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ROYAL OBSERVATORY, HONG KONG

METEOROLOGICAL RESULTS 1981

PART III—TROPICAL CYCLONE SUMMARIES

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

40° 30° 20° 10° 0°

THAD Aug

PHYLLIS Aug

SUSAN Aug

OGDEN Aug

JUNE Jun

AGNES Sep

SUSAN Aug

T.D. Jul

IKE Jun

VANESSA Aug

MAURY Jul

LYNN Jul

WARREN Aug

ROY Aug

T.D. Jul

PHYLLIS Aug

T.D. Aug

OGDEN Jul

VANESSA Aug

KELLY Jul

WARREN Aug

IKE Jun

THAD Aug

MAURY Jul

T.D. Jul

AGNES Aug

GERALD Apr

ROY Aug

LYNN Jul

JUNE Jun

KELLY Jun

HOLLY May

HOLLY Apr

GERALD Apr

R.O. 80

ROYAL OBSERVATORY HONG KONG

TRACKS OF TROPICAL CYCLONES
JANUARY—AUGUST, 1981

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.

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

40° 30° 20° 10° 0°

ELSIE Oct

GAY Oct

BILL Sep

JEFF Nov

CLARA Sep

IRMA Nov

HAZEN Nov

LEE Dec

FABIAN Oct

T.D. Nov

KIT Dec

R.O. 80

ROYAL OBSERVATORY HONG KONG

TRACKS OF TROPICAL CYCLONES
SEPTEMBER—DECEMBER, 1981

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.

METEOROLOGICAL RESULTS

1981

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 gale 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.

At the thirteenth session of the ESCAP/WMO Typhoon Committee held in December 1980, a common system for identification of tropical cyclones in the western North Pacific was adopted. Starting from 1 January 1981, the Japan Meteorological Agency undertook the responsibility of assigning to each tropical cyclone a common number which is composed of 4 digits in parentheses. For example, (8104) means the fourth tropical cyclone in 1981.

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 Cairm	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 ground floor of the building of the Radar Station.

The anemometer at the Royal Observatory was affected by the construction of a new building next to the existing headquarters building from June 1981 onwards. No wind data from this anemometer were therefore presented in this report. Wind conditions at the Royal Observatory may be estimated based on the findings published in Royal Observatory Technical Notes No. 41 and 45. Wind data obtained by the Cable & Wireless Ltd. at Stanley during the passage of S.T.S. Lynn were also available for analysis. 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 affected 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 1981 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 1981, 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 1981. 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 1981. 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 1981. The annual number of tropical cyclones which caused tropical cyclone warning signals to be 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 1946–1981.

Table 7 presents the casualties and damage figures associated with tropical cyclones in Hong Kong for the period 1937–1981. The information is compiled from local newspapers and from the Marine Department's records.

Table 8 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 1981. Information on the nearest approach, the maximum winds at the Hong Kong Airport 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 9 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 1981

In 1981 twenty eight tropical cyclones formed over the western North Pacific and the South China Sea and twelve of them attained typhoon intensity. Four tropical cyclones made landfall over south China. Seven tropical cyclones crossed the Philippines and three crossed Taiwan. Five tropical cyclones affected Japan while another two affected Korea. 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 1946–1980 is given in Figure 2.

During the year there were fourteen 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 35 years. Ten tropical cyclones moved into the area while four developed within it. Altogether 353 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 five of them. 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 only 206.1 mm which is the lowest since 1972. This amount was much below the annual average value of 566.9 mm and accounted for only 12 per cent of the year's total rainfall of 1 659.5 mm. Severe Tropical Storm Lynn alone brought 83.2 mm.

There were no tropical cyclones during January to March. Two tropical cyclones developed in April and May, but dissipated over the Pacific.

Three tropical cyclones developed during June. Severe Tropical Storm Ike (8104) recurved near Hainan and crossed Taiwan near Gaoxiong on 13 June killing five people. Typhoon June (8105) crossed Taibei on 20 June causing heavy rain in northern Taiwan. Typhoon Kelly (8106) formed east of the Philippines on 28 June and moved westwards.

Five tropical cyclones developed over the western North Pacific and the South China Sea during July. Typhoon Kelly crossed the central Philippines on 1 July and caused severe flooding and landslips. About 200 Philippinos were killed, mostly near the Mayon volcano. Kelly passed over the southwest coast of Hainan and dissipated near Vientiane on 5 July. Severe Tropical Storm Lynn (8107) crossed Luzon on 4 July, killing 17 people and leaving more than 65 000 homeless. In Hong Kong, the only Gale or Storm Signals of the year were hoisted for 28 hours 45 minutes for Severe Tropical Storm Lynn which passed about 80 nautical miles to the southwest on 7 July. 32 people were injured mostly by falling objects. In western Guangdong, 5 people were killed and there was considerable damage. Severe Tropical Storm Maury (8108) hit Taibei on 19 July and brought about a death toll of 38. A tropical depression (8109) formed off east Taiwan and dissipated near Hangzhou on 24 July. Severe Tropical Storm Ogden (8110) passed Kyushu on 31 July. Ogden dissipated west of Korea on 1 August.

Nine tropical cyclones developed during August. Severe Tropical Storm Phyllis (8112) became extratropical after skirting Hokkaido on 5 August. Phyllis caused 7 deaths and left about 22 500 homeless in Japan. Tropical Storms Roy (8113) and Warren (8117) formed over the South China Sea. Roy weakened near Dongsha Dao on 7 August while Warren crossed Hainan and dissipated near Hanoi on 20 August. Typhoon Thad (8115) passed over Tokyo on 23 August and crossed Honshu killing 20 people and leaving 23 missing. Typhoon Agnes (8118) Struck the Ryukyu Islands on 30 August and moved north into the Yellow Sea. Three other tropical cyclones moved away into the Pacific.

There were four tropical cyclones in September. Typhoon Agnes caused tremendous damage in Taiwan, Shanghai and South Korea. It brought the worst floods to the southern districts of Taiwan in the last 30 years. 32 people were killed or missing. In Shanghai, 14 people were killed or missing and about 300 junks capsized in the highest storm surge on record. Agnes passed close to South Korea on 3 September and brought a death toll of 93 with 33 others missing. Agnes also caused the highest storm surge there since 1949. Typhoon Clara (8120) wrecked a Philippine Navy destroyer near Calayan, just north of Luzon, on 20 September leaving only 18 survivors out of a crew of 97. On 22 September Clara crossed the China coast near Shanwei causing the death of 62 people in south China. Typhoons Bill (8119) and Elsie (8122) became extratropical east of Hokkaido on 7 September and 3 October respectively.

Tropical Storm Fabian (8123) formed near the central Philippines on 12 October and landed over Vietnam two days later. Typhoon Gay (8124) recurved near Okinawa and passed near Tokyo on 22 October, bring heavy rain and flooding.

Four tropical cyclones developed during November. A tropical depression formed off the coast of Vietnam on 10 November but dissipated overland the next day. Typhoon Hazen (8125) crossed the central Philippines on 20 November without causing serious damage. Typhoon Irma (8126) crossed the Philippines near Manila on 24 November. About 200 people were killed, mostly in a storm surge in Camarines Sur province about 120 nautical miles southeast of Manila. More than 400 000 people were made homeless. Typhoon Irma and Tropical Storm Jeff (8127) both dissipated near the Ryukyu Islands.

Typhoons Kit (8128) and Lee (8129) developed during December. Typhoon Kit dissipated near Mindanao on 21 December, but Typhoon Lee crossed the central Philippines on 26 December leaving 137 people dead and 4 others missing. About 500 000 people were made homeless.

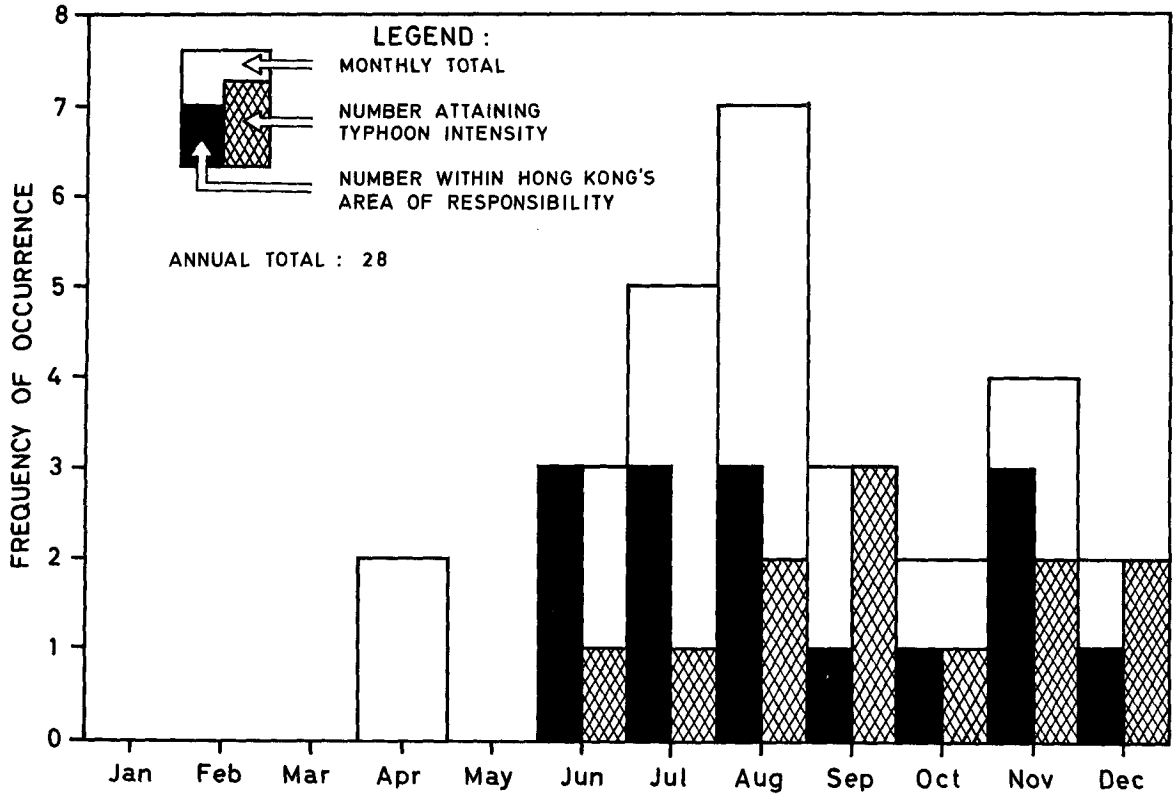

Figure 1. Monthly distribution of the frequency of occurrence of tropical cyclones and typhoons in the western North Pacific and the South China Sea in 1981.

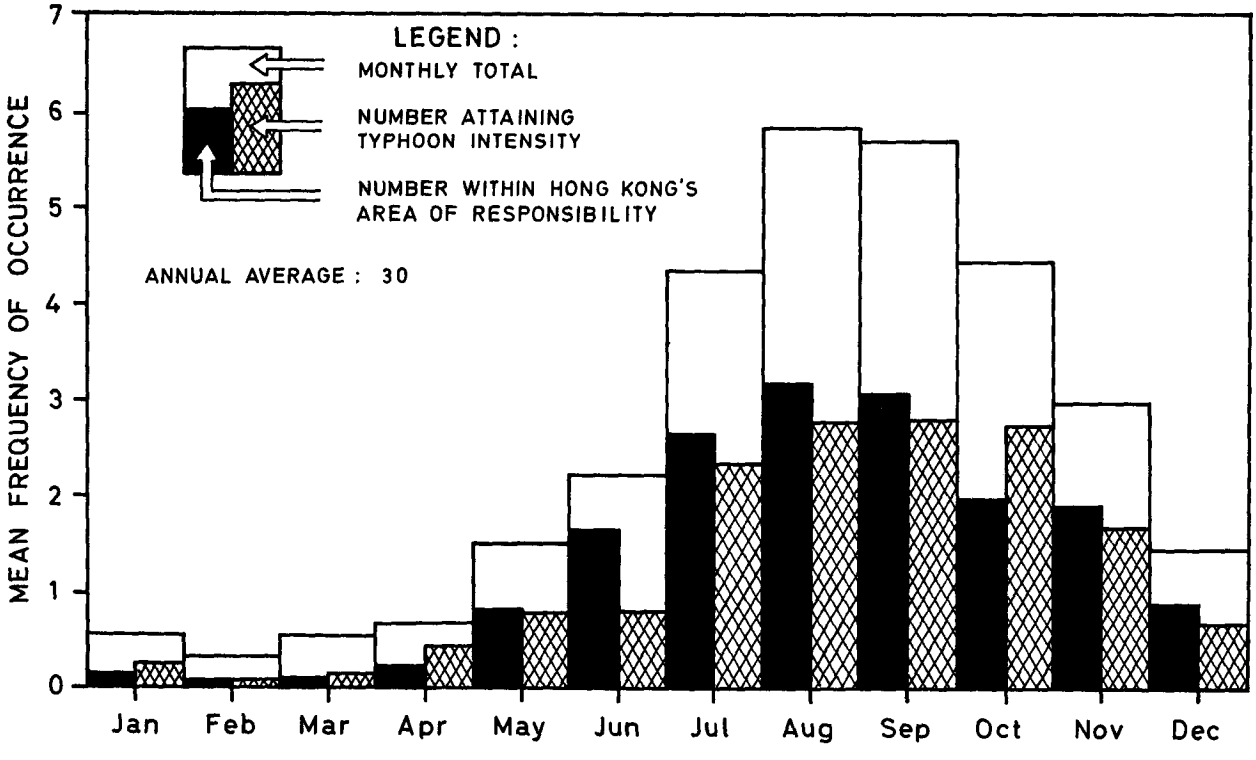

Figure 2. Monthly distribution of the mean frequency of occurrence of tropical cyclones and typhoons in the western North Pacific and the South China Sea, 1946–1980.

REPORTS ON TROPICAL CYCLONES AFFECTING HONG KONG IN 1981

SEVERE TROPICAL STORM IKE (8104)

9–15 June 1981

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

An area of low pressure moved westward across the northern part of the South China Sea on 8 June. It became a tropical depression on 9 June about 60 nautical miles north of Xisha Qundao while still moving westwards at about 8 knots. Satellite pictures indicated that the main cloud mass was displaced to the left of the centre. This depression intensified into a tropical storm named Ike that night as it decelerated in its westward movement when centred to the south of Hainan Dao. The cloud pattern was still not very well organized on 10 June, but sustained winds of around 40 knots and peak gusts reaching 64 knots were recorded at Sanhu Dao about 60 nautical miles from the centre. Ike slowed down and turned towards the northeast on 10 June. Some spiral cloud bands appeared the next day.

In Hong Kong, the Stand By Signal, No. 1, was hoisted at 9.00 a.m. on 11 June when Ike was centred about 300 nautical miles southwest of Hong Kong. Ike further intensified into a severe tropical storm in the afternoon and turned east-northeastwards, accelerating to about 13 knots on 12 June while its circulation became larger and covered an area about 500 nautical miles in diameter (Figure 4). At 8.00 a.m. on 12 June, the M.V. 'Luise Leonhardt' reported winds of 45 knots about 50 nautical miles east-southeast of the centre. At 10.40 p.m. on 12 June, a reconnaissance aircraft reported a minimum sea-level pressure of 967 millibars. Ike shrank in size on 13 June but remained compact near southern Taiwan, where it attained its maximum intensity. At 8.00 a.m. on 13 June, the S.S. 'President Madison' reported winds of 50 knots and a pressure of 981.6 millibars about 35 nautical miles from the centre. As Ike continued heading towards southern Taiwan, all signals were lowered in Hong Kong at 8.30 a.m. on 13 June when Ike was about 320 nautical miles to the east.

The severe tropical storm landed near Gaoxiong and moved northeastwards across Taiwan causing severe flooding and killing five people. At 8.00 p.m. on 13 June, a secondary centre formed off the northern tip of Taiwan. The primary centre dissipated off the east coast on 14 June but the secondary centre moved north-eastwards and dissipated the next day.

Ike was closest to Hong Kong around noon on 12 June when it was centred about 180 nautical miles to the south-southeast. The minimum sea-level pressure of 996.4 millibars at the Royal Observatory was recorded around 6.00 p.m. when the central pressure of Ike was estimated to be about 975 millibars.

In Hong Kong, winds were moderate easterly on 11 June but they turned fresh northerly the following morning. Winds subsided during the afternoon of 13 June. 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*	
Hong Kong Airport (SE)	N	15	N	31
Hong Kong Airport (NW)	N	20	N	39
Waglan Island	N	25	N	34
Tate's Cairn	N	28	N	42
Cheung Chau	N	20	N	32
King's Park	NNE	12	NNE	27
Star Ferry	E	13	E	21
Green Island	NNW	19	NW	29
Tsim Bei Tsui	N	20	N	30
Tai O	not available		not available	
Castle Peak	N	14	N	35
Chek Lap Kok	E	20	N	29
Lei Yue Mun	ENE	18	N	33
Yau Yat Chuen	N	20	N	39
Kowloon Tsai Hill	NNE	20	NNE	38

There were occasional slight showers on 11–12 June and the weather remained cloudy on 13 June. The daily amounts of rainfall recorded during the period 10–13 June were as follows:

	Royal Observatory	*Cheung Chau*	*Tate's Cairn*
10 June	0.1 mm	Nil	1.6 mm
11 June	2.2 mm	1.4 mm	16.0 mm
12 June	0.6 mm	Nil	0.2 mm
13 June	Nil	Trace	Nil
Total:	2.9 mm	1.4 mm	17.8 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 June	7.30 a.m.	0.5	13 June	12.45 p.m.
Tai Po Kau	2.2	13 June	7.00 a.m.	0.6	13 June	9.00 p.m.
Chi Ma Wan (Lantau Island)	2.3	12 June	7.15 a.m.	0.6	12 June	8.00 a.m.

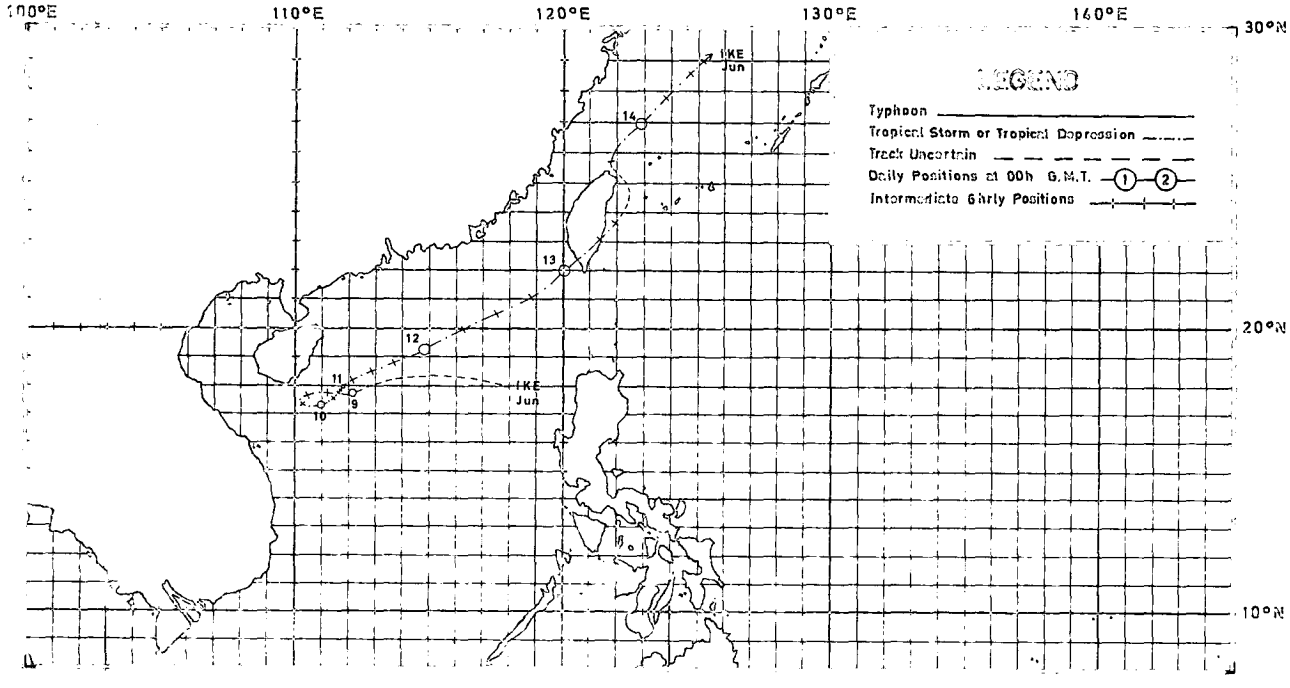

Figure 3. Track of Severe Tropical Storm Ike (8104): 9–15 June 1981.

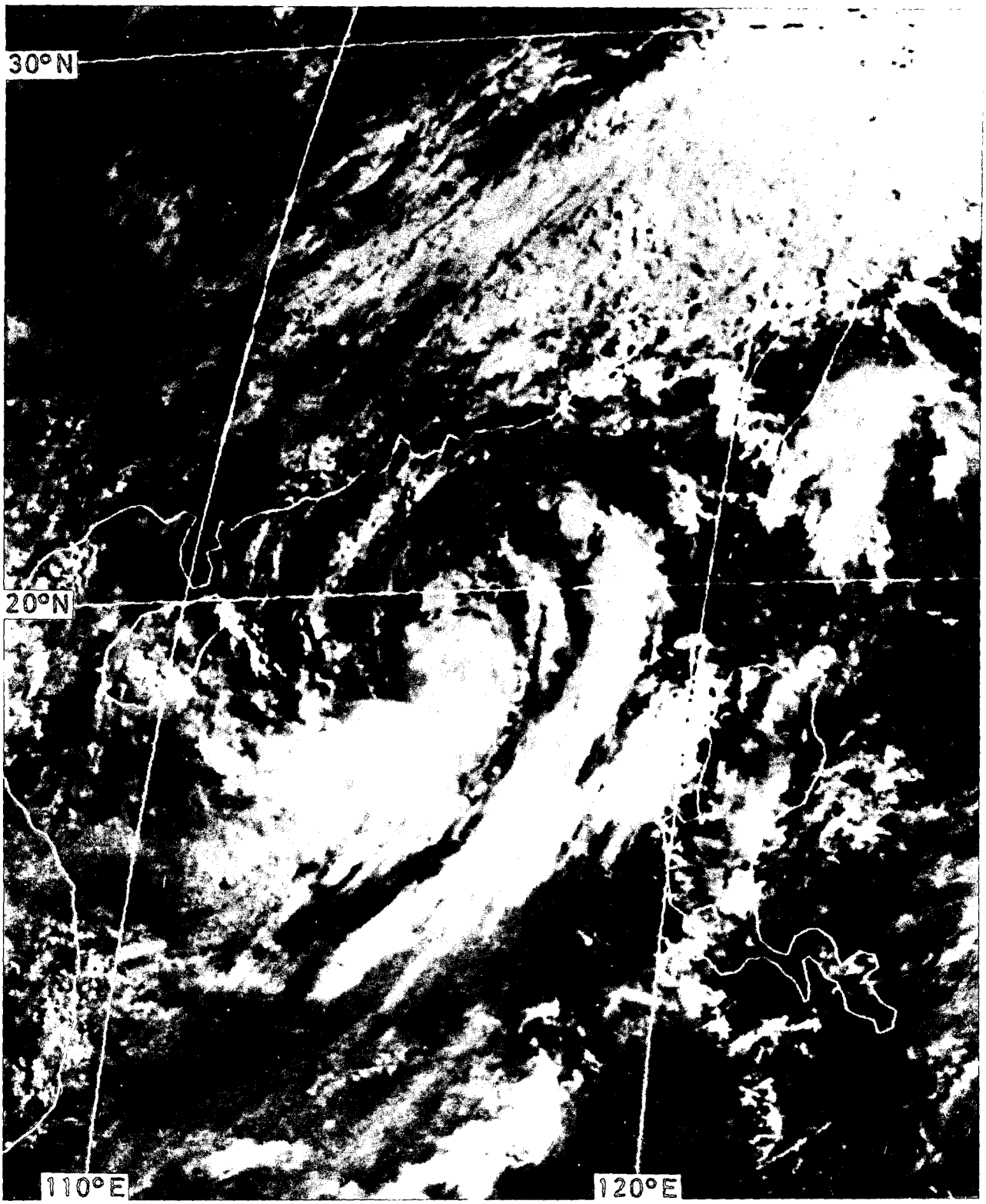

Figure 4. GMS-1 visible picture of Severe Tropical Storm Ike (8104) taken around 8.00 a.m. on 12 June 1981.

TYPHOON KELLY (8106)

28 June–5 July 1981

The track of this typhoon is shown in Figure 5

Kelly originated as a tropical depression about 280 nautical miles northwest of Yap Island on 28 June. It moved west-northwest at about 10 knots for two days but accelerated westwards at about 20 knots early on 30 June. Satellite pictures showed that the overcast area was about 150 nautical miles in diameter. Kelly intensified into a tropical storm in the evening of 30 June when it was about to cross the Philippines. Thunderstorms were widespread over the northern and central Philippines when Kelly was near the Catanduanes. Heavy rain caused severe flooding and landslips and about 200 Philippinos were killed, mostly residents near the Mayon volcano. Kelly entered the South China Sea on 1 July, moving westwards at about 10 knots. Spiral cloud bands developed on 2 July but were mostly confined to the south and the east quadrants.

Kelly intensified into a severe tropical storm and it turned to move north-northwest at 13 knots in the evening. At midnight on 2 July, a reconnaissance aircraft reported a minimum sea-level pressure of 975 millibars near the centre of the storm. Kelly attained typhoon intensity shortly afterwards and an 'eye' appeared on satellite pictures. In Hong Kong, the Stand By Signal, No. 1, was hoisted at 4.00 a.m. on 3 July when Kelly was centred about 370 nautical miles south of Hong Kong. Kelly altered its course again around 7.00 a.m. and moved west-northwest. At 11.00 a.m. on 3 July, the typhoon passed the Xisha Qundao between Xisha Dao and Sanhu Dao. Sustained winds of 76 knots with gusts reaching 80 knots and a minimum sea-level pressure of 970.8 millibars were recorded at Xisha Dao. Thunderstorms were also reported there soon after Kelly's passage. In Hong Kong, the Strong Wind Signal, No. 3, was hoisted at 11.45 a.m. on 3 July as winds strengthened. The typhoon reached its maximum intensity in the afternoon (Figure 6) and the maximum surface winds and minimum sea-level pressure near the centre,were estimated to be about 80 knots and 950 millibars respectively.

Kelly crossed the southwest coast of Hainan Dao early on 4 July and all signals were lowered in Hong Kong at 6.10 a.m. Kelly landed on the Vietnam coast about 10 nautical miles south of Hanoi on 5 July and degenerated into an area of low pressure near Vientiane in the evening. Kelly was closest to Hong Kong around 10.00 a.m. on 3 July when it was about 330 nautical miles to the south-southwest. The minimum sea-level pressure at the Royal Observatory was 1 006.6 millibars recorded around 5.00 p.m.

Winds in Hong Kong were moderate east-southeasterly on 2 July. They became fresh gusty early on 3 July and were strong at times during the day. Winds decreased in strength on 4 July but remained fresh offshore. 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*	
Hong Kong Airport (SE)	E	24	E	46
Hong Kong Airport (NW)	ESE	18	ESE	40
Waglan Island	ESE	23	ESE	35
Tate's Cairn	SE	25	SE	54
Cheung Chau	ESE	25	ESE	39
King's Park	E	20	E	39
Star Ferry	ESE	22	ESE	36
Green Island	E	20	E	30
Tsim Bei Tsui	SE	21	SE	33
Tai O	ESE	23	ESE	46
Castle Peak	SE	8	SE	25
Chek Lap Kok	E	26	E	42
Lei Yue Mun	E	25	E	53
Yau Yat Chuen	E	17	E	38
Kowloon Tsai Hill	E	22	E	40

Apart from some morning showers, the weather was fine, sunny and hot on 2 July. Some thunderstorms occurred around 5.00 a.m. on 3 July. Showers continued until early afternoon but it became fine afterwards. The daily amounts of rainfall recorded were as follows:

	Royal Observatory	*Cheung Chau*	*Tate's Cairn*
3 July	10.2 mm	8.9 mm	16.5 mm
4 July	4.3 mm	Trace	7.6 mm
Total:	14.5 mm	8.9 mm	24.1 mm

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	2.6	3 July	8.45 a.m.	0.5	3 July	1.30 p.m.
Tai Po Kau	2.6	3 July	8.00 a.m.	0.7	4 July	3.00 p.m.
Chi Ma Wan (Lantau Island)	2.8	4 July	9.15 a.m.	0.8	3 July	6.00 a.m.

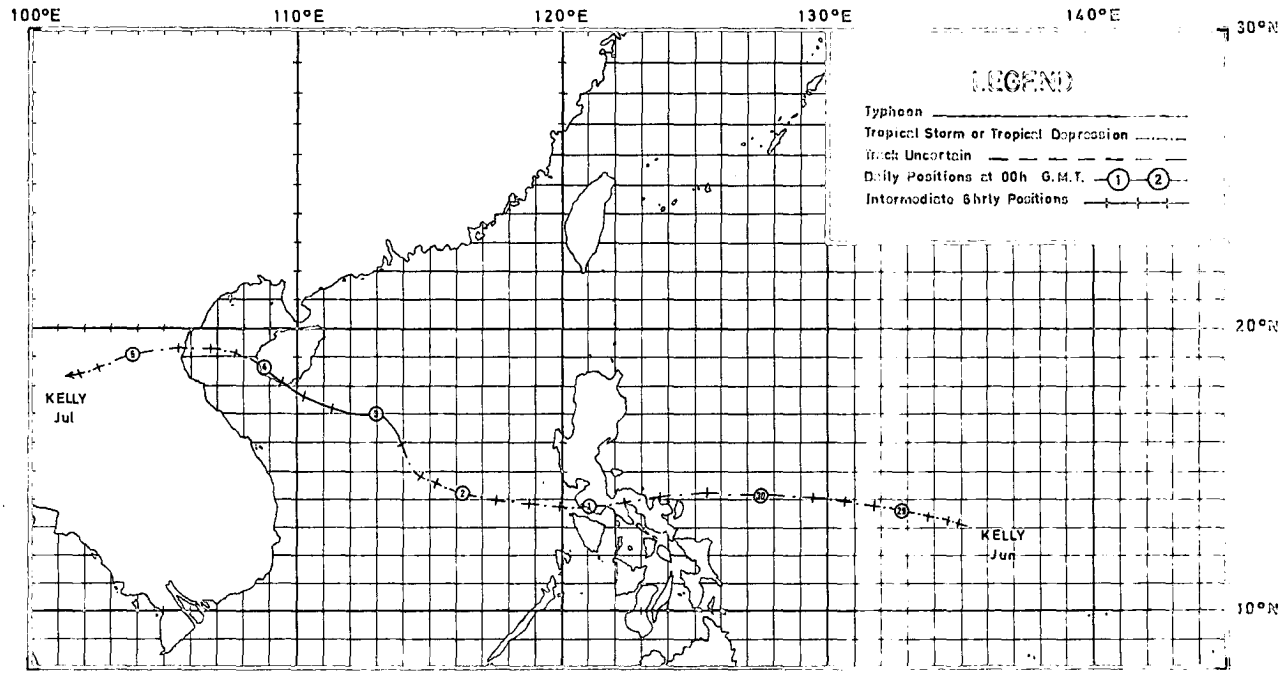

Figure 5. Track of Typhoon Kelly (8106): 28 June–5 July 1981.

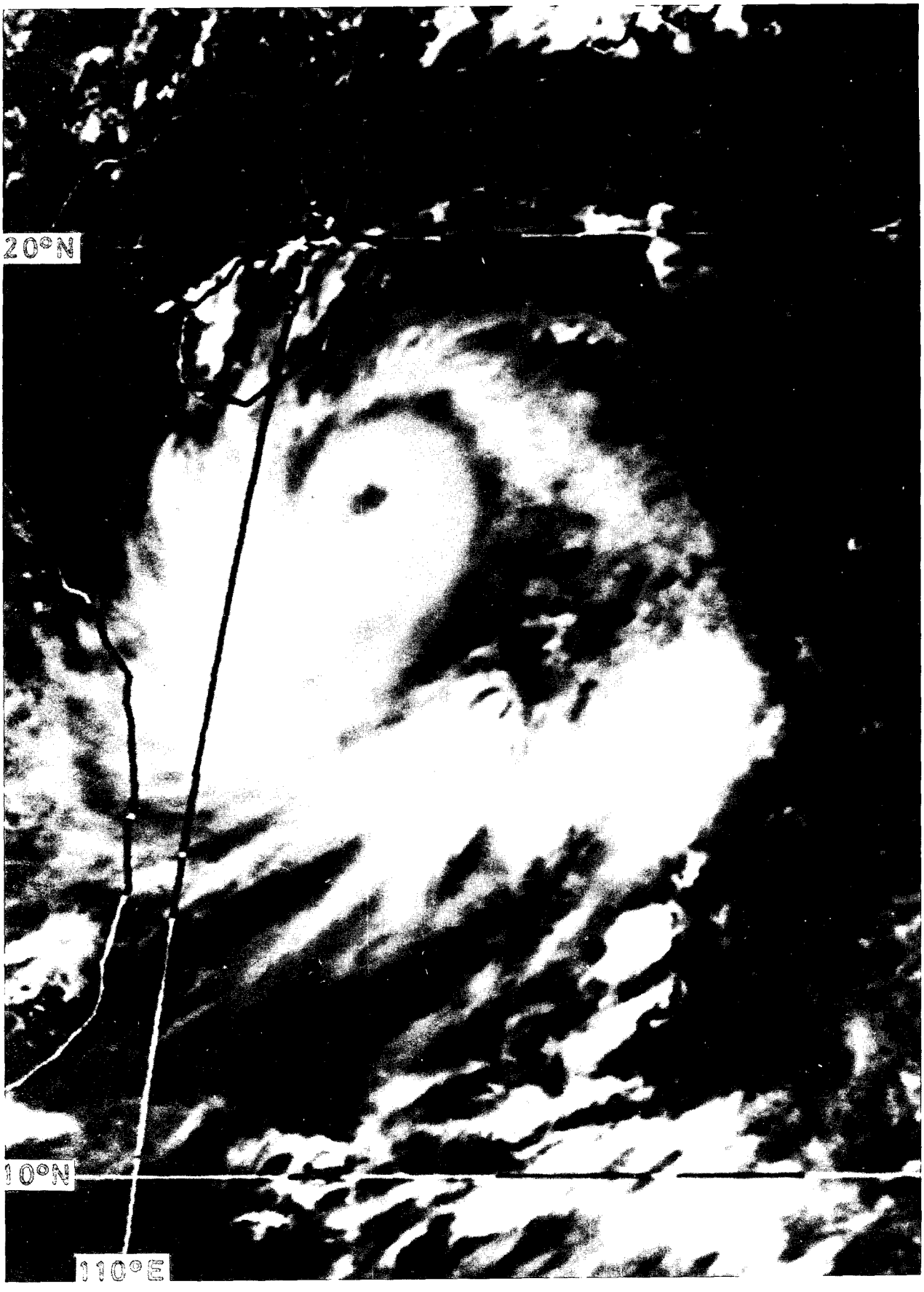

Figure 6. GMS-1 visible picture of Typhoon Kelly (8106) taken around 2.00 p.m. on 3 July 1981.

SEVERE TROPICAL STORM LYNN (8107)

3–7 July 1981

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

Lynn developed as a tropical depression about 440 nautical miles east-southeast of Manila early on 3 July. It became a tropical storm that afternoon and moved northwest at about 15 knots towards Luzon. On 4 July it slowed down about 90 nautical miles east of Manila. Satellite pictures showed that the main cloud mass was about 120 nautical miles in diameter with a well-defined 'eye'. There were cloud bands on the periphery of the circulation extending over the Bashi Channel. Lynn crossed Luzon in the evening of 4 July, killing 17 people and leaving more than 65 000 homeless. Radar reports from the Philippines suggested that the 'eye' turned northwards over Luzon but failed to cross the Cordillera Central. Lynn formed a new centre off the west coast of Luzon with maximum winds of about 40 knots.

Lynn continued moving northwestwards at about 15 knots over the South China Sea. Although satellite pictures on 5 July showed that the main cloud mass was quite diffuse, ships' reports indicated that Lynn had intensified into a severe tropical storm. At 8.00 p.m. on 5 July, the ship M.V. 'Ganbara' reported sustained winds of 55 knots about 85 nautical miles northeast of the centre. At 2.00 a.m. on 6 July, Lynn passed about 70 nautical miles southwest of Dongsha Dao, where winds of 30 knots and sea-level pressure of 998.9 millibars were recorded. At 8.00 a.m. on 6 July, winds of 37 knots were reported by two ships 180 and 290 nautical miles from the centre. The movement of Lynn showed remarkable constancy in direction contrasting with large variations in speed.

Early on 6 July the severe tropical storm slowed down abruptly when centred about 140 nautical miles south-southeast of Hong Kong (Figure 8). However, Lynn resumed its northwesterly course later that afternoon. Thunderstorms associated with the spiral bands (Figure 9) occurred at a number of stations over south China. At 6.00 a.m. on 7 July, Lynn passed over Shangchuan Dao, where maximum winds of 40 knots with gusts of 64 knots and a minimum sea-level pressure of 986.7 millibars were recorded. Lynn crossed the China coast about 2 hours later and dissipated near Nanning in the evening. Lynn caused considerable damage and killed 5 people in western Guangdong province.

In Hong Kong, the Stand By Signal, No. 1, was hoisted at 10.45 a.m. on 5 July when Lynn was about 390 nautical miles away to the southeast. Winds were moderate easterly. As Lynn intensified and moved closer, the Strong Wind Signal, No. 3, was hoisted at 7.45 p.m. Winds turned northeasterly and strengthened overnight. The No. 8NE Gale or Storm Signal was hoisted at 5.30 a.m. on 6 July. Winds of 36 knots with gusts of 50 knots were recorded at Green island that morning. There were east-northeasterly gales offshore, but the harbour was relatively sheltered. However, gusts reached 70 knots at Stanley in the afternoon. Winds gradually turned easterly and the No. 8SE Gale or Storm Signal was hoisted at 10.00 p.m. on 6 July. As Lynn passed to the southwest of Hong Kong during the night, winds turned southeasterly and gales became more general. Gusts reached 78 knots at Tai O and 54 knots at the Airport early on 7 July. The lowest sea-level pressure at the Royal Observatory was 999.6 millibars at 2.00 a.m. when Lynn was about 80 nautical miles away. Gales lasted for more than 10 hours at Cheung Chau and Chek Lap Kok which were nearer to the storm centre. Soon after Lynn crossed the coast (Figure 10), the No. 8SE Gale or Storm Signal was replaced by the Strong Wind Signal, No. 3, at 10.15 a.m. on 7 July. Winds gradually abated and all signals were lowered at 2.10 p.m. when Lynn was about 140 nautical miles to the west. The maximum mean hourly winds and gust peak speeds recorded 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*	
Hong Kong Airport (SE)	E	32	E	54
Hong Kong Airport (NW)	SE	30	E	49
Waglan Island	E	40	ESE	56
Tate's Cairn	E	35	E	66
Cheung Chau	SE	45	SE	65
King's Park	ESE	29	ESE	55
Star Ferry	SE	34	SE	51
Green Island	ENE	36	ESE	59
Tsim Bei Tsui	SE	35	SE	55
Tai O	ESE	38	ESE	78
Castle Peak	SE	16	SE	41
Chek Lap Kok	E	48	ESE	68
Lei Yue Mun	E	44	E	58
Yau Yat Chuen	ENE	24	ENE	52
Kowloon Tsai Hill	ENE	28	ENE	59
Stanley	E	44	ENE	70

Apart from a few isolated morning showers, the weather was fine and sunny on 5 July. A spiral rain band brought squally showers on 6 July and they became frequent during the day. Showers gradually died out on 8 July. The daily amounts of rainfall recorded were as follows:

	Royal Observatory	*Cheung Chau*	*Tate's Cairn*
5 July	0.5 mm	0.4 mm	1.0 mm
6 July	68.0 mm	38.0 mm	46.7 mm
7 July	14.9 mm	79.6 mm	41.8 mm
8 July	0.3 mm	Nil	3.5 mm
Total:	83.7 mm	118.0 mm	93.0 mm

Rain was heaviest in the northwestern parts of the New Territories (Figure 11).

Landslips occurred at Diamond Hill, Yau Tong, Kwun Tong and Shau Kei Wan. Tides were about 1 metre about the normal astronomical levels. Waves were 2–3 metres high at Big Wave Bay. There were minor floods in the Tuen Mun area. Minor losses were experienced by fish farms in the New Territories. Fallen trees, scaffoldings, sign-boards and rubble blocked several roads. 32 people were injured mostly by falling objects. Public transport came virtually to a standstill. At the airport, 25 flights were cancelled and 2 aircraft were diverted. However, there were no incidents at sea. Lynn brought 6 million cubic metres of water to the reservoirs but not sufficient to alleviate the water shortage.

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	2.6	6 July	12.30 p.m.	0.8	6 July	4.30 p.m.
Tai Po Kau	2.6	6 July	11.00 a.m.	1.2	6 July	3.30 p.m.
Chi Ma Wan (Lantau Island)	2.8	6 July	12.30 p.m.	0.9	7 July	2.30 a.m.

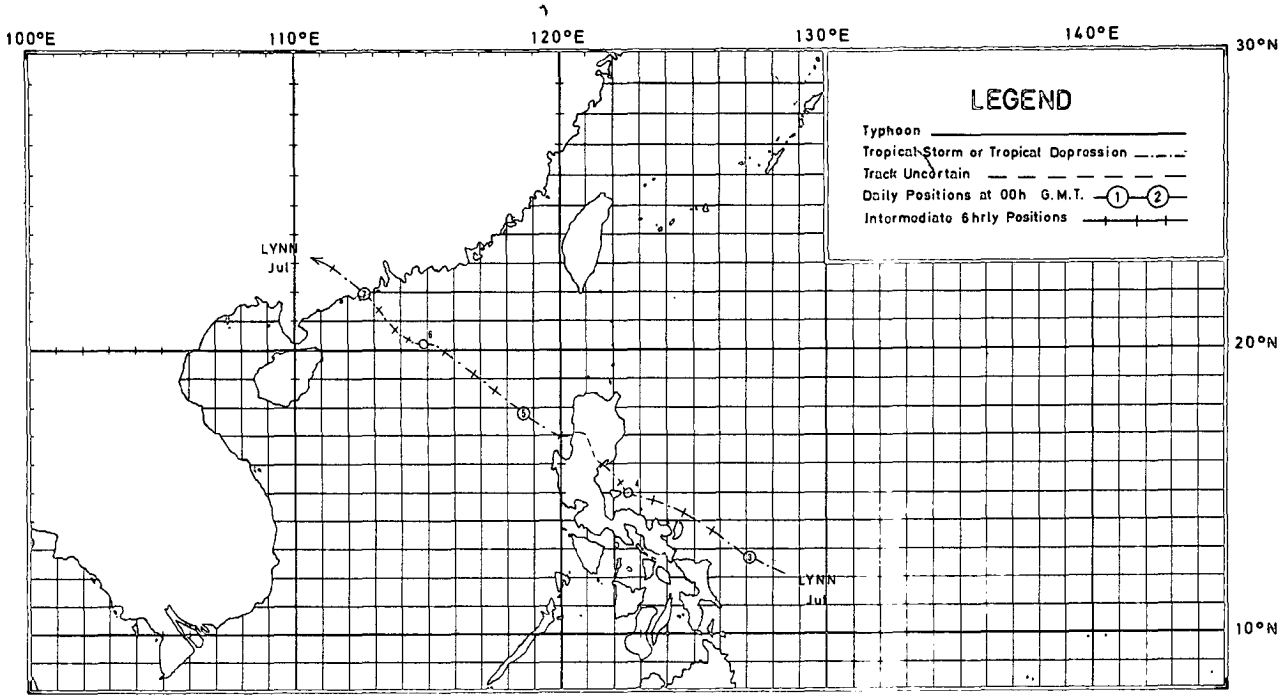

Figure 7. Track of Severe Tropical Storm Lynn (8107): 3–7 July 1981.

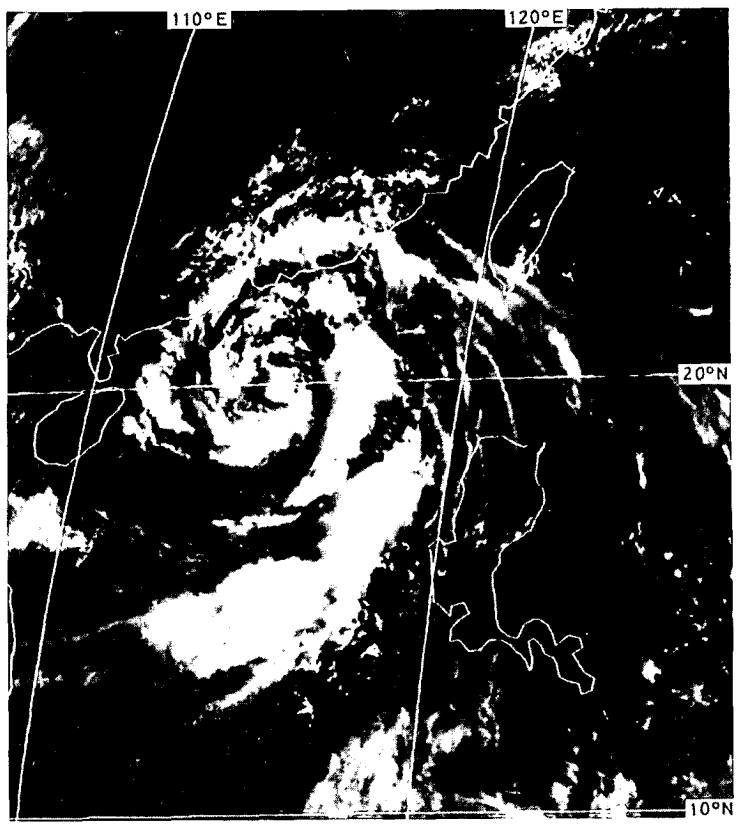

Figure 8. GMS-1 visible picture of Severe Tropical Storm Lynn (8107) taken around 8.00 a.m. on 6 July 1981.

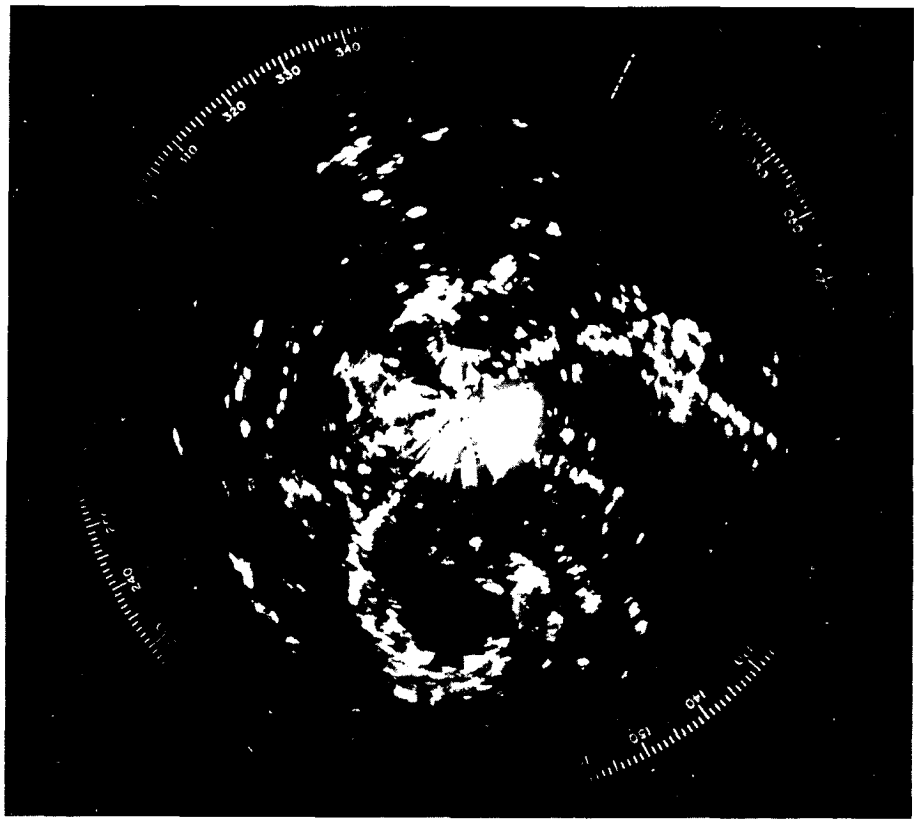

Figure 9. Radar picture of Severe Tropical Storm Lynn (8107) taken at 3.00 p.m. on 6 July 1981. (Range markers at 40-nautical mile intervals)

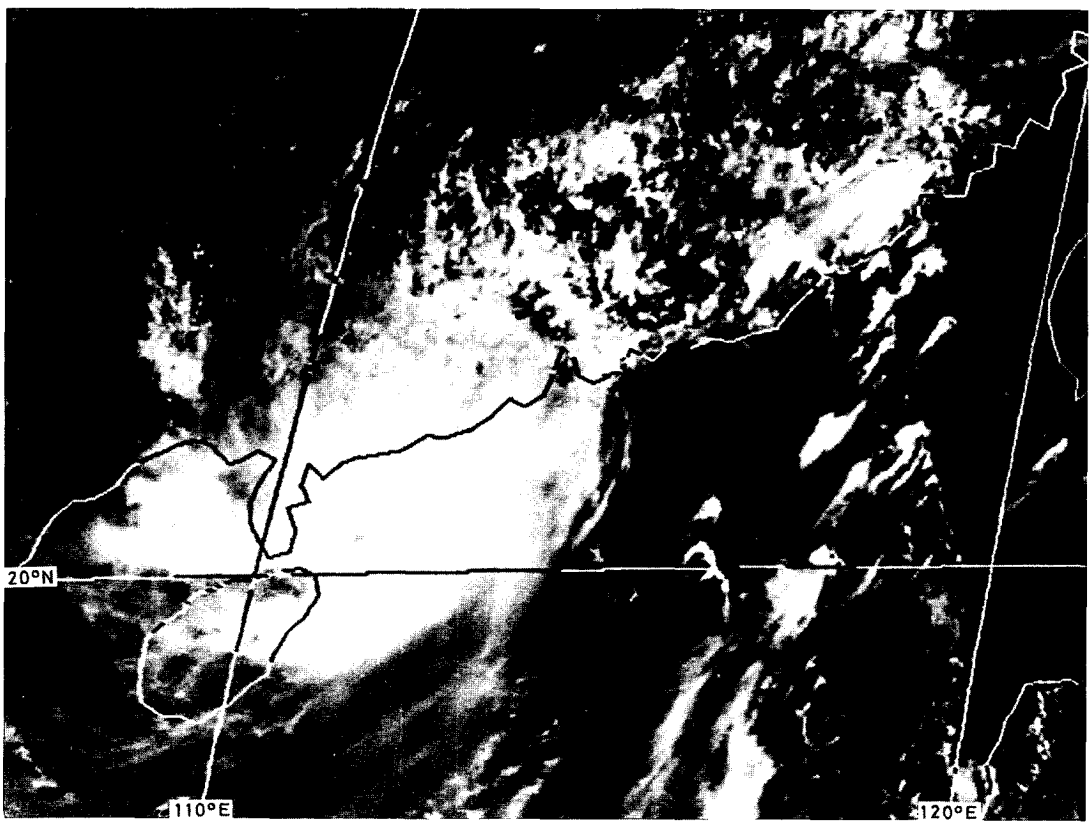

Figure 10. GMS-1 visible picture of Severe Tropical Storm Lynn (8107) taken around 11.00 a.m. on 7 July 1981.

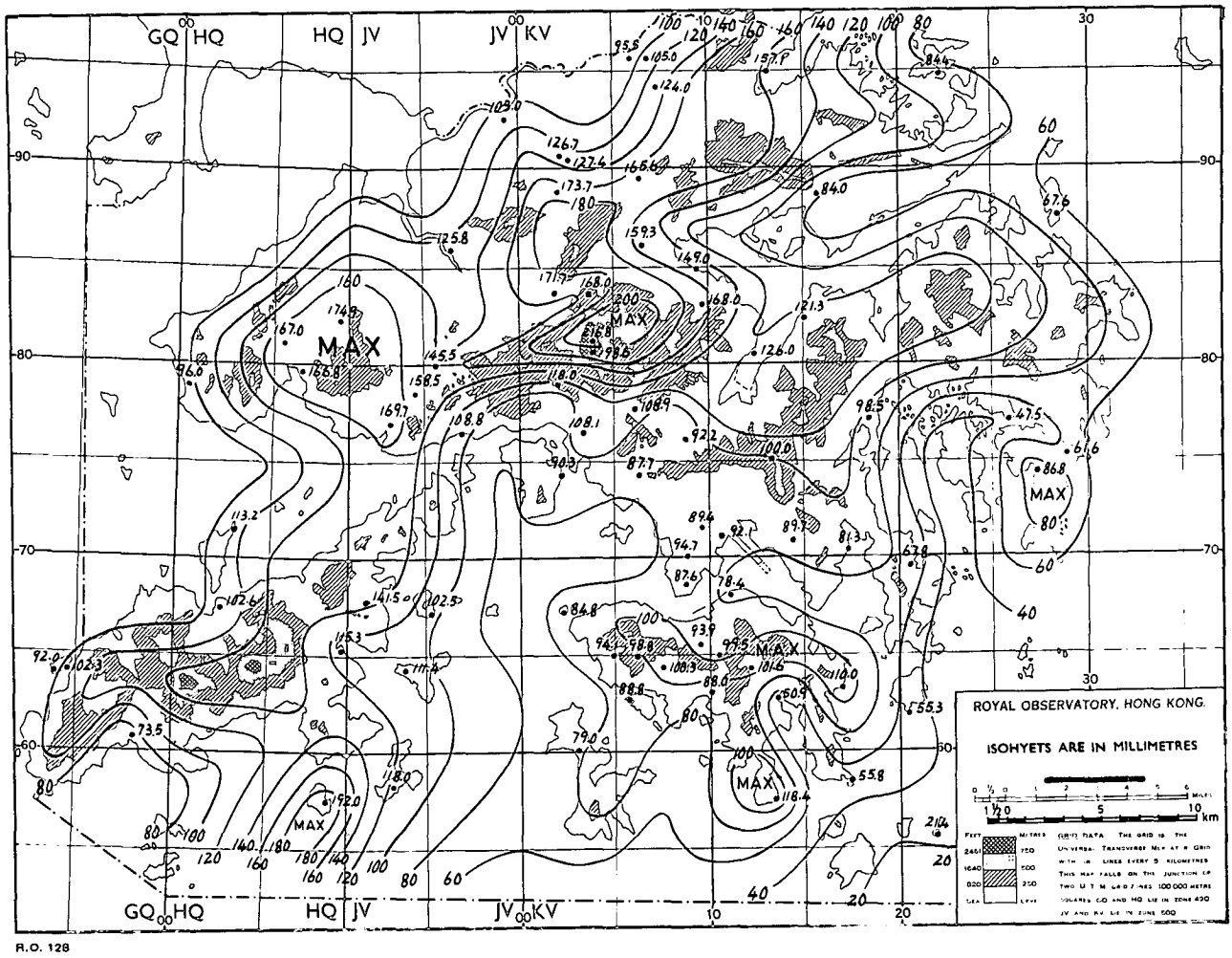

Figure 11. **Rainfall recorded during the passage of Severe Tropical Storm Lynn (8107)—4-day total ending at 3.00 p.m. on 8 July 1981.**

TROPICAL STORM ROY (8113)

4–7 August 1981

The track of this tropical storm is shown in Figure 12

A tropical depression formed over the South China Sea about 420 nautical miles south of Hong Kong on 4 August. It intensified into a tropical storm named Roy the same evening and moved northeastwards at about 4 knots. Satellite pictures showed that the main cloud mass was about 150 nautical miles in diameter. Early on 5 August, the cloud mass was displaced to the southwest of the surface centre. At 8.00 a.m. the M.V. 'Ohrmazd' reported sustained winds of 41 knots about 90 nautical miles southwest of the centre. Roy continued moving northeastwards and accelerated to about 10 knots on 6 August. The main cloud mass remained displaced and there were only weak cloud bands around the centre. In Hong Kong, the Stand By Signal, No. 1, was hoisted at 8.30 a.m. on 6 August when the tropical storm was about 340 nautical miles to the south-southeast. Roy slowed down to 6 knots and turned to move northwest in the evening. The minimum sea-level pressure at the Royal Observatory was 1 001.0 millibars recorded at 5.00 p.m. on 6 August.

On 7 August, Roy turned westwards and moved towards Dongsha Dao (Figure 13). At 5.00 p.m. the mean sea-level pressure at Dongsha Dao dropped to a minimum of 996.2 millibars when Roy was about 40 nautical miles to the east. Pressure began rising there afterwards although Roy continued to move closer. The maximum sustained winds reported were only 28 knots. This indicated that Roy had weakened into a tropical depression. In Hong Kong, the Stand By Signal, No. 1, was lowered at 11.15 p.m. on 7 August when the tropical depression was about 180 nautical miles to the southeast. It weakened further into an area of low pressure and continued to move west-southwestwards towards the southern tip of Hainan Dao. It finally dissipated over northern Vietnam on 11 August.

In Hong Kong, winds were light to moderate on 6 and 7 August but winds freshened from the east-southeast on 8 August. They gradually moderated on 9 August. 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*	
Hong Kong Airport (SE)	E	17	E	28
Hong Kong Airport (NW)	SE	13	ESE	41
Waglan Island	ESE	22	ESE	29
Tate's Cairn	E	19	E	36
Cheung Chau	SE	20	SE	27
King's Park	ESE	14	ESE	26
Star Ferry	SE	16	E	21
Green Island	E	19	E	28
Tsim Bei Tsui	E	16	E	24
Tai O	ESE	20	ESE	30
Castle Peak	E	10	ESE	25
Chek Lap Kok	E	23	E	31
Lei Yue Mun	ESE	17	ESE	25
Yau Yat Chuen	E	12	E	25
Kowloon Tsai Hill	E	14	E	27

The weather was sunny and hot on 6–8 August and there were some showers on the following few days. The daily amounts of rainfall recorded during the period 6–12 August were as follows:

	Royal Observatory	*Cheung Chau*	*Tate's Cairn*
6 August	Nil	Nil	Nil
7 August	Nil	Nil	Nil
8 August	Nil	Nil	Nil
9 August	5.3 mm	1.4 mm	6.8 mm
10 August	3.1 mm	3.7 mm	2.7 mm
11 August	11.2 mm	Trace	20.5 mm
12 August	1.5 mm	Nil	0.4 mm
Total:	21.1 mm	5.1 mm	30.4 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	1.7	6 Aug.	12.45 p.m.	0.2	7 Aug.	11.00 p.m.
Tai Po Kau	1.7	7 Aug.	0.30 a.m.	0.3	7 Aug.	6.15 a.m.
Chi Ma Wan (Lantau Island)	1.9	6 Aug.	12.15 p.m.	0.3	7 Aug.	4.00 p.m.

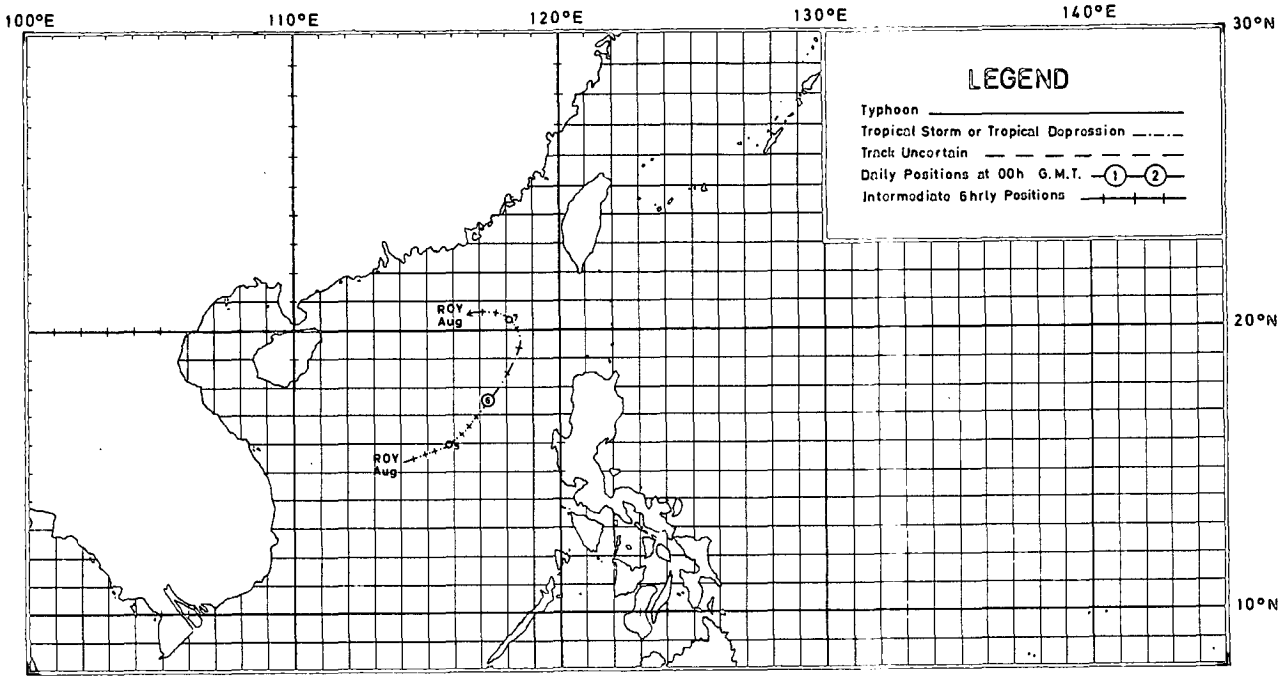

Figure 12. Track of Tropical Storm Roy (8113): 4–7 August 1981.

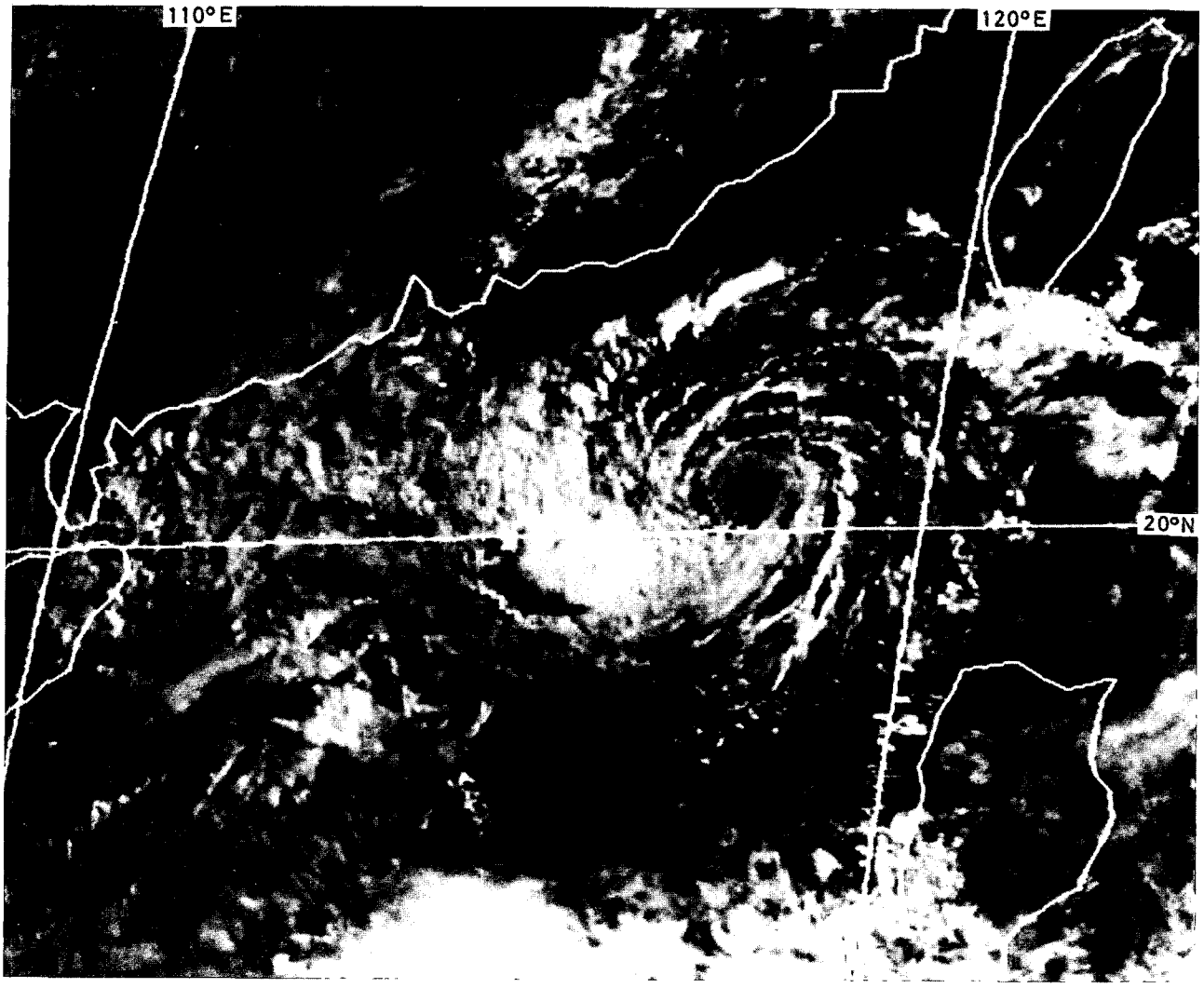

Figure 13. GMS-1 visible picture of Tropical Storm Roy (8113) taken around 8.00 a.m. on 7 August 1981.

TYPHOON CLARA (8120)

15–22 September 1981

The track of this typhoon is shown in Figure 14

Typhoon Clara originated as a tropical depression about 280 nautical miles west-southwest of Guam on 15 September. It became a tropical storm two days later and developed into a severe tropical storm early on 18 September. Clara further intensified to a typhoon about 420 nautical miles east of Manila during the afternoon and moved northwestward at about 11 knots. The 'eye' of the typhoon first appeared on satellite pictures taken at 5.00 a.m. on 19 September. The overcast area was about 150 nautical miles in diameter. At 5.44 p.m. a reconnaissance aircraft reported a minimum sea-level pressure of 924 millibars and maximum sustained winds of about 115 knots. At 8.00 p.m. satellite pictures showed a circular eye with diameter of about 30 nautical miles and there were active spiral cloud bands to the north. Clouds in Clara's circulation covered an area about 450 nautical miles in diameter.

Around noon on 20 September, Clara passed about 20 nautical miles southwest of Calayan, just north of Luzon (Figure 15), where sustained winds of 52 knots and a sea-level pressure of 977.1 millibars were recorded. A Philippine Navy destroyer ran aground off Calayan (Figure 16) and there were only 18 survivors from a crew of 97. There was severe flooding in the Philippines and thousands were made homeless in northern Luzon.

In Hong Kong, the Stand By Signal, No. 1, was hoisted at 9.00 p.m. on 20 September when Clara was about 380 nautical miles east-southeast of Hong Kong. Clara continued moving west-northwestward at about 10 knots and entered the South China Sea. At 2.00 a.m. on 21 September, the M.V. 'Martha Bakke' reported sustained winds of 50 knots about 70 nautical miles east of the centre. Clara brought heavy rain to northeastern and eastern parts of Taiwan and according to press reports, about 560 mm of rainfall were recorded in some places. However, there were no casualties or serious damage. Spiral rain bands began to appear on the Royal Observatory's radar in the morning of 21 September. Satellite pictures showed that the main cloud mass had diminished to about half its original size and the 'eye' had become smaller with a diameter of about 10 nautical miles (Figure 17). Maximum sustained winds were estimated at 90 knots near the centre. At 1.00 p.m. on 21 September, the Strong Wind Signal, No. 3, was hoisted in Hong Kong when Clara was about 210 nautical miles to the east-southeast and moving towards the south China coast.

At 5.00 p.m. Clara passed about 50 nautical miles northeast of Dongsha Dao where a sea-level pressure of 984.7 millibars and sustained winds of 45 knots were recorded. During the afternoon, Clara altered course and moved northwestward at about 10 knots. At 2.00 a.m. on 22 September, northerly winds of 30 knots and gusts of 62 knots were reported at Shanwei about 50 nautical miles northwest of the centre. Gusts also reached 60 knots at Shantou. Around 4.00 a.m. Clara crossed the coast near Shanwei about 100 nautical miles east-northeast of Hong Kong. According to press reports, the power supplies and telecommunications were disrupted in districts around Shantou where 21 000 hectares of farmland were flooded. It was reported that Clara caused the death of 62 people and made several thousand homeless in south China.

Clara was closest to Hong Kong around 6.00 a.m. on 22 September when centred about 90 nautical miles to the northeast (Figure 18), but the minimum sea-level pressure of 996.8 millibars at the Royal Observatory was recorded earlier at 4.00 a.m. when Clara crossed the coast. During the morning, the Observatory's radar revealed that the rain area diminished considerably and as Clara continued to weaken and moved away, all signals were lowered at 11.30 a.m. Clara finally dissipated about 150 nautical miles north of Hong Kong.

In Hong Kong, northerly winds freshened in the afternoon of 21 September. Winds became generally strong as they turned northwesterly around midnight. Maximum gusts of 47 knots and 51 knots were reported at the Airport and at Cheung Chau respectively early on 22 September. Winds turned westerly later in the morning and moderated rapidly. 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*	
Hong Kong Airport (SE)	W	26	NW	47
Hong Kong Airport(NW)	NNW	20	NW	44
Waglan Island	W	28	W	46
Tate's Cairn	NNW	30	NW	43
Cheung Chau	WNW	31	WNW	51
King's Park	W	26	W	30
Star Ferry	NW	25	WNW	41
Green Island	NW	26	NNW	41
Tsim Bei Tsui	WNW	26	WNW	38

Location	*Maximum mean hourly wind speed in knots with direction in points*		*Maximum gust peak speed in knots with direction in points*	
Tai O	NNW	22	NW	37
Castle Peak	NW	20	NW	39
Chek Lap Kok	NW	33	WNW	46
Lei Yue Mun	WNW	29	WNW	47
Yau Yat Chuen	W	16	WNW	39
Kowloon Tsai Hill	W	19	W	41

The weather was fine and dry on 20 September. It became cloudy on 21 September and some slight showers occurred in the evening. There were heavier showers the following morning and more showers during the day. The weather improved on 23 September. The daily amounts of rainfall recorded were as follows:

	Royal Observatory	*Cheung Chau*	*Tate's Cairn*
20 September	Nil	Nil	Nil
21 September	Trace	Trace	Nil
22 September	18.6 mm	19.7 mm	23.2 mm
Total:	18.6 mm	19.7 mm	23.2 mm

During the passage of Typhoon Clara, ferry services and air traffic were slightly affected. A double-decker bus overturned in gusty winds on Nam Fung Road on southern Hong Kong Island shortly after 6.30 a.m. on 22 September. A scaffolding was also blown down in Kowloon City. There were no other reports of serious damage.

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	2.7	22 Sep.	3.15 a.m.	0.6	22 Sep.	3.30 p.m.
Tai Po Kau	2.7	22 Sep.	4.00 a.m.	0.7	22 Sep.	4.30 a.m.
Chi Ma Wan (Lantau Island)	2.7	22 Sep.	3.15 a.m.	0.6	21 Sep.	3.30 p.m.

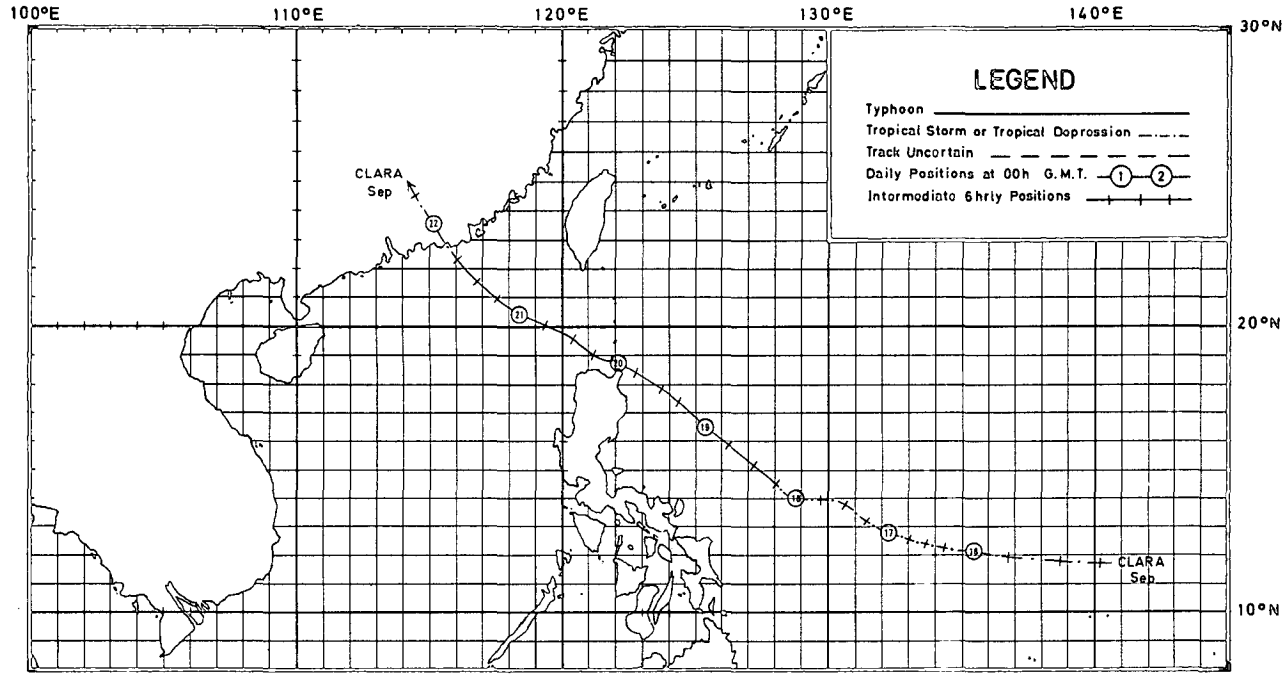

Figure 14. Track of Typhoon Clara (8120): 15–22 September 1981.

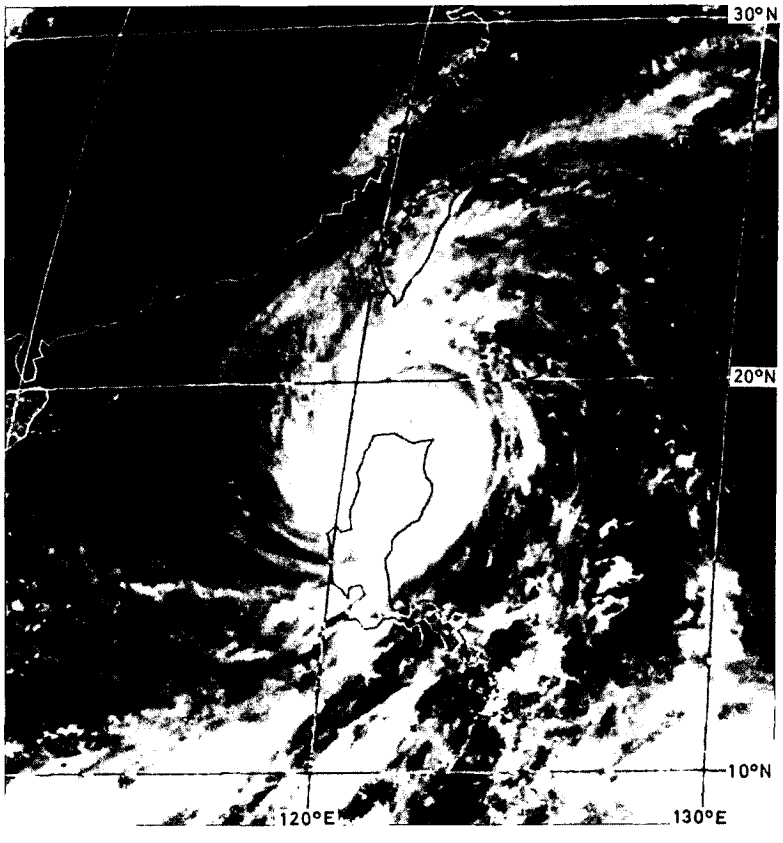

Figure 15. GMS-1 visible picture of Typhoon Clara (8120) taken around 11.00 a.m. on 20 September 1981.

Figure 16. **A Philippine Navy destroyer aground off Calayan during Typhoon Clara (8120). (By courtesy of South China Morning Post)**

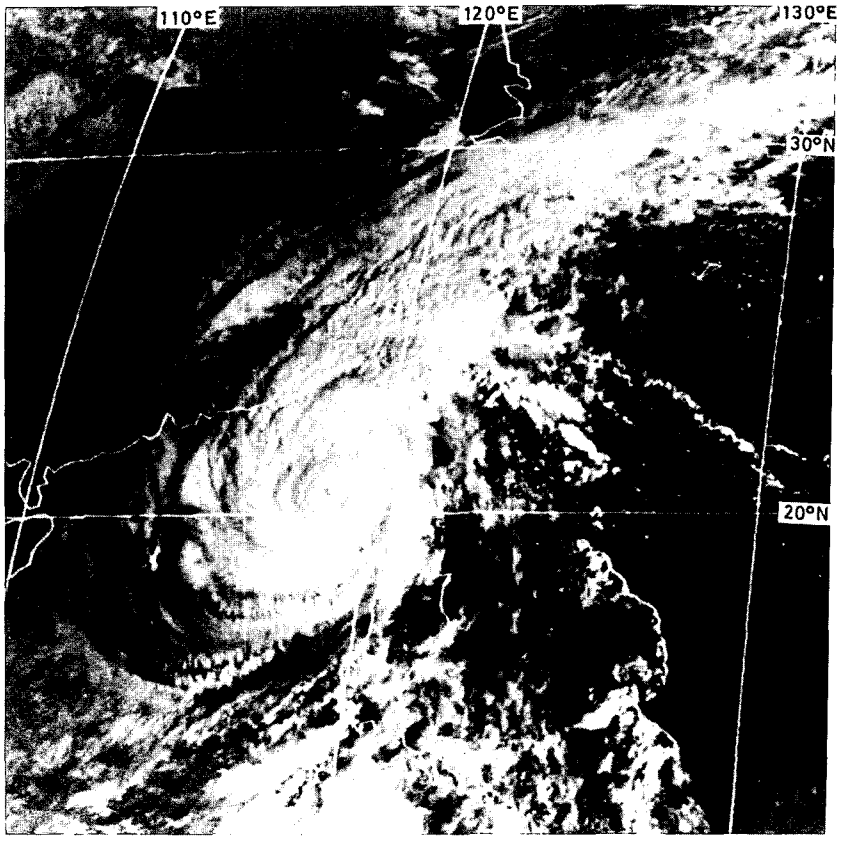

Figure 17. **GMS-1 visible picture of Typhoon Clara (8120) taken around 8.00 a.m. on 21 September 1981.**

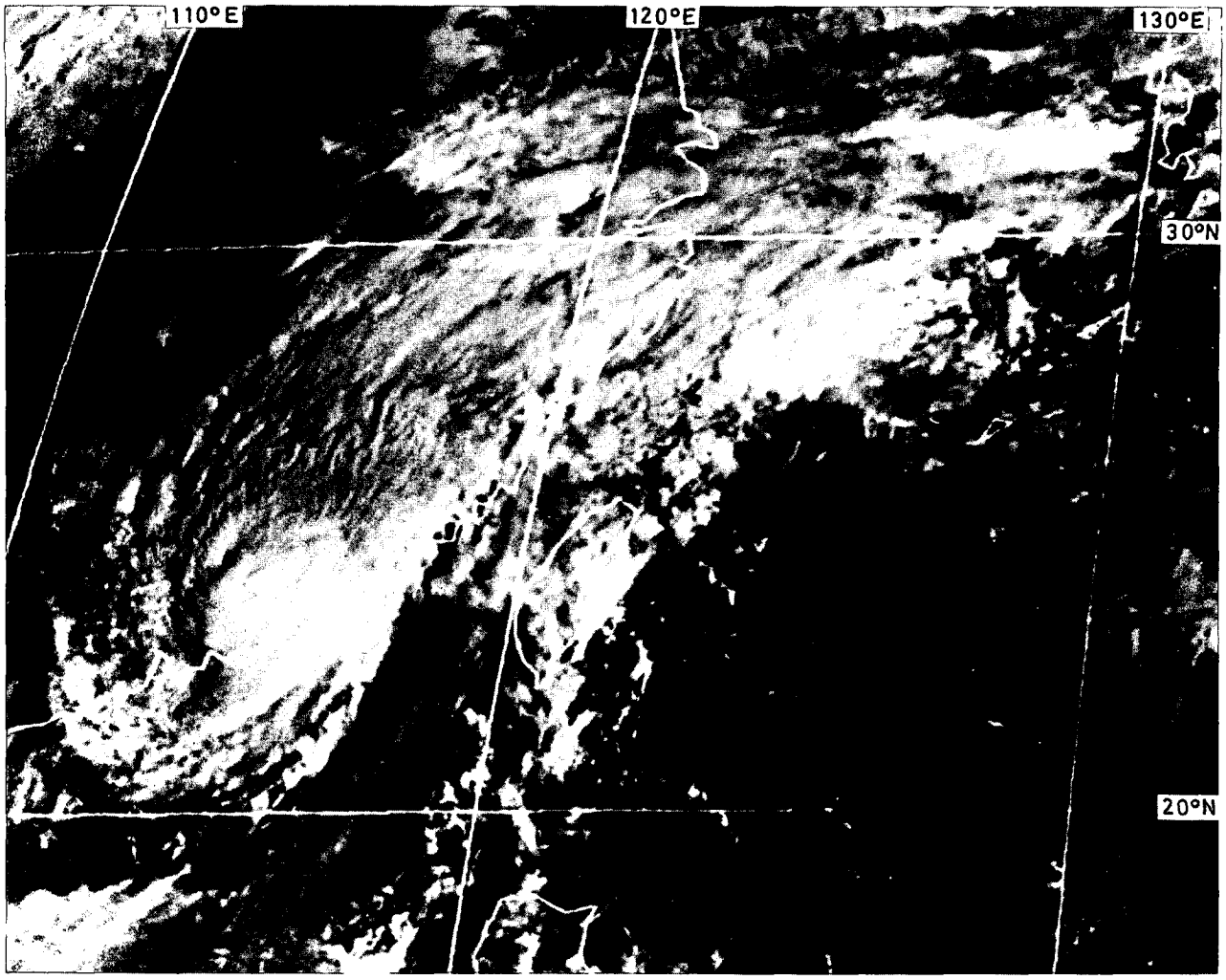

Figure 18. GMS-1 visible picture of Typhoon Clara (8120) taken around 8.00 a.m. on 22 September 1981.

TABLE 1. LIST OF TROPICAL CYCLONES IN THE WESTERN NORTH PACIFIC AND THE SOUTH CHINA SEA IN 1981

Name of tropical cyclone	Beginning of track				First day circle	Last day circle	End of track			
	Date	Time G.M.T.	Position °N	Position °E	Date	Date	Date	Time G.M.T.	Position °N	Position °E
Severe Tropical Storm Gerald (8102)	15 Apr	0600	5.4	153.5	16	20	20 Apr	0000	17.6	150.3
Tropical Storm Holly (8103)	30 Apr	1200	8.2	159.6	1	7	7 May	0600	12.0	145.5
Severe Tropical Storm Ike (8104)	9 Jun	0000	17.7	112.0	9	14	14 Jun	1800	28.9	125.0
Typhoon June (8105)	16 Jun	0600	13.2	132.0	17	23	23 Jun	0000	36.6	138.5
Typhoon Kelly (8106)	28 Jun	0600	12.9	134.7	29	5	5 Jul	1200	18.3	102.0
Severe Tropical Storm Lynn (8107)	3 Jul	0000	12.4	127.0	3	7	7 Jul	0600	22.8	111.5
Severe Tropical Storm Maury (8108)	17 Jul	1800	19.0	130.9	18	20	20 Jul	0600	25.6	117.8
Tropical Depression (8109)	21 Jul	1200	23.0	123.3	22	23	23 Jul	1800	30.5	118.4
Severe Tropical Storm Ogden (8110)	26 Jul	0000	21.0	149.3	26	1	1 Aug	1200	38.6	124.6
Tropical Depression (8111)	31 Jul	0600	16.9	141.8	1	2	2 Aug	1800	21.0	144.0
Severe Tropical Storm Phyllis (8112)	2 Aug	0600	23.0	146.7	3	5	5 Aug	1200	40.6	145.5
Tropical Storm Roy (8113)	4 Aug	0600	15.4	114.5	5	7	7 Aug	1200	20.6	117.1
Severe Tropical Storm Susan (8114)	11 Aug	0000	32.5	160.0	11	14	14 Aug	0000	40.9	153.6
Typhoon Thad (8115)	16 Aug	0000	18.6	131.1	16	23	23 Aug	0600	42.2	140.9
Tropical Storm Vanessa (8116)	15 Aug	1800	19.0	147.0	16	17	17 Aug	0600	28.7	159.5
Tropical Storm Warren (8117)	17 Aug	0000	17.6	113.1	17	20	20 Aug	1200	22.0	105.7
Typhoon Agnes (8118)	25 Aug	1200	16.3	147.0	26	3	3 Sep	1200	34.6	128.9
Typhoon Bill (8119)	2 Sep	1200	22.7	156.4	3	7	7 Sep	0600	40.2	157.5
Typhoon Clara (8120)	15 Sep	0600	11.7	140.2	16	22	22 Sep	0600	24.6	114.6
Typhoon Elsie (8122)	24 Sep	0600	10.5	146.2	25	2	2 Oct	1800	43.0	156.0
Tropical Storm Fabian (8123)	11 Oct	1800	10.2	126.2	12	14	14 Oct	1200	11.6	108.5
Typhoon Gay (8124)	14 Oct	0600	9.5	148.8	15	23	23 Oct	0000	39.6	147.5
Tropical Depression	10 Nov	0000	9.8	110.2	10	11	11 Nov	0000	10.8	107.6
Typhoon Hazen (8125)	13 Nov	0000	15.2	152.0	13	23	23 Nov	0000	20.8	109.1
Typhoon Irma (8126)	19 Nov	0000	13.1	149.3	19	27	27 Nov	0000	24.0	126.2
Tropical Storm Jeff (8127)	20 Nov	0600	8.0	158.0	21	26	26 Nov	1200	25.1	130.5
Typhoon Kit (8128)	11 Dec	0000	9.7	147.7	11	21	21 Dec	1200	9.8	127.8
Typhoon Lee (8129)	23 Dec	0000	10.0	137.7	23	29	29 Dec	0600	20.3	114.7*

* Last revision date: 26 July 2016

TABLE 2. TROPICAL CYCLONE WARNINGS FOR SHIPPING ISSUED IN 1981

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)
Severe Tropical Storm Ike*	48	9 Jun 0000	14 Jun 2100	141
Typhoon June	25	18 Jun 2100	21 Jun 2100	72
Typhoon Kelly*	37	30 Jun 1200	5 Jul 0000	108
Severe Tropical Storm Lynn*	31	3 Jul 1200	7 Jul 0600	90
Severe Tropical Storm Maury	11	19 Jul 0000	20 Jul 0600	30
Tropical Depression	12	22 Jul 0600	23 Jul 1800	36
Tropical Storm Roy*	29	4 Aug 0300	7 Aug 1500	84
Tropical Storm Warren	27	17 Aug 0600	20 Aug 1200	78
Typhoon Agnes	8	30 Aug 2100	31 Aug 1800	21
Typhoon Clara*	24	19 Sep 0300	22 Sep 0000	69
Tropical Storm Fabian	12	13 Oct 0300	14 Oct 1200	33
Typhoon Hazen	32	19 Nov 0600	23 Nov 0300	93
Typhoon Irma	25	23 Nov 1800	26 Nov 1800	72
Typhoon Lee	32	25 Dec 1200	29 Dec 0900	93
Total	353			1020

* 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 1981

SUMMARY

Signal	No. of occasions	Total duration
1	5	120 h 00 min
3	4	54 35
8 NORTHWEST	-	- -
8 SOUTHWEST	-	- -
8 NORTHEAST	1	16 30
8 SOUTHEAST	1	12 15
9	-	- -
10	-	- -
Total	11	203 20

DETAILS

Tropical cyclone	No. of warning bulletins issued	Signal	Hoisted Date	Hoisted Time*	Lowered Date	Lowered Time*
Severe Tropical Storm Ike	25	1	11 Jun	0900	13 Jun	0830
Typhoon Kelly	13	1	3 Jul	0400	3 Jul	1145
		3	3 Jul	1145	4 Jul	0610
Severe Tropical Storm Lynn	43	1	5 Jul	1045	5 Jul	1945
		3	5 Jul	1945	6 Jul	0530
		8NE	6 Jul	0530	6 Jul	2200
		8SE	6 Jul	2200	7 Jul	1015
		3	7 Jul	1015	7 Jul	1410
Tropical Storm Roy	20	1	6 Aug	0830	7 Aug	2315
Typhoon Clara	22	1	20 Sep	2100	21 Sep	1300
		3	21 Sep	1300	22 Sep	1130

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

TABLE 4. FREQUENCY AND TOTAL DURATION OF DISPLAY OF TROPICAL CYCLONE WARNING SIGNALS : 1946–1981

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
1981	5	4	0	0	1	1	0	0	11	203
Total	212	165	14	18	51	37	19	11	527	8 786
Mean	5.9	6.3	0.4	0.5	1.4	1.0	0.5	0.3	14.6	244.1

* 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 : 1946–1981

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
1981	15	5
Total	585	227
Mean	16.3	6.3

TABLE 6. DURATION OF DISPLAY OF TROPICAL CYCLONE WARNING SIGNALS IN HONG KONG : 1946-1981

Signal	Duration for each occasion			Duration per year		
	Mean	Maximum	Minimum	Mean	Maximum	Minimum
1	19 h 52 min	124 h 40 min	1 h 20 min	117 h 02 min	273 h 15 min	0 h 0 min
3*	20 36	71 45	1 00	130 44	267 45	23 55
8 NW+	6 39	13 00	1 30	2 35	13 00	0 0
8 SW+	5 20	11 10	2 30	2 40	16 10	0 0
8 NE+	10 58	35 35	2 15	15 33	61 45	0 0
8 SE+	7 52	21 45	0 20	8 06	31 15	0 0
8	8 40	35 35	0 20	28 54	82 25	0 0
9	3 39	6 30	0 25	1 55	11 00	0 0
10	5 52	9 10	2 30	1 47	12 10	0 0

* 1956-1981

+ 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 : 1937-1981

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
1981	3 - 7 Jul	S.T.S. Lynn	0	0	3	0	0	32

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. A SUMMARY OF METEOROLOGICAL OBSERVATIONS RECORDED IN HONG KONG DURING THE PASSAGES OF TROPICAL CYCLONES IN 1981

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
					n miles	knots	mbar			mbar	m	m	m
S.T.S. Ike	Jun	12	1200	SSE	180	NE 13	983	12	1800	996.4	0.5	0.6	0.6
T. Kelly	Jul	3	1000	SSW	330	W 15	955	3	1700	1006.6	0.5	0.7	0.8
S.T.S. Lynn	Jul	7	0700	WSW	80	NW 13	985	7	0200	999.6	0.8	1.2	0.9
T.S. Roy	Aug	7	2300	SE	180	WSW 5	996	6	1700	1001.0	0.2	0.3	0.3
T. Clara	Sep	22	0600	NE	90	NW 15	970	22	0400	996.8	0.6	0.7	0.6

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

TABLE 8. (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)				
		Hong Kong Airport (SE)	Waglan Island	Hong Kong Airport (SE)	Waglan Island	Hong Kong Airport (SE)	Waglan Island	(i) 300 n mile	(ii) 24 hours	(iii) 48 hours	(iv) 72 hours	(i) + (iv)
S.T.S. Ike	Jun	N 16	N 25	N 19	N 28	N 31	N 34	1.4	-	-	-	1.4
T. Kelly	Jul	E 24	ESE 23	E 26	ESE 26	E 46	ESE 35	outside 300 n miles				
S.T.S. Lynn	Jul	E 32	E 40	E 36	E 40	E 54	ESE 56	81.6	1.6	1.6	1.6	83.2
T.S. Roy	Aug	ESE 22	ESE 22	ESE 23	ESE 23	E 30	ESE 29	-	-	5.3	8.4	8.4
T. Clara	Sep	WNW 26	W 28	WNW 28	W 30	NW 47	W 46	15.2	3.6	16.8	16.8	32.0

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, normally refer to the period when tropical cyclone warning signals were hoisted. However, winds were strongest in Hong Kong about one day after T.S. Roy dissipated in the South China Sea. Times are given in Hong Kong Time.

TABLE 9 . TYPHOONS WHICH REQUIRED THE HOISTING OF THE HURRICANE SIGNAL NO. 10 DURING THE PERIOD 1946-1981

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 61	-	-	-	-	-	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 SEVERE TROPICAL STORM GERALD (8102)

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
April	15	0600	T.D.	1 000	25	5.4	153.5
		1200	T.D.	999	25	5.6	152.7
		1800	T.D.	997	30	6.0	152.0
	16	0000	T.S.	995	35	6.4	151.0
		0600	T.S.	990	40	7.1	149.3
		1200	S.T.S.	985	50	7.8	147.8
		1800	S.T.S.	982	50	8.4	146.5
	17	0000	S.T.S.	985	50	9.0	146.2
		0600	T.S.	990	45	10.0	146.0
		1200	T.S.	990	45	11.1	145.8
		1800	T.S.	990	40	11.8	145.7
	18	0000	T.S.	990	40	12.2	145.7
		0600	T.S.	991	40	12.8	145.8
		1200	T.S.	991	40	13.4	146.0
		1800	T.S.	992	40	14.0	146.4
	19	0000	T.S.	993	35	14.8	146.9
		0600	T.S.	993	35	15.3	147.3
		1200	T.S.	993	35	16.1	148.0
		1800	T.S.	996	35	17.1	149.0
	20	0000	T.D.	1 000	25	17.6	150.3

APPENDIX 2 SIX-HOURLY POSITIONS OF TROPICAL STORM HOLLY (8103)

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
April	30	1200	T.D.	1 001	25	8.2	159.6
		1800	T.D.	1 000	30	8.7	158.4
May	1	0000	T.S.	999	35	9.2	157.1
		0600	T.S.	997	35	9.5	155.8
		1200	T.S.	997	40	9.5	155.0
		1800	T.S.	997	40	9.4	154.0
	2	0000	T.S.	997	40	9.7	153.3
		0600	T.S.	998	40	10.0	152.6
		1200	T.S.	1 002	35	10.0	152.0
		1800	T.S.	1 002	35	10.0	151.4
	3	0000	T.S.	1 000	35	10.0	151.1
		0600	T.S.	998	35	10.3	150.8
		1200	T.D.	1 002	30	10.5	150.7
		1800	T.D.	1 001	30	10.7	150.6
	4	0000	T.S.	998	35	11.1	150.5
		0600	T.S.	998	35	11.3	150.4
		1200	T.S.	1 000	35	11.4	150.3
		1800	T.S.	1 000	35	11.5	150.0
	5	0000	T.S.	1 001	35	11.4	149.7
		0600	T.S.	1 000	35	11.3	149.9
		1200	T.S.	1 002	35	11.7	149.6
		1800	T.S.	1 002	35	11.8	149.1
	6	0000	T.D.	1 004	30	11.7	148.5
		0600	T.D.	1 004	25	11.5	147.8
		1200	T.D.	1 004	25	11.5	147.2
		1800	T.D.	1 005	25	11.6	146.6
	7	0000	T.D.	1 005	25	11.7	146.1
		0600	T.D.	1 005	25	12.0	145.5

APPENDIX 3 SIX-HOURLY POSITIONS OF SEVERE TROPICAL STORM IKE (8104)

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. ^{o}N	Long. ^{o}E
June	9	0000	T.D.	998	25	17.7	112.0
		0600	T.D.	998	30	17.6	111.1
		1200	T.S.	994	35	17.6	110.4
		1800	T.S.	994	45	17.3	110.2
	10	0000	T.S.	994	45	17.3	110.9
		0600	T.S.	994	45	17.5	111.2
		1200	T.S.	990	45	17.7	111.4
		1800	T.S.	988	45	17.8	111.5
	11	0000	T.S.	986	45	17.9	111.6
		0600	S.T.S.	983	50	18.2	112.1
		1200	S.T.S.	983	55	18.5	112.7
		1800	S.T.S.	985	55	18.8	113.4
	12	0000	S.T.S.	988	55	19.3	114.6
		0600	S.T.S.	980	55	20.0	116.1
		1200	S.T.S.	975	55	20.5	117.4
		1800	S.T.S.	970	60	21.0	118.8
	13	0000	S.T.S.	975	60	21.9	119.9
		0600	S.T.S.	980	55	23.0	121.2
		1200	S.T.S.	982	50	23.6	121.8
		1800	S.T.S.	982	50	25.6	121.6
	14	0000	T.S.	985	45	26.9	122.8
		0600	T.S.	986	40	27.7	123.7
		1200	T.D.	992	30	28.5	124.5
		1800	T.D.	998	25	28.9	125.0

APPENDIX 4 SIX-HOURLY POSITIONS OF TYPHOON JUNE (8105)

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
June	16	0600	T.D.	1 004	25	13.2	132.0
		1200	T.D.	1 002	25	13.4	131.6
		1800	T.D.	1 002	25	13.8	131.2
	17	0000	T.D.	1 002	25	14.3	130.8
		0600	T.D.	1 000	30	14.8	130.4
		1200	T.D.	996	30	15.3	130.0
		1800	T.S.	990	35	16.3	129.2
	18	0000	T.S.	985	40	17.5	128.2
		0600	T.S.	983	45	18.4	127.3
		1200	S.T.S.	980	50	19.2	126.3
		1800	S.T.S.	975	60	19.9	125.2
	19	0000	T.	970	70	20.4	124.2
		0600	T.	965	75	20.8	123.6
		1200	T.	965	75	21.2	123.2
		1800	T.	965	75	21.8	122.9
	20	0000	T.	965	75	22.9	122.7
		0600	T.	970	70	24.0	122.3
		1200	T.	970	70	24.8	121.6
		1800	T.	975	65	25.5	121.3
	21	0000	S.T.S.	980	60	26.1	121.5
		0600	S.T.S.	985	50	27.2	122.2
		1200	S.T.S.	990	50	28.5	123.2
		1800	T.S.	990	45	29.7	124.3
	22	0000	T.S.	990	45	31.0	125.5
		0600	T.S.	990	40	32.2	127.1
		1200	T.S.	990	35	33.6	130.0
		1800	T.S.	993	35	35.2	134.0
	23	0000	T.D.	996	30	36.6	138.5

APPENDIX 5 SIX-HOURLY POSITIONS OF TYPHOON KELLY (8106)

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
June	28	0600	T.D.	1 008	25	12.9	134.7
		1200	T.D.	1 008	25	13.0	134.4
		1800	T.D.	1 007	25	13.1	133.7
	29	0000	T.D.	1 006	25	13.3	132.7
		0600	T.D.	1 005	25	13.5	131.7
		1200	T.D.	1 004	25	13.6	130.6
		1800	T.D.	1 003	25	13.8	129.4
	30	0000	T.D.	1 002	25	13.9	127.5
		0600	T.D.	1 001	30	14.0	125.5
		1200	T.S.	998	45	13.9	123.7
		1800	T.S.	998	40	13.7	122.3
July	1	0000	T.S.	996	40	13.5	121.0
		0600	T.S.	994	40	13.5	119.9
		1200	T.S.	993	45	13.6	118.8
		1800	T.S.	990	45	13.8	117.6
	2	0000	S.T.S.	985	55	14.0	116.3
		0600	S.T.S.	980	60	14.4	115.3
		1200	S.T.S.	975	60	14.6	114.7
		1800	T.	970	65	15.8	114.0
	3	0000	T.	960	75	16.8	113.0
		0600	T.	950	80	17.1	111.4
		1200	T.	950	80	17.5	110.3
		1800	T.	960	75	18.0	109.5
	4	0000	T.	975	65	18.5	108.9
		0600	S.T.S.	980	60	19.0	107.8
		1200	S.T.S.	980	60	19.2	106.9
		1800	S.T.S.	985	55	19.2	105.7
	5	0000	S.T.S.	985	50	19.0	104.0
		0600	T.S.	990	40	18.5	102.7
		1200	T.D.	995	30	18.3	102.0

APPENDIX 6 SIX-HOURLY POSITIONS OF SEVERE TROPICAL STORM LYNN (8107)

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
July	3	0000	T.D.	1 000	30	12.4	127.0
		0600	T.S.	992	40	13.4	125.8
		1200	T.S.	990	45	14.1	124.6
		1800	T.S.	990	45	14.5	123.4
	4	0000	T.S.	990	45	14.8	122.5
		0600	T.S.	989	45	15.2	122.1
		1200	T.S.	989	45	15.9	121.5
		1800	T.S.	989	40	16.9	120.0
	5	0000	T.S.	994	45	17.6	118.6
		0600	S.T.S.	991	50	18.4	117.5
		1200	S.T.S.	986	60	19.0	116.7
		1800	S.T.S.	983	60	19.8	115.6
	6	0000	S.T.S.	982	55	20.1	114.9
		0600	S.T.S.	982	55	20.3	114.3
		1200	S.T.S.	983	55	20.6	113.8
		1800	S.T.S.	984	55	21.3	113.2
	7	0000	T.S.	985	45	21.9	112.6
		0600	T.S.	985	35	22.8	111.5

APPENDIX 7 SIX-HOURLY POSITIONS OF SEVERE TROPICAL STORM MAURY (8108)

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
July	17	1800	T.D.	998	25	19.0	130.9
	18	0000	T.D.	995	30	20.1	129.6
		0600	T.S.	992	40	21.3	128.9
		1200	T.S.	990	45	22.7	128.2
		1800	S.T.S.	988	50	24.1	127.2
	19	0000	S.T.S.	986	55	25.3	124.0
		0600	S.T.S.	982	55	25.3	122.8
		1200	S.T.S.	981	55	24.8	121.4
		1800	S.T.S.	988	50	25.2	120.2
	20	0000	T.S.	991	45	25.6	119.6
		0600	T.D.	996	30	25.6	117.8

APPENDIX 8 SIX-HOURLY POSITIONS OF THE TROPICAL DEPRESSION (8109) (21 - 23 JULY)

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
July	21	1200	T.D.	1 000	25	23.0	123.3
		1800	T.D.	998	25	24.1	123.4
	22	0000	T.D.	998	25	25.4	123.0
		0600	T.D.	997	30	26.3	122.0
		1200	T.D.	996	30	26.5	121.0
		1800	T.D.	996	30	26.5	120.5
	23	0000	T.D.	996	30	26.8	120.7
		0600	T.D.	996	30	28.3	121.2
		1200	T.D.	996	25	29.5	120.3
		1800	T.D.	1 000	25	30.5	118.4

APPENDIX 9 SIX-HOURLY POSITIONS OF SEVERE TROPICAL STORM OGDEN (8110)

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
July	26	0000	T.D.	1 008	25	21.0	149.3
		0600	T.D.	1 006	25	21.5	149.2
		1200	T.D.	1 005	25	21.9	149.0
		1800	T.D.	1 004	25	22.3	149.0
	27	0000	T.D.	1 002	25	22.9	148.8
		0600	T.D.	1 000	25	23.5	148.5
		1200	T.D.	998	25	24.0	148.0
		1800	T.D.	996	30	24.4	147.4
	28	0000	T.D.	994	30	25.0	146.7
		0600	T.S.	992	35	25.6	145.8
		1200	T.S.	990	35	26.1	144.8
		1800	T.S.	986	40	27.0	143.3
	29	0000	T.S.	985	45	27.7	141.7
		0600	T.S.	984	45	28.2	140.5
		1200	S.T.S.	982	50	28.7	139.2
		1800	S.T.S.	983	50	29.3	138.0
	30	0000	S.T.S.	986	50	29.9	136.6
		0600	S.T.S.	982	50	30.9	134.8
		1200	S.T.S.	977	50	31.2	132.8
		1800	S.T.S.	975	50	31.7	131.1
	31	0000	T.S.	990	40	32.7	129.3
		0600	T.S.	992	40	33.2	128.1
		1200	T.S.	992	35	34.0	126.5
		1800	T.S.	992	35	35.0	125.7
August	1	0000	T.D.	996	30	36.1	125.1
		0600	T.D.	1 002	25	37.3	124.7
		1200	T.D.	1 006	25	38.6	124.6

APPENDIX 10 SIX-HOURLY POSITIONS OF THE TROPICAL DEPRESSION (8111) (31 JULY - 2 AUGUST)

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
July	31	0600	T.D.	1 000	25	16.9	141.8
		1200	T.D.	1 000	25	16.9	141.5
		1800	T.D.	1 000	25	17.1	141.2
August	1	0000	T.D.	998	25	17.5	141.1
		0600	T.D.	996	25	18.2	141.2
		1200	T.D.	994	30	18.7	141.3
		1800	T.D.	990	30	19.0	141.5
	2	0000	T.D.	990	30	19.3	141.8
		0600	T.D.	990	30	19.7	142.2
		1200	T.D.	994	30	20.2	142.9
		1800	T.D.	998	25	21.0	144.0

APPENDIX 11 SIX-HOURLY POSITIONS OF SEVERE TROPICAL STORM PHYLLIS (8112)

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
August	2	0600	T.D.	996	30	23.0	146.7
		1200	T.S.	994	35	24.0	146.7
		1800	T.S.	990	40	24.9	146.7
	3	0000	T.S.	985	45	26.0	146.7
		0600	T.S.	985	45	27.5	146.6
		1200	T.S.	985	45	28.7	146.3
		1800	T.S.	985	45	29.7	145.9
	4	0000	T.S.	980	45	31.2	145.4
		0600	T.S.	980	45	32.8	145.2
		1200	T.S.	980	45	34.2	145.2
		1800	S.T.S.	980	50	35.4	145.2
	5	0000	S.T.S.	980	50	36.5	145.2
		0600	S.T.S.	975	55	38.5	145.3
		1200	S.T.S.	980	50	40.6	145.5

APPENDIX 12 SIX-HOURLY POSITIONS OF TROPICAL STORM ROY (8113)

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
August	4	0600	T.D.	998	30	15.4	114.5
		1200	T.S.	996	40	15.5	114.9
		1800	T.S.	994	40	15.6	115.3
	5	0000	T.S.	994	40	15.8	115.8
		0600	T.S.	992	45	16.2	116.3
		1200	T.S.	992	45	16.5	116.6
		1800	T.S.	992	45	16.8	116.9
	6	0000	T.S.	992	45	17.4	117.3
		0600	T.S.	990	45	18.4	118.1
		1200	T.S.	990	45	19.3	118.5
		1800	T.S.	990	45	20.0	118.4
	7	0000	T.S.	992	45	20.3	118.1
		0600	T.S.	992	40	20.6	117.6
		1200	T.D.	996	25	20.6	117.1

APPENDIX 13 SIX-HOURLY POSITIONS OF SEVERE TROPICAL STORM SUSAN (8114)

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
August	11	0000	S.T.S.	985	50	32.5	160.0
		0600	S.T.S.	985	50	33.1	159.7
		1200	T.S.	985	45	33.6	159.3
		1800	T.S.	985	45	34.3	158.3
	12	0000	T.S.	985	45	34.7	157.1
		0600	T.S.	990	40	35.1	156.3
		1200	T.S.	995	35	35.5	155.5
		1800	T.D.	998	30	36.2	155.0
	13	0000	T.D.	998	30	37.0	154.5
		0600	T.D.	1 000	25	37.6	154.3
		1200	T.D.	1 002	25	38.2	154.1
		1800	T.D.	1 004	25	39.3	153.8
	14	0000	T.D.	1 006	25	40.9	153.6

APPENDIX 14 SIX-HOURLY POSITIONS OF TYPHOON THAD (8115)

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
August	16	0000	T.D.	996	30	18.6	131.1
		0600	T.S.	992	35	18.9	131.5
		1200	T.S.	990	40	19.2	131.9
		1800	T.S.	990	40	19.6	132.2
	17	0000	T.S.	988	45	19.9	132.5
		0600	S.T.S.	986	50	20.2	132.7
		1200	S.T.S.	984	50	20.6	132.9
		1800	S.T.S.	980	55	21.1	133.1
	18	0000	S.T.S.	975	60	21.5	133.3
		0600	T.	970	65	22.1	133.4
		1200	T.	970	65	22.8	133.5
		1800	T.	965	70	23.5	133.7
	19	0000	T.	965	70	24.3	134.0
		0600	T.	960	75	24.9	134.3
		1200	T.	955	75	25.2	134.5
		1800	T.	955	75	25.6	134.8
	20	0000	T.	960	70	25.9	135.3
		0600	T.	960	70	26.2	135.6
		1200	T.	960	70	26.6	136.0
		1800	T.	965	70	27.1	136.4
	21	0000	T.	965	70	27.7	136.7
		0600	T.	965	70	28.4	137.1
		1200	T.	970	65	29.1	137.4
		1800	T.	970	65	29.8	137.6
	22	0000	T.	970	65	30.5	137.8
		0600	S.T.S.	970	60	31.2	138.1
		1200	S.T.S.	970	60	32.6	138.6
		1800	S.T.S.	965	60	34.4	139.4
	23	0000	S.T.S.	965	60	38.1	140.8
		0600	S.T.S.	965	55	42.2	140.9

APPENDIX 15 SIX-HOURLY POSITIONS OF TROPICAL STORM VANESSA (8116)

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
August	15	1800	T.D.	998	25	19.0	147.0
	16	0000	T.D.	996	30	20.9	150.1
		0600	T.D.	994	30	22.6	152.6
		1200	T.S.	994	35	24.3	155.0
		1800	T.S.	994	35	26.0	156.9
	17	0000	T.S.	992	40	27.3	158.3
		0600	T.S.	985	40	28.7	159.5

Vanessa moved out of 160°E

APPENDIX 16 SIX-HOURLY POSITIONS OF TROPICAL STORM WARREN (8117)

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °C	Long. °C
August	17	0000	T.D.	996	25	17.6	113.1
		0600	T.D.	995	30	17.7	112.9
		1200	T.D.	995	30	17.8	112.6
		1800	T.D.	995	30	17.9	112.3
	18	0000	T.D.	995	30	18.0	112.0
		0600	T.D.	995	30	18.0	111.5
		1200	T.D.	994	30	18.2	110.8
		1800	T.D.	994	30	18.6	109.8
	19	0000	T.D.	994	30	19.0	109.1
		0600	T.D.	994	30	19.5	108.5
		1200	T.D.	994	30	19.8	108.0
		1800	T.S.	992	40	19.9	107.6
	20	0000	T.S.	992	40	20.0	106.9
		0600	T.S.	990	40	20.8	106.0
		1200	T.D.	996	30	22.0	105.7

APPENDIX 17 SIX-HOURLY POSITIONS OF TYPHOON AGNES (8118)

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °C	Long. °C
August	25	1200	T.D.	1 007	25	16.3	147.0
		1800	T.D.	1 007	25	16.4	145.9
	26	0000	T.D.	1 007	25	16.5	144.7
		0600	T.D.	1 007	25	16.7	143.5
		1200	T.D.	1 004	25	16.9	142.0
		1800	T.D.	1 000	25	17.1	140.8
	27	0000	T.D.	995	30	17.3	139.7
		0600	T.S.	993	35	17.7	138.4
		1200	T.S.	991	40	18.1	137.3
		1800	T.S.	990	40	18.8	136.2
	28	0000	T.S.	988	45	19.3	135.2
		0600	S.T.S.	985	50	19.9	134.2
		1200	S.T.S.	983	50	20.4	133.1
		1800	S.T.S.	975	55	21.0	131.8
	29	0000	S.T.S.	975	55	21.6	130.8
		0600	S.T.S.	975	55	22.3	130.0
		1200	S.T.S.	970	60	23.0	128.9
		1800	S.T.S.	970	60	23.8	128.0
	30	0000	T.	960	70	24.4	127.2
		0600	T.	955	70	25.0	126.6
		1200	T.	955	75	25.6	126.0
		1800	T.	955	80	26.5	125.2
	31	0000	T.	950	80	27.2	124.7
		0600	T.	950	85	28.0	124.2
		1200	T.	950	80	29.0	123.7
		1800	T.	955	80	30.0	123.3
September	1	0000	T.	960	75	30.5	123.2
		0600	T.	960	75	31.0	123.3
		1200	T.	960	70	31.3	123.4
		1800	T.	965	65	31.7	123.6
	2	0000	S.T.S.	970	60	32.2	124.0
		0600	S.T.S.	970	60	32.5	124.3
		1200	S.T.S.	975	55	32.8	124.8
		1800	S.T.S.	975	55	33.1	125.3
	3	0000	S.T.S.	975	50	33.4	125.9
		0600	T.S.	980	40	33.9	127.2
		1200	T.S.	985	40	34.6	128.9

APPENDIX 18 SIX-HOURLY POSITIONS OF TYPHOON BILL (8119)

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
September	2	1200	T.D.	1 008	25	22.7	156.4
		1800	T.D.	1 004	25	22.5	154.9
	3	0000	T.D.	1 000	25	22.5	153.6
		0600	T.D.	995	30	22.5	152.8
		1200	T.S.	993	35	22.7	151.8
		1800	T.S.	990	40	23.0	151.0
	4	0000	T.S.	986	45	23.3	150.4
		0600	S.T.S.	980	50	23.9	149.4
		1200	S.T.S.	975	55	24.7	148.2
		1800	S.T.S.	970	60	25.5	147.2
	5	0000	T.	960	65	26.1	146.6
		0600	T.	960	70	27.1	145.9
		1200	T.	960	70	28.3	145.5
		1800	T.	960	70	29.5	145.5
	6	0000	T.	960	70	30.8	145.5
		0600	T.	965	65	32.7	146.2
		1200	S.T.S.	970	60	34.5	147.4
		1800	S.T.S.	970	60	36.6	149.6
	7	0000	S.T.S.	975	50	38.8	152.7
		0600	T.S.	985	40	40.2	157.5

APPENDIX 19 SIX-HOURLY POSITIONS OF TYPHOON CLARA (8120)

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
September	15	0600	T.D.	1 005	25	11.7	140.2
		1200	T.D.	1 005	25	11.8	138.7
		1800	T.D.	1 005	25	11.9	136.8
	16	0000	T.D.	1 005	25	12.1	135.5
		0600	T.D.	1 001	30	12.2	134.4
		1200	T.D.	1 000	30	12.3	133.7
		1800	T.D.	1 000	30	12.5	133.1
	17	0000	T.D.	998	30	12.7	132.3
		0600	T.S.	994	35	13.1	131.5
		1200	T.S.	989	40	13.8	130.8
		1800	S.T.S.	982	50	13.9	129.9
	18	0000	S.T.S.	980	55	14.0	128.8
		0600	T.	975	65	14.5	128.2
		1200	T.	965	75	15.2	127.3
		1800	T.	960	85	15.8	126.4
	19	0000	T.	950	95	16.5	125.5
		0600	T.	935	110	17.4	124.5
		1200	T.	925	115	17.9	123.8
		1800	T.	930	110	18.5	122.9
	20	0000	T.	940	110	18.7	122.1
		0600	T.	940	110	19.0	121.2
		1200	T.	960	100	19.6	120.5
		1800	T.	960	95	20.1	119.4
	21	0000	T.	960	90	20.5	118.6
		0600	T.	960	85	21.0	117.6
		1200	T.	960	85	21.6	116.9
		1800	T.	965	80	22.4	116.2
	22	0000	S.T.S.	975	50	23.6	115.2
		0600	T.D.	998	30	24.6	114.6

APPENDIX 20 SIX-HOURLY POSITIONS OF TYPHOON ELSIE (8122)

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
September	24	0600	T.D.	1 004	25	10.5	146.2
		1200	T.D.	1 001	25	10.8	145.5
		1800	T.D.	998	30	11.2	144.8
	25	0000	T.S.	995	35	11.5	144.1
		0600	T.S.	992	40	11.7	143.3
		1200	T.S.	988	45	12.0	142.2
		1800	S.T.S.	980	55	12.3	141.3
	26	0000	T.	970	65	12.7	140.3
		0600	T.	965	70	13.0	139.3
		1200	T.	955	80	13.2	138.4
		1800	T.	940	90	13.4	137.7
	27	0000	T.	925	100	14.0	137.1
		0600	T.	905	115	14.7	136.9
		1200	T.	900	120	15.5	136.5
		1800	T.	895	130	16.1	136.0
	28	0000	T.	895	135	16.8	135.2
		0600	T.	895	135	17.1	134.9
		1200	T.	895	135	17.9	134.5
		1800	T.	895	130	18.5	134.3
	29	0000	T.	900	120	19.6	133.7
		0600	T.	900	120	20.4	133.1
		1200	T.	905	115	21.4	132.5
		1800	T.	910	115	22.3	132.2
	30	0000	T.	915	115	23.1	131.9
		0600	T.	920	100	24.4	131.6
		1200	T.	925	100	25.3	131.6
		1800	T.	935	95	26.3	132.2
October	1	0000	T.	940	90	27.7	133.3
		0600	T.	940	90	28.9	135.4
		1200	T.	945	85	30.0	137.6
		1800	T.	950	80	31.5	140.3
	2	0000	T.	950	80	33.3	144.0
		0600	T.	955	75	35.5	148.4
		1200	S.T.S.	960	60	38.5	152.5
		1800	T.S.	975	45	43.0	156.0

APPENDIX 21 SIX-HOURLY POSITIONS OF TROPICAL STORM FABIAN (8123)

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
October	11	1800	T.D.	1 004	25	10.2	126.2
	12	0000	T.D.	1 004	25	11.0	124.6
		0600	T.D.	1 002	25	11.4	123.5
		1200	T.D.	1 002	25	11.7	122.2
		1800	T.D.	1 002	25	11.8	120.7
	13	0000	T.D.	1 000	30	11.8	118.9
		0600	T.D.	1 000	30	11.7	116.9
		1200	T.S.	1 000	35	11.6	114.9
		1800	T.S.	995	40	11.6	113.1
	14	0000	T.S.	995	40	11.6	111.3
		0600	T.S.	995	40	11.6	109.9
		1200	T.D.	1 000	30	11.6	108.5

APPENDIX 22 SIX-HOURLY POSITIONS OF TYPHOON GAY (8124)

Month	May	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
October	14	0600	T.D.	1 000	25	9.5	148.8
		1200	T.D.	998	25	11.5	148.6
		1800	T.D.	997	25	13.4	148.3
	15	0000	T.D.	995	30	14.9	148.0
		0600	T.D.	994	30	16.1	147.1
		1200	T.D.	993	30	16.6	145.7
		1800	T.S.	991	35	16.8	144.2
	16	0000	T.S.	990	35	17.2	142.6
		0600	T.S.	983	40	17.3	141.6
		1200	T.S.	980	45	17.5	140.8
		1800	T.S.	980	45	17.5	140.2
	17	0000	S.T.S.	975	50	17.1	139.5
		0600	S.T.S.	970	50	16.7	139.4
		1200	S.T.S.	970	50	16.9	138.5
		1800	S.T.S.	965	55	17.9	137.8
	18	0000	S.T.S.	955	55	18.3	136.7
		0600	S.T.S.	950	60	18.5	136.0
		1200	T.	950	65	18.8	135.0
		1800	T.	955	70	19.1	133.7
	19	0000	T.	960	75	19.6	132.3
		0600	T.	960	75	20.0	131.5
		1200	T.	955	80	20.4	130.4
		1800	T.	950	80	20.9	129.6
	20	0000	T.	950	80	21.5	129.0
		0600	T.	945	85	21.9	128.6
		1200	T.	950	85	22.7	128.3
		1800	T.	950	80	23.6	128.5
	21	0000	T.	955	80	24.6	129.0
		0600	T.	955	80	25.5	129.5
		1200	T.	960	75	26.5	130.3
		1800	T.	960	75	27.8	131.5
	22	0000	T.	965	70	29.3	133.4
		0600	T.	965	70	30.9	135.5
		1200	T.	970	65	33.2	138.8
		1800	S.T.S.	970	60	36.2	142.4
	23	0000	S.T.S.	975	55	39.6	147.5

APPENDIX 23 SIX-HOURLY POSITIONS OF THE TROPICAL DEPRESSION (10 - 11 NOVEMBER)

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
November	10	0000	T.D.	1 002	25	9.8	110.2
		0600	T.D.	1 002	25	10.0	109.6
		1200	T.D.	1 002	25	10.2	108.8
		1800	T.D.	1 004	25	10.5	108.1
	11	2000	T.D.	1 006	25	10.8	107.6

APPENDIX 24 SIX-HOURLY POSITIONS OF TYPHOON HAZEN (8125)

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
November	13	0000	T.D.	1 008	25	15.2	152.0
		0600	T.D.	1 008	25	15.3	150.9
		1200	T.D.	1 008	25	15.4	150.0
		1800	T.D.	1 006	25	15.5	149.2
	14	0000	T.D.	1 006	25	15.6	148.7
		0600	T.D.	1 000	25	15.6	148.1
		1200	T.D.	995	30	15.6	147.7
		1800	T.S.	991	35	15.5	147.2
	15	0000	T.S.	988	40	15.4	146.6
		0600	S.T.S.	983	50	14.9	145.4
		1200	S.T.S.	975	60	14.2	143.9
		1800	T.	965	70	13.7	142.5
	16	0000	T.	955	85	13.4	140.9
		0600	T.	955	85	13.3	139.0
		1200	T.	960	85	13.3	137.6
		1800	T.	970	70	13.8	135.9
	17	0000	T.	983	65	14.4	134.6
		0600	S.T.S.	985	60	14.5	133.2
		1200	S.T.S.	985	60	14.7	131.8
		1800	S.T.S.	985	55	15.0	130.5
	18	0000	S.T.S.	985	55	15.1	129.4
		0600	S.T.S.	985	50	14.9	128.4
		1200	S.T.S.	989	50	14.5	127.6
		1800	S.T.S.	981	55	14.1	126.8
	19	0000	S.T.S.	975	60	13.9	125.9
		0600	S.T.S.	975	60	13.6	124.8
		1200	S.T.S.	980	60	13.5	123.9
		1800	S.T.S.	980	60	13.4	123.0
	20	0000	S.T.S.	980	60	13.5	121.6
		0600	S.T.S.	980	60	13.7	120.0
		1200	S.T.S.	980	60	13.9	118.8
		1800	S.T.S.	980	55	14.2	117.5
	21	0000	S.T.S.	985	55	14.6	116.1
		0600	S.T.S.	990	50	15.3	114.5
		1200	T.S.	990	45	16.0	112.8
		1800	T.S.	990	45	16.5	111.7
	22	0000	T.S.	995	45	17.5	110.4
		0600	T.S.	1 000	40	18.4	109.7
		1200	T.D.	1 002	30	19.4	109.1
		1800	T.D.	1 002	30	20.5	109.0
	23	0000	T.D.	1 005	25	20.8	109.1

APPENDIX 25 SIX-HOURLY POSITIONS OF TYPHOON IRMA (8126)

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
November	19	0000	T.D.	1 003	25	13.1	149.3
		0600	T.D.	998	30	13.4	148.1
		1200	T.S.	997	35	13.7	146.8
		1800	T.S.	991	40	13.8	145.9
	20	0000	T.S.	991	45	13.9	144.7
		0600	S.T.S.	985	50	13.9	143.7
		1200	S.T.S.	980	50	13.9	142.7
		1800	S.T.S.	975	55	13.9	141.6
	21	0000	S.T.S.	965	60	13.8	140.4
		0600	T.	955	70	13.8	139.3
		1200	T.	945	80	13.7	138.0
		1800	T.	935	90	13.5	137.0
	22	0000	T.	920	100	13.4	135.9
		0600	T.	910	110	13.1	134.5
		1200	T.	905	115	12.7	132.7
		1800	T.	910	115	12.5	131.3
	23	0000	T.	915	115	12.5	129.8
		0600	T.	920	110	12.7	128.5
		1200	T.	925	110	13.3	126.2
		1800	T.	930	110	13.9	124.7
	24	0000	T.	935	105	14.6	123.4
		0600	T.	940	100	15.3	122.2
		1200	T.	960	80	16.3	120.6
		1800	S.T.S.	983	60	17.2	119.5
	25	0000	S.T.S.	989	55	18.0	119.1
		0600	S.T.S.	990	55	18.8	119.4
		1200	T.S.	990	45	19.7	120.0
		1800	T.S.	991	45	20.4	120.5
	26	0000	T.S.	992	40	21.2	121.3
		0600	T.S.	994	40	22.0	122.2
		1200	T.S.	996	35	22.8	123.2
		1800	T.S.	996	35	23.5	124.6
	27	0000	T.D.	998	30	24.0	126.2

APPENDIX 26 SIX-HOURLY POSITIONS OF TROPICAL STORM JEFF (8127)

Month	Day	Time • G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
November	20	0600	T.D.	1 006	25	8.0	158.0
		1200	T.D.	1 006	25	8.0	156.0
		0800	T.D.	1 006	25	8.0	154.0
	21	0000	T.D.	1 006	25	10.0	152.9
		0600	T.D.	1 005	25	11.4	152.3
		1200	T.D.	1 005	25	12.3	151.6
		1800	T.D.	1 005	25	12.9	150.9
	22	0000	T.D.	1 004	30	13.4	150.2
		0600	T.D.	1 004	30	13.6	149.8
		1200	T.D.	1 002	30	13.8	149.4
		1800	T.D.	1 002	30	13.9	148.8
	23	0000	T.S.	1 000	35	13.9	148.0
		0600	T.S.	1 000	35	13.7	146.9
		1200	T.S.	1 000	35	13.5	145.5
		1800	T.S.	1 000	35	13.3	144.0
	24	0000	T.S.	998	40	13.3	141.9
		0600	T.S.	998	40	13.4	139.8
		1200	T.S.	998	40	13.7	137.6
		1800	T.S.	998	40	14.1	136.3
	25	0000	T.S.	998	40	14.7	134.7
		0600	T.S.	998	35	15.6	132.5
		1200	T.S.	998	35	16.7	130.5
		1800	T.D.	999	30	17.6	129.8
	26	0000	T.D.	1 000	30	20.0	128.9
		0600	T.D.	1 002	25	22.7	128.9
		1200	T.D.	1 005	25	25.1	130.5

APPENDIX 27 SIX-HOURLY POSITION OF TYPHOON KIT (8128)

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
December	11	0000	T.D.	998	25	9.7	147.7
		0600	T.D.	995	30	10.1	147.8
		1200	T.S.	992	35	10.5	147.7
		1800	T.S.	992	35	10.8	147.6
	12	0000	T.S.	992	40	11.1	147.4
		0600	T.S.	992	40	11.3	147.1
		1200	T.S.	992	40	11.6	146.8
		1800	T.S.	992	40	11.9	146.3
	13	0000	T.S.	990	45	12.1	145.7
		0600	T.S.	990	45	12.3	144.8
		1200	S.T.S.	985	50	12.3	143.7
		1800	S.T.S.	985	50	12.5	142.9
	14	0000	S.T.S.	980	55	12.9	142.3
		0600	S.T.S.	975	60	13.4	141.9
		1200	T.	970	65	13.8	141.6
		1800	T.	965	70	14.2	141.5
	15	0000	T.	960	75	14.8	141.5
		0600	T.	945	80	15.1	141.4
		1200	T.	940	90	15.3	141.2
		1800	T.	940	90	15.4	140.8
	16	0000	T.	945	85	15.4	140.5
		0600	T.	950	80	15.3	140.0
		1200	T.	945	85	15.2	139.3
		1800	T.	945	85	15.2	138.3
	17	0000	T.	935	95	15.3	137.5
		0600	T.	925	100	15.5	137.0
		1200	T.	925	100	15.7	136.4
		1800	T.	930	95	15.9	135.8
	18	0000	T.	940	90	16.1	135.2
		0600	T.	950	85	16.1	134.5
		1200	T.	960	80	16.1	133.7
		1800	T.	970	70	16.0	132.8
	19	0000	T.	975	65	15.9	131.9
		0600	S.T.S.	975	60	16.0	131.3
		1200	S.T.S.	980	55	16.1	130.7
		1800	T.S.	990	45	16.2	130.5
	20	0000	T.S.	995	35	16.4	130.1
		0600	T.D.	998	30	15.2	130.5
		1200	T.D.	1 002	30	13.7	130.2
		1800	T.D.	1 005	25	13.0	129.4
	21	0000	T.D.	1 007	25	12.3	128.7
		0600	T.D.	1 008	25	11.2	128.6
		1200	T.D.	1 008	25	9.8	127.8

APPENDIX 28 SIX-HOURLY POSITIONS OF TYPHOON LEE (8129)

Month	Day	Time G.M.T.	Intensity	Estimated minimum central pressure (mbar)	Estimated maximum surface wind (knots)	Lat. °N	Long. °E
December	23	0000	T.D.	997	25	10.0	137.7
		0600	T.D.	997	30	10.1	136.1
		1200	T.S.	994	40	10.5	134.5
		1800	T.S.	992	45	11.1	133.2
	24	0000	S.T.S.	987	50	11.7	132.1
		0600	S.T.S.	975	60	12.0	131.0
		1200	T.	970	65	12.4	129.9
		1800	T.	960	75	12.6	128.7
	25	0000	T.	955	80	12.8	127.8
		0600	T.	950	85	12.7	126.4
		1200	T.	950	85	12.6	125.0
		1800	T.	950	85	12.7	123.4
	26	0000	T.	960	80	13.0	121.8
		0600	T.	970	65	13.3	120.3
		1200	S.T.S.	980	60	13.6	119.2
		1800	S.T.S.	986	55	13.9	118.0 *
	27	0000	S.T.S.	990	50	14.3	117.0 *
		0600	S.T.S.	990	50	14.7	116.1 *
		1200	S.T.S.	990	50	15.1	115.2 *
		1800	T.S.	994	45	15.7	114.2 *
	28	0000	T.S.	998	40	16.4	113.5 *
		0600	T.D.	1 000	30	17.2	113.2 *
		1200	T.D.	1 000	30	17.9	113.2 *
		1800	T.D.	1 004	25	18.5	113.3 *
	29	0000	T.D.	1 006	25	19.1	113.7 *
		0600	T.D.	1 006	25	20.3	114.7 *

* Last revision date: 26 July 2016