

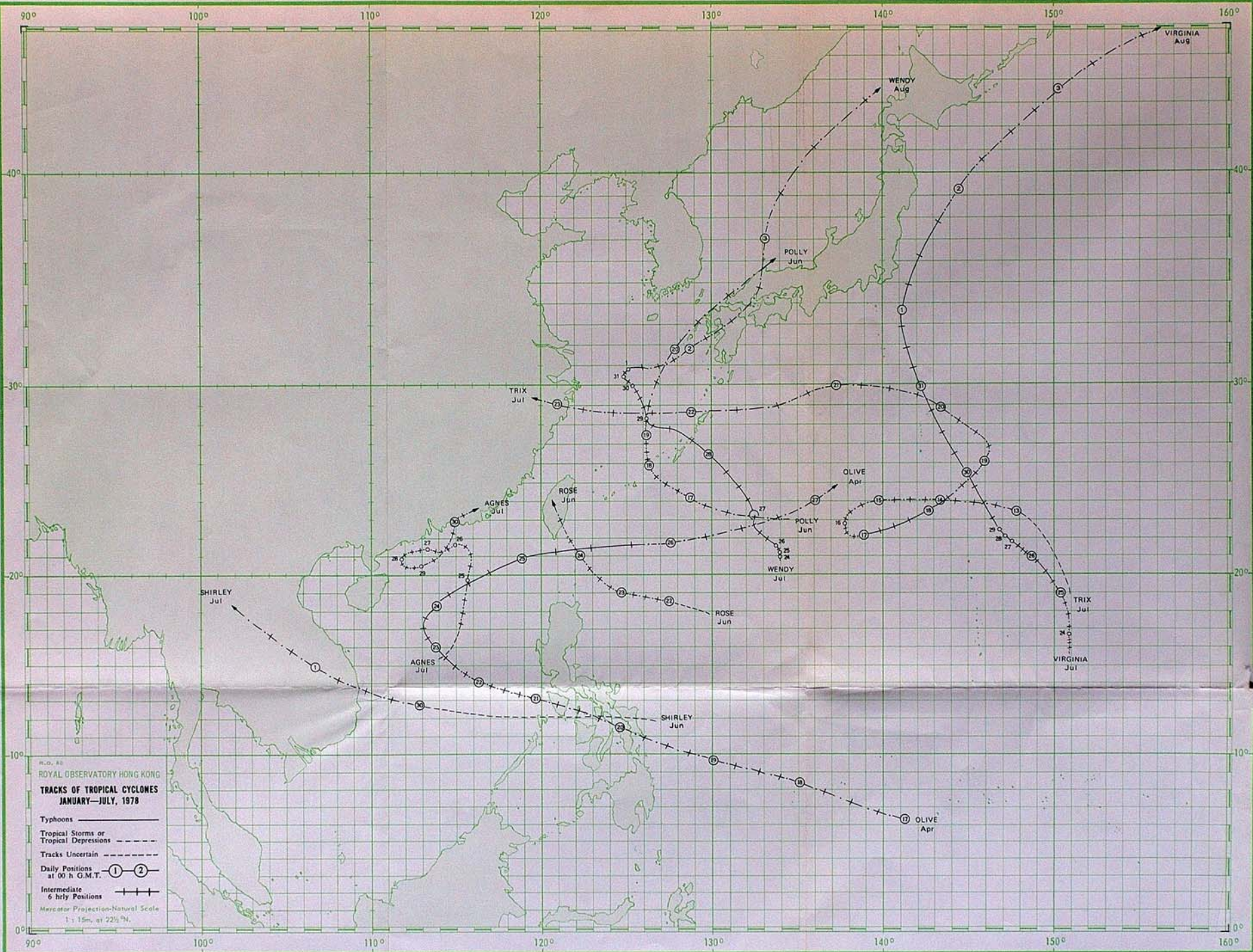
METEOROLOGICAL RESULTS

1978

PART III—TROPICAL CYCLONE SUMMARIES

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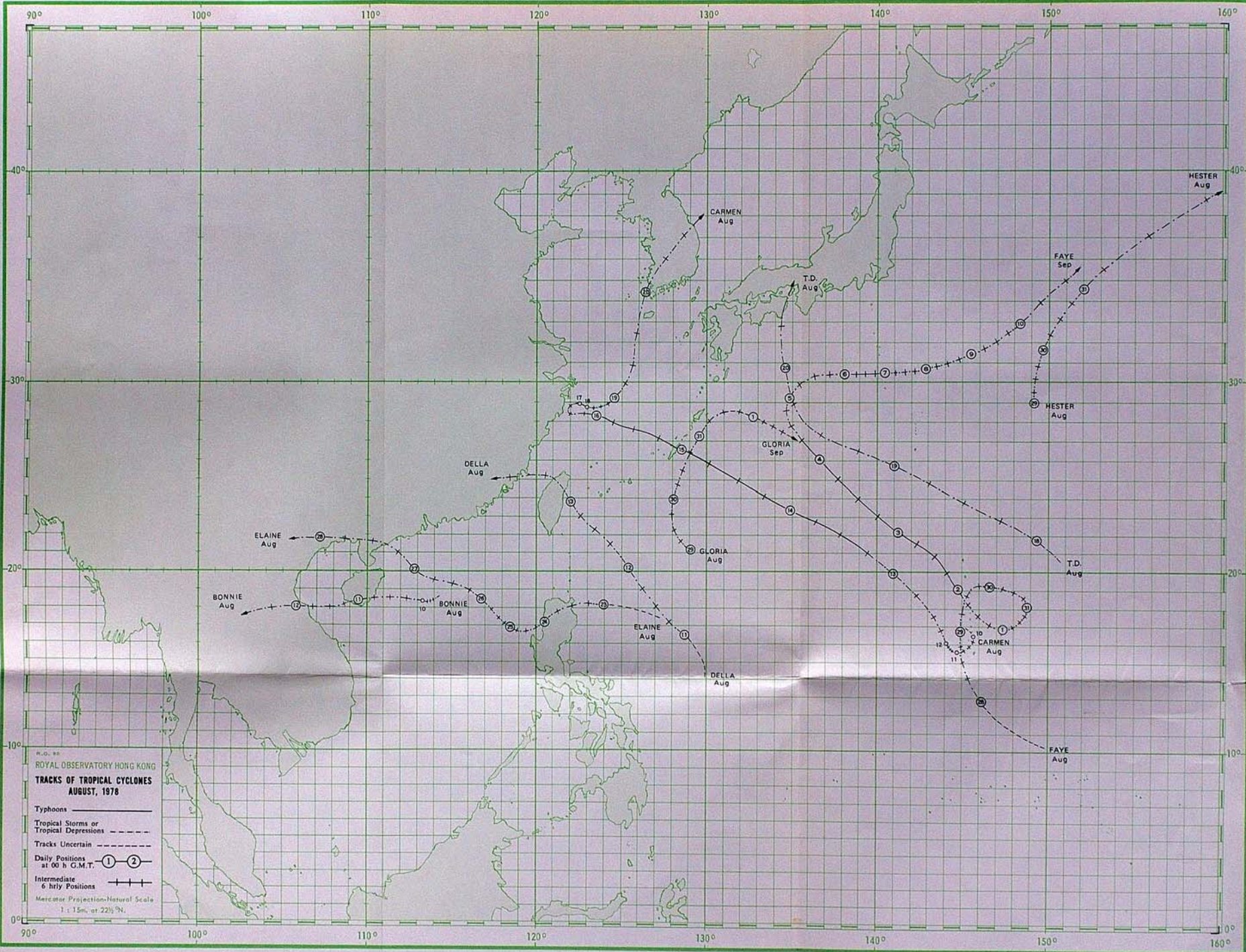
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R.O. 88
ROYAL OBSERVATORY HONG KONG
TRACKS OF TROPICAL CYCLONES
JANUARY—JULY, 1978

- Typhoons —————
- Tropical Storms or Tropical Depressions - - - - -
- Tracks Uncertain - · - · - ·
- Daily Positions at 00 h G.M.T. ①—②
- Intermediate 6 hly Positions + + + + +
- Merceptor Projection-Natural Scale
 1 : 15m, at 22½°N.

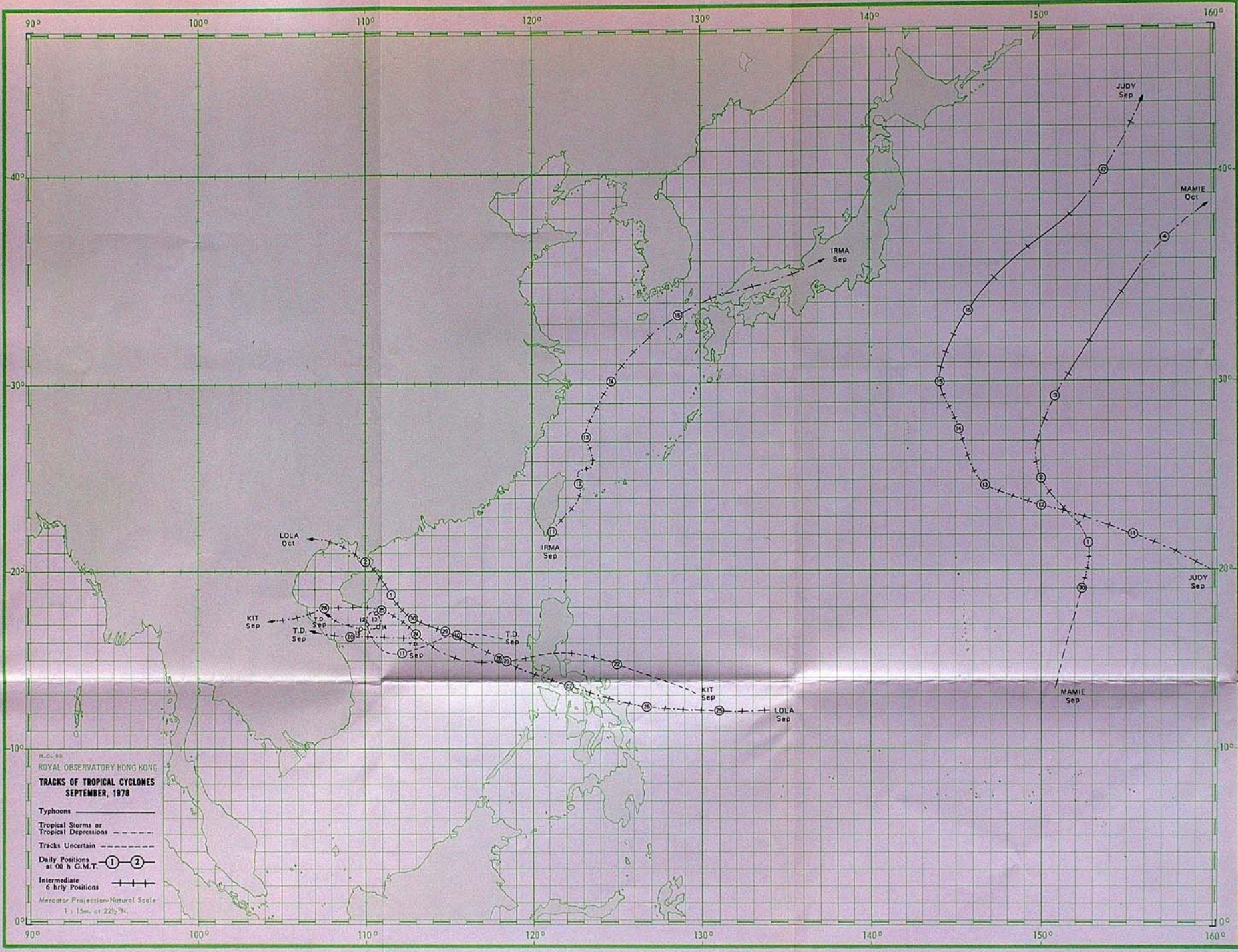




R.O. 88
ROYAL OBSERVATORY HONG KONG
TRACKS OF TROPICAL CYCLONES
AUGUST, 1978

- Typhoons —————
- Tropical Storms or Tropical Depressions - - - - -
- Tracks Uncertain - · - · - ·
- Daily Positions at 00 h C.M.T. ① — ②
- Intermediate 6 hrly Positions + + + + +

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



LOLA Oct

IRMA Sep

KIT Sep

T.D. Sep

T.D. Sep

T.D. Sep

KIT Sep

LOLA Sep

MAMIE Sep

JUDY Sep

MAMIE Oct

JUDY Sep

90°

100°

110°

120°

130°

140°

150°

160°

40°

40°

30°

30°

20°

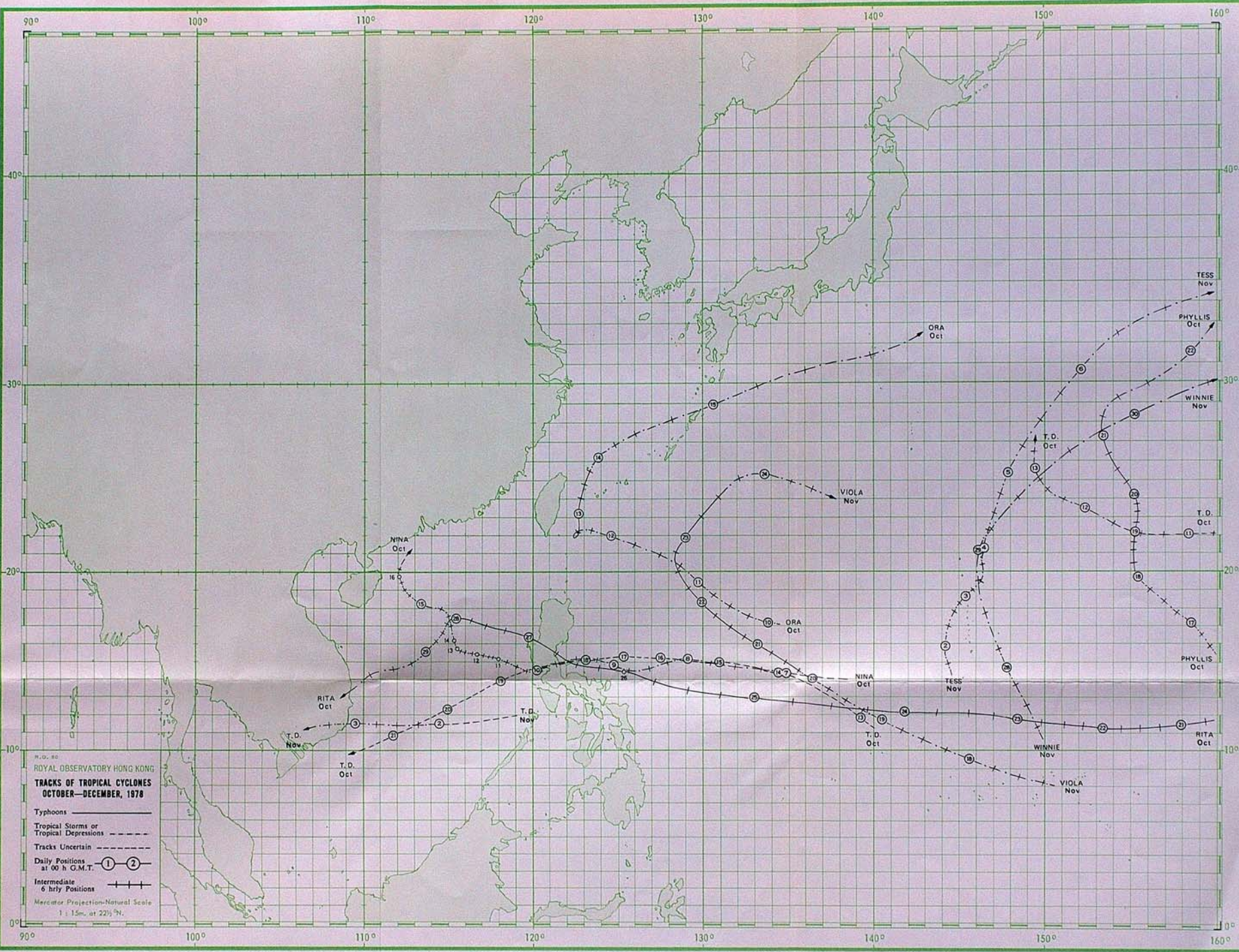
20°

10°

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R.O.C. 80
ROYAL OBSERVATORY HONG KONG
TRACKS OF TROPICAL CYCLONES
OCTOBER—DECEMBER, 1978

- 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.

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FOREWORD

This is the eleventh volume of Tropical Cyclone Summaries prepared by the Royal Observatory. The first issue dealt with the tropical cyclones of 1968 and appeared in 1971. These Tropical Cyclone Summaries have served as a convenient source of information on tropical cyclones occurring over the western North Pacific and the South China Sea.

A number of changes have taken place in the sources of basic data. Meteorological satellites, for example, have been constantly improved. The launch of the Japanese Geostationary Meteorological Satellite in 1978 was a major event in the history of tropical cyclone detection. Continuous surveillance of tropical cyclones is now possible even in areas with sparse conventional data.

The basic philosophy in preparing these summaries remains unchanged. We aim to collate all significant information on tropical cyclones occurring in this part of the world to make these reports sufficiently comprehensive to provide useful leads to research workers carrying out related investigations. We would be pleased to receive suggestions for further improving these summaries to meet the requirements of various users.

I wish to take this opportunity to thank Dr. P. C. Chin and the late Mr. S. Y. W. Tse for their efforts in starting this series of publication. I would also like to thank Messrs. T. S. Li and W. P. Kwong for their efforts in preparing and improving this publication during the past seven years.

GORDON J. BELL
Director
Royal Observatory

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 was done in order to meet the immediate needs of the press, shipping companies and others. These reports were cyclostyled and were 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				
Royal Observatory	22° 18'	114° 10'	(m)	(m)	(m)	Dines, Cup
Hong Kong Airport (Southeast)	22° 20'	114° 11'	33	32	61	Dines, Cup
Hong Kong Airport (Northwest)‡	22° 20'	114° 11'	24	4	16	Dines, Cup
Waglan Island	22° 11'	114° 18'	24	4	14	Dines, Cup
Tate's Cairn	22° 22'	114° 13'	62	55	75	Dines, Cup
Cheung Chau	22° 12'	114° 01'	*	575†	588	Dines
King's Park	22° 19'	114° 10'	79	72	92	Dines
Star Ferry	22° 19'	114° 10'	66	65	78	Cup
Green Island	22° 18'	114° 10'	*	3	17	Cup
Tsim Bei Tsui	22° 17'	114° 07'	*	76	90	Cup
Tai O	22° 29'	114° 00'	*	26	44	Dines
Castle Peak	22° 15'	113° 51'	*	76	90	Cup
	22° 23'	113° 58'	*	11	24	Dines

* No barometer.

† Level of the ground floor of the building compound of the Radar Station.

‡ Valid from 1 January to 27 November 1978 only.

Wind 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 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 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 in 1978 are tabulated and presented in the appendices.

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. Records of meteorological observations are in Hong Kong Time which is 8 hours ahead of G.M.T.

The following convention is used in this publication:

- (a) 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. During 1978 Hong Kong Time was eight hours in advance of Greenwich Mean Time.
- (b) 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 1978 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-stated 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 1978, 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 1978. 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 which is 8 hours ahead of G.M.T.

Table 4 presents a summary of the occasions on which the tropical cyclone warning signals were hoisted between 1946 and 1978. 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 1978. 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 1946-1978.

Table 7 presents the casualties and damage figures associated with tropical cyclones in Hong Kong for the period 1937-1978. 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 during the period 1974-1978. 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 1978. 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.

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TROPICAL CYCLONE SUMMARIES FOR 1978

In 1978 thirty-three* tropical cyclones formed over the western North Pacific and the South China Sea and thirteen of them attained typhoon intensity. Five tropical cyclones crossed the coast of China while the same number affected Taiwan. Nine† tropical cyclones passed over the Philippines and six crossed the coast of Indo-China while two dissipated just off the coast. Four tropical cyclones struck Japan and one landed in 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 the estimated minimum central pressures and maximum surface winds are also tabulated in the appendices. The monthly mean frequency of occurrence of tropical cyclones during the years 1947-1977 is given in Figure 2.

During the year there were twenty 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 figure of seventeen in the past thirty-one years. Thirteen tropical cyclones moved into the area while seven developed within it. Altogether 506 warnings for shipping were issued by the Royal Observatory in connection with nineteen of these tropical cyclones and tropical cyclone warnings signals were displayed in Hong Kong to give warning about eight of them.

In 1978 rainfall in Hong Kong associated with tropical cyclones amounted to 1372.2 mm which is more than twice the annual average of 566.9 mm and represents more than half of the year's total rainfall of 2593.0 mm. Most of the rainfall was due to two tropical cyclones, Severe Tropical Storm Agnes in July with 519.0 mm and Severe Tropical storm Nina in October with 420.2 mm.

Typhoon Olive was the first tropical cyclone that formed in the year 1978. It developed on 17 April over the Caroline Islands and moved into the South China Sea to threaten Hong Kong. This was the second time since 1947 that tropical cyclone warning signals were displayed in Hong Kong in April. Olive passed about 190 miles south-southeast of Hong Kong and had little effect on the weather in Hong Kong.

There were no tropical cyclones in May but three tropical cyclones in June landed in Vietnam, Taiwan and western Japan respectively.

Apart from Severe Tropical Storm Agnes there were three other typhoons in July. Typhoon Trix entered the east China coast near Shanghai; Typhoon Virginia passed close to the east coast of Japan and Typhoon Wendy crossed Kyushu and dissipated over the Sea of Japan. Severe Tropical Storm Agnes approached Hong Kong twice (once from the south and 3 days later from the southwest) and brought prolonged heavy rain. Agnes is unique in that it is the only tropical cyclone for which gale signals were hoisted on two separate occasions.

There were eight tropical cyclones over the western North Pacific and the South China Sea in August and tropical cyclone warning signals were hoisted for two of them. Typhoon Carmen crossed the Ryukyu Islands and later dissipated over Korea. Tropical Storm Della passed over Taiwan and degenerated into an area of low pressure near Xiamen (Amoy). One tropical depression landed in southern Japan while another two dissipated over the Pacific without encountering land.

Tropical cyclone warning signals were displayed in Hong Kong for Severe Tropical Storm Kit and Typhoon Lola in September. Two of the other five tropical cyclones in the month were unnamed and they both dissipated near the coast of north Vietnam. One of the remaining three landed in western Japan and the other two moved northward and eventually became extratropical well to the east of Japan.

Of the six tropical cyclones originated in October only Severe Tropical Storm Nina and Typhoon Rita came within three hundred miles of Hong Kong. The heavy rain associated with Nina caused many minor landslips and floods in Hong Kong while the strong to gale force winds of Typhoon Rita overturned several small boats and seriously affected air traffic. Typhoon Ora passed to the east of Taiwan and finally became an area of low pressure to the southeast of Japan. An unnamed tropical depression crossed the Philippines and dissipated off the coast of south Vietnam. Typhoon Phyllis and another tropical depression formed well to the east of the Mariana Islands and dissipated without encountering land.

The four tropical cyclones in November did not affect Hong Kong. One tropical depression landed in south Vietnam. The three others all originated near the Caroline Islands and dissipated over the Pacific.

No tropical cyclones were reported over the western North Pacific or the South China Sea in December.

* Typhoon Mary originated east of 160°E on 20 December 1977. It moved westwards and dissipated over the Philippines on 2 January 1978. Since, in this context, tropical cyclones were classified in accordance with the month of the first 6-hourly position of each track, Typhoon Mary was not counted as a tropical cyclone in 1978. This practice is intended to maintain consistency in the preparation of tropical cyclone statistics.

† including Typhoon Mary.

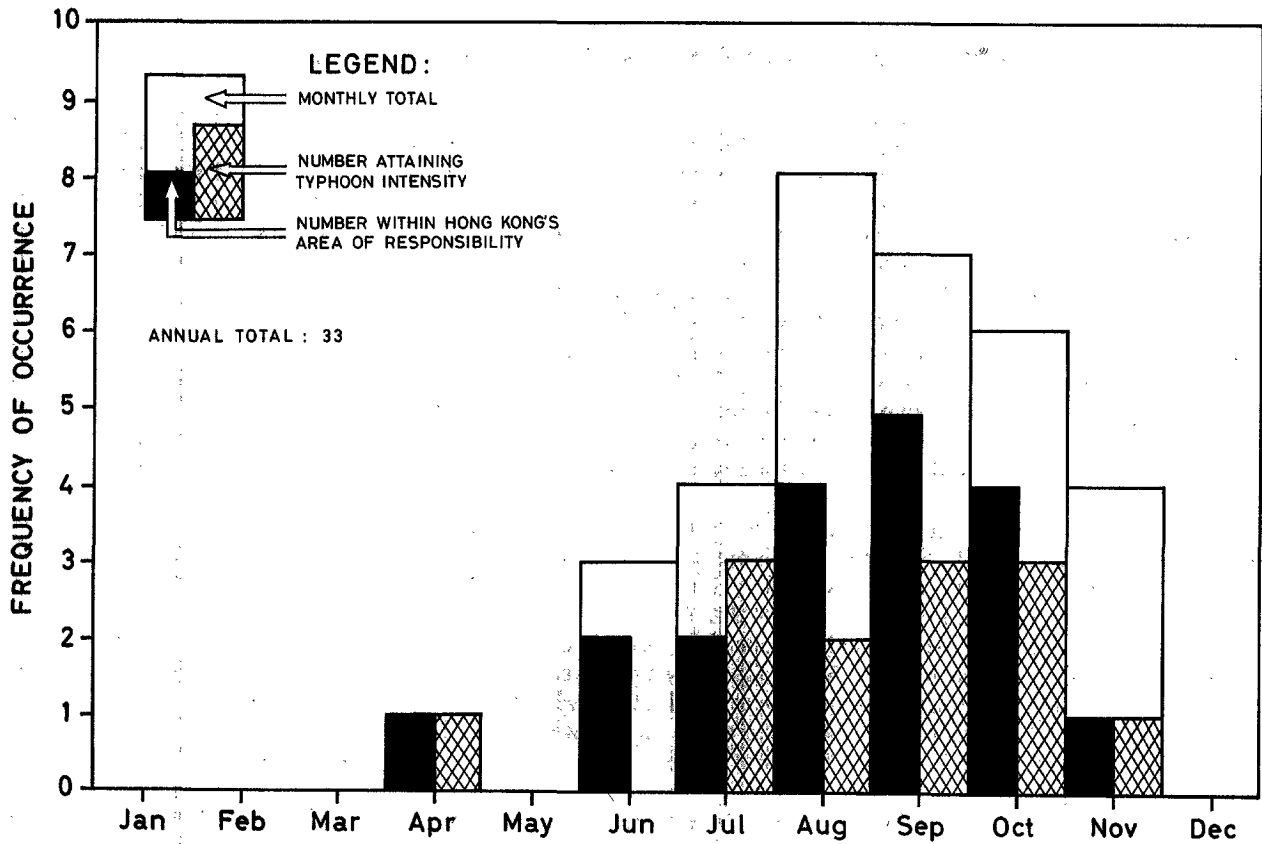


Figure 1. Monthly distribution of the frequency of occurrence of tropical cyclones and typhoons in the western North Pacific and the South China Sea in 1978 (classified in accordance with the month of the first 6-hourly position of each track).

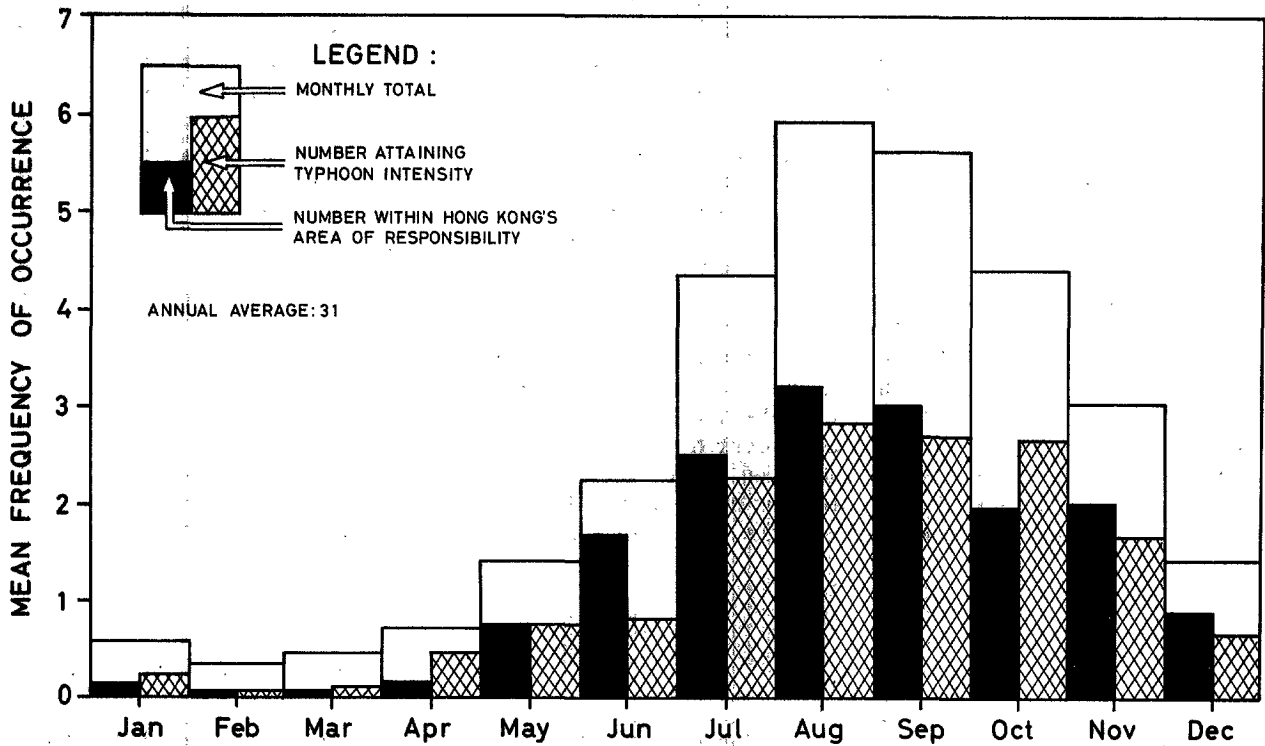


Figure 2. Monthly distribution of the mean frequency of tropical cyclones and typhoons in the western North Pacific and the South China Sea, 1947-1977 (classified in accordance with the first 6-hourly position of each track).

REPORTS ON TROPICAL CYCLONES AFFECTING HONG KONG IN 1978

TYPHOON OLIVE

17-27 April 1978

The track of this typhoon is shown in Figure 3

Typhoon Olive is one of the most intense tropical cyclones that has ever been observed in April. Winds of 90 knots and minimum sea-level pressure of 956 millibars were reported by reconnaissance aircraft when the typhoon was about 150 miles south of Hong Kong. A ship, the 'Lars Maersk', reported winds of 64 knots about 45 miles south-southeast of the centre. Olive was one of the very few typhoons that threatened Hong Kong and required the hoisting of the Stand By Signal as early in the year as April. The last similar occasion was Typhoon Violet of 1967.

Olive first developed as a tropical depression early on 17 April over the Caroline Islands about 1300 miles east-southeast of Manila. It moved steadily west-northwest towards south Luzon at 15 knots and intensified to a severe tropical storm three days later. Satellite pictures received at the Royal Observatory on the morning of 20 April indicated that the cloud mass of Olive covered an area about 300 miles in diameter and maximum winds were estimated to be about 60 knots (Figure 4). Later in the evening, a station in the central Philippines reported winds of 50 knots and a mean sea-level pressure of 991.1 millibars. After causing widespread damage over the central Philippines on 20-21 April, Olive continued to move west-northwest across the South China Sea and intensified further to a typhoon on the evening of 22 April. Satellite pictures revealed that Olive had a well-defined eye and its cloud mass covered an area about 350 miles in diameter. Maximum winds were estimated to be about 110 knots from these pictures (Figure 5). At 11.31 p.m. a reconnaissance aircraft reported that the minimum central pressure of Olive had dropped to 958 millibars. On the morning of 23 April, there were indications that Olive would take a more northerly course and come closer to Hong Kong. The Stand By Signal, No. 1, was therefore hoisted at 11.40 a.m. when the typhoon was centred about 360 miles south of Hong Kong.

Typhoon Olive took a northerly course during the night and established a steady northeasterly movement by the afternoon of 24 April as indicated by the Royal Observatory weather radar. The typhoon was closest to Hong Kong around 8.00 p.m. when it was centred about 190 miles to the south-southeast. The minimum sea-level pressure near the centre of Olive at this time was estimated to be about 960 millibars and winds of 90 knots were reported by reconnaissance aircraft a few hours earlier. Olive passed to the south of Dongsha Dao (Pratas Island) around midnight and rapidly moved out of the South China Sea on 25 April. In Hong Kong the Stand By Signal was lowered at 5.10 a.m. on the same day when Olive was centred about 230 miles to the east-southeast. Olive weakened gradually after crossing the Bashi Channel and degenerated into a low pressure area about 450 miles to the east-southeast of Okinawa on the morning of 27 April.

Typhoon Olive had little effect on the weather in Hong Kong. Winds were generally light to moderate easterly on 23 April but became fresh by the next morning. The weather was mainly cloudy on 23 and 24 April. It was brilliantly fine on the morning of 25 April and in the afternoon a maximum temperature of 31.5°C was recorded at the Royal Observatory. Other than the 1.1 mm of rainfall recorded at the Royal Observatory when thunderstorms occurred on the afternoon of 25 April, the passage of Olive did not bring any rain to Hong Kong as the nearest spiral rain band associated with the typhoon only came as close as 50 miles to the southeast. The minimum sea-level pressure at the Royal Observatory was 1005.0 millibars recorded at 6.00 p.m. on 24 April when the typhoon was about 190 miles to the south-southeast of Hong Kong. There were no reports of damage to property in Hong Kong.

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

Location	Highest tide above chart datum			Maximum storm surge above predicted level		
	Height (m)	Date	Time	Height (m)	Date	Time
North Point	2.3	25 Apr	10.30 a.m.	0.3	25 Apr	7.45 a.m.
Tai Po Kau	2.1	25 Apr	noon	0.3	25 Apr	7.30 a.m.
Chi Ma Wan (Lantau Island)	2.6	25 Apr	11.30 a.m.	0.7	25 Apr	1.45 p.m.

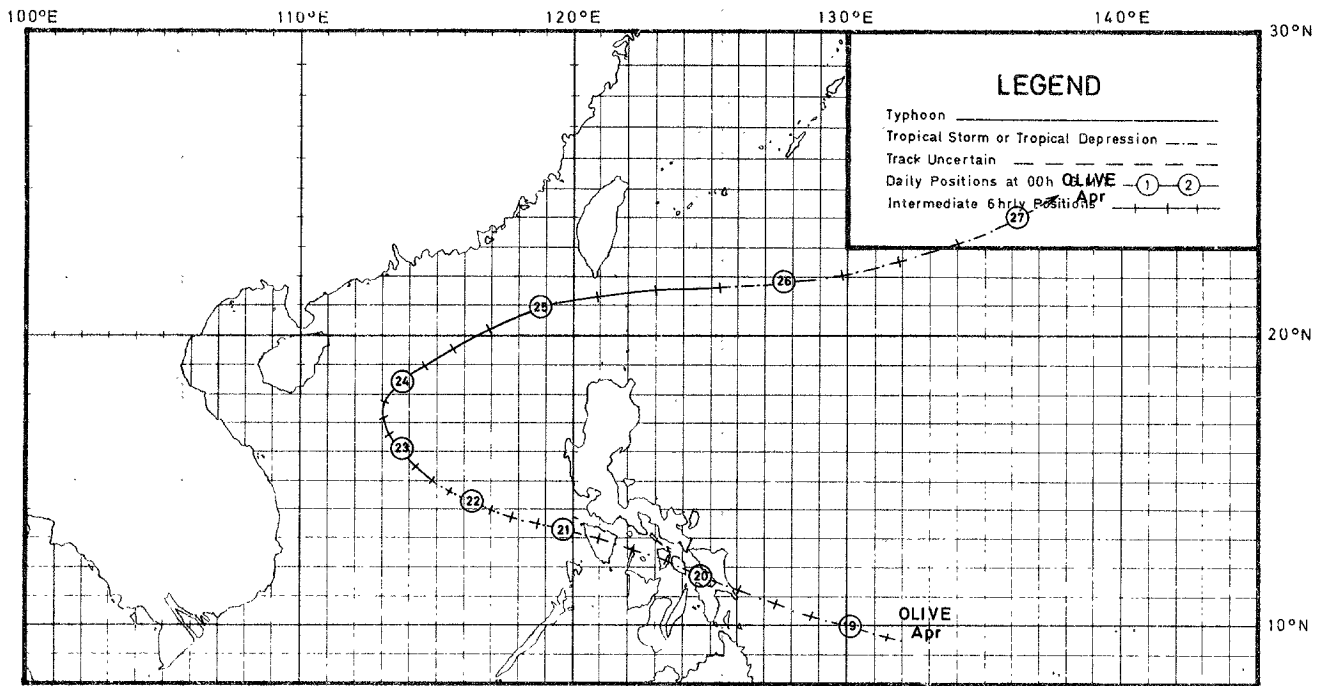


Figure 3. Track of Typhoon Olive: 17-27 April 1978.

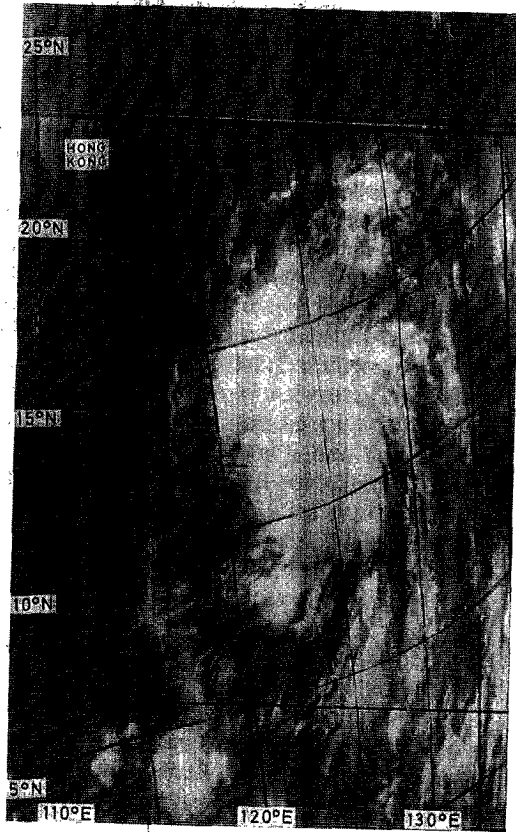


Figure 4. NOAA-4 infra-red APT picture of Typhoon Olive taken around 8.00 a.m. on 20 April 1978.

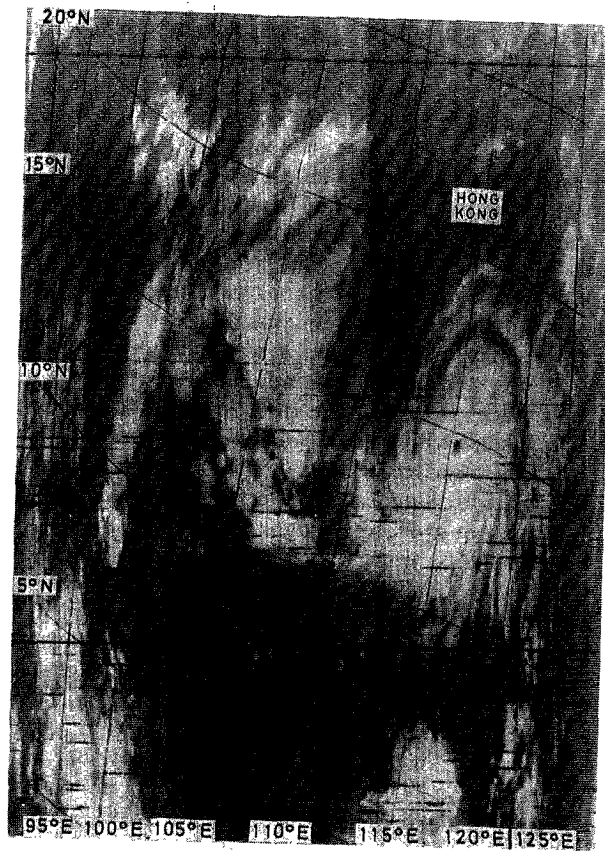


Figure 5. NOAA-4 infra-red APT picture of Typhoon Olive taken around 9.00 p.m. on 22 April 1978.

SEVERE TROPICAL STORM AGNES

24-30 July 1978

The track of this severe tropical storm is shown in Figure 6

Very few tropical cyclones have ever approached Hong Kong twice and Severe Tropical Storm Agnes is unique in that it is the only tropical cyclone for which gale signals were hoisted on two separate occasions. However the duration of the tropical cyclone warning signals did not break any records and the maximum sustained winds in the harbour were only 41 knots. Agnes, the fourth wettest tropical cyclone since 1884, brought 519.0 millimetres of much needed rain to Hong Kong and 14 smaller reservoirs were filled. As Agnes was slow moving rainfall in Hong Kong was very persistent and lasted for a long time but was fortunately never very intense.

An area of low pressure formed over the northern part of the South China Sea on 22 July. Meteorological satellite pictures received at the Royal Observatory early on the afternoon of 24 July indicated that the low pressure area over the South China Sea had developed into a tropical depression (Figure 7). At 2.00 p.m. it was centred about 310 miles south of Hong Kong and it moved northwards at about 9 knots towards the south China coast. In Hong Kong the Stand By Signal, No. 1, was hoisted at 7.30 a.m. on 25 July when the tropical depression was 180 miles away to the south-southeast. The tropical depression intensified into a tropical storm later in the afternoon and at 2.00 p.m. the M.V. 'Straat Nagoya' reported winds of 47 knots and a pressure of 990.6 millibars when it was 55 miles east-southeast of the centre. Satellite pictures received at the Royal Observatory revealed that the spiral cloud bands had become more organized but the eye was very diffuse (Figure 8).

Although the spiral rain bands associated with the tropical storm appeared on the Royal Observatory radar early on 25 July, it was difficult to locate the centre accurately as no well-defined eye could be observed. However, the radar observations indicated that during the evening the tropical storm slowed down slightly and gradually turned onto a northwesterly course. As the tropical storm was moving closer to Hong Kong, the Stand By Signal was replaced by the Strong Wind Signal, No. 3, at 10.50 p.m. on 25 July when the tropical storm was centred about 100 miles to the southeast. Overnight it moved west-northwest at about 5 knots. At 5.00 a.m. the M.V. 'Meric Viking' reported winds of 50 knots and a pressure of 993 millibars when it was 70 miles north-northeast of the tropical storm which was named Agnes. Radar observations early on the morning of 26 July indicated that the circulation of Agnes had become well organized although there was still no well-defined eye (Figure 9). At 7.00 a.m. Agnes was upgraded to a severe tropical storm when it was centred about 65 miles southeast of Hong Kong.

Agnes slowly approached Hong Kong but gales in urban areas were not expected until the evening because of the sheltering effect of the local hills. At 9.00 a.m. the Royal Observatory received a report from the M.V. 'S.A. Huguenot' made at 8.00 a.m. when it was 50 miles south-southwest of Hong Kong. This ship reported winds of 45 knots and a pressure of 989.8 millibars when it was 55 miles west of the centre of Agnes. At this time radar observations and satellite pictures suggested that Agnes was beginning to take a more westerly course which would cause it to pass about 50 miles to the south of Hong Kong. On this track winds would be expected to strengthen significantly as they turned from northeast to east. The 0000 G.M.T. observations confirmed the westerly movement and the Strong Wind Signal was therefore replaced by the No. 8 NORTHEAST Gale or Storm Signal at 9.15 a.m. on 26 July when Agnes was 60 miles southeast of the Royal Observatory.

During the morning and afternoon, Agnes moved on a westerly course at 6 knots across the South China Sea about 50 miles south of Hong Kong. At 2.00 p.m. winds of 60 knots and a pressure of 985.8 millibars were reported by the M.V. 'American Apollo' when it was 40 miles east of Agnes. Radar observations indicated well organized spiral rain bands associated with Agnes but the eye was still diffuse (Figure 10). Winds in Hong Kong gradually turned to easterly as expected and the No. 8 NORTHEAST Gale or Storm Signal was replaced by the No. 8 SOUTHEAST Gale or Storm Signal at 3.45 p.m. when Agnes was centred about 50 miles south of the Royal Observatory. Agnes was closest to Hong Kong around 5.00 p.m. and the Royal Observatory recorded a minimum pressure of 989.9 millibars. The minimum central pressure of Agnes was estimated to be about 980 millibars.

Agnes remained quasi-stationary about 60 miles due south of Hong Kong from approximately 5.00 p.m. to 10.00 p.m. and then began to drift slowly westwards and moved gradually away from Hong Kong. The No. 8 SOUTHEAST Gale or Storm Signal was replaced by the Strong Wind Signal at 1.30 p.m. on 27 July when Agnes was 100 miles southwest of Hong Kong and was moving westwards at 5 knots. During the afternoon it passed about 30 miles to the south of Shangchuan Dao where maximum winds of 52 knots with gusts of 76 knots and a minimum sea-level pressure of 984.8 millibars were reported.

Probably due to the extensive circulation of Typhoon Wendy, centred near the Ryukyu Islands, Agnes slowed down during the night of 27 July and remained quasi-stationary about 70 miles southwest of Shangchuan Dao. During the next day Agnes reversed its course and began to move eastwards at 4 knots, once again coming closer to Hong Kong. The Strong Wind Signal therefore remained hoisted. Radar observations late on the morning

of 29 July indicated that Agnes had begun to turn onto a northeasterly course at a speed of about 8 knots and was coming closer to Hong Kong. When Agnes was centred about 120 miles south-southwest of Hong Kong, the public were warned that the Gale or Storm Signal might be hoisted again later in the day. Agnes continued to move closer to Hong Kong and winds gradually increased from the northeast. The No. 8 NORTHEAST Gale or Storm Signal was hoisted again at 5.25 p.m. on 29 July when Agnes was 65 miles south of the Royal Observatory. At 5.00 p.m. the M.V. 'Tokyo Maru' reported a pressure of 973.0 millibars when it was near the centre of Agnes. During the evening and night of 29 July the Severe Tropical Storm varied between a northerly and a northeasterly course at about 8 knots heading towards the south China coast to the east of Hong Kong. Agnes was closest to Hong Kong around 3.00 a.m. on 30 July when it was 35 miles east of the Royal Observatory where a minimum sea-level pressure of 986.6 millibars was recorded. The minimum central pressure of Agnes at this time was estimated to be about 975 millibars. Gales in Hong Kong backed steadily from northeast to west overnight and the No. 8 NORTHEAST Gale or Storm Signal was replaced in succession by the No. 8 NORTHWEST at 2.30 a.m. and the No. 8 SOUTHWEST at 4.40 a.m. on 30 July respectively. Radar observations during the night indicated that Agnes was becoming less intense and its centre was difficult to locate (Figure 11). Agnes entered the south China coast about 40 miles east-northeast of the Royal Observatory around 5.00 a.m. The gales began to subside and the No. 8 SOUTHWEST Gale or Storm Signal was replaced by the Strong Wind Signal at 7.10 a.m. on 30 July when Agnes was about 45 miles northeast of the Royal Observatory. Agnes weakened rapidly over land and in Hong Kong, all signals were lowered at 3.10 p.m. on 30 July when Agnes degenerated into an area of low pressure over east Guangdong (Kwangtung) about 90 miles northeast of Hong Kong.

In Hong Kong winds were moderate easterly on 24 July but gradually freshened from the northeast during the next day. Fresh to strong northerlies set in overnight on 25th and by the next morning strong winds were being experienced in most places around Hong Kong with gales off shore and on hill-tops. Winds gradually turned to northeasterly during the afternoon and became easterly by the evening. As Hong Kong is exposed to easterly winds, almost continuous gales affected the urban areas from 6.00 p.m. on 26th until the next morning. The gales subsided in the afternoon but winds remained strong from the east. When Agnes approached Hong Kong again on 29th, winds increased once more from the northeast and gales were experienced in exposed places during the evening. Overnight, winds steadily turned first northerly and then westerly and slowly decreased in strength, but were still strong during the forenoon of 30 July. Winds subsided after midday and became light to moderate later in the day.

During the two approaches of Severe Tropical Storm Agnes, Tate's Cairn recorded a total of 48 hours of gales, (in this context, mean hourly winds equal to or exceeding 34 knots are listed as gales) 30 hours of which were continuous while Waglan Island recorded 39 hours, 27 of which were continuous. Gales were also recorded for 31 hours at Cheung Chau, 17 hours at the Star Ferry and 6 hours at the Hong Kong Airport. The maximum winds and gust peak speeds recorded at some selected locations were as follows:

Location	Maximum mean hourly wind in points and knots				Maximum gust in points and knots			
	First Approach (26-27 July)		Second Approach (29-30 July)		First Approach (26-27 July)		Second Approach (29-30 July)	
Royal Observatory	ENE	32	W	22	E	71	ENE	49
Hong Kong Airport (SE)	ENE	36	NW	25	ENE	70	NW	50
Hong Kong Airport (NW)	E	32	NW	25	E	67	ENE	53
Waglan Island	E	60	N	46	E	76	N	61
Tate's Cairn	ENE	59	NNE	48	ENE	93	NE	70
Cheung Chau	E	48	WNW	36	E	73	NW	52
King's Park	E	34	N	23	E	65	NW	48
Star Ferry	E	41	WNW	31	E	74	WNW	48
Green Island	ENE	60	E	40	E	90	NW	58
Tsim Bei Tsui	ESE	42	NW	30	E	57	NW	41
Tai O	NE	45	N	35	E	80	NNE	50
Castle Peak	N	22	NW	27	NE	51	NW	41
Stanley	not available							

The weather was mainly fine and hot on 24 July but showers began to set in during the evening. Continuous rain commenced on 26th and lasted until 30th. The weather improved on 31st and was fine and hot, apart from some scattered showers in the morning. The hourly rainfall rate was never very intense, and for most of the time it was less than 10 mm per hour at the Royal Observatory. There were only two hours with rainfall exceeding 20 mm ending at midnight on 24th and at 4 a.m. on 27th. Radar observations showed that even in the wall clouds round the eye the cloud tops never extended above about 8000 metres and these inner wall clouds never actually passed over Hong Kong.

The daily amounts of rainfall recorded at the Royal Observatory were as follows:

July 24	29.4 mm
25	22.5 mm
26	97.4 mm
27	110.5 mm
28	52.6 mm
29	118.5 mm
30	71.5 mm
31	12.3 mm
Total:	514.7 mm

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

Location	Highest tide above chart datum			Maximum storm surge above predicted level		
	Height (m)	Date	Time	Height (m)	Date	Time
North Point	2.2	26 Jul	1.45 p.m.	0.6	26 Jul	6.00 p.m.
Tai Po Kau	2.7	26 Jul	3.00 p.m.	1.2	26 Jul	3.00 p.m.
Chi Ma Wan (Lantau Island)	2.5	27 Jul	3.15 a.m.	0.9	26 Jul	9.45 a.m.

Although the normal activities in Hong Kong were affected by Severe Tropical Storm Agnes, no heavy damage to property resulted from the gale force winds. However, due to the prolonged rain, farmers in the New Territories suffered heavy losses as more than 1000 hectares of vegetable and flower crops were either inundated or destroyed and many fish ponds overflowed.

A total of 137 casualties were reported, mainly due to falling objects and flying glass. Two people were drowned in a taxi when it plunged into a pool of standing water. Another woman was killed when a hut collapsed in a landslide. More than 800 persons had to seek refuge in typhoon shelters.

The prolonged rain resulted in a number of landslips but none of them was very serious. Many roads and villages were flooded. One of the worst cases occurred in Chai Wan Kok in Tsuen Wan where three huts were washed away and another 30-40 huts were damaged. Many scaffoldings collapsed, roads were blocked by fallen trees and hoardings from construction sites and some old houses were severely damaged or undermined by the prolonged rain.

Traffic of all kinds was seriously interrupted. A total of 34 incoming flights were diverted from Hong Kong and 39 scheduled arrivals and 42 departures were cancelled. The number of delayed arrivals and departures totalled 61. All ferry services were suspended while buses, trams and trains all stopped running.

Some minor incidents occurred at sea. A few ships either dragged their anchors or drifted from their moorings but no serious damage was reported.

There was heavy damage to trees because they had been able to grow considerably in the last nine months since such strong winds last affected Hong Kong.

The ten wettest tropical cyclones since 1884 are shown in the following table:

TEN WETTEST TROPICAL CYCLONES
1884-1939; 1947-1978

Period when tropical cyclone was within 300 nautical miles of Hong Kong	Name of tropical cyclone	Total tropical cyclone rainfall* recorded at the Royal Observatory
17-18 Jul 1926	—	597.4
1-3 Jun 1916	—	559.8
26-27 Sep 1965	T.S. Agnes	527.4
24-30 Jul 1978	S.T.S. Agnes	519.0
23-24 Aug 1976	T.S. Ellen	516.1
17-19 Oct 1974	T. Carmen	469.3
23-28 Aug 1904	—	447.0
3-5 Aug 1911	—	437.9
4-6 Oct 1894	—	427.4
14-15 Jul 1925	—	423.2

* Total tropical cyclone rainfall is defined as the rainfall recorded during the period when the tropical cyclone was centred within 300 nautical miles of Hong Kong and during the following 3 days after the tropical cyclone moved outside or dissipated within 300 nautical miles of Hong Kong.

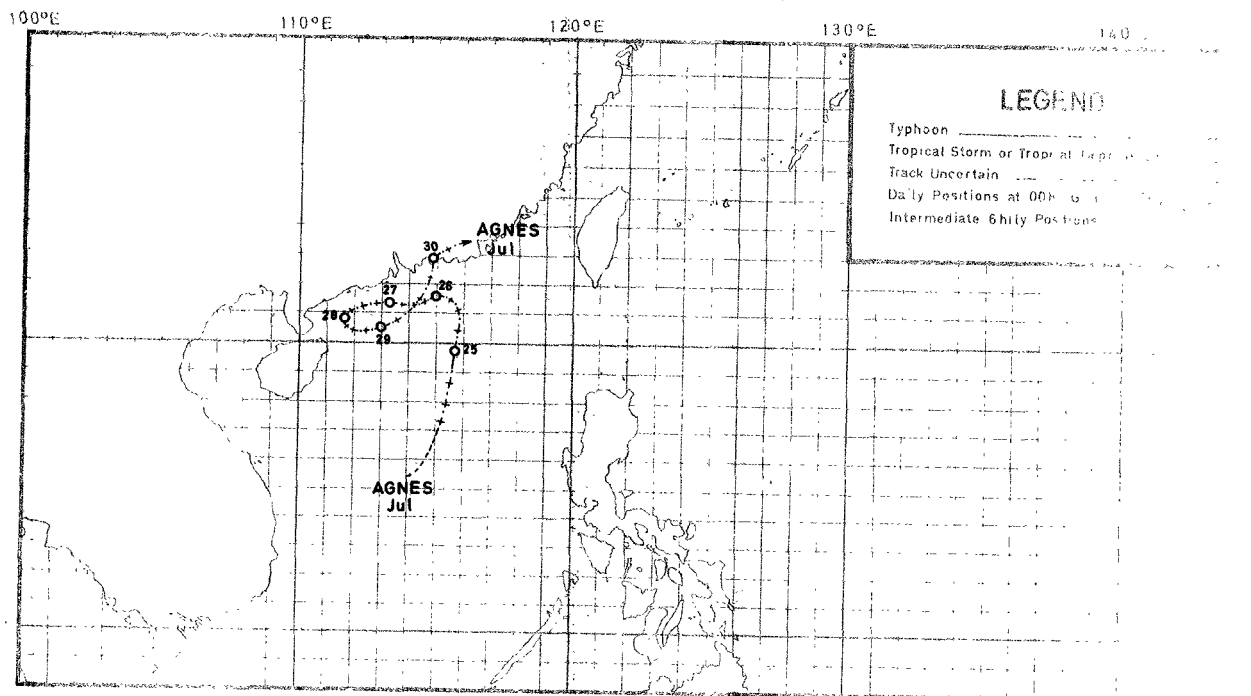


Figure 6. Track of Severe Tropical Storm Agnes: 24-30 July 1978.

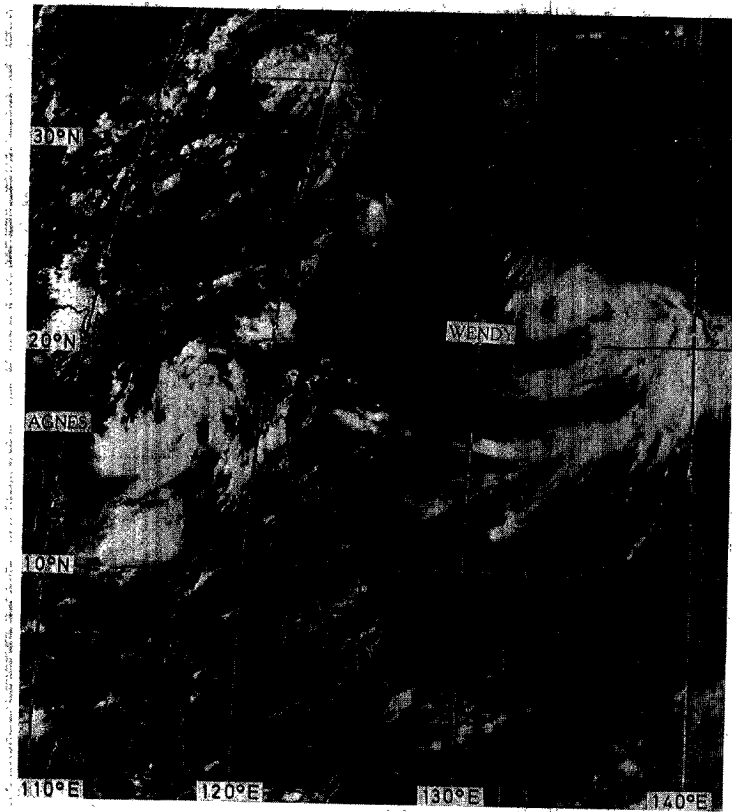


Figure 7. GMS-1 visible picture of Severe Tropical Storm Agnes taken around 2.00 p.m. on 24 July 1978.



Figure 8. GMS-1 visible picture of Severe Tropical Storm Agnes taken around 2.00 p.m. on 25 July 1978.



Figure 9. Radar picture of Severe Tropical Storm Agnes taken at 4.00 a.m. on 26 July 1978.
(Range markers at 40-mile intervals)

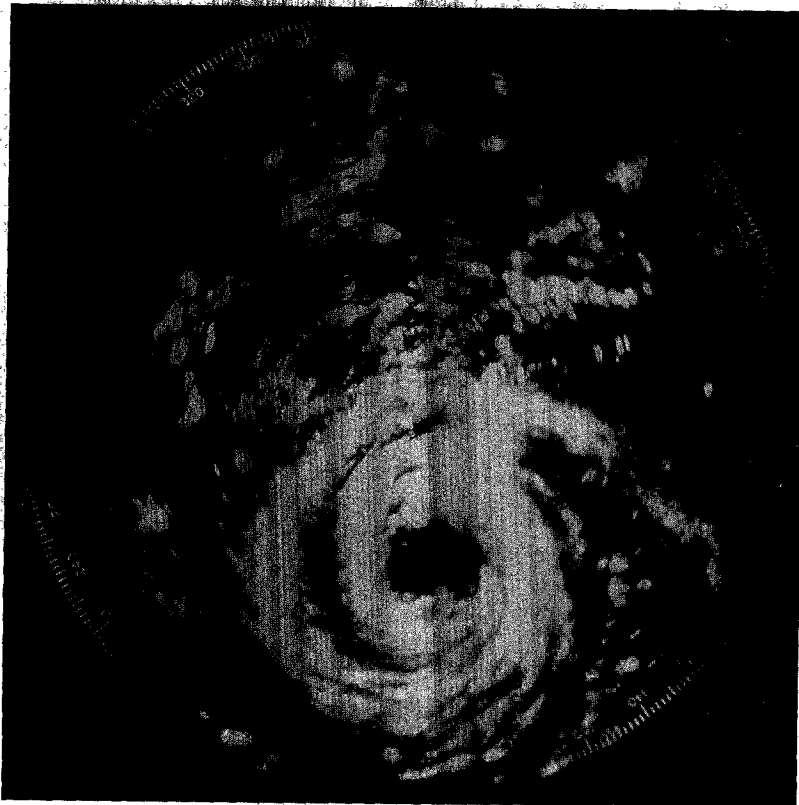


Figure 10. Radar picture of Severe Tropical Storm Agnes taken at 2.00 p.m. on 26 July 1978.
(Range markers at 40-mile intervals)



Figure 11. Radar picture of Severe Tropical Storm Agnes taken at 5.00 a.m. on 30 July 1978.
(Range markers at 40-mile intervals)

TROPICAL STORM BONNIE

9-12 August 1978

The track of this tropical storm is shown in Figure 12

In October 1974 in Typhoon Bess, a U.S. Air Force reconnaissance plane was lost with its crew of six. It was then intended to replace the name Bess by Bonnie. However, early warnings for the August 1978 storm from Guam inadvertently used the name Bess while later warnings changed to Bonnie. To avoid confusion during the course of the storm, the Royal Observatory Hong Kong continued to use the name Bess but the correct name Bonnie will be used in the records.

Bonnie first developed as a tropical depression over the northern part of the South China Sea on 9 August. In Hong Kong the Stand By Signal, No. 1, was hoisted at 4.30 p.m. on the same day when Bonnie was centred about 240 miles to the south. The tropical depression remained almost stationary to the south of Hong Kong and intensified to a tropical storm by the next morning. At 8.00 a.m. the M.V. 'Taifookshan' reported winds of 30 knots when it was 175 miles north of the centre of Bonnie. Satellite pictures received at the Royal Observatory indicated that the cloud bands associated with Bonnie was very disorganized and the maximum winds near the centre barely reached tropical storm intensity (Figure 13).

As winds in Hong Kong gradually freshened from the east, the Stand By Signal was replaced by the Strong Wind Signal, No. 3, at 12.15 p.m. on 10 August when Bonnie was about 240 miles south-southwest of Hong Kong. Bonnie began to move steadily westwards at about 9 knots during the day and early next morning it crossed southern Hainan Dao (Hainan Island) where a minimum sea-level pressure of 986.8 millibars was reported. The tropical storm continued to move westwards and entered the coast of north Vietnam on the night of 11 August. It degenerated into an area of low pressure over northern Thailand during 12 August. In Hong Kong all signals were lowered at 10.10 a.m. on 11 August when Bonnie was over Hainan Dao (Hainan Island) about 370 miles to the southwest.

Bonnie was closest to Hong Kong when it first developed into a tropical depression about 240 miles to the south. Its minimum sea-level pressure at this time was estimated to be about 990 millibars and a minimum pressure of 998.9 millibars was recorded at the Royal Observatory at 3.00 p.m.

In Hong Kong winds freshened from the east overnight on 9 August and became strong by the following afternoon. Winds gradually subsided early on 11 August and became moderate later in the day. The maximum winds and gust peak speeds recorded at some selected locations were as follows:

<i>Location</i>	<i>Maximum mean hourly wind in points and knots</i>		<i>Maximum gust in points and knots</i>	
Royal Observatory	E	20	E	45
Hong Kong Airport (SE)	E	26	E	53
Hong Kong Airport (NW)	E	21	E	46
Waglan Island	E	33	E	42
Tate's Cairn	E	33	E	54
Cheung Chau	E	28	E	49
King's Park	E	22	E	40
Star Ferry	E	27	E	45
Green Island	E	34	E	52
Tsim Bei Tsui	E	26		not available
Tai O	E	20	E	44
Castle Peak	E	12	E	30

Thunderstorms on the morning of 9 August heralded the onset of squally showers which lasted until the early morning of 12 August. The showers were heavy and frequent at first but became less so later in the period. The weather improved rapidly on 12 August and soon became fine and sunny. The daily amounts of rainfall recorded at the Royal Observatory were as follows:

August 9	37.9 mm
10	29.1 mm
11	14.1 mm
12	1.1 mm
Total:	82.2 mm

Although there was some minor flooding near Chai Wan, no damage to property was reported during the passage of Tropical Storm Bonnie. Apart from the temporary suspension of some ferry services to outlying islands, traffic was not affected.

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

Location	Highest tide above chart datum			Maximum storm surge above predicted level		
	Height (m)	Date	Time	Height (m)	Date	Time
North Point	1.9	11 Aug	2.30 a.m.	0.3	10 Aug	10.15 p.m.
Tai Po Kau	2.0	11 Aug	2.00 a.m.	0.5	11 Aug	10.30 a.m.
Chi Ma Wan (Lantau Island)	2.1	11 Aug	2.45 a.m.	0.6	10 Aug	9.30 a.m.

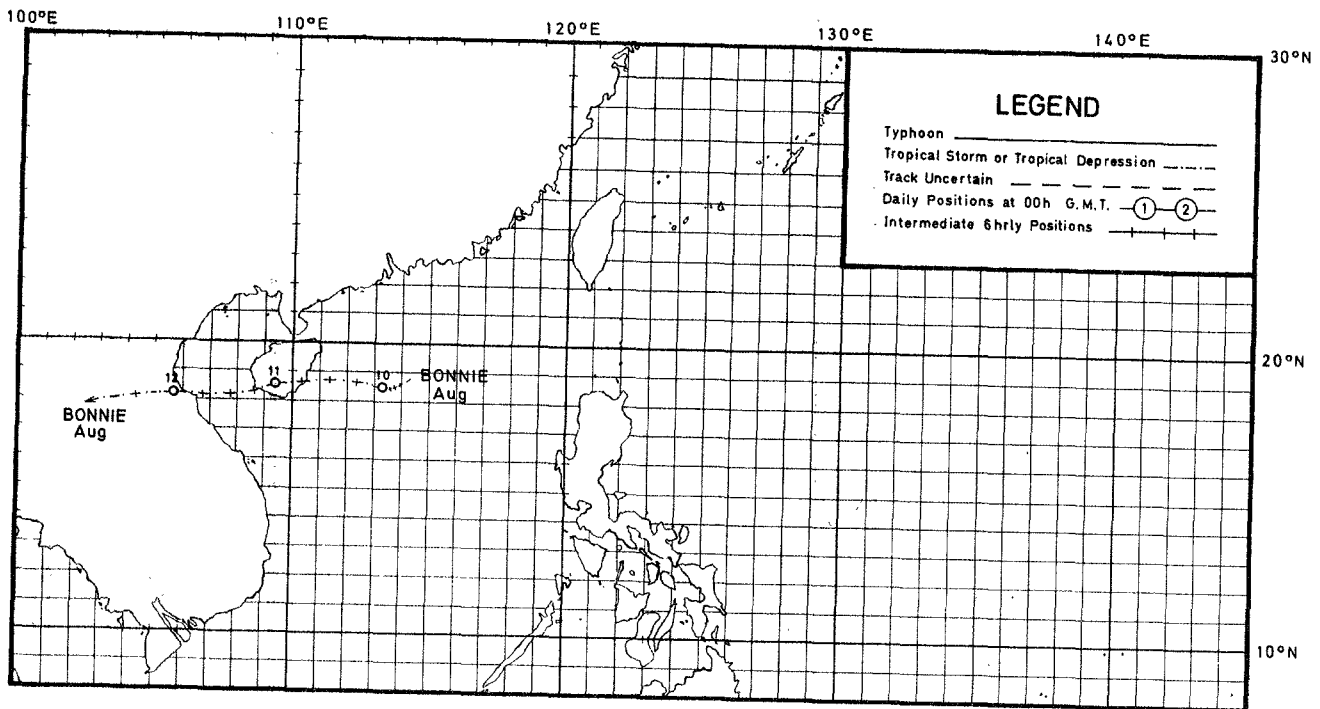


Figure 12. Track of Tropical Storm Bonnie: 9-12 August 1978.

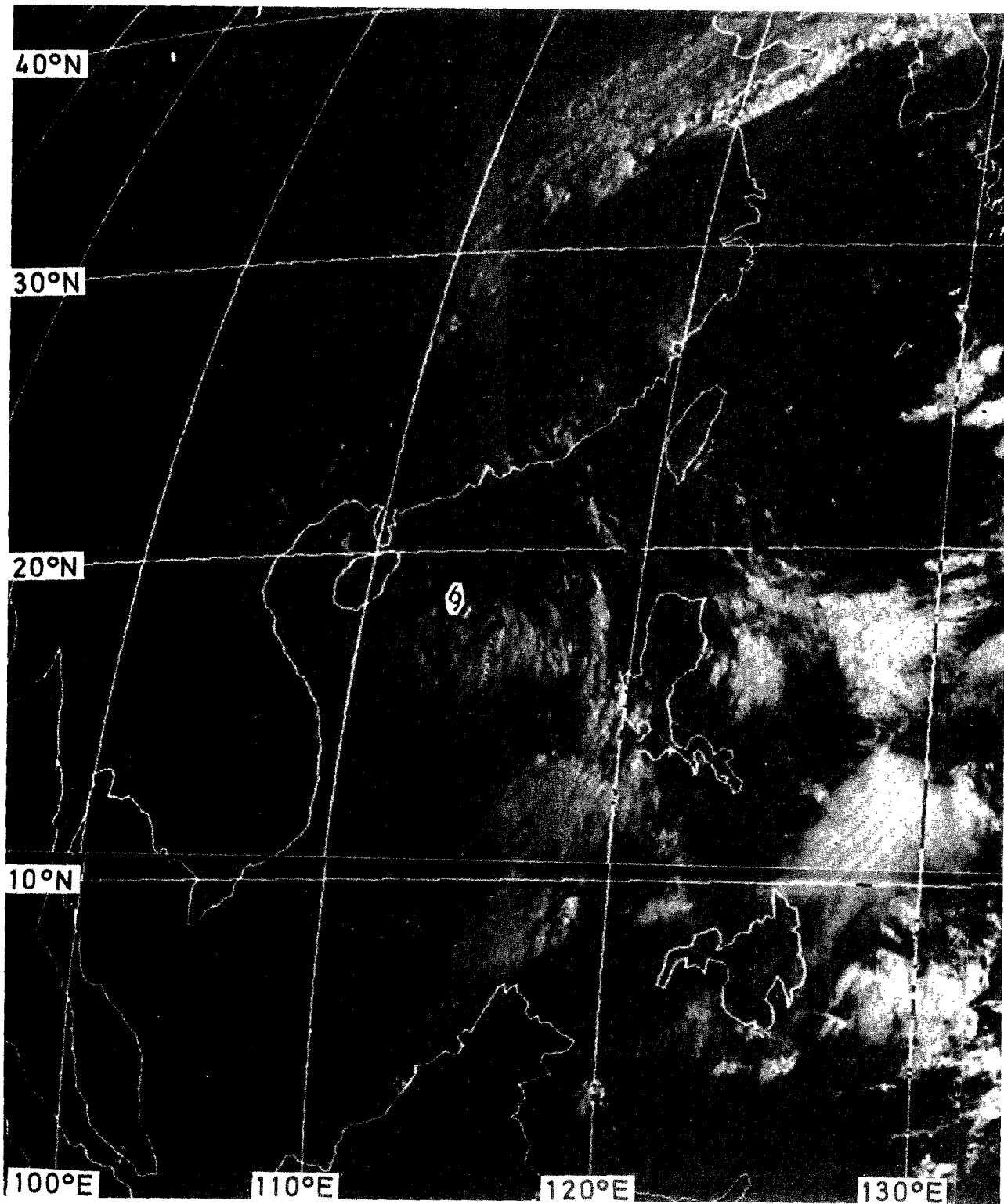


Figure 13. GMS-1 visible picture of Tropical Storm Bonnie taken around 8.00 a.m. on 10 August 1978.

SEVERE TROPICAL STORM ELAINE

23-28 AUGUST 1978

The track of this severe tropical storm is shown in Figure 14

Severe Tropical Storm Elaine first developed as a tropical depression about 270 miles northeast of Manila early on 23 August. At first it moved westwards to the northeast tip of Luzon but then changed to a southwesterly course across the island. It caused widespread damage and left thousands of people homeless in north Luzon. Elaine intensified to a tropical storm when it entered the South China Sea on the morning of 24 August. Satellite pictures received at the Royal Observatory revealed that there were well-organized spiral cloud bands but the centre was still ill-defined (Figure 15). Elaine further intensified to a severe tropical storm during the following morning and maximum winds near the centre were estimated from satellite pictures to be about 55 knots (Figure 16).

In Hong Kong the Stand By Signal, No. 1, was hoisted at 4.00 p.m. on 25 August when Elaine was centred about 380 miles to the southeast. Severe Tropical Storm Elaine moved northwestwards at about four knots and the next morning it passed about 130 miles south of Dongsha Dao (Pratas Island) where winds of 44 knots were reported. At 1.20 p.m. on 26 August it was centred about 240 miles south-southeast of Hong Kong and the Stand By Signal was replaced by the Strong Wind Signal, No. 3. During the early afternoon Elaine moved west-northwestwards and accelerated to about 10 knots. As winds over Hong Kong gradually strengthened from the northeast, the Strong Wind Signal was replaced by the No. 8 NORTHEAST Gale or Storm Signal at 9.15 p.m. on 26 August when Elaine was 180 miles south-southeast of Hong Kong. This was followed by the No. 8 SOUTHEAST Gale or Storm Signal at 7.10 a.m. the next morning when Elaine was 160 miles to the southwest.

Elaine almost reached typhoon intensity while it was over the northern part of the South China Sea and satellite pictures received at the Royal Observatory on both 26 and 27 August indicated that Elaine was very well-organized (Figures 17-18). At 5.00 a.m. on 26 August the M.V. 'Lloyd Bakke' reported a pressure of 967 millibars and winds of 37 knots when it was 50 miles northeast of the centre of Elaine. Minimum sea-level pressure of 970 millibars was also reported by a reconnaissance aircraft ten hours earlier. Elaine was closest to Hong Kong around 11.00 a.m. on 27 August when it was centred about 140 miles away to the southwest. At this time the pressure recorded at the Royal Observatory was 996.7 millibars and the minimum central pressure of Elaine was estimated to be about 965 millibars. Shangchuan Dao, 75 miles north of Elaine, reported winds of 54 knots with gusts up to 76 knots and a pressure of 986.9 millibars.

Gales in Hong Kong gradually subsided during the afternoon of 27 August as Elaine moved away from Hong Kong. The No. 8 SOUTHEAST Gale or Storm Signal was replaced by the Strong Wind Signal at 4.40 p.m. when Elaine was 170 miles to the west-southwest. Elaine entered the coast of west Guangdong (Kwangtung) around 5.00 p.m. and began to weaken as it moved westwards across Leizhou Bandao (the Luichow Peninsula). It degenerated into an area of low pressure over north Vietnam on the morning of 28 August. In Hong Kong all signals were lowered at 11.00 p.m. on 27 August when Elaine was 260 miles away to the west.

In Hong Kong winds were light and variable on 25 August but gradually freshened from the northeast the next morning. Strong winds were experienced in urban areas early on the evening of 26 August with gales off shore and on hill-tops. Gales became general over Hong Kong overnight and persisted until the following morning. The wind strength gradually decreased during the afternoon of 27 August and moderated later in the evening. The maximum winds and gust peak speeds recorded at some selected locations were as follows:

Location	Maximum mean hourly wind in points and knots		Maximum gust in points and knots	
	Direction	Speed	Direction	Speed
Royal Observatory	E	32	E	81
Hong Kong Airport (SE)	E	37	E	78
Hong Kong Airport (NW)	E	32	E	61
Waglan Island	ENE	53	ENE	69
Tate's Cairn	E	52	E	88
Cheung Chau	ESE	48	E	83
King's Park	E	36	E	68
Star Ferry	E	44	E	71
Green Island	E	44	E	80
Tsim Bei Tsui	ESE	46	not available	
Tai O	ESE	35	ESE	81
Castle Peak	not available		not available	

The weather was fine and hot on 25 August but scattered showers began to set in during the following afternoon. The showers became frequent and heavy on 27 August. However, the weather improved on 28 August when the afternoon was again fine and hot. The daily amounts of rainfall recorded at the Royal Observatory were as follows:

August 25	Nil
26	2.9 mm
27	45.8 mm
28	6.3 mm
29	0.6 mm
Total:	55.6 mm

Although gale force winds were experienced in Hong Kong during the passage of Elaine, little damage to property was reported. However, the severe tropical storm left one person dead and 51 people injured. Sixty people moved into typhoon shelters and a total of 1 143 people including many stranded picnickers stayed in emergency centres. Many roads were blocked by fallen scaffolding. One house on Hong Kong Island was declared in a dangerous condition and one hut in Tsuen Wan was damaged by a landslip. Traffic of all kinds was seriously affected. Nine aircraft were diverted from Hong Kong and another twenty flights were delayed.

Tides were running about one metre above normal early on 27 August but no flooding of low-lying areas was reported. The times and heights of the highest tides and maximum storm surges recorded at various locations during the display of tropical cyclone warning signals were as follows:

Location	Highest tide above chart datum			Maximum storm surge above predicted level		
	Height (m)	Date	Time	Height (m)	Date	Time
North Point	2.8	27 Aug	4.15 a.m.	1.0	27 Aug	8.30 a.m.
Tai Po Kau	2.9	27 Aug	5.00 a.m.	1.1	27 Aug	6.30 a.m.
Chi Ma Wan (Lantau Island)	3.0	27 Aug	4.00 a.m.	1.1	27 Aug	4.00 a.m.

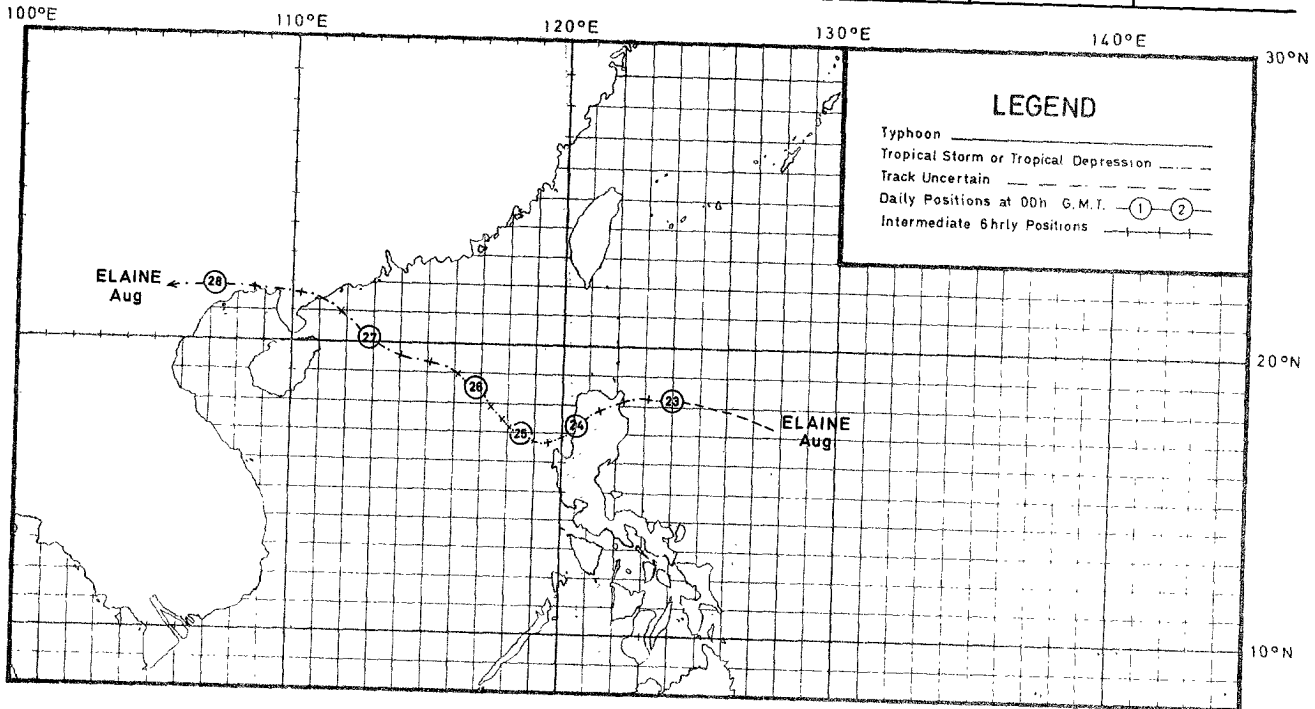


Figure 14. Track of Severe Tropical Storm Elaine: 23-28 August 1978.

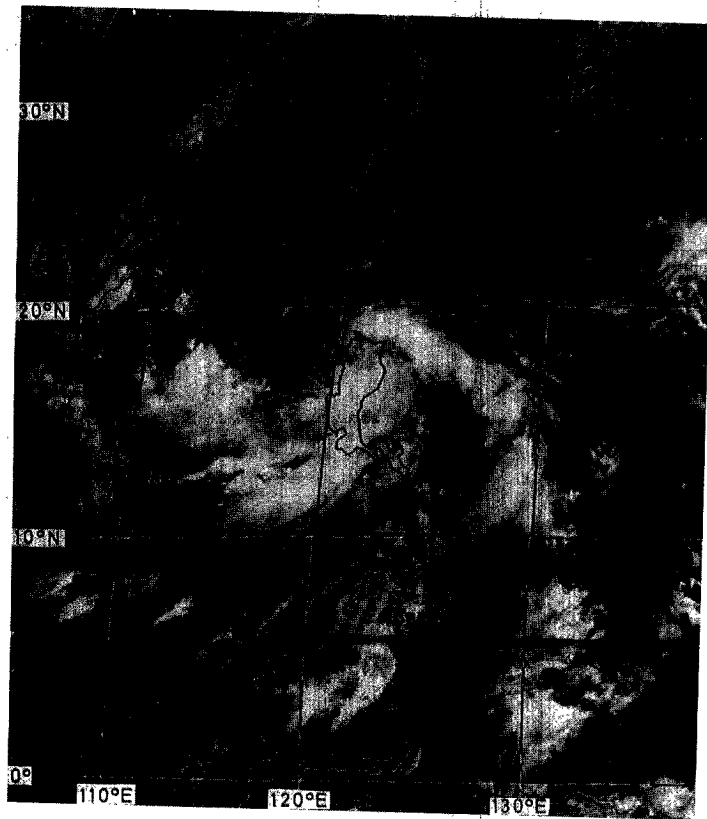


Figure 15. GMS-1 visible picture of Severe Tropical Storm Elaine taken around 11.00 a.m. on 24 August 1978.

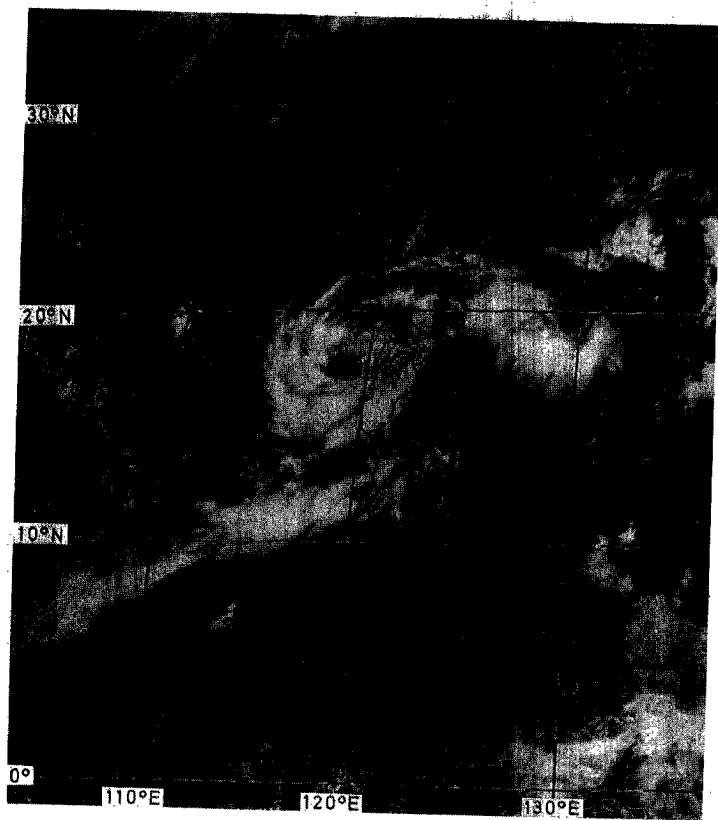


Figure 16. GMS-1 visible picture of Severe Tropical Storm Elaine taken around 11.00 a.m. on 25 August 1978.

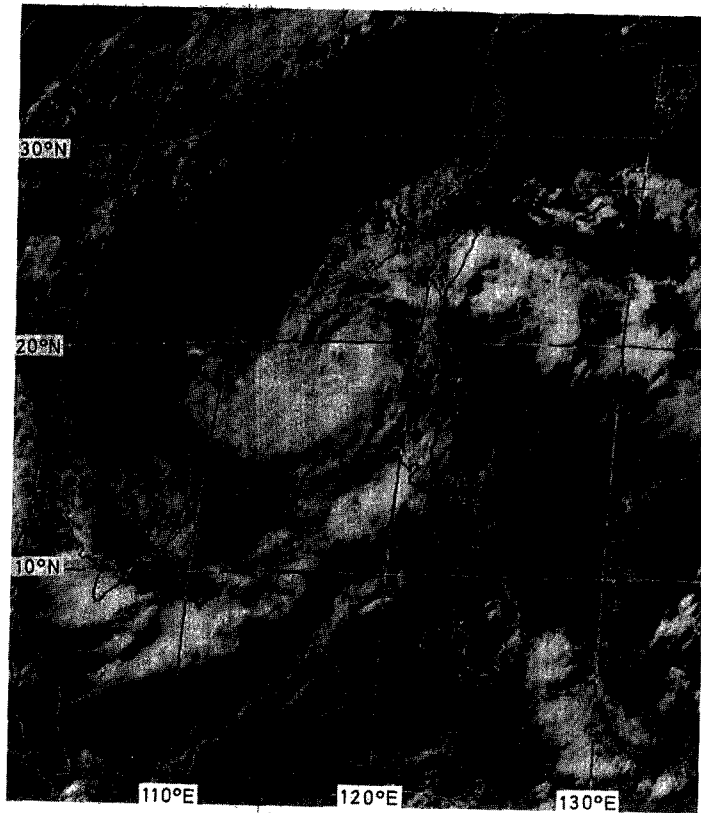


Figure 17. GMS-1 visible picture of Severe Tropical Storm Elaine taken around 2.00 p.m. on 26 August 1978.

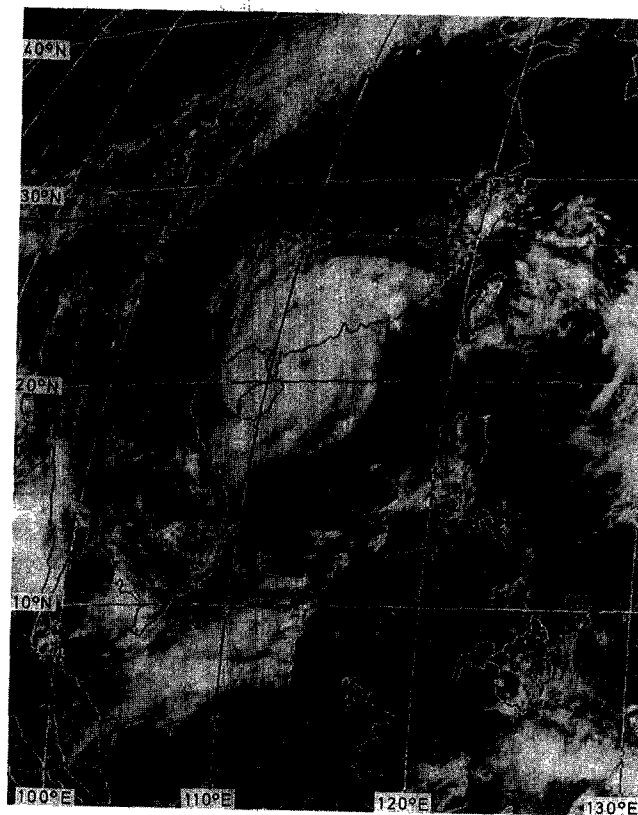


Figure 18. GMS-1 visible picture of Severe Tropical Storm Elaine taken around 2.00 p.m. on 27 August 1978.

SEVERE TROPICAL STORM KIT

22-26 SEPTEMBER 1978

The track of this severe tropical storm is shown in Figure 19

Severe Tropical Storm Kit first developed as a tropical depression about 230 miles east of Manila early on 22 September. It crossed central Luzon rapidly and entered the South China Sea the following morning. Satellite pictures received at the Royal Observatory later in the morning revealed that there were no spiral cloud bands associated with the circulation (Figure 20). However, as the tropical depression continued to move westwards across the South China Sea, it intensified and became a tropical storm early in the evening of 23 September when it was 440 miles south of Hong Kong. Maximum surface winds of 40 knots were reported by a reconnaissance aircraft at 5.58 p.m.

Kit gradually turned onto a northwesterly course during the night and enhanced the northeast monsoon over the northern part of the South China Sea. Winds outside Hong Kong Harbour became strong and the Strong Monsoon Signal was hoisted from 5.15 a.m. until 3.05 p.m. on 24 September. Meanwhile, Kit intensified further to become a severe tropical storm near Xisha Qundao (the Paracel Islands). Satellite pictures revealed that the spiral cloud bands associated with the circulation had become more organized (Figure 21). Winds of 60 knots were reported by the M.V. 'Bunga Teratai' near the centre of Kit but the pressure reported was only 999.7 millibars. A container ship, the 'American Sioux', ran aground on Bombay Reef in Xisha Qundao (the Paracel Islands) near the centre of Kit.

Later on 24 September the severe tropical storm moved slowly on a more northwesterly course which was bringing it closer to Hong Kong. The Stand By Signal, No. 1, was hoisted at 5.20 p.m. on the same day when Kit was 330 miles south-southwest of Hong Kong. Kit was closest to Hong Kong around 2.00 a.m. on 25 September when it was 320 miles to the south-southwest. At this time the pressure recorded at the Royal Observatory was 1010.7 millibars and the minimum central pressure of Kit was estimated to be about 990 millibars.

Kit changed to a westerly course on 25 September and passed the southern tip of Hainan Dao (Hainan Island) later in the afternoon. In Hong Kong all signals were lowered at 11.35 p.m. on the same day when Kit was 370 miles away to the southwest. Kit weakened gradually over the Gulf of Tonkin and crossed the coast of north Vietnam on the afternoon of 26 September. Although surface winds moderated on 27 September, Kit's circulation persisted at higher levels and widespread rain and flooding were reported over Vietnam, Lao and Thailand.

In Hong Kong winds were moderate northerly on 23 September but gradually freshened from the northeast overnight. Strong winds were experienced off shore on 24 September and they persisted until the following morning. However, winds in urban areas remained moderate or fresh.

It was fine and hot on 23 September but showers began to set in towards midnight. Frequent showers with occasional thunderstorms were experienced from 24 September until the morning of 26 September. The heaviest downpour occurred early on the morning of 26 September when the Royal Observatory recorded 30.8 mm of rainfall between 4.00 a.m. and 5.00 a.m. The daily amounts of rainfall recorded at the Royal Observatory were as follows:

23 September	0.4 mm
24 September	32.4 mm
25 September	71.5 mm
26 September	61.0 mm
Total:	165.3 mm

During the passage of Severe Tropical Storm Kit, no damage to property was reported. Although public transport was not affected, a speed boat with eight persons on board capsized near Ping Chau in Mirs Bay on the afternoon of 25 September. There was one survivor and all the other seven were reported missing.

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

Location	Highest tide above chart datum			Maximum storm surge above predicted level		
	Height (m)	Date	Time	Height (m)	Date	Time
North Point	2.4	25 Sep	2.30 a.m.	0.6	24 Sep	6.00 a.m.
Tai Po Kau	2.4	25 Sep	4.00 a.m.	0.7	24 Sep	3.00 p.m.
Chi Ma Wan (Lantau Island)	2.5	24 Sep	2.30 a.m.	0.6	24 Sep	3.15 a.m.

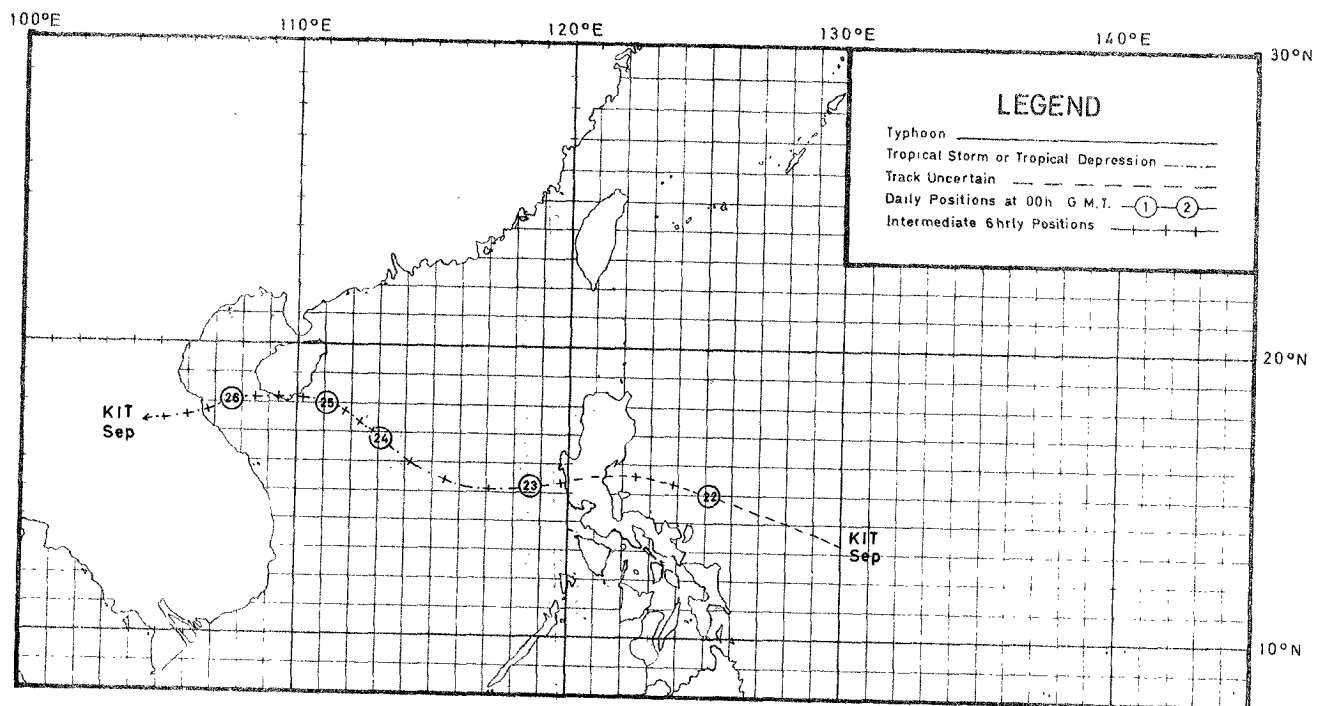


Figure 19. Track of Severe Tropical Storm Kit: 22-26 September 1978.

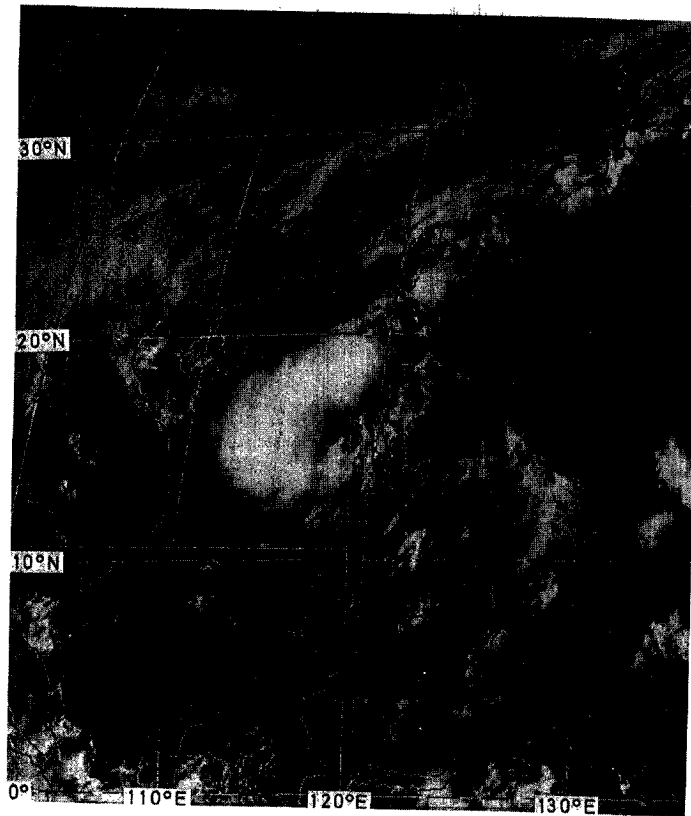


Figure 20. GMS-1 visible picture of Severe Tropical Storm Kit taken around 11.00 a.m. on 23 September 1978.

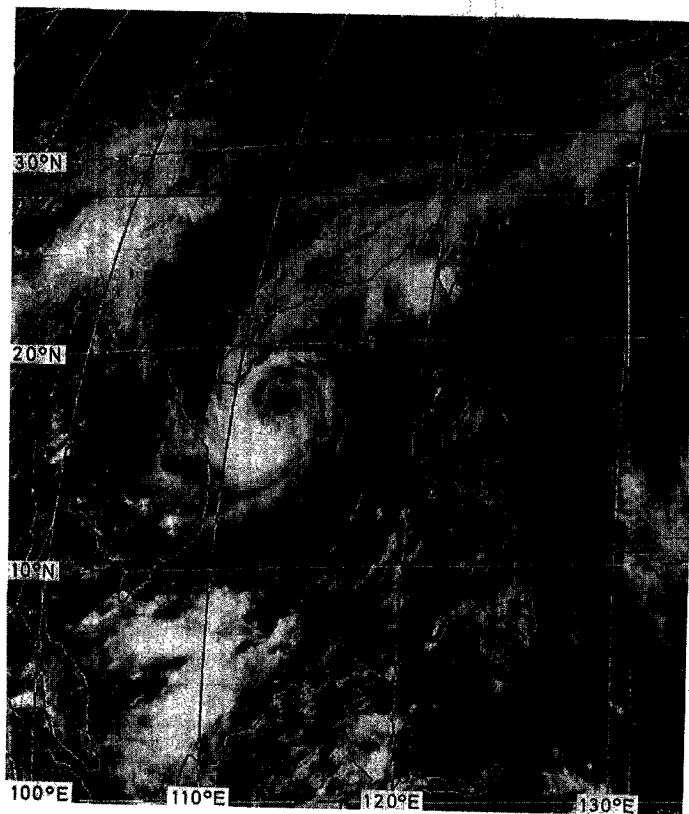


Figure 21. GMS-1 visible picture of Severe Tropical Storm Kit taken around 2.00 p.m. on 24 September 1978.

Typhoon Lola

24 September–3 October 1978

The track of this typhoon is shown in Figure 22

Lola was the first tropical cyclone of typhoon intensity to approach Hong Kong since Typhoon Olive in April this year. It developed as a tropical depression about 740 miles east of Manila on the evening of 24 September. At first it moved westwards at 13 knots but changed to a west-northwesterly course on 26 September after intensifying to a severe tropical storm. Satellite pictures received at the Royal Observatory in the morning indicated that the spiral cloud bands associated with the circulation had become more organized and maximum winds of 55 knots were estimated near the centre (Figure 23). Legaspi, a city on the southeastern tip of Luzon, reported a minimum sea-level pressure of 983.1 millibars at 2.00 a.m. on 27 September when Lola passed very close to it. Lola crossed central Luzon and caused extensive damage to crops and property. According to newspaper reports, 25 people were either killed or missing, more than 70 people were injured and thousands of people were made homeless.

Lola entered the South China Sea late on 27 September and continued to move west-northwest at 10 knots towards Hainan Dao (Hainan Island). At 11.00 a.m. on 28 September, the M.V. 'Lng Aquarius' reported winds of 50 knots and a pressure of 987.1 millibars when it was 60 miles east of the centre. Maximum surface winds of 50 knots were reported by a reconnaissance aircraft at 12.15 p.m. but Lola continued to intensify and became a typhoon later in the afternoon of 28 September. In Hong Kong the Stand By Signal, No. 1, was hoisted at 4.45 p.m. when Typhoon Lola was centred about 430 miles to the south-southeast.

Typhoon Lola continued to deepen over the South China Sea. Reconnaissance aircraft reports made on the morning of 29 September indicated that the minimum central pressure of Lola had dropped to 965 millibars while the maximum surface winds near the centre were still around 65 knots. Satellite pictures revealed that the cloud mass associated with the circulation covered an area about 300 miles in diameter and maximum winds of 70 knots were estimated near the centre (Figure 24). The tug, 'Viking' was hit by Lola about 200 miles east of Xisha Qundao (the Paracel Islands) on 29 September and was reported missing.

Due to the combined effect of the winter monsoon and the typhoon, there were strong winds at Waglan Island overnight on 28 September, although the typhoon was still some 350 miles away from Hong Kong. On 29 September the typhoon slowed down to about 5 knots still moving towards Hainan Dao (Hainan Island). On this track the typhoon was coming closer to Hong Kong and the Stand By Signal was replaced by the Strong Wind Signal, No. 3, at 12.10 p.m. on 29 September when Lola was centred about 330 miles to the south.

On 30 September Lola passed about 35 miles northeast of Xisha Qundao (the Paracel Islands) where a minimum pressure of 982.1 millibars and maximum winds of 50 knots with gusts of 68 knots were reported. Satellite pictures indicated that Lola had a well-defined eye with organized spiral cloud bands (Figure 25). The maximum winds estimated near the centre at this time were about 90 knots. During the morning of 30 September the typhoon began to turn onto a northwesterly course and headed slowly towards Leizhou Bandao (the Luichow Peninsula). Lola passed the northern tip of Hainan Dao (Hainan Island) on the night of 1 October and was closest to Hong Kong around 2.00 a.m. on 2 October when it was centred about 240 miles to the southwest. At this time the pressure recorded at the Royal Observatory was 1005.4 millibars and the estimated minimum central pressure of Lola was 970 millibars. A station on the northeastern tip of Hainan reported a minimum pressure of 978.1 millibars.

Lola began to move away from Hong Kong and gradually weakened after crossing Hainan Dao (Hainan Island). In Hong Kong all signals were lowered at 6.50 a.m. on 2 October when Lola was 250 miles to the west-southwest. Lola later crossed Leizhou Bandao (the Luichow Peninsula) and turned west-northwest towards north Vietnam. It crossed the coast about 130 miles east-northeast of Hanoi shortly after midnight and finally degenerated into an area of low pressure on the morning of 3 October. Lola brought heavy rain to northern Indo-China, especially the Mekong delta area, and aggravated the flooding already occurring in Vietnam, Lao, Kampuchea and Thailand.

It is interesting that after Typhoon Lola had passed over Xisha Qundao (the Paracel Islands), the sea temperature was lowered and persistent sea fog was reported on 3 October. This covered a wide area and showed up clearly on the satellite pictures.

In Hong Kong winds were moderate northeasterly on 28 September but strong winds began to blow off shore during the night. Winds gradually freshened in the urban areas and strong easterlies were experienced on 30 September and 1 October. Winds abated overnight and became moderate the following morning. The maximum winds and gust peak speeds recorded at some selected locations were as follows:

Location	Maximum mean hourly wind in points and knots		Maximum gust in points and knots	
	Direction	Speed	Direction	Speed
Royal Observatory	ENE	20	E	48
Hong Kong Airport (SE)	ENE	23	E	47
Hong Kong Airport (NW)	ENE	22	ENE	48
Waglan Island	E	40	E	50
Tate's Cairn	E	33	ENE	62
Cheung Chau	E	30	E	45
King's Park	E	20	E	40
Star Ferry	E	28	E	47
Green Island	E	35	ENE	54
Tsim Bei Tsui	E	20	not available	
Tai O	SE	32	SE	49
Castle Peak	not available		not available	

The weather was mainly fine on 28 September but turned cloudy with scattered showers on 29 September. The showers became heavy and squally during the following two days with a gradual improvement on 2 and 3 October and the weather became fine on 4 October. The daily amounts of rainfall recorded at the Royal Observatory were as follows:

28	September	Nil
29	September	5.5 mm
30	September	33.5 mm
1	October	56.3 mm
2	October	4.3 mm
3	October	5.0 mm
Total:		104.6 mm

During the passage of Typhoon Lola, little damage to property was reported. Traffic was only slightly affected. One aircraft was diverted from Hong Kong, otherwise public transport ran normally except for the suspension of a few ferry services to outlying areas. A mudslip occurred at Tai Hang Road on the morning of 1 October and a few roads in that area were temporarily closed.

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 predicted level		
	Height (m)	Date	Time	Height (m)	Date	Time
North Point	2.5	30 Sep	7.45 a.m.	0.5	30 Sep	2.30 p.m.
Tai Po Kau	2.6	1 Oct	10.00 a.m.	0.8	30 Sep	10.00 a.m.
Chi Ma Wan* (Lantau Island)	—	—	—	—	—	—

* Chi Ma Wan tide gauge was not working during Typhoon Lola.

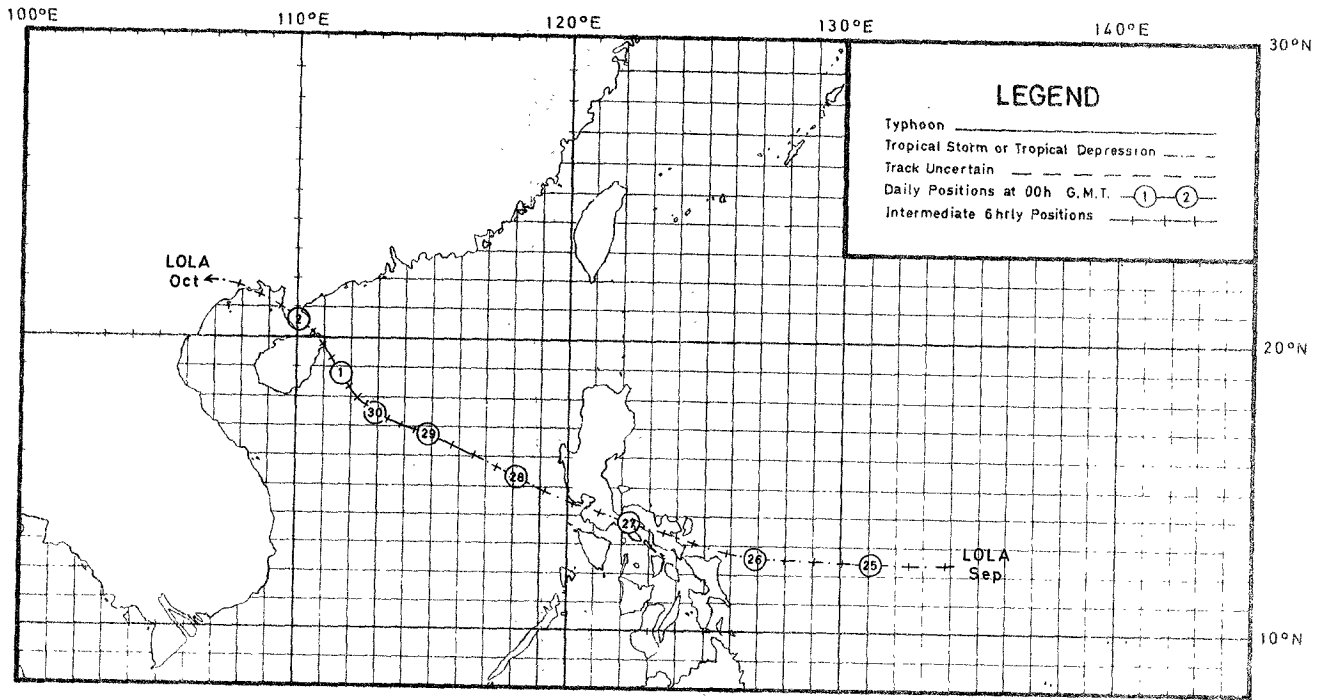


Figure 22. Track of Typhoon Lola: 24 September-3 October 1978.

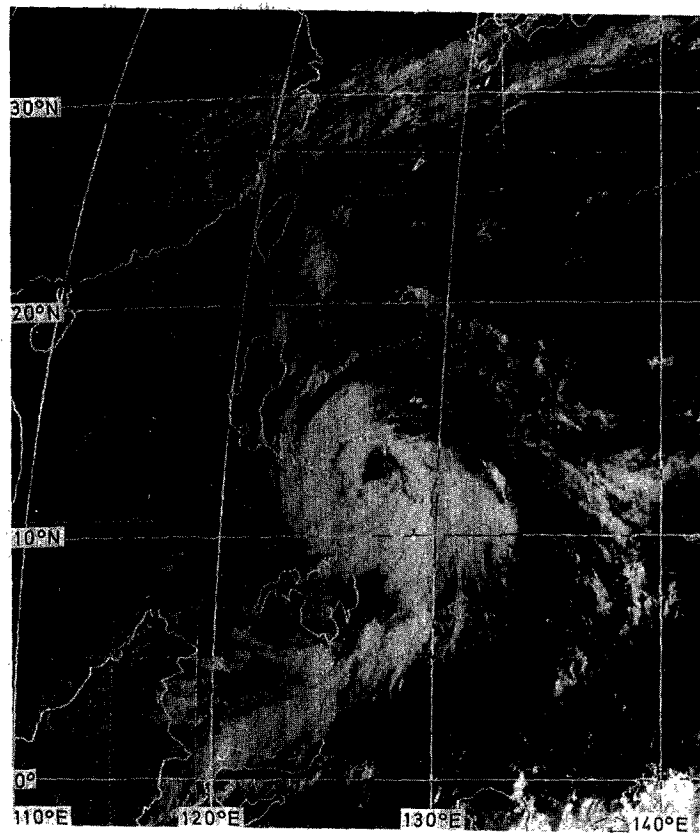


Figure 23. GMS-1 visible picture of Typhoon Lola taken around 8.00 a.m. on 26 September 1978.

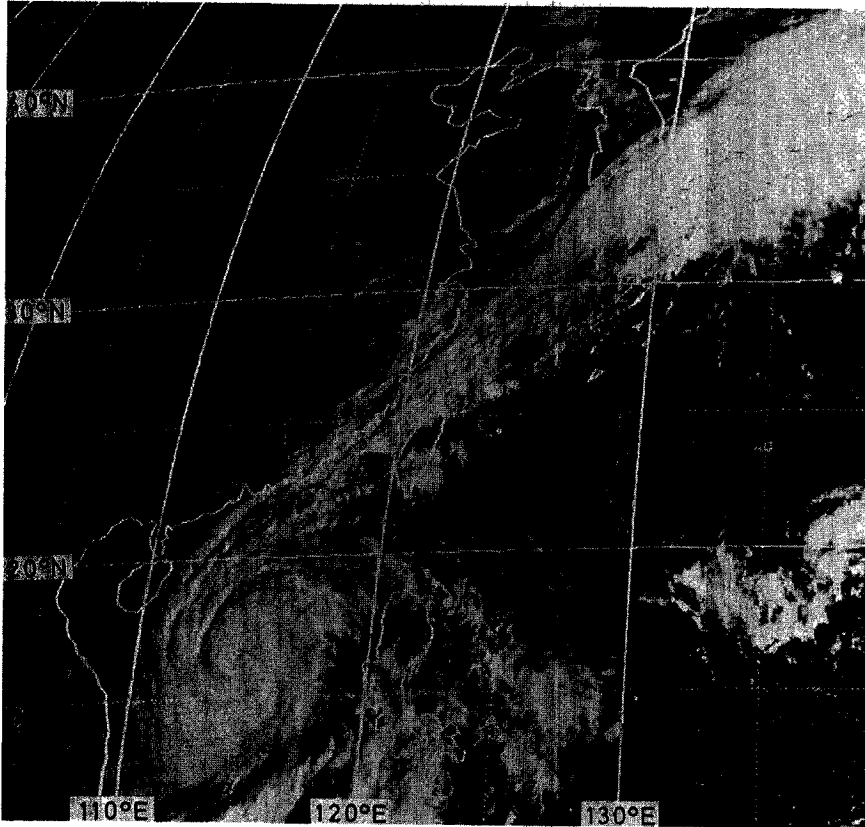


Figure 24. GMS-1 visible picture of Typhoon Lola taken around 8.00 a.m. on 29 September 1978.

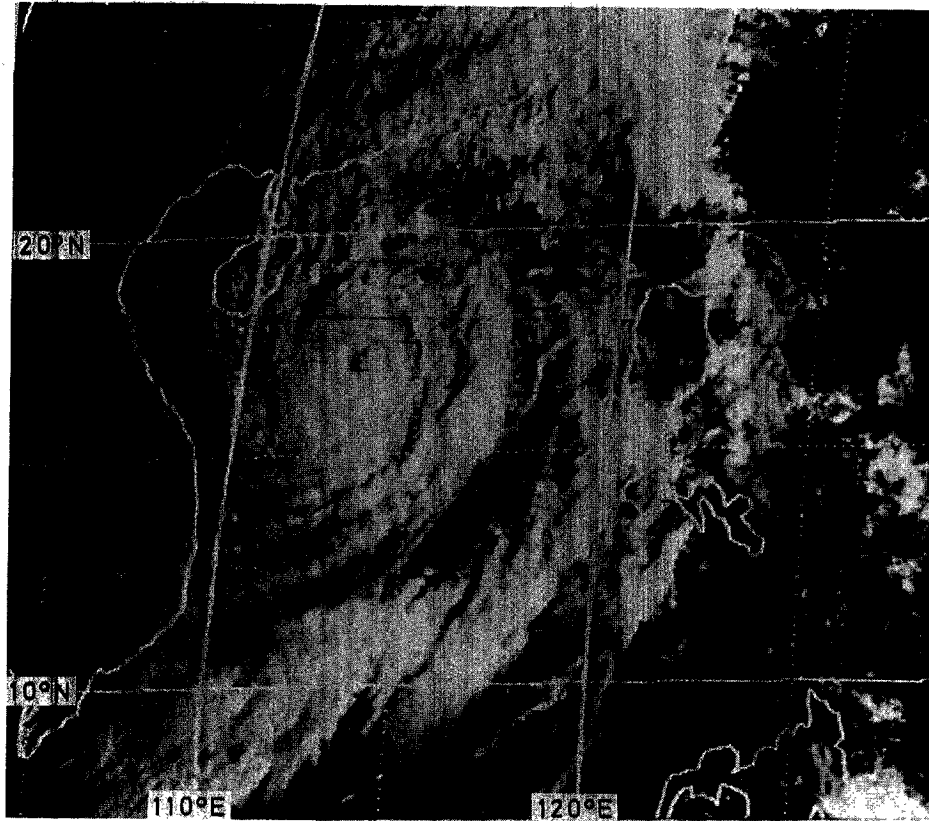


Figure 25. GMS-1 visible picture of Typhoon Lola taken around 8.00 a.m. on 30 September 1978.

SEVERE TROPICAL STORM NINA

7-16 October 1978

The track of this severe tropical storm is shown in Figure 26

Severe Tropical Storm Nina first developed as a tropical depression about 800 miles east of Manila on the morning of 7 October. It moved westwards at 14 knots towards central Luzon and intensified to become a tropical storm the following morning. Nina crossed central Luzon during the night of 9 October and made about 25 000 people homeless due to widespread flooding in Manila and its vicinity.

Nina slowed down to about 6 knots and moved west-northwestwards when it entered the South China Sea early on 10 October. It gradually intensified and became a severe tropical storm late the following evening. Although satellite pictures revealed that the circulation of Nina was not well organized and its centre ill defined, maximum winds were estimated to be about 55 knots near the centre. The minimum sea-level pressure reported by reconnaissance aircraft was 984 millibars. Winds of 52 knots were reported by the M.V. 'Stirling Bridge' when it was 100 miles southwest of the centre.

Possibly due to interaction with Typhoon Ora, centred near Taiwan, Severe Tropical Storm Nina remained almost stationary about 400 miles south of Hong Kong on 13 October. It enhanced the winter monsoon over the northern part of the South China Sea and the Strong Monsoon Signal was hoisted in Hong Kong from 5.35 a.m. to 11.30 a.m. On the night of 13 October the huge waves churned up by the winds in the wake of Nina overturned a tanker, the 'Kaifuka Maru No. 18' off Lubang Island, 75 miles southwest of Manila. Earlier in the afternoon, the M.V. 'Eastern Wave' reported winds of 68 knots and a pressure of 989 millibars when it was 95 miles southeast of the centre.

Nina started to move north-northwest at about 10 knots on 14 October and weakened into a tropical storm later in the afternoon. It turned on a west-northwesterly course and moved towards Hainan Dao (Hainan Island) during the evening. However, information received at the Royal Observatory the following morning indicated that Nina would change its course again and come closer to Hong Kong. The Stand By Signal, No. 1, was therefore hoisted at 9.30 a.m. on 15 October when Nina was centred about 240 miles to the south-southwest. This was followed by the Strong Wind Signal, No. 3, at 6.20 a.m. the next morning when the tropical storm was centred about 190 miles to the southwest of Hong Kong. Nina was then moving slowly northwards towards the South China coast to the west of Hong Kong. Although Nina was then within the range of the Royal Observatory weather radar, its centre was difficult to locate as there were no well-organized spiral rain bands around the centre. Similar problems were encountered in locating the centre on satellite pictures received at the Royal Observatory almost during the entire life of Nina. Although Nina turned north-northeast towards Hong Kong during the day on 16 October, it weakened rapidly and later degenerated into an area of low pressure about 170 miles to the southwest of Hong Kong near Shangchuan Dao where winds of only 20 knots and a mean sea-level pressure of 1011.6 millibars were reported. In Hong Kong all signals were lowered at 10.35 p.m. on 16 October.

In Hong Kong winds were generally moderate northerly or northeasterly on 12-14 October except a brief period of strong winds off shore and on hill-tops early on 13 October. Winds gradually freshened on 15 October and strong easterlies were experienced in urban areas the following day but at Waglan Island, the wind strength reached gale force for several hours. Winds subsided later in the evening but strong winds were still experienced off shore on 17 October. The maximum winds and gust peak speeds recorded at some selected locations were as follows:

<i>Location</i>	<i>Maximum mean hourly wind in points and knots</i>		<i>Maximum gust in points and knots</i>	
Royal Observatory	ENE	21	ENE	45
Hong Kong Airport (SE)	E	24	E	44
Hong Kong Airport (NW)	E	21	E	43
Waglan Island	E	46	E	56
Tate's Cairn	NE	38	NE	54
Cheung Chau	E	29	E	49
King's Park	E	19	E	37
Star Ferry	E	31	E	50
Green Island	E	43	E	66
Tsim Bei Tsui	ENE	24	not available	
Tai O	NNE	28	NNE	40
Castle Peak	N	28	N	44

It was fine and dry on 14 October but the following day became cloudy with some light rain. Heavy rain set in during the afternoon of 16 October and persisted until the next evening. The heaviest downpour occurred between midnight and 3.00 a.m. on 17 October when the Royal Observatory recorded 105.2 mm of rainfall. The weather gradually improved on 18 October and the following afternoon was mainly fine.

Since 1884 Nina was the third wettest storm to affect Hong Kong in October. The daily amounts of rainfall recorded at the Royal Observatory were as follows:

14	October	Nil
15	October	0.1 mm
16	October	120.9 mm
17	October	284.8 mm
18	October	7.4 mm
19	October	7.0 mm
Total:		420.2 mm

Apart from some scaffoldings being blown down by the strong winds of Severe Tropical Storm Nina, other damage to property was mainly due to the heavy rain. Many minor landslips occurred on both sides of the harbour. Part of an old building which was under demolition collapsed but nobody was hurt. An old man was trapped in a landslip in Tsim Sha Tsui while another was slightly hurt when a section of an awning at a cinema collapsed. Minor flooding of roads occurred in many locations. Traffic on many roads was heavily congested but ferry services operated normally apart from a few services to outlying islands. Air traffic was affected and many scheduled flights were delayed. Seven aircraft were diverted from 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 predicted level		
	Height (m)	Date	Time	Height (m)	Date	Time
North Point	2.9	14 Oct	8.15 a.m.	0.8	14 Oct	8.30 a.m.
Tai Po Kau	2.9	16 Oct	10.00 p.m.	1.1	11 Oct	7.00 a.m.
Chi Ma Wan (Lantau Island)	3.0	14 Oct	7.45 a.m.	1.0	13 Oct	8.00 p.m.

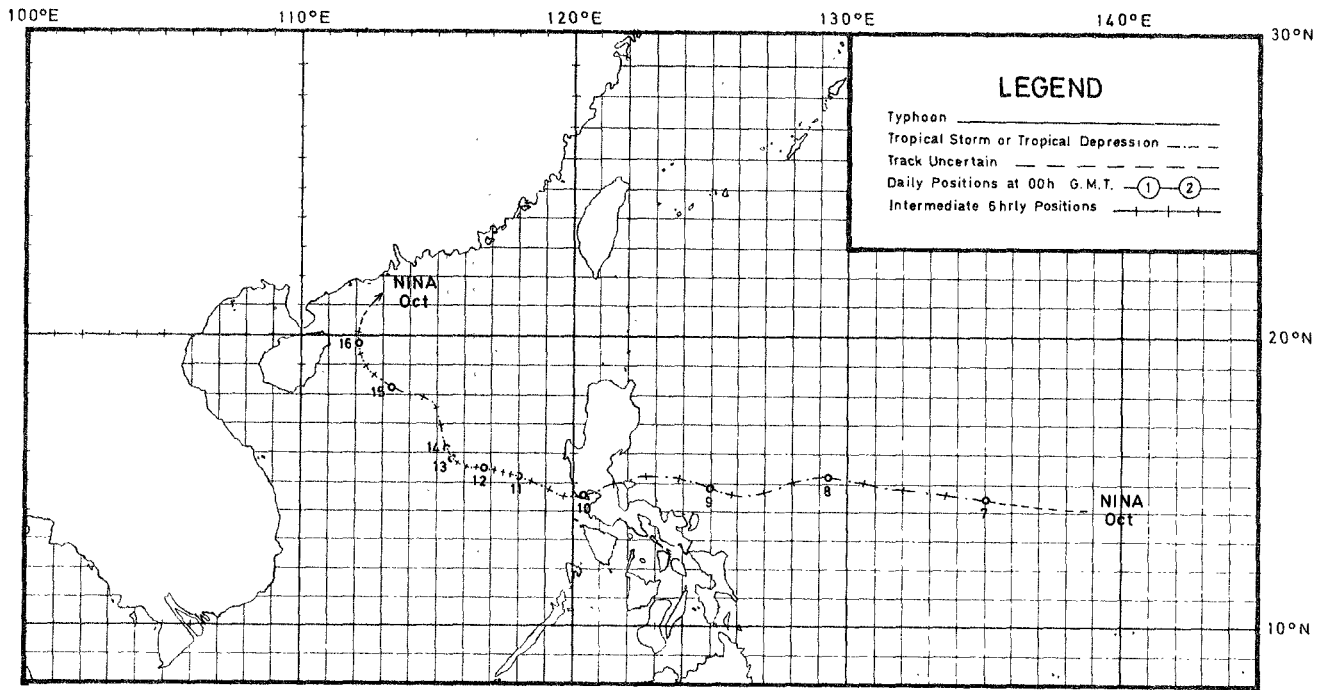


Figure 26. Track of Severe Tropical Storm Nina: 7-16 October 1978.

TYPHOON RITA

17-30 October 1978

The track of this typhoon is shown in Figure 27

Typhoon Rita was one of the most intense typhoons in the Pacific in recent years. The maximum winds reached 130 knots and the minimum central pressure fell to 878 millibars. It had a long life-span and travelled a distance of more than 4 000 miles across the North Pacific into the South China Sea.

Rita originated to the east of the Marshall Islands near the International Date Line on 17 October. It intensified gradually as it moved westwards and attained typhoon intensity on 20 October when it was about 500 miles south-southwest of Wake Island. Rita continued to intensify and was classified as a super-typhoon. At 6.22 a.m. a reconnaissance aircraft reported a minimum sea-level pressure of 888 millibars and maximum surface winds of 130 knots near the centre of the typhoon. Rita moved rapidly from east to west and late the same evening, it passed about 60 miles south of Guam where heavy damage to banana plantations was reported.

Typhoon Rita continued to move rapidly westward towards Luzon at a speed of 20 knots. Its central pressure fell to a minimum of 878 millibars when it was about 650 miles east of Manila around noon on 25 October. Satellite pictures received later in the afternoon revealed a distinct eye and good cirrus outflow associated with the circulation of the typhoon (Figure 28). Rita crossed Luzon the following night and caused disastrous damage to rice crops. More than 200 000 people were made homeless and over three hundred people were reported dead. Baler, a station on the east coast of Luzon, reported maximum winds of 50 knots when the typhoon passed just to its south. A minimum sea-level pressure of 971.5 millibars was reported at Infanta, 60 miles south of Baler.

Rita entered the South China Sea early on 27 October and slowed down gradually as it moved west-northwestwards towards Hainan Dao (Hainan Island). Although Rita weakened considerably after crossing the Philippines, its circulation remained intense with a large area of strong winds. A fishing boat, the "San Jose II" went aground on a reef about 400 miles southwest of Manila during the evening of 27 October.

In Hong Kong the Stand By Signal, No. 1, was hoisted at 11.45 a.m. on 27 October when Rita was centred about 430 miles to the southeast. Since an intense surge of the winter monsoon was expected to reach the south China coast later in the day, the combined effects of Rita and the monsoon were forecast to give rise to strong winds in Hong Kong overnight. The Strong Wind Signal, No. 3, was therefore hoisted at 4.30 p.m. on 27 October although the typhoon was still 390 miles to the south-southeast of Hong Kong and was moving west-northwest at about eight knots towards Hainan Dao (Hainan Island). The surge reached the coast in the evening and winds increased rapidly from the north. At 5.00 a.m. on 28 October, Shangchuan Dao reported winds of 58 knots with gusts up to 72 knots and the M.V. 'Maersk Tempo' reported winds of 52 knots when it was 120 miles southeast of Hong Kong.

Due to the influx of cold and dry air associated with the intense winter monsoon, the typhoon weakened rapidly and moved slowly southwestwards away from Hong Kong during the day of 28 October. Rita was closest to Hong Kong around 8.00 a.m. when it was centred about 300 miles to the south-southeast. The central pressure of Rita at this time was estimated to be about 990 millibars while the sea-level pressure recorded at the Royal Observatory was 1017.0 millibars.

Satellite pictures received early on 29 October revealed that the cloud bands associated with the circulation had become disorganized and the centre ill-defined (Figure 29). Although Rita weakened into a tropical storm and moved away from Hong Kong, the intense winter monsoon still caused strong to gale force winds over the northern part of the South China Sea. Consequently, the Strong Wind Signal was replaced by the Strong Monsoon Signal at 6.40 a.m. on 29 October when Rita was 400 miles south of Hong Kong. Earlier, a cargo ship, the M.V. 'Toubkal' went aground on Scarborough Shoal, 460 miles south-southeast of Hong Kong, and broke in two. Rita was then centred about 240 miles to the west of the ship. Rita continued to weaken and degenerated into an area of low pressure off the coast of south Vietnam the following morning. In Hong Kong all signals were lowered at noon on 29 October when Rita was centred about 440 miles to the south.

In Hong Kong winds were light and variable on 27 October but when the surge of the winter monsoon arrived in the evening winds rapidly freshened from the north and became strong overnight with gales off shore and on hill-tops. Winds abated during the morning of 29 October and became moderate in the afternoon. The maximum winds and gust peak speeds recorded at some selected locations were as follows:

<i>Location</i>	<i>Maximum mean hourly wind in points and knots</i>		<i>Maximum gust in points and knots</i>	
Royal Observatory	N	18	N	59
Hong Kong Airport (SE)	NNE	36	NNE	65
Hong Kong Airport (NW)	N	36	N	65
Waglan Island	N	48	N	60
Tate's Cairn	N	53	N	80
Cheung Chau	N	40	N	63
King's Park	N	29	N	66
Star Ferry	NNE	14	ENE	42
Green Island	N	43	N	60
Tsim Bei Tsui	N	26	not available	
Tai O	N	36	N	50
Castle Peak	N	30	N	47

Apart from the strong to gale force winds, the approach of Typhoon Rita did not cause any deterioration in Hong Kong's weather. It was brilliantly fine on 27 October but with the arrival of the monsoon surge it became cloudy with a few patches of light rain overnight. Conditions became very dry the following day and fine and sunny weather was again experienced on 30 October.

Typhoon Rita caused very little damage to property in Hong Kong. The strong to gale force winds overturned three sailing boats, a sampan and a small fishing boat. Fortunately everyone on board was rescued. Several signboard and scaffolding collapses were also reported. Two men and a woman were injured by falling objects. Ferry services to outlying areas and hydrofoil services between Hong Kong and Macau were suspended. Air traffic was affected and many scheduled flights were delayed. Eleven aircraft were diverted from Hong Kong due to the adverse wind conditions.

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 predicted level		
	Height (m)	Date	Time	Height (m)	Date	Time
North Point	2.3	29 Oct	8.15 p.m.	0.5	29 Oct	3.00 p.m.
Tai Po Kau	2.4	29 Oct	8.30 p.m.	0.5	29 Oct	7.30 a.m.
Chi Ma Wan (Lantau Island)	2.3	29 Oct	8.15 a.m.	0.5	29 Oct	8.15 a.m.

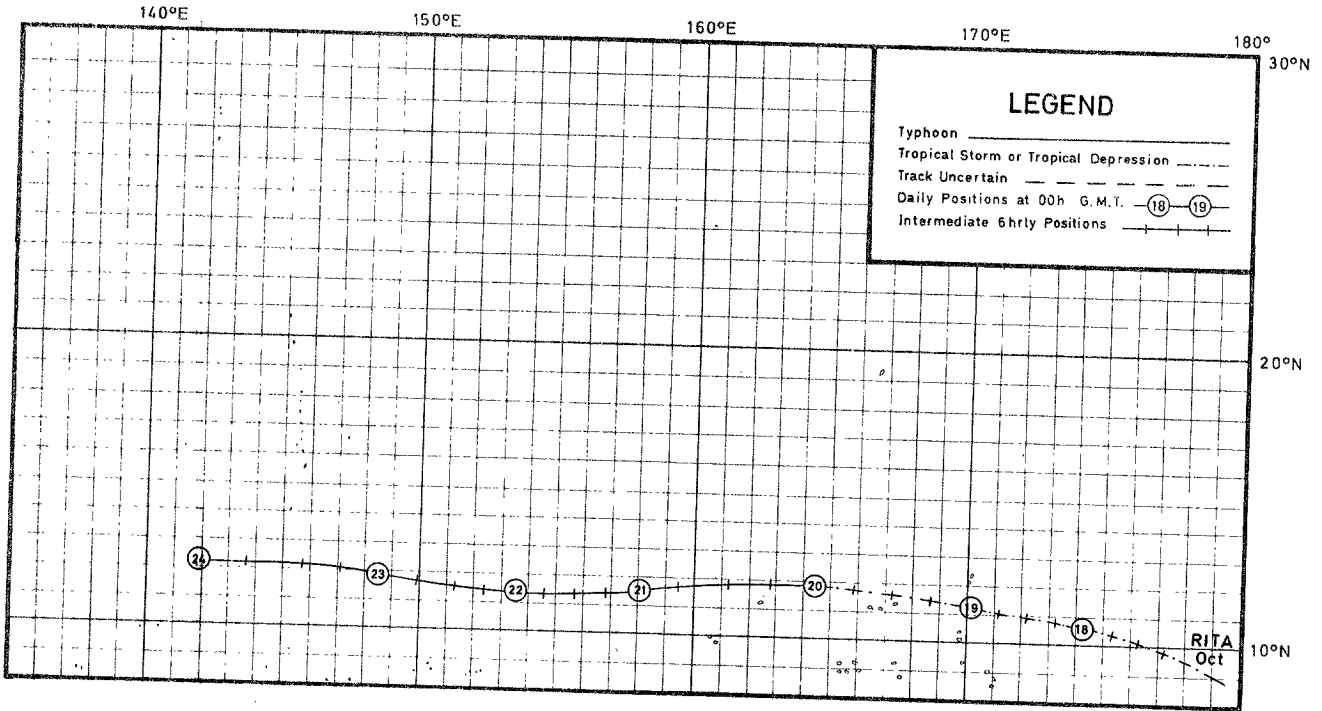


Figure 27(i). Track of Typhoon Rita: 17-30 October 1978.

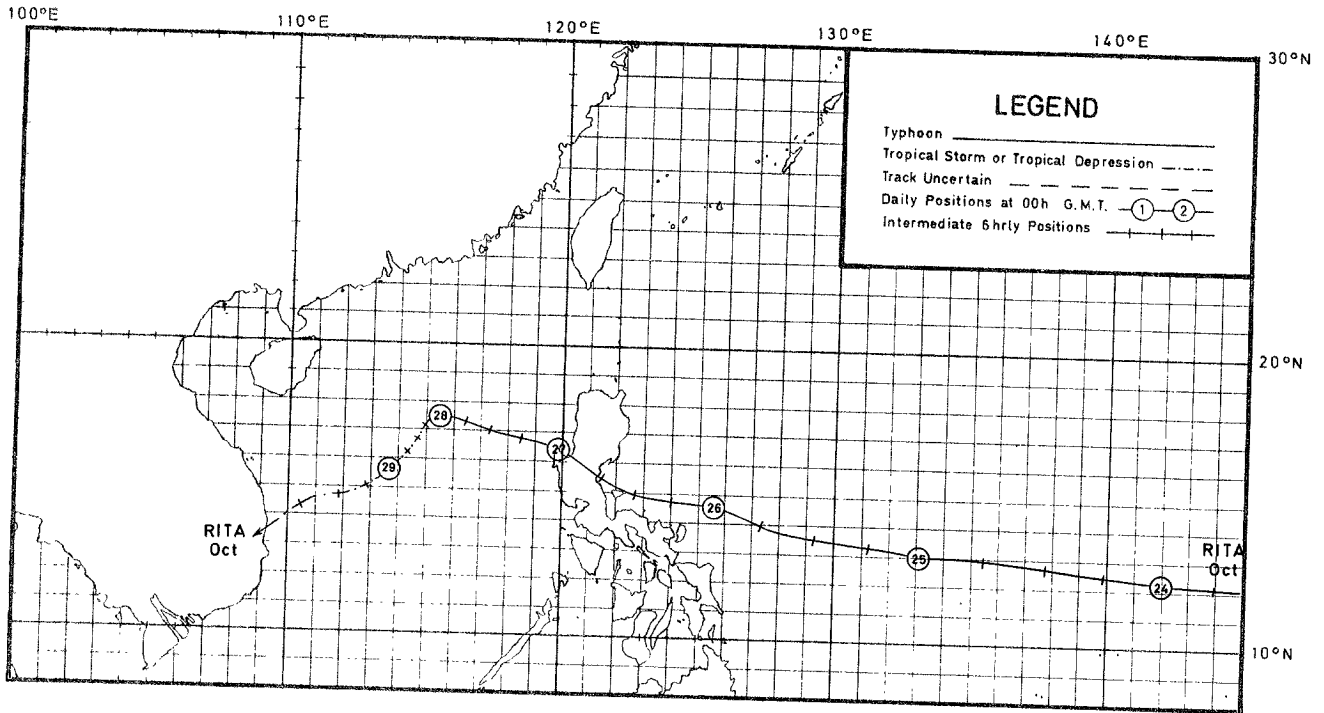


Figure 27(ii). Track of Typhoon Rita: 17-30 October 1978.

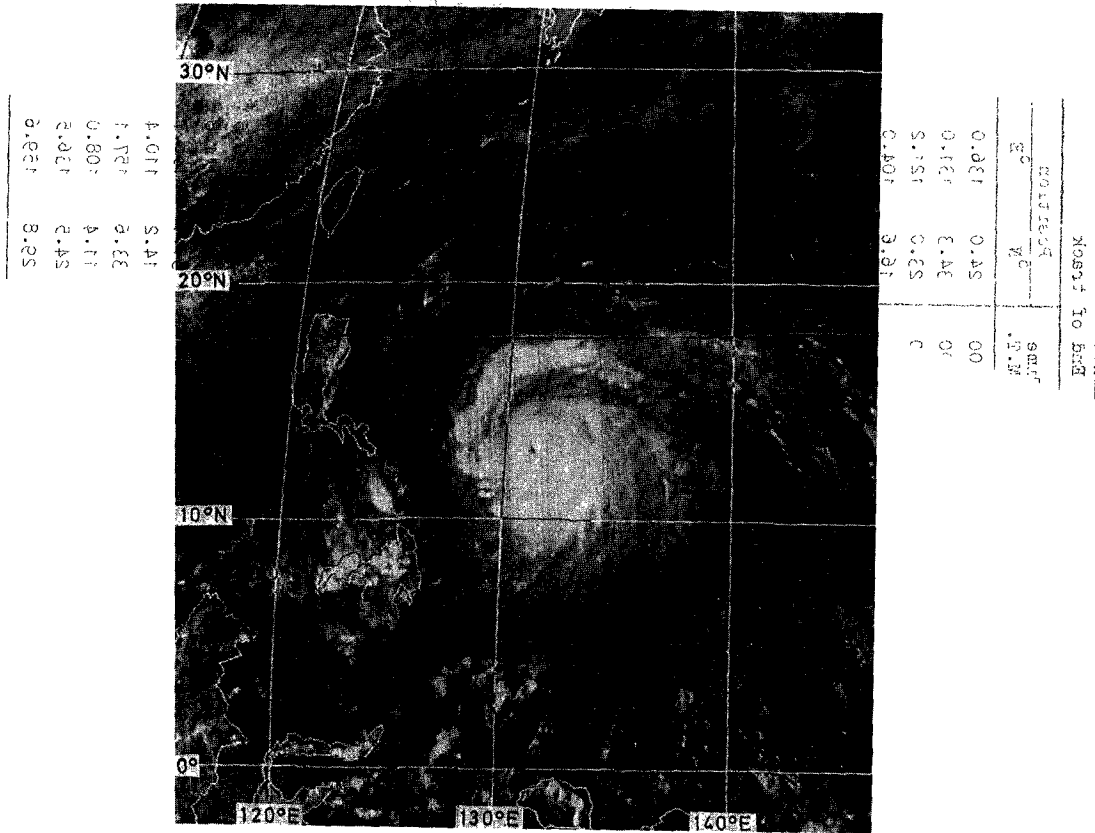


Figure 28. GMS-1 visible picture of Typhoon Rita taken around 2.00 p.m. on 25 October 1978.

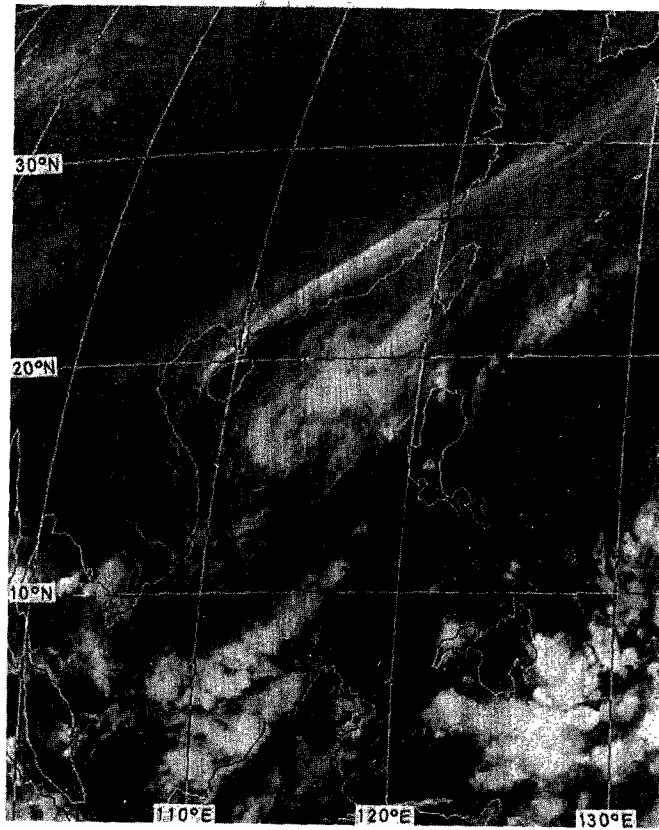


Figure 29. GMS-1 infra-red picture of Typhoon Rita taken around 5.00 a.m. on 28 October 1978.

TABLE 1. LIST OF TROPICAL CYCLONES IN THE WESTERN NORTH PACIFIC AND THE SOUTH CHINA SEA IN 1978

Name of tropical cyclone	Beginning of track				First day circle Date	Last day circle Date	End of track			
	Date	Time G.M.T.	Position				Date	Time G.M.T.	Position	
			$^{\circ}$ N	$^{\circ}$ E					$^{\circ}$ N	$^{\circ}$ E
1 Typhoon Olive	17 Apr	0000	6.3	141.3	17	27	27 Apr	0000	24.0	136.0
2 Tropical Storm Polly	16 Jun	0600	23.1	132.5	17	20	20 Jun	1200	34.3	131.0
3 Tropical Storm Rose	22 Jun	0000	18.4	127.5	22	24	24 Jun	1200	23.0	121.2
4 Tropical Storm Shirley	30 Jun	0000	12.7	112.7	30	1	1 Jul	1200	16.6	104.0
5 Typhoon Trix	13 Jul	0000	23.3	147.9	13	23	23 Jul	0000	29.0	121.0
6 Typhoon Virginia	23 Jul	0600	15.9	151.0	24	3	3 Aug	1200	45.7	155.2
7 Typhoon Wendy	24 Jul	0000	20.8	134.0	24	3	3 Aug	1800	43.0	139.1
8 Severe Tropical Storm Agnes	24 Jul	0600	17.3	115.2	25	30	30 Jul	0600	23.2	115.3
9 Tropical Storm Bonnie	9 Aug	0600	18.4	114.0	10	12	12 Aug	0600	17.9	104.3
10 Typhoon Carmen	10 Aug	0000	16.4	145.8	10	20	20 Aug	1200	37.0	128.7
11 Tropical Storm Della	11 Aug	0000	16.4	128.8	11	13	13 Aug	1200	25.0	118.5
12 Tropical Depression	18 Aug	0000	21.7	149.4	18	20	20 Aug	0600	32.7	134.4
13 Severe Tropical Storm Elaine	23 Aug	0000	18.2	124.0	23	28	28 Aug	0000	21.8	107.2
14 Typhoon Faye	28 Aug	0000	12.9	146.2	28	10	10 Sep	1200	35.0	151.0
15 Tropical Storm Gloria	29 Aug	0000	21.0	129.0	29	1	1 Sep	1800	27.4	134.5
16 Tropical Storm Hester	29 Aug	0000	29.0	149.3	29	31	31 Aug	1800	38.7	159.1
17 Tropical Depression	9 Sep	0600	16.2	118.5	10	15	15 Sep	1200	17.3	108.2
18 Severe Tropical Storm Irma	11 Sep	0000	22.1	121.2	11	15	15 Sep	1800	35.3	135.5
19 Typhoon Judy	10 Sep	0600	20.4	159.1	11	17	17 Sep	0600	42.1	155.4
20 Tropical Depression	19 Sep	0600	16.2	112.2	20	20	20 Sep	0600	16.4	108.1
21 Severe Tropical Storm Kit	22 Sep	0000	14.7	125.0	22	26	26 Sep	1800	17.3	105.1
22 Typhoon Lola	24 Sep	1200	12.1	133.7	25	2	2 Oct	1800	21.6	107.9
23 Typhoon Mamie	30 Sep	0000	19.0	152.5	30	4	4 Oct	0000	36.9	157.5
24 Severe Tropical Storm Nina	7 Oct	0000	14.4	134.9	7	16	16 Oct	0600	20.1	112.1
25 Typhoon Ora	10 Oct	0000	17.1	133.9	10	15	15 Oct	1800	31.3	139.9
26 Tropical Depression	10 Oct	1800	22.0	159.9	11	13	13 Oct	0600	26.4	149.5
27 Tropical Depression	13 Oct	0000	11.8	139.3	13	21	21 Oct	0000	10.9	111.8
28 Typhoon Phyllis	16 Oct	1200	15.8	159.7	17	22	22 Oct	0000	31.4	158.7
29 Typhoon Rita*	20 Oct	1800	11.6	159.4	21	29	29 Oct	1800	14.2	110.4
30 Severe Tropical Storm Tess	1 Nov	1800	14.9	144.5	2	6	6 Nov	1200	33.6	157.1
31 Tropical Depression	2 Nov	0000	11.5	114.5	2	3	3 Nov	0600	11.4	108.0
32 Typhoon Viola	17 Nov	0600	8.2	150.0	18	24	24 Nov	1200	24.5	136.5
33 Severe Tropical Storm Winnie	27 Nov	0600	11.3	149.7	28	30	30 Nov	0600	29.8	159.6

N.B. * originated east of 160 $^{\circ}$ E

Tropical Storm Nadine, 8-13 Jan (East of 160 $^{\circ}$ E)

TABLE 2. TROPICAL CYCLONE WARNINGS FOR SHIPPING ISSUED IN 1978

Tropical cyclone	No. of warnings issued	Date and time ⁺ of issue of		Duration of warnings (hours)
		First warning	Last warning	
Typhoon Mary	6	02 Jan 0900	03 Jan 0600	15
Typhoon Olive*	47	20 Apr 0000	25 Apr 1800	138
Tropical Storm Rose	15	23 Jun 0000	25 Jun 0000	48
Tropical Storm Shirley	6	30 Jun 0300	30 Jun 1800	15
Typhoon Trix	3	22 Jul 0900	22 Jul 1800	9
Severe Tropical Storm Agnes*	51	24 Jul 0600	30 Jul 0600	144
Tropical Storm Bonnie*	23	9 Aug 0600	12 Aug 0000	66
Typhoon Carmen	29	15 Aug 1800	19 Aug 0300	81
Tropical Storm Della	10	12 Aug 0600	13 Aug 1200	30
Severe Tropical Storm Elaine*	42	23 Aug 0000	28 Aug 0300	123
Tropical Depression	28	12 Sep 0000	15 Sep 0900	81
Severe Tropical Storm Irma	24	11 Sep 0300	14 Sep 0000	69
Tropical Depression	12	19 Sep 0300	20 Sep 1200	33
Severe Tropical Storm Kit*	35	22 Sep 0600	26 Sep 1200	102
Typhoon Lola*	54	26 Sep 1200	2 Oct 2100	153
Severe Tropical Storm Nina*	64	9 Oct 0000	16 Oct 1800	186
Typhoon Ora	19	12 Oct 0000	14 Oct 0600	54
Typhoon Rita*	32	26 Oct 0300	30 Oct 0000	93
Tropical Depression	6	2 Nov 0600	3 Nov 0600	24
Total	506			1464

* 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 1978

SUMMARY

Signal	No. of occasions	Total duration
1	8	173 h 10 min
3	9	227 35
8 NORTHWEST	1	2 10
8 SOUTHWEST	1	2 30
8 NORTHEAST	3	25 30
8 SOUTHEAST	2	31 15
9	-	-
10	-	-
Total	24	462 10

DETAILS

Tropical cyclone	No. of warning bulletins issued	Signal	Hoisted		Lowered	
			Date	Time*	Date	Time*
Typhoon Olive	19	1	23 Apr	1140	25 Apr	0510
Severe Tropical Storm Agnes	85	1	25 Jul	0730	25 Jul	2250
		3	25 Jul	2250	26 Jul	0915
		8 NE	26 Jul	0915	26 Jul	1545
		8 SE	26 Jul	1545	27 Jul	1330
		3	27 Jul	1330	29 Jul	1725
		8 NE	29 Jul	1725	30 Jul	0230
		8 NW	30 Jul	0230	30 Jul	0440
		8 SW	30 Jul	0440	30 Jul	0710
		3	30 Jul	0710	30 Jul	1510
Tropical Storm Bonnie	20	1	9 Aug	1630	10 Aug	1215
Severe Tropical Storm Elaine	37	3	10 Aug	1215	11 Aug	1010
		1	25 Aug	1600	26 Aug	1320
		3	26 Aug	1320	26 Aug	2115
		8 NE	26 Aug	2115	27 Aug	0710
		8 SE	27 Aug	0710	27 Aug	1640
		3	27 Aug	1640	27 Aug	2300
Severe Tropical Storm Kit	16	1	24 Sep	1720	25 Sep	2335
Typhoon Lola	41	1	28 Sep	1645	29 Sep	1210
		3	29 Sep	1210	2 Oct	0650
Severe Tropical Storm Nina	20	1	15 Oct	0930	16 Oct	0620
		3	16 Oct	0620	16 Oct	2235
Typhoon Rita	21	1	27 Oct	1145	27 Oct	1630
		3	27 Oct	1630	29 Oct	0640

* Hong Kong Time

TABLE 4. FREQUENCY AND TOTAL DURATION OF DISPLAY OF TROPICAL CYCLONE WARNING SIGNALS : 1946-1978

Year	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	0	0	18	290
1969	4	2	0	0	0	0	1	1	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
Total	192	148	13	18	47	33	18	10	479	7888
Mean	5.8	6.4	0.4	0.5	1.4	1.0	0.5	0.3	14.5	239.0

* 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 : 1946-1978

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	6
1970	21	4
1971	17	6
1972	14	9
1973	14	5
1974	17	9
1975	21	11
1976	12	7
1977	10	5
1978	10	8
1978	20	8
Total	535	206
Mean	16.2	6.2

Table 6. DURATION OF DISPLAY OF TROPICAL CYCLONE WARNING SIGNALS IN HONG KONG : 1946-1978

Signal	Duration for each occasion			Duration per year		
	Mean	Maximum	Minimum	Mean	Maximum	Minimum
1	19 h 07 min	124 h 40 min	1 h 20 min	111 h 14 min	273 h 15 min	0 h 0 min
3*	21 02	7† 45	1 00	135 19	267 45	23 55
8 NW ⁺	7 02	13 00	1 30	2 46	13 00	0
8 SW ⁺	5 20	11 10	2 30	2 55	16 10	0
8 NE ⁺	11 14	35 35	2 15	16 00	61 45	0
8 SE ⁺	7 51	21 45	0 20	7 51	31 15	0
8	8 47	35 35	0 20	29 32	82 25	0
9	3 49	6 30	1 10	2 05	11 00	0
10	6 05	9 10	2 30	1 50	12 10	0

* 1956 - 1978

+ 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 - 1978

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

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 : 1974-1978

Year	Date	Name of tropical cyclone	Name of ship	Location of grounding, etc.	Nature of incident	Remarks			
1974	7-14 Jun	T. Dinah	M.V. Silver Shelton	Victoria Harbour	Adrift				
	18-22 Jul	T. Ivy	M.V. Asmari M.V. Hwalung	East of Tsing Yi Kellett Bank Anchorage	Adrift Dragging anchor				
	15-19 Oct	T. Carmen	M.V. Terryusan Maru M.V. Uniparagon M.V. Oriental Hero M.V. Bright Sea M.V. Pearl Star	Off Po Toi Island South of Stonecutters Island Southwest of Stonecutters Island Southwest of Stonecutters Island Western Anchorage	Dragging anchor Adrift Adrift and in collision with M.V. Bright Sea Collision with M.V. Oriental Hero Dragging anchor	Slight damage Slight damage			
	21-27 Oct	T. Della	M.V. Lela M.V. Taolin	South of Stonecutters Island South of Stonecutters Island	Collision with M.V. Taolin Collision with M.V. Lela	Minor damage Minor damage			
1975	10-14 Aug	T.D.	M.V. Wuxi M.V. Hong Kong Truth M.V. Dehua	Hung Hom Ferry Pier Northwest of Stonecutters Island Northwest of Stonecutters Island	Aground Adrift and in collision with M.V. Dehua Collision with M.V. Hong Kong Truth	Slight damage			
	9-14 Oct	T. Elsie	M.V. Man Wah M.V. Sea Concord M.V. Caribbean Sea M.V. Yu Heng M.V. Teresa	Kowloon Bay Western Anchorage Western Anchorage North of West Point North of Lantau	Adrift Dragging anchor and in collision with M.V. Caribbean Sea Collision with M.V. Sea Concord Adrift Dragging anchor and in collision with M.V. Olympic Sky				
	16-23 Oct	S.T.S. Flossie	M.V. Olympic Sky	North of Lantau	Collision with M.V. Teresa				
			M.V. Slidre	Northwest of Green Island	Adrift				
			M.V. Shinpoku Maru	Off Stonecutters Island	Aground				
1976	15-21 Sep	T. Iris	M.V. Olympic Dale	Junk Bay	Aground	Causing damage to a fish breeding farm			
			M.V. United Glory M.V. Oriental Ruler M.V. Nantao M.V. Oceanic Constitution	Victoria Harbour Western Anchorage Western Anchorage Western Anchorage	Dragging anchor Dragging anchor Dragging anchor Dragging anchor and in collision with M.V. Oriental Empress				
			M.V. Oriental Empress	Western Anchorage	Collision with M.V. Oceanic Constitution				
			1977	3-5 Sep	T.S. Carla	M.V. Eastern Mercury	Kowloon City Ferry Pier	Adrift	Collided with five other vessels
						22-25 Sep	S.T.S. Freda	M.V. Padma M.V. Lamboos Tsagliotis	Western Anchorage Western Anchorage
1978	9-12 Aug	T.S. Bonnie	M.V. Australian Enterprise M.V. Yong Ding	Kellett Bank Anchorage Kellett Bank Anchorage	Collision Collision	Superficial damage Superficial damage			
	23-28 Aug	S.T.S. Elaine	M.V. Wetar	Kellett Bank Anchorage	Collision with M.V. Strait Container	Superficial damage			
			M.V. Strait Container	Kellett Bank Anchorage	Collision with M.V. Wetar	Superficial damage			
			M.V. Olympic Sun	North of Lantau	Dragging anchor and in collision with M.V. Phoebe Nr1	Minor damage			
			M.V. Phoebe Nr1	North of Lantau	Collision with M.V. Olympic Sun	Minor damage			
			M.V. Ding Hai	West of Stonecutters Island	Collision with M.V. Mendoza	Superficial damage			
M.V. Mendoza	West of Stonecutters Island	Collision with M.V. Ding Hai	Superficial damage						

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 1978

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
T. Olive	Apr	24	2000	SSE	190	NE	13	960	24	1800	1005.0	0.3	0.3	0.7
S.T.S. Agnes* (a)	Jul	26	1700	S	50	W	6	980	26	1700	989.8	0.6	1.2	0.9
S.T.S. Agnes* (b)	Jul	30	0300	E	35	N	7	975	30	0300	986.6	0.4	0.7	0.7
T.S. Bonnie	Aug	9	1400	S	240	SW	2	990	10	1700	998.7	0.3	0.5	0.6
S.T.S. Elaine	Aug	27	1100	SW	140	NW	13	965	27	0500	993.0	1.0	1.1	1.1
S.T.S. Kit	Sep	25	0200	SSW	320	WNW	7	990	24	1800	1008.8	0.6	0.7	0.6
T. Lola	Sep	2	0200	SW	240	NW	5	970	01	0500	1003.3	0.5	0.8	Not available
S.T.S. Nina	Oct	16	1400	SW	170	dissipated		1005	15	1600	1009.0	0.8	1.1	1.0
T. Rita	Oct	28	0800	SSE	300	SW	7	990	27	1600	1007.4	0.5	0.5	0.5

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	(1)+(iv)
T. Olive	Apr	E 12	ENE 23	E 15	ENE 24	E 28	ENE 29	-	1.1	1.1	30.7	30.7
S.T.S. Agnes*(a)	Jul	E 32	E 62	ENE 35	E 63	E 71	E 76	502.4	12.3	12.3	16.6	519.0
S.T.S. Agnes*(b)	Jul	W 22	N 46	W 22	N 47	ENE 49	N 61					
T.S. Bonnie	Aug	E 20	E 35	E 23	E 35	E 45	E 42	58.6	14.1	15.2	15.2	73.8
S.T.S. Elaine	Aug	E 33	ENE 53	E 38	ENE 53	E 81	ENE 69	49.4	5.6	6.2	6.2	55.6
S.T.S. Kit	Sep	ENE 18	ENE 35	ENE 20	ENE 35	ENE 39	ENE 43			165.3**		
T. Lola	Sep	ENE 20	E 40	E 25	E 42	E 48	E 50	89.0	5.0	5.0	8.6	107.6
S.T.S. Nina	Oct	ENE 21	E 46	ENE 22	E 46	ENE 45	E 56	2.7	350.8	406.6	417.5	420.2
T. Rita	Oct	N 18	N 48	N 20	N 50	N 59	N 60	-	-	-	-	-

N.B. ** Severe Tropical Storm Kit did not come within 300 n miles of Hong Kong

* (a) first approach ; (b) second approach

(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 1946-1978

Name of typhoon	Date	Nearest approach to Royal Observatory in 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	WRW 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	WRW 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

APPENDIX (1) SIX-HOURLY POSITIONS OF TYPHOON OLIVE

<i>Month</i>	<i>Day</i>	<i>Time G.M.T.</i>	<i>Intensity</i>	<i>Estimated minimum central pressure (mbar)</i>	<i>Estimated maximum surface wind (knots)</i>	<i>Lat. °N</i>	<i>Long. °E</i>
April	17	0000	T.D.	1005	25	6.3	141.3
		0600	T.D.	1005	25	6.7	139.8
		1200	T.D.	1004	25	7.3	138.2
		1800	T.D.	1004	25	7.8	136.6
	18	0000	T.D.	1003	30	8.4	135.1
		0600	T.D.	1000	30	8.7	134.0
		1200	T.D.	997	30	9.0	132.7
		1800	T.D.	997	30	9.3	131.3
	19	0000	T.S.	995	40	9.6	130.0
		0600	T.S.	990	40	10.0	128.6
		1200	T.S.	990	40	10.4	127.3
		1800	T.S.	985	45	10.9	126.0
	20	0000	S.T.S.	985	50	11.4	124.6
		0600	S.T.S.	985	50	11.9	123.3
		1200	S.T.S.	985	50	12.3	122.1
		1800	S.T.S.	990	50	12.7	120.9
	21	0000	S.T.S.	995	50	13.1	119.6
		0600	S.T.S.	990	50	13.3	118.7
		1200	S.T.S.	985	55	13.5	117.8
		1800	S.T.S.	985	55	13.8	117.0
	22	0000	S.T.S.	980	55	14.1	116.2
		0600	S.T.S.	970	60	14.5	115.5
		1200	T.	960	80	14.9	114.8
		1800	T.	955	80	15.4	114.3
	23	0000	T.	955	80	16.0	113.7
		0600	T.	955	85	16.5	113.3
		1200	T.	955	85	17.0	113.0
		1800	T.	955	85	17.6	113.1
	24	0000	T.	955	85	18.3	113.8
		0600	T.	955	85	18.9	114.5
		1200	T.	960	85	19.5	115.5
		1800	T.	965	80	20.1	116.9
	25	0000	T.	970	80	20.8	118.8
0600		T.	975	75	21.2	120.8	
1200		T.	980	70	21.4	122.9	
1800		T.	980	65	21.6	125.2	
26	0000	S.T.S.	980	55	21.7	127.6	
	0600	S.T.S.	980	50	22.1	129.7	
	1200	T.S.	985	45	22.4	131.8	
	1800	T.S.	990	40	23.1	133.9	
27	0000	T.S.	990	35	24.0	136.0	

APPENDIX (2) SIX-HOURLY POSITIONS OF TROPICAL STORM POLLY

<i>Month</i>	<i>Day</i>	<i>Time G.M.T.</i>	<i>Intensity</i>	<i>Estimated minimum central pressure (mbar)</i>	<i>Estimated maximum surface wind (knots)</i>	<i>Lat. °N</i>	<i>Long. °E</i>
June	16	0600	T.D.	1000	30	23.1	132.5
		1200	T.D.	1000	30	23.3	130.9
		1800	T.D.	1000	30	23.7	129.6
	17	0000	T.D.	997	30	24.2	128.7
		0600	T.D.	997	30	24.5	128.0
		1200	T.D.	997	30	24.9	127.3
	18	1800	T.D.	997	30	25.2	126.8
		0000	T.D.	995	30	25.8	126.3
		0600	T.D.	995	30	26.2	126.2
	19	1200	T.D.	995	30	26.5	126.2
		1800	T.D.	990	30	26.9	126.1
		0000	T.D.	990	30	27.3	126.1
	20	0600	T.S.	985	40	28.1	126.2
		1200	T.S.	985	40	28.9	126.3
		1800	T.S.	985	45	30.0	126.8
		0000	T.S.	990	40	31.7	127.8
		0600	T.S.	995	40	33.0	129.3
		1200	T.D.	997	30	34.3	131.0

APPENDIX (3) SIX-HOURLY POSITIONS OF TROPICAL STORM ROSE

<i>Month</i>	<i>Day</i>	<i>Time G.M.T.</i>	<i>Intensity</i>	<i>Estimated minimum central pressure (mbar)</i>	<i>Estimated maximum surface wind (knots)</i>	<i>Lat. °N</i>	<i>Long. °E</i>	
June	22	0000	T.D.	1003	25	18.4	127.5	
		0600	T.D.	1000	25	18.6	126.8	
		1200	T.D.	1000	25	18.7	126.1	
		1800	T.D.	1000	30	18.8	125.4	
	23	0000	T.D.	1000	30	19.0	124.7	
		0600	T.S.	995	35	19.3	124.0	
		1200	T.S.	995	35	19.7	123.4	
	24	1800	T.S.	995	35	20.3	122.8	
		0000	T.S.	995	35	21.0	122.3	
		0600	T.S.	995	35	21.8	121.7	
			1200	T.S.	1000	35	23.0	121.2

APPENDIX (4) SIX-HOURLY POSITIONS OF TROPICAL STORM SHIRLEY

<i>Month</i>	<i>Day</i>	<i>Time G.M.T.</i>	<i>Intensity</i>	<i>Estimated minimum central pressure (mbar)</i>	<i>Estimated maximum surface wind (knots)</i>	<i>Lat. °N</i>	<i>Long. °E</i>
June	30	0000	T.D.	998	30	12.7	112.7
		0600	T.S.	995	35	13.0	111.1
		1200	T.S.	995	45	13.5	109.6
		1800	T.D.	998	30	14.2	108.0
July	1	0000	T.D.	1000	25	14.9	106.5
		0600	T.D.	1000	25	15.8	105.2
		1200	T.D.	1000	25	16.6	104.0

APPENDIX (5) SIX-HOURLY POSITIONS OF TYPHOON TRIX

<i>Month</i>	<i>Day</i>	<i>Time G.M.T.</i>	<i>Intensity</i>	<i>Estimated minimum central pressure (mbar)</i>	<i>Estimated maximum surface wind (knots)</i>	<i>Lat. °N</i>	<i>Long. °E</i>
July	13	0000	T.D.	1004	25	23.3	147.9
		0600	T.D.	1004	25	23.7	146.7
		1200	T.D.	1004	25	23.8	145.4
		1800	T.D.	1002	25	23.9	144.3
	14	0000	T.D.	1000	25	24.0	143.4
		0600	T.D.	997	30	24.0	142.6
		1200	T.D.	995	30	24.0	141.7
		1800	T.D.	990	30	24.0	140.8
	15	0000	T.S.	985	35	23.9	139.9
		0600	T.S.	980	45	23.7	138.9
		1200	S.T.S.	980	50	23.3	138.2
		1800	S.T.S.	980	50	23.0	138.0
	16	0000	S.T.S.	975	50	22.7	137.9
		0600	S.T.S.	975	55	22.4	137.9
		1200	S.T.S.	975	60	22.2	138.0
		1800	S.T.S.	970	60	22.0	138.4
	17	0000	T.	970	65	22.2	139.1
		0600	T.	965	65	22.3	139.9
		1200	T.	970	65	22.6	140.7
		1800	T.	980	65	22.9	141.5
	18	0000	T.	980	65	23.4	142.7
		0600	S.T.S.	980	60	24.1	143.9
		1200	S.T.S.	980	55	24.8	144.7
		1800	S.T.S.	980	50	25.4	145.5
	19	0000	S.T.S.	980	50	26.0	146.0
		0600	T.S.	985	45	26.8	146.3
		1200	T.S.	985	45	27.4	145.5
		1800	T.S.	985	45	28.1	144.5
	20	0000	T.S.	990	40	28.7	143.5
		0600	T.S.	995	40	29.4	142.1
		1200	T.S.	995	40	29.7	140.5
		1800	T.S.	1000	40	29.8	138.9
	21	0000	T.S.	1000	40	29.8	137.3
		0600	T.D.	1000	30	29.5	135.7
		1200	T.D.	1000	30	28.9	133.9
		1800	T.D.	1000	30	28.7	131.5
	22	0000	T.D.	997	30	28.6	128.9
		0600	T.D.	997	30	28.5	126.5
		1200	T.D.	997	30	28.5	124.2
		1800	T.D.	997	30	28.7	122.4
	23	0000	T.D.	997	30	29.0	121.0

APPENDIX (6) SIX-HOURLY POSITIONS OF TYPHOON VIRGINIA

<i>Month</i>	<i>Day</i>	<i>Time G.M.T.</i>	<i>Intensity</i>	<i>Estimated minimum central pressure (mbar)</i>	<i>Estimated maximum surface wind (knots)</i>	<i>Lat. °N</i>	<i>Long. °E</i>	
July	23	0600	T.S.	985	40	15.9	151.0	
		1200	T.S.	985	40	16.2	151.0	
		1800	T.S.	985	40	16.4	151.0	
	24	0000	T.S.	985	45	16.6	151.0	
		0600	S.T.S.	985	50	17.1	151.0	
		1200	S.T.S.	985	50	17.8	150.9	
	25	1800	S.T.S.	980	50	18.4	150.7	
		0000	S.T.S.	980	55	19.0	150.4	
		0600	T.	975	65	19.5	150.0	
	26	1200	T.	975	65	20.0	149.6	
		1800	T.	980	65	20.6	149.1	
		0000	T.	980	65	20.9	148.7	
	27	0600	T.	980	65	21.1	148.5	
		1200	T.	980	65	21.3	148.3	
		1800	T.	980	65	21.5	148.0	
	28	0000	T.	985	65	21.7	147.7	
		0600	T.	985	65	21.8	147.6	
		1200	T.	985	65	21.9	147.5	
	29	1800	T.	985	65	22.0	147.4	
		0000	T.	980	65	22.1	147.2	
		0600	T.	980	65	22.2	147.1	
	30	1200	T.	980	65	22.2	147.0	
		1800	T.	980	65	22.4	147.0	
		0000	T.	980	65	22.4	146.9	
	31	0600	T.	980	65	23.0	146.5	
		1200	T.	980	65	23.9	146.0	
		1800	T.	985	65	24.7	145.5	
	August	1	0000	T.	985	65	25.4	145.0
			0600	T.	985	65	26.5	144.3
			1200	T.	985	65	27.5	143.6
	2	1800	T.	985	65	28.7	143.0	
0000		T.	980	65	29.8	142.3		
0600		T.	980	65	30.8	141.8		
3	1200	T.	980	65	31.8	141.5		
	1800	T.	980	65	32.8	141.2		
	0000	T.	980	65	33.5	141.3		
3	0600	T.	980	65	34.8	141.6		
	1200	T.	980	65	36.2	142.3		
	1800	T.	980	65	37.7	143.4		
3	0000	S.T.S.	980	55	39.2	144.5		
	0600	S.T.S.	980	50	40.5	146.0		
	1200	S.T.S.	980	50	41.7	147.6		
3	1800	S.T.S.	985	50	42.5	149.0		
	0000	T.S.	990	45	43.4	150.4		
	0600	T.S.	990	45	44.5	152.4		
		1200	T.S.	990	45	45.7	155.2	

APPENDIX (7) SIX-HOURLY POSITIONS OF TYPHOON WENDY

<i>Month</i>	<i>Day</i>	<i>Time G.M.T.</i>	<i>Intensity</i>	<i>Estimated minimum central pressure (mbar)</i>	<i>Estimated maximum surface wind (knots)</i>	<i>Lat. °N</i>	<i>Long. °E</i>
July	24	0000	T.D.	995	30	20.8	134.0
		0600	T.D.	995	30	20.9	134.0
		1200	T.S.	990	40	21.0	134.0
		1800	T.S.	990	45	21.1	134.0
	25	0000	S.T.S.	990	50	21.2	134.0
		0600	S.T.S.	985	55	21.3	133.9
		1200	S.T.S.	980	60	21.4	133.9
		1800	T.	975	65	21.4	133.8
	26	0000	T.	970	65	21.5	133.8
		0600	T.	965	65	21.9	133.2
		1200	T.	965	65	22.2	132.8
		1800	T.	960	65	22.6	132.5
	27	0000	T.	960	70	23.2	132.4
		0600	T.	960	70	24.0	132.2
		1200	T.	960	70	24.6	131.6
		1800	T.	960	70	25.4	130.8
	28	0000	T.	960	70	26.3	129.9
		0600	T.	965	70	27.1	128.9
		1200	T.	965	70	27.7	127.5
		1800	T.	965	65	27.8	126.5
	29	0000	T.	965	65	28.1	126.2
		0600	T.	965	65	28.8	126.0
		1200	T.	965	65	29.2	125.9
		1800	T.	960	65	29.6	125.6
	30	0000	T.	965	65	29.9	125.4
		0600	T.	965	65	30.0	125.3
		1200	T.	965	65	30.1	125.1
		1800	T.	965	65	30.2	125.0
	31	0000	T.	965	65	30.3	124.9
		0600	T.	965	65	30.4	124.9
		1200	T.	965	65	30.5	125.0
1800		T.	965	65	30.6	125.0	
August	1	0000	T.	970	65	30.7	125.1
		0600	T.	970	65	30.8	125.9
		1200	S.T.S.	975	55	30.9	126.9
	2	1800	S.T.S.	980	55	31.2	127.8
		0000	S.T.S.	980	50	31.7	128.7
		0600	T.S.	985	45	32.2	129.6
	3	1200	T.S.	985	35	33.1	131.2
		1800	T.S.	985	35	34.6	132.7
		0000	T.D.	985	30	36.9	133.2
		0600	T.D.	990	25	39.0	134.1
		1200	T.D.	990	25	41.0	136.0
		1800	T.D.	990	25	43.0	139.1

APPENDIX (8) SIX-HOURLY POSITIONS OF SEVERE TROPICAL STORM AGNES

<i>Month</i>	<i>Day</i>	<i>Time G.M.T.</i>	<i>Intensity</i>	<i>Estimated minimum central pressure (mbar)</i>	<i>Estimated maximum surface wind (knots)</i>	<i>Lat. °N</i>	<i>Long. °E</i>
July	24	0600	T.D.	997	25	17.3	115.2
		1200	T.D.	995	30	17.9	115.3
		1800	T.D.	995	30	18.6	115.4
	25	0000	T.D.	990	30	19.7	115.6
		0600	T.S.	985	45	20.4	115.8
		1200	T.S.	985	45	21.1	115.7
	26	1800	T.S.	985	45	21.4	115.5
		0000	S.T.S.	980	55	21.5	114.9
		0600	S.T.S.	980	60	21.3	114.5
	27	1200	S.T.S.	980	60	21.2	114.1
		1800	S.T.S.	980	60	21.3	113.7
		0000	S.T.S.	980	60	21.3	113.3
	28	0600	S.T.S.	980	60	21.3	112.8
		1200	S.T.S.	985	60	21.2	112.3
		1800	S.T.S.	985	55	21.0	111.9
	29	0000	S.T.S.	985	55	20.7	111.7
		0600	S.T.S.	985	55	20.5	111.8
		1200	S.T.S.	985	55	20.4	112.0
	30	1800	S.T.S.	985	55	20.4	112.5
		0000	S.T.S.	980	60	20.5	113.0
		0600	S.T.S.	975	60	20.8	113.6
		1200	S.T.S.	970	60	21.4	114.3
		1800	S.T.S.	975	55	22.3	114.8
		0000	T.S.	985	40	22.8	114.9
		0600	T.D.	990	30	23.2	115.3

APPENDIX (9) SIX-HOURLY POSITIONS OF TROPICAL STORM BONNIE

<i>Month</i>	<i>Day</i>	<i>Time G.M.T.</i>	<i>Intensity</i>	<i>Estimated minimum central pressure (mbar)</i>	<i>Estimated maximum surface wind (knots)</i>	<i>Lat. °N</i>	<i>Long. °E</i>
August	9	0600	T.D.	990	30	18.4	114.0
		1200	T.D.	990	30	18.3	113.8
		1800	T.D.	990	30	18.3	113.6
	10	0000	T.D.	990	30	18.4	113.4
		0600	T.S.	990	35	18.5	112.4
		1200	T.S.	985	40	18.5	111.4
	11	1800	T.S.	985	40	18.5	110.4
		0000	T.S.	985	45	18.4	109.5
		0600	T.S.	985	40	18.1	108.7
	12	1200	T.S.	985	40	18.0	107.8
		1800	T.S.	985	40	18.0	106.8
		0000	T.S.	990	35	18.0	105.8
		0600	T.D.	995	30	17.9	104.3

APPENDIX (10) SIX-HOURLY POSITIONS OF TYPHOON CARMEN

<i>Month</i>	<i>Day</i>	<i>Time G.M.T.</i>	<i>Intensity</i>	<i>Estimated minimum central pressure (mbar)</i>	<i>Estimated maximum surface wind (knots)</i>	<i>Lat. °N</i>	<i>Long. °E</i>
August	10	0000	T.D.	1004	30	16.4	145.8
		0600	T.D.	1004	30	16.1	145.8
		1200	T.D.	1004	30	15.9	145.5
		1800	T.D.	1000	30	15.7	145.2
	11	0000	T.D.	1000	30	15.6	144.8
		0600	T.S.	995	35	15.7	144.6
		1200	T.S.	990	40	15.8	144.4
		1800	T.S.	985	40	15.9	144.3
	12	0000	T.S.	980	45	16.1	144.3
		0600	S.T.S.	980	50	16.8	143.9
		1200	S.T.S.	980	50	17.5	143.5
		1800	S.T.S.	980	50	18.7	142.4
	13	0000	S.T.S.	980	55	19.9	141.1
		0600	T.	975	65	21.0	139.5
		1200	T.	975	65	22.0	138.0
		1800	T.	975	65	22.7	136.5
	14	0000	T.	970	70	23.3	135.0
		0600	T.	965	70	24.1	133.4
		1200	T.	965	70	24.9	131.9
		1800	T.	965	70	25.8	130.2
	15	0000	T.	965	70	26.5	128.6
		0600	T.	965	70	27.2	127.2
		1200	T.	965	70	27.5	125.8
		1800	T.	965	70	27.9	124.5
	16	0000	T.	965	70	28.3	123.7
		0600	T.	965	65	28.3	122.9
		1200	S.T.S.	965	60	28.3	122.0
		1800	S.T.S.	970	60	28.8	122.0
	17	0000	S.T.S.	970	60	28.8	122.5
		0600	S.T.S.	975	55	28.8	122.6
		1200	S.T.S.	980	55	28.8	122.8
		1800	S.T.S.	980	55	28.7	122.9
	18	0000	S.T.S.	980	55	28.7	123.0
		0600	S.T.S.	980	50	28.7	123.3
		1200	S.T.S.	980	50	28.7	123.8
		1800	S.T.S.	980	50	28.9	124.2
	19	0000	S.T.S.	980	50	29.1	124.6
		0600	S.T.S.	985	50	29.9	125.2
		1200	S.T.S.	985	50	30.8	125.7
		1800	T.S.	985	45	32.4	125.9
	20	0000	T.S.	985	40	34.3	126.4
		0600	T.S.	990	35	36.0	127.6
		1200	T.D.	995	25	37.0	128.7

APPENDIX (11) SIX-HOURLY POSITIONS OF TROPICAL STORM DELLA

<i>Month</i>	<i>Day</i>	<i>Time G.M.T.</i>	<i>Intensity</i>	<i>Estimated minimum central pressure (mbar)</i>	<i>Estimated maximum surface wind (knots)</i>	<i>Lat. °N</i>	<i>Long. °E</i>	
August	11	0000	T.D.	999	30	16.4	128.8	
		0600	T.D.	999	30	17.2	127.9	
		1200	T.D.	995	30	18.1	127.1	
		1800	T.D.	995	30	19.0	126.3	
	12	0000	T.D.	995	30	20.2	125.4	
		0600	T.S.	990	40	21.5	124.4	
		1200	T.S.	990	45	22.3	123.4	
	13	1800	T.S.	990	45	23.0	122.7	
		0000	T.S.	990	40	23.8	122.1	
		0600	T.S.	995	35	25.1	120.6	
			1200	T.D.	998	25	25.0	118.5

APPENDIX (12) SIX-HOURLY POSITIONS OF THE TROPICAL DEPRESSION (18-20 AUGUST)

<i>Month</i>	<i>Day</i>	<i>Time G.M.T.</i>	<i>Intensity</i>	<i>Estimated minimum central pressure (mbar)</i>	<i>Estimated maximum surface wind (knots)</i>	<i>Lat. °N</i>	<i>Long. °E</i>	
August	18	0000	T.D.	1008	25	21.7	149.4	
		0600	T.D.	1006	25	22.8	147.3	
		1200	T.D.	1004	25	23.8	145.2	
		1800	T.D.	1002	25	24.8	143.2	
	19	0000	T.D.	1000	30	25.7	141.1	
		0600	T.D.	998	30	26.4	139.0	
		1200	T.D.	998	30	27.3	136.8	
	20	1800	T.D.	1000	30	28.9	135.2	
		0000	T.D.	1004	25	30.6	134.6	
			0600	T.D.	1004	25	32.7	134.4

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

<i>Month</i>	<i>Day</i>	<i>Time G.M.T.</i>	<i>Intensity</i>	<i>Estimated minimum central pressure (mbar)</i>	<i>Estimated maximum surface wind (knots)</i>	<i>Lat. °N</i>	<i>Long. °E</i>
August	23	0000	T.D.	1000	30	18.2	124.0
		0600	T.D.	995	30	18.2	123.1
		1200	T.D.	995	30	18.1	122.2
	24	1800	T.D.	990	30	17.7	121.3
		0000	T.D.	990	30	17.2	120.5
		0600	T.S.	990	35	16.8	120.0
		1200	T.S.	990	40	16.7	119.4
		1800	T.S.	985	40	16.7	118.9
		0000	T.S.	985	45	16.9	118.5
	25	0600	S.T.S.	980	50	17.1	118.1
		1200	S.T.S.	980	50	17.4	117.8
		1800	S.T.S.	975	55	17.9	117.4
		0000	S.T.S.	975	60	18.4	116.8
		0600	S.T.S.	975	60	18.9	116.1
		1200	S.T.S.	970	60	19.3	115.1
	26	1800	S.T.S.	970	60	19.5	114.0
		0000	S.T.S.	965	60	20.0	112.9
		0600	S.T.S.	970	60	21.0	111.9
		1200	S.T.S.	975	60	21.6	110.3
	27	1800	T.S.	980	45	21.7	108.7
		0000	T.D.	990	30	21.8	107.2

APPENDIX (14) SIX-HOURLY POSITIONS OF TYPHOON FAYE

<i>Month</i>	<i>Day</i>	<i>Time G.M.T.</i>	<i>Intensity</i>	<i>Estimated minimum central pressure (mbar)</i>	<i>Estimated maximum surface wind (knots)</i>	<i>Lat. °N</i>	<i>Long. °E</i>
August	28	0000	T.D.	1000	25	12.9	146.2
		0600	T.D.	995	25	14.1	145.5
		1200	T.D.	995	30	15.0	145.2
		1800	T.D.	995	30	15.9	145.0
	29	0000	T.S.	995	35	16.7	145.0
		0600	T.S.	995	35	17.7	145.1
		1200	T.S.	995	35	18.7	145.3
		1800	T.S.	990	35	19.2	146.1
	30	0000	T.S.	990	35	19.2	146.7
		0600	T.S.	985	40	19.1	147.4
		1200	T.S.	985	40	18.9	148.1
		1800	T.S.	985	40	18.5	148.7
	31	0000	T.S.	985	40	18.1	148.9
		0600	T.S.	985	45	17.6	148.8
		1200	T.S.	985	45	17.3	148.5
1800		T.S.	985	45	17.0	148.1	
September	1	0000	T.S.	985	45	16.9	147.4
		0600	S.T.S.	980	50	17.1	146.7
		1200	S.T.S.	970	55	17.6	146.1
		1800	S.T.S.	960	60	18.3	145.4
	2	0000	T.	950	65	19.0	144.9
		0600	T.	935	80	19.9	144.2
		1200	T.	935	90	20.8	143.5
		1800	T.	935	90	21.5	142.5
	3	0000	T.	935	100	22.2	141.3
		0600	T.	940	100	23.0	140.1
		1200	T.	945	90	23.9	139.0
		1800	T.	950	80	25.0	137.8
	4	0000	T.	960	70	26.0	136.8
		0600	T.	975	65	27.0	135.7
		1200	S.T.S.	985	55	27.7	135.0
		1800	S.T.S.	990	55	28.5	134.7
	5	0000	S.T.S.	985	50	29.2	134.9
		0600	S.T.S.	980	50	29.8	135.5
		1200	S.T.S.	975	50	30.2	136.3
		1800	S.T.S.	975	55	30.3	137.3
	6	0000	T.	980	65	30.4	138.2
		0600	T.	980	65	30.4	138.8
		1200	T.	980	65	30.4	139.4
		1800	T.	980	65	30.4	139.9
	7	0000	S.T.S.	985	50	30.4	140.4
		0600	T.S.	990	45	30.4	141.1
		1200	T.S.	990	40	30.5	141.7
		1800	T.S.	990	40	30.5	142.2
	8	0000	T.S.	995	40	30.6	142.9
		0600	T.S.	995	40	30.8	143.5
1200		T.S.	995	40	31.0	144.2	
1800		T.S.	995	40	31.2	144.9	
9	0000	T.S.	995	40	31.4	145.6	
	0600	T.S.	995	40	31.6	146.3	
	1200	T.S.	998	35	32.0	147.0	
	1800	T.S.	998	35	32.4	147.7	
10	0000	T.D.	1004	30	32.9	148.3	
	0600	T.D.	1004	25	33.9	149.5	
	1200	T.D.	1004	25	35.0	151.0	

APPENDIX (15) SIX-HOURLY POSITIONS OF TROPICAL STORM GLORIA

<i>Month</i>	<i>Day</i>	<i>Time G.M.T.</i>	<i>Intensity</i>	<i>Estimated minimum central pressure (mbar)</i>	<i>Estimated maximum surface wind (knots)</i>	<i>Lat. °N</i>	<i>Long. °E</i>
August	29	0000	T.D.	998	25	21.0	129.0
		0600	T.D.	998	25	21.6	128.5
		1200	T.D.	998	25	22.2	128.2
		1800	T.D.	996	30	23.1	128.0
	30	0000	T.S.	994	35	23.9	128.1
		0600	T.S.	992	35	24.6	128.4
		1200	T.S.	992	35	25.4	128.7
		1800	T.S.	992	35	26.3	129.1
	31	0000	T.D.	992	30	27.2	129.6
		0600	T.D.	994	30	28.0	130.2
		1200	T.D.	996	30	28.4	131.0
		1800	T.D.	996	30	28.4	132.0
September	1	0000	T.D.	998	25	28.2	132.8
		0600	T.D.	998	25	27.9	133.3
		1200	T.D.	998	25	27.7	133.9
		1800	T.D.	998	25	27.4	134.5

APPENDIX (16) SIX-HOURLY POSITIONS OF TROPICAL STORM HESTER

<i>Month</i>	<i>Day</i>	<i>Time G.M.T.</i>	<i>Intensity</i>	<i>Estimated minimum central pressure (mbar)</i>	<i>Estimated maximum surface wind (knots)</i>	<i>Lat. °N</i>	<i>Long. °E</i>
August	29	0000	T.D.	1004	30	29.0	149.3
		0600	T.D.	1000	30	29.5	149.2
		1200	T.D.	998	30	30.1	149.3
		1800	T.D.	996	30	30.8	149.4
	30	0000	T.S.	994	35	31.6	149.8
		0600	T.S.	992	35	32.3	150.1
		1200	T.S.	990	40	33.1	150.7
		1800	T.S.	990	40	33.9	151.4
	31	0000	T.S.	990	40	34.5	152.1
		0600	T.S.	990	40	35.5	153.2
		1200	T.S.	990	40	37.1	155.9
		1800	T.S.	990	40	38.7	159.1

APPENDIX (17) SIX-HOURLY POSITIONS OF THE TROPICAL DEPRESSION (9-15 SEPTEMBER)

<i>Month</i>	<i>Day</i>	<i>Time G.M.T.</i>	<i>Intensity</i>	<i>Estimated minimum central pressure (mbar)</i>	<i>Estimated maximum surface wind (knots)</i>	<i>Lat. °N</i>	<i>Long. °E</i>
September	9	0600	T.D.	1000	25	16.2	118.5
		1200	T.D.	1000	25	16.4	117.5
		1800	T.D.	1000	25	16.4	116.5
	10	0000	T.D.	1000	25	16.4	115.5
		0600	T.D.	1000	25	16.3	114.7
		1200	T.D.	1000	25	16.0	113.9
	11	1800	T.D.	1000	25	15.7	113.1
		0000	T.D.	1000	25	15.4	112.2
		0600	T.D.	1000	25	15.4	111.4
	12	1200	T.D.	1000	25	15.8	110.8
		1800	T.D.	1000	30	16.4	110.4
		0000	T.D.	1000	30	17.0	110.2
		0600	T.D.	1000	30	17.2	110.2
		1200	T.D.	1000	30	17.5	110.2
		1800	T.D.	1000	30	17.6	110.4
	13	0000	T.D.	1000	30	17.6	110.6
		0600	T.D.	1000	30	17.5	110.8
		1200	T.D.	1000	30	17.3	110.8
	14	1800	T.D.	1000	30	17.1	110.8
		0000	T.D.	1000	30	16.9	110.7
		0600	T.D.	1000	30	16.8	110.5
15	1200	T.D.	1000	30	16.8	110.2	
	1800	T.D.	1000	30	16.8	110.1	
	0000	T.D.	1002	30	16.8	109.8	
	0600	T.D.	1002	25	17.0	109.0	
		1200	T.D.	1002	25	17.3	108.2

APPENDIX (18) SIX-HOURLY POSITIONS OF SEVERE TROPICAL STORM IRMA

<i>Month</i>	<i>Day</i>	<i>Time G.M.T.</i>	<i>Intensity</i>	<i>Estimated minimum central pressure (mbar)</i>	<i>Estimated maximum surface wind (knots)</i>	<i>Lat. °N</i>	<i>Long. °E</i>
September	11	0000	T.D.	998	25	22.1	121.2
		0600	T.D.	996	30	22.8	121.7
		1200	T.S.	994	35	23.4	122.4
		1800	T.S.	992	35	24.0	122.8
	12	0000	T.S.	990	40	24.8	122.9
		0600	T.S.	985	40	25.5	123.2
		1200	T.S.	980	40	26.0	123.5
		1800	T.S.	980	40	26.6	123.4
	13	0000	T.S.	980	40	27.2	123.2
		0600	T.S.	975	45	28.0	123.5
		1200	T.S.	975	45	28.7	123.9
		1800	T.S.	975	45	29.4	124.3
	14	0000	T.S.	975	45	30.0	124.8
		0600	T.S.	975	45	30.8	125.4
		1200	S.T.S.	975	55	31.5	126.1
		1800	S.T.S.	970	55	32.3	127.0
	15	0000	S.T.S.	970	60	33.3	128.7
		0600	S.T.S.	975	50	34.1	130.6
		1200	S.T.S.	992	50	34.7	133.1
		1800	T.S.	998	35	35.3	135.5

APPENDIX (19) SIX-HOURLY POSITIONS OF TYPHOON JUDY

<i>Month</i>	<i>Day</i>	<i>Time G.M.T.</i>	<i>Intensity</i>	<i>Estimated minimum central pressure (mbar)</i>	<i>Estimated maximum surface wind (knots)</i>	<i>Lat. °N</i>	<i>Long. °E</i>
September	10	0600	T.D.	1004	25	20.4	159.1
		1200	T.D.	1004	25	21.0	158.0
		1800	T.D.	1004	25	21.5	156.7
	11	0000	T.D.	1004	25	21.9	155.5
		0600	T.D.	1004	25	22.4	154.1
		1200	T.D.	1004	25	22.9	152.6
	12	1800	T.D.	1004	25	23.3	151.3
		0000	T.D.	1004	30	23.5	150.1
		0600	T.D.	1004	30	23.8	149.3
	13	1200	T.D.	1000	30	24.0	148.4
		1800	T.S.	995	35	24.3	147.7
		0000	T.S.	990	35	24.7	146.9
	14	0600	T.S.	985	40	25.4	146.2
		1200	T.S.	985	45	26.2	145.9
		1800	S.T.S.	980	50	27.1	145.5
	15	0000	S.T.S.	980	50	27.6	145.3
		0600	S.T.S.	980	50	28.1	145.1
		1200	S.T.S.	975	55	28.7	144.8
	16	1800	T.	970	65	29.3	144.4
		0000	T.	970	70	29.9	144.2
		0600	T.	960	70	30.7	144.3
	17	1200	T.	955	70	31.5	144.6
		1800	T.	950	80	32.3	145.1
		0000	T.	950	80	33.5	145.9
	18	0600	T.	950	80	35.1	147.4
		1200	T.	950	80	36.5	149.4
		1800	T.	960	70	38.0	151.9
	19	0000	S.T.S.	975	60	40.0	153.9
		0600	T.S.	985	45	42.1	155.4

APPENDIX (20) SIX-HOURLY POSITIONS OF THE TROPICAL DEPRESSION (19-20 SEPTEMBER)

<i>Month</i>	<i>Day</i>	<i>Time G.M.T.</i>	<i>Intensity</i>	<i>Estimated minimum central pressure (mbar)</i>	<i>Estimated maximum surface wind (knots)</i>	<i>Lat. °N</i>	<i>Long. °E</i>
September	19	0600	T.D.	997	25	16.2	112.2
		1200	T.D.	997	25	16.3	111.1
		1800	T.D.	997	25	16.4	110.1
	20	0000	T.D.	997	25	16.4	109.1
		0600	T.D.	1000	25	16.4	108.1

APPENDIX (21) SIX-HOURLY POSITIONS OF SEVERE TROPICAL STORM KIT

<i>Month</i>	<i>Day</i>	<i>Time G.M.T.</i>	<i>Intensity</i>	<i>Estimated minimum central pressure (mbar)</i>	<i>Estimated maximum surface wind (knots)</i>	<i>Lat. °N</i>	<i>Long. °E</i>
September	22	0000	T.D.	995	25	14.7	125.0
		0600	T.D.	997	25	15.2	123.7
		1200	T.D.	1000	25	15.4	122.3
		1800	T.D.	1000	30	15.1	119.5
	23	0000	T.D.	1000	30	15.0	118.5
		0600	T.D.	997	30	14.9	117.0
		1200	T.S.	995	35	15.2	115.4
		1800	T.S.	995	35	15.7	114.1
	24	0000	T.S.	995	35	16.5	113.0
		0600	S.T.S.	990	50	16.8	112.7
		1200	S.T.S.	990	50	17.2	112.3
		1800	S.T.S.	990	50	17.5	111.7
	25	0000	S.T.S.	990	55	17.8	111.0
		0600	S.T.S.	990	55	18.0	110.1
		1200	S.T.S.	990	55	18.0	109.3
		1800	S.T.S.	990	50	18.0	108.4
	26	0000	T.S.	990	45	17.9	107.5
		0600	T.S.	990	40	17.6	106.7
		1200	T.D.	990	30	17.4	106.0
		1800	T.D.	998	30	17.3	105.1

APPENDIX (22) SIX-HOURLY POSITIONS OF TYPHOON LOLA

<i>Month</i>	<i>Day</i>	<i>Time G.M.T.</i>	<i>Intensity</i>	<i>Estimated minimum central pressure (mbar)</i>	<i>Estimated maximum surface wind (knots)</i>	<i>Lat. °N</i>	<i>Long. °E</i>	
September	24	1200	T.D.	1000	25	12.1	133.7	
		1800	T.D.	1000	30	12.1	132.4	
	25	0000	T.D.	1000	30	12.1	131.0	
		0600	T.D.	1000	30	12.2	130.0	
		1200	T.D.	1000	30	12.2	129.0	
		1800	T.D.	998	30	12.3	127.9	
	26	0000	T.S.	995	45	12.4	126.8	
		0600	S.T.S.	990	50	12.5	125.8	
		1200	S.T.S.	985	50	12.9	124.5	
		1800	S.T.S.	980	50	13.2	123.4	
	27	0000	S.T.S.	985	55	13.5	122.2	
		0600	S.T.S.	985	55	13.9	121.1	
		1200	S.T.S.	985	55	14.2	120.1	
		1800	S.T.S.	985	55	14.6	119.1	
	28	0000	S.T.S.	985	55	15.1	118.0	
		0600	S.T.S.	980	60	15.5	117.3	
		1200	T.	975	65	15.9	116.5	
		1800	T.	970	65	16.2	115.7	
	29	0000	T.	965	65	16.6	114.8	
		0600	T.	965	65	16.8	114.3	
		1200	T.	970	70	16.9	113.9	
		1800	T.	970	75	17.1	113.3	
	30	0000	T.	970	75	17.3	112.9	
		0600	T.	970	70	17.5	112.5	
		1200	T.	970	70	17.9	112.2	
		1800	T.	970	70	18.2	111.9	
	October	1	0000	T.	970	65	18.6	111.6
			0600	T.	970	65	19.3	111.2
			1200	T.	970	65	19.7	110.9
			1800	T.	970	60	20.1	110.5
2		0000	S.T.S.	980	55	20.4	110.0	
		0600	T.S.	985	50	20.9	109.4	
		1200	T.S.	990	45	21.3	108.7	
		1800	T.D.	995	30	21.6	107.9	

APPENDIX (23) SIX-HOURLY POSITIONS OF TYPHOON MAMIE

<i>Month</i>	<i>Day</i>	<i>Time G.M.T.</i>	<i>Intensity</i>	<i>Estimated minimum central pressure (mbar)</i>	<i>Estimated maximum surface wind (knots)</i>	<i>Lat. °N</i>	<i>Long. °E</i>
September	30	0000	T.D.	1002	25	19.0	152.5
		0600	T.D.	1000	30	19.5	152.6
		1200	T.S.	996	35	20.0	152.8
		1800	T.S.	992	35	20.7	152.9
October	1	0000	T.S.	990	35	21.5	152.9
		0600	T.S.	990	35	22.5	152.3
		1200	T.S.	990	35	23.3	151.4
		1800	T.S.	985	40	24.3	150.6
	2	0000	S.T.S.	985	50	25.0	150.1
		0600	S.T.S.	985	50	25.8	149.9
		1200	S.T.S.	980	50	26.9	149.9
		1800	S.T.S.	975	50	28.1	150.3
	3	0000	S.T.S.	970	55	29.2	151.0
		0600	T.	965	65	30.3	151.7
		1200	T.	965	65	32.0	152.9
		1800	T.	960	65	34.4	154.8
	4	0000	S.T.S.	965	55	36.9	157.5

APPENDIX (24) SIX-HOURLY POSITIONS OF SEVERE TROPICAL STORM NINA

<i>Month</i>	<i>Day</i>	<i>Time G.M.T.</i>	<i>Intensity</i>	<i>Estimated minimum central pressure (mbar)</i>	<i>Estimated maximum surface wind (knots)</i>	<i>Lat. °N</i>	<i>Long. °E</i>
October	7	0000	T.D.	999	25	14.4	134.9
		0600	T.D.	997	30	14.5	133.3
		1200	T.D.	995	30	14.7	132.0
		1800	T.D.	995	30	15.0	130.5
	8	0000	T.D.	992	30	15.2	129.2
		0600	T.S.	990	35	15.0	128.0
		1200	T.S.	990	35	14.6	126.9
		1800	T.S.	985	40	14.6	125.7
	9	0000	T.S.	985	40	14.9	124.8
		0600	T.S.	985	45	15.2	123.8
		1200	T.S.	985	40	15.2	122.6
		1800	T.S.	985	40	14.9	121.4
	10	0000	T.S.	985	40	14.5	120.3
		0600	T.S.	985	40	14.5	119.7
		1200	T.S.	985	45	14.7	119.1
		1800	T.S.	985	45	15.0	118.5
	11	0000	T.S.	985	45	15.2	118.0
		0600	T.S.	985	45	15.3	117.7
		1200	S.T.S.	985	50	15.4	117.4
		1800	S.T.S.	985	50	15.4	117.1
	12	0000	S.T.S.	985	50	15.5	116.8
		0600	S.T.S.	985	55	15.5	116.4
		1200	S.T.S.	985	55	15.5	116.0
		1800	S.T.S.	985	55	15.6	115.7
	13	0000	S.T.S.	985	55	15.7	115.6
		0600	S.T.S.	985	55	15.8	115.6
		1200	S.T.S.	985	55	15.9	115.5
		1800	S.T.S.	985	55	16.0	115.5
	14	0000	S.T.S.	985	55	16.1	115.4
		0600	S.T.S.	985	50	17.0	115.1
		1200	T.S.	985	45	17.6	115.0
		1800	T.S.	985	45	17.9	114.5
	15	0000	T.S.	985	45	18.3	113.3
		0600	T.S.	990	45	18.7	112.7
		1200	T.S.	995	45	19.0	112.4
		1800	T.S.	1000	40	19.4	112.2
	16	0000	T.S.	1000	35	19.8	112.1
		0600	T.S.	1005	35	20.1	112.1

APPENDIX (25) SIX-HOURLY POSITIONS OF TYPHOON ORA

<i>Month</i>	<i>Day</i>	<i>Time G.M.T.</i>	<i>Intensity</i>	<i>Estimated minimum central pressure (mbar)</i>	<i>Estimated maximum surface wind (knots)</i>	<i>Lat. °N</i>	<i>Long. °E</i>
October	10	0000	T.D.	997	30	17.1	133.9
		0600	T.S.	995	35	17.5	132.7
		1200	T.S.	995	35	18.1	131.6
		1800	T.S.	995	35	18.7	130.7
	11	0000	T.S.	990	40	19.4	129.8
		0600	T.S.	990	45	20.3	128.7
		1200	T.S.	985	45	20.9	127.5
		1800	T.S.	980	45	21.4	126.0
	12	0000	S.T.S.	975	50	22.0	124.6
		0600	S.T.S.	970	60	22.2	123.5
		1200	T.	965	65	22.2	122.6
		1800	T.	960	65	22.2	122.7
	13	0000	T.	950	70	23.2	122.7
		0600	T.	945	70	24.0	122.8
		1200	T.	960	70	24.7	123.0
		1800	T.	980	70	25.5	123.4
	14	0000	S.T.S.	985	60	26.1	123.9
		0600	S.T.S.	990	50	26.8	124.9
		1200	T.S.	995	45	27.4	126.1
		1800	T.S.	995	45	28.1	128.2
	15	0000	T.S.	996	40	28.9	130.7
		0600	T.S.	998	35	29.8	133.2
		1200	T.S.	998	35	30.6	136.1
		1800	T.S.	996	35	31.3	139.9

APPENDIX (26) SIX-HOURLY POSITIONS OF THE TROPICAL DEPRESSION (10-13 OCTOBER)

<i>Month</i>	<i>Day</i>	<i>Time G.M.T.</i>	<i>Intensity</i>	<i>Estimated minimum central pressure (mbar)</i>	<i>Estimated maximum surface wind (knots)</i>	<i>Lat. °N</i>	<i>Long. °E</i>
October	10	1800	T.D.	1004	25	22.0	159.9
		0000	T.D.	1004	25	22.0	158.4
	11	0600	T.D.	1000	25	22.0	157.0
		1200	T.D.	1000	25	22.1	155.7
		1800	T.D.	1000	25	22.6	154.1
		0000	T.D.	1004	25	23.4	152.5
	12	0600	T.D.	1008	25	23.9	151.2
		1200	T.D.	1008	25	24.4	150.3
		1800	T.D.	1008	25	25.0	149.9
		0000	T.D.	1010	25	25.5	149.6
	13	0600	T.D.	1010	25	26.4	149.5

APPENDIX (27) SIX-HOURLY POSITIONS OF THE TROPICAL DEPRESSION (13-21 OCTOBER)

<i>Month</i>	<i>Day</i>	<i>Time G.M.T.</i>	<i>Intensity</i>	<i>Estimated minimum central pressure (mbar)</i>	<i>Estimated maximum surface wind (knots)</i>	<i>Lat. °N</i>	<i>Long. °E</i>
October	13	0000	T.D.	1003	25	11.8	139.3
		0600	T.D.	1003	25	12.6	138.2
		1200	T.D.	1004	25	13.4	137.0
		1800	T.D.	1004	25	13.9	135.8
	14	0000	T.D.	1005	25	14.4	134.4
		0600	T.D.	1005	25	14.5	133.5
		1200	T.D.	1006	25	14.7	132.7
		1800	T.D.	1006	25	14.8	131.8
	15	0000	T.D.	1007	25	14.9	131.0
		0600	T.D.	1007	25	14.9	130.2
		1200	T.D.	1007	25	15.0	129.3
		1800	T.D.	1007	25	15.0	128.4
	16	0000	T.D.	1007	25	15.1	127.6
		0600	T.D.	1007	25	15.2	127.0
		1200	T.D.	1007	25	15.2	126.5
		1800	T.D.	1007	25	15.2	125.9
	17	0000	T.D.	1007	25	15.2	125.4
		0600	T.D.	1007	25	15.2	124.8
		1200	T.D.	1007	25	15.2	124.3
		1800	T.D.	1007	25	15.1	123.7
	18	0000	T.D.	1007	25	15.1	123.2
		0600	T.D.	1007	25	15.0	122.0
		1200	T.D.	1008	25	14.7	120.6
		1800	T.D.	1008	25	14.4	119.3
19	0000	T.D.	1009	25	13.9	118.1	
	0600	T.D.	1009	25	13.5	117.4	
	1200	T.D.	1008	25	13.0	116.5	
	1800	T.D.	1008	25	12.6	115.8	
20	0000	T.D.	1007	25	12.2	115.0	
	0600	T.D.	1007	25	11.9	114.2	
	1200	T.D.	1008	25	11.5	113.4	
	1800	T.D.	1008	25	11.2	112.6	
21	0000	T.D.	1009	25	10.9	111.8	

APPENDIX (28) SIX-HOURLY POSITIONS OF TYPHOON PHYLLIS

<i>Month</i>	<i>Day</i>	<i>Time G.M.T.</i>	<i>Intensity</i>	<i>Estimated minimum central pressure (mbar)</i>	<i>Estimated maximum surface wind (knots)</i>	<i>Lat. °N</i>	<i>Long. °E</i>
October	16	1200	T.S.	985	40	15.8	159.7
		1800	T.S.	985	40	16.4	159.2
	17	0000	T.S.	980	45	17.1	158.6
		0600	T.S.	975	45	17.7	157.8
		1200	S.T.S.	970	50	18.4	157.0
		1800	S.T.S.	965	60	19.0	156.2
	18	0000	T.	955	70	19.7	155.7
		0600	T.	950	75	20.4	155.3
		1200	T.	955	80	21.1	155.3
	19	1800	T.	955	80	21.6	155.3
		0000	T.	955	85	22.1	155.4
		0600	T.	955	85	22.7	155.5
		1200	T.	955	85	23.2	155.5
		1800	T.	955	85	23.7	155.4
		0000	T.	955	80	24.1	155.3
	20	0600	T.	955	75	24.8	154.9
		1200	T.	955	70	25.5	154.3
		1800	T.	955	70	26.3	153.9
	21	0000	T.	955	70	27.2	153.6
		0600	T.	955	70	28.2	153.5
		1200	S.T.S.	960	60	29.2	154.4
	22	1800	S.T.S.	960	60	29.9	156.1
		0000	S.T.S.	965	55	31.4	158.7

APPENDIX (29) SIX-HOURLY POSITIONS OF TYPHOON RITA

<i>Month</i>	<i>Day</i>	<i>Time G.M.T.</i>	<i>Intensity</i>	<i>Estimated minimum central pressure (mbar)</i>	<i>Estimated maximum surface wind (knots)</i>	<i>Lat. °N</i>	<i>Long. °E</i>
October	17	0600	T.D.	1002	30	9.7	177.2
		1200	T.D.	1002	30	10.0	176.3
		1800	T.D.	1002	30	10.2	175.3
	18	0000	T.D.	1002	30	10.5	174.2
		0600	T.S.	1000	35	10.7	173.2
		1200	T.S.	1000	35	10.8	172.2
	19	1800	T.S.	1000	35	10.9	171.2
		0000	T.S.	995	35	11.1	170.1
		0600	T.S.	995	40	11.3	168.8
	20	1200	T.S.	980	40	11.5	167.3
		1800	S.T.S.	965	50	11.6	165.8
		0000	T.	955	65	11.7	164.3
	21	0600	T.	950	70	11.8	162.9
		1200	T.	945	70	11.7	161.3
		1800	T.	940	80	11.6	159.4
	22	0000	T.	935	90	11.4	158.0
		0600	T.	935	100	11.3	156.8
		1200	T.	935	105	11.2	155.7
	23	1800	T.	930	105	11.2	154.5
		0000	T.	920	110	11.2	153.4
		0600	T.	910	120	11.3	152.3
	24	1200	T.	900	125	11.4	151.2
		1800	T.	890	130	11.5	149.9
		0000	T.	885	135	11.7	148.5
	25	0600	T.	885	140	11.9	147.1
		1200	T.	890	145	12.0	145.6
		1800	T.	895	140	12.0	143.7
	26	0000	T.	900	140	12.1	141.9
		0600	T.	900	140	12.2	139.7
		1200	T.	895	140	12.5	137.6
	27	1800	T.	890	140	12.7	135.2
		0000	T.	880	145	12.8	133.0
		0600	T.	880	145	13.1	131.1
	28	1200	T.	885	145	13.3	129.1
		1800	T.	890	140	13.8	127.2
		0000	T.	910	140	14.4	125.4
	29	0600	T.	930	120	14.7	123.9
		1200	T.	950	120	14.8	122.6
		1800	T.	970	120	15.4	121.5
	30	0000	T.	975	100	16.4	119.8
		0600	T.	980	90	16.7	118.4
		1200	T.	985	65	16.9	117.2
31	1800	T.	990	65	17.2	116.3	
	0000	T.	990	65	17.4	115.5	
	0600	T.	995	65	17.1	114.9	
1	1200	S.T.S.	995	55	16.6	114.7	
	1800	S.T.S.	995	50	16.1	114.3	
	0000	T.S.	998	45	15.5	113.7	
2	0600	T.S.	1000	40	14.9	112.8	
	1200	T.S.	1000	40	14.6	111.7	
	1800	T.S.	1002	35	14.2	110.4	

APPENDIX (30) SIX-HOURLY POSITIONS OF SEVERE TROPICAL STORM TESS

<i>Month</i>	<i>Day</i>	<i>Time G.M.T.</i>	<i>Intensity</i>	<i>Estimated minimum central pressure (mbar)</i>	<i>Estimated maximum surface wind (knots)</i>	<i>Lat. °N</i>	<i>Long. °E</i>	
November	1	1800	T.D.	998	25	14.9	144.5	
		0000	T.D.	995	25	15.9	144.3	
	2	0600	T.D.	990	25	16.9	144.5	
		1200	T.D.	990	30	17.8	144.8	
		1800	T.D.	990	30	18.3	145.1	
		3	0000	T.S.	990	35	18.7	145.5
			0600	T.S.	985	40	19.0	145.9
			1200	T.S.	980	40	19.4	146.3
	4	1800	T.S.	980	45	20.3	146.4	
		0000	S.T.S.	975	50	21.3	146.4	
		0600	S.T.S.	975	50	22.2	146.8	
		1200	S.T.S.	975	50	23.2	147.1	
	5	1800	S.T.S.	975	55	24.2	147.5	
		0000	S.T.S.	975	55	25.3	148.0	
		0600	S.T.S.	975	55	26.7	148.9	
		1200	S.T.S.	975	55	28.0	149.9	
	6	1800	S.T.S.	975	55	29.4	151.0	
		0000	S.T.S.	975	50	30.5	152.3	
		0600	S.T.S.	975	50	32.4	154.4	
			1200	S.T.S.	980	45	33.6	157.1

APPENDIX (31) SIX-HOURLY POSITIONS OF THE TROPICAL DEPRESSION (2-3 NOVEMBER)

<i>Month</i>	<i>Day</i>	<i>Time G.M.T.</i>	<i>Intensity</i>	<i>Estimated minimum central pressure (mbar)</i>	<i>Estimated maximum surface wind (knots)</i>	<i>Lat. °N</i>	<i>Long. °E</i>
November	2	0000	T.D.	1000	25	11.5	114.5
		0600	T.D.	997	30	11.4	113.3
		1200	T.D.	1000	30	11.4	112.0
		1800	T.D.	1000	30	11.5	110.8
	3	0000	T.D.	1000	30	11.5	109.6
		0600	T.D.	1004	25	11.4	108.0

APPENDIX (32) SIX-HOURLY POSITIONS OF TYPHOON VIOLA

<i>Month</i>	<i>Day</i>	<i>Time G.M.T.</i>	<i>Intensity</i>	<i>Estimated minimum central pressure (mbar)</i>	<i>Estimated maximum surface wind (knots)</i>	<i>Lat. °N</i>	<i>Long. °E</i>
November	17	0600	T.D.	998	25	8.2	150.0
		1200	T.D.	998	30	8.5	148.6
		1800	T.S.	995	35	9.0	147.1
	18	0000	T.S.	995	40	9.5	145.7
		0600	T.S.	990	40	10.0	144.4
		1200	T.S.	990	40	10.6	143.0
	19	1800	T.S.	985	45	11.1	141.7
		0000	T.S.	985	45	11.7	140.5
		0600	T.S.	985	45	12.2	139.5
	20	1200	T.S.	980	45	12.8	138.5
		1800	S.T.S.	975	55	13.4	137.4
		0000	S.T.S.	970	60	14.0	136.5
	21	0600	T.	965	65	14.5	135.7
		1200	T.	950	70	15.0	134.9
		1800	T.	935	80	15.5	134.1
	22	0000	T.	915	80	15.9	133.2
		0600	T.	910	90	16.4	132.4
		1200	T.	915	90	16.9	131.6
	23	1800	T.	920	90	17.5	130.7
		0000	T.	925	90	18.3	130.0
		0600	T.	930	90	19.0	129.2
	24	1200	T.	935	85	20.0	128.6
		1800	T.	940	85	21.0	128.5
		0000	T.	945	80	21.9	129.0
	25	0600	T.	960	80	23.0	130.0
		1200	T.	975	80	24.0	131.0
		1800	S.T.S.	990	60	25.1	132.2
	26	0000	T.S.	995	45	25.3	133.7
		0600	T.S.	995	40	24.9	135.2
		1200	T.S.	995	35	24.5	136.5

APPENDIX (33) SIX-HOURLY POSITIONS OF SEVERE TROPICAL STORM WINNIE

<i>Month</i>	<i>Day</i>	<i>Time G.M.T.</i>	<i>Intensity</i>	<i>Estimated minimum central pressure (mbar.)</i>	<i>Estimated maximum surface wind (knots)</i>	<i>Lat. °N</i>	<i>Long. °E</i>
November	27	0600	T.D.	995	30	11.3	149.7
		1200	T.D.	995	30	12.5	149.1
		1800	T.D.	995	30	13.7	148.4
	28	0000	T.S.	990	35	14.7	147.9
		0600	T.S.	985	40	15.7	147.4
		1200	T.S.	985	40	17.7	146.6
		1800	T.S.	980	40	19.5	146.2
		0000	S.T.S.	975	50	21.0	146.3
	29	0600	S.T.S.	980	50	22.3	147.0
		1200	S.T.S.	980	50	24.0	148.5
		1800	S.T.S.	980	50	26.4	151.6
		0000	T.S.	985	45	28.3	155.3
	30	0600	T.S.	985	40	29.8	159.6