

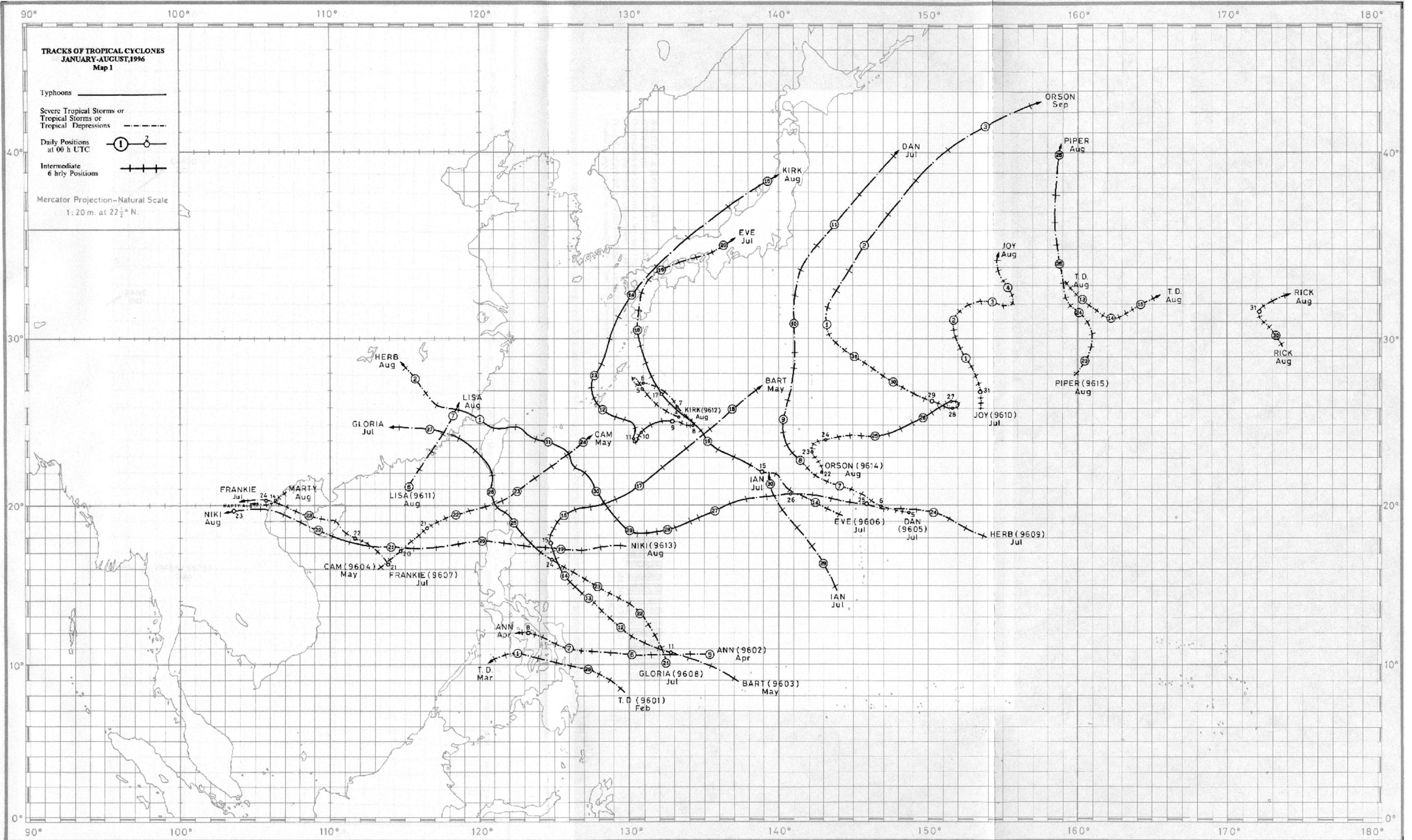
TROPICAL CYCLONES IN 1996

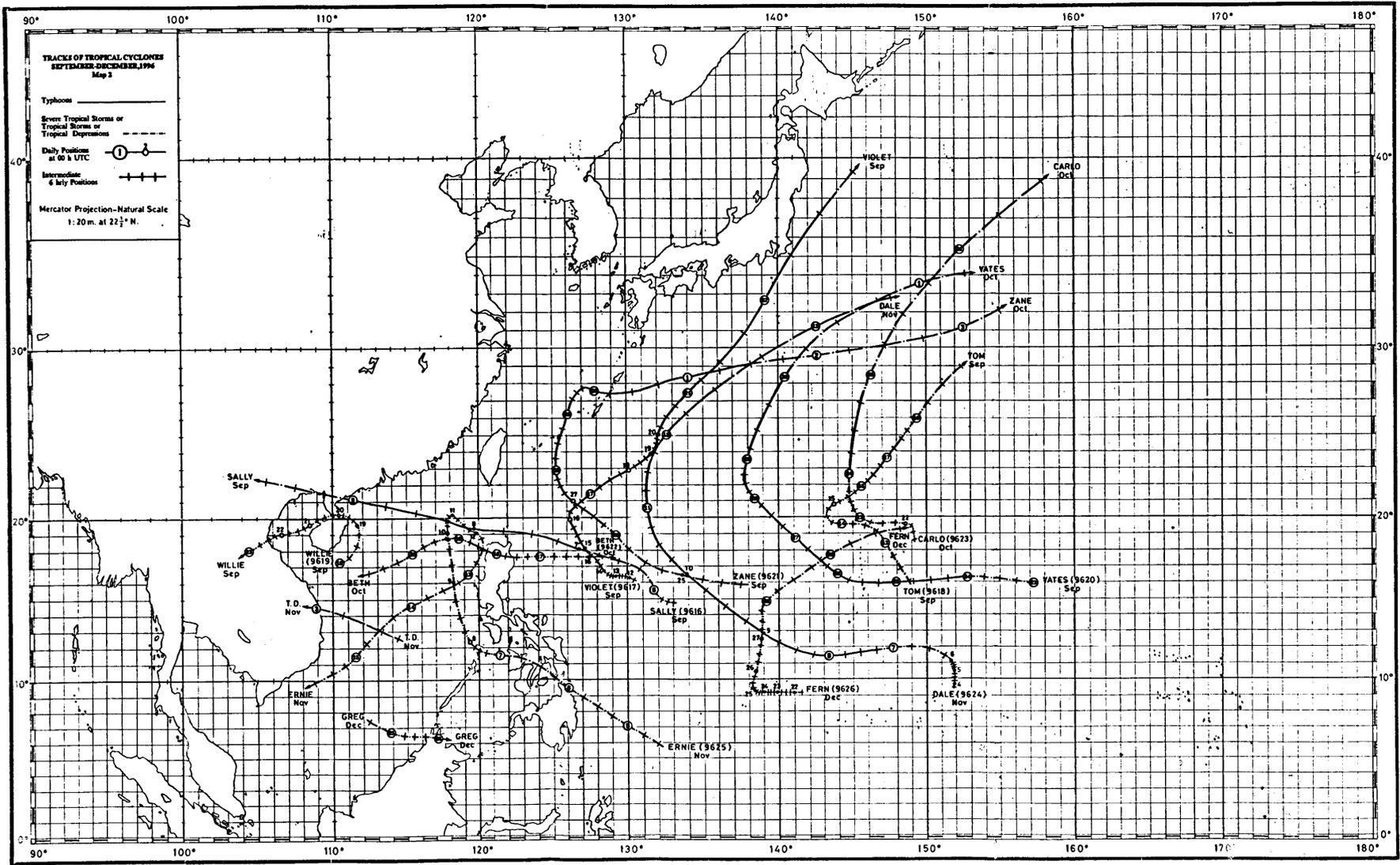
COPYRIGHT RESERVED

TRACKS OF TROPICAL CYCLONES
JANUARY-AUGUST, 1996
Map 1

- Typhoons —————
- Severe Tropical Storms or Tropical Storms or Tropical Depressions - - - - -
- Daily Positions at 00 h UTC (1) (2)
- Intermediate 6 hrly Positions (---)

Mercator Projection-Natural Scale
1: 20 m. at 22½° N.





Published March 1997

Distributed July 1997
Hong Kong Observatory
134A Nathan Road
Kowloon
Hong Kong

This publication is prepared and disseminated in the interest of promoting the exchange of information. The Government of Hong Kong (including its servants and agents) makes no warranty, statement or representation, express or implied, with respect to the accuracy, completeness, or usefulness of the information contained herein, and in so far as permitted by law, shall not have any legal liability or responsibility (including liability for negligence) for any loss, damage or injury (including death) which may result, whether directly or indirectly, from the supply or use of such information.

Permission to reproduce any part of this publication should be obtained through the Observatory.

This publication is available from:

Government Publications Centre
Ground Floor
Queensway Government Offices
66 Queensway
Hong Kong

551.515.2:551.506.1(512.317)

CONTENTS

	Page
FRONTISPIECE : Tracks of tropical cyclones in the western North Pacific and the South China Sea in 1996	
FIGURES	4
TABLES	6
HONG KONG'S TROPICAL CYCLONE WARNING SIGNALS	7
1. INTRODUCTION	9
2. TROPICAL CYCLONE OVERVIEW FOR 1996	13
3. REPORTS ON TROPICAL CYCLONES AFFECTING HONG KONG IN 1996	21
(a) Severe Tropical Storm Frankie (9607) : 21 - 24 July	22
(b) Typhoon Gloria (9608) : 21 - 27 July	26
(c) Tropical Depression Lisa (9611) : 6 - 7 August	30
(d) Typhoon Niki (9613) : 18 - 23 August	34
(e) Typhoon Sally (9616) : 5 - 10 September	38
(f) Severe Tropical Storm Willie (9619) : 18 - 23 September	45
(g) Typhoon Beth (9622) : 15 - 21 October	49
4. TROPICAL CYCLONE STATISTICS AND TABLES	53
5. TROPICAL CYCLONE POSITION AND INTENSITY DATA, 1996	69

FIGURES

	Page
1. Locations of anemometers and tide gauge stations mentioned in this report	12
2. Monthly distribution of the frequency of first occurrence of tropical cyclones in the western North Pacific and the South China Sea in 1996	15
3. Monthly distribution of the mean frequency of first occurrence of tropical cyclones in the western North Pacific and the South China Sea, 1961-1990	15
4. Track of Severe Tropical Storm Frankie (9607) : 21 - 24 July 1996	24
5. Rainfall distribution on 21 - 23 July 1996	24
6. Visible imagery of Frankie at around 11 a.m. on 22 July 1996 (originally captured by GMS of JMA)	25
7. Visible imagery of Frankie at around 11 a.m. on 23 July 1996 (originally captured by GMS of JMA)	25
8. Track of Typhoon Gloria (9608) : 21 - 27 July 1996	28
9. Rainfall distribution on 26 - 30 July 1996	28
10. Visible imagery of Gloria at around 11 a.m. on 26 July 1996 (originally captured by GMS of JMA)	29
11. Visible imagery of Gloria at around 11 a.m. on 27 July 1996 (originally captured by GMS of JMA)	29
12. Track of Tropical Depression Lisa (9611) : 6 - 7 August 1996	32
13. Rainfall distribution on 6 - 7 August 1996	32
14. Infra-red imagery of Lisa at around 5 p.m. on 6 August 1996 (originally captured by GMS of JMA)	33
15. Visible imagery of Lisa at around 8 a.m. on 7 August 1996 (originally captured by GMS of JMA)	33
16. Track of Typhoon Niki (9613) : 18 - 23 August 1996	36
17. Rainfall distribution on 20 - 22 August 1996	36
18. Infra-red imagery of Niki at around 8 p.m. on 20 August 1996 (originally captured by GMS of JMA)	37
19. Visible imagery of Niki at around 2 p.m. on 21 August 1996 (originally captured by GMS of JMA)	37

FIGURES

	Page
20. Track of Typhoon Sally (9616) : 5 - 10 September 1996	41
21. Rainfall distribution on 8 - 10 September 1996	41
22. Visible imagery of Sally at around 11 a.m. on 8 September 1996 (originally captured by GMS of JMA)	42
23. Infra-red imagery of Sally at around 7 p.m. on 8 September 1996 (originally captured by GMS of JMA)	42
24. Radar display of the rain echoes of Sally at 2.00 a.m. on 9 September 1996	43
25. A scaffolding collapsed onto the roof of a factory in Wong Chuk Hang	43
26. A railing blown down from the roof top of a high rise building in Ma On Shan	44
27. Track of Severe Tropical Storm Willie (9619) : 18 - 23 September 1996	47
28. Rainfall distribution on 18 - 22 September 1996	47
29. Visible imagery of Willie at around 11 a.m. on 19 September 1996 (originally captured by GMS of JMA)	48
30. Infra-red imagery of Willie at around 2 a.m. on 20 September 1996 (originally captured by GMS of JMA)	48
31. Track of Typhoon Beth (9622) : 15 - 21 October 1996	51
32. Rainfall distribution on 19 - 21 October 1996	51
33. Visible imagery of Beth at around 11 a.m. on 19 October 1996 (originally captured by GMS of JMA)	52
34. Visible imagery of Beth at around 11 a.m. on 20 October 1996 (originally captured by GMS of JMA)	52

TABLES

	Page
1. List of tropical cyclones in the western North Pacific and the South China Sea in 1996	55
2. Tropical cyclone warnings for shipping issued in 1996	56
3. Tropical cyclone warning signals hoisted in Hong Kong and number of warning bulletins issued in 1996	57
4. Frequency and total duration of display of tropical cyclone warning signals: 1956-1996	58
5. Number of tropical cyclones in Hong Kong's area of responsibility and the number that necessitated the display of tropical cyclone warning signals in Hong Kong: 1956-1996	59
6. Duration of tropical cyclone warning signals hoisted in Hong Kong: 1956-1996	60
7. A summary of meteorological observations recorded in Hong Kong during the passages of tropical cyclones in 1996	61
8. Tropical cyclone rainfall in Hong Kong	63
9. Typhoons requiring the hoisting of the Hurricane Signal No. 10 during the period 1946-1996	65
10. Casualties and damage caused by tropical cyclones in Hong Kong: 1967-1996	66

Hong Kong's Tropical Cyclone Warning Signals

Signal		Display		Meaning of the Signal
		Symbol	Lights	
Stand By	1		White White White	A tropical cyclone is centred within about 800 kilometres of Hong Kong and may later affect Hong Kong.
Strong Wind	3		Green White Green	Strong wind is expected or blowing in the Victoria harbour, with a sustained speed of 41-62 kilometres per hour (km/h), and gusts which may exceed 110 km/h.
NW'y Gale or Storm	8NW		White Green Green	Gale or storm force wind is expected or blowing in the Victoria harbour, with a sustained wind speed of 63-117 km/h from the quarter indicated and gusts which may exceed 180 km/h.
SW'y Gale or Storm	8SW		Green White White	
NE'y Gale or Storm	8NE		Green Green White	
SE'y Gale or Storm	8SE		White White Green	
Increasing Gale or Storm	9		Green Green Green	
Hurricane	10		Red Green Red	Hurricane force wind is expected or blowing, with sustained speed reaching upwards from 118 km/h and with gusts that may exceed 220 km/h.

Section 1

INTRODUCTION

Apart from a short break during 1940-1946, surface observations of meteorological elements since 1884 have been summarized and published in the Observatory's Meteorological Results. Upper-air observations began in 1947 and from then onwards the annual publication was divided into two parts, namely Part I - Surface Observations and Part II - Upper-air Observations. These two publications were re-titled "Summary of Radiosonde-Radiowind Ascents" and "Surface Observations in Hong Kong" in 1981 and 1987 respectively. In 1993, both of these publications were made obsolete, and since then surface and upper-air data have been included in one revised publication entitled "Summary of Meteorological Observations in Hong Kong".

During the period 1884-1939, reports on some destructive typhoons were printed as Appendices to the Meteorological Results. This practice was extended and accounts of all tropical cyclones which caused gales in Hong Kong were included in the Director's Annual Departmental Reports from 1947 to 1967 inclusive. The series "Meteorological Results Part III - Tropical Cyclone Summaries" was subsequently introduced. It contained information on tropical cyclones over the western North Pacific and the South China Sea. The first issue, which contained reports on tropical cyclones occurring in 1968, was published in 1971. Tropical cyclones within the area bounded by the Equator, 45°N, 100°E and 160°E were described. With reconnaissance aircraft reports (terminated from August 1987 onwards) and satellite pictures facilitating the tracking of tropical cyclones over the otherwise data-sparse ocean, the eastern boundary of the area of coverage was extended from 160°E to 180° from 1985 onwards. Starting from 1987, the series was re-titled as "Tropical Cyclones in 19YY" but its contents remained largely the same.

Tracks of tropical cyclones in the western North Pacific and the South China Sea were published in Meteorological Results up to 1939 and in Meteorological Results Part I from 1947 to 1967. Before 1961, only daily positions were plotted on the tracks. The time of the daily positions varied to some extent in the older publications but remained fixed at 0000 UTC after 1944. Details of the variation are given in the Royal Observatory Technical Memoir No. 11, Volume 1. From 1961 onwards, six-hourly positions are shown on the tracks of all tropical cyclones.

Provisional reports on individual tropical cyclones affecting Hong Kong have been prepared since 1960 to meet the immediate needs of the press, shipping companies and others. These reports are printed and supplied on request. Initially, reports were only written on those tropical cyclones for which gale or storm signals had been hoisted in Hong Kong. By 1968, it had become necessary to produce a report on every tropical cyclone that necessitated the hoisting of tropical cyclone warning signals.

In this publication, tropical cyclones are classified into the following four categories according to the maximum sustained surface winds near their centres :

A TROPICAL DEPRESSION (T.D.) has maximum sustained winds of less than 63 km/h.

A TROPICAL STORM (T.S.) has maximum sustained winds in the range 63-87 km/h.

A SEVERE TROPICAL STORM (S.T.S.) has maximum sustained winds in the range 88-117 km/h.

A TYPHOON (T.) has maximum sustained winds of 118 km/h or more.

Throughout this publication, maximum sustained surface winds when used without qualification refer to wind speeds averaged over a period of 10 minutes. Mean hourly winds are winds averaged over a 60-minute interval ending on the hour. Daily rainfall amounts are computed over a 24-hour period ending at midnight Hong Kong Time.

Over the western North Pacific and the South China Sea, tropical cyclone names are assigned by the Joint Typhoon Warning Center in Guam according to a pre-determined list that undergoes revisions from time to time. Since 1981, a common system for identification of tropical cyclones in the western North Pacific and the South China Sea has been adopted and the Japan Meteorological Agency is delegated with the responsibility of assigning to each tropical cyclone of tropical storm intensity or above a numerical code of four digits. For example, the second tropical cyclone of tropical storm intensity or above as classified by Japan Meteorological Agency which occurred within the region in 1996 was assigned the code "9602". In this publication, the appropriate code immediately follows the name of the tropical cyclone in bracket, e.g. Tropical Storm Ann (9602).

Surface wind data presented in this report were obtained from a network of anemometers operated by the Observatory. Details of the stations are listed on the next page:

Station	Position		Head of anemometer above M.S.L. (m)
	Latitude N	Longitude E	
Central (Star Ferry Pier)	22°17'	114°10'	17
Chek Lap Kok	22°19'	113°56'	19
Cheung Chau	22°12'	114°01'	92
Cheung Sha Wan	22°20'	114°09'	30
Green Island	22°17'	114°07'	105
Hong Kong Airport (SE)	22°19'	114°13'	16
King's Park	22°19'	114°10'	78
Lau Fau Shan	22°28'	113°59'	50
Ping Chau	22°33'	114°26'	39
Sai Kung	22°23'	114°16'	31
Sha Lo Wan	22°18'	113°54'	71
Sha Tin	22°24'	114°12'	16
Star Ferry Pier Kowloon	22°18'	114°10'	18
Ta Kwu Ling	22°32'	114°09'	28
Tai Mei Tuk	22°29'	114°14'	71
Tai Mo Shan	22°25'	114°07'	969
Tai Po Kau	22°27'	114°11'	28
Tap Mun	22°28'	114°21'	37
Tate's Cairn	22°22'	114°13'	588
Tsak Yue Wu	22°24'	114°19'	23
Tseung Kwan O	22°19'	114°15'	52
Tsing Yi (Ching Pak House)	22°21'	114°06'	136
Tuen Mun	22°24'	113°58'	68
Waglan Island	22°11'	114°18'	82
Wong Chuk Hang	22°15'	114°10'	30

Maximum storm surges caused by tropical cyclones were measured by tide gauges installed at several locations around Hong Kong. The locations of anemometers and tide gauges mentioned in this report are shown in Figure 1.

In Section 2, an overall review of all the tropical cyclones over the western North Pacific and the South China Sea in 1996 is presented.

The reports in Section 3 are individual accounts of the life history of tropical cyclones affecting Hong Kong in 1996. They include the following information:-

- (a) the effects of the tropical cyclone on Hong Kong;
- (b) the sequence of display of tropical cyclone warning signals;
- (c) the maximum gust peak speeds and maximum hourly mean winds recorded in Hong Kong;
- (d) the lowest barometric pressure recorded at the Observatory;
- (e) the daily amounts of rainfall recorded at the Observatory and selected locations;
- (f) the times and heights of the highest tides and maximum storm surges recorded in Hong Kong;
- (g) satellite pictures and/or radar displays if applicable.

Statistics and information relating to tropical cyclones are presented in various tables in Section 4.

Six-hourly positions together with the corresponding estimated minimum central pressures and maximum sustained surface winds for individual tropical cyclones are tabulated in Section 5.

In this publication, different times are used in different contexts. The official reference times are given in Co-ordinated Universal Time and labelled UTC. Times of the day expressed as "a.m." or "p.m." or as "morning", "evening", etc. in the tropical cyclone narratives are in Hong Kong Time which is eight hours ahead of UTC.

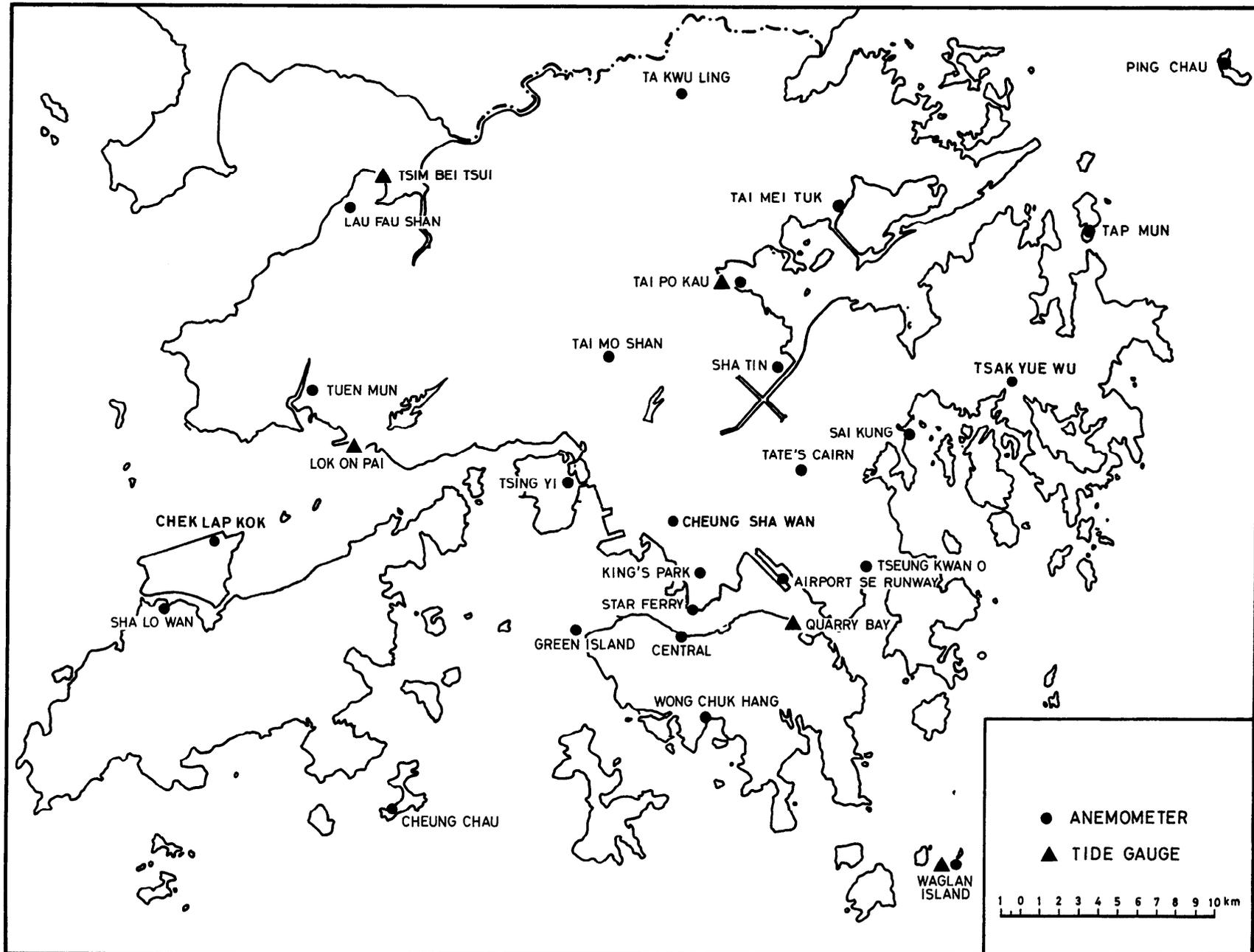


Figure 1. Locations of anemometers and tide gauge stations mentioned in this report.

Section 2

TROPICAL CYCLONE OVERVIEW FOR 1996

In 1996, there were 32 tropical cyclones over the western North Pacific and the adjacent seas bounded by the equator, 45°N, 100°E and 180°. Compared with the 30-year annual average (1961-1990) of 31 tropical cyclones, 1996 was a year with near normal tropical cyclone activity. Also, the number of tropical cyclones attaining typhoon intensity was near normal - a total of 16 typhoons in 1996 against the 30-year annual average of 15.6. The monthly distributions of the frequency of first occurrence of tropical cyclones and that of typhoons for 1996 are shown in Figure 2. The monthly mean frequencies of these two parameters during the years 1961 - 1990 are shown in Figure 3.

Amongst the tropical cyclones that affected the coast of Guangdong in 1996, Typhoon Sally (9616) would have been one of the most unforgettable in terms of its exceptionally fast movement over the South China Sea and the heavy death toll it brought on in western Guangdong and Guangxi. Substantial damage was also inflicted on Hainan Island by three tropical cyclones namely Frankie (9607), Niki (9613) and Willie (9619). Two typhoons, Gloria (9608) and Herb (9609), ravaged Taiwan in July and August respectively, and they also moved on to hit Fujian after crossing the Taiwan Strait. These two typhoons together with Tropical Depression Lisa (9611) were the only tropical cyclones that affected the east coast of China during the year.

During the year, 15 tropical cyclones occurred within the area of responsibility of Hong Kong (i.e. the area bounded by 10°N, 30°N, 105°E and 125°E). This number was near the 30-year (1961-90) annual average of 16.4. Of the 15 tropical cyclones, six developed within Hong Kong's area of responsibility. Altogether, 360 tropical cyclone warnings to ships and vessels were issued by the Observatory in 1996 (Table 2).

Local warning signals were hoisted in Hong Kong for seven tropical cyclones. Apart from Sally (9616) for which the highest signal hoisted was No. 8, all other tropical cyclones that affected Hong Kong, namely Frankie (9607), Gloria (9608) Lisa (9611), Niki (9613), Willie (9619) and Beth (9622), necessitated only the display of the Stand By Signal No. 1.

The total tropical cyclone rainfall (defined as the total rainfall recorded at the Observatory from the time when a tropical cyclone was centred within 600 km of Hong Kong to 72 hours after the tropical cyclone has dissipated or moved outside 600 km of Hong Kong) in 1996 amounted to 430.9 mm, 42 per cent below the mean annual value of 741.0 mm (1961-1990). It accounted for 19 per cent of the year's total rainfall of 2 249.1 mm. Rainfall figures associated with those tropical cyclones coming within 600 km of Hong Kong, altogether ten, are given in Table 8(a).

A review of all the tropical cyclones in 1996 is given in the following paragraphs.

The first tropical cyclone of 1996 was a tropical depression (9601) forming over the waters off the east coast of the Philippines about 1 150 km southeast of Manila on 28 February. Tracking west-northwestwards, this tropical depression crossed the Philippines and then dissipated over water on the night of 1 March.

In April, Ann (9602) formed as a tropical depression over the Pacific about 340 km west-northwest of Yap on 5 April and intensified into a tropical storm early the next morning. Moving westwards, it landed over the Philippines on 7 April. Ann weakened gradually and dissipated over the islands the next day.

Two tropical cyclones occurred over the western North Pacific and the South China Sea in May.

Over the western North Pacific, Bart (9603) developed as a tropical depression about 130 km west of Yap on 10 May. Tracking northwestwards, it intensified gradually and attained typhoon strength on 13 May. Bart recurved towards the northeast two days later and started to weaken. It became extratropical on 18 May.

Over the South China Sea, Cam (9604) formed as a tropical depression about 130 km east-southeast of Xisha on the night of 19 May and deepened into a tropical storm the next day. Heading northeastwards

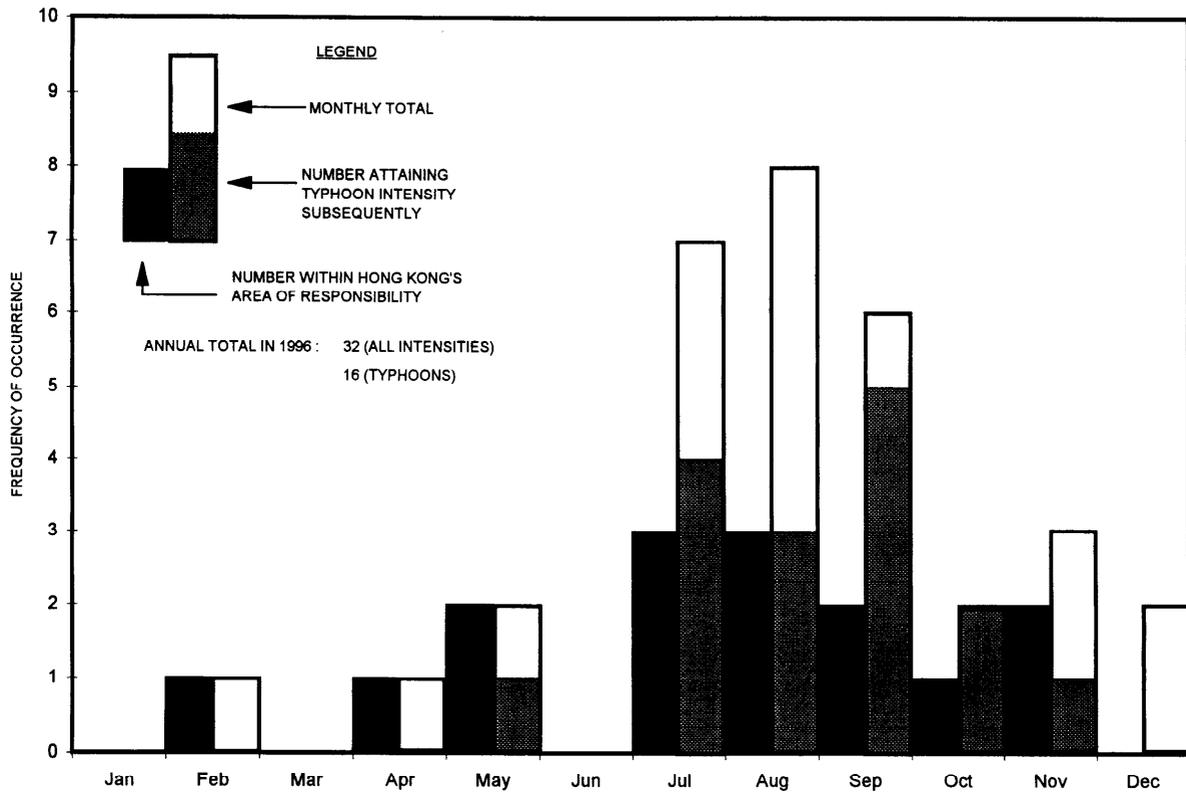


Figure 2. Monthly distribution of the frequency of first occurrence of tropical cyclones in the western North Pacific and the South China Sea in 1996.

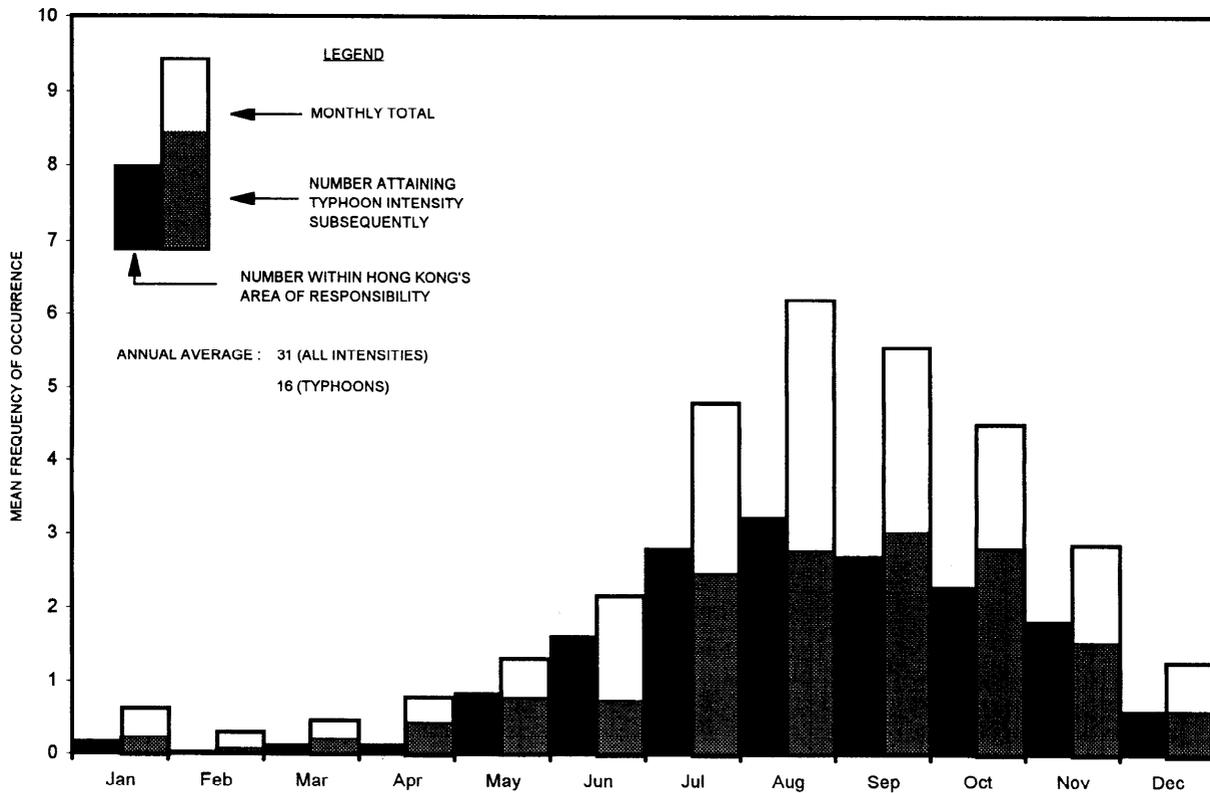


Figure 3. Monthly distribution of the mean frequency of first occurrence of tropical cyclones in the western North Pacific and the South China Sea, 1961-1990.

towards the Luzon Strait, Cam passed about 190 km to the south of Dongsha and was distant enough to spare Hong Kong from its influence. Cam entered the Pacific on 23 May and dissipated the next day.

Seven tropical cyclones occurred over the western North Pacific and the South China Sea in July. Amongst them, Severe Tropical Storm Frankie (9607) and Typhoon Gloria (9608) necessitated the hoisting of the Stand By Signal No. 1 in Hong Kong.

The first tropical cyclone in July formed about 950 km southeast of Iwo Jima on 5 July and was named Dan (9605). Tracking northwestwards, Dan intensified gradually and attained typhoon strength three days later. It then turned northwards towards Japan and weakened gradually. Passing about 250 km southeast of Tokyo, Dan took on a northeastward track and became extratropical on 11 July.

Typhoon Eve (9606) developed as a tropical depression about 640 km south-southeast of Iwo Jima on 13 July. Moving steadily northwestwards, it attained typhoon intensity on 15 July. Eve continued on a north-northwestward track towards Japan and made landfall over Kyushu on 18 July. It weakened rapidly while traversing northwards over Kyushu, dissipating into an area of low pressure the next day. In Japan, at least 15 people were injured during the passage of Eve.

Over the South China Sea, Frankie formed as a tropical depression about 170 km east-southeast of Xisha on 21 July. It intensified into a tropical storm and traversed Hainan Island the next day. Frankie crossed Beibu Wan and landed over northern Vietnam on 24 July, dissipating over land.

While Frankie was developing over the South China Sea, another tropical depression named Gloria formed over the western North Pacific about 1 340 km east-southeast of Manila on 21 July. Skirting past Luzon and the southern tip of Taiwan, Gloria finally made landfall near Xiamen on 27 July and dissipated over land. Detailed reports on Frankie and Gloria are presented in Section 3.

Herb (9609) developed as a tropical depression over the Pacific about 1 070 km east-northeast of Guam on 23 July. Tracking westwards, it intensified over water and attained typhoon intensity on 26 July. Herb adopted a northwestward track on 29 July and traversed the northern part of Taiwan on the early morning of 1 August, inflicting heavy damage on the island. At least 40 people were killed, 34 reported missing and 380 injured. Apart from bringing serious flooding and landslides, Herb also disrupted electricity supply to over two million households. A total of 13 counties were declared major disaster areas in the wake of Herb. The economic loss in Taiwan was put at NT\$ 30 billion. After crossing the Taiwan Strait, Herb made landfall over Fujian on 1 August causing severe damage where 18 people were killed and 2 300 houses were destroyed or inundated. The high winds associated with Herb also affected the coast of Zhejiang where five people were killed and five others were reported missing. Herb finally dissipated as an area of low pressure as it moved further inland.

Ian developed as a tropical depression about 200 km northwest of Guam on the early morning of 29 July. It tracked northwestwards and dissipated over water on 30 July.

The last tropical cyclone in July was Joy (9610). It formed as a tropical depression about 1 220 km east of Iwo Jima on 30 July. Drifting slowly at first, it began to move north-northwestwards on 1 August and intensified into a severe tropical storm. Joy turned eastwards the next day, but resumed a north-northwestward course on 4 August. It dissipated over water on 5 August.

Eight tropical cyclones formed over the western North Pacific and the South China Sea in August. Amongst them, Tropical Depression Lisa (9611) and Typhoon Niki (9613) necessitated the hoisting of the Stand By Signal No. 1 in Hong Kong.

Kirk (9612) developed as a tropical depression about 570 km east of Okinawa on 4 August. It moved northwestwards at first, but adopted a southeastward track on 6 August while intensifying east of Okinawa. Having attained typhoon strength, Kirk tracked towards the Ryukyus and traversed the islands on 12 August. It then moved on to ravage Kyushu and Honshu on 14 and 15 August, killing seven people and injuring about 60. Kirk became extratropical on 15 August.

Over the South China Sea, Lisa formed as a tropical depression about 170 km west-northwest of Dongsha on the morning of 6 August. Moving northeastwards, it made landfall near Shantou that evening and dissipated over land the next morning. A detailed report on Lisa is presented in Section 3.

A tropical depression developed over the Pacific about 1 710 km north-northwest of Wake Island on 12 August. Moving southeastwards at first, it turned northeastwards on 14 August and dissipated over water the next day.

Another short-lived tropical depression named Marty formed over Beibu Wan about 130 km east of Hanoi on the night of 13 August. Tracking southwestwards, it made landfall over northern Vietnam the next day and dissipated over land on the early morning of 15 August.

Niki developed as a tropical depression about 970 km east-northeast of Manila on 18 August. After sweeping across Luzon, it entered the South China Sea on 20 August and rampaged through Hainan Island two days later. Niki made landfall over northern Vietnam on the morning of 23 August and dissipated. A detailed report on Niki is presented in Section 3.

While Niki was wreaking havoc on Hainan, a tropical depression named Orson (9614) formed about 340 km south-southeast of Iwo Jima on 22 August. Orson drifted slowly at first but began to move east-northeastwards on 24 August and attained typhoon intensity the next day. After completing a clockwise loop on 27 and 28 August, Orson adopted a northwestward track and weakened. It intensified again on 31 August and began to recurve northeastwards the next day. Orson became extratropical on 3 September.

Over the western North Pacific, Piper (96 15) developed as a tropical depression about 1 190 km northwest of Wake Island on 23 August. It moved on a northward course and intensified into a severe tropical storm on 24 August. Piper became extratropical on 26 August.

Tropical Depression Rick formed about 1 360 km north-northeast of Wake Island on 30 August. It tracked northwestwards at first and turned east-northeastwards the next day. Rick dissipated on 1 September.

A total of six tropical cyclones formed over the western North Pacific and the South China Sea in September. Typhoon Sally (9616) necessitated the hoisting of the Strong Wind Signal No.3 and the Gale or Storm Signal No. 8 in Hong Kong for the first time in 1996. The Stand By Signal No. 1 was also displayed for Severe Tropical Storm Willie (9619).

Typhoon Sally developed as a tropical depression about 1 300 km east of Manila on 5 September. It entered the South China Sea on 8 September and later traversed Leizhou and Guangxi. Sally dissipated over northern Vietnam on 10 September. A detailed report on Sally is presented in Section 3.

Typhoon Violet (9617) developed over the western North Pacific about 1 030 km east of Manila on 12 September. Heading northwestwards, it intensified rapidly and attained typhoon strength on 14 September. Violet recurved northeastwards on 16 September and skirted past the southeastern coast of Japan on 22 September. It became extratropical the next day. Violet caused flooding and landslides in Japan, leaving at least eight people dead, five missing and 43 injured.

Soon after the formation of Violet, Tom (9618) developed as a tropical depression about 510 km east-northeast of Guam on 12 September. It moved northwestwards at first and intensified into a typhoon four days later. Tracking northeastwards, Tom became extratropical on 19 September.

Willie developed as a tropical depression about 200 km west-northwest of Xisha on 18 September. It moved northeastwards at first but turned northwestwards the next day. Willie adopted a west-southwestward track on 20 September and skirted past Leizhou and Hainan. It eventually made landfall over Vietnam on 22 September and dissipated over land. A detailed report on Willie is presented in Section 3.

Yates (9620) formed as a tropical depression about 1 360 km east of Guam on 23 September. It intensified into a typhoon the next day while tracking westwards. Yates took on a northwestward course on 26 September and started recurving three days later. It became extratropical on 1 October while moving northeastwards over the Pacific.

A tropical depression named Zane (9621) developed about 830 km west-northwest of Guam on 24 September. Tracking west-northwestwards, it attained typhoon intensity on 26 September. Zane took on a northward track two days later over the waters off the east coast of Taiwan and turned east-northeastwards on 30 September when it was over the Ryukyu Islands. Zane became extratropical on 3 October. In northern Taiwan, torrential rain associated with Typhoon Zane set off mudslides and cut roads. At least four persons were killed and about 420 people were stranded by floods. In Okinawa, electricity failure affected 7 730 households.

In October, Typhoon Beth (9622) necessitated the hoisting of the Stand By Signal No. 1 in Hong Kong. Beth developed as a tropical depression about 930 km east-northeast of Manila on 15 October. Tracking westwards, it attained typhoon intensity on 17 October and entered the South China Sea the next day. Beth dissipated over water near Xisha on 21 October. A detailed report on Beth is presented in Section 3.

Typhoon Carlo (9623) formed as a tropical depression about 730 km northeast of Guam on 21 October. It gathered strength over water and attained typhoon intensity on 24 October while moving northwards. Carlo adopted a northeastward track on 25 October after passing about 350 km east of Iwo Jima. It dissipated over water the next day.

Three tropical cyclones formed over the western North Pacific and the South China Sea in November.

A tropical depression developed over the South China Sea about 250 km north of Nansha on 2 November. Moving on a northwestward track, this tropical depression made landfall over Vietnam the next day and dissipated over land.

Dale (9624) formed as a tropical depression about 890 km east-southeast of Guam on 4 November. Dale was slow moving at first, but it started to move westwards two days later. Having intensified into a typhoon, Dale took on a northwestward track on 8 November and then recurved northeastwards on 12 November. It became extratropical on 13 November.

An area of disturbance developed into Tropical Depression Ernie (9625) about 780 km west-southwest of Yap on 4 November. It moved northwestwards at first, but turned westwards on 7 November while traversing the central Philippines. Ernie took on a northward course over the South China Sea the next day, slowing down when it was about 150 km southeast of Dongsha and then drifting southeastwards towards Luzon. Ernie turned towards the southwest along the west coast of Luzon on 12 November, thus completing a large clockwise loop over the South China Sea. Ernie dissipated over the coastal waters of southern Vietnam on 16 November. In the central Philippines 12 people were killed and 15 were missing in stormy weather associated with Ernie.

Two tropical cyclones occurred over the western North Pacific and the South China Sea in December.

Fern (9626) formed as a tropical depression about 370 km east of Yap on 22 December and soon deepened into a tropical storm. Moving westwards, Fern became a severe tropical storm and started tracking steadily northwards on 25 December. Fern turned northeastwards on 28 December and gradually weakened into an area of low pressure two days later.

Over the southern part of the South China Sea, a tropical depression named Greg developed about 390 km south-southwest of Nansha on 25 December. Tracking eastwards, Greg rampaged through the state of Sabah in Malaysia on 26 December and then weakened quickly into an area of low pressure. Greg killed at least 140 people in Sabah, leaving about 200 people missing and making over 3 000 homeless.

Note: Casualties and damage figures were compiled from press reports.

Section 3

REPORTS ON TROPICAL CYCLONES AFFECTING HONG KONG IN 1996

(a) Severe Tropical Storm Frankie (9607)

21 - 24 July 1996

The track of Frankie is shown in Figure 4

Over the South China Sea, Frankie formed as a tropical depression about 170 km east-southeast of Xisha on the morning of 21 July. Moving northwestwards, it intensified into a tropical storm and traversed Hainan Island the next day. In Hainan a thousand-tonne vessel capsized in high winds resulting in one death and 17 people missing. Moving across Beibu Wan and intensifying further into a severe tropical storm, Frankie made landfall over northern Vietnam on 24 July and gradually dissipated over land. In Vietnam more than 40 people were killed and 224 were injured.

In Hong Kong the Stand By Signal No.1 was hoisted at 2.30 p.m. on 21 July when Frankie was about 570 km to the south. Under the influence of its outer rainbands, there were occasional heavy squally showers with fresh gusty winds from the east. As Frankie intensified and moved closer, local winds became occasionally strong offshore and on high ground. Frankie began moving away from Hong Kong on the evening of 22 July and the No. 1 Signal was lowered at 10.30 p.m. Frankie was closest to Hong Kong at about 5 p.m. on 22 July when it was about 530 km to the southwest. At the Observatory Headquarters, the lowest hourly sea-level pressure of 1 001.9 hPa was recorded at 4 p.m.

During the passage of Frankie, there were several reports of toppled trees due to gusty winds but no injuries were reported.

The rainfall distribution associated with Frankie is shown in Figure 5. Information on wind, rainfall and tide during the passage of Frankie is given as follows :

Maximum gust peak speeds and maximum hourly mean winds with associated wind directions recorded at various stations during the hoisting of tropical cyclone warning signal for Frankie :-

Station (see Fig. 1)	Maximum Gust			Maximum Hourly Wind				
	Direction	Speed (km/h)	Date	Time	Direction	Speed (km/h)	Date	Time
Central	E	68	22 Jul	1029	E	27	22 Jul	1200
Chek Lap Kok	ESE	65	22 Jul	1151	ESE	38	22 Jul	1200
Cheung Chau	SE	115	22 Jul	1214	ESE	54	22 Jul	1200
Cheung Sha Wan	ENE	75	21 Jul	2257	ENE	25	21 Jul	2200
Green Island	SSE	88	22 Jul	2000	ESE	45	22 Jul	1100
H.K. Airport (SE)	E	85	22 Jul	1200	E	40	22 Jul	1100
					E	40	22 Jul	1200
King's Park	SE	76	22 Jul	1230	ESE	30	22 Jul	0500
Lau Fau Shan	ENE	70	21 Jul	1447	ENE	36	21 Jul	1500
Ping Chau	SE	59	22 Jul	1312	ESE	22	22 Jul	1200
Sai Kung	E	72	22 Jul	0603	S	31	22 Jul	2200
Sha Tin	ENE	54	22 Jul	0246	ENE	20	22 Jul	0300
Star Ferry	ESE	70	22 Jul	1230	ESE	40	22 Jul	1300
Ta Kwu Ling	E	77	22 Jul	1132	E	34	22 Jul	1200
Tai Mei Tuk	ENE	76	22 Jul	0441	ENE	51	22 Jul	0500
Tai Mo Shan	E	108	22 Jul	1255	ENE	76	22 Jul	0400
Tai Po Kau	E	76	22 Jul	0914	E	38	21 Jul	2400
Tap Mun	ESE	85	22 Jul	1236	E	34	22 Jul	0500
Tate's Cairn	E	99	22 Jul	0518	E	58	22 Jul	0400
Tsak Yue Wu	ENE	51	22 Jul	1235	E	19	22 Jul	1200

<u>Station</u> (see Fig. 1)	<u>Maximum Gust</u>			<u>Maximum Hourly Wind</u>			
	<u>Direction</u>	<u>Speed (km/h)</u>	<u>Date</u>	<u>Time</u>	<u>Direction</u>	<u>Speed (km/h)</u>	<u>Date</u>
Tseung Kwan O	SSE	68	22 Jul	2108	SE	20	22 Jul
					ESE	20	22 Jul
Tsing Yi	SE	96	22 Jul	1238	SE	47	22 Jul
Waglan Island	SE	106	22 Jul	1211	SE	51	22 Jul
Wong Chuk Hang	ESE	75	22 Jul	1953	E	31	22 Jul

Stations with incomplete record:

Sha Lo Wan

Tuen Mun

Daily rainfall amounts in millimetres recorded at the Observatory Headquarters and other stations during the passage of Frankie :-

<u>Station</u> (see Fig. 5)	<u>21 Jul</u>	<u>22 Jul</u>	<u>23 Jul</u>	<u>Total</u>
Observatory Headquarters	33.6	43.3	16.7	93.6
H19 (HK Island (east))	43.5	39.5	20.0	103.0
H13 (HK Island (west))	37.0	30.5	16.5	84.0
H21 (HK Island (south))	38.5	27.5	18.5	84.5
K04 (Kowloon (east))	27.5	20.5	25.0	73.0
K06 (Kowloon (west))	21.5	35.0	29.0	85.5
N17 (Lantau)	17.5	45.5	107.5	170.5
N13 (Sai Kung)	5.0	21.0	13.5	39.5
N09 (Sha Tin)	16.5	39.0	19.5	75.0
R26 (Shek Kong)	23.5	45.0	42.0	110.5
N05 (Sheung Shui)	13.5	29.5	16.5	59.5
R31 (Tai Po)	9.0	19.5	12.5	41.0
N06 (Tsuen Wan - Kwai Chung)	24.5	39.0	38.5	102.0
R21 (Tuen Mun)	29.0	16.5	12.0	57.5
N12 (Yuen Long)	20.5	24.0	8.0	52.5

Times and heights of the maximum sea level and the maximum storm surge recorded at tide stations in Hong Kong during the passage of Frankie :-

<u>Station</u> (see Fig. 1)	<u>Maximum sea level above chart datum</u>			<u>Maximum storm surge above astronomical tide</u>		
	<u>Height (m)</u>	<u>Date</u>	<u>Time</u>	<u>Height (m)</u>	<u>Date</u>	<u>Time</u>
Lok On Pai	2.10	22 Jul	12.51 p.m.	0.40	22 Jul	9.31 a.m.
Quarry Bay	1.99	22 Jul	11.32 a.m.	0.40	21 Jul	4.07 p.m.
Tai Po Kau	2.21	22 Jul	10.24 a.m.	0.67	21 Jul	3.42 p.m.
Waglan Island	2.08	22 Jul	11.27 a.m.	0.53	21 Jul	4.30 p.m.

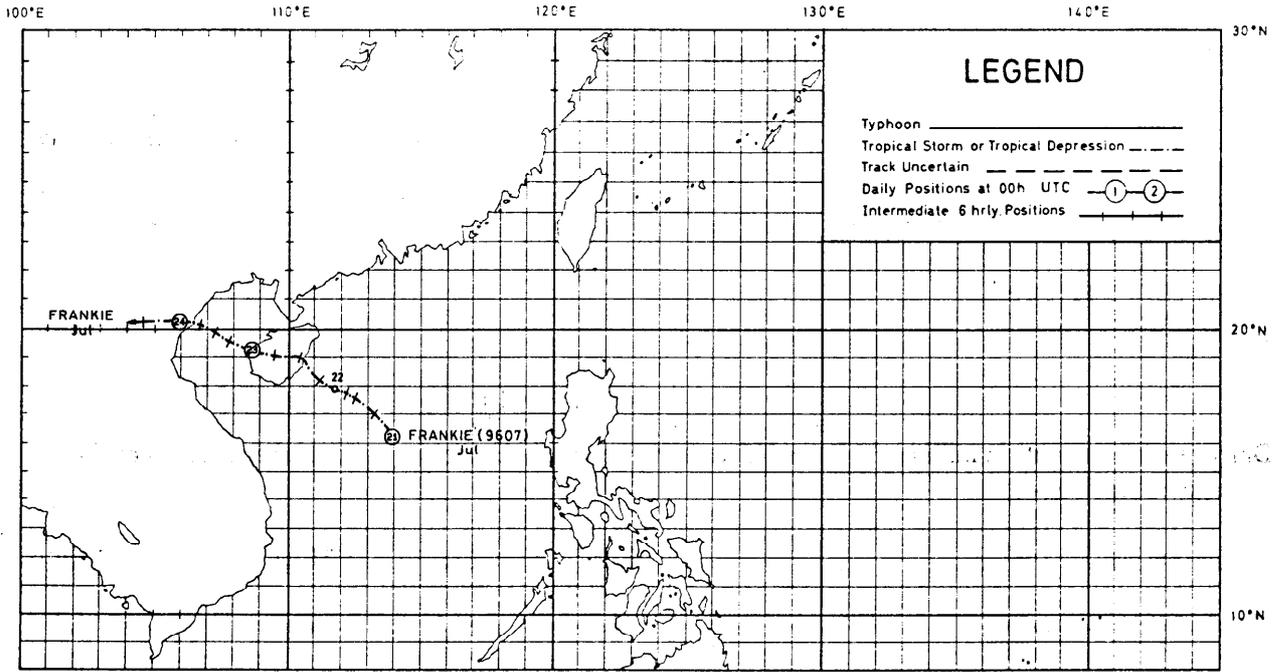


Figure 4. Track of Severe Tropical Storm Frankie (9607) : 21 - 24 July 1996.

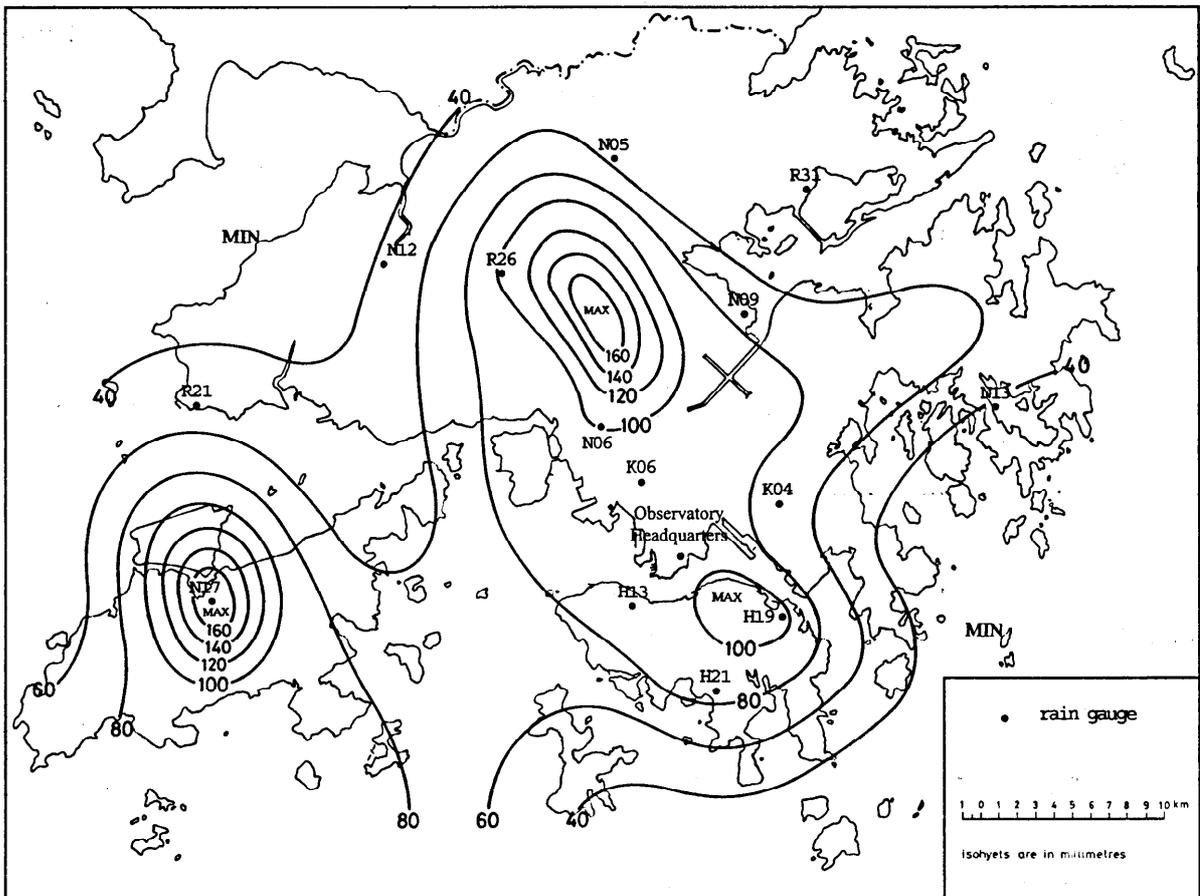


Figure 5. Rainfall distribution on 21 - 23 July 1996.

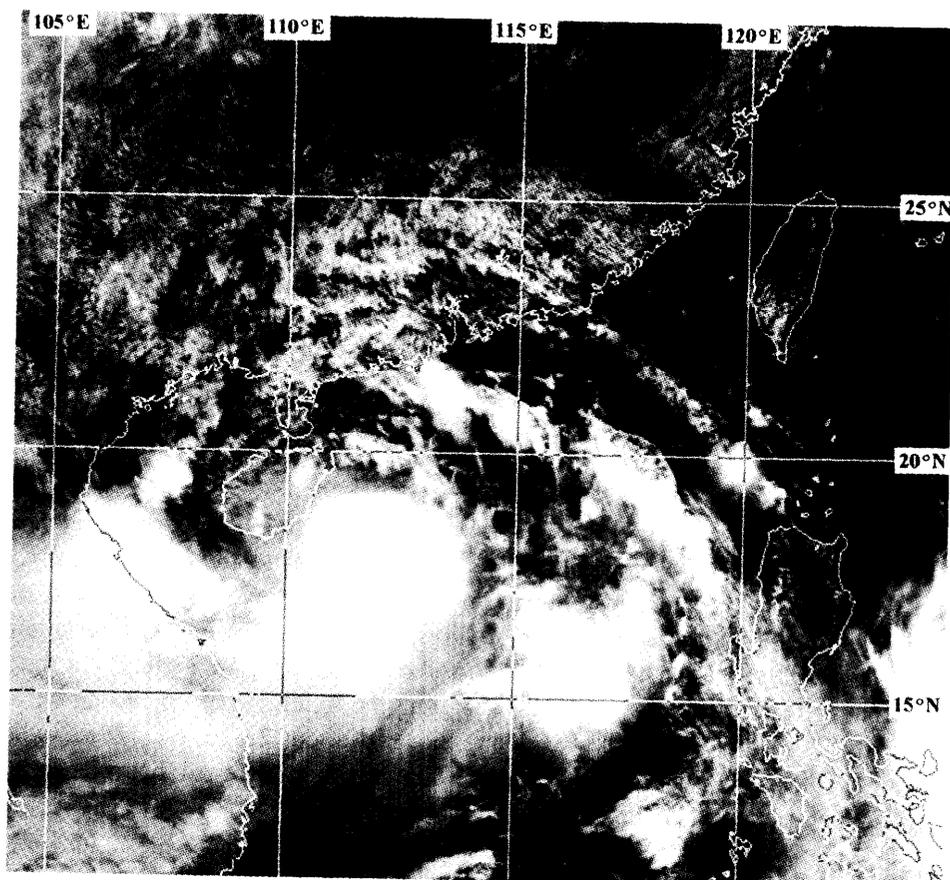


Figure 6. Visible imagery of Frankie at around 11 a.m. on 22 July 1996 (originally captured by GMS of JMA).

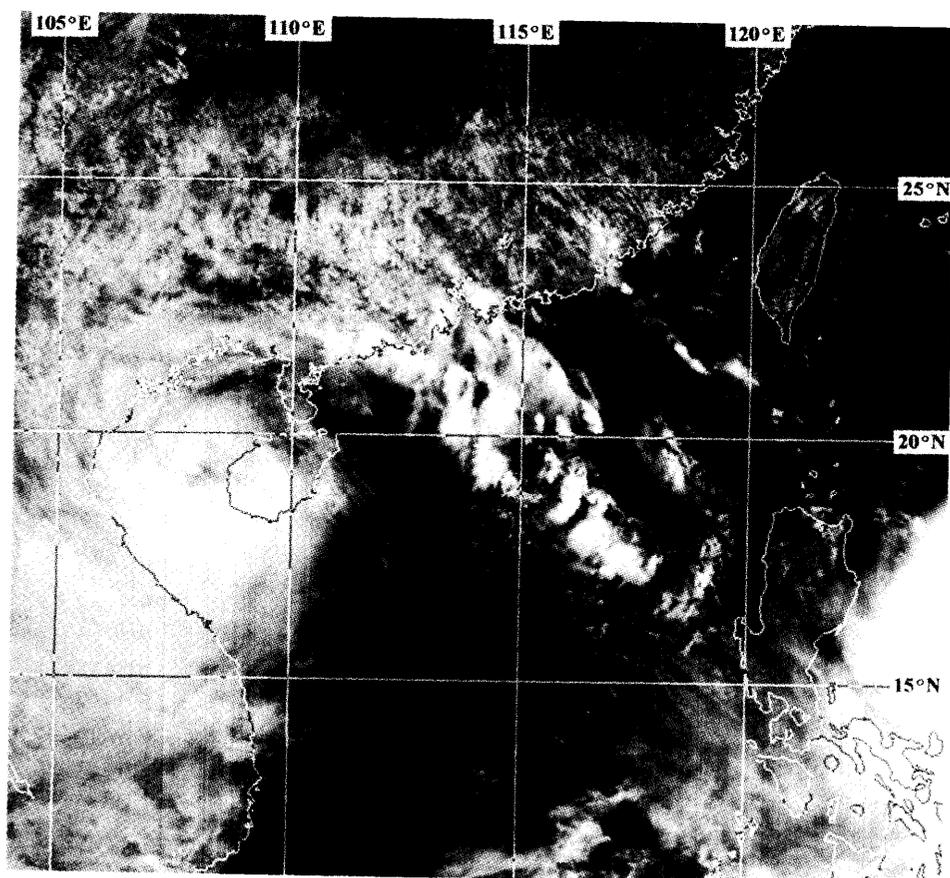


Figure 7. Visible imagery of Frankie at around 11 a.m. on 23 July 1996 (originally captured by GMS of JMA).

(b) Typhoon Gloria (9608)**21 - 27 July 1996**

The track of Gloria is shown in Figure 8

A tropical depression named Gloria formed about 1 340 km east-southeast of Manila on 21 July. Tracking northwestwards, it intensified gradually and attained typhoon strength on 24 July. Gloria skirted past the northern Philippines the next day, leaving at least 55 people dead or missing. It then moved on to ravage Taiwan on 26 July where two people died, one person was reported missing and six were injured. Gloria also caused considerable damage to agricultural produce in Taiwan and economic loss was estimated at NT\$ 580 million. Heading towards the coast of Fujian, Gloria made landfall near Xiamen on the morning of 27 July and dissipated over land.

Gloria was the first typhoon to enter the South China Sea this year. In Hong Kong the Stand By Signal No. 1 was hoisted at 11.30 a.m. on 26 July when Gloria was about 700 km to the east. Locally, westerly winds prevailed and the weather was fine and very hot during the day. A few squally showers set in during the evening when Hong Kong came under the influence of Gloria's outer rainbands. As Gloria made landfall near Xiamen early the next morning, the No. 1 Signal was lowered at 6.45 a.m. on 27 July. In the wake of Gloria, unstable southwesterlies affected the coast of Guangdong and the weather in Hong Kong became cloudy with rain for a couple of days. Gloria was closest to Hong Kong at about 2 p.m. on 27 July when it was about 280 km to the north-northeast. At the Observatory Headquarters, the lowest hourly sea-level pressure of 992.8 hPa was recorded at 4 p.m. on 26 July.

No significant damage was reported in Hong Kong during the passage of Gloria.

The rainfall distribution associated with Gloria is shown in Figure 9. Information on wind, rainfall and tide during the passage of Gloria is given as follows :

Maximum gust peak speeds and maximum hourly mean winds with associated wind directions recorded at various stations during the hoisting of tropical cyclone warning signal for Gloria :-

<u>Station</u> (see Fig. 1)	<u>Maximum Gust</u>			<u>Maximum Hourly Wind</u>				
	<u>Direction</u>	<u>Speed (km/h)</u>	<u>Date</u>	<u>Time</u>	<u>Direction</u>	<u>Speed (km/h)</u>	<u>Date</u>	<u>Time</u>
Central	WNW	41	26 Jul	2056	NW	16	26 Jul	1600
Chek Lap Kok	NW	75	26 Jul	2034	NW	36	26 Jul	2100
	NW	75	26 Jul	2037				
	NW	92	26 Jul	2049	NNW	30	26 Jul	2100
Cheung Chau	NW	43	26 Jul	2110	NW	14	26 Jul	2200
Cheung Sha Wan	NW	54	26 Jul	2050	WNW	30	26 Jul	1400
Green Island	WSW	52	26 Jul	2202	SW	30	26 Jul	2300
H.K. Airport (SE)	NNE	38	26 Jul	1719	W	13	26 Jul	2300
King's Park					WSW	13	26 Jul	2400
Lau Fau Shan	WNW	104	26 Jul	2016	WNW	47	26 Jul	2100
Ping Chau	W	38	27 Jul	0403	W	22	27 Jul	0400
Sai Kung	NNE	62	26 Jul	1701	NNW	12	26 Jul	1200
Sha Tin	NNW	30	26 Jul	1613	SSW	13	27 Jul	0200
Star Ferry	WNW	47	26 Jul	2106	W	27	26 Jul	1200
Ta Kwu Ling	NNE	49	26 Jul	1643	WNW	16	26 Jul	1600
Tai Mei Tuk	W	62	26 Jul	2223	W	31	26 Jul	2400
Tai Mo Shan	W	65	26 Jul	2223	W	47	26 Jul	2300
	WSW	65	26 Jul	2239				

Station (see Fig. 1)	Maximum Gust			Maximum Hourly Wind				
	Direction	Speed (km/h)	Date	Time	Direction	Speed (km/h)	Date	Time
Tai Po Kau	NNE	43	26 Jul	1608	W	25	26 Jul	2400
Tap Mun	WNW	77	26 Jul	1655	W	27	27 Jul	0400
Tate's Cairn	NW	54	26 Jul	1434	WSW	34	27 Jul	0400
Tsak Yue Wu	NW	38	26 Jul	1612	NNW	14	26 Jul	2400
Tseung Kwan O	NE	49	26 Jul	1710	W	13	27 Jul	0300
Tsing Yi	NW	70	26 Jul	2050	WNW	25	26 Jul	1600
Tuen Mun	NW	70	26 Jul	2028	NW	23	26 Jul	1400
Waglan Island	W	62	27 Jul	0054	W	47	27 Jul	0200
Wong Chuk Hang	W	47	26 Jul	2105	WSW	14	26 Jul	1600

Station with incomplete record:

Sha Lo Wan

Daily rainfall amounts in millimetres recorded at the Observatory Headquarters and other Wind stations during the passage of Gloria :-

Station (see Fig. 9)	26 Jul	27 Jul	28 Jul	29 Jul	30 Jul	Total
Observatory Headquarters	Trace	25.1	21.7	24.0	4.6	75.4
H19 (HK Island (east))	2.5	11.5	27.0	29.5	3.5	74.0
H13 (HK Island (west))	Nil	16.5	18.0	53.0	15.0	102.5
H21 (HK Island (south))	Nil	10.5	26.0	23.5	19.0	79.0
K04 (Kowloon (east))	1.5	33.5	33.0	37.0	24.0	129.0
K06 (Kowloon (west))	Nil	31.0	19.5	28.0	2.0	80.5
N17 (Lantau)	1.5	8.0	12.0	0.5	1.5	23.5
N13 (Sai Kung)	8.0	54.0	31.5	16.0	0.5	110.0
N09 (Sha Tin)	8.0	15.5	43.5	19.0	0.5	86.5
R26 (Shek Kong)	3.0	13.0	2.5	[5.5]	[1.0]	[25.0]
N05 (Sheung Shui)	5.0	14.0	21.0	7.0	Nil	47.0
R31 (Tai Po)	26.0	21.0	25.0	16.0	0.5	88.5
N06 (Tsuen Wan - Kwai Chung)	[Nil]	[18.0]	[30.5]	[17.5]	[22.0]	[88.0]
R21 (Tuen Mun)	5.5	2.5	19.5	4.5	25.0	57.0
N12 (Yuen Long)	3.0	16.0	18.0	2.5	Nil	39.5

Note : [] based on incomplete hourly data.

Times and heights of the maximum sea level and the maximum storm surge recorded at tide stations in Hong Kong during the passage of Gloria :-

Station (see Fig. 1)	Maximum sea level above chart datum			Maximum storm surge above astronomical tide		
	Height (m)	Date	Time	Height (m)	Date	Time
Lok On Pai	2.51	27 Jul	6.19 a.m.	0.37	26 Jul	8.53 p.m.
Quarry Bay	2.46	27 Jul	5.56 a.m.	0.41	26 Jul	9.40 p.m.
Tai Po Kau	2.51	27 Jul	5.45 a.m.	0.57	27 Jul	1.34 a.m.
Waglan Island	2.52	27 Jul	5.50 a.m.	0.45	26 Jul	9.24 p.m.

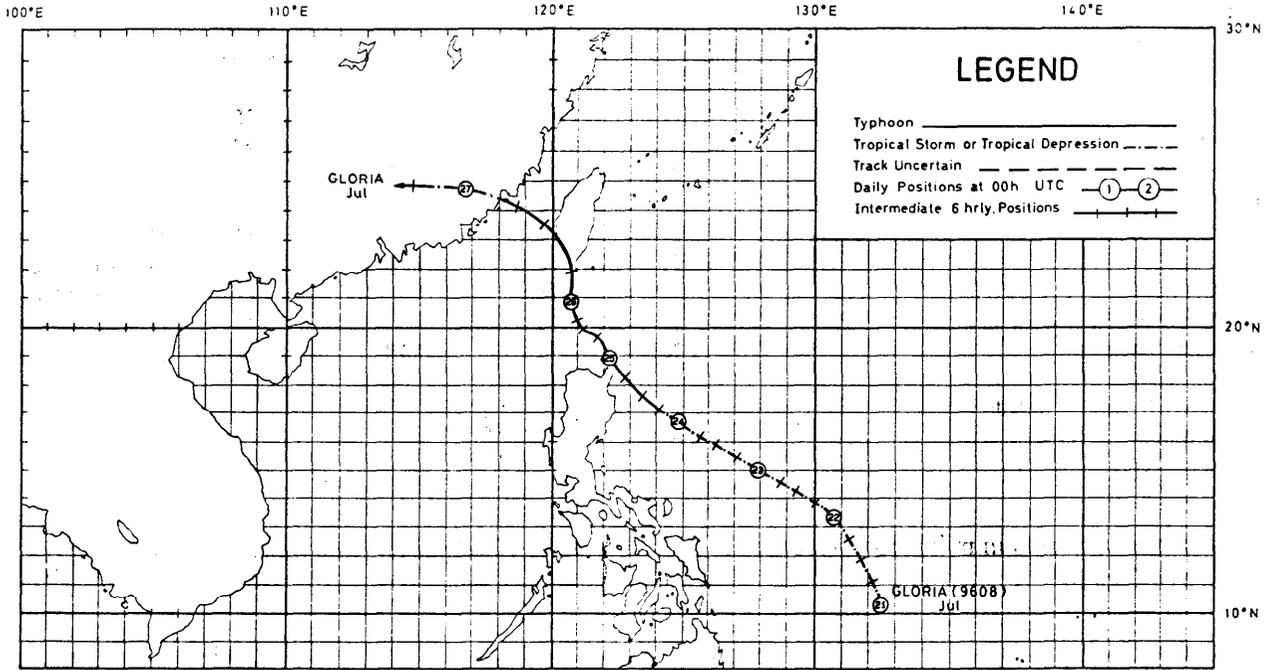


Figure 8. Track of Typhoon Gloria (9608) : 21 - 27 July 1996.

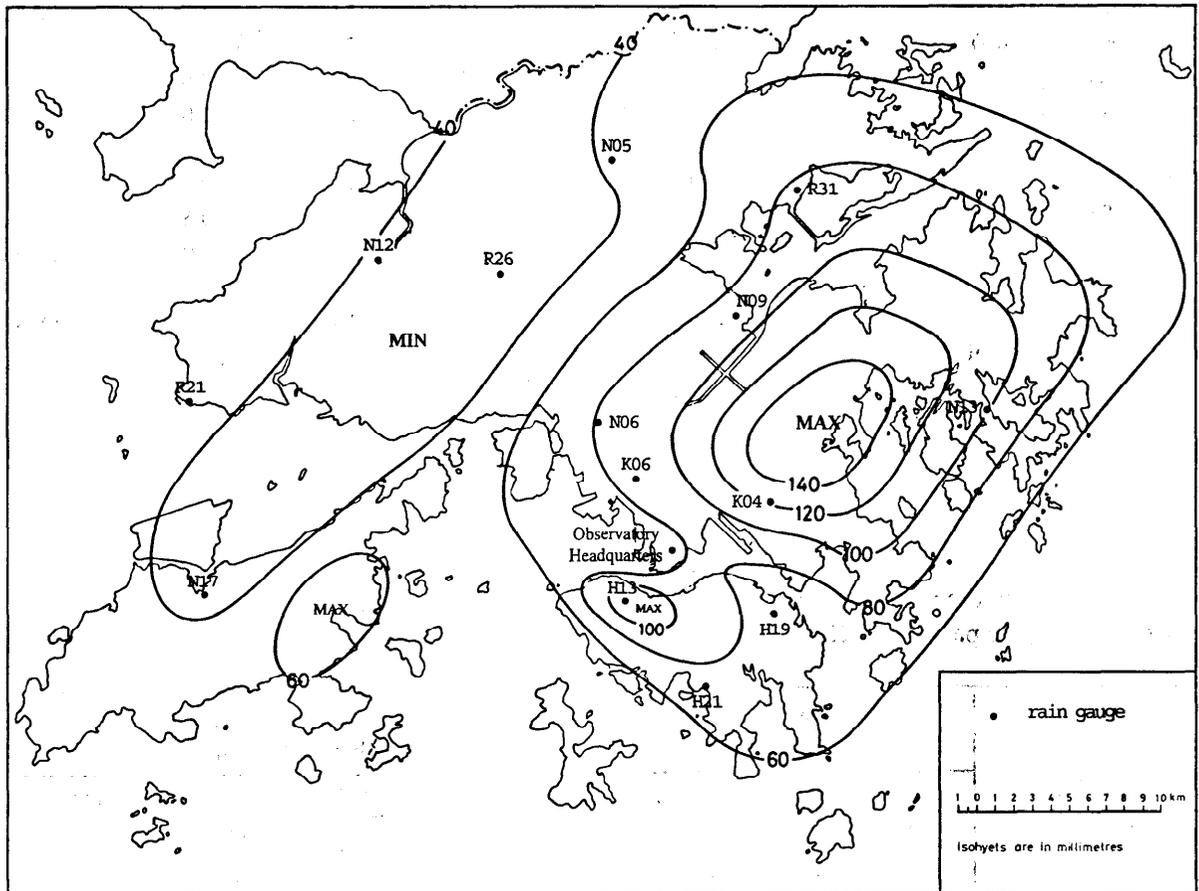


Figure 9. Rainfall distribution on 26 - 30 July 1996.

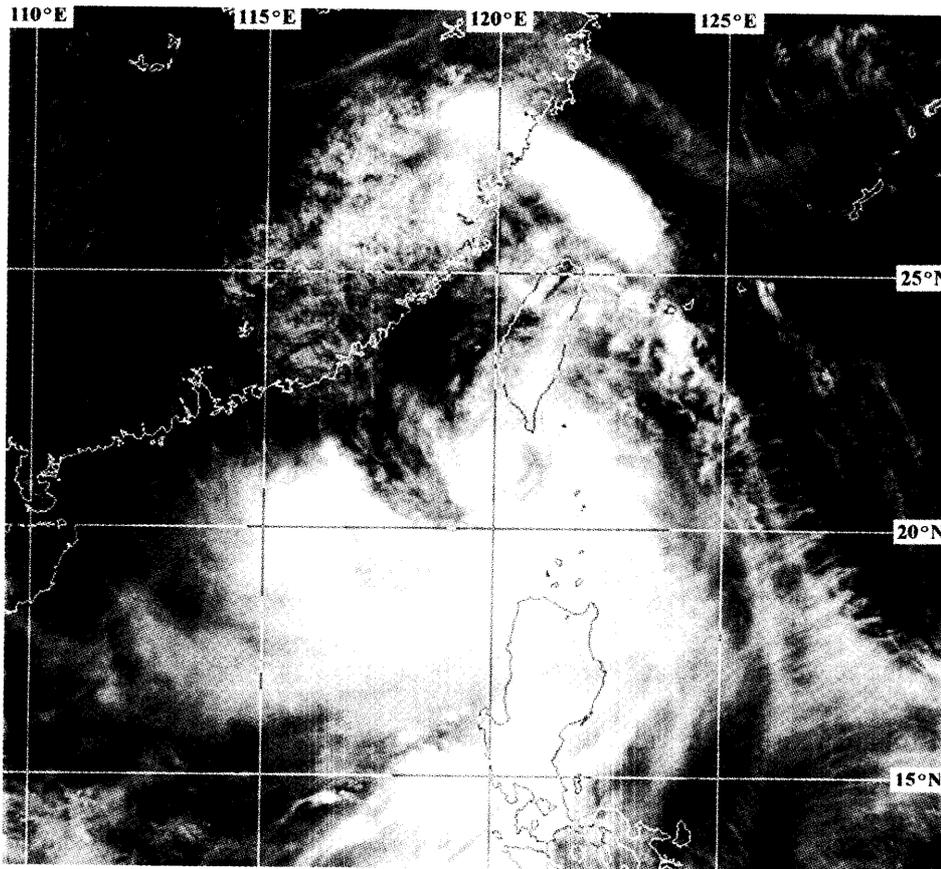


Figure 10. Visible imagery of Gloria at around 11 a.m. on 26 July 1996 (originally captured by GMS of JMA).

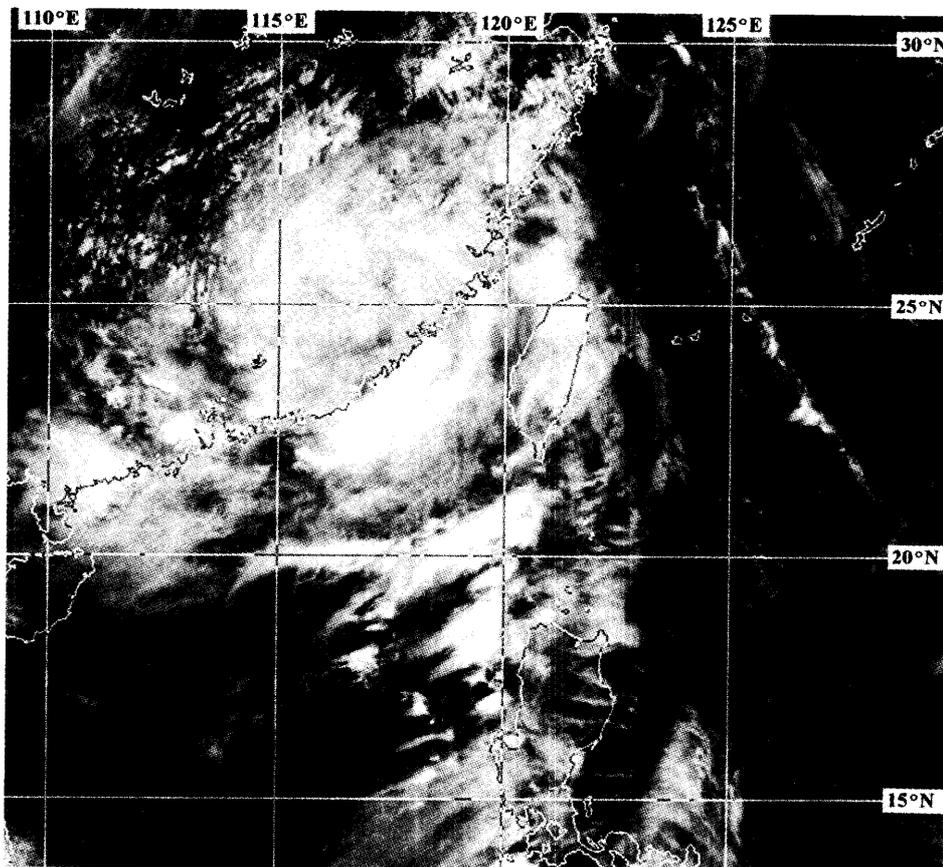


Figure 11. Visible imagery of Gloria at around 11 a.m. on 27 July 1996 (originally captured by GMS of JMA).

(c) Tropical Depression Lisa (9611)

6 - 7 August 1996

The track of Lisa is shown in Figure 12

Lisa formed as a tropical depression over the northern part of the South China Sea about 170 km west-northwest of Dongsha on the morning of 6 August. Moving northeastwards, Lisa made landfall near Shantou that evening. It then weakened over land and dissipated on 7 August. More than 90 people were killed in mainland China as a result of Lisa.

In Hong Kong the Stand By Signal No. 1 was hoisted at 9.00 a.m. on 6 August soon after Lisa formed over the South China Sea. The weather at the time was mainly cloudy with moderate northerly winds, gradually turning to southwesterlies as Lisa made landfall near Shantou that evening. Consequently, the No. 1 signal was lowered at 8.30 p.m. Lisa was closest to Hong Kong at around 10 a.m. on 6 August when it was about 160 km to the east-southeast. At the Observatory Headquarters, the lowest hourly sea-level pressure of 998.7 hPa was recorded at 6 p.m. that evening.

No significant damage was reported in Hong Kong during the passage of Lisa.

The rainfall distribution associated with Lisa is shown in Figure 13. Information on wind, rainfall and tide during the passage of Lisa is given as follows :

Maximum gust peak speeds and maximum hourly mean winds with associated wind directions recorded at various stations during the hoisting of tropical cyclone warning signal for Lisa :-

Station (see Fig. 1)	Maximum Gust			Maximum Hourly Wind				
	Direction	Speed (km/h)	Date	Time	Direction	Speed (km/h)	Date	Time
Central	NW	25	6 Aug	1352	NW	12	6 Aug	1400
Chek Lap Kok	WSW	34	6 Aug	1946	WNW	22	6 Aug	1400
Cheung Chau	N	45	6 Aug	1013	N	23	6 Aug	1000
Cheung Sha Wan	NNE	38	6 Aug	0956	NNE	14	6 Aug	1100
Green Island	NNE	31	6 Aug	0948	N	19	6 Aug	1000
	NNE	31	6 Aug	0949				
H.K. Airport (SE)	W	38	6 Aug	1808	W	23	6 Aug	1800
King's Park	NNE	31	6 Aug	1034	NE	14	6 Aug	1100
Lau Fau Shan	N	34	6 Aug	1021	SSW	22	6 Aug	2000
Sai Kung	NNE	41	6 Aug	0940	NNE	25	6 Aug	1100
Sha Tin	NE	25	6 Aug	0913	NE	9	6 Aug	1000
Star Ferry	NW	25	6 Aug	1353	W	16	6 Aug	1800
	W	25	6 Aug	1521				
Ta Kwu Ling	N	34	6 Aug	0950	N	19	6 Aug	1000
Tai Mei Tuk	NE	36	6 Aug	1028	NE	20	6 Aug	1000
					NE	20	6 Aug	1100
Tai Mo Shan	NNW	43	6 Aug	0925	NNW	34	6 Aug	0900
Tai Po Kau	WNW	31	6 Aug	1344	NW	14	6 Aug	1400
Tap Mun	NNE	31	6 Aug	1014	NNW	16	6 Aug	0900
					NNE	16	6 Aug	1100
Tate's Cairn	N	54	6 Aug	1006	N	34	6 Aug	1000
Tseung Kwan O	NE	40	6 Aug	0952	NE	19	6 Aug	1200
Tsing Yi	NNW	38	6 Aug	1324	W	20	6 Aug	1700
Tuen Mun	W	34	6 Aug	1844	NW	12	6 Aug	1500
Waglan Island	W	40	6 Aug	1940	W	31	6 Aug	2000

Station (see Fig. 1)	Maximum Gust			Maximum Hourly Wind				
	Direction	Speed (km/h)	Date	Time	Direction	Speed (km/h)	Date	Time
Wong Chuk Hang	NE	30	6 Aug	0958	NW	12	6 Aug	1007
	ENE	30	6 Aug	1007	ENE	12	6 Aug	1007

Stations with incomplete record:

Ping Chau
Sha Lo Wan
Tsak Yue Wu

Daily rainfall amounts in millimetres recorded at the Observatory Headquarters and other stations during the passage of Lisa :-

Station (see Fig. 13)	6 Aug	7 Aug	Total
Observatory Headquarters	Nil	Trace	Trace
H19 (HK Island (east))	Nil	Nil	Nil
H13 (HK Island (west))	Nil	Nil	Nil
H21 (HK Island (south))	Nil	Nil	Nil
K04 (Kowloon (east))	Nil	Nil	Nil
K06 (Kowloon (west))	Nil	Nil	Nil
N17 (Lantau)	Nil	Nil	Nil
N13 (Sai Kung)	Nil	Nil	Nil
N09 (Sha Tin)	[Nil]	1.0	[1.0]
R26 (Shek Kong)	Nil	[Nil]	[Nil]
N05 (Sheung Shui)	Nil	Nil	Nil
R31 (Tai Po)	Nil	Nil	Nil
N06 (Tsuen Wan - Kwai Chung)	Nil	Nil	Nil
R21 (Tuen Mun)	Nil	Nil	Nil
N12 (Yuen Long)	Nil	Nil	Nil

Note : [] based on incomplete hourly data.

Times and heights of the maximum sea level and the maximum storm surge recorded at tide stations in Hong Kong during the passage of Lisa :-

Station (see Fig. 1)	Maximum sea level above chart datum			Maximum storm surge above astronomical tide		
	Height (m)	Date	Time	Height (m)	Date	Time
Lok On Pai	1.71	6 Aug	2.23 p.m.	0.26	6 Aug	12.22 p.m.
Quarry Bay	1.65	6 Aug	1.52 p.m.	0.29	6 Aug	12.07 p.m.
Tai Po Kau	1.75	6 Aug	3.17 p.m.	0.42	6 Aug	11.13 a.m.
Waglan Island	1.72	6 Aug	3.44 p.m.	0.32	6 Aug	12.11 p.m.
Tsim Bei Tsui	1.74	6 Aug	3.04 p.m.	0.14	6 Aug	1.56 p.m.

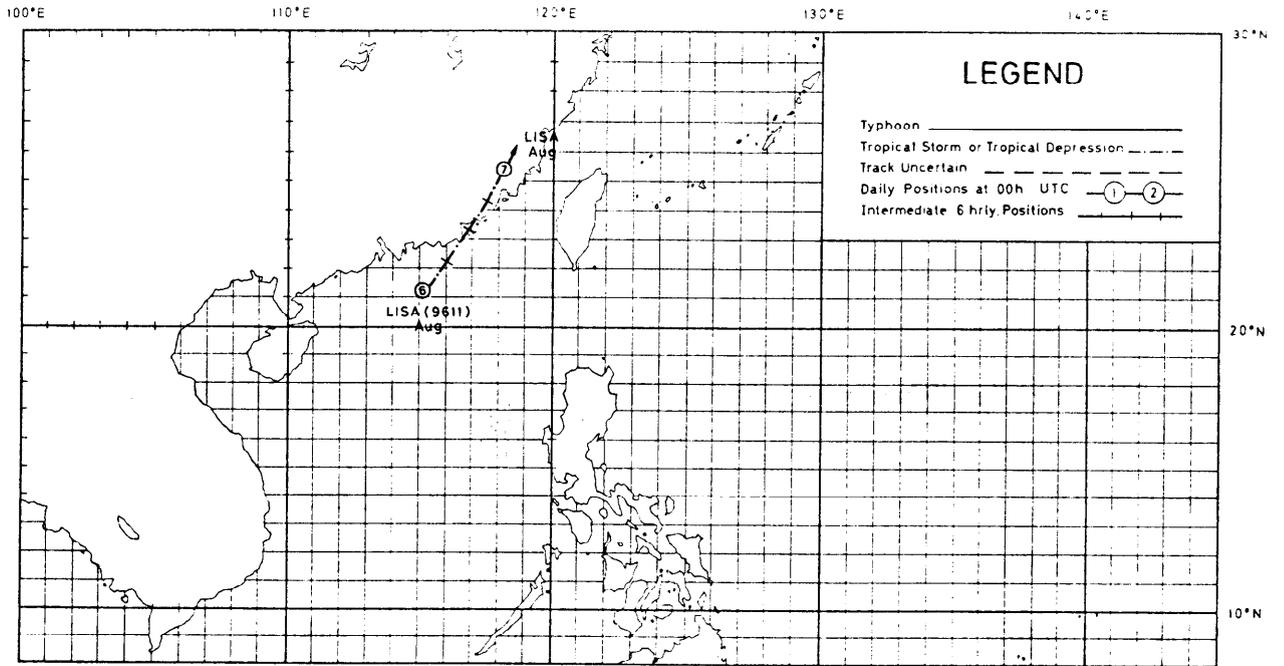


Figure 12. Track of Tropical Depression Lisa (9611) : 6 - 7 August 1996.

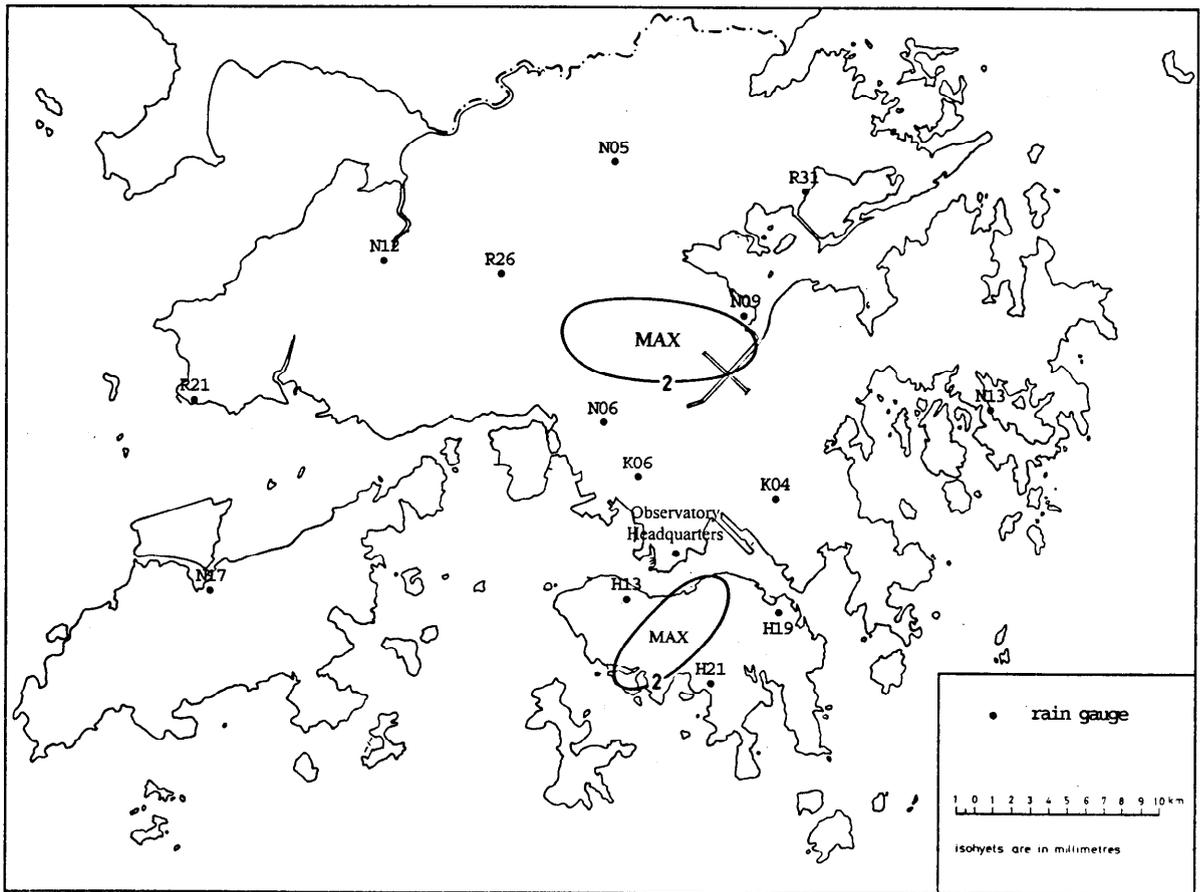


Figure 13. Rainfall distribution on 6 - 7 August 1996.

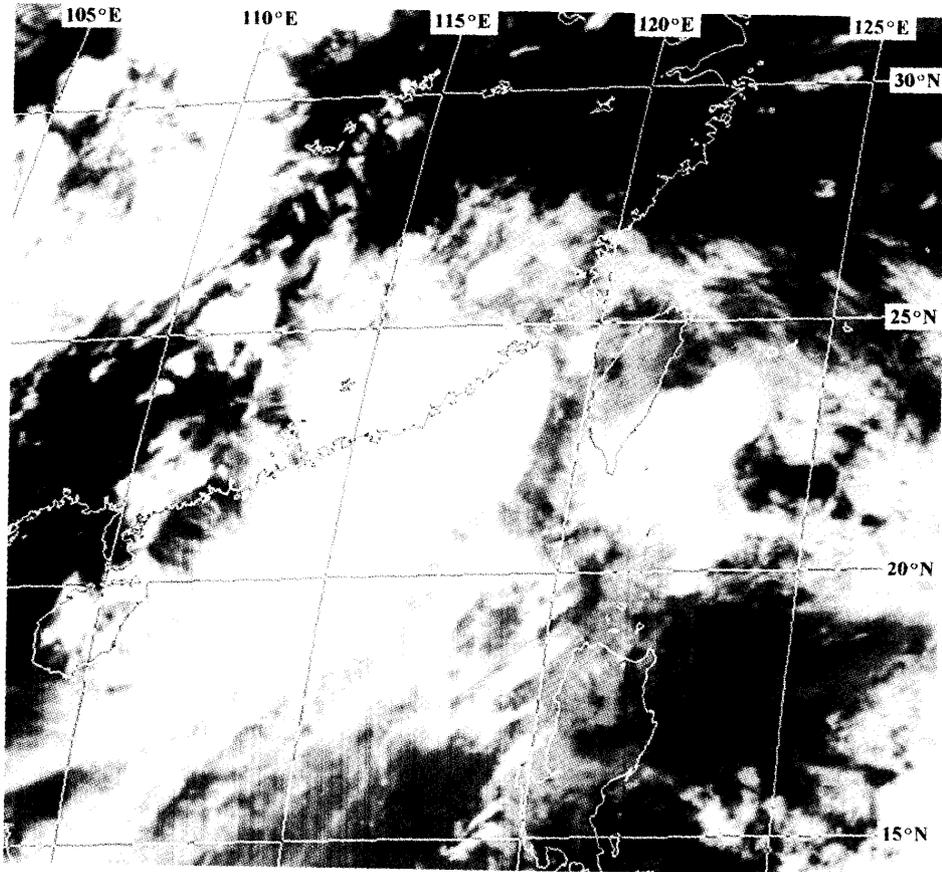


Figure 14. Infra-red imagery of Lisa at around 5 p.m. on 6 August 1996 (originally captured by GMS of JMA).

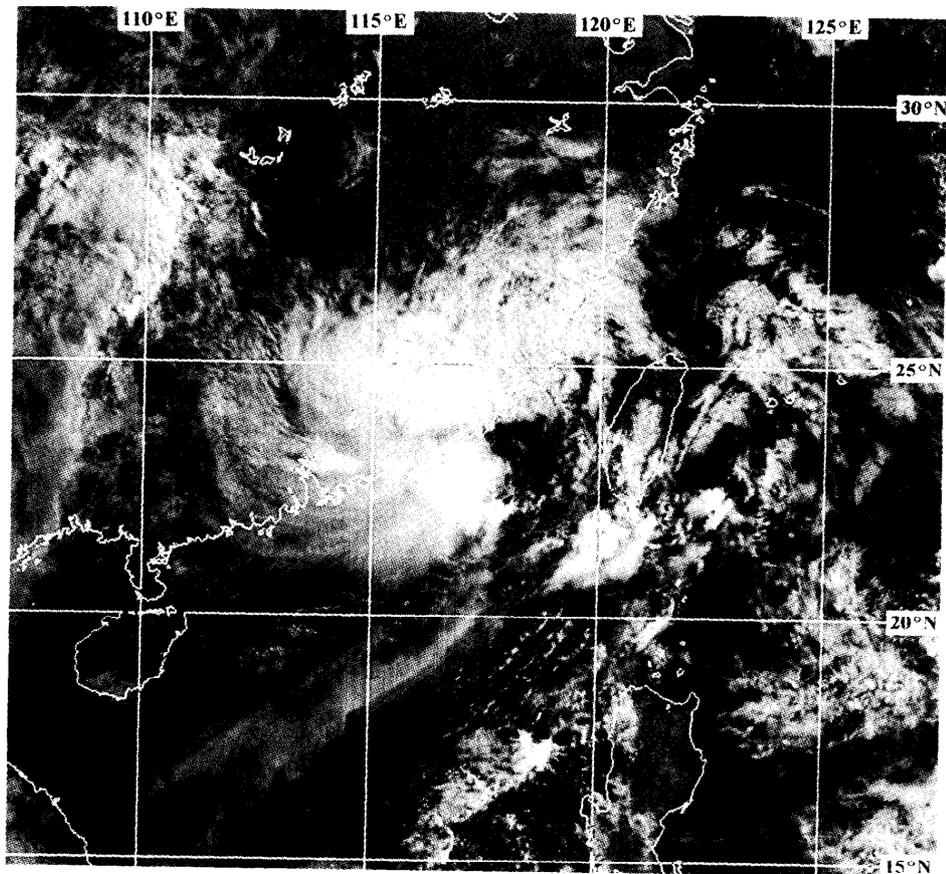


Figure 15. Visible imagery of Lisa at around 8 a.m. on 7 August 1996 (originally captured by GMS of JMA).

(d) Typhoon Niki (9613)**18 - 23 August 1996**

The track of Niki is shown in Figure 16

Niki developed as a tropical depression about 970 km east-northeast of Manila on 18 August and tracked westwards steadily. Deepening into a tropical storm, Niki swept across Luzon and entered the South China Sea on the morning of 20 August. It intensified into a severe tropical storm that afternoon and attained typhoon intensity about 90 km north-northeast of Xisha the next day. Niki rampaged through Hainan on 22 August, killing seven people there. It weakened into a severe tropical storm and traversed Beibu Wan before making landfall over northern Vietnam early the next morning. Niki eventually dissipated over land on 23 August. In Vietnam 12 people died in Niki's fury.

In Hong Kong the Stand By Signal No. 1 was hoisted at 9.45 a.m. on 20 August when Niki was about 770 km to the southeast. At first, light winds and fine weather prevailed over the territory. However, visibilities dropped in the Victoria Harbour as hazy conditions developed that afternoon. With Niki intensifying and moving closer, local winds freshened from the east. Niki came closest to Hong Kong at about 11 a.m. on 21 August when it was about 540 km to the south. Rainbands to the north of Niki were not particularly active, and only a few showers were reported in Hong Kong. The No.1 Signal was lowered at 10.45 p.m. on 21 August as Niki moved away. At the Observatory Headquarters, the lowest hourly sea-level pressure of 1 007.7 hPa was recorded at 4 p.m. on 20 August.

No significant damage was reported in Hong Kong during the passage of Niki.

The rainfall distribution associated with Niki is shown in Figure 17. Information on wind, rainfall and tide during the passage of Niki is given as follows :

Maximum gust peak speeds and maximum hourly mean winds with associated wind directions recorded at various stations during the hoisting of tropical cyclone warning signal for Niki :-

<u>Station</u> (see Fig. 1)	<u>Maximum Gust</u>			<u>Maximum Hourly Wind</u>				
	<u>Direction</u>	<u>Speed (km/h)</u>	<u>Date</u>	<u>Time</u>	<u>Direction</u>	<u>Speed (km/h)</u>	<u>Date</u>	<u>Time</u>
Central	E	49	21 Aug	1653	E	31	21 Aug	1400
Chek Lap Kok	ESE	49	21 Aug	1505	ESE	27	21 Aug	1500
	SSE	49	21 Aug	1900	ESE	27	21 Aug	1600
Cheung Chau	ESE	67	21 Aug	1808	E	40	21 Aug	1300
Cheung Sha Wan	ENE	59	21 Aug	1258	ENE	23	21 Aug	1400
Green Island	E	68	21 Aug	1500	E	51	21 Aug	1500
H.K. Airport (SE)	E	63	21 Aug	1515	E	30	21 Aug	1400
					E	30	21 Aug	1500
					E	30	21 Aug	1600
King's Park	E	54	21 Aug	1222	E	23	21 Aug	1400
	E	54	21 Aug	1346	ESE	23	21 Aug	1600
Lau Fau Shan	ENE	63	21 Aug	1339	ENE	38	21 Aug	1500
Ping Chau	E	62	20 Aug	2030	E	14	21 Aug	1000
Sai Kung	ENE	52	21 Aug	1323	ENE	38	21 Aug	1200
Sha Tin	ENE	41	20 Aug	2058	E	14	21 Aug	1600
Star Ferry	E	52	21 Aug	1338	E	31	21 Aug	1400
Ta Kwu Ling	E	51	21 Aug	1541	E	22	21 Aug	1600
Tai Mei Tuk	ENE	67	20 Aug	2039	E	41	21 Aug	1500
Tai Mo Shan	ENE	72	21 Aug	1609	ENE	52	21 Aug	0600
Tai Po Kau	ENE	54	20 Aug	2056	E	36	21 Aug	1400

Station (see Fig. 1)	Maximum Gust			Maximum Hourly Wind				
	Direction	Speed (km/h)	Date	Time	Direction	Speed (km/h)	Date	Time
Tap Mun	ENE	52	20 Aug	2032	E	30	21 Aug	1500
Tate's Cairn	ENE	76	21 Aug	1032	E	47	21 Aug	1400
Tsak Yue Wu	ENE	45	21 Aug	1200	E	22	21 Aug	1200
Tseung Kwan O	ESE	49	21 Aug	1251	NNE	19	21 Aug	1100
Tsing Yi	ESE	83	21 Aug	1555	ESE	40	21 Aug	1700
Tuen Mun	SE	49	21 Aug	1312	SSE	16	21 Aug	1600
	SSE	49	21 Aug	1601				
Waglan Island	E	58	21 Aug	1500	E	45	21 Aug	1500
Wong Chuk Hang	ENE	56	21 Aug	1416	ENE	27	21 Aug	1300
					ENE	27	21 Aug	1500

Station with incomplete record:
Sha Lo Wan

Daily rainfall amounts in millimetres recorded at the Observatory Headquarters and other stations during the passage of Niki :-

Station (see Fig. 17)	20 Aug	21 Aug	22 Aug	Total
Observatory Headquarters	Nil	0.4	10.5	10.9
H19 (HK Island (east))	Nil	2.5	Nil	2.5
H13 (HK Island (west))	Nil	Nil	1.0	1.0
H21 (HK Island (south))	Nil	Nil	0.5	0.5
K04 (Kowloon (east))	Nil	Nil	Nil	Nil
K06 (Kowloon (west))	0.5	Nil	2.5	3.0
N17 (Lantau)	Nil	6.5	Nil	6.5
N13 (Sai Kung)	Nil	Nil	Nil	Nil
N09 (Sha Tin)	1.5	Nil	Nil	1.5
R26 (Shek Kong)	[Nil]	[Nil]	[0.5]	[0.5]
N05 (Sheung Shui)	5.5	Nil	Nil	5.5
R31 (Tai Po)	4.0	Nil	Nil	4.0
N06 (Tsuen Wan - Kwai Chung)	Nil	0.5	2.0	2.5
R21 (Tuen Mun)	Nil	Nil	Nil	Nil
N12 (Yuen Long)	3.0	Nil	7.0	10.0

Note : [] based on incomplete hourly data.

Times and heights of the maximum sea level and the maximum storm surge recorded at tide stations in Hong Kong during the passage of Niki :-

Station (see Fig. 1)	Maximum sea level above chart datum			Maximum storm surge above astronomical tide		
	Height (m)	Date	Time	Height (m)	Date	Time
Lok On Pai	1.90	21 Aug	1.43 a.m.	insignificant	-	-
Quarry Bay	1.81	21 Aug	1.55 a.m.	insignificant	-	-
Tai Po Kau	1.80	21 Aug	3.00 a.m.	insignificant	-	-
Tsim Bei Tsui	2.00	21 Aug	1.23 a.m.	insignificant	-	-

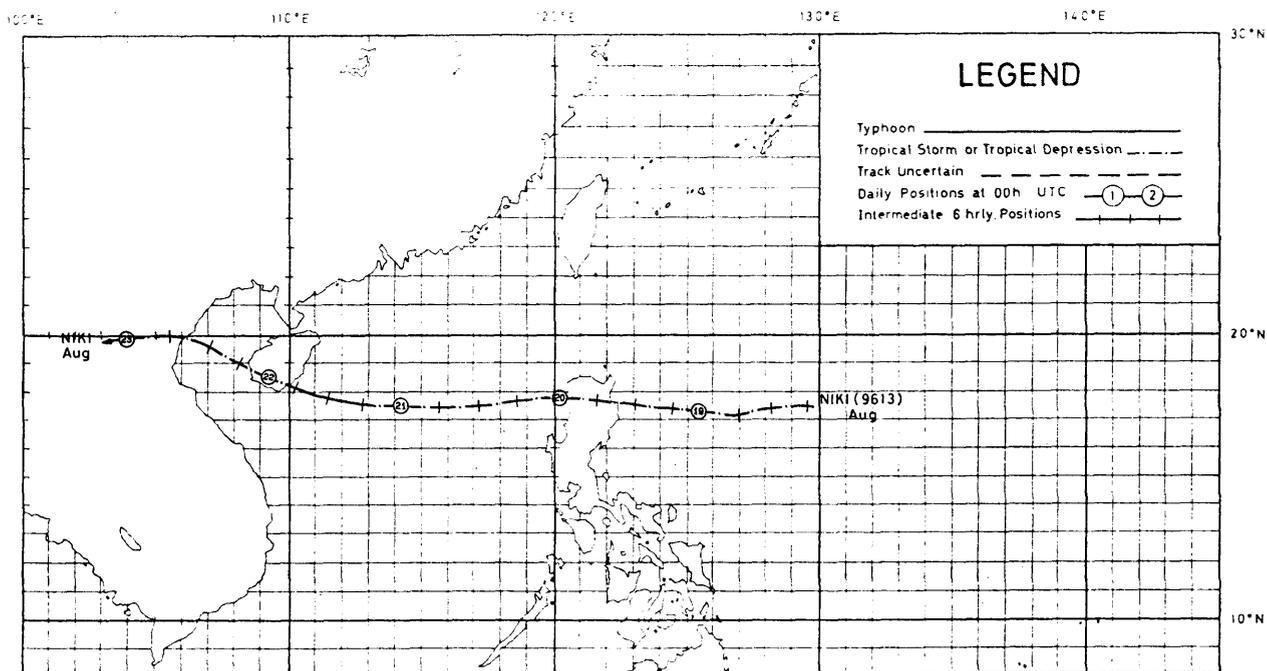


Figure 16. Track of Typhoon Niki (9613) : 18 - 23 August 1996.

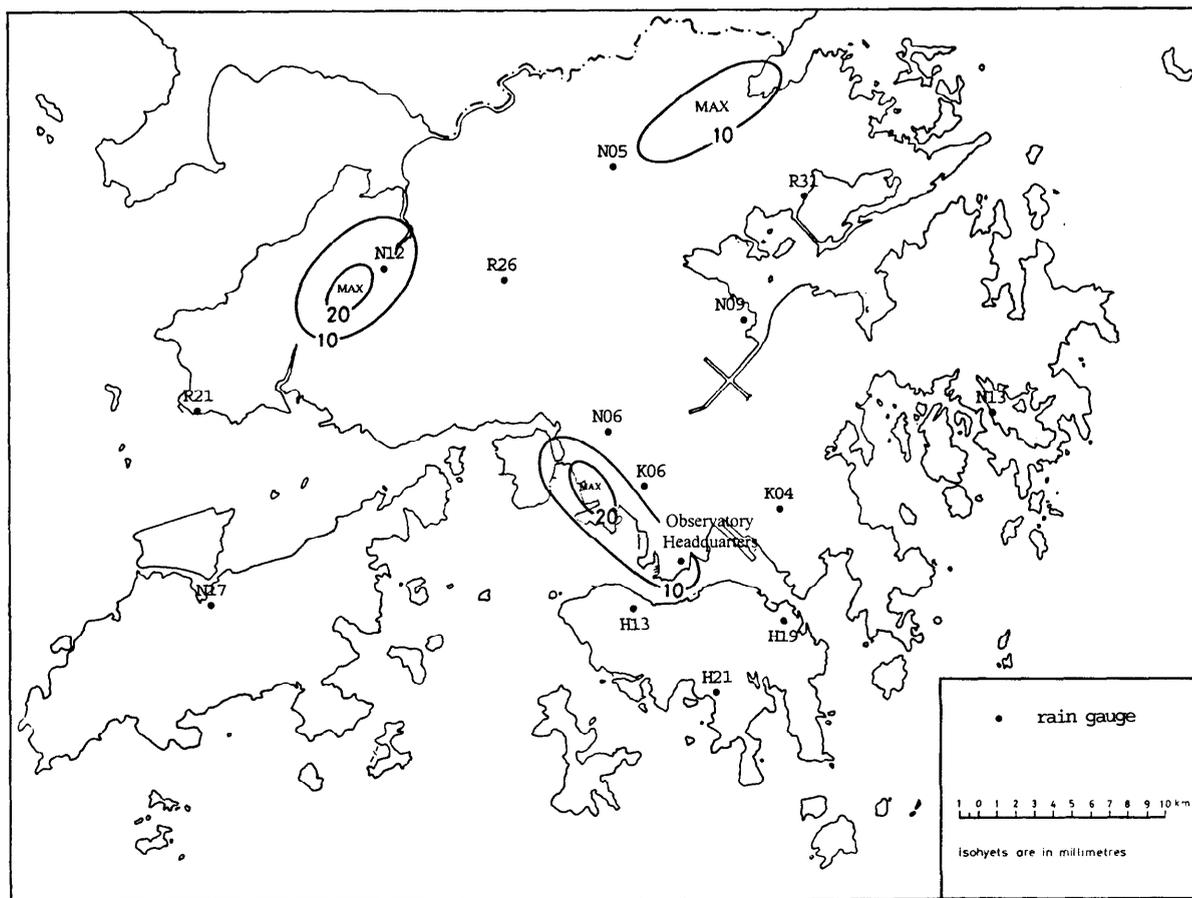


Figure 17. Rainfall distribution on 20 - 22 August 1996.

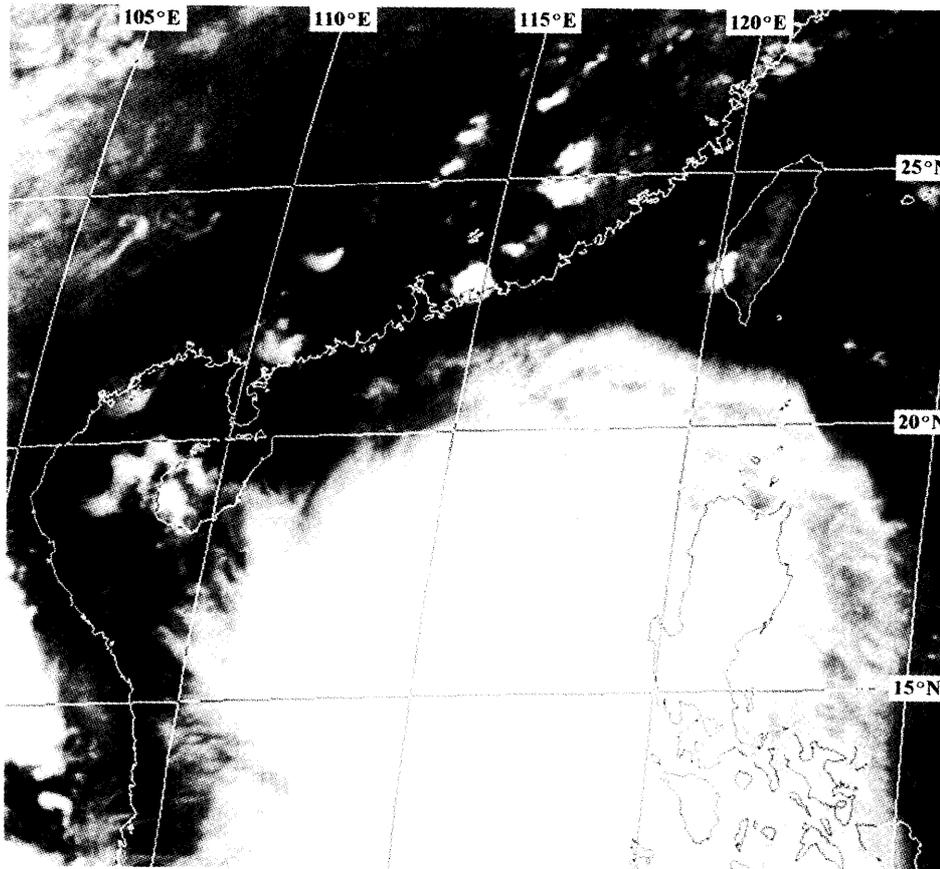


Figure 18. Infra-red imagery of Niki at around 8 p.m. on 20 August 1996 (originally captured by GMS of JMA).

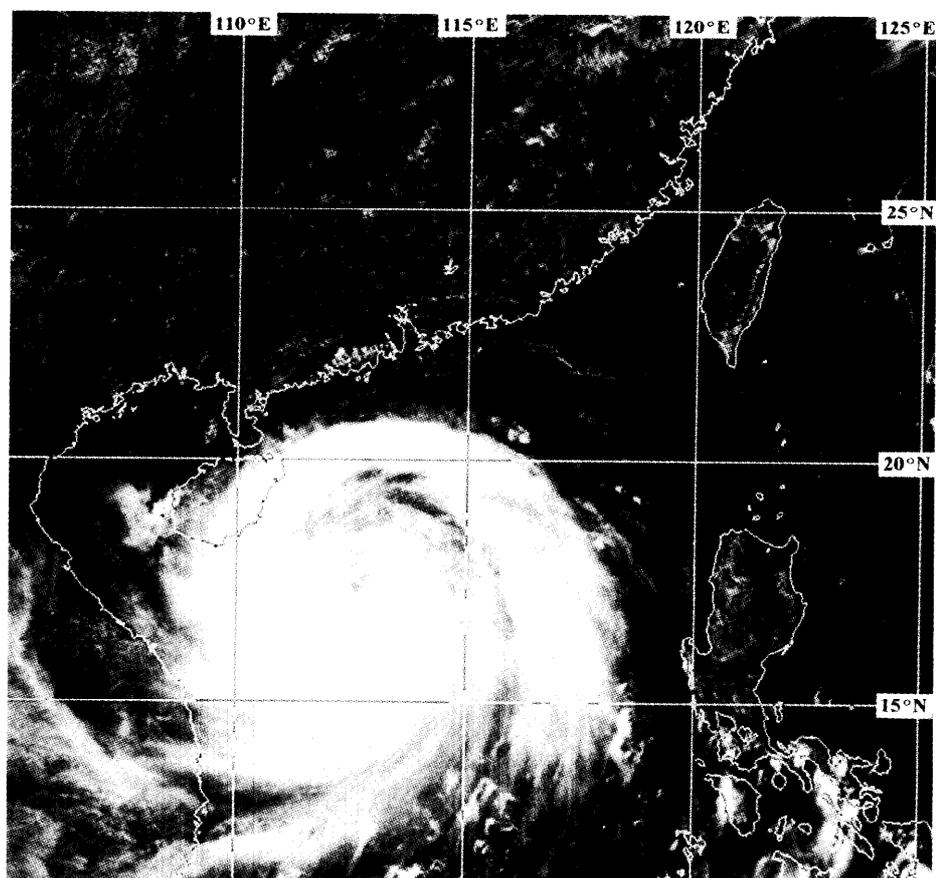


Figure 19. Visible imagery of Niki at around 2 p.m. on 21 August 1996 (originally captured by GMS of JMA).

(e) Typhoon Sally (9616)**5 - 10 September 1996**

The track of Sally is shown in Figure 20

Sally developed as a tropical depression about 1 300 km east of Manila on 5 September. Moving west-northwestwards, it intensified over water and attained typhoon strength on 7 September. Sally entered the South China Sea the next morning and moved rapidly towards the coast of western Guangdong. After traversing Leizhou and Guangxi on 9 September, Sally moved into northern Vietnam and dissipated over land the next day.

Sally inflicted very serious damage on western Guangdong and Guangxi. At least 140 people were killed, 130 missing and 2 000 injured. The hardest hit cities were Zhanjiang, Maoming and Yangjiang where communication, transport, electricity and water supplies were interrupted. About 300 000 houses collapsed and at least 500 000 hectares of farmland were damaged. At sea, more than 60 vessels were lost in high winds. The economic loss was estimated at over 12 billion RMB.

In Macau apart from toppled trees and fallen boarding, flooding exacerbated by high tide also affected the low-lying areas.

In Hong Kong the Stand By Signal No. 1 was hoisted at 5.00 a.m. on 8 September when Sally was about 770 km to the east-southeast. Local winds started off light and gradually became moderate northeasterly. Sally was a full fledged typhoon with the maximum sustained winds of up to 175 km/h estimated near centre while approaching the coast of western Guangdong. It was also an unusually fast moving typhoon. Sally's 24-hourly speed of 38 km/h over the northern part of the South China Sea equalled that of Typhoon Hope in 1979, making them the fastest typhoons in the region so far this century. As Sally sped towards Hong Kong, the Strong Wind Signal No.3 was hoisted at 5.00 p.m. Winds strengthened rapidly in the late evening with squally showers and thunderstorms setting in. With Sally passing the point of closest approach about 180 km to the south at around 2 a.m., winds veered from northeasterly to southeasterly. As a result, the harbour became more exposed and generally strong winds in the area also increased to gale force. The No.8 SOUTHEAST Gale or Storm Signal was hoisted at 2.15 a.m. Gales were recorded at Waglan and Cheung Chau with the maximum hourly winds exceeding 80 km/h. At Star Ferry, King's Park and Kai Tak airport, gusts of over 100 km/h were also reported.

Sally departed as quickly as it approached and soon the No.8 SOUTHEAST Gale or Storm Signal was replaced by the Strong Wind Signal No.3 at 5.40 a.m. as the gales subsided. All signals were lowered at 10.15 a.m. The No.8 signal was hoisted for only 3 hours and 25 minutes, the shortest interval since Severe Tropical Storm Wynne in 1984. At the Observatory Headquarters, the lowest hourly sea-level pressure of 1 000.0 hPa was recorded at 2 a.m. on 9 September.

Locally, some damage were sustained with many places seeing toppled trees, collapsed scaffoldings, fallen signboards. Several minor floodings were also reported. A man was killed and his two companions injured in high seas when they were fishing near Luk Chau. In Sheung Shui, a cleaning worker died as she slipped and fell into a swollen river. In Ma On Shan, two pedestrians were injured by a railing blown down from the roof top of a high-rise building.

The rainfall distribution associated with Sally is shown in Figure 21. Information on wind, rainfall and tide during the passage of Sally is given as follows :

Maximum gust peak speeds and maximum hourly mean winds with associated wind directions recorded at various stations during the hoisting of tropical cyclone warning signals for Sally :-

<u>Station</u> (see Fig. 1)	<u>Maximum Gust</u>			<u>Maximum Hourly Wind</u>				
	<u>Direction</u>	<u>Speed (km/h)</u>	<u>Date</u>	<u>Time</u>	<u>Direction</u>	<u>Speed (km/h)</u>	<u>Date</u>	<u>Time</u>
Central	ESE	99	9 Sep	0326	E	41	9 Sep	0200
					E	41	9 Sep	0300
Chek Lap Kok	E	85	9 Sep	0248	E	45	9 Sep	0400
Cheung Chau	ESE	135	9 Sep	0155	ESE	88	9 Sep	0400
Cheung Sha Wan	NE	96	9 Sep	0202	ENE	31	9 Sep	0300
	NE	96	9 Sep	0231				
Green Island	ESE	135	9 Sep	0339	ENE	75	9 Sep	0100
H.K. Airport (SE)	ENE	94	8 Sep	2345	E	40	9 Sep	0400
King's Park	ENE	104	9 Sep	0138	ENE	41	9 Sep	0100
					E	41	9 Sep	0300
Lau Fau Shan	E	88	9 Sep	0312	E	43	9 Sep	0400
Ping Chau	E	77	9 Sep	0359	E	31	9 Sep	0100
Sai Kung	SSE	126	9 Sep	0316	ENE	54	9 Sep	0200
Sha Tin	NE	94	9 Sep	0041	NE	30	8 Sep	2400
Star Ferry	ESE	101	9 Sep	0332	ESE	52	9 Sep	0400
Ta Kwu Ling	ENE	83	9 Sep	0131	NE	31	9 Sep	0100
Tai Mei Tuk	ENE	113	9 Sep	0229	ENE	75	9 Sep	0200
	E	113	9 Sep	0315				
Tai Mo Shan	E	158	9 Sep	0312	E	112	9 Sep	0400
Tai Po Kau	ENE	99	9 Sep	0218	E	62	9 Sep	0300
Tap Mun	SE	99	9 Sep	0323	E	56	9 Sep	0300
Tate's Cairn	ENE	146	9 Sep	0031	E	85	9 Sep	0200
Tsak Yue Wu	ENE	63	8 Sep	2351	NE	22	8 Sep	2300
	S	63	9 Sep	0242	NE	22	8 Sep	2400
					ENE	22	9 Sep	0200
Tseung Kwan O	ESE	96	9 Sep	0302	NNE	34	8 Sep	2400
Tsing Yi	SE	131	9 Sep	0306	ENE	54	9 Sep	0300
Tuen Mun	E	101	9 Sep	0255	NNE	30	8 Sep	2400
Waglan Island	E	140	9 Sep	0139	E	96	9 Sep	0100
Wong Chuk Hang	ENE	117	9 Sep	0311	E	45	9 Sep	0400

Station with incomplete record:
Sha Lo Wan

Daily rainfall amounts in millimetres recorded at the Observatory Headquarters and other stations during the passage of Sally :-

<u>Station</u> (see Fig. 21)	<u>8 Sep</u>	<u>9 Sep</u>	<u>10 Sep</u>	<u>Total</u>
Observatory Headquarters	4.6	40.3	Nil	44.9
H19 (HK Island (east))	7.0	32.5	Nil	39.5
H13 (HK Island (west))	4.0	34.5	Nil	38.5
H21 (HK Island (south))	9.5	49.0	Nil	58.5
K04 (Kowloon (east))	5.5	52.5	Nil	58.0
K06 (Kowloon (west))	5.0	50.5	Nil	55.5
N17 (Lantau)	2.5	57.5	2.0	62.0
N13 (Sai Kung)	4.0	48.5	Nil	52.5
N09 (Sha Tin)	4.5	72.5	Nil	77.0

<u>Station</u> (see Fig. 21)	<u>8 Sep</u>	<u>9 Sep</u>	<u>10 Sep</u>	<u>Total</u>
R26 (Shek Kong)	[3.0]	44.5	[Nil]	[47.5]
N05 (Sheung Shui)	3.5	49.5	Nil	53.0
R31 (Tai Po)	3.0	29.5	Nil	32.5
N06 (Tsuen Wan - Kwai Chung)	4.5	48.5	Nil	53.0
R21 (Tuen Mun)	2.0	27.0	1.0	30.0
N12 (Yuen Long)	2.5	38.5	Nil	41.0

Note : [] based on incomplete hourly data.

Times and heights of the maximum sea level and the maximum storm surge recorded at tide stations in Hong Kong during the passage of Sally :-

Station (see Fig. 1)	Maximum sea level above chart datum			Maximum storm surge above astronomical tide		
	Height (m)	Date	Time	Height (m)	Date	Time
Lok On Pai	3.02	9 Sep	6.56 a.m.	0.97	9 Sep	6.50 a.m.
Quarry Bay	2.85	9 Sep	5.34 a.m.	0.84	9 Sep	5.34 a.m.
Tai Po Kau	2.99	9 Sep	3.54 a.m.	1.23	9 Sep	3.15 a.m.
Tsim Bei Tsui	3.11	9 Sep	7.31 a.m.	0.96	9 Sep	6.19 a.m.

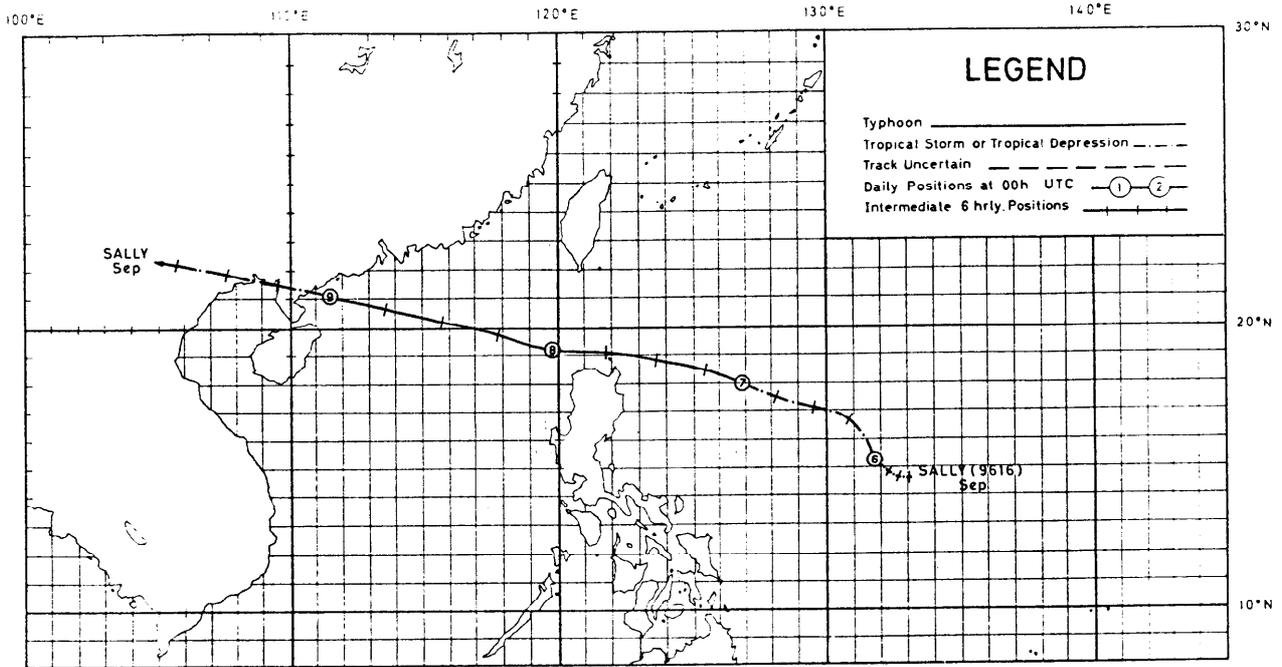


Figure 20. Track of Typhoon Sally (9616) : 5 - 10 September 1996.

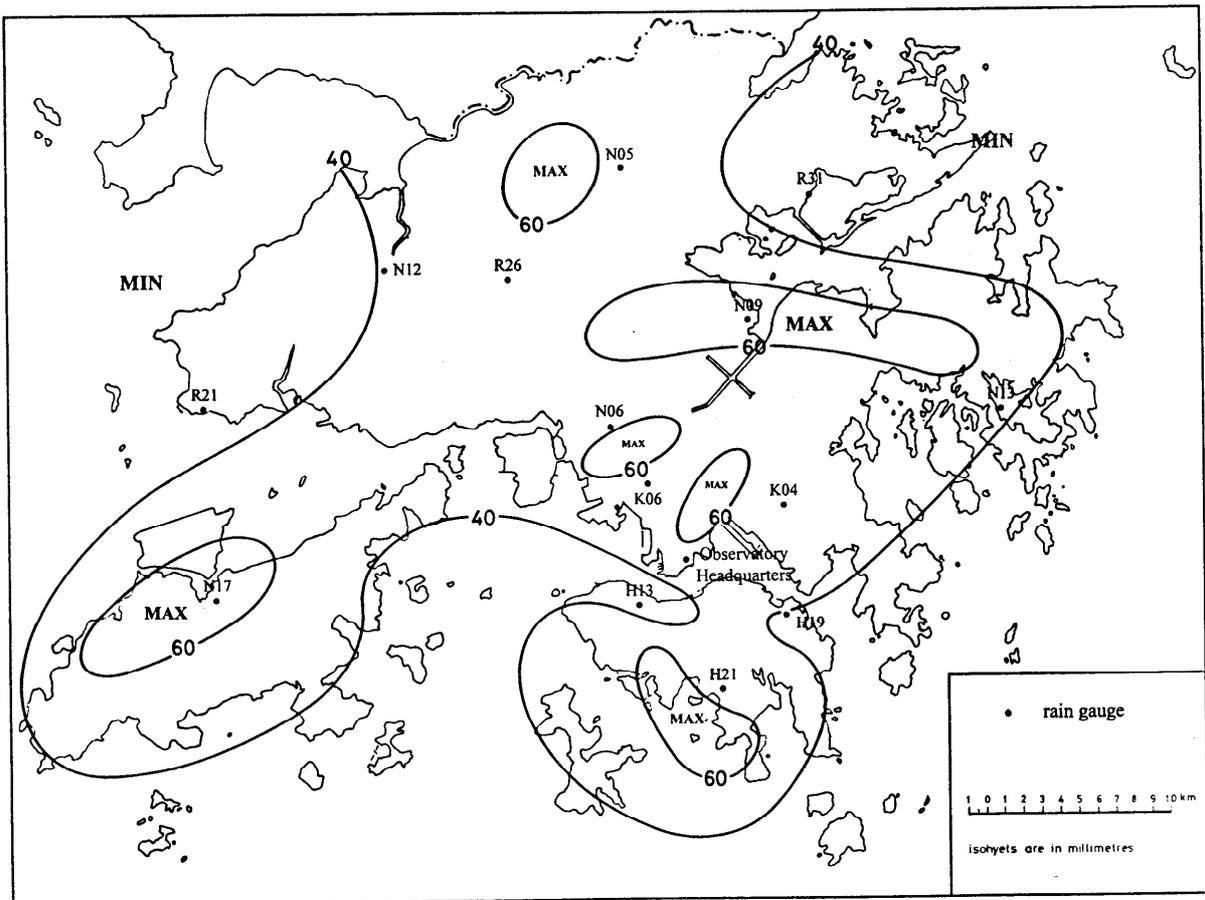


Figure 21. Rainfall distribution on 8 - 10 September 1996.

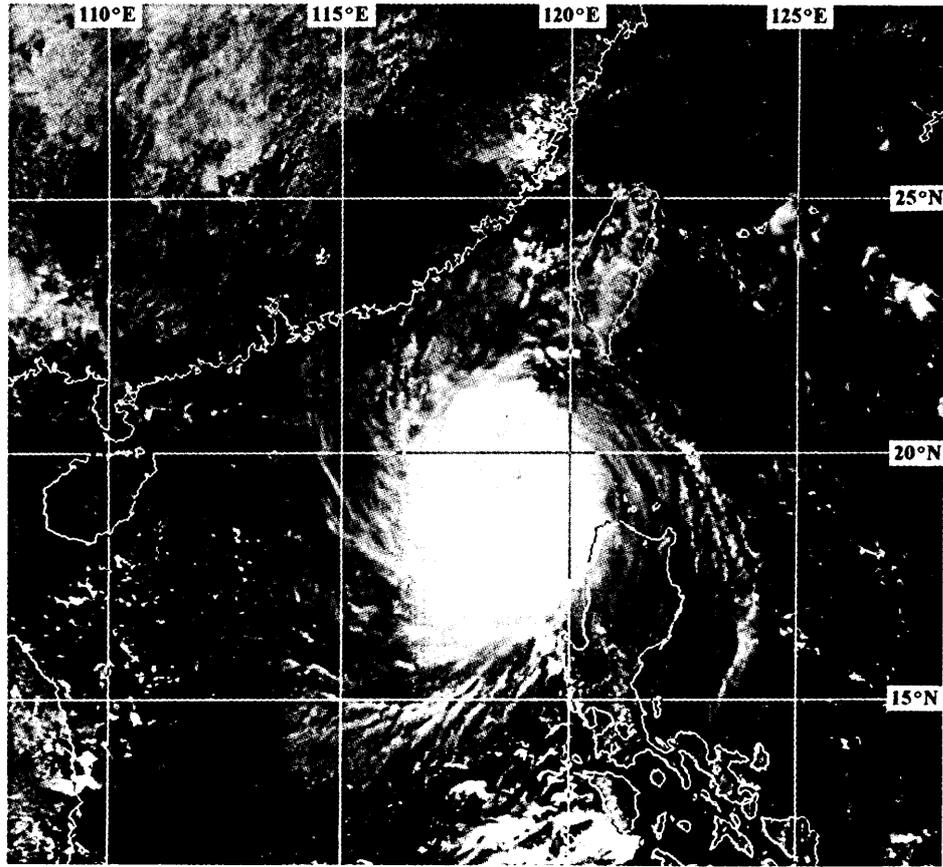


Figure 22. Visible imagery of Sally at around 11 a.m. on 8 September 1996 (originally captured by GMS of JMA).

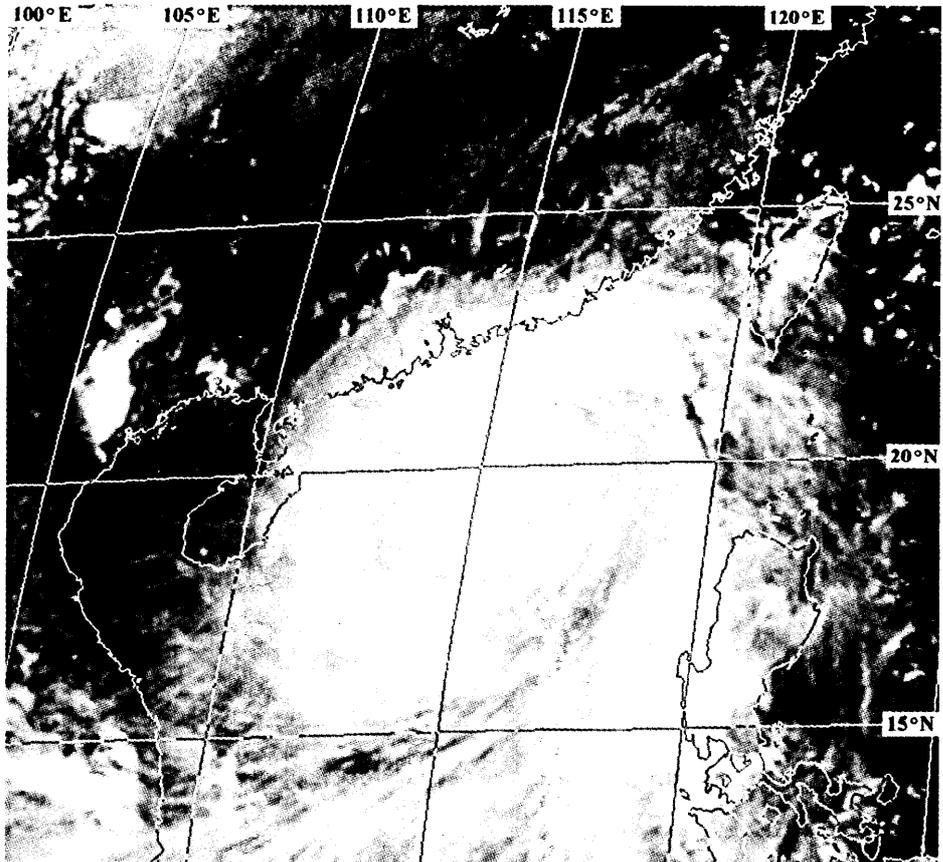


Figure 23. Infra-red imagery of Sally at around 7 p.m. on 8 September 1996 (originally captured by GMS of JMA).

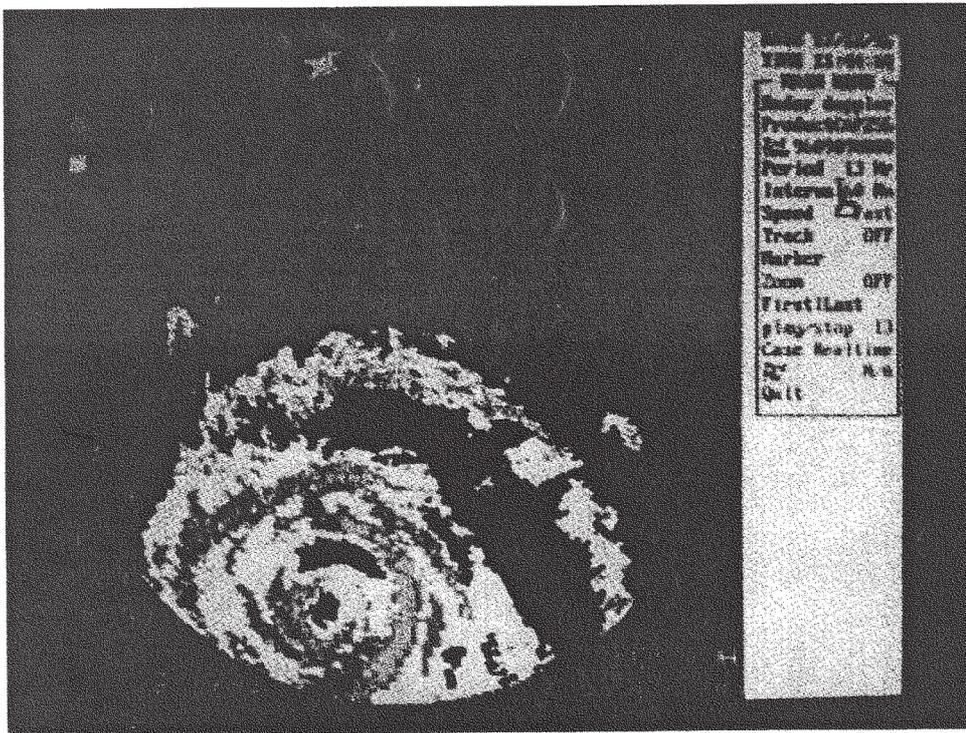


Figure 24. Radar display of the rain echoes of Sally at 2.00 a.m. on 9 September 1996.

版權照片刊登於印刷本內，該刊物可在香港天文台資源中心查閱。天文台資源中心地址：

香港九龍尖沙咀彌敦道 132 號
 美麗華大廈 23 樓 2304-2309 室
 (電話：2926 8250)

The copyrighted photo is available in the published version. The publication can be accessed at the Hong Kong Observatory Resource Centre located at :

Rooms 2304-2309, 23/F, Miramar Tower,
 132 Nathan Road, Tsim Sha Tsui, Kowloon.
 (Tel.: 2926 8250)

Figure 25. A scaffolding collapsed onto the roof of a factory in Wong Chuk Hang (by courtesy of Hongkong Standard).

版權照片刊登於印刷本內，該刊物可在香港天文台資源中心查閱。天文台資源中心地址：

香港九龍尖沙咀彌敦道 132 號
美麗華大廈 23 樓 2304-2309 室
〔電話：2926 8250〕

The copyrighted photo is available in the published version. The publication can be accessed at the Hong Kong Observatory Resource Centre located at :

Rooms 2304-2309, 23/F, Miramar Tower,
132 Nathan Road, Tsim Sha Tsui, Kowloon.
(Tel.: 2926 8250)

Figure 26. A railing blown down from the roof top of a high rise building in Ma On Shan (by courtesy of Oriental Daily News).

(f) Severe Tropical Storm Willie (9619)**18 - 23 September 1996**

The track of Willie is shown in Figure 27

An area of disturbance developed into a tropical depression named Willie about 200 km west-northwest of Xisha on the morning of 18 September and deepened into a tropical storm that afternoon. Moving northeastwards at first, it adopted a northwestward course the next day after intensifying into a severe tropical storm. Willie turned west-southwestwards and skirted past Leizhou and Hainan on 20 September. It then crossed Beibu Wan and weakened into a tropical storm. Willie made landfall over Vietnam on 22 September, dissipating over land the next day. In Hainan 38 people died and 96 were reported missing in the wake of Willie. In Vietnam at least 10 people were killed.

In Hong Kong the Stand By Signal No.1 was hoisted at 11.15 p.m. on 18 September when Willie was about 470 km to the south-southwest. As Willie began moving away, the No.1 signal was lowered at 9.00 a.m. on 20 September. Willie came closest to Hong Kong at about 2 p.m. on 19 September when it was about 390 km to the southwest. At the Observatory Headquarters, the lowest hourly sea-level pressure of 1 002.4 hPa was recorded at 3 p.m. and 4 p.m. on 19 September.

During the display of the No.1 signal, local winds were moderate easterly and occasionally fresh offshore. Willie's outer rainbands brought heavy squally showers and thunderstorms to the territory. In heavy rain, a drainage worker was washed away in a sewer as he was working in Sham Shui Po.

The outer rainbands of Willie continued to affect Hong Kong on 20 and 21 September. Rain was heaviest in the northeastern part of the New Territories where widespread flooding was reported in Sha Tau Kok and Ta Kwu Ling. A retaining wall collapsed in Sha Tin and a vehicle was washed down in a river in Sai Kung. Fortunately no casualties were reported in connection with these incidents.

The rainfall distribution associated with Willie is shown in Figure 28. Information on wind, rainfall and tide during the passage of Willie is given as follows :

Maximum gust peak speeds and maximum hourly mean winds with associated wind directions recorded at various stations during the hoisting of tropical cyclone warning signal for Willie :-

<u>Station</u> (see Fig. 1)	<u>Maximum Gust</u>				<u>Maximum Hourly Wind</u>			
	<u>Direction</u>	<u>Speed (km/h)</u>	<u>Date</u>	<u>Time</u>	<u>Direction</u>	<u>Speed (km/h)</u>	<u>Date</u>	<u>Time</u>
Central	E	47	19 Sep	1635	E	23	19 Sep	1200
Chek Lap Kok	E	41	19 Sep	1908	E	23	19 Sep	2000
Cheung Chau	ESE	65	19 Sep	1143	ESE	40	19 Sep	1800
Cheung Sha Wan	E	40	19 Sep	1125	E	14	19 Sep	1000
					E	14	19 Sep	1300
Green Island	ESE	59	19 Sep	1315	E	34	19 Sep	1900
H.K. Airport (SE)	ESE	59	19 Sep	1445	E	30	19 Sep	1200
King's Park	SE	49	19 Sep	1221	ESE	22	19 Sep	1200
Lau Fau Shan	ENE	45	19 Sep	1909	ENE	27	19 Sep	2000
Ping Chau	E	36	20 Sep	0542	E	14	20 Sep	0600
Sai Kung	SSE	56	19 Sep	1743	SE	20	19 Sep	1200
Sha Lo Wan	E	54	19 Sep	2330	E	30	19 Sep	2000
Sha Tin	ENE	41	19 Sep	1016	ESE	12	19 Sep	1300
Star Ferry	ESE	51	19 Sep	1222	ESE	30	19 Sep	1300
Ta Kwu Ling	E	49	19 Sep	1324	E	19	19 Sep	2000

<u>Station</u> (see Fig. 1)	Maximum Gust			Maximum Hourly Wind				
	<u>Direction</u>	<u>Speed (km/h)</u>	<u>Date</u>	<u>Time</u>	<u>Direction</u>	<u>Speed (km/h)</u>	<u>Date</u>	<u>Time</u>
Tai Mei Tuk	ESE	52	19 Sep	1744	E	31	19 Sep	1200
					E	31	19 Sep	1600
Tai Mo Shan	ENE	87	19 Sep	1253	ENE	62	19 Sep	2000
Tai Po Kau	ESE	49	19 Sep	1204	E	25	19 Sep	2000
Tap Mun	E	49	19 Sep	1500	ESE	27	19 Sep	1500
Tate's Cairn	ESE	65	19 Sep	1244	ESE	40	19 Sep	1300
Tsak Yue Wu	ENE	40	19 Sep	1845	ENE	13	19 Sep	1900
Tseung Kwan O	ESE	47	19 Sep	1243	ESE	16	19 Sep	1300
Tsing Yi	ESE	63	19 Sep	1150	ESE	31	19 Sep	1200
					ESE	31	19 Sep	1300
Tuen Mun	SSE	51	19 Sep	1050	SSE	16	19 Sep	1100
Waglan Island	SE	63	20 Sep	0426	E	38	19 Sep	1200
Wong Chuk Hang	ENE	51	19 Sep	1246	E	22	19 Sep	1200

Daily rainfall amounts in millimetres recorded at the Observatory Headquarters and other stations during the passage of Willie :-

<u>Station</u> (see Fig. 28)	<u>18 Sep</u>	<u>19 Sep</u>	<u>20 Sep</u>	<u>21 Sep</u>	<u>22 Sep</u>	<u>Total</u>
Observatory Headquarters	4.1	17.0	43.1	57.8	12.0	134.0
H19 (HK Island (east))	9.0	21.0	22.0	40.0	35.0	127.0
H13 (HK Island (west))	8.5	14.5	39.0	28.0	1.0	91.0
H21 (HK Island (south))	7.5	18.0	35.5	13.5	2.0	76.5
K04 (Kowloon (east))	45.0	47.0	30.5	49.0	3.5	175.0
K06 (Kowloon (west))	15.5	23.5	64.0	89.5	1.5	194.0
N17 (Lantau)	13.0	8.5	8.0	21.0	1.0	51.5
N13 (Sai Kung)	10.5	15.5	23.5	64.5	9.0	123.0
N09 (Sha Tin)	4.0	33.5	78.5	131.0	9.0	256.0
R26 (Shek Kong)	12.0	30.0	[23.0]	[44.0]	[Nil]	[109.0]
N05 (Sheung Shui)	4.5	46.5	93.0	82.5	Nil	226.5
R31 (Tai Po)	12.5	16.5	49.0	85.5	0.5	164.0
N06 (Tsuen Wan - Kwai Chung)	17.5	23.0	72.0	77.5	1.0	191.0
R21 (Tuen Mun)	4.5	1.0	[7.5]	11.0	Nil	24.0
N12 (Yuen Long)	16.5	17.5	17.0	32.0	5.5	88.5

Note : [] based on incomplete hourly data.

Times and heights of the maximum sea level and the maximum storm surge recorded at tide stations in Hong Kong during the passage of Willie :-

Station (see Fig. 1)	Maximum sea level above chart datum			Maximum storm surge above astronomical tide		
	Height (m)	Date	Time	Height (m)	Date	Time
Lok On Pai	2.26	20 Sep	1.30 a.m.	0.18	19 Sep	3.39 p.m.
Quarry Bay	2.17	20 Sep	1.44 a.m.	0.16	19 Sep	10.14 p.m.
Tai Po Kau	2.33	20 Sep	2.31 a.m.	0.35	19 Sep	10.09 p.m.
Waglan Island	2.24	20 Sep	1.25 a.m.	0.16	19 Sep	9.58 p.m.

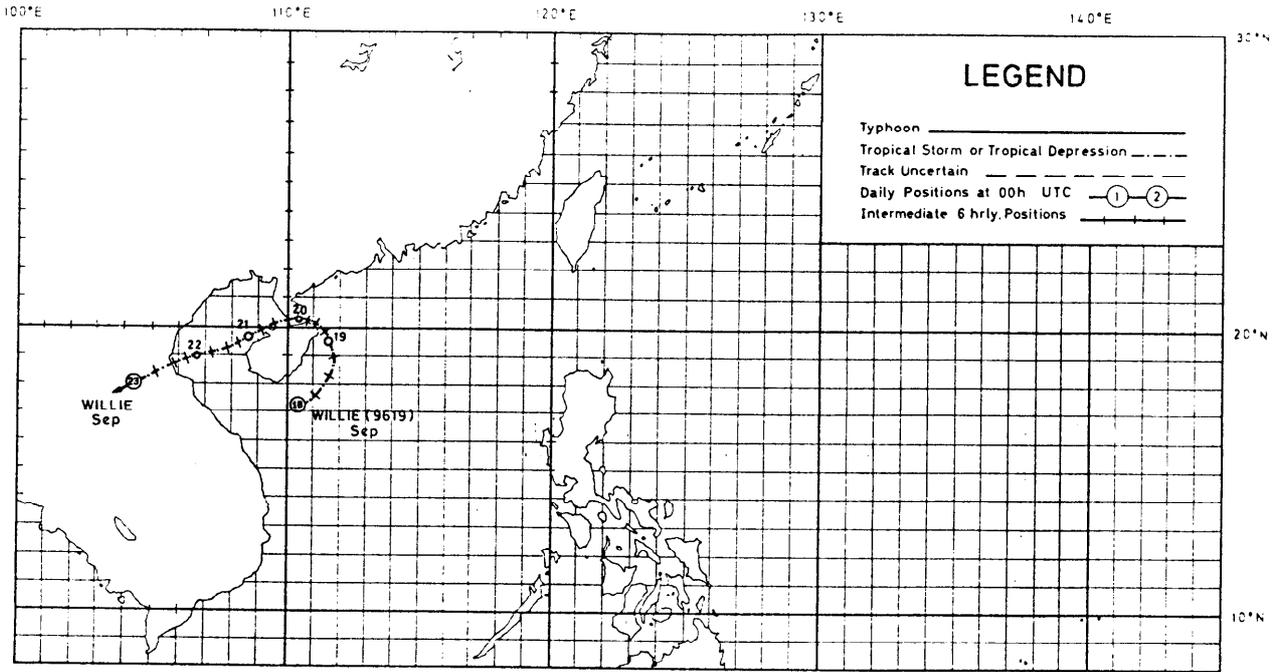


Figure 27. Track of Severe Tropical Storm Willie (9619) : 18 - 23 September 1996.

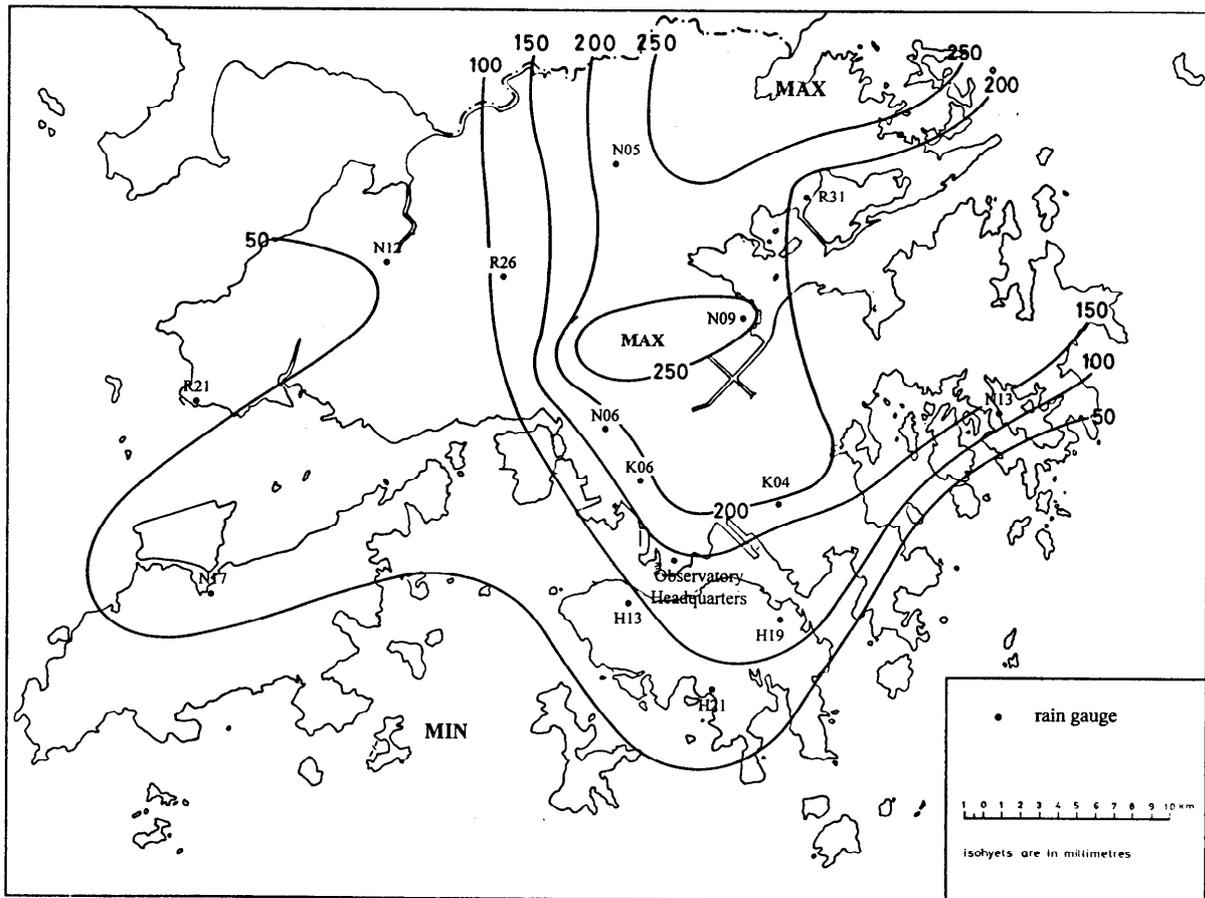


Figure 28. Rainfall distribution on 18 - 22 September 1996.

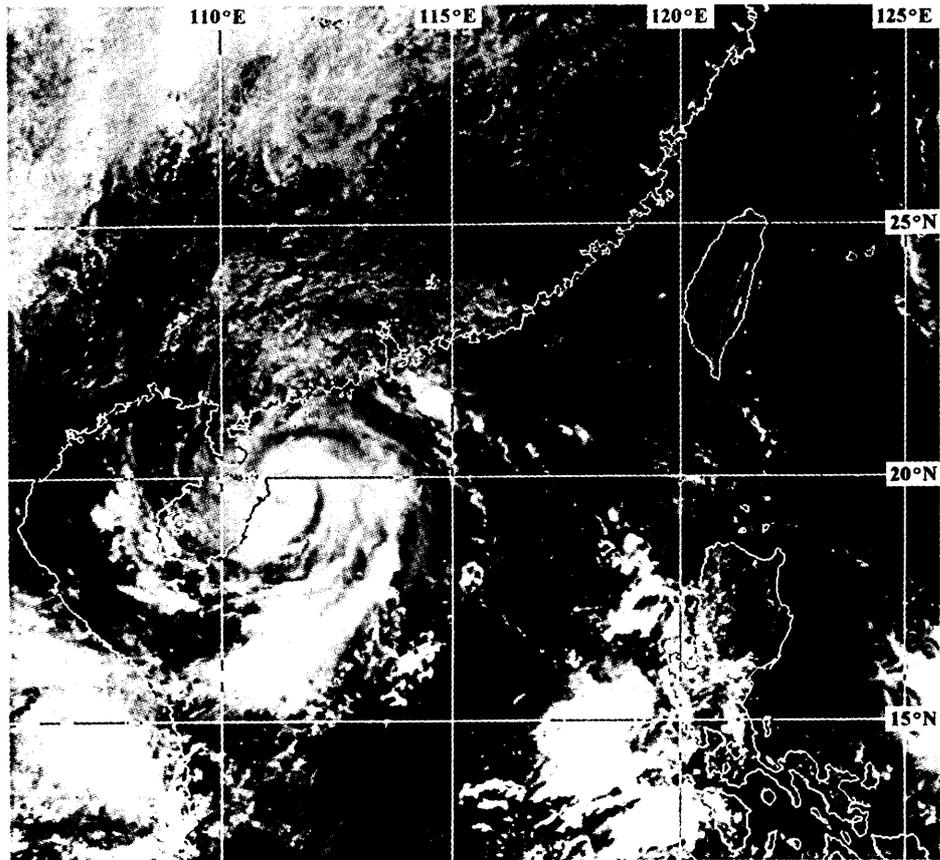


Figure 29. Visible imagery of Willie at around 11 a.m. on 19 September 1996 (originally captured by GMS of JMA).

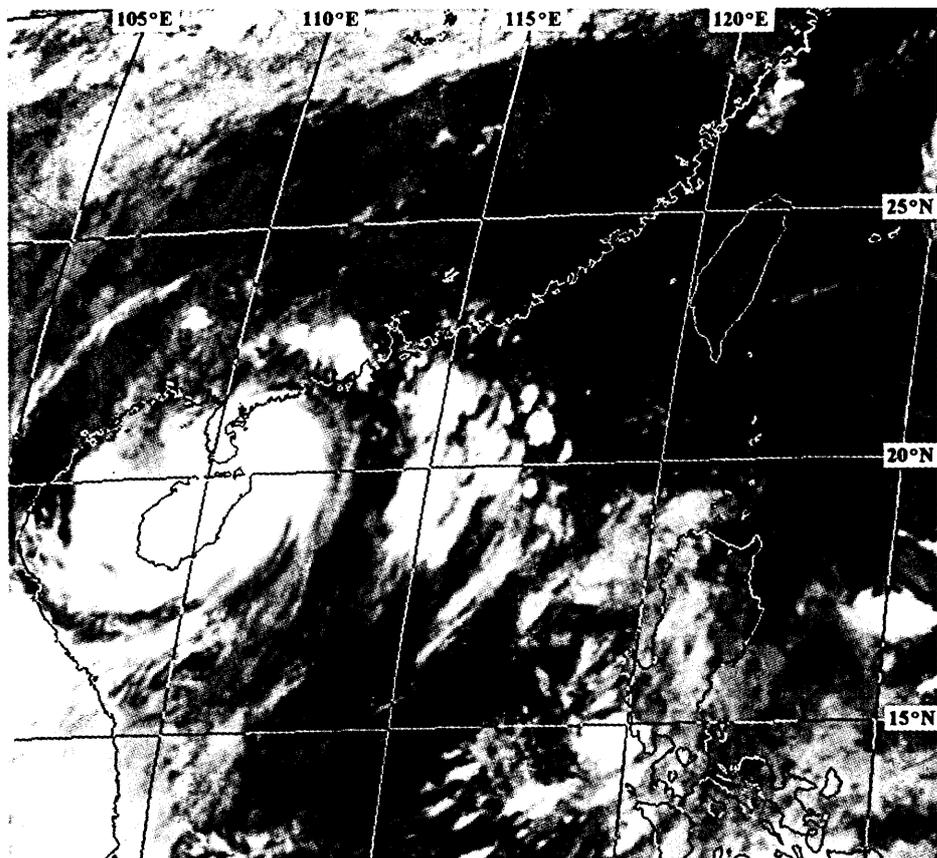


Figure 30. Infra-red imagery of Willie at around 2 a.m. on 20 September 1996 (originally captured by GMS of JMA).

(g) Typhoon Beth (9622)**15 - 21 October 1996**

The track of Beth is shown in Figure 31

Beth developed as a tropical depression about 930 km east-northeast of Manila on 15 October. Tracking westwards, it deepened into a tropical storm the next day and attained typhoon intensity on 17 October. Beth traversed Luzon and entered the South China Sea on 18 October. It weakened rapidly over water and dissipated near Xisha on 21 October.

In Hong Kong the Stand By Signal No.1 was hoisted at 11.45 a.m. on 19 October when Beth was about 570 km to the southeast. Beth had a relatively small circulation and Hong Kong was thus spared from its direct influence. However, over the offshore waters there were occasional strong east to northeasterly winds due to the combined effect of Beth and the northeast monsoon. As Beth moved away and weakened on the afternoon of 20 October, the No.1 signal was lowered at 2.00 p.m. Beth brought occasional rain to Hong Kong during its passage. It was closest to the territory at around 11 p.m. on 19 October when it was about 500 km to the south-southeast. At the Observatory Headquarters, the lowest hourly sea-level pressure of 1 010.9 hPa was recorded at 3 p.m. on 19 October.

On 20 October, a container vessel developed engine trouble in rough seas and poor weather about 200 km south of Hong Kong. 11 of the 24 crew members were airlifted to safety and those remaining on board also made it to safety.

The rainfall distribution associated with Beth is shown in Figure 32. Information on wind, rainfall and tide during the passage of Beth is given as follows :

Maximum gust peak speeds and maximum hourly mean winds with associated wind directions recorded at various stations during the hoisting of tropical cyclone warning signal for Beth :-

<u>Station</u> (see Fig. 1)	<u>Maximum Gust</u>		<u>Date</u>	<u>Time</u>	<u>Maximum Hourly Wind</u>		<u>Date</u>	<u>Time</u>
	<u>Direction</u>	<u>Speed (km/h)</u>			<u>Direction</u>	<u>Speed (km/h)</u>		
Central	E	34	19 Oct	2159	E	22	19 Oct	2300
Chek Lap Kok	ENE	31	20 Oct	1157	NNE	22	20 Oct	0700
Cheung Chau	E	41	19 Oct	2319	E	27	19 Oct	2400
Cheung Sha Wan	E	31	19 Oct	2132	N	13	20 Oct	0900
Green Island	E	51	19 Oct	2232	E	36	19 Oct	2300
H.K. Airport (SE)	E	45	19 Oct	2237	E	25	19 Oct	2400
King's Park	ESE	38	20 Oct	0423	E	19	19 Oct	2400
Lau Fau Shan	NNE	38	19 Oct	1657	NNE	22	20 Oct	0600
Ping Chau	E	22	19 Oct	2338	E	12	19 Oct	2300
Sai Kung	NNE	36	20 Oct	1044	E	25	19 Oct	2300
Sha Lo Wan	E	40	19 Oct	2249	ENE	22	20 Oct	1200
Sha Tin	NNE	27	20 Oct	1140	NE	13	20 Oct	1000
Star Ferry	ESE	38	20 Oct	1203	E	22	19 Oct	2300
Ta Kwu Ling	NNE	27	19 Oct	1340	N	13	19 Oct	1500
	N	27	19 Oct	1604				
Tai Mei Tuk	NNE	40	20 Oct	0623	NNE	25	20 Oct	0800
Tai Mo Shan	NNE	51	20 Oct	0536	NNE	40	20 Oct	1300
Tai Po Kau	E	27	19 Oct	1615	E	19	19 Oct	1700
Tap Mun	E	40	19 Oct	2147	E	23	19 Oct	2200

Station (see Fig. 1)	Maximum Gust			Maximum Hourly Wind				
	Direction	Speed (km/h)	Date	Time	Direction	Speed (km/h)	Date	Time
Tate's Cairn	NE	47	20 Oct	1120	NE	34	20 Oct	0600
	ENE	47	20 Oct	1334				
Tsak Yue Wu	NE	38	20 Oct	1000	NE	19	20 Oct	1000
Tseung Kwan O	E	40	19 Oct	2242	NNE	13	20 Oct	1400
Tsing Yi	NNE	40	20 Oct	1100	ESE	20	19 Oct	1800
Tuen Mun	NNE	34	20 Oct	1018	SE	14	19 Oct	1800
Waglan Island	E	65	20 Oct	0123	E	52	19 Oct	2300
					E	52	20 Oct	0200
Wong Chuk Hang	E	38	19 Oct	2310	E	19	19 Oct	2300
					E	19	19 Oct	2400

Daily rainfall amounts in millimetres recorded at the Observatory Headquarters and other stations during the passage of Beth :-

Station (see Fig. 32)	19 Oct	20 Oct	21 Oct	Total
Observatory Headquarters	Trace	22.2	1.2	23.4
H19 (HK Island (east))	Nil	50.0	0.5	50.5
H13 (HK Island (west))	Nil	25.0	2.0	27.0
H21 (HK Island (south))	Nil	61.5	Nil	61.5
K04 (Kowloon (east))	Nil	17.0	0.5	17.5
K06 (Kowloon (west))	Nil	8.0	Nil	8.0
N17 (Lantau)	Nil	3.5	0.5	4.0
N13 (Sai Kung)	Nil	22.5	2.0	24.5
N09 (Sha Tin)	Nil	6.0	Nil	6.0
N05 (Sheung Shui)	Nil	Nil	0.5	0.5
R31 (Tai Po)	Nil	0.5	Nil	0.5
N06 (Tsuen Wan - Kwai Chung)	Nil	6.5	Nil	6.5
R21 (Tuen Mun)	Nil	1.0	Nil	1.0
N12 (Yuen Long)	Nil	Nil	Nil	Nil

Times and heights of the maximum sea level and the maximum storm surge recorded at tide stations in Hong Kong during the passage of Beth :-

Station (see Fig. 1)	Maximum sea level above chart datum			Maximum storm surge above astronomical tide		
	Height (m)	Date	Time	Height (m)	Date	Time
Lok On Pai	2.52	20 Oct	3.07 a.m.	0.35	20 Oct	3.07 a.m.
Quarry Bay	2.65	20 Oct	2.41 a.m.	0.47	20 Oct	2.41 a.m.
Tai Po Kau	2.84	20 Oct	2.36 a.m.	0.75	20 Oct	2.24 a.m.
Tsim Bei Tsui	2.51	20 Oct	3.18 a.m.	0.34	20 Oct	12.57 p.m.

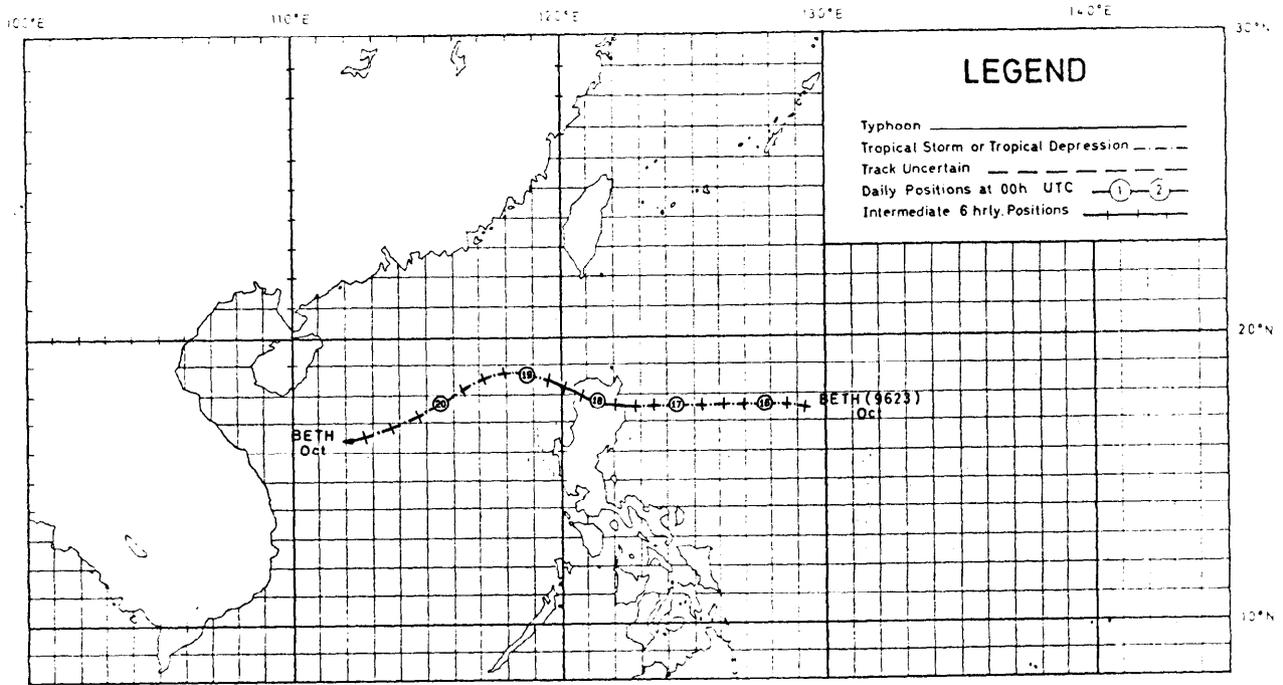


Figure 31. Track of Typhoon Beth (9622) : 15 - 21 October 1996.

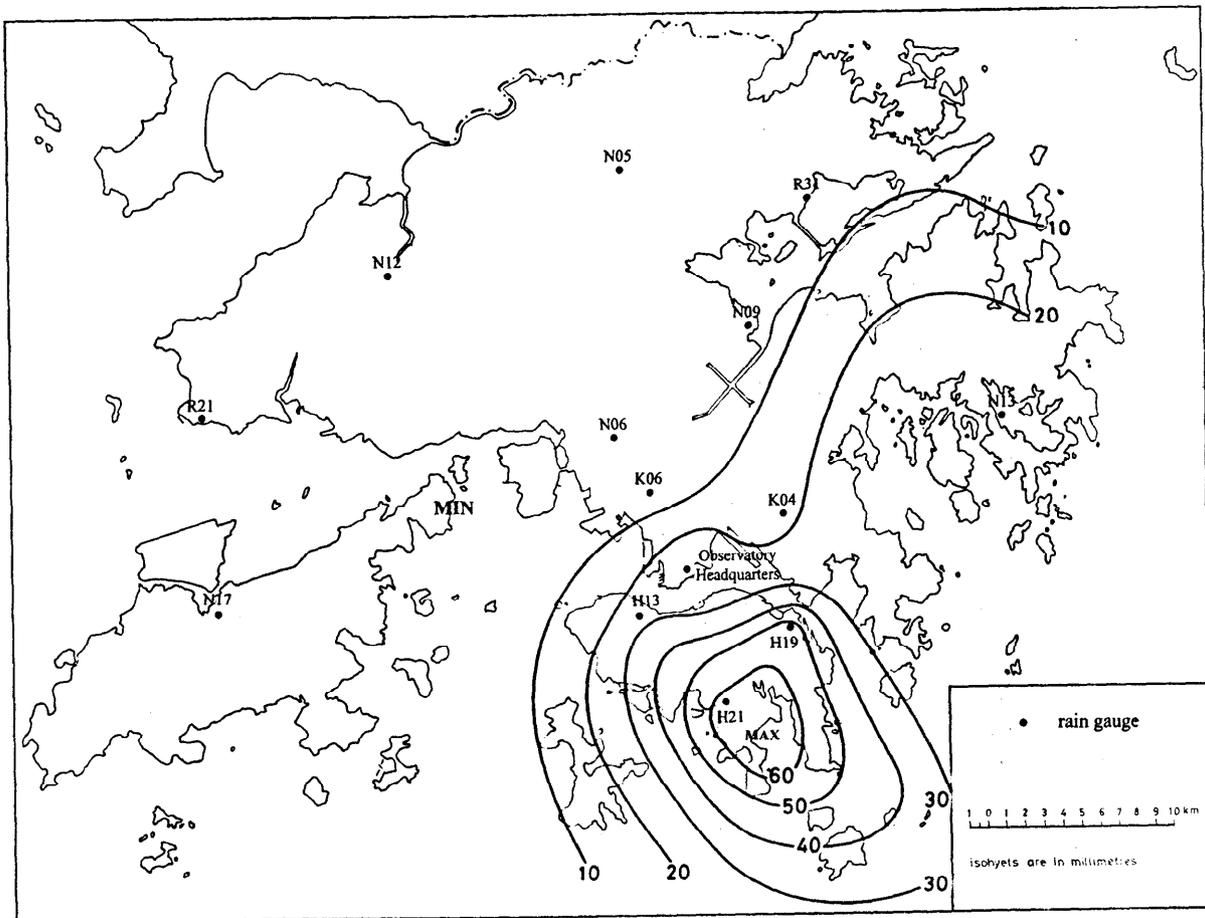


Figure 32. Rainfall distribution on 19 - 21 October 1996.

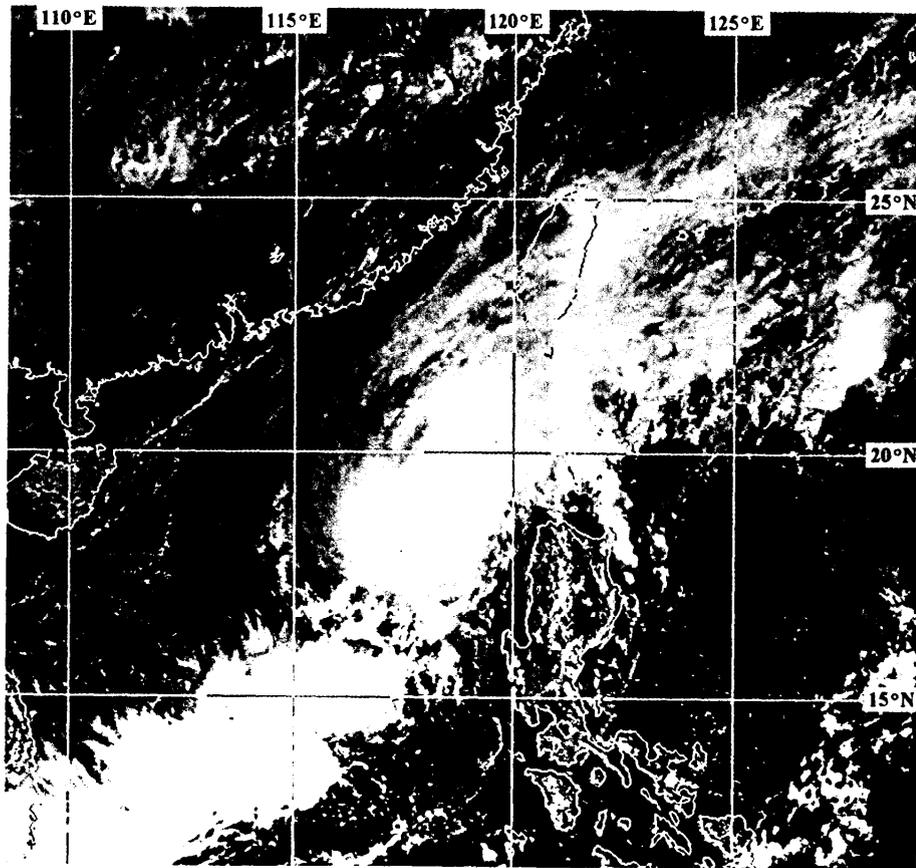


Figure 33. Visible imagery of Beth at around 11 a.m. on 19 October 1996 (originally captured by GMS of JMA).

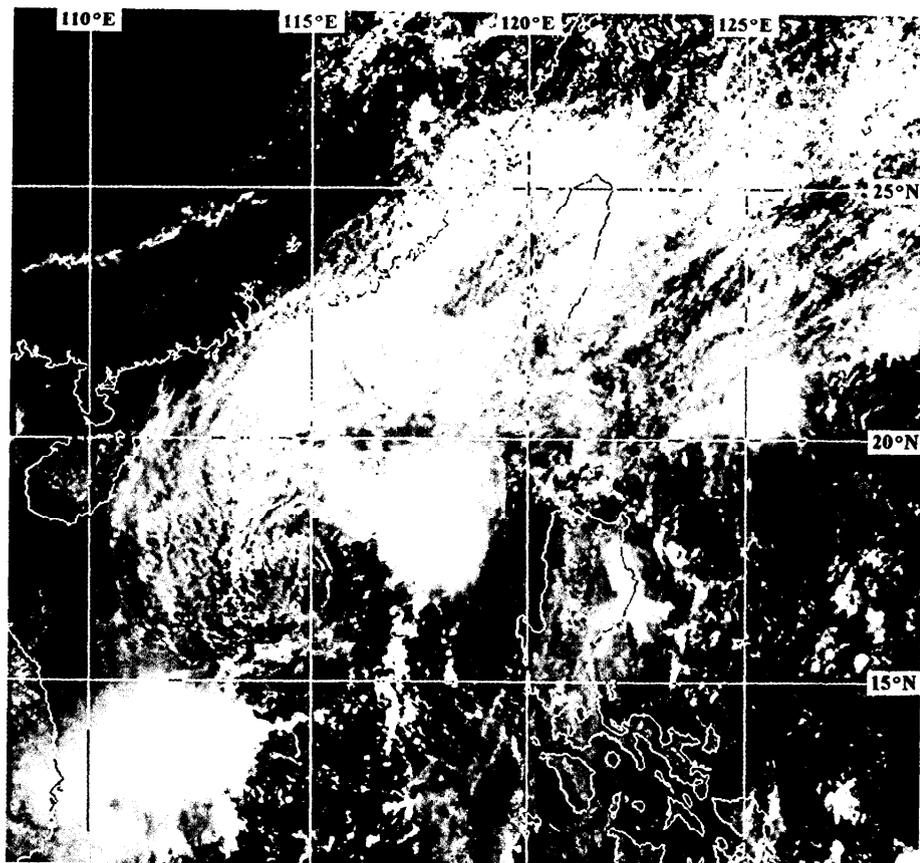


Figure 34. Visible imagery of Beth at around 11 a.m. on 20 October 1996 (originally captured by GMS of JMA).

Section 4

TROPICAL CYCLONE STATISTICS AND TABLES

TABLE 1 is a list of tropical cyclones in 1996 in the western North Pacific and the adjacent seas (i.e. the area bounded by the Equator, 45°N, 100°E and 180°). The dates cited are the residence times of each tropical cyclone within the above-mentioned region and as such might not cover the full life-span. This limitation applies to all other elements in the table.

TABLE 2 gives the number of tropical cyclone warnings for shipping issued by the Observatory in 1996, the durations of these warnings and the times of issue of the first and last warnings for all tropical cyclones in Hong Kong's area of responsibility (i.e. the area bounded by 10°N, 30°N, 105°E and 125°E). Times are given in hours and minutes in UTC.

TABLE 3 presents a summary of the occasions/durations of the hoisting of tropical cyclone warning signals in 1996. The sequence of the signals displayed and the number of tropical cyclone warning bulletins issued for each tropical cyclone are also given. Times are given in hours and minutes in Hong Kong Time.

TABLE 4 presents a summary of the occasions/durations of the hoisting of tropical cyclone warning signals from 1956 to 1996 inclusive.

TABLE 5 gives the annual number of tropical cyclones in Hong Kong's area of responsibility between 1956 and 1996. The annual number of tropical cyclones causing tropical cyclone warning signals to be raised in Hong Kong is also included.

TABLE 6 shows the maximum, mean and minimum durations of the tropical cyclone warning signals hoisted during the period 1956-1996.

TABLE 7 is a summary of meteorological information for each tropical cyclone affecting Hong Kong in 1996. Information on the nearest approach together with an estimate of the minimum central pressure of each tropical cyclone during its closest approach, the maximum winds at King's Park and Waglan Island, the minimum mean sea-level pressure recorded at the Observatory and the maximum storm surge (the excess, in metres, of the actual water level over that predicted in the Tide Tables) are included.

TABLE 8 tabulates the amount of rainfall associated with each tropical cyclone that came within 600 km of Hong Kong in 1996 and highlights the 10 wettest tropical cyclones in Hong Kong for the period 1884-1939 and 1947-1996.

TABLE 9 provides some meteorological information for those typhoons requiring the hoisting of the Hurricane Signal No. 10 in Hong Kong since 1946. The information presented includes the distances and bearings of nearest approach, the minimum mean sea-level pressures recorded at the Observatory and the maximum 60-minute mean winds and maximum gust peak speeds recorded at some stations in Hong Kong.

TABLE 10 presents the casualties and damage figures associated with tropical cyclones in Hong Kong for the past 30 years. The information is based on reports from various government departments, public utility companies and local newspapers.

TABLE 1. LIST OF TROPICAL CYCLONES IN THE WESTERN NORTH PACIFIC AND THE SOUTH CHINA SEA IN 1996

Name of tropical cyclone		Beginning of track				End of track				Remark		
		Date	Time UTC	Position °N °E		Date	Time UTC	Position °N °E				
Tropical Depression	(9601)	28	Feb	0600	8.5	129.5	1	Mar	1200	10.5	121.0	Dissipated
Tropical Storm Ann	(9602)	5	Apr	0000	10.7	135.3	8	Apr	0600	12.1	122.9	Dissipated
Typhoon Bart	(9603)	10	May	0600	9.3	136.9	18	May	0600	27.0	138.5	Became Extratropical
Tropical Storm Cam	(9604)	19	May	1200	16.3	113.4	24	May	0000	23.9	127.0	Dissipated
Typhoon Dan	(9605)	5	Jul	0000	19.7	148.8	11	Jul	1200	39.7	147.7	Became Extratropical
Typhoon Eve	(9606)	13	Jul	1200	19.6	144.0	20	Jul	0000	35.2	136.3	Dissipated
Severe Tropical Storm Frankie	(9607)	21	Jul	0000	16.4	113.9	24	Jul	0600	20.3	104.5	Dissipated
Typhoon Gloria	(9608)	21	Jul	0000	10.3	132.5	27	Jul	0600	24.8	114.8	Dissipated
Typhoon Herb	(9609)	23	Jul	0600	18.2	153.6	2	Aug	0600	28.3	115.0	Dissipated
Tropical Depression Ian		28	Jul	1800	15.0	143.8	30	Jul	0000	21.5	139.5	Dissipated
Severe Tropical Storm Joy	(9610)	30	Jul	0600	26.0	153.4	4	Aug	1800	34.4	154.6	Dissipated
Typhoon Kirk	(9612)	4	Aug	0000	25.5	133.3	15	Aug	0000	38.5	139.3	Became Extratropical
Tropical Depression Lisa	(9611)	6	Aug	0000	21.2	115.2	7	Aug	0000	25.5	118.2	Dissipated
Tropical Depression		12	Aug	0600	33.2	159.2	15	Aug	0600	32.3	165.0	Dissipated
Tropical Depression Marty		13	Aug	1200	20.8	107.0	14	Aug	1800	20.1	105.2	Dissipated
Typhoon Niki	(9613)	18	Aug	0600	17.5	129.5	23	Aug	0000	19.8	103.8	Dissipated
Typhoon Orson	(9614)	22	Aug	0000	22.1	142.9	3	Sep	0600	42.3	156.8	Became Extratropical
Tropical Storm Piper	(9615)	22	Aug	1800	28.0	159.8	26	Aug	0000	39.9	158.8	Became Extratropical
Tropical Depression Rick		29	Aug	1800	29.8	173.6	31	Aug	1800	32.5	173.8	Dissipated
Typhoon Sally	(9616)	5	Sep	0600	14.8	133.0	9	Sep	1800	22.3	105.7	Dissipated
Typhoon Violet	(9617)	11	Sep	1800	16.2	130.4	22	Sep	1800	39.3	145.1	Became Extratropical
Typhoon Tom	(9618)	12	Sep	0600	16.0	148.8	18	Sep	1800	28.9	152.4	Became Extratropical
Severe Tropical Storm Willie	(9619)	18	Sep	0000	17.2	110.5	23	Sep	0000	18.0	104.4	Dissipated
Typhoon Yates	(9620)	23	Sep	0000	15.9	157.2	1	Oct	0600	34.0	152.6	Became Extratropical
Typhoon Zane	(9621)	24	Sep	0600	15.8	137.5	3	Oct	0600	32.1	155.0	Became Extratropical
Typhoon Beth	(9622)	15	Oct	1200	17.5	129.1	20	Oct	1800	16.6	112.5	Dissipated
Typhoon Carlo	(9623)	21	Oct	0600	18.6	149.2	26	Oct	1200	38.8	157.8	Dissipated
Tropical Depression		2	Nov	0600	12.6	114.4	3	Nov	0000	14.4	109.0	Dissipated
Typhoon Dale	(9624)	3	Nov	1800	9.5	151.9	13	Nov	0600	32.8	147.6	Became Extratropical
Tropical Storm Ernie	(9625)	4	Nov	1200	5.9	132.0	15	Nov	1800	9.9	108.9	Dissipated
Severe Tropical Storm Fern	(9626)	21	Dec	1800	9.2	141.4	29	Dec	1800	19.3	148.2	Dissipated
Tropical Depression Greg		24	Dec	1800	7.4	112.5	26	Dec	0000	6.3	117.2	Dissipated

TABLE 2. TROPICAL CYCLONE WARNINGS FOR SHIPPING ISSUED IN 1996

Tropical cyclone	No. of warnings issued	Date and time ⁺ of issue of				Duration of warnings (hours)
		First warning		Last warning		
Tropical Depression	12	29 Feb 1800	2 Mar 0300			33
Tropical Storm Ann	21	7 Apr 0900	9 Apr 2100			60
Typhoon Bart	9	14 May 1800	15 May 1800			24
Tropical Storm Cam	34	19 May 1200	23 May 1200			96
* Severe Tropical Storm Frankie	26	21 Jul 0000	24 Jul 0300			75
* Typhoon Gloria	27	24 Jul 0000	27 Jul 0300			75
Typhoon Herb	15	31 Jul 0000	1 Aug 1800			42
* Tropical Depression Lisa	7	5 Aug 2100	6 Aug 1500			18
* Typhoon Niki	32	19 Aug 0300	23 Aug 0000			93
* Typhoon Sally	20	7 Sep 0900	9 Sep 1800			57
* Severe Tropical Storm Willie	40	18 Sep 0000	22 Sep 2100			117
* Typhoon Beth	35	16 Oct 2100	21 Oct 0300			102
Tropical Depression	7	2 Nov 0600	3 Nov 0000			18
Tropical Storm Ernie	75	6 Nov 1800	15 Nov 1800			216
Total	360					1026

* Tropical cyclones for which tropical cyclone warning signals were hoisted in H.K.

⁺ Times are given in hours UTC

TABLE 3. TROPICAL CYCLONE WARNING SIGNALS HOISTED IN HONG KONG AND NUMBER OF WARNING BULLETINS ISSUED IN 1996

SUMMARY

Signal	No. of occasions	Total duration
1	7	171 h 45 min
3	2	13 h 50 min
8 NORTHWEST	-	-
8 SOUTHWEST	-	-
8 NORTHEAST	-	-
8 SOUTHEAST	1	3 h 25 min
9	-	-
10	-	-
Total	10	189 h 0 min

DETAILS

Tropical cyclone	No. of warning bulletins issued	Signal	Hoisted		Lowered	
			Date	Time*	Date	Time*
Severe Tropical Storm Frankie	35	1	21 Jul	1430	22 Jul	2230
Typhoon Gloria	22	1	26 Jul	1130	27 Jul	0645
Tropical Depression Lisa	16	1	6 Aug	0900	6 Aug	2030
Typhoon Niki	40	1	20 Aug	0945	21 Aug	2245
Typhoon Sally	33	1	8 Sep	0500	8 Sep	1700
		3	8 Sep	1700	9 Sep	0215
		8 SE	9 Sep	0215	9 Sep	0540
		3	9 Sep	0540	9 Sep	1015
Severe Tropical Storm Willie	36	1	18 Sep	2315	20 Sep	0900
Typhoon Beth	27	1	19 Oct	1145	20 Oct	1400

* Hong Kong Time (UTC + 8)

TABLE 4. FREQUENCY AND TOTAL DURATION OF DISPLAY OF TROPICAL CYCLONE WARNING SIGNALS : 1956 - 1996

Signals Year	Signals								Total duration h min	
	1	3	8 NW	8 SW	8 NE	8 SE	9	10		
1956	5	4	0	0	0	0	0	0	191	25
1957	4	9	1	1	2	2	0	1	295	45
1958	4	5	0	0	1	0	0	0	214	5
1959	1	1	0	0	0	0	0	0	36	35
1960	11	7	0	2	2	2	1	1	432	35
1961	6	7	1	2	1	0	1	1	192	55
1962	4	3	0	1	1	0	1	1	158	10
1963	4	5	0	0	1	0	0	0	175	50
1964	11	14	1	3	5	3	3	2	570	15
1965	7	6	0	0	1	1	0	0	239	40
1966	6	5	0	0	2	2	0	0	284	40
1967	8	6	0	0	2	1	0	0	339	10
1968	7	7	0	1	1	0	1	1	290	10
1969	4	2	0	0	0	0	0	0	110	15
1970	6	8	2	1	2	0	0	0	286	45
1971	9	10	1	3	2	2	1	1	323	25
1972	8	6	0	0	1	1	0	0	288	20
1973	8	6	1	1	1	0	1	0	416	50
1974	12	10	0	0	2	1	1	0	525	20
1975	8	6	1	0	0	1	1	1	292	20
1976	6	6	0	0	1	2	0	0	351	30
1977	8	6	0	0	1	0	0	0	395	10
1978	8	9	1	1	3	2	0	0	462	10
1979	5	5	1	0	2	2	1	1	281	15
1980	10	8	0	0	1	1	0	0	414	5
1981	5	4	0	0	1	1	0	0	202	20
1982	7	4	0	0	0	0	0	0	247	35
1983	8	7	0	1	2	2	1	1	289	42
1984	6	6	0	0	1	0	0	0	280	2
1985	5	4	1	0	0	1	0	0	193	35
1986	6	7	0	1	1	0	0	0	305	0
1987	6	1	0	0	0	0	0	0	165	45
1988	6	4	0	0	0	0	0	0	204	10
1989	7	8	0	0	2	2	0	0	306	10
1990	6	4	0	0	0	0	0	0	245	10
1991	8	6	0	0	1	1	0	0	349	55
1992	5	5	0	0	1	1	0	0	167	5
1993	8	9	0	0	2	4	0	0	325	40
1994	4	3	0	0	0	0	0	0	138	10
1995	8	6	2	2	1	1	0	0	348	50
1996	7	2	0	0	0	1	0	0	189	0
Total	272	241	13	20	47	37	13	11	11526	49
Mean	6.6	5.9	0.3	0.5	1.1	0.9	0.3	0.3	281	9

TABLE 5. NUMBER OF TROPICAL CYCLONES IN HONG KONG'S AREA OF RESPONSIBILITY AND THE NUMBER THAT NECESSITATED THE DISPLAY OF TROPICAL CYCLONE WARNING SIGNALS IN HONG KONG : 1956 - 1996

Year	Number in Hong Kong's Area of responsibility	Number necessitating the display of signals in Hong Kong
1956	23	5
1957	12	6
1958	15	5
1959	18	2
1960	18	9
1961	24	6
1962	20	4
1963	13	4
1964	26	10
1965	16	6
1966	17	6
1967	17	8
1968	12	6
1969	11	4
1970	21	6
1971	20	9
1972	15	5
1973	17	9
1974	21	11
1975	12	7
1976	10	5
1977	10	8
1978	20	8
1979	18	6
1980	17	10
1981	15	5
1982	16	5
1983	15	7
1984	14	5
1985	15	5
1986	16	4
1987	12	5
1988	17	6
1989	17	7
1990	18	6
1991	14	6
1992	11	5
1993	14	9
1994	20	4
1995	17	8
1996	15	7
Total	669	259
Mean	16.3	6.3

TABLE 6. DURATION OF TROPICAL CYCLONE WARNING SIGNALS HOISTED IN HONG KONG : 1956 - 1996

Signal hoisted	Number of occasions	Duration of each occasion			Total duration per year		
		Mean h min	Maximum h min	Minimum h min	Mean h min	Maximum h min	Minimum h min
1 or higher	269	42 51	161 0	9 35	281 9	570 15	36 35
3 or higher	183	30 58	124 15	6 55	138 14	306 35	17 15
8 or higher	60	15 57	66 50	2 40	23 21	100 55	0 0
8 NW	13	6 29	15 45	1 30	2 3	15 45	0 0
8 SW	20	5 12	10 45	2 30	2 32	16 10	0 0
8 NE	47	8 28	35 35	2 35	9 42	40 20	0 0
8 SE	37	7 17	21 45	0 20	6 34	31 15	0 0
9 or higher	14	7 18	11 33	3 35	2 29	19 25	0 0
10	11	6 10	9 10	2 30	1 39	12 10	0 0

TABLE 7. A SUMMARY OF METEOROLOGICAL OBSERVATIONS RECORDED IN HONG KONG DURING THE PASSAGES OF TROPICAL CYCLONES IN 1996

(a)

Name of tropical cyclone	Month	Nearest approach to Hong Kong						Minimum hourly M.S.L. pressure at the Observatory				Maximum storm surge (metres)							
		Day	Hour*	Direction	Distance (km)	Movement (km/h)	Estimated minimum central pressure (hPa)	Month	Day	Hour*	Pressure (hPa)	Chi Ma Wan	Ko Lau Wan	Lok On Pai	Quarry Bay	Tai O	Tai Po Kau	Tsim Bei Tsui	Waglan Island
S.T.S. Frankie	Jul	22	17	SW	530	NW 19	975	Jul	22	16	1001.9	-	-	0.40	0.40	-	0.67	-	0.53
T. Gloria	Jul	27	14	NNE	280	W 34	992	Jul	26	16	992.8	-	-	0.37	0.41	-	0.57	-	0.45
T.D. Lisa	Aug	6	10	ESE	160	NE 25	996	Aug	6	18	998.7	-	-	0.26	0.29	-	0.42	0.14	0.32
T. Niki	Aug	21	11	S	540	W 24	975	Aug	20	16	1007.7	-	-	#	#	-	#	#	-
T. Sally	Sep	9	2	S	180	WNW 38	955	Sep	9	2	1000.0	-	-	0.97	0.84	-	1.23	0.96	-
S.T.S. Willie	Sep	19	14	SW	390	NW 7	984	Sep	19	15,16	1002.4	-	-	0.18	0.16	-	0.35	-	0.16
T. Beth	Oct	19	23	SSE	500	SW 16	980	Oct	19	15	1010.9	-	-	0.35	0.47	-	0.75	0.34	-

N. B. # Sea level rise insignificant.

* Hong Kong Time (UTC + 8).

(b)

Name of tropical cyclone	Month	Maximum 60-min mean wind in points and km/h		Maximum 10-min mean wind in points and km/h		Maximum gust peak speed in km/h with direction in points	
		King's Park	Waglan Island	King's Park	Waglan Island	King's Park	Waglan Island
S.T.S. Frankie	Jul	ESE 30	E 52	ESE, E 34	E 77	SE 76	SE 106
T. Gloria	Jul	W 16	W 47	N 20	W 49	NNE 38	W 62
T.D. Lisa	Aug	NE 14	N, W 31	NE 19	W 34	NNE 31	W 40
T. Niki	Aug	E, ESE 25	E 47	ESE 31	E 49	E 54	E 58
T. Sally	Sep	E 43	E 96	ENE, E 51	E 108	ENE 104	E 140
S.T.S. Willie	Sep	ESE 22	ESE 41	SE 25	SE 52	SE 49	SE 63
T. Beth	Oct	E 19	E 52	E 20	E 54	ESE 38	E 65

TABLE 8 (a). RAINFALL ASSOCIATED WITH TROPICAL CYCLONES THAT CAME WITHIN 600 KM OF HONG KONG (WITH OR WITHOUT HOISTING OF TROPICAL CYCLONE WARNING SIGNALS) IN 1996

Name of tropical cyclone	Period* when tropical cyclone within 600 km of Hong Kong (T ₁ → T ₂)	Rainfall at the Observatory (mm)				
		(i) 600 km (T ₁ → T ₂)	(ii) 24 hours after T ₂	(iii) 48 hours after T ₂	(iv) 72 hours after T ₂	(i) + (iv) Total T ₁ → (T ₂ + 72 hours)
T.S. Cam #	(T ₁) 20 May 0500 - (T ₂) 22 May 1400	Trace	Trace	Trace	Trace	Trace
S.T.S. Frankie	(T ₁) 21 Jul 1100 - (T ₂) 23 Jul 0200	79.6	14.0	14.0	14.0	93.6
T. Gloria	(T ₁) 26 Jul 1900 - (T ₂) 27 Jul 1400	2.2	38.6	65.4	73.2	75.4
T. Herb #	(T ₁) 1 Aug 1500 - (T ₂) 2 Aug 0400	Nil	1.6	17.8	46.2	46.2
T.D. Lisa	(T ₁) 6 Aug 0800 - (T ₂) 7 Aug 0800	Trace	Trace	Trace	Trace	Trace
T. Niki	(T ₁) 20 Aug 2200 - (T ₂) 21 Aug 2300	0.4	10.5	10.5	10.5	10.9
T. Sally	(T ₁) 8 Sep 1000 - (T ₂) 9 Sep 1700	40.9	4.0	4.0	5.1	46.0
S.T.S. Willie	(T ₁) 18 Sep 1400 - (T ₂) 21 Sep 0300	71.2	55.7	62.8	62.8	134.0
T. Beth	(T ₁) 19 Oct 0800 - (T ₂) 20 Oct 2200	20.6	2.8	2.8	2.8	23.4
T.S. Ernie #	(T ₁) 9 Nov 2200 - (T ₂) 11 Nov 2100	Nil	1.2	1.4	1.4	1.4
					Total :	430.9

N.B. # Tropical cyclones without hoisting of tropical cyclone warning signals.

* Hour in Hong Kong Time (UTC + 8).

(b). THE 10 WETTEST TROPICAL CYCLONES IN HONG KONG (1884-1939,1947-1996)

Tropical Cyclone			Rainfall at the Observatory (mm)				
Year	Month	Name	(i) 600 km	(ii) 24 hours	(iii) 48 hours	(iv) 72 hours	(i)+(iv)
*1926	Jul	-	34.8	534.0	561.1	562.2	597.0
*1916	Jun	-	494.8	27.9	59.4	67.2	562.0
1965	Sep	Agnes	404.6	8.9	64.3	126.1	530.7
1978	Jul	Agnes	502.4	12.3	12.3	16.6	519.0
1976	Aug	Ellen	90.7	394.2	421.0	425.4	516.1
1993	Sep	Dot	459.6	37.9	37.9	37.9	497.5
1982	Aug	Dot	41.2	322.5	403.1	450.5	491.7
1995	Aug	Helen	241.4	146.2	235.2	239.5	480.9
*1904	Aug	-	446.5	Nil	3.7	26.7	473.2
1974	Oct	Carmen	307.6	150.3	161.7	162.1	469.7

N.B. :

- (i) during the period in hours when the tropical cyclone was centred within 600 km of Hong Kong.
- (ii) during the 24-hour period after the tropical cyclone moved outside (or dissipated within) the 600 km radius.
- (iii) during the 48-hour period after the tropical cyclone moved outside (or dissipated within) the 600 km radius.
- (iv) during the 72-hour period after the tropical cyclone moved outside (or dissipated within) the 600 km radius.

* For years prior to 1961, (i) is the sum of daily rainfall on those days when tropical cyclone was centred within 600 km of Hong Kong, (ii) to (iv) are correspondingly the sum of daily rainfall figures of the following days.

TABLE 9. TYPHOONS REQUIRING THE HOISTING OF THE HURRICANE SIGNAL NO. 10 DURING THE PERIOD 1946-1996

Name of typhoon	Date	Nearest approach to the Observatory (km)	Minimum M.S.L. pressure (hPa)		Maximum 60-min mean wind in points and km/h							Maximum gust peak speed in km/h with direction in points							
			Hourly	Inst.	Observatory	King's	Hong Kong	Waglan	Cheung	Tate's	Green	Observatory	King's	Hong Kong	Waglan	Cheung	Tate's	Green	
					Headquarters	Park	Airport	Island	Chau	Cairn	Island	Headquarters	Park	Airport	Island	Chau	Cairn	Island	
-	18 Jul 1946	S 70	985.7	-	NE	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Gloria	22 Sep 1957	SW 55	986.2	984.3	ESE 115	-	ESE 72	E 113	-	-	-	E 187	-	ENE 158	ENE 185	-	-	-	-
Mary	9 Jun 1960	WNW 10	974.3	973.8	SSE 96	-	SSE 92	SSW 112	-	-	-	SSE 191	-	SE 164	SSW 194	-	-	-	-
Alice	19 May 1961	0	981.6	981.1	ENE 83	-	E 70	ESE 90	ENE 76	-	-	E 166	-	ENE 139	SW 128	ENE 135	-	-	-
Wanda	1 Sep 1962	SSW 20	955.1	953.2	N 133	-	N 108	NW 148	NW 118	SE 189	-	N 259	-	N 229	NNW 216	NW 232	ESE 284	-	-
Ruby	5 Sep 1964	SW 30	971.0	968.2	E 110	-	N 118	ENE 148	NE 113	ESE 167	-	NNE 227	-	NW 203	E 230	NNE 216	E 268	-	-
Dot	13 Oct 1964	E 35	978.9	977.3	NNW 88	-	N 67	N 117	NNW 96	NNE 157	-	N 175	-	N 198	N 184	WNW 205	NE 220	-	-
Shirley	21 Aug 1968	0	968.7	968.6	N 68	-	N 75	NNE 124	SSW 90	NNE 126	-	N 133	-	N 151	NE 209	SSW 167	NNE 203	-	-
Rose	17 Aug 1971	WSW 20	984.5	982.8	SE 103	-	SE 122	ESE 140	SE 131	S 148	-	ESE 224	-	ESE 211	ESE 189	SE 194	S 221	-	-
Elsie	14 Oct 1975	S 50	996.4	996.2	ENE 58	N 75	NNW 67	NNE 118	N 106	NE 130	NNW ##	NE 140	N 137	N 140	ENE 176	NE 158	NNE 180	NE 167	-
Hope	2 Aug 1979	NNW 10	961.8	961.6	W 75	WNW 79	W 115	SW 144	SSW 117	NW 115	W ##	W 175	WNW 166	WNW 182	SW 198	WSW 185	WNW 229	W 167	-
Ellen	9 Sep 1983	SW 45	983.9	983.1	E 92	E 88	E 112	ESE 169	ESE 171	E 126	S ##	E 185	E 167	E 203	E 227	SSE 238	ENE 218	S 220*	-

*estimated, exceeding upper limit of anemogram.

TABLE 10. CASUALTIES AND DAMAGE CAUSED BY TROPICAL CYCLONES IN HONG KONG : 1967 - 1996

Year	Date	Name of tropical cyclone	Ocean-going vessels in trouble	Small craft sunk or wrecked	Small craft damaged	Persons dead	Persons missing	Persons injured
1967	19 - 22 Aug	S.T.S. Kate	3	1	0	0	0	3
1968	17 - 22 Aug	T. Shirley	1	*	3	0	0	4
1969	22 - 29 Jul	T. Viola	0	3	0	0	0	0
1970	1 - 3 Aug	T.D.	0	0	0	2 ⁺	0	0
	8 - 14 Sep	T. Georgia	2	0	*	0	0	0
1971	15 - 18 Jun	T. Freda	8	0	0	2	0	30
	16 - 22 Jul	T. Lucy	10	2	13	0	0	38
	10 - 17 Aug	T. Rose	33**	303	*	110	5	286
1972	4 - 9 Nov	T. Pamela	3	0	0	1	0	8
1973	14 - 20 Jul	T. Dot	14	*	*	1	0	38
1974	7 - 14 Jun	T. Dinah	1	*	*	0	0	0
	18 - 22 Jul	T. Ivy	2	*	*	0	0	0
	15 - 19 Oct	T. Carmen	5	*	*	1	0	0
	21 - 27 Oct	T. Della	2	*	*	0	0	0
1975	10 - 14 Aug	T.D.	3	1	*	2	1	0
	9 - 14 Oct	T. Elsie	7	2	1	0	0	46
	16 - 23 Oct	S.T.S. Flossie	1	*	*	0	0	0
1976	22 Jun - 4 Jul	T. Ruby	0	0	0	3	2	2
	21 - 26 Jul	S.T.S. Violet	0	0	0	2	1	1
	5 - 6 Aug	S.T.S. Clara	0	0	0	0	0	4
	21 - 24 Aug	T.S. Ellen	0	4	7	27	3	65
	15 - 21 Sep	T. Iris	6	0	1	0	0	27
1977	4 - 6 Jul	T.D.	0	0	0	0	0	2
	3 - 5 Sep	T.S. Carla	1	0	0	0	0	1
	22 - 25 Sep	S.T.S. Freda	2	0	0	1	0	37
1978	24 - 30 Jul	S.T.S. Agnes	0	25	42	3	0	134
	9 - 12 Aug	T.S. Bonnie	2	0	0	0	0	0
	23 - 28 Aug	S.T.S. Elaine	8	5	8	1	0	51
	22 - 26 Sep	S.T.S. Kit	0	1	0	0	7	0
	7 - 16 Oct	S.T.S. Nina	0	0	0	0	0	2
	17 - 29 Oct	T. Rita	1	5	0	0	0	3
1979	1 - 6 Jul	T. Ellis	0	2	0	0	0	0
	26 - 30 Jul	T.S. Gordon	0	2	0	0	0	0
	28 Jul - 3 Aug	T. Hope	29	167	207	12	0	260
	6 - 9 Aug	T.D.	0	3	0	0	0	0
	16 - 24 Sep	S.T.S. Mac	2	12	0	1	0	67
1980	5 - 12 Jul	S.T.S. Ida	1	0	0	0	0	0
	18 - 23 Jul	T. Joe	4	0	1	2	1	59
	20 - 28 Jul	T. Kim	0	2	1	0	0	0
	29 Oct - 2 Nov	T.S. Cary	0	0	2	0	0	0
1981	3 - 7 Jul	S.T.S. Lynn	0	0	3	0	0	32
1982	27 Jun - 2 Jul	T.S. Tess	0	1	0	0	0	16
	22 - 30 Jul	T. Andy	0	0	1	0	0	0
	5 - 16 Sep	T. Irving	0	0	2	0	0	0

TABLE 10. (cont'd)

Year	Date	Name of tropical cyclone	Ocean-going vessels in trouble	Small craft sunk or wrecked	Small craft damaged	Persons dead	Persons missing	Persons injured
1983	12 - 19 Jul	T. Vera	0	1	0	0	0	0
	29 Aug - 9 Sep	T. Ellen	44	135	225	10	12	333
	10 - 14 Oct	T. Joe	2	0	3	0	0	58
	20 - 26 Oct	S.T.S. Lex	0	0	1	0	0	0
1984	27 Aug - 7 Sep	T. Ike	0	0	0	0	0	1
1985	19 - 25 Jun	T. Hal	0	4	2	0	1	13
	1 - 7 Sep	T. Tess	6	1	3	2	0	12
	13 - 22 Oct	T. Dot	0	0	0	0	0	1
1986	3 - 12 Jul	T. Peggy	3	0	3	1	0	26
	9 - 12 Aug	T.D.	0	1	5	0	0	3
	18 Aug - 6 Sep	T. Wayne	0	3	0	3	1	15 ⁺
	11 - 19 Oct	T. Ellen	1	2	1	0	0	4
1987	16 - 27 Oct	T. Lynn	0	0	0	0	0	1
1988	14 - 20 Jul	T. Warren	1	2	1	0	1	12
	19 - 22 Sep	T. Kit	0	0	1	0	0	0
	18 - 23 Oct	T. Pat	0	0	0	2	0	1
	21 - 29 Oct	T. Ruby	0	0	0	0	0	4
1989	16 - 21 May	T. Brenda	0	3	5	6	1	119
	11 - 19 Jul	T. Gordon	1	0	8	2	0	31
	8 - 14 Oct	T. Dan	1	0	1	0	0	0
1990	15 - 19 May	T. Marian	0	0	1	0	0	0
	15 - 19 Jun	S.T.S. Nathan	1	0	2	5	1	1
	21 - 30 Jun	T. Percy	0	0	0	1	0	0
	27 - 31 Jul	S.T.S. Tasha	0	1	0	0	0	1
	25 - 30 Aug	T. Becky	0	0	0	0	1	0
	10 - 20 Sep	T. Ed	0	0	0	0	0	1
1991	15 - 20 Jul	T. Amy	1	0	2	0	0	1
	20 - 24 Jul	S.T.S. Brendan	1	1	13	0	0	17
	13 - 18 Aug	T. Fred	0	1	0	0	0	0
1992	9 - 14 Jul	T. Eli	0	0	1	0	0	23
	17 - 18 Jul	T.S. Faye	1	0	3	2	0	24
	19 - 23 Jul	S.T.S. Gary	2	0	0	0	0	18
1993	21 - 28 Jun	T. Koryn	0	0	2	0	0	183
	16 - 21 Aug	T. Tasha	0	0	7	0	0	35
	9 - 14 Sep	T. Abe	0	0	0	1	0	0
	15 - 17 Sep	S.T.S. Becky	0	0	10	1	0	130
	23 - 27 Sep	T. Dot	0	1	0	0	1	48
	28 Oct - 5 Nov	T. Ira	0	1	0	2	0	30
1994	23 - 25 Jun	T.S. Sharon	0	1	1	0	0	5
	25 - 29 Aug	S.T.S. Harry	0	0	2	1	0	2
1995	7 - 12 Aug	S.T.S. Helen	0	0	0	3	0	35
	25 Aug - 1 Sep	T. Kent	0	0	0	0	0	5
	28 Sep - 4 Oct	T. Sibyl	0	0	0	0	0	14
1996	5 - 10 Sep	T. Sally	0	0	0	2	0	4
	18 - 23 Sep	S.T.S. Willie	0	0	0	0	1	0

N.B. Based on information supplied by relevant government departments and public utility companies. Damage reports in the local press were also examined and collated.

* Data unavailable.

+ Struck by lightning.

**Note: Number of Ocean-going vessels in trouble is revised on 30 Jul 2021.

Section 5

TROPICAL CYCLONE POSITION AND INTENSITY DATA, 1996

Six-hourly position and intensity data are tabulated for the following tropical cyclones in 1996 in the western North Pacific and the South China Sea (i.e. the area between the equator and 45°N, and between 100°E and 180°).

Name of tropical cyclone	Page
Tropical Depression of 28 February - 1 March (9601)	71
Tropical Storm Ann (9602)	72
Typhoon Bart (9603)	73
Tropical Storm Cam (9604)	74
Typhoon Dan (9605)	75
Typhoon Eve (9606)	76
Severe Tropical Storm Frankie (9607)	77
Typhoon Gloria (9608)	78
Typhoon Herb (9609)	79
Tropical Depression Ian	80
Severe Tropical Storm Joy (9610)	81
Typhoon Kirk (9612)	82
Tropical Depression Lisa (9611)	83
Tropical Depression of 12 - 15 August	84
Tropical Depression Marty	85
Typhoon Niki (9613)	86
Typhoon Orson (9614)	87
Tropical Storm Piper (9615)	88
Tropical Depression Rick	89
Typhoon Sally (9616)	90
Typhoon Violet (9617)	91
Typhoon Tom (9618)	92
Severe Tropical Storm Willie (9619)	93
Typhoon Yates (9620)	94
Typhoon Zane (9621)	95
Typhoon Beth (9622)	96
Typhoon Carlo (9623)	97
Tropical Depression of 2 - 3 November	98
Typhoon Dale (9624)	99
Tropical Storm Ernie (9625)	100
Severe Tropical Storm Fern (9626)	101
Tropical Depression Greg	102

Surface winds in this section refer to wind speeds averaged over a period of 10 minutes given in the unit of m/s. (Note: 1 m/s is about 2 knots or 4 km/h)

**SIX-HOURLY POSITION AND INTENSITY DATA OF
THE TROPICAL DEPRESSION OF 28 FEBRUARY - 1 MARCH (9601)**

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E		
Feb	28	0600	T.D.	1000	16	8.5	129.5		
		1200	T.D.	1000	16	9.1	128.8		
		1800	T.D.	1000	16	9.5	128.0		
	29	0000	T.D.	1000	16	9.8	127.1		
		0600	T.D.	1000	16	10.0	126.2		
		1200	T.D.	1000	16	10.2	125.2		
		1800	T.D.	1000	16	10.5	123.9		
		Mar	1	0000	T.D.	1000	16	10.8	122.5
				0600	T.D.	1000	16	10.7	121.7
1200	T.D.			1000	16	10.5	121.0		

Dissipated

**SIX-HOURLY POSITION AND INTENSITY DATA OF
TROPICAL STORM ANN (9602)**

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
Apr	5	0000	T.D.	1004	13	10.7	135.3
		0600	T.D.	1000	16	10.7	134.0
		1200	T.D.	1000	16	10.7	132.7
		1800	T.S.	998	18	10.7	131.4
	6	0000	T.S.	998	18	10.7	130.1
		0600	T.S.	998	18	10.8	128.8
		1200	T.S.	998	18	10.9	127.6
		1800	T.S.	998	18	10.9	126.8
	7	0000	T.S.	998	18	11.1	126.0
		0600	T.S.	998	18	11.4	125.2
		1200	T.S.	998	18	11.8	124.2
		1800	T.D.	1000	16	12.0	123.6
	8	0000	T.D.	1000	16	12.1	123.3
		0600	T.D.	1000	16	12.1	122.9

Dissipated

**SIX-HOURLY POSITION AND INTENSITY DATA OF
TYPHOON BART (9603)**

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
May	10	0600	T.D.	1000	16	9.3	136.9
		1200	T.D.	1000	16	10.0	135.4
		1800	T.D.	1000	16	10.5	133.9
	11	0000	T.S.	998	18	10.8	132.8
		0600	T.S.	998	18	11.1	131.9
		1200	T.S.	994	21	11.4	131.0
	12	1800	T.S.	994	21	11.8	130.2
		0000	T.S.	990	23	12.4	129.4
		0600	S.T.S.	985	25	13.0	128.7
	13	1200	S.T.S.	985	25	13.5	128.2
		1800	S.T.S.	980	28	14.0	127.7
		0000	S.T.S.	975	31	14.3	127.3
	14	0600	T.	970	33	14.7	126.9
		1200	T.	965	36	15.0	126.5
		1800	T.	955	41	15.3	126.1
	15	0000	T.	945	46	15.7	125.7
		0600	T.	945	46	16.2	125.4
		1200	T.	945	46	16.7	125.1
	16	1800	T.	945	46	17.2	124.9
		0000	T.	945	46	17.7	124.7
		0600	T.	945	46	18.2	124.7
	17	1200	T.	950	43	18.6	124.9
		1800	T.	955	41	19.0	125.2
		0000	T.	955	41	19.4	125.7
	18	0600	T.	960	39	19.8	126.4
		1200	T.	965	36	20.0	127.5
		1800	T.	965	36	20.4	129.1
	19	0000	T.	970	33	21.2	130.7
		0600	T.	970	33	22.4	132.2
		1200	T.	970	33	23.5	133.8
20	1800	S.T.S.	980	28	24.7	135.4	
	0000	S.T.S.	980	28	25.9	136.9	
	0600	S.T.S.	980	28	27.0	138.5	

Became Extratropical

**SIX-HOURLY POSITION AND INTENSITY DATA OF
TROPICAL STORM CAM (9604)**

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
May	19	1200	T.D.	1000	13	16.3	113.4
		1800	T.D.	1000	13	16.6	114.0
	20	0000	T.D.	998	16	17.2	114.8
		0600	T.D.	998	16	17.8	115.5
		1200	T.S.	996	18	18.2	116.0
		1800	T.S.	996	18	18.4	116.3
		0000	T.S.	996	18	18.6	116.5
	21	0600	T.S.	996	18	18.8	116.8
		1200	T.S.	996	18	19.0	117.2
		1800	T.S.	996	18	19.2	117.7
		0000	T.S.	996	18	19.5	118.4
	22	0600	T.S.	996	18	19.7	119.3
		1200	T.S.	996	18	20.0	120.4
		1800	T.S.	996	18	20.4	121.5
		0000	T.S.	996	18	20.9	122.6
	23	0600	T.S.	996	18	21.7	123.7
		1200	T.S.	996	18	22.4	124.8
		1800	T.D.	1000	16	23.1	125.9
	24	0000	T.D.	1000	16	23.9	127.0

Dissipated

**SIX-HOURLY POSITION AND INTENSITY DATA OF
TYPHOON DAN (9605)**

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
Jul	5	0000	T.D.	1000	13	19.7	148.8
		0600	T.D.	1000	13	19.7	148.3
		1200	T.D.	1000	13	19.8	147.8
		1800	T.D.	1000	13	19.9	147.3
	6	0000	T.D.	998	16	20.0	146.8
		0600	T.D.	998	16	20.4	146.2
		1200	T.S.	996	18	20.8	145.6
		1800	T.S.	992	21	21.0	144.8
	7	0000	T.S.	990	23	21.2	144.0
		0600	S.T.S.	985	25	21.5	143.2
		1200	S.T.S.	980	28	21.9	142.5
		1800	S.T.S.	975	31	22.3	141.9
	8	0000	T.	970	33	22.8	141.4
		0600	T.	970	33	23.2	140.9
		1200	T.	970	33	23.7	140.5
		1800	T.	970	33	24.5	140.3
	9	0000	T.	970	33	25.3	140.3
		0600	S.T.S.	975	31	26.4	140.6
		1200	S.T.S.	980	28	27.8	140.9
		1800	S.T.S.	980	28	29.3	141.0
	10	0000	S.T.S.	980	28	30.9	141.0
		0600	S.T.S.	980	28	32.4	141.0
		1200	S.T.S.	985	25	33.8	141.4
		1800	S.T.S.	985	25	35.1	142.5
11	0000	T.S.	990	23	36.3	143.7	
	0600	T.S.	990	23	37.8	145.4	
	1200	T.S.	990	23	39.7	147.7	

Became Extratropical

**SIX-HOURLY POSITION AND INTENSITY DATA OF
TYPHOON EVE (9606)**

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
Jul	13	1200	T.D.	1005	13	19.6	144.0
		1800	T.D.	1005	13	19.9	143.2
	14	0000	T.D.	1005	13	20.3	142.4
		0600	T.D.	1000	16	20.6	141.6
		1200	T.S.	996	18	21.0	140.7
	15	1800	T.S.	990	23	22.0	139.8
		0000	S.T.S.	980	31	22.1	138.9
		0600	T.	970	36	22.6	138.0
	16	1200	T.	970	36	23.0	137.0
		1800	T.	960	41	23.5	135.9
		0000	T.	960	41	24.0	135.2
	17	0600	T.	960	41	24.7	134.8
		1200	T.	960	41	25.5	133.7
		1800	T.	960	41	26.2	132.7
	18	0000	T.	960	41	26.9	132.1
		0600	T.	960	41	27.8	131.5
		1200	T.	960	41	28.7	131.1
	19	1800	T.	960	41	29.6	130.7
		0000	T.	970	36	30.5	130.5
		0600	S.T.S.	980	28	31.6	130.7
	20	1200	S.T.S.	985	25	32.6	130.9
		1800	T.S.	990	23	33.3	131.3
		0000	T.S.	998	18	33.8	132.1
	20	0600	T.D.	1000	16	34.2	133.4
1200		T.D.	1000	16	34.5	134.4	
1800		T.D.	1004	13	34.8	135.4	
		0000	T.D.	1004	13	35.2	136.3

Dissipated

**SIX-HOURLY POSITION AND INTENSITY DATA OF
SEVERE TROPICAL STORM FRANKIE (9607)**

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
Jul	21	0000	T.D.	998	13	16.4	113.9
		0600	T.D.	990	16	17.2	113.2
		1200	T.D.	990	16	17.7	112.4
		1800	T.S.	985	18	17.9	112.1
	22	0000	T.S.	975	23	18.0	111.7
		0600	T.S.	975	23	18.3	111.1
		1200	T.S.	975	23	19.1	110.4
		1800	T.S.	980	21	19.1	109.4
	23	0000	T.S.	980	21	19.4	108.6
		0600	T.S.	975	23	19.7	107.8
		1200	S.T.S.	970	28	20.0	107.2
		1800	S.T.S.	970	28	20.2	106.7
	24	0000	S.T.S.	975	25	20.3	105.9
		0600	T.S.	990	18	20.3	104.5

Dissipated

**SIX-HOURLY POSITION AND INTENSITY DATA OF
TYPHOON GLORIA (9608)**

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
Jul	21	0000	T.D.	1000	13	10.3	132.5
		0600	T.D.	1000	13	11.1	132.1
		1200	T.D.	1000	13	11.9	131.7
		1800	T.D.	1000	13	12.6	131.3
	22	0000	T.D.	1000	13	13.3	130.7
		0600	T.D.	998	16	13.9	130.0
		1200	T.S.	995	18	14.3	129.3
		1800	T.S.	990	21	14.6	128.7
	23	0000	T.S.	990	21	15.0	127.9
		0600	T.S.	985	23	15.5	127.1
		1200	S.T.S.	980	25	15.9	126.3
		1800	S.T.S.	980	25	16.2	125.7
	24	0000	S.T.S.	980	25	16.7	124.9
		0600	T.	970	33	17.2	124.1
		1200	T.	970	33	17.7	123.5
		1800	T.	965	36	18.3	122.9
	25	0000	T.	965	36	19.0	122.3
		0600	T.	965	36	19.7	121.8
		1200	T.	960	41	19.9	121.2
		1800	T.	960	41	20.3	121.1
	26	0000	T.	960	41	20.8	120.8
		0600	T.	960	41	21.9	120.9
		1200	T.	970	36	23.4	119.7
		1800	T.	980	33	24.2	118.7
	27	0000	S.T.S.	985	25	24.7	116.8
		0600	T.D.	992	13	24.8	114.8

Dissipated

**SIX-HOURLY POSITION AND INTENSITY DATA OF
TYPHOON HERB (9609)**

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E	
Jul	23	0600	T.D.	1000	16	18.2	153.6	
		1200	T.S.	998	18	18.7	152.5	
		1800	T.S.	994	21	19.2	151.4	
	24	0000	T.S.	990	23	19.6	150.3	
		0600	S.T.S.	985	25	19.8	149.2	
		1200	S.T.S.	985	25	19.9	148.1	
		1800	S.T.S.	985	25	19.9	147.0	
		25	0000	S.T.S.	985	25	20.1	145.9
			0600	S.T.S.	980	28	20.3	144.7
	1200		S.T.S.	980	28	20.5	143.5	
	26	1800	S.T.S.	980	28	20.7	142.2	
		0000	S.T.S.	980	28	20.8	140.8	
		0600	S.T.S.	980	28	20.6	139.2	
	27	1200	T.	975	33	20.4	137.7	
		1800	T.	970	36	20.1	136.7	
		0000	T.	970	36	19.7	135.7	
		0600	T.	960	41	19.3	134.6	
		1200	T.	950	43	19.1	134.0	
		1800	T.	950	43	18.8	133.0	
	28	0000	T.	950	43	18.5	132.5	
		0600	T.	950	43	18.5	131.8	
		1200	T.	950	43	18.4	131.1	
		1800	T.	950	43	18.3	130.5	
		29	0000	T.	950	43	18.5	130.0
			0600	T.	950	43	19.3	129.3
	1200		T.	950	43	19.9	128.7	
	30	1800	T.	950	43	20.3	128.3	
		0000	T.	950	43	21.0	127.9	
		0600	T.	945	46	22.1	127.1	
	31	1200	T.	940	49	22.4	126.4	
		1800	T.	940	49	23.3	126.0	
0000		T.	940	49	24.0	124.6		
0600		T.	940	49	24.1	123.8		
1200		T.	945	46	24.9	122.5		
1800		T.	950	43	24.7	121.0		
Aug	1	0000	T.	950	43	25.4	120.1	
		0600	T.	970	33	25.9	118.6	
		1200	T.S.	982	23	26.1	117.2	
		1800	T.S.	985	21	26.9	116.5	
	2	0000	T.S.	988	18	27.7	115.8	
		0600	T.D.	990	16	28.3	115.0	

Dissipated

**SIX-HOURLY POSITION AND INTENSITY DATA OF
TROPICAL DEPRESSION IAN**

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E	
Jul	28	1800	T.D.	1006	13	15.0	143.8	
		0000	T.D.	1002	16	16.4	143.0	
	29	0600	T.D.	1002	16	17.6	142.2	
		1200	T.D.	1002	16	18.7	141.2	
		1800	T.D.	1002	16	19.8	140.2	
		30	0000	T.D.	1006	13	21.5	139.5

Dissipated

**SIX-HOURLY POSITION AND INTENSITY DATA OF
SEVERE TROPICAL STORM JOY (9610)**

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
Jul	30	0600	T.D.	1006	13	26.0	153.4
		1200	T.D.	1006	13	26.3	153.4
		1800	T.D.	1006	13	26.6	153.4
	31	0000	T.D.	1002	16	26.9	153.4
		0600	T.D.	1002	16	27.4	153.3
		1200	T.S.	1000	18	27.9	153.1
Aug	1	1800	T.S.	996	21	28.4	152.9
		0000	T.S.	990	23	28.9	152.6
		0600	S.T.S.	985	25	29.5	152.2
	2	1200	S.T.S.	985	25	30.1	151.9
		1800	S.T.S.	985	25	30.6	151.7
		0000	S.T.S.	985	25	31.1	151.7
	3	0600	S.T.S.	980	28	31.6	152.1
		1200	S.T.S.	980	28	31.9	152.7
		1800	S.T.S.	980	28	32.1	153.5
	4	0000	S.T.S.	980	28	32.1	154.3
		0600	S.T.S.	980	28	31.9	155.0
		1200	S.T.S.	980	28	32.0	155.6
	4	1800	S.T.S.	985	25	32.5	155.5
		0000	T.S.	990	23	32.9	155.3
		0600	T.S.	994	21	33.3	155.0
4	1200	T.S.	998	18	33.8	154.7	
	1800	T.D.	1000	16	34.4	154.6	

Dissipated

**SIX-HOURLY POSITION AND INTENSITY DATA OF
TYPHOON KIRK (9612)**

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
Aug	4	0000	T.D.	1000	16	25.5	133.3
		0600	T.S.	998	18	25.8	132.5
		1200	T.S.	998	18	26.2	131.8
		1800	T.S.	998	18	26.8	131.2
	5	0000	T.S.	998	18	27.1	130.9
		0600	T.S.	994	21	27.4	130.7
		1200	T.S.	994	21	27.7	130.2
		1800	T.S.	990	23	27.3	130.6
	6	0000	T.S.	990	23	27.5	130.9
		0600	T.S.	990	23	27.3	131.7
		1200	T.S.	990	23	26.9	132.4
		1800	T.S.	990	23	26.4	133.0
	7	0000	T.S.	990	23	26.1	133.2
		0600	T.S.	990	23	25.6	133.6
		1200	T.S.	990	23	25.4	133.9
		1800	T.S.	990	23	25.2	134.1
	8	0000	S.T.S.	985	25	25.0	134.1
		0600	S.T.S.	980	28	25.0	134.0
		1200	S.T.S.	975	31	24.9	133.7
		1800	S.T.S.	975	31	25.1	133.5
	9	0000	T.	970	33	25.3	132.9
		0600	T.	970	33	25.3	132.1
		1200	T.	970	33	25.0	131.4
		1800	T.	970	33	24.7	130.9
	10	0000	T.	970	33	24.6	130.8
		0600	T.	970	33	24.4	130.7
		1200	T.	965	36	24.2	130.6
		1800	T.	965	36	23.8	130.4
	11	0000	T.	960	39	24.2	130.3
		0600	T.	960	39	24.8	130.4
1200		T.	960	39	25.3	129.7	
1800		T.	960	39	25.4	129.1	
12	0000	T.	960	39	25.9	128.3	
	0600	T.	960	39	26.3	127.9	
	1200	T.	960	39	26.5	127.7	
	1800	T.	960	39	27.2	127.5	
13	0000	T.	960	39	27.9	127.8	
	0600	T.	955	41	28.5	128.3	
	1200	T.	950	43	30.0	128.8	
	1800	T.	955	41	31.3	129.3	
14	0000	T.	960	39	32.4	130.2	
	0600	S.T.S.	970	31	33.9	131.9	
	1200	S.T.S.	980	25	35.5	133.9	
	1800	S.T.S.	980	25	37.2	136.5	
15	0000	T.S.	985	23	38.5	139.3	

Became Extratropical

**SIX-HOURLY POSITION AND INTENSITY DATA OF
TROPICAL DEPRESSION LISA (9611)**

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
Aug	6	0000	T.D.	996	16	21.2	115.2
		0600	T.D.	996	16	22.3	116.0
		1200	T.D.	996	16	23.4	116.8
		1800	T.D.	996	16	24.4	117.6
	7	0000	T.D.	996	16	25.5	118.2

Dissipated

**SIX-HOURLY POSITION AND INTENSITY DATA OF
THE TROPICAL DEPRESSION OF 12 - 15 AUGUST**

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E	
Aug	12	0600	T.D.	1000	16	33.2	159.2	
		1200	T.D.	1000	16	32.9	159.5	
		1800	T.D.	1000	16	32.6	159.9	
	13	0000	T.D.	1000	16	32.3	160.3	
		0600	T.D.	1000	16	32.0	160.7	
		1200	T.D.	1000	16	31.7	161.2	
	14	1800	T.D.	1000	16	31.4	161.7	
		0000	T.D.	1000	16	31.2	162.2	
		0600	T.D.	1000	16	31.3	162.7	
	15	1200	T.D.	1000	16	31.5	163.1	
		1800	T.D.	1000	16	31.7	163.6	
		0000	T.D.	1000	16	32.0	164.2	
			0600	T.D.	1000	16	32.3	165.0

Dissipated

**SIX-HOURLY POSITION AND INTENSITY DATA OF
TROPICAL DEPRESSION MARTY**

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
Aug	13	1200	T.D.	998	16	20.8	107.0
		1800	T.D.	998	16	20.6	106.7
	14	0000	T.D.	998	16	20.4	106.4
		0600	T.D.	998	16	20.2	106.1
		1200	T.D.	998	16	20.1	105.8
		1800	T.D.	1002	13	20.1	105.2

Dissipated

**SIX-HOURLY POSITION AND INTENSITY DATA OF
TYPHOON NIKI (9613)**

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E	
Aug	18	0600	T.D.	1000	13	17.5	129.5	
		1200	T.D.	998	16	17.5	128.1	
		1800	T.D.	998	16	17.2	126.9	
	19	0000	T.D.	998	16	17.3	125.4	
		0600	T.S.	994	21	17.4	124.4	
		1200	T.S.	994	21	17.6	123.0	
	20	1800	T.S.	990	23	17.7	121.6	
		0000	T.S.	990	23	17.8	120.1	
		0600	T.S.	990	23	17.7	118.6	
	21	1200	S.T.S.	985	25	17.5	117.1	
		1800	S.T.S.	980	28	17.4	115.6	
		0000	S.T.S.	975	31	17.5	114.1	
	22	0600	T.	970	33	17.6	112.7	
		1200	T.	970	33	17.8	111.4	
		1800	T.	970	33	18.1	110.2	
	23	0000	S.T.S.	975	31	18.5	109.2	
		0600	S.T.S.	975	31	19.0	108.1	
		1200	S.T.S.	975	31	19.6	107.0	
			1800	S.T.S.	975	31	19.9	105.5
			0000	T.S.	990	21	19.8	103.8

Dissipated

SIX-HOURLY POSITION AND INTENSITY DATA OF
TYPHOON ORSON (9614)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
Aug	22	0000	T.D.	1004	13	22.1	142.9
		0600	T.D.	1004	13	22.4	142.8
		1200	T.D.	1004	13	22.7	142.6
		1800	T.D.	1000	16	23.0	142.4
	23	0000	T.S.	998	18	23.4	142.2
		0600	T.S.	998	18	23.6	142.2
		1200	T.S.	998	18	23.8	142.3
		1800	T.S.	996	21	24.0	142.6
	24	0000	T.S.	990	23	24.1	143.1
		0600	S.T.S.	985	25	24.3	143.9
		1200	S.T.S.	980	28	24.3	144.7
		1800	S.T.S.	975	31	24.3	145.5
	25	0000	T.	970	33	24.3	146.4
		0600	T.	965	36	24.5	147.3
		1200	T.	960	39	24.8	148.1
		1800	T.	960	39	25.1	148.9
	26	0000	T.	960	39	25.4	149.6
		0600	T.	960	39	25.7	150.2
		1200	T.	960	39	26.0	150.7
		1800	T.	960	39	26.3	151.1
	27	0000	T.	965	36	26.4	151.5
		0600	T.	965	36	26.4	151.8
		1200	T.	965	36	26.3	152.0
		1800	T.	965	36	26.1	151.9
	28	0000	T.	970	33	26.1	151.6
		0600	T.	970	33	26.1	151.3
		1200	T.	970	33	26.2	151.0
		1800	S.T.S.	975	31	26.3	150.6
	29	0000	S.T.S.	980	28	26.4	150.2
		0600	S.T.S.	985	25	26.6	149.7
		1200	S.T.S.	985	25	26.9	149.0
1800		S.T.S.	985	25	27.2	148.3	
30	0000	S.T.S.	985	25	27.5	147.7	
	0600	T.S.	990	23	27.9	147.0	
	1200	T.S.	990	23	28.3	146.3	
	1800	T.S.	990	23	28.6	145.7	
31	0000	T.S.	990	23	29.0	145.0	
	0600	S.T.S.	985	25	29.4	144.4	
	1200	S.T.S.	985	25	29.8	143.8	
	1800	S.T.S.	985	25	30.3	143.4	
Sep	1	0000	S.T.S.	985	25	30.9	143.2
		0600	S.T.S.	985	25	31.8	143.3
		1200	T.S.	990	23	32.7	143.9
		1800	T.S.	990	23	33.8	144.6
	2	0000	T.S.	990	23	35.2	145.7
		0600	T.S.	990	23	36.8	147.2
		1200	T.S.	990	23	38.6	149.1
		1800	T.S.	992	21	40.1	151.3
	3	0000	T.S.	994	18	41.3	153.8
		0600	T.S.	994	18	42.3	156.8

Became Extratropical

**SIX-HOURLY POSITION AND INTENSITY DATA OF
TROPICAL STORM PIPER (9615)**

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E	
Aug	22	1800	T.D.	1005	13	28.0	159.8	
		23	0000	T.D.	1005	13	28.8	160.4
	23	0600	T.D.	1000	16	29.6	160.8	
		1200	T.D.	1000	16	30.3	160.9	
		1800	T.D.	1000	16	31.0	160.6	
		24	0000	T.D.	1000	16	31.5	160.0
			0600	T.S.	998	18	31.9	159.5
			1200	T.S.	998	18	32.4	159.2
	25	1800	T.S.	998	18	33.2	159.0	
		0000	T.S.	998	18	34.1	158.8	
		0600	T.S.	998	18	35.2	158.6	
		1200	T.S.	998	18	36.4	158.5	
		1800	T.S.	998	18	37.8	158.5	
	26	0000	T.D.	1000	16	39.9	158.8	

Became Extratropical

**SIX-HOURLY POSITION AND INTENSITY DATA OF
TROPICAL DEPRESSION RICK**

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E	
Aug	29	1800	T.D.	1008	13	29.8	173.6	
		0000	T.D.	1006	16	30.3	173.2	
	30	0600	T.D.	1006	16	30.7	172.8	
		1200	T.D.	1006	16	31.0	172.4	
		1800	T.D.	1006	16	31.3	172.1	
		31	0000	T.D.	1008	13	31.6	172.1
			0600	T.D.	1008	13	31.9	172.4
			1200	T.D.	1008	13	32.2	173.0
	1800		T.D.	1008	13	32.5	173.8	

Dissipated

**SIX-HOURLY POSITION AND INTENSITY DATA OF
TYPHOON SALLY (9616)**

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
Sep	5	0600	T.D.	998	16	14.8	133.0
		1200	T.D.	998	16	14.8	132.6
		1800	T.D.	998	16	15.0	132.3
	6	0000	T.S.	994	18	15.4	131.8
		0600	T.S.	994	18	16.8	130.8
		1200	T.S.	990	23	17.2	129.5
		1800	S.T.S.	982	28	17.6	128.1
	7	0000	T.	972	33	18.1	126.9
		0600	T.	962	39	18.6	125.4
		1200	T.	950	43	18.9	123.6
		1800	T.	935	49	19.2	121.8
	8	0000	T.	935	49	19.3	119.8
		0600	T.	935	49	19.9	117.8
		1200	T.	950	43	20.3	115.7
		1800	T.	955	41	20.7	113.6
	9	0000	T.	962	39	21.1	111.5
		0600	S.T.S.	980	28	21.5	109.5
		1200	T.S.	992	21	21.9	107.6
1800		T.D.	998	16	22.3	105.7	

Dissipated

**SIX-HOURLY POSITION AND INTENSITY DATA OF
TYPHOON VIOLET (9617)**

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
Sep	11	1800	T.D.	998	16	16.2	130.4
		0000	T.D.	998	16	16.3	130.1
	12	0600	T.S.	996	18	16.4	129.9
		1200	T.S.	992	21	16.4	129.7
		1800	T.S.	990	23	16.4	129.5
		0000	T.S.	990	23	16.4	129.3
		0600	S.T.S.	985	25	16.4	129.1
	13	1200	S.T.S.	980	28	16.4	128.9
		1800	S.T.S.	975	31	16.5	128.7
		0000	T.	970	33	16.7	128.5
		0600	T.	970	33	17.0	128.3
	14	1200	T.	965	36	17.3	128.0
		1800	T.	960	39	17.7	127.7
		0000	T.	955	41	18.1	127.3
		0600	T.	950	43	18.5	127.0
	15	1200	T.	945	46	18.9	126.8
		1800	T.	935	49	19.4	126.5
		0000	T.	930	51	19.9	126.3
		0600	T.	935	49	20.3	126.3
	16	1200	T.	940	46	20.6	126.6
		1800	T.	945	43	21.0	127.0
		0000	T.	945	43	21.3	127.6
		0600	T.	950	41	21.8	128.3
	17	1200	T.	950	41	22.2	129.0
		1800	T.	950	41	22.6	129.6
		0000	T.	950	41	22.9	130.1
		0600	T.	950	41	23.1	130.5
	18	1200	T.	950	41	23.3	130.9
		1800	T.	950	41	23.6	131.3
		0000	T.	950	41	23.8	131.6
		0600	T.	950	41	24.1	131.8
	19	1200	T.	950	41	24.4	131.9
		1800	T.	950	41	24.7	132.0
		0000	T.	950	41	25.0	132.1
		0600	T.	950	41	25.4	132.3
	20	1200	T.	950	41	26.0	132.6
1800		T.	955	39	26.6	133.2	
0000		T.	955	39	27.3	134.0	
0600		T.	955	39	28.1	134.9	
21	1200	T.	955	39	29.2	136.2	
	1800	T.	960	36	30.8	137.7	
	0000	T.	960	36	32.6	139.2	
	0600	T.	960	36	35.0	140.9	
22	1200	T.	965	33	37.2	142.9	
	1800	S.T.S.	975	28	39.3	145.1	

Became Extratropical

**SIX-HOURLY POSITION AND INTENSITY DATA OF
TYPHOON TOM (9618)**

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
Sep	12	0600	T.D.	1000	16	16.0	148.8
		1200	T.D.	1000	16	16.8	148.3
		1800	T.S.	998	18	17.6	147.8
	13	0000	T.S.	994	21	18.4	147.2
		0600	T.S.	994	21	19.1	146.6
		1200	T.S.	990	23	19.5	145.8
	14	1800	T.S.	990	23	19.6	145.0
		0000	T.S.	990	23	19.7	144.2
		0600	S.T.S.	985	25	19.7	143.6
	15	1200	S.T.S.	985	25	20.0	143.2
		1800	S.T.S.	980	28	20.4	143.3
		0000	S.T.S.	975	31	20.7	143.7
	16	0600	S.T.S.	975	31	20.9	144.1
		1200	S.T.S.	975	31	21.2	144.6
		1800	T.	970	33	21.5	145.1
	17	0000	T.	965	36	21.8	145.6
		0600	T.	965	36	22.2	146.0
		1200	T.	965	36	22.6	146.4
	18	1800	T.	970	33	23.1	146.9
		0000	T.	970	33	23.6	147.4
		0600	T.	970	33	24.1	147.8
	19	1200	T.	970	33	24.7	148.3
		1800	S.T.S.	975	31	25.2	148.8
		0000	S.T.S.	980	28	25.9	149.4
20	0600	S.T.S.	985	25	26.8	150.2	
	1200	T.S.	990	23	27.8	151.2	
	1800	T.S.	992	21	28.9	152.4	

Became Extratropical

**SIX-HOURLY POSITION AND INTENSITY DATA OF
SEVERE TROPICAL STORM WILLIE (9619)**

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
Sep	18	0000	T.D.	998	16	17.2	110.5
		0600	T.S.	992	21	17.6	111.1
		1200	T.S.	992	21	18.3	111.6
		1800	T.S.	990	23	19.0	111.8
	19	0000	S.T.S.	988	25	19.6	111.6
		0600	S.T.S.	984	28	19.9	111.4
		1200	S.T.S.	984	28	20.1	111.1
		1800	S.T.S.	980	31	20.2	110.8
	20	0000	S.T.S.	980	31	20.2	110.5
		0600	S.T.S.	982	28	20.2	110.1
		1200	S.T.S.	986	25	20.1	109.6
		1800	T.S.	990	23	19.9	109.1
	21	0000	T.S.	990	23	19.7	108.6
		0600	T.S.	994	21	19.5	108.2
		1200	T.S.	994	21	19.3	107.8
		1800	T.S.	994	21	19.1	107.2
	22	0000	T.S.	994	21	19.0	106.7
		0600	T.S.	994	21	18.9	106.3
		1200	T.S.	994	21	18.7	105.9
		1800	T.S.	996	18	18.4	105.2
	23	0000	T.D.	998	16	18.0	104.4

Dissipated

**SIX-HOURLY POSITION AND INTENSITY DATA OF
TYPHOON YATES (9620)**

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
Sep	23	0000	T.D.	1000	16	15.9	157.2
		0600	T.S.	994	21	16.1	156.1
		1200	S.T.S.	985	25	16.2	155.0
		1800	S.T.S.	975	31	16.3	153.9
	24	0000	T.	965	36	16.3	152.7
		0600	T.	965	36	16.2	151.5
		1200	T.	965	36	16.1	150.3
		1800	T.	965	36	16.0	149.1
	25	0000	T.	960	39	16.0	147.9
		0600	T.	960	39	16.0	146.7
		1200	T.	960	39	16.0	145.6
		1800	T.	965	36	16.1	144.7
	26	0000	T.	965	36	16.5	143.9
		0600	T.	965	36	16.9	143.2
		1200	T.	965	36	17.4	142.6
		1800	T.	965	36	18.0	141.9
	27	0000	T.	965	36	18.7	141.1
		0600	T.	965	36	19.4	140.2
		1200	T.	965	36	20.1	139.6
		1800	T.	965	36	20.7	138.9
	28	0000	T.	960	39	21.1	138.4
		0600	T.	960	39	21.5	138.0
		1200	T.	960	39	22.0	137.7
		1800	T.	960	39	22.6	137.7
29	0000	T.	960	39	23.4	138.0	
	0600	T.	960	39	24.2	138.3	
	1200	T.	965	36	25.2	138.7	
	1800	T.	970	33	26.7	139.4	
30	0000	T.	970	33	28.3	140.4	
	0600	S.T.S.	975	31	29.9	141.9	
	1200	S.T.S.	975	31	31.4	144.0	
	1800	S.T.S.	980	28	32.6	146.7	
Oct	1	0000	S.T.S.	985	25	33.5	149.6
		0600	T.S.	990	23	34.0	152.6

Became Extratropical

SIX-HOURLY POSITION AND INTENSITY DATA OF
TYPHOON ZANE (9621)

Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
24	0600	T.D.	1004	13	15.8	137.5
	1200	T.D.	1000	16	16.0	136.2
	1800	T.D.	1000	16	16.2	134.9
25	0000	T.S.	998	18	16.5	133.6
	0600	T.S.	996	21	16.8	132.3
	1200	T.S.	990	23	17.3	131.2
26	1800	S.T.S.	980	28	18.1	130.2
	0000	S.T.S.	975	31	18.9	129.3
	0600	T.	970	33	19.5	128.5
27	1200	T.	965	36	20.0	127.8
	1800	T.	960	39	20.5	127.1
	0000	T.	960	39	21.0	126.4
28	0600	T.	960	39	21.4	125.9
	1200	T.	955	41	21.8	125.6
	1800	T.	955	41	22.3	125.4
29	0000	T.	955	41	22.8	125.3
	0600	T.	955	41	23.5	125.3
	1200	T.	955	41	24.4	125.4
30	1800	T.	960	39	25.3	125.8
	0000	T.	960	39	26.2	126.1
	0600	T.	960	39	27.1	126.3
1	1200	T.	960	39	27.5	126.7
	1800	T.	960	39	27.6	127.1
	0000	T.	965	36	27.5	127.8
2	0600	T.	965	36	27.4	129.0
	1200	T.	965	36	27.5	130.4
	1800	T.	970	33	27.9	132.1
3	0000	T.	970	33	28.3	134.0
	0600	T.	970	33	28.7	136.1
	1200	T.	970	33	29.1	138.2
4	1800	S.T.S.	975	31	29.4	140.3
	0000	S.T.S.	980	28	29.6	142.6
	0600	S.T.S.	980	28	29.9	144.8
5	1200	S.T.S.	980	28	30.1	147.2
	1800	S.T.S.	980	28	30.6	149.8
	0000	S.T.S.	985	25	31.2	152.4
6	0600	T.S.	990	23	32.1	155.0

Became Extratropical

**SIX-HOURLY POSITION AND INTENSITY DATA OF
TYPHOON BETH (9622)**

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
Oct	15	1200	T.D.	1000	16	17.5	129.1
		1800	T.D.	1000	16	17.6	128.4
	16	0000	T.S.	998	18	17.6	127.6
		0600	T.S.	994	21	17.6	126.8
		1200	T.S.	990	23	17.6	126.0
		1800	S.T.S.	985	25	17.6	125.1
		0000	S.T.S.	980	28	17.6	124.2
	17	0600	S.T.S.	975	31	17.6	123.3
		1200	T.	970	33	17.6	122.6
		1800	T.	970	33	17.7	121.9
		0000	T.	970	33	17.8	121.2
		0600	T.	970	33	18.0	120.6
	18	1200	T.	970	33	18.3	120.0
		1800	T.	970	33	18.5	119.4
		0000	S.T.S.	975	31	18.7	118.6
		0600	S.T.S.	975	31	18.7	117.8
		1200	S.T.S.	980	28	18.6	117.0
	19	1800	S.T.S.	985	25	18.2	116.2
		0000	T.S.	990	23	17.8	115.4
		0600	T.S.	994	21	17.3	114.5
1200		T.S.	998	18	16.9	113.5	
1800		T.D.	1000	16	16.6	112.5	

Dissipated

**SIX-HOURLY POSITION AND INTENSITY DATA OF
TYPHOON CARLO (9623)**

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E	
Oct	21	0600	T.D.	1000	16	18.6	149.2	
		1200	T.D.	1000	16	19.0	149.1	
		1800	T.S.	998	18	19.4	149.0	
	22	0000	T.S.	998	18	19.6	148.6	
		0600	T.S.	994	21	19.7	147.9	
		1200	T.S.	994	21	19.7	147.0	
	23	1800	T.S.	990	23	19.7	146.2	
		0000	T.S.	990	23	20.0	145.5	
		0600	S.T.S.	985	25	20.4	145.1	
	24	1200	S.T.S.	980	28	20.9	144.9	
		1800	S.T.S.	975	31	21.5	144.8	
		0000	T.	970	33	22.6	144.8	
	25	0600	T.	965	36	23.8	145.0	
		1200	T.	970	33	25.2	145.2	
		1800	T.	970	33	26.8	145.5	
	26	0000	S.T.S.	975	31	28.5	146.2	
		0600	S.T.S.	980	28	30.2	147.2	
		1200	S.T.S.	985	25	31.9	148.4	
	26	1800	T.S.	980	23	33.6	150.1	
		0000	T.S.	994	21	35.3	152.3	
		0600	T.S.	998	18	37.0	155.0	
			1200	T.D.	1000	16	38.8	157.8

Dissipated

**SIX-HOURLY POSITION AND INTENSITY DATA OF
THE TROPICAL DEPRESSION OF 2 - 3 NOVEMBER**

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
Nov	2	0600	T.D.	1000	16	12.6	114.4
		1200	T.D.	998	16	13.0	113.3
		1800	T.D.	996	16	14.0	110.8
	3	0000	T.D.	996	16	14.4	109.0

Dissipated

**SIX-HOURLY POSITION AND INTENSITY DATA OF
TYPHOON DALE (9624)**

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E	
Nov	3	1800	T.D.	1002	13	9.5	151.9	
		4	0000	T.D.	998	16	9.7	151.9
	4	0600	T.D.	998	16	9.9	151.9	
		1200	T.S.	996	18	10.1	151.9	
		1800	T.S.	996	18	10.3	151.9	
		5	0000	T.S.	996	18	10.5	151.9
			0600	T.S.	996	18	10.7	151.9
	1200		T.S.	994	21	10.8	151.9	
	6	1800	T.S.	990	23	10.9	151.8	
		0000	T.S.	990	23	11.1	151.7	
		0600	S.T.S.	985	25	11.5	151.3	
		1200	S.T.S.	980	28	11.9	150.2	
	7	1800	S.T.S.	975	31	12.0	149.0	
		0000	S.T.S.	975	31	11.9	147.8	
		0600	T.	970	33	11.8	146.6	
		1200	T.	965	36	11.7	145.5	
	8	1800	T.	965	36	11.6	144.4	
		0000	T.	965	36	11.5	143.3	
		0600	T.	965	36	11.5	142.2	
		1200	T.	960	39	11.8	141.1	
	9	1800	T.	960	39	12.3	140.0	
		0000	T.	955	41	12.8	139.0	
		0600	T.	945	43	13.6	137.8	
		1200	T.	935	46	14.6	136.5	
	10	1800	T.	935	46	15.6	135.2	
		0000	T.	935	46	16.6	133.9	
		0600	T.	935	46	17.4	132.9	
		1200	T.	935	46	18.3	132.1	
	11	1800	T.	935	46	19.4	131.6	
		0000	T.	935	46	20.5	131.4	
		0600	T.	935	46	21.6	131.3	
		1200	T.	945	43	22.7	131.4	
	12	1800	T.	955	41	23.9	131.8	
		0000	T.	960	39	25.0	132.6	
		0600	T.	965	36	26.2	133.9	
		1200	T.	970	33	27.6	135.8	
	13	1800	S.T.S.	975	31	29.4	139.0	
		0000	S.T.S.	980	28	31.2	142.5	
		0600	S.T.S.	985	25	32.8	147.6	

Became Extratropical

SIX-HOURLY POSITION AND INTENSITY DATA OF
TROPICAL STORM ERNIE (9625)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
Nov	4	1200	T.D.	1000	13	5.9	132.0
		1800	T.D.	996	16	6.5	131.0
	5	0000	T.D.	996	16	7.1	130.0
		0600	T.D.	996	16	7.7	129.0
		1200	T.D.	996	16	8.3	128.1
		1800	T.S.	990	18	8.9	127.1
	6	0000	T.S.	990	18	9.5	126.1
		0600	T.S.	990	18	10.1	125.2
		1200	T.S.	990	18	10.7	124.2
		1800	T.S.	990	18	11.4	122.9
	7	0000	T.S.	990	18	11.6	121.5
		0600	T.S.	990	18	11.7	120.5
		1200	T.D.	994	16	11.8	120.0
		1800	T.D.	994	16	12.0	119.7
	8	0000	T.D.	994	16	12.4	119.4
		0600	T.D.	994	16	13.0	119.1
		1200	T.D.	994	16	13.8	118.8
		1800	T.D.	994	16	14.9	118.5
	9	0000	T.D.	994	16	16.0	118.3
		0600	T.D.	994	16	17.1	118.1
		1200	T.D.	994	16	18.1	118.0
		1800	T.S.	992	18	18.7	117.9
	10	0000	T.S.	990	21	19.1	117.9
		0600	T.S.	990	21	19.5	117.9
		1200	T.S.	990	21	19.8	117.9
		1800	T.S.	990	21	20.1	117.9
	11	0000	T.S.	994	18	20.2	118.2
		0600	T.S.	994	18	19.9	118.6
		1200	T.S.	994	18	19.6	119.0
		1800	T.S.	994	18	19.4	119.5
	12	0000	T.S.	994	18	19.1	119.9
		0600	T.D.	998	16	18.7	120.2
		1200	T.D.	998	16	18.0	120.2
		1800	T.D.	998	16	17.2	119.9
	13	0000	T.D.	998	16	16.5	119.3
		0600	T.D.	998	16	16.0	118.6
		1200	T.D.	998	16	15.5	117.6
		1800	T.D.	998	16	15.1	116.5
	14	0000	T.D.	998	16	14.5	115.3
		0600	T.D.	998	16	13.9	114.1
		1200	T.D.	998	16	13.1	113.1
		1800	T.D.	1002	13	12.3	112.3
	15	0000	T.D.	1002	13	11.5	111.5
		0600	T.D.	1002	13	10.9	110.9
		1200	T.D.	1002	13	10.4	110.0
		1800	T.D.	1002	13	9.9	108.9

Dissipated

**SIX-HOURLY POSITION AND INTENSITY DATA OF
SEVERE TROPICAL STORM FERN (9626)**

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
Dec	21	1800	T.D.	998	13	9.2	141.4
		0000	T.D.	996	16	9.2	141.0
	22	0600	T.D.	996	16	9.2	140.7
		1200	T.S.	994	18	9.2	140.4
		1800	T.S.	994	18	9.2	140.1
		0000	T.S.	994	18	9.2	139.9
	23	0600	T.S.	994	18	9.2	139.7
		1200	T.S.	994	18	9.2	139.5
		1800	T.S.	992	21	9.2	139.3
		0000	T.S.	992	21	9.2	139.1
	24	0600	T.S.	990	23	9.2	138.9
		1200	S.T.S.	985	25	9.2	138.7
		1800	S.T.S.	985	25	9.2	138.5
		0000	S.T.S.	985	25	9.3	138.3
	25	0600	S.T.S.	985	25	9.5	138.2
		1200	S.T.S.	985	25	9.8	138.2
		1800	S.T.S.	980	28	10.2	138.3
		0000	S.T.S.	980	28	10.6	138.4
	26	0600	S.T.S.	980	28	11.1	138.6
		1200	S.T.S.	975	31	11.6	138.7
		1800	S.T.S.	975	31	12.1	138.8
		0000	S.T.S.	975	31	12.6	138.8
	27	0600	S.T.S.	980	28	13.1	138.9
		1200	S.T.S.	980	28	13.6	138.9
		1800	S.T.S.	980	28	14.2	138.9
		0000	S.T.S.	985	25	14.7	139.2
	28	0600	S.T.S.	985	25	15.4	140.0
		1200	S.T.S.	985	25	16.1	141.0
		1800	S.T.S.	985	25	16.9	142.1
		0000	T.S.	990	23	17.7	143.4
	29	0600	T.S.	992	21	18.4	144.8
		1200	T.S.	994	18	19.0	146.4
1800		T.D.	1000	16	19.3	148.2	

Dissipated

**SIX-HOURLY POSITION AND INTENSITY DATA OF
TROPICAL DEPRESSION GREG**

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
Dec	24	1800	T.D.	1002	13	7.4	112.5
		0000	T.D.	998	16	6.7	113.9
	25	0600	T.D.	998	16	6.5	114.8
		1200	T.D.	998	16	6.5	115.5
		1800	T.D.	998	16	6.4	116.2
		0000	T.D.	1002	13	6.3	117.2

Dissipated