每月天氣摘要
二零一八年九月

Monthly Weather Summary
September 2018

目錄

Contents

二零一八年十月出版

香港天文台編製
香港九龍彌敦道134A

1. 除特別列明外，所有時間均以協調世界時加八小時為準。

2. 除特別列明外，所有氣象要素數值均在香港天文台錄得。

3. 因惡劣天氣引致的人命傷亡及財物損毀數字是由各政府部門提供或根據報章報導輯錄。

4. 本刊物的編製和發表，目的是促進資料交流。香港特別行政區政府（包括其僱員及代理人）對於本刊物所載資料的準確性、完整性或效用，概不作出明確或暗示的保證、聲明或陳述；在法律許可的範圍內，對於提供或使用這些資料而可能直接或間接引致任何損失、損壞或傷害（包括死亡），亦不負任何法律承擔或責任（包括疏忽責任）。

5. 未經香港天文台台長同意，不得翻印本刊物任何部分內容。

Published : October 2018

Prepared and published by : Hong Kong Observatory,
134A Nathan Road,
Kowloon,
Hong Kong.

1. Unless otherwise stated, all times given are 8 hours ahead of Co-ordinated Universal Time (UTC).

2. Values of meteorological elements are those recorded at the Hong Kong Observatory, unless otherwise specified.

3. Figures of damage and casualties caused by weather phenomena are compiled from press reports and information provided by other government departments.

4. This publication is prepared and disseminated in the interest of promoting the exchange of information. The Government of the Hong Kong Special Administrative Region (including its servants and agents) makes no warranty, statement or representation, express or implied, with respect to the accuracy, completeness, or usefulness of the information contained herein, and in so far as permitted by law, shall not have any legal liability or responsibility (including liability for negligence) for any loss, damage or injury (including death) which may result whether directly or indirectly, from the supply or use of such information.

5. Permission to reproduce any part of this publication should be obtained through the Director of the Hong Kong Observatory.

1. 二零一八年九月天氣回顧

二零一八年九月十六日強颱風山竹猛烈吹襲本港，當日天文台需要發出十號颶風信號達 10 小時，是本港自一九四六年以來發出十號颶風信號的第二最長時間，僅次於一九九九年颱風約克創下的十一小時紀錄。主要受山竹帶來的雨水影響，本月較正常多雨，錄得雨量 383.3 毫米，較九月份正常數值 327.6 毫米多百分之 17。本年首九個月的累積雨量為 1973.3 毫米，較同期正常值 2233.1 毫米少百分之 12。本月亦較正常炎熱，平均氣溫為 28.0 度，較正常值 27.7 度高 0.3 度。

受一道低壓槽影響，九月一日本港天氣大致多雲、間中有大驟雨及雷暴，大部分地區錄得 30 毫米以上的雨量，西貢和長洲的雨量更超過 70 毫米。隨著該低壓槽逐步減弱，九月二日至三日本港部分時間有陽光及有幾陣驟雨。高空反氣旋於九月四日為華南地區帶來普遍晴朗的天氣。

在風勢微弱的情況下，九月五日至七日本港天氣酷熱及部分時間有陽光，其間之高溫於下午在西貢及新界部分地區觸發雷雨。隨著一道冷鋒於九月七日晚間橫過華南，九月八日本港天氣轉為大致多雲及有幾陣驟雨，市區部分地方錄得 20 毫米以上的雨量，跑馬地的雨量更超過 40 毫米。與冷鋒相關的東北季候風在九月八日至十日為本港帶來幾陣驟雨及稍涼的天氣。

同時，位於呂宋海峽的一個低壓區於九月十一日增強為熱帶風暴，並命名為百里嘉，翌日向西移動及橫過南海北部，九月十三日百里嘉橫過雷州半島及逐漸減弱，其後在廣西內陸消散。受百里嘉外圍下沉氣流影響，九月十一日本港天氣普遍晴朗，當百里嘉於九月十二日在本港南面掠過，本港風勢較大及有驟雨。隨著風勢逐漸緩和，九月十三日除初時有幾陣驟雨外，本港部分時間有陽光。

與此同時，位於西北太平洋的超強颱風山竹於九月十四日向西北移動，九月十五日凌晨在呂宋登陸。橫過呂宋北部之後，九月十五日山竹持續向西北迅速移動及橫過南海北部，移向廣東沿岸。九月十六日早上山竹減弱為強颱風，下午在香港西南偏南約 100 公里掠過，黃昏前在廣東台山附近登陸並移入廣東西部。山竹於九月十七日晚上於廣西減弱為一個低壓區。

九月十四至十五日山竹的外圍下沉氣流為本港帶來普遍晴朗的天氣，九月十五日本港天氣酷熱，天文台氣溫飆升至全月最高的 35.1 度，亦是有記錄以來九月的第二高。隨著山竹靠近，九月十五日晚間本港風力增強，九月十六日山竹襲港期間，本港天氣急速轉壞，與山竹相關的破壞性暴風至颶風、嚴重風暴潮及狂風大雨對本港造成嚴重及廣泛破壞，包括沿岸及低窪地區出現嚴重水浸、相當多沿岸設施及建築物受損、大量塌樹、數以百計窗戶及玻璃幕牆破損和部分地區食水及電力供應受影響，超過 450 人於風暴期間受傷。九月十六日至十七日交通及運輸服務亦受到嚴重影響。在橫瀾島及長洲錄得的最高 60 分鐘平均風速分別為每小時 161 及 157 公里，均是該站歷來的第二最高。山竹所

引發的風暴潮令本港多處地區的水位異常地升高，二零一八年九月十六日下午維港內鰂魚涌的潮位最高升至 3.88 米(海圖基準面以上)，是自一九五四年之後的第二高，僅次於一九六二年溫黛襲港期間的最高紀錄 3.96 米(海圖基準面以上)。此外，山竹在鰂魚涌引發的最高風暴潮(天文潮位以上)為 2.35 米，打破了一九六二年溫黛所創下 1.77 米的紀錄，成為有記錄以來的最高。本港當日普遍錄得 100 毫米以上的雨量，部分地區雨量更超過 200 毫米。大雨期間，天文台氣溫下降至本月最低的 23.6 度。隨著山竹於九月十七日遠離香港，本地風勢逐漸緩和，但受到山竹外圍雨帶影響，本港仍有狂風驟雨。

隨著副熱帶高壓脊向西伸展，九月十八日本港除早上有幾陣驟雨外，日間轉為天晴。九月十九日至二十二日本港天氣維持普遍晴朗及炎熱。九月二十三日在風勢微弱的情況下，下午的高溫觸發局部地區雷暴，並為新界部分地區帶來超過 10 毫米的雨量。

受一股偏東氣流影響，九月二十四日至二十五日本港大致多雲，間中有驟雨及雷暴，天氣稍涼。其中，九月二十四日早上有大驟雨，本港普遍地區錄得 30 毫米以上的雨量，而大埔、葵青及九龍的雨量更超過 70 毫米。隨著偏東氣流逐漸緩和，九月二十六日至二十七日本港天氣夾雜陽光及驟雨。受東北季候風影響，除九月二十八日及二十九日早上有一兩陣驟雨外，月底本港天氣轉為普遍晴朗及乾燥。

本月有五個熱帶氣旋影響南海及北太平洋西部。

本月有兩班航機因惡劣天氣須轉飛其他地方。表 1.1 載列本月發出及取消各種警告/信號的詳情。

1. The Weather of September 2018

September 2018 was marked by the ferocious strike of severe typhoon Mangkhut which necessitated the issuance of the No. 10 Hurricane Signal in Hong Kong for 10 hours on 16 September. This is the second longest duration of No. 10 Hurricane Signal in Hong Kong since 1946, just next to the record of 11 hours set by Typhoon York in 1999. Mainly attributing to the rainfall brought by Mangkhut, the month was wetter than usual. The monthly rainfall was 383.3 millimetres, about 17 percent above the normal of 327.6 millimetres in September. The accumulated rainfall recorded in the first nine months of the year was 1973.3 millimetres, a deficit of 12 percent compared to the normal of 2233.1 millimetres for the same period. The month was also hotter than usual with a mean temperature of 28.0 degrees, 0.3 degrees above normal of 27.7 degrees.

Under the influence of a trough of low pressure, the weather in Hong Kong was mainly cloudy with occasional heavy showers and thunderstorms on 1 September. More than 30 millimetres of rainfall were recorded over most parts of the territory, and rainfall even

exceeded 70 millimetres over Sai Kung and Cheung Chau. With the trough of low pressure weakening gradually, there were sunny periods and a few showers on 2 - 3 September. An anticyclone aloft southern China brought generally fine weather to the territory on 4 September.

Under light wind conditions, it was very hot with sunny periods on 5 - 7 September. High temperatures also triggered thundery showers in the afternoon over Sai Kung and parts of the New Territories in these few days. As a cold front moved across southern China on the night of 7 September, local weather became mainly cloudy with some showers on 8 September. More than 20 millimetres of rainfall were recorded over parts of the urban areas, and rainfall even exceeded 40 millimetres over Happy Valley. The northeast monsoon associated with the cold front brought a few showers and slightly cooler weather to Hong Kong on 8 - 10 September.

Meanwhile, an area of low pressure over the Luzon Strait intensified into a tropical storm and was named as Barijat on 11 September. It moved westwards across the northern part of the South China Sea on the next day. Barijat then moved across Leizhou Peninsula and weakened gradually on 13 September, and dissipated over inland Guangxi afterwards. Under the influence of the outer subsiding air of Barijat, the weather of Hong Kong was generally fine on 11 September. Local weather became showery and windier on 12 September when Barijat skirted past to the south of Hong Kong. With winds subsiding gradually, apart from a few showers at first, there were sunny periods on 13 September.

Meanwhile over the western North Pacific, Super Typhoon Mangkhut tracked northwestwards on 14 September and made landfall over Luzon in the small hours of 15 September. After crossing the northern part of Luzon, Mangkhut continued to track northwestwards quickly across the northern part of the South China Sea on 15 September, edging towards the coast of Guangdong. Mangkhut weakened into a severe typhoon on the morning of 16 September and skirted about 100 km south-southwest of Hong Kong in the afternoon. It made landfall over the vicinity of Taishan of Guangdong before dusk and moved into western part of Guangdong. Mangkhut degenerated into an area of low pressure over Guangxi the next night.

Locally, the outer subsiding air of Mangkhut brought generally fine weather to Hong Kong on 14 – 15 September. It was also very hot on 15 September with the temperature at the Hong Kong Observatory soaring to 35.1 degrees, the highest of the month and the second highest on record for September. With the approach of Mangkhut, local winds strengthened on the night of 15 September. The weather in Hong Kong deteriorated rapidly during the passage of Mangkhut on 16 September. The destructive storm to hurricane force winds, severe storm surge and squally heavy rain associated with Mangkhut ravaged the territory and caused extensive damages to Hong Kong on that day, including serious flooding in many

coastal and low-lying areas, substantial damages of coastal structures and buildings, huge amount of fallen trees, many reports of smashed windows or glass curtain walls, and interruptions of water and power supply in some places. Over 450 people were also injured during the stormy weather. Traffic and transportation services were also seriously affected on 16 – 17 September. The maximum 60-minute mean wind speeds recorded at Waglan Island and Cheung Chau were 161 km/h and 157 km/h respectively. Both are the second highest record at the corresponding stations. The storm surge induced by Mangkhut resulted in unusually high water level in many parts of Hong Kong. The water levels at Quarry Bay of the Victoria Harbour rose to a maximum of 3.88 metres above Chart Datum on the afternoon of 16 September 2018, the second highest since 1954 and only lower than the record high of 3.96 metres above Chart Datum set by Super Typhoon Wanda in 1962. Moreover, the maximum storm surge (above astronomical tide) induced by Mangkhut at Quarry Bay was 2.35 metres which was the highest on record, breaking the previous record of 1.77 metres kept by Wanda in 1962. More than 100 millimetres of rainfall were generally recorded over Hong Kong, and rainfall even exceeded 200 millimetres over parts of the territory on that day. During the downpour, the temperature at the Hong Kong Observatory fell to a minimum of 23.6 degrees, the lowest in the month. With Mangkhut departing from Hong Kong, local winds subsided gradually on 17 September, but the outer rainbands associated with Mangkhut continued to bring squally showers to Hong Kong on that day.

With the subtropical ridge extending westwards, apart from a few morning showers, local weather became fine during the day on 18 September. The weather over Hong Kong remained generally fine and hot on 19 – 22 September. Under light wind situation, isolated thunderstorms triggered by high temperatures also brought more than 10 millimetres of rainfall to parts of the New Territories on the afternoon 23 September.

With the setting in of an easterly airstream, local weather became slightly cooler and mainly cloudy with occasional showers and thunderstorms on 24 - 25 September. Showers were heavy on the morning of 24 September with more than 30 millimetres of rainfall generally recorded over the territory and rainfall even exceeding 70 millimetres over Tai Po, Kwai Tsing and Kowloon. As the easterly airstream moderated gradually, local weather was marked by a mixture of sunshine and showers on 26 - 27 September. Apart from one or two morning showers on 28 and 29 September, the weather in Hong Kong became generally fine and dry towards the end of the month as affected by the northeast monsoon.

Five tropical cyclones occurred over the South China Sea and the western North Pacific in the month.

During the month, two aircraft were diverted due to adverse weather. Details of the issuance and cancellation of various warnings/signals in the month are summarized in Table 1.1.

表 1.1　二零一八年九月發出的警告及信號
Table 1.1　Warnings and Signals issued in September 2018

熱帶氣旋警告信號
Tropical Cyclones Warning Signals

熱帶氣旋名稱 Name of Tropical Cyclone	信號 Signal Number	開始時間 Beginning Time		終結時間 Ending Time	
		日/月 day/month	時 hour	日/月 day/month	時 hour
百里嘉 BARIJAT	1 3 1	11/9 12/9 13/9	1040 1220 0410	12/9 13/9 13/9	1220 0410 0740
山竹 MANGKHUT	1 3 8NE 9 10 8SE 3 1	14/9 15/9 16/9 16/9 16/9 16/9 17/9 17/9	2220 1620 0110 0740 0940 1940 0520 1440	15/9 16/9 16/9 16/9 16/9 17/9 17/9 17/9	1620 0110 0740 0940 1940 0520 1440 1910

暴雨警告信號
Rainstorm Warnings

顏色 Colour	開始時間 Beginning Time		終結時間 Ending Time	
	日/月 day/month	時 hour	日/月 day/month	時 hour
黃色 Amber	1/9	1255	1/9	1415
黃色 Amber	2/9	0740	2/9	0945
黃色 Amber	16/9	0910	16/9	1055
紅色 Red	16/9	1055	16/9	1850
黃色 Amber	16/9	1850	16/9	2230
黃色 Amber	24/9	1010	24/9	1200

酷熱天氣警告
Very Hot Weather Warning

開始時間 Beginning Time		終結時間 Ending Time	
日/月 day/month	時 hour	日/月 day/month	時 hour
5/9	1215	5/9	1700
6/9	0940	6/9	1800
14/9	0645	15/9	2315
21/9	1145	21/9	1800
22/9	1325	22/9	1645

雷暴警告
Thunderstorm Warning

開始時間 Beginning Time		終結時間 Ending Time		開始時間 Beginning Time		終結時間 Ending Time	
日/月 day/month	時 hour	日/月 day/month	時 hour	日/月 day/month	時 hour	日/月 day/month	時 hour
1/9	0755	1/9	1900	2/9	0645	2/9	1100
3/9	1055	3/9	1215	5/9	1655	5/9	1945
6/9	1240	6/9	1430	7/9	0520	7/9	0800
7/9	1155	7/9	1330	7/9	2225	8/9	0715
8/9	1340	8/9	1500	14/9	1720	14/9	1830
17/9	0430	17/9	0630	23/9	1545	23/9	1845
24/9	0705	24/9	1330	24/9	2005	24/9	2340

火災危險警告
Fire Danger Warnings

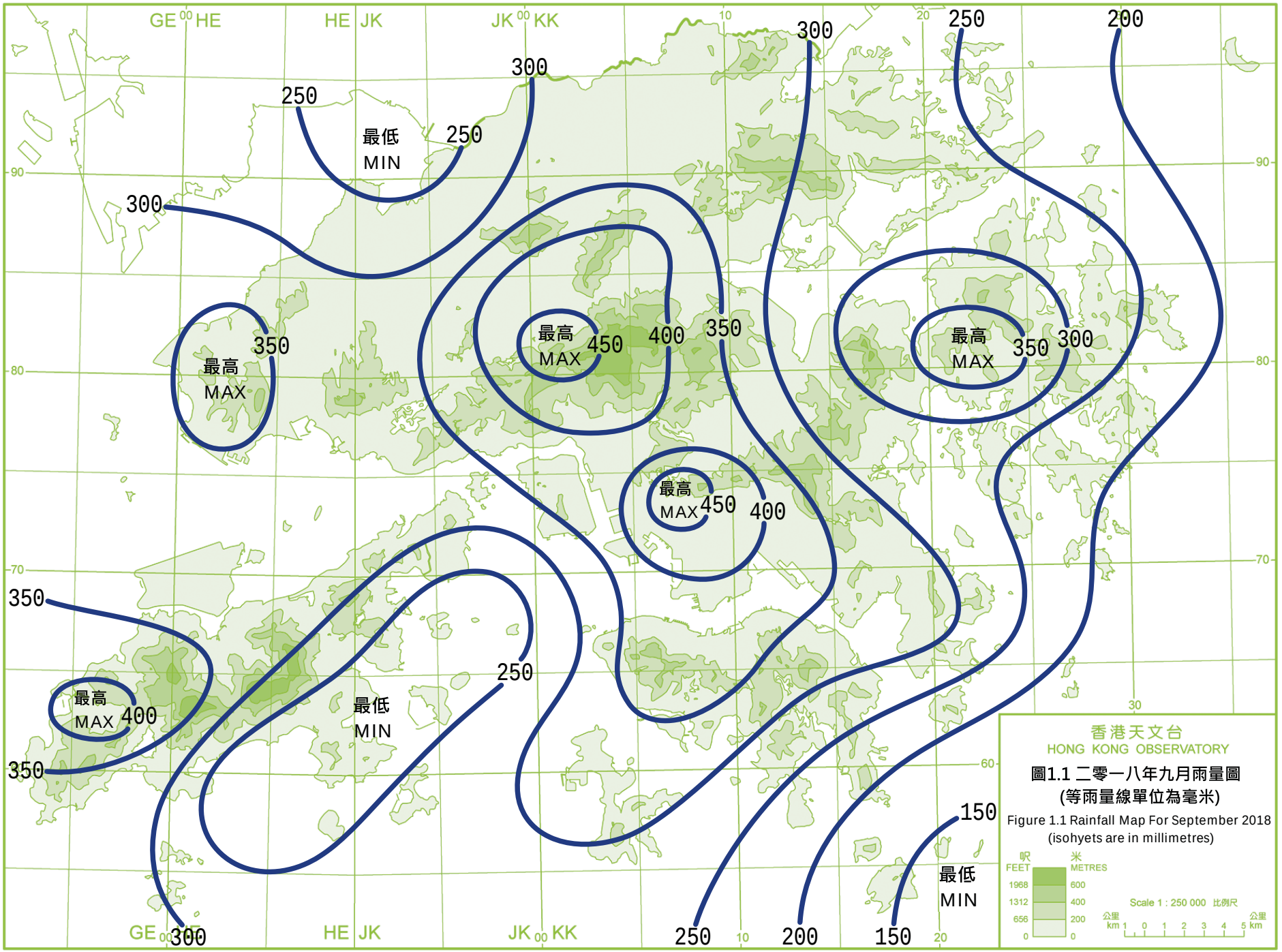
顏色 Colour	開始時間 Beginning Time		終結時間 Ending Time	
	日/月 day/month	時 hour	日/月 day/month	時 hour
黃色 Yellow	25/9	1000	25/9	1800
紅色 Red	29/9	0600	30/9	2045

新界北水浸特別報告
Special Announcement on Flooding in the northern New Territories

開始時間 Beginning Time		終結時間 Ending Time	
日/月 day/month	時 hour	日/月 day/month	時 hour
16/9	1125	16/9	2330
24/9	1110	24/9	1345

山泥傾瀉警告
Landslip Warning

開始時間 Beginning Time		終結時間 Ending Time	
日/月 day/month	時 hour	日/月 day/month	時 hour
16/9	1420	17/9	1120



H.K.O.128 (2014)
地政總署測繪處繪製
Cartography by Survey and Mapping Office, Lands Department.

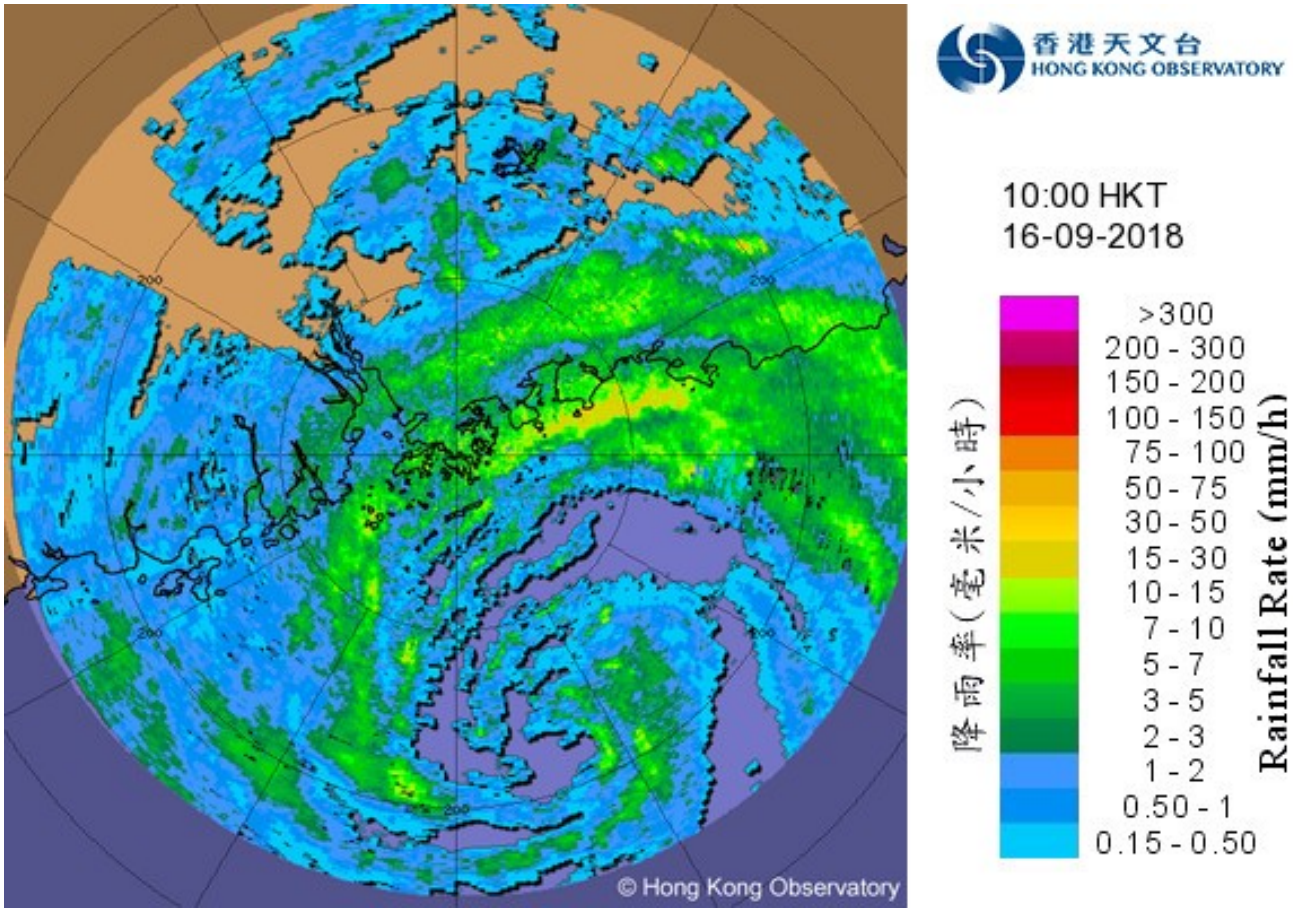


圖 1.2　　強颱風山竹於2018年9月16日早上10時的雷達圖像

Fig. 1.2　　Radar imagery of severe typhoon Mangkhut at 10:00 a.m. on 16 September 2018

圖 1.3　　山竹引發在杏花邨的風暴潮及巨浪

Fig. 1.3　　Storm surge and huge waves induced by Mangkhut at Heng Fa Chuen

圖 1.4　　山竹襲港期間尖沙咀有棚架倒塌

Fig. 1.4　　Bamboo scaffolding at Tsim Sha Tsui collapsed during the strike of Mangkhut

圖 1.5　山竹襲港期間紅磡有大廈玻璃幕牆嚴重破損

Fig. 1.5　Glass curtain walls at Hung Hom were severely damaged during the passage of Mangkhut

圖 1.6　山竹襲港期間官塘有樹木倒塌

Fig. 1.6　Fallen trees at Kwun Tong during the strike of Mangkhut

圖 1.7　西貢一艘遊艇於山竹襲港期間被大浪沖上岸

Fig. 1.7　A yacht was washed ashore by the powerful waves at Sai Kung during the passage of Mangkhut

2.1 二零一八年九月熱帶氣旋概述

二零一八年九月在北太平洋西部及南海區域出現了五個熱帶氣旋，當中百里嘉和山竹引致香港天文台需要發出熱帶氣旋警告信號，而九月十六日山竹襲港期間天文台更需要發出十號颶風信號。

熱帶低氣壓飛燕於八月二十七日晚上在關島以東約 1 520 公里的北太平洋西部上形成，初時向西北方向移動並迅速增強。飛燕於八月二十九日增強為颱風並轉向西移動，於八月三十一日進一步發展為超強颱風，翌日早上達到其最高強度，中心附近最高持續風速估計為每小時 230 公里。隨後兩天飛燕逐漸由西北轉向偏北移動，靠近日本以南海域，並減弱為強颱風。九月四日日間飛燕先後橫掃日本四國東部、大阪灣及本州的關西地區，翌日在北海道以西的海域演變為一股溫帶氣旋。

根據報章報導，飛燕為日本帶來狂風暴雨，廣泛地區受嚴重破壞，至少有 11 人死亡、超過 680 人受傷，超過 200 萬戶停電。飛燕所引發的嚴重風暴潮令大阪一帶錄得當地歷來的最高水位，沿岸地區嚴重水浸，當中關西國際機場需要全面關閉超過兩日，超過 5 000 名乘客滯留機場。

熱帶低氣壓百里嘉於九月十日早上在高雄之東南約 200 公里的海域上形成，大致向偏西方向移動，橫過南海北部。百里嘉於九月十一日增強為熱帶風暴，翌日晚上達到最高強度，中心附近最高持續風速估計為每小時 85 公里。九月十三日百里嘉橫過雷州半島及減弱，傍晚在廣西內陸消散。

根據報章報導，受百里嘉影響，湛江及茂名共有 4 萬人需要撤離。有關百里嘉的詳細資料及對香港的影響，請參閱它的熱帶氣旋報告。

熱帶低氣壓山竹於九月七日在關島以東約 2 330 公里的北太平洋西部上形成，隨後數天迅速向西移動，並逐漸增強，於九月十一日發展為超強颱風。山竹在九月十四日轉向西北移動，在登陸呂宋前達到其最高強度，中心附近的最高持續風速估計為每小時 250 公里。山竹橫過呂宋北部後減弱，並繼續迅速以西北路徑橫過南海北部，移近廣東沿岸。山竹在九月十六日上午減弱為強颱風，黃昏前在廣東台山附近登陸，隨後移入廣東西部及進一步減弱。翌日晚上山竹在廣西減弱為一個低壓區。

根據報章報導，山竹為呂宋帶來狂風暴雨。最少有 82 人死亡、138 人受傷及兩人失蹤，約 15 000 房屋倒塌。山竹為珠江口沿岸帶來破壞性的風力及嚴重的風暴潮，多處建築物及沿岸設施受損，低窪地區嚴重水浸。澳門有 40 人受傷，超過 5 500 人撤離，有多宗建築物損毀報告。內港水浸高度曾達 1.9 米或以上。山竹亦在廣東、廣西、海南、貴州及雲南造成至少六人死亡，接近 330 萬人受災。山竹為香港帶來猛烈風力和破紀錄的風暴潮，有關山竹的詳細資料及它在香港造成的廣泛破壞，請參閱稍後發佈的熱帶氣

旋報告。

熱帶低氣壓潭美於九月二十一日晚在關島之西北約 320 公里的北太平洋西部上形成，向西北偏西方向移動，並迅速增強。潭美於九月二十三日增強為颱風，翌日進一步增強為超強颱風。潭美於九月二十五日清晨達到其最高強度，中心附近最高持續風速估計為每小時 220 公里。當晚它轉向東北偏北方向緩慢移動，並開始減弱。隨後數天潭美逐漸移向琉球群島一帶，於九月二十九日掠過沖繩島後，採取東北路徑移向日本本州。潭美於九月三十日晚間橫過本州，翌日在本州東北部演變為一股溫帶氣旋。

根據報章報導，潭美吹襲日本期間造成至少五人死亡、一人失蹤及 200 人受傷，逾 130 萬戶停電。受潭美影響，日本海陸空交通幾乎癱瘓，超過十萬旅客受影響。

熱帶低氣壓康妮於九月二十九日清晨在關島之東南偏南約 370 公里的北太平洋西部上形成，向西北偏西移動，並迅速增強。康妮於九月三十日晚增強為颱風，移向琉球群島一帶。

2.1 Overview of Tropical Cyclones in September 2018

Five tropical cyclones occurred over the western North Pacific and the South China Sea in September 2018, of which Barijat and Mangkhut necessitated the issuance of the tropical cyclone warning signals by the Observatory. No.10 Hurricane Signal was issued during the passage of Mangkhut on 16 September.

Jebi formed as a tropical depression over the western North Pacific about 1 520 km east of Guam on the night of 27 August. It tracked northwestwards at first and intensified rapidly. Jebi intensified into a typhoon on 29 August and turned to move westwards. It further developed into a super typhoon on 31 August, reaching its peak intensity on the morning of 1 September with an estimated maximum sustained wind of 230 km/h near its centre. Jebi's track turned gradually from northwestwards to northwards and edged closer to the sea areas south of Japan in the next two days when it weakened into a severe typhoon. It swept across the eastern part of Shikoku, Osaka Bay and Kansai of Honshu during the day of 4 September. It evolved into an extratropical cyclone over the seas west of Hokkaido the next day.

According to press reports, the torrential rain and squalls brought by Jebi wreaked havoc

to Japan, with at least 11 people killed, 680 people injured. Electricity supply to more than 2 million households was interrupted. Record-breaking water levels were registered in the vicinity of Osaka because of the severe storm surge induced by Jebi, resulting in serious flooding over the coastal regions. The Kansai international airport was fully closed for more than two days because of serious inundation, forcing over 5 000 passengers to stay at the airport.

Barijat formed as a tropical depression over the sea areas about 200 km southeast of Gaoxiong on the morning of 10 September and moved generally westwards across the northern part of the South China Sea. It intensified into a tropical storm on 11 September and reached its peak intensity with an estimated maximum sustained wind of 85 km/h near its centre the next night. Barijat moved across Leizhou Peninsula and weakened on 13 September. It dissipated over inland Guangxi in that evening.

According to press reports, 40 000 people were evacuated in Maoming and Zhanjiang during the passage of Barijat. For detailed information of Barijat including its impact to Hong Kong, please refer to the Tropical Cyclone Report of Barijat.

Tropical depression Mangkhut formed over the western North Pacific about 2 330 km east of Guam on 7 September. Moving westwards rapidly, it intensified gradually in the following few days. Mangkhut developed into a super typhoon on 11 September. It turned to move northwest on 14 September, reaching its peak intensity before making landfall over Luzon with an estimated maximum sustained wind of 250 km/h near the centre. Mangkhut weakened after crossing the northern part of Luzon and continued to track northwestwards quickly across the northern part of the South China Sea, edging towards the coast of Guangdong. Mangkhut weakened into a severe typhoon on the morning of 16 September and made landfall over the vicinity of Taishan of Guangdong before dusk. It then moved into western part of Guangdong and weakened further. Mangkhut degenerated into an area of low pressure over Guangxi the next night.

According to press reports, Mangkhut brought torrential rain and squalls to Luzon. There were at least 82 deaths, 138 injuries and two missing. Around 15 000 houses were collapsed. Mangkhut brought damaging winds and severe storm surge to the coast of Pearl River estuary, leading to damages of many buildings and coastal structures, as well as serious inundation of low lying areas. In Macao, 40 people were injured and more than 5 500 people were evacuated. There were a number of reports of building damages. The water level of Inner Harbour was 1.9 metres or higher. At least six people were killed and more than 3.3 million were affected in Guangdong, Guangxi, Hainan, Guizhou and Yunnan. Mangkhut brought fierce winds and record-breaking storm surge to Hong Kong. For detailed

information of Mangkhut and the extensive damages that it brought to Hong Kong, please refer to the Tropical Cyclone Report of Mangkhut which will be issued later.

Trami formed as a tropical depression over the western North Pacific about 320 km northwest of Guam on the night of 21 September. It tracked generally west-northwestwards and intensified rapidly. Trami developed into a typhoon on 23 September and further intensified into a super typhoon the next day, reaching its peak intensity in the small hours of 25 September with an estimated maximum sustained wind of 220 km/h near its centre. Trami turned to move slowly on a north-northeasterly course on the night of 25 September and started to weaken. It moved towards the vicinity of the Ryukyu Islands gradually in the following days. After skirting past Okinawa on 29 September, Trami took on a northeast course towards Honshu of Japan. It skirted past Honshu of Japan during the night of 30 September and evolved into an extratropical cyclone over the northern part of Honshu the next day.

According to press reports, Trami left at least five deaths with one missing and 200 injured during its passage to Japan. Electricity supply to more than 1.3 million households was interrupted. Transportation services in Japan were paralyzed, affecting more than 100 000 passengers.

Kong-rey formed as a tropical depression over the western North Pacific about 370 km south-southeast of Guam on the early morning of 29 September. Moving west-northwestwards, it intensified rapidly. Kong-rey developed into a typhoon on the night of 30 September and moved towards the vicinity of the Ryukyu Islands.

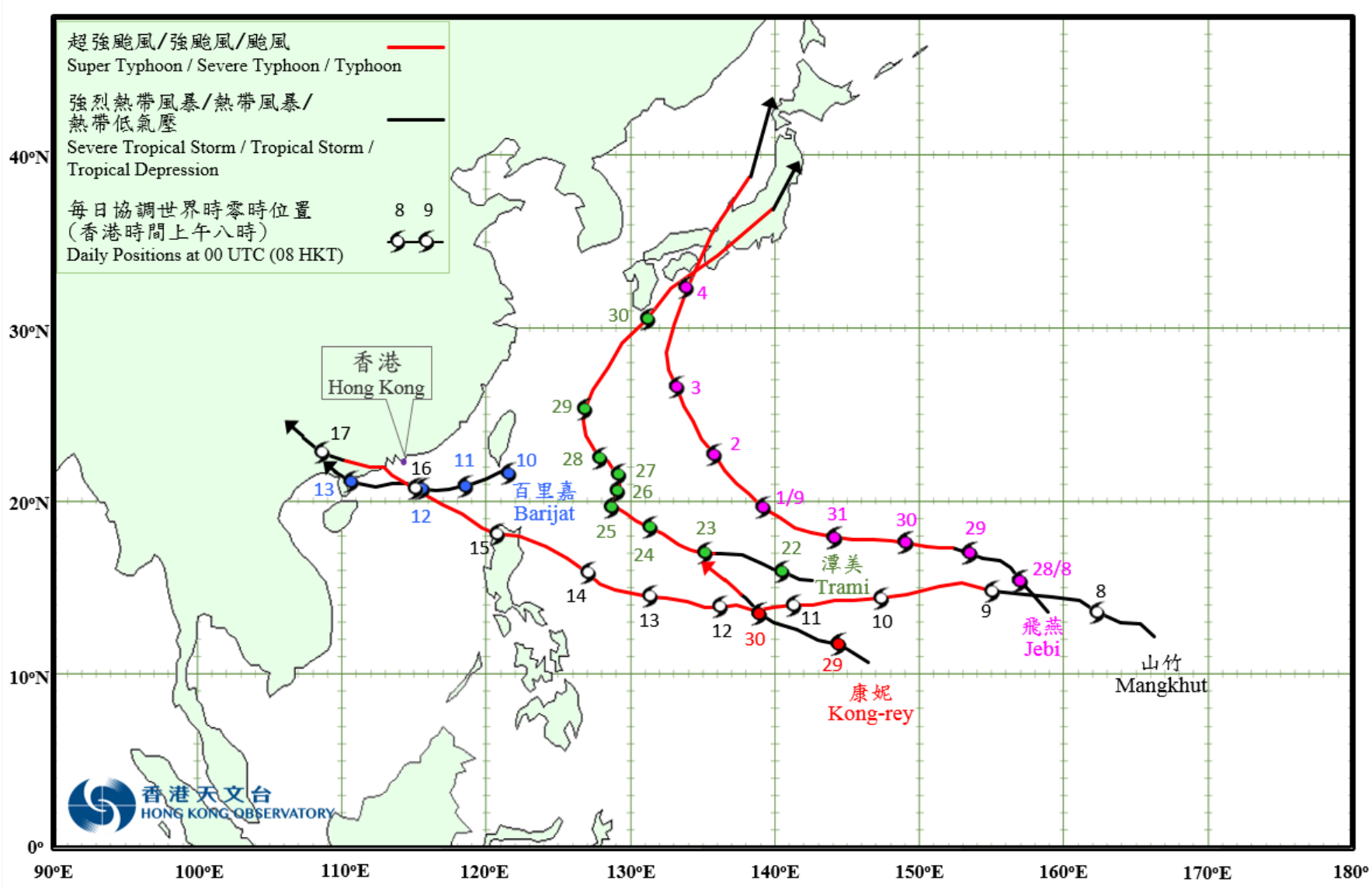


圖 2.1　　二零一八年九月的熱帶氣旋路徑圖

Fig. 2.1　　Tracks of tropical cyclones in September 2018

2.2 熱帶風暴百里嘉 (1823)

二零一八年九月十日至十三日

百里嘉是二零一八年第四個影響香港的熱帶氣旋。

熱帶低氣壓百里嘉於九月十日早上在高雄之東南約 200 公里的海域上形成，大致向偏西方向移動，橫過南海北部。百里嘉於九月十一日增強為熱帶風暴，翌日晚上達到最高強度，中心附近最高持續風速估計為每小時 85 公里。九月十三日百里嘉橫過雷州半島及減弱，傍晚在廣西內陸消散。

根據報章報導，受百里嘉影響，湛江及茂名共有 4 萬人需要撤離。

香港天文台在九月十一日上午 10 時 40 分發出一號戒備信號，當時百里嘉集結在香港之東南偏東約 460 公里。九月十一日本港普遍吹輕微至和緩偏北風。隨著百里嘉靠近本港，天文台在九月十二日下午 12 時 20 分發出三號強風信號，當時百里嘉位於香港之東南偏南約 170 公里。當日下午本港普遍吹清勁至強風程度東至東北風。百里嘉於下午 3 時左右最接近香港，在本港以南約 150 公里掠過。隨著百里嘉繼續向西移動並遠離香港，本港風勢逐漸緩和，天文台在九月十三日上午 4 時 10 分以一號戒備信號取代三號強風信號，並於當日上午 7 時 40 分取消所有熱帶氣旋警告信號。

百里嘉影響香港期間，尖鼻咀錄得最高潮位(海圖基準面以上) 2.88 米，大埔滘則錄得最大風暴潮(天文潮高度以上) 0.38 米。天文台總部於九月十二日下午 4 時 49 分錄得最低瞬時海平面氣壓 1006.0 百帕斯卡，當時百里嘉位於本港以南約 150 公里。

百里嘉吹襲香港期間並沒有造成嚴重破壞。受百里嘉外圍下沉氣流影響，九月十一日本港天氣普遍晴朗。百里嘉於九月十二日在本港南面掠過，當日本港有幾陣驟雨。隨著百里嘉遠離香港，九月十三日除初時有幾陣驟雨外，本港部分時間有陽光。

2.2 Tropical Storm Barijat (1823)
10 to 13 September 2018

Barijat was the fourth tropical cyclone affecting Hong Kong in 2018.

Barijat formed as a tropical depression over the sea areas about 200 km southeast of Gaoxiong on the morning of 10 September and moved generally westwards across the northern part of the South China Sea. It intensified into a tropical storm on 11 September and reached its peak intensity with an estimated maximum sustained wind of 85 km/h near its centre the next night. Barijat moved across Leizhou Peninsula and weakened on 13 September. It dissipated over inland Guangxi in that evening.

According to press reports, affected by Barijat, 40 000 people were evacuated in Maoming and Zhanjiang.

In Hong Kong, the No. 1 Standby Signal was issued at 10:40 a.m. on 11 September when Barijat was about 460 km east-southeast of Hong Kong. Local winds were light to moderate northerlies on 11 September. As Barijat edged closer towards Hong Kong, the No. 3 Strong Wind Signal was issued at 12:20 p.m. on 12 September when it was about 170 km south-southeast of Hong Kong. Local winds were generally fresh to strong east to northeasterlies in that afternoon. Barijat came closest to the territory at around 3 p.m. on that day as it skirted past about 150 km south of Hong Kong. As Barijat continued to track westwards and depart from Hong Kong, the No. 3 Strong Wind Signal was replaced by the No. 1 Standby Signal at 4:10 a.m. on 13 September, and all tropical cyclone warning signals were cancelled at 7:40 a.m. on that day.

During the passage of Barijat, a maximum sea level (above chart datum) of 2.88 m was recorded at Tsim Bei Tsui and a maximum storm surge (above astronomical tide) of 0.38 m was recorded at Tai Po Kau. The lowest instantaneous mean sea-level pressure of 1006.0 hPa was recorded at the Observatory headquarters at 4:49 p.m. on 12 September when Barijat was about 150 km south of Hong Kong.

Barijat did not cause any significant damage in Hong Kong. Under the influence of the outer subsiding air of Barijat, the weather of Hong Kong was generally fine on 11 September. As Barijat skirted past to the south of Hong Kong, there were a few showers on 12 September. With Barijat moving away from Hong Kong, apart from a few showers at first, there were sunny periods on 13 September.

表 2.2.1　在百里嘉影響下，本港各站在熱帶氣旋警告信號生效時所錄得的最高陣風、最高每小時平均風速及風向

Table 2.2.1　Maximum gust peak speeds and maximum hourly mean winds with associated wind directions recorded at various stations when the tropical cyclone warning signals for Barijat were in force

站 Station (http://www.weather.gov.hk/informtc/station2018_uc.htm)		最高陣風 Maximum Gust					最高每小時平均風速 Maximum Hourly Mean Wind				
		風向 Direction		風速 (公里/時) Speed (km/h)	日期/月份 Date/Month	時間 Time	風向 Direction		風速 (公里/時) Speed (km/h)	日期/月份 Date/Month	時間 Time
黃麻角(赤柱)	Bluff Head (Stanley)	東北偏東	ENE	70	12/9	14:32	東	E	31	12/9	19:00
中環碼頭	Central Pier	東	E	62	12/9	17:44	東	E	38	12/9	16:00
							東	E	38	12/9	17:00
長洲	Cheung Chau	東南偏東	ESE	67	12/9	19:30	東	E	40	12/9	20:00
							東	E	40	12/9	21:00
長洲泳灘	Cheung Chau Beach	東北偏東	ENE	67	12/9	14:54	東北偏東	ENE	51	12/9	15:00
青洲	Green Island	東北偏東	ENE	77	12/9	14:45	東北偏東	ENE	52	12/9	17:00
香港國際機場	Hong Kong International Airport	東北偏東	ENE	51	12/9	16:21	東北偏東	ENE	31	12/9	17:00
啟德	Kai Tak	東南偏東	ESE	54	12/9	20:48	東	E	25	12/9	22:00
京士柏	King's Park	東	E	58	12/9	18:25	東	E	22	12/9	18:00
流浮山	Lau Fau Shan	東北偏東	ENE	51	12/9	14:34	東北偏東	ENE	30	12/9	20:00
北角	North Point	東	E	58	12/9	17:19	東北偏東	ENE	36	12/9	15:00
坪洲	Peng Chau	東北偏東	ENE	62	12/9	14:52	東	E	41	12/9	17:00
平洲	Ping Chau	東南	SE	31	12/9	12:41	東南	SE	7	12/9	13:00
西貢	Sai Kung	東北偏東	ENE	56	12/9	13:45	東北偏東	ENE	34	12/9	17:00
沙洲	Sha Chau	東北	NE	49	12/9	12:24	東	E	25	12/9	15:00
							東	E	25	12/9	19:00
沙螺灣	Sha Lo Wan	東	E	47	12/9	19:52	東	E	23	12/9	17:00
沙田	Sha Tin	東北	NE	49	12/9	13:30	東北	NE	16	12/9	14:00
石崗	Shek Kong	東北	NE	49	12/9	14:25	東	E	22	12/9	22:00
九龍天星碼頭	Star Ferry (Kowloon)	東	E	54	12/9	19:30	東	E	30	12/9	20:00
打鼓嶺	Ta Kwu Ling	東北	NE	38	12/9	16:55	東北偏東	ENE	14	12/9	14:00
大美督	Tai Mei Tuk	東北偏東	ENE	63	12/9	14:05	東北偏東	ENE	47	12/9	14:00
大帽山	Tai Mo Shan	東南偏東	ESE	79	12/9	21:37	東南偏東	ESE	58	12/9	22:00
大埔滘	Tai Po Kau	東	E	45	12/9	18:42	東	E	31	12/9	19:00
							東	E	31	12/9	22:00
塔門東	Tap Mun East	東北偏東	ENE	58	12/9	13:35	東北偏東	ENE	43	12/9	17:00
大老山	Tate's Cairn	東北偏東	ENE	77	12/9	13:56	東	E	52	12/9	23:00
將軍澳	Tseung Kwan O	東	E	51	12/9	15:34	東北偏北	NNE	14	12/9	10:00
青衣島蜆殼油庫	Tsing Yi Shell Oil Depot	東南	SE	40	12/9	15:37	東南偏東	ESE	14	12/9	17:00
屯門政府合署	Tuen Mun Government Offices	東南偏東	ESE	43	12/9	14:13	東北偏北	NNE	14	12/9	06:00
橫瀾島	Waglan Island	東北偏東	ENE	77	12/9	14:24	東北偏東	ENE	63	12/9	15:00
濕地公園	Wetland Park	東	E	36	12/9	13:39	東	E	14	12/9	15:00
黃竹坑	Wong Chuk Hang	東北	NE	58	12/9	18:01	東北偏東	ENE	22	12/9	18:00

昂坪- 沒有資料　Ngong Ping - data not available

表 2.2.2　在百里嘉影響香港期間，熱帶氣旋警告信號系統的八個參考測風站在熱帶氣旋警告信號生效時錄得持續風力達到強風程度的時段

Table 2.2.2　Periods during which sustained strong force winds were attained at the eight reference anemometers in the tropical cyclone warning system when tropical cyclone warning signals for Barijat were in force

站 Station (http://www.weather.gov.hk/informtc/station2018_uc.htm)		最初達到強風*時間 Start time when strong wind speed* was attained		最後達到強風*時間 End time when strong wind speed* was attained	
		日期/月份 Date/Month	時間 Time	日期/月份 Date/Month	時間 Time
長洲	Cheung Chau	12/9	14:48	12/9	21:54

香港國際機場、啟德、沙田、流浮山、西貢、打鼓嶺及青衣島蜆殼油庫的持續風力未達到強風程度。

The sustained wind speed did not attain strong force at the Hong Kong International Airport, Kai Tak, Sha Tin, Lau Fau Shan, Sai Kung, Ta Kwu Ling and Tsing Yi Shell Oil Depot.

* 十分鐘平均風速達每小時 41 - 62 公里

* 10-minute mean wind speed of 41 - 62 km/h

註:　本表列出持續風力達到強風程度的起始及終結時間。期間風力可能高於或低於指定的風力。

Note: The table gives the start and end time of sustained strong winds.　Winds might fluctuate above or below the specified wind speeds in between the times indicated.

表 2.2.3　百里嘉掠過期間，香港天文台總部及其他各站所錄得的日雨量
Table 2.2.3　Daily rainfall amounts recorded at the Hong Kong Observatory Headquarters and other stations during the passage of Barijat

站 Station			九月十一日 11 Sep	九月十二日 12 Sep	九月十三日 13 Sep	總雨量(毫米) Total rainfall (mm)
香港天文台 Hong Kong Observatory (HKO)			0.0	微量 Trace	2.5	2.5
香港國際機場 Hong Kong International Airport (HKA)			0.0	2.1	0.3	2.4
長洲 Cheung Chau (CCH)			0.0	0.0	0.5	0.5
H23	香港仔	Aberdeen	0.0	3.5	1.5	5.0
N05	粉嶺	Fanling	0.0	0.0	0.5	0.5
N13	糧船灣	High Island	0.0	0.5	1.5	2.0
K04	佐敦谷	Jordan Valley	0.0	0.5	1.5	2.0
N06	葵涌	Kwai Chung	0.0	1.5	1.0	2.5
H12	半山區	Mid Levels	0.0	1.0	1.5	2.5
N09	沙田	Sha Tin	0.0	0.5	5.0	5.5
H19	筲箕灣	Shau Kei Wan	0.0	1.0	4.5	5.5
SEK	石崗	Shek Kong	0.5	1.0	3.0	4.5
K06	蘇屋邨	So Uk Estate	0.0	1.5	1.0	2.5
R31	大美督	Tai Mei Tuk	0.0	0.0	0.0	0.0
R21	踏石角	Tap Shek Kok	0.0	[0.0]	0.0	[0.0]
TMR	屯門水庫	Tuen Mun Reservoir	0.0	0.0	0.0	0.0

東涌 - 沒有資料　Tung Chung - data not available

註 : [ ] 基於不完整的每小時雨量數據。Note : [ ] based on incomplete hourly data.

表 2.2.4　百里嘉掠過期間，香港各潮汐站所錄得的最高潮位及最大風暴潮
Table 2.2.4　Times and heights of the maximum sea level and the maximum storm surge recorded at tide stations in Hong Kong during the passage of Barijat

站 Station (http://www.weather.gov.hk/informtc/station2018_uc.htm)		最高潮位 (海圖基準面以上) Maximum sea level (above chart datum)			最大風暴潮 (天文潮高度以上) Maximum storm surge (above astronomical tide)		
		高度(米) Height (m)	日期/月份 Date/Month	時間 Time	高度(米) Height (m)	日期/月份 Date/Month	時間 Time
鰂魚涌	Quarry Bay	2.51	12/9	11:31	0.30	12/9	13:10
石壁	Shek Pik	2.49	12/9	10:59	0.25	12/9	19:57
大廟灣	Tai Miu Wan	2.37	12/9	11:48	0.25	12/9	19:24
大埔滘	Tai Po Kau	2.56	11/9	11:07	0.38	12/9	15:20
尖鼻咀	Tsim Bei Tsui	2.88	11/9	11:22	0.27	13/9	00:03
橫瀾島	Waglan Island	2.50	12/9	11:49	0.19	12/9	13:46

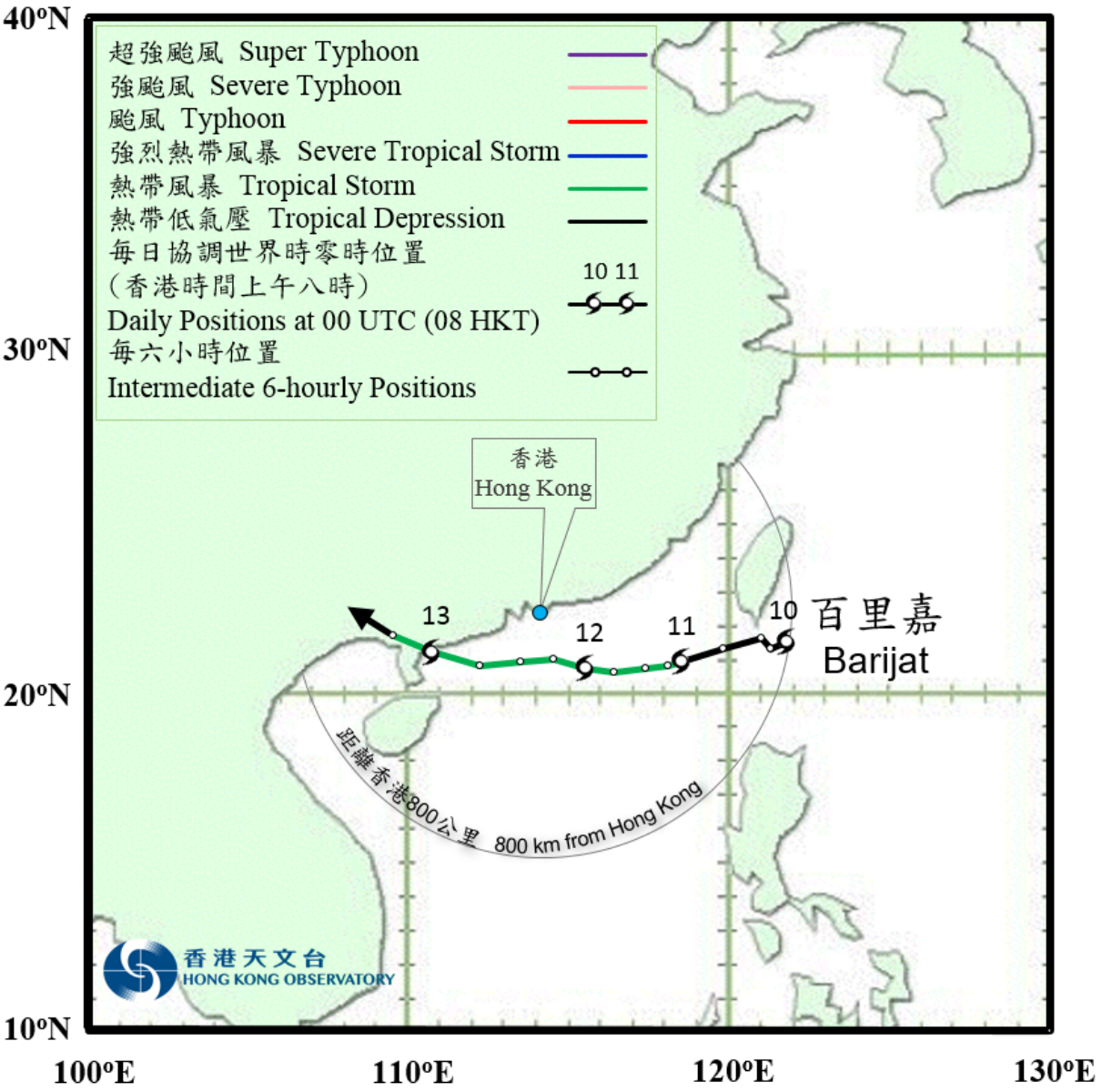


圖 2.2.1(a)　　二零一八年九月十日至十三日百里嘉的暫定路徑圖。

Figure 2.2.1(a)　Provisional track of Barijat: 10 – 13 September 2018.

圖 2.2.1(b)　　百里嘉接近香港時的暫定路徑圖。

Figure 2.2.1(b)　Provisional track of Barijat near Hong Kong.

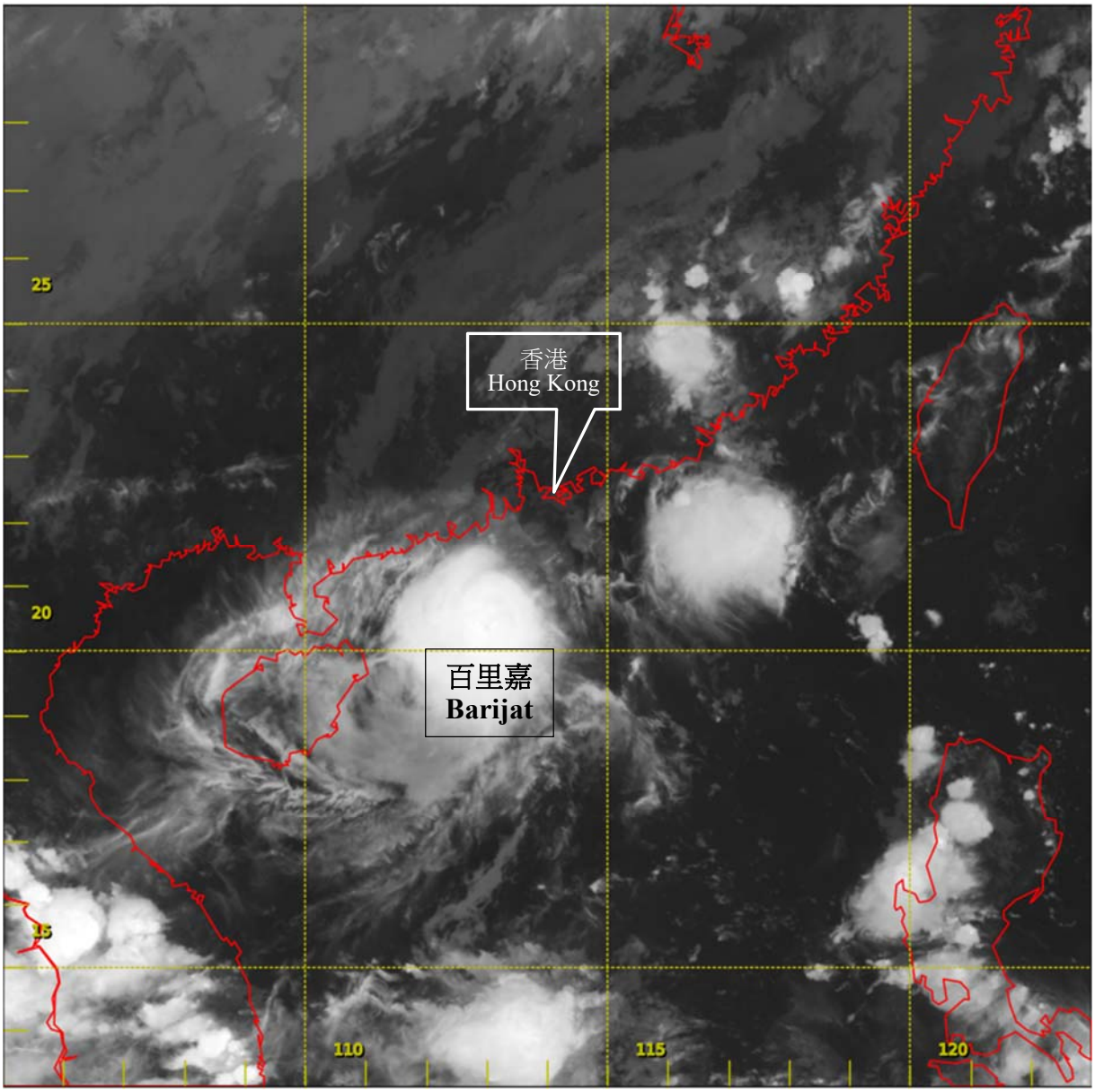


圖 2.2.2　二零一八年九月十二日下午 8 時的紅外線衛星圖片，當時百里嘉達到其最高強度，中心附近最高持續風速估計為每小時 85 公里。

Figure 2.2.2　Infra-red satellite imagery around 8 p.m. on 12 September 2018, when Barijat was at peak intensity with an estimated maximum sustained wind of 85 km/h near its centre.

〔此衛星圖像接收自日本氣象廳的向日葵 8 號衛星。〕

[The satellite imagery was originally captured by Himawari-8 Satellite (H-8) of Japan Meteorological Agency (JMA).]

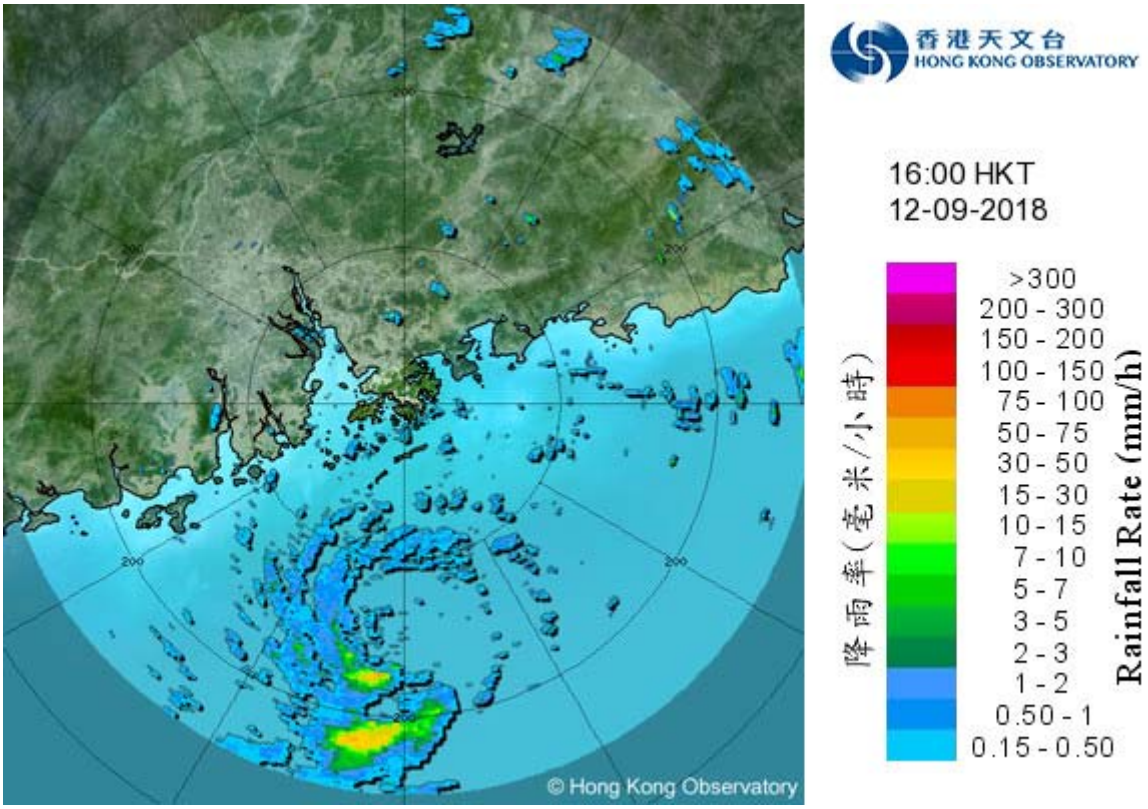


圖 2.2.3　二零一八年九月十二日下午 4 時的雷達回波圖像，當時百里嘉位於本港以南約150公里。與百里嘉相關的雨帶正影響廣東沿岸及南海北部。

Figure 2.2.3　Radar echoes captured at 4 p.m. on 12 September 2018 when the centre of Barijat was located about 150 km south of Hong Kong. Showers associated with Barijat were affecting the coast of Guangdong and the northern part of the South China Sea at the time.

2.3 超強颱風山竹 (1822)

二零一八年九月七日至十七日

山竹是二零一八年第五個影響香港的熱帶氣旋。繼二零一七年天鴿後，天文台在山竹襲港期間再次發出十號颶風信號，並持續了 10 小時，是戰後第二最長的十號颶風信號，僅次於一九九九年約克的 11 小時。山竹環流廣闊、風力強勁、移動迅速，加上其特別的風力結構，為香港帶來破壞性風力和破紀錄的風暴潮，並造成廣泛及嚴重的影響。

熱帶低氣壓山竹於九月七日在關島以東約 2 330 公里的北太平洋西部上形成，隨後數天迅速向西移動，並逐漸增強，於九月十一日發展為超強颱風。山竹在九月十四日轉向西北移動，在登陸呂宋前達到其最高強度，中心附近的最高持續風速估計為每小時 250 公里。山竹橫過呂宋北部後減弱，並繼續迅速以西北路徑橫過南海北部，移近廣東沿岸。山竹在九月十六日上午減弱為強颱風，黃昏前在廣東台山附近登陸，隨後移入廣東西部及進一步減弱。翌日晚上山竹在廣西減弱為一個低壓區。

根據報章報導，山竹為呂宋帶來狂風暴雨。最少有 82 人死亡、138 人受傷及兩人失蹤，約 15 000 間房屋倒塌。山竹為珠江口沿岸帶來破壞性的風力及嚴重的風暴潮，多處建築物及沿岸設施受損，低窪地區嚴重水浸。澳門有 40 人受傷，超過 5 500 人撤離，有多宗建築物損毀報告。內港離地面水浸高度曾達 1.9 米或以上。山竹亦在廣東、廣西、海南、貴州及雲南造成至少六人死亡，接近 330 萬人受災。

由於山竹移動迅速及預料會對香港構成嚴重威脅，天文台早於九月十四日晚上 10 時 20 分發出一號戒備信號，當時山竹集結在香港之東南偏東約 1 110 公里，是有記錄以來最遠的一次。九月十五日日間本港吹輕微至和緩的東北風。隨著山竹迅速移近廣東沿岸，天文台在九月十五日下午 4 時 20 分發出三號強風信號，當時山竹位於香港之東南約 650 公里。晚上本港風勢增強，吹清勁至強風程度的偏北風。隨著山竹繼續逼近珠江口一帶，天文台在九月十六日上午 1 時 10 分發出八號東北烈風或暴風信號，當時山竹集結在香港之東南約 410 公里。其後本港風勢繼續增強，離岸及高地吹烈風至暴風程度的偏北風。由於預料當山竹接近香港時，本港風力會進一步增強，天文台在上午 7 時 40 分發出九號烈風或暴風風力增強信號，當時山竹已移至香港之東南偏南約 200 公里。其後本港風力急速增強，天文台在上午 9 時 40 分發出十號颶風信號，當時山竹位於香港之東南偏南約 160 公里。在八號、九號及十號熱帶氣旋警告信號發出的時候，風暴與本港的距離均是自一九六一年以來該信號的最遠紀錄。九月十六日日間本港各區長時間受具破壞性的暴風至颶風所吹襲。山竹在下午 1 時左右最接近香港，當時它位於天文台總部之西南偏南約 100 公里。而隨著山竹在香港的西南面掠過，本港風向由東北逐漸轉為東南。黃昏前山竹在廣東台山附近登陸，遠離本港並逐漸減弱，當香港不再受颶風威脅，天文台在下午 7 時 40 分改發八號東南烈風或暴風信號。晚間本港風力繼續減弱，天文台在九月十七日上午 5 時 20 分改發三號強風信號，並於當日下午 2 時 40 分改發一號戒備信號。隨著山竹進一步移入內陸和減弱，天文台在九月十七日晚上 7 時 10 分取消所

有熱帶氣旋警告信號。

山竹橫過呂宋北部後減弱，其眼壁的對流亦較橫過呂宋前弱，相反離山竹中心約 100 至 200 公里之間的螺旋雨帶仍然保持強烈對流和十分完整的結構。綜合微波衛星圖像(圖 2.3.6)、多普勒天氣雷達圖像(圖 2.3.7)、地面觀測和氣象偵察飛行數據的分析，山竹眼壁外螺旋雨帶的風力明顯高於眼壁附近的環流。當山竹在香港南面經過時，該強烈螺旋雨帶在日間影響本港。再加上山竹在南海北部移動速度相當快(時速達 35 公里)，而香港長時間位於風暴的右半圓(亦即危險半圓)，風暴的風力及移動速度的疊加令香港當日大部分時間受到猛烈風力吹襲。因此，雖然山竹的路徑較接近澳門、珠海及台山一帶，但由於山竹特別的風力結構，本港所受風力卻是珠江三角洲一帶之中最強勁的。

山竹吹襲香港期間，香港各測風站錄得的最高風力載於表 2.3.1，香港整體的風力超越過去三十年引致天文台需要發出十號颶風信號的熱帶氣旋所帶來的風力，包括一九九九年的約克、二零一二年的韋森特及二零一七年的天鴿(見表 2.3.2)。九月十六日在橫瀾島及長洲錄得的最高 60 分鐘平均風速分別為每小時 161 及 157 公里，均是該站歷來的第二最高，僅次於一九八三年的愛倫。當日香港大部分地區錄得每小時超過 150 公里的陣風，大老山的陣風更達每小時 256 公里，排名於一九六二年的溫黛和一九六四年的露比之後。而位於維多利亞港內的北角測風站錄得的最高 10 分鐘平均風速為每小時 124 公里(圖 2.3.9)，是一九九八年該站啓用以來首次錄得持續颶風。另外，正在清水灣測試的自動測風站更錄得高達每小時 191 公里的 10 分鐘平均風速(註)，相信是天文台自一九八零年代開始在香港安裝自動氣象站以來的近地面最高紀錄。

各站錄得的最低瞬時海平面氣壓如下：

站	最低瞬時海平面氣壓(百帕斯卡)	日期/月份	時間
香港天文台總部	977.0	16/9	下午 1 時 28 分
香港國際機場	973.9	16/9	下午 2 時 11 分
京士柏	977.5	16/9	下午 1 時 44 分
打鼓嶺	981.3	16/9	下午 12 時 52 分
大埔	980.5	16/9	下午 1 時 17 分
沙田	980.1	16/9	下午 12 時 21 分
上水	979.8	16/9	下午 2 時 06 分
流浮山	976.7	16/9	下午 1 時 59 分
長洲	971.8	16/9	下午 2 時 10 分
橫瀾島	973.5	16/9	下午 12 時 10 分

山竹襲港的路徑是引致香港出現嚴重風暴潮的典型路徑。當時山竹在香港西南偏南近距離掠過，與其相關的猛烈東至東南風把海水推向並堆積在岸邊。加上山竹環流廣闊，它的風場推動較廣闊的洋面，繼而進一步推高水位。山竹所帶來的風暴潮令本港水位普

遍升高超過兩米，引致本港多處出現異常高的水位。天文台的六個潮汐站當中的五個(鰂魚涌、大埔滘、尖鼻咀、大廟灣及石壁)錄得破紀錄的風暴潮，其中鰂魚涌和大埔滘潮汐站分別錄得 2.35 米及 3.40 米的風暴潮增水。而橫瀾島潮汐站因在山竹吹襲期間受嚴重損毀，並未能錄得最高潮位紀錄。當日鰂魚涌的潮位(即天文潮位加風暴潮)最高升至 3.88 米(海圖基準面以上，下同)，超越了天鴿襲港時錄得的 3.57 米，並僅次於 1962 年溫黛襲港期間錄得的 3.96 米。大埔滘則錄得最高潮位 4.71 米，同樣僅次於溫黛襲港期間錄得的 5.03 米。有關山竹掠過期間香港各潮汐站所錄得的最高潮位可參考圖 2.3.11。

山竹前沿的下沉氣流於九月十四日及十五日為本港帶來大致天晴及酷熱的天氣。九月十五日天文台氣溫飆升至 35.1 度，是有記錄以來九月的第二高。在山竹環流的影響下，九月十六日本港天氣急速轉壞及有狂風大雨。當日本港大部分地區錄得超過 150 毫米的雨量。天文台曾發出紅色暴雨警告及新界北部水浸特別報告。受到與山竹相關的雨帶影響，九月十七日本港仍間中有狂風驟雨。

山竹吹襲期間，本港至少有 458 人受傷，另有超過六萬宗的塌樹報告，數目有記錄以來最多，多處有物件被吹倒、高空墜物及建築物受損，大角咀有建築地盤一個天秤被吹斷，亦有大廈外牆及天台屋被強風吹倒。秀茂坪有垃圾收集站的鐵皮屋頂被吹走。全港有至少 500 宗玻璃窗或玻璃幕牆損毀報告，當中紅磡、灣仔、中環、旺角有商業大廈玻璃幕牆爆裂。將軍澳有住宅單位的玻璃窗被吹毀，荔景亦有住宅單位的冷氣機被吹入室內，導致一人受傷。全港有超過四萬戶電力供應中斷(圖 2.3.13)，包括多個新界西及新界北的鄉郊地區、西貢、將軍澳及杏花邨的個別樓宇、長洲、吉澳、東平洲等。當中約 13 500 戶停電超過 24 小時，而一些較偏遠地區及個別樓宇的電力供應在四日後仍未能完全恢復。停電亦引致一些地方的食水供應受到影響。

與二零一七年的天鴿相比，山竹所引致的暴雨、風暴潮及巨浪造成的破壞更為嚴重。大澳、石壁、梅窩、長洲、杏花邨、小西灣、海怡半島、鯉魚門、將軍澳、沙田、大埔、西貢、元朗、流浮山、沙頭角、石澳及坪洲等多處沿岸地區因風暴潮和大浪而嚴重水浸。多個沿岸設施包括污水處理廠、公眾泳灘、海濱長廊及運動場都受到不同程度的損毀。大澳、鯉魚門及沙田曾大屋村一帶因嚴重水浸，多名村民需要疏散。海水亦湧入杏花邨及將軍澳南一帶，有地下停車場被海水淹浸，多輛汽車被淹沒。沙田城門河、吐露港沿岸及大埔林村河一帶的單車徑及行人隧道亦被海水淹浸。西貢南圍、流浮山、大埔三門仔新村、沙頭角新村亦有多間村屋水浸。在巨浪下數以百計不同大小的船隻擱淺、沉沒或受嚴重破壞。各區的農田、魚排及魚塘均有不同程度的損毀。

本港海陸空交通在山竹來襲當天癱瘓，而翌日部分地區的主要道路仍因塌樹或水浸需封閉，公共交通服務未能完全恢復正常，大部分專營巴士路線停駛，港鐵東鐵綫和輕鐵只維持有限度服務。多個渡輪碼頭設施嚴重損毀，影響渡輪復航。香港國際機場有 889 班航班取消。

有關山竹與其他曾引致本港發出十號颶風信號的熱帶氣旋比較，可參考天文台網誌《令我們覺醒的「山竹」》：https://www.weather.gov.hk/tc/blog/00000216.htm。

註：清水灣自動站位處複雜地形，風速計高度在海平面以上七十多米，估計相應近海平面的風速低於每小時 185 公里。

2.3 Super Typhoon Mangkhut (1822)
7 to 17 September 2018

Mangkhut was the fifth tropical cyclone affecting Hong Kong in 2018. After Hato in 2017, the Hurricane Signal No. 10 was issued again during the passage of Mangkhut and lasted for ten hours. It was the second longest duration of Signal No. 10 since World War II, just after the 11 hours of York in 1999. Mangkhut is characterized by its extensive circulation, ferocious winds and fast movement as well as special wind structure. It brought damaging winds and record-breaking storm surges to Hong Kong, causing widespread and serious impacts.

Tropical depression Mangkhut formed over the western North Pacific about 2 330 km east of Guam on 7 September. Moving westwards quickly, it intensified gradually in the following few days. Mangkhut developed into a super typhoon on 11 September. It turned to the northwest on 14 September, reaching its peak intensity before making landfall over Luzon with an estimated maximum sustained wind of 250 km/h near the centre. Mangkhut weakened after crossing the northern part of Luzon and continued to track northwestwards quickly across the northern part of the South China Sea towards the coast of Guangdong. Mangkhut weakened into a severe typhoon on the morning of 16 September and made landfall in the vicinity of Taishan of Guangdong before dusk. It then moved into western part of Guangdong and weakened further. Mangkhut degenerated into an area of low pressure over Guangxi the next night.

According to press reports, Mangkhut brought torrential rain and squalls to Luzon. There were at least 82 deaths, 138 injuries and two missing. Around 15 000 houses collapsed. Mangkhut brought damaging winds and severe storm surge to the coast of Pearl River estuary, leading to damages of many buildings and coastal structures, as well as serious inundation of low lying areas. In Macao, 40 people were injured and more than 5 500 people were evacuated. There were a number of reports of building damages. The height of the inundation in Inner Harbour once reached 1.9 metres or higher above ground. At least six people were killed and more than 3.3 million were affected in Guangdong, Guangxi, Hainan, Guizhou and Yunnan.

As Mangkhut was a fast-moving storm and posed a serious threat to Hong Kong, the Hong Kong Observatory issued the Standby Signal No. 1 well in advance at 10:20 p.m. on 14 September when Mangkhut was about 1 110 km east-southeast of the territory, the farthest distance on record. Local winds were light to moderate northeasterlies during the day of 15 September. As Mangkhut edged closer to the coast of Guangdong quickly, the No. 3 Strong Wind Signal was issued at 4:20 p.m. on 15 September when Mangkhut was about 650 km southeast of Hong Kong. Local winds strengthened at night, becoming fresh to strong northerlies. With Mangkhut maintaining its course towards the Pearl River Estuary, the Observatory issued the No. 8 Northeast Gale or Storm Signal at 1:10 a.m. on 16 September when Mangkhut was about 410 km southeast of the territory. Local winds continued to strengthen afterwards, with gale to storm force northerlies offshore and on high ground. As winds were expected to increase further when Mangkhut came closer to Hong Kong, the Increasing Gale or Storm Signal No. 9 was issued at 7:40 a.m. when Mangkhut was about 200 km south-southeast of the territory. With local winds picking up rapidly afterwards, the Observatory issued the Hurricane Signal No. 10 at 9:40 a.m. when Mangkhut was about 160 km south-southeast of the territory. At the time when tropical cyclone signals number 8, 9 and 10 were issued, the storm was the farthest away from Hong Kong for the corresponding signal since 1961. The destructive storm to hurricane force winds affected Hong Kong for a long period of time during the day of 16 September. Mangkhut came closest to the Hong Kong Observatory Headquarters around 1 p.m. with its centre was located about 100 km to the south-southwest. With Mangkhut shirting past to the southwest of Hong Kong, local winds veered from the northeast to the southeast gradually. Mangkhut made landfall over the vicinity of Taishan of Guangdong before dusk. With Mangkhut moving away from Hong Kong and weakening gradually, hurricane force winds no longer affected the territory. The No. 8 Southeast Gale or Storm Signal was issued at 7:40 p.m. to replace the No. 10 Signal. With local winds subsiding continuously, the No. 3 Strong Wind Signal was issued at 5:20 a.m. on 17 September, followed by the No. 1 Standby Signal at 2:40 p.m. Mangkhut moved further inland and weakened, and all tropical cyclone warning signals were cancelled at 7:10 p.m. that night.

While Mangkhut weakened after moving across the northern part of Luzon with weaker convection over the eyewall, the spiral rainband between 100 and 200 kilometres from its centre remained intense and the structure was intact. Analysis of microwave satellite images (Figure 2.3.6), Doppler weather radar images (Figure 2.3.7), surface observations and flight reconnaissance data revealed that the winds associated with the spiral rainband outside the eyewall were stronger than those near the eyewall. When Mangkhut skirted past to the south of Hong Kong, the intense spiral rainband swept across Hong Kong during the day. Moreover, Mangkhut moved rapidly over the northern part of the South China Sea (speed reaching 35 km/h). With Hong Kong staying in the right semicircle of the storm (also known as the dangerous semicircle) for a long time, the superposition of wind speed and moving speed of the storm brought ferocious winds to Hong Kong most of the time during the day. In view of the special wind structure of Mangkhut, the wind strength experienced by Hong Kong was the strongest among the Pearl River Delta areas even though Mangkhut tracked closer to Macao, Zhuhai and Taishan.

Table 2.3.1 showed the maximum wind recorded at various stations in Hong Kong during the passage of Mangkhut. Under the influence of Mangkhut, the wind strength over Hong Kong was generally stronger than that of the tropical cyclones necessitating the issuance of No. 10 signals in the recent three decades, including York in 1999, Vicente in 2012 and Hato in 2017 (Table 2.3.2). The maximum 60-minute mean wind speeds recorded at Waglan Island and Cheung Chau were 161 km/h and 157 km/h respectively. Both are the second highest records at the corresponding stations, just lower than the record high of Ellen in 1983. Gusts over 150 km/h were registered in most parts of the territory on that day and a maximum gust of 256 km/h was recorded at Tate's Cairn, ranking after Wanda in 1962 and Ruby in 1964. A maximum 10-minute mean wind of 124 km/h was registered at North Point anemometer located inside the Victoria Harbour (Figure 2.3.9), the first time sustained hurricane force winds were recorded at the station since the start of its operation in 1998. Besides, the automatic weather station under testing at Clear Water Bay even recorded a maximum 10-minute average wind speed of 191 km/h (Note), which is believed to be the highest record near the surface since the Observatory's commencement of automatic weather station installation in Hong Kong in the 1980s.

The lowest instantaneous mean sea-level pressures recorded at some selected stations are as follows:

Station	Lowest instantaneous mean sea-level pressure (hPa)	Date/Month	Time
Hong Kong Observatory Headquarters	977.0	16/9	1:28 p.m.
Hong Kong International Airport	973.9	16/9	2:11 p.m.
King's Park	977.5	16/9	1:44 p.m.
Ta Kwu Ling	981.3	16/9	12:52 p.m.
Tai Po	980.5	16/9	1:17 p.m.
Shatin	980.1	16/9	12:21 p.m.
Sheung Shui	979.8	16/9	2:06 p.m.
Lau Fau Shan	976.7	16/9	1:59 p.m.
Cheung Chau	971.8	16/9	2:10 p.m.
Waglan Island	973.5	16/9	12:10 p.m.

Mangkhut's track is a typical one causing severe storm surge in Hong Kong. When it skirted past to the south-southwest of Hong Kong, the associated ferocious east to southeasterly winds pushed water towards the shore and piled up against the coast. In addition, Mangkhut's extensive circulation drove a more extensive area of the ocean which in turn raised the water level further. The severe storm surge induced by Mangkhut raised the water level in Hong Kong generally by

more than two metres, resulting in an unusually high water level in many places in Hong Kong. Five of the six tide stations of the Observatory (including Quarry Bay, Tai Po Kau, Tsim Bei Tsui, Tai Miu Wan and Shek Pik) registered record breaking storm surges. Among them, the water level increases recorded at the tide station at Quarry Bay and Tai Po Kau were 2.35 metres and 3.40 metres respectively. As the tide station at Waglan Island was severely damaged by Mangkhut, the highest sea level was not recorded. The sea level (the sum of astronomical tide and storm surge) of Quarry Bay rose to a maximum of 3.88 metres (above Chart Datum, same below), exceeding the 3.57 metres registered during the passage of Hato in 2017, and only lower than the record high of 3.96 metres set by Wanda in 1962. A maximum water level of 4.71 metres was recorded at Tai Po Kau, also only lower than the record high of 5.03 metres set by Wanda. For the maximum sea level recorded at various tide stations in Hong Kong on 16 September 2018, please refer to Figure 2.3.11.

The subsiding air ahead of Mangkhut's circulation brought mainly fine and very hot weather to Hong Kong on 14 and 15 September. Temperature at the Hong Kong Observatory soared to 35.1 degrees on 15 September, the second highest record for September. Under the influence of the circulation of Mangkhut, the weather in Hong Kong deteriorated rapidly with heavy rain and squalls on 16 September. More than 150 millimetres of rainfall were recorded over most parts of the territory on that day. Red Rainstorm Warning and Special Announcement on Flooding in the Northern New Territories were issued by the Observatory. Under the influence of the rain bands associated with Mangkhut, there were still occasional squally showers on 17 September.

In Hong Kong, at least 458 people were injured during the passage of Mangkhut. There were more than 60 000 reports of fallen trees, the highest number on record. Many incidents of blowing down and falling objects as well as building damages were reported. A tower crane of a construction site in Tai Kok Tsui was blown down. The wall of a building and a rooftop home also collapsed. The roof of a refuse collection centre in Sau Ming Ping was also blown away. At least 500 reports of smashed windows or glass curtain walls were received. Among them, glass curtain walls of several commercial buildings in Hung Hom, Wan Chai, Central and Mong Kok were damaged. Windows were broken in several apartment buildings in Tseung Kwan O. An air conditioning unit was crashed into an apartment in Lai King, injuring a person inside. Electricity supply to over 40,000 households in Hong Kong was interrupted (Figure 2.3.13), including Sai Kung, Cheung Chau, Kat O, Tung Ping Chau, individual buildings in Tseung Kwan O and Heng Fa Chuen, and rural areas in the western and northern New Territories. Power outage to some 13,500 households lasted for more than 24 hours, and the electricity supply to some remote areas and individual buildings were not fully restored even after four days. Supply of fresh water in some places was also affected due to power outages.

The destructions caused by the heavy rain, storm surge and high waves induced by Mangkhut are more serious than those of Hato in 2017. Severe inundation triggered by storm surge and huge waves were observed in a number of coastal areas, including Tai O, Shek Pik, Mui Wo, Cheung Chau, Heng Fa Chuen, Siu Sai Wan, South Horizons, Lei Yue Mun, Tseung Kwan O, Sha Tin, Tai

Po, Sai Kung, Yuen Long, Lau Fau Shan, Sha Tau Kok, Shek O and Peng Chau. Many coastal structures suffered from different levels of damages, including sewage treatment works, public beaches, waterfront promenades and sports ground. Flooding was serious in Tai O, Lei Yue Mun and Tsang Tai Uk in Shatin and many residents were evacuated. Sea water flowed into the estates and underground car parks in Hung Fa Chuen and Tseung Kwan O south, submerging a number of private vehicles inside. The cycle tracks and subways near Shing Mun River in Shatin, coastal area of Tolo Harbour, Lam Tsuen River in Tai Po were inundated. A number of villages houses in Nam Wai in Sai Kung, Lau Fau Shan, Sam Mun Tsai San Tsuen in Tai Po and San Tsuen in Sha Tau Kok were seriously flooded. Hundreds of vessels of various sizes were stranded, sunk or seriously damaged by the powerful waves. Farmland, fish rafts and fish ponds in all districts suffered different levels of damage.

Sea, land and air transportation services were paralyzed on the day Mangkhut battered Hong Kong. Owing to fallen trees and flooding, parts of the major roads were still closed and public transports could not be fully resumed the next day. Most of the public bus services were suspended and there were limited services of East Rail Line and Light Rail of MTR. Ferry services resumption was affected due to the damage of facilities at a number of ferry terminals. 889 flights were cancelled at the Hong Kong International Airport.

For comparison between Mangkhut and the tropical cyclones necessitating the issuance of the Hurricane Signal No. 10, please refer to the Observatory's Blog – "A Wake up Call from Mangkhut" (https://www.weather.gov.hk/en/blog/00000216.htm).

Note: The automatic weather station at Clear Water Bay is located on a complex terrain with the anemometer at an elevation over 70 metres above sea level. The corresponding wind speed near sea level is estimated to be lower than 185 km/h.

表 2.3.1　在山竹影響下，本港各站在熱帶氣旋警告信號生效時所錄得的最高陣風、最高每小時平均風速及風向

Table 2.3.1　Maximum gust peak speeds and maximum hourly mean winds with associated wind directions recorded at various stations when the tropical cyclone warning signals for Mangkhut were in force

站 Station (http://www.weather.gov.hk/informtc/station2018_uc.htm)		最高陣風 Maximum Gust					最高每小時平均風速 Maximum Hourly Mean Wind				
		風向 Direction		風速 (公里/時) Speed (km/h)	日期/月份 Date/Month	時間 Time	風向 Direction		風速 (公里/時) Speed (km/h)	日期/月份 Date/Month	時間 Time
黃麻角(赤柱)	Bluff Head (Stanley)	-	-	157	16/9	14:00	-	-	101	16/9	15:00
中環碼頭	Central Pier	東	E	169	16/9	12:30	東	E	99	16/9	13:00
長洲	Cheung Chau	東	E	212	16/9	14:10	東	E	151	16/9	15:00
長洲泳灘	Cheung Chau Beach	東北	NE	209	16/9	12:01	東北偏東	ENE	142	16/9	14:00
青洲	Green Island	東北偏北	NNE	229	16/9	10:29	東北	NE	124	16/9	11:00
香港國際機場	Hong Kong International Airport	東南偏東	ESE	157	16/9	16:26	東	E	99	16/9	15:00
啟德	Kai Tak	東北偏東	ENE	142	16/9	10:28	東南偏東	ESE	77	16/9	17:00
		東北偏東	ENE	142	16/9	13:59					
京士柏	King's Park	東北偏北	NNE	161	16/9	10:17	東	E	67	16/9	15:00
流浮山	Lau Fau Shan	東北偏東	ENE	166	16/9	12:40	東北偏東	ENE	96	16/9	14:00
北角	North Point	東	E	171	16/9	12:51	東	E	110	16/9	13:00
平洲	Ping Chau	東	E	124	16/9	11:30	東南偏南	SSE	47	16/9	11:00
西貢	Sai Kung	東北	NE	180	16/9	11:43	東北	NE	108	16/9	12:00
沙洲	Sha Chau	東	E	164	16/9	14:02	東南偏東	ESE	103	16/9	15:00
沙螺灣	Sha Lo Wan	東	E	169	16/9	14:11	東	E	87	16/9	15:00
沙田	Sha Tin	東北偏北	NNE	149	16/9	11:42	東北偏北	NNE	47	16/9	11:00
石崗	Shek Kong	東北	NE	164	16/9	11:22	東	E	72	16/9	15:00
九龍天星碼頭	Star Ferry (Kowloon)	東	E	135	16/9	13:48	東	E	79	16/9	14:00
打鼓嶺	Ta Kwu Ling	東北偏東	ENE	133	16/9	13:28	東北偏北	NNE	52	16/9	11:00
大美督	Tai Mei Tuk	東北偏東	ENE	198	16/9	12:08	東北偏東	ENE	139	16/9	13:00
大帽山	Tai Mo Shan	東南偏東	ESE	250	16/9	14:05	東南偏東	ESE	167	16/9	15:00
大埔滘	Tai Po Kau	東	E	146	16/9	13:09	東	E	88	16/9	13:00
大老山	Tate's Cairn	東北偏東	ENE	256	16/9	10:33	東北偏東	ENE	158	16/9	12:00
將軍澳	Tseung Kwan O	東北偏北	NNE	153	16/9	10:40	東北偏北	NNE	52	16/9	11:00
青衣島蜆殼油庫	Tsing Yi Shell Oil Depot	東南偏東	ESE	137	16/9	14:22	東南偏東	ESE	58	16/9	15:00
屯門政府合署	Tuen Mun Government Offices	東	E	133	16/9	14:01	東南	SE	51	16/9	17:00
橫瀾島	Waglan Island	東北	NE	220	16/9	10:14	東北	NE	158	16/9	11:00
濕地公園	Wetland Park	東	E	130	16/9	13:06	東	E	58	16/9	14:00
黃竹坑	Wong Chuk Hang	東北偏東	ENE	173	16/9	13:40	東北偏東	ENE	54	16/9	14:00

-沒有資料 data not available

昂坪、坪洲、塔門東- 沒有資料　Ngong Ping, Peng Chau and Tap Mun-East data not available

表 2.3.2　山竹與過去三十年引致天文台需要發出十號颶風信號的熱帶氣旋(約克、韋森特及天鴿)襲港期間錄得的最高 60 分鐘平均風速及最高陣風

Table 2.3.2　Maximum 60-minute mean wind speeds and maximum gusts recorded during the passage of Mangkhut and the tropical cyclones necessitating the issuance of No. 10 signals in the recent three decades (York, Vicente and Hato)

站 / Station	最高 60 分鐘平均風速/最高陣風 (公里/小時) Maximum 60-minute mean wind speeds / Maximum gust peak speeds (km/h)			
	1999	2012	2017	2018
	約克 York	韋森特 Vicente	天鴿 Hato	山竹 Mangkhut
長洲 Cheung Chau	113/182	128/184	128/171	157/212
香港國際機場 Hong Kong International Airport	88/135	85/133	92/144	101/157
流浮山 Lau Fau Shan	106/158	59/106	70/112	96/166
啟德 Kai Tak	59/142	70/135	67/130	81/142
北角 North Point	77/155	67/130	85/137	110/171
西貢 Sai Kung	108/211	76/121	70/112	112/180
沙田 Sha Tin	51/153	41/88	40/104	51/149
九龍天星碼頭 Star Ferry (Kowloon)	81/149	83/122	63/112	85/135
青衣島蜆殼油庫 Tsing Yi Shell Oil Depot	85/153	43/106	45/106	59/137
打鼓嶺 Ta Kwu Ling	58/121	41/94	43/99	52/133
大尾督 Tai Mei Tuk	115/180	101/146	101/140	139/198
橫瀾島 Waglan Island	153/234	108/149	137/193	161/220

表 2.3.3　在山竹影響下，熱帶氣旋警告信號系統的八個參考測風站在熱帶氣旋警告信號生效時錄得持續風力達到強風及烈風程度的時段

Table 2.3.3　Periods during which sustained strong and gale force winds were attained at the eight reference anemometers in the tropical cyclone warning system when tropical cyclone warning signals for Mangkhut were in force

站 Station (http://www.weather.gov.hk/informtc/station2018_uc.htm)		最初達到強風* 時間		最後達到強風* 時間		最初達到烈風# 時間		最後達到烈風# 時間	
		Start time when strong wind speed* was attained		End time when strong wind speed* was attained		Start time when gale force wind speed# was attained		End time when gale force wind speed# was attained	
		日期/月份 Date/Month	時間 Time	日期/月份 Date/Month	時間 Time	日期/月份 Date/Month	時間 Time	日期/月份 Date/Month	時間 Time
長洲	Cheung Chau	15/9	21:27	17/9	18:13	16/9	04:20	17/9	08:04
香港國際機場	Hong Kong International Airport	16/9	03:47	17/9	09:23	16/9	07:53	17/9	01:35
沙田	Sha Tin	16/9	10:01	16/9	20:53	-			
啟德	Kai Tak	16/9	09:27	17/9	06:05	16/9	12:14	16/9	20:46
流浮山	Lau Fau Shan	16/9	01:11	17/9	01:06	16/9	08:13	16/9	16:34
西貢	Sai Kung	16/9	00:15	17/9	06:11	16/9	08:20	16/9	21:40
打鼓嶺	Ta Kwu Ling	16/9	10:04	16/9	16:40	-			
青衣島蜆殼油庫	Tsing Yi Shell Oil Depot	16/9	07:20	16/9	22:46	16/9	14:40	16/9	14:41

- 未達到指定的風速

- not attaining the specified wind speed

* 十分鐘平均風速達每小時 41-62 公里

* 10-minute mean wind speed of 41- 62 km/h

十分鐘平均風速達每小時 63-87 公里

10-minute mean wind speed of 63-87 km/h

註:　本表列出持續風力達到強風及烈風程度的起始及終結時間。期間風力可能高於或低於指定的風力。

Note: The table gives the start and end time of sustained strong or gale force winds. Winds might fluctuate above or below the specified wind speeds in between the times indicated.

表 2.3.4　山竹掠過期間，香港天文台總部及其他各站所錄得的日雨量

Table 2.3.4　Daily rainfall amounts recorded at the Hong Kong Observatory Headquarters and other stations during the passage of Mangkhut

站 (參閱圖 2.3.3) Station (See Fig. 2.3.3)			九月十四日 14 Sep	九月十五日 15 Sep	九月十六日 16 Sep	九月十七日 17 Sep	總雨量 (毫米) Total rainfall (mm)
香港天文台 Hong Kong Observatory (HKO)			0.0	微量 Trace	167.5	12.0	179.5
香港國際機場 Hong Kong International Airport (HKA)			0.0	微量 Trace	191.5	4.2	195.7
長洲 Cheung Chau (CCH)			[0.0]	0.0	79.0	9.0	[88.0]
H23	香港仔	Aberdeen	0.0	0.0	99.0	7.5	106.5
N05	粉嶺	Fanling	0.0	0.0	126.5	28.5	155.0
N13	糧船灣	High Island	0.0	0.0	[83.5]	2.0	[85.5]
K04	佐敦谷	Jordan Valley	0.0	0.0	160.0	6.0	166.0
N06	葵涌	Kwai Chung	0.0	0.0	214.0	22.5	236.5
H12	半山區	Mid Levels	0.0	0.0	143.0	22.0	165.0
N09	沙田	Sha Tin	1.5	0.0	223.0	0.0	224.5
H19	筲箕灣	Shau Kei Wan	0.0	0.0	138.5	6.5	145.0
SEK	石崗	Shek Kong	[0.0]	0.0	279.0	41.5	320.5
K06	蘇屋邨	So Uk Estate	0..0	0.0	[253.0]	17.0	[270.0]
R31	大美督	Tai Mei Tuk	0.5	0.0	[150.5]	[3.5]	[154.5]
R21	踏石角	Tap Shek Kok	0.0	0.0	213.0	36.0	249.0

東涌(N17)、屯門水庫(TMR) - 沒有資料　　Tung Chung (N17), Tuen Mun Reservoir (TMR) - data not available

註 : [　] 基於不完整的每小時雨量數據。Note : [　] based on incomplete hourly data.

表 2.3.5　山竹掠過期間，香港各潮汐站所錄得的最高潮位及最大風暴潮

Table 2.3.5　Times and heights of the maximum sea level and the maximum storm surge recorded at tide stations in Hong Kong during the passage of Mangkhut

站 Station (http://www.weather.gov.hk/informtc/station2018_uc.htm)		最高潮位 (海圖基準面以上) Maximum sea level (above chart datum)			最大風暴潮 (天文潮高度以上) Maximum storm surge (above astronomical tide)		
		高度(米) Height (m)	日期/月份 Date/Month	時間 Time	高度(米) Height (m)	日期/月份 Date/Month	時間 Time
鰂魚涌	Quarry Bay	3.88	16/9	14:42	2.35	16/9	14:42
石壁	Shek Pik	3.89	16/9	14:16	2.34	16/9	14:16
大廟灣*	Tai Miu Wan*	4.19	16/9	13:41	2.77	16/9	13:41
大埔滘	Tai Po Kau	4.71	16/9	12:34	3.40	16/9	12:34
尖鼻咀	Tsim Bei Tsui	4.18	16/9	17:14	2.58	16/9	17:21

*基於不完整的數據　* based on incomplete data

橫瀾島潮汐站在山竹吹襲期間受嚴重損毀，損毀前錄得的最高潮位為 2.68 米。

The tide station at Waglan Island was severely damaged by Mangkhut and the maximum sea level of 2.68 m was recorded before damage.

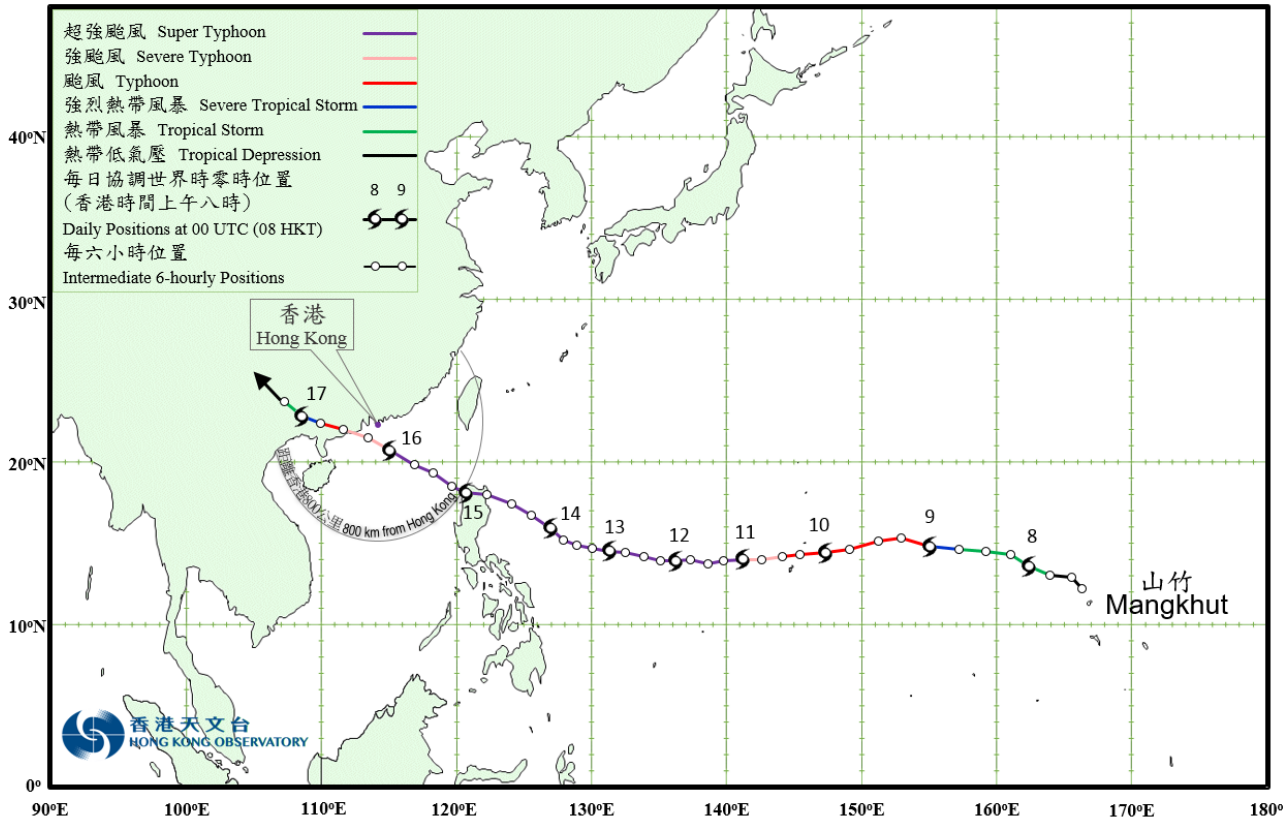


圖 2.3.1(a)　　二零一八年九月七日至十七日山竹的暫定路徑圖。

Figure 2.3.1(a)　Provisional track of Mangkhut: 7 – 17 September 2018.

圖 2.3.1(b)　　山竹接近香港時的暫定路徑圖。

Figure 2.3.1(b)　Provisional track of Mangkhut approaching Hong Kong.

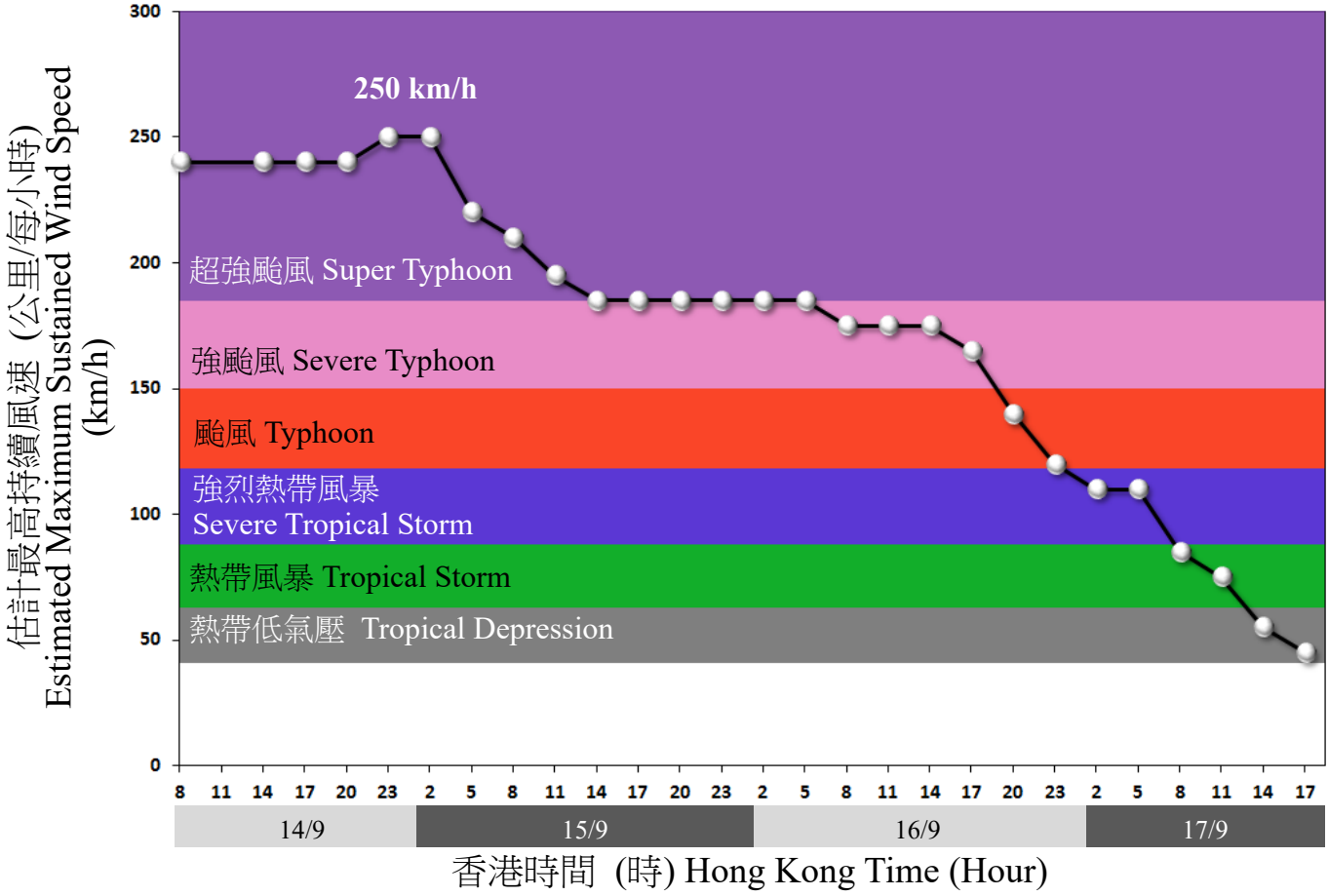


圖 2.3.2(a) 二零一八年九月十四日至十七日山竹最高持續風速的時間序列(暫定)。

Figure 2.3.2(a) Time series of maximum sustained wind speed of Mangkhut (provisional): 14 to 17 September 2018

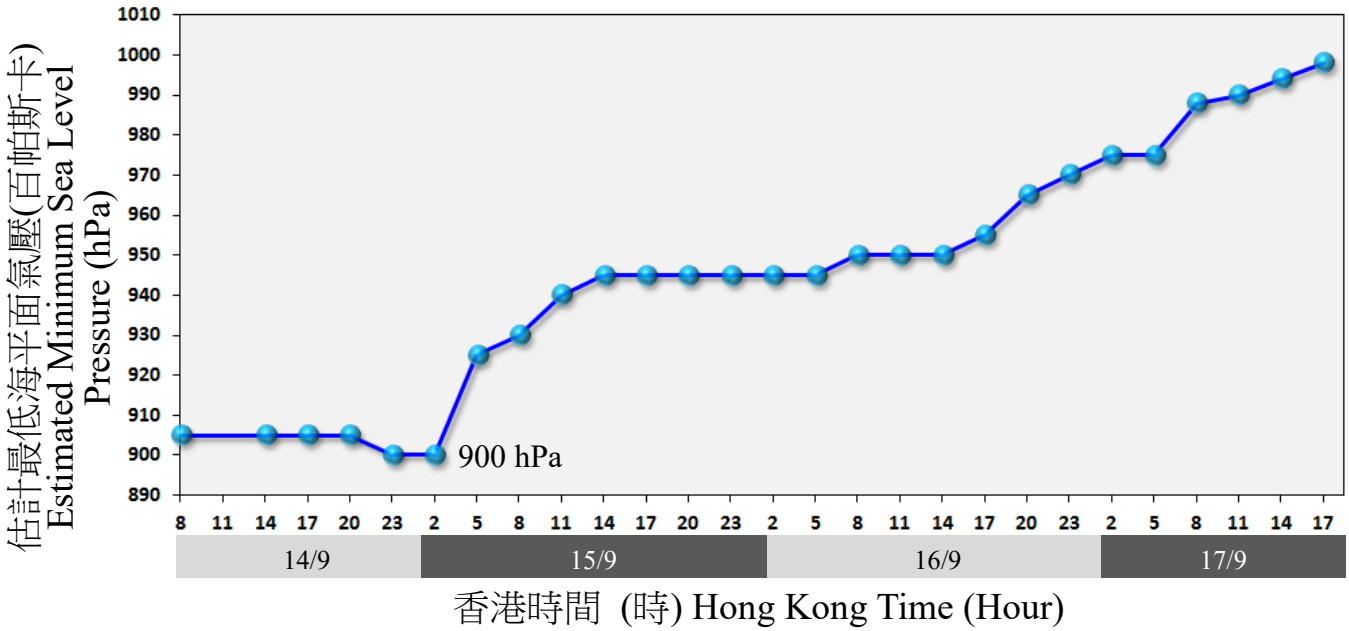


圖 2.3.2(b) 二零一八年九月十四日至十七日山竹最低海平面氣壓的時間序列(暫定)。

Figure 2.3.2(b) Time series of minimum sea level pressure of Mangkhut (provisional): 14 to 17 September 2018

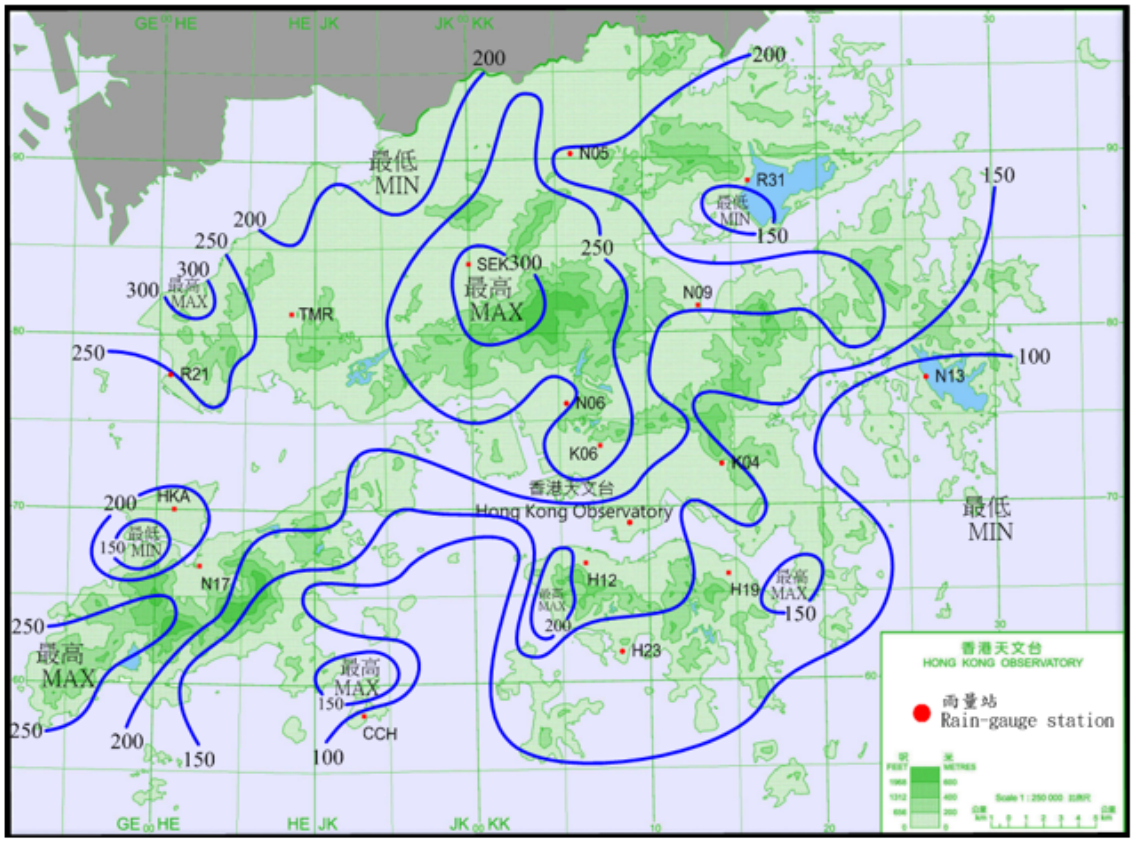


圖 2.3.3 二零一八年九月十四日至十七日的雨量分佈(等雨量線單位為毫米)。

Figure 2.3.3 Rainfall distribution on 14 - 17 September 2018 (isohyets in millimetres).

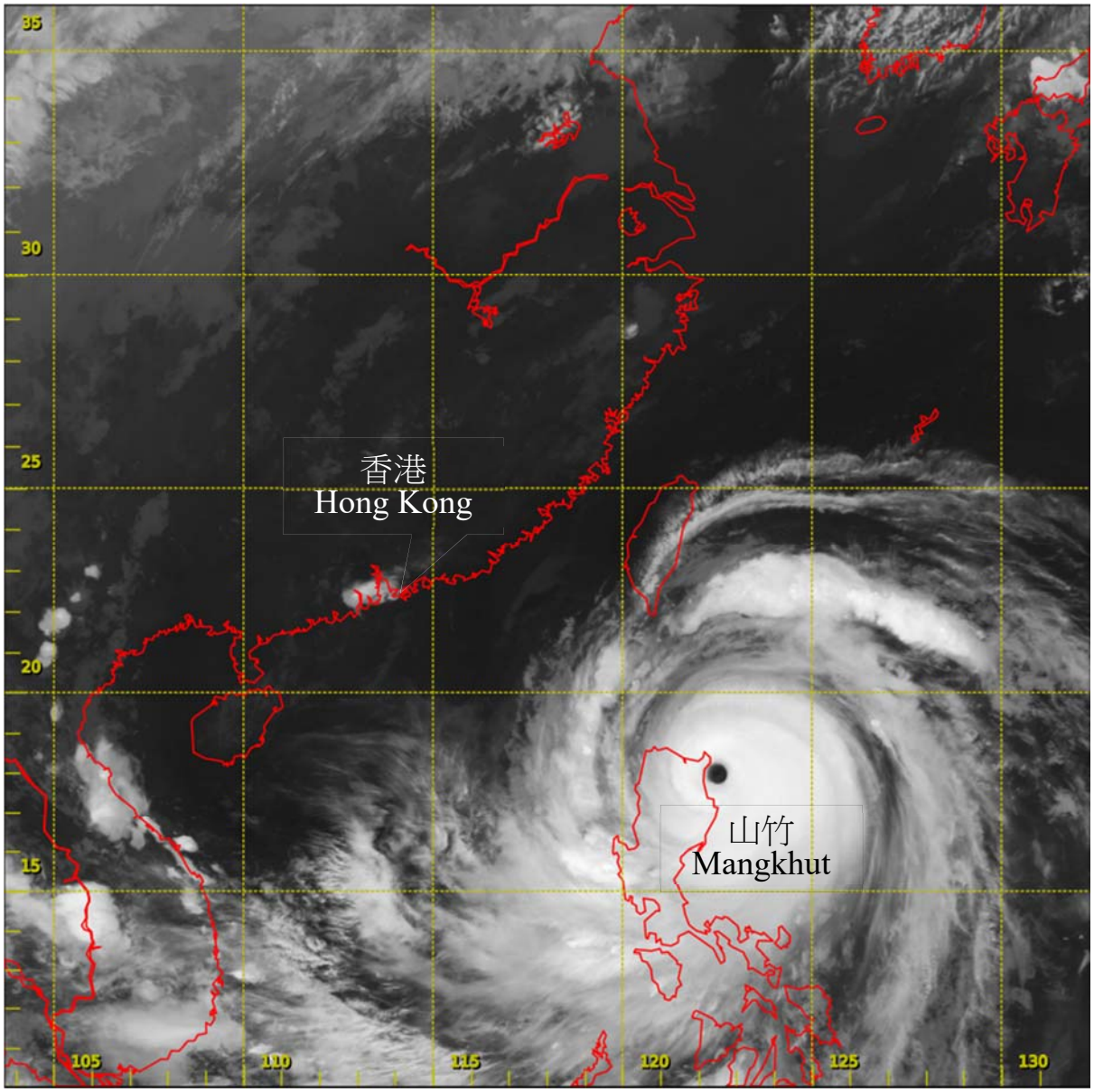


圖 2.3.4(a)　二零一八年九月十四日下午 11 時左右的紅外線衛星圖片，當時山竹達到其最高強度，中心附近最高持續風速估計為每小時 250 公里。

Figure 2.3.4(a)　Infra-red satellite imagery around 11 p.m. on 14 September 2018, when Mangkhut was at peak intensity with estimated maximum sustained winds of 250 km/h near its centre.

〔此衛星圖像接收自日本氣象廳的向日葵 8 號衛星。〕
[The satellite imagery was originally captured by Himawari-8 Satellite (H-8) of Japan Meteorological Agency (JMA).]

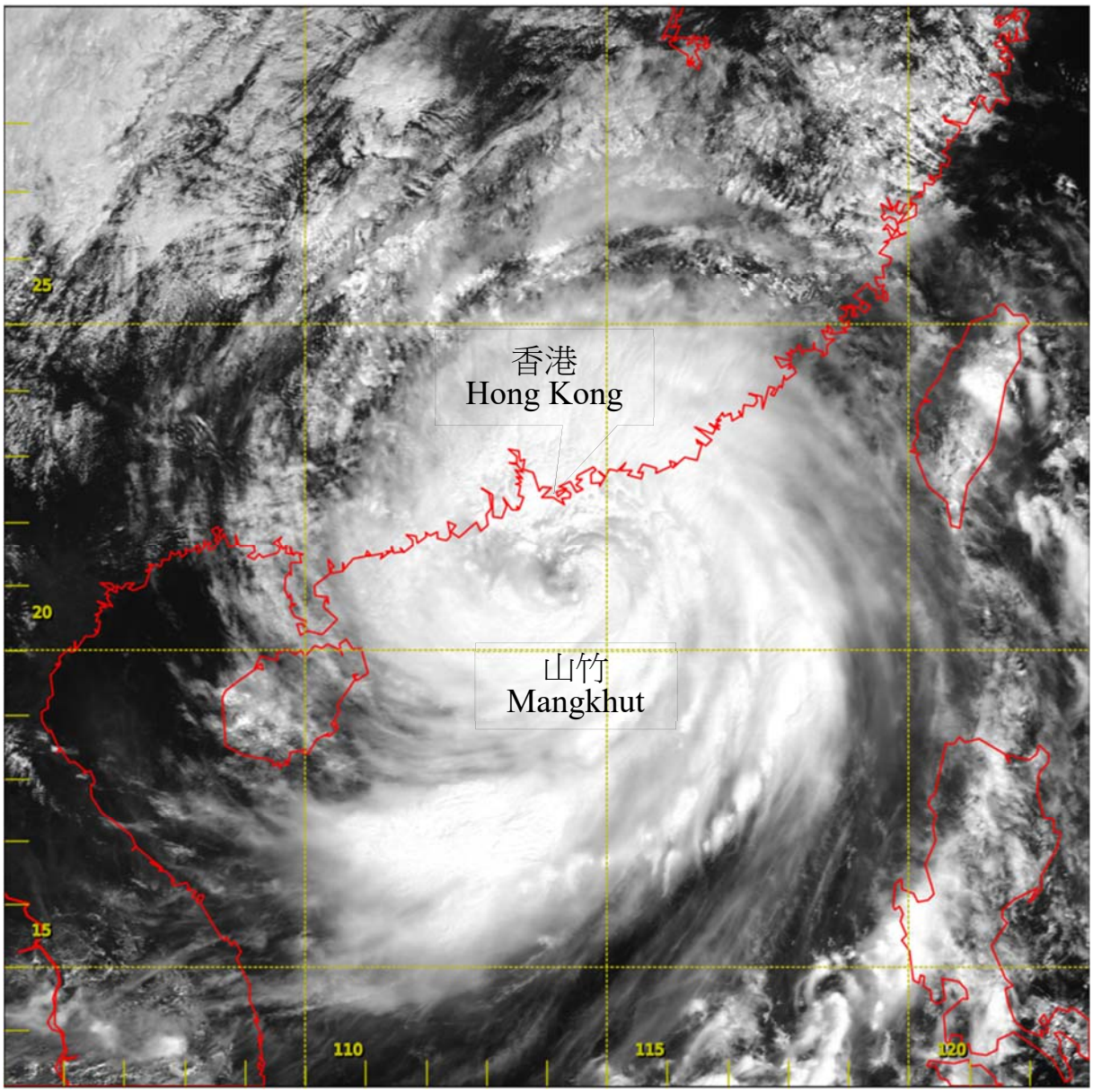


圖 2.3.4(b)　二零一八年九月十六日上午 11 時左右的可見光衛星圖片，山竹廣闊的環流覆蓋南海北部及華南沿岸地區。

Figure 2.3.4(b)　Visible satellite imagery around 11 a.m. on 16 September 2018. The extensive circulation of Mangkhut covered the northern part of the South China Sea and south China coastal areas.

〔此衛星圖像接收自日本氣象廳的向日葵 8 號衛星。〕
[The satellite imagery was originally captured by Himawari-8 Satellite (H-8) of Japan Meteorological Agency (JMA).]

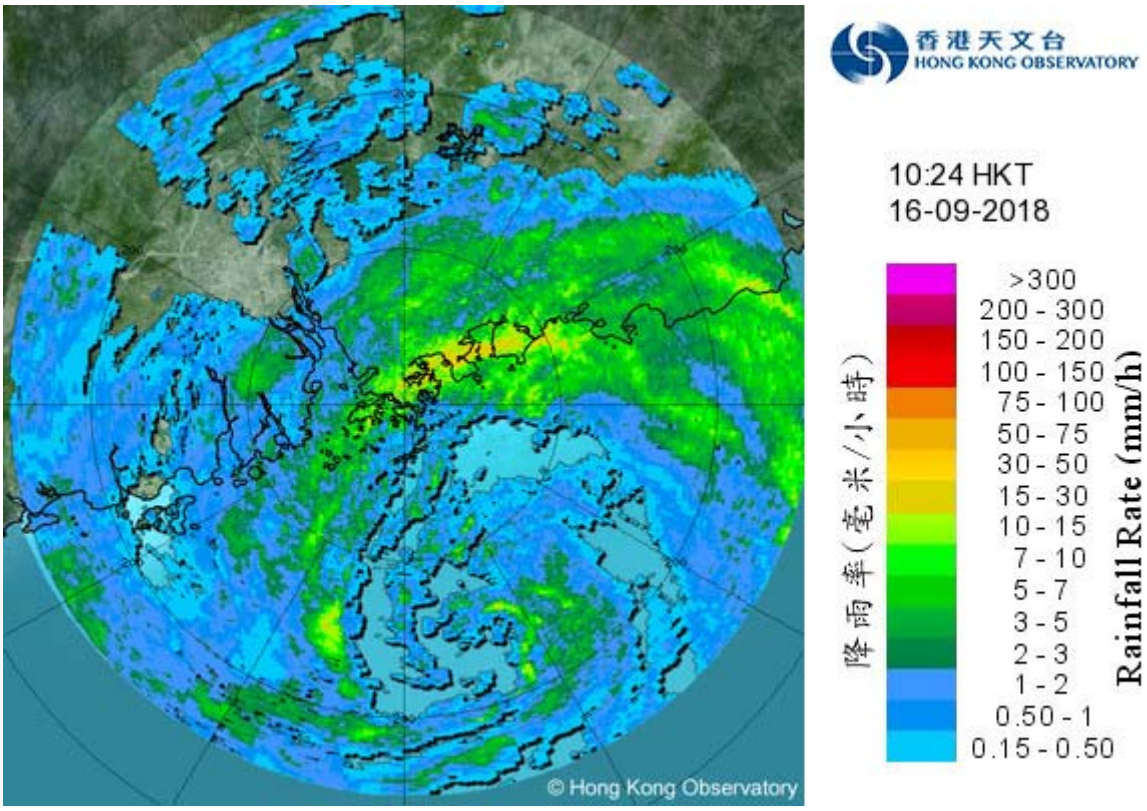


圖 2.3.5 (a)　二零一八年九月十六日上午 10 時 24 分的雷達回波圖像，當時山竹的強烈螺旋雨帶正影響香港。

Figure 2.3.5(a)　Image of radar echoes at 10:24 a.m. on 16 September 2018. The intense spiral rainband of Mangkhut was affecting Hong Kong at that time.

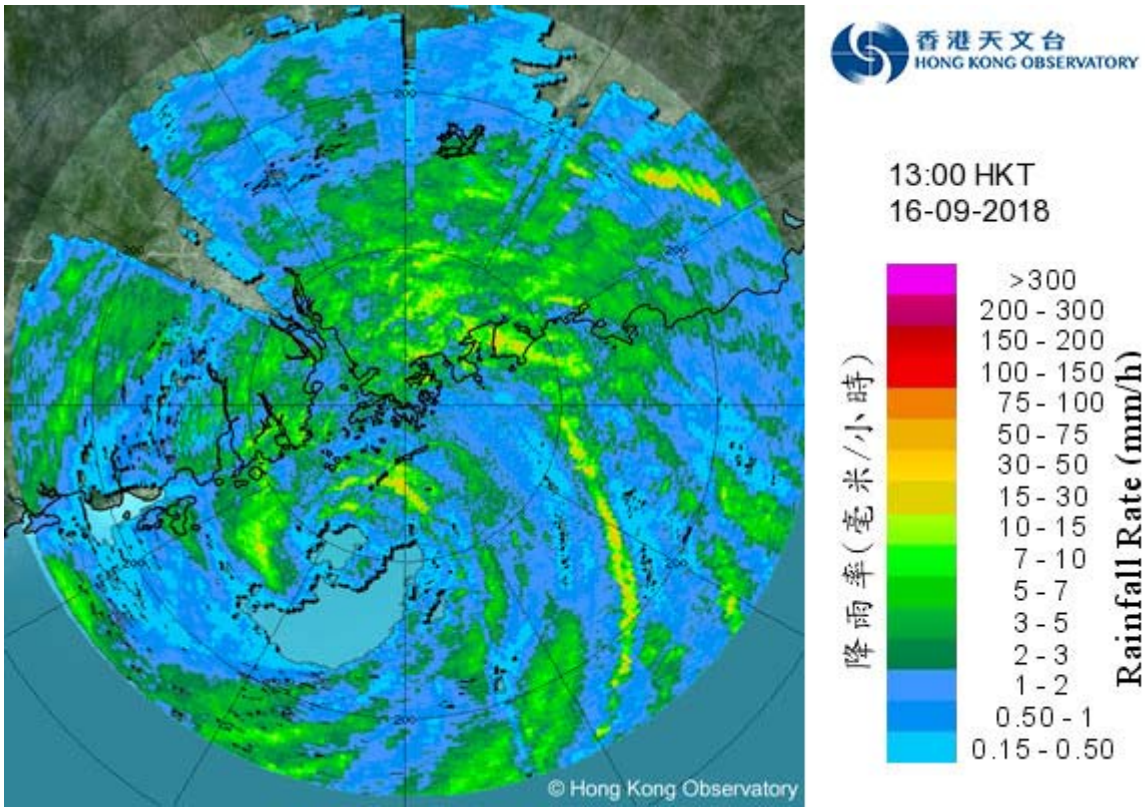


圖 2.3.5(b)　二零一八年九月十六日下午 1 時的雷達回波圖像，當時山竹最接近香港，其中心在天文台總部的西南偏南約 100 公里。

Figure 2.3.5(b)　Image of radar echoes at 1 p.m. on 16 September 2018 when Mangkhut was closest to Hong Kong, with its centre located about 100 km south-southwest of the Observatory Headquarters.

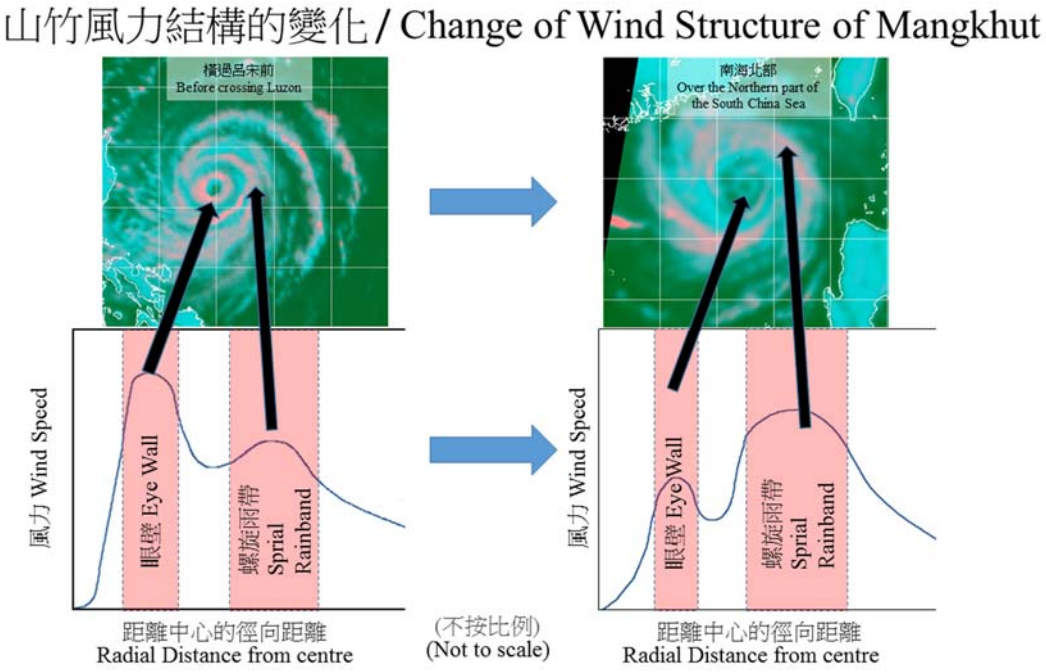


圖 2.3.6　山竹在橫過呂宋前及在南海北部風力結構變化的示意圖。

Figure 2.3.6　Diagram illustrating the change of wind structure of Mangkhut before crossing Luzon and over the northern part of the South China Sea.

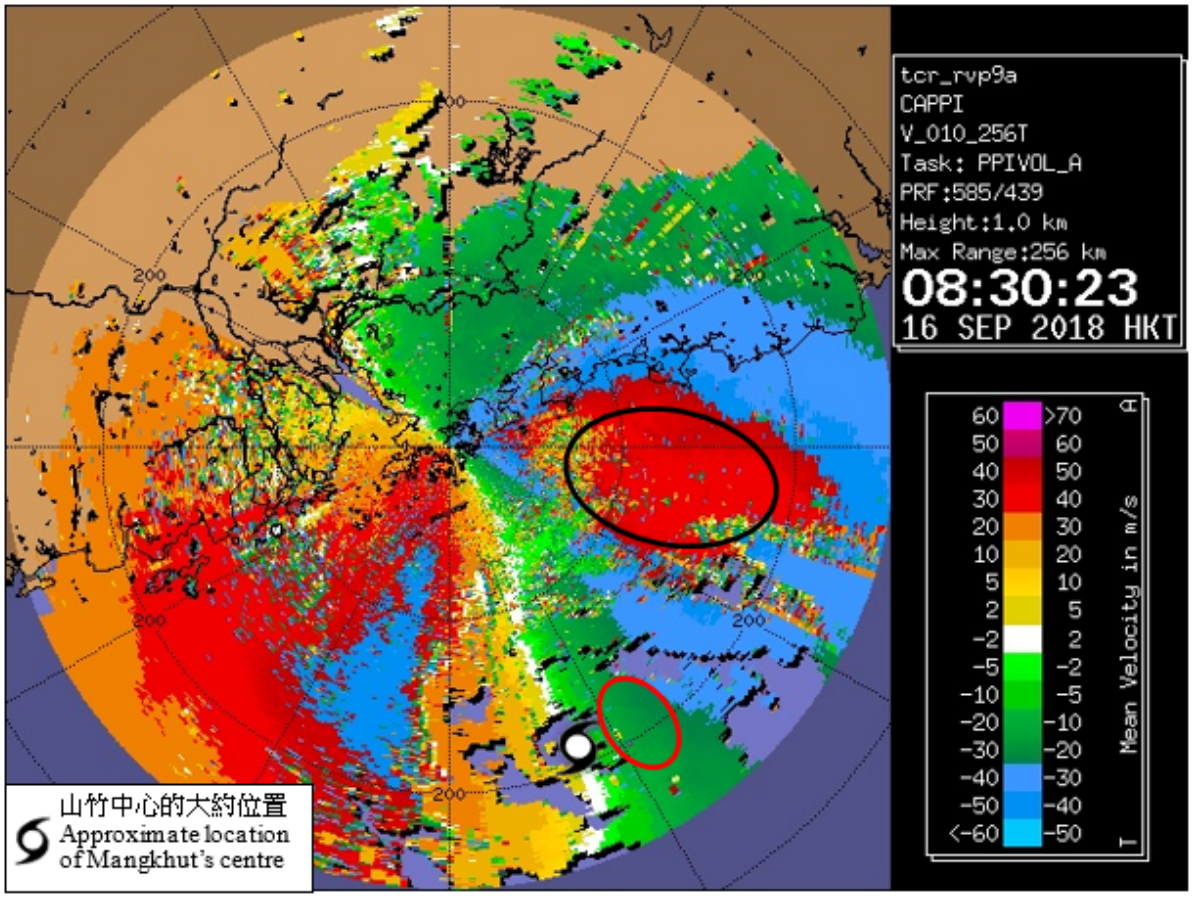


圖 2.3.7　二零一八年九月十六日上午 8 時 30 分的多普勒雷達回波圖像，顯示在 1 公里高度的徑向風(即雨區在雷達方向的速度，正(負)速度表示雨區遠離(接近)雷達)。圖像顯示山竹外圍螺旋雨帶的徑向風較眼壁的徑向風大。

Figure 2.3.7　Radar imagery showing the Doppler velocity at 8:30 a.m. on 16 September 2018. The image revealed the radial winds at 1 km (i.e. the velocity of rain echoes relative to the radar, and positive (negative) values indicates rain echoes moving away from (towards) the radar). The image showed that the radial wind over the outer spiral rainband was higher than that near the eyewall.

註：要注意的是多普勒天氣雷達速度探測範圍的限制。而最大可探測的速度稱為最大不模糊速度。大老山天氣雷達的最大不模糊速度為每秒 45.1 米。假若徑向風超過了最大不模糊速度，便會出現速度折疊的現象，速度會由正數(負數)每秒 45.1 米轉為負數(正數)每秒 45.1 米。

以山竹外圍螺旋雨帶 (即黑色圈部分)作為例子，圖中直接讀出的徑向風介乎每秒正 30 至 40 米(正數表示遠離雷達)，但事實上該雨區正移近雷達。經折疊修正之後，在雨區 1 公里高度的實際徑向風應介乎每秒負 50.1 米至負 60.1 米。相反在眼壁附近的雨區(紅色圈部分)並無出現速度折疊現象，徑向風介乎每秒負 20 至 30 米。

Note: Please note the constraint of the range of the velocity detected by Doppler radar. The maximum detectable speed is called Nyquist velocity. The Nyquist velocity of Tate's Cairn Weather Radar is 45.1 m/s. If the radial wind exceeds the Nyquist velocity, there will be velocity folding, and the radial speed will change from positive (negative) 45.1 m/s to negative (positive) 45.1 m/s.

Using the spiral rainband of Mangkhut (circled in black) as an example, the radial wind read directly from the figure ranged between +30 and +40 m/s (positive value means moving away from radar). In fact the rain echoes were moving towards the radar. After adjusting for the folding, the actual radial wind of the rain echoes at a height 1 km should range from –50.1 m/s to –60.1 m/s. In contrast, there was no velocity folding of the rain echoes near the eyewall (circled in red), and the radial wind ranged between –20 and –30 m/s.

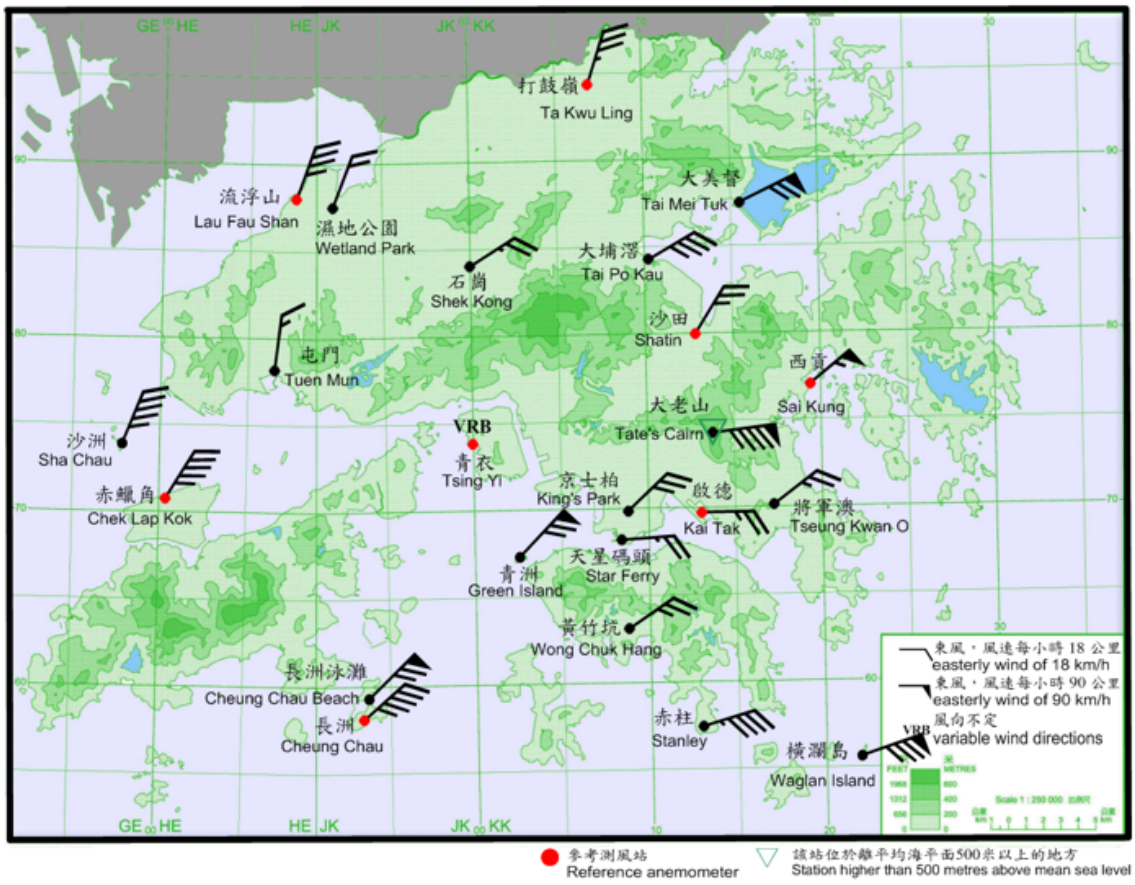


圖 2.3.8(a)　二零一八年九月十六日上午 11 時正香港各站錄得的十分鐘平均風向和風速。當時長洲泳灘、大老山、大美督、青洲及橫瀾島的風力達到颶風程度。

Figure 2.3.8(a)　10-minute mean wind direction and speed recorded at various stations in Hong Kong at 11 a.m. on 16 September 2018. Winds reached hurricane force at Cheung Chau Beach, Tate's Cairn, Tai Mei Tuk, Green Island and Waglan Island at that time.

註：　青衣當時錄得的十分鐘平均風速為每小時 27 公里。

Note:　The 10-minute mean wind speeds recorded at the time at Tsing Yi was 27 km/h.

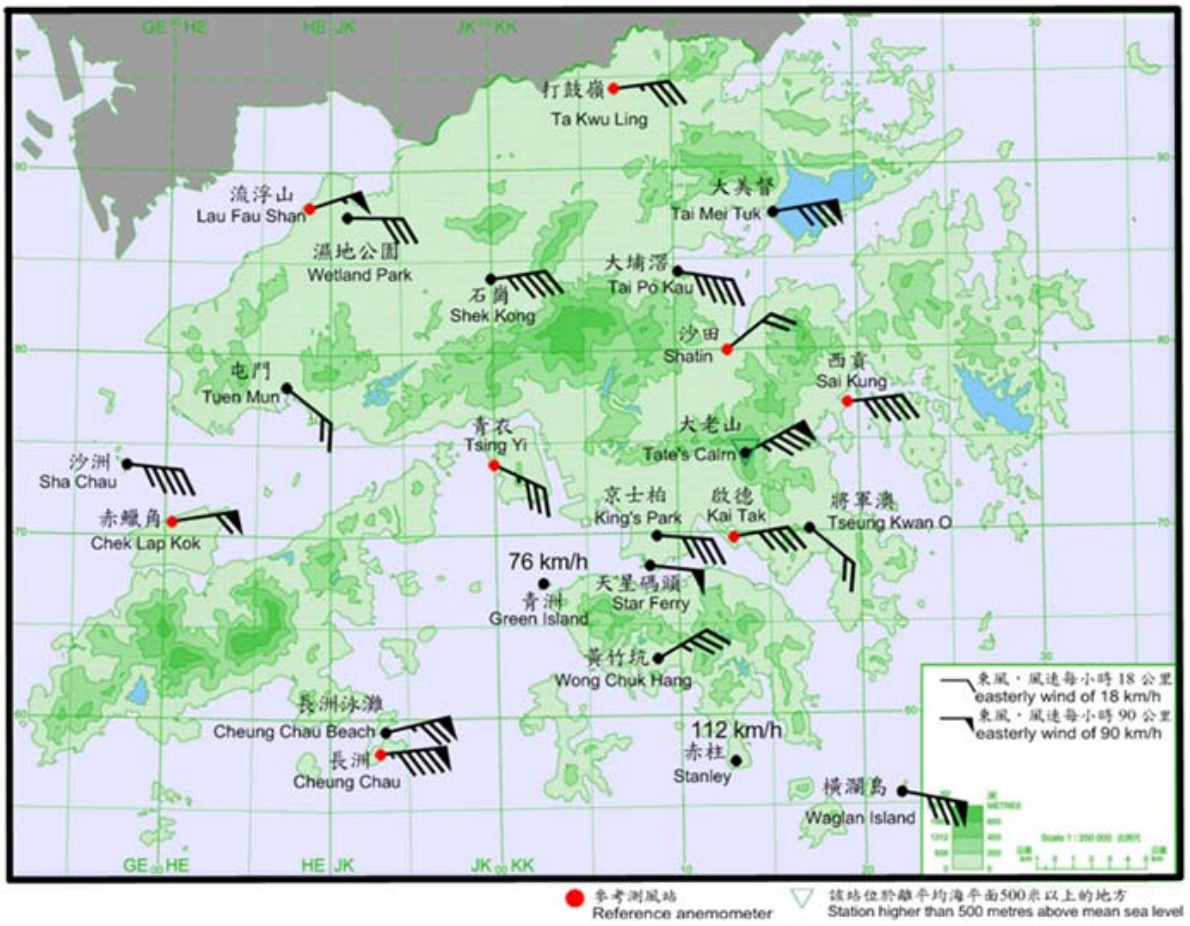


圖 2.3.8(b)　二零一八年九月十六日下午 2 時正香港各站錄得的十分鐘平均風向和風速。當時長洲、長洲泳灘、大老山、大美督及橫瀾島的風力達到颶風程度。

Figure 2.3.8(b)　10-minute mean wind direction and speed recorded at various stations in Hong Kong at 2 p.m. on 16 September 2018. Winds reached hurricane force at Cheung Chau, Cheung Chau Beach, Tate's Cairn, Tai Mei Tuk and Waglan Island at that time.

註： 青洲及赤柱當時只有風速數據。

Note: Only wind speeds were available at Green Island and Stanley at that time.

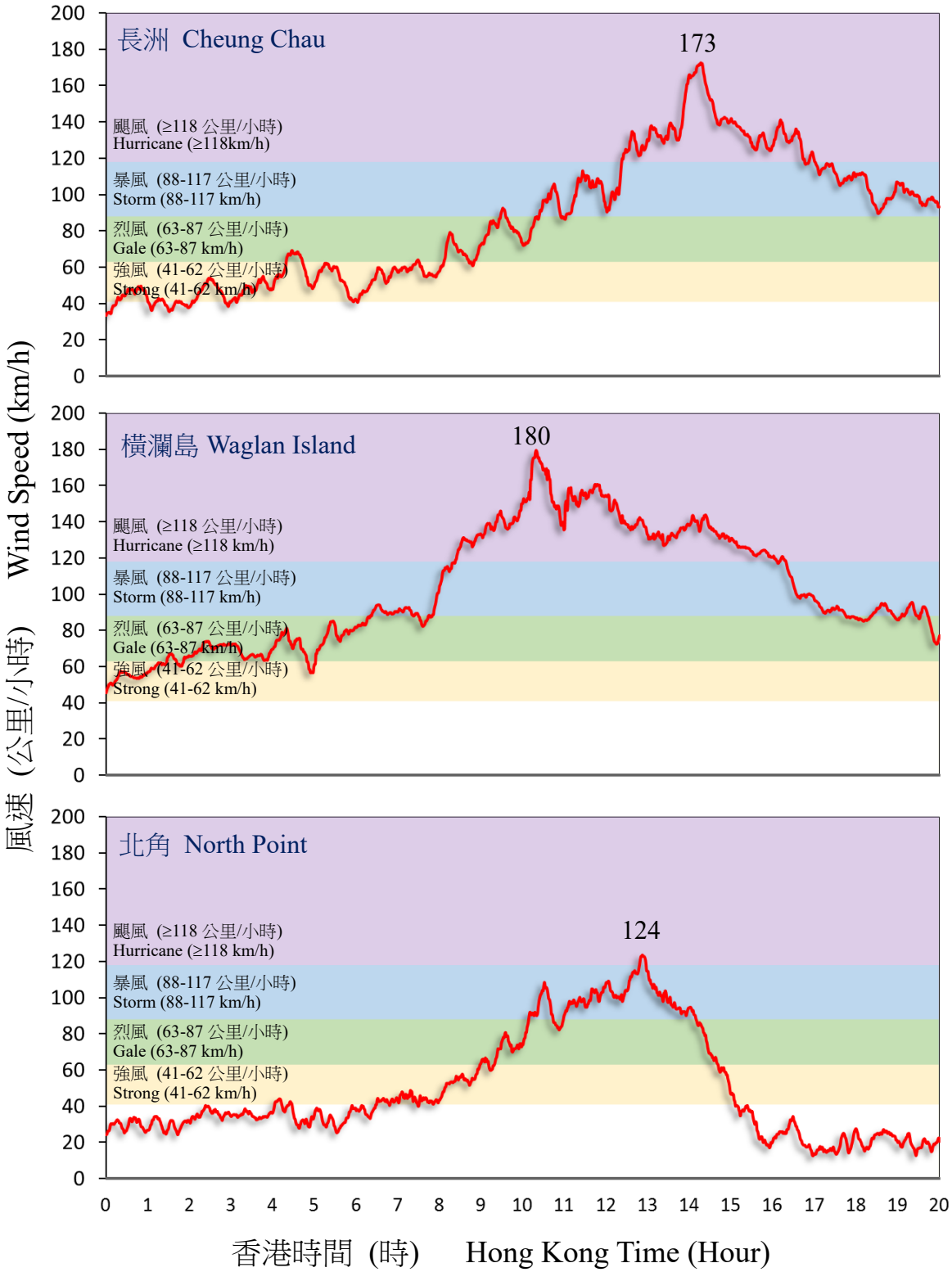


圖 2.3.9 二零一八年九月十六日在長洲、橫瀾島及北角錄得的十分鐘平均風速。

Figure 2.3.9 Traces of 10-minute mean wind speed at Cheung Chau, Waglan Island and North Point on 16 September 2018.

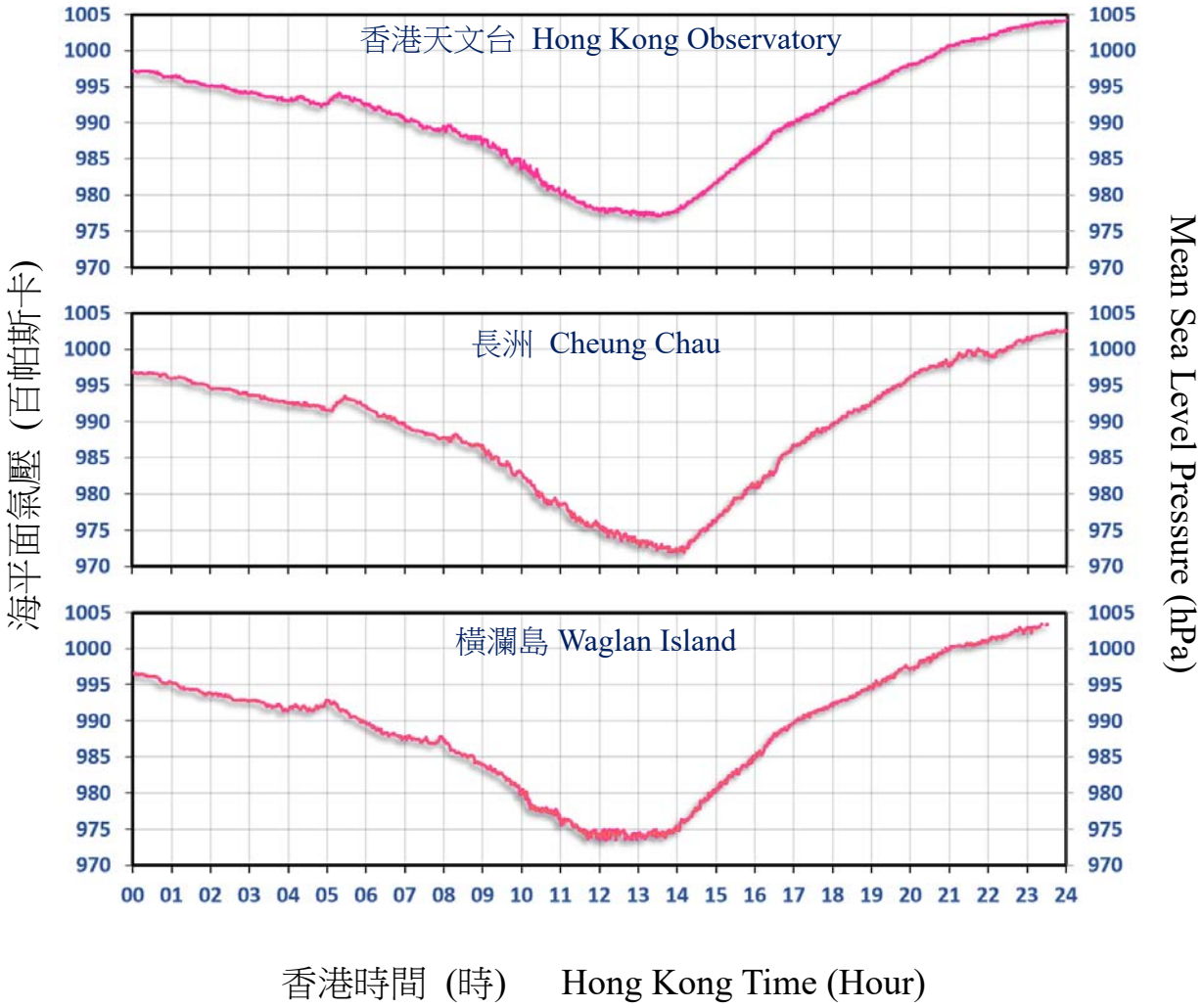


圖 2.3.10 二零一八年九月十六日香港天文台、長洲及橫瀾島錄得的海平面氣壓。

Figure 2.3.10 Traces of mean sea-level pressure recorded at the Hong Kong Observatory, Cheung Chau and Waglan Island on 16 September 2018.

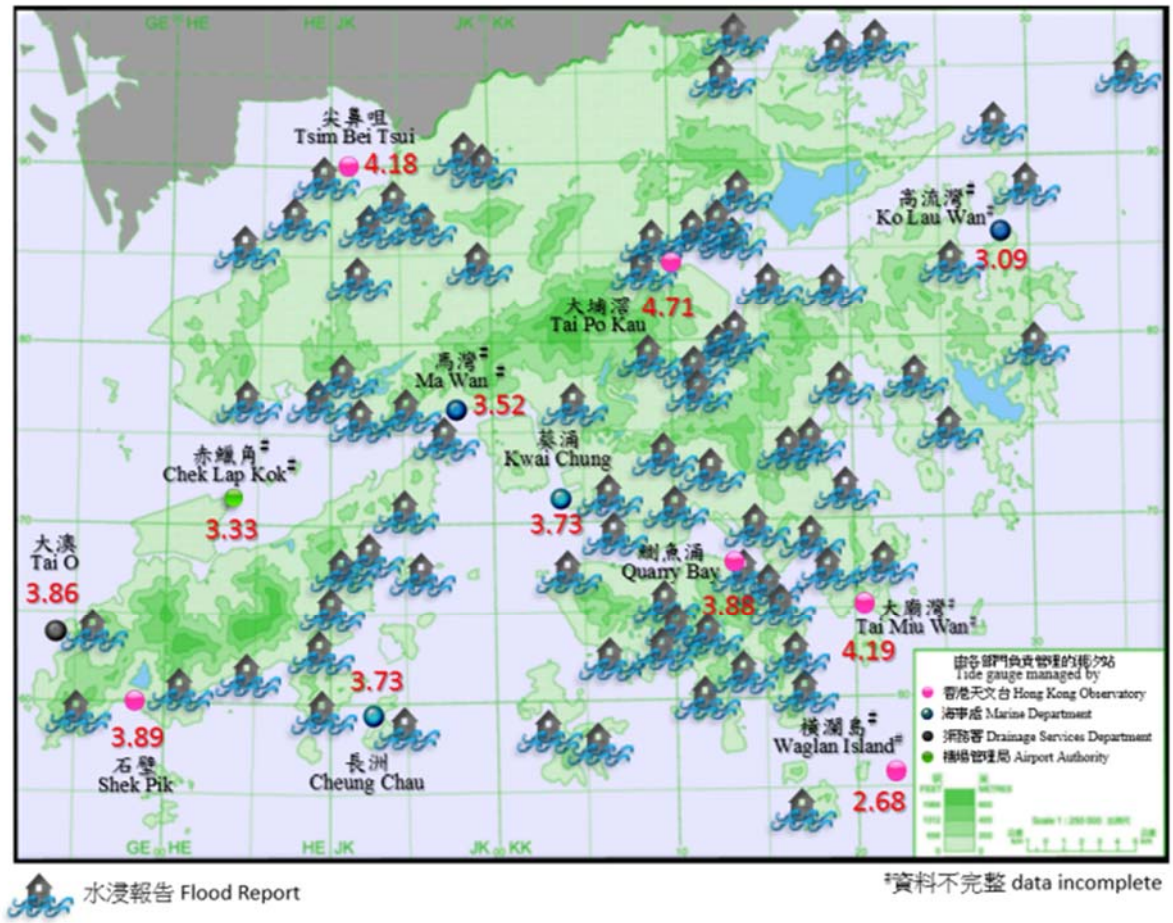


圖 2.3.11　二零一八年九月十六日香港各潮汐站錄得的最高潮位(單位為米，海圖基準面以上)及水浸報告。根據政府部門、新聞及社交媒體的資料，並非詳盡無遺。

Figure 2.3.11　Maximum sea level (metres above Chart Datum) recorded at various tide gauges in Hong Kong and flood reports from government departments, news and social media on 16 September 2018. The flood reports are not exhaustive.

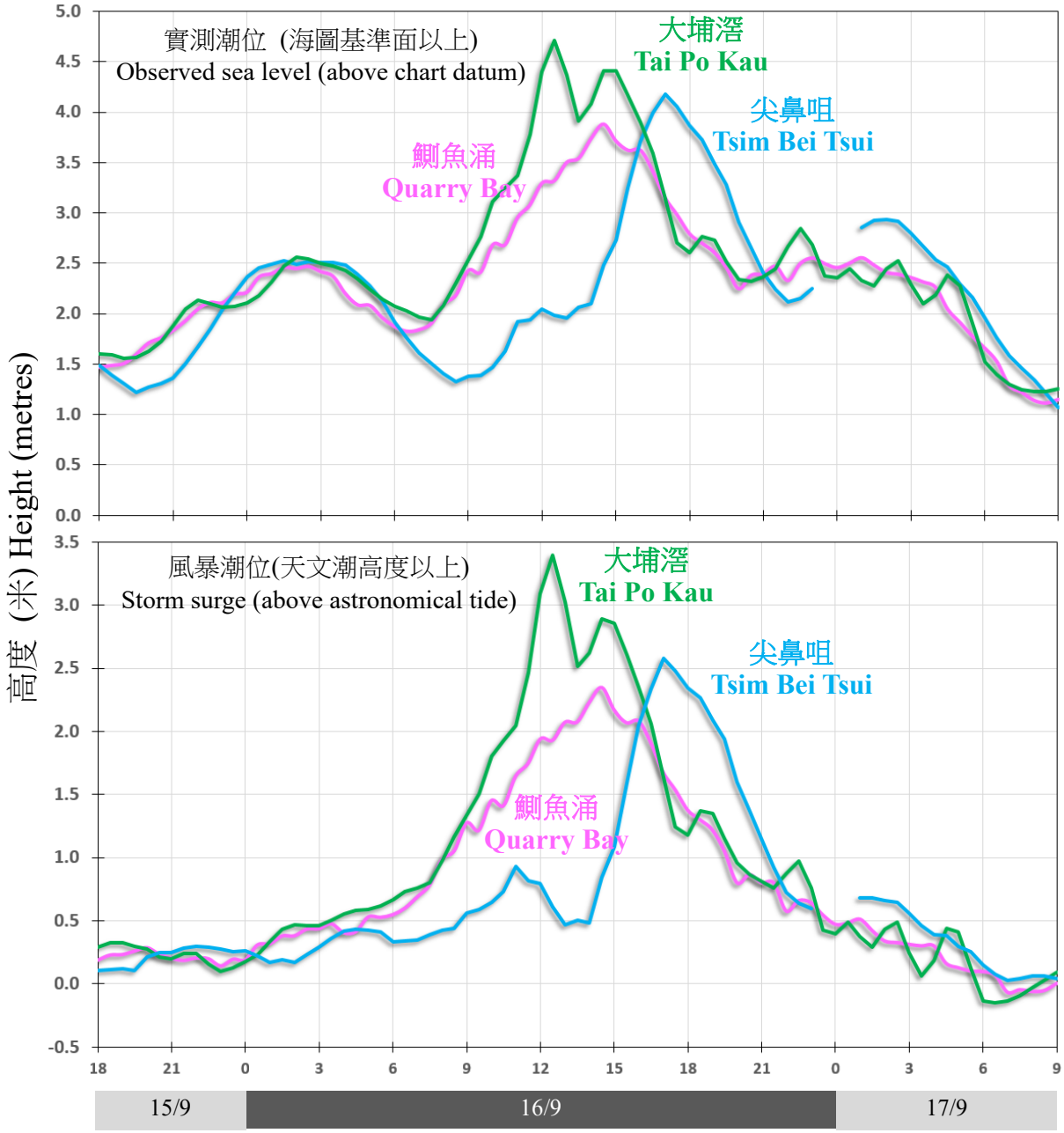


圖 2.3.12 二零一八年九月十六日在鰂魚涌、大埔滘及尖鼻咀錄得的潮位(海圖基準面以上)及風暴潮(天文潮高度以上)。

Figure 2.3.12 Traces of sea level (above chart datum) and storm surge (above astronomical tide) recorded at Quarry Bay, Tai Po Kau, and Tsim Bei Tsui on 16 September 2018.

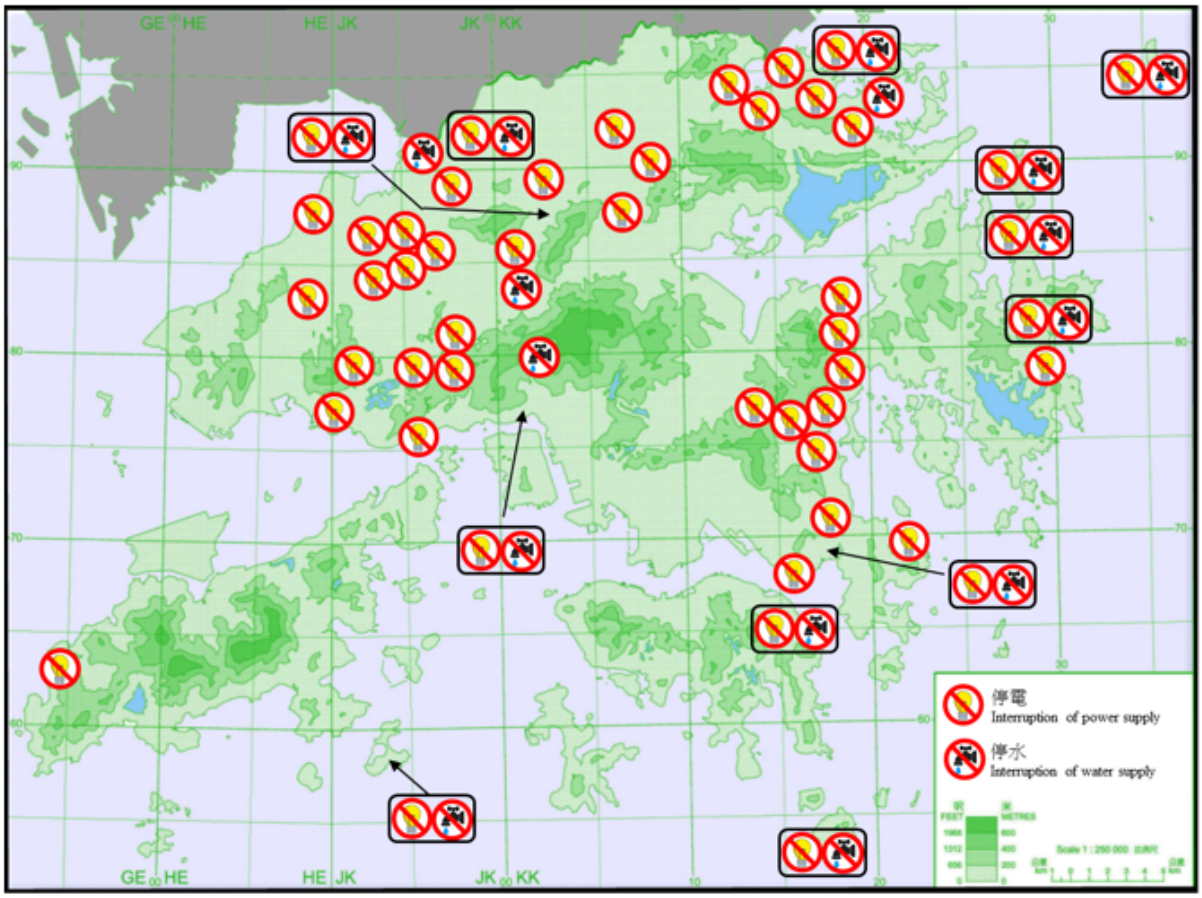
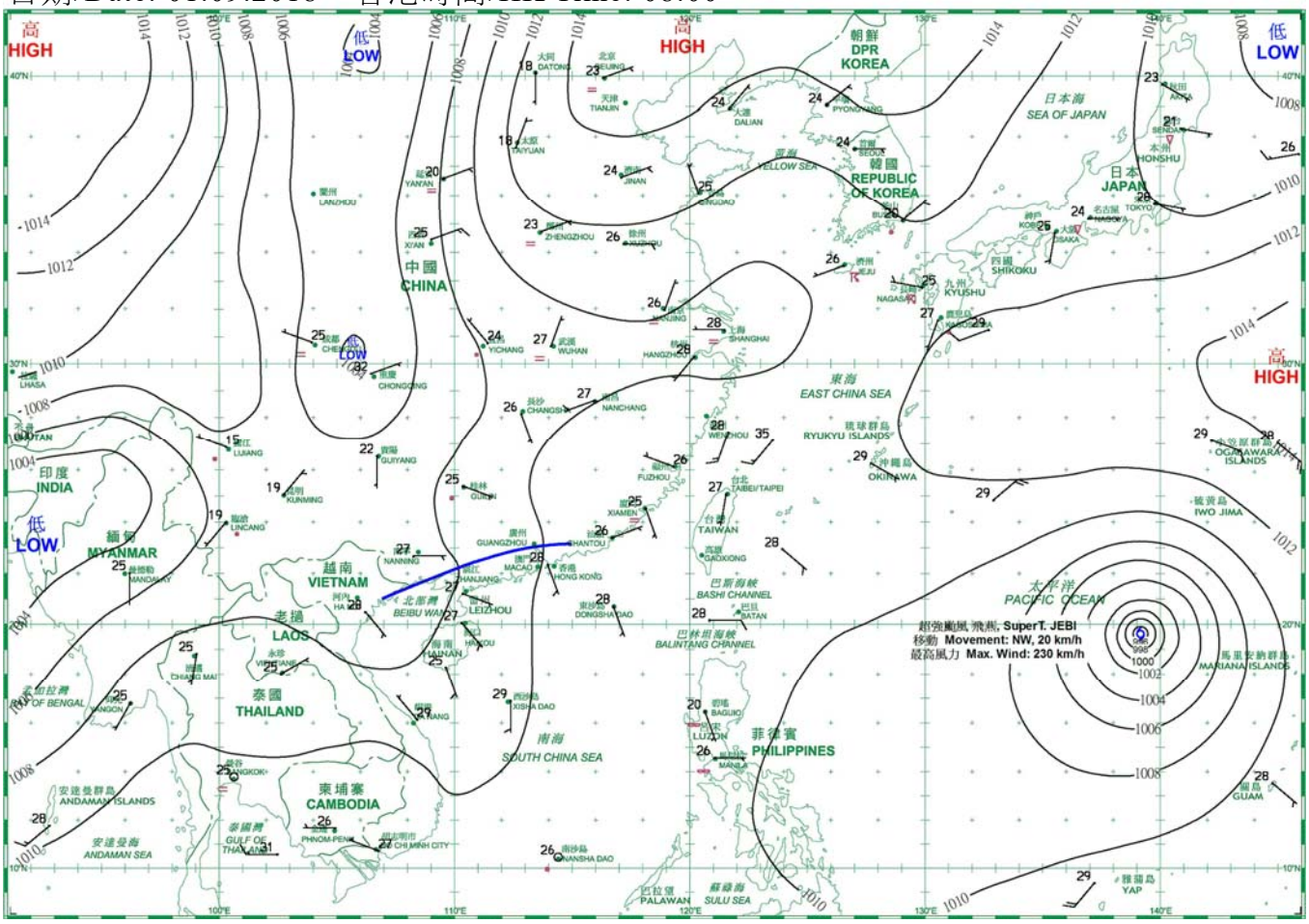


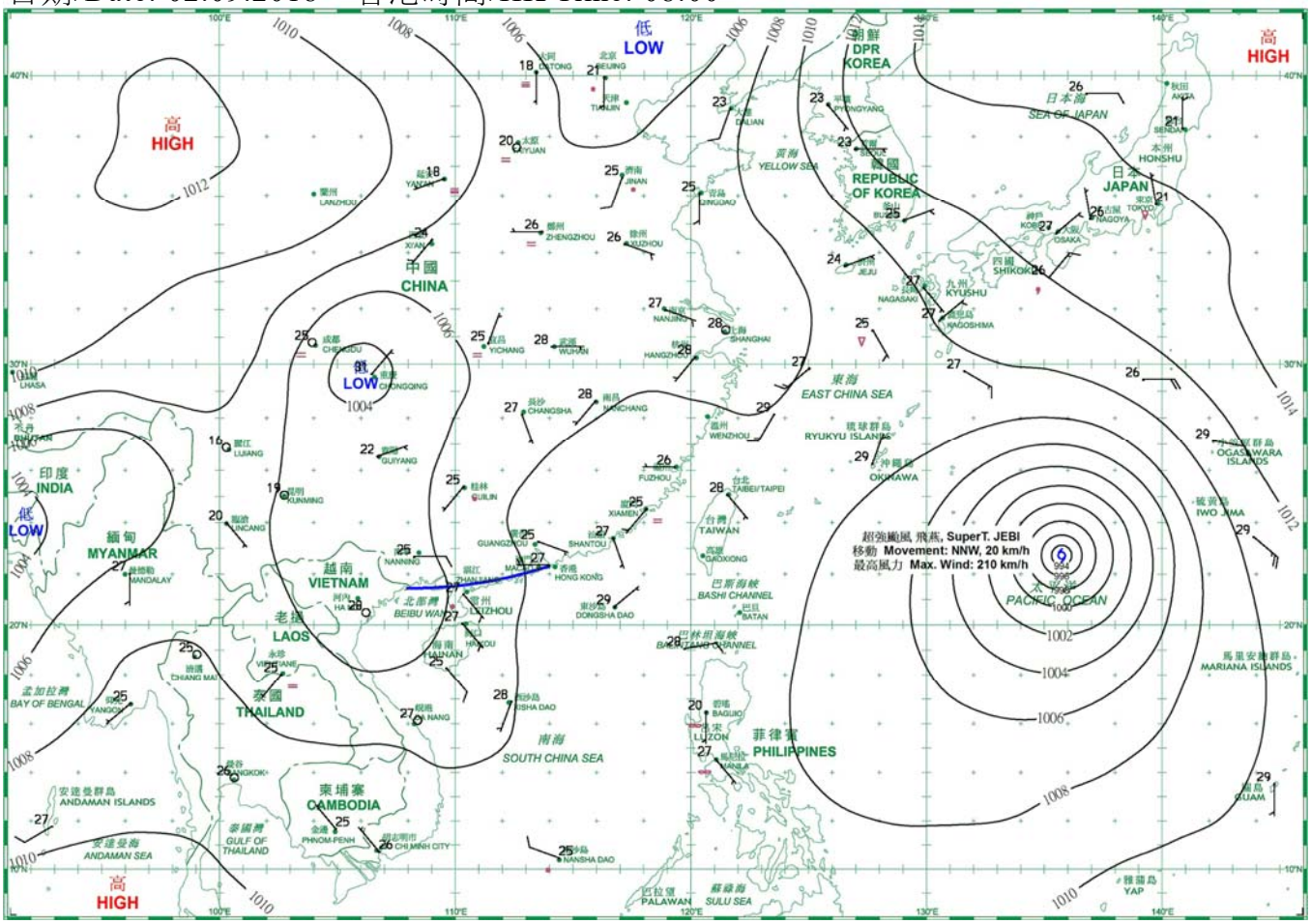
圖 2.3.13　在山竹的影響下，有關電力及食水中斷的報告。根據政府部門、新聞及社交媒體的資料，並非詳盡無遺。

Figure 2.3.13　Reports of interruption of power and water supply under the influence of Mangkhut based on government departments, news and social media. The incident reports are not exhaustive.

日期/Date: 01.09.2018 香港時間/HK Time: 08:00

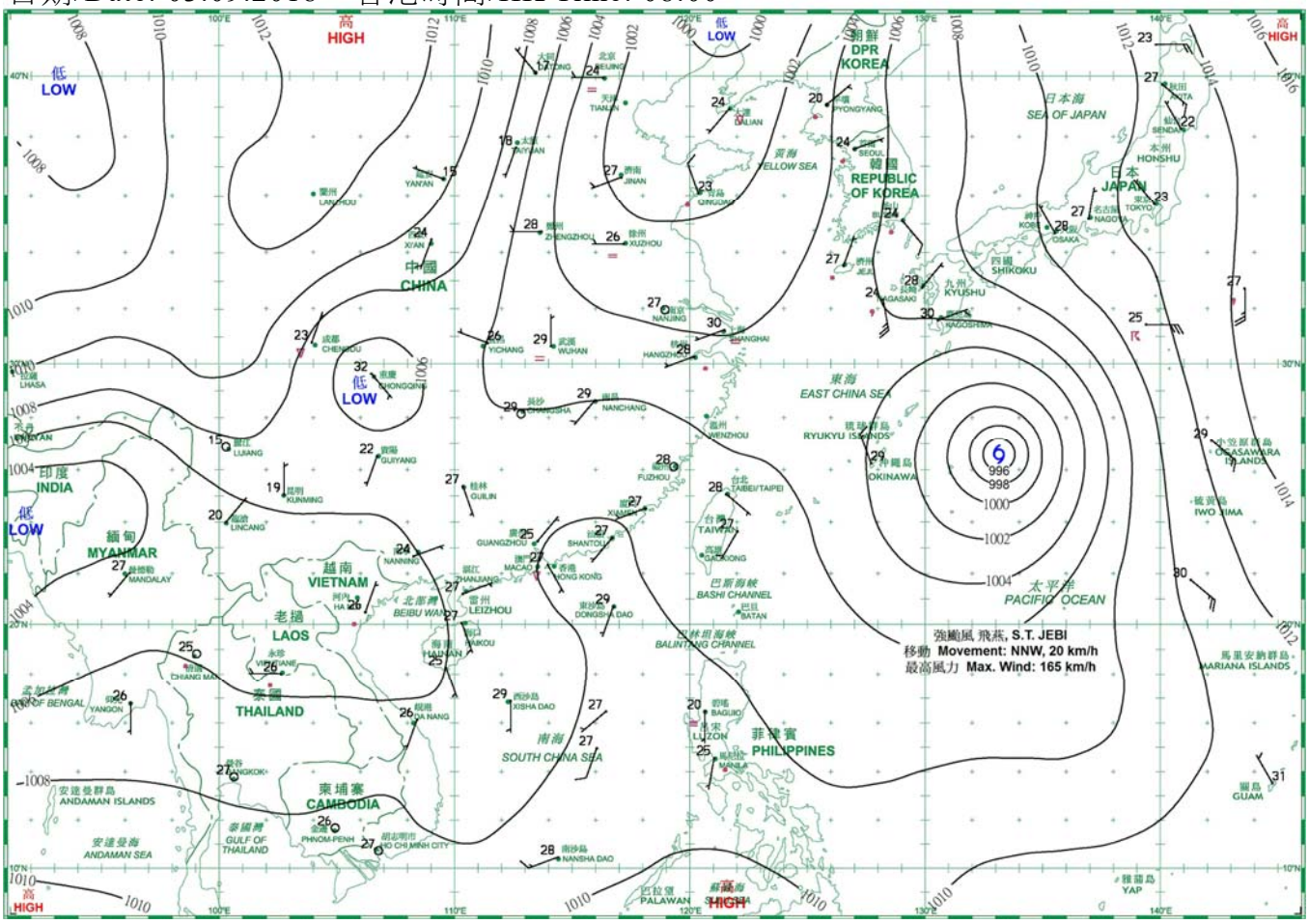


日期/Date: 02.09.2018 香港時間/HK Time: 08:00

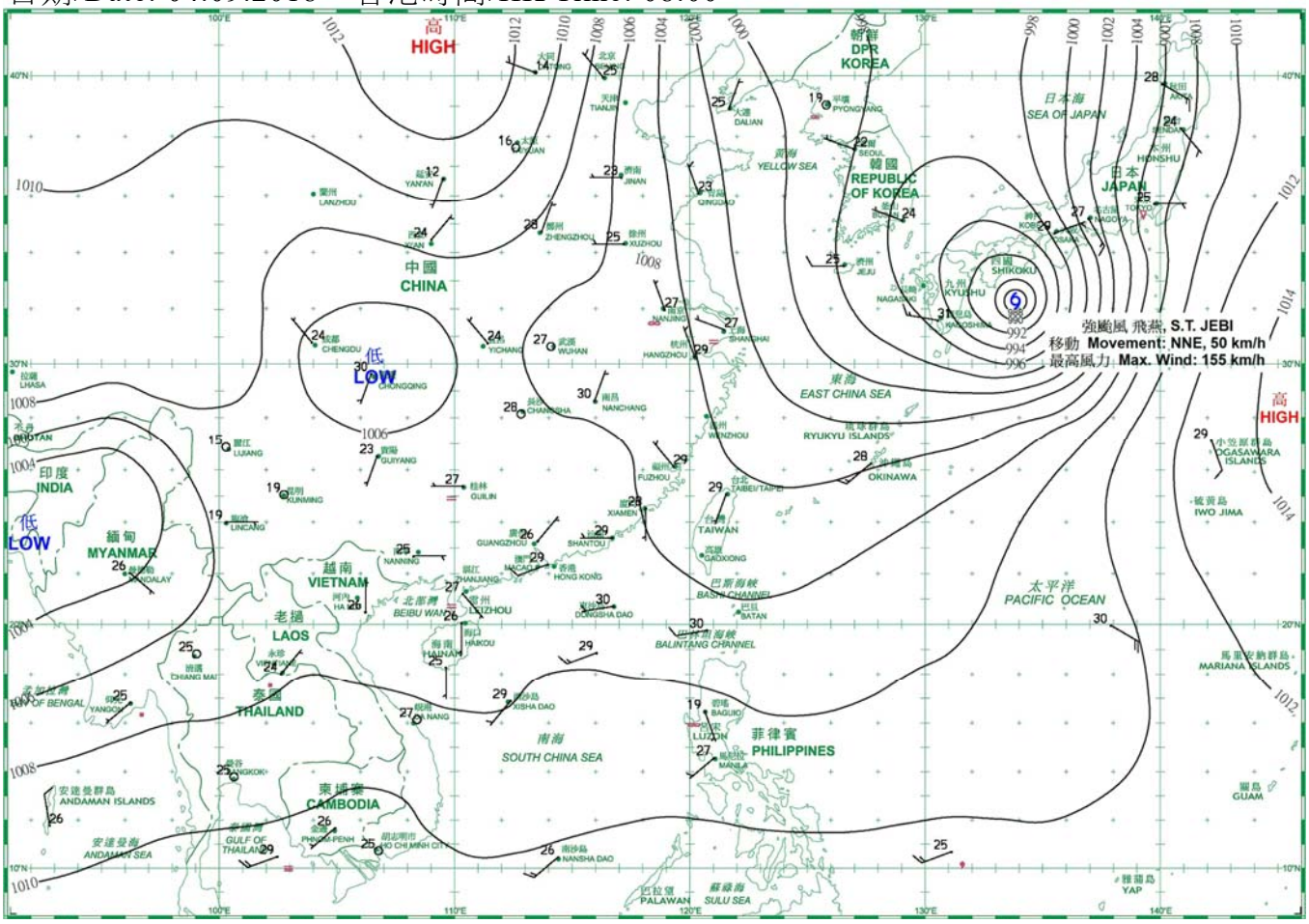


等壓線 Isobar(hPa) 暖鋒 Warm Front 靜止鋒 Stationary Front 消散中的冷鋒 Dissipating Cold Front
冷鋒 Cold Front 錮囚鋒 Occlusion 槽軸〔線〕Axis of Trough 熱帶氣旋中心 Centre of Tropical Cyclone

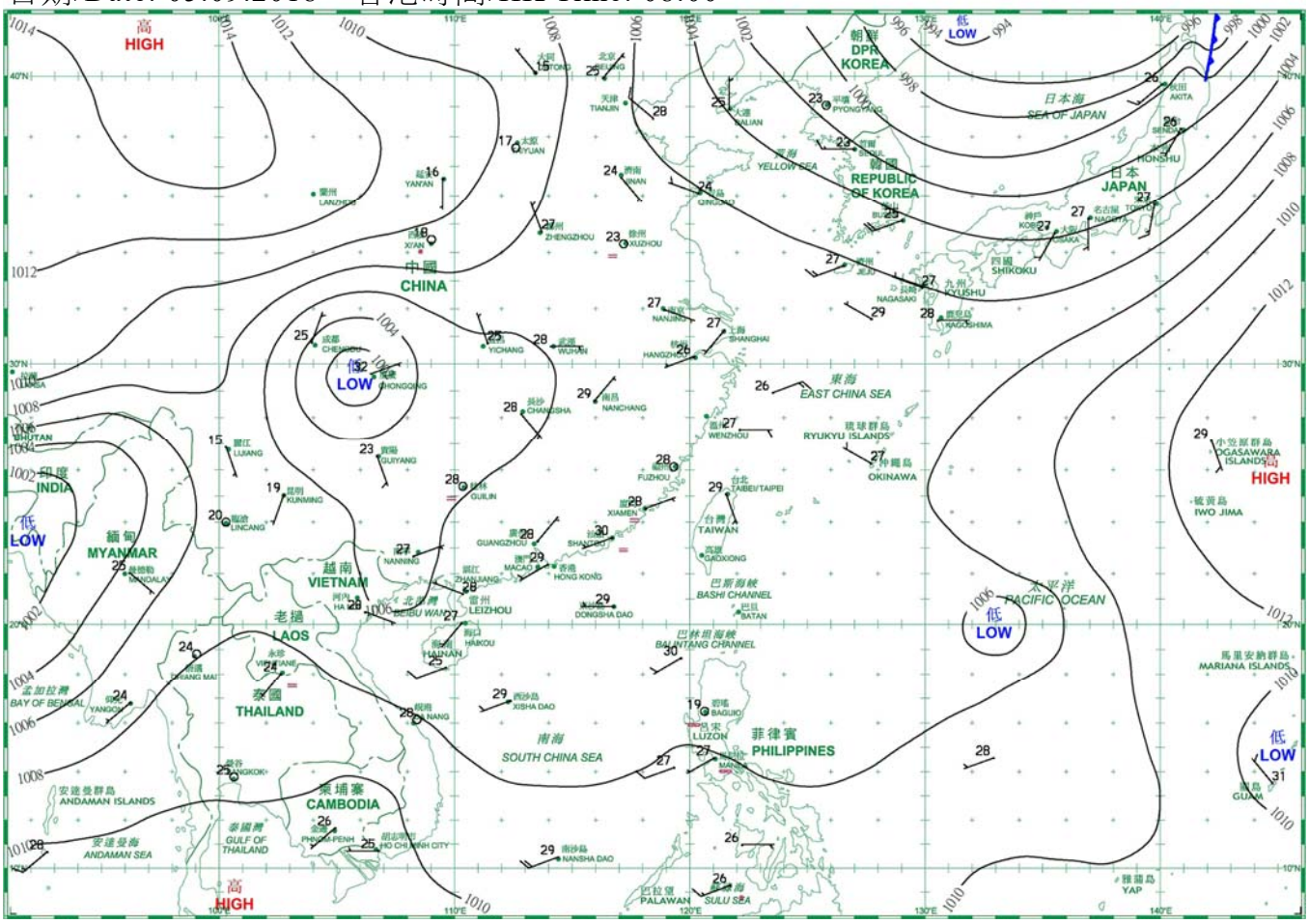
日期/Date: 03.09.2018　香港時間/HK Time: 08:00



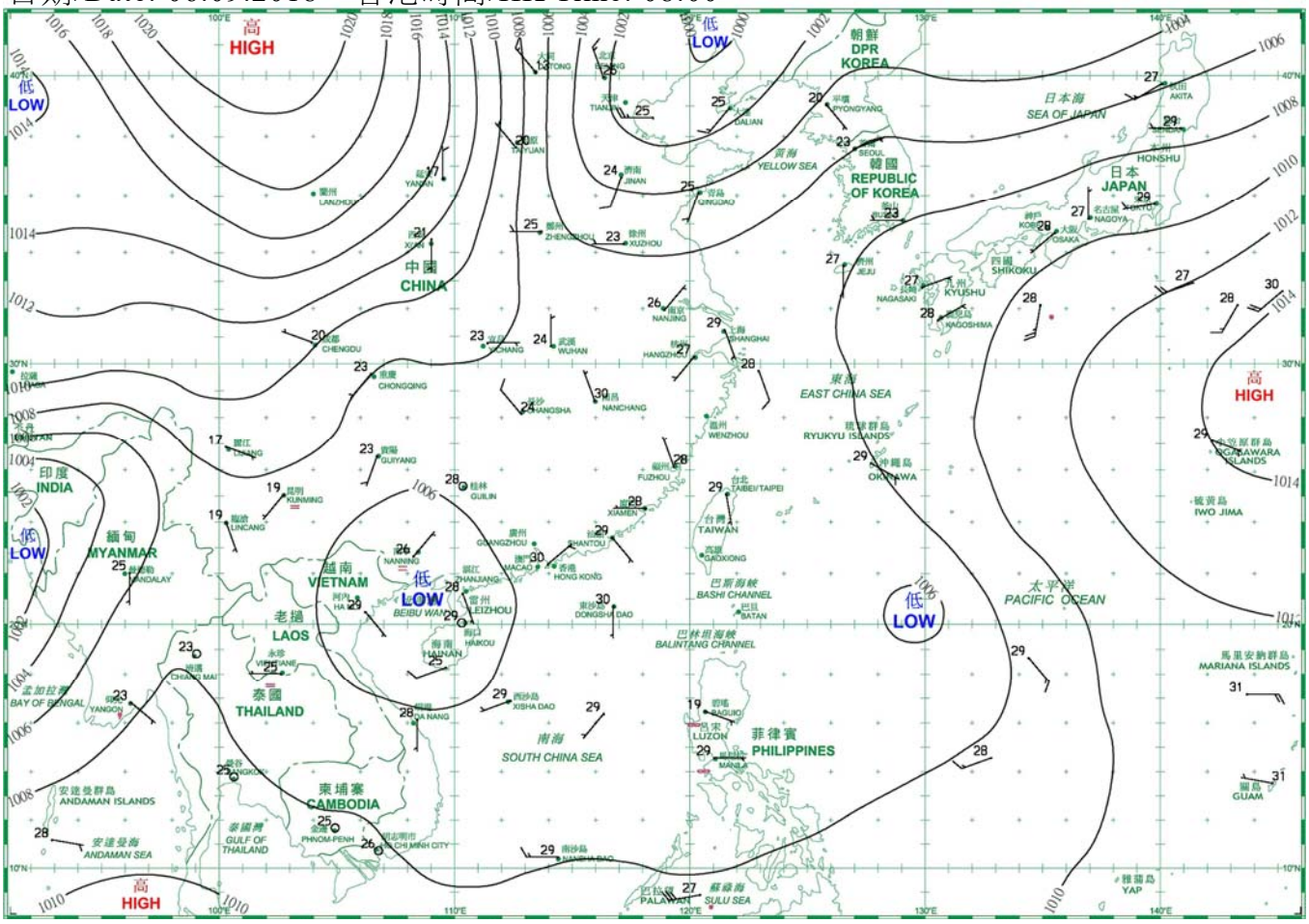
日期/Date: 04.09.2018　香港時間/HK Time: 08:00



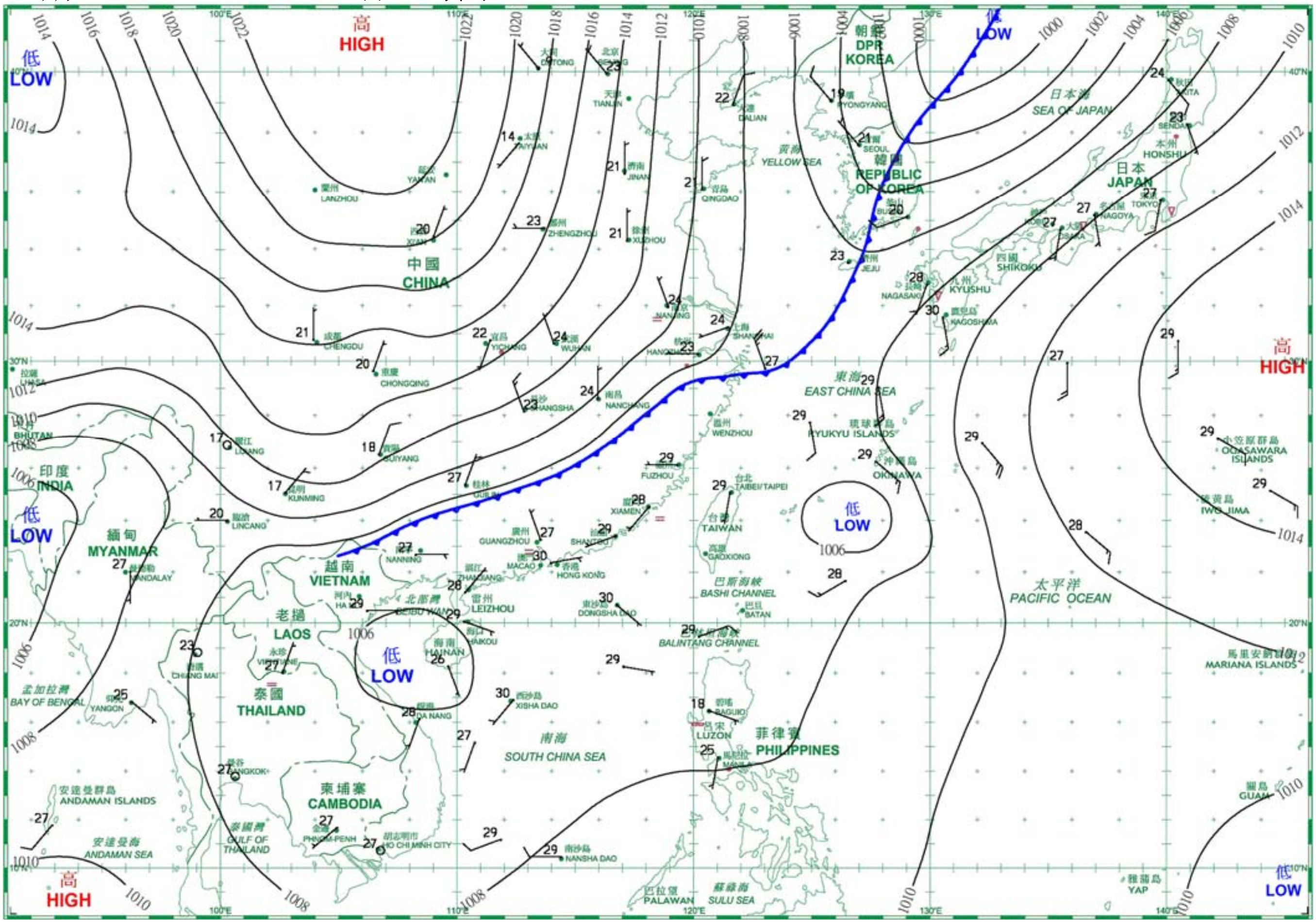
日期/Date: 05.09.2018　香港時間/HK Time: 08:00



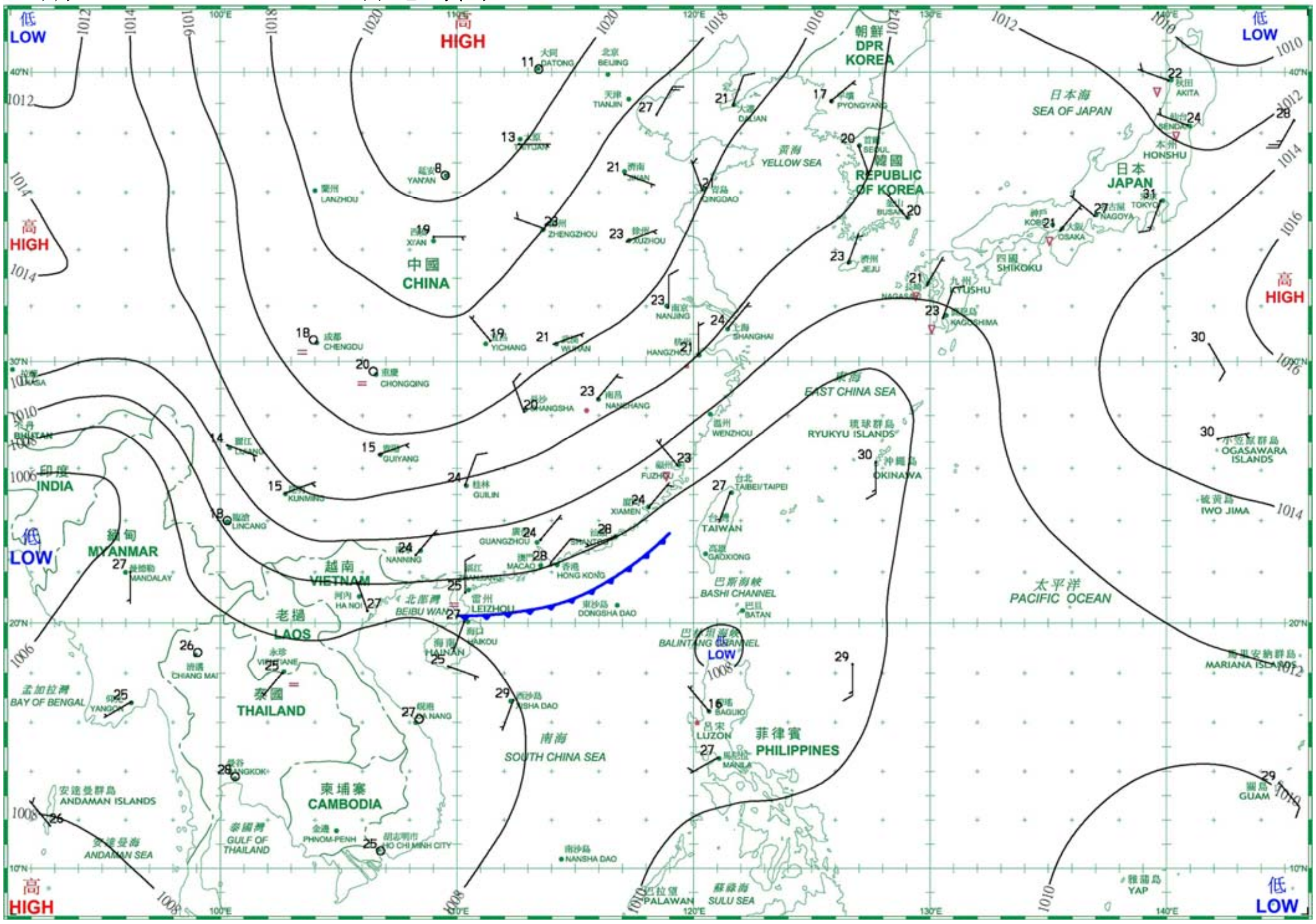
日期/Date: 06.09.2018　香港時間/HK Time: 08:00



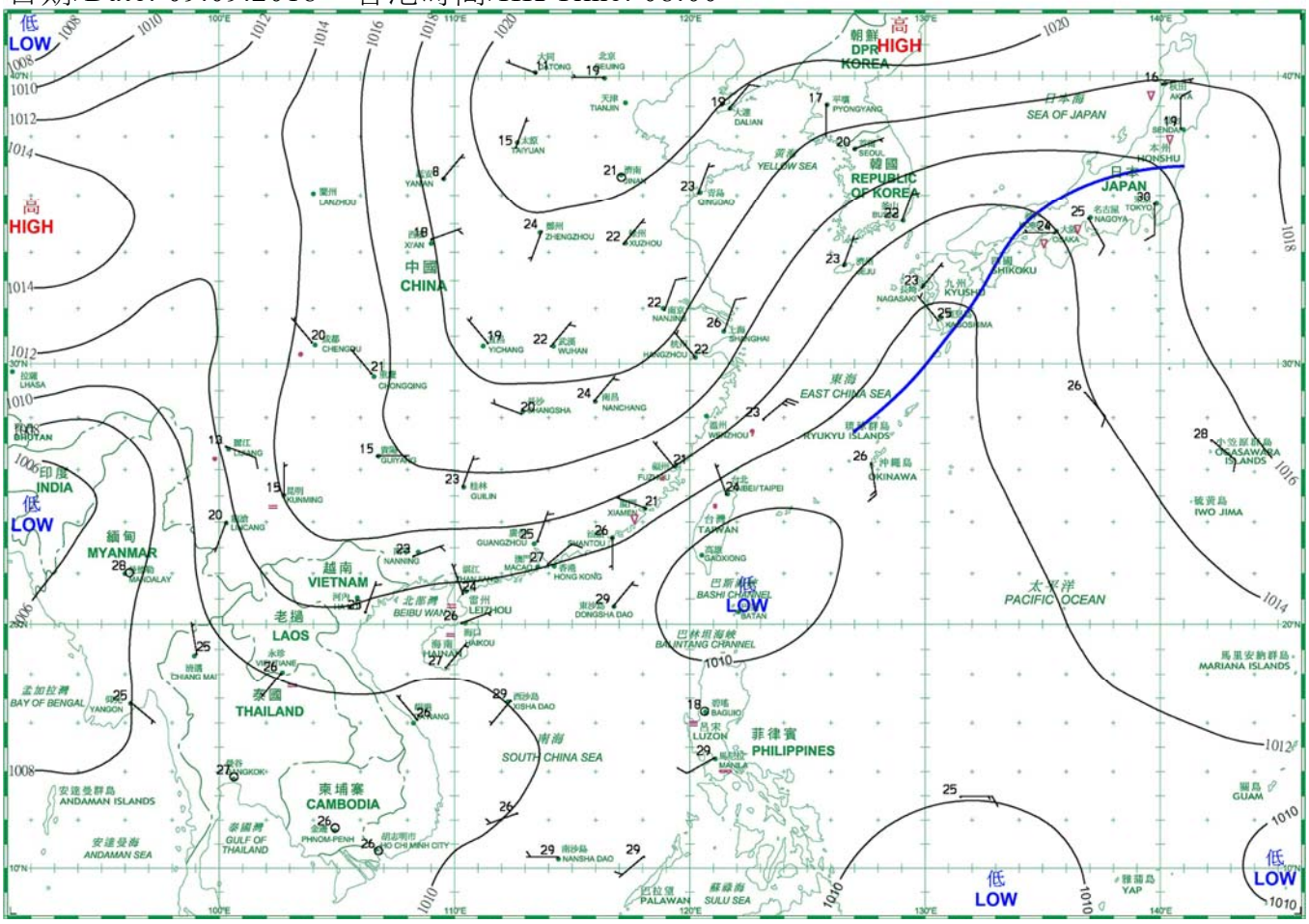
日期/Date: 07.09.2018　香港時間/HK Time: 08:00



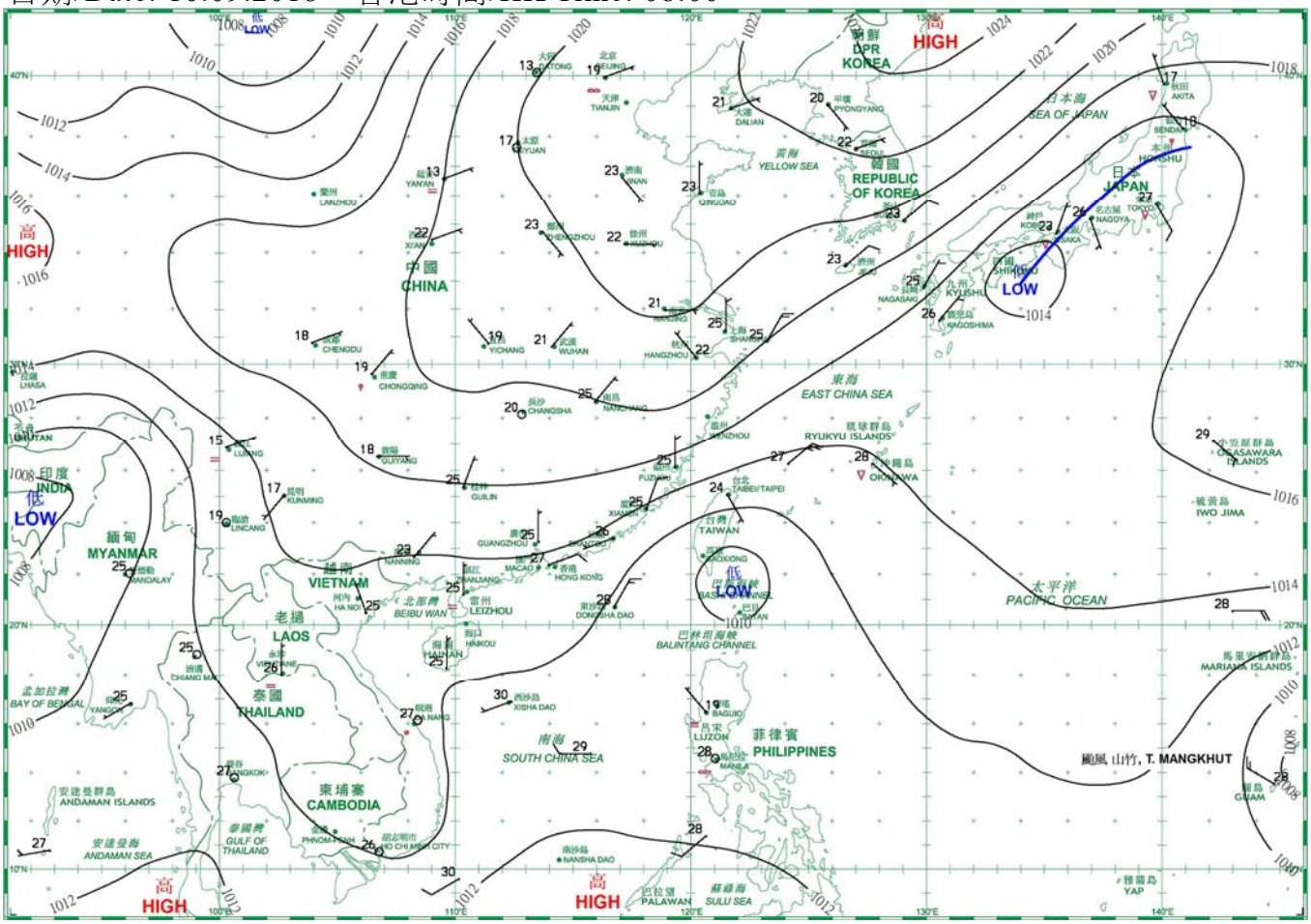
日期/Date: 08.09.2018　香港時間/HK Time: 08:00



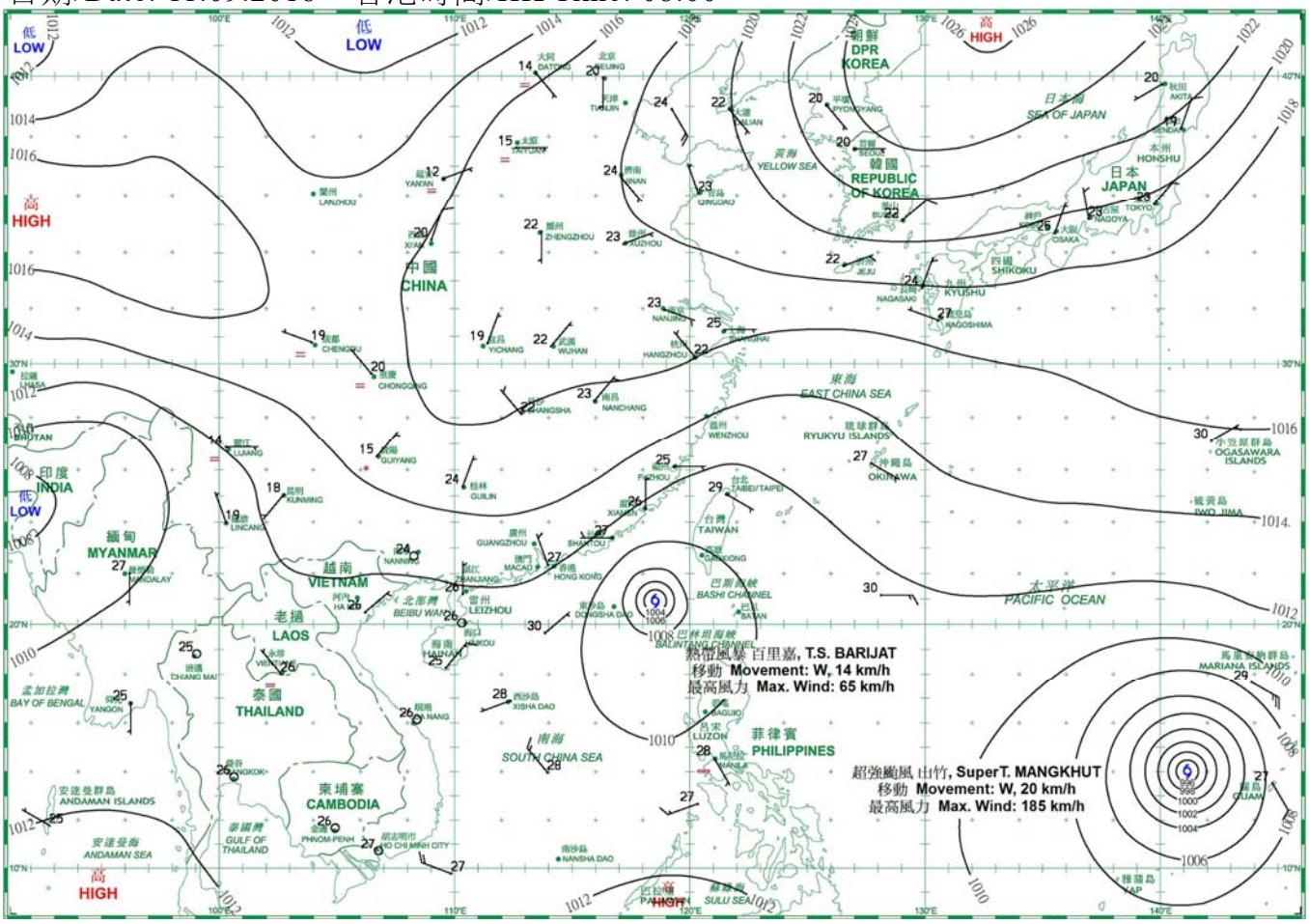
日期/Date: 09.09.2018　香港時間/HK Time: 08:00



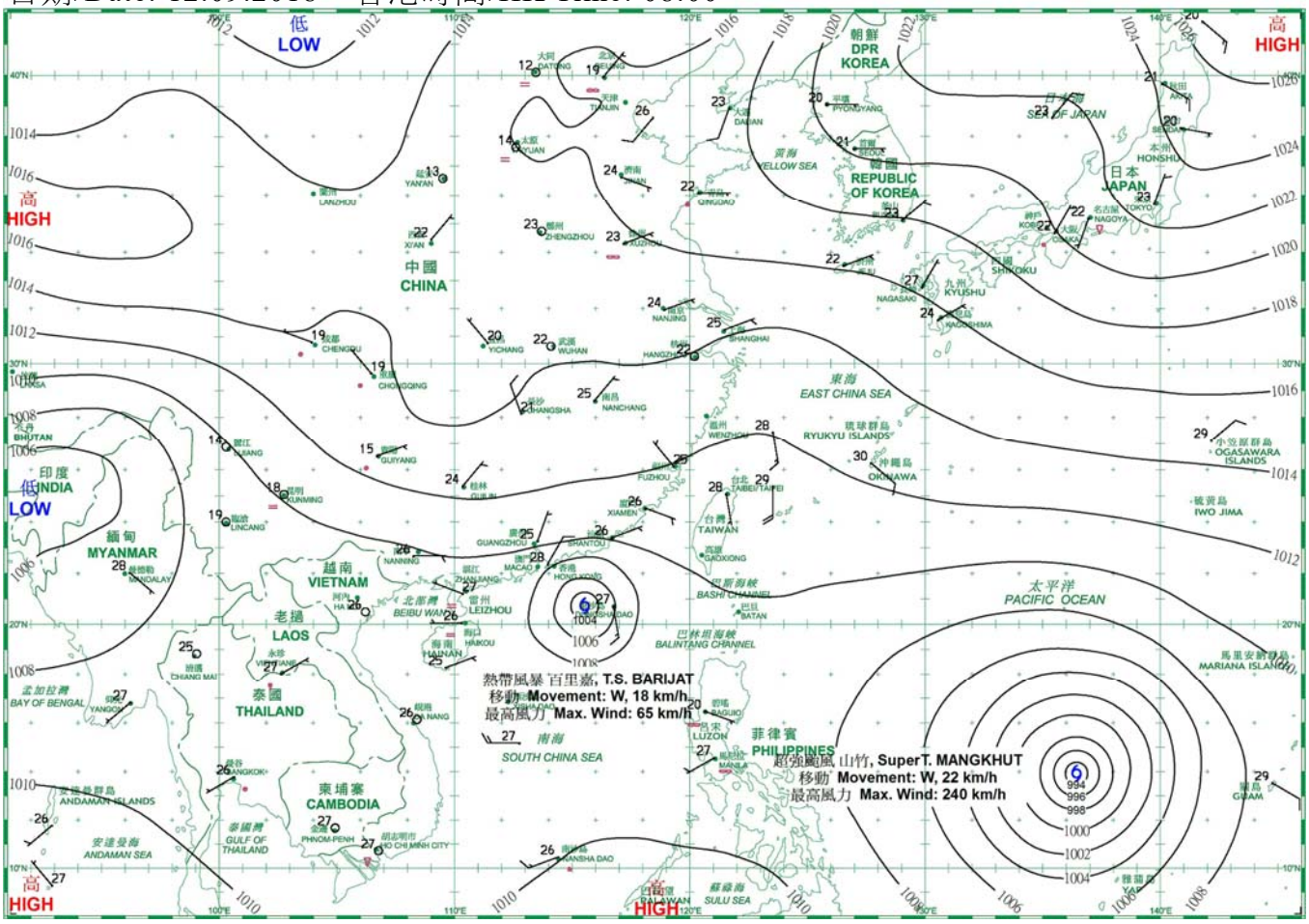
日期/Date: 10.09.2018　香港時間/HK Time: 08:00



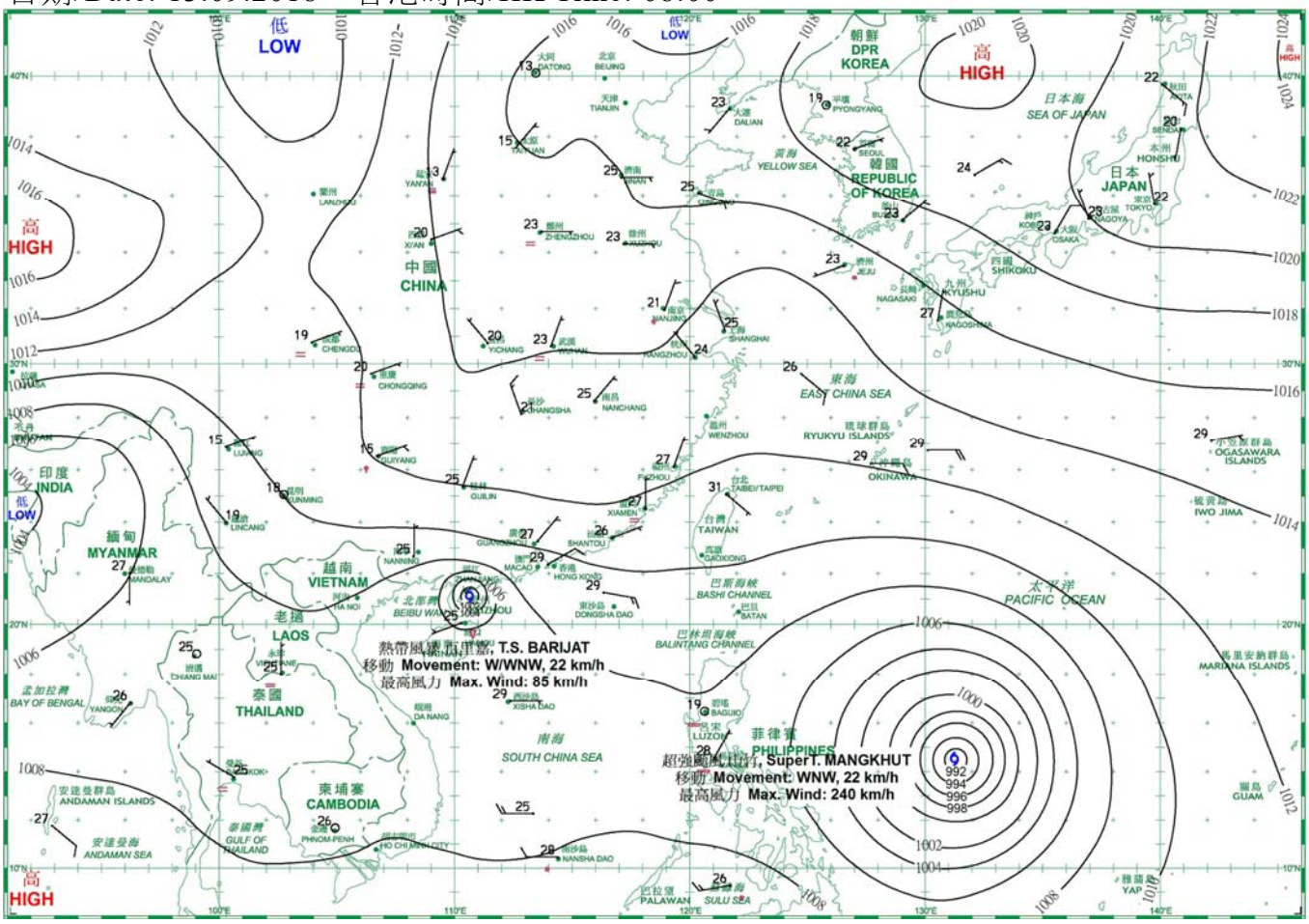
日期/Date: 11.09.2018　香港時間/HK Time: 08:00



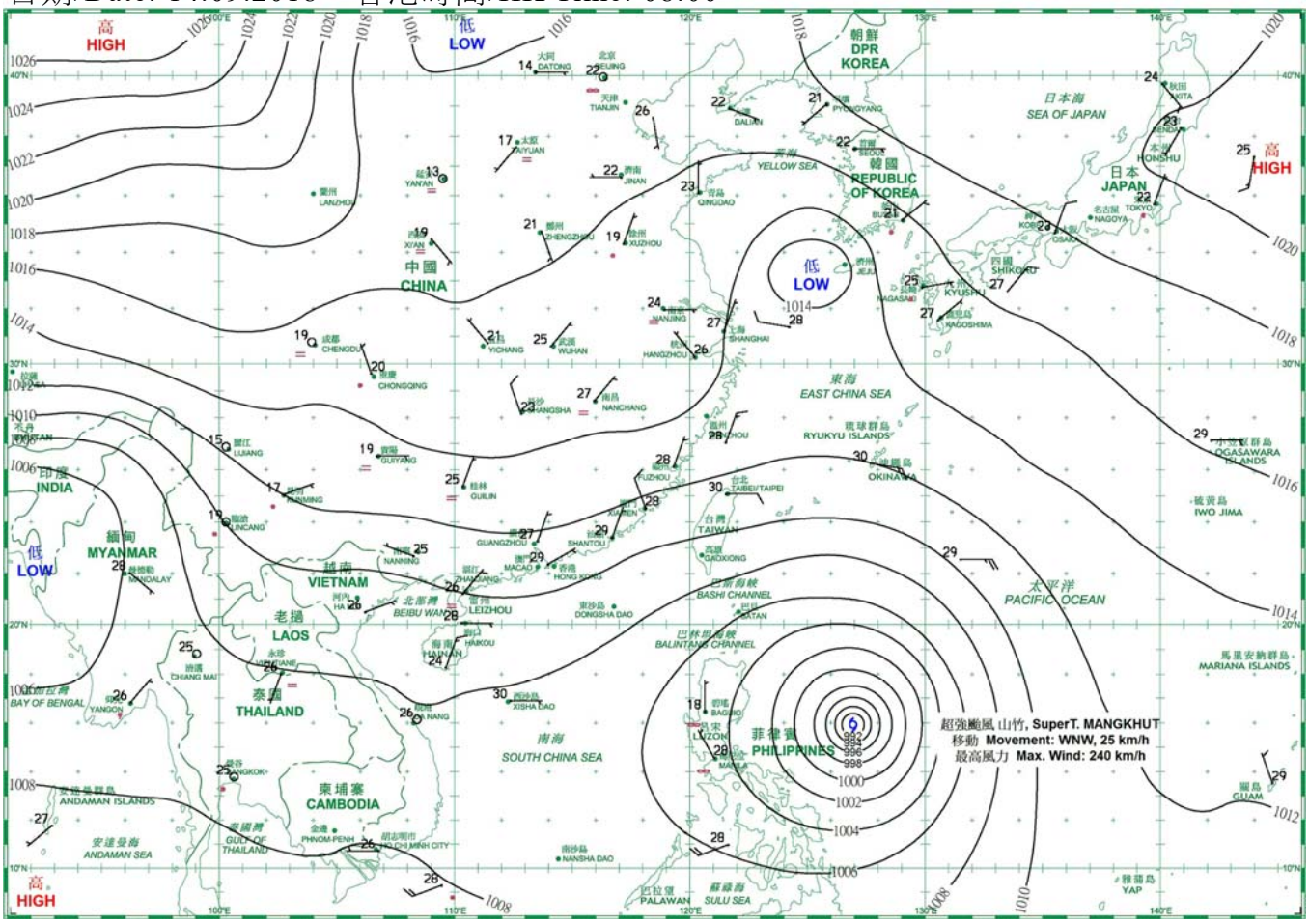
日期/Date: 12.09.2018　香港時間/HK Time: 08:00



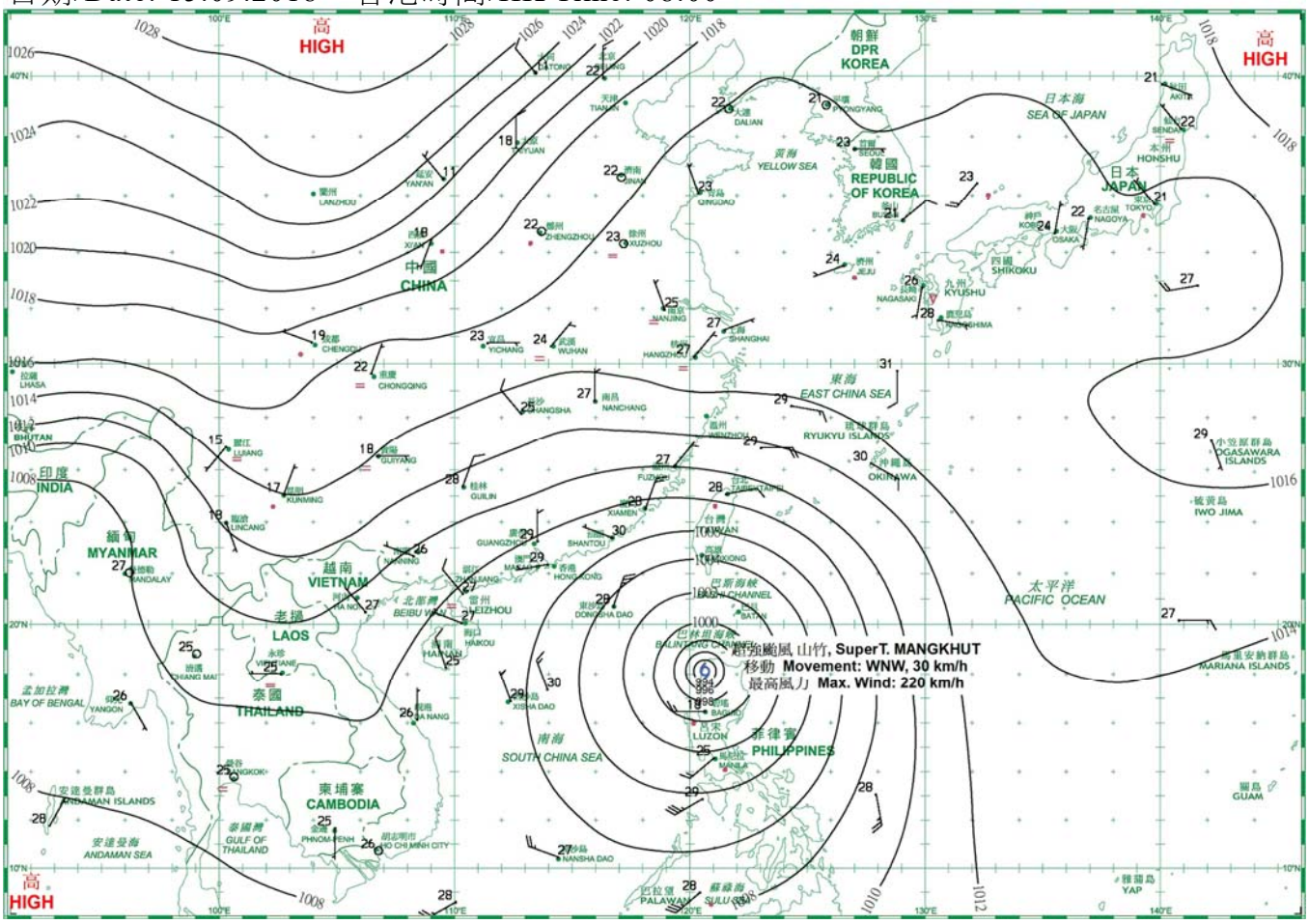
日期/Date: 13.09.2018　香港時間/HK Time: 08:00



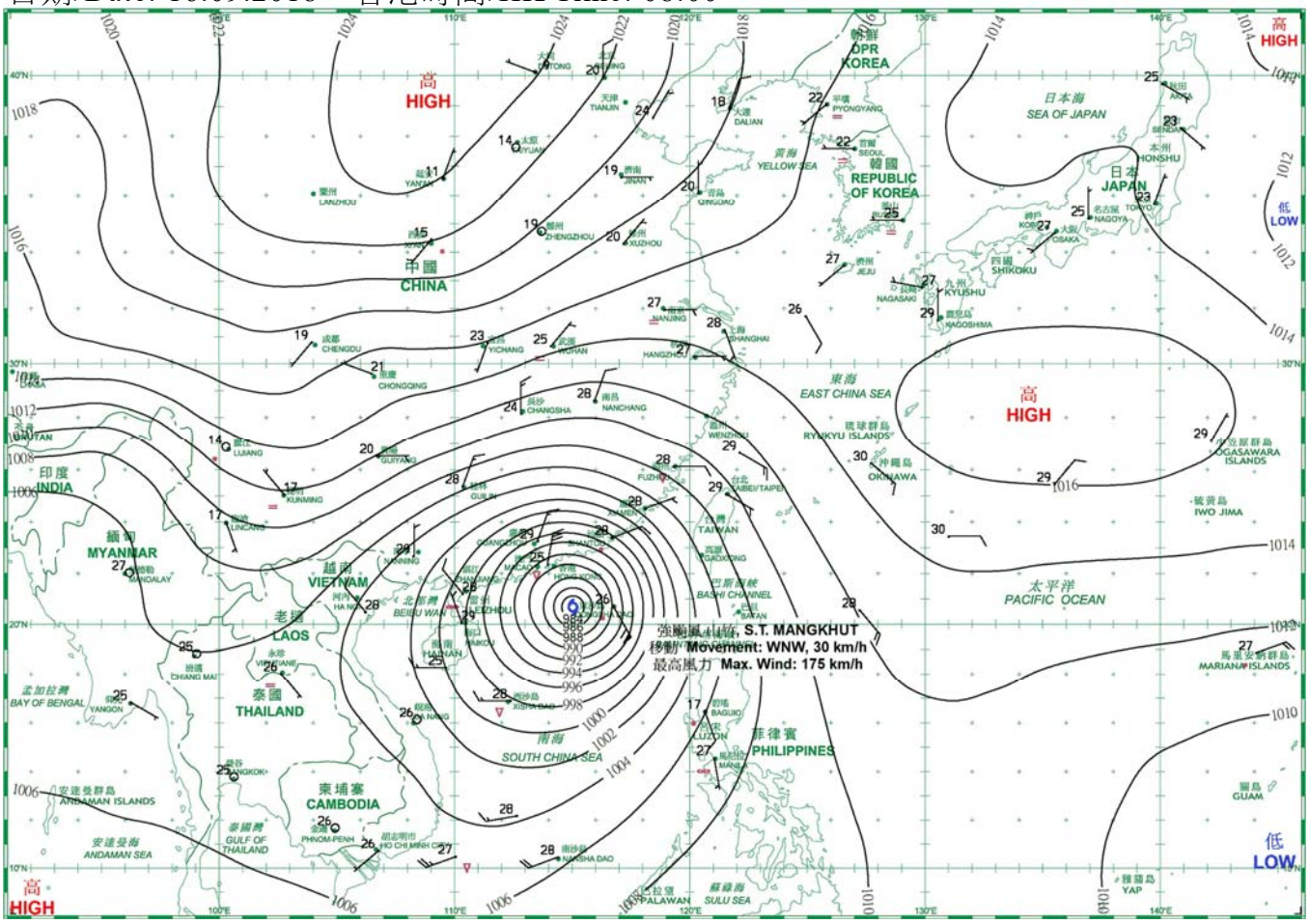
日期/Date: 14.09.2018　香港時間/HK Time: 08:00



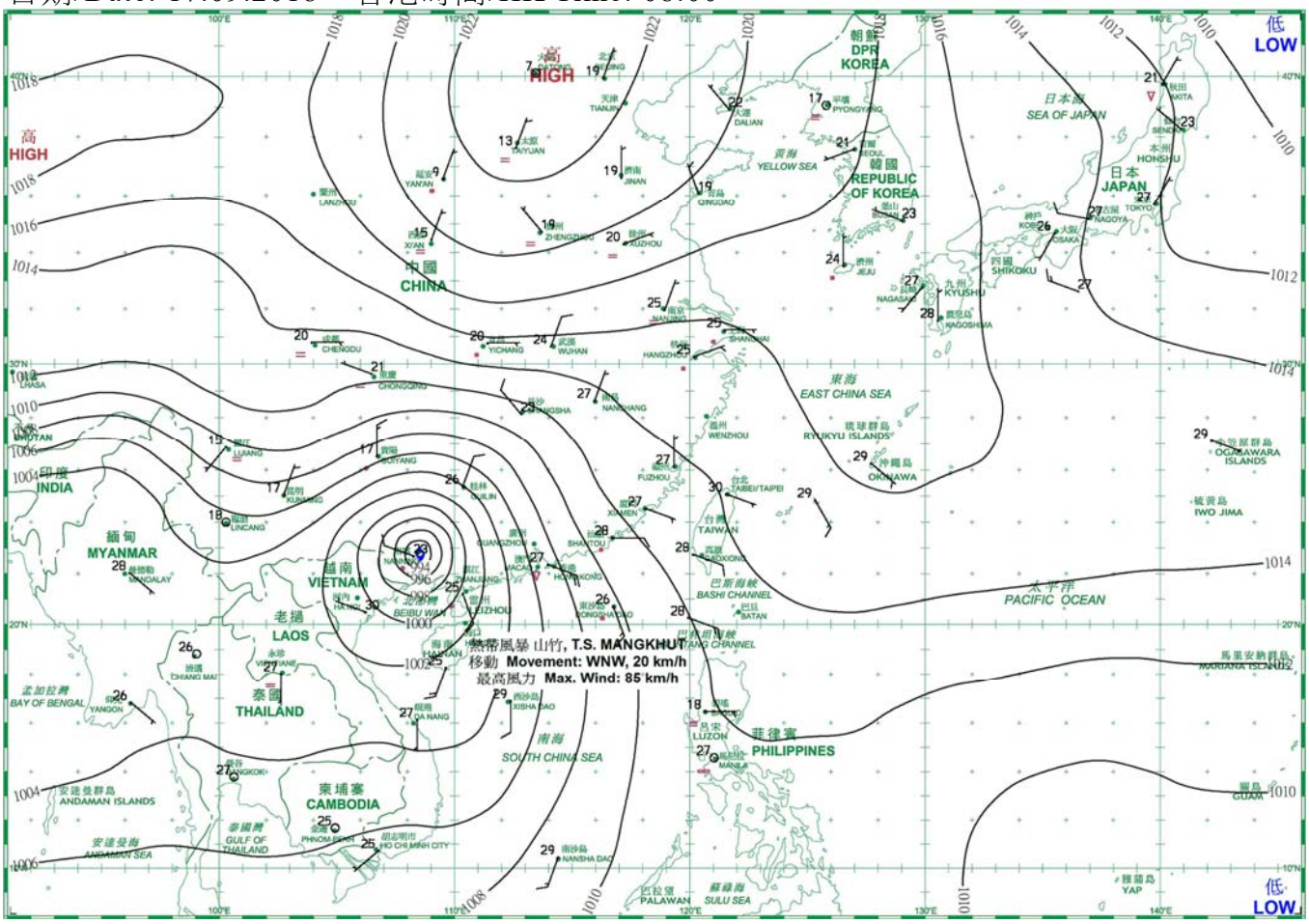
日期/Date: 15.09.2018　香港時間/HK Time: 08:00



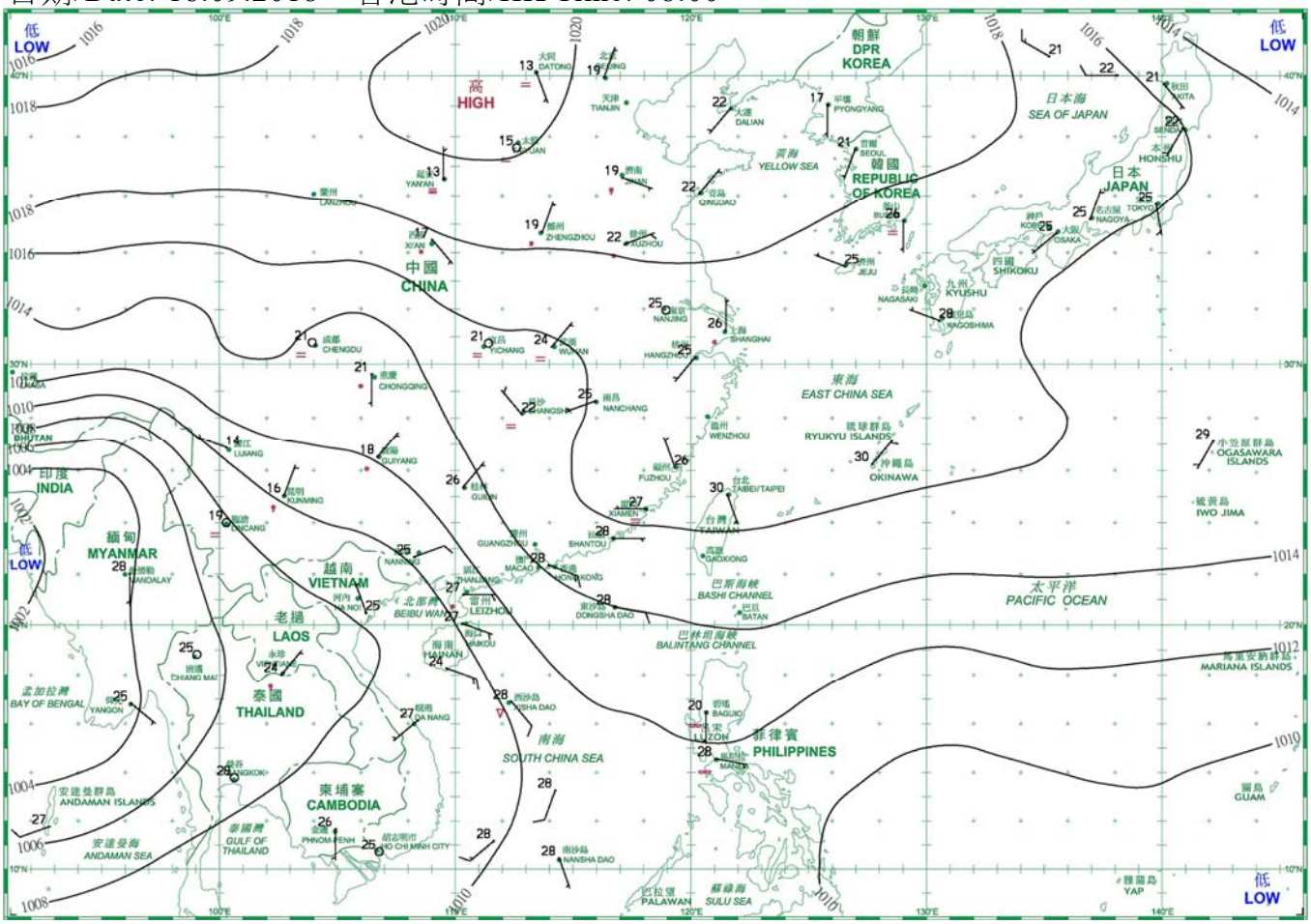
日期/Date: 16.09.2018　香港時間/HK Time: 08:00



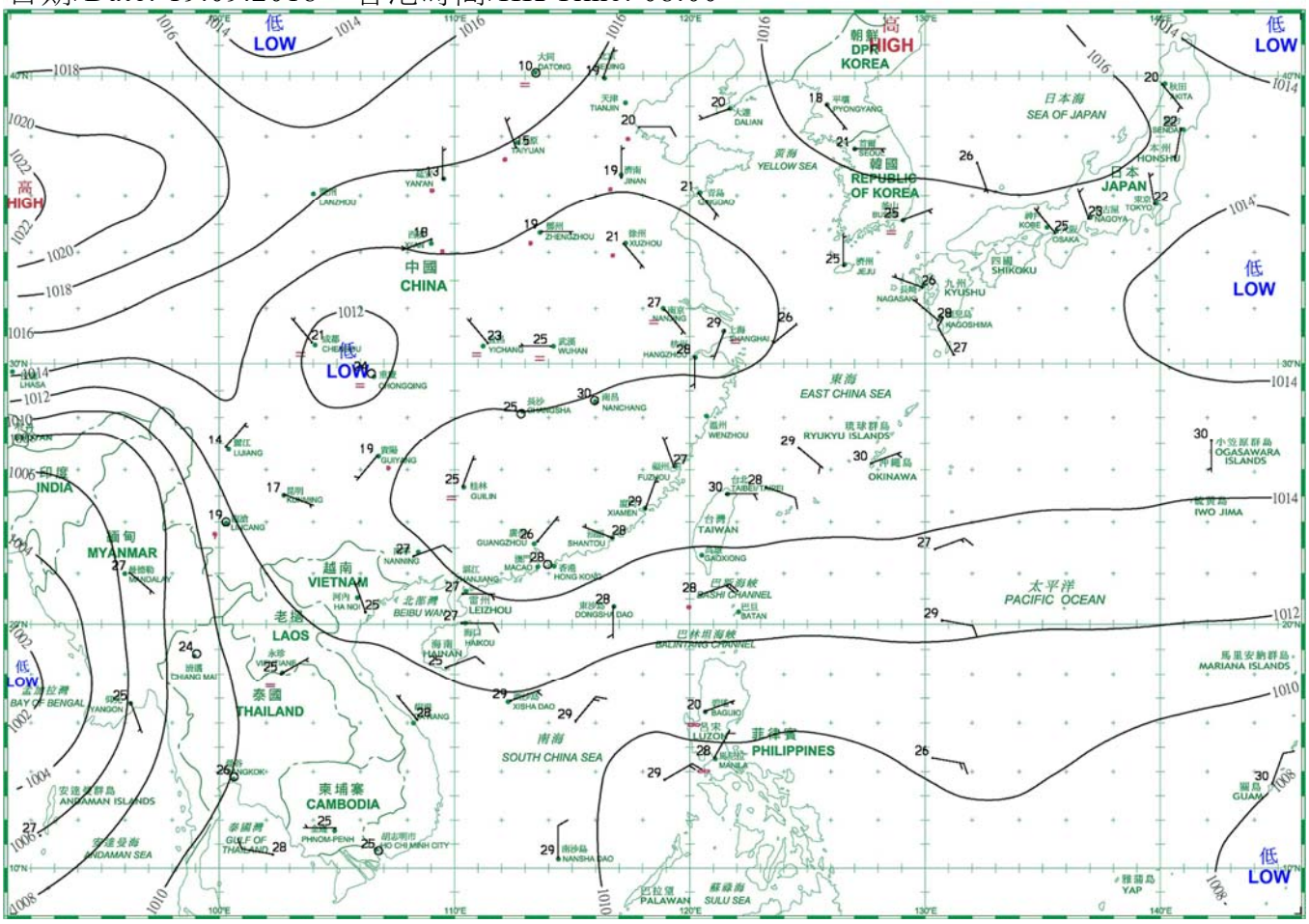
日期/Date: 17.09.2018　香港時間/HK Time: 08:00



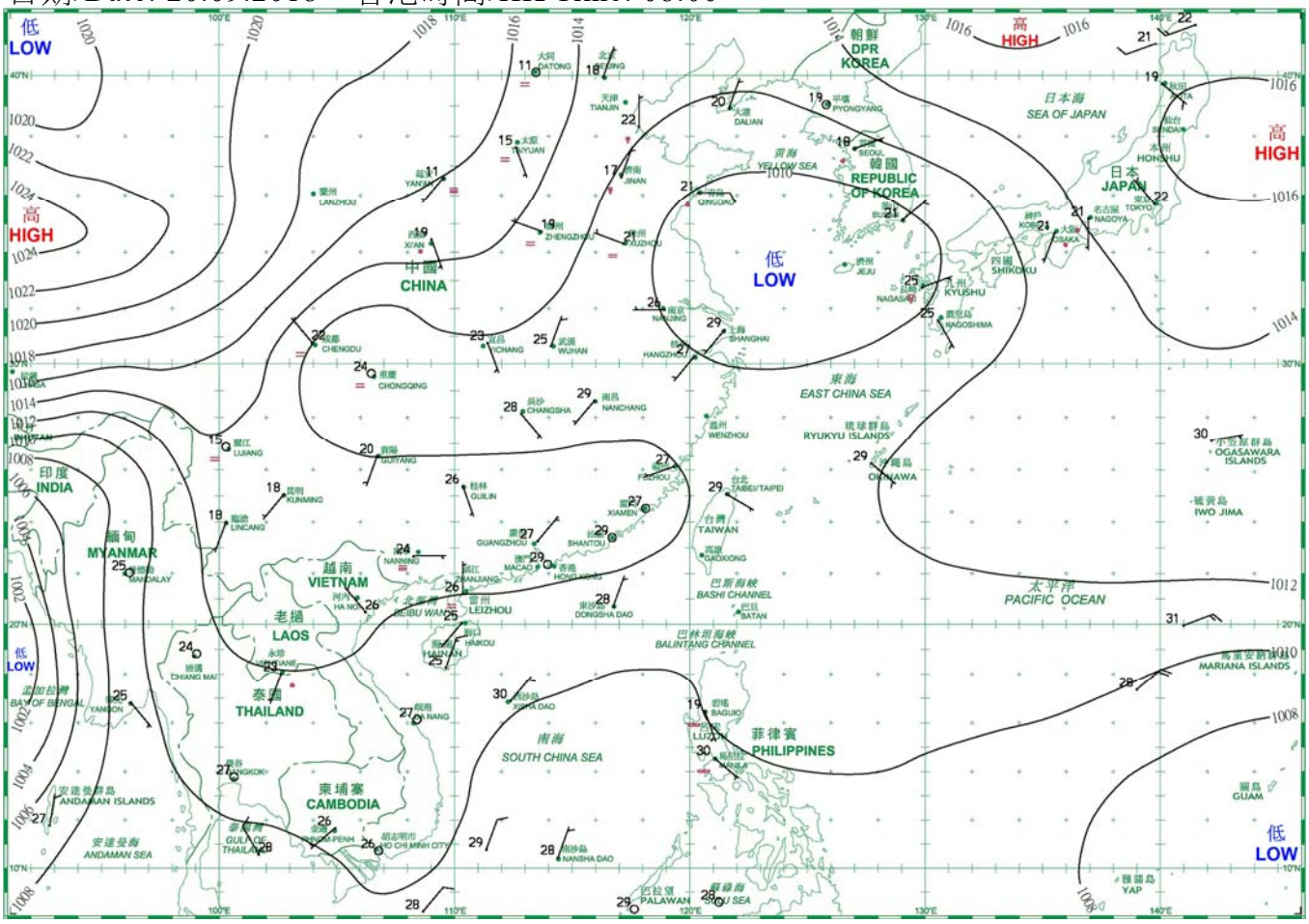
日期/Date: 18.09.2018　香港時間/HK Time: 08:00



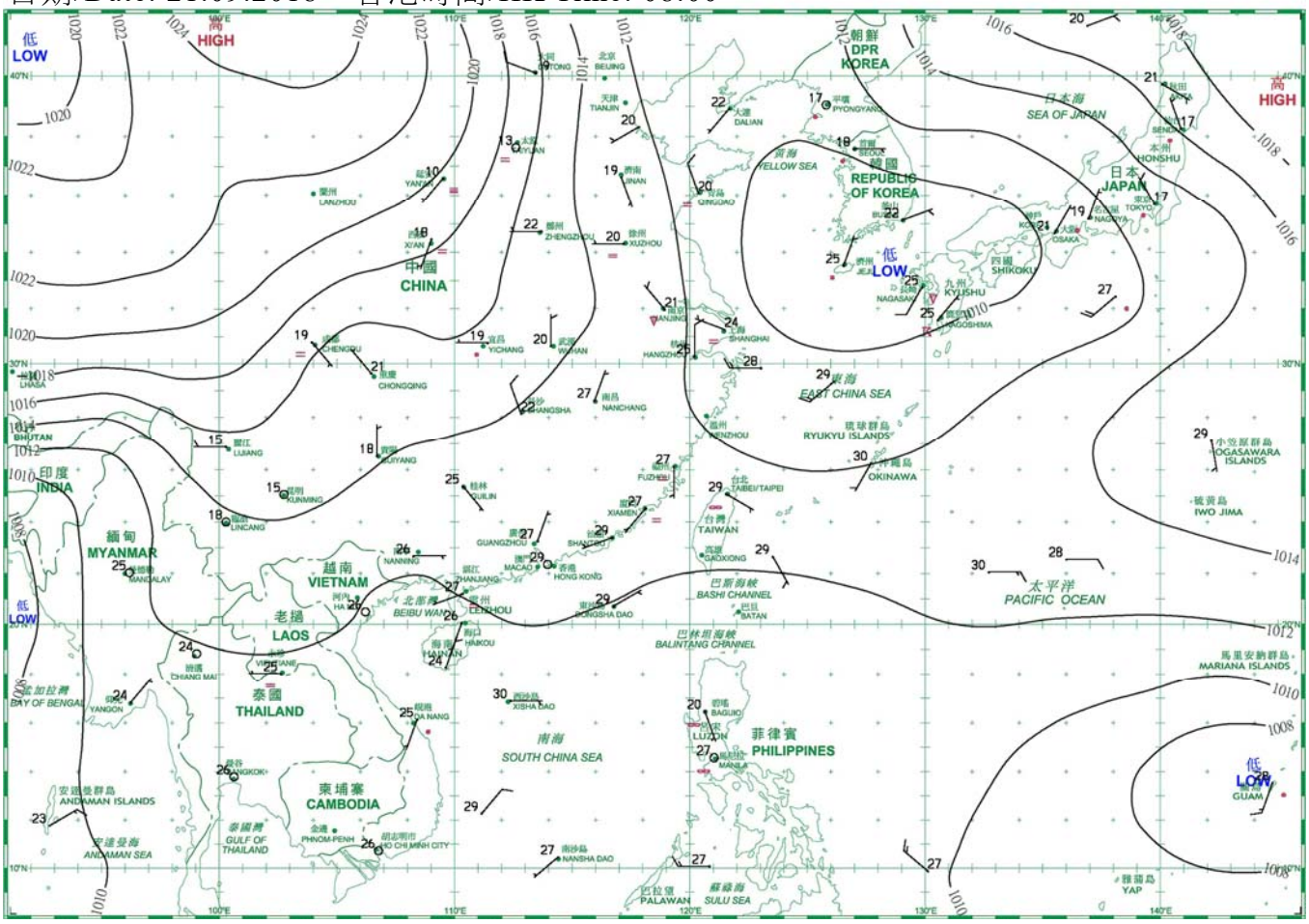
日期/Date: 19.09.2018　香港時間/HK Time: 08:00



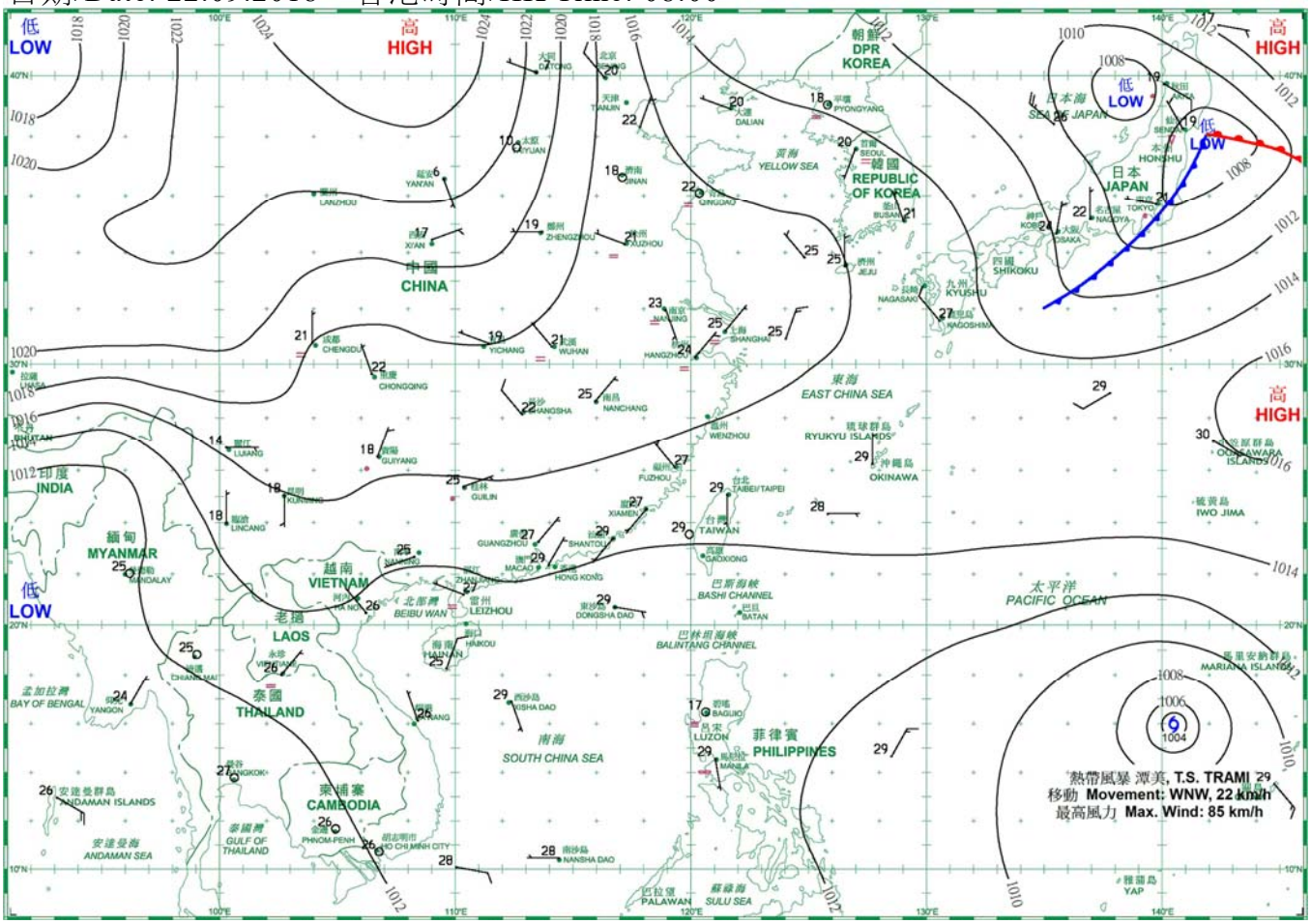
日期/Date: 20.09.2018　香港時間/HK Time: 08:00



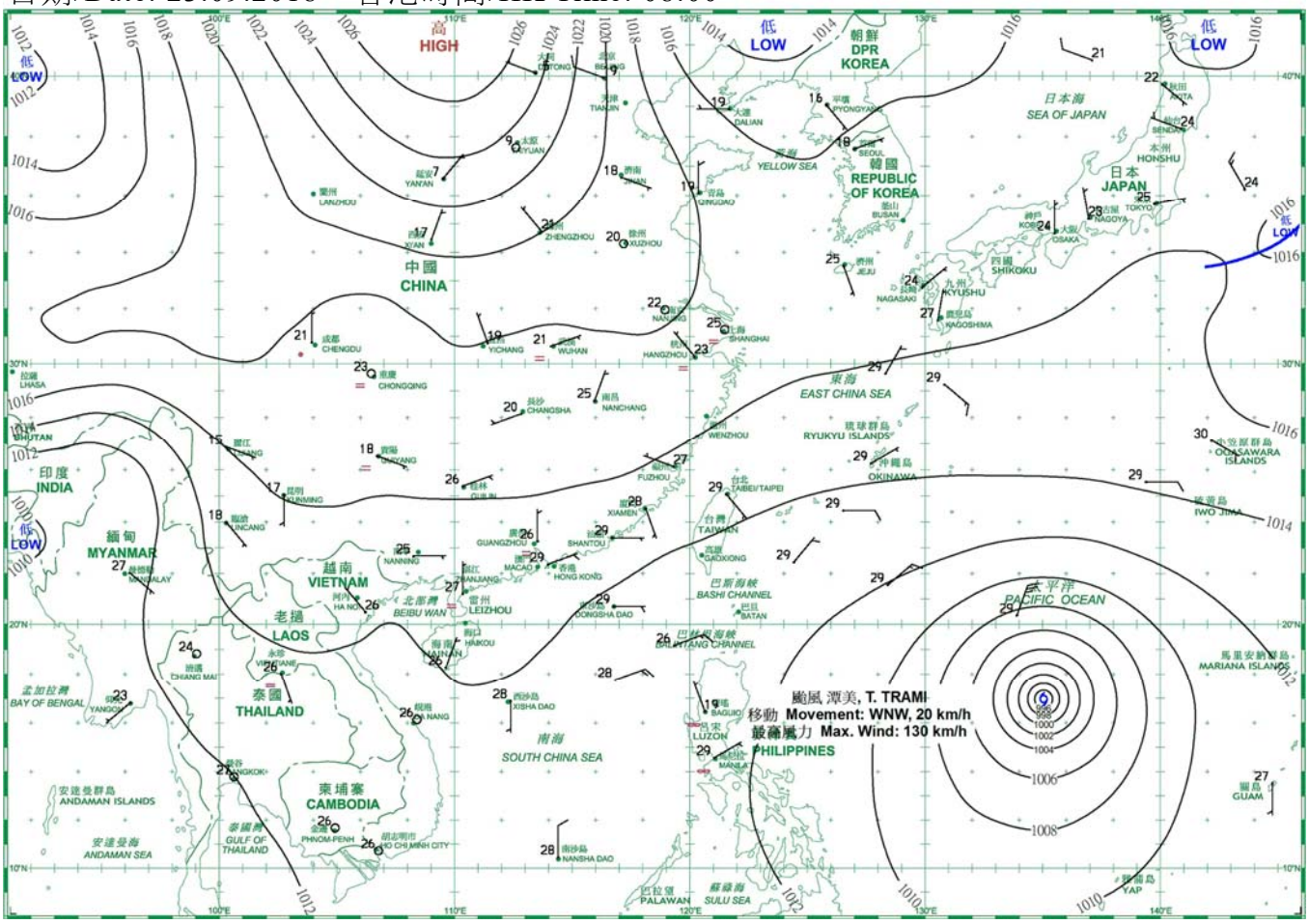
日期/Date: 21.09.2018　香港時間/HK Time: 08:00



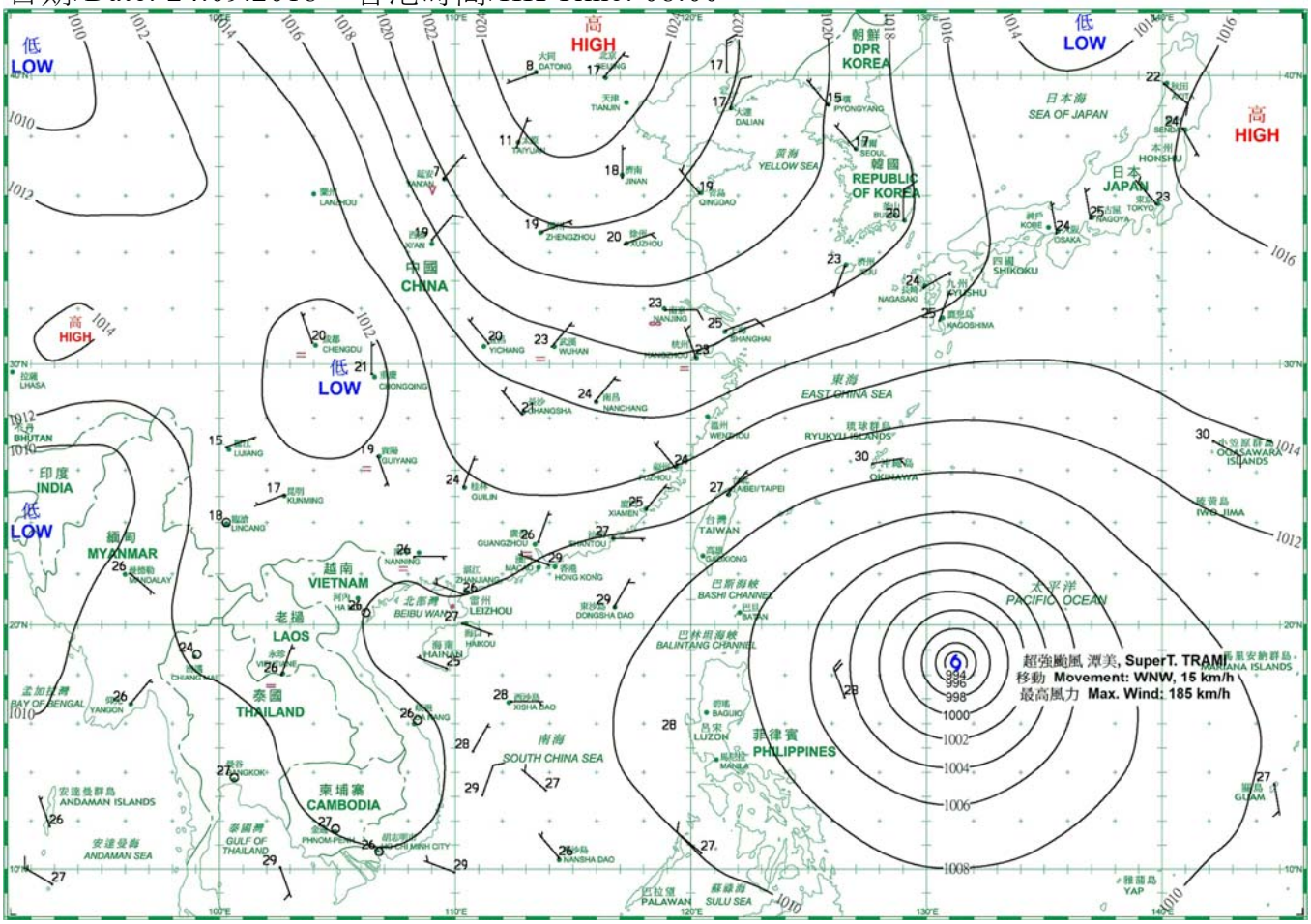
日期/Date: 22.09.2018　香港時間/HK Time: 08:00



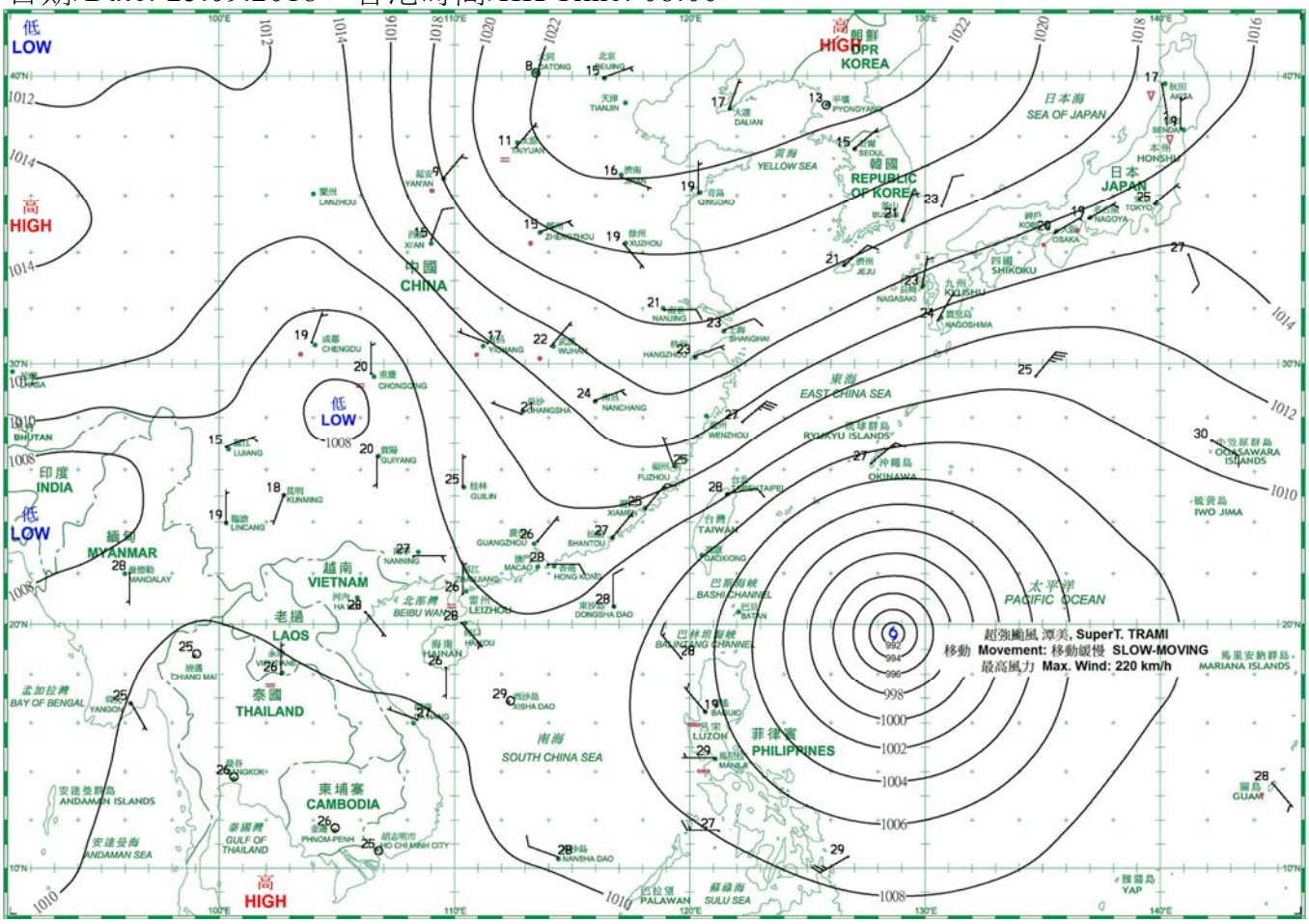
日期/Date: 23.09.2018　香港時間/HK Time: 08:00



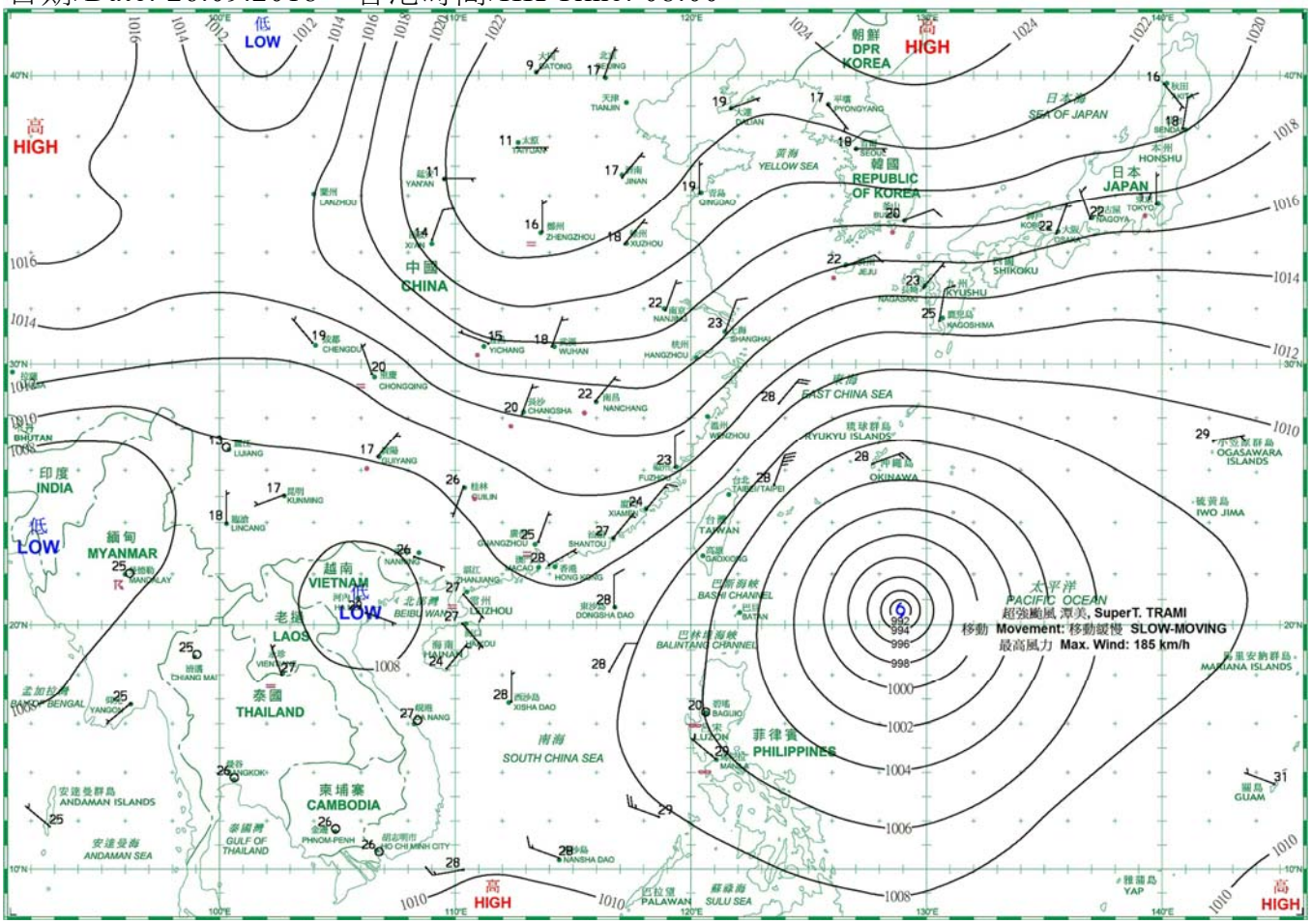
日期/Date: 24.09.2018　香港時間/HK Time: 08:00



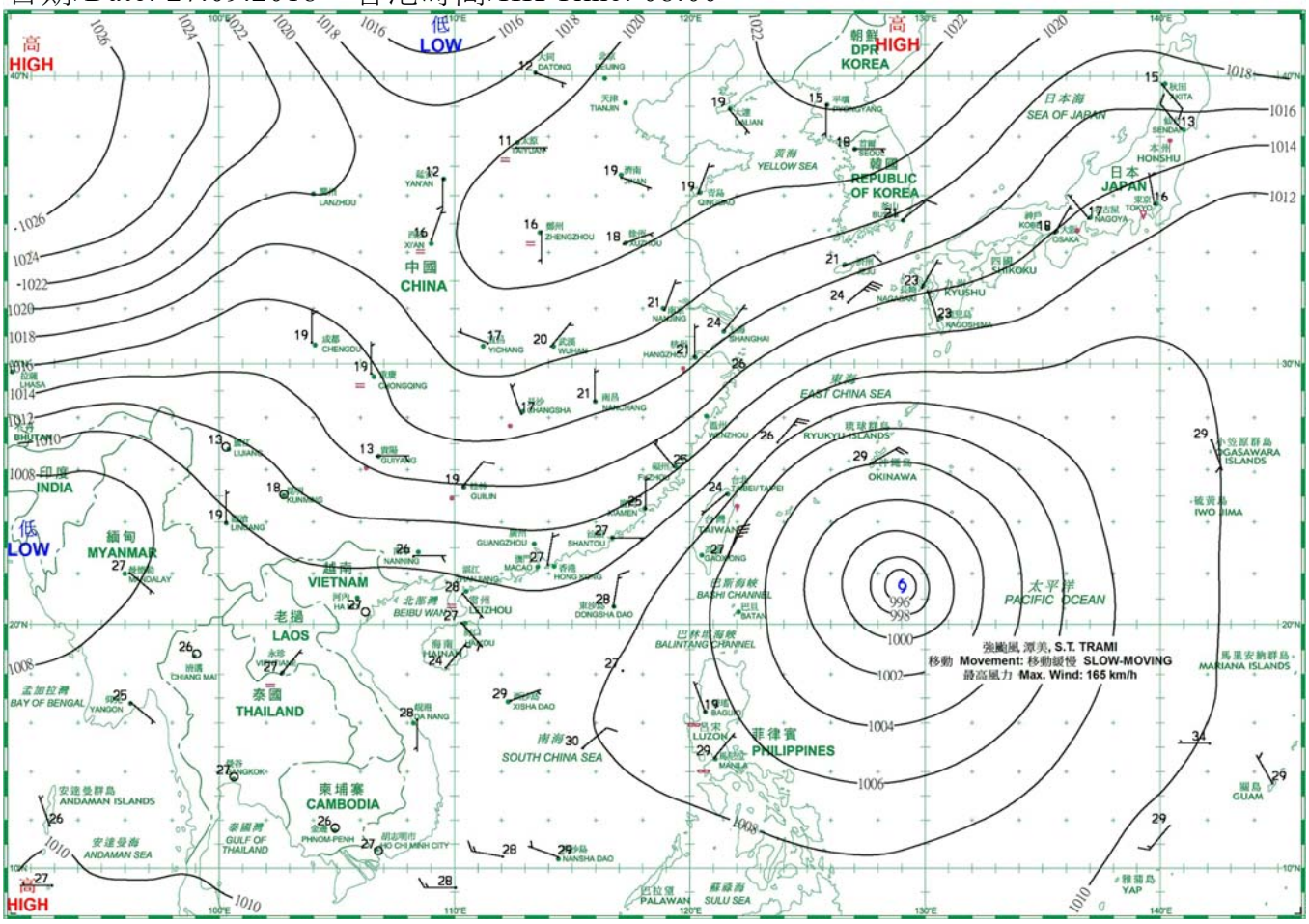
日期/Date: 25.09.2018　香港時間/HK Time: 08:00



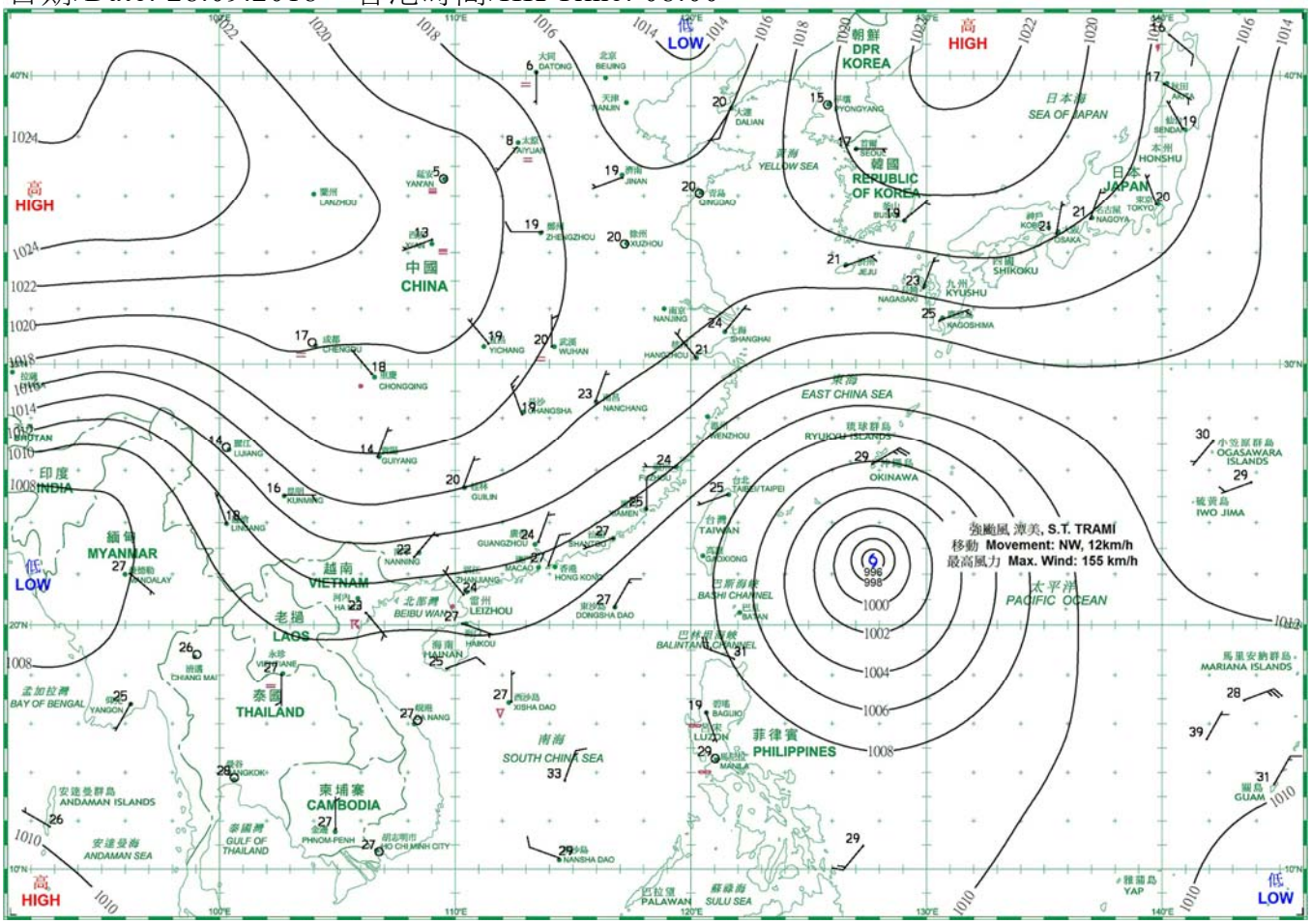
日期/Date: 26.09.2018　香港時間/HK Time: 08:00



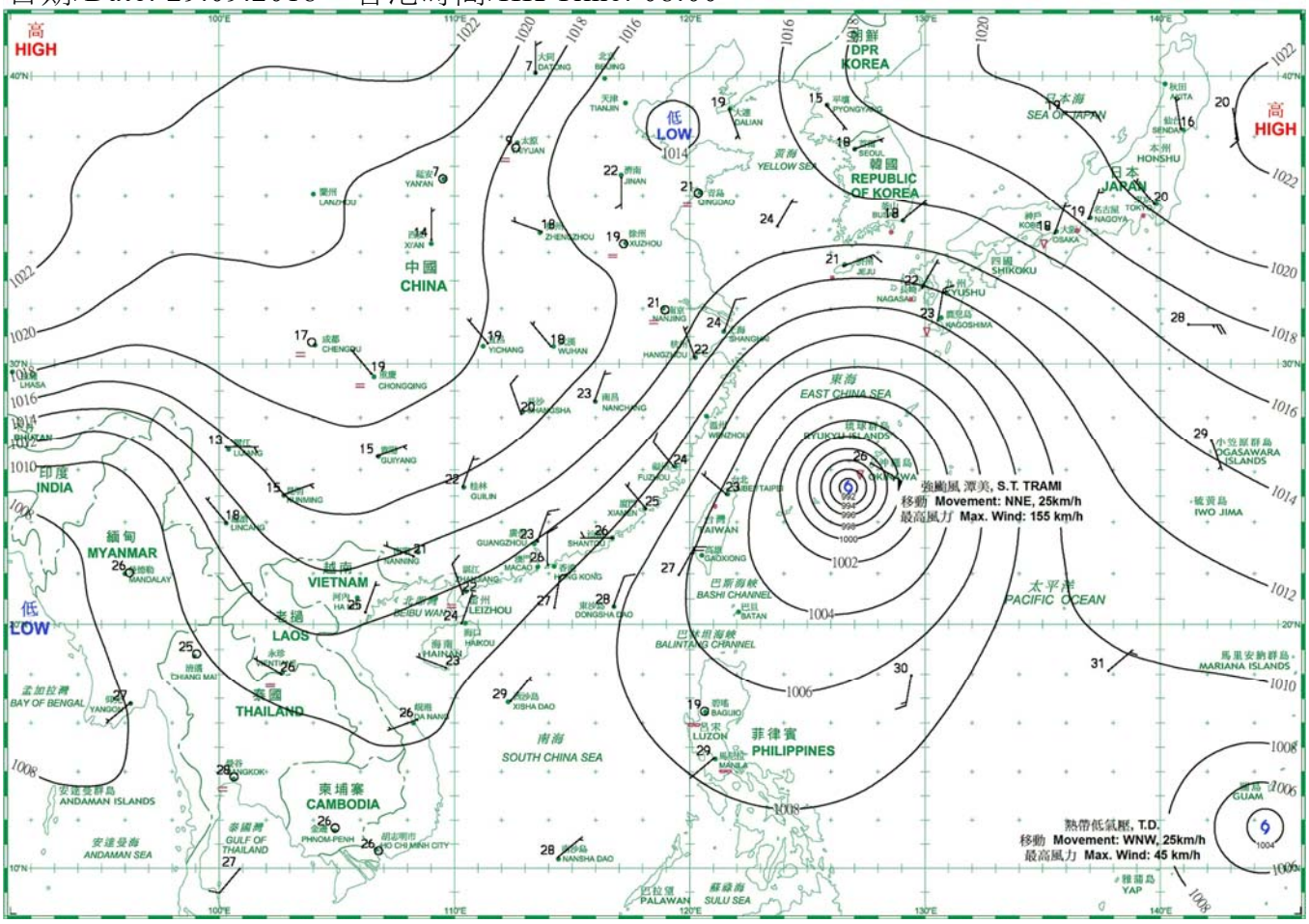
日期/Date: 27.09.2018　香港時間/HK Time: 08:00



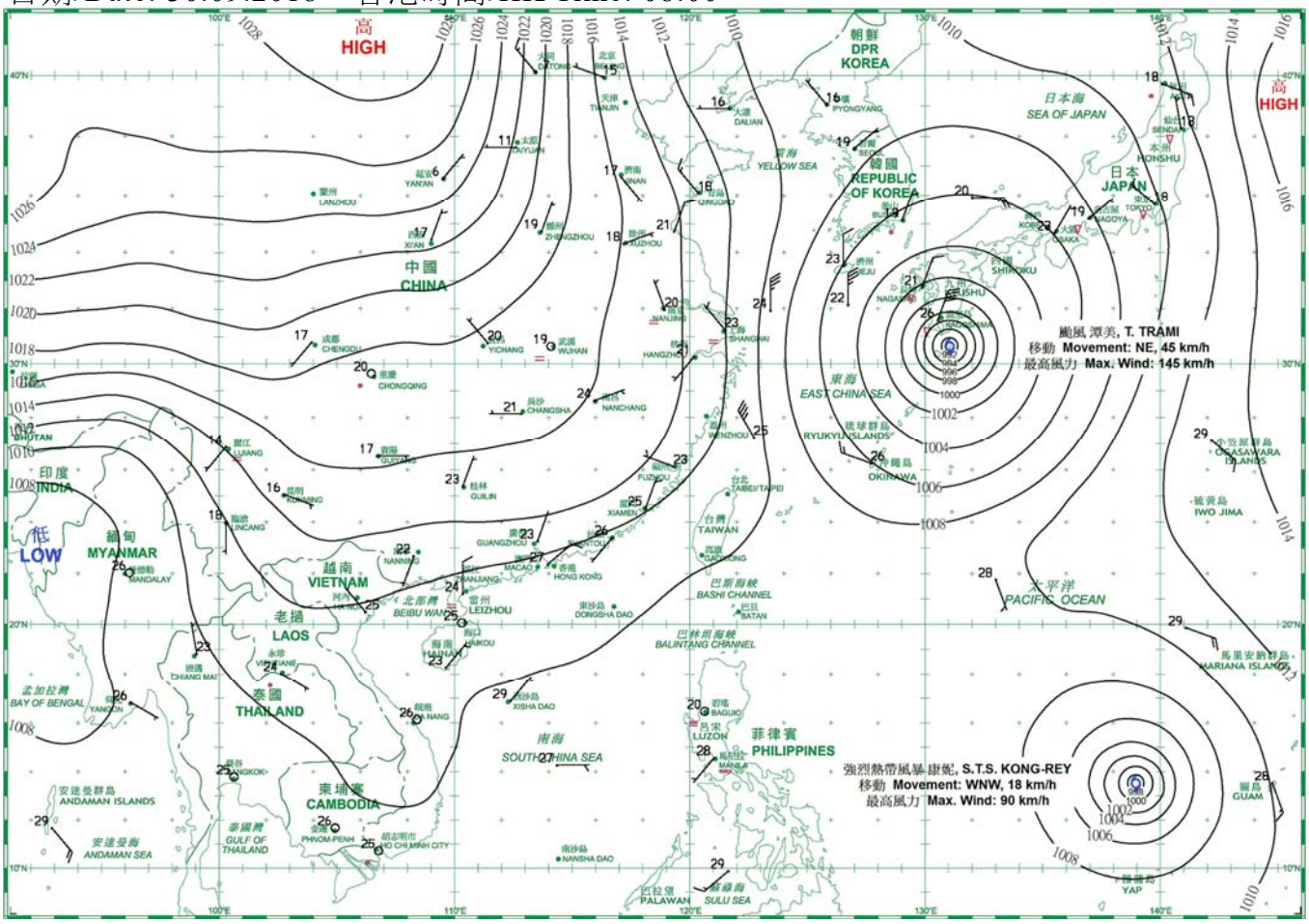
日期/Date: 28.09.2018　香港時間/HK Time: 08:00



日期/Date: 29.09.2018　香港時間/HK Time: 08:00



日期/Date: 30.09.2018　香港時間/HK Time: 08:00



4.1.1 二零一八年九月香港氣象觀測摘錄(一)

4.1.1 Extract of Meteorological Observations in Hong Kong (Part 1), September 2018

日期 Date	平均氣壓 Mean Pressure	氣溫 Air Temperature 最高 Maximum	平均 Mean	最低 Minimum	平均露點溫度 Mean Dew Point Temperature	平均相對濕度 Mean Relative Humidity	平均雲量 Mean Amount of Cloud	總雨量 Total Rainfall
九月 September	百帕斯卡 hPa	°C	°C	°C	°C	%	%	毫米 mm
1	1009.9	27.9	26.3	25.0	25.2	93	89	32.0
2	1007.9	29.9	26.8	24.6	24.5	88	76	9.8
3	1006.9	30.5	27.7	25.6	24.3	82	70	0.3
4	1005.7	32.0	29.1	27.0	25.3	80	40	-
5	1004.9	33.1	29.8	27.9	25.8	79	54	0.1
6	1005.4	31.8	29.6	28.2	26.1	82	77	-
7	1006.3	31.2	29.4	28.0	25.6	80	76	Tr
8	1008.6	29.6	27.4	25.6	23.8	81	86	24.6
9	1011.5	30.5	27.1	24.6	22.4	76	86	16.7
10	1012.5	28.3	26.1	24.3	22.4	80	83	0.2
11	1009.3	32.7	28.2	25.2	20.6	65	46	-
12	1007.7	28.7	27.8	26.9	23.6	78	87	Tr
13	1009.4	30.3	27.7	26.3	24.7	84	69	2.5
14	1009.2	31.7	28.8	26.7	24.6	78	72	-
15	1002.8	35.1	30.7	26.8	23.1	65	59	Tr
16	990.9	31.8	26.4	23.6	23.6	86	97	167.5
17	1008.6	30.4	27.5	25.8	25.4	89	93	12.0
18	1013.7	31.8	28.2	26.5	25.3	85	65	1.2
19	1012.7	31.4	28.6	26.2	24.0	77	43	-
20	1011.0	31.9	29.0	27.0	24.3	77	63	-
21	1011.6	31.9	29.2	27.4	23.4	71	33	-
22	1013.3	33.2	29.2	27.0	24.5	76	51	-
23	1013.1	32.4	29.0	27.6	24.7	78	76	Tr
24	1011.1	29.6	27.0	24.8	24.9	88	80	72.2
25	1009.9	30.2	27.0	24.8	23.1	80	82	34.5
26	1009.6	28.6	26.8	25.1	23.3	81	77	9.7
27	1009.8	30.2	27.3	26.0	22.9	77	88	Tr
28	1009.9	31.3	27.6	25.8	21.4	70	74	-
29	1008.9	31.3	27.4	24.3	18.8	60	26	-
30	1010.5	30.6	27.5	25.0	18.9	60	29	-
平均/總值 Mean/Total	1008.8	31.0	28.0	26.0	23.7	78	68	383.3
正常* Normal*	1008.9	30.1	27.7	25.8	23.4	78	66	327.6
觀測站 Station	天文台 Hong Kong Observatory							

天文台於九月十六日 13 時 28 分錄得本月最低氣壓 977.0 百帕斯卡。
The minimum pressure recorded at the Hong Kong Observatory was 977.0 hectopascals at 1328 HKT on 16 September.

天文台於九月十五日 14 時 7 分錄得本月最高氣溫 35.1 °C。
The maximum air temperature recorded at the Hong Kong Observatory was 35.1 °C at 1407 HKT on 15 September.

天文台於九月十六日 10 時 29 分錄得本月最低氣溫 23.6 °C。
The minimum air temperature recorded at the Hong Kong Observatory was 23.6 °C at 1029 HKT on 16 September.

京士柏於九月二十五日 2 時 9 分錄得本月最高1分鐘平均降雨率 118 毫米/小時。
The maximum 1-minute mean rainfall rate recorded at King's Park was 118 millimetres per hour at 0209 HKT on 25 September.

* 1981-2010 氣候平均值（除特別列明外） *(http://www.hko.gov.hk/wxinfo/climat/normal/cnormal09.htm)*

***** 1981-2010 Climatological normal, unless otherwise specified *(http://www.hko.gov.hk/wxinfo/climat/normal/enormal09.htm)*

Tr - 微量 (降雨量少於 0.05 毫米)

Tr - Trace of rainfall (amount less than 0.05 mm)

4.1.2 二零一八年九月香港氣象觀測摘錄(二)
4.1.2 Extract of Meteorological Observations in Hong Kong (Part 2), September 2018

日期 Date	出現低能見度的時數# Number of hours of Reduced Visibility#	總日照 Total Bright Sunshine	每日太陽總輻射 Daily Global Solar Radiation	總蒸發量 Total Evaporation	盛行風向 Prevailing Wind Direction	平均風速 Mean Wind Speed
九月 September	小時 hours	小時 hours	兆焦耳/米^2 MJ/m^2	毫米 mm	度 degrees	公里/小時 km/h
1	0	-	2.71	1.7	150	12.7
2	0	4.8	14.65	2.0	030	5.9
3	0	5.1	17.12	3.0	230	9.3
4	0	11.1	25.30	4.6	240	23.8
5	0	9.0	22.32	3.8	250	18.8
6	0	7.6	18.69	3.7	030	7.5
7	0	3.5	11.61	3.1	100	6.2
8	0	2.7	8.13	2.3	360	16.1
9	0	1.7	10.87	2.1	360	24.9
10	0	3.3	10.62	2.3	070	15.0
11	3	11.0	23.66	3.0	350	10.6
12	0	1.2	7.84	1.8	070	43.3
13	0	5.5	15.16	3.0	070	33.5
14	0	7.0	16.26	3.7	040	13.0
15	2	9.7	22.64	3.3	010	23.3
16	0	-	1.06	1.4	120	101.3
17	0	1.3	8.48	1.4	110	43.0
18	0	8.9	21.69	4.5	080	20.8
19	0	10.1	20.24	4.6	200	7.8
20	0	8.4	20.00	4.7	220	11.3
21	0	10.7	23.08	5.1	160	7.5
22	0	11.2	20.27	4.6	100	8.3
23	0	6.6	19.33	4.6	100	9.1
24	0	2.5	10.73	2.7	090	9.5
25	0	5.9	17.29	4.1	100	20.1
26	0	3.4	9.51	2.3	100	14.5
27	0	4.0	13.03	3.3	100	6.5
28	0	5.9	15.77	5.0	360	14.4
29	0	10.6	20.90	5.8	350	25.2
30	0	10.6	20.53	4.0	360	22.9
平均/總值 Mean/Total	5	183.3	15.65	101.5	090	19.5
正常* Normal*	78.5 §	172.3	14.61	125.9	090	22.6
觀測站 Station	香港國際機場 Hong Kong International Airport	京士柏 King's Park			橫瀾島^ Waglan Island^	

橫瀾島於九月十六日 10 時 14 分錄得本月最高陣風 220 公里/小時，風向 050 度。
The maximum gust peak speed recorded at Waglan Island was 220 kilometres per hour from 050 degrees at 1014 HKT on 16 September.

低能見度是指能見度低於 8 公里，不包括出現霧、薄霧或降水。
- 在2004年及以前，香港國際機場的能見度讀數是基於專業氣象觀測員每小時的觀測數據。在2005年及以後，讀數是採用位於機場南跑道中間的能見度儀表在每小時前10分鐘的平均數據。這與使用儀器觀測來改進能見度評估的國際趨勢是一致的。
- 在2007年10月10日前曾出現於此摘錄內香港國際機場2005年及以後的低能見度時數資料乃基於專業氣象觀測員每小時的觀測數據。有關資料已於2007年10月10日起改為以機場南跑道中間之能見度儀表在每小時前10分鐘的平均數據計算。

Reduced visibility refers to visibility below 8 kilometres when there is no fog, mist, or precipitation.
- The visibility readings at the Hong Kong International Airport are based on hourly observations by professional meteorological observers in 2004 and before, and average readings over the 10-minute period before the clock hour of the visibility meter near the middle of the south runway from 2005 onwards. The change of the data source in 2005 is an improvement of the visibility assessment using instrumented observations following the international trend.
- Before 10 October 2007, the number of hours of reduced visibility at the Hong Kong International Airport in 2005 and thereafter displayed in this summary was based on hourly visibility observations by professional meteorological observers. Since 10 October 2007, the data have been revised using the average visibility readings over the 10-minute period before the clock hour, as recorded by the visibility meter near the middle of the south runway.

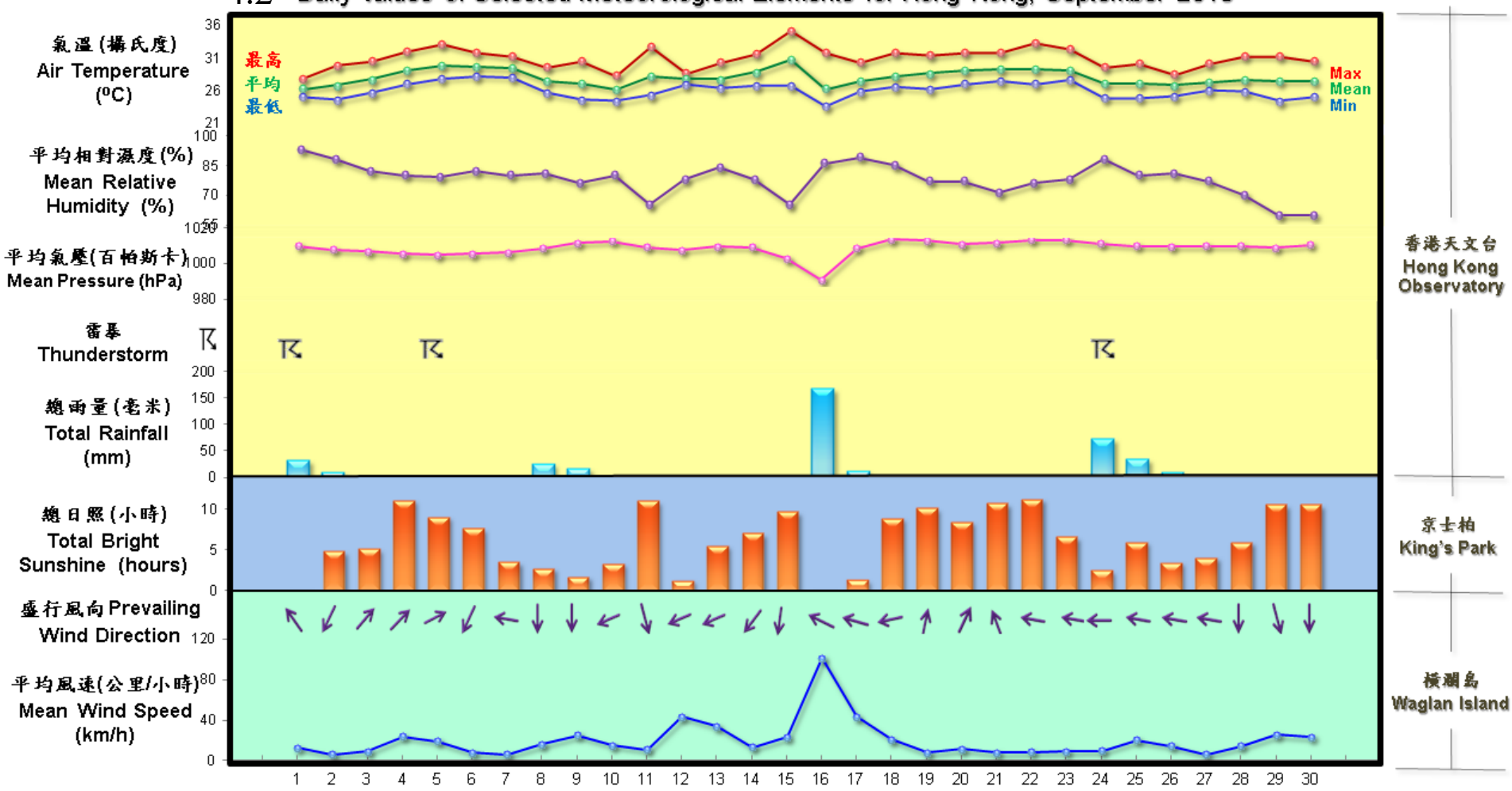
^ 如橫瀾島未能提供數據，則以長洲或其他鄰近氣象站的數據作補充，以計算盛行風向和平均風速。
^ In case the data are not available from Waglan Island, observations of Cheung Chau or other nearby weather stations will be incorporated in computing the Prevailing Wind Direction and Mean Wind Speed.

* 1981-2010 氣候平均值（除特別列明外） *(http://www.hko.gov.hk/wxinfo/climat/normal/cnormal09.htm)*
* 1981-2010 Climatological normal, unless otherwise specified *(http://www.hko.gov.hk/wxinfo/climat/normal/enormal09.htm)*

§ 1997-2017 平均值
§ 1997-2017 Mean value

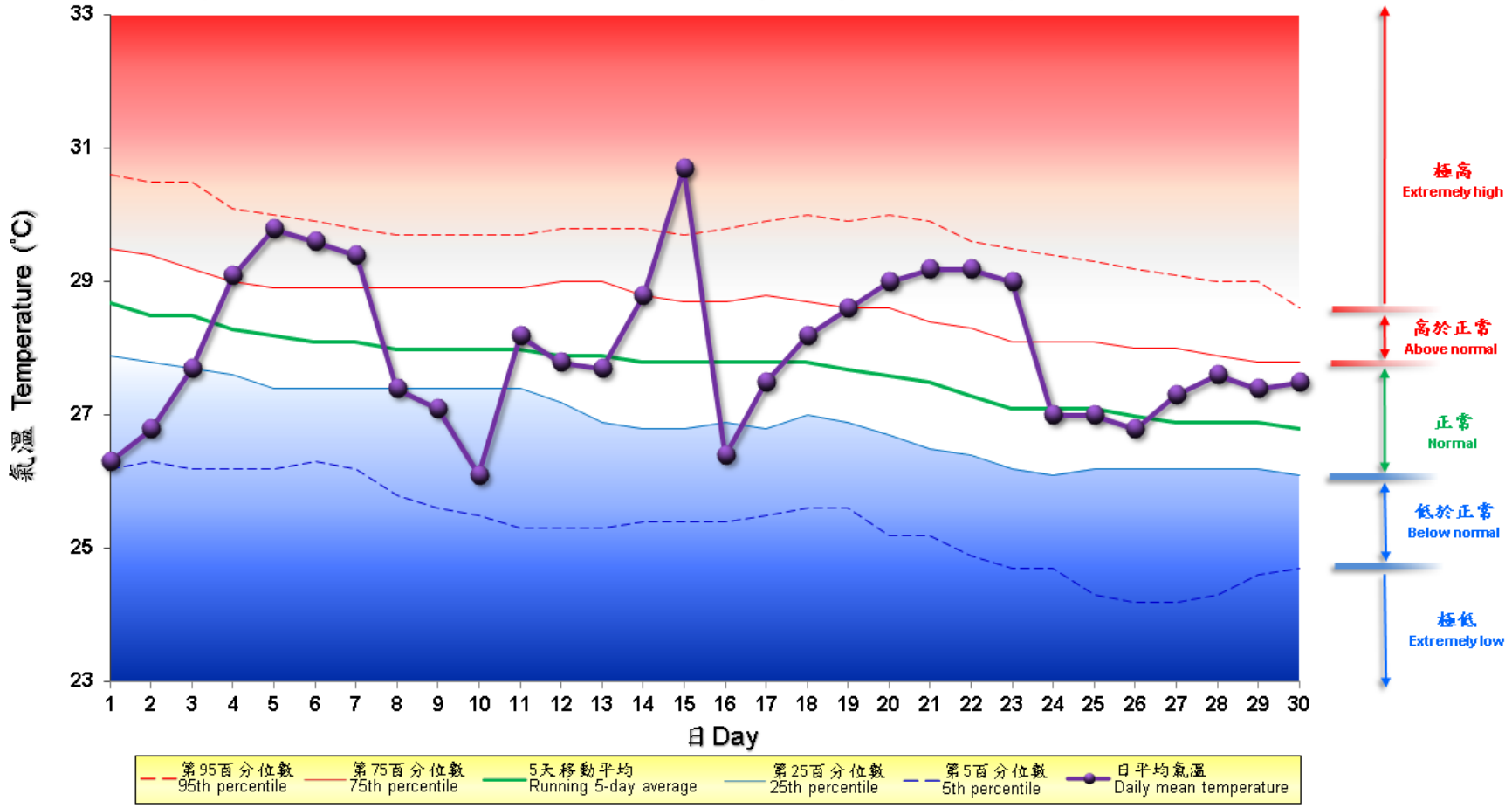
4.2 2018年9月部分香港氣象要素的每日記錄

4.2 Daily Values of Selected Meteorological Elements for Hong Kong, September 2018



4.3 2018年9月香港天文台錄得的日平均氣溫

4.3 Daily Mean Temperature recorded at the Hong Kong Observatory for September 2018



備註：
極高：高於第 95 百分位數
高於正常：介乎第 75 和第 95 百分位數之間
正常：介乎第 25 和第 75 百分位數之間
低於正常：介乎第 5 和第 25 百分位數之間
極低：低於第 5 百分位數
百分位數值及 5 天移動平均值是基於 1981 至 2010 年的數據計算所得

Remarks:
Extremely high: above 95th percentile
Above normal: between 75th and 95th percentile
Normal: between 25th and 75th percentile
Below normal: between 5th and 25th percentile
Extremely low: below 5th percentile
Percentile and 5-day running average values are computed based on the data from 1981 to 2010