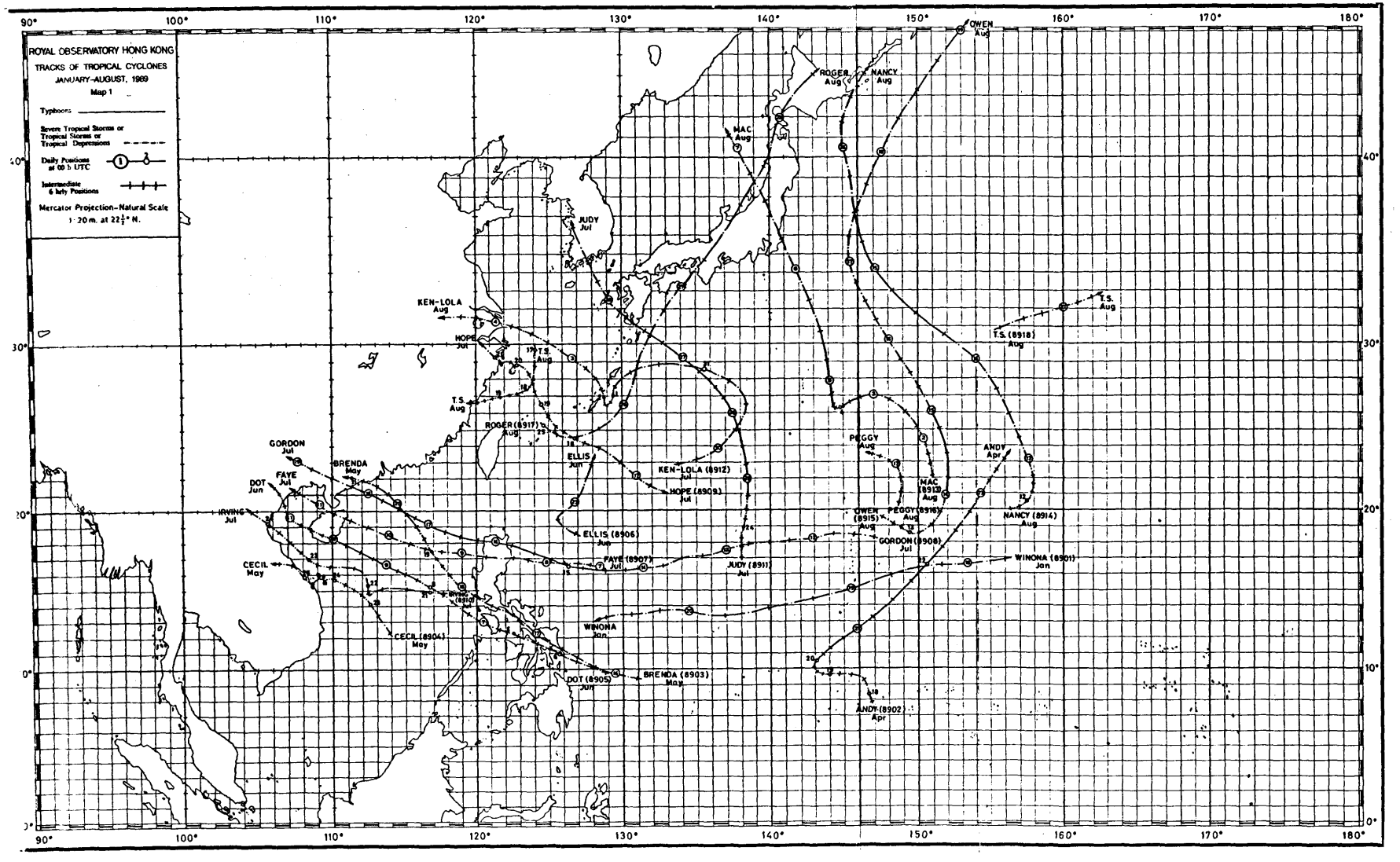
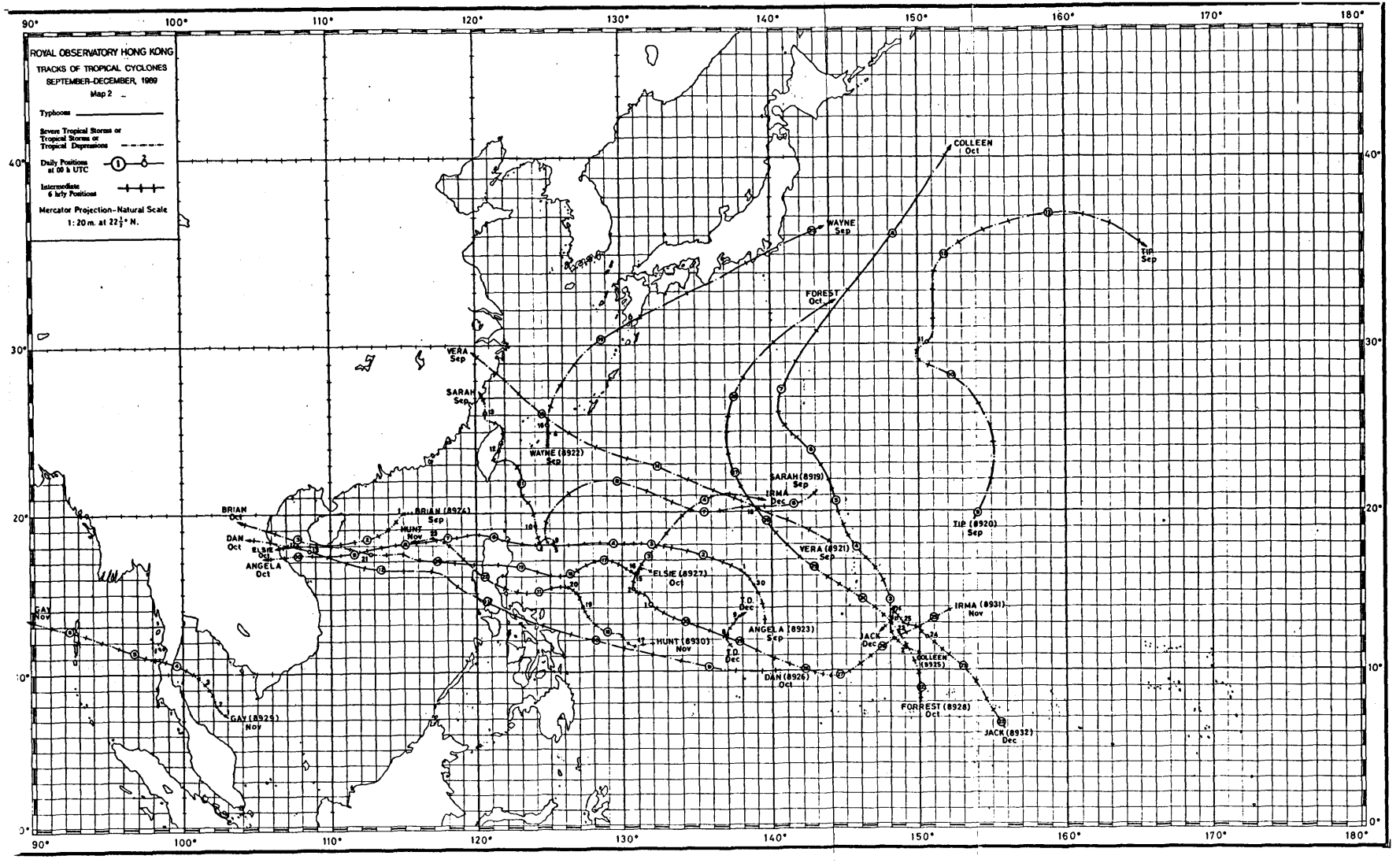

ROYAL OBSERVATORY HONG KONG
TRACKS OF TROPICAL CYCLONES
JANUARY–AUGUST, 1989
Map 1
Typhoons
Severe Tropical Storms or Tropical Storms or Tropical Depressions
Daily Positions at 00 h UTC
Intermediate 6 hrly Positions
Mercator Projection–Natural Scale
1: 20 m. at 22½° N.
90°
100°
110°
120°
130°
140°
150°
160°
170°
180°
40°
30°
20°
10°
0°
OWEN Aug
ROGER Aug
NANCY Aug
MAC Aug
JUDY Jul
KEN-LOLA Aug
HOPE Jul
T.S. Aug
T.S. (8918) Aug
ROGER (8917) Aug
PEGGY Aug
ANDY Apr
GORDON Jul
BRENDA May
FAYE Jul
DOT Jun
ELLIS Jun
KEN-LOLA (8912) Jul
HOPE (8909) Jul
MAC (8913) Aug
IRVING Jul
OWEN (8915) Aug
PEGGY (8916) Aug
NANCY (8914) Aug
ELLIS (8906) Jun
GORDON (8908) Jul
CECIL May
FAYE (8907) Jul
JUDY (8911) Jul
WINONA (8901) Jan
IRVING (8910) Jul
WINONA Jan
CECIL (8904) May
DOT (8905) Jun
BRENDA (8903) May
ANDY (8902) Apr


ROYAL OBSERVATORY HONG KONG
TRACKS OF TROPICAL CYCLONES
SEPTEMBER-DECEMBER, 1989
Map 2
Typhoons
Severe Tropical Storms or Tropical Storms or Tropical Depressions
Daily Positions at 09 h UTC
Intermediate 6 hrly Positions
Mercator Projection-Natural Scale
1: 20m. at 22½° N.
90°
100°
110°
120°
130°
140°
150°
160°
170°
180°
40°
30°
20°
10°
0°
COLLEEN Oct
WAYNE Sep
TIP Sep
FOREST Oct
VERA Sep
SARAH Sep
WAYNE (8922) Sep
SARAH (8919) Sep
IRMA Dec
BRIAN Oct
BRIAN (8924) Sep
HUNT Nov
DAN Oct
ELSIE Oct
ANGELA Oct
TIP (8920) Sep
VERA (8921) Sep
ELSIE (8927) Oct
T.D. Dec
IRMA (8931) Nov
ANGELA (8923) Sep
JACK Dec
HUNT (8930) Nov
T.D. Dec
COLLEEN (8935)
DAN (8926) Oct
GAY Nov
FORREST (8928) Oct
GAY (8925) Nov
JACK (8932) Dec

ROYAL OBSERVATORY HONG KONG

TROPICAL CYCLONES IN 1989

Published October 1990

Prepared by
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1. INTRODUCTION

Apart from a short break during 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 publication was divided into two parts, namely Part I-Surface Observations, and Part II - Upper-air Observations. The publication of Meteorological Results Part II was terminated in 1981. Upper-air data are now archived on magnetic tape. Starting from the 1987 issue, Part I was re-titled as Surface Observations in Hong Kong with the format and contents remaining unchanged.

During the period 1884-1939, reports on some destructive typhoons were printed as Appendices to the Meteorological Results. This practice was extended and accounts of all tropical cyclones which caused gales in Hong Kong were included in the Director's Annual Departmental Reports from 1947 until 1967 inclusive. The series 'Meteorological Results, Part III - Tropical Cyclone Summaries' was subsequently introduced. It contains information on tropical cyclones over the western North Pacific and the South China Sea. The first issue containing reports on tropical cyclones occurring during 1968, was published in 1971. In the 1984 issue, all tropical cyclones within the area bounded by the equator, 45°N, 100°E and 160°E, were described in the publication. Reconnaissance aircraft reports (terminated from August 1987 onwards) and satellite pictures have facilitated the tracking of tropical cyclones over the otherwise data-sparse ocean. Commencing 1985, the area of coverage is extended from 160°E to 180°. Starting from the 1987 issue, the series was re-titled as 'Tropical Cyclones in 19XX' but its contents remained largely the same.

Tracks of tropical cyclones in the western North Pacific and the South China Sea were published in Meteorological Results up to 1939 and in Meteorological Results, Part I from 1947 to 1967. Before 1961, only daily positions were plotted on the tracks. The time of the daily positions varied to some extent but remained fixed at 0000 UTC after 1944. Details of the variation are given in the Royal Observatory Technical Memoir No. 11, Volume 1. From 1961 onwards, six-hourly positions are shown on the tracks of all tropical cyclones.

Provisional reports on individual tropical cyclones affecting Hong Kong have been prepared since 1960 to meet the immediate needs of the press, shipping companies and others. These reports are printed and supplied on request. Initially, reports were only written on those tropical cyclones for which gale or storm signals had been hoisted in Hong Kong, but by 1968 it had become necessary to produce a report on every tropical cyclone which necessitated the hoisting of a tropical cyclone warning signal.

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

A TROPICAL DEPRESSION (T.D.) has maximum sustained winds of less than 63 km/h and at this stage the centre is often not very clearly defined and cannot always be located precisely.

A TROPICAL STORM (T.S.) has maximum sustained winds in the range 63-87 km/h.

A SEVERE TROPICAL STORM (S.T.S.) has maximum sustained winds in the range 88-l17 km/h.

A TYPHOON (T.) has maximum sustained winds of 118 km/h or more.

At the 13th session of the ESCAP/WMO Typhoon Committee held in December 1980, a common system for identification of tropical cyclones in the western North Pacific and the South China Sea was adopted. Since 1 January 1981, the Japan Meteorological Agency has undertaken the responsibility of assigning to each tropical cyclone of tropical storm intensity or above a common code which is composed of four digits. For example, the third tropical cyclone of tropical storm intensity or above which occurred within the region in 1989 was assigned the code (8903). The appropriate code immediately follows the name of the tropical cyclone in this publication, for example, Typhoon Brenda (8903).

Surface wind data presented in this report were obtained from a network of anemometers operated by the Royal Observatory. Instruments used in 1989 included M.O. Mark VI/V cup anemometers manufactured by R.W. Munro Ltd. and WS 201 cup anemometers manufactured by Teledyne Geotech. Details of the stations are listed below:

Station	Position		Head of anemometer above M.S.L.	Type of anemometer
	Latitude N	Longitude E		
			(m)	
Royal Observatory	22°18′	114°10′	72	Cup
Hong Kong Airport	22°20′	114°11′	14(NW)	Cup
			16(SE)†	Cup
Waglan Island△*	22°11′	114°18′	75	Cup
Tate's Cairn	22°22′	114°13′	588	Cup
Cheung Chau	22°12′	114°01′	92	Cup
King's Park	22°19′	114°10′	78	Cup
Star Ferry	22°18′	114°10′	17	Cup
Green Island	22°17′	114°07′	90	Cup
Tai O	22°15′	113°51′	90	Cup
Sha Tin△	22°24′	114°12′	16	Cup
Chek Lap Kok△	22°19′	113°56′	65	Cup
Lau Fau Shan△	22°28′	113°59′	50	Cup
Ta Kwu Ling△	22°32′	114°09′	28	Cup
Tuen Mun△	22°24′	113°58′	68	Cup
Wong Chuk Hang△	22°15′	114°10′	30	Cup
Cheung Sha Wan	22°20′	114°09′	30	Cup
Tai Mo Shan	22°25′	114°07′	969	Cup
Tsing Yi (Mobil Oil Co.)	22°21′	114°06′	18	Cup
Tamar	22°17′	114°10′	15	Cup

† Anemometer located near 22°19' 114°12'.
△ Automatic weather station
* Became automatic weather station with effect from 22 August 1989

Wind reports were also provided by Hong Kong International Terminal Ltd. at Kwai Chung. Maximum storm surges caused by tropical cyclones are measured by tide gauges installed at several locations in Hong Kong. The locations of these anemometers and tide gauges are shown in Figure 1.

The reports in Section 3 present a general description of the life history of tropical cyclones affecting Hong Kong in 1989. They include the following information:-

(a) the effect of the tropical cyclone on Hong Kong;
(b) the sequence of display of tropical cyclone warning signals;
(c) the maximum gust peak speeds and maximum mean hourly winds recorded in Hong Kong;
(d) the lowest barometric pressure recorded at the Royal Observatory;
(e) the daily amounts of rainfall recorded at the Royal Observatory and selected locations;
(f) the times and heights of the highest tides and maximum storm surges recorded in Hong Kong;
(g) satellite pictures and/or radar displays if applicable.

Six-hourly positions together with the corresponding estimated minimum central pressures and maximum sustained surface winds for individual tropical cyclones are tabulated and presented in Section 5.

In this publication, different times are used in different contexts. The reference times of tropical cyclone warnings for shipping are given in Co-ordinated Universal Time and labelled UTC. Unlabelled times given in hours and minutes (e.g. 1454) on a 24-hour clock or times expressed as a.m. or p.m. are in Hong Kong Time. Hong Kong Time is eight hours ahead of UTC.

Throughout this publication, maximum sustained surface winds when used without qualification refer to wind speeds averaged over a period of 10 minutes. Mean hourly winds were obtained by averaging the winds over a 60-minute interval ending on the hour. Daily rainfall amounts are rainfall recorded in a 24-hour period ending at midnight Hong Kong Time.

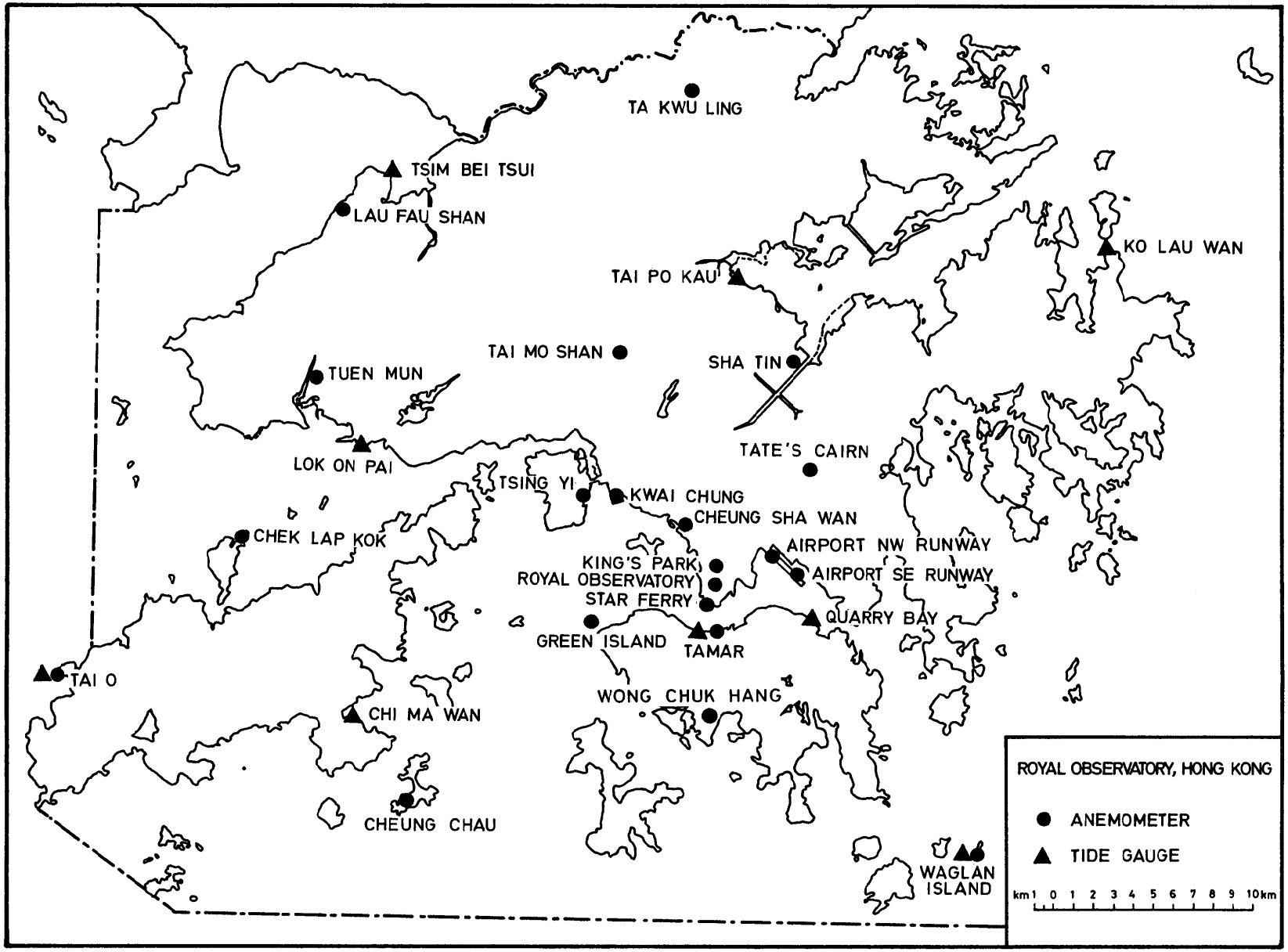

Figure 1. Locations of anemometer and tide gauge stations in Hong Kong.

2. TROPICAL CYCLONE SUMMARIES FOR 1989

In 1989, there were 34 tropical cyclones over the western North Pacific and the adjacent seas bounded by the equator, 45°N, 100°E and 180°. This is the first time since 1978 that the annual average (1951-1980) of 32 tropical cyclones is exceeded. The number of tropical cyclones attaining typhoon intensity is 21, which is also higher than the annual average of 16. The monthly distributions of the frequency of first occurrence of tropical cyclones and that of typhoons for 1989 are shown in Figure 2. The monthly mean frequencies of these two parameters during the years 1951-1980 are shown in Figure 3.

Eleven tropical cyclones affected the South China Sea, of which only three developed within the basin. The rest moved into the region after traversing the Philippines. However, the South China Sea had an unusually barren spell in August and September when it was nearly devoid of tropical cyclone activity. It would have been the first time on record that this happened if Brian had not formed on the last day of September. While southern Vietnam had a very quiet year, the northern part was affected by eight tropical cyclones, of which three made their passages via Hainan. In the south, there was the rare occurrence of a tropical cyclone developing within the Gulf of Thailand and subsequently hitting southern Thailand as a mature typhoon. Over southern China, western Guangdong was hit by two typhoons while eastern Guangdong remained relatively unscathed. Further to the east and north, Taiwan was devastated by Typhoon Sarah (8919) in September. Including a weakening Sarah, five tropical cyclones approached the coast of eastern China. Another four tropical cyclones struck Japan and one of them went on to hit South Korea in July.

The most intense tropical cyclone of the year was Typhoon Gordon (8908) in July. Prior to hitting northern Luzon, its lowest central pressure was estimated to be about 905 hPa with maximum sustained winds in excess of 210 km/h. The most destructive tropical cyclone was Typhoon Gay (8929) in early November. A total of 1 103 people was reported dead or missing on land and sea in Thailand. Financial damage was estimated to be over US$458 million. The most serious incident occurred in the Gulf of Thailand where a gas-drilling ship capsized. Only six of the 97-strong crew on board survived.

During the year, 17 tropical cyclones, which equalled the 30-year (1951-80) annual average, occurred within the area of responsibility of Hong Kong (i.e. the area bounded by l0°N, 30°N, 105°E and 125°E). Ten of these tropical cyclones moved into this area while the other seven developed within it. Altogether, 430 warnings for shipping were issued by the Royal Observatory in connection with these 17 tropical cyclones.

Tropical cyclone warning signals were displayed in Hong Kong for seven tropical cyclones. Six of them necessitated the hoisting of the Strong Wind Signal No. 3 and gale signals were hoisted for Typhoon Brenda in May and Typhoon Gordon in July.

The total tropical cyclone rainfall (defined as the total rainfall recorded at the Royal Observatory, Hong Kong from the time when a tropical cyclone was centred within 600 km of Hong Kong to 72 hours after the tropical cyclone has dissipated or moved outside 600 km of Hong Kong) during 1989 amounted to 643.4 mm, which is 13 per cent above the annual average value of 566.9 mm (18841939 and 1947-1970). It accounted for 33 per cent of the year's total rainfall of 1 944.6 mm. Eight tropical cyclones came within 600 km of Hong Kong. Typhoon Brenda (8903), ranked as the 10th wettest storm on record, contributed 439.6 mm of rainfall. Typhoon Elsie (8927) brought only a trace of rainfall and Typhoon Hunt (8930) contributed 3.0 mm. Rainfall figures associated with the other tropical cyclones are given in Table 10(b).

Winona (8901) was the first tropical cyclone to form over the western North Pacific in the year. It developed from an area of low pressure which originated east of the International Dateline and moved west-southwestwards into the western North Pacific on 15 January. After formation as a tropical depression about 1 250 km east-northeast of Guam early on 18 January, Winona moved rapidly west-southwestwards. It intensified to a tropical storm that afternoon. Winona passed about 150 km north of Guam on 19 January and then weakened to a tropical depression. It turned westwards early next morning and dissipated over water about 850 km east of Manila early on 21 January.

About three months later, Tropical Depression Andy (8902) developed over the Caroline Islands about 650 km south-southeast of Guam early on 18 April. It quickly strengthened into a tropical storm and moved north-northwestwards. Andy then turned westwards in the evening and continued to intensify. It began to recurve during the night of 19 April. By the next morning, Andy had reached typhoon strength and was moving steadily northeastwards. The eye of Typhoon Andy became visible on satellite imageries on the same day. It passed about 150 km south-southeast of Guam early on 21 April. Andy reached its peak intensity that afternoon with maximum winds near the centre estimated to be over 200 km/h. It began to weaken quickly the next day while maintaining a northeastward track. Andy became a severe tropical storm early on 23 April and a tropical storm that evening. It completed its extratropical transition on the morning of 24 April over the waters near Marcus Island.

The first tropical cyclone to affect Hong Kong occurred in May. Brenda (8903) formed over the western North Pacific about 1 220 km east-southeast of Manila early on 16 May. It crossed the Philippines as a tropical storm and intensified to a typhoon about 390 km south-southeast of Hong Kong over the South China Sea on 19 May. Brenda moved northwestwards across the South China Sea and made landfall early on 21 May over western Guangdong where it finally dissipated later that morning. In Hong Kong, six people were killed. In western Guangdong, the death toll was 84.

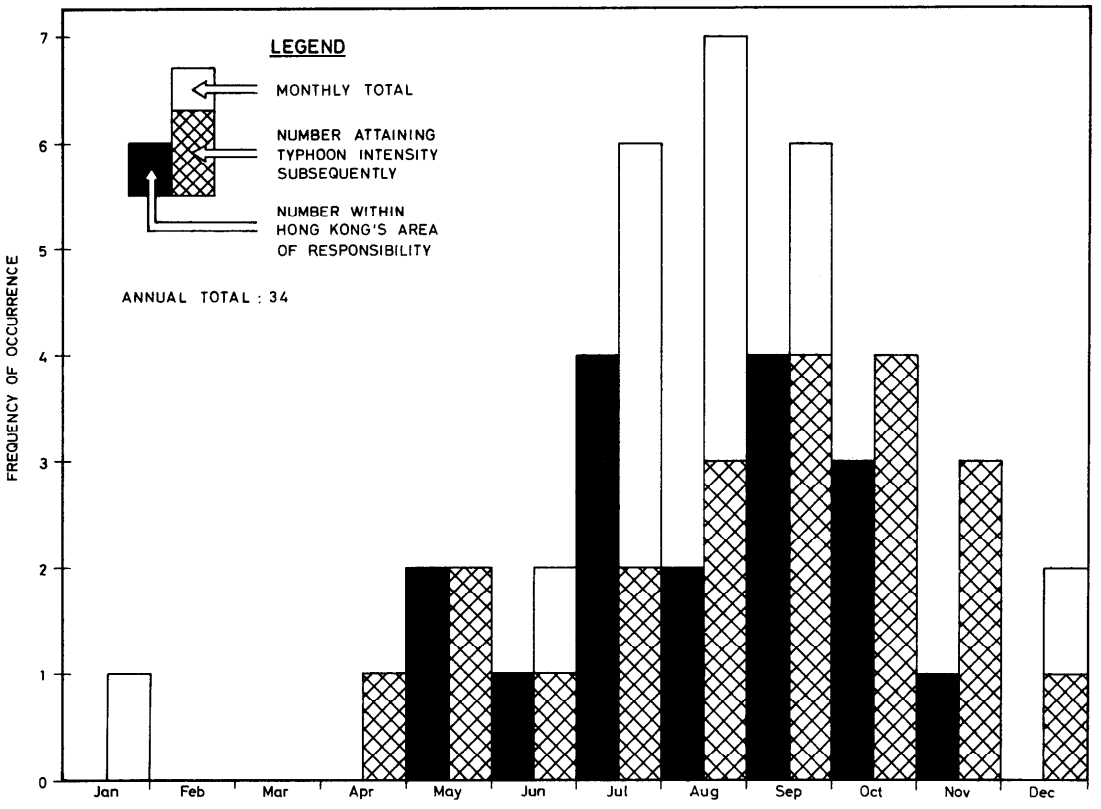

Figure 2. **Monthly distribution of the frequency of first occurrence of tropical cyclones in the western North Pacific and the South China Sea in 1989.**

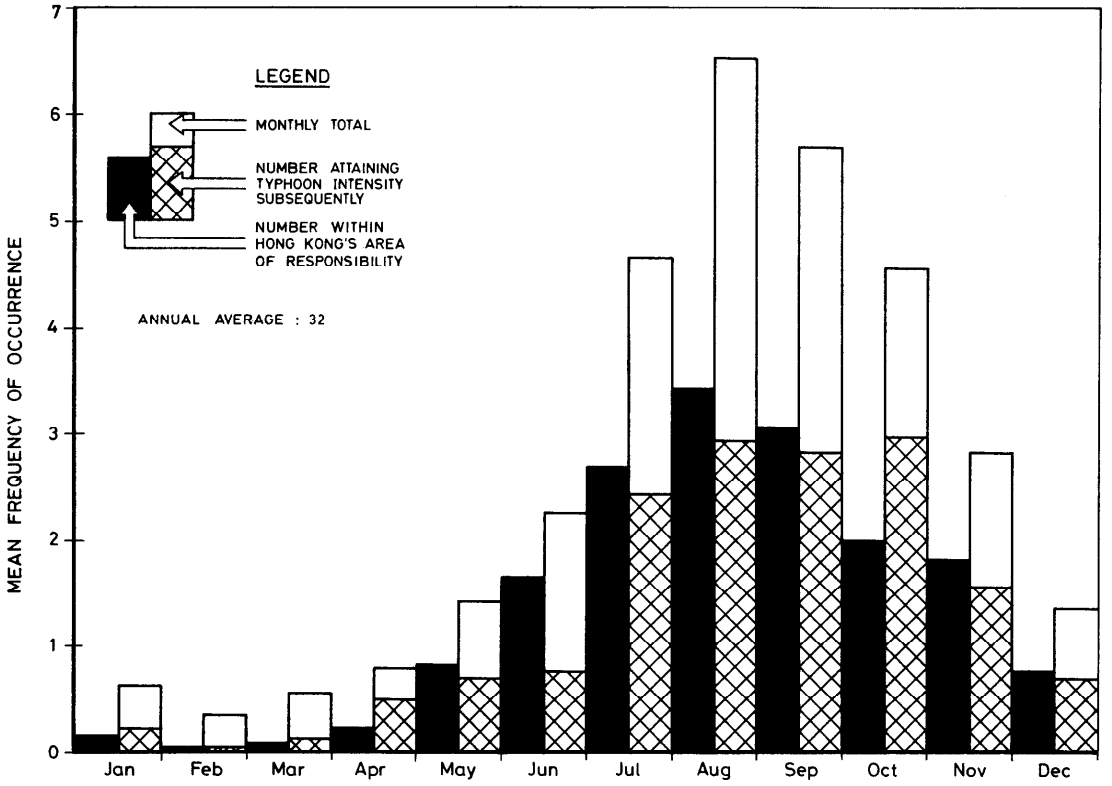

Figure 3. **Monthly distribution of the mean frequency of first occurrence of tropical cyclones in the western North Pacific and the South China Sea, 1951–1980.**

Following the dissipation of Brenda, Cecil (8904) formed as a tropical depression over the central part of the South China Sea about 740 km east-southeast of Danang on the evening of 22 May. It moved northwestwards at about 23 km/h initially and intensified rapidly. By the following afternoon it had attained severe tropical storm intensity and changed to a more west-northwestward track at about 13 km/h. A ragged eye developed on 24 May as Cecil became a typhoon. Its movement then became erratic and on the evening of 24 May, Cecil turned southwestwards. It made landfall about 80 km southeast of Danang early next morning and turned northwestwards again. Cecil weakened rapidly and became a tropical storm when it was about 110 km northwest of Danang. It moved westwards into Laos and weakened into an area of low pressure about 210 km west-northwest of Danang on the evening of 25 May.

Cecil brought torrential rain to the central part of Vietnam and caused catastrophic floods there. In the city of Hue, streets were under two metres of water. In the central provinces of Vietnam, 140 people were killed and about 600 were reported missing. About 112 000 hectares of rice paddy and 40 000 hectares of other crops were destroyed or damaged. In addition, about 36 000 houses and 150 schools were destroyed, leaving 150 000 people homeless. Fishing boats which sank or were damaged totalled 700. There were also reports of waterworks and dams being destroyed. The remnants of Cecil also brought heavy rain to the central and northeastern parts of Thailand.

Dot (8905) formed about 1 000 km east-southeast of Manila on 5 June and crossed the central Philippines as a tropical storm the next day. Maintaining a west-northwestward track across the South China Sea, it intensified to a typhoon about 400 km east-southeast of Xisha on 8 June. Dot traversed southern Hainan on 10 June and weakened to a severe tropical storm. Turning to the north-northwest over Beibu Wan, it landed over northern Vietnam on 11 June and dissipated. Two people were killed in Hainan and three in Vietnam.

Tropical Depression Ellis (8906) formed over the Pacific about 840 km south of Okinawa on the evening of 22 June. It moved west-northwestwards initially but turned to northeast early next morning while intensifying to a tropical storm. Ellis then moved north-northeastwards at a speed of 45 km/h and became extratropical on the afternoon of 23 June.

Six tropical cyclones developed in July, but only two of them attained typhoon intensity.

Faye (8907) formed about 830 km east-northeast of Manila on 7 July. It moved westwards and intensified to a severe tropical storm the next day. After crossing northern Luzon later that evening, Faye entered the South China Sea early on 9 July. It then crossed Hainan on the evening of 10 July and finally dissipated in Vietnam the next day.

A few hours before Faye dissipated, Gordon (8908) formed about 580 km north-northeast of Guam and moved westwards. It attained typhoon intensity on 14 July and crossed northern Luzon on the morning of 16 July. Gordon then traversed the northern part of the South China Sea on a west-northwestward track and made landfall over western Guangdong. It finally dissipated in Guangxi on 19 July. In Hong Kong, one person was killed. In Guangdong, 17 people were killed and flooding also caused severe damage. In the Philippines, 41 people were killed with 30 people reported missing.

As Gordon moved into the South China Sea, Hope (8909) formed as a tropical depression about 760 km southeast of Okinawa on the evening of 16 July. It moved northwestwards and entered the East China Sea a couple of days later. Hope intensified to a severe tropical storm on 19 July and turned north-northwestwards. It moved slowly and erratically on 20 July before landing over Zhejiang about 200 km southeast of Hangzhou early next morning. Hope then weakened rapidly and finally dissipated inland about 40 km southeast of Hangzhou on 21 July.

In Zhejiang, about 240 000 people were affected by floods in over 800 villages. The casualties included 122 people dead, 21 reported missing, and 900 seriously injured. About 205 000 hectares of farmland were affected. The total damage amounted to 1 050 million RMB. The damage was most severe in the Ninpo district where Hope made landfall. There were 14 people killed or injured. The extent of damage included about 20 000 metres of dykes, over 6 000 houses, 12 piers, and the sinking of 18 boats near the shore. Crops were lost, and transport and communication were also interrupted.

In the northern part of the neighbouring province of Fujian, heavy rain brought water levels in rivers to alarming levels. Widespread flooding occurred and over 4 000 houses were damaged. About 3 300 hectares of paddy rice field were inundated, 12 500 tonnes of grain were destroyed and 1 000 pigs were washed away. Transport and communication were also interrupted. The death toll was 24, and 1 000 people were injured.

While Hope was causing havoc over eastern China, another tropical cyclone named Irving (8910) formed over the South China Sea about 350 km west of Manila early on 21 July. Moving westwards, it soon developed into a tropical storm during the day. Irving then changed to a north-northwestward track early on 22 July. It passed about 70 km south-southwest of Xisha before reverting to a westward track. Irving intensified to a severe tropical storm early on 23 July and turned to the northwest, moving almost parallel to the Vietnam coast. Despite weakening to a tropical storm that afternoon, Irving temporarily re-gained severe tropical storm strength before making landfall about 200 km south of Hanoi next morning. It finally dissipated inland over Laos about 160 km southwest of Hanoi on the afternoon of 24 July.

In Vietnam, 102 people died and 488 people were injured. Over 80 000 houses were damaged. About 65 000 hectares of farmland were inundated and 256 boats sank.

Judy (8911) developed as a tropical depression about 1 470 km southeast of Okinawa on 23 July. It moved northwards and gradually intensified to a typhoon two days later when it was about 1 240 km east-southeast of Okinawa. Judy then turned northwestwards in the general direction of Kyushu. It traversed the southern part of Kyushu during the night of 27 July and crossed the Korea Strait the next day. Judy weakened to a tropical storm before making landfall over the southern part of the Korean Peninsula on the evening of 28 July. Over land, it turned to a north-northwestward track and dissipated about 130 km south of Seoul early on 29 July.

In Kyushu, two people were killed and six others were injured. Two houses were destroyed in rainstorms while nine others were damaged. Another 86 houses were flooded. Twenty-five cases of landslides occurred and electricity supply was interrupted. In Shikoku, three people died when their house was destroyed by fire.

In Korea, Judy caused landslides and flooding. Twenty-five people died and four were reported missing. About 7 700 houses and 15 000 hectares of farmland were flooded with 17 000 people made homeless. Highways to Pusan were also damaged and transportation was disrupted.

Soon after the demise of Judy, Tropical Depression Ken (8912) formed about 710 km east-southeast of Okinawa on 29 July. It moved rapidly northeastwards at first but gradually turned anti-clockwise to a westward track by 31 July. It was then renamed Lola as it moved towards the Ryukyu Islands. Tropical Storm Lola was slow-moving in the vicinity of the Ryukyu Islands on the first two days of August. It then took on a northwesterly track on the evening of 2 August and moved across the East China Sea. Lola further intensified to a severe tropical storm for a short period on 3 August. It made landfall near Shanghai on 4 August and weakened as it moved inland. Lola crossed Jiangsu Province and finally dissipated in Anhui Province about 110 km west-southwest of Nanjing on 5 August.

Very high tides occurred along the coastal regions of Zhejiang where Lola made landfall. Zhejiang, Jiangsu and Anhui provinces were devastated by severe floods. At least 90 000 hectares of farmland were inundated. Cotton and corn crops were blown down. About 300 houses were damaged. The total loss was estimated to be about 4 million RMB.

Besides Ken-Lola, seven other tropical cyclones occurred in August. All developed over the western North Pacific near or north of the latitude of 20°N. It was the second consecutive year that the South China Sea was devoid of tropical cyclones in August.

Tropical Depression Mac (8913) formed about 1 840 km southeast of Tokyo on 1 August and soon became a tropical storm. It moved north-northwestwards initially but turned progressively westwards the next day. Mac attained typhoon intensity about 1 180 km southeast of Tokyo on 3 August and tracked west-southwestwards. It made an abrupt turn to the north on 4 August and moved generally to the north-northwest for the next couple of days towards eastern Honshu. Mac weakened to a severe tropical storm early on 6 August and made landfall about 90 km east of Tokyo during the day. After crossing Honshu, it entered the Sea of Japan that night and finally dissipated about 380 km west-southwest of Sapporo on 7 August.

In Honshu, heavy rain associated with Mac caused extensive flooding and over 100 cases of landslides in Fukushima and Miyagi prefectures. Twelve houses were destroyed and over 4 000 houses were flooded. Eight people were killed, seven were reported missing and fifteen others were injured. Many flights were cancelled and railway lines in seven prefectures were paralysed.

Nancy (8914) formed as a tropical depression about 1 080 km west of Wake Island on 11 August and moved east-northeastwards initially. It gradually turned to a north-northwestward track on 12 August and intensified to a severe tropical storm the next day. Nancy reached typhoon strength about 1 260 km southeast of Tokyo on 14 August and moved northwestwards. It reverted to a more northward track the following day and weakened gradually to a tropical storm by 16 August. It then curved away to the north-northeast off the northeastern tip of Hokkaido that evening and became an extratropical cyclone over the Kuril Islands early next day.

Within 24 hours after the formation of Nancy, Owen (8915) developed as a tropical depression about 730 km north-northeast of Guam on 12 August and drifted southeastwards initially. It became a tropical storm and turned towards the northeast on the next day. Owen further intensified to a typhoon about 1 100 km northeast of Guam on 14 August. It took on a north-northwesterly course that evening and weakened to a severe tropical storm the next day. Owen passed about 510 km east of Tokyo on 17 August and recurved northeastwards. It weakened to a tropical storm early next day before evolving into an extratropical cyclone about 600 km southwest of Kamchatka on 19 August.

While Nancy and Owen were heading northwards into higher latitudes, another disturbance to the south developed into a tropical depression named Peggy (8916) about 860 km north-northeast of Guam on 16 August. It moved northwards at first but turned increasingly to the west the next day. Lacking any significant intensification, it finally dissipated about 1 120 km north of Guam early on 18 August.

While Owen and Peggy were roaming over the Pacific, a tropical depression developed over the East China Sea about 310 km east-southeast of Shanghai on 17 August. It moved southwards and turned west-southwestwards the next day. It intensified briefly to a tropical storm off the coast of northern Fujian on 19 August before making landfall about 100 km northeast of Fuzhou the following morning and dissipating over land.

Roger (8917) formed as a tropical depression near the Ryukyu Islands about 320 km west-southwest of Okinawa on 25 August. It moved to the southeast and east initially but accelerated northeastwards the next day. Meanwhile, Roger continued to intensify and reached severe tropical storm intensity about 180 km southeast of Kagoshima on 26 August. Roger made landfall over Shikoku on 27 August and weakened as it traversed Honshu and Hokkaido. It finally became an extratropical cyclone about 200 km northeast of Sapporo on 28 August.

As the track of Roger was almost parallel to the orientation of the Japanese islands, the whole country was affected. Torrential rain brought flooding and landslides and about 550 houses were flooded. Air traffic and rail services were paralysed. Three people were killed, three were reported missing and another 11 were injured.

At the time when Roger was intensifying and accelerating toward Japan, a tropical depression formed about 1 700 km northwest of Wake Island on 26 August. It moved east-northeastwards and became a tropical storm (8918) the next day. However, it failed to maintain its strength and soon dissipated about 1 550 km north-northwest of Wake Island that evening.

Six tropical cyclones occurred over the western North Pacific and the South China Sea in September. Sarah (8919) was the first to form on 6 September. It moved westwards after developing into a tropical depression about 860 km north-northwest of Guam. Sarah intensified to a tropical storm the next morning and turned west-northwestwards during the day. It became a severe tropical storm while turning southwestwards on 8 September. Sarah drifted south and remained slow-moving to the east of northern Luzon the next day. It then took on a northward course that evening and attained typhoon intensity on 10 September. Turning westwards on 11 September, Sarah made landfall over Taiwan about 190 km south of Taibei that night. It weakened to a severe tropical storm and moved along the east coast of Taiwan. Sarah entered the Taiwan Strait during the night of 12 September and continued to weaken as it approached the coast of eastern China. It made landfall over Zhejiang about 110 km south-southwest of Wenzhou the following afternoon and dissipated inland soon afterwards.

Rain associated with Sarah triggered off floods and landslides in the northern part of the Philippines, leaving 31 people dead. Over 200 000 people had to flee their homes. Rice and tobacco fields were ruined. Three bridges were destroyed by rampaging waters. The total damage in the Philippines was estimated to be at least 38 million pesos. In Taiwan, 19 people were killed while 14 others were reported missing. About 40 people were injured. A 12 000-tonne freighter, 'Lung Hao', broke in half after strong winds drove it away from Hualian harbour. Landslides and flooding triggered by heavy rain damaged bridges, roads and railways on the island. Electricity supply was interrupted and transportation was paralysed. Extensive agricultural areas were inundated. There were 28 houses destroyed and 41 houses damaged. Total loss in agriculture and forestry was estimated at about US$39 million.

Tip (8920) formed as a tropical depression about 1 200 km northeast of Guam on 9 September and moved north-northeastwards at a speed of over 40 km/h initially. It turned northwestwards that evening and intensified to a tropical storm the next day. After slowing down later on 10 September, Tip moved northwards the next day. It then gradually turned eastwards on 12 September and weakened to an area of low pressure about 2 300 km east of Tokyo early on 14 September.

As Tip veered away to the east, another disturbance to its southwest developed into a tropical depression named Vera (8921) about 510 km north-northwest of Guam on 12 September. It quickly intensified to a tropical storm and moved steadily west-northwestwards. Vera reached severe tropical storm intensity on the night of 13 September but struggled to maintain its strength over the next couple of days. After entering the East China Sea early on 15 September, Vera moved northwestwards towards Zhejiang. It made landfall about 250 km south-southeast of Hangzhou as a tropical storm that evening. As Vera moved further inland, it weakened to an area of low pressure about 90 km south of Hangzhou early on 16 September.

Zhejiang suffered severe damage with a death toll of 162. Another 354 people were reported missing while 692 people were injured. Gale force winds and rainstorms blew down power and telephone lines and breached dykes and dams. About 46 000 houses collapsed and 347 000 hectares of rice, orange and cotton fields were inundated. Another 16 000 hectares of crops were also washed out. In the scenic city of Hangzhou, the streets were flooded and hundreds of trees were blown down. Property losses in Zhejiang were estimated at 1.3 billion RMB. The remnant of Vera also affected the coastal areas of Jiangsu.

Wayne (8922) formed near the Ryukyu Islands about 370 km southwest of Okinawa early on 18 September and moved northwards initially. It intensified rapidly to a severe tropical storm that evening and tracked northeastwards. Wayne intensified further to a typhoon on 19 September and crossed the southern tip of Kyushu early that afternoon. It then weakened to a severe tropical storm the same evening and accelerated northeastwards. Wayne skirted the south coast of Honshu during the night and merged with an extratropical cyclone the following day.

In Japan, three people were killed and another person was reported missing. Four houses and four bridges were damaged while 4 000 houses were flooded. There were 166 reports of landslides in western Japan. Railway service in Tokyo was also interrupted due to heavy rain.

Angela (8923) developed as a tropical depression about 450 km north-northeast of Yap on 29 September. It moved north-northwestwards and turned to the west-northwest on 1 October. At the same time, Angela strengthened rapidly to a typhoon about 1 810 km east of Manila and maintained its intensity as it adopted a westward track towards the Philippines. It skirted along the north coast of Luzon early on 6 October and entered the South China Sea later that day. Staying on a generally westward course, Angela crossed the northern part of the South China Sea and landed over northern Vietnam on 10 October. In northern Philippines, 118 people were killed and crops were severely damaged.

A day after the formation of Angela in the Pacific, Brian (8924) formed about 290 km south-southeast of Hong Kong on 30 September and soon intensified to a tropical storm. It traversed the northern part of the South China Sea while Angela was still making its way towards Luzon. Brian intensified to a severe tropical storm on 1 October and moved southwestwards. It reached typhoon intensity the next day while taking on a more westward

track. Its centre skirted along the south coast of Hainan Island that night. Brian then started to weaken as it moved across the southern part of Beibu Wan. It soon dissipated after making landfall over northern Vietnam later on 3 October. In Hainan, 40 people were killed and heavy rain caused severe damage on the island.

Contemporary with Angela and Brian was Colleen (8925) which developed on 2 October about 600 km east-southeast of Guam. From an initial west-northwestward movement, it gradually turned northwards that day while intensifying to a tropical storm. Colleen then adopted a generally north-northwestward track towards Iwo Jima on 3 October and became a severe tropical storm the next day. It reached typhoon intensity about 620 km south-southeast of Iwo Jima early on 6 October. After passing Iwo Jima later in the day, Colleen started to turn northwards and passed to the west of the Ogasawara Islands on 7 October. From then onwards, Colleen accelerated to the northeast and became extratropical on 8 October about 1 200 km northeast of Tokyo.

On the day when Colleen' became extratropical and while Angela was still traversing the South China Sea, another tropical depression named Dan (8926) developed over the western North Pacific about 240 km east-northeast of Yap. It moved westwards initially but turned more to the west-northwest on 9 October towards southern Luzon. Before striking land, it reached typhoon intensity when it was about 630 km east-southeast of Manila on 10 October. Dan swept across southern Luzon during the night of 10 October and weakened to a severe tropical storm. After entering the South China Sea, it turned to a westward track and re-gained typhoon intensity on the night of 11 October. After passing Xisha on 12 October, it reverted to a west-northwestward course and made landfall over northern Vietnam the following day. In the Philippines, 80 people were killed and losses from crop and property damage as well as industrial disruption ran to millions of US dollars. In Vietnam, 34 people were killed. In Hainan, the number of persons killed due to Angela, Brian and Dan totalled 63.

Soon after the dissipation of Dan, Elsie (8927) formed as a tropical depression on 14 October about 1 180 kilometres east of Manila. It remained slow-moving over the next couple of days while gradually gathering strength over the warm waters of the western North Pacific. By 16 October, it had intensified to a typhoon and started to move slowly west-northwestwards. After moving for a day to the west-southwest on 17 October, Elsie took on a course to the west and later west-northwest on 18 October. With maximum winds of about 195 km/h near its centre, Elsie struck Luzon on 19 October and emerged from the west coast just to the north of Baguio in the evening on a westward track. Its intensity was reduced due to interaction with the mountainous terrain of central Luzon. The weakening trend continued as Elsie made its way across the South China Sea. It became a severe tropical storm the next evening. After passing about 80 km to the north of Xisha early on 21 October, Elsie skirted the south coast of Hainan Island that night. By then, Elsie had degenerated into a tropical storm. It made landfall the following day over the coast of Vietnam about 350 km south-southeast of Hanoi and dissipated rapidly overland.

In the Philippines, 17 people were killed and another 65 were injured during the passage of Elsie. Over 320 000 people were left homeless with at least 5 000 houses destroyed or damaged. Toppled power lines caused disruption in electricity supply and fallen trees blocked many highways. There were also several reports of damage to marine vessels. The financial loss in crops was estimated to be in the region of US$0.35 million. In Hainan Island, no serious casualties were reported during the passage of Elsie. However, damage due to the successive passages of Brian, Angela, Dan and Elsie amounted to 1 900 million RMB.

While Elsie was heading towards the Vietnam coast on 22 October, an area of low pressure developed into Tropical Depression Forrest (8928) about 820 km southeast of Guam. It moved northwestwards and passed 160 km to the northeast of Guam on 24 October, by which time it had intensified to a tropical storm. Forrest attained typhoon intensity about 520 km northwest of Guam on 25 October and persisted along a northwestward track over the next couple of days. However, it started to turn north on 27 October and then accelerated northeastwards the following day over the Pacific to the south of Japan. Forrest weakened to a severe tropical storm on 28 October and became extratropical the next morning when it was about 550 km southeast of Tokyo.

Gay (8929) was the most disastrous tropical cyclone of the year. It was also the first ever tropical cyclone to form over the Gulf of Thailand. Gay originated from a disturbance which hovered over the southern part of the South China Sea towards the end of October. Cloud clusters associated with this disturbance became more organized as the system drifted westwards into the Gulf of Thailand. It eventually developed into a tropical depression about 740 km south-southeast of Bangkok on 1 November and drifted northwestwards initially. It intensified to a tropical storm the next day and reached typhoon strength on the evening of 3 November when it was about 400 km south of Bangkok. Gay then turned west-northwestwards at about 11 km/h, crossed the isthmus of southwestern Thailand on 4 November and moved into the Andaman Sea. After traversing the Andaman Islands on 6 November as a severe tropical storm, it re-gained typhoon intensity and eventually landed and dissipated over the east coast of India on 9 November.

Gay was also the first tropical cyclone of typhoon strength to inflict a direct hit upon Thailand. In the Gulf of Thailand, an American gas-drilling ship, 'Seacrest', capsized on 4 November and only six of the 97 crew on board survived. In southern Thailand, 458 people were killed, 645 people were reported missing, and 194 fishing boats were sunk. About 29 500 houses were damaged and some 275 000 hectares of rubber, coconut, palm and other plantation crops were also severely damaged. The total damage in Thailand was estimated to be about US$280 million.

Hunt (8930) formed as a tropical depression about 710 km west-northwest of Yap early on 17 November and moved westwards initially. It intensified to a severe tropical storm about 900 km east-southeast of Manila on 18

November while moving northwestwards. Hunt became a typhoon about 680 km east of Manila on 19 November and reverted to a westward track on 20 November. Before reaching Luzon, Hunt weakened to a severe tropical storm and turned northwestwards again. It made landfall over the eastern coast of Luzon about 110 km north-northeast of Manila early on 22 November and lost much of its organization due to interaction with the mountainous terrain. Upon encountering the strong northeast monsoon over the northern part of the South China Sea, Hunt weakened further and became a tropical depression about 260 km south of Dongsha Dao on 23 November. Hunt then turned west-southwestwards and degenerated into an area of low pressure about 280 km south-southwest of Dongsha Dao that afternoon. In the Philippines, Hunt left at least nine people dead and thousands homeless.

Irma (8931) formed as a tropical depression about 780 km east of Guam on 25 November and moved southwestwards at about 20 km/h. It intensified to a tropical storm about 400 km south of Guam on 27 November and turned west-northwestwards. Irma became a typhoon about 220 km north-northeast of Yap early on 29 November. It reached peak intensity on 30 November and slowed down to about 10 km/h. On 2 December, Irma recurved northeastwards about 1 050 km east of Manila. It weakened to a severe tropical storm on 3 December and accelerated to about 30 km/h. Irma further weakened to a tropical storm on 4 December and turned eastwards before dissipating about 490 km south-southwest of Iwo Jima that evening.

A short-lived tropical depression formed about 280 km north-northwest of Yap early on 8 December. It moved northwestwards initially at about 12 km/h but turned northeastwards later in the day. It dissipated the next morning about 450 km north of Yap.

The last tropical cyclone of the year was Typhoon Jack (8932). It developed as a tropical depression on 22 December about 1 400 km east-southeast of Guam. Jack moved northwestwards at about 16 km/h initially but slowed down to a speed of 12 km/h the next morning. It became a tropical storm about 760 km east-southeast of Guam on 23 December and intensified further to a typhoon about 590 km east of Guam the following day. Jack turned westwards during the night of 24 December, but then reverted to a northwesterly track on the morning of 25 December and reached its peak intensity that day. After making a loop on 26 December, Jack began to drift south-southwestwards on the next day. It weakened rapidly and degenerated into an area of low pressure about 310 km east-southeast of Guam by the evening.

Note: Casualties and damage figures were consolidated from press reports.

3. REPORTS ON TROPICAL CYCLONES AFFECTING HONG KONG IN 1989

(a) Typhoon Brenda (8903)

16-21 May 1989

The track of Typhoon Brenda is shown in Figure 4

Brenda was the first tropical cyclone to affect Hong Kong in 1989. It developed as a tropical depression early on 16 May about 1 220 km east-southeast of Manila and moved west-northwestwards steadily at about 25 km/h. Brenda then intensified to a tropical storm that evening. It made landfall over Samar in the Philippines early on 17 May and moved northwestwards across the central part of the Philippines. Brenda passed about 40 km south of Manila and entered the South China Sea that evening. In the Philippines, at least four vessels sank in stormy weather. Communications were also cut off and power was disrupted. According to press reports 50 people were killed or reported missing and over 5 000 were made homeless.

Over the South China Sea, Brenda slowed down to about 13 km/h and intensified into a severe tropical storm on the afternoon of 18 May. Brenda reached typhoon strength the next day when it was about 390 km south-southeast of Hong Kong. A ragged eye also developed. Brenda moved northwestwards steadily at about 16 km/h towards the coast of western Guangdong on the evening of 19 May. Wind speeds in excess of 100 km/h at about 110 km from the centre of Brenda were reported on the morning of 20 May. As it approached the coast it turned west-northwestwards and crossed Shangchuan Dao. Brenda then made landfall about 50 km east of Yangjiang early on 21 May. It weakened rapidly overland and dissipated about 60 km west-northwest of Yangjiang later that morning.

In Guangdong, heavy rain and squally showers caused severe flooding and landslides. About 1.42 million hectares of agricultural land were inundated. Over 1 000 houses were destroyed or damaged. Direct economic losses were put at 590 million RMB. According to press reports, 84 people were killed and several others were injured in western Guangdong. Macau was also affected by heavy rain and violent showers. The bridge to Taipa was temporarily closed.

In Hong Kong the Stand By Signal No. 1 was hoisted at 8.45 a.m. on 19 May when Severe Tropical Storm Brenda was centred about 600 km south-southeast of Hong Kong. Winds were light to moderate northeasterly at first. As Brenda moved closer to Hong Kong, local winds began to increase and the Strong Wind Signal No. 3 was hoisted at 9.45 p.m. that evening. At about the same time, Brenda intensified into a typhoon. The Northeasterly Gale or Storm Signal, No. 8 NE, was hoisted at 5.15 a.m. on 20 May and later replaced by No. 8 SE at 4.00 p.m. Stormy conditions buffeted the territory. Brenda came closest to Hong Kong at around 5 p.m. when it was about 130 km to the southwest. The lowest sea-level pressure of 995.3 hPa was recorded at the Royal Observatory two hours earlier. As Brenda moved away from Hong Kong, local winds gradually subsided. The Gale or Storm Signal was replaced by the Strong Wind Signal No. 3 at 11.15 p.m. on 20 May. After making landfall over western Guangdong, Brenda weakened rapidly. All signals were lowered in Hong Kong at 7.15 a.m. on 21 May. The maximum hourly mean and maximum gust peak speeds together with associated wind directions at various locations during the passage of Brenda were as follows:

Location	*Maximum mean hourly wind speed in km/h with direction in points*		*Maximum gust peak speed in km/h-with direction in points*	
Royal Observatory	E	54	ENE	103
H.K. Airport (SE)	ENE	62	NE	106
H.K. Airport (NW)	NNE	54	NNE	130
Waglan Island	E	94	ENE	128
Tate's Cairn	ENE	108	E	187
Cheung Chau	E	90	N	139
King's Park	ESE	43	E	117
Star Ferry	E	52	E	99
Green Island	NE	94	NE	153
Tai O	ESE	68	SE	143
Sha Tin	ENE	36	ESE	68
Chek Lap Kok	E	81	E	128
Lau Fau Shan	ENE	43	ESE	79
Ta Kwu Ling	ESE	41	ESE	94
Tuen Mun	SE	34	SE	92
Tai Mo Shan	SE	118	SE	166
Cheung Sha Wan	NNE	38	ENE	117
Tsing Yi	NE	45	ENE	92
Kwai Chung	ESE	51	ENE	90

When the Stand By Signal No. 1 was hoisted on 19 May, the weather in Hong Kong was cloudy with scattered showers. Conditions deteriorated progressively during the day when Brenda continued to move closer on a northwestward course. On 20 May, rainbands associated with Brenda brought periods of heavy rain and frequent squally showers. The stormy weather prevailed until the early morning of 21 May but isolated showers continued for the rest of the day. The weather improved on 22 May with some sunny periods in the afternoon. The daily amounts of rainfall recorded at selected locations were as follows:

Date	*Royal Observatory*	*Sek Kong*	*Happy Valley*	*Tai Mei Tuk*
	mm	mm	mm	mm
19 May	6.7	13.5	6.5	11.0
20 May	322.8	382.5	301.0	177.5
21 May	102.9	143.5	102.0	44.5
22 May	0.7	1.5	Nil	4.5
23 May	1.9	3.0	1.0	1.0
24 May	6.1	5.5	5.0	13.5
Total	441.1	549.5	415.5	252.0

The times and heights of the highest tides and maximum storm surges recorded at various locations in Hong Kong during the passage of Brenda are tabulated below:

Location	Highest tide above chart datum			Maximum storm surge above astronomical tide		
	Height (m)	Date	Time	Height (m)	Date	Time
Chi Ma Wan	2.75	20 May	9.32 a.m.	0.91	20 May	11.45 a.m.
Ko Lau Wan	2.73	20 May	9.29 a.m.	0.98	20 May	5.15 p.m.
Lok On Pai	2.72	20 May	9.37 a.m.	0.85	20 May	6.15 p.m.
Quarry Bay	2.79	20 May	8.28 a.m.	0.88	20 May	2.45 p.m.
Tai O	2.78	20 May	9.08 a.m.	0.82	20 May	6.45 p.m.
Tai Po Kau	2.74	20 May	10.08 a.m.	1.00	20 May	5.45 p.m.
Tamar	2.62	20 May	9.32 a.m.	0.64	20 May	4.00 p.m.
Tsim Bei Tsui	2.86	20 May	9.32 a.m.	1.09	20 May	8.15 p.m.

In Hong Kong, torrential rain associated with Brenda resulted in 100 cases of landslides and 118 floods. In Tsz Wan Shan, more than 20 tonnes of mud and rocks crashed down a hillside and struck three squatter huts, leaving two people dead. At Yuen Long, a mud slide broke open a l00-square-metre hole at Lam Kam Road. Flooding was most severe in the northwestern New Territories and 100 villagers had to be evacuated by boats in Au Tau, Yuen Long. Serious flooding also occurred in Nam Bin Wai and Ha Tsuen. About 130 hectares of fish ponds were flooded. The loss was estimated to be 250 tonnes, which was worth about HK$2.8 million. The affected areas included Sheung Shui, San Tin, Ngau Tam Mei, Kam Tin, Lok Ma Chau, Pak Nai and Yuen Long. In addition, about 190 hectares of farmland were inundated and huge livestock losses were incurred, including some 66 000 chickens, 6 000 ducks, 1 000 pigs and 1 300 pairs of pigeons. Damage to crops and livestock in Pat Heung, San Tin, Kam Tin, Ha Tsuen, Shap Pat Heung, Ping Shan, Tuen Mun, Ta Kwu Ling, Sha Tau Kok, Kwu Tung and Sheung Shui was estimated to be HK$6 million. Three people were killed inside a taxi in a traffic accident in squally showers in Clear Water Bay Road and a crewman was drowned when his tugboat capsized off Stonecutters Island. There were also reports of fallen trees and collapsed scaffoldings. A yacht used by the armed forces for adventure training exercises sank 120 km southwest of Hong Kong in heavy seas on 20 May after the crewmen were taken off the boat by a patrol vessel. At the airport, more than 100 flights were diverted, delayed or cancelled. Bus, tram, and ferry services were all suspended and jetfoil and high-speed ferry services to China and Macau were cancelled. During the passage of Brenda, six people were killed, one reported missing, 119 injured and 899 people made homeless.

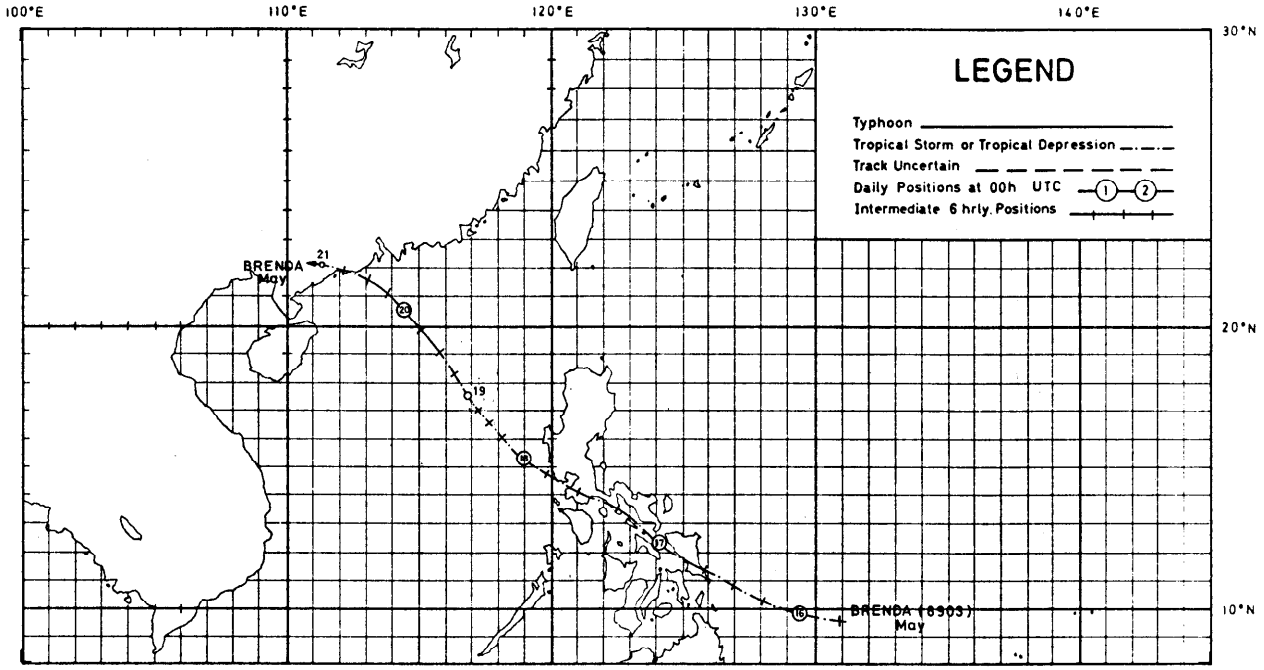

Figure 4. Track of Typhoon Brenda (8903): 16–21May 1989.

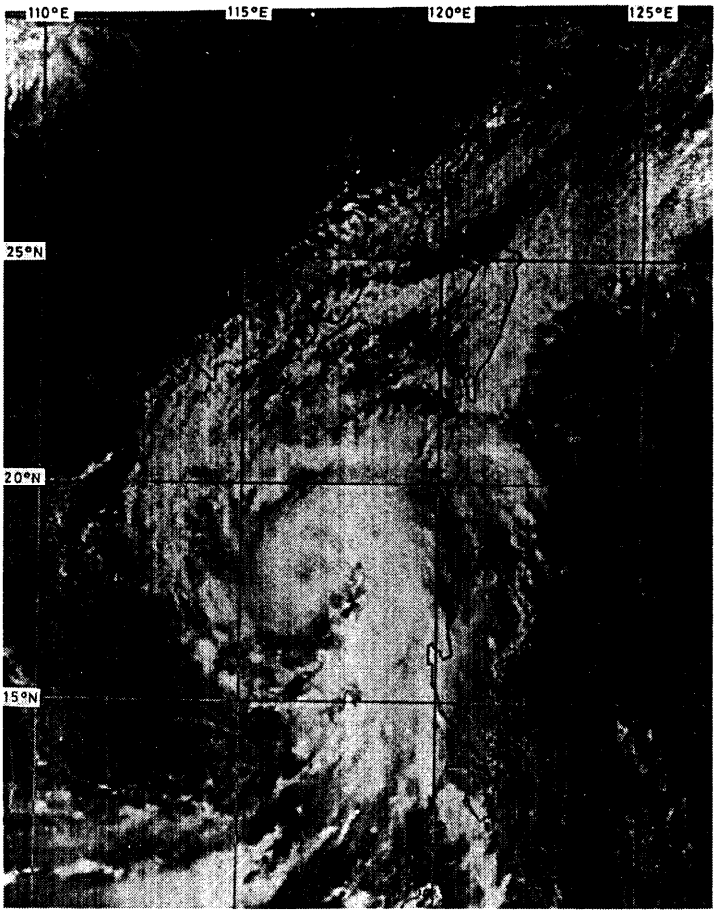

Figure 5. GMS-3 visible imagery of Severe Tropical Storm Brenda (8903) around 11.00 a.m. on 19 May 1989 showing the first of Brenda's rainbands passing over Hong Kong.

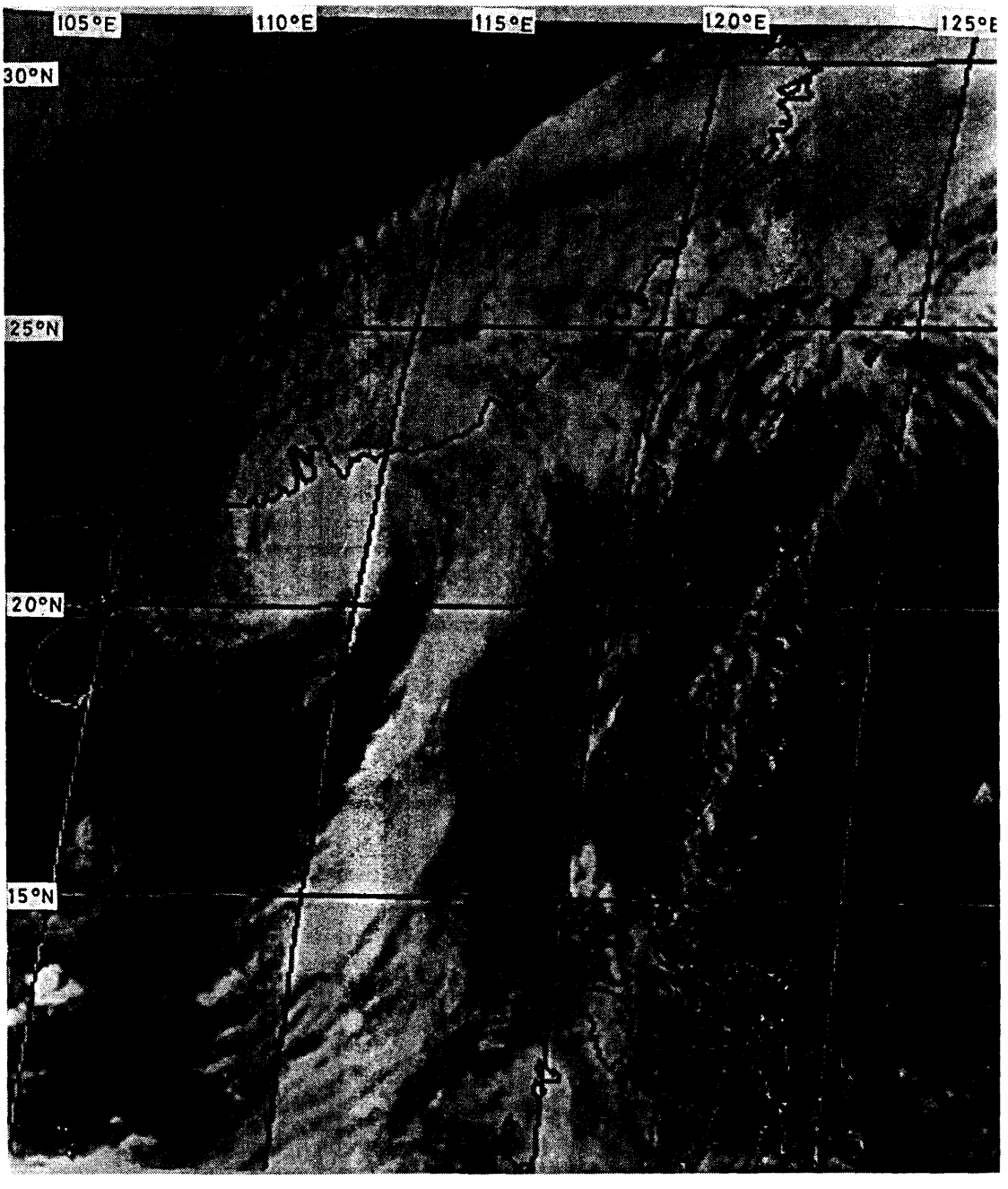

Figure 6. GMS-3 infra-red imagery of Typhoon Brenda (8903) around 2.00 p.m. on 20 May 1989 before its nearest approach to Hong Kong.

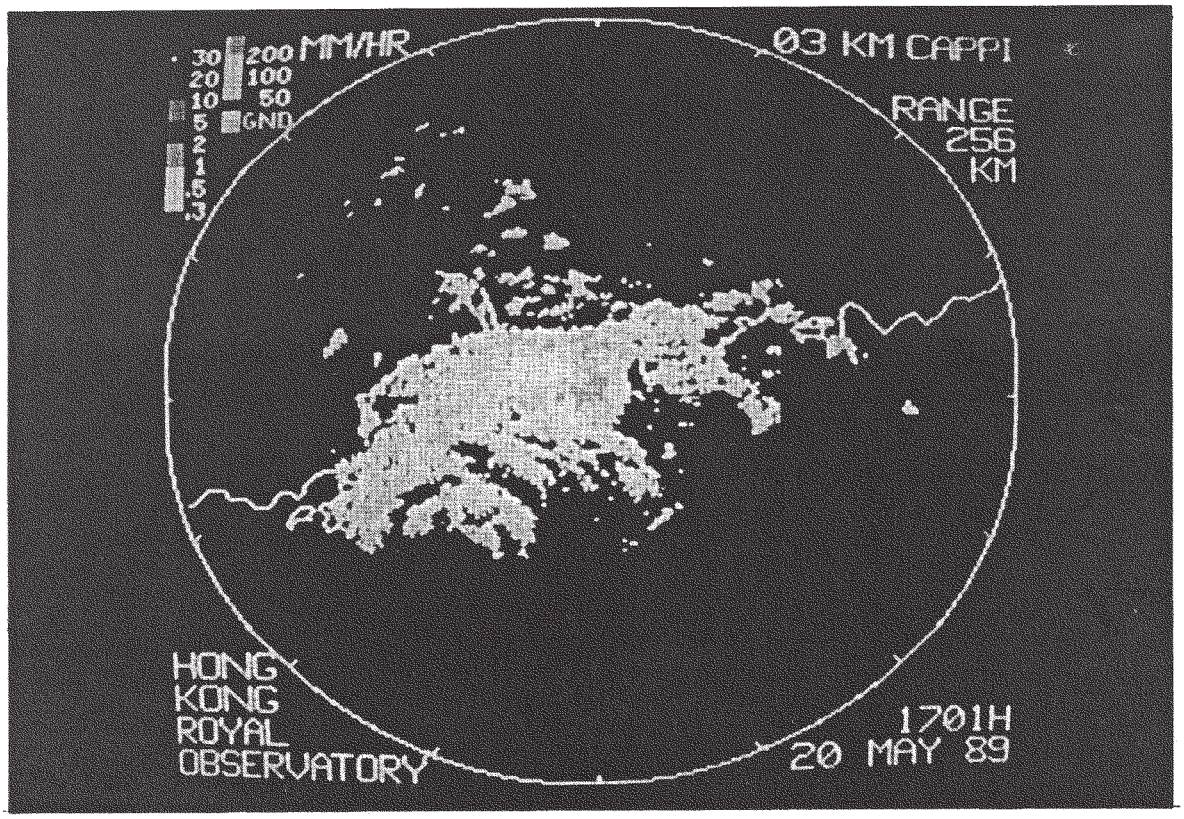

Figure 7. **Radar display of the rain echoes of Typhoon Brenda (8903) at 5.01 p.m. on 20 May 1989.**

Figure 8. **Flooding of road in Au Tau, Yuen Long on 21 May 1989 (by courtesy of Sing Tao Ltd.).**

Figure 9. **Flooding of road in Yuen Long on 21 May 1989 (by courtesy of South China Morning Post, Ltd.).**

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Figure 10. **Mud slide opened up a large hole at Lam Kam Road (by courtesy of South China Morning Post, Ltd.).**

Figure 11. Landslide in Tsz Wan Shan destroyed three huts on 21 May 1989 (by courtesy of the Hong Kong Standard).

Figure 12. Another scene of landslide in Tsz Wan Shan (by courtesy of Oriental Daily News).

(b) Typhoon Dot (8905)

5-12 June 1989

The track of Typhoon Dot is shown in Figure 13

Dot developed as a tropical depression about 1 000 km east-southeast of Manila on the afternoon of 5 June and moved west-northwestwards at about 19 km/h towards the Philippines. It intensified to a tropical storm the next morning and crossed the central Philippines rapidly. Upon entering the South China Sea on the morning of 7 June Dot turned northwestwards. Early on 8 June it slowed down to about 16 km/h while curving towards the west-northwest and intensified to a severe tropical storm. Dot reached typhoon intensity when it was about 400 km east-southeast of Xisha on the afternoon of 8 June. The centre of Dot passed about 30 km north-northeast of Xisha the following afternoon. Dot traversed southern Hainan on the morning of 10 June and weakened to a severe tropical storm. When Dot entered Beibu Wan that evening, it turned north-northwestwards. It finally made landfall as a tropical storm over northern Vietnam near Haiphong on the afternoon of 11 June. Over land, Dot moved northwestwards and dissipated about 70 km northeast of Hanoi that evening.

According to press reports, at least two people were killed and one was reported missing in Hainan Province. About 1 400 houses collapsed and 60 000 houses were damaged. Torrential rain brought damage to over 50 000 hectares of crops which included 30 000 hectares of rice paddy fields, 10 400 hectares of groundnuts and sesame, 6 500 hectares of sugar-cane, 1 900 hectares of rubber trees, 3 000 lumber trees, and 6 500 hectares of other crops. There were also reports of damaged dams and weirs. The total damage was estimated to be about 170 million RMB.

The coastal regions of Guangxi were affected by gale force winds and heavy rain. Over 300 houses collapsed and eight people were injured. Over 1 000 hectares of corn and sugar-cane were affected. However, heavy rain also eased the drought situation in Guangxi.

In Vietnam three people were killed. About 7 000 hectares of rice fields and 34 000 hectares of the winter-spring crops were flooded. Hanoi was flooded by torrential rain, with streets submerged under 50 to 70 cm of water. Electricity was cut off. Haiphong also suffered widespread property damage.

In Hong Kong, the Stand By Signal No. 1 was hoisted at 3.00 p.m. on 8 June when Typhoon Dot was centred about 750 km south-southeast of Hong Kong. Winds were moderate easterly at first but became fresh the next day. As Dot moved closer to Hong Kong, local winds continued to increase. The Strong Wind Signal No. 3 was hoisted at 7.00 p.m. on 9 June. Dot came closest to Hong Kong at around 8 p.m. when the centre passed about 600 km to the south-southwest. The lowest sea-level pressure of 1 002.7 hPa was recorded three hours earlier. Strong winds affected offshore areas on the morning of 10 June. As Dot moved further away, all signals were lowered at 12.15 p.m. on 10 June when Dot was about 640 km southwest of Hong Kong. The maximum hourly mean and maximum gust peak speeds together with associated wind directions at various locations during the passage of Dot were as follows:

Location	*Maximum mean hourly wind speed in km/h with direction in points*		*Maximum gust peak speed in km/h with direction in points*	
Royal Observatory	E	30	E	63
H.K. Airport (SE)	E	40	E	75
H.K. Airport (NW)	E	31	E	94
Waglan Island	E	45	E	79
Tate's Cairn	E	54	E	95
Cheung Chau	E	47	E	75
King's Park	ESE	30	ESE	70
Star Ferry	ESE	40	ESE	68
Green Island	ENE & E	45	E	82
Tai O	ESE	52	ESE	99
Sha Tin	E	20	ESE	41
Chek Lap Kok	E	59	ESE	83
Lau Fau Shan	E	30	E	54
Ta Kwu Ling	ESE	25	E	58
Tuen Mun	ENE	20	NE	56
Tai Mo Shan	ESE	79	ESE	110
Tamar	NE	22	ENE	58
Cheung Sha Wan	ENE	20	ENE	56
Tsing Yi	ESE	27	ESE	52
Kwai Chung	E	27	E	56

When the Stand By Signal No. 1 was hoisted on the afternoon of 8 June, the weather in Hong Kong was fine and hot. Fine weather prevailed the next day before conditions turned cloudy with isolated showers in the evening. Thundery showers occurred on the morning of 10 June. Weather gradually improved the next day and it became generally fine on 13 June. The daily amounts of rainfall recorded at selected locations were as follows:

Date	*Royal Observatory*	*Tai Mei Tuk*	*Fading*	*Kwun Tong*
	mm	mm	mm	mm
8 June	Trace	Nil	Nil	Nil
9 June	Nil	Nil	Nil	Nil
10 June	5.5	4.5	35.0	8.0
11 June	7.1	25.0	12.0	24.0
12 June	5.0	45.5	4.5	1.5
13 June	Nil	Nil	Nil	Nil
Total	17.6	75.0	51.5	39.5

The times and heights of the highest tides and maximum storm surges recorded at various locations in Hong Kong during the passage of Dot are tabulated below:

Location	Highest tide above chart datum			Maximum storm surge above astronomical tide		
	Height (m)	Date	Time	Height (m)	Date	Time
Chi Ma Wan	2.22	8 June	11.51 a.m.	0.25	9 June	10.30 p.m.
Ko Lau Wan	2.24	8 June	9.21 a.m.	0.51	9 June	9.30 a.m.
Lok On Pai	2.32	8 June	11.54 a.m.	0.20	9 June	mid-night
Quarry Bay	2.24	8 June	10.33 a.m.	0.22	10 June	11.30 a.m.
Tai O	2.26	8 June	11.51 a.m.	0.21	10 June	12.15 p.m.
Tai Po Kau	2.22	8 June	9.03 a.m.	0.48	9 June	8.15 p.m.
Tamar	2.14	8 June	10.27 a.m.	0.09	10 June	12.00 noon
Tsim Bei Tsui	2.58	8 June	12.04 p.m.	0.47	9 June	1.15 a.m.

There were no reports of damage in Hong Kong.

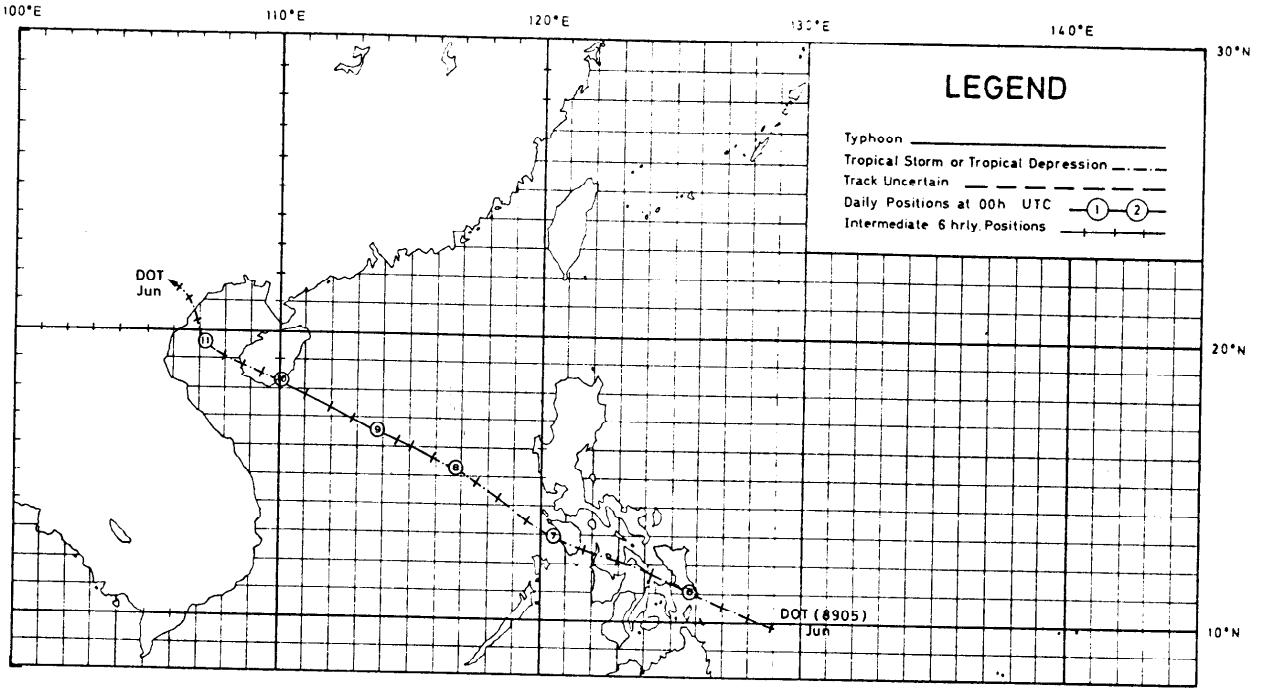

Figure 13. Track of Typhoon Dot (8905): 5–12 June 1989.

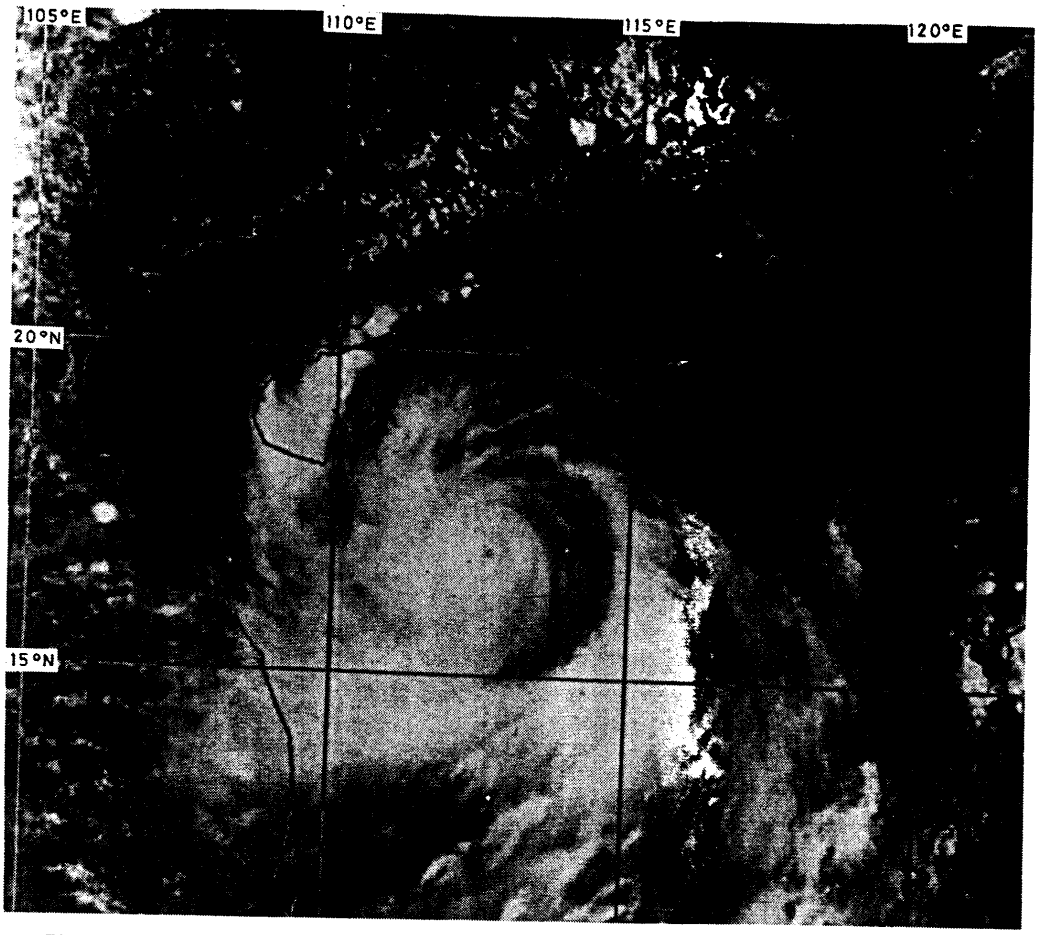

Figure 14. GMS-3 visible imagery of Typhoon Dot (8905) with a small eye around 2.00 p.m. on 9 June 1989.

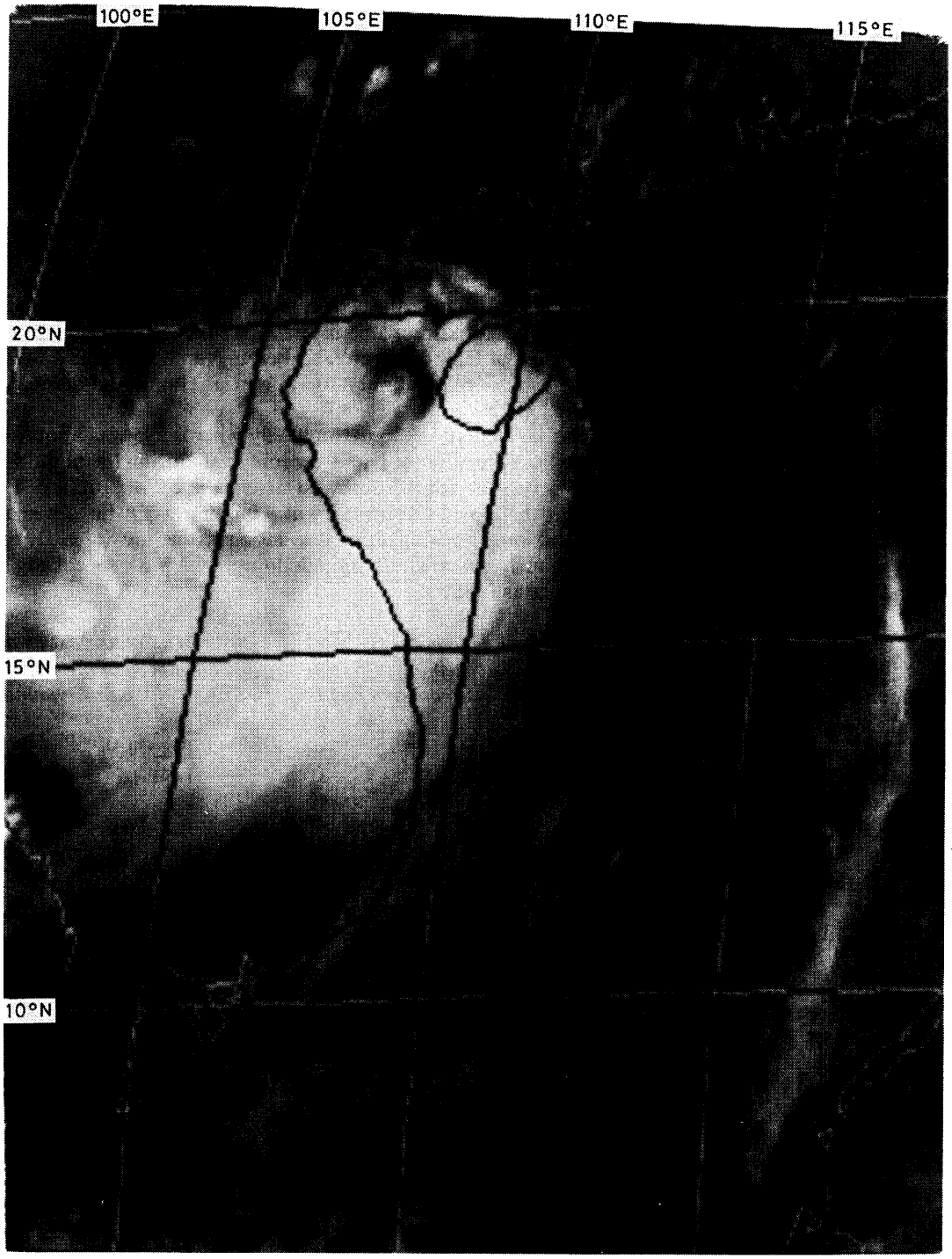

Figure 15. GMS-3 infra-red imagery of Severe Tropical Storm Dot (8905) over Beibu Wan around 2.00 a.m. on 11 June 1989 when torrential rain occurred over southern Hainan.

(c) Severe Tropical Storm Faye (8907)

7-11 July 1989

The track of Severe Tropical Storm Faye is shown in Figure 16

Faye developed as a tropical depression over the western North Pacific about 830 km east-northeast of Manila on 7 July. It moved westwards at about 13 km/h initially and intensified to a severe tropical storm on the afternoon of 8 July about 360 km northeast of Manila. Faye crossed northern Luzon that evening at a speed of about 36 km/h. Heavy rain occurred in 11 provinces in the northern part of the Philippines. Over land, Faye weakened to a tropical storm before it entered the South China Sea early on 9 July. It slowed down in the evening and turned west-northwestwards. Over the South China Sea, most of the rainbands associated with Faye were confined to the southwest of its centre and not much rain fell in Hong Kong. Faye made landfall over Hainan around midnight of 10 July. In Hainan, some tropical crops like pepper, sugar-cane, coffee and vegetables were ruined, but the damage was not severe. Telecommunications were also interrupted. Faye weakened further to a tropical depression and passed about 20 km south-southwest of Haikou. It crossed Beibu Wan on a northwestward track on 11 July. Faye finally made landfall over northern Vietnam about 170 km east of Hanoi and dissipated inland soon after.

In Hong Kong the Stand By Signal No. 1 was hoisted at 3.50 p.m. on 9 July when Faye was about 620 km to the south-southeast. Winds were moderate easterly in the afternoon and became fresh during the night. Faye came closest to Hong Kong when it was about 400 km to the south-southwest around noon on 10 July. The lowest sea-level pressure of 1 004.3 hPa was recorded at the Royal Observatory at 4.00 p.m. when Faye was about 510 km south-southwest of Hong Kong. With Faye no longer posing a threat to Hong Kong, the Stand By Signal No. 1 was lowered at the same time. The maximum hourly mean winds and maximum gust peak speeds together with associated wind directions at various locations were as follows:

Location	*Maximum mean hourly wind speed in km/h with direction in points*		*Maximum gust peak speed in km/h with direction in points*	
Royal Observatory	E	27	E	67
H.K. Airport (SE)	E	36	E & ESE	56
H.K. Airport (NW)	ESE	31	ENE	85
Waglan Island	E	49	E	88
Tate's Cairn	E	51	E & ESE	77
Cheung Chau	E & ESE	40	E	75
King's Park	ESE	23	ESE	63
Star Ferry	E	31	ESE	70
Green Island	ENE	45	SSE	87
Tai O	ESE	30	ESE	77
Sha Tin	E S E & E	19	S	45
Chek Lap Kok	E	45	ESE & SE	77
Lau Fau Shan	E	27	ESE	63
Ta Kwu Ling	ESE	20	SE	54
Tuen Mun	SE	20	SE	58
Tai Mo Shan	ENE	72	ENE	108
Tamar	ENE	19	ENE	56
Cheung Sha Wan	ENE	22	NE	54
Tsing Yi	SE	25	SE	52
Kwai Chung	ESE	22	ESE	52

The weather in Hong Kong was fine and hot on 9 July. It became cloudy with showers the next day as the outer rainbands of Faye began to affect the territory. The weather improved on 11 July with showers mainly in the morning. It became fine and sunny on 12 July. The daily amounts of rainfall recorded at some selected locations were as follows:

Date	*Royal Observatory*	*North Point*	*Tai Mei Tuk*	*High Island*
	mm	mm	mm	mm
9 July	Nil	Nil	Nil	Nil
10 July	23.8	37.0	12.5	5.5
11 July	7.4	8.0	9.0	2.0
12 July	Trace	Nil	Nil	Nil
Total	31.2	45.0	21.5	7.5

The times and heights of the highest tides and maximum storm surges recorded at various locations in Hong Kong during the passage of Faye are tabulated below:

Location	Highest tide above chart datum			Maximum storm surge above astronomical tide		
	Height (m)	Date	Time	Height (m)	Date	Time
Chi Ma Wan	1.88	10 July	12.32 p.m.	0.37	10 July	5.00 p.m.
Ko Lau Wan	1.87	10 July	10.22 a.m.	0.51	10 July	10.22 a.m.
Lok On Pai	1.87	10 July	12.59 p.m.	0.28	10 July	6.15 p.m.
Quarry Bay	1.84	9 July	11.00 a.m.	0.31	10 July	6.00 a.m.
Tai O	1.90	10 July	1.16 p.m.	0.20	10 July	0.15 a.m.
Tai Po Kau	1.88	10 July	10.55 a.m.	0.38	10 July	9.30 a.m.
Tamar	1.97	10 July	12.42 p.m.	0.44	10 July	4.00 a.m.
Tsim Bei Tsui	2.11	9 July	1.49 p.m.	0.40	10 July	2.15 a.m.
Waglan Island	1.85	10 July	11.48 a.m.	0.37	10 July	6.00 p.m.

There were no reports of damage and casualties in Hong Kong.

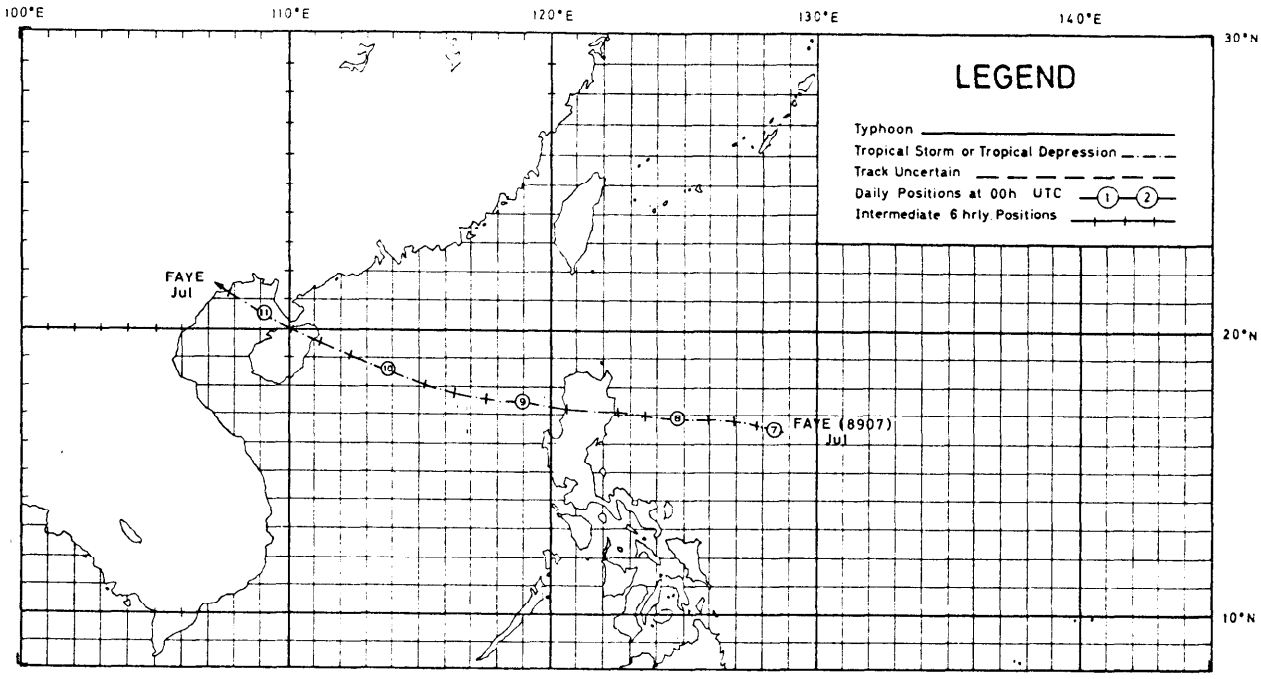

Figure 16. Track of Severe Tropical Storm Faye (8907): 7–11 July 1989.

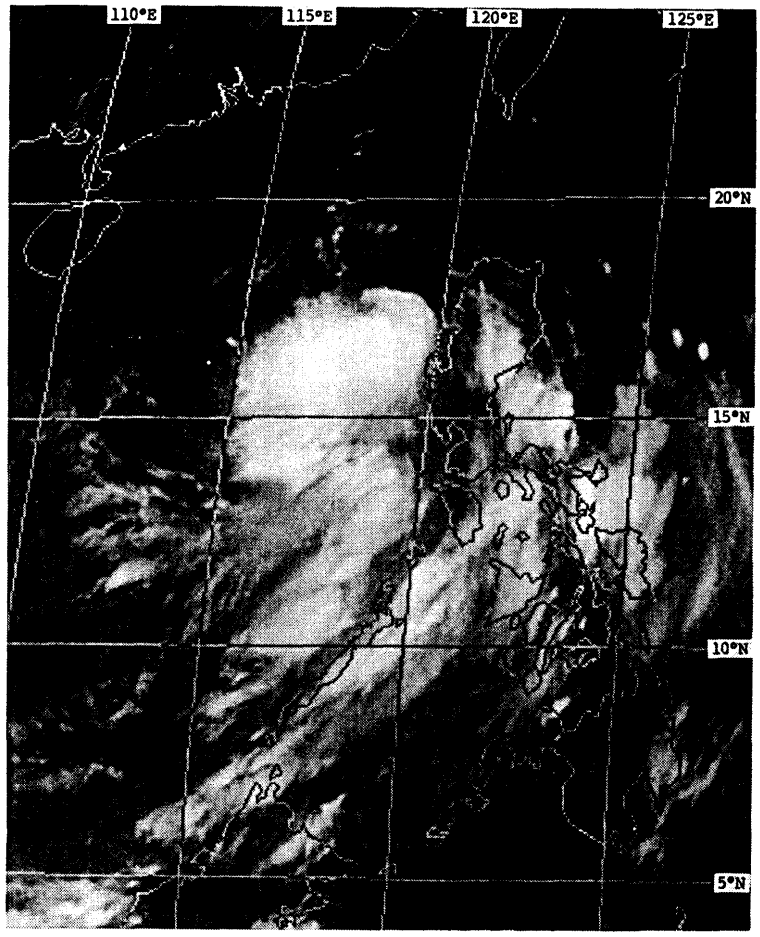

Figure 17. GMS-3 infra-red imagery taken around 8.00 a.m. on 9 July 1989 showing Tropical Storm Faye (8907) to the west of Luzon.

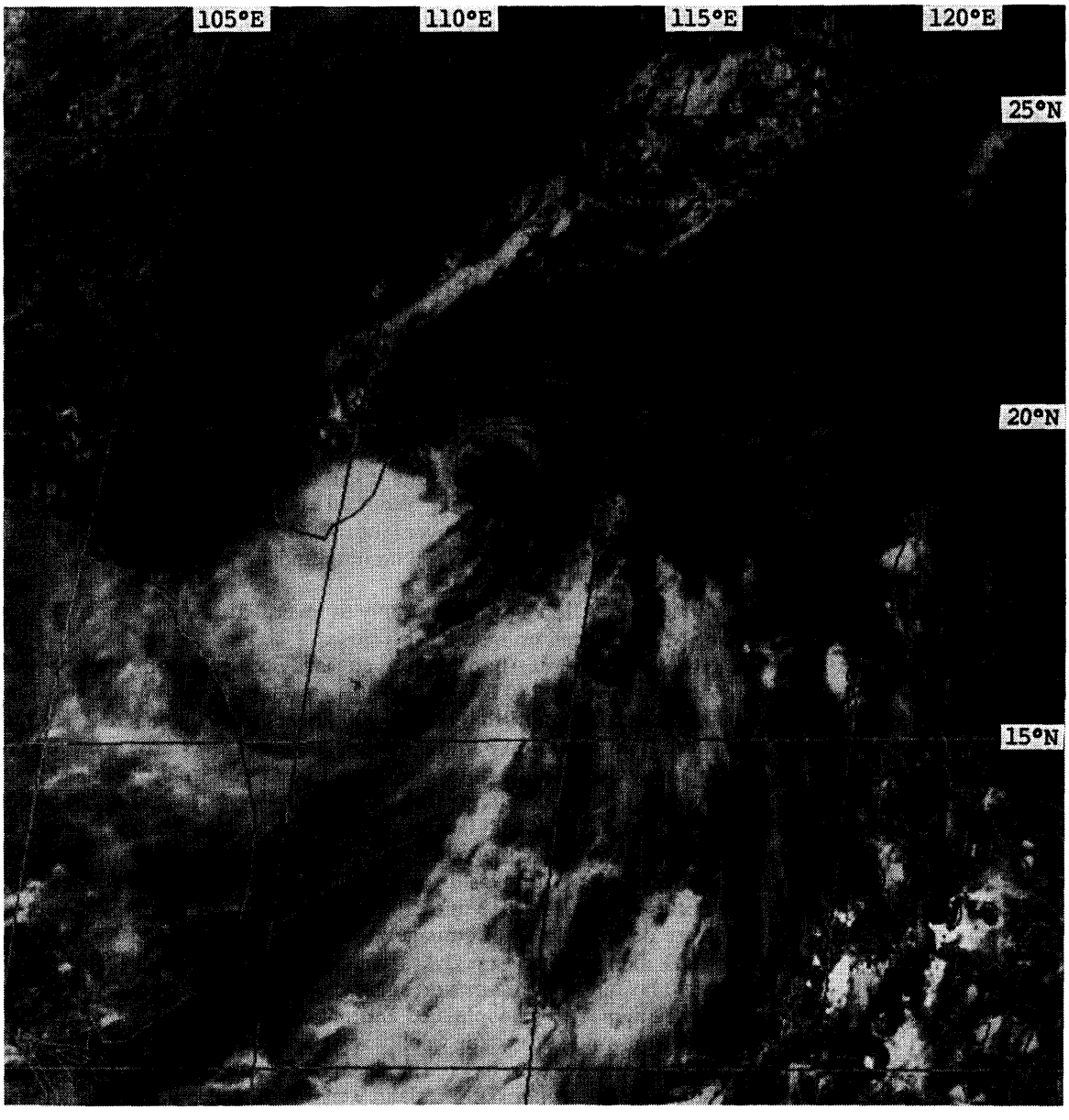

Figure 18. GMS-3 visible imagery of Tropical Storm Faye (8907) around 2.00 p.m. on 10 July 1989 showing generally weak convection except in the southwest quadrant.

(d) Typhoon Gordon (8908)

11-19 July 1989

The track of Typhoon Gordon is shown in Figure 19

Gordon was the most intense typhoon in 1989. The lowest estimated central pressure was 905 hPa and the highest maximum winds near the centre were in excess of 210 km/h. It formed as a tropical depression about 580 km north-northeast of Guam on 11 July. Initially Gordon moved westwards at about 23 km/h. It then turned west-southwestwards and intensified gradually to a severe tropical storm on 13 July. Gordon attained typhoon intensity on the morning of 14 July when it was about 1 130 km east-northeast of Manila. It turned westwards and then west-northwestwards towards northern Luzon. Gordon reached its maximum intensity on the morning of 15 July. It made landfall over northern Luzon during the early hours of 16 July while maintaining its intensity. However, Gordon weakened considerably over land with the estimated central pressure rising by 40 hPa in 6 hours.

According to press reports, the death toll in the Philippines was 41 and 30 people were reported missing. Torrential rain resulted in flooding and landslides in northern Luzon. Power and communication cables were blown down and seven provinces were blacked out. Numerous houses, schools and bridges were destroyed. At least 100 000 people had to seek refuge in typhoon shelters. The damage to crops and infrastructure totalled 638.4 million pesos.

Gordon entered the South China Sea at around mid-day on 16 July. It traversed the northern part of the South China Sea and made landfall over the western coast of Guangdong about 70 km west-southwest of Yangjiang on the afternoon of 18 July. It weakened to a severe tropical storm over land. As Gordon moved further inland into Guangxi, it continued to weaken rapidly. Gordon passed close to Nanning and finally dissipated about 70 km west-northwest of the city on the morning of 19 July.

In Macau, about half of the territory was flooded and electricity supply to several areas was cut off. Water level near the sea-front rose by 1.5 metres. The Macau-Taipa bridge was also closed.

In Guangdong Province, the damage was very severe. Abnormally high tides occurred along the coast. About 155 kilometres of coastal dykes were destroyed while 140 000 hectares of farmland were inundated, including 30 000 hectares of paddy rice and 3 000 hectares of pond fish. Over 80 000 houses were damaged. The death toll was 17 with 13 reported missing and more than 100 people injured. Yangjiang was the hardest hit area. Eight people were killed and 84 people were injured. Over 46 000 houses were destroyed or damaged while 252 fishing boats capsized. Twenty-three bridges collapsed and 252 kilometres of highway were washed away. About 95 kilometres of coastal dykes were also destroyed. Over 44 000 hectares of sugar-cane, rice paddies, fruits and fish ponds were flooded and 144 cattle died. The estimated damage in Yangjiang amounted to 120 million RMB. In Zhaoqing, eight other people died. In Zhuhai, one person was drowned and hundreds of houses collapsed. Over 1 000 hectares of rice paddies, 13 000 hectares of sugar-cane and 2 000 hectares of fish ponds were inundated. About 15 kilometres of coastal dykes were destroyed. Total damage in Zhuhai was estimated to be around 50 million RMB. In Zhongshan, about 1 600 metres of coastal dykes were destroyed. Nearly 4 500 hectares of farmland were inundated while about 1 000 hectares of banana and sugar-cane were destroyed. Over one million catties of pond fish were washed away. In Jiangmen two people died and one was reported missing. About 6 500 hectares of rice paddies, 10 000 hectares of fruits and sugar-cane were destroyed. About 90 houses were destroyed or damaged and the total damage was estimated to be over 100 million RMB. In the Guangzhou area, two kilometres of dykes were destroyed and about 4 000 hectares of farmland were inundated.

Gordon weakened considerably as it moved into Guangxi. Heavy rain in the area caused only some damage but was beneficial to the farmers.

In Hong Kong the Stand By Signal No. 1 was hoisted at 10.00 a.m. on 16 July when Gordon was about 830 km to the southeast. Winds were light and mainly from the west at first but became easterly in the evening. As Gordon moved closer to the south China coast, the Strong Wind Signal No. 3 was hoisted at 4.45 a.m. on 17 July. Winds began to strengthen after dawn. The No. 8 NE Gale or Storm Signal was hoisted at 5.30 p.m. on the same day and was replaced by the No. 8 SE at 3.00 a.m. the next day. Gale force winds affected the territory on the evening of 17 July and early next morning. Gordon came closest to Hong Kong around 3 a.m. on 18 July when it was about 190 km to the south-southwest. At the same time, the Royal Observatory recorded a minimum sea-level pressure of 990.6 hPa.

As Gordon continued its track west-northwestwards, winds in Hong Kong began to decrease. The Strong Wind Signal No. 3 replaced No. 8 SE at 9.10 a.m. on 18 July. Early that afternoon, Gordon made landfall over western Guangdong. As Gordon no longer posed a threat to Hong Kong, all signals were lowered at 2.00 p.m. During the passage of Gordon, mean winds of gale force and gusts reaching hurricane force were recorded in the territory. The maximum hourly mean and maximum gust peak speeds together with associated wind directions at various locations during the display of signals were as follows:

Location	*Maximum mean hourly wind speed in km/h with direction in points*		*Maximum gust peak speed in km/h with direction in points*	
Royal Observatory	ENE	51	ENE	115
H.K. Airport (SE)	E	58	E	112
H.K. Airport (NW)	E	49	NE	121
Waglan Island	ENE & E	90	E	126
Tate's Cairn	ESE	104	E	192
Cheung Chau	E	83	NE	124
King's Park	E	43	ENE	115
Star Ferry	E	56	E	101
Green Island	ENE	103	ENE	159
Tai O	ENE	58	E	118
Sha Tin	E	38	E	72
Chek Lap Kok	E	83	E	128
Lau Fau Shan	E	49	ENE	87
Ta Kwu Ling	ESE	40	E	96
Tuen Mun	SE	31	SE	103
Tai Mo Shan	E	118	E	182
Tamar	ENE	58	ENE	108
Cheung Sha Wan	NE	40	NE	112
Tsing Yi	NE	43	NE	106
Kwai Chung	E	43	ENE	90

When the Stand By Signal No. 1 was hoisted on 16 July, the weather was fine and hot. It was cloudy the next day with some showers in the morning. The weather deteriorated in the afternoon and showers were more frequent. Squally showers occurred on 18 July when Gordon was close to Hong Kong. With the dissipation of Gordon in Guangxi on 19 July, local weather gradually improved. Apart from some isolated showers, it became fine and sunny on 22 July.

The daily amounts of rainfall recorded at selected locations were as follows:

Date	*Royal Observatory*	*Central District*	*Sha Tin*	*Tuen Mun*
	mm	mm	mm	mm
16 July	Nil	Nil	Nil	Nil
17 July	11.5	13.5	16.5	10.5
18 July	119.7	178.0	133.0	48.5
19 July	Trace	1.5	Nil	Nil
20 July	0.5	Nil	Nil	Nil
21 July	Nil	Nil	Nil	Nil
Total	131.7	193.0	149.5	59.0

Gordon also brought abnormally high tides to the Pearl Estuary. The times and heights of the highest tides and maximum storm surges recorded at various locations in Hong Kong are tabulated as follows:

Location	Highest tide above chart datum			Maximum storm surge above astronomical tide		
	Height (m)	Date	Time	Height (m)	Date	Time
Chi Ma Wan	3.33	18 July	6.16 a.m.	1.16	18 July	0.30 a.m.
Ko Lau Wan	3.16	18 July	6.49 a.m.	1.26	18 July	3.30 a.m.
Lok On Pai	3.29	18 July	7.22 a.m.	0.98	18 July	2.45 a.m.
Quarry Bay	3.27	18 July	6.10 a.m.	1.20	18 July	3.24 a.m.
Tai O	3.50	18 July	7.19 a.m.	1.29	18 July	6.42 a.m.
Tai Po Kau	3.31	18 July	6.51 a.m.	1.36	18 July	3.15 a.m.
Tamar	3.23	18 July	6.56 a.m.	1.07	18 July	3.15 a.m.
Tsim Bei Tsui	3.73	18 July	8.16 a.m.	1.11	18 July	7.30 a.m.

In Hong Kong, a 15-year old girl was drowned while swimming in wavy sea on Lantau Island and an old woman was found dead in her flooded squatter hut at Tai O. In the same village nine senior residents had to be evacuated. Thirteen cases of flooding were reported, mostly in the outlying islands and the New Territories. The more severe ones occurred in Tai O where water level rose by more than one metre, and at Ping Ha Road in Yuen Long. Floodings in Lok Ma Chau and Shap Pat Heung destroyed some dykes and washed away pond fishes. However rainfall also helped the pond fish farmers because their ponds were short of fresh water prior to the passage of Gordon. Strong to gale force winds toppled scaffoldings and uprooted trees. In Ngau Chi Wan Village at Wong Tai Sin, an iron scaffolding fell on a stone hut. In Ho Man Tin, scaffolding fell from the roof of a building, damaging two parked cars. In Nanking Street, a car was also damaged by falling hoardings. In To Kwa Wan, three persons were injured by falling sign-boards. In Choi Hung, three persons were blown down by strong winds and were injured. In South Bay Road, one person was injured by a falling tree. Scaffoldings also fell in Pennington Street in Causeway Bay, Tin Kwong Road and Tsim Sha Tsui. On Clear Water Bay Road, a truck was overturned by strong winds. Altogether, 31 persons were injured by flying debris, falling scaffoldings and trees. Over 250 persons sought refuge in typhoon shelters. In the harbour, a barge ran aground off Shau Kei Wan and three boats sank at the Tai Lam marina. About 11 000 Vietnamese boat people had to be moved to safer accommodation. During the passage of Gordon, local ferries, buses, trams and ferry services to China and Macau were suspended. At the international airport, 24 incoming and 16 outgoing flights were delayed, 19 flights diverted to other places, and six incoming and seven outgoing flights were cancelled.

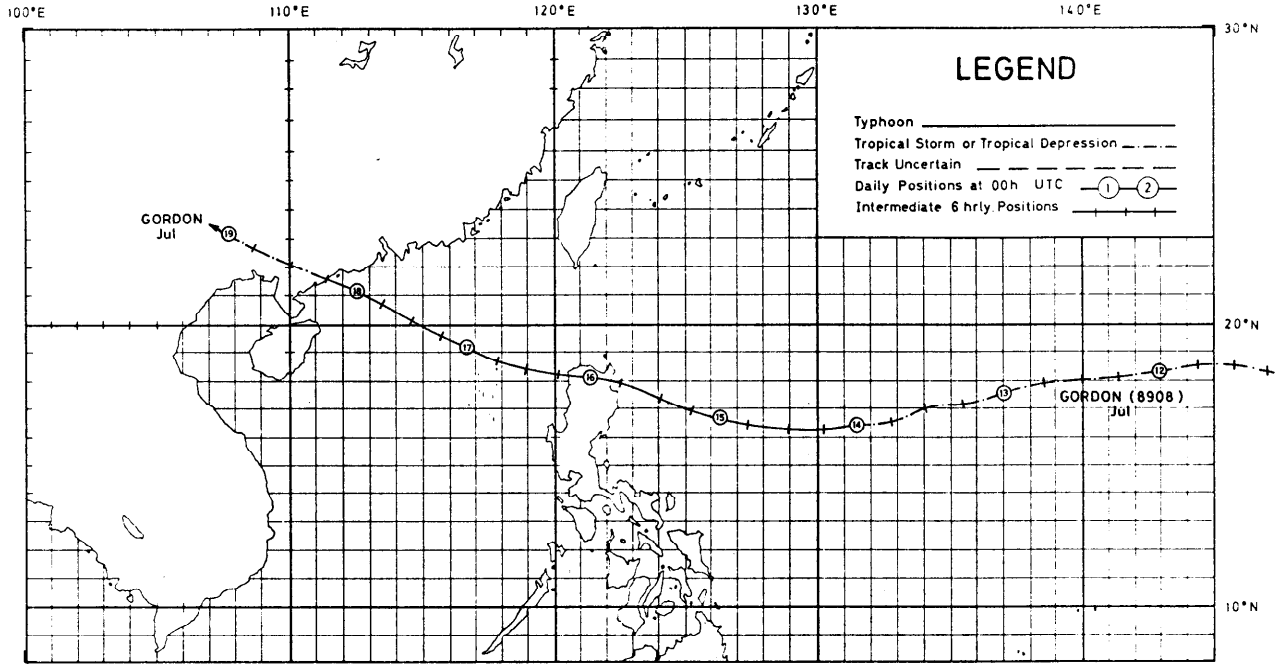

Figure 19. Track of Typhoon Gordon (8908): 11–19 July 1989.

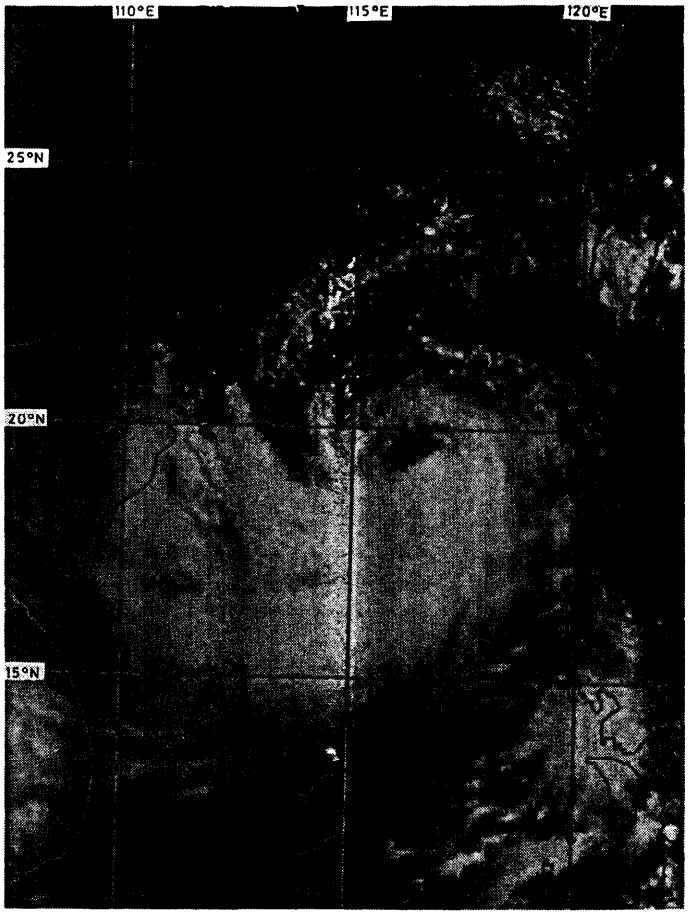

Figure 20. GMS-3 visible imagery of Typhoon Gordon (8908) around 11.00 a.m. on 17 July 1989 showing the first of Gordon's rainbands passing over Hong Kong.

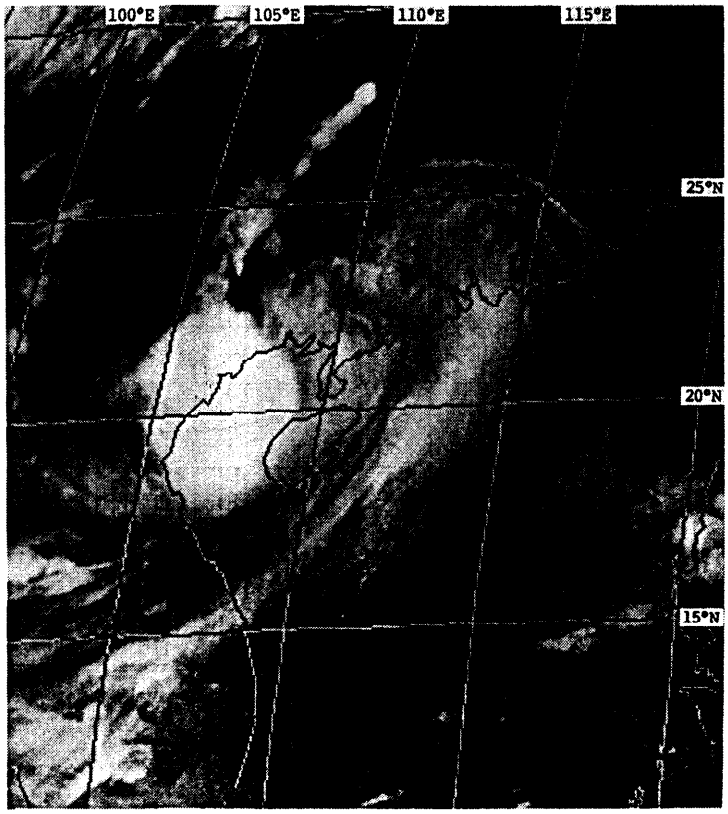

Figure 21. GMS-3 infra-red imagery around 8.00 p.m. on 18 July 1989 with the centre of Severe Tropical Storm Gordon (8908) just to the north of Leizhou Peninsula.

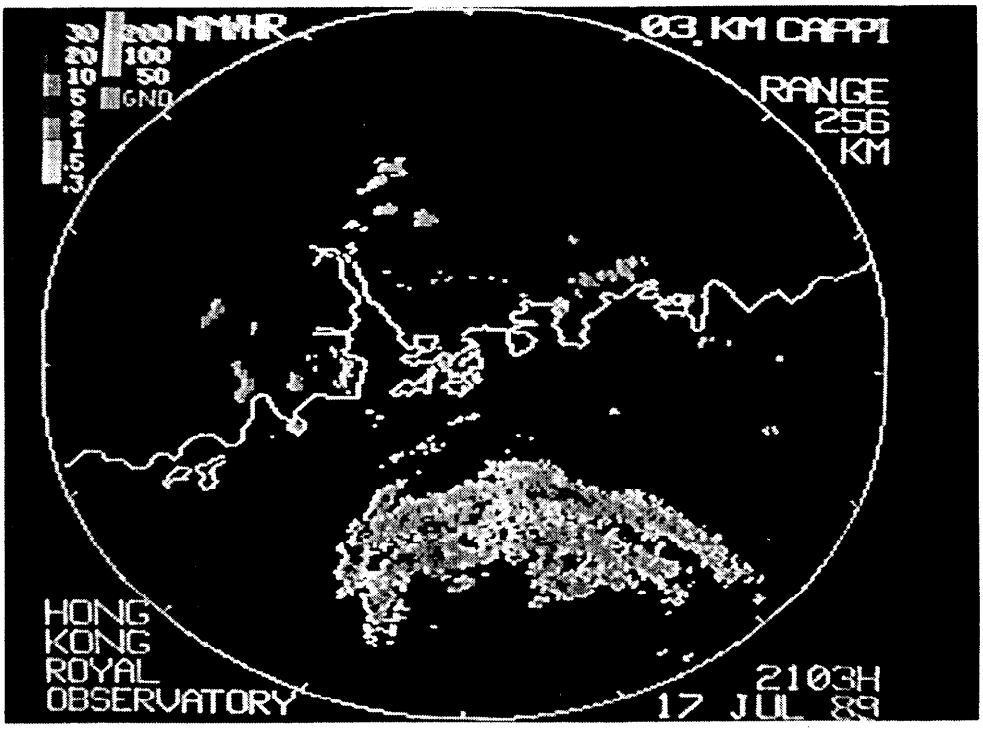

Figure 22. Radar display of the rainbands of Typhoon Gordon (8908) at 9.03 p.m. on 17 July 1989.

Figure 23. A truck was overturned by strong winds at Clear Water Bay Road (by courtesy of the Hong Kong Standard).

(e) Typhoon Brian (8924)

30 September-3 October 1989

The track of Typhoon Brian is shown in Figure 24

An area of low pressure formed to the west of Luzon on 28 September. It moved northwestwards and developed into a tropical depression about 290 km south-southeast of Hong Kong on 30 September. It became very slow-moving but continued to intensify to a tropical storm named Brian that evening. Brian began to move southwestwards steadily at about 25 km/h on the morning of 1 October and became a severe tropical storm that evening when it was about 370 km south of Hong Kong. It gradually turned westwards and attained typhoon intensity on 2 October about 230 km east of Yaxian, Hainan. A large eye was discernible on satellite imageries received at the Royal Observatory around that time. Typhoon Brian made landfall over Hainan about 30 km east of Yaxian that evening. It passed just south of the city after midnight and soon entered open waters again. It then changed its track west-northwestwards and weakened to a severe tropical storm. Brian made landfall over the northern part of Vietnam about 230 km south of Hanoi on the afternoon of 3 October and weakened rapidly to a tropical storm. As it moved further inland, it further weakened to an area of low pressure in Laos.

According to press reports, Brian caused severe flooding in Hainan. About 96 000 hectares of paddy rice were inundated. Forty people were killed and 529 were injured. About 15 900 houses collapsed and 169 000 were damaged. Over 25 million lumber trees and rubber trees were blown down. There were about 1 300 reports of damage of dams and hydro-electric stations and 63 damage reports of bridges. Other damage included 134 boats, 700 km of power cables and 2 100 km of telephone lines. The total damage was estimated to be about 837 million RMB. Off the coast of Hainan, a Hong Kong fishing vessel sank on the morning of 3 October. The area was searched but none of the seven crew members was found.

In Hong Kong, the Stand By Signal No. 1 was hoisted at 5.10 p.m. on 30 September when Brian was about 280 km south-southeast of Hong Kong. Winds were moderate northeasterly and became strong offshore the next day. Winds subsequently turned easterly that afternoon. As Brian continued to strengthen, the Strong Wind Signal No. 3 was hoisted at 3.45 p.m. on 1 October. Winds generally became strong with occasional gale force winds affecting the offshore areas in the evening. At the same time, a strong northeast monsoon was affecting southeast China. As the influence of Brian became less and the monsoon dominated, the Strong Wind Signal No. 3 was replaced by the Strong Monsoon Signal at noon on 2 October. Brian was closest to Hong Kong at around 8 a.m. on 1 October when it was about 270 km to the south-southeast. A minimum sea-level pressure of 1 007.1 hPa was recorded at the Royal Observatory at 4 a.m. and also at 5 a.m. the same day. The maximum hourly mean and maximum gust peak speeds together with associated wind directions at various locations during the display of tropical cyclone warning signals were as follows:

Location	*Maximum mean hourly wind speed in km/h with direction in points*		*Maximum gust peak speed in km/h with direction in points*	
Royal Observatory	*E*	*31*	E	*72*
H.K. Airport (SE)	*ENE*	*38*	*ENE*	*77*
H.K. Airport (NW)	*ENE*	30	*ENE*	90
Waglan Island	E	79	ESE	124
Tate's Cairn	ENE	65	ENE	115
Cheung Chau	NE	43	E	75
King's Park	ENE	22	ENE	79
Star Ferry	E	31	E	62
Green Island	ENE	58	ENE	79
Tai O	N	36	NE	64
Sha Tin	ESE & E	20	ENE	41
Chek Lap Kok	E	38	ENE	70
Lau Fau Shan	E	25	NNE	47
Ta Kwu Ling	E	20	E	45
Tuen Mun	NNE & NE	20	NE	52
Wong Chuk Hang	E	31	ENE	81
Tamar	ENE	34	ENE	68
Cheung Sha Wan	ENE	22	NNE	62
Tsing Yi	NE	30	NE	56

When the Stand By Signal No. 1 was hoisted on 30 September, the weather was cloudy with light rain. Rain stopped during the night of 2 October and the weather became cloudy with some sunny periods on the next day.

The daily amounts of rainfall recorded at selected locations were as follows:

Date	*Royal Observatory*	*Tai Mei Tuk*	*High Island*	*Causeway Bay*
	mm	mm	mm	mm
29 Sept	4.5	3.5	3.0	16.0
30 Sept	9.2	18.0	8.0	6.0
1 Oct	8.2	1.0	2.5	9.0
2 Oct	0.7	0.5	Nil	Nil
3 Oct	Nil	Nil	Nil	Nil
4 Oct	Nil	Nil	Nil	Nil
Total	22.6	23.0	13.5	31.0

The times and heights of the highest tides and maximum storm surges recorded at various locations in Hong Kong during the passage of Brian are tabulated below:

Location	Highest tide above chart datum			Maximum storm surge above astronomical tide		
	Height (m)	Date	Time	Height (m)	Date	Time
Chi Ma Wan	2.50	1 Oct	10.17 p.m.	0.60	2 Oct	0.50 a.m.
Lok On Pai	2.54	1 Oct	10.46 p.m.	0.51	2 Oct	0.56 a.m.
Quarry Bay	2.52	1 Oct	10.44 p.m.	0.48	2 Oct	4.55 a.m.
Tai O	2.53	1 Oct	10.56 p.m.	0.48	1 Oct	8.11 p.m.
Tai Po Kau	2.50	1 Oct	10.17 p.m.	0.53	2 Oct	10.19 a.m.
Tamar	2.50	2 Oct	10.50 p.m.	0.43	1 Oct	10.47 p.m.
Tsim Bei Tsui	2.64	2 Oct	11.58 p.m.	0.46	1 Oct	8.54 p.m.
Waglan Island	2.53	1 Oct	9.15 p.m.	0.62	2 Oct	6.00 a.m.

In Hong Kong, more than 20 vessels taking part in a harbour race capsized on 1 October. During the passage of Brian, there were no reports of damage or casualties in Hong Kong.

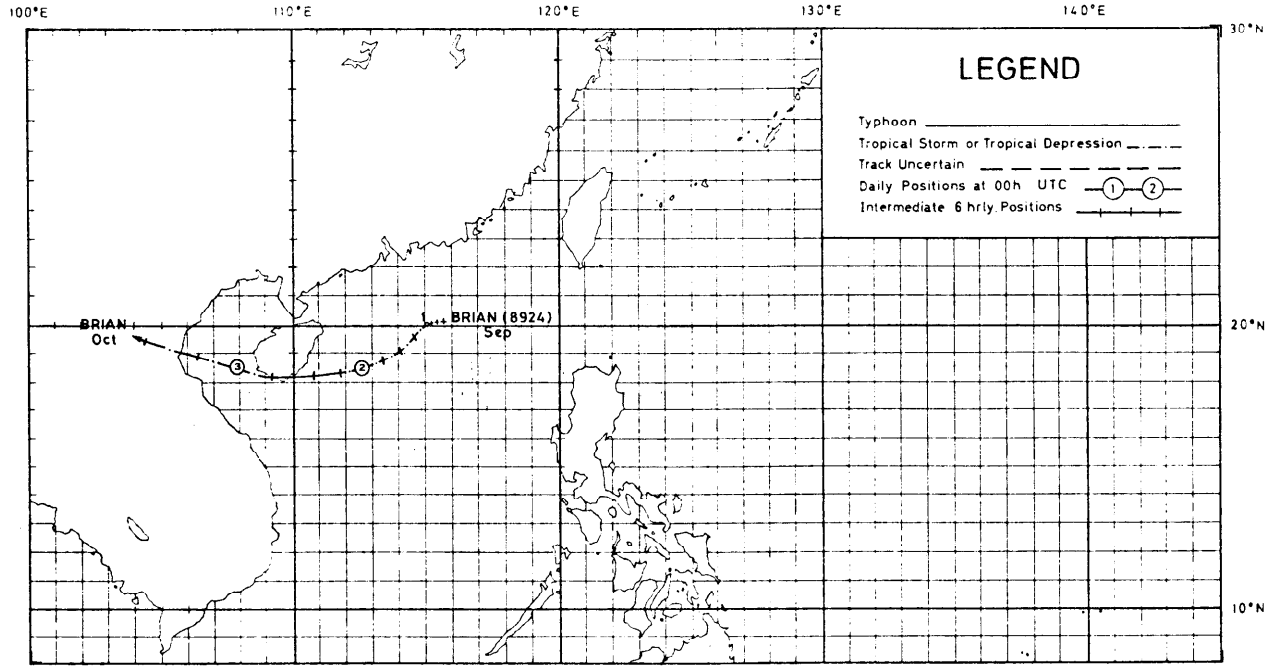

Figure 24. Track of Typhoon Brian (8924): 30 September–3 October 1989.

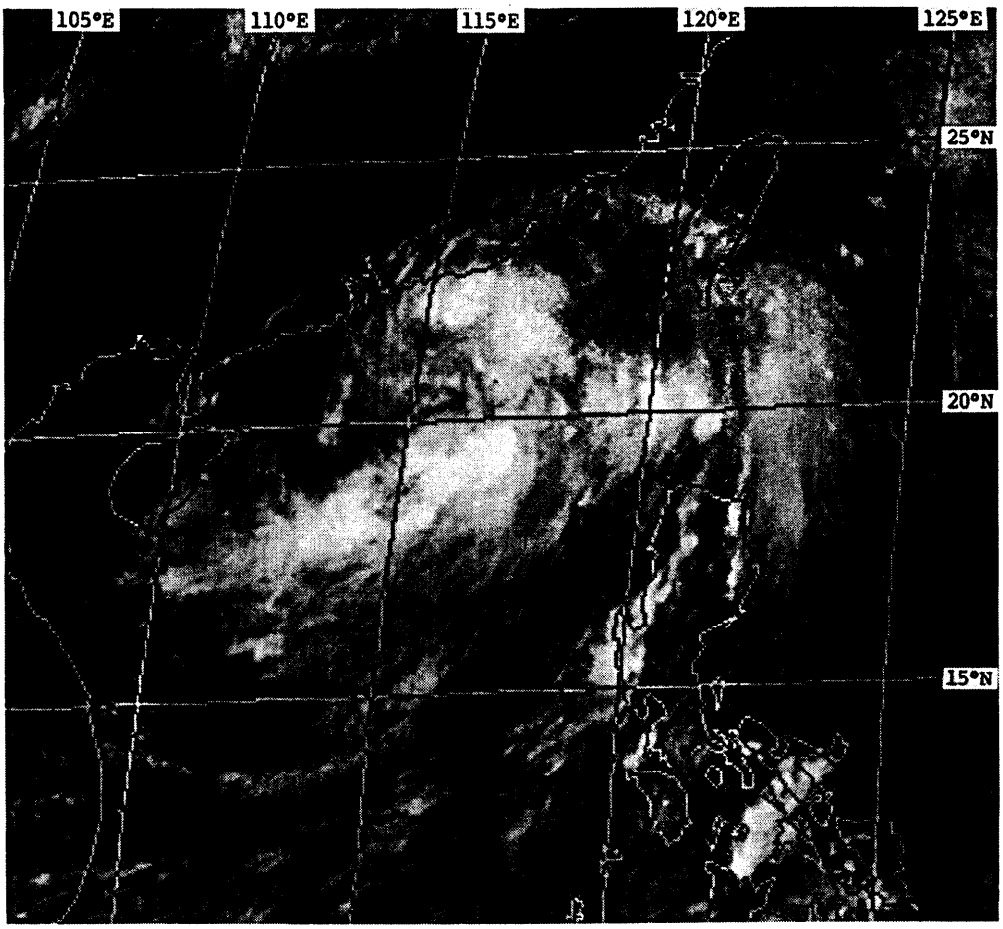

Figure 25. GMS-3 infra-red imagery around 2.00 p.m. on 30 September 1989 soon after the formation of Tropical Depression Brian (8924).

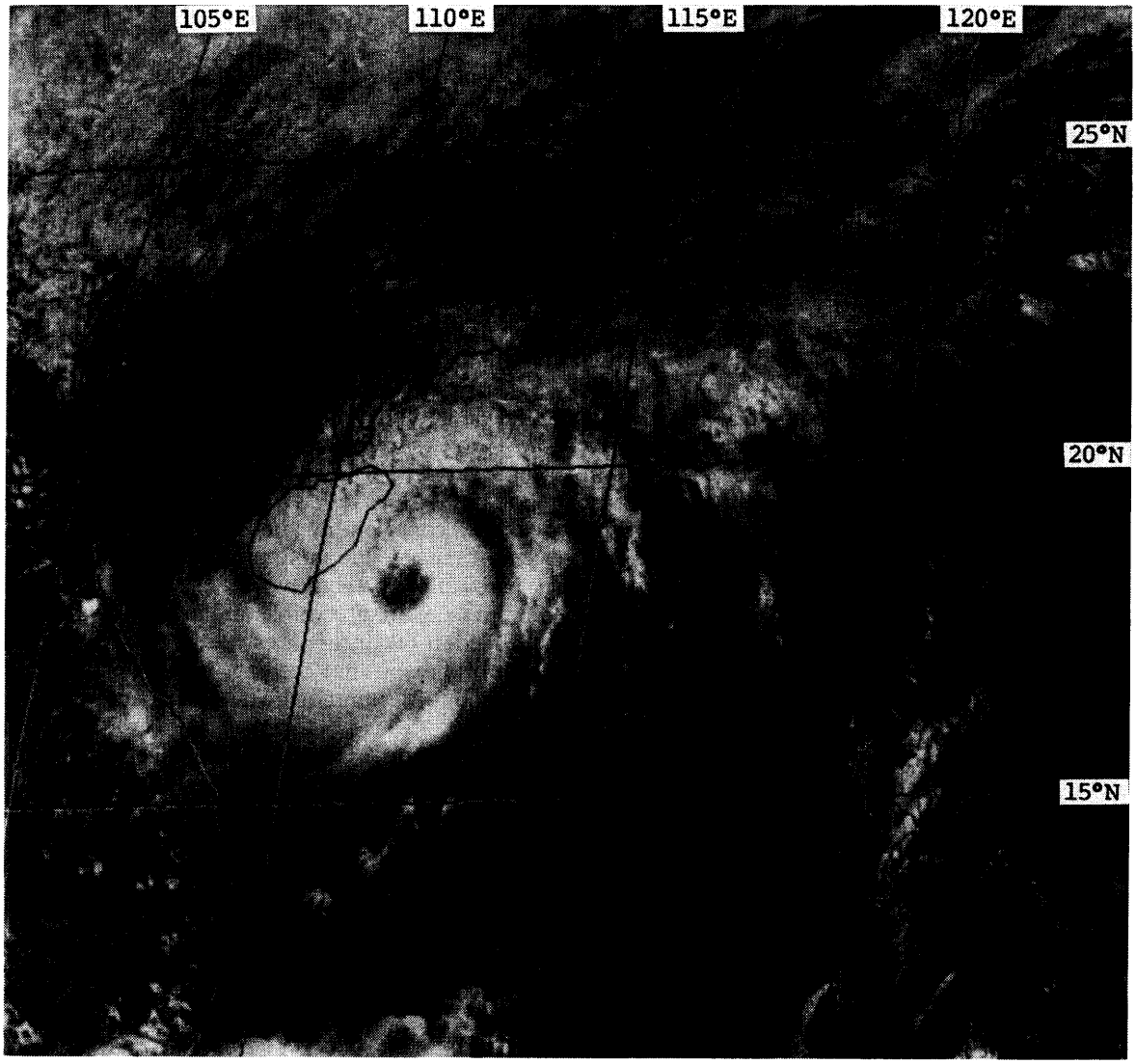

Figure 26. GMS-3 visible imagery showing the large eye of Typhoon Brian (8924) near Hainan around 2.00 p.m. on 2 October 1989.

(f) Typhoon Angela (8923)

29 September-10 October 1989

The track of Typhoon Angela is shown in Figure 27

Angela was a very intense typhoon. At its climax the maximum wind near its centre was estimated to be about 210 km/h. It first formed as a tropical depression about 450 km north-northeast of Yap on 29 September and moved north-northwestwards initially. Angela intensified to a tropical storm on the next day. It slowed down to about 6 km/h for a short period and further intensified to a typhoon about 770 km north of Yap on 1 October. A small eye began to appear on satellite imageries around that time. Angela then moved west-northwestwards at a steady speed of about 15 km/h. It turned west towards Luzon on 3 October. Its eye became larger as it approached land. Angela reached its peak intensity off the coast of northern Luzon on the evening of 5 October. Earlier in the afternoon, M.V. 'Australian Exporter' over the Balintang Channel, about 400 km west-northwest of the centre of Angela, reported surface winds of 108 km/h. The circulation of Angela swept across the northern coast of Luzon during the early hours of 6 October.

According to press reports, flooding caused by Typhoon Angela left at least 118 people killed and 27 injured in northern Philippines. About 1 400 houses were destroyed, 3 300 houses were damaged, and 9 000 people were left homeless. The strong winds also toppled electric and telephone posts. Rice fields and tobacco land were inundated. Crops damaged were estimated to be about 1.6 million pesos.

Angela entered the South China Sea on 6 October and weakened considerably after interacting with the terrain of northern Luzon. Although its eye could no longer be seen on the satellite imageries, it managed to maintain minimal typhoon intensity. It continued its westward track across the northern part of the South China Sea at about 13 km/h. Angela intensified again and a large ragged eye was again discernible on the satellite imageries on 8 October. It changed its track slightly to a west-southwest direction but turned westwards again on 9 October. Angela then began to weaken and passed about 80 km south of Yaxian that evening. It weakened to a severe tropical storm on 10 October and made landfall over Vietnam about 210 km northwest of Danang. Angela soon dissipated over land.

In Hong Kong, the Stand By Signal No. 1 was hoisted at 8.50 p.m. on 6 October when Angela was about 670 km to the southeast. Winds were light at first, but became moderate northerly the next day. As Angela continued to move westwards and came closer to Hong Kong, the Stand By Signal No. 1 was replaced by the Strong Wind Signal No. 3 at 9.00 p.m. on 7 October when Angela was about 500 km to the south-southeast. Winds turned easterly and increased in strength on 8 October. Angela was closest to Hong Kong at around noon on 8 October when it was about 460 km to the south. A minimum pressure of 1 009.7 hPa was recorded at the Royal Observatory earlier at 4 p.m. on 7 October. Meanwhile monsoon winds from southeast China were spreading southwards. The Signal No. 3 was replaced by the Strong Monsoon Signal at 9.45 a.m. on 9 October. At that time, Angela was about 610 km to the south-southwest and moving further away from Hong Kong. The maximum hourly mean and maximum gust peak speeds together with associated wind directions at various locations during the display of tropical cyclone warning signals were as follows:

Location	*Maximum mean hourly wind speed in km/h with direction in points*		*Maximum gust peak speed in km/h with direction in points*	
Royal Observatory	E	25	E	47
H.K. Airport (SE)	N & E	25	E	49
H.K. Airport (NW)	N	30	NNE & E	75
Waglan Island	E	63	E	79
Tate's Cairn	NNE	54	NNE	82
Cheung Chau	N	31	N & N E	51
King's Park	NNE	19	NNE	49
Star Ferry	E	22	E	45
Green Island	ENE	43	ENE	63
Tai O	N	34	N	53
Sha Tin	E	16	E	31
Chek Lap Kok	NNE	34	NNE	52
Ta Kwu Ling	NE	25	NNE	56
Tuen Mun	NNE&NE	23	NNE	52
Wong Chuk Hang	E	20	NNE	58
Tai Mo Shan	NE	63	NE	79
Tamar	ENE	27	NE	47
Cheung Sha Wan	NNE	22	NNE	52
Kwai Chung	E	14	NNE	31

When the Stand By Signal No. 1 was hoisted on 6 October, the weather was fine. It became cloudy on the afternoon of 8 October and a trace of rainfall was recorded that evening. Weather remained cloudy the next day but brighter weather set in during the afternoon of 10 October. The rainbands of Angela passed by to the south and only traces of rainfall were recorded in Hong Kong during its passage.

The times and heights of the highest tides and maximum storm surges recorded at various locations in Hong Kong during the passage of Angela are tabulated below:

Location	Highest tide above chart datum			Maximum storm surge above astronomical tide		
	Height (m)	Date	Time	Height (m)	Date	Time
Chi Ma Wan	2.66	9 Oct	3.44 a.m.	0.70	9 Oct	5.28 p.m.
Lok On Pai	2.61	9 Oct	3.55 a.m.	0.76	9 Oct	6.23 p.m.
Quarry Bay	2.70	9 Oct	3.23 a.m.	0.58	8 Oct	3.24 p.m.
Tai O	2.60	9 Oct	4.06 a.m.	0.68	9 Oct	6.21 p.m.
Tai Po Kau	2.65	9 Oct	2.44 a.m.	0.55	8 Oct	8.56 p.m.
Tamar	2.67	9 Oct	3.32 a.m.	0.57	9 Oct	4.17 a.m.
Tsim Bei Tsui	2.60	9 Oct	4.30 a.m.	0.85	9 Oct	6.56 p.m.
Waglan Island	2.76	9 Oct	2.55 a.m.	0.69	9 Oct	5.15 p.m.

In Hong Kong, there were no reports of damage or casualties. However, some ferry services to China and Ping Chau were suspended.

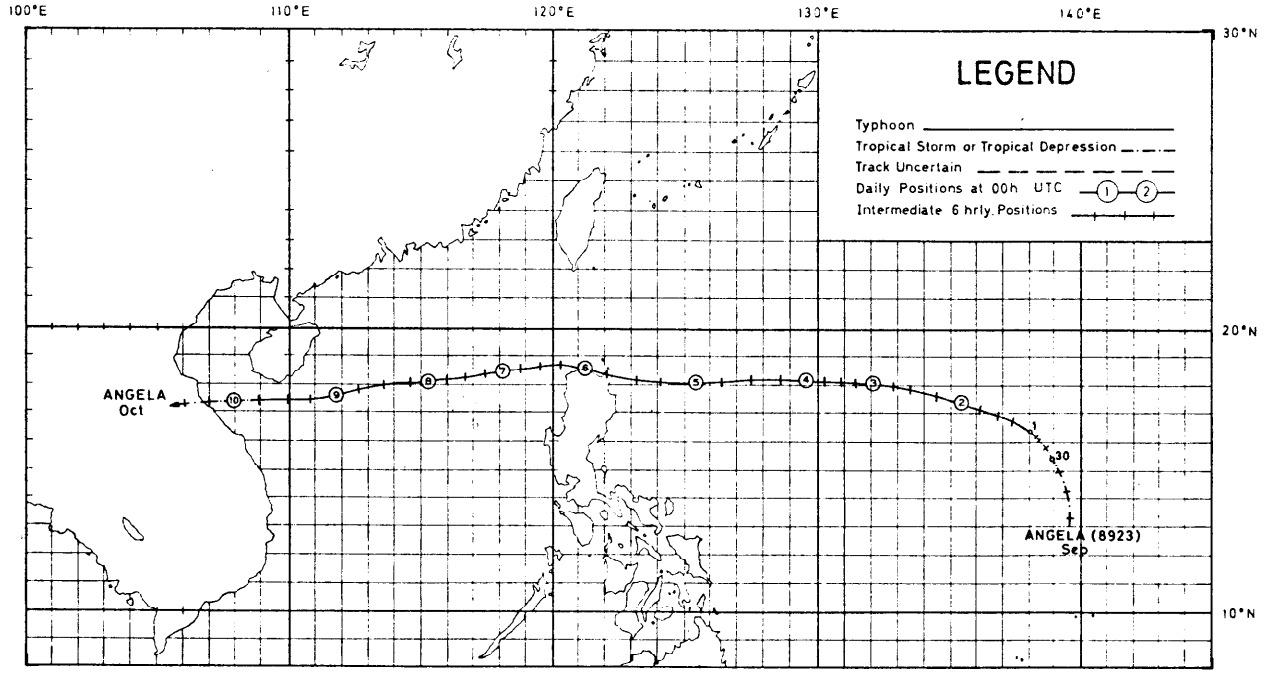

Figure 27. Track of Typhoon Angela (8923): 29 September–10 October 1989.

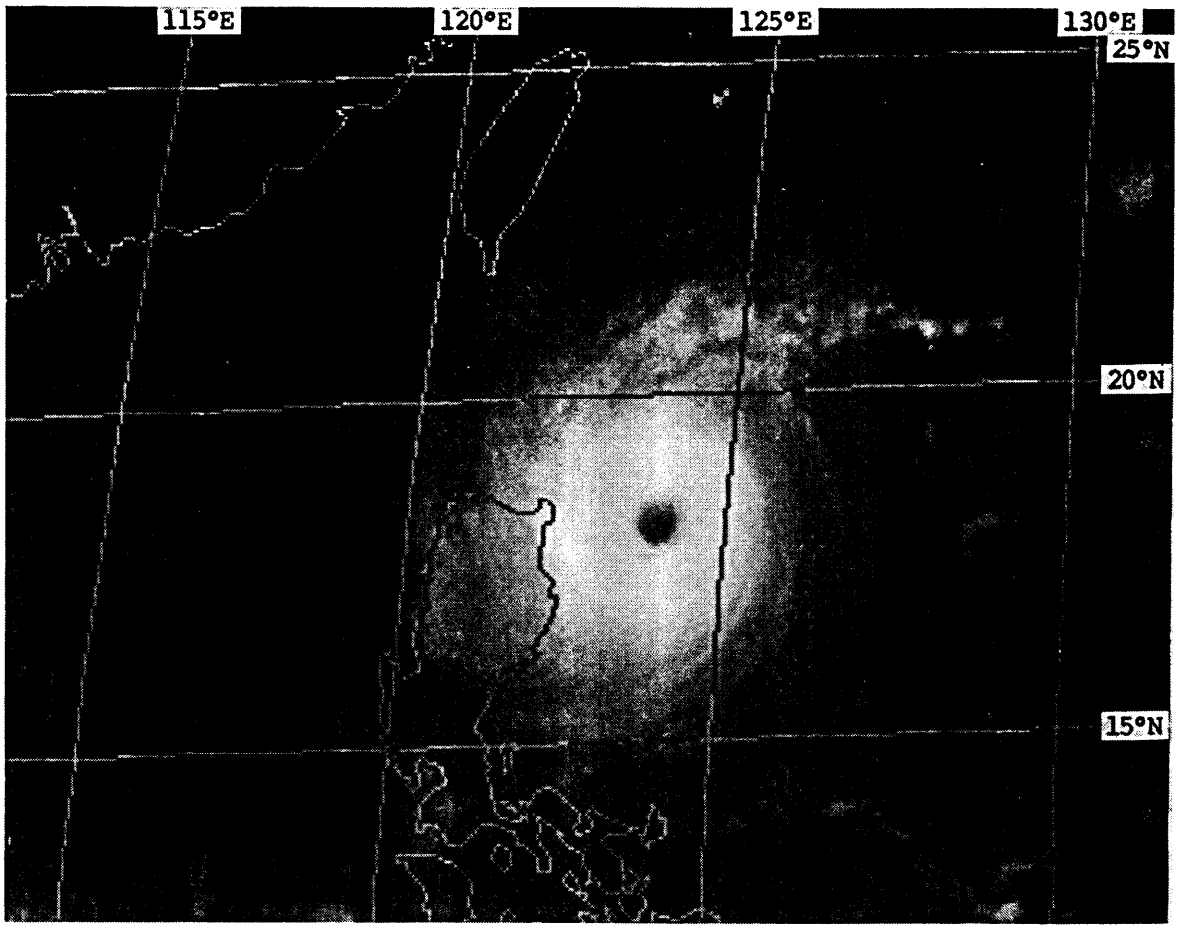

Figure 28. GMS-3 infra-red imagery around 2.00 p.m. on 5 October 1989 showing the large eye of Typhoon Angela (8923) to the east of northern Luzon.

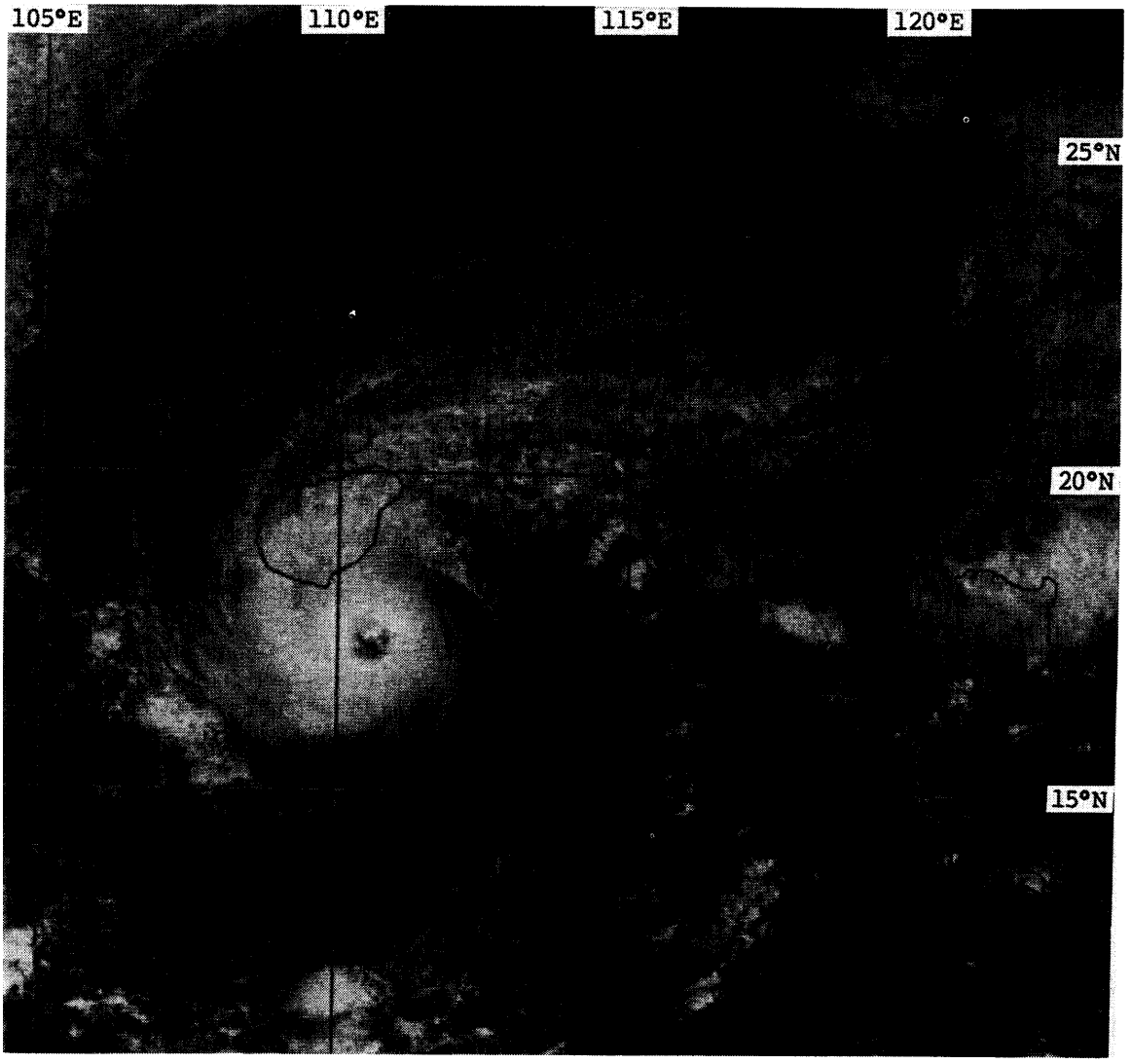

Figure 29. GMS-3 visible imagery around 2.00 p.m. on 9 October 1989 with the eye of Typhoon Angela (8923) still identifiable.

(g) Typhoon Dan (8926)

8-14 October 1989

The track of Typhoon Dan is shown in Figure 30

Dan formed as a tropical depression about 240 km east-northeast of Yap on 8 October. It intensified to a tropical storm on 9 October and moved west-northwestwards at a high speed of about 35 km/h. Dan further intensified to a severe tropical storm that evening and attained typhoon strength on 10 October when it was about 630 km east-southeast of Manila. It swept across the central Philippines during the night of 10 October, and passed just south of Manila the following morning.

According to press reports, 57 people were injured and 80 killed in the Philippines during the passage of Dan. Strong winds toppled trees and power pylons in Manila where power supply was cut off for more than 24 hours. At the international airport, two empty aircraft belonging to the visiting Bangladesh President and the Omani Deputy Prime Minister were pushed on to each other by strong gusty winds. Dan also sparked floods and landslides which made at least 142 000 people homeless. The losses from damage to crops and property as well as industrial disruption ran to millions of US dollars.

Dan weakened slightly to a severe tropical storm as it crossed the Philippines. It entered the South China Sea on a northwestward track on the morning of 11 October and turned westwards that evening. A wind of 112 km/h was reported by M.V. 'Maritime Champion' about 160 km northeast of the centre of Dan. Dan re-intensified and became a typhoon again about 660 km south of Hong Kong. It slowed down to about 22 km/h and crossed the Xisha Qundao on the afternoon of 12 October. A sea-level pressure of 967.1 hPa was reported by Xisha Dao. Dan developed an eye and reached its maximum intensity that evening. It moved west-northwestwards and passed about 80 km south-southwest of Yaxian, Hainan early on 13 October.

In Hainan, the city of Tongshi was severely flooded with water level rising to 1.5 metres high. In Lingshui and Yaxian Counties, flooding occurred in several villages and caused some houses to collapse, leaving hundreds of people homeless. Two people were killed and 21 were injured. Damage to agriculture, power supply and communication was severe. The casualties due to Brian, Angela and Dan were reported to be 63 killed, 15 missing and 712 injured. About 30 million rubber trees were blown down. The total loss due to the three typhoons was estimated to be over 1 000 million RMB.

Dan weakened to a severe tropical storm on 13 October as it moved towards the Vietnam coast. It made landfall about 300 km south of Hanoi that evening. Dan finally dissipated in Laos about 180 km east-northeast of Vientiane early on 14 October.

In Vietnam, 34 people were killed and 466 were injured. Floods caused by heavy rain swept away some 8 000 houses and several hundred boats. About 134 000 hectares of rice ready for harvest were inundated. Dan's powerful winds also blew down about 44 000 houses and tore off the roofs of another 500 000 houses. Traffic on the trans-Vietnamese highway was blocked.

In Hong Kong, the Stand By Signal No. 1 was hoisted at 8.00 p.m. on 11 October when Dan was about 720 km to the south-southeast. Winds were moderate easterly at first but increased gradually as Dan continued to intensify. The Strong Wind Signal No. 3 was hoisted at 5.00 a.m. on 12 October when Dan was about 660 km to the south. Dan was closest to Hong Kong at around 6 a.m. on 12 October when it was about 650 km to the south. The minimum pressure recorded at the Royal Observatory was 1 010.4 hPa at 3 p.m. that afternoon. Meanwhile, a strong northeast monsoon was also affecting southeast China. The combined effect of Dan and the monsoon gave rise to gale force winds offshore during the evening of 12 October. As Dan moved away from Hong Kong and the monsoon dominated, the Strong Wind Signal No. 3 was replaced by the Strong Monsoon Signal at 6.30 a.m. on 13 October when Dan was 750 km to the southwest.

The maximum hourly mean and maximum gust peak speeds together with associated wind directions at various locations during the display of tropical cyclone signals were as follows:

Location	*Maximum mean hourly wind speed in km/h with direction in points*		*Maximum gust peak speed in km/h with direction in points*	
Royal Observatory	E	31	E	65
H.K. Airport (SE)	E	41	E	70
H.K. Airport (NW)	E	31	ENE	75
Waglan Island	E	77	E	101
Tate's Cairn	ENE	58	E	99
Cheung Chau	E	45	ENE	76
King's Park	ESE	25	ESE	71
Star Ferry	E	40	E	72
Green Island	I N E	67	ENE	96
Tai O	E	40	E	88
Sha Tin	E	23	E & N E	45
Chek Lap Kok	E	54	E	72
Lau Fau Shan	E	27	E	45
Ta Kwu Ling	ESE	22	ESE	47
Tuen Mun	NNE	20	N E	47
Wong Chuk Hang	E	36	E	76
Tai MO Shan	ESE	81	ESE	108
Tamar	ENE	22	ENE	59
Cheung Sha Wan	ENE	22	ENE	68
Tsing Yi	E	30	ENE	63
Kwai Chung	E	25	ENE	54

When the Stand By Signal No. 1 was hoisted on 11 October, the weather was cloudy. Some light rain occurred over the next two days. With the dissipation of Dan over Laos, the weather became mainly fine on 14 October. The daily amounts of rainfall recorded at selected locations were as follows:

Date	*Royal Observatory* mm	*Tai Mei Tuk* mm	*High Island* mm	*Victoria Peak* mm
11 October	Nil	Nil	Nil	Nil
12 October	5.3	5.0	3.5	6.0
13 October	0.9	Nil	Nil	1.5
14 October	Trace	Nil	Nil	2.0
Total	6.2	5.0	3.5	9.5

The times and heights of the highest tides and maximum storm surges recorded at various locations in Hong Kong during the passage of Dan are tabulated below:

Location	Highest tide above chart datum			Maximum storm surge above astronomical tide		
	Height (m)	Date	Time	Height (m)	Date	Time
Chi Ma Wan	2.51	13 Oct	7.37 a.m.	0.38	12 Oct	9.51 a.m.
Ko Lau Wan	2.60	13 Oct	7.45 a.m.	0.69	13 Oct	3.51 a.m.
Lok On Pai	2.51	13 Oct	8.08 a.m.	0.33	12 Oct	2.47 p.m.
Quarry Bay	2.50	13 Oct	7.34 a.m.	0.38	12 Oct	2.16 p.m.
Tai O	2.51	13 Oct	8.39 a.m.	0.39	13 Oct	5.24 a.m.
Tai Po Kau	2.58	13 Oct	7.24 a.m.	0.59	13 Oct	3.26 a.m.
Tamar	2.52	13 Oct	7.25 a.m.	0.34	12 Oct	9.23 p.m.

There were no reports of damage or casualties in Hong Kong.

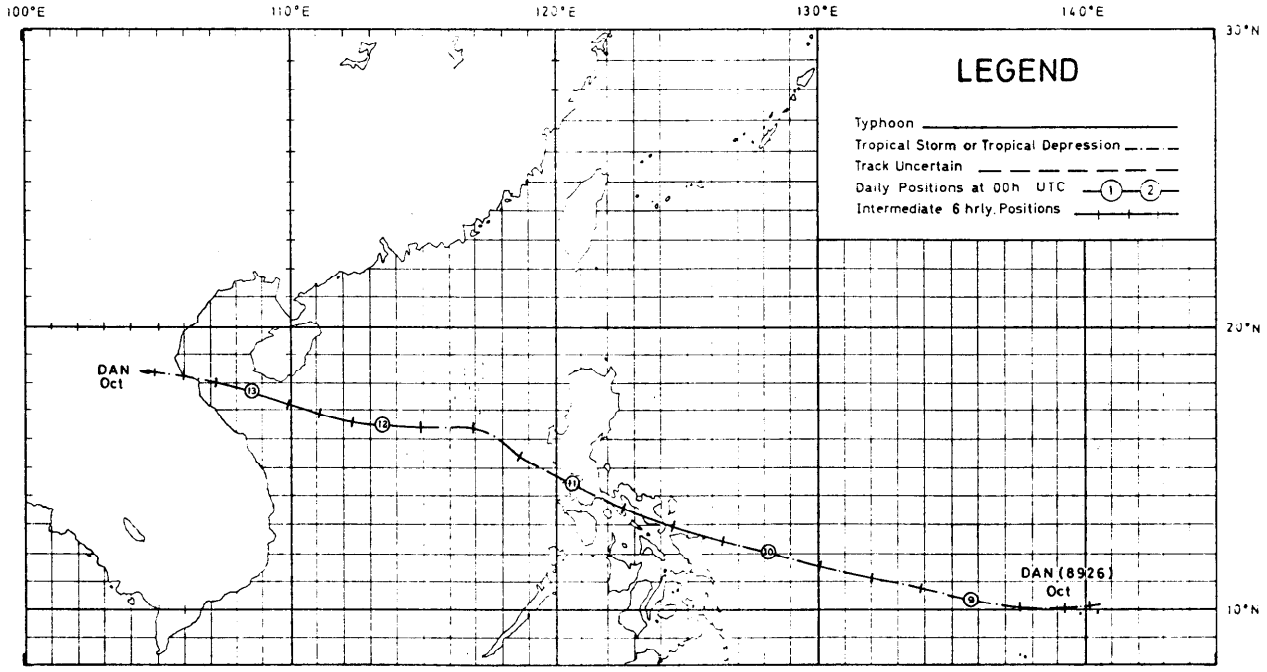

Figure 30. Track of Typhoon Dan (8926): 8–14 October 1989.

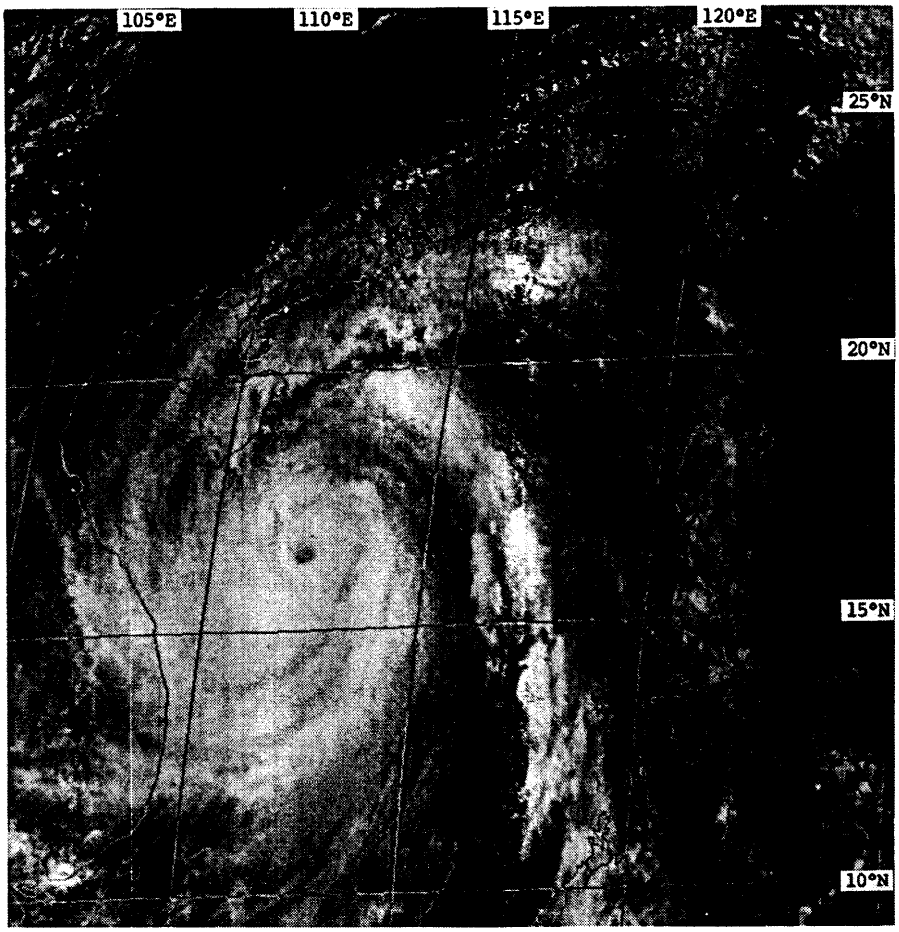

Figure 31. GMS-3 visible imagery of Typhoon Dan (8926) during its closest approach to Xisha Dao around 2.00 p.m. on 12 October 1989.

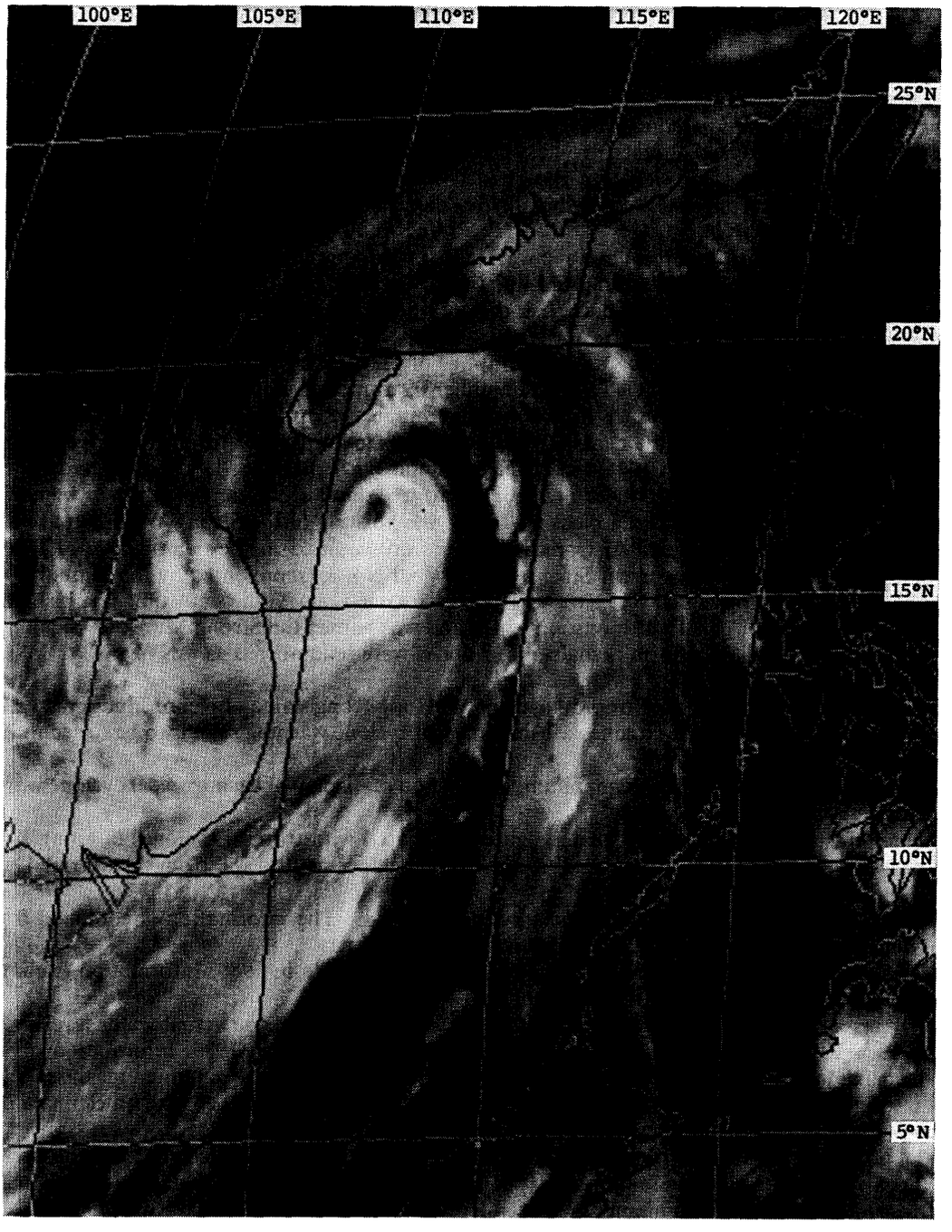

Figure 32. GMS-3 infra-red imagery around 8.00 p.m. on 12 October 1989 showing the extensive circulation of Typhoon Dan (8926).

4. DESCRIPTION OF TABLES

TABLE 1 is a list of tropical cyclones in 1989 in the western North Pacific and the adjacent seas (i.e. in the area bounded by the equator, 45°N, 100°E and 180°). The names of these tropical cyclones are those used by the U.S. Naval Oceanography Command Center/Joint Typhoon Warning Center in Guam. The four-digit numbers in parentheses are numbers assigned to each tropical cyclone of tropical storm intensity or above by the Japan Meteorological Agency. The dates cited are the residence times of each tropical cyclone within the above-mentioned region and as such might not cover the 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 1989, the duration of these warnings and the time of issue of the first and last warnings for all tropical cyclones in Hong Kong's area of responsibility (i.e. the area bounded by l0°N, 30°N, 105°E and 125°E). Times are given in hours and minutes in UTC.

TABLE 3 presents a summary of the occasions/durations of the hoisting of tropical cyclone warning signals in 1989. The sequence of the signals displayed and the number of tropical cyclone warning bulletins issued for each tropical cyclone are also given. Times are given in hours and minutes in Hong Kong Time.

TABLE 4 presents a summary of the occasions/durations of the hoisting of tropical cyclone warning signals from 1946 to 1989 inclusive. Between 1946 and 1955, the Stand By Signal, No. 1, was also used to warn strong winds. A Strong Wind Signal was introduced in 1950 to warn the onset of strong winds which were not expected to reach gale force (the symbol used was a black ball). For the hoisting of the Strong Wind Signal between 1950 and 1955, only those occasions related to tropical cyclones are counted in the compilation of figures for the column under the No. 3 signal. The current Strong Wind Signal No. 3, (represented by the symbol 1) was introduced in 1956 and the Stand By Signal No. 1 was redefined the same year. At the same time, the black ball symbol was utilized to warn strong or gale force monsoon winds and was named the Strong Monsoon Signal. With effect from 1 January 1973, the Gale or Storm Signals 5, 6, 7 and 8 were renumbered as 8 NW, 8 SW, 8 NE and 8 SE respectively.

TABLE 5 gives the annual number of tropical cyclones in Hong Kong's area of responsibility between 1946 and 1989. The annual number of tropical cyclones causing 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 1946-1989.

TABLE 7 presents the casualties and damage figures associated with tropical cyclones in Hong Kong for the period 1937-1989. The information is compiled from local newspaper reports and from the Marine Department's records.

TABLE 8 contains damage caused by tropical cyclones in 1989. The information is compiled from various government departments, public utility companies and local newspapers.

TABLE 9 contains particulars of ships damaged by tropical cyclones in 1989. Information is compiled from local newspapers and records of the Marine Department.

TABLE 10 presents the maximum storm surge (the excess, in metres, of the actual water level over that predicted in the Tide Tables) for each tropical cyclone affecting Hong Kong in 1989. Information on the nearest approach, the maximum winds at the Royal Observatory and Waglan Island, the minimum mean sea-level pressure and the total rainfall recorded at the Royal Observatory are also included together with an estimate of the minimum central pressure of each tropical cyclone during its closest approach.

TABLE 11 provides some meteorological information for those typhoons which required the hoisting of the Hurricane Signal, No. 10, in Hong Kong since 1946. The information presented includes the distances and the bearings of nearest approach, the minimum mean sea-level pressures recorded at the Royal Observatory and the maximum 60-minute mean winds and maximum gust peak speeds recorded at some stations in Hong Kong.

TABLE 12 presents the 10 wettest tropical cyclones in Hong Kong for the period 1884-1939 and 1947-1989.

TABLE l. LIST OF TROPICAL CYCLONES IN THE WESTERN NORTH PACIFIC AND THE SOUTH CHINA SEA IN 1989

Name of tropical cyclone		Beginning of track				End of track				Remark
		Date	Time UTC	Position °N	°E	Date	Time UTC	Position °N	°E	
Tropical Storm Winona	(8901)	17 Jan	1800	16.9	156.0	20 Jan	1800	13.4	128.8	Dissipated
Typhoon Andy	(8902)	17 Apr	1800	8.0	146.8	23 Apr	1800	23.3	156.0	Became Extratropical
Typhoon Brenda	(8903)	15 May	1800	9.5	130.9	21 May	0000	22.1	111.4	Dissipated
Typhoon Cecil	(8904)	22 May	1200	12.4	113.9	25 May	1200	16.7	106.4	Dissipated
Typhoon Dot	(8905)	5 Jun	0600	9.9	128.9	11 Jun	1800	21.5	106.2	Dissipated
Tropical Storm Ellis	(8906)	22 Jun	1200	18.7	126.9	23 Jun	0600	22.8	127.9	Became Extratropical
Severe Tropical Storm Faye	(8907)	7 Jul	0000	16.5	128.5	11 Jul	0600	21.2	107.9	Dissipated
Typhoon Gordon	(8908)	11 Jul	0600	18.3	147.0	19 Jul	0000	23.1	107.7	Dissipated
Severe Tropical Storm Hope	(8909)	16 Jul	1200	21.2	132.7	21 Jul	0600	29.9	120.5	Dissipated
Severe Tropical Storm Irving	(8910)	20 Jul	1800	14.8	117.7	24 Jul	0600	20.0	104.7	Dissipated
Typhoon Judy	(8911)	23 Jul	0600	17.1	138.0	28 Jul	1800	36.4	126.8	Dissipated
Severe Tropical Storm Ken-Lola	(8912)	29 Jul	1200	22.9	133.7	4 Aug	1800	31.5	117.8	Dissipated
Typhoon Mac	(8913)	1 Aug	0600	22.3	151.0	7 Aug	0600	41.2	137.4	Dissipated
Typhoon Nancy	(8914)	11 Aug	1200	20.1	156.4	16 Aug	1800	44.0	146.5	Became Extratropical
Typhoon Owen	(8915)	12 Aug	0600	19.6	147.6	18 Aug	1800	44.6	151.6	Moved north of 45°N
Tropical Depression Peggy	(8916)	16 Aug	0600	20.4	148.7	17 Aug	1800	23.4	146.8	Dissipated
Tropical Storm		17 Aug	0000	29.7	124.2	19 Aug	1800	26.6	120.2	Dissipated
Severe Tropical Storm Roger	(8917)	25 Aug	0000	25.3	124.7	28 Aug	0600	43.9	143.1	Became Extratropical
Tropical Storm	(8918)	26 Aug	0600	30.9	155.7	27 Aug	1200	32.6	162.0	Dissipated
Typhoon Sarah	(8919)	5 Sep	1800	21.1	142.9	13 Sep	0600	26.9	120.6	Dissipated
Tropical Storm Tip	(8920)	9 Sep	0000	19.9	154.1	13 Sep	1800	35.5	165.0	Dissipated
Severe Tropical Storm Vera	(8921)	12 Sep	0600	18.1	143.8	15 Sep	1800	29.4	120.1	Became Extratropical
Typhoon Wayne	(8922)	17 Sep	1800	24.1	124.8	20 Sep	0000	36.3	142.9	Became Extratropical
Typhoon Angela	(8923)	29 Sep	0600	13.3	139.5	10 Oct	1200	17.3	106.0	Dissipated
Typhoon Brian	(8924)	30 Sep	0600	20.1	115.6	3 Oct	1200	19.4	104.3	Dissipated
Typhoon Colleen	(8925)	1 Oct	1800	11.3	149.9	8 Oct	0600	40.0	152.0	Became Extratropical
Typhoon Dan	(8926)	8 Oct	0600	10.1	140.2	13 Oct	1800	18.5	104.8	Dissipated
Typhoon Elsie	(8927)	14 Oct	0600	16.4	131.8	22 Oct	0600	18.0	106.9	Dissipated
Typhoon Forrest	(8928)	21 Oct	1800	8.3	150.1	28 Oct	1800	32.3	143.7	Became Extratropical
Typhoon Gay	(8929)	1 Nov	0000	7.4	102.8	3 Nov	1800	10.3	100.2	Moved west of 100°E
Typhoon Hunt	(8930)	16 Nov	1800	11.8	132.0	23 Nov	0600	18.3	116.1	Dissipated
Typhoon Irma	(8931)	24 Nov	1800	13.9	152.0	4 Dec	1200	20.8	139.2	Dissipated
Tropical Depression		7 Dec	1800	11.7	137.1	9 Dec	0000	13.5	137.8	Dissipated
Typhoon Jack	(8932)	22 Dec	0000	6.7	155.5	27 Dec	1200	12.8	147.6	Dissipated

TABLE 2. TROPICAL CYCLONE WARNINGS FOR SHIPPING ISSUED IN 1989

Tropical cyclone	No. of warnings issued	Date and time+ of issue of		Duration of warnings (hours)
		First warning	Last warning	
*Typhoon Brenda	35	16 May 2100	21 May 0000	99
Typhoon Cecil	28	22 May 1800	26 May 0000	78
*Typhoon Dot	46	6 Jun 0300	11 Jun 1800	135
*Severe Tropical Storm Faye	29	8 Jul 0000	11 Jul 1200	84
*Typhoon Gordon	25	15 Jul 0900	18 Jul 0900	72
Severe Tropical Storm Hope	20	19 Jul 0000	21 Jul 0900	57
Severe Tropical Storm Irving	27	21 Jul 0000	24 Jul 0600	78
Tropical Storm	6	19 Aug 1200	20 Aug 0300	15
Severe Tropical Storm Roger	3	25 Aug 0300	25 Aug 0900	6
Typhoon Sarah	42	8 Sep 1500	13 Sep 1500	120
Severe Tropical Storm Vera	8	15 Sep 0000	15 Sep 2100	21
Typhoon Wayne	7	17 Sep 1500	18 Sep 0900	18
*Typhoon Brian	28	30 Sep 0300	3 Oct 1200	81
*Typhoon Angela	45	5 Oct 0300	10 Oct 1500	132
*Typhoon Dan	27	10 Oct 1200	13 Oct 1800	78
Typhoon Elsie	31	18 Oct 1500	22 Oct 0900	90
Typhoon Hunt	23	20 Oct 2100	23 Oct 1500	66
Total	430			1230

* Tropical cyclones for which tropical cyclone warning signals were hoisted in H.K.

+ Times are given in hours and minutes UTC

TABLE 3. TROPICAL CYCLONE WARNING SIGNALS HOISTED IN HONG KONG AND NUMBER OF WARNING BULLETINS ISSUED IN 1989

SUMMARY

Signal	No. of occasions	Total duration
1	7	139 h 40 min
3	8	132 h 50 min
8 NORTHWEST	-	-
8 SOUTHWEST	-	-
8 NORTHEAST	2	20 h 15 min
8 SOUTHEAST	2	13 h 25 min
9	-	-
10	-	-
Total	19	306 h 10 min

DETAILS

Tropical cyclone	No. of warning bulletins issued	Signal	Hoisted		Lowered	
			Date	Time*	Date	Time*
Typhoon Brenda	31	1	19 May	0845	19 May	2145
		3	19 May	2145	20 May	0515
		8 NE	20 May	0515	20 May	1600
		8 SE	20 May	1600	20 May	2315
		3	20 May	2315	21 May	0715
Typhoon Dot	22	1	8 Jun	1500	9 Jun	1900
		3	9 Jun	1900	10 Jun	1215
Severe Tropical Storm Faye	12	1	9 Jul	1550	10 Jul	1600
Typhoon Gordon	36	1	16 Jul	1000	17 Jul	0445
		3	17 Jul	0445	17 Jul	1730
		8 NE	17 Jul	1730	18 Jul	0300
		8 SE	18 Jul	0300	18 Jul	0910
		3	18 Jul	0910	18 Jul	1400
Typhoon Brian	20	1	30 Sep	1710	1 Oct	1545
		3	1 Oct	1545	2 Oct	1200
Typhoon Angela	29	1	6 Oct	2050	7 Oct	2100
		3	7 Oct	2100	9 Oct	0945
Typhoon Dan	17	1	11 Oct	2000	12 Oct	0500
		3	12 Oct	0500	13 Oct	0630

* Hong Kong Time (UTC + 8) in hours and minutes

TABLE 4. FREQUENCY AND TOTAL DURATION OF DISPLAY OF TROPICAL CYCLONE WARNING SIGNALS : 1946-1989

Signals / Year	1*	3*	8 NW+	8 SW+	8 NE+	8 SE+	9	10	Total	Total duration (hours)
1946	7	-	1	0	1	2	1	1	13	154.2
1947	6	-	1	0	1	0	0	0	8	124.2
1948	5	-	1	1	3	2	0	0	12	111.5
1949	4	-	0	0	1	1	1	0	7	67.1
1950	2	3	0	0	1	1	1	0	5	153.8
1951	4	3	0	0	2	3	1	0	10	182.8
1952	2	7	0	0	1	1	0	0	4	212.7
1953	2	4	1	1	2	1	1	0	8	251.2
1954	5	4	0	0	3	2	2	0	12	210.7
1955	0	3	0	0	0	0	0	0	0	100.8
1956	5	4	0	0	0	0	0	0	9	191.4
1957	4	9	1	1	2	2	0	1	20	295.8
1958	4	5	0	0	1	0	0	0	10	214.1
1959	1	1	0	0	0	0	0	0	2	36.6
1960	11	7	0	2	2	2	1	1	26	432.6
1961	6	7	1	2	1	0	1	1	19	192.9
1962	4	3	0	1	1	0	1	1	11	158.2
1963	4	5	0	0	1	0	0	0	10	175.8
1964	11	14	1	3	5	3	3	2	42	570.3
1965	7	6	0	0	1	1	0	0	15	239.7
1966	6	5	0	0	2	2	0	0	15	284.7
1967	8	6	0	0	2	1	0	0	17	339.2
1968	7	7	0	1	1	0	1	1	18	290.2
1969	4	2	0	0	0	0	0	0	6	110.3
1970	6	8	2	1	2	0	0	0	19	286.8
1971	9	10	1	3	2	2	1	1	29	323.4
1972	8	6	0	0	1	1	0	0	16	288.3
1973	8	6	1	1	1	0	1	0	18	416.8
1974	12	10	0	0	2	1	1	0	26	525.3
1975	8	6	1	0	0	1	1	1	18	292.3
1976	6	6	0	0	1	2	0	0	15	351.5
1977	8	6	0	0	1	0	0	0	15	395.2
1978	8	9	1	1	3	2	0	0	24	462.2
1979	5	5	1	0	2	2	1	1	17	281.3
1980	10	8	0	0	1	1	0	0	20	414.1
1981	5	4	0	0	1	1	0	0	11	202.3
1982	7	4	0	0	0	0	0	0	11	247.6
1983	8	7	0	1	2	2	1	1	22	289.7
1984	6	6	0	0	1	0	0	0	13	280.0
1985	5	4	1	0	0	1	0	0	11	193.6
1986	6	7	0	1	1	0	0	0	15	305.0
1987	6	1	0	0	0	0	0	0	7	165.8
1988	6	4	0	0	0	0	0	0	10	204.2
1989	7	8	0	0	2	2	0	0	19	306.2
Total§	226	206	15	20	57	42	20	12	635	11331.6
Mean§	6.6	6.1	0.3	0.5	1.3	1.0	0.5	0.3	14.4	257.5

* Figures in the columns under Signals No. 1 and No. 3 have different meanings prior to 1956 and care is required in interpreting these figures. Reference may be made to paragraph 4 on page 50.

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

§ The total and annual mean values for the frequency of display of Stand By Signal No. 1 and the Strong Wind Signal No. 3 are calculated for the period 1956-1989. The corresponding values for higher signals and the total duration are calculated for the period 1946-1989.

TABLE 5. NUMBER OF TROPICAL CYCLONES IN HONG KONG'S AREA OF RESPONSIBILITY AND THE NUMBER THAT NECESSITATED THE DISPLAY OF TROPICAL CYCLONE WARNING SIGNALS IN HONG KONG : 1946-1989

Year	Number in Hong Kong's Area of responsibility	Number necessitating the display of signals in Hong Kong
1946	13	6
1947	21	6
1948	15	4
1949	17	4
1950	14	5
1951	13	7
1952	21	9
1953	19	6
1954	18	7
1955	14	3
1956	23	5
1957	12	6
1958	15	5
1959	18	2
1960	18	9
1961	24	6
1962	20	4
1963	13	4
1964	26	10
1965	16	6
1966	17	6
1967	17	8
1968	12	6
1969	11	4
1970	21	6
1971	20	9
1972	15	5
1973	17	9
1974	21	11
1975	12	7
1976	10	5
1977	10	8
1978	20	8
1979	18	6
1980	17	10
1981	15	5
1982	16	5
1983	15	7
1984	14	5
1985	15	5
1986	16	4
1987	12	5
1988	17	6
1989	17	7
Total	725	271
Mean	16.5	6.2

TABLE 6. DURATION OF DISPLAY OF TROPICAL CYCLONE WARNING SIGNALS IN HONG KONG : 1946-1989

Signal	Duration of each occasion						Duration per year					
	Mean		Maximun		Minimum		Mean		Maximun		Minimum	
	h	min	h	min	h	min	h	min	h	min	h	min
1*	20	46	124	40	1	20	137	60	273	15	12	40
3*	20	26	71	45	1	0	123	50	267	45	23	55
8 NW+	7	15	15	45	1	30	2	28	15	45	0	0
8 SW+	5	31	11	10	2	30	2	31	16	10	0	0
8 NE+	10	32	35	35	2	15	13	39	61	45	0	0
8 SE+	7	35	21	45	0	20	7	14	31	15	0	0
Gale or Storm Signals (8 NW, 8 SW, 8 NE, 8 SE)	16	16	55	17	2	40	25	52	82	25	0	0
9	3	31	6	30	0	25	1	36	11	0	0	0
10	6	3	9	10	2	30	1	39	12	10	0	0

* 1956 - 1989

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

TABLE 7. CASUALTIES AND DAMAGE CAUSED BY TROPICAL CYCLONES IN HONG KONG : 1937 - 1989

Year	Date	Name of tropical cyclone	Ocean-going vessels in trouble	Small craft sunk or wrecked	Small craft damaged	Persons dead	Persons missing	Persons injured
1937	1 - 2 Sep	Typhoon	28	1 255	600	11 000	*	*
1957	20 - 23 Sep	T. Gloria	5	2	Several	8	*	111
1960	4 - 12 Jun	T. Mary	6	352	462	45	11	127
1961	17 - 21 May	T. Alice	*	*	*	4	0	20
	7 - 10 Sep	S.T.S. Olga	0	1	0	7	0	0
1962	28 Aug - 2 Sep	T. Wanda	36	1 297	756	130	53	*
1963	1 - 9 Sep	T. Faye	0	2	0	3	0	51
1964	26 - 28 May	T. Viola	5	18	18	0	0	41
	2 - 9 Aug	T. Ida	3	7	60	5	4	56
	2 - 6 Sep	T. Ruby	20	32	282	38	6	300
	4 - 10 Sep	T. Sally	0	0	0	9	0	24
	7 - 13 Oct	T. Dot	2	31	59	26	10	85
1965	6 - 16 Jul	T. Freda	0	1	0	2	0	16
	25 - 28 Sep	T.S. Agnes	0	0	0	5	0	3
1966	12 - 14 Jul	S.T.S. Lola	0	*	6	1	0	6
1967	19 - 22 Aug	S.T.S. Kate	3	1	0	0	0	3
1968	17 - 22 Aug	T. Shirley	1	*	3	0	0	4
1969	22 - 29 Jul	T. Viola	0	3	0	0	0	0
1970	1 - 3 Aug	T.D.	0	0	0	2+	0	0
	8 - 14 Sep	T. Georgia	2	0	*	0	0	0
1971	15 - 18 Jun	T. Freda	8	0	0	2	0	30
	16 - 22 Jul	T. Lucy	10	2	13	0	0	38
	10 - 17 Aug	T. Rose	33**	303	*	110	5	286
1972	4 - 9 Nov	T. Pamela	3	0	0	1	0	8
1973	14 - 20 Jul	T. Dot	14	*	*	1	0	38
1974	7 - 14 Jun	T. Dinah	1	*	*	0	0	0
	18 - 22 Jul	T. Ivy	2	*	*	0	0	0
	15 - 19 Oct	T. Carmen	5	*	*	1	0	0
	21 - 27 Oct	T. Della	2	*	*	0	0	0
1975	10 - 14 Aug	T.D.	3	1	*	2	1	0
	9 - 14 Oct	T. Elsie	7	2	1	0	0	46
	16 - 23 Oct	S.T.S. Flossie	1	*	*	0	0	0
1976	22 Jun - 4 Jul	T. Ruby	0	0	0	3	2	2
	21 - 26 Jul	S.T.S. Violet	0	0	0	2	1	1
	5 - 6 Aug	S.T.S. Clara	0	0	0	0	0	4
	21 - 24 Aug	T.S. Ellen	0	4	7	27	3	65
	15 - 21 Sep	T. Iris	6	0	1	0	0	27
1977	4 - 6 Jul	T.D.	0	0	0	0	0	2
	3 - 5 Sep	T.S. Carla	1	0	0	0	0	1
	22 - 25 Sep	S.T.S. Freda	2	0	0	1	0	37
1978	24 - 30 Jul	S.T.S. Agnes	0	25	42	3	0	134
	9 - 12 Aug	T.S. Bonnie	2	0	0	0	0	0
	23 - 28 Aug	S.T.S. Elaine	8	5	8	1	0	51
	22 - 26 Sep	S.T.S. Kit	0	1	0	0	7	0
	7 - 16 Oct	S.T.S. Nina	0	0	0	0	0	2
	17 - 29 Oct	T. Rita	1	5	0	0	0	3
1979	1 - 6 Jul	T. Ellis	0	2	0	0	0	0
	26 - 30 Jul	T.S. Gordon	0	2	0	0	0	0
	28 Jul - 3 Aug	T. Hope	29	167	207	12	0	260
	6 - 9 Aug	T.D.	0	3	0	0	0	0
	16 - 24 Sep	S.T.S. Mac	2	12	0	1	0	67
1980	5 - 12 Jul	S.T.S. Ida	1	0	0	0	0	0
	18 - 23 Jul	T. Joe	4	0	1	2	1	59
	20 - 28 Jul	T. Kim	0	2	1	0	0	0
	29 Oct - 2 Nov	T.S. Cary	0	0	2	0	0	0
1981	3 - 7 Jul	S.T.S. Lynn	0	0	3	0	0	32
1982	27 Jun - 2 Jul	T.S. Tess	0	1	0	0	0	16
	22 - 30 Jul	T. Andy	0	0	1	0	0	0
	5 - 16 Sep	T. Irving	0	0	2	0	0	0
1983	12 - 19 Jul	T. Vera	0	1	0	0	0	0
	29 Aug - 9 Sep	T. Ellen	44	135	225	10	12	333
	10 - 14 Oct	T. Joe	2	0	3	0	0	58
	20 - 26 Oct	S.T.S. Lex	0	0	1	0	0	0
1984	27 Aug - 7 Sep	T. Ike	0	0	0	0	0	1
1985	19 - 25 Jun	T. Hal	0	4	2	0	1	13
	1 - 7 Sep	T. Tess	6	1	3	2	0	12
	13 - 22 Oct	T. Dot	0	0	0	0	0	1
1986	3 - 12 Jul	T. Peggy	3	0	3	1	0	26
	9 - 12 Aug	T.D.	0	1	5	0	0	3
	18 Aug - 6 Sep	T. Wayne	0	3	0	3	1	15+
	11 - 19 Oct	T. Ellen	1	2	1	0	0	4
1987	16 - 27 Oct	T. Lynn	0	0	0	0	0	1
1988	14 - 20 Jul	T. Warren	1	2	1	0	1	12
	19 - 22 Sep	T. Kit	0	0	1	0	0	0
	18 - 23 Oct	T. Pat	0	0	0	2	0	1
	21 - 29 Oct	T. Ruby	0	0	0	0	0	4
1989	16 - 21 May	T. Brenda	0	3	5	6	1	119
	11 - 19 Jul	T. Gordon	1	0	8	2	0	31
	8 - 14 Oct	T. Dan	1	0	1	0	0	0

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

* Data unavailable
\+ Struck by lightning.

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

TABLE 8. DAMAGE CAUSED BY TROPICAL CYCLONES IN HONG KONG, 1989

Name of tropical cyclone	Month	Damage in physical terms					Damage in monetary terms (million HK$)					
		Agricultural	Public works facilities	Public utilities	Private property	Landslip & collapse of slope	Agricultural	Public works facilities	Public utilities	Private property	Others	Total
T. Brenda	May	fishponds : 160 hectares farmland : 190 hectares livestock : 75 600 heads fish : 265 tonnes	-	-	361 units	100	8.8	-	1.423	-	-	10.223
T. Gordon	Jul	fishponds : 17 hectares farmland : 4.5 hectares livestock : 452 heads fish : 19 tonnes	-	-	8 units	3	0.3	-	0.223	-	-	0.523

TABLE 9. SHIPS DAMAGED BY TROPICAL CYCLONES IN HONG KONG, 1989

Name of tropical cyclone	Date	Type of Vessel	Location of Incident	Nature of incident
T. Gordon	16-18 Jul	General Cargo Ship 'Bai Yun Shan'	Buoy A36	Broken mooring cable
T. Dan	11-13 Oct	Chinese Tug-boat 'Tong Hai Tuo 6'	Kwun Tong Typhoon Shelter	Collided with a local craft 'Sun Yew Lee No. 1'

TABLE 10. A SUMMARY OF METEOROLOGICAL OBSERVATIONS REOORDED IN HONG KONG DURING THE PASSAGES OF TROPICAL CYCLONES IN 1989

(a)

Name of tropical cyclone	Month	Nearest approach to Hong Kong						Minimum hourly M.S.L. pressure at the Royal Observatory			Maximum storm surge (metres)								
		Day	Hour*	Direction	Distance (km)	Movement (km/h)	Estimated minimum central pressure (hPa)	Day	Hour*	Pressure (hPa)	Chi Ma Wan	Ko Lau Wan	Lok On Pai	Quarry Bay	Tai O	Tai Po Kau	Tamar	Tsim Bei Tsui	Waglan Island
T. Brenda	May	20	17	SW	130	NW 16	970	20	15	995.3	0.91	0.98	0.85	0.88	0.82	1.00	0.64	1.09	-
T. Dot	Jun	9	20	SSW	600	WNW 16	950	9	17	1002.7	0.25	0.51	0.20	0.22	0.21	0.48	0.09	0.47	-
S.T.S. Faye	Jul	10	12	SSW	400	WNW 20	987	10	16	1004.3	0.37	0.51	0.28	0.31	0.20	0.38	0.44	0.40	0.37
T. Gordon	Jul	18	3	SSW	190	WNW 16	970	18	3	990.6	1.16	1.26	0.98	1.20	1.29	1.36	1.07	1.11	-
T. Brian	Oct	1	8	SSE	270	WSW 12	990	1	4,5	1007.1	0.60	-	0.51	0.48	0.48	0.53	0.43	0.46	0.62
T. Angela	Oct	8	12	S	460	W 13	945	7	16	1009.7	0.70	-	0.76	0.58	0.68	0.55	0.57	0.85	0.69
T. Dan	Oct	12	6	S	650	W 27	970	12	15	1010.4	0.38	0.69	0.33	0.38	0.39	0.59	0.34	-	-

* Hong Kong Time (UTC + 8)

(b)

Name of tropical cyclone	Month	Maximum 60-min mean wind in points and km/h		Maximum 10-min mean wind in points and km/h		Maximum gust peak speed in km/h with direction in points		Rainfall at the Royal Observatory (mm)				
		Royal Observatory	Waglan Island	Royal Observatory	Waglan Island	Royal Observatory	Waglan Island	(i) 600 km	(ii) 24 hours	(iii) 48 hours	(iv) 72 hours	(i) + (iv)
T. Brenda	May	E 54	E 94	E 54	E 101	ENE 103	ENE 128	410.2	22.5	22.9	29.4	439.6
T. Dot	Jun	E 31	E 47	E 31	E 51	E 63	E 79	Nil	5.5	12.6	17.6	17.6
S.T.S. Faye	Jul	E 27	E 49	E 34	E 68	E 67	E 88	25.9	5.3	5.3	5.3	31.2
T. Gordon	Jul	ENE 51	E 90	ESE 52	ENE 103	ENE 115	E 126	131.2	Trace	0.5	0.5	131.7
T. Brian	Oct	E 31	E 79	E 34	E 90	E 72	ESE 124	20.2	Trace	Trace	0.1	20.3
T. Angela	Oct	E 25	E 63	NNE 27	E 65	E 47	E 79	Trace	Nil	Nil	Nil	Trace
T. Dan	Oct	E 31	E 77	E 34	E 79	E 65	E 101	Outside 600 km				

N.B. (i) during the period when the tropical cyclone was centred within 600 km of Hong Kong.
(ii) during the 24-hour period after the tropical cyclone moved outside (or dissipated within) the 600 km radius.
(iii) during the 48-hour period after the tropical cyclone moved outside (or dissipated within) the 600 km radius.
(iv) during the 72-hour period after the tropical cyclone noved outside (or dissipated within) the 600 km radius.

TABLE 11 TYPHOONS WHICH REQUIRED THE HOISTING OF THE HURRICANE SIGNAL NO. 10 DURING THE FERIOD 1946-1989

Name of typhoon	Date	Nearest approach to Royal Observatory km	Minimum M.S.L. pressure (hPa)		Maximum 60-min mean winds in points and km/h								Maximum gust peak speed in km/h with direction in points							
			Hourly	Inst.	Royal Observatory	Hong Kong Airport	Waglan Island	Cheung Chau	Tate's Cairn	Cape Collinson	Green Island	Castle Peak	Royal Observatory	Hong Kong Airport	Waglan Island	Cheung Chau	Tate's Cairn	Cape Collinson	Green Island	Castle Peak
-	18 Jul 1946	S 70	985.7	-	NE -	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Gloria	22 Sep 1957	SW 55	986.2	984.3	ESE 115	ESE 72	E 113	-	-	-	-	-	E 187	ENE 158	ENE 185	-	-	-	-	-
Mary	9 Jun 1960	WNW 10	974.3	973.8	SSE 96	SSE 92	SSW 112	-	-	-	-	-	SSE 191	SE 164	SSW 194	-	-	-	-	-
Alice	19 May 1961	0	981.6	981.1	ENE 83	E 70	ESE 90	ENE 76	-	-	-	-	E 166	ENE 139	SW 128	ENE 135	-	-	-	-
Wanda	1 Sep 1962	SSW 20	955.1	953.2	N 133	N 108	NW 148	NW 118	SE 189	-	-	-	N 259	N 229	NNW 216	NW 232	ESE 284	-	-	-
Ruby	5 Sep 1964	SW 30	971.0	968.2	E 110	N 118	ENE 148	NE 113	ESE 167	SSE 153	-	-	NNE 227	NW 203	E 230	NNE 216	E 268	S 221	-	-
Dot	13 Oct 1964	E 35	978.9	977.3	NNW 88	N 67	N 117	NNW 96	NNE 157	N 101	-	-	N 175	N 198	N 184	WNW 205	NE 220	NNE 187	-	-
Shirley	21 Aug 1968	0	968.7	968.6	N 68	N 75	NNE 124	SSW 90	NNE 126	SSW 85	-	-	N 133	N 151	NE 209	SSW 167	NNE 203	N 173	-	-
Rose	17 Aug 1971	WSW 20	984.5	982.8	SE 103	SE 122	ESE 140	SE 131	S 148	SSW 137	-	-	ESE 224	ESE 211	ESE 189	SE 194	S 221	S 191	-	-
Elsie	14 Oct 1975	S 50	996.4	996.2	ENE 58	NNW 67	NNE 118	N 106	NE 130	-	NNW 118	N 65	NE 140	N 140	ENE 176	NE 158	NNE 180	-	NE 167	N 121
Hope	2 Aug 1979	NNW 10	961.8	961.6	W 75	W 115	SW 144	SSW 117	NW 115	-	W 108	- 96	W 175	WNW 182	SW 198	WSW 185	WNW 229	-	W 167	- 173
Ellen	9 Sep 1983	SW 45	983.9	983.1	E 92	E 112	ESE 169	ESE 171	E 126	-	S 137	SE 94	E 185	E 203	E 227	SSE 238	ENE 218	-	S 220*	SE 171

* estimated, exceeding upper limit of anemogram.

TABLE 12. THE 10 WETTEST TROPICAL CYCLONES IN HONG KONG
(1884-1939, 1947-1989)

Tropical Cyclone			Rainfall at the Royal Observatory (mm)				
Year	Month	Name	(i) 600 km	(ii) 24 hours	(iii) 48 hours	(iv) 72 hours	(i) + (iv)
* 1926	Jul	-	34.8	534.0	561.1	562.2	597.0
* 1916	Jun	-	494.8	27.9	59.4	67.2	562.0
1965	Sep	Agnes	404.6	8.9	64.3	126.1	530.7
1978	Jul	Agnes	502.4	12.3	12.3	16.6	519.0
1976	Aug	Ellen	90.7	394.2	421.0	425.4	516.1
1982	Aug	Dot	41.2	322.5	403.1	450.5	491.7
* 1904	Aug	-	446.5	NIL	3.7	26.7	473.2
1974	Oct	Carmen	307.6	150.3	161.7	162.1	469.7
* 1960	Jun	Mary	427.5	NIL	2.6	13.3	440.8
1989	May	Brenda	410.2	22.5	22.9	29.4	439.6

N.B.(i) during the period in hours when the tropical cyclone was centred within 600 km of Hong Kong.

(ii) during the 24-hour period after the tropical cyclone moved outside (or dissipated within) the 600 km radius.

(iii) during the 48-hour period after the tropical cyclone moved outside (or dissipated within) the 600 km radius.

(iv) during the 72-hour period after the tropical cyclone moved outside (or dissipatea within) the 600 km radius.

* For years prior to 1961, (i) is the sum of daily rainfall on those days when the tropical cyclone was centred within 600 km of Hong Kong, (ii) to (iv) are correspondingly the sum of daily rainfall figures of the following days.

5. TROPICAL CYCLONE POSITION AND INTENSITY DATA, 1989

Six-hourly position and intensity data are tabulated for the following tropical cyclones in 1989 in the western North Pacific and the South China Sea (i.e. the area between the equator and 45°N, and between 100°E and 180°).

Surface winds in this section refer to wind speeds averaged over a period of 10 minutes,

SIX-HOURLY POSITION AND INTENSITY DATA OF

TROPICAL STORM WINONA (8901)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface wind (m/s)	Lat. °N	Long. °E
Jan	17	1800	T.D.	1000	16	16.9	156.0
	18	0000	T.D.	1000	16	16.7	153.4
		0600	T.S.	997	18	16.6	151.6
		1200	T.S.	995	21	16.4	150.0
		1800	T.S.	997	18	16.0	148.2
	19	0000	T.S.	997	18	15.1	145.6
		0600	T.S.	997	18	14.5	142.9
		1200	T.D.	1000	16	13.9	139.9
		1800	T.D.	1003	13	13.4	136.9
	20	0000	T.D.	1003	13	13.7	134.5
		0600	T.D.	1000	16	13.7	132.5
		1200	T.D.	1000	16	13.5	130.6
		1800	T.D.	1000	16	13.4	128.8

Dissipated

SIX-HOURLY POSITION AND INTENSITY DATA OF TYPHOON ANDY (8902)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface wind (m/s)	Lat. °N	Long. °E
Apr	17	1800	T.D.	1000	16	8.0	146.8
	18	0000	T.S.	995	18	8.5	146.7
		0600	T.S.	995	18	9.3	146.3
		1200	T.S.	995	18	9.7	145.5
		1800	T.S.	990	21	9.7	144.7
	19	0000	S.T.S.	985	25	9.7	144.1
		0600	S.T.S.	985	25	9.7	143.6
		1200	S.T.S.	980	28	9.8	143.2
		1800	S.T.S.	975	31	10.2	143.0
	20	0000	T.	965	36	10.6	143.2
		0600	T.	955	43	11.0	143.6
		1200	T.	945	54	11.4	144.1
		1800	T.	945	54	12.0	145.0
	21	0000	T.	945	54	12.6	145.9
		0600	T.	940	57	13.3	146.9
		1200	T.	945	54	14.4	148.3
		1800	T.	950	49	15.6	149.6
	22	0000	T.	960	41	16.6	150.7
		0600	T.	965	39	17.7	151.7
		1200	T.	970	36	18.7	152.5
		1800	S.T.S.	975	31	19.8	153.6
	23	0000	S.T.S.	980	25	21.0	154.4
		0600	S.T.S.	980	25	21.8	155.0
		1200	T.S.	985	23	22.5	155.5
		1800	T.S.	990	18	23.3	156.0

Became Extratropical

SIX-HOURLY POSITION AND INTENSITY DATA OF

TYPHOON BRENDA (8903)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface wind (m/s)	Lat. °N	Long. °E
May	15	1800	T.D.	1000	13	9.5	130.9
	16	0000	T.D.	995	16	9.7	129.4
		0600	T.D.	995	16	10.2	128.1
		1200	T.S.	990	18	10.8	127.0
		1800	T.S.	990	21	11.3	125.9
	17	0000	T.S.	985	23	12.3	124.1
		0600	T.S.	985	23	13.5	122.5
		1200	T.S.	985	23	14.0	121.1
		1800	T.S.	985	23	14.7	119.8
	18	0000	T.S.	985	23	15.3	119.0
		0600	S.T.S.	980	25	16.0	118.2
		1200	S.T.S.	980	25	16.6	117.7
		1800	S.T.S.	980	28	17.0	117.3
	19	0000	S.T.S.	980	28	17.5	116.9
		0600	S.T.S.	975	31	18.3	116.3
		1200	T.	970	33	19.1	115.8
		1800	T.	965	39	19.8	115.2
	20	0000	T.	965	39	20.5	114.5
		0600	T.	970	36	21.1	113.8
		1200	T.	975	33	21.5	113.1
		1800	S.T.S.	985	28	21.9	112.2
	21	0000	T.D.	995	16	22.1	111.4

Dissipated

SIX-HOURLY POSITION AND INTENSITY DATA OF

TYPHOON CECIL (8904)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface wind (m/s)	Lat. °N	Long. °E
May	22	1200	T.D.	995	13	12.4	113.9
		1800	T.S.	990	18	13.5	113.2
	23	0000	T.S.	985	23	14.2	112.6
		0600	S.T.S.	980	25	14.8	112.0
		1200	S.T.S.	980	25	15.1	111.5
		1800	S.T.S.	980	25	15.4	110.9
	24	0000	S.T.S.	975	28	15.7	110.2
		0600	T.	965	36	15.5	109.6
		1200	T.	970	33	16.0	109.3
		1800	T.	970	33	15.5	108.7
	25	0000	S.T.S.	980	25	15.8	108.2
		0600	T.S.	990	18	16.7	107.4
		1200	T.D.	995	13	16.7	106.4

Dissipated

SIX-HOURLY POSITION AND INTENSITY DATA OF

TYPHOON DOT (8905)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface wind (m/s)	Lat. °N	Long. °E
Jun	5	0600	T.D.	1002	13	9.9	128.9
		1200	T.D.	1002	13	10.2	127.9
		1800	T.D.	1000	16	10.6	126.8
	6	0000	T.S.	995	18	11.0	125.7
		0600	T.S.	995	18	11.7	124.2
		1200	T.S.	995	18	12.2	122.9
		1800	T.S.	990	21	12.5	121.6
	7	0000	T.S.	990	21	12.9	120.4
		0600	T.S.	985	23	13.6	119.4
		1200	T.S.	985	23	14.3	118.4
		1800	S.T.S.	980	25	14.8	117.6
	8	0000	S.T.S.	975	28	15.3	116.8
		0600	T.	965	33	15.7	115.9
		1200	T.	960	36	16.1	115.0
		1800	T.	955	39	16.3	114.4
	9	0000	T.	955	39	16.6	113.6
		0600	T.	950	41	17.0	112.7
		1200	T.	950	41	17.4	111.8
		1800	T.	950	41	17.8	111.0
	10	0000	T.	960	36	18.2	110.1
		0600	S.T.S.	965	31	18.6	109.4
		1200	S.T.S.	970	25	18.8	108.7
		1800	S.T.S.	970	25	19.1	107.9
	11	0000	T.S.	975	23	19.6	107.2
		0600	T.S.	980	21	20.4	106.9
		1200	T.S.	985	18	21.2	106.5
		1800	T.D.	990	16	21.5	106.2

Dissipated

SIX-HOURLY POSITION AND INTENSITY OF

TROPICAL STORM ELLIS (8906)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface wind (m/s)	Lat. °N	Long. °E
Jun	22	1200	T.D.	1000	13	18.7	126.9
		1800	T.S.	990	18	19.6	125.6
	23	0000	T.S.	990	18	20.6	126.8
		0600	T.S.	990	18	22.8	127.9

Became Extratropical

SIX-HOURLY POSITION AND INTENSITY DATA OF SEVERE TROPICAL STORM FAYE (8907)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface wind (m/s)	Lat. °N	Long. °E
Jul	7	0000	T.D.	1000	13	16.5	128.5
		0600	T.D.	995	16	16.6	127.8
		1200	T.D.	995	16	16.7	127.0
		1800	T.S.	990	18	16.7	126.0
	8	0000	T.S.	985	21	16.7	124.8
		0600	S.T.S.	975	25	16.8	123.6
		1200	S.T.S.	975	25	17.0	122.6
		1800	T.S.	980	23	17.2	120.7
	9	0000	T.S.	980	23	17.4	119.0
		0600	T.S.	980	23	17.4	117.6
		1200	T.S.	985	21	17.7	116.4
		1800	T.S.	985	21	18.0	115.3
	10	0000	T.S.	985	21	18.5	113.8
		0600	T.S.	987	18	19.0	112.4
		1200	T.S.	987	18	19.4	111.3
		1800	T.D.	990	16	19.8	110.2
	11	0000	T.D.	990	16	20.5	109.2
		0600	T.D.	990	16	21.2	107.9

Dissipated

SIX-HOURLY POSITION AND INTENSITY DATA OF

TYPHOON GORDON (8908)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface wind (m/s)	Lat. °N	Long. °E
Jul	11	0600	T.D.	1000	13	18.3	147.0
		1200	T.D.	1000	13	18.5	145.7
		1800	T.D.	1000	13	18.5	144.3
	12	0000	T.D.	995	16	18.3	142.8
		0600	T.S.	990	18	18.1	141.3
		1200	T.S.	985	21	18.0	139.9
		1800	T.S.	980	23	17.8	138.4
	13	0000	S.T.S.	975	25	17.5	136.9
		0600	S.T.S.	975	25	17.2	135.4
		1200	S.T.S.	970	28	17.0	134.0
		1800	S.T.S.	965	31	16.6	132.7
	14	0000	T.	955	33	16.4	131.4
		0600	T.	945	39	16.3	130.2
		1200	T.	935	43	16.3	128.8
		1800	T.	925	49	16.4	127.4
	15	0000	T.	905	59	16.6	126.3
		0600	T.	905	59	16.9	125.2
		1200	T.	905	59	17.4	124.0
		1800	T.	915	54	17.9	122.5
	16	0000	T.	955	41	18.0	121.3
		0600	T.	970	36	18.2	120.1
		1200	T.	970	36	18.4	118.9
		1800	T.	970	36	18.7	117.8
	17	0000	T.	970	36	19.1	116.7
		0600	T.	970	36	19.6	115.7
		1200	T.	970	36	20.2	114.6
		1800	T.	970	36	20.7	113.5
	18	0000	T.	970	36	21.2	112.4
		0600	T.	970	36	21.6	111.3
		1200	S.T.S.	980	28	22.0	110.0
		1800	T.S.	985	21	22.7	108.7
	19	0000	T.D.	990	13	23.1	107.7

Dissipated

SIX-HOURLY POSITION AND INTENSITY DATA OF

SEVERE TROPICAL STORM HOPE (8909)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface wind (m/s)	Lat. °N	Long. °E
Jul	16	1200	T.D.	1002	13	21.2	132.7
		1800	T.D.	1000	16	21.6	131.8
	17	0000	T.D.	1000	16	22.3	130.9
		0600	T.D.	1002	13	23.0	129.8
		1200	T.D.	1000	16	23.8	128.4
		1800	T.S.	998	18	24.1	127.5
	18	0000	T.S.	995	21	24.5	126.9
		0600	T.S.	995	21	24.8	126.2
		1200	T.S.	995	21	25.2	125.6
		1800	T.S.	995	21	25.8	125.0
	19	0000	T.S.	995	23	26.5	124.5
		0600	S.T.S.	990	25	27.3	124.1
		1200	S.T.S.	990	25	27.7	124.0
		1800	S.T.S.	990	25	28.3	123.7
	20	0000	S.T.S.	985	28	28.7	122.9
		0600	S.T.S.	980	31	28.4	122.4
		1200	S.T.S.	980	31	29.0	122.4
		1800	S.T.S.	980	31	29.0	121.7
	21	0000	T.S.	995	21	29.3	121.3
		0600	T.S.	1000	18	29.9	120.5

Dissipated

SIX-HOURLY POSITION AND INTENSITY DATA OF

SEVERE TROPICAL STORM IRVING (8910)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface wind (m/s)	Lat. °N	Long. °E
Jul	20	1800	T.D.	995	16	14.8	117.7
	21	0000	T.S.	990	18	14.9	116.7
		0600	T.S.	985	21	15.2	115.2
		1200	T.S.	980	23	15.2	113.4
		1800	T.S.	980	23	14.8	112.4
	22	0000	T.S.	980	23	15.4	112.4
		0600	T.S.	980	23	16.5	111.4
		1200	T.S.	985	21	16.6	109.9
		1800	S.T.S.	975	25	16.7	109.1
	23	0000	S.T.S.	975	25	17.1	108.5
		0600	T.S.	980	23	17.5	107.9
		1200	T.S.	985	21	18.1	107.2
		1800	S.T.S.	975	25	18.7	106.5
	24	0000	T.S.	985	21	19.3	105.7
		0600	T.D.	995	16	20.0	104.7

Dissipated

SIX-HOURLY POSITION AND INTENSITY DATA OF

TYPHOON JUDY (8911)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface wind (m/s)	Lat. °N	Long. °E
Jul	23	0600	T.D.	995	13	17.1	138.0
		1200	T.D.	990	16	17.7	138.0
		1800	T.S.	985	21	18.3	138.0
	24	0000	T.S.	980	23	18.9	138.1
		0600	S.T.S.	975	28	19.5	138.3
		1200	S.T.S.	970	31	20.1	138.3
		1800	T.	965	33	20.9	138.4
	25	0000	T.	960	36	21.8	138.4
		0600	T.	955	41	22.9	138.3
		1200	T.	945	46	23.9	138.1
		1800	T.	950	43	25.0	137.8
	26	0000	T.	955	39	26.0	137.4
		0600	T.	955	39	26.8	136.9
		1200	T.	960	36	27.5	136.3
		1800	T.	965	33	28.4	135.3
	27	0000	T.	960	36	29.2	134.1
		0600	T.	960	36	30.0	132.7
		1200	T.	955	39	30.7	131.5
		1800	T.	960	36	31.5	130.3
	28	0000	S.T.S.	970	31	32.6	129.2
		0600	S.T.S.	975	28	33.5	128.5
		1200	T.S.	990	18	34.4	127.9
		1800	T.S.	990	18	36.4	126.8

Dissipated

SIX-HOURLY POSITION AND INTENSITY DATA OF

SEVERE TROPICAL STORM KEN-LOLA (8912)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface wind (m/s)	Lat. °N	Long. °E
Jul	29	1200	T.D.	990	13	22.9	133.7
		1800	T.S.	985	18	23.2	135.0
	30	0000	T.S.	985	18	23.9	136.4
		0600	T.S.	985	18	25.0	137.6
		1200	T.S.	985	18	26.5	138.4
		1800	T.S.	985	18	27.8	137.2
	31	0000	T.S.	980	21	28.5	135.5
		0600	T.S.	975	21	28.8	132.4
		1200	T.S.	975	21	28.4	130.6
		1800	T.S.	980	18	27.6	129.5
Aug	1	0000	T.D.	985	16	27.0	129.4
		0600	T.D.	990	13	26.6	129.3
		1200	T.D.	985	16	26.5	129.2
		1800	T.D.	985	16	26.5	129.0
	2	0000	T.S.	980	21	26.8	128.9
		0600	T.S.	975	23	27.4	128.7
		1200	T.S.	980	21	28.0	128.3
		1800	T.S.	980	21	28.5	127.6
	3	0000	S.T.S.	970	25	29.2	126.6
		0600	T.S.	975	23	30.1	125.0
		1200	T.S.	980	21	30.6	123.8
		1800	T.S.	980	21	31.0	122.6
	4	0000	T.S.	985	18	31.3	121.3
		0600	T.S.	985	18	31.5	120.1
		1200	T.D.	990	16	31.5	119.0
		1800	T.D.	995	13	31.5	117.8

Dissipated

SIX-HOURLY POSITION AND INTENSITY DATA OF

TYPHOON MAC (8913)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface wind (m/s)	Lat. °N	Long. °E
Aug	1	0600	T.D.	995	16	22.3	151.0
		1200	T.S.	990	18	22.9	150.9
		1800	T.S.	985	21	23.5	150.6
	2	0000	T.S.	985	21	24.3	150.3
		0600	T.S.	985	21	25.1	149.9
		1200	T.S.	980	23	26.0	149.2
		1800	S.T.S.	975	25	26.8	148.1
	3	0000	T.	965	33	27.0	147.0
		0600	T.	955	41	26.9	146.2
		1200	T.	955	41	26.6	145.4
		1800	T.	955	41	26.4	145.0
	4	0000	T.	955	41	26.3	144.8
		0600	T.	955	41	26.3	144.5
		1200	T.	960	39	26.4	144.3
		1800	T.	965	36	27.1	144.3
	5	0000	T.	965	36	27.9	144.1
		0600	T.	965	36	29.2	143.9
		1200	T.	965	33	30.7	143.5
		1800	S.T.S.	970	31	32.5	142.7
	6	0000	S.T.S.	970	31	34.2	141.8
		0600	S.T.S.	975	28	35.7	140.8
		1200	T.S.	980	23	37.7	139.8
		1800	T.S.	985	21	39.2	138.7
	7	0000	T.S.	990	18	40.4	137.9
		0600	T.D.	995	16	41.2	137.4

Dissipated

SIX-HOURLY POSITION AND INETENSITY DATA OF

TYPHOON NANCY (8914)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface wind (m/s)	Lat. °N	Long. °E
Aug	11	1200	T.D.	1000	13	20.1	156.4
		1800	T.D.	995	16	20.2	157.0
	12	0000	T.D.	995	16	20.6	157.5
		0600	T.S.	990	21	21.2	157.8
		1200	T.S.	990	21	21.7	157.9
		1800	T.S.	990	21	22.2	157.9
	13	0000	S.T.S.	985	25	23.2	157.6
		0600	S.T.S.	985	25	24.5	157.0
		1200	S.T.S.	980	28	25.8	156.3
		1800	S.T.S.	975	31	27.3	155.4
	14	0000	S.T.S.	975	31	29.0	154.0
		0600	T.	970	33	30.5	151.8
		1200	T.	970	33	31.7	150.0
		1800	T.	965	36	33.0	148.4
	15	0000	T.	970	33	34.2	147.1
		0600	T.	965	36	35.6	146.3
		1200	T.	970	33	37.1	145.9
		1800	S.T.S.	980	28	39.0	145.7
	16	0000	S.T.S.	985	25	40.4	145.1
		0600	T.S.	990	21	41.7	145.1
		1200	T.S.	990	21	42.8	145.7
		1800	T.S.	995	18	44.0	146.5

Became Extratropical

SIX-HOURLY POSITION AND INTENSITY DATA OF

TYPHOON OWEN (8915)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface wind (m/s)	Lat. °N	Long. °E
Aug	12	0600	T.D.	995	13	19.6	147.6
		1200	T.D.	995	13	19.2	148.3
		1800	T.D.	990	16	18.9	148.9
	13	0000	T.S.	985	18	18.6	149.3
		0600	T.S.	985	21	18.6	150.0
		1200	T.S.	980	23	19.0	150.9
		1800	S.T.S.	975	28	19.8	151.5
	14	0000	T.	970	33	20.8	151.9
		0600	T.	965	36	22.0	152.1
		1200	T.	970	33	23.5	151.9
		1800	T.	970	33	25.0	151.5
	15	0000	T.	970	33	26.2	150.9
		0600	S.T.S.	975	31	27.4	150.1
		1200	S.T.S.	975	31	28.3	149.5
		1800	S.T.S.	975	28	29.2	148.9
	16	0000	S.T.S.	980	25	30.3	148.0
		0600	S.T.S.	980	25	31.3	147.2
		1200	S.T.S.	980	25	32.4	146.5
		1800	S.T.S.	980	25	33.4	145.9
	17	0000	S.T.S.	975	28	34.5	145.5
		0600	S.T.S.	975	28	35.8	145.5
		1200	S.T.S.	980	25	37.2	145.9
		1800	T.S.	985	23	38.6	146.6
	18	0000	T.S.	985	23	40.2	147.6
		0600	T.S.	985	23	41.8	148.7
		1200	T.S.	985	21	43.2	150.1
		1800	T.S.	985	21	44.6	151.6
	19	0000	T.S.	990	18	46.0	153.0

Became Extratropical

SIX-HOURLY POSITION AND INTENSITY DATA OF TROPICAL DEPRESSION PEGGY (8916)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface wind (m/s)	Lat. °N	Long. °E
Aug	16	0600	T.D.	1000	13	20.4	148.7
		1200	T.D.	995	16	21.2	148.9
		1800	T.D.	995	16	22.0	148.9
	17	0000	T.D.	1000	13	22.7	148.5
		0600	T.D.	1000	13	23.0	148.0
		1200	T.D.	1000	13	23.3	147.4
		1800	T.D.	1000	13	23.4	146.8

Dissipated

SIX-HOURLY POSITION AND INTENSITY DATA OF

THE TROPICAL STORM OF 17-20 AUGUST

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface wind (m/s)	Lat. oN	Long. oE
Aug	17	0000	T.D.	998	13	29.7	124.2
		0600	T.D.	995	16	28.7	124.1
		1200	T.D.	995	16	27.9	123.9
		1800	T.D.	995	16	27.5	123.7
	18	0000	T.D.	995	16	27.3	123.5
		0600	T.D.	995	16	27.2	123.3
		1200	T.D.	995	16	27.1	122.9
		1800	T.D.	995	16	27.1	122.3
	19	0000	T.S.	993	18	26.9	121.7
		0600	T.S.	993	18	26.8	121.2
		1200	T.S.	990	21	26.7	120.7
		1800	T.D.	995	16	26.6	120.2

Dissipated

SIX-HOURLY POSITION AND INTENSITY DATA OF

SEVERE TROPICAL STORM ROGER (8917)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface wind (m/s)	Lat. oN	Long. oE
Aug	25	0000	T.D.	995	13	25.3	124.7
		0600	T.D.	995	16	24.7	125.6
		1200	T.D.	995	16	24.6	126.9
		1800	T.S.	990	21	25.0	128.4
	26	0000	T.S.	985	23	26.4	130.1
		0600	T.S.	985	23	29.0	131.1
		1200	S.T.S.	980	25	30.5	131.9
		1800	S.T.S.	975	28	31.8	132.9
	27	0000	S.T.S.	975	28	33.2	134.1
		0600	S.T.S.	980	25	34.7	135.6
		1200	T.S.	980	23	37.5	138.0
		1800	T.S.	980	23	39.4	139.7
	28	0000	T.S.	980	23	41.9	140.7
		0600	T.S.	980	23	43.9	143.1

Became Extratropical

SIX-HOURLY POSITION AND INTENSITY DATA OF THE TROPICAL STORM OF 26-27 AUGUST (8918)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface wind (m/s)	Lat. °N	Long. °E
Aug	26	0600	T.D.	1000	13	30.9	155.7
		1200	T.D.	1000	16	31.4	157.3
		1800	T.S.	995	18	31.7	158.7
	27	0000	T.S.	995	18	32.1	160.0
		0600	T.D.	1000	16	32.3	161.1
		1200	T.D.	1000	13	32.6	162.0

Dissipated

SIX-HOURLY POSITION AND INTENSITY DATA OF

TYPHOON SARAH (8919)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface wind (m/s)	Lat. °N	Long. °E
Sep	5	1800	T.D.	995	16	21.1	142.9
	6	0000	T.D.	995	16	20.4	141.4
		0600	T.D.	995	16	20.4	139.5
		1200	T.D.	995	16	20.4	138.0
		1800	T.S.	990	18	20.2	136.6
	7	0000	T.S.	985	21	20.1	135.5
		0600	T.S.	985	21	20.2	134.6
		1200	T.S.	985	21	20.7	133.4
		1800	T.S.	985	23	21.3	131.7
	8	0000	T.S.	985	23	21.9	129.7
		0600	S.T.S.	980	25	21.3	126.3
		1200	S.T.S.	980	25	19.5	124.7
		1800	S.T.S.	975	28	18.3	124.8
	9	0000	S.T.S.	975	28	18.1	125.3
		0600	S.T.S.	975	28	18.1	124.2
		1200	S.T.S.	975	28	17.7	124.3
		1800	S.T.S.	975	31	18.5	124.2
	10	0000	S.T.S.	975	31	19.2	124.0
		0600	T.	970	33	20.0	123.9
		1200	T.	960	39	20.7	123.5
		1800	T.	950	43	21.1	123.1
	11	0000	T.	940	51	21.8	123.1
		0600	T.	940	51	22.8	122.8
		1200	T.	940	51	23.3	122.0
		1800	T.	960	39	23.3	121.1
	12	0000	S.T.S.	975	31	23.7	121.5
		0600	S.T.S.	975	31	24.3	121.7
		1200	S.T.S.	980	28	25.0	121.9
		1800	S.T.S.	980	28	25.5	121.3
	13	0000	T.S.	985	23	26.1	120.7
		0600	T.S.	990	21	26.9	120.6

Dissipated

SIX-HOURLY POSITION AND INTENSITY DATA OF

TROPICAL STORM TIP (8920)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface wind (m/s)	Lat. °N	Long. °E
Sep	9	0000	T.D.	995	13	19.9	154.1
		0600	T.D.	990	16	22.0	154.9
		1200	T.D.	990	16	24.3	155.1
		1800	T.D.	990	16	26.5	154.1
	10	0000	T.S.	985	18	28.2	152.3
		0600	T.S.	985	18	28.7	150.7
		1200	T.S.	985	18	29.0	150.0
		1800	T.S.	985	18	29.5	149.9
	11	0000	T.S.	985	21	30.2	150.6
		0600	T.S.	985	21	31.5	151.0
		1200	T.S.	985	18	33.0	151.0
		1800	T.S.	985	18	34.0	151.1
	12	0000	T.S.	985	21	34.9	151.8
		0600	T.S.	980	23	35.6	152.8
		1200	T.S.	985	21	36.2	154.5
		1800	T.S.	980	23	36.7	156.3
	13	0000	T.S.	985	21	37.0	159.0
		0600	T.S.	985	21	36.9	161.2
		1200	T.S.	990	18	36.5	163.0
		1800	T.D.	995	16	35.5	165.0

Dissipated

SIX-HOURLY POSITION AND INTENSITY DATA OF SEVERE TROPICAL STORM VERA (8921)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface wind (m/s)	Lat. °N	Long. °E
Sep	12	0600	T.D.	1000	16	18.1	143.8
		1200	T.S.	995	18	18.8	142.5
		1800	T.S.	990	21	19.5	141.0
	13	0000	T.S.	990	21	20.2	139.2
		0600	T.S.	985	23	20.8	137.6
		1200	T.S.	985	23	21.3	136.2
		1800	S.T.S.	980	25	22.0	134.4
	14	0000	T.S.	985	23	22.8	132.4
		0600	S.T.S.	980	25	23.4	130.4
		1200	S.T.S.	980	25	24.0	128.3
		1800	T.S.	985	23	24.9	126.4
	15	0000	T.S.	985	23	26.1	124.6
		0600	S.T.S.	980	25	27.3	123.0
		1200	T.S.	990	23	28.4	121.4
		1800	T.S.	995	18	29.4	120.1

Became Extratropical

SIX-HOURLY POSITION AND INTENSITY DATA OF

TYPHOON WAYNE (8922)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface wind (m/s)	Lat. °N	Long. °E
Sep	17	1800	T.D.	995	16	24.1	124.8
	18	0000	T.S.	990	18	25.4	124.9
		0600	T.S.	985	21	26.6	125.1
		1200	S.T.S.	980	25	27.7	125.8
		1800	S.T.S.	975	31	28.9	126.8
	19	0000	T.	970	33	30.3	128.7
		0600	T.	970	33	31.6	131.4
		1200	S.T.S.	975	31	32.8	134.6
		1800	S.T.S.	980	28	34.4	138.5
	20	0000	T.S.	990	23	36.3	142.9

Became Extratropical

SIX-HOURLY POSITION AND INTENSITY DATA OF

TYPHOON ANGELA (8923)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface wind (m/s)	Lat. °N	Long. °E
Sep	29	0600	T.D.	1000	13	13.3	139.5
		1200	T.D.	1000	13	14.2	139.3
		1800	T.D.	995	16	14.9	139.1
	30	0000	T.D.	995	16	15.4	138.8
		0600	T.S.	990	18	15.8	138.6
		1200	T.S.	985	23	16.1	138.3
		1800	S.T.S.	975	31	16.3	138.1
Oct	1	0000	T.	965	36	16.4	137.8
		0600	T.	965	36	16.6	137.3
		1200	T.	955	41	16.8	136.7
		1800	T.	945	46	17.1	136.0
	2	0000	T.	945	46	17.3	135.2
		0600	T.	935	51	17.6	134.3
		1200	T.	935	51	17.8	133.4
		1800	T.	945	46	17.9	132.7
	3	0000	T.	950	41	18.0	132.0
		0600	T.	950	41	18.1	131.3
		1200	T.	950	41	18.1	130.7
		1800	T.	955	39	18.2	130.1
	4	0000	T.	955	39	18.2	129.4
		0600	T.	950	41	18.2	128.5
		1200	T.	945	43	18.2	127.4
		1800	T.	945	43	18.1	126.3
	5	0000	T.	940	49	18.0	125.2
		0600	T.	930	54	18.1	124.1
		1200	T.	920	59	18.2	123.1
		1800	T.	930	54	18.4	122.1
	6	0000	T.	950	41	18.6	121.2
		0600	T.	960	33	18.7	120.2
		1200	T.	960	33	18.6	119.4
		1800	T.	960	33	18.6	118.7
	7	0000	T.	955	36	18.5	118.0
		0600	T.	960	33	18.4	117.3
		1200	T.	960	33	18.3	116.6
		1800	T.	955	36	18.3	115.9
	8	0000	T.	945	41	18.2	115.2
		0600	T.	945	41	18.1	114.5
		1200	T.	945	41	18.0	113.5
		1800	T.	940	43	17.7	112.5
	9	0000	T.	940	43	17.6	111.6
		0600	T.	945	41	17.5	110.7
		1200	T.	950	36	17.5	109.8
		1800	T.	955	33	17.5	108.8
	10	0000	S.T.S.	965	28	17.5	107.8
		0600	S.T.S.	975	25	17.4	106.9
		1200	T.S.	985	21	17.3	106.0

Dissipated

SIX-HOURLY POSITION AND INTENSITY DATA OF

TYPHOON BRIAN (8924)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface wind (m/s)	Lat. °N	Long. °E
Sep	30	0600	T.D.	1000	13	20.1	115.6
		1200	T.S.	995	18	20.1	115.4
		1800	T.S.	995	18	20.1	115.2
Oct	1	0000	T.S.	990	23	20.0	115.0
		0600	T.S.	990	23	19.5	114.5
		1200	S.T.S.	985	25	19.0	114.0
		1800	S.T.S.	980	28	18.7	113.3
	2	0000	S.T.S.	980	28	18.4	112.5
		0600	T.	970	33	18.3	111.7
		1200	T.	965	36	18.3	110.7
		1800	T.	970	33	18.2	109.2
	3	0000	S.T.S.	980	28	18.5	107.8
		0600	S.T.S.	980	28	18.8	106.3
		1200	T.S.	990	18	19.4	104.3

Dissipated

SIX-HOURLY POSITION AND INTENSITY DATA OF

TYPHOON COLLEEN (8925)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface wind (m/s)	Lat. °N	Long. °E
Oct	1	1800	T.D.	1000	13	11.3	149.9
	2	0000	T.D.	995	16	11.5	149.1
		0600	T.D.	995	16	11.9	148.5
		1200	T.S.	990	18	12.5	148.1
		1800	T.S.	990	18	13.3	148.0
	3	0000	T.S.	990	21	14.5	147.9
		0600	T.S.	990	21	15.7	147.5
		1200	T.S.	985	23	16.5	147.0
		1800	S.T.S.	980	25	17.2	146.3
	4	0000	S.T.S.	975	28	17.9	145.7
		0600	S.T.S.	970	31	18.6	145.2
		1200	S.T.S.	970	31	19.3	144.8
		1800	T.	965	36	20.0	144.5
	5	0000	T.	960	39	20.7	144.3
		0600	T.	960	39	21.3	144.1
		1200	T.	955	41	22.0	143.8
		1800	T.	960	39	22.9	143.3
	6	0000	T.	965	33	23.7	142.5
		0600	T.	960	36	24.6	141.6
		1200	T.	960	36	25.3	140.9
		1800	T.	960	36	26.2	140.5
	7	0000	T.	960	36	27.4	140.8
		0600	T.	960	36	29.0	141.7
		1200	T.	960	36	30.7	143.1
		1800	T.	965	33	33.0	145.3
	8	0000	T.	965	33	36.0	148.3
		0600	S.T.S.	975	28	40.0	152.0

Became Extratropical

SIX-HOURLY POSITION AND INTENSITY DATA OF

TYPHOON DAN (8926)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface wind (m/s)	Lat. °N	Long. °E
Oct	8	0600	T.D.	1000	13	10.1	140.2
		1200	T.D.	1000	16	10.0	139.3
		1800	T.S.	995	18	10.1	137.5
	9	0000	T.S.	990	21	10.3	135.7
		0600	T.S.	990	23	10.7	133.9
		1200	S.T.S.	985	25	11.1	132.0
		1800	S.T.S.	975	31	11.5	130.1
	10	0000	S.T.S.	975	31	12.0	128.2
		0600	T.	975	33	12.4	126.4
		1200	T.	975	33	13.0	124.5
		1800	T.	975	33	13.6	122.6
	11	0000	S.T.S.	980	31	14.5	120.6
		0600	S.T.S.	980	31	15.4	118.7
		1200	S.T.S.	980	31	16.4	117.0
		1800	T.	970	36	16.4	115.0
	12	0000	T.	970	36	16.5	113.5
		0600	T.	960	39	16.6	112.3
		1200	T.	955	41	16.9	111.2
		1800	T.	960	39	17.4	109.9
	13	0000	T.	960	39	17.7	108.6
		0600	T.	970	33	18.1	107.2
		1200	S.T.S.	975	31	18.3	106.0
		1800	T.S.	990	21	18.5	104.8

Dissipated

SIX-HOURLY POSITION AND INTENSITY DATA OF

TYPHOON ELSIE (8927)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface wind (m/s)	Lat. °N	Long. °E
Oct	14	0600	T.D.	1000	13	16.4	131.8
		1200	T.D.	1000	16	16.5	131.2
		1800	T.S.	995	18	16.4	131.0
	15	0000	T.S.	990	21	16.2	131.0
		0600	T.S.	985	23	16.0	130.9
		1200	S.T.S.	980	25	16.1	130.8
		1800	S.T.S.	980	25	16.2	130.7
	16	0000	S.T.S.	975	31	16.3	130.5
		0600	T.	970	33	16.5	130.3
		1200	T.	970	33	16.8	129.8
		1800	T.	965	36	16.9	129.3
	17	0000	T.	960	41	17.0	128.8
		0600	T.	955	46	16.9	128.1
		1200	T.	955	46	16.7	127.5
		1800	T.	955	46	16.5	126.9
	18	0000	T.	950	49	16.2	126.4
		0600	T.	945	51	16.1	125.7
		1200	T.	945	51	16.1	125.0
		1800	T.	940	54	16.3	124.1
	19	0000	T.	940	54	16.6	123.0
		0600	T.	960	43	16.7	121.4
		1200	T.	975	33	16.8	119.8
		1800	T.	975	36	16.9	118.5
	20	0000	T.	975	36	17.0	117.3
		0600	T.	975	33	17.1	116.1
		1200	S.T.S.	980	31	17.5	115.0
		1800	S.T.S.	985	25	17.5	113.9
	21	0000	S.T.S.	985	25	17.5	112.7
		0600	S.T.S.	985	25	17.8	111.4
		1200	T.S.	990	23	18.1	110.1
		1800	T.S.	1000	18	18.1	108.7
	22	0000	T.D.	1005	16	18.1	107.8
		0600	T.D.	1005	13	18.0	106.9

Dissipated

SIX-HOURLY POSITION AND INTENSITY DATA OF

TYPHOON FORREST (8928)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface wind (m/s)	Lat. °N	Long. °E
Oct	21	1800	T.D.	1000	13	8.3	150.1
	22	0000	T.D.	1000	13	9.0	150.1
		0600	T.D.	1000	13	9.8	149.9
		1200	T.D.	1000	13	10.7	149.7
		1800	T.S.	995	18	11.6	149.1
	23	0000	T.S.	995	18	12.4	148.6
		0600	T.S.	995	18	13.0	148.1
		1200	T.S.	995	18	13.5	147.5
		1800	T.S.	990	21	14.1	146.9
	24	0000	T.S.	990	21	14.6	146.0
		0600	T.S.	985	23	15.1	145.2
		1200	S.T.S.	980	25	15.5	144.4
		1800	S.T.S.	975	28	15.9	143.7
	25	0000	S.T.S.	975	31	16.5	142.7
		0600	T.	970	36	17.2	141.8
		1200	T.	965	39	18.0	141.0
		1800	T.	965	39	18.7	140.3
	26	0000	T.	960	41	19.5	139.6
		0600	T.	955	43	20.2	139.0
		1200	T.	955	43	20.9	138.5
		1800	T.	945	49	21.6	137.9
	27	0000	T.	950	46	22.5	137.5
		0600	T.	950	43	23.5	137.1
		1200	T.	960	39	24.6	137.1
		1800	T.	965	36	25.8	137.1
	28	0000	T.	965	33	27.0	137.5
		0600	S.T.S.	970	31	28.1	138.1
		1200	S.T.S.	970	31	30.1	140.2
		1800	S.T.S.	970	31	32.3	143.7

Became Extratropical

SIX-HOURLY POSITION AND INTENSITY DATA OF

TYPHOON GAY (8929)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface wind (m/s)	Lat. °N	Long. °E
Nov	1	0000	T.D.	1005	13	7.4	102.8
		0600	T.D.	1005	13	7.6	102.7
		1200	T.D.	1005	16	7.7	102.5
		1800	T.D.	1005	16	7.8	102.4
	2	0000	T.S.	1000	18	8.0	102.3
		0600	T.S.	1000	18	8.2	102.2
		1200	T.S.	995	21	8.6	102.0
		1800	T.S.	995	23	9.0	101.8
	3	0000	S.T.S.	990	25	9.4	101.5
		0600	S.T.S.	985	31	9.8	101.1
		1200	T.	980	36	10.1	100.7
		1800	T.	980	39	10.3	100.2
	4	0000	T.	975	41	10.6	99.6
		0600	T.	985	36	10.8	98.9
		1200	T.	985	33	11.0	98.2
		1800	T.	985	33	11.1	97.6
	5	0000	T.	985	36	11.4	96.8
		0600	T.	985	36	11.7	95.8
		1200	S.T.S.	990	31	12.2	94.7
		1800	S.T.S.	990	28	12.5	93.5
	6	0000	S.T.S.	990	28	12.7	92.4
		0600	S.T.S.	985	31	13.0	91.2
		1200	T.	980	33	13.4	90.1
		1800	T.	975	36	13.6	89.0
	7	0000	T.	970	41	13.9	88.0
		0600	T.	965	43	14.2	87.0
		1200	T.	960	46	14.4	86.0
		1800	T.	965	43	14.5	85.0
	8	0000	T.	970	41	14.5	83.8
		0600	T.	980	36	14.6	82.6
		1200	S.T.S.	985	31	14.7	81.4
		1800	S.T.S.	995	25	14.8	80.3
	9	0000	T.S.	1000	21	14.9	79.2
		0600	T.D.	1005	16	14.7	78.0

Dissipated

SIX-HOURLY POSITION AND INTENSITY DATA OF

TYPHOON HUNT (8930)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface wind (m/s)	Lat. °N	Long. °E
Nov	16	1800	T.D.	1000	13	11.8	132.0
	17	0000	T.D.	1000	16	11.7	131.3
		0600	T.S.	995	18	11.6	130.7
		1200	T.S.	995	21	11.8	130.3
		1800	T.S.	990	23	12.4	130.0
	18	0000	S.T.S.	985	25	12.5	129.0
		0600	S.T.S.	980	28	13.0	128.2
		1200	S.T.S.	980	28	13.6	127.6
		1800	S.T.S.	980	31	13.9	127.4
	19	0000	T.	975	33	14.1	127.3
		0600	T.	965	39	14.7	127.1
		1200	T.	970	36	15.1	126.9
		1800	T.	975	33	15.3	126.7
	20	0000	T.	975	33	15.4	126.4
		0600	T.	970	36	15.4	126.1
		1200	T.	965	39	15.4	125.7
		1800	T.	970	36	15.3	125.1
	21	0000	T.	960	41	15.1	124.2
		0600	T.	965	39	15.1	123.3
		1200	T.	975	33	15.1	122.7
		1800	S.T.S.	985	31	15.3	121.8
	22	0000	T.S.	995	23	16.0	120.6
		0600	T.S.	1000	21	17.2	119.2
		1200	T.S.	1000	18	18.0	118.2
		1800	T.S.	1000	18	18.3	117.7
	23	0000	T.D.	1005	16	18.4	117.1
		0600	T.D.	1005	16	18.3	116.1

Dissipated

SIX-HOURLY POSITION AND INTENSITY DATA OF

TYPHOON IRMA (8931)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface wind (m/s)	Lat. °N	Long. °E
Nov	24	1800	T.D.	995	13	13.9	152.0
	25	0000	T.D.	995	13	13.3	151.0
		0600	T.D.	995	13	12.8	150.0
		1200	T.D.	995	13	12.5	149.1
		1800	T.D.	995	13	12.1	148.3
	26	0000	T.D.	995	13	11.5	147.4
		0600	T.D.	990	16	11.0	146.6
		1200	T.D.	990	16	10.5	145.9
		1800	T.S.	980	21	10.0	145.2
	27	0000	T.S.	980	21	9.7	144.5
		0600	T.S.	975	23	9.7	143.9
		1200	S.T.S.	970	25	9.8	143.3
		1800	S.T.S.	965	28	9.9	142.7
	28	0000	S.T.S.	965	28	10.2	141.9
		0600	S.T.S.	960	31	10.5	141.1
		1200	S.T.S.	960	31	10.9	140.1
		1800	T.	955	36	11.3	138.9
	29	0000	T.	945	41	11.9	137.8
		0600	T.	940	43	12.3	136.7
		1200	T.	940	43	12.7	135.8
		1300	T.	935	46	12.9	135.0
	30	0000	T.	925	54	13.1	134.2
		0600	T.	925	54	13.4	133.4
		1200	T.	935	46	13.7	132.7
		1800	T.	945	46	13.9	132.2
Dec	1	0000	T.	945	46	14.3	131.8
		0600	T.	955	36	14.9	131.5
		1200	T.	955	36	14.9	131.1
		1800	T.	955	36	15.0	130.9
	2	0000	T.	950	39	15.2	130.7
		0600	T.	955	39	15.8	130.7
		1200	T.	955	39	16.3	130.9
		1800	T.	960	36	16.7	131.3
	3	0000	T.	965	33	17.2	131.7
		0600	S.T.S.	975	31	17.9	132.3
		1200	S.T.S.	980	28	18.7	133.0
		1800	S.T.S.	980	28	19.8	134.0
	4	0000	T.S.	985	23	20.7	135.5
		0600	T.S.	990	21	21.1	137.3
		1200	T.D.	1000	16	20.8	139.2

Dissipated

SIX-HOURLY POSITION AND INTENSITY DATA OF THE TROPICAL DEPRESSION OF 8-9 DECEMBER

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface wind (m/s)	Lat. °N	Long. °E
Dec	7	1800	T.D.	998	13	11.7	137.1
	8	0000	T.D.	995	16	12.3	136.9
		0600	T.D.	995	16	12.7	137.1
		1200	T.D.	995	16	13.0	137.3
		1800	T.D.	995	16	13.3	137.5
	9	0000	T.D.	998	13	13.5	137.8

Dissipated

SIX-HOURLY POSITION AND INTENSITY DATA OF TYPHOON JACK (8932)

Month	Day	Time UTC	Intensity	Estimated minimum central pressure (hPa)	Estimated maximum surface wind (m/s)	Lat. °N	Long. °E
Dec	22	0000	T.D.	1000	13	6.7	155.5
		0600	T.D.	1000	13	7.5	155.0
		1200	T.D.	995	16	8.3	154.6
		1800	T.D.	995	16	9.4	153.8
	23	0000	T.D.	995	16	10.3	152.9
		0600	T.D.	995	16	11.0	152.0
		1200	T.S.	990	21	11.4	151.5
		1800	S.T.S.	985	25	11.8	151.0
	24	0000	S.T.S.	980	31	12.2	150.5
		0600	T.	970	33	12.6	150.2
		1200	T.	965	36	12.8	149.8
		1800	T.	960	39	12.9	149.3
	25	0000	T.	950	46	13.0	148.9
		0600	T.	940	51	13.3	148.7
		1200	T.	935	54	13.5	148.5
		1800	T.	935	54	13.7	148.3
	26	0000	T.	935	54	13.8	148.1
		0600	T.	950	46	13.9	148.0
		1200	T.	965	39	13.9	148.2
		1800	T.	975	33	13.7	148.2
	27	0000	S.T.S.	985	28	13.3	148.1
		0600	T.S.	990	23	13.0	147.9
		1200	T.D.	1000	16	12.8	147.6

Dissipated