006Z	15.1N 124.5E	SAT	(T7.0/7.0 /D0.5/23HRS)						NOAA 2			(CONF 03)							
74	070007Z	16.0N 124.0E	SAT	(T6.0/7.0 /W1.0/24HRS)						NOAA 2 (NESS)			(CONF 02)							
75	070018Z	15.7N 124.2E	P	5 2	-	190	120	90	20	130	90	10	-	-	24 16	CIRC		10		13
76	070035Z	16.0N 124.6E	SAT	(T7.0/7.0 /D2.5/69HRS)						PCN 3 DMSP										
77	070040Z	15.7N 124.2E	LRDR	- EYE; 75 PCT; CIRCULAR OPEN N; D28															14.4N 122.6E	-
78	070135Z	15.8N 124.0E	LRDR	- EYE; 75 PCT; CIRCULAR OPEN N; D30															14.4N 122.6E	-
79	070233Z	15.6N 123.7E	P	5 3	-	280	116	190	25	130	240	6	-	-	21 15	CIRC		15		13
80	070250Z	15.9N 124.0E	LRDR	- EYE, 75 PCT, CIRCULAR OPEN N, D35															14.4N 122.6E	-
81	070400Z	16.1N 123.8E	LRDR	- EYE, 75 PCT, CIRCULAR OPEN N															14.4N 122.6E	-
82	070429Z	16.3N 123.9E	SAT	(T7.0/7.0 /D2.5/69HRS)						PCN 3 DMSP										
83	070600Z	16.5N 123.5E	LRDR	- POSSIBLE EYE, SOLID NO DEFINITE EYE															14.4N 122.6E	-
84	070800Z	16.4N 123.4E	LRDR	- POSSIBLE EYE,															14.4N 122.6E	-
85	071100Z	17.1N 123.1E	LRDR	-												-	- -	-	15.0N 120.5E	-
86	071100Z	17.1N 123.1E	LRDR	-												-	- -	-	16.4N 120.6E	-
87	071316Z	17.2N 123.0E	SAT							PCN 6 DMSP										
88	071328Z	17.4N 123.0E	P	8 5	-	20	110	300	15	-	-	-	923	244	18 -	CIRC		12		14
89	071400Z	17.4N 122.7E	LRDR	- POSSIBLE EYE															15.0N 120.5E	-
90	071430Z	17.5N 122.8E	LRDR	- 6///?																
91	071430Z	17.4N 122.9E	LRDR	-												-	- -	-	16.4N 120.6E	-
92	071510Z	17.7N 122.8E	P	8 5	-	-	-	-	-	-	-	-	923	244	17 16	CIRC		12		14
93	071700Z	17.6N 122.8E	LRDR	- POOR FIX															18.2N 120.5E	-
94	071712Z	17.6N 122.8E	SAT							PCN 5 DMSP										
95	071800Z	17.8N 122.5E	LRDR	- EYE, CIRCULAR, D15															18.2N 120.5E	-
96	072000Z	18.1N 122.2E	LRDR	- EYE, OVAL, D27-30															18.2N 120.5E	-
97	072100Z	18.2N 122.2E	LRDR	- EYE, OVAL, D27-30															18.2N 120.5E	-
98	072200Z	18.3N 122.1E	LRDR	- EYE															18.2N 120.5E	-
99	072229Z	18.8N 122.0E	P	2 5	-	100	65	20	130	100	310	25	-	-	24 -	CIRC		30		15
100	080017Z	18.7N 121.9E	SAT	(T4.5/5.5 /W2.0/48HRS)						PCN 3 DMSP										

TYPHOON NORA
FIX POSITIONS FOR CYCLONE NO. 17
02 OCT TO 10 OCT

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR VEL BRG RNG	MAX OBS SFC WIND VEL BRG RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TI/TO	EYE FORM	ORIENTATION	EYE DIA	POSIT OF RADAR	MSN NMBR
101	080017Z	18.5N 122.0E	SAT	(T7.0/7.0 /D2.5/69HRS)			PCN 3 DMSP								
102	080017Z	18.4N 121.7E	SAT	(T5.0/5.5 /W0.5/24HRS)			PCN 3 DMSP								
103	080059Z	18.7N 121.9E	SAT	(T6.0/7.0 /W1.0/24HRS)			NOAA 2	(CONF 02)							
104	080103Z	18.8N 121.8E	SAT	(T5.0/5.0 /S /24HRS)			NOAA 2 (NESS)	(CONF 01)							
105	080300Z	19.1N 121.3E	P	2 10	-	360 50 270 15	120 270 10	-	-	23 13	CIRC		20		15
106	080414Z	18.8N 122.2E	SAT	(T5.0/5.0-/W2.0/24HRS)			PCN 1 DMSP								
107	080414Z	18.7N 122.0E	SAT	(T4.5/5.5 /W0.5/ HRS)			PCN 3 DMSP								
108	080700Z	19.9N 120.8E	P	5 5	-	100 70 360 70	70 360 30	973	287	17 14	-	- -	-		16
109	081000Z	20.3N 120.4E	LRDR	- EYE										18.2N 120.5E	
110	081630Z	20.3N 120.5E	P	- -	-	270 50 180 50	- - -	977	289	- -	-	- -	-		16
111	081258Z	20.0N 120.8E	SAT				PCN 3 DMSP								
112	081258Z	20.0N 121.0E	SAT				PCN 5 DMSP								
113	081334Z	20.4N 120.8E	P	10 10	700	30 70 340 40	- - -	978	291	15 11	-	- -	-		16
114	081559Z	20.6N 120.2E	P	3 2	-	190 40 100 10	- - -	976	294	17 -	-	- -	-		17
115	081657Z	20.0N 120.1E	SAT				PCN 3 DMSP								
116	082112Z	20.6N 119.9E	P	8 2	-	80 60 340 40	- - -	973	287	17 -	-	- -	-		17
117	082359Z	20.9N 119.8E	SAT	(T5.0/6.0-/W2.0/24HRS)			PCN 4 DMSP								
118	082359Z	21.0N 119.9E	SAT	(T5.0/5.0-/W2.0/24HRS)			PCN 5 DMSP								
119	082359Z	20.9N 120.0E	SAT	(T4.5/4.5 /S /24HRS)			PCN 3 DMSP								
120	090155Z	21.0N 119.9E	SAT	(T5.0/6.0 /W1.0/25HRS)			NOAA 2	(CONF 01)							
121	090158Z	21.0N 119.8E	SAT	(T5.0/5.0 /S /24HRS)			NOAA 2 (NESS)	(CONF 01)							
122	090359Z	21.0N 119.4E	SAT	(T4.5/4.5 /S / HRS)			PCN 1 DMSP								
123	090359Z	21.2N 119.2E	SAT	(T4.0/5.0 /W1.0/24HRS)			PCN 1 DMSP								
124	090359Z	21.2N 119.3E	SAT	(T5.0/5.0 /D /13HRS)			PCN 3 DMSP								
125	090400Z	21.4N 119.6E	LRDR	- 55///										22.6N 120.3E	-
126	090430Z	21.2N 119.6E	LRDR	-							-	- -	-	23.5N 119.6E	-
127	090515Z	21.5N 119.5E	LRDR	-							-	- -	-	23.5N 119.6E	-
128	090600Z	21.4N 119.5E	LRDR	- 55///										22.6N 120.3E	-
129	090810Z	21.4N 119.6E	P	3 2	700	200 60 110 40	- - -	974	286	14 12	CIRC		30		19
130	090730Z	21.6N 119.6E	LRDR	-							-	- -	-	23.0N 120.2E	-
131	090735Z	21.6N 119.8E	LRDR	-							-	- -	-	22.6N 120.4E	-
132	090830Z	21.6N 119.5E	LRDR	-							-	- -	-	23.5N 119.6E	-
133	090900Z	21.6N 119.5E	LRDR	- 55///										22.6N 120.3E	-
134	090930Z	21.8N 119.5E	LRDR	-							-	- -	-	23.5N 119.6E	-
135	090934Z	21.8N 119.5E	P	3 1	700	190 70 80 30	50 150 30	976	283	16 13	CIRC		20		19
136	091240Z	22.1N 119.3E	SAT				PCN 3 DMSP								
137	091240Z	22.2N 119.1E	SAT				PCN 3 DMSP								
138	091240Z	22.2N 119.3E	SAT				PCN 3 DMSP								
139	091500Z	22.1N 119.2E	LRDR	- 45///										22.6N 120.3E	-
140	091330Z	22.2N 119.4E	LRDR	-							-	- -	-	23.5N 119.6E	-
141	091400Z	22.2N 119.2E	LRDR	-							-	- -	-	23.5N 119.6E	-
142	091500Z	22.4N 119.1E	LRDR	-							-	- -	-	23.5N 119.6E	-
143	091600Z	22.6N 119.1E	LRDR	-							-	- -	-	23.5N 119.6E	-
144	091643Z	22.7N 119.3E	SAT				PCN 6 DMSP								
145	091643Z	23.0N 119.3E	SAT				PCN 2 DMSP								
146	091643Z	22.9N 119.4E	SAT				PCN 2 DMSP								
147	091700Z	22.7N 119.0E	LRDR	-							-	- -	-	23.5N 119.6E	-
148	091800Z	22.9N 119.1E	LRDR	-							-	- -	-	23.5N 119.6E	-
149	091900Z	22.9N 119.0E	LRDR	-							-	- -	-	23.5N 119.6E	-
150	092100Z	23.3N 118.9E	LRDR	-							-	- -	-	23.5N 119.6E	-
151	092200Z	23.7N 118.6E	LRDR	-							-	- -	-	23.5N 119.6E	-
152	092341Z	23.9N 118.4E	SAT	(T5.0/5.0 /D / HRS)			PCN 3 DMSP								
153	092341Z	23.9N 118.6E	SAT	(T4.0/5.0 /W1.0/24HRS)			PCN 3 DMSP								
154	092341Z	23.8N 118.7E	SAT	(T3.5/4.5 /W1.0/24HRS)			PCN 3 DMSP								
155	100345Z	24.8N 118.0E	SAT	(T3.0/4.0 /W2.0/24HRS)			PCN 3 DMSP								
156	100345Z	24.6N 118.0E	SAT	(T4.0/4.0 /S /24HRS)			PCN 3 DMSP								
157	100345Z	24.8N 118.0E	SAT	(T3.5/4.5 /W1.0/ HRS)			PCN 3 DMSP								

TYPHOON OPAL
FIX POSITIONS FOR CYCLONE NO. 18
04 OCT TO 08 OCT

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR VEL BRG RNG	MAX OBS SFC WIND VEL BRG RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TI/TO	EYE FORM	ORIENTATION	EYE DIA	POSIT OF RADAR	MSN NMBR
1	040114Z	10.5N 114.2E	SAT	(T2.0/2.0 /D1.0/24HRS)			NOAA 2	(CONF 01)							
2	040115Z	10.5N 114.0E	SAT	(T2.0/2.0 /D1.0/24HRS)			NOAA 2 (NESS)	(CONF 01)							
3	040130Z	11.5N 114.0E	SAT	(T1.0/1.0 /S / HRS)			PCN 5 DMSP								
4	040927Z	11.3N 114.8E	P	10 10	700	330 30 210 20	40 170 33	1002	308	12 10	-	- -	-		1
5	041230Z	11.7N 114.1E	SAT				PCN 5 DMSP								
6	041505Z	11.4N 114.0E	P	10 10	700	280 50 180 30	- - -	1001	308	10 8	-	- -	-		1
7	041614Z	11.0N 113.1E	SAT				PCN 5 DMSP								
8	042229Z	12.1N 113.3E	P	5 5	700	170 45 90 50	45 90 35	991	301	12 10	CIRC		25		2
9	050055Z	12.5N 112.7E	P	5 3	700	310 30 40 40	25 40 30	991	301	12 10	CIRC		25		2
10	050112Z	11.5N 113.2E	SAT	(T3.0/3.0 /D2.0/24HRS)			PCN 5 DMSP								
11	050207Z	12.9N 112.2E	SAT	(T3.0/3.0 /D1.0/24HRS)			NOAA 2 (NESS)								
12	050207Z	12.0N 111.9E	SAT	(T3.0/3.0 /D1.0/25HRS)			NOAA 2	(CONF 01)							
13	050254Z	12.6N 113.0E	SAT	(T3.0/3.0 /D / HRS)			ESSA 8 (VTBU)								
14	050309Z	12.4N 112.6E	P	5 12	700	140 50 70 58	45 70 50	990	300	13 10	CIRC		27		2
15	050458Z	12.7N 112.4E	SAT	(T3.0/3.0 /D2.0/24HRS)			PCN 5 DMSP								
16	051005Z	12.8N 112.6E	P	5 5	700	100 50 10 20	50 90 60	986	296	12 12	-	- -	-		3
17	051353Z	13.1N 111.8E	SAT				PCN 1 DMSP								
18	051510Z	12.9N 112.2E	P	10 10	700	190 60 110 25	- - -	982	293	14 9	-	- -	-		3
19	051741Z	12.9N 112.7E	SAT				PCN 5 DMSP								
20	052340Z	13.1N 112.0E	P	5 3	700	40 65 330 30	50 340 7	968	283	17 15	CIRC		15		4
21	060053Z	13.4N 111.7E	SAT	(T4.5/4.5 /D1.5/24HRS)			PCN 3 DMSP								
22	060107Z	13.8N 111.8E	SAT	(T4.0/4.0 /D1.0/25HRS)			NOAA 2	(CONF 02)							
23	060108Z	13.6N 111.5E	SAT	(T4.5/4.5-/D1.5/24HRS)			NOAA 2 (NESS)								
24	060354Z	13.3N 112.0E	P	5 2	700	270 75 180 30	75 180 25	968	283	17 16	CIRC		20		4
25	060443Z	13.4N 111.9E	SAT	(T4.5/4.5 /D1.5/24HRS)			PCN 1 DMSP								
26	061228Z	13.7N 113.3E	P	10 5	-	180 50 90 90	- - -	-	-	16 -	CIRC		40		5
27	061334Z	14.0N 112.4E	SAT				PCN 5 DMSP								
28	061303Z	13.9N 112.9E	P	10 5	-	210 50 120 40	- - -	-	-	17 -	CIRC		40		5
29	061720Z	14.0N 112.2E	SAT				PCN 3 DMSP								
30	070035Z	14.4N 111.9E	SAT	(T5.5/5.5 /D1.0/24HRS)			PCN 5 DMSP								
31	070202Z	14.3N 111.1E	SAT	(T4.5/4.5 /D0.5/24HRS)			NOAA 2	(CONF 02)							
32	070255Z	14.7N 110.9E	SAT	(T4.5/4.5 /D /23HRS)			ESSA 8 (VTBU)								
33	070400Z	14.2N 111.1E	P	10 10	700	180 40 100 20	75 100 45	971	286	16 14	-	- -	-		6
34	070429Z	14.1N 110.8E	SAT	(T5.5/5.5 /D1.0/24HRS)			PCN 3 DMSP								
35	070900Z	14.4N 111.0E	P	10 10	700	- - - -	85 120 10	971	286	17 12	-	- -	-		6
36	071310Z	14.5N 110.5E	SAT				PCN 6 DMSP								
37	071712Z	12.9N 109.3E	SAT				PCN 5 DMSP								
38	071628Z	14.2N 110.0E	P	5 8	700	140 45 50 50	- - -	981	292	15 14	CIRC		25		8
39	072105Z	14.3N 109.7E	P	5 6	700	150 35 60 20	- - -	985	293	16 14	CIRC		25		8

TYPHOON PATSY
FIX POSITIONS FOR CYCLONE NO. 19
06 OCT TO 15 OCT

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR VEL BRG RNG	MAX OBS SFC WIND VEL BRG RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT/TD	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSG NMBR
1	050019Z	14.5N 143.0E	SAT			(T1.5/1.5 /D0.5/24HRS)	NOAA 2 (NESS)	(CONF 02)							
2	052312Z	13.0N 142.4E	SAT			(T1.5/1.5 / / HRS)	PCN 3 DMSP								
3	052315Z	13.5N 142.0E	SAT			(T2.0/2.0 /D0.5/24HRS)	NOAA 2 (NESS)								
4	060301Z	13.0N 142.1E	SAT			(T1.5/1.5 / / HRS)	PCN 3 DMSP								
5	061153Z	13.0N 142.6E	SAT				PCN 5 DMSP								
6	061542Z	13.0N 142.2E	SAT				PCN 3 DMSP								
7	062254Z	12.9N 141.3E	SAT			(T3.0/3.0 /D1.5/24HRS)	PCN 3 DMSP								
8	070007Z	13.5N 141.7E	SAT			(T2.5/2.5 /D1.5/24HRS)	NOAA 2	(CONF 02)							
9	070007Z	12.9N 141.2E	SAT			(T3.0/3.0 /D1.0/24HRS)	NOAA 2 (NESS)	(CONF 01)							
10	070247Z	12.6N 140.9E	SAT			(T3.0/3.0 /D / HRS)	PCN 4 DMSP								
11	070247Z	12.9N 140.9E	SAT			(T3.0/3.0 /D1.5/ HRS)	PCN 3 DMSP								
12	070310Z	13.0N 141.0E	P	2 8	-	150 50 50 40	50 40 30	-	-	20 -	CIRC		50		2
13	071000Z	13.7N 140.6E	P	10 2	-	40 60 50 35	- - -	-	-	- -	CIRC		2		2
14	071135Z	13.0N 140.0E	SAT				PCN 6 DMSP								
15	071135Z	13.8N 140.3E	SAT				PCN 4 DMSP								
16	071530Z	13.7N 139.9E	SAT				PCN 3 DMSP								
17	071530Z	14.1N 139.9E	SAT				PCN 3 DMSP								
18	072210Z	14.0N 139.0E	SAT			(T4.0/4.0 /D1.5/24HRS)	NOAA 2	(CONF 01)							
19	072235Z	14.0N 139.2E	SAT			(T4.5/4.5 /D1.5/20HRS)	PCN 2 DMSP								
20	072235Z	13.9N 139.2E	SAT			(T4.0/4.0 /D / HRS)	PCN 1 DMSP								
21	072235Z	14.0N 138.9E	SAT			(T4.0/4.0 /D1.0/24HRS)	PCN 1 DMSP								
22	072309Z	14.1N 139.0E	SAT			(T4.0/4.0 /D1.0/24HRS)	NOAA 2 (NESS)	(CONF 01)							
23	080232Z	13.8N 138.3E	SAT			(T4.5/4.5 /D1.5/24HRS)	PCN 4 DMSP								
24	080432Z	14.1N 138.3E	SAT			(T4.0/4.0 /D1.0/24HRS)	PCN 3 DMSP								
25	080440Z	14.2N 138.2E	P	2 5	700	150 70 40 50	80 40 20	974	289	10 11	CIRC		30		3
26	080910Z	14.3N 138.1E	P	5 10	700	180 50 100 40	- - -	976	290	10 13	CIRC		30		3
27	081117Z	14.6N 137.8E	SAT				PCN 5 DMSP								
28	081117Z	14.7N 137.0E	SAT				PCN 6 DMSP								
29	081515Z	14.8N 137.2E	SAT				PCN 1 DMSP								
30	081515Z	14.7N 137.2E	SAT				PCN 1 DMSP								
31	082115Z	14.9N 136.1E	P	5 5	700	130 80 330 15	75 290 10	958	272	10 10	CIRC		20		4
32	082217Z	15.0N 135.9E	SAT			(T4.0/4.0 /D1.0/ HRS)	PCN 3 DMSP								
33	082217Z	15.0N 135.8E	SAT			(T4.5/4.5 /D1.5/ HRS)	PCN 2 DMSP								
34	082359Z	15.2N 135.7E	SAT			(T5.0/5.0 /D / HRS)	PCN 1 DMSP								
35	082359Z	15.0N 135.8E	SAT			(T5.0/5.0 /D1.0/24HRS)	PCN 1 DMSP								
36	090002Z	15.0N 135.6E	SAT			(T5.0/5.0 /D1.0/26HRS)	NOAA 2	(CONF 01)							
37	090004Z	15.1N 135.7E	SAT			(T5.0/5.0 /D1.0/24HRS)	NOAA 2 (NESS)	(CONF 01)							
38	090218Z	15.1N 135.1E	SAT			(T5.0/5.0 /D1.0/ HRS)	PCN 1 DMSP								
39	090219Z	15.2N 135.5E	SAT			(T4.5/4.5 /D1.5/20HRS)	PCN 1 DMSP								
40	090300Z	15.0N 135.4E	P	5 3	700	350 75 270 10	100 270 5	950	265	15 12	CIRC		10		4
41	090359Z	15.3N 135.0E	SAT			(T5.0/5.0 /D / HRS)	PCN 1 DMSP								
42	090359Z	15.1N 135.1E	SAT			(T5.0/5.0 /D1.0/ HRS)	PCN 1 DMSP								
43	090700Z	15.3N 135.0E	AC R	-							-	- -	-		-
44	091059Z	15.6N 133.8E	SAT				PCN 1 DMSP								
45	091059Z	15.3N 133.1E	SAT				PCN 5 DMSP								
46	091218Z	15.5N 133.6E	P	7 2	-	360 90 270 15	70 80 4	-	-	10 11	CIRC		7		5
47	091240Z	15.4N 133.8E	SAT				PCN 1 DMSP								
48	091240Z	15.4N 133.8E	SAT				PCN 1 DMSP								
49	091501Z	15.5N 133.3E	SAT				PCN 1 DMSP								
50	091501Z	15.6N 133.4E	SAT				PCN 1 DMSP								
51	092341Z	16.0N 131.8E	SAT			(T6.0/6.0 /D1.0/24HRS)	PCN 1 DMSP								
52	092341Z	16.1N 131.6E	SAT			(T5.0/5.0 /D0.5/ HRS)	PCN 1 DMSP								
53	092341Z	16.0N 131.9E	SAT			(T6.0/6.0 /D1.0/24HRS)	PCN 1 DMSP								
54	100020Z	15.8N 131.6E	P	1 1	700	240 100 - -	150 - -	893	214	25 12	CIRC	- -	5		6
55	100300Z	16.0N 131.1E	P	10 -	-	- - - -	- - -	-	-	- -	-	- -	-		6
56	100345Z	16.0N 131.0E	SAT			(T6.0/6.0 /D1.0/ HRS)	PCN 1 DMSP								
57	100345Z	16.0N 130.9E	SAT			(T6.0/6.0 /D1.0/24HRS)	PCN 1 DMSP								
58	100345Z	16.0N 131.2E	SAT			(T6.5/6.5 /D1.5/24HRS)	PCN 1 DMSP								
59	100900Z	16.3N 130.0E	P	5 3	700	120 125 50 10	130 80 4	911	230	23 13	CIRC		8		7
60	101222Z	16.2N 129.3E	SAT				PCN 5 DMSP								
61	101222Z	16.5N 129.0E	SAT				PCN 6 DMSP								
62	101222Z	16.5N 129.4E	SAT				PCN 5 DMSP								
63	101628Z	16.5N 128.3E	SAT				PCN 5 DMSP								
64	101628Z	16.4N 128.4E	SAT				PCN 5 DMSP								
65	101628Z	16.9N 129.0E	SAT				PCN 5 DMSP								
66	102147Z	16.8N 127.1E	P	5 3	700	40 75 330 15	130 40 30	962	276	20 20	ELIP	F-M	15X10		8
67	102322Z	17.1N 126.6E	SAT			(T6.5/6.5 /D1.5/24HRS)	PCN 4 DMSP								
68	102322Z	16.8N 126.8E	SAT			(T5.5/6.0 /W0.5/24HRS)	PCN 3 DMSP								
69	102358Z	16.0N 126.0E	SAT			(T6.0/6.0 /D1.0/24HRS)	NOAA 2	(CONF 02)							
70	110330Z	17.1N 126.2E	SAT			(T4.5/5.5 /W2.0/24HRS)	PCN 4 DMSP								
71	110330Z	17.0N 126.2E	SAT			(T5.5/6.0 /W0.5/ HRS)	PCN 3 DMSP								
72	110430Z	17.1N 126.2E	SAT			(T7.0/7.0 /D1.0/27HRS)	PCN 3 DMSP								
73	110747Z	17.3N 124.9E	P	15 10	-	- - - -	140 270 10	-	286	10 -	CIRC		10		9
74	110830Z	17.2N 124.5E	LRDR			- EYE. D10								14.4N 122.6E	
75	110900Z	17.3N 124.5E	LRDR			- CENTER 15 DEG SPIRAL OVERLAY								14.4N 122.6E	
76	111030Z	17.2N 124.0E	LRDR			- CENTER 15 DEG SPIRAL OVERLAY								14.4N 122.6E	
77	111130Z	17.1N 123.6E	LRDR			- CENTER 15 DEG SPIRAL OVERLAY								14.4N 122.6E	
78	111604Z	17.2N 123.4E	SAT				PCN 5 DMSP								
79	111204Z	17.2N 123.2E	SAT				PCN 3 DMSP								
80	111230Z	17.2N 123.2E	LRDR			-					-	- -	-	14.4N 122.6E	
81	111300Z	17.2N 122.9E	LRDR			-					-	- -	-	14.4N 122.6E	
82	111330Z	17.2N 122.8E	LRDR			- CENTER 15 DEG SPIRAL OVERLAY								14.4N 122.6E	
83	111613Z	18.2N 123.9E	SAT				PCN 3 DMSP								
84	111613Z	17.7N 124.2E	SAT				PCN 3 DMSP								
85	111613Z	17.8N 124.0E	SAT				PCN 3 DMSP								
86	112304Z	18.6N 122.8E	SAT			(T2.5/3.5 /W2.0/13HRS)	PCN 3 DMSP								
87	112304Z	18.5N 123.0E	SAT			(T4.5/4.5 /W2.0/ HRS)	PCN 3 DMSP								
88	120046Z	18.4N 122.4E	SAT			(T5.0/5.0 /W2.0/21HRS)	PCN 3 DMSP								
89	120053Z	19.0N 122.0E	SAT			(T3.0/4.0-/W3.0/24HRS)	NOAA 2	(CONF 01)							
90	120053Z	19.0N 122.0E	SAT			(T2.0/3.0 /W2.5/24HRS)	NOAA 2 (NESS)	(CONF 01)							
91	120316Z	19.0N 121.4E	SAT			(T4.5/4.5 /W2.0/ HRS)	PCN 5 DMSP								
92	120316Z	18.3N 121.2E	SAT			(T1.5/2.5 /W1.0/11HRS)	PCN 6 DMSP								
93	120457Z	19.0N 121.0E	SAT			(T5.0/5.0 /W2.0/ HRS)	PCN 5 DMSP								
94	130146Z	16.9N 111.6E	SAT			(T2.0/2.0 /D1.0/24HRS)	NOAA 2	(CONF 02)							
95	130149Z	17.5N 111.8E	SAT			(T3.0/3.0 /D1.0/24HRS)	NOAA 2 (NESS)	(CONF 02)							
96	130443Z	18.0N 112.6E	SAT			(T2.0/2.0 /D1.0/ HRS)	PCN 5 DMSP								
97	131309Z	17.4N 110.1E	SAT				PCN 5 DMSP								
98	131726Z	17.5N 107.0E	SAT				PCN 5 DMSP								
99	140009Z	17.0N 110.0E	SAT			(T1.0/2.0 /W / HRS)	PCN 3 DMSP								
100	140009Z	17.5N 106.7E	SAT			(T2.0/2.0 /D1.0/ HRS)	PCN 5 DMSP								
101	140242Z	16.4N 110.0E	SAT			(T1.5/1.5 / /24HRS)	NOAA 2								
102	140240Z	16.5N 109.9E	SAT			(T2.0/3.0 /W1.0/24HRS)	NOAA 2 (NESS)								
103	140302Z	15.8N 110.9E	SAT			(T2.0/2.0 / / HRS)	ESSA 8 (VTBU)								
104	140428Z	16.6N 110.0E	SAT			(T2.0/2.0 /S /24HRS)	PCN 3 DMSP								

TYPHOON RUTH
FIX POSITIONS FOR CYCLONE NO. 20
11 OCT TO 19 OCT

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV	ACCRY MET	FIX LVL	MAX OBS FLT LVL WIND DIR	VEL	BRG	RNG	MAX OBS SFC WIND VEL	BRG	RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TI	TO	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSN NMBR
1	102322Z	10.2N 140.4E	SAT	(T1.5/1.5 /D0.5/24HRS)							PCN 5 DMSP											
2	110330Z	10.2N 139.7E	SAT	(T1.5/1.5 /D0.5/ HRS)							PCN 5 DMSP											
3	111204Z	12.0N 138.5E	SAT								PCN 5 DMSP											
4	111204Z	12.1N 140.5E	SAT								PCN 5 DMSP											
5	111420Z	12.5N 140.6E	AC R	-														-	- -	-		.
6	111432Z	12.2N 139.9E	SAT								PCN 5 DMSP											
7	112259Z	11.0N 137.2E	SAT	(T2.0/2.0 /D1.0/24HRS)							NOAA 2			(CONF 02)								
8	112300Z	12.0N 137.8E	SAT	(T2.5/2.5 /D1.5/24HRS)							NOAA 2 (NESS)			(CONF 02)								
9	112304Z	12.8N 137.4E	SAT	(T2.5/2.5 /D1.0/24HRS)							PCN 3 DMSP											
10	112304Z	12.8N 137.3E	SAT	(T3.0/3.0 /D0.5/11HRS)							PCN 3 DMSP											
11	120040Z	13.3N 137.7E	P	5	5	-	100	35	40	50	35	40	50	999	-	25	24	-	- -	-		?
12	120300Z	13.1N 137.4E	P	5	5	-	90	40	360	15	45	90	15	995	-	25	24	-	- -	-		?
13	120310Z	13.1N 137.1E	SAT	(T2.5/2.5 /D1.0/ HRS)							PCN 3 DMSP											
14	121140Z	13.2N 135.1E	SAT								PCN 5 DMSP											
15	121225Z	12.9N 134.7E	P	2	20	-	-	-	-	-	-	-	-	-	309	-	-	-	- -	-		?
16	121520Z	13.5N 134.7E	P	2	15	-	150	41	100	15	-	-	-	1001	309	16	14	-	- -	-		?
17	121514Z	13.7N 134.5E	P	2	15	-	110	40	30	25	-	-	-	996	305	16	-	-	- -	-		?
18	121559Z	13.4N 134.2E	SAT								PCN 3 DMSP											
19	121559Z	13.7N 134.0E	SAT								PCN 6 DMSP											
20	122240Z	12.7N 132.3E	SAT	(T3.0/3.0 /D0.5/24HRS)							PCN 3 DMSP											
21	122240Z	12.8N 132.5E	SAT	(T3.5/3.5 /D0.5/24HRS)							PCN 4 DMSP											
22	122353Z	12.5N 133.0E	SAT	(T3.5/3.5 /D1.5/25HRS)							NOAA 2			(CONF 01)								
23	122355Z	12.6N 132.8E	SAT	(T3.5/3.5 /D1.0/24HRS)							NOAA 2 (NESS)			(CONF 02)								
24	130301Z	12.7N 131.8E	SAT	(T3.0/3.0 /D0.5/ HRS)							PCN 3 DMSP											
25	130301Z	12.9N 131.7E	SAT	(T3.5/3.5 /D0.5/ HRS)							PCN 4 DMSP											
26	130420Z	12.7N 132.0E	P	10	2	700	110	55	360	15	80	360	17	975	290	17	14	CIRC		13		4
27	130700Z	12.9N 131.4E	P	10	5	700	100	50	30	30	80	30	25	982	292	15	13	CIRC		14		4
28	131127Z	13.1N 130.7E	SAT								PCN 3 DMSP											
29	131127Z	13.5N 130.5E	SAT								PCN 4 DMSP											
30	131544Z	13.4N 130.0E	SAT								PCN 3 DMSP											
31	131544Z	13.4N 130.4E	SAT								PCN 3 DMSP											
32	131622Z	13.5N 130.2E	P	5	10	-	40	30	330	30	-	-	-	-	-	17	-	CIRC		25		6
33	132100Z	13.9N 129.0E	P	5	5	-	120	50	50	60	-	-	-	-	-	18	-	CIRC		25		6
34	140009Z	13.9N 128.2E	SAT	(T3.5/3.5 /D2.5/ HRS)							PCN 5 DMSP											
35	140009Z	14.0N 128.5E	SAT	(T4.0/4.0 /D1.0/24HRS)							PCN 3 DMSP											
36	140047Z	14.0N 128.0E	SAT	(T3.0/3.5 /W0.5/25HRS)							NOAA 2			(CONF 01)								
37	140052Z	14.0N 128.2E	SAT	(T3.0/3.5 /W0.5/24HRS)							NOAA 2 (NESS)											
38	140240Z	14.0N 128.1E	SAT	(T4.0/4.0 /D1.0/ HRS)							PCN 5 DMSP											
39	140340Z	14.2N 127.8E	P	5	10	700	60	65	350	40	60	350	35	987	298	15	14	-	- -	-		6
40	140920Z	14.5N 127.8E	SAT	(T3.5/3.5 /D2.5/ HRS)							PCN 3 DMSP											
41	140734Z	14.2N 126.8E	P	5	10	700	30	65	260	50	65	40	70	983	294	17	-	CIRC		40		7
42	141251Z	14.5N 126.6E	SAT								PCN 5 DMSP											
43	141251Z	14.4N 126.7E	SAT								PCN 3 DMSP											
44	141910Z	14.2N 126.0E	P	5	10	700	110	65	20	50	-	-	-	982	294	20	-	CIRC		40		7
45	141530Z	14.5N 126.0E	SAT								PCN 4 DMSP											
46	141530Z	14.5N 126.3E	SAT								PCN 1 DMSP											
47	142130Z	14.4N 125.2E	LRDR	- EYE, 10 DEG SPIRAL OVERLAY, 100 PCT, ELLIPTICAL, AXIS 44X32																	14.4N 122.6E	
48	142330Z	14.6N 124.8E	LRDR	- EYE, 90 PCT, CIRCULAR OPEN SW, D32																	14.4N 122.6E	
49	142351Z	14.5N 124.4E	SAT	(T4.5/4.5 /D0.5/24HRS)							PCN 3 DMSP											
50	142351Z	14.6N 124.6E	SAT	(T4.0/4.0 /D0.5/24HRS)							PCN 3 DMSP											
51	142351Z	14.5N 124.2E	SAT	(T5.5/5.5 /D2.0/ HRS)							PCN 1 DMSP											
52	150045Z	14.6N 124.7E	LRDR	- EYE, 75 PCT, CIRCULAR OPEN N, D60																	14.4N 122.6E	
53	150130Z	14.8N 124.3E	LRDR	- EYE, 75 PCT, CIRCULAR OPEN N, D60																	14.4N 122.6E	
54	150142Z	14.8N 124.4E	SAT	(T5.0/5.0+/D2.0/25HRS)							NOAA 2			(CONF 01)								
55	150140Z	14.8N 124.5E	SAT	(T5.0/5.0 /D1.5/24HRS)							NOAA 2 (NESS)											
56	150230Z	14.7N 124.1E	LRDR	- EYE, 70 PCT, CIRCULAR OPEN N, D65																	14.4N 122.6E	
57	150300Z	14.8N 124.2E	P	10	10	700	350	70	250	15	75	90	60	972	286	16	12	CIRC		30		8
58	150330Z	14.8N 124.0E	LRDR	- EYE, 70 PCT, CIRCULAR OPEN N, D55																	14.4N 122.6E	
59	150414Z	14.7N 123.6E	SAT	(T4.0/4.0 /D0.5/ HRS)							PCN 1 DMSP											
60	150414Z	14.7N 123.5E	SAT	(T4.5/4.5 /D0.5/ HRS)							PCN 1 DMSP											
61	150900Z	15.0N 122.7E	LRDR	- 67771																	14.4N 120.6E	
62	150947Z	15.1N 122.9E	P	-	5	700	110	65	20	54	65	20	40	961	277	16	13	CIRC		25		9
63	151000Z	15.1N 122.7E	LRDR	- 61301																	14.4N 120.6E	
64	151100Z	15.3N 122.5E	LRDR	- 32941																	14.4N 120.6E	
65	151130Z	15.0N 122.3E	LRDR	- EYE																	14.4N 122.6E	
66	151200Z	15.4N 122.1E	LRDR	- 20970																	14.4N 120.6E	
67	151230Z	15.0N 122.1E	LRDR	- EYE																	14.4N 122.6E	
68	151232Z	15.3N 122.2E	SAT								PCN 1 DMSP											
69	151232Z	15.0N 122.0E	SAT								PCN 1 DMSP											
70	151300Z	15.5N 122.0E	LRDR	- 20971																	14.4N 120.6E	
71	151400Z	15.7N 121.8E	LRDR	-														-	- -	-	14.4N 120.6E	
72	151430Z	15.8N 121.6E	LRDR	- EYE, 100 PCT, CIRCULAR, D33																	14.4N 122.6E	
73	151500Z	15.6N 121.4E	LRDR	- 22811																	14.4N 120.6E	
74	151545Z	15.9N 120.8E	LRDR	- POSSIBLE EYE, 100 PCT, CIRCULAR, D20																	18.2N 120.5E	
75	151600Z	15.7N 120.9E	LRDR	- 11011																	14.4N 120.6E	
76	151820Z	15.9N 120.8E	P	3	15	-	80	85	360	35	-	-	-	-	-	2	1	CIRC		30		10
77	151830Z	15.5N 120.7E	LRDR	- POSSIBLE EYE, D24																	18.2N 120.5E	
78	151657Z	15.7N 120.9E	SAT								PCN 1 DMSP											
79	151700Z	15.7N 120.7E	LRDR	- 10811																	14.4N 120.6E	
80	151730Z	15.9N 120.5E	LRDR	- EYE, D20																	18.2N 120.5E	
81	151800Z	15.8N 120.6E	LRDR	- 10822																	14.4N 120.6E	
82	151930Z	16.1N 120.5E	LRDR	- EYE, D20																	18.2N 120.5E	
83	152030Z	15.9N 119.9E	LRDR	- EYE, D14																	14.4N 120.6E	
84	152115Z	15.8N 119.6E	P	3	5	500	40	50	310	50	-	-	-	989	569	1	-	CIRC		40		10
85	152130Z	15.6N 119.3E	LRDR	- CENTER, D30																	18.2N 120.5E	
86	152333Z	16.1N 119.1E	SAT	(T4.5/4.5 /D0.5/ HRS)							PCN 3 DMSP											
87	152333Z	16.0N 119.1E	SAT	(T4.0/4.0 /S /24HRS)							PCN 3 DMSP											
88	152343Z	16.0N 119.0E	SAT	(T5.5/5.5 /D2.0/24HRS)							PCN 4 DMSP											
89	160042Z	16.1N 119.1E	SAT	(T4.5/5.0 /W0.5/24HRS)							NOAA 2			(CONF 01)								
90	160040Z	16.2N 119.0E	SAT	(T4.0/5.0 /W1.0/24HRS)							NOAA 2 (NESS)			(CONF 01)								
91	160330Z	16.3N 118.8E	LRDR	- EYE, ELLIPTICAL DIFFUSE, D32																	18.2N 120.5E	
92	160359Z	16.2N 118.1E	SAT	(T4.0/4.0 /S / HRS)							PCN 3 DMSP											
93	160359Z	16.1N 118.2E	SAT	(T4.0/4.0 /S0.5/26HRS)							PCN 3 DMSP											
94	160415Z	16.1N 118.3E	P	8	10	500	170	80	90	80	70	60	20	985	571	-2	-4	CIRC		25		11
95	160430Z	16.0N 118.2E	LRDR	- EYE, 50 PCT, ELLIPTICAL OPEN W																	18.2N 120.5E	
96	160530Z	16.2N 118.2E	LRDR	- EYE, 50 PCT, ELLIPTICAL, D35																	18.2N 120.5E	
97	160903Z	16.5N 117.5E	P	7	10	700	30	50	320	25	60	330	55	978	290	13	11	CIRC		25		11
98	161015Z	16.5N 116.3E	P	5	5	700	110	65	10	24	-	-	-	975	287	13	11	CIRC		20		12
99	161642Z	16.5N 116.1E	SAT								PCN 3 DMSP											
100	161642Z	15.9N 116.6E	SAT								PCN 5 DMSP											

TYPHOON RUTH
FIX POSITIONS FOR CYCLONE NO. 20
11 OCT TO 19 OCT

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR VEL BRG RNG	MAX OBS SFC WIND VEL BRG RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT/TO	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSG NMBR
101	162100Z	16.8N 115.2E	P	5 5	700	130 79 60 35	- - -	966	281	16 14	CIRC		21		12
102	170050Z	16.9N 114.3E	SAT	(T5.0/5.0 /D1.0/24HRS)			PCN 1 DMSP								
103	170138Z	16.9N 114.5E	SAT	(T5.0/5.0 /D0.5/25HRS)			NOAA 2	(CONF 01)							
104	170141Z	16.5N 114.5E	SAT	(T5.0/5.0 /D1.0/24HRS)			NOAA 2 (NESS)	(CONF 01)							
105	170344Z	16.5N 113.4E	SAT	(T4.5/4.5 /W1.0/28HRS)			PCN 3 DMSP								
106	170344Z	17.0N 113.8E	SAT	(T4.5/4.5 /D0.5/24HRS)			PCN 5 DMSP								
107	170344Z	16.8N 113.8E	SAT	(T5.0/5.0 /D1.0/ HRS)			PCN 5 DMSP								
108	170526Z	16.9N 113.5E	SAT	(T5.0/5.0 /D1.0/ HRS)			PCN 3 DMSP								
109	170955Z	16.8N 112.6E	P	5 10	700	150 90 70 80	40 70 100	957	273	16 14	CIRC		40		13
110	171503Z	16.8N 112.0E	P	5 8	700	130 109 40 30	- - -	960	274	18 11	CIRC		35		13
111	171628Z	16.9N 111.9E	SAT				PCN 5 DMSP								
112	171628Z	17.1N 112.0E	SAT				PCN 1 DMSP								
113	171628Z	17.0N 112.2E	SAT				PCN 3 DMSP								
114	172200Z	17.1N 111.1E	P	5 5	700	- - - -	- - -	960	276	16 11	CIRC		33		14
115	180038Z	17.2N 110.8E	SAT	(T5.0/5.0-/S /24HRS)			PCN 1 DMSP								
116	180232Z	17.2N 110.7E	SAT	(T5.0/5.0 /D0.5/25HRS)			ESSA 8 (VTBU)								
117	180234Z	18.0N 110.3E	SAT	(T5.0/5.0 /S /24HRS)			NOAA 2	(CONF 02)							
118	180312Z	17.7N 110.4E	SAT	(T5.0/5.0-/S / HRS)			PCN 1 DMSP								
119	181755Z	18.1N 109.3E	SAT				PCN 5 DMSP								
120	190020Z	20.0N 107.9E	SAT	(T4.0/4.0 /W0.5/24HRS)			PCN 4 DMSP								
121	190133Z	20.8N 108.0E	SAT	(T4.0/5.0 /W1.0/23HRS)			NOAA 2	(CONF 02)							
122	190133Z	20.8N 108.0E	SAT	(T4.0/5.0 /W1.0/23HRS)			NON DMSP								
123	190331Z	19.4N 108.7E	SAT	(T4.0/4.0 /W1.0/25HRS)			NON DMSP								
124	190457Z	20.8N 108.0E	SAT	(T3.0/4.0 /W2.0/27HRS)			PCN 1 DMSP								

TROPICAL STORM SARAH
FIX POSITIONS FOR CYCLONE NO. 21
10 NOV TO 10 NOV

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR VEL BRG RNG	MAX OBS SFC WIND VEL BRG RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT/TO	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSG NMBR
1	080049Z	10.8N 118.5E	SAT	(T2.0/2.0 /D0.5/24HRS)			NOAA 2 (NESS)	(CONF 02)							
2	090043Z	12.0N 115.4E	SAT	(T1.5/1.5 /D0.5/ HRS)			PCN 5 DMSP								
3	090144Z	11.0N 115.0E	SAT	(T2.0/2.0 /D1.0/24HRS)			NOAA 2	(CONF 01)							
4	090144Z	11.0N 115.0E	SAT	(T2.5/2.5 /D0.5/24HRS)			NOAA 2 (NESS)	(CONF 01)							
5	090450Z	12.7N 114.5E	SAT	(T1.5/1.5 /D0.5/ HRS)			PCN 3 DMSP								
6	091325Z	13.2N 113.2E	SAT				PCN 3 DMSP								
7	091739Z	13.5N 113.1E	SAT				PCN 3 DMSP								
8	100025Z	12.2N 111.4E	SAT	(T3.0/3.0 /D1.5/24HRS)			PCN 3 DMSP								
9	100041Z	12.8N 111.6E	SAT	(T3.0/3.0 /D1.0/24HRS)			NOAA 2	(CONF 02)							
10	100239Z	12.8N 110.5E	SAT	(T3.5/3.5-/D1.0/24HRS)			NOAA 2 (NESS)								
11	100408Z	12.1N 110.8E	P	10 5	700	120 40 350 50	45 360 15	992	301	14 10	CIRC		25		1
12	100441Z	12.1N 111.0E	SAT	(T3.0/3.0 /D1.5/24HRS)			PCN 3 DMSP								
13	100935Z	12.2N 109.8E	P	- 5	500	180 45 90 18	50 240 10	984	572	-2 -6	CIRC		25		2
14	101307Z	12.4N 109.7E	SAT				PCN 2 DMSP								
15	101725Z	12.3N 109.1E	SAT				PCN 3 DMSP								
16	110148Z	12.2N 107.6E	SAT	(T3.0/3.0 /D /24HRS)			PCN 5 DMSP								
17	140227Z	13.0N 89.5E	SAT	(T1.5/1.5 /D0.5/24HRS)			NOAA 2	(CONF 01)							
18	140229Z	12.5N 88.5E	SAT	(T2.0/2.0 /D1.0/24HRS)			NOAA 2 (NESS)								
19	140235Z	13.1N 89.7E	SAT	(T2.0/2.0 /D1.0/ HRS)			PCN 5 DMSP								
20	140524Z	13.2N 89.6E	SAT	(T2.0/2.0 /D1.0/ HRS)			PCN 5 DMSP								
21	141808Z	14.5N 89.5E	SAT	(T2.0/2.0 / / HRS)			PCN 3 DMSP								
22	150217Z	14.1N 89.1E	SAT	(T2.0/2.0 / / HRS)			PCN 3 DMSP								
23	150320Z	14.2N 88.1E	SAT	(T2.5/2.5 /D1.0/25HRS)			NOAA 2	(CONF 01)							
24	150323Z	14.0N 88.7E	SAT	(T2.5/2.5 /D0.5/24HRS)			NOAA 2 (NESS)								
25	150652Z	15.1N 88.6E	SAT	(T2.0/2.0 / / HRS)			PCN 3 DMSP								
26	151459Z	14.6N 87.4E	SAT				PCN 5 DMSP								
27	160159Z	15.2N 87.8E	SAT	(T4.0/4.0 / / HRS)			PCN 3 DMSP								
28	160224Z	15.3N 87.4E	SAT	(T3.5/3.5 /D1.0/24HRS)			NOAA 2 (NESS)								
29	160413Z	15.3N 88.5E	SAT	(T3.5/3.5 /D1.0/24HRS)			NOAA 2	(CONF 02)							
30	160037Z	15.8N 88.6E	SAT	(T4.0/4.0 /D2.0/24HRS)			PCN 1 DMSP								
31	160637Z	15.7N 88.7E	SAT	(T4.0/4.0 / / HRS)			PCN 3 DMSP								
32	161441Z	17.4N 89.0E	SAT				PCN 3 DMSP								
33	161441Z	17.4N 89.0E	SAT				PCN 3 DMSP								
34	170141Z	19.3N 90.9E	SAT	(T4.0/4.0 / / HRS)			PCN 3 DMSP								
35	170141Z	19.3N 91.3E	SAT	(T4.0/4.0 / / HRS)			PCN 4 DMSP								
36	170315Z	20.0N 90.6E	SAT	(T4.0/4.0 /D0.5/23HRS)			NOAA 2								
37	170414Z	19.3N 90.9E	SAT	(T4.0/4.0-/S /24HRS)			PCN 3 DMSP								
38	170622Z	20.2N 91.4E	SAT	(T4.0/4.0 / / HRS)			PCN 3 DMSP								

TROPICAL STORM THELMA
FIX POSITIONS FOR CYCLONE NO. 22
15 NOV TO 18 NOV

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR VEL BRG RNG	MAX OBS SFC WIND VEL BRG RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT/TO	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSG NMBR
1	100042Z	9.1N 132.5E	SAT	(T1.5/1.5 /D0.5/24HRS)			NOAA 2	(CONF 01)							
2	100044Z	8.5N 132.8E	SAT	(T1.5/1.5 /D0.5/24HRS)			NOAA 2 (NESS)								
3	102342Z	8.0N 130.8E	SAT	(T1.5/1.5 /S /23HRS)			NOAA 2	(CONF 02)							
4	120038Z	9.5N 125.5E	SAT	(T2.0/2.0 /D0.5/25HRS)			NOAA 2	(CONF 02)							
5	120040Z	9.8N 126.5E	SAT	(T2.0/2.0 /D0.5/24HRS)			NOAA 2 (NESS)								
6	130133Z	9.3N 121.0E	SAT	(T3.0/3.0 /D1.0/25HRS)			NOAA 2	(CONF 01)							
7	130134Z	9.5N 121.5E	SAT	(T3.0/3.0 /D1.0/25HRS)			NOAA 2 (NESS)								
8	140031Z	10.1N 117.4E	SAT	(T3.5/3.5 /D0.5/25HRS)			NOAA 2	(CONF 02)							
9	140034Z	10.2N 117.4E	SAT	(T3.0/3.0 /S /23HRS)			NOAA 2 (NESS)	(CONF 02)							
10	140054Z	10.2N 116.1E	SAT	(T1.5/1.5 /S /25HRS)			PCN 5 DMSP								
11	140524Z	10.5N 116.2E	SAT	(T1.5/1.5 /S /25HRS)			PCN 5 DMSP								
12	141330Z	12.0N 113.6E	SAT				PCN 5 DMSP								
13	141620Z	12.0N 112.8E	SAT				PCN 5 DMSP								
14	150030Z	10.5N 109.9E	SAT	(T1.5/1.5 /S /25HRS)			PCN 3 DMSP								
15	150036Z	10.8N 110.3E	SAT	(T3.0/3.0 / / HRS)			PCN 3 DMSP								
16	150127Z	10.3N 110.0E	SAT	(T3.5/3.5 /S /25HRS)			NOAA 2	(CONF 01)							
17	150129Z	10.0N 110.0E	SAT	(T3.5/3.5 /D0.5/24HRS)			NOAA 2 (NESS)								
18	150306Z	9.8N 110.1E	P	5 15		150 55 60 20	70 310 20	993	304	17 15	-	- -	-		1
19	150310Z	10.0N 109.7E	SAT	(T3.0/3.0 / / HRS)			PCN 3 DMSP								
20	150910Z	10.9N 109.7E	SAT	(T3.0/3.0 /D1.5/24HRS)			PCN 3 DMSP								
21	150900Z	9.7N 109.3E	P	1 15	-	90 60 360 15	60 360 10	991	301	18 17	-	- -	-		1
22	151317Z	9.8N 105.4E	SAT				PCN 5 DMSP								
23	151317Z	9.7N 105.7E	SAT				PCN 5 DMSP								
24	151754Z	8.9N 104.9E	SAT				PCN 5 DMSP								
25	160017Z	9.5N 108.0E	SAT	(T3.0/3.0 /D1.5/24HRS)			PCN 3 DMSP								
26	160017Z	9.6N 108.5E	SAT	(T2.0/2.0 / / HRS)			PCN 3 DMSP								
27	160223Z	9.7N 107.8E	SAT	(T2.5/3.5 /W1.0/24HRS)			NOAA 2 (NESS)								
28	160223Z	9.8N 107.8E	SAT	(T2.5/3.5-/W1.0/25HRS)			NOAA 2	(CONF 01)							
29	160455Z	9.8N 107.5E	SAT	(T1.5/2.5 /W1.5/24HRS)			PCN 3 DMSP								
30	160455Z	9.6N 107.5E	SAT	(T2.0/2.0 /W /24HRS)			PCN 3 DMSP								
31	161012Z	9.8N 106.6E	P	- 10	-	- 25 - -	30 - -	998	-	25 -	-	- -	-		1
32	161732Z	9.5N 104.8E	SAT				PCN 5 DMSP								
33	170124Z	9.0N 105.5E	SAT	(T1.5/2.5 /W1.0/23HRS)			NOAA 2	(CONF 02)							
34	170125Z	9.1N 103.0E	SAT	(T1.5/2.5 /W1.0/23HRS)			NOAA 2 (NESS)	(CONF 02)							
35	170441Z	9.0N 106.2E	SAT	(T1.0/1.5 /W0.5/24HRS)			PCN 5 DMSP								
36	180219Z	10.0N 100.0E	SAT	(T2.0/2.0 /D0.5/25HRS)			NOAA 2	(CONF 02)							
37	180220Z	10.0N 100.0E	SAT	(T1.5/1.5 /D /25HRS)			NOAA 2 (NESS)								

TROPICAL STORM VERA
FIX POSITIONS FOR CYCLONE NO. 23
19 NOV TO 26 NOV

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	FLT LVL WIND DIR VEL	MAX OBS BRG RNG	MAX OBS SFC WIND VEL BRG RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TI/TO	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSN NMBR
1	162329Z	7.5N 141.9E	SAT	(T1.5/1.5 /D0.5/23HRS)				NOAA 2	(CONF 01)							
2	162330Z	7.5N 142.0E	SAT	(T1.5/1.5 /D0.5/24HRS)				NOAA 2 (NESS)	(CONF 02)							
3	180023Z	10.7N 139.2E	SAT	(T1.5/1.5 /S /23HRS)				NOAA 2	(CONF 01)							
4	180023Z	11.0N 138.5E	SAT	(T1.5/1.5 /S /24HRS)				NOAA 2 (NESS)								
5	190110Z	11.0N 128.0E	SAT	(T2.5/2.5 /D1.0/25HRS)				NOAA 2	(CONF 02)							
6	190411Z	10.8N 128.1E	SAT	(T1.5/1.5 /D0.5/24HRS)				PCN 5 DMSP								
7	190901Z	10.3N 127.3E	P	10 30	-	140 28	70 230	35 330 230	1002	-	24 11	-	- -	-		1
8	191204Z	11.4N 126.7E	SAT					PCN 5 DMSP								
9	191655Z	11.7N 126.3E	SAT					PCN 5 DMSP								
10	200020Z	12.0N 124.2E	SAT	(T3.0/3.0 /D1.0/24HRS)				NOAA 2 (NESS)								
11	200020Z	12.0N 124.2E	SAT	(T3.0/3.0 /D0.5/23HRS)				NOAA 2	(CONF 01)							
12	200040Z	12.0N 124.5E	SAT	(T2.5/2.5 /D2.5/ HRS)				PCN 5 DMSP								
13	200200Z	11.4N 123.5E	ERDR	- 3310/											10.3N 124.0E	
14	200240Z	11.4N 123.3E	ERDR	- 2111/											10.3N 124.0E	
15	200357Z	12.2N 123.4E	SAT	(T2.0/2.0 /D0.5/24HRS)				PCN 5 DMSP								
16	200357Z	12.1N 124.1E	SAT	(T2.5/2.5 /D2.5/ HRS)				PCN 5 DMSP								
17	201146Z	12.8N 123.0E	SAT					PCN 5 DMSP								
18	201840Z	12.5N 121.5E	SAT					PCN 5 DMSP								
19	201841Z	12.8N 121.7E	SAT					PCN 5 DMSP								
20	210028Z	11.9N 120.1E	SAT	(T3.0/3.0 /D0.5/24HRS)				PCN 5 DMSP								
21	210113Z	11.9N 120.8E	SAT	(T3.0/3.0 /S /25HRS)				NOAA 2	(CONF 01)							
22	210114Z	11.5N 121.0E	SAT	(T3.0/3.0+/S /24HRS)				NOAA 2 (NESS)	(CONF 01)							
23	210342Z	11.6N 121.6E	SAT	(T3.0/3.0 /D0.5/24HRS)				PCN 5 DMSP								
24	210346Z	11.7N 121.3E	SAT	(T2.0/2.0 /S /24HRS)				PCN 5 DMSP								
25	211509Z	11.1N 121.9E	SAT					PCN 5 DMSP								
26	211828Z	10.9N 119.8E	SAT					PCN 5 DMSP								
27	211828Z	11.8N 120.4E	SAT					PCN 5 DMSP								
28	220010Z	11.8N 119.6E	SAT	(T4.0/4.0 /D1.0/24HRS)				PCN 5 DMSP								
29	220011Z	11.3N 119.9E	SAT	(T2.0/2.0 /S /24HRS)				PCN 5 DMSP								
30	220200Z	11.0N 119.5E	SAT	(T2.0/3.0 /W1.0/24HRS)				NOAA 2	(CONF 02)							
31	220211Z	11.5N 119.3E	SAT	(T3.5/3.5 /D0.5/24HRS)				NOAA 2 (NESS)	(CONF 02)							
32	220509Z	12.3N 118.6E	SAT	(T4.0/4.0 /D1.0/24HRS)				PCN 5 DMSP								
33	220905Z	12.5N 119.7E	P	- 10	700	190 35	170 20	45 210 30	995	305	12 12	ELIP	N-S	60X40		4
34	221251Z	12.6N 118.4E	SAT					PCN 5 DMSP								
35	221611Z	13.2N 117.7E	SAT					PCN 5 DMSP								
36	221611Z	13.1N 118.0E	SAT					PCN 5 DMSP								
37	222220Z	13.1N 117.7E	P	- 25	-	130 30	40 145	30 130 20	995	304	10 -	-	- -	-		5
38	222351Z	13.0N 117.8E	SAT	(T3.0/4.0 /W1.0/24HRS)				PCN 3 DMSP								
39	222351Z	13.2N 118.4E	SAT	(T1.5/2.0 /W0.5/24HRS)				PCN 3 DMSP								
40	230106Z	13.5N 117.5E	SAT	(T3.0/3.5 /W0.5/24HRS)				NOAA 2 (NESS)								
41	230109Z	13.5N 117.5E	SAT	(T3.0/3.0 /D1.0/23HRS)				NOAA 2	(CONF 01)							
42	230451Z	12.9N 117.3E	SAT	(T3.0/3.0 / / HRS)				PCN 3 DMSP								
43	230451Z	13.0N 117.5E	SAT	(T3.0/4.0 /W1.0/24HRS)				PCN 3 DMSP								
44	230930Z	13.3N 117.2E	P	2 8	700	- -	- -	35 300 50	993	305	14 -	-	- -	-		6
45	231233Z	13.5N 117.4E	SAT					PCN 5 DMSP								
46	231633Z	13.9N 117.2E	SAT					PCN 5 DMSP								
47	231739Z	14.0N 114.8E	SAT					PCN 5 DMSP								
48	231739Z	13.9N 115.8E	SAT					PCN 5 DMSP								
49	232217Z	14.5N 115.7E	P	2 5	-	190 45	- -	30 90 20	990	302	10 -	-	- -	-		7
50	240115Z	14.5N 115.5E	SAT	(T4.0/4.0 /D1.0/24HRS)				PCN 5 DMSP								
51	240115Z	14.7N 115.2E	SAT	(T4.0/4.0+/D1.0/20HRS)				PCN 3 DMSP								
52	240116Z	15.2N 114.7E	SAT	(T3.5/3.5 /D0.5/23HRS)				NOAA 2	(CONF 01)							
53	240440Z	15.1N 114.7E	SAT	(T4.0/4.0 /D1.0/24HRS)				PCN 3 DMSP								
54	240440Z	15.0N 114.2E	SAT	(T4.0/4.0+/D1.0/20HRS)				PCN 3 DMSP								
55	241147Z	15.6N 113.3E	P	10 10	-	220 45	130 25	- - -	996	305	16 -	-	- -	-		8
56	241215Z	15.8N 114.7E	SAT					PCN 5 DMSP								
57	241215Z	15.4N 114.3E	SAT					PCN 5 DMSP								
58	241356Z	16.0N 113.1E	SAT					PCN 5 DMSP								
59	241358Z	15.9N 113.3E	SAT					PCN 5 DMSP								
60	241724Z	16.3N 112.2E	SAT					PCN 5 DMSP								
61	241724Z	16.0N 113.1E	SAT					PCN 6 DMSP								
62	250027Z	16.3N 113.0E	P	3 5	700	240 45	- -	40 170 20	996	307	14 11	-	- -	-		9
63	250056Z	16.4N 112.5E	SAT	(T2.5/3.5 /W1.5/24HRS)				PCN 3 DMSP								
64	250056Z	16.7N 112.2E	SAT	(T2.5/3.5 /W1.5/24HRS)				PCN 5 DMSP								
65	250103Z	16.0N 111.7E	SAT	(T3.0/3.5 /W0.5/25HRS)				NOAA 2	(CONF 02)							
66	250104Z	16.5N 111.8E	SAT	(T3.0/3.5 /W0.5/24HRS)				NOAA 2 (NESS)	(CONF 02)							
67	250426Z	17.1N 111.9E	SAT	(T2.5/3.5 /W1.5/24HRS)				PCN 5 DMSP								
68	250426Z	16.3N 112.1E	SAT	(T2.5/3.5 /W1.5/24HRS)				PCN 3 DMSP								
69	251338Z	17.4N 111.1E	SAT					PCN 5 DMSP								
70	251709Z	17.4N 110.9E	SAT					PCN 5 DMSP								
71	260038Z	17.2N 111.8E	SAT	(T1.5/2.5 /W1.0/24HRS)				PCN 3 DMSP								
72	260411Z	17.3N 111.9E	SAT	(T1.5/2.5 /W1.0/24HRS)				PCN 3 DMSP								
73	260411Z	17.4N 111.9E	SAT	(T1.5/1.5 /W0.5/48HRS)				PCN 3 DMSP								

CHAPTER V — SUMMARY OF FORECAST VERIFICATION DATA

1. COMPARISON OF OBJECTIVE TECHNIQUES

a. GENERAL:

Objective techniques have been verified yearly since 1967. Year-to-year modifications and improvements have prevented any long period comparisons of the various objective techniques except for EXTRAPOLATION and ARAKAWA (1963). All of the dynamic objective forecast techniques used during the past season employed the simple steering concept of a point vortex in a smoothed flow field with adjustments based on past movement. None of the techniques provided intensity forecasts with their associated relationship to movement.

b. DISCUSSION OF OBJECTIVE TECHNIQUES:

(1) EXTRAPOLATION - Past 12-hour movement derived from current warning position and 12-hour old best track position is linearly extrapolated to 24 and 48 hours.

(2) ARAKAWA (1963) - Grid overlay values of surface pressure are entered into regression equations. Previously hand computed, computations were computerized during the latter half of the 1972 season.

(3) MOHATT 850/700 - A modification to the basic HATRACK program which advects a point vortex on a pre-selected analysis or prognostic SR (space mean) field at designated levels in six-hour time steps out through 84 hours. Utilizing the 12-hour history position, MOHATT computes the previous 12-hour forecast error and applies a bias correction to the forecasted positions out to 72 hours.

(4) TYMOD 12/24 - A modification to FLEWEACEN Pearl Harbor's objective technique TSGLOB. TYMOD advects a weighted point source using FNWC Monterey's global band upper air progs out to 72 hours. Outputs are provided for both 12- and 24-hour history. Bias corrections are applied to the forecast positions based on the previous 12- and 24-hour forecast errors.

(5) TYFOON-72 - Modified version (Jarrell and Wagoner, 1973) of the basic TYFOON program (Jarrell and Somervell, 1970). The program outputs forecast positions as the centers of probability ellipses out to 72 hours based on a group of analog storms which occurred within a time/space envelope centered about the date and position of the storm being forecast. Ellipses are based on the analog population weighted according to their similarity to the existing storms.

SUMMARY

	NO. OF ALERT SYSTEMS	ALERT SYSTEMS WHICH BECAME NUMBERED TROPICAL CYCLONES	TOTAL NUMBERED TROPICAL CYCLONES	DEVELOPMENT RATE
1970	32	18	27	56%
1971	48	33	37	69%
1972	41	29	32	71%
1973	26	22	23	85%

MONTHLY DISTRIBUTION

J	F	M	A	M	J	J	A	S	O	N	D
0	0	0	0	1	1	6	6	5	4	3	0

c. TESTING AND RESULTS:

In past years only one or two objective techniques provided 72-hour forecasts. For the first time, during 1973, the JTWC had five objective techniques to assist in formulating the 72-hour outlook. Although some of the objective techniques showed certain skill at various time frames, research is continuing in an effort to improve all of the objective techniques used by the JTWC.

(1) Table 5-1 presents a comparison of all objective techniques for all forecasts. Each objective technique is compared to the best track, each of the other objective techniques, and the official JTWC forecast. A comparison of the various techniques shows EXTRAPOLATION to be superior to all other techniques at both 24 and 48 hours. When compared to the official JTWC forecast, EXTRAPOLATION was only slightly higher at 24 hours and equal at 48 hours. TYFOON-72 was the second best technique at 24 and 48 hours and superior to the other techniques at 72 hours. When compared to the official JTWC forecast at 72 hours, TYFOON-72 was only slightly higher.

(2) Table 5-2 presents a comparison of all objective techniques for all typhoons where the maximum sustained surface wind was 35 knots or greater. Once again, EXTRAPOLATION was superior to all other techniques at both 24 and 48 hours and TYFOON-72 was best at 72 hours. When compared to the official JTWC forecast, however, EXTRAPOLATION was equal at 24 hours and slightly better at 48 hours. This indicates the regular tracks most typhoons described once they became well developed plus the lack of major recurvers during the 1973 season.

2. SUMMARY OF TROPICAL CYCLONE FORMATION ALERTS

For the fourth consecutive year, the JTWC issued Tropical Cyclone Formation Alert messages as a means of alerting Department of Defense interests to potentially dangerous tropical disturbances which normally had not reached the tropical depression stage.

Of the 26 tropical disturbances in the western North Pacific during 1973 for which alerts were issued, 22 were placed in warning status. Only Tropical Storm Hope, which developed from an upper tropospheric low, was not preceeded by a formation alert. Including revisions, extensions, and regenerations a total of 43 formation alert messages were issued.

The high ratio of tropical cyclones to formation alerts, 85%, can be attributed to the improved satellite interpretation procedures employed by the JTWC. Of the

43 alerts issued, 30 were based solely on satellite data, three on aircraft investigatives, and two on synoptic data. The remaining eight alerts were based on a combination of satellite plus aircraft, synoptic data, or land radar. Thus, 88% of all alerts issued during 1973 employed satellite data as their basis.

3. ANNUAL FORECAST VERIFICATION

Forecast positions for the warning, 24-, 48-, and 72-hour forecasts are verified against the best track using two criteria:

a. Only those forecasts for tropical cyclones which reach typhoon intensity and the best track winds are 35 kts or greater are verified; and

b. All forecasts for which best track positions exist are verified.

No verification statistics are computed for the 12-hour forecast positions. However, the 12-hour forecast position errors may be estimated by adding half the difference between the warning and 24-hour forecast position errors to the warning position error.

In addition to the methods described above for verifying absolute error distance, a computation of closest distance to the best track (right angle error) is also calculated for both methods. This is used to measure the demonstrated ability of the JTWC to forecast the path of motion without regard to speed.

Unless otherwise indicated, the following tables and figures depict the distribution of the typhoon criteria forecasting errors in the JTWC forecasts.

TABLE 5-1. JTWC ANNUAL AVERAGE FORECAST ERROR

	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
1964	133	284	429
1965	151	303	418
1966	136	280	432
1967	125	276	414
1968	105	229	337
1969	111	237	349
1970	98	181	272
1971	99	203	308
1972	116	245	382
1973	102	193	245

*Forecast positions north of 35°N were not verified

4. REFERENCES

Arakawa, H., "Statistical Method to Forecast the Movement and the Central Pressure of Typhoons in the Western North Pacific," Japan Meteorological Agency, Meteorological Research Institute Final Report, October 1963.

Jarrell, J.D., and W.L. Somervell, Jr., "A Computer Technique for Using Typhoon Analogs as a Forecast Aid," NAVWEARSCHFAC Tech. Paper No. 6-70, June 1970.

Jarrell, J.D., and R.A. Wagoner, "The 1972 Typhoon Analog Program (TYFOON-72)," ENVPREDRSCHFAC Tech. Paper No. 1-73, January 1973.

TABLE 5-2. 1973 OBJECTIVE TECHNIQUES VERIFICATION FOR TYPHOONS ONLY (see criterion a)

24-HOUR

	JTWC	XTRP	ARKW	TY24	TY12	TYFN	MH85	MH70
JTWC	195 102 102 0							
XTRP	164 100 100 0	164 100 100 0						
ARKW	42 92 120 28	40 102 122 21	42 120 120 0					
TY24	144 98 216 118	136 97 220 123	38 124 195 71	144 216 216 0				
TY12	150 99 181 82	140 97 182 85	38 124 166 42	142 216 181 -36	150 181 181 0			
TYFN	170 99 116 17	154 98 117 19	41 121 106 -15	143 215 115 -101	148 181 115 -65	170 116 116 0		
MH85	135 102 147 44	129 97 146 49	35 124 131 8	120 223 146 -77	126 177 145 -31	132 119 145 26	135 147 147 0	
MH70	125 101 125 25	119 95 124 28	34 126 120 -6	113 192 123 -69	118 158 123 -35	122 105 124 20	124 131 125 -6	125 125 125 0

NUMBER OF CASES	X-AXIS TECHNIQUE ERROR
Y-AXIS TECHNIQUE ERROR	ERROR DIFFERENCE Y-X

48-HOUR

	JTWC	XTRP	ARKW	TY24	TY12	TYFN	MH85	MH70
JTWC	136 193 193 0							
XTRP	120 192 190 -2	124 191 191 0						
ARKW	33 187 280 93	31 191 276 85	33 280 280 0					
TY24	104 187 389 202	102 185 395 210	30 283 360 77	109 392 392 0				
TY12	108 186 352 165	106 183 358 175	30 283 330 47	107 393 356 -37	115 360 360 0			
TYFN	125 190 210 20	117 189 214 25	32 287 222 -65	108 391 203 -189	113 357 205 -152	132 215 215 0		
MH85	98 196 314 118	96 188 314 127	27 264 266 2	91 400 308 -92	97 357 311 -46	101 210 308 98	103 312 312 0	
MH70	92 195 294 99	91 186 293 107	27 264 251 -13	87 399 282 -117	92 355 288 -67	95 209 288 79	97 311 291 -20	97 291 291 0

JTWC - OFFICIAL JTWC SUBJECTIVE FORECAST
XTRP - EXTRAPOLATION
ARKW - ARAKAWA
TY24 - TYMOD WITH 24-HR HISTORY
TY12 - TYMOD WITH 12-HR HISTORY
TYFN - TYFOON (WEIGHTED CLIMO)
MH85 - MOHATT 850-MB PROG
MH70 - MOHATT 700-MB PROG

72 HOUR

	JTWC	TY24	TY12	TYFN	MH85	MH70
JTWC	88 245 245 0					
TY24	71 252 616 364	76 618 618 0				
TY12	73 247 546 300	76 618 556 -62	80 563 563 0			
TYFN	82 246 267 21	75 615 271 -344	79 566 278 -288	92 291 291 0		
MH85	63 254 525 270	60 613 501 -112	64 532 504 -28	6 276 507 231	69 513 513 0	
MH70	61 254 499 246	58 605 477 -128	62 527 489 -38	65 277 493 216	67 494 499 4	67 499 499 0

TABLE 5-3. 1973 OBJECTIVE TECHNIQUES VERIFICATION FOR ALL FORECASTS (see criterion b)

24-HOUR

	JTWC	XTRP	ARKW	TY24	TY12	TYFN	MH85	MH70
JTWC	267 108 108 0							
XTRP	218 104 109 5	218 109 109 0						
ARKW	45 97 127 30	43 110 130 20	45 127 127 0					
TY24	184 102 208 106	176 105 211 106	41 132 201 69	184 208 208 0				
TY12	192 103 175 72	162 105 175 70	41 132 175 43	182 208 175 -34	192 175 175 0			
TYFN	215 103 120 16	198 106 120 14	44 128 112 -16	183 207 119 -89	190 174 119 -55	215 120 120 0		
MH85	161 106 148 42	155 105 147 42	37 130 136 6	143 218 147 -71	151 176 147 -29	158 124 147 23	161 148 148 0	
MH70	149 105 128 24	143 104 127 24	36 132 124 -8	134 191 126 -65	141 159 126 -33	146 112 128 15	148 134 128 -6	149 128 128 0

NUMBER OF CASES	X-AXIS TECHNIQUE ERROR
Y-AXIS TECHNIQUE ERROR	ERROR DIFFERENCE Y-X

48-HOUR

	JTWC	XTRP	ARKW	TY24	TY12	TYFN	MH85	MH70
JTWC	153 197 197 0							
XTRP	137 197 197 0	150 201 201 0						
ARKW	33 187 280 93	31 191 276 85	33 280 280 0					
TY24	116 192 397 205	120 192 402 210	30 283 360 77	128 398 398 0				
TY12	120 192 358 166	125 190 361 171	30 283 330 47	126 399 358 -41	135 361 361 0			
TYFN	137 195 209 14	136 194 212 18	32 287 222 -65	127 397 203 -194	133 358 204 -154	152 212 212 0		
MH85	105 203 311 108	107 196 313 117	27 264 266 2	101 413 308 -105	108 367 310 -57	112 213 307 95	114 311 311 0	
MH70	99 202 293 91	102 195 293 98	27 264 251 -13	97 413 285 -128	103 366 288 -78	106 212 289 76	108 310 291 -19	108 291 291 0

JTWC - OFFICIAL JTWC SUBJECTIVE FORECAST
XTRP - EXTRAPOLATION
ARKW - ARAKAWA
TY24 - TYMOD WITH 24-HR HISTORY
TY12 - TYMOD WITH 12-HR HISTORY
TYFN - TYFOON (WEIGHTED CLIMO)
MH85 - MOHATT 850-MB PROG
MH70 - MOHATT 700-MB PROG

72 HOUR

	JTWC	TY24	TY12	TYFN	MH85	MH70
JTWC	97 253 253 0					
TY24	79 261 611 350	95 617 617 0				
TY12	81 256 550 294	95 617 570 -47	100 577 577 0			
TYFN	90 254 266 12	94 615 305 -310	99 579 313 -267	112 319 319 0		
MH85	68 264 529 265	73 625 521 -104	78 572 526 -45	81 325 528 203	83 533 533 0	
MH70	66 264 506 242	70 617 505 -113	75 571 519 -52	78 323 522 199	80 513 526 12	80 526 526 0

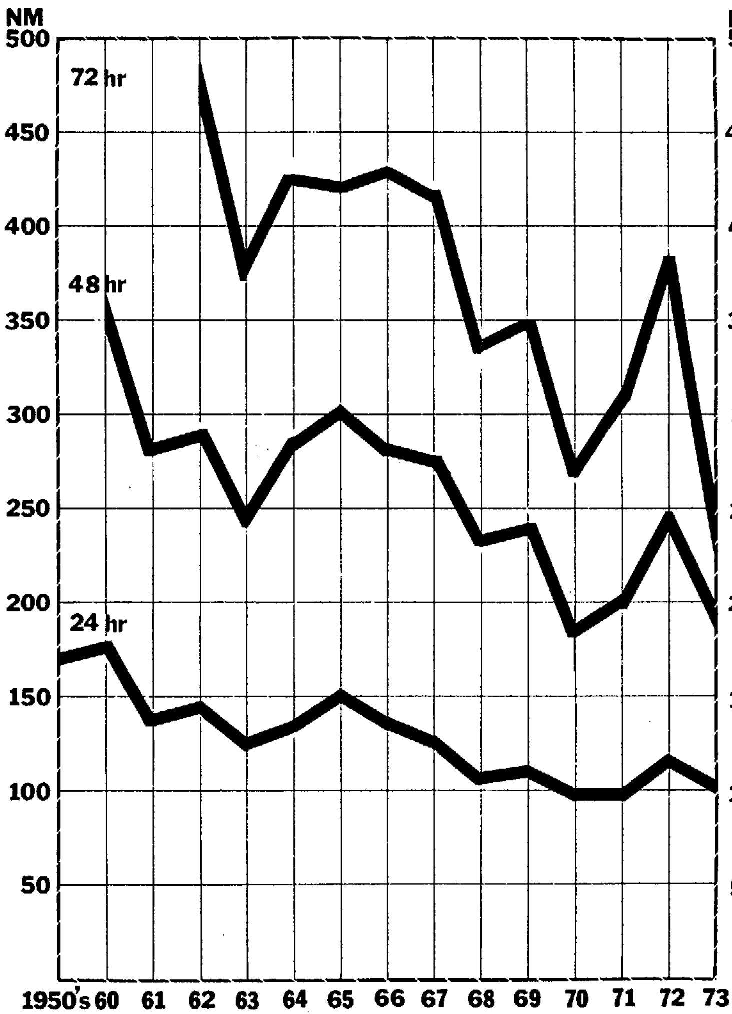


FIGURE 5-1. *Mean vector error.*

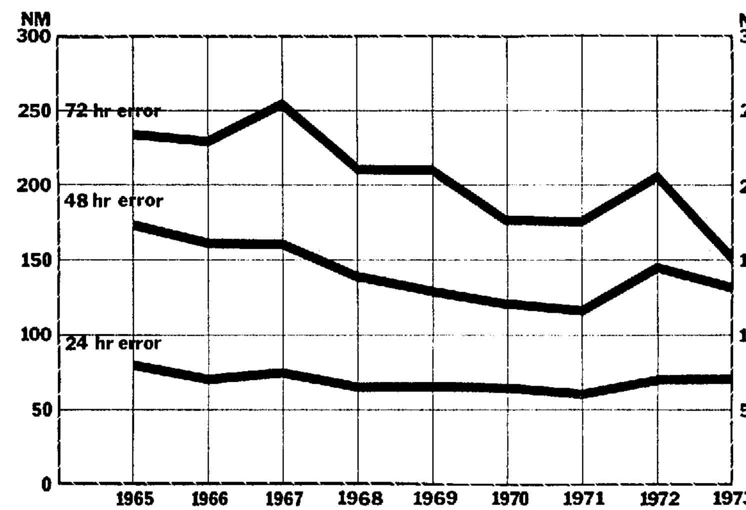


FIGURE 5-2. *Mean right angle error.*

4. SUMMARY OF INDIVIDUAL TROPICAL STORM VERIFICATION

TABLE 5-4. 1973 JTWC ERROR SUMMARY

(Average errors are given in nautical miles)

CYCLONE	WARNING POSIT ERROR	WARNING RT ANGLE ERROR	WARNING # WRNGS	24 HOUR FCST ERROR	24 HOUR RT ANGLE ERROR	24 HOUR # CASES	48 HOUR FCST ERROR	48 HOUR RT ANGLE ERROR	48 HOUR # CASES	72 HOUR FCST ERROR	72 HOUR RT ANGLE ERROR	72 HOUR # CASES
1. TS WILDA	12	7	9	63	50	5	---	---	---	---	---	---
2. TY ANITA	22	13	13	157	104	9	240	96	3	---	---	---
3. TY BILLIE	20	17	24	79	65	20	151	123	16	210	171	12
4. TS CLARA	28	20	7	92	88	3	---	---	---	---	---	---
5. TY DOT	25	15	19	123	79	11	256	156	2	---	---	---
6. TY ELLEN	17	13	28	135	90	16	201	116	6	55	53	2
7. TS FRAN	58	27	5	172	142	1	---	---	---	---	---	---
8. TY GEORGIA	17	12	15	114	96	11	255	225	7	279	243	1
9. TS HOPE	32	27	13	114	96	9	9	181	155	2	---	---
10. TY IRIS	24	15	30	138	96	26	265	153	21	328	157	17
11. TD 11	23	15	6	155	88	2	---	---	---	---	---	---
12. TS JOAN	65	43	10	191	139	6	---	---	---	---	---	---
13. TS KATE	31	21	8	114	71	4	---	---	---	---	---	---
14. TD 14	16	16	4	---	---	--	---	---	---	---	---	---
15. TY LOUISE	21	14	18	104	71	14	225	180	9	294	173	3
16. TY MARGE	18	10	12	77	67	8	224	166	3	---	---	---
17. TY NORA	17	10	34	104	77	30	192	156	24	267	218	20
18. TY OPAL	26	12	15	98	62	11	177	89	5	---	---	---
19. TY PATSY	21	14	29	65	37	22	212	122	21	318	170	17
20. TY RUTH	19	12	33	84	51	29	126	78	24	163	90	21
21. TS SARAH	13	10	4	---	---	--	---	---	---	---	---	---
22. TS THELMA	35	15	10	146	35	6	263	68	2	283	283	1
23. TS VERA	39	19	28	116	78	24	172	151	8	236	221	3
ALL FORECASTS	24	15	374	108	74	267	197	134	153	253	162	97
*TYPHOONS	19	12	239	102	71	195	193	131	136	245	153	88

*Includes only forecasts on cyclones that became typhoons and only when verifying best track wind was 35 kt.

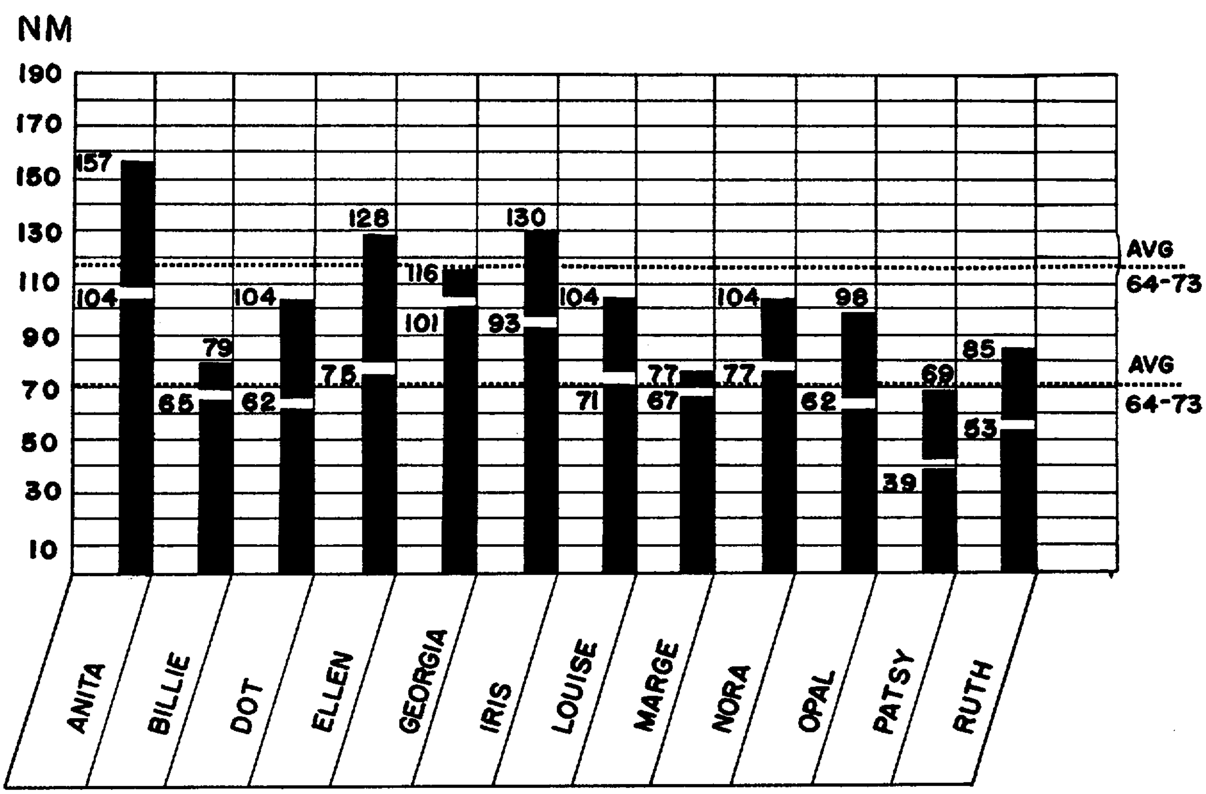


FIGURE 5-3. *1973 average vector and right angle errors of 24-hr forecasts.*

5. TROPICAL STORM AND DEPRESSION DATA

TROPICAL STORM WILDA

1200Z 1 JUL TO 1200Z 3 JUL

	BEST TRACK POSIT	WIND	WARNING POSIT	WIND	ERRORS DST	ERRORS WIND	24 HOUR FORECAST POSIT	WIND	ERRORS DST	ERRORS WIND	48 HOUR FORECAST POSIT	WIND	ERRORS DST	ERRORS WIND	72 HOUR FORECAST POSIT	WIND	ERRORS DST	ERRORS WIND
011200Z	19.6N 118.3E	45	19.3N 118.0E	30	25	-15	20.8N 115.8E	50	128	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
011800Z	20.3N 118.0E	50	20.2N 118.0E	40	6	-10	22.5N 117.0E	50	39	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
020000Z	20.9N 117.7E	55	20.7N 117.8E	50	13	-5	23.0N 116.8E	65	70	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
020600Z	21.5N 117.6E	55	21.5N 117.7E	55	6	0	24.3N 117.5E	45	47	-15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
021200Z	22.0N 117.7E	60	22.1N 117.7E	55	6	-5	25.1N 118.1E	40	32	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
021800Z	22.6N 117.7E	60	22.8N 117.7E	55	12	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
030000Z	23.6N 117.9E	60	23.4N 117.9E	50	12	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
030600Z	24.6N 118.3E	60	24.7N 118.2E	40	8	-20	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
031200Z	25.5N 118.5E	40	25.8N 118.5E	40	18	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

TROPICAL STORM CLARA

1800Z 12 JUL TO 0600Z 14 JUL

	BEST TRACK POSIT	WIND	WARNING POSIT	WIND	ERRORS DST	ERRORS WIND	24 HOUR FORECAST POSIT	WIND	ERRORS DST	ERRORS WIND	48 HOUR FORECAST POSIT	WIND	ERRORS DST	ERRORS WIND	72 HOUR FORECAST POSIT	WIND	ERRORS DST	ERRORS WIND
121800Z	28.1N 161.6E	35	27.6N 161.7E	30	30	-5	30.9N 159.4E	45	57	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
130000Z	28.7N 160.9E	40	28.3N 161.0E	30	24	-10	31.4N 159.2E	40	80	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
130600Z	29.3N 160.4E	50	29.2N 160.2E	45	12	-5	32.8N 159.2E	50	138	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
131200Z	29.8N 160.2E	45	30.6N 159.7E	45	54	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
131800Z	30.5N 160.4E	45	30.3N 160.2E	45	16	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
140000Z	31.0N 160.7E	40	30.9N 160.2E	45	26	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
140600Z	31.7N 161.6E	35	31.8N 161.0E	40	31	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

TROPICAL STORM FRAN

0000Z 29 JUL TO 0000Z 30 JUL

	BEST TRACK POSIT	WIND	WARNING POSIT	WIND	ERRORS DST	ERRORS WIND	24 HOUR FORECAST POSIT	WIND	ERRORS DST	ERRORS WIND	48 HOUR FORECAST POSIT	WIND	ERRORS DST	ERRORS WIND	72 HOUR FORECAST POSIT	WIND	ERRORS DST	ERRORS WIND
290000Z	18.9N 124.0E	35	19.3N 123.5E	25	37	-10	20.6N 120.0E	45	172	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
290600Z	19.2N 123.3E	40	19.3N 123.6E	35	18	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
291200Z	19.8N 122.5E	35	19.4N 122.7E	35	26	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
291800Z	20.8N 122.6E	30	19.4N 122.1E	35	88	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
300000Z	21.6N 122.9E	25	19.7N 122.1E	30	122	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

TROPICAL STORM HOPE

0600Z 9 AUG TO 0600Z 12 AUG

	BEST TRACK POSIT	WIND	WARNING POSIT	WIND	ERRORS DST	ERRORS WIND	24 HOUR FORECAST POSIT	WIND	ERRORS DST	ERRORS WIND	48 HOUR FORECAST POSIT	WIND	ERRORS DST	ERRORS WIND	72 HOUR FORECAST POSIT	WIND	ERRORS DST	ERRORS WIND
090600Z	26.1N 154.8E	30	26.4N 154.7E	30	19	0	30.0N 152.7E	40	122	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
091200Z	26.5N 153.8E	30	27.2N 154.2E	30	47	0	30.7N 153.4E	40	169	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
091800Z	27.0N 152.8E	35	27.2N 152.7E	30	13	-5	30.8N 149.7E	40	78	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
100000Z	27.7N 152.0E	40	27.5N 152.0E	40	12	0	30.2N 150.0E	45	12	5	33.0N 149.0E	45	158	15	--.- ---.-	--	--	--
100600Z	28.3N 151.4E	45	28.1N 151.1E	45	20	0	31.0N 148.8E	50	19	15	35.4N 147.0E	40	204	10	--.- ---.-	--	--	--
101200Z	29.0N 150.8E	40	28.7N 150.3E	50	32	10	32.3N 148.2E	50	60	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
101800Z	29.6N 150.3E	40	29.8N 150.2E	50	13	10	33.7N 149.1E	50	147	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
110000Z	30.3N 149.8E	40	30.4N 149.9E	40	8	0	34.2N 149.5E	35	212	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
110600Z	30.8N 149.1E	35	31.2N 149.2E	40	24	5	34.6N 148.4E	35	206	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
111200Z	31.3N 148.3E	30	31.2N 148.5E	40	12	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
111800Z	31.7N 147.4E	30	32.5N 148.1E	40	59	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
120000Z	32.2N 146.0E	30	33.5N 148.0E	40	127	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
120600Z	32.9N 144.8E	30	32.3N 144.8E	40	36	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

TROPICAL DEPRESSION 11

0000Z 13 AUG TO 0000Z 14 AUG

	BEST TRACK POSIT	WIND	WARNING POSIT	WIND	ERRORS DST	ERRORS WIND	24 HOUR FORECAST POSIT	WIND	ERRORS DST	ERRORS WIND	48 HOUR FORECAST POSIT	WIND	ERRORS DST	ERRORS WIND	72 HOUR FORECAST POSIT	WIND	ERRORS DST	ERRORS WIND
130000Z	30.0N 157.6E	30	30.0N 158.2E	30	31	0	31.4N 156.6E	45	148	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
130600Z	30.2N 156.8E	30	30.3N 157.8E	30	52	0	32.1N 156.0E	45	162	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
131200Z	30.3N 155.8E	30	30.2N 155.9E	30	8	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
131800Z	30.5N 154.8E	25	30.5N 154.4E	30	21	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
140000Z	30.8N 153.8E	25	30.7N 153.7E	30	8	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
140600Z	31.2N 153.0E	25	31.2N 152.6E	25	20	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

TROPICAL STORM JUAN

0600Z 18 AUG TO 1200Z 20 AUG

	BEST TRACK POSIT	WIND	WARNING POSIT	WIND	ERRORS DST	ERRORS WIND	24 HOUR FORECAST POSIT	WIND	ERRORS DST	ERRORS WIND	48 HOUR FORECAST POSIT	WIND	ERRORS DST	ERRORS WIND	72 HOUR FORECAST POSIT	WIND	ERRORS DST	ERRORS WIND
180600Z	19.4N 129.3E	30	19.2N 129.3E	30	12	0	19.8N 126.0E	45	141	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
181200Z	19.8N 128.0E	30	18.8N 129.3E	30	95	0	18.7N 125.9E	45	224	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
181800Z	20.7N 126.6E	30	18.6N 128.4E	30	161	0	18.8N 124.9E	40	221	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
190000Z	21.4N 125.5E	35	18.3N 127.2E	30	208	-5	18.9N 123.4E	40	195	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
190600Z	21.7N 124.5E	40	22.2N 125.0E	30	41	-10	24.8N 120.6E	35	219	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
191200Z	21.7N 123.5E	45	22.0N 123.5E	40	18	-5	23.6N 118.4E	35	148	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
191800Z	21.5N 122.2E	35	22.0N 122.0E	45	32	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
200000Z	21.5N 121.3E	30	20.7N 120.8E	45	55	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
200600Z	21.3N 119.4E	30	21.0N 119.4E	30	18	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
201200Z	21.3N 117.4E	30	21.1N 117.5E	15	13	-15	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

TROPICAL STORM KATE

0600Z 24 AUG TO 0000Z 26 AUG

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
240600Z	19.1N 111.7E	45	18.3N 111.7E	30	48	-15	17.8N 109.2E	40	149	-20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
241200Z	19.4N 111.3E	50	18.6N 111.3E	30	48	-20	18.8N 108.8E	25	117	-35	--.- ---.-	--	--	--	--.- ---.-	--	--	--
241800Z	19.7N 110.8E	55	18.9N 110.9E	30	48	-25	19.2N 108.7E	25	136	-35	--.- ---.-	--	--	--	--.- ---.-	--	--	--
250000Z	20.0N 109.5E	55	19.9N 109.9E	40	23	-15	20.8N 107.1E	45	56	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
250600Z	20.2N 108.5E	60	20.2N 108.9E	60	22	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
251200Z	20.4N 107.6E	60	20.5N 108.2E	60	34	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
251800Z	20.6N 106.8E	60	20.7N 107.0E	60	13	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
260000Z	20.8N 106.1E	40	21.0N 106.1E	35	12	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

TROPICAL DEPRESSION 14

1200Z 1 SEP TO 0600Z 2 SEP

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
011200Z	19.2N 106.8E	30	19.6N 107.5E	30	46	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
011800Z	19.2N 106.4E	30	19.4N 106.5E	30	13	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
020000Z	19.4N 105.9E	30	19.3N 105.9E	30	6	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
020600Z	19.7N 105.5E	25	19.7N 105.5E	30	0	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

TROPICAL STORM SARAH

0000Z 10 NOV TO 1800Z 10 NOV

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
100000Z	12.2N 111.6E	40	12.2N 111.5E	30	6	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
100600Z	12.2N 110.5E	50	12.1N 110.4E	50	8	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
101200Z	12.4N 109.5E	55	12.2N 109.4E	55	13	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
101800Z	12.5N 108.5E	35	12.2N 108.8E	35	25	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

TROPICAL STORM THELMA

0000Z 15 NOV TO 0600Z 18 NOV

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
150000Z	10.0N 111.7E	40	10.4N 110.0E	40	103	0	10.4N 104.8E	35	192	0	10.4N 100.1E	55	297	35	--.- ---.-	--	--	--
150600Z	10.0N 110.1E	50	9.9N 109.7E	55	24	5	9.6N 104.6E	50	159	20	15.9N 100.5E	65	230	45	10.9N 96.6E	60	284	35
151200Z	9.9N 108.8E	55	9.8N 108.7E	55	8	0	9.6N 103.9E	50	148	25	--.- ---.-	--	--	--	--.- ---.-	--	--	--
151800Z	9.8N 108.3E	45	9.7N 107.7E	55	36	10	9.6N 102.9E	55	165	30	--.- ---.-	--	--	--	--.- ---.-	--	--	--
160000Z	9.8N 108.0E	35	9.6N 108.3E	30	21	-5	9.6N 108.3E	30	189	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
160600Z	9.8N 107.3E	30	9.7N 107.3E	30	6	0	9.7N 104.0E	30	24	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
161200Z	9.8N 106.4E	25	9.8N 106.3E	30	6	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
161800Z	9.7N 105.7E	25	9.8N 105.4E	25	19	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
170000Z	9.7N 105.1E	20	9.0N 104.3E	25	63	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
170600Z	9.7N 104.4E	20	9.0N 105.3E	20	68	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
180600Z	10.4N 101.4E	25	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

TROPICAL STORM VERA

1200Z 19 NOV TO 0600Z 26 NOV

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
191200Z	10.0N 126.5E	30	10.6N 126.9E	30	43	0	12.0N 123.9E	35	40	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
191800Z	11.3N 125.5E	30	11.7N 125.9E	30	33	0	13.5N 122.5E	35	130	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
200000Z	11.5N 124.6E	30	12.1N 125.1E	25	46	-5	13.5N 122.7E	25	126	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
200600Z	11.4N 124.1E	30	11.8N 122.8E	30	80	0	12.7N 118.3E	40	230	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
201200Z	11.4N 123.6E	30	11.7N 123.3E	30	25	0	12.4N 119.7E	40	111	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
201800Z	11.4N 123.1E	30	11.5N 122.0E	30	65	0	11.6N 117.9E	40	158	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
210000Z	11.4N 122.6E	30	11.5N 121.0E	30	94	0	11.5N 116.9E	40	182	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
210600Z	11.4N 122.0E	30	11.5N 121.3E	30	41	0	11.5N 118.9E	35	38	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
211200Z	11.4N 121.3E	30	11.6N 122.5E	30	71	0	11.6N 121.4E	30	156	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
211800Z	11.5N 120.6E	30	11.6N 121.6E	30	59	0	11.6N 120.4E	30	136	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
220000Z	11.6N 120.0E	35	11.6N 120.3E	30	18	-5	11.6N 117.3E	40	81	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
220600Z	11.9N 119.4E	35	11.6N 119.6E	30	21	-5	11.6N 116.4E	40	109	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
221200Z	12.2N 118.8E	40	12.6N 119.4E	40	42	0	13.0N 117.0E	55	40	5	13.4N 114.6E	55	149	5	13.6N 111.4E	55	184	25
221800Z	12.6N 118.3E	40	12.8N 118.6E	40	31	0	13.2N 116.3E	50	55	0	13.4N 113.6E	45	155	0	13.5N 110.5E	40	219	15
230000Z	12.9N 117.7E	45	13.1N 117.3E	40	26	-5	13.8N 114.2E	50	60	0	14.1N 110.9E	45	159	0	14.1N 107.7E	20	304	-5
230600Z	13.2N 117.3E	45	13.4N 116.5E	40	48	-5	13.9N 113.4E	40	100	-10	14.1N 110.1E	35	191	0	--.- ---.-	--	--	--
231200Z	13.6N 116.7E	50	13.4N 116.6E	40	13	-10	13.8N 114.3E	40	120	-10	14.1N 111.0E	35	150	5	--.- ---.-	--	--	--
231800Z	14.1N 116.1E	50	13.6N 116.3E	40	21	-10	14.6N 113.8E	35	88	-10	14.8N 111.5E	35	128	10	--.- ---.-	--	--	--
240000Z	14.6N 115.3E	50	14.5N 115.4E	45	8	-5	15.6N 112.2E	55	43	10	15.7N 109.3E	45	174	20	--.- ---.-	--	--	--
240600Z	15.2N 114.5E	50	15.2N 114.2E	50	17	0	16.9N 110.4E	60	118	25	17.3N 107.2E	50	274	30	--.- ---.-	--	--	--
241200Z	15.7N 113.6E	50	15.6N 113.3E	50	18	0	16.9N 110.1E	60	116	30	--.- ---.-	--	--	--	--.- ---.-	--	--	--
241800Z	15.9N 113.1E	45	16.2N 113.3E	50	21	5	18.4N 110.4E	60	124	35	--.- ---.-	--	--	--	--.- ---.-	--	--	--
250000Z	16.2N 112.6E	45	16.8N 112.5E	55	36	10	18.8N 109.6E	40	162	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
250600Z	16.4N 112.4E	35	16.8N 111.7E	45	47	10	18.7N 108.1E	30	231	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
251200Z	16.6N 112.1E	30	17.3N 111.5E	45	54	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
251800Z	16.9N 111.9E	25	17.5N 110.6E	30	82	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
260000Z	17.2N 111.9E	25	17.2N 111.8E	30	6	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
260600Z	17.6N 112.0E	20	17.4N 111.9E	25	13	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

6. TYPHOON DATA

TYPHOON ANITA

1800Z 5 JUL TO 1800Z 8 JUL

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
051800Z	11.1N 112.6E	30	11.5N 112.0E	30	42	0	12.5N 109.7E	35	128	-25	--	--	--	--	--	--	--	--
060000Z	11.6N 112.4E	35	11.7N 111.4E	30	59	-5	12.8N 109.2E	30	150	-30	--	--	--	--	--	--	--	--
060600Z	12.2N 112.3E	50	12.5N 112.5E	50	21	0	13.9N 110.8E	60	104	-5	15.7N 108.3E	55	186	-15	--	--	--	--
061200Z	12.8N 112.1E	55	12.5N 112.2E	50	19	-5	13.3N 110.4E	60	206	-5	14.5N 108.4E	35	292	-25	--	--	--	--
061800Z	13.4N 111.7E	60	13.3N 111.5E	55	13	-5	14.7N 109.7E	65	168	0	16.5N 107.8E	50	244	10	--	--	--	--
070000Z	14.5N 111.1E	60	14.3N 111.0E	60	13	0	16.8N 109.5E	70	129	5	--	--	--	--	--	--	--	--
070600Z	15.6N 110.4E	65	15.8N 110.1E	70	21	5	20.7N 108.5E	45	182	-25	--	--	--	--	--	--	--	--
071200Z	16.7N 109.8E	65	16.5N 109.9E	75	13	10	20.3N 108.8E	45	194	-25	--	--	--	--	--	--	--	--
071800Z	17.3N 108.6E	65	17.3N 109.0E	75	23	10	21.0N 106.4E	50	156	10	--	--	--	--	--	--	--	--
080000Z	17.6N 107.4E	65	17.7N 107.7E	65	18	0	--	--	--	--	--	--	--	--	--	--	--	--
080600Z	18.3N 106.5E	70	18.3N 106.2E	65	17	-5	--	--	--	--	--	--	--	--	--	--	--	--
081200Z	18.7N 105.8E	70	18.5N 106.0E	65	16	-5	--	--	--	--	--	--	--	--	--	--	--	--
081800Z	19.1N 104.5E	40	19.2N 104.5E	50	6	10	--	--	--	--	--	--	--	--	--	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	22NM	157NM	240NM	0NM	22NM	157NM	240NM	0NM
AVERAGE RIGHT ANGLE ERROR	13NM	104NM	96NM	0NM	13NM	104NM	96NM	0NM
AVERAGE MAGNITUDE OF WIND ERROR	5KTS	14KTS	20KTS	0KTS	5KTS	14KTS	20KTS	0KTS
AVERAGE BIAS OF WIND ERROR	1KTS	-11KTS	-13KTS	0KTS	1KTS	-11KTS	-13KTS	0KTS
NUMBER OF FORECASTS	13	9	3	0	13	9	3	0

TYPHOON BILLIE

0600Z 13 JUL TO 1800Z 19 JUL

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
130600Z	16.7N 125.9E	40	16.8N 125.0E	45	52	5	19.5N 122.1E	70	193	0	22.6N 119.4E	80	332	-50	25.9N 117.3E	35	450	-80
131200Z	17.3N 125.6E	45	17.2N 125.2E	50	24	5	19.5N 123.3E	65	124	-20	21.8N 121.2E	80	229	-40	24.4N 119.4E	55	348	-65
131800Z	17.9N 125.4E	50	17.7N 125.1E	55	21	5	20.0N 123.6E	70	103	-30	22.8N 121.5E	80	204	-25	25.4N 119.5E	45	325	-75
140000Z	18.5N 125.3E	60	18.5N 125.1E	65	11	5	21.2N 124.2E	80	64	-35	24.1N 123.3E	90	104	-10	27.2N 122.6E	90	140	-25
140600Z	19.1N 125.5E	70	19.2N 125.2E	70	18	0	22.0N 124.9E	80	33	-50	24.8N 124.1E	90	77	-25	28.9N 123.3E	90	107	-20
141200Z	19.7N 125.5E	85	19.5N 125.4E	75	13	-10	21.8N 124.9E	90	37	-30	24.4N 123.8E	95	125	-35	27.3N 122.8E	95	175	-10
141800Z	20.3N 125.4E	100	20.2N 125.4E	80	6	-20	23.2N 124.9E	95	18	-10	26.0N 124.0E	95	83	-25	28.7N 123.6E	95	130	-5
150000Z	20.9N 125.3E	115	21.1N 125.3E	110	12	-5	24.0N 124.6E	135	33	35	26.7N 123.8E	130	92	15	29.5N 122.7E	115	134	30
150600Z	21.6N 125.3E	130	21.5N 125.3E	120	6	-10	24.1N 124.6E	135	57	20	26.6N 123.9E	125	126	15	29.8N 123.3E	110	213	35
151200Z	22.3N 125.3E	120	22.6N 125.2E	110	19	-10	25.4N 124.1E	100	87	-20	27.8N 122.7E	85	164	-20	30.3N 121.7E	60	202	-5
151800Z	23.1N 125.2E	105	23.2N 125.0E	110	13	5	26.0N 123.7E	100	98	-20	28.9N 122.2E	80	184	-20	31.9N 121.6E	55	137	0
160000Z	23.9N 125.2E	100	23.8N 125.2E	100	6	0	26.6N 124.9E	95	62	-20	29.5N 124.2E	85	125	0	32.8N 123.8E	75	164	25
160600Z	24.6N 125.5E	115	24.6N 125.2E	105	16	-10	27.8N 124.7E	95	44	-15	30.8N 124.3E	85	114	10	--	--	--	--
161200Z	25.6N 125.7E	120	25.5N 125.7E	100	6	-20	28.8N 126.2E	90	39	-15	32.1N 126.0E	80	156	15	--	--	--	--
161800Z	26.6N 125.4E	120	26.8N 125.6E	100	16	-20	30.5N 125.2E	90	21	-10	33.7N 125.7E	80	165	25	--	--	--	--
170000Z	27.6N 125.2E	115	27.8N 125.5E	110	20	-5	31.9N 124.5E	80	31	-5	36.5N 123.9E	55	141	5	--	--	--	--
170600Z	28.3N 125.3E	110	28.5N 124.9E	105	24	-5	31.8N 123.5E	75	57	0	--	--	--	--	--	--	--	--
171200Z	29.0N 125.5E	105	29.2N 125.2E	95	20	-10	32.5N 125.0E	70	101	5	--	--	--	--	--	--	--	--
171800Z	30.2N 125.4E	100	30.2N 125.3E	90	5	-10	33.8N 125.5E	65	155	10	--	--	--	--	--	--	--	--
180000Z	31.5N 124.9E	85	31.6N 125.4E	80	26	-5	36.3N 126.2E	55	216	5	--	--	--	--	--	--	--	--
180600Z	32.7N 124.1E	75	32.9N 124.3E	65	16	-10	--	--	--	--	--	--	--	--	--	--	--	--
181200Z	33.4N 123.3E	65	34.5N 123.5E	60	66	-5	--	--	--	--	--	--	--	--	--	--	--	--
181800Z	34.1N 122.4E	55	34.2N 122.1E	50	16	-5	--	--	--	--	--	--	--	--	--	--	--	--
190000Z	35.1N 122.0E	50	34.9N 120.8E	50	60	0	--	--	--	--	--	--	--	--	--	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	20NM	79NM	151NM	210NM	20NM	79NM	151NM	210NM
AVERAGE RIGHT ANGLE ERROR	17NM	65NM	123NM	171NM	17NM	65NM	123NM	171NM
AVERAGE MAGNITUDE OF WIND ERROR	8KTS	18KTS	20KTS	31KTS	8KTS	18KTS	20KTS	31KTS
AVERAGE BIAS OF WIND ERROR	-6KTS	-10KTS	-10KTS	-16KTS	-6KTS	-10KTS	-10KTS	-16KTS
NUMBER OF FORECASTS	24	20	16	12	24	20	16	12

TYPHOON DOT

0600Z 14 JUL TO 0600Z 20 JUL

	BEST TRACK POSIT	WIND	WARNING POSIT	WIND	ERRORS DST	WIND	24 HOUR FORECAST POSIT	WIND	ERRORS DST	WIND	48 HOUR FORECAST POSIT	WIND	ERRORS DST	WIND	72 HOUR FORECAST POSIT	WIND	ERRORS DST	WIND
140600Z	17.2N 114.6E	35	17.3N 112.8E	30	103	-5	19.3N 111.8E	45	120	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
141200Z	17.6N 114.6E	40	17.5N 114.6E	30	6	-10	19.4N 113.2E	45	56	-15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
141800Z	17.7N 114.1E	45	18.1N 114.2E	30	25	-15	20.6N 112.4E	45	116	-20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
150000Z	17.6N 113.6E	45	17.5N 113.8E	40	13	-5	18.2N 112.7E	50	82	-25	20.1N 110.6E	55	267	-10	--.- ---.-	--	--	--
150600Z	18.1N 113.5E	55	18.1N 113.4E	50	6	-5	19.7N 112.5E	60	76	-20	21.7N 111.2E	45	245	5	--.- ---.-	--	--	--
151200Z	18.5N 113.5E	60	18.4N 113.5E	60	6	0	20.3N 112.6E	65	89	-20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
151800Z	18.9N 113.4E	65	18.9N 113.3E	60	6	-5	20.9N 112.4E	65	119	-20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
160000Z	19.4N 113.4E	75	19.2N 113.3E	70	13	-5	20.7N 112.5E	80	171	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
160600Z	20.3N 113.7E	80	20.4N 113.5E	75	13	-5	23.0N 113.3E	50	108	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
161200Z	21.0N 114.0E	85	21.0N 113.5E	80	28	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
161800Z	21.8N 114.3E	85	21.8N 114.2E	75	6	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
170000Z	22.7N 114.7E	65	22.6N 114.4E	50	18	-15	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
170600Z	23.5N 115.2E	40	23.7N 115.1E	35	13	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
190000Z	27.8N 126.3E	30	28.2N 127.8E	30	83	0	32.4N 132.3E	45	287	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
190600Z	28.4N 127.1E	30	28.8N 126.7E	30	32	0	32.8N 127.3E	45	133	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
191200Z	29.6N 127.3E	30	29.8N 127.0E	30	20	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
191800Z	31.0N 127.2E	30	30.0N 127.0E	40	61	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
200000Z	32.6N 126.6E	25	32.6N 127.1E	35	25	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
200600Z	34.8N 126.1E	25	34.7N 126.2E	25	8	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS WARNING	24-HR	48-HR	72-HR	ALL FORECASTS WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	25NM	123NM	256NM	0NM	25NM	123NM	256NM	0NM
AVERAGE RIGHT ANGLE ERROR	15NM	79NM	156NM	0NM	15NM	79NM	156NM	0NM
AVERAGE MAGNITUDE OF WIND ERROR	6KTS	18KTS	8KTS	0KTS	6KTS	18KTS	8KTS	0KTS
AVERAGE BIAS OF WIND ERROR	-4KTS	-6KTS	-3KTS	0KTS	-4KTS	-6KTS	-3KTS	0KTS
NUMBER OF FORECASTS	19	11	2	0	19	11	2	0

TYPHOON ELLEN

1800Z 17 JUL TO 0600Z 29 JUL

	BEST TRACK POSIT	WIND	WARNING POSIT	WIND	ERRORS DST	WIND	24 HOUR FORECAST POSIT	WIND	ERRORS DST	WIND	48 HOUR FORECAST POSIT	WIND	ERRORS DST	WIND	72 HOUR FORECAST POSIT	WIND	ERRORS DST	WIND
171800Z	21.7N 139.1E	50	21.1N 139.1E	30	36	-20	22.2N 137.9E	40	78	-45	--.- ---.-	--	--	--	--.- ---.-	--	--	--
180000Z	22.3N 138.8E	65	22.0N 138.8E	55	18	-10	26.1N 137.7E	75	99	-25	29.2N 136.9E	80	70	15	32.3N 136.4E	80	8	30
180600Z	22.5N 138.4E	70	22.7N 138.0E	65	25	-5	25.7N 136.2E	75	113	-30	28.6N 135.9E	75	188	20	31.4N 134.5E	75	103	30
181200Z	22.8N 138.3E	75	22.8N 138.1E	70	11	-5	23.4N 137.5E	80	215	-10	25.2N 136.1E	75	386	20	--.- ---.-	--	--	--
181800Z	23.5N 138.1E	85	23.0N 137.9E	70	32	-15	24.3N 136.8E	80	248	0	26.0N 135.7E	75	356	25	--.- ---.-	--	--	--
190000Z	24.5N 138.2E	100	24.4N 138.0E	100	12	0	27.8N 137.7E	110	105	45	31.5N 136.1E	100	46	50	--.- ---.-	--	--	--
190600Z	25.7N 138.3E	105	26.0N 137.9E	100	28	-5	30.3N 136.8E	95	52	40	34.7N 135.3E	65	157	20	--.- ---.-	--	--	--
191200Z	26.9N 138.4E	90	26.7N 138.3E	95	13	5	30.8N 137.5E	90	52	35	--.- ---.-	--	--	--	--.- ---.-	--	--	--
191800Z	28.2N 138.4E	80	28.3N 138.4E	95	6	15	32.4N 137.5E	90	50	40	--.- ---.-	--	--	--	--.- ---.-	--	--	--
200000Z	29.5N 138.2E	65	29.3N 138.3E	75	13	10	33.5N 137.9E	60	105	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
200600Z	30.7N 137.7E	55	30.4N 137.8E	60	13	5	36.8N 138.0E	35	287	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
201200Z	31.6N 137.1E	55	31.7N 137.7E	45	31	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
201800Z	31.9N 136.7E	50	32.4N 136.4E	45	33	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
210000Z	32.2N 136.5E	50	32.6N 136.4E	40	24	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
210600Z	32.2N 136.3E	45	32.0N 136.5E	20	16	-25	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
230600Z	30.8N 132.1E	30	30.9N 131.8E	30	17	0	33.8N 127.8E	35	216	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
231200Z	30.3N 131.3E	30	30.4N 131.1E	30	12	0	32.8N 127.9E	35	143	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
231800Z	30.1N 130.9E	30	30.1N 130.8E	30	5	0	30.9N 126.9E	35	135	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
240000Z	30.3N 130.4E	30	30.2N 130.3E	30	8	0	30.2N 128.0E	25	121	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
240600Z	30.6N 129.8E	30	30.6N 129.4E	30	21	0	32.4N 127.0E	25	147	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
241200Z	30.9N 129.6E	30	30.8N 129.5E	30	8	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
241800Z	31.3N 129.5E	30	31.4N 129.4E	30	8	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
250000Z	31.7N 129.6E	25	32.0N 129.5E	25	19	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
250600Z	32.2N 129.9E	20	32.3N 129.5E	25	21	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
280600Z	32.5N 137.1E	45	32.6N 137.2E	40	8	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
281200Z	33.3N 137.5E	35	33.3N 137.4E	40	5	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
281800Z	34.1N 137.5E	25	34.0N 137.4E	40	8	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
290000Z	34.6N 137.2E	25	34.8N 137.5E	30	19	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS WARNING	24-HR	48-HR	72-HR	ALL FORECASTS WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	17NM	135NM	201NM	55NM	17NM	135NM	201NM	55NM
AVERAGE RIGHT ANGLE ERROR	13NM	90NM	116NM	53NM	13NM	90NM	116NM	53NM
AVERAGE MAGNITUDE OF WIND ERROR	6KTS	19KTS	25KTS	30KTS	6KTS	19KTS	25KTS	30KTS
AVERAGE BIAS OF WIND ERROR	-2KTS	4KTS	25KTS	30KTS	-2KTS	4KTS	25KTS	30KTS
NUMBER OF FORECASTS	28	16	6	2	28	16	6	2

TYPHOON GEORGIA

0600Z 09 AUG TO 1800Z 12 AUG

	BEST TRACK		WARNING				24 HOUR FORECAST				48 HOUR FORECAST				72 HOUR FORECAST			
					ERRORS				ERRORS				ERRORS				ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
090600Z	19.9N 116.6E	40	19.8N 116.6E	35	18	-5	19.6N 113.0E	60	25	-5	20.7N 109.5E	50	145	-30	22.8N 106.3E	25	279	-25
091200Z	19.7N 115.7E	50	19.9N 115.9E	50	16	0	20.4N 112.4E	60	68	-10	21.9N 109.0E	40	196	-25	--	--	--	--
091800Z	19.5N 114.8E	55	19.5N 114.9E	60	6	5	19.7N 111.3E	55	62	-15	21.0N 107.7E	35	215	-30	--	--	--	--
100000Z	19.5N 114.0E	60	19.3N 113.8E	60	16	0	19.1N 110.2E	55	96	-15	19.8N 106.1E	40	289	-20	--	--	--	--
100600Z	19.4N 113.4E	65	19.5N 113.4E	65	6	0	19.7N 109.8E	45	104	-25	20.6N 106.3E	40	264	-10	--	--	--	--
101200Z	19.3N 112.7E	70	19.5N 112.2E	65	31	-5	19.8N 108.7E	40	158	-25	20.9N 105.3E	25	310	-10	--	--	--	--
101800Z	19.1N 112.2E	70	18.9N 111.9E	65	21	-5	18.9N 108.1E	40	197	-25	20.3N 104.5E	25	369	-5	--	--	--	--
110000Z	19.1N 111.9E	70	19.1N 111.4E	65	28	-5	19.6N 108.4E	35	166	-25	--	--	--	--	--	--	--	--
110600Z	19.3N 111.6E	70	19.1N 111.5E	65	13	-5	19.5N 109.4E	45	131	-5	--	--	--	--	--	--	--	--
111200Z	19.6N 111.5E	65	19.1N 111.1E	65	37	0	19.6N 109.1E	40	157	5	--	--	--	--	--	--	--	--
111800Z	20.0N 111.4E	65	19.7N 111.5E	65	19	0	21.1N 110.2E	40	88	10	--	--	--	--	--	--	--	--
120000Z	20.5N 111.2E	60	20.5N 111.5E	65	17	5	--	--	--	--	--	--	--	--	--	--	--	--
120600Z	21.3N 111.0E	50	21.1N 111.1E	65	6	15	--	--	--	--	--	--	--	--	--	--	--	--
121200Z	21.7N 110.8E	35	21.8N 111.1E	45	18	10	--	--	--	--	--	--	--	--	--	--	--	--
121800Z	22.5N 110.7E	30	22.5N 110.7E	40	0	10	--	--	--	--	--	--	--	--	--	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	17NM	114NM	255NM	279NM	17NM	114NM	255NM	279NM
AVERAGE RIGHT ANGLE ERROR	12NM	96NM	225NM	243NM	12NM	96NM	225NM	243NM
AVERAGE MAGNITUDE OF WIND ERROR	5KTS	15KTS	17KTS	25KTS	5KTS	15KTS	17KTS	25KTS
AVERAGE BIAS OF WIND ERROR	1KTS	-12KTS	-17KTS	-25KTS	1KTS	-12KTS	-17KTS	-25KTS
NUMBER OF FORECASTS	15	11	7	1	15	11	7	1

TYPHOON IRIS

0600Z 10 AUG TO 1200Z 17 AUG

	BEST TRACK		WARNING				24 HOUR FORECAST				48 HOUR FORECAST				72 HOUR FORECAST			
					ERRORS				ERRORS				ERRORS				ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
100600Z	21.3N 130.9E	35	21.6N 130.8E	30	19	-5	25.3N 130.1E	50	126	-5	--	--	--	--	--	--	--	--
101200Z	22.2N 131.0E	40	21.8N 130.8E	40	26	0	--	--	--	--	26.1N 127.2E	80	285	5	27.8N 123.3E	80	545	-5
101800Z	22.8N 131.1E	45	23.0N 131.0E	50	13	5	26.2N 129.3E	70	202	10	28.3N 125.5E	85	448	10	29.6N 121.3E	85	678	0
110000Z	23.2N 130.8E	55	23.4N 130.7E	50	13	-5	26.1N 128.9E	75	207	10	28.3N 125.8E	85	436	5	29.6N 122.0E	85	613	5
110600Z	23.4N 131.1E	55	23.8N 130.6E	50	36	-5	26.5N 128.7E	75	238	5	29.1N 125.9E	80	472	-5	31.3N 122.7E	75	590	0
111800Z	23.1N 130.8E	60	23.2N 130.8E	50	6	-10	24.3N 130.1E	70	105	-5	26.7N 127.8E	80	294	-5	28.9N 124.8E	80	305	15
120000Z	23.1N 130.8E	65	23.6N 130.6E	55	32	-10	24.9N 129.3E	75	162	-5	26.7N 127.1E	80	297	0	28.8N 124.5E	80	261	10
120600Z	23.0N 130.8E	70	22.5N 131.1E	60	34	-10	23.4N 131.3E	75	38	-10	24.4N 128.5E	80	183	5	25.5N 125.2E	80	275	5
121200Z	22.9N 131.1E	75	23.0N 130.9E	70	13	-5	23.8N 130.2E	90	115	5	25.5N 127.7E	95	187	35	27.3N 124.8E	100	198	25
121800Z	23.1N 131.5E	75	23.3N 131.5E	70	12	-5	24.9N 130.6E	90	111	5	26.8N 128.3E	95	111	30	28.8N 125.5E	100	194	25
130000Z	23.3N 131.7E	80	23.4N 131.6E	75	8	-5	24.9N 130.6E	90	87	10	26.7N 129.0E	95	86	25	29.4N 127.2E	95	78	25
130600Z	23.4N 132.0E	85	23.2N 131.6E	85	25	0	24.6N 130.9E	105	64	30	26.7N 129.2E	110	127	35	29.3N 127.4E	100	138	35
131200Z	23.6N 132.3E	85	23.5N 132.2E	85	8	0	25.1N 132.4E	95	96	25	27.4N 131.2E	95	216	30	29.7N 129.0E	95	257	35
131800Z	24.2N 132.5E	85	24.0N 132.2E	85	20	0	26.0N 132.2E	90	128	25	28.6N 131.8E	85	265	10	31.3N 130.7E	80	335	30
140000Z	24.8N 132.7E	80	24.8N 132.2E	85	0	5	27.4N 131.8E	90	134	20	30.2N 131.2E	80	263	10	33.3N 130.2E	45	265	0
140600Z	25.4N 131.7E	75	25.4N 132.1E	85	22	10	28.0N 131.7E	70	160	-5	30.8N 131.2E	65	287	0	33.7N 130.3E	45	293	10
141200Z	26.2N 131.1E	70	26.2N 131.7E	80	32	10	28.9N 130.9E	70	169	-5	32.1N 131.1E	60	304	0	35.5N 131.2E	35	305	5
141800Z	27.3N 130.3E	65	27.6N 130.6E	80	24	15	32.4N 130.2E	60	229	-15	36.7N 131.5E	40	367	-10	--	--	--	--
150000Z	28.1N 129.4E	70	28.4N 129.9E	70	32	0	33.2N 128.0E	55	198	-15	38.5N 130.6E	35	313	-10	--	--	--	--
150600Z	28.8N 128.8E	75	28.7N 128.6E	65	12	-10	31.9N 125.6E	50	56	-15	37.4N 124.2E	40	95	5	--	--	--	--
151200Z	29.3N 127.7E	75	29.2N 128.2E	65	27	-10	31.9N 125.6E	55	39	-5	36.1N 124.5E	45	238	5	--	--	--	--
151800Z	29.8N 126.9E	75	29.7N 127.2E	65	17	-10	32.5N 124.1E	55	91	5	--	--	--	--	--	--	--	--
160000Z	30.3N 126.1E	70	30.2N 126.1E	60	6	-10	33.6N 123.0E	45	156	0	--	--	--	--	--	--	--	--
160600Z	31.0N 125.6E	65	31.3N 125.0E	55	18	-10	35.3N 123.6E	40	173	5	--	--	--	--	--	--	--	--
161200Z	32.4N 125.1E	60	31.9N 124.4E	55	46	-5	35.6N 122.0E	40	342	10	--	--	--	--	--	--	--	--
161800Z	33.9N 124.8E	50	33.3N 125.5E	55	50	5	--	--	--	--	--	--	--	--	--	--	--	--
170000Z	35.3N 125.4E	45	35.0N 126.1E	55	39	10	--	--	--	--	--	--	--	--	--	--	--	--
170600Z	37.3N 126.2E	35	36.8N 126.0E	50	31	15	--	--	--	--	--	--	--	--	--	--	--	--
171200Z	39.3N 127.5E	30	38.2N 126.5E	35	81	5	--	--	--	--	--	--	--	--	--	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	24NM	141NM	265NM	328NM	24NM	141NM	265NM	328NM
AVERAGE RIGHT ANGLE ERROR	16NM	97NM	153NM	157NM	16NM	97NM	153NM	157NM
AVERAGE MAGNITUDE OF WIND ERROR	7KTS	10KTS	11KTS	14KTS	7KTS	10KTS	11KTS	14KTS
AVERAGE BIAS OF WIND ERROR	-1KTS	3KTS	8KTS	14KTS	-1KTS	3KTS	8KTS	14KTS
NUMBER OF FORECASTS	29	25	21	17	29	25	21	17

TYPHOON LOUISE

00004 3 SEP TO 0600Z 7 SEP

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS		
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	
030000Z	18.9N 121.3E	60	18.3N 121.0E	55	25	-5	21.9N 118.4E	75	176	30	24.9N 117.7E	35	310	30	--.- ---.-	--	--	--	1
030600Z	19.2N 120.7E	50	19.8N 120.3E	55	42	5	22.3N 118.3E	75	181	20	25.4N 117.8E	35	363	35	--.- ---.-	--	--	--	2
031200Z	18.0N 120.2E	40	20.2N 119.6E	55	79	15	23.0N 117.9E	75	209	25	26.2N 118.0E	30	438	45	--.- ---.-	--	--	--	3
031800Z	18.9N 119.8E	40	18.9N 119.8E	55	0	15	18.6N 117.8E	65	74	10	20.6N 115.5E	75	130	0	23.4N 114.7E	35	334	-25	4
040000Z	19.1N 119.4E	45	19.1N 119.0E	50	23	5	19.6N 116.6E	60	29	-5	20.6N 114.0E	65	102	-5	22.4N 112.1E	35	234	-25	5
040600Z	19.3N 118.7E	50	19.4N 118.6E	45	8	-5	20.2N 116.4E	60	81	-10	21.5N 113.9E	65	157	0	23.4N 111.8E	30	312	-20	6
041200Z	19.5N 118.1E	50	19.8N 118.2E	50	19	0	21.5N 116.3E	65	159	-10	23.4N 114.2E	45	265	15	--.- ---.-	--	--	--	7
041800Z	19.7N 117.2E	55	19.9N 117.2E	50	12	-5	21.1N 114.2E	70	88	-5	22.6N 111.7E	45	167	15	--.- ---.-	--	--	--	8
050000Z	19.9N 116.2E	65	20.4N 116.1E	60	30	-5	22.5N 112.6E	40	150	-30	--.- ---.-	--	--	--	--.- ---.-	--	--	--	9
050600Z	19.9N 115.0E	70	19.9N 114.9E	70	6	0	20.4N 111.2E	85	13	20	21.8N 108.1E	45	90	-5	--.- ---.-	--	--	--	10
051200Z	19.8N 114.1E	75	19.9N 114.2E	80	8	5	20.2N 110.6E	85	32	25	--.- ---.-	--	--	--	--.- ---.-	--	--	--	11
051800Z	19.9N 113.3E	75	19.9N 113.2E	80	6	5	20.4N 109.9E	75	45	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--	12
060000Z	20.0N 112.3E	70	20.1N 112.4E	80	8	10	21.2N 109.3E	50	64	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	13
060600Z	20.3N 111.4E	65	20.2N 111.9E	70	29	5	20.7N 109.8E	50	162	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	14
061200Z	20.7N 110.4E	60	20.4N 110.6E	65	21	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--	
061800Z	20.9N 109.3E	60	20.7N 109.8E	60	30	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--	
070000Z	20.9N 108.2E	60	20.9N 108.4E	55	11	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--	
070600Z	20.8N 106.9E	50	21.2N 107.1E	55	26	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--	

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	21NM	104NM	225NM	294NM	21NM	104NM	225NM	294NM
AVERAGE RIGHT ANGLE ERROR	14NM	71NM	180NM	173NM	14NM	71NM	180NM	173NM
AVERAGE MAGNITUDE OF WIND ERROR	6KTS	16KTS	17KTS	23KTS	6KTS	16KTS	17KTS	23KTS
AVERAGE BIAS OF WIND ERROR	3KTS	6KTS	-17KTS	-23KTS	3KTS	6KTS	-17KTS	-23KTS
NUMBER OF FORECASTS	18	14	9	3	18	14	9	3

TYPHOON MARGE

00004 12 SEP TO 1800Z 14 SEP

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS		
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	
120000Z	17.3N 119.8E	30	17.9N 119.4E	25	29	-5	17.2N 115.1E	45	87	-15	--.- ---.-	--	--	--	--.- ---.-	--	--	--	1
120600Z	17.7N 118.4E	35	17.7N 118.3E	35	6	0	18.7N 114.3E	55	40	-20	19.8N 111.6E	65	159	25	--.- ---.-	--	--	--	2
121200Z	18.2N 117.1E	45	18.3N 117.0E	45	8	0	21.2N 112.4E	70	137	-10	24.2N 109.7E	25	300	-25	--.- ---.-	--	--	--	3
121800Z	18.4N 115.9E	50	18.5N 115.9E	55	6	5	20.0N 111.9E	70	78	-10	22.0N 109.2E	40	212	-15	--.- ---.-	--	--	--	4
130000Z	18.6N 114.7F	60	18.8N 114.7E	60	12	0	20.8N 110.8E	70	111	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	5
130600Z	18.8N 113.6E	75	18.9N 113.5E	65	8	-10	20.3N 109.4E	50	63	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	6
131200Z	18.9N 112.4E	80	19.0N 112.4E	85	6	5	20.6N 108.3E	60	71	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	7
131800Z	19.0N 111.0E	80	19.0N 111.1E	85	6	5	19.9N 106.8E	60	31	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	8
140000Z	19.2N 109.8E	60	19.4N 109.5E	65	21	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--	
140600Z	19.4N 108.8E	40	19.3N 108.2E	55	34	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--	
141200Z	19.5N 107.8E	50	19.6N 107.0E	55	45	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--	
141800Z	19.7N 106.3E	55	20.0N 105.8E	55	33	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--	

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	18NM	77NM	224NM	0NM	18NM	77NM	224NM	0NM
AVERAGE RIGHT ANGLE ERROR	10NM	67NM	166NM	0NM	10NM	67NM	166NM	0NM
AVERAGE MAGNITUDE OF WIND ERROR	5KTS	11KTS	22KTS	0KTS	5KTS	11KTS	22KTS	0KTS
AVERAGE BIAS OF WIND ERROR	2KTS	-3KTS	-5KTS	0KTS	2KTS	-3KTS	-5KTS	0KTS
NUMBER OF FORECASTS	12	8	3	0	12	8	3	0

TYPHOON NURA

0000Z 2 OCT TO 0600Z 10 OCT

	BEST TRACK POSIT	BEST TRACK WIND	WARNING POSIT	WARNING WIND	WARNING ERRORS DST	WARNING ERRORS WIND	24 HOUR FORECAST POSIT	24 HOUR FORECAST WIND	24 HR ERRORS DST	24 HR ERRORS WIND	48 HOUR FORECAST POSIT	48 HOUR FORECAST WIND	48 HR ERRORS DST	48 HR ERRORS WIND	72 HOUR FORECAST POSIT	72 HOUR FORECAST WIND	72 HR ERRORS DST	72 HR ERRORS WIND
020000Z	11.4N 135.3E	30	11.4N 135.3E	30	0	0	12.4N 132.7E	50	99	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
020600Z	11.4N 134.6E	30	11.7N 134.7E	30	19	0	13.1N 131.5E	50	143	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
021200Z	11.4N 133.8E	40	11.6N 133.8E	45	12	5	12.6N 129.8E	70	181	10	13.7N 126.5E	85	321	10	14.7N 123.4E	100	354	-25
021800Z	11.1N 133.1E	45	11.5N 133.0E	50	25	5	12.0N 129.3E	80	166	10	12.7N 126.1E	90	303	10	13.4N 123.0E	65	331	-40
030000Z	11.0N 133.6E	50	11.3N 133.5E	50	19	0	11.2N 131.5E	70	17	0	11.3N 127.6E	85	211	-5	11.8N 124.2E	65	267	-95
030600Z	11.6N 133.4E	55	11.3N 133.5E	50	19	-5	11.3N 131.4E	70	46	0	11.5N 127.6E	85	192	-25	11.8N 124.2E	65	224	-85
031200Z	11.3N 132.6E	60	11.3N 133.1E	55	29	-5	11.3N 130.9E	75	97	0	11.5N 127.7E	90	192	-35	11.7N 124.5E	80	196	-60
031800Z	10.9N 131.9E	70	11.3N 132.1E	55	27	-15	11.5N 129.0E	85	161	5	11.7N 125.3E	95	255	-50	12.1N 121.7E	75	258	-65
040000Z	11.4N 131.7E	70	11.1N 131.2E	75	34	5	11.4N 127.4E	100	227	10	11.9N 123.2E	70	310	-90	12.7N 119.0E	60	347	-60
040600Z	11.9N 131.9E	70	11.6N 131.5E	75	29	5	11.7N 129.9E	100	126	-10	12.0N 126.2E	110	168	-40	12.8N 122.6E	80	217	-75
041200Z	12.6N 131.9E	75	12.2N 131.5E	75	33	0	13.4N 129.8E	90	51	-35	13.5N 126.5E	100	94	-40	13.8N 122.2E	70	202	-40
041800Z	13.0N 131.3E	80	12.8N 131.1E	80	17	0	13.6N 128.9E	95	56	-50	13.5N 125.4E	110	100	-20	13.9N 120.9E	65	262	-75
050000Z	13.4N 130.7E	90	13.4N 130.6E	80	6	10	13.5N 127.6E	100	72	-60	13.6N 123.9E	90	121	-30	14.1N 119.5E	65	308	-25
050600Z	13.8N 130.1E	110	13.9N 129.9E	105	13	-5	14.6N 126.3E	125	17	-25	14.7N 122.2E	120	125	5	15.4N 118.1E	75	306	-5
051200Z	14.2N 129.5E	125	14.2N 129.7E	130	12	5	15.5N 127.7E	125	128	-15	16.8N 124.7E	115	99	5	17.8N 121.1E	60	139	15
051800Z	14.5N 128.6E	145	14.6N 128.7E	145	8	0	16.3N 125.8E	120	88	-10	17.4N 122.7E	115	38	15	18.6N 119.6E	65	113	10
060000Z	14.7N 127.7E	160	14.8N 127.9E	150	13	10	15.8N 124.3E	145	13	25	16.9N 120.3E	90	139	0	17.7N 116.8E	90	247	20
060600Z	14.8N 126.5E	150	14.8N 127.2E	155	40	5	15.2N 123.5E	140	66	25	15.8N 119.5E	90	241	10	16.2N 116.1E	90	365	20
061200Z	14.8N 125.6E	140	14.9N 125.7E	145	8	5	15.4N 121.7E	120	126	10	16.2N 117.9E	80	282	5	16.7N 114.9E	90	406	20
061800Z	15.1N 124.9E	130	14.9N 124.5E	140	26	10	15.3N 120.2E	90	208	-10	15.6N 116.4E	90	359	15	16.3N 113.3E	55	508	30
070000Z	15.6N 124.2E	120	15.7N 124.2E	140	6	20	17.4N 121.4E	110	85	20	19.5N 118.7E	80	96	10	22.5N 116.5E	90	137	25
070600Z	16.3N 123.6E	115	16.1N 123.4E	135	17	20	17.8N 120.8E	70	104	-10	20.1N 118.1E	80	110	10	23.0N 116.0E	85	161	45
071200Z	17.1N 123.0E	110	17.2N 123.0E	125	6	15	20.8N 121.8E	100	74	25	25.0N 123.2E	85	275	15	--.- ---.-	--	--	--
071800Z	18.0N 122.5E	100	18.1N 122.6E	125	8	25	21.9N 121.9E	100	130	25	25.9N 123.6E	85	317	20	--.- ---.-	--	--	--
080000Z	18.8N 121.7E	90	18.7N 121.8E	95	8	5	21.1N 120.0E	80	25	10	23.3N 118.6E	70	47	5	--.- ---.-	--	--	--
080600Z	19.5N 121.2E	80	19.5N 121.0E	95	11	15	21.5N 117.6E	90	106	20	23.6N 114.2E	35	213	5	--.- ---.-	--	--	--
081200Z	20.1N 120.7E	75	20.5N 120.3E	70	33	-5	23.2N 117.2E	60	141	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
081800Z	20.4N 120.2E	75	20.8N 120.0E	65	26	10	23.0N 117.4E	45	88	-20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
090000Z	20.8N 119.7E	70	20.8N 119.8E	70	6	0	21.9N 118.8E	75	127	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
090600Z	21.4N 119.5E	70	21.2N 119.3E	75	16	5	22.7N 118.0E	65	150	25	--.- ---.-	--	--	--	--.- ---.-	--	--	--
091200Z	22.0N 119.4E	70	22.1N 119.3E	75	5	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
091800Z	22.9N 119.0E	65	23.0N 119.1E	75	8	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
100000Z	24.0N 118.4E	65	23.8N 118.7E	70	20	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
100600Z	25.2N 117.7E	40	25.3N 117.7E	50	6	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS: WARNING	24-HR	48-HR	72-HR	ALL FORECASTS: WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	17NM	104NM	192NM	267NM	17NM	104NM	192NM	267NM
AVERAGE RIGHT ANGLE ERROR	10NM	77NM	156NM	218NM	10NM	77NM	156NM	218NM
AVERAGE MAGNITUDE OF WIND ERROR	7KTS	16KTS	20KTS	38KTS	7KTS	16KTS	20KTS	38KTS
AVERAGE BIAS OF WIND ERROR	3KTS	-1KTS	-9KTS	-22KTS	3KTS	-1KTS	-9KTS	-22KTS
NUMBER OF FORECASTS	34	30	4	20	34	30	24	20

TYPHOON OPAL

1200Z 4 OCT TO 0600Z 8 OCT

	BEST TRACK POSIT	BEST TRACK WIND	WARNING POSIT	WARNING WIND	WARNING ERRORS DST	WARNING ERRORS WIND	24 HOUR FORECAST POSIT	24 HOUR FORECAST WIND	24 HR ERRORS DST	24 HR ERRORS WIND	48 HOUR FORECAST POSIT	48 HOUR FORECAST WIND	48 HR ERRORS DST	48 HR ERRORS WIND	72 HOUR FORECAST POSIT	72 HOUR FORECAST WIND	72 HR ERRORS DST	72 HR ERRORS WIND
041200Z	11.5N 114.2E	40	11.4N 114.6E	30	24	-10	12.5N 111.9E	50	29	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
041800Z	11.8N 113.6E	45	11.5N 113.6E	35	18	-10	12.9N 110.6E	60	87	-5	14.2N 108.5E	35	232	-35	--.- ---.-	--	--	--
050000Z	12.2N 113.1E	45	12.2N 113.1E	45	0	0	14.5N 110.4E	65	117	-5	16.2N 107.1E	35	291	-40	--.- ---.-	--	--	--
050600Z	12.6N 112.7E	50	12.7N 112.4E	50	18	0	14.5N 109.1E	65	202	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
051200Z	12.8N 112.3E	60	12.9N 112.3E	55	6	-5	14.2N 110.7E	70	138	0	16.0N 108.0E	50	181	-20	--.- ---.-	--	--	--
051800Z	12.9N 112.1E	65	13.1N 112.0E	60	13	-5	14.9N 111.0E	70	102	0	16.4N 108.0E	80	163	20	--.- ---.-	--	--	--
060000Z	13.2N 111.9E	70	13.1N 112.0E	70	8	0	13.5N 111.3E	85	48	10	14.6N 108.9E	65	18	20	--.- ---.-	--	--	--
060600Z	13.4N 112.4E	75	13.6N 111.8E	75	37	0	15.1N 110.9E	90	49	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
061200Z	13.6N 113.0E	70	13.8N 111.7E	75	76	5	15.3N 110.7E	90	60	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
061800Z	14.0N 112.5E	70	14.1N 112.7E	75	13	5	15.3N 111.7E	80	125	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
070000Z	14.2N 111.7E	75	14.3N 112.4E	75	41	0	15.8N 110.4E	80	125	35	--.- ---.-	--	--	--	--.- ---.-	--	--	--
070600Z	14.3N 111.1E	75	14.2N 110.7E	75	24	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
071200Z	14.3N 110.6E	70	14.4N 110.7E	75	8	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
071800Z	14.3N 109.8E	60	14.2N 111.0E	75	70	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
080000Z	14.3N 108.9E	45	14.2N 109.4E	65	30	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS: WARNING	24-HR	48-HR	72-HR	ALL FORECASTS: WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	26NM	98NM	177NM	0NM	26NM	98NM	177NM	0NM
AVERAGE RIGHT ANGLE ERROR	12NM	62NM	89NM	0NM	12NM	62NM	89NM	0NM
AVERAGE MAGNITUDE OF WIND ERROR	5KTS	12KTS	27KTS	0KTS	5KTS	12KTS	27KTS	0KTS
AVERAGE BIAS OF WIND ERROR	1KTS	6KTS	-11KTS	0KTS	1KTS	6KTS	-11KTS	0KTS
NUMBER OF FORECASTS	15	11	5	0	15	11	5	0

TYPHOON PATSY

0600Z 6 OCT TO 0600Z 15 OCT

	BEST TRACK		WARNING				24 HOUR FORECAST				48 HOUR FORECAST				72 HOUR FORECAST			
	POSIT	WIND	POSIT	WIND	ERRORS DST	ERRORS WIND	POSIT	WIND	ERRORS DST	ERRORS WIND	POSIT	WIND	ERRORS DST	ERRORS WIND	POSIT	WIND	ERRORS DST	ERRORS WIND
060600Z	12.9N 142.1E	30	13.2N 141.8E	35	25	5	14.0N 140.1E	45	54	0	15.3N 137.6E	55	74	-10	16.9N 135.2E	55	98	-30
061200Z	12.9N 141.9E	30	13.0N 142.6E	35	41	5	13.6N 140.8E	45	26	-10	14.7N 138.7E	55	70	-15	16.2N 136.2E	65	150	-45
061800Z	12.9N 141.7E	30	13.1N 142.1E	35	26	5	13.4N 141.3E	45	109	-10	14.2N 139.4E	50	148	-25	15.4N 137.3E	60	260	-65
070000Z	12.9N 141.4E	35	13.0N 141.2E	40	13	5	14.1N 139.5E	60	41	0	15.3N 137.4E	70	87	-10	16.4N 135.2E	75	203	-65
070600Z	13.4N 140.8E	45	13.0N 140.7E	50	25	5	13.5N 138.5E	70	45	5	13.9N 136.0E	75	109	-20	14.8N 132.3E	80	129	-60
071200Z	13.8N 140.4E	55	13.5N 140.2E	55	21	0	15.0N 138.2E	70	50	0	16.4N 136.3E	75	159	-35	18.1N 134.0E	80	281	-40
071800Z	13.9N 139.5E	55	14.0N 139.6E	55	8	0	16.1N 137.3E	70	87	-5	17.8N 134.4E	75	155	-50	19.2N 131.0E	90	222	-25
080000Z	14.1N 138.8E	60	14.1N 138.7E	60	6	0	15.5N 135.5E	85	33	5	16.8N 132.3E	95	64	-15	18.4N 129.1E	100	163	5
080600Z	14.2N 138.2E	65	14.3N 138.0E	70	13	5	15.4N 135.2E	85	24	-10	16.7N 132.1E	90	91	-20	18.4N 128.8E	90	208	10
081200Z	14.5N 137.5E	70	14.7N 137.7E	70	17	0	16.2N 135.8E	85	128	-25	17.9N 133.5E	90	251	-30	19.5N 130.7E	100	376	25
081800Z	14.7N 136.9E	75	15.0N 137.0E	75	19	0	16.6N 135.1E	90	142	-35	18.2N 132.9E	95	288	-10	19.9N 130.1E	100	382	40
090000Z	15.1N 135.9E	80	15.2N 135.7E	80	13	0	16.4N 132.5E	90	55	-50	17.6N 130.2E	100	204	5	18.9N 128.0E	95	312	50
090600Z	15.3N 134.8E	95	15.2N 135.0E	90	13	-5	16.4N 132.4E	110	104	-30	18.0N 130.2E	100	279	20	19.2N 128.0E	90	419	60
091200Z	15.5N 133.7E	110	15.6N 133.7E	90	6	-20	17.3N 130.2E	110	71	-10	19.0N 127.9E	110	218	35	20.9N 125.8E	100	472	75
091800Z	15.7N 132.8E	125	15.7N 132.8E	95	0	-30	17.0N 129.3E	110	71	5	18.7N 127.0E	110	196	50	--.- ---.-	--	--	--
100000Z	15.9N 131.7E	140	15.9N 131.7E	140	0	0	17.4N 128.1E	160	85	65	19.5N 125.6E	145	183	105	--.- ---.-	--	--	--
100600Z	16.2N 130.6E	140	16.2N 130.6E	145	0	5	18.2N 126.8E	160	103	80	20.0N 123.5E	145	181	115	--.- ---.-	--	--	--
101200Z	16.4N 129.4E	120	16.5N 129.5E	130	8	10	18.4N 125.3E	120	74	45	20.6N 121.7E	110	260	85	23.5N 119.6E	90	552	60
101800Z	16.7N 128.1E	105	16.7N 128.0E	130	6	25	18.3N 123.5E	120	13	60	--.- ---.-	--	--	--	23.9N 117.9E	90	539	55
110000Z	16.9N 126.7E	95	17.0N 126.6E	130	8	35	19.3N 121.5E	90	70	50	--.- ---.-	--	--	--	26.2N 115.5E	25	631	-5
110600Z	17.1N 125.4E	80	17.3N 125.6E	100	17	20	18.8N 121.3E	75	40	45	--.- ---.-	--	--	--	--.- ---.-	--	--	--
111200Z	17.5N 124.4E	75	17.2N 123.4E	90	60	15	18.2N 118.1E	65	13	40	20.9N 114.9E	70	257	30	--.- ---.-	--	--	--
111800Z	18.1N 123.6E	60	18.0N 123.8E	50	13	-10	--.- ---.-	--	--	--	24.1N 117.6E	40	553	5	--.- ---.-	--	--	--
120000Z	18.6N 122.5E	40	18.7N 122.8E	45	18	5	--.- ---.-	--	--	--	24.6N 117.7E	25	629	-5	--.- ---.-	--	--	--
120600Z	18.7N 120.6E	30	19.4N 120.9E	35	45	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
121200Z	18.0N 118.0E	25	18.0N 119.0E	25	57	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
131200Z	17.5N 112.1E	40	17.5N 112.0E	30	6	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
131800Z	17.2N 111.0E	35	17.5N 109.6E	30	82	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
140000Z	17.0N 109.9E	30	16.5N 109.4E	30	41	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	21NM	65NM	212NM	318NM	21NM	65NM	212NM	318NM
AVERAGE RIGHT ANGLE ERROR	14NM	37NM	122NM	170NM	14NM	37NM	122NM	170NM
AVERAGE MAGNITUDE OF WIND ERROR	8KTS	27KTS	36KTS	42KTS	8KTS	27KTS	36KTS	42KTS
AVERAGE BIAS OF WIND ERROR	2KTS	10KTS	7KTS	2KTS	2KTS	10KTS	7KTS	2KTS
NUMBER OF FORECASTS	29	22	21	17	29	22	21	17

TYPHOON RUTH

1200Z 11 OCT TO 1200Z 19 OCT

	BEST TRACK		WARNING				24 HOUR FORECAST				48 HOUR FORECAST				72 HOUR FORECAST			
	POSIT	WIND	POSIT	WIND	ERRORS DST	ERRORS WIND	POSIT	WIND	ERRORS DST	ERRORS WIND	POSIT	WIND	ERRORS DST	ERRORS WIND	POSIT	WIND	ERRORS DST	ERRORS WIND
111200Z	12.2N 140.5E	30	12.4N 140.9E	35	26	5	13.6N 137.0E	55	123	10	14.8N 133.1E	70	170	10	16.3N 129.4E	90	209	30
111800Z	12.6N 139.0E	35	12.3N 139.5E	40	34	5	13.4N 135.6E	65	118	15	14.6N 131.7E	75	144	20	16.3N 128.1E	95	183	30
120000Z	13.0N 137.8E	40	12.7N 137.2E	45	39	5	14.2N 133.6E	65	94	10	15.9N 130.3E	80	162	30	17.4N 126.7E	90	206	20
120600Z	13.3N 136.3E	40	13.3N 136.8E	45	29	5	14.3N 134.5E	65	181	5	15.3N 131.9E	80	268	45	16.3N 129.2E	90	355	15
121200Z	13.3N 134.8E	45	13.2N 135.0E	50	8	5	13.8N 131.2E	60	46	0	14.6N 127.8E	70	79	10	15.5N 124.8E	80	155	-5
121800Z	13.1N 133.6E	50	13.6N 134.0E	45	38	-5	15.0N 129.6E	55	79	0	16.2N 126.0E	65	110	0	16.8N 122.7E	75	142	25
130000Z	12.9N 132.7E	55	13.0N 132.2E	50	30	-5	13.7N 126.9E	65	83	15	15.5N 123.2E	75	97	5	17.4N 119.7E	55	98	-5
130600Z	12.8N 131.8E	60	12.8N 131.4E	70	23	10	13.1N 126.8E	90	74	35	14.2N 122.7E	90	51	10	14.6N 118.8E	60	111	-5
131200Z	13.3N 130.6E	60	12.8N 130.9E	70	35	10	13.2N 127.9E	85	101	25	14.0N 125.1E	90	195	5	15.2N 122.2E	90	313	25
131800Z	13.7N 129.4E	55	13.5N 130.0E	65	37	10	15.0N 126.4E	75	58	10	16.0N 123.7E	85	190	35	16.9N 120.3E	55	263	-15
140000Z	14.0N 128.3E	50	14.2N 128.5E	65	17	15	16.3N 124.4E	80	102	10	17.2N 120.5E	50	116	-10	18.1N 116.8E	65	152	-15
140600Z	14.2N 127.4E	55	14.3N 127.4E	65	12	10	16.1N 123.4E	60	73	-20	17.0N 119.2E	40	80	-35	18.6N 115.6E	50	169	-35
141200Z	14.2N 126.5E	60	14.3N 126.4E	65	8	5	15.0N 122.4E	60	35	-25	15.5N 118.5E	50	106	-15	16.5N 114.5E	60	127	-30
141800Z	14.4N 125.6E	65	14.4N 125.4E	65	12	0	15.2N 121.4E	55	71	-5	15.7N 117.3E	55	109	-15	16.9N 113.4E	60	103	-30
150000Z	14.6N 124.6E	70	14.4N 124.7E	65	13	-5	14.9N 120.7E	50	115	-10	14.9N 116.8E	55	174	-15	15.6N 112.7E	60	141	-30
150600Z	14.9N 123.2E	80	14.9N 123.3E	75	6	-5	15.4N 118.8E	50	71	-15	15.8N 114.7E	60	100	-25	17.0N 110.7E	65	46	-20
151200Z	15.5N 122.1E	85	15.4N 122.4E	80	18	-5	16.4N 118.1E	55	69	-10	17.9N 114.3E	65	132	-25	20.0N 110.9E	65	125	-10
151800Z	15.9N 120.4E	50	16.0N 120.4E	65	6	15	17.2N 116.0E	65	34	-5	18.8N 112.6E	65	122	-25	20.8N 109.6E	50	107	-5
160000Z	15.9N 119.0E	60	15.8N 119.1E	65	8	5	16.2N 115.9E	75	88	-5	17.2N 112.2E	80	74	-10	18.0N 108.0E	70	116	20
160600Z	16.3N 118.0E	65	16.2N 117.9E	70	8	5	17.1N 113.8E	90	34	5	17.8N 110.1E	75	13	-10	18.2N 106.4E	60	169	15
161200Z	16.4N 116.9E	65	16.7N 117.0E	70	19	5	18.0N 113.0E	80	82	-10	19.1N 109.5E	65	48	-10	19.8N 105.8E	50	128	25
161800Z	16.7N 115.7E	70	16.7N 116.0E	70	17	0	17.6N 112.1E	80	46	-10	18.5N 108.5E	65	46	10	--.- ---.-	--	--	--
170000Z	16.8N 114.5E	80	16.8N 114.5E	75	0	-5	17.8N 110.0E	70	63	-20	18.0N 105.8E	40	186	-10	--.- ---.-	--	--	--
170600Z	16.8N 113.3E	85	16.9N 113.4E	75	8	-10	17.4N 108.9E	60	75	-25	17.4N 104.8E	20	260	-25	--.- ---.-	--	--	--
171200Z	16.8N 112.3E	90	16.9N 112.2E	85	8	-5	17.0N 107.5E	70	143	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
171800Z	17.0N 111.6E	90	16.9N 111.4E	85	13	-5	16.9N 107.3E	70	163	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
180000Z	17.2N 110.9E	90	17.2N 110.8E	85	6	-5	17.8N 107.2E	70	143	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
180600Z	17.6N 110.2E	85	17.8N 110.3E	80	13	-5	20.4N 108.3E	60	33	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
181200Z	18.3N 109.6E	75	18.5N 109.9E	70	21	-5	20.8N 107.6E	55	47	30	--.- ---.-	--	--	--	--.- ---.-	--	--	--
181800Z	19.1N 109.0E	55	19.2N 109.4E	65	23	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
190000Z	19.9N 108.4E	50	19.4N 108.4E	60	30	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
190600Z	20.7N 107.8E	45	21.1N 107.9E	55	25	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
191200Z	21.5N 107.2E	25	22.1N 107.4E	35	38	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	19NM	84NM	126NM	163NM	19NM	84NM	126NM	163NM
AVERAGE RIGHT ANGLE ERROR	12NM	51NM	78NM	90NM	12NM	51NM	78NM	90NM
AVERAGE MAGNITUDE OF WIND ERROR	7KTS	13KTS	16KTS	19KTS	7KTS	13KTS	16KTS	19KTS
AVERAGE BIAS OF WIND ERROR	3KTS	2KTS	-3KTS	-0KTS	3KTS	2KTS	-3KTS	-0KTS
NUMBER OF FORECASTS	33	29	24	21	33	29	24	21

ANNEX A

SUMMARY OF TROPICAL CYCLONES IN THE CENTRAL NORTH PACIFIC

1. GENERAL RESUME

Fleet Weather Central, Pearl Harbor, issued warnings on two tropical cyclones in 1973 for the Central Pacific as shown in Table A-1. Warnings were coordinated with the Central Pacific Hurricane Center, Honolulu, and the Eastern Pacific Hurricane Center, San Francisco, in accordance with the National Hurricane Operations Plan.

TABLE A-1. COMPARISON OF CENTRAL PACIFIC ANNUAL WARNING AND CLIMATOLOGY DATA

	1969	1970	1971	1972	1973
TOTAL NUMBER OF WARNINGS	0	27	19	76	43
CALENDAR DAYS OF WARNING	0	8	8	21	13
TROPICAL DEPRESSIONS	0	1	1	0	1
TROPICAL STORMS	0	1	1	3	0
HURRICANES	0	1	1	1	1
TOTAL	0	3	3	4	2

2. INDIVIDUAL CASES[1]

Two tropical cyclones entered the Central Pacific from the east during 1973. Both Doreen and Katherine were fully developed hurricanes in the Eastern North Pacific before crossing 140°W longitude. Only Doreen was still of hurricane intensity upon entering the Central North Pacific.

Doreen, the first hurricane of the year to invade the Central North Pacific, was first located on 16 July by weather satellite near 10°N 101°W over the warm waters off Panama. Throughout her life cycle, Doreen followed a path strikingly similar to that of Hurricane Celeste of August 1972.

The small storm rapidly intensified to hurricane strength as she moved westnorthwestward toward Hawaii. On the ninth day after detection, about 800 miles southeast of Hawaii, Doreen weakened to a tropical storm, turned to the southwest, and decelerated.

On the afternoon of the 27th, the 144-foot Greek ship, CORNELIA, sailed into the storm's path and sent out an emergency call for help when it lost its rudder while being lashed by 50 kt winds and 35-foot waves. A sea level pressure of 971mb was reported. The ship managed to clear the storm and continued to Panama after deciding not to return to Honolulu with Coast Guard assistance.

After the slowdown, Doreen accelerated toward the westnorthwest attaining 85kt winds near her center. She passed 300 miles southsouthwest of South Point, Hawaii on the afternoon of the 30th.

On the afternoon of the 29th, nine-foot ocean swells and three and a half foot surf generated by Doreen were observed at Kapoho, the easternmost town on the island of Hawaii.

On the afternoon of 1 August, a weak Doreen passed 100 miles north of Johnston Island. Doreen dissipated under an upper trough two days later as she crossed the International Date Line. No damage was incurred at Hawaii or Johnston Island.

Beginning as a weak cloud circulation seen by weather satellite on 28 September, Katherine, the second and last Central North Pacific storm of 1973, developed over the warm waters off Panama in the same area as Doreen. However, Katherine did not follow the same path. She moved towards the northwest, intensifying to hurricane strength on 1 October, but then curved to the southwest between 120 and 125°E longitude.

Weakening to tropical storm strength, Katherine turned to the southwest on the 3rd. By the 6th, she began to follow a more westerly course near 13°N 130°W, dissipating a few days later 600 miles eastsoutheast of the island of Hawaii under a cold upper trough.

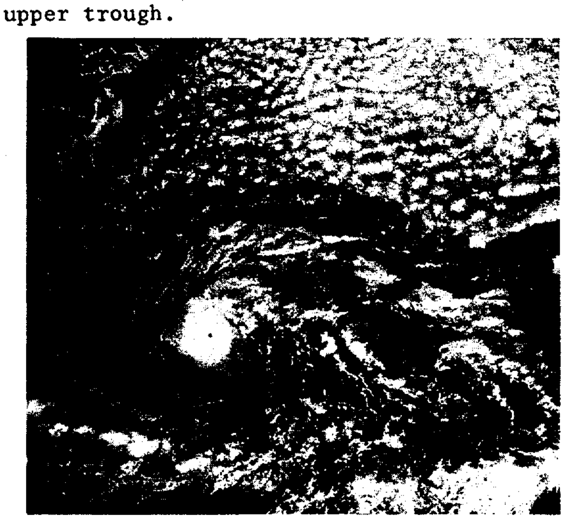
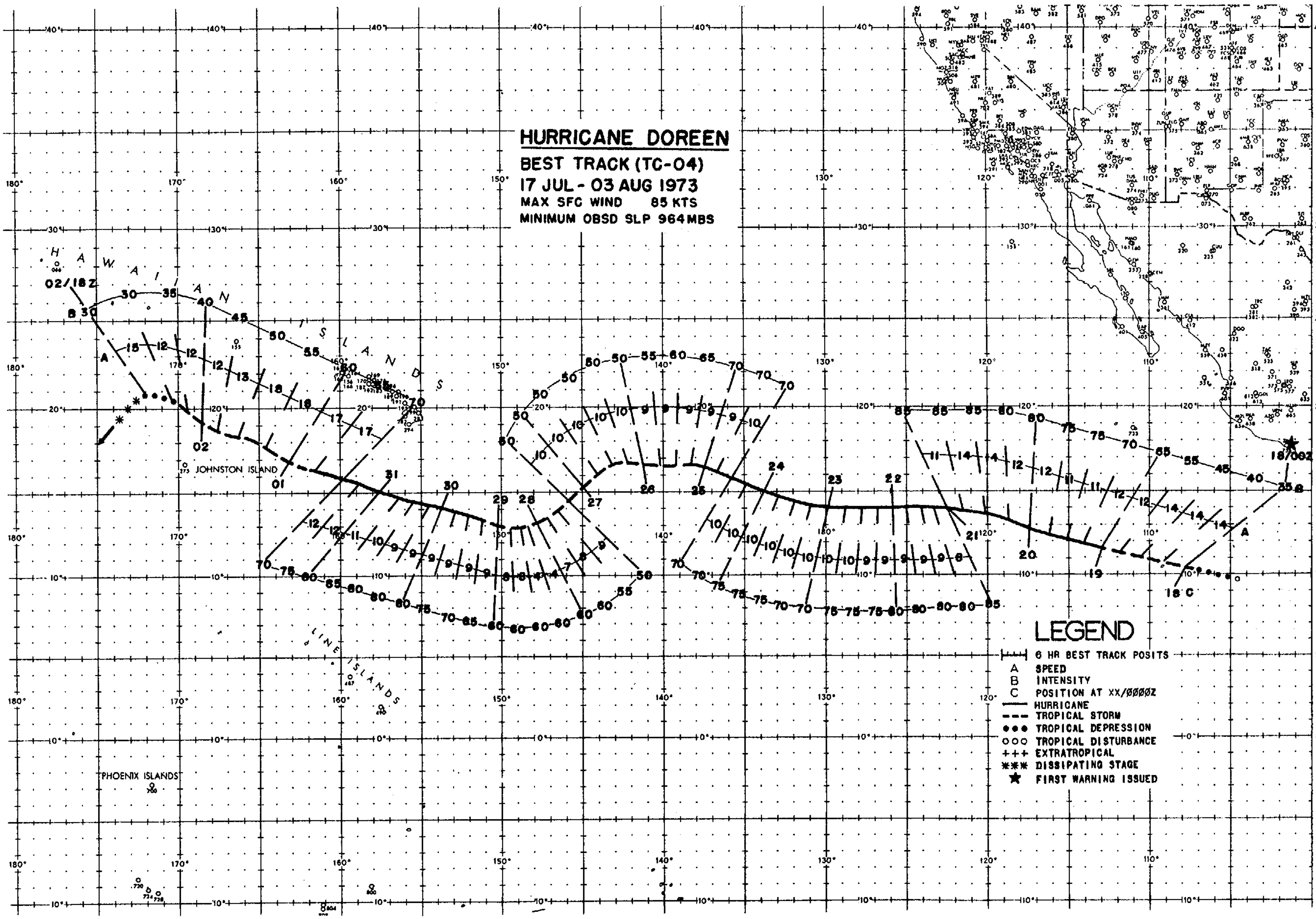
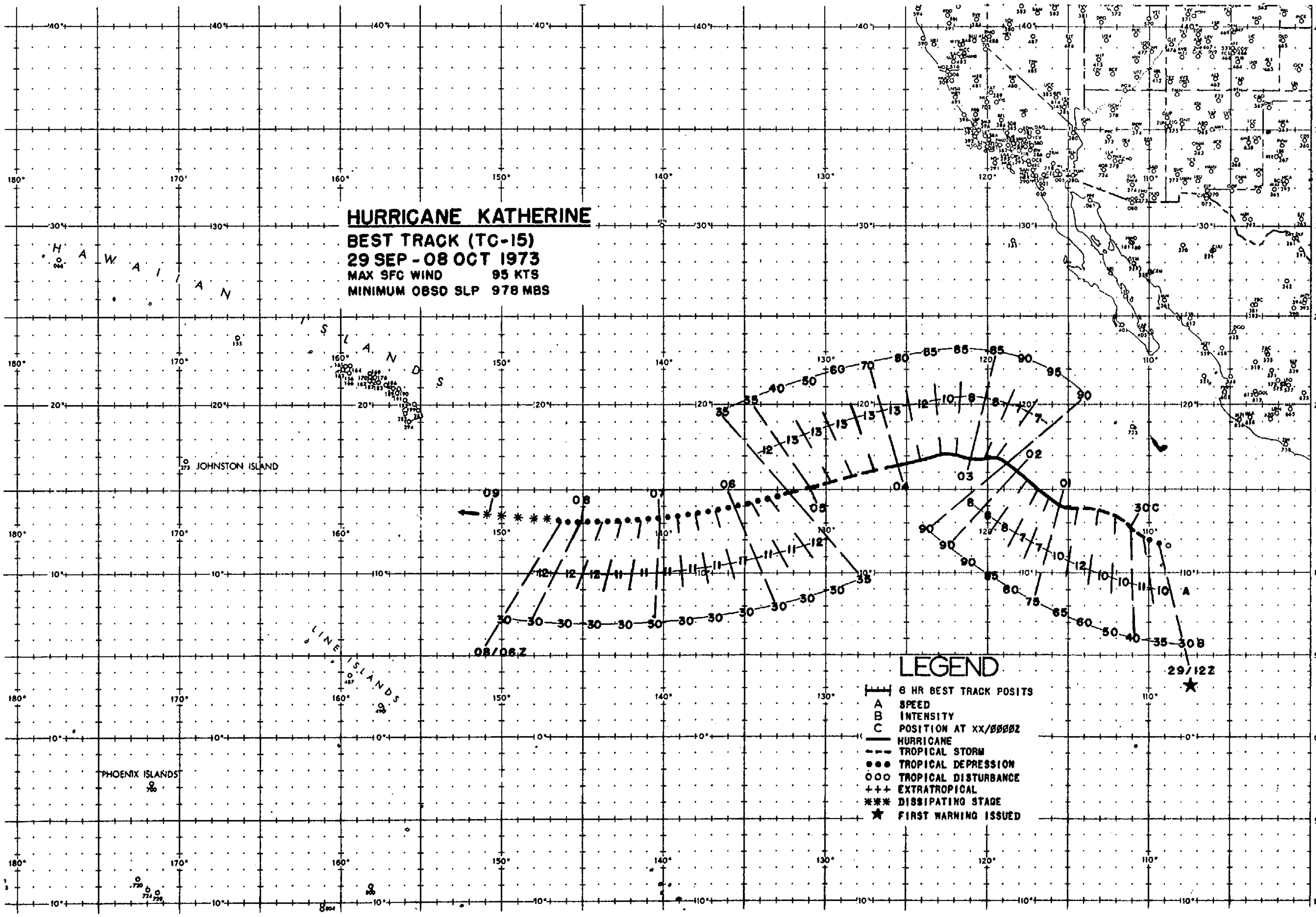


FIGURE A-1. *Tropical Storm Doreen, 28 July 1973, 2149 GMT. (DMSP imagery)*

[1]Report submitted by Meteorologist in Charge, NWS Forecast Office, Honolulu, Hawaii.


HURRICANE DOREEN
BEST TRACK (TC-04)
17 JUL - 03 AUG 1973
MAX SFC WIND 85 KTS
MINIMUM OBSD SLP 964 MBS
HAWAIIAN ISLANDS
JOHNSTON ISLAND
LINE ISLANDS
PHOENIX ISLANDS
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
C POSITION AT XX/ØØØØZ
HURRICANE
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED



HURRICANE KATHERINE
BEST TRACK (TC-15)
29 SEP - 08 OCT 1973
MAX SFC WIND 95 KTS
MINIMUM OBSD SLP 978 MBS
HAWAIIAN ISLANDS
JOHNSTON ISLAND
LINE ISLANDS
PHOENIX ISLANDS
08/06Z
29/12Z
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
C POSITION AT XX/0000Z
HURRICANE
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED

4. CENTER FIX DATA - HURRICANES

HURRICANE DOREEN

FIX POSITIONS FOR CYCLONE NO. 4
0600Z 18 JUL TO 0000Z 03 AUG

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV	ACCRY MET	FIX LVL	MAX OBS FLT LVL WIND DIR	VEL	BRG	RNG	MAX OBS SFC WIND VEL	BRG	RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TI/TO	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSN NMBR
1	171659Z	10.8N 125.0E	SAT							NON	DAPP										
2	181558Z	11.2N 111.5E	SAT							NON	DAPP										
3	191653Z	12.6N 116.5E	SAT							NON	DAPP										
4	201737Z	14.1N 121.5E	P	10	5	700	90	102	360	30	120	360	30	972	285	15 8	CIRC		20		1
5	201747Z	14.0N 122.2E	SAT							NON	DAPP										
6	202024Z	14.3N 121.9E	P	15	5	700	10	95	330	10	60	330	45	968	283	17 7	CIRC		23		2
7	211647Z	14.0N 125.5E	SAT							NON	DAPP										
8	211906Z	14.1N 125.2E	P	5	5	700	50	90	310	18	80	310	818	968	281	16 9	ELIP	SE-NW	15x 5		4
9	221741Z	14.8N 129.6E	SAT							NON	DAPP										
10	231007Z	14.4N 131.8E	SAT							PCN 1	DAPP										
11	231836Z	14.9N 133.8E	SAT	(T4.5/4.5 /D0.5/25HRS)						NON	DAPP										
12	241737Z	15.7N 135.5E	SAT							NON	DAPP										
13	241737Z	15.7N 135.5E	SAT							NON	DAPP										
14	242106Z	15.8N 137.0E	SAT	(T4.5/4.5 / / HRS)						PCN 1	DAPP										
15	250938Z	16.7N 138.9E	SAT							PCN 1	DAPP										
16	251830Z	16.6N 140.2E	SAT	(T3.5/4.5 /W1.0/25HRS)						NON	DAPP										
17	251830Z	16.6N 140.2E	SAT	(T3.5/4.5 /W1.0/25HRS)						NON	DAPP										
18	260923Z	16.8N 143.2E	SAT							PCN 1	DAPP										
19	261927Z	15.8N 144.6E	SAT	(T3.5/3.5 /S /25HRS)						NON	DAPP										
20	262218Z	15.5N 144.8E	SAT	(T2.5/2.5 /S1.0/24HRS)						PCN 1	DAPP										
21	271051Z	14.2N 146.2E	SAT							PCN 1	DAPP										
22	271827Z	13.6N 147.3E	SAT	(T4.0/4.0-/D0.5/23HRS)						NON	DAPP										
23	281924Z	13.0N 149.6E	SAT	(T4.0/4.0 /S /25HRS)						NON	DAPP										
24	291730Z	13.5N 152.5E	P	5	2	700	350	60	260	12	80	50	8	967	280	16 10	CIRC		12		6
25	291824Z	13.7N 152.5E	SAT	(T4.0/4.0 /S /23HRS)						NON	DAPP										
26	301830Z	14.5N 156.9E	P	10	2	700	40	78	300	12	85	90	3	962	278	20 11	CIRC		10		6
27	301918Z	14.8N 156.9E	SAT	(T4.0/4.0 /W /25HRS)						NON	DAPP										
28	302300Z	15.0N 157.6E	SAT	(T4.5/5.5 /W1.0/24HRS)						PCN 1	DAPP										
29	311136Z	15.8N 160.0E	SAT							PCN 1	DAPP										
30	312045Z	16.5N 162.0E	P	10	5	700	180	70	90	4	65	90	6	994	301	16 9	CIRC		20		6
31	011120Z	18.2N 166.0E	SAT							PCN 1	DAPP										
32	012106Z	19.0N 168.0E	SAT	(T2.0/3.0 /W1.0/24HRS)						NON	DAPP										
33	021939Z	20.3N 172.5E	SAT	(T2.0/2.0-/S /23HRS)						NON	DAPP										

HURRICANE KATHERINE

FIX POSITIONS FOR CYCLONE NO. 15
0600Z 30 SEP TO 1800Z 08 OCT

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV	ACCRY MET	FIX LVL	MAX OBS FLT LVL WIND DIR	VEL	BRG	RNG	MAX OBS SFC WIND VEL	BRG	RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TI/TO	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSN NMBR
1	291559Z	12.0N 110.2E	SAT							NON	DAPP										
2	300843Z	13.8N 113.0E	SAT							PCN 1	DAPP										
3	301653Z	13.8N 114.4E	SAT							NON	DAPP										
4	301945Z	14.0N 115.5E	SAT	(T4.5/4.5 /D0.5/ HRS)						PCN 1	DAPP										
5	301948Z	14.1N 114.8E	P	5	3	700	340	70	330	40	40	330	20	978	290	14 12	CIRC		20		1
6	011357Z	15.2N 117.2E	SAT							PCN 1	DAPP										
7	011743Z	15.4N 117.2E	SAT							NON	DAPP										
8	021539Z	16.9N 119.9E	SAT							PCN 1	DAPP										
9	022103Z	16.8N 120.5E	SAT	(T5.0/5.5 / / HRS)						PCN 1	DAPP										
10	022103Z	16.8N 120.5E	SAT	(T5.0/5.0 / 0.5/ HRS)						PCN 1	DAPP										
11	031707Z	16.8N 124.0E	SAT							PCN 1	DAPP										
12	031737Z	16.8N 124.8E	SAT							NON	DAPP										
13	051736Z	14.3N 134.5E	SAT							NON	DAPP										
14	080006Z	13.2N 146.4E	SAT	(T2.0/2.5 /W0.5/24HRS)						PCN 1	DAPP										
15	082259Z	13.5N 150.5E	SAT	(T1.5/2.0 /W0.5/22HRS)						PCN 1	DAPP										

HURRICANE DOREEN

1800Z 17 JUL TO 0000Z 3 AUG

	BEST TRACK		WARNING				24 HOUR FORECAST				48 HOUR FORECAST				72 HOUR FORECAST			
	POSIT	WIND	POSIT	WIND	ERRORS DST	ERRORS WIND	POSIT	WIND	ERRORS DST	ERRORS WIND	POSIT	WIND	ERRORS DST	ERRORS WIND	POSIT	WIND	ERRORS DST	ERRORS WIND
171800Z	10.1N 106.2W	30	9.0N 105.0W	30	97	0	9.0N 109.0W	35	211	-20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
180000Z	10.3N 107.7W	35	10.5N 107.0W	40	43	5	11.4N 111.7W	60	71	-5	12.3N 116.3W	75	66	-5	13.0N 121.0W	75	114	-10
180600Z	10.6N 109.0W	40	10.7N 108.1W	45	53	5	11.5N 113.0W	65	63	-5	12.5N 117.5W	75	86	-5	13.0N 122.0W	75	105	-10
181200Z	10.9N 110.4W	45	11.1N 110.0W	55	26	10	11.7N 115.0W	65	25	-10	11.8N 120.0W	75	114	-10	12.2N 125.5W	75	136	-5
181800Z	11.2N 111.8W	55	11.0N 111.3W	60	32	5	11.3N 116.4W	80	72	5	11.6N 121.6W	85	143	0	11.8N 127.0W	85	176	5
190000Z	11.6N 112.9W	65	11.6N 112.3W	65	35	0	12.5N 117.0W	80	34	0	13.5N 122.0W	100	50	15	14.0N 127.0W	100	64	20
190600Z	11.9N 114.0W	70	12.0N 113.5W	70	30	0	12.8N 118.0W	90	52	10	13.5N 123.0W	100	43	15	14.3N 128.0W	100	72	25
191200Z	12.1N 115.1W	75	12.2N 114.7W	100	24	25	13.0N 119.3W	100	63	15	13.8N 124.0W	90	21	10	14.6N 128.7W	80	63	5
191800Z	12.5N 116.3W	75	12.6N 116.1W	100	13	25	14.0N 121.4W	100	12	15	15.3N 126.0W	85	112	5	16.7N 131.8W	75	236	0
200000Z	12.8N 117.5W	80	13.0N 117.4W	100	13	20	14.2N 122.7W	100	8	15	15.5N 127.0W	85	142	5	16.8N 133.0W	75	245	5
200600Z	13.2N 118.8W	80	13.2N 118.7W	100	6	20	14.4N 123.9W	100	34	15	15.8N 129.0W	85	166	10	17.1N 134.1W	75	257	5
201200Z	13.7N 120.1W	85	13.5N 120.0W	100	13	15	14.7N 125.2W	100	68	20	16.1N 130.3W	80	191	5	17.5N 135.5W	65	274	-10
201800Z	14.0N 121.6W	85	14.1N 121.3W	120	18	35	15.5N 126.5W	100	116	20	15.5N 132.0W	80	205	5	15.0N 137.5W	60	266	-15
210000Z	14.1N 122.6W	85	14.5N 122.6W	110	24	25	16.0N 127.5W	90	151	10	17.2N 132.5W	75	242	5	18.5N 137.5W	60	289	-15
210600Z	14.1N 123.4W	85	14.7N 123.7W	90	40	5	16.1N 128.3W	60	152	-15	17.3N 132.9W	50	221	-20	18.6N 137.5W	40	242	-30
211200Z	14.1N 124.2W	80	15.1N 124.9W	80	72	0	16.4N 129.7W	60	180	-15	17.5N 134.5W	50	233	-25	19.0N 139.0W	40	269	-30
211800Z	14.1N 125.1W	80	14.6N 125.0W	80	30	0	15.0N 130.0W	60	92	-15	15.5N 134.0W	40	79	-35	15.5N 138.2W	30	91	-40
220000Z	14.0N 125.9W	80	14.6N 126.3W	80	43	0	15.0N 130.6W	55	71	-15	15.5N 135.5W	45	91	-30	15.7N 139.7W	35	126	-35
220600Z	14.0N 126.8W	75	14.5N 127.5W	80	50	5	14.7N 131.7W	50	60	-20	15.0N 136.0W	40	68	-30	15.0N 140.5W	35	163	-30
221200Z	14.0N 127.8W	75	14.6N 128.5W	75	54	0	14.8N 132.5W	50	39	-25	15.0N 137.0W	40	81	-30	15.0N 141.5W	35	162	-25
221800Z	14.0N 128.8W	75	14.8N 129.1W	65	51	-10	15.3N 133.3W	50	43	-25	15.5N 137.5W	40	55	-30	16.0N 141.5W	35	78	-20
230000Z	14.1N 129.8W	70	15.2N 130.2W	65	70	-5	16.4N 134.0W	50	84	-25	17.6N 137.8W	50	78	-20	18.8N 141.7W	40	134	-10
230600Z	14.2N 130.8W	70	15.3N 131.7W	65	86	-5	16.4N 137.7W	50	172	-20	17.3N 143.7W	50	317	-35	18.3N 149.7W	40	432	-10
231200Z	14.5N 131.9W	75	15.0N 132.0W	65	30	-10	15.0N 136.0W	50	43	-20	15.0N 140.0W	40	109	-30	15.0N 144.0W	30	104	-20
231800Z	14.7N 132.9W	75	14.8N 132.7W	60	13	-15	15.0N 136.0W	50	72	-20	15.0N 139.0W	40	121	-15	15.0N 142.5W	30	117	-20
240000Z	15.0N 134.0W	75	14.9N 134.8W	60	47	-15	14.9N 138.8W	60	108	-10	14.9N 142.8W	55	137	5	14.9N 146.8W	45	100	-5
240600Z	15.4N 134.9W	70	15.0N 134.5W	65	33	-5	15.0N 137.5W	65	104	0	15.0N 139.5W	60	190	10	15.0N 141.5W	60	251	10
241200Z	15.7N 135.8W	70	15.0N 135.0W	65	62	-5	15.0N 137.0W	65	167	5	15.0N 139.0W	60	265	10	15.0N 141.0W	60	325	5
241800Z	16.0N 136.7W	70	15.8N 136.7W	55	12	-15	16.6N 141.0W	45	40	-10	17.0N 142.5W	40	122	-10	17.0N 144.0W	35	283	-25
250000Z	16.3N 137.6W	70	15.8N 137.5W	70	30	0	16.3N 141.4W	70	21	20	17.0N 145.3W	65	108	15	17.7N 149.4W	65	288	5
250600Z	16.6N 138.2W	65	16.0N 138.0W	70	38	5	16.7N 141.9W	65	23	15	17.3N 145.8W	60	173	10	17.9N 149.7W	60	309	0
251200Z	16.7N 139.3W	60	16.5N 139.0W	70	21	10	17.0N 143.0W	60	29	10	17.5N 147.0W	60	217	5	18.0N 151.0W	60	338	0
251800Z	16.6N 140.3W	55	17.0N 140.1W	55	26	0	18.5N 144.1W	40	156	-10	19.5N 147.8W	35	366	-25	20.8N 151.0W	30	479	-30
260000Z	16.6N 141.2W	50	16.6N 141.1W	50	6	0	17.7N 145.1W	40	149	-10	18.7N 148.8W	35	338	-25	20.0N 152.3W	30	433	-30
260600Z	16.7N 142.3W	50	16.8N 142.0W	50	18	0	17.8N 145.9W	35	203	-15	19.9N 149.2W	30	421	-30	22.0N 151.4W	20	520	-45
261200Z	16.6N 143.3W	50	16.9N 143.6W	50	25	0	18.4N 147.2W	35	272	-20	20.5N 150.7W	30	474	-30	23.5N 153.4W	25	597	-45
261800Z	15.9N 144.3W	50	17.0N 144.5W	45	67	-5	18.0N 148.6W	35	286	-25	19.7N 152.4W	25	437	-35	--.- ---.-	--	--	--
270000Z	15.2N 145.1W	50	15.5N 145.2W	40	19	-10	15.5N 149.3W	40	165	-20	16.3N 153.5W	35	270	-25	16.9N 157.6W	35	284	-45
270600Z	14.4N 145.8W	50	15.5N 146.2W	40	70	-10	15.8N 150.5W	40	215	-20	16.5N 154.6W	35	274	-30	17.1N 158.8W	35	297	-45
271200Z	13.9N 146.5W	55	14.1N 146.5W	40	12	-15	13.4N 150.6W	40	116	-20	14.3N 154.7W	35	162	-35	15.4N 158.8W	35	203	-45
271800Z	13.4N 147.2W	60	13.7N 147.3W	40	19	-20	13.3N 151.6W	40	119	-20	13.3N 155.9W	40	182	-35	14.0N 160.0W	40	201	-45
280000Z	13.1N 147.9W	60	13.3N 148.0W	75	13	15	13.3N 152.2W	85	112	25	13.3N 156.3W	85	157	5	13.9N 160.5W	75	169	-5
280600Z	12.9N 148.3W	60	13.3N 149.0W	75	47	15	13.3N 153.2W	85	116	20	13.4N 157.4W	85	169	5	14.0N 161.5W	75	172	0
281200Z	12.8N 148.7W	60	12.7N 148.8W	75	8	15	12.5N 153.0W	85	88	15	12.8N 157.2W	85	146	5	13.5N 161.3W	75	159	5
281800Z	12.9N 149.6W	60	12.5N 149.7W	75	25	15	12.5N 153.1W	85	80	10	12.7N 156.5W	85	120	0	13.3N 159.7W	85	211	20
290000Z	13.0N 150.3W	60	13.0N 150.3W	90	0	30	13.6N 153.7W	90	24	10	14.5N 157.0W	90	55	10	15.6N 160.2W	90	186	30
290600Z	13.3N 151.2W	65	13.1N 151.2W	90	12	25	13.7N 154.6W	90	30	10	14.8N 157.9W	90	68	15	15.7N 151.2W	90	781	35
291200Z	13.6N 152.0W	70	13.3N 151.5W	100	34	30	14.1N 154.7W	100	47	20	15.5N 157.8W	100	122	30	16.6N 160.9W	100	317	50
291800Z	13.8N 152.8W	75	13.6N 152.6W	100	17	25	14.6N 155.8W	100	47	15	15.9N 158.8W	100	173	35	16.8N 161.9W	100	333	55
300000Z	14.0N 153.7W	80	13.9N 153.2W	100	30	20	15.4N 156.6W	100	73	20	16.9N 159.9W	100	189	40	18.4N 163.5W	100	296	60
300600Z	14.2N 154.6W	80	14.2N 154.0W	100	35	20	15.4N 157.1W	100	104	25	16.7N 160.2W	100	262	45	17.9N 163.3W	100	374	65
301200Z	14.5N 155.4W	80	14.4N 155.8W	90	24	10	15.4N 159.8W	90	25	20	16.3N 163.0W	80	178	30	17.2N 167.8W	80	245	50
301800Z	14.7N 156.6W	85	14.5N 156.8W	90	17	5	15.6N 160.9W	90	63	25	16.6N 164.9W	90	183	45	17.5N 169.0W	90	255	60
310000Z	15.0N 157.8W	80	15.1N 157.8W	75	6	-5	16.8N 162.1W	65	63	5	18.5N 166.3W	60	139	20	20.2N 170.6W	55	168	30
310600Z	15.4N 158.9W	75	15.5N 158.9W	75	6	0	17.2N 163.2W	65	89	10	18.9N 167.4W	60	135	25	--.- ---.-	--	--	--
311200Z	15.8N 159.9W	70	15.8N 160.1W	75	11	5	17.2N 164.3W	70	124	20	18.6N 168.6W	60	152	30	--.- ---.-	--	--	--
311800Z	16.2N 161.8W	65	16.3N 161.4W	75	24	10	17.9N 166.2W	65	80	20	19.6N 171.0W	60	86	30	--.- ---.-	--	--	--
010000Z	16.8N 163.2W	60	16.8N 163.1W	65	6	5	18.7N 169.1W	65	29	25	20.6N 175.2W	55	116	30	--.- ---.-	--	--	--
010600Z	17.6N 164.7W	55	17.3N 164.6W	65	19	10	19.1N 170.6W	65	70	30	--.- ---.-	--	--	--	--.- ---.-	--	--	--
011200Z	18.2N 166.2W	50	18.3N 166.2W	60	6	10	20.4N 172.4W	50	106	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
011800Z	18.4N 167.5W	45	17.9N 166.7W	55	54	10	19.0N 172.8W	50	103	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
020000Z	19.0N 168.7W	40	18.7N 168.3W	50	29	10	20.7N 174.2W	30	82	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
020600Z	19.8N 169.6W	35	19.1N 169.7W	45	42	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
021200Z	20.4N 170.5W	30	20.4N 170.6W	35	6	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
021800Z	20.6N 172.1W	30	21.0N 172.0W	35	25	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
030000Z	19.5N 173.5W	25	19.6N 173.5W	35	6	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	HURRICANES WHILE WIND OVER 35KTS WARNING	24-HR	48-HR	72-HR	ALL FORECASTS WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	30NM	92NM	172NM	247NM	30NM	92NM	169NM	246NM
AVERAGE RIGHT ANGLE ERROR	20NM	54NM	97NM	132NM	21NM	53NM	95NM	127NM
AVERAGE MAGNITUDE OF WIND ERROR	11KTS	16KTS	19KTS	23KTS	10KTS	16KTS	19KTS	24KTS
AVERAGE BIAS OF WIND ERROR	6KTS	1KTS	-2KTS	-6KTS	6KTS	2KTS	-1KTS	-3KTS
NUMBER OF FORECASTS	62	59	54	49	66	62	57	52

HURRICANE KATHERINE

1200Z 29 SEP TO 1800Z 8 OCT

	BEST TRACK		WARNING				24 HOUR FORECAST				48 HOUR FORECAST				72 HOUR FORECAST			
	POSIT	WIND	POSIT	WIND	ERRORS DST	ERRORS WIND	POSIT	WIND	ERRORS DST	ERRORS WIND	POSIT	WIND	ERRORS DST	ERRORS WIND	POSIT	WIND	ERRORS DST	ERRORS WIND
291200Z	11.8N 109.5W	30	11.7N 110.0W	30	30	0	13.4N 113.6W	30	33	-30	--.- ---.-	--	--	--	--.- ---.-	--	--	--
291800Z	12.1N 110.2W	35	11.8N 110.6W	40	29	5	14.0N 113.9W	60	47	-5	17.4N 116.0W	60	150	-30	21.2N 116.3W	50	343	-40
300000Z	12.8N 111.3W	40	12.1N 111.2W	45	42	5	15.0N 115.0W	65	61	-10	19.4N 114.5W	60	220	-30	23.0N 116.3W	60	453	-25
300600Z	13.3N 112.2W	50	13.1N 112.1W	50	13	0	16.0N 115.0W	70	104	-10	19.8N 115.9W	75	256	-15	23.5N 115.3W	60	530	-25
301200Z	13.8N 113.2W	60	13.6N 113.0W	50	17	-10	16.6N 115.4W	60	129	-25	20.7N 115.8W	55	313	-40	24.7N 114.9W	50	641	-35
301800Z	13.9N 114.7W	65	13.9N 114.8W	60	6	-5	15.3N 119.5W	55	104	-35	16.5N 124.2W	50	230	-40	16.8N 129.3W	45	292	-35
010000Z	14.1N 115.5W	75	14.3N 116.0W	60	31	-15	15.5N 120.7W	75	148	-15	16.4N 125.0W	70	259	-15	16.6N 130.5W	65	275	-5
010600Z	14.7N 116.2W	80	14.6N 116.3W	70	8	-10	15.8N 120.4W	75	98	-15	16.3N 124.8W	70	171	-15	16.8N 129.0W	65	115	5
011200Z	15.0N 116.9W	85	15.3N 118.5W	70	94	-15	17.1N 123.1W	70	200	-25	19.5N 127.3W	65	291	-20	23.0N 130.5W	60	452	10
011800Z	15.5N 117.7W	90	15.3N 117.3W	80	26	-10	17.1N 120.2W	80	18	-10	20.3N 125.5W	75	230	-5	24.0N 123.5W	65	624	25
020000Z	16.1N 118.2W	90	16.0N 118.0W	85	13	-5	18.5N 120.0W	75	114	-10	21.5N 121.5W	60	386	-10	25.0N 122.0W	40	777	5
020600Z	16.6N 118.9W	90	16.2N 118.8W	85	25	-5	18.0N 122.5W	80	69	-5	19.5N 126.5W	65	200	25	20.5N 130.5W	45	354	10
021200Z	16.9N 119.6W	95	16.0N 118.5W	85	83	-10	18.1N 122.3W	80	74	-5	20.1N 124.9W	65	330	15	22.3N 127.2W	50	588	20
021800Z	16.8N 120.2W	90	16.5N 120.3W	85	19	-5	18.0N 123.0W	75	99	-5	19.3N 125.7W	80	330	40	21.0N 129.0W	50	513	20
030000Z	16.9N 121.1W	85	17.1N 120.9W	80	17	-5	18.5N 124.0W	55	158	-15	20.0N 127.0W	40	371	5	21.0N 130.5W	30	516	0
030600Z	17.0N 121.9W	85	17.3N 121.5W	75	29	-10	18.8N 124.7W	50	207	-10	20.3N 128.0W	40	406	25	21.5N 131.5W	30	553	0
031200Z	17.0N 122.9W	85	17.7N 122.4W	75	51	-10	19.0N 125.4W	55	261	5	19.9N 128.7W	45	424	15	20.0N 132.0W	30	518	0
031800Z	16.8N 124.2W	80	16.8N 124.7W	65	29	-15	15.9N 129.1W	55	50	15	15.2N 133.5W	50	83	20	14.6N 138.0W	45	96	15
040000Z	16.4N 125.7W	70	16.6N 125.7W	65	12	-5	15.7N 130.0W	55	68	20	15.0N 135.0W	50	76	20	14.0N 139.0W	45	86	15
040600Z	16.2N 127.1W	60	16.4N 127.0W	60	13	0	15.5N 132.0W	45	43	10	15.0N 137.0W	40	72	10	14.5N 142.0W	40	83	10
041200Z	15.7N 128.4W	50	16.1N 128.2W	55	27	5	15.2N 133.3W	40	48	10	14.2N 138.2W	30	43	0	13.5N 143.2W	25	29	-5
041800Z	15.4N 129.8W	40	15.7N 129.7W	55	19	15	15.0N 135.5W	40	75	10	17.0N 141.0W	35	241	5	20.0N 146.0W	35	429	5
050000Z	15.1N 131.0W	35	15.7N 129.9W	50	73	15	15.0N 137.0W	40	92	10	17.5N 142.0W	35	269	5	20.5N 147.0W	30	455	0
050600Z	14.8N 132.2W	35	15.2N 132.0W	50	27	15	15.0N 137.5W	45	80	15	17.0N 142.0W	40	229	10	19.0N 146.0W	35	347	5
051200Z	14.4N 133.4W	30	15.3N 132.2W	50	88	20	14.9N 138.7W	45	93	15	15.5N 143.0W	40	145	10	18.0N 147.7W	35	281	10
051800Z	14.2N 134.5W	30	14.2N 134.5W	50	0	20	13.0N 138.3W	40	52	10	12.0N 142.2W	40	119	10	15.4N 162.3W	35	767	10
060000Z	14.0N 135.8W	30	14.1N 135.6W	45	13	15	12.5N 141.0W	35	63	5	12.0N 146.0W	30	84	0	--.- ---.-	--	--	--
060600Z	13.8N 136.9W	30	14.0N 137.5W	40	37	10	14.0N 142.5W	25	75	-5	15.0N 145.0W	25	131	-5	--.- ---.-	--	--	--
061200Z	13.5N 138.0W	30	14.6N 138.7W	40	77	10	15.8N 142.7W	30	155	0	17.5N 148.0W	25	251	0	--.- ---.-	--	--	--
061800Z	13.4N 139.1W	30	13.0N 139.8W	50	47	20	12.5N 143.8W	50	36	20	11.8N 147.7W	50	130	25	--.- ---.-	--	--	--
070000Z	13.3N 140.3W	30	12.6N 141.0W	50	58	20	11.8N 146.5W	50	113	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
070600Z	13.2N 141.5W	30	12.5N 142.0W	45	51	15	12.5N 147.0W	40	58	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
071200Z	13.2N 142.8W	30	13.1N 143.2W	40	24	10	13.9N 148.2W	35	43	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
071800Z	13.1N 143.9W	30	12.9N 144.1W	35	17	5	13.0N 148.2W	35	63	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
080000Z	13.1N 145.1W	30	13.3N 146.3W	35	71	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
080600Z	13.2N 146.3W	30	13.4N 146.8W	35	31	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
081200Z	13.3N 147.9W	25	13.6N 148.2W	35	29	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
081800Z	13.4N 149.2W	25	13.5N 148.0W	30	70	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	HURRICANES WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	30NM	104NM	276NM	442NM	35NM	92NM	222NM	405NM
AVERAGE RIGHT ANGLE ERROR	18NM	65NM	176NM	326NM	19NM	62NM	157NM	308NM
AVERAGE MAGNITUDE OF WIND ERROR	8KTS	14KTS	19KTS	20KTS	10KTS	13KTS	15KTS	13KTS
AVERAGE BIAS OF WIND ERROR	-3KTS	-9KTS	-10KTS	-10KTS	3KTS	-1KTS	-1KTS	-0KTS
NUMBER OF FORECASTS	23	20	15	11	38	34	29	25

ANNEX B

BAY OF BENGAL TROPICAL CYCLONES

1. SUMMARY OF DATA [1]

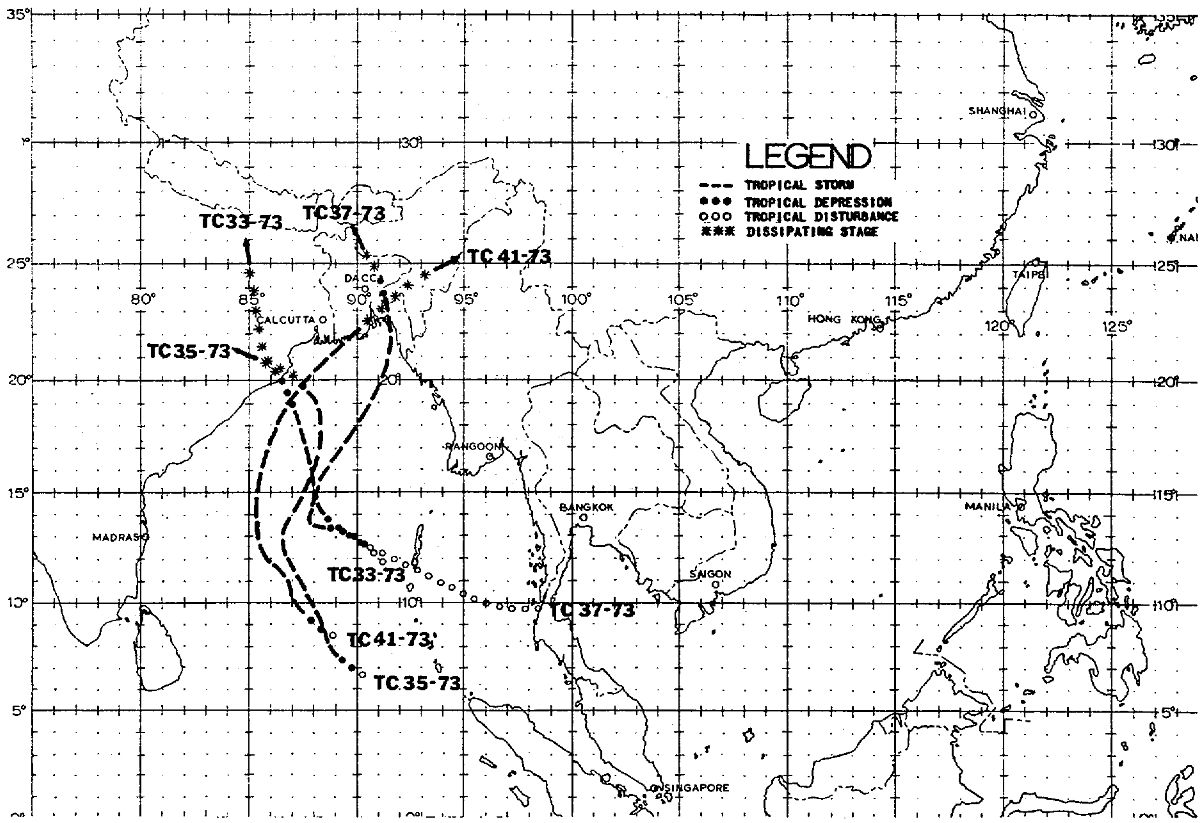


FIGURE B-1. *Composite chart of best tracks for the Bay of Bengal.*

TABLE B-1. 1973 BAY OF BENGAL TROPICAL CYCLONES

CYCLONE	INCLUSIVE DATES	MAX SFC WND	MIN OBS SLP	NO. OF WARNINGS ISSUED	REMARKS
33-73	08 OCT - 12 OCT	40	---	9	-----------------
35-73	04 NOV - 09 NOV	70	988	13	-----------------
37-73	15 NOV - 17 NOV	55	---	4	FORMERLY TS SARAH
41-73	05 DEC - 09 DEC	60	---	8	-----------------

[1] Tropical cyclones in the Bay of Bengal are numbered consecutively from the beginning of the calendar year and are included with those developing in the South Pacific and Indian oceans. The JTWC area of responsibility in the Bay of Bengal includes the area north of the equator from the Malay Peninsula to 90°E. The JTWC issued two warnings in the Bay of Bengal during 1973 when T.C. 33-73 went ashore east of Dacca and when T.C. 35-73 was forecast to recurve and move eastward into the JTWC's area of responsibility. All other warnings were issued by FLEWEACEN Guam. All Bay of Bengal cyclones for 1973 are included in Annex B.

2. TROPICAL CYCLONE TRACKS

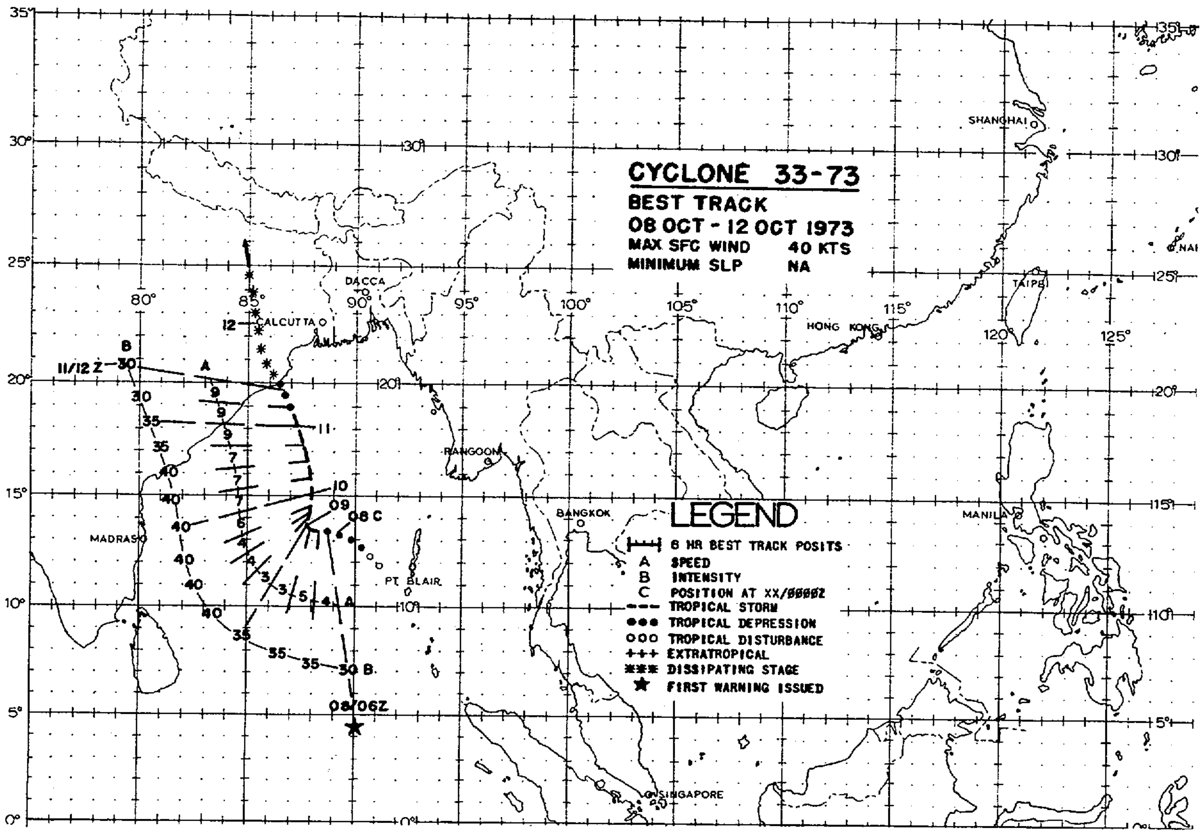


FIGURE B-2. *Best track chart for Tropical Cyclone 33-73.*

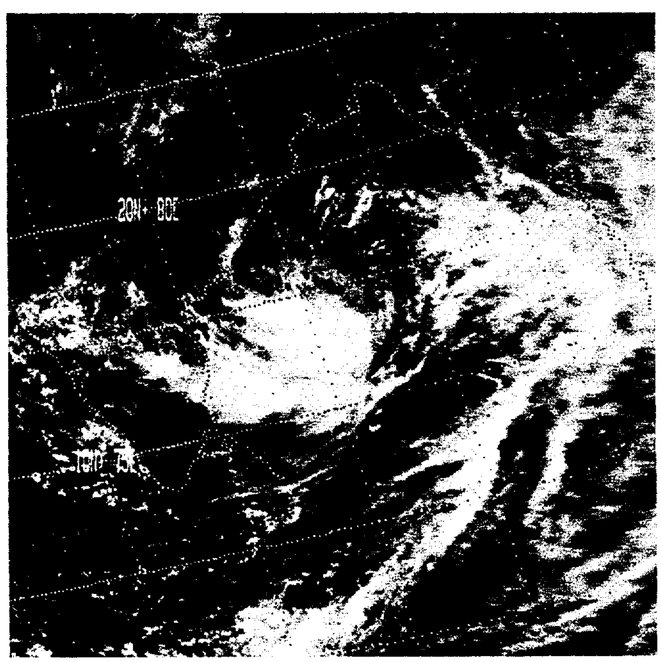


FIGURE B-3. *NOAA-2 imagery of Tropical Cyclone 33-73, 9 October 1973, 0353 GMT.*

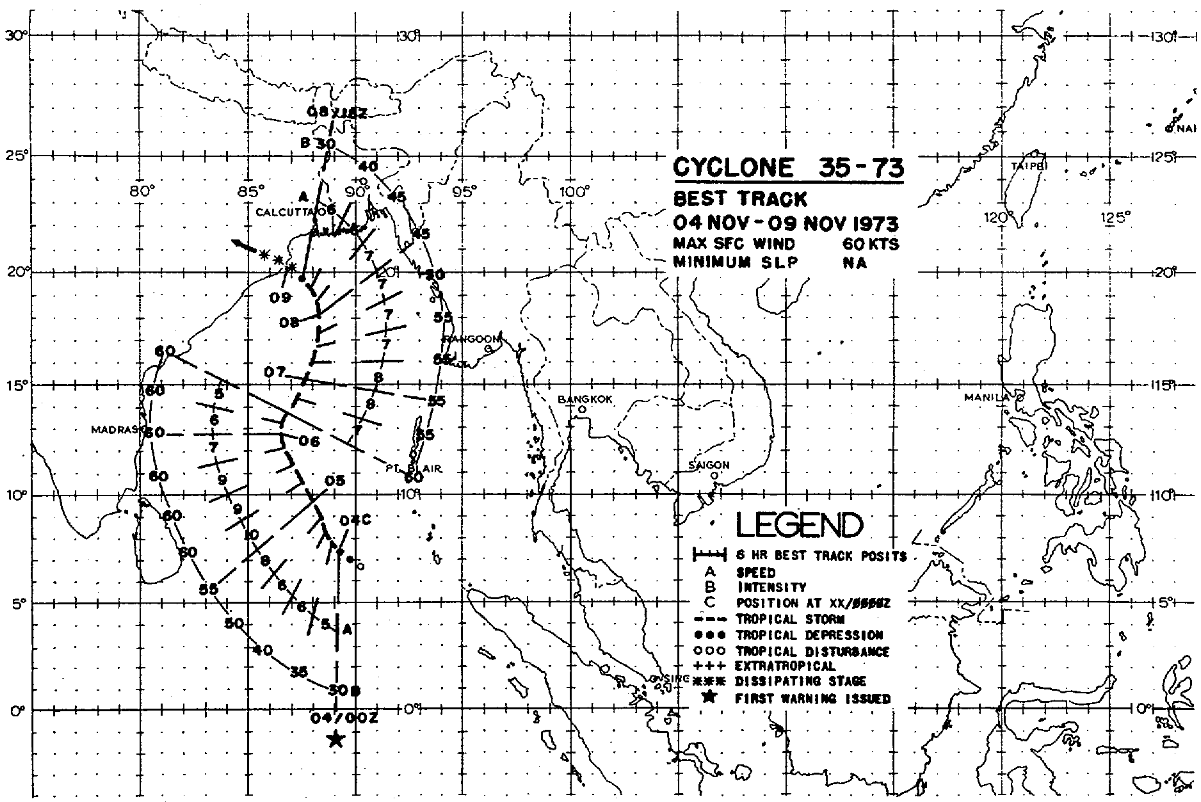


FIGURE B-4. *Best track chart for Tropical Cyclone 35-73.*

FIGURE B-5. *DMSP imagery of Tropical Cyclone 35-73, 8 November 1973, 0243 GMT.*

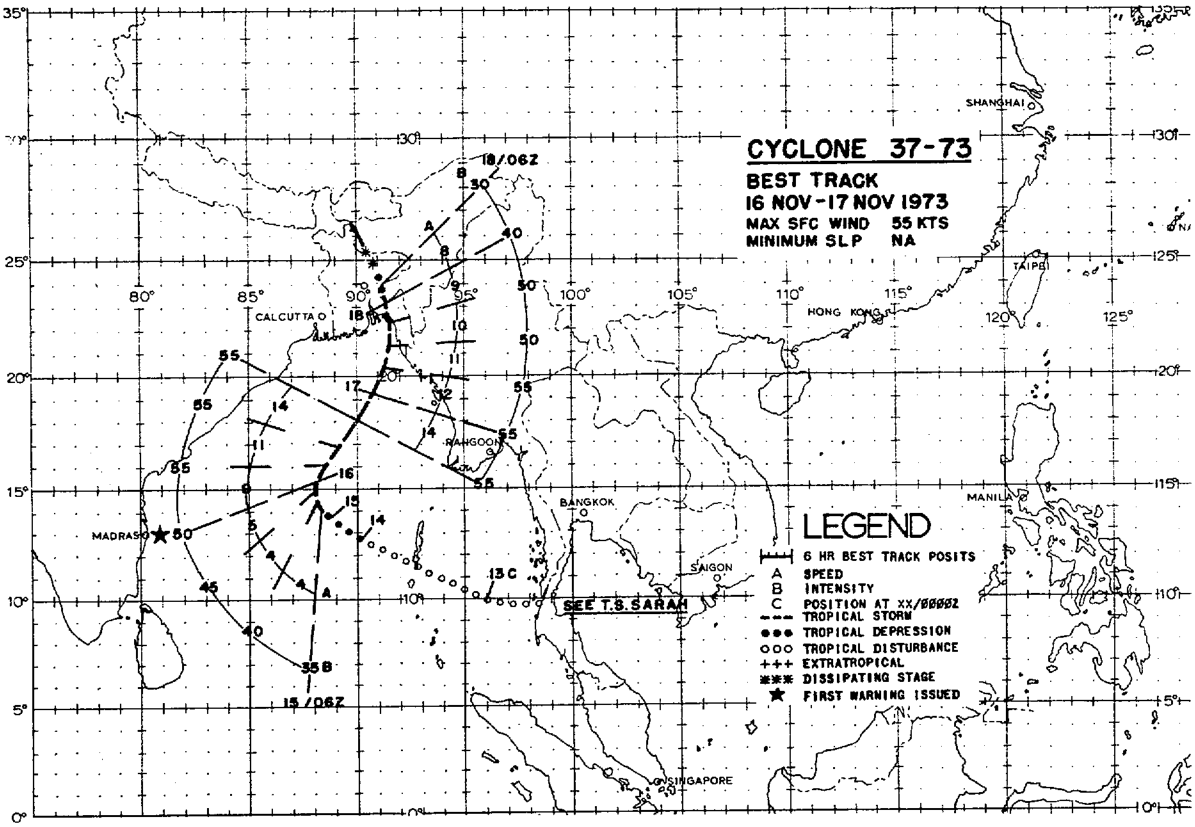


FIGURE B-6. *Best track chart for Tropical Cyclone 37-73.*

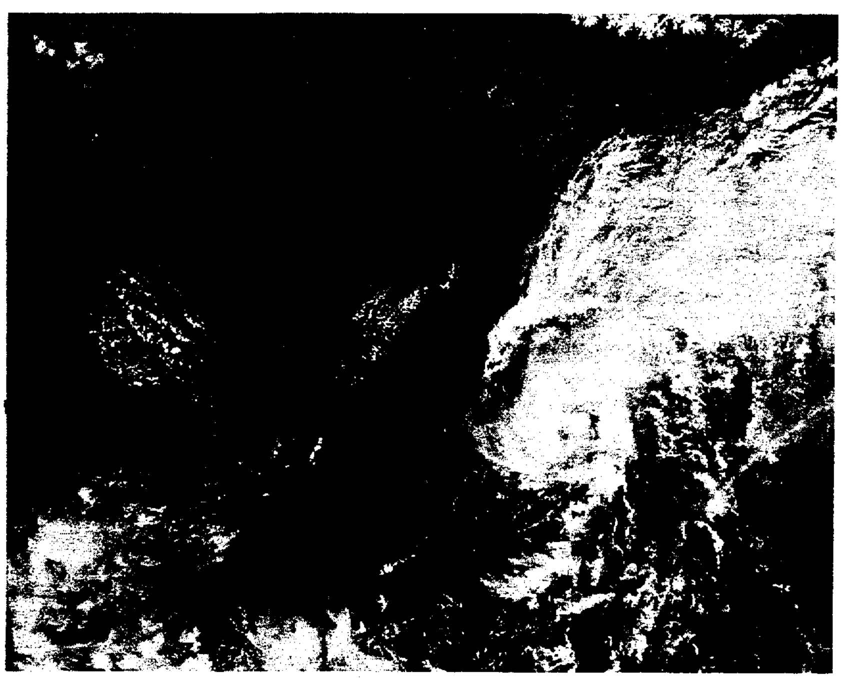


FIGURE B-7. *DMSP imagery of Tropical Cyclone 37-73, 16 November 1973, 0159 GMT.*

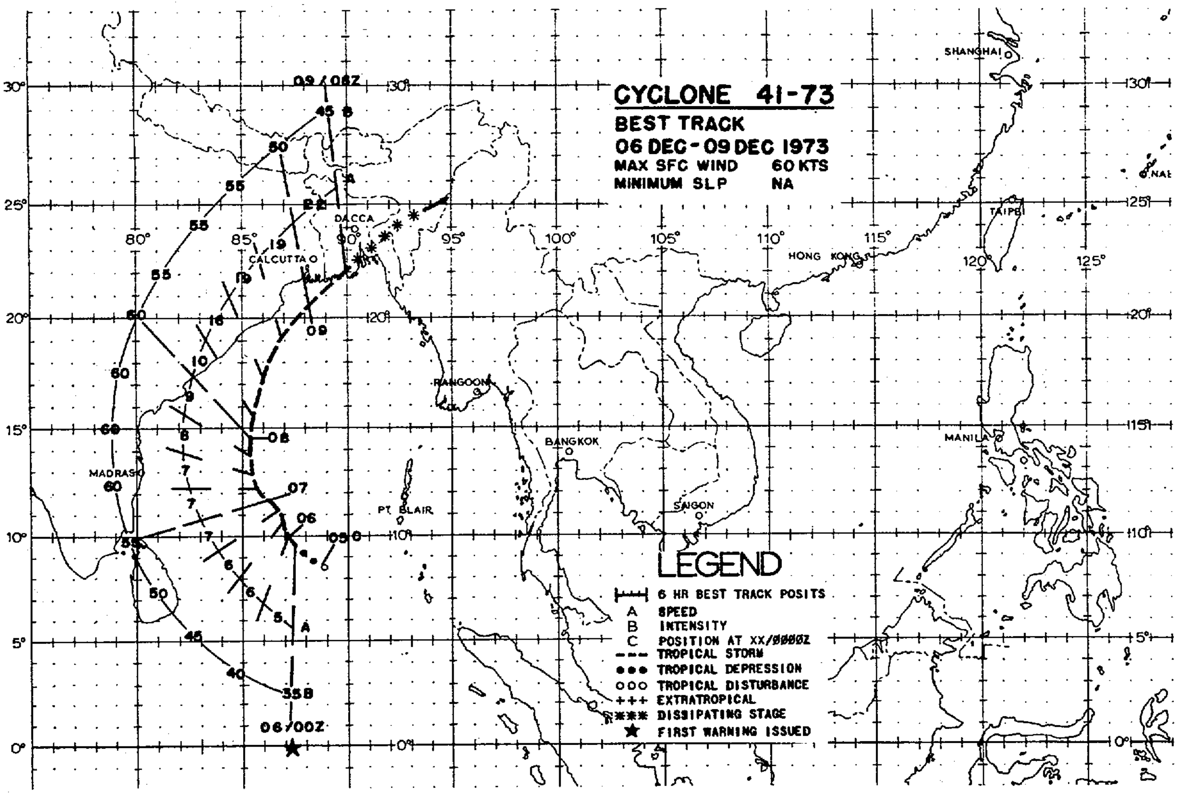


FIGURE B-8. *Best track chart for Tropical Cyclone 41-73.*

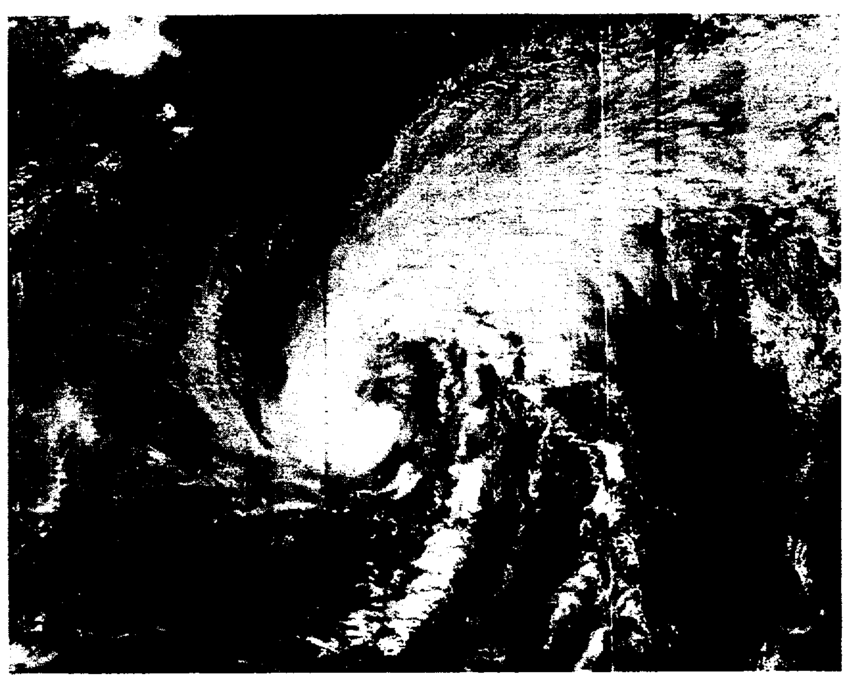


FIGURE B-9. *DMSP imagery of Tropical Cyclone 41-73, 8 December 1973, 0621 GMT.*

3. CENTER FIX DATA

TROPICAL CYCLONE 33-73
FIX POSITIONS FOR CYCLONE NO. 33-73
0600Z 08 OCT TO 0000Z 12 OCT

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR VEL BRG RNG	MAX OBS SFC WIND VEL BRG RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TI/TO	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSG NMBR
1	806137	18.8N 927.0E	SAT	(T	0/ 0 /	/ MRS)	PCN 3 DMSP								
2	812137	28.8N 527.5E	SAT				PCN 3 DMSP								
3	818137	38.8N 30.0E	SAT	(T	0/ 0 /	/ MRS)	PCN 3 DMSP								
4	900137	58.7N 833.5E	SAT	(T	0/ 0 /	/ MRS)	PCN 3 DMSP								
5	906137	88.7N 801.5E	SAT	(T	0/ 0 /	/ MRS)	PCN 3 DMSP								
6	912147	28.7N 901.5E	SAT				PCN 3 DMSP								
7	918147	58.8N 100.5E	SAT	(T	0/ 0 /	/ MRS)	PCN 3 DMSP								
8	1000157	18.8N 136.0E	SAT	(T	0/ 0 /	/ MRS)	PCN 3 DMSP								
9	1006157	88.7N 935.0E	SAT	(T	0/ 0 /	/ MRS)	PCN 3 DMSP								
10	1012167	58.7N 835.0E	SAT				PCN 3 DMSP								
11	1018172	38.7N 634.5E	SAT	(T	0/ 0 /	/ MRS)	PCN 3 DMSP								
12	1100187	18.7N 434.0E	SAT	(T	0/ 0 /	/ MRS)	PCN 3 DMSP								
13	1106187	98.7N 33.5E	SAT	(T	0/ 0 /	/ MRS)	PCN 3 DMSP								
14	1112197	78.6N 533.5E	SAT				PCN 3 DMSP								
15	1118207	98.5N 833.0E	SAT	(T	0/6.0 /	/ MRS)	PCN 3 DMSP								
16	1200237	58.5N 234.5E	SAT	(T	0/6.0 /	/ MRS)	PCN 3 DMSP								

TROPICAL CYCLONE 35-73
FIX POSITIONS FOR CYCLONE NO. 35-73
0000Z 04 NOV TO 1200Z 09 NOV

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR VEL BRG RNG	MAX OBS SFC WIND VEL BRG RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TI/TO	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSG NMBR
1	400072	58.9N 131.5E	SAT	(T	0/6.0 /	/ MRS)	PCN 3 DMSP								
2	406072	88.8N 832.5E	SAT	(T	0/6.0 /	/ MRS)	PCN 3 DMSP								
3	412082	38.8N 533.5E	SAT				PCN 3 DMSP								
4	418082	98.8N 334.0E	SAT	(T	0/6.0 /	/ MRS)	PCN 3 DMSP								
5	500092	78.8N 33.5E	SAT	(T	0/6.0 /	/ MRS)	PCN 3 DMSP								
6	0506102	68.7N 533.0E	SAT	(T	0/1.0 /	/ MRS)	PCN 3 DMSP								
7	512112	38.7N 133.0E	SAT				PCN 3 DMSP								
8	518122	18.6N 633.5E	SAT	(T	0/1.0 /	/ MRS)	PCN 3 DMSP								
9	600122	88.6N 536.0E	SAT	(T	0/1.0 /	/ MRS)	PCN 3 DMSP								
10	606132	38.6N 602.0E	SAT	(T	0/1.0 /	/ MRS)	PCN 3 DMSP								
11	612132	88.6N 803.0E	SAT				PCN 3 DMSP								
12	618142	48.7N 303.0E	SAT	(T	0/1.0 /	/ MRS)	PCN 3 DMSP								
13	700152	28.7N 702.5E	SAT	(T	0/1.0 /	/ MRS)	PCN 3 DMSP								
14	706162	18.8N 2.0E	SAT	(T	0/1.0 /	/ MRS)	PCN 3 DMSP								
15	712162	78.8N 200.5E	SAT				PCN 3 DMSP								
16	718172	48.8N 300.5E	SAT	(T	0/1.0 /	/ MRS)	PCN 3 DMSP								
17	800182	28.8N 335.5E	SAT	(T	0/1.0 /	/ MRS)	PCN 3 DMSP								
18	806182	88.8N 133.5E	SAT	(T	0/1.0 /	/ MRS)	PCN 3 DMSP								
19	808182	98.8N 133.0E	SAT				PCN 3 DMSP								
20	812192	38.7N 933.0E	SAT				PCN 3 DMSP								
21	818192	78.7N 531.0E	SAT	(T	0/1.0 /	/ MRS)	PCN 3 DMSP								
22	900202	28.6N 930.0E	SAT	(T	0/1.0 /	/ MRS)	PCN 3 DMSP								

TROPICAL CYCLONE 37-73
FIX POSITIONS FOR CYCLONE NO. 37-73
0000Z 16 NOV TO 0800Z 17 NOV

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR VEL BRG RNG	MAX OBS SFC WIND VEL BRG RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TI/TO	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSG NMBR
1	1600152	38.8N 136.0E	SAT	(T	0/1.0 /	/ MRS)	PCN 3 DMSP								
2	1606162	18.8N 504.5E	SAT	(T	0/1.0 /	/ MRS)	PCN 3 DMSP								
3	1612162	98.9N 103.5E	SAT				PCN 3 DMSP								
4	1618182	8.9N 903.5E	SAT	(T	0/3.0 /	/ MRS)	PCN 3 DMSP								
5	1700192	29.0N 703.0E	SAT	(T	0/2.5 /	/ MRS)	PCN 3 DMSP								
6	1706202	29.1N 201.5E	SAT	(T	0/2.0 /	/ MRS)	PCN 3 DMSP								
7	1708202	49.1N 301.5E	SAT				PCN 3 DMSP								
8	1712212	39.1N 401.0E	SAT				PCN 3 DMSP								
9	1718222	39.1N 536.0E	SAT	(T	0/1.0 /	/ MRS)	PCN 3 DMSP								
10	1800232	19.1N 435.0E	SAT	(T	0/1.0 /	/ MRS)	PCN 3 DMSP								
11	1806232	99.1N 234.0E	SAT	(T	0/1.0 /	/ MRS)	PCN 3 DMSP								
12	1812242	69.0N 933.5E	SAT				PCN 3 DMSP								

TROPICAL CYCLONE 41-73
FIX POSITIONS FOR CYCLONE NO. 41-73
0000Z 06 DEC TO 1200Z 09 DEC

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR VEL BRG RNG	MAX OBS SFC WIND VEL BRG RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TI/TO	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSG NMBR
1	600092	78.7N 531.5E	SAT	(T	0/1.0 /	/ MRS)	PCN 3 DMSP								
2	606102	18.7N 232.0E	SAT	(T	0/1.0 /	/ MRS)	PCN 3 DMSP								
3	612102	68.6N 933.5E	SAT				PCN 3 DMSP								
4	618112	28.6N 632.5E	SAT	(T	0/1.0 /	/ MRS)	PCN 3 DMSP								
5	700112	78.6N 231.5E	SAT	(T	0/1.0 /	/ MRS)	PCN 3 DMSP								
6	706122	28.5N 732.5E	SAT	(T	0/1.0 /	/ MRS)	PCN 3 DMSP								
7	712122	98.5N 534.5E	SAT				PCN 3 DMSP								
8	718132	78.5N 336.0E	SAT	(T	0/1.0 /	/ MRS)	PCN 3 DMSP								
9	0800142	68.5N 301.0E	SAT	(T	0/1.0 /	/ MRS)	PCN 3 DMSP								
10	0806152	68.5N 601.5E	SAT	(T	0/2.5 /	/ MRS)	PCN 3 DMSP								
11	0812172	38.6N 1.5E	SAT				PCN 3 DMSP								
12	0818192	28.6N 803.0E	SAT	(T	0/5.5 /	/ MRS)	PCN 3 DMSP								
13	0900202	68.8N 105.0E	SAT	(T	0/6.5 /	/ MRS)	PCN 3 DMSP								
14	0906222	18.9N 905.0E	SAT	(T	0/7.0 /	/ MRS)	PCN 3 DMSP								
15	0912232	49.1N 505.0E	SAT				PCN 3 DMSP								

4. POSITION AND VERIFICATION DATA

TROPICAL CYCLONE 33-73

0600Z 08 OCT TO 0000Z 12 OCT

	BEST TRACK			WARNING			ERRORS		24 HOUR FORECAST			ERRORS		48 HOUR FORECAST			ERRORS		72 HOUR FORECAST			ERRORS	
	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
080600Z	13.1N	88.9E	30	13.1N	88.6E	35	17	5	13.9N	86.2E	45	93	5	15.2N	83.5E	55	256	15	--.-	---.-	--	--	--
081200Z	13.2N	88.5E	35	14.0N	88.0E	35	56	0	16.1N	85.7E	45	170	5	18.5N	83.9E	45	252	5	--.-	---.-	--	--	--
081800Z	13.3N	88.0E	35	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
090000Z	13.5N	87.8E	35	13.3N	87.5E	35	21	0	14.2N	86.1E	45	127	5	15.0N	84.7E	45	241	10	--.-	---.-	--	--	--
090600Z	13.8N	87.8E	40	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
091200Z	14.2N	87.9E	40	13.8N	87.3E	40	42	0	14.4N	86.1E	60	159	20	15.2N	85.0E	65	282	35	--.-	---.-	--	--	--
091800Z	14.5N	88.1E	40	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
100000Z	15.1N	88.1E	40	14.4N	88.1E	40	42	0	15.4N	88.7E	60	178	25	16.6N	89.0E	65	464	40	--.-	---.-	--	--	--
100600Z	15.8N	87.9E	40	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
101200Z	16.5N	87.8E	40	16.0N	88.3E	40	41	0	17.6N	88.5E	45	169	15	--.-	---.-	--	--	--	--.-	---.-	--	--	--
101800Z	17.3N	87.6E	35	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
110000Z	18.1N	87.4E	35	17.5N	86.8E	40	49	5	19.8N	86.3E	50	229	25	--.-	---.-	--	--	--	--.-	---.-	--	--	--
110600Z	18.9N	87.0E	30	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
111200Z	19.7N	86.5E	30	18.7N	86.5E	45	60	15	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
111800Z	20.9N	85.8E	25	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
120000Z	23.5N	85.7E	25	21.5N	86.8E	35	149	10	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--

	ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	53NM	161NM	295NM	0NM
AVERAGE RIGHT ANGLE ERROR	26NM	75NM	170NM	0NM
AVERAGE MAGNITUDE OF WIND ERROR	4KTS	14KTS	21KTS	0KTS
AVERAGE BIAS OF WIND ERROR	4KTS	14KTS	21KTS	0KTS
NUMBER OF FORECASTS	9	7	5	0

TROPICAL CYCLONE 35-73

0000Z 04 NOV TO 1200Z 09 NOV

	BEST TRACK			WARNING			ERRORS		24 HOUR FORECAST			ERRORS		48 HOUR FORECAST			ERRORS		72 HOUR FORECAST			ERRORS	
	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
040000Z	7.5N	89.1E	30	7.2N	89.4E	35	25	5	7.7N	87.1E	40	131	-15	8.2N	85.3E	45	287	-15	--.-	---.-	--	--	--
040600Z	7.8N	88.8E	35	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
041200Z	8.3N	88.5E	40	7.7N	87.5E	40	69	0	8.9N	84.8E	60	197	0	9.8N	82.5E	75	347	15	--.-	---.-	--	--	--
041800Z	8.9N	88.3E	50	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
050000Z	9.7N	88.0E	55	8.3N	85.8E	45	154	-10	9.8N	82.5E	65	295	5	10.8N	79.1E	40	565	-15	--.-	---.-	--	--	--
050600Z	10.6N	87.5E	60	10.7N	87.4E	50	8	-10	14.3N	88.2E	70	110	10	18.1N	89.3E	80	141	25	--.-	---.-	--	--	--
051200Z	11.3N	87.1E	60	11.6N	87.7E	55	39	-5	15.3N	88.4E	75	129	15	19.0N	89.7E	80	162	25	--.-	---.-	--	--	--
051800Z	12.1N	86.6E	60	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
060000Z	12.8N	86.5E	60	13.4N	87.9E	60	89	0	17.2N	89.1E	75	144	20	20.5N	90.2E	80	194	45	--.-	---.-	--	--	--
060600Z	13.3N	86.6E	60	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
061200Z	13.8N	86.8E	60	14.2N	86.2E	70	42	10	17.8N	86.6E	80	112	25	21.0N	87.6E	80	102	40	--.-	---.-	--	--	--
061800Z	14.4N	87.3E	55	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
070000Z	15.2N	87.7E	55	15.4N	86.4E	80	76	25	19.4N	89.5E	70	99	25	--.-	---.-	--	--	--	--.-	---.-	--	--	--
070600Z	16.1N	88.8E	55	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
071200Z	16.7N	88.7E	55	17.1N	87.3E	75	57	20	21.5N	93.1E	40	319	0	--.-	---.-	--	--	--	--.-	---.-	--	--	--
071800Z	17.4N	88.3E	50	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
080000Z	18.2N	88.3E	45	19.3N	90.2E	70	126	25	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
080600Z	18.9N	88.1E	45	18.6N	90.5E	60	137	15	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
081200Z	19.3N	87.9E	40	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
081800Z	19.7N	87.5E	30	19.6N	88.9E	55	79	25	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
090000Z	20.2N	86.9E	25	19.5N	88.5E	55	99	30	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--

	ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	77NM	171NM	257NM	0NM
AVERAGE RIGHT ANGLE ERROR	68NM	132NM	184NM	0NM
AVERAGE MAGNITUDE OF WIND ERROR	14KTS	13KTS	24KTS	0KTS
AVERAGE BIAS OF WIND ERROR	10KTS	5KTS	10KTS	0KTS
NUMBER OF FORECASTS	13	9	7	0

TROPICAL CYCLONE 37-73

00007 16 NOV TO 0800Z 17 NOV

	BEST TRACK			WARNING					24 HOUR FORECAST					48 HOUR FORECAST					72 HOUR FORECAST				
	POSIT		WIND	POSIT		WIND	ERRORS DST	ERRORS WIND	POSIT		WIND	ERRORS DST	ERRORS WIND	POSIT		WIND	ERRORS DST	ERRORS WIND	POSIT		WIND	ERRORS DST	ERRORS WIND
160000Z	15.3N	88.1E	50	15.0N	87.9E	60	21	10	16.5N	86.8E	75	274	20	--.-	---.-	--	--	--	--.-	---.-	--	--	--
160600Z	16.1N	88.5E	55	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
161200Z	16.9N	89.1E	55	16.3N	88.2E	60	63	5	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
161800Z	18.0N	89.9E	55	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
170000Z	19.2N	90.7E	55	18.6N	89.1E	60	97	5	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
170800Z	20.4N	91.3E	55	20.5N	91.8E	60	29	5	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--

	ALL FORECASTS WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	52NM	274NM	0NM	0NM
AVERAGE RIGHT ANGLE ERROR	32NM	97NM	0NM	0NM
AVERAGE MAGNITUDE OF WIND ERROR	6KTS	20KTS	0KTS	0KTS
AVERAGE BIAS OF WIND ERROR	6KTS	20KTS	0KTS	0KTS
NUMBER OF FORECASTS	4	1	0	0

TROPICAL CYCLONE 41-73

0000Z 06 DEC TO 1200Z 09 DEC

	BEST TRACK			WARNING					24 HOUR FORECAST					48 HOUR FORECAST					72 HOUR FORECAST				
	POSIT		WIND	POSIT		WIND	ERRORS DST	ERRORS WIND	POSIT		WIND	ERRORS DST	ERRORS WIND	POSIT		WIND	ERRORS DST	ERRORS WIND	POSIT		WIND	ERRORS DST	ERRORS WIND
060000Z	9.7N	87.5E	35	7.1N	87.0E	40	158	5	7.8N	85.2E	50	240	-5	8.5N	83.5E	60	379	0	--.-	---.-	--	--	--
060600Z	10.1N	87.2E	40	10.0N	87.2E	40	6	0	10.8N	85.3E	50	87	-10	11.6N	84.7E	60	245	5	--.-	---.-	--	--	--
061200Z	10.6N	86.9E	45	10.2N	87.6E	40	48	-5	11.2N	86.5E	55	117	-5	12.0N	85.3E	75	319	20	--.-	---.-	--	--	--
061800Z	11.2N	86.6E	50	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
070000Z	11.7N	86.2E	55	11.0N	87.1E	45	53	-10	13.9N	87.1E	50	112	-10	15.7N	88.2E	65	293	15	--.-	---.-	--	--	--
070600Z	12.2N	85.7E	60	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
071200Z	12.9N	85.5E	60	12.7N	85.0E	45	31	-15	15.2N	83.9E	60	174	5	17.3N	83.9E	65	560	35	--.-	---.-	--	--	--
071800Z	13.7N	85.3E	60	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
080000Z	14.6N	85.3E	60	14.0N	85.1E	60	38	0	16.8N	84.6E	65	301	15	--.-	---.-	--	--	--	--.-	---.-	--	--	--
080600Z	15.6N	85.6E	55	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
081200Z	17.3N	86.0E	55	16.2N	85.3E	60	77	5	19.2N	86.0E	65	396	35	--.-	---.-	--	--	--	--.-	---.-	--	--	--
081800Z	19.2N	86.8E	55	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
090000Z	20.6N	88.1E	50	21.3N	87.8E	50	45	0	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
090600Z	22.1N	89.9E	45	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
091200Z	23.4N	91.5E	30	23.3N	91.6E	40	8	10	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--

	ALL FORECASTS WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	52NM	204NM	359NM	0NM
AVERAGE RIGHT ANGLE ERROR	38NM	80NM	110NM	0NM
AVERAGE MAGNITUDE OF WIND ERROR	6KTS	12KTS	15KTS	0KTS
AVERAGE BIAS OF WIND ERROR	-1KTS	4KTS	15KTS	0KTS
NUMBER OF FORECASTS	9	7	5	0

APPENDIX

ABBREVIATIONS AND DEFINITIONS

The following abbreviations and definitions apply for the purpose of this report.

1. ABBREVIATIONS

AC&W	Aircraft Control and Warning
AIREPS	Commerical and Military Aircraft Weather Report
AJTWC	Alternate Joint Typhoon Warning Center (Asian Tactical Forecast Center, Fuchu, Japan)
APT	Automatic Picture Transmission
AWN	Automatic Weather Network
CINCPAC	Commander in Chief, Pacific
CINCPACAF	Commander in Chief, Pacific Air Forces
CINCPACFLT	Commander in Chief, Pacific Fleet
CINCUSARPAC	Commander in Chief, U.S. Army Pacific
DAPP	Data Acquisition and Processing Program (Renamed DMSP)
DMSP	Defense Meteorological Satellite Program
ENVPREDRSCHFAC	Environmental Prediction Research Facility (Naval Postgraduate School, Monterey, California)
NESS	National Environmental Satellite Service (Suitland, Maryland)
NWS/NOAA	National Weather Service, National Oceanic and Atmospheric Administration
PACOM	Pacific Command
SLP (MSLP)	Sea Level Pressure (Minimum Sea Level Pressure)
TCRC	Tropical Cyclone Reconnaissance Coordinator
WMO	World Meteorological Organization

2. DEFINITIONS

CYCLONE - An atmospheric closed circulation rotating counterclockwise in the northern hemisphere.

TROPICAL CYCLONE - A non-frontal cyclone of synoptic scale, developing over tropical or sub-tropical waters and having a definite organized circulation and warm core.

TROPICAL DEPRESSION - A tropical cyclone in which the maximum sustained surface wind is 33 kt or less.

TROPICAL STORM - A tropical cyclone with maximum sustained surface winds in the range 34 to 63 kt inclusive.

TYPHOON/HURRICANE - A tropical cyclone with maximum sustained surface wind speeds 64 kt or greater. West of 180 degrees longitude the name TYPHOON is used and east of 180 degrees longitude the name HURRICANE is used. All descriptive references to typhoons apply equally to hurricanes.

SUPER TYPHOON - A typhoon with maximum sustained winds greater than or equal to 130 kt.

TROPICAL DISTURBANCE - A discrete system of apparently organized convection, generally 100 to 300 miles in diameter originating in the tropics or sub-tropics, having a non-frontal migratory character and having maintained its identity for 24 hours or more. It may or may not be associated with a detectable perturbation on the wind field. As such, it is the basic generic designation which, in successive stages of intensification, may be subsequently classified as a tropical depression, tropical storm or typhoon.

EYE/CENTER - EYE refers to the roughly circular central area of a well-developed tropical cyclone usually characterized by comparatively light winds and fair weather. If more than half surrounded by wall cloud, the word EYE is used; otherwise, the area is referred to as a CENTER.

WALL CLOUD - A densely organized, roughly circular structure of cumuliform clouds completely or partially surrounding the eye or center of a tropical cyclone.

MAXIMUM SUSTAINED WIND - Highest surface wind speed of a cyclone averaged over a one minute period of time.

EXTRATROPICAL - A term used in warnings and tropical summaries to indicate that a cyclone has lost its "tropical characteristics." The term implies both poleward displacement from the tropics and the conversion of the cyclone's dominant energy source from latent heat of condensation release to baroclinic processes.

TROPICAL CYCLONE RECONNAISSANCE COORDINATOR - A CINCPACAF representative designated to levy tropical cyclone weather reconnaissance requirements on CINCPACAF reconnaissance units within a designated area of PACOM and to function as a coordinator between CINCPACAF, weather reconnaissance units, and JTWC.

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NHC (2)
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1. REPORT NUMBER Annual Typhoon Report 1973	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (*and Subtitle*) ANNUAL TYPHOON REPORT 1973		5. TYPE OF REPORT & PERIOD COVERED Annual (JAN-DEC 1973)
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(*s*)		8. CONTRACT OR GRANT NUMBER(*s*)
9. PERFORMING ORGANIZATION NAME AND ADDRESS FLEET WEATHER CENTRAL/JOINT TYPHOON WARNING CENTER (FLEWEACEN/JTWC), GUAM FPO SAN FRANCISCO 96630		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS FLEET WEATHER CENTRAL/JOINT TYPHOON WARNING CENTER (FLEWEACEN/JTWC), GUAM FPO SAN FRANCISCO 96630		12. REPORT DATE 1973
		13. NUMBER OF PAGES 98
14. MONITORING AGENCY NAME & ADDRESS(*if different from Controlling Office*)		15. SECURITY CLASS. (*of this report*) UNCLASSIFIED
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Tropical depressions
Super typhoons

20. ABSTRACT (*Continue on reverse side if necessary and identify by block number*)

Annual publication summarizing the tropical cyclone season in the western North Pacific, Bay of Bengal, and the central North Pacific. A brief narrative is given on each typhoon in the western North Pacific including the best track. Pertinent reconnaissance data used to construct the best tracks are provided. Forecast verification data and statistics for the JTWC are summarized. Research efforts at the JTWC is discussed briefly.

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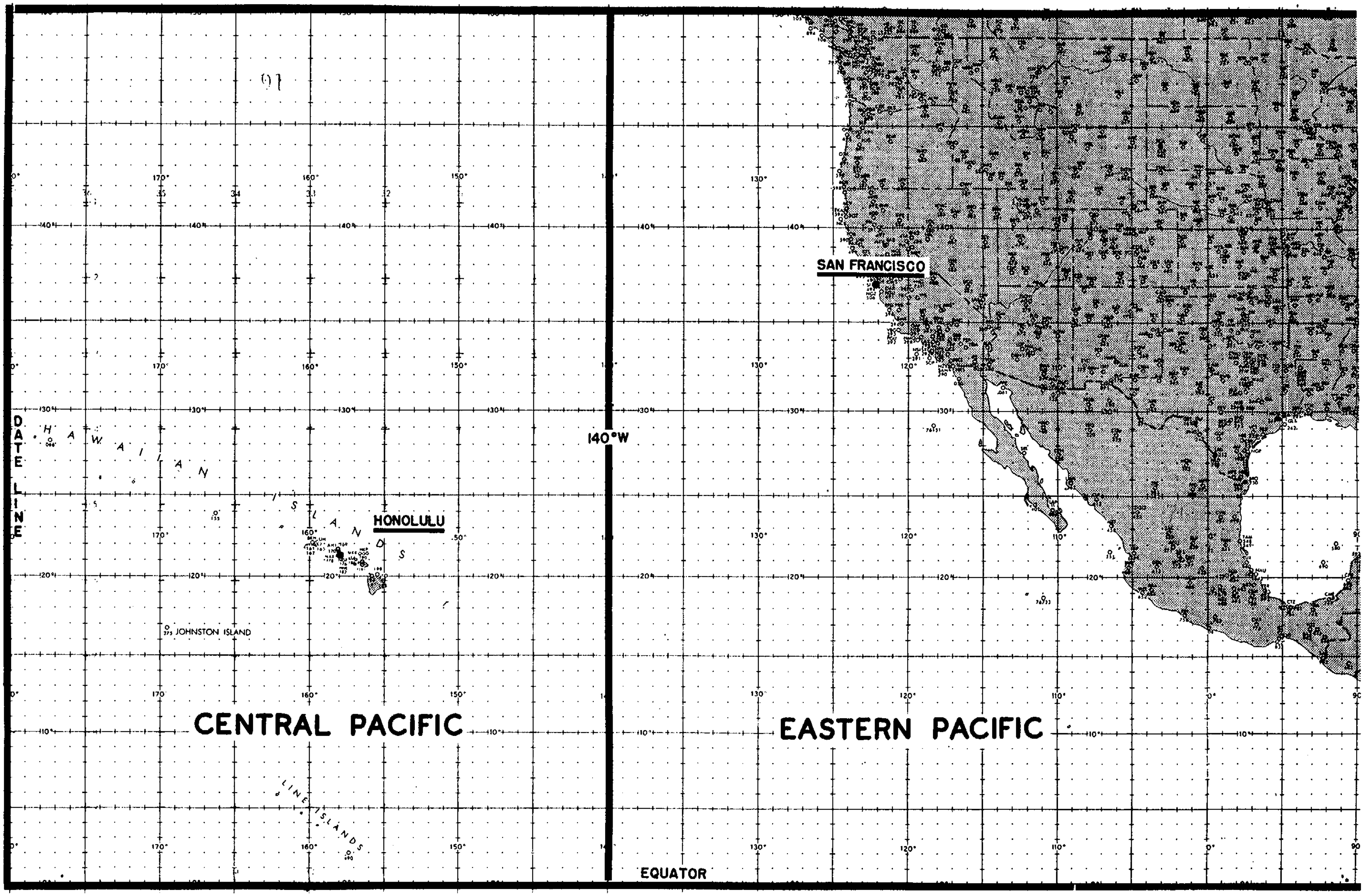
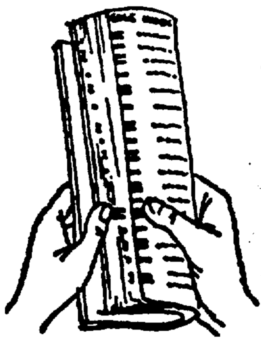


Areas of Responsibility - Central and Eastern Pacific Hurricane Centers

EDGE INDEX

HOW TO USE THE EDGE INDEX



Bend the book nearly double and hold it in your right hand as shown.

Locate the listing you want in the Edge Index.

Match up the 1 or 2 line symbol next to the listing you have selected with the corresponding 1 or 2 dot symbol on the page edge.

OPEN THERE.

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