1980

ANNUAL TROPICAL CYCLONE REPORT

NAVAL OCEANOGRAPHY COMMAND

JOINT TYPHOON WARNING CENTER
GUAM, MARIANA ISLANDS

AIR WEATHER SERVICE

REPORT DOCUMENTATION PAGE

Form Approved OMB No. 0704-0188

1. REPORT DATE (DD-MM-YYYY)
01-01-1995

2. REPORT TYPE
Annual Typhoon Report

3. DATES COVERED (FROM - TO)
xx-xx-1995 to xx-xx-1995

4. TITLE AND SUBTITLE
1980 Annual Typhoon Report
Unclassified

5a. CONTRACT NUMBER

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)
Tupaz, Jesus B. ;
Murray, Thomas R. ;
Diercks, John W. ;

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME AND ADDRESS
Joint Typhoon Warning Center
425 Luapele Road
Pearl Harbor, HI96860-3103

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME AND ADDRESS
Naval Pacific Meteorology and Oceanography Center
Joing Typhoon Warning Center
425 Luapele Road
Pearl Harbor, HI96860-3103

10. SPONSOR/MONITOR'S ACRONYM(S)

11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
APUBLIC RELEASE
,

13. SUPPLEMENTARY NOTES
See Also ADM001257, 2000 Annual Tropical Cyclone Report Joing Typhoon Warning Center (CD includes 1959-1999 ATCRs). Block 1 and Block 3 should be 1980.

14. ABSTRACT
The Annual Typhoon Report summarizes the tropical cyclones occurring during 1980 in the western North Pacific, the Central North Pacific and the North Indian Oceans.

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:

a. REPORT
Unclassified

b. ABSTRACT
Unclassified

c. THIS PAGE
Unclassified

17. LIMITATION OF ABSTRACT
Public Release

18. NUMBER OF PAGES
192

19. NAME OF RESPONSIBLE PERSON
Fenster, Lynn
lfenster@dtic.mil

19b. TELEPHONE NUMBER
International Area Code
Area Code Telephone Number
703767-9007
DSN
427-9007

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std Z39.18

U. S. NAVAL OCEANOGRAPHY COMMAND CENTER
JOINT TYPHOON WARNING CENTER
COMNAVMARIANAS BOX 17
FPO SAN FRANCISCO 96630

JESUS B. TUPAZ
*THOMAS R. MURRAY
Captains, United States Navy

COMMANDING

JOHN W. DIERCKS
Lieutenant Colonel, United States Air Force

DIRECTOR, JOINT TYPHOON WARNING CENTER

STAFF

LCDR James H. Bell, USN
CAPT Richard A. Todd, USAF
CAPT Clifford R. Matsumoto, USAF
*CAPT John D. Shewchuk, USAF
*CAPT Gerald A. Guay, USAF
LT George M. Dunnavan, USN
LTJG Jack E. Huntley, USNR
1 LT James A. Smith, USAF
LTJG Raymond R. Fagen, USNR
ENS Robert C. Weir, USN
AG1 Donald L. McGowan, USN
*SSGT Charles J. Lee, USAF
*SSGT William H. Taylor, USAF
*AG2 Kenneth A. Kellogg, USN
AG2 Stephani A. Bubanich, USN
SGT Konrad W. Crowder, USAF
*AG3 Victoria J. Macke, USN
*AG3 Winifred A. Few, USN
*AG3 Carl A. Gantz, USN
SGT John W. Archambeau, USAF
*AG3 Sally E. Stege, USN
AG3 Beverly A. McCreary, USN
SRA Michael P. Blomquist, USAF
AGAN Sarah J. McNelly, USN
A1C Randolph G. Quinto, USAF
A1C Kathlyn A. Mentz, USAF
AGAN Paul E. Brewer, USN

CONTRIBUTOR: Det 1, 1WW - USAF

MAJ David C. Danielson
CAPT Michael S. Risch
*CAPT John E. Oleyar
*CAPT James P. Millard
CAPT Marsha A. Korose
MSGT Tommy M. Pelley

*Transferred during 1980

FRONT COVER: *The islands of Guam and Rota as viewed by satellite (DMSP imagery).*

FOREWORD

The Annual Tropical Cyclone Report is prepared by the Staff of the Joint Typhoon Warning Center (JTWC). JTWC is a combined USAF/USN entity operating under the command of the U. S. Naval Oceanography Command Center, Guam. The senior Air Force Officer assigned is designated as Director, JTWC and is responsible to the Commanding Officer, U.S. Naval Oceanography Command Center, Guam for the operation of the JTWC. The senior Naval Officer of the JTWC is designated as the Deputy Director/Operations Officer. The JTWC was established by CINCPACFLT message 280208Z April 1959 when directed by CINCPAC message 230233Z April 1959. Its operation is guided by the CINCPACINST 3140.1 (series).

The Naval Oceanography Command Center/ Joint Typhoon Warning Center, Guam has the responsibility to:

1. Provide continuous meteorological watch of all tropical activity north and south of the equator, west of the Date line, and east of the African coast (JTWC area of responsibility) for potential tropical cyclone development.

2. Provide warnings for all significant tropical cyclones in the assigned area of responsibility.

3. Determine tropical cyclone reconnaissance requirements and assign priorities.

4. Conduct an annual post-analysis of all tropical cyclones occurring within the JTWC area of responsibility and prepare an Annual Tropical Cyclone Report for issuance to interested agencies. Only summaries and statistics for Northern Hemisphere tropical cyclones are included in this report.

5. Conduct tropical cyclone forecasting and detection research as practicable.

In the event of incapacitation of the JTWC, the Alternate JTWC (AJTWC) assumes responsibility for issuing warnings. The U. S. Naval Western Oceanography Center, Pearl Harbor, Hawaii is designated as the AJTWC. Assistance in determining tropical cyclone reconnaissance requirements and in obtaining reconnaissance data is provided by Detachment 4, 1st Weather Wing, Hickam AFB, Hawaii.

The meteorological services of the United States are planning to implement the metric system of measurement over the next few years. Some civilian and military agencies have started the education program by showing the metric equivalents to current units of measure. This Annual Tropical Cyclone Report includes metric equivalents to most measures.

Unless otherwise stated, all satellite data used in this report are Air Force Air Weather Service data acquired by Air Force Communications Command personnel and analyzed by satellite analysts at Det 1, 1WW, colocated with the JTWC at Nimitz Hill, Guam; Det 5, 1WW, Clark Air Base, Philippines; Det 8, 30WS, Kadena Air Base, Japan; Det 15, 30WS, Osan Air Base, Korea; Det 4, 1WW, Hickam Air Force Base, Hawaii; and Air Force Global Weather Central, Offutt Air Force Base, Nebraska. The Naval Oceanography Command Detachment, Diego Garcia, also provided timely satellite position fixes for tropical disturbances in the Arabian Sea and Bay of Bengal.

The Staff of JTWC is indebted to Captain Thomas R. Murray, USN and Captain Jesus B. Tupaz, USN, for the many valuable suggestions and comments provided during preparation of the 1980 Annual Tropical Cyclone Report.

The staff of the Joint Typhoon Warning Center wishes to thank the men and women of the Fleet Air Photographic Laboratory, Naval Air Station, Agana for their services in the reproduction of the satellite data for this report.

NOTE: Appendix 4 contains information on how to obtain past issues of the Annual Typhoon Report.

TABLE OF CONTENTS

CHAPTER I - OPERATIONAL PROCEDURES

1. GENERAL

Routine services provided by the Joint Typhoon Warning Center (JTWC) include the following: (1) Significant Tropical Weather Advisories issued daily describing all tropical disturbances and their potential for further development; (2) Tropical Cyclone Formation Alerts issued whenever interpretation of satellite, synoptic and/or aircraft data indicates likely formation of a significant tropical cyclone; (3) Tropical Cyclone Warnings issued four times daily for significant tropical cyclones; and (4) Prognostic Reasoning messages issued twice daily for tropical storms and typhoons in the Pacific area.

JTWC responds to changing requirements of activities serviced. Therefore, contents of routine services are subject to change from year to year usually as a result of deliberations at the Tropical Cyclone Conference.

2. DATA SOURCES

a. COMPUTER PRODUCTS:

The Naval Oceanography Command Center (NAVOCEANCOMCEN) Guam provides computerized meteorological/oceanographic products for JTWC. In addition, the standard array of synoptic-scale computer analyses and prognostic charts are available from the Fleet Numerical Oceanography Center (FLENUMOCEANCEN) at Monterey, California. With the installation of the Naval Environmental Display Stations (NEDS) during 1978, JTWC now has very timely access to FLENUMOCEANCEN products and is able to more efficiently and effectively use these products.

b. CONVENTIONAL DATA:

Conventional meteorological data are defined as surface and upper-air observations from island, ship and land stations plus weather observations from commercial and military aircraft (AIREPS). Conventional data charts are prepared daily at 0000Z and 1200Z for the surface/gradient, 700 mb, and 500 mb levels. A chart of upper-air data is prepared which utilizes 200 mb rawinsonde data, AIREPS above 29,000 ft within 6 hours of the 0000Z and 1200Z synoptic times, and satellite blow-off winds.

c. AIRCRAFT RECONNAISSANCE:

Aircraft weather reconnaissance data are invaluable in the positioning of the center of developing systems and essential for the accurate determination of the eye/center location, maximum intensity, minimum sea-level pressure and radius of significant winds exhibited by tropical cyclones. Winds and pressure-height data at the 500 and/or 400 mb level, provided by reconnaissance aircraft while enroute to, or returning from, fix missions, are also used to supplement the sparse data in the tropics and subtropics. These data are plotted on large-scale sectional charts for each mission flown. A comprehensive discussion of aircraft weather reconnaissance is presented in Chapter II.

d. SATELLITE RECONNAISSANCE:

Meteorological satellite data from the Defense Meteorological Satellite Program (DMSP) and the National Oceanic and Atmospheric Administration played a major role in the early detection and tracking of tropical cyclones in 1980. A discussion of this role is presented in Chapter II.

e. RADAR RECONNAISSANCE

During 1980, as in recent years, land radar coverage was utilized extensively when available. Once a storm moved within the range of a land radar site, reports were usually received hourly. Use of radar during 1980 is discussed in Chapter II.

3. COMMUNICATIONS

a. JTWC currently has access to three primary communications circuits.

(1) The Automated Digital Network (AUTODIN) is used for dissemination of warnings and other related bulletins to Department of Defense installations. These messages are relayed for further transmission over U. S. Navy Fleet Broadcasts, U. S. Coast Guard CW (continuous wave morse code) and voice communications. Inbound message traffic for JTWC is received via AUTODIN addressed to NAVOCEANCOMCEN GUAM.

(2) The Air Force Automated Weather Network (AWN) provides weather data to JTWC through a dedicated circuit from the Automated Digital Weather Switch (ADWS) at Hickam AFB, Hawaii. The ADWS selects and routes the large volume of meteorological reports necessary to satisfy JTWC requirements for the right data at the right time. Weather bulletins prepared by JTWC are inserted into the AWN circuit via the NEDS and the Nimitz Hill Naval Telecommunication Center (NTCC) of the Naval Communications Area Master Station Western Pacific.

(3) The Naval Environmental Data Network (NEDN) provides the communications link with the computers at FLENUMOCEANCEN. JTWC is able to both receive environmental data from FLENUMOCEANCEN and access the computers directly to run various programs.

b. Besides providing forecasters with the ability to rapidly access computer products, the NEDS has become the backbone of the JTWC communications system. The NEDS has a direct interface with the AWN. Manual insertion of paper tapes into the AWN by the NTCC provides a backup AWN interface. AUTODIN message tapes are prepared by JTWC personnel on the NEDS for insertion into the AUTODIN circuit by NTCC. The NEDS is also used by the Typhoon Duty Officer (TDO) to request forecast aids which are processed by the computers at FLENUMOCEANCEN Monterey and transmitted back to the TDO over the NEDN circuit.

4. ANALYSES

A composite surface/gradient level (3000 ft) manual analysis is accomplished on the 0000Z and 1200Z conventional data. Analysis of the wind field using streamlines is stressed for tropical and subtropical regions. Analysis of the pressure field is stressed for higher latitudes and in the vicinity of tropical cyclones.

Manual analysis of the 500 mb level is accomplished on the 0000Z and 1200Z data. Although the analysis of the 500 mb height field is important, knowledge of the wind field to more clearly delineate steering currents is equally important.

A composite upper-tropospheric manual analysis, utilizing rawinsonde data from 300 mb through 100 mb, wind directions extracted from satellite data by Det 1, 1WW and AIREPS (plus or minus 6 hours) at or above 29,000 feet is accomplished on 0000Z and 1200Z data daily. Wind and height data are used to arrive at a representative analysis of tropical cyclone outflow patterns, of steering currents and of areas that may indicate tropical cyclone intensity change. All charts are hand plotted over areas of tropical cyclone activity to provide all available data as soon as possible to the TDO. These charts are augmented by the computer-plotted charts for the final analyses.

Additional sectional charts at intermediate synoptic times and auxiliary charts such as station-time plot diagrams and pressure-change charts are also analyzed during periods of significant tropical cyclone activity.

5. FORECAST AIDS

a. CLIMATOLOGY:

Climatological publications utilized during the 1980 typhoon season include previous JTWC Annual Typhoon Reports and climatic publications from local sources, Naval Environmental Prediction Research Facility, Naval Postgraduate School, Air Weather Service, First Weather Wing and Chanute Technical Training Center. Publications from other Air Force and Navy activities, various universities and foreign countries are also used by the JTWC.

b. OBJECTIVE TECHNIQUES:

The following objective techniques were employed in tropical cyclone forecasting during 1980. A description of these techniques is presented in Chapter IV.

(1) 12 HR EXTRAPOLATION

(2) CLIMATOLOGY

(3) HPAC (Combined extrapolation and climatology)

(4) TROPICAL CYCLONE MODEL (Dynamic)

(5) CYCLOPS (Steering)

(6) TYAN78 (Analog)

6. FORECASTING PROCEDURES

a. INITIALIZATION:

In the preparation of each warning, the actual surface location (fix) of the tropical cyclone eye/center just prior to (within three hours of) warning time is of prime importance. JTWC uses the Selective Reconnaissance Program (SRP) to levy an optimum mix of aircraft, satellite and radar resources to obtain fix information. When tropical cyclones are either poorly defined or the actual surface location cannot be determined, or when conflicting fix information is received, the "best estimate" of the surface location is subjectively determined from the analysis of all available data. If fix data are not available due to reconnaissance platform malfunctions or communication problems, synoptic data or extrapolation from previous fixes are used. The initial forecast (warning time) position is then obtained by extrapolation using the current fix and a "best track" of the cyclone movement to date.

b. TRACK FORECASTING:

An initial forecast track is developed based on the previous forecast and the objective techniques. This initial track is subjectively modified based on the following:

(1) The prospects for recurvature are evaluated. This evaluation is based primarily on present and forecast positions and amplitude of middle tropospheric mid-latitude troughs from the latest 500 mb analysis and numerical prognoses.

(2) Determination of steering level is partly influenced by maturity and vertical extent of the system. For mature cyclones located south of the 500 mb subtropical ridge, forecast changes in speed of movement are closely correlated with forecast changes in the intensity of the ridge. When steering currents are very weak, the tendency for cyclones to move northward due to their internal forces is an important consideration.

(3) The proximity of the tropical cyclone to other tropical cyclones is evaluated to determine if there is a possibility of Fujiwhara interaction.

(4) Over the 12- to 72-hr forecast spectrum, speed of movement during the early timeframe is biased toward persistence (12-hr extrapolation), while that near the end of the timeframe is biased towards objective techniques and climatology.

(5) A final check is made against climatology to determine the likelihood of the forecast track. If the forecast deviates greatly from climatology, the forecast rationale is reappraised and the track adjusted as necessary.

c. INTENSITY FORECASTING:

In forecasting intensity, heavy reliance is placed on aircraft reconnaissance reports, the Dvorak satellite interpretation model, wind and pressure data from ships and land stations in the vicinity of the cyclone, and the objective techniques. Additional considerations are the position and intensity of the tropical upper-tropospheric trough (TUTT), extent and intensity of upper-level outflow, sea-surface temperature, terrain influences, speed of movement and proximity to an extratropical environment.

7. WARNINGS

Tropical cyclone warnings are issued when a definite closed circulation is evident and maximum sustained wind speeds are forecast to increase to 34 or more knots within 48 hours, or the cyclone is in such a position that life or property may be endangered within 72 hours. Warnings are also issued in other situations if it is determined that there is a need to alert military and civil interests to conditions which may become hazardous in a short period of time. Each tropical cyclone warning is numbered sequentially and includes the initial warning time, eye/center position, intensity, the radial extent of 30, 50 and 100 knot surface winds (when applicable), the levied reconnaissance platform used, the instantaneous speed and direction of movement of the cyclone's surface center at warning time and the forecast information. The forecast intervals for all tropical cyclones, regardless of intensity, are 12, 24, 48, and 72 hr. Warnings within the JTWC North Pacific area are issued within two hours of 0000Z 0600Z, 1200Z and 1800Z with the constraint that two consecutive warnings may not be more than seven hours apart. Warnings in the JTWC North Indian Ocean area are issued within two hours of 0200Z, 0800Z, 1400Z, and 2000Z with the constraint that two consecutive warnings may not be more than seven hours apart. These variable warning times allow for maximum use of all available reconnaissance platforms and more effectively distributes the workload in multiple cyclone situations. If warnings are discontinued and a cyclone reintensifies, warnings are numbered consecutively from the last warning issued. Warning forecast positions are verified against the corresponding post-analysis "best track" positions. A summary of the verification results from 1980 is presented in Chapter IV.

Beginning on 1 January 1980, JTWC commenced issuing tropical cyclone warnings in an ADP (Automatic Data Processing) format. The new format allows commands with ADP equipment to enter tropical cyclone warning data directly into ADP equipment data bases. The new format also possesses readability for users without ADP equipment.

8. PROGNOSTIC REASONING MESSAGE

In the North Pacific area, prognostic reasoning messages are transmitted based on the 0000Z and 1200Z warnings or whenever the previous reasoning is no longer valid. This plain language message is intended to provide users with the reasoning behind the latest JTWC forecast. Prognostic reasoning messages are not normally prepared for tropical depressions nor for cyclones in the North Indian Ocean area.

For the 1980 season, JTWC included confidence statements for the 24- and 48-hour forecasts. The confidence values were percentage probabilities that the 24-hour forecast position error would be less than 100 nm and less than 150 nm, respectively, and that the 48-hour error would be less than 200 nm and less than 300 nm, respectively. These probabilities were based on objective data from error analysis studies of past cyclones and were a function of latitude, longitude, storm intensity, organization and the number of western Pacific cyclones in existence.

Prognostic reasoning information applicable to all customers is provided in the remarks section of warnings when significant forecast changes are made or when deemed appropriate by the TDO.

9. SIGNIFICANT TROPICAL WEATHER ADVISORY

This plain language message, summarizing significant weather in the JTWC area of responsibility, north of the equator, is issued by 0600Z daily. It contains a detailed, non-technical description of all significant tropical disturbances and the JTWC evaluation of potential for significant tropical cyclone development within the 24-hour forecast period.

10. TROPICAL CYCLONE FORMATION ALERT

Alerts are issued whenever interpretation of satellite and other meteorological data indicates significant tropical cyclone formation is likely. These alerts will specify a valid period not to exceed 24 hours and must either be cancelled, reissued or superseded by a warning prior to expiration of the valid period.

CHAPTER II - RECONNAISSANCE AND FIXES

1. GENERAL

The Joint Typhoon Warning Center depends on reconnaissance to provide necessary, accurate, and timely meteorological information in support of each warning. JTWC relies primarily on three sources of reconnaissance: aircraft, satellite, and radar. Optimum utilization of all available reconnaissance resources is obtained through use of the Selective Reconnaissance Program (SRP), whereby various factors are considered in selecting a specific reconnaissance platform for each warning. These factors include: cyclone location and intensity, reconnaissance platform capabilities and limitations, and the cyclone's threat to life/property afloat and ashore. A summary of reconnaissance fixes received during 1980 is included in Section 6.

2. RECONNAISSANCE AVAILABILITY

a. Aircraft:

Aircraft weather reconnaissance is performed in the JTWC area of responsibility by the 54th Weather Reconnaissance Squadron (54 WRS). The squadron, presently equipped with six WC-130 aircraft, is located at Andersen Air Force Base, Guam. From July through October, augmentation by the 53rd WRS at Keesler Air Force Base, Mississippi brings the total number of available aircraft to nine. The JTWC reconnaissance requirements are provided daily throughout the year to the Tropical Cyclone Aircraft Reconnaissance Coordinator (TCARC). These requirements include area(s) to be investigated, tropical cyclone(s) to be fixed, fix times, and forecast positions of fixes. The following priorities are utilized in acquiring meteorological data from aircraft, satellite, and land-based radar in accordance with CINCPACINST 3140.1N:

"(1) Investigative flights and vortex or center fixes for each scheduled warning in the Pacific area of responsibility. One aircraft fix per day of each cyclone of tropical storm or typhoon intensity is desirable.

(2) Supplementary fixes.

(3) Synoptic data acquisition."

As in previous years, aircraft reconnaissance provided direct measurements of height, temperature, flight-level winds, sea level pressure, estimated surface winds (when observable), and numerous additional parameters. The meteorological data are gathered by the Aerial Reconnaissance Weather Officers (ARWO) and dropsonde operators of Detachment 4, Hq AWS who fly with the 54th. These data provide the Typhoon Duty Officer (TDO) indications of changing cyclone characteristics, radius of cyclone associated winds, and present cyclone position and intensity. Another important aspect of these data is their availability for research in tropical cyclone analysis and forecasting.

b. Satellite

Satellite fixes from USAF ground sites and USN ships provide day and night coverage in the JTWC area of responsibility. Interpretation of this satellite imagery provides cyclone positions and estimates of storm intensities through the Dvorak technique (for daytime passes).

Detachment 1, 1st Weather Wing, which receives and processes polar orbiting satellite data, is the primary fix site for the western North Pacific. Satellite fix positions received at JTWC from the Air Force Global Weather Central (AFGWC), Offutt Air Force Base, Nebraska and the Naval Oceanography Command Detachment at Deigo Garcia were the major sources of satellite data for the Indian Ocean. GOES fixes were also provided by the National Environmental Satellite Service, Honolulu, Hawaii for tropical cyclones near the dateline.

c. Radar

Land radar provides positioning data on well developed cyclones when in proximity (usually within 175 nm (324 km) of the radar site) of the Republic of the Philippines, Taiwan, Hong Kong, Japan, the Republic of Korea, Kwajalein, and Guam.

d. Synoptic

In 1980, the JTWC also determined tropical cyclone positions based on the analysis of the surface/gradient level synoptic data. These positions were helpful in situations where the vertical structure of the tropical cyclone was weak or accurate surface positions from aircraft were not available due to flight restrictions.

3. AIRCRAFT RECONNAISSANCE SUMMARY

During the 1980 tropical season, the JTWC levied 213 six-hourly vortex fixes and 65 investigative missions. In addition to the levied vortex fixes, 133 supplemental fixes were also obtained. The number of levied investigative missions has increased steadily over the past five years in response to JTWC's increased efforts to detect initial tropical cyclone development. The average vector error for all aircraft fixes received at the JTWC during 1980 was 17 nm (31 km).

Aircraft reconnaissance effectiveness is summarized in Table 2-1 using the criteria as set forth in CINCPACINST 3140.1N.

TABLE 2-1. AIRCRAFT RECONNAISSANCE EFFECTIVENESS

EFFECTIVENESS		NUMBER OF LEVIED FIXES	PERCENT
COMPLETED ON TIME		190	89.2
EARLY		5	2.3
LATE		14	6.6
MISSED		4	1.9
	TOTAL	213	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
1974	358	30	8.4
1975	217	7	3.2
1976	317	11	3.5
1977	203	3	1.5
1978	290	2	0.7
1979	289	14	4.8
1980	213	4	1.9

4. SATELLITE RECONNAISSANCE SUMMARY

The Air Force provides satellite reconnaissance support to JTWC using imagery data from DMSP and NOAA polar-orbiting spacecraft. The NOAA imagery processing capability was new for DMSP tactical site operations during 1980. Western North Pacific DMSP tactical sites received this additional capability in February 1980 in sufficient time for the Northern Hemisphere tropical cyclone season.

The DMSP cyclone surveillance network consists of both tactical and centralized facilities. Tactical DMSP sites are located at Nimitz Hill, Guam; Clark AB, Philippines; Kadena AB, Japan; Osan AB, Korea; and Hickam AFB, Hawaii. These sites provide a combined coverage that covers the JTWC area of responsibility in the western North Pacific from near the dateline westward to the Malay Peninsula. An important addition in 1980 was the Navy tactical site at Diego Garcia. Unlike the DMSP sites, Diego Garcia can process only NOAA polar-orbiting meteorological spacecraft. However, the unique coverage of this site, located in the central South Indian Ocean, greatly expanded the satellite reconnaissance network's coverage of this vital area. Prior to 1980, the JTWC had to depend entirely on the Air Force Global Weather Central (AFGWC) for all Indian Ocean cyclone reconnaissance.

AFGWC is the centralized member of the satellite cyclone surveillance network. Located at Offutt AFB, Nebraska, AFGWC has the capability to process the daily worldwide coverage of two polar-orbiting spacecraft, whether DMSP or NOAA. This enables AFGWC to provide coverage four times daily over the entire JTWC area of responsibility. Imagery processed at AFGWC is recorded on-board the spacecraft as it passes over the earth. Later, these data are downlinked to AFGWC via a network of command/readout sites and communications satellites. This enables AFGWC to obtain the coverage necessary to fix all cyclones of interest to JTWC. AFGWC has the primary responsibility to provide cyclone surveillance over the entire Indian Ocean, a small portion of the western North Pacific near the dateline, as well as the South Pacific from the dateline westward to the Indian Ocean. Additionally, AFGWC can be tasked to provide storm positions in the western North Pacific as backup to the tactical site coverage routinely available in this region.

The thread that ties the network together is Det 1, 1WW colocated with JTWC atop Nimitz Hill, Guam. Based on available satellite coverage, Det 1 coordinates satellite reconnaissance requirements with JTWC and tasks the individual network sites for the necessary storm fixes. The tasking concept is to position every cyclone or disturbance once from each satellite pass that covers the cyclone. Further, when a satellite position is required as the basis for a warning, called a levied fix, a dual-site tasking concept is applied. Under this concept, two sites are tasked to fix the cyclone off the same satellite pass. This provides the necessary redundancy to virtually guarantee JTWC a successful satellite fix of the cyclone. Using this dual-site concept, the satellite reconnaissance network was able to meet percent of JTWC's levied satellite fix requirements. This year, dual-site tasking was extended to most of the Indian Ocean with the addition of the Navy site at Diego Garcia to the tactical site network. Previously, dual-site tasking was available only in the western North Pacific.

The network provides JTWC with several products and services. The main service is one of surveillance. With the exception of Osan, each site reviews its daily coverage for any indications of development. If an area shows indications of development, JTWC is notified. Once JTWC issues either an alert or warning, the network is tasked to provide three products: cyclone positions, cyclone intensity estimates, and 24-hour cyclone intensity forecasts. Satellite cyclone positions are assigned position code numbers (PCN) depending on the availability of geography for precise gridding and the degree of organization of the cyclone's circulation center (Table 2-2). During 1980, the network provided JTWC with 1327 satellite fixes of tropical cyclones. A comparison of those fixes made on numbered tropical cyclones with their corresponding JTWC best

TABLE 2-2. POSITION CODE NUMBERS

PCN	METHOD OF CENTER DETERMINATION/GRIDDING
1	EYE/GEOGRAPHY
2	EYE/EPHEMERIS
3	WELL DEFINED CC/GEOGRAPHY
4	WELL DEFINED CC/EPHEMERIS
5	POORLY DEFINED CC/GEOGRAPHY
6	POORLY DEFINED CC/EPHEMERIS

CC=Circulation Center

TABLE 2-3. MEAN DEVIATIONS (NM) OF DMSP, NOAA6, AND TIROS N DERIVED TROPICAL CYCLONE POSITIONS FROM JTWC BEST TRACK POSITIONS. NUMBER OF CASES IN PARENTHESIS.

PCN	WESTPAC 1974-1979 AVERAGE (ALL SITES)	WESTPAC 1980 (ALL SITES)	INDIAN OCEAN 1980 (ALL SITES)
1	13.5 (193)	12.2 (76)	-
2	18.4 (67)	16.2 (13)	-
3	20.6 (282)	20.4 (153)	-
4	25.0 (96)	12.9 (11)	-
5	37.3 (407)	39.2 (318)	35.7 (8)
6	46.4 (197)	33.3 (81)	44.6 (12)
1&2	14.8 (260)	12.8 (89)	-
3&4	21.4 (378)	19.9 (164)	-
5&6	40.3 (604)	38.0 (399)	41.0 (20)

track positions is shown in Table 2-3. Estimates of the cyclone's current intensity and a 24-hour intensity forecast are made once each day by applying the Dvorak technique (NOAA Technical Memorandum NESS 45 as revised) to daylight visual data. Figure 2-1 compares these current intensity and forecast intensities with the observed cyclone intensities for the 1980 storm season. Satellite-derived cyclone positions, intensity estimates, and intensity forecasts constitute the satellite portion of the JTWC forecast data base.

The availability of polar-orbiting meteorological satellites declined during the year as spacecraft failures plagued the network. Two scheduled launches, one DMSP and one NOAA, encountered launch vehicle problems that resulted in the failure of the platforms to achieve orbit. Therefore, no new spacecraft became available this year. At the first of the year, three spacecraft were fully operational: DMSP FTV 13536 (F-2) in a mid-morning orbit, NOAA-6 in a sunrise orbit, and TIROS-N in a mid-afternoon orbit. Further, the DMSP spacecraft FTV 15539 (F-4) was operational for late morning passes only. Subsequent failures rapidly decimated these ranks. TIROS-N first failed in late January, was recovered in February, but failed for good in early November. However, TIROS-N was operational for most of the Northern Hemisphere tropical cyclone season. F-2 failed in February and F-4 failed in August. F-3 (FTV 14537) failed initially in December 1979 but was partially recovered in April 1980. While F-3's coverage was limited to the center 50 percent of the visual imagery only, its ascending (daylight) coverage was fully incorporated into surveillance network operations, particularly to support the JTWC

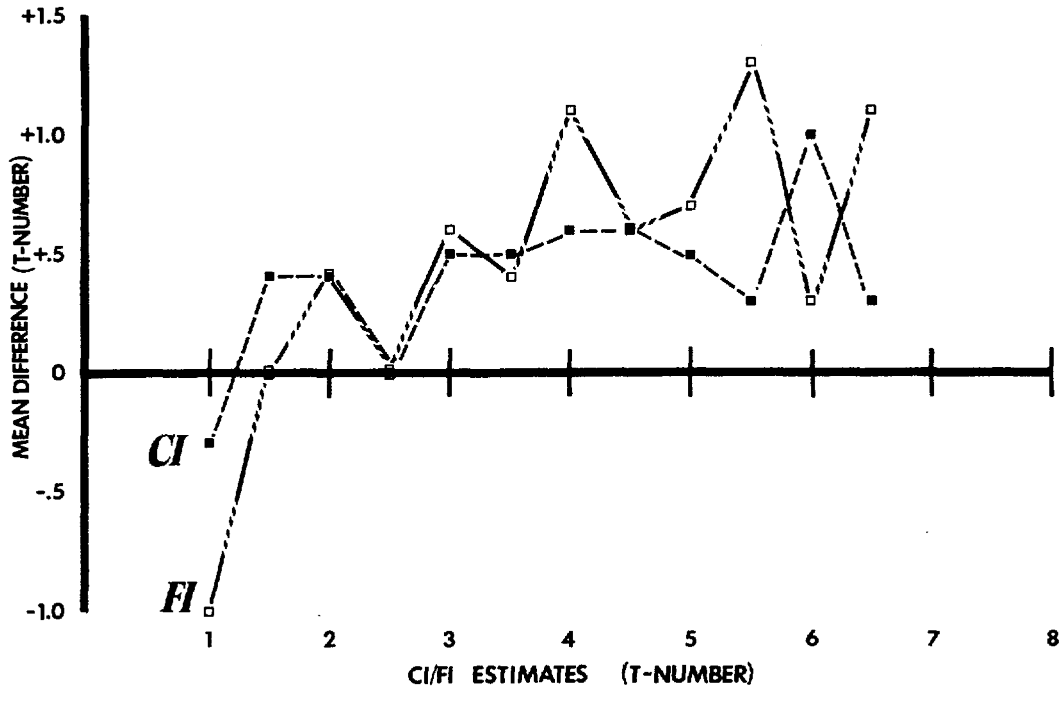


FIGURE 2-1. DVORAK Current Intensity (CI) errors and Forecast Intensity (FI) errors for 1980 (116 cases). Comparisons are made against the best track intensity values, in which the CI's were used along with aircraft reconnaissance data to determine the best track intensities. (Shewchuk and Weir, 1980)

0000Z warning. Therefore, by the end of the season, the only fully operational polar-orbiting spacecraft was NOAA-6.

Besides fixes from the network, JTWC also received satellite-derived cyclone positions from several secondary sources during 1980. These included: the Naval Oceanography Command Detachment (NOCD) Cubi Point, Philippines; U. S. Navy ships equipped for direct readout; the National Environmental Satellite Service (NESS) using NOAA and GOES data; and the Naval Polar Oceanography Center, Suitland, Maryland using stored-DMSP and NOAA data. Fixes from these secondary sources are not included in the network statistics.

5. RADAR RECONNAISSANCE SUMMARY

Ten of the 28 significant tropical cyclones occurring over the western North Pacific during 1980 passed within range of land based radars with sufficient cloud pattern organization to be fixed. The hourly and oftentimes, half-hourly land radar fixes that were obtained and transmitted to JTWC totaled 413.

The WMO radar code defines three categories of accuracy: good (within 10 km (5.4 nm)), fair within 10-30 km (5.4-16.2 nm)), and poor (within 30-50 km (16.2-27 nm)). This year, 413 radar fixes were coded in this manner; 147 were good, 153 fair, and 113 poor. Compared to the JTWC best track, the mean vector deviation for land radar sites was 15 nm (28 km). Excellent support through timely and accurate radar fix positioning allowed JTWC to track and forecast tropical cyclone movement through even the most difficult and erratic tracks.

The 54 WRS made 2 radar center fixes from their WC-130 aircraft when actual tropical cylone penetration was restricted. No radar fixes were received on Indian Ocean tropical cyclones.

6. TROPICAL CYCLONE FIX DATA

A total of 2134 fixes on 28 northwest Pacific tropical cyclones and 35 fixes on 2 northern Indian Ocean tropical cyclones were received at JTWC. Table 2-4, Fix Platform Summary, delineates the number of fixes per platform for each individual tropical cyclone. Season totals and percentages are also indicated.

Annex A includes individual fix data for each tropical cyclone. Fix data are divided into four categories: Satellite, Aircraft, Radar, and Synoptic. Those fixes labelled with an asterisk (*) were determined to be unrepresentative of the surface center and were not used in determining the best tracks. Within each category, the first three columns are as follows:

FIX NO. - Sequential fix number

TIME (Z) - GMT time in day, hours and minutes

FIX POSITION - Latitude and longitude to the nearest tenth of a degree

Depending upon the category, the remainder of the format varies as follows:

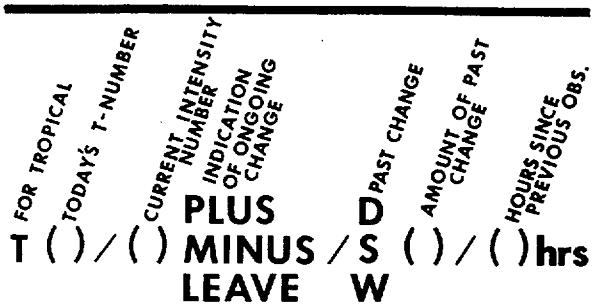
a. Satellite

(1) ACCRY - Position Code Number (PCN) is used to indicate the accuracy of the fix position. A "1" indicates relatively high accuracy and a "6" relatively low accuracy.

TABLE 2-5. MAXIMUM SUSTAINED WIND SPEED (KT) AS A FUNCTION OF DVORAK T NUMBER AND MINIMUM SEA LEVEL PRESSURE (MSLP)

TROPICAL CYCLONE INTENSITY	WIND SPEED	MSLP (NW PACIFIC)
T 1.0	25	—
T 1.5	25	—
T 2.0	30	1003
T 2.5	35	999
T 3.0	45	994
T 3.5	55	988
T 4.0	65	981
T 4.5	77	973
T 5.0	90	964
T 5.5	102	954
T 6.0	115	942
T 6.5	127	929
T 7.0	140	915
T 7.5	155	900
T 8.0	170	884

(2) DVORAK CODE - Intensity evaluation and trend utilizing visual satellite data. (For specifics, refer to NOAA TM; NESS-45)(Table 2-5).



EXAMPLE: T5/6 MINUS/W1.5/24hrs.

(3) SAT - Specific satellite used for fix position (DMSP 37 or 39, TIROS-N, NOAA6, Other, or Geostationary Operational Environmental Satellite (GOES, 135W)).

(4) COMMENTS - For explanation of abbreviations, see Appendix.

(5) SITE - ICAO call sign of the specific satellite tracking station.

b. Aircraft

(1) FLT LVL - The constant pressure surface level, in mb, maintained during the penetration. Seven hundred mb is the normal level flown in developed cyclones due to turbulence factors. Low-level missions are flown at 1500 ft.

(2) 700 MB HGT - Minimum height of the 700 mb pressure surface within the vortex recorded in meters.

TABLE 2-4 FIX SUMMARY FOR 1980

FIX SUMMARY

	AIRCRAFT	DMSP	NOAA6	TIROS-N	GOES3	OTHER SAT	RADAR	SYNOPTIC	TOTAL
WESTERN PACIFIC									
TD 01	9	16	12	-	-	14	-	5	56
TS CARMEN	-	4	10	3	15	20	-	-	52
TY DOM	24	34	27	2	-	33	-	-	120
TY ELLEN	25	26	19	2	-	25	-	-	97
TS FORREST	19	15	14	1	-	18	7*	-	74
TS GEROGIA	2	5	9	3	-	11	-	7	37
TS HERBERT	4	15	12	-	-	27	-	5	63
TS IDA	12	20	12	5	-	13	-	-	62
TY JOE	13	13	11	2	-	21	3	2	65
TD 10	-	4	6	-	-	9	-	3	22
ST KIM	23	16	16	3	-	21	-	-	79
TY LEX	21	22	21	1	-	29	-	-	94
TY MARGE	9	5	15	3	-	24	-	-	56
TD 14	1	1	4	3	-	11	-	-	20
TY NORRIS	12	2	14	12	-	21	41	-	102
TD 16	3	1	8	3	-	7	-	-	22
TY ORCHID	13	1	12	10	-	21	51	-	108
TY RUTH	-	-	7	5	-	13	1	2	28
TY PERCY	13	3	12	13	-	17	43	-	101
TY SPERRY	10	1	16	3	-	20	10	-	60
TS THELMA	8	-	8	8	-	22	-	-	46
TY VERNON	18	4	15	2	-	30	-	-	69
ST WYNNE	51	3	26	14	-	51	195	-	340
TS ALEX	6	-	10	-	-	14	-	-	30
TY BETTY	36	3	26	4	-	51	46	-	166
TS CARY	3	-	7	7	-	17	-	-	34
TY DINAH	15	-	8	-	-	30	17	-	70
TS ED	16	-	15	-	-	27	-	3	61
TOTAL	366	214	372	109	15	617	414	27	2134
% OF TOTAL NO. OF FIXES	17.1	10.0	17.4	5.1	.7	29.0	19.4	1.3	100

* INCLUDES 2 AIRCRAFT RADAR FIXES

	NOAA6	OTHER	SYNOPTIC	TOTAL
INDIAN OCEAN				
TC 23-80	12	-	-	12
TC 27-80	11	22	2	35
TOTAL	23	22	2	47
% OF TOTAL NO. OF FIXES	48.9	46.8	4.3	100

(3) OBS MSLP - If the surface center can be visually detected (e.g., in the eye), the minimum sea level pressure is obtained by a dropsonde released above the surface vortex center. If the fix is made at the 1500-foot level, the sea level pressure is extrapolated from that level.

(4) MAX-SFC-WND - The maximum surface wind (knots) is an estimate made by the ARWO based on sea state. This observation is limited to the region of the flight path and may not be representative of the entire cyclone. Availability of data is also dependent upon the absence of undercast conditions and the presence of adequate illumination. The positions of the maximum flight level wind and the maximum observed surface wind do not necessarily coincide.

(5) MAX-FLT-LVL-WND - Wind speed (knots) at flight level is measured by the AN/APN 147 doppler radar system aboard the WC-130 aircraft. Values entered in this category represent the maximum wind measured prior to obtaining a scheduled fix. This measurement may not represent the maximum flight level wind associated with the tropical cyclone because the aircraft only samples those portions of the tropical cyclone along the flight path. In most instances, the flight path is through the weak sector of the cyclone. In areas of heavy rainfall, the doppler radar may track energy reflected from precipitation rather than from the sea surface, thus, preventing accurate wind speed measurement. In obvious cases, such erroneous wind data will not be reported. In addition, the doppler radar system on the WC-130 restricts wind measurements to drift angles less than or equal to 27 degrees if the wind is normal to the aircraft heading.

(6) ACCRY - Fix position accuracy. Both navigational (OMEGA and LORAN) and meteorological (by the ARWO) estimates are given in nautical miles.

(7) EYE SHAPE - Geometrical representation of the eye based on the aircraft radar presentation. The eye shape is reported only if the center is 50% or more surrounded by wall cloud.

(8) EYE DIAM/ORIENTATION - Diameter of the eye in nautical miles. In case of an elliptical eye, the lengths of the major and minor axes and the orientation of the major axis are respectively listed. In the case of concentric eye walls, both diameters are listed.

c. Radar

(1) RADAR - Specific type of platform utilized for fix (land radar site, aircraft, or ship).

(2) ACCRY - Accuracy of fix position (good, fair, or poor) as given in the WMO ground radar weather observation code (FM20-V).

(3) EYE SHAPE - Geometrical representation of the eye given in plain language (circular, elliptical, etc.).

(4) EYE DIAM - Diameter of eye given in kilometers.

(5) RADOB CODE - Taken directly from WMO ground weather radar observation code FM20-V. The first group specifies the vortex parameters, while the second group describes the movement of the vortex center.

(6) RADAR POSITION - Latitude and longitude of tracking station given in tenths of a degree.

(7) SITE - WMO station number of the specific tracking station.

d. Synoptic

(1) INTENSITY ESTIMATE - TDO's analysis of low-level synoptic data to determine a cyclone's maximum sustained surface wind (knots).

(2) NEAREST DATA - Accuracy of fix based on distance (nautical miles) from the fix position to the nearest synoptic report or to the average distance of reports in data sparse cases.

CHAPTER III - SUMMARY OF TROPICAL CYCLONES

1. WESTERN NORTH PACIFIC TROPICAL CYCLONES

During 1980, the western North Pacific experienced the second consecutive year of below normal tropical cyclone activity. Twenty-eight tropical cyclones occurred during both 1979 and 1980 as compared to the average annual total of about 33. Four significant tropical cyclones failed to develop beyond the tropical depression (TD) stage and nine tropical storms (TS) failed to reach typhoon intensity. Of the 15 tropical cyclones that developed to typhoon (TY) intensity, only 2 reached the 130 kt (67 m/sec) intensity necessary to be classified as super typhoons (ST). Tropical cyclones reaching tropical storm intensity or greater are assigned names in alphabetical order from a list of alternating male/female names found in CINPACINST 3140.1 CH-2. Diffferent lists of alternating male/female names are used for eastern and central North Pacific and North Atlantic cyclones. Each tropical cyclone's maximum surface winds (MAX SFC WND), in knots, and minimum observed sea

TABLE 3-1 WESTERN NORTH PACIFIC

1980 SIGNIFICANT TROPICAL CYCLONES

CYCLONE	TYPE	NAME	PERIOD OF WARNING	CALENDAR DAYS OF WARNING	MAX SFC WIND(KT)	MIN OBS SLP	NUMBER OF WARNINGS	DISTANCE TRAVELLED(NM)
01	TD	TD-01	20 MAR-24 MAR	5	30	1000	17	2439
02	TS	CARMEN	05 APR-08 APR	4	60	980	9	1179
03	TY	DOM	09 MAY-19 MAY	11	90	956	42	1938
04	TY	ELLEN	13 MAY-21 MAY	9	110	931	34	2423
05	TS	FORREST	20 MAY-26 MAY	7	55	990	26	2451
06	TS	GEORGIA	21 MAY-24 MAY	4	55	985	12	993
07	TS	HERBERT	24 JUN-28 JUN	5	50	980	15	2521
08	TS	IDA	06 JUL-11 JUL	6	60	980	23	1527
09	TY	JOE	17 JUL-23 JUL	7	105	940	25	2541
10	TD	TD-10	17 JUL-19 JUL	3	30	1000	7	1007
11	ST	KIM	20 JUL-27 JUL	8	130	908	29	2661
12	TY	LEX	29 JUL-07 AUG	10	80	962	36	1810
13	TY	MARGE	08 AUG-15 AUG	8	110	944	31	1980
14	TD	TD-14	15 AUG-16 AUG	2	20	1003	7	229
15	TY	NORRIS	24 AUG-28 AUG	5	90	950	20	1710
16	TD	TD-16	04 SEP-06 SEP	3	25	1002	8	776
17	TY	ORCHID	07 SEP-11 SEP	5	85	958	19	2043
18	TY	RUTH	14 SEP-16 SEP	3	65	975	13	60
19	TY	PERCY	14 SEP-19 SEP	6	125	919	20	1260
20	TY	SPERRY	15 SEP-20 SEP	6	65	987	22	2624
21	TS	THELMA	26 SEP-30 SEP	5	55	982	16	1681
22	TY	VERNON	27 SEP-03 OCT	7	105	935	25	2141
23	ST	WYNNE	04 OCT-14 OCT	11	150	890	44	3728
24	TS	ALEX	12 OCT-14 OCT	3	35	999	8	1844
25	TY	BETTY	29 OCT-07 NOV	10	120	928	39	3228
26	TS	CARY	29 OCT-01 NOV	4	40	998	14	1068
27	TY	DINAH	21 NOV-25 NOV	5	100	941	17	3530
28	TS	ED	16 DEC-21DEC	6	50	988	20	815
			1980 TOTALS	128*			598	

* OVERLAPPING DAYS INCLUDED ONLY ONCE IN SUM.

level pressure (MIN OBS SLP), in millibars, were obtained from best estimates based on all available data. The distance travelled, in nautical miles, was calculated from the JTWC official best track (see Annex A).

Table 3-2 provides further information on the monthly distribution of tropical cyclones and statistics on Tropical Cyclone Formation Alerts and Warnings. The number of warning days decreased from 149 to 128 from 1979 to 1980.

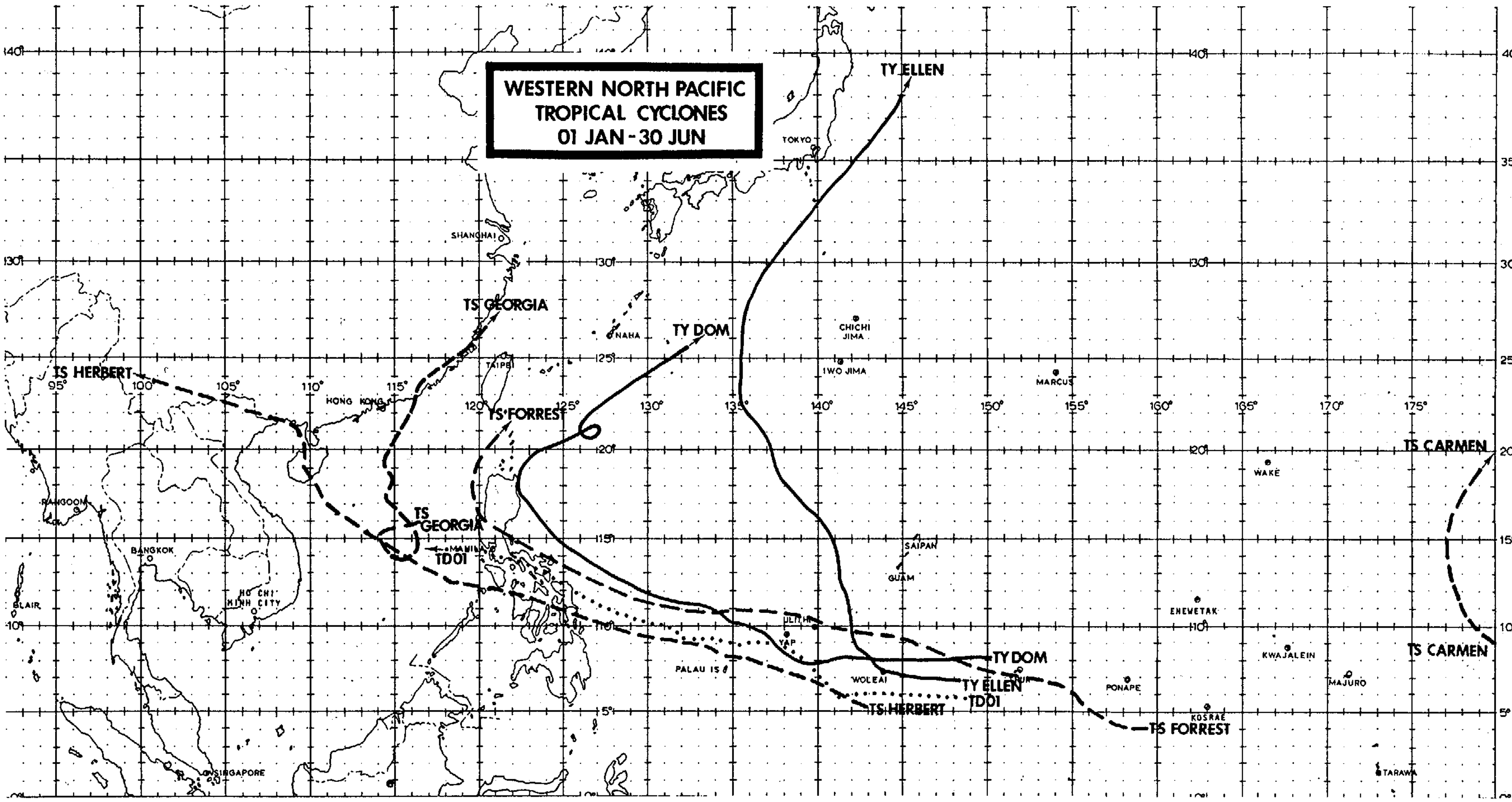
TABLE 3-2.

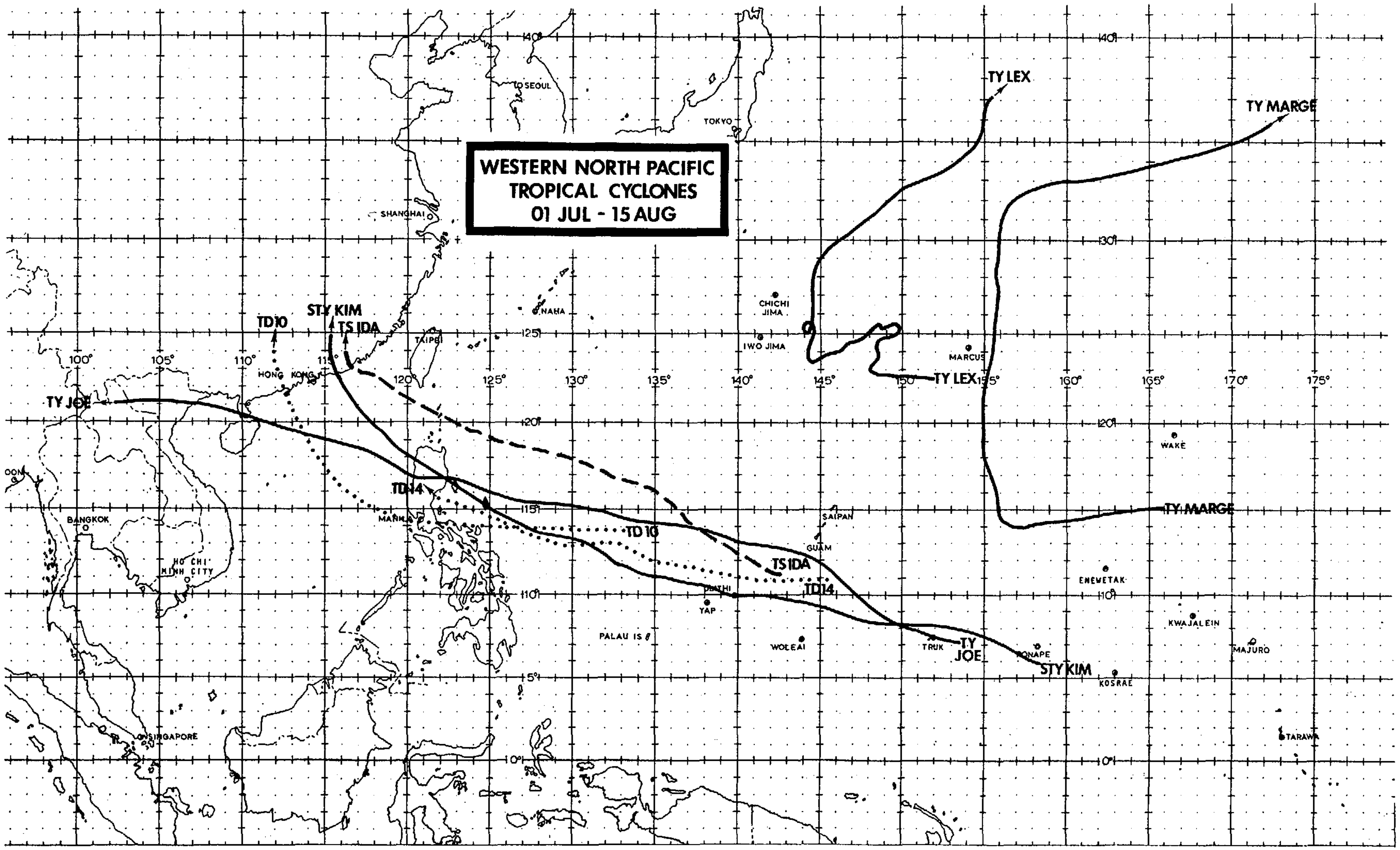
1980 SIGNIFICANT TROPICAL CYCLONE STATISTICS

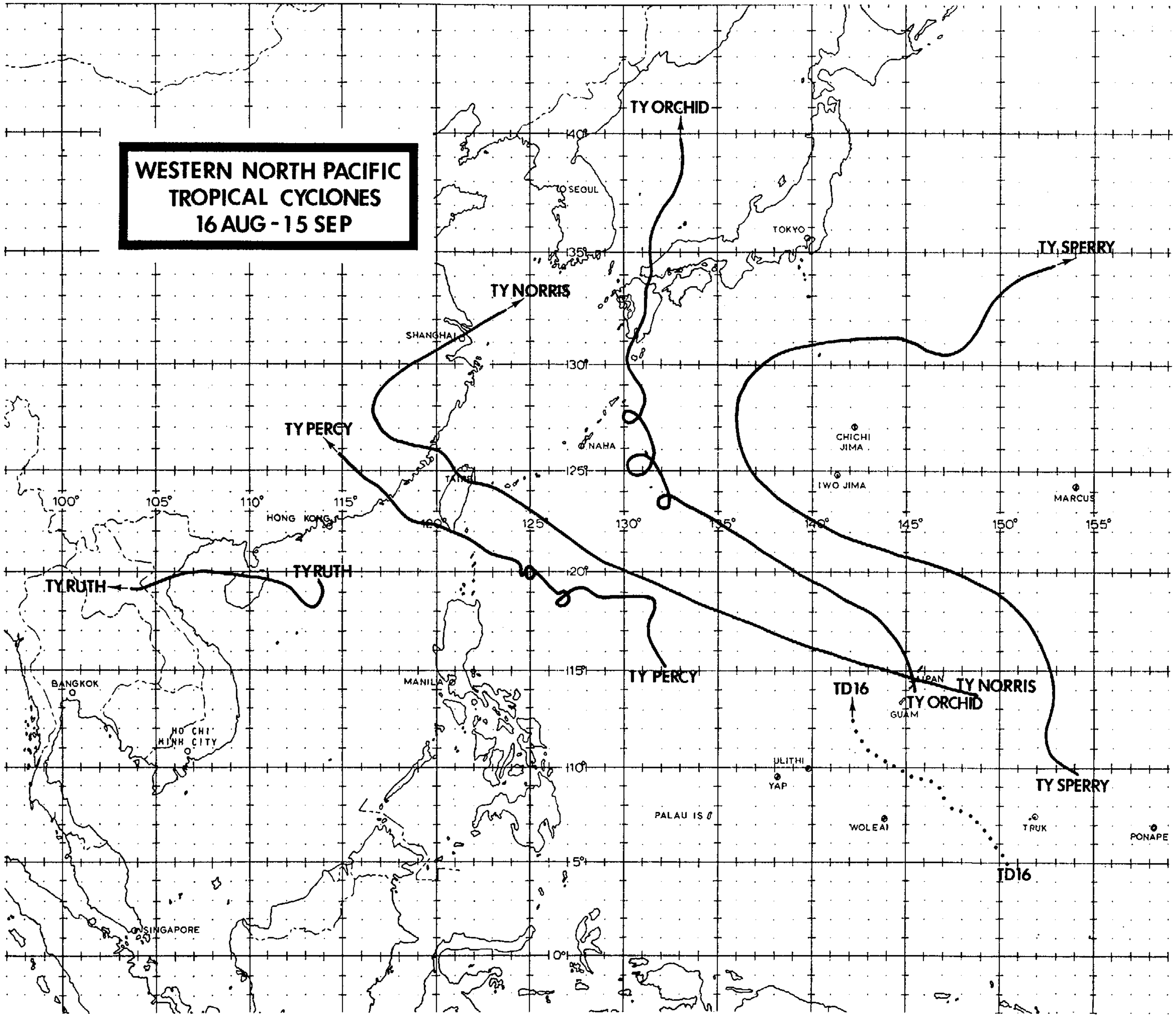
WESTERN NORTH PACIFIC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL	(1959-79) AVERAGE
TROPICAL DEPRESSIONS	0	0	1	0	0	0	1	1	1	0	0	0	4	4.8
TROPICAL STORMS	0	0	0	1	2	1	1	0	1	2	0	1	9	10.0
TYPHOONS	0	0	0	0	2	0	3	2	5	2	1	0	15	17.8
ALL CYCLONES	0	0	1	1	4	1	5	3	7	4	1	1	28	32.6
(1959-79) AVERAGE	.6	.4	.6	.9	1.4	2.0	5.2	6.7	6.0	4.7	2.7	1.4	32.6	

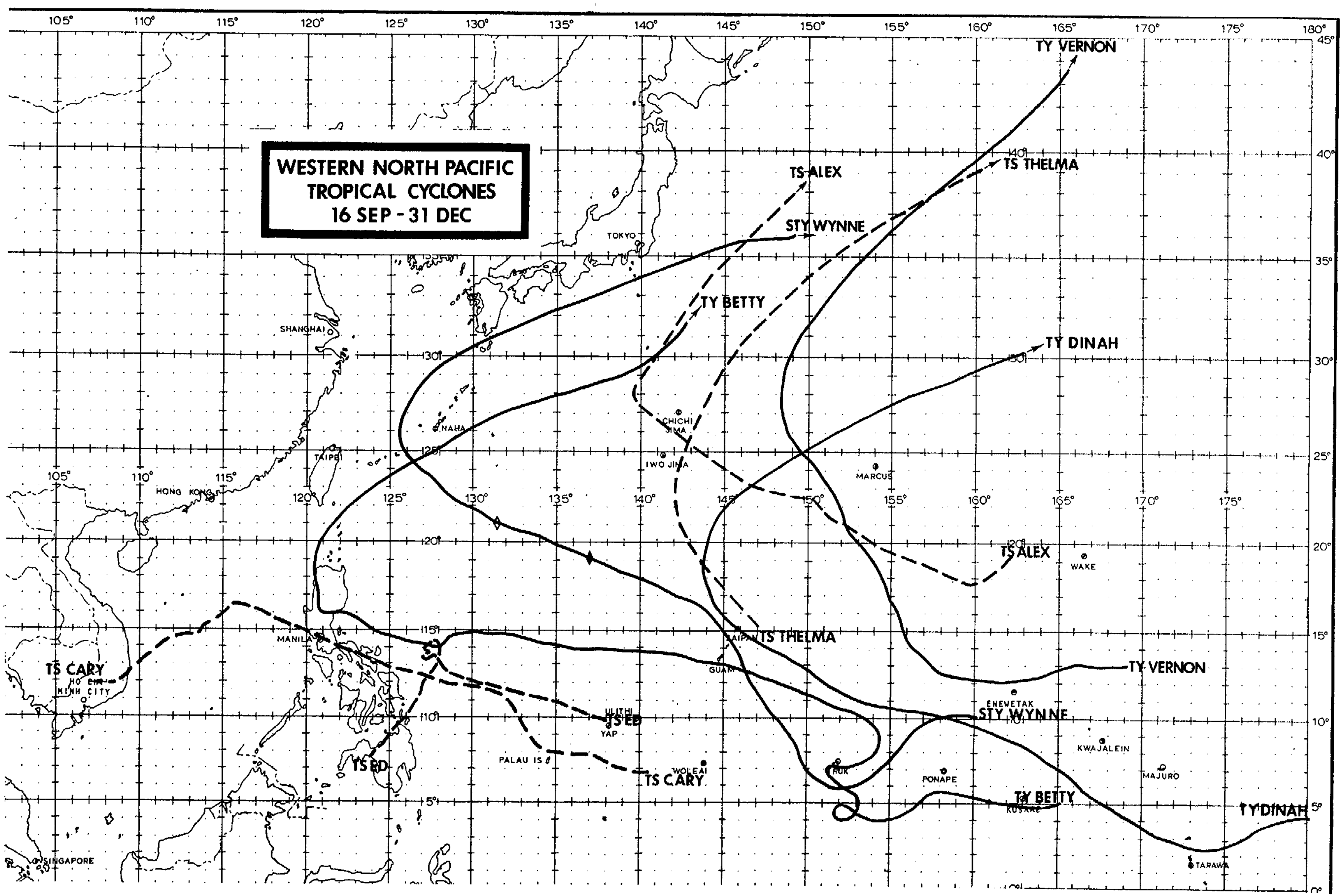
FORMATION ALERTS: 28 of 37 (76%) Formation Alert Events developed into tropical cyclones. Tropical Cyclone Formation Alerts were issued for all significant tropical cyclones which developed during 1980.

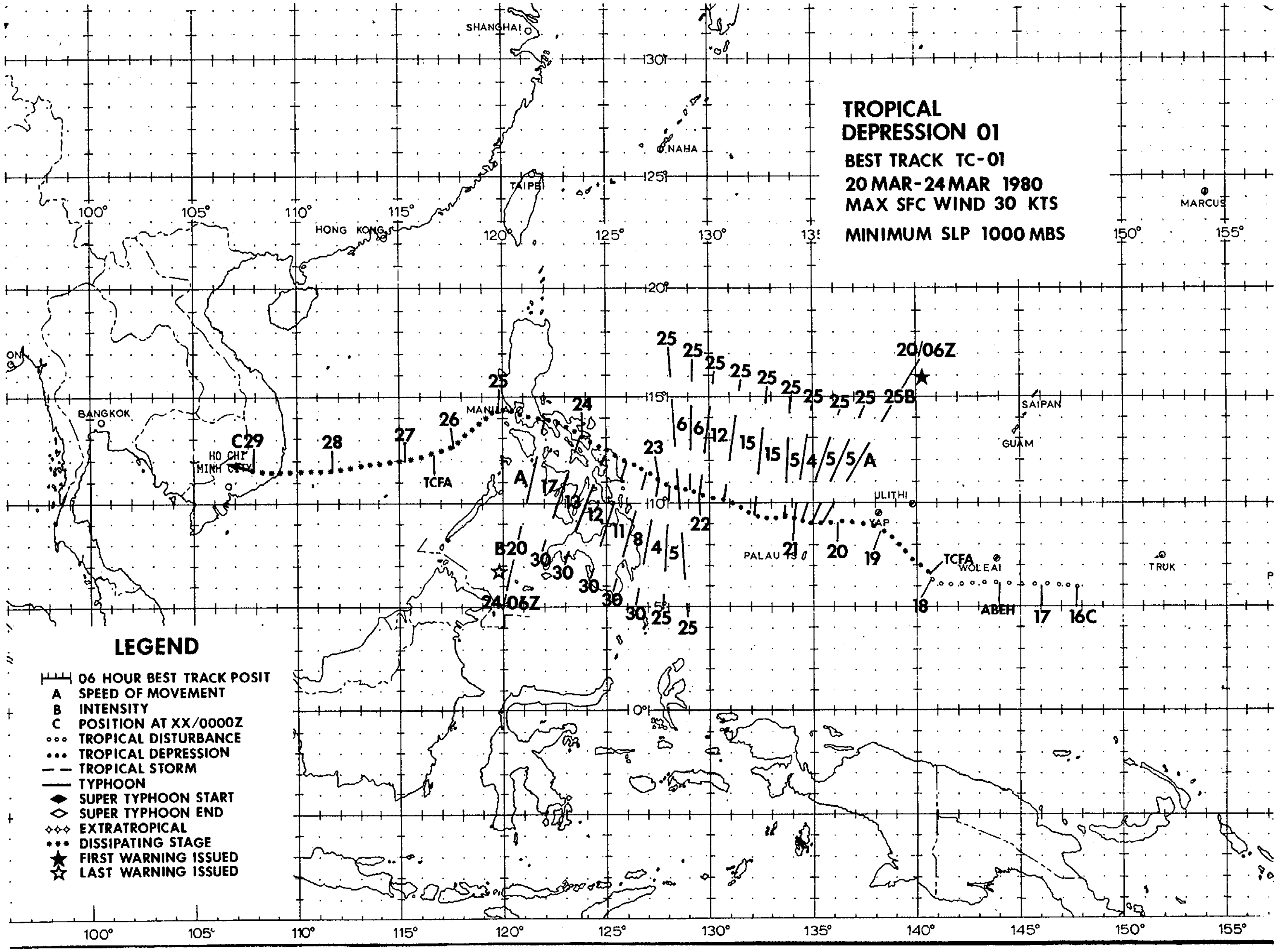
WARNINGS:
Number of warning days: 128
Number of warning days with 2 cyclones: 37
Number of warning days with 3 or more cyclones: 3


WESTERN NORTH PACIFIC
TROPICAL CYCLONES
01 JAN - 30 JUN
TY ELLEN
TY DOM
TS GEORGIA
TS HERBERT
TS FORREST
TS CARMEN
TD01
TOKYO
SHANGHAI
NAHA
CHICHI JIMA
IWO JIMA
MARCUS
TAIPEI
HONG KONG
MANILA
RANGOON
BANGKOK
HO CHI MINH CITY
BLAIR
SINGAPORE
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
WOLEAI
PONAPE
KOSRAE
ENEWETAK
WAKE
KWAJALEIN
MAJURO
TARAWA


WESTERN NORTH PACIFIC
TROPICAL CYCLONES
01 JUL - 15 AUG
TY LEX
TY MARGE
STY KIM
TS IDA
TD10
TD14
TY JOE
TD 10
TS IDA
TD14
TY LEX
TY MARGE
TY JOE
STY KIM
SEOUL
TOKYO
SHANGHAI
NAHA
TAIPEI
HONG KONG
CHICHI JIMA
IWO JIMA
MARCUS
WAKE
BANGKOK
HO CHI MINH CITY
MANILA
SAIPAN
GUAM
YAP
PALAU IS
WOLEAI
TRUK
PONAPE
KOSRAE
ENEWETAK
KWAJALEIN
MAJURO
TARAWA
SINGAPORE
100°
105°
110°
120°
125°
130°
135°
140°
145°
150°
155°
160°
165°
170°
175°
40°
30°
25°
20°
15°
10°
5°


WESTERN NORTH PACIFIC
TROPICAL CYCLONES
16 AUG - 15 SEP
TY ORCHID
TY SPERRY
TY NORRIS
TY PERCY
TY RUTH
TY RUTH
TY PERCY
TD16
TY NORRIS
TY ORCHID
TY SPERRY
TD16
SEOUL
TOKYO
SHANGHAI
NAHA
CHICHI JIMA
IWO JIMA
MARCUS
TAIPEI
HONG KONG
BANGKOK
MANILA
HO CHI MINH CITY
GUAM
ULITHI
YAP
PALAU IS
WOLEAI
TRUK
PONAPE
SINGAPORE
100°
105°
110°
115°
120°
125°
130°
135°
140°
145°
150°
155°
40°
35°
30°
25°
20°
15°
10°
5°
0°


WESTERN NORTH PACIFIC
TROPICAL CYCLONES
16 SEP - 31 DEC
TY VERNON
TS THELMA
TS ALEX
STY WYNNE
TY BETTY
TY DINAH
TS CARY
TS ED
TOKYO
SHANGHAI
NAHA
TAIPEI
HONG KONG
MANILA
HO CHI MINH CITY
SINGAPORE
CHICHI JIMA
IWO JIMA
MARCUS
WAKE
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
WOLEAI
TRUK
PONAPE
KUSAIE
ENEWETAK
KWAJALEIN
MAJURO
TARAWA
105°
110°
115°
120°
125°
130°
135°
140°
145°
150°
155°
160°
165°
170°
175°
180°
45°
40°
35°
30°
25°
20°
15°
10°
5°
0°


TROPICAL DEPRESSION 01
BEST TRACK TC-01
20 MAR-24 MAR 1980
MAX SFC WIND 30 KTS
MINIMUM SLP 1000 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
20/06Z
24/06Z
TCFA
SHANGHAI
NAHA
TAIPEI
HONG KONG
MANILA
BANGKOK
HO CHI MINH CITY
PALAU
YAP
ULITHI
WOLEAI
GUAM
SAIPAN
MARCUS
TRUK

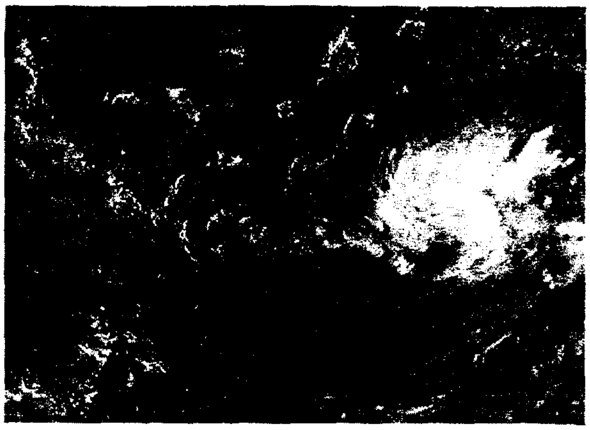


FIGURE 3-01-1. TD 01 at 15-20 kt (8-10 m/sec) intensity about 500 nm (926 km) south-southwest of Guam, 18 March 1980, 0120Z. (DMSP imagery)

TD 01 was first detected as an area of increased convective activity about 500 nm (926 km) south-southeast of Guam on 16 March. During the early part of the year, intense convective activity is usually located south of the equator. March is the start of the transition period when the equatorial trough begins to migrate slowly northward. During this period, the equatorial trough can occasionally extend into the Northern Hemisphere. This extension, however, is normally short-lived because the southwest monsoon has yet to become fully established. Post-analysis indicates that TD 01 developed from a temporary extension of the equatorial trough into the Northern Hemisphere.

The first aircraft reconnaissance mission into TD 01 on the morning of 18 March reported 15-20 kt (8-10 m/sec) surface winds, primarily in the northern semicircle, and a minimum sea-level pressure of 1005 mb. Based on this information and satellite imagery which showed improved upper-level outflow in the southeast quadrant (Fig. 3-01-1), a Tropical Cyclone Formation Alert (TCFA) was issued at 180300Z.

The tropical disturbance was monitored closely for the next 48 hours. The first reconnaissance mission also reported a 60 nm (111 km) displacement between the surface center and the 1500 ft (457 m) center. Subsequent missions discovered a similar displacement between the surface and 700 mb centers. This was consistent with the synoptic data which showed that strong mid- to upper-level southeasterlies were causing TD 01 to tilt with height toward the northwest.

By the 20th, surface winds in the southern semicircle had increased to 20 kt (10 m/sec), while 30 kt (15 m/sec) winds were observed in the northern semicircle. The circulation was better defined on satellite imagery, and the MSLP had decreased to 1000.7 mb. Continued development was expected and the first warning on TD 01 was issued at 200600Z.

Taking into consideration the strong vertical wind shear and the fact that March is historically a month of minimum typhoon development, TD 01 was never forecast to reach more than minimal tropical storm strength of 40 kt (21 m/sec).

From 20 through 24 March, TD 01 followed a climatological west-northwest track toward Luzon, occasionally showing speed changes as it responded to a series of mid-level short-wave troughs moving eastward across the Pacific from the Asian mainland.

As TD 01 approached southeastern Luzon, it began to interact both with a shear line extending toward it from the northeast and a building high pressure ridge between Taiwan and Luzon (Fig. 3-01-2). The net result was a flare-up in the convective activity and an increase in surface wind speed north of the surface center. Although two land stations reported 40 kt (21 m/sec) winds during landfall on Luzon, the sea-level pressures were not observed below 1007 mb. Considering the effects of topography, 30 kt (15 m/sec) appears to be the best estimate of TD 01's intensity at that time. Figure 3-01-2 shows that northeasterly winds of 25-40 kt (13-21 m/sec) were present north of TD 01 to the vicinity of Taiwan. These strong winds were being enhanced by TD 01, but were more the result of the building high pressure ridge off the Asian mainland. Therefore, an extratropical wind warning was issued for the area by NAVOCEANCOMCEN Guam.

After making landfall, TD 01 tracked slowly westward south of Manila into the South China Sea. A TCFA was issued for the remnants of TD 01 at 260615Z when improved organization of the cloud pattern (Fig. 3-01-3) suggested that regeneration might occur. The disturbance was watched for three more days, but ship reports showed nothing more than a weak wave in the east-northeasterly flow, and the system dissipated rapidly after moving ashore on the Vietnam coast near Ho Chi Minh City.

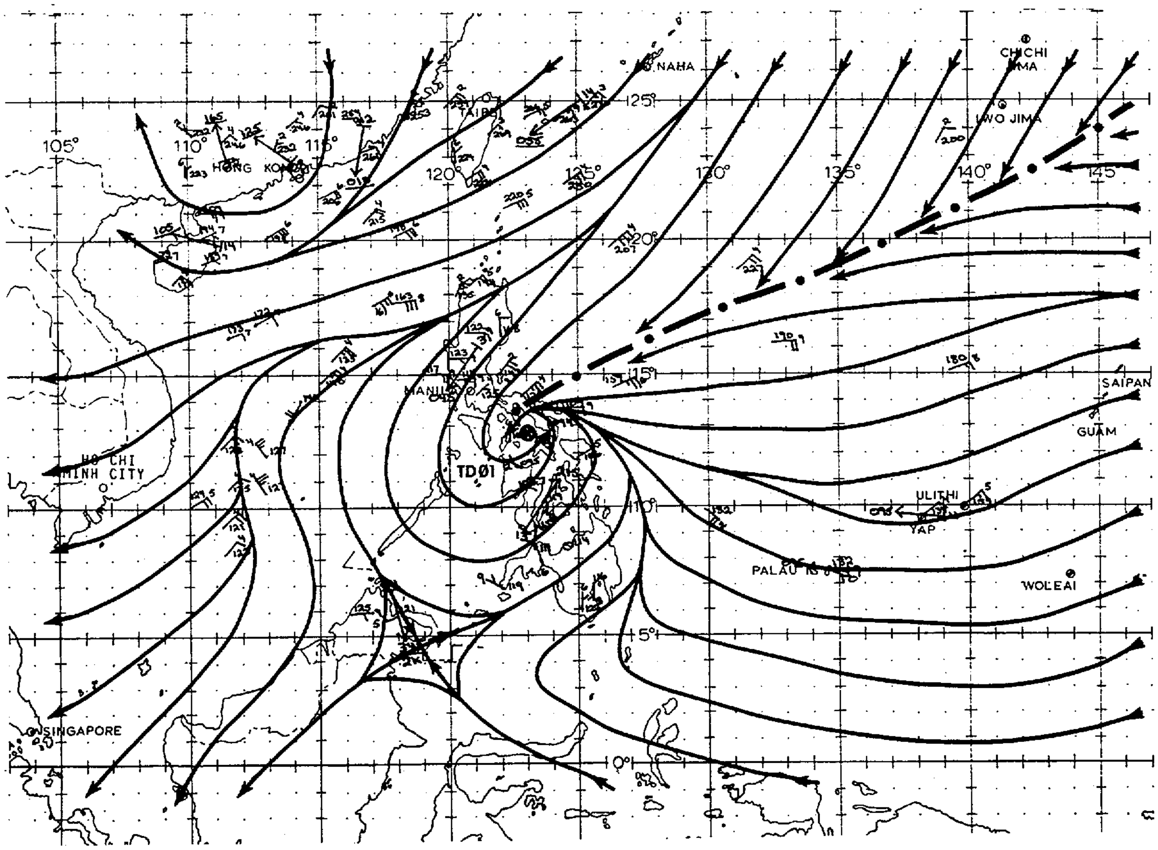


FIGURE 3-01-2. The 240000Z March 1980 surface (———\ )/gradient-level (ddd<——<ff) wind data and streamline analysis. Wind speeds are in knots.

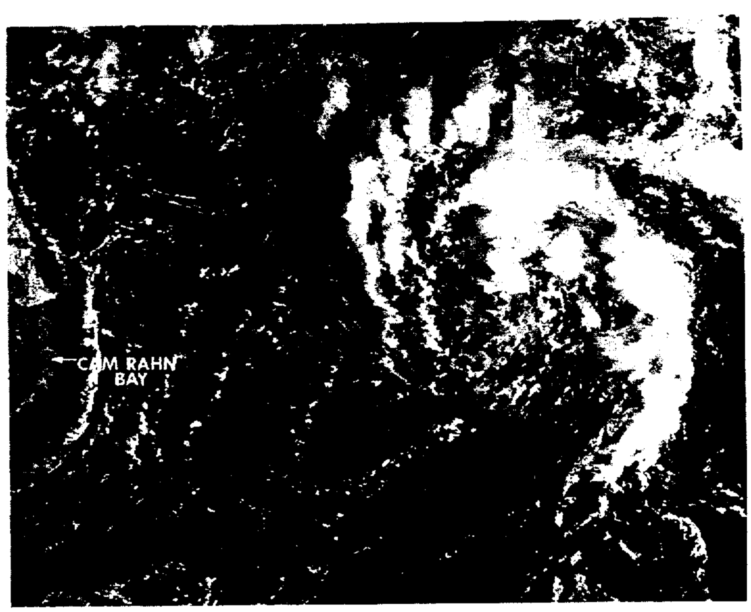
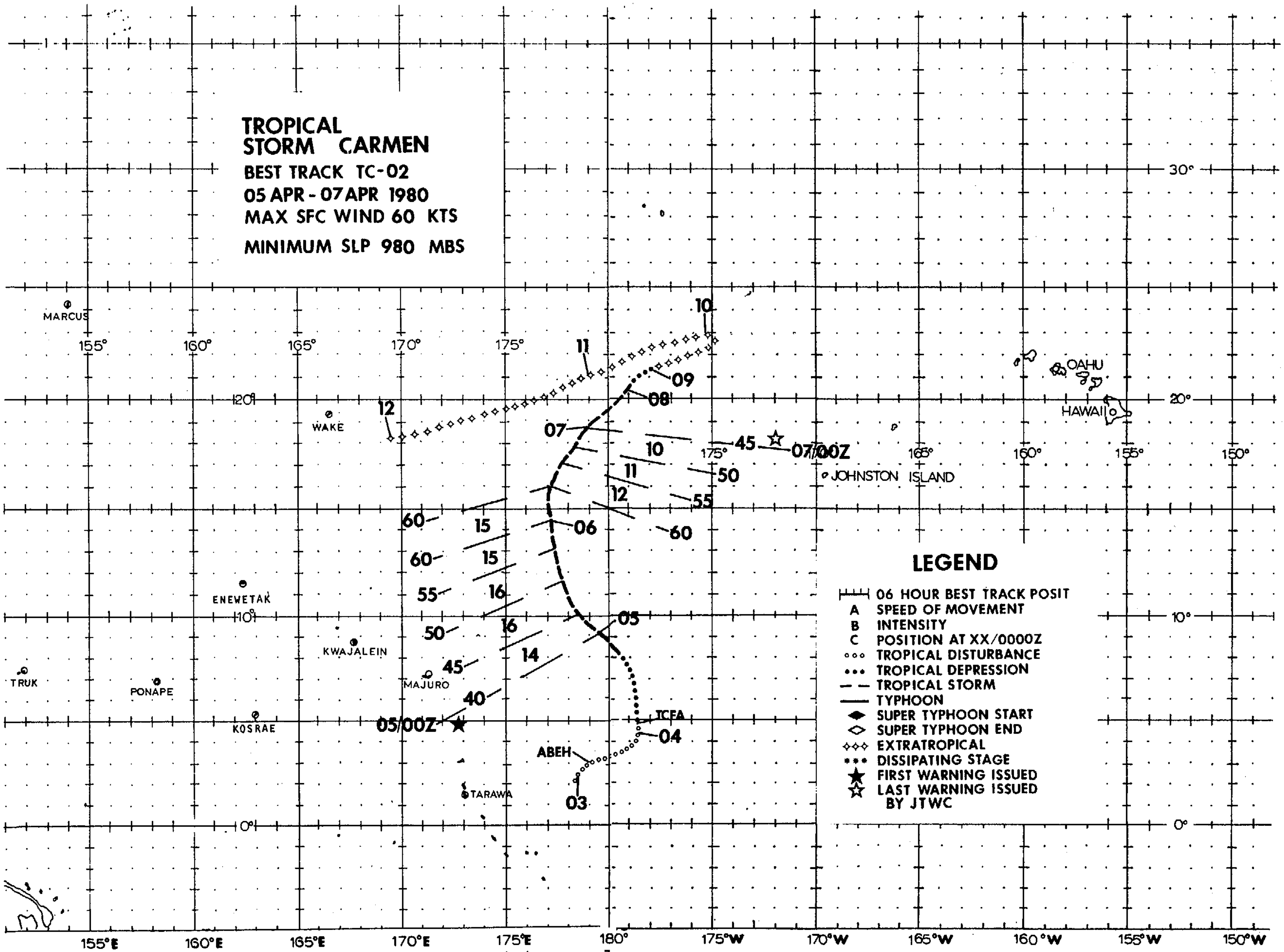


FIGURE 3-01-3. The remnants of TD 01 in the South China Sea showing signs of regeneration, 26 March 1980, 0206Z. (DMSP imagery)


TROPICAL
STORM CARMEN
BEST TRACK TC-02
05 APR - 07 APR 1980
MAX SFC WIND 60 KTS
MINIMUM SLP 980 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
BY JTWC
MARCUS
WAKE
ENEWETAK
KWAJALEIN
TRUK
PONAPE
KOSRAE
MAJURO
TARAWA
JOHNSTON ISLAND
OAHU
HAWAII
05/00Z
07/00Z
TCFA
ABEH
155°E
160°E
165°E
170°E
175°E
180°
175°W
170°W
165°W
160°W
155°W
150°W
30°
20°
10°
0°

Tropical Storm Carmen, the second significant tropical cyclone of the season, might well have gone undetected if it had occurred prior to the advent of meteorological satellite surveillance. Carmen developed in and tracked through a very sparse synoptic data region near the dateline in early April 1980. Once organized, Carmen's closest point of approach to a reporting station (Majuro Atoll, WMO 91376) was 450 nm (833 km). During its entire life, Carmen was closely monitored by the Joint Typhoon Warning Center (JTWC) and the Central Pacific Hurricane Center (CPHC) using polar-orbiting and geostationary satellites to confirm Carmen's existence.

Available satellite imagery and synoptic data indicated that Carmen developed in a relatively active near-equatorial trough (NET) during a period in which a parallel disturbance, TC 20-80 (Wally), was developing in the Southern Hemisphere. (The term parallel disturbances is also referred to as "double vortices".) Similar to many previous cases, most recently Typhoon Kim (1977) and Typhoon Lucy (1977) and their respective Southern Hemisphere cyclones, Carmen and TC 20-80 took nearly mirror-image tracks over open water. In this case, each cyclone moved towards its respective pole in response to a weakness in each hemisphere's sub-tropical ridge. Once organized, Carmen moved north-northwest and then, at the ridge axis, began its recurvature to the northeast. Similarly, TC 20-80 moved south-southwest until it began recurvature to the southeast at the ridge axis. Although TC 20-80 accelerated in its extratropical transition near 26 degrees south latitude, Carmen slowed as she moved eastward across the dateline. Several days later Carmen dissipated in the northeast trade wind flow south of Wake Island.

The disturbance which became Tropical Storm Carmen was first detected in satellite imagery at 0000Z on 2 April. By 021800Z, the area of convection had moved from the equator to near 02N 178E. At 030600Z, the Significant Tropical Weather Advisory (ABEH PGTW) discussed a surface circulation near 03N 179E. The major convection associated with the circulation continued to move northeast at 10 kt (19 km/hr) east of the dateline. The Central Pacific Hurricane Center (CPHC) monitors developing tropical cyclones east of the dateline and the responsibility for issuing tropical cyclone formation alerts (TCFA) in this region belongs to the Naval Western Oceanography Center (NWOC) at Pearl Harbor, Hawaii. By 0200Z on 4 April, the organization of the disturbance had improved significantly and NWOC issued a TCFA for an area that straddled the dateline between 04N and 08N. At 050000Z, the developing cyclone moved west of the dateline, and based on the improved satellite signature, the first warning on TD02 was issued at that time. During the next 48 hours, Carmen intensified, reaching a peak intensity of 60 kt (31 m/sec) at approximately 060000Z. Figure 3-02-1 shows satellite imagery of Carmen at peak intensity. Carmen then gradually weakened as she approached the dateline for a third time (second approach from the west). The last JTWC warning was issued at 070000Z and the CPHC issued its first warning at 070600Z. While east of the dateline, Carmen continued to weaken as her movement slowed to 5 kt (9 km/hr). The final warning was issued by CPHC at 090000Z with TD02 near 21.5N 178W.

Due to Carmen's location (near the dateline) and month of occurrence (April), JTWC forecasters had few viable forecasting aids to develop their warnings. Climatology and analog programs were non-existent for the area and season, and the steering model is unreliable south of 10N. Without the input of these valuable aids, the initial warning was based on sparse mid-level synoptic data and described a north-northwest track with recurvature near 17N. This basic track was maintained in subsequent JTWC warnings. Maintenance of this basic track through recurvature provided JTWC with 72-hour forecast errors (210 nm (389 km)) which were significantly lower than the 10-year average of 348 nm (644 km).

Intensity estimates and forecasts were based entirely on the Dvorak method for estimating tropical cyclone intensity (1975) The first series of Dvorak intensity estimates at 041954Z, 050000Z and 050233Z supported 35 kt (18 m/sec) maximum winds. However, upgrading to tropical storm status did not occur until the 051200Z warning. This delay is not unusual. Initial warnings tend to be conservative because satellite imagery of a developing tropical cyclone often appears more intense for a brief period before returning to a more "normal" signature for the early development stage. Indeed, the Dvorak method has a built in constraint which limits initial estimates to T1.5 (25 kt (13 m/sec)) or less. The initial Dvorak intensities received at JTWC were T2.5 (35 kt (18 m/sec)). In post-analysis, the higher estimates were supported with the trend showing that TD02 (Carmen) actually reached tropical storm strength at 041800Z, 6 hours prior to the first warning.

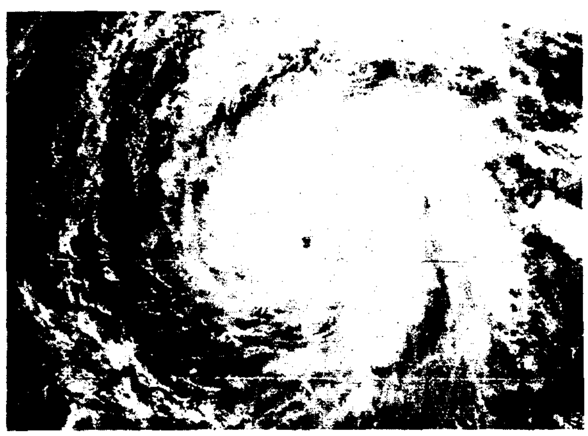
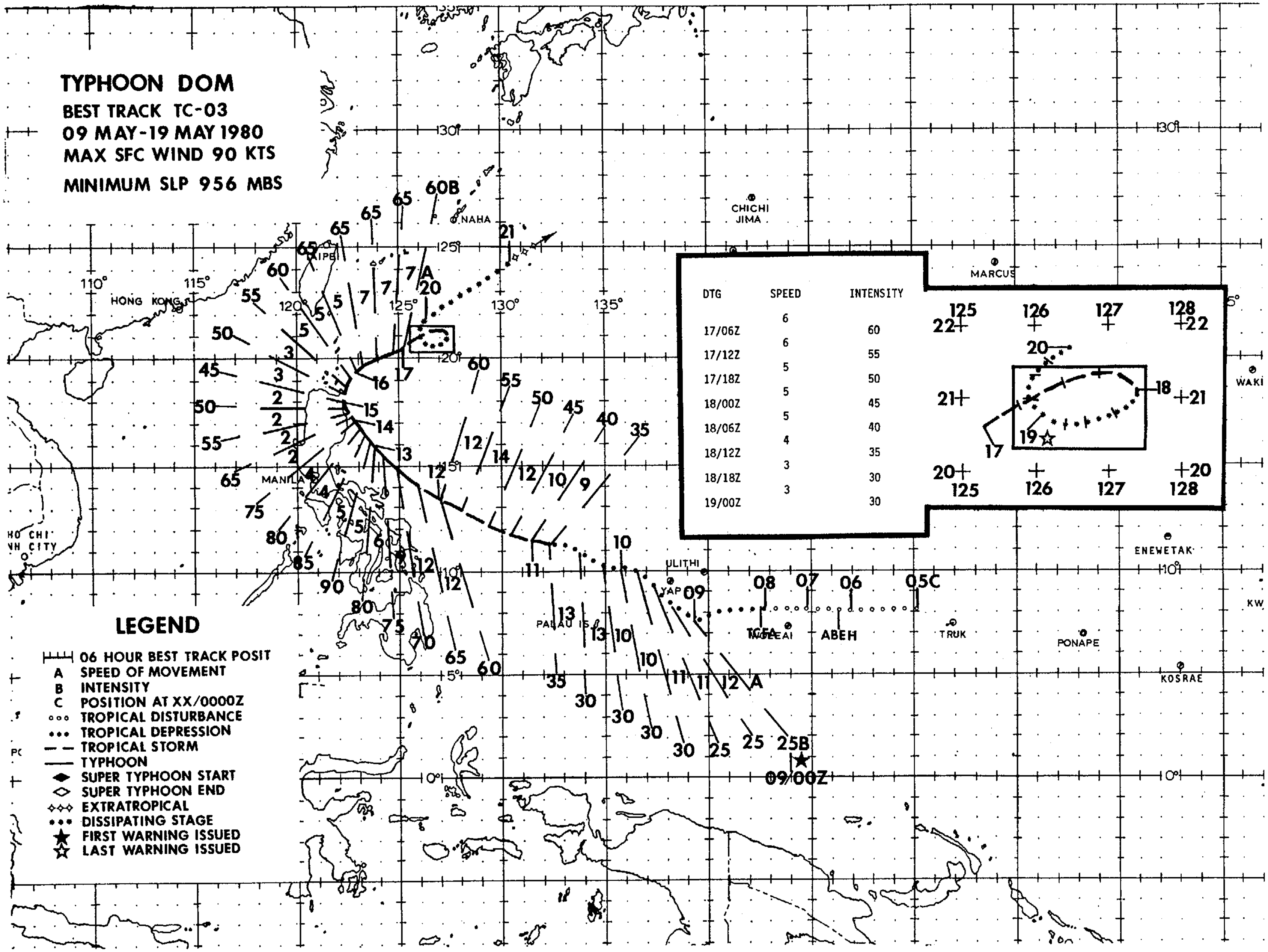


FIGURE 3-02-1. TS Carmen, near maximum intensity of 60 kt (31 m/sec), 05 April 1980, 2231Z. (DMSP imagery)


TYPHOON DOM
BEST TRACK TC-03
09 MAY-19 MAY 1980
MAX SFC WIND 90 KTS
MINIMUM SLP 956 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
DTG
SPEED
INTENSITY
17/06Z
17/12Z
17/18Z
18/00Z
18/06Z
18/12Z
18/18Z
19/00Z
6 6 5 5 5 4 3 3
60 55 50 45 40 35 30 30
HONG KONG
TAIPEI
NAHA
MANILA
HO CHI MINH CITY
CHICHI JIMA
MARCUS
WAKI
ENEWETAK
ULITHI
YAP
PALAU IS
WOLEAI
ABEH
TRUK
PONAPE
KOSRAE
09/00Z

Dom was the first tropical cyclone that developed to typhoon intensity in the western North Pacific in 1980. Dom had several features of interest: a pronounced tilt in the vertical axis during the developing stages and the execution of a rare anticyclonic loop in the later stages of his existence.

Satellite imagery showed a weak disturbance which first appeared along the near equatorial trough on 5 May. The disturbance showed no significant development as it tracked across the Caroline Islands during the following three days. The first investigation by reconnaissance aircraft was scheduled on 8 May when a significant increase in convective activity was noted. The weak circulation located by the aircraft prompted JTWC to issue a Tropical Cyclone Formation Alert for an area south of Guam. By the 9th, satellite imagery indicated strong outflow on the west side of the circulation and increased organization of convective cloud elements became evident as the disturbance continued to develop. As the circulation became more organized, reconnaissance aircraft observed an increase in the surrounding surface winds. The first warning on TD03 was issued at 090000Z.

Little change in intensity occurred during the next two days, during which time the 700 mb circulation was displaced as much as 77 nm (143 km) west-southwest of the surface center. This displacement was indicative of marked vertical shear caused by strong mid- to upper-level easterly flow.

Vertical shear remained strong during Dom's early stages of development as he moved westward steered by strong mid- to upper-level easterlies along the southern periphery of the mid-level subtropical ridge axis. On 10 May, a mid-tropospheric low pressure center developed over the Asia Mainland, causing the ridge to recede eastward. This created a weakness in the ridge near the Philippines, allowing Dom to track west-northwestward away from the strong mid- to upper-level easterlies. With the decrease in vertical wind shear, Dom's axis became more vertical and development proceeded. Dom reached tropical storm intensity at 101800Z as an anticyclone with outflow in all quadrants developed at upper-levels.

A large area of low-level convergence formed to the northeast of Dom as evidenced by convective activity shown by satellite

FIGURE 3-03-1. Typhoon Dom at 40 kt (21 m/sec) intensity tracking west-northwestward at 9 kt (17 km/hr), 11 May 1980, 0213Z. (DMSP visual imagery)

imagery on the 11th (Fig. 3-03-1). This are of convection dissipated as an induced ridge formed between Dom and a circulation to the southeast of Guam which would later develop into Typhoon Ellen. Dom attained typhoon intensity at 120600Z. When Dom intensified to 90 kt (46 m/sec), he had a large eye 30 nm (56 nm) in diameter and his speed of movement decreased markedly as he moved away from the strong mid- to upper-level easterly steering flow. Dom became virtually stationary as he drifted slowly toward Luzon with weakening commencing due to the decreased moisture content of the air being drawn into Dom's circulation across the mountainous terrain of Luzon. By 141200Z, Dom had weakened to tropical storm intensity and was tracking northward at 2 kts (1 m/sec) showing indications of impending recurvature.

Dom unexpectedly regained typhoon strength 24 hours after recurvature. Reintensification was made possible by a lessening of the land effect and energy provided by a tongue of warm water extending north of Luzon (Fig. 3-03-2). Dom then tracked northeastward south of the area of maximum sea surface temperature (SST). A later SST analysis (Fig. 3-03-3) showed the decrease in SST which is normally observed after the passage of a tropical cyclone. This decrease in SST is caused primarily by evaporative cooling and the mixing of surface water with cooler sub-surface water and, to a lesser extent, by the addition of rain water and the decrease in solar radiation reaching the surface (Brand, 1970). Dom's final decrease to tropical storm intensity was due to the shearing effect of strong upper-tropospheric westerlies and strong low-level easterlies. The upper-level center continued to track eastward, whereas the surface circulation began a rare anticyclonic loop as it tracked westward under the influence of the low-level easterly flow. At 190000Z, JTWC issued the final warning on Dom, although post-analysis indicated he ceased to exist as a significant tropical cyclone on the 18th.

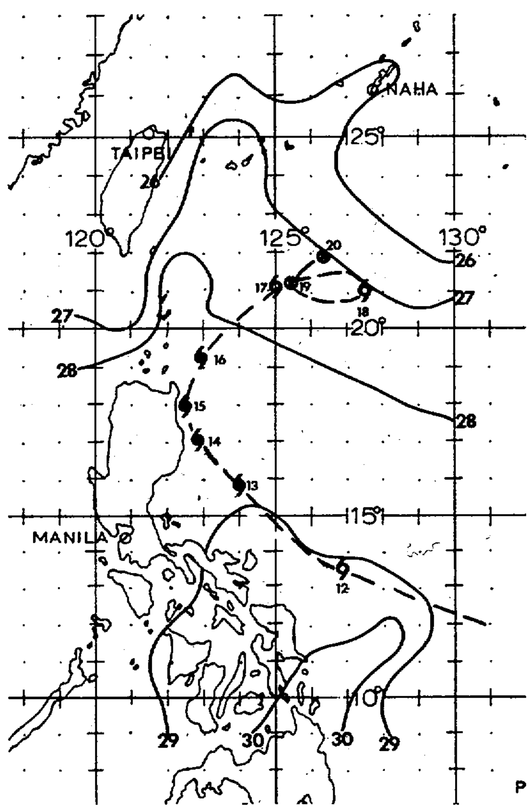


FIGURE 3-03-2. Composite sea surface temperature analysis of data from 10-16 May 1980, produced by the Oceanographic Services Division of Naval Oceanography Command Center, Guam.

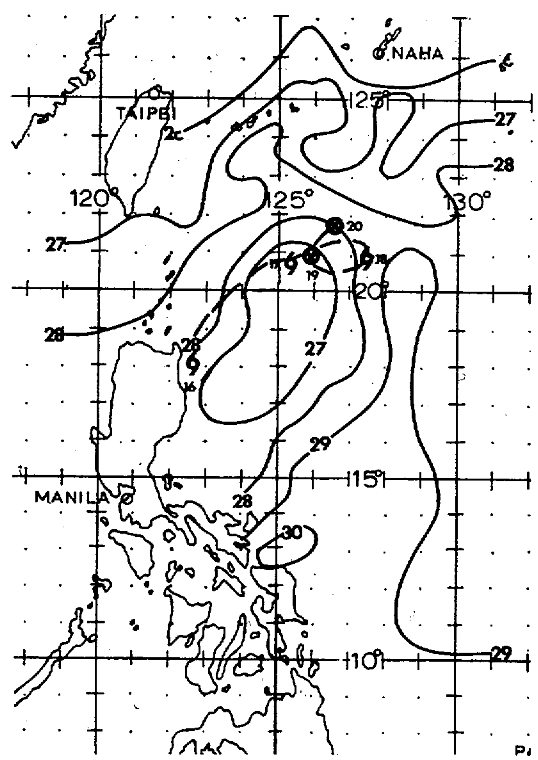
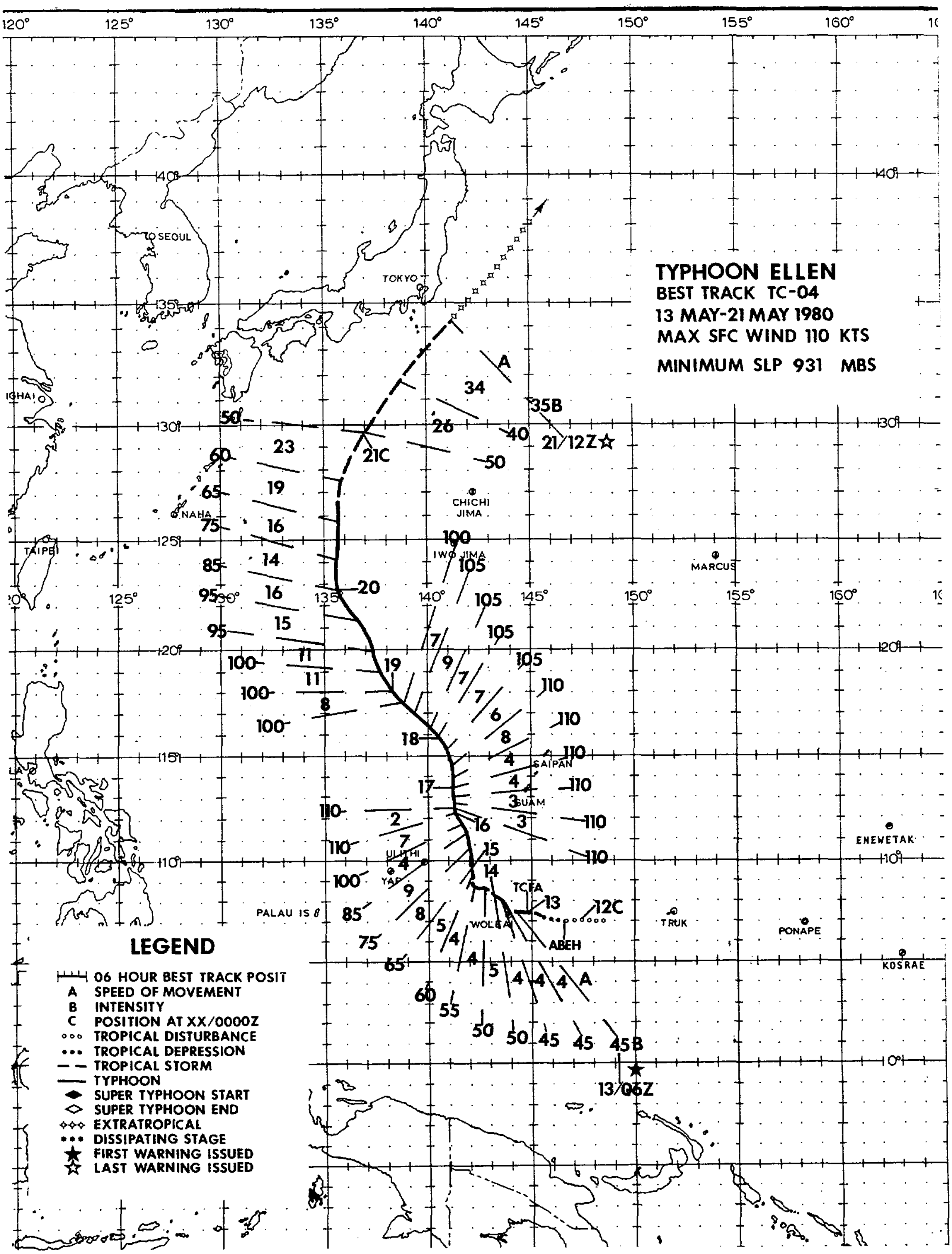


FIGURE 3-03-3. Composite sea surface temperature analysis of data from 17-23 May 1980, produced by the Oceanographic Services Division of Naval Oceanography Command Center, Guam.

Triggered by a mid-tropospheric trough which entered the South China Sea, an extratropical surface low pressure system formed south of Japan at 200000Z with the associated frontal boundary extending to the southwest of Okinawa. At this time, Typhoon Ellen was 600 nm (1113 km) east-northeast of the remnants of Dom. On the 20th, both the remnants of Dom and Typhoon Ellen accelerated toward the extratropical low along the east side of the frontal boundary. By 211200Z, the three systems had merged to form an intensifying mid-latitude storm over the east coast of central Honshu, Japan. This deepening mid-latitude storm tracked northeastward along the northern periphery of the mid-Pacific ridge.


TYPHOON ELLEN
BEST TRACK TC-04
13 MAY-21 MAY 1980
MAX SFC WIND 110 KTS
MINIMUM SLP 931 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
SEOUL
TOKYO
NAHA
TAIPEI
CHICHI JIMA
IWO JIMA
MARCUS
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
WOLEAI
TRUK
PONAPE
ENEWETAK
KOSRAE
TCFA
ABEH
21/12Z
13/06Z
21C
12C

Typhoon Ellen developed in an active, near-equatorial trough west of the Truk Islands on 11 May 1980. Strong upper-level divergence over the Caroline Islands and a weak 500 mb steering currents, produced by a northward adjustment of the 500 mb ridge axis to 25N, provided an excellent environment for tropical cyclone development. Ellen was an interesting tropical cyclone from several viewpoints. During her existence, Ellen underwent rapid initial development, abruptly changed track at a low latitude, and followed a slow oscillatory motion for an 18 hour period.

Ellen's initial tropical disturbance became evident on satellite imagery between 111200Z and 120000Z. However, a Tropical Cyclone Formation Alert (TCFA) was not issued at that time because 120000Z synoptic data did not indicate a well-defined surface circulation with lowering surface pressures. A weakening of the satellite signature during the next 12 hours supported this decision. Between 121200Z and 121600Z, Ellen's satellite signature improved markedly and a TCFA was issued. Aircraft reconnaissance at 130422Z confirmed Ellen's rapid development and estimated 45-50 kt (23-26 m/sec) maximum surface winds. The first warning was issued at 130600Z. Post-analysis indicates that Ellen reached tropical storm strength at 121800Z.

Ellen appeared to be following TY Dom's track across the Philippine Sea as she tracked initially west over Woleai Atoll and then west-northwestward toward Ulithi Atoll. On 15 May, Ellen abruptly turned to the north and was headed for Japan. By 150000Z, she was tracking north-northwestward at approximately 8 kt (15 km/hr) and had intensified to 65 kt (33 m/sec). At 170000Z, Ellen passed 220 nm (407 km) west of Guam with maximum sustained surface winds of 110 kt (57 m/sec). Figure 3-04-1 is satellite imagery during this period of Ellen's track.

After her abrupt turn, Typhoon Ellen's surface circulation followed a pronounced

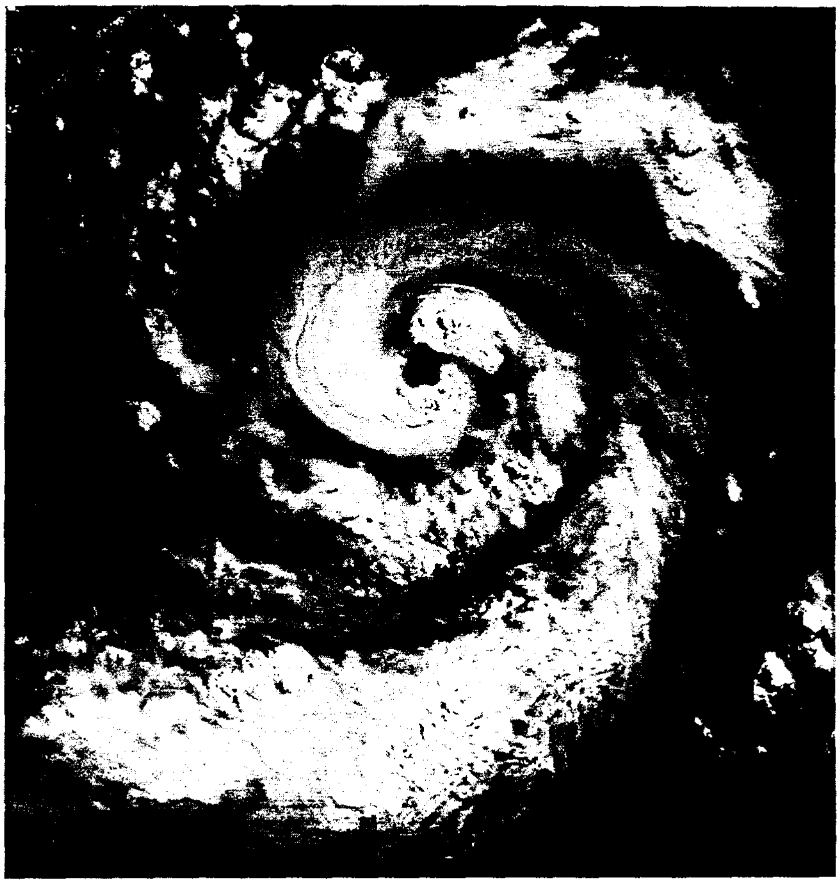


FIGURE 3-04-1. Typhoon Ellen shortly after reaching typhoon intensity, 15 May 1980, 0054Z. (DMSP imagery)

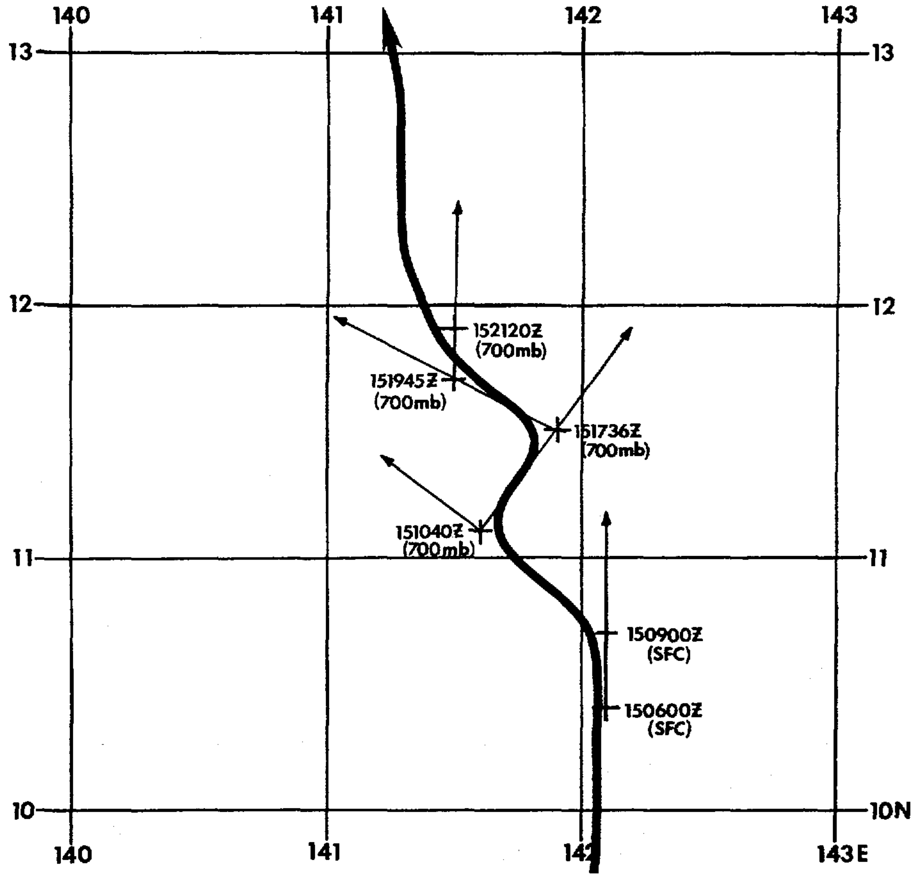


FIGURE 3-04-2. Typhoon Ellen's best track between 141800Z and 160600Z May 1980. Surface and 700 mb positions observed by aircraft reconnaissance, and vectors between successive aircraft fixes, are shown.

oscillatory motion about a basic north-northwest track. Surface positions observed by aircraft reconnaissance and vectors between successive aircraft fixes during this period are illustrated in Figure 3-04-2. These short term oscillations were difficult to interpret and thus made forecasting Ellen's movement very difficult.

As Ellen was undergoing this oscillatory motion, aircraft reconnaissance also observed that the location of minimum sea level pressure appeared to rotate close to the wall cloud in a highly elliptical eye. During the same period, Ellen deepened to her lowest minimum sea level pressure of 931 mb and intensified an additional 45 kt (23 m/sec), reaching her maximum intensity of 110 kt (57 m/sec).

This oscillatory motion and uncertainty in the position and strength of the 500 mb subtropical ridge axis created a significant forecast problem. Forecasts of early recurvature to the northeast did not materialize as Ellen continued on a north-northwest track toward Japan. Once north of the ridge axis, Ellen recurved between 25N and 30N and accelerated northeastward at forward speeds in excess of 30 kt (56 km/hr). Following recurvature, Ellen weakened rapidly and merged with an extratropical low pressure system south of Honshu.

Ellen's actual track passed closer to Japan than originally forecast due to rapid deepening of a mid-latitude trough over Japan and rapid intensification of the subtropical ridge east of Japan. In response, 500 mb winds south of Japan backed in direction and strengthened, causing Ellen to accelerate northeastward and pass 120 nm (222 km) east of Yokosuka Naval Station, Japan (Fig. 3-04-3). Department of Defense resources in Japan reported no major damage, and Yokosuka only reported 20-25 kt (10-13 m/sec) sustained winds during the passage of Ellen. Flooding reported in Kyushu and Shikoku resulted from heavy rain produced by the extratropical low pressure system which eventually merged with Ellen south of Honshu.

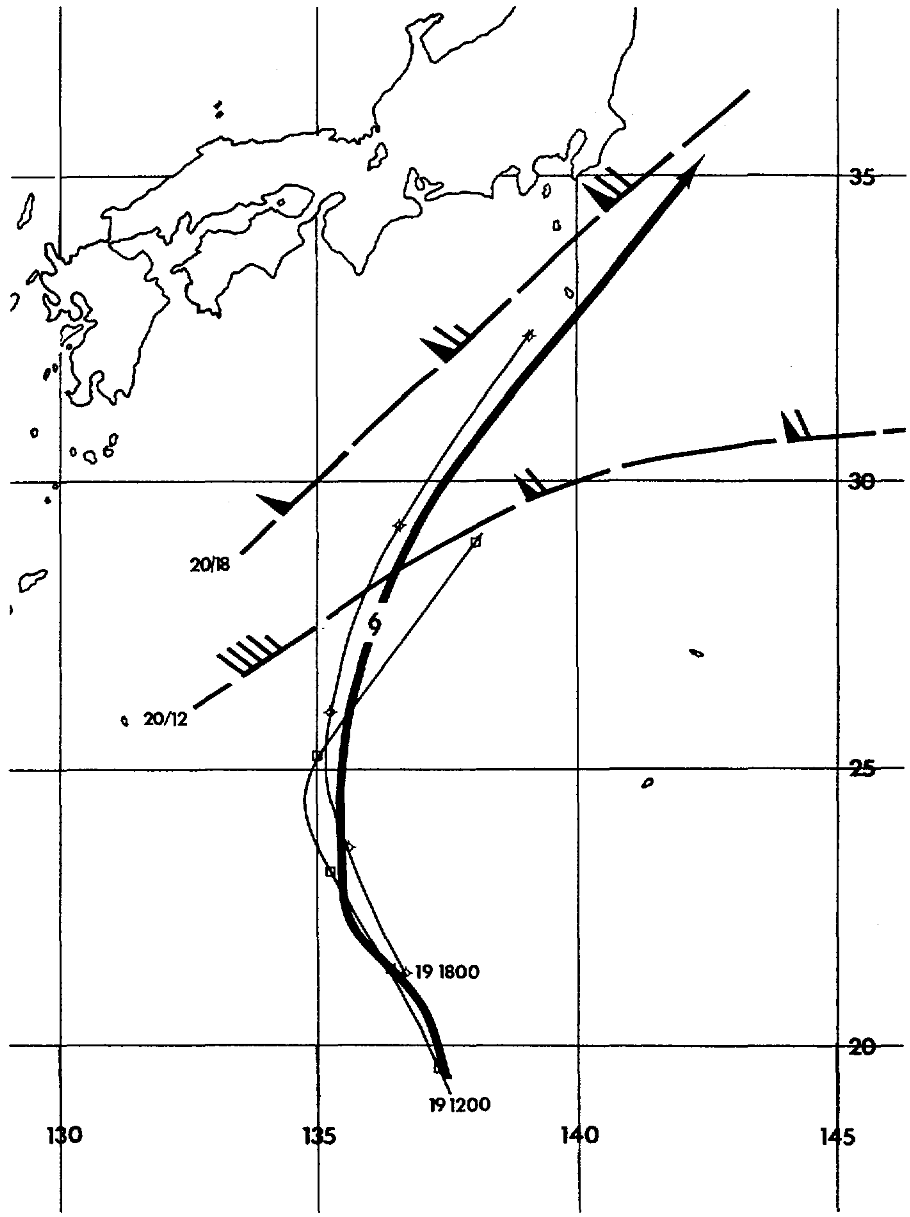
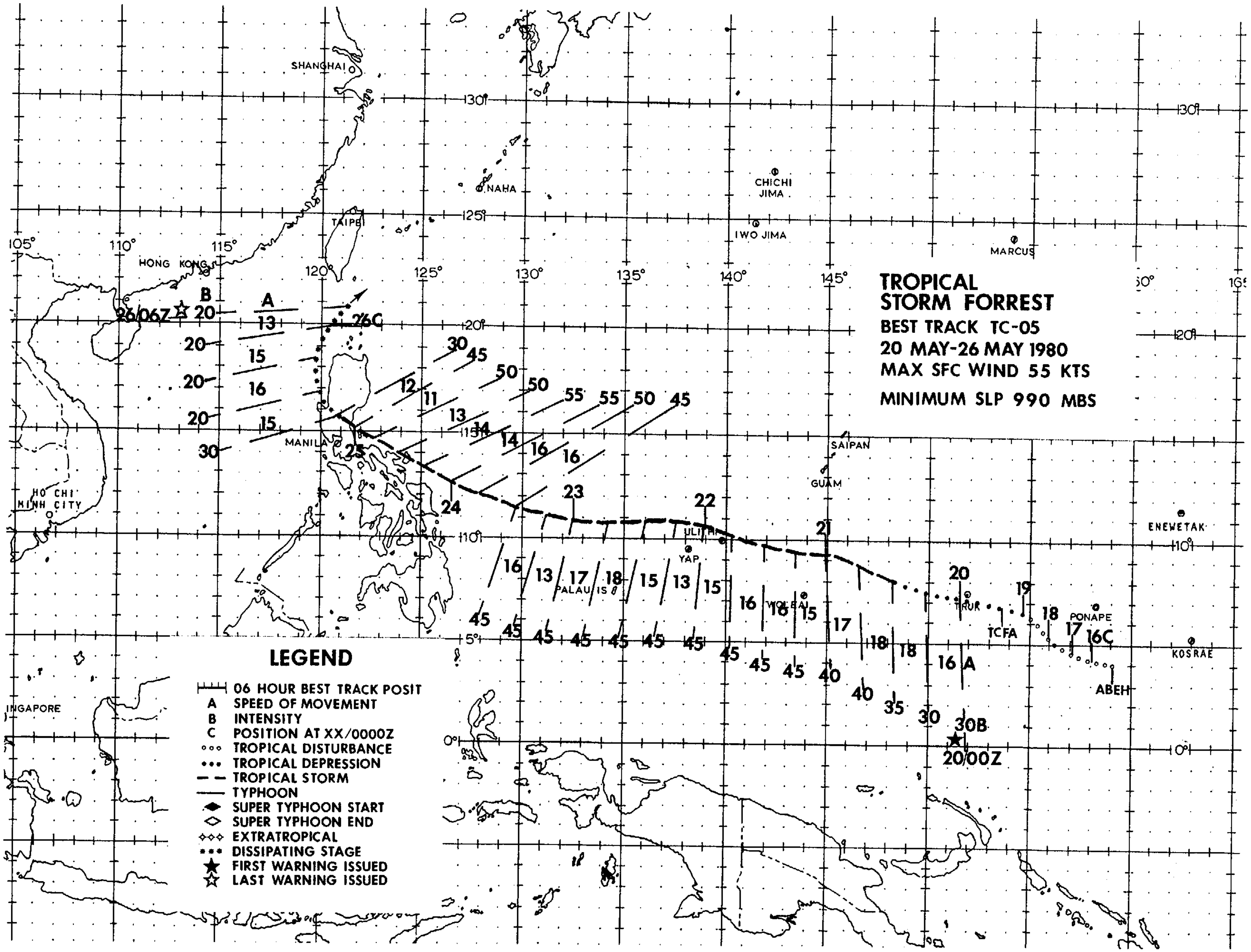


FIGURE 3-04-3. Forecast tracks for Typhoon Ellen from 191200Z and 191800Z data bases. Selected 24-hr forecast wind vectors at 500 mb for each data base are also illustrated, along with the final best track (▬▬) for that period.



TROPICAL STORM FORREST
BEST TRACK TC-05
20 MAY-26 MAY 1980
MAX SFC WIND 55 KTS
MINIMUM SLP 990 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
SHANGHAI
NAHA
CHICHI JIMA
IWO JIMA
MARCUS
TAIPEI
HONG KONG
MANILA
SAIPAN
GUAM
HO CHI MINH CITY
ENEWETAK
YAP
ULITHI
PALAU IS
WOLEAI
TRUK
PONAPE
KOSRAE
TCFA
ABEH
INGAPORE
26/06Z
20/00Z

Tropical Storm Forrest was influenced by an unusually large and strong mid-tropospheric ridge which built westward across the Philippine Sea following the recurvature of Typhoon Ellen. This ridge dominated the entire northwestern Pacific and affected Forrest's direction of movement, forward speed, and intensity.

The majority of TS Forrest's track was spent skirting the southern periphery of the large subtropical ridge. During the month of May, cyclones typically track northwestward over the Philippine Sea. However, Figure 3-05-1 shows that nearly zonal 500 mb flow prevailed during this period and forced Forrest to track nearly due west. This steady zonal flow also pushed Forrest forward at speeds reaching 18 kt (33 km/hr), which is 3 times the climatological mean speed.

The strength of the subtropical ridge also affected Forrest's intensity. The subtropical ridge raised environmental pressures throughout the northwestern Pacific north of Forrest. Aircraft reconnaissance consistently observed winds in Forrest that were 10 to 15 kt (5 to 8 m/sec) stronger than would be expected from Forrest's minimum sea-level pressure of 990 mb and the Atkinson and Holliday (1977) pressure/wind relationship (Fig. 3-05-2). The Atkinson and Holliday relationship indicates that the 55 kt (28 m/sec) maximum sustained winds observed in Forrest (Fig. 3-05-3) are typically associated with tropical cyclones having a 983 mb minimum sea-level pressure. Aircraft reconnaissance also observed that Forrest tilted south-southwest from the surface to 700 mb. The surface and 700 mb centers were displaced as much as 35 nm (65 km) at times, apparently in response to upper-level northeast flow which existed over Forrest.

Following landfall on Luzon, Forrest weakened rapidly while passing approximately 40 nm (74 km) northeast of Clark AB. Highest observed wind speeds at this location associated with the passage of TS Forrest were in the 10 to 15 kt (5 to 8 m/sec) range.

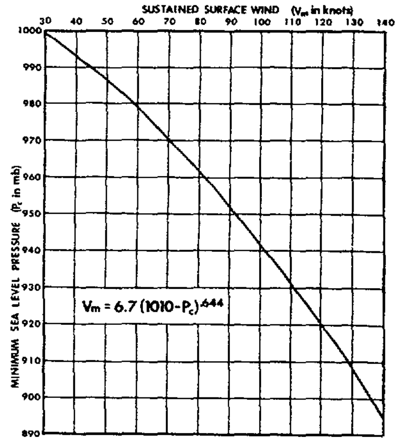


FIGURE 3-05-2. Atkinson and Holliday (1977) maximum sustained surface wind-minimum sea-level pressure relationship.

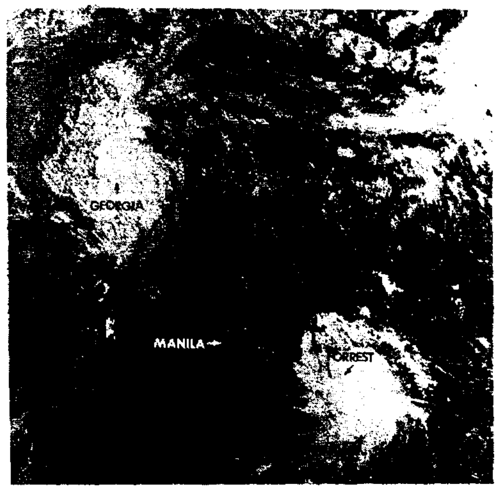


FIGURE 3-05-3. Tropical Storm Forrest at maximum intensity, 23 May 1980, 2344Z. Tropical Storm Georgia is making landfall over southeastern China. (NOAA 6 imagery)

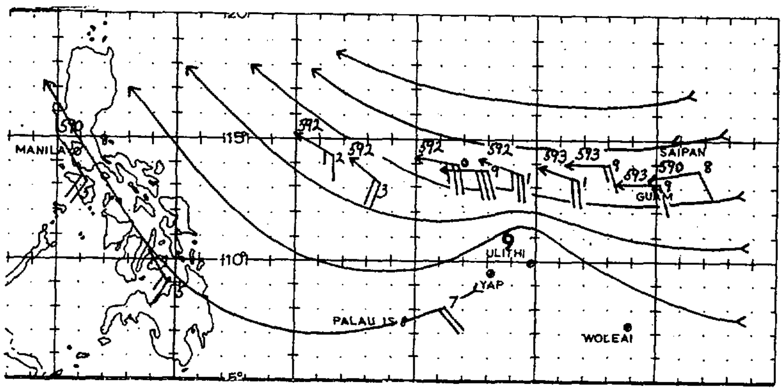
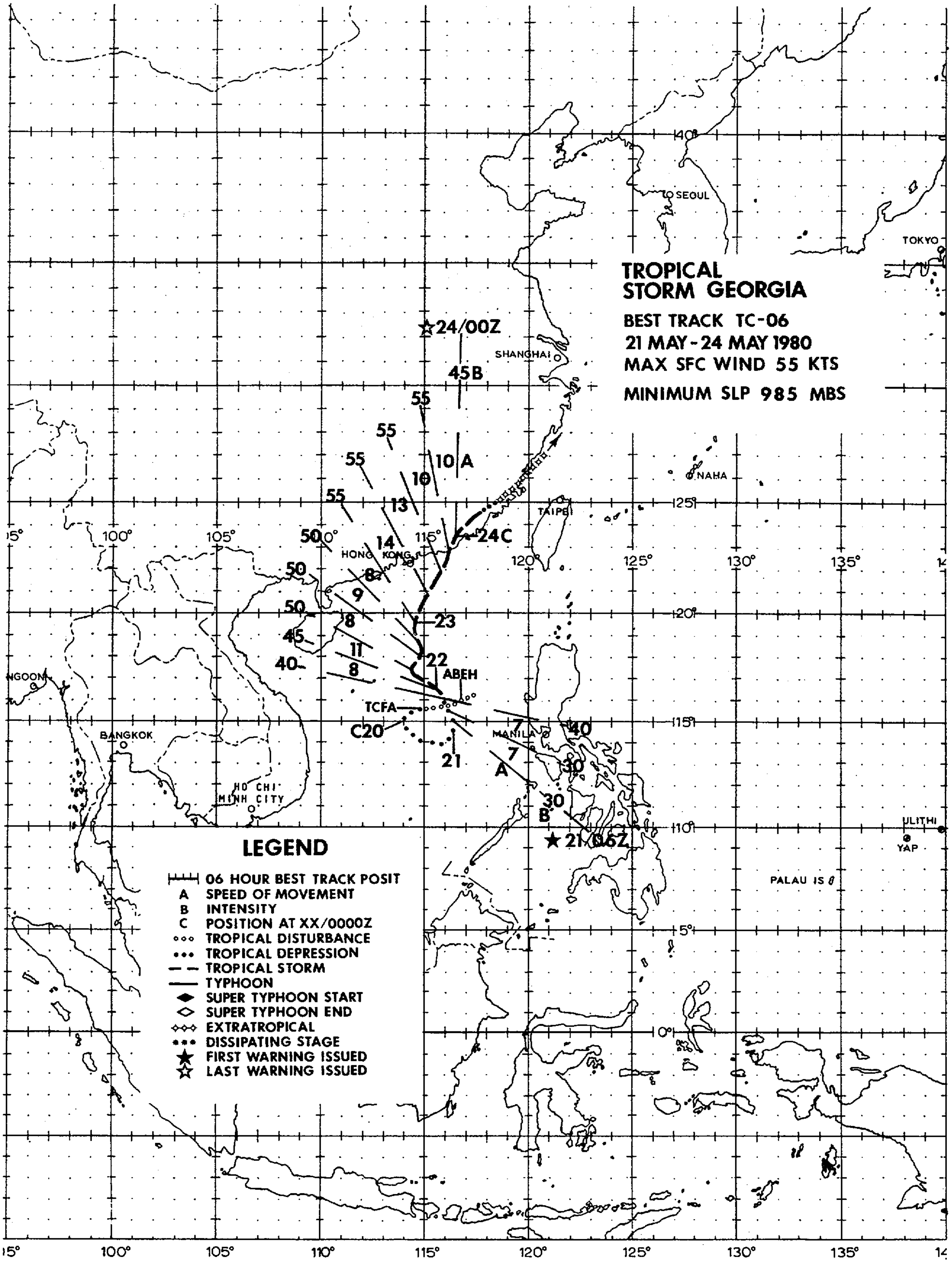


FIGURE 3-05-1. The 220000Z May 1980 streamline analysis of 500 mb rawinsonde ( ) and aircraft reconnaissance ( ) data. The 500 mb heights are plotted in decameters and wind speeds are in knots.



TROPICAL STORM GEORGIA
BEST TRACK TC-06
21 MAY - 24 MAY 1980
MAX SFC WIND 55 KTS
MINIMUM SLP 985 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
24/00Z
21/06Z
TCFA
SEOUL
TOKYO
SHANGHAI
NAHA
TAIPEI
HONG KONG
MANILA
BANGKOK
HO CHI MINH CITY
ULITHI
YAP
PALAU IS

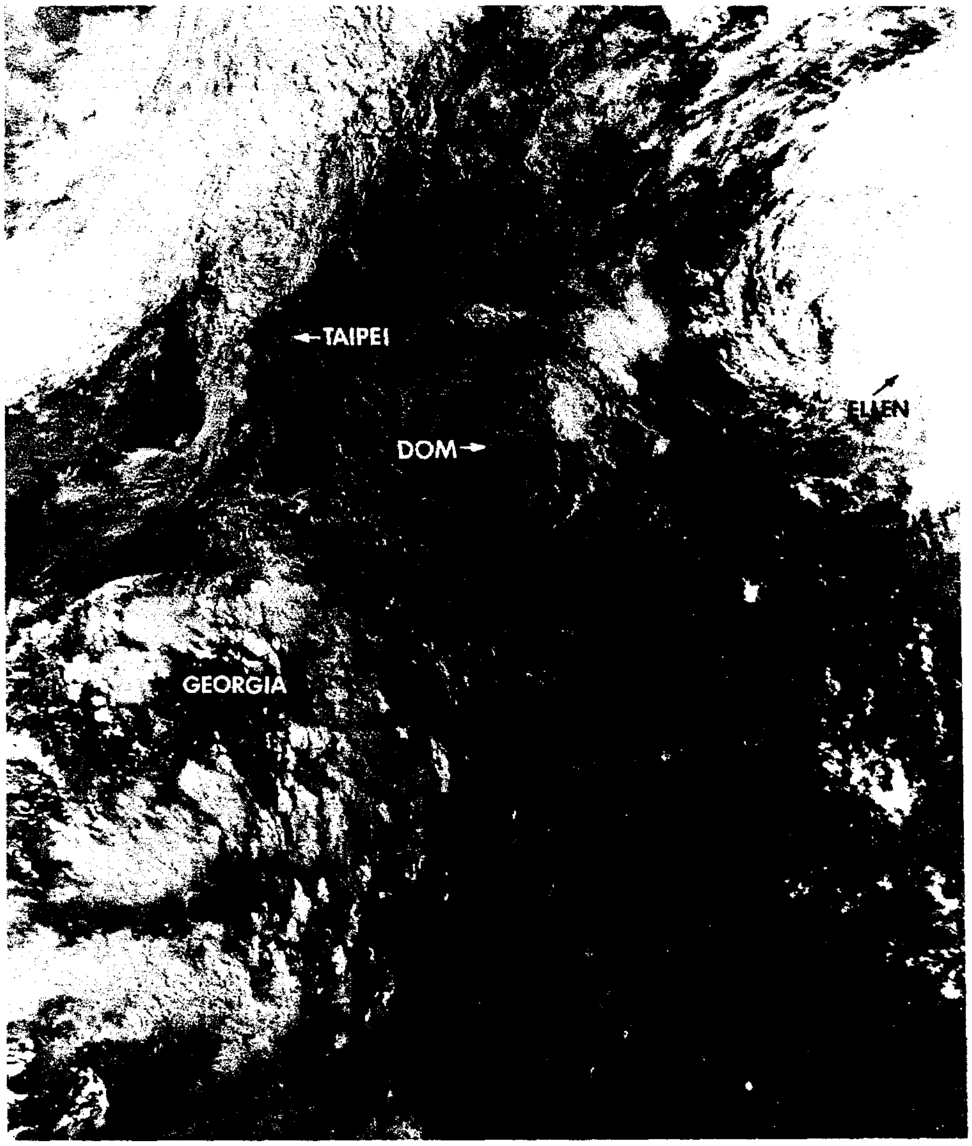


FIGURE 3-06-1. Typhoon Ellen, the remnants of Typhoon Dom, and the initial stage of Tropical Storm Georgia in the South China Sea, 19 May 1980, 2332Z. (NOAA6 imagery)

Tropical Storm Georgia is a classic example of a tropical cyclone which developed in the South China Sea during the transition period between the northeast and southwest monsoon. "Monsoon depressions" are often short-lived, difficult to locate with precision, and usually have broad, but relativily weak, surface circulation patterns. Georgia may well have reached typhoon strength if she had been able to remain over open water.

During the latter part of May, an active surface trough extended from near Iwo Jima southwestward into the South China Sea. Embedded in this trough were Typhoon Ellen, near Iwo Jima, the remnants of Typhoon Dom (an exposed low-level circulation), and the weak tropical disturbance which would become Tropical Storm Georgia (Fig. 3-06-1).

Synoptic data first indicated possible tropical cyclone development in the South

China Sea on the 19th of May. Although the satellite signature was poor, the synoptic data showed a surface circulation with a significant pressure drop near the center. Based on this data, a Tropical Cyclone Formation Alert (TCFA) was issued at 191341Z. Figure 3-06-2 is a surface streamline analysis at 200000Z and illustrates the well-defined surface circulation. The corresponding satellite imagery at about the same time still showed a lack of convective organization (Fig. 3-06-1). The depression finally began to show significant development, and the first warning on TD 06 was issued at 210600Z.

JTWC forecasters relied heavily on the forecast aids which were consistent in indicating northward movement with recurvature between the coast of China and the east coast of Taiwan. Southerly 500 mb steering winds also supported northward movement.

Figures 3-06-3 and 03-06-4 show the increase in surface inflow and the resulting increase in organized convective activity that occurred shortly after Georgia reached tropical storm strength.

Only two aircraft reconnaissance missions were flown on TS Georgia. The first

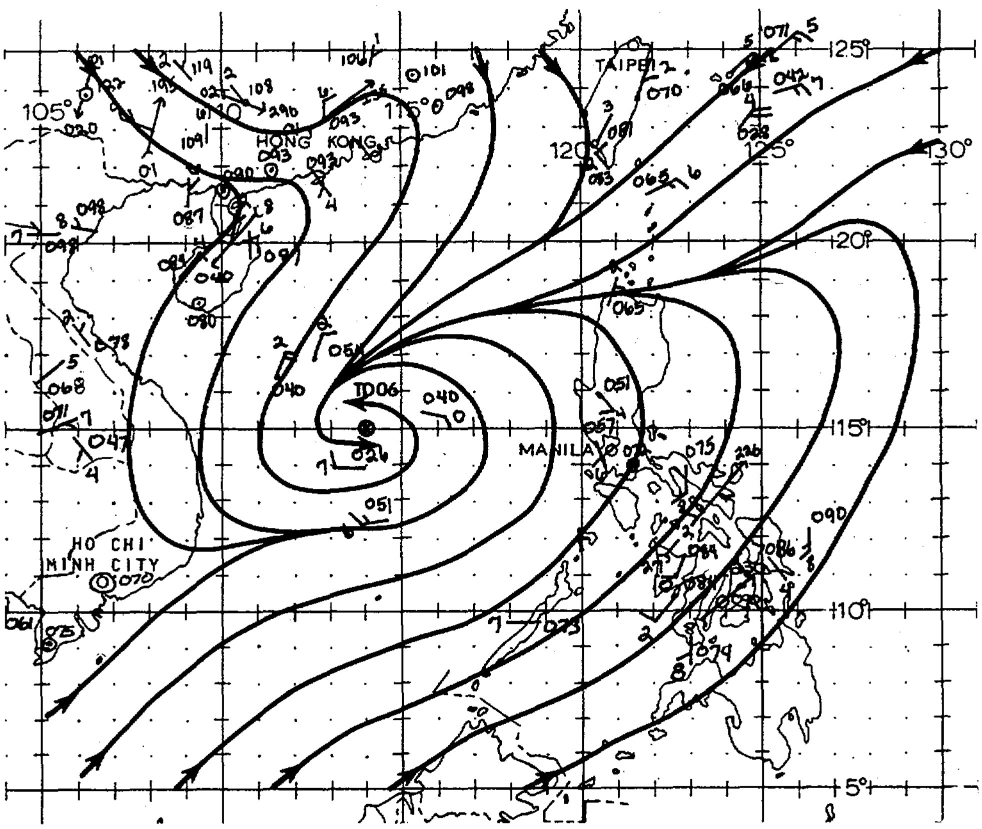


FIGURE 3-06-2. *The 200000Z May 1980 surface (——↘)/ gradient (<——<) level streamline analysis in the vicinity of Tropical Storm Georgia. Winds are in knots.*

mission observed a minimum sea-level pressure of 986 mb and surface winds of 50 kt (26 m/sec). The second mission could not provide a center fix because of restricted air space due to Georgia's proximity to both China and Hai-nan Island. Two ships, the "Clara Maersk" and the "Chevalier Paul", reported winds of 50 kt (26 m/sec) and 54 kt (28 m/sec), respectively. These observations support the best track estimated maximum intensity of 55 kt (28 m/sec).

After making landfall near Shan-tou, Georgia traveled north-northeastward, about 20 nm (37 km) inland from the coast, eventually passing north of Chin-men-tao, which reported winds of 44 kt (23 m/sec) with gusts to 60 kt (31 m/sec). Rapid weakening occurred thereafter as Georgia was absorbed into an extratropical low pressure system that was moving over the East China Sea from the Asian mainland.

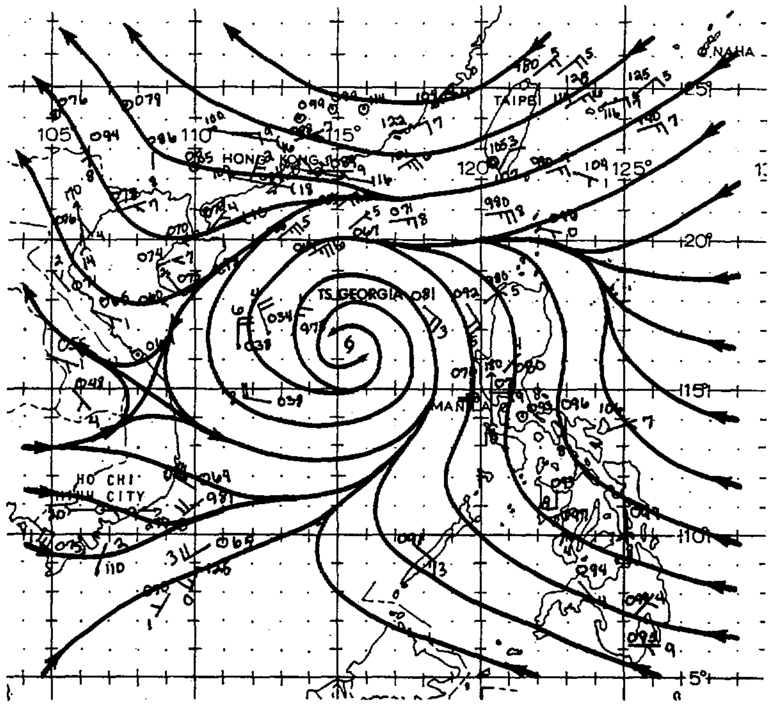


FIGURE 3-06-3. The 220000Z May 1980 surface (⟵) / gradient (⟵) level streamline analysis in the vicinity of Tropical Storm Georgia. Winds are in knots.

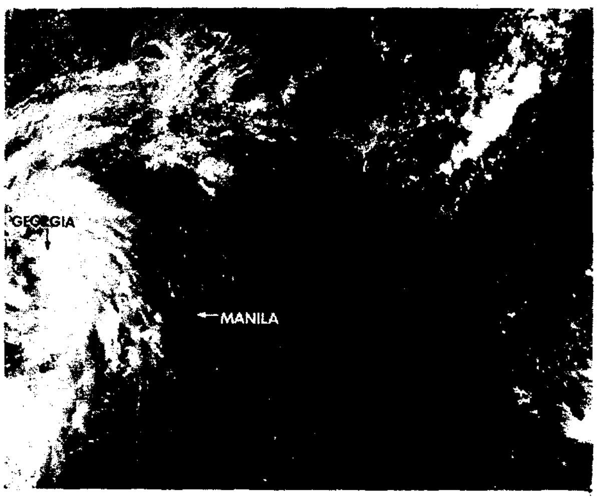
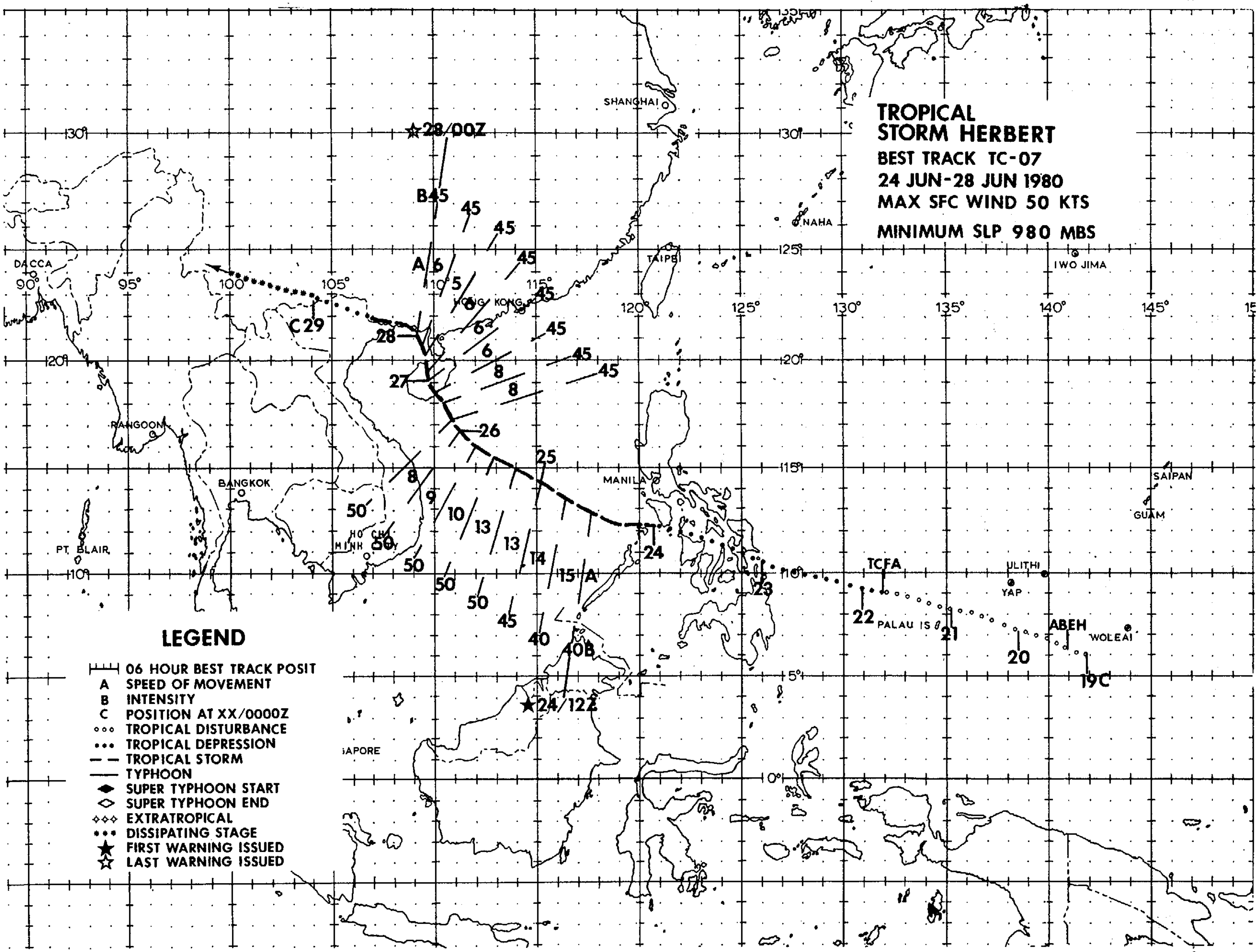


FIGURE 3-06-4. Tropical Storm Georgia at 45 kt (23 m/sec) intensity, 22 May 1980, 0158Z. (DMSP imagery)


TROPICAL STORM HERBERT
BEST TRACK TC-07
24 JUN-28 JUN 1980
MAX SFC WIND 50 KTS
MINIMUM SLP 980 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
28/00Z
24/12Z
TCFA
SHANGHAI
NAHA
TAIPEI
IWO JIMA
HONG KONG
MANILA
RANGOON
BANGKOK
PT. BLAIR
DACCA
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
WOLEAI
ABEH

A broad equatorial trough existed on 18 June stretching from the Philippine Islands to the eastern Caroline Islands along 5N. Although synoptic data suggested several circulations along the trough axis, satellite imagery during the following 48 hours indicated increased convective activity around the eastern periphery of the trough as a result of convergent easterly flow.

At 201200Z, increased convection was noted near the primary surface circulation east of the Palau Islands. By 211200Z, satellite imagery indicated improved organization with synoptic data revealing increased southwest gradient level inflow and 20-25 kt (11-13 m/sec) wind reports from ships northeast of the depression. As a result, a tropical cyclone formation alert (TCFA) was issued at 211800Z.

The depression moved west-northwestward toward Leyte in the Philippine Islands on 22 June. The mountainous island chain was expected to prevent further development and the TCFA was cancelled at 221800Z. However, the potential for significant tropical cyclone development was expected to improve once again as the depression entered the South China Sea.

Thus, with the depression located south of Mindoro and moving west-northwestward, a formation alert was reissued at 240000Z. Aircraft reconnaissance at 240717Z located a circulation center just west of Busuanga Island with surface winds estimated at 40 kt (21 m/sec) and a minimum sea level pressure of 996 mb. Based on the aircraft data and evidence of increased convective activity on satellite imagery, the first warning on Tropical Storm Herbert was issued at 241200Z.

In the South China Sea, Herbert tracked northwestward toward Hai-nan Island while intensifying slowly. Maximum intensity of 50 kt (26 m/sec) was attained at 250600Z and was sustained for the next 24 hours as Herbert passed 15 nm (28 km) southwest of the Paracel Islands. Peak winds of 46 kt (24 m/sec) were reported by the islands at 260000Z. Landfall on Hai-nan occurred near 261800Z with maximum sustained winds of 45 kt (23 m/sec). Over Hai-nan, Herbert tracked around the western face of Wu Chih Sham Mountain and exited due north into the Gulf of Tonkin. A north-northwest track over the Gulf of Tonkin ended with landfall south of Chin-hsien, China at 280300Z with 45 kt (23 m/sec) intensity, as verified by land station reports. Once over southern China, Herbert weakened quickly and dissipated as a significant tropical cyclone by 290000Z (Fig. 3-07-1).

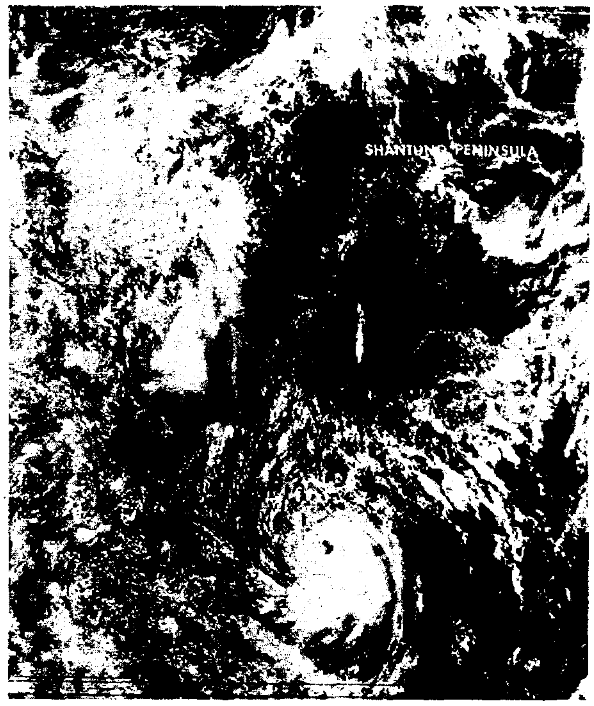


FIGURE 3-07-1. Tropical Storm Herbert at 45 kt (23 m/sec) intensity making landfall over southern China, 28 June 1980, 0316Z. (DMSP imagery)

A strong mid-level ridge extending from southern China eastward across the Pacific along 24N provided the steering flow as Herbert tracked steadily along the southern periphery of the ridge. The 500 mb analyses on 25 and 26 June showed that the ridge extended westward to near 108E just west of Hai-nan Island. Thus, a turn toward the northeast was expected following landfall over southern China. However, the 270000Z 500 mb analysis revealed that the ridge actually built westward across southern China, resulting in Herbert's westward track during his dissipation stage following landfall.

The definitive mid-level synoptic pattern and steering flow provided JTWC with good warning continuity and resulted in excellent forecast vector errors of 77 nm (143 km), 128 nm (237 km), and 57 nm (106 km) for 24, 48, and 72 hours, respectively.

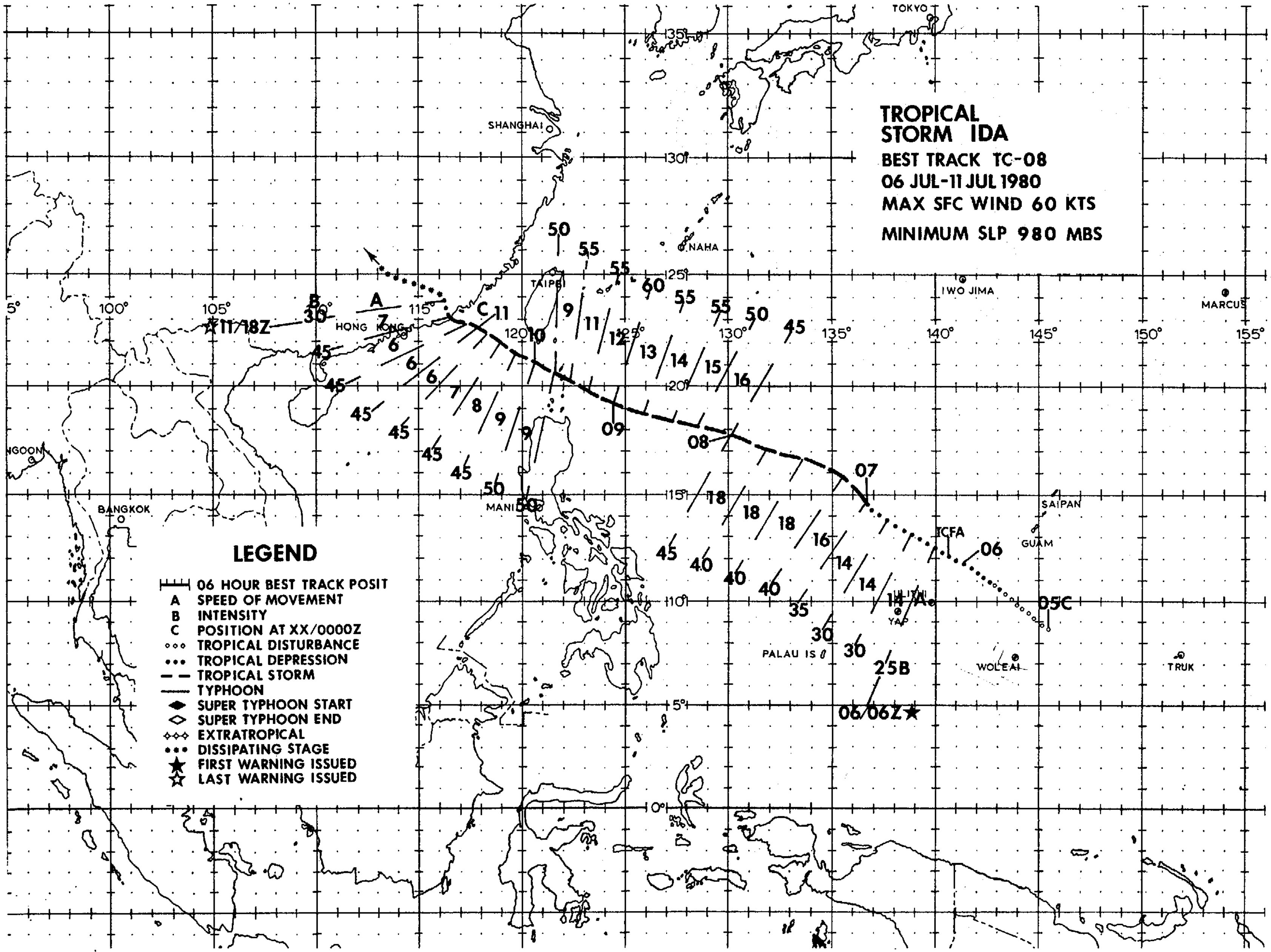

TROPICAL STORM IDA
BEST TRACK TC-08
06 JUL-11 JUL 1980
MAX SFC WIND 60 KTS
MINIMUM SLP 980 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
TOKYO
SHANGHAI
NAHA
TAIPEI
HONG KONG
MANILA
BANGKOK
IWO JIMA
MARCUS
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
WOLEAI
TRUK
TCFA
11/18Z
06/06Z
06
07
08
09
05C
25B

FIGURE 3-08-1. Tropical Storm Ida intensifying in the Philippine Sea. The discontinuous outer rainband (clockwise from the northwest to the east) was evident from the cyclone's initial development until weakening near the Bashi Channel, 6 July 1980, 2236Z. (NOAA visual imagery)

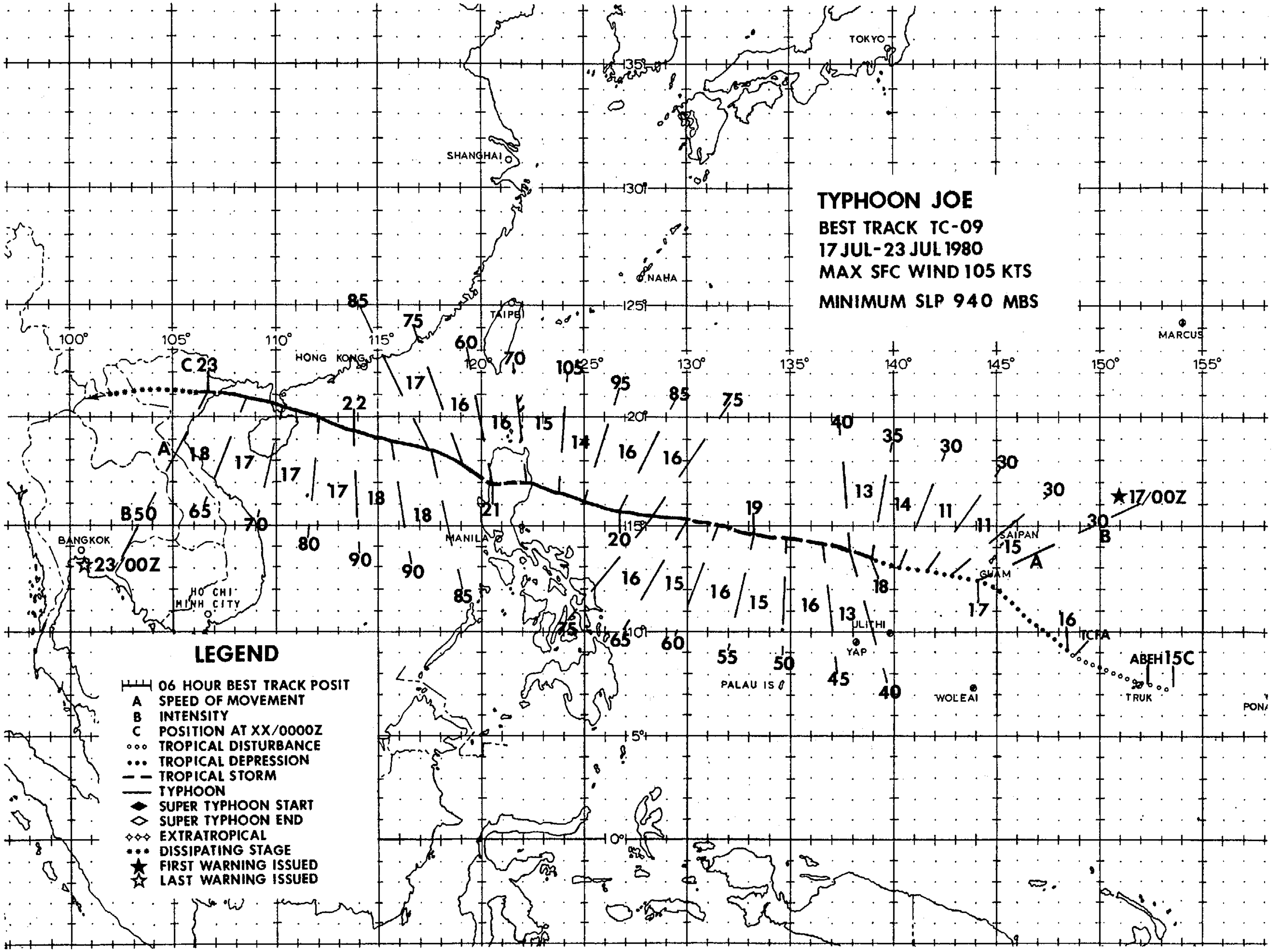
During the first three weeks of July, the monsoon trough extended eastward from the South China Sea to near 160E. Areas of active convection were common during that period with several disturbances eventually developing into significant tropical cyclones (Ida, Joe and Kim).

TD 08, the first of these disturbances which became organized, formed in the vicinity of two areas of active convection which JTWC had been tracking within the trough for several days. At 051800Z, satellite imagery indicated improved convective organization about a surface circulation near 12N 142E. Aerial reconnaissance at 060145Z located a surface center and observed maximum winds of 25 kt (13 m/sec). At 060300Z, a Tropical Cyclone Formation Alert (TCFA) was issued and the initial warning followed at 060600Z based on continued organization as indicated by satellite imagery.

Ida's track never posed a dilemma for JTWC forecasters. She initially tracked northwest before interacting with a persistent ridge, whose axis was along 28N. Maintenance of the ridge throughout Ida's lifespan was responsible for the cyclone's overall west-northwest track and the ability of JTWC to predict landfall within 35 nm (65 km) of the actual point as early as 77 hours prior to the occurrence. As Ida approached the western Philippine Sea, her forward movement slowed from a maximum of 18 kt (33 km/hr) to less than 10 kt (18 km/hr) in the Bashi Channel. During this period, Ida reached her maximum intensity of 60 kt (31 m/sec) and lowest sea level pressure of 980 mb. As Ida moved through the Bashi Channel, she weakened to 45 kt (23 m/sec) and then maintained this intensity until making landfall on the southeastern coast of mainland China, just south of Shan-t'ou (WMO 59316) at 1300Z on 11 July.

A predominate feature during all but the later stages of Ida's track was a strong and persistent rain or feeder band. Figure 3-08-1 shows this feature on NOAA satellite imagery. On 6 July, while Ida was organizing southwest of Guam, the Naval Air Station at Agana, Guam recorded 1.15 inches (29 mm) of rain in 3 hours and a peak gust of 31 kt (16 m/sec) as the band passed over the island. Subsequent aircraft reconnaissance in support of the 072130Z and 090735Z position fixes noted increases in the flight level winds and temperatures while transiting this outer band. These higher flight-level temperatures and winds were an apparent response to the release of latent heat of condensation from extensive convection within the band. The mission ARWO[1] on the 090735Z fix stated, "The 700 mb center was very weak with no strong wind band in any quadrant close to the center. It took us quite a while to locate a fairly broad area of light and variable winds...The northern end of this area was open, and to the northeast we observed a broad band of surface winds peaking at 85 kt (44 m/sec) situated about 25 nm (46 km) out." This was not an uncommon feature from aircraft reconnaissance data on Ida. Generally these maximum winds were located in the northeast quadrant, close to the rainband. However, the 85 kt (44 m/sec) wind was considered to be a transistory feature because all other indicators showed no reason for a sudden and short-lived intensification of the cyclone.

[1]CHARLES B. STANFIELD, Capt, USAF: Mission Aerial Reconnaissance Weather Officer (ARWO).


TYPHOON JOE
BEST TRACK TC-09
17 JUL-23 JUL 1980
MAX SFC WIND 105 KTS
MINIMUM SLP 940 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
TOKYO
SHANGHAI
NAHA
TAIPEI
HONG KONG
MANILA
BANGKOK
HO CHI MINH CITY
MARCUS
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
WOLEAI
TRUK
TCFA
ABEH
17/00Z
23/00Z
C23

Typhoon Joe, the ninth tropical cyclone in the Western Pacific region, proved to be very predictable. A near static synoptic pattern prevailed in the mid- to upper-troposphere within the subtropics throughout most of Joe's existence. Figures 3-09-1 and 3-09-2 show the distinguishable traits in the structure of the mid- and upper-troposphere. As a result of this pattern, Joe followed a nearly straight track from genesis to dissipation with few exceptions.

Joe's genesis from a tropical disturbance into a mature tropical cyclone was slow. Satellite imagery first indicated a disturbance along the equatorial trough on 14 July over the Caroline Islands. Later satellite data revealed a gradual increase of convective activity with an apparent increase in organization. As a result of the information received from this series of satellite imagery, a tropical cyclone formation alert (TCFA) was issued at 2153Z on the 15th.

The first aircraft reconnaissance of the disturbance on the 16th found a weak surface circulation which did not extend up to the 700 mb level. At that time the minimum sea level pressure was 1006 mb and the disturbance was tracking northwestward at 14 kt (26 km/hr). Defense Meteorological Satellite Program (DMSP) imagery at 0021Z on the 17th suggested that the disturbance was developing a circulation center that extended at least to mid-tropospheric levels (Fig. 3-09-3) with strong convective activity located west of the exposed surface circulation. As discussed by Huntley and Diercks (1980), weak developing tropical cyclones often have the 700 mb center displaced from the surface circulation in the direction of strongest convective activity. As the tropical cyclone develops and intensifies, the surface circulation moves under the 700 mb center and becomes vertically aligned. Later satellite data did show that the surface center had moved closer to the area of strong convection. This sequence of events prompted JTWC to issue the first warning at 0000Z on 17 July for Tropical Depression 09. Aircraft reconnaissance on the 17th substantiated that the disturbance had indeed developed significantly since the 16th and that TD 09's circulation center had extended up to the 700 mb level with no significant displacement of the surface and 700 mb center noted at that time.

FIGURE 3-09-3. Typhoon Joe during his early stage of development, 17 July 1980, 0021Z. Arrow shows location of exposed low-level circulation center. (DMSP imagery)

FIGURES 3-09-1 and 3-09-2 are on the following page.

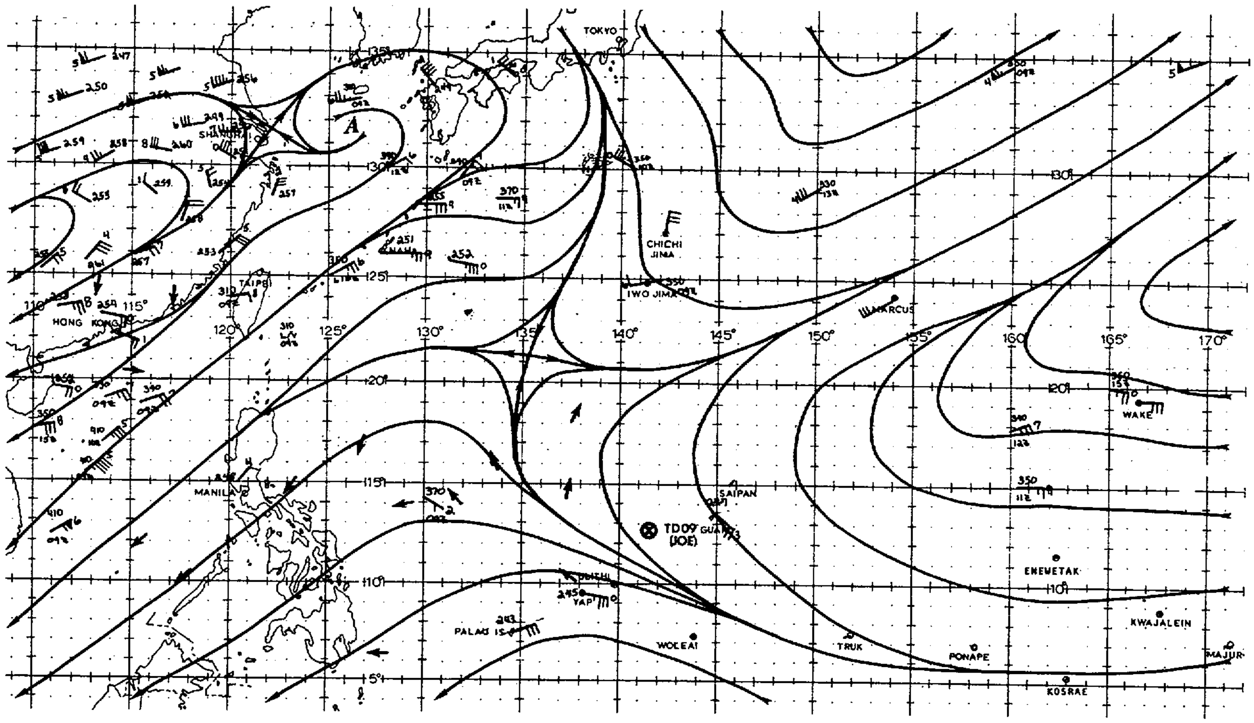


FIGURE 3-09-1. 200 mb streamline analysis at 171200Z July 1980. The analysis depicts the synoptic pattern which prevailed during much of Typhoon Joe's existence. Wind data are a combination of RAOBS, AIREPS, and satellite-derived (+) winds for the 250 mb to 150 mb levels. Wind speeds are in knots.

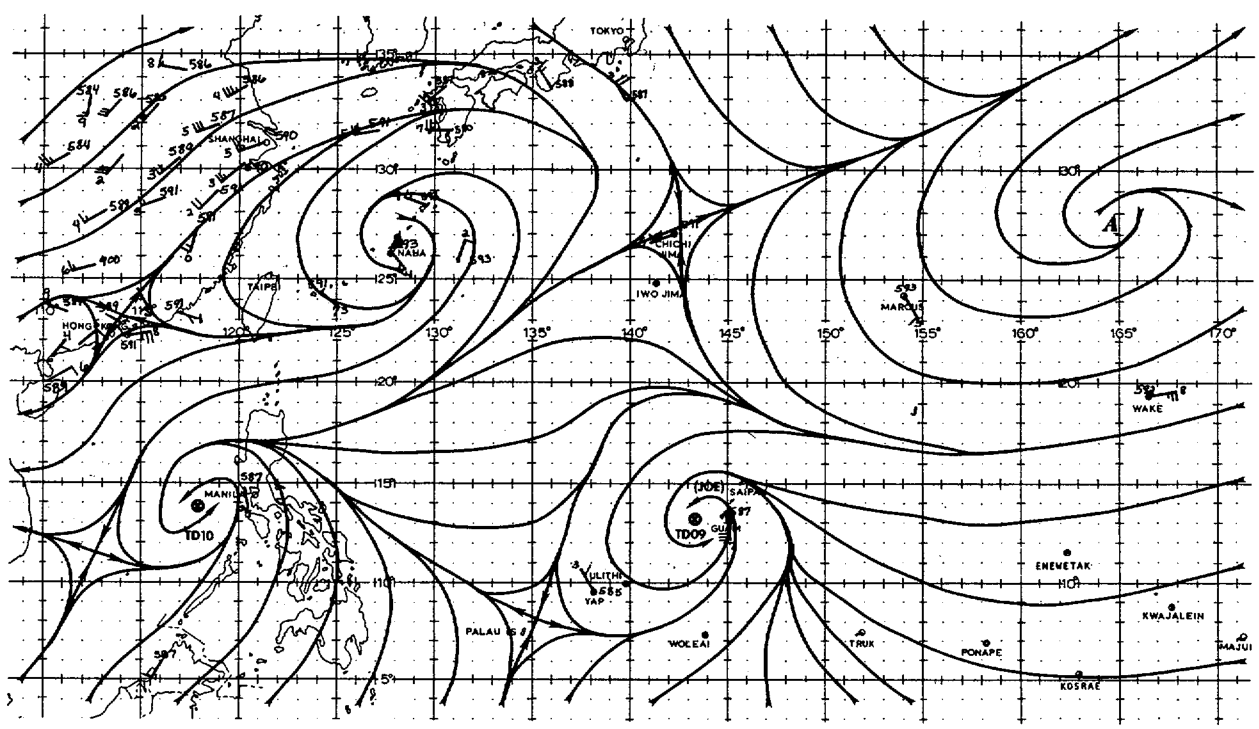


Figure 3-09-2. 500 mb streamline analysis at 170000Z July 1980. The analysis depicts the synoptic pattern which prevailed during much of Typhoon Joe's existence. Wind speeds are in knots.

TD 09 developed rapidly from that point and was upgraded to Tropical Storm Joe on the 18th. Typhoon strength was attained on the 19th.

As mentioned earlier, Joe tracked along a nearly straight course through much of his existence. His forward speed of movement was rapid and nearly constant, even while passing over Luzon. This unusually persistent track and high speed of movement was correlated with an abnormally strong mid- and upper-tropospheric subtropical ridge. The subtropical ridge at both levels deviated significantly from the climatological norm. The 200 mb anticyclone, normally located over the China mainland, extended further east to the north of Joe's track and south of Japan (Fig. 3-09-1). Similarly, the mid-tropospheric ridge was to the north of Joe's track and was much stronger than normal (Fig. 3-09-2).

This pattern did not significantly change during Joe's lifetime, except briefly while he was first developing into a tropical depression. Joe's track took a slight northwestward jog in response to a short wave trough which weakened the mid- to upper-tropospheric ridge. This short wave trough quickly passed eastward and the ridge built back north of Joe.

Six hours prior to landfall over Luzon, Joe attained an intensity of 105 kts (54 m/sec) with a minimum sea level pressure of 940 mb at 1200Z on 20 July. Joe weakened rapidly to tropical storm strength while crossing Luzon, but still remained very destructive. As he tracked across the mountainous terrain of Luzon, where peaks approach 10,000 ft, the track deviated slightly, becoming more westward. It took just over 6 hours for Joe to cross Luzon, but in that short time, the Philippine Islands were inundated by heavy rains which produced massive flooding and resulted in extensive crop and property damage. Approximately 177,000 people were left homeless and 19 deaths were reported. Exact figures could not be compiled in time due to Typhoon Kim which hit the Philippines within a week of Joe, compounding destruction that the Philippines had already suffered. No significant damage was reported to U. S. military installations in the Philippines.

Upon entry into the South China Sea, Joe reintensified to typhoon strength. Before this time, JTWC expected Joe to track northwest onto the Asian mainland about 100 nm (185 km) west of Hong Kong and dissipate. The mid- and upper-tropospheric ridge, however, extended westward, causing Joe to continue on a west-northwest track toward Vietnam. Also, from the time Joe entered the South China Sea through dissipation, he maintained a rapid speed of movement due to the strong ridge to the north. Typhoon Joe attained a second maximum intensity of 90 kt (46 m/sec) as determined by Dvorak analysis of satellite data (Fig. 3-09-4). At the time of maximum intensity, the radius of winds greater than 30 kt (15 m/sec) extended 450 nm to the east of Joe's center, covering most of the South China Sea north of 10N. While transiting across the South China Sea, Joe devastated the coastal regions which paralleled his track. Much damage to crops and property occurred in southern China due to flooding caused by torrential rains. Joe also left many homeless and claimed more lives while tracking toward Vietnam.

Satellite imagery showed that Joe had an eye as he made landfall near Haiphong, Vietnam. During this period, winds were reported in excess of 70 kt (36 m/sec) by the Vietnam News Agency. After landfall, Joe dissipated rapidly due to land and vertical wind shear effects. The final warning was issued by JTWC at 0000Z on 23 July as the remnants of Joe began to dissipate over the mountains of Laos.

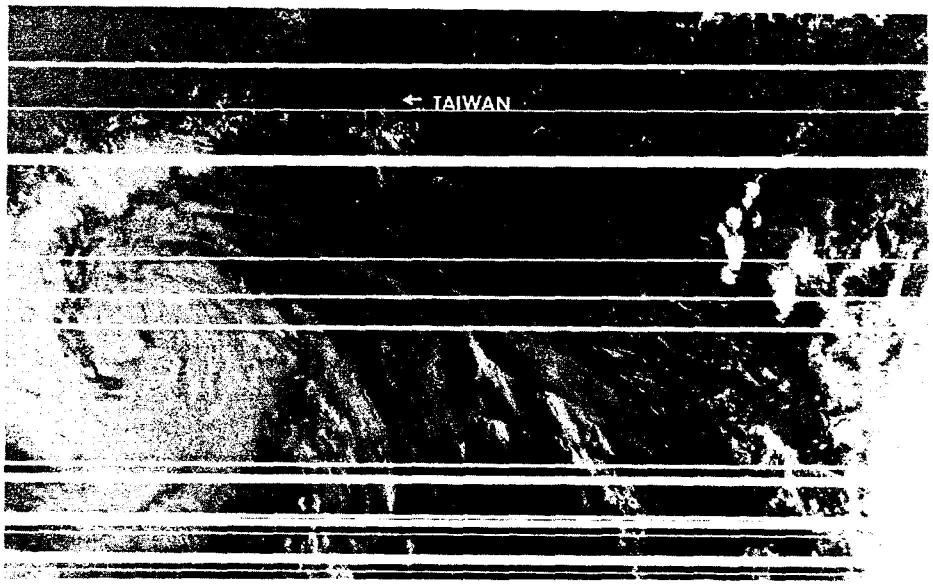
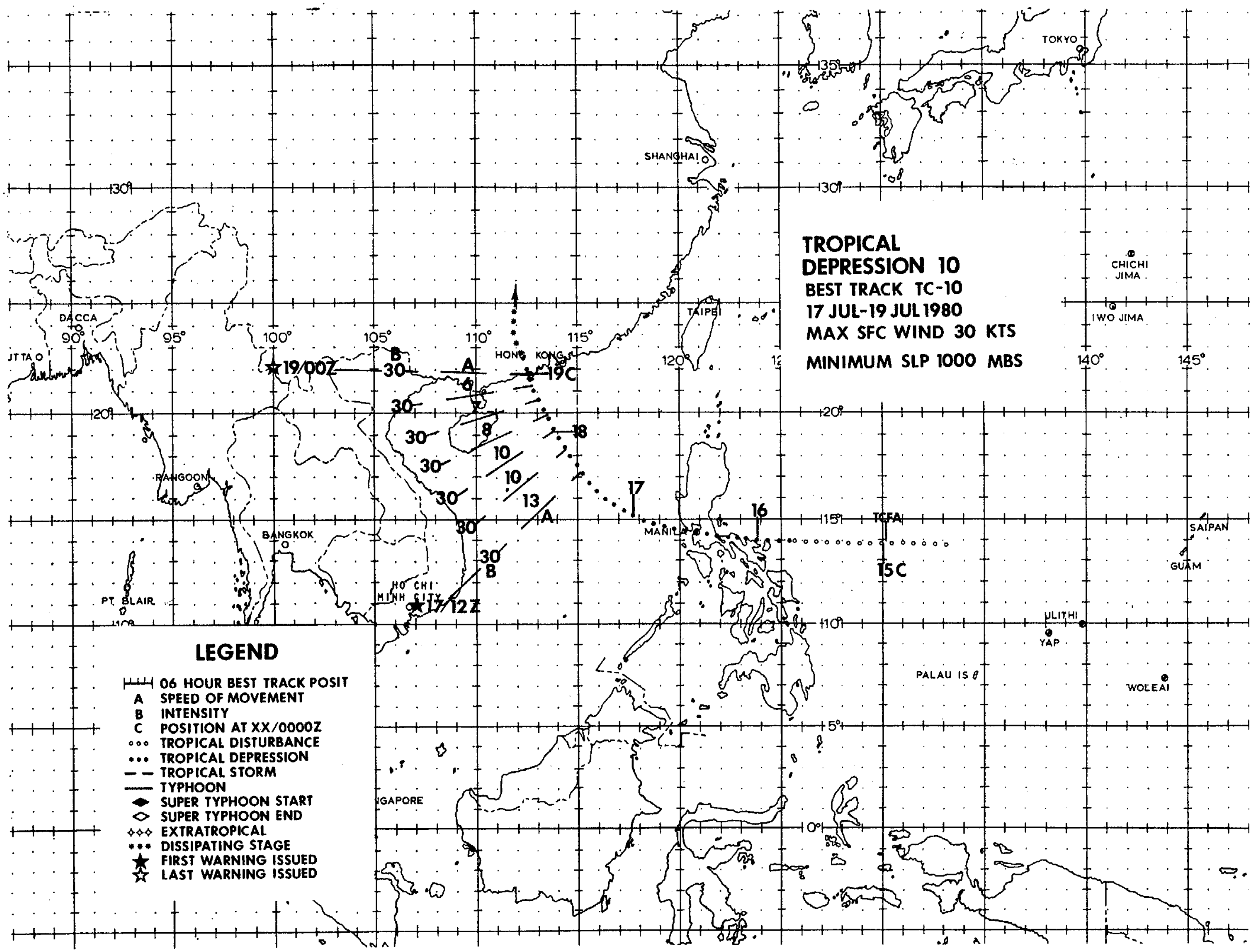


FIGURE 3-09-4. *Typhoon Joe after reintensifying to 90 kt (46 m/sec) in the South China Sea, 21 July 1980, 2347Z. (DMSP imagery)*


TROPICAL
DEPRESSION 10
BEST TRACK TC-10
17 JUL-19 JUL 1980
MAX SFC WIND 30 KTS
MINIMUM SLP 1000 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
19/00Z
17/12Z
19C
18
17
16
15C
TCFA
TOKYO
SHANGHAI
TAIPEI
HONG KONG
MANILA
DACCA
RANGOON
BANGKOK
HO CHI MINH CITY
PT. BLAIR
CHICHI JIMA
IWO JIMA
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
WOLEAI
90°
95°
100°
105°
110°
115°
120°
140°
145°
135
30°
20°
15°
10°
5°

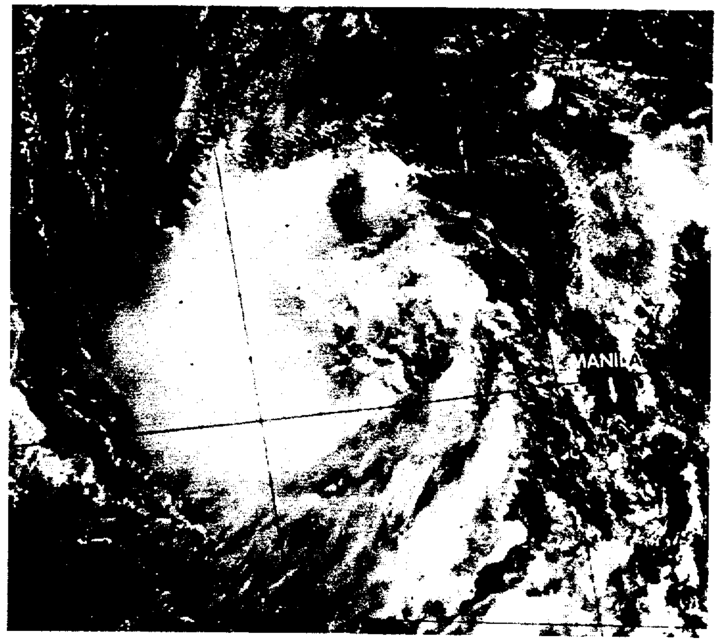


FIGURE 3-10-1. Tropical Depression 10 220 nm (407 km) west-northwest of Manila 13 hours prior to issuance of first warning. Heavy convection is located two degrees west of the surface circulation, 17 July 1980, 0203Z. (DMSP imagery)

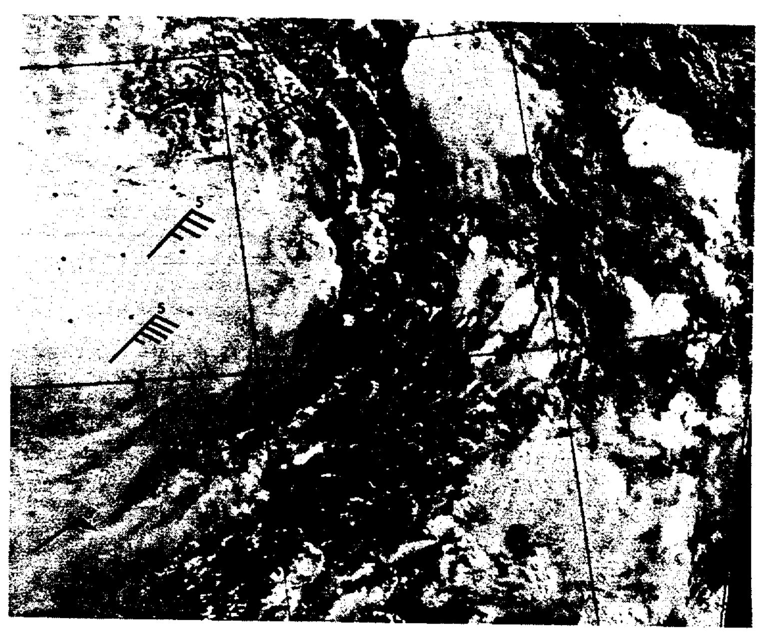
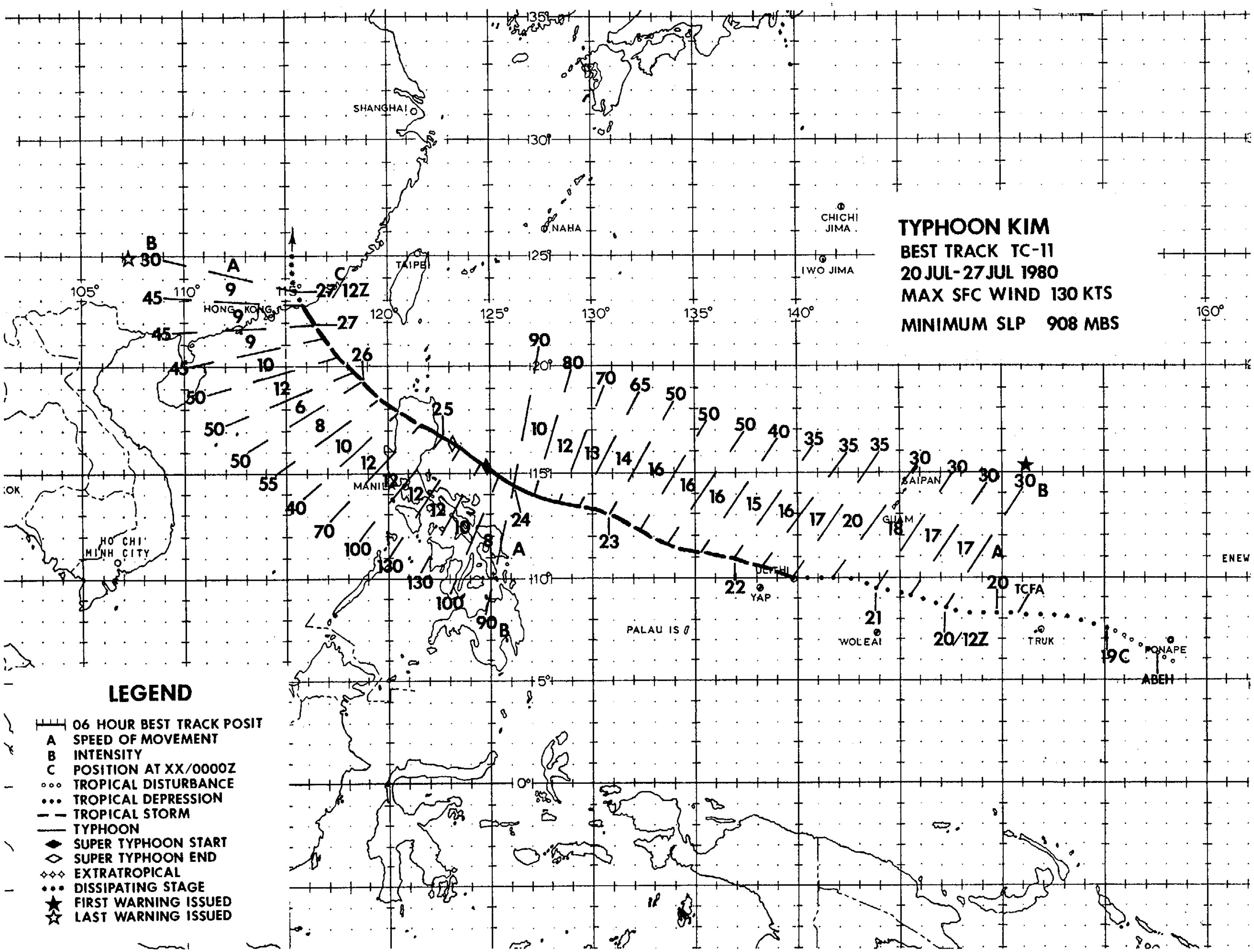


FIGURE 3-10-2. Tropical Depression 10 215 nm (398 km) south of Hong Kong with low-level circulation partially exposed due to strong vertical wind shear, 17 July 1980, 2334Z (NOAA6 imagery). Wind barbs represent aircraft and radiosonde reports near the 200 mb level at 171200Z.


TYPHOON KIM
BEST TRACK TC-11
20 JUL-27 JUL 1980
MAX SFC WIND 130 KTS
MINIMUM SLP 908 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
SHANGHAI
TAIPEI
NAHA
CHICHI JIMA
IWO JIMA
HONG KONG
MANILA
HO CHI MINH CITY
SAIPAN
GUAM
YAP
PALAU IS
WOLEAI
TRUK
PONAPE
TCFA
ENEW
27/12Z
20/12Z
19C
ABEH
105°
110°
115°
120°
125°
130°
135°
140°
160°

Super Typhoon Kim, one of the most intense typhoons of the 1980 season, slammed onto the eastern coast of Luzon four days after Typhoon Joe had practically immobilized the area. Accounts of the aftermath of Typhoon Kim indicated that an estimated 15 people were killed and 167,000 residents of the Philippines were displaced. Torrential rains caused massive flooding over Luzon as far south as Manila

Kim, the first super typhoon of the 1980 season, was first detected on satellite imagery on 19 July. The disturbance appeared as an area of enhanced convection embedded in the near-equatorial trough. Further intensification appeared likely as the tropical upper-tropospheric trough (TUTT) was positioned to the northwest of the convective area. Because the disturbance was in a favorable position for continued development, a Tropical Cyclone Formation Alert (TCFA) was issued at 192040Z. Aircraft reconnaissance data at 200800Z indicated a well-defined closed surface circulation with wind speeds of 25 to 30 kt (12 to 15 m/sec) and a central pressure of 1001 mb approximately 360 nm (667 km) southeast of Guam. Based on this data, the first warning on TD 11 was issued at 201200Z.

TD 11 initially moved west-northwestward passing approximately 240 nm (444 km) south of Guam before heading directly towards the island of Ulithi. At 211200Z, TD 11 passed directly over Ulithi, which reported a wind maximum of 35 kt (18 m/sec). This information, plus a subsequent aircraft report of a central surface pressure of 997 mb, prompted JTWC to upgrade TD 11 to Tropical Storm Kim at 211800Z. Aircraft data at that time, however, indicated that Kim was poorly alig-

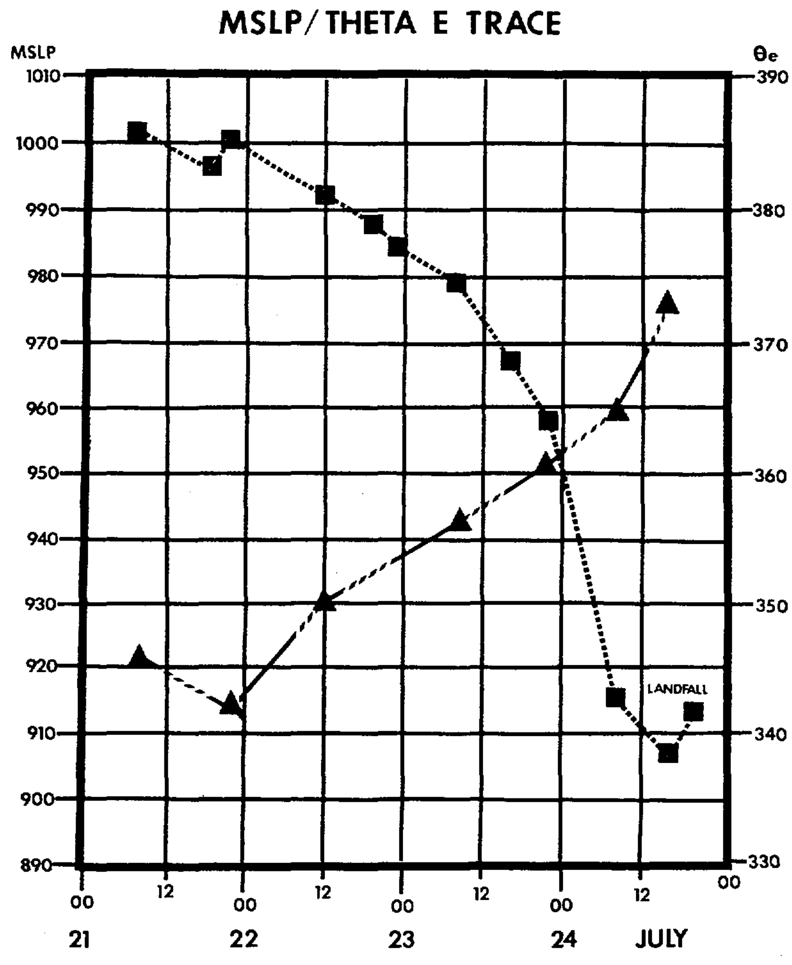


FIGURE 3-11-1. *Time cross-section of Kim's minimum sea-level pressure versus 700 mb equivalent potential temperature (THETA E (θ_e)) as derived from aircraft reconnaissance data.*

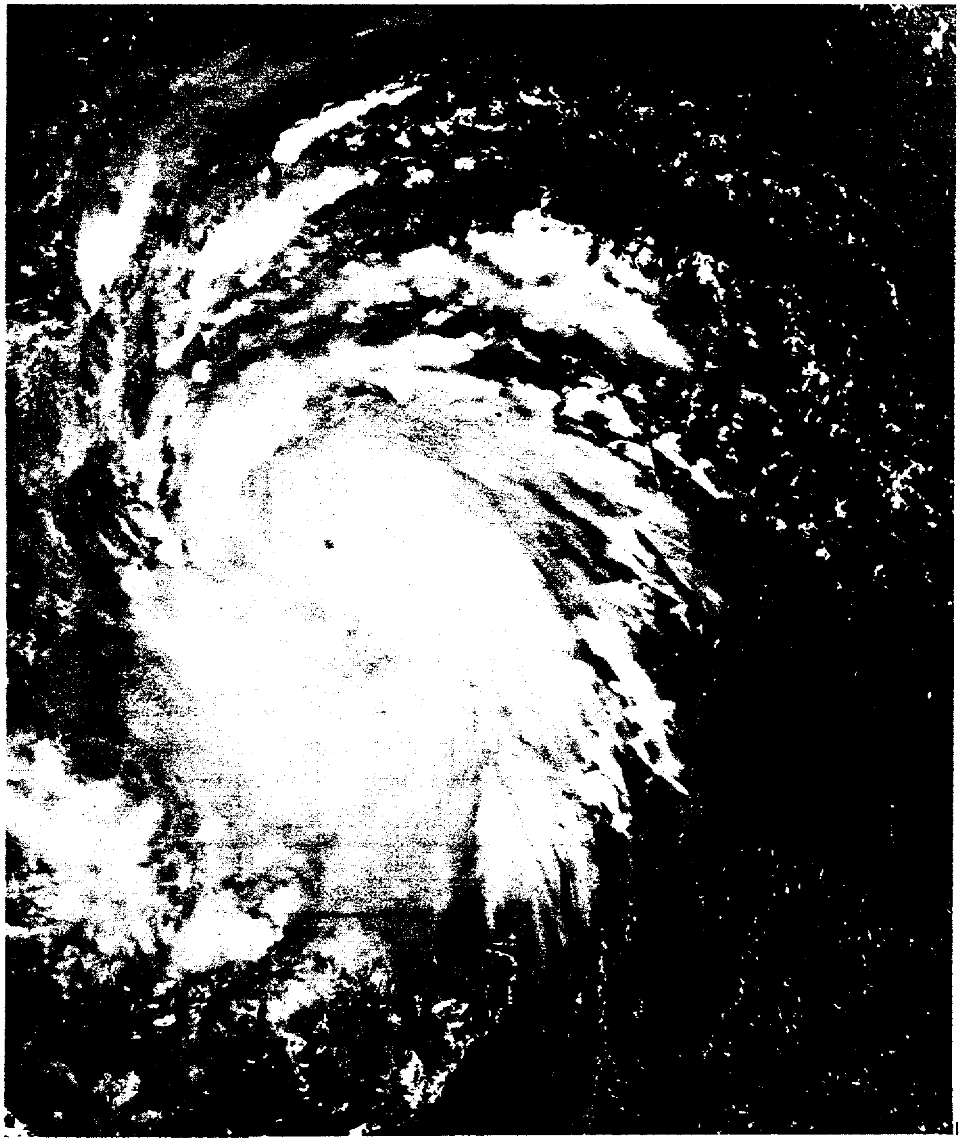


FIGURE 3-11-2. Typhoon Kim at approximately 110 kt (57 m/sec) intensity before she reached super typhoon strength, 24 July 1980, 0125Z. (DMSP imagery)

ned in the vertical, with the 700 mb center well to the southeast of the surface center and the 700 mb wind flow largely disorganized. Therefore, further intensification was slow during the 22nd and 23rd. During this period, Kim followed a path similar to Typhoon Joe across the Philippine Sea, tracking west-northwestward along the southern periphery of the subtropical mid-tropospheric ridge.

At 230600Z, aircraft reconnaissance observed a fairly substantial drop in surface pressure to 979 mb and indications that an eyewall was partially forming. Upon receipt of the data, which signalled the beginnings of a period of more rapid intensification, Kim was upgraded to a typhoon.

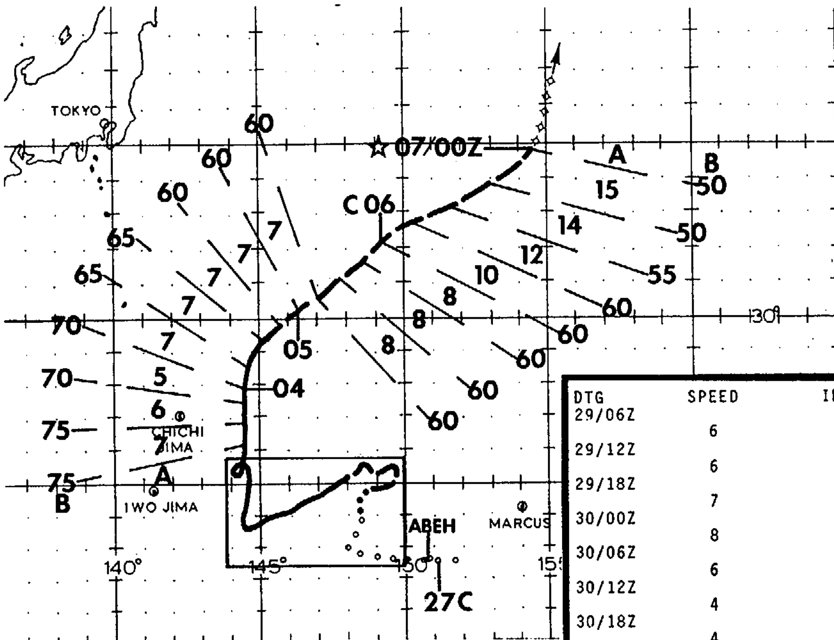
During this period of falling pressures and corresponding intensification, an empirically derived forecasting aid (Fig. 3-11-1) proved very valuable to JTWC. This forecasting aid relates surface pressure and 700 mb equivalent potential temperature (θ_e) to future intensification. The hypothesis is that rapid intensification is likely to take place in a tropical cyclone within the next 12 to 36 hours after these two traces intersect. Typhoon Kim's intensification trend verified this study.

At 241603Z, a minimum sea level pressure of 908 mb was measured by dropsonde. This pressure was sufficiently low to qualify Kim as a super typhoon (Fig. 3-11-2). By the next aircraft penetration, however, Kim's central pressure had risen to 918 mb. A possible reason for this rise in pressure was that Kim was now only eight hours from landfall on the coast of Luzon and the mountainous terrain had begun to disturb Kim's low-level inflow. Shortly afterwards, at about 250000Z, Typhoon Kim moved onto the coast of Luzon (Fig. 3-11-3) with accompanying maximum sustained winds of 100 kt (52 m/sec) and reported wind gusts as high as 125 kt (64 m/sec).

Terrain further weakened Kim as she moved slowly across Luzon before emerging in the South China Sea as an ill-defined tropical storm. JTWC forecasters expected Kim to reintensify as a typhoon over the South China Sea similar to Joe only several days earlier. Aircraft reconnaissance, however, continued to report that Kim lacked significant organization and that her associated convective tops were significantly lower than previously observed.

A weakness in the mid-tropospheric ridge, thought to have been induced by Typhoon Joe's passage several days earlier, allowed Kim to track more northwest towards Hong Kong. Changing little in direction or intensity as she tracked across the South China Sea, Kim finally made landfall on the coast of China 90 nm (167 km) northeast of Hong Kong at about 270600Z. Maximum sustained winds of 45 kt (23 m/sec) and wind gusts to 60 kt (31 m/sec) were reported as Kim moved inland.

FIGURE 3-11-3. Typhoon Kim over the east coast of Luzon, Philippines and the remnants of Typhoon Joe in the vicinity of northern Laos, 25 July 1980, 0246Z. (NOAA 6 imagery)



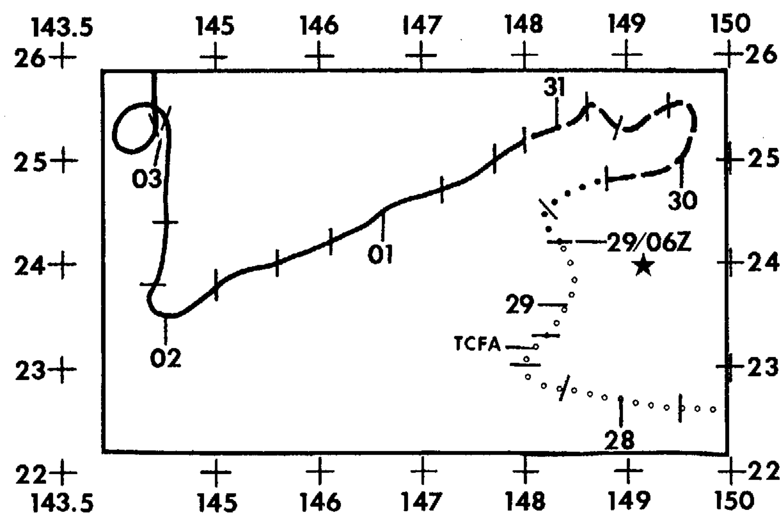
LEGEND

- 06 HOUR BEST TRACK POSIT
- A SPEED OF MOVEMENT
- B INTENSITY
- C POSITION AT XX/0000Z
- ◦◦◦ TROPICAL DISTURBANCE
- ••• TROPICAL DEPRESSION
- — — TROPICAL STORM
- —— TYPHOON
- ◆ SUPER TYPHOON START
- ◇ SUPER TYPHOON END
- ◇◇◇ EXTRATROPICAL
- ••• DISSIPATING STAGE
- ★ FIRST WARNING ISSUED
- ☆ LAST WARNING ISSUED

TYPHOON LEX

BEST TRACK TC-12
29 JUL-07 AUG 1980
MAX SFC WIND 80 KTS
MINIMUM SLP 962 MBS

DTG	SPEED	INTENSITY
29/06Z	6	30
29/12Z	6	30
29/18Z	7	35
30/00Z	8	40
30/06Z	6	45
30/12Z	4	50
30/18Z	4	55
31/00Z	3	60
31/06Z	4	65
31/12Z	5	65
31/18Z	6	65
01/00Z	6	65
01/06Z	6	65
01/12Z	6	70
01/18Z	6	70
02/00Z	7	75
02/06Z	7	75
02/12Z	9	75
02/18Z	7	75
03/00Z	9	80



Typhoon Lex was the most difficult tropical cyclone to forecast during the entire 1980 season. This typhoon developed from a Tropical Upper Tropospheric Trough (TUTT) near 22N 152E and initially moved westward. From this point, Lex made five right angle or greater turns and executed one tight cyclonic loop before finally heading northeastward into the western Pacific east of Japan. The only saving grace was that Lex remained well away from major landmasses and did not affect any military installations ashore or afloat.

Lex was first observed as a small disturbed area of convection on 24 July. The first satellite position fix at 260600Z placed the disturbance approximately 125 nm (230 km) south-southwest of Marcus Island. The disturbance moved almost due west (Fig. 3-12-1), and a Tropical Cyclone Formation Alert (TCFA) was issued at 281500Z when the satellite signature improved. The first warning was issued for Tropical Depression (TD) 12 at 290600Z after aircraft reconnaissance located a surface circulation center with a central pressure of 1002 mb and estimated maximum surface winds of 35 kt (18 m/sec). Twelve hours later, as the satellite signature continued to improve, the cyclone was upgraded to Tropical Storm Lex.

During the early development stage, a deep steering current was not evident above Lex. However, a broad 200 mb trough to the north-northeast seemed to have the strongest influence and turned Lex from a westward to a northeastward track. As the upper trough moved eastward, a middle-and upper-level ridge built northwest of Lex. The steering currents veered from southwesterly to northeasterly in response to the intensifying subtropical ridge, and Lex turned to a southwestward track.

Lex continued to intensify slowly during his southwestward movement, reaching typhoon strength of 65 kt (33 m/sec) at 310600Z. Shortly after 020000Z, Lex again changed direction and headed on a northward track through a break in the subtropical ridge. The break developed as a trough deepened to the north over the Sea of Japan. At the same time, anticyclonic cells intensified at all levels to the southeast and west-southwest of Lex.

Lex executed a cyclonic loop while accelerating northward and, before completing the loop, reached his maximum intensity of 80 kt (41 m/sec). The satellite signature for Lex at maximum intensity is illustrated in Figure 3-12-2. Upon exiting the loop, Lex continued tracking north until a deep surface low and associated cold front began moving eastward across Japan. As the frontal system approached from the west, Lex commenced recurvature to the northeast and accelerated slightly. The slow entrainment of cold air caused Lex to weaken and transition into an extratropical system. The last warning was issued for Lex at 070000Z August 1980.

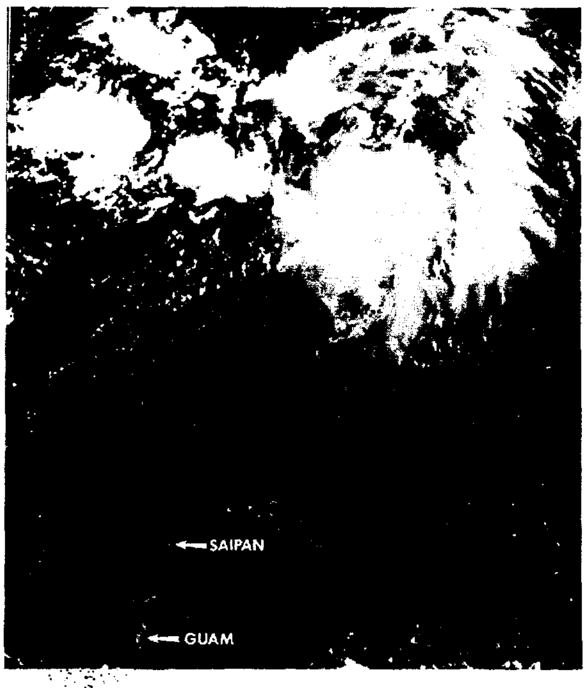
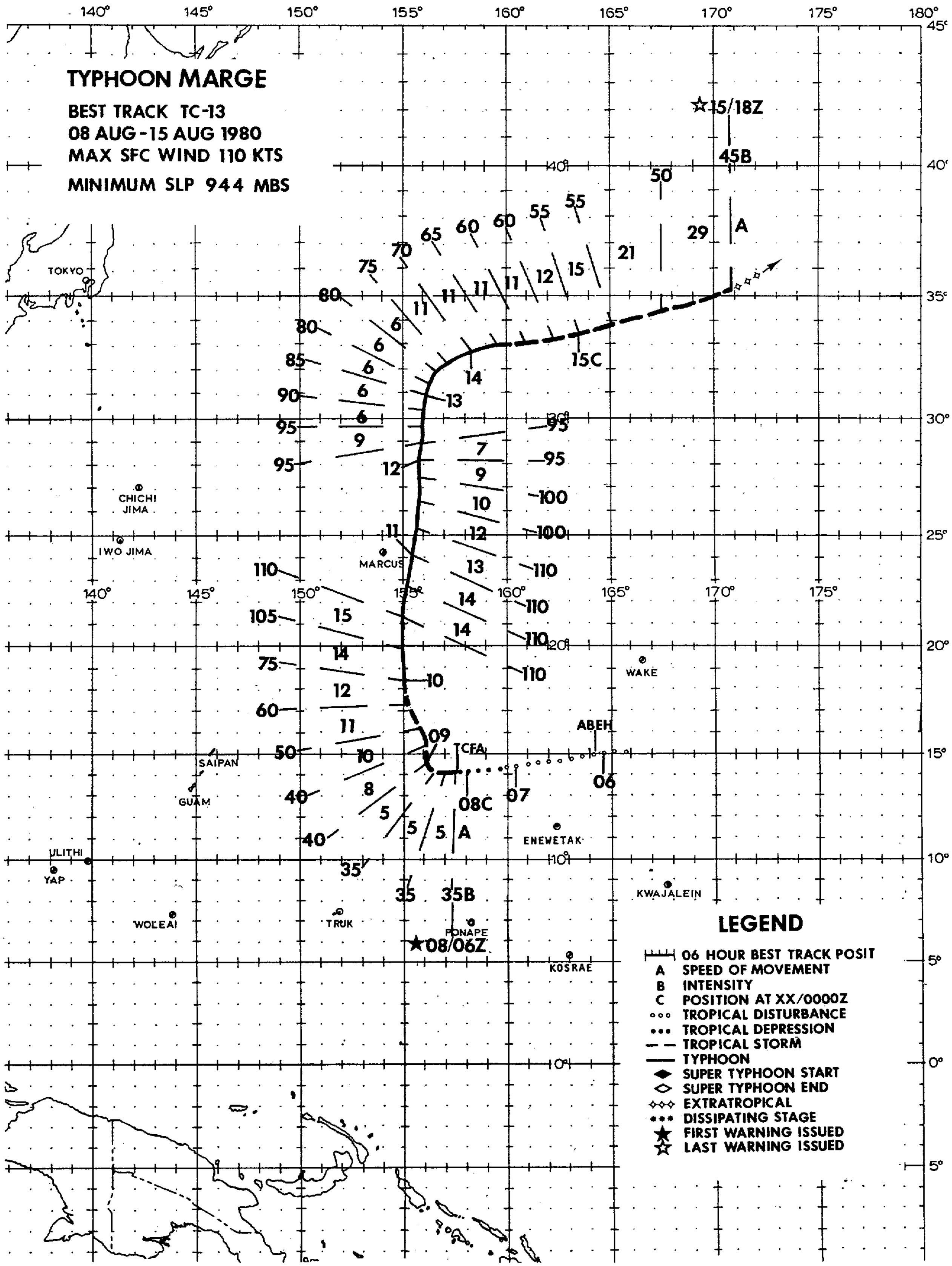


FIGURE 3-12-1. Lex as a tropical disturbance prior to issuance of a TCFA, 27 July 1980, 0026Z. (DMSP imagery)

FIGURE 3-12-2. Typhoon Lex at maximum intensity of 80 kt (41 m/sec), 2 August 1980, 2242Z. Iwo Jima is about 155 nm (285 km) west of Lex. (NOAA6 imagery)


TYPHOON MARGE
BEST TRACK TC-13
08 AUG-15 AUG 1980
MAX SFC WIND 110 KTS
MINIMUM SLP 944 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
TOKYO
CHICHI JIMA
IWO JIMA
MARCUS
WAKE
SAIPAN
GUAM
ULITHI
YAP
WOLEAI
TRUK
PONAPE
ENEWETAK
KWAJALEIN
KOSRAE
ABEH
TCFA
08/06Z
15/18Z
140°
145°
150°
155°
160°
165°
170°
175°
180°
45°
40°
35°
30°
25°
20°
15°
10°
5°
0°

Marge was the sixth tropical cyclone to reach typhoon strength during 1980. She developed west of the Marshall Islands in an area that had shown considerable instability since Typhoon Lex passed through the area in late July.

The convection that signaled Marge's formation first appeared on satellite imagery at 051200Z August 1980. Because of continual intensity variations in the convection, the tropical disturbance was not considered suspect until 060600Z when it was first mentioned in the Significant Tropical Weather Advisory Bulletin (ABEH PGTW). Through most of this period, the convection was embedded in a broad easterly flow. Typhoon Lex still displayed considerable influence over the region, causing the usual easterly current to be diverted northward over the Mariana Islands (Fig. 3-13-1). By 060000Z, Lex had moved far enough to the north that his influence over the easterly flow had weakened and the surface flow had split. One current was still drawn northward toward Lex, while the other current curved southward between the Marshall Islands and the Northern Mariana Islands. The southern current was drawn back into a broad low-level circulation between the eastern Caroline Islands and the Marshall Islands (Fig. 3-13-2). Satellite imagery showed an increase in convection corresponding to this change in the flow pattern.

Convective activity appeared to consolidate near 15N 159E by 061600Z. The convective area continued to expand and by 070000Z covered an area nearly 5-degrees square, with the most intense activity remaining near 15N 159E. Post-analysis shows that Marge formed during the period between 070000Z and 071200Z. An evaluation of the satellite imagery for this time period indicates that tropical depression stage was attained at 070600Z. By 071200Z, a north-south trough oriented along 160E was analyzed at the surface/gradient level. The circulation associated with Marge appeared to be part of this trough (Fig. 3-13-3).

The first reconnaissance into Marge, at 080533Z, observed surface winds of 35 kt (18 m/sec) and a central pressure of 998 mb. Based on these data, the initial warning on

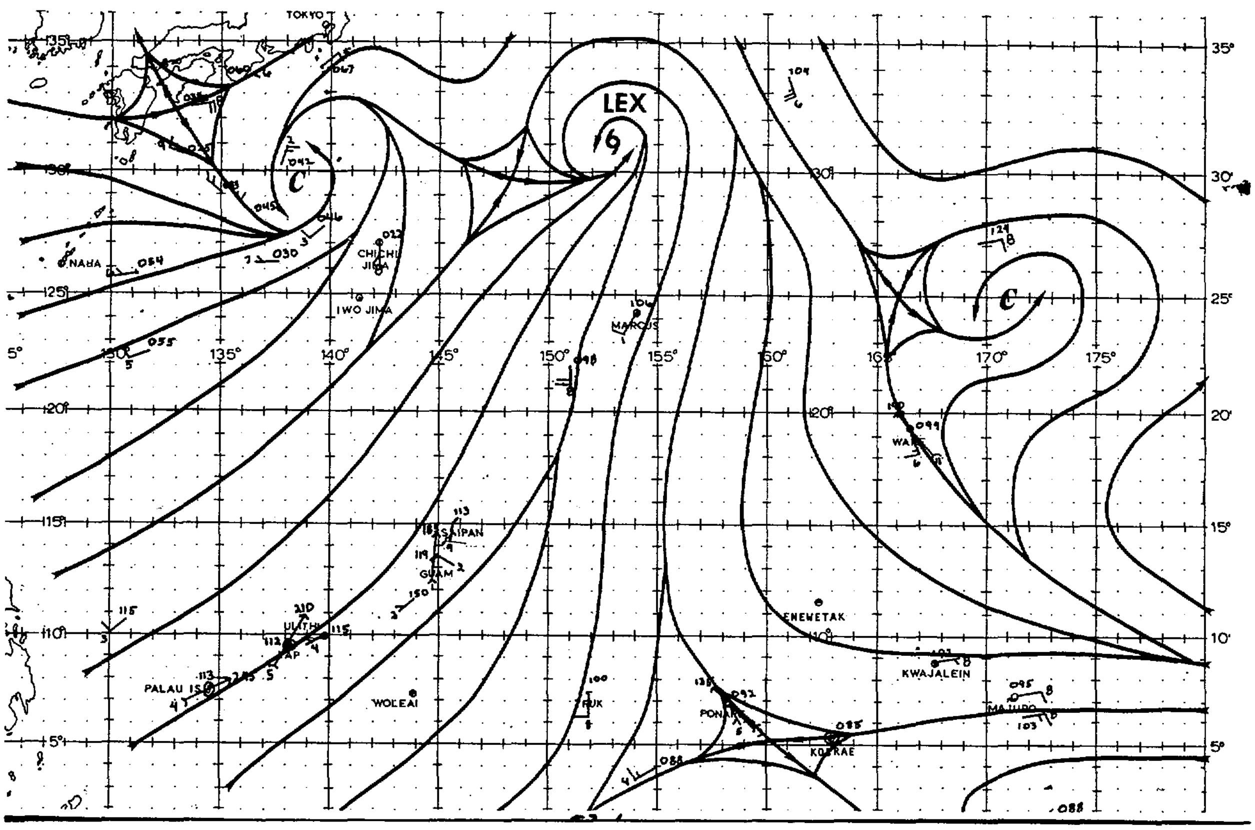


FIGURE 3-13-1. The 051200Z August 1980 surface (⟵\)/gradient-level (ddd⟵‹ff) wind data and streamline analysis. Wind speeds are in knots.

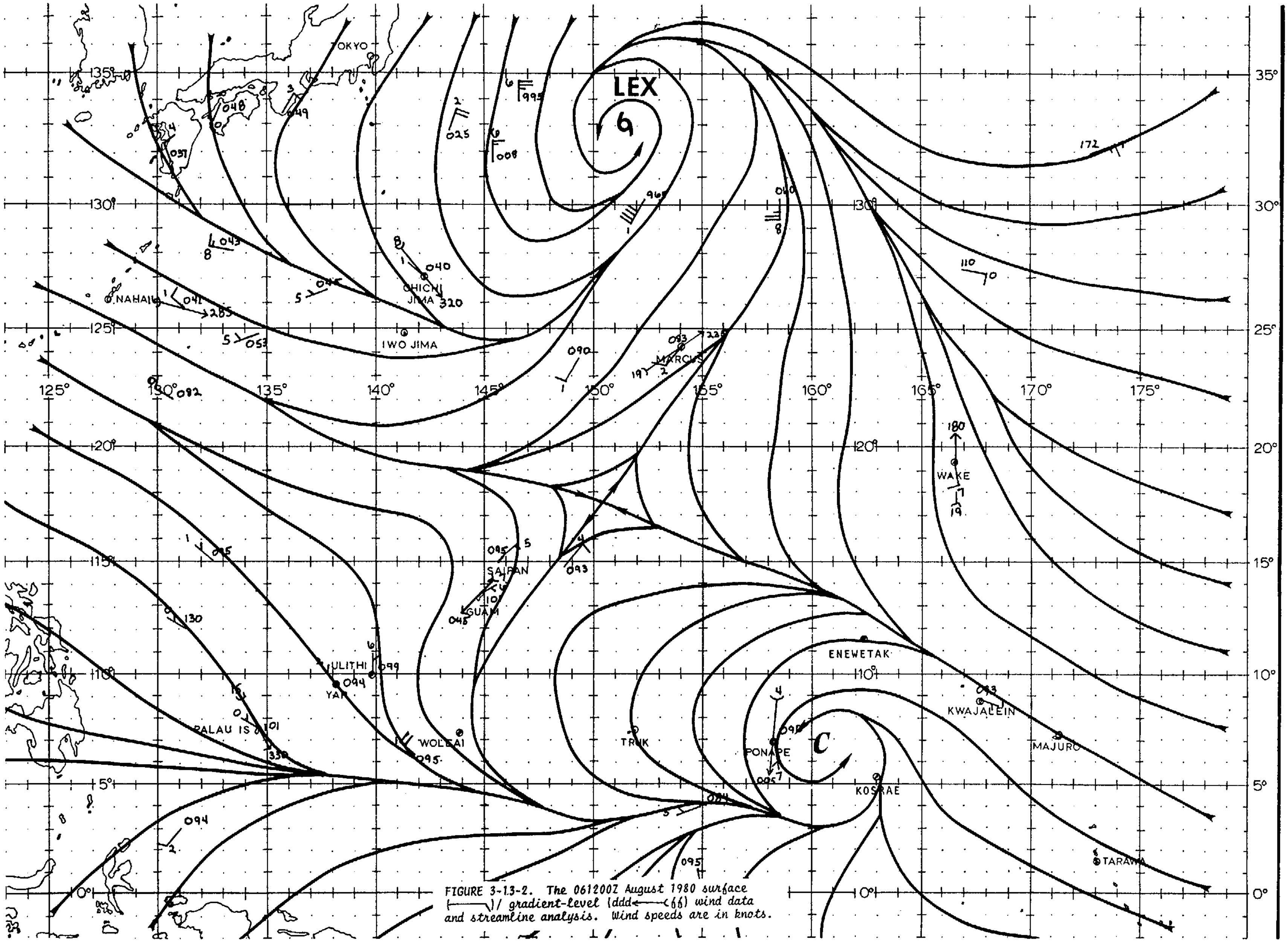


FIGURE 3-1.3-2. The 061200Z August 1980 surface ⊢——\/ gradient-level (ddd←—<ff) wind data and streamline analysis. Wind speeds are in knots.

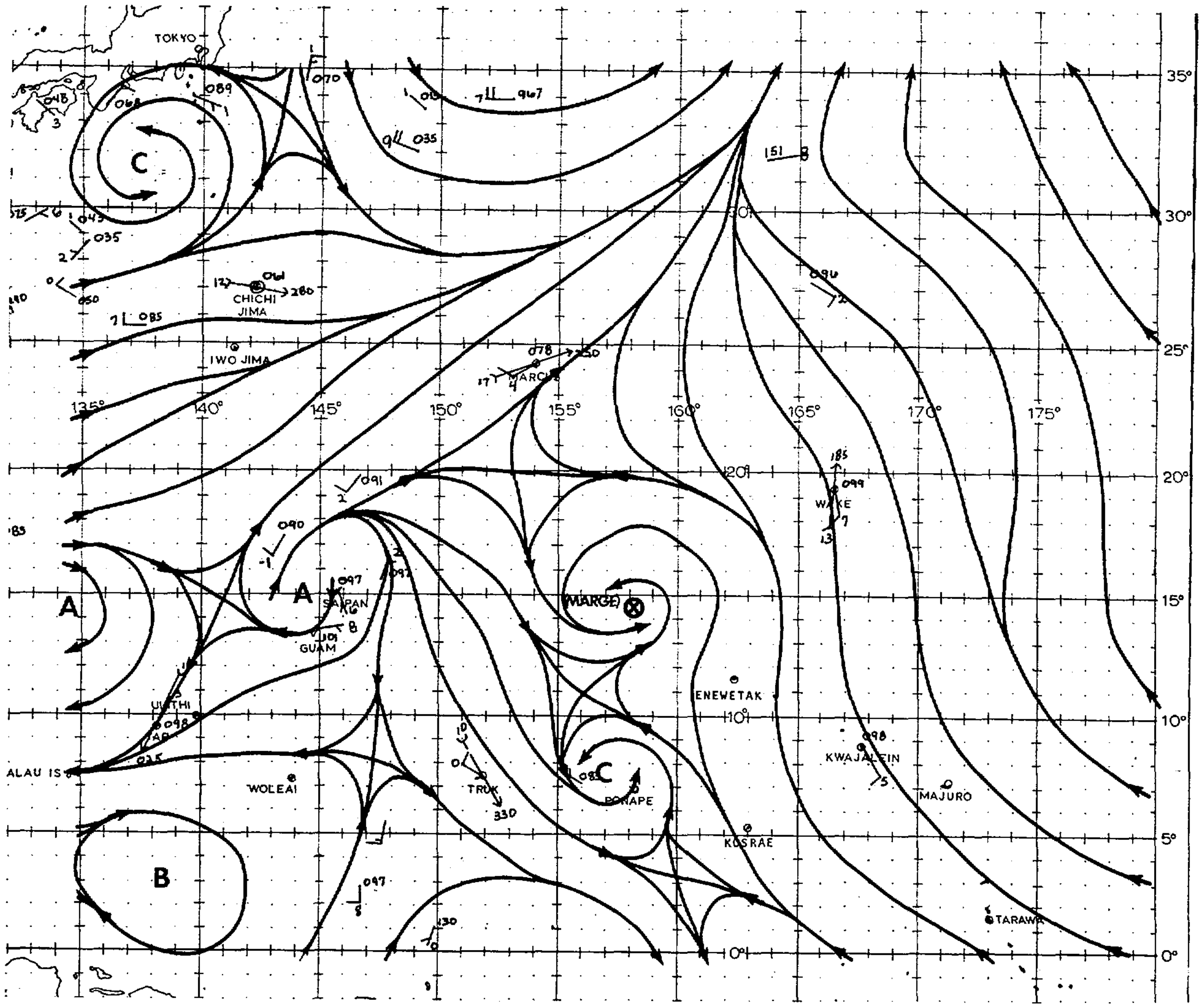


FIGURE 3-13-3. The 071200Z August 1980 surface (———\\)/gradient-level (ddd←——(ff) wind data and streamline analysis. Wind speeds are in knots.

Tropical Storm Marge was issued at 080800Z.

Marge initially followed a generally west-southwestward track. Objective forecast aids showed considerable scatter at this stage, a common occurrence during the formative stages of a tropical cyclone. A mid-tropospheric ridge was analyzed to the north of Marge. The key questions at that time concerned the status of this ridge, i.e., was it strong enough to keep Marge on a west-southwestward track, or was there a weakness which could allow her to recurve to the north-northwest. The 080000Z 500 mb streamline analysis (Fig. 3-13-4) indicated that Marge was located in a col, thus providing a channel for a more northerly track than predicted by climatology. The 500 mb reconnaissance data provided by the 54th Weather Reconnaissance Squadron north of Marge proved very valuable in locating this col. A sequence of satellite fixes between 081600Z and 082330Z was the first indication that Marge was reacting to the weakness in the ridge and had started a northward turn. A 090300Z satellite position fix, combined with aircraft fixes at 090615Z and 090839Z, confirmed the northward track.

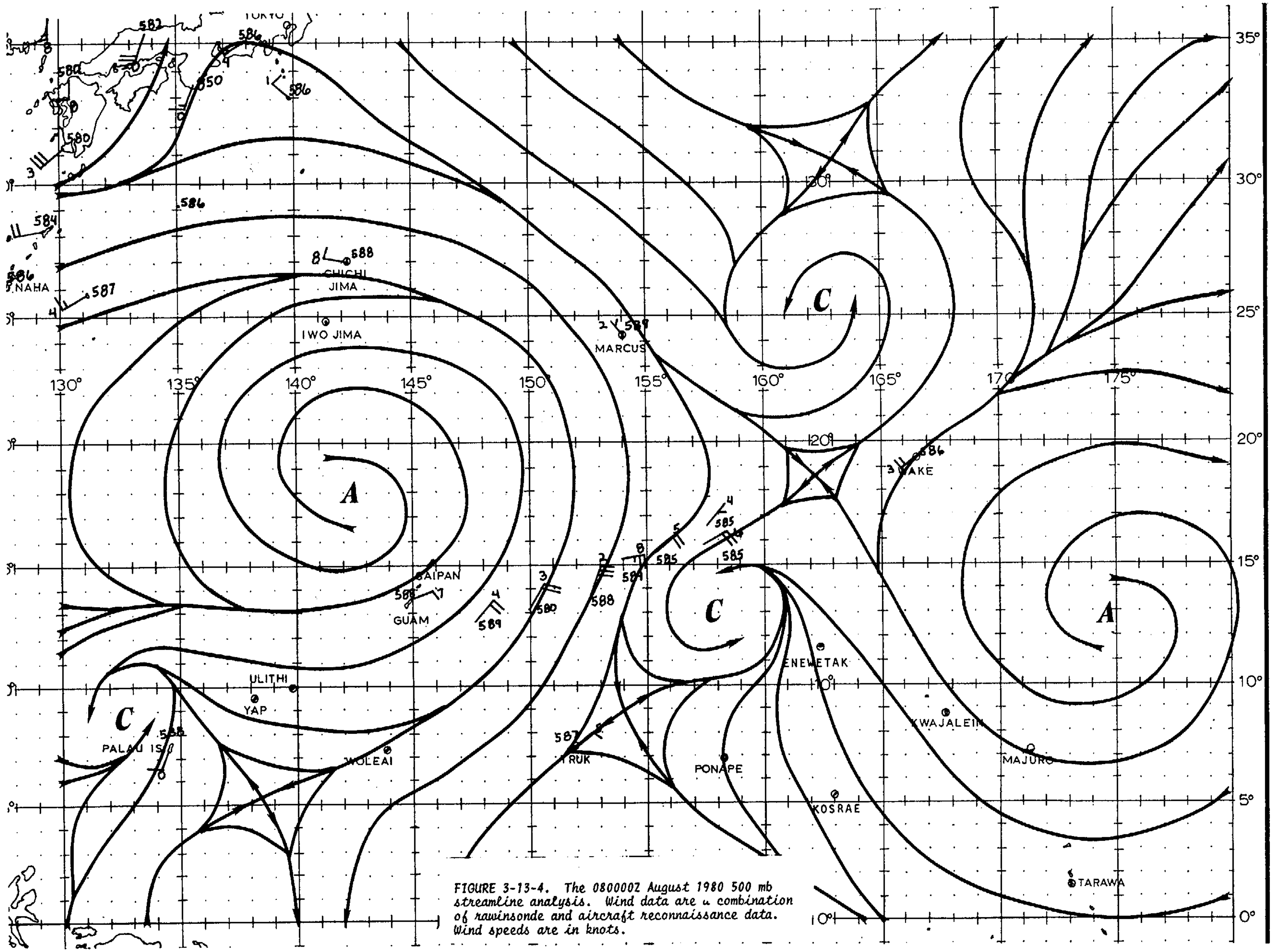


FIGURE 3-13-4. The 080000Z August 1980 500 mb streamline analysis. Wind data are a combination of rawinsonde and aircraft reconnaissance data. Wind speeds are in knots.

Marge continued northward for 17 degrees of latitude on a track between two centers in the subtropical ridge. During the northward trek, Marge intensified to typhoon strength which she maintained for nearly 5 days. A minimum sea-level pressure of 944 mb supported a maximum intensity of 110 kt (56 m/sec) (Atkinson and Holliday, 1977) for 18 hours (Fig. 3-13-5).

By 131200Z, Marge began to encounter strong upper-level westerlies. A second course change accompanied by gradual acceleration and weakening began at that time. Marge tracked east-northeastward and continued to accelerate under the influence of the strong mid-latitude westerlies. The final warning on Marge was issued at 151800Z as she transitioned into an extratropical cyclone and merged with a mid-latitude low pressure system.

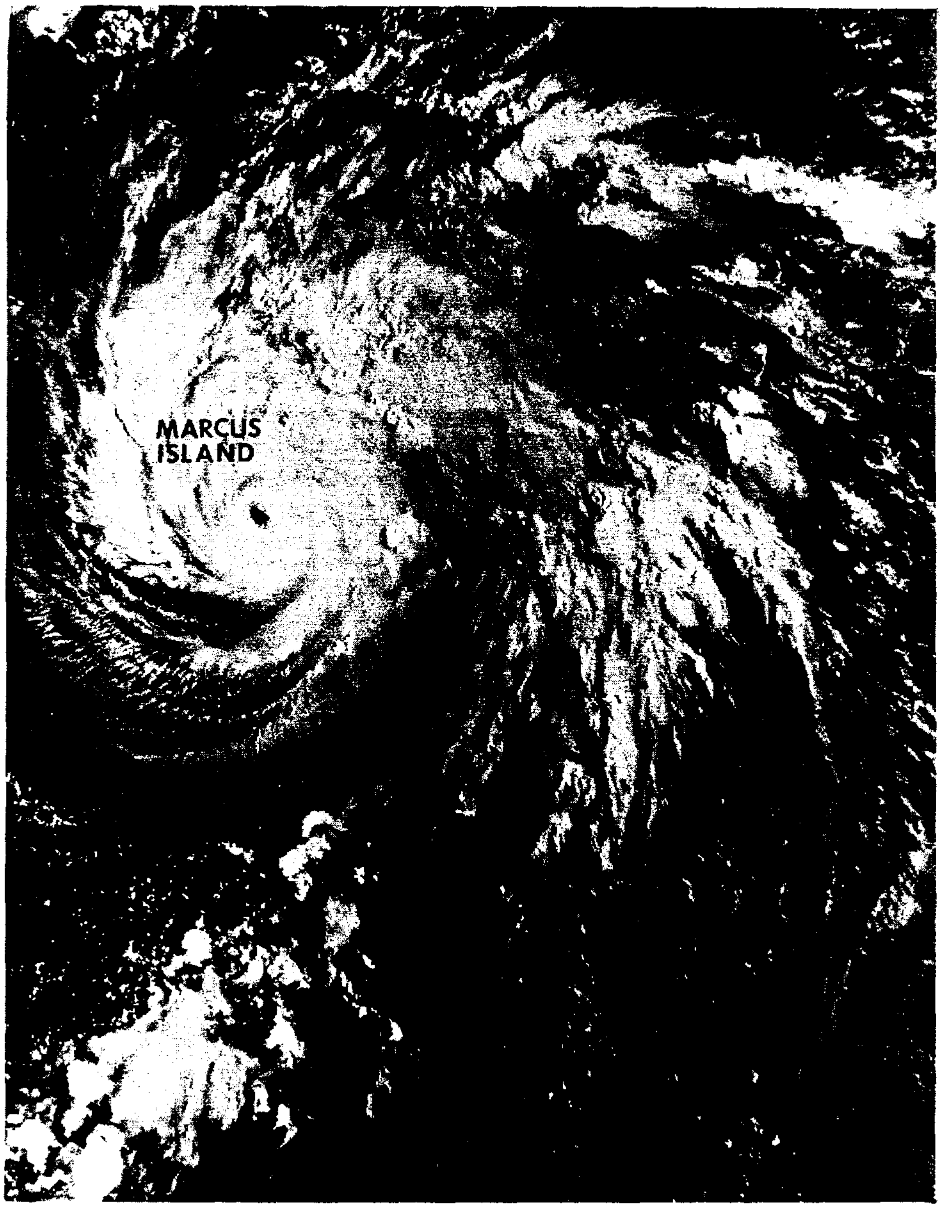


FIGURE 3-13-5. *Visual satellite imagery of Typhoon Marge just after reaching maximum intensity and minimum sea-level pressure, 10 August 1980, 2124Z. (NOAA6 imagery)*

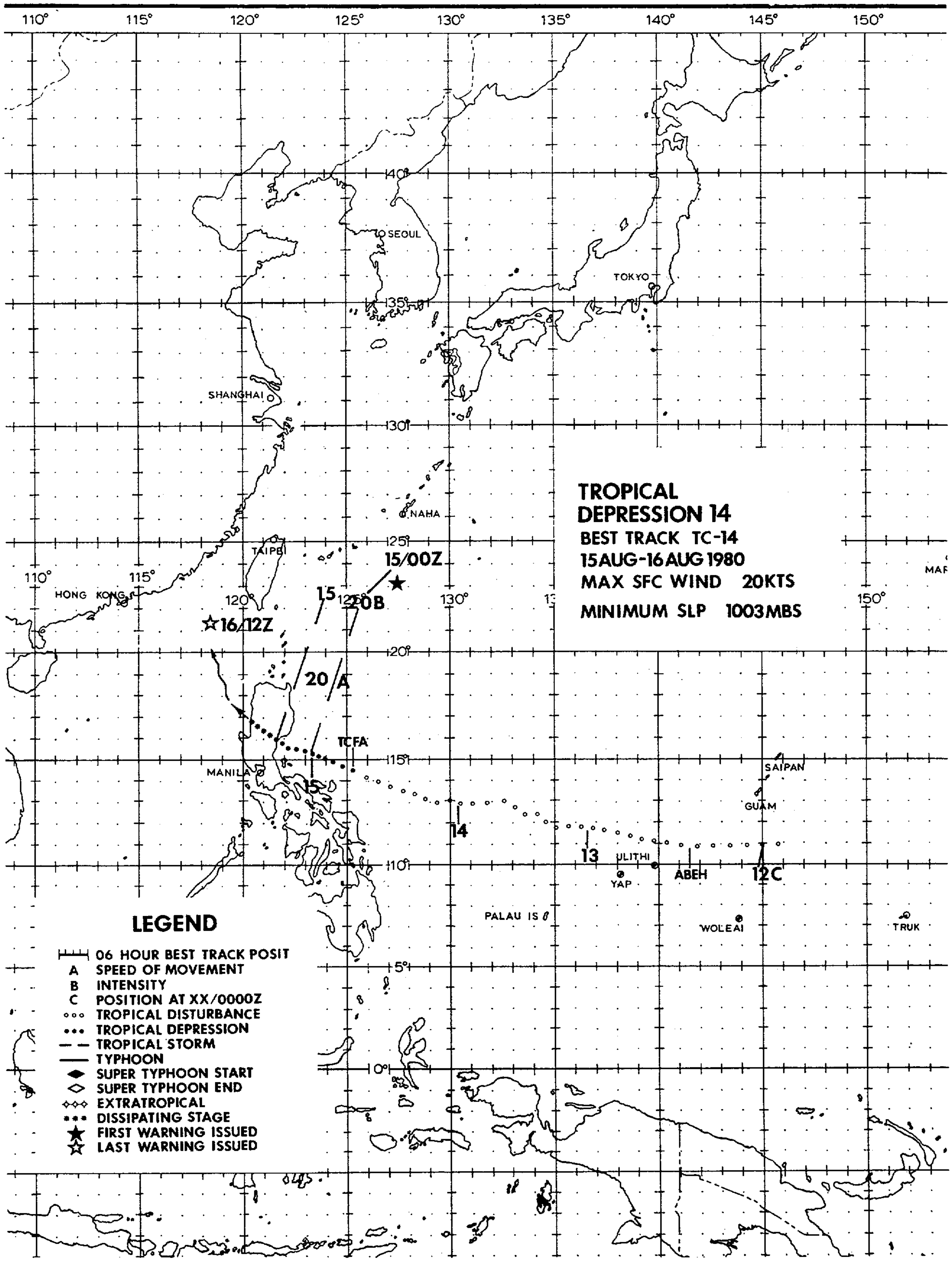
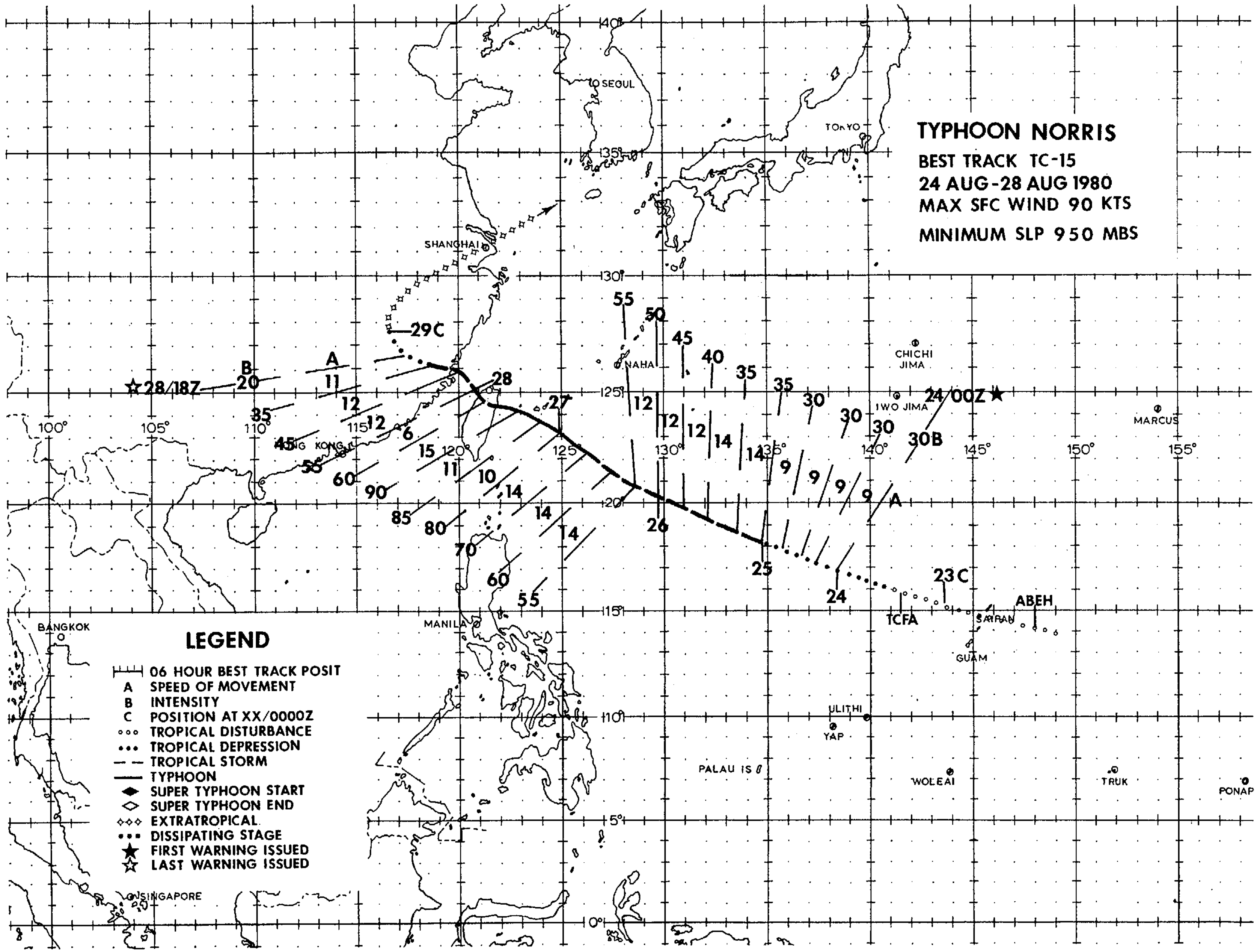

TROPICAL
DEPRESSION 14
BEST TRACK TC-14
15AUG-16AUG 1980
MAX SFC WIND 20KTS
MINIMUM SLP 1003MBS
15/00Z
16/12Z
15
20B
20/A
TCFA
15
14
13
12C
SEOUL
TOKYO
SHANGHAI
NAHA
TAIPEI
HONG KONG
MANILA
SAIPAN
GUAM
ULITHI
YAP
ABEH
PALAU IS
WOLEAI
TRUK
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED

FIGURE 3-14-01. Tropical Depression 14 at 20 kt (10 m/sec) intensity just prior to landfall on the east coast of Luzon, 14 August 1980, 2317Z (NOAA6 imagery). TD 14 weakened rapidly over the mountains of Luzon and never reintensified over the South China Sea as was expected.


TYPHOON NORRIS
BEST TRACK TC-15
24 AUG-28 AUG 1980
MAX SFC WIND 90 KTS
MINIMUM SLP 950 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
SEOUL
TOKYO
SHANGHAI
NAHA
CHICHI JIMA
IWO JIMA
MARCUS
BANGKOK
MANILA
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
WOLEAI
TRUK
PONAP
SINGAPORE
28/18Z
29C
24/00Z
23C
TCFA
ABEH

The near equatorial trough was reestablished between Guam and Ponape as Typhoon Marge moved northward toward Marcus Island on 10 August. A weak surface circulation developed along the trough axis south of Guam and slowly drifted toward the Philippine Islands over the next two weeks. Although this disturbance never developed into a significant tropical cyclone, it played a major role in delaying the intensification of a disturbance that tracked westward from Wake Island and eventually became Typhoon Norris.

A deep Tropical Upper-Tropospheric Trough (TUTT) was first analyzed on the 151200Z 200 mb analysis over the Marshall Islands from Wake Island southwestward to Truk. Sparse surface data gave no indications of a perturbation in the low-level tradewind flow at that time.

For the next seven days, the TUTT and associated convective activity to the southeast migrated slowly westward. Figure 3-15-1 depicts the position of the TUTT in relation to the area of enhanced convection that eventually developed into Typhoon Norris. It was not until 211200Z that the upper-level disturbance was reflected at the surface as a weak circulation.

The increased convection and resultant heating of the upper troposphere, as the disturbance approached a position north of Guam, is graphically illustrated in Figure 3-15-2. The streamline analysis reveals the development of a sharp ridge which built northeastward toward Marcus Island and eventually split the TUTT into two cells. By 230000Z, an upper-level anticyclone had formed over the surface disturbance, and, as the disturbance continued to organize, a Tropical Cyclone Formation Alert was issued at 230900Z. The preceding discussion illustrates the initiation of a tropical cyclone induced by upper-level divergence and enhanced convection southeast of the TUTT cell (Sadler, 1978). Norris tracked virtually straight west-northwestward at an average speed of 12 kt (22 km/hr) from the time of first warning as a tropical depression at 240200Z until landfall on northern Taiwan at 271600Z. This straight track was due to the strong mid-level subtropical ridge which extended along 27N from southern China eastward to the International Dateline during the latter part of August.

The circulation mentioned earlier near the Philippine Islands prevented Norris from developing and intensifying more rapidly. The surface flow pattern was split between the two circulations until 260000Z when the other circulation finally went ashore over Luzon and dissipated. With all the low-level inflow now available, Norris intensi-

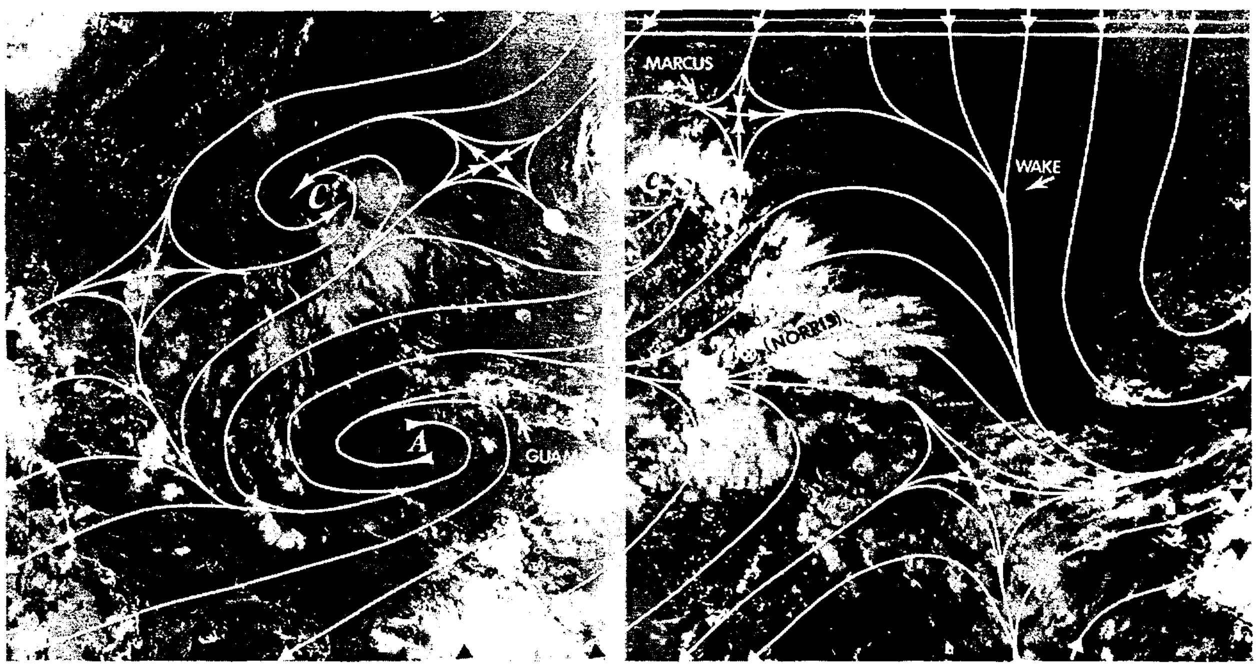


FIGURE 3-15-1. 210000Z August 1980 200 mb streamline analysis superimposed on satellite imagery at 202200Z. This figure depicts convective activity associated with upper-level cyclonic circulations and the enhanced convection southeast of the TUTT that eventually developed into Typhoon Norris. (NOAA6 imagery)

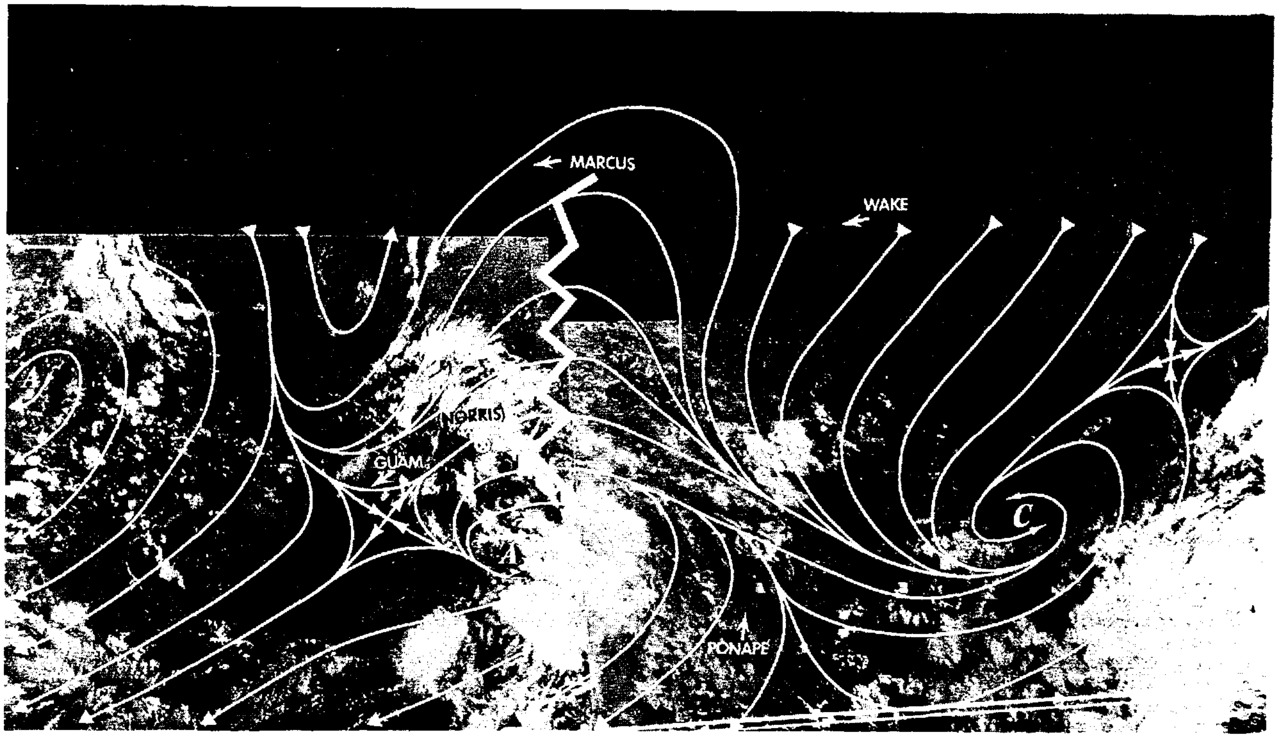


FIGURE 3-15-2. 220000Z August 1980 200 mb streamline analysis superimposed on satellite imagery at 212100Z. This figure illustrates convective heating which built a sharp ridge to the east of the TUTT cell. This ridge pushed the TUTT northward and eventually split it into two cells. (NOAA6 imagery)

fied quickly from 50 kt (26 m/sec) and 985 mb at 260000Z to a peak of 90 kt (46 m/sec) and 950 mb about 36 hours later.

Norris' equivalent potential temperature (θ_e) and minimum sea-level pressure (MLSP) curves intersected at 260000Z. Using JTWC's θ_e/MSLP study (see discussion on Super Typhoon Kim), Norris' sea level pressure was expected to fall 44 mb and maximum surface winds to increase 55 kt (28 m/sec) beyond that point. It seems very likely that this intensification would have occurred if landfall on Taiwan had not taken place within 42 hours.

The well-established mid-level ridge north of Norris, with a strong high pressure cell located between Taiwan and Okinawa, was responsible for the climatological west-northwestward track with Norris skirting the northern tip of Taiwan. However, with Norris 500 nm (926 km) southeast of Taiwan, the 260000Z 500 mb analysis indicated that the ridge was beginning to weaken between Taiwan and Okinawa with the high pressure cell retreating northeastward to a position east of Okinawa. By 261200Z, a definite break in the ridge was evident with the high cell now over the Bonin Islands and a secondary cell located near 25N 112E over southern China. The numerical forecast series during this period also supported the persistence of this break. Thus, JTWC's warnings after 260000Z were consistent in forecasting recurvature

FIGURE 3-15-3. Typhoon Norris 20 nm (37 km) southeast of Yonagunijima (WMO station 47912) and 95 nm (176 km) southeast of Taipei near peak intensity of 90 kt (46 m/sec), 27 August 1980, 1051Z (NOAA6 imagery). Yonagunijima reported sustained winds of 80 kt (41 m/sec) one hour later.

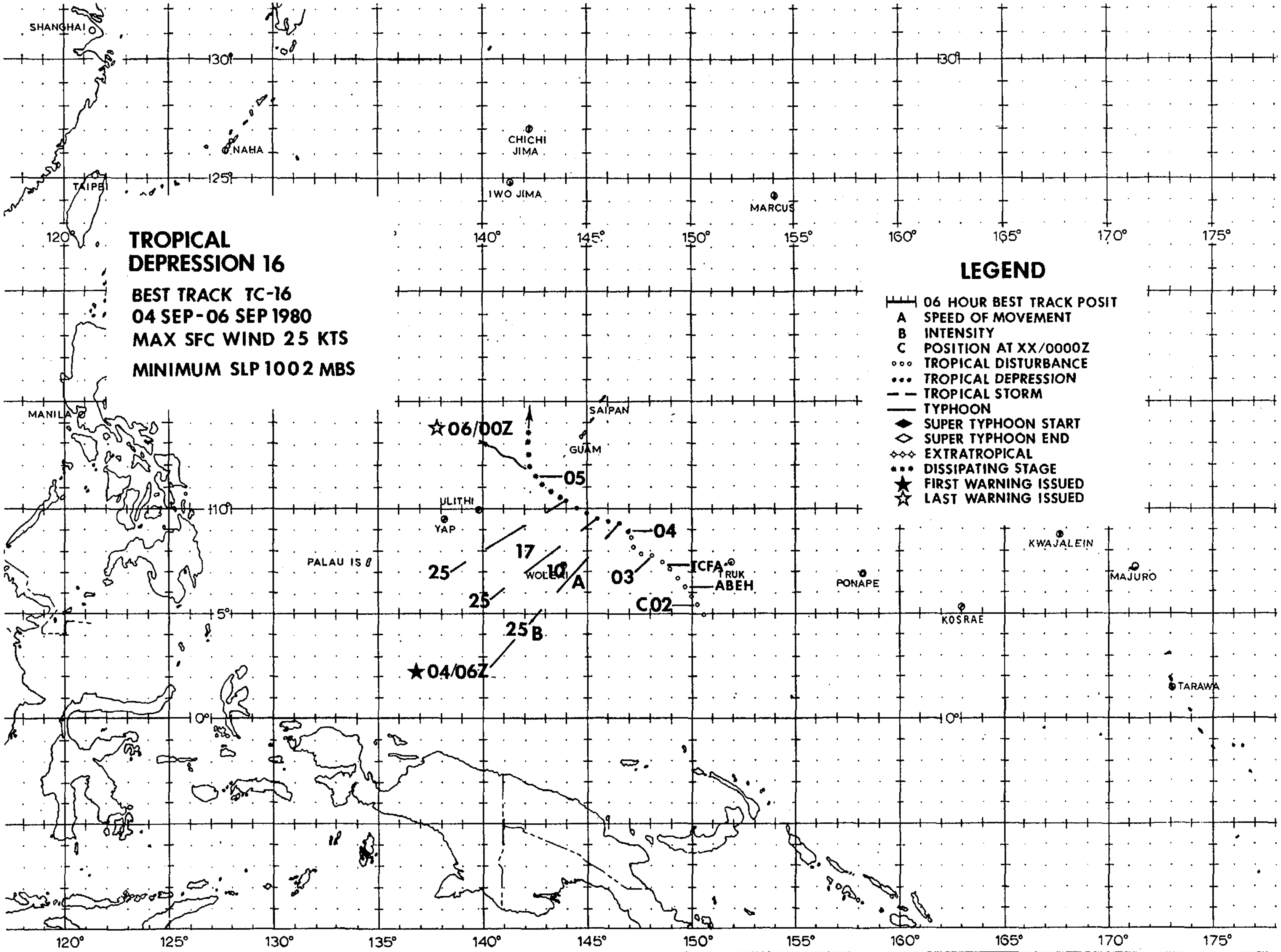
north of Taiwan and along the coast of mainland China into the Korea Strait.

Norris passed 10 nm (18 km) southwest of Yonagunijima at 271200Z. At that time, the island reported southeast winds of 80 kt (41 m/sec) and a sea-level pressure of 952.2 mb (Fig. 3-15-3). Norris then turned to a more westward track toward northern Taiwan. Excellent radar coverage from the island stations of Ishigakijima and Miyakojima and from Hua-Lien on Taiwan permitted JTWC to follow Norris as he tracked across Taiwan and into the Formosa Strait just north of Hsin-Chu. Strongest surface winds of 39 kt (20 m/sec) with gusts to 64 kt (33 m/sec) on northern Taiwan were reported by Taipei at 271600Z (Fig. 3-15-4).

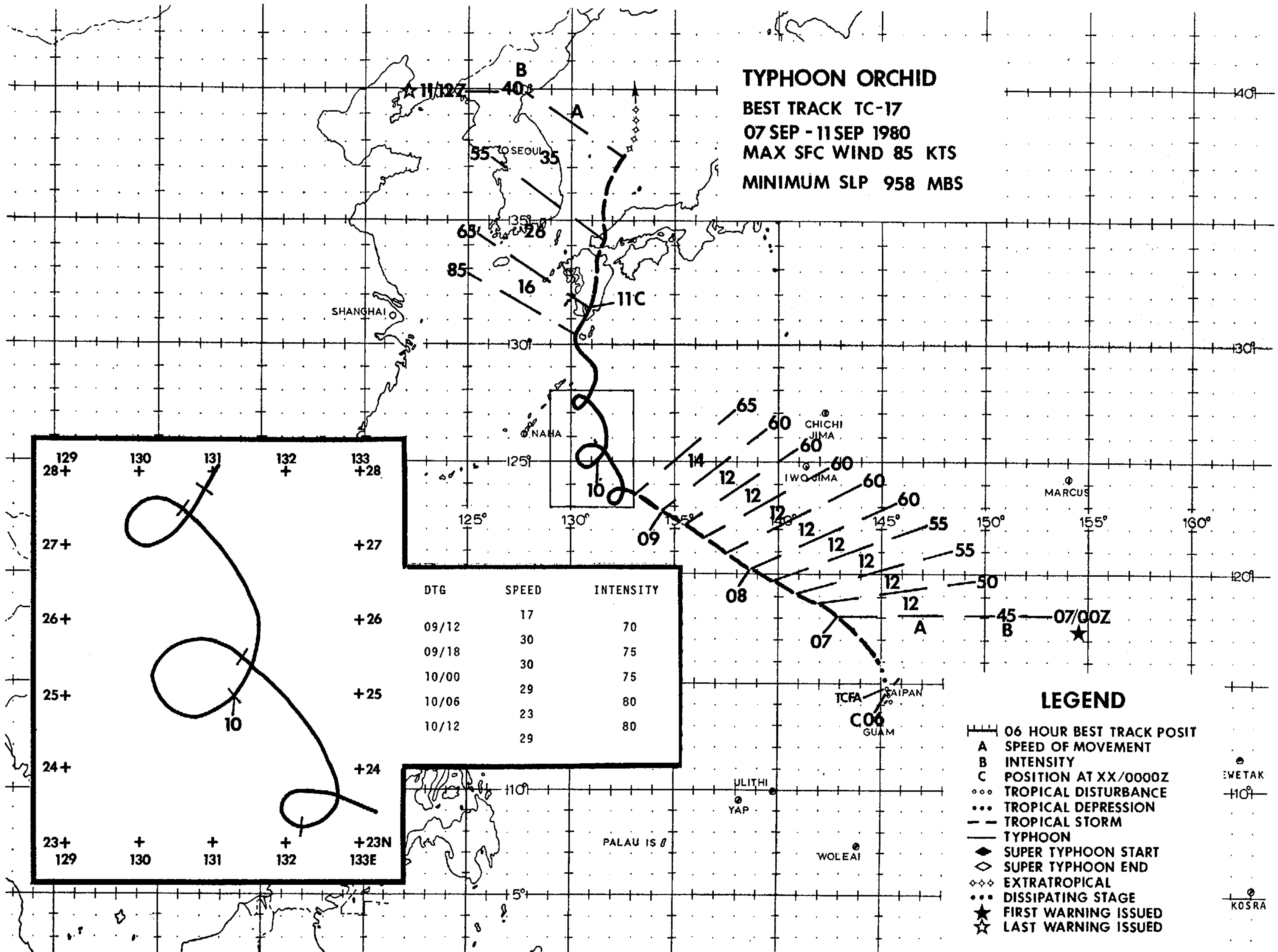
Norris' track across Taiwan, change in speed, and observed weakening were classic examples of the effects of Taiwan on tropical cyclones (Brand and Blelloch, 1973). The mountainous terrain of Taiwan apparently produced an induced surface low on the lee side of the mountain range, resulting in the marked increase in speed and the westward bend in Norris' track.

Landfall just south of Fu-Chou on mainland China occurred about 280900Z and, although penetrating deeper inland than forecast, Norris eventually recurved northeastward and the remnants linked with a frontal system that moved out over the Yellow Sea and Sea of Japan.

FIGURE 3-15-4. Typhoon Norris as seen by radar at Hua-Lien, 27 August 1980, 0800Z. (Photograph courtesy of the Central Weather Bureau, Taipei, Taiwan)



TROPICAL DEPRESSION 16
BEST TRACK TC-16
04 SEP-06 SEP 1980
MAX SFC WIND 25 KTS
MINIMUM SLP 1002 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
☆06/00Z
05
04
03
C02
TCFA
ABEH
17
10
A
25
25
25
25 B
★04/06Z
SHANGHAI
NAHA
CHICHI JIMA
IWO JIMA
MARCUS
TAIPEI
MANILA
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
WOLEAI
TRUK
PONAPE
KOSRAE
KWAJALEIN
MAJURO
TARAWA
30°
25°
10°
5°
0°
120°
125°
130°
135°
140°
145°
150°
155°
160°
165°
170°
175°


TYPHOON ORCHID
BEST TRACK TC-17
07 SEP - 11 SEP 1980
MAX SFC WIND 85 KTS
MINIMUM SLP 958 MBS
DTG SPEED INTENSITY
09/12 17 30 70
09/18 30 75
10/00 30 75
10/06 29 80
10/12 23 29 80
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
SEOUL
SHANGHAI
NAHA
CHICHI JIMA
IWO JIMA
MARCUS
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
WOLEAI
EWETAK
KOSRA
TCFA
11/12Z
07/00Z

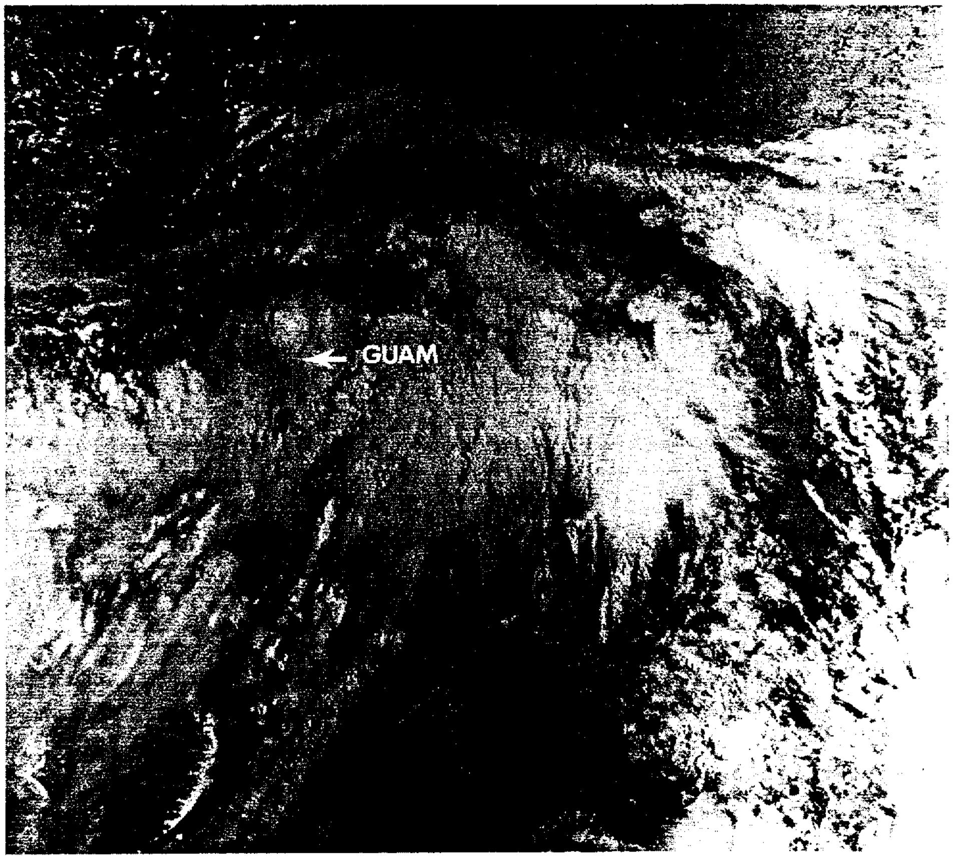


FIGURE 3-17-1. Satellite imagery showing extensive unorganized convection in the vicinity of Guam, 05 September 1980, 2150Z (NOAA6 imagery). This imagery along with synoptic and aircraft data supported the decision to issue the final warning on TD 16. The increased convection east and north of Guam also alerted JTWC to the possible development of another disturbance between Guam and Saipan.

The discussion for Typhoon Orchid would be incomplete without reviewing the brief life of Tropical Depression 16. Both systems developed near the eastern extension of the monsoon trough. The dissipation of Tropical Depression 16 was followed by the subsequent development of the disturbance which became Typhoon Orchid. The influence of the monsoon trough was investigated to explain the structure of these cyclones and, ultimately, to offer an explanation for Orchid's most unusual behavior south of Japan.

During the first few days of September, the monsoon trough was evident as far east as 160E along 05N. Satellite imagery on 2 September indicated increased convection near a weak circulation at the eastern end of the trough. The first of two formation alerts was issued at 021400Z. Further development was not observed on satellite imagery during the next 36 hours. A reconnaissance aircraft at 040155Z located a closed surface circulation with 25 kt (13 m/sec) maximum winds and a minimum sea-level pressure of 1002 mb. The first warning on TD 16 followed at 040600Z, and during the next 42 hours, JTWC tracked the depression as it moved west-northwestward. Aircraft investigations during this period showed a largely unorganized system. Unlike the investigation at 040155Z, these investigations repeatedly suggested that multiple centers existed in the area. Post-analysis indicated that sometime during the 42-hour period, the surface center associated with TD 16 weakened within the trough while JTWC continued to follow a persistent convective center to the west.

Although TD 16 continued to weaken, warnings were still issued because the potential for significant tropical cyclone development remained high in the region. Another disturbance eventually developed northeast of TD 16 as TD 16 weakened. Satellite imagery received at 052150Z (Fig. 3-17-1) showed that the entire area near Guam was under extensive, but apparently unorganized convection. The final warning was issued for TD 16 when aircraft reconnaissance at 060050Z failed to locate a significant surface circulation.

By 060000Z, satellite imagery indicated that a tropical cyclone formation alert was required for a rapidly developing disturbance just north of Guam. A reconnaissance aircraft investigated the disturbance at 060120Z but was unable to close a surface circulation. The aircraft and synoptic data showed an extensive light and variable wind area extending more than 100 nm (185 km) west of the disturbance. Synoptic data, nevertheless, indicated that gale force winds (greater than 33 kt (17 m/sec)) existed in the eastern semicircle of the disturbance. After coordination with forecasters at Naval Oceanography Command Center, Guam[1], a gale warning was issued for the area. The first warning for Tropical Storm Orchid was issued at 070200Z. This warning was based on aircraft reconnaissance at 070005Z which observed 45 kt (23 m/sec) surface winds in the northeast quadrant of the storm. The same aircraft observed only 10-15 kt (5-8 m/sec) northwest winds in the western quadrant, indicating that a closed surface circulation existed only for 6-12 hours before the first warning on Tropical Storm Orchid.

During the five-day period from 02 to 08 September, the axis of the monsoon trough moved from 05N to 18N. A near equatorial or buffer ridge developed at low latitudes and extended from the Philippines to the east of Orchid. The pre-existing subtropical ridge north of Orchid and the presence of the near equatorial ridge provided a broad wind band, which extended counter-clockwise from the south-southwest of Orchid to the northwest at distances as far as 800 nm (1482 km) from Orchid's center. A composite surface streamline analysis from 07000Z to 091200Z indicates that this pattern maintained itself, virtually unchanged, during a 60-hour period during which Orchid moved west-northwest at 12 kt (22 km/hr). Figure 3-17-2 shows this pattern with the 081200Z surface wind field around Orchid superimposed. After 091200Z, the northwest wind component strengthened around Orchid as the monsoon trough began interacting with a mid-latitude trough in the east China Sea.

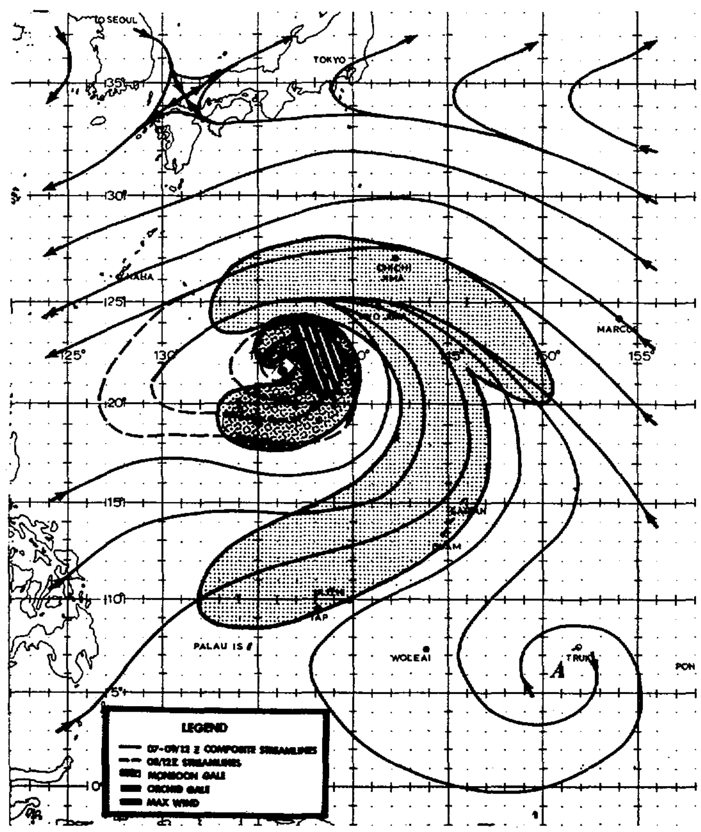


FIGURE 3-17-2. A composite surface streamline analysis of the monsoon trough based on data collected from 070000Z to 091200Z. The 081200Z streamlines (dashed lines) are superimposed for Orchid.

[1] The Joint Typhoon Warning Center functions operationally under the command of the Naval Oceanography Command Center, Guam (NOCC). Destructive wind warnings for the western North Pacific are included in the services provided by NOCC.

Although TD 16 and Typhoon Orchid developed in the same location with respect to the monsoon trough, it now appears that TD 16 failed to intensify because it could not sustain its own circulation pattern independent of the enhanced flow around the trough. Orchid sustained an independent circulation beginning on 7 September.

By 090000Z, Orchid had moved north into the subtropical latitudes near 23N. The monsoon trough was showing signs of weakening, and by 091800Z, the eastern portion of the wind band collapsed into Orchids's circulation pattern. Interaction with the mid-latitude trough moving east from Asia signalled the beginning of a change in Orchid's trajectory towards recurvature. The numerical prognostic series indicated a further eastward progression of the mid-latitude trough, but the series did not reflect the presence of Orchid at the middle and upper levels of the troposphere. Initial recurvature tracks anticipated a deepening of the trough and eventual recurvature southeast of Japan. The trough stalled near 130E, however, and the opportunity for recurvature was delayed until Orchid approached the Ryukyu Islands about 12 to 18 hours later.

In post-analysis, JTWC often finds some phenomenon that is not evident to the forecaster in real-time but which explains the motion or character of a tropical cyclone. In Orchid's case, JTWC was well aware of her circulation pattern; what wasn't known was the effect of this circulation pattern on Orchid's trajectory. Once formed, Orchid moved to the west-northwest at a nearly constant speed. During this portion of her track, Orchid was well behaved and there was no known "rule of thumb" which would have provided JTWC with a prior warning of the motion that the cyclone would undergo in the 36-hour period beginning at 090600Z. Beginning at 090600Z, Orchid executed three high speed cyclonic loops while maintaining an overall forward speed of 14 kt (26 km/hr) toward the north. Satellite, aircraft, and radar surveillance provided dense reconnaissance coverage of Orchid during these loops (Fig. 3-17-3). Orchid finally stabilized on her northward track just prior to landfall on Kyushu, Japan. Figure 3-17-4 illustrates an expanded surface best track, a partial 700 mb track based on aircraft data, and the overall smoothed track, which may have been followed by Orchid at some level above 700 mb. An analogy which may offer some insight into Orchid's unexplained motion is given next.

Before offering the analogy, some conjecture is required based on the assumption that Orchid's circulation pattern relative to the broad-scale circulation was "conditionally" unstable, i.e., all the forces acting on Orchid were only in balance as long as she maintained a constant heading. As Orchid approached the mid-latitude trough, this balance was interrupted and the potential unstable character of the cyclone, embedded in this particular synoptic pattern, was realized. One analogy that can be used to explain the trajectory involves a child's toy top. The top, inherently unstable because of its small base and wide body, will spin uniformly about its axis as long as it maintains equilibrium. A loss of rotational speed or a tap along the side will cause the top to stumble and the base will appear to accelerate along a predictable looping pattern until the top's stability is either restored or it comes to rest.

It is suggested here that the effect was virtually the same when Orchid began interacting with the mid-latitude trough. The best track shows that Orchid regained her equilibrium within the mid-latitude trough prior to making landfall in southern Japan. Orchid did not loop again and she returned to a slower speed of 18 kt (33 km/hr) prior to accelerating during the extratropical transition period.

Orchid caused considerable damage and loss of life in Japan and Korea. High winds and torrential rains associated with Orchid were blamed for six deaths, numerous injuries, and considerable damage to crops in southern Japan. At least three deaths were reported in South Korea as Orchid moved east of Korea into the Sea of Japan. Another 112 fishermen were reported missing in the Korea Straits following Orchid's passage.

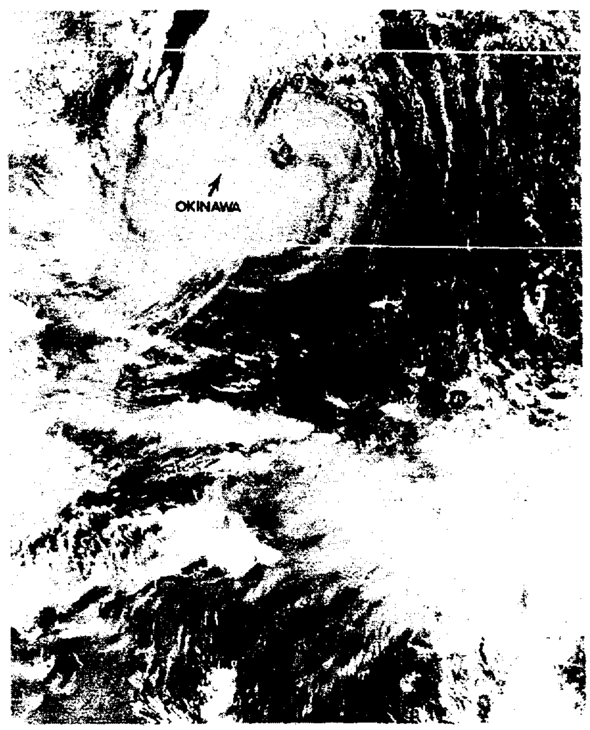


FIGURE 3-17-3. Typhoon Orchid, near maximum intensity, completing the second of three cyclonic loops, 10 September 1980, 0625Z. (TIROSN imagery)

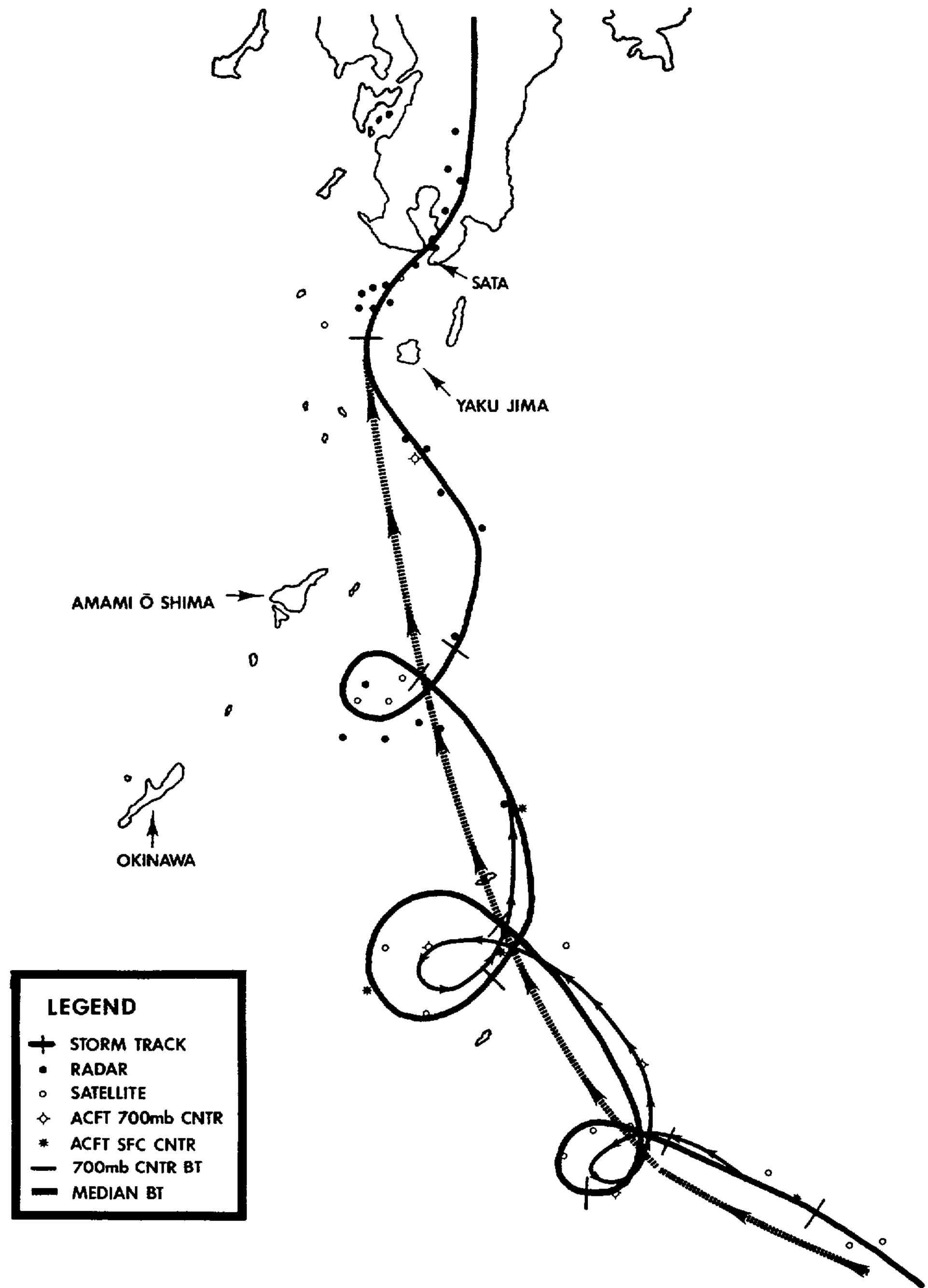
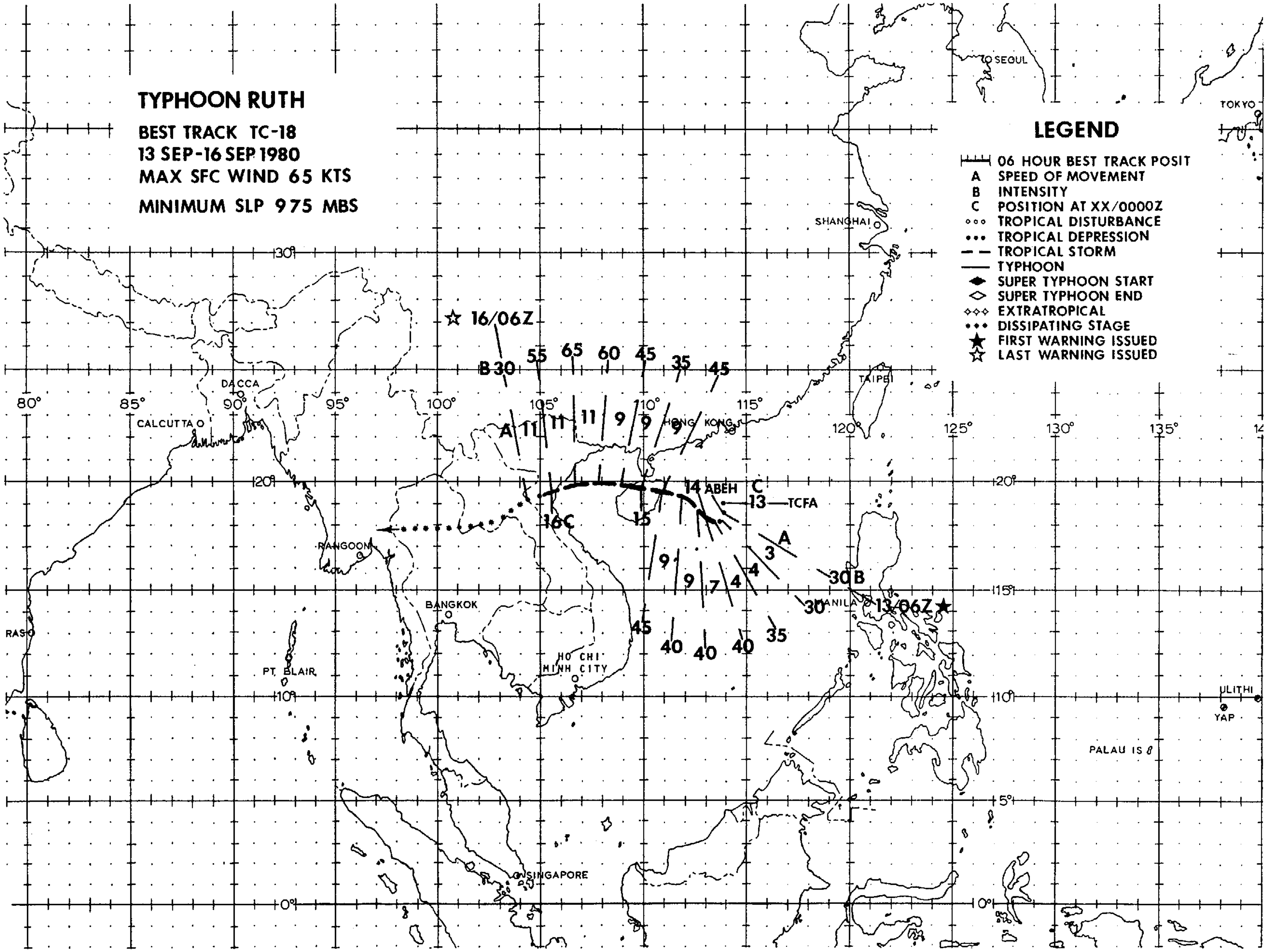


FIGURE 3-17-4. An expanded best track from 090600Z to 110000Z. The figure shows the distribution of fix positions, a partial 700 mb track, and an overall smoothed track.



TYPHOON RUTH
BEST TRACK TC-18
13 SEP-16 SEP 1980
MAX SFC WIND 65 KTS
MINIMUM SLP 975 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
16/06Z
13/06Z
TCFA
SEOUL
TOKYO
SHANGHAI
TAIPEI
DACCA
CALCUTTA
HONG KONG
RANGOON
BANGKOK
HO CHI MINH CITY
MANILA
PT. BLAIR
SINGAPORE
ULITHI
YAP
PALAU IS

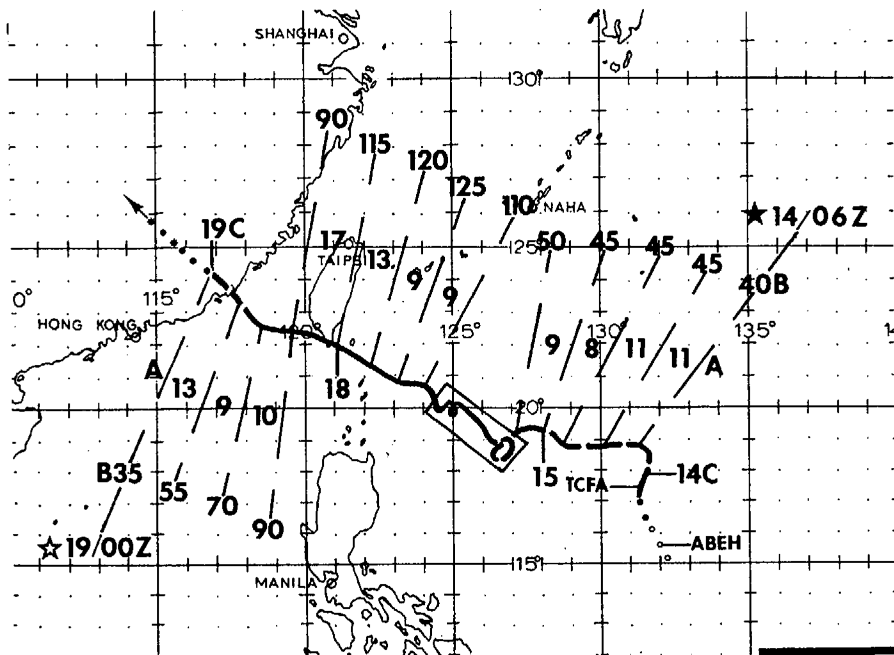
Typhoon Ruth was the second of five typhoons occurring in September. Unlike the other typhoons, Ruth began as a monsoon depression in the South China Sea on 11 September. For two days, the depression remained quasi-stationary with the weak surface circulation embedded in the monsoonal trough. Synoptic data on the 13th, however, indicated that the circulation was intensifying; also, satellite imagery showed that it was forming its own outflow center. As a result, JTWC issued a formation alert at 130047Z. Later satellite data showed that further development had occurred which prompted the first warning to be issued on TD 18 at 130600Z.

During the early phase of development, TD 18 tracked slowly southward, steered by the near surface wind flow. By 131800Z, TD 18 had intensified to Tropical Storm Ruth and had started to track northwestward at an accelerated forward speed of movement. For the rest of her existence, Ruth tracked along the southern periphery of the 500 mb ridge which was centered over southern Mainland China. She reached her first maximum intensity of 45 kt (23 m/sec) prior to landfall over Hai-Nan Tao, but quickly weakened to minimal tropical storm strength while over the island. Ruth entered the Gulf of Tonkin on the 15th and, during her transit, rapidly intensified to typhoon strength with a maximum surface wind of 65 kt (33 m/sec) and a minimum sea-level pressure of 975 mb.

Brand (1970) summarized the finding of Perlroth (1969) who showed that vertical temperature differences between the ocean surface and the 200 ft (61 m) water depth have an important effect on development of tropical cyclones. Perlroth reported that approximately 90% of the tropical cyclones that reached hurricane intensity in the equatorial Atlantic from 1901-1965 occurred where the climatological difference between the ocean surface temperature and the 200 ft (61 m) temperature was 3.9C degrees or less. Climatology for September shows that the Gulf of Tonkin has warm sea surface temperatures (29C) and a vertical temperature gradient along Ruth's track which is within the constraints reported by Perlroth for intensification to typhoon strength. Thus, the northern portion of the Gulf of Tonkin can serve as a sufficient heat source for tropical cyclones, such as Ruth, to intensify when conditions are favorable. This apparently is true despite the fact that the Gulf is surrounded on three sides by land.

Ruth made landfall at 160000Z south of Thanh Hou, Vietnam. Nearly half a million people were left homeless with 106 persons known dead or missing in Vietnam. Ruth also caused massive crop damages and interrupted communications in the area.

After landfall, Ruth again weakened and dissipated as a significant tropical cyclone. The remnants of Ruth tracked west-southwestward for the next two days and dissipated over the Bilauk-taung Range along the border of Burma and Thailand.



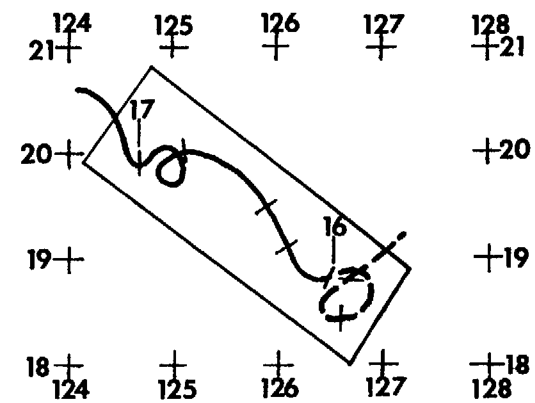
LEGEND

- 06 HOUR BEST TRACK POSIT
- A SPEED OF MOVEMENT
- B INTENSITY
- C POSITION AT XX/0000Z
- ∘∘∘ TROPICAL DISTURBANCE
- ••• TROPICAL DEPRESSION
- — — TROPICAL STORM
- —— TYPHOON
- SUPER TYPHOON START
- SUPER TYPHOON END
- EXTRATROPICAL
- DISSIPATING STAGE
- ★ FIRST WARNING ISSUED
- ☆ LAST WARNING ISSUED

TYPHOON PERCY

BEST TRACK TC-19
14 SEP-19 SEP 1980
MAX SFC WIND 125 KTS
MINIMUM SLP 919 MBS

DTG	SPEED	INTENSITY
	06	
15/12Z		50
	07	
15/18Z		55
	10	
16/00Z		65
	04	
16/06Z		70
	04	
16/12Z		75
	09	
16/18Z		85
	11	
17/00Z		95
	10	



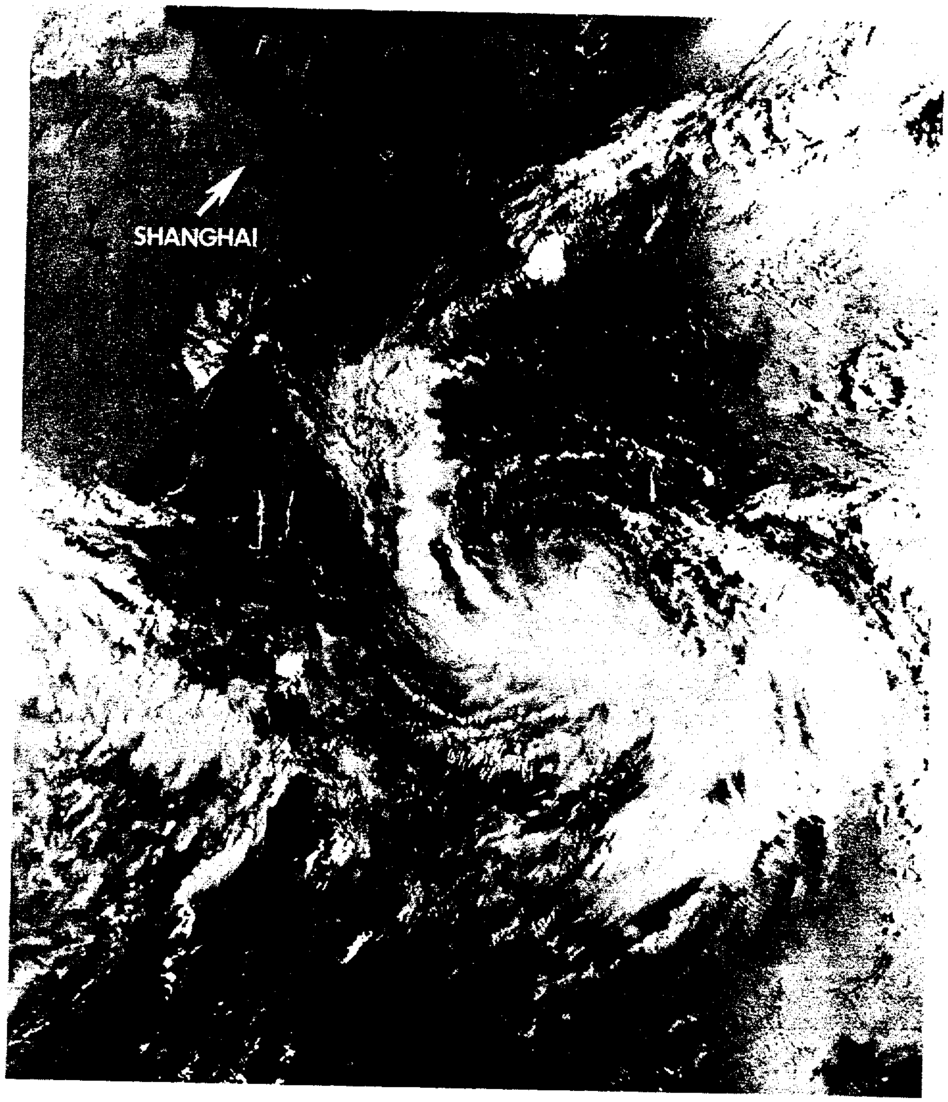


FIGURE 3-19-1. Tropical Storm Percy at 45 kt (23 m/sec) intensity, 14 September 1980, 2333Z. Percy's low-level center at that time was partially exposed on the northeastern edge of a large convective area. (NOAA6 imagery)

The disturbance which eventually developed into the tenth typhoon of 1980 became evident on satellite imagery at 130600Z September 1980 as a focal point of cumulus banding. This development occurred at the base of a mid-tropospheric, mid-latitude trough that extended south of Japan along 133E. With further intensification likely, a Tropical Cyclone Formation Alert (TCFA) was issued by JTWC at 132157Z. An aircraft reconnaissance investigation soon afterwards found a well-developed closed circulation with 1500 ft (457m) flight level winds of 35 kt (16 m/sec) and a minimum sea-level pressure of 992 mb. Upon receipt of these data, the first warning on Tropical Storm Percy was issued at 140600Z.

By that time, the mid-tropospheric, mid-latitude trough had moved eastward, and Percy's track, in response, shifted from a northward to a more climatological west-northwestward track as the ridge extended eastward north of Percy. Percy's development was slow at this time as scatter between satellite and aircraft fixes indicated that he was poorly aligned in the vertical. Convection on satellite imagery was displaced southwest of Percy's surface center. The mid-tropospheric ridge that extended from eastern China along 28N to a position north of Okinawa also restricted upper-level outflow in Percy's northern semicircle. Between 15 and 17 July, however, reconnaissance aircraft consistently reported decreasing heights and increasing temperatures near the 700 mb center (Fig. 3-19-1).

During this time, Percy decelerated and began moving erratically. He eventually completed two tight cyclonic loops while intensifying to typhoon strength by 160000Z. Shortly afterward, at 160248Z, aircraft reconnaissance reported that the eyewall had become fully enclosed. JTWC forecast significant intensification for the next 36 hours as the Theta E (Θ_e) forecast intensity aid (see summary for Super Typhoon Kim) indicated an approaching intersection of the 700 mb equivalent potential temperature trace and the minimum sea-level pressure trace.

During Percy's period of erratic movement, there was speculation that a Fujiwhara interaction might develop between Percy and then Tropical Storm Sperry, which was located 800 nm (1575 km) to the east. A comparison of the post-analysis best tracks for Percy and Sperry shows that the two vorticies were never close enough for an interaction to occur (Brand, 1968).

Interestingly, Percy did dominate much of the low-level circulation pattern between the two systems. A reconnaissance aircraft mission flown between Percy and Sperry indicated that the wind shift from southerly to northerly flow did not occur until about 100 nm (185 km) west of Sperry's surface center (Fig. 3-19-2).

Significant intensification did take place as Percy's eye gradually grew tighter and sea-level pressure continued to fall (Fig 3-19-3). An aircraft fix at 171306Z indicated a 700 mb height of 2387 m, which extrapolates to a sea-level pressure of 919 mb and supports maximum sustained surface winds of 125 kt (64 m/sec). Due to his proximity to Taiwan, however, Percy then began to slowly weaken. A subsequent reconnaissance aircraft at 171616Z reported a rise in the 700 mb level to 2407 m. Approximately 9 hours later, Typhoon Percy made landfall on the extreme southern tip of Taiwan.

FIGURE 3-19-2. Percy just prior to reaching typhoon strength during the period of erratic movement over the Philippine Sea, 15 September 1980, 2311Z. (NOAA6 infrared imagery)

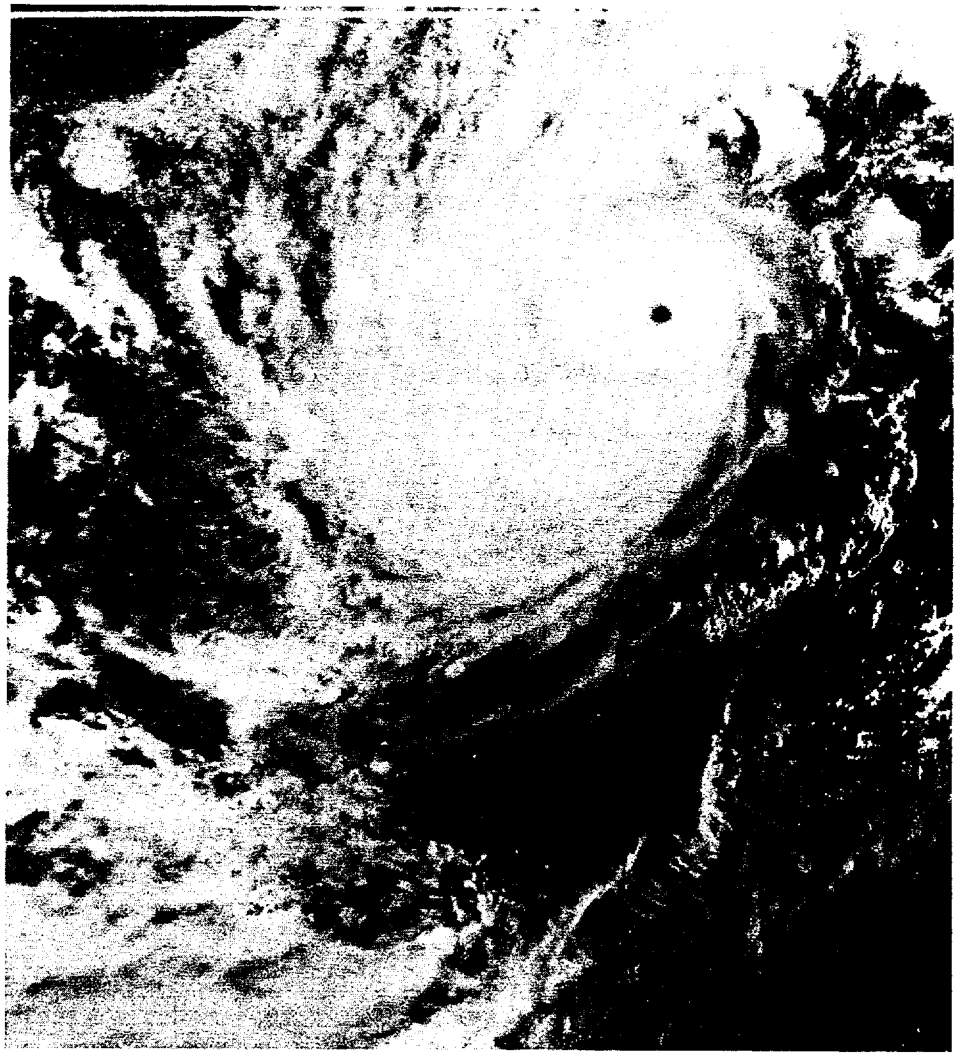
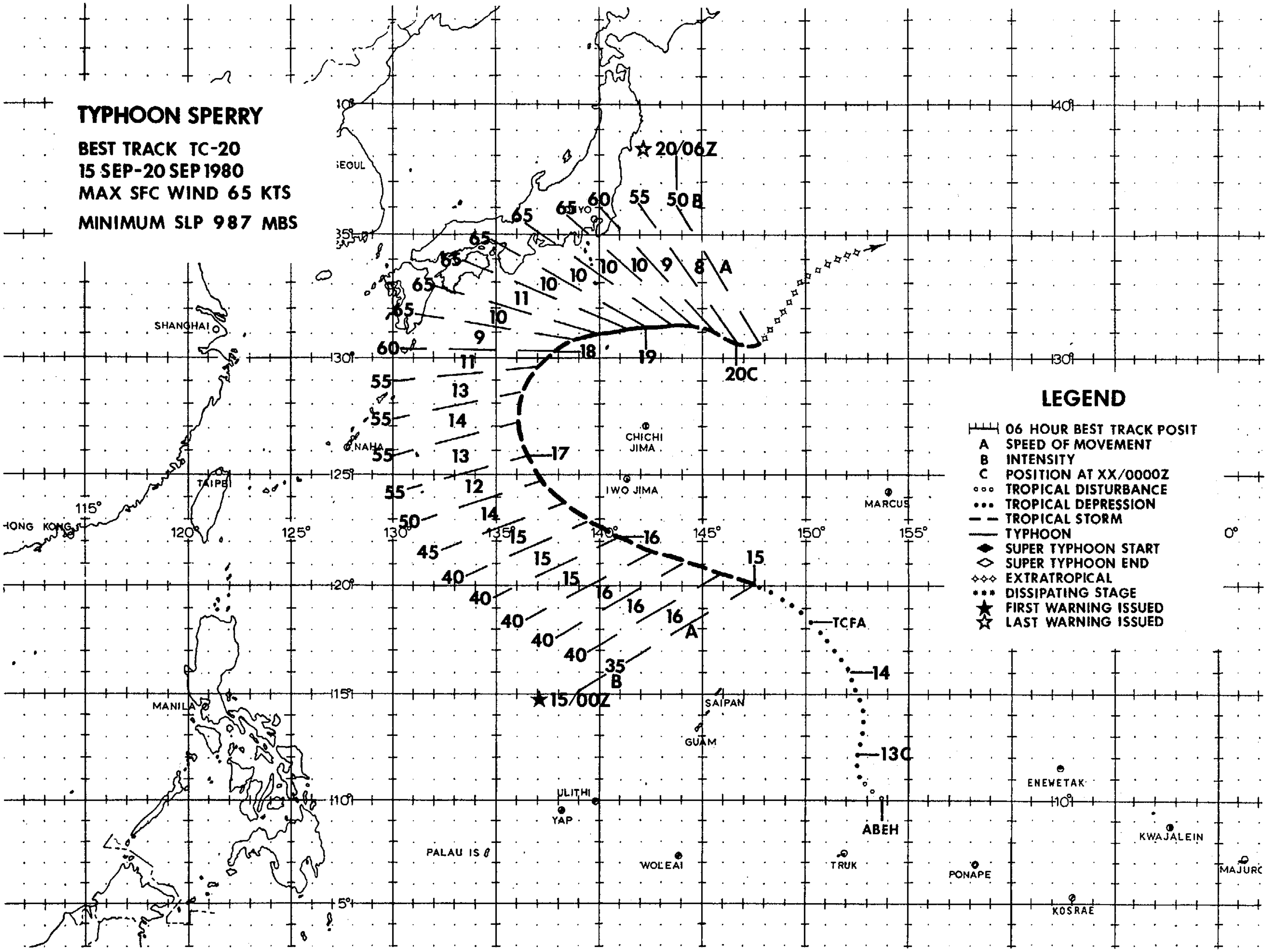


FIGURE 3-19-3. Typhoon Percy with 110 kt (57 m/sec) maximum surface winds while intensifying rapidly to near super typhoon strength, 17 September 1980, 0645Z. (Tiros N imagery)

The island of Taiwan so disrupted Percy's low-level inflow that he was never able to significantly re-intensify. Despite emerging over the Formosa Strait, Percy continued to weaken almost as quickly as he had intensified only a day earlier. By 182100Z he had made landfall on the coast of China about 240 nm (444 km) east of Canton, with estimated maximum sustained surface winds of 45 kt (23 m/sec). Percy continued to track inland and dissipated several hours later over the mountains of Mainland China.

Newspaper accounts of Typhoon Percy's landfall over southern Taiwan indicated 7 dead and 16 injured. Heavy rain accompanying Percy damaged 140 homes, flooded rice fields, and destroyed banana crops.


TYPHOON SPERRY
BEST TRACK TC-20
15 SEP-20 SEP 1980
MAX SFC WIND 65 KTS
MINIMUM SLP 987 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
15/00Z
20/06Z
TCFA
ABEH
13C
14
15
16
17
18
19
20C
SEOUL
SHANGHAI
TAIPEI
HONG KONG
NAHA
MANILA
CHICHI JIMA
IWO JIMA
MARCUS
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
WOLEAI
TRUK
PONAPE
KOSRAE
ENEWETAK
KWAJALEIN
MAJURO

Typhoon Sperry developed in the monsoon trough east-southeast of Guam. The disturbance was first reported in the Significant Tropical Weather Advisory (ABEH PGTW) on 12 September as an area of showers and thundershowers. Sparse synoptic data did not indicate that a surface circulation existed at that time. However, the upper-air pattern was favorable for continued development. Sperry developed slowly and was described in the ABEH PGTW on 14 September as a large surface circulation with little organized convection. A well-defined upper-level anticyclone, which provided a good outflow mechanism for continued development, existed over Sperry.

The initial warning for Tropical Depression 20 was issued at 150000Z. Post-analysis indicates that Sperry had actually attained tropical storm strength of 35 kt (18 m/sec) by that time. The 141200Z 500 mb analysis (Fig. 3-20-1) and the 72-hour numerical forecast series (see Fig. 3-20-2) suggested that a straight forecast track toward Kyushu, Japan was most likely because the forecast series built the subtropical ridge northwestward toward Japan. Thus, on the initial warning, Sperry was forecast to track along the southern periphery of the 500 mb subtropical ridge. An early recurvature track was not considered likely due to the forecast intensification of the subtropical ridge.

By 160000Z, it was evident that the subtropical ridge was not building as forecast. Southerly steering flow was evident south and east of Japan. Sperry was being steered by the mid-level southeasterly flow and was ex-

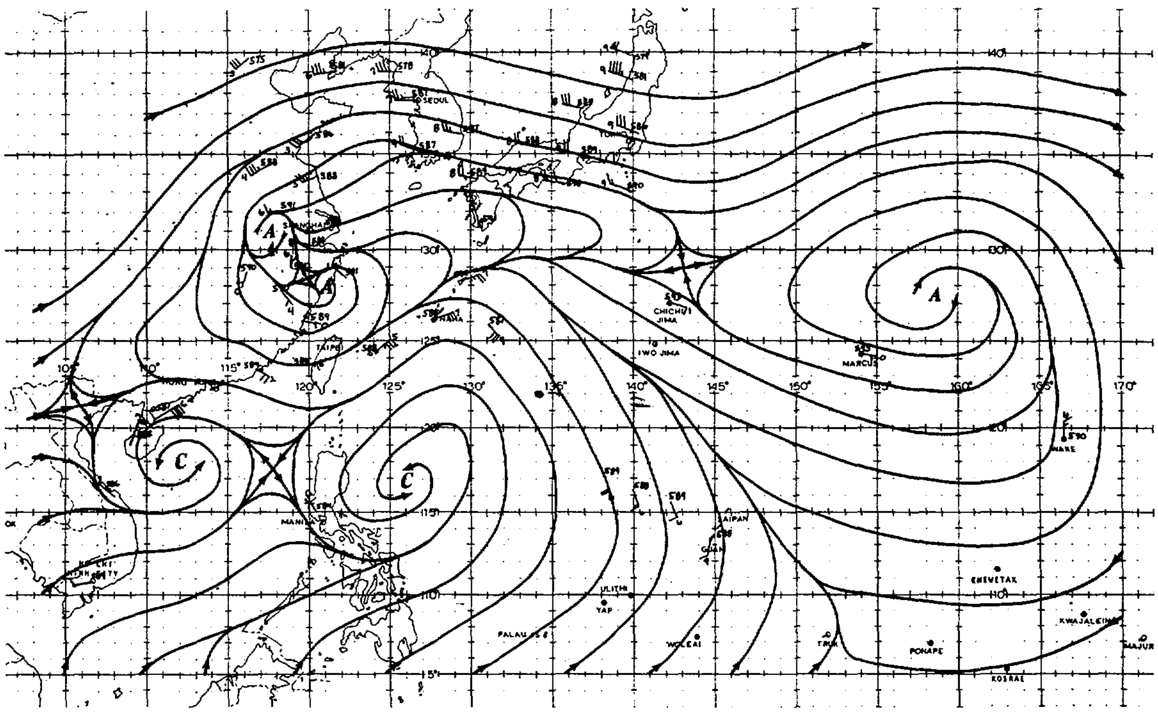


FIGURE 3-20-1. The 141200Z September 1980 500 mb streamline analysis. Wind speeds are in knots.

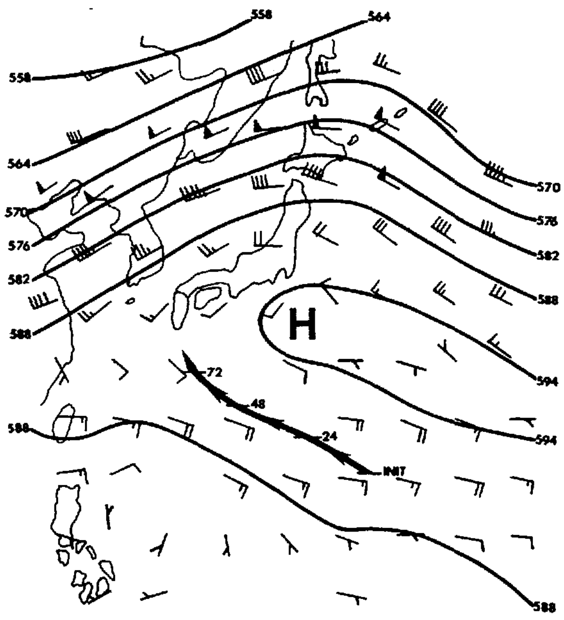


FIGURE 3-20-2. The 48 hour 500 mb numerical forecast chart based on the 141200Z September 1980 computer analysis. JTWC's 150000Z September forecast track for Sperry is also indicated, from initial position to the 72 hour forecast position.

pected to continue to follow a north-northwestward track until he moved north of the ridge axis. Then strong mid-level westerlies were expected to dominate. Therefore, a recurvature track and a weakening tendency over Japan was forecast. This change to a recurvature track was supported by the 161200Z 500 mb analysis (Fig. 3-20-3) and the 72-hour numerical forecast series (see Fig. 3-20-4). Sperry did, in fact, recurve, but significantly south of Japan as the subtropical ridge retreated to the southeast. This discussion of the forecast tracks for Sperry illustrates the difficulties that JTWC encounters both in analyzing the axis of the subtropical ridge in data sparse regions and interpreting the guidance from numerical forecasts for the same region.

As Sperry began to recurve on the 17th, the estimated maximum surface wind speeds were consistently higher than supported by the maximum wind/minimum sea-level pressure (MSLP) relationship of Atkinson and Holliday (1977). Maximum winds of 65 kt (33 m/sec) and MSLPs of 992 mb were observed by aircraft reconnaissance. A MSLP of 992 mb corresponds to a maximum wind of 45 kt (see Fig. 3-05-2). These stronger winds were probably due to an increased pressure gradient resulting from the higher environmental pressures at subtropical latitudes.

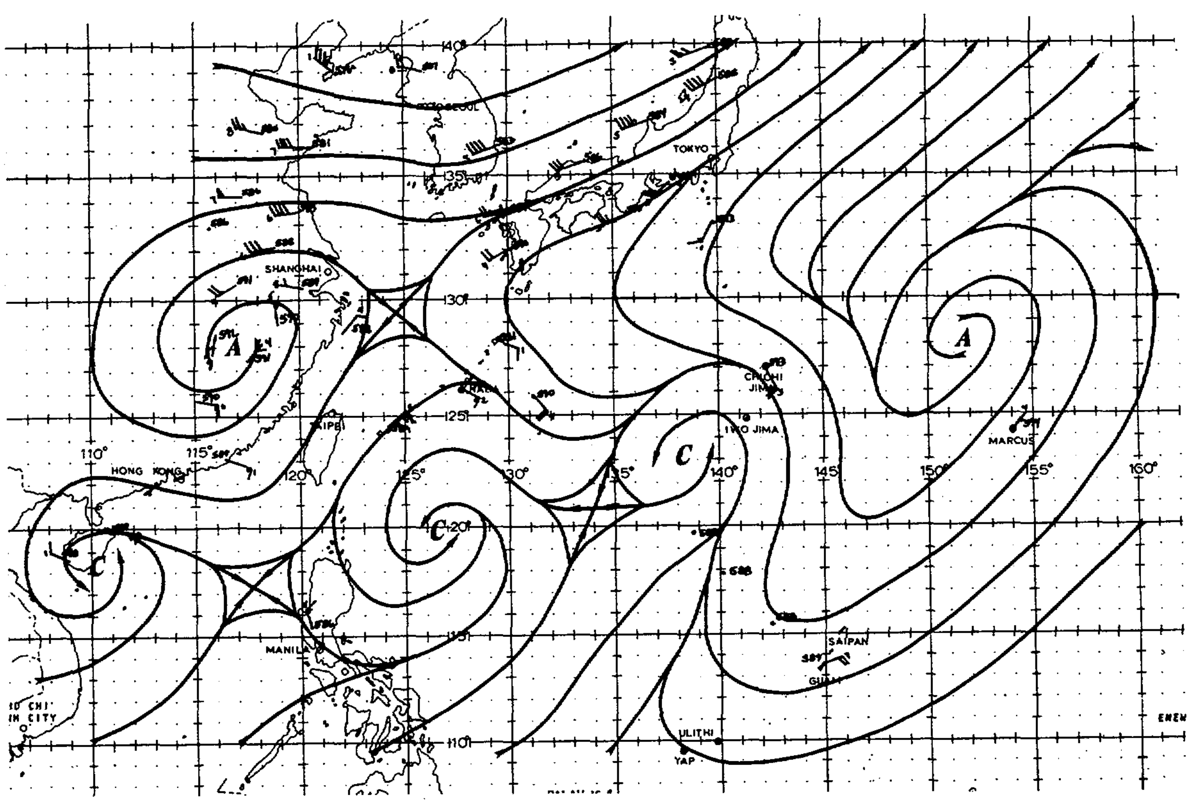


FIGURE 3-20-3. The 161200Z September 1980 500 mb streamline analysis. Wind speeds are in knots.

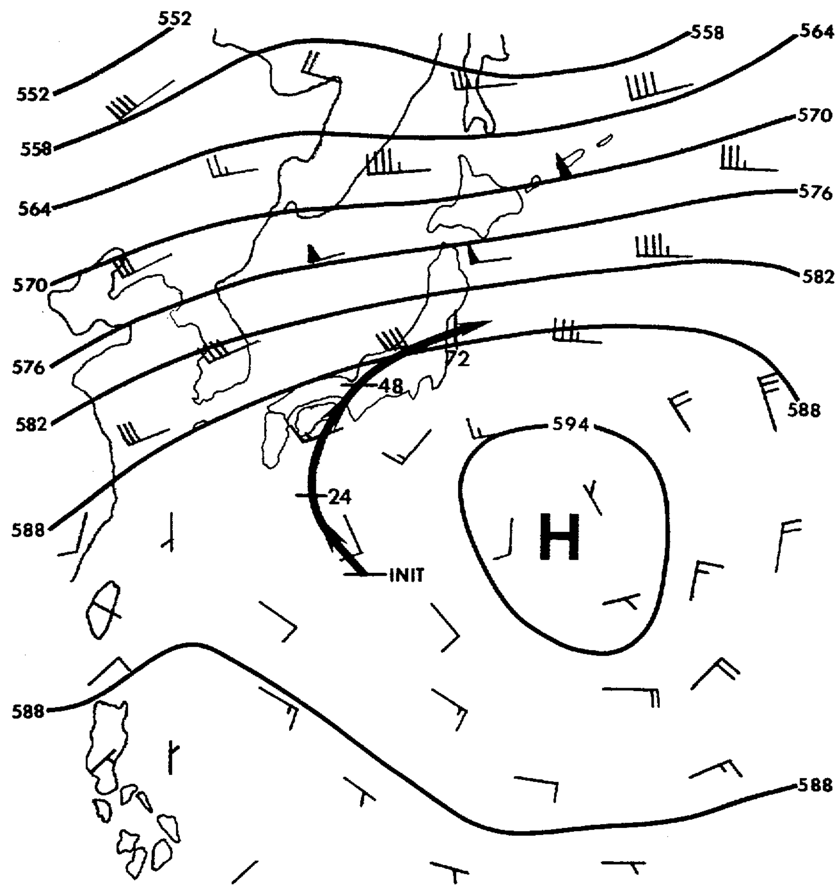
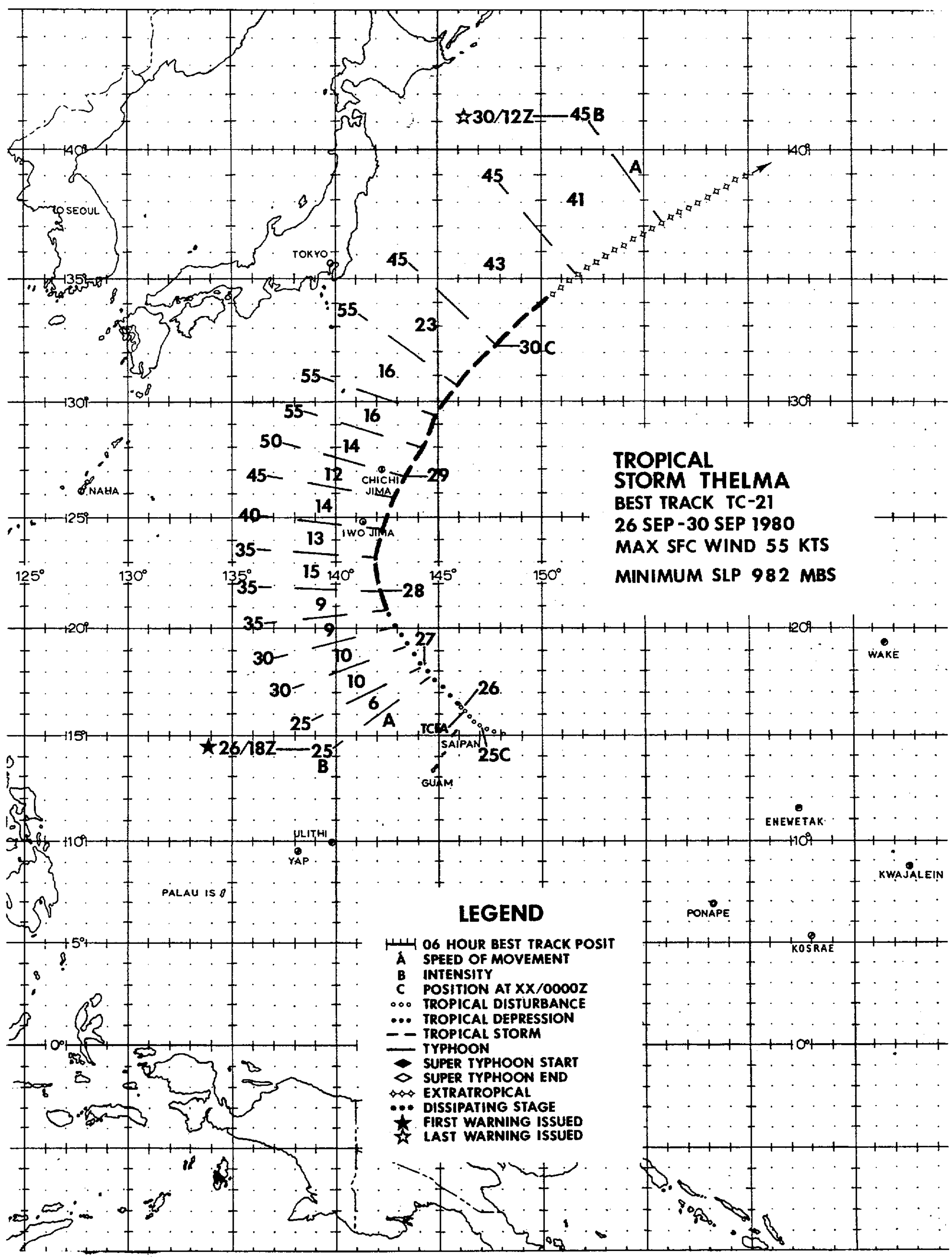


FIGURE 3-20-4. The 48 hour 500 mb numerical forecast chart based on the 161200Z September computer analysis. JTWC's 170000Z September forecast track for Sperry is also indicated, from initial position to the 72 hour forecast position.

Sperry did not begin to weaken significantly until the 19th because his eastward movement kept him over warmer water for a longer period of time and also kept him south of the strong mid- to upper-level westerlies which would have weakened him due to strong vertical wind shear.


TROPICAL
STORM THELMA
BEST TRACK TC-21
26 SEP-30 SEP 1980
MAX SFC WIND 55 KTS
MINIMUM SLP 982 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
☆30/12Z—45B
★26/18Z—25
SEOUL
TOKYO
NAHA
CHICHI JIMA
IWO JIMA
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
WAKE
ENEWETAK
KWAJALEIN
PONAPE
KOSRAE

Thelma began as a disturbance in the monsoon trough approximately 100 nm (185 km) north-northeast of Saipan. Although Thelma's forecast track posed few problems, analysis of the cyclone was not straight-forward due to Thelma's very abnormal structure.

Satellite imagery began showing intensification of convective activity in the maximum cloud zone within the latitude belt 10-20N from southeast Asia to the Marshall Islands on 23 September. A significant area of convection developed in the monsoon trough near Saipan early on 23 September. This convection gradually increased and began suggesting the presence of a surface circulation later on the same day. Data at 500 mb, however, indicated that the curvature in the cloud signature was associated with a mid-tropospheric circulation as no circulation was apparent from surface/gradient wind data. A circulation at the surface/gradient level was finally analyzed just south of Guam at 241200Z. By 250000Z, the low-level circulation that produced Thelma was analyzed over the Northern Mariana Islands (Fig. 3-22-1). This circulation continued to develop and drift westward while becoming the dominant circulation in that portion of the monsoon trough.

From her onset, Thelma did not display classical tropical storm characteristics. Height gradients observed by reconnaissance aircraft at 700 mb were very flat; thus maximum winds near the center were significantly lower than suggested by the central sea-level pressure (Atkinson and Holliday, 1977). Also, the maximum wind band was some distance away from the center, and the 700 mb temperature field showed higher temperatures outside the cyclone center for most of the early aircraft penetrations. Table 3-3 presents a summation of aircraft data and highlights the points presented above. Figure 3-22-2 shows the reconnaissance data plot for the last daylight penetration of Thelma. The wind field and other data presented on the plot are fairly representative of Thelma's entire life.

As previously stated, Thelma's track presented no real problems. Streamline analyses at 500 mb showed that Thelma developed just south of a break in the subtropical ridge. After following a northwesterly course, Thelma first turned northward and almost immediately thereafter began to track northeastward. Cyclogenesis/frontogenesis occurred simultaneously in a baroclinic zone that persisted throughout Thelma's life in the area from Okinawa northeastward to a point off the coast of Japan. The continual presence of this surface trough appears to be one of the factors that directed Thelma's northeastward movement (Fig. 3-22-3). Upper-level steering was provided by relatively strong westerlies which reached south to the Bonin and Volcano Islands. During her northeast trek, Thelma reached maximum intensity of 55 kt (28 m/sec). Further intensification was probably suppressed by restrictions on her upper-level outflow. Thelma continued to accelerate toward the northeast and transitioned into an extratropical low pressure system by 0400Z on 30 September.

TABLE 3-3

Date/Time	Maximum Temperature: Inside Center °C	Maximum Temperature: Outside Center °C	Central Pressure MB	Intensity (KT): Observed Surface	Intensity (KT): Atkinson/Holliday	Bearing/Range of MAX FLT LVL Wind (DEG/NM)
27/1530Z	12	13	993	N/O	42	100/136
28/0308Z	14	15	989*	30	48	320/110
28/1418Z	12	15	987	N/O	50	240/40
29/0258Z	14	10	982	55	57	350/110
29/1500Z	13	13	981*	N/O	59	120/150

Aircraft data extracted from detailed vortex messages and peripheral data observations. (Asterisks indicate **central pressure** extrapolated from 700 mb data.)

FIGURES 3-22-1, 3-22-2 and 3-22-3 are on the following pages.

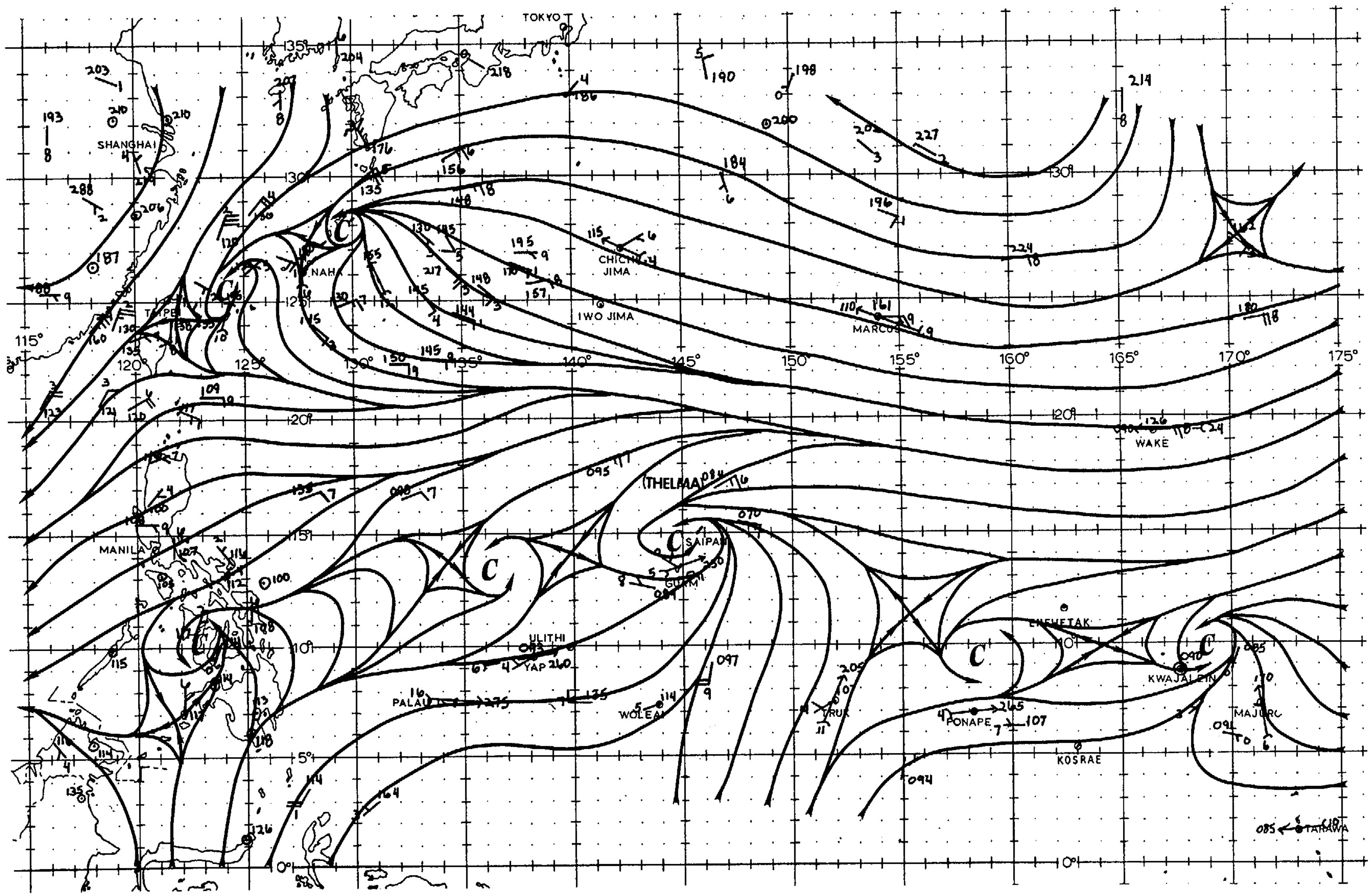


FIGURE 3-22-1. The 250000Z September 1980 surface (←—— ‖) / gradient-level (ddd←—— ‹ff) wind data and streamline analysis. Wind speeds are in knots.

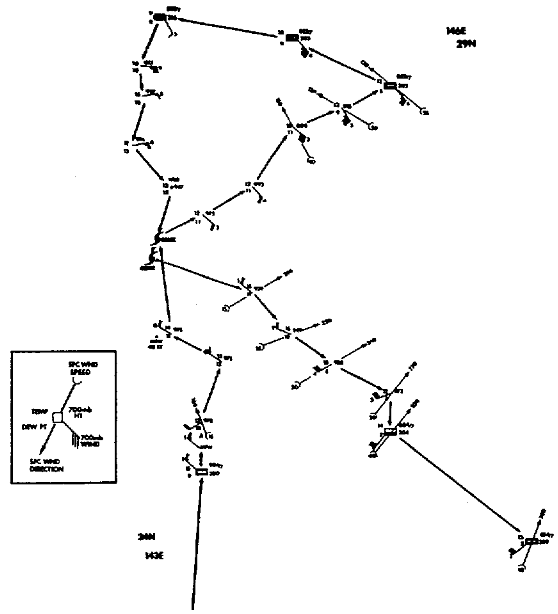


FIGURE 3-22-2. Plot of aircraft reconnaissance data for the 290300Z September 1980 fix of Tropical Storm Thelma.

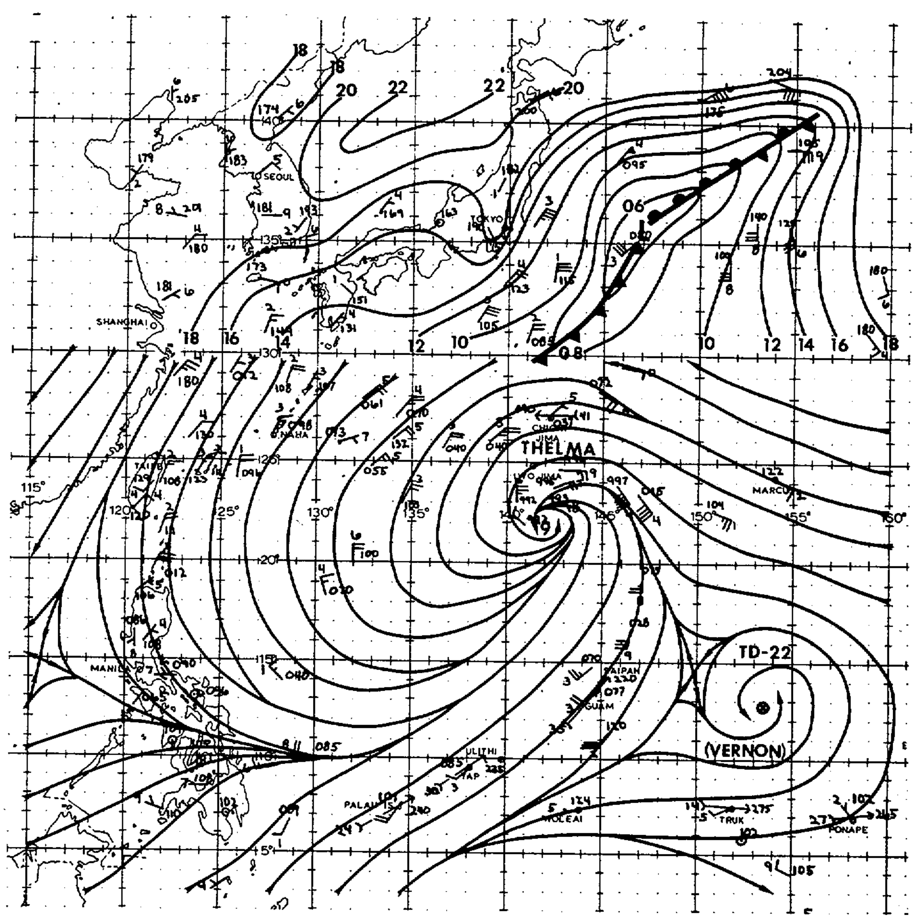
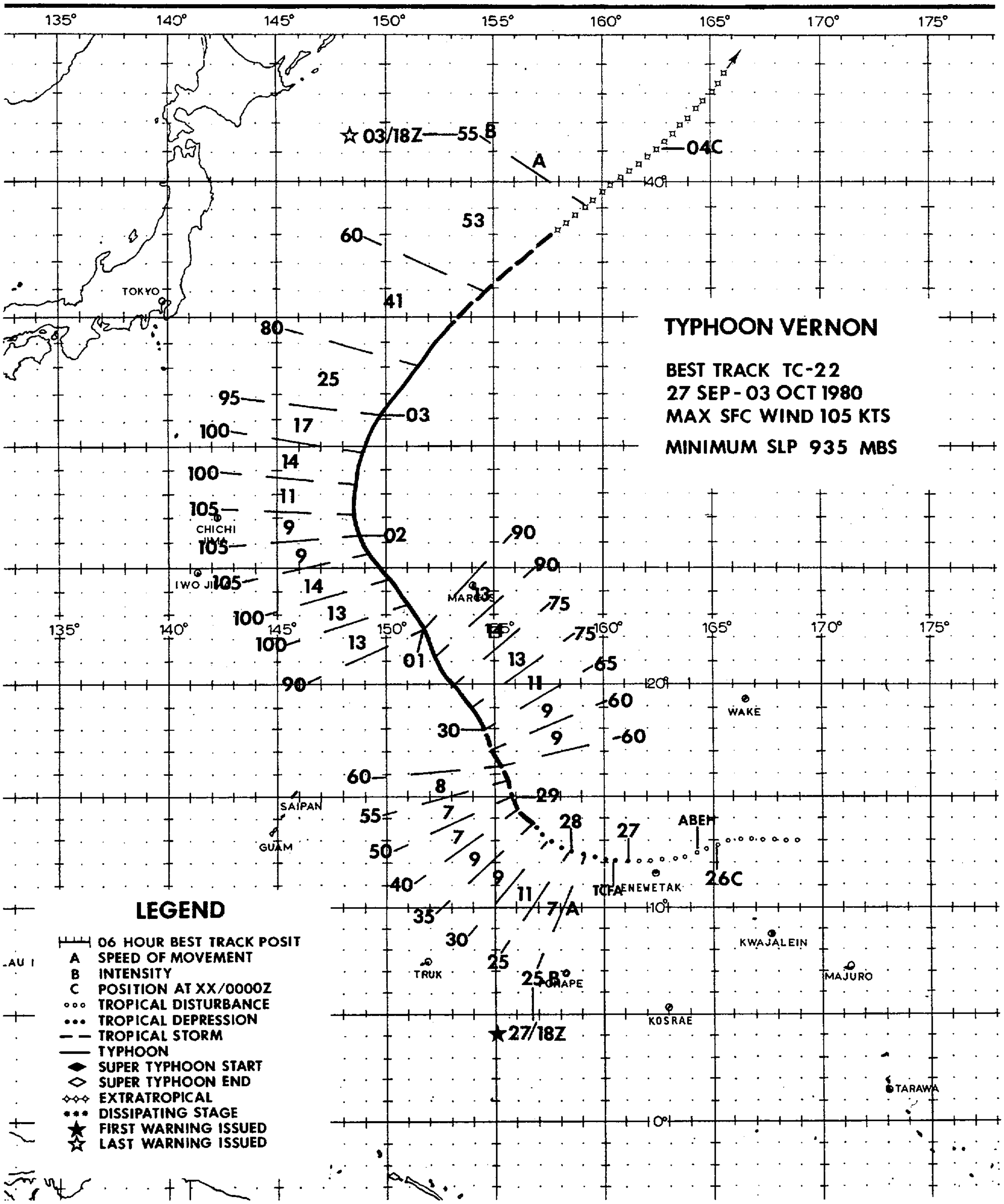


FIGURE 3-22-3. The 280000Z September 1980 surface (——) /gradient-level (ddd←——(ff) wind data and streamline analysis. Winds speeds are in knots.


TYPHOON VERNON
BEST TRACK TC-22
27 SEP - 03 OCT 1980
MAX SFC WIND 105 KTS
MINIMUM SLP 935 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
03/18Z
27/18Z
TOKYO
CHICHI JIMA
IWO JIMA
MARCUS
SAIPAN
GUAM
TRUK
PONAPE
KOSRAE
ENEWETAK
KWAJALEIN
MAJURO
WAKE
TARAWA
TCFA
ABEH

During the latter part of summer, tropical cyclone activity in the northwestern Pacific reaches its peak. Multiple circulations develop within the Near Equatorial Trough and two (or more) cyclones of tropical storm or typhoon strength often exist at the same time.

If one tropical cyclone is located to the northwest of another developing circulation, it usually dominates and prevents the system to the southeast from intensifying as rapidly as it normally would. This is due primarily to the upper-level outflow from the system to the northwest which enhances the climatological northwesterlies and restricts the outflow channels of the cyclone located to the southeast. The cyclone to the northwest is also, generally, the older of the two and has the opportunity to establish control of the low-level inflow. The development of the system to the southeast is, therefore, delayed until the other cyclone either weakens or moves far enough away from the tropics that its influence becomes insignificant (see Roger and Tip, 1979 and Lex and Marge, 1980). Typhoon Vernon and Tropical Storm Thelma engaged in just such an interaction during the end of September and beginning of October.

Vernon was first observed, as an area of increased thunderstorm activity, about 200 nm (370 km) northeast of Eniwetok Atoll on 26 September. Initial movement was westward at about 7 kt (13 km/hr). As the convection continued to organize, a Tropical Cyclone Formation Alert (TCFA) was issued at 270600Z, and the first warning followed 12 hours later.

During that period, Tropical Storm Thelma was developing north of Guam. Thelma, although never more than tropical storm strength, nonetheless had a huge associated cyclonic circulation pattern which extended to at least the 500 mb level and covered most of the area between the Philippine Islands and Guam, and as far north as southern Japan. Because Thelma covered such a large area and was located to the northwest of Vernon, she robbed him of strong low-level inflow and restricted the upper-level outflow in his northwest semicircle in the manner described above.

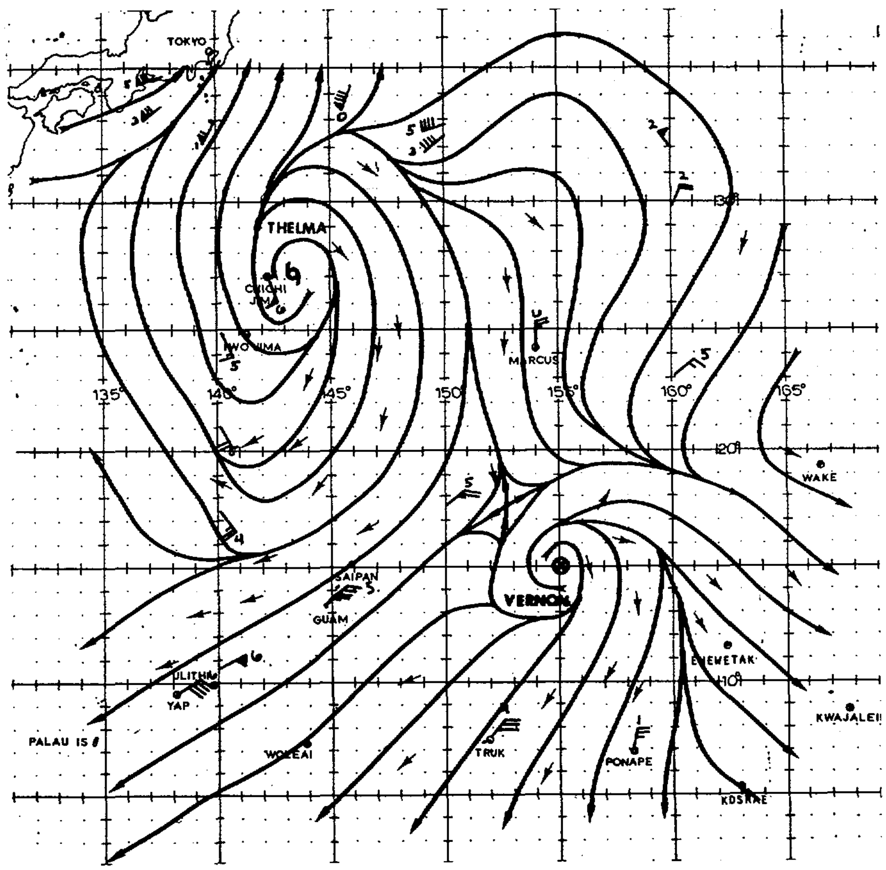


FIGURE 3-22-1. Upper-level streamline analysis (near the 200 mb level) at 290000Z September 1980. Data are rawinsonde and aircraft winds ( ) and satellite-derived wind vectors ( ). Winds are in knots.

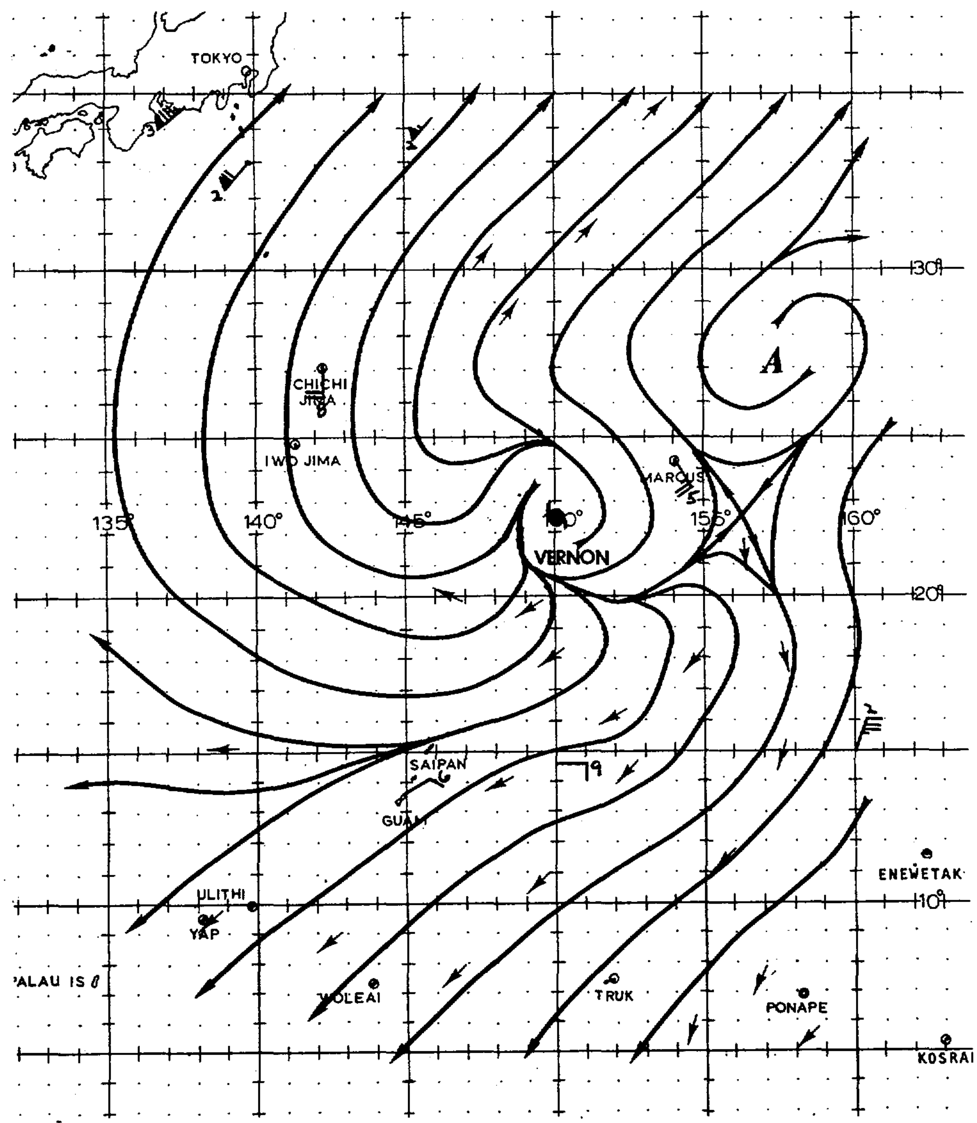


FIGURE 3-22-2. Upper-level streamline analysis (near the 200 mb level) at 011200Z October 1980. Data are rawinsonde and aircraft winds ( ) and satellite-derived wind vectors ( ). Winds are in knots.

After the 28th, Vernon began tracking more northwestward as he moved into the mid-level trough which was associated with Thelma. Thelma helped to maintain this trough throughout her lifetime as indicated by reconnaissance aircraft and the few island reporting stations in the vicinity. Vernon was steered by the southeasterly winds on the east side of this trough until 021200Z October. At that time, he came in contact with the southern extension of the mid-latitude jet-stream which accelerated him to the north-east, eventually to 53 kt (98 km/hr).

Figures 3-22-1 and 3-22-2 show a dramatic change which took place in the upper-level flow pattern; the outflow from Thelma initially restricted Vernon's outflow in his northwest semicircle (Fig. 3-22-1), but by 011200Z, Thelma had moved off to the northeast. This opened up an outflow channel to the north and northwest (Fig. 3-22-2) which enabled Vernon to reach his maximum intensity of 105 kt (54 m/sec) (Fig. 3-22-3). Without the influence of TS Thelma, Vernon most probably would have reached maximum intensity earlier and maintained it longer.

Vernon made the transition to an extra-tropical system quite rapidly. Satellite imagery showed that he lost almost all of his heavy convection between 031200Z and 031800Z. Ship reports off the coast of Japan indicated that the remnants of Vernon continued to maintain gale force winds until 5 October.

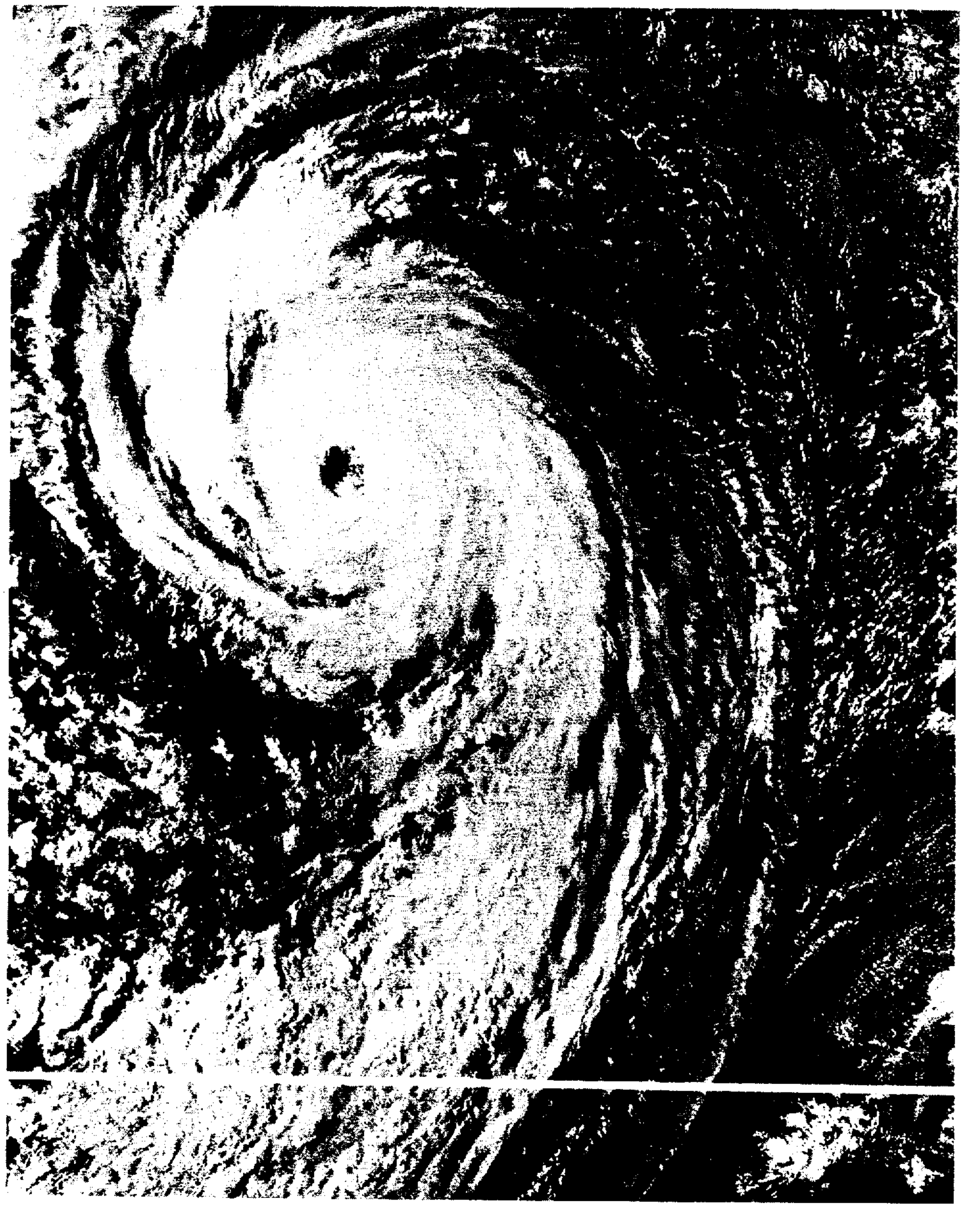
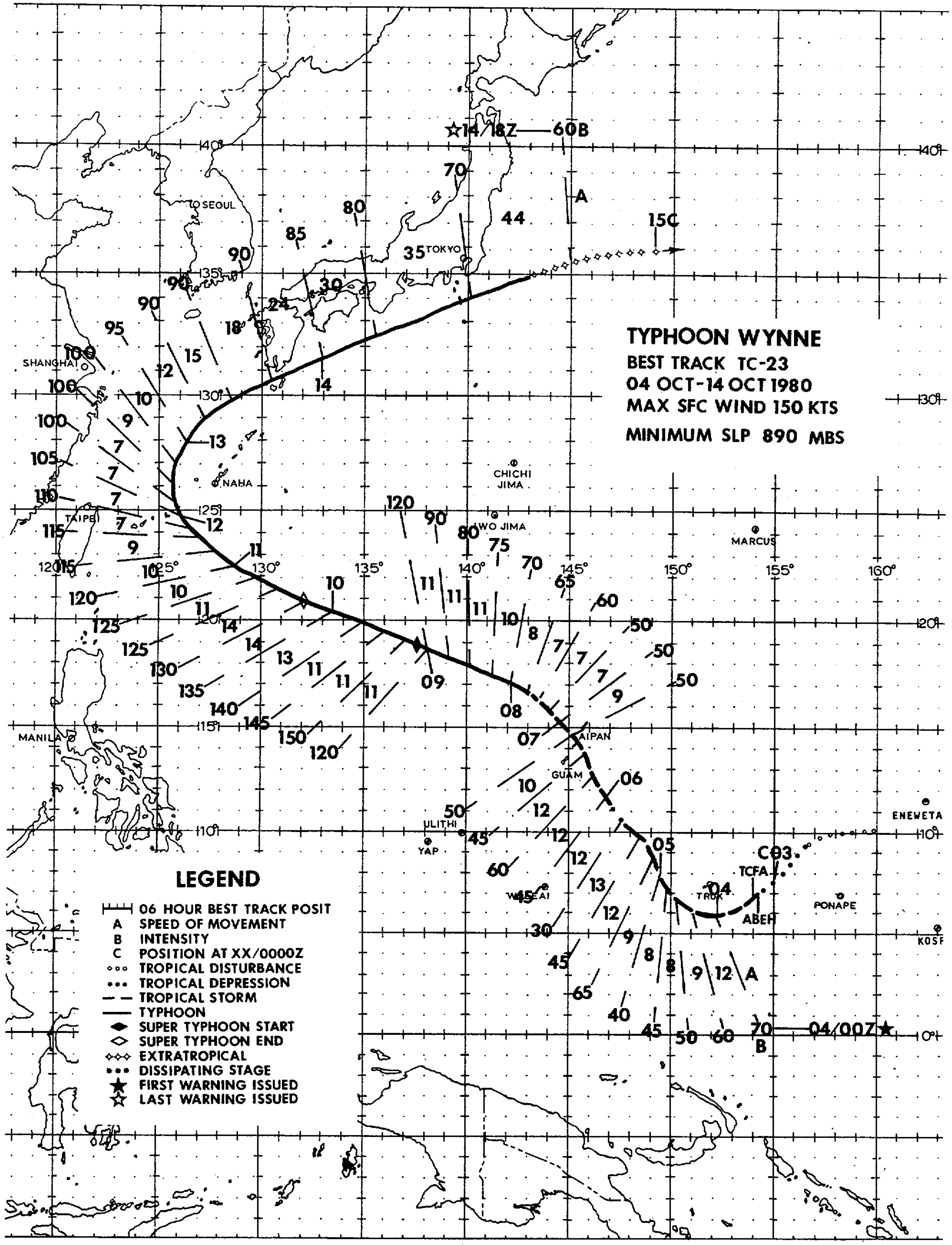


FIGURE 3-22-3. *Typhoon Vernon, with a 40 nm (74 km) ragged eye, at maximum intensity of 105 kt (54 m/sec), 01 October 1980, 2216Z. (NOAA6 imagery)*


TYPHOON WYNNE
BEST TRACK TC-23
04 OCT-14 OCT 1980
MAX SFC WIND 150 KTS
MINIMUM SLP 890 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
14/18Z—60B
04/00Z
TCFA
SEOUL
TOKYO
SHANGHAI
NAHA
CHICHI JIMA
IWO JIMA
MARCUS
TAIPEI
MANILA
SAIPAN
GUAM
ULITHI
YAP
WOLEAI
TRUK
PONAPE
ENEWETAK
KOSRAE

The disturbance that eventually developed into Super Typhoon Wynne was evident on satellite imagery as early as 1800Z on 30 September, although at that time, it appeared to be simply enhanced convection embedded in the convergent inflow into Typhoon Vernon located 1000 nm (1852 km) to the northwest. By 020000Z October, however, the disturbance had separated from the inflow into Vernon, and by 021200Z, the convective activity had increased in organization with good curvature and upper-level outflow evident from satellite data.

The small scale of the disturbance and the tightness of the circulation that characterized Wynne during most of her life prevented the circulation from appearing on synoptic analyses and led to an underestimation of severity during her formative stage. These facts heavily influenced the decision to delay the issuance of a Tropical Cyclone Formation Alert for 21 hours, although post-analysis indicates that tropical storm strength was achieved as early as 030600Z.

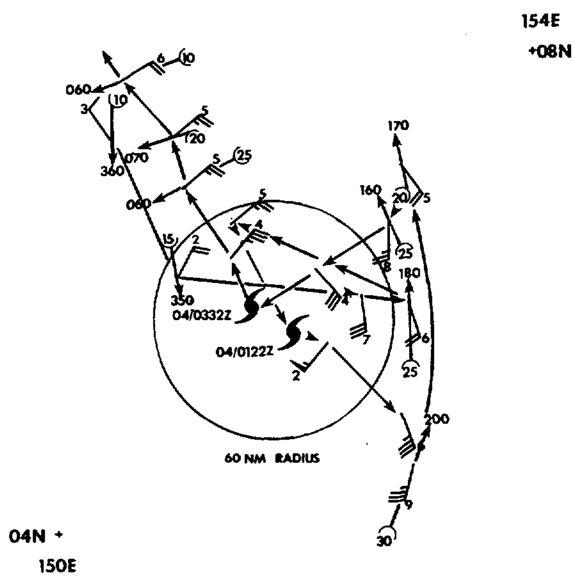


FIGURE 3-23-1. Plot of aircraft reconnaissance data for the 040122Z and 040332Z October 1980 fixes of Tropical Storm Wynne.

Because of her proximity to Guam, numerous aircraft reconnaissance missions were flown into the developing tropical cyclone. This extensive coverage confirmed Wynne's small circulation (Fig. 3-23-1 and 3-23-2) and permitted JTWC to monitor her development very closely.

Although Typhoon Lex may have been the most interesting cyclone of the year in terms of movement, Super Typhoon Wynne proved to be the most unusual in terms of intensity oscillations. As shown in Figure 3-23-3, Wynne's early stage of development was characterized by short periods of rapid intensification and weakening, rather than by a typical smooth, gradual intensification. From 3 October to 7 October, Wynne's intensity and convective activity fluctuated significantly, as she attained typhoon or near typhoon strength only to weaken to near tropical depression intensity three times following a diurnal cycle. Although not as marked as the oscillations in the observed maximum winds, the minimum sea level pressure also exhibited a cyclical oscillation that closely approximated the periodicity of the maximum winds.

There have been documented cases of tropical cyclones exhibiting intensity variations (Holliday, 1976). However, these occurrences were limited to well-developed typhoons with minimum sea level pressures below 970 mb and with a single weakening-reintensifying cycle.

An examination of the satellite imagery during this period of large short-term changes in intensity (Figure 3-23-4) reveals that maximum activity in deep convection occurred in the early morning hours (0700 to 0800 local time) with a minimum in the evening hours (1900 to 2000 local time). An increase in cirrus toward the late afternoon (1600 local time) was also evident. These observations agree with the findings of Arnold (1977). Although Arnold found no evidence of intensity change accompanying the change in cirrus or deep convection, significant intensity change was observed in the case of Wynne with a lag of 6 to 8 hours between maximum convective activity and maximum observed winds.

Wynne's third and final period of weakening occurred as she tracked 45 nm (83 km) northeast of Guam. This weakening, combined with her small circulation, resulted in Wynne having virtually no effect on Guam. Wynne continued to intensify rapidly following her third reintensification cycle at 071800Z, attaining super typhoon strength just 30 hours later and a peak intensity of 150 kt (77 m/sec) in another 6 hours. Figure 3-23-5 depicts Wynne near maximum intensity about 490 nm (908 km) southeast of Okinawa. Minimum sea level pressure (MSLP) during this 35-hour period dropped from 982 mb to 890 mb - a 31 mb/12 hr fall.

JTWC's Theta E (θ_e)/MSLP study once again accurately predicted this explosive deepening as the θ_e and MSLP trace intersected at 081400Z. Wynne's intensity peaked 16 hours after the time of intersection with the surface winds increasing by 85 kt (44 m/sec) and the MSLP falling another 62 mb.

As Wynne tracked north-northwestward past Guam, she was expected to move through

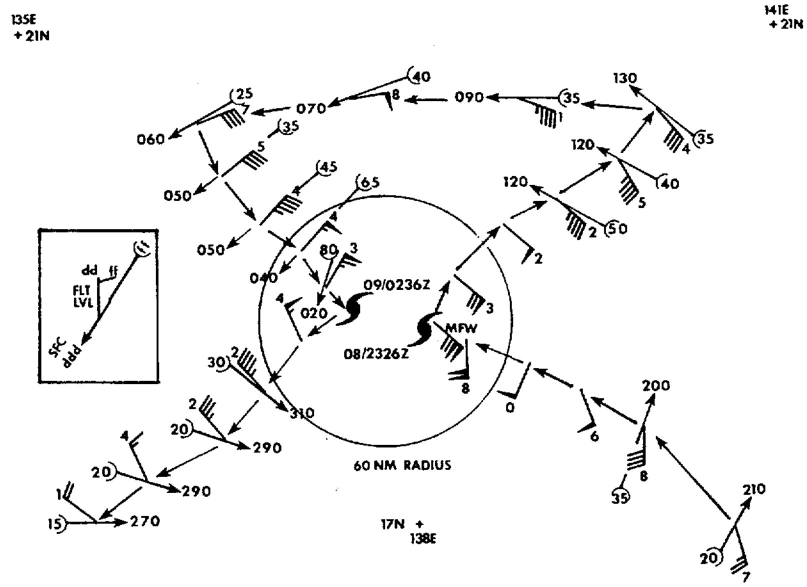


FIGURE 3-23-2. Plot of aircraft reconnaissance data for the 082326Z and 090236Z October 1980 fixes of Typhoon Wynne.

an apparent weakness in the subtropical ridge north of Guam. However, the weakness between 25N and 30N was evidently too far north to permit her to break through the ridge, and she eventually came under the influence of the strong anticyclone located between Okinawa and the Bonin Islands. Post-analysis of available 500-mb data indicates that a change to a more westward forecast track around the southern periphery of the anticyclone could have been made 24 hr earlier. Once the forecast track was changed to reflect the shift in the synoptic flow pattern to a more definitive easterly steering current, JTWC was consistent in accurately predicting recurvature just west of Okinawa. Wynne actually recurved 100 nm (185 km) west of Okinawa, and her slow 7 kt (4 m/sec) bend around the island brought over two days of torrential rain and winds gusting to more than 65 kt (33 m/sec). Very few injuries were reported with farm crops receiving the major wind damage. A small island 30 nm (56 km) northwest of Okinawa and closer to Wynne's path, however, reported winds of 100 kt (51 m/sec) and severe damage.

Once north of the ridge axis, Wynne tracked virtually straight east-northeastward on a heading of 070 degrees. This course kept her approximately 80 nm (148 km) from the coast of Japan. Thirty (15 m/sec) to forty-five kt (23 m/sec) winds were reported by Japanese coastal stations as Wynne accelerated northeastward. Heavy rains claimed several lives and flooded over a thousand homes.

As Wynne accelerated past Japan at speeds exceeding 40 kt (74 km/hr), the vertical wind shear and the influx of cooler, drier air resulted in rapid extratropical transition. A reconnaissance aircraft at 141500Z was unable to find a circulation at 700 mb and satellite imagery at 141800Z revealed no active convection. The remnants of Wynne eventually were absorbed by a developing low pressure system east of Japan.

FIGURES 3-23-3 and 3-23-4 are on the following pages

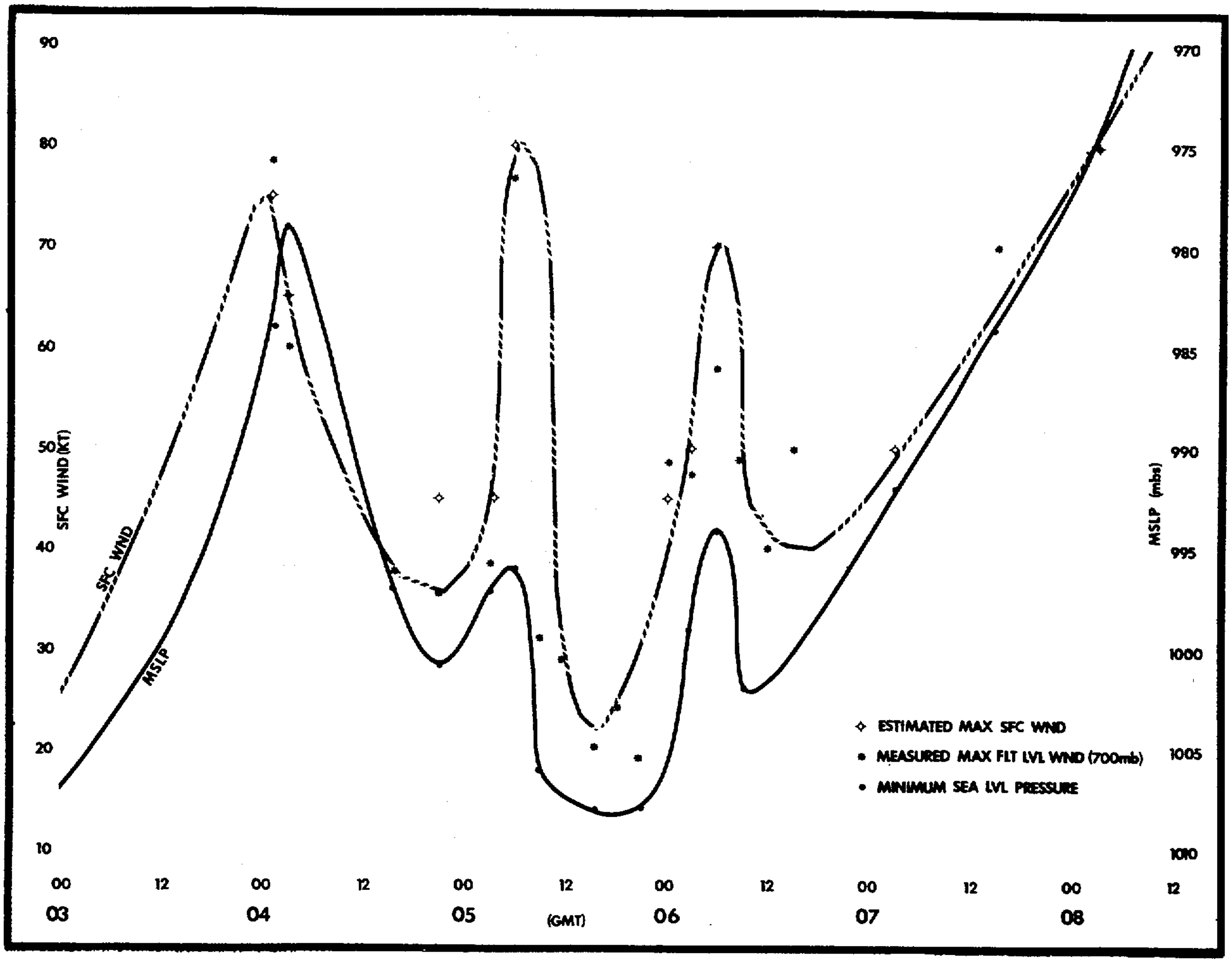


FIGURE 3-23-3. *Smoothed traces of Wynne's maximum wind speed and minimum sea level pressure versus time for the period 3-9 October 1980.*

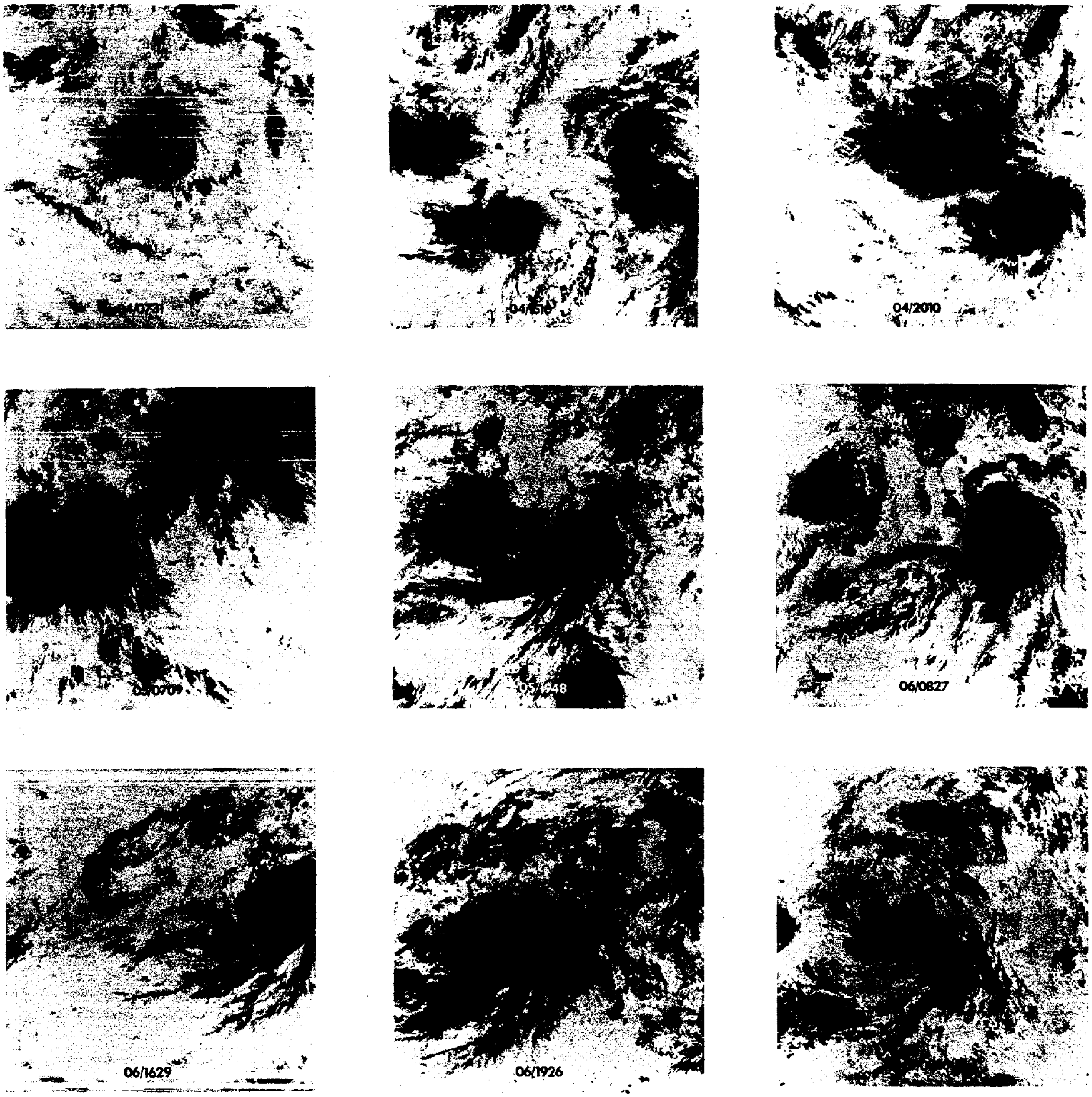


FIGURE 3-23-4. Series of infrared imageries of Wynne during the period of intensity oscillations. The sequence shows definite weakening of the deep convection during the late evening (particularly the 042011 local and 061916 local imageries), followed by a noticeable increase in the convection on the morning satellite imagery. All times local. (NOAA6 and TIROS N imagery)

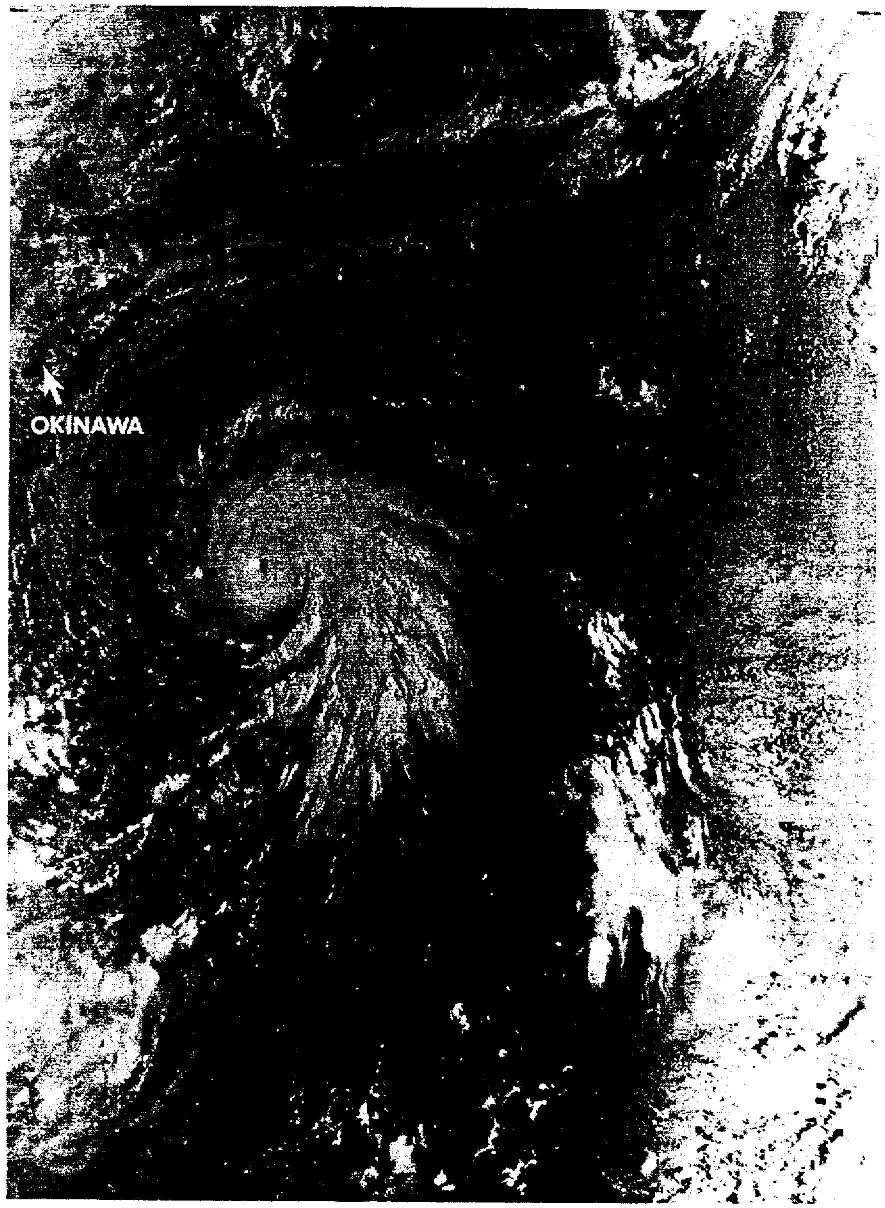
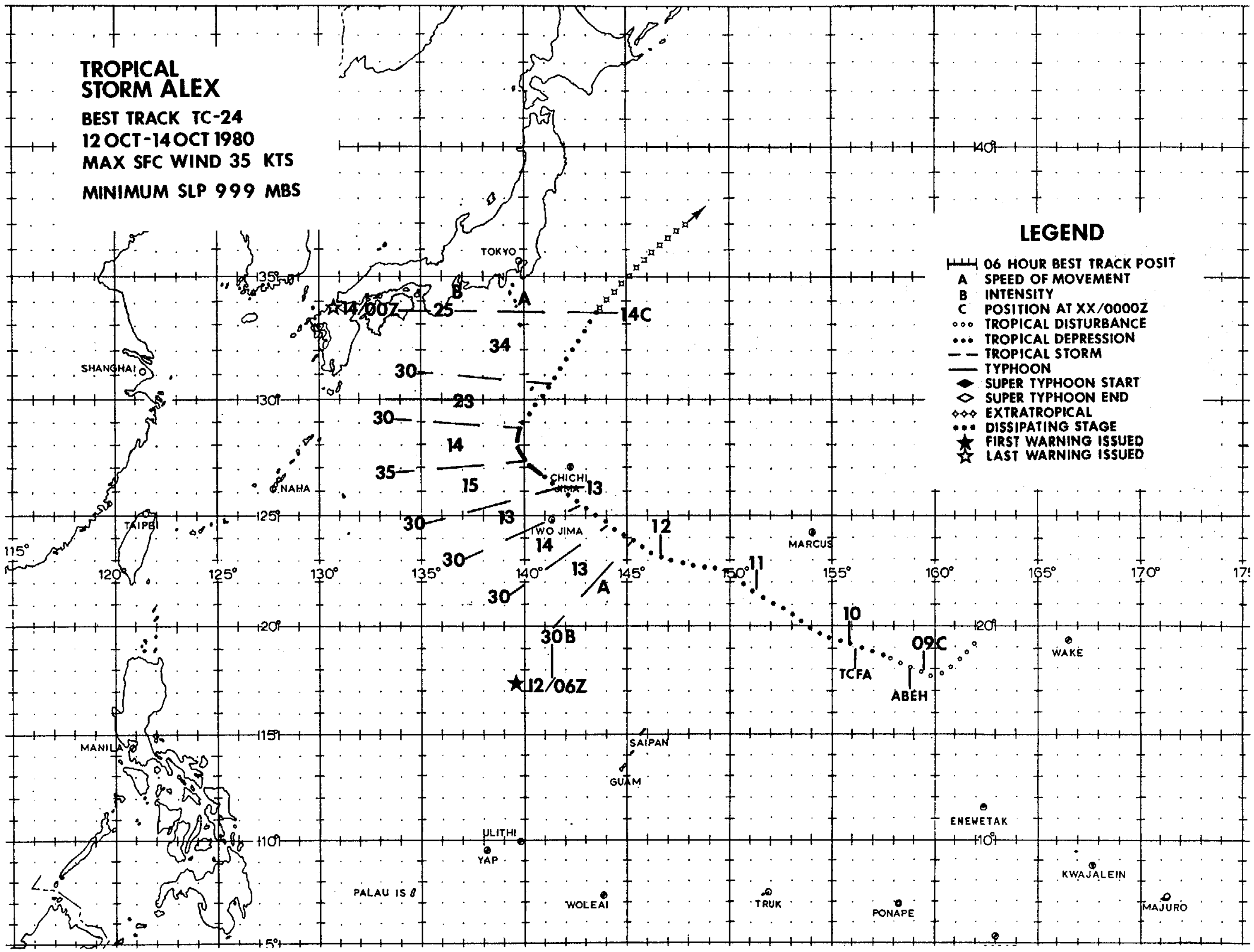


FIGURE 3-23-5. Super Typhoon Wynne near maximum intensity 490 nm (907 km) southeast of Okinawa and 730 nm (1352 km) northwest of Guam, 9 October 1980, 2240Z. (NOAA6 imagery)


TROPICAL
STORM ALEX
BEST TRACK TC-24
12 OCT-14 OCT 1980
MAX SFC WIND 35 KTS
MINIMUM SLP 999 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
14/00Z
25
B
A
14C
34
30
23
30
7
14
35
15
13
12
11
10
09C
TCFA
ABEH
30B
12/06Z
TOKYO
SHANGHAI
NAHA
TAIPEI
CHICHI JIMA
IWO JIMA
MARCUS
WAKE
MANILA
SAIPAN
GUAM
ENEWETAK
ULITHI
YAP
PALAU IS
WOLEAI
TRUK
PONAPE
KWAJALEIN
MAJURO
115°
120°
125°
130°
135°
140°
145°
150°
155°
160°
165°
170°
40
35
30
25
20
15
10
5°

Tropical Storm Alex, the 24th tropical cyclone of 1980, was induced by a Tropical Upper Tropospheric Trough (TUTT) in a manner similar to that described by Sadler (1976). A small disturbed area of convection drifting westward from near 170E was observed on satellite imagery on 7 October. By the 8th, this area had come under the influence of a relatively strong upper-level divergent area generated by a dissipating TUTT cell. The convection increased noticeably with outflow to the north, but little outflow was evident in the southern and western quadrants.

The restricted outflow pattern was characteristic throughout Alex's existence and is attributed to the proximity of Super Typhoon Wynne, which was located west of Alex. Alex's coexistence with Wynne was significant in light of Wynne's overall dominance of the western Pacific region. Wynne absorbed much of the energy that otherwise would have been available to Alex (Fig. 3-24-1).

Satellite imagery showed that the convective area continued to persist until late on the 9th when JTWC issued a Tropical Cyclone Formation Alert (TCFA). Aircraft reconnaissance on the 10th found a weak surface circulation with the associated convection located north and east of the surface center. Nearly the entire western half of the circulation was exposed at that time.

For the following 48 hours, the disturbance intensified gradually and tracked northwestward at 12 kt (22 km/hr). At 120600Z, the first warning was issued for TD 24. Within 24 hours, TD 24 intensified to Tropical Storm Alex with maximum surface winds of 35 kt (18 m/sec). At that time, Alex's low-level circulation center was not exposed to the west, but aircraft reconnaissance encountered only weak convective activity around the circulation's center. During the next 6 hours, Alex recurved to the northeast and weakened to 30 kt (15 m/sec) intensity.

After Alex had recurved, Alex and Wynne were within 800 nm (1482 km) of each other such that a Fujiwhara effect was possible. This was not observed, however, because Alex and Wynne were both beginning to interact with the jet stream which became the dominant steering mechanism over both cyclones. Due to this jet stream, Alex rapidly accelerated northeastward. At 140000Z, JTWC issued the final warning on Alex as he was beginning to transition into an extratropical system. Satellite imagery received after the final warning showed that the transition was very rapid.

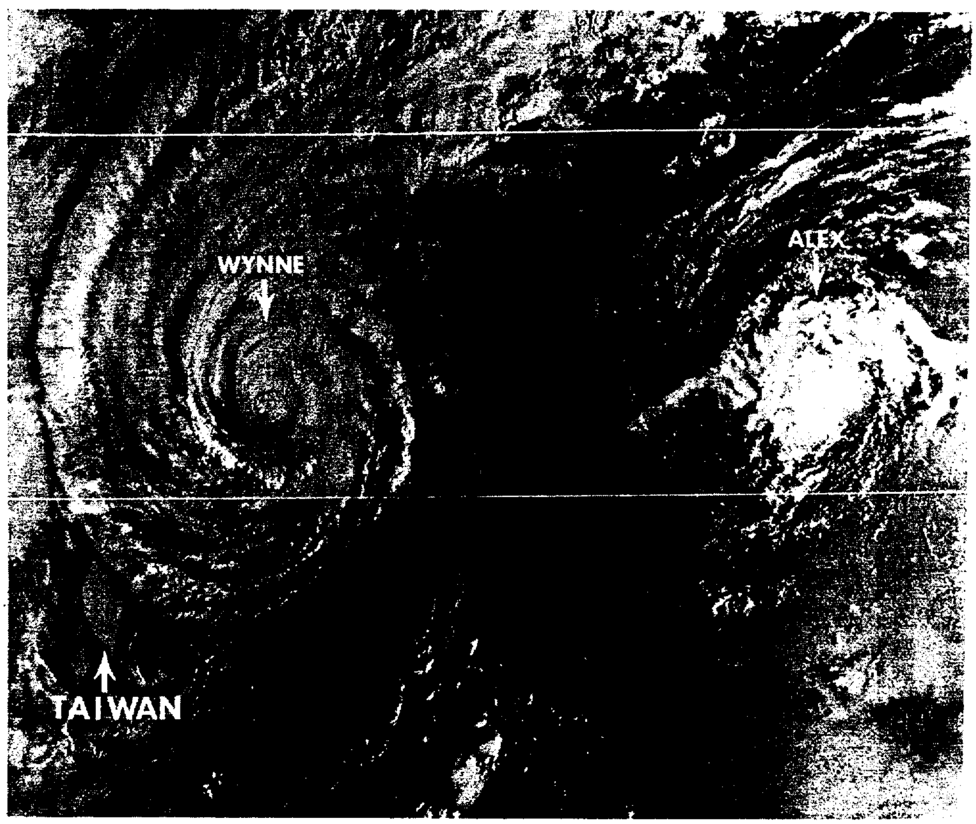
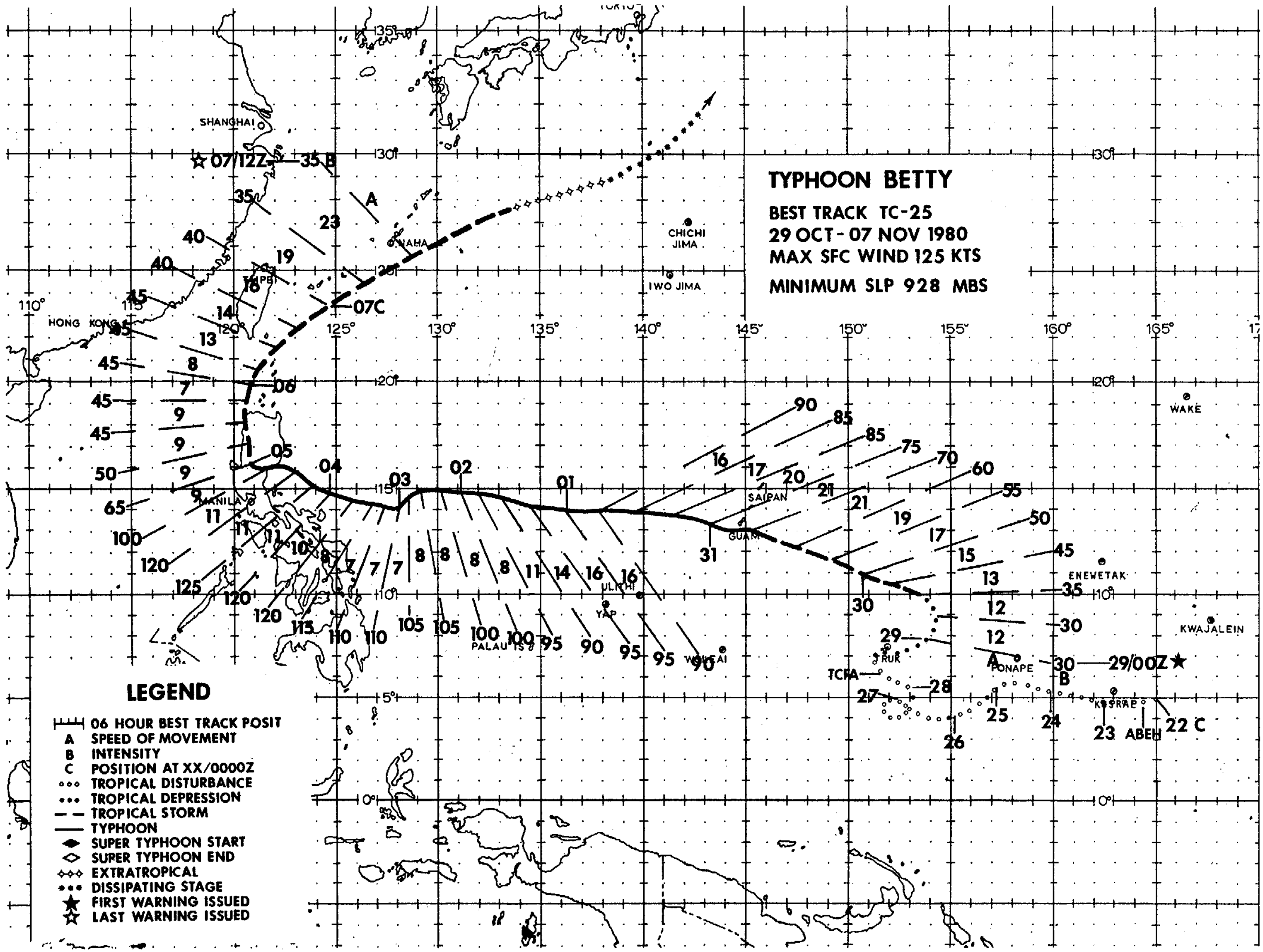


FIGURE 3-24-1. Visual imagery of Tropical Storm Alex at 30 kt (15 m/sec) intensity, 12 October 1980, 2314Z. (NOAA6 imagery)


TYPHOON BETTY
BEST TRACK TC-25
29 OCT - 07 NOV 1980
MAX SFC WIND 125 KTS
MINIMUM SLP 928 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
SHANGHAI
HONG KONG
TAIPEI
MANILA
NAHA
CHICHI JIMA
IWO JIMA
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
WOLEAI
TRUK
PONAPE
KOSRAE
ENEWETAK
KWAJALEIN
WAKE
07/12Z
29/00Z
TCFA
ABEH

Betty, the 25th significant tropical cyclone of 1980, developed east of Truk Atoll from a weak disturbance which had been monitored for almost a week in the eastern Caroline Islands. Just prior to passing south of Guam, Betty attained typhoon strength and then continued to intensify as she tracked into the Philippine Sea. About 12 hours prior to landfall on Luzon, Betty reached her peak intensity of 125 kt (64 m/sec). During the 18 hours that Betty tracked over north central Luzon, she weakened considerably, but in the process caused extensive damage and loss of life. Downgraded to tropical storm strength, Betty moved northeastward through the Bashi Channel and eventually dissipated as a weak extratropical low southeast of Japan.

Betty had her origin in a weak disturbance south of Truk which showed increased potential for development on the 27th and 28th of October. The 280000Z gradient level winds from Truk and Ponape, as well as low-level winds from a weather reconnaissance flight west of the disturbance, indicated a closed circulation with 20 to 25 kt (10 to 13 m/sec) winds. At 280800Z, a Tropical Cyclone Formation Alert (TCFA) was issued and, during the alert period, the disturbance veered sharply to the east as it approached Truk on an erratic course from the south. After veering, hourly reports from Truk and satellite imagery indicated increased organization, and the first warning for TD 25 was issued at 290000Z with maximum surface winds of 30 kt (15 m/sec).

Despite the erratic movement shown during its formative stages and the apparent northeastward trajectory TD 25 had assumed by the first warning, the initial and subsequent warnings correctly identified a west-northwest track which indicated passage just south of Guam. However, due to limited mid-level (700 mb or 500 mb) steering data north of Betty, the first six warnings failed to adequately forecast her acceleration which resulted in a speed of movement of 21 kt (39 km/hr) as she passed Guam. As a result, although the 72 hour forecast position of the second warning predicted Betty's exact position as she passed south of Guam, the average vector error during this period was very high. The 72 hour forecast position mentioned above, had a total error of 585 nm (1083 km) due to the acceleration which caused Betty to reach the 72 hour point in just 34 hours! Such errors resulting from under forecasting speed of movement highlight the importance of adequate mid-level data in the steering current. When available, especially from reconnaissance aircraft, such data usually increase the ability of forecasters to evaluate the potential for changes in the short-term, as well as long-term motion of tropical cyclones.

After passing south of Guam, Typhoon Betty turned west and continued to intensify, reaching 100 kt (61 m/sec) 48 hours later. During this period, the 500 mb analyses began to show a short wave trough moving east through mainland China. JTWC forecasts keyed on this feature and, based on computer-derived prognostic charts, recurvature was expected to begin near 125E by 030000Z. The probability of this forecast verifying increased when, at 020000Z, the short wave trough deepened as it moved off Asia. However, by 021200Z, Betty unexpectedly turned southwestward. By 030000Z, the trough had moved quickly eastward north of Betty and the opportunity for recurvature had passed. Shortly afterwards, attention focused on another short wave moving through China and recurvature was again forecast to occur, this time just east of Luzon. By 040000Z, however, available 500 mb data did not show any significant amplitude to this trough and the recurvature track was abandoned in favor of a northwestward track over Luzon into southern China.

Although Betty continued to intensify after passing Guam, the data normally used to evaluate a tropical cyclone's intensity showed considerable scatter. Figure 3-25-1 graphically depicts these data as well as the final best track intensities. In searching for an explanation of the scatter, the comments from mission ARWOs on 01 November and 04 November may offer some insight concerning the character of Betty during this period. On the 011594Z mission: "Although this storm (Betty) was strong, it had no eyewall. The most fascinating feature was the rotating feeder band of convection that was spiralling inward at an enormous rate."[1] On this single fix mission, a maximum 700 mb flight level wind of 95 kt (49 m/sec) was observed. However, daylight missions before and after this mission estimated surface winds in excess of 100 kt (51 m/sec) (Fig. 3-25-2). On the 032200Z, 040150Z and 040340Z fix missions, it was observed that "Typhoon Betty.....was a textbook typhoon. Everything was aligned perfectly."[2] At 040600Z, Betty reached her peak intensity of 125 kt (64 m/sec). The development of a textbook typhoon correlated closely with the reduction in scatter between maximum surface wind estimates shown in Figure 3-25-1.

[1]Candis L. Weatherford, 1 LT, USAF, Mission ARWO.

[2]James B. Near, 1 LT, USAF, Mission ARWO.

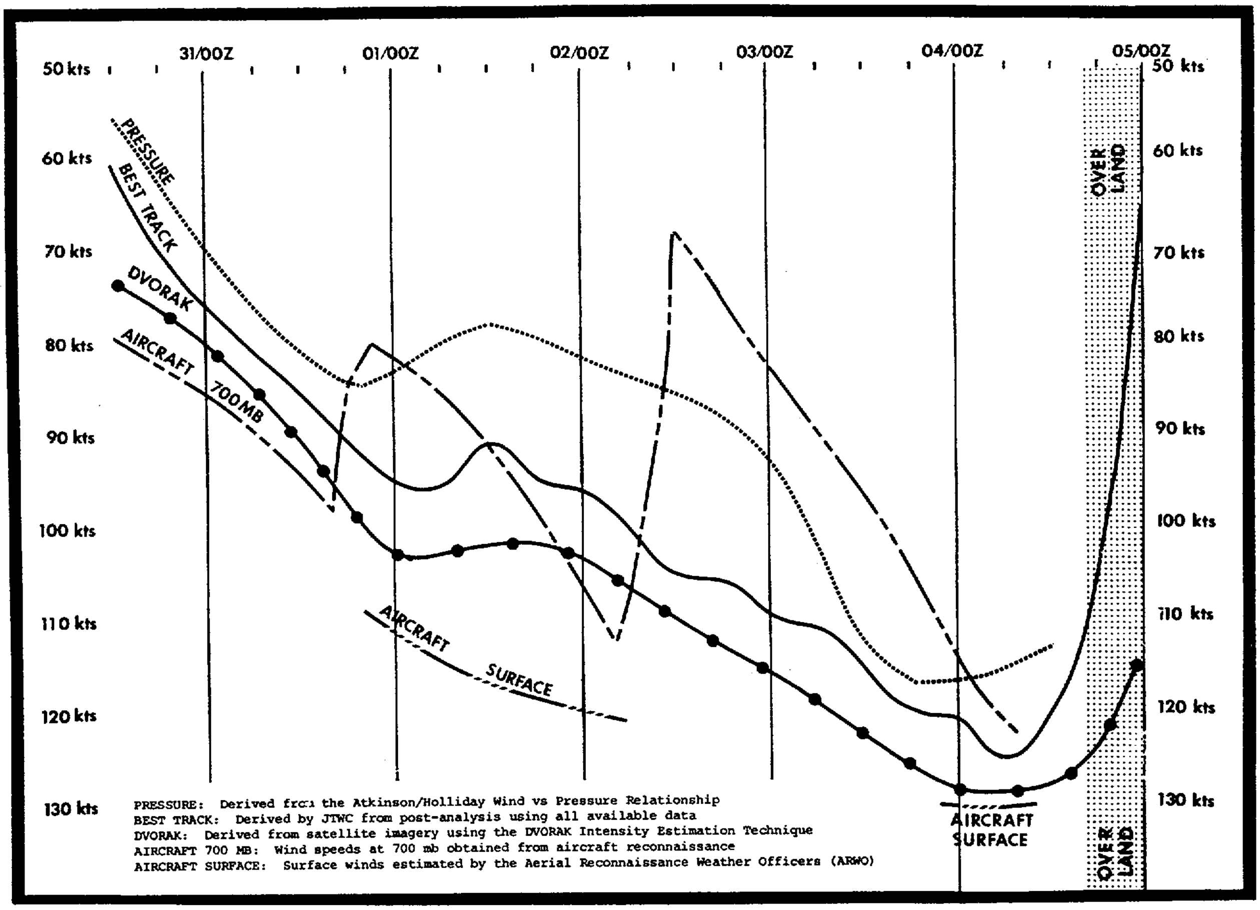
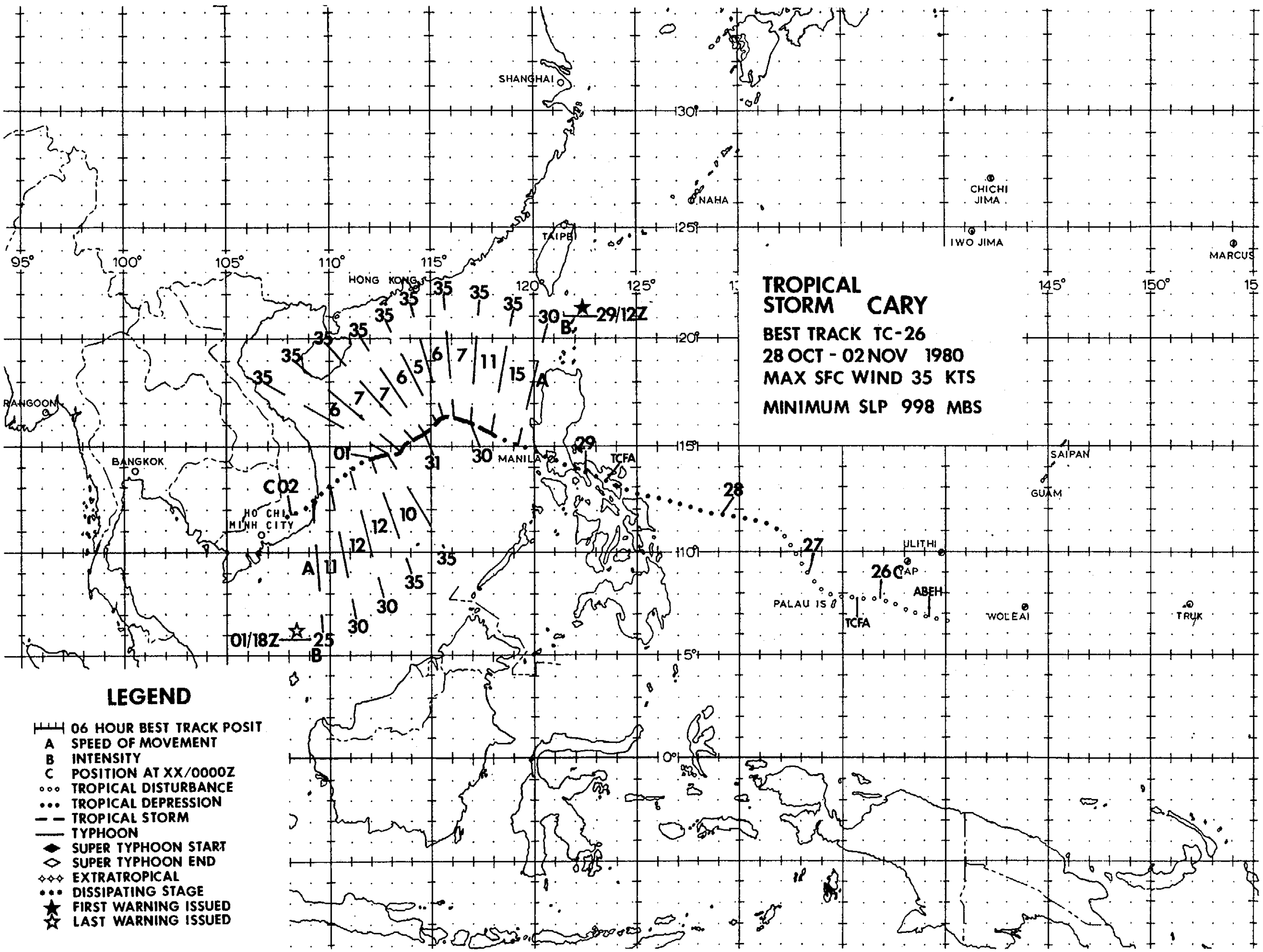


FIGURE 3-25-1. Time series of various intensity parameters evaluated by JTWC while Betty was at typhoon strength. Note the large scatter in the traces until 040600Z.

The decision to abandon a forecast recurve track east of Luzon put the central and northern provinces of Luzon on alert. At 041600Z, Typhon Betty, packing 120 kt (62 m/sec) winds, slammed into central Luzon south of Cape San Ildefonso. Most weather observing stations stopped reporting prior to Betty's approach, so her actual intensity as she crossed Luzon can only be inferred from a JTWC study of prior tropical cyclones crossing the Philippines (Sikora, 1976), satellite imagery (Dvorak intensity estimates), and aircraft reconnaissance reports just prior to and after Betty crossed Luzon. However intense Betty may have been, there is little doubt that she was one of the most destructive typhoons of recent history. Initial reports received several days after Betty crossed Luzon indicated at least 81 people dead, thousands homeless, and extensive crop damage from flooding and mudslides. The Cagayan Valley in northern Luzon, hard hit by Betty, lost most of its rice crop from floodwaters which rose to roof-top level in some areas. Philippine Defense Minister, Juan Ponce Enrile, described the Cagayan Valley from a helicopter survey, stating, "It looks like a sea from the air."

As Betty weakened over Luzon, the ridge that influenced her track into the Philippines broke down, thus, allowing her to drift northward along the Cordillera Central Mountains and eventually to be drawn into the weak short wave trough which had stalled off the coast of Taiwan. Emerging from Luzon as a 45 kt (23 m/sec) tropical storm, Betty never regained her earlier fury as she moved east of Taiwan and the Ryukyu Islands before undergoing an extratropical transition just prior to 080000Z. As an extratropical system, the remnants of Betty did not persist long. This once powerful typhoon was last observed 12 hours later dissipating southeast of Honshu, near 32N 143E.

FIGURE 3-25-2. During this stage of Typhoon Betty's development, intense banding was reported by aircraft reconnaissance along with areas of surface winds in excess of 100 kt (51 m/sec), 31 October 1980, 2252Z. (NOAA6 imagery)


TROPICAL STORM CARY
BEST TRACK TC-26
28 OCT - 02 NOV 1980
MAX SFC WIND 35 KTS
MINIMUM SLP 998 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
SHANGHAI
NAHA
CHICHI JIMA
IWO JIMA
MARCUS
TAIPEI
HONG KONG
RANGOON
BANGKOK
HO CHI MINH CITY
MANILA
TCFA
SAIPAN
GUAM
ULITHI
YAP
ABEH
PALAU IS
WOLEAI
TRUK
29/12Z
01/18Z
95°
100°
105°
110°
115°
120°
125°
145°
150°
30°
25°
20°
15°
10°
5°
0°

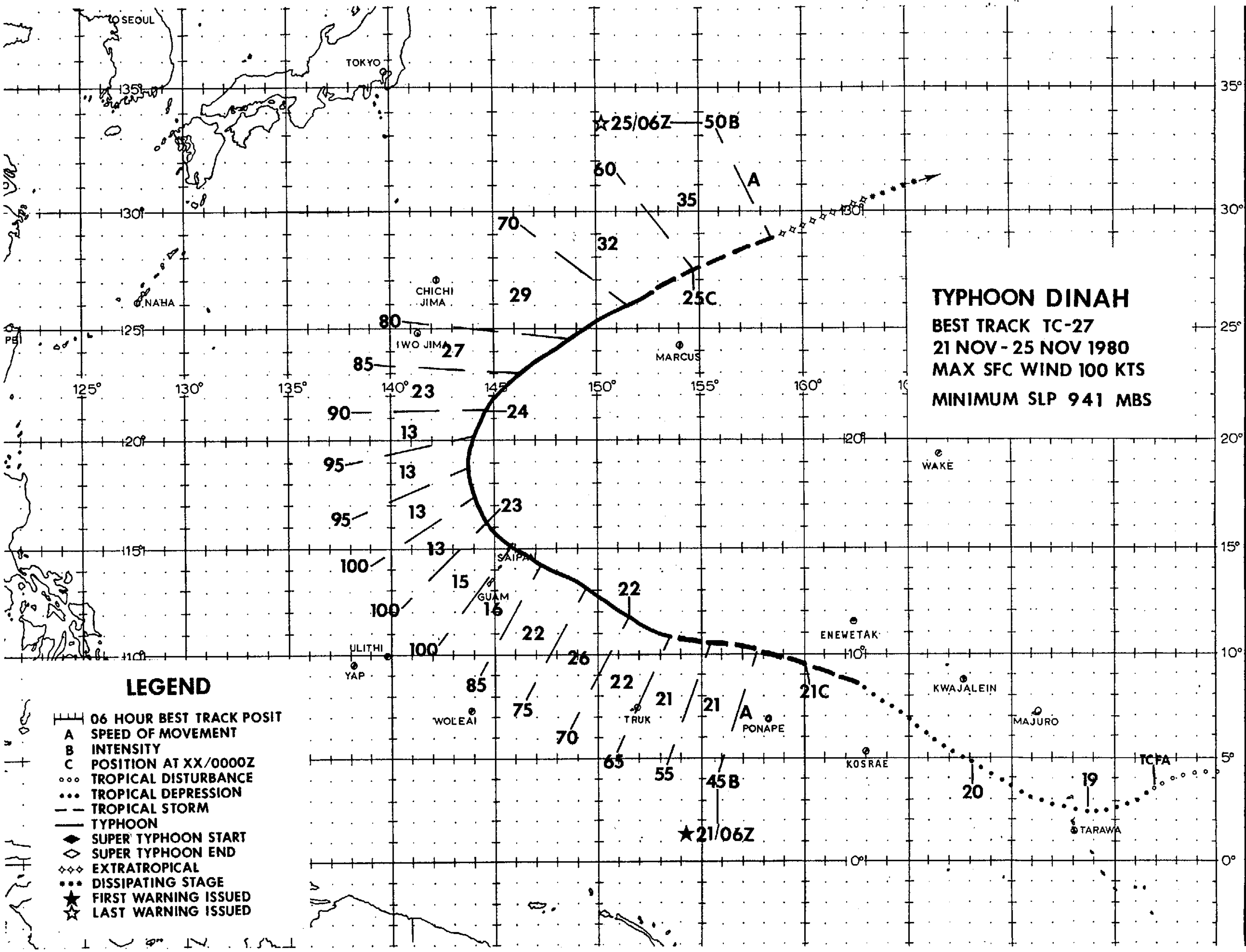
Tropical Storm Cary was first observed as a area of increased convective activity east of the Palau Islands on the 25th of October. A Tropical Cyclone Formation Alert (TCFA) was issued a day later when the disturbance had moved to a position about halfway between Yap and the Palau Islands.

All convection associated with this circulation dissipated shortly afterward, however, leaving only an exposed low-level circulation center. Over the next 24 hours, the system moved west-northwestward toward the Philippines. Just east of the Phillippines, the convection again developed and 30 kt (15 m/sec) winds were reported from coastal stations. Based on this information, a second TCFA was issued at 282200Z.

The circulation maintained its indentity as it passed over the Philippines just south of Clark AB and Subic Bay Naval Station. The first warning on TD 26 was issued at 291200Z as the disturbance was moving into the South China Sea. Tropical storm strength was reached 6 hours later.

Tropical Storm Cary moved west-northwestward and then west-southwestward in response to a low-level northeast monsoonal surge (Fig. 3-26-1) and eventually dissipated over Vietnam on 02 November.

FIGURE 3-26-1. Tropical Storm Cary near maximum intensity in the South China Sea. The surface center is partially exposed as indicated by the cumulus banding southeast of the main convection, 01 November 1980, 0033Z. (NOAA6 imagery)


TYPHOON DINAH
BEST TRACK TC-27
21 NOV - 25 NOV 1980
MAX SFC WIND 100 KTS
MINIMUM SLP 941 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
☆25/06Z
50B
★21/06Z
45B
25C
21C
TCFA
SEOUL
TOKYO
NAHA
CHICHI JIMA
IWO JIMA
MARCUS
WAKE
SAIPAN
GUAM
ULITHI
YAP
WOLEAI
TRUK
PONAPE
ENEWETAK
KWAJALEIN
MAJURO
KOSRAE
TARAWA
125°
130°
135°
140°
145°
150°
155°
160°
35°
30°
25°
20°
15°
10°
5°
0°

Dinah, the final typhoon of the 1980 season and the third tropical cyclone this season to threaten Guam, began to develop in mid-November as a focal point of cumulus banding embedded in the monsoon trough oriented east-west near Kwajalein. Initial development of this system was slow and erratic, as four successive Tropical Cyclone Formation Alerts (TCFAs) were issued for this area between 18 and 20 November. On the 21st however, this system finally established a well-developed outflow pattern, and its heaviest associated convection, which was initially more evident along the periphery of the circulation, began to consolidate about the system's center. The first warning on Tropical Storm Dinah was issued at 210600Z. At that time, having established a well-developed outflow to all quadrants, Dinah intensified rapidly and subsequently reached typhoon strength at 211800Z, just 12 hours after the initial warning.

A post-analysis of Dinah's development reveals some unique properties. First, she exhibited a very compact circulation, which she maintained throughout her lifespan as a tropical cyclone. The 30 kt (15 m/sec) wind radius was significantly less than normal. Second, a persistent easterly flow occurred near the surface during Dinah's initial development and may have been a primary factor for her slow and erratic development. For example, the surface analysis at 200000Z (Fig. 3-27-1) indicated an associated surface circulation near 4N 168E and a brisk easterly gradient-level flow north of the surface circulation. This flow pattern resulted in both the abnormally rapid movement of the developing system and an unusually pronounced asymmetry in her wind field which displaced the maximum wind band to the north of the circulation center. A subsequent surface analysis, at 211200Z (Fig. 3-27-2), however, did not indicate a surface circulation, but rather weak easterly flow south of where the

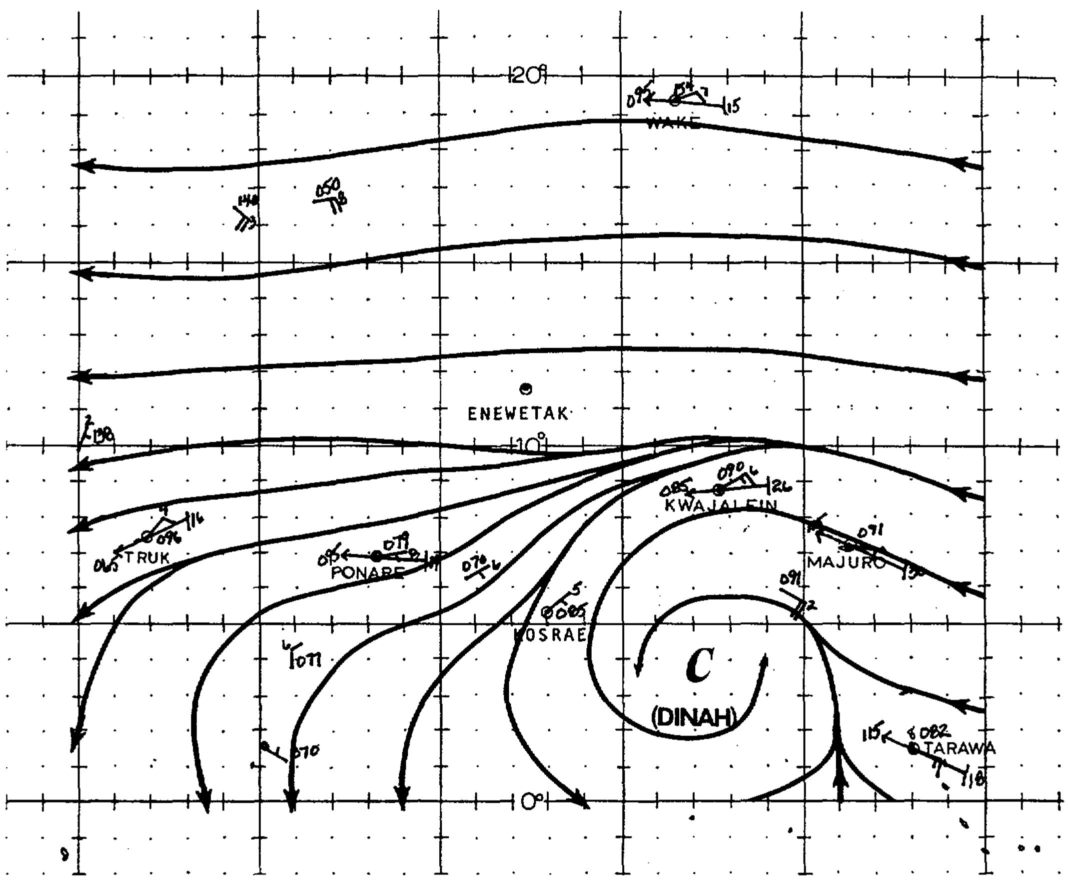


FIGURE 3-27-1. The 200000Z November 1980 surface (⟶)/gradient-level (ddd⟵ff) wind data and streamline analysis. Wind speeds are in knots.

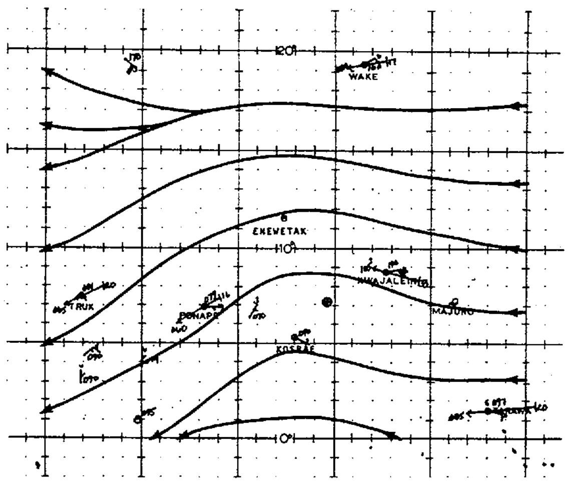


FIGURE 3-27-2. The 201200Z November 1980 surface (———) /gradient-level (ddd←——ff) wind data and streamline analysis. Wind speeds are in knots. ⊗ indicates satellite position of Dinah at about the same time.

circulation's position was indicated in satellite imagery. At the same time, cyclonic flow was present over the area at 500 mb and a closed cyclonic center existed just northwest of the disturbance at 200 mb. In view of the above data, it is probable that Dinah developed from a mid- or upper-level cyclone that subsequently generated its own surface circulation. The Aerial Reconnaissance Weather Officer (ARWO)[1] aboard the initial flight into what ultimately became Typhoon Dinah, stated "the storm was compact, with a very sharp pressure gradient and good banding....We had difficulty closing off the circulation to the north and northwest because it may just have actually closed [itself] off".

By the time Dinah intensified to a typhoon, she posed a definite threat to Guam within 48 hr; thus, the decision was made to evacuate military aircraft from the island. A comparison of the 500 mb analysis (which is generally considered the primary steering level for tropical cyclones) just prior to and subsequent to the aircraft evacuation, demonstrates the great importance of enroute aircraft reports of flight-level winds (AIREPS) and the significance they can make to a tropical cyclone forecast. The 500 mb streamline analysis at 211200Z (Fig. 3-28-3) shows a strong anticyclone near Marcus Island and strong ridging west-southwestward toward the Philippine Islands. In response, JTWC forecast Typhoon Dinah to pass just off the northeastern tip of Guam. The next 500

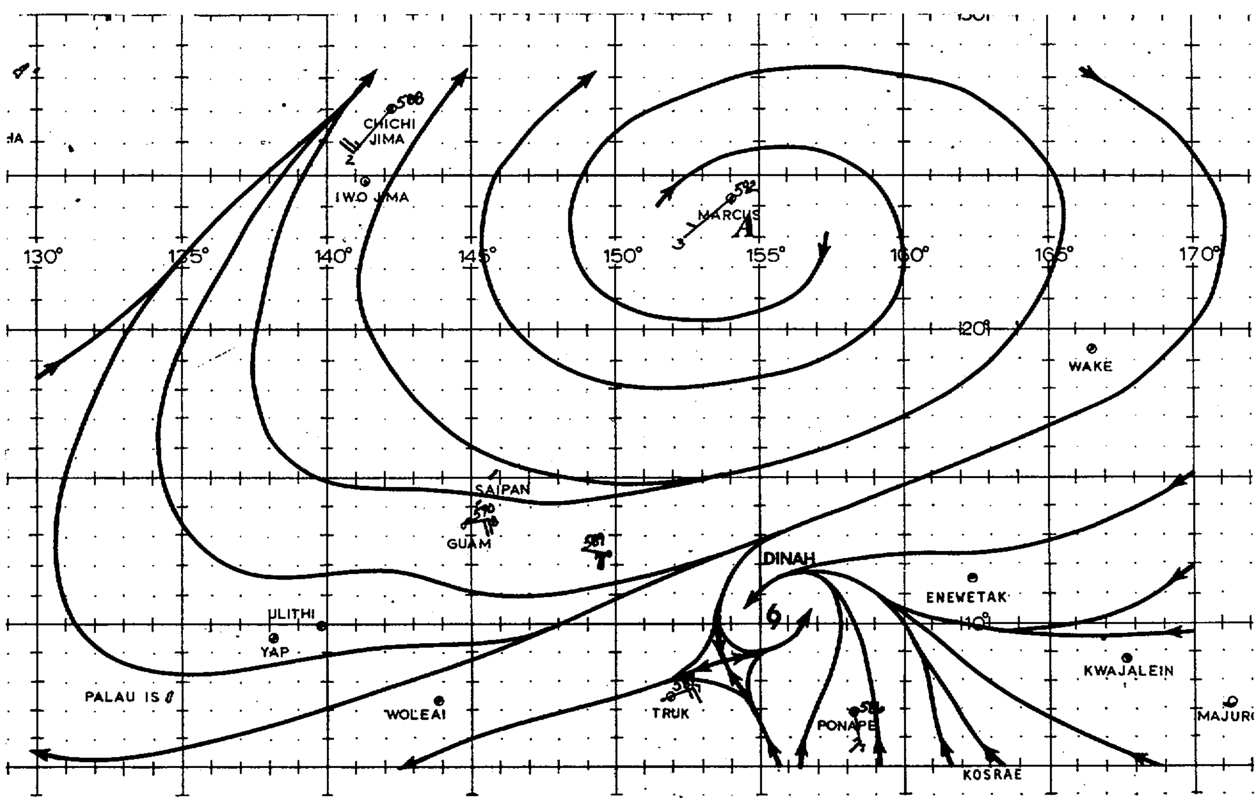


FIGURE 3-27-3. The 211200Z November 1980 500 mb wind data and streamline analysis. Wind speeds are in knots.

[1]Richard F. Ferris, 1 Lt, USAF: Mission ARWO

mb streamline analysis at 220000Z (Fig. 3-28-4), which was augmented by a series of AIREPS taken by an evacuation flight enroute from Guam to Okinawa, enabled JTWC to analyze a weakness in the ridge just north of Guam. In view of this new information, JTWC amended Dinah's forecast track to predict that Dinah would track near Saipan vice Guam. Because Dinah was so compact, this small change in track was enough that Guam received very little wind as Dinah passed to the northeast, but Saipan and nearby Tinian received typhoon-force winds and sustained extensive damage.

Dinah continued to intensify rapidly as she began to move into the weakness north of Guam toward the Northern Marianas Islands. Dinah subsequently crossed the northeastern portion of Saipan at 221845Z and reached maximum intensity at 222100Z, with maximum sustained winds of 100 kt (52 m/sec) and gusts to 130 kt (67 m/sec). After crossing Saipan, Dinah continued to move through the weakness in the ridge near 140E and began to recurve to the north on 23 November. She then weakened and accelerated to the northeast in response to a mid-tropospheric longwave trough which was moving eastward past Marcus Island on the 24th. Dinah transitioned to an extratropical cyclone by 251200Z.

Damage to the islands of Saipan and Tinian was massive, with 60 homes destroyed and another 214 homes suffering damages. Saipan, in the aftermath of Typhoon Dinah, was completely without power for several days and 85 percent of the water system was not functioning. Carlos S. Camacho, Governor of Saipan, estimated damages totalling 7 million dollars. Shortly after damages were assessed, President Carter declared the area a major disaster area, enabling the area to qualify for federal disaster fund relief.

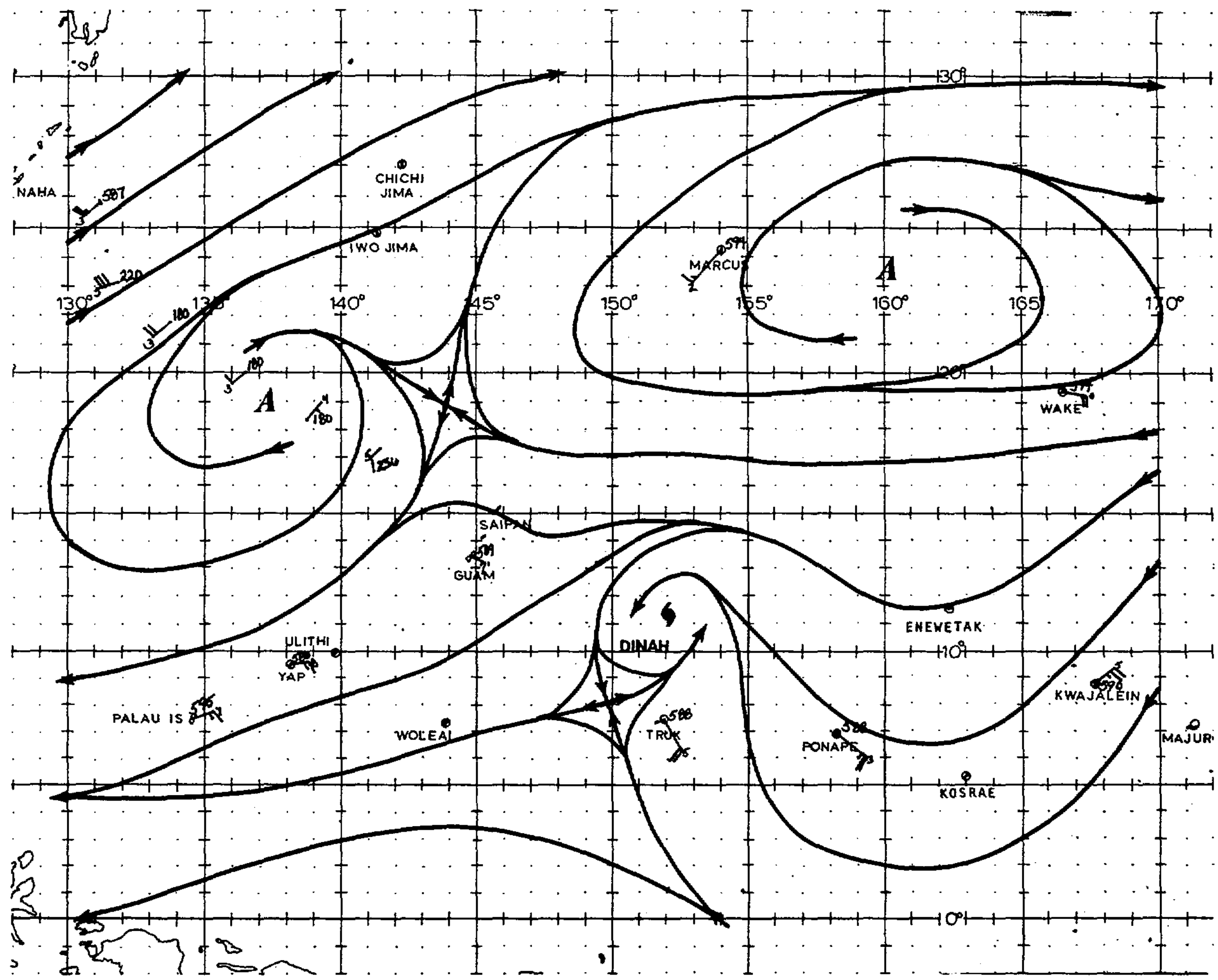
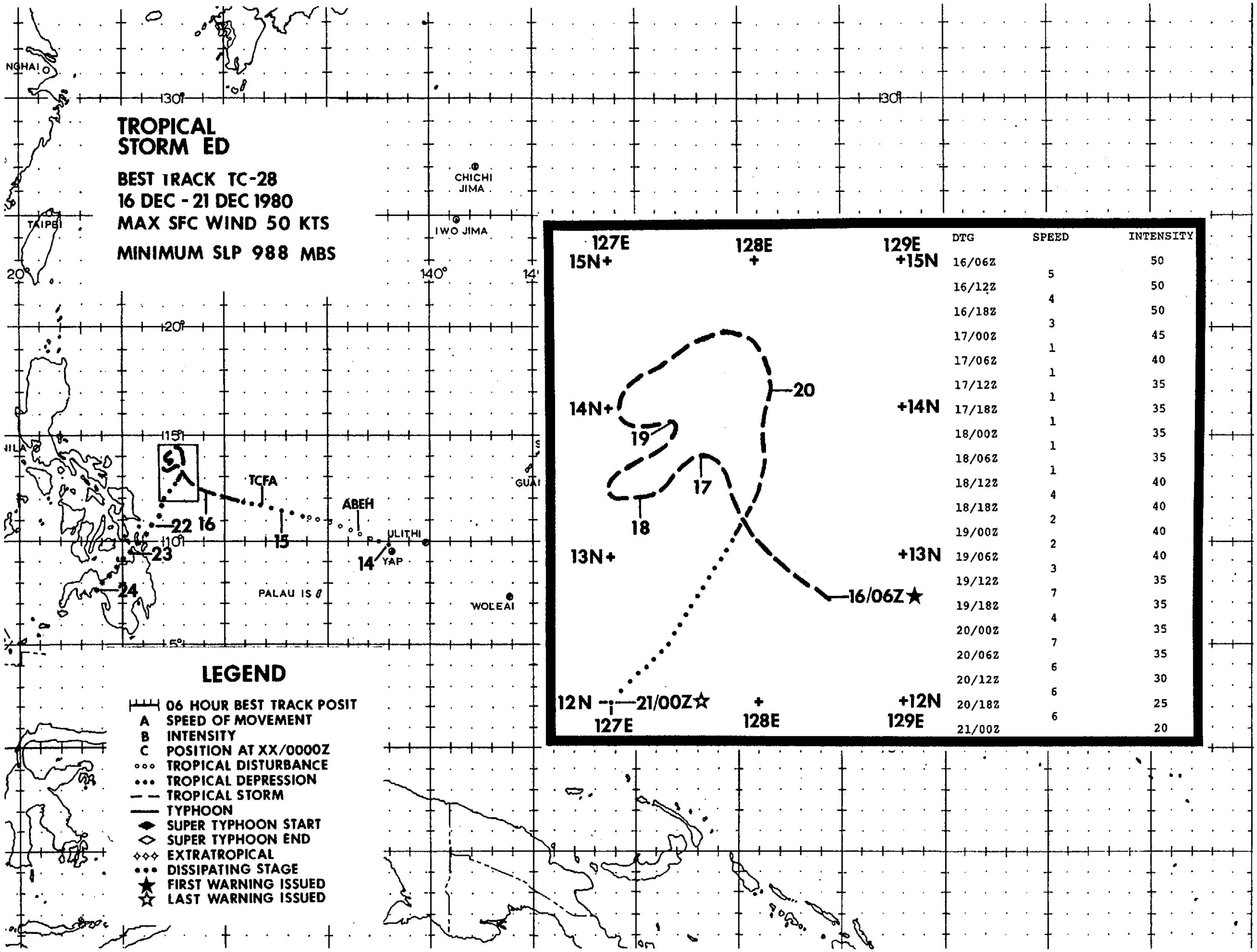


FIGURE 3-27-4. The 220000Z November 1980 500 mb wind data and streamline analysis. Wind speeds are in knots. Note the AIREPS northwest of Guam which were provided to JTWC by a Navy aircraft evacuating from Guam to Okinawa.



TROPICAL STORM ED
BEST TRACK TC-28
16 DEC - 21 DEC 1980
MAX SFC WIND 50 KTS
MINIMUM SLP 988 MBS
TAIPEI
CHICHI JIMA
IWO JIMA
TCFA
ABEH
ULITHI
YAP
PALAU IS
WOLEAI
GUAM
16
15
14
22
23
24
127E
128E
129E
15N
14N
13N
12N
20
19
17
18
16/06Z
21/00Z
DTG
SPEED
INTENSITY
16/06Z 50
5
16/12Z 50
4
16/18Z 50
3
17/00Z 45
1
17/06Z 40
1
17/12Z 35
1
17/18Z 35
1
18/00Z 35
1
18/06Z 35
1
18/12Z 40
4
18/18Z 40
2
19/00Z 40
2
19/06Z 40
3
19/12Z 35
7
19/18Z 35
4
20/00Z 35
7
20/06Z 35
6
20/12Z 30
6
20/18Z 25
6
21/00Z 20
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED

Tropical Storm Ed was the last significant tropical cyclone to develop in the western North Pacific in 1980. Ed was never forecast to reach typhoon strength due to the strong vertical wind shear which developed in the vicinity of the Philippine Islands during the last half of December.

Tropical Storm Ed was first observed as a disturbance near Yap on the 14th of December. The disturbance moved westward at between 12 and 15 kt (22 to 28 km/hr) as its convective activity and overall organization continued to improve. A Tropical Cyclone Formation Alert (TCFA) was issued when a reconnaissance aircraft observed a well-defined low-level circulation with a minimum sea-level pressure of 1004 mb. The first warning on Tropical Storm Ed was issued at 160000Z when 50 kt (25 m/sec) surface winds and a 991 mb pressure were reported. Maximum surface winds were consistently observed northeast of Ed in a region of enhanced pressure gradient between the cyclone's center and a strong surface ridge.

It became evident from synoptic analyses that Ed was moving into an area which was unfavorable for continued development. Figures 3-28-1 and 3-28-2 are representative of the

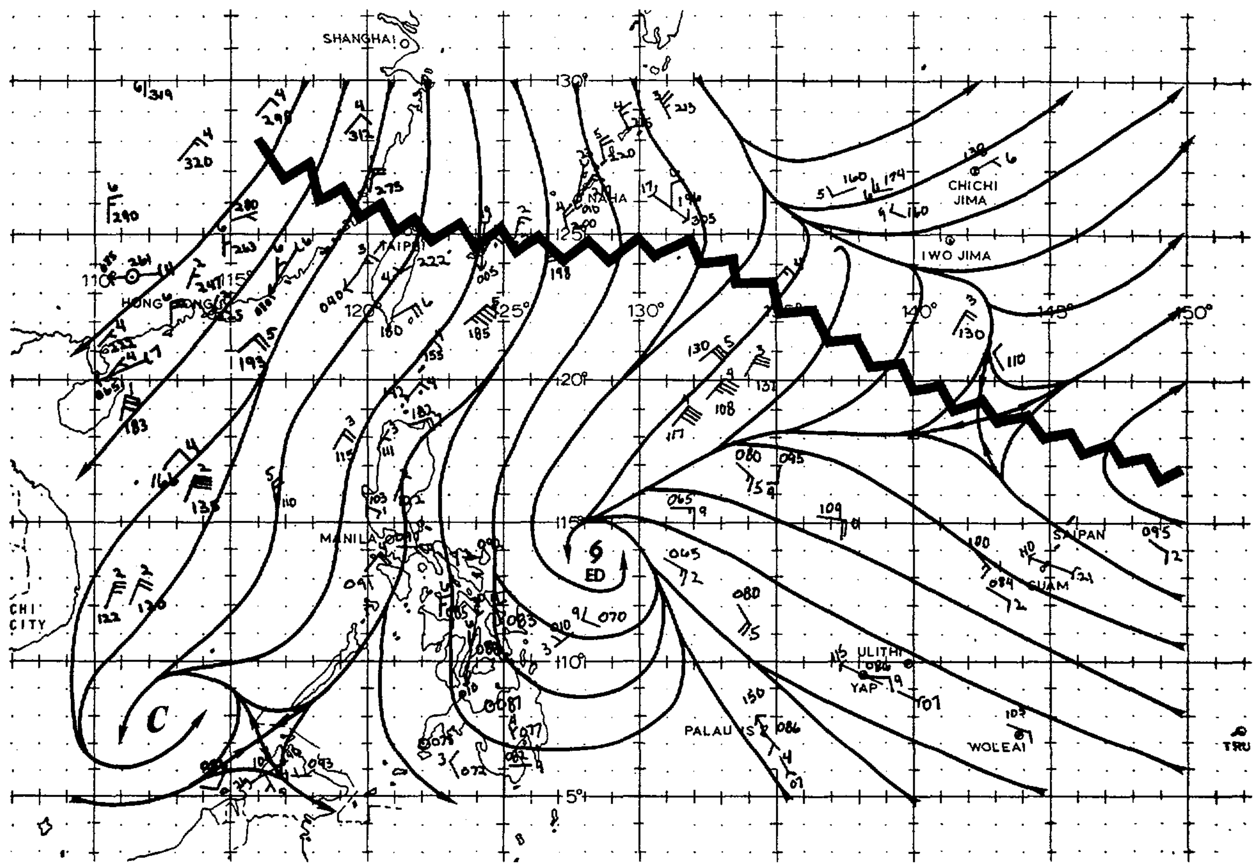


FIGURE 3-28-1. The 200000Z December 1980 surface (⟶) / gradient level (⟵) wind data and streamline analysis in the vicinity of Tropical Storm Ed. Wind speeds are in knots.

basic flow patterns which existed at the surface and 200 mb levels during most of Ed's existence. The strong surface ridge mentioned above extended from the Asian mainland into the Pacific Ocean north of Ed and maintained a strong northeasterly low-level flow in the vicinity of the Philippine Islands (Fig. 3-28-1). At the same time, strong southwesterly flow at the 200 mb level was present off the east coast of the Philippines (Fig. 3-28-2). The resultant strong vertical wind shear not only caused Ed to weaken as his convection moved off to the northeast, but it also helped to maintain a confused steering flow which induced Ed to follow an erratic course while he was northeast of Simar.

Eventually, after most of his convection had been sheared off, Ed's surface center began to track to the southwest under the influence of the strong surface ridge to the north. Dissipation as a significant tropical cyclone was completed on the 24th as the remnants of Ed moved into northern Mindanao.

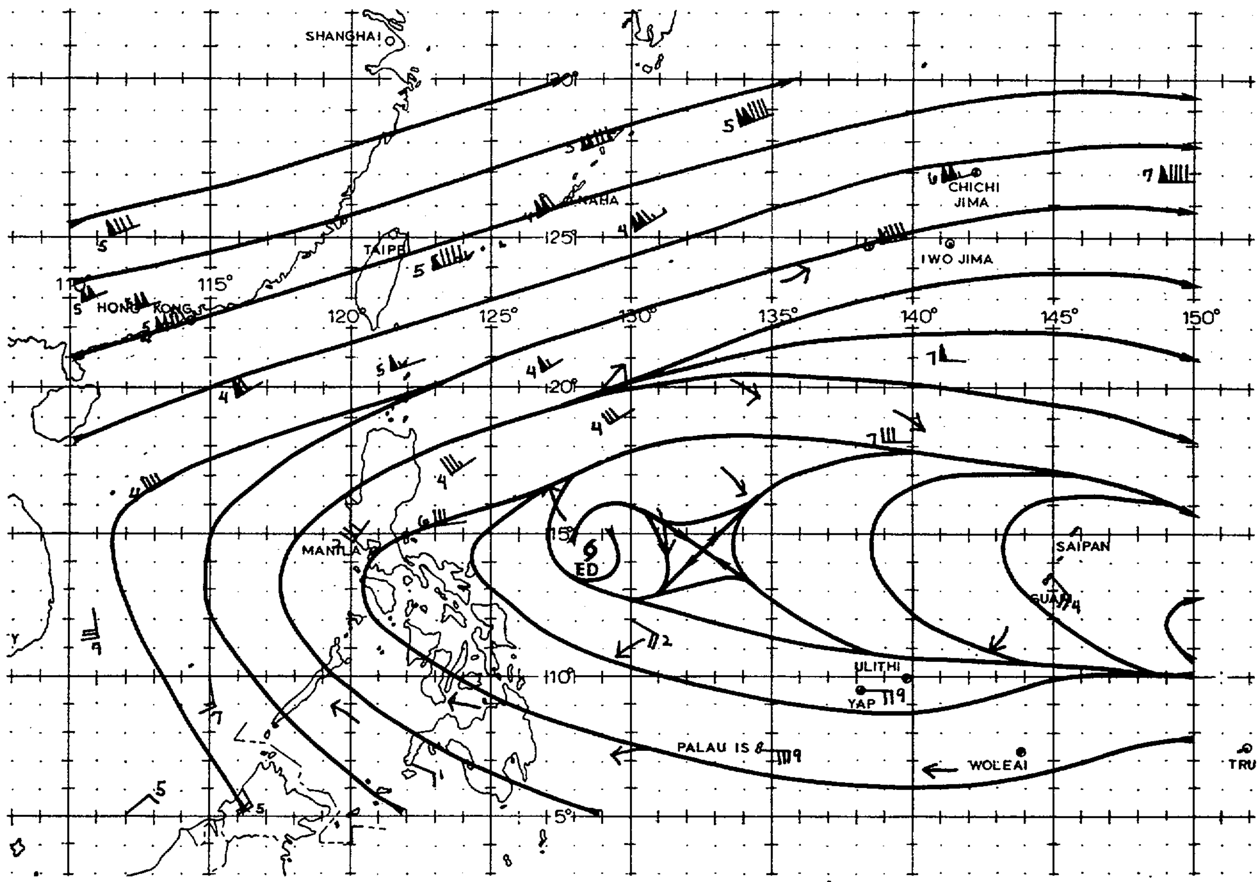


FIGURE 3-28-2. The 200000Z December 1980 200 mb streamline analysis. Wind speeds are in knots.

2. NORTH INDIAN OCEAN TROPICAL CYCLONES

During 1980, there was a notable lack of significant tropical cyclone activity in the North Indian Ocean area (Table 3-3). Two tropical cyclones developed near the end of the year: one in the Arabian Sea (TC 23-80) and one that began in the Bay of Bengal (TC 27-80) and tracked south of India into the Arabian Sea. This was a dramatic decrease from the 1979 total of seven which was the greatest number observed in the two areas since JTWC expanded its area of responsibility westward to include the Arabian Sea in 1975.

TABLE 3-3 NORTH INDIAN OCEAN

1980 SIGNIFICANT TROPICAL CYCLONES

CYCLONE	PERIOD OF WARNING	CALENDAR DAYS OF WARNING	MAX SFC WIND (KT)	EST MIN SLP	NUMBER OF WARNINGS	DISTANCE TRAVELLED (NM)
TC 23-80	17 NOV-19 NOV	3	35	995	8	940
TC 27-80	16 DEC-17 DEC	2	35	996	6	2122
	1980 TOTALS	5			14	

TABLE 3-4

1980 SIGNIFICANT TROPICAL CYCLONE STATISTICS

NORTH INDIAN OCEAN	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
ALL CYCLONES	0	0	0	0	0	0	0	0	0	0	1	1	2
(1971-1979) AVERAGE*	0.1	0	0	0.3	0.5	0.4	0	0	0.5	0.8	1.5	0.3	4.4

FORMATION ALERTS 2 of the 7 (28%) Formation Alert Events developed into numbered cyclones.

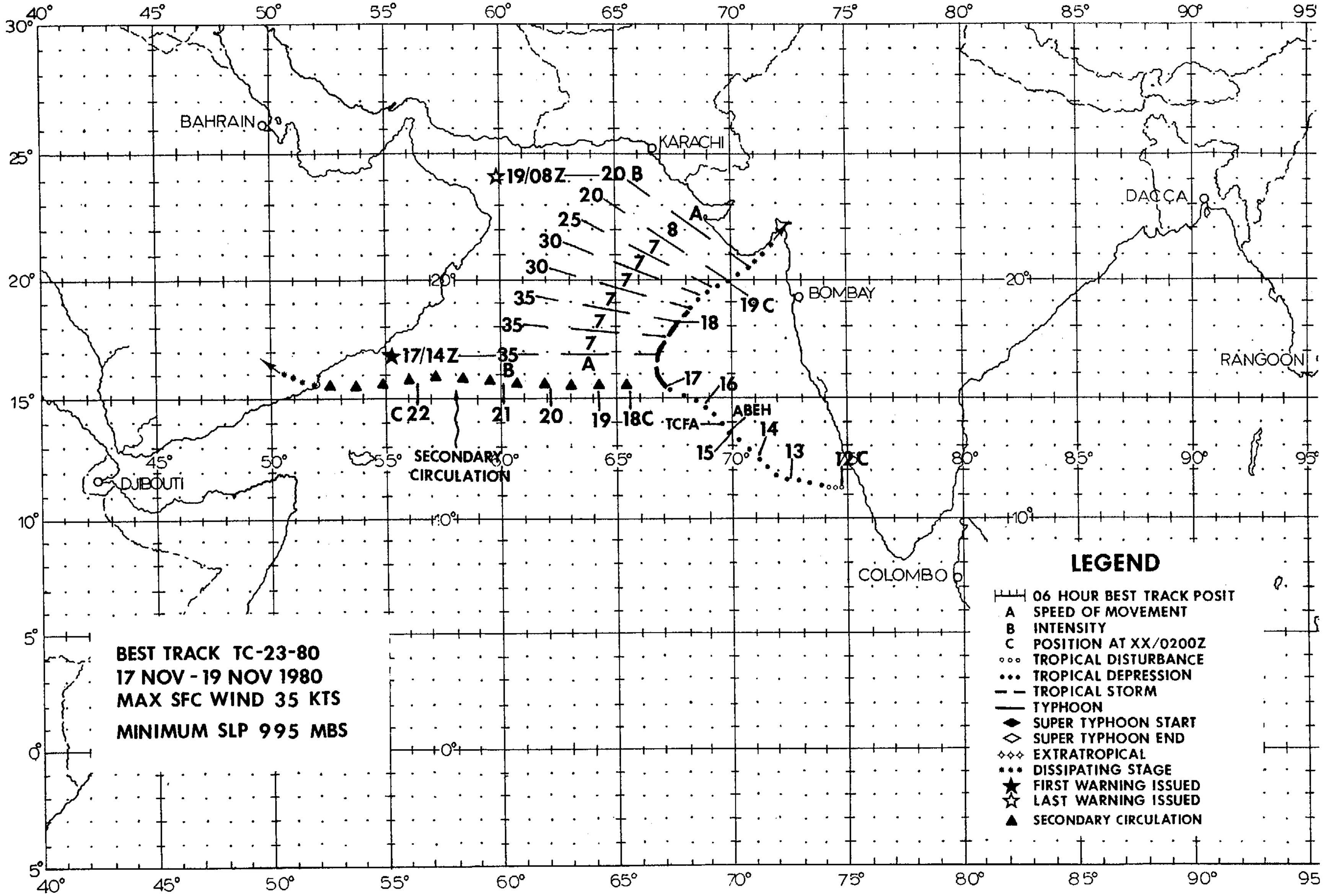
WARNINGS

Number of warning days: 5

Number of warning days with 2 cyclones: 0

Number of warning days with 3 or more cyclones: 0

*From 1971 through 1979, only Bay of Bengal cyclones were considered; the JTWC area of responsibility was extended in 1975 to include Arabian Sea cyclones.

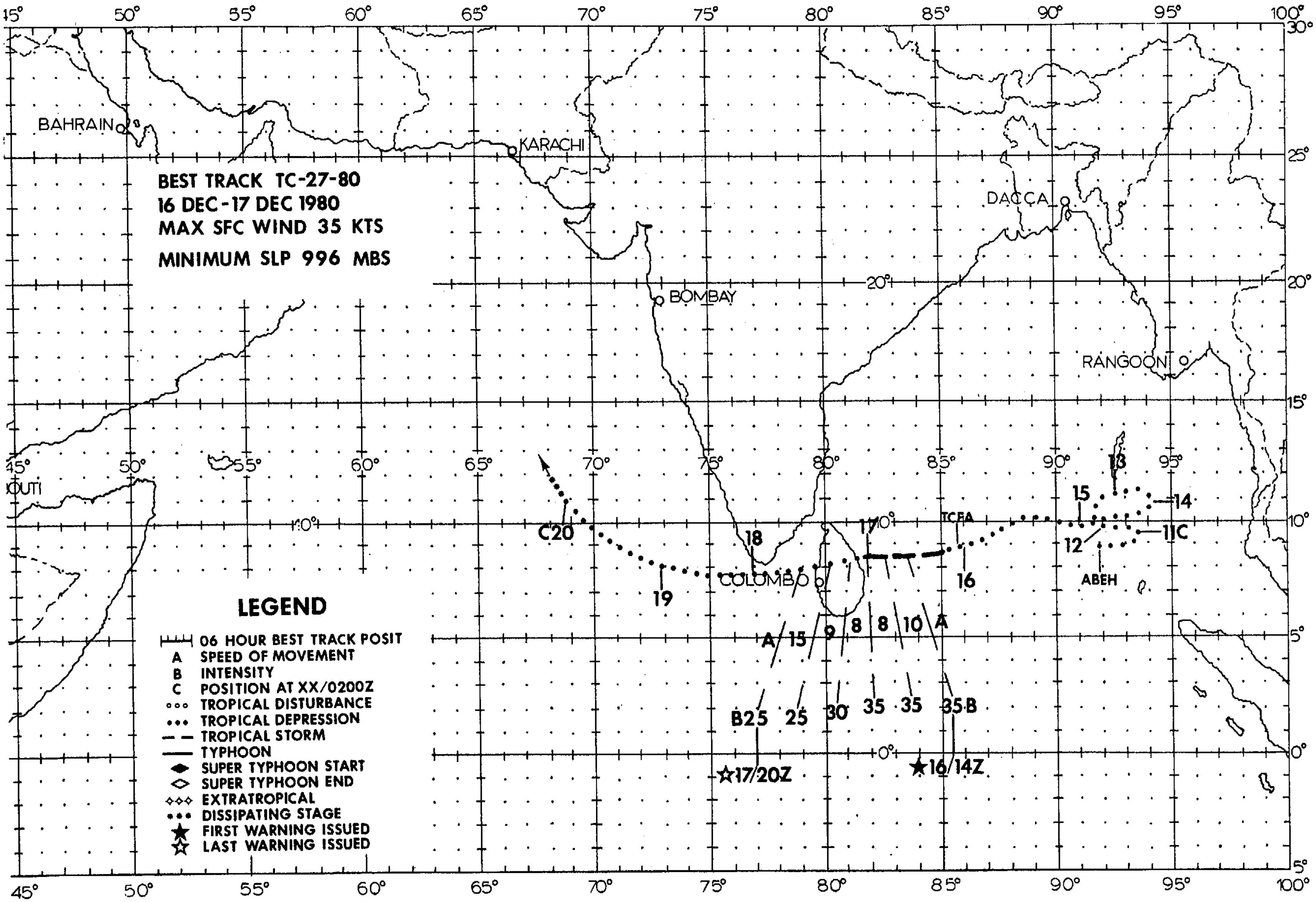

BEST TRACK TC-23-80
17 NOV - 19 NOV 1980
MAX SFC WIND 35 KTS
MINIMUM SLP 995 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0200Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
SECONDARY CIRCULATION
BAHRAIN
KARACHI
DACCA
BOMBAY
RANGOON
DJIBOUTI
COLOMBO
19/08Z
17/14Z
SECONDARY CIRCULATION
TCFA
ABEH
19 C
18C
12C
C 22

TC 23-80 was the first of only two significant tropical cyclones in 1980 to occur over the North Indian Ocean. It developed during the autumn transition season just prior to the northeast monsoon period. Originating as an area of enhanced convection in the monsoon trough off the southwest coast of India, TC 23-80 tracked steadily northwestward over the Arabian Sea between 12 and 17 November.

On 17 November, a mid-tropospheric trough tracking eastward toward India began to induce TC 23-80 to recurve to the northeast. The main area of convection and the associated low-level center did indeed begin to recurve. However, satellite imageries, which were evaluated during post-analysis (Fig. 3-29-1), indicate that a second low-level circulation formed southwest of TC 23-80 on 17 November. The first circulation continued northeastward and dissipated near the Indian coast, while the secondary circulation continued moving westward as a well-defined, exposed low-level circulation (Fig. 3-29-2). This secondary circulation eventually weakened and dissipated on the coast of Saudi Arabia, five days after cyclogenesis.

FIGURE 3-29-1. TC 23-80 just prior to recurvature over the Arabian Sea. The low-level secondary circulation (⊗) is just beginning to develop on the extreme southwest edge of the main mass of convection, 17 November 1980, 1539Z. (NOAA6 imagery from AFGWC, Offutt AFB, Nebraska)

FIGURE 3-29-2. The secondary low-level center as a well-developed circulation tracking westward towards Saudi Arabia, 19 November 1980, 0358Z. (NOAA6 imagery from AFGWC, Offutt AFB, Nebraska)


BEST TRACK TC-27-80
16 DEC-17 DEC 1980
MAX SFC WIND 35 KTS
MINIMUM SLP 996 MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0200Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
BAHRAIN
KARACHI
BOMBAY
DACCA
RANGOON
COLOMBO
TCFA
ABEH
★16/14Z
☆17/20Z
A 15 9 8 8 10 A
B25 25 30 35 35 35B
C20 19 18 17 16 15 14 13 12 11C

CHAPTER IV - SUMMARY OF FORECAST VERIFICATION

1. ANNUAL FORECAST VERIFICATION

a. Western North Pacific Area

Forecast positions at warning times and 24-, 48-, and 72-hour valid times were verified against corresponding best tracks. Vector errors and right angle errors for individual tropical cyclones were calculated and are displayed in Table 4-1. Annual mean errors for all tropical cyclones are listed in Table 4-2 for comparison. Frequency distributions of the vector errors for 24-, 48-, and 72-hour forecasts on all 1980 tropical cyclones are shown in Figure 4-1. Annual mean vector errors are graphed in Figure 4-2.

TABLE 4-1. FORECAST ERROR SUMMARY FOR THE 1980 WESTERN NORTH PACIFIC SIGNIFICANT TROPICAL CYCLONES (ERRORS IN NAUTICAL MILES)

		WARNING			24 HOUR			48 HOUR			72 HOUR		
		POSIT ERROR	RT ANGLE ERROR	# WRNGS	POSIT ERROR	RT ANGLE ERROR	# WRNGS	POSIT ERROR	RT ANGLE ERROR	# WRNGS	POSIT ERROR	RT ANGLE ERROR	# WRNGS
1.	TD-01	26	12	17	102	20	14	94	53	11	157	65	7
2.	TS CARMEN	32	19	9	154	90	9	266	179	7	250	218	5
3.	TY DOM	29	15	42	137	106	39	191	133	27	324	237	23
4.	TY ELLEN	14	10	34	130	76	31	300	201	27	484	414	23
5.	TS FORREST	37	17	26	106	56	22	227	123	18	388	227	14
6.	TS GEORGIA	44	29	12	112	52	10	199	140	6	299	293	2
7.	TS HERBERT	29	19	15	78	39	11	130	102	7	64	53	2
8.	TS IDA	21	11	23	98	37	19	182	73	14	253	126	7
9.	TY JOE	18	13	25	99	61	20	197	98	17	301	184	13
10.	TD-10	42	33	7	115	92	2						
11.	ST KIM	23	16	29	95	63	25	159	109	22	211	123	18
12.	TY LEX	18	11	36	137	97	32	314	251	24	499	421	20
13.	TY MARGE	20	11	31	114	58	26	276	180	20	506	371	12
14.	TD-14	126	67	2									
15.	TY NORRIS	26	19	20	103	78	17	183	134	13	212	144	9
16.	TD-16	70	20	5	241	28	1						
17.	TY ORCHID	36	22	19	95	62	16	175	98	12	284	179	8
18.	TY RUTH	20	11	13	113	60	9	241	130	5	314	131	1
19.	TY PERCY	26	18	20	164	113	17	245	172	14	309	291	9
20.	TY SPERRY	23	17	22	176	133	19	324	236	10	571	413	8
21.	TS THELMA	81	43	16	145	83	11	358	218	7	978	577	4
22.	TY VERNON	30	18	25	145	77	21	216	185	17	248	203	13
23.	ST WYNNE	18	12	44	119	66	41	248	137	36	370	273	30
24.	TS ALEX	28	17	8	118	46	4						
25.	TY BETTY	23	14	39	131	81	36	306	215	29	524	405	28
26.	TS CARY	38	27	14	180	158	11	421	358	7	630	540	3
27.	TY DINAH	25	14	17	145	93	13	304	175	9	673	336	5
28.	TS ED	40	21	20	146	120	16	292	262	11	402	378	4
ALL FORECASTS		28	16	590	126	79	492	243	164	370	389	287	268

TABLE 4-2. ANNUAL MEAN FORECAST ERRORS (NM) FOR THE WESTERN NORTH PACIFIC

	24-HR		48-HR		72-HR	
YEAR	VECTOR	RIGHT ANGLE	VECTOR	RIGHT ANGLE	VECTOR	RIGHT ANGLE
1971	111	64	212	118	317	177
1972	117	72	245	146	381	210
1973	108	74	197	134	253	162
1974	120	78	226	157	348	245
1975	138	84	288	181	450	290
1976	117	71	230	132	338	202
1977	148	83	283	157	407	228
1978	127	75	271	179	410	297
1979	124	77	226	151	316	223
1980	126	79	243	164	389	287

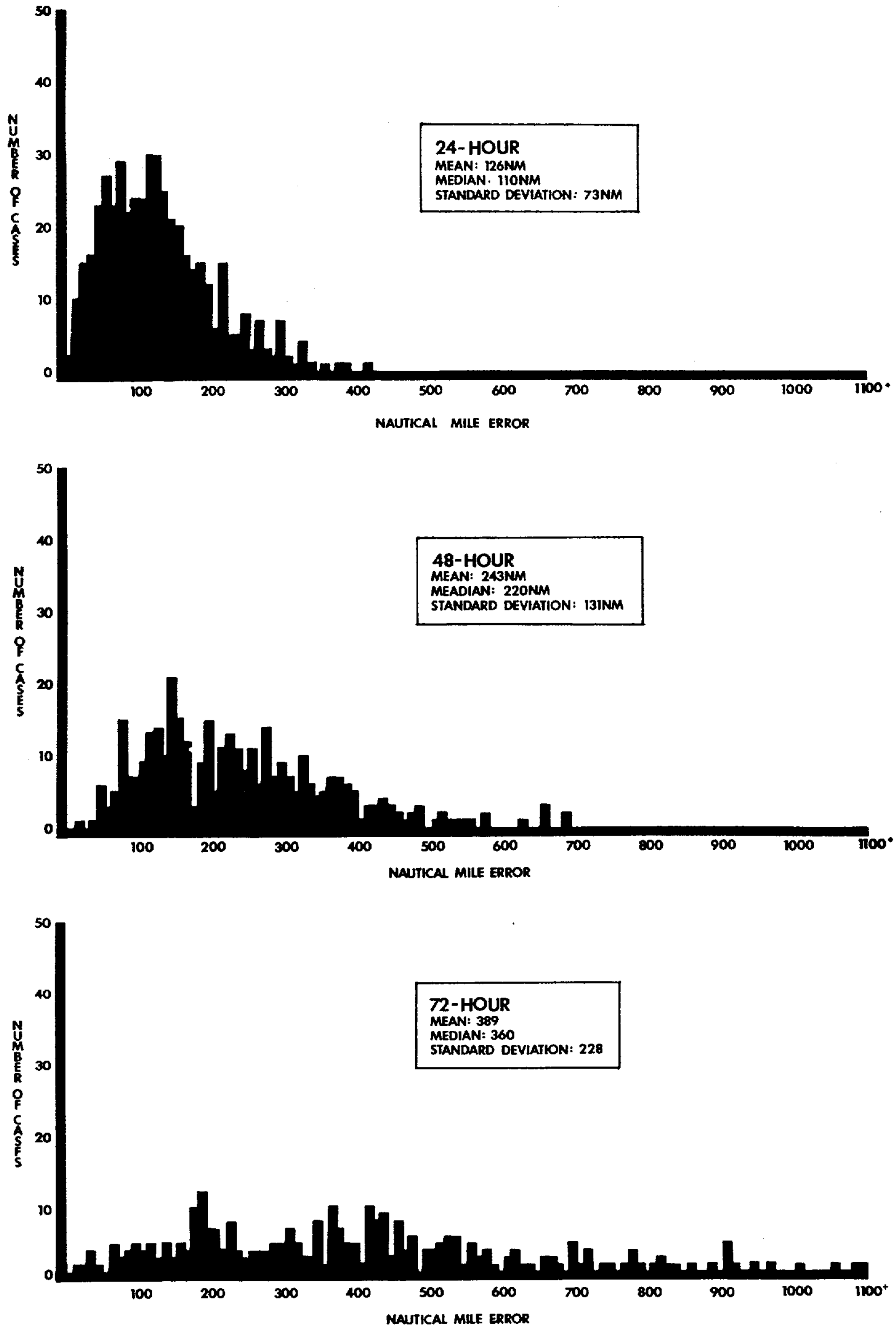


FIGURE 4-1. *Frequency distribution of 1979 24-, 48-, and 72-hour forecast vector errors for all significant tropical cyclones in the western North Pacific.*

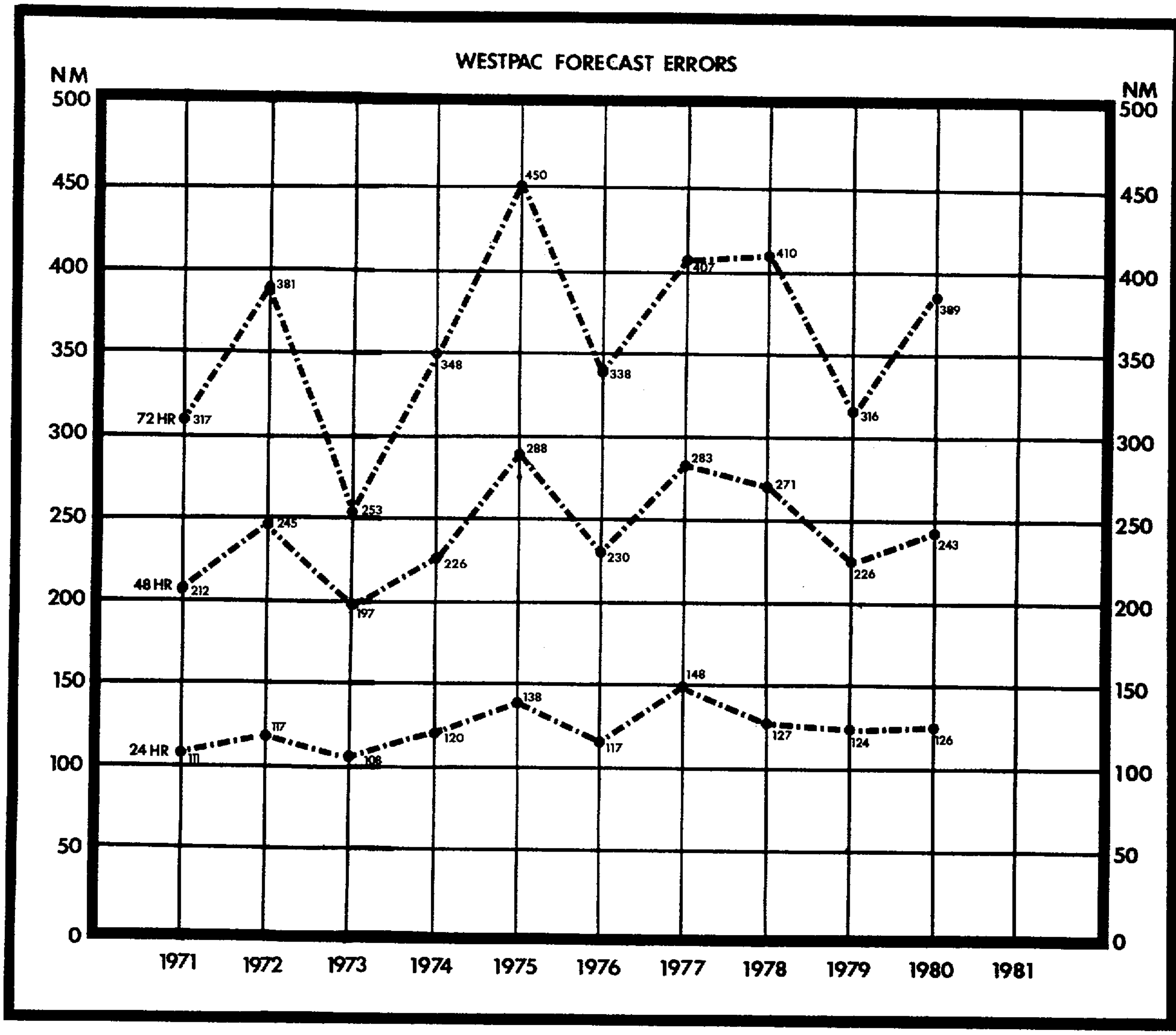


FIGURE 4-2. *Annual vector errors (nm) for all cyclones in the western North Pacific.*

Intensity verification statistics for all significant tropical cyclones in the western North Pacific area are depicted in Figures 4-3 and 4-4. The average absolute magnitude of the intensity error as well as the intensity bias (algebraic average) are graphically depicted. This year's data show that the absolute magnitude of JTWC's forecast intensity errors (Fig. 4-3) has not changed significantly from 1979 throughout 72 hours. The mean algebraic errors (Fig. 4-4), however, show that JTWC had a definite negative bias through 72 hours. This negative bias means that JTWC consistently under forecast tropical cyclone intensity during 1980. Verification of intensity forecasts by objective aids is also depicted in Figures 4-3 and 4-4. (An explanation of the objective forecasting aids is found in this chapter, Section 2-Comparison of Objective Techniques.)

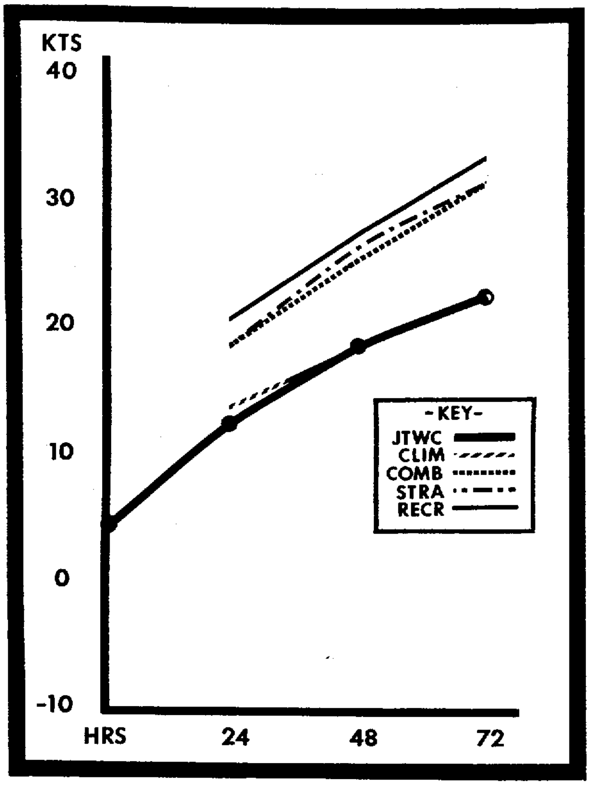


FIGURE 4-3. *Comparison of average intensity errors (magnitude) for all cyclones in the western North Pacific.*

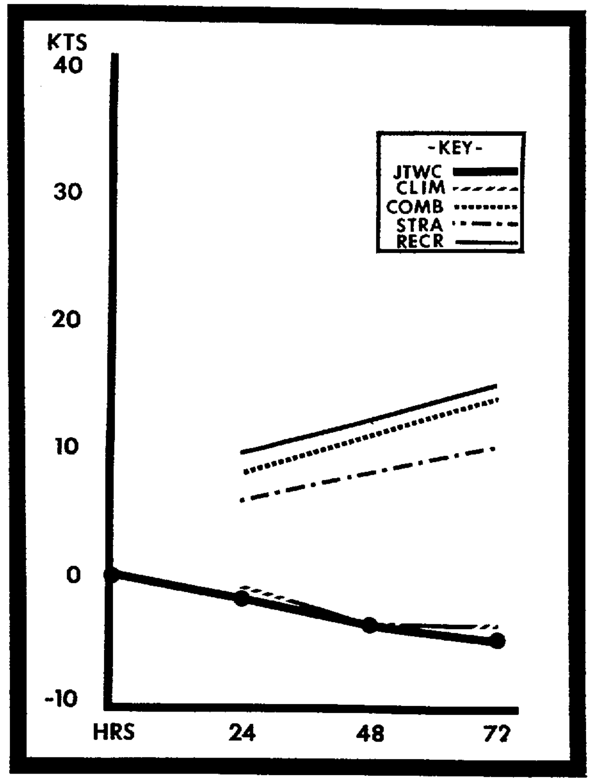


FIGURE 4-4. *Comparison of average intensity errors (biases) for all cyclones in the western North Pacific.*

b. North Indian Ocean Area

Forecast positions at warning, 24-, 48-, and 72-hour valid times were verified for TC 23-80 and TC 27-80 by the same methods used for the western North Pacific. It should be noted that, due to the abnormally low number of Indian Ocean tropical cyclones, the forecast error statistics are not considered to be representative of a significant improvement in forecasting for that region. Table 4-3 is the forecast error summary for TC 23-80 and TC 27-80. Table 4-4 contains the annual average of forecast errors back through 1971. Vector errors are plotted in Figure 4-5. Seventy-two-hour forecast errors were evaluated for the first time in 1979.

Forecast intensities are not verified for North Indian Ocean tropical cyclones.

TABLE 4-3. FORECAST ERROR SUMMARY FOR THE 1980 NORTH INDIAN OCEAN SIGNIFICANT TROPICAL CYCLONES.

	WARNING			24 HOUR			48 HOUR			72 HOUR		
CYCLONE	POSIT ERROR	RT ANGLE ERROR	# WRNGS	POSIT ERROR	RT ANGLE ERROR	# WRNGS	POSIT ERROR	RT ANGLE ERROR	# WRNGS	POSIT ERROR	RT ANGLE ERROR	# WRNGS
TC 23-80	24	16	8	120	66	4	-	-	-	-	-	-
TC 27-80	65	55	6	109	81	3	93	87	2	167	126	1
*ALL FORECASTS	41	33	14	115	73	7	93	87	2	167	126	1

*NOTE: 1980's error statistics are not considered to be representative of forecast accuracy trends due to the small number of JTWC forecasts which were verified.

TABLE 4-4 ANNUAL MEAN FORECAST ERRORS FOR THE NORTH INDIAN OCEAN (the Arabian Sea was not included prior to 1975).

	24-HR		48-HR		72-HR	
YEAR	VECTOR	RIGHT ANGLE	VECTOR	RIGHT ANGLE	VECTOR	RIGHT ANGLE
1971	232	-	410	-	-	-
1972	224	101	292	112	-	-
1973	182	99	299	160	-	-
1974	137	81	238	146	-	-
1975	145	99	228	144	-	-
1976	138	108	204	159	-	-
1977	122	94	292	214	-	-
1978	133	86	202	128	-	-
1979	151	99	270	202	437	371
1980	115	73	93	87	167	126

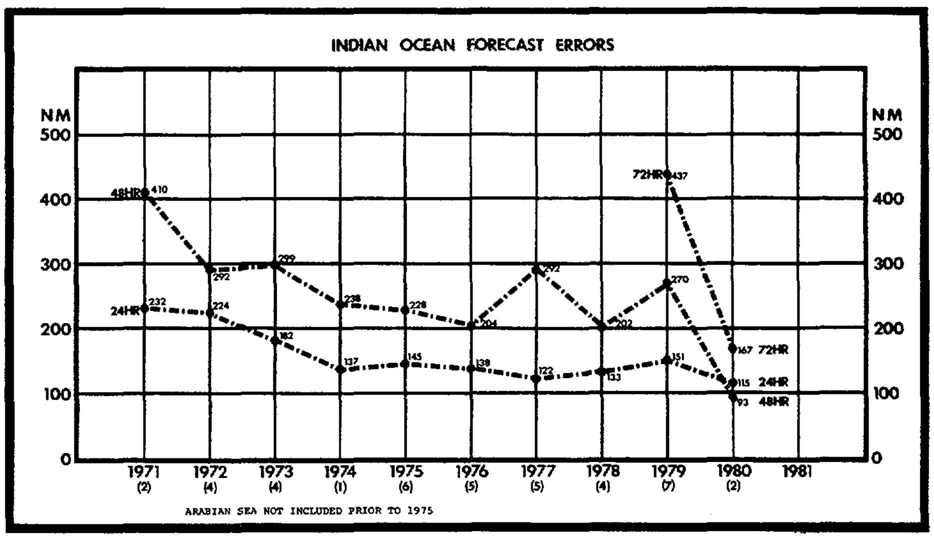


FIGURE 4-5. Annual mean vector errors (nm) for all cyclones in the north Indian Ocean.

2. COMPARISON OF OBJECTIVE TECHNIQUES

a. General

Objective techniques used by JTWC are divided into four main categories: (1) climatological and analog techniques; (2) extrapolation; (3) steering techniques; and (4) a dynamic model. The analog technique provides three movement forecasts: one for straight moving cyclones, one for recurving cyclones, and one which combines the tracks of straight, recurving, and all other cyclones that do not meet the criteria of straight or recurving analogs. All objective techniques, except the Tropical Cyclone Model (TCM), were executed using operational data available at warning time. The TCM used analysis fields for initialization that were not available at warning time. The TCM forecasts were received at JTWC 9 to 12 hours after warning time.

b. Description of Objective Techniques

(1) EXTRAPOLATION -- A track from the 12-hour old preliminary best track position through the current warning position which is linearly extrapolated to 24 and 48 hours.

(2) CLIM -- A climatological aid which provides 24-, 48-, and 72-hour tropical cyclone forecast positions and intensity changes for initial latitude/longitude positions. The data are arranged by months and are based on historical data from 1945 to 1973.

(3) HPAC -- The 24- and 48-hour forecast positions are derived from the midpoints of straight lines connecting the 24 - and 48-hour positions on the EXTRAPOLATION track at the CLIM track.

(4) TCM -- The dynamic Tropical Cyclone Model (TCM) is a coarse mesh (220 km) primitive equation model. The digitized tropical cyclone warning position is bogused in the 850 mb wind and temperature fields of the FLENUMOCEANCEN Global Band Analysis. Hemispheric forecast data are used on the boundaries.

(5) CYCLOPS -- An updated version of the HATTRACK/MOHATT steering program which can provide steering forecasts at the 1000, 850, 700, 500, 400, 300, and 200 mb levels. The program can be run in the unmodified or modified version with analysis or prognostic fields. The program advects a point vortex on a preselected analysis and/or smoothed prognostic field at designated levels in 6-hour time steps through 72 hours. In the modified version, the program uses the previous 12-hour history position to compute the 12-hour forecast error and applies a bias correction to the forecast positions. As in previous years, the modified version in the prognostic mode for the 500 and 700 mb levels was verified.

(6) TYAN78 -- An updated analog program which combines the earlier versions TYFN75 and INJAH74. The program scans history tapes for cyclones similar (within a specified acceptance envelope) to the current cyclone. For the NW Pacific region, three types of 24-, 48-, and 72-hour position and intensity forecasts are provided (straight, recurve, and combined). For all other regions, types of tracks are not segregated.

c. Testing and Results

A comparison of selected techniques is included in Table 4-5 for all western North Pacific cyclones and in Table 4-6 for Indian Ocean cyclones. In Tables 4-5 and 4-6, "X-AXIS" refers to techniques listed horizontally across the top, while "Y-AXIS" refers to techniques listed vertically. The example in Table 4-5 compares COMB to CY70. In the 394 cases available for comparison, the average 24-hour vector error was 133 nm for COMB and 138 nm for CY70. The difference of 5 nm is shown in the lower right. (Differences are not always exact due to computational round off.)

STATISTICS FOR YEAR 24 HR FCSTS

	JTWC	STRA	RECR	COMB	CY70	CY50	TCMO	CLIM	XTRP	HPAC
JTWC	492 126									
	126 0									
STRA	341 122	349 135								
	135 13	135 0								
RECR	403 127	348 135	417 135							
	131 5	131 -3	135 0							
COMB	403 127	349 135	416 135	417 132						
	131 4	121 -13	132 -2	132 0						
CY70	418 127	327 135	393 135	394 133	432 141					
	140 13	127 -7	139 3	138 5	141 0					
CY50	423 126	332 135	398 135	398 133	431 141	437 136				
	135 9	130 -5	136 1	136 3	136 -4	136 0				
TCMO	153 130	103 136	128 133	128 127	130 141	131 133	156 137			
	136 6	130 -5	138 5	138 11	137 -3	137 5	137 0			
CLIM	473 125	348 135	414 135	414 132	422 141	427 136	153 135	488 160		
	158 33	151 16	160 25	160 27	161 20	161 25	166 31	160 0		
XTRP	478 125	343 134	409 133	409 132	424 141	429 135	154 137	478 160	492 143	
	142 17	134 0	142 9	142 11	143 2	143 7	142 5	142 -17	143 0	
HPAC	465 125	342 134	407 133	407 132	415 140	420 135	151 135	478 160	478 142	478 130
	129 4	121 -12	131 -2	131 0	131 -8	131 -3	131 -3	130 -29	130 -11	130 0

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

STATISTICS FOR YEAR 48 HR FCSTS

	JTWC	STRA	RECR	COMB	CY70	CY50	TCMO	CLIM	XTRP	HPAC
JTWC	370 243									
	243 0									
STRA	284 243	299 295								
	288 45	295 0								
RECR	309 245	299 295	346 257							
	244 -1	251 -44	257 0							
COMB	309 245	299 295	346 257	346 243						
	232 -12	235 -59	243 -13	243 0						
CY70	311 248	277 296	322 259	322 244	350 266					
	262 15	262 -33	267 8	267 24	266 0					
CY50	318 247	283 296	328 259	328 244	350 266	357 256				
	254 7	253 -43	257 -1	257 13	254 -11	256 0				
TCMO	115 262	92 304	108 269	108 253	107 258	109 248	128 259			
	251 -10	241 -62	248 -20	248 -4	254 -3	254 6	259 0			
CLIM	356 243	296 294	341 257	341 242	338 266	345 257	124 252	394 300		
	281 38	279 -15	301 44	301 59	303 37	303 46	307 55	300 0		
XTRP	362 244	296 293	340 255	340 241	344 266	351 255	126 257	386 297	399 306	
	303 60	300 6	304 49	304 63	306 40	307 51	323 66	302 5	306 0	
HPAC	351 243	294 293	337 255	337 241	334 265	341 256	122 250	386 297	386 302	386 255
	244 1	242 -50	255 0	255 14	255 -9	256 0	269 19	255 -41	255 -47	255 0

JTWC - OFFICAL JTWC FORECAST
STRA - STRAIGHT (TYAN 78)
RECR - RECURVE (TYAN 78)
COMB - COMBINED (TYAN 78)
CY70 - CYCLOPS 700-MB PROG
CY50 - CYCLOPS 500-MB PROG
TCMO - TROPICAL CYCLONE MODEL (ONE-WAY)
CLIM - CLIMATOLOGY
XTRP - 12-HOUR EXTRAPOLATION
HPAC - MEAN OF XTRP AND CLIMATOLOGY

STATISTICS FOR YEAR 72 HR FCSTS

	JTWC	STRA	RECR	COMB	CY70	CY50	TCMO	CLIM	XTRP	HPAC
JTWC	268 389									
	389 0									
STRA	212 394	242 451								
	421 27	451 0								
RECR	228 393	242 451	268 386							
	371 -21	376 -74	386 0							
COMB	228 393	242 451	268 386	268 378						
	364 -28	373 -77	378 -7	378 0						
CY70	221 403	220 455	245 394	245 380	263 419					
	416 13	416 -38	420 26	420 40	419 0					
CY50	228 399	228 454	252 392	252 379	262 419	270 419				
	422 23	412 -41	419 28	419 40	417 -1	419 0				
TCMO	66 437	60 472	68 398	68 374	66 398	68 415	83 349			
	361 -74	343 -128	326 -72	326 -47	342 -55	341 -73	349 0			
CLIM	258 394	239 446	265 387	265 375	257 418	264 422	80 341	305 445		
	429 35	425 -20	449 62	449 73	449 30	449 27	427 85	445 0		

TABLE 4-5.
ERROR STATISTICS FOR THE WESTERN NORTH PACIFIC FOR 1980

STATISTICS FOR YEAR 24 HR FCSTS

	JTWC	TY78	CY70	CY50	TCMO	CLIM	XTRP	HPAC
JTWC	7 115 115 0							
TY78	6 122 114 -8	9 141 141 0						
CY70	5 129 99 -30	5 117 99 -17	5 99 99 0					
CY50	5 129 106 -23	5 117 106 -10	5 99 106 7	5 106 106 0				
TCMO	3 141 183 42	4 136 209 72	2 80 218 138	2 107 218 111	4 209 209 0			
CLIM	7 115 97 -17	9 141 150 8	5 99 98 0	5 106 98 -6	4 209 159 -49	10 144 144 0		
XTRP	7 115 100 -14	9 141 138 -3	5 99 103 4	5 106 103 -2	4 209 149 -59	10 144 129 -15	10 129 129 0	
HPAC	7 115 84 -31	9 141 134 -6	5 99 97 -1	5 106 97 -8	4 209 136 -72	10 144 125 -18	10 129 125 -2	10 125 125 0

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

STATISTICS FOR YEAR 48 HR FCSTS

	JTWC	TY78	CY70	CY50	TCMO	CLIM	XTRP	HPAC
JTWC	2 93 93 0							
TY78	1 90 245 156	5 285 285 0						
CY70	0 0 0 0	1 320 126 -193	1 126 126 0					
CY50	0 0 0 0	1 320 369 49	1 126 369 243	1 369 369 0				
TCMO	1 90 271 181	3 312 303 -8	1 126 306 179	1 369 306 -62	3 303 303 0			
CLIM	2 93 326 233	5 285 419 134	1 126 504 378	1 369 504 135	3 303 418 115	6 401 401 0		
XTRP	2 93 72 -20	5 285 184 -100	1 126 221 95	1 369 221 -147	3 303 200 -102	6 401 158 -241	6 158 158 0	
HPAC	2 93 144 51	5 285 278 -5	1 126 358 231	1 369 358 -10	3 303 271 -31	6 401 260 -140	6 158 260 101	6 260 260 0

JTWC - OFFICAL JTWC FORECAST
TY78 - ANALOG (TYAN 78)
CY70 - CYCLOPS 700-MB PROG
CY50 - CYCLOPS 500-MB PROG
TCMO - TROPICAL CYCLONE MODEL (ONE-WAY)
XTRP - 12-HOUR EXTRAPOLATION
HPAC - MEAN OF XTRP AND CLIMATOLOGY

STATISTICS FOR YEAR 72 HR FCSTS

	JTWC	TY78	CY70	CY50	TCMO	CLIM
JTWC	1 167 167 0					
TY78	1 167 389 222	2 427 427 0				
CY70	0 0 0 0	1 465 77 -387	1 77 77 0			
CY50	0 0 0 0	1 465 681 216	1 77 681 604	1 681 681 0		
TCMO	1 167 306 138	2 427 304 -122	1 77 303 226	1 681 303 -377	2 304 304 0	
CLIM	1 167 513 346	2 427 636 209	1 77 760 683	1 681 760 79	2 304 636 332	3 585 585 0

TABLE 4-6.
ERROR STATISTICS FOR THE NORTH INDIAN OCEAN FOR 1980

CHAPTER V - APPLIED TROPICAL CYCLONE RESEARCH SUMMARY

1. JTWC RESEARCH

Part of the mission of the Joint Typhoon Warning Center is to conduct applied tropical cyclone research as time and resources permit. The purpose of this research is to improve the timeliness and accuracy of operational forecasts. During 1980, there was continued effort to convert and update operational programs and to streamline operational procedures for compatibility with the Naval Environmental Display Station (NEDS). The following abstracts summarize the year's applied research projects which were completed or are still in progress.

EQUIVALENT POTENTIAL TEMPERATURE/MINIMUM SEA-LEVEL PRESSURE RELATIONSHIPS FOR FORECASTING TROPICAL CYCLONE INTENSIFICATION

(Dunnavan, G. M., NAVOCEANCOMCEN/JTWC)

A technique for forecasting rapid/explosive deepening has been under operational evaluation by JTWC for the past two tropical cyclone seasons. The technique indicates situations where significant intensification can be expected to occur in the near future based on the current 700 mb equivalent potential temperature and surface pressure at the cyclone center. Data from the past three tropical cyclone seasons will be collected and used to "fine tune" the temperature/pressure forecast graph. The results will then be published as a NAVOCEANCOMCEN/JTWC TECH NOTE.

TROPICAL CYCLONE WIND RADIUS PROGRAM

(Huntley, J. E., NAVOCEANCOMCEN/JTWC)

A wind radius program, developed by Holland (Bureau of Meteorology, Melbourne, Australia) was adapted for use by JTWC forecasters on a TI-59 calculator. The program requires the tropical cyclone's minimum sea-level pressure and the radius of maximum wind. This program is useful in data sparse areas in the northwest Pacific and was modified to use Dvorak satellite intensity data for Southern Hemisphere tropical cyclones.

EVALUATION OF OBJECTIVE TECHNIQUES

(Matsumoto, C. R., NAVOCEANCOMCEN/JTWC)

The 24-, 48-, and 72-hour position forecasts from the CYCLOPS steering program were evaluated during the 1980 tropical cyclone season. The unmodified and modified versions in both analysis and prognostic modes at the 500 mb level were compared against each other and against the official JTWC forecasts. Results indicate that none of the versions of CYCLOPS was able to match the official JTWC forecasts. However, the modified prognostic mode was very competitive and clearly superior to the other modes. The modified analysis mode was a close second, while the unmodified analysis mode performed poorly.

EVALUATION OF THE NAVY NESTED TWO-WAY INTERACTIVE TCM (NTCM)

(Matsumoto, C. R., NAVOCEANCOMCEN/JTWC)

The accuracy and timeliness of the new NTCM were evaluated during the 1980 tropical cyclone season. Approximately 70 NTCM forecasts were received in an ARQ mode for tropical cyclones commencing with Typhoon Norris and ending with Typhoon Dinah. The average turnaround time for these forecasts was two hours. Preliminary verification indicates that the forecasts, although more accurate than the official JTWC forecasts at 48 and 72 hours, were not as accurate as the One-Way interactive TCM that uses the analysis fields instead of 12-hour prognostic fields used by the NTCM.

A NEW TROPICAL CYCLONE FORECAST AID BASED ON A BLENDING OF PERSISTENCE AND CLIMATOLOGY (BPAC)

(Weir, R. C., NAVOCEANCOMCEN/JTWC)

A program has been designed for use with a TI-59 calculator which generates 12 to 72 hr forecasts. These forecasts are based on a non-linear persistence developed from the past 36 hr motion of a tropical cyclone and blended with climatology. The blending routine gives less weight to persistence at each forecast interval.

2. NEPRF RESEARCH

TROPICAL CYCLONE RESEARCH AT OR UNDER CONTRACT TO THE NAVAL ENVIRONMENTAL PREDICTION RESEARCH FACILITY (NEPRF), MONTEREY, CALIFORNIA

THE NAVY TWO-WAY INTERACTIVE NESTED TROPICAL CYCLONE MODEL (NTCM)

(Harrison, E. J., Jr., NEPRF)

A primitive equation, two-way interactive nested tropical cyclone model has been developed by NEPRF. Evaluation of the model as a typhoon track forecasting aid was begun during the 1980 typhoon season. The model is currently initialized from the FNOC global band prognosis fields. Within the next year the model will be coded for the new CYBER 203 computer being installed at FNOC, and will be initialized from the new global model prognosis fields.

THE PERFORMANCE OF THE NTCM WHEN INITIALIZED WITH GLOBAL BAND ANALYSES VERSUS GLOBAL BAND 12-HR PROGNOSES VALID AT THE SAME TIME

(Fiorino, M. and Harrison, E. J., Jr, NEPRF)

The present version of the NTCM is initialized with 12-hr old global band prognostic fields because the tau zero analysis is not available until several hours past warning time. The performance of the model in 1980 was not as good as expected considering the results of the developmental evaluation using test cases. Most of the difference is thought to be because the test cases were initialized with analyses. The 1980 forecasts are now being recomputed with tau zero analyses. Initial results show differences which hopefully can be quantified with more cases.

THE EFFECT OF HEATING ON TYPHOON TRACK FORECASTING USING THE NTCM

(Fiorino, M., NEPRF)

A major difference between the NTCM and other typhoon model is the analytic representation of the diabatic effects of cumulus convection. To determine which characteristics of the heating field have the largest influence on the track, the heating profile is varied in space and time. Once these characteristics (magnitude, spatial distribution, etc.) have been identified, an attempt will be made to find an optimum set of heating parameters for several storms which can be related to satellite observations.

PREDICTING TROPICAL CYCLONE FORMATION IN WESTPAC

(Lowe, P. R., NEPRF)

The "Genesis" program has been evaluated from spring 1980 to fall 1980. The procedure has correctly forecast all tropical cyclone development during this time period. Further, false alarms were minimal in that only one case was forecast to develop which subsequently did not develop (TD-10). One problem was isolated during the evaluation. During the months of August and September, "Genesis" was prone to forecast development somewhat prematurely. Subsequent analysis of the program determined and corrected the cause of the problem. "Genesis" became operational in early October. A formal technical report on "Genesis" performance for the year 1980 is planned.

TROPICAL CYCLONE STRIKE AND WIND PROBABILITIES

(Brand, S., NEPRF, Jarrell, J. D., Science Applications, Inc., and Chin, D., Systems and Applied Sciences Corp.)

Tropical cyclone strike and wind probability is a method for determining up through 72-hr that a tropical cyclone will come within or affect geographic points of interest to the user. The output from this program can be used as an aid for operational decisions associated with tropical cyclone evasion, evacuation, and base preparedness. Applications presently being developed, tested and implemented include: strike and wind probability and geographic depictions in the western North Pacific; optimum track ship routing (OTSR) aspects in the western North Pacific; eastern North Pacific strike probabilities; and western North Atlantic and Gulf of Mexico strike probabilities.

TROPICAL CYCLONE HAVEN STUDIES

(Turpin, R. and Brand, S., NEPRF)

Six additional ports and harbors have been evaluated and will be forwarded as change TWO to the Typhoon Havens Handbook for the Western Pacific and Indian Oceans. In addition, COMSECONDFLT and CINCLANTFLT have requested 22 ports and harbors in the Atlantic and Gulf of Mexico be evaluated as hurrican havens. Work has commenced on these port studies.

SOUTHERN HEMISPHERE UPPER-LEVEL TROPICAL CYCLONE STEERING TECHNIQUES

(Hamilton, H., Systems and Applied Sciences Corp.)

The current automated objective steering forecast technique (operationally termed CYCLOPS) has been developed for operational forecast use in the Southern Hemisphere.

TROPICAL CYCLONE SURFACE WIND DISTRIBUTION

(Tsui, T., Brand, S., and Brody, L. R., NEPRF)

Based on data from 1966 to 1977 JTWC tropical cyclone warnings, a statistical wind distribution forecast model has been developed and tested. The results of the statistical test, using the independent data of the 1979 tropical cyclone season, showed that the 30-kt and 50-kt wind radius forecast model provides competitive automated forecasts as compared to the official forecasts of JTWC. The asymmetric nature of a tropical cyclone is incorporated in the model. In addition, a by-product of this model is suggested wind radius information in a format for insertion into the tropical cyclone warning.

TROPICAL CYCLONE INTENSITY

(Tsui, T., Brody, L. R., and Brand, S., NEPRF)

A climatology/persistence tropical cyclone intensity forecast model has been developed. The data base consists of 1966 to 1979 western North Pacific tropical cyclones. Synoptic variables such as equivalent potential temperature are now being incorporated as predictors in the model. Two other predictors which may be included in the future are the cloud-top temperature pattern and the spiral pattern of the cloud bands derived from the satellite IR and visible imagery, respectively.

SATELLITE BASED TROPICAL CYCLONE INTENSITY FORECASTS

(Brody, L. R. and Tsui, T., NEPRF)

The Satellite Processing and Display System (SPADS) is being used both to test available statistical algorithms and to develop new statistical algorithms which make

24-hr forecasts of changes in tropical cyclone intensity. These statistical algorithms are based on satellite-measured equivalent blackbody temperatures of cloud tops surrounding tropical cyclones. IR data for both GOES-EAST and GOES-WEST for the 1979 tropical cyclone season are being used in this study.

AUTOMATIC EXTRACTION OF TROPICAL CYCLONE SATELLITE WINDS

(Lee, D. H., NEPRF)

Satellite winds of the quality, quantity, and density necessary for initialization of tropical cyclone models can be quickly extracted from successive geostationary satellite images using the System for Automatic Wind Extraction from Geostationary Satellite-data (SAWEGS). This recently developed system used Fast Fourier Transforms to extract cloud winds by computing the cross-covariance between images, and includes a unique edge enhancement technique plus other features which allow the automatic production of winds in tropical cyclone cases. Recent studies of the application of SAWEGS to tropical cyclone image sets have shown the good quality and coverage of resulting vectors as well as the system's remaining difficulties.

TROPICAL CYCLONE SPIRAL LINEARIZATION TECHNIQUE

(Lee, D. H., NEPRF)

A new technique for quantizing information inherent in the spiral banding structure of tropical cyclones has been developed. The Spiral Linearization Technique involves the transformation of a satellite image to polar stereographic coordinates and subsequent remapping into a selected spiral coordinate system. Cloud structures which conform to the spiral shape are portrayed as linear formations after linearization. Statistical and quantitative analyses of the linearized image yield information on a cyclone's structure which can be correlated with the cyclone's characteristics and behavior. A system to apply this technique is under development on the NEPRF Satellite-data Processing and Display System.

3. PUBLICATIONS

Dunnavan, G. M., and Diercks, J. W., 1980: An Analysis of Super Typhoon Tip (October 1979), Monthly Weather Review, Vol. 108. pp 195-203.

Super Typhoon Tip was an eventful tropical cyclone which developed in the western North Pacific in early October 1979. Besides establishing the world's record for the lowest minimum sea level pressure ever measured in a tropical cyclone, Tip also possessed the largest surface circulation pattern ever observed for a tropical cyclone. The development cycle of Super Typhoon Tip from a weak disturbance to a mature typhoon to an extratropical system is discussed in view of the record breaking performance of this typhoon.

Guay, G. A., 1980: Tropical Cyclone Forecast Verification as a Function of Reconnaissance Platform, NAVOCEANCOMCEN/JTWC 80-3, TECH NOTE.

Harrison (1975) examined tropical cyclone forecast accuracy as a function of the reconnaissance platform used as the basis for each forecast's initial position. Using 1973 and 1974 data, Harrison showed that forecasts based on aircraft position fixes were most accurate when compared to the Joint Typhoon Warning Center's best tracks. Unlike the earlier study, forecasts based on satellite reconnaissance were more accurate than forecasts based on aircraft reconnaissance for tropical cyclones which never reached typhoon intensity.

Lubeck, O. M., and Shewchuk, J. D., 1980: Tropical Cyclone Minimum Sea Level Pressure Maximum Sustained Wind Relationship, NAVOCEANCOMCEN/JTWC 80-1, TECH NOTE.

This paper investigates empirical relationships between maximum sustained surface winds and minimum sea-level pressure in western North Pacific tropical cyclones. The empirical equation developed by Atkinson and Holliday (1977) is reviewed and evaluated using 13 independent cases collected since the original study. New relationships were developed using the original dependent data set in Atkinson and Holliday and were tested also against the 13 independent cases. These new relationships were based on different assumptions for reducing observed peak wind gusts to one-minute sustained surface winds. There were no significant differences between the original Atkinson and Holliday relationship and the new relationships. Introducing environmental pressure and latitude as additional predictors did not improve the pressure-wind relationship.

Shewchuk, J. D., and Weir, R. C., 1980: An Evaluation of the DVORAK Technique for Estimating Tropical Cyclone Intensities from Satellite Imagery. NAVOCEANCOMCEN/JTWC 80-2, TECH NOTE.

This paper investigates the accuracy of tropical cyclone intensity estimates as derived from the Dvorak technique. Estimates of current intensity and 24-hour forecast intensities were verified against JTWC official best track data. Results from a 396-case sample indicate overall absolute and bias errors of less than one CI number, even though forecast intensity errors were twice that of the current intensity estimates. Comparison of Dvorak and JTWC intensity errors indicate that they are essentially equal. The Dvorak 24-hour forecast intensities are also superior to all objective forecast aids available to the JTWC. Dvorak forecast data were also evaluated as a function of the tropical cyclone's life cycle. Results show a tendency of the Dvorak technique to over-forecast developing and weakening trends. Verification of cases which included a PLUS or MINUS symbol indicated no improvement over cases with no symbols. However, the use of the symbols is believed to reduce forecast intensity error.

ANNEX A TROPICAL CYCLONE DATA

1. WESTERN NORTH PACIFIC CYCLONE DATA

TROPICAL DEPRESSION 01

BEST TRACK DATA

	BEST TRACK			WARNING			ERRORS		24 HOUR FORECAST			ERRORS		48 HOUR FORECAST			ERRORS		72 HOUR FORECAST				
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
031800Z	6.4	140.9	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
031806Z	16.8	140.5	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
031812Z	7.6	139.7	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
031818Z	8.2	139.0	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
031900Z	8.7	138.3	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
031906Z	8.8	137.9	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
031912Z	9.0	137.3	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
031918Z	9.0	136.7	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
032000Z	9.0	136.2	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
032006Z	9.0	135.6	25	9.2	135.1	25.	32.	0.	9.9	132.1	30.	101.	5.	11.2	129.7	35.	51.	10.	13.0	127.2	40.	90.	10.
032012Z	9.0	135.0	25	8.9	134.8	25.	13.	0.	9.4	132.4	35.	13.	10.	10.4	129.8	40.	69.	15.	12.3	127.7	40.	101.	10.
032018Z	9.1	134.6	25	9.2	134.2	30.	24.	5.	10.0	131.8	35.	59.	10.	11.2	129.3	40.	69.	15.	13.5	127.8	40.	179.	10.
032100Z	9.2	134.2	25	9.4	133.7	30.	32.	5.	10.2	131.2	35.	89.	10.	11.6	128.9	40.	79.	10.	13.3	127.0	40.	192.	10.
032106Z	9.3	133.7	25	9.1	133.7	30.	12.	5.	9.5	131.6	35.	153.	10.	10.7	128.3	40.	98.	10.	12.5	125.4	35.	202.	15.
032112Z	9.2	132.3	25	9.6	133.0	30.	48.	5.	10.6	130.0	35.	77.	10.	11.9	127.2	40.	70.	10.	13.3	124.6	35.	185.	15.
032118Z	10.1	130.8	25	9.9	132.1	30.	77.	5.	10.9	129.1	35.	53.	10.	12.3	126.2	40.	77.	10.	13.9	123.3	35.	152.	20.
032200Z	10.4	129.7	25	10.5	129.7	30.	6.	5.	12.5	125.3	30.	167.	0.	15.3	122.2	35.	158.	5.	0.0	0.0	0.	-0.	0.
032206Z	10.5	129.2	25	10.7	129.0	30.	17.	5.	12.6	125.2	30.	124.	0.	15.3	122.2	35.	90.	15.	0.0	0.0	0.	-0.	0.
032212Z	10.8	128.7	25	11.2	128.0	30.	47.	5.	13.5	124.0	30.	147.	0.	16.7	121.7	35.	162.	15.	0.0	0.0	0.	-0.	0.
032218Z	10.8	128.2	25	11.3	127.8	30.	38.	5.	12.7	125.1	30.	17.	0.	14.7	122.8	25.	125.	10.	0.0	0.0	0.	-0.	0.
032300Z	11.0	127.7	30	10.8	127.7	20.	12.	-10.	12.0	125.5	20.	124.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
032306Z	11.5	127.0	30	11.3	127.4	20.	26.	-10.	12.3	125.2	20.	196.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
032312Z	12.0	126.0	30	12.1	126.3	20.	19.	-10.	14.0	123.4	15.	110.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
032318Z	12.5	124.9	30	12.5	125.0	20.	6.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
032400Z	13.1	123.7	30	13.3	123.8	20.	13.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
032406Z	13.8	122.2	20	14.1	122.2	20.	18.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
032412Z	14.0	121.5	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
032418Z	14.2	120.7	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
032500Z	14.3	119.8	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	26.	102.	94.	157.	0.	0.	0.	0.
AVG RIGHT ANGLE ERROR	12.	20.	53.	65.	0.	0.	0.	0.
AVG INTENSITY MAGNITUDE ERROR	6.	6.	11.	13.	0.	0.	0.	0.
AVG INTENSITY BIAS	-0.	4.	11.	13.	0.	0.	0.	0.
NUMBER OF FORECASTS	17	14	11	7	0	0	0	0

DISTANCE TRAVELED BY STORM IS 2439. NM

AVERAGE SPEED OF STORM IS 15. KNOTS

TROPICAL DEPRESSION TD-01
FIX POSITIONS FOR CYCLONE NO. 1

SATELLITE FIXES

	FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	SATELLITE	COMMENTS	SITE
	1	162358	6.0N 147.5E	PCN 6	T0.0/0.0	DMSP39	INIT OBS	PGTW
	2	170300	5.0N 146.6E	PCN 0		OTHER		PGTW
	3	180121	8.5N 140.1E	PCN 5	T1.0/1.0 /D1.0/25HRS	DMSP39		PGTW
*	4	181007	10.0N 140.3E	PCN 6		NOAA6		PGTW
*	5	182247	8.8N 139.5E	PCN 5		NOAA6		PGTW
	6	190101	8.8N 138.1E	PCN 3	T1.0/1.0 /S0.0/24HRS	DMSP39		PGTW
*	7	190945	10.6N 137.4E	PCN 5		NOAA6		PGTW
	8	192225	9.1N 135.9E	PCN 3		NOAA6		PGTW
	9	200041	9.1N 135.6E	PCN 3	T2.0/2.0 /D1.0/24HRS	DMSP39		PGTW
	10	201104	9.4N-134.3E	PCN 6		NOAA6		PGTW
	11	201600	9.7N 134.0E	PCN 0		OTHER		PGTW
	12	202203	9.6N 133.7E	PCN 5		NOAA6	DATA EDGE	PGTW
	13	210203	9.3N 133.5E	PCN 5	T2.0/2.0 /S0.0/26HRS	DMSP39		PGTW
	14	210203	10.5N 132.5E	PCN 5	T2.0/2.0	DMSP39	INIT OBS	RPMK
*	15	210900	10.8N 131.9E	PCN 0		OTHER		PGTW

16	211043	11.1N 130.9E	PCN 5		NOAA6		PGTW
17	211600	12.0N 130.9E	PCN 0		OTHER		PGTW
18	212322	10.3N 130.4E	PCN 3		NOAA6	EXPOSED LLC	PGTW
19	220124	11.5N 128.2E	PCN 3	T1.0/1.0 /S0.0/24HRS	DMSP39		RODN
20	220144	10.9N 130.2E	PCN 5	T1.0/1.0	DMSP39	INIT OBS	RODN
21	220144	10.4N 130.1E	PCN 3	T1.0/2.0 /W1.0/24HRS	DMSP39		PGTW
22	220900	11.2N 129.1E	PCN 0		OTHER		PGTW
23	221021	11.0N 129.7E	PCN 5		NOAA6		PGTW
24	221600	11.3N 129.3E	PCN 0		OTHER		PGTW
25	222300	10.7N 128.3E	PCN 5		NOAA6		PGTW
26	230124	11.4N 128.1E	PCN 3	T1.0/1.0 /S0.0/24HRS	DMSP39		PGTW
27	230900	12.1N 126.9E	PCN 0		OTHER		PGTW
28	231600	12.3N 125.4E	PCN 0		OTHER		PGTW
29	232100	13.0N 124.4E	PCN 0		OTHER		PGTW
30	240000	12.8N 123.4E	PCN 0		OTHER		PGTW
31	240246	14.6N 121.9E	PCN 5	T2.0/2.0	DMSP39	INIT OBS	RPMK
32	240246	13.8N 122.5E	PCN 5	T1.0/1.0 /S0.0/25HRS	DMSP39		RODN
33	260206	11.8N 117.4E	PCN 5	T1.5/1.5	DMSP39	INIT OBS	PGTW
34	260300	12.1N 117.4E	PCN 0		OTHER		PGTW
35	261200	12.5N 116.8E	PCN 0		OTHER		PGTW
36	261215	12.3N 116.5E	PCN 6		NOAA6		RPMK
37	270147	11.8N 114.9E	PCN 5		DMSP39		PGTW
38	270300	12.2N 114.3E	PCN 0		OTHER		PGTW
39	270320	12.1N 115.0E	PCN 5		DMSP39	NO DVORAK	RPMK
40	271153	12.2N 113.7E	PCN 6		NOAA6		RPMK
41	280000	11.5N 112.8E	PCN 0		OTHER		PGTW
42	280309	11.0N 111.3E	PCN 5	T1.0/1.0	DMSP39	INIT OBS	RODN

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV	ACCRY MET	EYE SHAPE	EYE ORIEN- DIAM/TATION	EYE TEMP (C) OUT	IN	DP	SST	MSN NO.
1	180205	6.3N 140.6E	1500FT		1005	20 050 240	090 44 050 240	5	5			+23	+23	+22		1
2	190007	8.3N 138.9E	1500FT		1006	20 030 230	100 30 030 230	5	10			+22	+23	+23	28	2
3	200045	9.1N 135.7E	1500FT		1003	25 030 30	120 32 060 70	6	7					+25	24	3
4	200926	8.7N 135.1E	700MB	3123		35 020 120	130 22 020 120	5	10			+ 9	+13	+ 8		4
5	210100	8.9N 134.1E	700MB	3097		25 010 65	130 20 040 120	6	8				+ 9	+ 8		6
6	210635	9.4N 133.7E	700MB	3083		10 120 10	250 10 000 000	10	10				+11	+ 9		6
7	212207	10.4N 130.0E	700MB	3101	1003	15 330 55	090 46 010 130	5	15			+12	+12	+11		8
8	221946	11.1N 128.5E	700MB	3104		20 120 100	090 42 010 150	10	15				+12	+ 8		10
9	222315	10.6N 127.7E	700MB	3120	1005	15 090 60	160 32 100 80	4	45			+12	+12	+ 8		10

SYNOPTIC FIXES

FIX NO.	TIME (Z)	FIX POSITION	INTENSITY ESTIMATE	NEAREST DATA (NM)	COMMENTS
* 1	230000	12.0N 128.0E	030	20	
* 2	231200	11.5N 127.0E	030	20	
3	231800	12.4N 125.0E	030	90	
4	232100	12.8N 124.5E	030	20	
5	240000	13.0N 124.0E	010	20	

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TROPICAL STORM CARMEN

BEST TRACK DATA

MO/DA/HR	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 HOUR FORECAST ERRORS DST	24 HOUR FORECAST ERRORS WIND	48 HOUR FORECAST POSIT		48 HOUR FORECAST WIND	48 HOUR FORECAST ERRORS DST	48 HOUR FORECAST ERRORS WIND	72 HOUR FORECAST POSIT		72 HOUR FORECAST WIND	72 HOUR FORECAST DST	72 HOUR FORECAST WIND
040400Z	4.7	181.4	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
040406Z	6.0	181.2	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
040412Z	7.2	181.1	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
040418Z	8.3	100.4	35	0.0	0.0	0.	-0.	0.	0.0	0.8	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
040500Z	9.2	179.6	40	9.5	180.0	30.	30.	-10.	13.7	177.7	40.	56.	-20.	18.1	178.0	45.	70.	0.	20.9	181.9	35.	91.	0.
040506Z	10.1	178.5	45	10.0	178.9	30.	24.	-15.	13.6	176.2	40.	155.	-20.	17.0	176.4	40.	236.	-5.	20.0	180.3	30.	40.	-5.
040512Z	11.6	177.8	50	11.0	178.2	40.	43.	-10.	14.7	175.8	60.	184.	5.	18.5	177.9	55.	139.	15.	21.2	181.7	45.	38.	15.
040518Z	13.1	177.4	55	13.8	177.7	45.	45.	-10.	19.6	179.9	50.	136.	0.	22.8	186.5	50.	388.	10.	25.0	192.7	40.	650.	10.
040600Z	14.5	177.2	60	14.7	176.8	45.	26.	-15.	18.7	176.6	50.	136.	5.	21.9	183.4	35.	193.	0.	24.0	189.3	30.	431.	5.
040606Z	16.0	177.2	60	15.5	177.2	45.	30.	-15.	19.3	188.1	40.	23.	-5.	23.0	185.6	35.	312.	0.	0.0	0.0	0.	-0.	0.
040612Z	17.1	177.8	55	17.0	177.9	60.	8.	5.	20.9	182.8	45.	172.	5.	23.9	190.0	35.	523.	5.	0.0	0.0	0.	-0.	0.
040618Z	17.9	178.3	50	18.4	178.7	50.	38.	0.	22.0	184.4	35.	263.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
040700Z	18.8	179.0	45	18.5	179.8	50.	49.	5.	21.0	185.0	40.	260.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
040706Z	19.4	179.7	45	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
040712Z	19.7	180.0	40	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
040718Z	20.0	180.2	40	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
040800Z	20.3	100.4	35	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
040806Z	20.6	180.6	35	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
040812Z	20.9	181.1	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
040818Z	21.2	181.6	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
040900Z	21.4	182.0	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS WRNG	ALL FORECASTS 24-HR	ALL FORECASTS 48-HR	ALL FORECASTS 72-HR	TYPHOONS WHILE OVER 35 KTS WRNG	TYPHOONS WHILE OVER 35 KTS 24-HR	TYPHOONS WHILE OVER 35 KTS 48-HR	TYPHOONS WHILE OVER 35 KTS 72-HR
AVG FORECAST POSIT ERROR	32.	154.	266.	250.	0.	0.	0.	0.
AVG RIGHT ANGLE ERROR	19.	90.	179.	218.	0.	0.	0.	0.
AVG INTENSITY MAGNITUDE ERROR	9.	8.	5.	7.	0.	0.	0.	0.
AVG INTENSITY BIAS	-7.	-3.	4.	5.	0.	0.	0.	0.
NUMBER OF FORECASTS	9	9	7	5	0	0	0	0

DISTANCE TRAVELED BY STORM IS 1179. NM

AVERAGE SPEED OF STORM IS 10. KNOTS

TROPICAL STORM CARMEN
FIX POSITIONS FOR CYCLONE NO. 2

SATELLITE FIXES

	FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	SATELLITE	COMMENTS	SITE
*	1	310000	6.7N 174.3W	PCN 0		OTHER		PGTW
	2	040015	4.5N 179.5W			GOES3		NESS
	3	040900	6.9N 178.0W	PCN 0		OTHER		PGTW
*	4	041015	5.7N 179.9E			GOES3		NESS
	5	041200	7.1N 178.3W	PCN 0		OTHER		PGTW
	6	041515	7.4N 180.0E			GOES3	EST MAX WNDS 35 KTS	NESS
	7	041530	7.5N 179.7E	PCN 6		NOAA6		KGWC
	8	041600	8.8N 179.0W	PCN 0		OTHER		PGTW
*	9	041714	6.6N 180.0E	PCN 6		NOAA6		KGWC
	10	041915	8.5N 179.9E			GOES3		NESS
	11	041954	8.5N 179.7E	PCN 6	T2.5/2.5	NOAA6	INIT OBS	KGWC
	12	041954	9.0N 179.9E	PCN 6		NOAA6		PHIK
	13	042100	9.5N 179.2W	PCN 0		OTHER		PGTW
	14	050000	9.7N 179.6E	PCN 0	T2.5/2.5	OTHER	INIT OBS	PGTW
	15	050233	9.4N 179.1E	PCN 6	T2.5/2.5	TIROSN	INIT OBS	PHIK
	16	050234	9.6N 178.4E	PCN 6		NOAA6		KGWC
	17	050300	9.4N 179.0E	PCN 0		OTHER		PGTW
	18	050653	9.4N 178.2E	PCN 6		NOAA6		PHIK
	19	050900	11.3N 178.9E	PCN 0		OTHER		PGTW
	20	051119	11.1N 177.5E			GOES3	EST MAX WNDS 45 KTS OVER WATER	NESS
	21	051200	11.8N 178.3E	PCN 0		OTHER		PGTW
	22	051519	13.0N 177.6E	PCN 4		TIROSN		PHIK
	23	051600	13.5N 178.0E	PCN 0		OTHER		PGTW
*	24	051932	13.9N 177.3E	PCN 6		NOAA6		PHIK
	25	051932	13.6N 177.2E	PCN 6	T3.5/3.5 /D1.0/24HRS	NOAA6		KGWC
	26	052015	13.7N 177.0E			GOES3	EST MAX SFC WNDS 55 KTS	NESS
	27	052100	14.1N 177.5E	PCN 0		OTHER		PGTW
	28	052231	14.1N 177.0E	PCN 2	T4.5/4.5 /D2.0/20HRS	DMSP39		PHIK
	29	060000	14.5N 177.4E	PCN C	T3.5/3.5 /D1.0/24HRS	OTHER		PGTW
	30	060300	14.8N 177.7E	PCN 0		OTHER		PGTW
	31	060450	15.8N 177.2E			GOES3	RGD EYE EST MAX WNDS 60 KTS	NESS
	32	060600	16.1N 177.3E	PCN C		OTHER	RGD BNDG EYE	PGTW
	33	060811	16.5N 177.2E	PCN 6		NOAA6		KGWC
	34	060900	16.4N 177.7E	PCN C		OTHER	RGD EYE	PGTW
	35	061200	16.8N 177.5E	PCN C		OTHER	PARTIALLY BNDING EYE	PGTW
	36	061508	18.0N 178.4E	PCN 6		TIROSN		PHIK
	37	061600	17.7N 178.2E	PCN C		OTHER	RGD EYE	PGTW
	38	061615	17.4N 178.0E			GOES3	EST MAX WNDS 65 KTS	NESS
	39	061800	18.0N 178.8E	PCN C		OTHER		PGTW
	40	061910	18.4N 178.3E	PCN 5	T3.5/4.5 /W1.0/21HRS	NOAA6		PHIK
	41	062100	18.0N 179.2E	PCN 0		OTHER		PGTW
	42	062210	18.3N 179.0E	PCN 6	T3.5/4.5 /W1.0/24HRS	DMSP39		PHIK
	43	070000	18.5N 179.2E	PCN 0	T2.5/3.5 /W1.0/24HRS	OTHER		PGTW

44	071115	19.5N	179.5W			GOES3		NESS
45	071915	20.0N	179.5W			GOES3		NESS
46	072151	20.1N	179.9W	PCN 6		DMSP39		PHIK
47	072315	20.1N	179.5W			GOES3		NESS
48	080615	20.6N	179.4W			GOES3		NESS
49	081200	20.6N	179.4W			GOES3		NESS
50	081800	21.0N	178.5W			GOES3		NESS
51	082131	21.3N	178.2W	PCN 3	T1.0/2.0 / W.	DMSP39	LLCC	PHIK
52	090000	21.4N	178.0W			GOES3		NESS

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TYPHOON DOM

BEST TRACK DATA

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
MO/DA/HR	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
050800Z	8.2 142.6	20	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.
050806Z	8.2 141.8	20	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.
050812Z	8.1 140.9	20	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.
050818Z	7.9 140.2	20	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.
050900Z	7.7 139.2	25	7.8 140.1	30.	54.	5.	8.3 137.7	40.	164.	10.	9.2 135.3	50.	262.	10.	10.2 133.3	55.	426.	-5.
050906Z	8.3 138.2	25	7.8 138.7	30.	42.	5.	8.3 136.0	40.	139.	10.	9.3 133.8	50.	249.	5.	10.5 131.9	55.	411.	-10.
050912Z	9.1 137.4	25	8.1 137.3	30.	60.	5.	8.7 134.1	40.	139.	10.	9.4 131.3	45.	209.	-5.	10.1 129.0	45.	370.	-25.
050918Z	9.9 136.6	30	9.2 137.4	30.	63.	0.	11.3 135.3	40.	176.	5.	12.3 133.1	45.	300.	-10.	12.8 130.8	45.	410.	-30.
051000Z	10.2 135.7	30	10.0 137.0	30.	77.	0.	12.3 134.8	40.	199.	0.	14.1 132.6	50.	332.	-10.	15.8 130.8	50.	396.	-30.
051006Z	10.3 134.8	30	10.7 135.4	30.	43.	0.	13.0 132.4	45.	137.	0.	15.0 129.9	50.	237.	-15.	17.8 128.5	45.	294.	-45.
051012Z	11.0 133.7	30	11.6 133.5	30.	38.	0.	14.5 129.4	40.	132.	-10.	17.0 126.8	50.	163.	-20.	19.3 124.3	45.	171.	-40.
051018Z	11.3 132.3	35	12.2 132.3	30.	54.	-5.	14.8 128.6	40.	113.	-15.	17.0 125.8	50.	124.	-25.	19.2 123.2	40.	137.	-40.
051100Z	11.5 131.5	40	11.9 131.5	30.	24.	-10.	14.0 128.0	40.	68.	-20.	16.8 125.1	45.	87.	-35.	19.5 123.2	35.	139.	-40.
051106Z	11.8 130.4	45	12.0 129.8	40.	37.	-5.	13.5 124.7	50.	70.	-15.	15.3 122.2	45.	100.	-45.	18.3 122.5	40.	61.	-25.
051112Z	12.3 129.3	50	12.3 129.5	45.	12.	-5.	14.0 125.4	55.	59.	-15.	16.8 122.6	45.	42.	-40.	19.2 122.7	35.	102.	-20.
051118Z	13.0 128.0	55	13.5 128.4	50.	38.	-5.	16.2 125.4	50.	76.	-25.	18.2 124.0	60.	93.	-20.	20.8 124.6	35.	223.	-15.
051200Z	13.6 126.9	60	13.8 126.7	50.	17.	-10.	17.1 123.8	60.	72.	-20.	19.7 123.9	50.	162.	-25.	22.2 126.0	35.	322.	-10.
051206Z	14.1 125.9	65	14.5 125.4	55.	38.	-10.	18.2 123.5	60.	114.	-30.	19.7 123.9	50.	159.	-15.	23.0 126.1	35.	349.	-15.
051212Z	14.9 125.0	70	15.1 124.9	69.	13.	-10.	17.0 123.6	65.	74.	-20.	20.0 124.0	55.	172.	0.	23.6 126.3	40.	366.	-15.
051218Z	15.5 124.3	75	15.0 124.3	60.	18.	-15.	19.0 123.3	65.	126.	-15.	22.5 125.0	50.	322.	0.	25.7 128.8	40.	522.	-20.
051300Z	15.9 123.9	80	16.0 124.0	70.	8.	-10.	18.0 123.2	80.	53.	5.	21.2 123.9	65.	209.	20.	24.8 127.6	50.	414.	-15.
051306Z	16.3 123.6	90	16.3 123.8	70.	11.	-20.	18.1 123.3	80.	59.	15.	21.2 123.9	65.	193.	15.	24.8 127.4	50.	383.	-15.
051312Z	16.6 123.3	85	16.8 123.2	85.	13.	0.	19.4 122.7	85.	114.	30.	22.8 124.9	70.	284.	15.	25.9 128.9	50.	452.	-15.
051318Z	16.9 123.1	80	17.2 122.9	85.	21.	5.	19.6 122.9	80.	117.	30.	22.9 125.1	65.	266.	5.	26.0 129.0	45.	419.	-20.
051400Z	17.2 122.8	75	17.5 122.8	85.	18.	10.	19.5 122.6	75.	90.	30.	22.6 125.0	65.	224.	0.	26.2 129.2	45.	397.	-15.
051406Z	17.3 122.7	65	17.3 122.9	80.	11.	15.	19.2 123.0	65.	64.	15.	22.6 125.5	55.	215.	-10.	26.2 129.2	45.	367.	-15.
051412Z	17.5 122.5	55	17.6 122.6	75.	8.	20.	13.5 122.7	60.	55.	5.	22.3 125.2	45.	161.	-20.	26.1 129.0	30.	325.	-25.
051418Z	17.7 122.4	50	17.8 122.3	60.	8.	10.	19.7 122.3	55.	40.	-5.	22.5 124.8	45.	137.	-20.	0.0 0.0	0.	-0.	0.
051500Z	18.0 122.4	45	18.0 122.3	55.	6.	10.	19.8 122.6	45.	29.	-20.	22.6 124.8	40.	123.	-20.	0.0 0.0	0.	-0.	0.
051506Z	18.3 122.4	50	18.4 122.3	55.	8.	5.	20.3 122.9	45.	40.	-20.	23.5 125.6	40.	156.	-20.	0.0 0.0	0.	-0.	0.
051512Z	18.6 122.5	55	18.5 122.7	45.	13.	-10.	20.2 123.4	40.	33.	-25.	24.2 126.1	30.	100.	-25.	0.0 0.0	0.	-0.	0.
051518Z	19.1 122.6	60	19.0 122.7	45.	8.	-15.	21.7 124.0	40.	90.	-25.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.
051600Z	19.4 122.9	65	19.0 122.7	40.	26.	-25.	21.0 124.0	30.	102.	-30.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.
051606Z	19.7 123.2	65	20.1 123.4	60.	26.	-5.	24.0 126.0	50.	193.	-10.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.
051612Z	19.9 123.9	65	20.1 124.1	55.	16.	-10.	23.1 128.2	45.	151.	-10.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.
051618Z	20.2 124.7	65	20.4 124.8	55.	13.	-10.	23.5 129.0	45.	175.	-5.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.
051700Z	20.6 125.3	60	20.5 125.7	65.	23.	5.	24.2 132.2	35.	323.	-10.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.
051706Z	20.9 125.8	60	21.0 126.4	65.	34.	5.	22.0 129.9	45.	196.	5.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.
051712Z	21.2 126.4	55	21.2 126.5	65.	6.	10.	24.3 131.3	35.	333.	0.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.
051718Z	21.3 126.9	50	21.2 127.2	60.	18.	10.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.
051800Z	21.1 127.4	45	21.3 127.1	55.	21.	10.	23.3 130.5	30.	286.	0.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.
051806Z	20.8 127.1	40	21.2 127.8	55.	46.	15.	22.9 131.2	30.	315.	5.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.
051812Z	20.7 126.7	35	21.1 128.0	50.	76.	15.	21.9 131.8	30.	324.	5.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.
051818Z	20.6 126.4	30	21.1 129.0	45.	148.	15.	21.2 131.5	30.	295.	10.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.
051900Z	20.8 126.1	30	20.9 126.2	40.	8.	10.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.
051906Z	21.0 125.9	25	20.9 125.9	35.	6.	10.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.
051912Z	21.3 126.0	25	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.
051918Z	21.5 126.2	20	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.
052000Z	21.7 126.5	20	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.	0.0 0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	40-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	29.	137.	191.	324.	22.	115.	191.	324.
AVG RIGHT ANGLE ERROR	15.	106.	133.	238.	12.	88.	133.	238.
AVG INTENSITY MAGNITUDE ERROR	9.	14.	17.	22.	10.	15.	17.	22.
AVG INTENSITY BIAS	0.	-4.	-11.	-22.	0.	-6.	-11.	-22.
NUMBER OF FORECASTS	42	39	27	23	32	32	27	23

DISTANCE TRAVELED BY STORM IS 1938. NM

AVERAGE SPEED OF STORM IS 7. KNOTS

TYPHOON DOM
FIX POSITIONS FOR CYCLONE NO. 3

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	SATELLITE	COMMENTS	SITE
* 1	050918	8.6N 149.2E	PCN 6		NOAA6		PGTW
* 2	052150	10.1N 149.4E	PCN 5	T1.0/1.0	NOAA6	INIT OBS	PGTW
* 3	060029	10.1N 148.9E	PCN 5		DMSP39		PGTW
* 4	071015	9.8N 143.2E	PCN 6		NOAA6		PGTW
5	072137	8.8N 142.6E	PCN 5		DMSP37		PGTW
6	072255	8.7N 142.6E	PCN 5		NOAA6		PGTW
7	080131	8.8N 141.9E	PCN 5	T1.0/1.0	DMSP39		PGTW
8	080632	8.0N 142.1E	PCN 5		TIROSN	PSN SUSPECT	PGTW
* 9	080953	10.3N 142.5E	PCN 5		NOAA6		PGTW
* 10	081735	10.4N 141.7E	PCN 5		TIROSN		PGTW
* 11	082116	8.8N 140.3E	PCN 3		DMSP37		PGTW
12	082233	8.6N 140.3E	PCN 5		NOAA6		PGTW
13	090110	8.9N 140.4E	PCN 5	T2.5/2.5 /D1.5/24HRS	DMSP39		PGTW
* 14	090111	9.6N 140.0E	PCN 5	T1.5/1.5	DMSP39	INIT OBS	RPMK
15	090300	8.4N 140.0E	PCN 0		OTHER		PGTW
16	090930	9.0N 137.7E	PCN 5		NOAA6		PGTW
17	091600	10.1N 137.0E	PCN 0		OTHER		PGTW
18	092055	10.3N 136.8E	PCN 5		DMSP37		RODN
19	092100	10.8N 136.5E	PCN 0		OTHER		PGTW
20	092210	10.9N 136.3E	PCN 5		NOAA6		PGTW
21	100005	11.1N 135.9E	PCN 5	T2.5/2.5 /S0.0/24HRS	DMSP39		PGTW
22	100300	11.2N 135.2E	PCN 0		OTHER		PGTW
23	101050	11.7N 133.2E	PCN 5		NOAA6		PGTW
24	101600	11.9N 132.8E	PCN 0		OTHER		PGTW
25	102100	12.2N 131.7E	PCN 0		OTHER		PGTW
26	102215	11.6N 131.4E	PCN 5		DMSP37		PGTW
27	102330	11.5N 131.0E	PCN 5		NOAA6		PGTW
28	110213	11.8N 130.3E	PCN 5	T3.0/3.0	DMSP39	INIT OBS	RODN

29	110213	11.8N 130.4E	PCN 5	T2.5/2.5+/S0.0/25HRS	DMSP39		PGTW
30	110300	11.6N 130.1E	PCN 0		OTHER		PGTW
31	110600	11.9N 129.6E	PCN 0		OTHER		PGTW
32	110900	12.3N 129.7E	PCN 0		OTHER		PGTW
33	111020	12.3N 129.6E	PCN 3		NOAA6		PGTW
34	111600	13.1N 128.7E	PCN 0		OTHER		PGTW
35	112154	13.6N 127.6E	PCN 3		DMSP37		PGTW
36	112307	14.0N 127.3E	PCN 1		NOAA6		PGTW
37	120153	14.2N 126.6E	PCN 3	T3.5/3.5	DMSP39	INIT OBS	RPMK
38	120153	13.9N 126.5E	PCN 3	T3.5/3.5-/D1.0/24HRS	DMSP39		PGTW
39	120300	14.1N 126.4E	PCN C		OTHER		PGTW
40	120900	14.7N 125.6E	PCN C		OTHER		PGTW
41	121147	15.3N 125.2E	PCN 6		NOAA6		RODN
42	121200	15.3N 125.1E	PCN C		OTHER		PGTW
43	121600	15.7N 124.8E	PCN C		OTHER		PGTW
44	122133	16.2N 124.5E	PCN 5		DMSP37	ON DATA EDGE	PGTW
45	122245	16.0N 124.3E	PCN 3	T4.0/4.0 /D0.5/21HRS	NOAA6		PGTW
46	130134	16.2N 124.0E	PCN 1	T5.0/5.0	DMSP39	INIT OBS	RODN
47	130134	16.2N 123.8E	PCN 1		DMSP39		PGTW
48	130900	16.7N 123.6E	PCN E		OTHER		PGTW
49	131125	17.0N 123.2E	PCN 2		NOAA6		RPMK
50	131125	16.8N 123.3E	PCN 1		NOAA6		PGTW
51	131600	16.9N 123.1E	PCN E		OTHER		PGTW
52	140004	17.2N 122.9E	PCN 3	T4.0/5.0 /W0.5/25HRS	NOAA6		RODN
53	140114	17.2N 122.7E	PCN 5		DMSP39	DATA EDGE	RPMK
54	140255	17.2N 122.8E	PCN 3		DMSP39		RODN
55	140255	17.2N 122.7E	PCN 3	T4.5/4.5	DMSP39	INIT OBS	RPMK
56	140600	17.5N 122.3E	PCN E		OTHER		PGTW
57	140900	17.7N 122.3E	PCN 0		OTHER		PGTW
58	141102	17.6N 122.5E	PCN 1		NOAA6		PGTW
59	141600	17.6N 122.4E	PCN C		OTHER		PGTW
60	142234	17.8N 122.3E	PCN 3		DMSP37		RODN
61	142342	18.0N 122.4E	PCN 3	T3.5/3.5	NOAA6	INIT OBS	PGTW
62	150235	18.0N 122.3E	PCN 3	T4.0/4.5 /W0.5/26HRS	DMSP39		RODN
63	150236	18.1N 122.3E	PCN 5	T3.0/3.0 /W1.5/24HRS	DMSP39		RPMK
64	151040	18.6N 122.5E	PCN 3		NOAA6		PGTW
65	151600	18.9N 122.5E	PCN 0		OTHER		PGTW
66	151800	19.1N 123.1E	PCN 0		OTHER		PGTW
67	152100	19.1N 122.8E	PCN C		OTHER		PGTW
68	152211	19.1N 123.3E	PCN 3		DMSP37		PGTW
69	152320	19.4N 123.1E	PCN 3		NOAA6		PGTW
70	160216	19.6N 123.1E	PCN 3	T4.0/4.0-/D0.5/26HRS	DMSP39		PGTW
71	160216	19.5N 123.1E	PCN 3	T4.0/4.0-/D1.0/24HRS	DMSP39		RPMK
72	160900	19.8N 123.7E	PCN C		OTHER		PGTW
73	161018	19.8N 123.8E	PCN 3		NOAA6		PGTW
74	161600	20.0N 124.2E	PCN E		OTHER		PGTW
75	161800	20.0N 124.4E	PCN E		OTHER		PGTW
76	162150	20.4N 125.1E	PCN 3		DMSP37		PGTW
77	170156	20.8N 125.3E	PCN 3	T5.0/5.0	DMSP39	INIT OBS	RODN
78	170156	20.7N 125.4E	PCN 3	T4.0/4.0-/S0.0/24HRS	DMSP39		PGTW
79	170900	21.0N 126.1E	PCN E		OTHER		PGTW
80	171137	21.1N 126.4E	PCN 6		NOAA6	DATA EDGE	RPMK
81	171600	20.9N 126.6E	PCN 0		OTHER		PGTW
82	172100	21.0N 127.2E	PCN 0		OTHER		PGTW
83	172129	21.2N 126.9E	PCN 5		DMSP37		PGTW
84	172235	21.2N 126.9E	PCN 5		NOAA6		PGTW
85	180017	21.0N 127.7E	PCN 5		NOAA6		RODN
86	180136	20.8N 127.2E	PCN 5	T3.0/3.5 /W1.0/24HRS	DMSP39		PGTW
87	180136	21.0N 127.1E	PCN 5	T3.0/3.5 /W1.0/23HRS	DMSP39		RPMK
88	180300	21.1N 127.3E	PCN 0		OTHER		PGTW
89	180900	21.0N 128.0E	PCN 0		OTHER		PGTW
90	181200	20.8N 128.4E	PCN 0		OTHER		PGTW
91	181600	21.2N 128.6E	PCN 0		OTHER		PGTW
92	182100	21.0N 129.3E	PCN 0		OTHER		PGTW
93	182354	20.9N 126.2E	PCN 3	T2.0/3.0 /W1.0/23HRS	NOAA6		RPMK
94	190117	20.8N 126.2E	PCN 3	T1.5/2.5 /W1.5/24HRS	DMSP39		PGTW
95	190117	20.9N 126.1E	PCN 3		DMSP39		RPMK
96	191053	21.2N 125.9E	PCN 3		NOAA6		PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE ORIEN- DIAM/TATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	090122	7.7N 138.9E	1500FT		1007	35 360 165	090 40 360 165	3 20			+25 +25 +25 27	3
2	100300	10.3N 135.3E	700MB	3119	1005	30 000 130	170 40 000 130	5 53			+14 +12 +10	4
3	100603	10.3N 134.7E	700MB	3091		10 160 70	220 20 160 130	8 50				4
4	100800	11.0N 133.9E	700MB	3083		25 320 45	030 27 320 45	6 15			+13 +11 + 8	4
5	102136	11.6N 131.7E	700MB	3081		30 010 20	130 35 030 80	4 10			+10 +13 +10	5
6	110647	12.0N 130.4E	700MB	3034		45 080 40	180 65 080 40	5 5				6
7	110915	12.2N 129.9E	700MB	3022	991	55 350 10	270 40 230 40	5 3			+13 +14 +10	6
8	111925	13.2N 127.8E	700MB	2973			210 50 180 70	5 3				7
9	112200	13.4N 127.0E	700MB	2970	985	40 340 20	270 32 180 25	5 3			+12 +14 +10	7
10	120615	14.3N 125.8E	700MB	2910		55 010 45	150 64 040 90	6 4				8
11	120830	14.5N 125.3E	700MB	2889	976	55 350 35	070 64 350 65	12 3			+11 +14 +11	8
12	121932	15.7N 124.2E	700MB	2838			310 44 220 15	4 2				9
13	122151	15.8N 124.1E	700MB	2834	968	55 330 25	060 72 330 20	5 2			+11 +17 +10	9
14	130604	16.4N 123.6E	700MB	2751		45 360 10	300 59 260 35	7 3				10
15	130844	16.6N 123.3E	700MB	2730	956	50 350 60	070 80 350 40	13 3	CIRCULAR	30	+11 +21 + 8	10
16	131919	17.3N 123.0E	700ME	2760			250 90 160 20	5 2				11
17	132200	17.3N 122.9E	700MB	2767	963	75 310 15	060 90 310 20	5 2	CIRCULAR	30	+11 +22 + 6	11
18	140930	17.4N 122.6E	700MB	2944	383	70 020 10	270 44 190 70	4 2	CIRCULAR	40	+12 +16 +12	12
19	141900	17.8N 122.5E	700MB	2947	982		040 53 350 10	3 2	CIRCULAR	30	+10 +17 +11	14
20	150603	18.2N 122.6E	700MB	3000		35 150 35	240 66 150 15	4 3				15
21	160211	19.7N 123.0E	700MB	2900	977	55 100 60	220 59 080 70	5 5			+10 +16 + 8	16
22	161901	20.4N 124.8E	700MB	2885			290 62 200 50	5 5				17
23	162142	20.2N 125.0E	700MB	2871	974	65 240 20	320 87 230 15	5 3	CIRCULAR	50	+17 +17 +10	17
24	171449	21.0N 126.8E	700MB	2906			230 69 170 20	5 5			+13 +15 +12	18

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TYPHOON ELLEN

BEST TRACK DATA

	BEST TRACK			WARNING					24 HOUR FORECAST					48 HOUR FORECAST					72 HOUR FORECAST				
							ERRORS					ERRORS					ERRORS						
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
051112Z	6.9	148.5	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
051118Z	6.9	147.9	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
051200Z	7.0	147.4	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
051206Z	7.0	146.7	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
051212Z	7.0	146.1	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
051218Z	7.1	145.4	35	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
051300Z	7.2	144.8	40	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
051306Z	7.3	144.2	45	7.2	144.1	40.	8.	-5.	7.8	141.2	50.	96.	0.	9.3	138.1	55.	239.	-20.	11.3	134.8	65.	386.	-45.
051312Z	7.5	143.8	45	7.6	142.9	50.	54.	5.	8.9	138.8	60.	202.	5.	11.2	135.0	65.	398.	-20.	13.8	131.5	75.	574.	-35.
051318Z	7.8	143.5	45	7.4	143.0	50.	38.	5.	8.3	140.2	60.	128.	0.	10.0	136.6	65.	314.	-35.	12.2	133.3	75.	468.	-35.
051400Z	8.1	143.2	50	8.2	143.2	45.	6.	-5.	9.6	141.0	55.	59.	-10.	11.2	137.3	60.	241.	-50.	12.2	133.5	75.	453.	-35.
051406Z	8.4	142.7	50	8.5	142.8	45.	8.	-5.	10.1	139.5	55.	140.	-20.	11.5	135.0	65.	372.	-45.	13.0	130.5	75.	623.	-35.
051412Z	8.6	142.2	55	8.5	142.0	45.	13.	-10.	9.8	139.6	55.	154.	-30.	11.7	136.0	65.	314.	-45.	14.2	131.8	75.	538.	-35.
051418Z	9.0	142.1	60	8.6	141.8	50.	30.	-10.	9.8	139.5	70.	168.	-30.	11.6	136.0	80.	318.	-30.	14.3	131.6	80.	533.	-25.
051500Z	9.5	142.0	65	9.6	141.8	65.	13.	0.	11.2	139.1	95.	142.	-15.	13.2	135.6	100.	326.	-10.	16.2	131.7	100.	507.	-5.
051506Z	10.4	142.0	75	10.4	142.0	75.	0.	0.	13.0	142.8	100.	94.	-10.	16.8	144.1	90.	249.	-20.	20.2	146.1	70.	412.	-35.
051512Z	11.2	141.8	85	11.2	141.9	80.	6.	-5.	14.5	142.8	100.	143.	-10.	18.1	144.8	90.	302.	-20.	21.2	147.3	70.	515.	-35.
051518Z	11.6	141.7	100	11.6	141.9	100.	12.	0.	14.5	142.7	110.	130.	0.	17.8	144.4	90.	266.	-15.	21.2	147.3	80.	525.	-20.
051600Z	12.2	141.3	110	12.3	141.5	110.	13.	0.	15.1	141.5	110.	109.	0.	17.8	143.0	90.	194.	-15.	21.2	145.3	80.	438.	-20.
051606Z	12.4	141.3	110	12.5	141.2	110.	8.	0.	14.7	140.9	95.	62.	-15.	17.3	141.9	85.	119.	-20.	20.3	144.1	70.	370.	-30.
051612Z	12.6	141.3	110	12.6	141.2	105.	6.	-5.	14.2	140.1	90.	61.	-20.	16.9	141.8	80.	137.	-25.	20.0	143.8	70.	365.	-25.
051618Z	12.8	141.3	110	13.0	141.3	105.	12.	-5.	14.7	141.3	190.	34.	85.	17.4	141.8	80.	165.	-20.	20.3	144.1	70.	417.	-25.
051700Z	13.3	141.2	110	13.3	141.2	110.	0.	0.	15.2	141.1	95.	42.	-10.	18.0	141.3	80.	170.	-20.	21.3	143.0	70.	412.	-15.
051706Z	13.7	141.2	110	13.7	141.2	110.	0.	0.	15.3	141.2	95.	87.	-10.	18.3	141.3	85.	207.	-15.	21.6	142.8	75.	421.	0.
051712Z	14.5	141.1	110	14.4	141.2	110.	8.	0.	17.1	141.1	95.	98.	-10.	19.8	141.8	85.	253.	-10.	22.8	143.6	75.	462.	10.
051718Z	15.0	140.8	105	14.4	141.2	110.	43.	5.	17.1	141.1	95.	127.	-5.	19.8	141.8	85.	299.	-10.	22.8	143.7	75.	506.	15.
051800Z	15.6	140.5	105	15.6	140.5	110.	0.	5.	18.0	139.8	95.	85.	-5.	21.1	140.8	85.	297.	0.	24.5	143.2	75.	453.	25.
051806Z	16.3	140.1	105	16.2	140.2	110.	8.	5.	18.6	139.8	95.	128.	-5.	21.7	141.0	85.	327.	10.	24.9	143.6	75.	478.	35.
051812Z	16.9	139.4	105	17.1	139.5	105.	13.	0.	20.5	138.2	90.	62.	-5.	23.7	138.7	80.	198.	15.	26.5	141.5	65.	466.	30.
051818Z	17.4	138.9	100	17.8	138.8	105.	25.	5.	20.1	136.0	90.	82.	-5.	23.0	134.7	80.	276.	20.	26.2	137.0	65.	820.	35.
051900Z	18.0	138.3	100	18.0	138.2	100.	6.	0.	20.7	135.6	85.	114.	0.	23.4	134.0	70.	409.	20.	0.0	0.0	0.	-0.	0.
051906Z	18.9	137.7	100	18.8	137.5	100.	13.	0.	22.0	134.7	85.	129.	10.	25.2	134.2	70.	457.	30.	0.0	0.0	0.	-0.	0.
051912Z	19.9	137.3	95	19.8	137.3	95.	6.	0.	23.2	135.2	80.	146.	15.	26.2	135.0	65.	583.	30.	0.0	0.0	0.	-0.	0.
051918Z	21.3	136.7	95	21.3	136.6	95.	6.	0.	26.0	135.2	80.	97.	20.	29.2	136.5	70.	682.	40.	0.0	0.0	0.	-0.	0.
052000Z	22.6	135.7	85	22.1	135.6	85.	30.	0.	25.9	134.3	55.	268.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
052006Z	24.0	135.6	75	23.4	135.2	75.	42.	0.	28.0	135.0	50.	296.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
052012Z	25.6	135.7	65	25.6	135.6	65.	5.	0.	31.7	140.9	40.	157.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
052018Z	27.5	135.9	60	27.1	135.8	65.	24.	5.	32.1	141.0	30.	410.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
052100Z	29.7	137.0	50	29.6	136.9	55.	8.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
052106Z	31.7	138.8	40	31.3	139.0	45.	26.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
052112Z	34.3	141.3	35	34.3	141.3	35.	0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
052118Z	38.1	145.1	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	14.	130.	300.	484.	14.	121.	286.	469.
AVG RIGHT ANGLE ERROR	10.	76.	201.	414.	10.	77.	207.	423.
AVG INTENSITY MAGNITUDE ERROR	3.	12.	23.	26.	3.	12.	22.	26.
AVG INTENSITY BIAS	-0.	-2.	-10.	-13.	0.	-2.	-12.	-15.
NUMBER OF FORECASTS	34	31	27	23	34	30	26	22

DISTANCE TRAVELED BY STORM IS 2423. NM

AVERAGE SPEED OF STORM IS 10. KNOTS

TYPHOON ELLEN
FIX POSITIONS FOR CYCLONE NO. 4

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	SATELLITE	COMMENTS	SITE
1	121006	7.9N 144.2E	PCN 5		NOAA6		PGTW
2	122133	7.0N 143.9E	PCN 5		DMSP37		PGTW
3	122245	6.9N 143.5E	PCN 5	T2.0/2.0	NOAA6	INIT OBS	PGTW
4	122352	7.0N 143.3E	PCN 5		DMSP39		PGTW
5	130944	6.4N 143.3E	PCN 5		NOAA6	CORRECTED FROM 7.4N	PGTW
6	131200	6.6N 143.3E	PCN 0		OTHER		PGTW
7	131600	6.8N 143.2E	PCN 0		OTHER		PGTW
8	132112	7.8N 143.5E	PCN 5		DMSP37		PGTW
9	132223	7.8N 143.2E	PCN 5	T3.0/3.0 /D1.0/24HRS	NOAA6		PGTW
10	140114	8.0N 143.2E	PCN 5		DMSP39		PGTW
11	140114	8.2N 143.0E	PCN 5	T2.0/2.0	DMSP39	INIT OBS	RPMK
12	140921	8.3N 142.2E	PCN 5		NOAA6		PGTW
13	141600	8.4N 141.9E	PCN 0		OTHER		PGTW
14	142051	9.2N 142.1E	PCN 4		DMSP37		PGTW
15	142201	9.5N 141.8E	PCN 3	T4.5/4.5 /D1.5/24HRS	NOAA6		PGTW
16	150054	9.6N 141.7E	PCN 1		DMSP39	EYE FIX	PGTW
17	150054	9.5N 142.1E	PCN 1	T3.5/3.5 /D1.5/24HRS	DMSP39		RPMK
18	150330	10.0N 141.9E	PCN E		OTHER		PGTW
19	150512	10.3N 141.8E	PCN 1		TIROSN	EYE FIX	PGTW
20	150600	10.4N 140.0E	PCN E		OTHER		PGTW
21	150900	10.8N 141.9E	PCN E		OTHER		PGTW
22	151040	11.2N 141.8E	PCN 1		NOAA6		PGTW
23	151200	11.1N 141.9E	PCN E		OTHER		PGTW
24	151600	11.5N 141.7E	PCN E		OTHER		PGTW
25	151757	11.7N 141.4E	PCN 1		TIROSN		PGTW
26	151800	11.7N 141,6E	PCN E		OTHER		PGTW
27	152029	11.8N 141.3E	PCN 2		DMSP37		PGTW

28	152100	12.0N 141.6E	PCN E		OTHER		PGTW
29	152139	12.0N 141.5E	PCN 1		NOAA6		PGTW
30	160034	12.1N 141.2E	PCN 2	T5.0/5.0	DMSP39	INIT OBS	RODN
31	160034	12.1N 141.3E	PCN 1	T5.5/5.5 /D1.0/26HRS	DMSP39		PGTW
32	160300	12.4N 141.3E	PCN E		OTHER		PGTW
33	160900	12.5N 141.2E	PCN E		OTHER		PGTW
34	161018	12.6N 141.3E	PCN 1		NOAA6		PGTW
35	161609	12:4N 141.2E	PCN E		OTHER		PGTW
36	161600	12.8N 141.4E	PCN 1		OTHER		PGTW
37	161800	13.0N 141.3E	PCN 1		OTHER		PGTW
38	162258	13.1N 141.3E	PCN 1		NOAA6		PGTW
39	170015	13.2N 141.3E	PCN 1	T6.0/6.0-/D0.5/24HRS	DMSP39		PGTW
40	170300	13.5N 141.2E	PCN C		OTHER	FULL DISC FIX	PGTW
41	170900	14.1N 141.3E	PCN C		OTHER		PGTW
42	170956	14.2N 141.3E	PCN 1		NOAA6		PGTW
43	171200	14.5N 141.3E	PCN E		OTHER		PGTW
44	171600	15.1N 141.0E	PCN E		OTHER		PGTW
45	172129	15.4N 140.7E	PCN 1		DMSP37		PGTW
46	172235	15.4N 140.5E	PCN 1		NOAA6		PGTW
47	180136	15.8N 140.5E	PCN 1	T6.0/6.0	DMSP39	INIT OBS	RPMK
48	180136	15.7N 140.4E	PCN 1	T5.5/6.0 /W0.5/25HRS	DMSP33		PGTW
49	180300	16.0N 140.3E	PCN E		OTHER		PGTW
50	180934	16.6N 139.6E	PCN 1		NOAA6		PGTW
51	181600	17.4N 139.0E	PCN E		OTHER		PGTW
52	182107	17.8N 138.4E	PCN 1		DMSP37		PGTW
53	182213	17.8N 138.4E	PCN 1		DMSP39		PGTW
54	190116	18.2N 138.3E	PCN 1	T6.0/6.0 /S0.0/24HRS	DMSP39		RPMK
55	190117	18.2N 138.1E	PCN 1	T6.0/6.0 /D0.5/24HRS	DMSP39		PGTW
56	190117	18.2N 138.1E	PCN 1	T5.0/5.0	DMSP39	INIT OBS	RODN
57	191053	19.9N 137.0E	PCN 5		NOAA6		PGTW
58	191600	20.8N 136.9E	PCN 0		OTHER		PGTW
59	192046	21.7N 136.5E	PCN 3		DMSP37		PGTW
60	192332	22.1N 136.0E	PCN 3		NOAA6		PGTW
61	200057	22.8N 135.5E	PCN 3	T4.0/5.0 /W2.0/24HRS	DMSP39		PGTW
62	200057	22.7N 135.7E	PCN 4	T3.5/4.5 /W1.5/23HRS	DMSP39		RODN
63	200600	23.8N 136.0E	PCN 1		OTHER		PGTW
64	201030	24.4N 137.5E	PCN 5		NOAA6	LLCC NEAR 24.5N 135.5E	PGTW
65	201600	26.4N 135.7E	PCN 0		OTHER		PGTW
66	202310	29.0N 137.1E	PCN 3		NOAA6		PGTW
67	210037	29.8N 137.1E	PCN 3	T2.5/3.5 /W1.5/24HRS	DMSP39		PGTW
68	210037	30.1N 136.8E	PCN 3	T3.0/3.5 /W0.5/24HRS	DMSP39		RODN
69	210218	30.4N 137.6E	PCN 3		DMSP39	NO DVORK	RPMK
70	210300	30.6N 138.0E	PCN 0		OTHER		PGTW
71	211002	33.2N 140.2E	PCN 3		NOAA6		RODN
72	211008	33.5N 140.4E	PCN 5		NOAA6		PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE DIAM/ORIENTATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	130422	7.2N 144.4E	700MB	3080	998	50 260 60	320 50 240 75	1 2			+14 +15 + 5	1
2	132120	8.0N 143.4E	700MB	3033		45 350 15	060 45 290 40	4 5			+10 +14 +10	2
3	140033	8.2N 143.2E	700MB	3029		55 050 27	110 62 040 30	4 4				2
4	140243	8.3N 142.9E	700MB	3022		55 350 23	120 55 030 25	4 3			+12 +14 +10	2
5	142350	9.5N 142.0E	700MB	2808	975	65 260 20	360 74 260 10	5 2	CIRCULAR	22	+12 +16 +10	3
6	150600	10.4N 142.1E	700MB	2812		80 050 10	080 75 050 15	4 3				4
7	150900	10.7N 142.1E	700MB	2766	963	80 350 10	170 70 080 20	4 6	ELLIPTICAL	15 10 050	+12 +18 +12	4
8	151040	11.1N 141.6E	700MB	2742			360 80 270 8	4 3				4
9	151736	11.5N 141.9E	700MB	2535			110 90 360 25	6 2	CIRCULAR	12	+12 +20 + 9	5
10	151945	11.7N 141.5E	700MB	2522	935		180 97 150 20	5 2				5
11	152120	11.9N 141.5E	700MB	2510	933	100 250 30	300 105 250 10	5 2	CIRCULAR	12	+ 8 +21 +13	5
12	160519	12.3N 141.2E	700MB	2582		100 090 15	150 97 090 8	5 4				6
13	161033	12.9N 141.4E	700MB	2492			310 89 270 12	9 5	CIRCULAR	22		7
14	162121	13.1N 141.2E	700MB	2497	931	60 330 30	040 90 320 15	6 5	CIRCULAR	21	+10 +21 +11	7
15	170630	13.8N 141.2E	700MB	2525		65 090 20	100 126 020 20	5 5				8
16	170905	14.1N 141.2E	700MB	2541	935	100 330 20	330 100 250 20	5 5	CIRCULAR	15	+11 +19 +11	8
17	171900	15.1N 140.8E	700MB	2551			230 105 130 16	5 1	CIRCULAR			9
18	172132	15.4N 140.5E	700MB	2560	939	100 180 5	310 92 240 11	5 1	CIRCULAR	13	+12 +17 +11	9
19	181842	17.7N 138.3E	700MB	2616			170 72 090 55	6 5	ELLIPTICAL	15 10 160		11
20	191830	21.4N 136.8E	700MB	2789			200 115 150 20	5 2				13
21	192115	21.9N 135.9E	700MB	2796	967	65 320 15	050 61 320 60	2 3			+17 +21 + 8	13
22	200655	24.1N 135.6E	700MB	2839		80 150 10	270 60 140 12	5 1				14
23	200905	24.8N 135.6E	700MB	2869	974	80 320 10	360 37 320 40	4 1			+11 +19 + 9	14
24	201836	28.2N 136.1E	700MB	2907			230 93 150 75	5 20				15
25	202100	28.9N 136.5F	700MB	2916	980	35 330 70	090 55 330 52	5 20			+ 8 +14 +11	15

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TROPICAL STORM FORREST

BEST TRACK DATA

	BEST TRACK			WARNING			ERRORS		24 HOUR FORECAST			ERRORS		48 HOUR FORECAST			ERRORS		72 HOUR FORECAST			ERRORS	
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
051900Z	6.4	154.6	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
051906Z	6.7	153.9	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
051912Z	6.8	153.2	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
051918Z	6.9	152.4	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
052000Z	7.2	151.4	30	6.7	151.4	35.	30.	5.	7.9	148.3	45.	218.	5.	9.5	145.3	55.	387.	10.	11.2	142.4	65.	586.	20.
052006Z	7.4	149.8	30	7.7	150.1	35.	25.	5.	10.0	146.2	45.	168.	0.	11.6	143.7	55.	366.	10.	14.2	142.1	65.	665.	20.
052012Z	8.0	148.1	35	7.7	147.8	35.	25.	0.	9.8	143.5	45.	100.	0.	11.8	140.9	55.	292.	10.	14.2	138.9	65.	569.	20.
052018Z	8.7	146.5	40	8.3	145.8	40.	48.	0.	10.2	140.2	50.	6.	5.	12.2	136.7	60.	174.	15.	13.8	133.8	70.	358.	20.
052100Z	9.3	144.9	40	9.2	145.2	40.	19.	0.	11.2	140.3	50.	97.	5.	12.9	136.7	60.	278.	15.	14.2	133.6	70.	428.	15.
052106Z	9.5	143.4	45	9.6	143.7	45.	19.	0.	12.0	138.0	65.	77.	20.	13.7	134.3	75.	239.	30.	16.0	132.0	80.	422.	25.
052112Z	9.7	141.8	45	9.6	142.1	45.	19.	0.	11.2	137.3	60.	78.	15.	12.8	133.6	70.	250.	25.	14.7	131.0	80.	413.	30.
052118Z	10.1	140.2	45	9.8	140.8	45.	40.	0.	11.0	136.2	60.	124.	15.	12.8	132.8	70.	289.	20.	15.2	130.6	80.	457.	30.
052200Z	10.5	138.8	45	10.6	138.6	40.	13.	-5.	12.7	132.3	45.	108.	0.	14.7	128.2	50.	159.	-5.	16.4	125.4	60.	217.	15.
052206Z	10.8	137.5	45	11.2	136.7	45.	53.	0.	13.5	130.2	55.	147.	10.	15.7	126.3	60.	151.	5.	18.0	124.0	60.	225.	30.
052212Z	10.9	136.0	45	11.0	136.0	45.	6.	0.	12.8	130.8	55.	104.	10.	15.2	127.0	60.	193.	10.	17.3	124.5	60.	269.	40.
052218Z	10.8	134.1	45	11.4	134.5	45.	43.	0.	13.8	129.0	55.	120.	5.	16.5	125.3	60.	184.	10.	19.1	123.2	60.	196.	40.
052300Z	10.9	132.4	45	10.8	132.2	50.	13.	5.	11.2	125.6	55.	101.	0.	12.7	121.3	45.	158.	0.	15.5	119.0	50.	[illegible]82.	30.
052306Z	11.2	131.1	45	10.8	130.5	50.	43.	5.	11.0	124.4	50.	151.	-5.	13.0	120.5	45.	168.	15.	16.0	118.5	55.	344.	35.
052312Z	11.6	129.5	45	11.3	129.7	45.	21.	0.	12.2	124.6	35.	115.	-15.	13.4	121.1	30.	228.	10.	0.0	0.6	0.	-0.	0.
052318Z	12.1	127.9	50	11.5	127.8	45.	36.	-5.	12.8	122.8	35.	114.	-15.	14.3	119.5	30.	251.	10.	0.0	0.0	0.	-0.	0.
052400Z	12.7	126.4	55	12.7	126.3	50.	6.	-5.	15.1	121.7	45.	13.	0.	17.9	119.2	35.	145.	15.	0.0	0.0	0.	-0.	0.
052406Z	13.4	125.2	55	13.2	124.8	55.	26.	0.	15.7	120.6	40.	13.	10.	19.1	119.1	40.	176.	20.	0.0	0.0	0.	-0.	0.
052412Z	14.0	123.9	50	13.9	124.1	55.	13.	5.	16.0	120.2	40.	64.	20.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
052418Z	14.7	122.7	50	14.8	122.4	55.	18.	5.	17.3	119.0	40.	85.	20.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
052500Z	15.3	121.8	45	15.2	121.9	50.	8.	5.	18.0	119.6	35.	130.	15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
052506Z	15.8	120.8	30	15.7	121.4	45.	35.	15.	18.2	119.7	35.	196.	15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
052512Z	17.0	119.8	20	15.7	120.6	35.	90.	15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
052518Z	18.5	119.8	20	16.2	119.5	35.	138.	15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
052600Z	20.0	120.5	20	18.9	119.8	25.	77.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
052606Z	21.0	121.5	20	19.9	120.5	20.	86.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	37.	106.	227.	388.	0.	0.	0.	0.
AVG RIGHT ANGLE ERROR	17.	56.	123.	227.	0.	0.	0.	0.
AVG INTENSITY MAGNITUDE ERROR	4.	9.	13.	26.	0.	0.	0.	0.
AVG INTENSITY BIAS	3.	6.	13.	26.	0.	0.	0.	0.
NUMBER OF FORECASTS	26	22	18	14	0	0	0	0

DISTANCE TRAVELED BY STORM IS 2451. NM

AVERAGE SPEED OF STORM IS 14. KNOTS

TROPICAL STORM FORREST
FIX POSITIONS FOR CYCLONE NO. 5

SATELLITE FIXES

	FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	SATELLITE	COMMENTS	SITE
	1	181723	5.2N 155.7E	PCN 5		TIROSN		PGTW
	2	182335	6.1N 155.1E	PCN 5	T1.0/1.0	DMSP39	INIT OBS	PGTW
	3	190911	6.5N 154.1E	PCN 5		NOAA6		PGTW
	4	191600	7.2N 151.6E	PCN 0		OTHER		PGTW
*	5	192046	7.5N 154.2E	PCN 5		DMSP37		PGTW
	6	192151	6.9N 151.0E	PCN 5		NOAA6		PGTW
	7	200057	6.8N 150.6E	PCN 5	T2.0/2.0 /D1.0/25HRS	DMSP39		PGTW
	8	200600	7.5N 149.3E	PCN 0		OTHER		PGTW
	9	200849	7.4N 148.7E	PCN 5		NOAA6		PGTW
	10	200900	7.5N 148.7E	PCN 0		OTHER		PGTW
	11	201200	8.0N 147.8E	PCN 0		OTHER		PGTW
	12	201600	8.2N 146.5E	PCN 0		OTHER		PGTW
	13	202015	8.9N 145.8E	PCN 5		DMSP37		PGTW
	14	202129	8.6N 145.7E	PCN 5		NOAA6		PGTW
	15	210037	9.2N 144.8E	PCN 5	T3.0/3.0	DMSP39	INIT OBS	RODN
	16	210300	9.2N 144.0E	PCN 0		OTHER		PGTW
	17	210900	9.2N 142.4E	PCN 0		OTHER		PGTW
	18	211000	9.6N 142.0E	PCN 5		NOAA6		PGTW
	19	211200	9.6N 141.1E	PCN 0		OTHER		PGTW
	20	211600	9.7N 140.9E	PCN 0		OTHER		PGTW
	21	212248	9.8N 138.9E	PCN 3		NOAA6		PGTW
*	22	220017	10.4N 137.8E	PCN 3	T3.5/3.5 /S0.0/24HRS	DMSP39		PGTW
*	23	220946	10.4N 135.4E	PCN 5		NOAA6		PGTW
	24	221200	10.5N 135.0E	PCN 0		OTHER		PGTW
	25	221600	10.7N 133.3E	PCN 0		OTHER		PGTW
*	26	222226	10.4N 132.0E	PCN 3		NOAA6		PGTW
*	27	222226	10.4N 132.0E	PCN 3		NOAA6		PGTW
	28	230139	10.3N 131.8E	PCN 5	T3.0/3.5-/W0.5/25HRS	DMSP39		PGTW
	29	230139	10.3N 131.8E	PCN 3	T4.0/4.0	DMSP39	INIT OBS	RODN
	30	230600	11.2N 130.9E	PCN 3		OTHER	EXPOSED LLCC	PGTW
	31	230900	11.5N 130.2E	PCN 0		OTHER		PGTW
	32	231105	11.4N 129.4E	PCN 5		NOAA6		PGTW
	33	231600	11.2N 128.1E	PCN 0		OTHER		PGTW
	34	232345	12.4N 126.4E	PCN 5		NOAA6		PGTW
	35	240119	12.6N 126.1E	PCN 5	T4.0/4.0-/D1.0/24HRS	DMSP39		PGTW
	36	240119	12.7N 126.1E	PCN 3	T4.0/4.0 /S0.0/24HRS	DMSP39		RODN
	37	241043	13.7N 124.3E	PCN 5		NOAA6		PGTW
	38	241600	14.3N 122.9E	PCN 0		OTHER		PGTW
	39	242223	14.5N 122.2E	PCN 5		DMSP37		PGTW
	40	242322	15.2N 122.4E	PCN 5	T3.5/4.0-/W0.5/22HRS	NOAA6		PGTW
	41	250241	15.4N 121.5E	PCN 5	T3.5/3.5	DMSP39	INIT OBS	RPMK
	42	250241	15.5N 121.2E	PCN 5	T4.0/4.0 /S0.0/25HRS	DMSP39		RODN
	43	250300	15.6N 120.4E	PCN 0		OTHER		PGTW
*	44	251200	15.9N 119.8E	PCN 0		OTHER		PGTW
*	45	251202	16.3N 118.6E	PCN 6		NOAA6		RODN

* 46	251600	16.0N 118.9E	PCN 0		OTHER	PGTW
* 47	260221	16.9N 118.1E	PCN 5	T1.5/2.0 /W2.0/27HRS	DMSP39	PGTW
* 48	260221	17.0N 118.0E	PCN 5		DMSP39	RODN

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE ORIEN- DIAM/TATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	190102	6.4N 154.7E	700MB	3139	1007	25 040 10	120 24 070 10	4 2			+24 +25 +24 29	1
2	200024	6.7N 151.2E	1500FT		1002	45 270 10	090 55 090 20	3 2			+29 +26 +26 27	2
3	200315	7.3N 150.8E	700MB	3119	1001	25 140 10	170 39 140 10	5 2			+11 +14 + 6	2
4	202102	9.0N 145.9E	700MB	3114	1002	50 360 40	100 50 360 40	5 5			+11 +14 + 6	3
5	210311	9.3N 144.2E	700MB	3074	998	55 360 15	100 52 360 15	5 3	CIRCULAR	20	+10 +15 + 6	3
6	210952	9.0N 142.7E	700MB	3128	1009	40 360 60	100 47 020 90	2 5			+15 +11 +10	4
7	212136	10.4N 139.3E	700MB	3112	1002	40 030 20	160 48 070 45	5 3			+14 +12 + 9	5
8	220607	10.7N 137.5E	700MB	3082		45 040 45	120 40 040 45	10 20				6
9	220841	10.9N 136.8E	700MB	3079	999	30 200 60	220 30 190 60	5 10			+10 +13 +11	6
10	222136	10.8N 132.9E	700MB	3061	996	90 140 10	100 60 030 15	5 5			+14 +16 + 7	7
11	230820	11.3N 130.5E	700MB	3067	999	50 340 40	110 60 030 90	2 3			+12 +12 + 9	8
12	232121	12.4N 127.0E	700MB	3034		50 270 20	080 47 330 82	6 2				9
13	232242	12.6N 126.6E	700MB	3029	994	50 310 15	090 61 010 10	6 2	CIRCULAR	20	+10 +17 +13	9
14	240633	13.6N 125.1E	700MB	3014		50 350 30	050 59 350 30	5 5				10
15	240828	13.7N 124.7E	700MB					3 0	CIRCULAR	12		10
16	241930	14.9N 122.4E	700MB	3079	999		080 49 350 30	1 3				11
17	242220	15.1N 122.2E	700MB	3061	996	50 060 30	150 60 060 30	1 3			+12 +12 + 9	11
18	251945	18.2N 119.7E	700MB	3106		30 000 00						12
19	252138	19.3N 120.1E	700MB	3136		25 030 50	080 12 350 30	5 20			+14 +11 + 7	12

RADAR FIXES

FIX NO.	TIME (Z)	FIX POSITION	RADAR	ACCRY	EYE SHAPE	EYE DIAM	RADOB-CODE ASWAR TDDFF	COMMENTS	RADAR POSITION	SITE WMO NO.
1	210813	9.1N 144.8E	ACFT					54WRS		
2	240828	13.6N 124.7E	ACFT	POOR	CIRCULAR	12		RDR EYE 13.7N 124.7E 54WRS		
3	250000	15.4N 121.9E	LAND						16.3N 120.6E	98321
4	250235	15.6N 121.8E	LAND					WELL DEFINED WALL CLOUD	15.2N 120.6E	98327
5	250300	15.6N 121.5E	LAND						16.3N 120.6E	98321
6	250305	15.7N 121.8E	LAND						15.2N 120.6E	98327
7	250400	15.7N 121.5E	LAND						14.1N 123.0E	98440

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TROPICAL STORM GEORGIA

BEST TRACK DATA

	BEST TRACK			WARNING			ERRORS		24 HOUR FORECAST			ERRORS		48 HOUR FORECAST			ERRORS		72 HOUR FORECAST				
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
051912Z	15.5	115.0	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
051918Z	15.3	114.4	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
052000Z	15.0	114.0	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
052006Z	14.4	114.4	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
052012Z	14.0	115.0	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
052018Z	13.9	115.8	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
052100Z	14.5	116.4	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
052106Z	15.0	116.4	30	15.3	116.6	30.	21.	0.	16.6	117.0	35.	156.	-15.	18.2	118.2	40.	229.	-15.	21.2	121.8	35.	305.	-10.
052112Z	15.5	116.1	30	15.5	116.7	30.	35.	0.	16.6	117.0	35.	145.	-15.	18.2	118.2	40.	259.	-15.	21.2	121.8	35.	293.	5.
052118Z	16.2	115.8	40	16.2	115.7	30.	6.	-10.	17.8	116.4	35.	113.	-15.	19.9	118.3	35.	204.	-20.	0.0	0.0	0.	-0.	0.
052200Z	16.7	115.4	45	16.0	115.8	30.	24.	-15.	18.2	116.3	35.	127.	-20.	19.9	118.0	40.	231.	-5.	0.0	0.0	0.	-0.	0.
052206Z	17.4	114.4	50	17.5	114.4	45.	6.	-5.	19.6	114.9	55.	74.	0.	22.0	116.5	60.	146.	15.	0.0	0.0	0.	-0.	0.
052212Z	18.0	114.9	50	17.9	114.8	45.	8.	-5.	20.0	116.2	60.	116.	5.	22.9	117.8	60.	123.	30.	0.0	0.0	0.	-0.	0.
052218Z	18.8	114.7	50	18.6	115.2	45.	31.	-5.	21.1	116.8	60.	101.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
052300Z	19.6	114.6	55	19.2	115.0	50.	33.	-5.	21.5	115.7	65.	127.	20.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
052306Z	20.8	115.2	55	20.4	114.8	50.	33.	-5.	23.5	115.8	40.	100.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
052312Z	21.9	115.8	55	21.4	115.4	55.	37.	0.	24.3	117.5	30.	56.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
052318Z	22.7	116.2	55	22.2	116.0	55.	32.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
052400Z	23.5	116.5	45	23.4	121.4	30.	269.	-15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
052406Z	24.3	117.4	45	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
052412Z	24.9	118.3	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	44.	112.	199.	299.	0.	0.	0.	0.
AVG RIGHT ANGLE ERROR	29.	52.	140.	293.	0.	0.	0.	0.
AVG INTENSITY MAGNITUDE ERROR	5.	10.	17.	0.	0.	0.	0.	0.
AVG INTENSITY BIAS	-5.	-4.	-2.	-3.	0.	0.	0.	0.
NUMBER OF FORECASTS	12	10	6	2	0	0	0	0

DISTANCE TRAVELED BY STORM IS 993. NM

AVERAGE SPEED OF STORM IS 8. KNOTS

TROPICAL STORM GEORGIA
FIX POSITIONS FOR CYCLONE NO. 6

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	SATELLITE	COMMENTS	SITE
1	191200	16.6N 117.0E	PCN 0		OTHER		PGTW
2	201200	14.2N 115.7E	PCN 0		OTHER		PGTW
3	210218	15.2N 117.0E	PCN 5	T1.0/1.0	DMSP39	INIT OBS	PGTW
4	210218	15.2N 116.2E	PCN 5		DMSP39		RPMK
5	210900	15.5N 115.5E	PCN 0		OTHER		PGTW
6	211150	15.3N 116.4E	PCN 5		NOAA6		RPMK
7	211212	13.3N 116.4E	PCN 6		NOAA6		RPMK
8	211600	15.9N 115.6E	PCN 0		OTHER		PGTW
9	212100	16.5N 115.4E	PCN 0		OTHER		PGTW
10	220029	16.7N 115.9E	PCN 5	T2.0/2.0	NOAA6	INIT OBS	RPMK
11	220029	16.7N 115.7E	PCN 5	T1.0/1.0	NOAA6	INIT OBS	RODN
12	220159	16.8N 115.2E	PCN 5	T2.5/2.5 /D1.5/24HRS	DMSP39		PGTW
13	221127	17.8N 114.7E	PCN 5		NOAA6		RPMK
14	221200	18.4N 114.6E	PCN 0		OTHER		PGTW
15	221600	18.7N 114.8E	PCN 0		OTHER		PGTW
16	222002	18.9N 114.7E	PCN 3		TIROSN		RPMK
17	230000	19.6N 114.9E	PCN C		OTHER		PGTW
18	230006	19.6N 114.3E	PCN 5	T2.0/2.0 /S0.0/24HRS	NOAA6		RPMK
19	230320	20.3N 115.9E	PCN 3	T3.0/3.0 /D2.0/27HRS	DMSP39		RODN
20	230600	20.7N 115.2E	PCN C		OTHER		PGTW
21	230900	21.0N 115.4E	PCN 0		OTHER		PGTW
22	231105	21.7N 115.6E	PCN 5		NOAA6		PGTW
23	231600	21.9N 115.8E	PCN 0		OTHER		PGTW
24	231950	22.4N 116.2E	PCN 5		TIROSN		RODN
25	231950	22.4N 116.3E	PCN 3		TIROSN	EXPSD LLCC	ROD*
26	232345	22.8N 116.9E	PCN 5		NOAA6		PGTW
27	240301	22.4N 117.1E	PCN 3	T3.0/3.0 /S0.0/24HRS	DMSP39		RODN
28	241043	24.5N 117.6E	PCN 5		NOAA6		PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE ORIEN- DIAM/TATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	220703	17.6N 114.4E	700MB	2996	986	50 110 75	190 57 110 110	10 5				12
2	220905	17.6N 114.6E	700MB	2986	987	30 330 65	120 59 360 77	10 10			+13 +10	16

SYNOPTIC FIXES

FIX NO.	TIME (Z)	FIX POSITION	INTENSITY ESTIMATE	NEAREST DATA (NM)	COMMENTS
1	190000	16.5N 117.5E	15	10	
2	191200	15.5N 115.0E	20	80	
3	200000	15.0N 114.8E	20	60	
4	210000	14.5N 116.5E	25	20	
5	211200	15.5N 115.8E	30	10	
6	221200	18.0N 115.0E	35	30	
7	240000	23.5N 116.5E	45	10	

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TROPICAL STORM HERBERT

BEST TRACK DATA

MO/DA/HR	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 HOUR FORECAST ERRORS DST	24 HOUR FORECAST ERRORS WIND	48 HOUR FORECAST POSIT		48 HOUR FORECAST WIND	48 HOUR FORECAST ERRORS DST	48 HOUR FORECAST ERRORS WIND	72 HOUR FORECAST POSIT		72 HOUR FORECAST WIND	72 HOUR FORECAST DST	72 HOUR FORECAST WIND
061900Z	6.0	141.8	10	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0	0.0	0.0	0.	-0.	0.
061906Z	6.3	141.0	10	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
061912Z	6.7	140.0	10	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
061918Z	7.0	139.3	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062000Z	7.2	138.5	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062006Z	7.6	137.9	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062012Z	7.8	137.1	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062018Z	8.1	136.2	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062100Z	8.3	135.2	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062106Z	8.6	134.1	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062112Z	8.9	133.0	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062118Z	9.1	131.9	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062200Z	9.3	130.9	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062206Z	9.6	129.8	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062212Z	9.8	128.6	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062218Z	10.2	127.4	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062300Z	10.5	126.0	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062306Z	11.1	124.8	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062312Z	11.6	123.5	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062318Z	12.0	122.2	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062400Z	12.3	120.7	35	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062406Z	12.3	119.2	40	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	0.	0.
062412Z	12.9	117.7	40	12.5	118.0	35.	39.	-5.	14.1	113.0	40.	84.	-10.	17.0	110.8	45.	62.	0.	19.5	110.5	45.	66.	0.
062418Z	13.6	116.4	40	13.1	116.7	35.	35.	-5.	15.1	112.3	40.	56.	-10.	18.4	110.6	45.	35.	0.	20.7	110.6	45	62.	0.
062500Z	14.3	115.2	45	14.5	115.1	35.	13.	-10.	18.3	111.5	45.	96.	-5.	21.3	111.4	45.	167.	0.	0.0	0.0	0.	-0.	0.
062506Z	15.0	114.0	50	15.1	113.4	40.	35.	-10.	18.8	110.0	45.	100.	-5.	22.0	110.6	30.	158.	-15.	0.0	0.0	0	-0.	0.
062512Z	15.5	112.8	50	16.0	113.3	45.	41.	-5.	18.8	112.0	55.	98.	10.	22.2	113.2	55.	233.	10.	0.0	0.0	0	-0.	0.
062518Z	16.0	112.0	50	16.7	112.0	50.	42.	0.	19.3	110.4	0.	53.	-45.	21.8	111.3	0.	123.	-45.	0.0	0.0	0	0.	0.
062600Z	16.7	111.3	50	17.0	111.0	45.	25.	-5.	20.7	110.1	35.	104.	-10.	22.5	111.0	25.	130.	-20	0.0	0.0	0.	0.	0.
062606Z	17.3	110.8	50	17.5	110.3	45.	31.	-5.	21.1	109.5	35.	96.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062612Z	18.0	110.5	45	18.5	110.6	40.	30.	-5.	21.2	109.7	30.	60.	-15.	0.0	0.0	0.	-0.	0	0.0	0.0	0.	-0.	0.
062618Z	18.5	110.0	45	18.9	110.1	40.	25.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062700Z	19.0	109.7	45	19.2	109.6	35.	13.	-10.	20.4	109.2	30.	42.	-15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062706Z	19.5	109.7	45	19.7	109.5	35.	16.	-10.	20.8	109.0	30.	70.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062712Z	20.2	109.6	45	20.5	109.8	35.	21.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062718Z	20.6	109.5	45	21.0	109.6	30.	25.	-15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062800Z	21.1	109.2	45	21.8	109.7	25.	50.	-20.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0	0.0	0.0	0.	-0.	0.
062806Z	21.7	108.2	40	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062812Z	21.9	106.9	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062818Z	22.4	105.6	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
062900Z	22.9	104.2	10	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS WRNG	24-HR	48-HR	72-HR	TYPHOONS WHILE OVER 35 KTS WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	29.	78.	130.	64.	0.	0.	0.	0.
AVG RIGHT ANGLE ERROR	19.	39.	102.	53.	0.	0.	0.	0.
AVG INTENSITY MAGNITUDE ERROR	8.	13.	13.	0.	0.	0.	0.	0.
AVG INTENSITY BIAS	-8.	-11.	-10.	0.	0.	0.	0.	0.
NUMBER OF FORECASTS	15	11	7	2	0	0	0	0

DISTANCE TRAVELED BY STORM IS 2521. NM

AVERAGE SPEED OF STORM IS 11. KNOTS

TROPICAL STORM HERBERT
FIX POSITIONS FOR CYCLONE NO. 7

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	SATELLITE	COMMENTS	SITE
1	210031	8.4N 135.1E	PCN 5	T0.5/0.5	DMSP39	INIT OBS	PGTW
2	211027	8.9N 133.3E	PCN 5		NOAA6		PGTW
3	211800	9.0N 132.2E	PCN 0		OTHER		PGTW
4	212307	9.3N 130.9E	PCN 6		NOAA6		PGTW
5	220152	9.4N 130.0E	PCN 5	T1.0/1.0 /D0.5/25HRS	DMSP39		PGTW
6	220300	9.5N 129.8E	PCN 0		OTHER		PGTW
7	221005	10.6N 129.0E	PCN 5		NOAA6	DATA EDGE	PGTW
* 8	222245	11.8N 124.9E	PCN 5		NOAA6	DATA EDGE	PGTW
9	230133	10.3N 125.5E	PCN 3	T2.0/2.0-/D1.0/24HRS	DMSP39		PGTW
* 10	231200	12.8N 120.6E	PCN 0		OTHER		PGTW
* 11	231800	12.8N 119.5E	PCN 0		OTHER		PGTW
* 12	240000	12.4N 119.4E	PCN 0		OTHER		PGTW
13	240600	12.4N 120.0E	PCN 0		OTHER		PGTW
14	240154	12.3N 120.0E	PCN 5	T2.0/2.0	DMSP39	INIT OBS	RPMK
* 15	240300	12.2N 119.2E	PCN 0		OTHER		PGTW
16	240900	12.6N 118.3E	PCN 0		OTHER		PGTW
17	241102	12.8N 117.7E	PCN 5		NOAA6		PGTW
18	241200	13.0N 117.5E	PCN 0		OTHER		PGTW
19	241600	13.2N 116.7E	PCN 0		OTHER		PGTW
* 20	242100	14.4N 114.4E	PCN E		OTHER		PGTW
21	242341	14.5N 114.8E	PCN 3	T3.5/3.5	NOAA6	INIT OBS	PGTW
* 22	250235	14.5N 112.4E	PCN 5	T3.0/3.0 /D1.0/24HRS	DMSP39		RPMK
* 23	250235	14.7N 113.7E	PCN 5	T3.0/3.0+	DMSP39	INIT OBS	RODN
24	250900	15.1N 113.2E	PCN 0		OTHER		PGTW
25	251200	15.4N 112.2E	PCN 0		OTHER		PGTW
26	251221	15.6N 112.7E	PCN 5		NOAA6		RPMK
27	251600	16.2N 112.0E	PCN 0		OTHER		PGTW
* 28	252100	17.1N 111.3E	PCN 0		OTHER		PGTW
29	252255	16.5N 111.2E	PCN 6		DMSP37		RPMK
30	260100	16.9N 111.0E	PCN 6	T3.5/3.5 /D0.5/22HRS	NOAA6		RPMK
31	260215	17.0N 111.0E	PCN 5	T2.5/3.5-/W1.0/26HRS	DMSP39		PGTW
32	260215	17.1N 110.8E	PCN 5	T2.5/3.0 /W0.5/24HRS	DMSP39		RODN
33	260600	17.6N 111.2E	PCN 0		OTHER		PGTW
34	260900	18.1N 111.0E	PCN 0		OTHER		PGTW
35	261159	17.8N 110.5E	PCN 5		NOAA6	280X1 CH3	RODN
36	261200	18.2N 110.4E	PCN 0		OTHER		PGTW

37	261600	18.5N 110.2E	PCN 0		OTHER			PGTW
38	262100	19.1N 110.0E	PCN 0		OTHER			PGTW
39	262234	18.8N 109.5E	PCN 6		DMSP37			RPMK
40	262234	19.0N 109.6E	PCN 3		DMSP37			RODN
41	270038	19.0N 109.4E	PCN 5	T4.0/4.0-/D0.5/24HRS	NOAA6			RPMK
42	270336	19.6N 109.7E	PCN 5		DMSP39			RPMK
43	270900	20.3N 110.1E	PCN 0		OTHER			PGTW
44	271136	20.1N 109.3E	PCN 5		NOAA6			RODN
45	271200	20.3N 110.2E	PCN 0		OTHER			PGTW
46	271600	20.8N 109.9E	PCN 0		OTHER			PGTW
47	272213	20.7N 109.3E	PCN 5		DMSP37	DATA EDGE		RODN
48	280000	21.5N 109.4E	PCN 0		OTHER			PGTW
49	280016	20.8N 109.2E	PCN 5	T3.0/3.0-	NOAA6	INIT OBS		RODN
50	280300	21.8N 108.7E	PCN 0		OTHER			PGTW
51	280316	21.4N 108.4E	PCN 3	T3.0/4.0-/W1.0/26HRS	DMSP39			RPMK
52	280316	21.6N 108.6E	PCN 5		DMSP39			RODN
53	280900	21.5N 107.1E	PCN 0		OTHER			PGTW
54	281200	21.8N 106.6E	PCN 0		OTHER			PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE ORIEN- DIAM/TATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	240717	12.4N 118.9E	1500FT		996	40 040 7	220 50 160 10	5 1			+24 +27 +24 27	2
2	242300	14.4N 115.2E	700MB	3061	998	25 050 30	160 40 050 5	5 5			+12 +12	3
3	250620	14.9N 113.8E	700MB	3051	996	35 090 20	140 49 090 10	5 3				4
4	250822	15.4N 113.7E	700MB	3028	992	45 050 10	150 42 050 10	6 3			+14 +12 +12	4

SYNOPTIC FIXES

FIX NO.	TIME (Z)	FIX POSITION	INTENSITY ESTIMATE	NEAREST DATA (NM)	COMMENTS
1	221200	10.5N 129.0E	25	15	
2	230000	11.0N 126.0E	25	40	
3	231200	11.5N 123.5E	20	30	
4	271200	20.0N 110.0E	30	20	
5	280000	21.1N 109.2E	45	20	

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TROPICAL STORM IDA

BEST TRACK DATA

	BEST TRACK			WARNING			ERRORS		24 HOUR FORECAST			ERRORS		48 HOUR FORECAST			ERRORS		72 HOUR FORECAST			ERRORS	
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
070600Z	12.5	139.9	25	12.2	139.8	25.	19.	0.	13.6	135.8	35.	135.	-5.	14.8	131.8	45.	278.	-5.	15.8	128.6	55.	389.	0.
070612Z	13.2	138.8	30	12.9	139.7	25.	55.	-5.	14.5	136.0	40.	191.	0.	15.7	132.2	45.	339.	-10.	16.2	128.9	45.	452.	-5.
070618Z	13.9	137.6	30	13.7	138.7	30.	65.	0.	15.3	134.7	45.	201.	5.	16.4	130.5	45.	306.	-10.	17.1	126.9	45.	378.	-5.
070700Z	14.7	136.5	35	14.5	136.2	40.	21.	5.	16.4	131.7	55.	124.	10.	18.0	127.6	60.	197.	0.	20.2	123.8	70.	192.	20.
070706Z	15.8	135.3	40	15.5	135.4	40.	19.	0.	17.5	131.0	55.	145.	5.	19.6	126.9	65.	208.	10.	22.0	123.3	70.	207.	25.
070712Z	16.7	133.6	40	16.5	133.8	40.	17.	0.	19.6	129.2	50.	133.	-5.	21.4	125.0	60.	170.	10.	22.4	120.8	65.	109.	20.
070718Z	17.2	131.0	40	17.2	132.0	45.	11.	5.	19.6	126.9	55.	75.	0.	21.2	122.9	65.	89.	15.	22.5	119.0	65.	45.	20.
070800Z	17.8	130.1	45	18.0	130.2	45.	13.	0.	20.9	123.8	60.	101.	0.	22.9	118.8	55.	143.	5.	0.0	0.0	0.	-0.	0.
070806Z	18.3	128.6	50	18.3	128.6	50.	0.	0.	20.7	123.3	60.	54.	5.	23.4	118.2	50.	137.	5.	0.0	0.0	0.	-0.	0.
070812Z	18.6	127.1	55	18.8	127.0	55.	13.	0.	20.7	120.6	65.	93.	15.	24.1	116.9	50.	167.	5.	0.0	0.0	0.	-0.	0.
070818Z	18.9	125.8	55	19.2	125.0	55.	49.	0.	21.6	118.5	60.	170.	10.	25.2	116.0	30.	206.	-15.	0.0	0.0	0.	-0.	0.
070900Z	19.3	124.4	60	19.2	124.6	60.	13.	0.	20.8	119.7	60.	48.	10.	23.5	116.7	50.	77.	5.	0.0	0.0	0.	-0.	0.
070906Z	19.8	123.2	55	19.7	123.3	60.	8.	5.	21.4	118.6	60.	56.	15.	24.3	116.2	20.	102.	-25.	0.0	0.0	0.	-0.	0.
070912Z	20.3	122.2	50	20.3	122.2	60.	0.	10.	22.4	117.7	60.	71.	15.	25.2	115.9	15.	125.	-30.	0.0	0.0	0.	-0.	0.
070918Z	20.7	121.4	50	20.7	120.7	60.	39.	10.	23.2	116.7	50.	95.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071000Z	21.1	120.5	50	20.8	120.9	55.	29.	5.	22.2	118.5	45.	50.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071006Z	21.5	119.6	45	21.2	119.8	55.	21.	10.	22.8	116.8	45.	17.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071012Z	22.0	118.9	45	21.7	118.8	55.	19.	10.	23.8	115.8	30.	57.	-15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071018Z	22.4	118.2	45	22.4	118.1	55.	6.	10.	24.6	116.1	25.	48.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071100Z	22.6	117.7	45	22.7	116.8	45.	50.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071106Z	22.8	117.1	45	22.7	117.1	45.	6.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071112Z	23.2	116.6	45	23.0	116.6	45.	12.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071118Z	23.8	116.2	30	23.8	116.2	30.	0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	21.	98.	182.	253.	0.	0.	0.	0.
AVG RIGHT ANGLE ERROR	11.	37.	73.	126.	0.	0.	0.	0.
AVG INTENSITY MAGNITUDE ERROR	3.	7.	11.	14.	0.	0.	0.	0.
AVG INTENSITY BIAS	3.	3.	-3.	11.	0.	0.	0.	0.
NUMBER OF FORECASTS	23	19	14	7	0	0	0	0

DISTANCE TRAVELED BY STORM IS 1527. NM

AVERAGE SPEED OF STORM IS 12. KNOTS

TROPICAL STORM IDA
FIX POSITIONS FOR CYCLONE NO. 8

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	SATELLITE	COMMENTS	SITE
* 1	050600	7.6N 144.8E	PCN 0		OTHER		PGTW
2	060037	11.8N 140.9E	PCN 3	T0.0/0.0	DMSP39	INIT OBS	PGTW
3	060529	12.1N 139.9E	PCN 5		TIROSN		PGTW
4	060957	12.9N 140.1E	PCN 5		NOAA6	LLCU LINES	PGTW
5	061600	14.1N 137.9E	PCN 0		OTHER		PGTW
6	062043	13.7N 136.7E	PCN 6		DMSP37	PSN BASED ON UL FEATURES	PGTW
7	062100	14.0N 137.4E	PCN 0		OTHER		PGTW
8	062236	14.0N 136.2E	PCN 5	T2.0/2.0 /D2.0/22HRS	NOAA6		PGTW
9	070158	14.9N 135.6E	PCN 5		DMSP39		PGTW
* 10	070159	15.5N 135.5E	PCN 5	T3.0/3.0	DMSP39	INIT OBS	RPMK
11	070300	15.3N 135.2E	PCN 0		OTHER		PGTW
12	071116	16.!N 133.5E	PCN 5		NOAA6		PGTW
13	071200	16.2N 133.4E	PCN E		OTHER		PGTW
14	071600	16.6N 132.4E	PCN 0		OTHER		PGTW
15	072355	17.6N 129.7E	PCN 5		NOAA6		PGTW
16	072355	17.9N 129.6E	PCN 5		NOAA6	DVORAK ON 39 PASS	RPMK
17	080139	17.6N 129.4E	PCN 5	T3.5/3.5 /D1.5/27HRS	DMSP39		PGTW
18	080139	17.8N 129.0E	PCN 5	T4.0/4.0 /D1.0/24HRS	DMSP39		RPMK
19	080139	17.7N 129.4E	PCN 5	T4.0/4.0+	DMSP39	INIT OBS	RODN
20	081053	18.6N 126.7E	PCN 5		NOAA6	PARTIALLY EXPOSED LLCC	PGTW
* 21	081600	19.4N 125.0E	PCN 0		OTHER		PGTW
22	082142	19.1N 124.5E	PCN 6		DMSP37		PGTW
23	082333	19.6N 124.5E	PCN 5		NOAA6		PGTW
24	090119	19.1N 124.0E	PCN 5	T4.0/4.0 /S0.0/24HRS	DMSP39		RPMK
25	090119	19.4N 124.2E	PCN 5	T3.5/3.5 /S0.0/24HRS	DMSP39		PGTW
26	090119	18.9N 124.1E	PCN 5	T4.0/4.0 /S0.0/24HRS	DMSP39		RODN
27	090300	19.5N 123.9E	PCN 0		OTHER		PGTW
28	091031	19.9N 121.8E	PCN 5		NOAA6		PGTW
29	091600	20.4N 120.6E	PCN 0		OTHER		PGTW
30	092310	21.0N 120.8E	PCN 5	T3.0/3.5 /W0.5/20HRS	NOAA6		PGTW
31	100241	21.0N 119.5E	PCN 5	T3.0/4.0 /W1.0/24HRS	DMSP39		RPMK
32	100241	21.0N 120.2E	PCN 5	T3.0/4.0-/W1.0/25HRS	DMSP39		RODN
33	100625	21.5N 119.8E	PCN 5		TIROSN		PGTW
34	100625	21.0N 119.6E	PCN 5	T4.0/4.0	TIROSN	INIT OBS	RKSO
35	100807	21.2N 119.3E	PCN 5		TIROSN		RPMK
36	101150	21.4N 118.6E	PCN 6		NOAA6		RPMK
37	101600	22.0N 118.5E	PCN 0		OTHER		PGTW
38	102100	22.2N 117.6E	PCN 0		OTHER		PGTW
* 39	102240	22.3N 116.7E	PCN 6		DMSP37		RPMK
40	110030	22.4N 117.7E	PCN 5	T3.0/3.0-/S0.0/22HRS	NOAA6		RODN
41	110220	22.0N 117.5E	PCN 3	T3.0/3.0-/S0.0/24HRS	DMSP39		RPMK
42	110221	22.6N 117.5E	PCN 3	T3.0/3.0-/S0.0/27HRS	DMSP39		PGTW
43	110221	22.0N 117.4E	PCN 3	T4.5/4.5-/D0.5/20HRS	DMSP39		RKSO
44	110756	23.2N 116.3E	PCN 5		TIROSN		RPMK
45	110900	23.3N 116.4E	PCN 0		OTHER		PGTW
46	111200	23.7N 116.3E	PCN 0		OTHER		PGTW
47	112219	24.2N 115.3E	PCN 5		DMSP37		RPMK
48	112220	23.3N 114.8E	PCN 6		DMSP37		RODN
49	120007	23.8N 114.6E	PCN 5	T2.5/3.0-/W0.5/24HRS	NOAA6		RODN
50	120201	24.8N 114.2E	PCN 5	T1.5/3.0-/W1.5/24HRS	DMSP39		PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE ORIEN- DIAM/TATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	060145	11.8N 140.9E	1500FT		1002	25 260 60	280 34 240 60	3 2			+24 +25 +24 26	1
2	062326	14.5N 136.5E	700MB	3060	998	50 090 60	190 46 080 62	3 5			+11 +11 +11	2
3	070615	15.6N 135.4E	700MB	3035		45 130 90	220 46 130 120	5 5				3
4	070915	16.3N 134.6E	700MB	3021	992	25 220 05	230 28 190 100	4 2			+13 +15 +10	3
5	072130	17.5N 130.8E	700MB	3031	992	35 090 15	170 45 090 100	10 2			+13 +14 + 9	4
6	080633	18.3N 128.5E	700MB	2975		60 070 90		15 9				5
7	080850	18.5N 127.8E	700MB	2961	998	55 010 35	120 55 010 35	10 9			+19 +18 + 9	5
8	082133	19.1N 125.1E	700MB	2911		65 050 60	100 53 020 40	5 5			+14 +16 +12	6
9	090735	19.9N 122.9E	700MB	2960		85 040 20	170 46 100 125	5 10				7
10	090903	20.2N 122.6E	700MB	2957	981	85 090 40	130 30 090 40	5 10			+15 +16 +10	7
11	091936	20.7N 121.3E	700MB	2965			360 35 210 120	3 5				8
12	092217	20.8N 121.0E	700MB	3000	998	45 130 70		2 12			+12 +16 +13	8

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TYPHOON JOE

BEST TRACK DATA

MO/DA/HR	BEST TRACK POSIT		BEST TRACK WIND	WARNING POSIT		WARNING WIND	WARNING ERRORS DST	WARNING ERRORS WIND	24 HOUR FORECAST POSIT		24 HR WIND	24 HR ERRORS DST	24 HR ERRORS WIND	48 HOUR FORECAST POSIT		48 HR WIND	48 HR ERRORS DST	48 HR ERRORS WIND	72 HOUR FORECAST POSIT		72 HR WIND	72 HR DST	72 HR WIND
071600Z	9.2	148.3	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071606Z	10.1	147.2	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071612Z	11.0	146.0	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071618Z	11.9	145.1	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071700Z	12.4	144.1	30	12.7	143.8	20.	25.	-10.	16.1	139.6	40.	166.	5.	19.5	135.4	55.	318.	0.	20.2	130.0	70.	336.	-1[illegible]
071706Z	12.7	142.8	30	13.3	142.9	20.	36.	-10.	16.2	130.9	40.	154.	0.	18.8	134.9	55.	299.	-5.	20.3	130.4	70.	396.	-25.
071712Z	12.9	141.6	30	13.0	142.5	20.	53.	-10.	15.2	138.2	45.	120.	0.	17.3	133.7	55.	243.	-10.	19.2	129.1	70.	347.	-3[illegible]
071718Z	13.0	140.3	30	13.1	140.4	20.	8.	-10.	14.4	135.5	45.	40.	-5.	15.5	130.8	55.	150.	-20.	17.0	126.1	70.	223.	0.
071800Z	13.4	138.9	35	13.2	139.0	25.	13.	-10.	14.2	134.2	50.	63.	-5.	15.5	129.6	60.	173.	-25.	17.3	125.1	70.	269.	1[illegible]
071806Z	13.9	137.7	40	14.1	137.5	35.	17.	-5.	15.3	132.5	55.	60.	-5.	17.0	127.6	65.	158.	-30.	19.3	123.2	70.	254.	-[illegible]
071812Z	14.2	136.4	45	14.2	136.3	40.	6.	-5.	15.7	131.2	60.	73.	-5.	17.8	126.2	70.	162.	-35.	20.4	121.7	70.	275.	-1[illegible]
071818Z	14.4	134.8	50	14.4	135.1	45.	17.	-5.	16.1	130.1	65.	117.	-10.	18.2	125.2	70.	185.	0.	20.9	120.7	70.	316.	-20.
071900Z	14.6	133.2	55	14.6	133.3	50.	6.	-5.	16.3	127.2	70.	54.	-15.	18.1	122.0	75.	116.	15.	20.5	117.6	85.	229.	-[illegible]
071906Z	15.0	131.5	60	15.0	131.7	55.	12.	-5.	16.6	125.7	75.	50.	-20.	18.8	120.5	80.	104.	5.	21.5	116.3	85.	259.	5.
071912Z	15.3	130.0	65	15.3	130.1	65.	6.	0.	17.2	123.9	90.	43.	-15.	19.7	118.7	110.	111.	25.	22.7	115.0	110.	300.	4[illegible]
071918Z	15.4	128.2	75	15.8	128.8	70.	42.	-5.	18.0	123.0	95.	75.	25.	20.3	118.3	110.	178.	20.	23.3	114.8	90.	[illegible]	[illegible]
072000Z	15.6	126.6	85	15.7	126.7	80.	8.	-5.	17.3	119.4	60.	62.	0.	19.0	115.1	70.	83.	-20.	22.0	112.5	75.	331.	5[illegible]
072006Z	16.1	125.0	95	16.0	125.0	85.	6.	-10.	17.5	118.6	65.	29.	-10.	19.3	114.8	70.	162.	-10.	0.0	0.0	0.	-0.	0.
072012Z	16.5	123.7	105	16.4	123.3	90.	24.	-15.	17.8	118.1	70.	58.	-15.	19.6	114.4	70.	241.	0.	0.0	0.0	0.	-0.	0.
072018Z	17.0	122.2	70	17.1	122.2	95.	6.	25.	18.0	117.5	70.	125.	-20.	20.1	113.9	70.	311.	5.	0.0	0.0	0.	-0.	0.
072100Z	16.9	120.4	60	17.4	120.7	65.	34.	5.	18.6	116.1	80.	144.	-10.	21.2	113.1	80.	362.	55.	0.0	0.0	0.	-0.	0.
072106Z	17.0	119.0	75	17.8	119.0	85.	0.	10.	20.3	113.7	70.	98.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072112Z	18.4	117.3	85	18.7	117.5	75.	21.	-10.	22.0	113.1	70.	188.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072118Z	18.9	115.5	90	19.2	115.3	75.	21.	-15.	23.2	112.1	15.	250.	-50.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072200Z	19.4	113.7	90	19.9	113.7	70.	30.	-20.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	[illegible]
072206Z	19.9	112.0	80	20.2	112.0	80.	18.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	[illegible]
072212Z	20.4	110.2	70	20.4	110.2	80.	0.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072210Z	20.8	108.4	65	20.8	108.2	80.	11.	15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072300Z	21.2	106.6	25	21.3	106.9	55.	10.	30.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS WRNG	24-HR	48-HR	72-HR	TYPHOONS WHILE OVER 35 KTS WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	18.	99.	197.	301.	15.	99.	187.	299.
AVG RIGHT ANGLE ERROR	13.	61.	98.	184.	13.	61.	90.	189.
AVG INTENSITY MAGNITUDE ERROR	10.	11.	16.	19.	9.	11.	14.	17.
AVG INTENSITY BIAS	-2.	-8.	-2.	1.	0.	-8.	-5.	-3.
NUMBER OF FORECASTS	25	20	17	13	20	20	16	12

DISTANCE TRAVELED BY STORM IS 2541. NM

AVERAGE SPEED OF STORM IS 15. KNOTS

TYPHOON JOE
FIX POSITIONS FOR CYCLONE NO. 9

SATELLITE FIXES

	FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	SATELLITE	COMMENTS	SITE
	1	160936	10.6N 146.3E	PCN 6		NOAA6		PGTW
	2	162216	12.1N 145.0E	PCN 5	T1.0/1.0	NOAA6	INIT OBS	PGTW
*	3	170022	12.2N 144.6E	PCN 5		DMSP39		PGTW
	4	170300	12.5N 144.3E	PCN 0		OTHER		PGTW
	5	170600	13.4N 142.7E	PCN 0		OTHER		PGTW
	6	170900	13.5N 142.0E	PCN 0		OTHER		PGTW
	7	171200	13.4N 141.4E	PCN 0		OTHER		PGTW
	8	171600	13.7N 140.2E	PCN 0		OTHER		PGTW
	9	171800	13.8N 139.8E	PCN 0		OTHER		PGTW
	10	172154	13.6N 139.0E	PCN 5		NOAA6		PGTW
	11	180143	14.1N 138.5E	PCN 5	T2.5/2.5 /D1.5/27HRS	DMSP39		PGTW
	12	180143	13.5N 130.3E	PCN 5	T1.5/1.5	DMSP39	INIT OBS	RODN
	13	180900	14.4N 136.9E	PCN 0		OTHER		PGTW
	14	181033	14.3N 136.3E	PCN 5		NOAA6		PGTW
	15	181200	14.5N 136.0E	PCN 0		OTHER		PGTW
	16	181600	14.8N 135.4E	PCN 0		OTHER		PGTW
	17	182132	14.4N 134.2E	PCN 5		DMSP37		PGTW
	18	182312	14.6N 133.2E	PCN 5		NOAA6		PGTW
	19	190123	14.6N 132.6E	PCN 3	T3.5/3.5 /D1.0/24HRS	DMSP39		PGTW
	20	190123	14.8N 132.8E	PCN 3	T3.5/3.5 /D2.0/24HRS	DMSP39		RODN
	21	190300	14.6N 132.1E	PCN 0		OTHER		PGTW
	22	191011	14.9N 130.2E	PCN 3		NOAA6	WEAK THERMAL EYE	PGTW
	23	191600	15.8N 129.4E	PCN 0		OTHER		PGTW
	24	192250	15.7N 127.5E	PCN 3		NOAA6		PGTW
	25	200103	15.8N 126.6E	PCN 3	T4.5/4.5-/D1.0/24HRS	DMSP39		PGTW
	26	200103	15.5N 125.9E	PCN 3	T5.0/5.0-/D1.5/24HRS	DMSP39		RODN
	27	200300	16.1N 126.1E	PCN E		OTHER		PGTW
	28	200612	16.1N 125.2E	PCN 1		TIROSN		PGTW
	29	201200	16.4N 123.8E	PCN E		OTHER		PGTW
	30	201600	16.9N 122.7E	PCN E		OTHER		PGTW
	31	201857	17.2N 121.2E	PCN C		TIROSN		PGTW
	32	202100	17.2N 121.2E	PCN C		OTHER		PGTW
	33	210009	17.2N 120.0E	PCN 5		NOAA6		RODN
	34	210225	17.5N 119.8E	PCN 1	T4.0/4.0+/W0.5/25HRS	DMSP39		PGTW
	35	210225	17.5N 119.7E	PCN 1	T5.0/5.0 /S0.0/25HRS	DMSP39		RODN
	36	210225	17.4N 119.8E	PCN 1	T4.5/4.5+	DMSP39	INIT OBS	RKSO
	37	211107	18.4N 117.6E	PCN 3		NOAA6		PGTW
	38	211600	18.8N 115.7E	PCN C		OTHER		PGTW
	39	212100	19.2N 114.5E	PCN C		OTHER		PGTW
	40	212347	19.3N 114.0E	PCN 2		NOAA6		PGTW
	41	220205	19.6N 113.0E	PCN 1	T5.5/5.5-/D0.5/24HRS	DMSP39		RODN
	42	220205	19.5N 113.2E	PCN 1	T5.0/5.0-/D1.0/24HRS	DMSP39		PGTW
	43	220900	20.2N 111.1E	PCN C		OTHER		PGTW
	44	221226	20.8N 109.9E	PCN 6		NOAA6		RODN
	45	221600	20.5N 108.8E	PCN C		OTHER		PGTW
	46	222100	20.9N 107.6E	PCN E		OTHER		PGTW
	47	230000	21.0N 106.6E	PCN C		OTHER		PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE DIAM/ORIENTATION	EYE TEMP (C) OUT/	IN/	DP/	SST	MSN NO.
1	160525	9.8N 147.3E	1500FT		1006	15 230 25		4 5						27	1
2	162328	12.6N 143.9E	1500FT		1006	20 060 60	090 22 060 60	3 3			+23	+24	+24	27	2
3	170730	12.3N 143.1E	1500FT		1005	15 340 80	020 30 320 120	3 30			+24	+26	+24	27	2
4	171512	12.8N 141.1E	700MB	3107	1004		140 31 070 180	5 5			+12	+13	+ 7		3
5	171848	12.8N 140.3E	700MB	3095			170 28 060 25	5 10							3
6	180837	14.1N 137.1E	700MB	3035	991	40 090 10	180 35 090 10	6 2				+24	+24	28	4
7	182000	14.3N 133.7E	700MB	2947			140 65 040 10	2 2							5
8	182209	14.5N 133.6E	700MB	2938	983	50 330 30	040 61 330 20	2 2	ELLIPTICAL	20 15 090	+15	+15	+14		5
9	190828	15.1N 130.9E	700MB	2881	974	65 010 10	130 74 070 15	5 5	ELLIPTICAL	27 20 010	+15	+16	+16		6
10	192219	15.6N 127.2E	700MB	2741	958	80 240 5	160 89 090 15	6 2	ELLIPTICAL	20 10 150	+13	+19	+12		7
11	200600	16.0N 124.8E	700MB	2636		55 090 8	170 100 090 18	2 2	ELLIPTICAL	19 16 150					8
12	200900	16.2N 124.2E	700MB	2570	940	70 130 8	300 73 220 15	10 5	CIRCULAR	17		+20	+12		8
13	210853	16.2N 118.2E	700MB	2915	982	50 120 90	190 64 130 120	4 5			+13	+14	+11		10

RADAR FIXES

FIX NO.	TIME (Z)	FIX POSITION	RADAR	ACCRY	EYE SHAPE	EYE DIAM	RADOB-CODE ASWAR TDDFF	COMMENTS	RADAR POSITION	SITE WMO NO.
1	201700	17.0N 122.6E	LAND					WALLACE AS	16.6N 120.3E	
2	202000	17.4N 121.7E	LAND					WALLACE AS	16.6N 120.3E	
3	210520	17.4N 119.6E	LAND		CIRCULAR	34			15.2N 120.6E	98327

SYNOPTIC FIXES

FIX NO.	TIME (Z)	FIX POSITION	INTENSITY ESTIMATE	NEAREST DATA (NM)	COMMENTS
* 1	141200	7.0N 155.0E	15	180	
2	231200	21.0N 102.0E	15	50	

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TROPICAL DEPRESSION 10

BEST TRACK DATA

	BEST TRACK			WARNING					24 HOUR FORECAST					48 HOUR FORECAST					72 HOUR FORECAST				
							ERRORS					ERRORS					ERRORS						
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
071518Z	14.0	125.4	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071600Z	14.0	123.9	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071606Z	14.2	122.2	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071612Z	14.4	120.8	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071618Z	14.7	119.2	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071700Z	15.2	117.8	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071706Z	16.0	116.3	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071712Z	17.2	115.2	30	17.3	115.0	30.	13.	0.	21.1	111.3	45.	98.	15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071718Z	18.3	114.4	30	17.9	114.1	30.	29.	0.	21.9	110.5	40.	133.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071800Z	19.1	113.9	30	19.9	114.8	25.	70.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071806Z	19.9	113.5	30	20.7	113.9	25.	53.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071812Z	20.7	113.0	30	21.8	113.2	25.	67.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071818Z	21.3	112.8	30	21.9	113.1	20.	40.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071900Z	21.8	112.5	30	22.0	112.2	20.	20.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071906Z	22.6	112.3	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	42.	115.	0.	0.	0.	0.	0.	0.
AVG RIGHT ANGLE ERROR	33.	92.	0.	0.	0.	0.	0.	0.
AVG INTENSITY MAGNITUDE ERROR	5.	13.	0.	0.	0.	0.	0.	0.
AVG INTENSITY BIAS	-5.	13.	0.	0.	0.	0.	0.	0.
NUMBER OF FORECASTS	7	2	0	0	0	0	0	0

DISTANCE TRAVELED BY STORM IS 1007. NM

AVERAGE SPEED OF STORM IS 12. KNOTS

TROPICAL DEPRESSION TD-10
FIX POSITIONS FOR CYCLONE NO. 10

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	SATELLITE	COMMENTS	SITE
* 1	150101	14.0N 133.9E	PCN 3	T1.0/1.0	DMSP39	INIT OBS	PGTW
* 2	150959	14.0N 132.0E	PCN 6		NOAA6		PGTW
3	160223	14.2N 112.2E	PCN 5	T1.0/1.0	DMSP39	INIT OBS	RODN
4	161112	14.3N 118.5E	PCN 6		NOAA6		RODN
* 5	161118	13.7N 117.6E	PCN 5		NOAA6		PGTW
6	162357	15.1N 118.0E	PCN 5	T1.5/1.5 /D0.5/22HRS	NOAA6		RODN
7	170203	15.7N 117.5E	PCN 5	T1.5/1.5	DMSP39	INIT OBS	PGTW
8	170300	15.8N 117.3E	PCN 0		OTHER		PGTW
9	170900	16.3N 115.2E	PCN 0		OTHER		PGTW
10	171055	16.5N 115.0E	PCN 5		NOAA6		PGTW
11	171200	16.3N 114.3E	PCN 0		OTHER		PGTW
12	171600	17.6N 114.2E	PCN 0		OTHER		PGTW
13	171800	17.7N 113.7E	PCN 0		OTHER		PGTW
14	172335	19.7N 114.3E	PCN 5	T1.0/1.5-/W0.5/21HRS	NOAA6	SECONDARY CTR AT 18.9N 114.2E	PGTW
15	180300	20.2N 113.3E	PCN 0		OTHER		PGTW
16	180324	20.1N 113.8E	PCN 5	T1.5/1.5 /S0.0/27HRS	DMSP39		RODN
* 17	180900	21.3N 113.2E	PCN 0		OTHER		PGTW
* 18	181200	21.8N 113.1E	PCN 0		OTHER		PGTW
* 19	181600	22.5N 113.2E	PCN 0		OTHER		PGTW

SYNOPTIC FIXES

FIX NO.	TIME (Z)	FIX POSITION	INTENSITY ESTIMATE	NEAREST DATA (NM)	COMMENTS
1	181200	21.0N 113.0E	30	100	
2	190000	21.5N 112.5E	30	15	
3	191200	23.5N 112.0E	5	15	

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

SUPER TYPHOON KIM

BEST TRACK DATA

	BEST TRACK			WARNING			ERRORS		24 HOUR FORECAST			ERRORS		48 HOUR FORECAST			ERRORS		72 HOUR FORECAST				
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
071900Z	7.5	155.2	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071906Z	7.8	153.8	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	-0.
071912Z	8.1	152.5	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
071918Z	8.2	151.1	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072000Z	8.3	149.7	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072006Z	0.3	148.5	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072012Z	8.5	147.3	30	8.3	147.4	30.	13.	0.	9.2	141.7	40.	127.	5.	11.9	135.8	50.	124.	0.	14.5	130.0	65.	112.	-5.
072018Z	9.1	145.6	30	8.8	145.6	30.	18.	0.	10.2	139.4	40.	66.	5.	12.9	132.7	55.	48.	5.	15.7	126.1	70.	117.	-10.
072100Z	9.5	143.9	30	9.5	143.9	30.	0.	0.	12.0	137.4	50.	72.	15.	14.2	130.9	60.	72.	0.	16.3	124.3	70.	154.	-20.
072106Z	10.0	141.8	30	9.9	142.3	30.	30.	0.	12.4	135.9	50.	80.	10.	14.7	129.5	60.	78.	-5.	16.0	122.9	70.	187.	-30.
072112Z	10.0	139.7	35	10.2	140.1	30.	26.	-5.	12.2	133.5	60.	38.	10.	14.8	126.3	65.	136.	-5.	17.8	121.2	65.	242.	-65.
072118Z	10.4	138.3	35	10.6	138.8	30.	32.	-5.	12.7	132.6	60.	35.	10.	15.2	126.3	65.	85.	-15.	17.8	121.2	65.	162.	-65.
072200Z	10.9	136.9	35	11.0	136.7	40.	13.	5.	13.3	130.6	55.	21.	-5.	15.6	124.9	75.	100.	-15.	17.7	119.6	65.	181.	-35.
072206Z	11.2	135.3	40	11.5	135.3	40.	18.	0.	13.8	129.2	60.	27.	-5.	16.3	123.5	75.	141.	-25.	18.3	118.7	65.	175.	-5.
072212Z	11.6	133.7	50	11.3	134.5	40.	50.	-10.	12.6	128.7	65.	64.	-5.	14.4	123.0	75.	110.	-55.	17.4	117.8	65.	157.	25.
072218Z	12.2	132.3	50	12.2	132.2	45.	6.	-5.	14.5	125.3	70.	188.	-10.	16.5	119.5	60.	230.	-70.	19.8	114.5	70.	298.	15.
072300Z	13.0	130.8	60	13.2	130.6	60.	17.	0.	16.2	123.5	75.	104.	-15.	18.7	118.1	60.	203.	-40.	21.8	112.8	60.	362.	10.
072306Z	13.4	129.4	65	14.1	129.0	65.	48.	0.	16.9	122.0	60.	232.	-40.	19.9	116.3	65.	338.	-5.	23.1	111.4	25.	434.	-25.
072312Z	13.6	128.3	70	13.7	128.0	70.	18.	0.	15.5	122.5	80.	121.	-50.	17.7	117.2	70.	188.	30.	21.4	113.1	80.	253.	30.
072318Z	14.0	127.1	80	14.0	126.9	70.	12.	-10.	15.5	122.2	80.	86.	-50.	17.3	117.8	70.	125.	15.	20.4	113.9	80.	171.	35.
072400Z	14.4	126.1	90	14.4	125.9	85.	12.	-5.	15.8	121.5	70.	83.	-30.	17.8	117.1	80.	127.	30.	21.2	113.2	80.	177.	35.
072406Z	14.8	125.4	100	14.9	124.8	90.	35.	-10.	16.5	120.2	65.	93.	-5.	18.6	115.8	85.	156.	35.	22.1	112.6	60.	100.	15.
072412Z	15.4	124.6	130	15.2	124.5	110.	13.	-20.	16.3	121.0	80.	100.	40.	17.8	116.8	85.	160.	35.	21.0	113.0	90.	208.	60.
072418Z	16.2	123.5	130	15.9	123.2	120.	25.	-10.	18.0	118.9	85.	50.	30.	20.1	114.4	90.	152.	45.	23.5	111.1	50.	237.	30.
072500Z	16.7	122.6	100	16.9	122.3	90.	21.	-10.	19.3	118.0	90.	39.	40.	21.3	113.5	90.	160.	45.	0.0	0.0	0.	-0.	0.
072506Z	17.3	121.6	70	17.1	121.3	65.	21.	-5.	19.2	117.2	80.	69.	30.	21.0	112.8	75.	195.	30.	0.0	0.0	0.	-0.	0.
072512Z	17.9	120.5	40	17.6	120.0	75.	34.	35.	19.6	115.3	80.	132.	30.	22.0	111.6	45.	235.	15.	0.0	0.0	0.	-0.	0.
072518Z	18.5	119.6	55	18.3	119.3	55.	21.	0.	20.4	115.3	75.	99.	30.	22.7	111.2	30.	240.	10.	0.0	0.0	0.	-0.	0.
072600Z	19.3	118.7	50	19.3	118.4	55.	17.	5.	21.3	114.0	75.	133.	30.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072606Z	19.7	118.3	50	19.5	118.1	60.	16.	10.	21.3	114.4	75.	114.	30.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072612Z	20.4	117.5	50	20.2	117.1	50.	25.	0.	23.0	112.1	30.	190.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072618Z	21.3	116.8	45	21.0	115.5	45.	75.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072700Z	21.9	116.3	45	22.1	115.6	45.	41.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072706Z	22.7	115.8	45	22.8	115.8	45.	6.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072712Z	23.6	115.5	30	23.6	115.3	30.	11.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072718Z	24.5	115.3	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	23.	95.	159.	211.	25.	91.	150.	210.
AVG RIGHT ANGLE ERROR	16.	63.	109.	123.	18.	58.	96.	112.
AVG INTENSITY MAGNITUDE ERROR	5.	21.	24.	29.	6.	22.	25.	27.
AVG INTENSITY BIAS	-1.	4.	3.	-0.	0.	4.	2.	-6.
NUMBER OF FORECASTS	29	25	22	18	24	24	20	16

DISTANCE TRAVELED BY STORM IS 2661. NM

AVERAGE SPEED OF STORM IS 13. KNOTS

SUPER TYPHOON KIM
FIX POSITIONS FOR CYCLONE NO. 11

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	SATELLITE	COMMENTS	SITE
1	182100	5.5N 155.5E	PCN 0		OTHER		PGTW
2	182342	8.0N 154.7E	PCN 5	T1.0/1.0	DMSP39	INIT OBS	PGTW
3	190300	7.2N 154.2E	PCN 0		OTHER		PGTW
4	190600	7.2N 153.8E	PCN 0		OTHER		PGTW
5	191011	8.5N 151.2E	PCN 5		NOAA6		PGTW
6	200103	8.5N 147.8E	PCN 5	T1.0/1.0	DMSP39	INIT OBS	PGTW
7	200612	8.7N 148.0E	PCN 3		TIROSN	LLCU LINES	PGTW
8	200948	9.2N 147.1E	PCN 5		NOAA6		PGTW
9	201600	9.1N 146.2E	PCN 0		OTHER		PGTW
10	202050	9.3N 144.9E	PCN 6		DMSP39		PGTW
11	202228	9.5N 144.8E	PCN 3		NOAA6		PGTW
12	210044	9.9N 143.7E	PCN 3	T1.5/1.5 /D0.5/24HRS	DMSP39		PGTW
13	210044	9.7N 143.8E	PCN 5	T1.0/1.0	DMSP39	INIT OBS	RODN
14	210300	10.1N 143.4E	PCN 0		OTHER		PGTW
15	210926	10.0N 141.2E	PCN 5		NOAA6		PGTW
16	211600	10.4N 139.3E	PCN 0		OTHER		PGTW
17	212206	10.5N 137.9E	PCN 3	T2.5/2.5 /D1.0/22HRS	NOAA6		PGTW
18	220024	11.0N 136.8E	PCN 5	T2.5/2.5 /D1.5/24HRS	DMSP39		RODN
19	220300	11.2N 136.6E	PCN 0		OTHER		PGTW
20	220900	11.2N 134.6E	PCN 0		OTHER		PGTW
21	221045	11.5N 134.2E	PCN 5		NOAA6		PGTW
22	221600	11.6N 133.3E	PCN 0		OTHER		PGTW
23	222148	12.6N 131.2E	PCN 5		DMSP37	PSN BSD ON UL FEATURES	PGTW
24	222325	12.7N 130.7E	PCN 5		NOAA6	PSN BSD ON ULCC	PGTW
25	230145	13.3N 130.2E	PCN 3	T4.0/4.0 /D1.5/28HRS	DMSP39		PGTW
26	230145	13.3N 130.4E	PCN 3	T3.5/3.5 /D1.0/25HRS	DMSP39		RODN
27	230900	13.9N 128.6E	PCN 0		OTHER		PGTW
28	231023	13.8N 128.5E	PCN 5		NOAA6		PGTW
29	231600	14.1N 127.2E	PCN 0		OTHER		PGTW
30	232302	14.4N 126.2E	PCN 3		NOAA6	PSBL EYE FRMNG	PGTW
31	240125	14.5N 125.8E	PCN 6	T5.0/5.0-/D1.0/24HRS	DMSP39		PGTW
32	240900	15.3N 124.7E	PCN E		OTHER		PGTW
33	241135	15.1N 124.8E	PCN 6		NOAA6		RODN
34	241200	15.6N 124.3E	PCN E		OTHER		PGTW
35	250000	16.7N 122.3E	PCN C		OTHER		PGTW
36	250021	16.6N 122.3E	PCN 3	T5.0/5.0	NOAA6	INIT OBS	RODN
37	250247	16.8N 122.0E	PCN 3		DMSP39		RODN
36	250300	17.0N 121.8E	PCN C		OTHER		PGTW

39	250600	17.3N 121.4E	PCN 0		OTHER		PGTW
40	250656	17.4N 121.4E	PCN 3	T5.0/5.0+/S0.0/30HRS	TIROSN		PGTW
41	250900	17.8N 121.2E	PCN 0		OTHER		PGTW
42	251119	17.9N 120.8E	PCN 3		NOAA6		PGTW
43	251120	17.8N 120.5E	PCN 5		NOAA6		RODN
44	252225	18.4N 120.2E	PCN 3	T4.5/4.5+	DMSP37	INIT OBS	RKSO
45	252359	19.1N 119.0E	PCN 5	T4.0/5.0 /W1.0/24HRS	NOAA6		RODN
46	260227	19.3N 118.5E	PCN 5		DMSP39		RODN
47	260227	19.1N 118.5E	PCN 3	T3.5/4.5+/W1.5/21HRS	DMSP39		PGTW
48	260645	20.1N 117.8E	PCN 5		TIROSN		PGTW
49	260900	20.2N 117.3E	PCN 0		OTHER	PSN BSD ON CONSERV FEATURES	PGTW
50	261057	20.3N 117.6E	PCN 5		NOAA6		PGTW
51	261600	20.9N 116.0E	PCN 0		OTHER		PGTW
52	262100	21.8N 116.7E	PCN 0		OTHER		PGTW
53	262337	22.1N 116.6E	PCN 5		NOAA6		PGTW
54	270207	22.0N 116.0E	PCN 3	T4.0/4.5-/W0.5/28HRS	DMSP39		RKSO
55	270207	22.2N 116.5E	PCN 5	T3.5/3.5-/S0.0/24HRS	DMSP39		PGTW
56	270900	23.5N 115.6E	PCN 0		OTHER		PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE DIAM/ORIEN-TATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	192105	10.1N 149.6E	1500FT		1008	25 320 10	110 26 000 00	20 3			+26 +24 +24	2
2	200800	8.3N 148.3E	1500FT		1001	35 090 10	090 30 360 15	10 1			+23 +23 28	3
3	210610	10.0N 142.0E	700MB	3106		30 040 50	130 34 320 10	5 3				5
4	210733	9.9N 141.3E	700MB	3104	1004	25 160 5	120 31 000 00	5 3			+12 +12 + 9	5
5	211932	10.5N 137.5E	700MB	3068			130 61 040 30	10 1				6
6	212256	10.8N 137.1E	700MB	3100	1001	30 030 10	060 34 270 70	10 2			+13 +12 + 7	6
7	221127	10.9N 134.7E	700MB	3023	992		260 50 180 20	10 2	CIRCULAR	15	+10 +14 +10	8
8	221930	12.4N 131.7E	700MB	2989			160 59 020 15	5 3				9
9	222223	12.9N 131.2E	700MB	2964	982	65 070 20	130 18 050 15	5 2			+14 +16 +12	9
10	230703	13.4N 129.2E	700MB	2909		80 060 10	150 65 060 24	6 2	CIRCULAR	30		10
11	230848	13.5N 128.9E	700MB	2897	979	80 070 10	030 65 300 28	4 2	CIRCULAR	25	+10 +15 +12	10
12	231628	13.9N 127.5E	700MB	2825	967		280 58 190 5	10 5	CIRCULAR	20	+15 +17	11
13	231938	14.3N 126.8E	700MB	2778			190 85 090 10	7 5	CIRCULAR	15		11
14	232204	14.3N 126.3E	700MB	2723	958	85 360 5	040 80 330 10	10 2	CIRCULAR	15	+18 +19	11
15	240805	15.0N 125.1E	700MB	2356	916	110 270 5	260 115 160 5	5 2	CIRCULAR	7	+12 +20 +13	13
16	241603	15.8N 123.7E	700MB	2297	908		120 123 100 15	5 1	CIRCULAR	7	+13 +22 +15	14
17	241943	16.3N 123.1E	700MB	2338			210 105 140 15	5 1				14
18	242150	16.6N 122.7E	700MB	2377	918	100 020 5	090 78 020 15	10 2	CIRCULAR	6	+21 +21 +16	14
19	251555	18.2N 119.7E	700MB	2992	990		250 48 170 47	4 4			+12 +12	15
20	251931	18.9N 119.5E	700MB	2985			300 46 230 147	2 10				15
21	252240	19.1N 118.8E	700MB	2984	989	50 020 28	080 58 360 59	3 5			+12	15
22	260605	19.7N 118.3E	700MB	2993	989	45 140 145	200 50 140 148	5 5				16
23	260843	20.0N 117.7E	700MB	2982	987	35 280 60	340 37 280 60	12 6			+15 +16 +10	16

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TYPHOON LEX

BEST TRACK DATA

MO/DA/HR	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	DST	WIND
072606Z	22.5	152.8	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072612Z	22.5	152.3	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072618Z	22.5	151.8	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072700Z	22.5	151.3	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072706Z	22.5	150.7	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072712Z	22.5	150.1	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072718Z	22.5	149.6	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072800Z	22.7	149.0	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072806Z	22.8	148.5	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072812Z	23.0	148.0	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072818Z	23.4	148.2	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072900Z	23.7	148.4	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
072906Z	24.2	148.4	30	24.0	148.5	30.	13.	0.	25.5	147.4	40.	108.	-5.	26.9	145.4	50.	173.	-15.	28.5	143.8	60.	285.	-5.
072912Z	24.7	148.3	30	24.6	148.3	30.	6.	0.	26.5	147.8	50.	88.	0.	28.9	147.7	55.	235.	-10.	31.3	149.9	50.	492.	-20.
072918Z	24.8	148.8	35	24.8	148.2	35.	33.	0.	26.8	147.8	55.	89.	0.	29.1	147.8	55.	265.	-10.	31.5	150.2	50.	536.	-20.
073000Z	25.0	149.5	40	25.1	149.3	45.	12.	5.	26.7	150.1	55.	128.	-5.	28.5	151.3	55.	347.	-10.	30.7	152.8	50.	616.	-25.
073006Z	25.6	149.4	45	25.6	149.8	50.	22.	5.	27.5	150.9	55.	203.	-10.	29.6	152.0	50.	450.	-15.	31.6	153.4	45.	665.	-30.
073012Z	25.4	148.9	50	25.3	149.2	55.	17.	5.	27.4	150.0	55.	211.	-10.	29.6	151.2	50.	448.	-20.	31.9	153.1	45.	637.	-30.
073018Z	25.5	148.6	55	25.7	149.3	55.	40.	0.	27.2	149.8	55.	204.	-10.	29.3	151.1	50.	463.	-20.	31.7	152.9	45.	579.	-30.
073100Z	25.3	148.3	60	25.2	148.6	60.	17.	0.	25.9	149.8	70.	154.	5.	28.1	148.8	70.	333.	-5.	30.3	148.7	65.	370.	-15.
073106Z	25.2	148.0	65	25.2	148.0	60.	0.	-5.	27.2	146.0	75.	179.	10.	30.2	146.2	65.	394.	-10.	32.8	148.2	50.	441.	-25.
073112Z	25.0	147.1	65	25.2	147.7	65.	35.	0.	27.5	144.7	75.	215.	5.	30.4	144.2	65.	359.	-10.	32.8	145.8	50.	366.	-25.
073118Z	24.7	147.2	65	24.9	146.6	65.	35.	0.	25.7	144.0	75.	126.	5.	28.0	143.1	65.	172.	-10.	31.2	144.4	50.	227.	-20.
080100Z	24.5	146.6	65	24.6	146.6	65.	6.	0.	25.2	143.7	60.	110.	-15.	27.2	141.2	55.	202.	-25.	30.7	141.1	40.	244.	-30.
080106Z	24.2	146.1	65	24.6	145.7	65.	32.	0.	25.9	142.2	55.	173.	-20.	29.0	140.7	50.	258.	-25.	32.2	141.8	40.	262.	-25.
080112Z	24.0	145.6	70	24.1	145.8	70.	12.	0.	24.2	142.8	65.	93.	-10.	26.1	140.2	60.	228.	-15.	29.3	139.1	55.	313.	-10.
080118Z	23.8	145.0	70	24.0	145.0	70.	12.	0.	24.5	142.2	65.	136.	-10.	26.5	139.9	60.	246.	-10.	29.8	138.9	50.	347.	-10.
080200Z	23.5	144.5	75	23.5	144.5	75.	0.	0.	22.6	141.8	80.	219.	0.	21.8	138.5	85.	488.	15.	21.1	135.2	90.	807.	30.
080206Z	23.8	144.4	75	23.3	143.9	75.	41.	0.	22.5	141.2	85.	261.	10.	21.7	138.0	90.	548.	25.	20.9	134.6	90.	982.	30.
080212Z	24.4	144.5	75	23.8	144.4	75.	36.	0.	23.6	142.4	85.	220.	10.	23.2	140.2	90.	444.	25.	22.3	137.0	90.	775.	30.
080218Z	25.4	144.5	75	24.3	144.0	80.	71.	5.	24.4	142.8	85.	199.	15.	24.7	141.1	85.	382.	25.	25.2	139.5	90.	608.	30.
080300Z	25.4	144.4	80	25.6	144.0	80.	25.	0.	26.7	141.8	75.	160.	5.	28.5	140.1	75.	338.	15.	30.5	139.2	70.	524.	10.
080306Z	26.2	144.4	75	26.2	144.4	80.	0.	5.	29.7	144.0	65.	75.	0.	34.0	146.2	55.	207.	-5.	0.0	0.0	0.	-0.	0.
080312Z	26.8	144.4	75	26.8	144.6	80.	11.	5.	30.3	145.1	65.	66.	0.	34.3	147.7	55.	197.	-5.	0.0	0.0	0.	-0.	0.
080318Z	27.4	144.4	70	27.6	144.3	75.	13.	5.	31.2	144.6	60.	103.	0.	35.1	147.9	45.	218.	-15.	0.0	0.0	0.	-0.	0.
080400Z	27.9	144.5	70	27.9	144.4	70.	5.	0.	31.0	145.0	55.	82.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
080406Z	28.6	144.7	65	28.8	144.7	65.	12.	0.	28.8	144.7	55.	161.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
080412Z	29.2	145.1	65	29.5	144.9	65.	21.	0.	29.4	144.9	50.	178.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
080418Z	29.7	145.6	60	30.0	145.2	60.	27.	0.	33.5	147.2	45.	139.	-15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
080500Z	30.2	146.3	60	30.2	146.3	60.	0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
080506Z	30.6	147.0	60	30.8	147.0	60.	12.	0.	32.9	149.8	55.	27.	-5.	35.0	152.5	45.	135.	5.	0.0	0.0	0.	-0.	0.
080512Z	31.0	147.8	60	31.0	147.5	60.	15.	0.	33.0	150.8	50.	37.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
080518Z	31.5	148.6	60	31.4	148.5	60.	8.	0.	33.2	152.3	50.	47.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
080600Z	32.1	149.3	60	32.2	149.5	60.	12.	0.	35.3	153.3	50.	62.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
080606Z	32.6	150.2	60	32.7	149.9	60.	16.	0.	36.2	152.9	45.	102.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
080612Z	33.2	151.5	55	33.2	151.3	55.	10.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
080618Z	33.8	152.9	50	34.0	153.0	50.	13.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
080700Z	34.8	154.4	50	34.7	154.5	50.	8.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
080706Z	36.0	155.0	40	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS WRNG	24-HR	48-HR	72-HR	TYPHOONS WHILE OVER 35 KTS WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	18.	137.	314.	499.	18.	137.	314.	499.
AVG RIGHT ANGLE ERROR	11.	97.	251.	421.	11.	97.	251.	421.
AVG INTENSITY MAGNITUDE ERROR	1.	7.	14.	23.	1.	7.	14.	23.
AVG INTENSITY BIAS	1.	-2.	-5.	-10.	0.	-2.	-5.	-10.
NUMBER OF FORECASTS	36	32	24	20	34	32	24	20

DISTANCE TRAVELED BY STORM IS 1810. NM

AVERAGE SPEED OF STORM IS 6. KNOTS

TYPHOON LEX
FIX POSITIONS FOR CYCLONE NO. 12

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	SATELLITE	COMMENTS	SITE
1	260916	22.5N 152.5E	PCN 5		NOAA6		PGTW
* 2	261600	23.8N 152.0E	PCN 0		OTHER		PGTW
3	262155	22.4N 151.3E	PCN 5	T0.5/0.5	NOAA6	INIT OBS ILL DEFINED CC	PGTW
* 4	270026	22.3N 151.3E	PCN 5		DMSP39	VERY LITTLE LLCU INFLOW	PGTW
* 5	270654	22.6N 149.2E	PCN 5		NOAA6		PGTW
6	280006	23.0N 149.0E	PCN 5	T0.5/0.5 /S0.0/24HRS	DMSP39	EXPOSED LLCU AT 27.0N 152.4E	PGTW
7	281013	22.9N 147.9E	PCN 5		NOAA6	ULCC CONVECTION IMPROVED	PGTW
8	281200	22.8N 148.1E	PCN 0		OTHER		PGTW
* 9	282316	24.9N 148.4E	PCN 5	T1.0/1.0 /D0.5/24HRS	DMSP39	UL 22.0N 147.9E	PGTW
10	290611	24.3N 148.4E	PCN 3		TIROSN	LLCU	PGTW
11	290900	24.3N 148.3E	PCN 0		OTHER		PGTW
12	290950	24.6N 148.2E	PCN 5		NOAA6	ULCC 23.6N 149.1E	PGTW
13	291600	24.7N 148.4E	PCN 0		OTHER		PGTW
14	292230	25.0N 149.5E	PCN 5		NOAA6		PGTW
15	300107	25.1N 149.6E	PCN 3	T2.5/2.5 /D1.5/25HRS	DMSP39		PGTW
16	300107	25.3N 149.9E	PCN 3	T4.0/4.0	DMSP39	INIT OBS	RODN
* 17	300300	25.7N 149.2E	PCN 0		OTHER		PGTW
18	300900	25.8N 149.5E	PCN 0		OTHER		PGTW
19	300928	25.6N 149.6E	PCN 5		NOAA6		PGTW
* 20	301600	25.7N 149.5E	PCN 0		OTHER		PGTW
21	302207	25.4N 148.8E	PCN 5	T3.5/3.5 /D1.0/21HRS	NOAA6		PGTW
22	310300	25.4N 149.9E	PCN 0		OTHER		PGTW
23	310906	25.0N 147.7E	PCN 3		NOAA6		PGTW
24	311600	24.5N 146.9E	PCN 0		OTHER		PGTW
25	312145	24.7N 146.6E	PCN 5		NOAA6		PGTW
26	010027	24.4N 146.2E	PCN 5	T4.0/4.0 /D0.5/26HRS	DMSP39		PGTW

27	010027	24.6N 145.9E	PCN 5	T4.0/4.0	DMSP39	INIT OBS	RODN
28	010300	24.3N 145.9E	PCN 0		OTHER		PGTW
29	010843	24.1N 145.3E	PCN 6		NOAA6		PGTW
30	011600	24.0N 145.2E	PCN 0		OTHER		PGTW
31	012304	23.8N 144.4E	PCN 5		NOAA6		PGTW
32	020008	23.7N 144.4E	PCN 5	T4.5/4.5 /D0.5/24HRS	DMSP39		PGTW
33	020300	23.4N 144.5E	PCN 0		OTHER		PGTW
34	021002	23.8N 144.3E	PCN 5		NOAA6		PGTW
* 35	021200	23.8N 144.1E	PCN 0		OTHER		PGTW
36	021600	24.3N 144.1E	PCN 0		OTHER		PGTW
37	022242	25.0N 144.5E	PCN 3		NOAA6	PSN BSD ON WELL DFND LLCC	PGTW
38	030129	25.4N 144.4E	PCN 3	T5.0/5.0-/D0.5/25HRS	DMSP39	PSBL EYE FRMNG	PGTW
39	030129	25.5N 144.5E	PCN 3	T4.5/4.5	DMSP39	INIT OBS	RODN
40	030300	25.9N 144.4E	PCN E		OTHER		PGTW
41	030940	26.3N 144.3E	PCN 3		NOAA6		PGTW
42	031600	27.3N 144.2E	PCN 0		OTHER		PGTW
43	032056	27.6N 144.2E	PCN 6		DMSP37		PGTW
44	032219	27.8N 144.6E	PCN 3		NOAA6		PGTW
45	040109	27.8N 144.6E	PCN 3	T5.0/5.0-	DMSP39	INIT OBS	RKSO
46	040109	28.0N 144.6E	PCN 3	T3.5/4.5 /W1.5/24HRS	DMSP39		PGTW
47	040300	28.3N 144.7E	PCN C		OTHER		PGTW
48	040900	29.1N 144.9E	PCN C		OTHER		PGTW
49	040917	29.0N 144.8E	PCN 3		NOAA6		PGTW
50	041600	29.5N 145.3E	PCN 0		OTHER		PGTW
51	042034	29.8N 146.2E	PCN 3	T3.5/4.0-/W1.5/19HRS	DMSP37		RKSO
52	042035	29.9N 146.0E	PCN 5		DMSP37		PGTW
53	042157	30.0N 146.2E	PCN 3		NOAA6		PGTW
54	050049	30.2N 146.3E	PCN 3		DMSP39		RKSO
55	050049	30.2N 146.6E	PCN 3	T3.5/3.5-/S0.0/24HRS	DMSP39		PGTW
56	050300	30.4N 146.8E	PCN C		OTHER		PGTW
57	050855	30.8N 147.4E	PCN 4		NOAA6		PGTW
58	050900	30.9N 147.7E	PCN C		OTHER		PGTW
59	051200	30.9N 147.7E	PCN E		OTHER		PGTW
60	051600	31.2N 148.3E	PCN C		OTHER		PGTW
61	052013	31.7N 149.0E	PCN 3	T3.5/3.5 /S0.0/24HRS	DMSP37		RKSO
62	052013	31.8N 148.9E	PCN 4		DMSP37		PGTW
63	052135	31.9N 149.1E	PCN 3		NOAA6		PGTW
64	060029	32.1N 149.3E	PCN 3	T4.0/4.0-/D0.5/24HRS	DMSP39		PGTW
65	060029	32.2N 149.4E	PCN 1	T4.0/4.0-	DMSP39	INIT OBS	RODN
66	060300	32.3N 149.6E	PCN E		OTHER		PGTW
67	060833	32.7N 150.6E	PCN 4		NOAA6		PGTW
68	060900	32.9N 150.9E	PCN C		OTHER		PGTW
69	061200	33.1N 151.5E	PCN E		OTHER		PGTW
70	061600	33.7N 152.6E	PCN C		OTHER		PGTW
71	061952	34.0N 153.3E	PCN 4		DMSP37		PGTW
72	070000	34.9N 154.4E	PCN C		OTHER		PGTW
73	070900	36.6N 155.2E	PCN C		OTHER		PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE DIAM	EYE ORIENTATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	290138	23.9N 148.6E	1500FT		1002	35 170 30	190 29 130 50	4 1				+21 +25 +25	1
2	292225	24.8N 149.3E	700MB	3015	994	35 250 60	230 36 120 15	3 4				+16 +14 +10	2
3	301004	25.3N 149.0E	700MB	2947	984		270 50 190 45	5 4				+11 +11 +11	4
4	301904	25.4N 148.6E	700MB	2910			230 53 140 30	5 5					5
5	302137	25.3N 148.6E	700MB	2906	926	25 310 120	040 45 330 30	5 7	CIRCULAR	30		+10	5
6	310602	25.2N 148.0E	700MB	2858		40 200 60	300 60 200 15	5 3					6
7	310838	25.1N 148.0E	700MB	2856	972	65 280 15	360 67 280 15	5 5	CIRCULAR	30		+14 +15 +12	6
8	311922	24.6N 147.3E	700MB	2852			210 56 140 88	4 3					7
9	312149	24.6N 146.8E	700MB	2862	971	50 340 30	070 60 360 30	5 3				+15 +17 +13	7
10	010640	24.1N 146.2E	700MB			70 230 20	320 64 230 15	8 2					8
11	010908	24.1N 145.8E	700MB		963	70 260 60	350 66 260 30	8 3				+14 +19 +14	8
12	011910	23.8N 144.9E	700MB	2853			280 50 200 60	10 2					9
13	012130	23.6N 144.7E	700MB	2835	967	50 360 40	100 60 360 25	2 2				+16 +18 +12	9
14	020747	24.0N 144.5E	700MB	2817		90 180 45	290 73 210 70	3 3					10
15	020915	24.1N 144.6E	700MB	2812	965		070 62 360 85	3 3				+15 +15 +11	10
16	021930	25.4N 144.4E	700MB	2782			270 62 100 60	5 3					11
17	022150	25.3N 144.1E	700MB	2771	962	45 040 160	360 48 280 50	10 4				+11 +15 +15	11
18	030609	26.2N 144.4E	700MB	2765		40 150 130	270 62 190 25	6 3					12
19	030850	26.4N 144.5E	700MB	2772	963	55 320 20	040 55 320 15	8 3				+14 +15 +14	12
20	031900	27.5N 144.3E	700MB	2809			310 52 240 25	2 2					13
21	032200	27.6N 144.5E	700MB	2824	969	50 310 100	020 51 310 100	2 2				+15 +12	13

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TYPHOON MARGE

BEST TRACK DATA

MO/DA/HR	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	DST	WIND
080712Z	14.3	159.1	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
080718Z	14.3	158.5	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
080800Z	14.2	158.0	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
080806Z	14.2	157.5	35	14.5	157.2	35.	25.	0.	14.6	155.8	45.	51.	5.	14.6	153.3	50.	325.	-55.	14.6	150.8	55.	693.	-55.
080812Z	14.1	157.0	35	14.3	156.8	40.	17.	5.	14.2	154.4	50.	146.	0.	14.4	151.9	50.	448.	-60.	14.8	149.5	55.	782.	-45.
080818Z	14.2	156.5	35	14.2	156.3	40.	12.	5.	14.4	153.9	50.	189.	-10.	14.7	151.6	50.	519.	-60.	14.9	149.2	55.	837.	-45.
080900Z	14.6	156.1	40	14.1	155.8	40.	35.	0.	14.3	153.4	50.	261.	-25.	14.6	150.8	55.	624.	-55.	15.0	148.0	65.	904.	-30.
080906Z	15.4	156.1	40	14.7	155.7	45.	48.	5.	15.1	153.4	55.	295.	-50.	15.4	150.6	60.	654.	-50.	15.8	147.0	70.	901.	-25.
080912Z	16.3	155.7	50	16.2	155.0	45.	8.	-5.	18.2	154.8	55.	186.	-55.	20.0	153.3	60.	412.	-40.	21.8	151.8	70.	526.	-25.
080918Z	17.3	155.2	60	16.7	155.6	45.	43.	-15.	18.7	154.3	55.	244.	-55.	20.6	152.8	60.	443.	-40.	22.3	151.2	70.	542.	-20.
081000Z	18.4	155.0	75	18.5	154.9	65.	8.	-10.	22.8	154.2	85.	102.	-25.	25.9	154.5	85.	159.	-10.	28.2	155.3	70.	172.	-15.
081006Z	19.8	155.0	105	19.9	155.0	70.	6.	-35.	25.0	155.4	90.	21.	-20.	28.6	157.2	80.	70.	-15.	30.9	159.8	70.	181.	-10.
081012Z	21.3	155.0	110	21.3	155.0	110.	0.	0.	26.7	155.5	120.	20.	20.	30.1	157.6	85.	90.	-10.	32.0	160.6	65.	203.	-15.
081018Z	22.7	155.2	110	22.7	155.3	110.	6.	0.	27.2	156.3	110.	32.	10.	30.6	158.7	80.	140.	-10.	32.5	161.0	60.	232.	-15.
081100Z	24.1	155.4	110	24.0	155.5	110.	8.	0.	28.2	156.7	100.	48.	5.	31.2	158.0	70.	98.	-15.	34.2	159.2	50.	98.	-20.
081106Z	25.3	155.6	110	25.4	155.6	110.	6.	0.	30.5	156.8	90.	106.	-5.	33.5	157.8	65.	146.	-15.	0.0	0.0	0.	-0.	0.
081112Z	26.5	155.8	100	26.7	155.7	100.	13.	0.	31.3	156.3	80.	92.	-15.	34.7	157.9	60.	179.	-20.	0.0	0.0	0.	-0.	0.
081118Z	27.5	155.8	100	27.8	155.9	95.	19.	-5.	31.9	156.7	75.	102.	-15.	35.0	158.2	55.	169.	-20.	0.0	0.0	0.	-0.	0.
081200Z	28.3	155.8	95	28.7	156.1	95.	29.	0.	32.1	156.7	70.	72.	-15.	35.3	158.5	50.	155.	-20.	0.0	0.0	0.	-0.	0.
081206Z	28.9	155.9	95	29.0	155.4	95.	27.	0.	31.7	156.3	85.	18.	5.	34.1	157.3	70.	135.	5.	0.0	0.0	0.	-0.	0.
081212Z	29.8	155.9	95	29.8	156.1	95.	10.	0.	32.7	156.6	75.	48.	-5.	35.9	158.6	60.	202.	0.	0.0	0.0	0.	-0.	0.
081218Z	30.3	156.0	90	30.6	156.2	80.	21.	-10.	33.5	156.8	50.	74.	-25.	36.7	159.6	45.	240.	-15.	0.0	0.0	0.	-0.	0.
081300Z	31.0	156.1	85	31.1	155.9	80.	12.	-5.	33.7	156.4	50.	116.	-20.	36.2	158.2	40.	306.	-15.	0.0	0.0	0.	-0.	0.
081306Z	31.4	156.3	80	31.8	156.1	75.	26.	-5.	34.7	156.9	50.	172.	-15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081312Z	31.9	156.6	80	32.1	156.3	70.	19.	-10.	34.7	157.4	50.	198.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081318Z	32.3	157.2	75	32.7	156.7	65.	35.	-10.	34.7	158.2	45.	215.	-15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081400Z	32.7	158.4	70	32.8	157.9	65.	31.	-5.	34.0	162.3	45.	67.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081406Z	32.9	159.6	65	32.9	159.3	65.	15.	0.	34.1	165.2	45.	18.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081412Z	33.1	160.9	60	33.2	160.8	60.	0.	0.	34.2	168.7	40.	60.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081418Z	33.3	162.2	60	33.4	162.2	55.	6.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081500Z	33.5	163.5	55	33.4	163.0	50.	26.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081506Z	33.8	165.2	55	33.7	164.3	50.	45.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081512Z	34.4	167.5	50	34.0	166.7	50.	46.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
081518Z	35.3	170.8	45	35.3	170.8	45.	0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS WRNG	24-HR	48-HR	72-HR	TYPHOONS WHILE OVER 35 KTS WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	20.	114.	276.	506.	20.	114.	276.	506.
AVG RIGHT ANGLE ERROR	11.	58.	180.	371.	11.	58.	180.	371.
AVG INTENSITY MAGNITUDE ERROR	5.	18.	27.	27.	5.	18.	27.	27.
AVG INTENSITY BIAS	-4.	-14.	-26.	-27.	0.	-14.	-26.	-27.
NUMBER OF FORECASTS	31	26	20	12	31	26	20	12

DISTANCE TRAVELED BY STORM IS 1980. NM

AVERAGE SPEED OF STORM IS 10. KNOTS

TYPHOON MARGE
FIX POSITIONS FOR CYCLONE NO. 13

SATELLITE FIXES

	FIX NO.	TIME (Z)	FIX POSITION		ACCRY	DVORAK CODE	SATELLITE	COMMENTS	SITE
*	1	060833	16.2N	161.6E	PCN 6		NOAA6		PGTW
	2	072100	14.2N	158.0E	PCN 0		OTHER		PGTW
	3	072350	14.0N	157.9E	PCN 5	T0.5/0.5	DMSP39	INIT OBS	PGTW
	4	080929	13.8N	157.0E	PCN 6		NOAA6		PGTW
	5	081600	13.8N	156.4E	PCN 0		OTHER		PGTW
	6	081701	13.7N	156.3E	PCN 6		TIROSN		PGTW
	7	082100	13.8N	156.2E	PCN 0		OTHER		PGTW
	8	082209	13.8N	156.1E	PCN 5		NOAA6		PGTW
	9	082330	13.9N	156.0E	PCN 6	T2.5/2.5 /D2.0/24HRS	DMSP39		PGTW
	10	090300	14.6N	155.9E	PCN 0		OTHER		PGTW
	11	090907	16.1N	155.9E	PCN 6		NOAA6		PGTW
	12	091600	16.7N	155.3E	PCN 0		OTHER		PGTW
	13	092147	18.1N	154.8E	PCN 5	T3.5/3.5 /D1.0/22HRS	NOAA6		PGTW
	14	100300	19.3N	155.3E	PCN E		OTHER		PGTW
	15	100845	20.9N	154.9E	PCN 2		NOAA6		PGTW
	16	101600	22.4N	156.2E	PCN E		OTHER		PGTW
	17	102008	23.4N	155.1E	PCN 2		DMSP37		PGTW
	18	102100	23.4N	155.4E	PCN E		OTHER		PGTW
	19	102124	23.3N	155.4E	PCN 1	T5.5/5.5 /D2.0/24HRS	NOAA6		PGTW
	20	110822	25.9N	155.6E	PCN 2		NOAA6		PGTW
	21	110900	26.1N	155.9E	PCN E		OTHER		PGTW
	22	111600	27.4N	156.0E	PCN E		OTHER		PGTW
	23	111947	27.8N	155.9E	PCN 4	T5.5/5.5-/S0.0/22HRS	DMSP37		PGTW
	24	112100	28.0N	156.2E	PCN C		OTHER		PGTW
	25	112102	27.8N	156.0E	PCN 3		NOAA6		PGTW
	26	120511	28.8N	155.8E	PCN 1		TIROSN		PGTW
	27	120900	29.5N	156.1E	PCN E		OTHER		PGTW
	28	120941	29.5N	156.0E	PCN 1		NOAA6		PGTW
	29	121200	29.8N	156.0E	PCN C		OTHER		PGTW
	30	121800	30.4N	156.1E	PCN C		OTHER		PGTW
	31	121926	30.5N	155.7E	PCN 3	T4.5/5.5-/W1.0/24HRS	DMSP39		PGTW
	32	122100	30.8N	156.0E	PCN C		OTHER		PGTW
	33	122221	30.8N	156.0E	PCN 3		NOAA6		PGTW
	34	130000	31.0N	156.2E	PCN C		OTHER		PGTW
	35	130300	31.3N	156.2E	PCN C		OTHER		PGTW
	36	130919	31.7N	156.4E	PCN 3		NOAA6		PGTW
	37	131600	32.4N	156.7E	PCN 0		OTHER		PGTW
	38	132100	32.7N	158.0E	PCN 0		OTHER		PGTW
	39	132158	32.5N	157.7E	PCN 3	T3.5/4.5-/W1.0/26HRS	NOAA6		PGTW
	40	140448	32.9N	159.1E	PCN 3		TIROSN		PGTW

41	140857	33.1N 160.1E	PCN 3		NOAA6	PGTW
42	141600	33.3N 161.7E	PCN 0		OTHER	PGTW
43	142100	33.3N 162.2E	PCN 0		OTHER	PGTW
44	150300	33.8N 163.6E	PCN 0	T3.5/3.5-/S0.0/29HRS	OTHER	PGTW
45	150600	34.0N 164.4E	PCN 0		OTHER	PGTW
46	150834	33.9N 165.8E	PCN 6		NOAA6	PGTW
47	151600	35.2N 169.9E	PCN 0		OTHER	PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE DIAM	ORIENTATION	EYE TEMP (C) OUT/	IN/	DP/	SST	MSN NO.
1	080533	14.3N 157.6E	1500FT		998	35 040 50	190 45 070 40	5 1					+26		28	1
2	090035	14.7N 156.2E	700MB	3025	992	35 250 24	360 24 250 24	7 3	CIRCULAR	22		+10	+15	+12		2
3	090615	15.5N 156.1E	700MB	3015		40 030 15	320 35 230 15	6 4								3
4	090839	15.8N 156.0E	700MB	3019	990	40 100 90	160 57 090 15	5 2	CIRCULAR	15		+11	+15	+11		3
5	091902	17.5N 154.9E	700MB	2869			270 64 220 45	10 3								4
6	092215	18.2N 155.1E	700MB	2841			120 77 360 25	5 2	CIRCULAR	20		+ 9	+18	+13		4
7	100642	20.1N 155.1E	700MB	2666		106 180 5	300 80 180 10	5 1								5
8	100835	20.7N 155.0E	700MB	2624	944	120 050 10	150 114 010 15	5 1	CIRCULAR	15		+12	+23	+ 8		5
9	110437	25.1N 155.6E	700MB	2637	946	110 290 5	290 110 250 10	5 1	CIRCULAR	12		+16	+17	+15		7

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TROPICAL DEPRESSION 14

BEST TRACK DATA

	BEST TRACK			WARNING			ERRORS		24 HOUR FORECAST			ERRORS		48 HOUR FORECAST			ERRORS		72 HOUR FORECAST			
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST WIND
081418Z	14.6	125.3	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0. 0.
081500Z	15.3	123.4	20	15.5	123.8	30.	26.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0. 0.
081506Z	16.0	121.6	15	16.5	125.5	30.	226.	15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0. 0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	126.	0.	0.	0.	0.	0.	0.	0.
AVG RIGHT ANGLE ERROR	67.	0.	0.	0.	0.	0.	0.	0.
AVG INTENSITY MAGNITUDE ERROR	13.	0.	0.	0.	0.	0.	0.	0.
AVG INTENSITY BIAS	13.	0.	0.	0.	0.	0.	0.	0.
NUMBER OF FORECASTS	2	0	0	0	0	0	0	0

DISTANCE TRAVELED BY STORM IS 229. NM

AVERAGE SPEED OF STORM IS 19. KNOTS

TROPICAL DEPRESSION TD-14
FIX POSITIONS FOR CYCLONE NO. 14

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	SATELLITE	COMMENTS	SITE
* 1	122221	8.1N 137.5E	PCN 5	T0.0/0.0	NOAA6	INIT OBS	PGTW
2	141600	13.8N 126.8E	PCN 0		OTHER		PGTW
3	141800	14.4N 125.4E	PCN 0		OTHER	BSD ON UL FLOW	PGTW
4	142100	14.9N 124.4E	PCN 0		OTHER	PSN BSD ON CONTINUITY	PGTW
5	142206	15.4N 124.3E	PCN 5		DMSP37	PSN BSD ON UL FEATURES	PGTW
6	142317	15.9N 123.4E	PCN 5	T2.0/2.0	NOAA6	INIT OBS	PGTW
7	150300	16.0N 122.7E	PCN 0		OTHER		PGTW
* 8	150900	16.0N 121.8E	PCN 0		OTHER		PGTW
9	151157	16.8N 121.9E	PCN 5		NOAA6		RODN
10	151600	17.3N 120.8E	PCN 0		OTHER	CONTINUITY FROM KADENA	PGTW
11	151904	17.6N 120.9E	PCN 6		TIROSN	POOR LONGITUDINAL PSN	RPMK
12	151904	17.6N 120.0E	PCN 5		TIROSN	LLCC PSN AT 15.1N 128.7E	PGTW
13	152100	18.6N 119.4E	PCN 0		OTHER	PSN BSD ON ULCC AND CONTINUITY	PGTW
* 14	152100	14.6N 126.1E	PCN 0		OTHER	PSN BSD ON LLCC	PGTW
15	160000	18.8N 118.4E	PCN 0		OTHER	PSN BSD ON CONTINUITY	PGTW
16	160036	19.7N 120.2E	PCN 5	T1.5/1.5	NOAA6	INIT OBS	RODN
17	160300	19.9N 119.1E	PCN 0		OTHER		PGTW
18	160749	20.1N 116.2E	PCN 5	T1.0/1.0	TIROSN	INIT OBS	RPMK
19	160900	19.8N 117.0E	PCN 0		OTHER		PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE ORIEN- DIAM/TATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	150442	16.2N 127.1E	1500FT		1004	20 240 40	290 19 240 40	8 5			+24 +25 +24 27	2

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TYPHOON NORRIS

BEST TRACK DATA

	BEST TRACK			WARNING					24 HOUR FORECAST					48 HOUR FORECAST					72 HOUR FORECAST				
							ERRORS					ERRORS					ERRORS						
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
082300Z	15.2	143.6	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082306Z	15.8	142.2	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082312Z	16.1	140.7	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082318Z	16.4	139.4	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082400Z	16.8	138.3	30	16.8	138.3	30.	0.	0.	18.3	133.5	40.	74.	5.	19.7	128.6	50.	74.	0.	21.8	124.5	60.	81.	-20.
082406Z	17.2	137.4	30	17.1	137.2	30.	13.	0.	18.7	132.2	45.	74.	10.	20.5	127.9	55.	41.	0.	22.9	124.1	65.	37.	-20.
082412Z	17.5	136.6	30	17.2	134.9	30.	99.	0.	18.3	133.0	45.	78.	5.	19.8	129.2	55.	147.	-5.	21.8	125.7	65.	218.	-25.
082418Z	17.9	135.7	30	18.1	135.3	30.	26.	0.	20.1	131.6	45.	38.	0.	22.4	128.2	55.	111.	-15.	25.3	125.3	65.	217.	5.
082500Z	18.2	134.8	35	19.1	134.8	30.	54.	-5.	22.0	131.8	45.	155.	-5.	24.2	127.9	60.	177.	-20.	26.8	124.6	65.	226.	10.
082506Z	18.7	133.5	35	18.8	133.5	35.	6.	0.	20.2	129.2	50.	45.	-5.	24.8	125.3	60.	109.	-25.	26.3	123.1	65.	169.	20.
082512Z	19.3	132.1	40	19.2	132.3	40.	13.	0.	20.6	128.3	50.	77.	-10.	23.3	125.0	60.	134.	-30.	26.5	122.9	65.	226.	30.
082518Z	19.8	131.0	45	19.7	131.0	40.	6.	-5.	21.9	126.2	55.	24.	-15.	25.6	123.5	65.	131.	5.	29.4	122.2	65.	303.	45.
082600Z	20.2	129.8	50	19.9	129.6	45.	21.	-5.	22.4	124.8	65.	42.	-15.	25.8	122.5	70.	99.	15.	29.0	124.5	60.	434.	45.
082606Z	20.7	128.6	55	20.8	128.5	55.	6.	0.	23.2	124.2	65.	24.	0.	26.8	122.3	75.	137.	30.	0.0	0.0	0.	-0.	0.
082612Z	21.5	127.3	60	21.2	127.3	60.	18.	0.	24.0	123.2	80.	28.	-10.	27.7	122.6	70.	229.	35.	0.0	0.0	0.	-0.	0.
082618Z	22.3	126.2	70	22.3	126.1	65.	6.	-5.	26.3	123.0	85.	138.	25.	29.8	124.6	70.	424.	50.	0.0	0.0	0.	-0.	0.
082700Z	23.1	124.9	80	23.4	125.0	75.	19.	-5.	28.0	123.3	85.	220.	30.	31.5	126.5	70.	564.	55.	0.0	0.0	0.	-0.	0.
082706Z	23.5	123.9	85	23.9	123.7	85.	21.	0.	27.8	121.9	85.	157.	40.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082712Z	24.3	122.8	90	24.6	123.0	85.	21.	-5.	28.2	122.1	85.	220.	50.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082718Z	24.5	121.4	60	24.8	122.0	80.	37.	20.	28.2	120.4	60.	186.	40.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082800Z	25.0	120.9	55	25.5	120.3	55.	44.	0.	28.6	119.5	30.	164.	15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082806Z	25.8	120.0	45	25.7	120.3	55.	17.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082812Z	26.1	118.7	35	26.8	118.8	40.	42.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082818Z	26.6	117.4	20	27.4	117.0	30.	52.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
082900Z	27.6	116.6	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	26.	103.	183.	212.	22.	93.	126.	168.
AVG RIGHT ANGLE ERROR	19.	78.	134.	144.	17.	69.	84.	102.
AVG INTENSITY MAGNITUDE ERROR	4.	16.	22.	24.	4.	15.	16.	19.
AVG INTENSITY BIAS	1.	9.	7.	10.	0.	7.	-1.	0.
NUMBER OF FORECASTS	20	17	13	9	15	15	11	7

DISTANCE TRAVELED BY STORM IS 1710. NM

AVERAGE SPEED OF STORM IS 12. KNOTS

TYPHOON NORRIS
FIX POSITIONS FOR CYCLONE NO. 15

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	SATELLITE	COMMENTS	SITE
1	222200	15.6N 144.4E	PCN 5	T0.0/0.0	NOAA6	INIT OBS	PGTW
2	230300	15.4N 143.1E	PCN 0		OTHER		PGTW
3	230900	16.1N 141.2E	PCN 0		OTHER		PGTW
4	231039	16.5N 140.9E	PCN 5		NOAA6		PGTW
5	231200	16.5N 140.9E	PCN 0		OTHER		PGTW
6	232100	16.5N 139.2E	PCN 0		OTHER		PGTW
7	232319	16.7N 138.5E	PCN 5	T1.0/1.0 /D1.0/25HRS	NOAA6		PGTW
8	240300	16.8N 138.1E	PCN 0		OTHER		PGTW
9	240617	17.1N 137.7E	PCN 5		TIROSN		PGTW
10	240900	17.3N 137.0E	PCN 0		OTHER		PGTW
11	241017	17.1N 137.0E	PCN 5		NOAA6		PGTW
12	241902	18.3N 135.7E	PCN 5		TIROSN		PGTW
13	241902	18.9N 135.9E	PCN 5		TIROSN		RPMK
14	242100	18.4N 135.3E	PCN 0		OTHER		PGTW
15	242257	18.3N 135.1E	PCN 5	T2.5/2.5 /D1.5/24HRS	NOAA6		PGTW
16	250600	19.0N 133.5E	PCN 5	T3.0/3.0	TIROSN	INIT OBS	RODN
17	250606	19.0N 133.5E	PCN 3		TIROSN		PGTW
18	250900	19.2N 132.9E	PCN 0		OTHER		PGTW
19	250955	19.2N 132.8E	PCN 5		NOAA6		PGTW
20	251600	19.5N 131.2E	PCN 0		OTHER		PGTW
21	252100	20.1N 130.2E	PCN 0		OTHER		PGTW
22	252124	19.6N 130.2E	PCN 6	T4.0/4.0	DMSP37	INIT OBS	RPMK
23	252134	19.9N 130.0E	PCN 6		DMSP37		PGTW
24	252234	19.6N 130.0E	PCN 5	T3.5/3.5 /D1.0/24HRS	NOAA6		PGTW
25	260100	20.2N 129.7E	PCN 0		OTHER		PGTW
26	260554	20.4N 128.5E	PCN 3		TIROSN		PGTW
27	260554	20.5N 128.8E	PCN 5	T4.0/4.0 /D1.0/24HRS	TIROSN	INIT OBS	RODN
28	260900	20.7N 128.0E	PCN 0		OTHER		PGTW
29	261114	21.1N 127.6E	PCN 5		NOAA6		PGTW
30	261114	21.8N 128.0E	PCN 6		NOAA6		RPMK
31	261114	21.3N 127.9E	PCN 5		NOAA6		RODN
32	262100	23.0N 125.7E	PCN 0		OTHER		PGTW
33	262353	23.2N 125.0E	PCN 1	T4.5/4.5 /D1.0/25HRS	NOAA6		PGTW
34	270724	23.5N 123.6E	PCN 1	T4.0/4.0	TIROSN	INIT OBS	RKSO
35	270900	24.0N 123.3E	PCN E		OTHER		PGTW
36	271051	24.3N 123.1E	PCN 2		NOAA6		PGTW
37	271200	24.5N 122.9E	PCN E		OTHER		PGTW
38	271600	24.8N 122.0E	PCN 0		OTHER		PGTW
39	272010	24.4N 120.7E	PCN 3		TIROSN		RKSO
40	272010	24.3N 121.0E	PCN 3		TIROSN		RODN
41	272339	24.9N 121.0E	PCN 3	T3.5/3.5 /W1.0/24HRS	NOAA6		PGTW
42	280300	25.6N 120.5E	PCN 0		OTHER		PGTW
43	280713	25.6N 118.6E	PCN 3	T3.5/3.5-	TIROSN	INIT OBS	RPMK
44	280713	24.7N 118.8E	PCN 5	T3.0/3.0-	TIROSN	INIT OBS	RODN
45	280900	26.1N 118.4E	PCN 0		OTHER		PGTW
46	281029	25.4N 117.9E	PCN 5		NOAA6	FIX BSD ON UL FEATURES	PGTW
47	281200	26.1N 117.2E	PCN 0		OTHER		PGTW
48	281600	26.7N 116.9E	PCN 0		OTHER		PGTW
49	282100	26.4N 115.8E	PCN 0		OTHER		PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE ORIEN- DIAM/TATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	240100	16.9N 132.1E	1500FT		1005	35 030 10	090 25 030 15	6 5			+25 +26 +26 28	1
2	241215	17.8N 136.4E	700MB	3131			130 30 130 60	2 3				2
3	241520	18.3N 135.8E	700MB	3115	1002		270 25 210 120	5 5			+12 +12 + 8	2
4	250008	18.2N 134.7E	700MB	3064		35 360 30	230 18 050 20	5 5				3
5	250307	18.6N 133.9E	700MB	3034		35 350 23	240 34 160 15	8 10			+11 +13 +12	3
6	260424	20.6N 128.9E	700MB	2962	983	35 240 35	290 42 240 35	5 5			+11 +16 +12	6
7	261228	21.6N 127.1E	700MB	2898			220 70 140 40	2 4				7
8	261445	21.8N 126.8E	700MB	2873	973		050 55 300 50	2 3			+12 +17 +10	7
9	262030	22.6N 125.7E	700MB	2796								8
10	262100	22.9N 125.5E	700MB	2790	962		330 42 240 17	4 3			+13 +18 +11	8
11	270008	23.1N 124.8E	700MB	2764		55 310 45	030 72 310 20	4 2				8
12	270250	23.4N 124.2E	700MB	2714	954	65 010 33	140 94 070 30	4 3			+16 +18 +15	8

RADAR FIXES

FIX NO.	TIME (Z)	FIX POSITION	RADAR	ACCRY	EYE SHAPE	EYE DIAM	RADOB-CODE ASWAR TDDFF	COMMENTS	RADAR POSITION	SITE WMO NO.
1	262100	22.6N 125.6E	LAND				55//5 53011		24.3N 124.2E	47918
2	262100	22.7N 125.5E	LAND				22913 53114		24.8N 125.3E	47927
3	270000	23.1N 124.9E	LAND				55//4 73118		24.3N 124.2E	47918
4	270100	23.3N 124.7E	LAND				55//4 73116		24.3N 124.2E	47918
5	270100	23.4N 124.6E	LAND				51913		24.8N 125.3E	47927
6	270200	23.3N 124.5E	LAND				50913 73014		24.3N 124.2E	47918
7	270200	23.4N 124.5E	LAND				11914 53012		24.8N 125.3E	47927
8	270300	23.3N 124.2E	LAND				51913 72914		24.3N 124.2E	47918
9	270300	23.4N 124.2E	LAND				11813 52714		24.8N 125.3E	47927
10	270400	23.5N 124.1E	LAND				50813 72912		24.3N 124.2E	47918
11	270400	23.5N 123.9E	LAND				21914 52816		24.8N 125.3E	47927
12	270500	23.5N 123.9E	LAND				55//3 72911		24.3N 124.2E	47918
13	270500	23.4N 123.8E	LAND				21843 52611		24.8N 125.3E	47927
14	270500	23.5N 123.8E	LAND				5//// /2714		24.0N 121.6E	46699
15	270500	23.5N 123.7E	LAND				5//// /2612	RCKK		
16	270600	23.6N 123.7E	LAND				///// /3106		24.0N 121.6E	46699
17	270700	23.6N 123.6E	LAND				10812 52907		24.0N 121.6E	46699
18	270700	23.6N 123.6E	LAND				55//3 73009		24.3N 124.2E	47918
19	270700	23.5N 123.6E	LAND				12814 53205		24.8N 125.3E	47927
20	270800	23.6N 123.6E	LAND				12814 53205		24.8N 125.3E	47927
21	270800	23.7N 123.5E	LAND				5//// /3506		24.0N 121.6E	46699
22	270800	23.6N 123.5E	LAND				50913 72908		24.3N 124.2E	47918
23	270900	23.8N 123.4E	LAND				50913 73210		24.3N 124.2E	47918
24	270900	23.8N 123.4E	LAND				11973 53114		24.8N 125.3E	47927
25	271000	23.9N 123.3E	LAND				5//// /3506		24.0N 121.6E	46699
26	271000	23.8N 123.4E	LAND				5//// /3506		24.0N 121.6E	46699
27	271000	23.9N 123.3E	LAND				50912 73207		24.3N 124.2E	47918
28	271000	23.9N 123.3E	LAND				10622 53308		24.8N 125.3E	47927
29	271100	24.1N 123.2E	LAND				10812 73312		24.3N 124.2E	47918
30	271100	24.1N 123.1E	LAND				12832 53216		24.8N 125.3E	47927
31	271100	24.1N 123.0E	LAND				5//// /3113		24.0N 121.6E	46699
32	271200	24.2N 122.8E	LAND				21932 53019		24.8N 125.3E	47927
33	271200	24.3N 122.9E	LAND				45//2 73214		24.3N 124.2E	47918
34	271300	24.3N 122.5E	LAND				21842 52916		24.8N 125.3E	47927
35	271300	24.4N 122.5E	LAND				45//3 73010		24.3N 124.2E	47918
36	271400	24.5N 122.4E	LAND				55//3 73016		24.3N 124.2E	47918
37	271500	24.6N 122.0E	LAND				55//3 73016		24.3N 124.2E	47918
38	271500	24.5N 122.0E	LAND				7///3 52919		24.3N 124.2E	47918
39	271600	24.5N 121.8E	LAND				55//3 72814		24.3N 124.2E	47918
40	271700	24.5N 121.5E	LAND				65//2 72718		24.3N 124.2E	47918
41	271800	24.5N 121.3E	LAND				65//2 72612		24.3N 124.2E	47918

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TROPICAL DEPRESSION 16

BEST TRACK DATA

	BEST TRACK			WARNING					24 HOUR FORECAST					48 HOUR FORECAST					72 HOUR FORECAST				
							ERRORS					ERRORS					ERRORS						
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
090118Z	4.9	150.8	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090200Z	5.5	150.1	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090206Z	6.2	149.8	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090212Z	6.9	149.1	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090218Z	7.5	148.5	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090300Z	7.8	148.0	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090306Z	7.9	147.5	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090312Z	8.2	147.2	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090318Z	8.4	147.1	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090400Z	8.9	146.9	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090406Z	9.4	146.5	25	9.2	146.5	25.	12.	0.	10.4	144.7	50.	241.	35.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090412Z	9.6	145.5	25	9.5	146.2	30.	42.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090418Z	10.3	144.0	25	10.0	145.5	30.	90.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090500Z	11.6	142.6	20	10.7	143.2	30.	64.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090506Z	13.6	142.2	15	11.2	141.9	30.	144.	15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	70.	241.	0.	0.	0.	0.	0.	0.
AVG RIGHT ANGLE ERROR	20.	28.	0.	0.	0.	0.	0.	0.
AVG INTENSITY MAGNITUDE ERROR	7.	35.	0.	0.	0.	0.	0.	0.
AVG INTENSITY BIAS	7.	35.	0.	0.	0.	0.	0.	0.
NUMBER OF FORECASTS	5	1	0	0	0	0	0	0

DISTANCE TRAVELED BY STORM IS 776. NM

AVERAGE SPEED OF STORM IS 9. KNOTS

TROPICAL DEPRESSION TD-16
FIX POSITIONS FOR CYCLONE NO. 16

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	SATELLITE	COMMENTS	SITE
1	012139	5.3N 150.3E	PCN 5	T0.5/0.5	NOAA6	INIT OBS	PGTW
2	020300	5.8N 149.6E	PCN 0		OTHER		PGTW
3	021010	6.4N 149.4E	PCN 5		NOAA6		PGTW
4	022025	7.8N 148.5E	PCN 5		DMSP37		PGTW
5	022216	7.9N 148.5E	PCN 6	T1.5/1.5 /D1.0/24HRS	NOAA6		PGTW
6	030000	7.9N 147.5E	PCN 0		OTHER		PGTW
7	030604	8.0N 147.0E	PCN 5		TIROSN		PGTW
8	030956	8.6N 147.3E	PCN 5		NOAA6		PGTW
9	032235	8.8N 148.0E	PCN 5	T2.0/2.0 /D0.5/24HRS	NOAA6	UL 10.2N 145.0E	PGTW
10	040300	9.5N 147.3E	PCN 0		OTHER		PGTW
11	040900	9.6N 146.6E	PCN 0		OTHER		PGTW
12	040934	9.5N 146.5E	PCN 5		NOAA6		PGTW
13	041200	9.6N 146.1E	PCN 0		OTHER		PGTW
14	041837	10.3N 144.3E	PCN 6		TIROSN		PGTW
15	041837	10.2N 144.6E	PCN 6		TIROSN		RPMK
16	042100	10.3N 143.6E	PCN 0		OTHER		PGTW
17	042213	10.2N 143.6E	PCN 5	T2.5/2.5 /D0.5/24HRS	NOAA6		PGTW
18	050911	12.2N 142.6E	PCN 5		NOAA6		PGTW
19	051600	14.2N 142.7E	PCN 0		OTHER		PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE DIAM/ORIENTATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	040155	8.9N 146.8E	1500FT		1002	25 030 30	330 25 300 50	5 10			+22 +22 +22 29	3
2	041451	10.0N 144.7E	700MB	3122	1010		050 17 030 80	5 15			+10 +10 +10	4
3	050844	12.1N 142.5E	700MB	3088	1001	25 330 135	040 18 330 135	5 5			+12 +10	5

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TYPHOON ORCHID

BEST TRACK DATA

MO/DA/HR	BEST TRACK POSIT		BEST TRACK WIND	WARNING POSIT		WARNING WIND	WARNING ERRORS DST	WARNING ERRORS WIND	24 HOUR FORECAST POSIT		24 HR WIND	24 HR ERRORS DST	24 HR ERRORS WIND	48 HOUR FORECAST POSIT		48 HR WIND	48 HR ERRORS DST	48 HR ERRORS WIND	72 HOUR FORECAST POSIT		72 HR WIND	72 HR ERRORS DST	72 HR ERRORS WIND
090600Z	14.7	145.2	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090606Z	15.2	145.1	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090612Z	16.1	144.8	35	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090618Z	17.1	143.9	40	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
090700Z	18.0	142.8	45	18.0	142.8	40.	0.	-5.	21.2	138.5	65.	60.	5.	23.8	135.3	75.	77.	10.	26.9	133.7	80.	172.	5.
090706Z	18.7	141.9	50	19.4	142.0	45.	42.	-5.	23.2	138.1	70.	147.	10.	26.8	136.4	80.	266.	10.	29.3	135.5	75.	279.	-5.
090712Z	19.3	140.8	55	19.8	140.7	55.	30.	0.	23.5	136.7	80.	114.	20.	26.7	134.5	85.	243.	10.	29.6	134.8	75.	231.	-5.
090718Z	19.7	139.7	55	19.4	138.6	55.	64.	0.	22.3	134.5	80.	56.	20.	25.9	132.8	85.	79.	10.	28.8	133.0	75.	174.	-10.
090800Z	20.2	138.6	60	19.9	137.0	55.	92.	-5.	22.7	132.7	75.	94.	10.	26.3	131.3	85.	78.	10.	29.6	132.0	75.	122.	10.
090806Z	20.8	137.5	60	20.7	137.5	60.	6.	0.	23.0	134.2	70.	67.	0.	26.1	132.2	80.	119.	0.	29.2	132.5	75.	308.	20.
090812Z	21.6	136.5	60	21.2	136.6	60.	25.	0.	23.8	133.5	80.	80.	5.	26.2	132.0	85.	112.	5.	29.5	133.7	75.	478.	35.
090818Z	22.2	135.5	60	22.4	135.3	60.	16.	0.	25.5	132.5	85.	59.	10.	28.8	132.9	80.	170.	-5.	32.1	137.4	70.	517.	40.
090900Z	22.8	134.4	65	22.9	134.6	60.	13.	-5.	26.2	132.2	80.	87.	5.	29.7	132.7	85.	137.	20.	0.0	0.0	0.	-0.	0.
090906Z	23.5	133.1	70	23.4	133.6	65.	28.	-5.	26.7	131.2	75.	57.	-5.	30.9	132.2	70.	205.	15.	0.0	0.0	0.	-0.	0.
090912Z	23.2	132.2	75	24.2	132.9	65.	71.	-10.	28.6	129.9	75.	71.	-5.	32.5	132.8	70.	287.	30.	0.0	0.0	0.	-0.	0.
090918Z	25.5	131.4	75	24.9	131.5	70.	36.	-5.	29.2	129.7	75.	76.	-10.	34.7	131.0	55.	330.	25.	0.0	0.0	0.	-0.	0.
091000Z	25.0	131.3	75	25.4	130.0	70.	74.	-5.	29.7	127.9	75.	185.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091006Z	27.5	130.6	80	27.2	131.2	75.	37.	-5.	34.2	132.6	65.	50.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091012Z	27.8	130.9	80	28.8	130.7	75.	61.	-5.	35.8	133.8	50.	112.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091018Z	30.4	130.2	85	30.0	130.5	80.	28.	-5.	37.8	136.2	50.	198.	20.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091100Z	31.4	130.9	65	31.2	130.3	60.	33.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091106Z	34.3	131.6	55	34.2	131.6	50.	6.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091112Z	37.3	132.4	40	37.3	132.7	45.	14.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091118Z	40.0	133.0	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS WRNG	24-HR	48-HR	72-HR	TYPHOONS WHILE OVER 35 KTS WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	36.	95.	175.	284.	36.	88.	161.	251.
AVG RIGHT ANGLE ERROR	22.	62.	98.	179.	22.	55.	103.	159.
AVG INTENSITY MAGNITUDE ERROR	4.	10.	13.	16.	4.	9.	11.	13.
AVG INTENSITY BIAS	-3.	7.	12.	11.	0.	6.	10.	7.
NUMBER OF FORECASTS	19	16	12	8	19	15	11	7

DISTANCE TRAVELED BY STORM IS 2043. NM

AVERAGE SPEED OF STORM IS 15. KNOTS

TYPHOON ORCHID
FIX POSITIONS FOR CYCLONE NO. 17

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	SATELLITE	COMMENTS	SITE
1	052151	14.6N 145.2E	PCN 5		NOAA6		PGTW
2	060300	14.8N 145.1E	PCN 0		OTHER		PGTW
3	060529	14.5N 145.2E	PCN 5	T1.5/1.5	TIROSN	INIT OBS	PGTW
4	060900	15.4N 145.0E	PCN 0		OTHER		PGTW
5	061030	15.7N 144.7E	PCN 5		NOAA6		PGTW
6	061200	16.0N 144.6E	PCN 0		OTHER		PGTW
7	062128	17.0N 143.9E	PCN 5	T2.5/2.5 /D1.0/24HRS	NOAA6		PGTW
8	070300	19.1N 142.7E	PCN 0		OTHER		PGTW
9	070900	19.4N 141.5E	PCN 0		OTHER		PGTW
10	071008	19.7N 141.3E	PCN 5		NOAA6		PGTW
11	071200	19.7N 141.0E	PCN 0		OTHER		PGTW
12	071600	20.3N 139.6E	PCN 0		OTHER		PGTW
13	071802	19.8N 138.4E	PCN 6		TIROSN		PGTW
14	072100	19.8N 138.2E	PCN 0		OTHER		PGTW
15	072247	19.9N 137.9E	PCN 5	T3.5/3.5 /D1.0/25HRS	NOAA6		PGTW
16	080300	20.1N 137.2E	PCN 0		OTHER		PGTW
17	080648	20.9N 137.3E	PCN 5		TIROSN		PGTW
18	080648	21.2N 136.9E	PCN 5	T4.0/4.0	TIROSN	INIT OBS	RPMK
19	080900	21.4N 136.8E	PCN 0		OTHER		PGTW
20	080945	21.2N 136.8E	PCN 5		NOAA6		PGTW
21	081200	21.8N 136.4E	PCN 0		OTHER		PGTW
22	081600	22.6N 135.2E	PCN 0		OTHER		PGTW
23	082100	22.6N 135.0E	PCN 0		OTHER		PGTW
24	082225	22.6N 134.7E	PCN 5	T4.0/4.0 /D0.5/24HRS	NOAA6		PGTW
25	082225	22.2N 134.7E	PCN 6	T4.0/4.0	NOAA6	INIT OBS	RODN
26	090300	23.3N 133.9E	PCN 0		OTHER		PGTW
27	090636	23.6N 132.7E	PCN 5	T3.0/4.0 /W1.0/24HRS	TIROSN		RPMK
28	090636	23.4N 132.8E	PCN 5		TIROSN		PGTW
29	090900	23.7N 132.3E	PCN 0		OTHER		PGTW
30	091104	23.4N 132.0E	PCN 5		NOAA6		PGTW
31	091200	23.6N 132.1E	PCN 0		OTHER		PGTW
32	091600	25.3N 132.0E	PCN 0		OTHER		PGTW
33	092119	25.3N 130.3E	PCN 6		DMSP37		PGTW
34	092344	24.7N 130.6E	PCN 5	T4.0/4.0 /S0.0/24HRS	NOAA6		PGTW
35	100300	25.8N 130.5E	PCN 0		OTHER		PGTW
36	100625	27.4N 130.0E	PCN 1	T4.0/4.0	TIROSN	INIT OBS	RKSO
37	100625	27.3N 130.7E	PCN 3		TIROSN		PGTW
38	100900	27.5N 130.4E	PCN 0		OTHER		PGTW
39	101200	27.3N 130.3E	PCN 0		OTHER		PGTW
40	102100	30.5N 129.8E	PCN 0		OTHER		PGTW
41	102321	31.3N 130.7E	PCN 3	T4.0/4.0-/S0.0/24HRS	NOAA6		PGTW
42	102321	30.9N 130.4E	PCN 5	T3.0/3.0	NOAA6	INIT OBS	RPMK
43	110613	34.4N 133.7E	PCN 3	T3.0/4.0 /W1.0/24HRS	TIROSN		RKSO
44	110613	34.4N 131.7E	PCN 5		TIROSN		PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE ORIEN- DIAM/TATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	070005	18.0N 142.7E	1500FT		992	45 060 45	160 46 080 28	3 1			+24 +26 +26 27	1
2	071300	18.9N 139.3E	700MB	3016			160 36 080 30	8 5			+12 +16 +11	2
3	080547	20.8N 137.5E	700MB	2928	900	40 340 20	220 37 140 90	3 10			+14 +14 +14	3
4	081335	21.8N 136.3E	700MB	2872			210 31 140 90	5 5				4
5	081452	21.9N 135.9E	700MB	2861	971		210 31 140 90	5 5			+15 +16 +12	4
6	090204	23.0N 134.1E	700MB	2870	974	35 140 210	220 37 140 140	5 5			+13 +14 +11	5
7	091210	23.1N 132.8E	700MB	2797			180 67 070 75	2 2				6
8	091505	24.3N 132.7E	700MB	2814	996		280 67 210 130	2 5			+11 +16 +16	6
9	091938	25.2N 130.7E	700MB	2724			090 55 360 5	10 2				7
10	092139	24.9N 130.2E	700MB	2743	964	60 060 45	080 55 080 40	5 10			+16 +17 +12	7
11	100040	25.2N 131.4E	700MB	2744		60 140 90	220 70 140 105	5 10				8
12	100253	26.4N 131.5E	700MB	2760	960	70 060 5	340 40 240 103	5 10	CIRCULAR	12	+15	8
13	101610	29.5N 130.5E	700MB	2789	965		160 88 060 190	2 2			+12 +17 +17	9

RADAR FIXES

FIX NO.	TIME (Z)	FIX POSITION	RADAR	ACCRY	EYE SHAPE	EYE DIAM	RADOB-CODE ASWAR TDDFF	COMMENTS	RADAR POSITION	SITE WMO NO.
1	100300	26.4N 131.4E	LAND						28.4N 129.5E	47909
2	100500	27.2N 130.8E	LAND						28.4N 129.5E	47909
3	100700	27.5N 130.8E	LAND						28.4N 129.5E	47909
4	100900	27.1N 129.9E	LAND						28.4N 129.5E	47909
5	101000	27.1N 130.3E	LAND						28.4N 129.5E	47909
6	101100	27.3N 130.6E	LAND						28.4N 129.5E	47909
7	101200	27.8N 130.9E	LAND						28.4N 129.5E	47909
8	101200	27.8N 130.9E	LAND				52963 50327		28.4N 129.5E	47909
9	101400	28.8N 131.3E	LAND				55943 53632		28.4N 129.5E	47909
10	101500	29.2N 130.8E	LAND				52883 53232		28.4N 129.5E	47909
11	101600	29.6N 130.6E	LAND				52813 53427		28.4N 129.5E	47909
12	101600	29.7N 130.5E	LAND				225/0 5////		30.6N 131.0E	47869
13	101700	30.0N 130.3E	LAND				52943 53432		28.4N 129.5E	47909
14	101800	30.3N 130.2E	LAND				226/0 5////		30.6N 131.0E	47869
15	101800	30.5N 130.2E	LAND				55943 53527		28.4N 129.5E	47890
16	101900	30.6N 130.1E	LAND				65/43 53313		28.4N 129.5E	47090
17	101900	30.5N 130.2E	LAND				5///0 53611		30.6N 131.0E	47869
18	102000	30.7N 130.1E	LAND				65/43 50208		28.4N 129.5E	47909
19	102000	30.7N 130.1E	LAND				3490/ 4////		33.4N 130.2E	47806
20	102100	30.8N 130.2E	LAND				34/// 40305		33.4N 130.2E	47806
21	102100	30.6N 130.2E	LAND				10370 50009		30.6N 131.0E	47869
22	102200	30.8N 130.3E	LAND				2008/ 40708		33.4N 130.2E	47806
23	102200	30.8N 130.4E	LAND				20310 50316		30.6N 131.0E	47869
24	102300	31.1N 130.7E	LAND				2014/ 40316		33.4N 130.2E	47806
25	102300	31.2N 130.8E	LAND				5///1 50432		30.6N 131.0E	47869
26	110000	31.6N 130.9E	LAND				5///1 53627		30.6N 131.0E	47869
27	110100	31.7N 131.0E	LAND				20/1/ 50419		33.4N 130.2E	47806
28	110100	31.8N 130.9E	LAND				6///1 53616		30.6N 131.0E	47869
29	110200	32.3N 131.0E	LAND				6//01 5////		34.3N 132.6E	47792
30	110200	32.1N 132.1E	LAND				20/1/ 50122		33.4N 130.2E	47806
31	110200	32.5N 131.2E	LAND				6//// 50241		30.6N 131.0E	47869
32	110300	32.7N 131.2E	LAND				55//1 50227		34.3N 132.6E	47792
33	110300	32.7N 131.1E	LAND				2011/ 53632		33.4N 130.2E	47806
34	110300	32.6N 131.1E	LAND				1060/ /////		33.3N 134.2E	47899
35	110400	33.2N 131.2E	LAND				55//1 53627		34.3N 132.6E	47792
36	110400	33.6N 131.1E	LAND				65/// 53649		33.4N 130.2E	47806
37	110400	33.0N 131.3E	LAND				3035/ 50324		33.3N 134.2E	47899
38	110500	33.7N 131.2E	LAND				55//1 53627		34.3N 132.6E	47792
39	110500	33.8N 131.3E	LAND				35/// 50419		33.4N 130.2E	47806
40	110600	34.4N 131.6E	LAND				55//2 5////		35.5N 133.1E	47791
41	110700	35.0N 131.5E	LAND				22401 36035		35.5N 133.1E	47971
42	110700	35.6N 131.1E	LAND				55//2 53522		34.3N 132.6E	47792
43	110700	34.8N 131.7E	LAND				30/// 50135		33.4N 130.2E	47806
44	110900	35.8N 131.7E	LAND				///// 36024		35.5N 133.1E	47791
45	110900	35.6N 131.3E	LAND				55//2 50130		34.3N 132.6E	47792
46	111000	35.4N 131.7E	LAND				65//1 01024		35.5N 133.1E	47791
47	111000	35.1N 131.2E	LAND				55//2 53630		34.3N 132.6E	47792
48	111000	35.4N 131.7E	LAND				6//// 53632		33.4N 130.2E	47806
49	111100	36.8N 132.1E	LAND				65/// 02035		35.5N 133.1E	47791
50	111200	37.3N 132.3E	LAND				65/// 03038		35.5N 133.1E	47791
51	111200	37.3N 132.3E	LAND				65/// 50338		35.5N 133.1E	47791

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TYPHOON RUTH

BEST TRACK DATA

	BEST TRACK			WARNING			ERRORS		24 HOUR FORECAST			ERRORS		48 HOUR FORECAST			ERRORS		72 HOUR FORECAST				
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
091300Z	19.0	113.9	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091306Z	18.6	113.8	30	18.8	113.8	30.	12.	0.	19.2	112.7	30.	26.	-10.	19.9	111.1	45.	124.	0.	21.4	109.5	50.	314.	20.
091312Z	18.3	113.7	30	18.2	113.6	30.	8.	0.	17.3	112.0	40.	126.	0.	17.1	110.0	50.	209.	-10.	0.0	0.0	0.	-0.	0.
091318Z	18.1	113.4	35	18.0	113.0	30.	23.	-5.	17.6	111.4	45.	124.	0.	17.7	109.5	50.	202.	-15.	0.0	0.0	0.	-0.	0.
091400Z	18.3	113.0	40	18.4	113.6	30.	35.	-10.	18.1	112.5	50.	175.	15.	18.0	110.3	55.	280.	0.	0.0	0.0	0.	-0.	0.
091406Z	18.8	112.5	40	18.4	113.3	40.	51.	0.	18.1	112.2	50.	212.	5.	17.8	111.0	55.	383.	25.	0.0	0.0	0.	-0.	0.
091412Z	19.4	111.8	40	19.3	112.3	40.	29.	0.	20.6	109.7	30.	114.	-30.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091418Z	19.6	110.8	45	20.2	110.7	40.	36.	-5.	21.5	106.0	20.	109.	-45.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091500Z	19.7	109.9	35	19.6	109.8	35.	8.	0.	19.9	106.5	45.	59.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091506Z	19.8	108.9	45	19.8	108.9	45.	0.	0.	20.3	105.0	0.	74.	-30.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091512Z	19.9	107.8	60	19.9	107.9	50.	6.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091518Z	19.8	106.7	65	20.2	106.2	50.	37.	-15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091600Z	19.6	105.5	55	19.4	105.5	55.	12.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091606Z	19.2	104.4	30	19.1	104.5	30.	8.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	20.	113.	241.	314.	24.	118.	206.	0.
AVG RIGHT ANGLE ERROR	11.	60.	130.	131.	14.	62.	107.	0.
AVG INTENSITY MAGNITUDE ERROR	3.	16.	10.	20.	5.	14.	6.	0.
AVG INTENSITY BIAS	-3.	-12.	0.	20.	0.	-9.	-6.	0.
NUMBER OF FORECASTS	13	9	5	1	10	8	4	0

DISTANCE TRAVELED BY STORM IS 608. NM

AVERAGE SPEED OF STORM IS 8. KNOTS

TYPHOON RUTH
FIX POSITIONS FOR CYCLONE NO. 18

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	SATELLITE	COMMENTS	SITE
1	122100	18.8N 113.6E	PCN 0		OTHER		PGTW
2	130300	18.7N 113.9E	PCN C		OTHER		PGTW
3	130600	18.7N 113.8E	PCN 0	T2.0/2.0	OTHER	INIT OBS	PGTW
4	130900	18.4N 113.7E	PCN 0		OTHER		PGTW
5	131116	18.1N 113.7E	PCN 5		NOAA6		PGTW
6	131116	10.4N 113.3E	PCN 5		NOAA6		RODN
7	131600	18.1N 113.0E	PCN 0		OTHER		PGTW
8	132017	18.0N 112.2E	PCN 6		TIROSN		RPMK
9	132018	18.4N 113.6E	PCN 5		TIROSN		RODN
10	132355	18.3N 113.3E	PCN 3	T3.0/3.0	NOAA6	INIT OBS	PGTW
11	140300	18.4N 113.3E	PCN 0		OTHER		PGTW
12	140721	18.9N 112.6E	PCN 5	T3.0/3.0	TIROSN	INIT OBS	RPMK
13	140900	19.2N 112.6E	PCN 0		OTHER		PGTW
14	141200	19.3N 111.9E	PCN 0		OTHER		PGTW
15	141600	20.0N 111.0E	PCN 0		OTHER		PGTW
16	142006	19.8N 110.5E	PCN 5		TIROSN		RPMK
17	142006	19.7N 109.5E	PCN 5		TIROSN		RODN
18	150114	19.8N 109.5E	PCN 6	T4.0/4.0-/D1.0/18HRS	NOAA6		RPMK
19	150300	19.6N 109.3E	PCN C		OTHER		PGTW
20	150900	19.9N 108.5E	PCN 0		OTHER		PGTW
21	151213	19.7N 107.8E	PCN 4		NOAA6	RAGGED EYE	RODN
22	151600	20.2N 107.0E	PCN E		OTHER		PGTW
23	152100	19.5N 106.2E	PCN E		OTHER		PGTW
24	160052	19.2N 105.6E	PCN 3		NOAA6	NO DVORAK	RPMK
25	160052	19.5N 105.3E	PCN 3	T4.5/4.5-	NOAA6	INIT OBS	RODN

RADAR FIXES

FIX NO.	TIME (Z)	FIX POSITION	RADAR	ACCRY	EYE SHAPE	EYE DIAM	RADOB-CODE ASWAR TDDFF	COMMENTS	RADAR POSITION	SITE WMO NO.
1	140600	18.6N 112.6E	LAND				6//// /////		22.3N 114.2E	45005

SYNOPTIC FIXES

FIX NO.	TIME (Z)	FIX POSITION	INTENSITY ESTIMATE	NEAREST DATA (NM)	COMMENTS
* 1	170000	18.0N 100.1E	10	60	
* 2	180000	17.0N 98.5E	10	50	

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TYPHOON PERCY

BEST TRACK DATA

	BEST TRACK			WARNING					24 HOUR FORECAST					48 HOUR FORECAST					72 HOUR FORECAST				
							ERRORS					ERRORS					ERRORS					ERRORS	
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
091312Z	16.4	131.5	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091318Z	17.1	131.3	35	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091400Z	17.7	131.5	40	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091406Z	18.7	131.3	40	18.5	131.6	45.	21.	5.	21.7	131.8	65.	298.	15.	24.9	129.6	75.	397.	5.	26.2	125.6	70.	344.	-40.
091412Z	18.7	130.0	45	19.2	131.3	45.	79.	0.	22.2	130.7	65.	302.	15.	25.4	128.1	75.	373.	0.	28.2	125.0	70.	460.	-55.
091418Z	18.8	128.8	45	18.7	128.8	45.	6.	0.	19.5	124.1	60.	156.	5.	21.7	121.8	65.	219.	-20.	26.0	123.3	70.	287.	-50.
091500Z	19.3	128.1	45	19.0	127.9	50.	21.	5.	20.6	122.8	65.	234.	0.	25.4	119.2	70.	447.	-25.	30.7	122.0	40.	534.	-75.
091506Z	19.2	127.2	50	19.5	126.8	50.	29.	0.	21.4	122.2	55.	256.	-15.	24.3	119.5	65.	337.	-45.	0.0	0.0	0.	-0.	0.
091512Z	18.8	126.7	50	19.9	126.2	50.	71.	0.	21.6	122.8	65.	214.	-10.	24.5	119.9	40.	287.	-85.	27.8	119.5	49.	393.	-30.
091518Z	18.4	126.6	55	18.7	126.1	55.	34.	0.	19.3	123.1	70.	120.	-15.	22.0	120.3	70.	113.	-50.	26.0	119.3	45.	181.	-10.
091600Z	18.8	126.5	65	18.7	126.2	55.	18.	-10.	19.3	124.1	70.	49.	-25.	22.0	120.3	70.	46.	-45.	26.0	119.3	45.	173.	10.
091606Z	19.1	126.1	70	19.0	125.8	70.	18.	0.	20.3	122.3	85.	102.	-25.	23.2	119.5	60.	42.	-30.	27.0	116.4	35.	188.	5.
091612Z	19.5	125.9	75	19.4	125.7	75.	13.	0.	20.9	123.1	90.	12.	-35.	24.0	120.4	45.	126.	-25.	27.8	120.2	40.	309.	20.
091618Z	20.0	125.1	85	19.7	125.6	80.	33.	-5.	21.6	123.8	100.	91.	-20.	24.3	121.4	60.	296.	5.	0.0	0.0	0.	-0.	0.
091700Z	19.9	124.7	95	20.2	124.9	80.	21.	-15.	22.0	122.2	100.	62.	-15.	25.0	120.6	55.	212.	20.	0.0	0.0	0.	-0.	0.
091706Z	20.6	124.1	110	20.5	124.2	100.	8.	-10.	23.0	122.1	115.	152.	25.	26.0	121.1	120.	293.	90.	0.0	0.0	0.	-0.	0.
091712Z	20.7	123.1	125	21.1	123.6	110.	37.	-15.	23.8	121.7	110.	185.	40.	26.9	121.2	60.	345.	40.	0.0	0.0	0.	-0.	0.
091718Z	21.3	122.2	120	21.2	122.4	120.	13.	0.	24.2	120.0	70.	132.	15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091800Z	21.8	121.1	115	21.8	121.3	125.	11.	10.	26.1	119.1	60.	166.	25.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091806Z	22.5	119.4	90	23.0	119.8	100.	37.	10.	27.6	119.3	65.	247.	35.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091812Z	22.8	118.5	70	23.2	118.5	90.	24.	20.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091818Z	23.3	117.8	55	23.5	117.8	55.	12.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091900Z	24.2	116.8	35	24.2	117.2	30.	22.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091906Z	24.9	115.8	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091912Z	25.7	114.9	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	26.	164.	245.	309.	26.	158.	233.	326.
AVG RIGHT ANGLE ERROR	18.	113.	172.	291.	18.	105.	150.	307.
AVG INTENSITY MAGNITUDE ERROR	6.	20.	35.	33.	6.	19.	30.	39.
AVG INTENSITY BIAS	-1.	1.	-12.	-25.	0.	-1.	-25.	-36.
NUMBER OF FORECASTS	20	17	14	9	20	16	12	7

DISTANCE TRAVELED BY STORM IS 1260. NM

AVERAGE SPEED OF STORM IS 9. KNOTS

TYPHOON PERCY
FIX POSITIONS FOR CYCLONE NO. 19

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	SATELLITE	COMMENTS	SITE
1	131200	16.9N 131.4E	PCN 0		OTHER		PGTW
2	131600	17.2N 130.9E	PCN 0		OTHER		PGTW
3	132356	17.7N 131.3E	PCN 6		NOAA6		PGTW
4	140300	18.3N 131.5E	PCN C		OTHER		PGTW
5	140721	18.8N 131.7E	PCN 5		TIROSN		PGTW
6	140721	17.8N 130.8E	PCN 5	T3.0/3.0	TIROSN	INIT OBS	RPMK
7	141054	19.2N 130.7E	PCN 5		NOAA6		PGTW
8	142113	19.2N 128.7E	PCN 5		DMSP37		PGTW
9	142333	19.3N 128.3E	PCN 3	T3.0/3.0	NOAA6	INIT OBS	PGTW
10	150709	19.6N 127.3E	PCN 5		TIROSN		PGTW
11	151031	18.7N 126.8E	PCN 5		NOAA6	UL PSBL EYE FRMG	PGTW
12	151600	18.9N 126.6E	PCN C		OTHER		PGTW
13	151954	18.7N 127.1E	PCN 5		TIROSN	LRG OVCST NO DEFINITION	RKSO
14	152100	18.3N 126.7E	PCN 0		OTHER		PGTW
15	152311	18.9N 126.1E	PCN 3	T4.0/4.0 /D1.0/24HRS	NOAA6		PGTW
16	152311	18.8N 125.7E	PCN 5		NOAA6		RPMB
17	160657	19.1N 126.2E	PCN 1		TIROSN		PGTW
18	160657	19.0N 126.2E	PCN 1		TIROSN		RPMB
19	160658	19.0N 126.0E	PCN 1	T5.0/5.0	TIROSN	INIT OBS	RODN
20	160900	19.3N 126.0E	PCN E		OTHER		PGTW
21	161009	19.3N 125.9E	PCN 1		NOAA6		PGTW
22	161600	20.0N 125.2E	PCN E		OTHER		PGTW
23	161943	20.0N 125.0E	PCN 1		TIROSN		RKSO
24	162100	19.9N 124.9E	PCN E		OTHER		PGTW
25	162212	19.0N 125.1E	PCN 4		DMSP37		RPMK
26	162248	20.1N 124.9E	PCN 1	T5.0/5.0 /D1.0/24HRS	NOAA6		PGTW
27	170000	19.9N 124.7E	PCN E		OTHER		PGTW
28	170030	19.7N 124.9E	PCN 5		NOAA6		RPMK
29	170646	20.5N 124.2E	PCN 1	T6.0/6.0 /D1.0/24HRS	TIROSN		RODN
30	170645	20.7N 124.0E	PCN 1		TIROSN		PGTW
31	170900	20.7N 123.6E	PCN E		OTHER		PGTW
32	171931	21.6N 121.9E	PCN 5		TIROSN		RPMK
33	172100	21.5N 121.5E	PCN E		OTHER		PGTW
34	172151	21.6N 121.3E	PCN 3		DMSP37	NO DVORAK	PGTW
35	180007	21.8N 121.2E	PCN 1	T6.0/6.0	NOAA6	INIT OBS	RPMK
36	180300	22.2N 120.5E	PCN 0		OTHER		PGTW
37	180634	22.2N 119.5E	PCN 3		TIROSN	NO CH2 FOR DV	RODN
38	180634	22.5N 119.4E	PCN 5		TIROSN		PGTW
39	180900	22.5N 118.9E	PCN 0		OTHER		PGTW
40	181105	22.5N 118.5E	PCN 5		NOAA6		PGTW
41	181200	22.6N 118.3E	PCN 0		OTHER		PGTW
42	181600	23.3N 118.2E	PCN 0		OTHER		PGTW
43	182100	23.7N 117.7E	PCN 0		OTHER		PGTW
44	182345	24.1N 116.8E	PCN 3	T3.0/3.0	NOAA6	INIT OBS	PGTW
45	190900	25.3N 115.4E	PCN C		OTHER		PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE ORIEN- DIAM/TATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	140244	18.1N 131.6E	1500FT		992	50 150 5	060 35 320 33	1 1			+25 +26 +23 27	1
2	141207	18.7N 129.9E	700MB	3000			170 45 030 30	5 2				2
3	141524	18.7N 129.3E	700MB	3003			020 42 280 25	7 3			+11 +14 +14	2
4	150352	19.3N 127.4E	700MB	2991	985	40 130 60	030 39 330 16	5 5			+16 +19 +12	3
5	151237	18.7N 126.8E	700MB	3011			130 50 100 45	1 3				4
6	151435	18.7N 126.5E	700MB	2991	987		040 35 280 20	1 2			+19 +21 + 8	4
7	160011	18.7N 126.4E	700MB	2879		65 160 15	230 62 160 15	2 5				5
8	160248	18.8N 126.2E	700MB	2857	970	65 330 20	020 69 330 18	6 2	CIRCULAR	22	+12 +16 +12	5
9	161316	19.4N 125.9E	700MB	2803			340 55 260 35	5 2	CIRCULAR	25		6
10	170110	20.0N 124.5E	700MB	2644		80 180 7	270 52 170 35	3 1	CIRCULAR	20		7
11	170302	20.3N 124.5E	700MB	2583		100 310 8	180 73 100 45	3 1	CIRCULAR	20	+14 +18 +11	7
12	171306	20.8N 123.0E	700MB	2387			240 100 160 8	4 2	CIRCULAR	15	+25 +12	8
13	171616	21.0N 122.4E	700MB	2407			070 126 340 10	4 5	CIRCULAR	15	+12 +24 +12	8

RADAR FIXES

FIX NO.	TIME (Z)	FIX POSITION	RADAR	ACCRY	EYE SHAPE	EYE DIAM	RADOB-CODE ASWAR TDDFF	COMMENTS	RADAR POSITION	SITE WMO NO.
1	171100	20.7N 123.3E	LAND				207/5 3////		24.0N 121.6E	46699
2	171200	20.7N 123.1E	LAND				20715 52908		24.0N 121.6E	46699
3	171300	20.8N 123.0E	LAND				20624 53109		24.0N 121.6E	46699
4	171400	20.8N 122.8E	LAND				10614 52708		24.0N 121.6E	46699
5	171500	20.9N 122.6E	LAND				10674 52807		24.0N 121.6E	46699
6	171600	20.9N 122.6E	LAND				20734 53105		24.0N 121.6E	46699
7	171700	20.9N 122.4E	LAND				4//// 53106		22.6N 120.3E	46744
8	171700	21.0N 122.4E	LAND				20734 53109		24.0N 121.6E	46699
9	171800	21.0N 122.3E	LAND				4///1 53209		22.6N 120.3E	46744
10	171800	21.2N 122.3E	LAND				10713 53212		24.0N 121.6E	46699
11	171900	21.2N 122.2E	LAND				4///1 53111		22.6N 120.3E	46744
12	171900	21.3N 122.3E	LAND				10654 532//		24.0N 121.6E	46699
13	172000	21.3N 121.9E	LAND				2///3 53218		22.6N 120.3E	46744
14	172000	21.5N 122.0E	LAND				10733 53215		24.0N 121.6E	46699
15	172100	21.5N 121.7E	LAND				10503 53016		22.6N 120.3E	46744
16	172100	21.5N 121.7E	LAND				10583 52916		24.0N 121.6E	46699
17	172200	21.6N 121.4E	LAND				10512 52916		22.6N 120.3E	46744
18	172200	21.7N 121.5E	LAND				10384 53110		24.0N 121.6E	46699
19	172300	21.8N 121.2E	LAND				10423 53016		22.6N 120.3E	46744
20	172300	21.8N 121.2E	LAND				35664 52914		24.0N 121.6E	46699
21	180000	21.8N 120.9E	LAND				10123 53018		22.6N 120.3E	46744
22	180000	21.9N 121.1E	LAND				55//3 53310		24.0N 121.6E	46699
23	180100	22.0N 120.7E	LAND				15/// 53014		22.6N 120.3E	46744
24	180100	22.0N 121.0E	LAND				55//4 52909		24.0N 121.6E	46699
25	180200	22.1N 120.5E	LAND				15/// 53012		22.6N 120.3E	46744
26	180300	22.3N 120.2E	LAND				10082 53023		22.6N 120.3E	46744
27	180400	22.3N 119.9E	LAND				25/63 52716		22.6N 120.3E	46744
28	180500	22.4N 119.5E	LAND				15/63 52719		22.6N 120.3E	46744
29	180600	22.4N 119.5E	LAND				25/63 50000		22.6N 120.3E	46744
30	180700	22.4N 119.3E	LAND				25/63 52718		22.6N 120.3E	46744
31	180800	22.4N 119.2E	LAND				25//3 52709		22.6N 120.3E	46744
32	180900	22.4N 119.1E	LAND				25//3 52705		22.6N 120.3E	46744
33	181000	22.4N 119.0E	LAND				25//3 52704		22.6N 120.3E	46744
34	181100	22.5N 118.9E	LAND				25//3 53105		22.6N 120.3E	46744
35	181200	22.6N 118.8E	LAND				25/// 53113		22.6N 120.3E	46744
36	181300	22.7N 118.6E	LAND				25/// 53109		22.6N 120.3E	46744
37	181400	22.8N 118.5E	LAND				25/// 53111		22.6N 120.3E	46744
38	181500	23.0N 118.3E	LAND				25/// 53110		22.6N 120.3E	46744
39	181600	23.1N 118.2E	LAND				25/// 53112		22.6N 120.3E	46744
40	181700	23.3N 118.0E	LAND				25/// 53114		22.6N 120.3E	46744
41	181800	23.5N 117.8E	LAND				25/// 53113		22.6N 120.3E	46744
42	181900	23.7N 117.7E	LAND				2030/ 53116		22.6N 120.3E	46744
43	182000	23.8N 117.6E	LAND				25/// 53212		22.6N 120.3E	46744

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

NNNN
12290441 KNPN CY 46

TYPHOON SPERRY

BEST TRACK DATA

	BEST TRACK			WARNING			ERRORS		24 HOUR FORECAST			ERRORS		48 HOUR FORECAST			ERRORS		72 HOUR FORECAST				
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
091206Z	10.1	153.7	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091212Z	10.5	153.1	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091218Z	11.1	152.6	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091300Z	12.2	152.5	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091306Z	13.2	152.8	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091312Z	14.2	152.7	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091318Z	15.1	152.4	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091400Z	16.0	152.0	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091406Z	17.1	151.2	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091412Z	18.3	150.3	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091418Z	19.3	149.0	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091500Z	20.0	147.4	35	19.9	147.8	30.	23.	-5.	22.2	141.8	45.	44.	5.	24.9	136.0	55.	58.	0.	27.5	132.0	65.	346.	5.
091506Z	20.6	145.8	40	20.3	146.1	40.	25.	0.	22.9	140.2	55.	33.	15.	25.2	135.4	65.	124.	10.	28.0	131.2	70.	422.	5.
091512Z	21.1	144.2	40	21.2	144.4	45.	13.	5.	23.5	138.7	55.	25.	10.	26.3	133.9	65.	179.	10.	29.4	129.2	70.	565.	5.
091518Z	21.6	142.5	40	21.8	142.7	50.	16.	10.	24.5	136.8	60.	20.	10.	27.4	132.2	65.	279.	10.	30.4	127.7	70.	694.	5
091600Z	22.2	141.0	40	22.0	140.8	45.	16.	5.	24.9	134.5	65.	116.	10.	28.3	130.8	70.	384.	10.	32.2	129.6	65.	653.	0.
091606Z	22.9	139.6	40	22.8	139.2	45.	23.	5.	25.7	133.2	65.	174.	10.	29.9	129.8	65.	461.	0.	33.8	129.9	50.	700.	-15.
091612Z	23.7	138.3	45	23.2	138.3	45.	30.	0.	26.1	133.2	65.	214.	10.	29.4	129.9	60.	329.	-5.	33.9	131.2	45.	698.	-20.
091618Z	24.7	137.1	50	24.5	137.0	50.	13.	0.	28.7	133.0	65.	210.	10.	32.3	133.0	70.	423.	5.	36.2	138.2	30.	493.	-30.
091700Z	25.8	136.4	55	25.5	136.0	55.	28.	0.	29.7	132.2	70.	292.	10.	34.4	135.5	60.	396.	-5.	0.0	0.0	0.	-0.	0.
091706Z	27.2	136.0	55	27.0	136.0	55.	12.	0.	32.6	136.7	55.	152.	-10.	38.0	145.0	45.	407.	-20.	0.0	0.0	0.	-0.	0.
091712Z	28.5	136.2	55	28.2	135.9	55.	24.	0.	34.1	138.2	55.	212.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091718Z	29.6	136.9	55	30.0	136.4	55.	35.	0.	35.2	141.6	45.	246.	-20.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091800Z	30.3	137.8	60	30.4	138.0	50.	12.	-10.	34.5	147.5	35.	323.	-30.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091806Z	30.7	138.7	65	31.0	138.7	65.	18.	0.	34.3	146.9	40.	247.	-25.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091812Z	30.9	140.0	65	31.1	139.6	65.	24.	0.	32.6	145.2	45.	87.	-20.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091818Z	31.1	141.2	65	31.4	141.2	65.	18.	0.	32.7	148.2	40.	162.	-20.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091900Z	31.2	142.4	65	31.5	142.8	65.	27.	0.	32.9	150.4	45.	233.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091906Z	31.3	143.5	65	31.4	144.3	65.	41.	0.	32.6	152.0	45.	249.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091912Z	31.2	144.7	65	31.4	145.3	65.	33.	0.	32.9	153.8	40.	296.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
091918Z	30.9	145.8	60	31.5	146.0	60.	37.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
092000Z	30.6	146.7	55	31.0	146.8	55.	24.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
092006Z	30.6	147.7	50	30.5	147.7	50.	6.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
092012Z	31.2	148.3	45	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
092018Z	31.8	148.9	45	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
092100Z	32.5	149.4	40	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
092106Z	33.1	149.9	40	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
092112Z	33.6	150.6	40	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
092118Z	34.0	151.4	35	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
092200Z	34.3	152.3	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	23.	176.	324.	571.	23.	176.	324.	571.
AVG RIGHT ANGLE ERROR	17.	133.	236.	413.	17.	133.	236.	413.
AVG INTENSITY MAGNITUDE ERROR	2.	13.	8.	11.	2.	13.	8.	11.
AVG INTENSITY BIAS	0.	-3.	2.	-6.	0.	-3.	2.	-6.
NUMBER OF FORECASTS	22	19	10	9	22	19	10	9

DISTANCE TRAVELED BY STORM IS 2624. NM

AVERAGE SPEED OF STORM IS 11. KNOTS

TYPHOON SPERRY
FIX POSITIONS FOR CYCLONE NO. 20

SATELLITE FIXES

	FIX NO.	TIME (Z)	FIX POSITION		ACCRY	DVORAK CODE	SATELLITE	COMMENTS	SITE
*	1	120957	10.3N	153.3E	PCN 5		NOAA6		PGTW
*	2	122055	11.0N	152.4E	PCN 6	T1.0/1.0	NOAA6	INIT OBS	PGTW
	3	140912	17.4N	150.9E	PCN 5		NOAA6		PGTW
	4	141600	19.4N	149.8E	PCN 0		OTHER		PGTW
	5	142152	19.8N	148.0E	PCN 3	T2.5/2.5	NOAA6	INIT OBS	PGTW
	6	150050	20.4N	145.2E	PCN 5		NOAA6		PGTW
	7	151600	21.5N	143.2E	PCN 0		OTHER		PGTW
	8	152052	21.6N	141.5E	PCN 5		DMSP37		PGTW
	9	152311	22.1N	141.1E	PCN 3	T3.5/3.5 /D1.0/25HRS	NOAA6		PGTW
	10	160300	23.1N	139.4E	PCN 0		OTHER		PGTW
	11	161009	23.2N	139.0E	PCN 5		NOAA6		PGTW
	12	161200	23.6N	138.7E	PCN 0		OTHER		PGTW
	13	161600	24.1N	137.3E	PCN 0		OTHER	IR WKNESS	PGTW
	14	161934	24.3N	137.2E	PCN 3		TIROSN		PGTW
	15	162100	25.0N	137.0E	PCN 0		OTHER		PGTW
	16	162248	25.4N	136.5E	PCN 3	T4.0/4.0 /D0.5/24HRS	NOAA6		PGTW
	17	170000	25.4N	136.5E	PCN 0		OTHER		PGTW
	18	170646	27.2N	136.0E	PCN 5		TIROSN		PGTW
	19	170900	27.7N	136.3E	PCN 0		OTHER		PGTW
	20	170947	27.7N	136.2E	PCN 5		NOAA6		PGTW
	21	172100	29.1N	137.2E	PCN 0		OTHER		PGTW
	22	172226	30.0N	138.1E	PCN 5	T3.5/4.0-/W0.5/24HRS	NOAA6		PGTW
	23	180300	30.6N	138.3E	PCN 0		OTHER		PGTW
	24	180634	31.4N	138.8E	PCN 5		TIROSN		PGTW
	25	180900	31.4N	139.1E	PCN 0		OTHER		PGTW
	26	180924	31.0N	139.5E	PCN 3		NOAA6		PGTW
	27	181200	31.1N	140.0E	PCN 0		OTHER		PGTW
	28	181600	31.2N	140.8E	PCN 0		OTHER		PGTW
	29	182100	31.1N	141.8E	PCN E		OTHER		PGTW
	30	182204	31.2N	142.0E	PCN 3	T4.0/4.0-/D0.5/24HRS	NOAA6		PGTW
	31	190000	31.2N	142.3E	PCN E		OTHER		PGTW
	32	190900	31.3N	144.2E	PCN E		OTHER		PGTW
	33	190902	31.3N	144.3E	PCN 3		NOAA6		PGTW
	34	191200	31.1N	144.8E	PCN C		OTHER		PGTW
	35	191600	31.5N	145.2E	PCN 0		OTHER		PGTW

36	192100	30.8N 145.9E	PCN 0		OTHER		PGTW
37	192141	30.8N 146.3E	PCN 5	T3.0/4.0 /W1.0/24HRS	NOAA6		PGTW
38	200300	30.3N 147.2E	PCN 0		OTHER		PGTW
39	200839	30.8N 148.3E	PCN 6		NOAA6		PGTW
40	202300	32.6N 149.0E	PCN 6		NOAA6		PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE ORIEN- DIAM/TATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	150230	20.3N 146.8E	700MB	3043	995	45 020 15	110 40 020 15	3 2			+14 +15 +10	2
2	150641	20.8N 145.8E	700MB	3046	993	50 360 20	030 41 330 15	3 2			+12 +16 +11	2
3	160325	22.6N 140.3E	700MB	3076		45 150 35	220 38 150 75	5 2			+10 +13	3
4	161727	24.7N 137.2E	700MB	3019	991		020 36 310 15	5 2			+11 +13 +13	5
5	170309	26.4N 136.2E	700MB	3003	990	50 040 30	110 47 030 15	6 2			+11 +16 +12	6
6	171457	29.2N 136.3E	700MB	2994	987		310 49 190 19	10 2			+13 +16 +12	8
7	180308	30.6N 138.0E	700MB	3043	989	65 170 44	290 58 240 27	3 5			+17 +16 + 8	9
8	180535	30.5N 138.6E	700MB	3025		65 220 25	070 42 360 30	4 5				9
9	180718	30.9N 138.0E	700MB	3016		55 010 40	100 50 010 40	5 3				10
10	180829	30.9N 139.0E	700MB	3004	990	65 230 40	290 54 230 40	5 2			+13 +15 +10	10

RADAR FIXES

FIX NO.	TIME (Z)	FIX POSITION	RADAR	ACCRY	EYE SHAPE	EYE DIAM	RADOB-CODE ASWAR TDDFF	COMMENTS	RADAR POSITION	SITE WMO NO.
1	180700	30.6N 139.0E	LAND				21871 50508		35.3N 138.7E	47639
2	180800	30.6N 139.2E	LAND				11511 50911		35.3N 138.7E	47639
3	180900	30.6N 139.3E	LAND				14841 50905		35.3N 138.7E	47639
4	181100	30.6N 139.8E	LAND				24451 50914		35.3N 138.7E	47639
5	181200	39.6N 140.1E	LAND				54//1 50196		35.3N 138.7E	47639
6	181300	30.8N 140.3E	LAND				52/11 70711		35.3N 138.7E	47639
7	182000	30.6N 139.8E	LAND				24451 50914		35.3N 138.7E	47639
8	190200	31.2N 143.0E	LAND				35//1 50611		35.3N 138.7E	47639
9	190200	31.2N 143.0E	LAND				35//1 50611		35.3N 138.7E	47639
10	190300	31.2N 143.4E	LAND				3///1 70716		35.3N 130.7E	47639

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TROPICAL STORM THELMA

BEST TRACK DATA

	BEST TRACK			WARNING			ERRORS		24 HOUR FORECAST			ERRORS		48 HOUR FORECAST			ERRORS		72 HOUR FORECAST				
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
092500Z	15.5	147.0	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
092506Z	15.6	146.8	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
092512Z	15.8	146.6	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
092518Z	16.1	146.3	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
092600Z	16.3	146.1	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
092606Z	16.7	145.6	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
092612Z	17.3	145.1	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
092618Z	17.8	144.7	25	17.2	143.0	30.	103.	5.	19.1	139.7	50.	187.	15.	21.1	135.5	65.	493.	20.	22.0	130.0	75.	1000.	20.
092700Z	18.3	144.3	25	17.7	142.9	30.	87.	5.	19.0	140.3	50.	193.	15.	20.7	137.5	65.	490.	15.	23.2	135.5	70.	650.	25.
092706Z	19.2	143.6	30	18.0	142.4	30.	99.	0.	19.1	140.2	50.	265.	15.	20.9	137.5	65.	559.	10.	23.5	135.5	70.	1093.	25.
092712Z	20.0	143.0	30	20.5	143.9	30.	59.	0.	23.9	143.0	45.	49.	5.	26.0	140.5	60.	309.	5.	28.3	139.7	60.	969.	15.
092718Z	20.8	142.5	35	22.8	141.9	45.	124.	10.	27.6	139.6	45.	206.	0.	30.9	139.3	65.	344.	10.	0.0	0.0	0.	-0.	0.
092800Z	21.7	142.2	35	21.8	142.0	35.	13.	0.	26.0	142.8	30.	61.	-20.	31.5	149.1	20.	49.	-25.	0.0	0.0	0.	-0.	0.
092806Z	23.2	142.0	35	22.4	142.1	35.	48.	0.	26.1	143.5	30.	119.	-25.	31.7	148.4	20.	266.	-25.	0.0	0.0	0.	-0.	0.
092812Z	24.5	142.4	40	24.4	142.0	30.	23.	-10.	28.7	144.9	30.	42.	-25.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
092818Z	25.8	142.9	45	25.8	142.8	40.	5.	-5.	30.1	146.5	30.	44.	-25.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
092900Z	26.8	143.5	50	26.8	143.5	50.	0.	0.	30.6	146.9	50.	103.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
092906Z	28.0	144.2	55	26.3	143.5	55.	100.	0.	31.2	147.3	40.	325.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
092912Z	29.4	144.9	55	28.0	144.2	55.	91.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
092918Z	30.7	146.0	55	30.8	150.0	55.	205.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
093000Z	32.3	147.9	45	32.0	146.2	55.	88.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
093006Z	35.2	151.7	45	33.9	147.9	50.	202.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
093012Z	37.3	155.8	45	37.8	155.5	45.	33.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	81.	145.	358.	978.	0.	0.	0.	0.
AVG RIGHT ANGLE ERROR	43.	83.	218.	577.	0.	0.	0.	0.
AVG INTENSITY MAGNITUDE ERROR	3.	14.	16.	21.	0.	0.	0.	0.
AVG INTENSITY BIAS	1.	-4.	1.	21.	0.	0.	0.	0.
NUMBER OF FORECASTS	16	11	7	4	0	0	0	0

DISTANCE TRAVELED BY STORM IS 1681. NM

AVERAGE SPEED OF STORM IS 13. KNOTS

TROPICAL STORM THELMA
FIX POSITIONS FOR CYCLONE NO. 21

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	SATELLITE	COMMENTS	SITE
* 1	272200	23.7N 143.1E	PCN 5	T3.0/3.0 /D1.0/24HRS	NOAA6		PGTW
2	252249	15.7N 147.3E	PCN 5	T0.5/0.5	NOAA6	INIT OBS	PGTW
3	260000	15.6N 145.4E	PCN 0		OTHER		PGTW
* 4	260900	16.5N 144.0E	PCN 0		OTHER		PGTW
* 5	261200	17.0N 144.0E	PCN 0		OTHER		PGTW
6	262227	18.1N 144.5E	PCN 6	T2.0/2.0 /D1.5/24HRS	NOAA6		PGTW
7	270300	17.7N 142.7E	PCN 0		OTHER		PGTW
8	270632	19.3N 143.6E	PCN 5		TIROSN		PGTW
9	270900	19.4N 144.3E	PCN 0		OTHER		PGTW
10	270925	20.1N 144.2E	PCN 5		NOAA6		PGTW
* 11	271200	21.1N 144.1E	PCN 0		OTHER		PGTW
* 12	271600	22.6N 143.2E	PCN 0		OTHER		PGTW
* 13	272100	23.4N 142.8E	PCN 0		OTHER		PGTW
14	280300	22.1N 142.7E	PCN 0		OTHER	ULCC 24.3 142.6	PGTW
15	280600	23.7N 141.5E	PCN C		OTHER	PSN BSD ON EXPSD LLCC	PGTW
16	280621	23.4N 141.3E	PCN 3		TIROSN		PGTW
17	280621	23.7N 141.4E	PCN 3	T2.0/2.0	TIROSN	INIT OBS	RPMK
18	280900	23.2N 141.5E	PCN 0		OTHER	ULCCS AT 23.2 143.4 25.8 143.4	PGTW
19	280903	23.1N 141.3E	PCN 6		NOAA6	ULCCS AT 23.1 143.3 25.8 143.2	PGTW
20	281200	24.9N 143.6E	PCN 0		OTHER		PGTW
21	281600	25.1N 143.2E	PCN 0		OTHER		PGTW
22	281906	26.0N 143.7E	PCN 6		TIROSN		PGTW
23	291906	25.5N 145.6E	PCN 5		TIROSN		RPMK
24	282100	26.1N 143.3E	PCN 0		OTHER		PGTW
25	282143	26.5N 143.5E	PCN 5	T2.5/3.0 /W0.5/24HRS	NOAA6	PSBL LLCC 26.1 142.3	PGTW
26	290300	27.6N 143.6E	PCN 0		OTHER		PGTW
27	290600	28.2N 144.1E	PCN 0		OTHER		PGTW
28	290609	28.2N 143.5E	PCN 5		TIROSN	PSBL LLCC 26.4 143.7	PGTW
29	290609	28.0N 144.9E	PCN 5	T3.0/3.0	TIROSN	INIT OBS	RODN
30	290900	29.2N 144.4E	PCN 0		OTHER		PGTW
31	291022	28.6N 144.8E	PCN 5		NOAA6		PGTW
32	291200	29.9N 144.8E	PCN 0		OTHER		PGTW
* 33	291600	31.6N 146.1E	PCN 0		OTHER		PGTW
34	291854	30.0N 146.6E	PCN 5		TIROSN		PGTW
35	292100	30.7N 147.0E	PCN 0		OTHER	PSBL LLVL 31.9146.4	PGTW
36	292301	31.5N 148.3E	PCN 5	T1.0/2.5 /W1.5/25HRS	NOAA6	PSBL LLCC ULCC 32.6 146.5	PGTW
37	300600	35.3N 151.8E	PCN 0		OTHER	ULCC	PGTW
38	300900	36.8N 153.8E	PCN 0		OTHER	ULCC	PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE ORIEN-DIAM/TATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	271530	22.1N 142.3E	700MB	3014	993		170 33 100 136	4 10			+12 +11	3
2	280100	21.9N 141.9E	700MB	3007		25 020 170	100 27 020 150	4 3				4
3	280300	22.1N 142.2E	700MB	2993		30 300 35	360 23 320 110	4 4			+15 +14 +12	4
4	281104	25.7N 143.1E	700MB	2981			340 44 200 40	2 5				5
5	281418	25.2N 143.9E	700MB	2981	987		320 27 240 40	2 5			+15 +12 +10	5
6	290015	27.0N 143.1E	700MB	2964		40 100 60	310 23 170 130	5 3				6
7	290258	26.9N 145.0E	700MB	2934	982	55 060 42	090 36 350 110	5 4			+10 +14 +12	6
8	291500	30.2N 144.4E	700MB	2925			290 50 120 150	5 2			+13 +13 +13	7

TYPHOON VERNON

BEST TRACK DATA

MO/DA/HR	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	DST	WIND
092700Z	12.2	161.2	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
092706Z	12.2	160.4	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
092712Z	12.3	159.8	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
092718Z	12.4	159.1	25	12.6	158.9	30.	17.	5.	14.0	154.7	45.	81.	5.	16.0	150.0	55.	283.	-5.	18.8	144.4	65.	479.	-15.
092800Z	12.6	158.4	25	13.0	157.8	30.	42.	5.	14.6	152.9	50.	163.	10.	17.0	148.1	65.	369.	0.	19.3	144.8	75.	427.	-15.
092806Z	13.2	157.4	30	13.0	157.5	30.	13.	0.	14.0	154.0	50.	133.	5.	16.0	149.5	65.	308.	-10.	18.8	145.5	75.	415.	-20.
092812Z	13.8	156.7	35	13.1	156.7	30.	42.	-5.	14.5	153.1	50.	166.	0.	16.5	148.5	65.	334.	-10.	19.7	144.7	75.	422.	-25.
092818Z	14.5	156.0	40	14.4	155.0	40.	58.	0.	16.6	150.1	65.	270.	5.	19.6	145.9	75.	382.	-5.	24.1	143.8	85.	306.	-20.
092900Z	15.0	155.7	40	14.8	154.5	50.	70.	10.	17.9	150.9	65.	205.	0.	22.2	148.8	80.	161.	-10.	26.7	140.4	80.	24.	-25.
092906Z	15.7	155.5	45	15.5	155.5	55.	12.	10.	17.6	153.5	70.	87.	-5.	21.0	151.4	90.	151.	-5.	25.5	150.3	90.	144.	-15.
092912Z	16.4	155.2	50	16.4	155.3	60.	6.	10.	19.5	153.8	75.	49.	0.	23.1	150.4	85.	90.	-15.	27.1	149.1	90.	82.	-10.
092918Z	17.1	154.8	60	17.3	154.9	65.	13.	5.	20.6	152.7	75.	94.	-5.	24.4	149.8	85.	79.	-20.	28.6	149.3	85.	75.	-15.
093000Z	18.0	154.5	65	18.1	154.4	65.	8.	0.	21.2	152.1	75.	75.	-15.	25.5	149.7	85.	76.	-20.	29.7	149.5	85.	90.	-10.
093006Z	19.0	153.9	75	19.0	154.1	75.	11.	0.	22.3	151.3	0.	74.	-95.	26.5	149.5	0.	72.	-105.	31.1	150.1	0.	136.	-80.
093012Z	20.0	153.1	75	20.2	153.5	75.	25.	0.	23.8	151.6	90.	90.	-10.	26.8	150.8	100.	151.	0.	31.5	153.3	90.	276.	30.
093018Z	22.1	152.2	80	21.1	152.2	80.	60.	0.	25.0	149.9	110.	40.	5.	30.4	153.2	80.	225.	-20.	33.5	161.2	55.	347.	0.
100100Z	22.4	151.7	90	22.3	152.3	85.	34.	-5.	26.8	151.3	110.	141.	5.	31.7	155.3	75.	287.	-20.	0.0	0.0	0.	-0.	0.
100106Z	23.5	151.0	95	23.3	151.2	100.	16.	5.	26.9	150.5	110.	109.	5.	31.2	154.6	75.	198.	-5.	0.0	0.0	0.	-0.	0.
100112Z	24.6	150.2	100	24.7	150.4	100.	12.	0.	29.6	149.6	110.	89.	10.	34.2	156.5	75.	142.	15.	0.0	0.0	0.	-0.	0.
100118Z	25.6	149.2	105	26.5	149.5	105.	56.	0.	33.7	152.8	90.	306.	-10.	35.2	165.3	60.	368.	5.	0.0	0.0	0.	-0.	0.
100200Z	26.4	148.7	105	27.3	148.5	110.	55.	5.	32.7	150.4	90.	96.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100206Z	27.3	148.5	105	27.0	148.4	110.	19.	5.	32.0	149.0	85.	138.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100212Z	28.4	148.6	100	28.7	148.6	110.	18.	10.	33.3	150.3	80.	266.	20.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100218Z	29.8	148.9	100	29.7	148.7	105.	12.	5.	34.8	153.7	75.	371.	20.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100300Z	31.2	149.7	95	31.1	149.7	100.	6.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100306Z	33.1	151.4	80	32.8	151.3	90.	19.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100312Z	36.0	154.6	60	34.7	153.8	80.	87.	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100318Z	39.1	159.3	55	39.0	160.0	50.	33.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS WRNG	24-HR	48-HR	72-HR	TYPHOONS WHILE OVER 35 KTS WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	30.	145.	216.	248.	31.	145.	216.	248.
AVG RIGHT ANGLE ERROR	18.	77.	185.	203.	19.	77.	185.	203.
AVG INTENSITY MAGNITUDE ERROR	5.	11.	16.	22.	5.	11.	16.	22.
AVG INTENSITY BIAS	4.	-2.	-14.	-17.	0.	-2.	-14.	-17.
NUMBER OF FORECASTS	25	21	17	13	22	21	17	13

DISTANCE TRAVELED BY STORM IS 2141. NM

AVERAGE SPEED OF STORM IS 13. KNOTS

TYPHOON VERNON
FIX POSITIONS FOR CYCLONE NO. 22

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	SATELLITE	COMMENTS	SITE
1	252100	12.5N 165.0E	PCN 5	T1.0/1.0	NOAA6	INIT OBS	PGTW
2	260000	13.0N 164.9E	PCN 0		OTHER		PGTW
3	260502	13.3N 163.7E	PCN 3		TIROSN		PGTW
4	261200	12.8N 164.4E	PCN 0		OTHER		PGTW
5	270300	12.4N 160.5E	PCN 0	T1.5/1.5 /D0.5/30HRS	OTHER		PGTW
6	270900	12.2N 160.4E	PCN 0		OTHER		PGTW
7	270925	12.3N 160.1E	PCN 5		OTHER		PGTW
8	271200	12.1N 159.8E	PCN 0		OTHER		PGTW
9	271600	13.2N 159.3E	PCN 0		OTHER		PGTW
10	271958	12.6N 158.5E	PCN 6		DMSP37		PGTW
11	272100	12.8N 158.5E	PCN 0		OTHER		PGTW
12	280000	12.8N 157.9E	PCN 0	T2.5/2.5 /D1.0/21HRS	OTHER		PGTW
13	280300	13.0N 157.8E	PCN 0		OTHER		PGTW
14	280600	13.7N 157.5E	PCN C		OTHER		PGTW
15	280900	13.4N 158.0E	PCN 0		OTHER		PGTW
16	280903	13.3N 157.8E	PCN 6		NOAA6		PGTW
17	281200	13.3N 157.6E	PCN 0		OTHER		PGTW
18	281600	14.1N 156.6E	PCN 0		OTHER		PGTW
19	281937	14.3N 155.5E	PCN 6		DMSP37		PGTW
20	282143	14.7N 155.1E	PCN 5	T3.0/3.0 /D0.5/21HRS	NOAA6		PGTW
21	290300	15.4N 154.6E	PCN 0		OTHER	SECONDARY LLCC 15.3 155.4	PGTW
22	290600	15.5N 156.0E	PCN 0		OTHER		PGTW
23	290840	15.9N 155.4E	PCN 6		NOAA6		PGTW
24	290900	16.1N 155.5E	PCN 0		OTHER		PGTW
25	291200	16.6N 155.2E	PCN 0		OTHER		PGTW
26	291600	16.9N 155.1E	PCN 0		OTHER		PGTW
27	291712	17.3N 154.4E	PCN 4		TIROSN		PGTW
28	292100	17.7N 154.4E	PCN C		OTHER		PGTW
29	292120	17.6N 154.7E	PCN 3	T3.5/3.5 /D0.5/24HRS	NOAA6		PGTW
30	300818	19.7N 153.6E	PCN 2		NOAA6		PGTW
31	302100	21.5N 152.5E	PCN E		OTHER		PGTW
32	302157	21.8N 152.6E	PCN 1	T4.5/4.5 /D1.0/24HRS	NOAA6		PGTW
33	302239	22.0N 152.0E	PCN 1		NOAA6		PGTW
34	010937	23.9N 150.5E	PCN 2		NOAA6		PGTW
35	010937	24.1N 151.0E	PCN 1		NOAA6		RODN
36	011200	24.6N 150.3E	PCN E		OTHER		PGTW
37	011600	25.1N 149.3E	PCN E		OTHER		PGTW
38	012014	25.9N 148.7E	PCN 2		DMSP37		PGTW
39	012100	25.8N 149.1E	PCN E		OTHER		PGTW
40	012216	26.1N 148.9E	PCN 1	T4.0/4.5 /D0.5/25HRS	NOAA6		PGTW
41	020915	27.9N 148.6E	PCN 1		NOAA6		PGTW
42	020915	28.0N 148.5E	PCN 1		NOAA6		RODN
43	021200	28.4N 148.6E	PCN E		OTHER		PGTW
44	021953	30.3N 148.8E	PCN 6		DMSP37	CNTR OBSCURED BY SHADOW	PGTW
45	022100	30.2N 149.1E	PCN E		OTHER		PGTW
46	022154	30.6N 149.4E	PCN 1	T4.5/4.5-/S0.0/24HRS	NOAA6		PGTW

47	030000	31.2N 149.6E	PCN E	OTHER	PGTW
48	030400	32.5N 150.7E	PCN E	OTHER	PGTW
49	030900	34.5N 152.7E	PCN O	OTHER	PGTW
50	030952	34.3N 152.4E	PCN 6	NOAA6	PGTW
51	031600	38.3N 158.0E	PCN O	OTHER	PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE ORIEN- DIAM/TATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	280310	12.8N 157.9E	1500FT		997	25 280 105	320 30 280 55	5 10			+26 +26 +23 27	2
2	281610	14.5N 156.1E	700MB	3010			320 54 230 140	15 5			+10 +13 + 7	3
3	281534	14.5N 156.0E	700MB	3009			180 48 120 50	10 5				3
4	290507	15.5N 155.5E	700MB	2947	982	40 290 60	350 47 290 90	5 5				.4
5	290726	15.8N 155.4E	700MB	2954		55 130 115	210 60 130 105	5 5				4
6	290908	16.1N 155.4E	700MB	2962	984		050 73 280 60	5 5			+10 +14 +10	4
7	291538	16.9N 155.0E	700MB	2891	975		330 62 230 38	4 8			+14 +20 + 7	5
8	300229	18.4N 154.3E	700MB	2821		50 200 120	270 70 200 52	5 5	CIRCULAR	40		6
9	300410	18.8N 154.2E	700MB	2803	964	50 270 15	150 81 070 85	5 3	CIRCULAR	40	+13 +19 + 6	6
10	301319	20.3N 152.8E	700MB	2752			320 56 230 50	2 4				7
11	301621	20.9N 152.4E	700MB	2697	952		100 60 060 30	2 4	CIRCULAR	45	+15 +20 + 9	7
12	010028	22.4N 151.7E	700MB	2663		40 210 70	300 75 180 25	5 5	CIRCULAR			8
13	010323	22.8N 151.3E	700MB	2611	944	80 180 5	020 75 310 30	6 3	CIRCULAR	35	+13 +19 + 9	8
14	011704	25.4N 149.3E	700MB	2544	937		260 97 170 18	4 2	CIRCULAR	30	+13 +19 +14	9
15	020001	26.4N 148.6E	700MB	2580		80 210 30	300 80 200 20	4 3				10
16	020251	26.7N 148.5E	700MB	2553		80 320 10	030 74 320 15	4 2	ELLIPTICAL	22 15 120	+15 +19 +13	10
17	021145	28.3N 148.5E	700MB	2564			250 92 160 15	2 2				11
18	021420	29.0N 148.6E	700MB	2578	940		350 68 280 36	2 2	ELLIPTICAL	40 25 060	+14 +18 +14	11

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

SUPER TYPHOON WYNNE

BEST TRACK DATA

MO/DA/HR	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
100212Z	9.4	156.5	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100218Z	8.4	155.7	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100300Z	7.6	155.0	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100306Z	7.0	154.2	35	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100312Z	6.6	153.7	50	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100318Z	6.2	152.9	60	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100400Z	6.0	152.2	70	5.8	152.2	55.	12.	-15.	6.8	140.4	70.	97.	30.	9.5	145.5	80.	152.	35.	12.8	142.7	90.	102.	40.
100406Z	6.2	151.1	60	6.2	151.2	60.	6.	0.	7.7	147.9	75.	97.	10.	10.4	145.0	85.	154.	25.	13.2	142.2	95.	187.	45.
100412Z	6.7	150.3	50	6.0	150.8	60.	51.	10.	7.3	140.2	70.	150.	25.	10.1	145.3	80.	222.	35.	13.0	142.5	90.	205.	50.
100418Z	7.3	149.8	45	7.2	149.4	50.	24.	5.	9.8	146.3	70.	85.	40.	12.8	143.5	80.	147.	30.	15.6	140.9	90.	137.	25.
100500Z	8.0	149.5	40	7.8	149.4	45.	13.	5.	9.9	147.5	60.	115.	15.	12.8	144.0	70.	150.	20.	15.7	143.5	90.	112.	20.
100506Z	8.8	149.1	65	8.8	149.1	50.	0.	-15.	11.9	147.4	65.	85.	5.	15.0	144.8	75.	66.	25.	18.8	143.5	95.	155.	20.
100512Z	9.8	148.4	45	8.8	149.1	50.	73.	5.	11.9	147.4	65.	151.	20.	15.9	144.9	75.	109.	15.	18.8	143.5	95.	195.	15.
100518Z	10.6	147.5	30	10.7	147.2	40.	19.	10.	13.9	142.8	45.	141.	-5.	15.8	137.7	55.	309.	-10.	16.1	133.1	65.	372.	-25.
100600Z	11.7	146.8	45	11.5	146.2	45.	37.	0.	14.7	141.5	55.	177.	5.	16.3	135.5	65.	300.	-5.	17.0	129.2	75.	510.	-45.
100606Z	12.7	146.2	60	12.6	146.0	50.	13.	-10.	15.2	142.2	65.	110.	15.	17.2	136.2	75.	285.	0.	17.9	129.7	90.	476.	-60.
100612Z	13.8	145.7	45	13.5	145.7	50.	18.	5.	16.7	141.8	60.	100.	0.	17.7	135.6	70.	262.	-10.	18.0	129.5	80.	300.	-65.
100618Z	14.7	145.1	50	14.7	144.9	40.	12.	-10.	17.7	140.2	60.	171.	-5.	18.8	134.2	70.	285.	-20.	18.8	126.6	80.	473.	-60.
100700Z	15.3	144.5	50	15.5	144.2	45.	21.	-5.	19.3	141.5	60.	142.	-10.	23.3	139.6	70.	289.	-50.	29.0	139.9	75.	618.	-60.
100706Z	15.8	144.0	50	15.8	144.1	50.	6.	0.	18.3	142.2	0.	78.	-75.	21.7	140.1	0.	233.	-150.	26.2	144.2	0.	734.	-130.
100712Z	16.3	143.5	60	16.6	143.6	50.	19.	-10.	19.6	141.3	55.	119.	-25.	23.2	139.9	65.	305.	-80.	20.8	141.8	60.	711.	-65.
100718Z	16.7	143.0	65	16.8	143.1	55.	8.	-10.	19.6	141.3	70.	142.	-20.	23.2	140.0	75.	342.	-65.	20.2	142.2	70.	770.	-55.
100800Z	17.0	142.1	70	17.3	142.8	60.	44.	-10.	19.7	141.2	70.	190.	-50.	22.7	140.1	75.	395.	-60.	26.5	140.5	75.	692.	-45.
100806Z	17.4	141.2	75	17.5	141.1	65.	8.	-10.	19.3	137.8	75.	47.	-75.	22.1	135.9	80.	218.	-50.	25.5	135.2	85.	413.	-30.
100812Z	17.9	140.2	80	17.8	140.1	70.	8.	-10.	19.9	137.0	80.	59.	-65.	23.5	135.3	85.	276.	-40.	28.2	136.3	95.	554.	-30.
100818Z	18.3	139.2	90	18.5	139.0	95.	16.	5.	21.7	134.8	110.	102.	-30.	26.3	134.3	105.	359.	-20.	30.0	138.3	95.	711.	-15.
100900Z	18.7	138.0	120	19.0	138.0	140.	18.	20.	21.9	134.5	150.	104.	15.	25.5	134.0	140.	332.	20.	29.8	137.6	100.	679.	-5.
100906Z	19.1	137.0	150	19.2	136.7	150.	18.	0.	20.9	132.0	150.	6.	20.	23.1	128.0	130.	12.	15.	26.7	126.5	210.	86.	110.
100912Z	19.6	136.0	145	19.5	136.2	150.	13.	5.	20.9	132.4	150.	96.	25.	22.8	128.7	130.	102.	15.	26.4	127.0	120.	67.	20.
100918Z	20.0	134.9	140	20.2	134.9	140.	12.	0.	22.4	130.2	120.	37.	-5.	24.9	127.5	110.	64.	0.	27.9	127.0	90.	79.	-10.
101000Z	20.5	133.4	135	20.6	133.7	140.	10.	5.	23.0	129.4	120.	41.	0.	26.2	126.8	110.	92.	5.	29.2	127.9	90.	111.	-5.
101006Z	20.9	132.1	130	20.8	132.2	130.	8.	0.	23.6	127.9	110.	19.	-5.	27.5	126.8	100.	136.	0.	30.6	129.6	85.	165.	-5.
101012Z	21.5	130.8	125	21.4	130.7	125.	8.	0.	24.1	127.0	100.	21.	-15.	27.8	127.3	90.	129.	-10.	31.8	131.3	75.	187.	-15.
101018Z	22.0	129.7	125	22.1	129.5	125.	13.	0.	25.6	126.5	100.	84.	-10.	30.2	129.5	85.	269.	-15.	34.4	136.2	65.	370.	-25.
101100Z	22.6	128.8	120	22.6	128.8	125.	0.	5.	26.4	126.7	100.	101.	-5.	30.8	130.2	85.	263.	-10.	34.8	137.2	70.	288.	-15.
101106Z	23.3	128.0	115	23.6	128.1	115.	19.	0.	27.8	127.4	95.	167.	-5.	32.5	133.6	85.	396.	-5.	38.0	144.0	60.	491.	-20.
101112Z	23.8	127.2	115	23.8	127.4	110.	11.	-5.	27.7	127.4	90.	128.	-10.	32.5	133.6	80.	306.	-10.	0.0	0.0	0.	-0.	0.
101118Z	24.2	126.6	110	24.8	126.5	110.	36.	0.	29.2	127.8	90.	165.	-10.	33.8	134.0	80.	265.	-10.	0.0	0.0	0.	-0.	0.
101200Z	24.8	126.1	105	24.8	126.1	105.	0.	0.	28.2	125.8	90.	36.	-5.	33.3	130.8	65.	154.	-20.	0.0	0.0	0.	-0.	0.
101206Z	25.4	125.8	100	25.3	125.4	100.	22.	0.	27.8	125.0	85.	130.	-5.	32.2	129.0	75.	374.	-5.	0.0	0.0	0.	-0.	0.
101212Z	26.1	125.8	100	26.1	125.7	100.	5.	0.	29.6	126.2	95.	120.	5.	34.8	153.9	85.	681.	15.	0.0	0.0	0.	-0.	0.
101218Z	27.0	125.9	100	26.9	125.6	100.	17.	0.	31.5	128.7	0.	110.	-90.	36.3	136.7	0.	404.	-60.	0.0	0.0	0.	-0.	0.
101300Z	27.9	126.4	95	27.8	126.3	100.	8.	5.	32.1	130.1	75.	152.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101306Z	28.8	127.2	90	28.9	127.0	90.	12.	0.	33.3	131.8	60.	234.	-20.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101312Z	29.8	128.5	90	29.6	128.4	85.	13.	-5.	34.2	134.2	50.	292.	-20.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101318Z	30.5	130.5	90	30.3	130.0	80.	28.	-10.	33.0	138.4	60.	358.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101400Z	31.5	133.0	85	31.7	133.4	75.	24.	-10.	37.6	147.0	50.	142.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101406Z	32.6	136.4	80	32.4	136.3	75.	13.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101412Z	34.0	140.1	70	34.0	139.9	75.	10.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-6.	0.
101418Z	35.5	145.0	60	36.2	145.1	60.	42.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101500Z	36.0	149.2	50	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS WRNG	24-HR	48-HR	72-HR	TYPHOONS WHILE OVER 35 KTS WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	18.	119.	248.	370.	18.	120.	248.	370.
AVG RIGHT ANGLE ERROR	12.	66.	137.	273.	12.	65.	137.	273.
AVG INTENSITY MAGNITUDE ERROR	5.	20.	27.	37.	5.	19.	27.	37.
AVG INTENSITY BIAS	-1.	-8.	-13.	-15.	0.	-10.	-13.	-15.
NUMBER OF FORECASTS	44	41	36	30	43	40	36	30

DISTANCE TRAVELED BY STORM IS 3728. NM

AVERAGE SPEED OF STORM IS 12. KNOTS

SUPER TYPHOON WYNNE
FIX POSITIONS FOR CYCLONE NO. 23

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	SATELLITE	COMMENTS	SITE
1	021200	9.3N 156.4E	PCN 0		OTHER		PGTW
2	021953	8.2N 155.4E	PCN 6		DMSP37		PGTW
3	022154	7.8N 155.2E	PCN 5	T0.5/0.5	NOAA6	INIT OBS	PGTW
4	030400	7.6N 154.3E	PCN 0		OTHER		PGTW
5	030852	6.6N 153.7E	PCN 6		NOAA6		PGTW
6	031200	6.5N 153.6E	PCN 0		OTHER		PGTW
7	031600	6.3N 153.0E	PCN 0		OTHER		PGTW
8	031800	6.4N 152.7E	PCN 0		OTHER		PGTW
9	032100	6.2N 152.2E	PCN 0		OTHER		PGTW
10	032132	6.0N 152.1E	PCN 3	T2.5/2.5 /D2.0/24HRS	NOAA6		PGTW
11	040000	6.0N 152.0E	PCN E		OTHER		PGTW
12	040400	6.1N 151.6E	PCN E		OTHER		PGTW
13	040511	6.3N 151.2E	PCN 3		TIROSN		PGTW
* 14	041011	5.7N 150.9E	PCN 5		NOAA6		PGTW
* 15	041200	5.6N 150.5E	PCN 0		OTHER		PGTW
16	042109	7.5N 149.8E	PCN 3	T3.5/3.5 /D1.0/24HRS	NOAA6		PGTW
17	050949	9.7N 148.9E	PCN 5		NOAA6		PGTW
18	051200	9.7N 148.4E	PCN 0		OTHER		PGTW
19	051600	10.1N 147.8E	PCN 0		OTHER		PGTW
20	052030	11.5N 147.4E	PCN 6		DMSP37		PGTW
21	052228	11.8N 146.9E	PCN 5	T3.0/3.0+/W0.5/25HRS	NOAA6		PGTW
22	060000	11.9N 146.7E	PCN 0		OTHER		PGTW
23	060400	12.5N 146.3E	PCN 0		OTHER		FGTW
24	060600	12.6N 145.9E	PCN 0		OTHER		PGTW
25	060630	12.6N 146.0E	PCN 3		TIROSN		PGTW

26	060900	13.3N 145.6E	PCN 0		OTHER		PGTW
27	060926	13.3N 145.4E	PCN 3		NOAA6		PGTW
* 28	061200	13.8N 144.6E	PCN 0		OTHER		PGTW
29	061600	14.7N 145.2E	PCN 0		OTHER		PGTW
* 30	061800	15.0N 144.8E	PCN 0		OTHER		PGTW
31	062100	15.0N 144.5E	PCN 0		OTHER		PGTW
32	062206	15.3N 144.4E	PCN 5	T3.0/3.0 /S0.0/24HRS	NOAA6		PGTW
33	070000	15.3N 143.9E	PCN 0		OTHER		PGTW
34	070400	15.7N 144.1E	PCN 0		OTHER		PGTW
35	070618	16.0N 143.9E	PCN 5		TIROSN		PGTW
36	070900	16.2N 143.8E	PCN 0		OTHER		PGTW
37	070904	16.2N 143.4E	PCN 6		NOAA6		PGTW
* 38	071600	17.2N 142.7E	PCN 0		OTHER		PGTW
39	071903	17.1N 142.7E	PCN 5		TIROSN		PGTW
40	071903	17.8N 143.0E	PCN 5		TIROSN		RPMK
41	072100	17.3N 142.5E	PCN 0		OTHER		PGTW
42	072143	16.8N 142.1E	PCN 5	T4.0/4.0 /D1.0/24HRS	NOAA6		PGTW
43	080000	17.0N 142.1E	PCN E		OTHER		PGTW
44	080400	17.3N 141.5E	PCN E		OTHER		PGTW
45	080600	17.5N 141.1E	PCN C		OTHER		PGTW
46	080607	17.4N 141.1E	PCN 3		TIROSN		PGTW
47	080900	17.7N 140.6E	PCN C		OTHER		PGTW
48	081023	17.7N 140.4E	PCN 3		NOAA6		PGTW
49	081200	17.8N 140.1E	PCN E		OTHER		PGTW
50	081600	18.4N 139.4E	PCN E		OTHER		PGTW
51	082100	18.5N 138.7E	PCN E		OTHER		PGTW
52	082107	18.0N 138.6E	PCN 2	T5.5/5.5	DMSP37	INIT OBS	RKSO
* 53	082211	18.4N 138.4E	PCN 1		NOAA6	PSN BASED ON DISTINCT EYE	RPMB
54	082302	18.8N 138.1E	PCN 1		NOAA6		RKSO
55	082302	18.8N 138.1E	PCN 1	T5.0/5.0 /D1.5/25HRS	NOAA6		PGTW
56	090300	18.0N 137.6E	PCN E		OTHER		PGTW
57	090555	19.1N 137.1E	PCN 1		TIROSN		PGTW
58	090900	19.2N 136.7E	PCN E		OTHER		PGTW
59	091000	19.3N 136.5E	PCN 1		NOAA6		PGTW
60	091200	19.3N 136.1E	PCN E		OTHER		PGTW
61	091600	19.8N 135.3E	PCN E		OTHER		PGTW
62	092100	20.3N 134.2E	PCN E		OTHER		PGTW
* 63	092149	20.7N 133.6E	PCN 1		NOAA6	PSN BASED ON WELL DEFINED EYE	RPMB
64	092240	20.3N 133.8E	PCN 1	T6.5/6.5 /D1.0/24HRS	NOAA6		PGTW
65	100300	20.6N 132.7E	PCN E		OTHER		PGTW
* 66	100725	21.7N 132.0E	PCN 1		NOAA6	EYE PARTIALLY CLD FILLED	RPMB
67	100900	21.2N 131.5E	PCN E		OTHER		PGTW
68	101119	21.4N 130.9E	PCN 1		NOAA6		PGTW
69	101829	21.8N 129.8E	PCN 1		TIROSN		RPMK
70	101829	21.8N 129.5E	PCN 1		TIROSN		PGTW
71	102100	22.4N 129.3E	PCN E		OTHER		RODN
72	110000	22.6N 128.8E	PCN E		OTHER		PGTW
73	111057	23.5N 127.2E	PCN 1		NOAA6		PGTW
74	111200	23.5N 127.1E	PCN E		OTHER		PGTW
75	112100	24.4N 126.3E	PCN E		OTHER		PGTW
76	112336	24.8N 126.2E	PCN 1	T6.0/6.0	NOAA6	INIT OBS	PGTW
77	120900	25.7N 125.5E	PCN E		OTHER		PGTW
78	121034	25.8N 125.6E	PCN 1		NOAA6		PGTW
79	121034	27.1N 126.4E	PCN C		OTHER		PGTW
80	121947	27.3N 126.3E	PCN 5		TIROSN		RPMK
81	122314	27.7N 126.3E	PCN 3	T4.5/5.5-/W1.5/24HRS	NOAA6		PGTW
* 82	130651	29.1N 127.9E	PCN 3	T4.0/4.5-	TIROSN	INIT OBS	RKSO
* 83	130651	28.9N 127.4E	PCN 1	T5.0/5.0-	TIROSN	INIT OBS	RODN
84	130900	29.4N 128.0E	PCN C		OTHER		PGTW
85	131935	30.8N 131.2E	PCN 3		TIROSN		RKSO
86	132100	30.9N 132.0E	PCN 0		OTHER		PGTW
87	132251	31.4N 132.5E	PCN 3	T4.0/4.5 /W0.5/24HRS	NOAA6		PGTW
88	140000	31.5N 133.1E	PCN C		OTHER		PGTW
89	140300	32.2N 134.9E	PCN 0		OTHER		PGTW
90	140900	33.3N 137.8E	PCN 0		OTHER		PGTW
91	140948	33.6N 138.8E	PCN 5		NOAA6		PGTW
92	141600	35.8N 143.3E	PCN 0		OTHER		PGTW
93	142100	35.9N 146.8E	PCN 0		OTHER		PGTW
94	150000	35.1N 148.6E	PCN 0		OTHER		PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE DIAM/ORIENTATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	040122	5.7N 152.0E	700MB	2954	984	75 110 20	210 82 110 20	15 2	CIRCULAR	10	+11 +16 +10	1
2	040332	5.9N 151.7E	700MB	2919	976	65 020 15	110 55 030 20	10 2	CIRCULAR	12	+12 +20 + 9	1
3	041617	7.1N 149.9E	700MB	3064			320 38 220 8	5 2	CIRCULAR	15	+13 +15 +10	2
4	041624	7.6N 149.6E	700MB	3044			270 57 160 9	5 2				2
5	042111	7.6N 143.6E	700MB	3098		45 010 5	010 26 270 25	5 2	CIRCULAR	15	+12 +13 + 9	2
6	050320	8.4N 149.3E	700MB	3068	997	45 350 20	010 32 300 15	4 3			+10 +17 + 8	3
7	050621	9.0N 149.1E	700MB	3047	996	80 090 30	160 74 100 12	4 3			+14 +17 + 8	3
* 8	050855	8.3N 149.0E	700MB	3122	1006		070 31 330 130	10 7			+10 +12 + 7	4
* 9	051142	8.9N 148.1E	700MB	3135			140 29 020 160	10 5				4
10	051615	10.3N 146.8E	700MB	3127	1008		100 20 340 100	10 5			+12 +10 + 8	5
11	051831	10.4N 146.7E	700MB	3125			090 24 340 130	6 5				5
* 12	052011	10.5N 146.3E	700MB	3127	1008		200 19 120 105	6 5			+ 9 +11 + 8	5
13	060052	11.8N 146.6E	700MB	3054		45 270 5	300 52 270 15	2 1	ELLIPTICAL	13 10 050		6
14	060305	12.2N 146.4E	700MB	3041	999	50 060 5	190 45 140 10	2 4	ELLIPTICAL	10 13 030	+ 9 +14 + 6	6
15	060618	12.9N 146.4E	700MB	3070	994	70 100 15	120 46 100 5	2 7				7
16	060907	13.4N 146.2E	700MB	3090	1002		150 49 040 30	2 5			+16 +12 + 8	7
17	061207	13.8N 146.0E	700MB	3081			080 40 340 13	2 5				7
18	061514	14.4N 145.6E	700MB	3073			180 50 090 12	2 2			+11 +15	8
19	070317	15.5N 144.3E	700MB	3033	992	50 360 7	340 44 270 10	3 1	CIRCULAR	20	+ 9 +14 + 8	10
20	071445	16.5N 143.3E	700MB	2965	984		070 70 010 28	5 1	CIRCULAR	15	+11 +16 + 9	12
21	080240	17.1N 141.5E	700MB	2882	975	80 030 15	200 53 100 8	6 5	ELLIPTICAL	25 15 040	+ 9 +14 +12	14
22	081245	17.9N 139.9E	700MB	2660			030 108 350 10	4 1	CIRCULAR	12		15
23	081511	18.3N 139.4E	700MB	2578	952		350 87 270 15	4 1	CIRCULAR	13	+11 +16 +12	15
24	082326	18.7N 138.1E	700MB	2197		130 120 7	130 115 090 12	5 1				16
25	090236	18.8N 137.6E	700MB	2130	890	130 290 16	010 110 290 14	5 1	CIRCULAR	10	+13 +29 +15	16
26	091255	19.6N 135.9E	700MB	2207			180 113 090 10	5 1	CIRCULAR	12		17
27	091437	19.8N 135.6E	700MB	2199	898		260 110 180 10	5 1	CONCENTRIC	11 34	+14 +22 +17	17
28	100012	20.5N 133.3E	700MB	2313		100 100 20	200 114 150 14	4 1	CIRCULAR	20		18
29	100258	20.6N 132.8E	700MB	2309	912	100 010 8	020 104 270 12	3 1	CIRCULAR	19	+10 +17 +17	18

30	101120	21.6N 131.0E	700MB	2267	907				200	114	100	18	5	2	CIRCULAR	17			+13 +19	21
31	101423	21.7N 130.2E	700MB	2262	906				010	124	280	12	7	2	CIRCULAR	18			+12 +17	21
32	110055	22.8N 128.8E	700MB	2384		100	090	10	180	75	090	20	4	1						22
33	110201	22.9N 128.5E	700MB	2372	918	100	090	10	010	73	270	30	4	1	CIRCULAR	20			+14 +18 +14	22
34	110740	23.5N 122.7E	700MB	2349		100	130	15	200	107	130	20	10	2						23
35	110912	23.6N 127.6E	700MB	2338	914	110	230	15	320	100	230	15	10	4	CIRCULAR	20			+13 +20 +16	23
36	111222	23.7N 127.1E	700MB	2325					090	110	030	15	5	1	CIRCULAR	17				24
37	111440	24.0N 126.7E	700MB	2346	915				220	115	140	15	5	1	CIRCULAR	19			+14 +17	24
38	112120	24.5N 126.3E	700MB	2421	924				110	95	030	10	7	2	CIRCULAR	18			+15 +17 +16	25
39	120026	24.8N 126.1E	700MB	2437		100	330	15	290	58	210	30	5	3						25
40	120349	25.1N 125.7E	700MB	2435	925	80	360	25	090	68	360	61	4	1	CIRCULAR	15			+14 +17 +14	26
41	120700	25.7N 125.8E	700MB	2413		100	100	30	210	97	130	16	4	1						26
42	121019	25.8N 125.6E	700MB	2428	925				100	62	090	150	10	2	CIRCULAR	20			+13 +19 +16	27
43	121320	26.3N 125.7E	700MB	2454	927				210	55	150	110	10	2	ELLIPTICAL	13	10	120	+15 +18 +17	27
44	130133	28.1N 126.5E	700MB	2564		45	080	115	160	71	080	85	5	2						29
45	130315	28.4N 126.6E	700MB	2582	943				210	72	130	75	5	2					+13 +18 +17	29
46	131239	29.9N 128.7E	700MB						150	76	060	60	10	2						30
47	131505	30.1N 129.3E	700MB						320	79	260	68	4	2					+18 +18 +14	30
48	140022	31.5N 133.0E	700MB	2659		70	070	30	180	68	070	60	2	2						31
49	140230	31.8N 134.2E	700MB	2720	956	100	250	60	330	81	250	30	2	2					+15 +15 +14	31
50	140528	32.4N 135.8E	700MB	2791		80	150	9	160	56	070	90	5	2						32
51	140734	32.8N 136.9E	700MB	2783		80	150	30	240	81	150	30	5	5					+14 +16 +14	32

RADAR FIXES

FIX NO.	TIME (Z)	FIX POSITION	RADAR	ACCRY	EYE SHAPE	EYE DIAM	RADOB-CODE ASWAR TDDFF	COMMENTS	RADAR POSITION	SITE WMO NO.
1	052335	12.0N 146.7E	LAND	GOOD	CIRCULAR	20		WALL CLD OPEN N-E	13.6N 144.9E	91218
2	060135	12.0N 146.6E	LAND	GOOD	CIRCULAR	20			13.6N 144.9E	91218
3	060235	12.3N 146.4E	LAND	GOOD	CIRCULAR	20			13.6N 144.9E	91218
4	060335	12.5N 146.4E	LAND	GOOD	CIRCULAR			WALL CLD OPEN E	13.6N 144.9E	91218
5	060435	12.6N 146.3E	LAND	FAIR	CIRCULAR	20			13.6N 144.9E	91218
6	060535	12.7N 146.1E	LAND	POOR					13.6N 144.9E	91218
* 7	060635	13.1N 146.1E	LAND	POOR					13.6N 144.9E	91218
8	060810	13.3N 146.3E	LAND	POOR					13.6N 144.9E	91218
* 9	060910	13.7N 146.3E	LAND	POOR					13.6N 144.9E	91218
10	060935	13.8N 146.3E	LAND	POOR					13.6N 144.9E	91218
11	061010	13.7N 146.1E	LAND	POOR					13.6N 144.9E	91218
12	061135	13.8N 146.0E	LAND	POOR					13.6N 144.9E	91218
13	061210	13.8N 146.0E	LAND	POOR					13.6N 144.9E	91218
14	061235	13.8N 146.0E	LAND	POOR					13.6N 144.9E	91218
15	061335	14.1N 145.6E	LAND	POOR					13.6N 144.9E	91218
16	061410	14.3N 145.9E	LAND	FAIR	CIRCULAR	30		WALL CLD OPEN N	13.6N 144.9E	91218
17	061435	14.4N 145.8E	LAND	GOOD	CIRCULAR	23		WALL CLD OPEN N	13.6N 144.9E	91218
18	061510	14.7N 145.5E	LAND	GOOD	CIRCULAR	25		WALL CLD OPEN SW-NE	13.6N 144.9E	91218
19	061535	14.6N 145.6E	LAND	GOOD	CIRCULAR	23		WALL CLD OPEN N	13.6N 144.9E	91218
20	061735	14.9N 145.3E	LAND	GOOD	CIRCULAR	22			13.6N 144.9E	91218
21	061835	15.0N 145.3E	LAND	GOOD	CIRCULAR	22		WALL CLD OPEN N	13.6N 144.9E	91218
22	061910	15.0N 145.1E	LAND	GOOD	CIRCULAR	20			13.6N 144.9E	91218
23	061935	15.1N 145.1E	LAND	GOOD	CIRCULAR	20			13.6N 144.9E	91218
24	062010	15.2N 145.0E	LAND	FAIR	CIRCULAR	20		WALL CLD OPEN N	13.6N 144.9E	91218
25	062035	15.2N 145.0E	LAND	FAIR	CIRCULAR	20		WALL CLD OPEN N	13.6N 144.9E	91218
26	062335	15.4N 144.4E	LAND	FAIR					13.6N 144.9E	91218
27	070035	15.4N 144.3E	LAND	FAIR					13.6N 144.9E	91218
28	070310	15.6N 144.1E	LAND	GOOD	CIRCULAR	25			13.6N 144.9E	91218
29	070335	15.7N 144.0E	LAND	GOOD	CIRCULAR	25		NORTHERN HALF WYNNE ATTENUATED	13.6N 144.9E	91218
30	070434	15.7N 144.0E	LAND	GOOD	CIRCULAR	25			13.6N 144.9E	91218
31	070535	15.8N 144.0E	LAND	GOOD					13.6N 144.9E	91218
32	070635	15.9N 143.9E	LAND	GOOD				NORTHERN HALF WYNNE ATTENUATED	13.6N 144.9E	91218
33	070735	15.9N 143.9E	LAND	GOOD				NORTHERN HALF WYNNE ATTENUATED	13.6N 144.9E	91218
34	070810	16.0N 143.8E	LAND	FAIR					13.6N 144.9E	91218
35	070835	16.1N 143.7E	LAND	POOR					13.6N 144.9E	91218
36	110700	23.5N 127.8E	LAND				20713 52814		26.2N 127.8E	47937
37	110735	23.4N 127.7E	LAND	FAIR					26.4N 127.8E	47935
38	110800	23.4N 127.8E	LAND				65/02 /////		24.3N 124.2E	47918
39	110800	23.6N 127.6E	LAND				3///3 5////		24.8N 125.3E	47927
40	110800	23.5N 127.7E	LAND				20613 52805		26.2N 127.8E	47937
41	110900	23.4N 127.5E	LAND				65/13 52716		24.3N 124.2E	47918
42	110900	23.5N 127.5E	LAND				20873 52508		24.8N 125.3E	47927
43	111000	23.4N 127.4E	LAND				65/13 53008		24.3N 124.2E	47918
44	111000	23.6N 127.4E	LAND				20723 53008		28.4N 125.3E	47927
45	111000	23.6N 127.5E	LAND				11174 72905		26.2N 127.8E	47937
46	111100	23.5N 127.4E	LAND				65/13 72809		24.3N 124.2E	47918
47	111100	23.6N 127.3E	LAND				20813 53005		28.4N 125.3E	47927
48	111100	23.7N 127.4E	LAND				10713 73006		26.2N 127.8E	47937
49	111130	23.7N 127.3E	LAND	FAIR					26.4N 127.8E	47935
50	111200	23.6N 127.2E	LAND				11717 52608		28.4N 125.3E	47927
51	111200	23.6N 127.2E	LAND				10702 73207		24.3N 124.2E	47918
52	111205	23.8N 127.2E	LAND	FAIR					26.4N 127.8E	47935
53	111235	23.8N 127.2E	LAND	FAIR					26.4N 127.8E	47935
54	111300	23.8N 127.2E	LAND				10713 53511		28.4N 125.3E	47927
55	111300	23.7N 127.2E	LAND				10712 73006		26.2N 127.8E	47937
56	111300	23.7N 127.2E	LAND				10712 73206		24.3N 124.2E	47918
57	111310	23.9N 127.1E	LAND	FAIR					26.4N 127.8E	47935
58	111400	23.8N 127.1E	LAND				10713 53305		28.4N 125.3E	47927
59	111400	23.8N 127.2E	LAND				10713 73105		26.2N 127.8E	47937
60	111400	23.7N 127.1E	LAND				10713 73207		24.3N 124.2E	47918
61	111500	24.0N 127.0E	LAND				11843 53314		28.4N 125.3E	47927
62	111500	24.0N 127.1E	LAND				10713 73207		26.2N 127.8E	47937
63	111500	23.9N 127.1E	LAND				10713 73406		24.3N 124.2E	47918
64	111600	24.2N 126.9E	LAND				11713 53214		28.4N 125.3E	47927
65	111600	24.2N 127.0E	LAND				20743 73410		26.2N 127.8E	47937
66	111600	24.1N 126.9E	LAND				10612 73311		24.3N 124.2E	47918
67	111700	24.3N 126.7E	LAND				10612 53015		28.4N 125.3E	47927
68	111700	24.3N 126.8E	LAND				20613 73311		26.2N 127.8E	47937
69	111700	24.3N 126.7E	LAND				10512 73215		24.3N 124.2E	47918
70	111800	24.4N 126.6E	LAND				20613 73112		26.2N 127.8E	47937
71	111900	24.3N 126.3E	LAND				12812 52506		28.4N 125.3E	47927
72	111900	24.3N 126.5E	LAND				20714 72716		26.2N 127.8E	47937
73	111900	24.3N 126.3E	LAND				55/42 72911		24.3N 124.2E	47918
74	112000	24.3N 126.3E	LAND				11712 52004		28.4N 125.3E	47927
75	112000	24.2N 126.4E	LAND				20712 72608		26.2N 127.8E	47937
76	112000	24.2N 126.3E	LAND				55/42 72613		24.3N 124.2E	47918
77	112100	24.3N 126.4E	LAND				10513 50505		28.4N 125.3E	47927
78	112100	24.3N 126.4E	LAND				10612 72102		24.3N 124.2E	47918
79	112200	24.5N 126.3E	LAND				10513 53312		28.4N 125.3E	47927
80	112200	24.5N 126.4E	LAND				20613 73106		26.2N 127.8E	47937

81	112200	24.5N	126.4E	LAND		11712 70104	24.3N	124.2E	47918
82	112300	24.7N	126.3E	LAND		10512 53511	28.4N	125.3E	47927
83	112300	24.6N	126.3E	LAND		20613 73509	26.2N	127.8E	47937
84	112300	24.6N	126.3E	LAND		12012 73507	24.3N	124.2E	47918
85	120100	24.9N	126.0E	LAND		20612 732//	24.3N	124.2E	47918
86	120100	24.9N	125.9E	LAND		11512 53013	28.4N	125.3E	47927
87	120100	24.9N	126.0E	LAND		20512 73210	26.2N	127.8E	47937
88	120110	25.0N	126.0E	LAND	FAIR		26.4N	127.8E	47935
89	120135	25.1N	125.9E	LAND	FAIR		26.4N	127.8E	47935
90	120200	24.9N	125.9E	LAND		20612 73100	26.2N	127.8E	47937
91	120200	25.0N	125.9E	LAND		21012 73111	24.3N	124.2E	47918
92	120200	25.0N	125.8E	LAND		12512 52908	28.4N	125.3E	47927
93	120300	25.0N	125.8E	LAND		10512 53504	28.4N	125.3E	47927
94	120300	25.0N	125.8E	LAND		21612 72907	24.3N	124.2E	47918
95	120400	25.0N	125.8E	LAND		10513 72704	26.2N	127.8E	47936
96	120400	25.0N	125.8E	LAND		10513 73104	24.3N	124.2E	47918
97	120400	25.1N	125.8E	LAND		10512 53604	28.4N	125.3E	47927
98	120500	25.0N	125.8E	LAND		10513 73204	26.2N	127.8E	47937
99	120500	25.1N	125.8E	LAND		20514 73404	24.3N	124.2E	47918
100	120700	25.4N	125.8E	LAND		20614 73508	24.3N	124.2E	47918
101	120700	25.6N	125.8E	LAND		11412 53512	28.4N	125.3E	47927
102	120700	25.4N	125.8E	LAND		10515 73608	26.2N	127.8E	47937
103	120800	25.6N	125.6E	LAND		12512 53008	28.4N	125.3E	47927
104	120800	25.5N	125.7E	LAND		20612 73511	26.2N	127.8E	47937
105	120900	25.6N	125.8E	LAND		5//42 73609	28.4N	125.3E	47927
106	120900	25.7N	125.7E	LAND		11002 73306	24.3N	124.2E	47918
107	120900	25.7N	125.6E	LAND		10412 53308	28.4N	125.3E	47927
108	120935	25.8N	125.8E	LAND	GOOD		26.4N	127.8E	47935
109	121000	25.9N	125.6E	LAND		10512 50308	28.4N	125.3E	47927
110	121000	25.7N	125.6E	LAND		10513 73407	26.2N	127.8E	47937
111	121000	25.7N	125.7E	LAND		21712 73306	24.3N	124.2E	47918
112	121010	25.8N	125.8E	LAND	GOOD		26.4N	127.8E	47935
113	121035	25.9N	125.8E	LAND	GOOD		26.4N	127.8E	47935
114	121100	25.8N	125.7E	LAND		11812 73305	24.3N	124.2E	47918
115	121100	25.9N	125.6E	LAND		10412 53504	28.4N	125.3E	47927
116	121100	25.8N	125.7E	LAND		10513 70105	26.2N	127.8E	47937
117	121110	26.0N	125.8E	LAND	GOOD		26.4N	127.8E	47935
118	121135	26.0N	125.7E	LAND	GOOD		26.4N	127.8E	47935
119	121200	25.9N	125.6E	LAND		10512 53305	28.4N	125.3E	47927
120	121200	26.0N	125.8E	LAND		45//2 70207	24.3N	124.2E	47918
121	121210	26.2N	125.7E	LAND	GOOD		26.4N	127.8E	47935
122	121235	26.1N	125.9E	LAND	GOOD		26.4N	127.8E	47935
123	121300	26.2N	125.7E	LAND		10512 50214	28.4N	125.3E	47927
124	121300	26.1N	125.7E	LAND		10554 70100	26.2N	127.8E	47937
125	121300	26.0N	125.7E	LAND		55//2 70105	24.3N	124.2E	47918
126	121335	26.3N	125.8E	LAND	GOOD		26.4N	127.8E	47935
127	121400	26.4N	125.7E	LAND		11512 53612	28.4N	125.3E	47927
128	121400	26.1N	125.7E	LAND		10434 70105	26.2N	127.8E	47937
129	121410	26.4N	125.8E	LAND	GOOD		26.4N	127.8E	47935
130	121435	26.5N	125.9E	LAND	GOOD		26.4N	127.8E	47935
131	121500	26.4N	125.7E	LAND		10412 53006	28.4N	125.3E	47927
132	121510	26.6N	125.8E	LAND	GOOD		26.4N	127.8E	47935
133	121535	26.6N	125.9E	LAND	GOOD		26.4N	127.8E	47935
134	121600	26.6N	125.8E	LAND		12513 50214	28.4N	125.3E	47927
135	121600	26.5N	125.7E	LAND		10512 73608	26.2N	127.8E	47937
136	121610	26.7N	125.9E	LAND	GOOD		26.4N	127.8E	47935
137	121635	26.7N	125.9E	LAND	GOOD		26.4N	127.8E	47935
138	121700	26.7N	125.7E	LAND		10413 53406	28.4N	125.3E	47927
139	121700	26.6N	126.0E	LAND		///// /////	26.2N	127.8E	47937
140	121710	26.8N	125.9E	LAND	GOOD		26.4N	127.8E	47935
141	121800	26.9N	125.9E	LAND		11613 50316	28.4N	125.3E	47927
142	122100	27.4N	126.1E	LAND		72742 50308	28.4N	125.3E	47927
143	122100	27.3N	125.9E	LAND		10612 70110	26.2N	127.8E	47937
144	122200	27.5N	126.0E	LAND		20412 70110	26.2N	127.8E	47937
145	130100	28.0N	126.3E	LAND		20562 70311	26.2N	127.8E	47937
146	130100	28.1N	126.5E	LAND		25/12 50416	28.4N	129.5E	47909
147	130200	28.2N	126.6E	LAND		55//2 50614	28.4N	129.5E	47909
148	130200	28.3N	126.5E	LAND		35//2 70315	26.2N	127.8E	47937
149	130300	28.4N	126.7E	LAND		55/12 50313	28.4N	129.5E	47909
150	130400	28.6N	126.9E	LAND		55112 50413	28.4N	129.5E	47909
151	130500	28.7N	127.0E	LAND		55/12 50310	28.4N	129.5E	47909
152	130700	29.2N	127.4E	LAND		25/02 50316	28.4N	129.5E	47909
153	130800	28.2N	127.6E	LAND		55/43 50613	28.4N	129.5E	47909
154	130900	29.3N	127.9E	LAND		55/12 50813	28.4N	129.5E	47909
155	131000	29.4N	128.0E	LAND		55/12 50613	28.4N	129.5E	47909
156	131100	29.6N	128.5E	LAND		55/12 50722	28.4N	129.5E	47909
157	131200	29.6N	128.5E	LAND		55/42 50411	28.4N	129.5E	47909
158	131300	29.8N	128.9E	LAND		55/42 50619	28.4N	129.5E	47909
159	131400	29.9N	129.1E	LAND		55/42 50713	28.4N	129.5E	47909
160	131400	29.9N	129.2E	LAND		5///1 50622	30.6N	131.0E	47869
161	131500	30.0N	129.5E	LAND		55/12 50719	28.4N	129.5E	47909
162	131500	30.1N	129.5E	LAND		5///1 50722	30.6N	131.0E	47869
163	131600	30.2N	129.8E	LAND		55/12 50622	28.4N	129.5E	47909
164	131600	30.1N	129.9E	LAND		5///1 50819	30.6N	131.0E	47869
165	131700	30.3N	130.2E	LAND		55/42 50819	28.4N	129.5E	47909
166	131700	30.3N	130.2E	LAND		5///1 50619	30.6N	131.0E	47869
167	131800	30.5N	130.4E	LAND		65/62 50619	28.4N	129.5E	47909
168	131800	30.3N	130.7E	LAND		5///1 50830	30.6N	131.0E	47869
169	131900	30.6N	130.9E	LAND		65/12 50827	28.4N	129.5E	47909
170	131900	30.5N	131.1E	LAND		22601 50622	30.6N	131.0E	47869
171	132000	30.8N	131.4E	LAND		65/62 50624	28.4N	129.5E	47909
172	132000	30.8N	131.3E	LAND		4//41 50522	30.6N	131.0E	47869
173	132100	31.0N	131.6E	LAND		65/42 50419	28.4N	129.5E	47909
174	132100	31.1N	131.9E	LAND		4///1 50627	30.6N	131.0E	47869
175	132200	31.2N	132.1E	LAND		65//2 4////	33.3N	134.2E	47899
176	132200	31.2N	132.1E	LAND		4///1 50616	30.6N	131.0E	47869
177	132300	31.3N	132.5E	LAND		65//2 50722	33.3N	134.2E	47899
178	132300	31.2N	132.7E	LAND		5///0 50827	30.6N	131.0E	47869
179	140100	31.5N	133.5E	LAND		65//1 50627	33.3N	134.2E	47899
180	140100	31.4N	133.5E	LAND		6///0 50716	30.6N	131.0E	47869
181	140200	31.7N	134.1E	LAND		65//1 50632	33.3N	134.2E	47899
182	140200	31.6N	134.1E	LAND		7//// 50735	30.6N	131.0E	47869
183	140300	31.8N	134.5E	LAND		65//1 50727	33.3N	134.2E	47899
184	140400	32.1N	135.0E	LAND		65//1 50632	33.3N	134.2E	47899
185	140400	31.9N	135.2E	LAND		6//// 50727	35.3N	138.7E	47639
186	140500	32.4N	135.6E	LAND		55//1 50632	33.3N	134.2E	47899
187	140500	32.1N	135.5E	LAND		401// 50622	35.3N	138.7E	47639
188	140700	32.8N	136.8E	LAND		65//1 50638	33.3N	134.2E	47899
189	140700	32.5N	136.8E	LAND		5591/ 70727	35.3N	138.7E	47639
190	140800	33.0N	137.4E	LAND		75/// 50632	33.3N	134.2E	47899
191	140800	32.9N	137.6E	LAND		55/// 70738	35.3N	138.7E	47639
192	140900	33.3N	138.2E	LAND		55/// 70638	35.3N	138.7E	47639
193	141000	33.7N	138.9E	LAND		65/// 70641	35.3N	138.7E	47639
194	141100	33.7N	139.6E	LAND		65/// 70738	35.3N	138.7E	47639
195	141200	33.7N	140.2E	LAND		65/// 70835	35.3N	138.7E	47639

TROPICAL STORM ALEX

BEST TRACK DATA

	BEST TRACK			WARNING			ERRORS		24 HOUR FORECAST			ERRORS		48 HOUR FORECAST			ERRORS		72 HOUR FORECAST				
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
100806Z	19.1	162.0	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100812Z	18.3	161.1	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100818Z	17.7	160.3	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100900Z	17.8	159.5	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100906Z	18.0	158.8	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100912Z	18.3	158.2	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
100918Z	18.6	157.4	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101000Z	19.1	155.9	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101006Z	19.4	154.8	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101012Z	20.0	153.7	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101018Z	20.7	152.6	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101100Z	21.4	151.3	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101106Z	22.3	150.3	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101112Z	22.6	149.1	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101118Z	22.6	147.7	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101200Z	23.2	146.6	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101206Z	23.9	145.3	30	23.6	145.0	30.	24.	0.	27.0	142.0	40.	96.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101212Z	24.6	144.1	30	24.2	144.5	30.	32.	0.	26.3	141.1	40.	157.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101218Z	25.4	142.8	30	25.4	143.0	30.	11.	0.	29.3	141.3	40.	42.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101300Z	26.2	141.7	30	26.8	141.3	30.	42.	0.	32.5	140.5	45.	175.	20.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101306Z	27.2	140.2	35	27.2	140.6	35.	21.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101312Z	28.7	139.9	30	28.2	139.8	35.	30.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101318Z	30.6	141.4	30	30.3	141.7	30.	24.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
101400Z	33.7	143.7	25	33.1	143.4	25.	39.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	28.	118.	0.	0.	0.	0.	0.	0.
AVG RIGHT ANGLE ERROR	17.	46.	0.	0.	0.	0.	0.	0.
AVG INTENSITY MAGNITUDE ERROR	1.	11.	0.	0.	0.	0.	0.	0.
AVG INTENSITY BIAS	1.	11.	0.	0.	0.	0.	0.	0.
NUMBER OF FORECASTS	8	4	0	0	0	0	0	0

DISTANCE TRAVELED BY STORM IS 1844. NM

AVERAGE SPEED OF STORM IS 13. KNOTS

TROPICAL STORM ALEX
FIX POSITIONS FOR CYCLONE NO. 24

SATELLITE FIXES

	FIX NO.	TIME (Z)	FIX POSITION		ACCRY	DVORAK CODE	SATELLITE	COMMENTS	SITE
	1	080841	19.4N	161.7E	PCN 6		NOAA6		PGTW
*	2	081600	19.7N	160.4E	PCN 0		OTHER		PGTW
	3	082121	18.1N	159.4E	PCN 5	T1.0/1.0	NOAA6	INIT OBS	PGTW
	4	090300	18.4N	159.1E	PCN 0		OTHER		PGTW
	5	091200	18.7N	158.1E	PCN 0		OTHER		PGTW
	6	091600	18.7N	157.6E	PCN 0		OTHER		PGTW
	7	092058	18.8N	156.1E	PCN 5	T1.5/1.5 /D0.5/24HRS	NOAA6		PGTW
	8	100938	19.6N	153.8E	PCN 5		NOAA6	ULCC 20.9 155.1	PGTW
*	9	102217	22.5N	153.1E	PCN 5	T1.5/1.5 /S0.0/24HRS	NOAA6	UL ONLY	PGTW
	10	110915	22.7N	150.0E	PCN 5		NOAA6		PGTW
	11	111200	23.1N	149.6E	PCN 0		OTHER		PGTW
	12	112155	23.1N	147.4E	PCN 5	T2.0/2.0 /D0.5/24HRS	NOAA6		PGTW
	13	120600	24.6N	145.6E	PCN 0		OTHER		PGTW
	14	120853	24.5N	145.0E	PCN 5		NOAA6		PGTW
	15	120900	24.6N	145.0E	PCN 0		OTHER		PGTW
	16	122100	26.2N	141.8E	PCN 0		OTHER		PGTW
	17	122314	26.2N	141.3E	PCN 5	T2.0/2.0+/S0.0/24HRS	NOAA6		PGTW
	18	130900	27.6N	139.7E	PCN 0		OTHER		PGTW
	19	131600	29.9N	140.9E	PCN 0		OTHER		PGTW
	20	132100	31.8N	142.4E	PCN 0		OTHER		PGTW
	21	132251	32.9N	143.0E	PCN 5	T2.5/2.5-/D0.5/24HRS	NOAA6		PGTW
	22	140000	33.6N	143.5E	PCN 0		OTHER		PGTW
	23	140300	35.5N	145.5E	PCN 0		OTHER		PGTW
	24	140900	38.3N	150.1E	PCN 0		OTHER		PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE ORIEN- DIAM/TATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	100546	19.4N 154.6E	1500FT		1009	25 050 75	170 25 060 70	3 10			+20 +24 +23 28	1
2	110303	21.9N 150.8E	1500FT		1006	15 070 45	020 15 270 25	8 5			+23 +24 +24 28	2
3	120014	23.3N 146.3E	1500FT		1004	40 030 60	110 51 030 60	5 2			+24 +24 +23 29	3
4	121520	25.1N 143.3E	700MB	3081	1000		080 47 360 20	10 5			+12 +16 +11	5
5	130108	26.2N 141.3E	700MB	3109		35 110 60	160 46 060 15	3 3				6
6	130414	26.9N 140.7E	700MB	3098	999	35 350 10	120 33 360 15	5 3			+15 +17 +10	6

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TYPHOON BETTY

BEST TRACK DATA

	BEST TRACK			WARNING			ERRORS		24 HOUR FORECAST			ERRORS		48 HOUR FORECAST			ERRORS		72 HOUR FORECAST				
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
102812Z	7.1	151.3	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
102818Z	7.3	152.7	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
102900Z	7.8	153.8	30	8.2	152.9	35.	58.	5.	10.2	149.0	60.	103.	10.	11.8	144.5	70.	117.	-5.	13.2	139.5	80.	197.	-15.
102906Z	8.9	154.2	30	8.9	154.1	35.	6.	5.	11.2	153.2	60.	242.	5.	12.2	149.2	70.	479.	-10.	13.0	144.5	50.	579.	-15.
102912Z	9.9	153.4	35	9.6	153.2	40.	21.	5.	11.9	149.4	60.	130.	0.	12.7	146.2	75.	401.	-10.	13.4	142.6	80.	554.	-10.
102918Z	10.4	152.1	45	10.8	152.0	50.	25.	5.	12.9	147.1	70.	116.	0.	13.6	142.5	85.	274.	-5.	15.8	138.8	90.	397.	-5.
103000Z	10.9	150.6	50	10.6	151.5	50.	56.	0.	12.2	146.8	70.	224.	-5.	14.0	142.0	85.	336.	-10.	16.4	137.5	90.	375.	-5.
103006Z	11.7	149.1	55	11.0	149.2	60.	8.	5.	13.3	143.1	80.	118.	0.	14.7	137.2	85.	153.	-10.	17.0	131.5	90.	146.	-10.
103012Z	12.2	147.2	60	12.4	147.5	60.	21.	0.	13.8	141.3	80.	110.	-5.	15.2	135.7	85.	150.	-5.	18.0	130.5	90.	192.	-15.
103018Z	12.9	145.1	70	12.8	145.7	65.	35.	-5.	14.2	138.9	80.	65.	-10.	16.5	132.8	90.	117.	-5.	20.0	128.2	95.	317.	-10.
103100Z	13.2	143.1	75	13.3	143.5	70.	24.	-5.	15.3	136.4	95.	79.	0.	18.5	130.9	115.	222.	20.	23.5	129.0	105.	550.	-5.
103106Z	13.6	141.1	80	13.6	141.7	80.	35.	0.	16.4	133.9	100.	137.	5.	21.1	129.0	120.	377.	20.	26.2	131.2	110.	749.	0.
103112Z	13.8	139.4	85	14.1	139.3	85.	19.	0.	17.3	132.2	105.	101.	15.	22.2	128.8	115.	431.	10.	27.8	134.2	105.	902.	-10.
103118Z	14.0	137.8	90	13.8	137.5	85.	21.	-5.	15.2	130.3	110.	103.	15.	17.1	125.0	125.	252.	20.	21.0	122.2	120.	434.	0.
110100Z	14.0	136.2	95	14.3	136.3	90.	19.	-5.	15.8	129.8	115.	100.	20.	19.2	125.1	130.	344.	20.	23.3	127.3	115.	527.	-5.
110106Z	14.2	134.6	95	14.1	134.6	90.	6.	-5.	15.8	128.6	115.	107.	15.	19.5	125.0	110.	343.	0.	23.2	127.1	100.	515.	-25.
110112Z	14.4	133.1	90	14.2	132.5	90.	37.	0.	16.6	126.4	100.	192.	-5.	20.8	125.5	95.	388.	-20.	24.7	133.0	85.	780.	-35.
110118Z	14.7	132.0	95	14.8	131.8	85.	13.	-10.	17.2	126.8	80.	182.	-25.	21.6	127.7	75.	432.	-45.	25.3	135.2	60.	940.	-45.
110200Z	14.8	131.2	95	15.0	130.4	85.	48.	-10.	17.6	126.6	80.	221.	-30.	21.6	127.7	75.	430.	-45.	25.8	136.0	50.	1056.	-15.
110206Z	14.9	130.2	100	14.9	130.3	100.	6.	0.	16.8	127.1	80.	156.	-30.	19.6	126.6	70.	294.	-55.	22.9	129.7	60.	605.	10.
110212Z	15.0	129.3	105	15.2	129.4	100.	13.	-5.	16.8	126.2	90.	146.	-25.	19.0	124.8	80.	223.	-40.	22.7	128.2	60.	504.	15.
110218Z	14.7	128.6	105	15.2	128.5	105.	30.	0.	16.7	125.3	100.	129.	-20.	18.9	124.2	80.	228.	-25.	22.6	127.5	60.	435.	15.
110300Z	14.2	128.1	110	14.2	128.1	110.	0.	0.	15.2	127.9	115.	100.	-5.	16.6	125.2	105.	253.	40.	18.8	124.2	95.	203.	50.
110306Z	14.2	127.3	110	14.4	127.7	110.	26.	0.	15.9	126.0	115.	139.	-10.	17.8	124.3	105.	207.	55.	20.0	124.4	95.	103.	50.
110312Z	14.4	126.7	115	14.7	126.6	115.	19.	0.	16.0	123.6	110.	47.	-10.	18.3	121.4	50.	51.	5.	21.4	122.0	60.	13.	15.
110318Z	14.6	125.8	120	14.6	126.0	115.	12.	-5.	15.3	123.1	110.	96.	5.	17.8	121.2	50.	90.	5.	20.8	121.8	65.	127.	25.
110400Z	14.8	124.8	120	14.6	124.9	115.	13.	-5.	15.4	120.9	70.	54.	5.	17.2	117.2	80.	260.	35.	20.3	115.2	65.	560.	25.
110406Z	15.2	123.7	125	14.9	123.5	120.	21.	-5.	16.3	119.1	75.	109.	25.	18.2	115.3	85.	362.	40.	21.0	112.2	65.	813.	30.
110412Z	15.8	122.8	120	14.7	122.5	120.	60.	0.	17.2	118.3	80.	141.	35.	19.5	114.5	85.	447.	40.	22.2	112.4	50.	918.	15.
110418Z	16.0	121.6	105	16.0	121.2	100.	23.	-5.	17.4	117.2	85.	221.	40.	19.9	114.0	85.	539.	45.	23.3	111.9	40.	1086.	5.
110500Z	16.3	120.8	65	16.3	120.5	65.	17.	0.	17.9	116.4	80.	276.	35.	20.8	113.3	65.	651.	25.	0.0	0.0	0.	-0.	0.
110506Z	17.3	120.7	50	17.7	120.7	40.	24.	-10.	22.0	121.0	20.	84.	-25.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110512Z	18.3	120.5	45	18.5	120.3	45.	16.	0.	21.0	120.0	30.	126.	-15.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110518Z	19.2	120.6	45	19.6	120.9	45.	29.	0.	23.8	123.6	20.	85.	-20.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110600Z	19.9	120.8	45	19.4	120.7	45.	30.	0.	22.2	122.1	45.	163.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110606Z	20.6	121.2	45	20.6	121.3	40.	6.	-5.	24.4	125.4	25.	60.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110612Z	21.5	122.2	45	21.6	122.4	35.	13.	-10.	25.6	128.4	25.	22.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110618Z	22.4	123.3	40	22.5	123.6	25.	18.	-15.	27.0	132.8	25.	64.	-10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110700Z	23.5	124.7	40	23.5	125.1	40.	22.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110706Z	24.4	126.5	35	24.6	126.3	40.	16.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110712Z	25.6	128.8	35	25.3	128.5	35.	24.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110718Z	26.9	131.6	35	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	23.	131.	306.	524.	23.	131.	306.	524.
AVG RIGHT ANGLE ERROR	14.	81.	215.	405.	14.	81.	215.	405.
AVG INTENSITY MAGNITUDE ERROR	4.	14.	23.	17.	4.	14.	23.	17.
AVG INTENSITY BIAS	-2.	-1.	3.	1.	0.	-1.	3.	1.
NUMBER OF FORECASTS	39	36	29	28	37	36	29	28

DISTANCE TRAVELED BY STORM IS 3228. NM

AVERAGE SPEED OF STORM IS 13. KNOTS

TYPHOON BETTY
FIX POSITIONS FOR CYCLONE NO. 25

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	SATELLITE	COMMENTS	SITE
1	261200	6.6N 151.3E	PCN 0		OTHER		PGTW
2	262122	4.6N 152.8E	PCN 5		NOAA6		PGTW
3	271001	4.5N 151.9E	PCN 5		NOAA6		PGTW
4	280939	6.4N 151.2E	PCN 5		NOAA6		PGTW
5	281200	7.5N 150.9E	PCN 0		OTHER		PGTW
6	281600	7.0N 150.8E	PCN 0		OTHER		PGTW
7	282218	7.1N 153.1E	PCN 5		NOAA6		PGTW
8	290000	7.5N 152.6E	PCN 0	T2.5/2.5	OTHER	INIT OBS	PGTW
9	290300	8.3N 153.1E	PCN 0		OTHER		PGTW
10	290916	9.4N 153.7E	PCN 5		NOAA6		PGTW
11	291200	9.8N 153.5E	PCN 0		OTHER		PGTW
12	291600	10.0N 152.2E	PCN 0		OTHER		PGTW
13	292023	10.9N 150.9E	PCN 6		DMSP37		PGTW
14	292100	11.1N 150.4E	PCN 0		OTHER		PGTW
15	292156	10.7N 151.1E	PCN 5	T3.5/3.5 /D1.0/22HRS	NOAA6		PGTW
16	300000	11.2N 150.7E	PCN 0		OTHER		PGTW
17	300300	11.0N 150.1E	PCN 0		OTHER		PGTW
18	300515	11.5N 149.5E	PCN 5		TIROSN		PGTW
19	300600	12.4N 148.8E	PCN 0		OTHER		PGTW
20	300854	11.6N 148.3E	PCN 5		NOAA6		PGTW
21	301800	13.0N 145.3E	PCN 6		TIROSN		PGTW
22	302100	12.8N 143.7E	PCN 0		OTHER		PGTW
23	302133	12.8N 144.2E	PCN 5	T4.5/4.5 /D1.0/24HRS	NOAA6		PGTW
24	310300	13.7N 142.3E	PCN 0		OTHER		PGTW
25	310900	13.8N 140.3E	PCN C		OTHER		PGTW
26	311013	13.9N 139.8E	PCN 3		NOAA6		PGTW
27	311200	13.6N 138.8E	PCN 0		OTHER		PGTW
28	311600	14.3N 138.2E	PCN 0		OTHER		PGTW
29	312121	13.6N 136.8E	PCN 3		DMSP37		PGTW

30	312252	13.6N 136.3E	PCN 3	T5.5/5.5 /D1.0/25HRS	NOAA6		PGTW
31	312252	13.7N 136.6E	PCN 5		NOAA6		RPMK
32	010300	14.0N 135.6E	PCN 0		OTHER		PGTW
33	010900	14.1N 133.3E	PCN 0		OTHER		PGTW
34	010950	14.1N 133.4E	PCN 5		NOAA6		PGTW
35	011200	14.5N 132.9E	PCN 0		OTHER		PGTW
36	011600	14.2N 132.3E	PCN 0		OTHER		PGTW
37	011919	14.5N 131.6E	PCN 5		TIROSN		PGTW
38	011919	14.4N 131.4E	PCN 5		TIROSN		RPMK
39	012230	14.7N 131.3E	PCN 3	T5.0/5.5 /W0.5/24HRS	NOAA6		PGTW
40	020300	14.8N 130.3E	PCN 0		OTHER		PGTW
41	020600	15.2N 130.3E	PCN 0		OTHER		PGTW
42	020900	15.0N 129.7E	PCN 0		OTHER		PGTW
43	021109	15.1N 129.4E	PCN 5		NOAA6		PGTW
44	021200	15.2N 129.1E	PCN 0		OTHER		PGTW
45	022100	14.8N 128.2E	PCN 0		OTHER		PGTW
46	030000	14.4N 127.9E	PCN C	T6.0/6.0 /D1.0/25HRS	OTHER		PGTW
47	030300	14.3N 127.9E	PCN E		OTHER		PGTW
48	030900	14.5N 127.1E	PCN E		OTHER		PGTW
49	031047	14.6N 127.0E	PCN 1		NOAA6		PGTW
50	031200	14.5N 126.7E	PCN E		OTHER		PGTW
51	032100	14.5N 125.2E	PCN E		OTHER		PGTW
52	032150	14.6N 125.0E	PCN 1		DMSP37		PGTW
53	032326	14.6N 124.9E	PCN 1	T6.5/6.5 /D0.5/24HRS	NOAA6		PGTW
54	040300	14.8N 124.2E	PCN E		OTHER		PGTW
55	040900	15.4N 123.2E	PCN E		OTHER		PGTW
56	041010	15.5N 122.3E	PCN 6		NOAA6		RODN
57	041024	15.6N 123.2E	PCN E		NOAA6		PGTW
58	041200	15.7N 122.6E	PCN E		OTHER		PGTW
59	041600	15.9N 121.6E	PCN E		OTHER		PGTW
60	042100	16.1N 120.9E	PCN 0		OTHER		PGTW
61	042304	16.0N 120.6E	PCN 5	T5.0/6.0 /W1.5/24HRS	NOAA6		PGTW
62	050000	16.3N 120.7E	PCN 0		OTHER		PGTW
63	050300	16.8N 120.9E	PCN 0		OTHER		PGTW
64	050900	17.6N 120.4E	PCN 0		OTHER		PGTW
65	051137	18.1N 120.7E	PCN 6		NOAA6		RODN
66	051200	17.7N 120.2E	PCN 0		OTHER		PGTW
67	052100	18.9N 120.7E	PCN 0		OTHER		PGTW
68	060000	19.5N 121.2E	PCN 0	T3.0/4.0+/W2.0/25HRS	OTHER		PGTW
* 69	060022	19.1N 119.3E	PCN 3	T2.5/2.5	NOAA6	INIT OBS	RPMK
70	060300	20.2N 120.9E	PCN 0		OTHER		PGTW
71	060900	21.1N 121.0E	PCN 0		OTHER		PGTW
72	061115	20.9N 121.5E	PCN 6		NOAA6		RODN
73	061120	21.2N 121.7E	PCN 5		NOAA6		PGTW
74	062100	20.6N 123.5E	PCN 0		OTHER		PGTW
75	070000	22.0N 124.6E	PCN 5	T3.0/3.0	NOAA6	INIT OBS	RKSO
76	070000	23.6N 124.5E	PCN 0	T2.0/3.0 /W1.0/24HRS	OTHER		PGTW
77	070900	24.7N 127.4E	PCN 0		OTHER		PGTW
78	071050	25.5N 128.4E	PCN 5		NOAA6		PGTW
79	071200	25.8N 128.7E	PCN 0		OTHER		PGTW
80	071600	26.8N 130.2E	PCN 0		OTHER		PGTW
81	072337	27.9N 134.1E	PCN 5	T1.0/2.0 /W1.0/24HRS	NOAA6		PGTW
82	080000	27.8N 135.5E	PCN 0		OTHER		PGTW
83	080300	28.0N 137.6E	PCN 0		OTHER		PGTW
84	080600	28.8N 140.2E	PCN 0		OTHER		PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE DIAM/ORIENTATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	290451	8.7N 154.2E	1500FT		1001	30 290 120	320 30 290 120	6 8			+25 +25 +24 29	1
2	291526	10.5N 152.6E	700MB	3009	994		140 28 020 20	3 5			+11 +12	2
3	292112	10.3N 151.8E	700MB	3024	993	35 270 10	360 33 270 60	5 5			+11 +13 +12	3
4	300042	11.0N 150.5E	700MB	3024		40 100 20	200 54 110 30	5 6				3
5	300253	11.4N 150.1E	700MB	2999	991	50 070 10	150 84 060 30	5 5			+12 +13 +11	3
6	300833	11.8N 148.5E	700MB	2994	988	35 300 90	050 49 290 60	8 5			+10 +14 +10	4
7	301132	12.1N 147.5E	700MB	2977			130 72 070 20	5 3			+14 +11	4
8	301309	12.4N 146.0E	700MB	2942	981		150 79 070 15	5 3			+12 +15 +13	4
9	311305	13.7N 139.0E	700MB	2771			350 56 280 10	5 2				5
10	311448	13.7N 138.6E	700MB	2760	959		020 96 290 40	10 2			+13 +19 +12	5
11	311834	14.0N 137.8E	700MB	2736			360 57 280 75	5 1				6
12	312128	14.1N 137.0E	700MB		960	100 350 20	080 80 300 20	5 1			+17 +18 +11	6
13	010033	13.9N 136.1E	700MB	2759	962	110 350 17	170 68 070 55	5 1			+13 +18 +13	6
14	011459	14.7N 132.6E	700MB	2798			050 94 320 10	6 5			+11 +17	8
15	020029	14.7N 131.0E	700MB	2749		120 270 20	010 109 270 20	4 3			+11 +21	9
16	020306	14.9N 130.7E	700MB	2734	956	120 090 40	150 112 080 15	4 3			+18 +21 +11	9
17	021131	15.0N 129.6E	700MB				140 63 060 25	5 2			+12 +18	10
18	021404	15.0N 129.0E	700MB		959		350 68 280 70	5 2	ELLIPTICAL	19 10 350	+16 +19 +12	10
19	030026	14.1N 128.1E	700MB	2702		60 290 110	020 87 310 60	8 5			+12 +17	11
20	030302	14.2N 127.9E	700MB	2659	948	80 150 15	230 69 150 20	5 3	CIRCULAR	35	+16 +17 +14	11
21	030544	14.3N 127.6E	700MB	2603		45 330 100	030 90 310 15	8 3	CIRCULAR	30	+15 +17 +12	11
22	031200	14.4N 126.7E	700MB	2474			350 100 270 35	7 1	CIRCULAR	35		12
23	031429	14.4N 126.4E	700MB	2458	928		280 113 210 30	7 1	CIRCULAR	30	+12 +22 +11	12
24	032200	14.6N 125.3E	700MB	2441	926	60 270 10	360 105 270 20	5 5	CIRCULAR	35	+14 +19 +13	13
25	040150	14.8N 124.5E	700MB			130 040 10	170 112 080 14	5 5	CIRCULAR	35		13
26	040340	14.9N 124.1E	700MB	2475	928	130 010 16	030 120 310 22	3 2	CIRCULAR	35	+17 +18 +15	13
27	040851	15.5N 123.1E	700MB	2459	928		320 76 180 25	5 3	CONCENTRIC	25 30	+11 +15 +15	14
28	041106	15.7N 122.8E	700MB	2482				5 3	CIRCULAR	25	+15 +15	14
29	050040	17.9N 120.3E	700MB	2967	987	45 300 30	360 39 280 80	2 10			+12 +11 + 7	15
30	051317	18.8N 120.7E	700MB	3000			130 55 030 110	5 3				16
31	051550	19.2N 120.8E	700MB	2997	988		340 36 240 90	5 3			+14 +14 +10	16
32	060335	20.2N 121.1E	700MB	2999	990	30 040 100	130 39 040 180	5 5			+ 8 +12 +11	17
33	061322	21.9N 122.4E	700MB	3011			320 75 220 100	2 5				18
34	061555	22.1N 123.1E	700MB	3017	993		130 56 030 70	2 5			+12 +12 + 8	19
35	070135	23.8N 125.2E	700MB	3032		40 040 10	330 60 230 80	2 2				19
36	070400	24.2N 125.7E	700MB	3026	994	40 360 15	020 30 300 60	5 2			+14 +15 +10	19

RADAR FIXES

FIX NO.	TIME (Z)	FIX POSITION	RADAR	ACCRY	EYE SHAPE	EYE DIAM	RADOB-CODE ASWAR TDDFF	COMMENTS	RADAR POSITION	SITE WMO NO.
1	032100	14.7N 125.6E	LAND				3//// 52720	/999/	14.1N 123.0E	98440
2	032200	14.8N 125.4E	LAND				35//3 52717	/////	14.1N 123.0E	98440
3	032300	14.8N 125.2E	LAND				20/34 52725	///// /999/	14.1N 123.0E	98440
4	040000	14.8N 125.1E	LAND				20/44 73005	///// /999/	14.1N 123.0E	98440
5	040100	14.8N 124.9E	LAND				20/34 53407	///// /999/	14.1N 123.0E	98440
6	040200	14.9N 124.7E	LAND				20/14 53019	///// /999/	14.1N 123.0E	98440
7	040200	16.2N 121.4E	LAND				45/// 43205		16.3N 120.6E	98321
8	040300	15.1N 124.5E	LAND				10/95 53214	///// /999/	14.1N 123.0E	98440
9	040500	15.2N 124.1E	LAND				10/15 53100	///// /999/	14.1N 123.0E	98440
10	040700	15.5N 123.7E	LAND				10326 53113	///// /999/	14.1N 123.0E	89440
11	040700	15.4N 123.8E	LAND				1085/ 53006	EYE CI DIA 25NM	16.3N 120.6E	98321
12	040800	15.6N 123.5E	LAND				10434 53219	///// /999/	14.1N 123.0E	98440
13	040900	15.8N 123.3E	LAND				10324 53214	///// /999/	14.1N 123.0E	30440
14	040900	15.7N 123.4E	LAND				1198/ 53110	EYE EL DIA 20NM		98431
15	041200	16.1N 122.7E	LAND				1083/ 52910	EYE 90 PCT CIR OPEN NE DIA 27NM	16.3N 120.6E	98321
16	041300	16.2N 122.6E	LAND				1081/ 53406	EYE 90 PCT CIR OPEN NE DIA 27NM	16.3N 120.6E	98321
17	041300	16.2N 122.5E	LAND				1093/ /////	/999/	16.3N 120.6E	98321
18	041400	16.2N 122.4E	LAND				1070/ 52815	EYE 100 PCT CIR DIA 19NM	16.3N 120.6E	98321
19	041400	16.3N 122.3E	LAND				1083/ 43012	EYE 100 PCT CIR DIA 22NM	16.3N 120.6E	98321
20	041400	16.8N 122.1E	LAND				35502 /////	/9999/	16.3N 120.6E	98321
21	041600	16.2N 122.1E	LAND				1068/ 52815	EYE 100 PCT CIR DIA 17NM	16.3N 120.6E	98321
22	041600	16.2N 122.0E	LAND				1052/ 42706	EYE 100 PCT CIR DIA 17NM	16.3N 120.6E	98321
23	041600	16.1N 121.9E	LAND				1042/ 52512	EYE 100 PCT CIR DIA 13NM	16.3N 120.6E	98321
24	041700	16.0N 121.7E	LAND				1114/ 52410	EYE EL DIA 5NM	16.3N 120.6E	98321
25	041800	16.1N 121.6E	LAND				35/// 43605	EYE ILL DEFINED	16.3N 120.6E	98321
26	041900	16.1N 121.4E	LAND				45/// 52910		16.3N 120.6E	98321
27	050200	19.2N 120.1E	LAND				4//// /////		16.3N 120.6E	98321
28	050800	17.7N 120.8E	LAND				35556 632//	EYE OPEN NW		98231
29	051600	18.9N 120.1E	LAND				2290/ /////	EYE 50 PCT EL OPEN SW TO SSW	16.3N 120.6E	98321
30	051600	19.2N 119.9E	LAND				42/// 6////		16.3N 120.6E	98321
31	060000	19.1N 120.1E	LAND				4//// /////		16.3N 120.6E	98321
32	060200	19.7N 120.2E	LAND				4//// 40312		16.3N 120.6E	98321
33	060500	19.9N 120.9E	LAND				40000 4////		16.3N 120.6E	98321
34	060600	20.0N 120.4E	LAND				4//// 43605		16.3N 120.6E	98321
35	060700	20.0N 121.0E	LAND				35642 50637			98231
36	062100	23.4N 124.8E	LAND				6///3 43622		24.8N 125.3E	47927
37	062200	23.7N 125.0E	LAND				6//// 50419		24.8N 125.3E	47927
38	070700	24.8N 127.1E	LAND				65/32 50624		26.2N 127.8E	47937
39	070800	24.6N 127.3E	LAND				65912 51511		26.2N 127.8E	47937
40	071000	25.1N 128.1E	LAND				/5//2 70716		26.2N 127.8E	47937
41	071100	25.2N 128.6E	LAND				/5//2 70626		26.2N 127.8E	47937
42	071200	25.4N 128.9E	LAND				65/12 70723		26.2E 127.8E	47937
43	071300	25.4N 129.2E	LAND				65/12 70722		26.2N 127.8E	47937
44	071600	25.9N 130.6E	LAND				65//2 5////		28.4N 129.5E	47909
45	071800	26.6N 131.6E	LAND				65//1 5////		28.4N 129.5E	47909
46	071900	26.7N 132.0E	LAND				65//2 50624		28.4N 129.5E	47909

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TROPICAL STORM CARY

BEST TRACK DATA

	BEST TRACK			WARNING			ERRORS		24 HOUR FORECAST			ERRORS		48 HOUR FORECAST			ERRORS		72 HOUR FORECAST			ERRORS	
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
102818Z	13.0	124.5	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
102900Z	13.8	122.5	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
102906Z	14.5	121.0	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
102912Z	15.1	119.4	30	14.8	120.0	25.	39.	-5.	16.3	115.2	50.	38.	15.	18.5	111.2	55.	260.	20.	20.4	107.7	45.	457.	15.
102918Z	15.7	118.0	35	15.5	118.3	40.	21.	5.	17.3	113.6	50.	120.	15.	19.1	110.1	45.	311.	10.	21.1	107.2	40.	532.	15.
103000Z	16.1	117.0	35	16.2	117.0	40.	6.	5.	19.0	113.2	50.	220.	15.	21.3	112.4	45.	401.	10.	25.2	115.7	20.	909.	0.
103006Z	16.3	116.2	35	16.8	115.7	50.	41.	15.	19.8	112.9	60.	277.	25.	22.0	112.3	50.	489.	20.	0.0	0.0	0.	-0.	0.
103012Z	16.3	115.6	35	17.8	114.7	50.	103.	15.	21.2	112.4	55.	388.	20.	23.6	113.2	50.	651.	20.	0.0	0.0	0.	-0.	0.
103018Z	16.0	115.2	35	16.5	114.9	40.	34.	5.	17.6	112.1	35.	101.	0.	18.7	109.4	30.	376.	5.	0.0	0.0	0.	-0.	0.
103100Z	15.6	114.7	35	16.9	114.2	45.	83.	10.	18.2	111.4	40.	210.	5.	19.5	108.9	30.	456.	10.	0.0	0.0	0.	-0.	0.
103106Z	15.3	114.1	35	15.6	114.3	45.	21.	10.	15.8	112.2	40.	130.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
103112Z	14.8	113.6	35	15.2	113.2	45.	33.	10.	14.8	109.8	30.	103.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
103118Z	14.7	113.0	35	14.7	112.4	35.	35.	0.	14.5	107.6	20.	156.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110100Z	14.6	112.0	35	14.3	112.7	35.	44.	0.	14.0	109.5	30.	146.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110106Z	13.9	111.1	30	14.5	111.0	35.	36.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110112Z	13.1	110.1	30	13.6	110.3	30.	32.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110118Z	12.4	109.2	25	12.5	109.2	25.	6.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
110200Z	11.9	108.2	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	38.	180.	421.	630.	0.	0.	0.	0.
AVG RIGHT ANGLE ERROR	27.	158.	358.	540.	0.	0.	0.	0.
AVG INTENSITY MAGNITUDE ERROR	6.	11.	14.	10.	0.	0.	0.	0.
AVG INTENSITY BIAS	5.	10.	14.	10.	0.	0.	0.	0.
NUMBER OF FORECASTS	14	11	7	3	0	0	0	0

DISTANCE TRAVELED BY STORM IS 1068. NM

AVERAGE SPEED OF STORM IS 10. KNOTS

TROPICAL STORM CARY
FIX POSITIONS FOR CYCLONE NO. 26

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	SATELLITE	COMMENTS	SITE
* 1	281120	11.4N 124.6E	PCN 5		NOAA6		PGTW
* 2	282359	14.7N 120.6E	PCN 5		NOAA6		RPMK
3	290000	15.0N 121.1E	PCN 0		OTHER		PGTW
4	291058	15.4N 118.6E	PCN 5		NOAA6		PGTW
5	291600	15.7N 118.7E	PCN 0		OTHER		PGTW
6	291954	16.9N 117.5E	PCN 6		TIROSN		PGTW
7	292100	17.2N 116.7E	PCN 0		OTHER		PGTW
8	292337	16.1N 116.5E	PCN 5	T2.5/2.5	NOAA6	INIT OBS	PGTW
9	300000	16.5N 116.2E	PCN 0		OTHER		PGTW
10	300300	16.8N 116.3E	PCN 0		OTHER		PGTW
11	300900	12.0N 116.2E	PCN 0		OTHER		PGTW
12	301211	17.7N 114.5E	PCN 5		NOAA6		RODN
13	301600	17.7N 114.5E	PCN 0		OTHER		PGTW
14	301942	16.9N 114.8E	PCN 5		TIROSN	2ND CC 184N 1181E	RPMK
15	301942	16.7N 115.1E	PCN 5		TIROSN		PGTW
16	310300	15.4N 114.7E	PCN 0		OTHER		PGTW
17	310600	15.4N 113.7E	PCN 0		OTHER		PGTW
18	310827	15.0N 114.8E	PCN 5		TIROSN	PRTLY EXPSD LLCC	RPMK
19	310900	15.0N 113.6E	PCN 0		OTHER		PGTW
20	311200	14.5N 113.6E	PCN 0		OTHER		PGTW
21	311600	14.4N 114.1E	PCN 0		OTHER		PGTW
22	312100	14.7N 112.1E	PCN 0		OTHER		PGTW
23	312112	14.5N 113.3E	PCN 6		TIROSN		RPMK
24	010033	14.7N 112.0E	PCN 5	T3.0/3.0	NOAA6	INIT OBS	RPMK
25	010300	14.6N 111.6E	PCN 0		OTHER		PGTW
26	010815	13.5N 110.5E	PCN 5		TIROSN		RPMK
27	010900	13.6N 111.2E	PCN 0		OTHER		PGTW
28	011131	13.2N 110.1E	PCN 5		NOAA6		RODN
29	011200	13.1N 109.7E	PCN 0		OTHER		PGTW
30	011600	12.6N 109.7E	PCN 0		OTHER		PGTW
31	012101	11.5N 108.9E	PCN 5		TIROSN		RPMK

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE DIAM/ORIENTATION	EYE TEMP (C) OUT/	IN/	DP/	SST	MSN NO.
1	260534	7.8N 136.4E	1500FT		1007	25 090 70	070 28 330 85	8 8			+24	+24	+23	20	1
2	292354	16.1N 117.0E	1500FT		998	030 090 090	200 035 120 035	5 1			+25	+26		29	1
3	301405	16.1N 115.5E	700MB	3050	1001		090 039 020 060	5 5				+14	+10		2

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TYPHOON DINAH

BEST TRACK DATA

MO/DA/HR	BEST TRACK POSIT		BEST TRACK WIND	WARNING POSIT		WARNING WIND	WARNING ERRORS DST	WARNING ERRORS WIND	24 HOUR FORECAST POSIT		24 HOUR WIND	24 HOUR ERRORS DST	24 HOUR ERRORS WIND	48 HOUR FORECAST POSIT		48 HOUR WIND	48 HOUR ERRORS DST	48 HOUR ERRORS WIND	72 HOUR FORECAST POSIT		72 HOUR WIND	72 HOUR DST	72 HOUR WIND
111806Z	4.3	180.1	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111812Z	3.8	177.5	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111818Z	2.8	175.7	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111900Z	2.4	173.9	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111906Z	2.7	172.3	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111912Z	3.3	170.8	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111918Z	4.0	169.5	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112000Z	4.8	168.1	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112006Z	5.7	166.5	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112012Z	7.3	164.7	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112018Z	8.6	162.6	35	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112100Z	9.5	160.1	40	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112106Z	10.2	157.7	45	10.5	157.6	35.	19.	-10.	12.6	149.6	45.	32.	-30.	15.9	143.3	55.	103.	-45.	20.8	138.0	65.	436.	-20.
112112Z	10.5	155.5	55	10.8	155.3	40.	21.	-15.	13.1	148.2	55.	84.	-30.	16.6	142.8	60.	138.	-35.	21.2	138.2	70.	612.	-10.
112118Z	10.8	153.5	65	11.0	153.3	60.	17.	-5.	14.0	146.3	60.	70.	-40.	18.0	141.2	85.	210.	-10.	23.4	137.6	95.	770.	25.
112200Z	11.7	151.5	70	11.4	151.4	75.	19.	5.	14.3	143.5	100.	133.	0.	18.8	137.6	110.	427.	20.	24.8	139.6	70.	829.	10.
112206Z	13.1	149.4	75	13.0	149.4	80.	6.	5.	17.2	142.0	100.	126.	0.	22.7	139.8	105.	358.	20.	27.4	145.0	70.	716.	20.
112212Z	14.2	147.3	85	14.0	147.5	75.	17.	-10.	18.2	140.9	65.	167.	-30.	24.5	143.5	60.	283.	-20.	0.0	0.0	0.	-0.	0.
112218Z	15.1	145.9	100	15.2	145.3	80.	35.	-20.	20.3	140.8	95.	185.	0.	26.2	146.2	70.	205.	0.	0.0	0.0	0.	-0.	0.
112300Z	16.2	144.7	100	16.2	144.8	100.	6.	0.	21.8	142.4	95.	130.	5.	27.2	148.2	85.	350.	25.	0.0	0.9	0.	-0.	0.
112306Z	17.4	144.2	100	16.2	144.1	100.	72.	0.	21.4	142.0	80.	256.	-5.	27.0	147.6	65.	585.	15.	0.0	0.0	0.	-0.	0.
112312Z	18.7	143.8	95	18.6	143.9	90.	8.	-5.	23.3	145.1	75.	211.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112318Z	20.2	144.1	95	20.4	144.0	85.	13.	-10.	27.2	150.2	70.	100.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112400Z	21.4	144.7	90	21.1	144.7	95.	18.	5.	25.6	150.3	70.	263.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112406Z	23.0	146.3	85	21.2	144.7	90.	139.	5.	29.4	156.2	55.	125.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112412Z	24.6	148.7	80	24.5	148.7	85.	6.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112418Z	26.0	151.5	70	25.9	151.4	80.	8.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112500Z	27.4	154.8	60	27.5	154.9	65.	8.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
112506Z	28.8	158.5	50	29.0	158.3	60.	16.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS WRNG	24-HR	48-HR	72-HR	TYPHOONS WHILE OVER 35 KTS WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	25.	145.	304.	673.	25.	145.	304.	673.
AVG RIGHT ANGLE ERROR	14.	93.	175.	336.	14.	93.	175.	336.
AVG INTENSITY MAGNITUDE ERROR	7.	12.	21.	17.	7.	12.	21.	17.
AVG INTENSITY BIAS	-1.	-9.	-3.	5.	0.	-9.	-3.	5.
NUMBER OF FORECASTS	17	13	9	5	17	13	9	5

DISTANCE TRAVELED BY STORM IS 3530. NM

AVERAGE SPEED OF STORM IS 21. KNOTS

TYPHOON DINAH
FIX POSITIONS FOR CYCLONE NO. 27

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	SATELLITE	COMMENTS	SITE
1	180900	4.3N 178.9E	PCN 0		OTHER		PGTW
2	181200	4.1N 177.4E	PCN 0		OTHER		PGTW
3	182100	3.2N 174.6E	PCN 0		OTHER		PGTW
4	190000	4.0N 173.6E	PCN 0		OTHER		PGTW
5	192049	4.2N 169.0E	PCN 6	T0.5/0.5	NOAA6	INIT OBS	PGTW
6	200900	6.8N 165.8E	PCN 0		OTHER		PGTW
7	201200	7.1N 165.0E	PCN 0		OTHER		PGTW
8	201600	8.6N 163.1E	PCN 0		OTHER		PGTW
9	202100	8.9N 161.8E	PCN 0		OTHER		PGTW
10	210000	9.6N 159.9E	PCN 0		OTHER		PGTW
11	210600	10.1N 157.2E	PCN 0	T3.0/3.0	OTHER	INIT OBS	PGTW
12	210900	10.1N 156.8E	PCN 0		OTHER		PGTW
13	210906	10.4N 156.4E	PCN 6		NOAA6		PGTW
14	211200	10.6N 155.7E	PCN 0		OTHER		PGTW
15	211600	10.7N 153.9E	PCN C		OTHER		PGTW
16	212100	11.4N 152.3E	PCN E		OTHER		PGTW
17	220000	11.8N 151.4E	PCN E	T4.5/4.5 /D1.5/18HRS	OTHER		PGTW
18	220300	12.4N 150.3E	PCN E		OTHER		PGTW
19	220600	13.1N 149.2E	PCN E		OTHER		PGTW
20	220900	13.9N 147.9E	PCN C		OTHER		PGTW
21	221200	14.3N 147.2E	PCN C		OTHER		PGTW
22	221600	15.0N 146.2E	PCN C		OTHER		PGTW
23	222122	15.7N 145.3E	PCN 1	T5.5/5.5 /D1.0/21HRS	NOAA6		PGTW
24	230300	16.8N 144.4E	PCN C		OTHER		PGTW
25	230600	17.3N 144.4E	PCN C		OTHER		PGTW
26	230900	18.0N 144.1E	PCN C		OTHER		PGTW
27	231002	18.2N 143.9E	PCN 3		NOAA6		PGTW
28	231002	17.9N 143.9E	PCN 1		NOAA6		RODN
29	231200	18.5N 144.0E	PCN E		OTHER		PGTW
30	232241	20.9N 144.6E	PCN 3	T4.0/5.5 /W1.5/25HRS	NOAA6		PGTW
31	240300	22.0N 145.2E	PCN E		OTHER		PGTW
32	240900	23.6N 147.5E	PCN E		OTHER		PGTW
33	240939	23.8N 147.8E	PCN 1		NOAA6		RODN
34	241200	24.5N 148.7E	PCN E		OTHER		PGTW
35	241600	25.5N 150.4E	PCN E		OTHER		PGTW
36	242219	26.9N 153.8E	PCN 3	T3.0/4.0 /W1.0/24HRS	NOAA6		PGTW
37	250300	28.0N 156.5E	PCN 0		OTHER		PGTW
38	251200	30.2N 162.8E	PCN 0		OTHER		PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE ORIEN- DIAM/TATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	210229	9.8N 159.0E	1500FT		998	55 050 75	100 61 050 75	8 1				1
2	211722	10.7N 153.7E	700MB	2884	976		020 53 280 8	7 2	CIRCULAR	8	+13 +15 +11	2
3	212347	11.4N 151.6E	700MB	2831		90 200 5	360 33 270 18	5 1				3
4	220245	12.3N 150.6E	700MB	2831	970	100 090 2	190 85 030 7	5 2	CIRCULAR	4	+11 +15 +13	3
5	220826	13.4N 148.6E	700MB	2879	975		080 70 360 5	4 1			+12 +15 +14	4
6	221224	14.1N 147.2E	700MB	2842			080 53 310 20	4 2				4
7	221448	14.4N 146.6E	700MB	2755			060 82 340 5	4 1	CIRCULAR	5	+11 +17 +15	4
8	221601	13.0N 149.4E	700MB	2808		100 040 3	010 71 280 15	5 2				3
9	222105	15.6N 145.3E	700MB	2564	941	100 330 5	250 54 150 15	1 2	CIRCULAR	7	+14 +18 +12	5
10	230104	16.3N 144.6E	700MB	2645		80 340 3	250 56 150 5	5 4				5
11	230356	16.8N 144.3E	700MB	2648	948	100 060 6	130 92 030 15	4 2			+14 +18 +12	5
12	231321	18.9N 143.8E	700MB	2749			290 67 210 20	7 2				6
13	231536	19.6N 143.9E	700MB	2719	955		040 70 310 15	7 2	ELLIPTICAL	25 20 110	+11 +19 +10	6
14	240112	21.5N 144.8E	700MB	2702		100 170 28	240 99 170 28	5 2				7
15	240422	22.3N 145.6E	700MB	2712		90 290 10	030 56 290 25	5 2	ELLIPTICAL	20 15 020	+11 +19 +11	7

RADAR FIXES

FIX NO.	TIME (Z)	FIX POSITION	RADAR	ACCRY	EYE SHAPE	EYE DIAM	RADOB-CODE ASWAR TDDFF	COMMENTS	RADAR POSITION	SITE WMO NO.
1	221110	13.9N 147.6E	LAND						13.6N 144.9E	91218
2	221135	14.0N 147.5E	LAND						13.6N 144.9E	91218
3	221210	14.2N 147.3E	LAND						13.6N 144.9E	91218
4	221235	14.2N 147.3E	LAND						13.6N 144.9E	91218
5	221335	14.3N 146.8E	LAND						13.6N 144.9E	91218
6	221516	14.6N 146.3E	LAND						13.6N 144.9E	91218
7	221535	14.8N 146.4E	LAND						13.6N 144.9E	91218
8	221610	14.8N 146.3E	LAND						13.6N 144.9E	91218
9	221710	14.8N 146.2E	LAND						13.6N 144.9E	91218
10	221735	14.9N 146.1E	LAND						13.6N 144.9E	91218
11	221810	15.0N 146.0E	LAND						13.6N 144.9E	91218
12	221835	15.2N 145.8E	LAND						13.6N 144.9E	91218
13	222035	15.6N 145.2E	LAND						13.6N 144.9E	91218
14	222110	15.6N 145.3E	LAND						13.6N 144.9E	91218
15	222135	15.7N 145.2E	LAND			49			13.6N 144.9E	91218
16	222210	15.8N 145.1E	LAND						13.6N 144.9E	91218
17	222235	15.8N 145.0E	LAND						13.6N 144.9E	91218

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TROPICAL STORM ED

BEST TRACK DATA

	BEST TRACK			WARNING					24 HOUR FORECAST					48 HOUR FORECAST					72 HOUR FORECAST				
							ERRORS					ERRORS					ERRORS						
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
121400Z	9.8	138.0	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121406Z	10.3	136.5	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121412Z	10.7	135.4	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121418Z	11.2	133.9	15	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121500Z	11.4	132.7	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121506Z	11.7	131.5	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121512Z	11.9	130.7	35	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121518Z	12.1	129.9	40	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121600Z	12.3	129.2	45	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121606Z	12.7	128.5	50	12.8	128.5	40.	6.	-10.	14.3	126.0	50.	96.	10.	15.6	123.7	45.	232.	10.	16.5	121.3	25.	374.	-15.
121612Z	13.1	128.0	50	13.2	127.8	40.	13.	-10.	14.8	125.2	50.	149.	15.	15.9	122.8	50.	282.	10.	16.8	120.0	30.	442.	-5.
121618Z	13.5	127.8	50	13.4	127.6	50.	13.	0.	14.9	125.7	59.	129.	15.	16.2	124.2	45.	233.	5.	17.0	122.1	25.	360.	-10.
121700Z	13.6	127.7	45	13.8	127.1	50.	37.	5.	15.4	125.5	50.	155.	15.	16.5	123.8	40.	259.	0.	0.0	0.0	0.	-0.	0.
121706Z	13.6	127.5	40	13.7	127.2	50.	18.	10.	15.0	125.9	30.	115.	15.	16.5	124.1	40.	237.	0.	17.5	121.8	25.	433.	-10.
121712Z	13.5	127.4	35	13.9	126.8	50.	42.	15.	15.2	125.4	50.	137.	10.	16.7	123.8	40.	246.	5.	0.0	0.0	0.	-0.	0.
121718Z	13.4	127.3	35	14.3	126.6	45.	67.	10.	16.8	124.9	40.	231.	0.	17.1	122.9	30.	322.	-5.	0.0	0.0	0.	-0.	0.
121800Z	13.4	127.2	35	14.4	125.8	45.	101.	10.	15.8	124.3	45.	212.	5.	17.2	122.5	40.	371.	5.	0.0	0.0	0.	-0.	0.
121806Z	13.4	127.0	35	13.7	127.0	45.	18.	10.	14.7	125.8	45.	94.	5.	15.7	124.5	40.	245.	5.	0.0	0.0	0.	-0.	0.
121812Z	13.5	127.0	40	13.9	126.9	45.	25.	5.	15.2	125.5	45.	115.	10.	16.1	123.8	40.	296.	10.	0.0	0.0	0.	-0.	0.
121818Z	13.7	127.3	40	14.0	127.5	45.	21.	5.	16.1	128.3	40.	100.	5.	18.2	133.5	25.	493.	0.	0.0	0.0	0.	-0.	0.
121900Z	13.9	127.4	40	14.6	127.6	45.	43.	5.	16.3	129.8	40.	137.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121906Z	13.9	127.2	40	13.8	127.3	45.	8.	5.	14.8	126.7	35.	113.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121912Z	14.2	127.2	35	14.0	127.1	45.	13.	10.	14.7	126.5	35.	120.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121918Z	14.5	127.8	35	14.3	127.4	40.	26.	5.	15.2	126.8	30.	171.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
122000Z	14.1	128.1	35	15.2	128.1	35.	66.	0.	16.1	127.8	25.	249.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
122006Z	13.4	128.0	35	14.2	127.8	35.	49.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
122012Z	12.9	127.7	30	14.4	127.6	35.	90.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
122018Z	12.4	127.4	25	14.4	127.6	35.	120.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
122100Z	12.0	127.0	20	11.9	126.8	25.	13.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	40.	146.	292.	402.	0.	0.	0.	0.
AVG RIGHT ANGLE ERROR	21.	120.	262.	378.	0.	0.	0.	0.
AVG INTENSITY MAGNITUDE ERROR	7.	8.	5.	10.	0.	0.	0.	0.
AVG INTENSITY BIAS	5.	8.	4.	-10.	0.	0.	0.	0.
NUMBER OF FORECASTS	20	16	11	4	0	0	0	0

DISTANCE TRAVELED BY STORM IS 987. NM

AVERAGE SPEED OF STORM IS 6. KNOTS

TROPICAL STORM ED
FIX POSITIONS FOR CYCLONE NO. 28

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION	ACCRY	DVORAK CODE	SATELLITE	COMMENTS	SITE
1	140000	9.9N 138.0E	PCN 0	T1.0/1.0	OTHER	INIT OBS	PGTW
2	140300	10.0N 137.1E	PCN 0		OTHER		PGTW
3	141200	10.5N 135.4E	PCN 0		OTHER		PGTW
4	141600	11.3N 134.5E	PCN 0		OTHER		PGTW
5	142100	12.8N 134.1E	PCN 0		OTHER		PGTW
6	142314	12.7N 133.8E	PCN 5	T2.0/2.0 /D1.0/23HRS	NOAA6		PGTW
7	150000	12.3N 133.3E	PCN 0		OTHER		PGTW
8	150300	13.0N 133.0E	PCN 0		OTHER		PGTW
9	151021	13.1N 130.2E	PCN 6		NOAA6		PGTW
10	151600	13.5N 130.0E	PCN 0		OTHER		PGTW
11	152252	12.2N 129.1E	PCN 5	T1.0/2.0 /W1.0/24HRS	NOAA6		PGTW
12	160000	13.0N 129.9E	PCN 0		OTHER		PGTW
13	160900	13.4N 127.6E	PCN 0		OTHER		PGTW
14	161200	13.5N 127.5E	PCN 0		OTHER		PGTW
15	162100	13.6N 127.3E	PCN 0		OTHER		PGTW
16	170000	13.7N 127.0E	PCN 0		OTHER		PGTW
17	170010	13.8N 127.1E	PCN 5		NOAA6		RODN
18	170900	14.0N 126.7E	PCN 0		OTHER		PGTW
19	171100	14.7N 127.2E	PCN 5		NOAA6		PGTW
20	171200	15.8N 127.4E	PCN 0		OTHER		PGTW
21	171600	14.6N 125.9E	PCN 0		OTHER		PGTW
22	172100	14.3N 126.3E	PCN 0		OTHER		PGTW
23	172348	14.6N 125.7E	PCN 5	T3.0/3.0	NOAA6	INIT OBS	PGTW
24	180900	13.8N 127.0E	PCN 0		OTHER		PGTW
25	181045	13.7N 128.2E	PCN 5		NOAA6		RPMK
26	181046	13.7N 127.2E	PCN 5		NOAA6		RODN
27	181046	14.0N 127.0E	PCN 5		NOAA6		PGTW
28	181200	13.7N 127.1E	PCN 0		OTHER		PGTW
29	181600	14.3N 127.7E	PCN 0		OTHER		PGTW
30	182100	14.4N 127.4E	PCN 0		OTHER	ULCC 15.4 127.5	PGTW
31	182325	14.0N 127.8E	PCN 5	T2.0/3.0 /W1.0/24HRS	NOAA6		PGTW
32	190900	16.1N 127.9E	PCN 0		OTHER		PGTW
33	191023	15.2N 127.6E	PCN 5		NOAA6		PGTW
34	191023	15.8N 127.1E	PCN 5		NOAA6		RPMK
35	191200	14.7N 128.1E	PCN 0		OTHER		PGTW
36	192100	15.5N 129.0E	PCN 0		OTHER		PGTW
37	192303	15.3N 128.8E	PCN 5	T2.0/2.0-/S1.0/24HRS	NOAA6		PGTW
38	200600	14.4N 128.0E	PCN 0		OTHER		PGTW
39	200900	14.3N 126.0E	PCN 0		OTHER		PGTW
40	201142	14.5N 128.0E	PCN 5		NOAA6		RPMK
41	201600	14.7N 127.5E	PCN 0		OTHER		PGTW
42	202240	12.0N 126.9E	PCN 3	T1.0/1.0 /W1.0/24HRS	NOAA6	LL EXPOSED	PGTW

AIRCRAFT FIXES

FIX NO.	TIME (Z)	FIX POSITION	FLT LVL	700MB HGT	OBS MSLP	MAX-SFC-WND VEL/BRG/RNG	MAX-FLT-LVL-WND DIR/VEL/BRG/RNG	ACCRY NAV/MET	EYE SHAPE	EYE ORIEN- DIAM/TATION	EYE TEMP (C) OUT/ IN/ DP/SST	MSN NO.
1	150450	11.7N 131.7E	1500FT		1004	35 020 20	150 32 020 20	2 3			+25 +25 +22	1
2	160320	12.6N 128.9E	1500FT			50 090 15	160 60 090 15	6 5			+23 +26 +26 28	2
3	161315	13.1N 127.9E	700MB	3049			240 33 140 40	10 8				3
4	161610	13.8N 127.8E	700MB	3037			020 50 300 35	10 10			+12 +15 + 7	3
5	170316	13.5N 127.4E	700MB	3025	991	50 060 10	080 33 350 15	3 2			+11 +15 +10	4
6	171341	13.3N 126.9E	700MB	3040			120 38 040 35	10 5				5
7	171558	13.5N 127.3E	700MB	3032	992		350 32 290 120	10 5			+13 +14 +11	5
8	180304	13.4N 127.1E	700MB	3024	992	35 320 75	020 51 330 100	7 3			+10 +14 +10	6
9	181340	13.8N 127.5E	700MB	3032			340 40 240 30	5 5				7
10	181555	13.9N 127.5E	700MB	3016	991		290 50 200 15	5 8			+14 +14 +10	7
11	190245	13.9N 127.4E	700MB	3029		40 300 10	080 32 300 18	3 2				8
12	190413	13.9N 127.3E	700MB	3021	989	35 090 15	200 32 100 18	3 2			+13 +17 +10	8
13	191348	14.2N 127.2E	700MB	3064			080 22 020 30	10 5				9
14	191543	14.5N 127.7E	700MB	3067	999		230 32 150 50	6 5			+12 +12 +12	9
15	200230	13.9N 128.1E	700MB	3066		45 300 50	010 20 320 40	10 6				10
16	200420	14.0N 128.0E	700MB	3065	995	40 150 10	270 23 160 90	10 5			+15 +17 +11	10

SYNOPTIC FIXES

FIX NO.	TIME (Z)	FIX POSITION	INTENSITY ESTIMATE	NEAREST DATA (NM)	COMMENTS
1	160000	12.0N 129.0E	20	60	
2	181200	13.5N 127.0E	35	20	
3	210000	12.0N 127.0E	30	30	

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

TROPICAL CYCLONE 23-80

BEST TRACK DATA

	BEST TRACK			WARNING					24 HOUR FORECAST					48 HOUR FORECAST					72 HOUR FORECAST				
							ERRORS					ERRORS					ERRORS						
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
111202Z	11.3	74.8	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111208Z	11.3	74.1	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111214Z	11.4	73.5	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111220Z	11.5	73.0	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111302Z	11.6	72.5	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111308Z	11.8	72.0	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111314Z	12.0	71.6	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111320Z	12.2	71.4	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111402Z	12.4	71.1	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111408Z	12.7	70.8	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111414Z	12.9	70.6	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111420Z	13.3	70.3	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111502Z	13.5	69.9	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111508Z	13.7	69.7	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111514Z	14.1	69.5	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111520Z	14.4	69.1	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111602Z	14.7	68.7	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111608Z	14.9	68.4	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111614Z	15.0	68.0	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111620Z	15.2	67.6	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111702Z	15.4	67.1	35	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111708Z	16.1	66.7	35	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111714Z	16.9	66.8	35	15.9	66.4	35.	64.	0.	17.8	65.1	40.	220.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111720Z	17.6	67.2	35	17.3	67.4	35.	21.	0.	19.1	69.8	35.	45.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111802Z	18.2	67.6	35	17.8	67.9	35.	29.	0.	17.8	67.9	30.	169.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111808Z	18.7	68.2	30	18.1	68.4	35.	30.	5.	19.8	71.2	30.	46.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111814Z	19.2	68.7	30	19.2	68.8	30.	6.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111820Z	19.6	69.2	25	19.8	69.4	30.	16.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111902Z	19.9	69.9	20	20.0	69.8	25.	8.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
111908Z	20.4	70.7	20	20.3	70.7	20.	6.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	24.	120.	0.	0.	0.	0.	0.	0.
AVG RIGHT ANGLE ERROR	16.	66.	0.	0.	0.	0.	0.	0.
AVG INTENSITY MAGNITUDE ERROR	2.	10.	0.	0.	0.	0.	0.	0.
AVG INTENSITY BIAS	2.	10.	0.	0.	0.	0.	0.	0.
NUMBER OF FORECASTS	8	4	0	0	0	0	0	0

DISTANCE TRAVELED BY STORM IS 940. NM

AVERAGE SPEED OF STORM IS 5. KNOTS

TC23-80
FIX POSITIONS FOR CYCLONE NO. 23

SATELLITE FIXES

	FIX NO.	TIME (Z)	FIX POSITION		ACCRY	DVORAK CODE	SATELLITE	COMMENTS	SITE
	1	120311	11.3N	74.7E	PCN 5	T2.0/2.0	NOAA6	INIT OBS	KGWC
	2	130248	11.7N	72.2E	PCN 5	T1.5/1.5 /W0.5/24HRS	NOAA6		KGWC
*	3	140407	13.7N	68.1E	PCN 6	T1.5/1.5 /S0.0/24HRS	NOAA6		KGWC
	4	141505	12.8N	70.4E	PCN 6		NOAA6		KGWC
	5	150345	13.5N	69.9E	PCN 6	T2.0/2.0 /D0.5/24HRS	NOAA6		KGWC
	6	151443	14.0N	69.8E	PCN 6		NOAA6		KGWC
*	7	160322	14.0N	69.6E	PCN 5	T2.0/2.0 /S0.0/24HRS	NOAA6		KGWC
	8	161420	15.1N	68.0E	PCN 6		NOAA6		KGWC
	9	170300	15.5N	67.1E	PCN 5	T2.5/2.5 /D0.5/24HRS	NOAA6		KGWC
	10	171539	17.0N	67.2E	PCN 6		NOAA6		KGWC
	11	180410	18.5N	67.5E	PCN 6	T1.5/2.5 /W1.0/24HRS	NOAA6		KGWC
	12	181516	18.9N	68.6E	PCN 6		NOAA6		KGWC

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

BEST TRACK DATA

	BEST TRACK			WARNING			ERRORS		24 HOUR FORECAST			ERRORS		48 HOUR FORECAST			ERRORS		72 HOUR FORECAST				
MO/DA/HR	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
121008Z	8.9	92.0	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121014Z	8.9	92.9	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121020Z	9.1	93.4	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121102Z	9.5	93.5	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121108Z	9.7	93.2	20	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121114Z	9.7	92.8	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121120Z	9.7	92.5	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121202Z	9.8	92.0	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121208Z	10.2	91.6	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121214Z	10.8	91.8	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121220Z	11.1	92.1	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121302Z	11.2	92.6	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121308Z	11.3	93.2	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121314Z	11.3	93.7	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121320Z	11.0	94.0	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121402Z	10.8	94.0	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121408Z	10.5	93.7	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121414Z	10.3	93.3	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121420Z	10.2	92.5	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121502Z	9.8	91.1	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121508Z	10.0	90.0	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121514Z	10.1	88.5	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121520Z	9.3	87.0	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121602Z	8.8	85.7	30	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121608Z	8.6	84.6	35	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121614Z	8.6	83.5	35	8.2	82.8	35.	43.	0.	8.6	78.0	30.	89.	5.	9.2	74.7	35.	98.	10.	11.9	70.8	40.	167.	15.
121620Z	8.5	82.6	35	8.4	82.1	35.	30.	0.	8.8	78.1	30.	73.	5.	9.1	75.9	30.	97.	5.	0.0	0.0	0.	-0.	0.
121702Z	8.4	81.0	35	9.1	81.6	35.	43.	0.	10.0	78.6	20.	167.	-5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121708Z	8.3	81.1	30	9.3	80.7	35.	64.	5.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121714Z	8.1	80.2	25	9.8	80.2	35.	102.	10.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121720Z	7.8	78.8	25	9.5	79.0	25.	102.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121802Z	7.7	77.0	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121808Z	7.7	75.8	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121814Z	7.7	74.7	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121820Z	7.9	73.9	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121902Z	8.1	72.9	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121908Z	8.5	71.7	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121914Z	9.1	70.7	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
121920Z	9.8	69.9	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.
122002Z	10.9	68.8	25	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.	0.0	0.0	0.	-0.	0.

	ALL FORECASTS				TYPHOONS WHILE OVER 35 KTS			
	WRNG	24-HR	48-HR	72-HR	WRNG	24-HR	48-HR	72-HR
AVG FORECAST POSIT ERROR	65.	109.	93.	167.	0.	0.	0.	0.
AVG RIGHT ANGLE ERROR	55.	81.	67.	126.	0.	0.	0.	0.
AVG INTENSITY MAGNITUDE ERROR	3.	5.	8.	15.	0.	0.	0.	0.
AVG INTENSITY BIAS	3.	2.	8.	15.	0.	0.	0.	0.
NUMBER OF FORECASTS	6	3	2	1	0	0	0	0

DISTANCE TRAVELED BY STORM IS 2016. NM

AVERAGE SPEED OF STORM IS 9. KNOTS

TC27-80

FIX POSITIONS FOR CYCLONE NO. 27

SATELLITE FIXES

FIX NO.	TIME (Z)	FIX POSITION		ACCRY	DVORAK CODE	SATELLITE	COMMENTS	SITE
1	101200	9.5N	93.1E	PCN 0		OTHER		PGTW
2	110000	9.4N	93.5E	PCN 0		OTHER		PGTW
3	110225	9.6N	93.5E	PCN 6	T1.5/1.5	NOAA6	INIT OBS	KGWC
4	110600	9.4N	93.1E	PCN 0	T1.0/1.0	OTHER	INIT OBS	PGTW
5	110900	9.5N	92.4E	PCN 0		OTHER		PGTW
* 6	111200	9.9N	92.0E	PCN 0		OTHER		PGTW
* 7	120203	11.3N	92.2E	PCN 5	T2.0/2.0 /D0.5/24HRS	NOAA6		KGWC
8	120300	10.0N	92.2E	PCN 0	T1.0/1.0 /S0.0/21HRS	OTHER		PGTW
9	120600	10.4N	91.6E	PCN 0		OTHER		PGTW
10	122100	10.8N	92.6E	PCN 0		OTHER		PGTW
* 11	130140	11.2N	92.8E	PCN 5	T2.0/2.0 /S0.0/24HRS	NOAA6		KGWC
* 12	130300	11.0N	93.2E	PCN 0	T0.5/0.5 /W0.5/24HRS	OTHER		PGTW
13	140117	11.3N	93.9E	PCN 5	T1.5/2.0-/W0.5/24HRS	NOAA6		KGWC
* 14	141358	11.2N	95.0E	PCN 6		NOAA6		FJDG
15	150055	10.5N	92.0E	PCN 6	T1.5/2.0-/W0.5/24HRS	NOAA6		KGWC
16	150300	9.4N	91.5E	PCN 0	T1.0/1.0	OTHER	INIT OBS	PGTW
17	151600	10.5N	88.7E	PCN 0		OTHER		PGTW
18	160214	8.2N	86.5E	PCN 5	T2.0/2.0 /D0.5	NOAA6		KGWC
19	160300	8.7N	85.5E	PCN 0		OTHER		PGTW
20	160600	8.2N	84.2E	PCN 0	T2.5/2.5-/D1.5/27HRS	OTHER		PGTW
21	161200	8.2N	83.7E	PCN 0		OTHER		PGTW
22	161600	8.6N	83.2E	PCN 0		OTHER		PGTW
23	162100	9.1N	82.6E	PCN 0		OTHER		PGTW
24	170000	9.0N	82.3E	PCN 0		OTHER		PGTW
25	170900	9.0N	81.0E	PCN 0		OTHER		PGTW
* 26	171200	9.4N	80.4E	PCN 0		OTHER		PGTW
* 27	171431	9.0N	80.9E	PCN 6		NOAA6		FJDG
* 28	171600	9.4N	79.2E	PCN 0		OTHER		PGTW
29	180600	7.8N	76.2E	PCN 0		OTHER		PGTW
30	180900	8.3N	76.1E	PCN 0		OTHER		PGTW
31	200343	12.3N	70.4E	PCN 6	T1.0/1.0 /S0.0	NOAA6		KGWC
32	200406	11.2N	68.2E	PCN 5	T1.0/1.0 /S0.0	NOAA6		KGWC
33	201504	11.0N	69.3E	PCN 4	T1.0/1.0 /S0.0	NOAAS		KGWC

SYNOPTIC FIXES

FIX NO.	TIME (Z)	FIX POSITION	INTENSITY ESTIMATE	NEAREST DATA (NM)	COMMENTS
1	171200	8.0N 81.0E	25	30	
2	180000	7.5N 77.5E	20	30	

NOTICE - THE ASTERISKS (*) INDICATE FIXES UNREPRESENTATIVE AND NOT USED FOR BEST TRACK PURPOSES.

APPENDIX I

CONTRACTIONS

ACCRY	Accuracy
ACFT	Aircraft
ADP	Automatic Data Processing
AIREP	Aircraft Weather Report(s) (Commercial and Military)
ANT	Antenna
APT	Automatic Picture Transmission
ARWO	Aerial Reconnaissance Weather Officer
ATT	Attenuation
AVG	Average
AWN	Automated Weather Network
BRG	Bearing
CDO	Central Dense Overcast
CI	Current Intensity
CLD	Cloud
CLSD	Closed
CNTR	Center
CPA	Closest Point of Approach
DEG	Degree(s)
DIAM	Diameter
DIR	Direction
DMSP	Defense Meteorological Satellite Program
ELEV	Elevation
FLT	Flight
GOES	Geostationary Operational Environmental Satellite
HGT	Height
HPAC	Mean of XTRP and Climatology
HR	Hour(s)
HVY	Heavy
ICAO	International Civil Aviation Organization
IR	Infrared
KM	Kilometer(s)
KT	Knot(s)
LLCC	Low-Level Circulation Center
LVL	Level
M	Meter(s)
M/SEC	Meters per Second
MAX	Maximum
MB	Millibar(s)
MET	Meteorological
MIN	Minimum
MSN	Mission
NAV	Navigational
NAVPGSCOL	Naval Postgraduate School
NEDN	Naval Environmental Data Network
NEDS	Naval Environmental Display Station
NEPRF	Naval Environmental Prediction Research Facility
NESS	National Environmental Satellite Service
NET	Near Equatorial Trough
NM	Nautical Mile(s)
N/O	Not Observed
NOAA	National Oceanic and Atmospheric Administration
NRL	Naval Research Laboratory
NTCC	Naval Telecommunications Center
OBS	Observation(s)
PCN	Position Code Number
PSBL	Possible
PTLY	Partly
QUAD	Quadrant
RADOB	Radar Observation
RECON	Reconnaissance
RNG	Range
SAT	Satellite
SFC	Surface
SLP(MSLP)	Sea Level Pressure (Minimum Sea Level Pressure)
SPOL	Spiral Overlay
SRP	Selective Reconnaissance Program

STNRY	Stationary
SST	Sea Surface Temperature
ST	Super Typhoon
TC	Tropical Cyclone
TCARC	Tropical Cyclone Aircraft Reconnaissance Coordinator
TCFA	Tropical Cyclone Formation Alert
TCM	Tropical Cyclone Model
TD	Tropical Depression
TIROS	Television Infrared Observation Satellite
TS	Tropical Storm
TY	Typhoon
TUTT	Tropical Upper Tropospheric Trough (Sadler, 1976)
VEL	Velocity
VIS	Visual
VSBL	Visible
WESTPAC	Western Pacific
WMO	World Meteorological Organization
WND	Wind
WRS	Weather Reconnaissance Squadron
XTRP	Extrapolation
Z	Zulu Time (Greenwich mean time)

APPENDIX II

DEFINITIONS

BEST TRACK - A subjectively smoothed path, versus a precise and very erratic fix-to-fix path, used to represent tropical cyclone movement.

CENTER - The axis or pivot of a tropical cyclone. Usually determined by wind, temperature, and/or pressure distribution.

CYCLONE - A closed atmospheric circulation rotating about an area of low pressure (counterclockwise in the northern hemisphere)

EPHEMERIS - Position of a body (satellite) in space as a function of time. When no geographical reference is available for gridding satellite imagery, then only ephemeris gridding is possible which is solely based on the theoretical satellite position and is susceptible to errors from satellite pitch, orbit eccentricity, and the non-spherical earth.

EXPLOSIVE DEEPENING - A decrease in the minimum sea level pressure of a tropical cyclone of 2.5 mb/hr for 12 hrs or 5.0 mb/hr for 6 hrs (ATR 1971).

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 primary energy sources from release of latent heat of condensation to baroclinic processes. The term carries no implications as to strength or size.

EYE - "EYE" is used to describe the central area of a tropical cyclone when it is more than half surrounded by wall cloud.

FUJIWHARA EFFECT - An interaction in which tropical cyclones within about 700 nm (1296 km) of each other begin to rotate cyclonically about one another. When intense tropical cyclones are within about 400 nm (741 km) of each other, they may also begin to move closer to each other.

MAXIMUM SUSTAINED WIND - Maximum surface wind speed averaged over a 1-minute period of time. Peak gusts over water average 20 to 25 percent higher than sustained wind.

RAPID DEEPENING - A decrease in the minimum sea level pressure of a tropical cyclone of 1.25 mb/hr for 24 hrs (ATR 1971).

RECURVATURE - The turning of a tropical cyclone from an initial path toward the west or northwest to the north then northeast.

SIGNIFICANT TROPICAL CYCLONE - A tropical cyclone becomes "significant" with the issuance of the first numbered warning by the responsible warning agency.

SUPER TYPHOON/HURRICANE - A typhoon/hurricane in which the maximum sustained surface wind (1-minute mean) is 130 kt (67 m/sec) or greater.

TROPICAL CYCLONE - A non-frontal low pressure system of synoptic scale developing over tropical or subtropical waters and having a definite organized circulation.

TROPICAL CYCLONE AIRCRAFT RECONNAISSANCE COORDINATOR - A CINCPACAF representative designated to levy tropical cyclone aircraft weather reconnaissance requirements on reconnaissance units within a designated area of the PACOM and to function as coordinator between CINCPACAF, aircraft weather reconnaissance units, and the appropriate typhoon/hurricane warning center.

TROPICAL DEPRESSION - A tropical cyclone in which the maximum sustained surface wind (1-minute mean) is 33 kt (17 m/sec) or less.

TROPICAL DISTURBANCE - A discrete system of apparently organized convection--generally 100 to 300 nm (185-556 km) in diameter--originating in the tropics or subtropics, 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 of the wind field. As such, it is the basic generic designation which, in successive stages of intensification, may be classified as a tropical depression, tropical storm or typhoon (hurricane).

TROPICAL STORM - A tropical cyclone with maximum sustained surface winds (1-minute mean) in the range of 34 to 63 kt (17-32 m/sec) inclusive.

TROPICAL UPPER TROPOSPHERIC TROUGH (TUTT) - "A dominant climatological system, and a daily synoptic feature, of the summer season over the tropical North Atlantic, North Pacific and South Pacific Oceans," from Sadler, James C., Feb. 1976: Tropical Cyclone Initiation by the Tropical Upper Tropospheric Trough (NAVENVPREDRSCHFAC Technical Paper No. 2-76)

TYPHOON/HURRICANE - A tropical cyclone in which the maximum sustained surface wind (1-minute mean) is 64 kt (33 m/sec) or greater. West of 180 degrees longitude they are called typhoons and east of 180 degrees they are called hurricanes. Foreign governments use these or other terms for tropical cyclones and may apply different intensity criteria.

WALL CLOUD - An organized band of cumuliform clouds immediately surrounding the central area of a tropical cyclone. The wall cloud may entirely enclose the eye or only partially surround the center.

APPENDIX III

REFERENCES

Arnold, C. P., 1977: Tropical Cyclone Cloud and Intensity Relationships. Dept of Atmos. Sci. Paper No. 277, Colorado State University, Ft. Collins, Co, 155 pp.

Atkinson, G. D., and Holliday, C. R., 1977: Tropical Cyclone Minimum Sea Level Pressure - Maximum Sustained Wind Relationship for Western North Pacific. Monthly Weather Review, Vol. 105, No. 4, pp. 421-27 (also FLEWEACEN TECH NOTE: JTWC 75-1).

Brand, S., 1968: Interaction of Binary Tropical Cyclones of the Western North Pacific Ocean. NAVWEARSCHFAC TECH REPORT No. 26-68.

Brand, S., and Blelloch, J. W., 1973: Changes in Characteristics of Typhoons Crossing the Island of Taiwan. ENVPREDRSCHFAC Technical Paper No. 8-73, 21 pp.

Dvorak, V. F., 1973: A Technique for the Analysis and Forecasting of Tropical Cyclone Intensities from Satellite Pictures, NOAA TM NESS 45, 19 pp.

Guard, C. P., 1979: The Intensity of Recurving Western North Pacific Tropical Cyclones: A New Look. Unpublished, 33 pp. (available from NAVOCEANCOMCEN/JTWC, COMNAVMAR, Box 17, FPO SF 96630).

Harrison, E. J., 1975: Forecast Verification as a Function of Reconnaissance Platform. FLEWEACEN TECH NOTE: JTW 75-2, 16 pp.

Holliday, C. R., 1976: Double Intensification of Typhoon Gloria, 1974 and a Brief Review of Similar Occurrences. FLEWEACEN TECH NOTE: JTWC 76-1, 16 pp.

Ramage, C. S., 1971: Monsoon Meteorology, Academic Press, 253 pp.

Riehl, H., 1971: Intensity of Recurving Typhoons, NAVWEASERSCHFAC Technical Paper No. 3-71, 11 pp.

Sadler, J. C., 1976: Tropical Cyclone Initiation by the Tropical Upper Tropospheric Trough, NAVENVPREDRSCHFAC Technical Paper No. 2-76, 103 pp.

Sikora, C. R., 1976: A Reevaluation of the Changes in Speed and Intensity of Tropical Cyclones Crossing the Philippines, FLEWEACEN TECH NOTE: JTWC 76-2, 11 pp.

APPENDIX IV

PAST ANNUAL TYPHOON REPORTS

Copies of past Annual Typhoon Reports can be obtained through the:

National Technical Information Service
5285 Port Royal Road
Springfield, Virginia 22161

Refer to the following acquisition numbers when ordering:

YEAR	ACQUISITION NUMBER
1959	AD 786147
1960	AD 786148
1961	Ad 786149
1962	AD 786128
1963	AD 786208
1964	AD 786209
1965	AD 786210
1966	AD 785891
1967	AD 785344
1968	AD 785251
1969	AD 785178
1970	AD 785252
1971	AD 768333
1972	AD 768334
1973	AD 777093
1974	AD 010271
1975	AD A023601
1976	AD A038484
1977	AD A055512
1978	AD A070904
1979	AD A082071

DISTRIBUTION

AFGWC (2)
AFGL/LYU (2)
AF WEACEN TAIWAN (3)
AMERICAN INST OF TAIWAN (1)
AMERICAN STATISTICS INDEX (1)
ARRS/CC (2)
AWS/DNT (5)
AWS/DOR (5)
BUR OF MET, BRISBANE (2)
BUR OF MET, MELBOURNE (4)
BUR OF MET, PERTH (1)
CATHOLIC UNIVERSITY OF AMERICA (2)
CENWEABUR TAIWAN (3)
CINCPAC (2)
CINCPACAF/DOW (1)
CINCPACFLT (5)
CIUDAD UNIV, MEXICO (1)
CIVIL DEFENSE, GUAM (3)
CIVIL DEFENSE, SAIPAN (6)
CNO WASHINGTON DC (1)
CNOC (2)
COLORADO STATE UNIV (3)
COLORADO STATE UNIV (LIBR) (1)
COMFAIRECONRON ONE (VQ-1) (3)
COMLOGSUPFORSEVENTHFLT (1)
COMNAVAIRSYSCOM (1)
COMNAVFACENGCOMPACDIV (1)
COMNAVMARIANAS (2)
COMNAVSURFPAC (2)
COMPATRECONFORSEVENTHFLT (1)
COMPHIBGRU ONE (1)
COMSC (1)
COMSEVENTHFLT (2)
COMSUBGRU SEVEN (1)
COMTHIRDFLT (1)
COMUSNAVPHIL (1)
DDC, VA (1)
DEPT OF AIR FORCE (1)
DET 2, 1WW (2)
DET 2, 7WW (1)
DET 4, 1WW (2)
DET 4, HQ AWS (2)
DET 5, 1WW (1)
DET 8, 30WS (2)
DET 10, 30WS (1)
DET 15, 30WS (1)
DET 17, 30WS (1)
DET 18, 30WS (1)
ENVSCISUPGRU (1)
FAA, GUAM (5)
FLENUMOCEANCEN MONTEREY (2)
FLORIDA STATE UNIV TALLAHASSEE (2)
GEOLOGICAL SURVEY, GUAM (2)
GOVENOR OF GUAM (4)
GUAM PUBLIC LIBRARY (5)
INDIA MET DEPT (3)
INST OF PHYSICS, TAIWAN (2)
JAPAN MET AGENCY (3)
JASDF, TOKYO (2)
LOS ANGELES PUBLIC LIBR (2)
MAC/HO, IL (2)
MARINERS WEATHER LOG (1)
MASS INSTI OF TECH (1)
MCAS FUTENMA (1)
MCAS IWAKUNI (2)
MCAS KANEOHE BAY (1)
MET DEPT BANGKOK (1)
MET RESEARCH INST LIBR, TOKYO (2)
MET SOC OF NSW, AUST (1)
NASA GREENBELT, MD (4)
NAT CLIM CNTR, NC (1).
NAT WEA ASSOCIATION (1)
NATWEASERV FOROFF, HONOLULU (2)
NATEASERV PACREG (2)
NAVAL ACADEMY (2)
NAVEASTOCEANCEN, NORFOLK (1)
NAVHISTCEN (1)
NAVOCEANCOMCEN, ROTA (1)
NAVOCEANCOMFAC, JACKSONVILLE (1)
NAVOCEANCOMFAC, YOKOSUKA (3)
NAVPOLAROCEANCEN, SUITLAND (1)
NAVWESTOCEANCEN, PEARL HARBOR (2)
NCBC (1)
NEPRF (8)
NESS/SFSS (1)
NHC, NOAA (3)
NOAA/EDS CORAL GABLES, FL (4)
NOAA/ERL RX9 ROCKVILLE, MD (1)
NOAA/HYDROLOGY BR SILVER SPRINGS, MD (1)
NOAA/LIBRARY ROCKVILLE, MD (1)
NOAA/NESS WASHINGTON DC (2)
NOAA/PMEL SEATTLE, WA (2)
NOCD, AGANA (3)
NOCD, ASHEVILLE (1)
NOCD, ATSUGI (1)
NOCD, BARBERS POINT (1)
NOCD, CUBI POINT (1)
NOCD, KADENA (2)
NOCD, MISAWA (2)
NPGS DEPT OF MET (3)
NPGS LIBR (1)
OCEAN ROUTES INC, CA (2)
OCEANO SERVICES INC, CA (1)
OKINAWA MET OBS (1)
OLG/HQ AWS (1)
PACAF/DOS (1)
PAGASA RP (3)
ROYAL OBSERVATORY HONG KONG (5)
STARS AND STRIPES (1)
TAIWAN UNIV (3)
TEXAS A&M UNIV (1)
TTPI, SAIPAN (8)
TYPHOON COM SECR, MANILA (1)
UNIV OF CHICAGO (1)
UNIV OF GUAM (2)
UNIV OF HAWAII DEPT OF MET (3)
UNIV OF HAWAII LIBR (1)
UNIV OF ILLINOIS AT URBANA-CHAMPAIGN (1)
UNIV OF MEXICO (1)
UNIV OF RP (2)
UNIV OF WASHINGTON (1)
UNSECDEF, PENTAGON (1)
USS BELLEAUWOOD (LHA-3) (1)
USS BLUE RIDGE (1)
USS CONSTELLATION (2)
USS CORAL SEA (1)
USS ENTERPRISE (1)
USS KITTY HAWK (1)
USS LONG BEACH (2)
USS NEW ORLEANS (2)
USS OKINAWA (1)
USS RANGER (2)
USS TARAWA (1)
USS TRIPOLI (1)
WEA SERV MET OBS, AGANA (2)
WORLD WEATHER BLDG LIBR (1)
1WW/DON (6)
3AD/DOX (1)
3WW/DNC (1)
5WW/DNC (1)
17 WS/WE (1)
30WSQ (3)
34 AWF, 920 WRG (1)
41 RWRW (2)
43SW/OI (1)
54WRS (3)
3350 TCHTG (1)

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER Annual Tropical Cyclone Report 1980	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE *(and Subtitle)* ANNUAL TROPICAL CYCLONE REPORT 1980		5. TYPE OF REPORT & PERIOD COVERED Annual (JAN-DEC 1980) 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s)		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS U. S. Naval Oceanography Command Center/Joint Typhoon Warning Center (NAVOCEANCOMCEN/JTWC) FPO San Francisco 96630		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS U. S. Naval Ocenography Command Center/Joint Typhoon Warning Center (NAVOCEANCOMCEN/JTWC) FPO San Francisco 96630		12. REPORT DATE 1980 13. NUMBER OF PAGES
14. MONITORING AGENCY NAME & ADDRESS*(if different from Controlling Office)*		15. SECURITY CLASS. *(of this report)* UNCLASSIFIED 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT *(of this Report)*

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT *(of the abstract entered in Block 20, if different from Report)*

18. SUPPLEMENTARY NOTES

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*

Tropical cyclones
Tropical cyclone forecasting
Tropical cyclone research
Tropical cyclone steering model
Tropical cyclone fix data
Tropical storms
Tropical depressions
Typhoons
Meteorological satellite
Aircraft reconnaissance

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 Arabian Sea. A brief narrative is given on each significant tropical cyclone including the best track. All 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 and NEPRF are discussed briefly.

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE
S/N 0102-014-6601

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

NAVAL OCEANOGRAPHY COMMAND CENTER
JOINT TYPHOON WARNING CENTER
GUAM

1980 ANNUAL TROPICAL CYCLONE REPORT