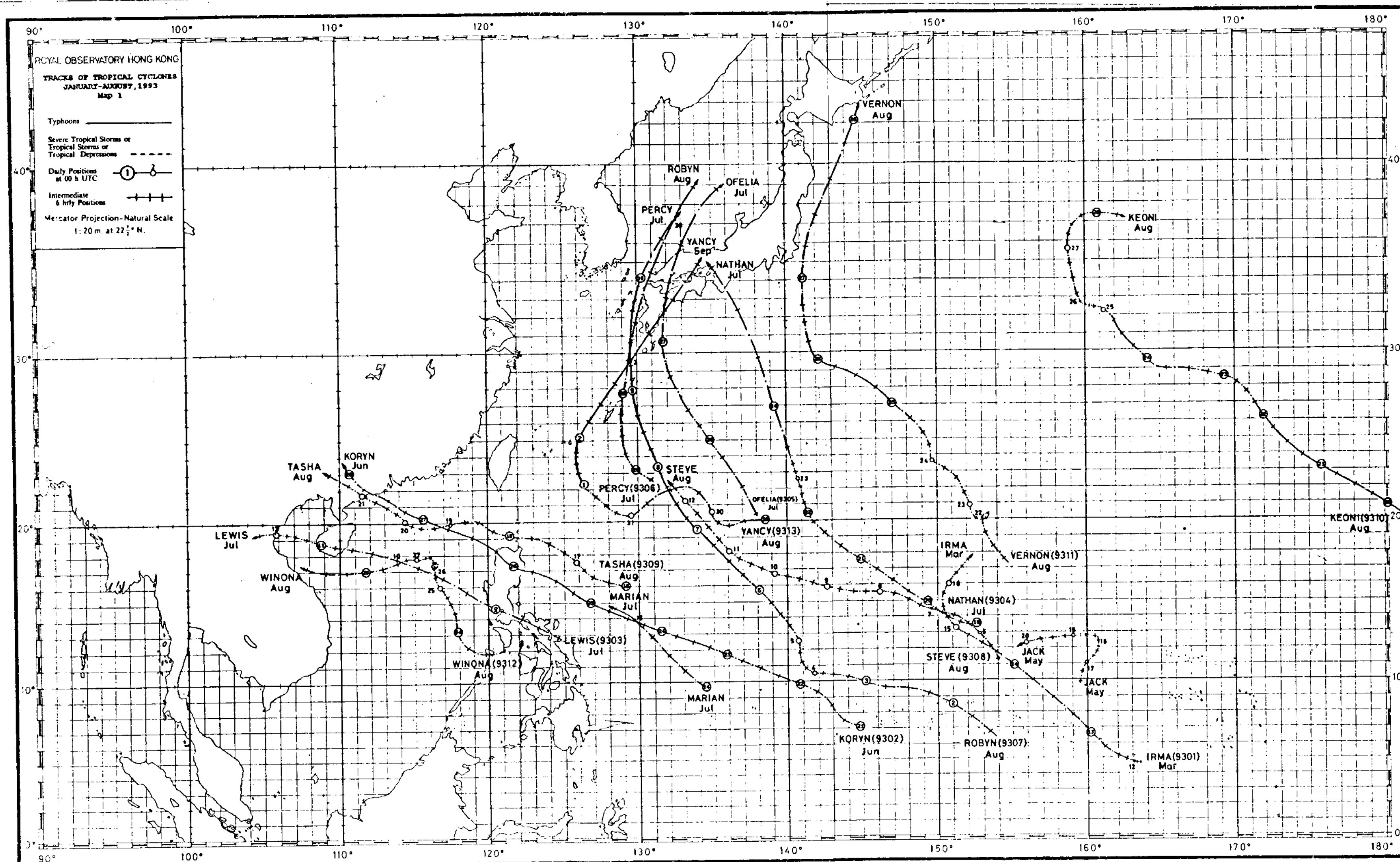
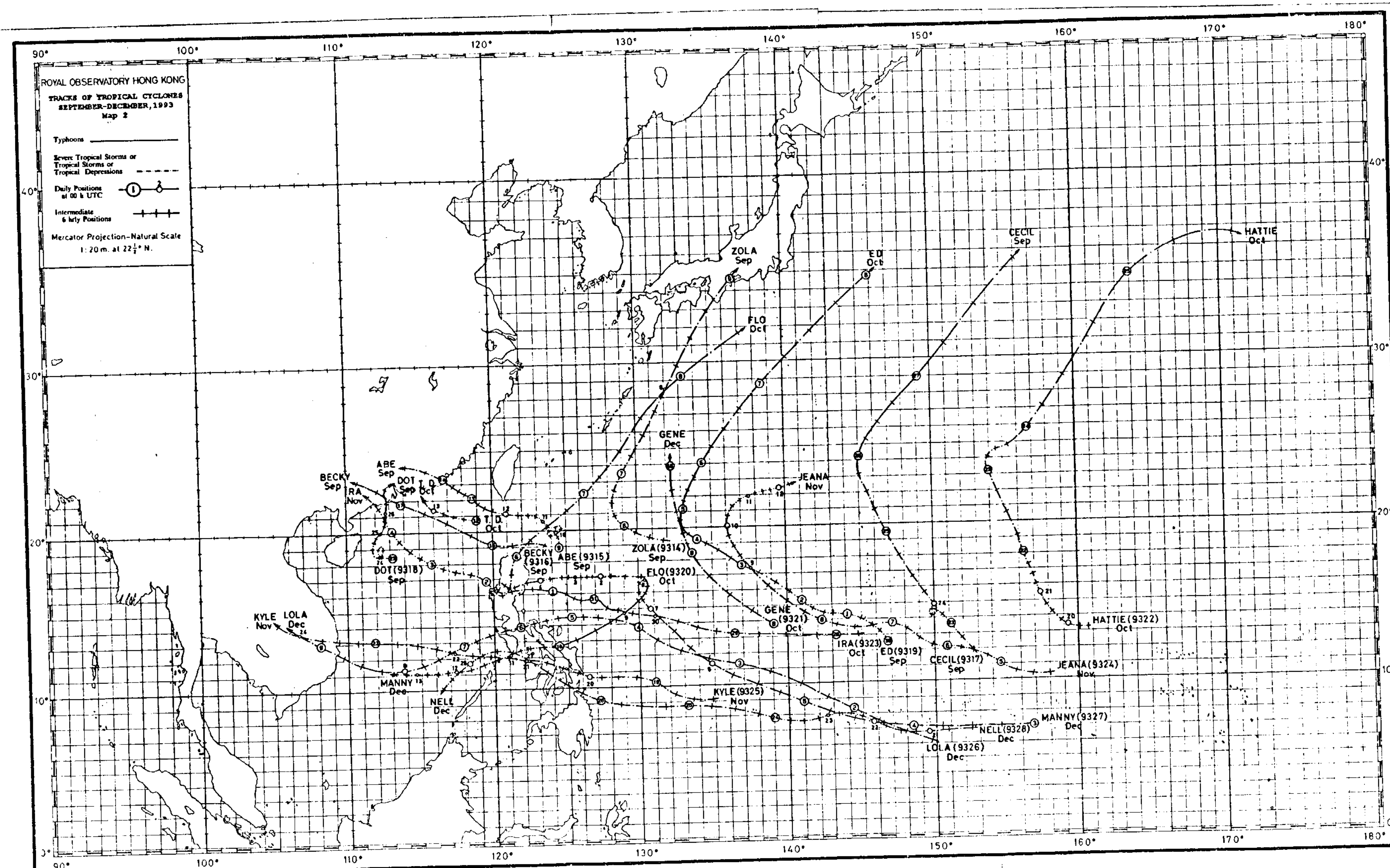
ROYAL OBSERVATORY HONG KONG

TROPICAL CYCLONES IN 1993



ROYAL OBSERVATORY HONG KONG
TRACKS OF TROPICAL CYCLONES
JANUARY-AUGUST, 1993
Map 1
Typhoons
Severe Tropical Storms or Tropical Storms or Tropical Depressions
Daily Positions at 00 h UTC
Intermediate 6 hrly Positions
Mercator Projection-Natural Scale
1: 20 m. at 22½° N.
VERNON Aug
ROBYN Aug
OFELIA Jul
PERCY Jul
YANCY Sep
NATHAN Jul
KEONI Aug
KORYN Jun
TASHA Aug
STEVE Aug
PERCY(9306) Jul
OFELIA(9305) Jul
YANCY(9313) Aug
LEWIS Jul
WINONA Aug
TASHA(9309) Aug
MARIAN Jul
IRMA Mar
VERNON(9311) Aug
NATHAN(9304) Jul
KEONI(9310) Aug
LEWIS(9303) Jul
WINONA(9312) Aug
STEVE (9308) Aug
JACK May
JACK May
MARIAN Jul
KORYN(9302) Jun
ROBYN(9307) Aug
IRMA(9301) Mar



ROYAL OBSERVATORY HONG KONG
TRACKS OF TROPICAL CYCLONES
SEPTEMBER-DECEMBER, 1993
Map 2
Typhoons
Severe Tropical Storms or
Tropical Storms or
Tropical Depressions
Daily Positions
at 00 h UTC
Intermediate
6 hrly Positions
Mercator Projection-Natural Scale
1: 20 m. at 22½° N.
ZOLA Sep
ED Oct
CECIL Sep
HATTIE Oct
FLO Oct
GENE Dec
JEANA Nov
ABE Sep
BECKY Sep
IRA Nov
DOT Sep
T. D. Oct
BECKY (9316) Sep
ABE (9315) Sep
ZOLA (9314) Sep
FLO (9320) Oct
DOT (9318) Sep
GENE (9321) Oct
IRA (9323) Oct
ED (9319) Sep
CECIL (9317) Sep
HATTIE (9322) Oct
JEANA (9324) Nov
KYLE Nov
LOLA Dec
MANNY Dec
NELL Dec
KYLE (9325) Nov
NELL (9328) Dec
MANNY (9327) Dec
LOLA (9326) Dec

Published January 1995

Prepared by
Royal Observatory
134A Nathan Road
Kowloon
Hong Kong

This publication is available from:

Government Publications Centre
General Post Office Building
Ground Floor
Connaught Place
Hong Kong

551.515.2:551.506.1(512.317)

CONTENTS

FIGURES

FIGURES

TABLES

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'ly 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'ly Gale or Storm	8SW		Green White White	
NE'ly Gale or Storm	8NE		Green Green White	
SE'ly Gale or Storm	8SE		White White Green	
Increasing Gale or Storm	9		Green Green Green	Gale or storm force wind is increasing or expected to increase significantly in strength.
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-l946, surface observations of meteorological elements since 1884 have been summarized and published in the Royal 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. The publication of Meteorological Results Part II was terminated in 1981. Upper-air data are now archived on magnetic tapes. Starting from 1987, Part I was re-titled as "Surface Observations in Hong Kong" but the format and contents remained unchanged.

During the period 1884-l939, 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-l17 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 first tropical cyclone of tropical storm intensity or above which occurred within the region in 1993 was assigned the code "9301". In this publication, the appropriate code immediately follows the name of the tropical cyclone in bracket, e.g. Severe Tropical Storm Irma (9301).

Surface wind data presented in this report were obtained from a network of anemometers operated by the Royal 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°lO'	17
Cheung Chau	22°12'	114°0l'	92
Green Island	22°17'	114°07'	105
Hong Kong Airport (SE)	22°19'	114°13'	16
King's Park	22°19'	114°lO'	78
Lau Fau Shan	22°28'	113°59'	50
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°lO'	18
Ta Kwu Ling	22°32'	114°09'	28
Tai Mo Shan	22°25'	114°07'	969
Tai Po Kau	22°27'	114°ll'	28
Tate's Cairn	22°22'	114°13'	588
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°ll'	114°18'	82
Wong Chuk Hang	22°15'	114°lO'	30

Wind reports were also provided by Hong Kong International Terminal Ltd. at Kwai Chung. Maximum storm surges caused by tropical cyclones were measured by tide gauges installed at several locations around Hong Kong. The locations of these anemometers and tide gauges arc 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 1993 is presented.

The reports in Section 3 are individual accounts of the life history of tropical cyclones affecting Hong Kong in 1993. 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 Royal Observatory;
(e) the daily amounts of rainfall recorded at the Royal 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 arc 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 arc tabulated in Section 5.

In this publication, different times arc used in different contests. The offical 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.

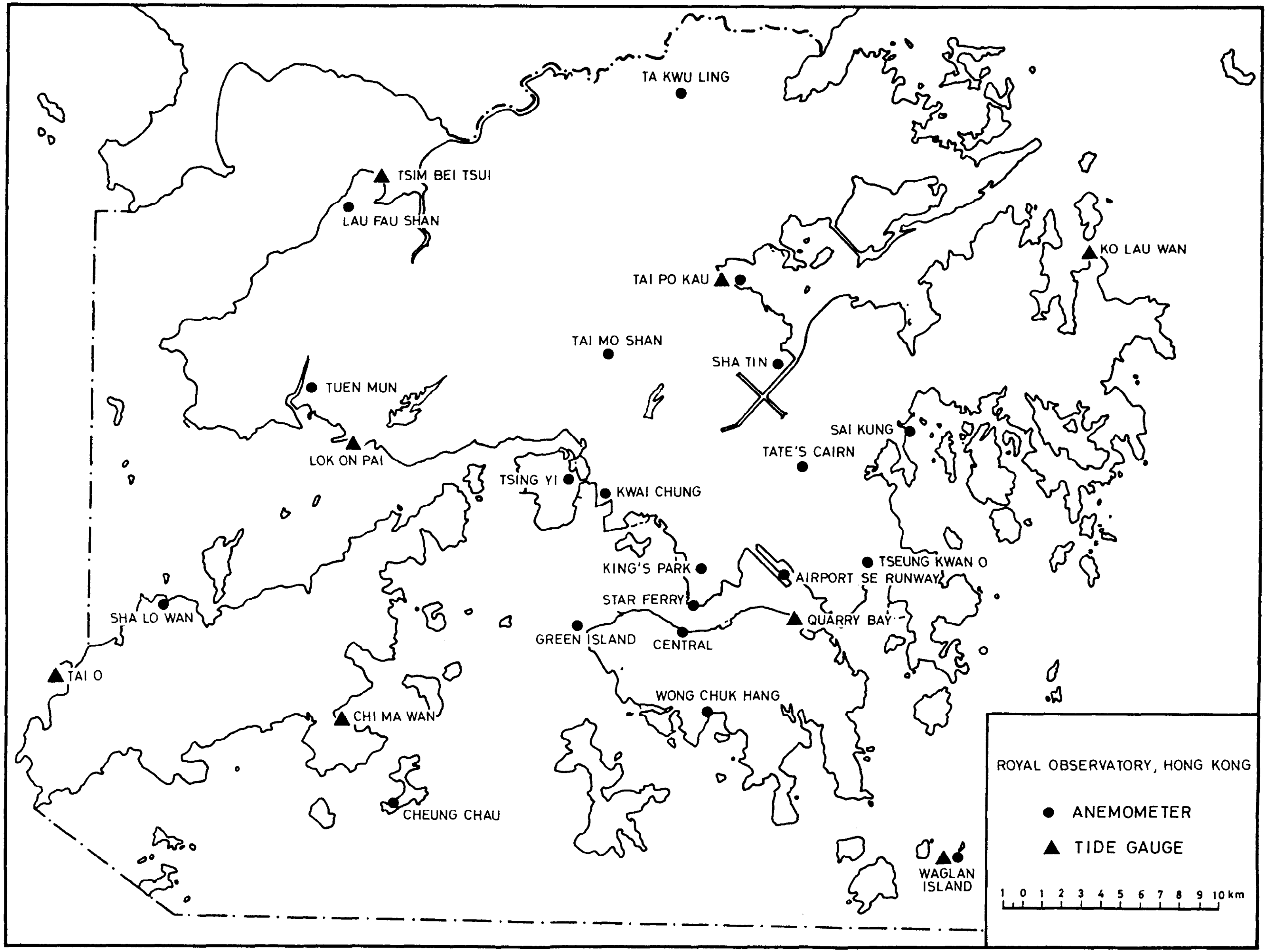


Figure 1. Locations of anemometers and tide gauge stations in Hong Kong.

Section 2

TROPICAL CYCLONE OVERVIEW FOR 1993

In 1993, there were 31* 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, 1993 was generally speaking a year with normal tropical cyclone activity. Also, the number of tropical cyclones attaining typhoon intensity was near-normal - a total of 15 typhoons in 1993 against the 30-year annual average of 15.6. The monthly distributions of the frequency of first occurrence of tropical cyclones and of typhoons for 1993 are shown in Figure 2. The monthly mean frequencies of these two parameters during the years 1961 - 1990 are shown in Figure 3.

While Ed (9319) was the strongest typhoon in 1993, Lola (9326) was the most destructive in terms of the human damage inflicted. More than 270 people were killed in Lola's fury in the Philippines. The passages of Yancy (9313) over Japan and of Kyle (9325) over Vietnam also led to relatively high casualties figures in those countries. Among the storms that affected China in 1993, Typhoon Tasha (9309) turned out to be the most costly one.

In 1993, the south China coast was hit by six storms. Five of these landed over western Guangdong and the sixth made landfall near Shantou. In contrast, both eastern China and Taiwan were free from the threat of tropical cyclones as storms approaching the region tended to recurve early. Japan was hit by as many as seven tropical cyclones during the year while the Philippines was affected by nine. Amongst those storms that traversed the Philippines, Kyle (9325) and Lola (9326) crossed the South China Sea and affected Indo-China in the late season.

During the year, 14 tropical cyclones occurred within the area of responsibility of Hong Kong (i.e. the area bounded by l0°N, 30°N, 105°E and 125°E). This number was slightly lower than the 30-year (196l-90) annual average of 16.4. Of the 14 tropical cyclones, six developed within Hong Kong's area of responsibility. Altogether, 439 tropical cyclone warnings to ships and vessels were issued by the Royal Observatory in 1993 (Table 2).

Local tropical cyclone warning signals were hoisted for nine storms. The Stand By Signal No. 1 was the highest signal required for Severe Tropical Storm Lewis (9303), Tropical Storm Winona (9312), Typhoon Abe (9315) and a tropical depression in October. The Strong Wind Signal No.3 was the highest signal required for Typhoon Ira (9323), and the Gale or Storm Signal No.8 was that for Typhoon Koryn (9302), Typhoon Tasha (9309), Severe Tropical Storm Becky (9316) and Typhoon Dot (9318). The last time when the No.8 signal was hoisted for four or more tropical cyclones in a year was in 1964.

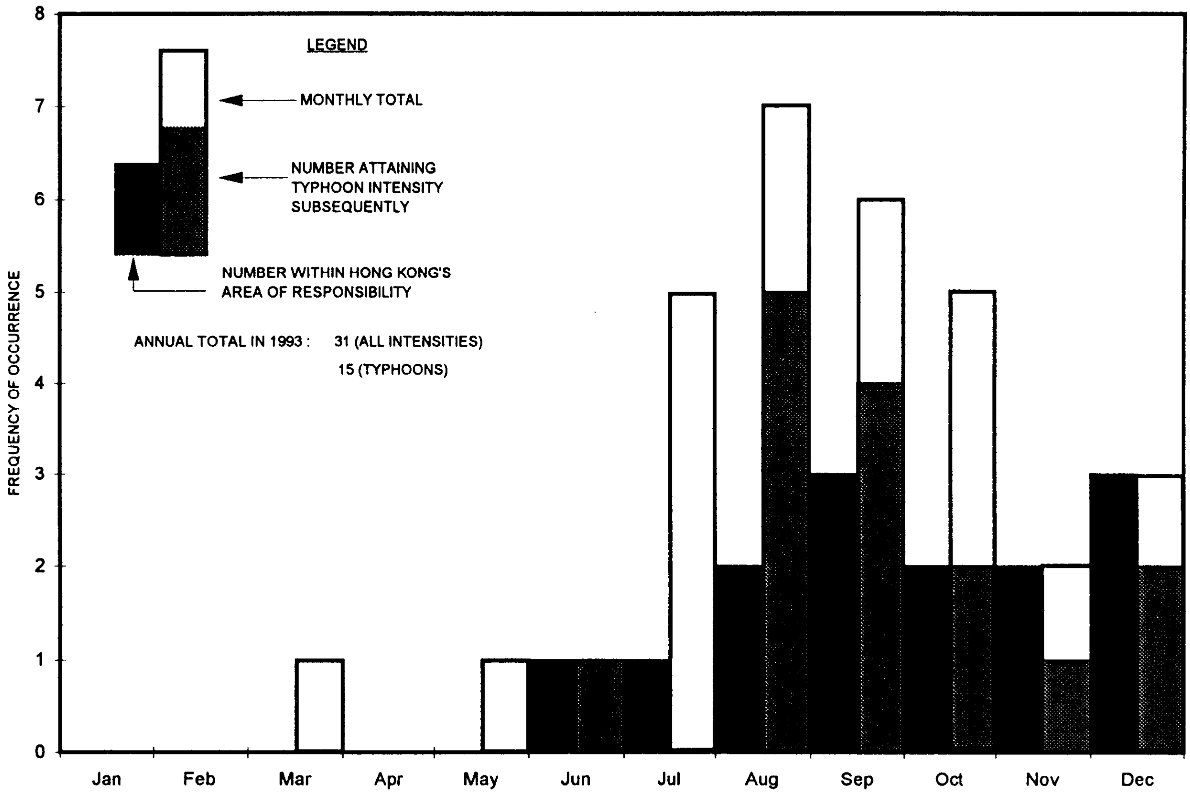
The total tropical cyclone rainfall (defined as the total rainfall recorded at the Royal Observatory from the time when a tropical cyclone was centred within 600 km of Hong Kong to 72 hours after the tropical cyclone has dissipated or moved outside 600 km of Hong Kong) in 1993 amounted to 1 018.4 mm, 37 per cent above the mean annual value of 741.0 mm (1961-1990). It accounted for 43 per cent of the year's total rainfall of 2 343.9 mm. The nine tropical cyclones that necessitated the hoisting of tropical cyclone warning signals all came within 600 km of Hong Kong. Rainfall figures associated with these tropical cyclones are given in Table 8(a).

The following is a review of all the tropical cyclones in 1993.

The first tropical cyclone in 1993 originated from an area of disturbance near the Caroline Islands. It developed to a tropical depression named Irma (9301) about 1240 km east-southeast of Truk on the evening of 11 March and deepened to a tropical storm the next day. Moving slowly at first, Irma accelerated northwestwards to a speed of 30 km/h on 13 March. It also intensified to a severe tropical storm about 710 km east of Truk that afternoon. By the next morning, Irma had weakened to a tropical storm. It started recurving towards the north-northeast on 16 March. After weakening to a tropical depression about 760 km east-northeast of Guam that evening, Irma degenerated to an area of low pressure on the morning of 17 March over the Pacific.

---

*including Typhoon Keoni(9310) which formed over the central North Pacific and moved across the International Date Line into the western North Pacific.



Fi **Figure 2. Monthly distribution of the frequency of first occurrence of tropical cyclones in the western North Pacific and the South China Sea in 1993.**

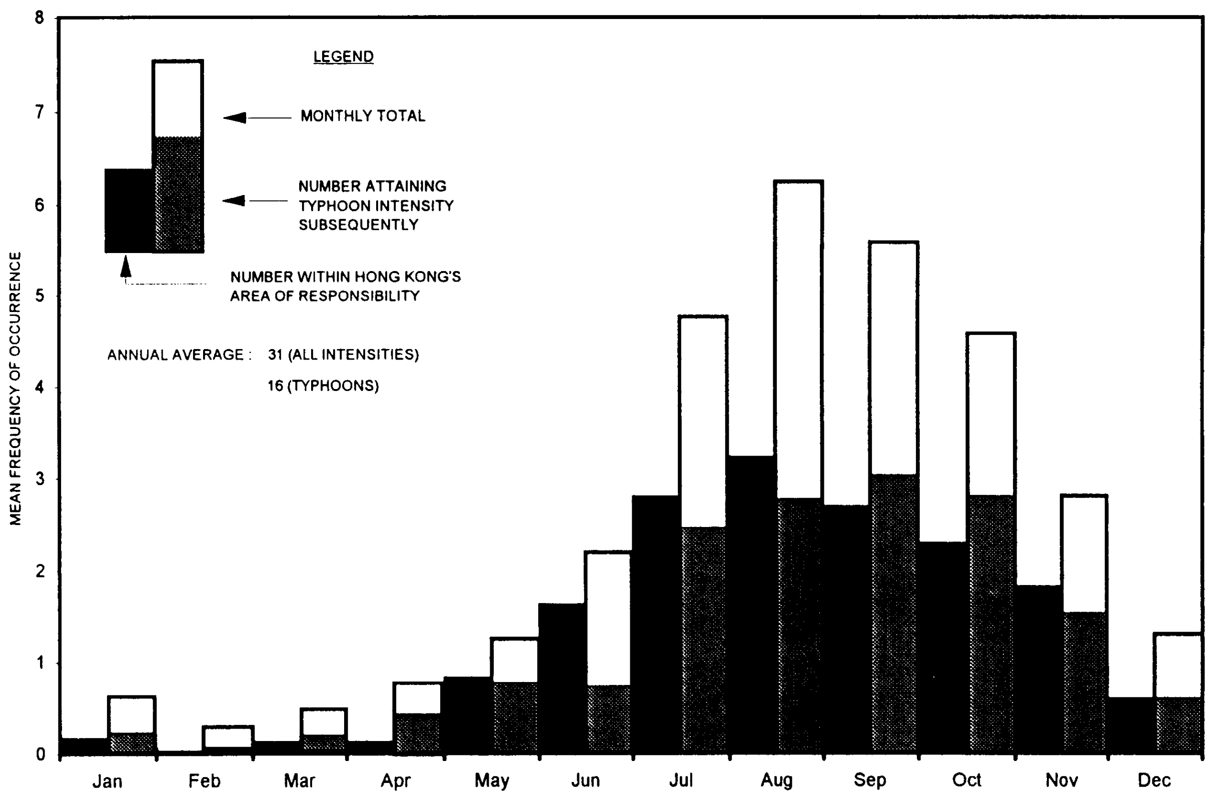


Figure 3. Monthly distribution of the mean frequency of first occurrence of tropical cyclones in the western North Pacific and the South China Sea, 1961-1990.

Two months later, another disturbance developed to a tropical depression named Jack about 810 km east-northeast of Truk on 16 May. It moved northwards at about 13 km/h initially but turned towards the northeast at a reduced speed of 7 km/h the next day. After intensifying to a tropical storm about 1 030 km east-northeast of Truk early on 18 May, Jack started to take on a westward course. It weakened to a tropical depression that afternoon, but intensified again to a tropical storm on 19 May while picking up speed to 15 km/h. Jack became a tropical depression early on 20 May and dissipated over water soon afterwards.

In June, Koryn (9302) developed from an area of low pressure over the Caroline Islands. It intensified to a tropical depression on 21 June and attained typhoon intensity two days later. Koryn necessitated the hoisting of the No. 8 Gale or Storm Signals in Hong Kong. A detailed report on Typhoon Koryn is presented in Section 3.

There were five tropical cyclones over the western North Pacific and the South China Sea in July. One of them, Severe Tropical Storm Lewis (9303), necessitated the hoisting of the Stand By Signal No. 1 in Hong Kong.

Lewis formed over the central Philippines on 8 July. After crossing southern Luzon, Lewis entered the South China Sea on 9 July. It intensified to a severe tropical storm while heading towards Hainan. Lewis then moved westwards across Beibu Wan, landing over northern Vietnam and dissipating in Laos on 12 July. A detailed report on Lewis is present in Section 3.

Two days after the dissipation of Lewis, Tropical Depression Marian formed over the western North Pacific about 1 490 km east-southeast of Manila on 14 July. Throughout its entire lifetime, Marian was poorly organized and its movement was northwestwards at 27 km/h in the general direction of Luzon. Marian dissipated over water on the afternoon of 15 July.

Nathan (9304) formed over the western North Pacific about 750 km east of Guam on 19 July. Moving west-northwestwards at 16 km/h initially, it deepened to a tropical storm the next day. Nathan turned northwestwards and weakened temporarily to a tropical depression on the evening of 21 July. Changing direction towards the north-northwest, Nathan re-gained tropical storm intensity the next day. Nathan intensified further to a severe tropical storm on 24 July when it was about 920 km south-southeast of Osaka. Nathan became extratropical over the coastal waters of Japan early on 25 July.

The fourth tropical cyclone in July was Ofelia (9305). It formed as a tropical depression over the western North Pacific on the afternoon of 25 July about 1 220 km east-southeast of Okinawa. Moving northwestwards at 41 km/h, it intensified to a tropical storm early the next morning: Ofelia took on a north-northwestward course that night and made landfall over Kyushu about 60 km east-southeast of Kagoshima on 27 July. Having swept across southern Japan, Ofelia recurved northeastwards and became extratropical over the Sea of Japan on the early morning of 28 July.

While Ofelia was over the Sea of Japan, a tropical depression named Percy (9306) developed about 500 km south-southeast of Okinawa on the morning of 28 July. After deepening to a tropical storm that afternoon, Percy deepened further to a severe tropical storm early the next morning when it was about 70 km northeast of Okinawa. Heading north-northeastwards, Percy made landfall over Kyushu on the evening of 29 July and entered the Sea of Japan early the next morning. It weakened to a tropical storm about 1 030 km southwest of Sapporo and became extratropical later in the day.

There were seven tropical cyclones occurring over the western North Pacific and the South China Sea in August. Two of them, Typhoon Tasha (9309) and Tropical Storm Winona (9312), necessitated the hoisting of tropical cyclone warning signals in Hong Kong.

Robyn (9307) formed as a tropical depression over the Caroline Islands about 1 150 km southeast of Guam on the evening of 1 August. Heading west-northwestwards at 25 km/h initially, it deepened to a tropical storm the next day. Robyn began to turn northwestwards on 4 August and deepened further to a severe tropical storm when it was about 480 km southwest of Guam. Gathering strength over water, Robyn attained typhoon intensity on 6 August when it was about 970 km west-northwest of Guam. Peak intensity was reached on 7 and 8 July with maximum sustained winds and minimum sea-level pressure near its centre estimated at 165 km/h and 940 hPa respectively. After sweeping across the Ryukyus on 9 August, Robyn accelerated and recurved towards Japan. It skirted past western Kyushu and entered the Sea of Japan on 10 August before evolving into an extratropical cyclone the next day.

Robyn brought torrential rain to southwestern Japan, causing floods and landslides. Nine people were killed and 50 others injured. A total of 564 houses and buildings were destroyed or inundated. Roads were cut at 15 locations and two dikes were ruined. In Kyushu, more than 10 000 people had to flee their homes. Electricity supply to about 215 000 households was cut off. Air, land and sea traffic were disrupted in Kyushu and some other areas in western Japan. Robyn also affected South Korea, leaving six people dead.

While Robyn was making its way towards the Ryukyu Islands on 5 August, an area of disturbance near the Mariana Islands developed to a tropical depression named Steve (9308) about 950 km east-southeast of Guam. It tracked northwestwards at 15 km/h during the first 24 hours and headed west-northwestwards over the next couple of days. Gathering strength over water, Steve intensified to a tropical storm on 8 August and then to a severe tropical storm two days afterwards when it was about 840 km west-northwest of Guam. However, it failed to maintain its intensity and rapidly weakened to a tropical storm a few hours later. Moving northwestwards at 27 km/h, Steve dissipated over the western North Pacific on 12 August.

Tasha formed over the western North Pacific to the east of the Philippines on 16 August. After traversing the Luzon Strait, it entered the South China Sea on 18 August. Tasha landed over the coast of western Guangdong and inflicted severe damage there. A detailed report on Tasha is presented in Section 3.

While Tasha was affecting Hong Kong, Typhoon Keoni (9310) moved northwestwards at 22 km/h across the International Date Line and entered the western North Pacific on 20 August. Keoni reached peak intensity on 21 August when maximum sustained winds of 165 km/h and minimum sea-level pressure of 940 hPa were estimated near its centre. Keoni weakened to a severe tropical storm about 970 km north-northeast of Wake Island the next day, but re-intensified to a typhoon on 24 August. It slowed down to about 7 km/h and weakened to a severe tropical storm again on 25 August. Recurving into higher latitudes over the next few days, Keoni degenerated to a tropical depression about 2 040 km north-northwest of Wake Island on 28 August. It dissipated over water shortly afterwards.

As Tasha was making landfall over western Guangdong and Kenoi traversing the western North Pacific near the International Data Line, Vernon (9311) formed as a tropical depression on 21 August about 1 060 km east-northeast of Guam. After moving north-northwestwards for the first 18 hours, it made a clockwise loop on 22 August and deepened to a tropical storm. Vernon continued to intensify over the next couple of days and attained typhoon intensity about 570 km east-northeast of Iwo Jima on 25 August while moving northwestwards at 25 km/h. Peak intensity was reached that afternoon when maximum sustained winds and minimum sea-level pressure of 140 km/h and 960 hPa respectively were estimated near its centre. Vernon recurved the following day, weakening to a severe tropical storm when it was about 460 km south of Tokyo. It skirted past eastern Honshu on 27 August while heading north-northeastwards. Vernon became extratropical over the eastern waters of Hokkaido the next day.

Two days after the dissipation of Tasha, Winona formed as a tropical depression near the central Philippines. It moved with a speed of 22 km/h towards the west. After deepening to a tropical storm on the evening of 23 August, Winona moved northwestwards towards the northern part of the South China Sea where it performed a looping motion. It then tracked towards Vietnam and dissipated over water before reaching the land. A detailed report on Winona is presented in Section 3.

The last tropical cyclone in August was Yancy (9313). It developed over the western North Pacific as a tropical depression about 1 030 km northwest of Guam on 29 August. Yancy deepened to a tropical storm the next day. It intensified further to a severe tropical storm on the evening of 31 August while moving northwestwards at 15 km/h. Yancy attained typhoon strength about 500 km south-southwest of Okinawa on 1 September and then recurved northeastwards towards Japan the following day. Peak intensity was also reached on 2 September when maximum sustained winds of 185 km/h and minimum sea-level pressure of 930 hPa were estimated near its centre. Moving at about 40 km/h, Yancy landed over Kyushu on 3 September and wreaked havoc on southern Japan. It became extratropical over Honshu on 4 September.

In Japan, torrential rain associated with Yancy caused severe flooding and landslides. About 48 people were killed and 266 were injured. A total of 285 houses were destroyed and 1 607 houses were inundated. Roads, dams and bridges were also damaged. Over the coastal waters, two vessels were damaged and 13 others capsized. Electricity supply to about 410 000 households were cut off. Most transport in southern and western Japan were paralysed, affecting more than 250 000 people.

A total of six tropical cyclones formed in September. Amongst them, Zola (9314) affected Japan while Abe (9315), Becky (9316) and Dot (9318) hit the south China coast in quick succession and necessitated the hoisting of tropical cyclone warning signals in Hong Kong.

Zola formed as a tropical depression about 880 km south-southeast of Okinawa on 5 September, just two days after Yancy had rampaged through Japan. Moving west-northeastwards at 15 km/h initially, Zola intensified to a tropical storm the next morning and recurved north-northeastwards that evening. Moving steadily towards Japan, Zola intensified to a severe tropical storm about 960 km southwest of Tokyo on 8 September. It made landfall over Honshu on the morning of 9 September and weakened to a tropical storm about 350 km west-southwest of Tokyo a few hours later. Zola then quickly dissipated over land.

Abe formed as a tropical depression over the western North Pacific about 580 km northeast of Manila on 9 September. Moving slowly over water, it deepened to a tropical storm the following day. After traversing the Luzon Strait, Abe entered the South China Sea and became a typhoon on 12 September. It made landfall in the vicinity of Shantou and then dissipated over land two days later.

Following the dissipation of Abe, Becky formed as a tropical depression over the waters to the northeast of Luzon about 530 km north-northeast of Manila on 15 September. It traversed westwards over the Luzon Strait and intensified to a tropical storm the next day. After entering the South China Sea, Becky took on a northwestward course at 30 km/h towards the south China coast. It intensified to a severe tropical storm on the morning of 17 September and then landed over the coast of western Guangdong. Detailed report on Abe and Becky are presented in Section 3.

After a lull of a few days, another low pressure area over the western North Pacific developed to a tropical depression named Cecil (9317) about 800 km east-southeast of Guam on 22 September. Moving northwestwards at 20 km/h initially, Cecil deepened to a tropical storm on the morning of 23 September. Cecil also started making an anticlockwise loop that afternoon before tracking north-northwestwards and intensifying to a severe tropical storm the next day. It attained typhoon intensity about 1 040 km north of Guam early on 26 September and started recurving northeastwards. Peak intensity was also attained that day when maximum sustained winds and minimum sea-level pressure of 130 km/h and 965 hPa were estimated near its centre. Accelerating towards the northeast, Cecil gradually lost its strength and became extratropical early on 28 September.

Dot was the third tropical cyclone to affect the South China Sea in September. It began as a tropical depression about 320 km southeast of Haikou on 23 September. Moving slowly over water, it deepened to a tropical storm the next day. Dot became a typhoon on 25 September while heading towards the coast of western Guangdong. It made landfall about 180 km west-southwest of Hong Kong on 26 September. Heavy rain associated with Dot brought widespread flooding to Hong Kong. A detailed report on Dot is presented in Section 3.

The last tropical cyclone in the September was Ed (9319). It developed to a tropical depression about 180 km southeast of Guam on 30 September. Moving west-northwestwards at 14 km/h, Ed skirted past Guam and deepened to a tropical storm on 1 October. Gathering strength over water, Ed intensified to a severe tropical storm that evening and attained typhoon intensity about 980 km west-northwest of Guam on 3 October. Ed was the strongest typhoon in 1993. Maximum sustained winds of 195 km/h and minimum sea-level pressure of 925 hPa were estimated near its centre at the time of peak intensity on 4 October. Ed started to recurve northeastwards the next day. It weakened to a severe tropical storm about 1 000 km south-southwest of Tokyo early on 7 October. Extratropical transition took place the next morning.

Soon after the formation of Ed, Flo (9320) formed as a tropical depression over the western North Pacific about 970 km east-northeast of Manila on 1 October. Moving westwards towards Luzon, it intensified progressively and became a severe tropical storm early on 3 October. Flo attained typhoon intensity on the morning of 4 October with maximum sustained winds and minimum sea-level pressure of 120 km/h and 970 hPa respectively near its centre. It made landfall over Luzon that afternoon and soon weakened to a severe tropical storm. On completing an anticlockwise loop over Luzon, Flo weakened further to a tropical storm about 270 km north of Manila early on 6 October. Flo re-gained severe tropical storm intensity on 7 October while moving northeastwards over the Pacific. Accelerating to about 75 km/h, it became extratropical near the coastal waters of Japan the following day.

Flo brought torrential rain to the northern Philippines, causing serious flooding. At least 126 people were killed, 26 others reported missing and 37 injured. More than 659 000 people were made homeless. Some 2 300 houses were buried in the Pampanga Province due to mudflows formed by flood water and the volcanic ash of Mount Pinatubo.

While Flo and Ed were traversing the Pacific, Tropical Depression Gene (9321) formed to their south about 650 km west of Guam on 8 October. Gene was a poorly organised tropical cyclone. Tracking generally northwestwards for two days, it dissipated over the Pacific on the morning of 10 October.

Two days after Gene’s dissipation, another tropical depression formed over the northern part of the South China Sea about 200 km east of Dongsha. It skirted past Dongsha and headed towards the south China coast. This tropical depression was relatively short-lived and it dissipated over water the next day. A detailed report on this tropical depression is presented in Section 3.

An area of disturbance developed to Tropical Depression Hattie (9322) about 990 km southwest of Wake Island on 19 October. Moving westwards at 12 km/h initially, Hattie took on a north-northwestward track the next day. It intensified to a tropical storm about 1 200 km west of Wake Island on 22 October and began to recurve northeastwards. Further intensification took place on 24 October when Hattie became a severe tropical storm about 1 280 km northwest of Wake Island. Moving into higher latitudes, Hattie weakened to a tropical storm on the morning of 25 October. It became extratropical later that day when moving eastwards at about 60 km/h.

The last tropical cyclone in October was Ira (9323). It formed about 100 km southwest of Guam on 28 October. Moving in the general direction of Luzon, Ira gathered strength over water and intensified to a typhoon on 30 October. After rampaging through Luzon, Ira weakened rapidly over the South China Sea. It became a tropical depression just before making landfall near Yangjiang on 4 November and dissipated over land the next day. Ira necessitated the hoisting of tropical cyclone warning signals in Hong Kong for the first time in November since 1974. A detailed report on Ira is presented in Section 3.

Another area of disturbance developed as Tropical Depression Jeana (9324) about 1 410 km east-southeast of Guam on 4 November. It moved west-northwestwards at about 20 km/h initially. Moving northwestwards, Jeana deepened to a tropical storm about 760 km west-northwest of Guam on the early morning of 9 November. It recurved on 10 November and began to track east-northeastwards the next day. After weakening to a tropical depression on the morning of 12 November, Jeana dissipated over the Pacific later that day.

Kyle (9325) started as a tropical depression about 410 km west of Yap Island on 18 November. Drifting west-northwestwards at about 20 km/h, Kyle intensified to a tropical storm on 19 November and swept across the central Philippines on 20 November. In the Philippines, hundreds of people had to flee their homes due to serious flooding brought by Kyle. Eight people were killed and one was reported missing. Kyle became a severe tropical storm after entering the South China Sea on 22 November and attained typhoon strength early the next day when it was about 300 km north-northwest of Nansha. Peak intensity was reached on the afternoon of 23 November when maximum sustained winds and minimum sea-level pressure were estimated to be 140 km/h and 960 hPa respectively. It landed over Vietnam about 380 km northeast of Ho Chi Minh City that evening and soon weakened to a severe tropical storm. Moving further inland, Kyle continued to lose strength and became an area of low pressure on 24 November. In Vietnam, the passage of Kyle caused 71 deaths, 476 injuries. In addition, 59 persons were reported missing. Torrential rain and high winds destroyed 5 600 houses and thousands of hectares of crops. In addition, hundreds of fishing boats were damaged.

A total of three tropical cyclones formed over the western North Pacific in December. All of them affected the Philippines before entering the South China Sea.

Lola (9326) formed as a tropical depression about 950 km south-southeast of Guam on 1 December. Gathering strength over water, it became a tropical storm two days later and intensified to a severe tropical storm early on 4 December. It attained typhoon strength about 520 km east of Manila the next day and reached peak intensity that afternoon when maximum sustained winds and minimum sea-level pressure near its centre were estimated to be 130 km/h and 965 hPa respectively. Taking on a west-southwestward track, Lola weakened to a severe tropical storm while making landfall over the Philippines that evening. In the Philippines, 273 people were killed, 607 injured and 90 others reported missing. Most of those who lost their lives were drowned in floods. Landslides and floods damaged over 30 000 houses. At least 242 000 people had to flee their homes. Communications were disrupted and many roads were blocked. Direct economic loss was estimated at US$94 million.

Lola left the Philippines as a tropical storm on 6 December and proceeded to cross the South China Sea. After re-intensifying to a severe tropical storm on 7 December and then to a typhoon the next day, Lola weakened again to a severe tropical storm on the morning of 9 December. It made landfall over southern Vietnam a couple of hours later. Moving further inland, Lola degenerated to an area of low pressure later that day.

Lola brought severe flooding to southern Vietnam, leaving 96 dead, 50 injured and at least 85 missing. More than 9 000 houses were ruined and over 500 fishing boats were damaged or lost. About 16 500 hectares of corn, cassava and tobacco were destroyed. A total of 11 000 hectares of rice fields was also inundated. Economic loss amounted to US$166 million.

Tropical Depression Manny (9327) developed about 480 km east of Truk on 3 December. Moving west-northwestwards at 36 km/h, it deepened to a tropical storm early on 5 December and intensified further to a severe tropical storm that evening. Manny attained typhoon strength on 8 December while making a clockwise loop over the Pacific about 950 km east of Manila. Manny reached peak intensity on the evening of 9 December with maximum sustained winds and minimum sea-level pressure near its centre estimated to be 140 km/h and 960 hPa respectively. Although Manny weakened progressively to a tropical storm as it swept across the central Philippines on 10 and 11 December, its fury still claimed at least 93 lives. Electricity supply and telecommunications were cut off in some areas. Crops and property losses were estimated at US$50 million. Upon entering the South China Sea, Manny weakened further to a tropical depression on the evening of 11 December but re-intensified to a tropical storm the next day. However, it weakened to a tropical depression again on the evening of 13 December and dissipated over the South China Sea a few hours later.

Nell (9328) was the last tropical cyclone to occur over the western North Pacific and the South China Sea in 1993. It began as a tropical depression about 1 080 km southeast of Guam on 20 December. Moving westwards at an average speed of 20 km/h, Nell became a tropical storm on the evening of 24 December and intensified further to a severe tropical storm 24 hours later. It made landfall over the Philippines on 26 December. After rampaging through the Philippines on a west-northwestward track, Nell entered the South China Sea and turned southwestwards on the evening of 27 December, having first weakened to a tropical storm in the afternoon. Weakening further on the way, Nell eventually dissipated over water on 29 December.

In the Philippines, 167 people were killed and 52 others reported missing as Nell swept across it. Electricity supply to three southern provinces was cut off for a week. Economic loss was estimated to be US$105 million.

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

Section 3

REPORTS ON TROPICAL CYCLONES AFFECTING HONG KONG IN 1993

(a) **Typhoon Koryn (9302)**

21-28 June 1993

The track of Koryn is shown in Figure 4

An area of low pressure formed over the Caroline Islands on 15 June. It moved northwards initially and turned westwards two days later. This low pressure area then developed into a tropical depression on 21 June and was named Koryn while it was 710 km east-southeast of Yap. Early the next day, Koryn deepened further into a tropical storm and moved towards the west-northwest at 23 km/h. Two days later, rapid intensification took place and Koryn became a typhoon with a discernible eye. On the evening of 24 June, Koryn attained its peak intensity with maximum sustained winds of about 175 km/h and sea-level pressure of 935 hPa near the centre. It then moved steadily west-northwestwards at 23 km/h landing on northern Luzon early on 26 June.

In the northern Philippines, heavy rain brought by Koryn triggered off mudflows on the slopes of Mount Pinatubo and landslides along major roads isolated the mountain resort city of Baguio. Strong winds uprooted trees and blew down electricity pylons. Fifty-one people were killed, five were reported missing, 109 were injured and 23 000 had to flee their homes. Sixteen provinces were declared to be in a state of public calamity. In Manila, floods of three metres deep were reported.

Koryn entered the South China Sea around midday on 26 June. Moving west-northwestwards at a speed of about 30 km/h across the northern part of the South China Sea, Koryn made landfall near Yangjiang, about 240 km west-southwest of Hong Kong near midnight on 27 June. Koryn had weakened into a severe tropical storm just before landing and it then turned northwestwards, dissipating over Guangxi on the morning of 28 June.

In Guangdong, gales and torrential rain damaged 333 000 hectares of crops and fruits. About 32 000 houses collapsed, 353 000 houses were damaged and 5.25 million people were affected. Direct economic loss was estimated at 1.2 billion RMB. In Guangzhou, a cargo ship overturned but fortunately the crew members were rescued.

In Macau, heavy rain and sea swells flooded some streets. About 130 families had to leave their homes when facades or roofs of their homes were swept away. More than 600 people had to seek shelter. Two cars were damaged by falling trees. The Macau-Taipa bridge had to be closed due to gale force winds.

In Hong Kong the Stand By Signal No. 1 was hoisted at 3.10 p.m. on 26 June when Koryn was about 740 km to the southeast of Hong Kong. The weather was fine and very hot at first but it turned cloudy in the evening and winds gradually strengthened from the northeast. With Koryn approaching the south China coast, the Strong Wind Signal No. 3 was hoisted at 3.30 a.m. on 27 June when Koryn was about 380 km southeast of Hong Kong. Local weather deteriorated rapidly as the outer rainbands of Koryn affected the territory. The No. 8 NORTHEAST Gale or Storm Signal was hoisted seven hours later and gale to storm force winds accompanied by heavy rain began to affect the territory. At 4.30 p.m., when Koryn was about 170 km south-southwest of Hong Kong, the No. 8 SOUTHEAST Gale or Storm Signal was hoisted.

The lowest sea-level pressure of 994.3 hPa was recorded at the Royal Observatory at around 3 p.m. on 27 June. Koryn was closest to Hong Kong at 6 p.m. when it was about 160 km to the territory’s southwest. As gale force winds subsided, the No. 8 SOUTHEAST Gale or Storm Signal was replaced by the Strong Wind Signal, No. 3, at 10.25 p.m. that night when Koryn was about 220 km west-southwest of Hong Kong. Koryn made landfall near Yangjiang around midnight on 27 June and all tropical cyclone warning signals were lowered at 4.15 a.m. on 28 June. There were still some showers on 28 June, but the weather continued to improve over the next few days as Koryn dissipated over Guangxi.

Over the south China coastal waters, a 7 884-tonne Singapore cargo ship, 'Lian Gang', sank about 120 km southeast of Hong Kong shortly after midday on 27 June in the very rough seas. Waves of 15 metres were reported. The captain and three other crew members of the 28-crew vessel were killed. Distress signals were received from the Russian vessels 'Neftega 61' and 'Lara Mikheenko'. A 400-tonne Hong Kong-based ship 'Belinetta' ran aground among the Lema Islands south of Hong Kong.

In Hong Kong, there were landslips, floods, collapsing scaffoldings and hoardings, as well as falling trees and signboards. About 183 people were injured. In Yau Ma Tei , a 5m by 10m scaffolding collapsed, damaging three cars and a lorry. In Ngau Tau Kok, a similar accident damaged a van and three other cars. Collapsed scaffoldings were also reported in Repulse Bay and Central. Trees were uprooted in the Mid-levels, Ho Man Tin, Kowloon Tong, and Pokfulam where four families had to be evacuated. In Diamond Hill, a family of four also had to be evacuated because the roof of their hut was blown away. In Shek 0, three beach platforms were swept ashore. Electricity supply was interrupted in many places in the New Territories. A total of 32 flights was cancelled and 63 diverted. Ferry services to China and Macau were suspended.

The roads leading to and from the container terminal in Kwai Chung were heavily congested for nearly eight hours on 28 June as container truck drivers tried to make up for time lost during the passage of Koryn.

The rainfall distribution associated with Koryn is shown in Figure 5. Information on wind, rainfall and tide during the passage of Koryn 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 Koryn :-

	Maximum Gust			Maximum Hourly Wind		
Station (see Fig.1)	Direction	Speed(km/h)	Date Time	Direction	Speed(km/h)	Date Time
Central	E	113	27 Jun 1702	E	52	27 Jun 1400
Cheung Chau	E	171	27 Jun 1529	ESE	110	27 Jun 2000
Green Island	ENE	158	27 Jun 1225	ENE	101	27 Jun 1300
H.K. Airport(SE)	ENE	118	27 Jun 1151	ESE	54	27 Jun 1900
King's Park	ESE	121	27 Jun 1605	ESE	47	27 Jun 1800
Kwai Chung	ENE	142	27 Jun 1509	ENE	83	27 Jun 1600
Lau Fau Shan	E	144	27 Jun 1609	E	65	27 Jun 1700
Sai Kung	NE	128	27 Jun 1040	ENE	67	27 Jun 1500
Sha Tin	NE	99	27 Jun 1528	SE	34	28 Jun 0100
	ENE	99	27 Jun 1529			
Star Ferry	ESE	118	27 Jun 1928	ESE	68	27 Jun 2000
Ta Kwu Ling	ESE	103	27 Jun 1716	ESE	47	27 Jun 1800
	ESE	103	27 Jun 1735			
Tai Po Kau	ESE	117	27 Jun 1842	E	68	27 Jun 1600
Tate's Cairn	SE	169	27 Jun 1552	SE	108	27 Jun 1600
Tseung Kwan O	NE	118	27 Jun 1137	SSE	43	27 Jun 2000
Tsing Yi	E	175	27 Jun 1545	SE	85	27 Jun 2000
Tuen Mun	SE	130	27 Jun 1911	SE	43	27 Jun 2100
Waglan Island	E	151	27 Jun 1455	ENE	101	27 Jun 1200
				ENE	101	27 Jun 1300
Wong Chuk Hang	E	140	27 Jun 1642	E	58	27 Jun 1800

Stations with incomplete record :
Tai Mo Shan
Sha Lo Wan

Daily rainfall amounts in millimetres recorded at the Royal Observatory and other stations on days when tropical cyclone warning signals were hoisted for Koryn :-

Station (see Fig.5)	26 Jun	27 Jun	28 Jun	Total
Royal Observatory	8.7	9.5	10.9	29.1
H19 (HK Island (east))	1.5	12.0	19.0	32.5
H13 (HK Island (west))	7.5	18.0	13.5	39.0
H21 (HK Island (south))	3.0	17.0	9.5	29.5
K04 (Kowloon (east))	9.0	11.5	22.5	43.0
K06 (Kowloon (west))	9.5	9.0	5.5	24.0
N17 (Lantau)	3.5	26.5	36.0	66.0
N05 (Sheung Shui)	17.0	32.0	10.0	59.0
N13 (Sai Kung)	1.0	10.0	21.5	32.5
N09 (Sha Tin)	28.0	25.5	14.5	68.0
R31 (Tai Po)	9.5	27.5	34.0	71.0
N06 (Tsuen Wan - Kwai Chung)	9.5	21.5	8.5	39.5
R21 (Tuen Mun)	Nil	25.0	24.0	49.0
N12 (Yuen Long)	0.5	16.0	14.0	30.5

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

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	2.49	27 June	5.11 p.m.	1.34	27 June	7.56 p.m.
Quarry Bay	2.61	27 June	5.03 p.m.	1.34	27 June	6.58 p.m.
Tai Po Kau	3.01	27 June	4.20 p.m.	1.46	27 June	4.20 p.m.

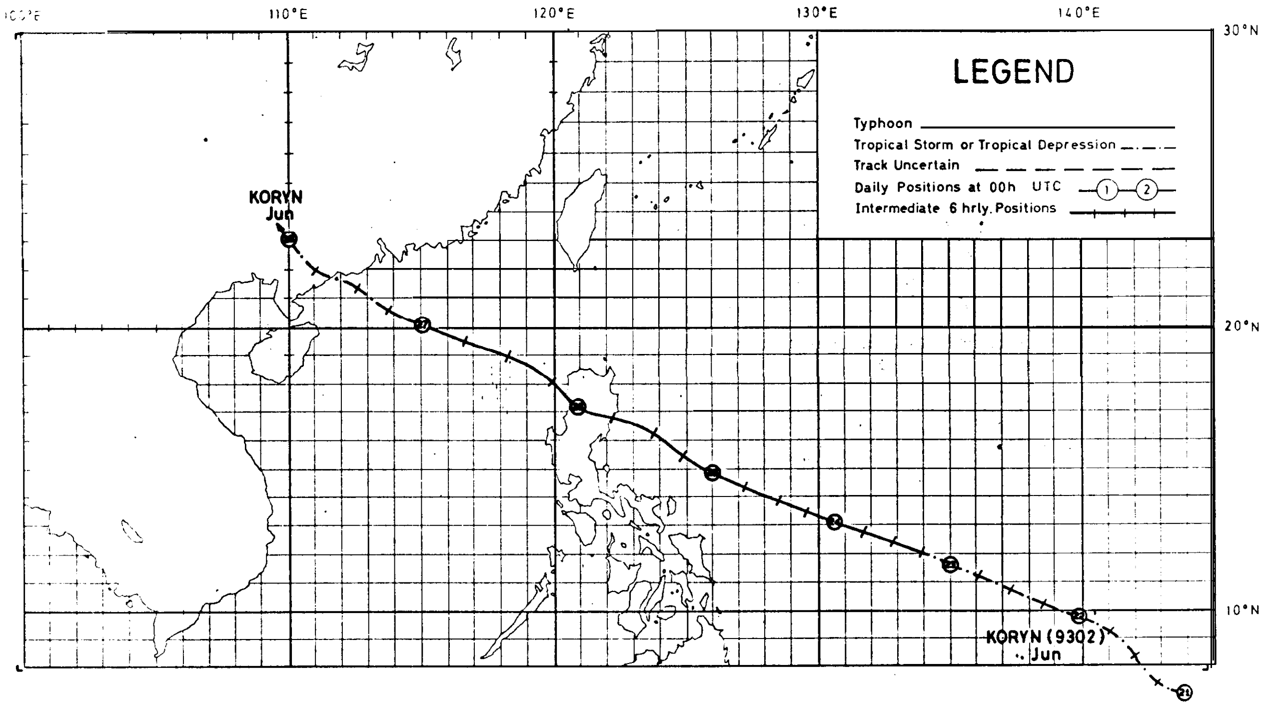


Figure 4. Track of Typhoon Koryn (9302) : 21 - 28 June 1993.

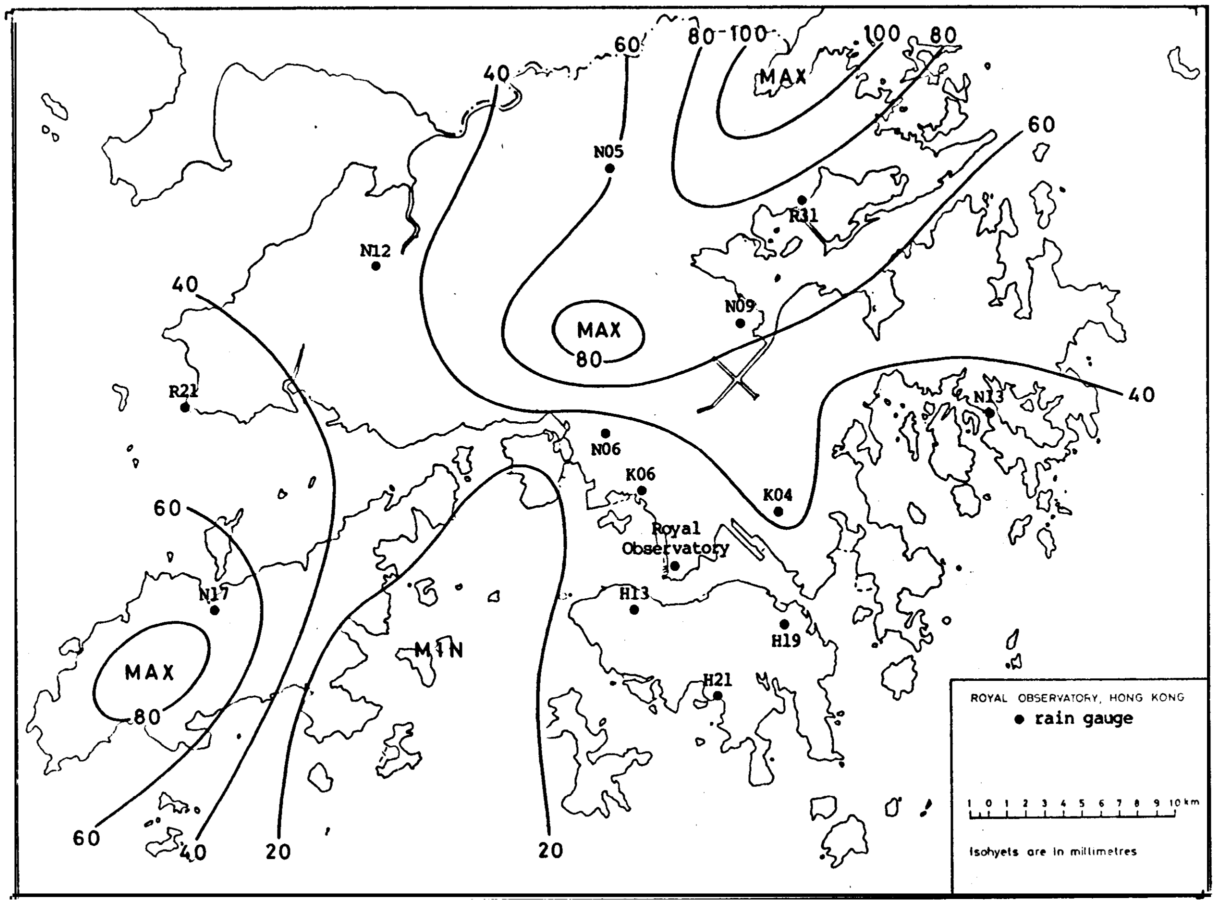


Figure 5. Rainfall distribution on 26 - 28 June 1993.

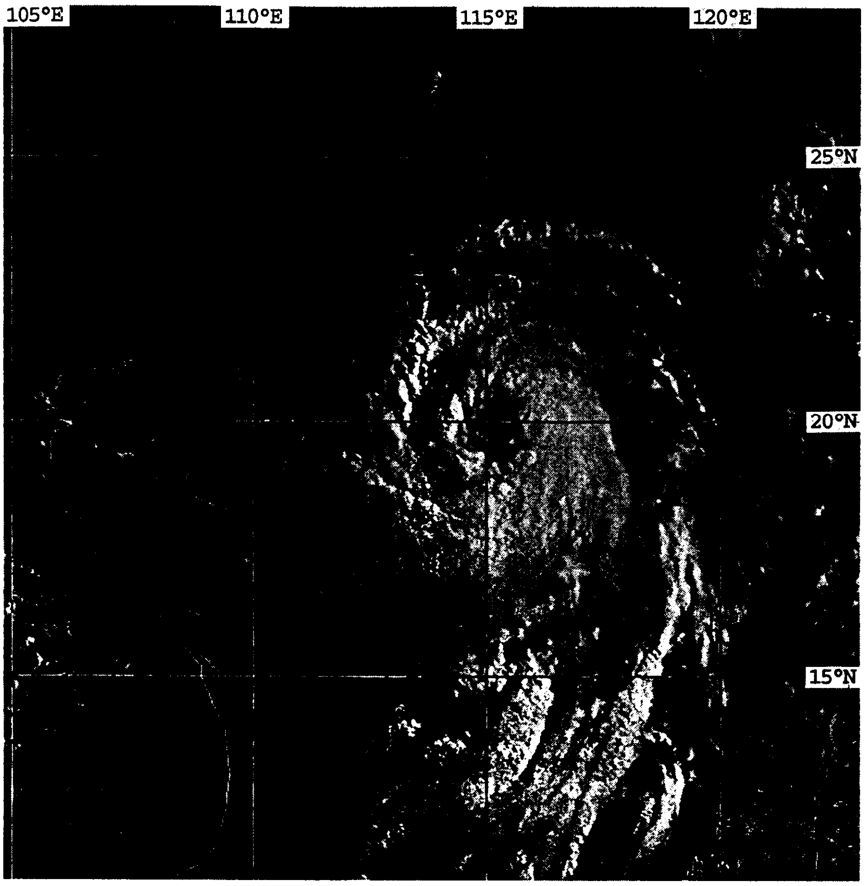


Figure 6. GMS-4 visible imagery of Koryn at around 8 a.m. on 27 June 1993.

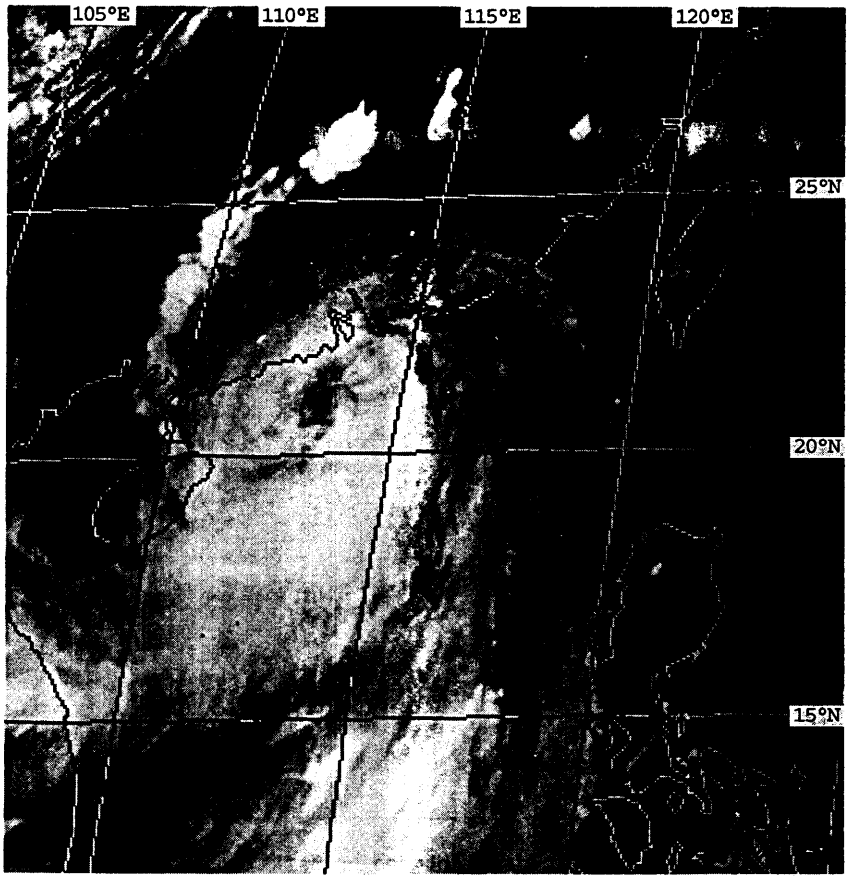


Figure 7. GMS-4 infra-red imagery of Koryn at around 5 p.m. on 27 June 1993.

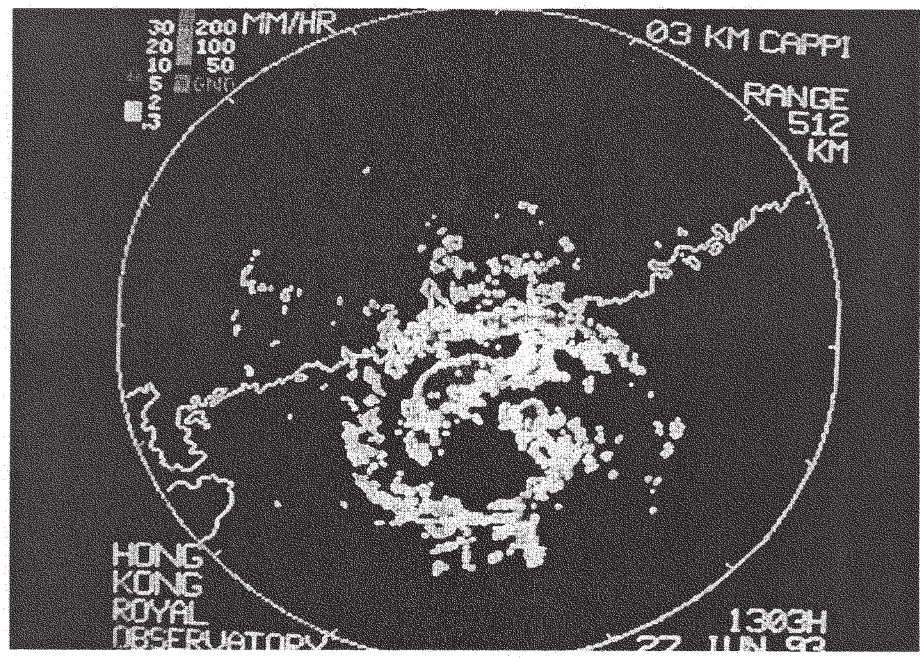


Figure 8. Radar display of the rain echoes of Koryn at 1.03 p.m. on 27 June 1993.

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 9. A tree was blown down in Central (by courtesy of Wah Kiu Yat Po).

(b) Severe Tropical Storm Lewis (9303)

8-12 July 1993

The track of Lewis is shown in Figure 10

Lewis originated from an area of disturbance to the east of the southern Philippines. Moving west-northwestwards at 22 km/h, Lewis developed into a tropical depression on 8 July when it was over the central Philippines and about 400 km east-southeast of Manila. In the central Philippines, strong winds blew down high voltage wires and killed two people. Three vessels capsized, 17 people were killed and three others were reported missing.

Lewis maintained its west-northwestward course and accelerated to 38 km/h upon entering the South China Sea on 9 July. It gathered strength and became a tropical storm that evening about 700 km south-southeast of Hong Kong. Lewis intensified further into a severe tropical storm about 150 km north-northwest of Xisha at around midday the next day. It attained peak intensity that evening when the minimum sea-level pressure and maximum sustained winds were estimated to be 975 hPa and 105 km/h respectively. Lewis made landfall over southern Hainan about 190 km south-southwest of Haikou at around midnight of 10 July, weakening to a tropical storm as it traversed the island. Some 700 houses on Hainan were destroyed.

Lewis entered Beibu Wan early on 11 July and weakened further to a tropical depression about 370 km southeast of Hanoi. Slowing down to 14 km/h, it attained tropical storm strength again while moving westwards across the waters of Beibu Wan that evening. It made landfall over northern Vietnam about 190 km south of Hanoi early the next morning. Two people were killed and two others were injured. Moving further inland, Lewis degenerated into an area of low pressure over Laos on the afternoon of 12 July.

In Hong Kong, the Stand By Signal No. 1 was hoisted at 0.05 a.m. on 10 July when Lewis was about 610 km to the southeast. The weather was fine apart from a few showers in the morning. Winds were moderate easterlies at first, but became strong gusty offshore in the evening when the territory came under the influence of heavy showers and squally thunderstorms.

Lewis was closest to Hong Kong at around midday on 10 July when it was about 510 km to the south-southwest. The lowest sea-level pressure of 1005.8 hPa was recorded at the Royal Observatory at around 5 p.m. that day. Lewis began to move further away from Hong Kong in the evening. The Stand By Signal No. 1 was lowered at 10.00 p.m. when Lewis was about 610 km to the southwest. However, showers and thunderstorms continued to affect the territory until 13 July.

In Hong Kong, heavy showers associated with Lewis caused landslides in parts of the New Territories, leaving 21 families and 73 other people homeless.

The rainfall distribution associated Lewis is shown in Figure 11. Information on wind, rainfall and tide during the passage of Lewis 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 Lewis :-

	Maximum Gust			Maximum Hourly Wind		
Station (see Fig.1)	Direction	Speed(km/h)	Date Time	Direction	Speed(km/h)	Date Time
Central	E	49	10 Jul 1649	ESE	20	10 Jul 1700
Cheung Chau	E	58	10 Jul 1600	ESE	34	10 Jul 0700
Green Island	S	65	10 Jul 1702	ENE	34	10 Jul 1600
				ENE	34	10 Jul 1700
H.K. Airport(SE)	E	54	10 Jul 1659	E	25	10 Jul 1700
King's Park	SE	43	10 Jul 1702	ESE	14	10 Jul 1700
	S	43	10 Jul 1703			
Kwai Chung	ESE	62	10 Jul 1707	E	27	10 Jul 0700
Lau Fau Shan	SE	54	10 Jul 1737	SE	20	10 Jul 1600

Station (see Fig.1)	Maximum Gust Direction	Speed(km/h)	Date Time	Maximum Hourly Wind Direction	Speed(km/h)	Date Time
Sai Kung	SSE	56	10 Jul 1703	S	19	10 Jul 1800
Sha Tin	S	38	10 Jul 1712	E	12	10 Jul 1400
				E	12	10 Jul 1700
Star Ferry	ESE	68	10 Jul 1659	E	23	10 Jul 1700
Ta Kwu Ling	SSE	45	10 Jul 1737	ESE	16	10 Jul 1600
Tai Po Kau	SSE	65	10 Jul 1721	E	23	10 Jul 1700
Tate's Cairn	SE	76	10 Jul 1708	ESE	31	10 Jul 1700
Tseung Kwan O	SSE	51	10 Jul 1700	E	16	10 Jul 1200
Tsing Yi	ESE	72	10 Jul 1721	SE	30	10 Jul 0600
Tuen Mun	S	43	10 Jul 1707	SE	16	10 Jul 0800
Waglan Island	S	79	10 Jul 1640	ESE	34	10 Jul 0600
Wong Chuk Hang	E	54	10 Jul 1654	E	19	10 Jul 1700

Stations with incomplete record :
Tai Mo Shan
Sha Lo Wan

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

Station (see Fig.11)		10 Jul	11 Jul	12 Jul	13 Jul	Total
Royal Observatory		22.2	32.1	24.8	39.7	118.8
H19	(HK Island (east))	13.0	16.5	11.0	57.0	97.5
H13	(HK Island (west))	21.5	32.5	30.5	56.5	141.0
H21	(HK Island (south))	14.0	29.0	16.0	49.0	108.0
K04	(Kowloon (east))	9.0	4.0	28.5	49.5	91.0
K06	(Kowloon (west))	8.5	36.0	33.0	34.5	112.0
N17	(Lantau)	12.5	7.0	10.0	60.0	89.5
N05	(Sheung Shui)	9.5	31.5	23.5	53.0	117.5
N09	(Sha Tin)	14.5	24.5	20.0	36.0	95.0
R31	(Tai Po)	10.0	11.5	34.0	31.0	86.5
N06	(Tsuen Wan - Kwai Chung)	10.5	49.0	41.5	40.0	141.0
R21	(Tuen Mun)	10.5	17.5	13.0	37.5	78.5
N12	(Yuen Long)	16.5	17.5	19.0	14.5	67.5

Station with incomplete record :
N13 (Sai Kung)

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

Station (see Fig.1)	Maximum sea level above chart datum			Maximum storm surge above astronomical tide		
	Height (m)	Date	Time	Height (m)	Date	Time
Ko Lau Wan	1.73	10 July	10.32 a.m.	0.18	10 July	10.59 p.m.
Lok On Pai	1.93	9 July	12.44 p.m.	0.08	10 July	5.15 p.m.
Quarry Bay	1.74	10 July	11.18 a.m.	0.11	10 June	10.46 p.m.
Tai O	1.68	10 July	1.04 p.m.	0.14	10 July	5.25 p.m.
Tsim Bei Tsui	2.25	9 July	12.49 p.m.	0.06	11 July	1.07 a.m.

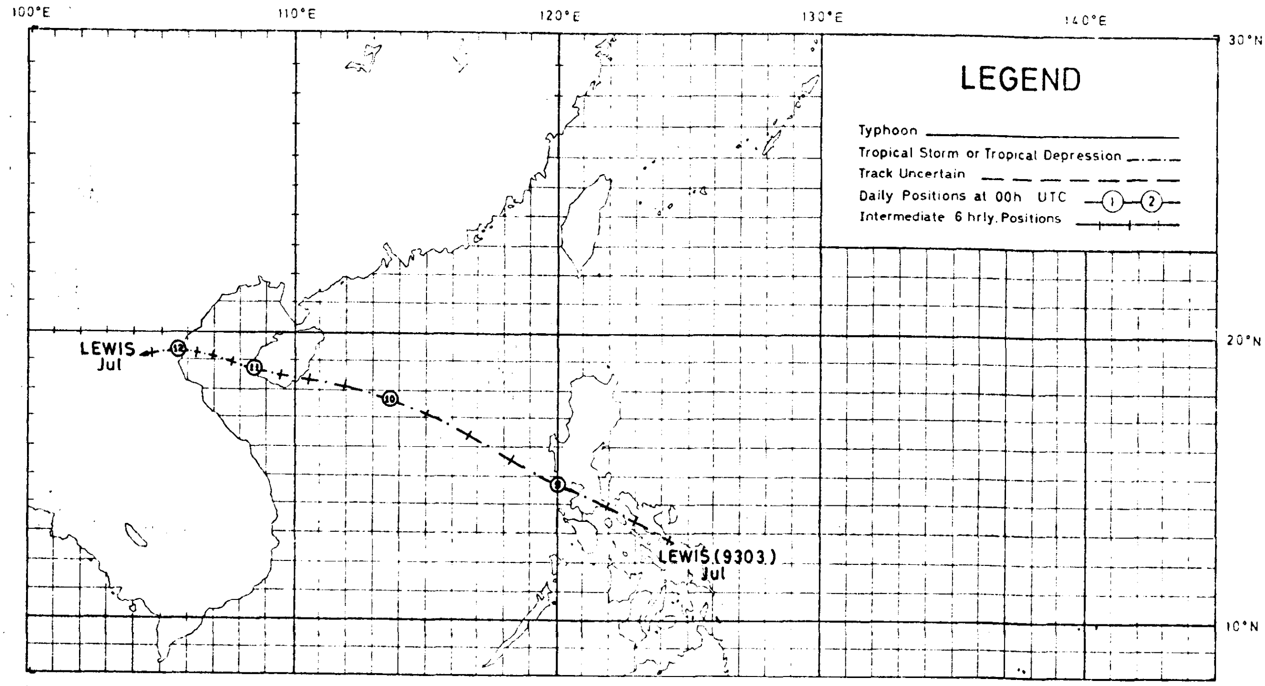


Figure 10. Track of Severe Tropical Storm Lewis (9303) : 8 - 12 July 1993.

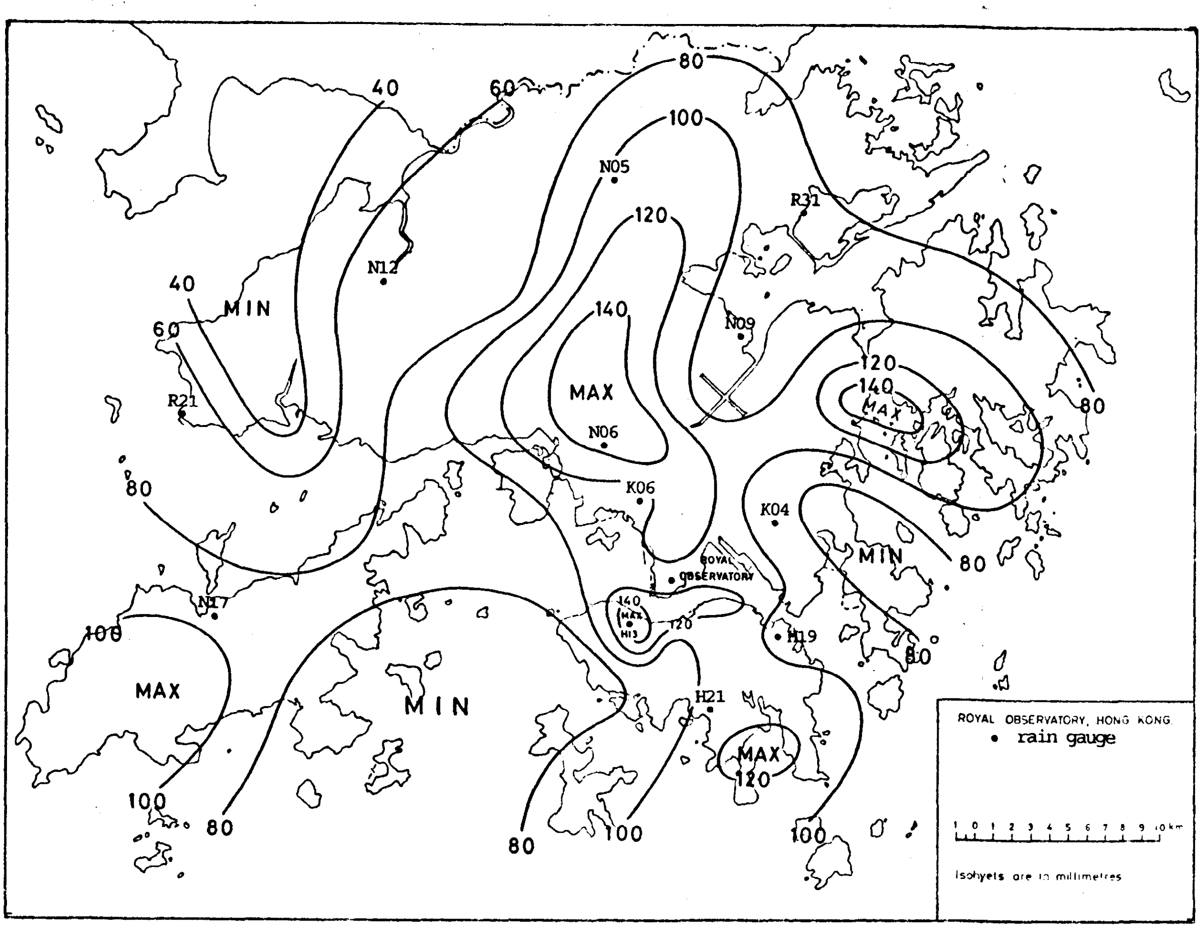


Figure 11. Rainfall distribution on 10 - 13 July 1993.

Figure 12. GMS-4 infra-red imagery of Lewis at around 11 a.m. on 10 July 1993.

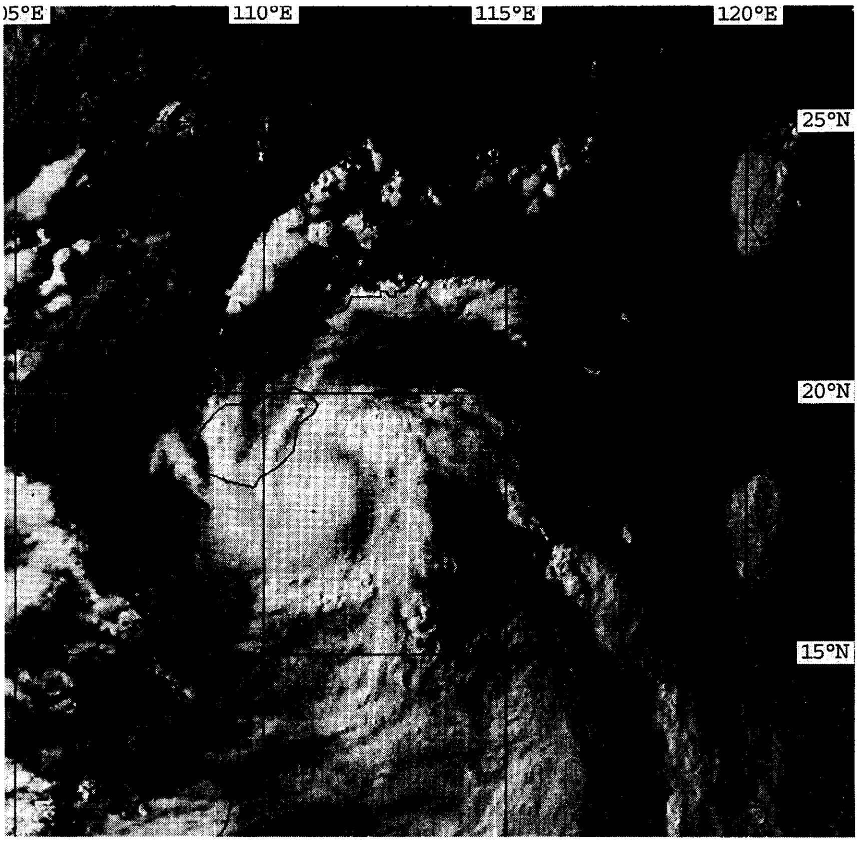


Figure 13. GMS-4 visible imagery of Lewis at around 5 p.m. on 10 July 1993.

(c) Typhoon Tasha (9309)

16-21 August 1993

The track of Tasha is shown in Figure 14

Tasha formed as a tropical depression over the western Pacific about 820 km east of Manila on the morning of 16 August. Moving west-northwestwards at about 16 km/h initially, Tasha began to take on a more northwestward track that night towards the Luzon Strait. It developed into a tropical storm on the early morning of 18 August while it was about 500 km north-northeast of Manila. Tasha traversed the Luzon Strait on a west-northwestward course at about 20 km/h and entered the South China Sea that afternoon.

Heavy rain associated with Tasha caused flooding in the northern Philippines. Four people were killed and more than 43 000 others had to flee their homes. Lightning disrupted the commuter rail system in Manila, stranding thousands of passengers. In San Marcelino, a town 100 km west of Manila, heavy rain unleashed tonnes of debris from Mount Pinatubo. Three people were killed and more than 600 houses were damaged.

Tasha took on a westward course at 18 km/h after entering the South China Sea. It slowed down to about 13 km/h on the evening of 19 August and turned towards the northwest. Further intensification of Tasha into a severe tropical storm took place about 230 km southsouthwest of Hong Kong on the afternoon of 20 August. It became a typhoon and attained peak intensity that evening about 220 km southwest of Hong Kong while maintaining a steady northwestward movement at 16 km/h. The minimum sea-level pressure and maximum sustained winds were estimated to be 970 hPa and 120 km/h respectively. Tasha maintained its typhoon strength only for a few hours and it weakened into a severe tropical storm about 260 km west-southwest of Hong Kong just before making landfall. It eventually landed over the coast of western Guangdong about 120 km east-northeast of Zhanjiang on the morning of 21 August. It continued to dissipate as it moved further inland.

In Yangjiang, one person was killed and ten others were injured. About 7 500 people were stranded by floods and 56 000 hectares of farmland were inundated. A total of 25 000 houses was destroyed. Electricity supply was cut for three days and telecommunication links were disrupted. Direct•economic loss was estimated at 520 million RMB. Tasha also claimed seven lives in Hainan. About 41 500 people were stranded by floods and 7 800 hectares of farmland were inundated. A total of 4 370 houses was damaged or destroyed. There was also damage reported in other nearby places.

In Macau, flooding was exacerbated by the high tide occurring at the time. According to press reports, much of the low-lying areas were inundated. A total of 215 people from 46 households had to be evacuated. The Macau-Taipa bridge and the Taipa-Coloane causeway were closed to traffic.

In Hong Kong, the Stand By Signal No. 1 was hoisted at 4.15 p.m. on 18 August when Tasha was about 640 km to the east-southeast. The weather was fine and hot that day due to a relatively dry continental airstream brought on by Tasha. The Strong Wind Signal No. 3 was hoisted at 10.45 a.m. the next morning when Tasha was about 380 km to the southeast. Winds strengthened from the northeast that afternoon and squally showers set in. As Tasha took on a more northwestward track and came closer to Hong Kong on 20 August, winds strengthened significantly. The No. 8 SOUTHEAST Gale or Storm Signal was hoisted at 4.00 p.m. that afternoon when Tasha was about 230 km to the south-southwest. Gale force winds were reported over the offshore areas. Tasha was closest to Hong Kong at around 6 p.m. on 20 August when it was about 220 km to the south-southwest. At almost the same time, the lowest sea-level pressure of 995.4 hPa was recorded at the Royal Observatory. Tasha began to weaken as it approached the coastal areas. The No. 8 SOUTHEAST Gale or Storm Signal was replaced by the Strong Wind Signal No. 3 at 0.30 a.m. on 21 August when it was about 240 km to the west-southwest. Following the landing of Tasha, all signals were lowered at 9.40 a.m. that morning when it was about 350 km to the west of Hong Kong. There were still showers on 21 August, but the weather improved considerably the next day.

A Malaysian freighter "Interhill King" was in trouble about 658 km southeast of Hong Kong on the early morning of 21 August. All of the 21 crew members were rescued by two passing ships.

Locally, 35 people were injured during the passage of Tasha. Falling trees and signboards were reported. There were also collapsed scaffoldings in Aberdeen, Central, Kowloon City and Tsuen Wan. On Hong Kong Island, there was a landslide at Pok Fu Lam Road. Public transport was largely disrupted and ferry services to outlying islands, Macau and China were suspended or cancelled. At the airport, three flights were cancelled, five were delayed and four were diverted away from Hong Kong.

The roads leading to and from the container terminals in Kwai Chung were jammed by more than 3 000 container trucks as the drivers tried to meet shipping deadlines. Over 600 ferry passengers were stranded at Peng Chau when a Lantau-bound ferry made for shelter after failing to dock at Mui Wo.

The rainfall distribution associated with Tasha is shown in Figure 15. Information on wind, rainfall and tide during the passage of Tasha 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 Tasha :-

	Maximum Gust			Maximum Hourly Wind		
Station (see Fig.1)	Direction	Speed(km/h)	Date Time	Direction	Speed(km/h)	Date Time
Central	ESE	96	20 Aug 2335	ESE	43	20 Aug 1700
Cheung Chau	SE	133	21 Aug 0308	SE	94	21 Aug 0100
Green Island	ESE	133	21 Aug 0149	ESE	63	21 Aug 0200
H.K. Airport(SE)	E	101	20 Aug 1233	ESE	51	21 Aug 0100
				ESE	51	21 Aug 0300
King's Park	SE	90	21 Aug 0204	ESE	40	20 Aug 1700
Kwai Chung	ESE	106	20 Aug 2344	E	63	20 Aug 1900
				ESE	63	21 Aug 0200
Lau Fau Shan	SE	101	21 Aug 0324	E	49	20 Aug 1700
Sai Kung	SE	112	20 Aug 2345	SSE	56	21 Aug 0300
Sha Lo Wan	E	142	20 Aug 1657	E	63	20 Aug 1300
Sha Tin	SE	83	21 Aug 0336	SE	31	21 Aug 0600
				SE	31	21 Aug 0700
Star Ferry	ESE	113	20 Aug 2316	ESE	56	20 Aug 2400
Ta Kwu Ling	SE	92	21 Aug 0200	ESE	34	20 Aug 1500
Tai Po Kau	ESE	99	20 Aug 2036	ESE	51	20 Aug 1500
Tate's Cairn	S	128	21 Aug 0419	S	76	21 Aug 0500
Tseung Kwan O	SSE	92	21 Aug 0155	SSE	38	21 Aug 0300
Tsing Yi	SE	140	21 Aug 0231	SE	70	21 Aug 0200
Tuen Mun	SE	99	20 Aug 2237	SE	38	20 Aug 2400
	SE	99	21 Aug 0132			
Waglan Island	SSE	126	21 Aug 0215	SE	90	20 Aug 2400
				SE	90	21 Aug 0100
Wong Chuk Hang	ESE	121	20 Aug 0811	E	49	21 Aug 0200

Station with incomplete record :
Tai Mo Shan

Daily rainfall amounts in millimetres recorded at the Royal Observatory and other stations on days when tropical cyclone warning signals were hoisted for Tasha :-

Station (see Fig.15)		18 Aug	19 Aug	20 Aug	21 Aug	Total
Royal Observatory		Nil	0.2	24.6	13.9	38.7
H19	(HK Island (east))	5.0	Nil	25.0	22.0	52.0
H13	(HK Island (west))	Nil	Nil	37.0	23.0	60.0
H21	(HK Island (south))	Nil	Nil	25.5	8.0	33.5
K04	(Kowloon (east))	4.5	Nil	30.0	24.0	58.5
K06	(Kowloon (west))	Nil	1.0	24.0	12.5	37.5
R12	(Lantau)	Nil	Nil	17.5	46.0	63.5
N05	(Sheung Shui)	Nil	Nil	72.5	37.0	109.5
N13	(Sai Kung)	Nil	Nil	25.0	61.0	86.0
N09	(Sha Tin)	Nil	Nil	50.0	24.0	74.0
R31	(Tai Po)	Nil	Nil	33.5	44.0	77.5
N06	(Tsuen Wan - Kwai Chung)	Nil	0.5	40.0	23.5	64.0
R21	(Tuen Mun)	Nil	0.5	35.5	84.0	120.0
R26	(Shek Kong)	Nil	1.0	86.5	35.0	122.5

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

Station (see Fig.1)	Maximum sea level above chart datum			Maximum storm surge above astronomical tide		
	Height (m)	Date	Time	Height (m)	Date	Time
Tai Po Kau	2.71	20 Aug	12.02 p.m.	0.89	20 Aug	8.47 p.m.
Lok On Pai	2.87	20 Aug	11.14 a.m	0.52	20 Aug	10.02 a.m.
Quarry Bay	2.77	20 Aug	10.56 a.m.	0.58	20 Aug	12.56 p.m.
Tai O	3.01	20 Aug	11.40 a.m.	0.72	20 Aug	4.25 p.m.
Tsim Bei Tsui	3.15	20 Aug	11.09 a.m.	0.70	20 Aug	10.28 p.m.

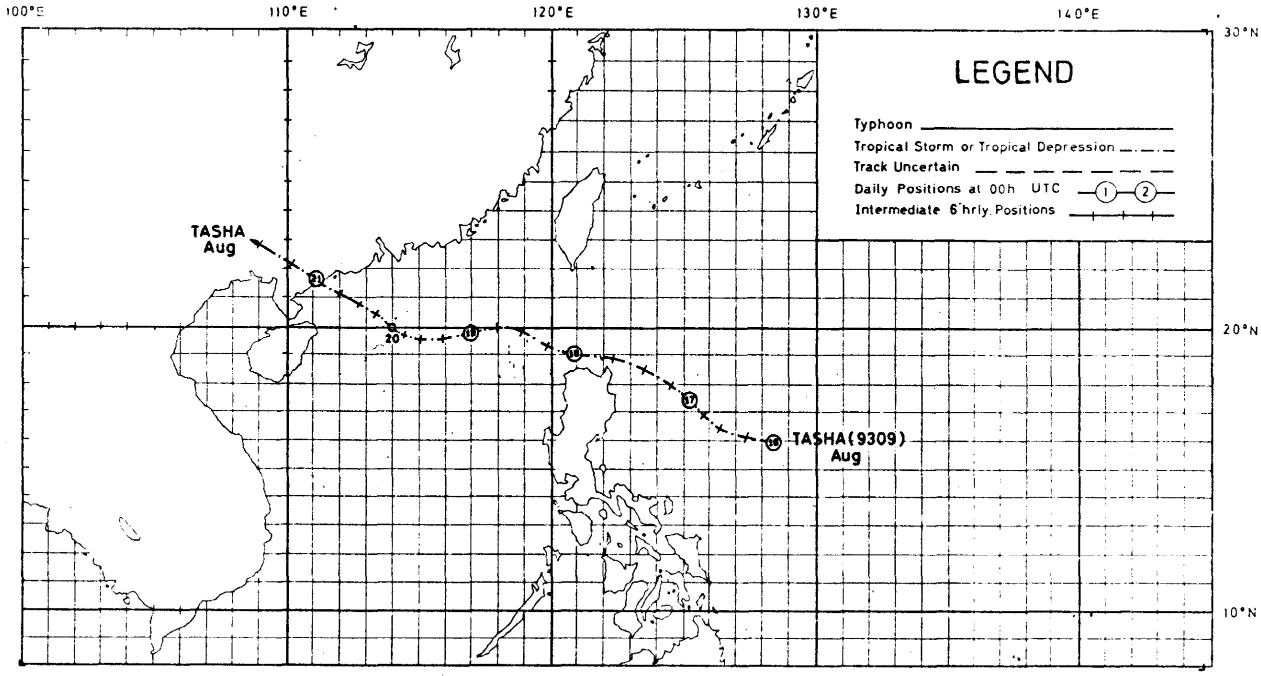


Figure 14. Track of Typhoon Tasha (9309) : 16 - 21 August 1993.

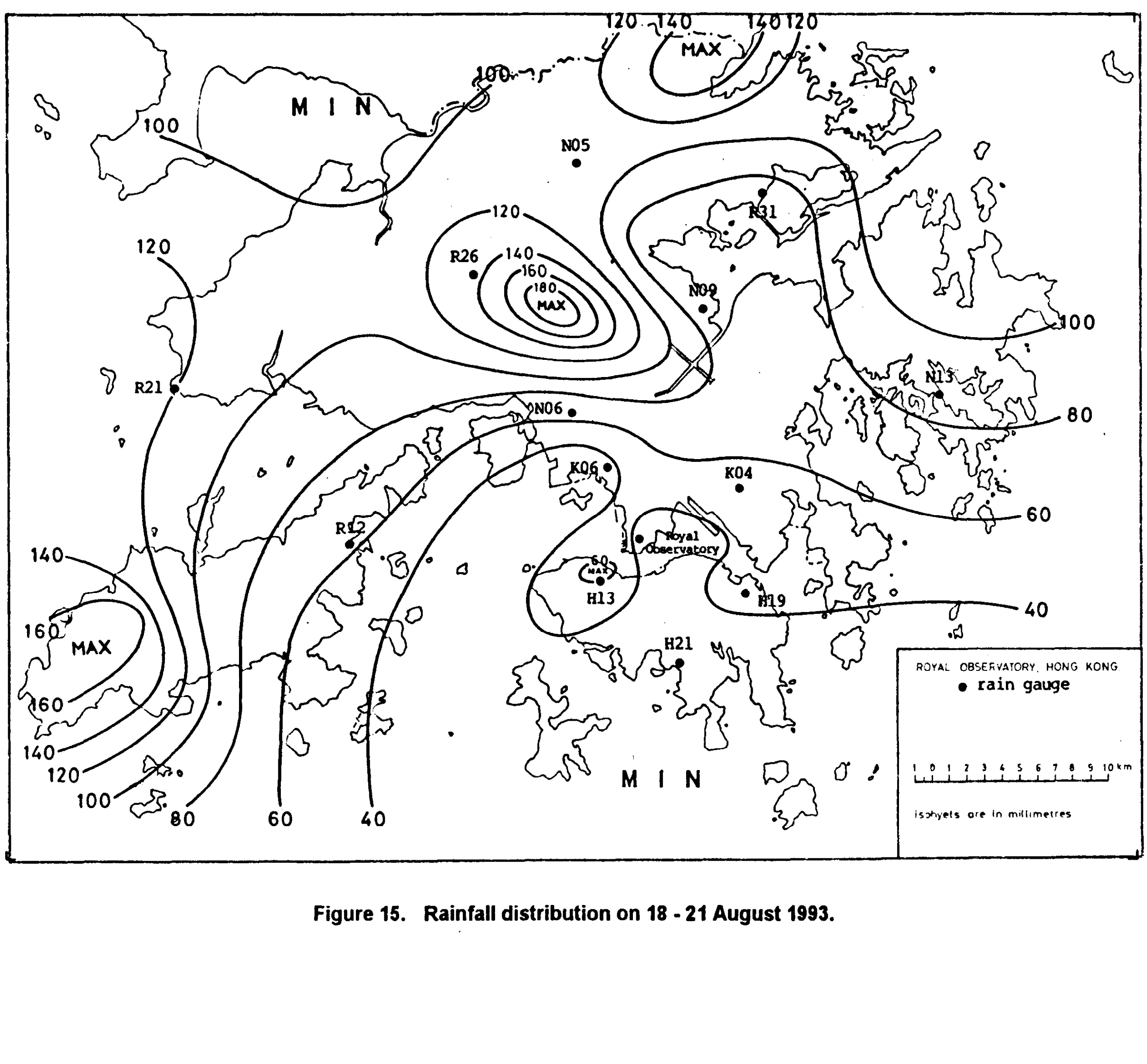


Figure 15. Rainfall distribution on 18 - 21 August 1993.

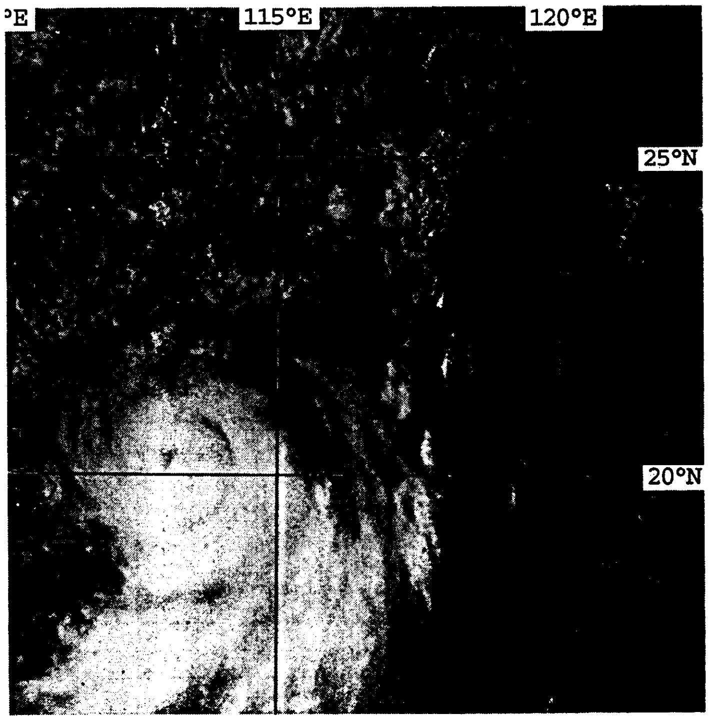


Figure 16. GMS-4 visible imagery of Tasha at around 2 p.m. on 20 August 1993.

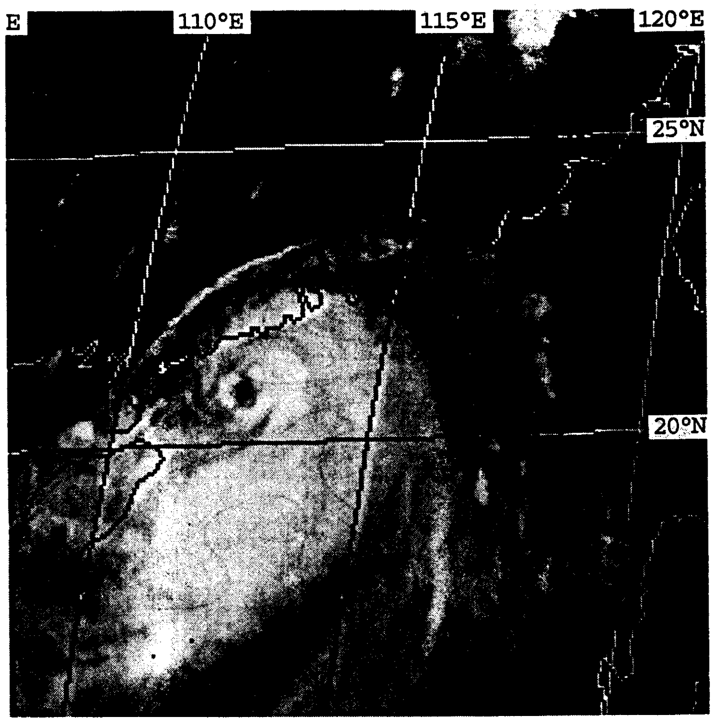


Figure 17. GMS-4 infra-red imagery of Tasha at around 8 p.m. on 20 August 1993.

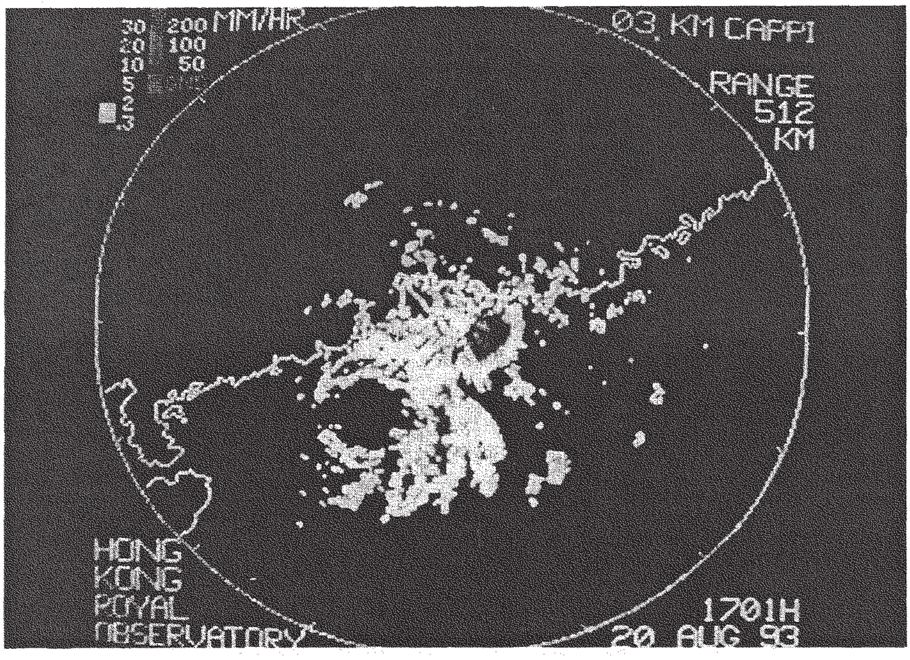


Figure 18. Radar display of the rain echoes of Tasha at 5.01 p.m. on 20 August 1993.

Figure 19. A collapsed scaffolding in Kowloon City (by courtesy of Oriental Daily News).

(d) Tropical Storm Winona (9312)

23-29 August 1993

The track of Winona is shown in Figure 20

Winona originated from an area of disturbance in the vicinity of the central Philippines. It developed into a tropical depression about 290 km south of Manila in the afternoon of 23 August, moving towards the west at 22 km/h initially. Winona deepened rapidly into a tropical storm during the following few hours. It began to take on a northwestward track and slowed down to about 13 km/h the next morning. Peak intensity was attained in the afternoun when the minimum sea-level pressure and maximum sustained winds of Winona were estimated to be 990 hPa and 75 km/h respectively.

Winona decelerated further to about 7 km/h on the evening of 25 August when its centre displayed a looping motion over the northern part of the South China Sea. After weakening into a tropical depression about 560 km south-southeast of Hong Kong on the afternoon of 26 August, Winona began to move west-southwestwards that evening and its speed gradually increased to 20 km/h. It re-gained tropical storm strength on the morning of 28 August about 250 km southeast of Yaxian while heading westwards at 23 km/h. As it approached the coast of Vietnam that evening, it weakened into a tropical depression about 110 km northeast of Dar-rang. Further weakening took place that night over the coastal waters of Vietnam before Winona made landfall.

In Hong Kong, the Stand By Signal No. 1 was hoisted at 10.30 p.m. on 25 August when Winona was about 570 km to the south-southeast. The signal was lowered at 3.45 p.m the next day when Winona started moving westwards towards Vietnam.

Winona was closest to Hong Kong at around 2 p.m. on 27 August when it was about 510 km to the south. The lowest sea-level pressure of 1004.2 hPa was recorded at the Royal Observatory three hours later. During the passage of Winona, local winds were light to moderate. Apart from some haze, the weather was fine and no rainfall was recorded.

No significant damage was reported in Hong Kong.

Information on wind and tide during the passage of Winona is given as follows :

Maximum gust peak speeds and maximum hourly mean winds with associated wind directions recorded at various stations on days when tropical cyclone warning signal was hoisted for Winona :-

	Maximum Gust			Maximum Hourly Wind		
Station (see Fig.1)	Direction	Speed(km/h)	Date Time	Direction	Speed(km/h)	Date Time
Central	ENE	19	26 Aug 1414	ENE	13	26 Aug 1500
Cheung Chau	SE	16	26 Aug 1419	SE	13	26 Aug 1500
	SE	16	26 Aug 1416			
Green Island	S	27	26 Aug 1331	S	22	26 Aug 1400
H.K. Airport(SE)	SE	25	26 Aug 1320	SE	20	26 Aug 1400
King's Park	ESE	19	26 Aug 1321	SE	9	26 Aug 1400
	SE	19	26 Aug 1316			
	SE	19	26 Aug 1318			
	SE	19	26 Aug 1332			
	SE	19	26 Aug 1339			
Kwai Chung	SSW	23	26 Aug 1354	SW	14	26 Aug 1500
Lau Fau Shan	WSW	22	26 Aug 1500	SE	12	26 Aug 0300
Sai Kung	S	25	26 Aug 1300	S	19	26 Aug 1400
Sha Lo Wan	SW	16	26 Aug 1444	W	6	26 Aug 1400
				WSW	6	26 Aug 1500
Sha Tin	NNE	16	26 Aug 1151	NNE	7	26 Aug 1300
Star Ferry	E	22	26 Aug 1408	E	12	26 Aug 1400
	E	22	26 Aug 1424	E	12	26 Aug 1500

Station (see Fig.1)	Maximum Gust Direction	Maximum Gust Speed(km/h)	Maximum Gust Date Time	Maximum Hourly Wind Direction	Maximum Hourly Wind Speed(km/h)	Maximum Hourly Wind Date Time
Ta Kwu Ling	ESE	27	26 Aug 1458	ESE	14	26 Aug 1500
Tai Mo Shan	NNE	16	26 Aug 1338	NNW	12	26 Aug 0700
				N	12	26 Aug 0800
Tai Po Kau	E	19	26 Aug 1425	E	14	26 Aug 1500
	E	19	26 Aug 1451			
	E	19	26 Aug 1452			
	E	19	26 Aug 1453			
Tate's Cairn	E	19	26 Aug 1330	SSE	13	25 Aug 2400
	ESE	19	26 Aug 1401			
Tseung Kwan O	SSW	20	26 Aug 1355	SSW	12	26 Aug 1400
Tsing Yi	SSE	22	26 Aug 1250	S	7	26 Aug 1400
				S	7	26 Aug 1500
Tuen Mun	SSE	23	25 Aug 2325	S	13	25 Aug 2400
Waglan Island	SSE	22	26 Aug 1545	SSE	16	26 Aug 1600
Wong Chuk Hang	SE	22	26 Aug 1317	SE	13	26 Aug 1300

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

Station (see Fig.1)	Maximum sea level above chart datum			Maximum storm surge above astronomical tide		
	Height (m)	Date	Time	Height (m)	Date	Time
Tai Po Kau	1.98	26 Aug	5.25 a.m.	0.16	26 Aug	8.45 p.m.
Lok On Pai	2.02	26 Aug	3.51 a.m.	0.01	26 Aug	4.12 p.m.
Quarry Bay	1.96	26 Aug	1.57 a.m.	0.02	26 Aug	8.59 p.m.
Tai O	2.06	26 Aug	3.43 a.m.	0.12	26 Aug	9.41 a.m.
Tsim Bei Tsui	2.29	26 Aug	3.33 a.m.	0.13	26 Aug	5.44 p.m.

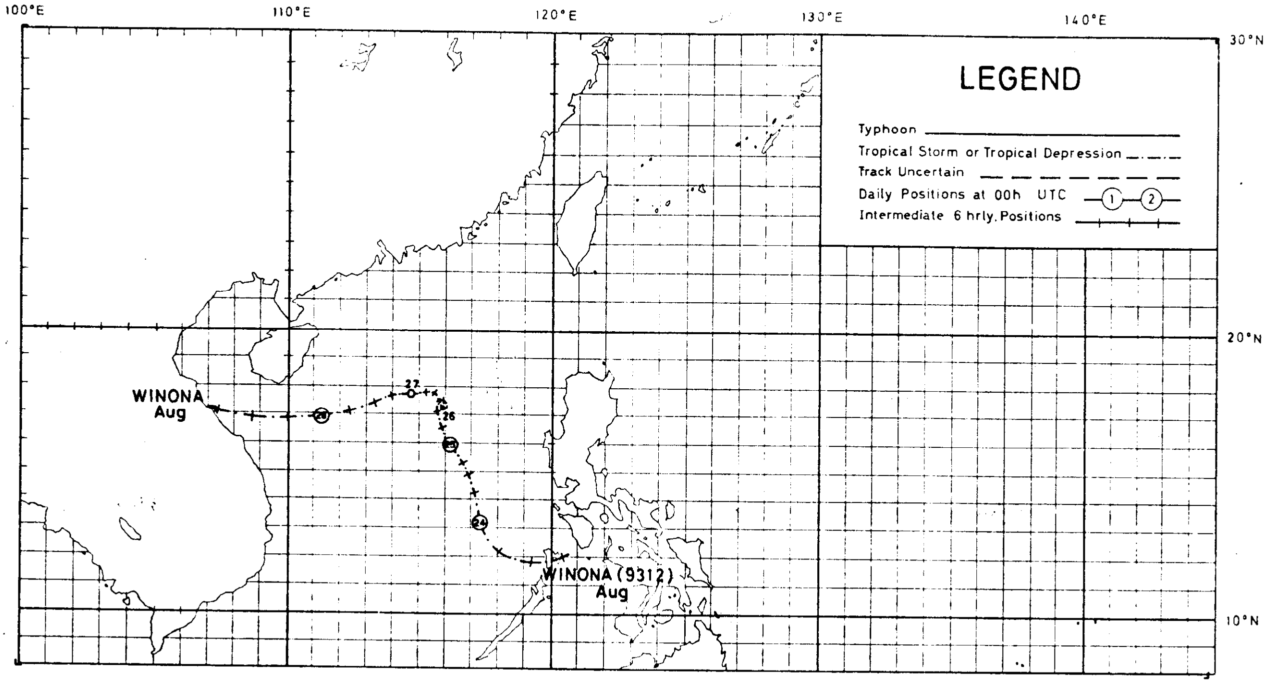


Figure 20. Track of Tropical Storm Winona (9312) : 23 - 29 August 1993.

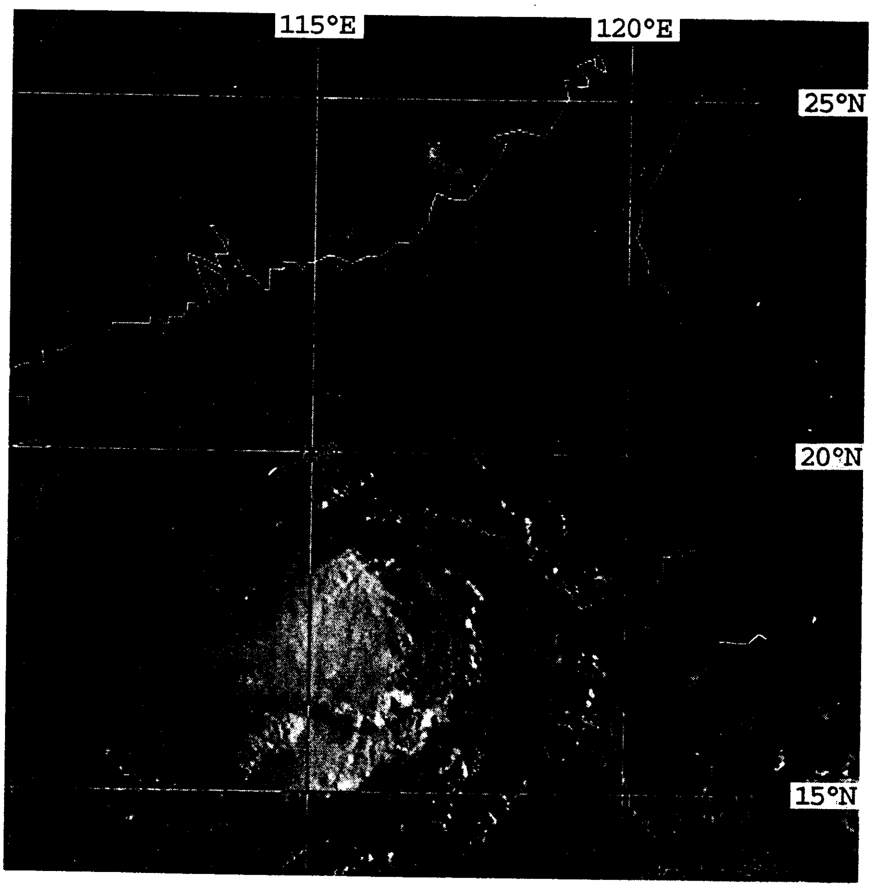


Figure 21. GMS-4 visible imagery of Winona at around 8 a.m. on 26 August 1993.

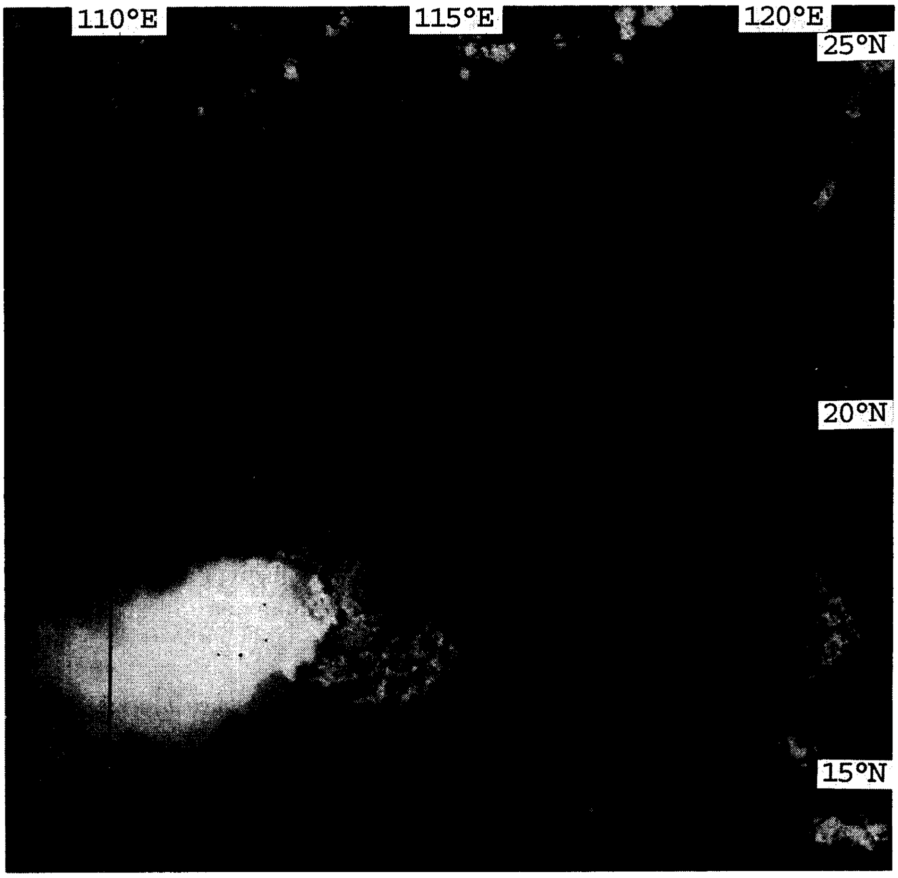


Figure 22. GMS-4 visible imagery of Winona at around 2 p.m. on 27 August 1993.

(e) Typhoon Abe (9315)

9 - 14 September 1993

The track of Abe is shown in Figure 23

Abe formed as a tropical depression over the western North Pacific about 580 km northeast of Manila on the morning of 9 September, It slowed down from an initial speed of 13km/h to about 10 km/h that evening and intensified into a tropical storm the next morning. Moving west-northwestward, Abe deepened into a severe tropical storm on the evening of 11 September when it was about 280 km southeast of Gaoxiong. It entered the South China Sea on the afternoon of 12 September, intensified further into a typhoon and turned towards the northwest. Abe attained peak intensity with maximum sustained winds of about 160 km/h and sea-level pressure of 950 hPa near its centre on 13 September when it was about 200 km southwest of Gaoxiong.

Abe was a rather compact typhoon. As it traversed the Luzon Strait, its intense rainbands affected southern Taiwan. Highway traffic was interrupted and one person was killed by flash flooding.

Abe made landfall over the coast of eastern Guangdong about 50 km south-southwest of Shantou on the morning of 14 September. It weakened rapidly into a tropical storm that afternoon. Tracking west-northwestwards with a speed of 22 km/h, Abe finally degenerated into an area of low pressure over Guangdong that night.

In Shantou and Jieyang, 11 people were killed and more than 290 people were injured. A total of about 116 000 houses was damaged or destroyed. Agricultural produce, irrigation facilities, telecommunication wires, power cables, bridges and roads also suffered damage. Direct economic loss was estimated at 1685 million RMB. A Taiwan freighter “Heng Yun” sank off the coast of Shantou. Fortunately all 21 crew members were rescued.

In Macau the Macau-Hong Kong helicopter service was suspended.

In Hong Kong, the Stand By Signal No. 1 was hoisted at 9.50 a.m. on 12 September when Abe was about 660 km to the south-southeast. Apart from a few isolated showers, the weather was generally fine that day. Squally showers set in as the outermost rainbands of Abe began to affect the territory the next day. The lowest sea-level pressure of 1005.4 hPa was recorded at the Royal Observatory at around 4 p.m. on 13 September when Abe was about 380 km to the east. The Stand By Signal No. 1 was lowered at 7.50 a.m. on 14 September about two hours after Abe made landfall about 250 km to the east-northeast of Hong Kong. As Abe moved further inland, it came closest to Hong Kong at around 5 p.m. that day when it was about 150 km to the north-northeast. Following the dissipation of Abe, the weather improved and there were periods of sunshine in the following couple of days.

In Hong Kong, a man was drowned after he was thrown into water from a boat hit by a sudden swell. Minor flooding was reported at the West Kowloon corridor. Ferry services between Hong Kong and Shanwei were suspended.

The rainfall distribution associated with Abe is shown in Figure 24. Information on wind, rainfall and tide during the passage of Abe 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 Abe :-

	Maximum Gust			Maximum Hourly Wind		
Station (see Fig.1)	Direction	Speed(km/h)	Date Time	Direction	Speed(km/h)	Date Time
				E	16	13 Sep 2000
Central	NNW	41	13 Sep 1949	E	14	13 Sep 2000
Cheung Chau	NE	36	13 Sep 2032	N	20	13 Sep 0700
Green Island	ENE	54	13 Sep 1957	WNW	27	13 Sep 1400

Station (see Fig.1)	Maximum Gust Direction	Maximum Gust Speed(km/h)	Maximum Gust Date Time	Maximum Hourly Wind Direction	Maximum Hourly Wind Speed(km/h)	Maximum Hourly Wind Date Time
H.K. Airport(SE)	SW	31	13 Sep 2027	W	16	12 Sep 2400
				SE	16	13 Sep 1500
King's Park	ESE	25	13 Sep 1905	ESE	12	13 Sep 2000
Kwai Chung	NE	51	13 Sep 1940	SSW	19	12 Sep 1400
Lau Fau Shan	WNW	36	13 Sep 1844	WNW	27	13 Sep 1900
Sai Kung	NE	31	13 Sep 0939	NNE	19	13 Sep 1100
Sha Lo Wan	ENE	30	14 Sep 0531	NW	16	13 Sep 1400
Sha Tin	NNE	30	13 Sep 1452	SW	12	13 Sep 2100
Star Ferry	NNW	31	13 Sep 1947	W	14	13 Sep 1400
Ta Kwu Ling	ESE	38	13 Sep 1855	E	14	13 Sep 1900
Tai Mo Shan	N	34	13 Sep 1200	N	25	13 Sep 0300
Tai Po Kau	E	31	13 Sep 1840	E	14	13 Sep 1200
Tate's Cairn	N	31	14 Sep 0408	NNW	22	13 Sep 0300
Tseung Kwan O	ENE	27	13 Sep 1006	E	14	13 Sep 1200
Tuen Mun	NW	34	13 Sep 1325	NW	16	13 Sep 1400
Waglan Island	WNW	38	13 Sep 2120	WNW	27	13 Sep 2200
Wong Chuk Hang	NW	38	13 Sep 2009	ESE	12	13 Sep 1200

Stations with incomplete record :
Tsing Yi

Daily rainfall amounts in millimetres recorded at the Royal Observatory and other stations on days when tropical cyclone warning signal was hoisted for Abe :-

Station (see Fig.24)	12 Sep	13 Sep	14 Sep	Total
Royal Observatory	Trace	56.2	5.8	62.0
H19 (HK Island (east))	Nil	13.5	2.5	16.0
H13 (HK Island (west))	Nil	47.0	Nil	47.0
H21 (HK Island (south))	Nil	14.0	Nil	14.0
H04 (Kowloon (east))	Nil	13.5	15.5	29.0
H06 (Kowloon (west))	Nil	32.5	33.0	65.5
N17 (Lantau)	Nil	Nil	1.5	1.5
N13 (Sai Kung)	Nil	Nil	10.5	10.5
N09 (Sha Tin)	Nil	1.5	29.0	30.5
N05 (Sheung Shui)	Nil	0.5	7.5	8.0
141 (Tai Po)	Nil	Nil	Nil	Nil
N06 (Tseun Wan - Kwai Chung)	Nil	16.0	43.5	59.5
R21 (Tuen Mun)	Nil	Nil	Nil	Nil
N12 (Yuen Long)	Nil	Nil	Nil	Nil

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

Station (see Fig.1)	Maxmimum see level above chart datum			Maximum storm surge above astronomical tide		
	Height (m)	Date	Time	Height (m)	Date	Time
Ko Lau Wan	2.23	14 Sep	7.54 a.m.	0.17	12 Sep	5.42 a.m.
Lok On Pai	2.31	14 Sep	7.55 a.m.	0.13	13 Sep	7.33 p.m.
Quarry Bay	2.26	14 Sep	7.34 a.m.	0.15	13 Sep	5.30 p.m.
Tsim Bei Tsui	2.57	14 Sep	7.50 a.m.	0.31	14 Sep	5.11 a.m.

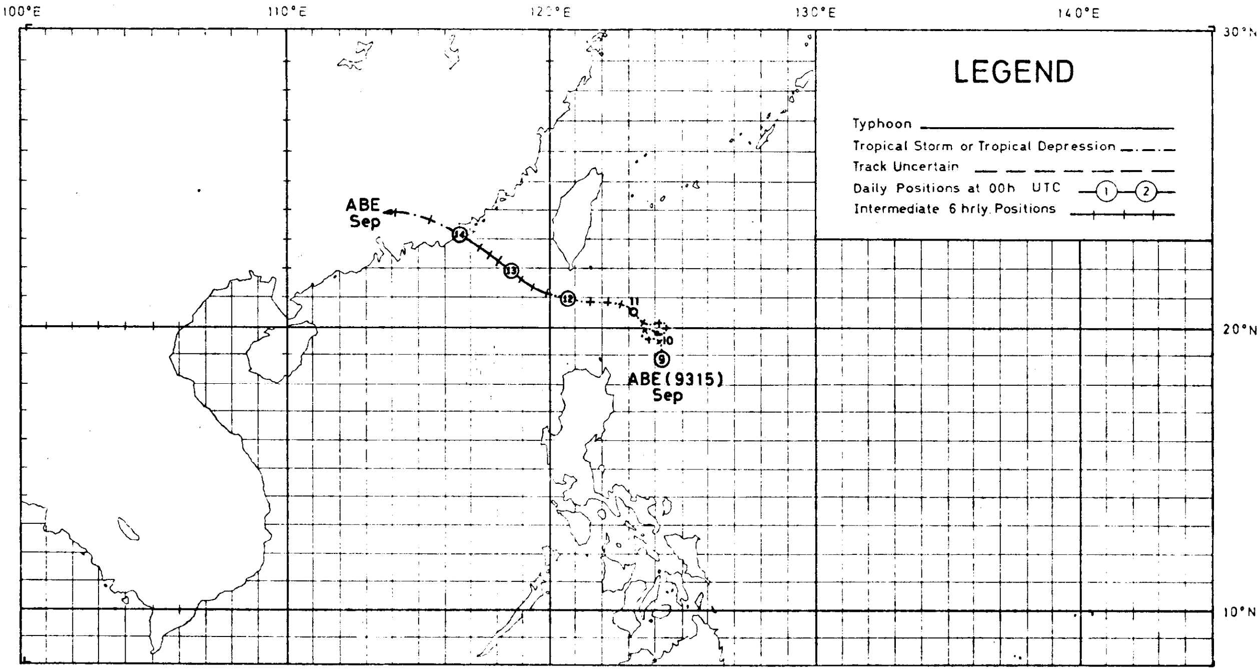


Figure 23. Track of Typhoon Abe (9315) : 9 - 14 September 1993.

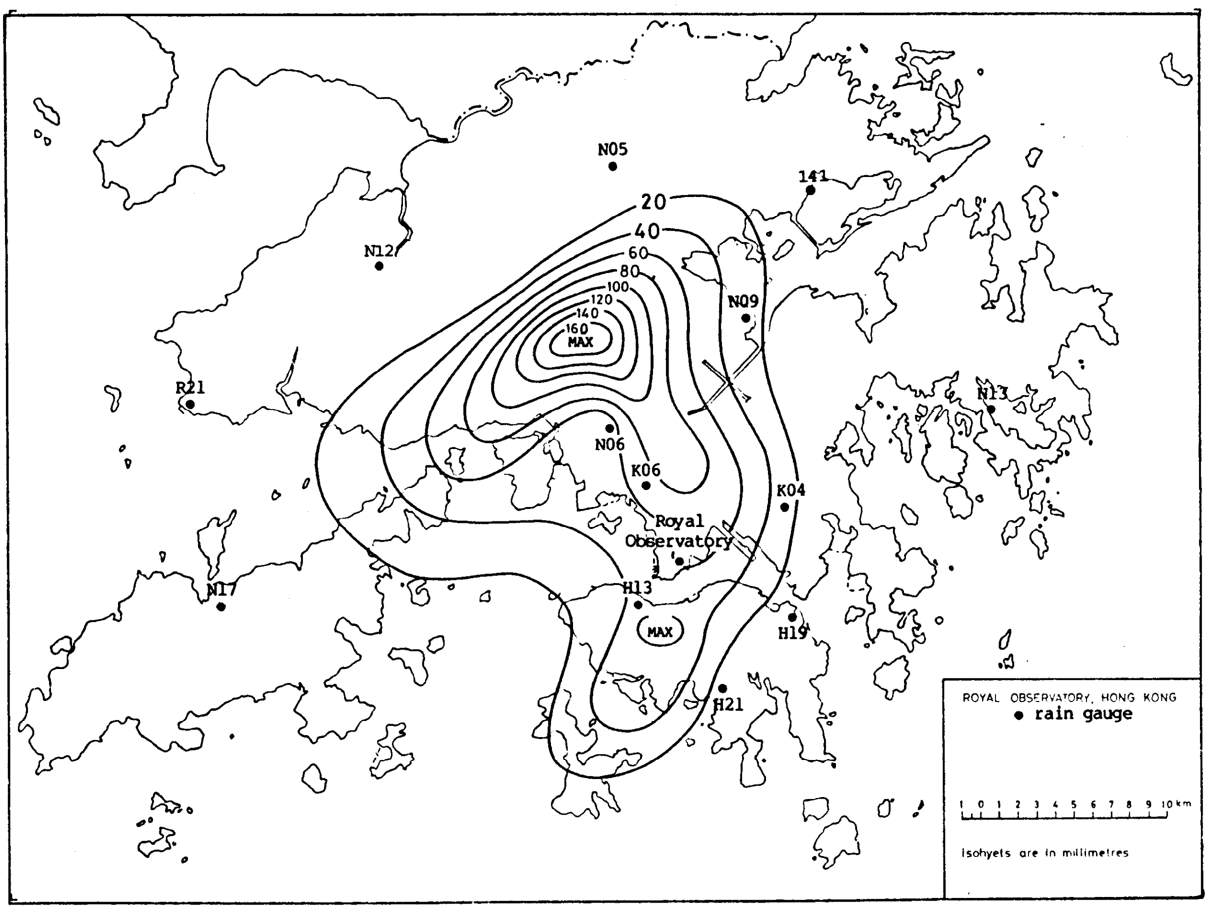


Figure 24. Rainfall distribution on 12 - 14 September 1993.

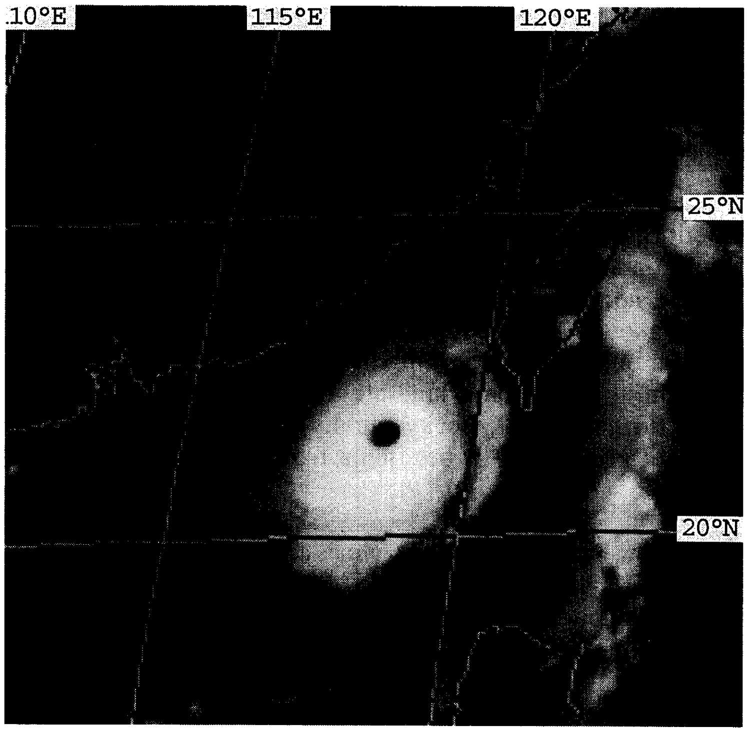


Figure 25. GMS-4 infra-red imagery of Abe at around 5 a.m. on 13 September 1993.

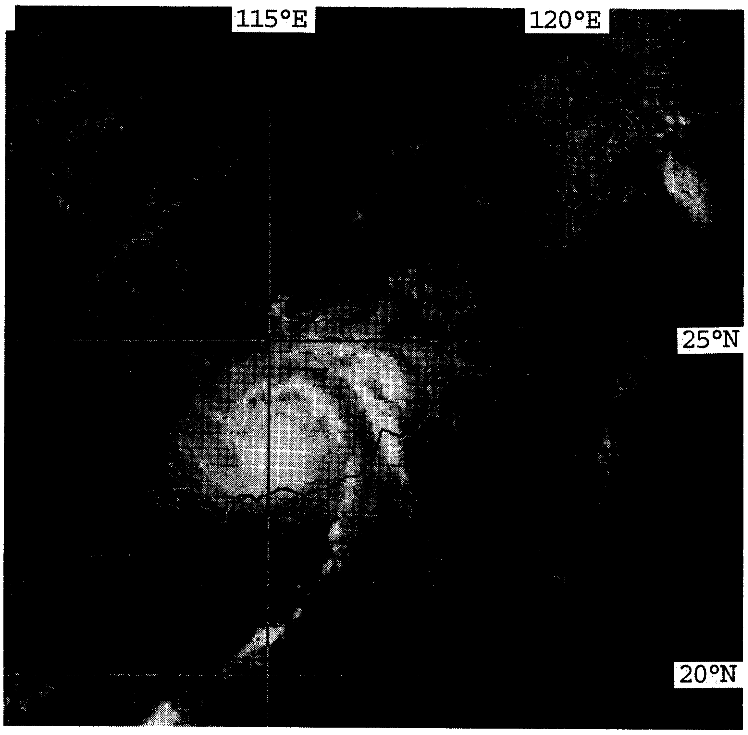


Figure 26. GMS-4 visible imagery of Abe at around 2 p.m. on 14 September 1993.

(f) Severe Tropical Storm Becky (9316)

15-17 September 1993

The track of Becky is shown in Figure 27

Becky originated from an area of low pressure over the waters east of the Philippines. It became a tropical depression about 530 km north-northeast of Manila on 15 September. Tracking westwards through the Luzon Strait at a steady speed of 20 km/h, Becky deepened into a tropical storm the next morning. It then adopted a northwestward course and accelerated to 30 km/h after entering the South China Sea. Becky passed about 50 km southwest of Dongsha that evening and then intensified further into a severe tropical storm on the early morning of 17 September. Approaching the coast of western Guangdong at around 34 km/h, Becky made landfall later that morning about 140 km west-southwest of Hong Kong. On moving further inland, Becky rapidly weakened into a tropical storm about 200 km northeast of Zhanjiang that afternoon. It became a tropical depression a few hours later and soon dissipated over land.

In Guangdong seven people were killed in the high winds and heavy rain associated with Becky. Some 7 000 houses were destroyed, 50 000 houses damaged and 152 000 hectares of farmland affected. There were also damage to 24 vessels, 300 km of power lines and 670 hectares of fish ponds. Water and electricity supplies were cut off in many areas. Economic losses amounted to 1.52 billion RMB.

In Macau, heavy rain associated with Becky caused severe flooding in low-lying areas. About 1 700 people had to flee their homes. Hundreds of cars and motorcycles were damaged. Over 50 people were injured by fallen objects. The Taipa-Coloane causeway had to be closed and the outer harbour passenger terminal was badly damaged when a barge crashed into it.

In Hong Kong, the Stand By Signal No. 1 was hoisted at 9.30 a.m. on 16 September when Becky was about 660 km to the southeast. The weather was generally fine with light winds at first. As Becky moved closer, winds picked up from the northeast with squally showers and thunderstorms beginning to affect the territory. The Strong Wind Signal No. 3 was hoisted at 10.30 p.m. that night. With winds continuing to strengthen and the No. 8 NORTHEAST Gale or Storm Signal was hoisted at 2.50 a.m. on 17 September. Becky was closest to Hong Kong at around 7 a.m. that morning when it was about 110 km to the south-southwest. The lowest sea-level pressure of 997.3 hPa was recorded at the Royal Observatory at the same time. As winds began to turn to southeast, the No. 8 SOUTHEAST Gale or Storm Signal was hoisted at 7.30 a.m. when Becky was about 110 km to the south-southwest. Stormy weather continued to affect the territory until Becky landed over western Guangdong. Showers eased off in the afternoon and the No. 8 SOUTHEAST Gale or Storm Signal was replaced by the Strong Wind Signal No. 3 at 3.10 p.m. when Becky was about 270 km to the west. All signals were lowered at 5.00 p.m. that evening.

Becky hit Hong Kong with full force during its passage. On land, a taxi driver was killed in a traffic accident, 130 people were injured, most of them by flying objects. In the gale to storm force winds trees toppled, scaffoldings collapsed and a l00-metre hoist in a construction site in Tsim Sha Tsui fell, hitting a nearby building in Mody Road and bringing down two air conditioners. In the same district, a container fell from the second floor podium of the Peninsula Hotel, smashing several windows at the nearby Kowloon Hotel. In Yuen Long, a section of the overhead cables at the Tin Shui Wai Light Rail Transit extension was damaged by high winds, interrupting railway services. There were 36 reports of flooding and seven reports of landslides. About 120 people sought refuge in 47 temporary shelters. Electricity supply was cut off in some parts of the New Territories. At sea, six vessels sank leaving 11 people dead and about 70 missing. A Royal Air Force Wessex helicopter ditched in bad weather during a search-and-rescue mission about 13 km south of Shek Kwu Chau. At the airport, 14 flights were cancelled, 14 diverted and 83 delayed. Ferry services between Hong Kong and Macau were suspended.

The rainfall distribution associated with Becky is shown in Figure 28. Information on wind, rainfall and tide during the passage of Becky 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 Becky :-

	Maximum Gust			Maximum Hourly Wind		
Station (see Fig.1)	Direction	Speed(km/h)	Date Time	Direction	Speed(km/h)	Date Time
Central	ESE	131	17 Sep 0829	ESE	56	17 Sep 0800
Cheung Chau	ESE	198	17 Sep 0738	E	115	17 Sep 0800
H.K. Airport(SE)	E	148	17 Sep 0709	ESE	72	17 Sep 0900
				ESE	72	17 Sep 1000
King's Park	ESE	142	17 Sep 0832	ESE	54	17 Sep 0900
Kwai Chung	E	140	17 Sep 0827	E	92	17 Sep 0900
Lau Fau Shan	E	149	17 Sep 0758	E	68	17 Sep 0900
Sai Kung	SE	124	17 Sep 0855	SSE	77	17 Sep 1000
Sha Lo Wan	E	216	17 Sep 0834	E	99	17 Sep 0800
Sha Tin	SSE	103	17 Sep 0912	SSE	34	17 Sep 1000
Star Ferry	ESE	133	17 Sep 0832	ESE	76	17 Sep 0900
Ta Kwu Ling	SE	110	17 Sep 0927	ESE	45	17 Sep 0900
Tai Mo Shan	SSE	221	17 Sep 0831	SE	155	17 Sep 0800
Tate's Cairn	ESE	176	17 Sep 0647	ESE	103	17 Sep 0800
Tseung Kwan O	SSE	146	17 Sep 0826	SSE	51	17 Sep 1000
Tsing Yi	SE	180	17 Sep 0830	SE	104	17 Sep 0900
	SE	180	17 Sep 0831			
	SE	180	17 Sep 0832			
	SE	180	17 Sep 0857			
	SE	180	17 Sep 0858			
Tuen Mun	SE	148	17 Sep 0844	SE	54	17 Sep 1000
Waglan Island	E	176	17 Sep 0514	SE	122	17 Sep 0900
Wong Chuk Hang	ESE	149	17 Sep 0723	E	62	17 Sep 0800

Stations with incomplete record :
Tai Po Kau
Green Island

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

Station (see Fig. 28)	16 Sep	17 Sep	18 Sep	Total
Royal Observatory	0.3	70.8	20.4	91.5
H19 (HK Island (east))	0.5	80.5	35.0	116.0
H13 (HK Island (west))	0.5	114.5	21.5	136.5
H21 (HK Island (south))	0.5	97.0	22.0	119.5
K04 (Kowloon (east))	1.0	91.0	44.0	136.0
K06 (Kowloon (west))	7.5	76.0	28.0	111.5
N17 (Lantau)	22.0	36.0	39.0	97.0
N13 (Sai Kung)	4.0	42.5	43.0	89.5
N09 (Sha Tin)	6.5	63.5	18.5	88.5
N05 (Sheung Shui)	0.5	58.5	40.0	99.0
N06 (Tsuen Wan - Kwai Chung)	30.0	85.0	26.0	141.0
R21 (Tuen Mun)	13.0	77.5	18.5	109.0
N12 (Yuen Long)	12.5	38.0	28.5	79.0

Station with incomplete record :
R31 (Tai Po)

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

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	3.38	17 Sep	10.58 a.m	1.02	17 Sep	10.58 a.m.
Quarry Bay	3.08	17 Sep	10.34 a.m.	0.88	17 Sep	8.45 a.m.
Tai Po Kau	3.25	17 Sep	7.14 a.m.	1.42	17 Sep	7.06 a.m.
Tsim Bei Tsui	3.98	17 Sep	11.37 a.m.	1.32	17 Sep	11.37 a.m.

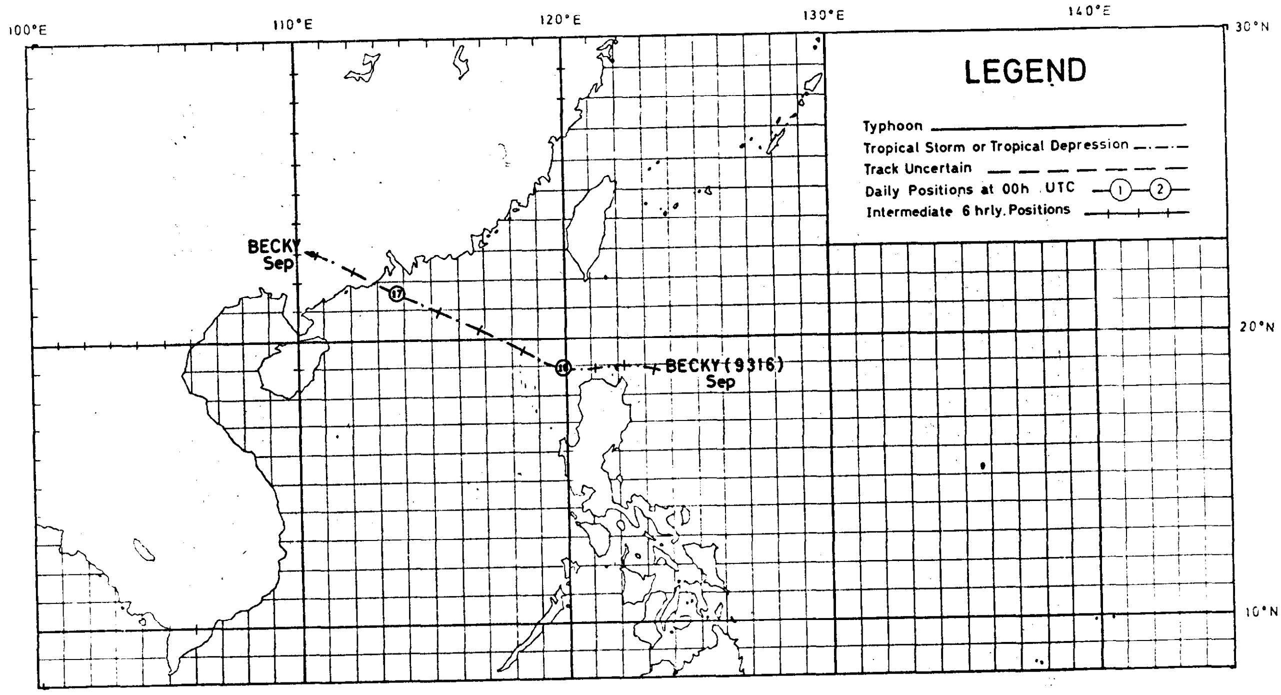


Figure 27. Track of Severe Tropical Storm Becky (9316) : 15 - 17 September 1993.

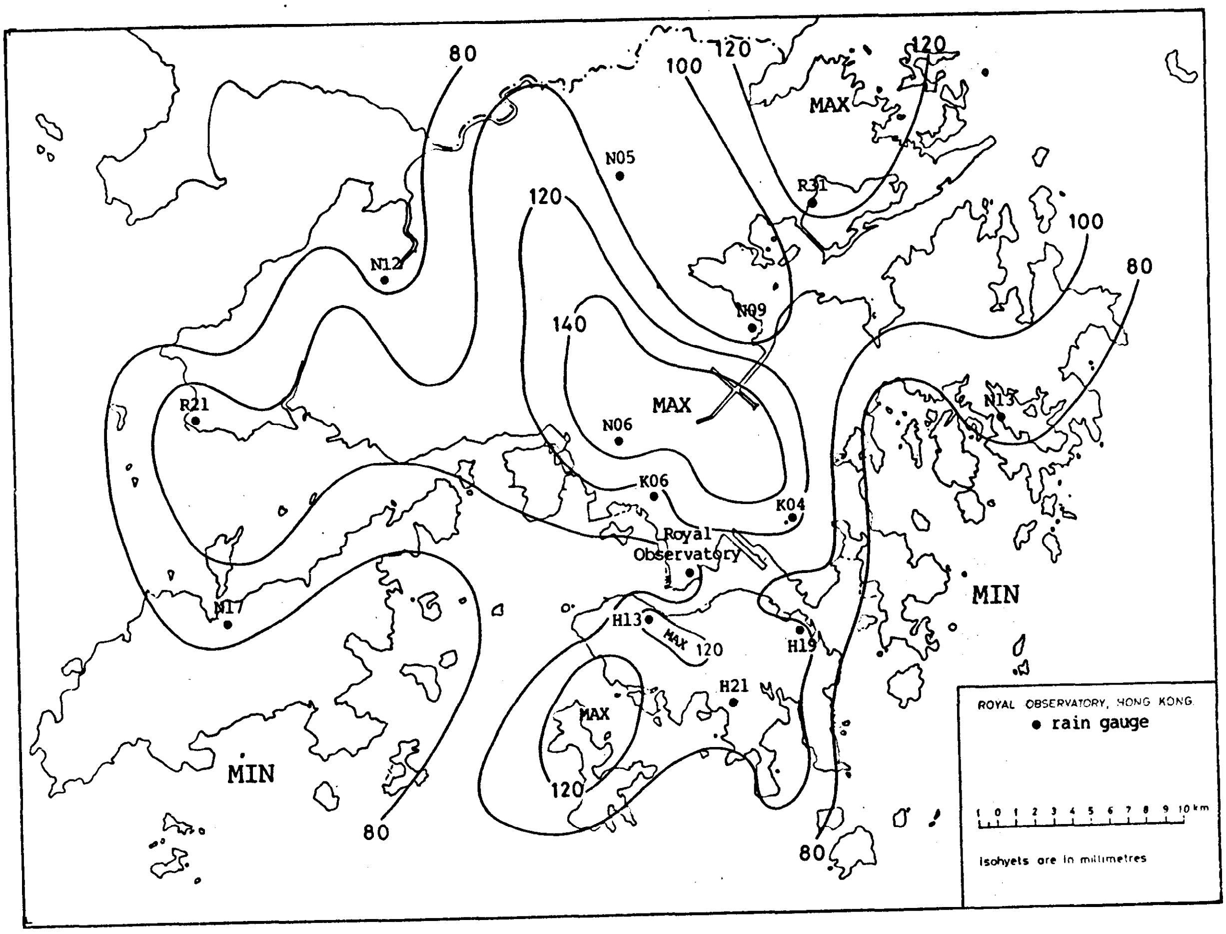


Figure 28. Rainfall distribution on 16 - 18 September 1993.

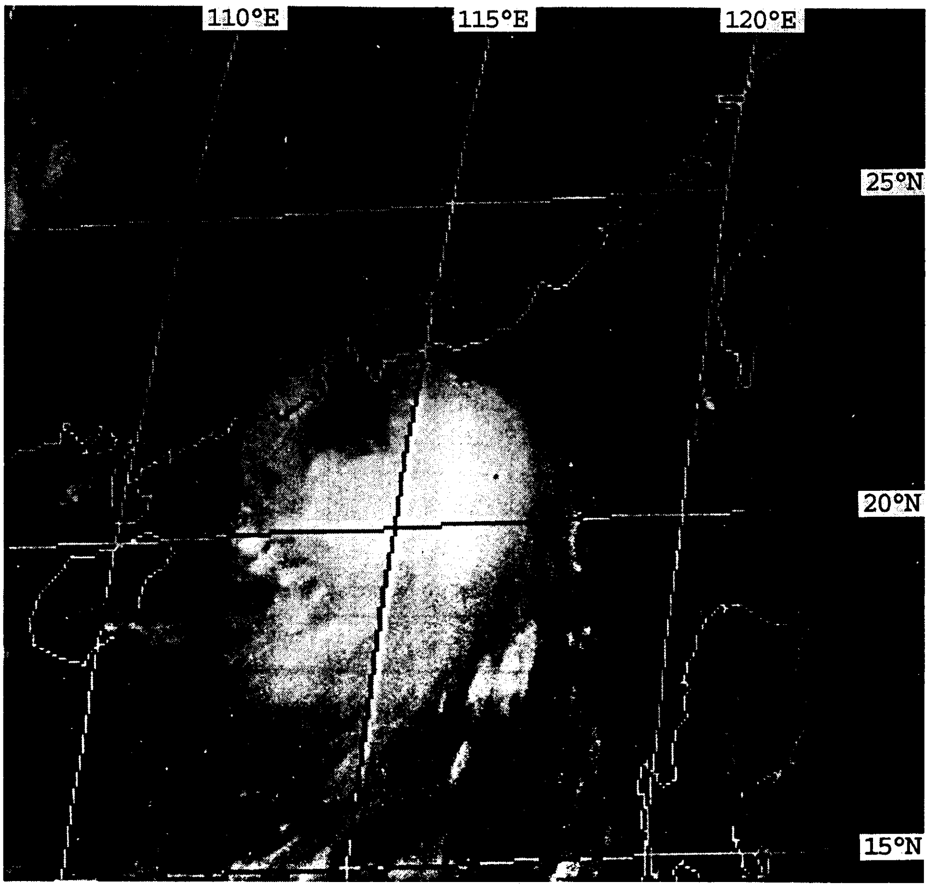


Figure 29. GMS-4 infra-red imagery of Becky at around 5 a.m. on 17 September 1993.

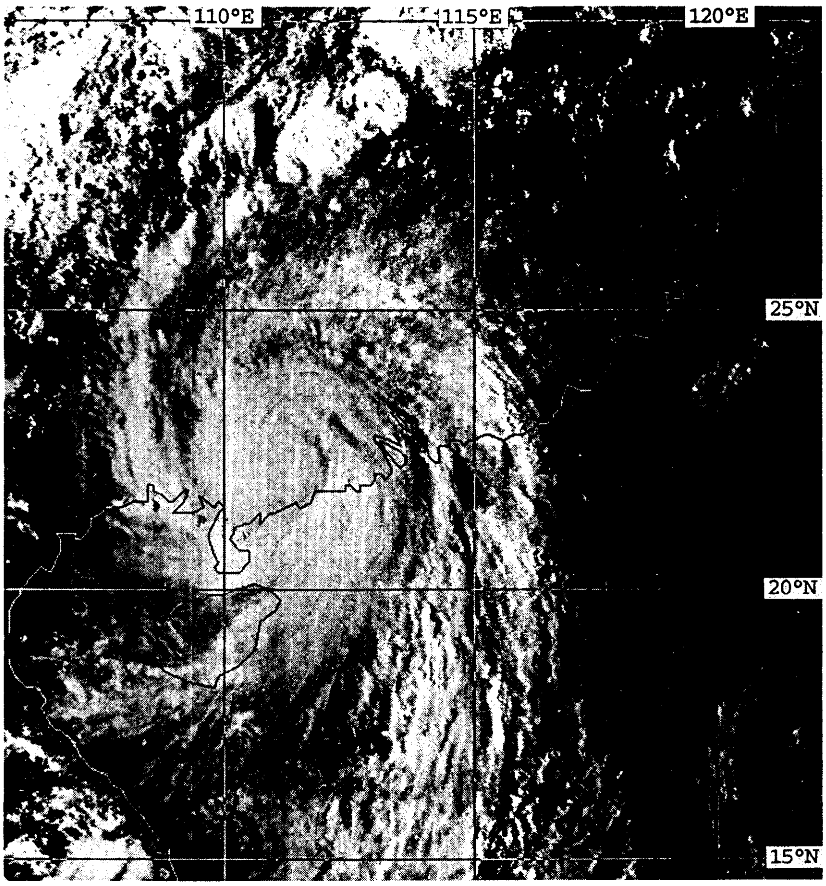


Figure 30. GMS-4 visible imagery of Becky at around 5 p.m. on 17 September 1993.

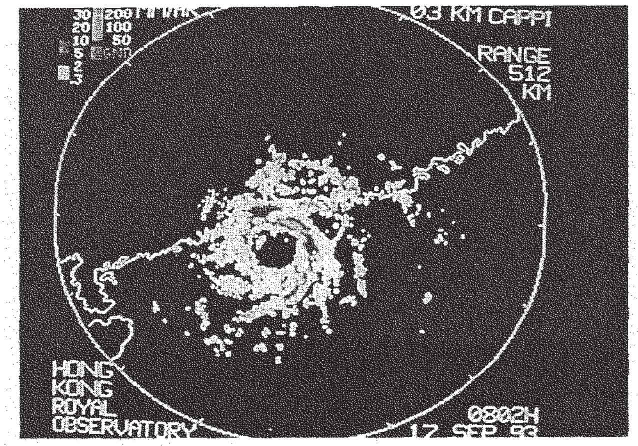


Figure 31. Radar display of the rain echoes of Becky at 8.02 a.m. on 17 September 1993,

Figure 32. A 100-metre hoist in a construction site fell and hit a nearby building in Mody Road, Tsim Sha Tsui (by courtesy of Wah Kiu Yat Po).

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 33. **A Chinese freighter ran aground off Cape D'Aguilar (by courtesy of Ming Pao Daily News).**

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 34. **Several windows at Kowloon Hotel were smashed by a container fell from the second floor podium of the nearby Peninsula Hotel (by courtesy of Wah Kiu Yat Po).**

(g) Typhoon Dot (9318)

23-27 September 1993

The track of Dot is shown in Figure 35

An area of disturbance over the South China Sea developed into a tropical depression named Dot on 23 September. Over the waters east of Hainan Island, Dot intensified into a tropical storm on the afternoon of 24 September while moving north-northeastwards at a speed of 8 km/h towards the coast of western Guangdong. It deepened into a severe tropical storm on the early morning of 25 September and began to track northwards. An eye could be identified at the centre of Dot as it attained typhoon strength about 300 km southwest of Hong Kong that afternoon. Dot reached peak intensity on the early morning of 26 September. The minimum sea-level pressure and maximum sustained winds near its centre were estimated to be 965 hPa and 140 km/h respectively. Dot then accelerated to about 12 km/h and made landfall over the coast of western Guangdong about 180 km west-southwest of Hong Kong in the afternoon. Dot weakened rapidly into a tropical storm shortly afterwards. It became a tropical depression early next morning about 190 km west of Hong Kong and eventually dissipated over land.

In southern Guangdong, torrential rain associated with Dot caused widespread flooding. About 1.38 million people were affected in total. In Shenzhen, two persons lost their lives and one went missing. 31 000 houses, 18 000 hectares of farmland and 230 km of highway were damaged. Ten ships sank and one went missing. Direct economic loss was estimated at 1.36 billion RMB.

In Macau, under the influence of Dot an unoccupied three-storey building in the urban area collapsed and the Macau-Taipa bridge also had to be closed.

In Hong Kong, as the strong northeast monsoon gave way to the strong winds brought on by Dot on 25 September, the Strong Monsoon Signal was replaced by the Strong Wind Signal No. 3 at 4.15 p.m. that day when Dot was about 290 km to the southwest. As Dot came closer to Hong Kong on 26 September, winds strengthened further. The No. 8 SOUTHEAST Gale or Storm Signal was hoisted at 9.15 a.m. that morning when Dot was about 210 km to the west-southwest. As Dot made landfall in the afternoon and local winds began to subside, the No. 8 SOUTHEAST Gale or Storm Signal was replaced by the Strong Wind Signal No. 3 at 4.00 p.m. This was also the time when the lowest sea-level pressure of 1 005.7 hPa was recorded at the Royal Observatory. All signals were lowered at 6.00 p.m. in the evening. Dot was closest to Hong Kong on the early morning of 27 September when it was about 150 km to the west-northwest. Torrential rain affected the territory during the night of 26 September, but the weather improved on the following day.

During the passage of Dot, nine people were injured by collapsed scaffoldings and toppled trees. A traffic accident occurred in Aberdeen, injuring six more people. The heavy downpour associated with Dot triggered 63 landslips, causing chaos and interruption to traffic in Ap Lei Chau, Repulse Bay, Central and Tai PO. In Tsuen Wan, a mudslide damaged a gas pipe and more than 70 families had to be evacuated. The low-lying areas in the northern New Territories suffered from some of the worst flooding seen in recent decades. More than 40 villages were inundated and over 200 villagers stranded. A total of 33 people were injured. More than 450 hectares of farmland, about one third of the total in Hong Kong were flooded. Nearly 2 000 households of crop farmers and 50 households of fish farmers were affected. Damage to crops, livestock and fisheries amounted to about HK$ 80 million. In addition, electricity supply to 1 400 households was cut off.

At sea, a fisherman was reported missing from a fishing boat that sank in rough seas near Hong Kong. Ferry services to outlying islands, Macau and China were suspended. At the airport, several flights were cancelled, diverted or delayed. Dot brought plenty of rain to the territory and 14 out of the 17 reservoirs in Hong Kong were full in the wake of Dot.

The rainfall distribution associated with Dot is shown in Figure 36. Information on wind, rainfall and tide during the passage of Dot 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 Dot :-

	Maximum Gust			Maximum Hourly Wind		
Station (see Fig.1)	Direction	Speed(km/h)	Date Time	Direction	Speed(km/h)	Date Time
Central	ESE	62	26 Sep 0745	E	31	25 Sep 2000
Cheung Chau	E	96	26 Sep 1216	E	59	26 Sep 1300
Green Island	ENE	96	26 Sep 0910	E	63	26 Sep 0900
H.K. Airport(SE)	ENE	72	25 Sep 1711	ENE	36	25 Sep 2200
King's Park	E	68	26 Sep 1208	E	23	25 Sep 2000
Kwai Chung	ENE	79	26 Sep 0822	ENE	43	26 Sep 0900
Lau Fau Shan	ENE	63	26 Sep 0412	ENE	36	26 Sep 1500
Sai Kung	ENE	87	26 Sep 0726	ENE	49	26 Sep 1200
	ENE	87	26 Sep 0859			
Sha Lo Wan	E	96	26 Sep 0821	E	54	26 Sep 0800
				E	54	26 Sep 0900
Sha Tin	NE	72	26 Sep 0609	NE	23	26 Sep 0700
Star Ferry	ESE	67	26 Sep 0757	E	38	26 Sep 0900
Ta Kwu Ling	E	59	26 Sep 1108	E	23	26 Sep 1700
Tai Mo Shan	ESE	118	26 Sep 0831	E	79	25 Sep 2100
Tai Po Kau	E	63	26 Sep 1142	E	41	26 Sep 0700
Tate's Cairn	E	118	26 Sep 0548	E	63	26 Sep 0400
Tseung Kwan O	NNE	79	26 Sep 0440	NNE	23	26 Sep 0500
Tsing Yi	ENE	92	26 Sep 0905	ENE	45	26 Sep 1000
Tuen Mun	NE	63	26 Sep 0241	NE	20	26 Sep 0300
Waglan Island	E	112	26 Sep 0520	E	83	25 Sep 2200
				E	83	26 Sep 0100
				E	83	26 Sep 0200
Wong Chuk Hang	E	83	26 Sep 1212	E	36	26 Sep 0700

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

Station (see Fig.36)	23 Sep	24 Sep	25 Sep	26 Sep	27 Sep	Total
Royal Observatory	43.0	71.2	121.8	223.9	37.9	497.8
H19 (HK Island (east))	57.0	87.5	143.0	263.5	46.0	597.0
H13 (HK Island (west))	56.5	107.0	221.0	329.5	56.0	770.0
H21 (HK Island (south))	49.5	85.0	164.5	272.0	30.5	601.5
K04 (Kowloon (east))	48.5	94.5	169.0	291.5	40.5	644.0
K06 (Kowloon (west))	36.5	63.5	120.5	229.0	41.5	491.0
N13 (Sai Kung)	41.0	71.5	96.0	142.0	27.0	377.5
N09 (Sha Tin)	18.0	52.5	135.5	318.5	61.0	585.5
N05 (Sheung Shui)	19.5	39.0	65.5	316.5	41.5	482.0
R31 (Tai Po)	23.5	36.0	93.5	166.0	81.5	400.5
N06 (Tsuen Wan - Kwai Chung)	33.5	61.5	126.0	255.0	49.0	525.0
R21 (Tuen Mun)	5.5	62.0	97.0	145.5	74.0	384.0
N12 (Yuen Long)	7.5	35.5	59.0	116.0	52.0	270.0

Station with incomplete record :
N17 (Lantau)

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

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	2.17	26 Sep	6.32 a.m	0.42	26 Sep	2.17 p.m.
Quarry Bay	2.39	26 Sep	6.02 a.m.	0.48	26 Sep	1.53 p.m.
Tai Po Kau	2.57	26 Sep	6.08 a.m.	0.55	26 Sep	3.28 a.m.
Tsim Bei Tsui	2.46	26 Sep	6.09 a.m.	0.56	26 Sep	4.20 p.m.

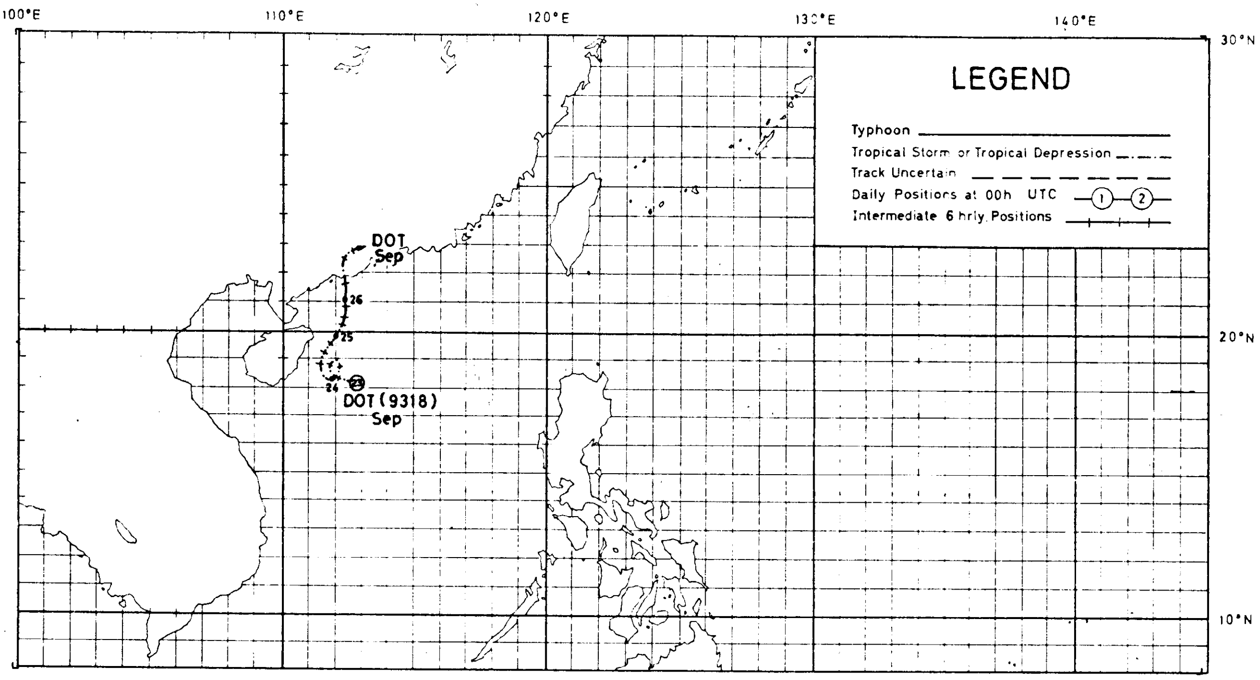


Figure 35. Track of Typhoon Dot (9318) : 23 - 27 September 1993.

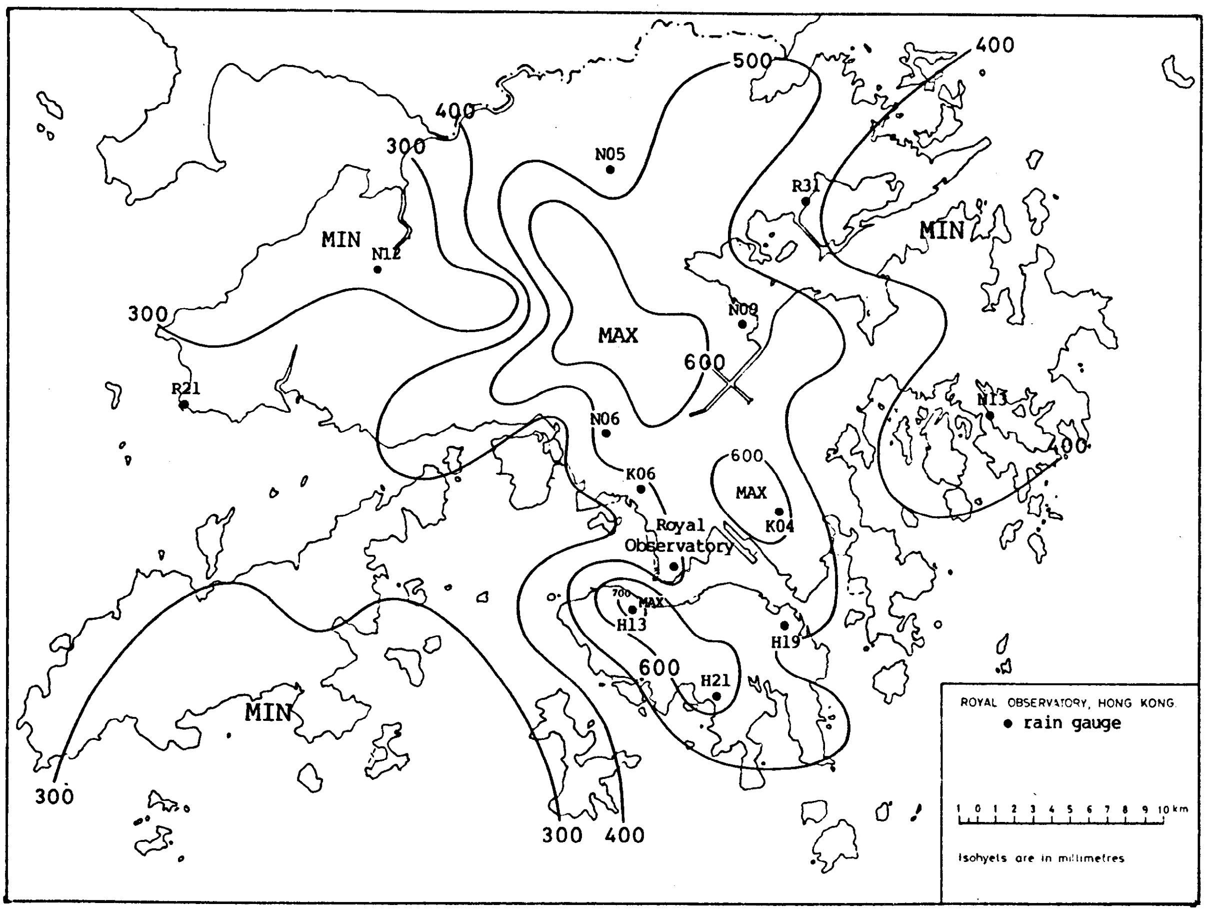


Figure 36. Rainfall distribution on 23 - 27 September 1993.

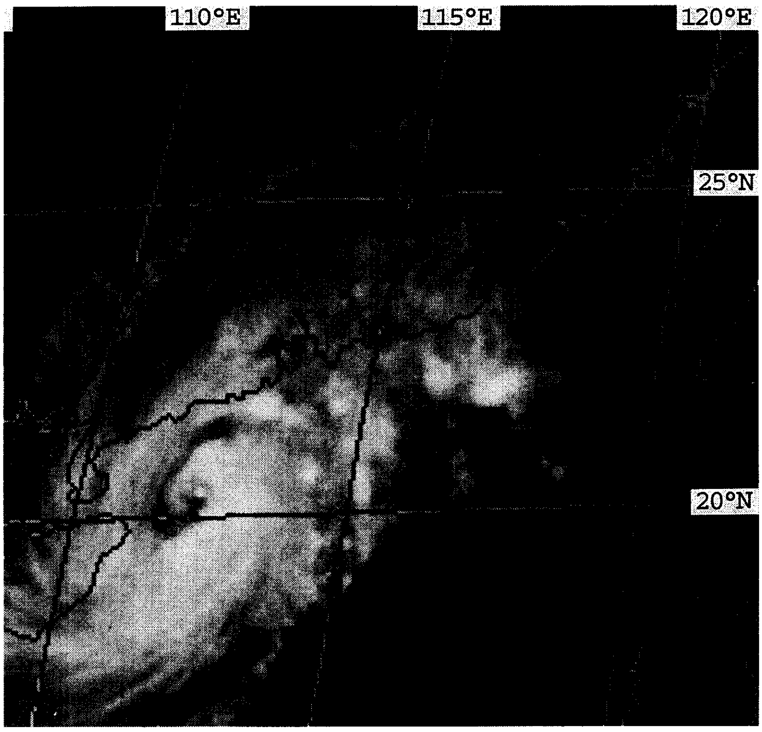


Figure 37. GMS-4 infra-red imagery of Dot at around 2 p.m. on 25 September 1993.

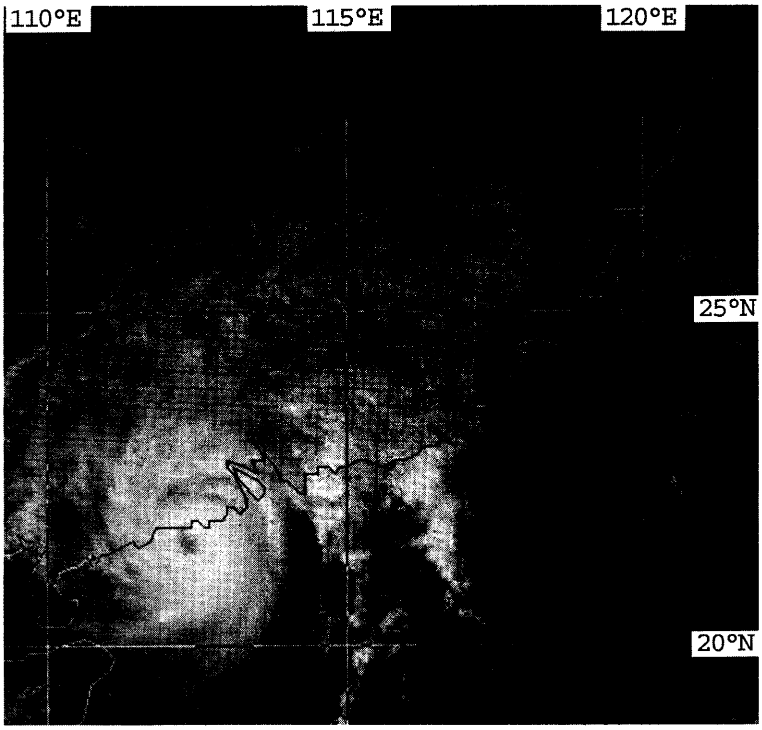


Figure 38. GMS-4 visible imagery of Dot at around 2 p.m. on 26 September 1993.

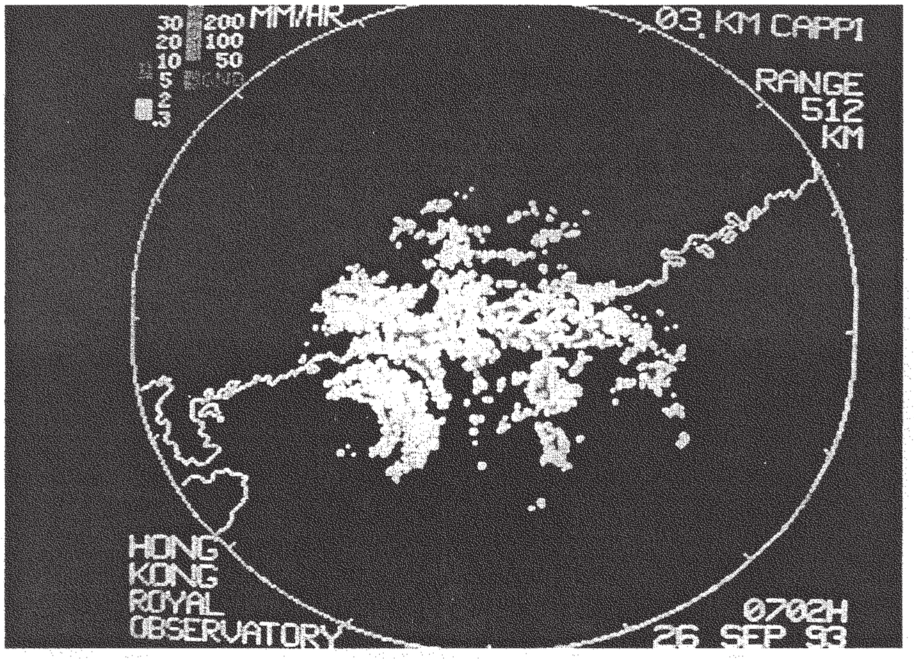


Figure 39. Radar display of the rain echoes of Dot at 7.02 a.m. on 26 September 1993.

Figure 40. Flooding in the northern New Territories (by courtesy of Wah Kiu Yat Po).

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 41. Flooding in Ho Sheung Heung village (by courtesy of Ming Pao Daily News).

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 42. A mudslide in Allway Gardens, Tsuen Wan (by courtesy of Oriental Daily News).

Figure 43. Excess water was discharged from Shing Mun Reservoir (by courtesy of Oriental Daily News).

(h) Tropical Depression

12-13 October 1993

The track of the tropical depression is shown in Figure 44

An area of disturbance over the northern part of the South China Sea developed into a tropical depression about 200 km east of Dongsha on the morning of 12 October. Moving westwards at about 14 km/h, it took on a west-northwesterly track after passing close to Dongsha at around midnight. The tropical depression then turned towards the northwest on the morning of 13 October and dissipated over water that afternoon.

In Hong Kong, the Stand By Signal No. 1 was hoisted at 4.45 p.m. on 12 October when the tropical depression was about 390 km to the east-southeast. The weather was generally fine at first with light to moderate easterlies offshore. As the tropical depression came closer the next day, clouds and rain began to affect the territory. The tropical depression was closest to Hong Kong when it was about 120 km to the southeast at around 2 p.m. that afternoon. It degenerated into an area of low pressure shortly afterwards. The Stand By Signal No. 1 was lowered at 4.45 p.m. The lowest sea-level pressure of 1 013.2 hPa was recorded at the Royal Observatory at around 5 p.m. Heavy showers associated with the remnant of the tropical depression affected the territory until the next morning.

In Hong Kong, no damage was reported and local transport was generally unaffected.

The rainfall distribution associated with the tropical depression is shown in Figure 45. Information on wind, rainfall and tide during the passage of the tropical depression is given as follows :

Maximum gust peak speeds and maximum hourly mean winds with associated wind directions recorded at various stations on days when tropical cyclone warning signal was hoisted for the tropical depression :-

	Maximum Gust			Maximum Hourly Wind		
Station (see Fig.1)	Direction	Speed(km/h)	Date Time	Direction	Speed(km/h)	Date Time
Central	E	30	13 Oct 1255	N	13	13 Oct 1300
Cheung Chau	N	51	13 Oct 1437	N	27	13 Oct 1400
				N	27	13 Oct 1500
Green Island	NNE	45	13 Oct 1256	NNE	30	13 Oct 1300
	NNE	45	13 Oct 1300			
H.K. Airport(SE)	NE	30	13 Oct 1229	NE	14	13 Oct 1300
King's Park	N	30	13 Oct 1035	ESE	12	12 Oct 2200
	NNE	30	13 Oct 1036			
Kwai Chung	NNE	38	13 Oct 1328	NW	20	13 Oct 1600
Lau Fau Shan	NE	25	13 Oct 0913	NW	14	13 Oct 1500
Sai Kung	NNW	41	13 Oct 1434	N	22	13 Oct 1500
Sha Lo Wan	NE	31	13 Oct 1028	ENE	16	13 Oct 1200
	NE	31	13 Oct 1030			
Sha Tin	NNW	34	13 Oct 1402	NE	9	13 Oct 1300
Star Ferry	WNW	23	13 Oct 1421	WNW	13	13 Oct 1600
	W	23	13 Oct 1529			
Ta Kwu Ling	NNE	31	13 Oct 0910	N	12	13 Oct 1000
Tai Mo Shan	NE	56	13 Oct 1253	ENE	40	13 Oct 1400
	ENE	56	13 Oct 1256			
Tai Po Kau	W	27	13 Oct 1503	W	14	13 Oct 1600
Tate's Cairn	NNE	54	13 Oct 1548	NNE	38	13 Oct 1600
Tseung Kwan O	N	45	13 Oct 1541	N	22	13 Oct 1600
Tsing Yi	NE	43	13 Oct 1301	NNE	20	13 Oct 1400
	NNE	43	13 Oct 1315			
Tuen Mun	NE	31	13 Oct 0937	NE	13	13 Oct 1000
				NE	13	13 Oct 1200
				NE	13	13 Oct 1300
Waglan Island	NNE	63	13 Oct 1629	N	40	13 Oct 1300
				N	40	13 Oct 1600
				NNE	40	13 Oct 1700
Wong Chuk Hang	NW	45	13 Oct 1031	NE	13	13 Oct 1400

Daily rainfall amounts in millimetres recorded at the Royal Observatory and other stations during the passage of the tropical depression :-

Station (see Fig.45)	12 Oct	13 Oct	14 Oct	Total
Royal Observatory	Nil	13.6	69.4	83.0
H19 (HK Island (east))	Nil	7.5	63.5	71.0
H13 (HK Island (west))	Nil	40.5	65.5	106.0
H21 (HK Island (south))	Nil	8.0	32.0	40.0
K04 (Kowloon (east))	Nil	24.5	103.0	127.5
K06 (Kowloon (west))	Nil	27.0	75.0	102.0
R11 (Lantau)	Nil	42.0	26.5	88.5
N05 (Sheung Shui)	Nil	45.0	58.0	103.0
N13 (Sai Kung)	Nil	12.0	27.0	39.0
N09 (Sha Tin)	Nil	48.0	37.5	85.5
R31 (Tai Po)	Nil	40.0	16.5	56.5
N06 (Tsuen Wan - Kwai Chung)	Nil	47.0	68.0	115.0
R21 (Tuen Mun)	Nil	41.5	8.5	50.0
N12 (Yuen Long)	Nil	35.0	44.5	79.5

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

Station see Fig.1)	Maximum sea level above chart datum			Maximum storm surge above astronomical tide		
	Height (m)	Date	Time	Height (m)	Date	Time
Ko Lau Wan	2.28	12 Oct	6.14 a.m.	0.32	12 Oct	6.14 a.m.
Lok On Pai	2.02	13 Oct	7.46 a.m.	0.06	14 Oct	4.20 a.m.
Quarry Bay	2.24	12 Oct	6.02 a.m.	0.16	12 Oct	6.02 a.m.
Tai Po Kau	2.31	12 Oct	6.26 a.m.	0.43	12 Oct	6.26 a.m.
Tsim Bei Tsui	2.45	13 Oct	7.45 a.m.	0.52	14 Oct	5.59 a.m.

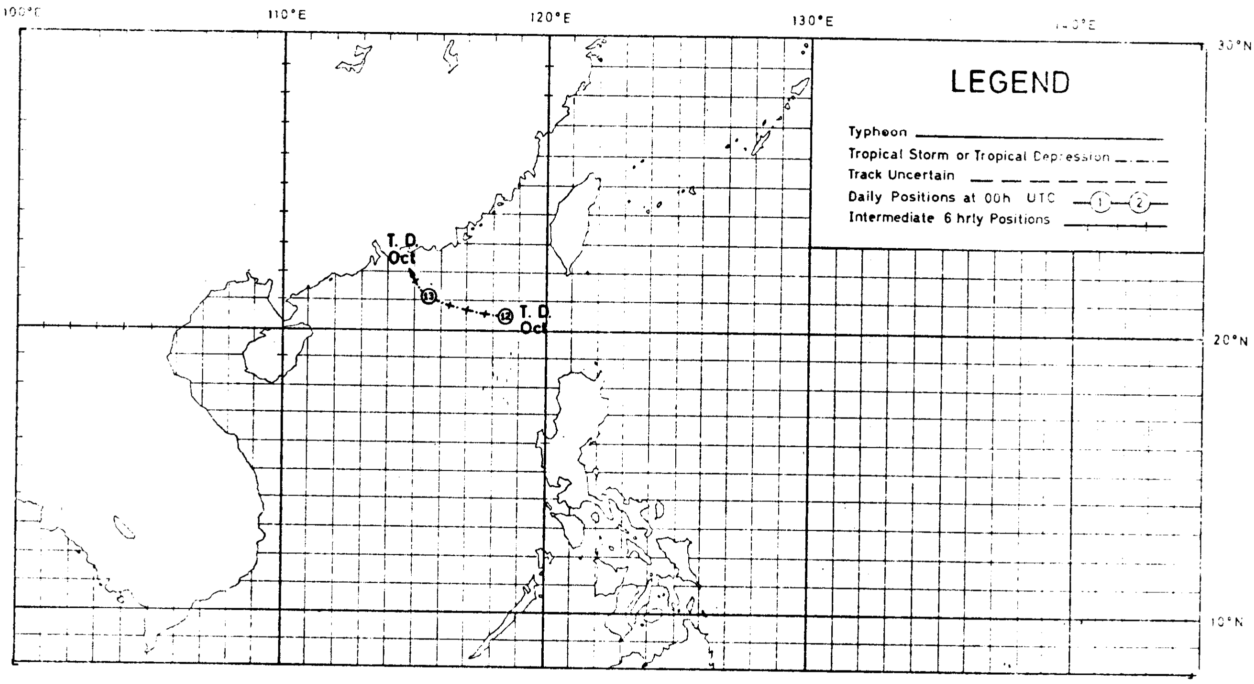


Figure 44. Track of the Tropical Depression of 12 - 13 October 1993.

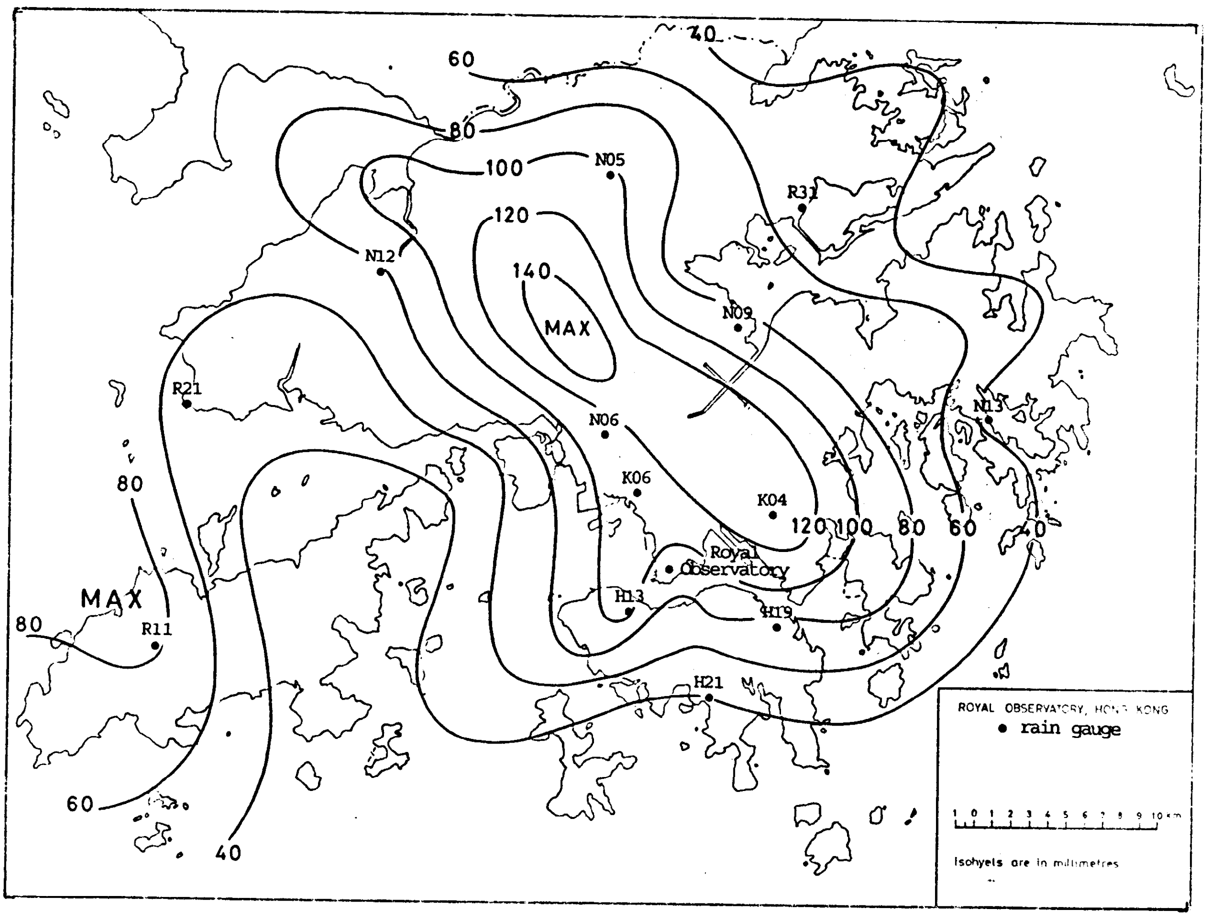


Figure 45. Rainfall distribution on 12 - 14 October 1993.

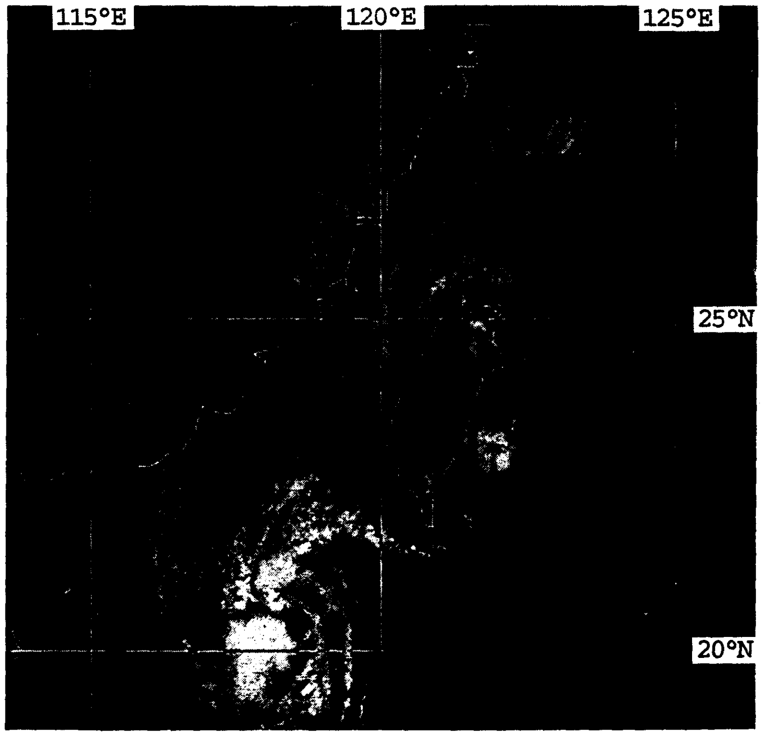


Figure 46. GMS-4 visible imagery of the Tropical Depression at around 11 a.m. on 12 October 1993.

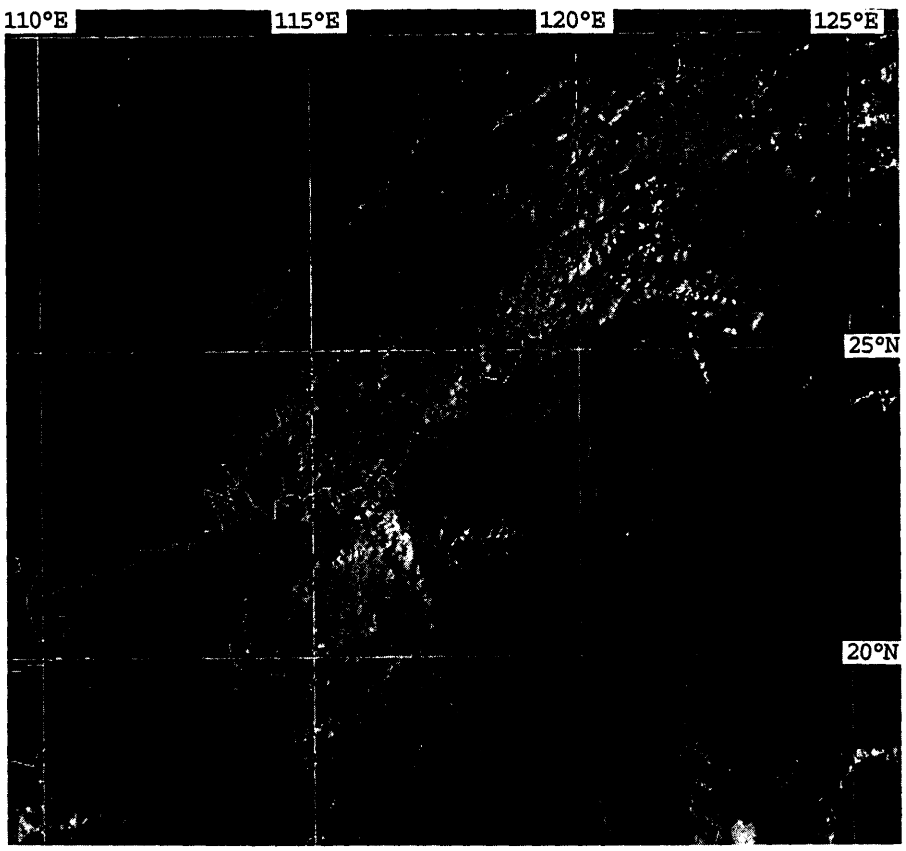


Figure 47. GMS-4 visible imagery of the Tropical Depression at around 8 a.m. on 13 October 1993.

(i) Typhoon Ira (9323)

28 October - November 1993

The track of Ira is shown in Figure 48

Ira formed as a tropical depression about 100 km southwest of Guam early on 28 October. Moving westwards at about 38 km/h, it intensified to a tropical storm that night. Ira deepened further into a severe tropical storm early on 30 October and attained typhoon intensity in the evening. With a well-defined eye, Ira reached peak intensity about 510 km east of Manila on 31 October when the minimum sea-level pressure and maximum sustained winds near its centre were estimated to be 940 hPa and 160 km/h respectively. It weakened into a severe tropical storm after making landfall over Luzon on 1 November and became a tropical storm shortly before entering the South China Sea.

In the Philippines, 21 people died, five went missing and seven others were injured. Heavy rain associated with Ira triggered off mudflows down the slopes of Mount Pinatubo. Nearby villages were buried and about 20 000 people had to be evacuated. Extensive crop damage was reported. Total economic loss amounted to US$60 million.

Ira weakened into a tropical depression on the afternoon of 2 November while traversing the South China Sea, but re-intensified into a tropical storm the next day. It weakened again into a tropical depression on the evening of 4 November. Ira made landfall about 50 km southwest of Yangjiang around midnight and dissipated over land the next morning.

In Guangdong, 3 700 houses were destroyed or damaged and more than 62 800 families were affected. Total economic loss was around US$16 million.

In Macau, flooding occurred in some low-lying areas. Helicopter and some ferry services between Hong Kong and Macau were suspended.

In Hong Kong, the Stand By Signal No. 1 was hoisted at 3.50 p.m. on 2 November when Ira was about 700 km to the southeast. The weather that afternoon was generally cloudy with moderate to fresh winds from the north. Winds strengthened from the east on the early morning of 4 November and the Strong Wind Signal No. 3 was hoisted at 4.10 a.m. It remained cloudy with rain all day. Ira came closest to Hong Kong at around 5 p.m. when it was about 250 km to the southwest. The lowest sea-level pressure of 1008.7 hPa was recorded at the Royal Observatory an hour earlier. All signals were lowered at 0.35 a.m. on 5 November as Ira landed near Yangjiang.

In Hong Kong, an aircraft with 296 passengers on board skidded off the Kai Tak airport runway and plunged into the harbour at 11.37 a.m. on 4 November. Fortunately, most of the passengers escaped unscathed, but 23 needing treatment in hospitals for minor injuries. The airport had to be closed for more than six hours, affecting some 200 flights.

During the passage of Ira, a sampan capsized over the waters between Lamma Island and Green Island. In Tsuen Wan and Shau Kei Wan, several vehicles were damaged by collapsed scaffoldings. Ferry services from Central to Tsim Sha Tsui East, and Central to some outlying islands were suspended.

Thunderstorms and heavy showers associated with the remnant of Ira affected Hong Kong early on the morning of 5 November. Rain was particularly heavy in the western part of the territory. A total of over 700 millimetres was recorded in Tung Chung on 4 and 5 November. Altogether, about 80 flooding incidents and 125 cases of landslides were reported in the territory. An elderly man in Yuen Long and a taxi driver in Lantau were killed. Seven people were injured and over 100 were stranded by floods. About 40 village houses in Yuen Long and 90 hectares of agricultural land, mostly in Kam Tin and Pat Heung, were inundated. A total of around 2.7 hectares of fish ponds was devastated with losses estimated at HK$75 000. Flooding in Lantau Island caused damage to many roads. Two pipelines were broken by landslides at Mui Wo, interrupting water supplies to Cheung Chau and Chi Ma Wan. The flood waters also inundated the main water pumping station in Tuen Mun, leaving around

430 000 residents in the area without fresh water supplies for several days.

The rainfall distribution associated with Ira is shown in Figure 49. Information on wind, rainfall and tide during the passage of Ira 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 Ira:-

	Maximum Gust			Maximum Hourly Wind		
Station (see Fig.1)	Direction	Speed(km/h)	Date Time	Direction	Speed(km/h)	Date Time
Central	ESE	75	4 Nov 2158	ESE	38	4 Nov 1600
Cheung Chau	E	112	4 Nov 2022	E	70	4 Nov 1900
Green Island	E	101	4 Nov 1314	E	70	4 Nov 0500
	ENE	101	4 Nov 1527			
H.K. Airport(SE)	ENE	85	4 Nov 0510	E	51	4 Nov 2000
	ENE	85	4 Nov 1313			
King's Park	E	72	4 Nov 1605	ESE	25	4 Nov 2100
Kwai Chung	ENE	96	4 Nov 1835	ENE	58	4 Nov 2000
Lau Fau Shan	E	94	4 Nov 1948	E	45	4 Nov 2000
Sai Kung	ENE	79	4 Nov 1417	ENE	51	4 Nov 2000
Sha Lo Wan	E	121	4 Nov 2136	E	76	4 Nov 2000
Sha Tin	NE	83	4 Nov 2033	ENE	30	4 Nov 2100
Star Ferry	ESE	81	4 Nov 1640	E	47	4 Nov 1900
Ta Kwu Ling	ESE	65	4 Nov 2053	E	30	4 Nov 2100
Tai Mo Shan	E	148	4 Nov 1930	E	99	4 Nov 2200
Tai Po Kau	E	70	4 Nov 1808	E	47	4 Nov 2100
Tate's Cairn	E	124	4 Nov 1342	E	76	4 Nov 2100
Tseung Kwan O	ESE	75	4 Nov 1949	ESE	30	4 Nov 2000
Tsing Yi	ENE	103	4 Nov 0502	ENE	52	4 Nov 0600
Tuen Mun	ESE	70	4 Nov 2144	E	23	4 Nov 2200
Waglan Island	E	104	4 Nov 1906	E	83	4 Nov 1600
Wong Chuk Hang	ENE	94	4 Nov 1546	ENE	45	4 Nov 1600

Daily rainfall amounts in millimetres recorded at the Royal Observatory and other stations on days when tropical cyclone warning signals were hoisted for Ira :-

Station (see Fig.49)	2 Nov	3 Nov	4 Nov	5 Nov	Total
Royal Observatory	Nil	Trace	86.1	36.2	122.3
H13 (HK Island (west))	Nil	Nil	168.0	51.5	219.5
H21 (HK Island (south))	Nil	Nil	130.5	23.0	153.5
K04 (Kowloon (east))	Nil	Nil	104.5	30.5	135.0
K06 (Kowloon (west))	Nil	1.0	99.5	27.0	127.5
N17 (Lantau)	Nil	1.5	257.5	517.5	776.5
N13 (Sai Kung)	Nil	Nil	60.0	18.5	78.5
N09 (Sha Tin)	Nil	0.5	85.5	30.0	116.0
N05 (Sheung Shui)	Nil	Nil	61.0	41.5	102.5
R31 (Tai Po)	Nil	1.0	84.5	24.5	110.0
N06 (Tsuen Wan - Kwai Chung)	Nil	1.0	117.5	36.5	155.0
R21 (Tuen Mun)	Nil	1.5	134.0	344.5	480.0
N12 (Yuen Long)	Nil	Nil	52.5	214.5	267.0

Station with incomplete record :
H19 (HK Island (east))

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

Station (see Fig.1)	Maximum sea level above chart datum			Maximum storm surge above astronomical tide		
	Height (m)	Date	Time	Height (m)	Date	Time
Ko Lau Wan	2.65	3 Nov	11.56 p.m.	0.64	4 Nov	8.00 a.m.
Lok On Pai	2.53	3 Nov	11.39 p.m.	0.39	4 Nov	8.31 a.m.
Quarry Bay	2.68	3 Nov	11.44 p.m.	0.45	4 Nov	7.54 a.m.
Tai Po Kau	2.66	4 Nov	00.09 a.m.	0.65	4 Nov	8.29 a.m.
Tsim Bei Tsui	2.97	3 Nov	11.17 p.m.	0.79	5 Nov	9.11 a.m.

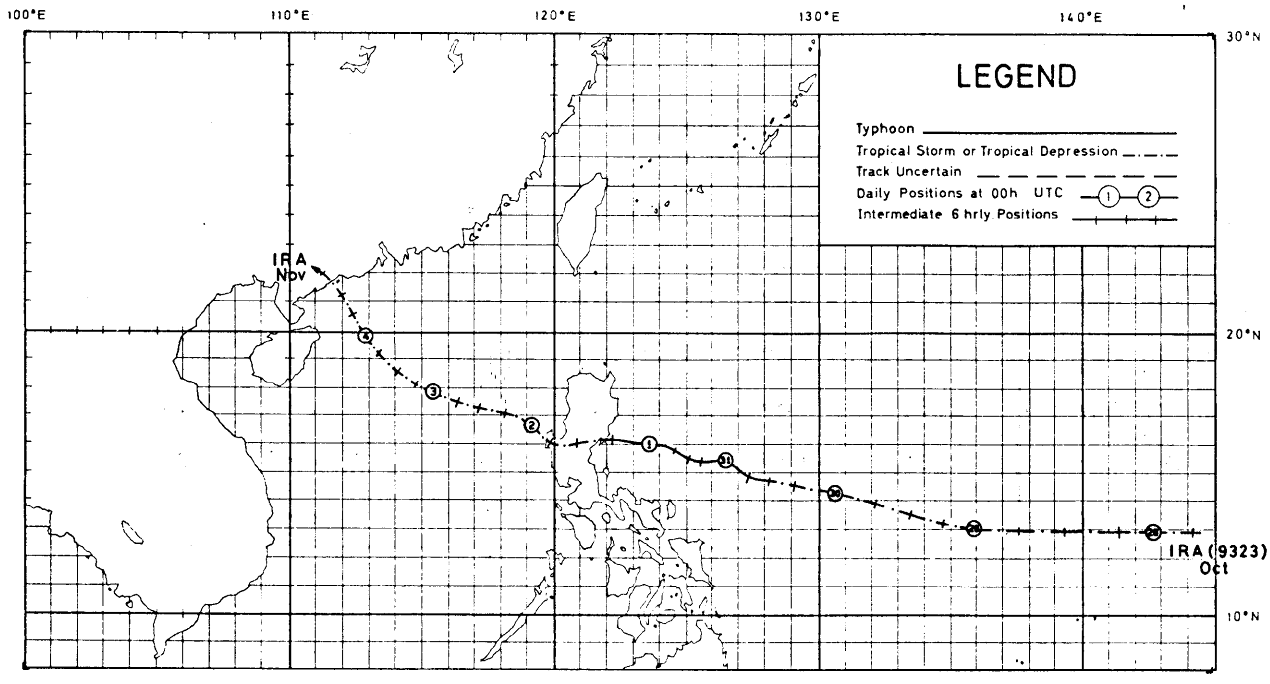


Figure 48. Track of Typhoon Ira (9323) : 28 October - 5 November 1993.

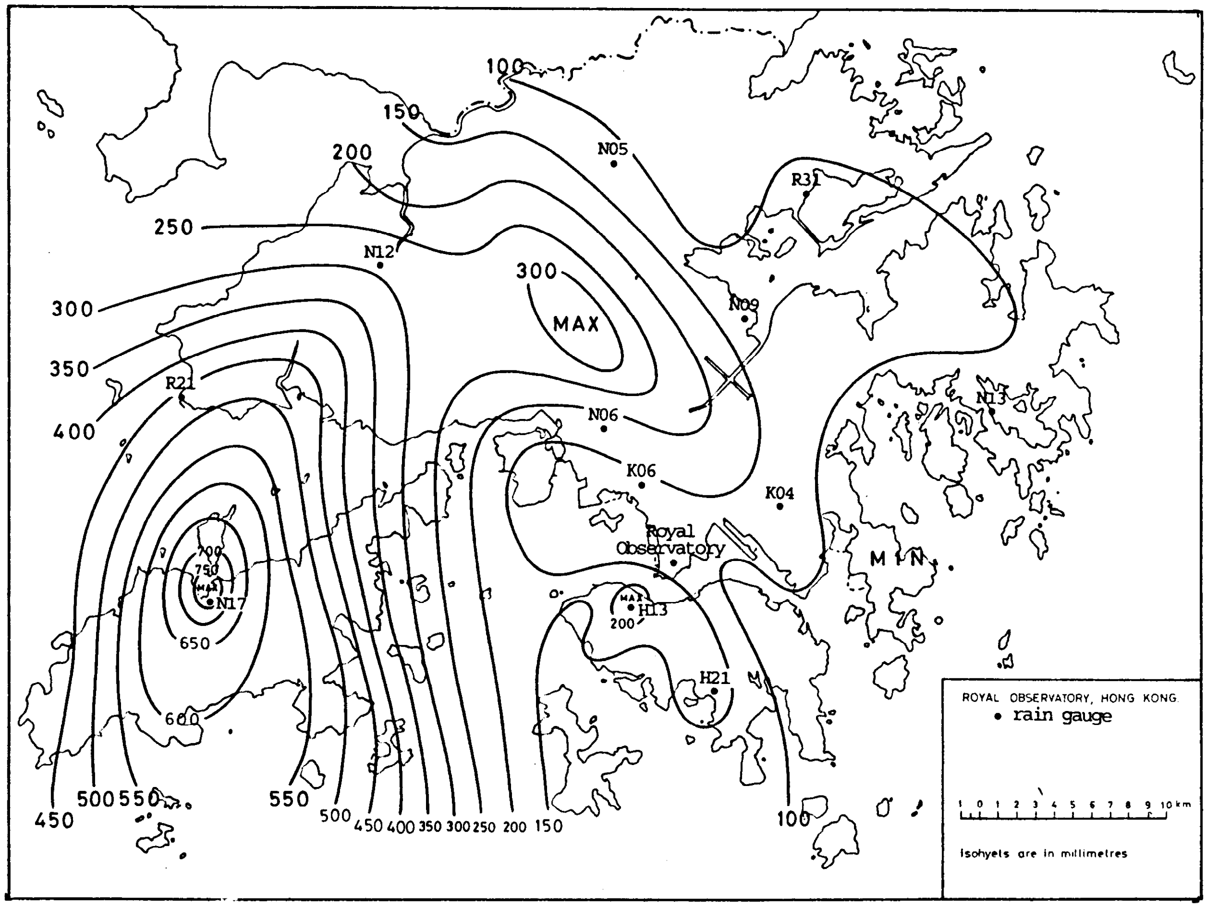


Figure 49. Rainfall distribution on 2 - 5 November 1993.

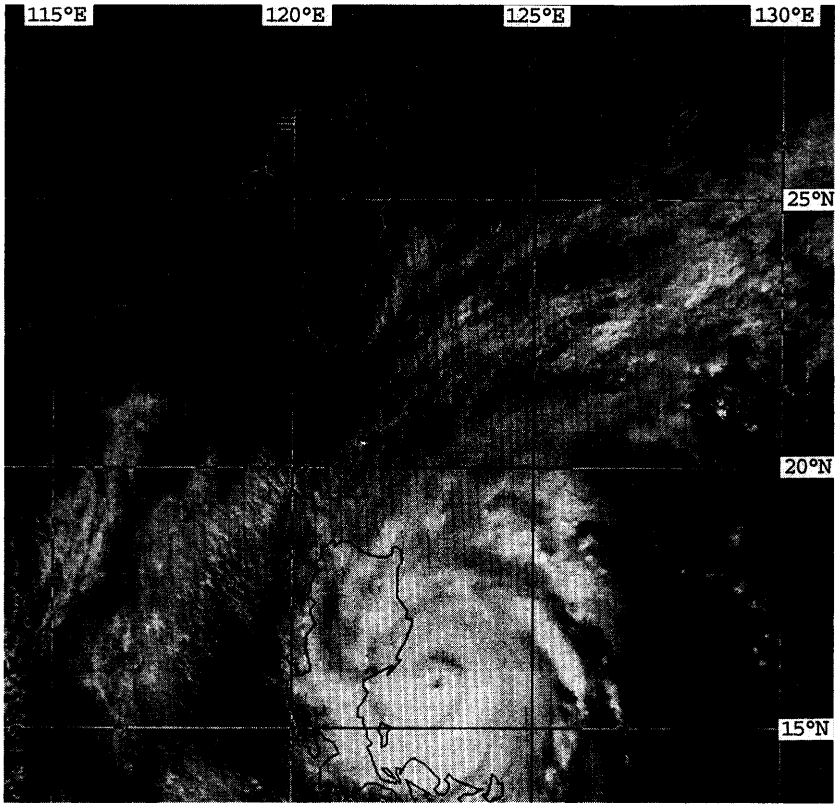


Figure 50. GMS-4 visible imagery of Ira at around 11 a.m. on 1 November 1993.

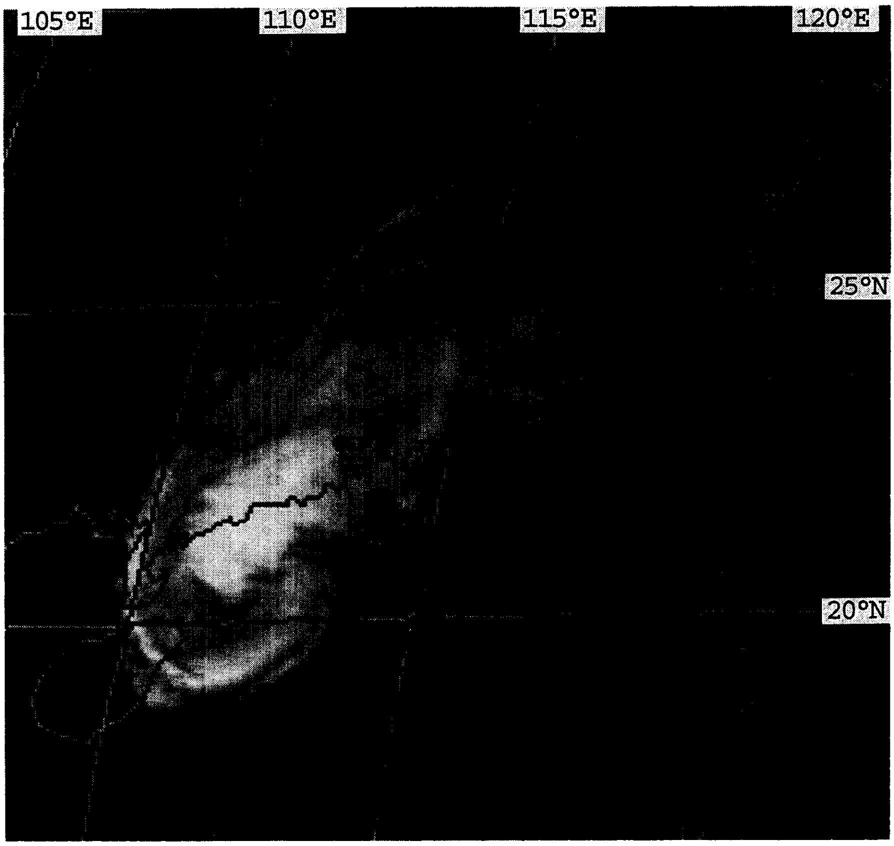


Figure 51. GMS-4 infra-red imagery of Ira at around 5 p.m. on 4 November 1993.

Figure 52. A flood scene in the New Territories (by courtesy of Oriental Daily News).

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 53. An aircraft skidded off the runway into Victoria Harbour under adverse weather (by courtesy of Ming Pao Daily News).

Figure 54. A taxi driver and the taxi were submerged in flood water in Lantau (by courtesy of Wen Wei Po).

Section 4

TROPICAL CYCLONE STATISTICS AND TABLES

TABLE 1 is a list of tropical cyclones in 1993 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 Royal Observatory in 1993, 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 l0°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 1993. 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 1993 inclusive.

TABLE 5 gives the annual number of tropical cyclones in Hong Kong's area of responsibility between 1956 and 1993. 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- 1993.

TABLE 7 is a summary of meteorological information for each tropical cyclone affecting Hong Kong in 1993. 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 Royal 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 1993 and highlights the 10 wettest tropical cyclones in Hong Kong for the period 1884- 1939 and 1947-1993.

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 neareat approach, the minimum mean sea-level pressures recorded at the Royal Observatory and the maximum 60-minute mean winds and maximum gust peak speeds recorded at some stations in Hong Kong.

TABLE 10 contains damage caused by tropical cyclones in 1993. The information is compiled from reports by various government departments, public utility companies and local newspapers.

TABLE 11 presents the casualties and damage figures associated with tropical cyclones in Hong Kong for the past 30 years. The information is compiled from local newspaper reports and from the Marine Departments records.

TABLE 1. LIST OF TROPICAL CYCLONES IN THE WESTERN NORTH PACIFIC AND THE SOUTH CHINA SEA IN 1993

Name of tropical cyclone		Beginning of track					End of track					Remark
		Date		Time UTC	Position °N	Position °E	Date		Time UTC	Position °N	Position °E	
Severe Tropical Storm Irma	(9301)	11	Mar	1200	4.7	162.7	16	Mar	1800	17.4	151.4	Dissipated
Tropical Storm Jack		16	May	1200	9.9	158.8	20	May	0000	12.3	155.3	Dissipated
Typhoon Koryn	(9302)	21	Jun	0000	7.1	144.1	28	Jun	0000	23.1	110.2	Dissipated
Severe Tropical Storm Lewis	(9303)	8	Jul	0600	12.7	124.1	12	Jul	0600	19.2	104.5	Dissipated
Tropical Depression Marian		14	Jul	0000	9.8	133.8	15	Jul	0600	14.6	127.9	Dissipated
Severe Tropical Storm Nathan	(9304)	19	Jul	0000	13.4	151.8	24	Jul	1800	34.5	134.5	Became Extratropical
Tropical Storm Ofelia	(9305)	25	Jul	0600	20.3	137.7	27	Jul	1800	38.6	134.8	Became Extratropical
Severe Tropical Storm Percy	(9306)	27	Jul	1800	22.4	130.3	30	Jul	0000	37.0	132.1	Became Extratropical
Typhoon Robyn	(9307)	1	Aug	1200	6.8	152.8	10	Aug	1200	38.7	133.3	Became Extratropical
Severe Tropical Storm Steve	(9308)	5	Aug	1200	11.3	153.3	12	Aug	0600	22.3	131.5	Dissipated
Typhoon Tasha	(9309)	16	Aug	0000	16.0	128.5	21	Aug	1200	22.8	109.0	Dissipated
Typhoon Keoni	(9310)	20	Aug	0000	20.7	179.4	28	Aug	0600	37.1	161.5	Dissipated
Typhoon Vernon	(9311)	21	Aug	0600	17.5	153.8	28	Aug	0000	42.0	144.1	Became Extratropical
Tropical Storm Winona	(9312)	23	Aug	0600	12.0	120.6	28	Aug	1800	17.1	107.5	Dissipated
Typhoon Yancy	(9313)	29	Aug	0000	20.0	137.8	3	Sep	1800	34.7	133.6	Became Extratropical
Severe Tropical Storm Zola	(9314)	5	Sep	0600	19.0	131.3	9	Sep	0000	34.4	136.2	Dissipated
Typhoon Abe	(9315)	9	Sep	0000	18.8	124.2	14	Sep	1200	23.8	113.9	Dissipated
Severe Tropical Storm Becky	(9316)	15	Sep	0600	18.9	123.2	17	Sep	1200	22.6	110.5	Dissipated
Typhoon Cecil	(9317)	22	Sep	1200	11.8	152.0	27	Sep	1800	35.2	155.0	Became Extratropical
Typhoon Dot	(9318)	23	Sep	0000	18.3	112.8	26	Sep	1800	22.7	112.8	Dissipated
Typhoon Ed	(9319)	30	Sep	0000	12.6	146.2	8	Oct	0000	34.4	145.4	Became Extratropical
Typhoon Flo	(9320)	1	Oct	0600	16.7	129.8	8	Oct	0600	31.4	136.7	Became Extratropical
Tropical Depression Gene	(9321)	8	Oct	0000	13.6	138.8	10	Oct	0000	23.7	131.9	Dissipated
Tropical Depression		12	Oct	0000	20.5	118.6	13	Oct	0600	21.7	115.1	Dissipated
Severe Tropical Storm Hattie	(9322)	19	Oct	1200	13.0	160.0	25	Oct	1200	36.3	170.2	Became Extratropical
Typhoon Ira	(9323)	27	Oct	1800	12.9	144.2	4	Nov	1800	22.0	111.2	Dissipated
Tropical Storm Jeana	(9324)	4	Nov	0600	10.2	157.3	12	Nov	0600	22.3	139.8	Dissipated
Typhoon Kyle	(9325)	18	Nov	0600	8.9	134.4	24	Nov	0600	14.0	105.0	Dissipated
Typhoon Lola	(9326)	1	Dec	0600	6.1	149.2	9	Dec	0600	13.7	105.9	Dissipated
Typhoon Manny	(9327)	3	Dec	0000	7.0	156.2	13	Dec	1200	10.9	113.0	Dissipated
Severe Tropical Storm Nell	(9328)	20	Dec	1200	6.7	151.9	28	Dec	1800	10.1	116.3	Dissipated

TABLE 2. TROPICAL CYCLONE WARNINGS FOR SHIPPING ISSUED IN 1993

Tropical cyclone	No. of warnings issued	Date and time† of issue of						Duration of warnings (hours)
		First warning			Last warning			
*Typhoon Koryn	24	25	Jun	0600	28	Jun	0000	66
*Severe Tropical Storm Lewis	32	8	Jul	0900	12	Jul	0600	93
*Typhoon Tasha	43	16	Aug	2100	22	Aug	0300	126
*Tropical Storm Winona	51	23	Aug	0000	29	Aug	0600	150
*Typhoon Abe	42	9	Sep	0300	14	Sep	0600	123
*Severe Tropical Storm Becky	24	14	Sep	2100	17	Sep	1800	69
*Typhoon Dot	30	23	Sep	0900	26	Sep	2100	84
Typhoon Flo	30	3	Oct	0600	6	Oct	2100	87
*Tropical Depression	9	12	Oct	0900	13	Oct	0900	24
*Typhoon Ira	35	31	Oct	1500	4	Nov	2100	102
Typhoon Kyle	30	20	Nov	0900	24	Nov	0000	87
Typhoon Lola	33	5	Dec	0000	20	Dec	0000	360
Typhoon Manny	35	9	Dec	1800	14	Dec	0000	102
Severe Tropical Storm Nell	21	26	Dec	1200	29	Dec	0000	60
Total	439							1533

* 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 1993

SUMMARY

Signal	No. of occasions	Total duration
1	8	189 h 20 min
3	9	96 h 50 min
8 NORTHWEST	-	-
8 SOUTHWEST	-	-
8 NORTHEAST	2	10 h 40 min
8 SOUTHEAST	4	28 h 50 min
9	-	-
10	-	-
Total	23	325 h 40 min

DETAILS

Tropical cyclone	No. of warning bulletins issued	Signal	Hoisted Date	Hoisted Time*	Lowered Date	Lowered Time*
Typhoon Koryn	41	1	26 Jun	1510	27 Jun	0330
		3	27 Jun	0330	27 Jun	1030
		8 NE	27 Jun	1030	27 Jun	1630
		8 SE	27 Jun	1630	27 Jun	2225
		3	27 Jun	2225	28 Jun	0415
Severe Tropical Storm Lewis	22	1	10 Jul	0005	10 Jul	2200
Typhoon Tasha	67	1	18 Aug	1615	19 Aug	1045
		3	19 Aug	1045	20 Aug	1600
		8 SE	20 Aug	1600	21 Aug	0030
		3	21 Aug	0030	21 Aug	0940
Tropical Storm Winona	17	1	25 Aug	2230	26 Aug	1545
Typhoon Abe	47	1	12 Sep	0950	14 Sep	0750
Severe Tropical Storm Becky	41	1	16 Sep	0930	16 Sep	2230
		3	16 Sep	2230	17 Sep	0250
		8 NE	17 Sep	0250	17 Sep	0730
		8 SE	17 Sep	0730	17 Sep	1510
		3	17 Sep	1510	17 Sep	1700
Typhoon Dot	28	3	25 Sep	1615	26 Sep	0915
		8 SE	26 Sep	0915	26 Sep	1600
		3	26 Sep	1600	26 Sep	1800
Tropical Depression in October	27	1	12 Oct	1645	13 Oct	1645
Typhoon Ira	57	1	2 Nov	1550	4 Nov	0410
		3	4 Nov	0410	5 Nov	0035

* Hong Kong Time (UTC + 8)

TABLE 4. FREQUENCY AND TOTAL DURATION OF DISPLAY OF TROPICAL CYCLONE WARNING SIGNALS : 1956-1993

Year \ Signals	1	3	8 NW	8 SW	8 NE	8 SE	9	10	Total duration h	Total duration min
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
Total	253	230	11	18	46	35	13	11	10850	49
Mean	6.7	6.1	0.3	0.5	1.2	0.9	0.3	0.3	285	33

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 - 1993

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
Total	617	240
Mean	16.2	6.3

TABLE 6. DURATION OF TROPICAL CYCLONE WARNING SIGNALS HOISTED IN HONG KONG : 1956-1993

Signal hoisted	Number of occasions	Duration of each occasion: Mean h	min	Maximum h	min	Minimum h	min	Total duration per year: Mean h	min	Maximum h	min	Minimum h	min
1 or higher	250	43	24	161	0	9	35	285	33	570	15	36	35
3 or higher	176	31	18	124	15	6	55	145	0	306	35	23	55
8 or higher	56	16	30	66	50	2	40	24	18	100	55	0	0
8 NW	11	6	51	15	45	1	30	1	59	15	45	0	0
8 SW	18	5	17	10	45	2	30	2	30	16	10	0	0
8 NE	46	8	31	35	35	2	35	10	18	40	20	0	0
8 SE	35	7	25	21	45	0	20	6	50	31	15	0	0
9 or higher	14	7	18	11	33	3	35	2	41	19	25	0	0
10	11	6	10	9	10	2	30	1	47	12	10	0	0

TABLE 7. A SUMMARY OF METEOROLOGICAL OBSERVATIONS RECORDED IN HONG KONG DURING THE PASSAGES OF TROPICAL CYCLONES IN 1993

(a)

Name of tropical cyclone	Month	Nearest approach to Hong Kong						Minimum M.S.L. pressure at the Royal 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
T. Koryn	Jun	27	18	SW	160	WNW 25	970	Jun	27	15	994.3	-	-	1.34	1.34	-	1.46	-	-
S.T.S. Lewis	Jul	10	11	SSW	510	WNW 30	985	Jul	10	17	1005.8	-	0.18	0.08	0.11	0.14	-	0.06	-
T. Tasha	Aug	20	18	SSW	220	NW 13	970	Aug	20	18	995.4	-	-	0.52	0.58	0.72	0.89	0.70	-
T.S. Winona	Aug	27	14	S	510	WSW 13	1000	Aug	27	17	1004.2	-	-	0.01	0.02	0.12	0.16	0.13	-
T. Abe	Sep	14	17	NNE	150	W 23	995	Sep	13	16	1005.4	-	0.17	0.13	0.15	-	-	0.31	-
S.T.S. Becky	Sep	17	7	SSW	110	WNW 30	980	Sep	17	7	997.3	-	-	1.02	0.88	-	1.42	1.32	-
T. Dot	Sep	27	2	WNW	150	ENE 12	1000	Sep	26	16	1005.7	-	-	0.42	0.48	-	0.55	0.56	-
T.D.	Oct	13	14	SE	120	NW 14	1008	Oct	13	17	1013.2	-	0.32	0.06	0.16	-	0.43	0.52	-
T. Ira	Nov	4	17	SW	250	NNW 16	995	Nov	4	16	1008.7	-	0.64	0.39	0.45	-	0.65	0.79	-

* 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	
T. Koryn	Jun	ESE	49	ENE	101	ESE	52	E	104	ESE	121	E	151
S.T.S. Lewis	Jul	ESE	16	ESE	34	SE	23	S	59	SE,S	43	S	79
T. Tasha	Aug	ESE	40	SE	92	ESE	45	SSE	99	SE	90	SSE	126
T.S. Winona	Aug	SE	9	SSE	16	W	12	SSE	20	SE,ESE	19	SSE	22
T. Abe	Sep	SE	13	WNW	27	SE	13	WNW	30	ESE	25	WNW	38
S.T.S. Becky	Sep	SE	54	SE	122	ESE	62	SE	125	ESE	142	E	176
T. Dot	Sep	E	23	E	87	ENE	30	E	92	E	68	E	112
T.D.	Oct	N	12	NNE	43	N	16	NNE	49	N,NNE	30	NNE	63
T. Ira	Nov	E	27	E	83	E	31	E	87	E	72	E	104

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 1993

Name of tropical cyclone	Period* when tropical cyclone within 600 km of Hong Kong ($T_1 \rightarrow T_2$)	Rainfall at the Royal Observatory (mm)				
		(i) 600 km ($T_1 \rightarrow T_2$)	(ii) 24 hours after T_2	(iii) 48 hours after T_2	(iv) 72 hours after T_2	(i) + (iv) Total $T_1 \rightarrow$ (T_2+72 hours)
T. Koryn	(T_1) 26 Jun 2100 - (T_2) 28 Jun 0800	14.0	7.1	7.4	7.4	21.4
S.T.S. Lewis	(T_1) 10 Jul 0400 - (T_2) 10 Jul 1700	0.4	45.0	67.9	93.6	94.0
T. Tasha	(T_1) 18 Aug 2000 - (T_2) 21 Aug 2000	38.4	1.8	1.8	1.8	40.2
T.S. Winona	(T_1) 26 Aug 1400 - (T_2) 27 Aug 2100	NIL	Trace	Trace	Trace	Trace
T. Abe	(T_1) 12 Sep 1800 - (T_2) 14 Sep 2000	56.2	5.9	6.2 +	77.0 +	133.2
S.T.S. Becky	(T_1) 16 Sep 1200 - (T_2) 17 Sep 2000	71.1 +	20.4	23.8	23.8	94.9
T. Dot	(T_1) 23 Sep 0800 - (T_2) 27 Sep 0200	459.6	37.9	37.9	37.9	497.5
T.D. in Oct	(T_1) 12 Oct 0800 - (T_2) 13 Oct 1400	4.1	78.9	79.2	79.2	83.3
T. Ira	(T_1) 3 Nov 0400 - (T_2) 5 Nov 0200	91.7	31.1	32.7	33.0	124.7

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

+ Figures in column (iii) and (iv) of T. Abe overlap the rainfall amount in column (i) of S.T.S. Becky by 70.8 mm.

(b). THE 10 WETTEST TROPICAL CYCLONES IN HONG KONG (1884-1939, 1947-1993)

Tropical Cyclone			Rainfall at the Royal 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
*1904	Aug	-	446.5	Nil	3.7	26.7	473.2
1974	Oct	Carmen	307.6	150.3	161.7	162.1	469.7
*1960	Jun	Mary	427.5	Nil	2.6	13.3	440.8

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 1946-1993

Name of typhoon	Date	Nearest approach to Royal 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.	Royal Observatory	King's Park	Hong Kong Airport	Waglan Island	Cheung Chau	Tate's Cairn	Green Island	Royal Observatory	King's Park	Hong Kong Airport	Waglan Island	Cheung Chau	Tate's Cairn	Green 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 118	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 108	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 137	E 185	E 167	E 203	E 227	SSE 238	ENE 218	S 220*

* estimated, exceeding upper limit of anemogram.

TABLE 10. DAMAGE CAUSED BY TROPICAL CYCLONES IN HONG KONG, 1993

Name of tropical cyclone	Month	Damage in physical terms					Damage in monetary terms (million HK$)					
		Agricultural	Public works facilities	Public utilities	Private property	Landslip & collapse of slope	Agricultural	Public works facilities	Public utilities	Private property	Others	Total
T. Koryn	Jun	farmland: 104 hectares	harbour & port: 6 sites	electricity supply: 8000 families	6 units	-	-	1.6	0.9	-	-	2.500
S.T.S. Lewis	Jul	-	-	-	11 units	-	-	-	-	-	-	-
T. Tasha	Aug	-	harbour & port: 1 site	electricity supply: 1500 families	-	1 case	-	0.6	0.3	-	-	0.400
S.T.S. Becky	Sep	farmland: 43 hectares livestock: 150 heads	river embankment: 1 site harbour & port: 5 sites	railway: 1 site electricity supply: 4000 families	6 units	7 cases	0.150	1.9	1.1	-	-	3.150
T. Dot	Sep	farmland: 450 hectares livestock: 797 heads fish: 106 tonnes poultry: 31675 heads	road: 4 sites	electricity supply: 1400 families water supply: 6 sites	72 units	63 cases	80.000	1.8	46.4	-	-	128.200
T. Ira	Nov	farmland: 92.7 hectares	harbour & port: 1 site	water supply: 3 sites	34 units	125 cases	0.075	18.3	6.2	-	-	24.575

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.

TABLE 11. CASUALTIES AND DAMAGE CAUSED BY TROPICAL CYCLONES IN HONG KONG : 1964-1993

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
1964	26 - 28 May	T. Viola	5	18	18	0	0	41
	2 - 9 Aug	T. Ida	3	7	60	5	4	56
	2 - 6 Sep	T. Ruby	20	32	282	38	6	300
	4 - 10 Sep	T. Sally	0	0	0	9	0	24
	7 - 13 Oct	T. Dot	2	31	59	26	10	85
1965	6 - 16 Jul	T. Freda	0	1	0	2	0	16
	25 - 28 Sep	T.S. Agnes	0	0	0	5	0	3
1966	12 - 14 Jul	S.T.S. Lola	0	*	6	1	0	6
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

TABLE 11. (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
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
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

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, 1993

Six-hourly position and intensity data are tabulated for the following tropical cyclones in 1993 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°).

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
SEVERE TROPICAL STORM IRMA (9301)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
Mar	11	1200	T.D.	995	13	4.7	162.7
		1800	T.D.	995	16	4.7	162.5
	12	0000	T.D.	995	16	4.8	162.3
		0600	T.D.	995	16	5.0	161.9
		1200	T.S.	990	18	5.2	161.3
		1800	T.S.	990	21	5.7	160.4
	13	0000	T.S.	985	23	6.7	159.4
		0600	S.T.S.	980	25	7.8	158.3
		1200	S.T.S.	980	25	8.9	157.0
		1800	T.S.	985	23	10.0	155.7
	14	0000	T.S.	985	21	11.0	154.3
		0600	T.S.	990	18	11.8	153.2
		1200	T.S.	990	18	12.3	152.3
		1800	T.S.	990	18	12.8	151.4
	15	0000	T.S.	990	18	13.3	150.5
		0600	T.S.	990	21	13.8	150.0
		1200	T.S.	985	23	14.5	149.7
		1800	T.S.	985	23	15.3	149.8
	16	0000	T.S.	990	21	16.0	150.2
		0600	T.S.	990	18	16.6	150.6
		1200	T.D.	995	16	17.0	151.0
		1800	T.D.	995	13	17.4	151.4

Dissipated

SIX-HOURLY POSITION AND INTENSITY DATA OF
TROPICAL STORM JACK

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
May	16	1200	T.D.	1000	16	9.9	158.8
		1800	T.D.	1000	16	10.5	159.0
	17	0000	T.D.	1000	16	11.1	159.3
		0600	T.D.	1000	16	11.5	159.7
		1200	T.D.	1000	16	11.8	159.9
		1800	T.S.	995	18	12.1	160.0
	18	0000	T.S.	995	18	12.4	160.0
		0600	T.D.	1000	16	12.7	159.8
		1200	T.D.	1005	13	12.7	159.2
		1800	T.D.	1005	13	12.7	158.8
	19	0000	T.D.	1000	16	12.7	158.4
		0600	T.S.	995	18	12.7	157.8
		1200	T.S.	995	18	12.6	157.0
		1800	T.D.	1000	16	12.5	156.2
	20	0000	T.D.	1005	13	12.3	155.3

Dissipated

SIX-HOURLY POSITION AND INTENSITY DATA OF
TYPHOON KORYN (9302)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
Jun	21	0000	T.D.	1000	13	7.1	144.1
		0600	T.D.	1000	13	7.6	143.2
		1200	T.D.	995	16	8.5	142.3
		1800	T.S.	990	18	9.3	141.3
	22	0000	T.S.	990	18	9.9	140.1
		0600	T.S.	985	23	10.3	138.8
		1200	T.S.	985	21	10.8	137.6
		1800	T.S.	985	23	11.3	136.3
	23	0000	S.T.S.	975	28	11.7	135.2
		0600	T.	965	33	12.2	134.2
		1200	T.	960	36	12.5	133.1
		1800	T.	955	39	12.9	132.0
	24	0000	T.	945	43	13.2	130.9
		0600	T.	940	46	13.6	129.8
		1200	T.	935	49	13.9	128.7
		1800	T.	950	41	14.4	127.5
	25	0000	T.	965	33	14.9	126.3
		0600	T.	965	33	15.5	125.1
		1200	T.	960	36	16.3	124.0
		1800	T.	960	36	16.8	122.5
	26	0000	T.	965	33	17.2	121.2
		0600	T.	965	33	18.1	120.1
		1200	T.	965	33	19.0	118.6
		1800	T.	965	33	19.5	116.9
	27	0000	T.	965	33	20.1	115.3
		0600	T.	965	33	20.6	114.0
		1200	S.T.S.	970	31	21.4	112.8
		1800	T.S.	980	23	22.0	111.3
	28	0000	T.D.	990	16	23.1	110.2

Dissipated

SIX-HOURLY POSITION AND INTENSITY DATA OF
SEVERE TROPICAL STORM LEWIS (9303)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
Jul	8	0600	T.D.	1000	13	12.7	124.1
		1200	T.D.	995	16	13.3	122.9
		1800	T.D.	995	16	13.9	121.8
	9	0000	T.D.	995	16	14.7	119.9
		0600	T.D.	995	16	15.6	118.1
		1200	T.S.	990	21	16.4	116.5
		1800	T.S.	990	21	17.1	114.9
	10	0000	T.S.	985	23	17.7	113.4
		0600	S.T.S.	980	25	18.1	111.8
		1200	S.T.S.	975	28	18.3	110.5
		1800	T.S.	985	21	18.5	109.3
	11	0000	T.D.	990	16	18.7	108.4
		0600	T.D.	990	16	18.9	107.5
		1200	T.S.	985	18	19.1	106.8
		1800	T.S.	985	21	19.2	106.2
	12	0000	T.S.	985	21	19.3	105.5
		0600	T.D.	995	16	19.2	104.5

Dissipated

SIX-HOURLY POSITION AND INTENSITY DATA OF
TROPICAL DEPRESSION MARIAN

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hpa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
Jul	14	0000	T.D.	1000	13	9.8	133.8
		0600	T.D.	1000	13	10.7	132.5
		1200	T.D.	1000	13	11.7	131.4
		1800	T.D.	1000	13	12.8	130.3
	15	0000	T.D.	1000	13	13.8	129.2
		0600	T.D.	1000	13	14.6	127.9

Dissipated

SIX-HOURLY POSITION AND INTENSITY DATA OF SEVERE TROPICAL STORM NATHAN (9304)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
Jul	19	0000	T.D.	1005	13	13.4	151.8
		0600	T.D.	1005	13	13.6	150.9
		1200	T.D.	1005	16	13.9	150.1
		1800	T.D.	1005	16	14.3	149.2
	20	0000	T.S.	995	18	14.8	148.8
		0600	T.S.	990	21	15.5	147.4
		1200	T.S.	990	21	16.2	146.4
		1800	T.S.	990	21	16.9	145.4
	21	0000	T.S.	990	21	17.5	144.3
		0600	T.S.	995	18	18.3	143.0
		1200	T.D.	1000	16	19.2	141.9
		1800	T.D.	1000	16	19.9	141.2
	22	0000	T.D.	1000	16	20.5	140.8
		0600	T.S.	995	21	21.0	140.6
		1200	T.S.	995	21	21.5	140.4
		1800	T.S.	995	21	22.0	140.3
	23	0000	T.S.	990	23	22.5	140.1
		0600	T.S.	990	23	22.9	140.0
		1200	T.S.	990	23	23.3	139.9
		1800	T.S.	990	23	24.3	139.6
	24	0000	S.T.S.	985	25	26.8	138.6
		0600	S.T.S.	980	28	29.6	137.6
		1200	T.S.	990	23	32.2	136.2
		1800	T.S.	995	21	34.5	134.5

Became Extratropical

SIX-HOURLY POSITION AND INTENSITY DATA OF
TROPICAL STORM OFELIA (9305)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
Jul	25	0600	T.D.	1000	13	20.3	137.7
		1200	T.D.	1000	16	22.0	136.4
		1800	T.S.	995	21	23.8	135.1
	26	0000	T.S.	995	21	25.0	134.1
		0600	T.S.	995	21	25.7	133.6
		1200	T.S.	990	23	26.6	132.8
		1800	T.S.	990	23	28.5	131.7
	27	0000	T.S.	990	23	30.6	131.2
		0600	T.S.	995	21	32.9	131.4
		1200	T.S.	995	21	35.7	132.5
		1800	T.D.	1000	16	38.6	134.8

Became Extratropical

SIX-HOURLY POSITION AND INTENSITY DATA OF
SEVERE TROPICAL STORM PERCY (9306)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
Jul	27	1800	T.D.	1000	13	22.4	130.3
	28	0000	T.D.	995	16	23.1	129.3
		0600	T.S.	990	21	24.0	128.7
		1200	T.S.	985	23	25.1	128.5
		1800	S.T.S.	975	28	26.3	128.4
	29	0000	S.T.S.	975	28	27.6	128.7
		0600	S.T.S.	975	28	29.4	129.0
		1200	S.T.S.	980	25	31.6	129.4
		1800	S.T.S.	980	25	34.2	130.5
	30	0000	T.S.	985	23	37.0	132.1

Became Extratropical

SIX-HOURLY POSITION AND INTENSITY DATA OF
TYPHOON ROBYN (9307)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
Aug	1	1200	T.D.	1005	13	6.8	152.8
		1800	T.D.	1005	13	7.7	151.6
	2	0000	T.D.	1000	16	8.5	150.3
		0600	T.D.	1000	16	9.2	148.8
		1200	T.S.	995	18	9.5	147.3
		1800	T.S.	990	21	9.7	145.9
	3	0000	T.S.	990	21	10.0	144.6
		0600	T.S.	990	21	10.3	143.4
		1200	T.S.	985	23	10.4	142.4
		1800	S.T.S.	980	25	10.5	141.7
	4	0000	S.T.S.	980	25	10.6	141.1
		0600	S.T.S.	980	25	10.8	140.6
		1200	S.T.S.	980	25	11.2	140.3
		1800	S.T.S.	980	25	11.8	140.2
	5	0000	S.T.S.	980	25	12.5	140.1
		0600	S.T.S.	980	25	13.4	139.6
		1200	S.T.S.	980	25	14.2	139.0
		1800	S.T.S.	975	28	14.9	138.3
	6	0000	S.T.S.	970	31	15.7	137.4
		0600	T.	965	33	16.6	136.4
		1200	T.	955	41	17.4	135.4
		1800	T.	940	46	18.4	134.5
	7	0000	T.	940	46	19.4	133.4
		0600	T.	940	46	20.1	132.6
		1200	T.	940	46	21.0	132.0
		1800	T.	940	46	22.0	131.4
	8	0000	T.	940	46	23.2	130.8
		0600	T.	940	46	24.3	130.3
		1200	T.	945	43	25.3	129.9
		1800	T.	945	43	26.3	129.5
	9	0000	T.	945	43	27.7	129.2
		0600	T.	945	43	29.0	129.1
		1200	T.	950	41	30.4	129.1
		1800	T.	955	39	32.2	129.2
	10	0000	T.	960	36	34.0	129.8
		0600	S.T.S.	970	31	36.0	131.1
		1200	S.T.S.	980	25	38.7	133.3

Became Extratropical

SIX-HOURLY POSITION AND INTENSITY DATA OF
SEVERE TROPICAL STORM STEVE (9308)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
Aug	5	1200	T.D.	1005	13	11.3	153.3
		1800	T.D.	1005	13	12.1	152.8
	6	0000	T.D.	1005	13	12.9	152.1
		0600	T.D.	1005	13	13.6	151.3
		1200	T.D.	1005	13	14.0	150.4
		1800	T.D.	1005	13	14.2	149.6
	7	0000	T.D.	1000	16	14.4	148.9
		0600	T.D.	1000	16	14.7	148.2
		1200	T.D.	1000	16	15.0	147.4
		1800	T.D.	1000	16	15.4	146.5
	8	0000	T.D.	1000	16	15.6	145.6
		0600	T.S.	995	18	15.6	144.7
		1200	T.S.	995	18	15.6	143.8
		1800	T.S.	990	21	15.7	142.9
	9	0000	T.S.	990	21	15.9	142.0
		0600	T.S.	990	21	16.1	141.1
		1200	T.S.	990	21	16.3	140.2
		1800	T.S.	985	23	16.5	139.4
	10	0000	T.S.	985	23	16.7	138.6
		0600	S.T.S.	980	25	17.0	137.8
		1200	T.S.	990	21	17.3	137.0
		1800	T.S.	990	21	17.6	136.2
	11	0000	T.S.	995	18	18.1	135.5
		0600	T.D.	1000	16	18.8	134.8
		1200	T.D.	1000	16	19.6	134.1
		1800	T.D.	1005	13	20.4	133.4
	12	0000	T.D.	1005	13	21.2	132.6
		0600	T.D.	1005	13	22.3	131.5

Dissipated

SIX-HOURLY POSITION AND INTENSITY DATA OF
TYPHOON TASHA (9309)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
Aug	16	0000	T.D.	1000	16	16.0	128.5
		0600	T.D.	1000	16	16.2	127.4
		1200	T.D.	1000	16	16.5	126.4
		1800	T.D.	1000	16	16.9	125.8
	17	0000	T.D.	1000	16	17.4	125.3
		0600	T.D.	1000	16	18.0	124.6
		1200	T.D.	1000	16	18.5	123.6
		1800	T.S.	995	18	18.9	122.4
	18	0000	T.S.	990	21	19.1	120.9
		0600	T.S.	990	21	19.3	119.9
		1200	T.S.	990	21	19.9	119.0
		1800	T.S.	990	23	20.0	118.0
	19	0000	T.S.	990	23	19.8	117.0
		0600	T.S.	985	23	19.6	116.0
		1200	T.S.	985	23	19.6	115.1
		1800	T.S.	985	23	19.7	114.5
	20	0000	T.S.	985	23	20.0	114.0
		0600	S.T.S.	980	28	20.4	113.4
		1200	T.	970	33	20.8	112.8
		1800	S.T.S.	970	31	21.2	112.0
	21	0000	S.T.S.	975	25	21.7	111.1
		0600	T.S.	980	21	22.2	110.2
		1200	T.D.	990	16	22.8	109.0

Dissipated

SIX-HOURLY POSITION AND INTENSITY DATA OF
TYPHOON KEONI (9310)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
Aug	20	0000	T.	970	36	20.7	179.4
		0600	T.	960	39	21.3	178.3
		1200	T.	960	39	21.9	177.2
		1800	T.	960	39	22.5	176.0
	21	0000	T.	955	41	23.1	174.9
		0600	T.	940	46	23.7	173.8
		1200	T.	940	46	24.5	172.7
		1800	T.	955	41	25.3	171.8
	22	0000	T.	955	41	26.1	171.1
		0500	T.	965	36	26.8	170.6
		1200	S.T.S.	975	31	27.5	170.0
		1800	S.T.S.	975	31	28.0	169.3
	23	0000	S.T.S.	975	31	28.3	168.5
		0600	S.T.S.	975	31	28.6	167.5
		1200	S.T.S.	975	31	28.8	166.2
		1800	S.T.S.	975	31	28.8	164.7
	24	0000	S.T.S.	975	31	29.4	163.4
		0600	T.	970	33	30.1	162.5
		1200	T.	970	33	30.8	161.8
		1800	T.	965	36	31.6	161.2
	25	0000	S.T.S.	975	31	32.1	160.5
		0600	S.T.S.	975	31	32.3	159.9
		1200	S.T.S.	975	31	32.3	159.6
		1800	S.T.S.	980	28	32.4	159.3
	26	0000	T.S.	990	23	32.6	159.0
		0600	T.S.	990	23	33.0	158.8
		1200	T.S.	995	21	33.8	158.6
		1800	T.S.	995	21	34.6	158.3
	27	0000	T.S.	995	21	35.4	158.2
		0600	T.S.	995	21	36.1	158.2
		1200	T.S.	995	21	36.6	158.5
		1800	T.S.	995	21	37.0	159.1
	28	0000	T.S.	995	21	37.2	160.0
		0600	T.D.	1000	16	37.1	161.5

Dissipated

SIX-HOURLY POSITION AND INTENSITY DATA OF
TYPHOON VERNON (9311)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
Aug	21	0600	T.D.	1005	13	17.5	153.8
		1200	T.D.	1000	16	18.3	153.1
		1800	T.D.	1000	16	19.1	152.6
	22	0000	T.S.	995	18	20.0	152.3
		0600	T.S.	995	18	20.3	152.7
		1200	T.S.	99s	18	20.0	152.5
		1800	T.S.	995	21	20.0	152.0
	23	0000	T.S.	995	21	20.8	151.6
		0600	T.S.	990	23	21.6	151.2
		1200	S.T.S.	985	25	22.4	150.7
		1800	S.T.S.	985	25	23.0	149.9
	24	0000	S.T.S.	980	28	23.5	149.1
		0600	S.T.S.	980	28	24.4	148.9
		1200	S.T.S.	975	31	25.2	148.5
		1800	S.T.S.	975	31	26.0	147.6
	25	0000	T.	965	36	26.8	146.6
		0600	T.	960	39	27.8	145.4
		1200	T.	960	39	28.5	144.1
		1800	T.	965	33	29.0	142.7
	26	0000	T.	965	33	29.6	141.6
		0600	T.	965	33	30.4	141.0
		1200	S.T.S.	970	31	31.6	140.7
		1800	S.T.S.	970	31	32.5	140.6
	27	0000	S.T.S.	970	31	33.9	140.6
		0600	S.T.S.	970	31	35.6	140.8
		1200	S.T.S.	970	31	37.2	141.4
		1800	S.T.S.	970	31	39.0	142.5
	28	0000	S.T.S.	975	28	42.0	144.1

Became Extratropical

SIX-HOURLY POSITION AND INTENSITY DATA OF
TROPICAL STORM WINONA (9312)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
Aug	23	0600	T.D.	1000	13	12.0	120.6
		1200	T.S.	995	18	11.8	119.4
		1800	T.S.	995	18	12.2	118.2
	24	0000	T.S.	995	21	13.2	117.5
		0600	T.S.	990	21	14.3	117.3
		1200	T.S.	990	21	14.9	117.0
		1800	T.S.	992	21	15.3	116.8
	25	0000	T.S.	992	21	15.9	116.3
		0600	T.S.	995	21	16.6	116.0
		1200	T.S.	1000	18	17.2	115.8
		1800	T.S.	995	21	17.5	116.0
	26	0000	T.S.	995	21	17.2	116.0
		0600	T.D.	1000	16	17.5	115.8
		1200	T.D.	1000	16	17.8	115.7
		1800	T.D.	1000	16	17.8	115.3
	27	0000	T.D.	1000	16	17.7	114.8
		0600	T.D.	1000	13	17.7	114.1
		1200	T.D.	1000	16	17.4	113.4
		1800	T.D.	1000	16	17.1	112.5
	28	0000	T.S.	995	18	16.9	111.4
		0600	T.S.	995	18	16.8	110.1
		1200	T.D.	1000	16	16.8	108.8
		1800	T.D.	1000	13	17.1	107.5

Dissipated

SIX-HOURLY POSITION AND INTENSITY DATA OF
TYPHOON YANCY (9313)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
Aug	29	0000	T.D.	1005	13	20.0	137.8
		0600	T.D.	1005	13	19.9	136.6
		1200	T.D.	1000	16	19.6	135.5
		1800	T.S.	995	18	19.8	134.8
	30	0000	T.S.	995	18	20.5	134.3
		0600	T.S.	995	18	21.7	133.6
		1200	T.S.	995	18	21.8	131.6
		1800	T.S.	995	18	21.0	130.0
	31	0000	T.S.	990	23	20.3	129.0
		0600	T.S.	990	23	20.4	128.0
		1200	S.T.S.	985	25	20.9	127.3
		1800	S.T.S.	980	28	21.4	126.7
Sep	1	0000	T.	970	33	22.1	126.0
		0600	T.	960	39	22.8	125.6
		1200	T.	950	43	23.4	125.4
		1800	T.	945	46	24.1	125.4
	2	0000	T.	935	49	24.9	125.7
		0600	T.	930	51	25.9	126.3
		1200	T.	930	51	26.9	127.1
		1800	T.	930	51	28.1	128.0
	3	0000	T.	935	49	29.5	129.1
		0600	T.	945	43	30.9	130.3
		1200	T.	960	36	32.8	131.9
		1800	S.T.S.	975	28	34.7	133.6

Became Extratropical

SIX-HOURLY POSITION AND INTENSITY DATA OF
SEVERE TROPICAL STORM ZOLA (9314)

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.	1005	16	19.0	131.3
		1200	T.D.	1005	16	19.3	130.4
		1800	T.D.	1005	16	19.6	129.5
	6	0000	T.S.	1000	21	20.0	128.7
		0600	T.S.	995	21	20.6	128.0
		1200	T.S.	995	21	21.4	127.9
		1800	T.S.	990	21	22.2	128.1
	7	0000	T.S.	990	23	23.2	128.6
		0600	T.S.	990	23	24.3	129.3
		1200	T.S.	995	21	25.6	130.1
		1800	T.S.	995	21	26.9	130.9
	8	0000	T.S.	995	21	28.2	131.7
		0600	S.T.S.	990	25	29.6	132.5
		1200	S.T.S.	990	25	31.1	133.4
		1800	S.T.S.	990	25	32.7	134.4
	9	0000	T.S.	995	21	34.4	136.2

Dissipated

SIX-HOURLY POSITION AND INTENSITY DATA OF
TYPHOON ABE (9315)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
Sep	9	0000	T.D.	1000	13	18.8	124.2
		0600	T.D.	1000	13	19.4	124.1
		1200	T.D.	1000	13	19.4	123.7
		1800	T.D.	1000	16	19.7	123.5
	10	0000	T.S.	995	18	19.7	123.9
		0600	T.S.	995	21	19.9	124.3
		1200	T.S.	995	21	20.0	123.9
		1800	T.S.	990	21	20.0	123.4
	11	0000	T.S.	990	23	20.4	123.1
		0600	T.S.	985	23	20.7	122.6
		1200	S.T.S.	980	28	20.7	122.1
		1800	S.T.S.	975	31	20.7	121.4
	12	0000	S.T.S.	975	31	20.8	120.6
		0600	T.	970	36	21.0	119.7
		1200	T.	960	39	21.2	119.2
		1800	T.	950	43	21.5	118.8
	13	0000	T.	950	43	21.8	118.4
		0600	T.	950	43	22.1	117.9
		1200	T.	960	39	22.3	117.5
		1800	T.	965	36	22.6	117.1
	14	0000	T.	970	33	23.1	116.3
		0600	T.S.	995	23	23.5	115.2
		1200	T.D.	1000	13	23.8	113.9

Dissipated

SIX-HOURLY POSITION AND INTENSITY DATA OF
SEVERE TROPICAL STORM BECKY (9316)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
Sep	15	0600	T.D.	1000	13	18.9	123.2
		1200	T.D.	1000	16	19.0	122.1
		1800	T.D.	1000	16	18.9	121.0
	16	0000	T.S.	995	21	18.9	119.8
		0600	T.S.	985	23	19.6	118.2
		1200	T.S.	985	23	20.3	116.7
		1800	S.T.S.	980	31	20.9	115.1
	17	0000	S.T.S.	980	31	21.5	113.6
		0600	T.S.	985	23	22.3	111.9
		1200	T.D.	995	13	22.6	110.5

Dissipated

SIX-HOURLY POSITION AND INTENSITY DATA OF
TYPHOON CECIL (9317)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
Sep	22	1200	T.D.	1005	13	11.8	152.0
		1800	T.D.	1000	16	12.6	151.3
	23	0000	T.S.	995	18	13.4	150.5
		0600	T.S.	995	18	14.0	150.0
		1200	T.S.	995	18	14.4	149.3
		1800	T.S.	995	18	13.9	149.3
	24	0000	T.S.	990	23	14.7	149.4
		0600	T.S.	990	23	15.4	148.8
		1200	S.T.S.	985	25	16.4	148.0
		1800	S.T.S.	985	25	17.8	147.1
	25	0000	S.T.S.	980	28	19.3	146.3
		0600	S.T.S.	980	28	20.7	145.5
		1200	S.T.S.	975	31	21.8	145.0
		1800	T.	970	33	22.9	144.5
	26	0000	T.	965	36	24.0	144.5
		0600	T.	965	36	25.0	145.0
		1200	T.	965	36	26.0	145.8
		1800	T.	970	33	27.1	146.9
	27	0000	T.	970	33	28.7	148.6
		0600	T.	970	33	30.6	150.5
		1200	S.T.S.	980	28	32.8	152.7
		1800	T.S.	990	23	35.2	155.0

Became Extratropical

SIX-HOURLY POSITION AND INTENSITY DATA OF
TYPHOON DOT (9318)

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	13	18.3	112.8
		0600	T.D.	1000	16	18.3	112.2
		1200	T.D.	1000	16	18.8	111.9
		1800	T.D.	1000	16	18.7	112.3
	24	0000	T.D.	1000	16	18.3	112.0
		0600	T.S.	995	21	18.8	111.6
		1200	T.S.	990	23	19.2	111.7
		1800	S.T.S.	985	25	19.5	111.9
	25	0000	S.T.S.	980	31	19.8	112.1
		0600	T.	975	33	20.2	112.3
		1200	T.	970	36	20.5	112.4
		1800	T.	965	39	20.8	112.5
	26	0000	T.	965	39	21.0	112.5
		0600	T.	975	33	21.6	112.5
		1200	T.S.	990	23	22.4	112.4
		1800	T.D.	1000	13	22.7	112.8

Dissipated

SIX-HOURLY POSITION AND INTENSITY DATA OF
TYPHOON ED (9319)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
Sep	30	0000	T.D.	1005	13	12.6	146.2
		0600	T.D.	1005	13	13.1	145.7
		1200	T.D.	1000	16	13.5	145.1
		1800	T.S.	995	18	13.8	144.4
Oct	1	0000	T.S.	990	23	14.1	143.5
		0600	T.S.	990	23	14.2	142.6
		1200	S.T.S.	985	25	14.3	141.9
		1800	S.T.S.	980	28	14.6	141.2
	2	0000	S.T.S.	975	28	15.1	140.5
		0600	S.T.S.	975	28	15.7	139.7
		1200	S.T.S.	970	31	16.3	138.8
		1800	S.T.S.	970	31	16.9	137.7
	3	0000	T.	965	33	17.4	136.6
		0600	T.	965	33	17.8	135.8
		1200	T.	960	36	18.4	135.0
		1800	T.	960	36	18.8	134.2
	4	0000	T.	950	41	19.1	133.6
		0600	T.	935	49	19.5	133.0
		1200	T.	925	54	19.8	132.7
		1800	T.	940	46	20.3	132.5
	5	0000	T.	945	43	20.9	132.6
		0600	T.	950	41	21.5	132.8
		1200	T.	955	39	22.2	133.1
		1800	T.	960	36	23.0	133.5
	6	0000	T.	965	33	23.8	134.0
		0600	T.	965	33	24.8	134.8
		1200	T.	965	33	25.8	135.6
		1800	S.T.S.	970	31	27.0	136.7
	7	0000	S.T.S.	970	31	28.4	138.0
		0600	S.T.S.	975	28	30.0	139.8
		1200	S.T.S.	980	25	31.5	141.4
		1800	S.T.S.	980	25	33.0	143.3
	8	0000	S.T.S.	980	25	34.4	145.4

Became Extratropical

SIX-HOURLY POSITION AND INTENSITY DATA OF
TYPHOON FLO (9320)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
Oct	1	0600	T.D.	1005	13	16.7	129.8
		1200	T.D.	1005	13	16.8	128.8
		1800	T.D.	1000	16	16.8	127.8
	2	0000	T.D.	1000	16	16.8	126.9
		0600	T.S.	995	21	16.8	126.4
		1200	T.S.	990	23	16.8	126.0
		1800	S.T.S.	985	25	16.8	125.6
	3	0000	S.T.S.	985	25	16.8	125.2
		0600	S.T.S.	980	28	16.8	124.8
		1200	S.T.S.	980	28	16.8	124.3
		1800	S.T.S.	975	31	16.7	123.6
	4	000.0	T.	970	33	16.6	122.8
		0600	S.T.S.	975	31	16.5	121.9
		1200	S.T.S.	980	28	16.2	121.1
		1800	S.T.S.	985	25	16.4	120.4
	5	0000	S.T.S.	985	25	16.2	119.8
		0600	S.T.S.	980	28	15.7	120.2
		1200	S.T.S.	985	25	16.1	120.7
		1800	T.S.	990	23	17.0	120.9
	6	0000	T.S.	990	23	18.2	121.3
		0600	T.S.	990	23	19.2	122.2
		1200	T.S.	990	23	20.1	123.5
		1800	T.S.	990	23	21.0	124.8
	7	0000	T.S.	990	23	22.0	126.0
		0600	T.S.	990	23	23.1	127.2
		1200	S.T.S.	985	25	24.7	128.5
		1800	S.T.S.	985	25	26.6	130.0
	8	0000	S.T.S.	980	28	29.0	132.8
		0600	S.T.S.	980	28	31.4	136.7

Became Extratropical

SIX-HOURLY POSITION AND INTENSITY DATA OF
TROPICAL DEPRESSION GENE (9321)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
Oct	8	0000	T.D.	1000	16	13.6	138.8
		0600	T.D.	1000	16	14.6	137.2
		1200	T.D.	1000	16	15.6	135.7
		1800	T.D.	1000	16	16.8	134.3
	9	0000	T.D.	1000	16	18.2	133.2
		0600	T.D.	1000	16	19.5	132.7
		1200	T.D.	1000	16	20.8	132.3
		1800	T.D.	1000	16	22.2	132.0
	10	0000	T.D.	1000	16	23.7	131.9

Dissipated

SIX-HOURLY POSITION AND INTENSITY DATA OF
THE TROPICAL DEPRESSION OF 12-13 OCTOBER

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
Oct	12	0000	T.D.	1008	13	20.5	118.6
		0600	T.D.	1008	13	20.6	117.8
		1200	T.D.	1008	13	20.7	117.1
		1800	T.D.	1008	13	20.9	116.4
	13	0000	T.D.	1008	13	21.2	115.7
		0600	T.D.	1008	13	21.7	115.1

Dissipated

SIX-HOURLY POSITION AND INTENSITY DATA OF
SEVERE TROPICAL STORM HATTIE (9322)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
Oct	19	1200	T.D.	1000	13	13.0	160.0
		1800	T.D.	1000	13	13.0	159.4
	20	0000	T.D.	995	16	13.2	158.8
		0600	T.D.	995	16	13.5	158.2
		1200	T.D.	995	16	14.0	157.6
		1800	T.D.	995	16	14.6	157.2
	21	0000	T.D.	995	16	15.2	156.8
		0600	T.D.	995	16	15.8	156.6
		1200	T.D.	995	16	16.4	156.3
		1800	T.D.	995	16	17.0	156.0
	22	0000	T.D.	995	16	17.8	155.7
		0600	T.S.	990	18	18.9	155.3
		1200	T.S.	990	21	20.3	154.7
		1800	T.S.	985	23	21.7	154.0
	23	0000	T.S.	985	23	22.9	153.3
		0600	T.S.	985	23	23.8	153.3
		1200	T.S.	985	23	24.2	154.0
		1800	T.S.	985	23	24.5	154.8
	24	0000	T.S.	985	23	25.5	156.1
		0600	S.T.S.	980	28	26.8	157.2
		1200	S.T.S.	980	28	28.6	158.7
		1800	S.T.S.	985	25	31.5	160.8
	25	0000	T.S.	990	23	34.1	163.1
		0600	T.S.	990	23	35.8	166.4
		1200	T.S.	995	21	36.3	170.2

Became Extratropical

SIX-HOURLY POSITION AND INTENSITY DATA OF
TYPHOON IRA (9323)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
Oct	27	1800	T.D.	1005	13	12.9	144.2
	28	0000	T.D.	1000	16	12.9	142.8
		0600	T.D.	1000	16	12.9	141.4
		1200	T.S.	995	18	13.0	139.4
		1800	T.S.	990	21	13.0	137.6
	29	0000	T.S.	990	21	13.1	136.0
		0600	T.S.	990	21	13.2	134.7
		1200	T.S.	985	23	13.5	133.5
		1800	S.T.S.	975	28	13.9	132.2
	30	0000	S.T.S.	975	28	14.3	130.7
		0600	S.T.S.	965	31	14.6	129.2
		1200	T.	955	36	14.7	128.2
		1800	T.	950	39	14.9	127.4
	31	0000	T.	945	41	15.4	126.6
		0600	T.	940	46	15.4	125.7
		1200	T.	945	41	15.5	125.1
		1800	T.	945	41	15.8	124.6
Nov	1	0000	T.	945	41	16.0	123.7
		0600	T.	945	41	16.1	122.3
		1200	S.T.S.	965	31	16.0	120.9
		1800	T.S.	985	21	16.1	119.9
	2	0000	T.S.	995	18	16.7	119.2
		0600	T.D.	1000	16	17.1	118.2
		1200	T.D.	1000	16	17.3	117.2
		1800	T.D.	1000	16	17.5	116.3
	3	0000	T.D.	1000	16	17.8	115.5
		0600	T.S.	995	18	18.2	114.8
		1200	T.S.	995	18	18.6	114.1
		1800	T.S.	990	18	19.2	113.4
	4	0000	T.S.	995	18	19.9	112.9
		0600	T.S.	995	18	20.6	112.4
		1200	T.D.	1000	16	21.3	112.0
		1800	T.D.	1000	13	22.0	111.2

Dissipated

SIX-HOURLY POSITION AND INTENSITY DATA OF
TROPICAL STORM JEANA (9324)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
Nov	4	0600	T.D.	1004	13	10.2	157.3
		1200	T.D.	1004	13	10.3	156.2
		1800	T.D.	1004	13	10.5	155.1
	5	0000	T.D.	1004	13	10.9	154.0
		0600	T.D.	1004	13	11.4	153.0
		1200	T.D.	1004	13	11.7	152.1
		1800	T.D.	1004	13	11.9	151.2
	6	0000	T.D.	1004	13	12.0	150.3
		0600	T.D.	1004	13	12.2	149.3
		1200	T.D.	1004	13	12.6	148.4
		1800	T.D.	1004	13	13.2	147.6
	7	0000	T.D.	1002	16	13.5	146.5
		0600	T.D.	1002	16	13.4	145.2
		1200	T.D.	1002	16	13.3	144.0
		1800	T.D.	1002	16	13.5	142.8
	8	0000	T.D.	1002	16	13.8	141.8
		0600	T.D.	1002	16	14.3	140.6
		1200	T.D.	1002	16	15.1	139.5
		1800	T.S.	995	18	16.0	138.2
	9	0000	T.S.	995	18	17.2	137.0
		0600	T.S.	995	18	18.0	136.4
		1200	T.S.	995	18	18.6	136.0
		1800	T.S.	995	18	19.2	135.7
	10	0000	T.S.	995	18	19.8	135.6
		0600	T.S.	990	23	20.4	135.6
		1200	T.S.	990	23	21.0	135.9
		1800	T.S.	990	23	21.4	136.4
	11	0000	T.S.	990	23	21.7	137.0
		0600	T.S.	995	21	21.8	137.5
		1200	T.S.	995	18	21.9	138.0
		1800	T.S.	995	18	22.0	138.5
	12	0000	T.D.	1000	16	22.1	139.1
		0600	T.D.	1005	13	22.3	139.8

Dissipated

SIX-HOURLY POSITION AND INTENSITY DATA OF TYPHOON KYLE (9325)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
Nov	18	0600	T.D.	1005	13	8.9	134.4
		1200	T.D.	1005	13	9.0	133.2
		1800	T.D.	1000	16	9.3	131.9
	19	0000	T.D.	1000	16	10.1	130.7
		0600	T.D.	1000	16	10.5	129.4
		1200	T.S.	996	18	10.5	128.2
		1800	T.S.	996	18	10.5	127.0
	20	0000	T.S.	996	18	10.6	126.1
		0600	T.S.	996	18	10.8	125.3
		1200	T.S.	996	18	11.1	124.3
		1800	T.S.	994	21	11.5	123.2
	21	0000	T.S.	994	21	11.7	121.8
		0600	T.S.	994	21	11.8	120.6
		1200	T.S.	990	23	11.9	119.4
		1800	T.S.	990	23	12.0	118.2
	22	0000	S.T.S.	985	25	12.2	117.0
		0600	S.T.S.	980	28	12.4	115.8
		1200	S.T.S.	975	31	12.7	114.5
		1800	T.	970	33	12.8	113.1
	23	0000	T.	965	36	12.8	111.7
		0600	T.	960	39	12.9	110.4
		1200	T.	970	33	13.0	109.2
		1800	S.T.S.	980	28	13.1	108.0
	24	0000	T.S.	995	21	13.4	106.4
		0600	T.D.	1005	13	14.0	105.0

Dissipated

SIX-HOURLY POSITION AND INTENSITY DATA OF
TYPHOON LOLA (9326)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
Dec	1	0600	T.D.	1004	13	6.1	149.2
		1200	T.D.	1004	13	6.7	147.4
		1800	T.D.	1004	13	7.4	145.6
	2	0000	T.D.	1004	13	8.2	143.9
		0600	T.D.	1002	13	9.0	142.1
		1200	T.D.	1002	13	9.9	140.3
		1800	T.D.	1000	16	10.7	138.3
	3	0000	T.D.	1000	16	11.2	136.2
		0600	T.S.	995	18	11.6	134.2
		1200	T.S.	990	23	12.1	132.3
		1800	S.T.S.	985	25	12.8	130.8
	4	0000	S.T.S.	975	31	13.7	129.5
		0600	S.T.S.	975	31	14.1	128.0
		1200	S.T.S.	975	31	14.2	126.8
		1800	T.	970	33	14.3	125.8
	5	0000	T.	970	33	14.3	124.9
		0600	T.	965	36	14.3	124.0
		1200	S.T.S.	975	31	14.1	123.2
		1800	S.T.S.	980	28	13.9	122.3
	6	0000	S.T.S.	985	25	13.7	121.3
		0600	S.T.S.	985	25	13.5	120.3
		1200	T.S.	990	23	13.2	119.3
		1800	T.S.	990	23	12.9	118.4
	7	0000	S.T.S.	985	25	12.5	117.6
		0600	S.T.S.	985	25	12.2	116.8
		1200	S.T.S.	982	25	11.8	115.9
		1800	S.T.S.	980	28	11.4	114.9
	8	0000	S.T.S.	975	31	11.1	113.5
		0600	T.	970	33	11.1	112.0
		1200	T.	970	33	11.4	110.6
		1800	S.T.S.	980	28	12.0	109.4
	9	0000	T.S.	990	23	12.7	107.8
		0600	T.D.	1000	16	13.7	105.9

Dissipated

SIX-HOURLY POSITION AND INTENSITY DATA OF
TYPHOON MANNY (9327)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
Dec	3	0000	T.D.	1004	13	7.0	156.2
		0600	T.D.	1002	13	7.0	154.0
		1200	T.D.	1002	13	7.0	151.9
		1800	T.D.	1002	13	7.o	149.8
	4	0000	T.D.	1000	16	7.1	147.8
		0600	T.D.	1000	16	7.3	145.8
		1200	T.D.	1000	16	7.7	143.9
		1800	T.S.	995	21	8.2	142.2
	5	0000	T.S.	995	21	8.8	140.6
		0600	T.S.	990	23	9.4	139.0
		1200	S.T.S.	985	25	10.0	137.4
		1800	S.T.S.	985	25	10.5	135.8
	6	0000	S.T.S.	985	25	11.3	134.3
		0600	S.T.S.	985	25	12.3	133.0
		1200	S.T.S.	985	25	13.3	131.9
		1800	S.T.S.	980	28	14.2	131.1
	7	0000	S.T.S.	980	28	14.8	130.4
		0600	S.T.S.	980	28	15.3	129.9
		1200	S.T.S.	980	28	15.8	129.7
		1800	S.T.S.	975	31	16.3	129.7
	8	0000	T.	970	33	16.6	130.0
		0600	T.	970	33	16.3	130.3
		1200	T.	970	33	15.8	130.0
		1800	T.	970	33	15.2	129.5
	9	0000	T.	970	33	14.6	128.6
		0600	T.	965	36	14.0	127.6
		1200	T.	960	39	13.4	126.4
		1800	T.	960	39	12.9	125.2
	10	0000	T.	970	33	12.5	124.1
		0600	S.T.S.	980	28	12.5	123.0
		1200	S.T.S.	985	25	12.4	122.1
		1800	T.S.	990	23	12.3	121.4
	11	0000	T.S.	995	21	12.0	120.7
		0600	T.S.	995	21	11.7	119.9
		1200	T.D.	1000	16	11.4	119.0
		1800	T.D.	1000	16	11.1	118.1
	12	0000	T.S.	995	18	11.0	117.3
		0600	T.S.	995	18	10.9	116.5
		1200	T.S.	995	18	10.9	115.8
		1800	T.S.	995	18	10.9	115.1
	13	0000	T.S.	995	18	10.9	114.4
		0600	T.S.	995	18	10.9	113.7
		1200	T.D.	1000	16	10.9	113.0

Dissipated

SIX-HOURLY POSITION AND INTENSITY DATA OF
SEVERE TROPICAL STORM NELL (9328)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface winds (m/s)	Lat. °N	Long. °E
Dec	20	1200	T.D.	1002	13	6.7	151.9
		1800	T.D.	1002	13	6.7	150.3
	21	0000	T.D.	1002	13	6.7	149.0
		0600	T.D.	1002	13	6.7	148.0
		1200	T.D.	1002	13	6.8	147.0
		1800	T.D.	1002	13	7.1	146.0
	22	0000	T.D.	1002	13	7.4	145.2
		0600	T.D.	1002	13	7.7	144.4
		1200	T.D.	1002	13	7.9	143.7
		1800	T.D.	1002	13	7.9	142.9
	23	0000	T.D.	1002	13	7.8	142.1
		0600	T.D.	1002	13	7.6	141.4
		1200	T.D.	1000	16	7.5	140.5
		1800	T.D.	1000	16	7.5	139.6
	24	0000	T.D.	1000	16	7.7	138.6
		0600	T.D.	1000	16	8.0	137.4
		1200	T.S.	998	18	8.3	135.9
		1800	T.S.	998	18	8.5	134.3
	25	0000	T.S.	995	21	8.6	132.8
		0600	T.S.	990	23	8.6	131.2
		1200	S.T.S.	980	28	8.7	129.7
		1800	S.T.S.	980	28	8.8	128.2
	26	0000	S.T.S.	980	28	9.1	126.9
		0600	S.T.S.	975	31	9.6	125.6
		1200	S.T.S.	980	28	10.2	124.4
		1800	S.T.S.	985	25	10.9	123.2
	27	0000	S.T.S.	985	25	11.7	121.9
		0600	T.S.	990	23	12.2	120.9
		1200	T.S.	990	23	12.3	119.8
		1800	T.S.	990	23	12.0	118.9
	28	0000	T.S.	995	21	11.5	118.1
		0600	T.S.	995	18	11.0	117.4
		1200	T.D.	1000	16	10.5	116.8
		1800	T.D.	1000	16	10.1	116.3

Dissipated