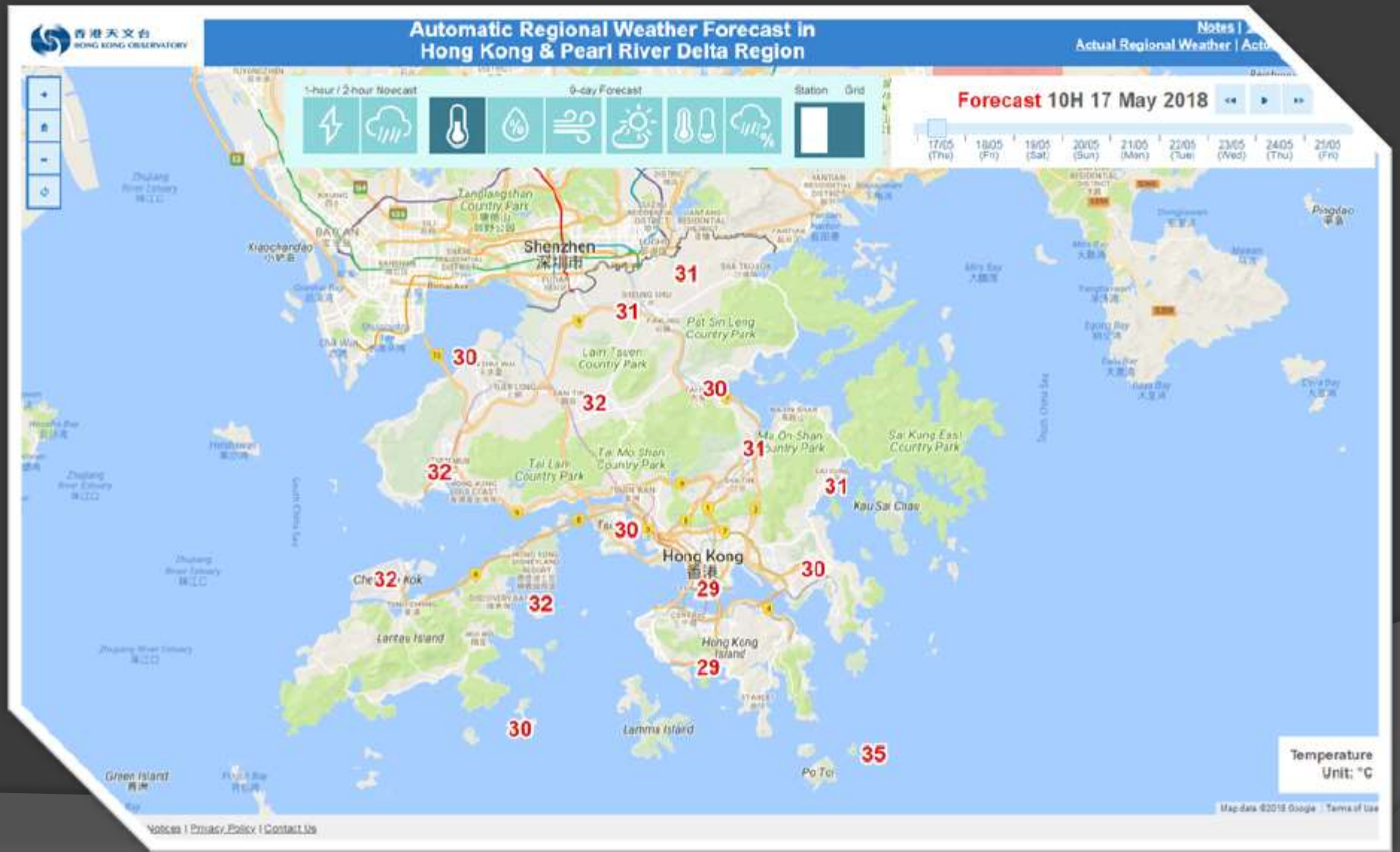
香港天文台
HONG KONG OBSERVATORY

13 October 2018

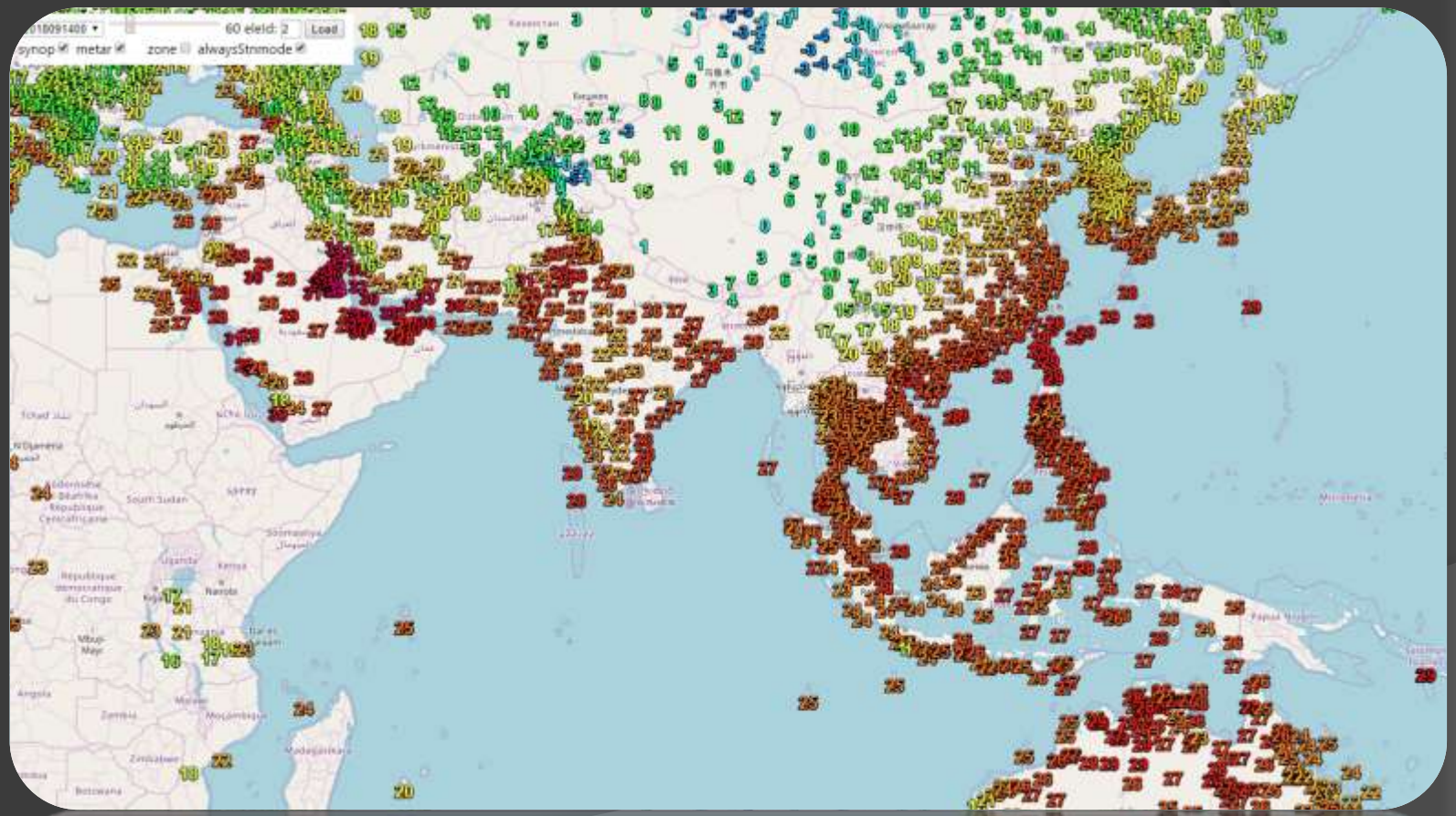
WEATHER SUPPORTING SMART AIRPORT
氣象服務@智能機場

Location Specific Weather Forecast
定點天氣預報

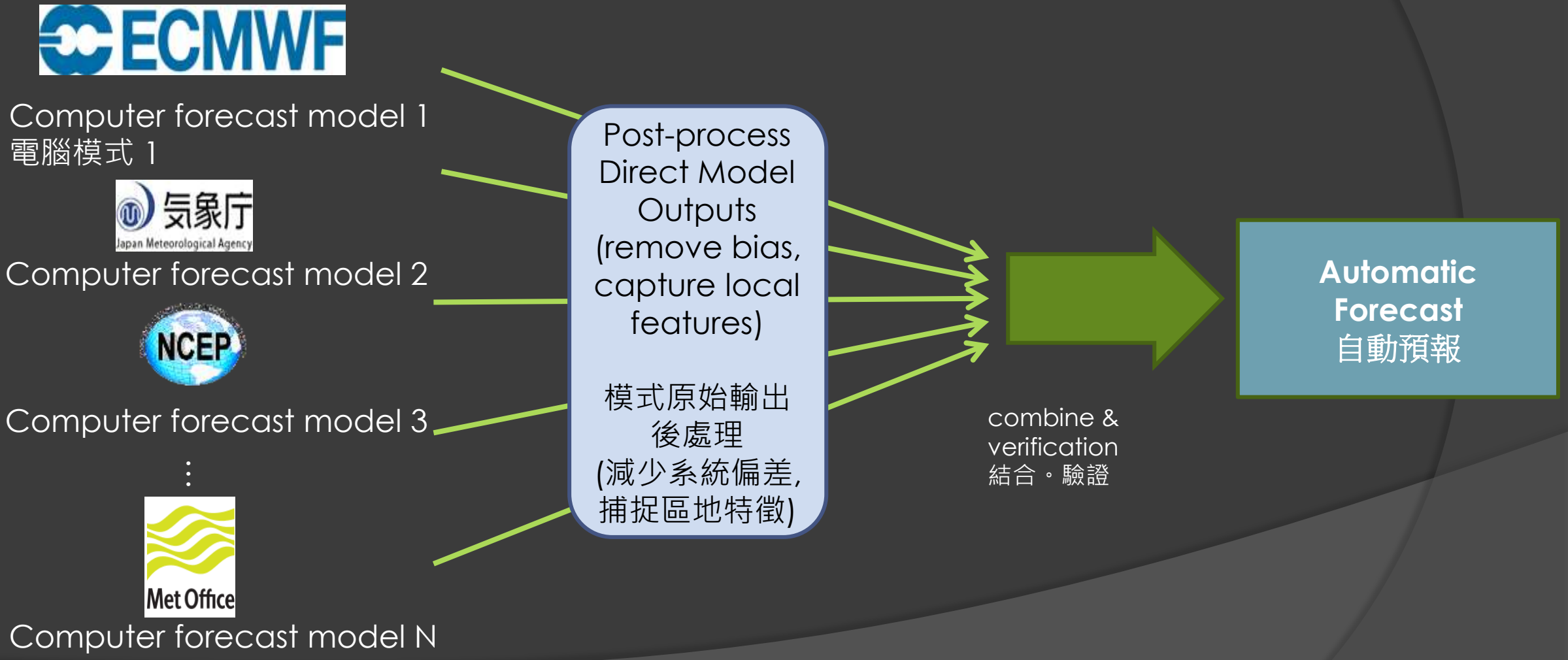
HKO Digital Forecast Service to Public
天文台　公眾數碼分區自動天氣預報



Extending Automatic Weather Forecast to Major Airports and Popular Destinations Worldwide
自動預報產品擴展至全球主要城市及機場

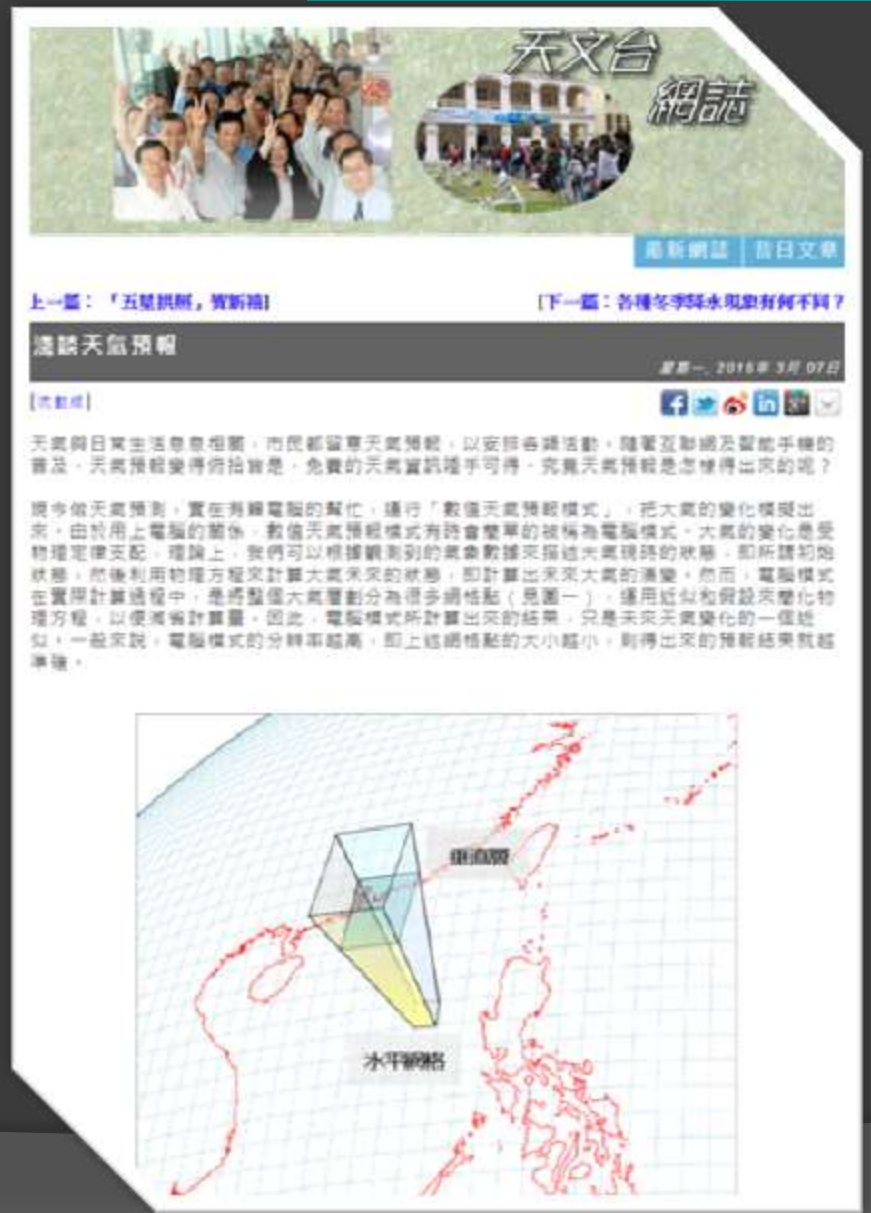


Principles 操作原理



淺談天氣預報

http://www.hko.gov.hk/blog/b5/archives/0000018



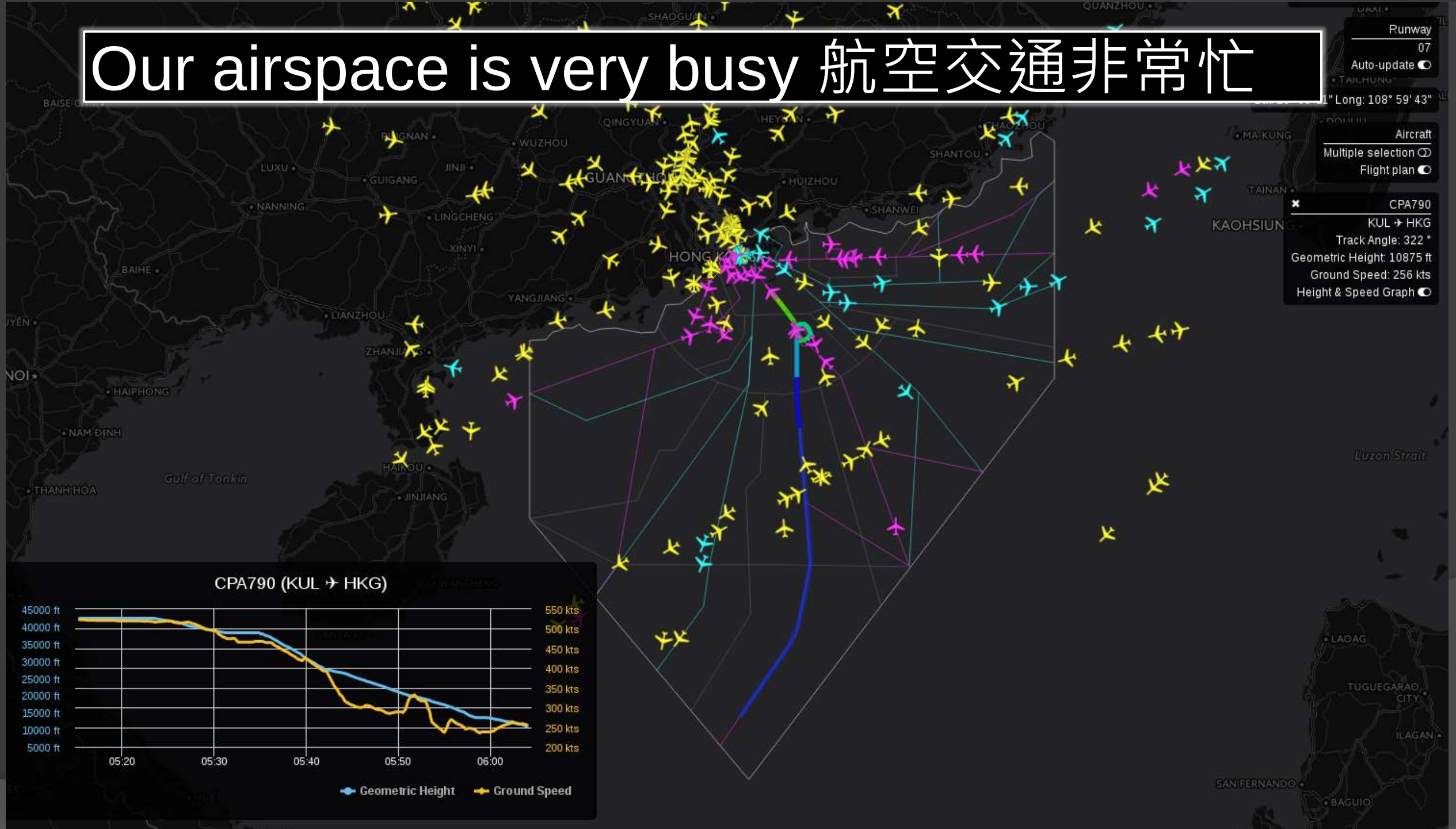
集合預報的概念

1
EXIT

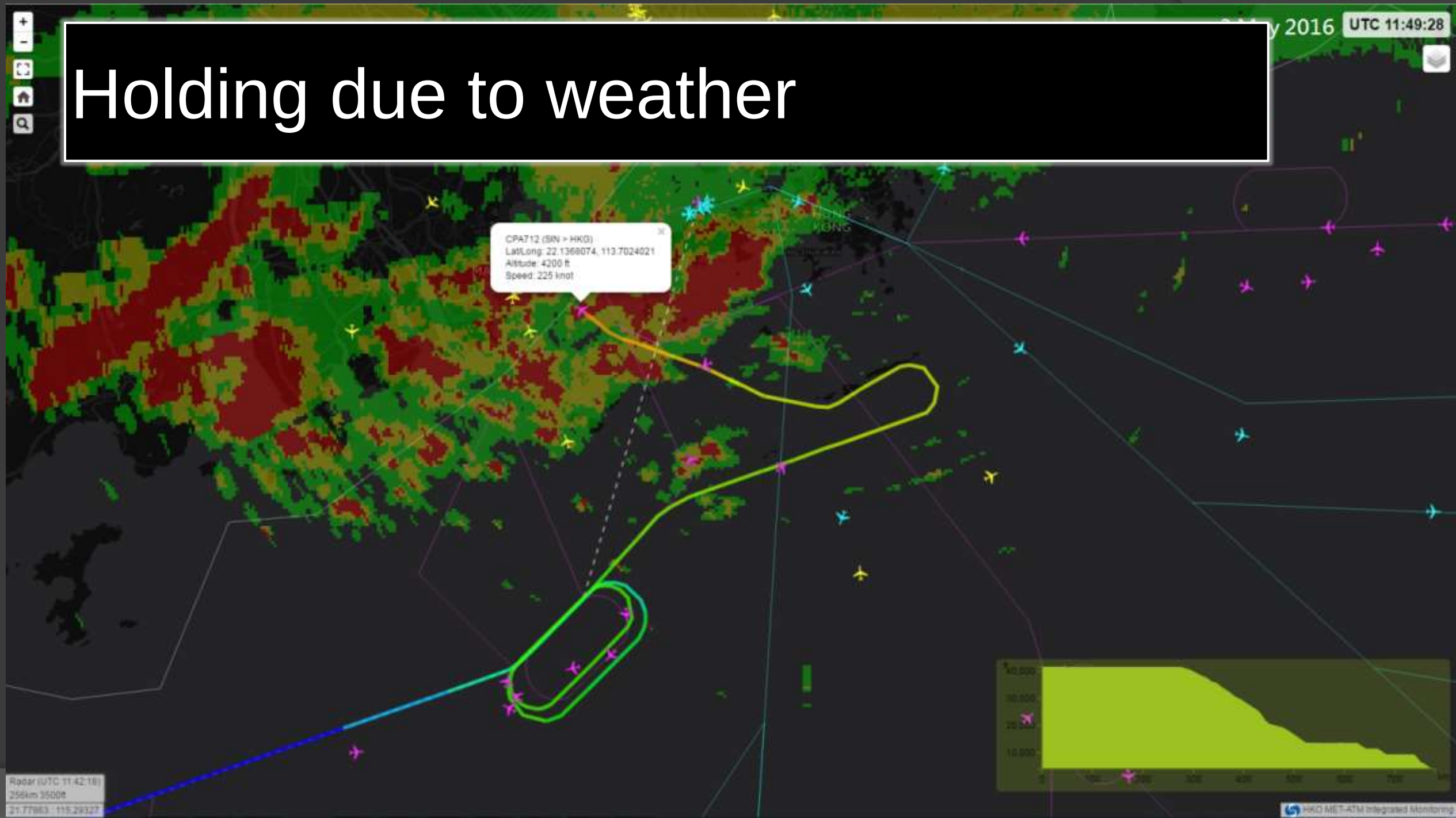
AIR TRAFFIC FLOW CONTROL AND MANAGEMET
空中交通流量管理

© xiongyi

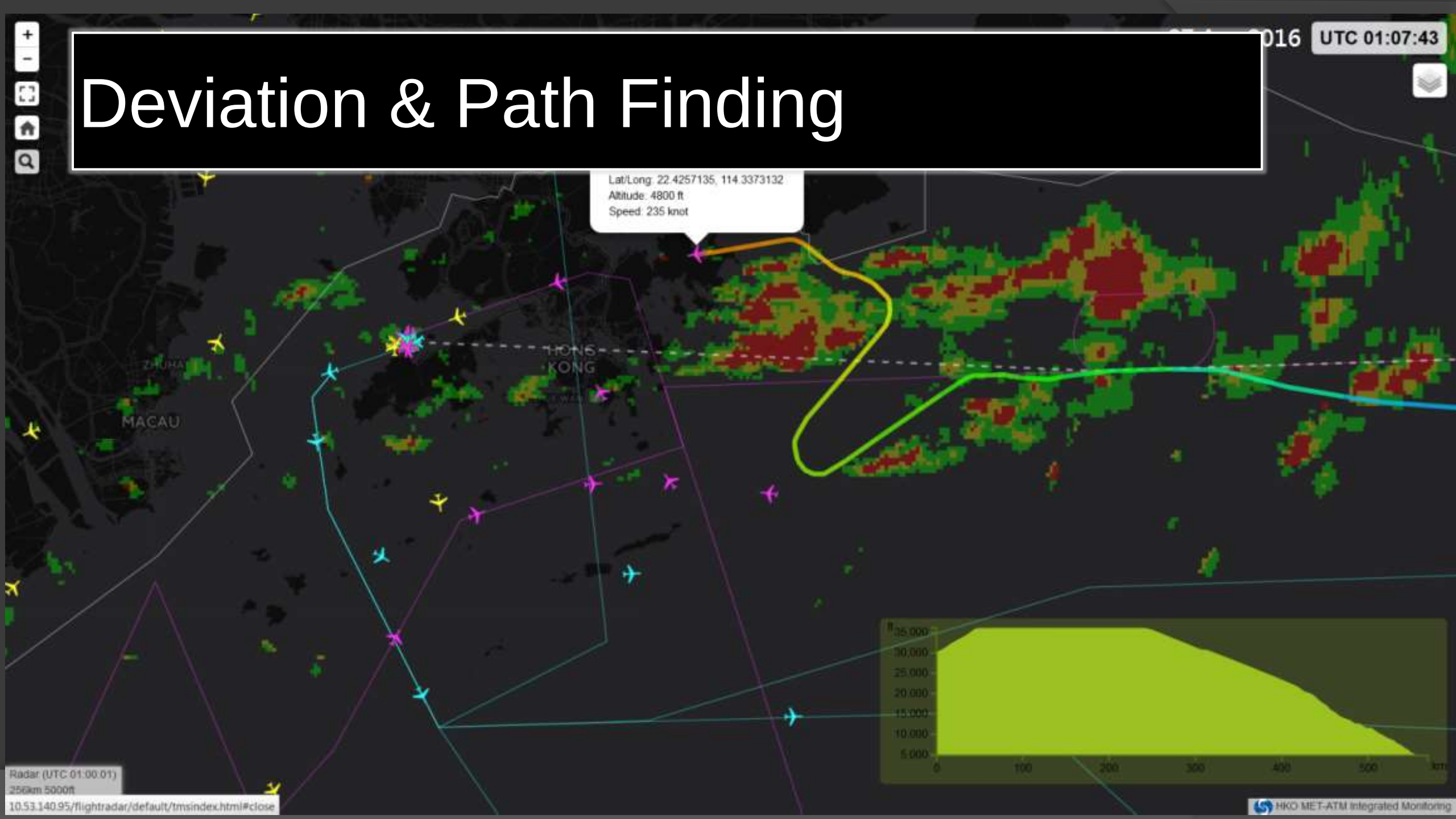
Our airspace is very busy 航空交通非常忙



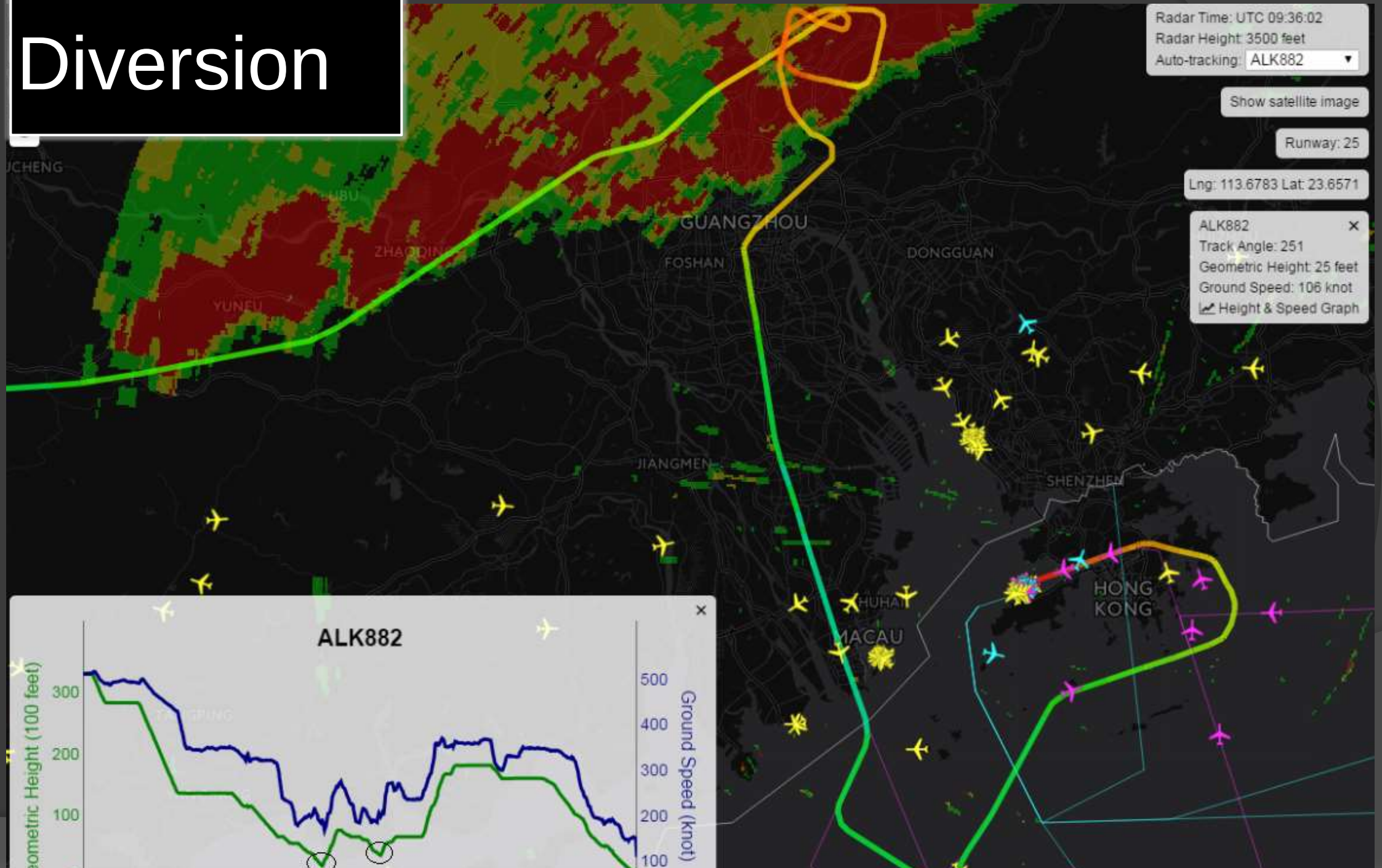
Holding due to weather



Deviation & Path Finding



Diversion

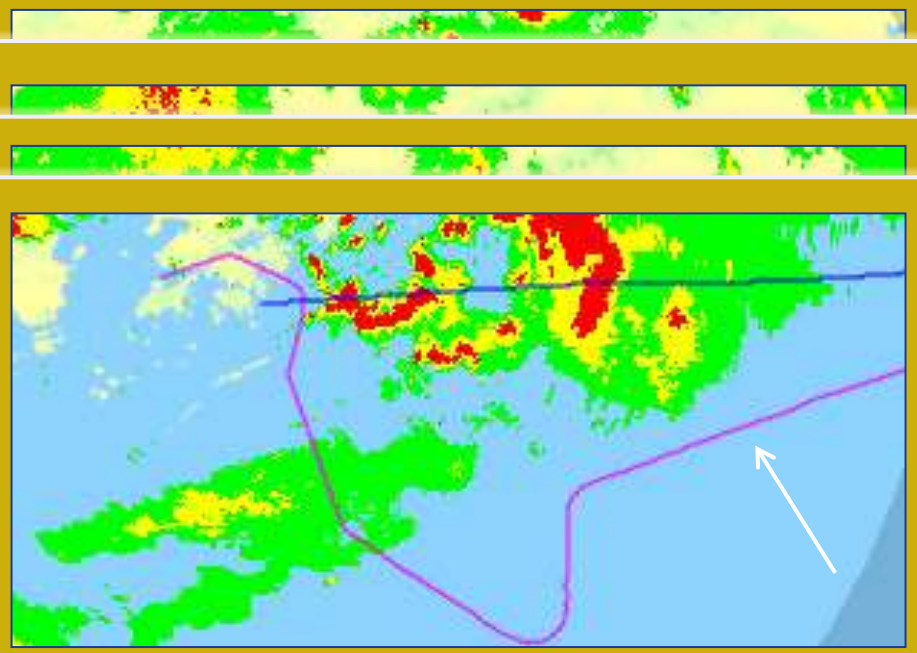

Radar Time: UTC 09:36:02
Radar Height: 3500 feet
Auto-tracking: ALK882
Show satellite image
Runway: 25
Lng: 113.6783 Lat: 23.6571
ALK882
Track Angle: 251
Geometric Height: 25 feet
Ground Speed: 106 knot
Height & Speed Graph
GUANGZHOU
FOSHAN
DONGGUAN
JIANGMEN
SHENZHEN
ZHUHAI
MACAU
HONG KONG
ALK882
Geometric Height (100 feet)
Ground Speed (knot)
300
200
100
500
400
300
200
100

WEATHER AVOIDANCE
天氣繞避

Weather Avoidance Decision

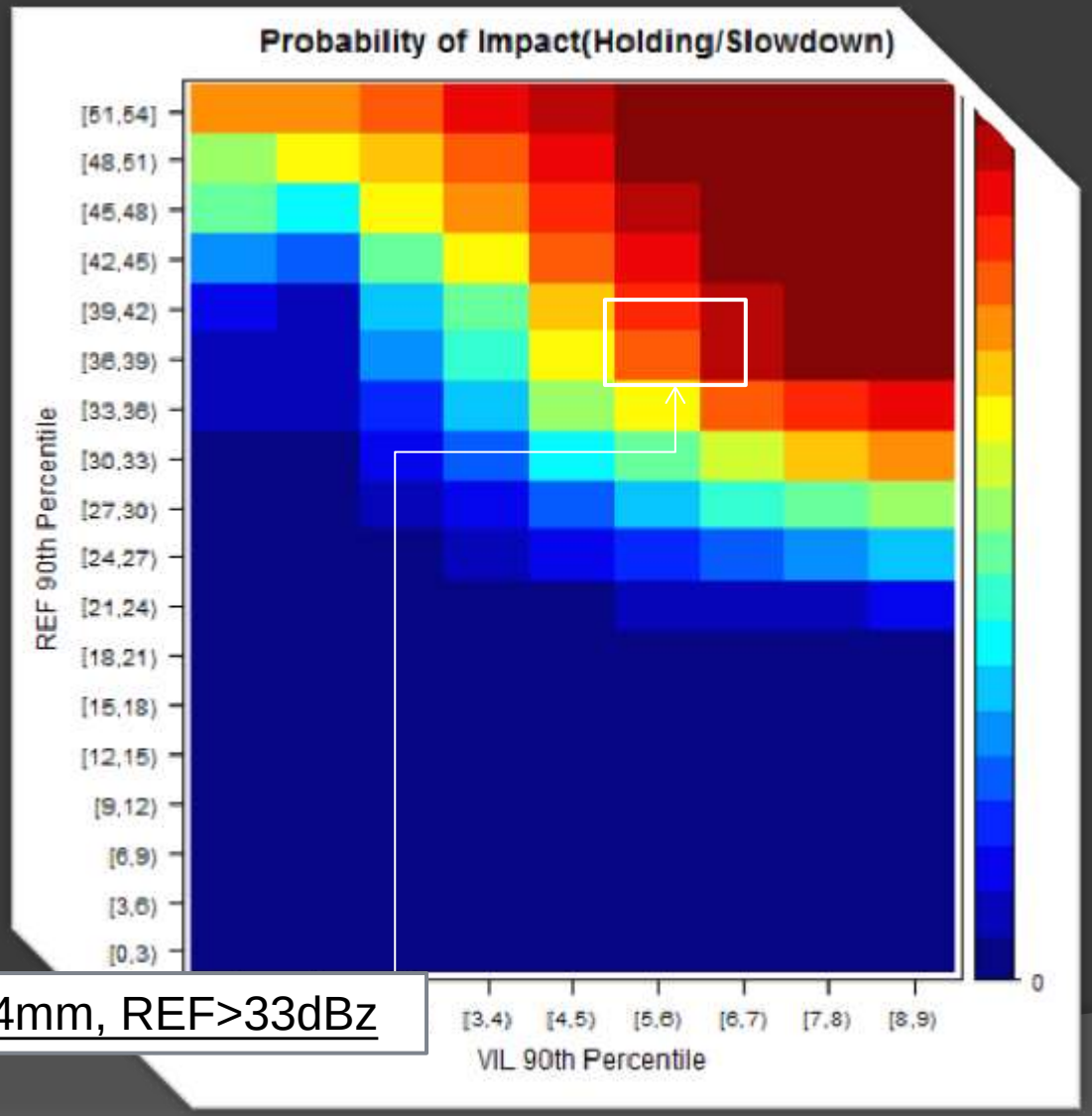
Weather Avoidance Decision

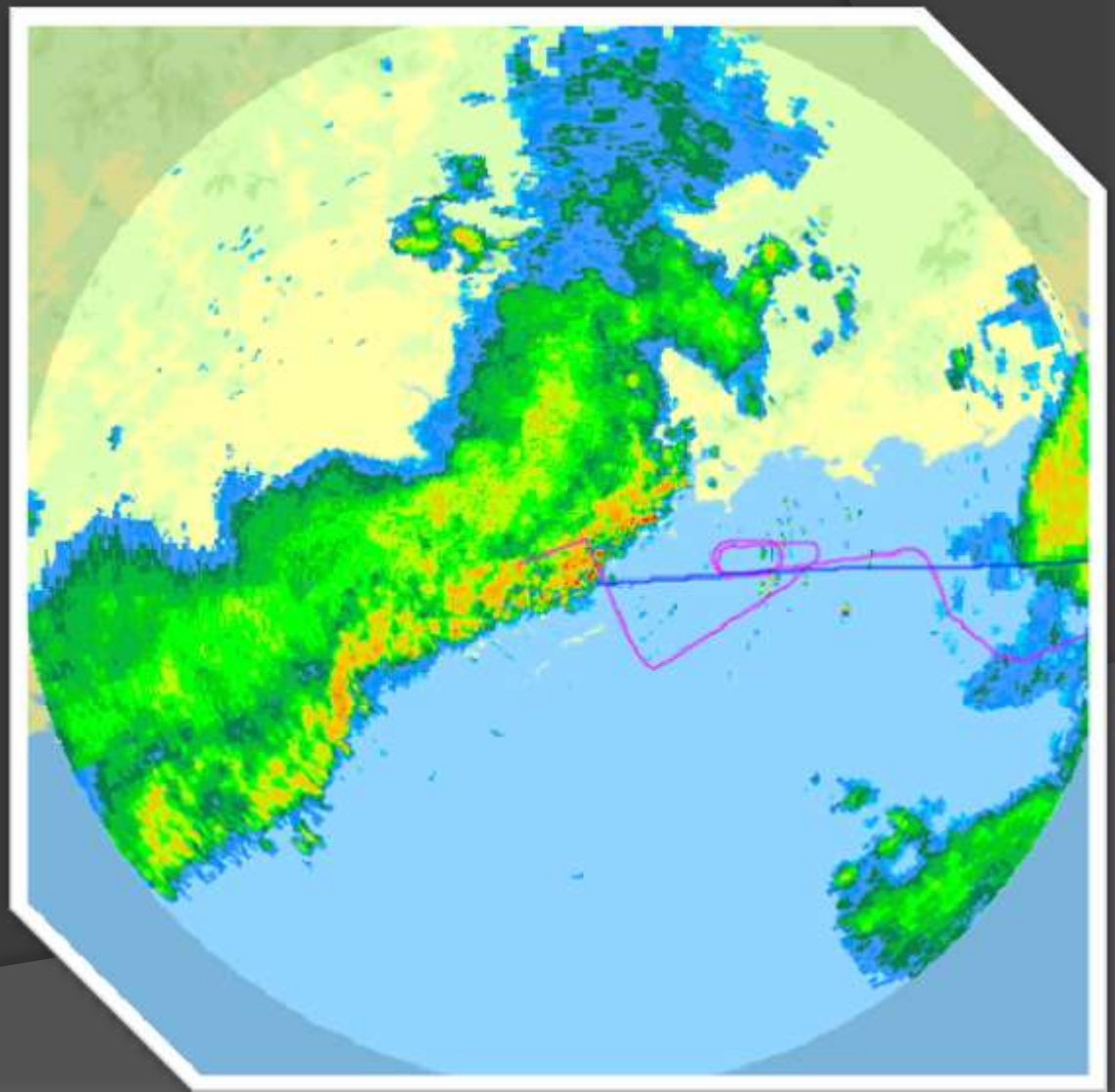
- Holding
- Slowdown
- Missed Approach
- Deviation & Path-Finding



Avoid the storm along the planned path
Find another acceptable flight path and gap between convection

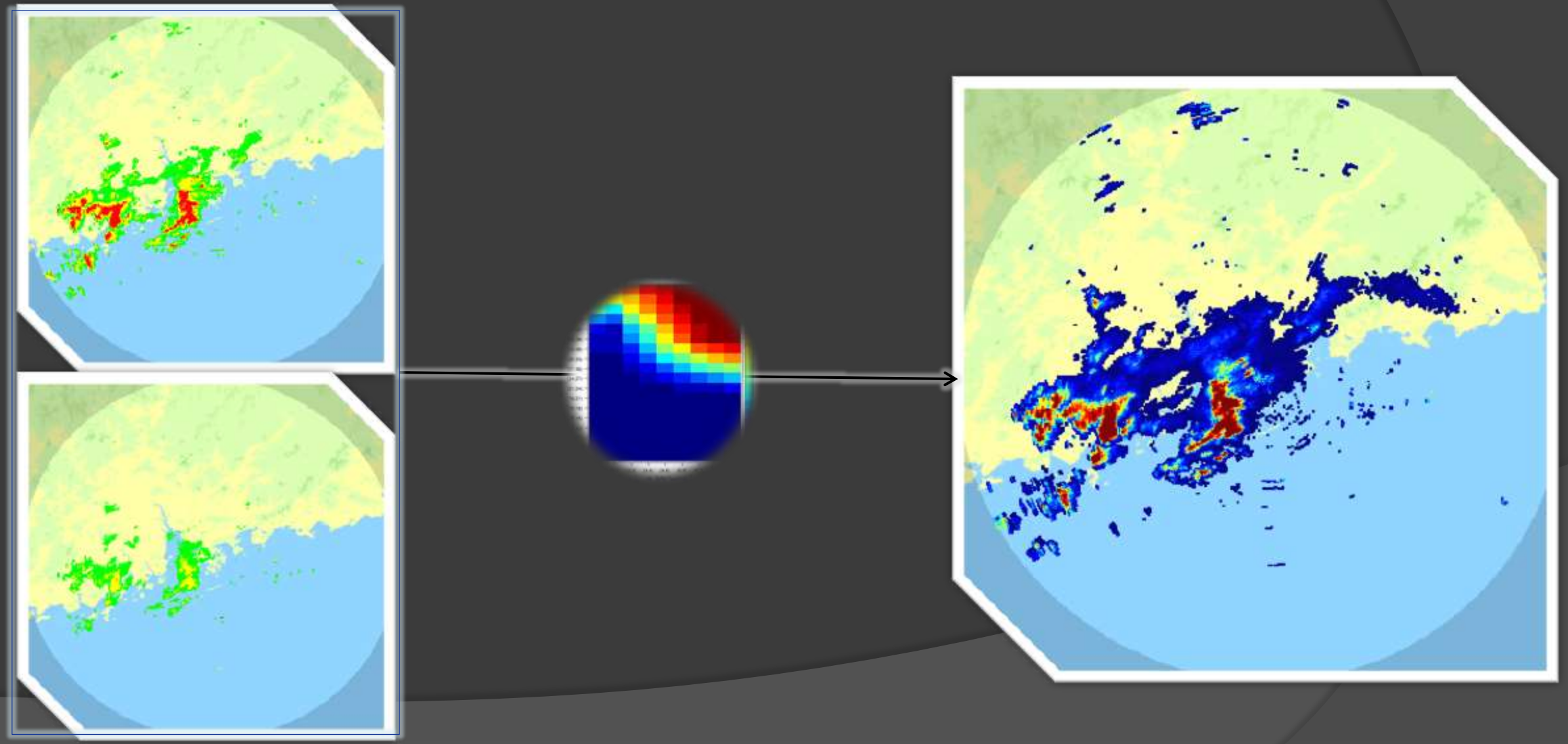
Probability of avoidance action
繞避天氣的機率





VIL>4mm, REF>33dBz

Impact to air space capacity
天氣對空域的影響



AIRPORT ACCEPTANCE RATE (AAR)
機場抵達率

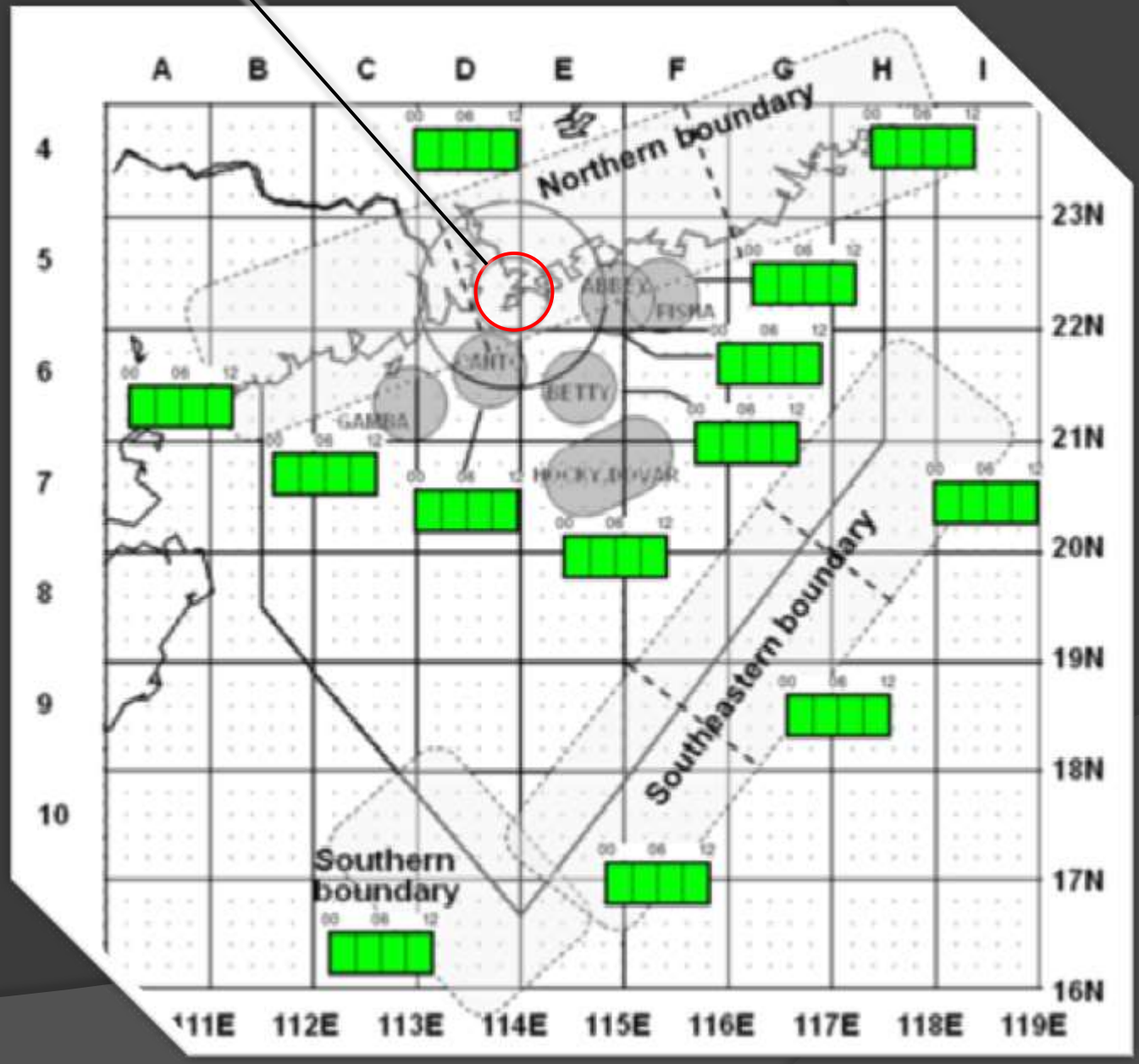
3 Major Feeds 三個主要入口

20nm of ARP

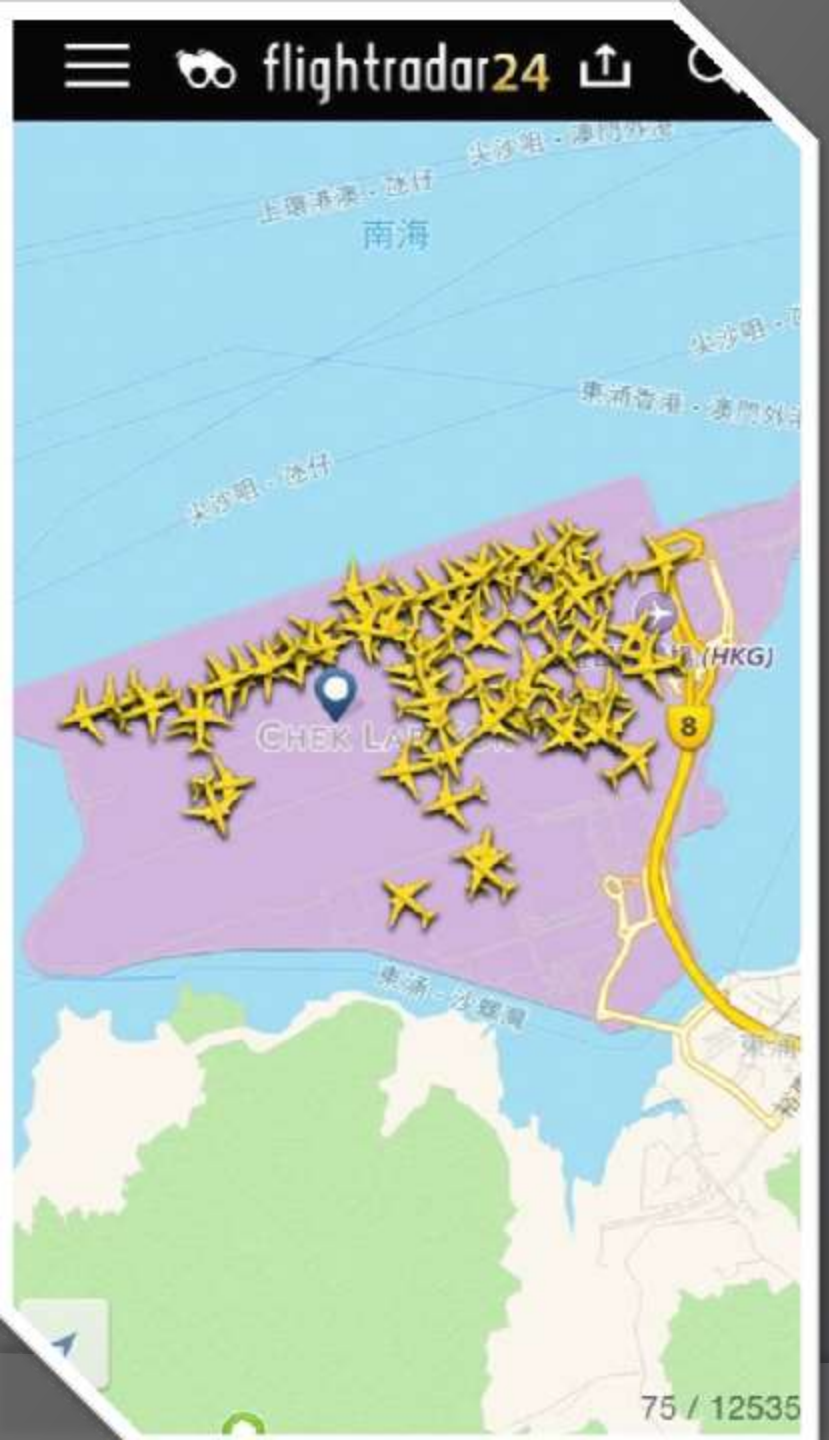
TS/CB forecast for adjacent areas

UTC	13	14	15	16-18
20nm of ARP				
ABBEY				
BETTY				
CANTO				

Prepared at 1300UTC



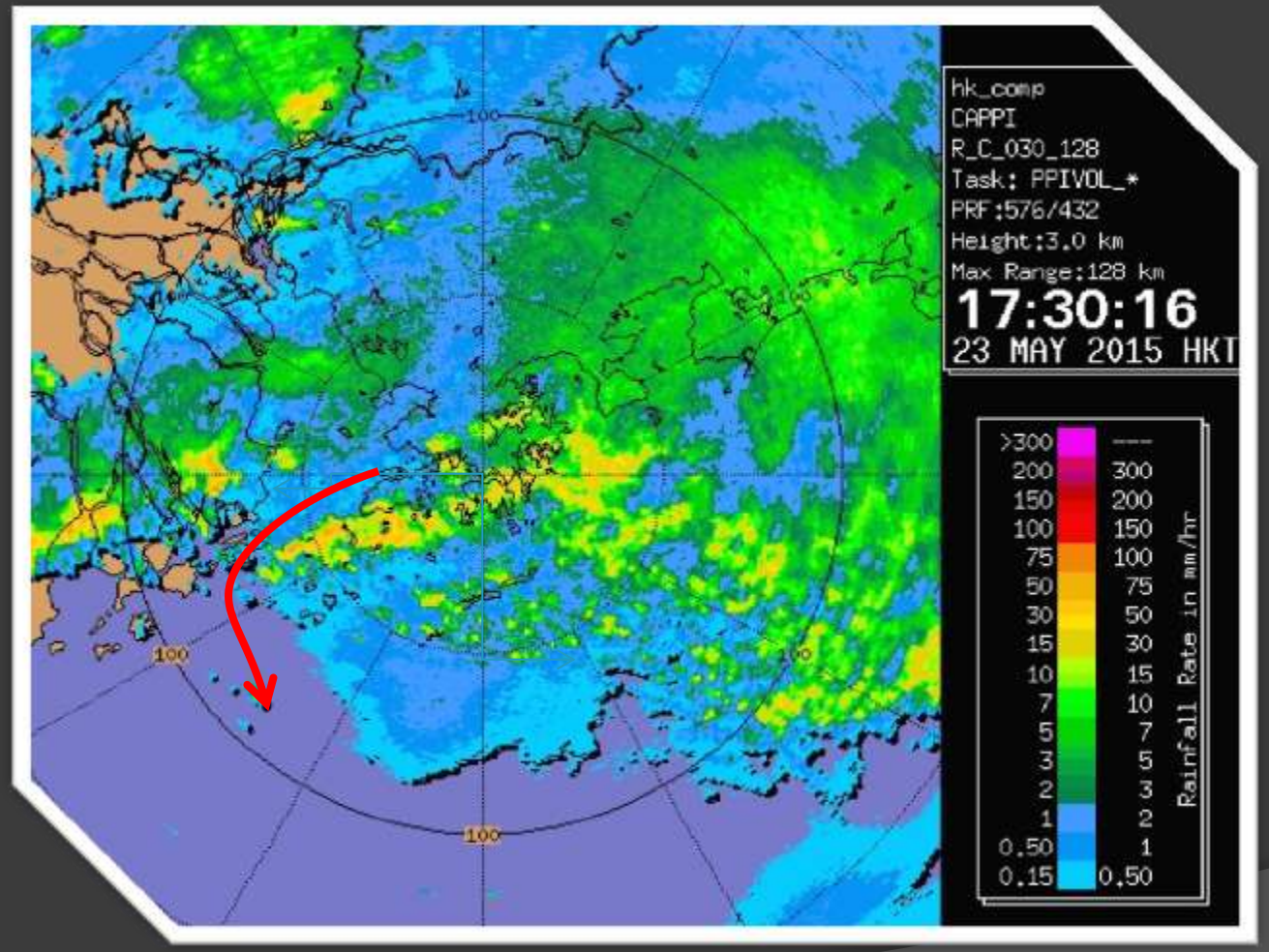
AIRPORT DEPARTURE RATE (ADR)
機場出發率



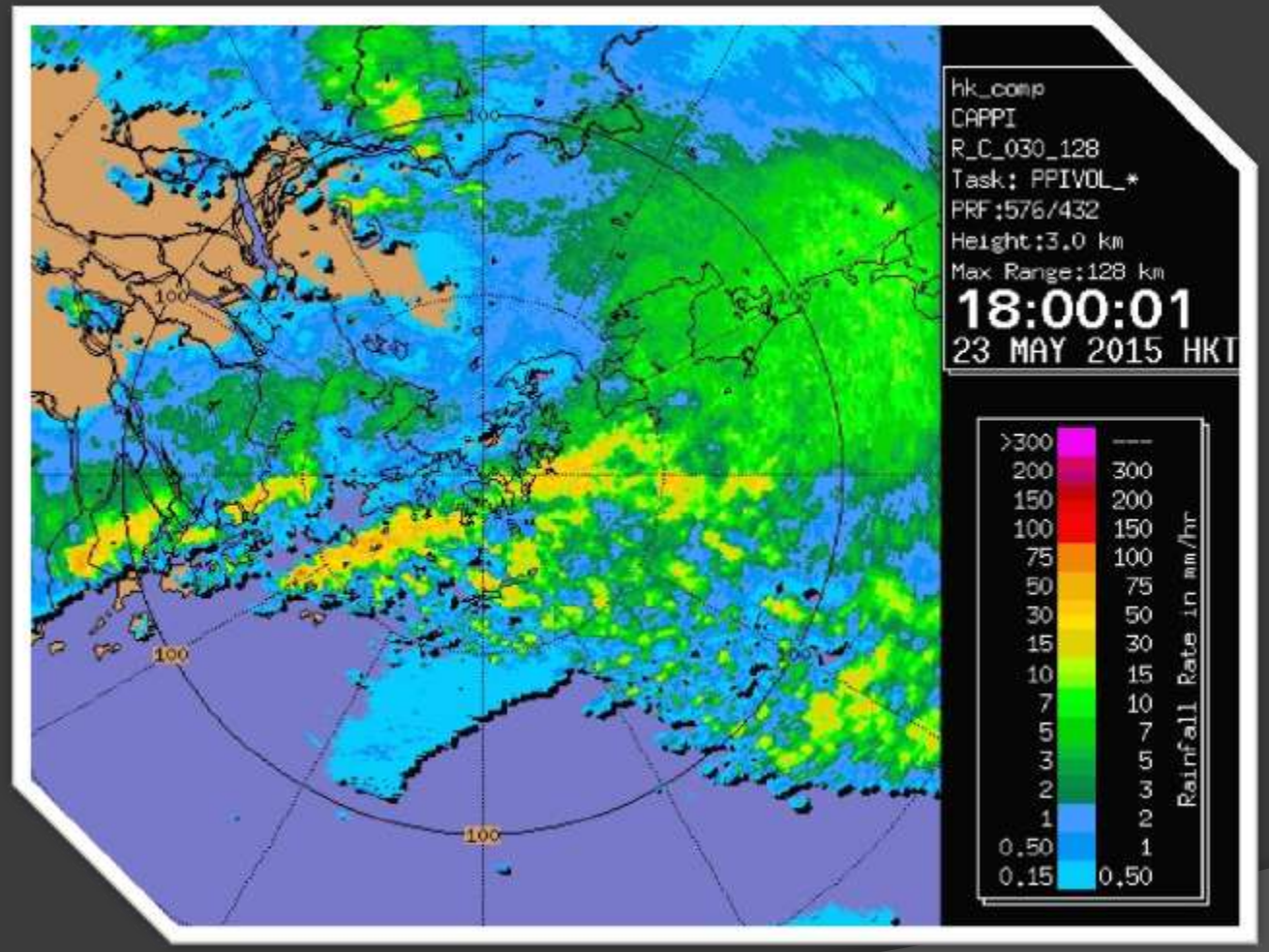
- Apron parking was full from 1800 to 0500 the next day.
- 178 arrived flights held on taxiway
- Waiting 2 hours and 32 minutes at most

A Major Disruption to airport on 23 May 2015
機場大擠塞

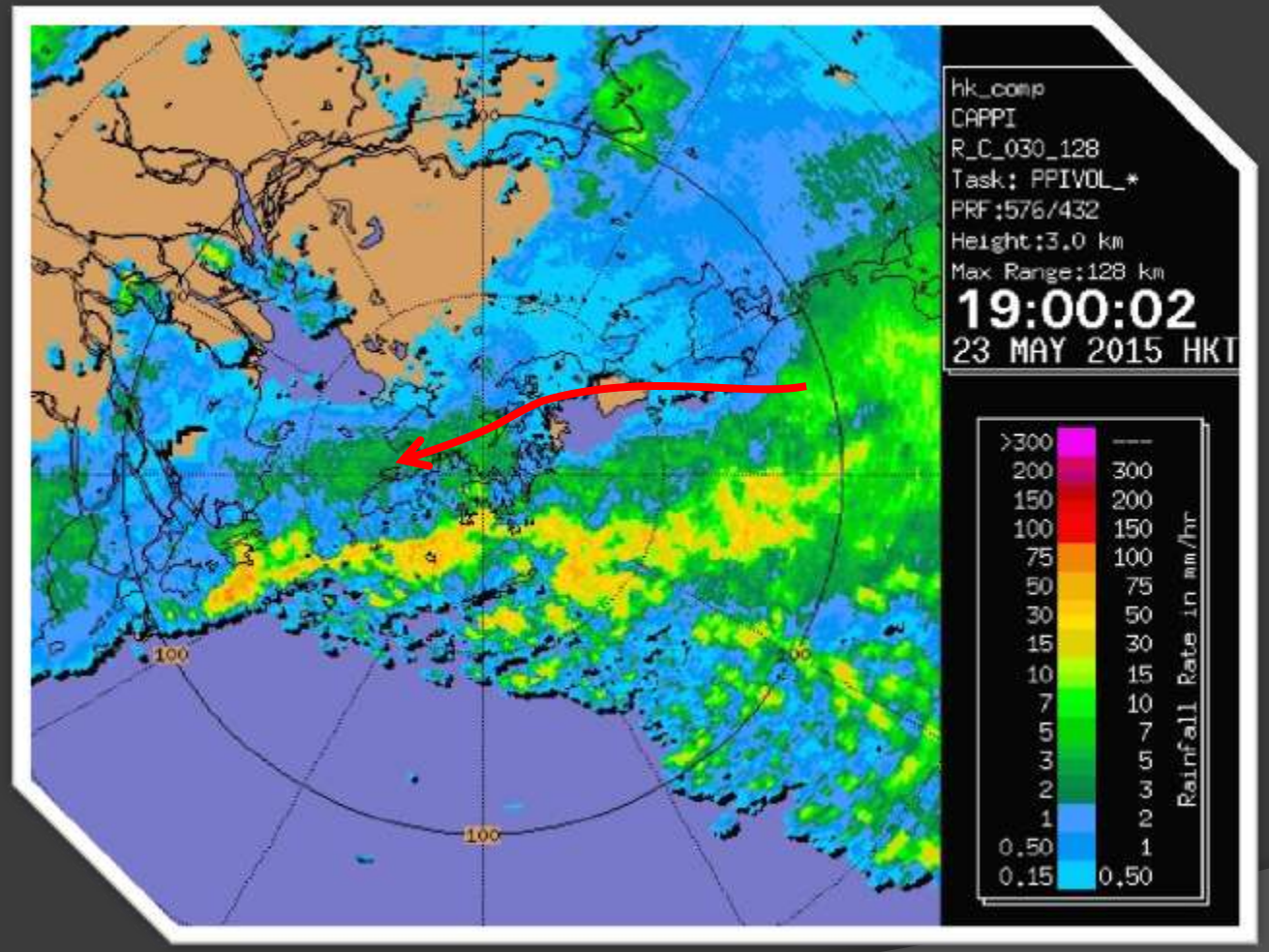
Trouble with Outgoing flights

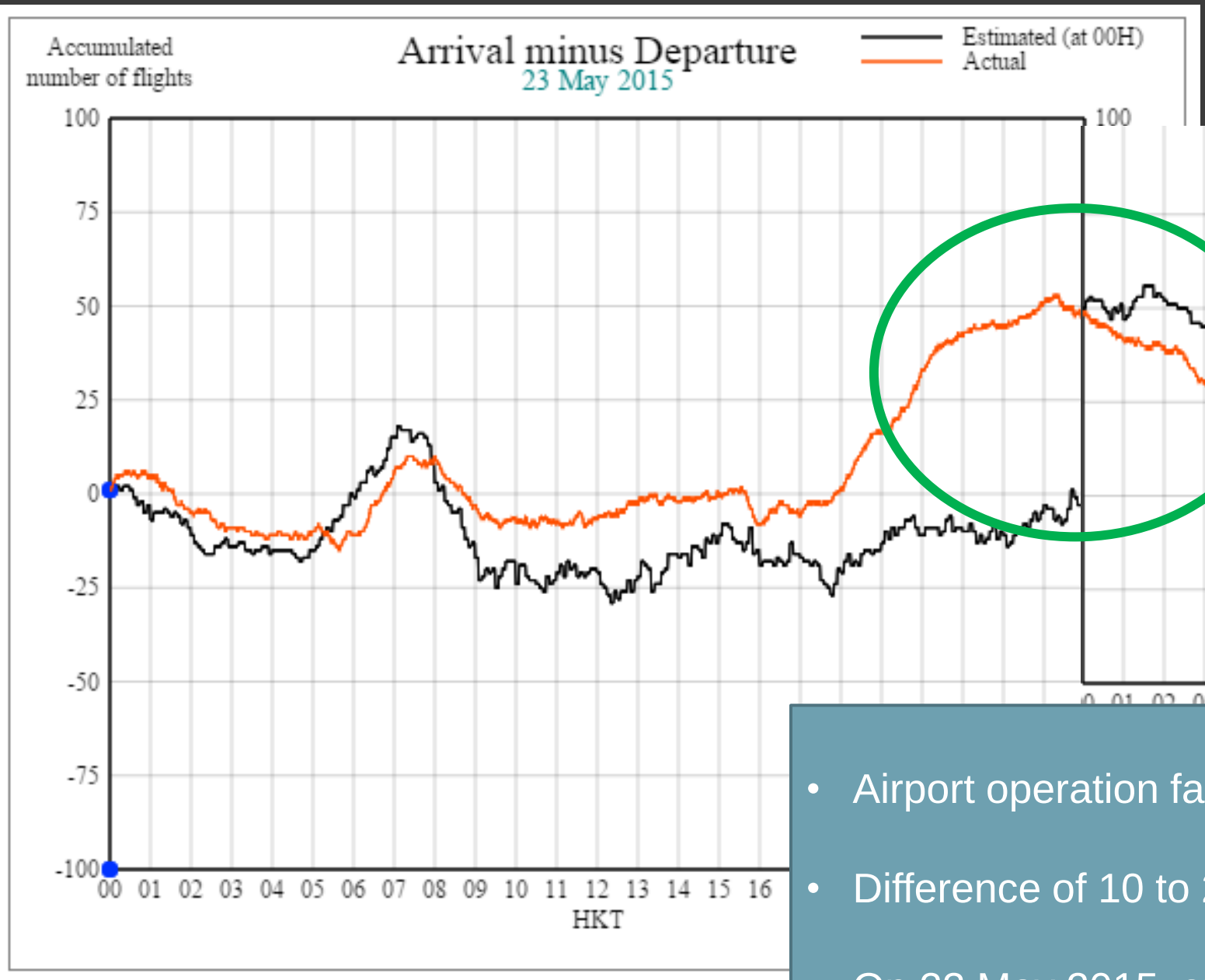


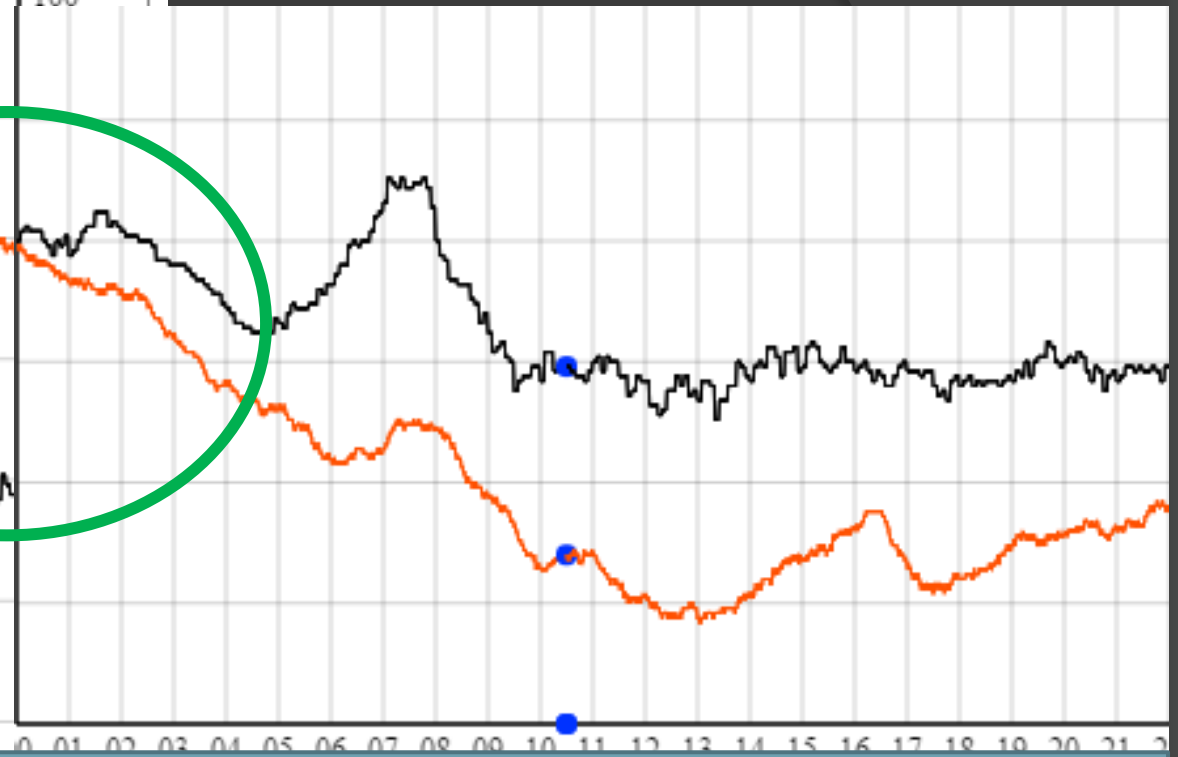
18:00H


hk_comp
CAPPI
R_C_030_128
Task: PPIVOL_*
PRF:576/432
Height:3.0 km
Max Range:128 km
18:00:01
23 MAY 2015 HKT
>300
200
150
100
75
50
30
15
10
7
5
3
2
1
0.50
0.15
300
200
150
100
75
50
30
15
10
7
5
3
2
1
0.50
Rainfall Rate in mm/hr
100
100
100
100

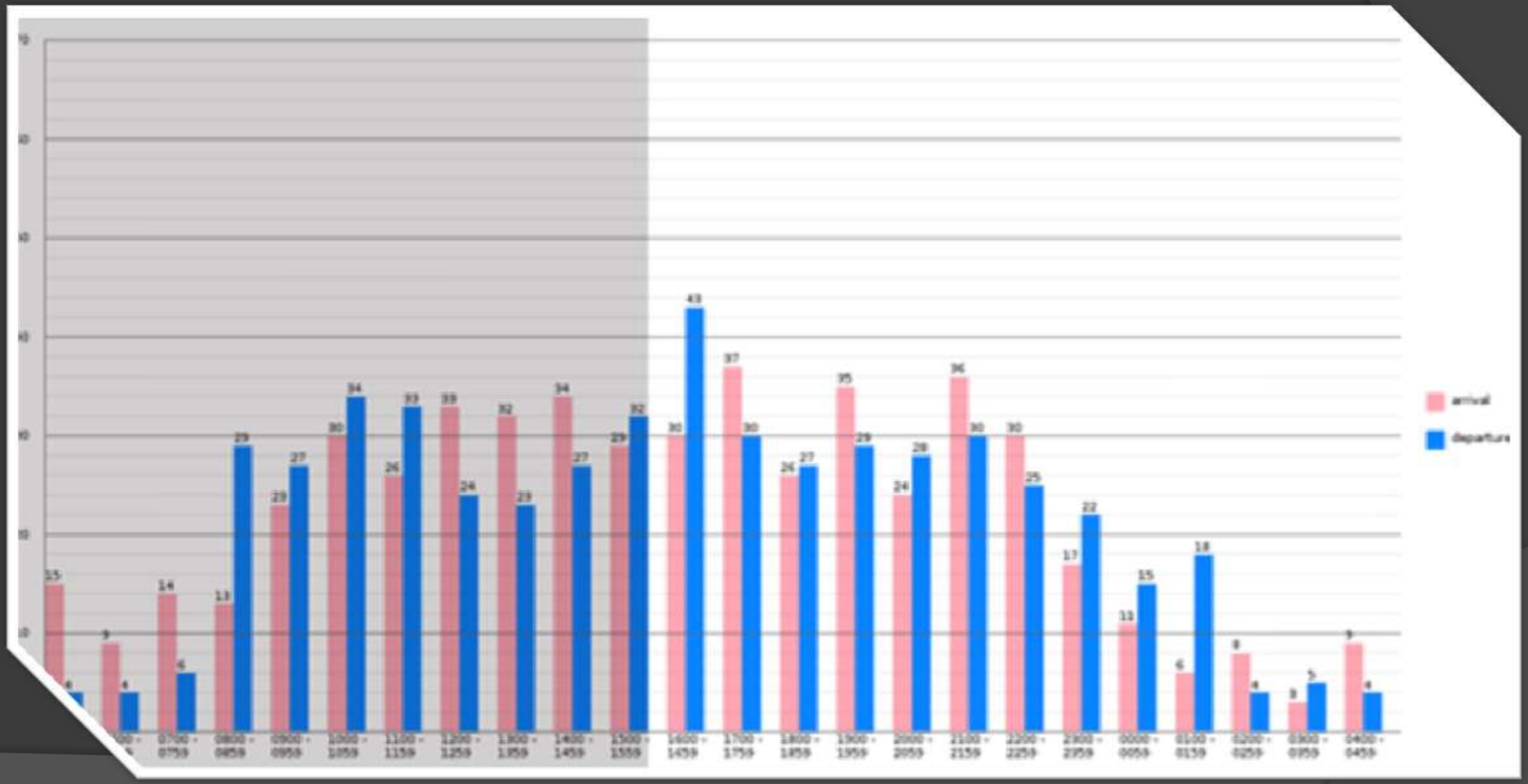
19:00H


hk_comp
CAPPI
R_C_030_128
Task: PPIVOL_*
PRF:576/432
Height:3.0 km
Max Range:128 km
19:00:02
23 MAY 2015 HKT
>300
200
150
100
75
50
30
15
10
7
5
3
2
1
0.50
0.15
300
200
150
100
75
50
30
15
10
7
5
3
2
1
0.50
Rainfall Rate in mm/hr
100
100

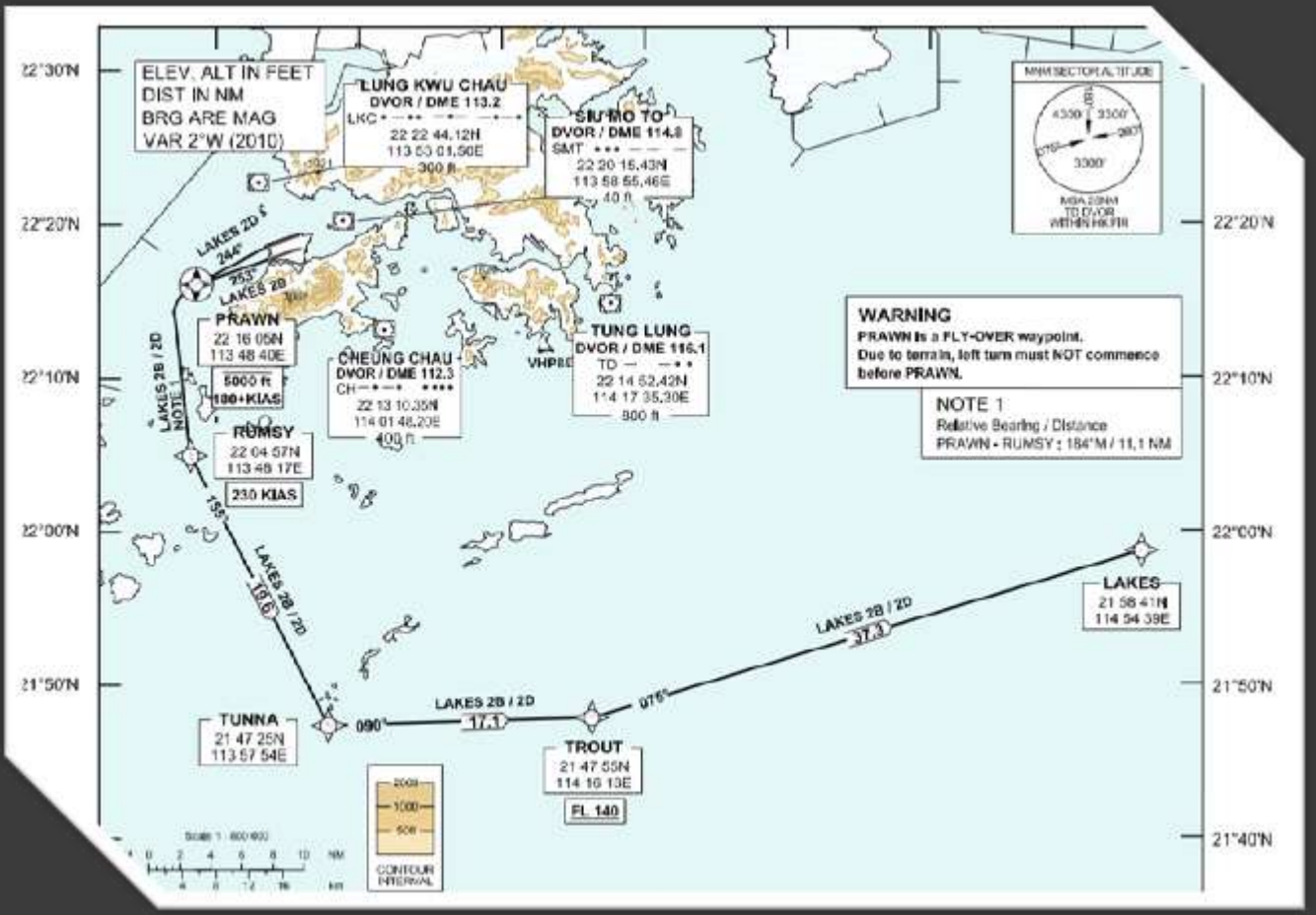




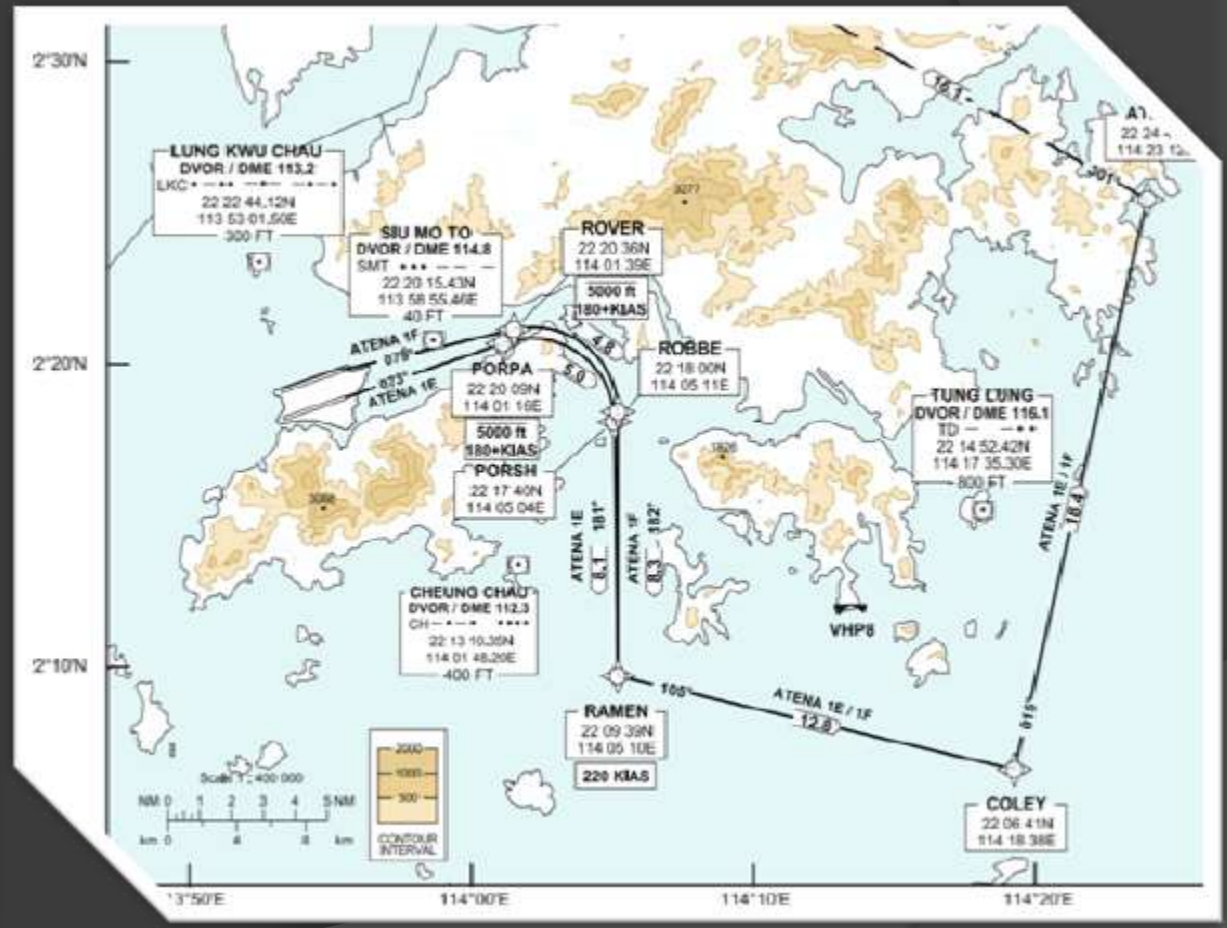
- Airport operation faces problem when Departure << Arrival
- Difference of 10 to 20 is OK in general
- On 23 May 2015, surplus was over 40 for consecutive hours

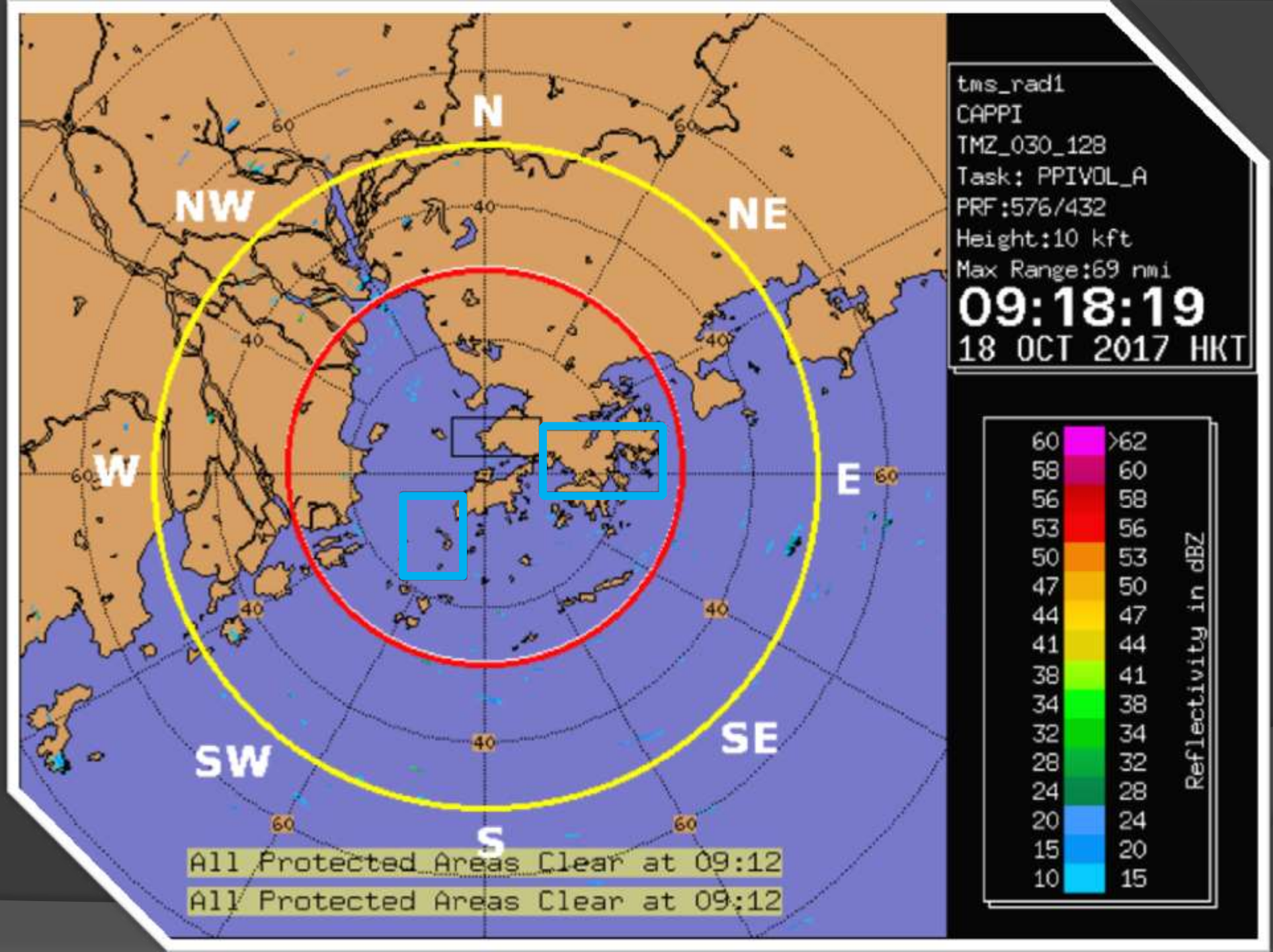

arrival
departure
15
6
9
4
14
6
13
29
23
27
30
34
26
33
33
24
32
29
34
27
29
32
30
43
37
30
26
27
35
29
24
28
36
30
30
25
17
22
11
15
6
18
8
4
3
5
9
4
0700 - 0759
0800 - 0859
0900 - 0959
1000 - 1059
1100 - 1159
1200 - 1259
1300 - 1359
1400 - 1459
1500 - 1559
1600 - 1659
1700 - 1759
1800 - 1859
1900 - 1959
2000 - 2059
2100 - 2159
2200 - 2259
2300 - 2359
0000 - 0059
0100 - 0159
0200 - 0259
0300 - 0359
0400 - 0459

RWY 25 departure

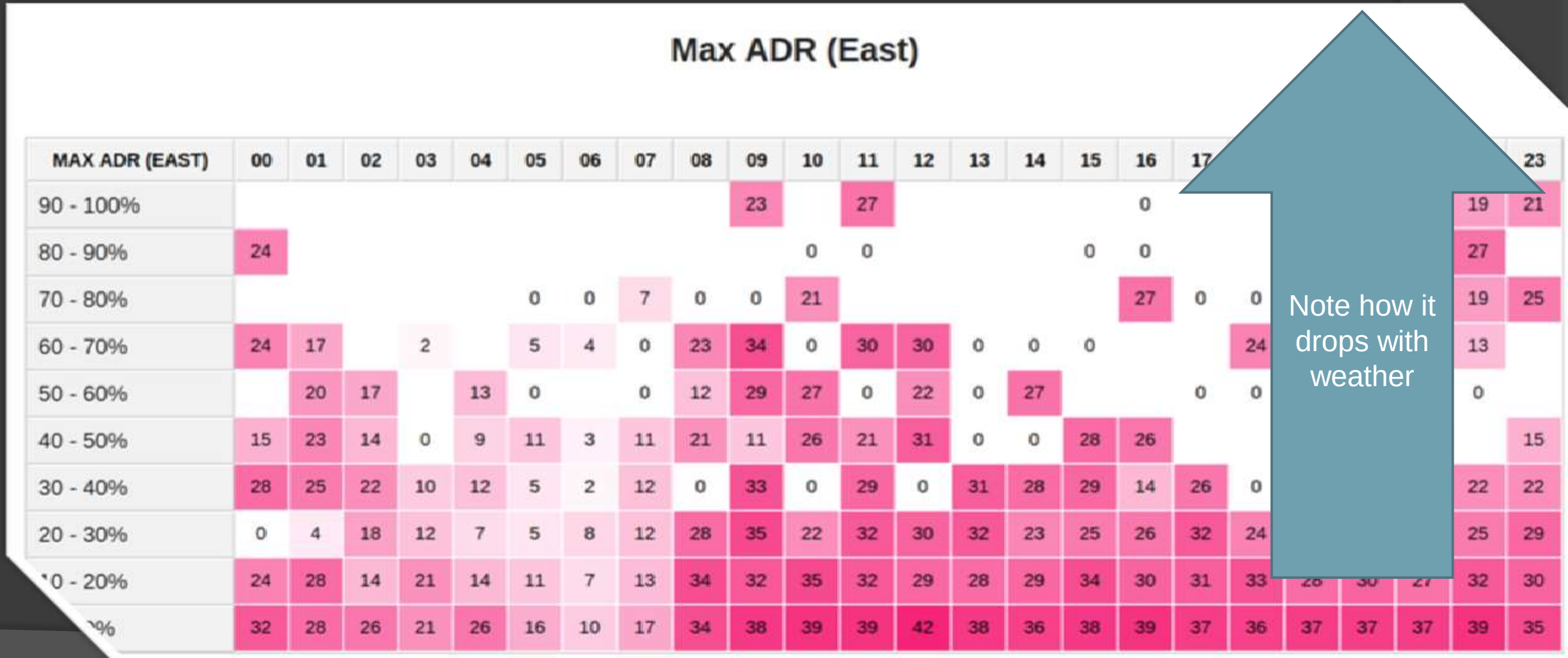


RWY 07 departure



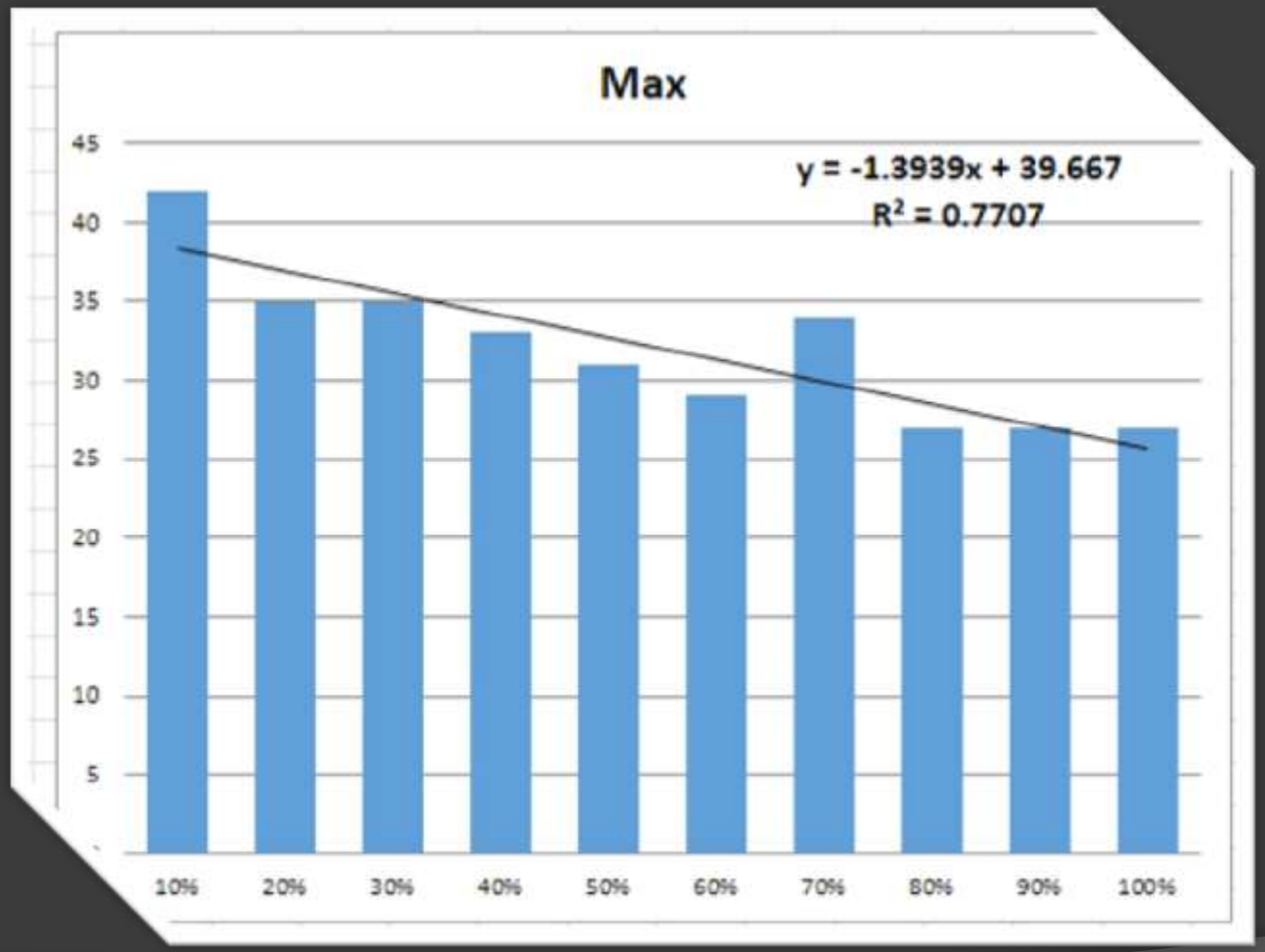

tms_rad1
CAPPI
TMZ_030_128
Task: PPIVOL_A
PRF:576/432
Height:10 kft
Max Range:69 nmi
09:18:19
18 OCT 2017 HKT
N
NE
E
SE
S
SW
W
NW
60
40
All Protected Areas Clear at 09:12
All Protected Areas Clear at 09:12
60 >62
58 60
56 58
53 56
50 53
47 50
44 47
41 44
38 41
34 38
32 34
28 32
24 28
20 24
15 20
10 15
Reflectivity in dBZ

Maximum Departure Rate revealed some Dependence to Weather over Departure Corridors



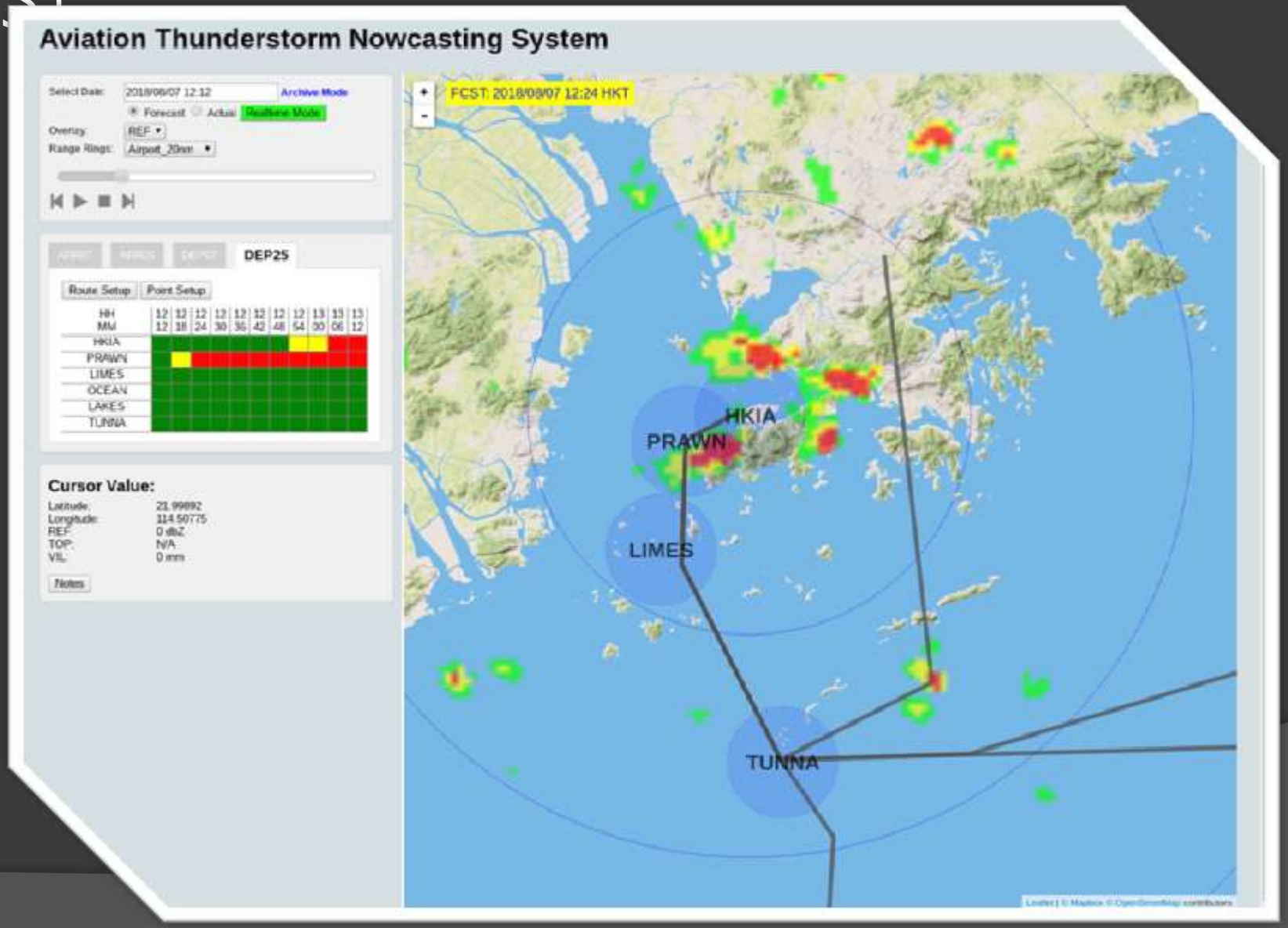
MAX ADR (EAST)	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17					23
90 - 100%										23		27					0					19	21
80 - 90%	24										0	0				0	0					27	
70 - 80%						0	0	7	0	0	21						27	0	0			19	25
60 - 70%	24	17		2		5	4	0	23	34	0	30	30	0	0	0			24			13	
50 - 60%		20	17		13	0		0	12	29	27	0	22	0	27			0	0			0	
40 - 50%	15	23	14	0	9	11	3	11	21	11	26	21	31	0	0	28	26						15
30 - 40%	28	25	22	10	12	5	2	12	0	33	0	29	0	31	28	29	14	26	0			22	22
20 - 30%	0	4	18	12	7	5	8	12	28	35	22	32	30	32	23	25	26	32	24			25	29
10 - 20%	24	28	14	21	14	11	7	13	34	32	35	32	29	28	29	34	30	31	33	28	30	32	30
%0	32	28	26	21	26	16	10	17	34	38	39	39	42	38	36	38	39	37	36	37	37	39	35

ADR Weather Constrain

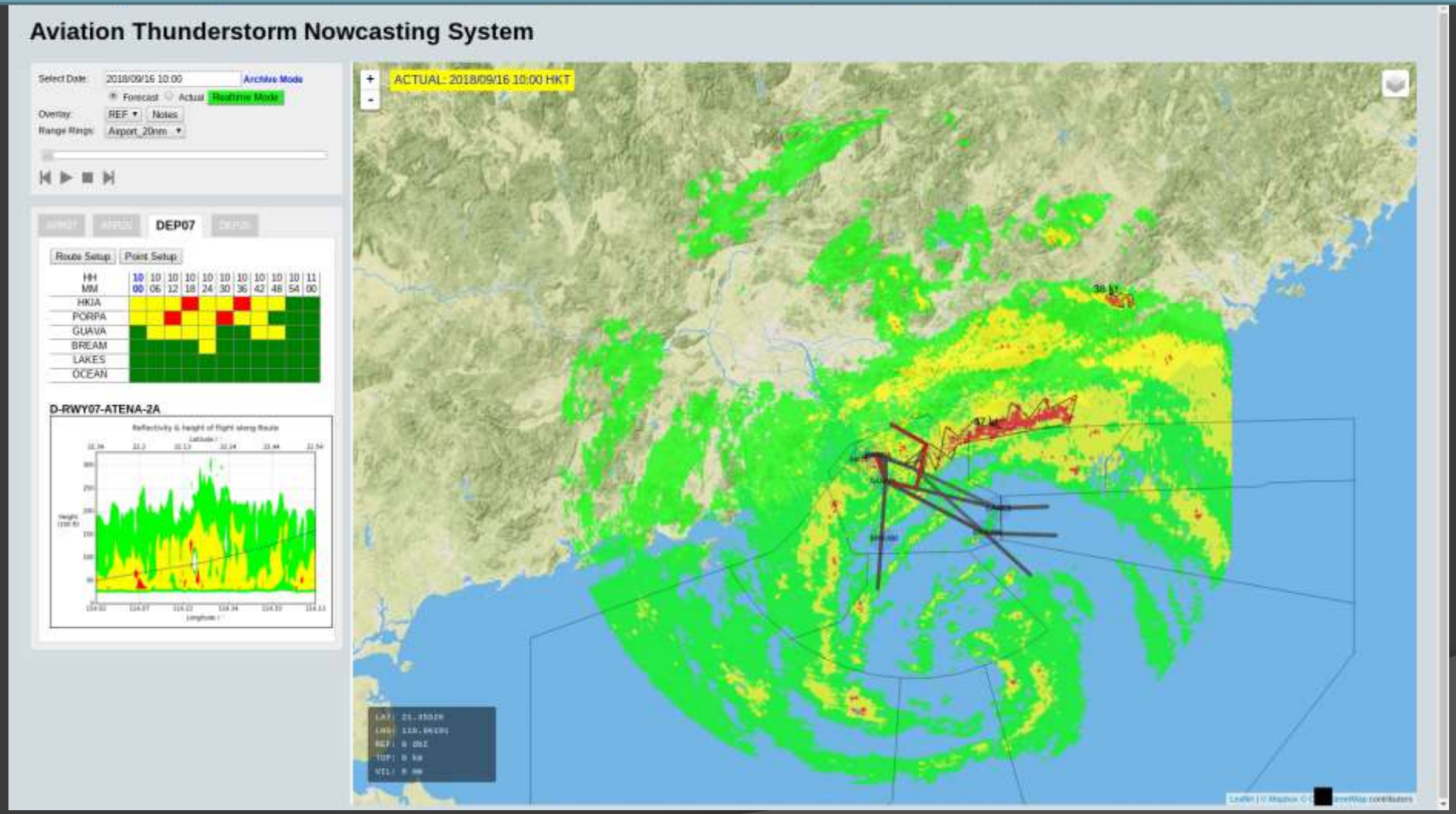


- Severity of weather in the “departure corridor” has a fair correlation to the maximum achievable ADR
- 天氣越差，最大出發率越低

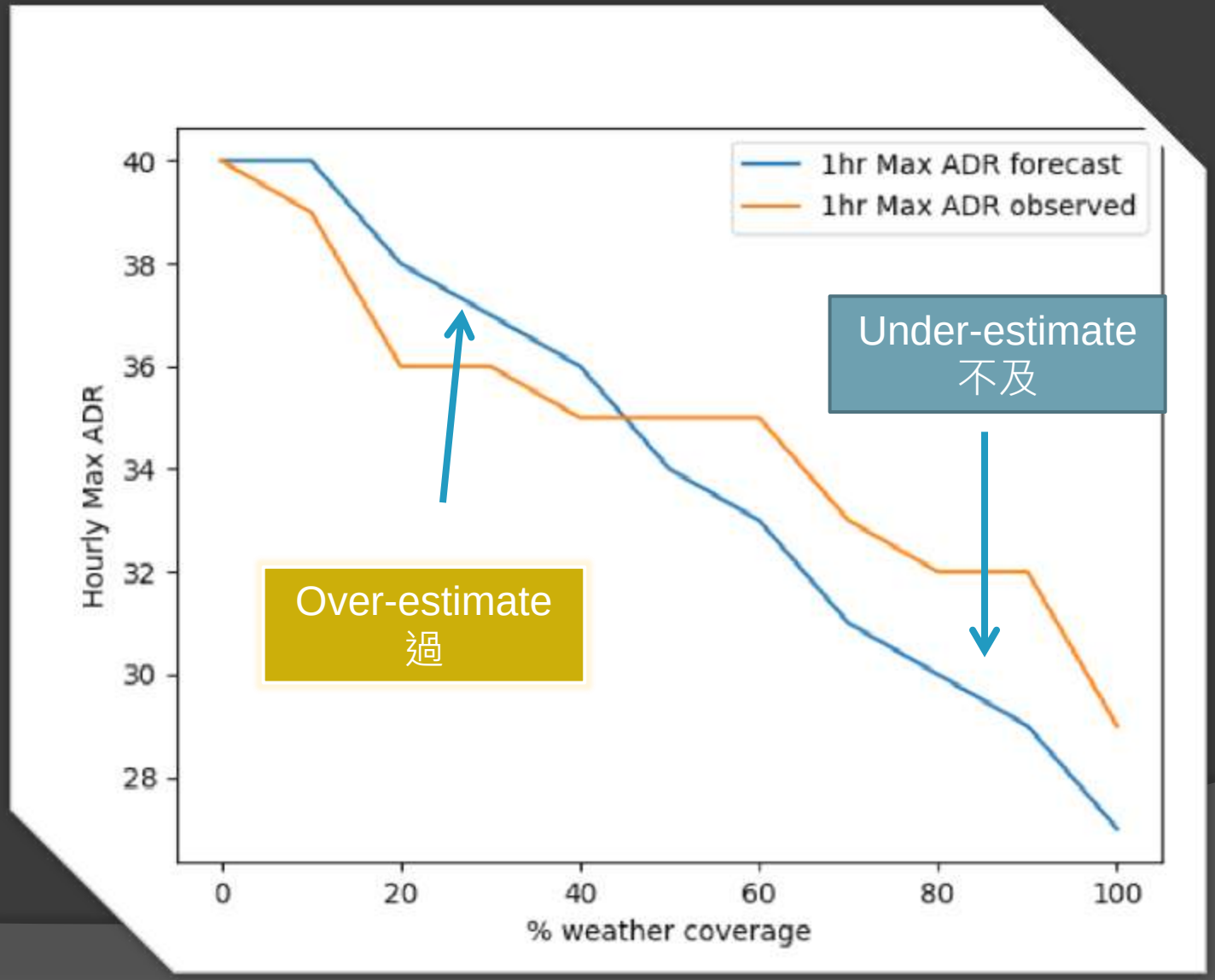
Aviation Thunderstorm Nowcasting System (ATNS)



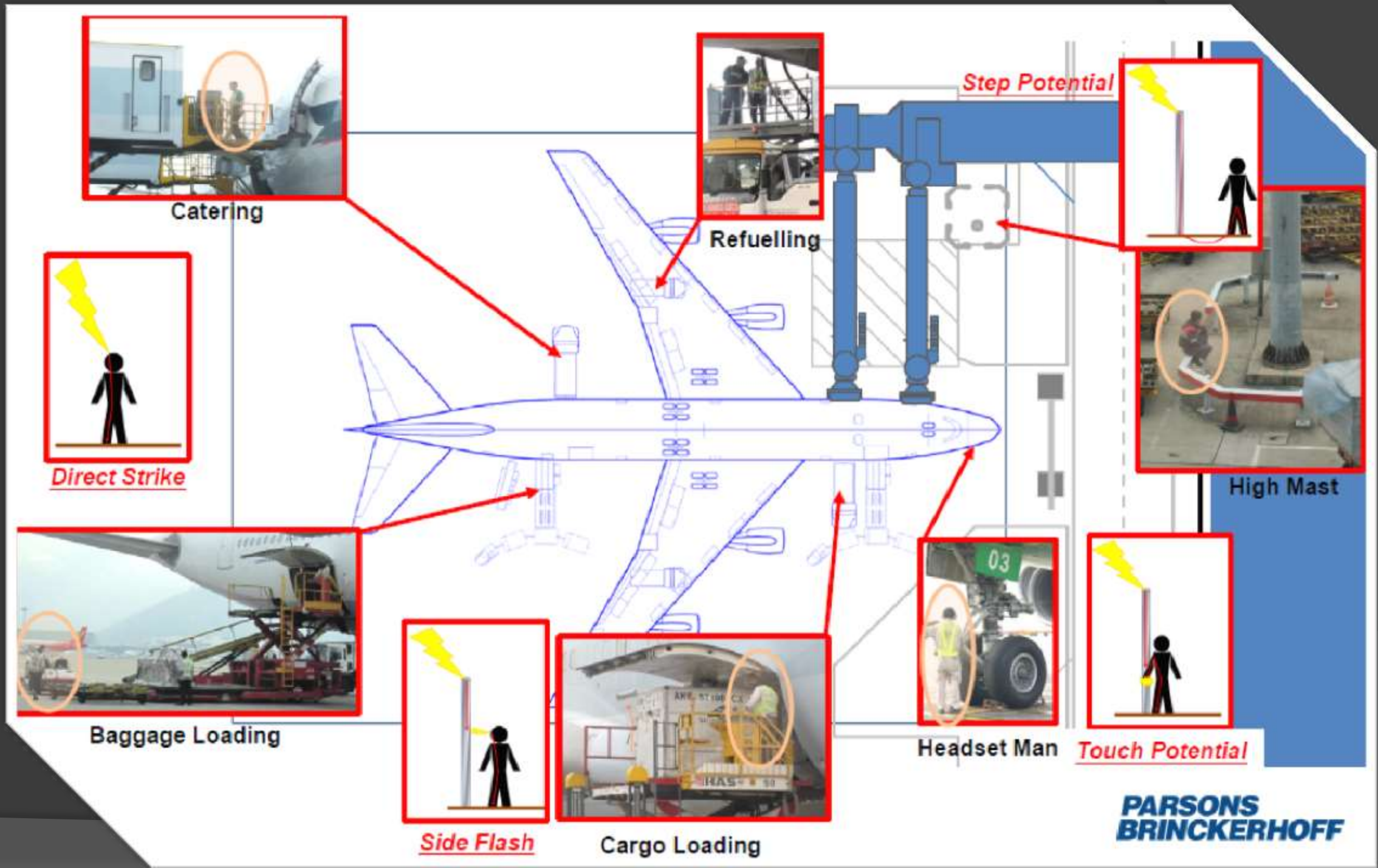
Super Typhoon Mangkhut 超強颱風山竹



Departure and Forecast Weather of 2016



LIGHTNING PROTECTION
閃電防護


Catering
Refuelling
Step Potential
Direct Strike
High Mast
Baggage Loading
Side Flash
Cargo Loading
Headset Man
Touch Potential
PARSONS BRINCKERHOFF

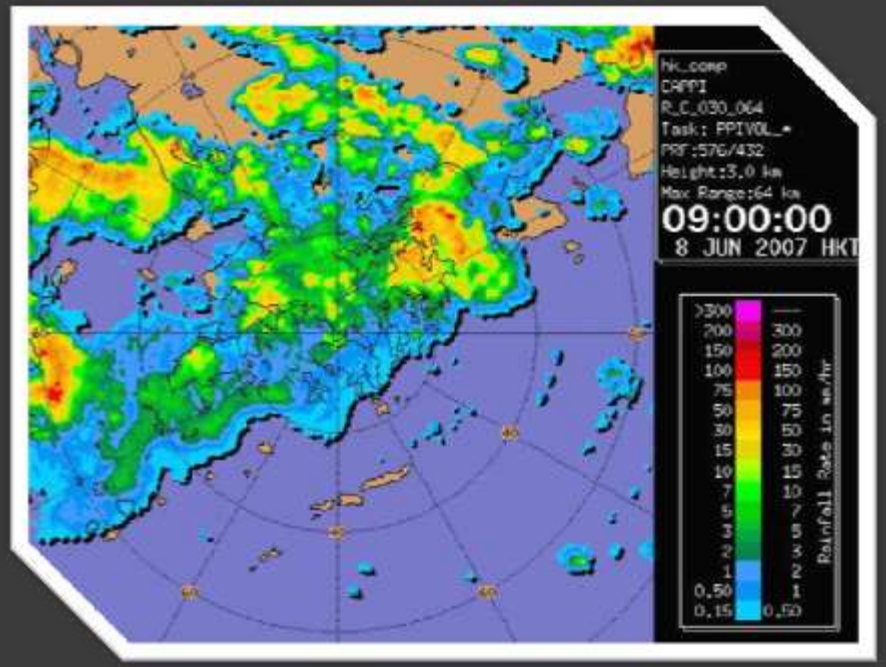
RED Lightning Alert

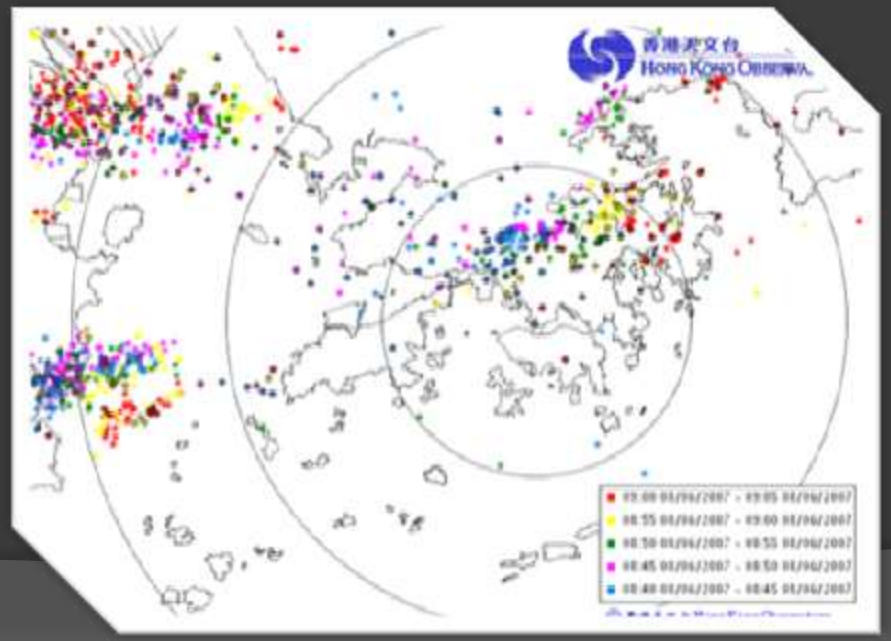
AMBER Lightning Alert

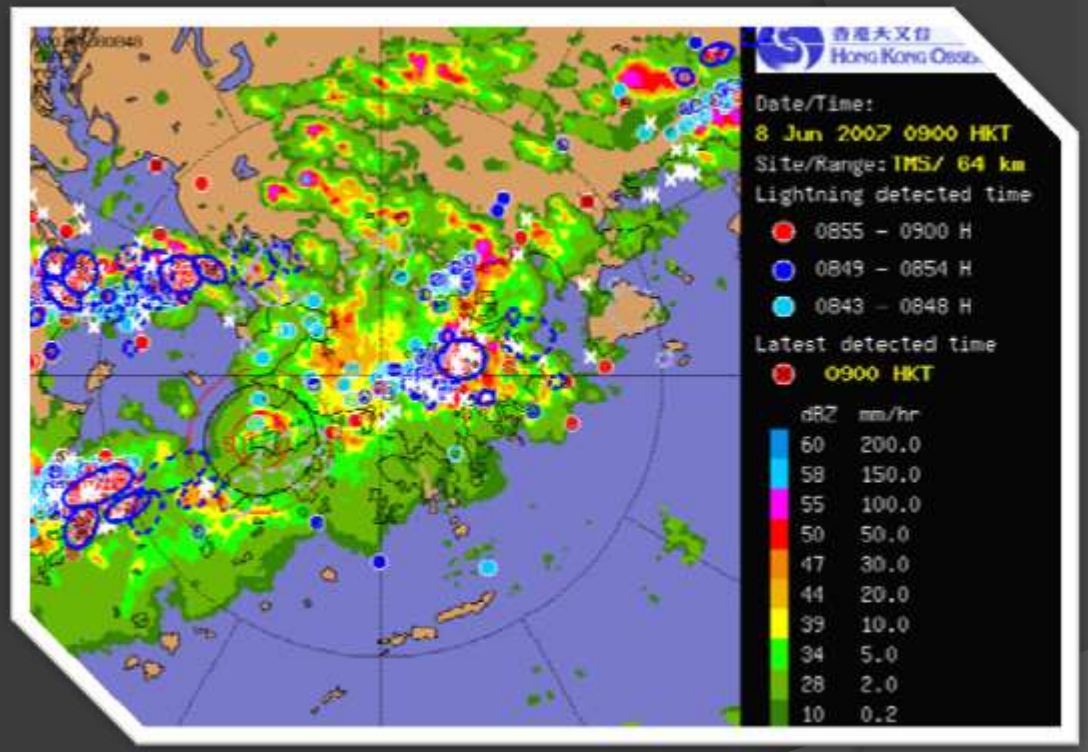
- All ground operations have to stop and take measures to protect against lightning threat
- Re-fueling, catering, embarkment /disembarkment, baggage/cargo handling, aircraft push would be delayed

HKO Airport Thunderstorm and Lightning Alerting System (ATLAS)
機場雷暴及閃電預告系統

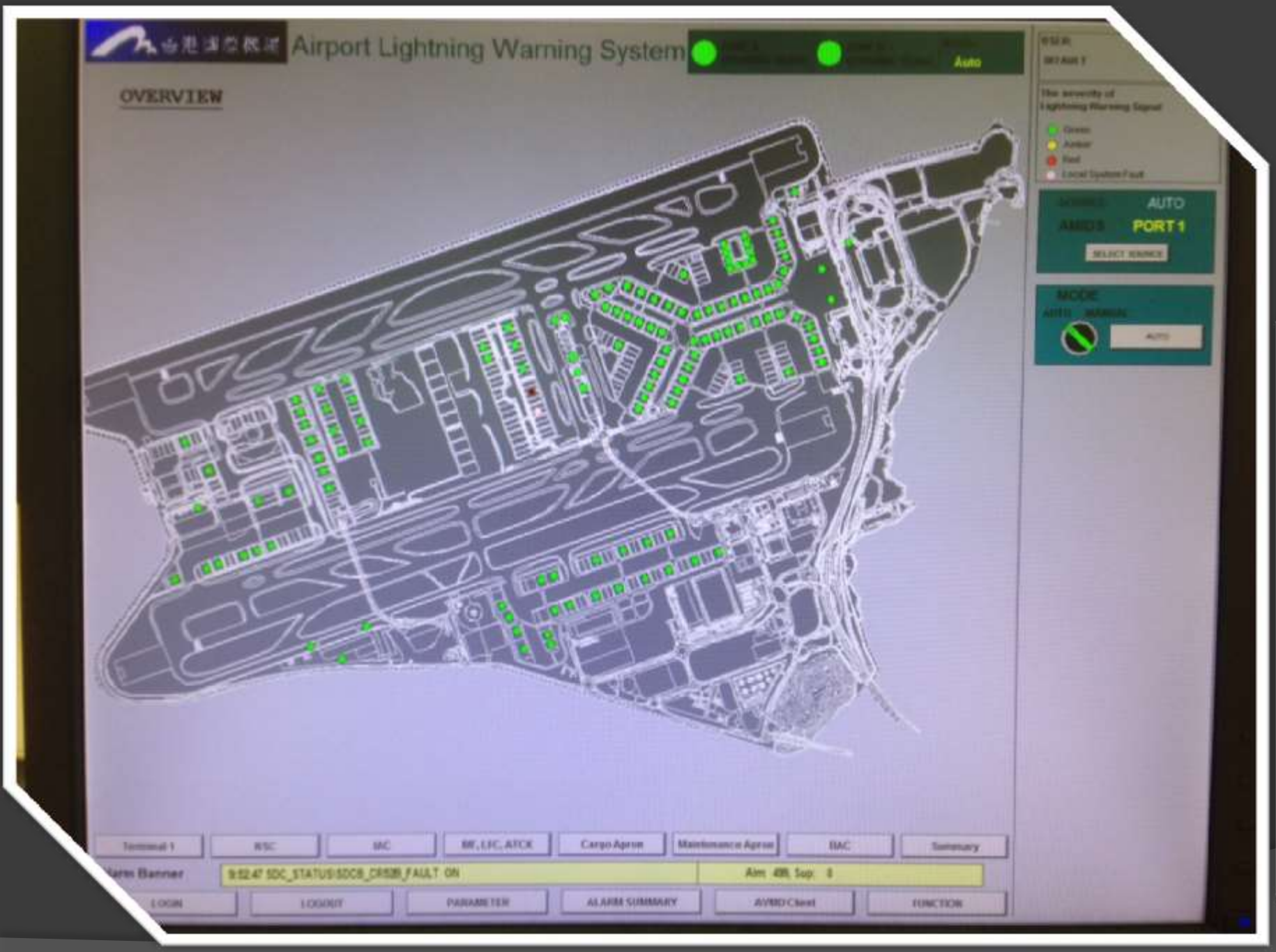
- HKO Lightning Location Information System (LLIS) Cloud-to-Ground (CG) lightning data
- HKO Weather Radar data


hk_comp
CAPPI
R_C_030_064
Task: PPIVOL_*
PRF:576/432
Height:3.0 km
Max Range:64 km
09:00:00
8 JUN 2007 HKT
>300
200
150
100
75
50
30
15
10
7
5
3
2
1
0.50
0.15
300
200
150
100
75
50
30
15
10
7
5
3
2
1
0.50
Rainfall Rate in mm/hr


香港天文台
Hong Kong Observatory


香港天文台
Hong Kong Observatory
Date/Time:
8 Jun 2007 0900 HKT
Site/Range: TMS/ 64 km
Lightning detected time
0855 – 0900 H
0849 – 0854 H
0843 – 0848 H
Latest detected time
0900 HKT
dBZ mm/hr
60 200.0
58 150.0
55 100.0
50 50.0
47 30.0
44 20.0
39 10.0
34 5.0
28 2.0
10 0.2

ALWS


Airport Lightning Warning System
OVERVIEW
AUTO
PORT 1
MODE

AIRPORT
LIGHTNING
WARNING

ALWS

AIRPORT
LIGHTNING
WARNING
S49R
高 度 5.7 米

AIRPORT
LIGHTNING
WARNING

C30

Lightning current discharged through aircraft, NLG // staff (50 – 200kA)

PARSONS BRINCKERHOFF

香港天文台
HONG KONG OBSERVATORY

Aviation Meteorological Information Dissemination System

Radar & Satellite Imageries | HKIA observations and forecast | Flight Planning | TC Information | Thunderstorm and Significant Convection | SIGMET and VA Advisories | General and Local Aviation Weather | References | International Projects | Other Links

User Groups
Flight Operation

Warnings in force

My Products
- Radar & Satellite
- Radar - 64km
- Extended take-off Forecast
- Latest ATIS
- TerMet
- Weather Summary for HKIA
- Standard Flight Document Package
- Select / Print Flight Document
- HKO TC Information

Edit

Volcanic Ash
- Information on Volcanic Eruption / Ash Cloud
- Volcanic Ash Advisory (Graphical)

Thunderstorm and Significant Convection
- Significant Convection Monitoring and Forecast (trial)
- Airport Thunderstorm and Lightning Alerting System (ATLAS)
- Aviation Thunderstorm Nowcasting System
- Lightning Around HKIA
- Lightning Display With Advanced Features
- Lightning Overlaid Onto Radar

What's New
Previous Layout

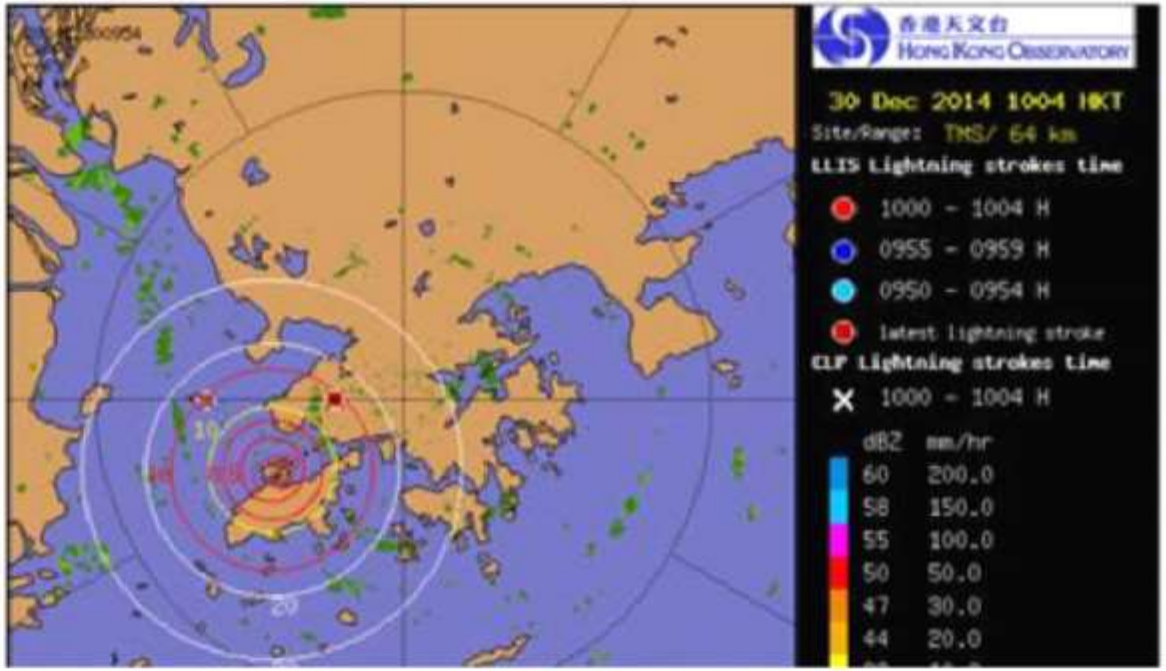
Airport Thunderstorm and Lightning Alerting System (ATLAS)

HKO ATLAS status

Zone B: BLUE

Zone A: BLUE

at 10:05:32 HKT 30 Dec 2014

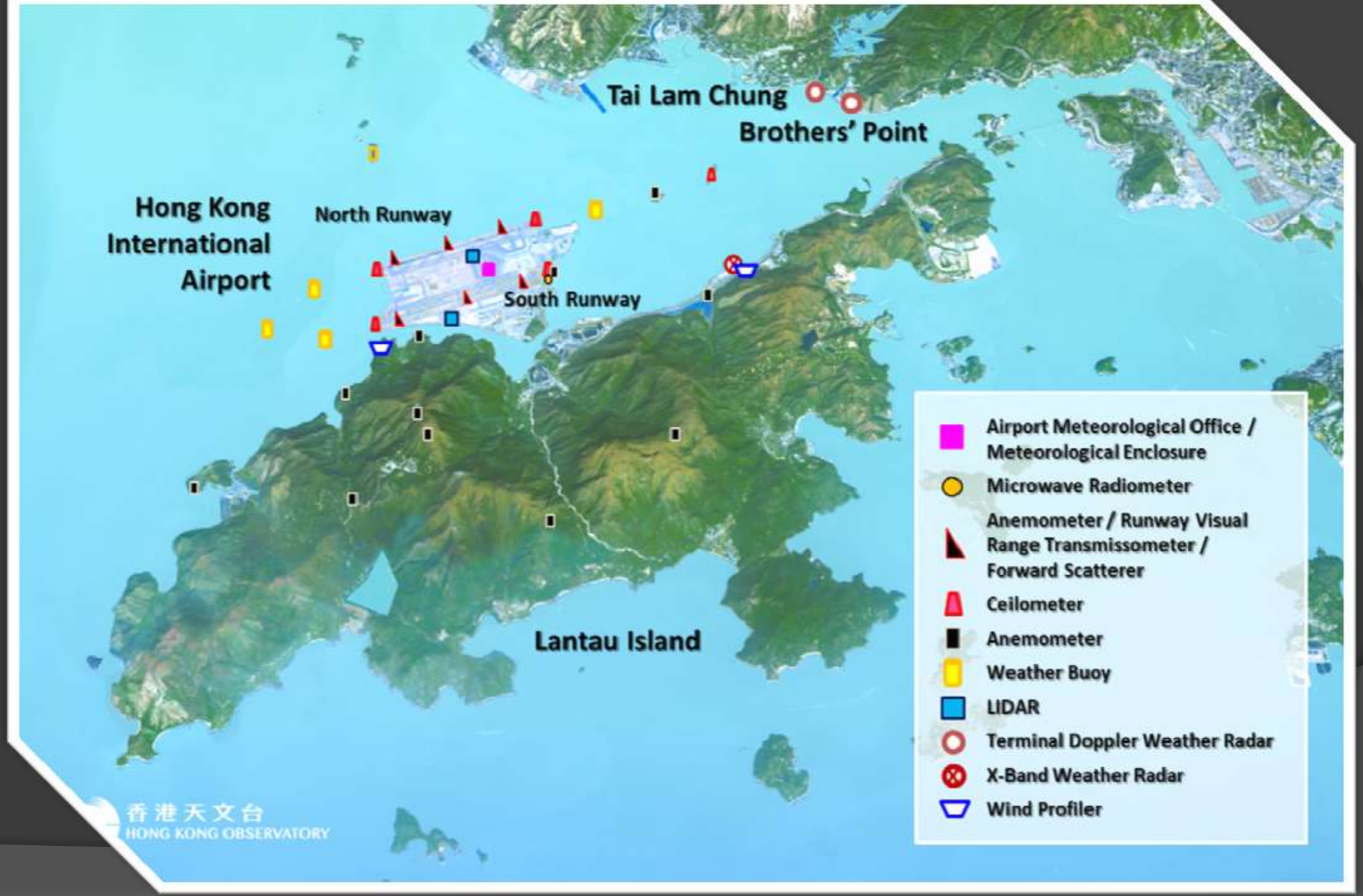


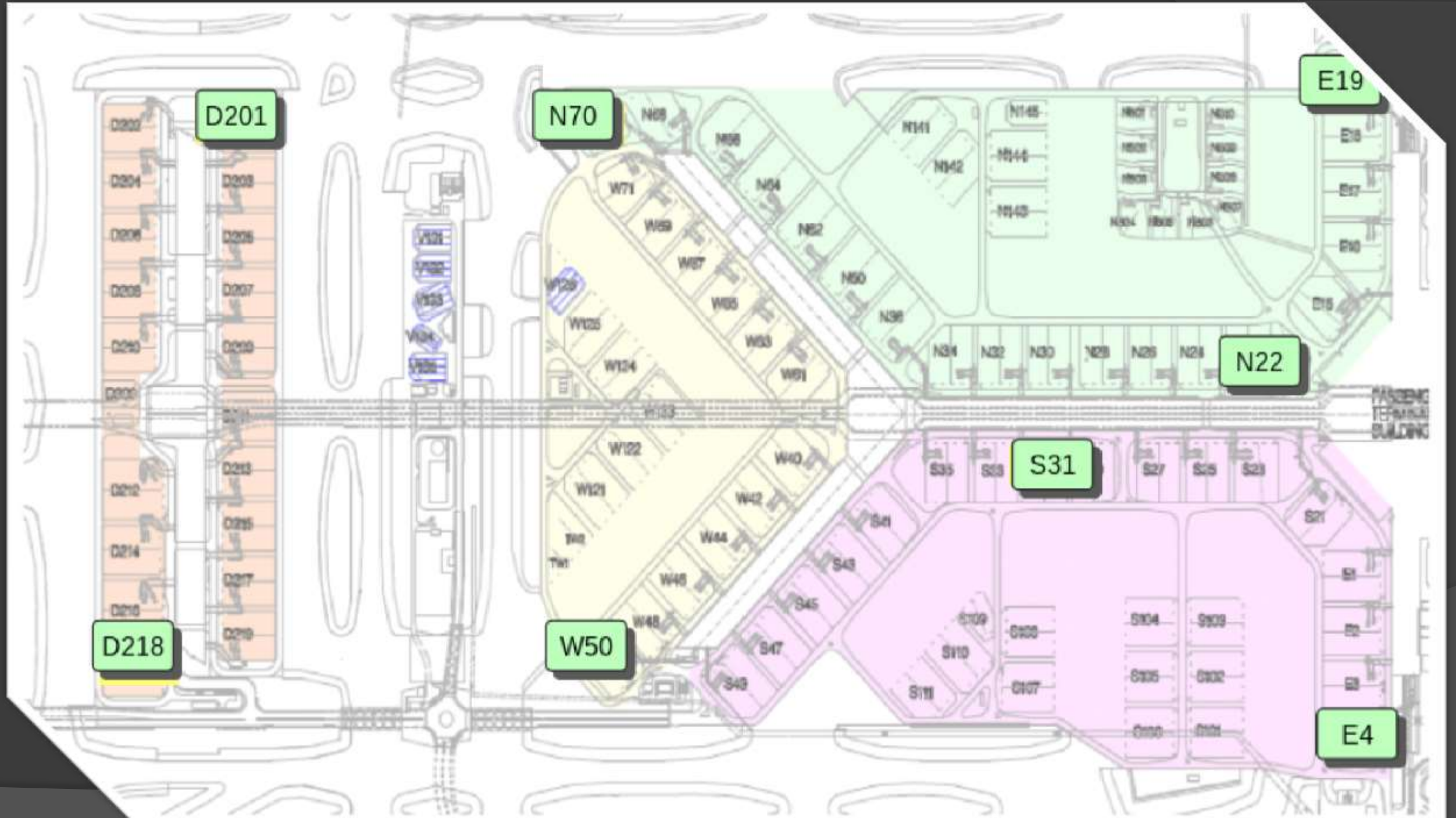
Control:

Latest | Play | Pause | Next | Prev

Slow | Normal | Fast

WIND MEASUREMENTS
機場風力測量


Tai Lam Chung
Brothers' Point
Hong Kong International Airport
North Runway
South Runway
Lantau Island
Airport Meteorological Office / Meteorological Enclosure
Microwave Radiometer
Anemometer / Runway Visual Range Transmissometer / Forward Scatterer
Ceilometer
Anemometer
Weather Buoy
LIDAR
Terminal Doppler Weather Radar
X-Band Weather Radar
Wind Profiler
香港天文台
HONG KONG OBSERVATORY


D201
N70
E19
N22
S31
W50
D218
E4

Theme of World Met Day 2018
WEATHER READY
CLIMATE SMART
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