

**ROYAL OBSERVATORY, HONG KONG**

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**METEOROLOGICAL RESULTS**  
**1971**

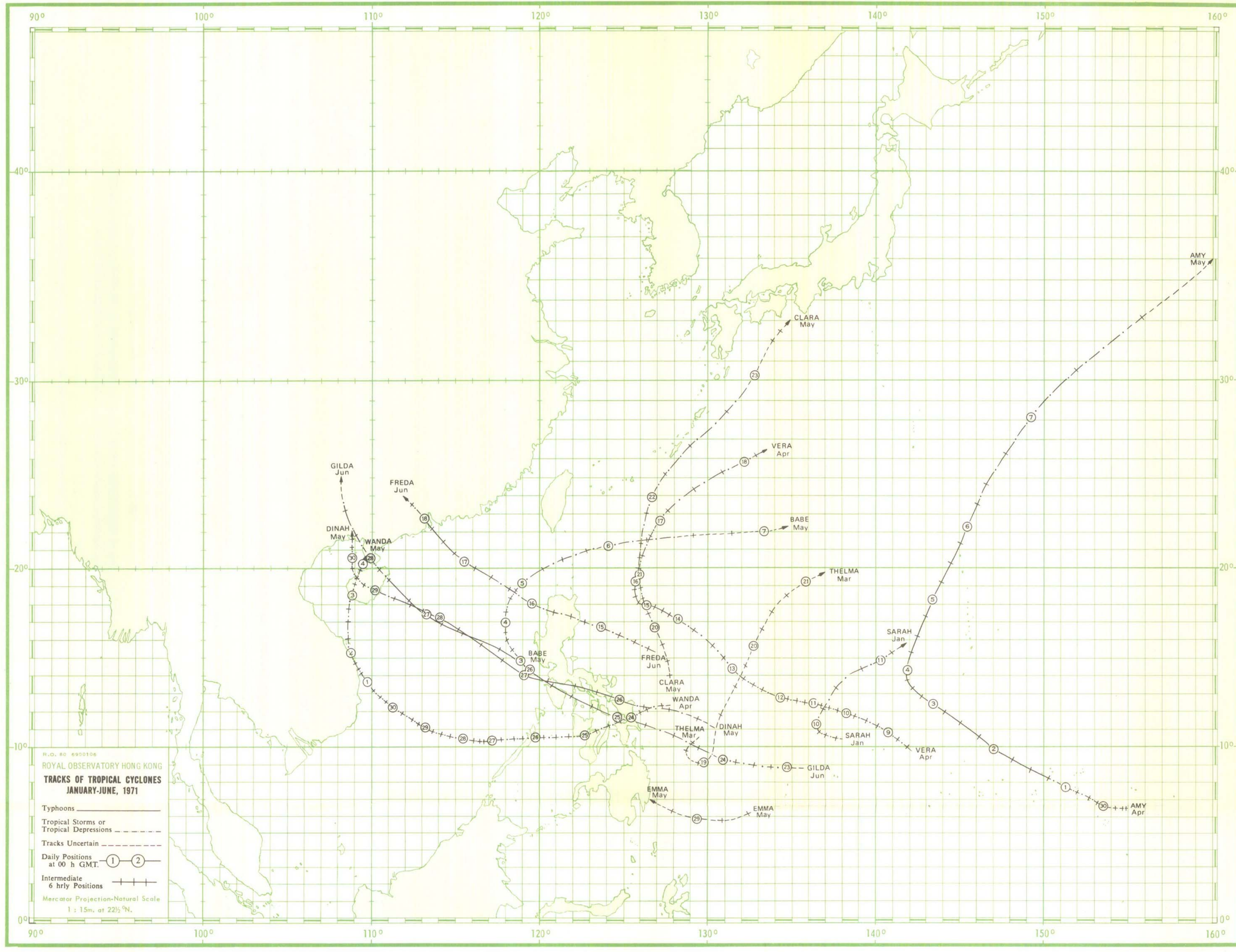
**PART III—TROPICAL CYCLONE SUMMARIES**



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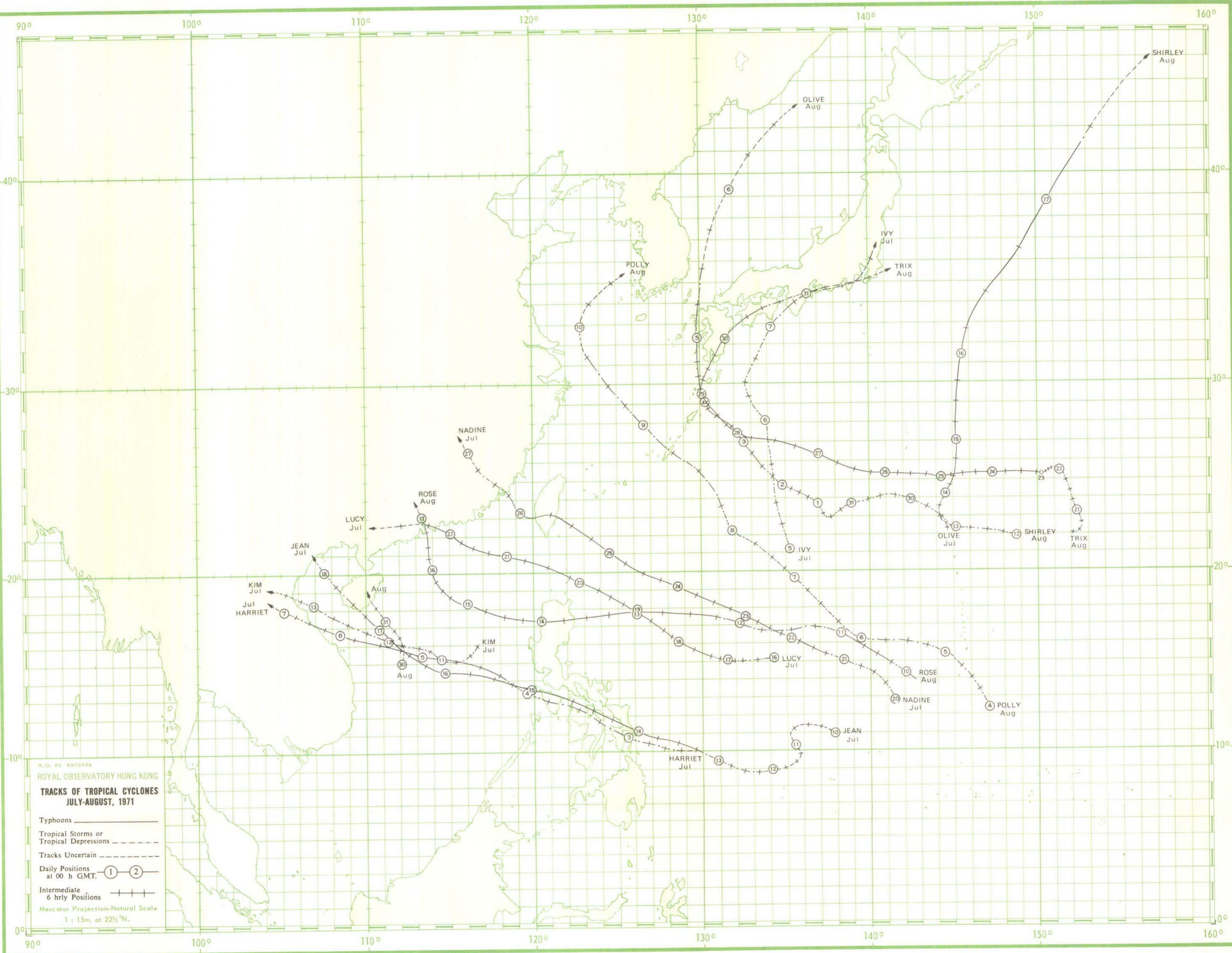
**1973**



R.O. 80 6900106  
**ROYAL OBSERVATORY HONG KONG**  
**TRACKS OF TROPICAL CYCLONES**  
**JANUARY-JUNE, 1971**

- 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.



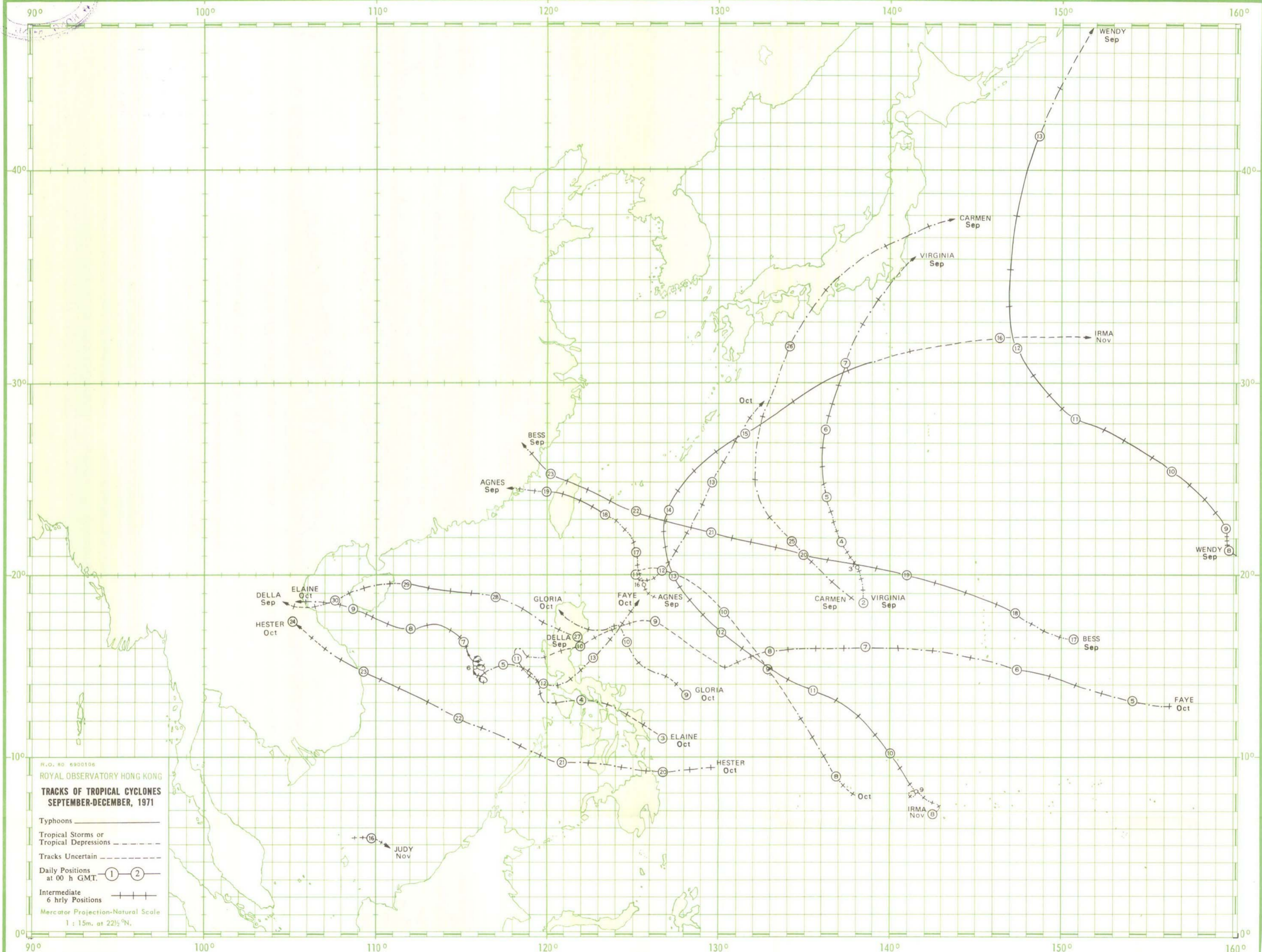
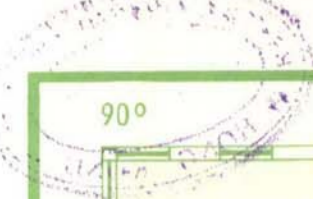
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 ROYAL OBSERVATORY HONG KONG  
**TRACKS OF TROPICAL CYCLONES  
 JULY-AUGUST, 1971**

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.



R.O. NO 6900106  
 ROYAL OBSERVATORY HONG KONG  
**TRACKS OF TROPICAL CYCLONES  
 SEPTEMBER-DECEMBER, 1971**

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.

DELLA Sep  
 HESTER Oct

ELAINE Oct

GLORIA Oct

FAYE Oct

AGNES Sep

GLORIA Oct

ELAINE Oct

HESTER Oct

AGNES Sep

BESS Sep

CARMEN Sep

VIRGINIA Sep

CARMEN Sep

VIRGINIA Sep

IRMA Nov

WENDY Sep

WENDY Sep

FAYE Oct

BESS Sep

JUDY Nov

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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 North 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 North 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 G.M.T. since 1944. The day circle time used for each tropical cyclone is given in the Royal Observatory Technical Memoir No. 11, Volume 1. 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 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.

Surface wind observations are made regularly at 6 stations in the Colony. 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 the Hong Kong Airport, 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. (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

\* 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 Tropical Cyclone Warning Signals;
- (c) the maximum gusts (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 Tropical Cyclone Warnings for Shipping are given in G.M.T., records of meteorological observations are kept in Hong Kong Standard Time (G.M.T.+8 hours), while Local Time used is either Hong Kong Standard Time or Hong Kong Summer Time (G.M.T.+9 hours). In 1971 Hong Kong Summer Time was in force during the period between 3.30 (Hong Kong Standard Time) in the morning of April 18 and 3.30 (Hong Kong Summer Time) in the morning of October 17.

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 Times;
- (c) Times labelled 'G.M.T.' are in Greenwich Mean Time.

Distances are generally given in international nautical miles (n mile), 1 international nautical mile being 1,852 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.

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\* 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 1971 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 1971, 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 number of occasions each of the Tropical Cyclone Warning Signals was hoisted, and also the total time throughout the year 1971 that each signal was displayed. The sequence in which signals were displayed in each tropical cyclone affecting Hong Kong and the number of Tropical Cyclone 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 G.M.T.

**Table 4** shows the number of occasions on which Tropical Cyclone Warning Signals were hoisted and their annual total duration during the period 1946-1971. 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 1946-1971. 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 1946-1971.

**Table 7** presents the casualties and damage figures associated with tropical cyclones in Hong Kong for the period 1937-1971. 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 in 1971. The information is also compiled from local newspapers.

**Table 9** presents some features of tropical cyclones which gave gales or winds of greater force at the Observatory since 1884. In this context, the criterion used is the hourly mean wind speed centred on the hour recorded at the Royal Observatory. In each case, data are tabulated in chronological order according to the date and time of minimum pressure recorded at the Royal Observatory. The information presented includes lowest hourly reading of the 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 1971

1971 will probably be remembered for Typhoon 'Rose' which caused the highest death toll and heaviest damage to property in the Colony since Typhoon 'Wanda' in 1962. The year was also notable for the unusually large number of tropical cyclones which affected the Colony.

During the year, 36 tropical cyclones formed over the western North Pacific (west of 160°E) and the South China Sea, of which 21 attained typhoon intensity. A total of 9 tropical cyclones affected China, 5 passed over Japan, 6 entered the coast of Indo-China and 12 crossed the Philippine Islands, while none affected Korea or the Malay Peninsula. The monthly distribution of these tropical cyclones is shown in Figure 1 and a brief summary of their tracks is contained in Table 1.

A total of 15 tropical cyclones entered Hong Kong's Area of Responsibility for Tropical Cyclone Warnings for Shipping, while 4 developed within this area. Altogether, 405 Tropical Cyclone Warnings for Shipping were issued on these 19 tropical cyclones by the Royal Observatory, Hong Kong. 9 tropical cyclones necessitated the display of local signals, of which Typhoons 'Freda', 'Lucy' and 'Rose' came sufficiently close to the Colony to cause gales or winds of greater force at the Observatory.

In the first three months of the year, there were only two tropical storms. Tropical Storm 'Sarah' formed over the western North Pacific near Yap on January 9. It recurved towards the northeast and dissipated near the Mariana Islands two days later. Tropical Storm 'Thelma' developed to the east of the Philippines on March 18 but it moved northeastwards and degenerated into an area of low pressure on March 21.

Three tropical cyclones occurred in April. 'Vera' was the first typhoon of the year. It formed near Yap on April 8 and moved northwestwards at first but recurved towards the northeast near the Balintang Channel and dissipated to the east of Okinawa on April 18. Severe Tropical Storm 'Wanda' crossed the southern Philippine Islands on April 24 and caused considerable damage. After passing Nansha, 'Wanda' recurved to the north and affected the coast of Vietnam during the period from May 1 to 2. It dissipated over the Luichow Peninsula after crossing Hainan on May 4. Typhoon 'Amy' developed near the Caroline Islands on April 29 and recurved well to the east of the Philippines after passing close to Guam. It then followed an easterly track after recurvature and dissipated on May 7 soon after crossing the 160°E meridian. 'Amy' is the deepest April typhoon on record with a minimum central sea-level pressure of 895 millibars.

One typhoon and three tropical storms developed in May. Tropical Storm 'Babe' formed near the west coast of the Philippines on May 3, but recurved towards the northeast. It moved into the Pacific through the Bashi Channel on May 5 and dissipated 2 days later. Tropical Storm 'Carla' developed east of Luzon on May 19 and dissipated just to the south of Honshu on May 23 after passing east of the Ryukyu Islands. Typhoon 'Dinah' crossed the central Philippine Islands on May 26. It passed over Hainan Island on May 29 and crossed the south China coast just west of the Luichow Peninsula on May 30. Towards the end of the month, Tropical Storm 'Emma' formed east of Mindanao but dissipated about 24 hours later.

Although there were only two typhoons in June, both affected Hong Kong. Typhoon 'Freda' passed close to the west of Hong Kong on June 18 and brought gales to the Colony. Typhoon 'Gilda' passed about 260 miles to the southwest on June 27 and strong winds were experienced in exposed places in the Colony.

In July, 7 tropical cyclones were observed and 5 of them attained typhoon intensity. Tropical Storm 'Ivy' passed near Tokyo in July 7. Typhoon 'Harriet', Severe Tropical Storm 'Kim' and Typhoon 'Jean' crossed the South China Sea in succession, each being separated from the other by 5 days. Typhoon 'Lucy' passed about 23 miles north-northeast of the Royal Observatory on July 22 and brought sustained gales and torrential rain to the Colony. Typhoon 'Nadine' moved along a northwesterly track in the Pacific and devastated southern Taiwan on July 26. Towards the end of the month, Typhoon 'Olive' developed far out in the Pacific. It recurved northwards and passed western Kyushu on August 5.

A total of 5 tropical cyclones formed in August, 3 of which reached typhoon intensity. Severe Tropical Storm 'Polly' developed in the Pacific south of the Mariana Islands on August 4 and maintained a northwesterly track. It dissipated in the Yellow Sea on August 10 soon after recurvature. Typhoon 'Rose' formed to the west of Guam on August 10 and crossed northern Luzon 4 days later. After entering the South China Sea, 'Rose' recurved to the north and battered Hong Kong on August 16 with hurricane force winds and torrential rain, leaving a tragic death toll. Both 'Shirley' and 'Trix' were recurving typhoons. 'Shirley' was located far out in the Pacific while 'Trix' affected southern Japan after recurvature during August 29-31. A tropical depression formed over the South China Sea near the Paracel Islands on August 30. It moved northwestwards and crossed Hainan on the last day of the month.

In September, 5 typhoons and 2 less intense tropical cyclones were detected. Typhoon 'Virginia' formed west of the Marianas. It moved northwards and passed east of Tokyo on September 7. Typhoon 'Wendy' developed far out in the Pacific near Wake Island on September 4. It crossed the 160°E meridian on September 8 and recurved to the north 4 days later. A tropical depression formed in the wake of 'Wendy' on September 14 but only lasted for about 12 hours. Both Typhoon 'Agnes' and 'Bess' landed in the Fukien Province after crossing northern Taiwan. Typhoon 'Della' developed over the east coast of Luzon on September 27. It crossed the South China Sea on a westerly track and dissipated over North Vietnam at the end of the month after crossing Hainan and the Gulf of Tonkin.

Three typhoons and one tropical storm developed in October. Typhoon 'Elaine' remained in the South China Sea for about 5 days and followed a looping track on October 5-7. Typhoon 'Faye' and Tropical Storm 'Gloria' formed a binary system on October 9-10. 'Gloria' dissipated over northern Luzon on October 10 while 'Faye' crossed Luzon twice in 3 days. Typhoon 'Hester' passed northern Mindanao on October 20. It crossed the South China Sea during the following 2 days. 'Hester' entered the east coast of South Vietnam on October 23 and dissipated overland next day.

In November, only two tropical cyclones were observed. Typhoon 'Irma' toured around the western edge of the Pacific for about a week from November 8 to 16. 'Irma' was the deepest November typhoon on record and its lowest central sea-level pressure was 884 millibars. Tropical Storm 'Judy' formed over the South China Sea to the northwest of Borneo on November 15, but it dissipated on the following day. It was the last tropical cyclone of the year.

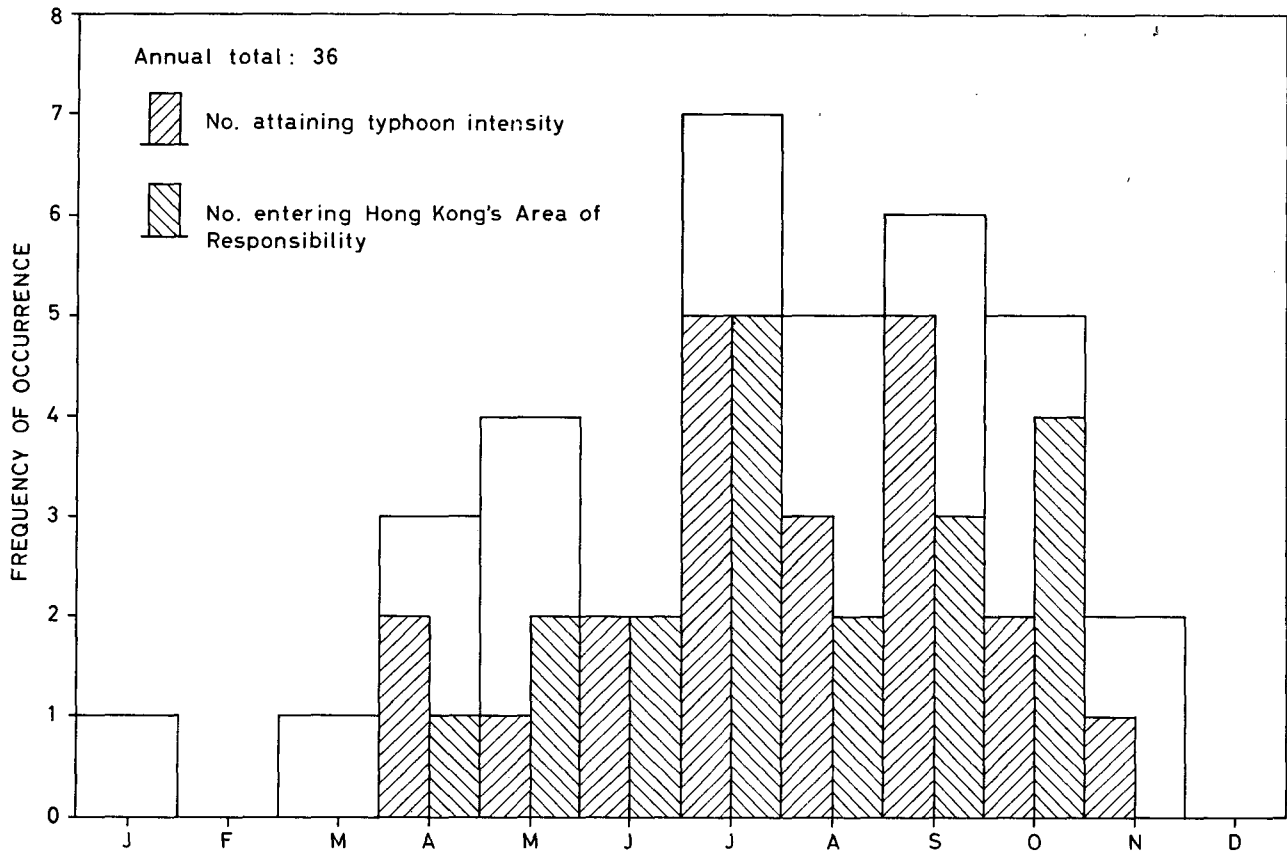


Figure 1. Monthly distribution of the frequency of occurrence of tropical cyclones in the western North Pacific and the South China Sea in 1971 (classified in accordance with the month of the first day circle of each track).

## REPORT ON TROPICAL CYCLONES AFFECTING HONG KONG

### TYPHOON 'DINAH'

May 25-30, 1971

*The track of this typhoon is shown in Figure 2*

On May 25, 'Dinah' developed as a tropical storm about 580 miles east-southeast of Manila. It soon intensified into a typhoon and moved west-northwestwards at about 14 knots.

At 7.00 a.m. on May 26, a reconnaissance aircraft reported that the minimum sea-level pressure was 920 millibars and the maximum surface winds were 90 knots. Satellite pictures received at the Royal Observatory in the afternoon (Figure 3) showed that the circulation of 'Dinah' was well organized and covered an area about 360 miles in diameter. 'Dinah' crossed the central Philippines on May 26, leaving 13 dead and 44 missing. The typhoon entered the South China Sea early on May 27 and then turned onto a northwesterly course.

In Hong Kong, the Stand By Signal, No. 1, was hoisted at 6.00 a.m. on May 28, when 'Dinah' was centred about 320 miles south of the Colony. Later in the day the typhoon turned towards the west-northwest again and headed towards Hainan Island at about 10 knots. All signals were lowered at 8.20 a.m. on May 29, when 'Dinah' was centred about 300 miles southwest of the Colony. It weakened to a tropical storm early on May 29, shortly before it crossed Hainan Island. Early next morning, when 'Dinah' was centred over the Gulf of Tonkin, it took a more northerly course and crossed the south China coast near Pei Hai about 290 miles west of Hong Kong late on May 30 and dissipated rapidly overland.

During the period May 28-29, moderate to fresh southeasterly winds were experienced in the Colony. The weather was generally cloudy with isolated showers. The total rainfall recorded on these two days was 0.6 mm. There were no abnormal changes in tide heights during the period when the Stand By Signal, No. 1, was displayed.

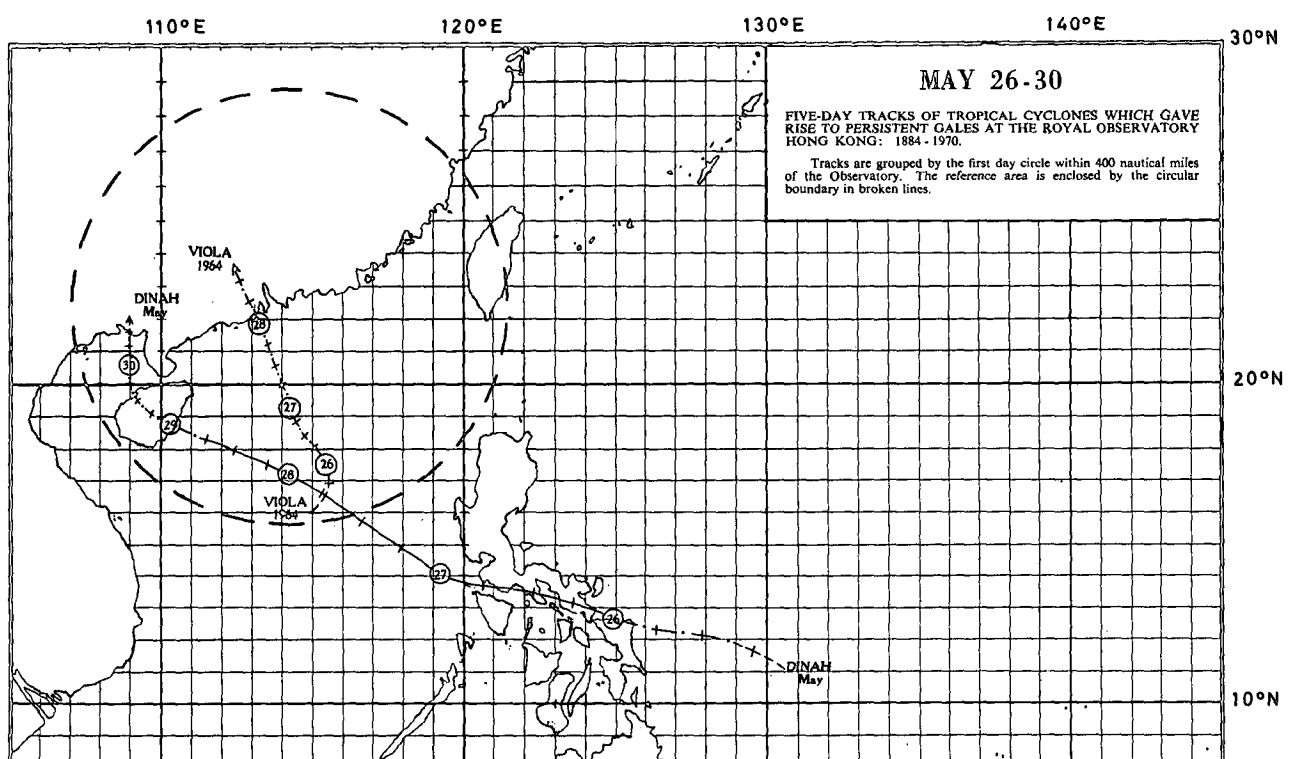


Figure 2. Track of Typhoon 'Dinah': May 25 - 30, 1971.

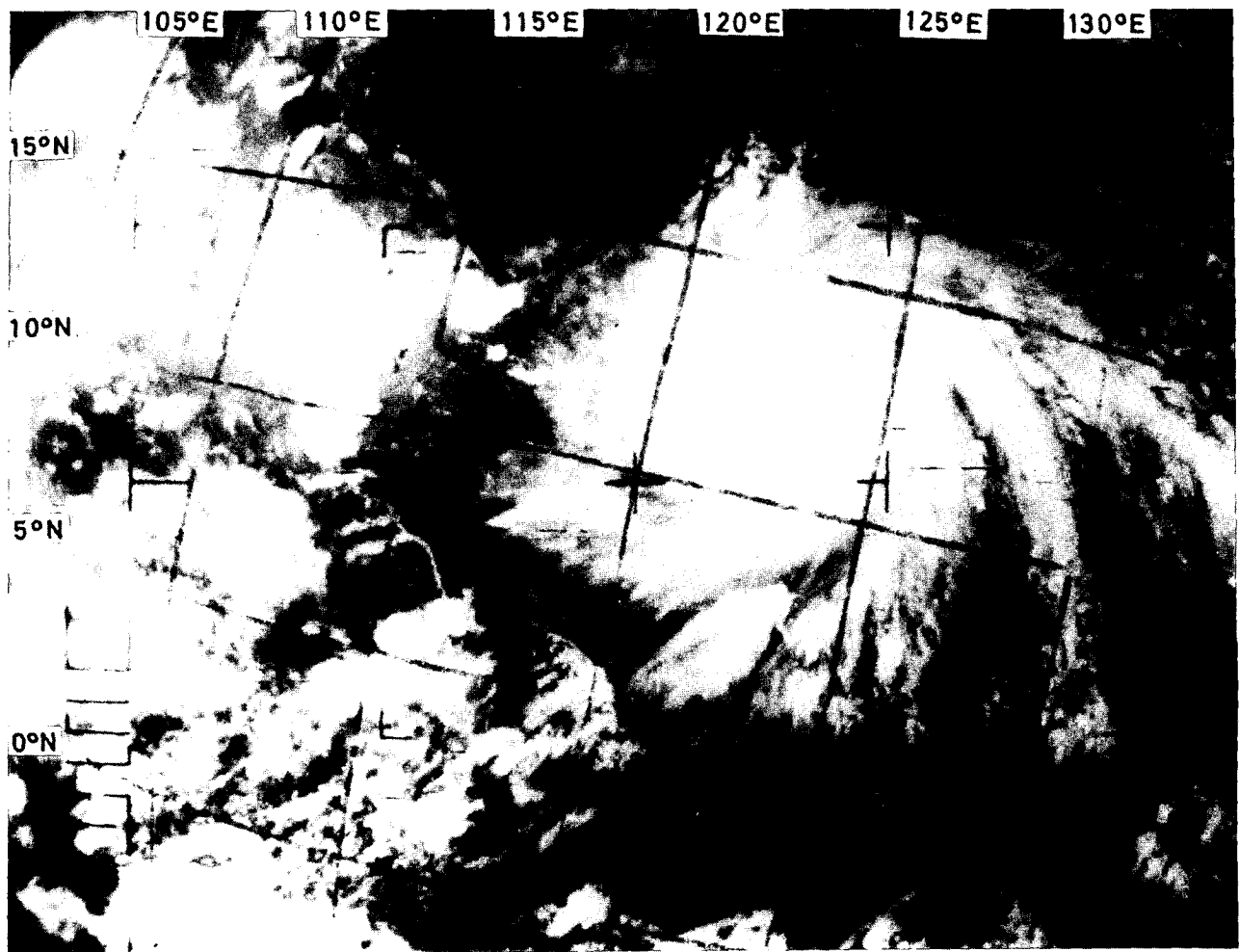


Figure 3. NOAA-1 APT picture of Typhoon 'Dinah' taken at 4.09 p.m. on May 26, 1971.

### TYPHOON 'FREDA'

June 14-18, 1971

*The track of this typhoon is shown in Figure 4*

On June 14, Tropical Storm 'Freda' developed about 350 miles east of Manila. It moved west-northwestwards at about 10 knots and crossed northern Luzon late on the following day. After entering the South China Sea early on June 16, the storm turned to a northwesterly course with an average speed of 11 knots and soon deepened to a typhoon.

In Hong Kong, the Stand By Signal, No. 1, was hoisted at 12.15 p.m. on June 16 when 'Freda' was centred about 360 miles southeast of the Colony, and was replaced by the Strong Wind Signal, No. 3, at 11.10 p.m. on the same day when the typhoon was about 210 miles to the southeast. 'Freda' passed about 50 miles to the south of Pratas Island around midnight when it began to slow down considerably. The typhoon was tracked by the Royal Observatory radar from 3.00 a.m. onwards on June 17. Its eye was poorly defined most of the time and varied between 25 and 35 miles in diameter. Figure 5 is a radar picture of 'Freda' taken at 8.00 a.m. At 3.26 p.m. a reconnaissance aircraft reported that the minimum sea-level pressure near the centre was 984 millibars. Satellite pictures received at the Royal Observatory in the late afternoon of June 17 (Figure 6) showed that the circulation of the typhoon covered an area about 420 miles in diameter but was not well organized.

Typhoon 'Freda' continued to approach the Colony and the Northeast Gale or Storm Signal, No. 7, was hoisted at 10.20 a.m. on June 17 when it was centred about 130 miles south-southeast of Hong Kong. Winds over the Colony were moderate to fresh at first but increased steadily during the day and reached gale force over the sea late in the afternoon. 'Freda' came within 60 miles of the Observatory by about 8.00 p.m. and the radar pictures taken during the evening (Figure 7) showed that the rainbands were broad and dense. Towards midnight, gales had become general over the whole Colony. Typhoon 'Freda' was closest to the Colony at 1.40 a.m. on June 18, when it was centred about 22 miles southwest of the Royal Observatory. The minimum sea-level pressure recorded at the Observatory at the same time was 984.3 millibars. The Southeast Gale or Storm Signal, No. 8, was hoisted at 2.10 a.m. and was replaced by the Southwest Gale or Storm Signal, No. 6, at 6.15 a.m. to warn the change in the direction of the gales. During the morning of June 18, gale force winds turned to southeast and then southwest as 'Freda' crossed the coast about 40 miles to the west of Hong Kong. In Macau the winds moderated around 5.00 a.m. as the eye passed nearby.

'Freda' weakened to a tropical depression during the afternoon of June 18 and No. 6 Signal was replaced by No. 3 Signal at 2.10 p.m. Strong southwesterly winds over the Colony persisted for about two hours but began to moderate as 'Freda' dissipated over the Kwangtung Province about 160 miles northwest of Hong Kong in the late afternoon. All signals were lowered at 4.10 p.m.

During the passage of Typhoon 'Freda', the maximum sustained winds were 57 knots at Cape Collinson, 59 knots at Cheung Chau, 38 knots at the Royal Observatory and 70 knots at Tate's Cairn. The maximum gust peak speeds reported were 103 knots at Tate's Cairn and 79 knots at the Royal Observatory.

In Hong Kong, the weather was mainly fine in the early morning on June 17, but became cloudy with frequent heavy showers in the afternoon. Almost continuous rain was experienced throughout the night when the gale signals were displayed and significant improvement in the weather only took place in the late afternoon of June 18.

Two people were killed and twenty-nine injured during the passage of Typhoon 'Freda'. Five ships broke adrift and some flooding in the low-lying areas near Taipo in the New Territories were reported. The damage to property was, however, slight.

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

June 16	Nil
June 17	87.9 mm
June 18	95.3 mm

Figure 8 shows the hourly amounts of rainfall and the barometric pressure recorded at the Royal Observatory during the passage of Typhoon 'Freda'. The heaviest hourly rainfall of 27.3 mm was observed about 5 hours after the occurrence of minimum barometric pressure at the Observatory.

The times and heights of the highest tides and maximum storm surges recorded at the various locations in the Colony during Typhoon 'Freda' 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	2.35	Jun 18	7.05 a.m.	0.85	Jun 18	1.50 a.m.
Tai Po Kau	2.61	Jun 18	2.40 a.m.	1.37	Jun 18	2.40 a.m.
Chi Ma Wan (Lantau)	2.50	Jun 18	6.55 a.m.	1.01	Jun 18	12.20 a.m.

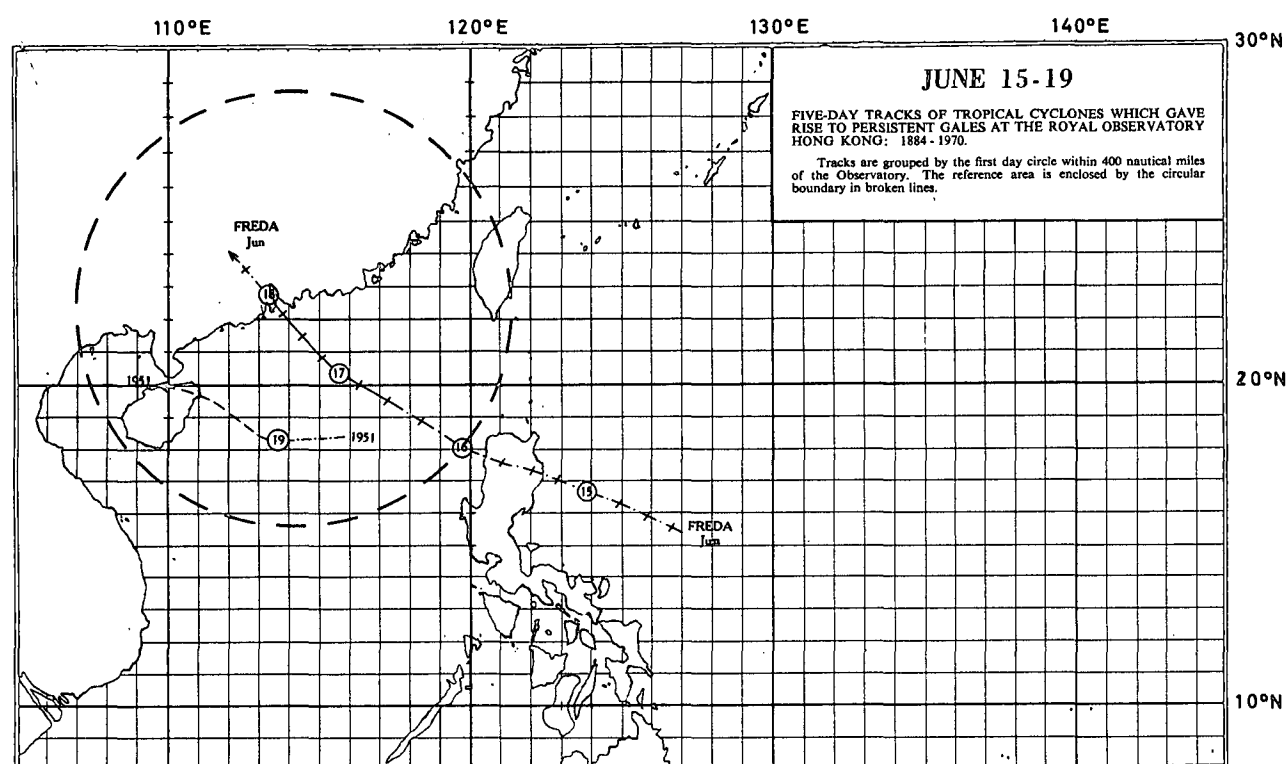


Figure 4. Track of Typhoon 'Freda': June 14 - 18, 1971.

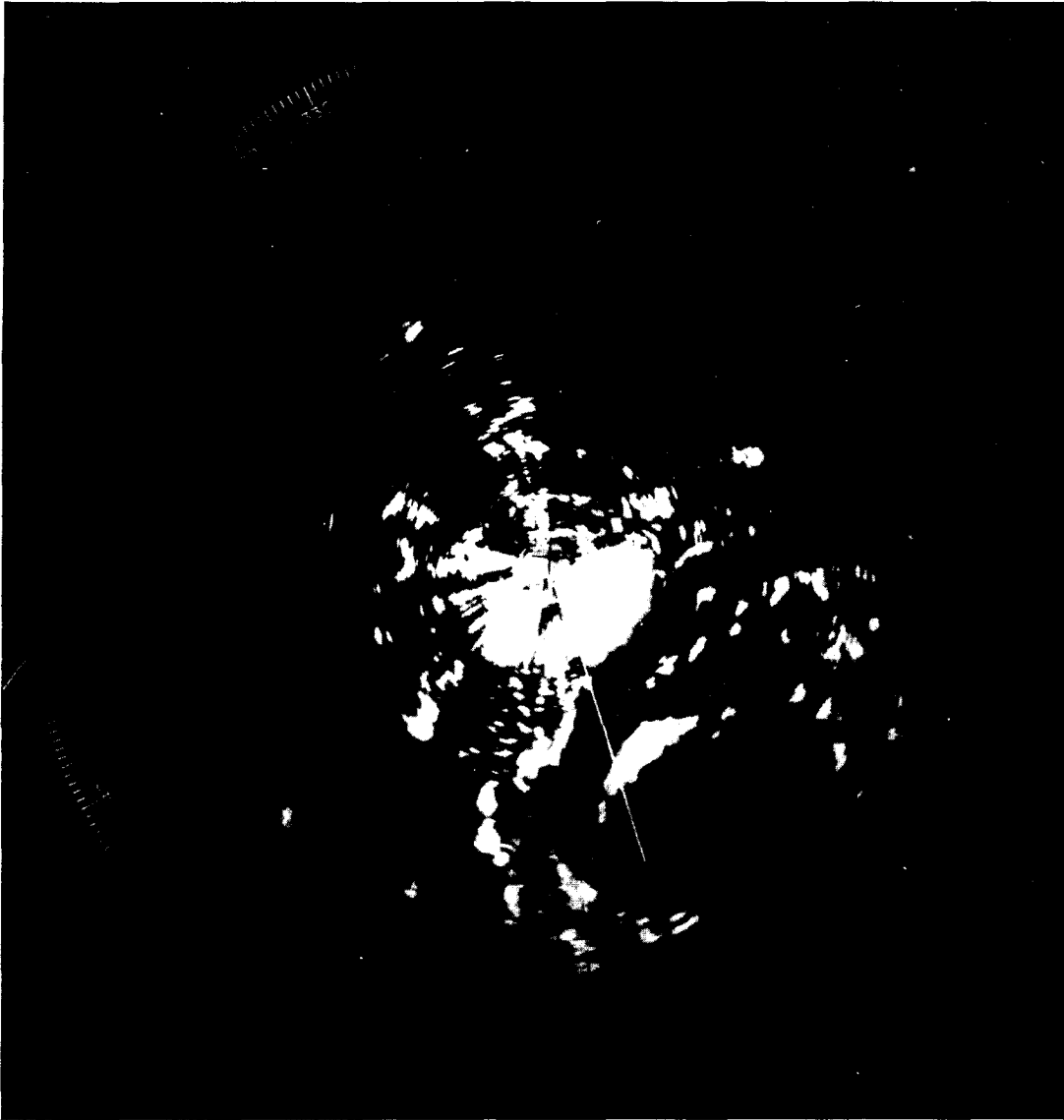


Figure 5. Picture of Typhoon 'Freda' taken from the radarscope at the Royal Observatory at 8.00 a.m. on June 17, 1971.

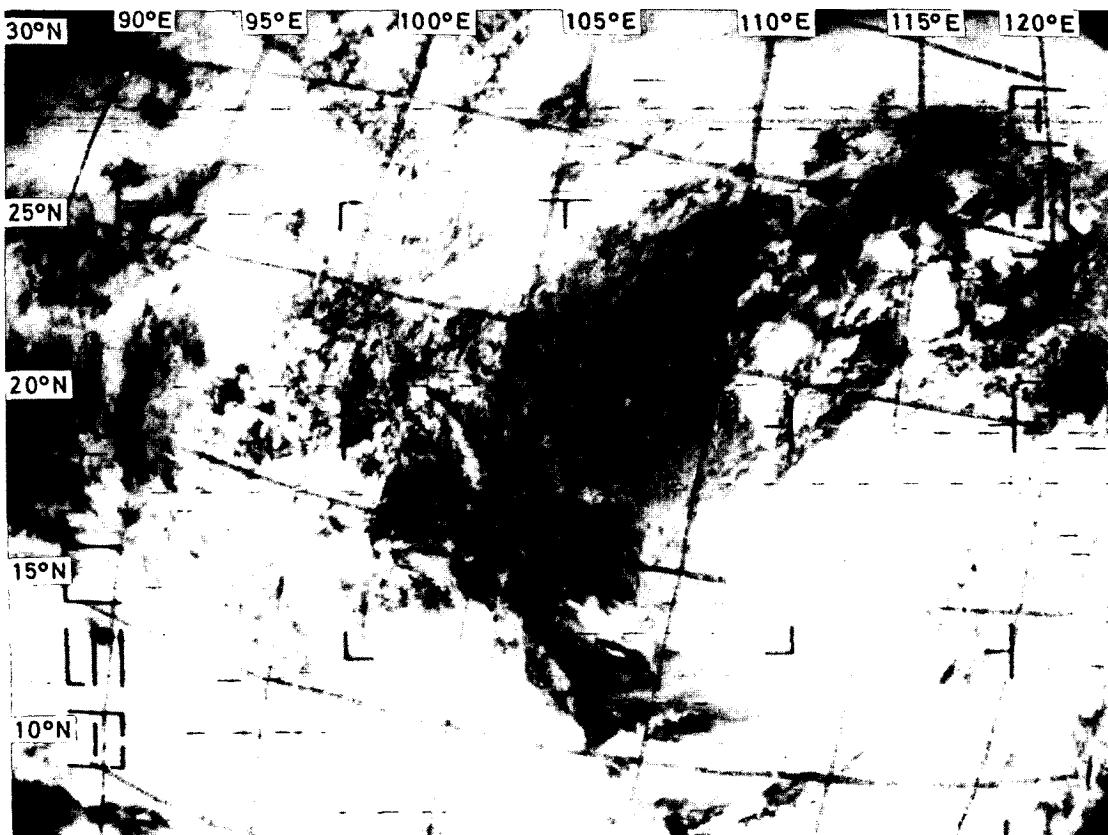


Figure 6. NOAA-1 APT picture of Typhoon 'Freda' taken at 4.54 p.m. on June 17, 1971.

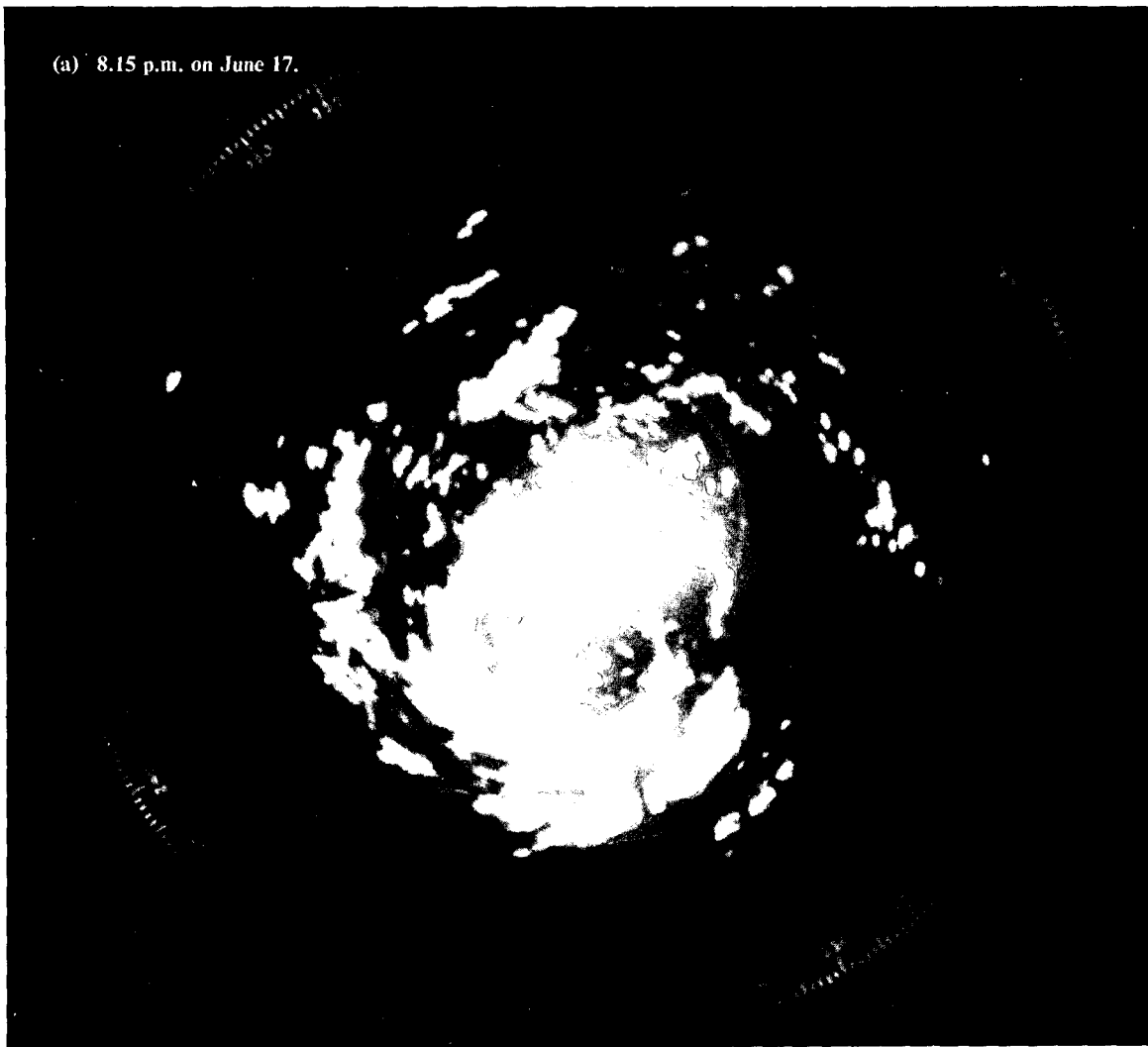
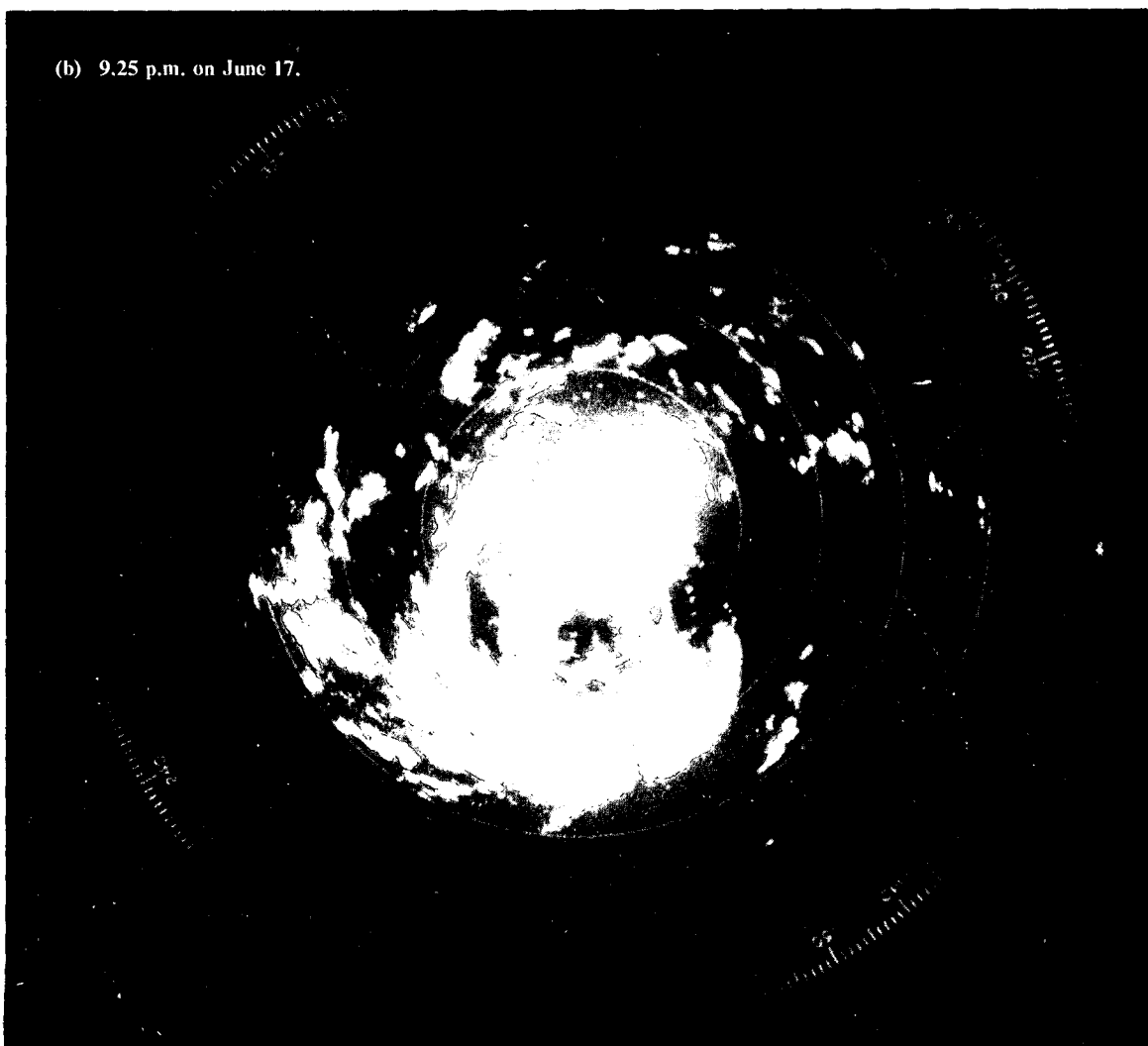
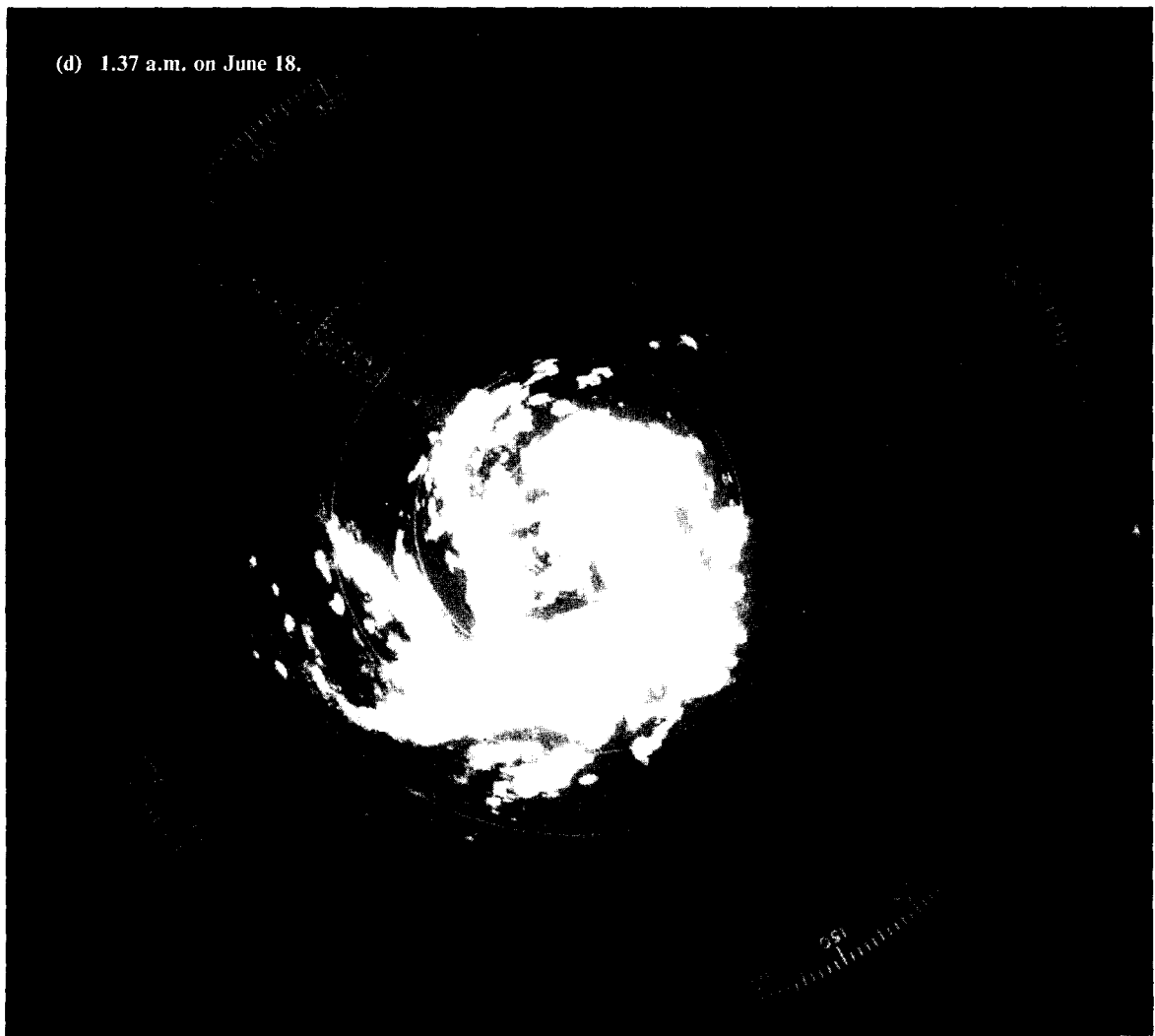
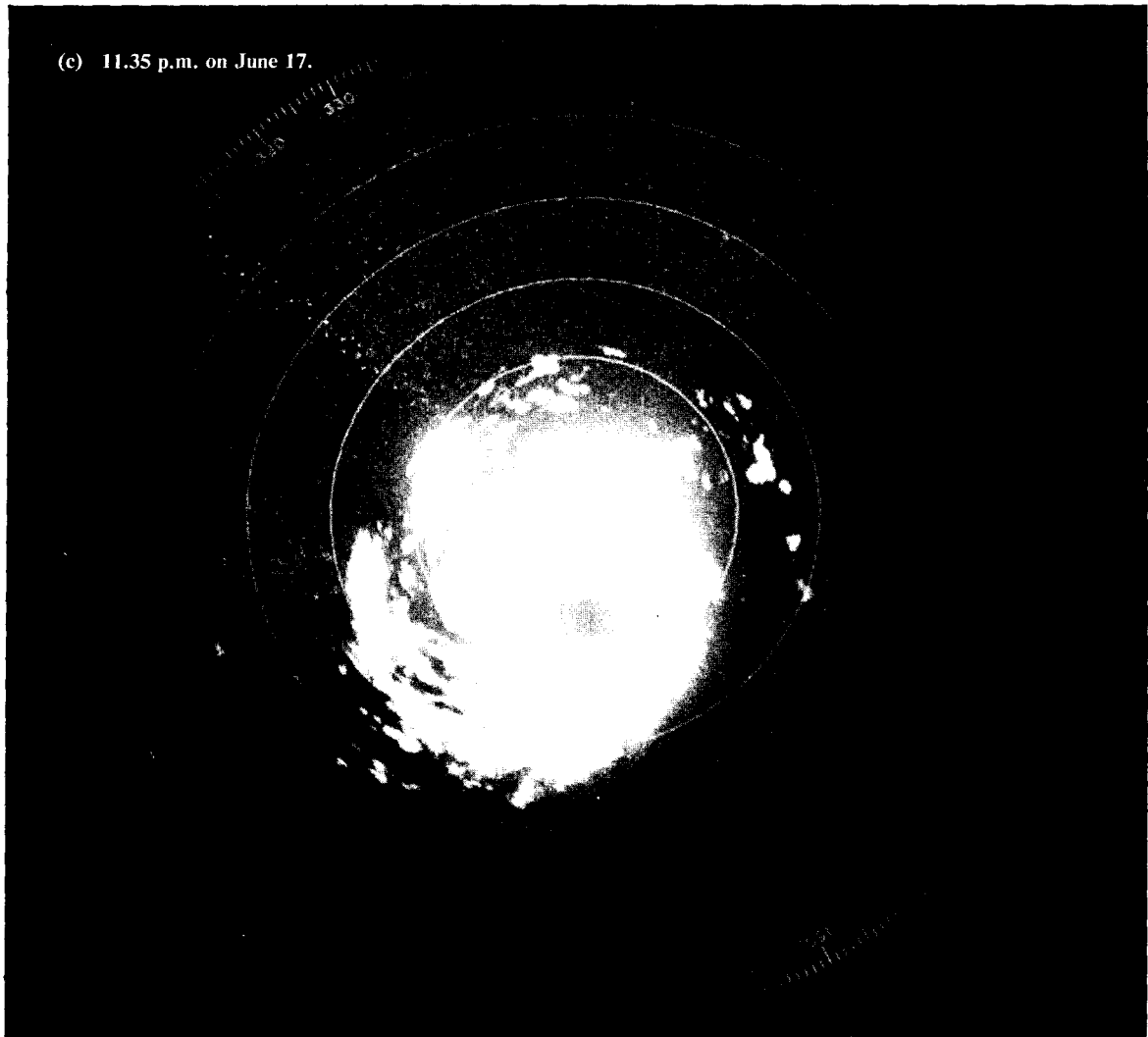
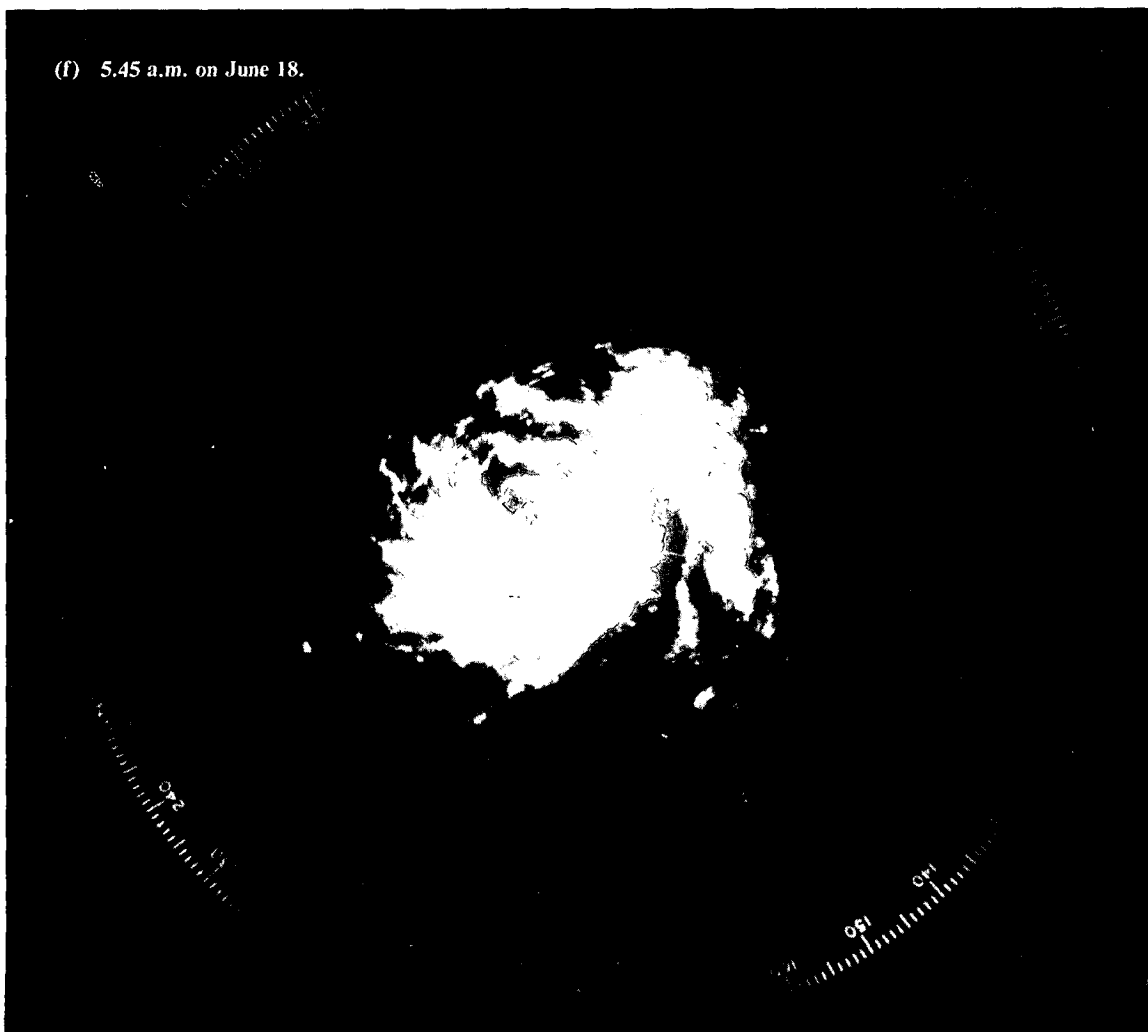
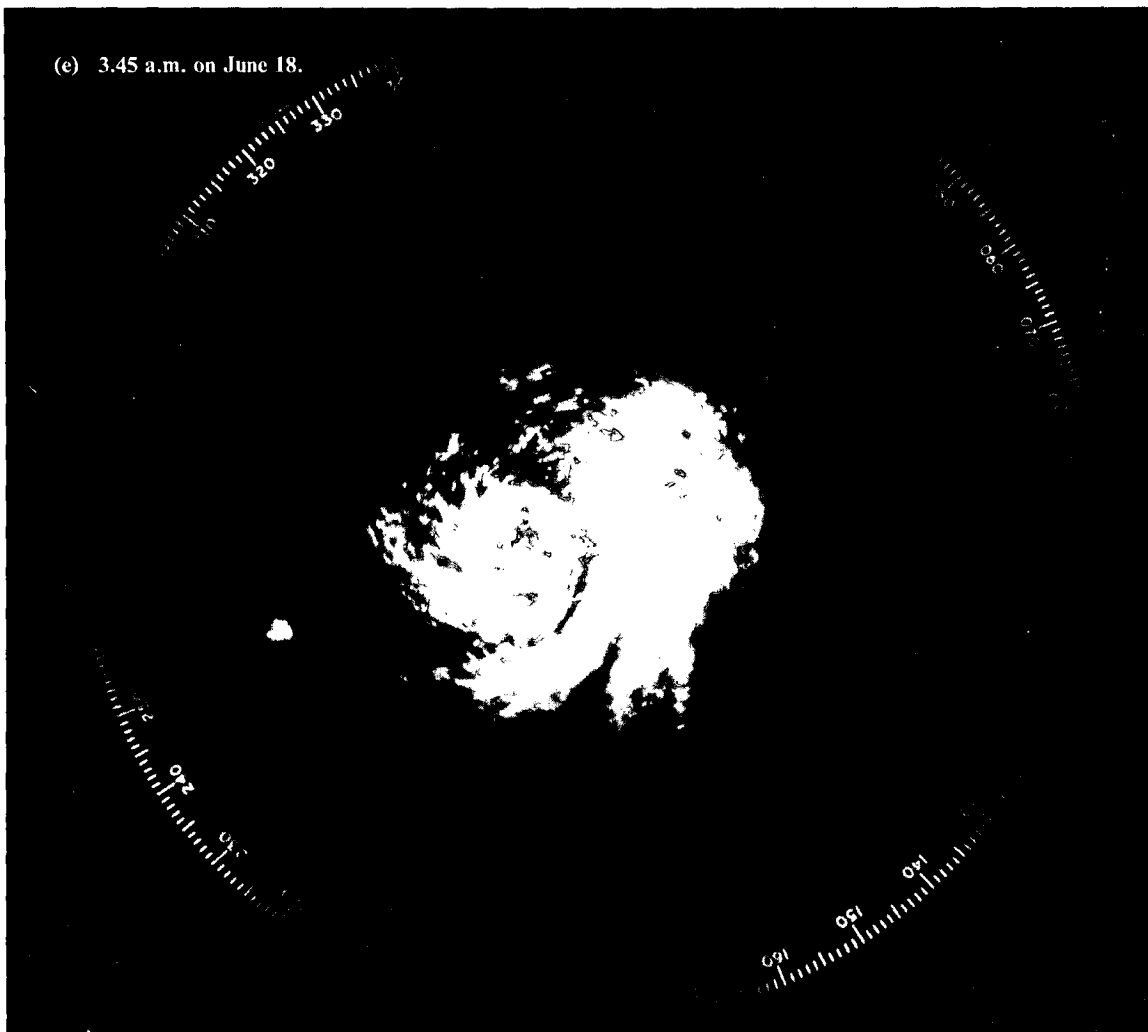


Figure 7. Sequence of radar pictures of Typhoon 'Freda' during the night of June 17 - 18, 1971.









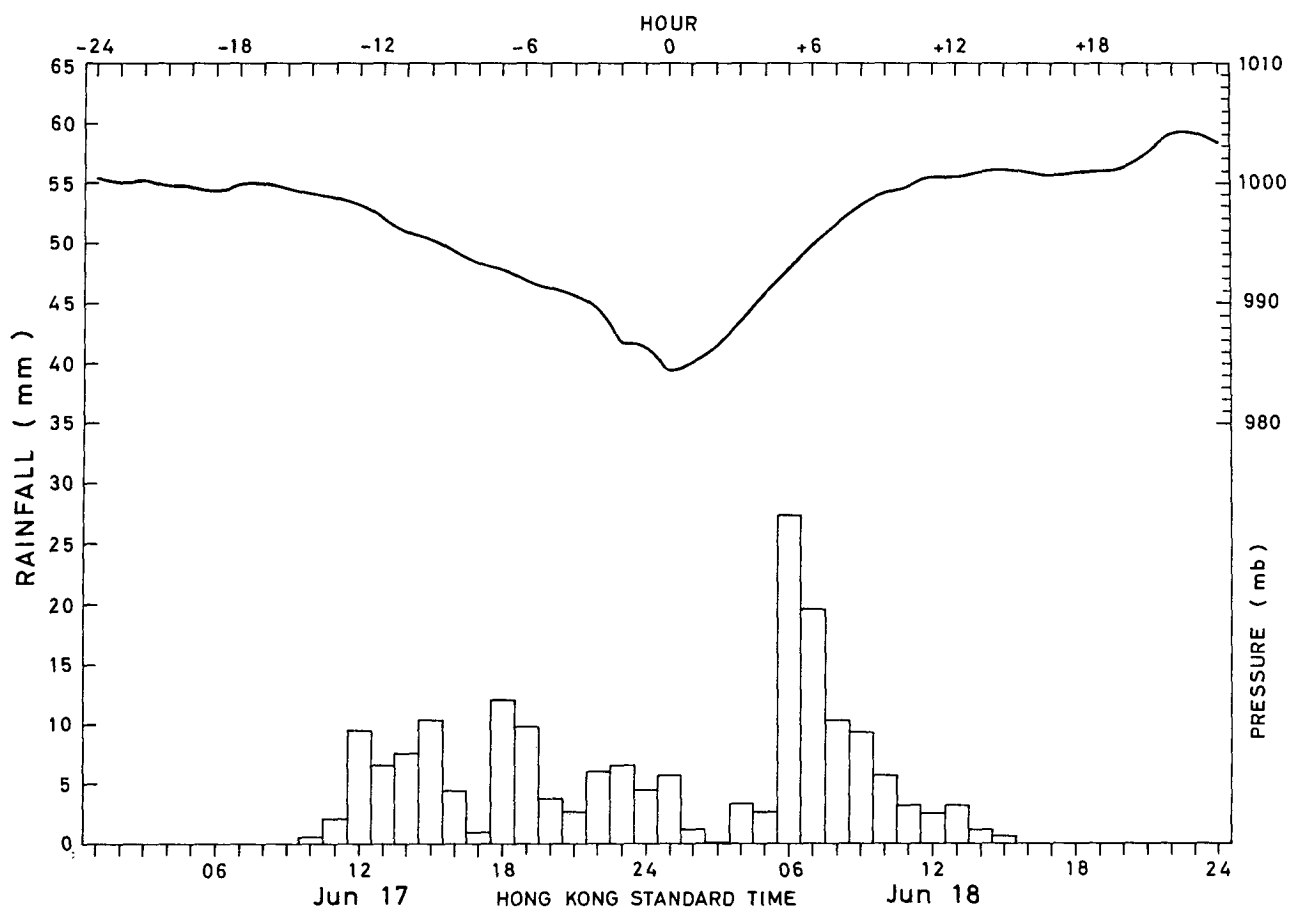


Figure 8. Hourly rainfall distribution and pressure profile at the Royal Observatory during the passage of Typhoon 'Freda'. The time-scale is measured from the hour of lowest barometric pressure.

## TYPHOON 'GILDA'

June 23-28, 1971

*The track of this typhoon is shown in Figure 9*

Early on June 23, 'Gilda' formed as a tropical depression near the Caroline Islands about 200 miles west-southwest of Yap. It moved westwards at about 9 knots at first and then west-northwest at 16 knots on June 24. 'Gilda' intensified into a typhoon early on the following day and crossed the central Philippines during the evening. The typhoon entered the South China Sea on June 26, still moving rapidly west-northwestwards. At 10.10 a.m. a reconnaissance aircraft reported maximum surface winds of 90 knots and a minimum sea-level pressure of 945 millibars near its centre.

In Hong Kong, the Stand By Signal, No. 1, was hoisted at 8.30 p.m. on June 26, when the typhoon was centred about 380 miles south-southeast of the Colony. This was replaced by the Strong Wind Signal, No. 3, at 5.30 a.m. on June 27, when 'Gilda' was some 320 miles south of Hong Kong. Satellite pictures received at the Royal Observatory on the morning of June 27 (Figure 10) revealed that the circulation of 'Gilda' covered an area about 300 miles in diameter but was not very well organized. During the afternoon on the same day, 'Gilda' turned northwestwards towards Hainan and slowed down to about 11 knots. The typhoon was closest to the Colony at about 8.00 p.m. when it was centred some 260 miles to the southwest.

All signals were lowered at 11.45 p.m. on June 27 as 'Gilda' weakened to a tropical storm and crossed the coast of northeastern Hainan. It then passed across the Luichow Peninsula and gradually turned to a north-northwesterly course. 'Gilda' finally dissipated over the Kwangsi Province about 380 miles west-northwest of Hong Kong late on June 28.

In Hong Kong, surface winds freshened from the east on June 27 and became strong on hill tops and in exposed places during the evening as the wind direction turned to southeast. The weather was cloudy with scattered showers. During the period June 26-27, the maximum gust peak speeds recorded were 46 knots at the Royal Observatory, 43 knots at Tate's Cairn and 38 knots at Cheung Chau. At the Royal Observatory the total rainfall recorded on these two days was 7.4 mm. There were no abnormal changes in tide heights during the period when Tropical Cyclone Warning Signals were on display.

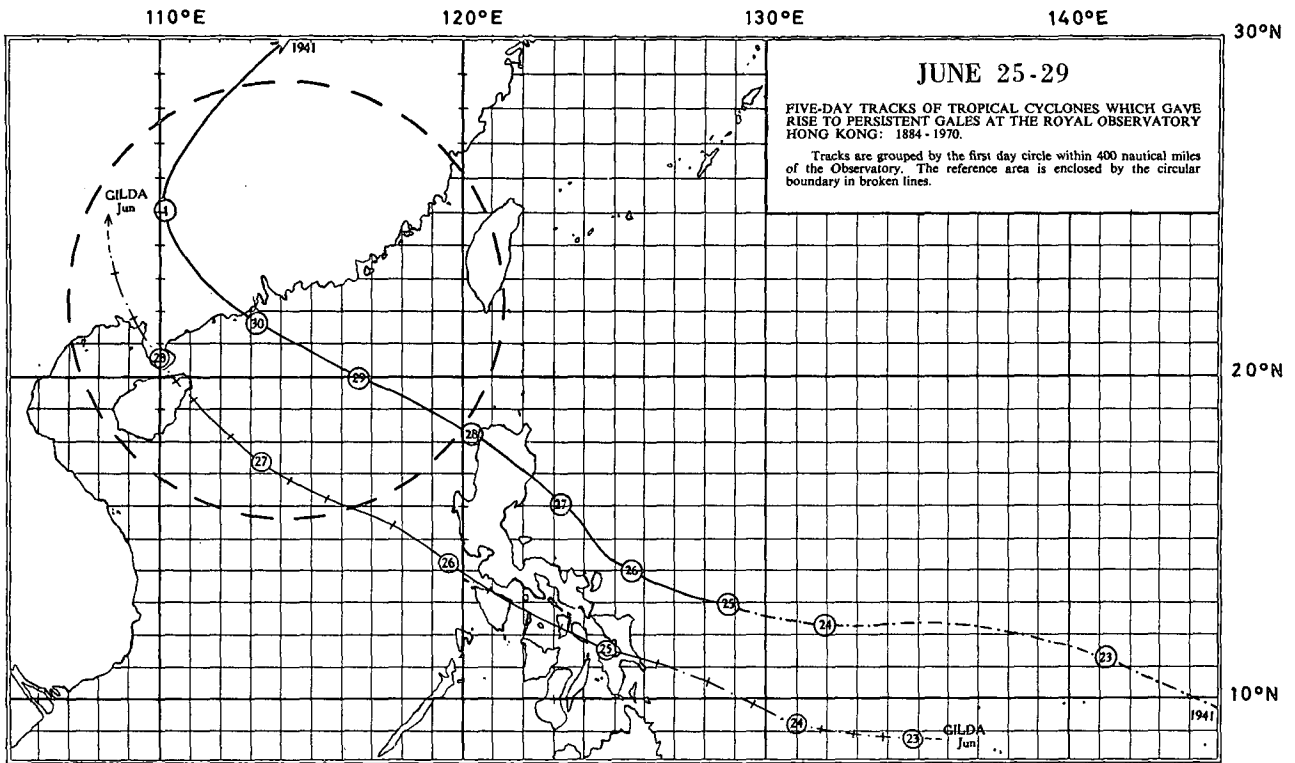


Figure 9. Track of Typhoon 'Gilda': June 23 - 28, 1971.

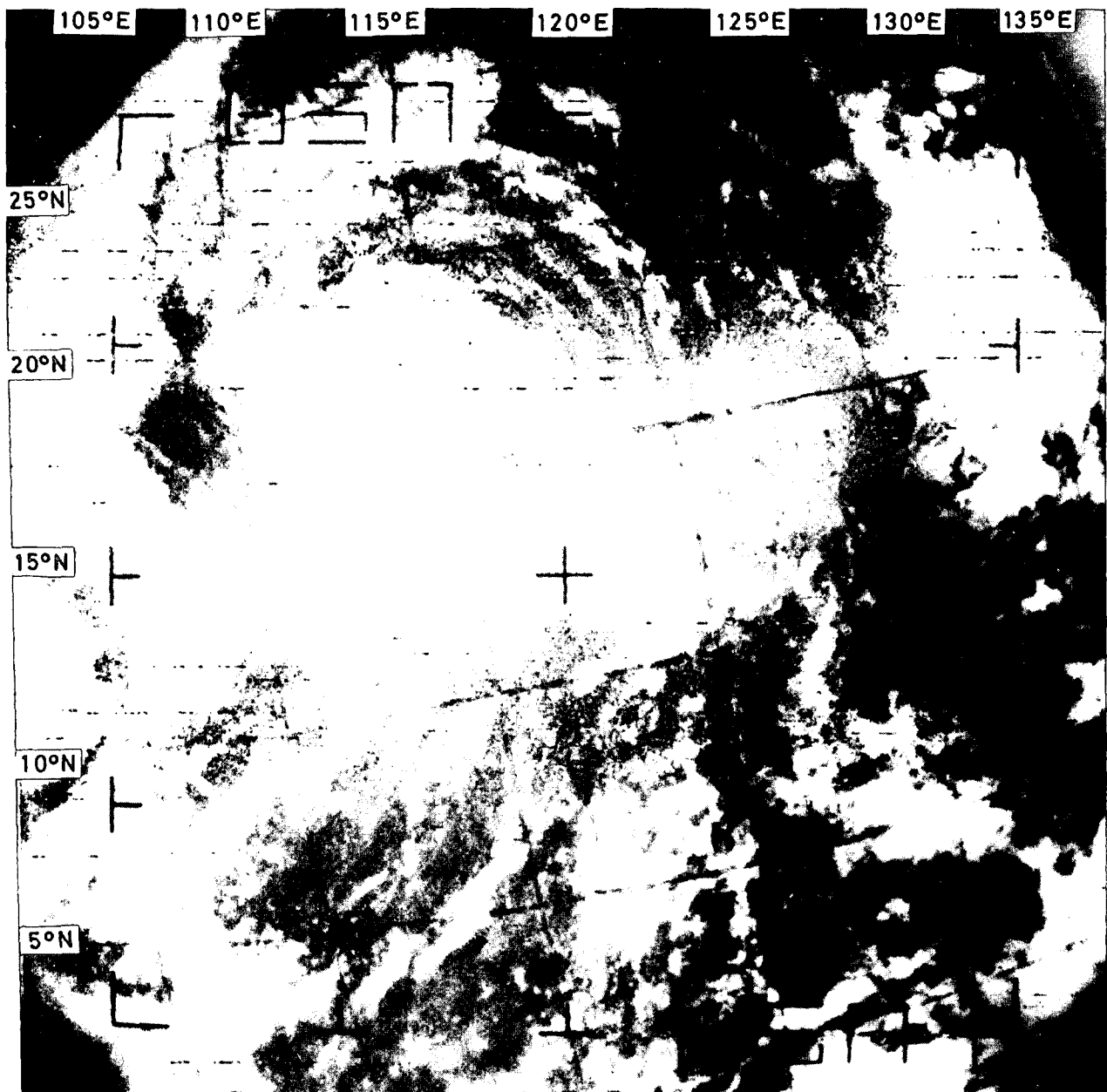


Figure 10. ESSA-8 APT picture of Typhoon 'Gilda' taken at 11.06 a.m. on June 27, 1971.

## TYPHOON 'HARRIET'

July 2-7, 1971

*The track of this typhoon is shown in Figure 11*

Early on July 2, Tropical Storm 'Harriet' developed about 560 miles east-southeast of Manila. It moved west-northwest at about 10 knots at first but accelerated to 16 knots as it crossed the central Philippines on the following day. 'Harriet' entered the South China Sea on July 4 and intensified to a typhoon.

In Hong Kong, the Stand By Signal, No. 1, was hoisted at 5.40 a.m. on July 5 when the typhoon was centred about 420 miles south of the Colony but was lowered at 5.10 p.m. on the same day as 'Harriet' persisted in its course towards North Vietnam. A satellite picture received at the Royal Observatory at about noon (Figure 12) indicated that the circulation of 'Harriet' covered an area about 360 miles in diameter. At 6.45 p.m. a reconnaissance aircraft reported a minimum sea-level pressure of 929 millibars and maximum surface winds of 120 knots near its centre. On July 6, 'Harriet' crossed the coast of North Vietnam about 210 miles south of Hanoi during the late evening and dissipated about 130 miles inland the next day.

On July 5, winds over the Colony were light to moderate from the east to southeast and fresh in exposed places. The weather was cloudy with scattered showers and the rainfall recorded at the Royal Observatory amounted to 10.9 mm. However, showery conditions continued in Hong Kong for the next 3 days as the remnant of 'Harriet' enhanced the southwest monsoon and a total of 34.1 mm of rainfall was recorded at the Royal Observatory during the period July 6-8. There was no significant rise in tide heights during the period when the Stand By Signal, No. 1, was hoisted.

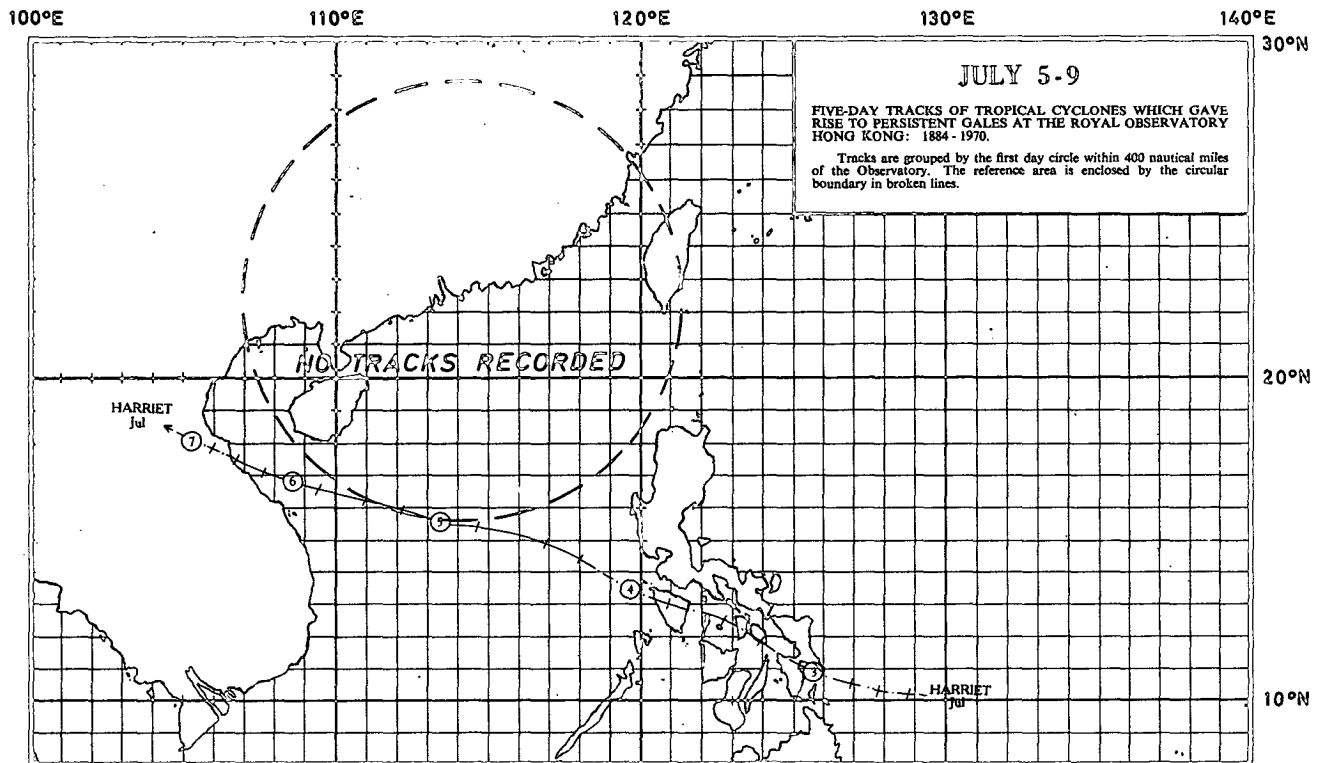


Figure 11. Track of Typhoon 'Harriet': July 2 - 7, 1971.

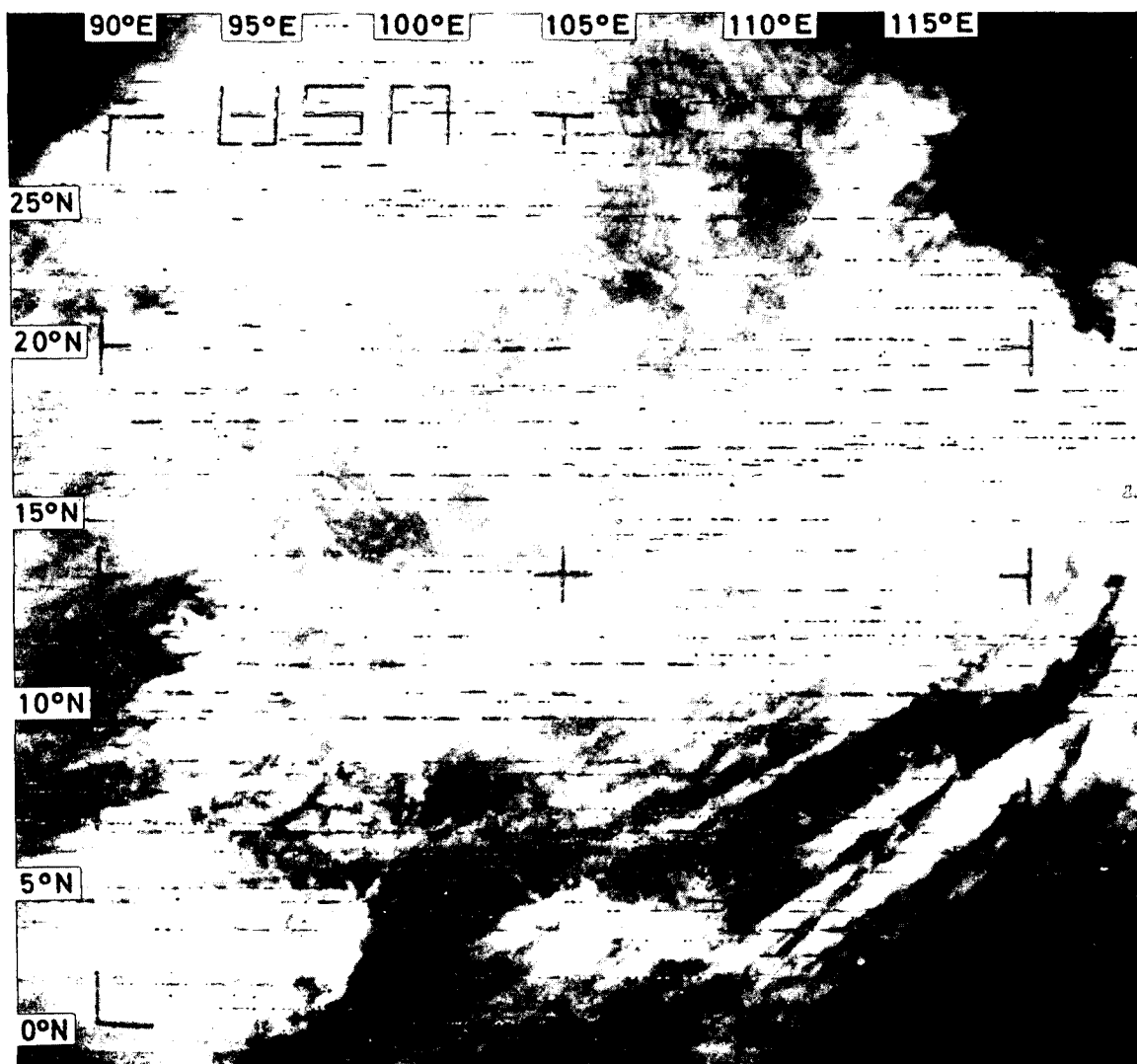


Figure 12. ESSA-8 APT picture of Typhoon 'Harriet' taken at 12.11 p.m. on July 5, 1971.

### TYPHOON 'LUCY'

July 16-22, 1971

*The track of this typhoon is shown in Figure 13*

On July 16, a tropical depression formed about 750 miles east of Manila and moved slowly westwards. It soon deepened to a tropical storm, was named 'Lucy', and further intensified to a typhoon in the afternoon on July 17. On July 18, Typhoon 'Lucy' turned to a northwesterly course and crossed the Balintang Channel into the South China Sea during the following two days. The typhoon then took a west-northwesterly track towards Hong Kong and at 1.00 p.m. on July 20 a reconnaissance aircraft reported maximum surface winds of 120 knots and sea-level pressure of 937 millibars near the typhoon centre. Satellite pictures received at the Royal Observatory during the period July 17-22 (Figure 14) indicated that the circulation of Typhoon 'Lucy' was very extensive with an average diameter of about 600 miles.

In Hong Kong, the Stand By Signal, No. 1, was hoisted at 12.30 a.m. on July 21 when 'Lucy' was centred about 370 miles east-southeast of the Colony and was replaced by the Strong Wind Signal, No. 3, at 3.45 p.m. on the same day as the typhoon moved closer to the Colony. In Hong Kong winds were light to moderate in the evening, but gradually freshened from the north during the night and became strong in exposed places by about 3.00 a.m. on July 22. As the typhoon continued to move towards Hong Kong, the Northwest Gale or Storm Signal, No. 5, was hoisted at 3.00 a.m. on July 22 when 'Lucy' was about 110 miles away to the east-southeast. Radar pictures taken at the Royal Observatory in the next few hours (Figure 15) showed that the eye of the typhoon was about 40 miles in diameter with well-defined rainbands. The northwesterly winds continued to increase and reached gale force on hill tops during the morning of July 22. The Southwest Gale or Storm Signal, No. 6, replaced No. 5 at 12.30 p.m. when 'Lucy' was about 22 miles northeast of Tate's Cairn to warn the change of gale direction from northwesterly to southwesterly. A minimum sea-level pressure of 977.9 millibars was recorded at the Royal Observatory about 10 minutes later. Southwesterly gales were experienced in most places over the Colony during the afternoon of July 22.

'Lucy' weakened to tropical storm intensity over south Kwangtung on July 22, and the No. 6 Signal was replaced by the Strong Wind Signal, No. 3, at 4.10 p.m. as winds over the Colony began to moderate. 'Lucy' moved westwards towards Canton in the evening of July 22 and finally dissipated over western Kwangtung about 210 miles west of Hong Kong early next morning. All signals were lowered at 2.35 a.m. on July 23. Due to the enhancement of the summer monsoon over the South China Sea, winds over Hong Kong remained fresh and were occasionally strong in exposed places during the morning of July 23.

During the passage of 'Lucy', sustained gales were experienced at practically all meteorological observing stations over the Colony. The maximum gust peak speeds recorded were 80 knots at Tate's Cairn and Waglan Island, 72 knots at Cape Collinson, 70 knots at Cheung Chau, 68 knots at the Royal Observatory and 63 knots at the Hong Kong Airport.

The weather in Hong Kong on July 21 was cloudy with occasional thundery showers mainly in the evening. Torrential rain and heavy squally showers developed during the early morning of July 22 and persisted until dusk. More than 100 mm of rainfall were recorded at the Royal Observatory between 11.00 a.m. and 3.00 p.m. on that day. However, significant improvement occurred in the late evening and very little rain fell after midnight.

The passage of 'Lucy' left 38 persons injured, of whom 18 had to stay in hospital for treatment. Floods were reported at 13 locations in the Colony, causing heavy losses of crops and livestock in low-lying areas in the New Territories. Many roads were blocked by landslides, collapsed scaffoldings, fallen signboards, and other debris blown down by the wind. Two buildings were endangered on the Island and five freighters got into difficulties. Practically all public transport services were suspended during the day on July 22.

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

July 21	7.6 mm
July 22	142.5 mm

Figure 16 depicts the hourly rainfall amounts and the barometric pressure recorded at the Royal Observatory during the passage of Typhoon 'Lucy'. The heaviest hourly rainfall of 32.8 mm was observed two hours after the occurrence of minimum pressure at the Observatory.

Wind-generated waves of 5.5 metres were registered by the electronic wave-recorder near Waglan Island at about 5.00 p.m. on July 21. The times and heights of the highest tides and maximum storm surges recorded at the various locations in the Colony during Typhoon 'Lucy' 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	2.91	Jul 22	10.25 a.m.	0.97	Jul 22	2.00 p.m.
Tai Po Kau	2.82	Jul 22	7.40 a.m.	1.40	Jul 22	3.20 p.m.
Chi Ma Wan (Lantau)	Recorder unserviceable					

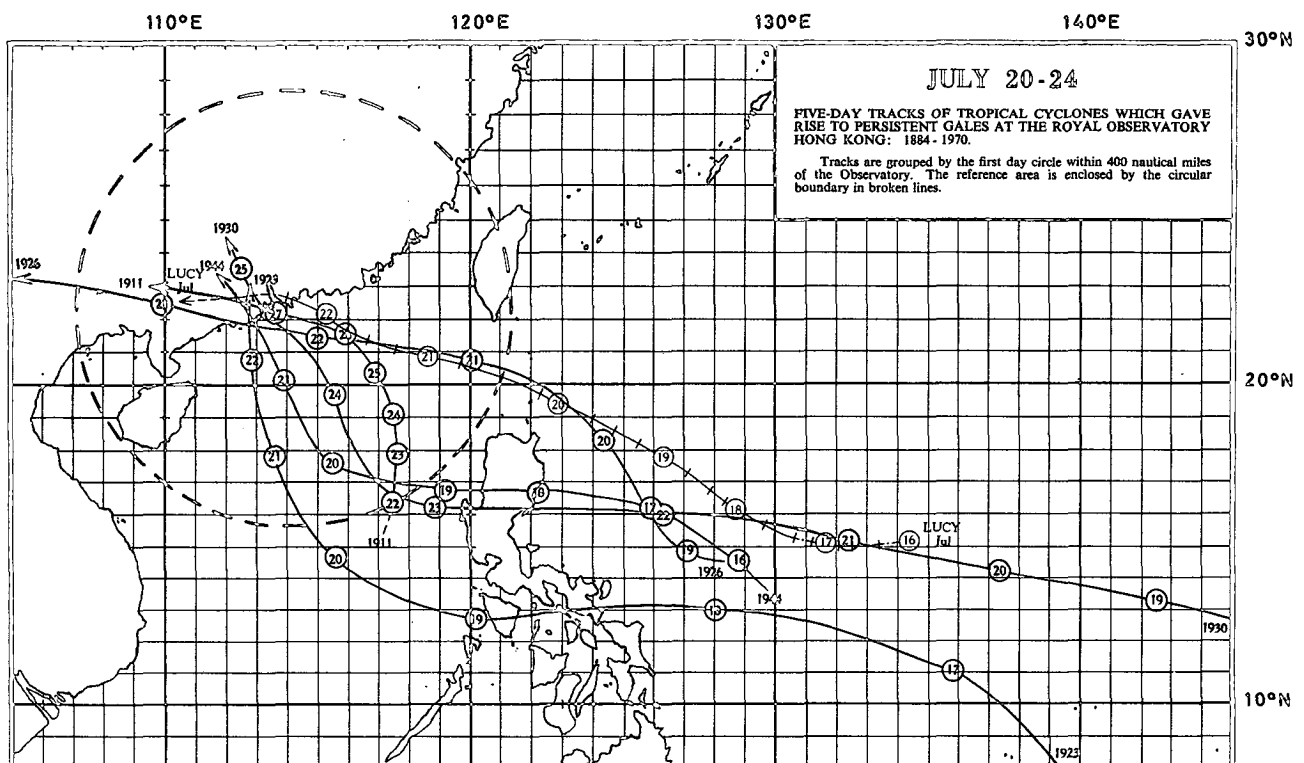


Figure 13. Track of Typhoon 'Lucy': July 16 - 22, 1971.

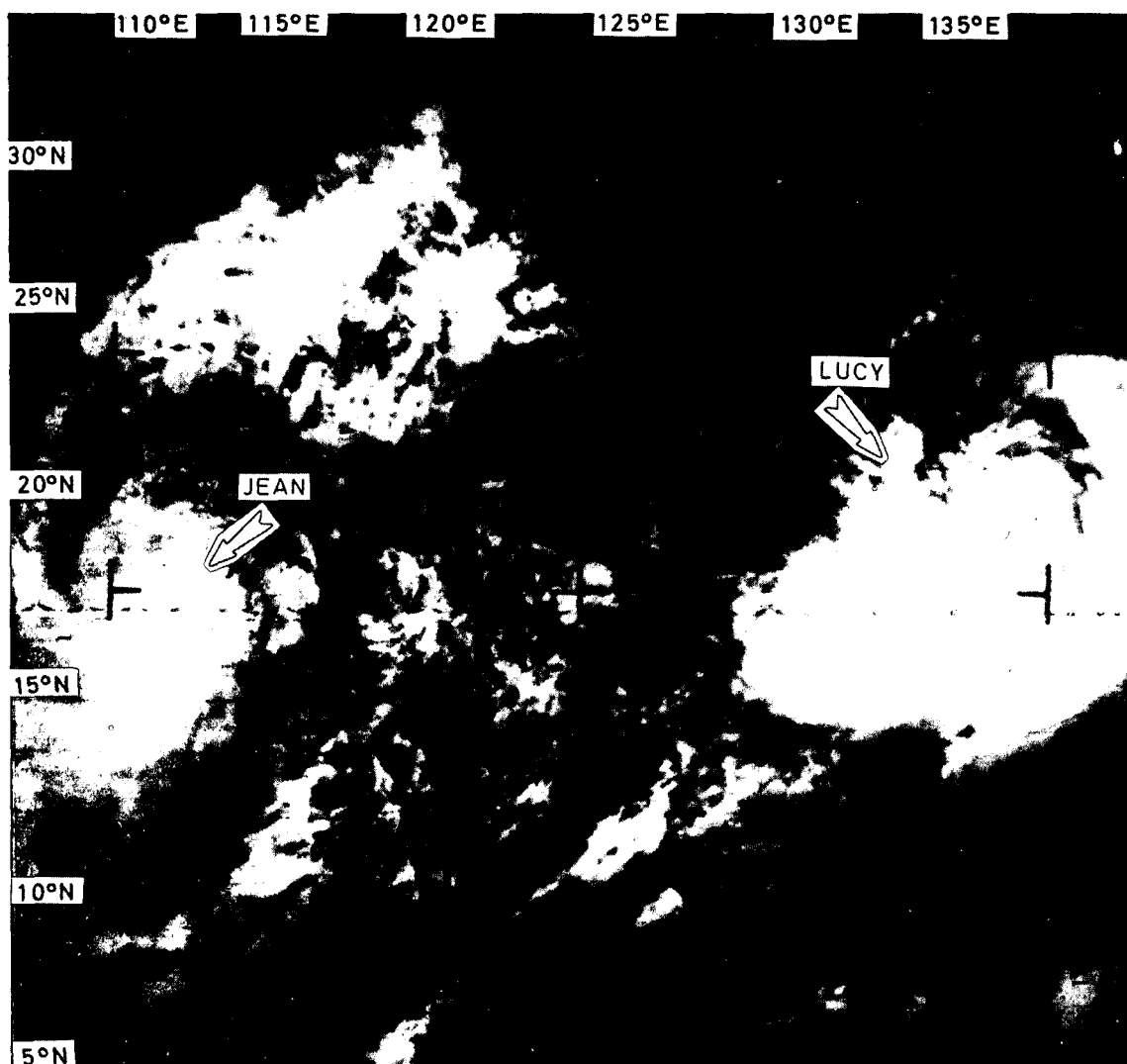
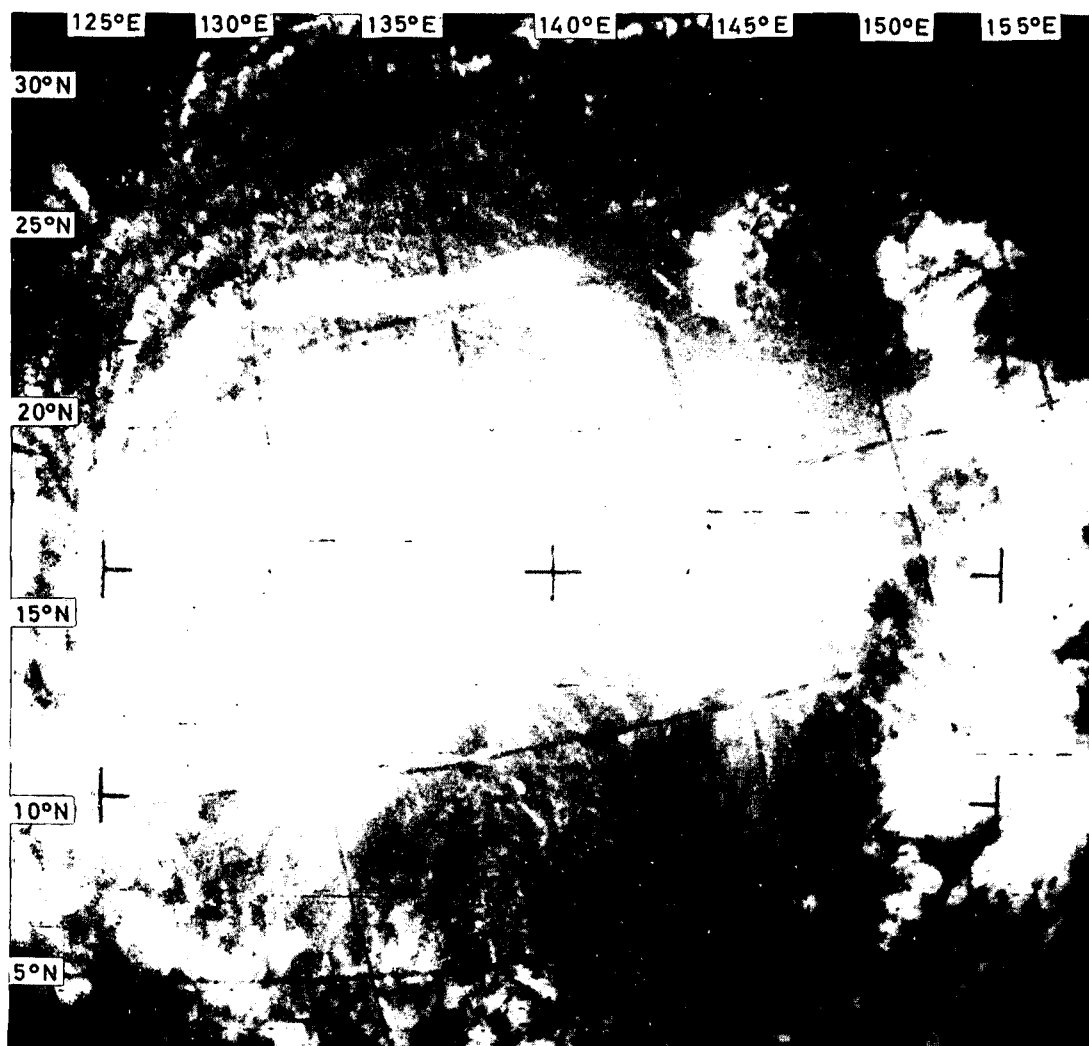
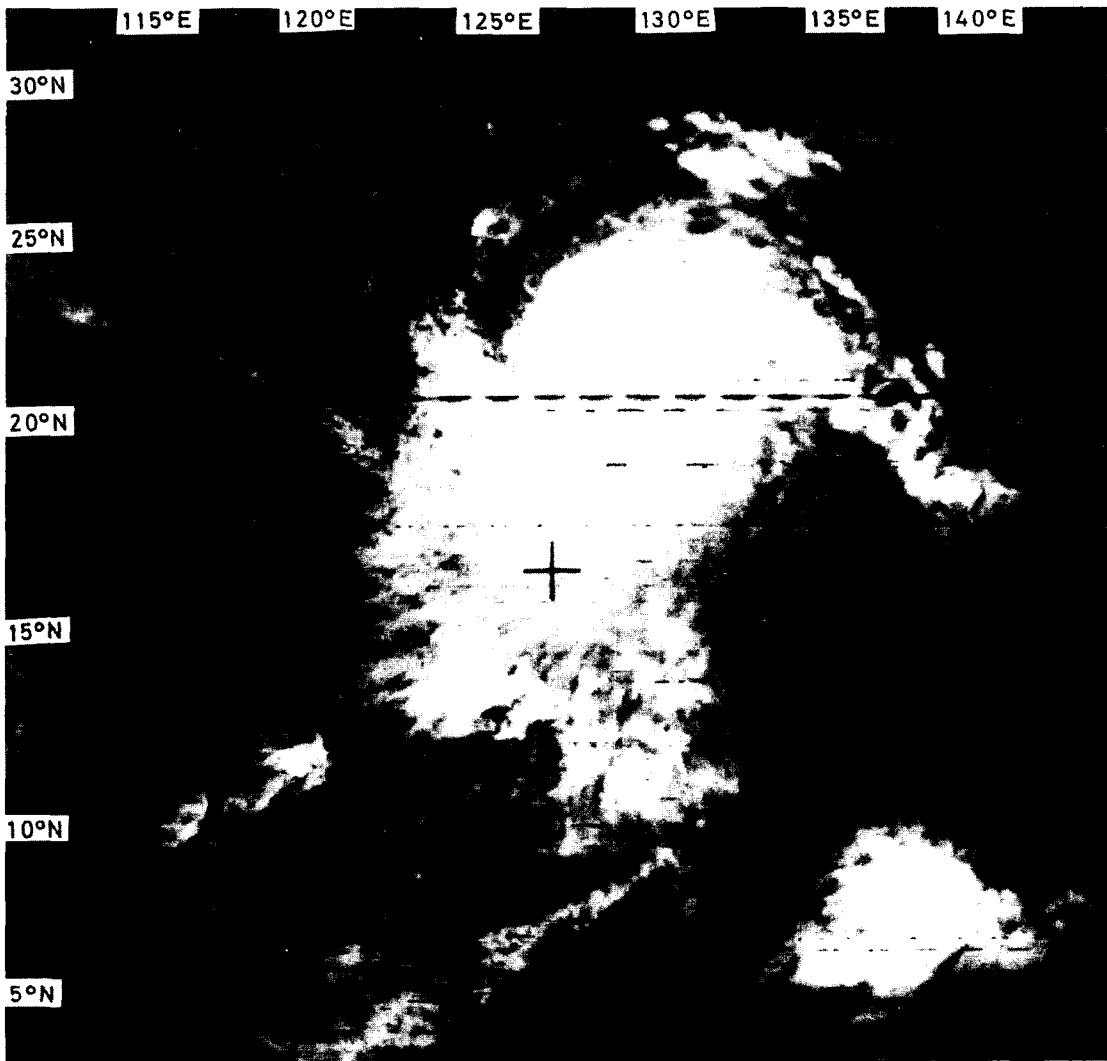


Figure 14. Sequence of ESSA-8 APT pictures of Typhoon 'Lucy' taken during the period July 17 - 22, 1971.  
(a) 10.55 a.m. on July 17.

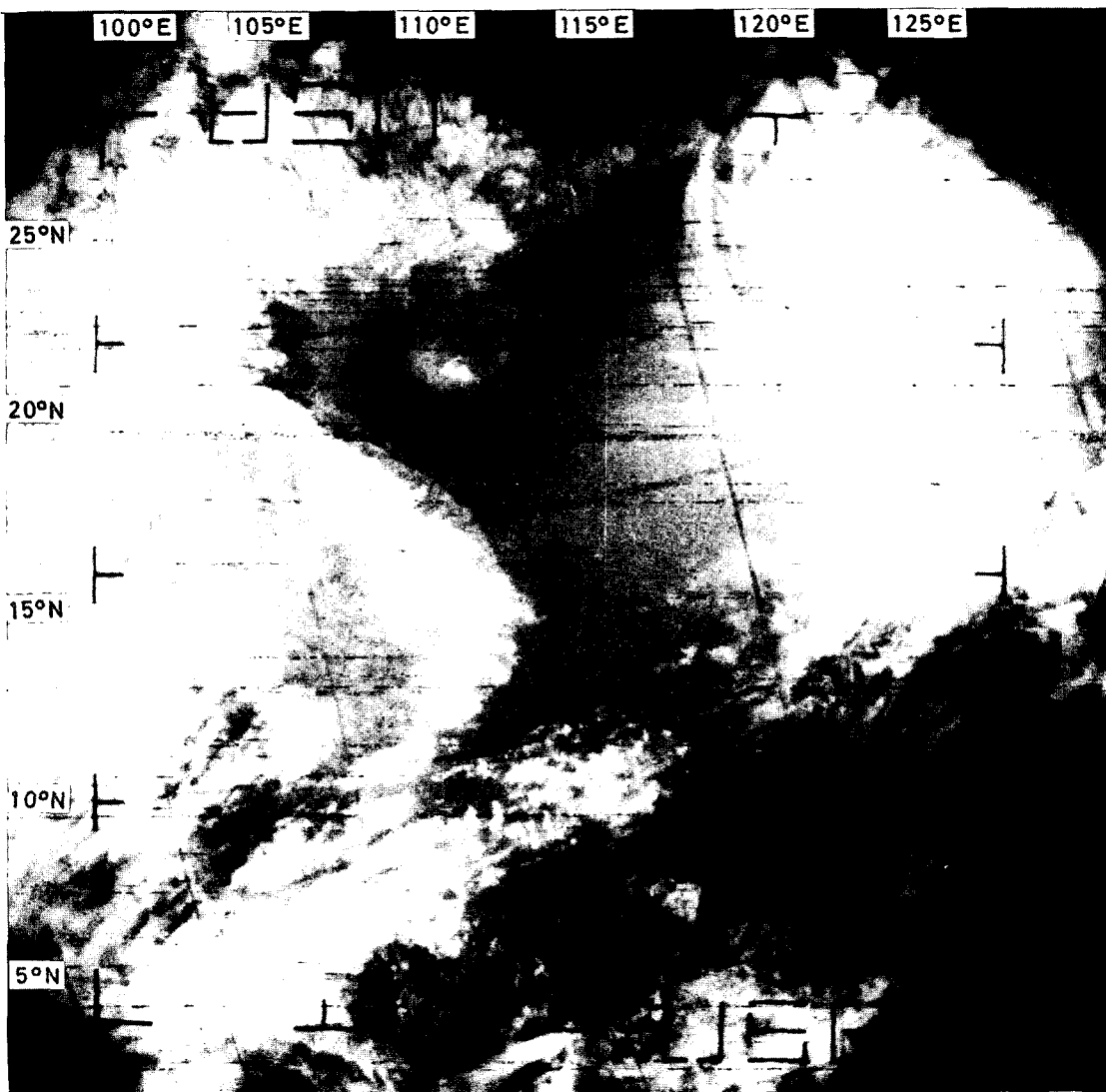


(b) 9.52 a.m. on July 18.

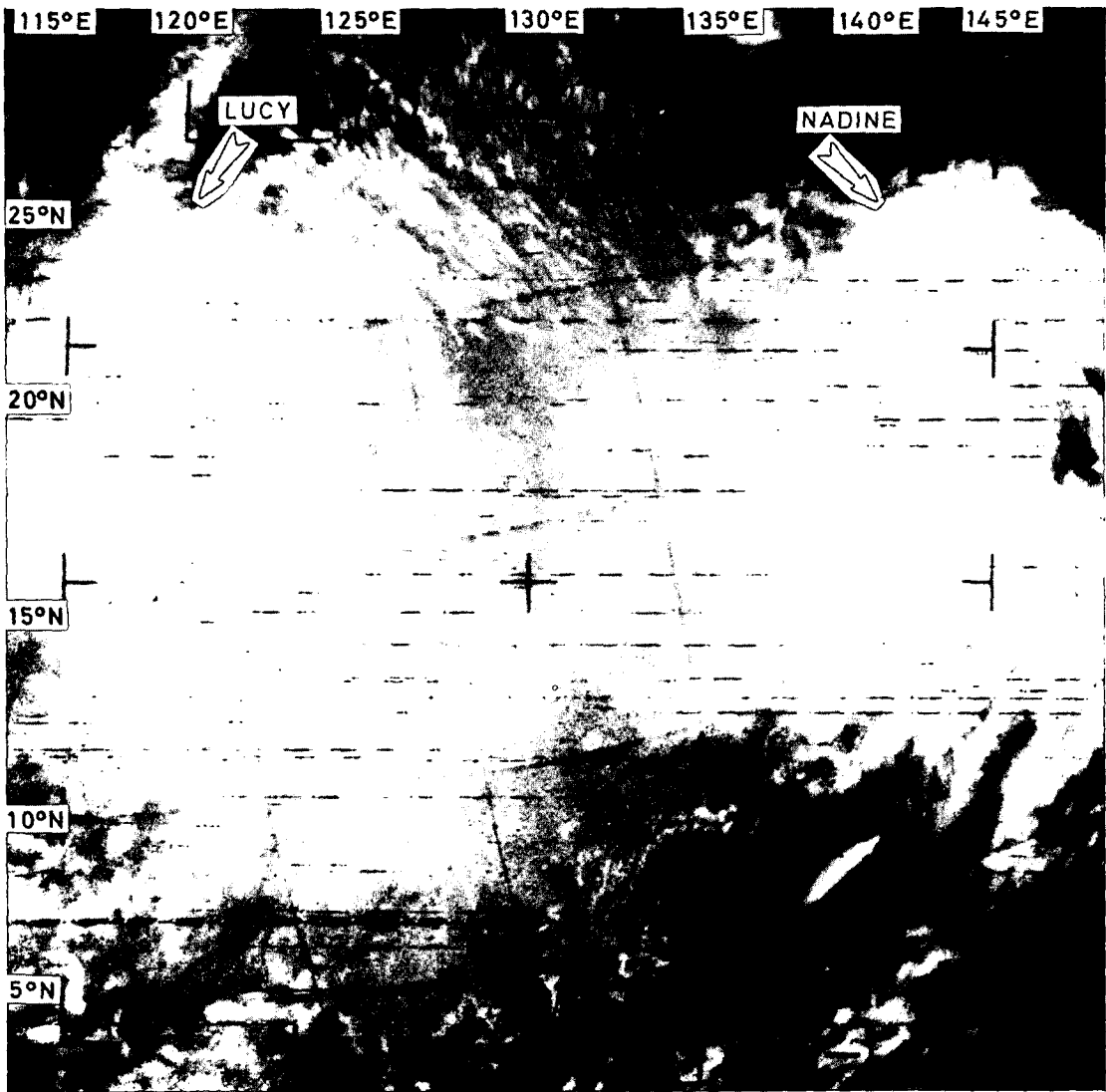




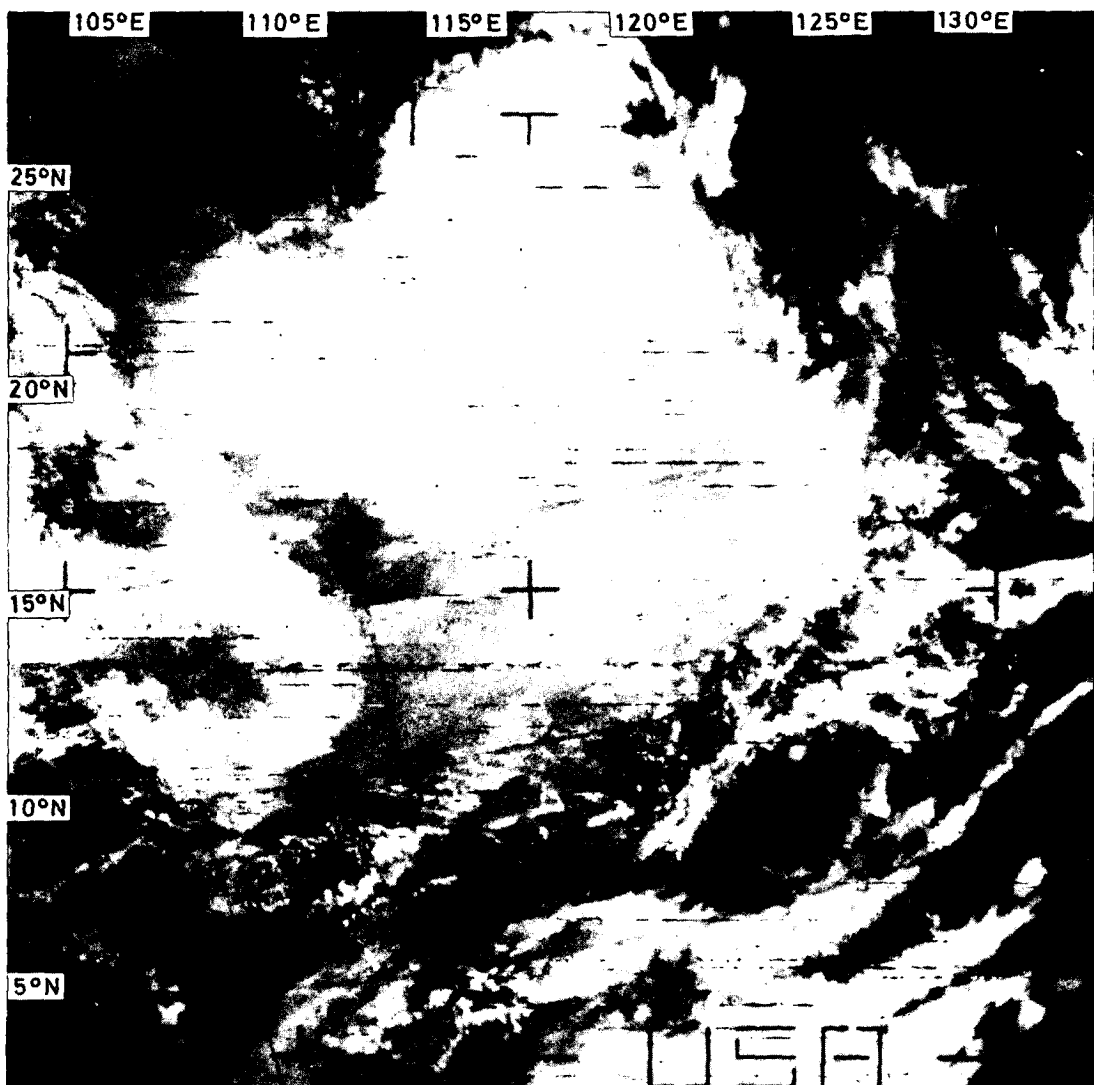
(c) 10.43 a.m. on July 19.



(d) 11.35 a.m. on July 20.



(e) 10.31 a.m. on July 21.



(f) 11.22 a.m. on July 22.

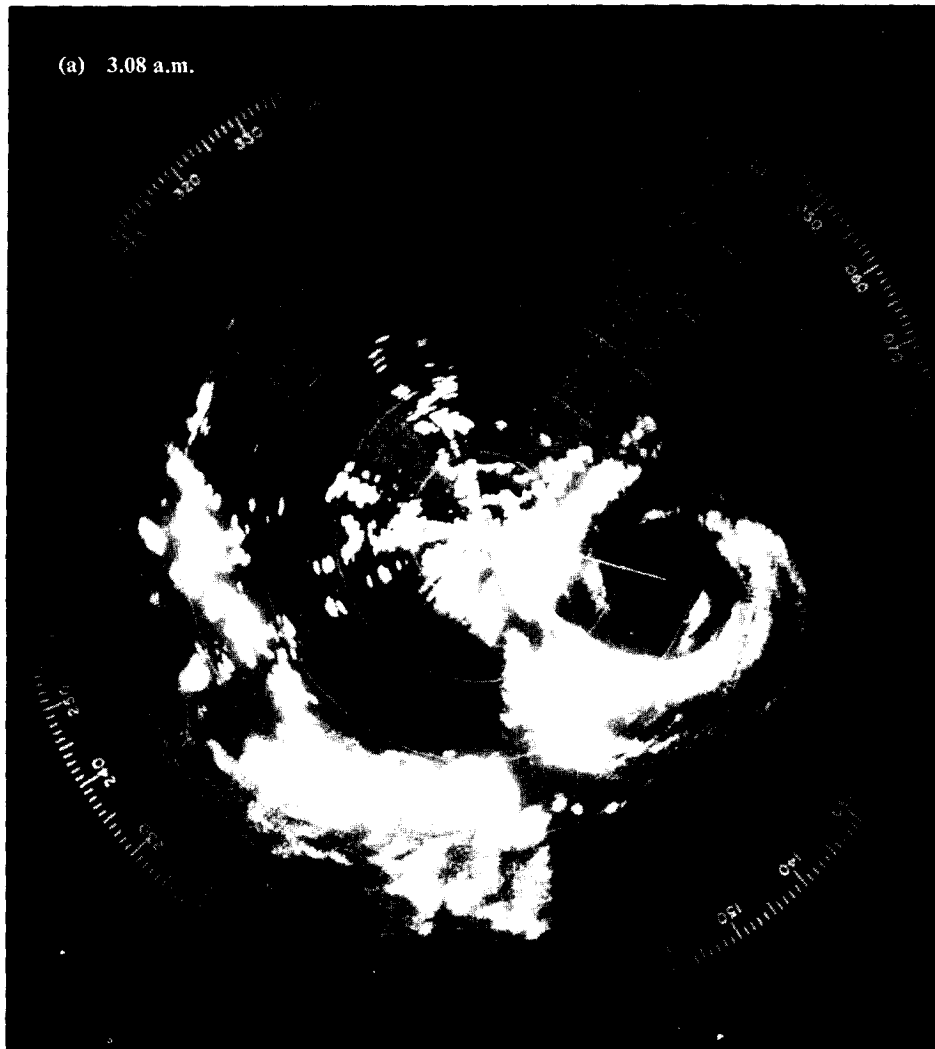
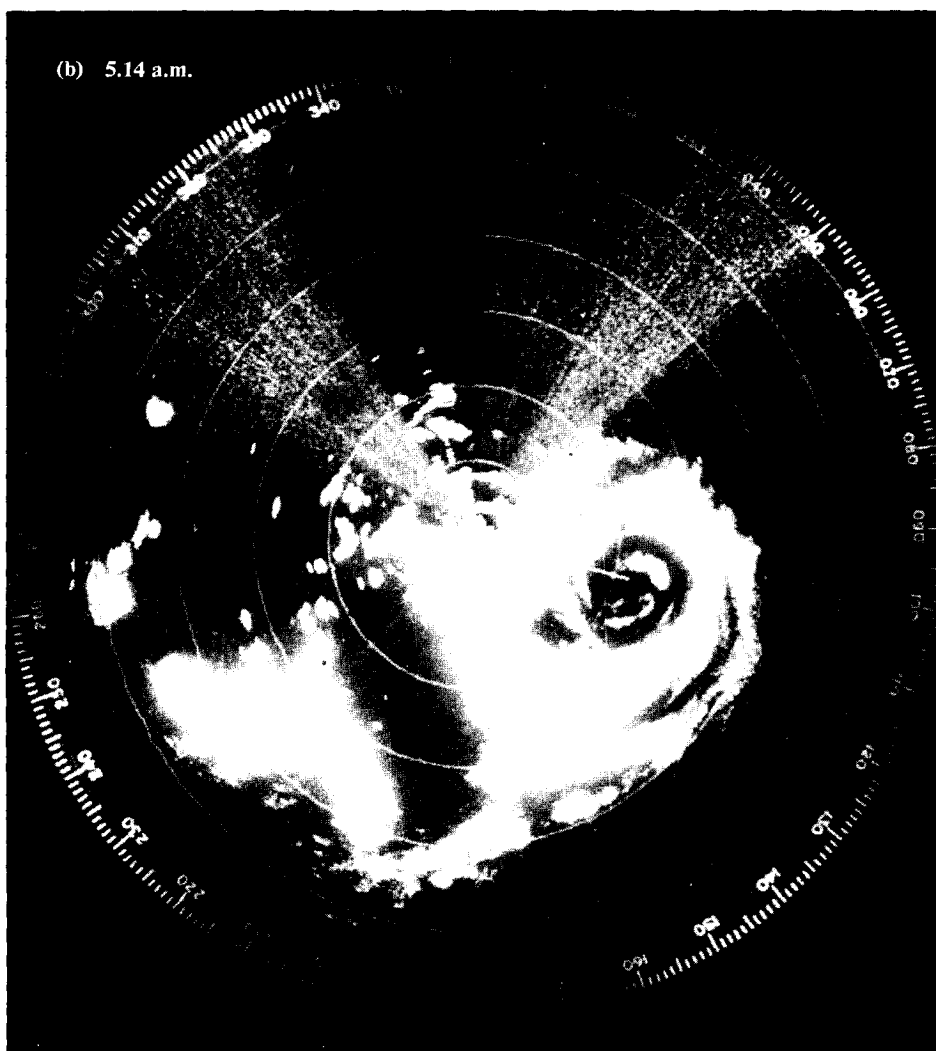
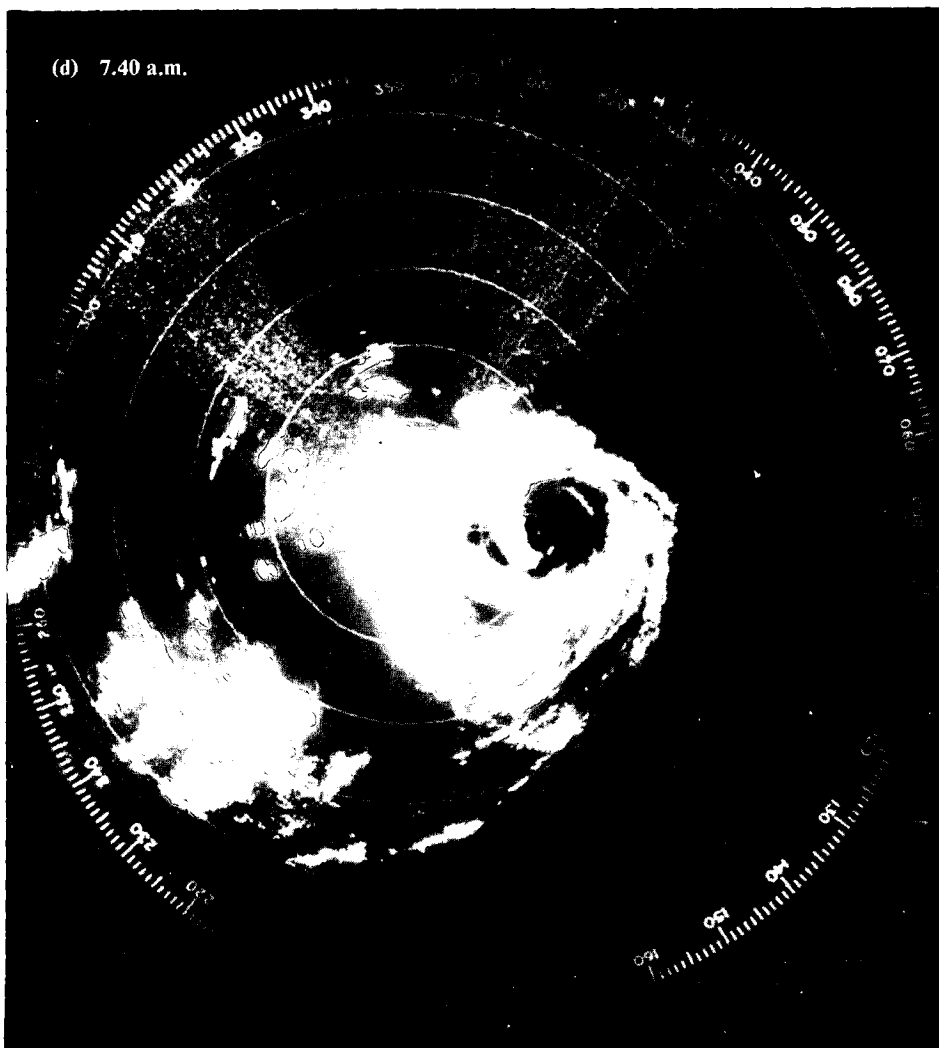
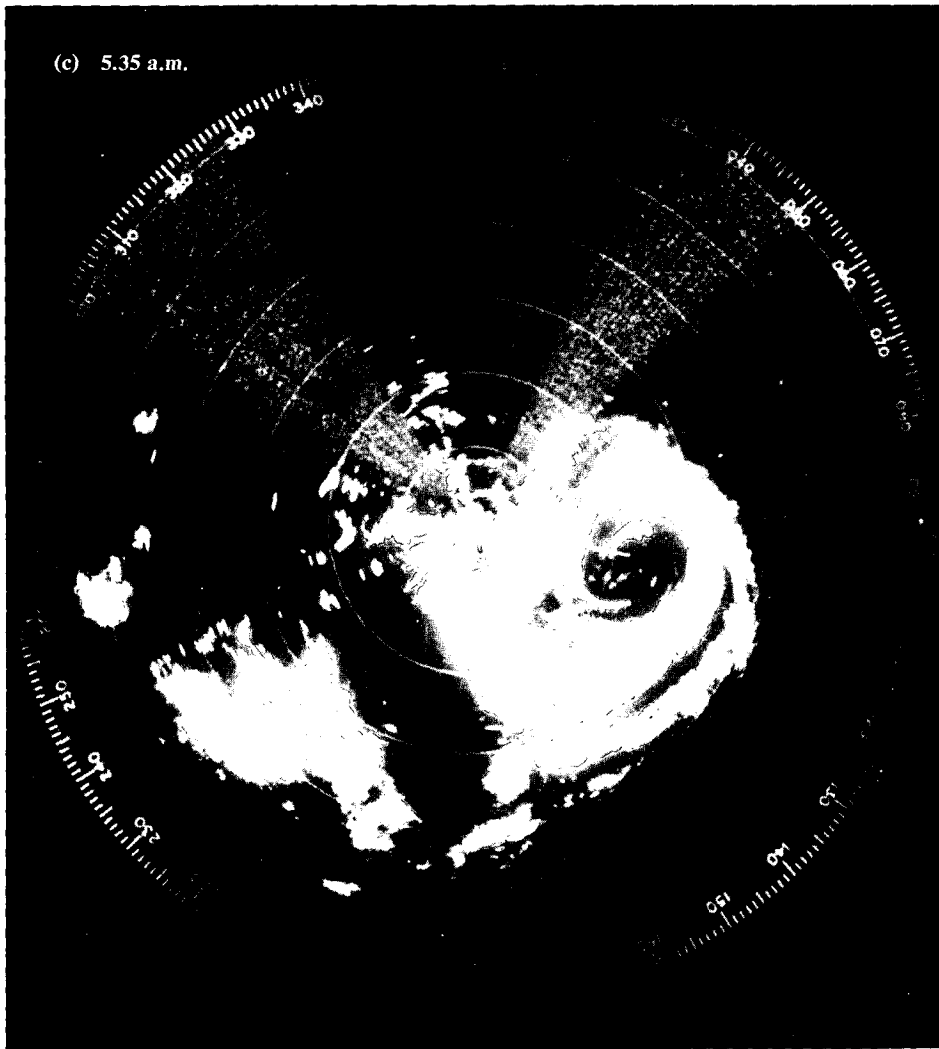


Figure 15. Sequence of radar pictures of Typhoon 'Lucy' taken at the Royal Observatory on July 22, 1971.





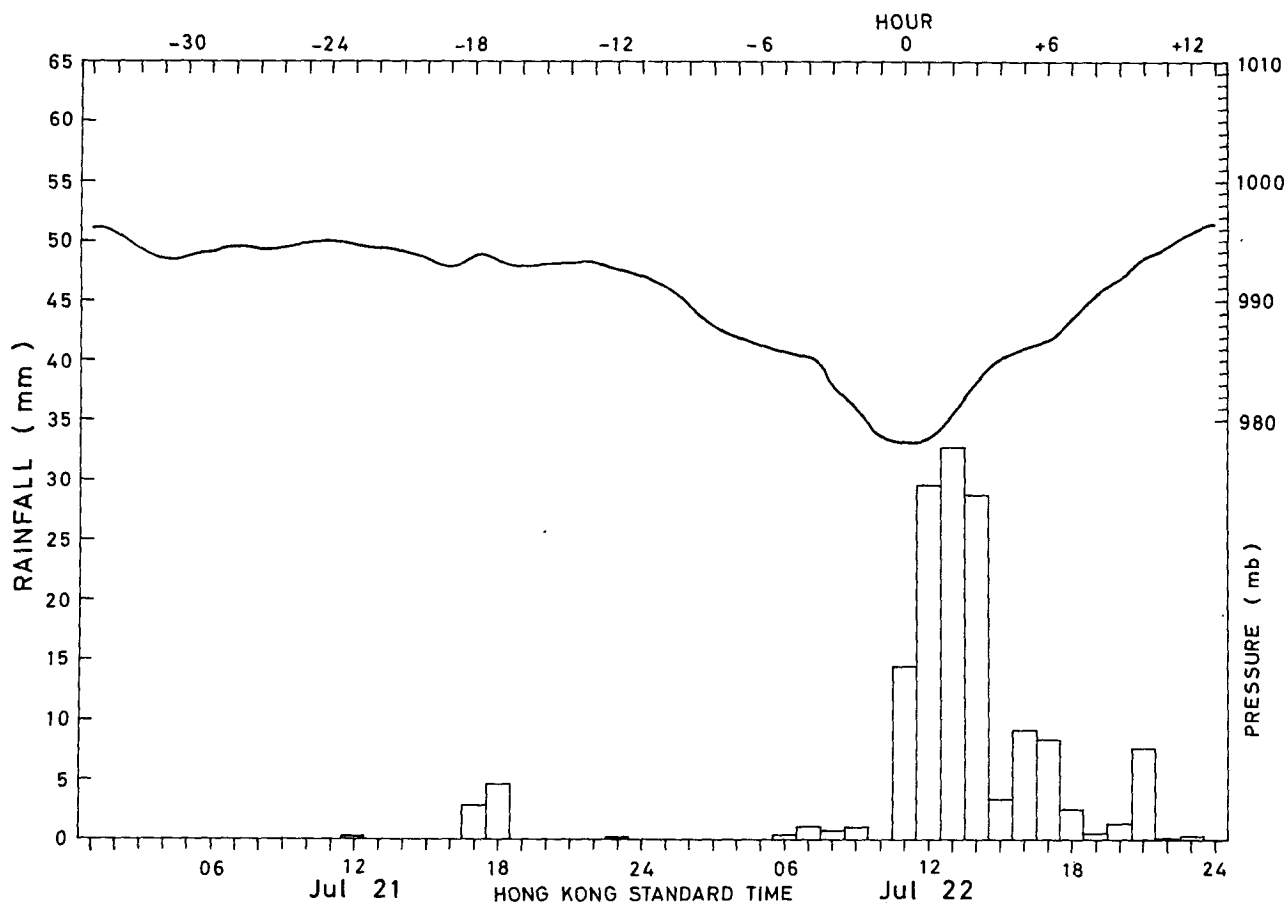


Figure 16. Hourly rainfall distribution and pressure profile at the Royal Observatory during the passage of Typhoon 'Lucy'. The time-scale is measured from the hour of lowest barometric pressure.

## TYPHOON 'NADINE'

July 20-27, 1971

*The track of this typhoon is shown in Figure 17*

On July 20, a tropical depression developed about 190 miles west-southwest of Guam. It moved north-westwards at 9 knots at first and intensified to a typhoon named 'Nadine' on the following day.

During the period July 21-24, Typhoon 'Nadine' moved steadily west-northwestwards at an average speed of 9 knots across the Pacific. At 7.02 a.m. on July 24, a reconnaissance aircraft reported that the maximum surface wind was 140 knots and the minimum sea-level pressure was 903 millibars near its centre. A satellite picture received at the Royal Observatory on the same morning (Figure 18) revealed that the circulation of 'Nadine' was well organized and covered an area about 540 miles in diameter.

The typhoon crossed southern Taiwan early on July 26, and left a death toll of 25 persons. In addition, 1,255 houses were destroyed.

In Hong Kong, the Stand By Signal, No. 1, was hoisted at 11.45 a.m. on July 26 when 'Nadine' was about 290 miles east-northeast of the Colony and was replaced by the Strong Wind Signal, No. 3, at 7.00 p.m. 'Nadine' weakened rapidly after it crossed the coast near Amoy during the evening of July 26 and finally dissipated over the Kiangsi Province about 320 miles north-northeast of Hong Kong early next morning. All signals were lowered at 9.35 a.m. on July 27.

On July 26, winds over the Colony were mainly fresh but became generally strong in the evening. The strong southwesterlies persisted throughout the night and the maximum gust peak speeds recorded were 40 knots at Cape Collinson, 41 knots at the Hong Kong Airport, 44 knots at Cheung Chau and Waglan Island, 48 knots at Tate's Cairn and 50 knots at the Royal Observatory.

Typhoon 'Nadine' brought only a few patches of light rain to Hong Kong. During the period July 26-27, the total rainfall recorded at the Royal Observatory amounted to only 1.7 mm. There were no abnormal changes in the tide heights in Hong Kong during the period when Tropical Cyclone Warning Signals were on display.

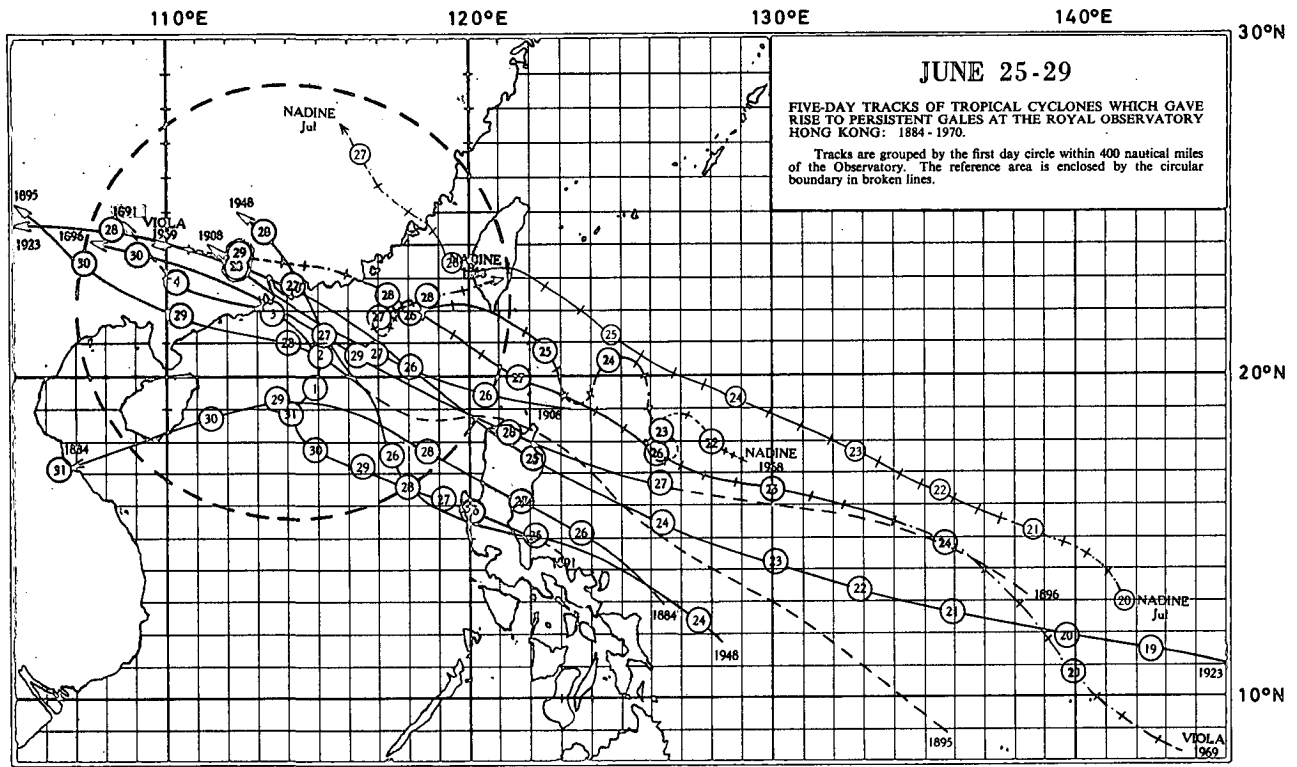


Figure 17. Track of Typhoon 'Nadine': July 20 - 27, 1971.

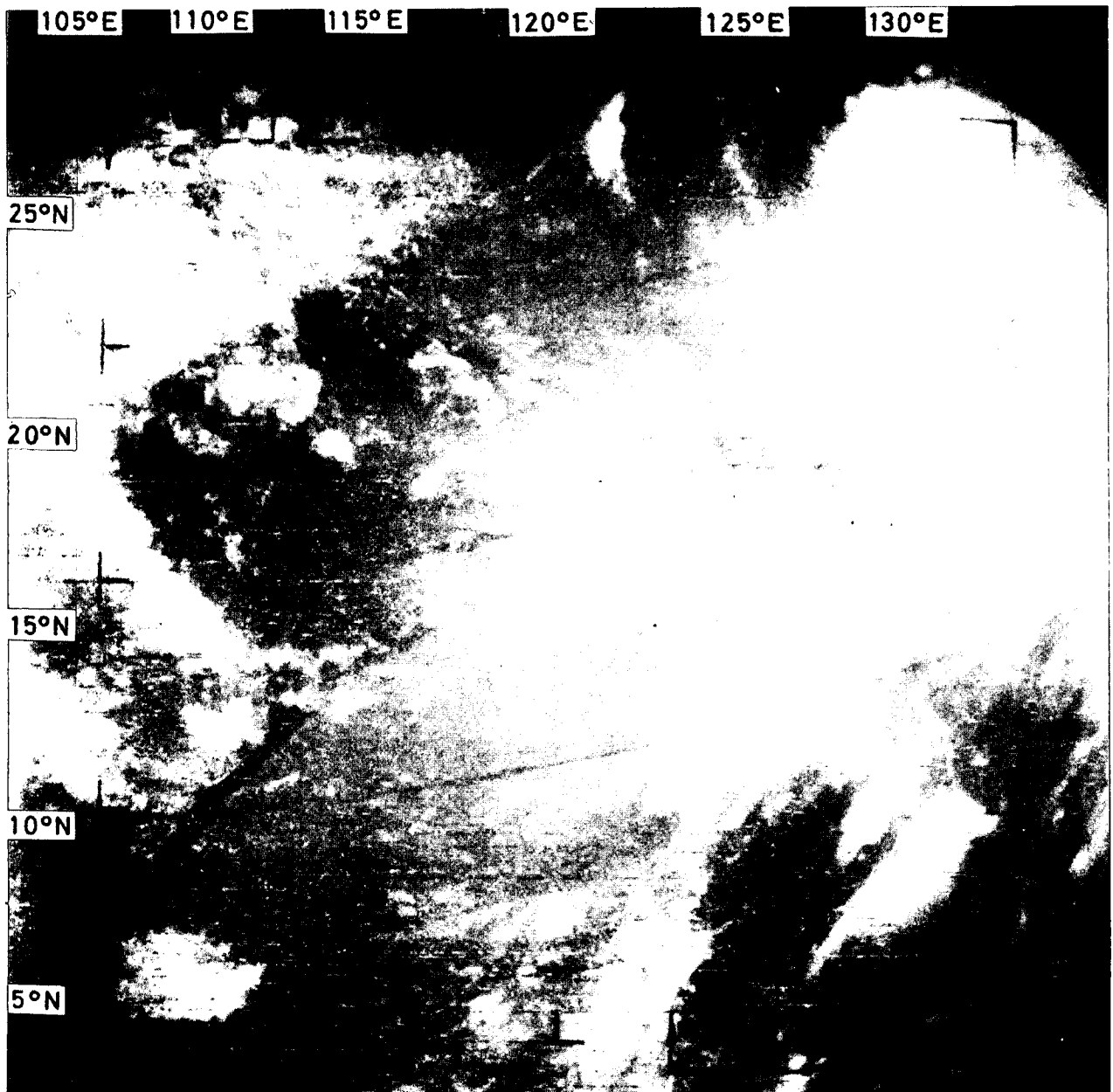


Figure 18. ESSA-8 APT picture of Typhoon 'Nadine' taken at 11.09 a.m. on July 24, 1971.

## TYPHOON 'ROSE'

August 10-17, 1971

The track of this typhoon is shown in Figure 19

Typhoon 'Rose' was one of the most intense and violent typhoons that have affected Hong Kong. Maximum wind speeds were only slightly lower than in Typhoon 'Ruby' of 1964 and Typhoon 'Wanda' of 1962 and they occurred during the night whereas both 'Ruby' and 'Wanda' passed in daylight. Like other tropical cyclones that approached from the south, such as Typhoon 'Mary' of 1960, 'Rose' caused very heavy rainfall. The strongest winds were from the east-southeast whereas in 'Wanda' the strongest winds were from the north.

On August 10, 'Rose' developed as a tropical depression about 110 miles west of Guam and soon intensified to a typhoon. It moved west-northwestwards at 11 knots at first but then followed a westerly track at about 14 knots for the next three days. During the period August 11-12, the reported maximum winds within the circulation of 'Rose' fluctuated between storm and hurricane force. However, it remained as a typhoon from August 13 onwards. The centre of Typhoon 'Rose' started to cross north Luzon early in the morning of August 14 and entered the South China Sea later in the day. Satellite pictures (Figures 20-22) showed that during the period August 12-14 the circulation of Typhoon 'Rose' was characterized by a relatively small cloud mass covering an area between 240 and 360 miles in diameter.

In Hong Kong, the Stand By Signal, No 1, was hoisted at 5.00 p.m. on August 14, when 'Rose' was centred about 400 miles southeast of the Colony, and was moving west-northwest at about 10 knots.

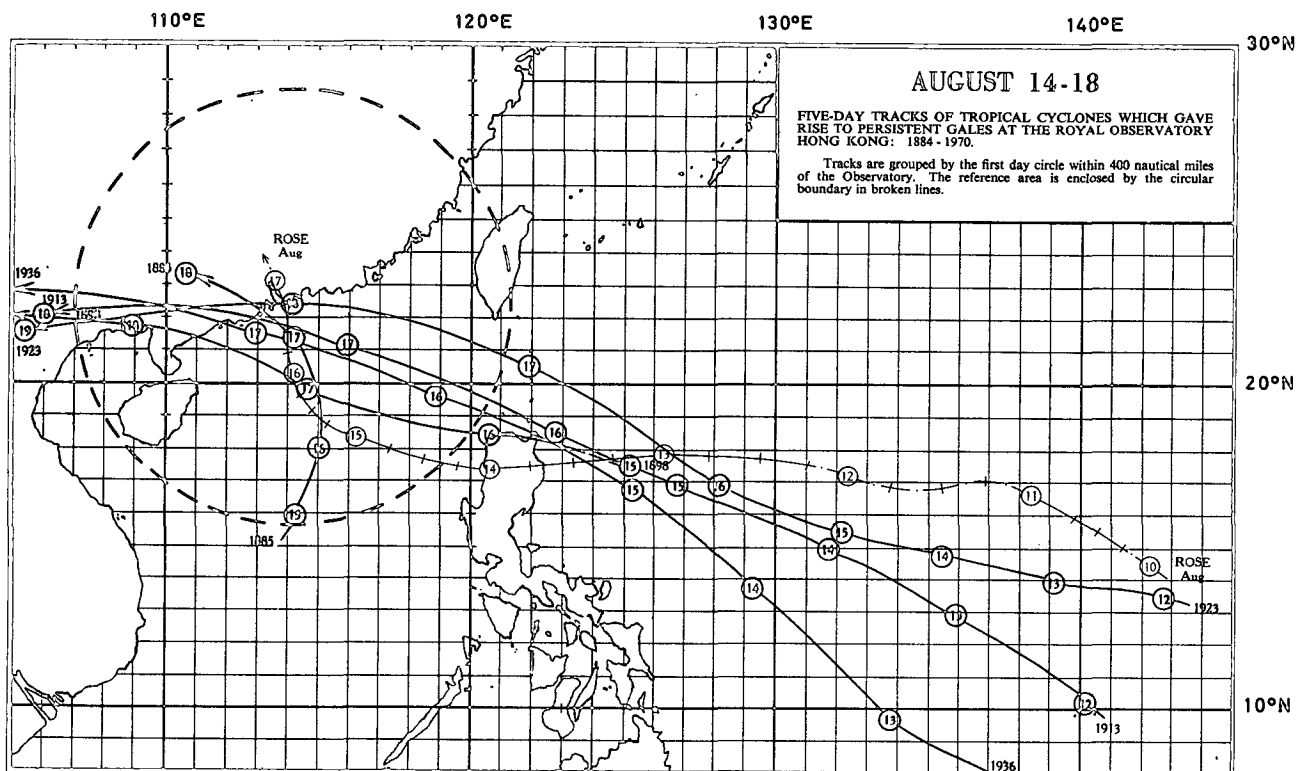


Figure 19. Track of Typhoon 'Rose': August 10 - 17, 1971.

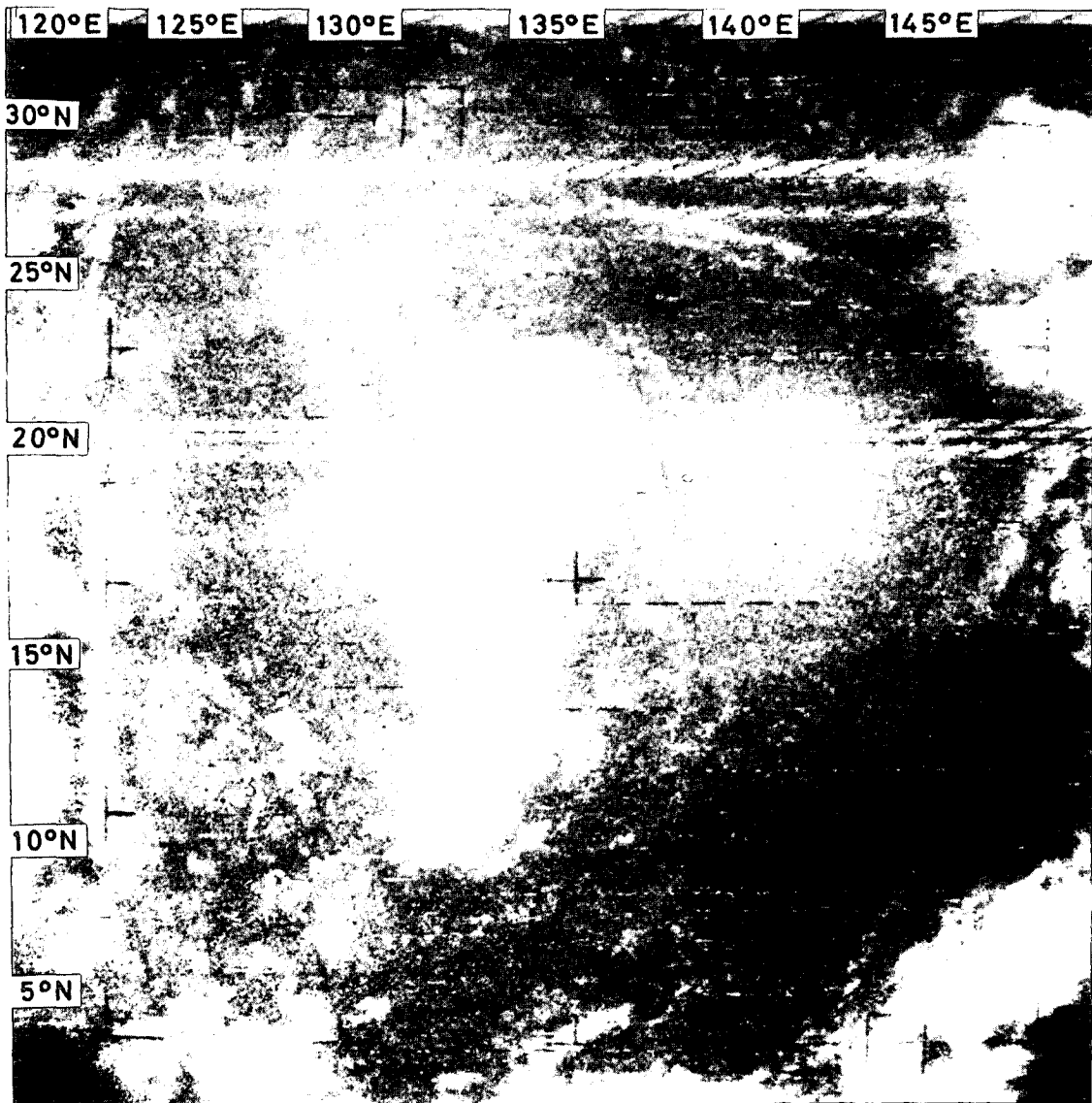


Figure 20. ESSA-8 APT picture of Typhoon 'Rose' taken at 10.09 a.m. on August 12, 1971.

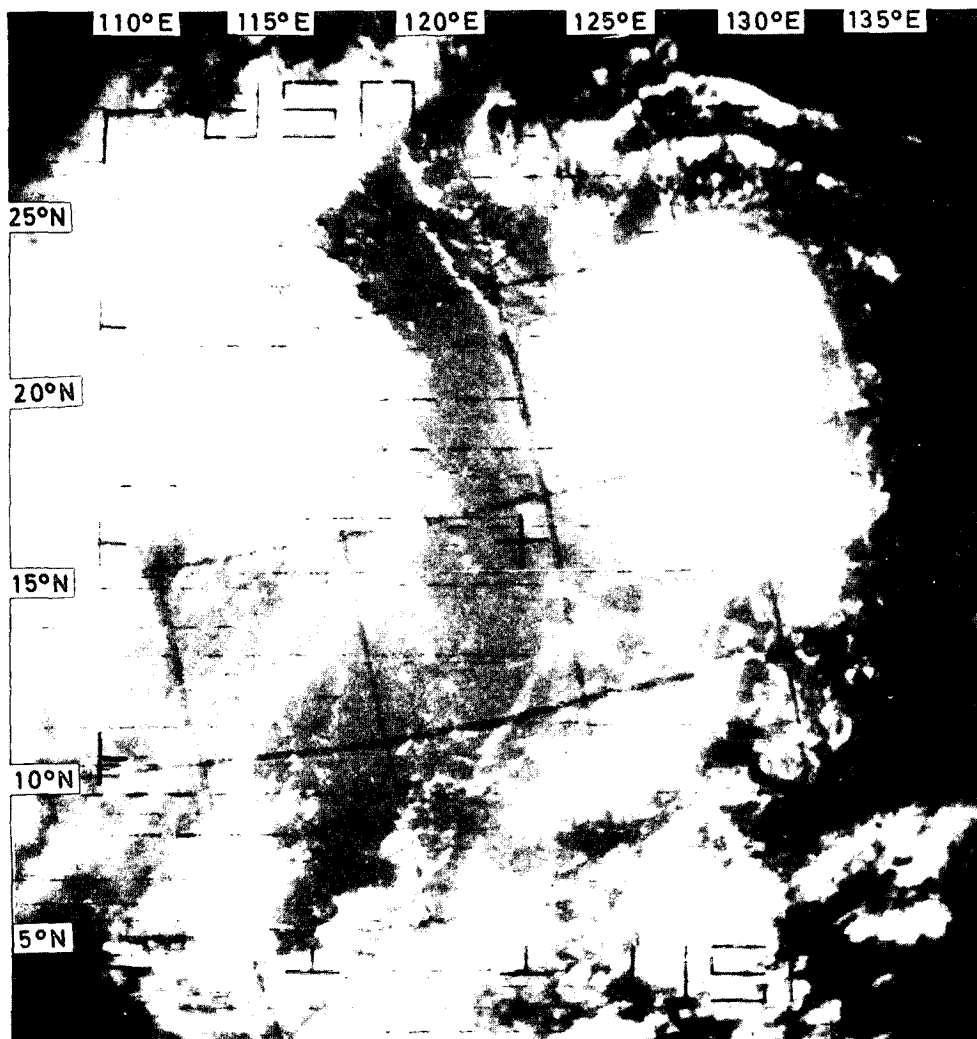


Figure 21. ESSA-8 APT picture of Typhoon 'Rose' taken at 11.00 a.m. on August 13, 1971.



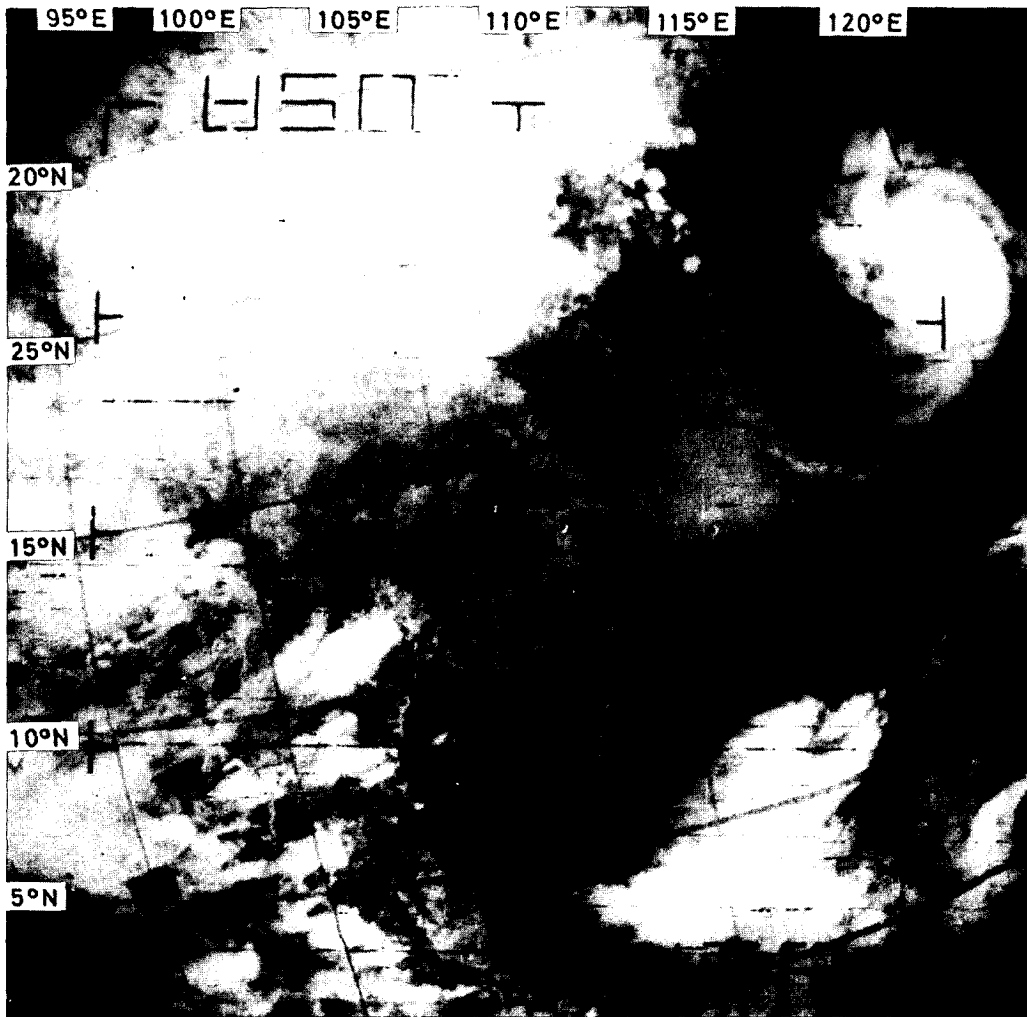


Figure 22. ESSA-8 APT picture of Typhoon 'Rose' taken at 11.52 a.m. on August 14, 1971.

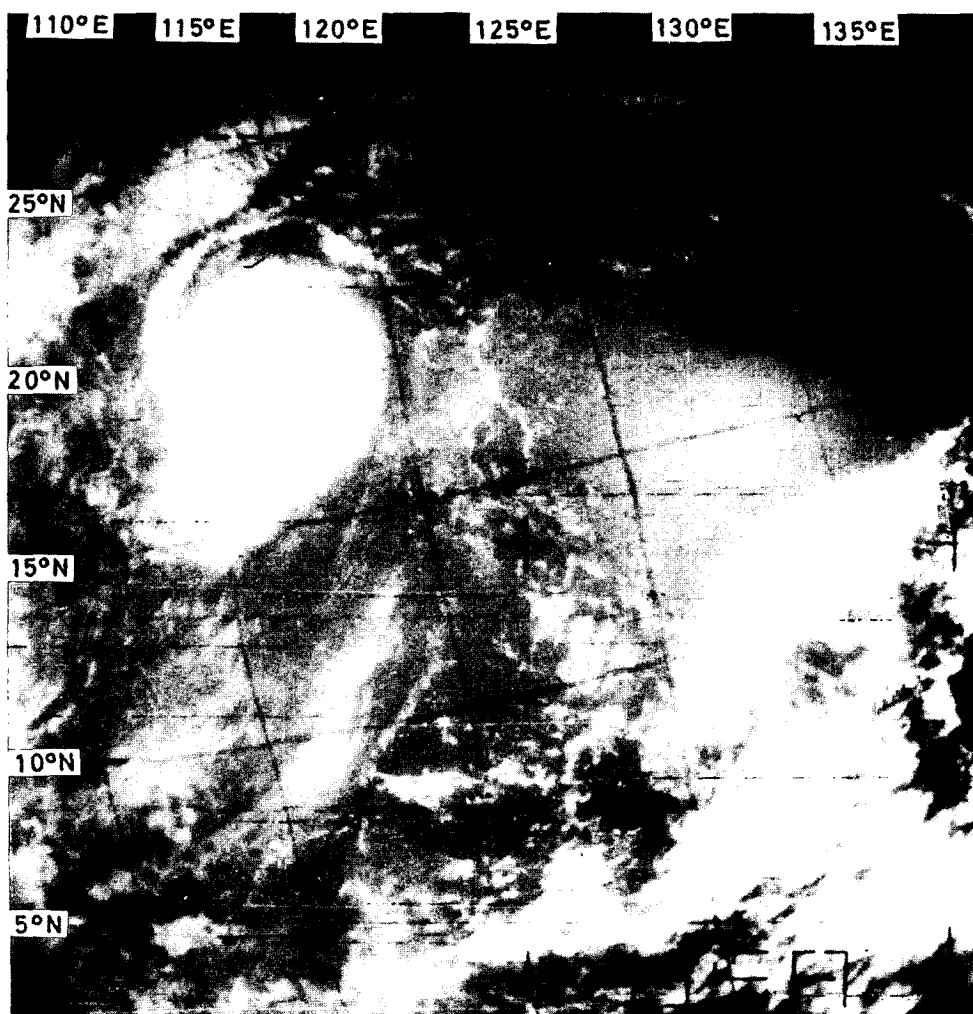


Figure 23. ESSA-8 APT picture of Typhoon 'Rose' taken at 10.48 a.m. on August 15, 1971.



Figure 24. Radar picture of Typhoon 'Rose' taken at the Royal Observatory at 10.27 p.m. on August 15, 1971.



Figure 25. Radar picture of Typhoon 'Rose' taken at the Royal Observatory at 12.05 a.m. on August 16, 1971.

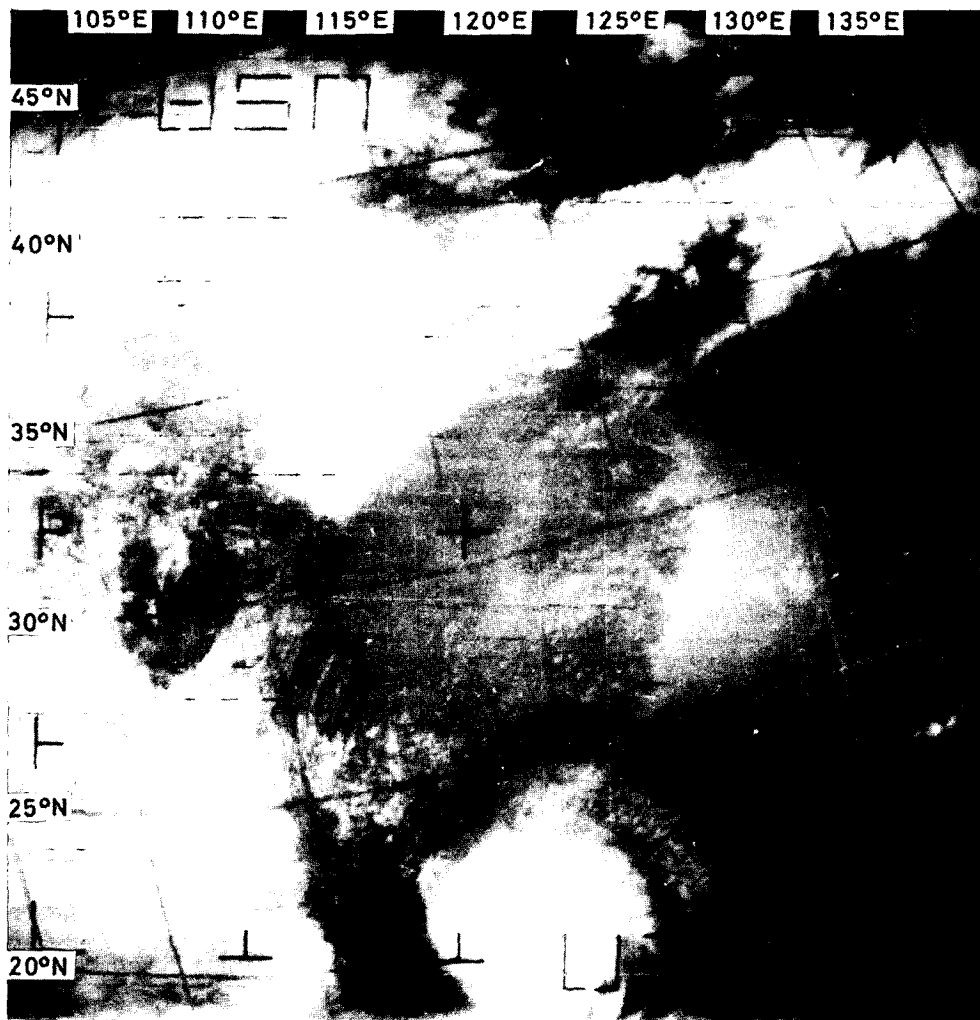


Figure 26(a). ESSA-8 APT picture of Typhoon 'Rose' taken at 11.33 a.m. on August 16, 1971.

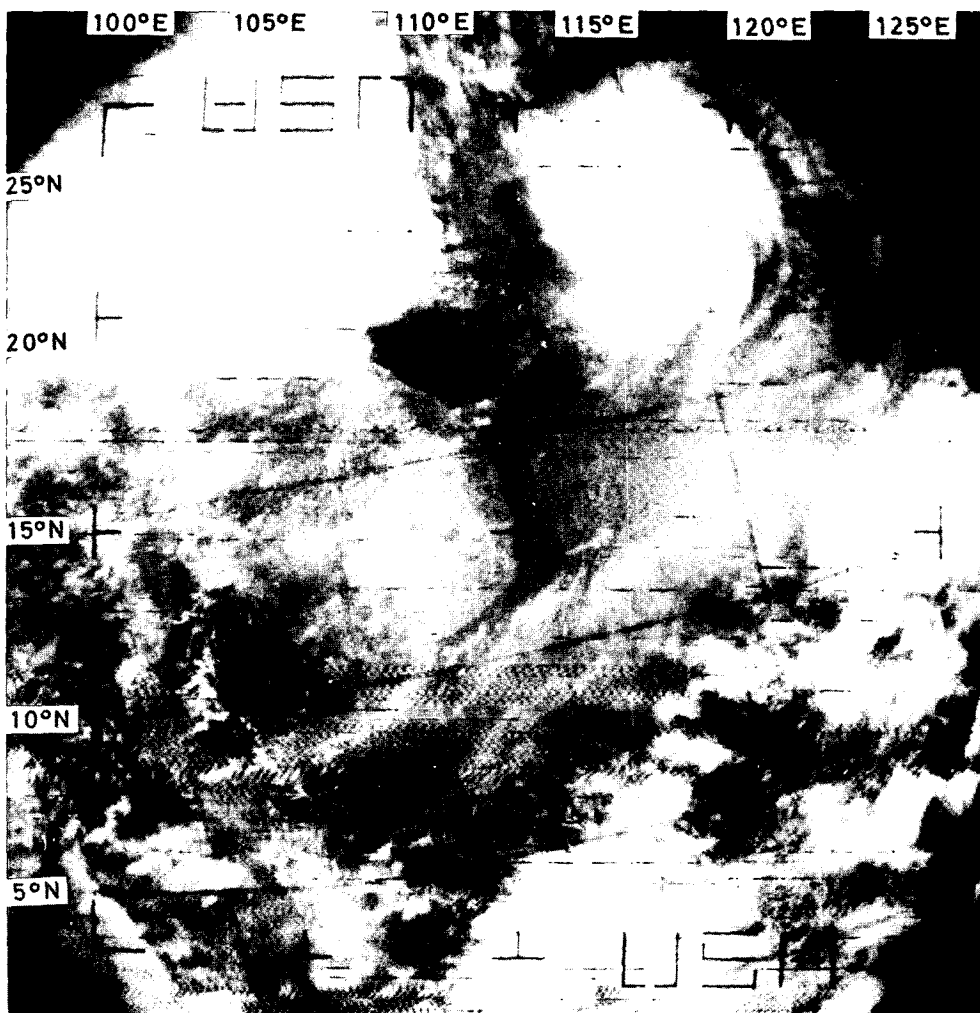


Figure 26(b). ESSA-8 APT picture of Typhoon 'Rose' taken at 11.39 a.m. on August 16, 1971.

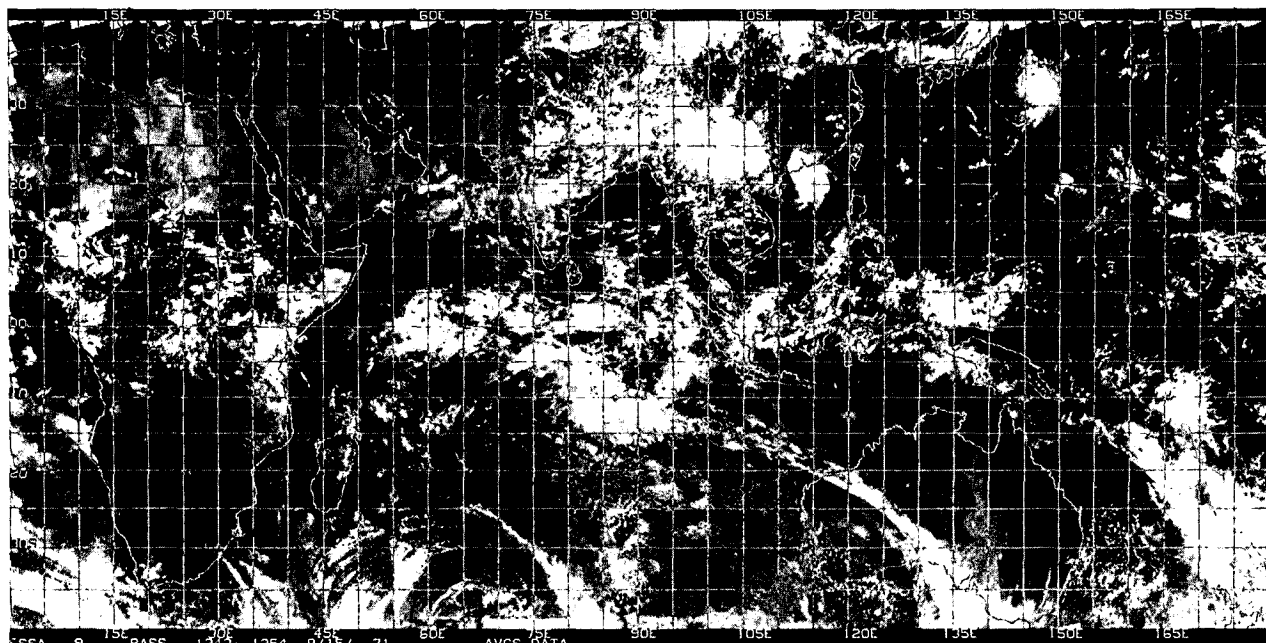


Figure 26(c). A digitized mosaic of satellite pictures of Typhoon 'Rose' taken on August 16, 1971.  
(By Courtesy of ESSA)



Figure 27. Radar picture of Typhoon 'Rose' taken at 1.00 p.m. on August 16, 1971.

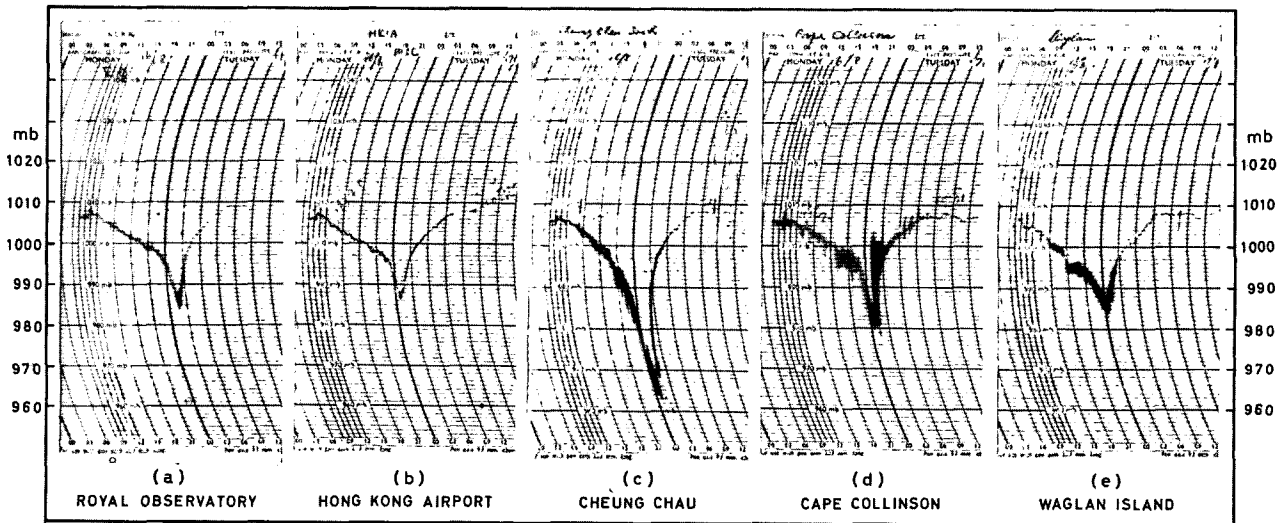


Figure 28. Record of barometric pressure at various meteorological stations in Hong Kong during the passage of Typhoon 'Rose' on August 16 - 17, 1971.

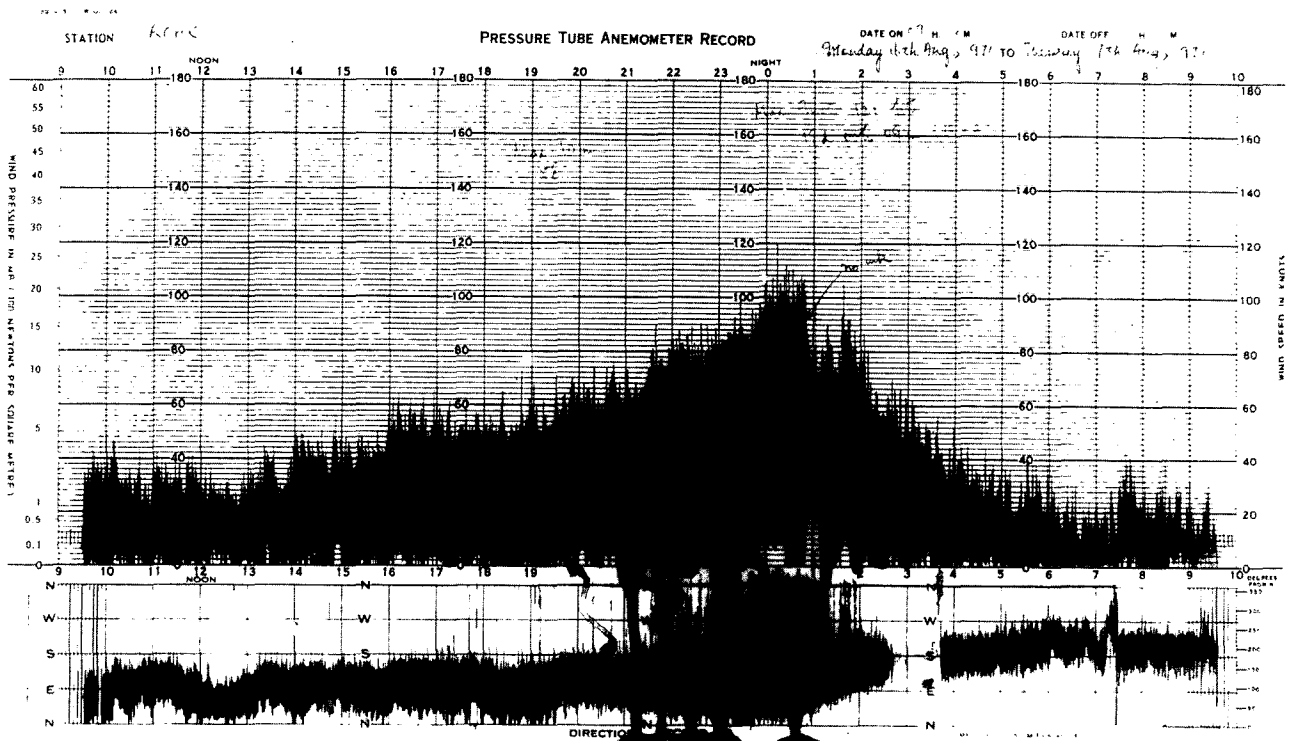


Figure 29. Record of wind speed and direction at the Royal Observatory during the passage of Typhoon 'Rose' on August 16 - 17, 1971.

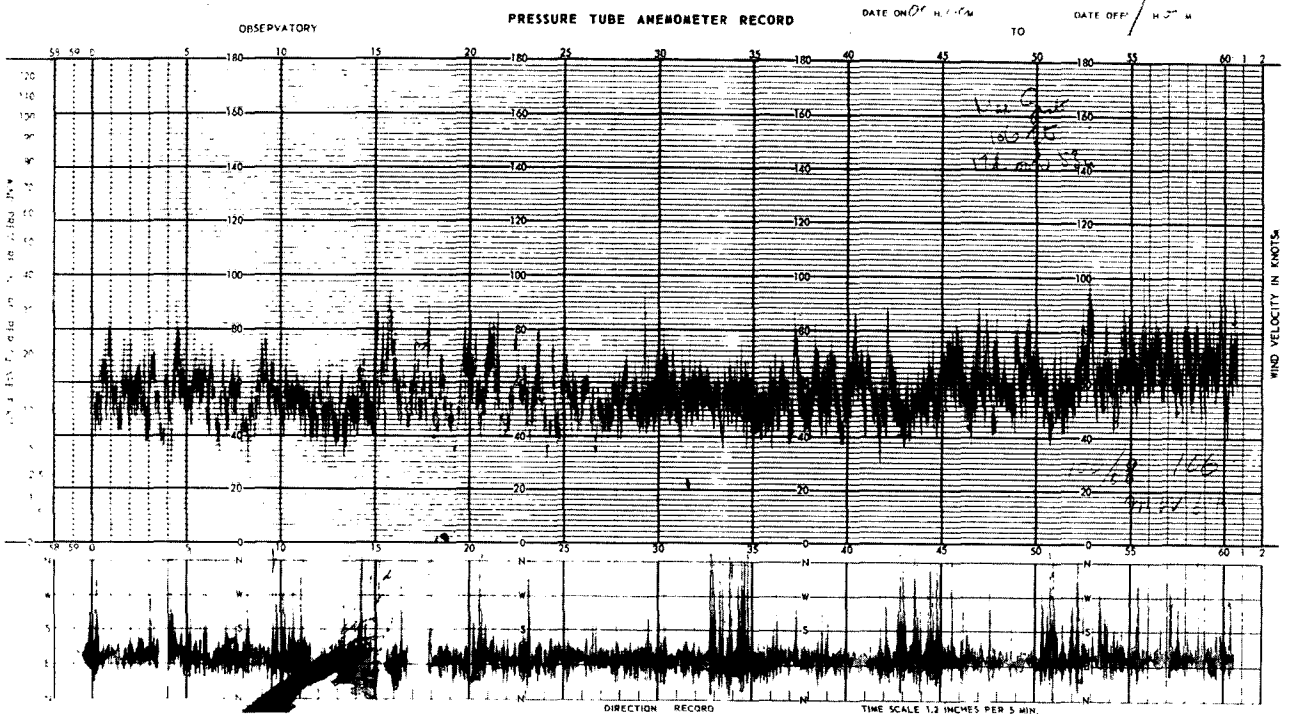


Figure 30. Quick-run record of wind speed and direction at the Hong Kong International Airport during the passage of Typhoon 'Rose' on August 16 - 17, 1971.

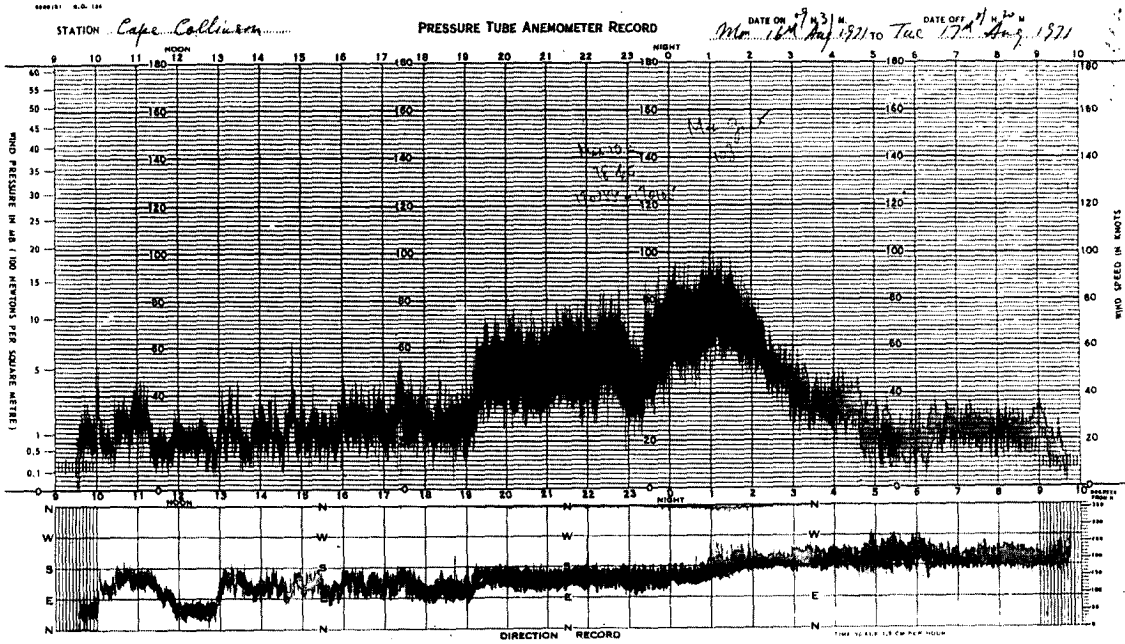


Figure 31. Record of wind speed and direction at Cape Collinson during the passage of Typhoon 'Rose' on August 16 - 17, 1971.

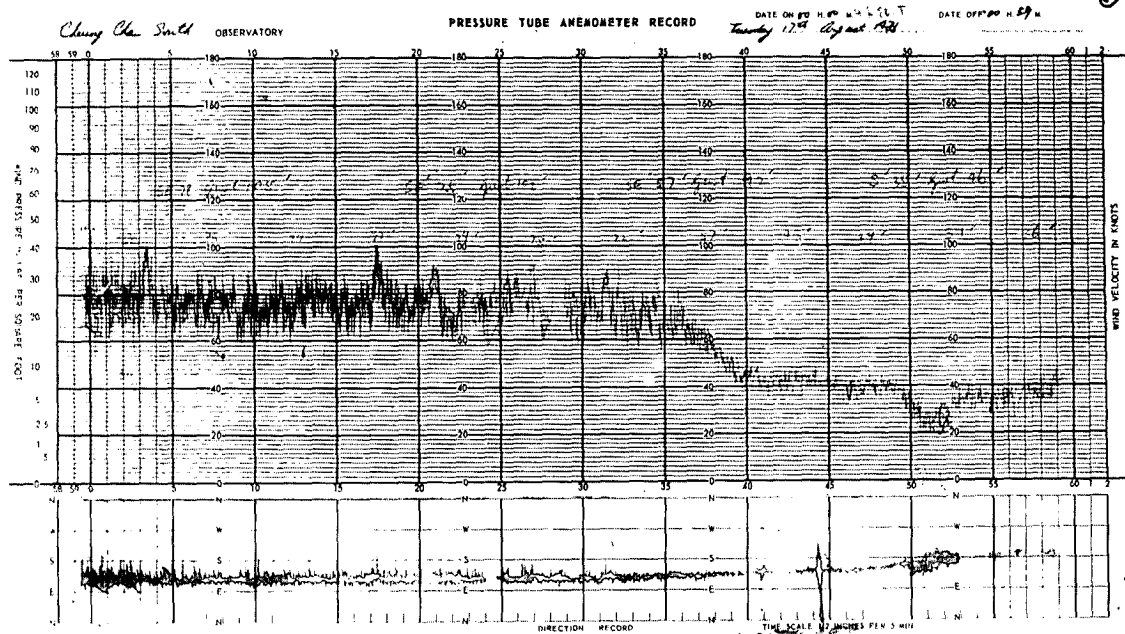


Figure 32. Quick-run record of wind speed and direction at Cheung Chau during the passage of Typhoon 'Rose' on August 16 - 17, 1971.

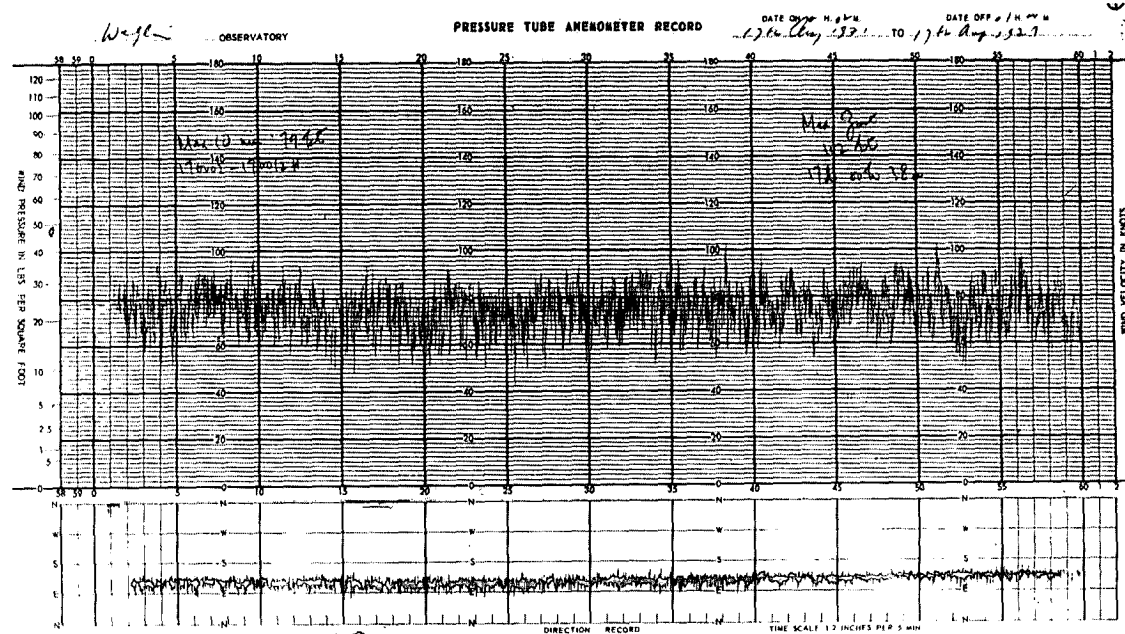


Figure 33. Quick-run record of wind speed and direction at Waglan Island during the passage of Typhoon 'Rose' on August 16 - 17, 1971.

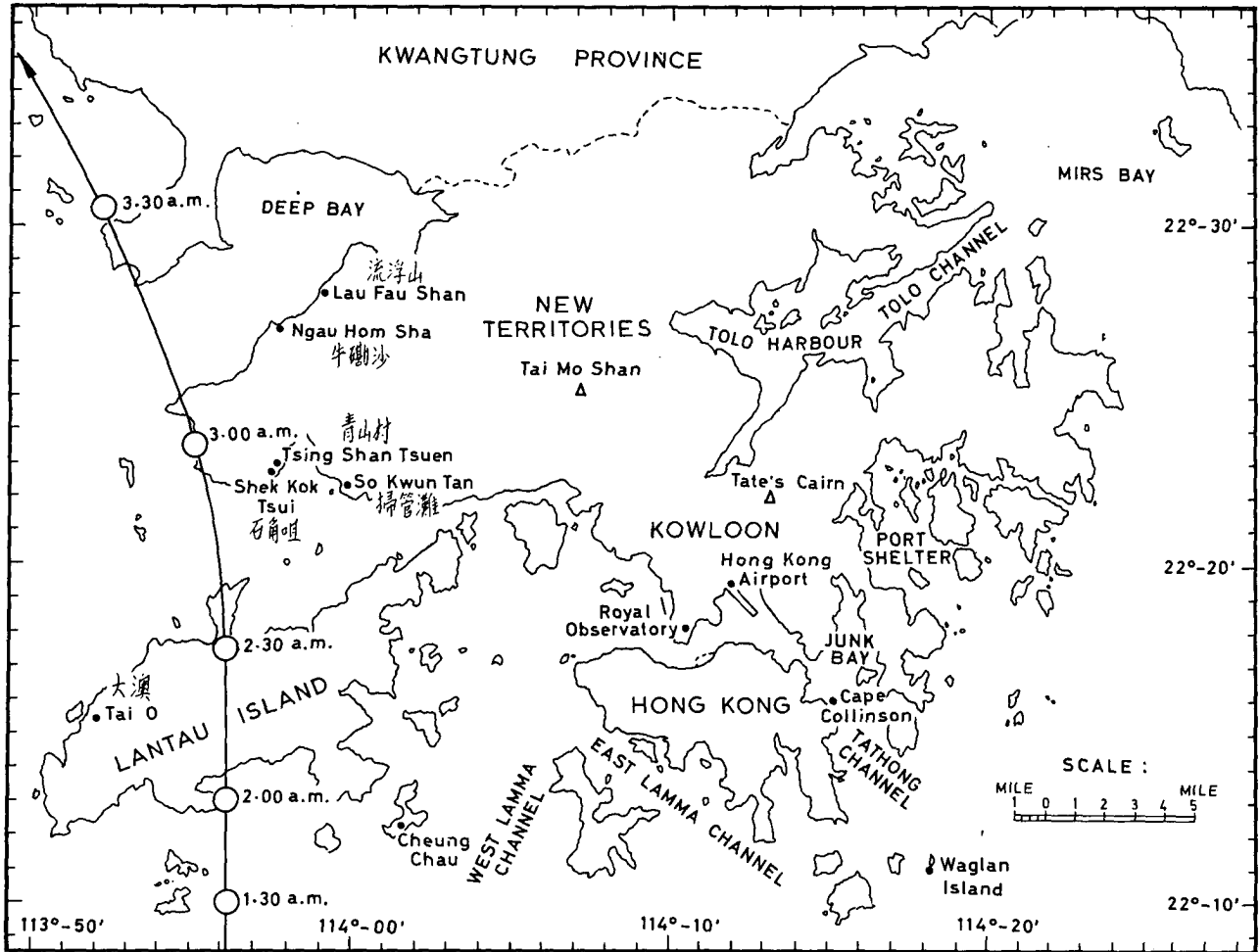


Figure 34. Trajectory of the centre of the eye of Typhoon 'Rose' over the western part of Hong Kong on August 17, 1971.

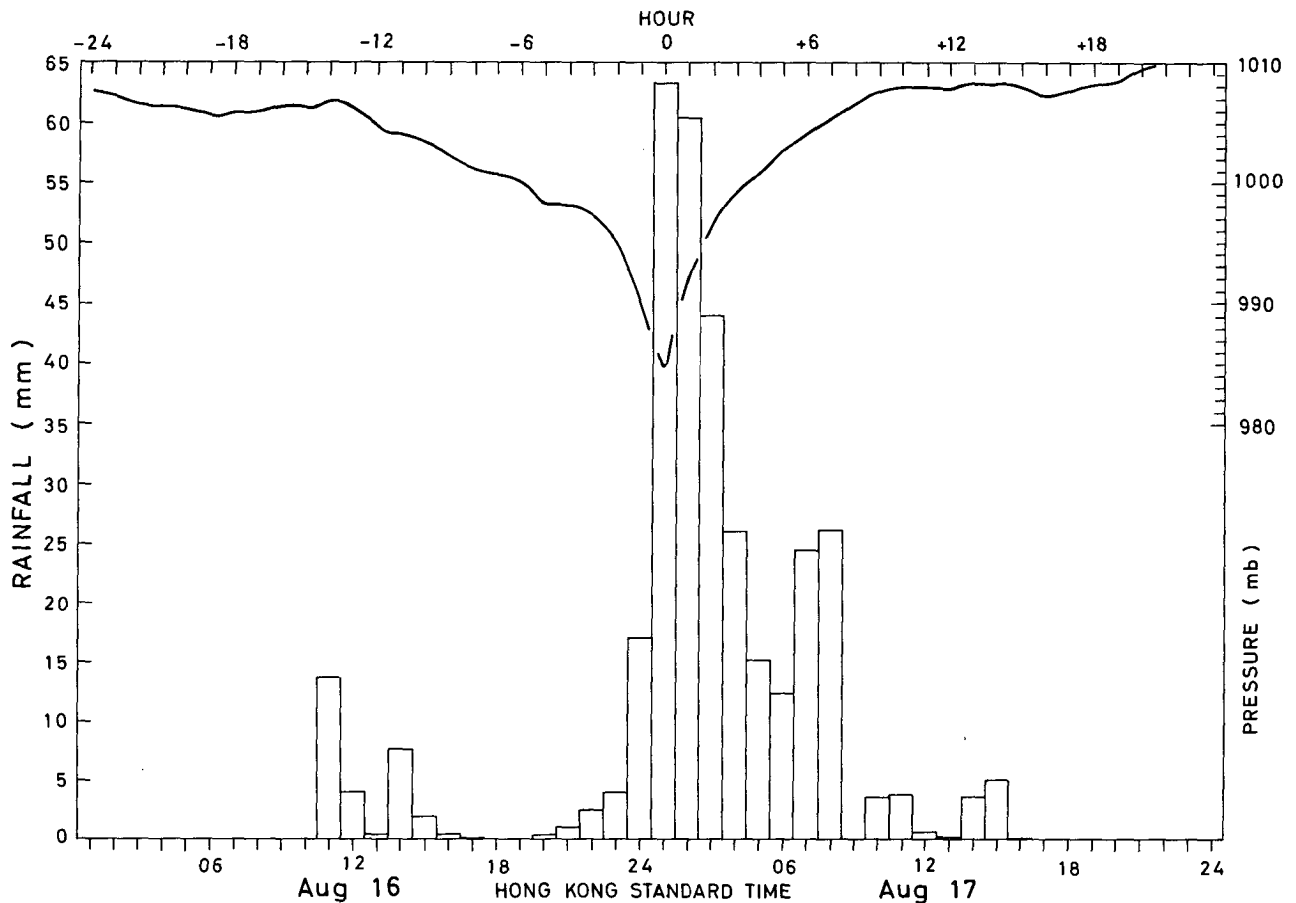


Figure 35. Hourly amounts of rainfall and barometric pressure profile as recorded at the Royal Observatory during the passage of Typhoon 'Rose' on August 16 - 17, 1971.

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**Figure 36. Photographs of damage and disruption caused by Typhoon 'Rose' in Hong Kong on August 16-17, 1971.**

(a) A panoramic view of ships in distress off Lantau Island.  
(By Courtesy of South China Morning Post)

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(b) S.S. 'Fatshan' lying on her side with the tanker 'Winfield Trader' stranded in the background.  
(By Courtesy of South China Morning Post)



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(c) S.S. 'Macau' wallowing on the coast of Tsing Yi Island.  
(By Courtesy of Hong Kong Standard)

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(d) USS 'Regulus', with its back broken, sprawling on Kauyi Chau.  
(By Courtesy of Hong Kong Standard)

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(e) S.S. 'Kota Sentosa' after head-on collision with embankment at Tai Kok Tsui, Kowloon.

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(f) S.S. 'Kaohsiung' stranded in Penny's Bay, Lantau Island.

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(g) Five people were injured when this 6-storey building collapsed in Tung Street amidst the fury of Typhoon 'Rose'.

*(By Courtesy of Hong Kong Standard)*

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(h) Squatter huts in Sam Ka Tsuen in a chaotic state after the ravage of 'Rose'.

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(i) Wreckage of collapsed huge signboard left by 'Rose' in Wan Chai.

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(j) A scene in Nathan Road after Typhoon 'Rose'.

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(k) The remnant of an electricity sub-station in Kwun Tong after a fire during Typhoon 'Rose'.  
(Gale-force winds rendering it impossible for firemen to control the blaze).  
*(By Courtesy of South China Morning Post)*

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(l) Landslides in Taiipo Road, Kowloon.

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(m) Flooding at Sports Road, Happy Valley—a common scene over the Colony after Typhoon 'Rose'.  
(By Courtesy of Hong Kong Standard)

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(n) Trees bent at Statue Square.

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(o) Huge trees uprooted in Nathan Road.

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(p) Trees toppled in many parts of the New Territories.  
(By Courtesy of Hong Kong Standard)

On August 15, 'Rose' slowed down to about 7 knots as it turned to a northwesterly course. Positions of the typhoon located by reconnaissance aircraft formed a very erratic track and the eye diameter fluctuated between 13 and 50 miles. However, the reconnaissance reports showed that 'Rose' was continuously intensifying with its central pressure falling from an estimated 987 millibars at 1.25 p.m. on August 14 to 959 millibars by midnight on August 15-16. The intensification was also substantiated by a marked increase in the symmetry of the cloud mass associated with the typhoon as revealed by a satellite picture taken on the morning of August 15 (Figure 23). At 7.00 p.m. on the same day, a reconnaissance aircraft reported a maximum surface wind of 130 knots near the centre of 'Rose'. By the late afternoon, it was possible to identify the eye of Typhoon 'Rose' on the Observatory's radar displays. The radar presentation revealed that the rainbands of Typhoon 'Rose' were well organized but only covered an area about 100 miles in diameter. The eye was well defined most of the time and was about 20 miles in diameter. These features (Figures 24 and 25) indicated that 'Rose' was a compact and well-developed typhoon.

On August 16, the typhoon began to move on a northerly course at about 7 knots towards Hong Kong and the Strong Wind Signal, No. 3, was hoisted at 5.05 a.m. when it was about 150 miles away to the south. A statement was issued by the Royal Observatory to warn the community that because of the relatively small size of Typhoon 'Rose' winds might increase very rapidly over the Colony. The Northeast Gale or Storm Signal, No. 7, was hoisted at 9.50 a.m. as Typhoon 'Rose' continued to approach the Colony. Satellite pictures taken during the morning (Figure 26) showed that the circulation of 'Rose' was still very well organized and that clouds covered an area about 360 miles in diameter.

At about 10 a.m. a ship, S.S. Nuddea, reported that she was experiencing 90 to 110 knot winds some 10 miles east-northeast of the typhoon centre. At 12.25 p.m. when the eye (Figure 27) was about 100 miles away, the Southeast Gale or Storm Signal, No. 8, was hoisted to replace No. 7 to warn a change in the direction of the gales. At about 1.00 p.m. S.S. Nuddea, one of Hong Kong's voluntary observing ships, went into the eye of Typhoon 'Rose' where the wind suddenly ceased and the lowest pressure recorded was 953.7 millibars. At 2.45 p.m. the vessel was approaching a rainband when gale force winds of 41-47 knots commenced suddenly from south by east. At 3.30 p.m. the pressure remained at 953.7 millibars but started to rise to 955.7 millibars by 4.00 p.m. By then the wind had veered to southwest and had increased to a sustained speed of over 130 knots. At about the same time another ship within 7 miles of the centre recorded a minimum pressure of 952 millibars.

During the morning on August 16, surface winds over the Colony were mainly fresh from the northeast quarter. The wind speed increased gradually in the afternoon and gales were experienced in outlying islands by the early evening. Sustained winds of gale force were reported by all local stations soon after dark and the wind direction turned first east and later southeast.

The Increasing Gale or Storm Signal, No. 9, was hoisted at 9.10 p.m. on August 16 when 'Rose' was about 50 miles south-southwest of the Royal Observatory and was replaced by the Hurricane Signal, No. 10, at 10.50 p.m. as the eye of the typhoon continued to move northwards at 10 knots. During the night of August 16-17, winds of hurricane force were experienced in many places, particularly over the western part of the Colony. The edge of the eye of Typhoon 'Rose' passed close to the west of Cheung Chau at about 1.52 a.m. on August 17. The surface wind at Cheung Chau decreased from 66 to below 25 knots in 15 minutes and the sea level pressure fell to 963.2 millibars. At about the same time a minimum pressure of 982.8 millibars was recorded at the Royal Observatory.

Barograms of Typhoon 'Rose' recorded at various meteorological stations in Hong Kong during the period August 16-17 are reproduced in Figure 28 and the anemograms for the same period are shown in Figures 29-33. Winds at Tai O fell to almost calm around 2.20 a.m. when the eye passed over but returned to hurricane force shortly after 2.45 a.m. Calm wind conditions were also experienced for about half an hour between 2.00 a.m. and 3.00 a.m. in Castle Peak, Shek Kok Tsui and Tsing Shau Tsuen\*. Winds were reported to have died down around 3.00 a.m. over coastal areas southwest of Ngau Hom Sha.

However, no noticeable calm intervals were reported in places east of So Kwun Tan and Lau Fau Shan Market. The central calm region or the 'wind eye' in Typhoon 'Rose' was well defined and covered an area of about 10 miles in diameter. The gale area of Typhoon 'Rose' was about 120 miles in diameter when gales were first experienced in exposed places over the Colony. However, the gale area gradually reduced to about 60 miles in diameter as the centre of 'Rose' passed over Lantau Island and the western districts of the Colony.

After crossing the western coast of Castle Peak, the centre of 'Rose' passed over Deep Bay and moved away from the Colony north-northwestwards towards Canton. The trajectory of the centre of the eye over the western part of the Colony is depicted in Figure 34.

As the typhoon began to weaken overland, No. 10 was replaced by the Southwest Gale or Storm Signal, No. 6, at 4.40 a.m. This was followed by the Strong Wind Signal, No. 3, at 9.15 a.m. All signals were lowered at noon on August 17.

'Rose' weakened to a tropical storm at about noon on August 17 and dissipated near Canton about 110 miles north-northwest of the Colony. Fresh southerly winds prevailed over the Colony for several hours in the early afternoon.

During the passage of 'Rose', there were 6 hours of gales at the Royal Observatory, while hurricane force winds were recorded for 1 hour at the Hong Kong Airport, 2 hours at Cape Collinson and Waglan Island, 3 hours at Cheung Chau, and 4 hours at Tate's Cairn. The maximum gust peak speeds recorded were 102 knots at Waglan Island, 103 knots at Cape Collinson, 105 knots at Cheung Chau, 114 knots at the northwest end and 106 knots at the southeast end of Hong Kong Airport, 102 knots at Tate's Cairn, and 121 knots at the Royal Observatory. At

\* Place names referred to in this context are given on the base map in Figure 34.



the top of Tai Mo Shan, a maximum gust peak speed of 150 knots was recorded at 1.43 a.m. just before the anemometer was broken at 2.11 a.m. on August 17.

The weather in Hong Kong was cloudy with scattered showers on the morning of August 16, but the showers became frequent and squally during the day and heavy rain set in towards midnight. Torrential rain occurred during the early morning of August 17 and a total of 167.5 mm of rainfall was recorded at the Royal Observatory in the three hours between 1.00 a.m. and 4.00 a.m. Brilliant flashes of lightning were also observed at this time but because of the noise caused by the wind no thunder could be heard at the observing stations. During the heavy rain on August 17 the trace of the 'Jardi' rate-of-rainfall recorder at Tate's Cairn rose to above the upper limit of the chart and the maximum instantaneous rate which occurred around 8.30 a.m. was estimated to be 513 mm/h. The weather improved rapidly during the afternoon of August 17 and no rainfall was recorded after 5.00 p.m.

An unusual phenomenon observed was the development of sea fog at Waglan Island, Cheung Chau and Cape Collinson during the morning of August 18. This was probably caused by a lowering of the sea surface temperature by Typhoon 'Rose'. Fog is rare in Hong Kong in August.

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

August 14	Trace
August 15	Nil
August 16	52.8 mm
August 17	288.1 mm
August 18	Nil

The daily total rainfall of 288.1 mm on August 17 is the highest value ever recorded in one calendar day in August in Hong Kong. Figure 35 shows the hourly amounts of rainfall and the barometric pressure profile as recorded at the Royal Observatory during the passage of Typhoon 'Rose'. The heaviest hourly rainfall of 63.3 mm occurred at the hour of minimum barometric pressure at the Observatory.

The times and heights of the highest tides and maximum storm surges recorded at the various locations in the Colony during Typhoon 'Rose' 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	2.56	Aug 17	2.20 a.m.	0.64	Aug 17	2.20 a.m.
Tai Po Kau	3.00	Aug 17	3.25 a.m.	0.98	Aug 17	3.25 a.m.
Chi Ma Wan (Lantau)	2.98	Aug 17	1.05 a.m.	1.23	Aug 17	1.05 a.m.

Wind-generated waves of about 9.5 metres from trough to crest were registered by the electronic wave-recorder near Waglan Island at noon on August 16 just before the submerged cable lead was broken by a landslide. However, waves estimated to be 14 metres high were observed by H.M.S. Argonaut about 70 miles north of the typhoon a few hours later. A survey of coastal areas in the west of the Colony showed that the rise of water did not exceed 3 metres, equivalent to a surge of about 1 metre. This is less than would be expected considering the intensity of the typhoon and past records.

A summary of observations made on August 16-17 during the passage of the typhoon is given in Appendix A and a comparison of various meteorological elements recorded during Typhoon 'Rose' and other tropical cyclones which caused gales at the Royal Observatory since 1960 is presented in Appendix B.

Tragically, 'Rose' was the worst typhoon for fatalities and heavy damage to property in Hong Kong since Typhoon 'Wanda' in 1962. In general, heavier damage was reported in the western than in the eastern side of the Colony. 36 ocean-going vessels went aground or suffered collision. About 300 small craft, including 100 pleasure craft, were sunk or damaged. Three of the 14 hydrofoils on the Hogn Kong-Macau run were severely damaged and a total of 6 Hong Kong & Yaumati ferries went aground while taking shelter in Kowloon Bay. In addition, the 'Fat Shan', a Hong Kong-Macau Ferry, capsized and the 'Lee Hong', a laid-up ferry vessel, was sunk. The death toll from Typhoon 'Rose' stood at 110 confirmed deaths and a further 15 were missing and presumed dead. Most of the deaths occurred on board the capsized 'Fat Shan'. Of the 92 people on board, there were only four survivors, 73 confirmed deaths and the others were still missing and presumed dead. 286 persons were injured of whom 90 had to be hospitalized.

A total of 5,644 people from 1,032 families was made homeless and 653 huts were destroyed. About 24 buildings were damaged in 12 locations, of which 6 were beyond repair or collapsed. Cables affecting some 30,000 telephones were out of order. There were numerous landslides resulting in 110 cases of road blockage of which 30 were serious. Flooding occurred in 35 locations in low-lying and coastal areas. Fallen scaffoldings and signboards, uprooted trees and broken boughs were common scenes all around the city.

Amidst the fury of Typhoon 'Rose' a fire broke out shortly after 9.00 p.m. on August 16 in a large power sub-station in Kwun Tong, Kowloon and the flames were fanned by the high winds to such an intensity that fire-fighters were unable to control it at times. Although the fire was put out at about 10.30 p.m. it triggered a general power failure, resulting in a blackout in Kowloon and the New Territories. Thousands of people were trapped in elevators during the power cut. There were 43 fire alarms altogether.

Hundreds of pigs and over 40,000 chickens as well as other poultry were killed, about 1,356 hectares of vegetable and garden crops damaged and some 20,000 fruit trees blown down. Considerable loss of pond fish due to overflow was also reported.

Some photographs showing damage and disruption caused by Typhoon 'Rose' are shown in Figure 36.

APPENDIX A

SURFACE WINDS RECORDED AT VARIOUS METEOROLOGICAL STATIONS IN HONG KONG DURING TYPHOON 'ROSE' ON AUGUST 16-17, 1971

		Royal Observatory			Hong Kong Airport			Waglan Island			Cheung Chau			Cape Collinson			Tate's Cairn		
Date	Time	Direction	10-min Mean Speed*	Maximum Gust Peak Speed	Direction	10-min Mean Speed	Maximum Gust Peak Speed	Direction	10-min Mean Speed	Maximum Gust Peak Speed	Direction	10-min Mean Speed	Maximum Gust Peak Speed	Direction	10-min Mean Speed	Maximum Gust Peak Speed	Direction	10-min Mean Speed	Maximum Gust Peak Speed
			kn	kn		kn	kn		kn	kn		kn	kn		kn	kn		kn	kn
August 16	0100	E	16	32	E	14	24	ENE	20	24	E	16	27	ENE	14	24	E	14	34
	0200	E	10	31	ENE	16	26	ENE	19	26	E	12	23	ENE	17	23	E	13	32
	0300	ENE	9	30	ENE	15	28	ENE	22	26	ENE	13	22	ENE	15	25	ENE	20	32
	0400	ENE	13	33	ENE	20	31	ENE	26	31	ENE	15	29	ENE	23	30	ENE	25	44
	0500	ENE	13	31	ENE	18	32	ENE	26	31	ENE	15	29	ENE	18	29	ENE	18	39
	0600	ENE	12	24	ENE	18	31	NE	25	33	ENE	18	28	NE	16	28	ENE	21	38
	0700	ENE	12	36	ENE	20	36	NE	28	38	ENE	18	31	ENE	18	32	ENE	25	41
	0800	ENE	12	38	NE	22	33	NE	33	40	ENE	19	32	NE	21	36	ENE	28	45
	0900	ENE	17	43	ENE	23	40	NE	33	43	ENE	23	40	NE	23	39	ENE	30	52
	1000	ENE	18	50	ENE	27	48	E	33	51	E	24	54	ENE	23	41	ENE	33	52
	1100	ESE	12	49	E	23	47	E	36	51	ESE	27	54	SSE	33	54	SE	24	48
	1200	E	17	42	ENE	20	45	E	28	53	E	25	52	ENE	24	49	E	28	53
	1300	E	15	38	ENE	22	39	E	31	45	ENE	20	38	E	18	34	ENE	28	50
	1400	E	17	45	E	24	47	E	33	48	E	29	49	ESE	25	47	E	38	58
	1500	ESE	26	56	E	29	51	E	33	51	E	36	62	SE	26	62	E	34	65
	1600	E	20	57	E	26	49	E	44	63	E	35	53	SE	31	47	E	38	62
	1700	E	29	68	E	28	55	E	43	64	E	45	69	SE	29	48	ESE	42	70
	1800	E	25	62	E	29	59	E	43	64	E	41	66	ESE	30	57	ESE	46	78
	1900	E	28	74	E	32	63	ESE	50	75	E	40	68	ESE	29	52	E	47	91
	2000	ESE	34	72	E	39	71	E	55	78	ESE	61	87	SSE	51	74	ESE	42	76
	2100	ESE	31	76	E	45	82	E	59	82	ESE	66	91	SSE	51	77	SE	43	87
	2200	E	43	90	E	54	84	E	64	84	ESE	63	103	SSE	57	84	SE	56	87
	2300	E	41	91	E	60	92	E	68	92	ESE	59	97	SSE	47	86	SE	58	96
	2400	E	55	105	E	61	96	ESE	77	99	ESE	73	101	SSE	71	94	SE	70	117
August 17	0100	ESE	56	121	ESE	66	106	SE	74	102	S	33	105	S	77	103	SSE	62	114
	0200	SSE	36	106	SSE	48	99	SSE	64	94	SSW	66	88	S	66	103	S	77	120
	0300	S	30	81	SSE	30	69	SSE	50	80	SSW	50	84	SSW	42	83	S	60	116
	0400	S	22	62	S	26	58	SSE	46	62	SSW	44	64	SSW	36	66	S	54	86
	0500	S	15	45	S	30	52	SSW	32	57	SSW	41	57	SW	27	54	SSW	48	74
	0600	SW	10	40	SSW	22	38	SSE	40	54	SW	32	53	SW	21	44	SSW	29	55
	0700	SSW	8	32	S	16	41	SSE	40	53	WSW	24	40	SSW	25	46	SSW	13	41
	0800	S	12	43	S	22	47	S	35	47	SSW	27	40	SSW	26	39	SSW	36	53
	0900	S	12	40	SSE	21	38	S	31	50	SSW	28	35	SSW	28	38	SSW	33	49
	1000	SSW	8	32	S	16	31	S	27	34	SSW	23	33	SSW	11	38	SSW	20	43
	1100	S	17	31	S	21	37	S	24	35	S	28	34	SW	17	34	SSW	28	41
	1200	SSW	5	28	S	15	29	SSE	25	29	S	18	31	SSW	13	27	SSW	15	32

\* 10-minute mean speed ending at the hour.

APPENDIX B

COMPARISON OF TROPICAL CYCLONES WHICH CAUSED GALES AT THE ROYAL OBSERVATORY SINCE 1960

Name of Tropical Cyclone	Date and Time of Occurrence of Maximum Wind		Nearest Approach from R.O.	Royal Observatory										Maximum Gust Peak Speeds at other Stations					
				Instantaneous Minimum Pressure	Rainfall*	No. of Hours with Gales	Mean Hourly Wind Before and After the Maximum Hourly						Maximum Gust Peak Speed	Hong Kong Airport	Waglan Island	Cheung Chau	Cape Collinson	Tate's Cairn	
							-3 h	-2 h	-1 h	Maximum Hourly	+1 h	+2 h							+3 h
	Date	Time	n mile	mb	mm	kn	kn	kn	kn	kn	kn	kn	kn	kn	kn	kn	kn	kn	
Typhoon Mary	1960 Jun	9 0200	5 WNW	973.8	427.5	19	42	44	44	50	44	36	37	103	88	105	—	—	—
Typhoon Alice	1961 May	19 1100	0	981.1	95.4	6	34	38	42	43	12	14	39	89	75	69	73	—	—
S.T.S. Olga	Sep	10 0300	30 NE	986.1	211.7	1	26	31	33	35	33	32	26	64	72	65	66	—	—
Typhoon Wanda	1962 Sep	1 0900	10 SSW	953.2	267.3	8	36	45	54	68	48	40	36	140	108	117	125	—	154
Typhoon Viola	1964 May	28 0300 & 0600	50 WSW	991.9	300.4	3	28 35	27 32	32 33	35 35	32 33	33 34	35 23	82	79	76	85	79	90
Typhoon Ida	Aug	8 2000	32 SW	972.0	121.9	2	24	26	31	42	39	30	24	112	93	100	88	89	118
Typhoon Ruby	Sep	5 1300	17 SW	968.2	191.5	6	35	49	56	58	43	38	24	122	110	124	117	120	145
Typhoon Sally	Sep	10 2200	32 NE	989.1	181.2	1	17	19	26	35	30	18	16	56	51	61	67	67	83
Typhoon Dot	Oct	13 0400	18 E	977.3	331.2	8	32	41	43	46	38	31	29	94	—	99	111	101	119
S.T.S. Lola	1966 Jul	13 2000	13 S	989.5	164.7	1	16	27	28	35	25	32	24	82	66	71	75	72	—
Typhoon Shirley	1968 Aug	21 1500	0	968.6	257.9	4	22	23	34	37	35	34	23	72	82	113	90	93	110
Typhoon Freda	1971 Jun	18 2300	22 SW	984.3	187.6	1	26	25	28	34	25	25	23	79	80	70	82	71	103
Typhoon Lucy	Jul	22 1200	23 NNE	977.9	150.2	1	19	25	28	34	27	21	13	68	63	80	70	72	80
Typhoon Rose	Aug	17 0000	11 WSW	982.8	340.9	6	34	40	44	53	50	37	28	121	106	102	105	103	120

\* Rainfall is taken from the time of hoisting of the first tropical cyclone warning signal until 24 hours after the last Tropical Cyclone Warning for Shipping was issued.

**TYPHOON 'DELLA'****September 27-30, 1971***The track of this typhoon is shown in Figure 37*

Early on September 27, 'Della' developed as a tropical storm near the eastern coast of north Luzon about 130 miles north-northeast of Manila. It moved west-northwest at 11 knots across the South China Sea and intensified to a typhoon early next day.

At about 11.54 a.m. on September 28, a satellite picture received at the Royal Observatory (Figure 38) revealed that the circulation of 'Della' was not well organized and covered an area about 300 miles in diameter. At 1.00 p.m. on the same day, a reconnaissance aircraft reported maximum winds of 70 knots and the minimum sea-level pressure of 994 millibars near the centre of the typhoon. In Hong Kong, the Stand By Signal, No. 1, was hoisted at 7.20 a.m. on September 28 when the typhoon was about 290 miles southeast of the Colony and was replaced by the Strong Wind Signal, No. 3, at 12.10 p.m. on the same day. 'Della' followed a westerly track, passing about 190 miles to the south during the evening and all signals were lowered by 3.10 p.m. the next day.

After crossing Hainan Island on September 29, 'Della' weakened into a tropical storm and turned onto a west-southwesterly course. It entered the coast of North Vietnam about 180 miles south of Hanoi late on September 30 and dissipated overland a few hours later.

Winds over the Colony freshened from the east during the afternoon of September 28 and became generally strong overnight. The strong winds persisted until the late morning on September 29 when they began to moderate.

During the passage of 'Della', the maximum gust peak speeds recorded were 37 knots at Cape Collinson, 40 knots at the Hong Kong Airport, 43 knots at Waglan Island, 44 knots at Cheung Chau, 49 knots at the Royal Observatory and 54 knots at Tate's Cairn. The weather was cloudy on September 28. There were frequent showers on September 29 and 30 and a total of 59.4 mm of rainfall was recorded at the Royal Observatory on these two days.

The times and heights of the highest tides and maximum storm surges recorded at the various locations in the Colony during Typhoon 'Della' 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	2.49	Sep 29	4.15 a.m.	0.45	Sep 28	4.30 p.m.
Tai Po Kau	2.46	Sep 29	5.45 a.m.	0.48	Sep 29	7.00 p.m.
Chi Ma Wan (Lantau)	2.71	Sep 29	4.20 a.m.	0.61	Sep 28	4.30 p.m.

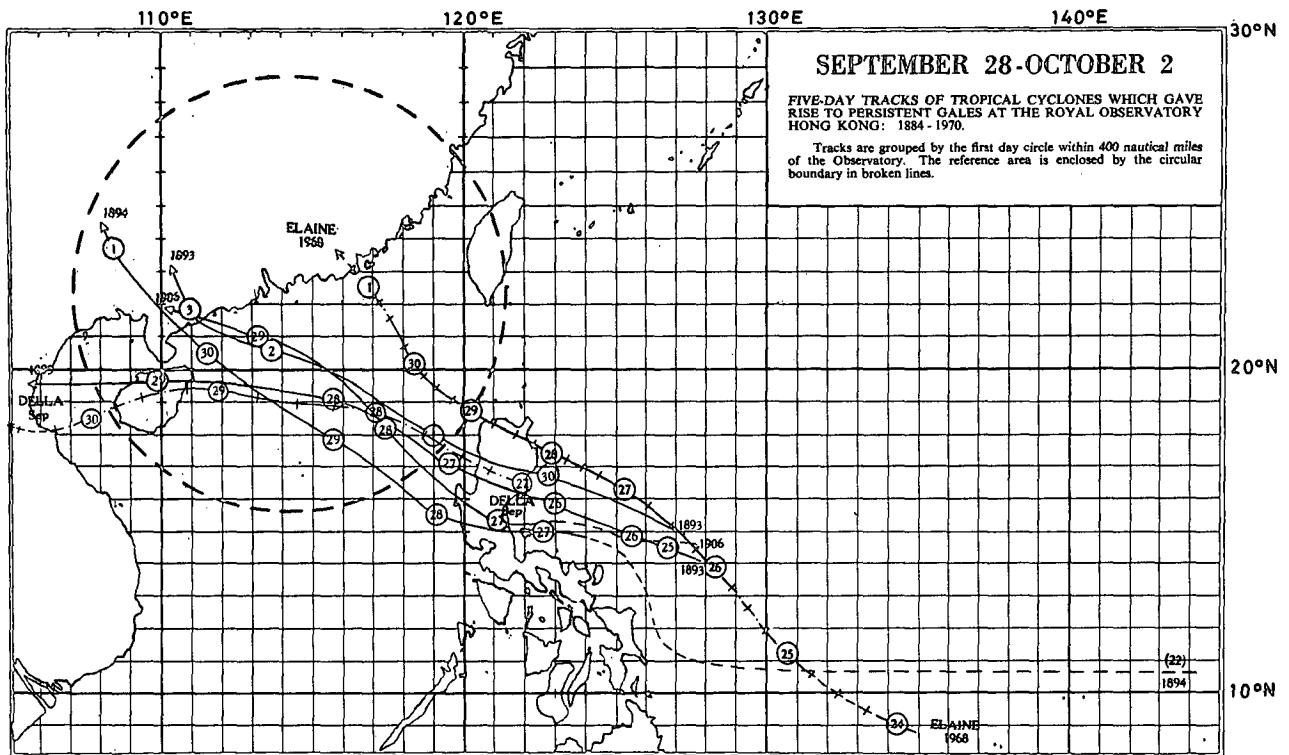


Figure 37. Track of Typhoon 'Della': September 27 - 30, 1971.

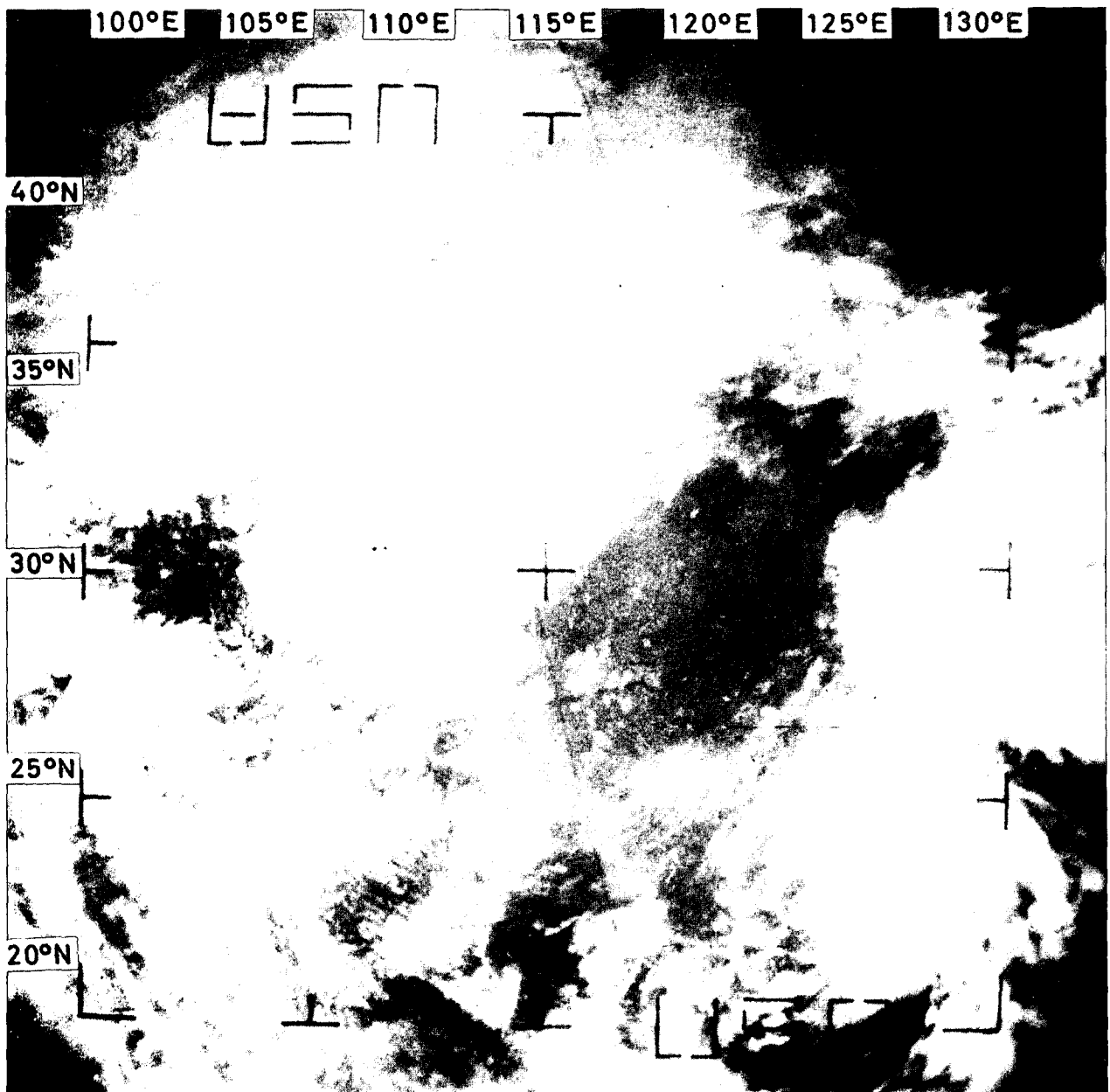


Figure 38. ESSA-8 APT picture of Typhoon 'Della' taken at 11.54 a.m. on September 28, 1971.

## TYPHOON 'ELAINE'

October 3-9, 1971

*The track of this typhoon is shown in Figure 39*

On October 3, a tropical depression developed over the Pacific about 400 miles east-southeast of Manila and soon deepened into a tropical storm named 'Elaine'. It crossed the central Philippines and entered the South China Sea on the following day.

On October 5, 'Elaine' intensified to a typhoon but moved erratically with a general direction towards the north. At about 11.10 a.m. on October 6, a satellite picture received at the Royal Observatory (Figure 40) showed that the circulation of 'Elaine' was well organized and covered an area 650 miles in diameter. At 1.04 p.m. on the same day a reconnaissance aircraft reported maximum surface winds of 120 knots and a minimum sea-level pressure of 968 millibars near the centre of the typhoon.

In Hong Kong, the Stand By Signal, No. 1, was hoisted at 6.50 a.m. on October 7 when 'Elaine' was centred about 370 miles to the south and was replaced by the Strong Wind Signal, No. 3, at 9.30 p.m. on the same day. The typhoon moved along a west-northwesterly track during the night and all signals were lowered at 6.30 p.m. the next day. 'Elaine' passed close to the south of Hainan early on October 9. It weakened to a tropical storm as it crossed the Gulf of Tonkin during the evening and dissipated rapidly near the north Vietnam coast about 160 miles south of Hanoi.

During October 7-8, winds over the Colony were fresh but occasionally strong in exposed places. The weather was cloudy with patches of light rain. However, only a trace of rainfall was recorded at the Royal Observatory on these two days.

Abnormally high tides were experienced in the Colony during the period October 5-10 and some flooding occurred at Tai O, Victoria and Quarry Bay during the night of October 7-8. The tide level was generally about one metre higher than normal. Local fishermen reported that they had not observed such a phenomenon in the last 20 years. This was probably caused by an unusual movement of ocean currents in the Pacific as high tides were also recorded in Japan around the same time.

The times and heights of the highest tides and maximum storm surges recorded at the various locations in the Colony during Typhoon 'Elaine' 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	3.21	Oct 8	12.10 a.m.	0.78	Oct 8	12.10 a.m.
Tai Po Kau	3.35	Oct 7	midnight	0.89	Oct 7	midnight
Chi Ma Wan (Lantau)	3.35	Oct 8	12.30 a.m.	1.01	Oct 8	2.00 a.m.

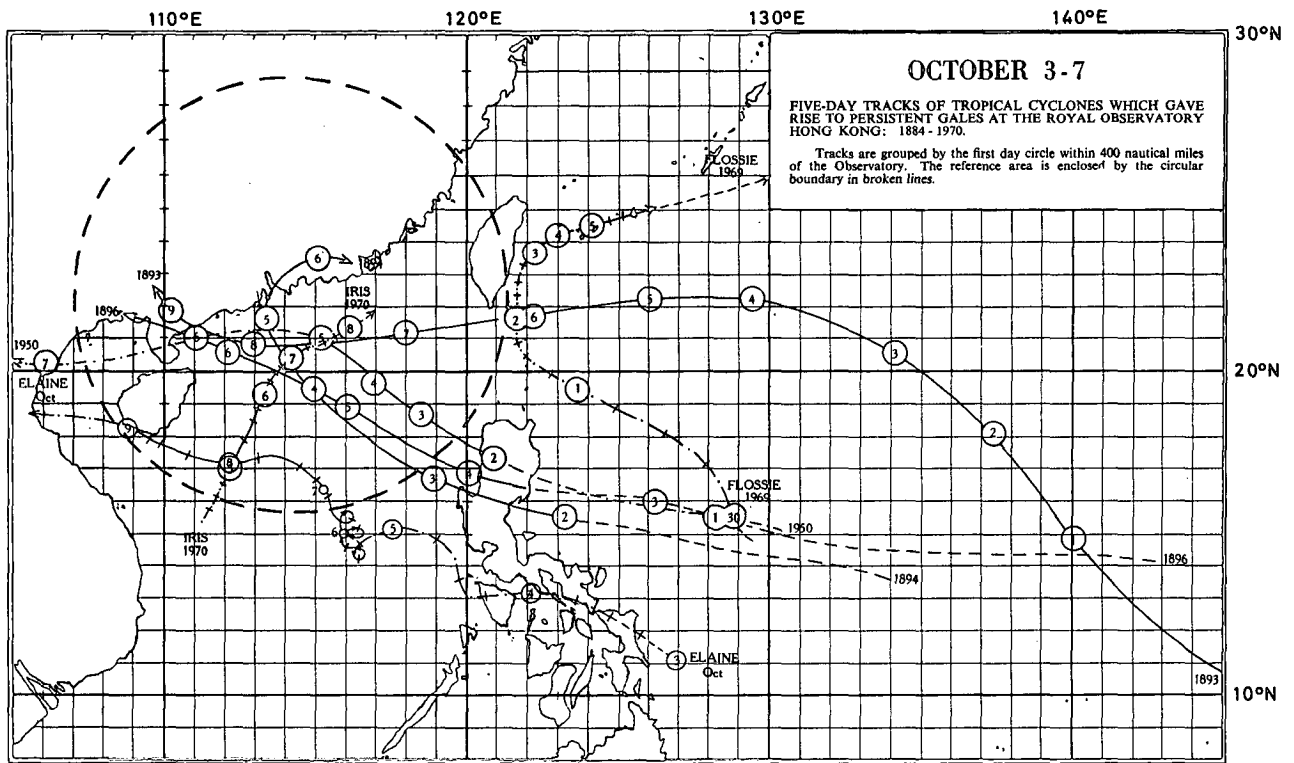


Figure 39. Track of Typhoon 'Elaine': October 3 - 9, 1971.

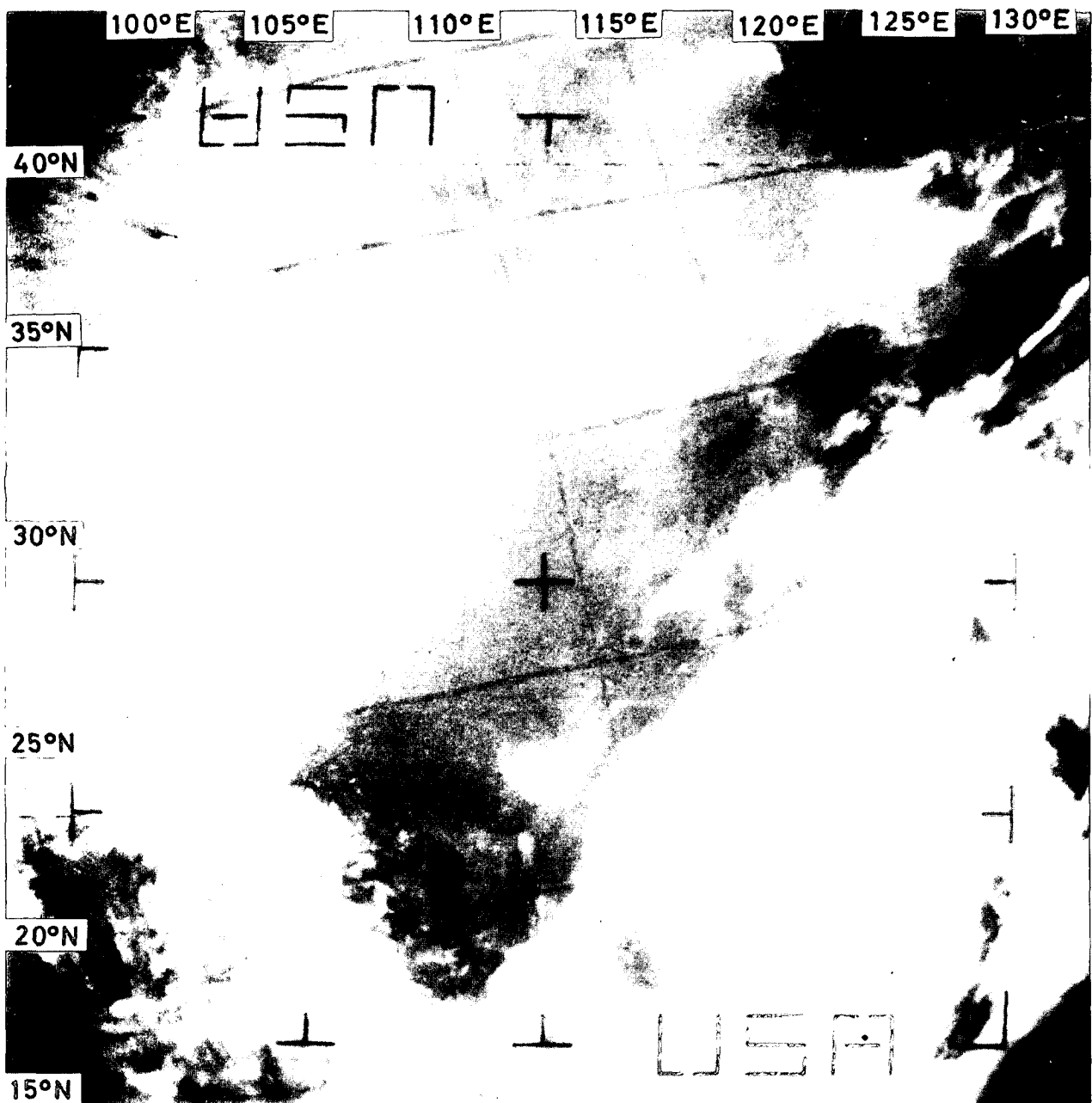


Figure 40. ESSA-8 APT picture of Typhoon 'Elaine' taken at 11.55 a.m. on October 7, 1971.



TABLE 1

## LIST OF TROPICAL CYCLONES IN THE WESTERN NORTH PACIFIC AND THE SOUTH CHINA SEA IN 1971

Name of Tropical Cyclone	Beginning of Track					First day circle	Last day circle	Ending of Track					
	Date		Time	Position				Date		Time	Position		
	G.M.T.			°N	°E			G.M.T.			°N	°E	
1	T.S. Sarah	Jan	9	0300	10.5	138.0	10	11	Jan	11	1200	15.8	141.8
2	T.S. Thelma	Mar	18	0300	10.5	129.5	19	21	Mar	21	0300	19.7	137.0
3	Typhoon Vera	Apr	8	0900	9.7	142.2	9	18	Apr	18	0900	26.4	133.6
4	S.T.S. Wanda	Apr	23	0300	12.3	127.9	24	4	May	4	0300	20.7	110.3
5	Typhoon Amy*	Apr	29	0600	6.5	154.9	30	7	May	7	1800	36.0	160.0
6	T.S. Babe	May	3	0000	14.8	119.0	3	7	May	7	0600	22.2	134.9
7	T.S. Carla	May	19	0600	14.0	127.9	20	23	May	23	1800	33.0	135.0
8	Typhoon Dinah	May	25	0300	11.0	130.5	26	30	May	30	1500	22.0	109.0
9	T.S. Emma	May	28	1200	6.1	132.4	29	29	May	29	1200	7.0	126.7
10	Typhoon Freda	Jun	14	0300	15.3	127.0	15	18	Jun	18	0900	24.0	112.0
11	Typhoon Gilda	Jun	22	1800	8.8	135.8	23	28	Jun	28	1800	25.0	108.3
12	Typhoon Harriet	Jul	2	0300	10.1	139.5	3	7	Jul	7	0600	18.5	104.4
13	S.T.S. Ivy	Jul	5	0000	21.3	135.3	5	7	Jul	7	2100	37.0	140.7
14	Typhoon Jean	Jul	10	0000	11.0	138.0	10	18	Jul	18	0600	21.1	107.1
15	S.T.S. Kim	Jul	10	0600	16.0	116.8	11	13	Jul	13	1800	19.2	104.5
16	Typhoon Lucy	Jul	16	0000	15.4	134.4	16	22	Jul	22	1800	22.6	110.4
17	Typhoon Nadine	Jul	20	0000	12.9	141.5	20	27	Jul	27	0300	27.4	115.7
18	Typhoon Olive	Jul	29	0600	22.3	144.7	30	6	Aug	6	1500	43.0	136.0
19	S.T.S. Polly	Aug	4	0000	12.5	147.2	4	10	Aug	10	1500	35.4	125.6
20	Typhoon Rose	Aug	9	2100	14.0	142.8	10	17	Aug	17	0600	23.9	113.2
21	Typhoon Shirley	Aug	12	0000	22.0	148.9	12	17	Aug	17	1200	45.0	156.8
22	Typhoon Trix	Aug	20	0600	22.1	152.0	21	31	Aug	31	1800	35.5	141.5
23	Tropical Depression	Aug	30	0000	15.1	112.2	30	31	Aug	31	1200	19.1	110.2
24	Typhoon Virginia	Sep	2	0000	18.5	138.6	2	7	Sep	7	1800	36.0	141.4
25	Typhoon Wendy*	Sep	7	2100	21.3	160.0	8	13	Sep	13	0900	46.0	152.0
26	Typhoon Agnes	Sep	15	0600	18.8	126.3	16	19	Sep	19	1500	24.8	118.0
27	Typhoon Bess	Sep	17	0000	16.4	150.8	17	23	Sep	23	0900	27.0	118.7
28	T.S. Carmen	Sep	24	0600	18.7	137.9	25	26	Sep	26	2100	37.8	144.0
29	Typhoon Della	Sep	27	0000	16.6	122.0	27	30	Sep	30	1500	18.5	105.0
30	Typhoon Elaine	Oct	3	0000	11.0	127.0	3	9	Oct	9	2100	18.6	105.6
31	S.T.S. Faye	Oct	4	1800	12.8	156.4	5	13	Oct	13	2100	18.5	125.3
32	Tropical Storm	Oct	7	1200	8.0	138.0	8	13	Oct	13	2100	29.0	132.6
33	T.S. Gloria	Oct	9	0000	13.5	128.3	9	10	Oct	10	1800	18.0	121.0
34	Typhoon Hester	Oct	19	1200	9.5	129.8	20	24	Oct	24	0000	17.5	105.4
35	Typhoon Irma	Nov	9	0000	6.9	142.6	9	16	Nov	16	0600	32.2	151.8
36	T.S. Judy	Nov	15	1200	5.5	109.0	16	16	Nov	16	0900	5.0	110.8

\* Track extends outside chart area.

TABLE 2  
TROPICAL CYCLONE WARNINGS FOR SHIPPING ISSUED IN 1971

Tropical Cyclone	No. of Warnings Issued	Date and Time of Issue of		Duration of Warnings (hours)
		First Warning	Last Warning	
Severe Tropical Storm Wanda	40	Apr 24 0900	May 4 0000	231
Tropical Storm Babe	12	May 3 1200	May 6 0600	66
Typhoon Dinah*	29	May 26 0000	May 30 1200	108
Typhoon Freda*	24	Jun 14 1800	Jun 18 0600	84
Typhoon Gilda*	22	Jun 25 0000	Jun 28 1200	84
Typhoon Harriet*	25	Jul 3 0600	Jul 7 0000	90
Severe Tropical Storm Kim	22	Jul 10 1200	Jul 13 1800	78
Typhoon Jean	29	Jul 14 0600	Jul 18 0600	96
Typhoon Lucy*	25	Jul 19 1200	Jul 22 1800	78
Typhoon Nadine*	13	Jul 25 0000	Jul 27 0000	48
Typhoon Rose*	29	Aug 13 0600	Aug 17 0300	93
Tropical Depression	11	Aug 30 0600	Aug 31 1800	36
Typhoon Agnes	3	Sep 16 0600	Sep 16 1800	12
	10	Sep 17 1200	Sep 19 1800	54
Typhoon Bess	6	Sep 22 0300	Sep 23 0600	27
Typhoon Della*	27	Sep 27 0000	Sep 30 0900	81
Typhoon Elaine*	41	Oct 3 0600	Oct 9 1800	156
Severe Tropical Storm Faye	24	Oct 10 0600	Oct 13 1800	84
Tropical Storm Gloria	2	Oct 10 0000	Oct 10 0600	6
Typhoon Hester	11	Oct 21 1200	Oct 24 0000	60
<b>Total</b>	<b>405</b>			<b>1572</b>

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

N.B. 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 1971

SUMMARY

Signal	No. of Occasions	Total Duration
1	9	135h 50min
3	10	123 10
5	1	9 30
6	3	16 10
7	2	18 25
8	2	12 50
9	1	1 40
10	1	5 50

DETAILS

Tropical Cyclone	No. of Warning Bulletins Issued	Signal	Hoisted		Lowered	
			Date	Time	Date	Time
Typhoon Dinah	13	1	May 28	0500	May 29	0720
Typhoon Freda	44	1	Jun 16	1115	Jun 16	2210
			Jun 16	2210	Jun 17	0920
			Jun 17	0920	Jun 18	0110
			Jun 18	0110	Jun 18	0515
			Jun 18	0515	Jun 18	1310
Typhoon Gilda	14	1	Jun 26	1930	Jun 27	0430
			Jun 27	0430	Jun 27	2245
Typhoon Harriet	8	1	Jul 5	0440	Jul 5	1610
Typhoon Lucy	33	1	Jul 20	2330	Jul 21	1445
			Jul 21	1445	Jul 22	0200
			Jul 22	0200	Jul 22	1130
			Jul 22	1130	Jul 22	1510
			Jul 22	1510	Jul 23	0135
Typhoon Nadine	10	1	Jul 26	1045	Jul 26	1800
			Jul 26	1800	Jul 27	0835
Typhoon Rose	47	1	Aug 14	1600	Aug 16	0405
			Aug 16	0405	Aug 16	0850
			Aug 16	0850	Aug 16	1125
			Aug 16	1125	Aug 16	2010
			Aug 16	2010	Aug 16	2150
			Aug 16	2150	Aug 17	0340
			Aug 17	0340	Aug 17	0815
Aug 17	0815	Aug 17	1100			
Typhoon Della	14	1	Sep 28	0620	Sep 28	1110
			Sep 28	1110	Sep 29	1410
Typhoon Elaine	17	1	Oct 7	0550	Oct 7	2030
			Oct 7	2030	Oct 8	1730

TABLE 4

FREQUENCY OF HOISTING AND TOTAL DURATION OF DISPLAY  
OF TROPICAL CYCLONE WARNING SIGNALS: 1946-1971

Year		Signal								Total	Total Duration (hours)
		1	3*	5	6	7	8	9	10		
1946		7	—	1	0	1	2	1	1	13	154
1947		6	—	1	0	1	0	0	0	18	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	1015
	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
1971		9	10	1	3	2	2	1	1	29	323
1956 to 1971	Total	97	99	6	14	23	13	8	8	268	4142
	Mean	6.1	6.2	0.4	0.9	1.4	0.8	0.5	0.5	16.7	258.9

\* 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 NECESSITATED THE DISPLAY OF TROPICAL CYCLONE WARNING SIGNALS  
IN HONG KONG: 1946-1971

Year	Number in Hong Kong's Area of Responsibility	Number Necessitating the Display of Signals in Hong Kong
1946	9	6
1947	21	6
1948	15	4
1949	16	4
1950	13	5
1951	12	7
1952	22	9
1953	19	6
1954	17	7
1955	14	3
1956	23	5
1957	12	6
1958	14	5
1959	19	2
1960	20	9
1961	22	6
1962	16	4
1963	13	4
1964	25	10
1965	16	6
1966	16	6
1967	16	8
1968	12	6
1969	11	4
1970	21	6
1971	19	9
Mean	17	6

TABLE 6

DURATION OF DISPLAY OF TROPICAL CYCLONE WARNING SIGNALS IN HONG KONG: 1946-1971

Signal	Duration			
	Mean	Maximum	Minimum	Mean per year
1	16h 55min	102h 10min	1h 20min	87h 09min
3*	19 59	71 45	1 00	123 39
5	7 41	13 00	1 30	2 57
6	5 41	11 10	2 30	3 30
7	11 39	35 35	2 15	17 02
8	7 19	17 20	0 20	7 19
5-8	8 54	35 35	0 20	30 48
9	3 30	6 15	1 10	2 01
10	6 26	9 10	2 30	2 14

\* 1956-1971.

TABLE 7 ✓

CASUALTIES AND DAMAGE CAUSED BY TROPICAL CYCLONES IN HONG KONG: 1937-1971

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
1971 T. Freda	13	0	0	2	0	30
T. Lucy	7	0	0	0	0	38
T. Rose	38	303	*	110	15	286

N.B. 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  
IN 1971

Name of Tropical Cyclone	Name of Ship	Location of Grounding, etc.	Nature of Incident	Remarks
Typhoon Freda	S.S. Themis	Victoria Harbour	Slight Damage	11 other ocean-going ships suffered slight damage or went adrift.
	S.S. El Jigue	Kowloon Bay	Went Adrift	
Typhoon Lucy	S.S. Tjamar	Victoria Harbour	Collision	5 other ocean-going ships were in trouble.
	S.S. Michael Jebsen	Victoria Harbour	Collision	
Typhoon Rose	U.S.N. Regulus	Kau Yi Chau	Aground	8 other ocean-going ships went adrift or collided with other vessels.
	S.S. Kim Seng	Ping Chau	Aground	
	S.S. Red Sea	N.E. Lantau	Aground	
	S.S. Huntsland	N.E. Lantau	Aground	
	S.S. Tion Hong	N.E. Lantau	Aground	
	S.S. Jade Lily	N.E. Lantau	Aground	
	S.S. Kaohsiung	N.E. Lantau	Aground	
	S.S. Winfield Trader	N.E. Lantau	Aground	
	S.S. Guimaras	N.E. Lantau	Aground	
	S.S. Fern Bank	N.E. Lantau	Aground	
	S.S. Kyoho Maru	N.E. Lantau	Aground	
	S.S. Gallantry	N.E. Lantau	Aground	
	S.S. Taikoo King	N.E. Lantau	Aground	
	S.S. Macau	Kap Shui Mun	Aground	
	S.S. Billy	Kap Shui Mun	Aground	
	S.S. Lucky Star No. 1	Castle Peak Road (Opposite Ma Wan Island)	Aground	
	S.S. Monruby	Rambler Channel	Aground	
	S.S. Jilin	E. Coast Tsing Yi	Aground	
	S.S. Sea Coral	S.E. Coast Tsing Yi	Aground	
	S.S. Lao Shan	S.E. Coast Tsing Yi	Aground	
	S.S. Man On	N. Coast Stonecutters	Aground	
	S.S. Flying Dragon	E. Coast Stonecutters	Aground	
	S.S. Watudambo	S.E. Coast Stonecutters	Aground	
	S.S. Wah Fat	S.E. Coast Stonecutters	Aground	
	S.S. Kota Sentosa	Tai Kok Tsui	Collision	
	S.S. Iron Yampi	Hung Hom	Aground	
	S.S. Fatshan	N.E. Lantau	Capsized	
S.S. Lee Hong	E. of Tsing Yi	Sunk		
S.S. Eastern Cape	Kau I Chau	Aground		
S.S. El Jigue	Kowloon Bay	Collision		

*N.B.* Information compiled from local newspapers.

TABLE 9 ✓

## TROPICAL CYCLONES CAUSING PERSISTENT GALES AT THE ROYAL OBSERVATORY

1884 - 1971

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
	Date	Time	Direction	Speed (kn)				Hourly Reading	Instantaneous Minimum	
	1884	July .....	29	0300	E/S	34	ENE to ESE .....	v	997.5	
		September ...	11	0200	ENE	57	N/E to SSE .....	v	979.8	
	1885	August .....	17	1400	ESE	34	E to S/E .....	v	997.8	
	1887	September ...	17	1700	E/S	44	NE to SE .....	v	999.3	
		September ...	21	0400	E	36	ENE to SE/E .....	v	1000.6	
		September ...	25	1400	E	35	ENE to ESE .....	v	1000.4	
	1889	October .....	16	0400	W/N	39	NW/N to W .....	b	997.0	
	1890	October .....	13	0400	NE/E	34	NE to ENE .....	v	1006.4	
	1891	July .....	19	0500	SSW	41	NW/W to SSW ...	b	980.9	
		August .....	3	0400	ESE	39	NNE to SE .....	v	990.7	
	1893	September ...	9	0300	NW	38	NNW to NW/W...	b	983.2	
		September ...	28	1600	E/N	39	NE/E to E/N .....	v	999.3	
		October .....	2	1400	E	52	NNE to SE .....	v	991.8	
		October .....	8	0400	E/N	37	N/E to ESE .....	v	1000.7	
	1894	September ...	19	0300	E/S	43	NE/E to SE .....	v	995.4	
		September ...	25	0900	E/N	55	NE to SE .....	v	994.5	
		September ...	30	0600	E	41	NE/N to SE/E ...	v	999.6	
		October .....	5	1700	SE/S	54	NE/E to SW/S ...	v	987.0	
	1895	July .....	28	1600	NE/E	34	NE/N to E/S .....	v	995.1	
	1896	July .....	29	2200	E/S	69	NNE to S/E .....	v	976.6	
		August .....	9	1600	ENE	42	NE/E to SE/E .....	v	997.8	
		October .....	6	0400	E/N	42	NE/E to SE .....	v	996.4	
	1897	September ...	17	1500	NE/E	36	NE/E to ENE .....	v	1004.6	
	1898	August .....	5	0300	E	39	ENE to SE .....	v	987.1	
		August .....	17	1700	E	39	ENE to SE .....	v	995.8	
	1900	September ...	11	0500	E	43	NE/E to SE .....	v	996.6	
		November ...	10	0600	NNE	57	NE/E to SW/W ...	b	975.0	Centre recurved around Hong Kong. Highest hourly wind velocity.
	1902	July .....	18	1600	SW/S	39	N to SW/S .....	b	984.4	
		August .....	2	2000	SW/S	52	NW/W to SW/S...	b	986.9	
	1904	August .....	10	0200	E/S	34	E to ESE .....	v	998.1	
		August .....	25	1700	E/N	36	E/N to NNE .....	b	986.8	
	1905	August .....	30	1500	ENE	41	N/E to E/N .....	v	988.2	
	1906	September ...	18	1000	SSW	49	NW to S .....	b	986.2	
		September ...	20	0400	E/S	36	ENE to ESE .....	v	1000.5	
		September ...	29	0900	E/N	50	NNE to SE .....	v	993.9	
	1907	September ...	14	0100	E/S	48	NE/N to SE .....	v	993.3	
	1908	July .....	28	0100	SSE	52	N to S/E .....	v	978.0	
		October .....	11	0100	E/S	34	NE/E to E/N .....	v	1003.6	
	1909	October .....	19	1700	ESE	48	NNE to SE .....	v	987.4	
		October .....	25	1700	E	35	NE to SE .....	v	1003.6	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		
	Date	Time	Direction	Speed (kn)				Hourly Reading	Instantaneous Minimum			
	1911	July .....	4	0300	ESE	36	63	3	ENE to SE .....	v	996.9	Dines anemograph installed in 1911.  Centre passed a few miles to N'ward.
		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	
		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	997.3	
											992.9	
										980.1		
										995.5		
										990.8		
										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		
	Date	Time	Direction	Speed (kn)				Hourly Reading	Instantaneous Minimum			
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 Typhoon Freda Typhoon Lucy Typhoon Rose	1961	May .....	19	1200	ESE	43	89	6	ENE to SW..... v	981.6	981.1	Centre passed over Observatory.
		September ...	10	0200	W	35	64	1	NNE to SW ..... b	986.5	986.1	
		September ...	1	1000	N	68	140	8	NNW to S ..... v	955.1	953.2	Centre passed about 10 miles to S'ward. Max. gust peak speed at Tate's Cairn 154 kn.
	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	
	1971	June .....	18	0100	E	34	79	1	ENE to SE ..... v	984.4	984.3	
		July .....	22	1100	W	34	68	1	NW to S ..... b	978.2	977.9	
		August .....	17	0100	ESE	53	121	6	E to S ..... v	984.5	982.8	

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

\* Estimated.

v=veering.

b=backing.