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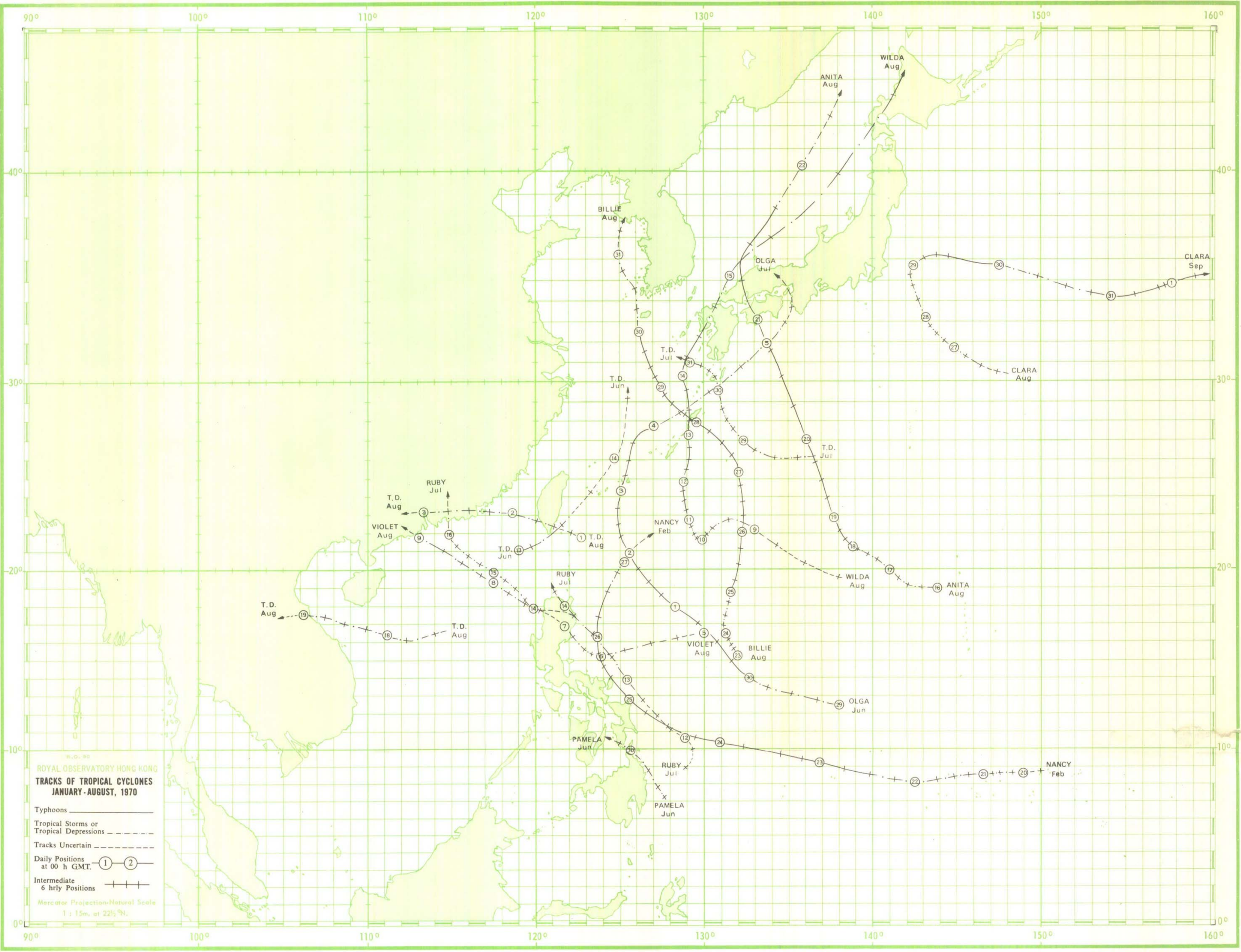
METEOROLOGICAL RESULTS
1970

PART III—TROPICAL CYCLONE SUMMARIES



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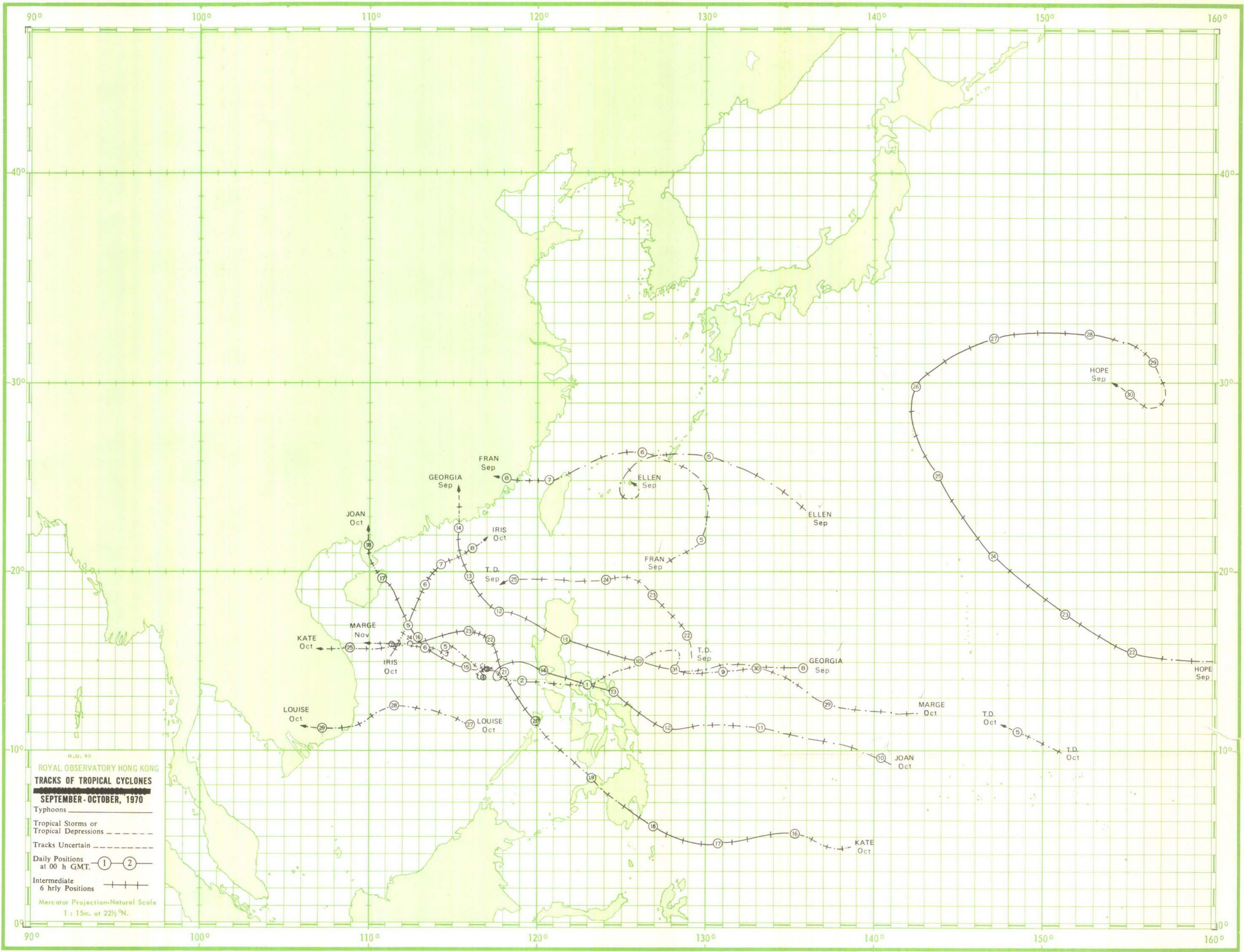
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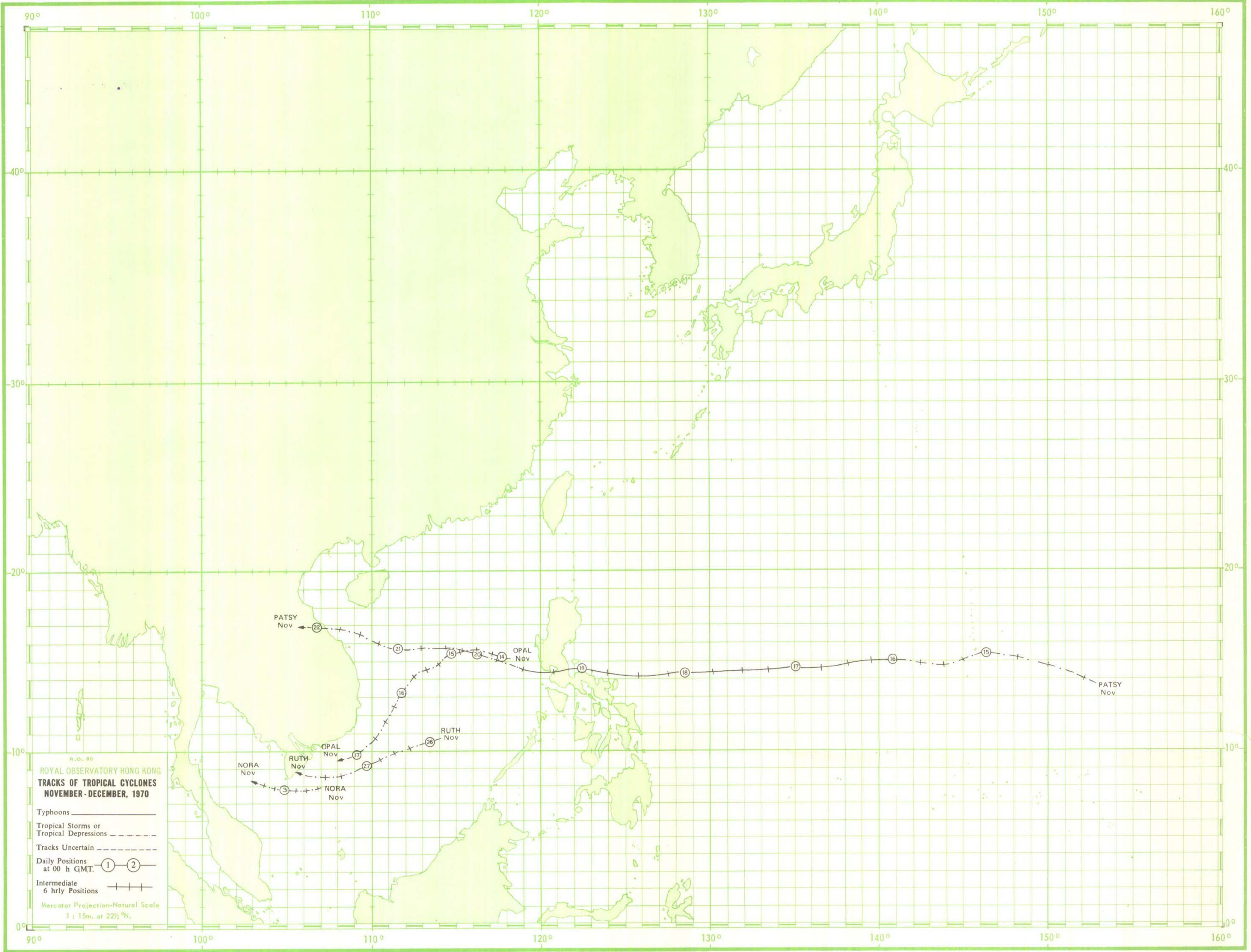
ROYAL OBSERVATORY HONG KONG
TRACKS OF TROPICAL CYCLONES
JANUARY - AUGUST, 1970

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

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



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ROYAL OBSERVATORY HONG KONG
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SEPTEMBER-OCTOBER, 1970
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R.O. 80
ROYAL OBSERVATORY HONG KONG
TRACKS OF TROPICAL CYCLONES
NOVEMBER - DECEMBER, 1970

THE HYDROMETEOROLOGICAL SECTION

Royal Observatory,

Nathan Road,

Kowloon.

(Tel. 677171 Ex. 37)

METEOROLOGICAL RESULTS

1970

PART III—TROPICAL CYCLONE SUMMARIES

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FRONTISPIECE: Tracks of Tropical Cyclones in the western Pacific and the South China Sea, 1970

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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 began 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. In 1971, 'Meteorological Results, Part III—Tropical Cyclone Summaries' was introduced and the first issue of the series was concerned with tropical cyclones which formed over the western Pacific and the South China Sea in 1968.

During the period 1884 - 1939, reports on destructive typhoons were occasionally prepared and were included in the Appendices of Meteorological Results. However, since 1947, this practice was extended and information on all tropical cyclones which caused gales in Hong Kong was contained in the Annual Departmental Reports of the Director of the Royal Observatory.

Tracks of tropical cyclones in the western Pacific and the South China Sea were published in Meteorological Results, Part I up to 1967. For the period 1884 - 1960, the tracks were plotted with day circle positions only. The day circle time varied to some extent but had remained fixed at 0000 GMT since 1944. The day circle time used in each tropical cyclone is given in the Appendix of Royal Observatory Technical Memoir No. 7. From 1961 onwards, 6-hourly intermediate positions were also 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 in cyclostyled form and were supplied on request. Initially, reports were only written on those tropical cyclones causing gale or storm signals to be hoisted in Hong Kong, but by 1968 it had become necessary to produce individual reports for every tropical cyclone for which any 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.

Surface wind observations are made regularly at 6 stations in the Colony. The Cheung Chau Aeronautical Meteorological Station moved to a new site where observations commenced at 1100 GMT on April 20, 1970. The old station was located at 22°12'N, 114°02'E. Each station is equipped with a Dines pressure-tube anemograph incorporating a twin-pen direction recorder, manufactured by R. W. Munro Limited. Quick-run mechanisms are also fitted to the anemometers at Hong Kong Airport, Waglan Island and Tate's Cairn 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. (m)	Elevation of ground above M.S.L. (m)	Head of anemometer above M.S.L. (m)
	Latitude N	Longitude E			
Royal Observatory	22° 18'	114° 10'	33	32	61
Hong Kong Airport	22° 20'	114° 11'	24	4	10
Waglan Island	22° 11'	114° 18'	56	55	74
Tate's Cairn	22° 22'	114° 13'	*	576†	589
Cheung Chau	22° 12'	114° 01'	79	72	92
Cape Collinson	22° 16'	114° 15'	48	46	59

N.B.

* No barometer.

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

‡ Information on the operation of Hong Kong's system of visual Tropical Cyclone Warning Signals is contained in other publications of the Royal Observatory, Hong Kong.

The reports in Section 5 present a general description of the life history of each tropical cyclone affecting Hong Kong from formation to dissipation. In more detail it states:—

- (a) how the tropical cyclone affected Hong Kong;
- (b) the sequence of display of Local Storm Signals;
- (c) the maximum gust peak speeds recorded at various stations in the Colony;
- (d) the lowest barometric pressure recorded in the Colony; and
- (e) the daily amount of rainfall recorded at the Royal Observatory.

Whenever practical, radar photographs and cloud pictures of the tropical cyclone received from weather satellites are included along with information and data obtained from aircraft reconnaissance reports*.

It has proved necessary to use different times in different contexts in this publication. The reference times of non-local warnings for shipping are given in GMT, records of meteorological observations are kept in Hong Kong Standard Time (GMT+8 hours), while Local Time is used in reports on tropical cyclones and other press releases. The Local Time used is either Hong Kong Standard Time or Hong Kong Summer Time (GMT+9 hours). In 1970 Hong Kong Summer Time was in force during the period between 3.30 (Hong Kong Standard Time) in the morning of April 19 and 3.30 (Hong Kong Summer Time) in the morning of October 18.

The following conventions are used in this publication:

- (a) Unlabelled times given in hours and minutes (e.g., 1454) on a 24-hour clock are in Hong Kong Standard Time;
- (b) Times expressed as a.m. or p.m. are in Hong Kong Local Time;
- (c) Times labelled 'GMT' are in Greenwich Mean Time.

Distances are generally given in international nautical miles (n mile), 1 international nautical mile being 1852 metres exactly. In order to shorten the text the words 'international' and 'nautical' are usually omitted. The unit of speed is one international knot (kn), which is equal to 1.852 km/h or about 0.514 m/s.

* The wind speed reports by reconnaissance aircraft included in this publication were taken directly from the Annual Typhoon Report published by the Fleet Weather Central/Joint Typhoon Warning Center at Guam and no attempt was made to convert these observations into equivalent '10-minute mean winds' as normally reported by all surface stations.

DESCRIPTION OF TABLES

Table 1 is a list of tropical cyclones in 1970 in the western 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 non-local tropical cyclone warnings issued by the Royal Observatory, Hong Kong in 1970, 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 GMT.

Table 3 presents a summary of the number of occasions each of the Tropical Cyclone Warning Signals was hoisted, and also the total time throughout the year 1970 that each signal was displayed. The sequence in which signals were displayed in each tropical cyclone affecting Hong Kong and the number of Warning Bulletins issued in each case are also given. Times are given in hours and minutes in Hong Kong Standard Time which is 8 hours ahead of GMT.

Table 4 shows the number of occasions on which Tropical Cyclone Warning Signals were hoisted and their annual total duration during the period 1946-1970. The Strong Wind Signal, No. 3, was not introduced until 1956.

Table 5 gives the annual number of tropical cyclones in Hong Kong's Area of Responsibility between 1946-1970. 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 signal during the period 1946-1970.

Table 7 presents the casualty and damage figures associated with tropical cyclones in Hong Kong for the period 1937-1970. The information is compiled from local newspapers and the figures should only be considered as approximations.

Table 8 contains the particulars of ships sunk, damaged, grounded, etc., by various tropical cyclones which gave rise to persistent gales at the Royal Observatory, Hong Kong for the period 1960-1970. The information is compiled from local newspapers and the figures should only be considered as approximations.

Table 9 presents some features of tropical cyclones which gave gales or winds of greater force at the Observatory since 1884. In each case, data are tabulated in chronological order according to the date and time of barometric minimum recorded at the Royal Observatory. The information presented includes lowest hourly reading of barometer (reduced to M.S.L.) the maximum gust peak speed, duration of gale, direction of strongest winds and the sequence of wind direction in terms of veering and backing. Statements on storm surges and additional information, where applicable, are included as remarks. Information on gusts was not available before the installation of the Dines anemograph in 1911.

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TROPICAL CYCLONE SUMMARY FOR 1970

During the year, 28 tropical cyclones were detected in the western North Pacific and the South China Sea, of which 12 attained typhoon intensity. The monthly distribution of these tropical cyclones is shown in Figure 1 and a brief summary of their tracks is contained in Table 1. Twelve tropical cyclones recurved over the western North Pacific, of which 3 passed over southwest Japan. 13 tropical cyclones intruded Hong Kong's Area of Responsibility for non-local tropical cyclone warnings, while 7 formed within this area. Altogether, 348 non-local warnings were issued on 18 of these tropical cyclones by the Royal Observatory, Hong Kong, while six tropical cyclones necessitated the display of tropical cyclone warning signals in Hong Kong.

In the first 5 months of the year, Typhoon 'Nancy' was the only tropical cyclone observed in the whole area. This unseasonable typhoon formed in the Pacific near the Caroline Islands in February. It moved west-north-westwards at first but later recurved to the east of the Philippines. 'Nancy' was the first typhoon to last for more than seven days in any February on record. The last typhoon observed in February was Typhoon 'Irma' of 1953.

Three tropical cyclones were observed in June. The first developed near Taiwan and moved rapidly northeast to the East China Sea. The second was Typhoon 'Olga', which formed to the east of the Philippines and recurved near the Ryukyu Islands to hit Japan. The third developed east of Mindanao and dissipated to the southwest of Samar Island of the Philippines.

There were two tropical cyclones in July. Tropical Storm 'Ruby' passed about 40 miles to the east of Hong Kong on July 16 and caused strong winds over the Colony with gales in exposed places. On the following day a maximum instantaneous rate of rainfall of 378 mm/h was recorded at the Royal Observatory, which is the highest ever recorded in Hong Kong. The other tropical cyclone of the month was a weak tropical depression which formed about 500 miles east of Okinawa and dissipated near Kyushu.

In August, seven tropical cyclones were observed. Four developed into typhoons and moved northwards to affect Japan and Korea. One crossed the coast of North Vietnam. The remaining two passed within 60 miles of Hong Kong and gave rise to periods of strong winds over the Colony.

Five tropical cyclones formed in September and two attained typhoon intensity. Tropical Storms 'Ellen' and 'Fran' formed a binary system near the Ryukyu Islands. After some rotating movements of the two systems, 'Ellen' became absorbed into the circulation of 'Fran' and the latter crossed the southeast coast of China. Typhoon 'Georgia' passed about 60 miles east of the Royal Observatory on September 14 and produced gale force winds but very little rain in Hong Kong. Typhoon 'Hope' was the only tropical cyclone which formed east of 160°E in the Pacific and spent its entire life east of 140°E. The last tropical cyclone of the month was a weak tropical depression, which formed to the east of Luzon and dissipated after crossing the Balintang Channel.

A succession of six tropical cyclones crossed the South China Sea during October, of which three were typhoons.

In November, there were four tropical cyclones but only one attained typhoon intensity. A tropical storm formed to the south of Indo-China but soon dissipated to the east of the Malay Peninsula. Typhoon 'Patsy' hit the central Philippines and caused severe damage in Manila. The other two were tropical storms which developed over the South China Sea and dissipated to the south of Saigon.

No tropical cyclones were reported in the western Pacific and the South China Sea in December.

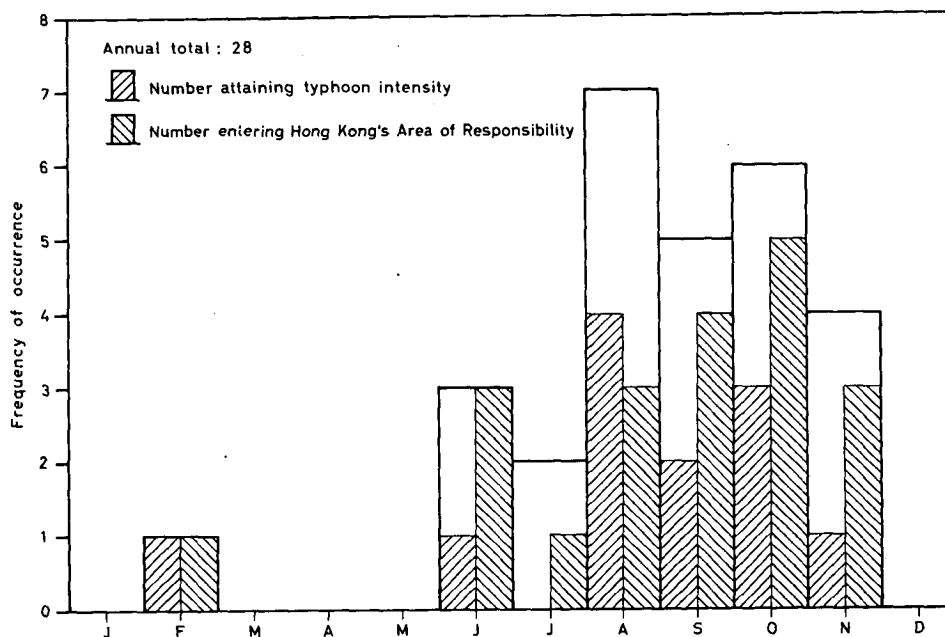


Figure 1. Monthly distribution of the frequency of occurrence of tropical cyclones and typhoons in the western Pacific and the South China Sea in 1970.

REPORTS ON TROPICAL CYCLONES AFFECTING HONG KONG

TROPICAL STORM 'RUBY'

July 11 - 16, 1970

The track of this tropical storm is shown in Figure 2

Late on July 11, a tropical depression formed to the east of Mindanao about 560 miles southeast of Manila. It drifted slowly and erratically to the north at first, and then moved northwestwards at about 12 knots the next day. Early on July 13, the depression intensified into a tropical storm named 'Ruby' when it was centred about 270 miles east of Manila. However, a satellite picture received that morning (Figure 3) revealed that the circulation was not very well organized. 'Ruby' crossed the coast of northern Luzon early in the morning on July 14 and left a death toll of 4 persons in the Philippines. The heavy rain in the south semicircle of the storm circulation caused widespread flooding in several sections of Manila and the disappearance of a fishing boat with 13 people aboard.

On July 14, 'Ruby' weakened temporarily over Luzon and its circulation broke down into two centres, which are clearly depicted by a satellite picture received on the same morning (Figure 4). The eastern centre drifted northwards and soon dissipated in the Balintang Channel while the other centre intensified in the South China Sea about 250 miles southeast of Pratas Island (Figure 5).

In Hong Kong, the Stand By Signal, No. 1, was hoisted at 3.30 p.m. on July 14 when 'Ruby' was centred about 400 miles southeast of the Colony and was moving northwestwards at about 8 knots. At noon on July 15, a report from a reconnaissance aircraft indicated that the minimum central pressure of 'Ruby' was then 985 millibars. The storm passed about 25 miles south of Pratas Island some 3 hours later. The maximum winds reported by this station reached 38 knots and the minimum sea-level pressure was 991.8 millibars. The Strong Wind Signal, No. 3, was hoisted to replace No. 1 at 10.40 p.m. on July 15 when Tropical Storm 'Ruby' was centred about 130 miles southeast of Hong Kong. During the night, winds were generally fresh from a northerly direction and strong in exposed places.

At 5.00 a.m. on July 16, the eye of Tropical Storm 'Ruby' appeared on the radarscope at the Royal Observatory and there were indications (Figure 6) that the storm was intensifying. 'Ruby' reached a position about 48 miles east-southeast of Hong Kong at about 9.00 a.m. and then turned northwards. Its closest approach was about 40 miles to the east of the Royal Observatory at about 11.00 a.m. The lowest sea-level barometric pressure recorded was 993.7 millibars at the Observatory and 991.9 millibars at Cape Collinson.

'Ruby' accelerated to about 12 knots and crossed the coast about 50 miles to the east-northeast of the Observatory at about 12.30 p.m. Thereafter 'Ruby' weakened rapidly and degenerated into an area of low pressure about 130 miles to the north-northeast of Hong Kong about 6 hours later.

As the direction of the gales changed through three quadrants on July 16 it was necessary to display the North-east, Northwest and Southwest Gale or Storm Signals, Nos. 7, 5 and 6 sequentially at 5.45 a.m., 10.30 a.m. and 12.00 noon respectively. No. 6 was replaced by No. 3 at 2.30 p.m. as the centre moved further away from Hong Kong. All signals were lowered at 10.15 p.m. on the same day.

On July 16, the local weather was overcast with frequent squally rain which increased during the afternoon and the late evening. Winds were generally strong in the harbour area and reached gale force in exposed places. The maximum gust peak speeds recorded were 69 knots at the Royal Observatory, 48 knots at the Hong Kong International Airport, 50 knots at Cheung Chau, 45 knots at Cape Collinson, 83 knots at Waglan Island and 58 knots at Tate's Cairn. Winds began to moderate after dark and the last strong winds were recorded around 10.00 p.m.

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

July 14	NIL
July 15	0.4 mm
July 16	73.3 mm
July 17	24.9 mm

The maximum instantaneous rate of rainfall of 378 mm/h was recorded at the Observatory at 8.25 a.m. on July 17. This is the highest value ever recorded. The previous record of 320 mm/h occurred on August 3, 1955.

The times and heights of the highest tides and maximum storm surges recorded at the various locations in the Colony during the passage of Tropical Storm 'Ruby' 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	2.36	Jul 16	7.00 a.m.	0.30	Jul 16	2.27 a.m.
Tai Po Kau	2.30	Jul 16	7.00 a.m.	0.32	Jul 15	9.30 p.m.
Chi Ma Wan (Lantau)	2.50	Jul 16	6.24 a.m.	0.40	Jul 15	9.20 p.m.

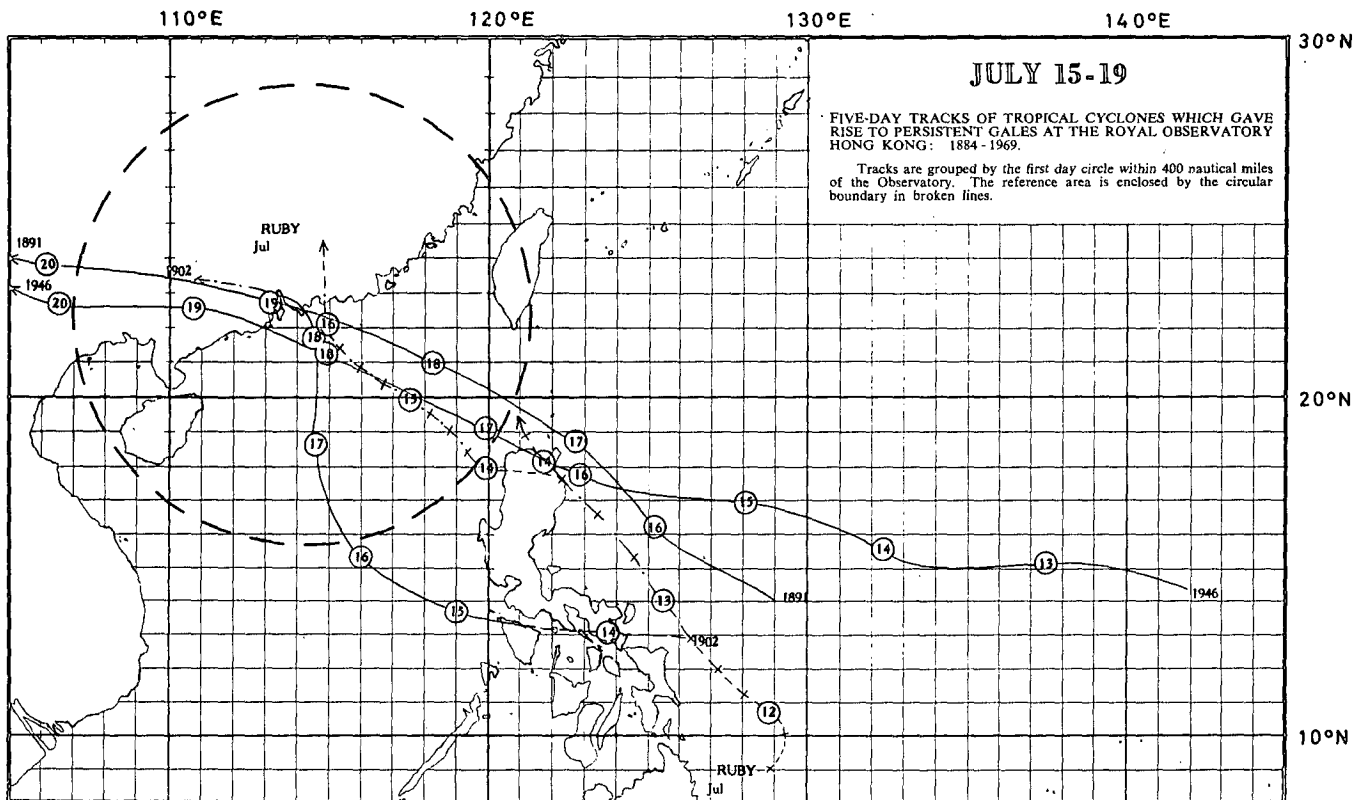


Figure 2. Track of Tropical Storm 'Ruby': July 11 - 16, 1970.

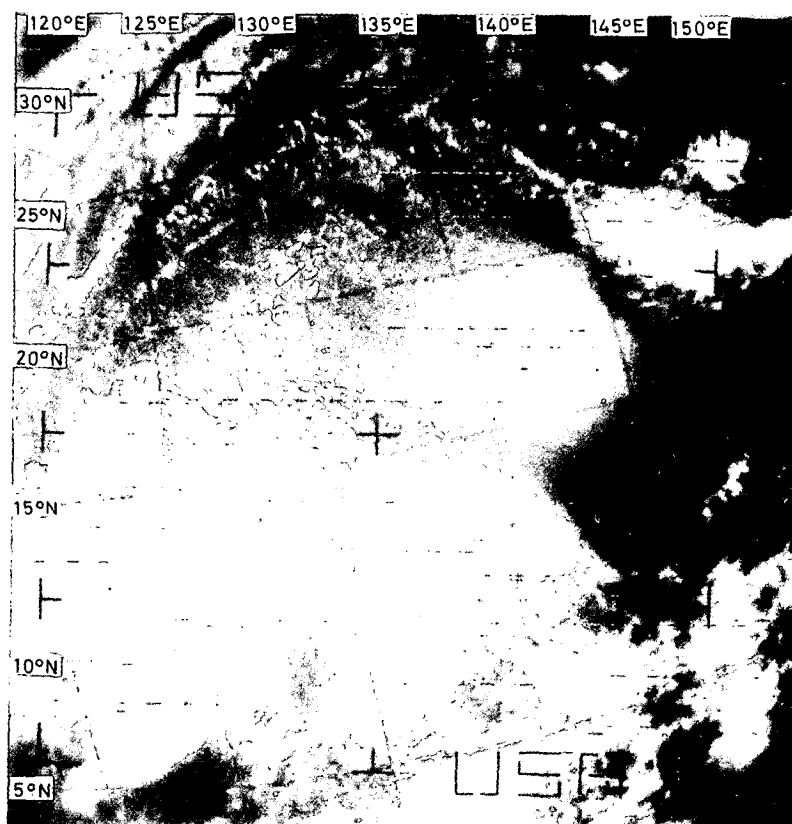


Figure 3. ESSA 8 APT picture of Tropical Storm 'Ruby' taken at 9.56 a.m. on July 13, 1970.

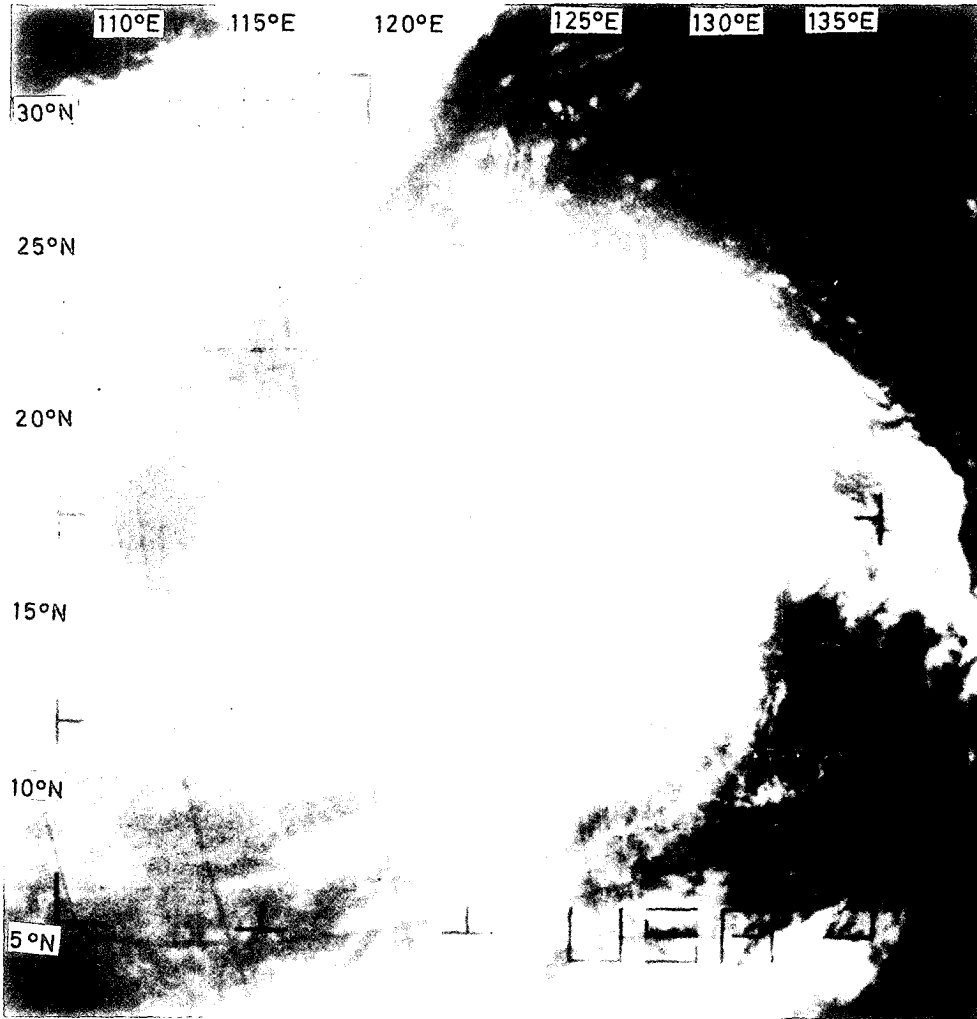


Figure 4. ESSA 8 APT picture of Tropical Storm 'Ruby' taken at 10.47 a.m. on July 14, 1970.

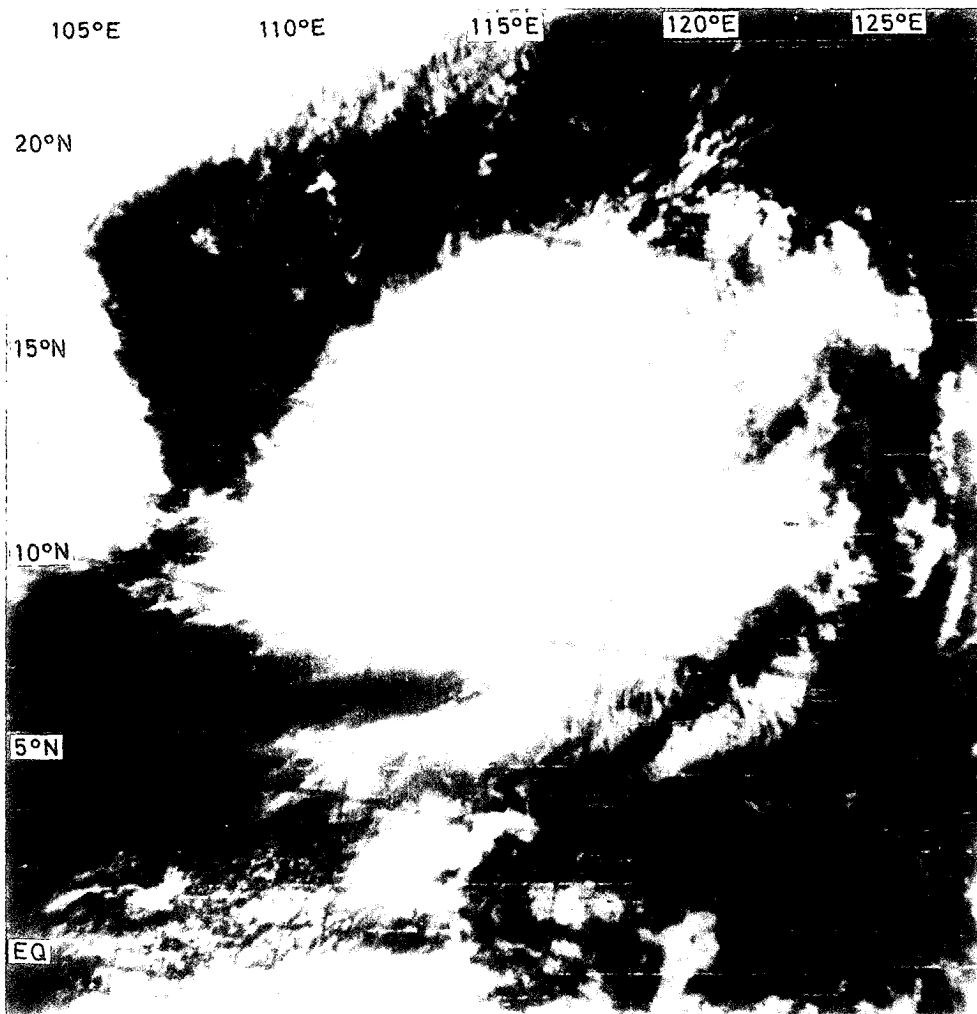
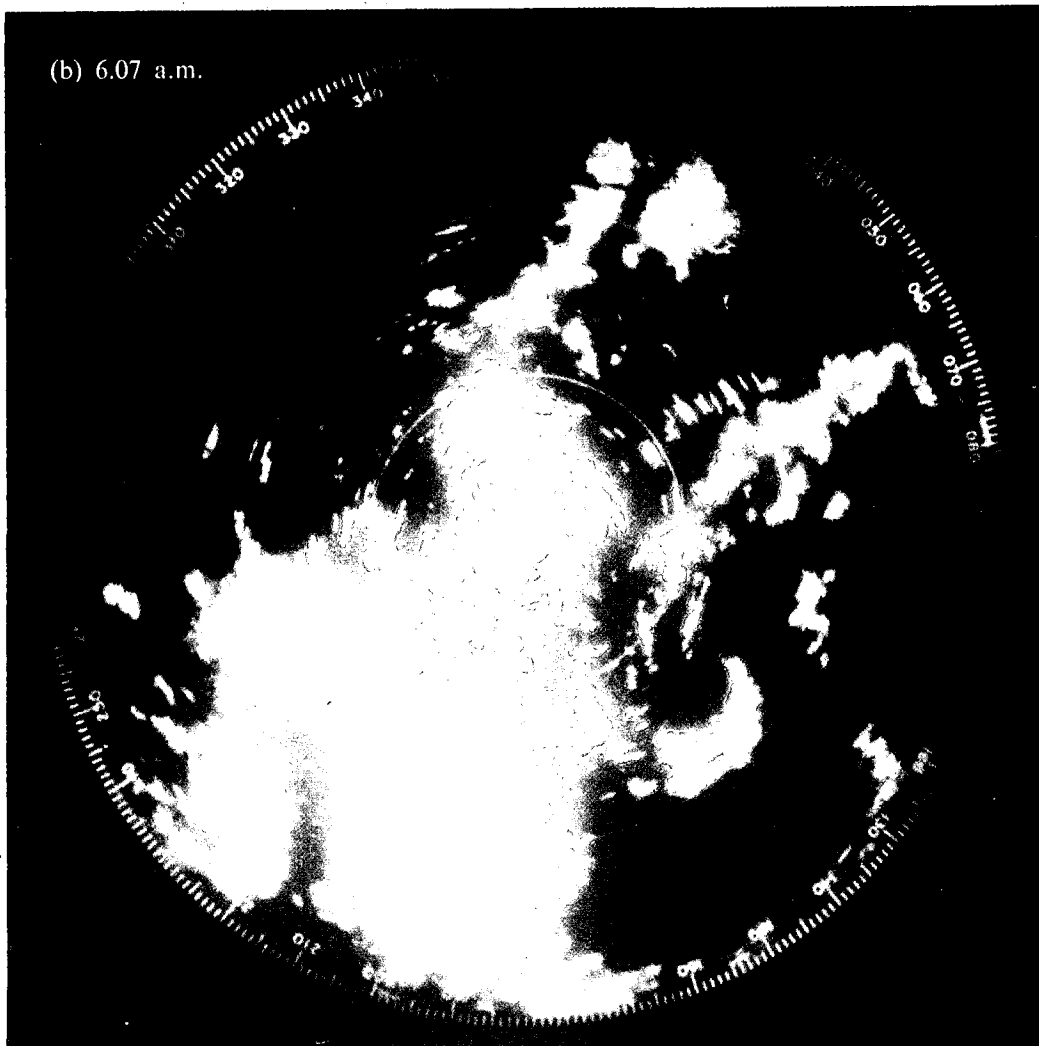
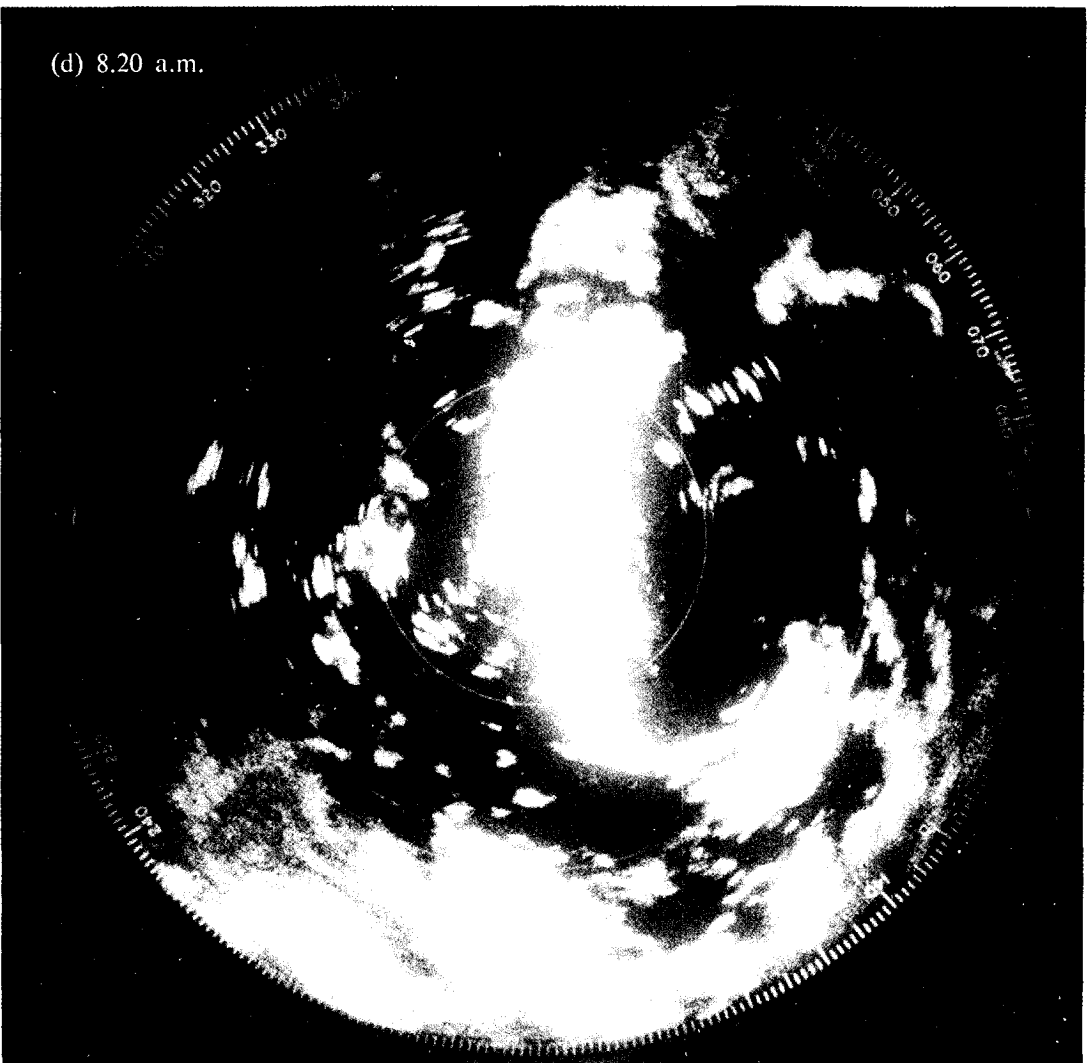
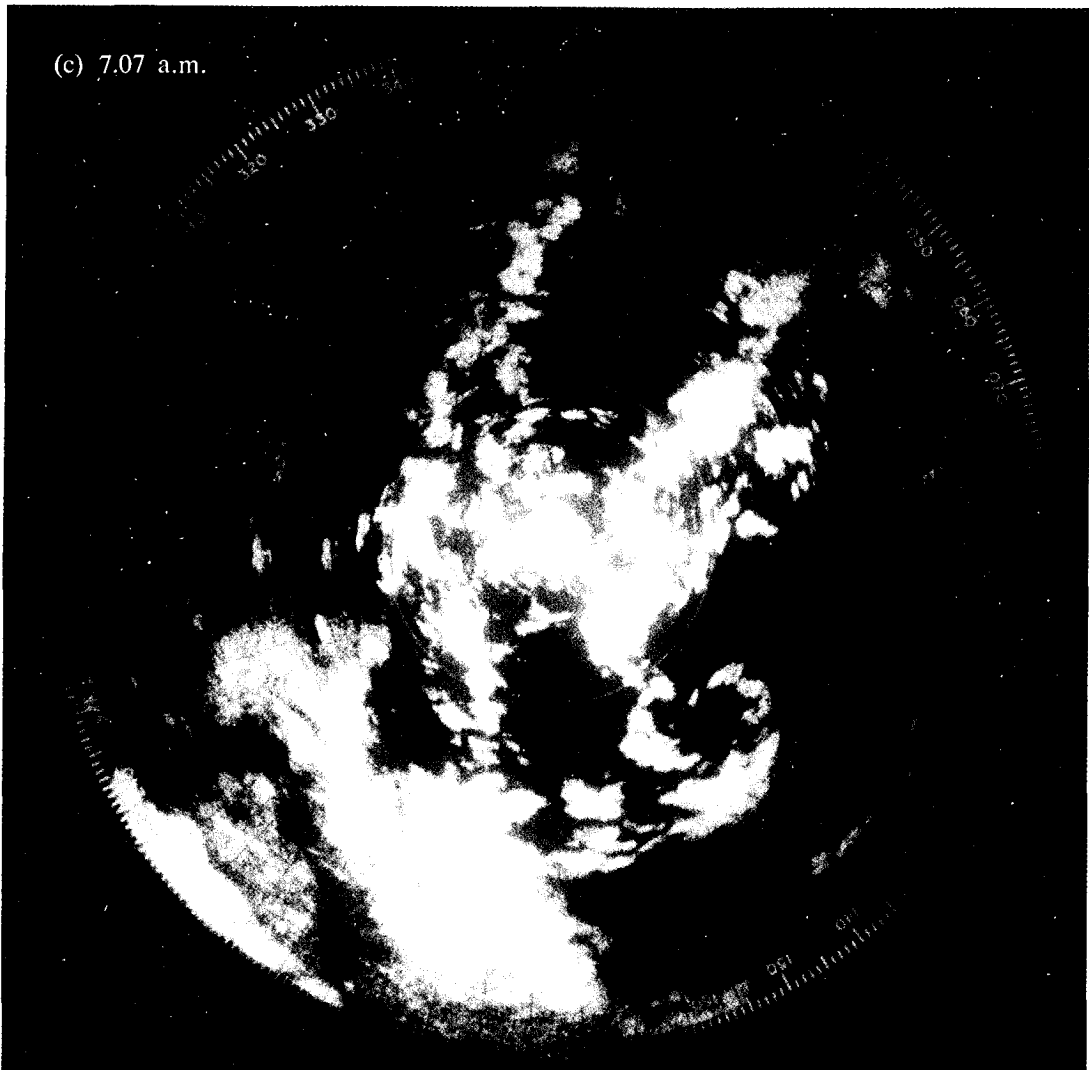


Figure 5. NIMBUS 3 APT picture of Tropical Storm 'Ruby' taken at 12.17 p.m. on July 14, 1970.



Figure 6. Pictures of Tropical Storm 'Ruby' taken from the Observatory's Plessey Type 43S Radar at Tate's Cairn on July 16, 1970. (Range markers at 40 n mile intervals. Antenna elevation 1.5°).





TROPICAL DEPRESSION

August 1 - 3, 1970

The track of this tropical depression is shown in Figure 7

Towards the end of July an active trough of low pressure stretched across the northern part of the South China Sea and through the Luzon Strait to the Ryukyu Islands. Early on August 1, a tropical depression formed on this trough some 180 miles east-southeast of Tainan and began to move west-northwestwards at about 10 knots. As the tropical depression crossed the southern tip of Taiwan during the night, its circulation became disorganized and broke up into several centres. However, a satellite picture received at about noon on August 2 (Figure 8) indicated that the depression had reformed over the South China Sea and ships reported winds of 25 knots near its centre. Radar photographs taken at the Observatory on the same day (Figures 9 and 10) showed that the circulation of the depression was not well organized but the associated rain area was extensive.

As the depression was expected to take a more westerly track and came closer to Hong Kong, the Stand By Signal, No. 1, was hoisted at noon on August 2, when it was centred about 220 miles to the east-northeast. The Strong Wind Signal, No. 3, replaced No. 1 at 5.30 p.m. on the same day when the tropical depression was centred about 160 miles east-northeast of the Colony. The tropical depression crossed the coast near Swatow about 140 miles east-northeast of Hong Kong and moved westwards at about 12 knots. At its closest approach it was about 50 miles north of Hong Kong at about 6.30 a.m. on August 3. The depression continued to move steadily westwards away from the Colony and rapidly degenerated into a large area of low pressure some 50 miles west of Canton in the late afternoon. All signals were lowered at 4.15 p.m. on the same day.

In Hong Kong, periods of rain set in at about noon on August 2 with moderate to fresh gusty westerly winds. These were followed by prolonged and widespread thunderstorms. At the Observatory thunderstorms were almost continuous between 5.35 p.m. and 8.05 p.m. and were heaviest between 7.00 and 8.00 p.m. when 65.6 mm of rain were recorded. At Cheung Chau and Waglan Island strong gusty winds were also experienced for a short period during the thunderstorms. Winds rose steadily overnight and became generally strong over the Colony early next morning when Ferry Companies first hoisted their red flags. The strong winds and squally showers persisted until late afternoon on August 3 and the last strong winds were reported around 4.00 p.m. The maximum gust peak speeds recorded were 47 knots at Cape Collinson, 51 knots at Cheung Chau and the Hong Kong International Airport, 59 knots at Tate's Cairn, 59 knots at Waglan Island and 64 knots at the Royal Observatory.

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

August 2	82.6 mm
August 3	140.9 mm
August 4	11.8 mm

The heavy thunderstorms on August 2 caused widespread flooding in the Colony. A hut in Holy Cross Path Village in Shau Kei Wan collapsed. Two persons were killed by lightning strokes on Lantau Island.

The times and heights of the highest tides and maximum storm surges recorded at the various locations in the Colony during the passage of the tropical depression 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	2.26	Aug 2	9.57 a.m.	0.20	Aug 2	2.00 p.m.
Tai Po Kau	2.41	Aug 3	9.30 a.m.	0.44	Aug 3	3.00 p.m.
Chi Ma Wan (Lantau)	2.42	Aug 2	9.30 a.m.	0.37	Aug 2	7.40 p.m.

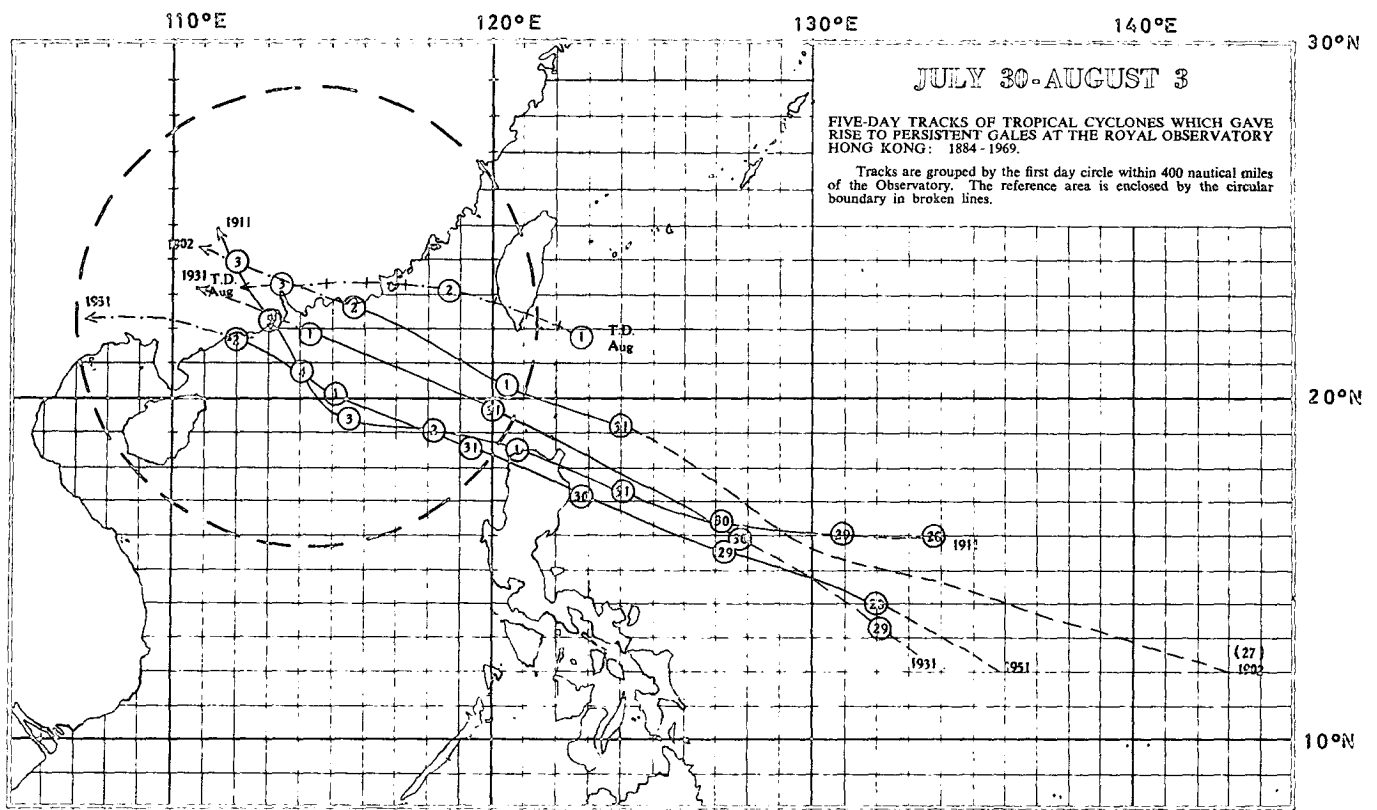


Figure 7. Track of the tropical depression: August 1 - 3, 1970.

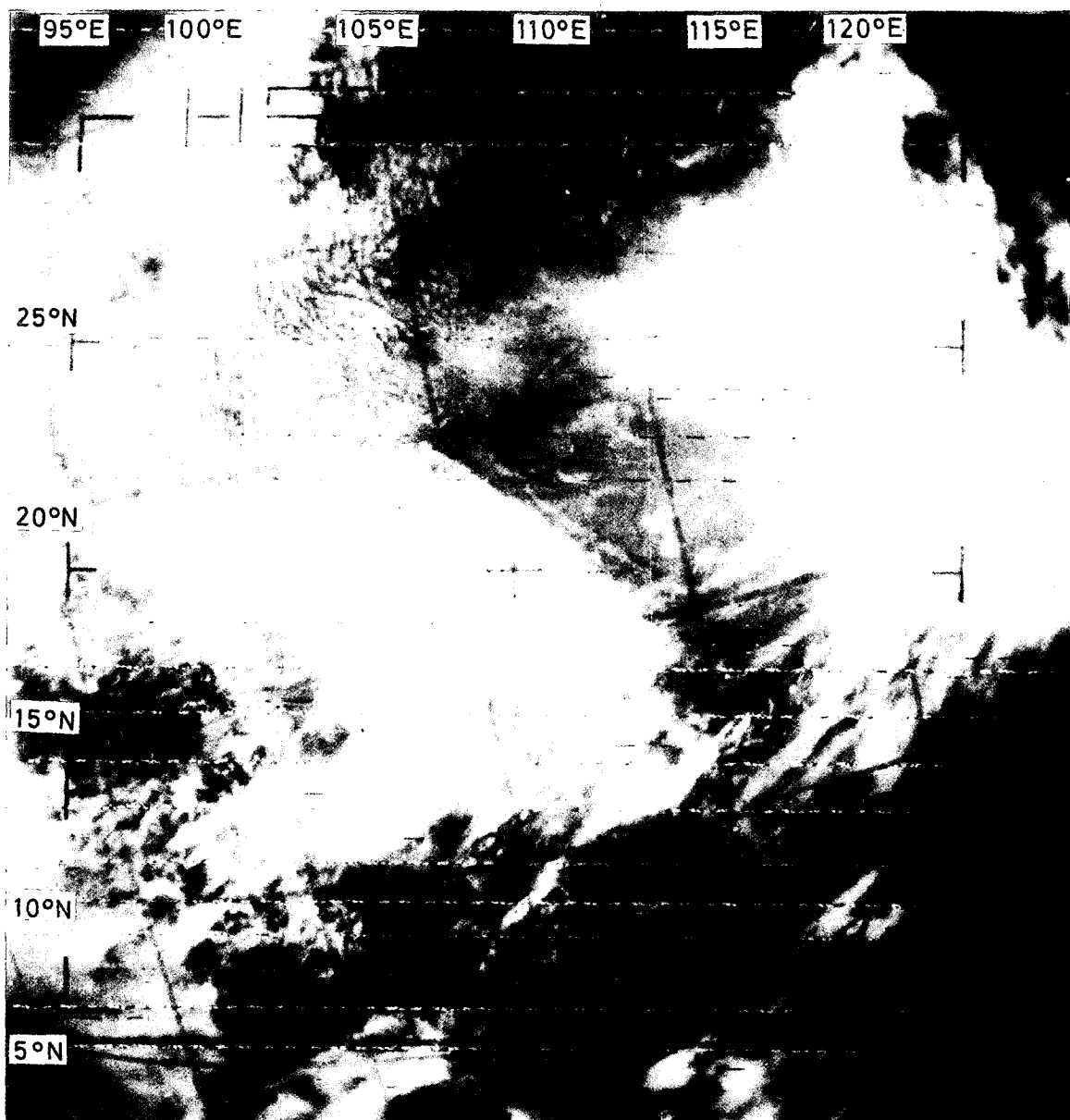


Figure 8. ESSA 8 APT picture of the tropical depression taken at 11.41 a.m. on August 2, 1970.

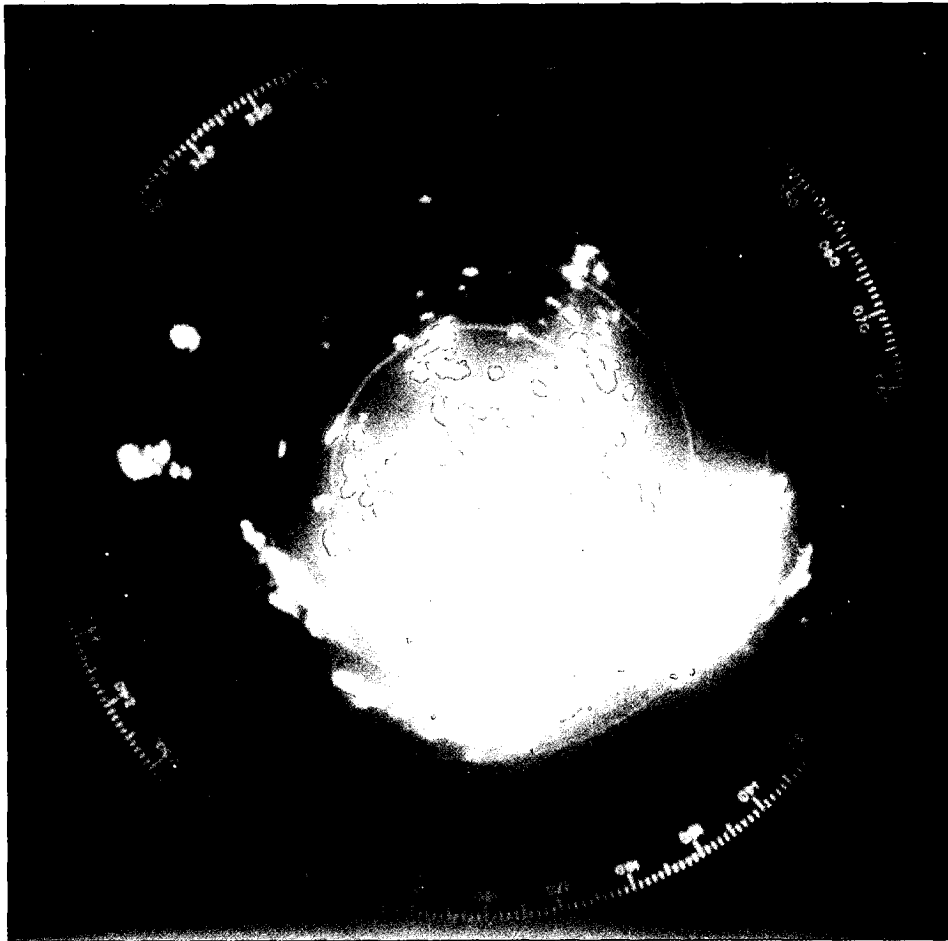


Figure 9. Radar picture of the tropical depression taken at the Royal Observatory at 3.00 p.m. on August 2, 1970.
(Range markers at 40 n mile intervals).



Figure 10. Radar picture of the tropical depression taken at the Royal Observatory at 8.00 p.m. on August 2, 1970.
(Range markers at 40 n mile intervals).

TROPICAL STORM 'VIOLET'

August 5 - 9, 1970

The track of this tropical storm is shown in Figure 11

Early on August 5, a tropical depression formed in an active trough of low pressure about 520 miles east-northeast of Manila and soon intensified to a tropical storm named 'Violet'. It moved west-southwestwards at about 15 knots towards Manila during the first 24 hours and then drifted northwestwards at about 7 knots. At noon on August 6, a reconnaissance aircraft reported central minimum sea-level pressure of 995 millibars and maximum surface winds of 45 knots. Satellite pictures received a few hours later (Figures 12 and 13) showed that 'Violet' had a well-defined eye with a circulation of almost 500 miles in diameter.

Tropical Storm 'Violet' crossed northern Luzon on August 7 and entered the northern part of the South China Sea later in the afternoon. The passing over Luzon resulted in a temporary weakening of the storm and maximum winds reported by land stations near the centre were only 28 knots. Early on August 8, gradual intensification took place again and gales were reported by ships within the circulation of the storm. However, because of the cold-core nature of the storm the maximum winds did not occur near the centre but at a distance of 100-150 miles away and the winds at the upper levels were stronger than at the surface. At 3.00 a.m. on August 9, when the storm was centred about 80 miles south-southeast of Hong Kong, winds at the Royal Observatory were 16 knots at the surface and 42 knots at 3 km. 'Violet' moved steadily west-northwest at about 12 knots over the South China Sea, but failed to intensify further to a typhoon possibly due to the presence of a wave disturbance in the lower troposphere. The storm was closest to the Colony at about 7.00 a.m. on August 9 when it was centred about 60 miles to the south-southwest. However, its eye was very poorly defined on the radar of the Royal Observatory and the storm was relatively dry with a large area of clear weather (Figure 14). It crossed the south China coast about 80 miles west-southwest of Hong Kong at about 10.00 a.m. and rapidly degenerated into an area of low pressure a few hours later.

In Hong Kong, the Stand By Signal, No. 1, was hoisted at 6.45 p.m. on August 7 when 'Violet' was centred about 400 miles to the southeast and was replaced by the Strong Wind Signal, No. 3, at noon the next day when the storm was about 230 miles away. Winds were light and variable in the afternoon of August 8 but began to freshen from the north in the evening and became generally strong before midnight. The wind direction also turned steadily to the east during the night. By the morning of August 9, winds became southeasterly and began to moderate. All signals were lowered at 11.30 a.m. on the same day as the rapidly weakening storm moved further away from the Colony. During the passage of 'Violet' the maximum gust peak speeds recorded were 42 knots at Cape Collinson and the Hong Kong International Airport, 48 knots at the Royal Observatory, 49 knots at Waglan Island, 51 knots at Cheung Chau and 60 knots at Tate's Cairn. The weather was cloudy and showery during the period August 7-9 and thunderstorms were reported on August 7.

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

August 7	9.1 mm
August 8	16.0 mm
August 9	9.1 mm

There was no significant rise in the tide height in Hong Kong during the passage of Tropical Storm 'Violet'.

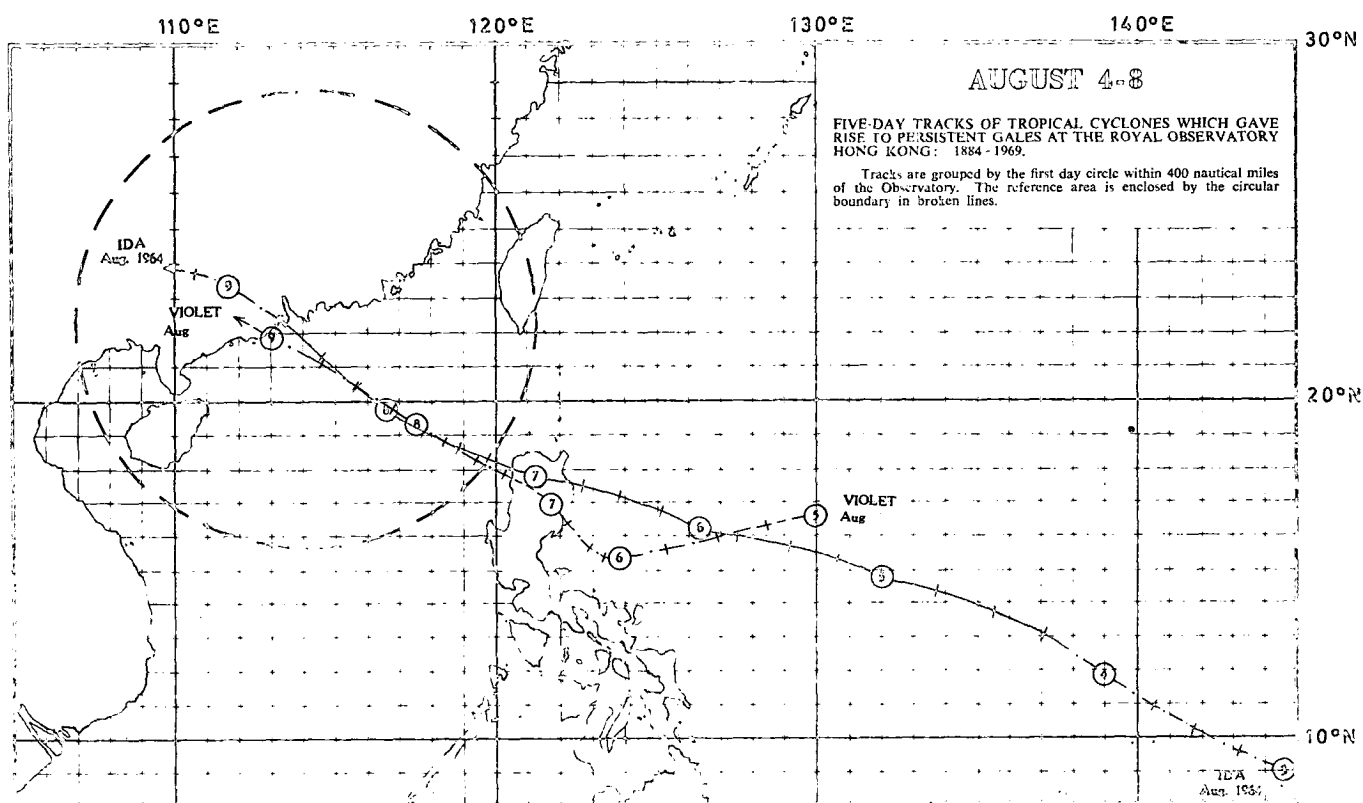


Figure 11. Track of Tropical Storm 'Violet' August 5 - 9, 1970.

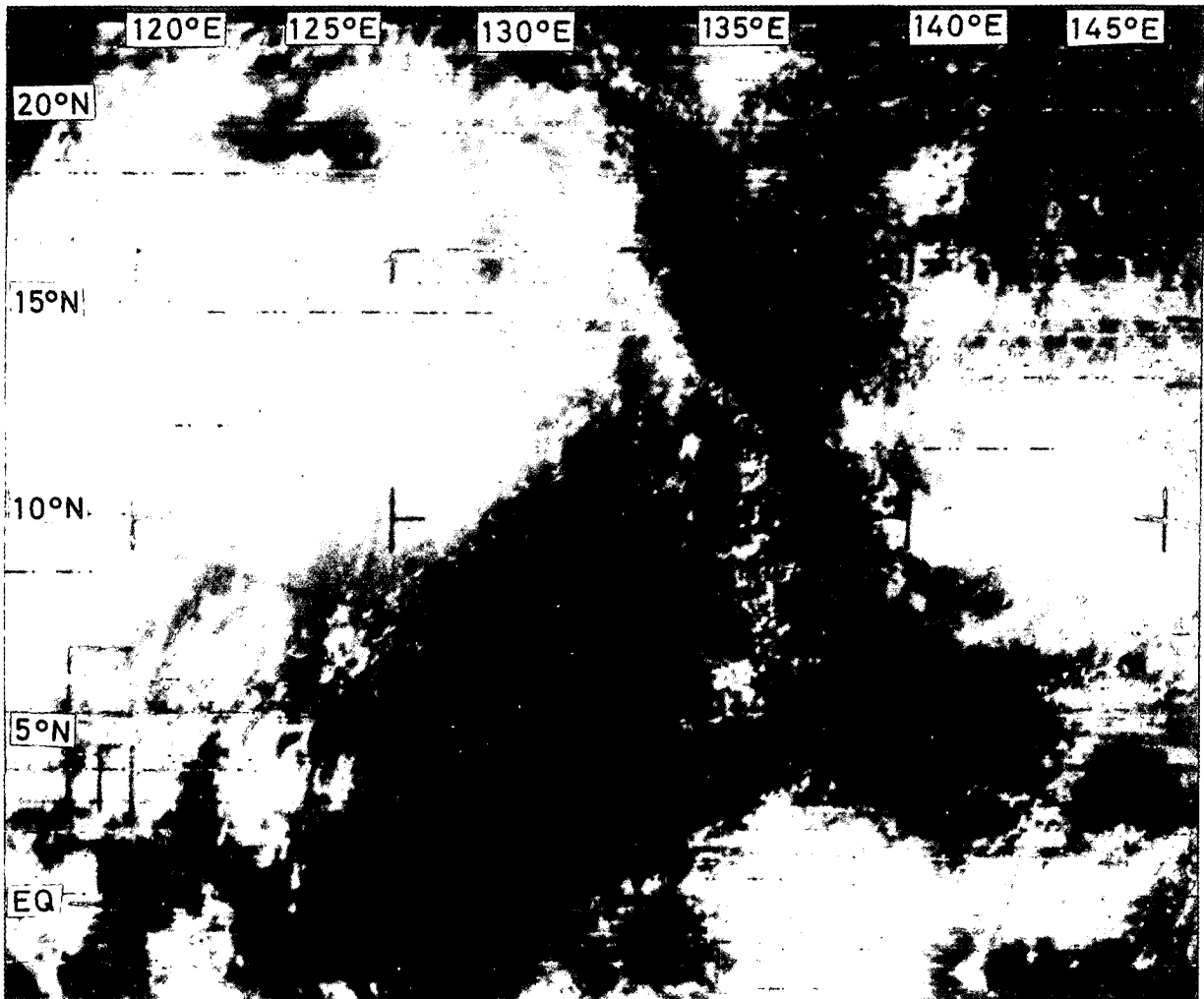


Figure 12. ITOS 1 APT picture of Tropical Storm 'Violet' taken at 3.02 p.m. on August 6, 1970.

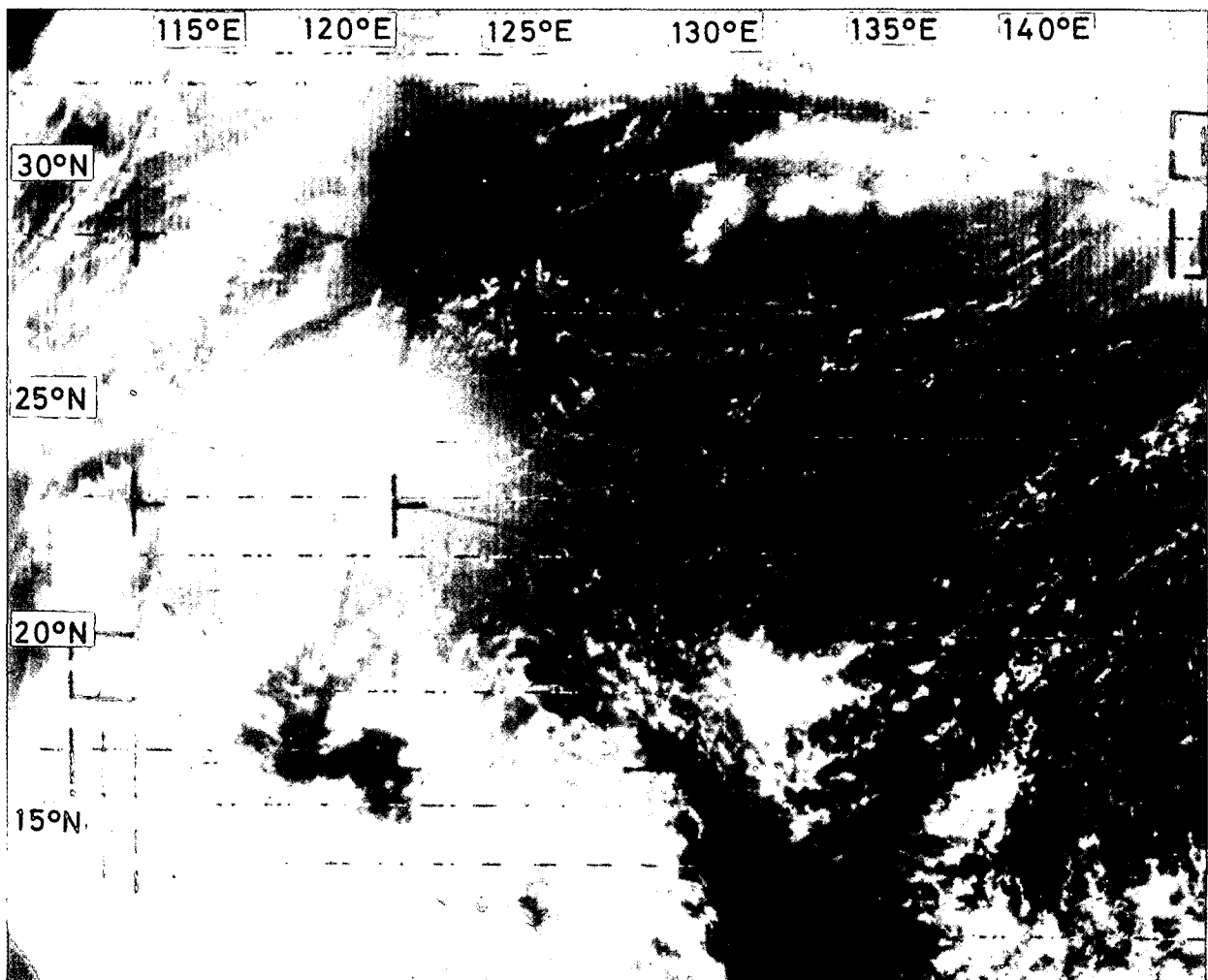


Figure 13. ITOS 1 APT picture of Tropical Storm 'Violet' taken at 3.06 p.m. on August 6, 1970.

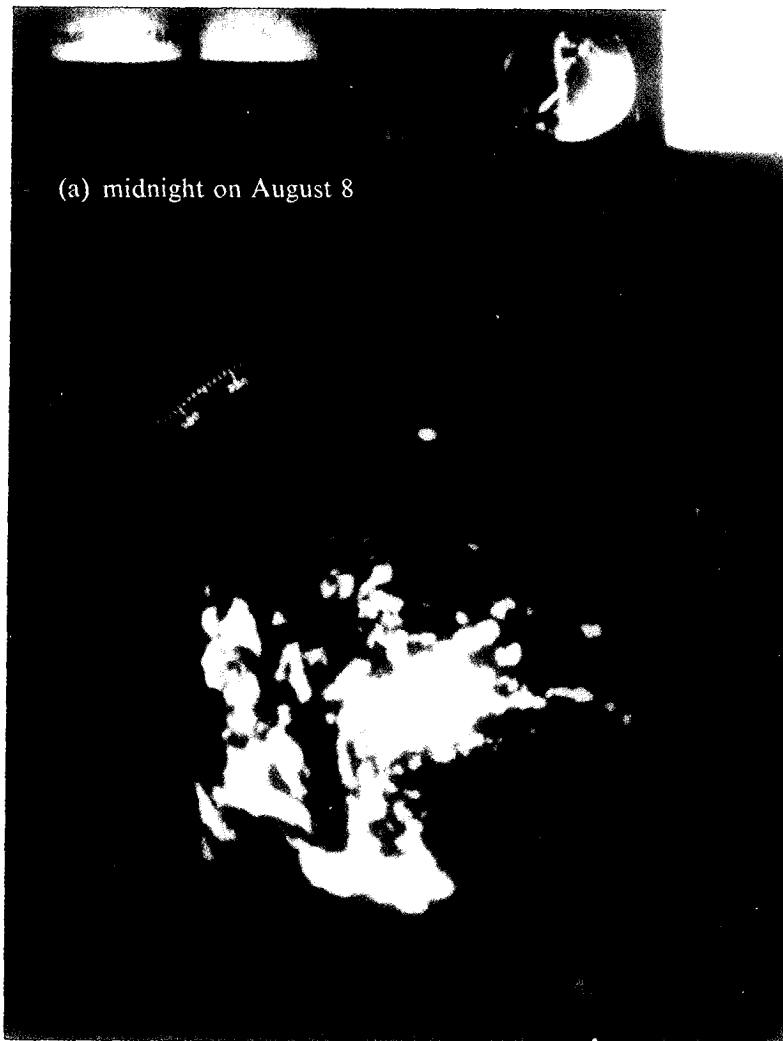
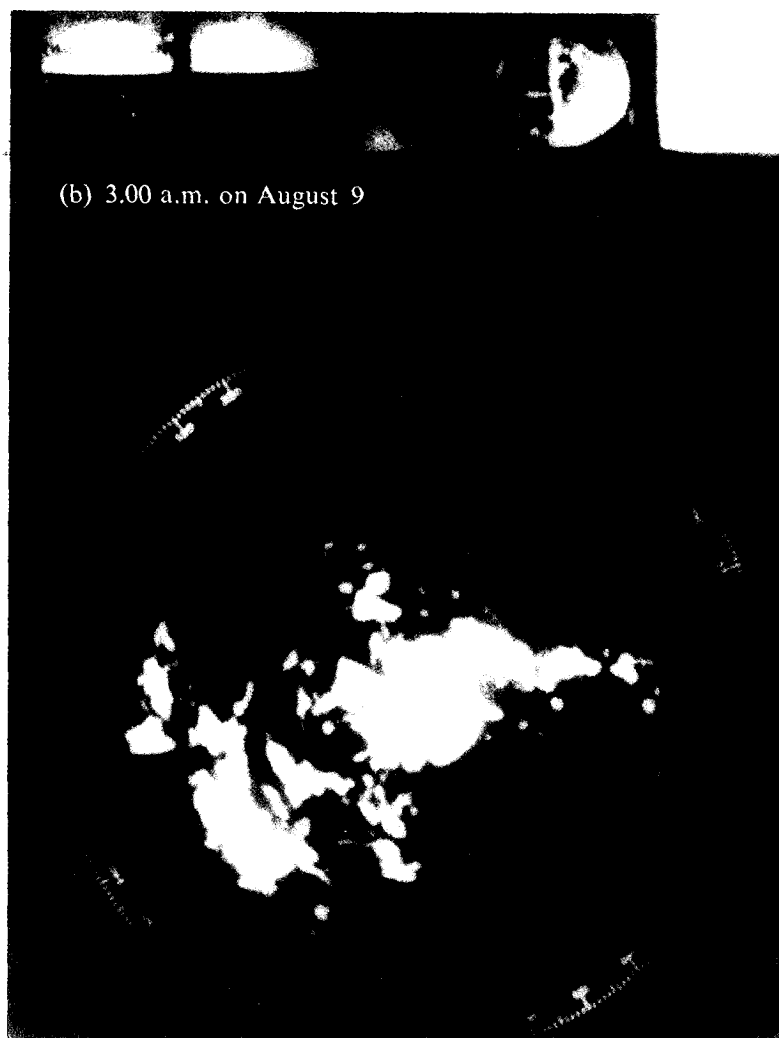


Figure 14. Radar pictures of Tropical Storm 'Violet' taken at the Royal Observatory during the period August 8 - 9, 1970.
(Range markers at 40 n mile intervals).



TYPHOON 'GEORGIA'

September 8 - 14, 1970

The track of this typhoon is shown in Figure 15

Early on September 8, a tropical depression formed in the western Pacific about 340 miles north-northwest of Yap. It soon deepened to a tropical storm named 'Georgia' and became a typhoon the next day. 'Georgia' moved westwards towards Manila at about 12 knots at first and then turned to a west-northwesterly course at 10 knots on September 10. At 3.00 p.m. on the same day, a reconnaissance aircraft reported maximum winds of 130 knots near the centre and a minimum central sea-level pressure of 920 millibars.

'Georgia' crossed northern Luzon during the morning of September 11 and entered the South China Sea in the afternoon. The typhoon weakened considerably during its passage over Luzon. However, reintensification took place over the South China Sea and at 6.10 p.m. on September 12, reports by reconnaissance aircraft indicated that the minimum central sea-level pressure was 975 millibars with maximum winds of 80 knots.

Satellite pictures received during the period September 9 - 12 (Figures 16 - 19) showed that Typhoon 'Georgia' had a well-defined eye and its circulation covered an area about 350 - 400 miles in diameter.

In Hong Kong, the Stand By Signal, No. 1, was hoisted at 8.00 p.m. on September 11, when 'Georgia' was centred about 440 miles southeast of the Colony and was replaced by the Strong Wind Signal, No. 3, at 8.00 p.m. the next day when the typhoon was about 250 miles to the south-southeast. Winds were light and variable throughout most of the day on September 12, but slowly freshened from the north overnight and became generally strong by the afternoon the next day.

Typhoon 'Georgia' changed to a northerly course during the afternoon on September 13, and as it was moving close to the Colony the Northeast Gale or Storm Signal, No. 7, was hoisted at 10.20 p.m. Locally, winds continued to increase and reached gale force in exposed places by about 2.00 a.m. on September 14.

'Georgia' moved steadily northwards to the east of Hong Kong and No. 7 was replaced by the Northwest Gale or Storm Signal, No. 5, at 4.00 a.m. on September 14. The Typhoon was closest to the Colony at about 8.00 a.m. on the same day when it was about 60 miles east of the Royal Observatory. At this time, the Observatory's radar showed that the eye of Typhoon 'Georgia' was oval in shape with an average diameter of about 70 miles (Figure 20).

Typhoon 'Georgia' crossed the south China coast about 70 miles east-northeast of the Observatory during the morning of September 14 and winds over Hong Kong began to moderate. No. 5 was replaced by the Strong Wind Signal, No. 3, at 11.10 a.m. on the same day and all signals were lowered at 5.30 p.m. 'Georgia' weakened rapidly as it moved further north and finally degenerated to an area of low pressure about 170 miles north-northeast of Hong Kong during the evening. During the passage of 'Georgia', the maximum gust peak speeds recorded were 55 knots at Waglan Island, 56 knots at the Observatory, 59 knots at the Hong Kong International Airport and Cheung Chau, 72 knots at Cape Collinson and 73 knots at Tate's Cairn.

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

September 11	11.5 mm
September 12	NIL
September 13	16.5 mm
September 14	24.2 mm

The times and heights of the highest tides and maximum storm surges recorded at the various locations in the Colony during Typhoon 'Georgia' 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	2.61	Sep 14	8.55 a.m.	0.58	Sep 14	12.40 a.m.
Tai Po Kau	2.89	Sep 14	5.30 a.m.	1.11	Sep 14	5.15 a.m.

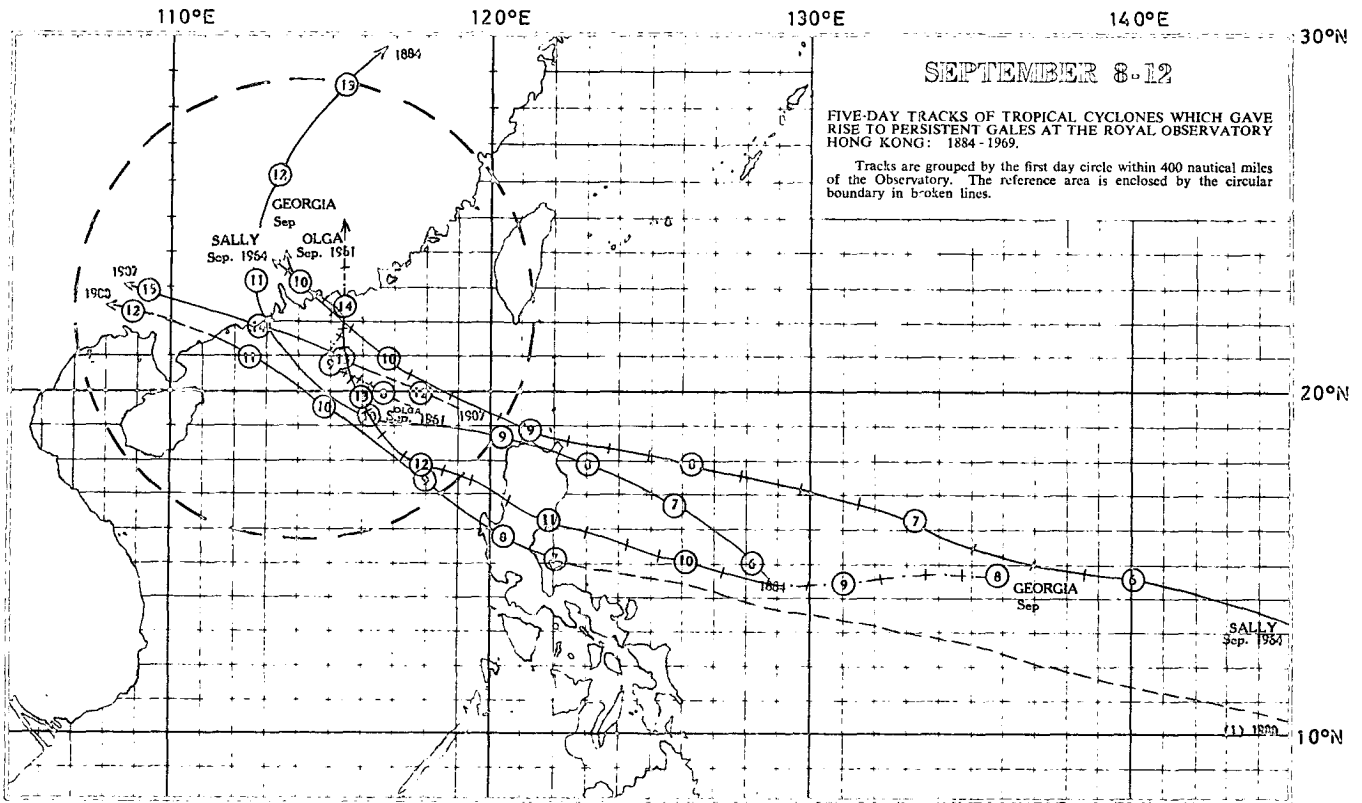


Figure 15. Track of Typhoon 'Georgia': September 8 - 14, 1970.



Figure 16. ESSA 8 APT picture of Typhoon 'Georgia' taken at 9.43 a.m. on September 9, 1970.

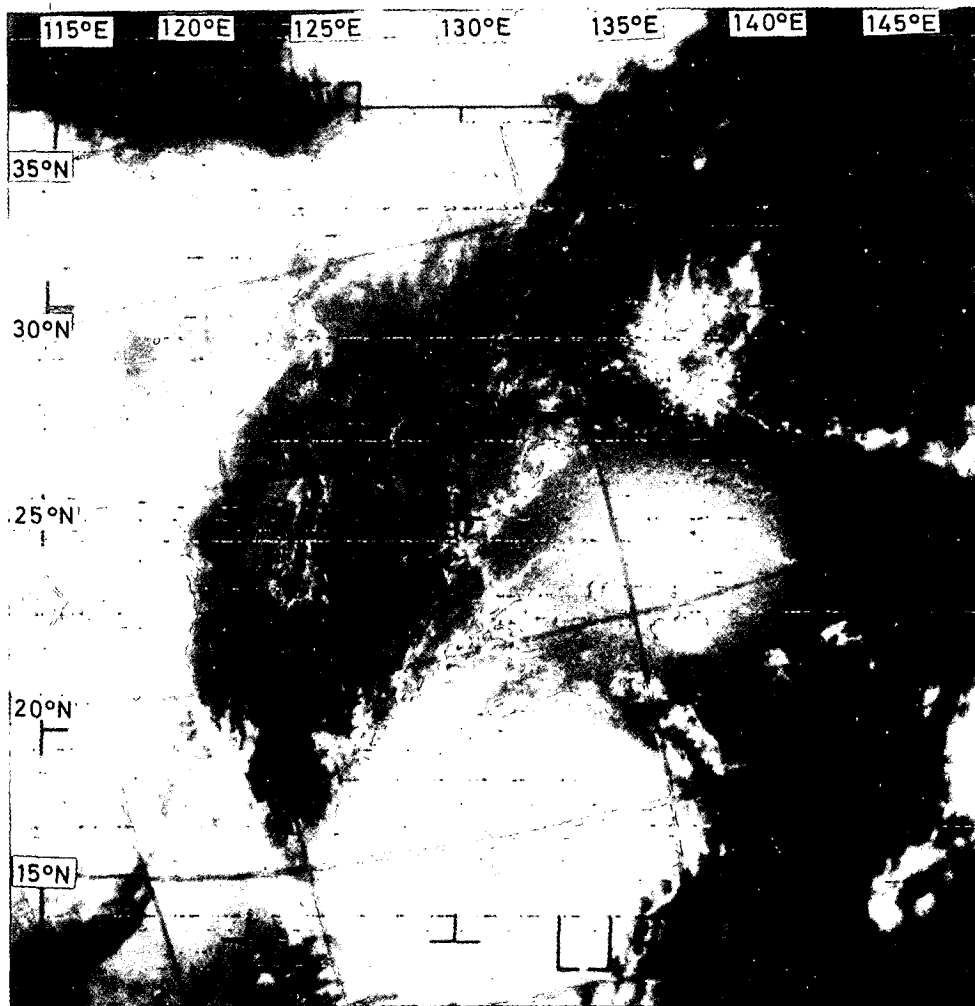


Figure 17. ESSA 8 APT picture of Typhoon 'Georgia' taken at 10.28 a.m. on September 10, 1970.

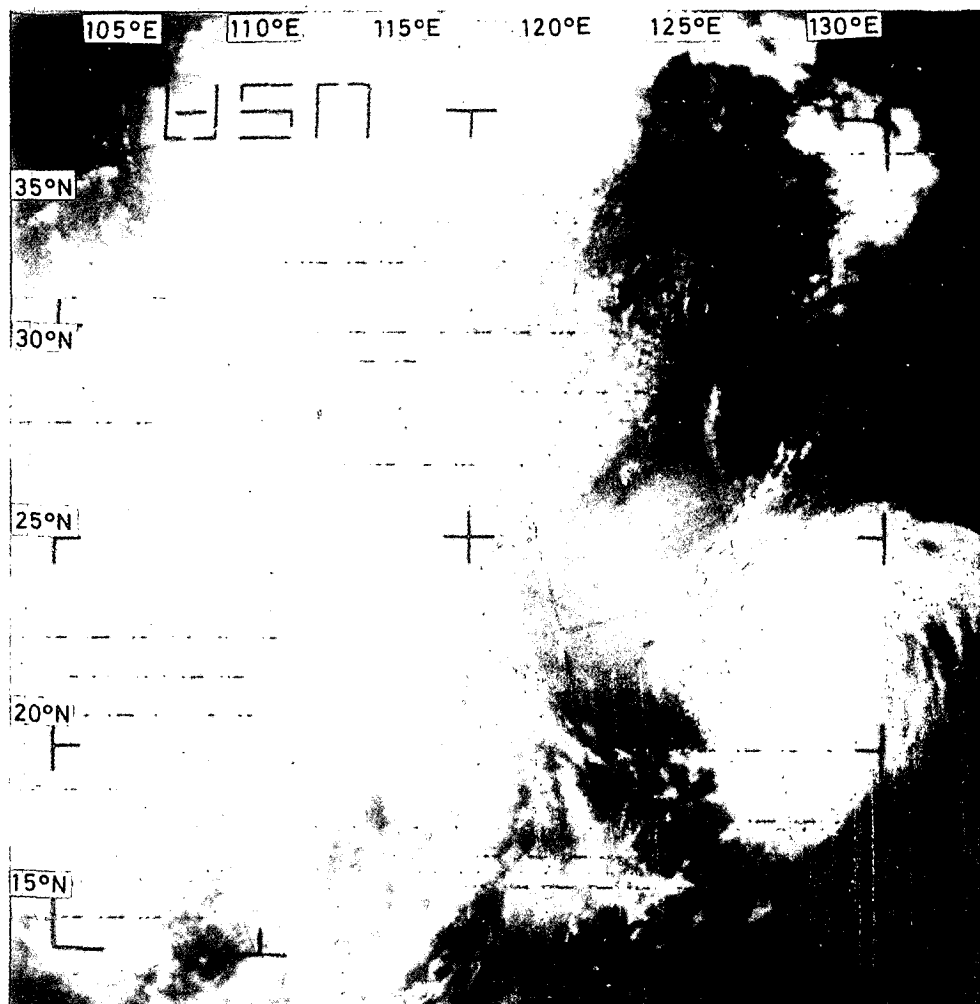


Figure 18. ESSA 8 APT picture of Typhoon 'Georgia' taken at 11.20 a.m. on September 11, 1970.

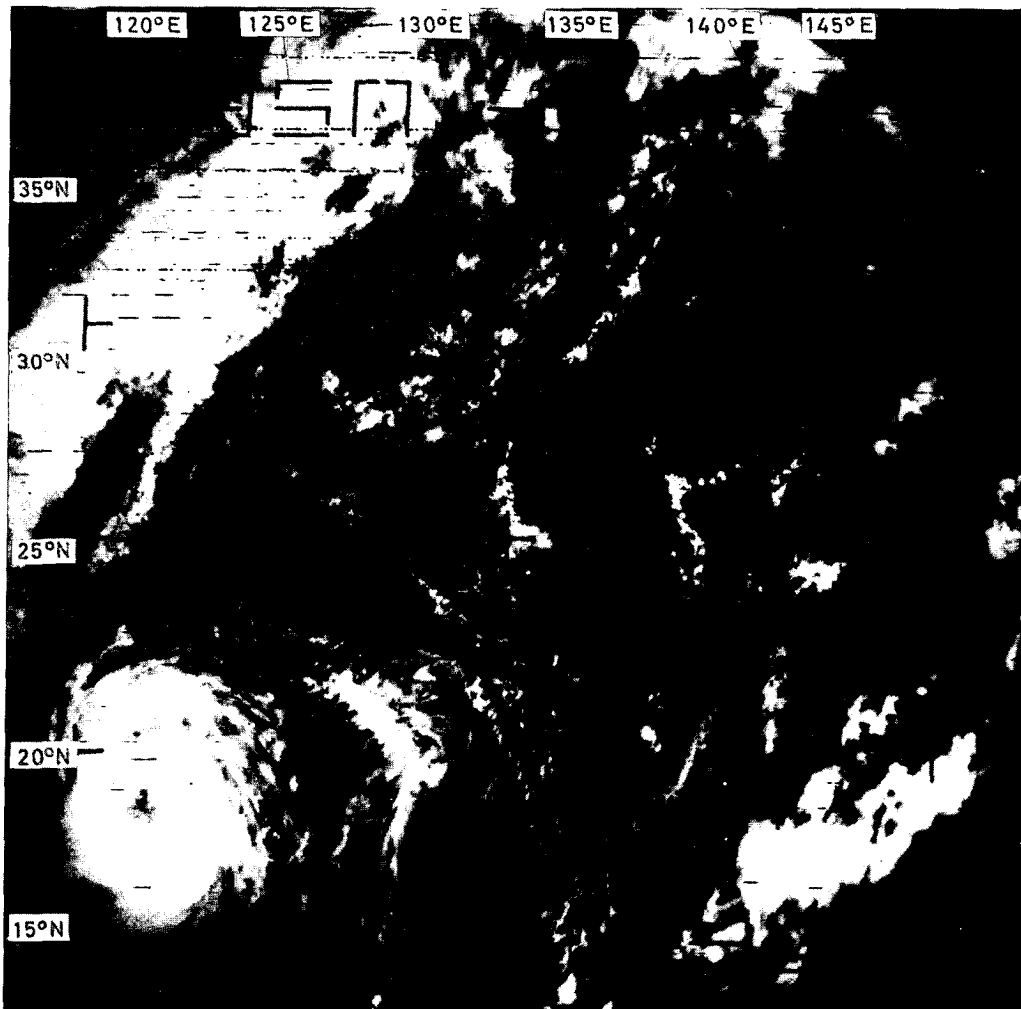


Figure 19. ESSA 8 APT picture of Typhoon 'Georgia' taken at 10.16 a.m. on September 12, 1970.

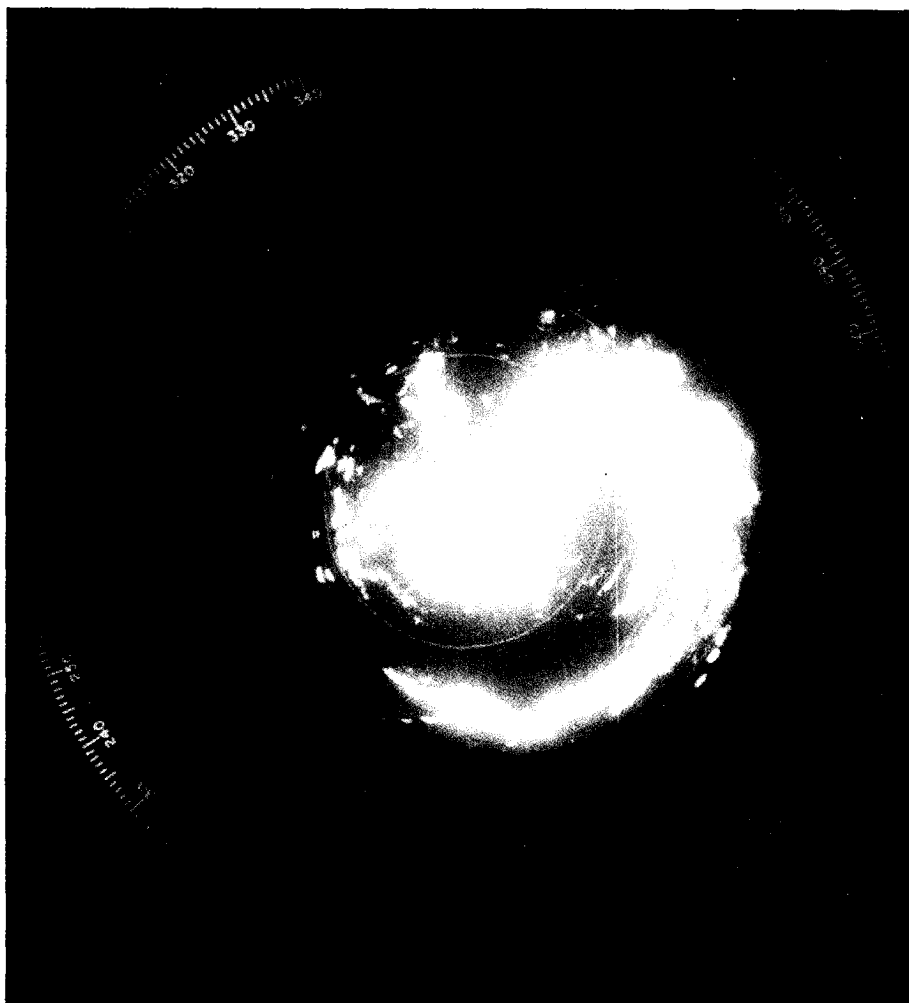


Figure 20. Radar picture of Typhoon 'Georgia' taken at the Royal Observatory at 7.55 a.m. on September 14, 1970.
(Range markers at 40 n mile intervals).

TYPHOON 'IRIS'

October 4 - 8, 1970

The track of this typhoon is shown in Figure 21

During October 2 - 3, an active trough of low pressure extended from west to east across the South China Sea. On October 4, a tropical storm developed in this trough about 90 miles southwest of the Paracel Islands and was named 'Iris'. It moved north-northeastwards at about 6 knots at first and passed close to the northwest of the Paracel Islands early on October 5. At 9.00 a.m. on the same day, 'Iris' intensified to a typhoon and winds of 68 knots were observed at a land station near its centre. The sea-level pressure reported by the station was 996.5 millibars. However, its circulation was relatively small and satellite photographs received by the Royal Observatory a few hours later (Figures 22 and 23) indicated that the size of the typhoon was about 300 miles in diameter.

In Hong Kong, the Stand By Signal, No. 1, was hoisted at 2.30 p.m. on October 5 when 'Iris' was centred about 280 miles to the south-southwest. The typhoon appeared on the Observatory's radar shortly after 4.00 a.m. on October 6 and a well-defined eye was observed three hours later (Figure 24). The Strong Wind Signal, No. 3, was raised to replace No. 1 at 6.45 a.m. on the same morning as the typhoon came to about 200 miles to the south-southwest. 'Iris' then slowed down to about 3 knots and turned to a northeasterly course later in the day. Satellite pictures received at the Observatory on October 6 (Figures 25 and 26) revealed that the circulation of Typhoon 'Iris' remained well-organized and there was little change in its size. However, the typhoon deepened considerably during the afternoon (Figure 27) and at 6.02 p.m. on the same day a reconnaissance aircraft reported maximum surface winds of 100 knots and minimum sea-level pressure of 944 millibars near its centre.

On October 7, Typhoon 'Iris' moved east-northeastwards at about 5 knots and weakened to a tropical storm. Its eye became ill-defined and was no longer discernible on the Observatory's radar by the afternoon. The No. 3 signal was replaced by No. 1 at 5.15 p.m. to indicate that 'Iris' no longer constituted an immediate threat to the Colony but might re-intensify afterwards. However, it weakened further to a tropical depression and dissipated rapidly over the northern part of the South China Sea near Pratas early on October 8. All signals were lowered at 10.15 a.m. on the same day.

In Hong Kong winds freshened from the east during the night of October 5 and became strong in exposed places on October 6. During the passage of 'Iris', the maximum gust peak speeds recorded were 32 knots at the Hong Kong International Airport, 34 knots at Cheung Chau and the Royal Observatory, 36 knots at Cape Collinson, and 42 knots at Tate's Cairn and Waglan Island. The weather was generally cloudy and rainy during the period October 5 - 8 and the following daily amounts of rainfall were recorded at the Royal Observatory:

October 5	2.8 mm
October 6	13.8 mm
October 7	2.0 mm
October 8	6.0 mm

There was no significant rise in the tide height in Hong Kong during the passage of Typhoon 'Iris'.

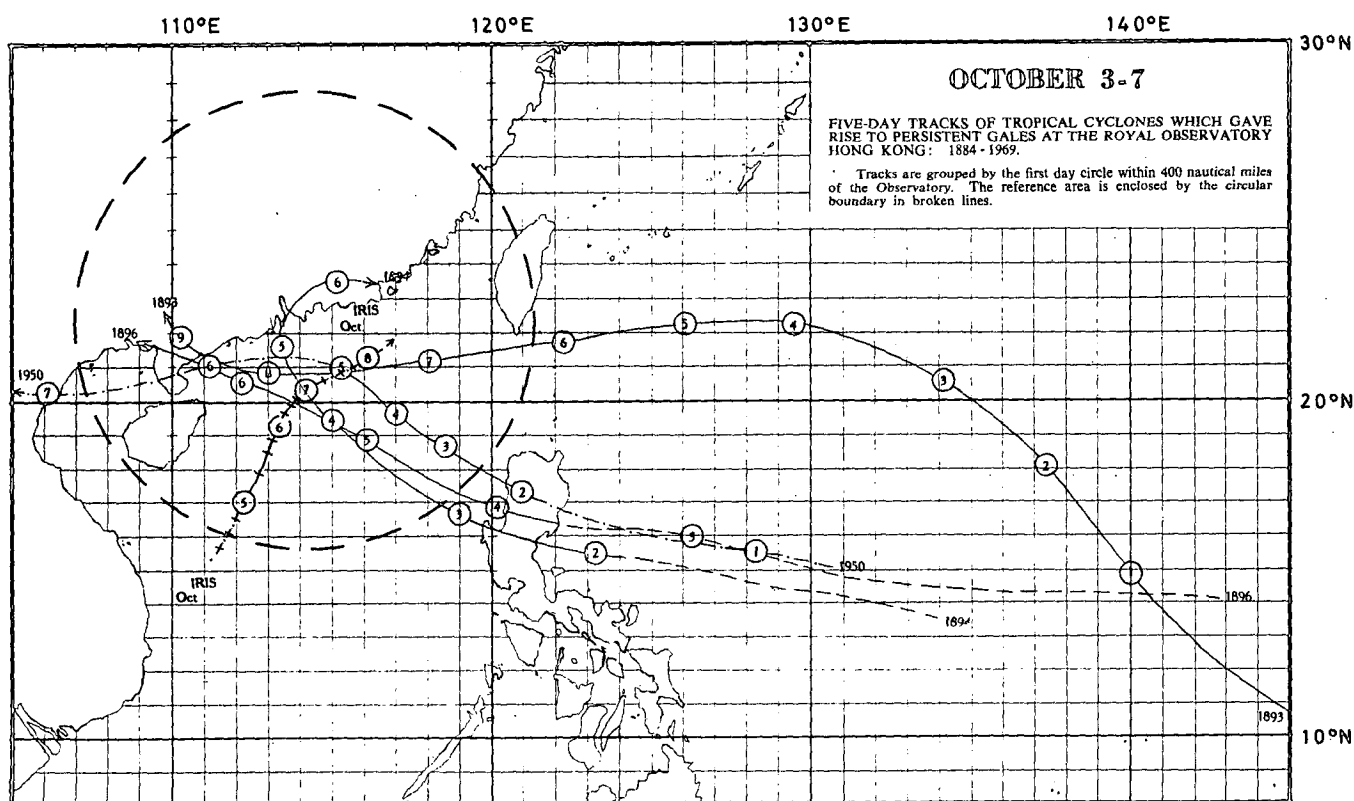


Figure 21. Track of Typhoon 'Iris': October 4 - 8, 1970.

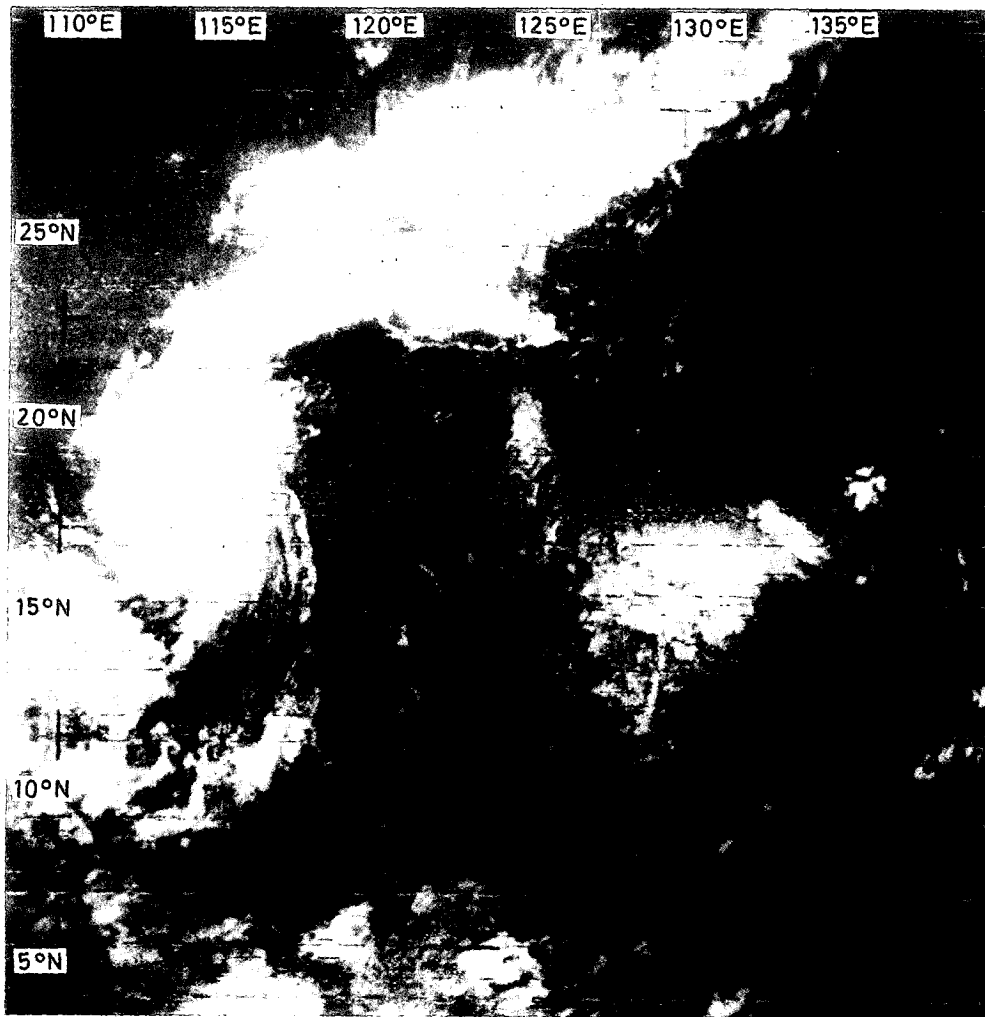


Figure 22. ESSA 8 APT picture of Typhoon 'Iris' taken at 10.48 a.m. on October 5, 1970.

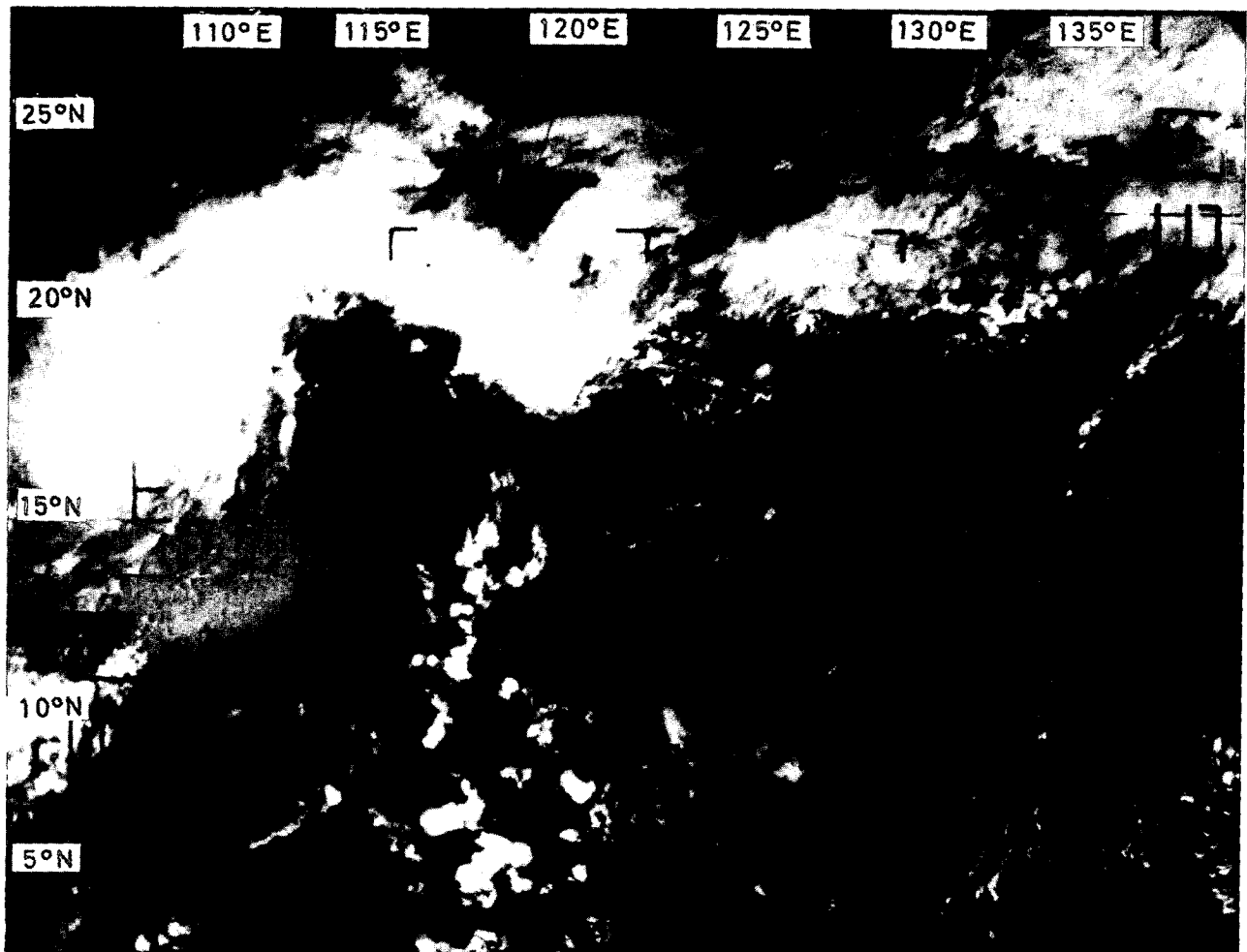


Figure 23. ITOS 1 APT picture of Typhoon 'Iris' taken at 3.49 p.m. on October 5, 1970.



Figure 24. Radar picture of Typhoon 'Iris' taken at the Royal Observatory at 7.00 a.m. on October 6, 1970.
(Range markers at 40 n mile intervals).

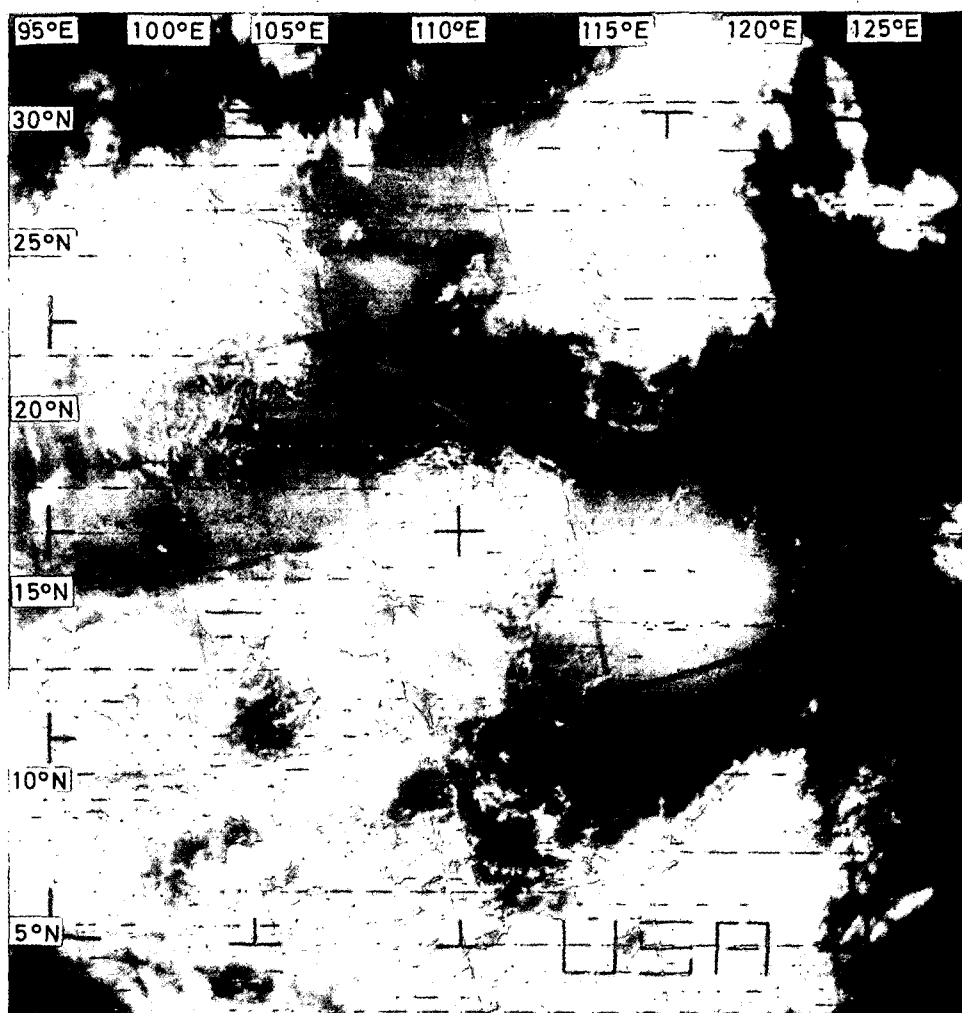


Figure 25. ESSA 8 APT picture of Typhoon 'Iris' taken at 11.39 a.m. on October 6, 1970.

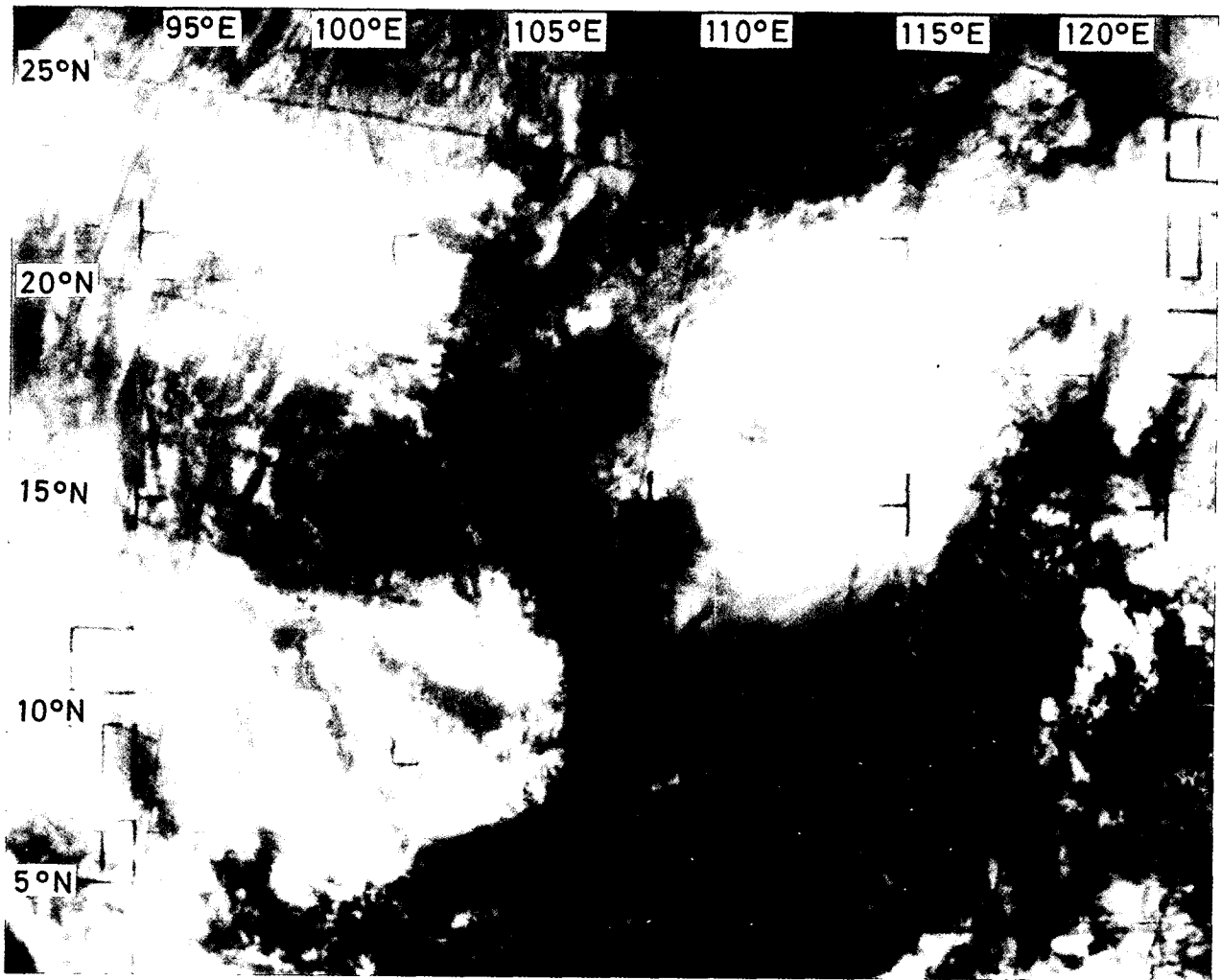


Figure 26. ITOS 1 APT picture of Typhoon 'Iris' taken at 4.46 p.m. on October 6, 1970.

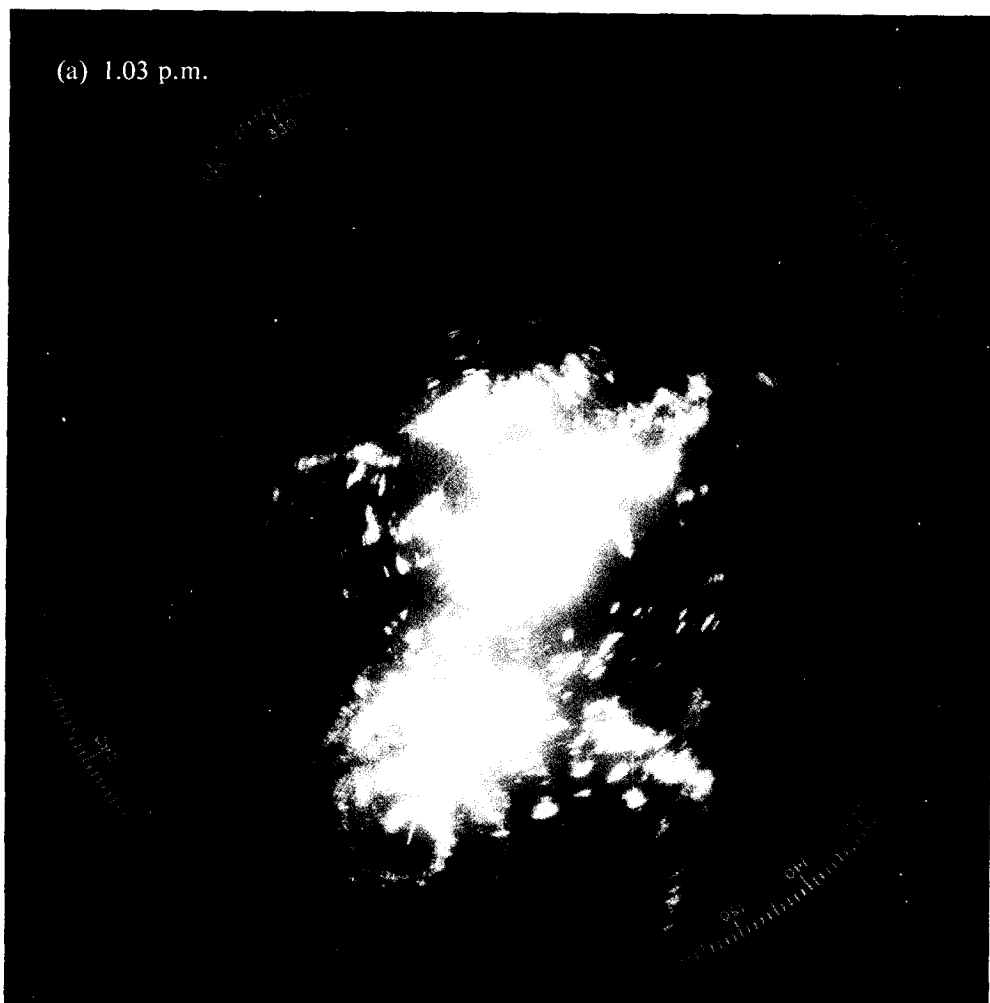
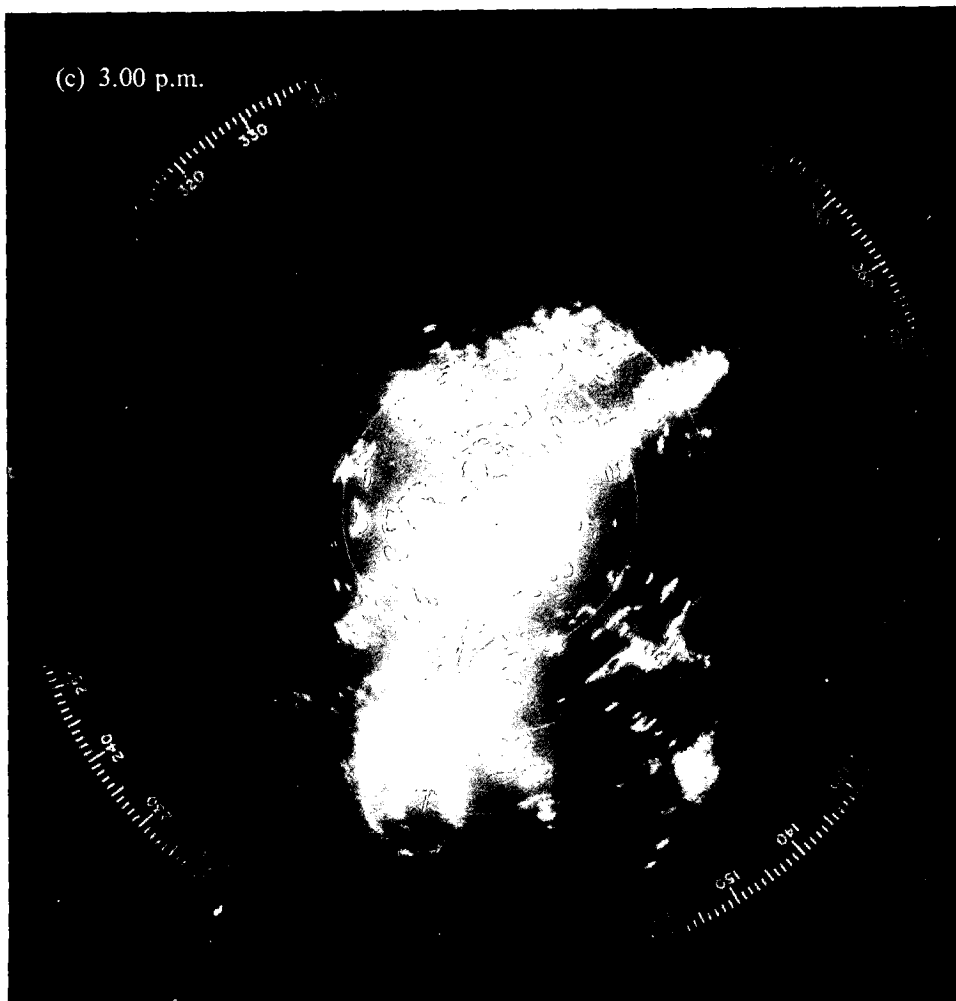
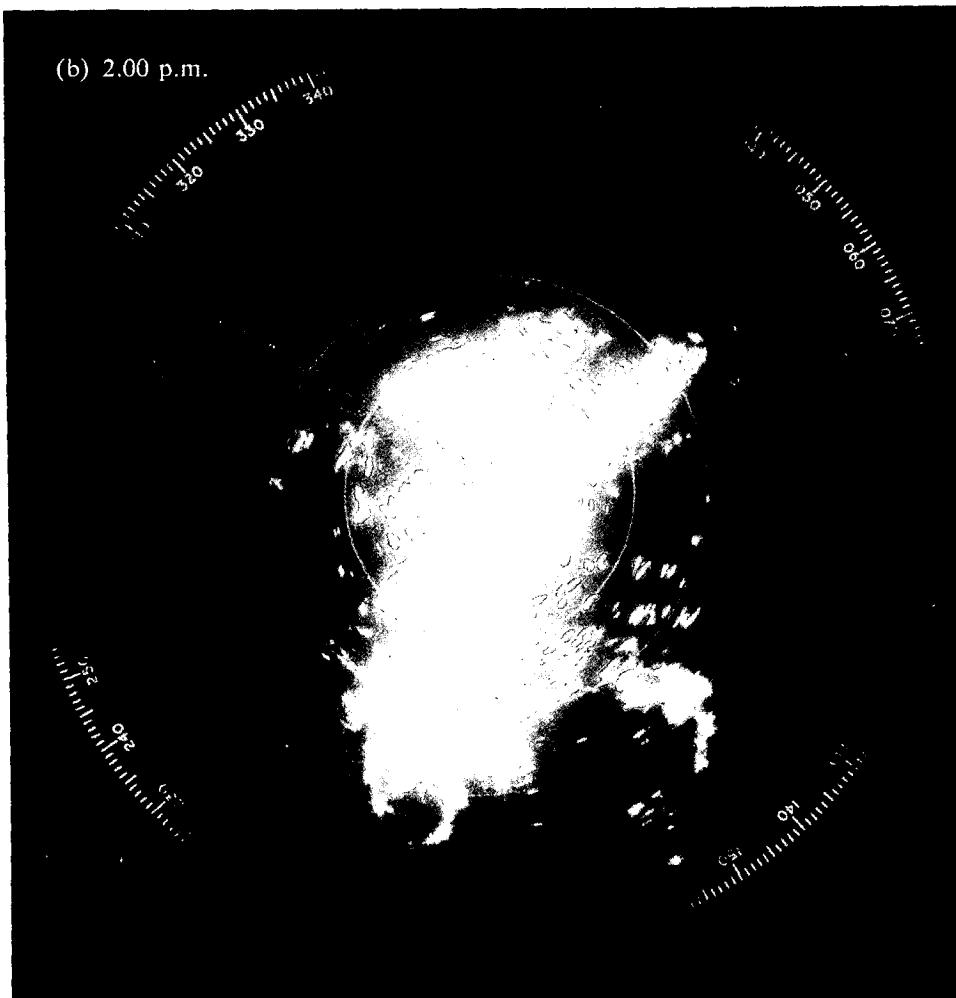
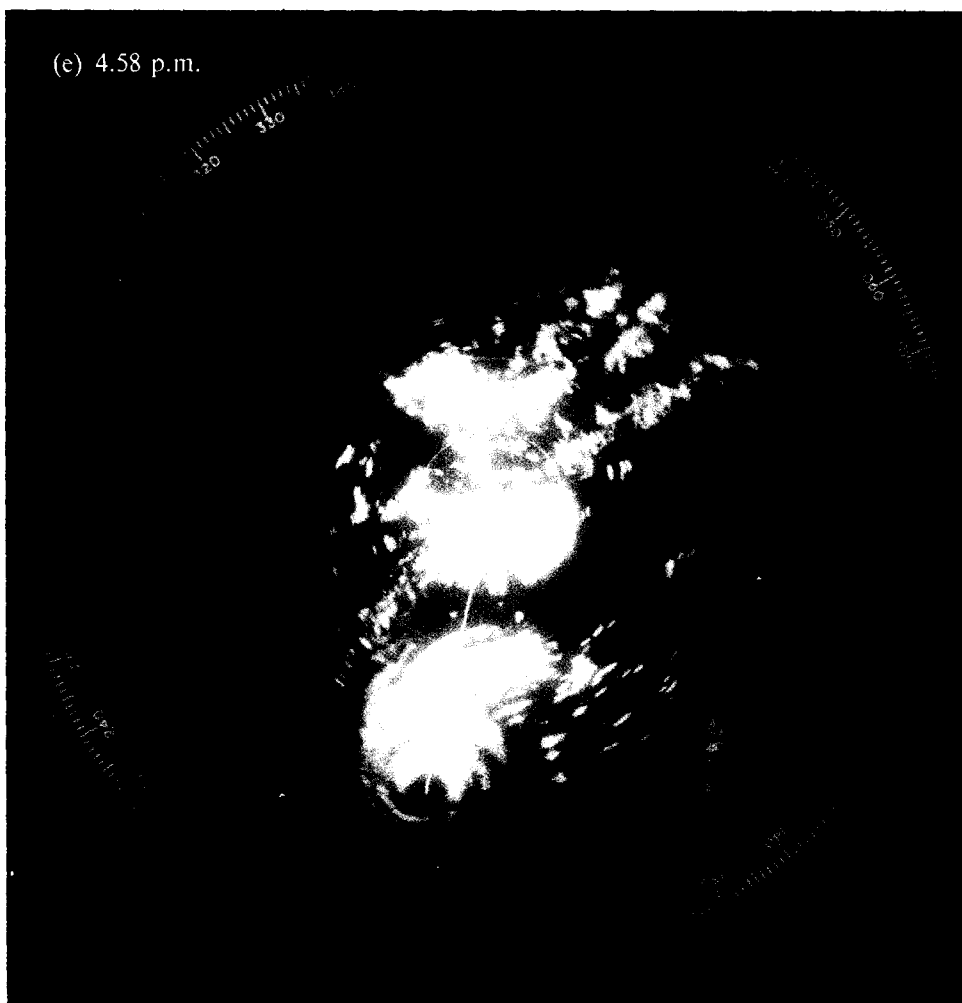
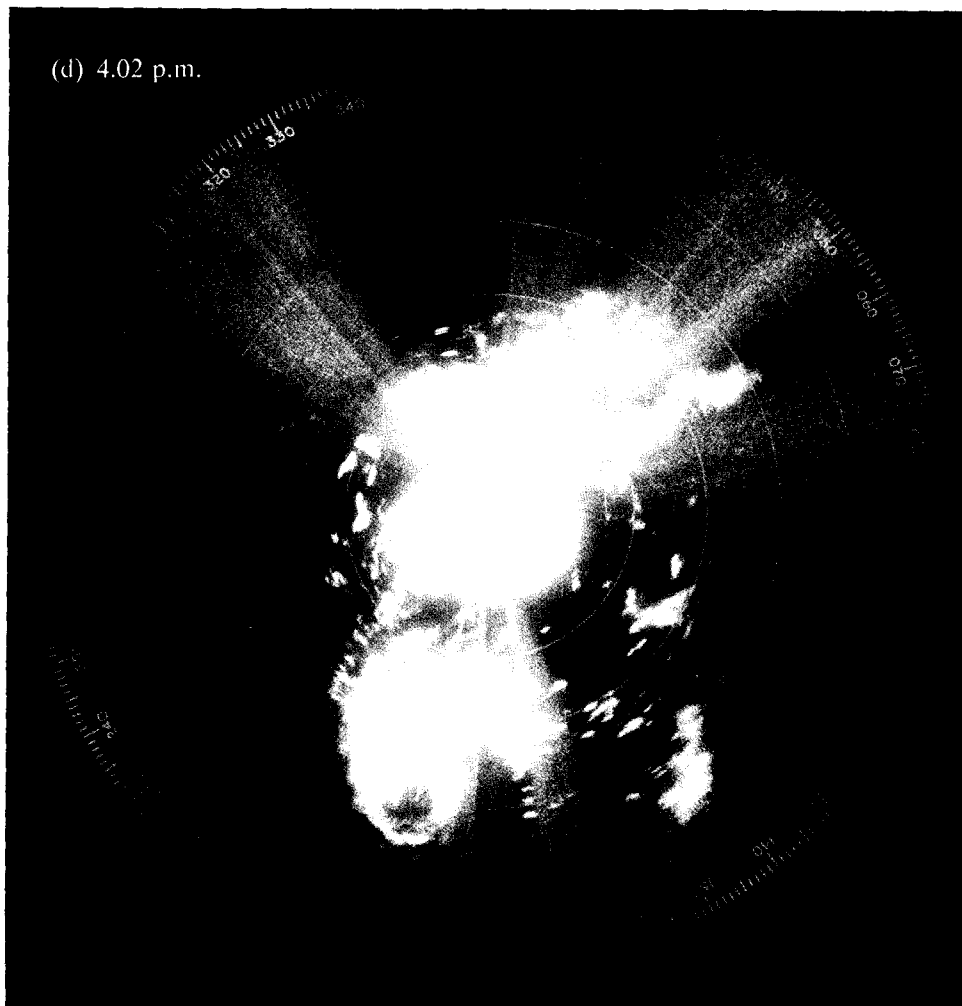
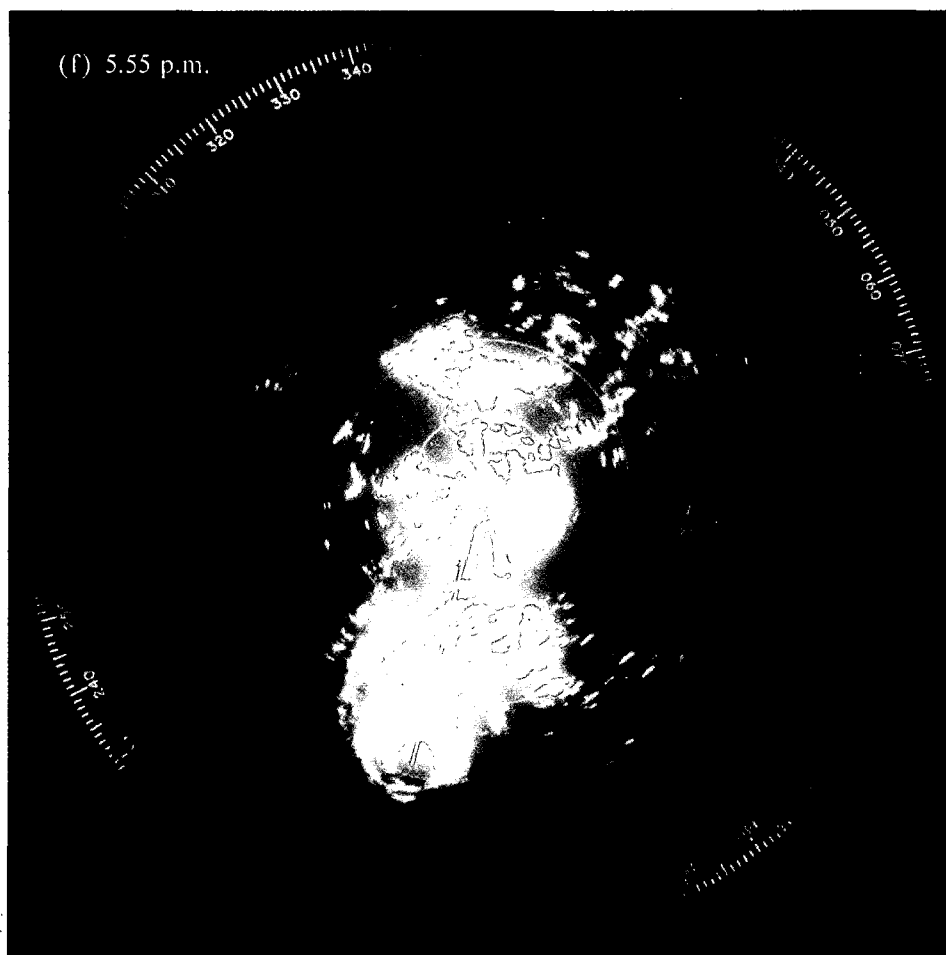


Figure 27. Radar pictures of Typhoon 'Iris' taken at the Royal Observatory on October 6, 1970. (Range markers at 40 n mile intervals).







TYPHOON 'JOAN'

October 10 - 18, 1970

The track of this typhoon is shown in Figure 28

Early on October 10, a tropical storm developed near the Caroline Islands and was named 'Joan'. At first, it moved west-northwestwards at about 17 knots. On October 11, it slowed down slightly and turned towards the west. Satellite photographs received by the Royal Observatory on that morning (Figure 29) indicated that the storm was about 350 miles in diameter. At noon on the same day, a reconnaissance aircraft reported maximum surface winds of 70 knots and minimum sea-level pressure of 976 millibars near its centre. 'Joan' was upgraded to a typhoon during the afternoon of October 11.

On October 12, the typhoon resumed a west-northwesterly course and continued to intensify. At 6.00 a.m. on October 13, maximum surface winds near its centre reported by a reconnaissance aircraft were 150 knots and the central sea-level pressure was 901 millibars. On October 14, Typhoon 'Joan' passed within 10 miles to the southwest of Manila, causing a tidal wave, widespread damage and more than 500 fatalities.

At this time, the anticyclone over north China intensified and caused a strong northeast monsoon over the south China coast. The Strong Monsoon Signal, the Black Ball, was hoisted in Hong Kong at 4.30 p.m. on October 15. Winds over the Colony were generally fresh to strong during the night. Typhoon 'Joan' turned onto a northwesterly course and the Black Ball was replaced by the Strong Wind Signal, No. 3, at 3.15 p.m. on October 16 when the centre of the typhoon was about 310 miles south-southwest of Hong Kong. Satellite photographs received by the Royal Observatory shortly after 4.30 p.m. on the same day (Figure 30) indicated that 'Joan' was a relatively large typhoon with a diameter of about 450 miles.

In Hong Kong, winds remained generally strong on October 16 but decreased rather rapidly the next morning. All signals were lowered at 5.00 p.m. on October 17 when the typhoon was about 250 miles southwest of the Colony. At this time, 'Joan' was near Hainan Island. Its centre was difficult to locate since many ships had moved away from the area as a result of broadcast warnings, and aircraft reconnaissance reports were not available. However, satellite pictures still enabled the centre to be located. 'Joan' crossed the northeastern tip of Hainan Island and dissipated overland on October 18. During the passage of Typhoon 'Joan', the maximum gust peak speeds recorded were 44 knots at Cape Collinson, 46 knots at the Hong Kong International Airport, 49 knots at Waglan Island, 51 knots at Cheung Chau and 55 knots at the Royal Observatory. The typhoon brought more than half of the total rainfall for October and the daily amounts of rainfall recorded at the Royal Observatory were as follows:—

October 16	31.8 mm
October 17	57.7 mm
October 18	6.8 mm

There was no significant rise in the tide height in Hong Kong during the passage of Typhoon 'Joan'.

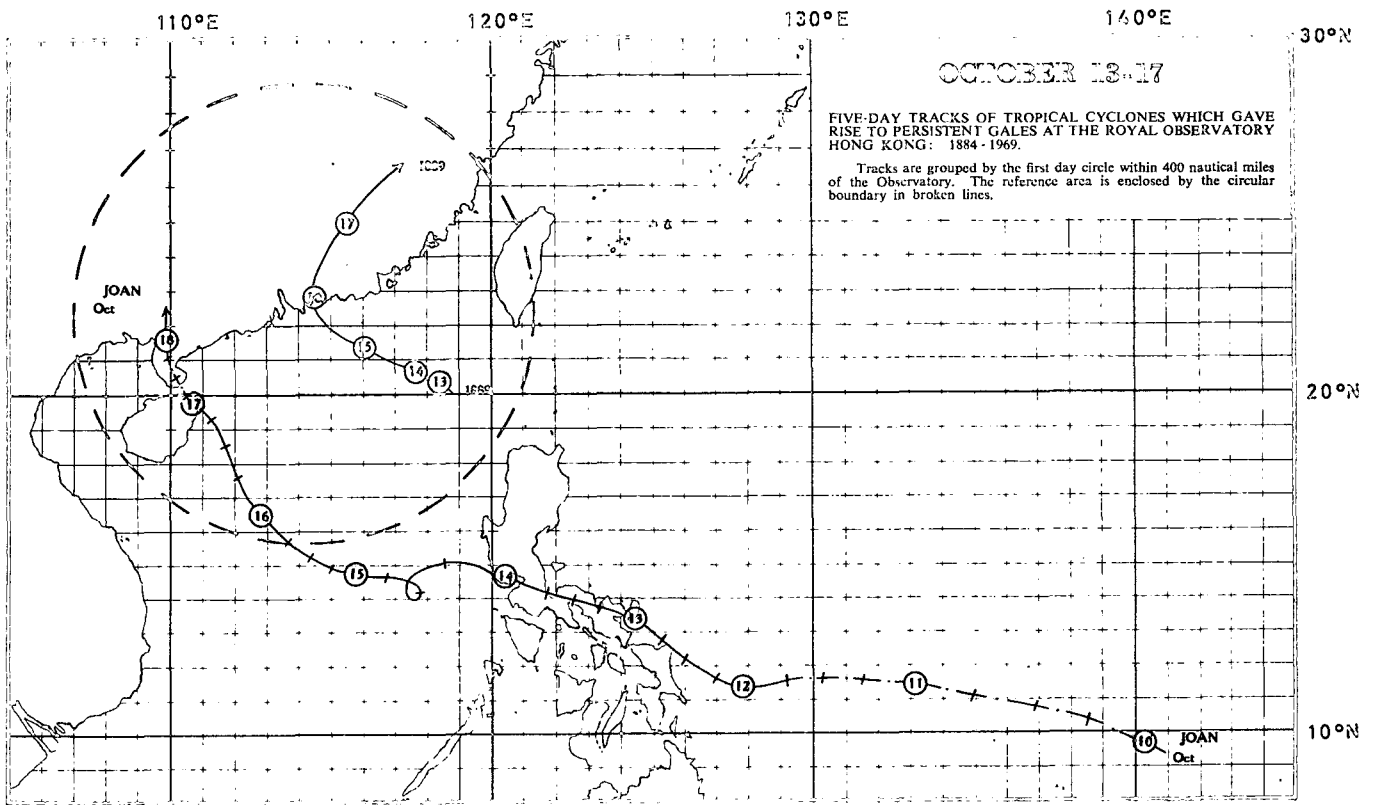


Figure 28. Track of Typhoon 'Joan': October 10 - 18, 1970.

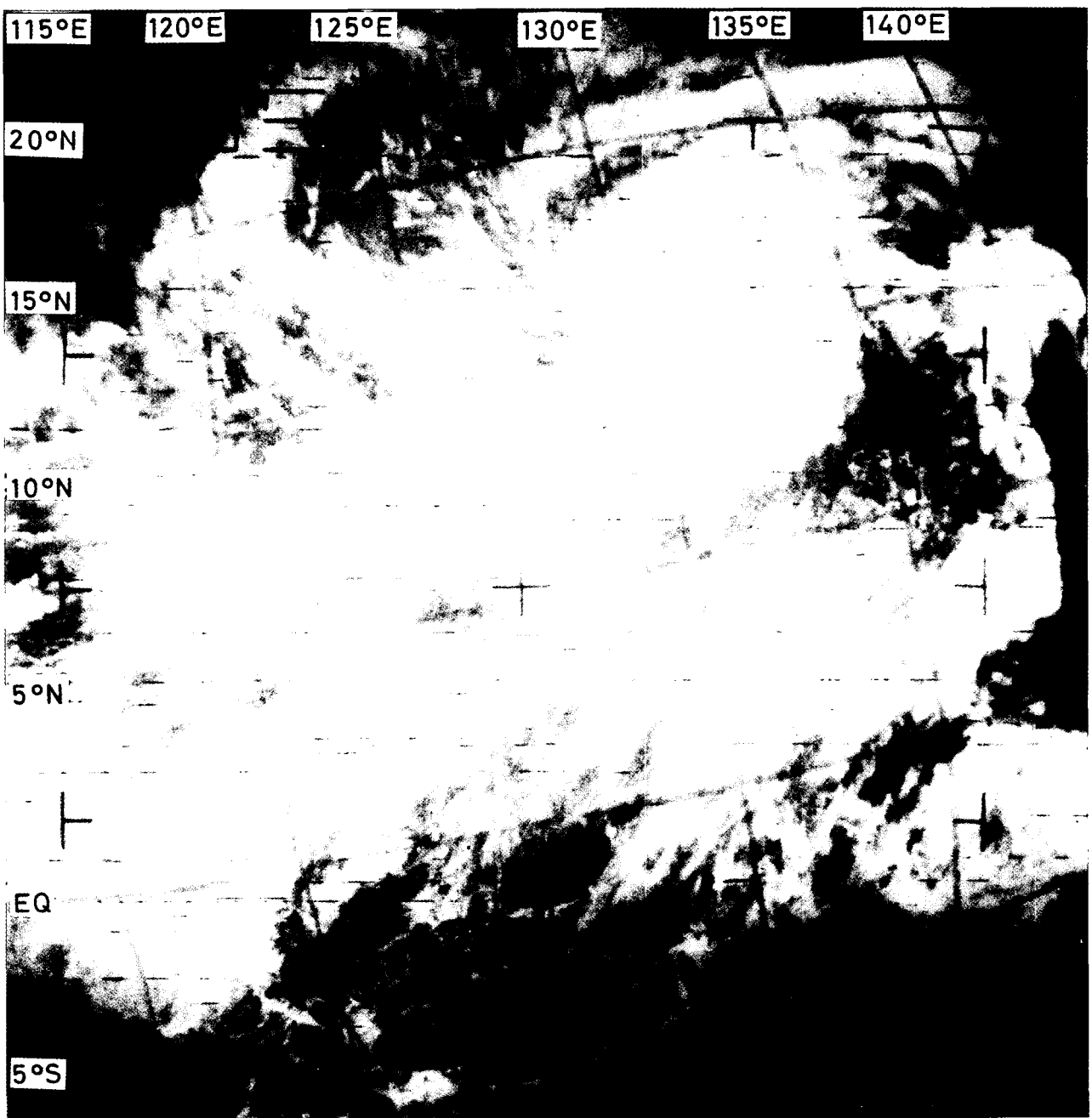


Figure 29. ESSA 8 APT picture of Typhoon 'Joan' taken at 10.14 a.m. on October 11, 1970.

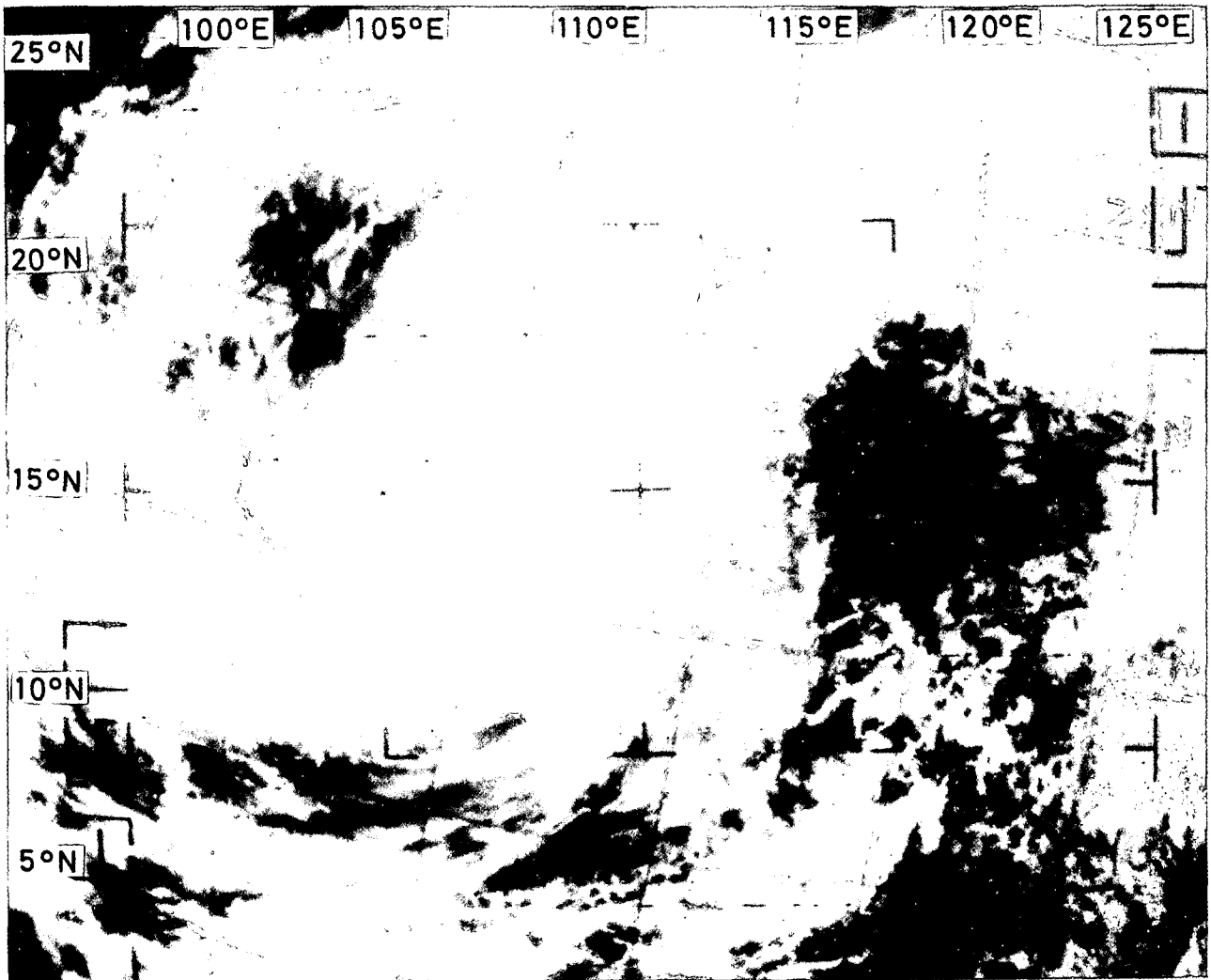


Figure 30. ITOS 1 APT picture of Typhoon 'Joan' taken at 4.34 p.m. on October 16, 1970.

TABLE 1

LIST OF TROPICAL CYCLONES IN THE WESTERN PACIFIC AND THE SOUTH CHINA SEA IN 1970

Name of Tropical Cyclone	Beginning of Track				First day circle	Last day circle	Ending of Track			
	Date	Time GMT	Position				Date	Time GMT	Position	
			°N	°E					°N	°E
1 Typhoon Nancy	Feb 19	1800	8.8	149.9	20	27	Feb 27	0300	22.0	127.0
2 Tropical Depression	Jun 13	0000	21.0	119.0	13	14	Jun 14	0600	29.2	125.5
3 Typhoon Olga	Jun 29	0000	12.5	138.0	29	5	Jul 05	1800	35.4	134.1
4 T.S. Pamela	Jun 29	0600	7.3	127.7	30	30	Jun 30	1200	10.8	124.0
5 T.S. Ruby	Jul 11	1200	8.9	128.9	12	16	Jul 16	1200	24.3	114.8
6 Tropical Depression	Jul 28	0300	26.2	136.7	29	31	Jul 31	0300	31.2	128.4
7 Tropical Depression	Aug 01	0000	21.7	122.7	1	3	Aug 03	0600	23.1	112.2
8 T.S. Violet	Aug 05	0000	16.5	130.0	5	9	Aug 09	0300	22.3	112.0
9 Typhoon Wilda	Aug 08	0600	19.6	138.0	9	15	Aug 15	2100	44.7	142.0
10 Typhoon Anita	Aug 16	0000	19.0	144.0	16	22	Aug 22	0900	43.7	138.3
11 Tropical Depression	Aug 17	0900	16.6	114.7	18	19	Aug 19	0300	17.4	105.2
12 Typhoon Billie	Aug 23	0000	15.3	132.0	23	31	Aug 31	0900	37.8	125.3
13 Typhoon Clara*	Aug 26	0300	30.4	148.0	27	1	Sep 01	0900	35.3	160.0
14 T.S. Ellen	Sep 04	0300	23.3	136.0	5	5	Sep 05	2100	24.8	125.6
15 T.S. Fran	Sep 04	0900	20.5	127.5	5	8	Sep 08	0300	25.2	117.5
16 Typhoon Georgia	Sep 08	0000	14.6	135.8	8	14	Sep 14	0900	24.9	115.3
17 Typhoon Hope*	Sep 21	0900	15.1	160.0	22	30	Sep 30	0300	30.0	154.0
18 Tropical Depression	Sep 21	2100	15.6	129.2	22	25	Sep 25	0300	19.2	117.8
19 Typhoon Iris	Oct 04	0300	15.4	111.3	5	8	Oct 08	0300	21.8	117.0
20 Tropical Depression	Oct 04	0600	10.1	150.9	5	5	Oct 05	0300	11.5	147.4
21 Typhoon Joan	Oct 09	2100	9.3	141.0	10	18	Oct 18	0300	22.5	110.0
22 Typhoon Kate	Oct 15	0300	4.5	138.5	16	25	Oct 25	0900	15.8	107.0
23 T.S. Louise	Oct 27	0000	11.4	116.1	27	29	Oct 29	0300	11.3	106.3
24 T.S. Marge	Oct 28	0300	12.2	142.5	29	7	Nov 07	0900	16.0	110.2
25 T.S. Nora	Nov 02	0600	7.8	106.8	3	3	Nov 03	1500	8.2	103.0
26 T.S. Opal	Nov 14	0000	15.2	117.8	14	17	Nov 17	0300	9.4	108.2
27 Typhoon Patsy	Nov 14	0300	13.8	152.8	15	22	Nov 22	0300	16.9	105.7
28 T.S. Ruth	Nov 25	2100	10.7	114.1	26	27	Nov 27	1800	8.8	105.4

* Track extends outside chart area.

TABLE 2

NON-LOCAL TROPICAL CYCLONE WARNINGS ISSUED IN 1970

Tropical Cyclone	No. of Warnings Issued	Date and Time of Issue of				Duration of Warnings (h)
		First Warning		Last Warning		
Typhoon Nancy	7	Feb 25	0600	Feb 26	2100	39
Tropical Depression	6	Jun 13	0000	Jun 14	0300	27
Typhoon Olga	3	Jul 2	1800	Jul 3	0600	12
Tropical Storm Ruby*	24	Jul 13	0600	Jul 16	1200	78
Tropical Depression*	18	Aug 1	0000	Aug 3	0600	54
Tropical Storm Violet*	24	Aug 6	0000	Aug 9	0000	72
Tropical Depression	12	Aug 17	0900	Aug 19	0000	39
Tropical Storm Fran	12	Sep 6	1200	Sep 8	0300	39
Typhoon Georgia*	30	Sep 10	0600	Sep 14	0900	99
Tropical Depression	5	Sep 24	0000	Sep 25	0000	24
Typhoon Iris*	27	Oct 4	0600	Oct 8	0000	90
Typhoon Joan*	35	Oct 13	0000	Oct 18	0000	120
Typhoon Kate	43	Oct 19	1200	Oct 25	0600	138
Tropical Storm Louise	8	Oct 27	0600	Oct 29	0000	42
Tropical Storm Marge	3	Oct 31	1800	Nov 1	0600	12
	42	Nov 2	0300	Nov 7	0900	126
Tropical Storm Opal	20	Nov 14	0600	Nov 17	0000	66
Typhoon Patsy	26	Nov 18	1800	Nov 22	0300	81
Tropical Depression	3	Nov 26	0000	Nov 26	1200	12
Total	348					1,170

Times are given in hours GMT.

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

TABLE 3

TROPICAL CYCLONE WARNING SIGNALS HOISTED IN HONG KONG AND NUMBER OF WARNING BULLETINS ISSUED IN 1970

SUMMARY

Signal	No. of Occasions	Total Duration
1	6	11h 10min
3	8	154 00
5	2	8 40
6	1	2 30
7	2	10 25
8	Nil	—
9	Nil	—
10	Nil	—

DETAILS

Tropical Cyclone	No. of Warning Bulletins Issued	Signal	Hoisted		Lowered	
			Date	Time	Date	Time
Tropical Storm Ruby	27	1	Jul 14	1430	Jul 15	2140
		3	Jul 15	2140	Jul 16	0445
		7	Jul 16	0445	Jul 16	0930
		5	Jul 16	0930	Jul 16	1100
		6	Jul 16	1100	Jul 16	1330
		3	Jul 16	1330	Jul 16	2115
Tropical Depression	16	1	Aug 2	1100	Aug 2	1630
		3	Aug 2	1630	Aug 3	1515
Tropical Storm Violet	22	1	Aug 7	1745	Aug 8	1100
		3	Aug 8	1100	Aug 9	1030
Typhoon Georgia	41	1	Sep 11	1900	Sep 12	1900
		3	Sep 12	1900	Sep 13	2120
		7	Sep 13	2120	Sep 14	0300
		5	Sep 14	0300	Sep 14	1010
		3	Sep 14	1010	Sep 14	1630
Typhoon Iris	26	1	Oct 5	1330	Oct 6	0545
		3	Oct 6	0545	Oct 7	1615
		1	Oct 7	1615	Oct 8	0915
Typhoon Joan	10	3	Oct 16	1415	Oct 17	1600

TABLE 4

FREQUENCY OF HOISTING AND TOTAL DURATION OF DISPLAY OF
TROPICAL CYCLONE WARNING SIGNALS: 1946 - 1970

Signal No.		1	3*	5	6	7	8	9	10	Total	Total Duration (h)
Year											
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
1946 to 1955	Total	37	—	4	2	15	13	7	1	79	1,015
	Mean	3.7	—	0.4	0.2	1.5	1.3	0.7	0.1	7.9	101.5
1956		5	4	0	0	0	0	0	0	9	191
1957		4	9	1	1	2	2	0	1	20	296
1958		4	5	0	0	1	0	0	0	10	214
1959		1	1	0	0	0	0	0	0	2	37
1960		11	7	0	2	2	2	1	1	26	433
1961		6	7	1	2	1	0	1	1	19	193
1962		4	3	0	1	1	0	1	1	11	158
1963		4	5	0	0	1	0	0	0	10	176
1964		11	14	1	3	5	3	3	2	42	570
1965		7	6	0	0	1	1	0	0	15	240
1966		6	5	0	0	2	2	0	0	15	285
1967		8	6	0	0	2	1	0	0	17	339
1968		7	7	0	1	1	0	1	1	18	290
1969		4	2	0	0	0	0	0	0	6	110
1970		6	8	2	1	2	0	0	0	19	287
1956 to 1970	Total	88	89	5	11	21	11	7	7	239	3,819
	Mean	5.9	5.9	0.3	0.7	1.4	0.7	0.5	0.5	19.5	254.6

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

TABLE 5

NUMBER OF TROPICAL CYCLONES IN HONG KONG'S AREA OF RESPONSIBILITY AND THAT WHICH NECESSITATED THE DISPLAY OF TROPICAL CYCLONE WARNING SIGNALS IN HONG KONG: 1946 - 1970

Year	Number in Hong Kong's Area of Responsibility	Number Necessitating the Display of Signals in Hong Kong
1946	9	6
1947	21	6
1948	15	4
1949	16	4
1950	13	5
1951	12	7
1952	22	9
1953	19	6
1954	17	7
1955	14	3
1956	23	5
1957	12	6
1958	14	5
1959	19	2
1960	20	9
1961	22	6
1962	16	4
1963	13	4
1964	25	10
1965	16	6
1966	16	6
1967	16	8
1968	12	6
1969	11	4
1970	21	6
Mean	17	6

TABLE 6

DURATION OF DISPLAY OF TROPICAL CYCLONE WARNING SIGNALS IN HONG KONG: 1946 - 1970

Signal	Duration			
	Mean	Maximum	Minimum	Mean per year
1	17h 03min	102h 10min	1h 20min	85h 13min
3*	20 51	71 45	1 00	123 41
5	7 28	13 00	1 30	2 41
6	5 45	11 10	2 30	3 00
7	11 47	35 35	2 15	16 58
8	7 24	17 20	0 20	7 06
5 - 8	9 04	35 35	0 20	29 45
9	3 38	6 15	1 10	2 02
10	6 31	9 10	2 30	2 05

* 1956 - 1970.

TABLE 7

CASUALTIES AND DAMAGE CAUSED BY TROPICAL CYCLONES IN HONG KONG: 1937 - 1970

Tropical Cyclone	Ocean-going Vessels in Trouble	Junks Sunk or Wrecked	Junks Damaged	Persons Dead	Persons Missing	Persons Injured
1937 Typhoon	28	545	1,255	11,000	*	*
1957 T. Gloria	5	2	Several	8	*	111
1960 T. Mary	6	352	462	11	11	127
1961 T. Alice	*	*	*	4	0	20
1962 T. Wanda	36	1,297	756	130	53	*
1964 T. Viola	5	18	18	0	0	41
T. Ida	3	7	60	5	4	56
T. Ruby	20	32	282	38	6	300
T. Sally	0	0	0	9	0	24
T. Dot	2	31	59	26	10	85
1966 S.T.S. Lola	0	*	6	1	0	6
1968 T. Shirley	1	*	3	0	0	4
1970 Tropical Depression (Aug 1 - 3)	0	0	0	2†	0	0
T. Georgia	2	0	*	0	0	0

Information compiled from local newspapers since 1937.

* Data unavailable.

† Struck by lightning.

TABLE 8

SHIPS SUNK, DAMAGED, GROUNDED, ETC., BY TROPICAL CYCLONES
IN HONG KONG: 1960 - 1970

Year	Name of Tropical Cyclone	Name of Ship	Location of Grounding, etc.	Nature of Incident	Remarks
1960	Typhoon Mary	S.S. Malaya Fair	On the side of the new Kai Tak Runway	Stranded	5 ocean-going vessels broke away from their mooring buoys in the harbour.
		U.S. Aircraft Carrier	Gin Drinker's Bay	Aground	
1961	Typhoon Alice	S.S. Adri XI	At Stonecutters Island	Aground	
1962	Typhoon Wanda	S.S. Bogola	In Tolo Harbour	Stranded	27 ocean-going ships were in trouble: many other vessels broke from their mooring at the height of the gales and drifted ashore or collided with other ships.
		S.S. Crescent	In Tolo Harbour	Stranded	
		S.S. Cronulla	In Victoria Harbour near North Point	Capsized	
		S.S. Haijye	On Harbour Island, Tolo Harbour	Aground	
		S.S. Lian Hin	North of Stonecutters Island	Hard aground	
		S.S. Ocean Ventura	In Tolo Harbour	Aground	
		S.S. Tung Feng	North of Green Island	Sunk	
		S.S. Vinkon	At Tai Po near the railway	Aground	
S.S. Yeni Meserret	Near Kennedy Town	Aground			
1964	Typhoon Viola	S.S. Gloria	At Lantau Island	Aground	
		S.S. Irene X	At Ping Chau	Aground	
		S.S. Rugeley	At Lantau Island	Aground	
		S.S. Saint George	At Stonecutters Island	Aground	
	Typhoon Ida	S.S. Dorothy	Near Kowloon Dock	Aground	S.S. Irene X drifted from berthing place to Kellet Island.
		S.S. Grosvenor Explorer	Near Hunghum Reclamation	Aground	
		S.S. Ruthy Ann	At Kowloon Bay	Aground	
	Typhoon Ruby	S.S. Grosvenor Explorer	In Victoria Harbour	Aground	15 ships went aground during this Typhoon.
	Typhoon Dot	S.S. Blissful	In Victoria Harbour	Collision	
		S.S. Negro Star	In Victoria Harbour	Collision	
S.S. Sevilla		In Victoria Harbour	Aground		
1968	Typhoon Shirley	S.S. La Grande Abeto	Stonecutters Island	Stranded	Rammed by S.S. La Grande Abeto.
		S.S. San Eduardo	Near Stonecutters Island	Collision	
1970	Typhoon Georgia	S.S. Suna State	Near Stonecutters Island	Slight damage	
		S.S. Hai Ning	Near Stonecutters Island	Anchor chain broken	

N.B. Information compiled from local newspapers since 1937.

TABLE 9

TROPICAL CYCLONES CAUSING PERSISTENT GALES AT THE ROYAL OBSERVATORY

1884 - 1970

Name of Tropical Cyclone	Date and Time of Occurrence of Minimum Pressure		Maximum Mean Hourly Wind		Maximum Gust Peak Speed (kn)	Duration of Gales (h)	Sequence of Wind Direction	Minimum Pressure (mb)		Remarks
			Direction	Speed (kn)				Hourly Reading	Instantaneous Minimum	
	Date	Time								
1884	July	29	0300	E/S	34	5	ENE to ESE v	997.5		
	September	11	0200	ENE	57	15	N/E to SSE v	979.8		
1885	August	17	1400	ESE	34	1	E to S/E v	997.8		
1887	September	17	1700	E/S	44	14	NE to SE v	999.3		
	September	21	0400	E	36	5	ENE to SE/E v	1000.6		
	September	25	1400	E	35	3	ENE to ESE v	1000.4		
1889	October	16	0400	W/N	39	4	NW/N to W b	997.0		
1890	October	13	0400	NE/E	34	1	NE to ENE v	1006.4		
1891	July	19	0500	SSW	41	5	NW/W to SSW ... b	980.9		
	August	3	0400	ESE	39	10	NNE to SE v	990.7		
1893	September	9	0300	NW	38	3	NNW to NW/W... b	983.2		
	September	28	1600	E/N	39	14	NE/E to E/N v	999.3		
	October	2	1400	E	52	23	NNE to SE v	991.8		
	October	8	0400	E/N	37	4	N/E to ESE v	1000.7		
1894	September	19	0300	E/S	43	15	NE/E to SE v	995.4		
	September	25	0900	E/N	55	10	NE to SE v	994.5		
	September	30	0600	E	41	17	NE/N to SE/E ... v	999.6		
	October	5	1700	SE/S	54	27	NE/E to SW/S ... v	987.0		
1895	July	28	1600	NE/E	34	2	NE/N to E/S v	995.1		
1896	July	29	2200	E/S	69	10	NNE to S/E v	976.6		
	August	9	1600	ENE	42	10	NE/E to SE/E ... v	997.8		
	October	6	0400	E/N	42	17	NE/E to SE v	996.4		
1897	September	17	1500	NE/E	36	2	NE/E to ENE ... v	1004.6		
1898	August	5	0300	E	39	7	ENE to SE v	987.1		
	August	17	1700	E	39	8	ENE to SE v	995.8		
1900	September	11	0500	E	43	12	NE/E to SE v	996.6		
	November	10	0600	NNE	57	11	NE/E to SW/W ... b	975.0		
1902	July	18	1600	SW/S	39	2	N to SW/S b	984.4		
	August	2	2000	SW/S	52	3	NW/W to SW/S... b	986.9		
1904	August	10	0200	E/S	34	1	E to ESE v	998.1		
	August	25	1700	E/N	36	6	E/N to NNE b	986.8		
1905	August	30	1500	ENE	41	10	N/E to E/N v	988.2		
1906	September	18	1000	SSW	49	2	NW to S b	986.2		
	September	20	0400	E/S	36	3	ENE to ESE v	1000.5		
	September	29	0900	E/N	50	15	NNE to SE v	993.9		
1907	September	14	0100	E/S	48	12	NE/N to SE v	993.3		
1908	July	28	0100	SSE	52	5	N to S/E v	978.0		
	October	11	0100	E/S	34	1	NE/E to E/N v	1003.6		
1909	October	19	1700	ESE	48	13	NNE to SE v	987.4		
	October	25	1700	E	35	1	NE to SE v	1003.6		

Centre recurved around
Hong Kong.
Highest hourly wind velocity.

Centre passed over Cheung Chau.

TABLE 9—Contd.

Name of Tropical Cyclone	Date and Time of Occurrence of Minimum Pressure		Maximum Mean Hourly Wind		Maximum Gust Peak Speed (kn)	Duration of Gales (h)	Sequence of Wind Direction	Minimum Pressure (mb)		Remarks		
			Direction	Speed (kn)				Hourly Reading	Instantaneous Minimum			
	Date	Time										
	1911 July	4	0300	ESE	36	63	3	ENE to SE..... v	996.9	Dines anemograph installed in 1911.		
	July	27	1000	ESE	38	64	4	N to SSE..... v	988.2			
	August	5	0900	S/E	39	69	12	ENE to SSE..... v	991.1			
	1913 August	17	1100	ENE	55	91	11	NE/N to SE/E... v	991.1			
	September	18	2300	SW/W	36	61	1	WNW to SSW... b	992.2			
	1915 November	5	1600	E	36	60	2	NE/E to SE..... v	1002.3			
	1916 September	7	0200	E	35	56	1	ENE to SE/E..... v	999.1			
	1917 August	13	1100	SSW	40	81	2	backed from NW b	986.6			
	1918 August	15	0800	E/N	40	82	4	NE/E to S/E..... v	987.7			
	1919 August	22	1600	E/S	38	73	5	E/N to SE/E..... v	999.2			
	1922 September	20	1700	ENE	35	65	3	NE/E to E/S..... v	999.8	Centre passed a few miles to S'ward.		
	1923 July	2	0500	E/S	39	—	8	ENE to S/E..... v	990.8			
	July	22	1700	ESE	41	76	11	E/N to S/E..... v	988.7			
	July	27	1000	S/W	38	—	1	SW/S to S/W..... b	983.1			
	August	18	1000	NNE	67	113*	3	N/W to ESE..... v	971.7			
	1926 July	22	0900	N/E	38	74	5	NE/N to ESE... v	991.7			
	September	27	0600	E/N	46	88	6	N to ESE..... v	991.8			
	1927 August	20	1400	NE/E	53	101	10	NNE to SE..... v	982.4			
	1928 July	15	0100	E	38	66	4	NE/E to SE/E... v	992.7			
	1929 August	22	1400	SE	57	102	3	NNE to S/E..... v	983.2			
	1930 July	24	1800	E	42	72	6	NE/N to ESE... v	990.9			
		1931 August	1	1200	E/N	60	118*	5	NE/N to SE..... v		989.2	Max. gust peak speed 145 kn at North Point. Centre passed over Observatory.
		September	2	1500	S/E	41	82	3	NE/N to S/E..... v		988.7	
1932 September		17	0500	NE/E	35	69	2	NE/E to ESE..... v	996.1			
1936 August		17	0300	E/N	62	115*	6	NE/N to SE/S... v	979.3			
1937 September		2	0400	NE/E	59	130*	5	NNW to SE/S... v	958.3			
1939 November		23	1600	E/N	35	64	1	E to NW..... v	989.5			
1940 August		21	0900	E	45	72	12	NNW to E/S..... v	990.2			
	1941 June	30	1600	ENE	44	83	9	NE to E..... v	977.8	Severest typhoon during the period on July 22, 1944.		
	September	16	1200	E/N	55	94	9	N to S/E..... v	983.7			
	1942 - 1945			No records due to World War II. (No very severe typhoons).								
	1946 July	18	1600	N/E	—	95	7	N to S..... v	985.7			
	1948 June	10	1200	E	39	48	1	NE to ESE..... v	993.1			
	July	27	1700	SSW	45	64	8	NNE to SW..... b	981.1			
	September	3	0400	E	46	75	14	NE to ESE..... v	996.3			
	1949 September	8	0300	E	56	81	6	N to SE..... v	991.3			
	1950 October	5	0400	E	34	59	1	N to ENE..... v	997.2			

TABLE 9—Contd.

Name of Tropical Cyclone	Date and Time of Occurrence of Minimum Pressure		Maximum Mean Hourly Wind		Maximum Gust Peak Speed (kn)	Duration of Gales (h)	Sequence of Wind Direction	Minimum Pressure (mb)		Remarks		
			Direction	Speed (kn)				Hourly Reading	Instantaneous Minimum			
	Date	Time										
Typhoon Susan Typhoon Ida Typhoon Pamela Typhoon Gloria Typhoon Mary	1951	June	18	1800	E	36	63	2	ENE to ESE v	1001.7	1001.6	Centre passed over Cheung Chau.
		August	1	1800	ENE	44	76	19	ENE to ESE v	990.8	990.1	
		September ...	2	1400	ENE	36	59	4	ENE to E v	1002.9	1002.4	
	1953	September ...	18	1800	NE	42	75	8	N to ESE v	995.0	994.7	
	1954	August	29	1400	ENE	47	87	12	NNE to ESE v	992.9	992.4	
		November ...	6	1100	E	47	84	5	NNE to SE v	997.6	997.1	
	1957	September ...	22	1700	ENE	59	101	14	N to SE v	986.2	984.3	
	1960	June	9	0500	SSE	50	103	19	ENE to SW v	974.3	973.8	
Typhoon Alice Severe Tropical Storm Olga Typhoon Wanda Typhoon Viola Typhoon Ida Typhoon Ruby Typhoon Sally Typhoon Dot Severe Tropical Storm Lola Typhoon Shirley	1961	May	19	1200	ESE	43	89	6	ENE to SW v	981.6	981.1	Centre passed over Observatory. Centre passed about 10 miles to S'ward. Max. gust peak speed at Tate's Cairn 154 kn.
		September ...	10	0200	W	35	64	1	NNE to SW b	986.5	986.1	
	1962	September ...	1	1000	N	68	140	8	NNW to S v	955.1	953.2	
	1964	May	28	0700	ESE	35	82	3	ENE to SSE v	993.0	991.9	
		August	8	2300	NE	42	112	2	NNE to SSE v	972.3	972.0	
		September ...	5	1300	ESE	58	122	6	N to SE v	971.0	968.2	
		September ...	10	2100	WSW	35	56	1	NNW to SW b	989.9	989.1	
		October	13	0500	N	46	94	8	N to SW b	978.9	977.3	
	1966	July	13	2000	E	35	82	1	ENE to SSE v	990.1	989.5	
	1968	August	21	1800	N	37	72	4	NNE to SSW b	968.7	968.6	

Note: No corrections for air-density have been made to the wind speeds in this table.

* Estimated.

v = veering.

b = backing.