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ROYAL OBSERVATORY, HONG KONG

METEOROLOGICAL RESULTS 1980

PART III—TROPICAL CYCLONE SUMMARIES

90° 100° 110° 120° 130° 140° 150° 160°

40° 30° 20° 10° 0°

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ROYAL OBSERVATORY HONG KONG

TRACKS OF TROPICAL CYCLONES
JANUARY—JULY, 1980

Typhoons

Tropical Storms or Tropical Depressions

Tracks Uncertain

Daily Positions at 00 h G.M.T. (1) (2)

Intermediate 6 hrly Positions

Mercator Projection-Natural Scale
1 : 15m. at 22½°N.

ELLEN May

LEX Aug

GEORGIA May

IDA Jul

KIM Jul

DOM May

T.S. Jul

HERBERT Jun

FORREST May

JOE Jul

T.D. Jul

GEORGIA May

T.D. Jul

T.S. Jul

JOE Jul

HERBERT Jun

IDA Jul

KIM Jul

DOM May

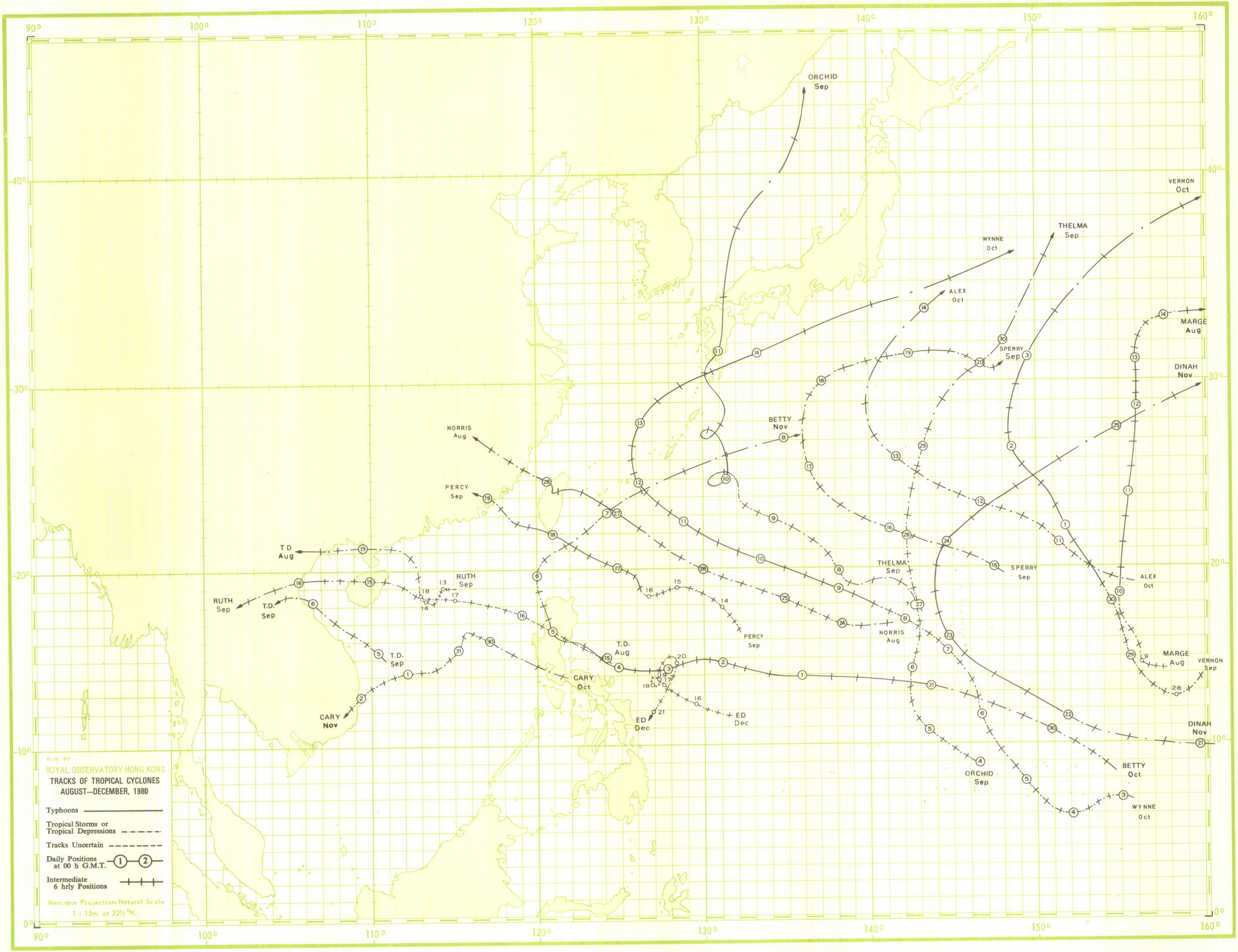
ELLEN May

FORREST May

T.D. Mar

T.D. Mar

LEX Jul


90°
100°
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20°
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ORCHID
Sep
VERNON
Oct
THELMA
Sep
WYNNE
Oct
ALEX
Oct
MARGE
Aug
SPERRY
Sep
DINAH
Nov
NORRIS
Aug
BETTY
Nov
PERCY
Sep
TD
Aug
RUTH
Sep
T.D.
Sep
T.D.
Aug
CARY
Oct
CARY
Nov
ED
Dec
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R.O. 80
ROYAL OBSERVATORY HONG KONG
TRACKS OF TROPICAL CYCLONES
AUGUST—DECEMBER, 1980
Typhoons
Tropical Storms or Tropical Depressions
Tracks Uncertain
Daily Positions at 00 h G.M.T.
Intermediate 6 hrly Positions
Mercator Projection-Natural Scale
1 : 15m. at 22½°N.

METEOROLOGICAL RESULTS

1980

PART III—TROPICAL CYCLONE SUMMARIES

CONTENTS

INTRODUCTION

Apart from a short break 1940–1946, surface observations of meteorological elements since 1884 have been summarized and published in the Royal Observatory's Meteorological Results. Upper-air observations were begun in 1947 and from then onwards the annual volumes were divided into two parts, namely Part I – Surface Observations and Part II – Upper-air Observations.

During the period 1884–1939, reports on destructive typhoons were occasionally prepared and were included as Appendices to the Meteorological Results. However, after 1947, this practice was extended and an account of all tropical cyclones which caused gales in Hong Kong was included in the Annual Departmental Reports. The first issue of a new series – 'Meteorological Results, Part III – Tropical Cyclone Summaries' was introduced in 1971. It contained information about all tropical cyclones over the western North Pacific and the South China Sea (i.e. the area bounded by the Equator, 45°N, 100°E and 160°E) that occurred in the year 1968.

Tracks of tropical cyclones in the western North Pacific and the South China Sea were published in Meteorological Results, Part I up to 1967. During the period 1884–1960, the tracks were plotted with day circle positions only. The time of the day circle varied to some extent but remained fixed at 0000 G.M.T. after 1944. The day circle times used for earlier tropical cyclones are given in the Royal Observatory Technical Memoir No. 11, Volume 1. From 1961 onwards, 6-hourly positions were shown on the tracks of all tropical cyclones.

Provisional reports on individual tropical cyclones affecting Hong Kong have been prepared since 1960; this is done in order to meet the immediate needs of the press, shipping companies and others. These reports are cyclostyled and supplied on request. Initially, reports were only written on those tropical cyclones for which gales or storm signals had been hoisted in Hong Kong, but by 1968 it had become necessary to produce a report on every tropical cyclone during which any tropical cyclone warning signal was raised.

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

A TROPICAL DEPRESSION (T.D.) has maximum sustained winds of less than 34 knots and at this stage the centre is often not very clearly defined and cannot always be fixed precisely.

A TROPICAL STORM (T.S.) has maximum sustained winds in the range 34–47 knots.

A SEVERE TROPICAL STORM (S.T.S.) has maximum sustained winds in the range 48–63 knots.

A TYPHOON (T.) has maximum sustained winds of 64 knots or more.

The Royal Observatory has a network of anemographs to record surface winds in Hong Kong. The instruments used are all Dines pressure-tube anemographs or M.O. Mark IV cup generator type anemographs manufactured by R.W. Munro Ltd. Quick-run mechanisms are also fitted to the anemographs at the Hong Kong Airport (Southeast), Waglan Island, Tate's Cairn and Cheung Chau for recording the fine structure of the wind flow in typhoons for research purposes. Details of these stations are given below.

Station	Position		Elevation of barometer above M.S.L.	Elevation of ground above M.S.L.	Head of anemometer above M.S.L.	Type of anemometer
	Latitude N	Longitude E	(m)	(m)	(m)	
Royal Observatory	22° 18′	114° 10′	33	32	61	Dines, Cup
Hong Kong Airport (Southeast)	22° 20′	114° 11′	24	4	16	Dines, Cup
Hong Kong Airport (Northwest)	22° 20′	114° 11′	24	4	14	Dines, Cup
Waglan Island	22° 11′	114° 18′	62	55	75	Dines, Cup
Tate's Cairn	22° 22′	114° 13′	*	575†	588	Dines
Cheung Chau	22° 12′	114° 01′	79	72	92	Dines
King's Park	22° 19′	114° 10′	66	65	78	Cup
Star Ferry	22° 18′	114° 10′	*	3	17	Cup
Green Island	22° 17′	114° 07′	*	76	90	Cup
Tsim Bei Tsui	22° 29′	114° 00′	*	26	44	Dines
Tai O	22° 15′	113° 51′	*	76	90	Cup
Castle Peak	22° 23′	113° 58′	*	11	24	Dines,
Chek Lap Kok	22° 19′	113° 56′	53	52	65	Cup
Lei Yue Mun	22° 17′	114° 14′	*	54	73	Cup
Yau Yat Chuen	22° 20′	114° 10′	*	27	64	Cup
Kowloon Tsai Hill	22° 20′	114° 11′	*	91	105	Cup

* No barometer.

† Level of the around floor of the building of the Radar Station.

Winds measurements are also made by China Light & Power Co. Ltd. at Hok Un and Tsing Yi Island, by Cable & Wireless Ltd. at Stanley, by the R.A.F. at Tai Mo Shan, by the University of Hong Kong at Cape D'Aguilar and by the Chinese University at Ma Liu Shui. Wind speed measurements have not been corrected for the reduced density of the air but in most cases this would increase the figures in the tables by less than 5 per cent.

The reports in Section 5 present a general description of the life history of each tropical cyclone affecting Hong Kong from formation to dissipation including:

(*a*) how the tropical cyclone affecting Hong Kong;
(*b*) the sequence of display of tropical cyclone warning signals;
(*c*) the maximum gust peak speeds and maximum winds recorded at various stations in Hong Kong;
(*d*) the lowest barometric pressure recorded in Hong Kong;
(*e*) the daily amount of rainfall recorded at the Royal Observatory; and
(*f*) the times and heights of the highest tides and maximum storm surges recorded in Hong Kong.

Whenever practical, radar photographs and pictures received from weather satellites are included together with information and data* obtained from reconnaissance aircraft. With a view to providing further information on the characteristics of tropical cyclones, 6-hourly positions together with the corresponding estimated minimum central pressures and maximum surface winds for individual tropical cyclones are tabulated and presented in the appendix.

In this publication different times have been in use in different contexts. The reference times of tropical cyclone warnings for shipping are given in G.M.T. Unlabelled times given in hours and minutes (e.g. 1454) on a 24-hour clock or times expressed as a.m. or p.m. are in Hong Kong Time. Hong Kong Time is 8 hours ahead of G.M.T. Times labelled 'G.M.T.' are in Greenwich Mean Time.

* The data from reconnaissance aircraft were taken directly from eye-fix messages received operationally at the Royal Observatory, Hong Kong. No attempt has been made to convert the wind speeds into equivalent '10-minute mean winds' to make them comparable with reports from surface stations.

DESCRIPTION OF TABLES

Table 1 is a list of tropical cyclones in 1980 in the western North Pacific and the South China Sea (i.e. in the area bounded by the Equator, 45°N, 100°E and 160°E). The names of these tropical cyclones are those used by the U.S. Fleet Weather Central/Joint Typhoon Warning Center, Guam. The dates cited cover the period during which the track of each tropical cyclone lay within the above-mentioned region and may not necessarily represent its 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, Hong Kong in 1980, the duration of these warnings and the time of validity of the first and last warnings for all tropical cyclones in Hong Kong's area of responsibility (i.e. the area bounded by 10°N, 30°N, 105°E and 125°E). Times are given in hours G.M.T.

Table 3 presents a summary of the occasions on which the tropical cyclone warning signals were hoisted during 1980. 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 on which the tropical cyclone warning signals were hoisted between 1946 and 1980. The Strong Wind Signal, No. 3, was not introduced until 1956 and the Gale or Storm Signals 5, 6, 7 and 8 were renumbered as 8 NW, 8 SW, 8 NE and 8 SE respectively with effect from 1 January 1973.

Table 5 gives the annual number of tropical cyclones in Hong Kong's area of responsibility between 1946 and 1980. The annual number of tropical cyclones which caused tropical cyclone warning signals to raised in Hong Kong is also included.

Table 6 shows the maximum, mean and minimum duration of display of each tropical cyclone warning signal during the period 1946–1980.

Table 7 presents the easualties and damage figures associated with tropical cyclones in Hong Kong for the period 1937–1980. The information is compiled from local newspapers and from the Marine Department's records.

Table 8 contains the particulars of ships sunk, damaged, grounded, etc., by various tropical cyclones in 1980. The information is compiled from local newspapers and from the Marine Department's records.

Table 9 presents the maximum storm surge (the excess, in metres, of the actual water level over that predicted in the tide Tables) for each tropical cyclone affecting Hong Kong in 1980. Information on the nearest approach, the maximum winds at the Royal Observatory and Waglan Island, the minimum sea-level pressure and the total rainfall recorded at the Royal Observatory is also included together with an estimate of the minimum central pressure of each tropical cyclone during its closest approach.

Table 10 presents some meteorological information for those typhoons which required the hoisting of the Hurricane Signal, No. 10, in Hong Kong since 1946. The information presented includes the distances and bearings of nearest approach, the minimum sea-level pressures recorded at the Royal Observatory and the maximum 60-minute mean winds and maximum gusts recorded at some selected stations in Hong Kong.

LIST OF FIGURES

TROPICAL CYCLONE SUMMARIES FOR 1980

In 1980 twenty-eight tropical cyclones formed over the western North Pacific and the South China Sea and fifteen of them attained typhoon intensity. Eight tropical cyclones crossed the coast of Guangdong (Kwangtung). Two tropical cyclones passed over Taiwan while another nine crossed the Philippines. Six tropical cyclones affected Vietnam but only one hit Japan. The monthly distribution of tropical cyclones is shown in Figure 1 and a brief summary of their tracks is contained in Table 1. Six-hourly positions of these tropical cyclones together with their estimated minimum central pressures and maximum surface winds are tabulated in the appendix. The monthly mean frequency of occurrence of tropical cyclones during the years 1946–1979 is given in Figure 2.

During the year there were seventeen tropical cyclones in Hong Kong's area of responsibility for tropical cyclone warnings for shipping (i.e. the area bounded by 10°N, 30°N, 105°E and 125°E) compared with an average of sixteen over the past 34 years. Eleven tropical cyclones moved into the area while six developed within it. Altogether 458 warnings for shipping were issued by the Royal Observatory in connection with these tropical cyclones, and tropical cyclone warning signals were displayed in Hong Kong during ten of them. However, only two tropical cyclones came within 100 nautical miles of Hong Kong and there was very little damage.

The total tropical cyclone rainfall during the year amounted to 627.1 mm which is slightly above the annual average value of 566.9 mm and accounts for 37 per cent of the year's total rainfall of 1 710.6 mm. More than half of the rainfall was due to two tropical cyclones in July: Severe Tropical Storm Ida with 190.8 mm and Typhoon Kim with 139.2 mm.

The first tropical cyclone of the year was a tropical depression which crossed the central Philippines on 24 March and dissipated off Vietnam five days later. There were no tropical cyclones during April.

Typhoons Dom and Ellen and Severe Tropical Storm Forrest originated near the Caroline Islands on 9, 13 and 20 May respectively. Dom and Ellen both recurved but Forrest crossed north Luzon on 25 May and weakened over the Bashi Channel. Severe Tropical Storm Georgia developed over the South China Sea on 19 May and caused strong winds in Hong Kong. Georgia landed near Shantou (Swatow) on 24 May.

Severe Tropical Storm Herbert was the only tropical cyclone during June. It crossed Hainan Dao (Hainan Island) and dissipated near Hanoi on 28 June.

There were six tropical cyclones during July and tropical cyclone warning signals were hoisted for four of them. On 2 July a tropical depression formed over the South China Sea but dissipated the next day. Severe Tropical Storm Ida passed close to Basco Island on 10 July and landed near Shantou. On 19 July a tropical storm struck Shangchuan Dao (St. John's Island) and then dissipated near Nanning in southwest China. Typhoon Joe crossed Luzon on 21 July leaving about 50 000 homeless. It passed about 190 nautical miles to the south-southwest of Hong Kong on 22 July. This was the only occasion on which gale signals were hoisted in Hong Kong in 1980. Joe later struck the Leizhou (Luichow) Peninsula and according to Chinese newspapers, the typhoon was the strongest over the region in 26 years. Typhoon Kim followed Joe's path and devastated the northern Philippines on 25 July. 12 000 houses were destroyed and 500 villages flooded. Kim landed near Shantou two days later. Typhoon Lex recurved to the southeast of Japan and became extratropical.

There were three tropical cyclones in August. Typhoon Marge formed east of Guam and became extratropical south of the Aleutian Islands. A tropical depression crossed the Leizhou Peninsula and weakened near Hanoi. Typhoon Norris swept past Taiwan and brought much-needed rain. It then crossed the China coast near Xiamen (Amoy).

Seven tropical cyclones developed over the western North Pacific and the South China Sea in September but none of them came very close to Hong Kong. The earliest one, a tropical depression, landed in Vietnam. Typhoon Orchid passed over Kyushu on 11 September causing damage in 23 of the 47 Japanese provinces and later affected South Korea. Typhoon Ruth struck Hainan Dao on 15 September and reached Vietnam the next day. Ruth was said to be the worst typhoon to hit Thanh Hoa province in 30 years. At least 106 people were killed or missing and about 500 000 made homeless. Typhoon Percy crossed the southern tip of Taiwan devastating banana and sugar cane plantations. Three other tropical cyclones moved away into the Pacific.

Of the five tropical cyclones developing in October, only Tropical Storm Cary threatened Hong Kong. It dissipated over the Vietnam coast on 2 November. Typhoon Wynne battered the Ryukyu Islands, and after absorbing Tropical Storm Alex, Wynne became extratropical off Japan. Typhoon Betty formed near the Caroline Islands on 29 October and struck Luzon on 5 November inflicting an estimated loss of US$54 million in property and crops. Typhoon Dinah recurved and become extratropical on 26 November.

Tropical Storm Ed was the only tropical cyclone that developed during December. It dissipated east of the Philippines.

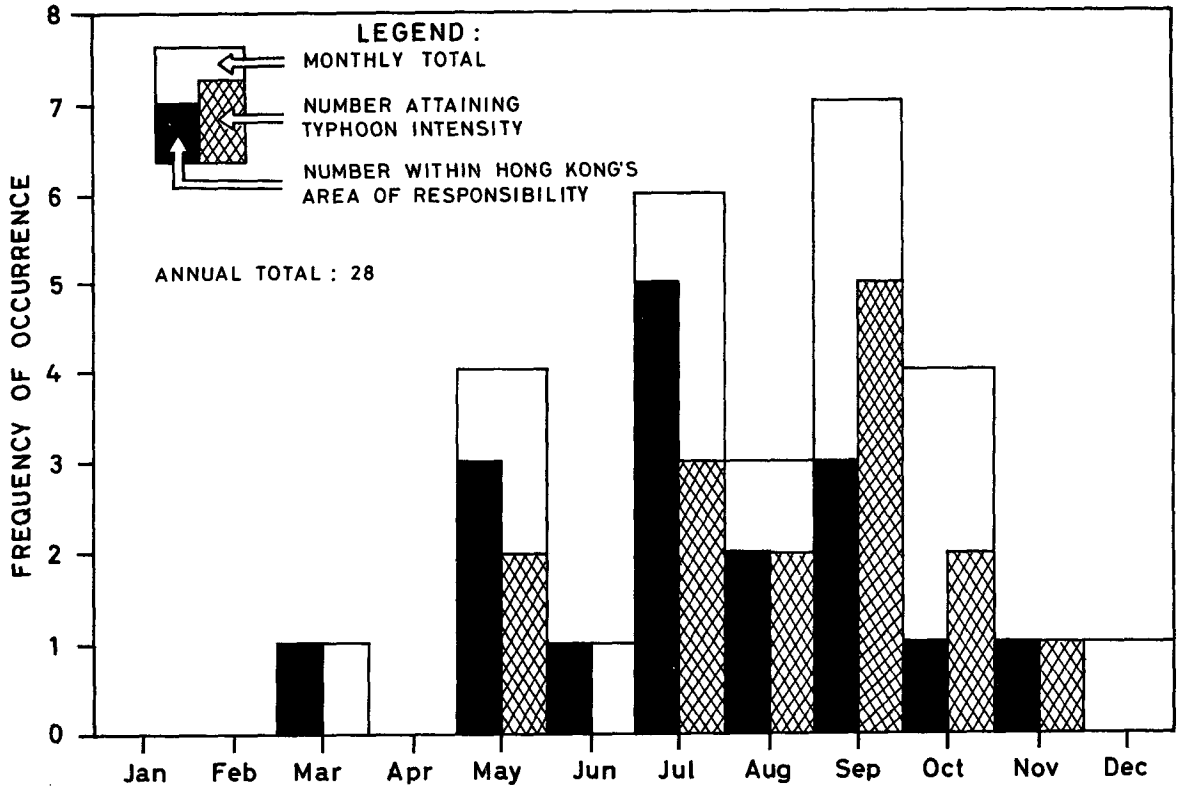

Figure 1. Monthly distribution of the frequency of occurrence of tropical cyclones and typhoons in the western North Pacific and the South China Sea in 1980.

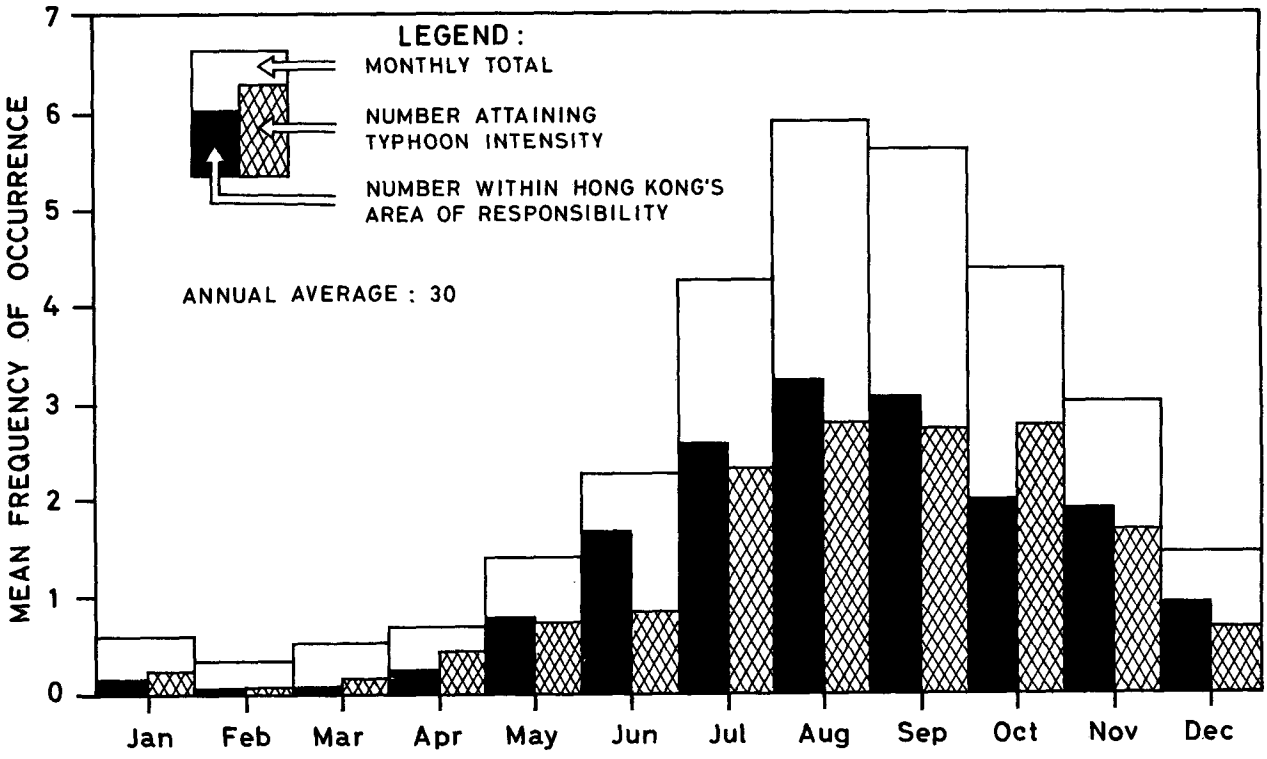

Figure 2. Monthly distribution of the mean frequency of occurrence of tropical cyclones and typhoons in the western North Pacific and the South China Sea, 1946–1979.

REPORTS ON TROPICAL CYCLONES AFFECTING HONG KONG IN 1980

SEVERE TROPICAL STORM GEORGIA

19–25 May 1980

The track of this severe tropical storm is shown in Figure 3

Severe Tropical Storm Georgia was the first tropical cyclone to approach Hong Kong in 1980. An intense cold front passed through Hong Kong on 15 May and continued southwards into the South China Sea. Georgia first developed as a tropical depression on the remains of the cold front about 400 nautical miles south of Hong Kong early on 19 May and remained quasi-stationary during the next two days. Georgia started to establish a northerly course on 21 May and intensified into a tropical storm by the following morning when satellite pictures received at the Royal Observatory indicated that the cloud patterns associated with the circulation had become more organized.

In Hong Kong the Stand By Signal, No. 1, was hoisted at 11.45 a.m. on 22 May when the tropical storm was centred about 340 nautical miles to the south-southeast and was moving slowly north-northwestwards towards Hong Kong. Georgia picked up speed during the day and turned onto a northerly course at about 8 knots. Later in the afternoon reconnaissance aircraft reported maximum surface winds of 50 knots and a minimum sea-level pressure of 987 millibars when Georgia was centred about 290 nautical miles to the south of Hong Kong.

Early on 23 May Georgia turned onto a north-northeasterly track and moved towards Shantou (Swatow) at 11 knots. Georgia was still coming closer to Hong Kong and the Stand By Signal was replaced by the Strong Wind Signal, No. 3, at 11.45 a.m. on 23 May. Georgia was then centred about 140 nautical miles to the south-southeast of Hong Kong and showed signs of intensification. Earlier, at 11.00 a.m. the M.V. 'Chevalier Paul' reported winds of 54 knots and a pressure of 996.8 millibars when Georgia was centred about 60 nautical miles to its east. Six hours later the M.V. 'Clara Maersk' also reported winds of 50 knots and a pressure of 992.0 millibars when Georgia was centred about 55 nautical miles to its southeast. Satellite pictures received during the morning revealed that there were well-organized spiral cloud bands round the centre of Georgia but the eye was ill defined (Figure 4). The Royal Observatory weather radar indicated heavy spiral rain bands to the east of the centre but there was very little rain to the west of the centre and no eye was discernible.

Georgia became a severe tropical storm during the afternoon of 23 May and continued to move north-northeastwards towards Shantou. Georgia was closest to Hong Kong around 11.00 p.m. when it passed about 90 nautical miles to the east-southeast. At this time the minimum central pressure of Georgia was estimated to be around 990 millibars and the mean sea-level pressure recorded at the Royal Observatory was 1001.0 millibars. In Hong Kong all signals were lowered at 5.45 a.m. on 24 May as Georgia crossed the coast of south China near Shantou about 110 nautical miles east-northeast of Hong Kong. Georgia weakened considerably over land and finally degenerated into an area of low pressure over the East China Sea some 24 hours later.

Early on the morning of 24 May Georgia passed very close to Shantou where a minimum mean sea-level pressure of 990.2 millibars and maximum peak gusts of 68 knots were reported. The highest sustained wind observed by a land station was 44 knots at 5.00 p.m. in Kinmen when Georgia was about 40 nautical miles to the northwest of the station.

In Hong Kong winds were moderate easterly on 22 May but gradually freshened from the northeast during the night and became strong during the following morning. Gales were experienced off-shore and on hill tops during the afternoon of 23 May. However, winds weakened during the night and turned to southwesterly the following day. The maximum mean hourly winds and gust peak speeds together with associated wind directions recorded at some selected locations were as follows:

Location	*Maximum mean hourly wind speed in knots with direction in points*		*Maximum gust peak speed in knots with direction in points*	
Royal Observatory	ENE	17	ENE	43
Hong Kong Airport (SE)	ENE	30	ENE	53
Hong Kong Airport (NW)	NNE	24	ENE	56
Waglan Island	ENE	35	NNE	52
Tate's Cairn	ENE	41	ENE	64
Cheung Chau	NE	28	NNE	49
King's Park	ENE	20	ENE	55
Star Ferry	E	19	E	35
Green Island	ENE	26	ENE	41

Location	*Maximum mean hourly wind speed in knots with direction in points*		*Maximum gust peak speed in knots with direction in points*	
Tsim Bei Tsui	not available		not available	
Tai O	NNE	22	NNE	32
Castle Peak	N	13	N	27
Chek Lap Kok	WSW	20	NE	32
Lei Yue Mun	ENE	30	ENE	51
Yau Yat Chuen	ENE	23	ENE	51
Kowloon Tsai Hill	ENE	28	ENE	59
Stanley (A)	NNE	49	NNE	73
Stanley (B)	NNE	40	NNE	71

The weather was mainly cloudy with some scattered showers on 22 May and the showers became more frequent during the following day. Conditions improved early on 24 May and there were long sunny periods in the morning. The daily rainfall amounts recorded during the period 21–24 May were as follows:

	Royal Observatory	*Cheung Chau*	*Tate's Cairn*
21 May	Trace	Nil	0.6 mm
22 May	0.4 mm	1.2 mm	3.0 mm
23 May	14.9 mm	8.9 mm	12.1 mm
24 May	Trace	Nil	0.7 mm
Total:	15.3 mm	10.1 mm	16.4 mm

During the approach of Severe Tropical Storm Georgia, damage in Hong Kong was minimal. Apart from some scaffolding partly blown down by the strong winds which slowed traffic for a time in Tai Kok Tsui Road, no other incidents were reported. However, some ferries to outlying islands were temporarily suspended. Ferry services between Guangzhou (Canton) and Hong Kong as well as between Shantou (Swatow) and Hong Kong were cancelled. Altogether 26 incoming and outgoing scheduled flights were cancelled and another eight flights bound for Hong Kong were diverted to other airports.

The times and heights of the highest tides and maximum storm surges recorded at various locations in Hong Kong during the display of tropical cyclone warning signals were as follows:

Location	Highest tide above chart datum			Maximum storm surge above astronomical tide		
	Height (m)	Date	Time	Height (m)	Date	Time
North Point	2.0	22 May	1.15 p.m.	0.7	23 May	8.00 p.m.
Tai Po Kau	1.9	23 May	1.30 p.m.	0.7	23 May	6.00 p.m.
Chi Ma Wan (Lantau Island)	2.1	23 May	2.30 p.m.	0.7	23 May	2.30 p.m.

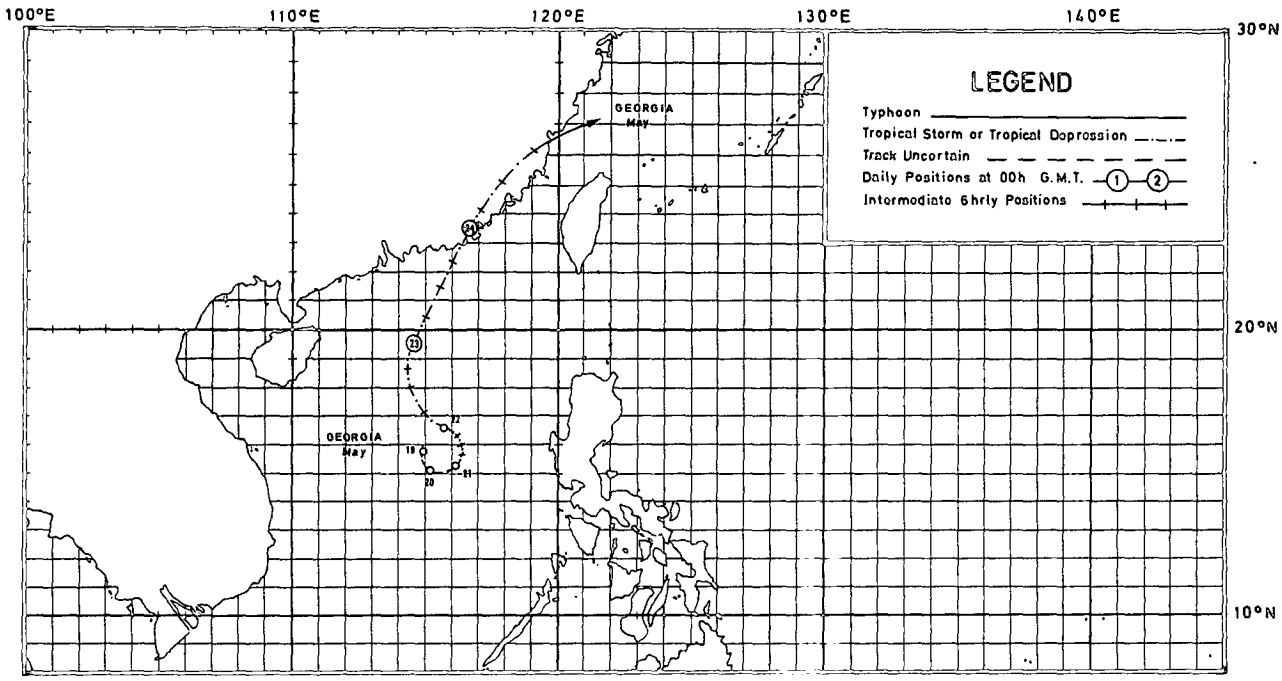

Figure 3. Track of Severe Tropical Storm Georgia: 19–25 May 1980.

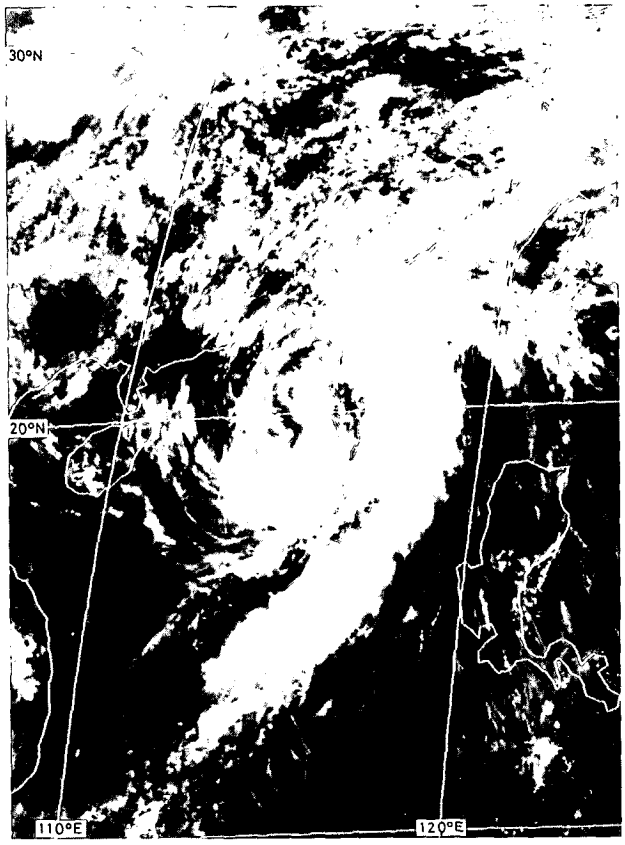

Figure 4. GMS–1 visible picture of Severe Tropical Storm Georgia taken around 8.00 a.m. on 23 May 1980.

SEVERE TROPICAL STORM HERBERT

24–28 June 1980

The track of this severe tropical storm is shown in Figure 5

Severe Tropical Storm Herbert originated as a tropical depression about 650 nautical miles south of Hong Kong on 24 June. At first it moved rapidly west-northwestwards at about 17 knots towards north Vietnam but gradually changed to a northwesterly course and slowed down to about 10 knots during the following day. Herbert intensified into a tropical storm early on 25 June and at 4.22 p.m. a reconnaissance aircraft reported maximum surface winds of 45 knots and a minimum sea-level pressure of 992 millibars near the centre of the tropical storm. However, satellite pictures received in the afternoon indicated that there were no well-organized spiral cloud bands associated with the circulation. The pictures showed an area of dense overcast near the centre of the tropical storm.

The centre of Herbert passed over the Paracel Islands between Xisha Dao and Sanhu Dao around 5.00 a.m. on 26 June and at this time winds of 42 knots with gust peak speeds of 62 knots and a mean sea-level pressure of 988.5 millibars were reported at Sanhu Dao. As Herbert was still coming closer to Hong Kong the Stand By Signal, No. 1, was hoisted at 7.35 a.m. on 26 June when the centre of Herbert was about 350 nautical miles to the south-southwest of Hong Kong.

Herbert was upgraded to a severe tropical storm and at 8.00 a.m. on 26 June it was 30 nautical miles due north of Sanhu Dao where winds of 46 knots and gust peak speeds of 60 knots were reported. Severe Tropical Storm Herbert continued to move towards Hainan at about 5 knots and weakened into a tropical storm as it crossed Hainan during the evening. Shortly before Herbert entered the Gulf of Tonkin on the afternoon of 27 June, a coastal station recorded a minimum mean sea-level pressure of 985.3 millibars. Winds of 46 knots with gust peak speeds of 60 knots were reported by another weather station on the east coast of Hainan. Satellite pictures also showed more organized spiral cloud bands while Herbert was crossing Hainan (Figure 6).

At first Tropical Storm Herbert maintained a northwesterly course over the Gulf of Tonkin but during the morning of 28 June, it began to turn westwards and, later in the afternoon, it crossed the coast about 110 nautical miles east-northeast of Hanoi. Herbert soon degenerated into an area of low pressure over north Vietnam. In Hong Kong all signals were lowered at 11.30 a.m. on 28 June when Herbert was centred about 330 nautical miles west of Hong Kong.

Herbert was closest to Hong Kong around 2.00 a.m. on 28 June when it was about 300 nautical miles to the west-southwest. At this time the minimum central pressure of Herbert was estimated to be 985 millibars and the mean sea-level pressure recorded at the Royal Observatory was 1005.4 millibars.

In Hong Kong winds were moderate easterly on 25 June but with the approach of Herbert fresh to strong southeasterly winds were experienced in exposed places during the following three days. The maximum mean hourly winds and gust peak speeds together with associated wind directions recorded at some selected locations were as follows:

Location	*Maximum mean hourly wind speed in knots with direction in points*		*Maximum gust peak speed in knots with direction in points*	
Royal Observatory	E	14	S	33
Hong Kong Airport (SE)	ESE	21	ESE	43
Hong Kong Airport (NW)	SE	19	SE	43
Waglan Island	SE	26	SE	48
Tate's Cairn	S	30	S	48
Cheung Chau	SE	27	S	40
King's Park	ESE	18	ESE	37
Star Ferry	ESE	20	ESE	36
Green Island	SE	18	SE	34
Tsim Bei Tsui	SE	18	SE	37
Tai O	SE	22	SE	41
Castle Peak	SE	13	SE	43
Chek Lap Kok	ESE	23	SE	41
Lei Yue Mun	ESE	23	SE	36
Yau Yat Chuen	ESE	15	E	37
Kowloon Tsai Hill	ESE	16	ESE	40

The weather was mainly fine on 25 June but became cloudy with scattered showers and some thunderstorms during the following four days. The daily amounts of rainfall recorded were as follows:

	Royal Observatory	*Cheung Chau*	*Tate's Cairn*
25 June	Trace	Trace	0.7 mm
26 June	16.8 mm	8.1 mm	1.5 mm
27 June	30.3 mm	12.1 mm	26.2 mm
28 June	11.1 mm	68.6 mm	24.8 mm
29 June	24.5 mm	25.3 mm	49.6 mm
Total:	82.7 mm	114.1 mm	102.8 mm

During the approach of Severe Tropical Storm Herbert, damage in Hong Kong was minimal. Most kinds of transport were not affected. However, two men on board a commercial helicopter were killed when the helicopter crashed into the slopes of Tai Mo Shan on the afternoon of 27 June. The showers on the morning of 29 June flooded some roads and caused a few minor landslips.

The times and heights of the highest tides and maximum storm surges recorded at various locations in Hong Kong during the display of the Stand By Signal were as follows:

Location	Highest tide above chart datum			Maximum storm surge above astronomical tide		
	Height (m)	Date	Time	Height (m)	Date	Time
North Point	2.3	28 June	7.15 a.m.	0.2	28 June	6.45 p.m.
Tai Po Kau	2.2	28 June	7.30 a.m.	0.4	28 June	12.30 p.m.
Chi Ma Wan (Lantau Island)	2.5	28 June	8.30 a.m.	0.5	27 June	7.00 p.m.

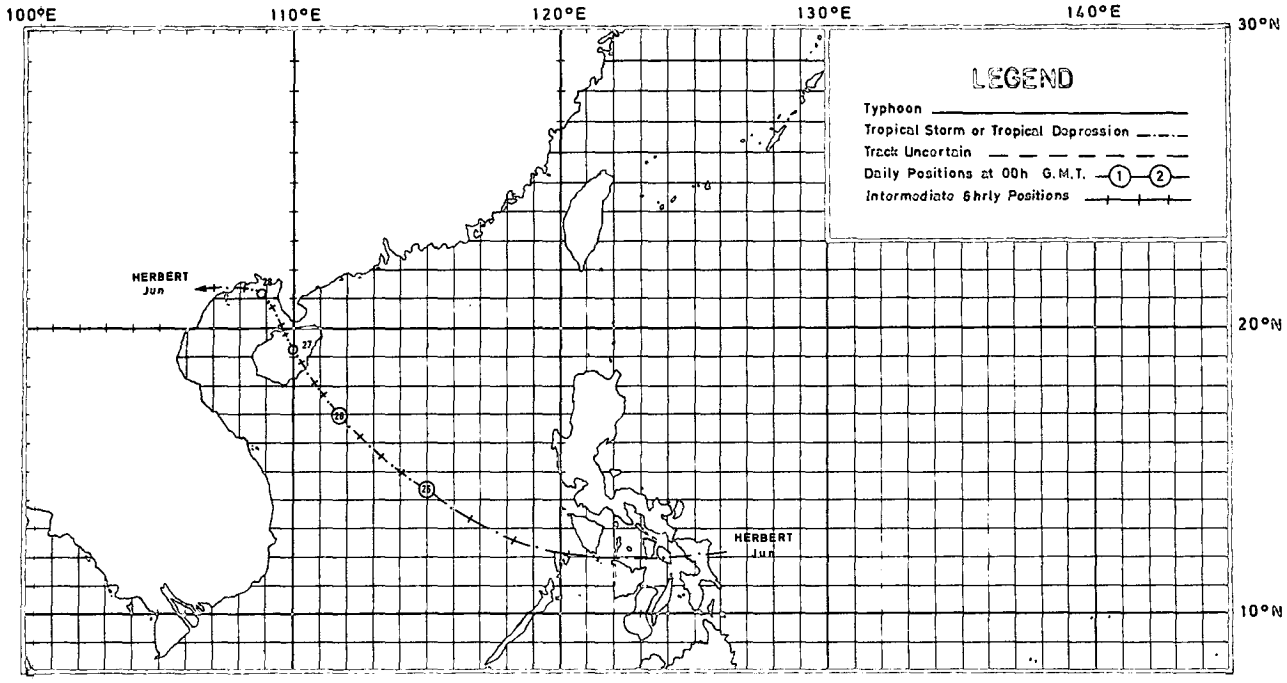

Figure 5. **Track of Severe Tropical Storm Herbert: 24–28 June 1980.**

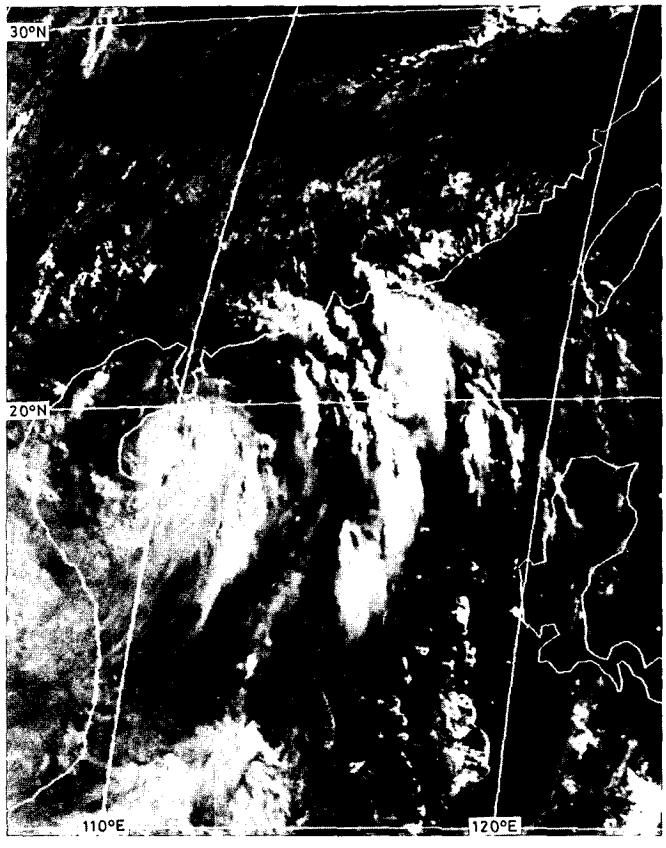

Figure 6. **GMS–1 visible picture of Severe Tropical Storm Herbert taken around 8.00 a.m. on 27 June 1980.**

SEVERE TROPICAL STORM IDA

5–12 July 1980

The track of this severe tropical storm is shown in Figure 7

Severe Tropical Storm Ida first formed as a tropical depression about 240 nautical miles southwest of Guam on 5 July. It moved northwestwards at 11 knots and intensified into a tropical storm early on 7 July. Satellite pictures showed that Ida was well-organized with a central cloud mass and some spiral bands in the northwest quadrant of the storm. While still moving northwestwards, it speeded up to about 18 knots. Ida further intensified into a severe tropical storm on 8 July. It began to turn onto a west-northwest course and moved at about 13 knots towards the Bashi Channel. At 5.33 a.m. on 9 July, a reconnaissance aircraft reported maximum surface winds of 65 knots and a minimum sea-level pressure of 979 millibars. However, satellite pictures received the same morning showed that the central cloud mass had shrunk in size. Ida continued to head west-northwestwards and passed close to Basco Island early on 10 July where a minimum pressure of 981.8 millibars was reported at 1.00 a.m. The M.V. 'Benvalla' reported winds of 57 knots and gust peak speeds of 75 knots when it was about 40 nautical miles from the centre of the storm.

Satellite pictures on 10 July revealed that the main cloud mass of the severe tropical storm was displaced to the southwest of the centre. Ida slowed down as it entered the South China Sea. In Hong Kong, the Stand By Signal, No. 1, was hoisted at 6.00 a.m. on 10 July when the centre of Ida was about 390 nautical miles to the east-southeast of Hong Kong.

Early on 11 July, Ida began to take a northwesterly course and moved towards the south China coast at about 7 knots (Figure 8). Ida was closest to Hong Kong around 8.00 p.m. on 11 July when it was about 150 nautical miles to the east-northeast (Figure 9). At this time the minimum central pressure of Ida was estimated to be 984 millibars and the mean sea-level pressure recorded at the Royal Observatory was 997.7 millibars. At around 9.00 p.m. Ida crossed the coast near Shantou (Swatow) where a mean sea-level pressure of 985.1 millibars was reported. Surface winds of 38 knots and gust peak speeds of 52 knots were also reported at the same time. In Hong Kong, all signals were lowered at 6.10 a.m. on 12 July when Ida was centred over south China about 160 nautical miles northeast of Hong Kong, where it weakened rapidly and degenerated into an area of low pressure.

In Hong Kong winds were moderate westerly on 9–10 July. As Ida moved closer to Hong Kong, winds began to freshen on 11 July and were strong offshore at times overnight. Winds turned to southwesterly and abated in the evening on 12 July. The maximum mean hourly winds and gust peak speeds together with associated wind directions recorded at some selected locations were as follows:

Location	*Maximum mean hourly wind speed in knots with direction in points*		*Maximum gust peak speed in knots with direction in points*	
Royal Observatory	WSW	19	WSW	41
Hong Kong Airport (SE)	WSW	21	WSW	42
Hong Kong Airport (NW)	WNW	11	WNW	30
Waglan Island	WSW	36	WSW	53
Tate's Cairn	WSW	28	WSW	48
Cheung Chau	W	28	W	48
King's Park	SW	17	SW	33
Star Ferry	W	22	W	41
Green Island	W	25	W	34
Tsim Bei Tsui	ESE	20	ESE	31
Tai O	SW	15	SW	35
Castle Peak	WSW	19	WSW	40
Chek Lap Kok	W	29	W	43
Lei Yue Mun.	WNW	20	WNW	43
Yau Yat Chuen	SW	11	SW	25
Kowloon Tsai Hill	W	18	W	45

The weather was fine and very hot on 9–10 July. The maximum temperature of 35.0°C recorded at the Royal Observatory on 10 July was the highest in July during the last twelve years. There was a remarkable display of lightning during the evening but very little thunder was heard. This was partly because most of the discharges occurred between clouds rather than from cloud to ground and partly because the excellent visibility made distant thunderstorms appear closeby. Scattered showers and thunderstorms persisted during the following four days. Radar echoes on 11 July reached a maximum height of 19 670 m (Figure 10). The daily amounts of rainfall recorded during the period 10–14 July were as follows:

	Royal Observatory	*Cheung Chau*	*Tate's Cairn*
10 July	5.6 mm	Trace	2.5 mm
11 July	71.0 mm	72.9 mm	73.0 mm
12 July	73.9 mm	25.3 mm	91.9 mm
13 July	17.4 mm	13.3 mm	22.0 mm
14 July	22.9 mm	13.4 mm	28.5 mm
Total:	190.8 mm	124.9 mm	217.9 mm

There were no reports of damage to property in Hong Kong. However, a 12-year-old girl was missing after she slipped into a torrential stream at Sheung Shui on 11 July.

The times and heights of the highest tides and maximum storm surges recorded at various locations in Hong Kong during the display of the Stand By Signal were as follows:

Location	Highest tide above chart datum			Maximum storm surge above astronomical tide		
	Height (m)	Date	Time	Height (m)	Date	Time
North Point	2.4	11 July	8.30 a.m.	0.5	11 July	11.45 a.m.
Tai Po Kau	2.3	11 July	8.30 a.m.	0.8	11 July	11.30 a.m.
Chi Ma Wan (Lantau Island)	2.4	12 July	9.00 a.m.	0.5	10 July	9.30 p.m.

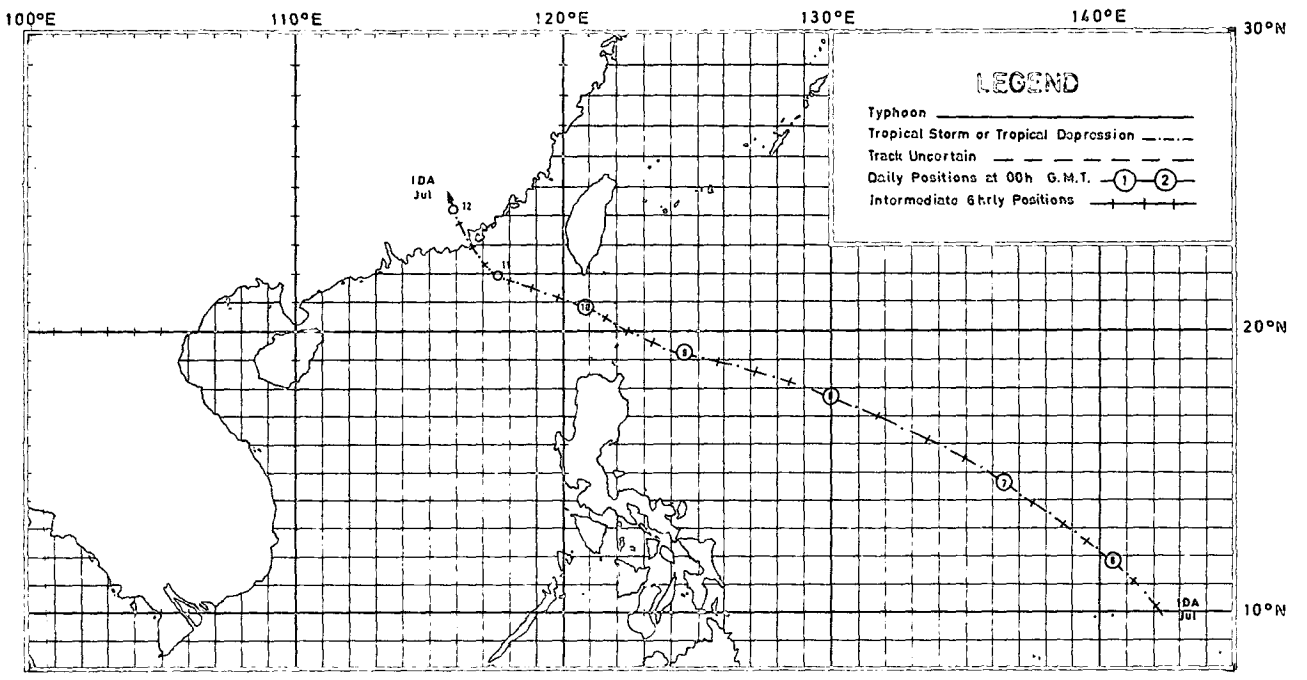

Figure 7. Track of Severe Tropical Storm Ida: 5–12 July 1980.

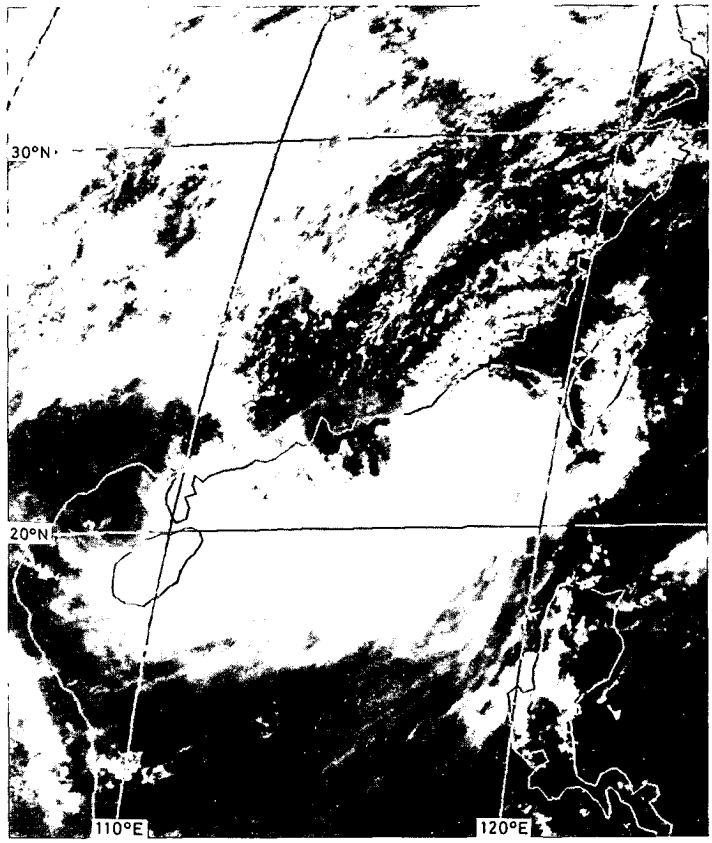

Figure 8. GMS–1 visible picture of Severe Tropical Storm Ida taken around 11.00 a.m. on 11 July 1980.

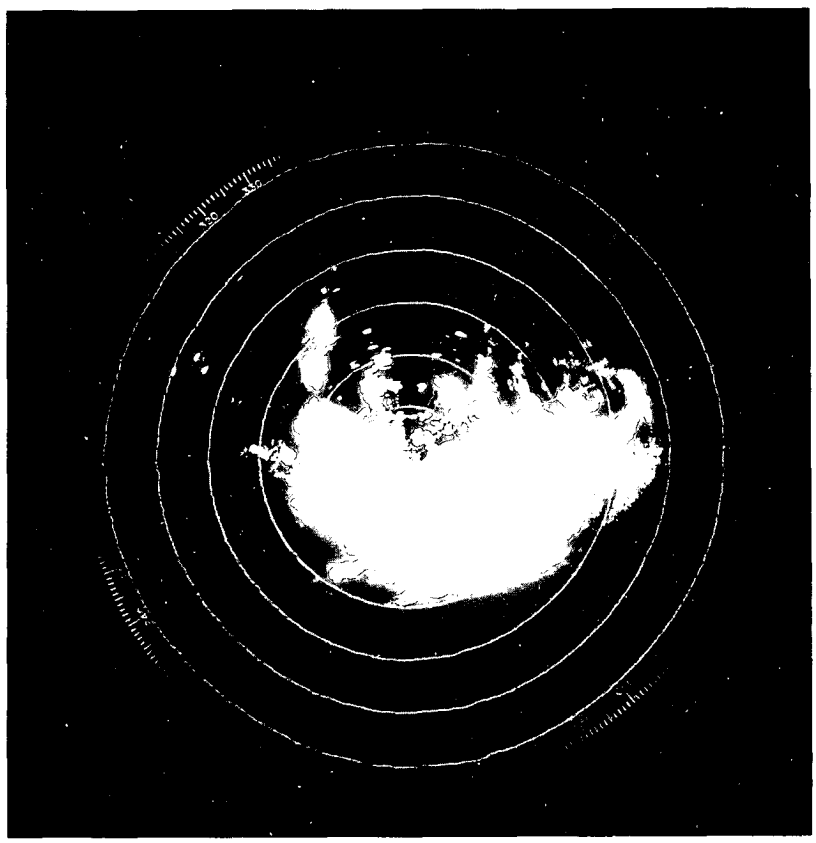

Figure 9. Radar picture of Severe Tropical Storm Ida taken at 8.00 p.m. on 11 July 1980.

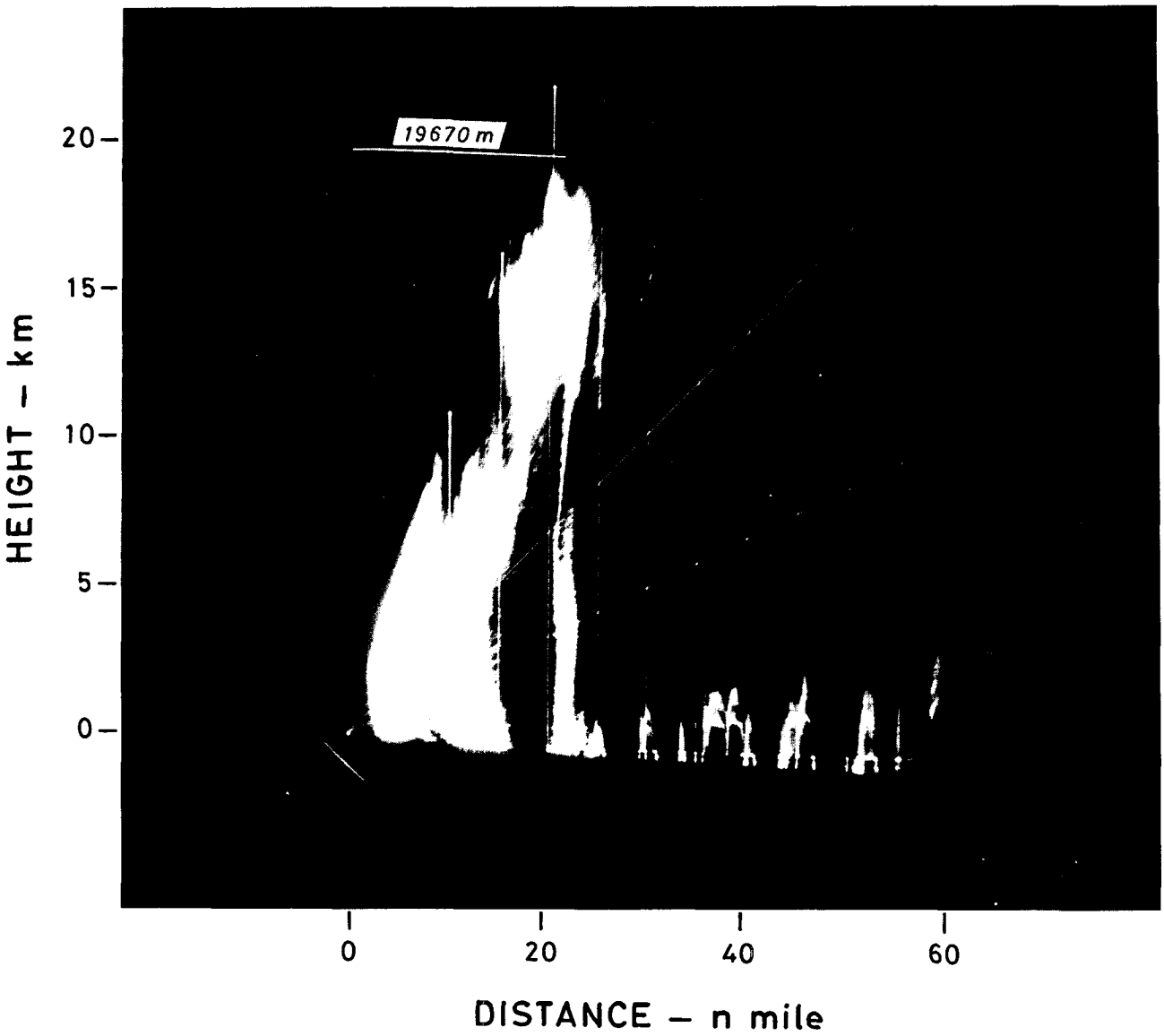

Figure 10. Radar cross-section of Severe Tropical Storm Ida at a bearing of 056° taken at 5.32 p.m. on 11 July 1980.

TROPICAL STORM

15–19 July 1980

The track of this tropical storm is shown in Figure 11

A tropical depression formed on 15 July about 520 nautical miles east of Manila. It started moving west-northwestwards at 21 knots but turned westwards on 16 July. It slowed down to 8 knots while crossing the Philippines and passed close to Manila at 7.00 p.m. on 16 July where a minimum sea-level pressure of 1006.5 millibars was reported. On entering the South China Sea it turned northwestwards and accelerated to about 18 knots on 17 July. Satellite pictures showed that the depression was not well-organized and the center was ill-defined. During the night of 17 July it slowed down and intensified into a tropical storm.

At 8.00 a.m. on 18 July, the M.V. 'Vishva Apurva' reported winds of 36 knots about 110 nautical miles from the centre. However, satellite pictures taken around 2.00 p.m. indicated that the clouds were still diffuse (Figure 12). At 5.00 p.m. the M.V. 'Paronga' also reported winds of 37 knots 60 nautical miles from the centre. At this time the central pressure was estimated to be 996 millibars. It continued moving on its northwesterly course at 11 knots and made landfall near Shangchuan Dao (St. John's Island) around 8.00 a.m. on 19 July (Figure 13). Later it degenerated into an area of low pressure near Nanning in southwest China.

In Hong Kong, the Stand by Signal, No. 1, was hoisted at 10.30 a.m. on 18 July when the storm was about 200 nautical miles south of Hong Kong. Winds soon freshened from the east and the strong Wind Signal, No. 3, was hoisted at 2.10 p.m. on 18 July. During the rest of the day, winds were strong at times offshore and in exposed places. Winds turned southeasterly during the evening and maintained their strength throughout the night. The storm had weakened into a tropical depression when it was closest to Hong Kong at 2.00 a.m. on 19 July. Winds began to subside after the depression crossed the south China coast. All signals were lowered at 9.10 a.m. on 19 July when the depression was 140 nautical miles west-southwest of Hong Kong. The minimum sea-level pressure at the Royal Observatory was 1002.7 millibars at 4.00 p.m. on 18 July.

The maximum mean hourly winds and gust peak speeds together with associated wind directions recorded at some selected locations were as follows:

Location	*Maximum mean hourly wind speed in knots with direction in points*		*Maximum gust peak speed in knots with direction in points*	
Royal Observatory	E	16	E	39
Hong Kong Airport (SE)	E	21	SSE	44
Hong Kong Airport (NW)	E	20	SE	39
Waglan Island	SSE	28	SSE	44
Tate's Cairn	S	31	S	56
Cheung Chau	SE	31	SE	44
King's Park	ESE	19	ESE	37
Star Ferry	ESE	22	SSE	46
Green Island	S	26	SE	38
Tsim Bei Tsui	SE	22	SE	37
Tai O	SE	26	SE	55
Castle Peak	SSE	20	SSE	36
Chek Lap Kok	SE	29	SE	49
Lei Yue Mun	E	28	E	39
Yau Yat Chuen	ENE	18	E	33
Kowloon Tsai Hill	E	21	E	41

The weather was fine and hot on 17 July. Some scattered squally showers occurred on 18–19 July but conditions improved in the evening of 19 July and the next day was fine and sunny. The daily amounts of rainfall recorded during the period 17–19 July were as follows:

	Royal Observatory	*Cheung Chau*	*Tate's Cairn*
17 July	1.6 mm	Nil	2.0 mm
18 July	13.7 mm	9.6 mm	21.9 mm
19 July	22.5 mm	13.8 mm	30.6 mm
Total:	37.8 mm	23.4 mm	54.5 mm

Apart from some fallen scaffoldings, damage to property in Hong Kong was minimal.

The times and heights of the highest tides and maximum storm surges recorded at various locations in Hong Kong during the display of tropical cyclone warning signals were as follows:

Location	Highest tide above chart datum			Maximum storm surge above astronomical tide		
	Height (m)	Date	Time	Height (m)	Date	Time
North Point	1.9	18 July	11.45 a.m.	0.3	18 July	2.45 p.m.
Tai Po Kau	1.9	18 July	11.00 a.m.	0.5	18 July	5.00 p.m.
Chi Ma Wan (Lantau Island)	2.1	18 July	12.15 p.m.	0.4	18 July	11.45 p.m.

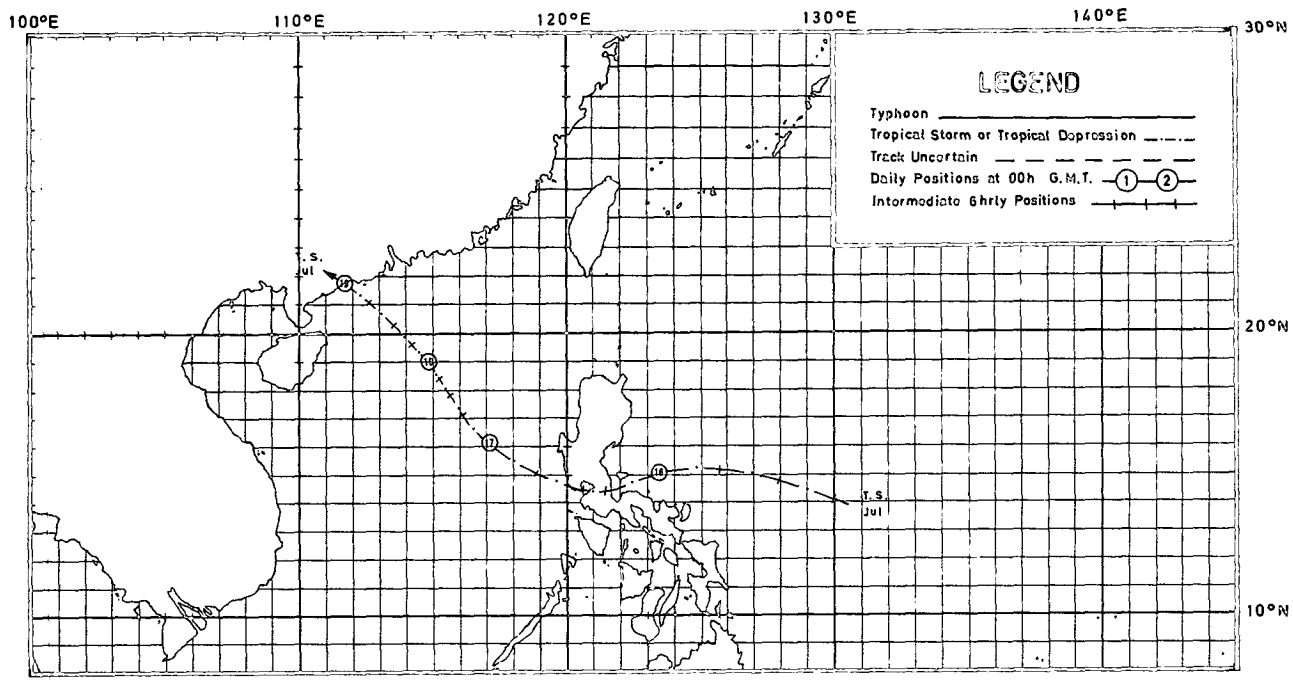

Figure 11. Track of the Tropical Storm: 15–19 July 1980.

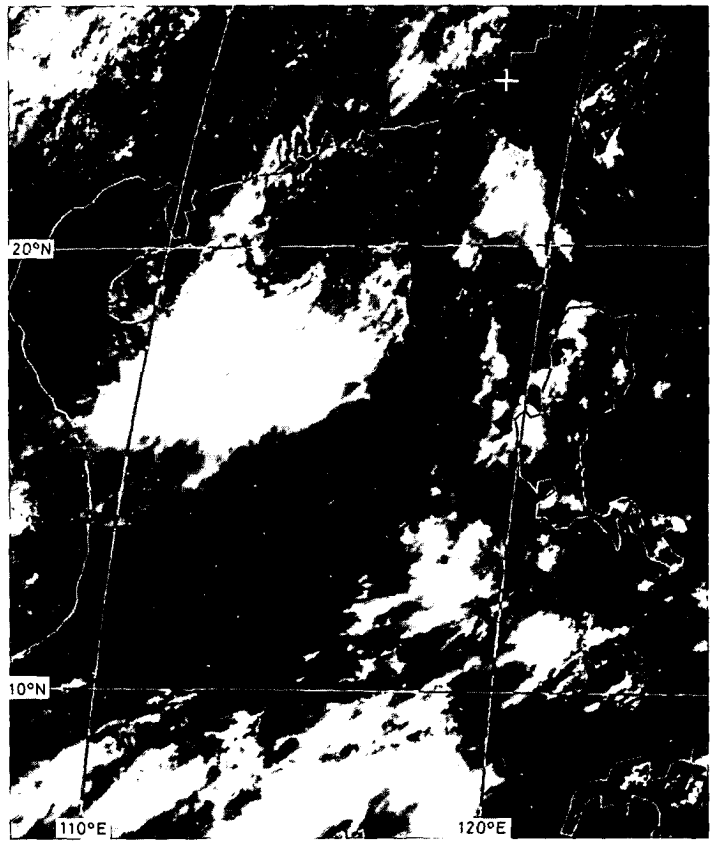

Figure 12. GMS–1 visible picture of the Tropical Storm taken around 2.00 p.m. on 18 July 1980.

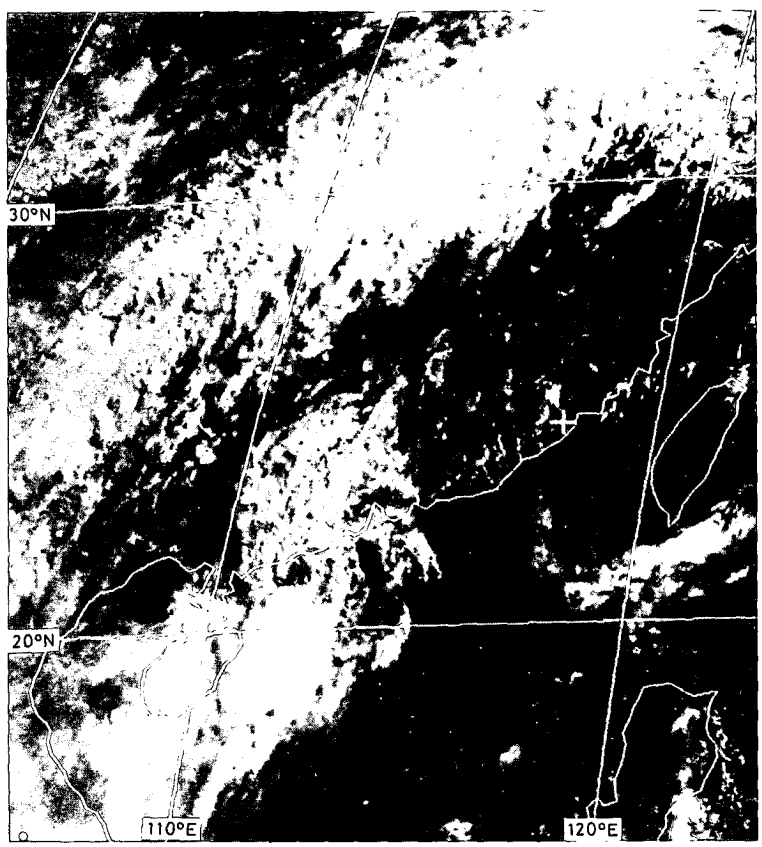

Figure 13. GMS–1 visible picture of the Tropical Storm taken around 8.00 a.m. on 19 July 1980.

TYPHOON JOE

18–23 July 1980

The track of this typhoon is shown in Figure 14

Joe developed from an area of low pressure about 160 nautical miles west-southwest of Guam. It was first warned as a tropical depression on 18 July about 330 nautical miles west of Guam moving west-northwest at 14 knots. It intensified into a tropical storm on the same day still moving steadily towards the Philippines. On the morning of 19 July, it further intensified into a severe tropical storm. Satellite pictures received at 8.00 a.m. showed that the overcast was about 130 nautical miles in diameter. At 2.00 p.m. on 19 July, the 'eye' of Joe became discernible on satellite pictures as Joe attained typhoon strength. At 4.28 p.m. a reconnaissance aircraft reported maximum surface winds of 65 knots and a minimum sea-level pressure of 974 millibars near the centre. The typhoon continued on its west-northwesterly course at 16 knots and by 8.00 a.m. on 20 July Joe was centred about 340 nautical miles east-northeast of Manila. At the same time, satellite pictures revealed that the overcast had expanded in size with a diameter of about 150 nautical miles and the circulation of Joe covered an area about 400 nautical miles in diameter (Figure 15). At 5.00 p.m. a reconnaissance aircraft reported maximum surface winds of 70 knots and a. minimum sea-level pressure of 940 millibars. A distinct 'eye' appeared on satellite pictures at 8.00 p.m. and Joe had estimated maximum surface winds of about 100 knots.

The typhoon crossed Luzon early on 21 July causing tremendous damage to plantations and crops (Figure 16). According to press reports, about 50 000 Philippinos lost their homes and at least 2 fishermen died. The typhoon weakened slightly after striking Luzon but widespread thunderstorms occurred in the southwesterly airstream over the central Philippines. Joe intensified again over the South China Sea and early on 22 July the maximum surface winds were estimated to be about 80 knots (Figure 17). At 8.00 a.m. the M.V. 'Samoa' reported winds of 58 knots 150 nautical miles from the centre. Joe maintained its west-northwesterly track at 17 knots heading towards the Leizhou (Luichow) Peninsula. At 2.00 p.m. on 22 July the M.V. 'Apollo Peak' reported winds of 57 knots and mean sea-level pressure of 973 millibars when it was 40 nautical miles from the centre. Joe passed over the Leizhou Peninsula and according to Chinese newspapers, the typhoon caused 188 deaths and was the strongest over the region in 26 years. Joe entered the Gulf of Tonkin late on 22 July. The island station Bach Longvi recorded winds of 62 knots and sea-level pressure of 980.3 millibars at 2.00 a.m. on 23 July as Joe passed 50 nautical miles away. Joe then turned westwards and crossed the coast of Vietnam near Hanoi at 8.00 a.m. (Figure 18). Joe weakened rapidly overland and degenerated into an area of low pressure in the early hours of 24 July.

In Hong Kong, the Stand By signal, No. 1, was hoisted at 12.00 noon on 21 July when Joe was centred 400 nautical miles southeast of Hong Kong. In view of the extensive circulation and fast movement of Joe, the Strong Wind Signal, No. 3, was hoisted at 4.15 p.m. Winds were mainly light northerly at first but became moderate northeasterly in the evening. A few hours later, strong northeasterly winds set in. The No. 8 NORTHEAST Gale or Storm Signal was hoisted at 4.40 a.m. on 22 July when Joe was centred 200 nautical miles south of Hong Kong. Winds began to turn easterly and gales were soon experienced offshore. The No. 8 SOUTHEAST Gale or Storm Signal was hoisted at 10.45 a.m. as winds continued to veer. There were gales in exposed places and offshore throughout the morning and early afternoon, but inside the harbour, gales only lasted for a brief period. Winds gradually turned southeasterly during the afternoon and the gales began to subside. The Gale Signal was replaced by the Strong Wind Signal, No. 3, at 6.05 p.m. when Joe was centred 220 nautical miles west-southwest of Hong Kong. Strong southeasterly winds continued for some hours but all signals were lowered at 1.30 a.m. on 23 July. Joe was closest to Hong Kong around 10.00 a.m. on 22 July when it was 190 nautical miles to the south-southwest. The minimum mean sea-level pressure at the Royal Observatory was 1001.2 millibars in violent showers at 4.00 a.m. on 22 July.

The maximum mean hourly winds and maximum gust peak speeds together with associated wind directions recorded at some selected locations were as follows:

Location	*Maximum mean hourly wind speed in knots with direction in points*		*Maximum gust peak speed in knots with direction in points*	
Royal Observatory	E	24	E	58
Hong Kong Airport (SE)	ENE	32	ENE	63
Hong Kong Airport (NW)	E	30	E	56
Waglan Island	E	42	E	68
Tate's Cairn	E	47	E	77
Cheung Chau	E	40	E	65
King's Park	E	28	E	53
Star Ferry	E	32	E	55
Green Island	ENE	36	ENE	54

Location	*Maximum mean hourly wind speed in knots with direction in points*		*Maximum gust peak speed in knots with direction in points*	
Tsim Bei Tsui	ESE	35	ESE	69
Tai O	SE	35	SE	78
Castle Peak	E	16	E	52
Chek Lap Kok	ESE	38	ESE	62
Lei Yue Mun	E	40	E	59
Yau Yat Chuen	ENE	30	ENE	63
Kowloon Tsai Hill	E	32	E	70
Stanley (A)	—	55	—	73
Stanley (B)	NE	45	NE	83

The weather was fine and hot on 21 July. It became cloudy during the night and the first heavy squally showers occurred before dawn on 22 July. The showers ceased for a few hours in the morning but became frequent in the afternoon. Echoes of the active rain bands were displayed on the radar (Figure 19 and 20). The maximum instantaneous rate of rainfall at the Royal Observatory was 235 mm/h recorded in a violent shower around 4.00 p.m. The weather improved quickly during the evening and the following morning was fine. A spiral rain band brought some thunderstorms around noon on 23 July. Scattered showers followed in the afternoon but conditions improved again soon afterwards. The daily amounts of rainfall recorded were as follows:

	Royal Observatory	*Cheung Chau*	*Tate's Cairn*
21 July	Nil	Nil	0.7 mm
22 July	40.7 mm	29.4 mm	30.0 mm
23 July	21.2 mm	6.6 mm	24.0 mm
Total:	61.9 mm	36.0 mm	54.7 mm

Typhoon Joe claimed two lives in an accident on a construction site in Kwai Chung. One man who was last seen in a sinking junk off Aberdeen Harbour was reported missing. 59 people were injured, mostly by flying debris or broken glass. 3 ocean-going vessels broke away from their anchors and were adrift in the harbour. One of them collided with a vessel at a buoy. There were numerous cases of fallen scaffoldings, sign-boards, traffic signs and trees. Air and sea traffic came to a halt and road traffic was seriouly affected. Typhoon Joe caused only minor damage to farms and fish ponds in the New Territories.

The times and heights of the highest tides and maximum storm surges recorded at various locations in Hong Kong during the approach of Typhoon Joe were as follows:

Location	Highest tide above chart datum			Maximum storm surge above astronomical tide		
	Height (m)	Date	Time	Height (m)	Date	Time
North Point	2.2	22 July	6.15 a.m.	0.9	22 July	1.30 p.m.
Tai Po Kau	2.3	22 July	6.30 a.m.	0.9	22 July	2.00 p.m.
Chi Ma Wan (Lantau Island)	2.5	22 July	4.30 p.m.	1.1	22 July	2.00 p.m.

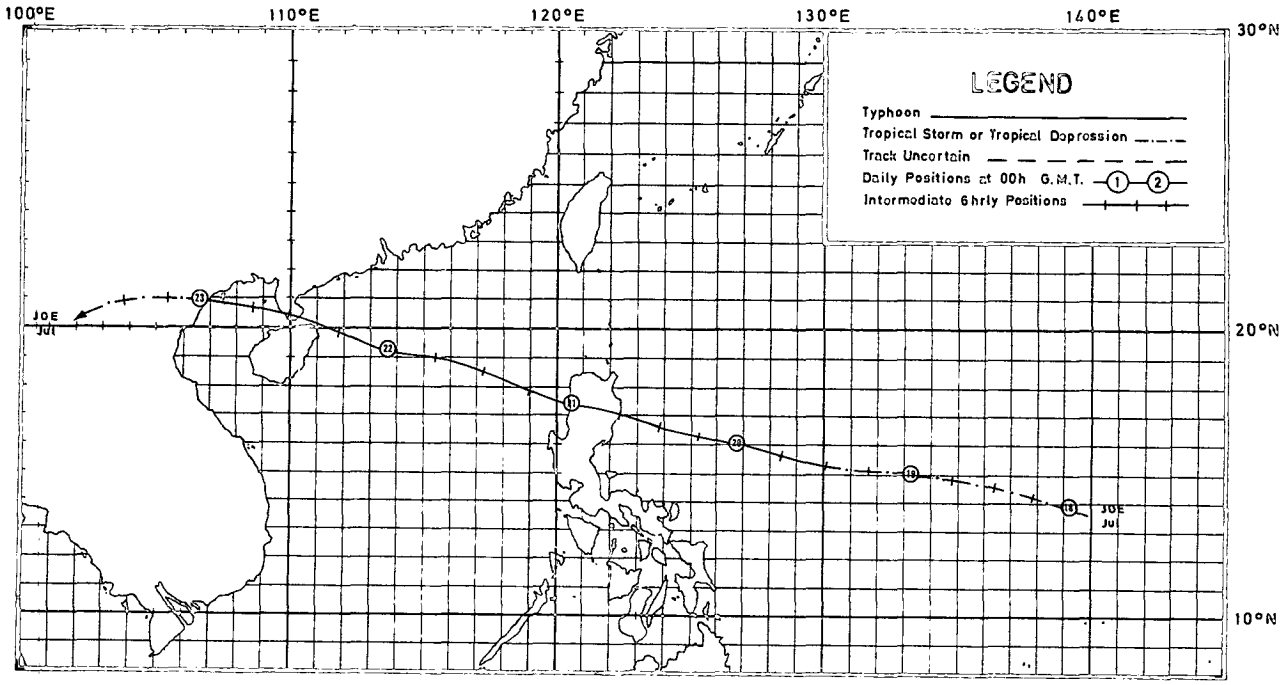

Figure 14. Track of Typhoon Joe: 18–23 July 1980.

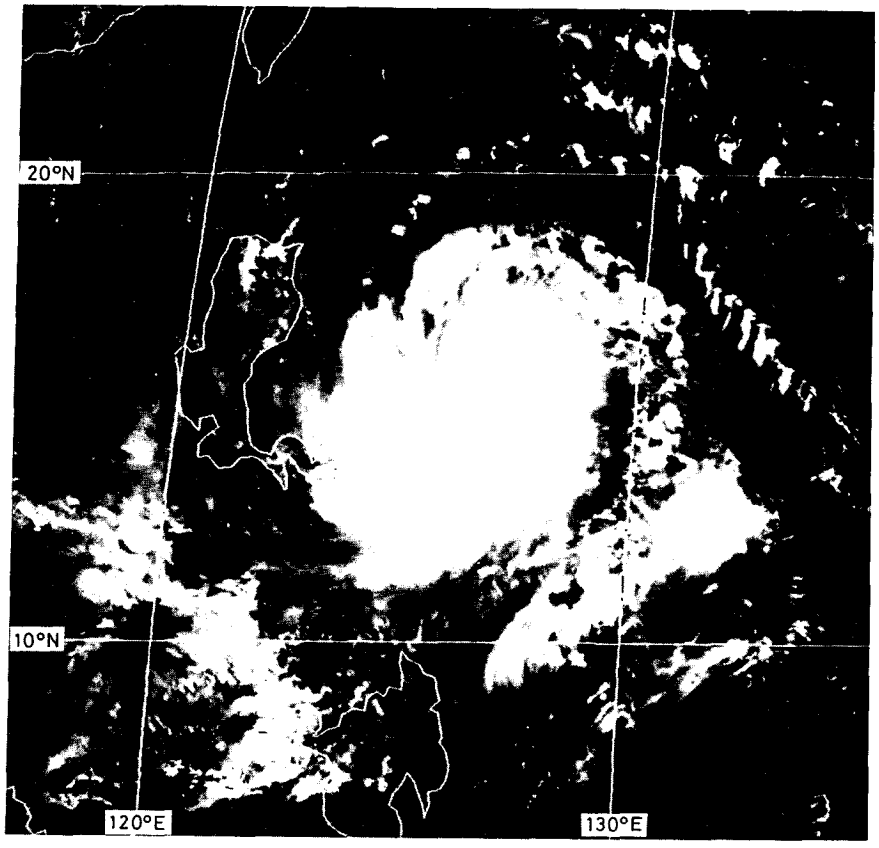

Figure 15. GMS–1 visible picture of Typhoon Joe taken around 8.00 a.m. on 20 July 1980.

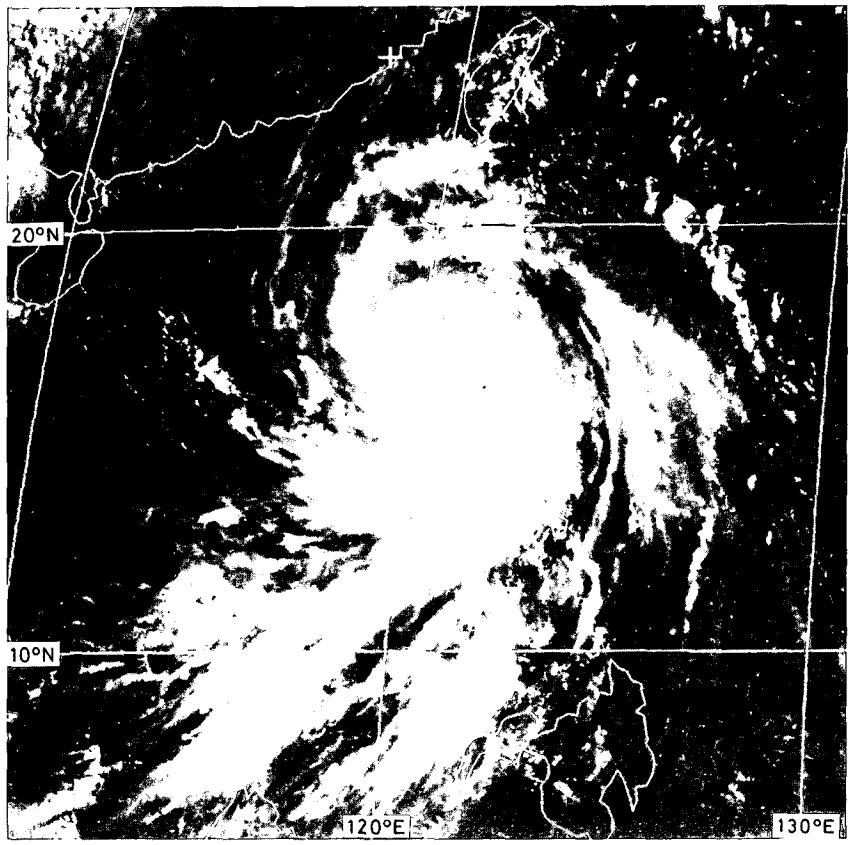

Figure 16. GMS–1 visible picture of Typhoon Joe taken around 8.00 a.m. on 21 July 1980.

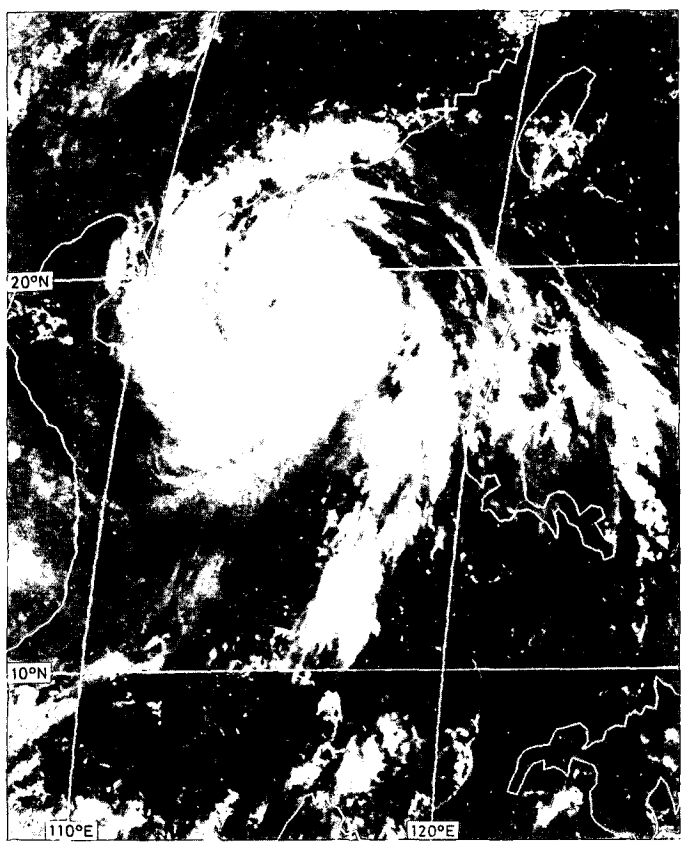

Figure 17. GMS–1 visible picture of Typhoon Joe taken around 8.00 a.m. on 22 July 1980.

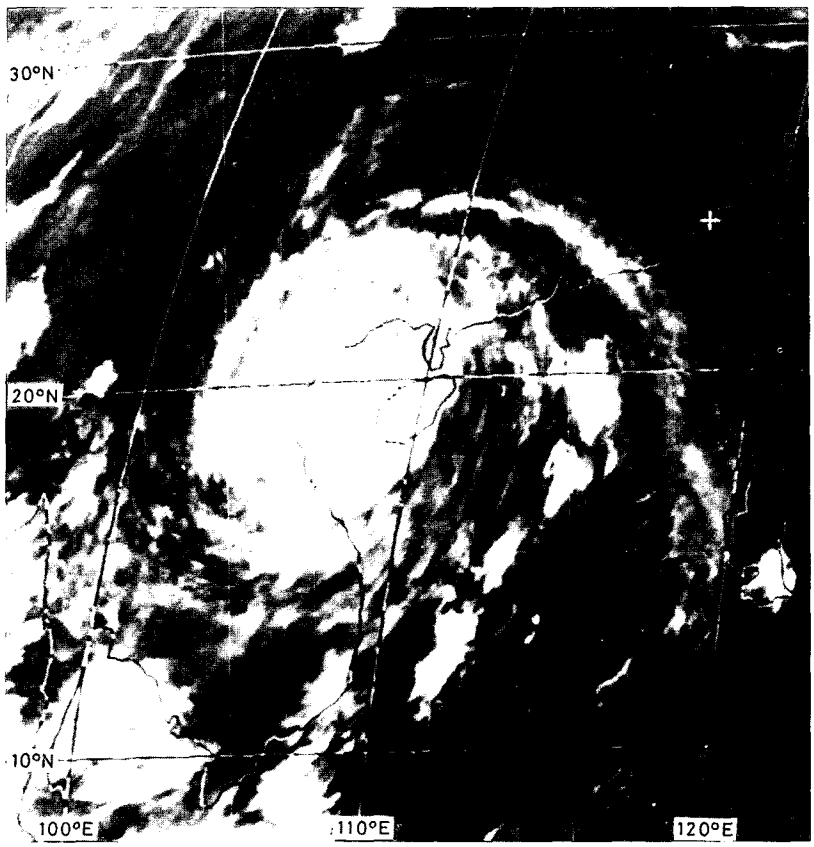

Figure 18 GMS–1 infra-red picture of Typhoon Joe taken around 8.00 a.m. on 23 July 1980.

Figure 19. Radar picture of Typhoon Joe taken at 9.30 p.m. on 21 July 1980.

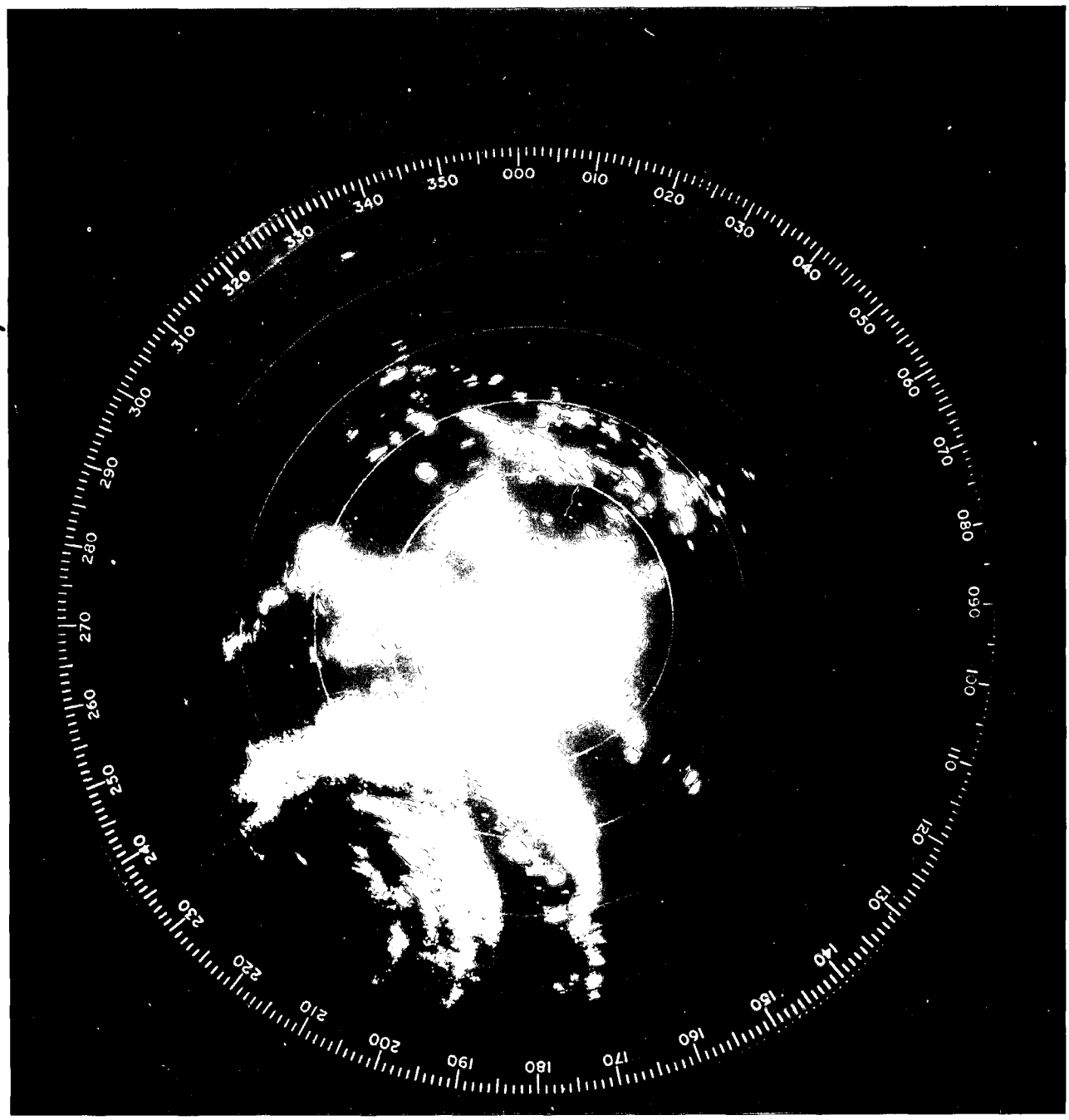

Figure 20. Radar picture of Typhoon Joe taken at 1.30 p.m. on 22 July 1980.

TYPHOON KIM

20–28 July 1980

The track of this typhoon is shown in Figure 21

Typhoon Kim first developed as a tropical depression about 330 nautical miles southeast of Guam on 20 July. It moved steadily west-northwestwards at 17 knots and intensified into a tropical storm on 22 July. It became a severe tropical storm early the next day and at 8.00 a.m. satellite pictures revealed that Kim had a circular overcast about 150 nautical miles in diameter. Kim attained typhoon strength when it was about 420 nautical miles east-southeast of Manila and then turned to move northwest at 11 knots.

At 11.00 a.m. on 24 July, a distinct 'eye' appeared on satellite pictures. There were numerous active spiral bands and the circulation of Kim covered an extensive area about 600 nautical miles in diameter (Figure 22). At 4.05 p.m., a reconnaissance aircraft reported maximum surface winds of 110 knots and minimum sea-level pressure of 916 millibars. Kim continued on its northwesterly course at 12 knots and hit the coast of Luzon around 8.00 a.m. on 25 July (Figure 23). Kim devastated the northern Philippines leaving 31 people dead and 8 others missing. 12 000 houses were destroyed and 500 villages were flooded.

Kim weakened considerably after crossing Luzon. As the typhoon entered the South China Sea around 8.00 p.m. on 25 July, the clouds in the northwest quadrant had decreased substantially. The M.V. 'Japan Iris' reported winds of 58 knots at 8.00 a.m. on 26 July about 80 nautical miles from the centre (Figure 24). At 5.00 p.m. winds of 32 knots were reported at Dongsha Dao (Pratas Island) which was then 80 nautical miles northwest of the centre of Kim. This indicated that Kim had weakened into a severe tropical storm. Kim passed close to Dongsha Dao in the early hours of 27 July while still heading towards the south China coast at 9 knots. Satellite pictures received around 8.00 a.m. on 27 July showed that most of the cloud was confined to the south and southwest quadrants of the storm (Figure 25). Some narrow spiral bands to the north brought showers to the coastal areas but Kim had weakened into a tropical storm.

When it was about 120 nautical miles southeast of Hong Kong, Kim altered its course and headed northwards at 10 knots. It crossed the coast about 55 nautical miles southwest of Shantou (Swatow) around 4.00 p.m. on 27 July (Figure 26), where maximum gusts of 70 knots were reported. It degenerated rapidly into an area of low pressure over south China early on 28 July.

In Hong Kong, winds were light to moderate southwesterly on 25 July. The Stand By Signal, No. 1, was hoisted at 12.45 a.m. on 26 July when Kim was centred about 380 nautical miles southeast of Hong Kong. Moderate northerly winds set in during the evening. As Kim was coming closer to Hong Kong, the Strong Wind Signal, No. 3, was hoisted at 11.10 p.m. Strong northerly winds were first experienced offshore around 5.00 a.m. on 27 July. Winds gradually turned northwesterly in the morning and westerly during the afternoon and stengthened further. Winds continued to turn and became southwesterly in the evening with gales for a brief period offshore. Strong southwesterly winds persisted in the morning of 28 July, but as Kim had dissipated overland, all signals were lowered at 7.15 a.m. Kim was closest to Hong Kong around 3.00 p.m. on 27 July when it was centred about 100 nautical miles east of Hong Kong and the minimum sea-level pressure at the Royal Observatory was 998.9 millibars. The remnants of Kim enhanced the southwest monsoon over south China and the Strong Monsoon Signal was hoisted from 11.00 a.m. to 4.00 p.m. on 28 July. The maximum mean hourly winds and maximum gust peak speeds together with associated wind directions recorded at some selected locations were as follows:

Location	*Maximum mean hourly wind speed in knots with direction in points*		*Maximum gust peak speed in knots with direction in points*	
Royal Observatory	SW	22	SW	58
Hong Kong Airport (SE)	SW	31	SW	51
Hong Kong Airport (NW)	SW	22	SW	50
Waglan Island	SW	42	SW	57
Tate's Cairn	SW	35	SW	58
Cheung Chau	SW	30	SW	56
King's Park	SW	24	SW	55
Star Ferry	WSW	31	WSW	69
Green Island	SSW	36	SSW	53
Tsim Bei Tsui	NW	28	SSW	56
Tai O	SW	36	SW	56
Castle Peak	SSW	24	S	44
Chek Lap Kok	SW	29	SW	50
Lei Yue Mun	not available		not available	
Yau Yat Chuen	SSW	22	SSW	47
Kowloon Tsai Hill	SW	24	SW	46

The weather was fine and very hot on 25–26 July. Violent squally thunderstorms occurred in the late afternoon on 26 July. A total of 32.8 mm of rainfall was recorded at the Royal Observatory between 5.00 p.m. and 6.00 p.m. when the Hammer Hill electric substation was damaged by lightning. The weather remained unsettled on 27–28 July with frequent heavy showers and periods of rain. Thunderstoms occurred on both evenings. It became fine again on 29 July. The daily amounts of rainfall recorded were as follows:

	Royal Observatory	*Cheung Chau*	*Tate's Cairn*
26 July	38.7 mm	33.5 mm	25.0 mm
27 July	41.4 mm	28.0 mm	72.0 mm
28 July	56.2 mm	25.7 mm	91.5 mm
Total:	136.3 mm	87.2 mm	188.5 mm

Typhoon Kim only caused slight damage to property in Hong Kong. There were no injuries. Thunderstorms on 26 July led to an electricity blackout in some districts in Kowloon. A minor landslip occurred on Shouson Hill Road the same evening. Some villages were flooded in Tai Po and Sheung Shui. There were reports of damage to vegetables in the New Territories due to squally showers. A landslip also occurred on Lam Kam Road near Kadoorie Farm on 28 July.

The times and heights of the highest tides and maximum storm surges recorded at various locations in Hong Kong during the display of tropical cyclone warning signals were as follows:

Location	Highest tide above chart datum			Maximum storm surge above astronomical tide		
	Height (m)	Date	Time	Height (m)	Date	Time
North Point	2.5	27 July	8.00 a.m.	0.5	27 July	12.15 p.m.
Tai Po Kau	2.4	28 July	8.00 a.m.	0.7	27 July	1.00 p.m.
Chi Ma Wan (Lantau Island)	2.7	27 July	8.15 a.m.	0.5	26 July	10.45 p.m.

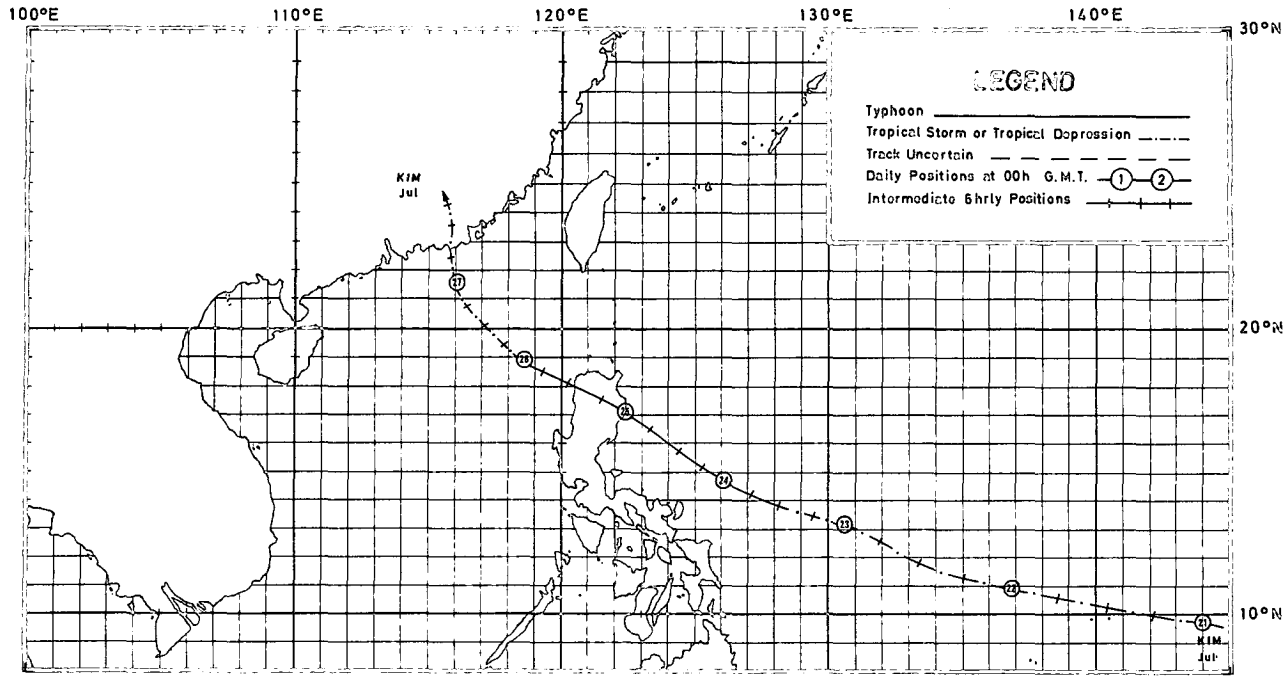

Figure 21. Track of Typhoon Kim: 20–28 July 1980.

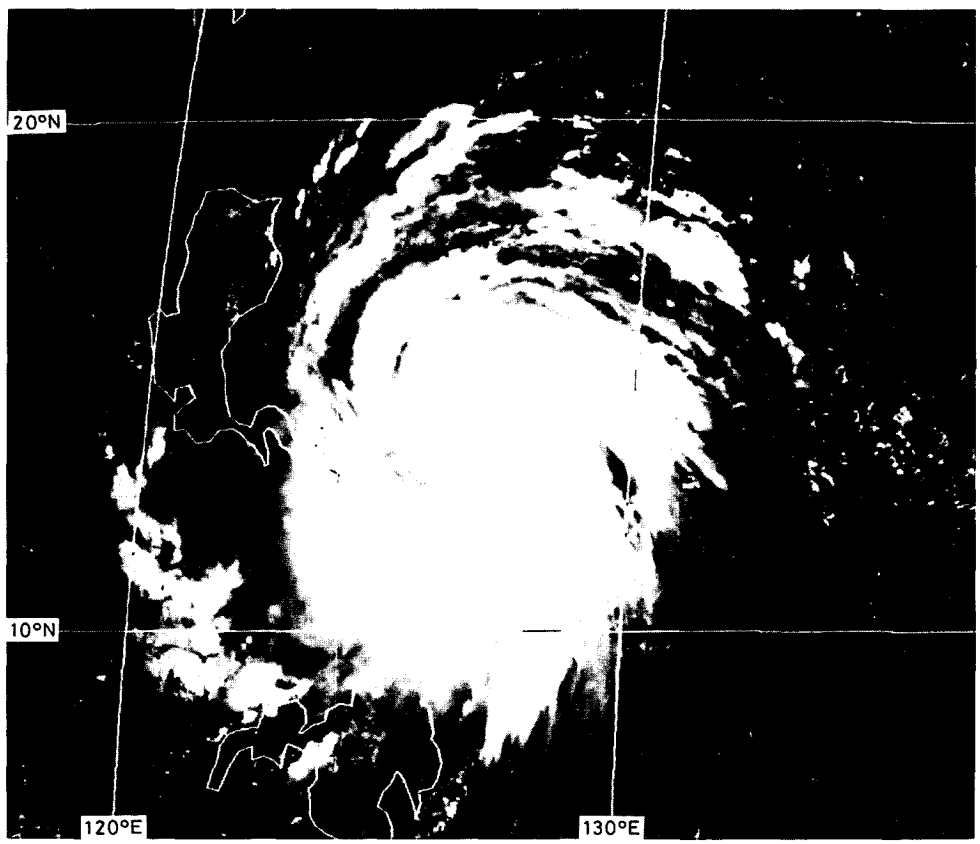

Figure 22. GMS–1 visible picture of Typhoon Kim taken around 8.00 a.m. on 24 July 1980.

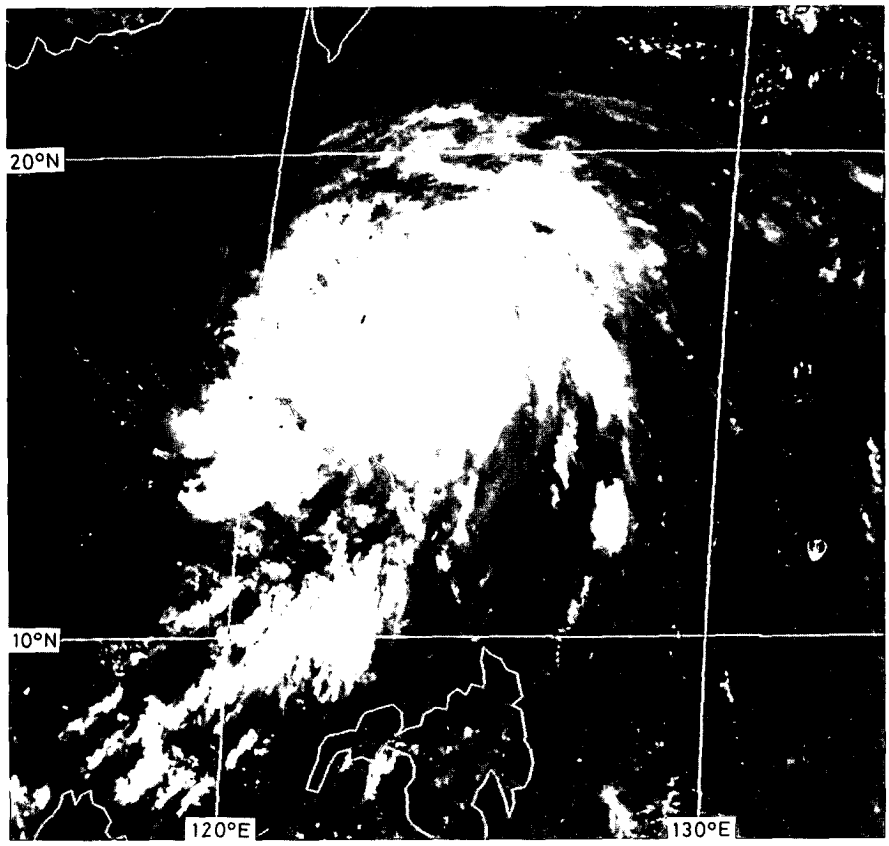

Figure 23. GMS–1 visible picture of Typhoon Kim taken around 8.00 a.m. on 25 July 1980.

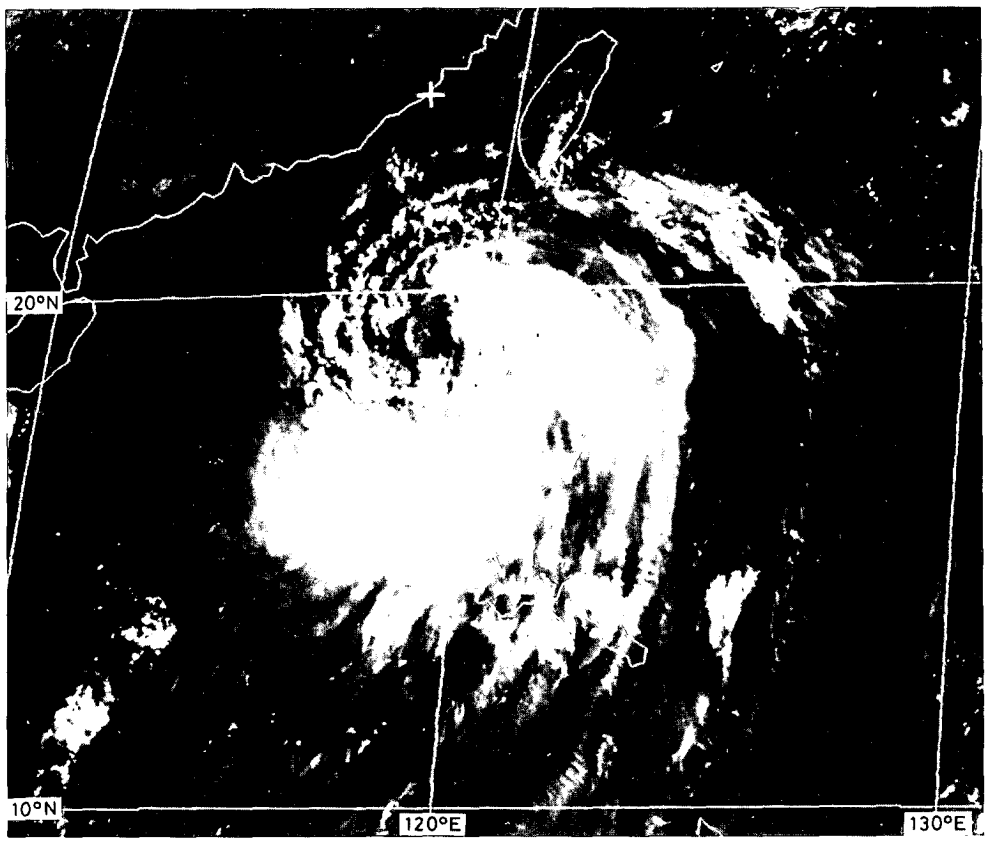

Figure 24. GMS–1 visible picture of Typhoon Kim taken around 8.00 a.m. on 26 July 1980.

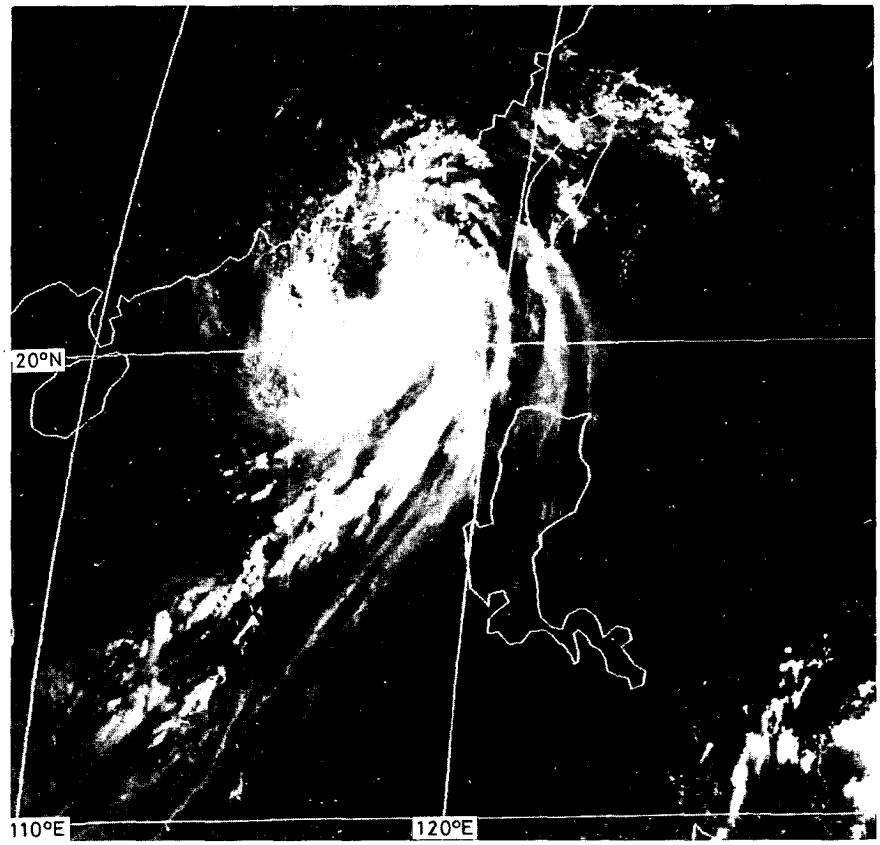

Figure 25. GMS–1 visible picture of Typhoon Kim taken around 8.00 a.m. on 27 July 1980.

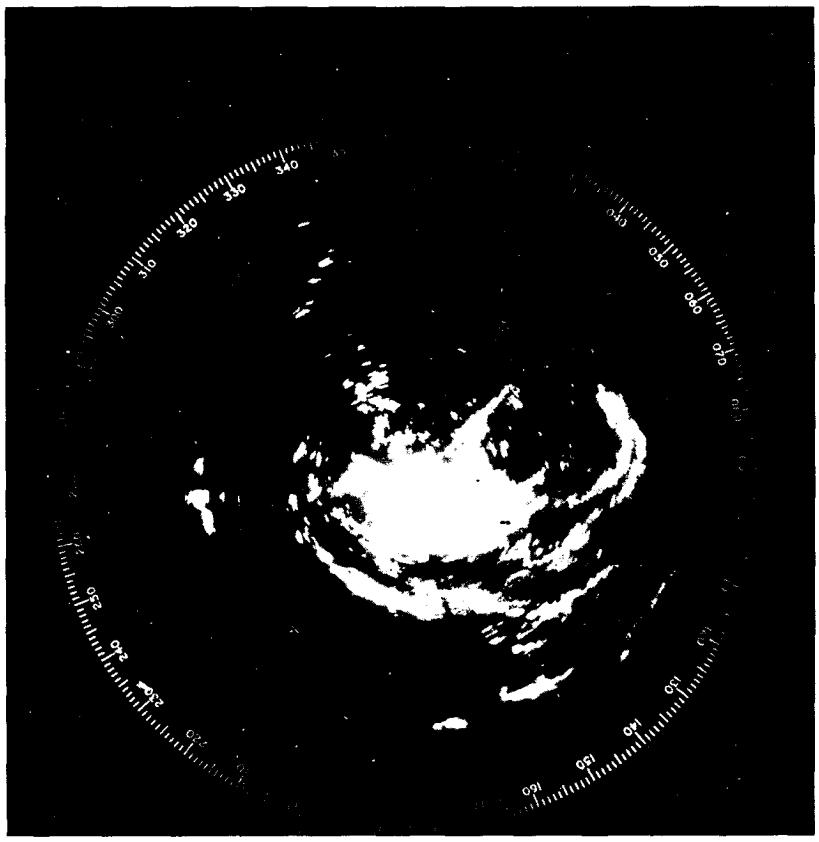

Figure 26. Radar picture of Typhoon Kim taken at 3.00 p.m. on 27 July 1980.

TROPICAL DEPRESSION

15–19 August 1980

The track of this tropical depression is shown in Figure 27

Early on 13 August an area of low pressure formed over the western North Pacific about 800 nautical miles east of Manila. The low pressure area moved west-northwest towards Luzon and two days later intensified into a tropical depression about 180 nautical miles east of Manila. The tropical depression had a very weak circulation as it crossed Luzon during the night of 15 August and when it first entered the South China Sea its centre was very diffuse.

In Hong Kong the Stand By Signal, No. 1, was hoisted at 9.10 p.m. on 16 August when the depression was estimated to be about 300 nautical miles south-southeast of Hong Kong. Although the centre was ill defined on satellite pictures, ship's reports received on 17 August indicated a five-knot westward movement. At 2.00 p.m. on 17 August the M.V. 'Vishva Amitabh' reported a pressure of 999.7 millibars 50 nautical miles east of the centre and at 2.00 a.m. on 18 August another ship reported winds of 34 knots about 70 nautical miles north of the centre.

Early on 18 August when the tropical depression was centred about 240 nautical miles south-southwest of Hong Kong it turned sharply northwards and began to come closer to Hong Kong. The Stand By Signal was replaced by the Strong Wind Signal, No. 3, at 2.35 p.m. on 18 August when the centre was about 170 nautical miles south-southwest of Hong Kong (Figure 28). However, during the evening, the depression resumed its westward movement away from Hong Kong. It crossed the Leizhou (Luichow) Peninsula during the night of 18 August and at 11.00 a.m. the following morning it passed just south of a station named Beihai where winds of 34 knots with gust peak speeds of 56 knots and a mean sea-level pressure of 997.4 millibars were reported. In Hong Kong all signals were lowered at 6.50 a.m. on 19 August when the depression was 240 nautical miles west-southwest of Hong Kong. It continued to move westwards and dissipated soon after crossing the coast about 80 nautical miles east of Hanoi on the evening of 19 August.

The tropical depression was closest to Hong Kong around 8.00 p.m. on 18 August when it was about 140 nautical miles to the southwest. The minimum central pressure of the depression at that time was estimated to be 998 millibars and the mean sea-level pressure recorded at the Royal Observatory was 1003.5 millibars. The minimum mean sea-level pressure experienced at the Royal Observatory was 1000.4 millibars recorded at 4.00 p.m. on 18 August when the depression was about 150 nautical miles south-southwest of Hong Kong.

In Hong Kong there were light easterly winds on 16 August but as the tropical depression came closer, winds gradually increased and strong winds were experienced in many locations on 18 August. They abated early on 19 August. The maximum mean hourly winds and maximum gust peak speeds together with associated wind directions recorded at some selected locations were as follows:

Location	*Maximum mean hourly wind speed in knots with direction in points*		*Maximum gust peak speed in knots with direction in points*	
Royal Observatory	ENE	15	E	43
Hong Kong Airport (SE)	SE	25	E	41
Hong Kong Airport (NW)	ENE	19	E	46
Waglan Island	E	30	E	47
Tate's Cairn	S	32	S	59
Cheung Chau	SE	26	SSE	50
King's Park	ESE	16	SE	38
Star Ferry	ESE	22	SE	40
Green Island	ENE	22	S	37
Tsim Bei Tsui	SE	22	ENE	34
Tai O	SSE	25	SSE	59
Castle Peak	SE	17	SE	39
Chek Lap Kok	SE	18	SE	35
Lei Yue Mun	SE	28	SE	43
Yau Yat Chuen	ENE	18	ENE	37
Kowloon Tsai Hill	E	22	E	45

The weather was mainly fine on 16 and 17 August but there were scattered showers and isolated thunderstorms during the evening of 17 August. The showers became more frequent on 18 August. Although the weather improved on 19 August, some thunderstorms were still experienced that evening. The daily amounts of rainfall recorded during the period 16–20 August were as follows:

	Royal Observatory	*Cheung Chau*	*Tate's Cairn*
16 August	Nil	Nil	Nil
17 August	15.3 mm	12.6 mm	2.0 mm
18 August	25.5 mm	26.5 mm	45.3 mm
19 August	15.6 mm	6.3 mm	13.7 mm
20 August	4.3 mm	20.0 mm	4.0 mm
Total:	60.7 mm	65.4 mm	65.0 mm

The tropical depression caused no damage in Hong Kong.

The times and heights of the highest tides and maximum storm surges recorded at various locations in Hong Kong during the display of tropical cyclone warning signals were as follows:

Location	Highest tide above chart datum			Maximum storm surge above astronomical tide		
	Height (m)	Date	Time	Height (m)	Date	Time
North Point	1.9	19 Aug.	1.00 a.m.	0.3	18 Aug.	3.45 p.m.
Tai Po Kau	1.8	19 Aug.	0.30 a.m.	0.4	18 Aug.	5.00 p.m.
Chi Ma Wan (Lantau Island)	2.0	19 Aug.	1.45 a.m.	0.4	18 Aug.	3.15 p.m.

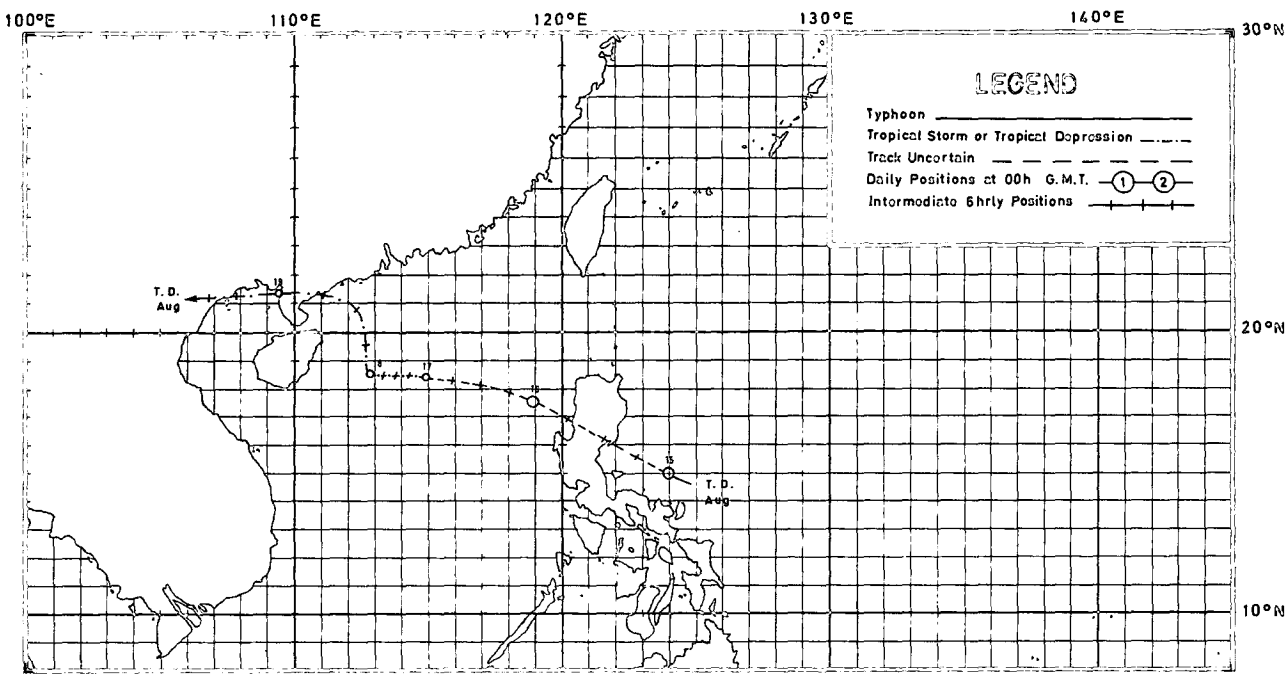

Figure 27. Track of the Tropical Depression: 15–19 August 1980.

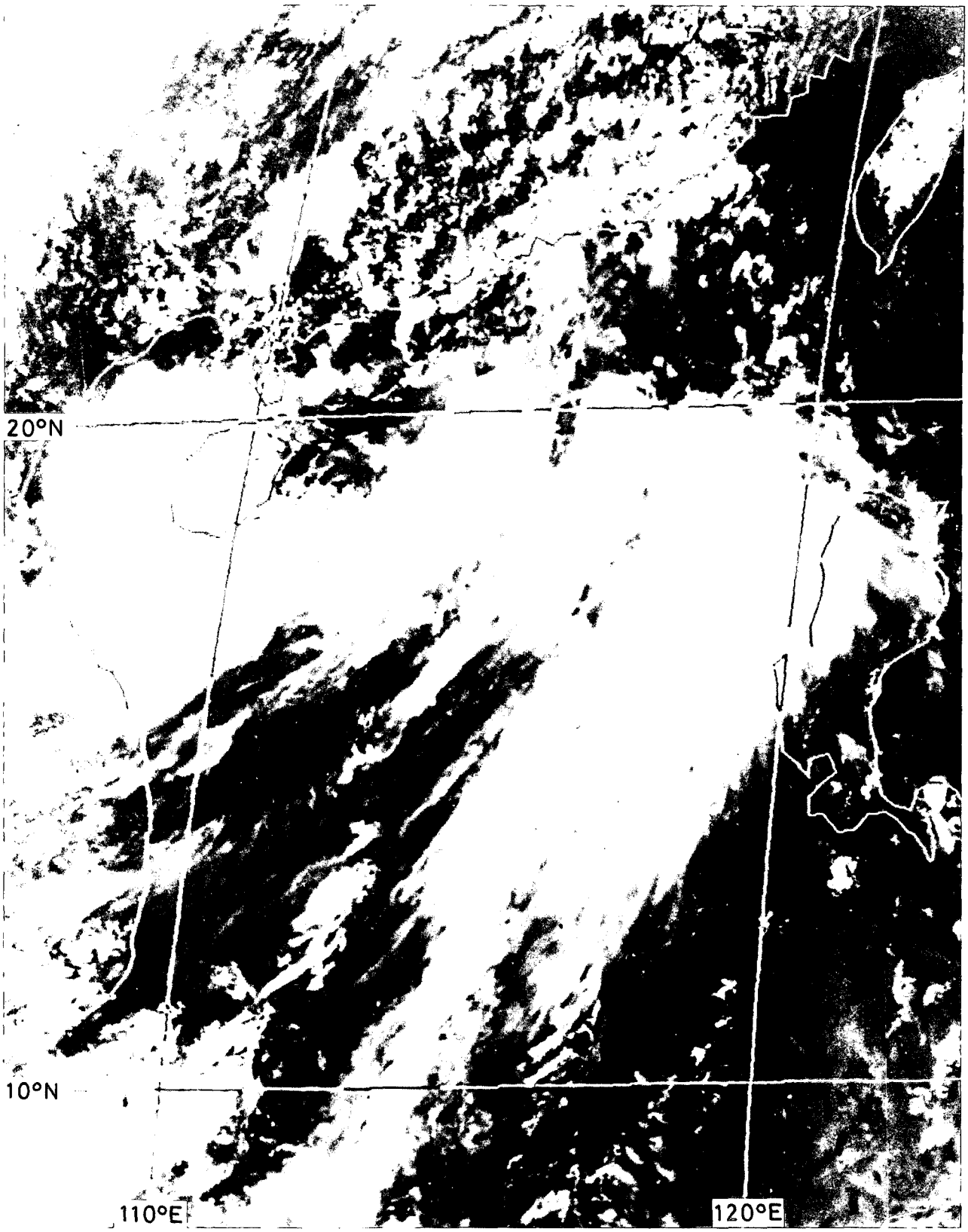

Figure 28. GMS–1 visible picture of the Tropical Depression taken around 2.00 p.m. on 18 August 1980.

TYPHOON RUTH

12–16 September 1980

The track of this typhoon is shown in Figure 29

Ruth formed as a tropical depression on a trough of low pressure about 210 nautical miles south of Hong Kong on 12 September. It started drifting westwards at about 3 knots and then turned southwestwards on 13 September. It intensified into a tropical storm early the next day and altered course again to move northwest at 7 knots towards Hainan Dao (Hainan Island). Satellite pictures revealed that the overcast area was about 90 nautical miles in diameter (Figure 30).

Early on 15 September Ruth crossed the coast of Hainan Dao about 40 nautical miles southeast of Haikou (Haihow), where a maximum gust of 62 knots and a minimum sea-level pressure of 991.9 millibars were recorded. Ruth continued to move westwards at 9 knots and intensified into a severe tropical storm as it entered the Gulf of Tonkin (Figure 31). It moved across the Gulf of Tonkin at 9 knots and became a typhoon early on 16 September. An 'eye' about 25 nautical miles in diameter appeared on the satellite pictures and the overcast area was about 180 nautical miles in diameter. At 2.00 a.m. a surface wind of 70 knots was reported at Bach Longvi, an island station in the Gulf of Tonkin about 45 nautical miles from the centre.

At 8.00 a.m. on 16 September, the typhoon reached the coast of Vietnam about 95 nautical miles south of Hanoi. Maximum winds and minimum sea-level pressure near the centre of the typhoon were estimated to be 75 knots and 970 millibars respectively. According to press reports, Ruth was the worst typhoon to hit Thanh Hoa province in 30 years. At least 106 people were killed or missing and about 500 000 people were made homeless. A major rice growing region was devastated with the loss of about 2 million tonnes of rice.

Ruth then moved west-southwest at 15 knots, weakening rapidly and dissipatd over Lao in the evening of 16 September.

In Hong Kong, the Stand By Signal, No. 1, was hoisted at 10.00 p.m. on 12 September when Ruth was about 210 nautical miles south of Hong Kong. Winds were moderate east-northeasterly. Ruth was closest to Hong Kong around 5.00 a.m. on 13 September when it was about 200 nautical miles to the south. The minimum sea-level pressure at the Royal Observatory was 1003.8 millibars recorded at 4.00 p.m. on 13 September. Winds strengthened in the afternoon of 13 September and the Strong Wind Signal, No. 3, was hoisted at 5.15 p.m. Easterly winds remained strong on 14 September. As Ruth moved across Hainan Dao, all signals were lowered at 6.30 a.m. on 15 September and winds moderated in the afternoon. The maximum mean hourly winds and gust peak speeds together with associated wind directions recorded at some selected locations were as follows:

Location	*Maximum mean hourly wind speed in knots with direction in points*		*Maximum gust peak speed in knots with direction in points*	
Royal Observatory	E	15	E	40
Hong Kong Airport (SE)	E	22	E	38
Hong Kong Airport (NW)	E	18	E	47
Waglan Island	E	30	E	43
Tate's Cairn	E	27	E	47
Cheung Chau	E	23	E	40
King's Park	E	16	E	32
Star Ferry	E	20	E	36
Green Island	E	25	E	35
Tsim Bei Tsui	ESE	28	ESE	39
Tai O	ESE	22	ESE	43
Castle Peak	N	8	E	27
Chek Lap Kok	E	27	E	40
Lei Yue Mun	E	27	E	47
Yau Yat Chuen	ENE	20	ENE	37
Kowloon Tsai Hill	E	25	E	46

The weather was fine and hot on 12 September. The first showers came in the evening of 13 September. Frequent showers persisted until the morning of 15 September and the weather improved afterwards. The daily amounts of rainfall recorded during the period 12–15 September were as follows:

	Royal Observatory	*Cheung Chau*	*Tate's Cairn*
12 September	Nil	Nil	Nil
13 September	0.6 mm	1.6 mm	Nil
14 September	22.2 mm	14.0 mm	29.5 mm
15 September	12.0 mm	1.0 mm	3.5 mm
Total:	34.8 mm	16.6 mm	33.0 mm

There were no reports of damage in Hong Kong.

The times and heights of the highest tides and maximum storm surges recorded at various locations in Hong Kong during the display of tropical cyclone warning signals were as follows:

Location	Highest tide above chart datum			Maximum storm surge above astronomical tide		
	Height (m)	Date	Time	Height (m)	Date	Time
North Point	2.2	13 Sep.	11.30 p.m.	0.4	14 Sep.	9.15 p.m.
Tai Po Kau	2.2	12 Sep.	12.30 p.m.	0.6	13 Sep.	2.00 a.m.
Chi Ma Wan (Lantau Island)	2.4	13 Sep.	10.30 p.m.	0.6	14 Sep.	3.45 a.m.

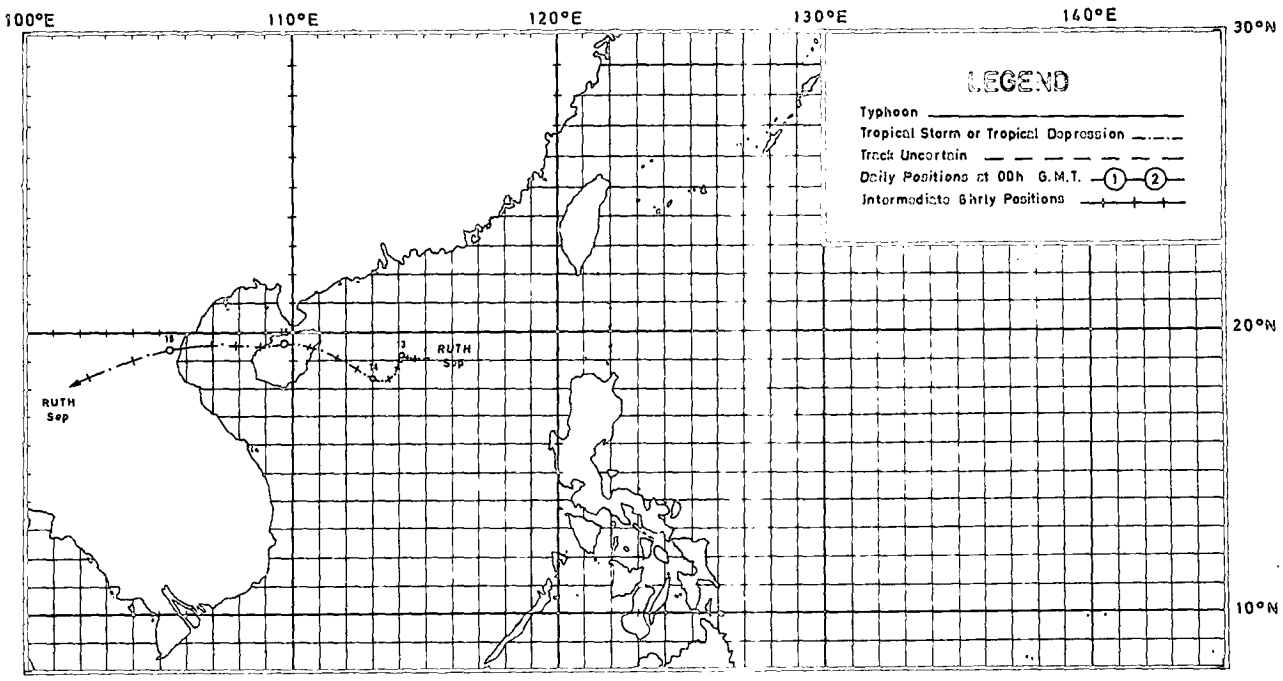

Figure 29. Track of Typhoon Ruth: 12–16 September 1980.

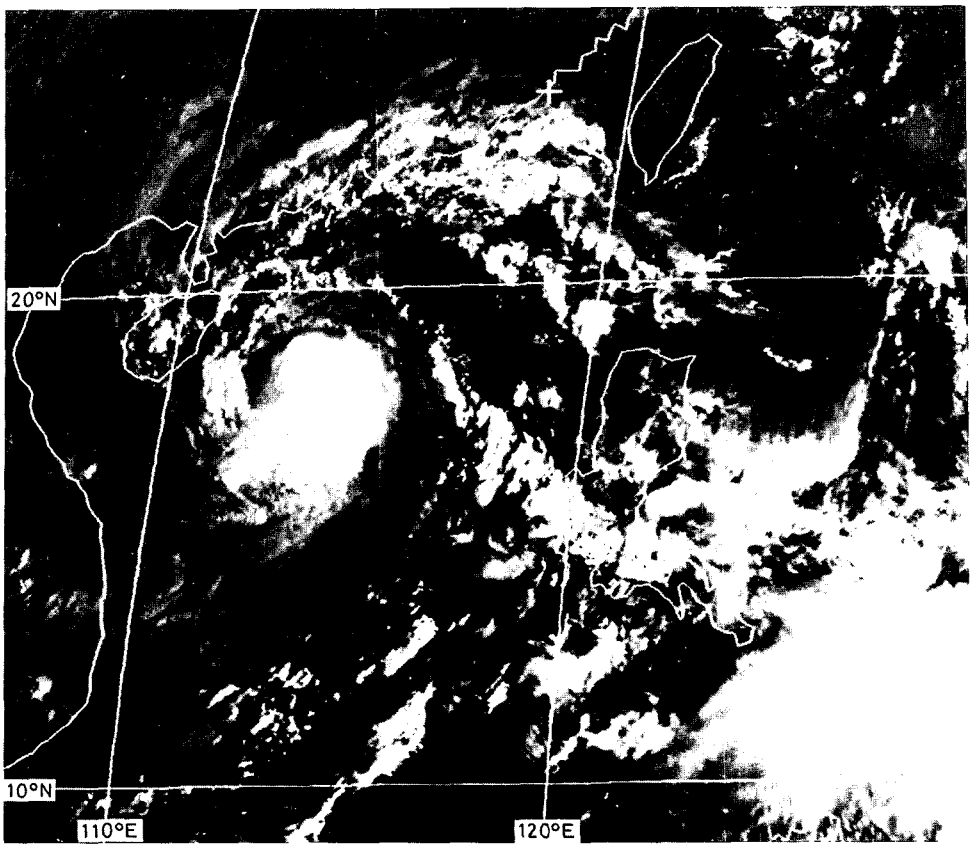

Figure 30. GMS–1 visible picture of Typhoon Ruth taken around 8.00 a.m. on 14 September 1980.

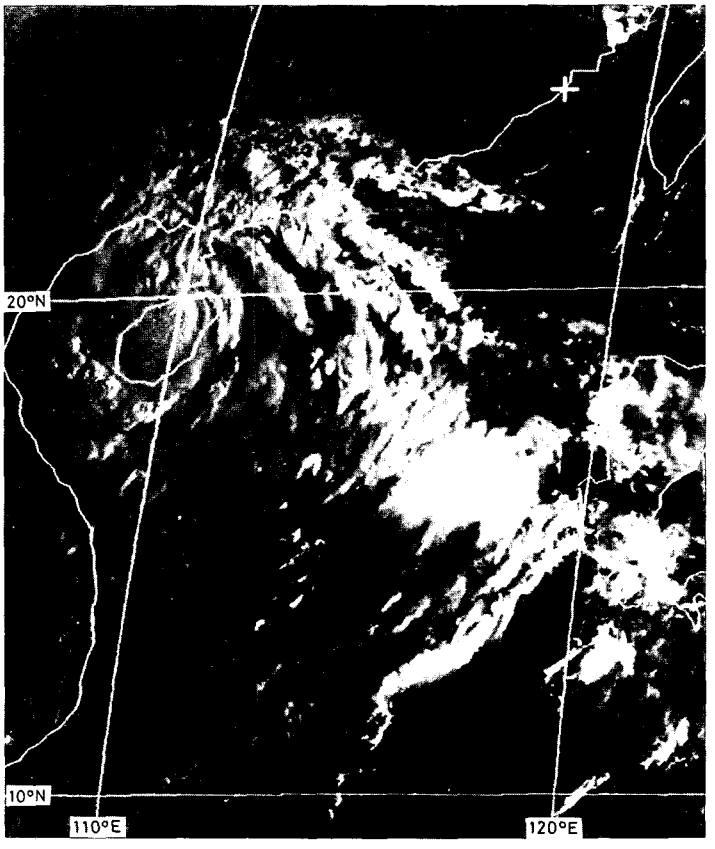

Figure 31. GMS–1 visible picture of Typhoon Ruth taken around 8.00 a.m. on 15 September 1980.

TYPHOON PERCY

13–19 September 1980

The track of this typhoon is shown in Figure 32

Percy originated as an area of low pressure about 640 nautical miles east-northeast of Manila on 13 September. It moved northeast at about 6 knots and deepened into a tropical storm the next day. Early on 16 September it became a severe tropical storm and in the afternoon it intensified further into a typhoon about 400 nautical miles northeast of Manila. Percy then moved west-northwest and continued to intensify. Satellite pictures on 17 September showed that the overcast area was about 120 nautical miles in diameter. At 9.10 a.m., a reconnaissance aircraft reported maximum surface winds of 80 knots and at 9.06 p.m., another aircraft reported a minimum sea-level pressure of 920 millibars near the centre. At 11.00 p.m. there was the remarkable report of northerly 99 knot sustained winds and gust peak speeds of 118 knots from Lan Yu Island off southeast Taiwan, about 90 nautical miles from the centre. The typhoon reached its maximum intensity early on 18 September when the maximum surface winds were about 110 knots. The cloud mass expanded to cover an area more than 200 miles in diameter still moving towards southern Taiwan at 15 knots.

At 6.00 a.m. on 18 September Percy passed about 20 nautical miles south of Lan Yu, where a minimum sea-level pressure of 973.2 millibars and a southerly surface wind of 96 knots were recorded. Percy crossed the southern tip of Taiwan close to Hengchun (Figure 33) and caused serious damage in southern Taiwan and Lan Yu. 9 people died and about 400 houses collapsed or were destroyed. Banana and sugar cane plantations were devastated.

At 2.00 p.m. M.V. 'Nedlloyd Napier' in the Taiwan Strait reported surface winds of 55 knots and a mean sea-level pressure of 993.6 millibars about 80 nautical miles northwest of the centre. Percy slowed down for several hours and then turned northwest at 13 knots towards the South China coast in the evening. It weakened into a severe tropical storm as it crossed the coast about 50 nautical miles northeast of Shantou (Swatow) around 5.00 a.m. on 19 September. Percy continued to weaken rapidly in the afternoon but a vortex in the clouds still persisted (Figure 34).

Percy was closest to Hong Kong when centred overland about 190 nautical miles to the northeast, but the minimum sea-level pressure at the Royal Observatory was 1001.5 millibars recorded at 7.00 p.m. on 18 September when Percy was about 270 nautical miles to the east.

In Hong Kong, the Stand By Signal, No. 1, was hoisted at 9.15 a.m. on 18 September when Percy was about 360 nautical miles to the east. As the northerly winds from the continental anticyclone were expected to be reinforced by the extensive circulation of Typhoon Percy, the strong Wind Signal, No. 3, was hoisted at 12.00 noon on 18 September. Winds became fresh to strong north-northwesterly during the day, but moderated as Percy weakened overnight. All signals were lowered at 6.00 a.m. on 19 September when Percy was about 200 nautical miles northeast of Hong Kong. The maximum mean hourly winds and gust peak speeds together with associated wind directions recorded at some selected locations were as follows:

Location	*Maximum mean hourly wind speed in knots with direction in points*		*Maximum gust peak speed in knots with direction in points*	
Royal Observatory	W	10	W	26
Hong Kong Airport (SE)	WNW	16	WNW	30
Hong Kong Airport (NW)	N	13	N	29
Waglan Island	N	20	N	29
Tate's Cairn	N	26	NNW	39
Cheung Chau	N	21	N	35
King's Park	NW	10	N	21
Star Ferry	WNW	17	WNW	27
Green Island	NW	17	WNW	25
Tsim Bei Tsui	NW	20	N	28
Tai O	N	17	N	26
Castle Peak	WNW	14	NW	27
Chek Lap Kok	NW	20	NW	27
Lei Yue Mun	NW	15	NW	24
Yau Yat Chuen	NNW	13	NNW	28
Kowloon Tsai Hill	N	16	N	31

The weather was fine and dry on 17–18 September but turned cloudy on 19 September. No rainfall was recorded during the passage of Percy.

There were no reports of damage in Hong Kong.

The times and heights of highest tides and maximum storm surges recorded at various locations in Hong Kong during the display of tropical cyclone warning signals were as follows:

Location	Highest tide above chart datum			Maximum storm surge above astronomical tide		
	Height (m)	Date	Time	Height (m)	Date	Time
North Point	2.5	19 Sep.	4.00 a.m.	0.5	18 Sep.	3.30 p.m.
Tai Po Kau	2.5	19 Sep.	4.00 a.m.	0.6	18 Sep.	3.00 a.m.
Chi Ma Wan (Lantau Island)	2.6	19 Sep.	4.15 a.m.	0.7	18 Sep.	3.00 a.m.

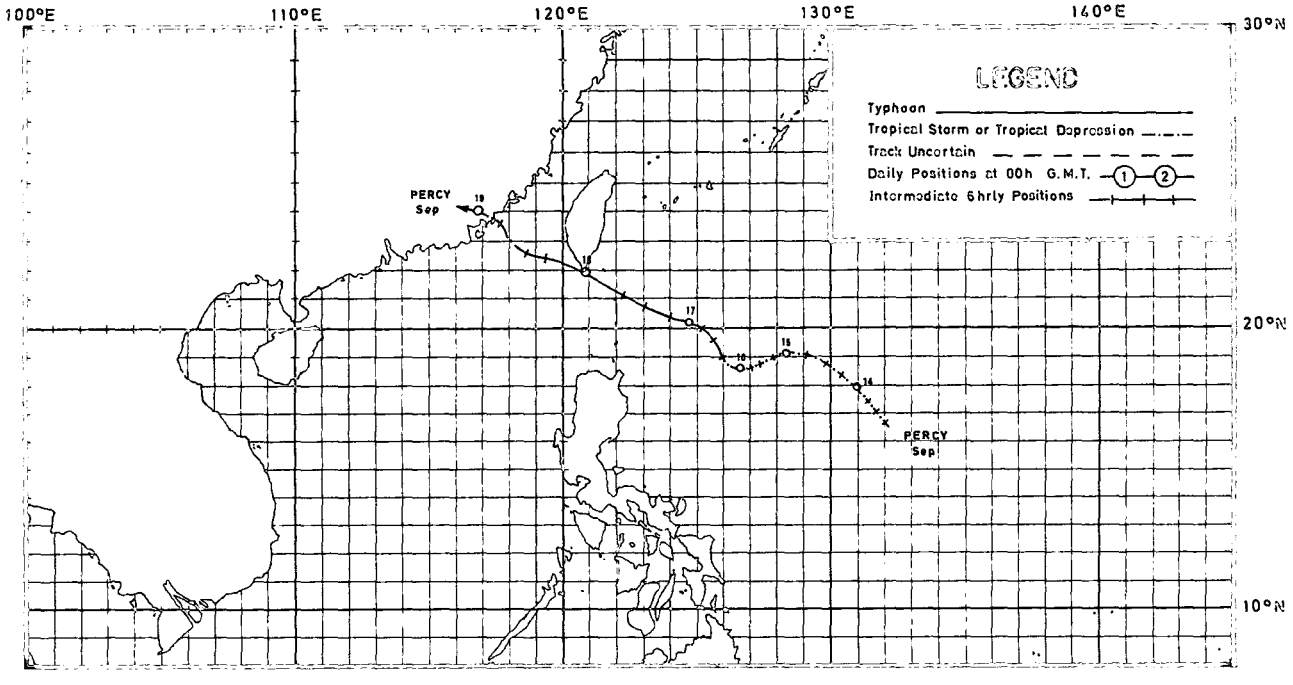

Figure 32. Track of Typhoon Percy: 13–19 September 1980.

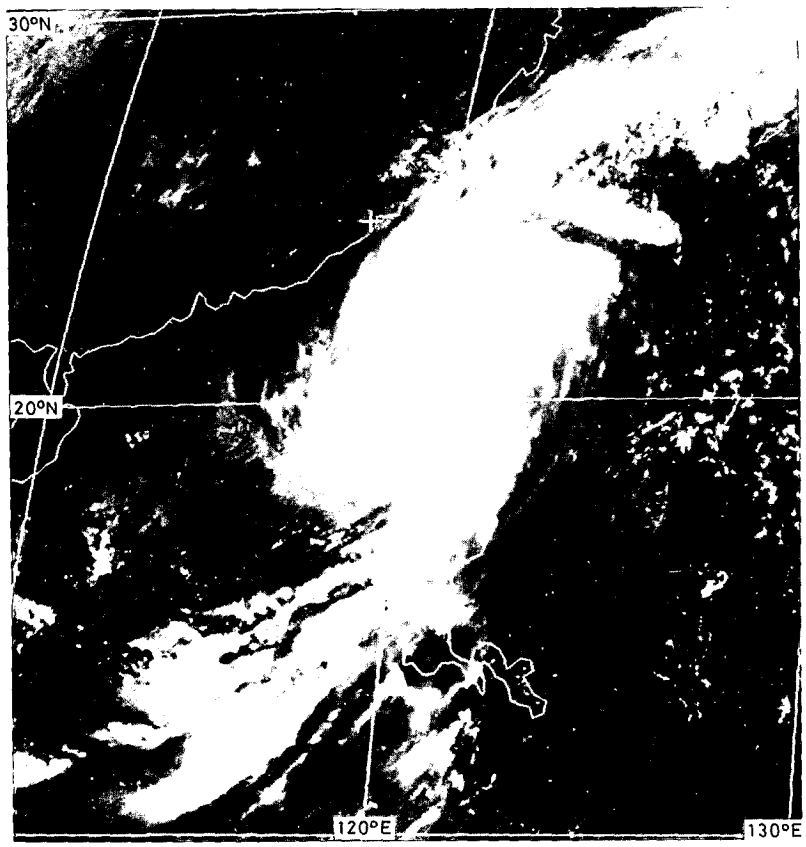

Figure 33. GMS–1 visible picture of Typhoon Percy taken around 8.00 a.m. on 18 September 1980.

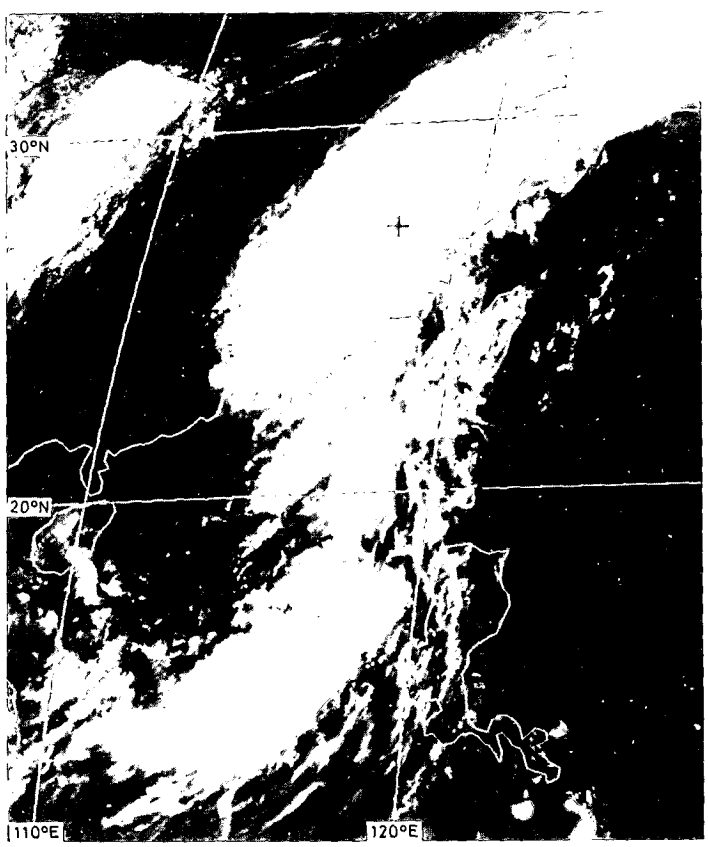

Figure 34. GMS–1 visible picture of Typhoon Percy taken around 2.00 p.m. on 19 September 1980.

TROPICAL STORM CARY

29 October – 2 November 1980

The track of this tropical storm is shown in figure 35

Tropical Storm Cary developed as a tropical depression about 35 nautical miles southeast of Manila on 29 October. It started moving west-northwest at about 16 knots and intensified into a tropical storm over the South China Sea the next day. Satellite pictures showed that the overcast area was about 100 nautical miles in diameter. Cary slowed down considerably as it encountered the gale force northeast monsoon in the northern part of the South China Sea. Cary was most intense between 11.00 a.m. on 30 October and 8.00 a.m. on 31 October when three ships reported northeasterly winds of 42–45 knots and the minimum central pressure was estimated to be about 990 millibars. However, the main cloud mass remained displaced from the low-level circulation centre (Figure 36).

On 1 November, gales were experienced at Xisha Qundao (Paracel Islands). At 5.00 p.m. sustained winds of 40 knots and gusts of 62 knots were reported at Sanhu Dao about 150 nautical miles north of the centre. Cary weakened into a tropical depression off the coast of Vietnam and dissipated overland about 120 nautical miles northeast of Ho Chi Minh Ville on 2 November.

In Hong Kong, the Stand By Signal, No. 1, was hoisted at 4.30 p.m. on 30 October when Cary was centred about 380 nautical miles away to the south-southeast. Winds were moderate easterly, fresh offshore during the night, but turned northerly for several hours the following morning. The Stand By Signal was lowered at 2.55 p.m. on 31 October when the centre was about 450 nautical miles to the south and moving away southwestwards. The maximum mean hourly winds and gust peak speeds together with associated wind directions recorded at some selected locations were as follows:

Location	*Maximum mean hourly wind speed in knots with direction in points*		*Maximum gust peak speed in knots with direction in points*	
Royal Observatory	E	6	E	20
Hong Kong Airport (SE)	E	10	E	19
Hong Kong Airport (NW)	E	12	E	32
Waglan Island	E	22	E	28
Tate's Cairn	NNE	19	NE	32
Cheung Chau	ESE	17	ESE	25
King's Park	SE	12	SE	23
Star Ferry	E	14	E	21
Green Island	E	13	E	19
Tsim Bei Tsui	NE	10	NE	18
Tai O	ENE	13	ENE	19
Castle Peak	N	9	N	17
Chek Lap Kok	N	13	N	19
Lei Yue Mun	E	16	E	25
Yau Yat Chuen	N	11	ENE	23
Kowloon Tsai Hill	NE	11	NE	23

Cary was closest around 11.00 p.m. on 30 October when it was about 360 nautical miles to the south-southeast of Hong Kong, but the minimum sea-level pressure of 1013.5 millibars at the Royal Observatory was recorded earlier at 3.00 p.m.

The weather remained fine, sunny and dry on 30–31 October and there was no rainfall.

There were no reports of damage.

The times and heights of the highest tides and maximum storm surges recorded at various locations in Hong Kong during the display of the Stand By Signal were as follows:

Location	Highest tide above chart datum			Maximum storm surge above astronomical tide		
	Height (m)	Date	Time	Height (m)	Date	Time
North Point	2.3	30 Oct.	1.15 a.m.	0.6	31 Oct.	4.30 p.m.
Tai Po Kau	2.4	30 Oct.	2.00 a.m.	0.6	30 Oct.	2.30 p.m.
Chi Ma Wan (Lantau Island)	2.4	30 Oct.	1.30 a.m.	0.8	31 Oct.	4.00 p.m.

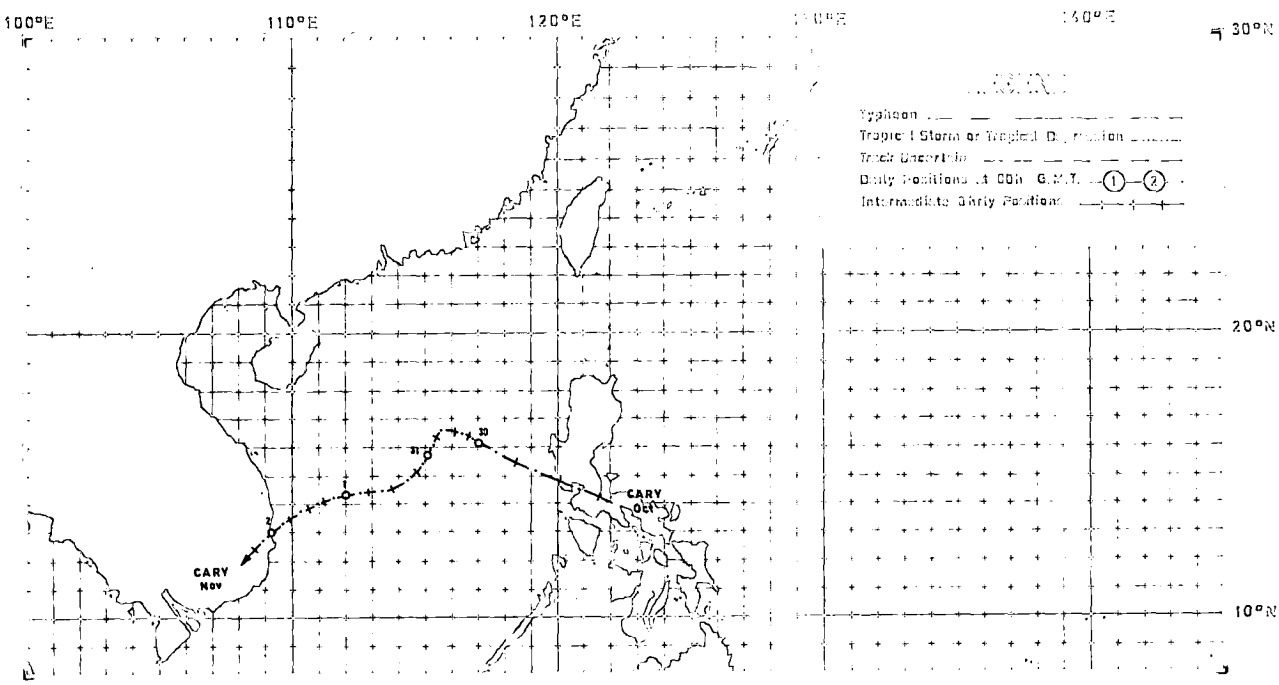

Figure 35. Track of Tropical Storm Cary: 29 October – 2 November 1980.

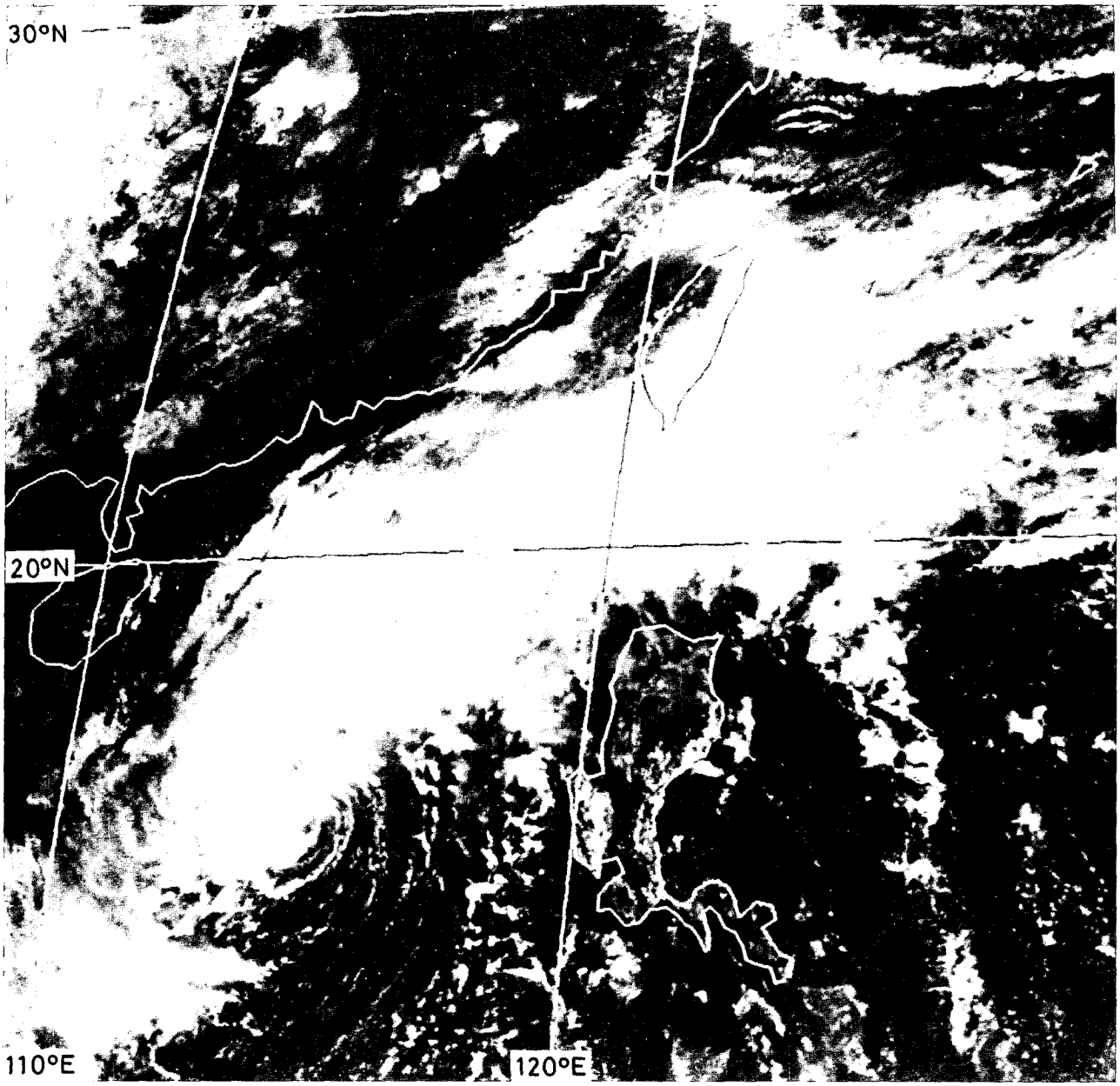

Figure 36. GMS–1 visible picture of Tropical Storm Cary taken around 11.00 a.m. on 31 October 1980.

TABLE 1. LIST OF TROPICAL CYCLONES IN THE WESTERN NORTH PACIFIC AND THE SOUTH CHINA SEA IN 1980

	Name of tropical cyclone	Beginning of track				First day circle Date	Last day circle Date	End of track			
		Date	Time G.M.T.	Position °N	Position °E			Date	Time G.M.T.	Position °N	Position °E
1	Tropical Depression	20 Mar	0000	8.9	135.7	20	29	29 Mar	0000	10.4	109.6
2	Typhoon Dom	9 May	0000	7.6	139.5	9	21	21 May	0000	23.1	130.5
3	Typhoon Ellen	13 May	0000	7.1	144.6	13	22	22 May	1200	42.4	151.8
4	Severe Tropical Storm Forrest	20 May	0000	6.9	151.5	20	26	26 May	0000	20.0	120.4
5	Severe Tropical Storm Georgia	19 May	0000	15.7	114.8	19	24	24 May	1800	26.2	119.0
6	Severe Tropical Storm Herbert	24 Jun	1200	12.5	118.1	25	28	28 Jun	1200	21.5	107.0
7	Tropical Depression	2 Jul	0000	17.4	117.5	2	3	3 Jul	0000	19.6	117.5
8	Severe Tropical Storm Ida	5 Jul	1200	10.1	142.1	6	12	12 Jul	0000	24.2	116.0
9	Tropical Storm	15 Jul	0600	14.0	130.0	16	19	19 Jul	0000	21.8	112.0
10	Typhoon Joe	18 Jul	0000	13.5	139.0	18	23	23 Jul	1200	20.9	104.0
11	Typhoon Kim	20 Jul	1200	8.9	147.5	21	27	27 Jul	1800	24.4	115.7
12	Typhoon Lex	28 Jul	1800	23.4	148.2	29	8	8 Aug	1200	42.0	156.0
13	Typhoon Marge	8 Aug	0600	14.3	157.5	9	14	14 Aug	0600	33.3	159.2
14	Tropical Depression	15 Aug	0000	15.0	124.0	15	19	19 Aug	1200	21.2	107.0
15	Typhoon Norris	23 Aug	1200	16.9	141.0	24	28	28 Aug	1800	26.5	117.3
16	Tropical Depression	5 Sep	0000	15.4	110.3	5	6	6 Sep	0600	18.5	104.9
17	Typhoon Orchid	4 Sep	0000	9.0	146.4	4	11	11 Sep	1800	41.4	135.8
18	Typhoon Percy	13 Sep	0600	16.6	132.1	14	19	19 Sep	0000	24.0	117.0
19	Typhoon Ruth	12 Sep	1200	19.0	114.7	13	16	16 Sep	1200	18.5	102.6
20	Typhoon Sperry	15 Sep	0000	20.0	147.5	15	20	20 Sep	0600	30.5	137.5
21	Severe Tropical Storm Thelma	27 Sep	0000	18.0	142.8	27	30	30 Sep	0600	36.1	150.5
22	Typhoon Vernon	27 Sep	1200	13.7	159.7	28	3	3 Oct	1800	38.3	158.9
23	Typhoon Wynne	3 Oct	0000	6.8	155.0	3	14	14 Oct	1800	35.0	145.0
24	Tropical Storm Alex	10 Oct	0600	19.5	154.5	11	14	14 Oct	0000	23.6	143.4
25	Typhoon Betty	29 Oct	0600	8.9	154.1	30	8	8 Nov	0000	27.0	134.8
26	Tropical Storm Cary	29 Oct	0600	14.1	121.5	30	2	2 Nov	0600	12.3	108.7
27	Typhoon Dinah	21 Nov	0000	9.8	159.7	21	25	25 Nov	0600	29.0	158.4
28	Tropical Storm Ed	15 Dec	0600	11.8	131.4	16	21	21 Dec	0000	12.0	126.9

TABLE 2. TROPICAL CYCLONE WARNINGS FOR SHIPPING ISSUED IN 1980

Tropical cyclone	No. of warnings issued	Date and time+ of issue of First warning	Date and time+ of issue of Last warning	Duration of warnings (hours)
Tropical Depression	40	24 Mar 0600	29 Mar 0300	117
Typhoon Dom	36	12 May 1200	16 May 2100	105
Severe Tropical Storm Georgia*	49	19 May 0000	25 May 0300	147
Severe Tropical Storm Forrest	15	24 May 0600	26 May 0300	45
Severe Tropical Storm Herbert*	34	24 Jun 0900	28 Jun 1200	99
Tropical Depression	9	2 Jul 0300	3 Jul 0300	24
Severe Tropical Storm Ida*	27	8 Jul 2100	12 Jul 0300	78
Tropical Storm*	25	16 Jul 0300	19 Jul 0300	72
Typhoon Joe*	25	20 Jul 0900	23 Jul 0900	72
Typhoon Kim*	27	24 Jul 0900	27 Jul 1500	78
Tropical Depression*	38	15 Aug 0000	19 Aug 1500	111
Typhoon Norris	15	27 Aug 0000	28 Aug 1800	42
Tropical Depression	11	5 Sep 0000	6 Sep 0600	30
Typhoon Ruth*	32	12 Sep 0900	16 Sep 0600	93
Typhoon Percy*	17	16 Sep 2100	19 Sep 0000	51
Tropical Storm Cary*	32	29 Oct 0600	2 Nov 0600	96
Typhoon Betty	26	4 Nov 0000	7 Nov 0300	75
Total	458			1335

* Tropical cyclones for which tropical cyclone warning signals were hoisted in Hong Kong

\+ Times are given in hours G.M.T.

TABLE 3. TROPICAL CYCLONE WARNING SIGNALS HOISTED IN HONG KONG AND NUMBER OF WARNING BULLETINS ISSUED IN 1980

SUMMARY

Signal	No. of occasions	Total duration
1	10	240 h 15 min
3	8	160 25
8 NORTHWEST	-	- -
8 SOUTHWEST	-	- -
8 NORTHEAST	1	6 5
8 SOUTHEAST	1	7 20
9	-	- -
10	-	- -
Total	20	414 5

DETAILS

Tropical cyclone	No. of warning bulletins issued	Signal	Hoisted Date	Hoisted Time*	Lowered Date	Lowered Time*
Severe Tropical Storm Georgia	20	1	22 May	1145	23 May	1145
		3	23 May	1145	24 May	0545
Severe Tropical Storm Herbert	22	1	26 Jun	0735	28 Jun	1130
Severe Tropical Storm Ida	20	1	10 Jul	0600	12 Jul	0610
Tropical Storm	12	1	18 Jul	1030	18 Jul	1410
		3	18 Jul	1410	19 Jul	0910
Typhoon Joe	26	1	21 Jul	1200	21 Jul	1615
		3	21 Jul	1615	22 Jul	0440
		8 NE	22 Jul	0440	22 Jul	1045
		8 SE	22 Jul	1045	22 Jul	1805
		3	22 Jul	1805	23 Jul	0130
Typhoon Kim	26	1	26 Jul	0045	26 Jul	2310
		3	26 Jul	2310	28 Jul	0715
Tropical Depression	27	1	16 Aug	2110	18 Aug	1435
		3	18 Aug	1435	19 Aug	0650
Typhoon Ruth	28	1	12 Sep	2200	13 Sep	1715
		3	13 Sep	1715	15 Sep	0630
Typhoon Percy	11	1	18 Sep	0915	18 Sep	1200
		3	18 Sep	1200	19 Sep	0600
Tropical Storm Cary	13	1	30 Oct	1630	31 Oct	1455

* Hong Kong Time (G.M.T. + 8)

TABLE 4. FREQUENCY AND TOTAL DURATION OF DISPLAY OF TROPICAL CYCLONE WARNING SIGNALS : 1946-1980

Year \ Signals	1	3*	8 NW+	8 SW+	8 NE+	8 SE+	9	10	Total	Total duration (hours)
1946	7	-	1	0	1	2	1	1	13	154
1947	6	-	1	0	1	0	0	0	8	124
1948	5	-	1	1	3	2	0	0	12	112
1949	4	-	0	0	1	1	1	0	7	67
1950	2	-	0	0	1	1	1	0	5	102
1951	4	-	0	0	2	3	1	0	10	133
1952	2	-	0	0	1	1	0	0	4	74
1953	2	-	1	1	2	1	1	0	8	116
1954	5	-	0	0	3	2	2	0	12	133
1955	0	-	0	0	0	0	0	0	0	0
1956	5	4	0	0	0	0	0	0	9	191
1957	4	9	1	1	2	2	0	1	20	296
1958	4	5	0	0	1	0	0	0	10	214
1959	1	1	0	0	0	0	0	0	2	37
1960	11	7	0	2	2	2	1	1	26	433
1961	6	7	1	2	1	0	1	1	19	193
1962	4	3	0	1	1	0	1	1	11	158
1963	4	5	0	0	1	0	0	0	10	176
1964	11	14	1	3	5	3	3	2	42	570
1965	7	6	0	0	1	1	0	0	15	240
1966	6	5	0	0	2	2	0	0	15	285
1967	8	6	0	0	2	1	0	0	17	339
1968	7	7	0	1	1	0	1	1	18	290
1969	4	2	0	0	0	0	0	0	6	110
1970	6	8	2	1	2	0	0	0	19	287
1971	9	10	1	3	2	2	1	1	29	323
1972	8	6	0	0	1	1	0	0	16	288
1973	8	6	1	1	1	0	1	0	18	417
1974	12	10	0	0	2	1	1	0	26	525
1975	8	6	1	0	0	1	1	1	18	292
1976	6	6	0	0	1	2	0	0	15	352
1977	8	6	0	0	1	0	0	0	15	395
1978	8	9	1	1	3	2	0	0	24	462
1979	5	5	1	0	2	2	1	1	17	281
1980	10	8	0	0	1	1	0	0	20	414
Total	207	161	14	18	50	36	19	11	516	8583
Mean	5.9	6.4	0.4	0.5	1.4	1.0	0.5	0.3	14.7	245.2

* The Strong Wind Signal, No. 3, was introduced in 1956.

+ Gale or Storm Signals, 5, 6, 7 and 8 were renumbered as 8 NW, 8 SW, 8 NE, 8 SE respectively with effect from 1 January 1973.

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 : 1946-1980

Year	Number in Hong Kong's area of responsibility	Number necessitating the display of signals in Hong Kong
1946	9	6
1947	21	6
1948	15	4
1949	16	4
1950	13	5
1951	12	7
1952	22	9
1953	19	6
1954	17	7
1955	14	3
1956	23	5
1957	12	6
1958	14	5
1959	19	2
1960	20	9
1961	22	6
1962	16	4
1963	13	4
1964	25	10
1965	16	6
1966	16	6
1967	16	8
1968	12	6
1969	11	4
1970	21	6
1971	17	9
1972	14	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
Total	570	222
Mean	16.3	6.3

TABLE 6. DURATION OF DISPLAY OF TROPICAL CYCLONE WARNING SIGNALS IN HONG KONG : 1946 - 1980

Signal	Duration for each occasion			Duration per year		
	Mean	Maximum	Minimum	Mean	Maximum	Minimum
1	19 h 46 min	124 h 40 min	1 h 20 min	116 h 57 min	273 h 15 min	0 h 0 min
3*	20 46	71 45	1 00	133 46	267 45	23 55
8 NW+	6 39	13 00	1 30	2 39	13 00	0
8 SW+	5 20	11 10	2 30	2 45	16 10	0
8 NE+	10 52	35 35	2 15	15 31	61 45	0
8 SE+	7 45	21 45	0 20	7 58	31 15	0
8	8 34	35 35	0 20	28 54	82 25	0
9	3 39	6 30	0 25	1 59	11 00	0
10	5 52	9 10	2 30	1 51	12 10	0

* 1956 - 1980

\+ Gale or Storm Signals, 5, 6, 7, and 8 were renumbered as 8NW, 8SW, 8NE, and 8SE respectively with effect from 1 January 1973

TABLE 7. CASUALTIES AND DAMAGE CAUSED BY TROPICAL CYCLONES IN HONG KONG : 1937-1980

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
1937	1 - 2 Sep	Typhoon	28	545	1 255	11 000	*	*
1957	20-23 Sep	T. Gloria	5	2	Several	8	*	111
1960	4 - 12 Jun	T. Mary	6	352	462	11	11	127
1961	17 - 21 May	T. Alice	*	*	*	4	0	20
1962	28 Aug - 2 Sep	T. Wanda	36	1 297	756	130	53	*
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
1966	12 - 14 Jul	S.T.S. Lola	0	*	6	1	0	6
1968	17 - 22 Aug	T. Shirley	1	*	3	0	0	4
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	0	0	0	0	38
	10 - 17 Aug	T. Rose	33**	303	*	110	15	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	3	*	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	33	3	0	134
	9 - 12 Aug	T.S. Bonnie	2	0	0	0	0	0
	23 - 28 Aug	S.T.S. Elaine	6	3	0	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
	28 Jul - 3 Aug	T. Hope	29	56	108	12	0	260
	16 - 24 Sep	S.T.S. Mac	2	0	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	0	3	0	0	0
	29 Oct - 2 Nov	T.S. Cary	0	0	2	0	0	0

N.B. Information compiled from Hong Kong newspapers and from the Marine Department's records

* Data unavailable

\+ Struck by lightning

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

TABLE 8. SHIPS SUNK, DAMAGED, GROUNDED, ETC., BY TROPICAL CYCLONES IN HONG KONG, 1980

Year	Date	Name of tropical cyclone	Name of ship	Location of grounding, etc.	Nature of incident
1980	15 - 19 Jul	S.T.S. Ida	M.V. Banner Lock	Buoy A-51	Adrift
	18 - 23 Jul	T. Joe	M.V. Hong Yin	Buoy A-11	Adrift and collided with M.V. Nan Shan
			M.V. Nan Shan	Buoy B-17	Collided with M.V. Hong Yin
			M.V. Paz	Western Anchorage	Adrift
			M.V. Antilia	Buoy A-10	Adrift

N.B. *Information compiled from Hong Kong newspapers and from the Marine Department's records*

TABLE 9. A SUMMARY OF METEOROLOGICAL OBSERVATIONS RECORDED IN HONG KONG DURING THE PASSAGES OF TROPICAL CYCLONES IN 1980

Name of tropical cyclone	Month	*Nearest approach to Hong Kong*							Minimum hourly M.S.L. *pressure at the* Royal Observatory			*Maximum storm surge*		
		Day	Time*	Direction	Distance	Movement		Estimated minimum central pressure	Day	Time*	Pressure	North Point	Tai Po Kau	Chi Ma Wan
				points	n miles	points	knots	mbar			mbar	m	m	m
S.T.S. Georgia	May	23	2300	ESE	90	NNE	10	990	23	1800	999.4	0.7	0.7	0.7
S.T.S. Herbert	Jun	28	0200	WSW	300	NW	5	985	26	1700	1004.2	0.2	0.4	0.5
S.T.S. Ida	Jul	11	2000	ENE	150	NNW	8	984	11	1700	993.8	0.5	0.8	0.5
T.S.	Jul	19	0200	SW	105	NW	10	1000	18	1600	1002.7	0.3	0.5	0.4
T. Joe	Jul	22	1000	SSW	190	WNW	18	965	22	0400	1001.2	0.9	0.9	1.1
T. Kim	Jul	27	1500	E	100	N	10	993	27	1500	998.9	0.5	0.7	0.5
T.D.	Aug	18	2000	SW	140	WNW	10	998	18	1600	1000.4	0.3	0.4	0.4
T. Ruth	Sep	13	0500	S	200	W	2	993	13	1500	1003.8	0.5	0.6	0.6
T. Percy	Sep	19	0800	NE	190	WNW	9	1000	18	1700	1001.5	0.4	0.6	0.7
T.S. Cary	Oct	30	2300	SSE	360	SSW	8	991	30	1500	1013.5	0.6	0.6	0.8

* Hong Kong Time (G.M.T. + 8)

TABLE 9. (Cont'd)

Name of tropical cyclone	Month	Maximum 60-min mean wind in points and knots		Maximum 10-min mean wind in points and knots		Maximum gust peak speed in points and knots		Rainfall at the Royal Observatory (mm)				
		Royal Observatory	Waglan Island	Royal Observatory	Waglan Island	Royal Observatory	Waglan Island	(i) 300 n mile	(ii) 24 hours	(iii) 48 hours	(iv) 72 hours	(i) + (iv)
S.T.S. Georgia	May	ENE 17	ENE 35	ENE 22	NNE 37	ENE 43	NNE 52	15.3	-	-	-	15.3
S.T.S. Herbert	Jun	E 14	SE 26	E 14	SE 28	S 33	SE 48	-	12.8	35.6	-	35.6
S.T.S. Ida	Jul	WSW 19	WSW 36	WSW 24	WSW 42	WSW 41	WSW 53	114.6	46.0	54.8	76.2	190.8
T.S.	Jul	E 16	SSE 28	E 16	SSE 33	E 39	SSE 44	16.3	21.5	21.5	21.5	37.8
T. Joe	Jul	E 24	E 42	E 28	E 44	E 58	E 68	40.7	21.2	21.2	21.2	61.9
T. Kim	Jul	SW 22	SW 44	SW 29	SW 45	SW 58	SW 57	86.9	49.4	50.0	52.3	139.2
T.D.	Aug	ENE 15	E 30	ENE 15	E 31	E 43	E 47	45.7	14.2	15.7	15.7	61.4
T. Ruth	Sep	E 15	E 32	E 17	E 33	E 40	E 43	31.0	4.6	4.6	4.6	35.6
T. Percy	Sep	W 10	N 21	W 13	N 23	W 26	N 29	-	-	-	-	-
T.S. Cary	Oct	E 6	E 22	ENE 8	E 24	E 20	E 28	outside 300 n miles				

N.B. (i) during the period when the tropical cyclone was centred within 300 n miles of Hong Kong
(ii) during the 24-hour period after the tropical cyclone moved outside (or dissipated within) the 300-n mile radius
(iii) during the 48-hour period after the tropical cyclone moved outside (or dissipated within) the 300-n mile radius
(iv) during the 72-hour period after the tropical cyclone moved outside (or dissipated within) the 300-n mile radius
All data, other than the rainfall, refer to the period when tropical cyclone warning signals were hoisted. Times are given in Hong Kong Time.

TABLE 10. TYPHOONS WHICH REQUIRED THE HOISTING OF THE HURRICANE SIGNAL NO. 10 DURING THE PERIOD 1946-1980

Name of typhoon	Date	Nearest approach to Royal Observatory n miles	Minimum M.S.L. pressure (mbar)		Maximum 60-min mean winds in points and knots								Maximum gust in points and knots							
			Hourly	Inst.	Royal Observatory	Hong Kong Airport	Waglan Island	Cheung Chau	Tate's Cairn	Cape Collinson	Green Island	Castle Peak	Royal Observatory	Hong Kong Airport	Waglan Island	Cheung Chau	Tate's Cairn	Cape Collinson	Green Island	Castle Peak
-	18 Jul 1946	S 37	985.7	-	NE -	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Gloria	22 Sep 1957	SW 30	986.2	984.3	ESE 62	ESE 39	E 6*	-	-	-	-	-	E 101	ENE 86	ENE 100	-	-	-	-	-
Mary	9 Jun 1960	WNW 5	974.3	973.8	SSE 52	SSE 50	SSW 60	-	-	-	-	-	SSE 103	SE 88	SSW 105	-	-	-	-	-
Alice	19 May 1961	0	981.6	981.1	ENE 45	E 38	ESE 49	ENE 41	-	-	-	-	E 89	ENE 75	SW 69	ENE 73	-	-	-	-
Wanda	1 Sep 1962	SSW 10	955.1	953.2	N 72	N 58	NW 80	NW 64	SE 102	-	-	-	N 140	N 123	NNW 117	NW 125	ESE 154	-	-	-
Ruby	5 Sep 1964	SW 17	971.0	968.2	E 59	N 64	ENE 80	NE 61	ESE 90	SSE 83	-	-	NNE 122	NW 110	E 124	NNE 117	E 145	S 120	-	-
Dot	13 Oct 1964	E 18	978.9	977.3	NNW 48	N 36	N 63	NNW 52	NNE 85	N 54	-	-	N 94	N 107	N 99	WNW 111	NE 119	NNE 101	-	-
Shirley	21 Aug 1968	0	968.7	968.6	N 37	N 40	NNE 67	SSW 49	NNE 68	SSW 46	-	-	N 72	N 82	NE 113	SSW 90	NNE 110	N 93	-	-
Rose	17 Aug 1971	WSW 11	984.5	982.8	SE 55	SE 66	ESE 76	SE 71	S 80	SSW 74	-	-	ESE 121	ESE 114	ESE 102	SE 105	S 120	S 103	-	-
Elsie	14 Oct 1975	S 27	996.4	996.2	ENE 31	NNW 36	NNE 64	N 57	NE 70	-	NNW 64	N 35	NE 76	N 76	ENE 95	NE 86	NNE 97	-	NE 90	N 65
Hope	2 Aug 1979	NNW 6	961.8	961.6	W 40	W 62	SW 78	SSW 63	NW 62	-	W 58	- 52	W 94	WNW 98	SW 107	WSW 100	WNW 123	-	W 90	- 93

APPENDIX 1 SIX-HOURLY POSITIONS OF THE TROPICAL DEPRESSION (20-29 MARCH)

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
March	20	0000	T.D.	1004	25	8.9	135.7
		0600	T.D.	1004	25	9.0	135.1
		1200	T.D.	1004	25	9.1	134.4
		1800	T.D.	1004	25	9.3	133.6
	21	0000	T.D.	1004	25	9.6	132.8
		0600	T.D.	1004	25	9.8	132.0
		1200	T.D.	1004	25	10.0	131.3
		1800	T.D.	1004	25	10.4	130.5
	22	0000	T.D.	1004	25	10.6	129.7
		0600	T.D.	1004	25	10.9	129.0
		1200	T.D.	1004	25	11.1	128.2
		1800	T.D.	1004	25	11.4	127.4
	23	0000	T.D.	1004	30	11.6	126.6
		0600	T.D.	1004	30	11.8	125.9
		1200	T.D.	1006	30	12.0	125.2
		1800	T.D.	1006	25	12.3	124.5
	24	0000	T.D.	1006	25	12.4	123.8
		0600	T.D.	1006	25	12.6	123.1
		1200	T.D.	1006	25	12.8	122.4
		1800	T.D.	1006	25	13.0	121.7
	25	0000	T.D.	1008	25	13.1	121.0
		0600	T.D.	1008	25	13.1	120.2
		1200	T.D.	1008	25	13.0	119.4
		1800	T.D.	1008	25	12.9	118.7

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
March	26	0000	T.D.	1008	25	13.0	118.0
		0600	T.D.	1008	25	13.0	117.4
		1200	T.D.	1008	25	13.2	117.0
		1800	T.D.	1008	25	13.3	116.5
	27	0000	T.D.	1008	25	13.4	116.0
		0600	T.D.	1008	25	13.4	115.5
		1200	T.D.	1008	25	13.3	114.9
		1800	T.D.	1008	25	13.1	114.3
	28	0000	T.D.	1008	25	13.0	113.7
		0600	T.D.	1008	25	12.4	112.5
		1200	T.D.	1008	25	11.8	111.5
		1800	T.D.	1008	25	11.1	110.6
	29	0000	T.D.	1008	25	10.4	109.6

APPENDIX 2 SIX-HOURLY POSITIONS OF TYPHOON DOM

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
May	9	0000	T.D.	1004	30	7.6	139.5
		0600	T.D.	1004	30	7.7	138.7
		1200	T.D.	1004	30	8.2	137.8
		1800	T.D.	1004	30	9.0	136.9
	10	0000	T.D.	1004	30	9.7	135.8
		0600	T.D.	1002	30	10.4	134.8
		1200	T.D.	1002	30	10.9	133.6
		1800	T.D.	1002	30	11.3	132.4
	11	0000	T.D.	1000	30	11.6	131.1
		0600	T.S.	995	40	12.0	130.4
		1200	T.S.	990	45	12.3	129.5
		1800	T.S.	990	45	12.9	127.9
	12	0000	S.T.S.	985	50	13.7	126.6
		0600	S.T.S.	980	50	14.1	125.9
		1200	S.T.S.	975	50	14.6	125.3
		1800	S.T.S.	970	55	15.2	124.6
	13	0000	T.	965	65	15.9	123.9
		0600	T.	960	70	16.3	123.5
		1200	T.	955	75	16.7	123.2
		1800	T.	960	75	16.9	123.0
	14	0000	T.	965	70	17.1	122.8
		0600	T.	965	70	17.3	122.6
		1200	T.	970	65	17.6	122.5
		1800	S.T.S.	975	60	17.7	122.5
	15	0000	S.T.S.	980	55	18.0	122.4
		0600	S.T.S.	980	55	18.3	122.5
		1200	S.T.S.	980	50	18.6	122.5
		1800	S.T.S.	980	50	19.0	122.6

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
May	16	0000	S.T.S.	980	50	19.4	122.8
		0600	S.T.S.	980	55	19.7	123.4
		1200	S.T.S.	980	55	20.1	124.0
		1800	S.T.S.	980	55	20.3	124.7
	17	0000	S.T.S.	975	60	20.7	125.5
		0600	S.T.S.	975	60	20.9	126.2
		1200	S.T.S.	975	60	21.0	126.7
		1800	S.T.S.	980	55	21.1	127.2
	18	0000	S.T.S.	980	55	21.2	127.6
		0600	S.T.S.	980	55	21.3	128.0
		1200	S.T.S.	985	50	21.2	128.4
		1800	T.S.	990	45	21.2	129.1
	19	0000	T.S.	990	40	20.5	126.2
		0600	T.S.	990	35	20.6	125.7
		1200	T.S.	990	35	21.0	125.9
		1800	T.D.	995	30	21.1	126.2
	20	0000	T.D.	1000	30	21.3	126.6
		0600	T.D.	1000	30	21.4	126.9
		1200	T.D.	1000	30	21.6	127.2
		1800	T.D.	1002	30	22.3	128.8
	21	0000	T.D.	1004	30	23.1	130.5

APPENDIX 3 SIX-HOURLY POSITIONS OF TYPHOON ELLEN

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
May	13	0000	T.D.	1000	30	7.1	144.6
		0600	T.S.	995	45	7.4	144.2
		1200	T.S.	995	45	7.6	143.8
		1800	T.S.	995	45	7.9	143.4
	14	0000	S.T.S.	990	50	8.2	143.1
		0600	S.T.S.	990	50	8.5	142.7
		1200	S.T.S.	985	55	8.7	142.4
		1800	S.T.S.	980	60	9.2	142.0
	15	0000	S.T.S.	975	60	9.6	142.0
		0600	T.	965	70	10.4	142.0
		1200	T.	950	80	11.1	142.0
		1800	T.	935	90	11.6	141.7
	16	0000	T.	935	90	12.1	141.5
		0600	T.	935	90	12.3	141.4
		1200	T.	940	90	12.6	141.3
		1800	T.	940	90	13.0	141.3
	17	0000	T.	940	90	13.2	141.3
		0600	T.	940	90	13.7	141.3
		1200	T.	940	90	14.5	141.2
		1800	T.	940	90	15.1	140.9
	18	0000	T.	940	90	15.7	140.4
		0600	T.	940	90	16.2	139.9
		1200	T.	940	90	16.8	139.3
		1800	T.	945	100	17.5	138.7
	19	0000	T.	945	110	18.2	138.1
		0600	T.	950	90	19.0	137.6
		1200	T.	955	90	19.9	137.1
		1800	T.	965	90	21.1	136.5

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
May	20	0000	T.	970	80	22.5	135.8
		0600	T.	970	70	23.8	135.6
		1200	T.	975	70	25.7	135.5
		1800	S.T.S.	980	60	27.8	135.9
	21	0000	S.T.S.	980	60	29.8	137.1
		0600	T.	980	70	31.5	139.0
		1200	T.	980	70	33.7	141.8
		1800	T.	980	70	35.9	144.4
	22	0000	S.T.S.	980	60	38.3	146.8
		0600	S.T.S.	985	50	40.5	149.2
		1200	S.T.S.	985	50	42.4	151.8

APPENDIX 4 SIX-HOURLY POSITIONS OF SEVERE TROPICAL STORM FORREST

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
May	20	0000	T.D.	1004	30	6.9	151.5
		0600	T.D.	1000	30	7.6	150.2
		1200	T.S.	1000	35	8.1	148.4
		1800	T.S.	1000	35	8.7	146.8
	21	0000	T.S.	1000	35	9.2	145.0
		0600	T.S.	1000	40	9.1	143.6
		1200	T.S.	1000	40	9.2	142.2
		1800	T.S.	1000	40	10.0	140.5
	22	0000	T.S.	1000	40	10.4	138.8
		0600	T.S.	1000	40	10.6	137.4
		1200	T.S.	998	45	10.7	135.8
		1800	T.S.	998	45	10.7	134.0
	23	0000	T.S.	998	45	10.9	132.4
		0600	T.S.	998	45	11.2	131.0
		1200	T.S.	998	45	11.5	129.5
		1800	T.S.	998	45	12.0	128.0
	24	0000	S.T.S.	995	50	12.7	126.5
		0600	S.T.S.	995	50	13.4	125.1
		1200	S.T.S.	995	50	14.0	124.0
		1800	S.T.S.	995	50	14.6	122.9
	25	0000	S.T.S.	995	50	15.1	121.9
		0600	T.S.	1000	40	15.6	120.8
		1200	T.S.	1002	35	16.4	119.2
		1800	T.S.	1002	35	17.9	119.1
	26	0000	T.D.	1004	30	20.0	120.4

APPENDIX 5 SIX-HOURLY POSITIONS OF SEVERE TROPICAL STORM GEORGIA

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
May	19	0000	T.D.	1000	25	15.7	114.8
		0600	T.D.	1000	25	15.5	114.8
		1200	T.D.	1000	25	15.3	114.8
		1800	T.D.	1000	25	15.1	114.9
	20	0000	T.D.	1000	25	15.0	115.1
		0600	T.D.	1000	30	14.9	115.3
		1200	T.D.	1000	30	14.9	115.7
		1800	T.D.	1000	30	15.0	115.9
	21	0000	T.D.	1000	30	15.2	116.1
		0600	T.D.	1000	30	15.5	116.3
		1200	T.D.	998	30	15.9	116.3
		1800	T.D.	998	30	16.2	116.1
	22	0000	T.S.	995	40	16.5	115.7
		0600	T.S.	990	45	17.1	114.9
		1200	T.S.	990	45	18.0	114.5
		1800	T.S.	990	45	18.6	114.3
	23	0000	T.S.	990	45	19.5	114.5
		0600	S.T.S.	990	55	20.5	115.0
		1200	S.T.S.	990	55	21.5	115.5
		1800	T.S.	990	45	22.4	116.0
	24	0000	T.S.	990	45	23.4	116.5
		0600	T.S.	995	45	24.2	117.0
		1200	T.S.	1000	35	25.1	117.8
		1800	T.D.	1002	30	26.2	119.0

APPENDIX 6 SIX-HOURLY POSITIONS OF SEVERE TROPICAL STORM HERBERT

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
June	24	1200	T.D.	1000	30	12.5	118.1
		1800	T.D.	1000	30	13.3	116.5
	25	0000	T.S.	998	35	14.2	114.8
		0600	T.S.	995	35	14.9	113.9
		1200	T.S.	990	40	15.5	113.1
		1800	T.S.	990	45	16.2	112.3
	26	0000	S.T.S.	990	50	17.0	111.6
		0600	S.T.S.	990	50	17.8	111.1
		1200	S.T.S.	990	50	18.2	110.7
		1800	T.S.	990	45	18.9	110.2
	27	0000	T.S.	990	40	19.3	109.9
		0600	T.S.	985	40	19.9	109.7
		1200	T.S.	985	40	20.2	109.4
		1800	T.S.	985	40	20.8	109.2
	28	0000	T.S.	985	40	21.3	108.8
		0600	T.S.	990	35	21.5	108.1
		1200	T.D.	990	30	21.5	107.0

APPENDIX 7 SIX-HOURLY POSITIONS OF THE TROPICAL DEPRESSION (2-3 JULY)

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
July	2	0000	T.D.	1000	25	17.4	117.5
		0600	T.D.	998	30	17.9	117.3
		1200	T.D.	998	30	18.5	117.1
		1800	T.D.	998	30	19.0	117.2
	3	0000	T.D.	1000	25	19.6	117.5

APPENDIX 8 SIX-HOURLY POSITIONS OF SEVERE TROPICAL STORM IDA

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
July	5	1200	T.D.	1004	25	10.1	142.1
		1800	T.D.	1002	25	10.9	141.2
	6	0000	T.D.	1002	25	11.7	140.4
		0600	T.D.	1001	25	12.4	139.5
		1200	T.D.	1000	30	13.1	138.6
		1800	T.S.	999	35	13.8	137.5
	7	0000	T.S.	997	40	14.5	136.4
		0600	T.S.	994	40	15.5	135.0
		1200	T.S.	992	45	16.2	133.6
		1800	T.S.	992	45	16.9	131.7
	8	0000	S.T.S.	990	50	17.6	129.9
		0600	S.T.S.	984	55	18.2	128.5
		1200	S.T.S.	982	55	18.5	127.2
		1800	S.T.S.	980	60	19.0	125.8
	9	0000	S.T.S.	980	60	19.2	124.5
		0600	S.T.S.	984	60	19.6	123.4
		1200	S.T.S.	982	60	20.0	122.4
		1800	S.T.S.	980	55	20.5	121.6
	10	0000	S.T.S.	983	55	20.8	120.8
		0600	S.T.S.	986	55	21.2	119.8
		1200	S.T.S.	986	55	21.4	118.8
		1800	S.T.S.	986	50	21.8	118.0
	11	0000	S.T.S.	986	50	22.0	117.6
		0600	S.T.S.	985	50	22.4	117.2
		1200	S.T.S.	984	50	23.0	116.7
		1800	T.S.	990	45	23.7	116.3
	12	0000	T.D.	995	30	24.2	116.0

APPENDIX 9 SIX-HOURLY POSITIONS OF THE TROPICAL STORM (15-19 JULY)

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
July	15	0600	T.D.	1004	25	14.0	130.0
		1200	T.D.	1004	30	14.6	127.9
		1800	T.D.	1004	30	15.1	125.8
	16	0000	T.D.	1004	30	14.9	123.6
		0600	T.D.	1006	30	14.4	121.5
		1200	T.D.	1006	30	14.4	120.7
		1800	T.D.	1006	30	15.0	119.0
	17	0000	T.D.	1004	30	16.1	117.3
		0600	T.D.	1004	30	17.2	116.4
		1200	T.D.	1003	30	17.8	115.8
		1800	T.D.	1000	30	18.4	115.4
	18	0000	T.S.	998	35	18.9	115.0
		0600	T.S.	996	35	19.6	114.4
		1200	T.S.	998	35	20.3	113.7
		1800	T.D.	1000	30	21.1	112.8
	19	0000	T.D.	1000	30	21.8	112.0

APPENDIX 10 SIX-HOURLY POSITIONS OF TYPHOON JOE

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
July	18	0000	T.D.	1002	25	13.5	139.0
		0600	T.D.	999	30	13.9	137.7
		1200	T.S.	994	35	14.3	136.3
		1800	T.S.	986	40	14.5	134.7
	19	0000	S.T.S.	981	50	14.7	133.2
		0600	S.T.S.	975	60	14.9	131.6
		1200	T.	970	65	15.0	130.0
		1800	T.	965	75	15.5	128.4
	20	0000	T.	955	80	15.8	126.7
		0600	T.	950	80	16.1	125.3
		1200	T.	940	100	16.5	123.8
		1800	T.	945	100	17.0	122.4
	21	0000	T.	975	80	17.3	120.5
		0600	T.	980	70	17.9	119.0
		1200	T.	980	75	18.5	117.4
		1800	T.	970	80	19.0	115.5
	22	0000	T.	965	80	19.2	113.7
		0600	T.	965	75	19.9	111.9
		1200	T.	965	75	20.5	110.1
		1800	T.	970	75	20.8	108.2
	23	0000	T.	975	65	20.9	106.8
		0600	S.T.S.	989	50	21.0	105.6
		1200	T.D.	997	25	20.9	104.0

APPENDIX 11 SIX-HOURLY POSITIONS OF TYPHOON KIM

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
July	20	1200	T.D.	1002	25	8.9	147.5
		1800	T.D.	1002	25	9.2	145.7
	21	0000	T.D.	1002	25	9.5	143.9
		0600	T.D.	1003	25	9.9	142.1
		1200	T.D.	1002	30	10.2	140.4
		1800	T.D.	1000	30	10.5	138.6
	22	0000	T.S.	1000	35	10.7	136.8
		0600	T.S.	996	35	11.2	135.1
		1200	T.S.	992	40	11.7	133.4
		1800	T.S.	986	45	12.5	132.0
	23	0000	S.T.S.	981	55	13.1	130.6
		0600	S.T.S.	980	60	13.4	129.5
		1200	T.	975	65	13.7	128.2
		1800	T.	965	70	14.1	127.2
	24	0000	T.	950	80	14.6	126.2
		0600	T.	925	110	15.1	125.4
		1200	T.	910	110	15.7	124.5
		1800	T.	910	110	16.4	123.4
	25	0000	T.	925	100	17.0	122.4
		0600	T.	950	85	17.5	121.6
		1200	T.	975	85	18.1	120.3
		1800	T.	980	75	18.5	119.4
	26	0000	T.	985	65	18.9	118.7
		0600	S.T.S.	985	60	19.5	118.0
		1200	S.T.S.	985	50	20.2	117.3
		1800	S.T.S.	990	50	20.8	116.5
	27	0000	T.S.	990	45	21.5	116.2
		0600	T.S.	992	40	22.5	116.0
		1200	T.S.	996	35	23.6	116.0
		1800	T.D.	1000	25	24.4	115.7

APPENDIX 12 SIX-HOURLY POSITIONS OF TYPHOON LEX

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
July	28	1800	T.D.	1006	25	23.4	148.2
	29	0000	T.D.	1002	25	23.8	148.4
		0600	T.D.	1000	30	24.0	148.7
		1200	T.D.	998	30	24.3	148.9
		1800	T.S.	996	35	24.6	149.2
	30	0000	T.S.	992	40	24.9	149.4
		0600	S.T.S.	988	50	25.2	149.4
		1200	S.T.S.	983	50	25.4	149.2
		1800	S.T.S.	980	55	25.3	148.9
	31	0000	S.T.S.	975	55	25.2	148.6
		0600	S.T.S.	975	55	25.1	148.2
		1200	S.T.S.	970	60	25.0	147.7
		1800	S.T.S.	970	60	24.8	147.2
August	1	0000	S.T.S.	970	60	24.5	146.6
		0600	T.	965	65	24.2	146.0
		1200	T.	965	65	23.9	145.4
		1800	T.	965	65	23.7	145.0
	2	0000	T.	965	65	23.7	144.6
		0600	T.	965	65	24.0	144.5
		1200	T.	960	70	24.2	144.4
		1800	T.	960	70	24.8	144.3
	3	0000	T.	960	70	25.5	144.4
		0600	T.	965	65	26.2	144.4
		1200	T.	965	65	26.9	144.3
		1800	T.	965	65	27.5	144.3
	4	0000	S.T.S.	970	60	28.0	144.4
		0600	S.T.S.	970	60	28.6	144.6
		1200	S.T.S.	970	60	29.2	144.9
		1800	S.T.S.	970	60	29.6	145.3

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
August	5	0000	S.T.S.	975	55	30.0	145.9
		0600	S.T.S.	975	55	30.4	146.8
		1200	S.T.S.	980	50	30.9	147.9
		1800	S.T.S.	980	50	31.4	148.6
	6	0000	S.T.S.	980	50	32.0	149.3
		0600	T.S.	980	45	32.7	150.0
		1200	T.S.	980	45	33.3	151.3
		1800	T.S.	985	40	34.0	152.7
	7	0000	T.S.	985	40	34.7	154.2
		0600	T.S.	985	40	35.7	155.4
		1200	T.S.	985	40	36.8	156.3
		1800	T.S.	985	40	38.3	156.5
	8	0000	T.S.	985	40	39.7	156.1
		0600	T.S.	985	40	41.0	156.0
		1200	T.S.	985	40	42.0	156.0

APPENDIX 13 SIX-HOURLY POSITIONS OF TYPHOON MARGE

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
August	8	0600	T.D.	998	30	14.3	157.5
		1200	T.S.	996	35	14.4	157.1
		1800	T.S.	994	35	14.4	156.6
	9	0000	T.S.	992	35	14.6	156.3
		0600	T.S.	990	40	15.6	156.1
		1200	T.S.	980	45	16.4	155.6
		1800	S.T.S.	975	50	17.3	155.0
	10	0000	T.	970	65	18.5	155.0
		0600	T.	960	90	19.9	155.1
		1200	T.	950	100	21.3	155.2
		1800	T.	945	100	22.7	155.4
	11	0000	T.	945	100	24.1	155.5
		0600	T.	945	100	25.4	155.6
		1200	T.	945	90	26.7	155.8
		1800	T.	950	85	27.8	156.0
	12	0000	T.	960	85	28.7	156.1
		0600	T.	960	85	29.3	156.1
		1200	T.	960	85	29.8	156.1
		1800	T.	965	70	30.4	156.1
	13	0000	T.	970	70	31.0	156.0
		0600	T.	975	70	31.5	156.0
		1200	T.	975	65	32.1	156.2
		1800	S.T.S.	975	60	32.7	156.7
	14	0000	S.T.S.	975	60	33.1	157.7
		0600	S.T.S.	975	60	33.3	159.2
		1200					
		1800	Marge moved east of 160°E				

APPENDIX 14 SIX-HOURLY POSITIONS OF THE TROPICAL DEPRESSION (15-19 AUGUST)

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
August	15	0000	T.D.	1006	25	15.0	124.0
		0600	T.D.	1006	25	15.6	122.8
		1200	T.D.	1006	25	16.2	121.6
		1800	T.D.	1006	25	16.9	120.3
	16	0000	T.D.	1004	25	17.5	119.0
		0600	T.D.	1004	25	17.9	118.1
		1200	T.D.	1002	30	18.1	117.0
		1800	T.D.	1002	30	18.2	116.0
	17	0000	T.D.	1000	30	18.4	115.0
		0600	T.D.	998	30	18.5	114.5
		1200	T.D.	998	30	18.5	114.0
		1800	T.D.	998	30	18.5	113.5
	18	0000	T.D.	998	30	18.6	113.0
		0600	T.D.	998	30	19.6	112.8
		1200	T.D.	998	30	20.7	112.4
		1800	T.D.	996	30	21.3	111.2
	19	0000	T.D.	996	30	21.3	109.5
		0600	T.D.	996	30	21.2	108.0
		1200	T.D.	998	25	21.2	107.0

APPENDIX 15 SIX-HOURLY POSITIONS OF TYPHOON NORRIS

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
August	23	1200	T.D.	1005	25	16.9	141.0
		1800	T.D.	1005	25	16.8	139.5
	24	0000	T.D.	1005	25	16.9	138.3
		0600	T.D.	1005	25	17.2	137.4
		1200	T.D.	1004	25	17.7	136.5
		1800	T.D.	1000	30	18.0	135.6
	25	0000	T.D.	997	30	18.3	134.8
		0600	T.D.	995	30	18.8	133.5
		1200	T.S.	992	35	19.1	132.3
		1800	T.S.	988	35	19.6	131.0
	26	0000	T.S.	985	40	20.0	130.0
		0600	S.T.S.	982	50	20.6	128.6
		1200	S.T.S.	980	55	21.3	127.5
		1800	T.	965	65	22.3	126.2
	27	0000	T.	960	75	23.1	124.9
		0600	T.	950	85	23.7	123.8
		1200	T.	950	85	24.3	122.7
		1800	T.	965	75	24.4	121.4
	28	0000	T.	980	65	25.0	120.6
		0600	S.T.S.	985	55	25.6	119.2
		1200	T.S.	992	45	26.0	118.3
		1800	T.S.	996	35	26.5	117.3

APPENDIX 16 SIX-HOURLY POSITIONS OF THE TROPICAL DEPRESSION (5-6 SEPTEMBER)

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
September	5	0000	T.D.	1000	30	15.4	110.3
		0600	T.D.	998	30	16.0	109.7
		1200	T.D.	996	30	16.5	108.8
		1800	T.D.	996	30	17.2	107.8
	6	0000	T.D.	998	30	18.3	106.4
		0600	T.D.	1000	25	18.5	104.9

APPENDIX 17 SIX-HOURLY POSITIONS OF TYPHOON ORCHID

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
September	4	0000	T.D.	1000	25	9.0	146.4
		0600	T.D.	1004	25	9.3	145.7
		1200	T.D.	1008	25	9.8	145.0
		1800	T.D.	1008	25	10.3	144.3
	5	0000	T.D.	1005	25	10.9	143.5
		0600	T.D.	1002	25	11.5	142.8
		1200	T.D.	1000	25	12.4	142.5
		1800	T.D.	999	30	13.3	142.4
	6	0000	T.D.	997	30	14.4	142.5
		0600	T.D.	996	30	15.2	142.7
		1200	T.D.	995	30	16.1	142.9
		1800	T.S.	993	35	17.0	143.0
	7	0000	T.S.	992	40	18.0	142.7
		0600	T.S.	992	45	19.2	141.8
		1200	T.S.	991	45	19.2	140.1
		1800	S.T.S.	988	50	19.2	138.8
	8	0000	S.T.S.	984	50	19.9	138.1
		0600	S.T.S.	980	50	20.8	137.5
		1200	S.T.S.	975	55	21.6	136.6
		1800	S.T.S.	970	55	22.3	135.3
	9	0000	S.T.S.	970	55	22.8	134.1
		0600	S.T.S.	970	60	23.2	133.3
		1200	S.T.S.	965	60	23.5	132.5
		1800	T.	965	65	25.4	131.3
	10	0000	T.	960	65	25.0	131.2
		0600	T.	960	65	27.5	130.3
		1200	T.	960	65	27.8	131.0
		1800	T.	960	70	30.4	130.2
	11	0000	T.	960	65	31.6	131.0
		0600	T.	970	65	34.3	131.3
		1200	T.	975	65	37.5	132.1
		1800	S.T.S.	980	50	41.4	135.8

APPENDIX 18 SIX-HOURLY POSITIONS OF TYPHOON PERCY

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
September	13	0600	T.D.	1000	25	16.6	132.1
		1200	T.D.	1000	30	17.0	131.8
		1800	T.D.	995	30	17.4	131.5
	14	0000	T.S.	992	40	17.9	131.0
		0600	T.S.	991	40	18.3	130.5
		1200	T.S.	991	40	18.7	129.9
		1800	T.S.	989	40	19.0	129.2
	15	0000	T.S.	986	45	19.0	128.4
		0600	T.S.	986	45	18.9	128.0
		1200	T.S.	990	45	18.8	127.4
		1800	S.T.S.	982	50	18.6	127.2
	16	0000	S.T.S.	975	55	18.5	126.7
		0600	T.	970	65	19.0	126.1
		1200	T.	965	70	19.6	125.8
		1800	T.	960	75	19.9	125.4
	17	0000	T.	950	80	20.1	124.8
		0600	T.	940	80	20.3	124.1
		1200	T.	920	100	20.7	123.1
		1800	T.	915	110	21.2	122.3
	18	0000	T.	920	110	21.9	121.0
		0600	T.	940	90	22.4	119.5
		1200	T.	965	70	22.6	118.8
		1800	S.T.S.	987	50	23.5	117.8
	19	0000	T.D.	1000	30	24.0	117.0

APPENDIX 19 SIX-HOURLY POSITIONS OF TYPHOON RUTH

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
September	12	1200	T.D.	995	25	19.0	114.7
		1800	T.D.	994	30	19.0	114.5
	13	0000	T.D.	993	30	19.0	114.3
		0600	T.D.	992	30	18.9	114.2
		1200	T.D.	992	30	18.7	114.1
		1800	T.S.	990	35	18.3	113.8
	14	0000	T.S.	990	35	18.3	113.3
		0600	T.S.	990	35	18.6	112.6
		1200	T.S.	985	40	19.1	111.9
		1800	T.S.	985	45	19.5	110.8
	15	0000	T.S.	985	45	19.5	109.9
		0600	S.T.S.	980	50	19.5	109.0
		1200	S.T.S.	975	60	19.6	108.1
		1800	T.	970	75	19.5	107.2
	16	0000	T.	970	75	19.4	105.7
		0600	S.T.S.	980	55	19.0	104.3
		1200	T.D.	995	25	18.5	102.6

APPENDIX 20 SIX-HOURLY POSITIONS OF TYPHOON SPERRY

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
September	15	0000	T.D.	994	25	20.0	147.5
		0600	T.S.	995	35	20.6	146.0
		1200	T.S.	996	40	21.2	144.5
		1800	T.S.	997	40	21.7	142.6
	16	0000	T.S.	998	40	22.2	141.2
		0600	T.S.	997	40	22.8	139.7
		1200	T.S.	994	40	23.5	138.3
		1800	T.S.	991	45	24.5	137.1
	17	0000	T.S.	990	45	25.6	136.4
		0600	S.T.S.	989	50	26.9	136.1
		1200	S.T.S.	988	50	28.0	136.0
		1800	S.T.S.	987	50	29.3	136.5
	18	0000	S.T.S.	986	55	30.0	137.3
		0600	S.T.S.	984	55	30.7	138.6
		1200	S.T.S.	980	60	31.0	139.9
		1800	S.T.S.	975	60	31.2	141.2
	19	0000	T.	970	65	31.3	142.4
		0600	T.	970	65	31.5	143.7
		1200	T.	970	65	31.4	144.9
		1800	S.T.S.	980	55	31.2	145.9
	20	0000	T.S.	985	45	30.8	146.7
		0600	T.S.	990	40	30.5	147.5

APPENDIX 21 SIX-HOURLY POSITIONS OF SEVERE TROPICAL STORM THELMA

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
September	27	0000	T.D.	998	25	18.0	142.8
		0600	T.D.	997	25	18.8	142.6
		1200	T.D.	995	25	19.8	142.4
		1800	T.D.	992	30	20.7	142.3
	28	0000	T.D.	991	30	21.7	142.2
		0600	T.S.	989	35	22.9	142.3
		1200	T.S.	988	40	24.3	142.5
		1800	T.S.	986	40	25.6	142.9
	29	0000	T.S.	983	45	26.6	143.3
		0600	S.T.S.	982	50	27.5	143.6
		1200	S.T.S.	981	50	29.0	144.5
		1800	S.T.S.	981	50	30.4	146.0
	30	0000	S.T.S.	980	50	32.0	148.1
		0600	T.S.	981	45	36.1	150.5

APPENDIX 22 SIX-HOURLY POSITIONS OF TYPHOON VERNON

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
September	27	1200	T.D.	1000	25	13.7	159.7
		1800	T.D.	1000	25	13.0	159.0
	28	0000	T.D.	998	25	12.7	158.3
		0600	T.D.	995	25	12.9	157.6
		1200	T.D.	993	30	13.3	156.9
		1800	T.S.	990	35	14.0	156.2
	29	0000	T.S.	985	40	15.0	155.6
		0600	T.S.	983	45	15.8	155.3
		1200	S.T.S.	980	50	16.5	155.1
		1800	S.T.S.	975	55	17.2	154.8
	30	0000	S.T.S.	970	60	18.1	154.5
		0600	T.	965	65	19.0	154.0
		1200	T.	960	65	20.1	153.1
		1800	T.	955	70	21.4	152.3
October	1	0000	T.	950	75	22.2	151.8
		0600	T.	940	80	23.3	151.2
		1200	T.	940	80	24.6	150.3
		1800	T.	940	85	25.6	149.2
	2	0000	T.	935	85	26.5	148.6
		0600	T.	940	80	27.3	148.4
		1200	T.	940	80	28.5	148.5
		1800	T.	940	80	29.7	148.8
	3	0000	T.	945	75	31.2	149.5
		0600	T.	955	70	33.4	151.3
		1200	S.T.S.	970	60	35.9	154.3
		1800	S.T.S.	980	50	38.3	158.9

APPENDIX 23 SIX-HOURLY POSITIONS OF TYPHOON WYNNE

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
October	3	0000	T.D.	1000	25	6.8	155.0
		0600	T.D.	992	25	6.8	154.2
		1200	T.S.	987	35	6.6	153.5
		1800	T.S.	982	45	6.2	153.0
	4	0000	T.	975	65	6.0	152.1
		0600	S.T.S.	980	60	6.1	151.3
		1200	S.T.S.	988	60	6.6	150.5
		1800	T.S.	995	45	7.2	149.8
	5	0000	T.S.	999	40	7.9	149.3
		0600	T.S.	997	45	8.7	148.6
		1200	T.S.	1007	45	9.7	147.8
		1800	T.S.	1008	45	10.7	147.0
	6	0000	T.S.	998	45	11.7	146.6
		0600	T.S.	994	45	12.6	146.4
		1200	T.S.	999	45	13.6	146.0
		1800	T.S.	997	35	14.6	145.4
	7	0000	T.S.	994	40	15.3	144.6
		0600	T.S.	990	40	15.8	144.1
		1200	T.S.	988	45	16.2	143.5
		1800	S.T.S.	983	50	16.7	142.8
	8	0000	S.T.S.	980	55	17.1	142.1
		0600	S.T.S.	965	60	17.5	141.1
		1200	T.	950	65	17.9	140.1
		1800	T.	930	80	18.5	139.0
	9	0000	T.	895	115	18.8	138.1
		0600	T.	890	125	19.1	137.1
		1200	T.	895	125	19.5	136.1
		1800	T.	900	125	20.0	134.9

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
October	10	0000	T.	910	125	20.5	133.4
		0600	T.	910	120	20.9	132.0
		1200	T.	905	120	21.4	130.8
		1800	T.	910	120	22.0	129.7
	11	0000	T.	920	120	22.6	128.8
		0600	T.	915	120	23.1	128.0
		1200	T.	915	115	23.7	127.3
		1800	T.	920	110	24.2	126.4
	12	0000	T.	925	105	24.8	126.1
		0600	T.	920	100	25.3	125.8
		1200	T.	925	90	26.0	125.7
		1800	T.	930	85	26.8	125.8
	13	0000	T.	935	80	27.9	126.3
		0600	T.	945	80	29.1	127.3
		1200	T.	950	80	29.8	128.6
		1800	T.	950	80	30.5	130.5
	14	0000	T.	955	75	31.4	133.3
		0600	T.	960	70	32.5	136.2
		1200	T.	970	65	33.8	140.3
		1800	S.T.S.	980	55	35.0	145.0

APPENDIX 24 SIX-HOURLY POSITIONS OF TROPICAL STORM ALEX

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
October	10	0600	T.D.	1008	25	19.5	154.5
		1200	T.D.	1008	25	20.0	153.1
		1800	T.D.	1007	25	20.6	152.3
	11	0000	T.D.	1006	25	21.4	151.3
		0600	T.D.	1006	30	22.2	150.3
		1200	T.D.	1005	30	22.8	149.2
		1800	T.D.	1005	30	23.3	147.9
	12	0000	T.S.	1004	35	23.6	146.7
		0600	T.S.	1003	35	24.0	145.4
		1200	T.S.	1001	35	24.4	144.2
		1800	T.D.	1001	30	25.3	142.8
	13	0000	T.D.	1000	30	26.1	141.6
		0600	T.D.	1000	30	27.2	140.3
		1200	T.D.	1000	30	28.8	139.8
		1800	T.D.	1000	30	31.0	140.6
	14	0000	T.D.	1000	25	33.6	143.4

APPENDIX 25 SIX-HOURLY POSITIONS OF TYPHOON BETTY

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
October	29	0600	T.D.	1000	30	8.9	154.1
		1200	T.S.	996	35	9.5	153.3
		1800	T.S.	994	45	10.0	152.2
	30	0000	S.T.S.	993	50	10.8	150.8
		0600	S.T.S.	989	55	11.6	149.1
		1200	S.T.S.	988	55	12.2	147.3
		1800	S.T.S.	982	60	12.8	145.7
	31	0000	T.	975	65	13.3	143.5
		0600	T.	970	70	13.7	141.3
		1200	T.	960	75	13.9	139.2
		1800	T.	960	85	14.0	137.6
November	1	0000	T.	960	85	14.0	135.9
		0600	T.	965	85	14.1	133.9
		1200	T.	965	85	14.4	132.4
		1800	T.	965	85	14.6	131.7
	2	0000	T.	960	90	14.8	131.1
		0600	T.	955	90	15.0	130.3
		1200	T.	960	90	15.0	129.5
		1800	T.	955	90	14.8	128.7
	3	0000	T.	955	90	14.5	127.8
		0600	T.	940	95	14.4	127.3
		1200	T.	930	100	14.3	126.7
		1800	T.	925	115	14.4	125.9
	4	0000	T.	925	115	14.5	124.9
		0600	T.	930	115	15.0	123.7
		1200	T.	930	115	15.8	122.8
		1800	T.	950	110	16.0	121.6

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
November	5	0000	T.	965	100	16.5	120.8
		0600	T.	980	70	17.3	120.6
		1200	T.	989	65	18.0	120.3
		1800	S.T.S.	988	50	18.9	120.0
	6	0000	S.T.S.	990	50	19.7	120.0
		0600	T.S.	990	45	20.6	120.5
		1200	T.S.	991	45	21.3	121.7
		1800	T.S.	993	40	22.1	122.9
	7	0000	T.S.	994	40	23.2	124.2
		0600	T.S.	995	35	24.4	126.3
		1200	T.D.	996	30	25.4	128.9
		1800	T.D.	998	25	26.3	131.6
	8	0000	T.D.	1000	25	27.0	134.8

APPENDIX 26 SIX-HOURLY POSITIONS OF TROPICAL STORM CARY

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
October	29	0600	T.D.	1002	25	14.1	121.5
		1200	T.D.	1000	25	14.7	120.0
		1800	T.D.	1000	30	15.4	118.5
	30	0000	T.S.	998	40	16.1	117.0
		0600	T.S.	994	45	16.3	116.6
		1200	T.S.	992	45	16.5	116.1
		1800	T.S.	990	45	16.3	115.5
	31	0000	T.S.	990	45	15.6	115.2
		0600	T.S.	994	40	15.1	114.7
		1200	T.S.	996	40	14.5	113.8
		1800	T.S.	996	40	14.4	113.0
November	1	0000	T.S.	996	40	14.3	112.1
		0600	T.S.	998	40	14.1	111.3
		1200	T.S.	998	40	13.8	110.7
		1800	T.S.	1000	40	13.4	110.0
	2	0000	T.D.	1002	30	13.0	109.3
		0600	T.D.	1006	25	12.3	108.7

APPENDIX 27 SIX-HOURLY POSITIONS OF TYPHOON DINAH

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
November	21	0000	T.D.	1002	25	9.8	159.7
		0600	T.D.	993	30	10.0	157.5
		1200	T.S.	984	35	10.3	155.4
		1800	S.T.S.	975	50	10.8	153.4
	22	0000	T.	970	65	11.6	151.8
		0600	T.	970	70	12.9	149.4
		1200	T.	970	75	13.9	147.4
		1800	T.	950	80	15.1	145.6
	23	0000	T.	950	90	16.1	144.7
		0600	T.	950	90	17.4	144.1
		1200	T.	960	90	18.6	143.9
		1800	T.	955	90	20.0	144.0
	24	0000	T.	955	90	21.3	144.5
		0600	T.	950	85	22.7	146.1
		1200	T.	960	80	24.4	148.7
		1800	T.	970	70	25.9	151.4
	25	0000	S.T.S.	980	60	27.5	154.9
		0600	S.T.S.	985	55	29.0	158.4

APPENDIX 28 SIX-HOURLY POSITIONS OF TROPICAL STORM ED

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
December	15	0600	T.D.	1002	25	11.8	131.4
		1200	T.D.	996	25	11.9	130.7
		1800	T.D.	992	30	12.1	130.1
	16	0000	T.S.	990	30	12.4	129.5
		0600	T.S.	990	35	12.7	128.9
		1200	T.S.	990	40	12.9	128.4
		1800	T.S.	990	40	13.2	128.0
	17	0000	T.S.	990	45	13.5	127.5
		0600	T.S.	990	45	13.9	127.1
		1200	T.S.	990	45	13.9	126.9
		1800	T.S.	990	40	13.8	126.8
	18	0000	T.S.	992	40	13.6	126.9
		0600	T.S.	992	40	13.4	127.1
		1200	T.S.	994	40	13.5	127.2
		1800	T.S.	994	40	13.6	127.3
	19	0000	T.S.	995	40	13.8	127.3
		0600	T.S.	995	40	14.3	127.3
		1200	T.S.	996	35	14.7	127.5
		1800	T.S.	996	35	15.1	127.9
	20	0000	T.D.	998	30	14.8	128.2
		0600	T.D.	998	30	14.1	128.1
		1200	T.D.	998	30	13.2	127.7
		1800	T.D.	1000	25	12.6	127.3
	21	0000	T.D.	1000	25	12.0	126.9