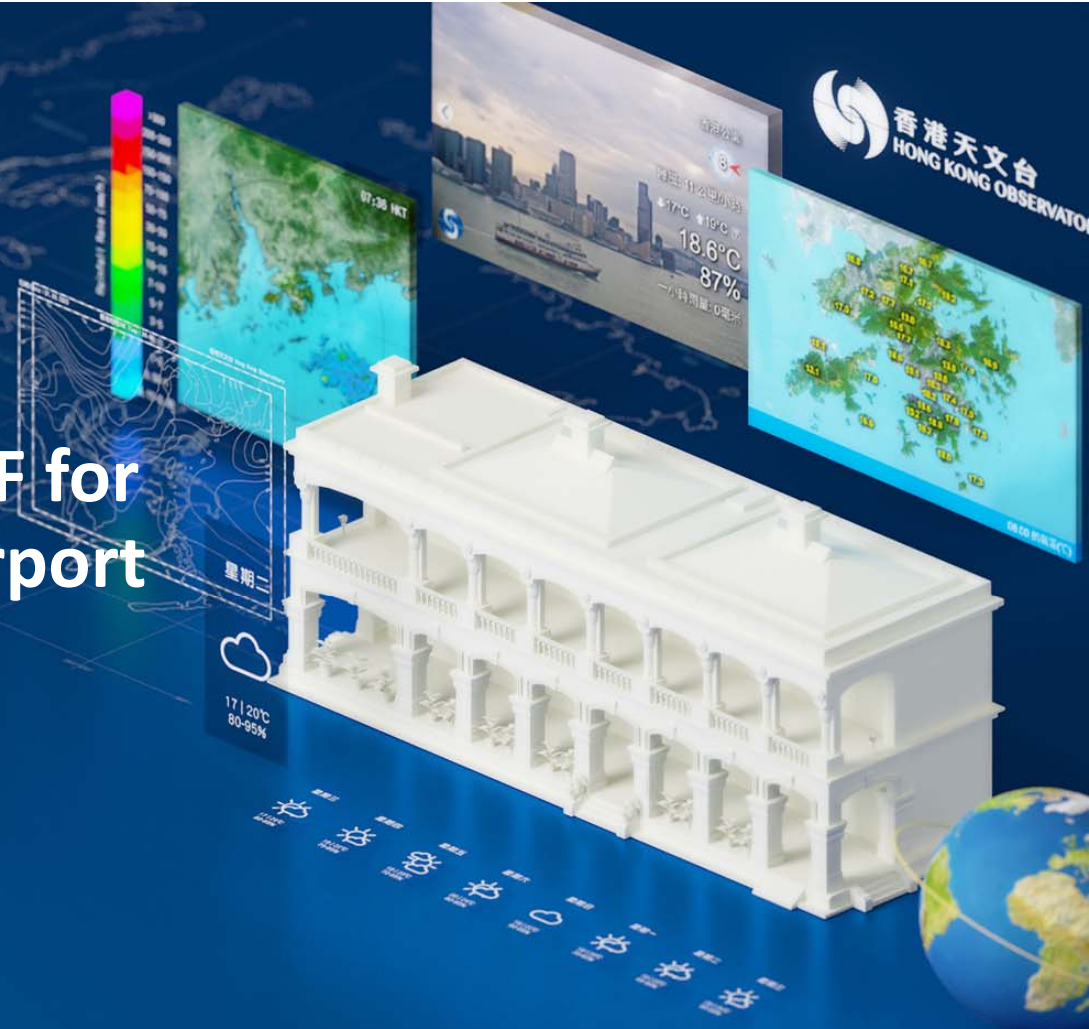


Three-hourly Updates of TAF for Hong Kong International Airport

CHONG Man-lok, John
Hong Kong Observatory

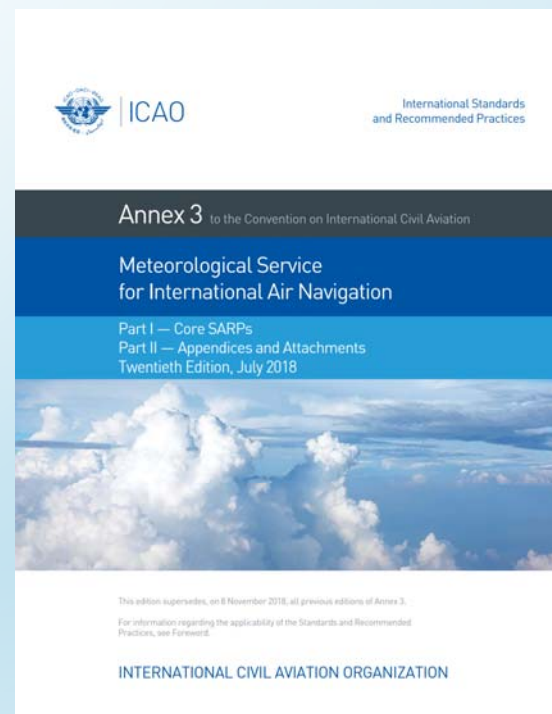
ICAO APAC MET/ATM Seminar
1 May 2023



Current ICAO Recommendation

Annex 3 Section 6.2.6 Recommendation

- The period of validity of a routine TAF should be not less than 6 hours and not more than 30 hours
- The period of validity should be determined by regional air navigation agreement
- Routine TAF valid for less than 12 hours should be issued every 3 hours and those valid for 12 to 30 hours should be issued every 6 hours



Evolution of TAF issued by HKO

TAF valid for 24 hours (long TAF) issued for 00, 06, 12, 18 UTC
TAF valid for 9 hours (short TAF) issued for 00, 03, 06, ..., 18, 21 UTC



5 November 2008 onwards

TAF valid for 30 hours issued for 00, 06, 12, 18 UTC
Short TAFs cancelled
(Amendment 74 of ICAO Annex 3, not more than one TAF to be valid at an aerodrome at any given time)

6-hourly
TAF



8 September 2022 onwards

TAF valid for 30 hours issued for 00, 03, 06, ..., 18, 21 UTC
(Exceeds ICAO recommendation!)

3-hourly
TAF

Development of 3-hourly TAF

- Repeatedly raised by airline operators and pilots through **customer surveys and liaison group meetings** to boost capacity of VHHH and facilitate flight planning
- **Officially brought up in 2018** and agreed locally among airline representatives and the Hong Kong Civil Aviation Department (Air Traffic Service)
- **Internal trial run conducted from August 2018 to October 2019**
- Improvement in TAF performance especially in the first three hours of TAF, due to more accurate timing and intensity of short-term weather change
- From June 2022 onwards, there have been increase in manpower with two aviation forecasters manning the AMO round the clock (two during daytime and one during nighttime previously), providing the opportunity to officially launch **3-hourly update of TAF**
- 3-hourly update of TAF was provided by other States also, such as Australia, Canada, New Zealand, Switzerland and the USA

Preparation before implementation

- Liaised closely with the Hong Kong Civil Aviation Department (Air Navigation Service Provider)
- Updated necessary webpages, as well as upstream and downstream systems
- Informed ICAO APAC office
- Updated the Aeronautical Fixed Telecommunication Network (AFTN) and Aeronautical Message Handling System (AMHS) templates to prepare both TAC and IWXXM versions of TAF
- Updated the Aeronautical Information Publication GEN 3.5 Section 10.1.1 (*General information of meteorological services provided for VHHH, see below*) accordingly
- Upgraded the TAF verification system
- **First official 3-hourly TAF at VHHH was issued for 03Z on 8 September 2022**

10.1 GENERAL INFORMATION

10.1.1 An Aviation Forecaster is on duty H24 at the AMO to prepare weather forecasts, issue warning messages and provide weather briefings. An additional Aviation Forecaster is on duty during daytime to provide weather briefings and enhanced forecasts and warnings of weather impacting air traffic. Aerodrome forecasts (TAF) valid for 30 hours are issued **every 3 hours**. The 30-hour TAF includes forecast of the maximum and minimum temperatures within the validity period. A forecast valid for 9 to 12 hours is extracted from the 30-hour TAF for inclusion in the scheduled VOLMET broadcasts and D-VOLMET (see Table GEN 3.5.13 VOLMET Service). Landing forecast is issued in the form of a trend forecast appended to MET reports, and is updated with the issuance of MET reports.

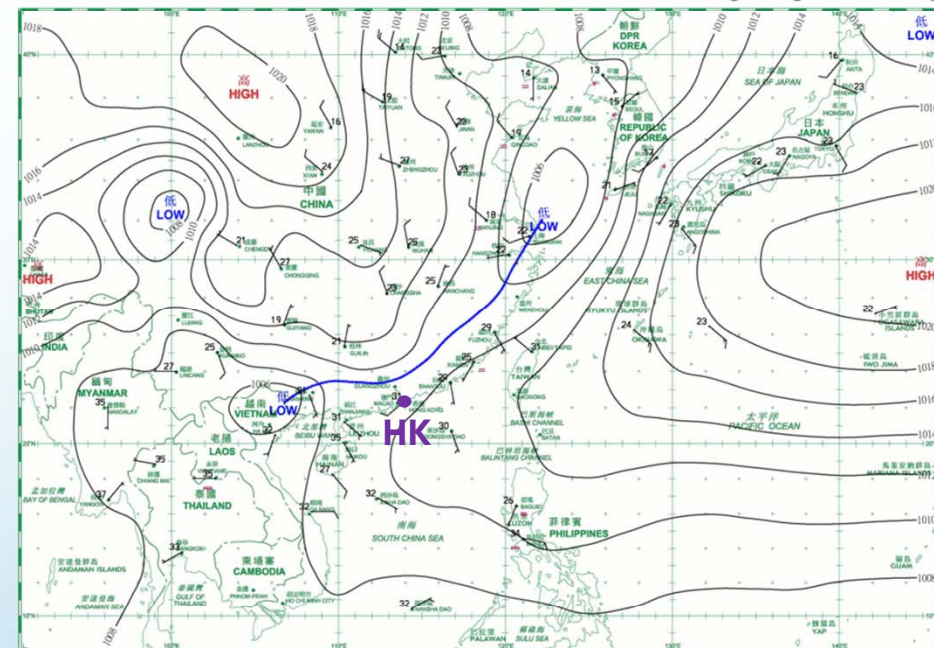
Benefits of 3-hourly update of TAF

- Reflect forecast of **subtle changes** in weather that do not fulfill the criteria of TAF amendment
- Re-assessment of **rapidly changing weather**, such as thunderstorms or squalls, can be effectively conveyed through more frequent updates of TAF
- Forecast of high-impact weather in TAF has indications of the weather conditions in the vicinity, including the **arrival and departure corridors**
- With the fine-tuning of intensity and timing of high-impact weather in TAF updated every 3 hours, **ATFM unit will be able to implement or lift flow control with better estimation in capacity and precision in time**
- Minimize impact of adverse weather brought to air traffic
- Airlines can make use of more updated TAF for **pre-flight and in-flight planning**

Benefits – Example 1 (4 May 2021)

- A trough of low pressure lingered over inland in the afternoon
- Bands of thundery showers located at about 200 km to the North of HK and moved eastward
- Brief showers developed over 200 km to the Northwest of HK and **became more organized in the afternoon with lightning strokes embedded**
- The convective activity was closely monitored and anticipated to cross HKIA after 12 UTC
- Thunderstorms were included in the AMD TAF issued at 0847Z to alert users on the upcoming adverse weather

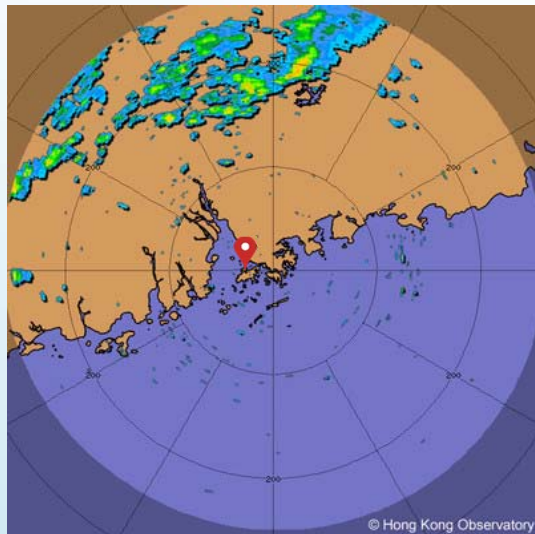
日期/Date: 04.05.2021 香港時間/HK Time: 14:00 香港天文台 Hong Kong Observatory



Surface chart at 06 UTC

Benefits – Example 1 (4 May 2021)

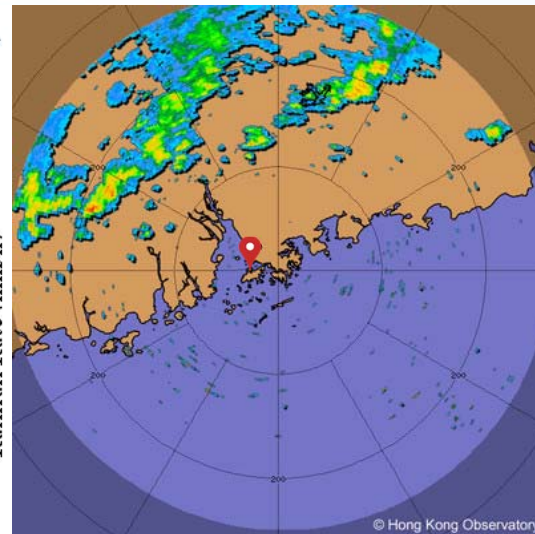
0600 UTC



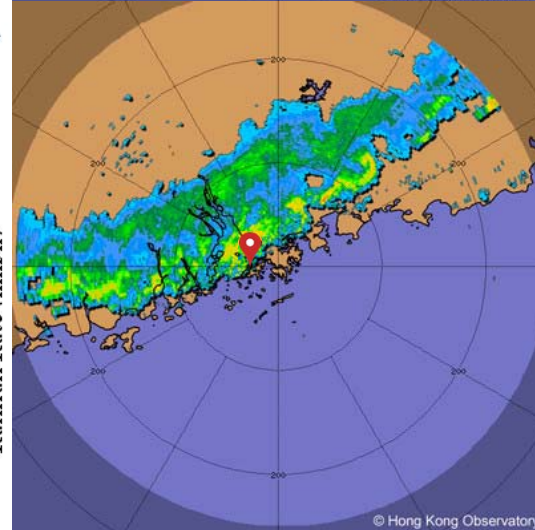
1000 UTC



0800 UTC



1200 UTC



Benefits – Example 1 (4 May 2021)

TAF issued at 05 UTC

TAF VHHH 040500Z 0406/0512 20010KT 9000 FEW015
SCT025 TX32/0406Z TX29/0506Z TN24/0422Z
BECMG 0411/0413 VRB05KT
TEMPO 0421/0501 36010KT 4000 SHRA FEW010CB
SCT020
TEMPO 0505/0512 4000 SHRA FEW010CB SCT020
TEMPO 0509/0512 12010KT=



AMD TAF issued at 0847 UTC

TAF AMD VHHH 040847Z 0409/0512 20010KT 9000
FEW015 SCT025 TX29/0409Z TX29/0506Z
TN24/0422Z
**TEMPO 0411/0417 VRB15G35KT 2500 TSRA +SHRA
FEW010 SCT020CB BKN040**
BECMG 0417/0419 36010KT
TEMPO 0505/0512 4000 SHRA FEW010CB SCT020
TEMPO 0509/0512 12010KT=

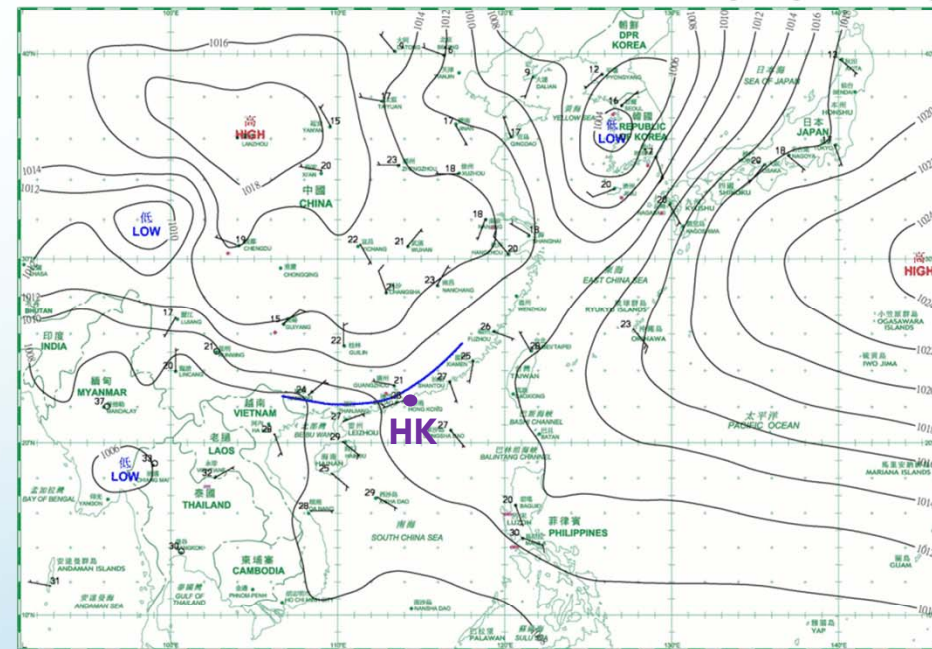
**METAR VHHH 041030Z VRB04KT 9999 FEW010 28/23 Q1009 TEMPO FM1200 31015G35KT 2500 TSRA +SHRA FEW010 SCT020CB
BKN040=**
METAR VHHH 041100Z VRB04KT 9999 FEW010 SCT030 29/22 Q1009 TEMPO FM1200 31015G35KT 2500 TSRA +SHRA FEW010 SCT020CB
BKN040=
METAR VHHH 041130Z 15008KT 110V190 9999 FEW010 SCT028 28/23 Q1010 TEMPO FM1200 31015G35KT 2500 TSRA +SHRA FEW010
SCT020CB BKN040=
METAR VHHH 041200Z 25005G19KT 170V340 9999 FEW010 FEW020CB SCT025 28/23 Q1011 TEMPO FM1200 31015G35KT 2500 TSRA
+SHRA FEW010 SCT020CB BKN040=
**SPECI VHHH 041207Z 32014G24KT 250V350 2200 1300E R07R/P2000N R25L/P2000N R07L/P2000N R25R/P2000D +TSRA FEW010
FEW020CB SCT025 24/22 Q1012 NOSIG=**
METAR VHHH 041230Z 04006KT 350V110 4500 +TSRA FEW010 FEW020CB SCT025 23/22 Q1012 NOSIG=

METAR, SPECI & TREND at 1030-1230 UTC

Benefits – Example 1 (4 May 2021)

- The trough of low pressure lingered over inland and edged southward to the coastal areas in late afternoon
- **Around 08 UTC**, the forecasters were more convinced that the most probable timing of adverse weather should start affecting VHHH around 12 UTC
- Since the 3-hourly update of TAF was not in operation at that time, the AMD TAF was issued at 0847Z until it was **more certain** that the thunderstorms would affect VHHH
- If 3-hourly TAF was implemented, a more accurate TAF would be likely issued at 08 UTC, i.e. 47 minutes prior
- ATC could receive a more advance alert of about 3 hours

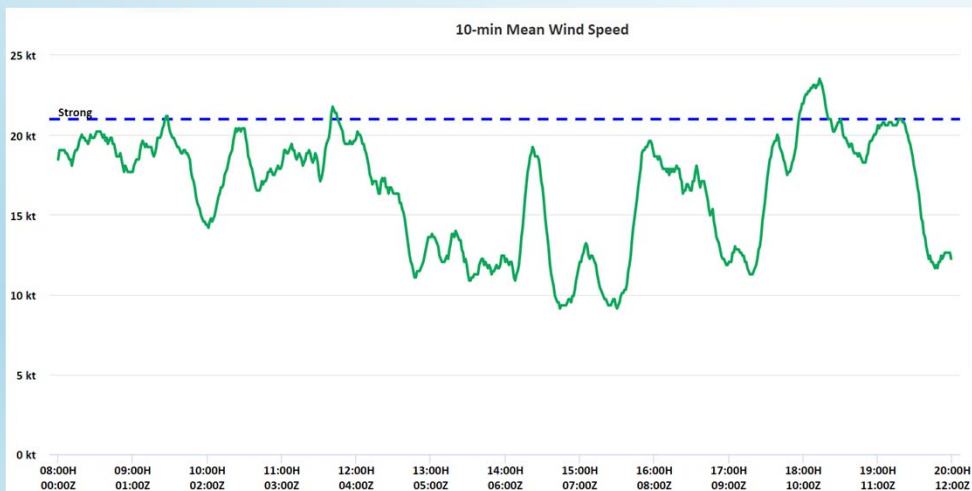
日期/Date: 04.05.2021 香港時間/HK Time: 20:00 香港天文台 Hong Kong Observatory



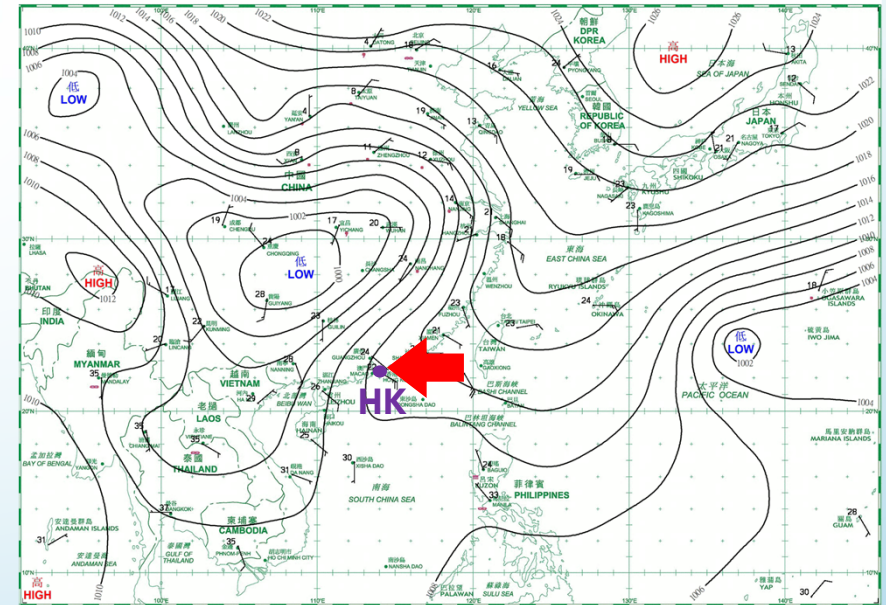
Surface chart at 12 UTC

Benefits – Example 2 (3 Apr 2023)

- An easterly airstream affected Hong Kong on 3 Apr
- Easterlies at HKIA occasionally reached strong force (at or above 22 knots)
- Winds slightly relaxed in early afternoon but picked up again in the evening



日期/Date: 03.04.2023 香港時間/HK Time: 14:00 香港天文台 Hong Kong Observatory



Surface chart at 06 UTC

10-min mean wind at METAR reporting station at 00-12 UTC

Benefits – Example 2 (3 Apr 2023)

TAF issued at 05 UTC

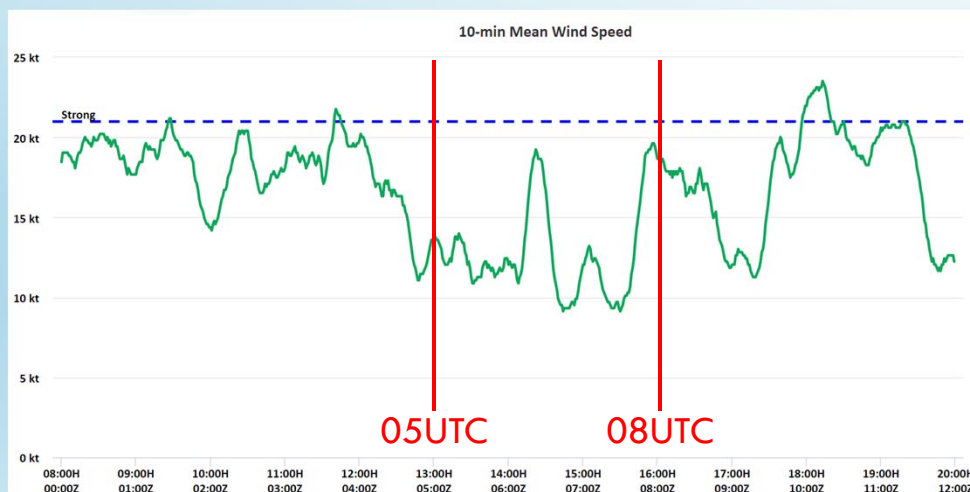
TAF VHHH 030500Z 0306/0412 **10010KT** 9000
FEW010 SCT020 TX24/0306Z TX26/0406Z TN22/0323Z
TEMPO 0306/0312 10015G25KT
TEMPO 0322/0404 4000 SHRA FEW008CB SCT020
BECMG 0400/0402 16010KT=



TAF issued at 08 UTC

TAF VHHH 030800Z 0309/0415 **10015KT** 9000
FEW010 SCT020 TX26/0406Z TN22/0323Z
TEMPO 0309/0312 10020G30KT
TEMPO 0322/0404 4000 SHRA FEW008CB SCT020
BECMG 0400/0402 16010KT=

10-min mean wind at METAR reporting station

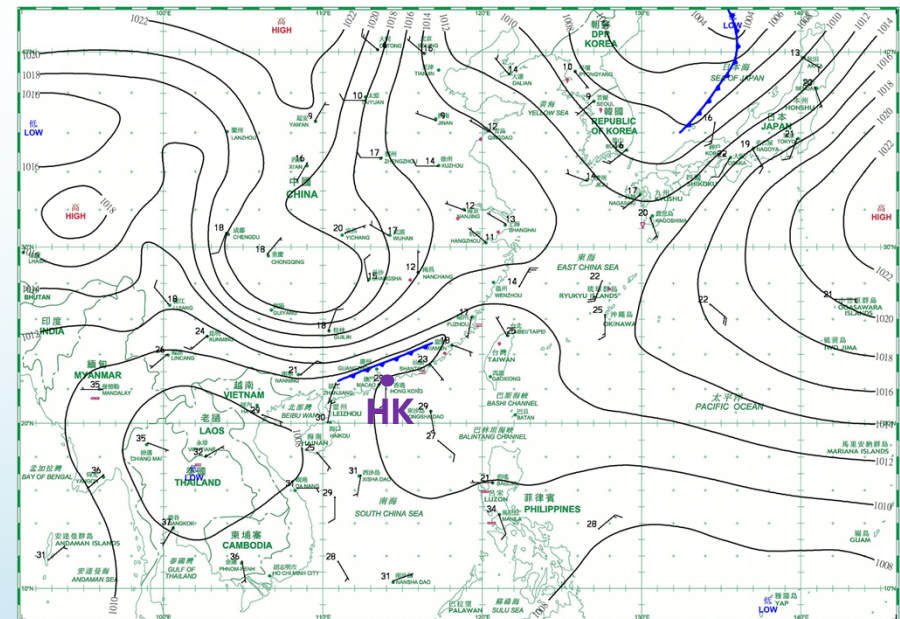


- TAF amendment criteria not met (change in wind direction of less than 60 degrees and a wind speed of less than 10 knots)
- **Additional TAF** at 08 UTC (TAF normally issued 1 hour before valid time) provided an opportunity for the forecaster to update TAF to **reflect higher wind speed in the near future** with respect to observations
- Higher wind speed → higher head wind → lower runway capacity (distance-based separation)
- Early indication of higher wind speed could assist ATFM's early decision making on the need to adjust runway capacity

Benefits – Example 3 (6 Apr 2023)

- A weak cold front developed over inland in the afternoon and would move across Hong Kong at night
- Bands of thundery showers developed along the cold front and **became more organized in the afternoon**
- The cold front moved across HKIA at 12 UTC, but convections weakened as well
- No thunderstorms were reported at HKIA

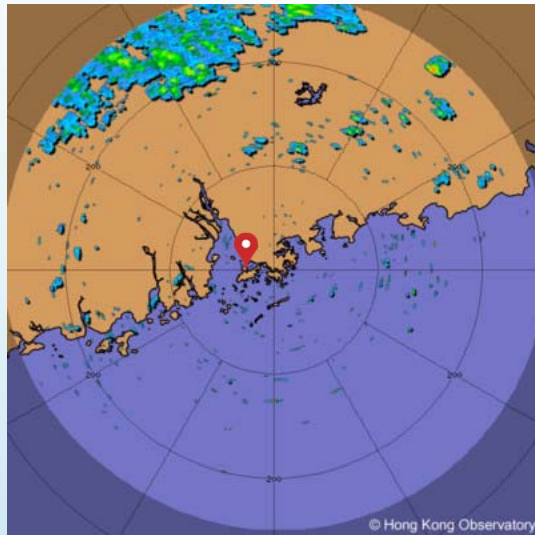
日期/Date: 06.04.2023 香港時間/HK Time: 14:00 香港天文台 Hong Kong Observatory



Surface chart at 06 UTC

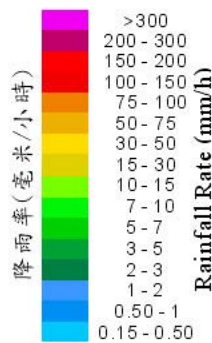
Benefits – Example 3 (6 Apr 2023)

0500 UTC



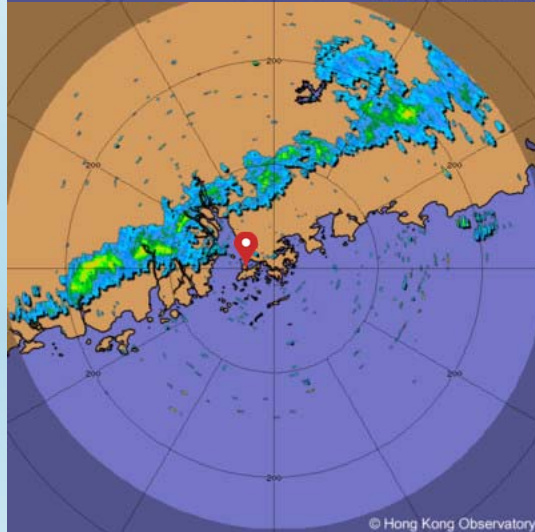
香港天文台
HONG KONG OBSERVATORY

13:00 HKT
06-04-2023



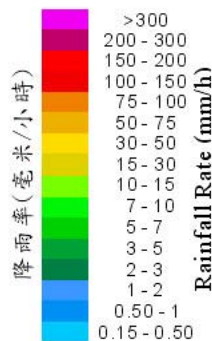
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1100 UTC



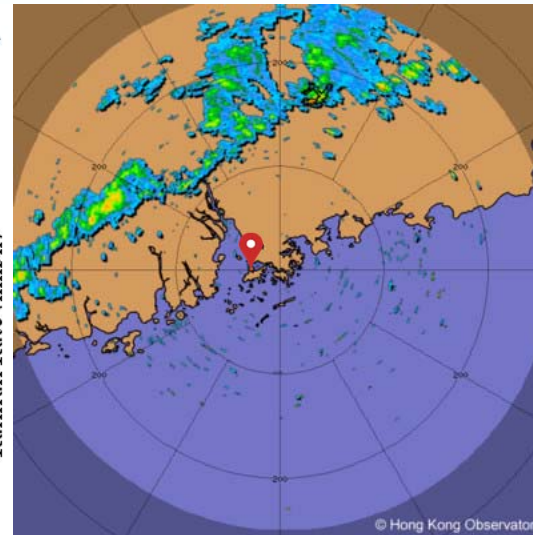
香港天文台
HONG KONG OBSERVATORY

19:00 HKT
06-04-2023



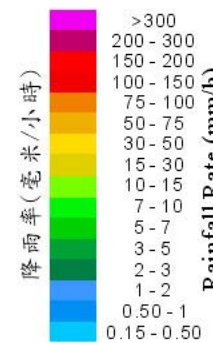
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0800 UTC



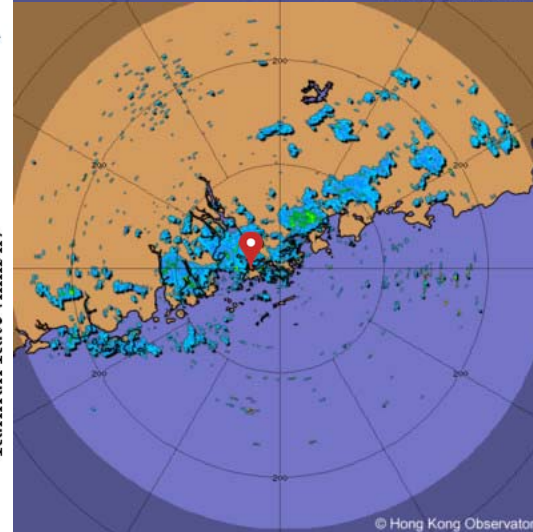
香港天文台
HONG KONG OBSERVATORY

16:00 HKT
06-04-2023



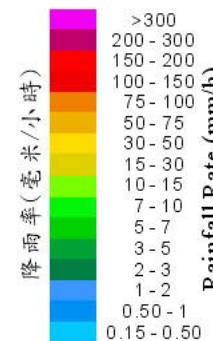
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1400 UTC



香港天文台
HONG KONG OBSERVATORY

22:00 HKT
06-04-2023



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Benefits – Example 3 (6 Apr 2023)

TAF issued at 05 UTC

TAF VHHH 060500Z 0606/0712 19010KT 9999 FEW010
SCT040 TX28/0606Z TX25/0706Z TN21/0623Z
TEMPO 0606/0609 4000 SHRA FEW008CB SCT015
TEMPO 0609/0614 3000 TSRA SHRA FEW008CB
SCT015
BECMG 0612/0614 02010KT
BECMG 0710/0712 08010KT=



TAF issued at 08 UTC

TAF VHHH 060800Z 0609/0715 19010KT 9999
FEW010 SCT040 TX26/0609Z TX25/0706Z
TN21/0623Z
TEMPO 0609/0614 **VRB15G25KT** 3000 TSRA SHRA
FEW008CB SCT015
BECMG 0612/0614 **36015KT**
BECMG 0710/0712 08010KT=

METAR VHHH 061100Z 22004KT 9999 FEW012 SCT040 27/22
Q1010 NOSIG=
METAR VHHH 061130Z 22006KT 9999 FEW012 SCT040 27/22
Q1010 NOSIG=
METAR VHHH **061200Z 32019KT** 9999 -SHRA FEW007 SCT022
24/21 Q1011 TEMPO 33015G25KT 4000 SHRA=
METAR VHHH 061230Z 32016KT 7000 -SHRA FEW005 SCT022
22/21 Q1012 RERA TEMPO 4000 SHRA=
METAR VHHH 061300Z 31013KT 8000 SHRA FEW005 SCT018
21/20 Q1012 RERA TEMPO 4000 SHRA=

METAR at 1100-1300 UTC

- Based on the development of convections, the TAF at 08 UTC **reflected possible risk** that a **squall line** might develop and affect the aerodrome with significant gusts
- Winds actually freshened during the passage of the front while the convections weakened
- Northwesterly winds gave rise to **crosswinds** at VHHH

Thank you