

WMO VCP Workshop on MET-ATM

October 2018

Phase II of Haneda/Narita Airport

Collaboration between MET and ATM

Case study of 17th February 2017 in Japan

Yuki Kato
Japan Meteorological Agency (JMA)

Contents

- **Overview**
- **Forecast & ATFM measures**
- **Situation of the day**
- **Conclusion**

Contents

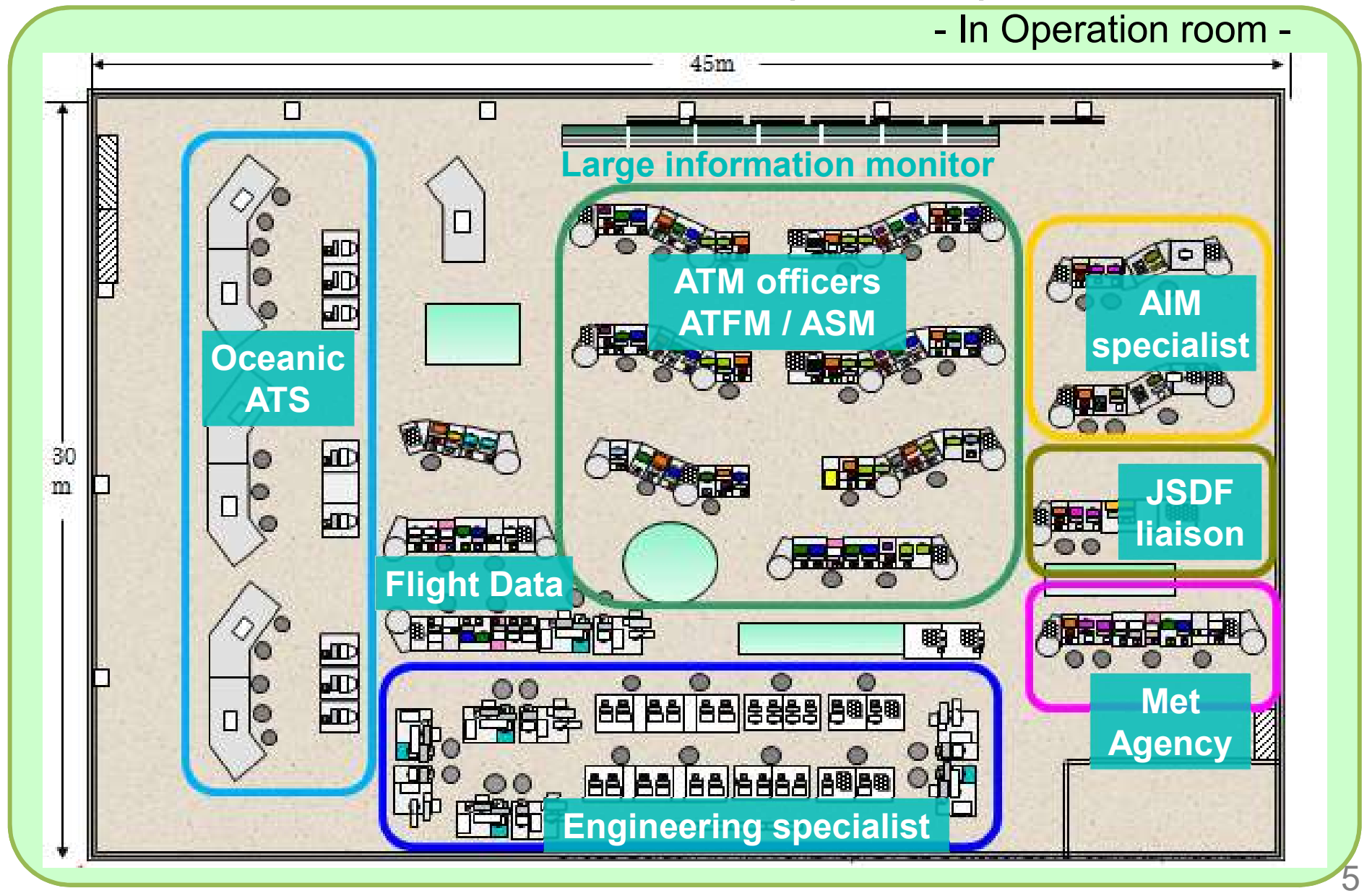
- **Overview**
- Forecast & ATFM measures
- Situation of the day
- Conclusion

About ATMC (JCAB)



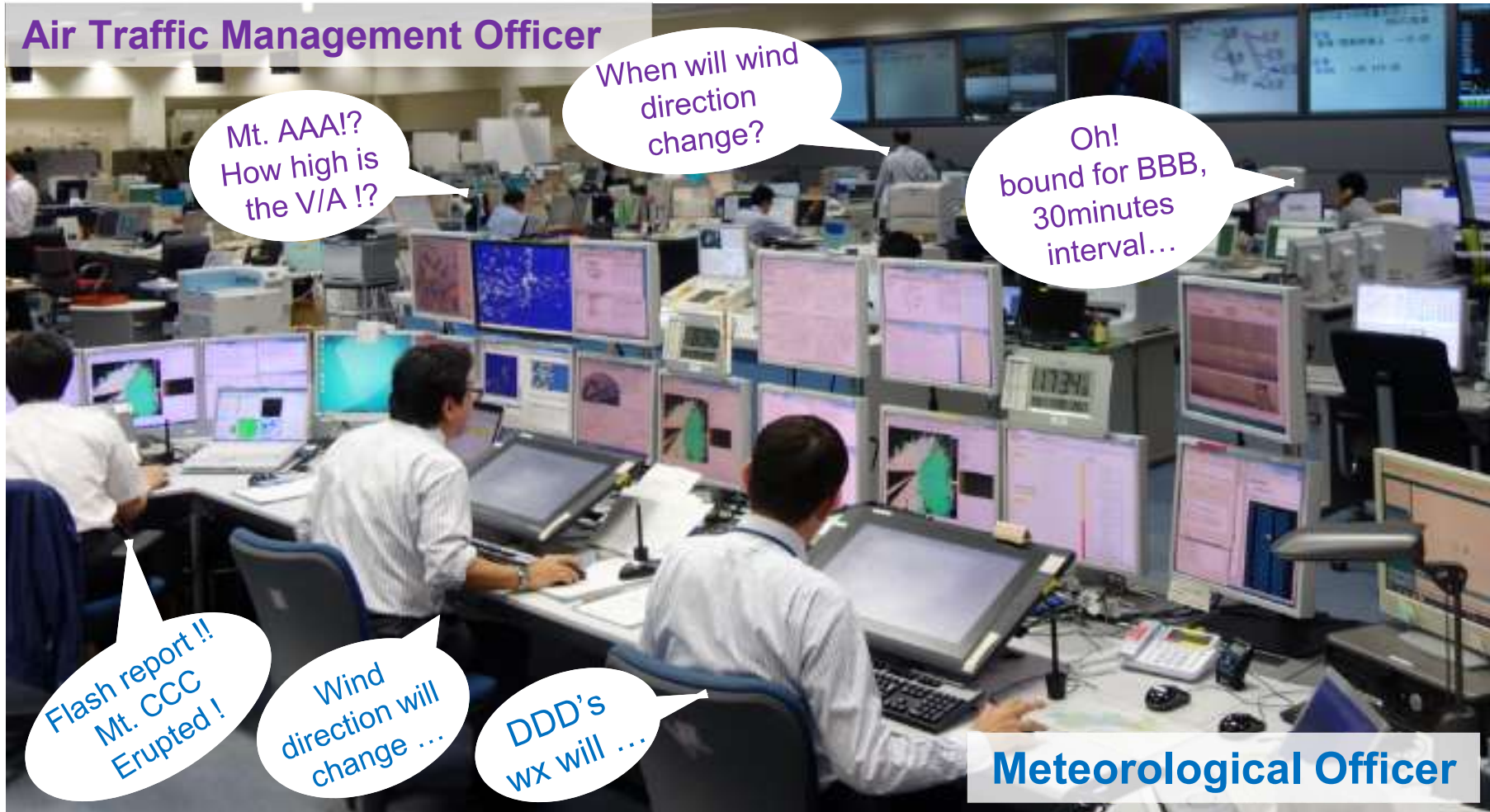
About ATMC (JCAB)

- In Operation room -



About ATMC (JCAB)

- In Operation room -



About ATMC (JCAB)

- Daily Weather Briefing -

REGULAR WEATHER BRIEFING



2200, 0445, 1200 UTC (0700, 1345, 2100 Local time)
for crew
in Pre-operation briefing

About ATMC (JCAB)

- Daily Weather Briefing -

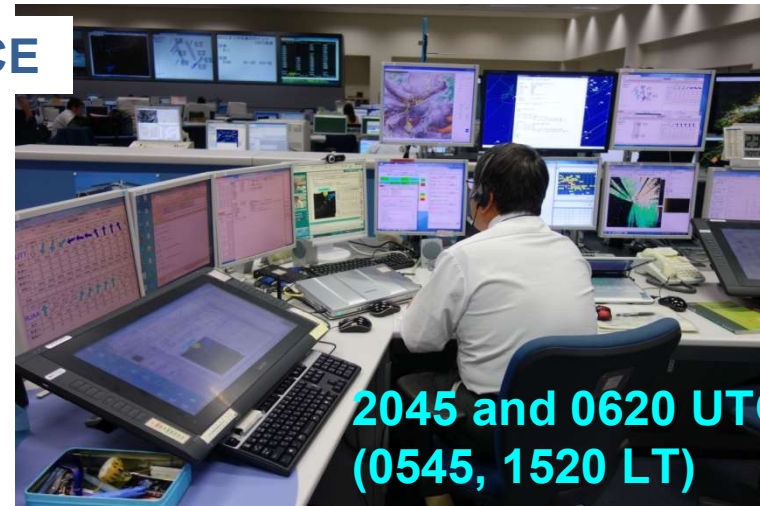
REGULAR WEATHER BRIEFING



AD HOC



IN CDM CONFERENCE

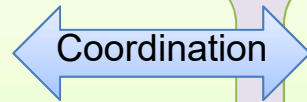


Overview

Organization of JMA to support ATM

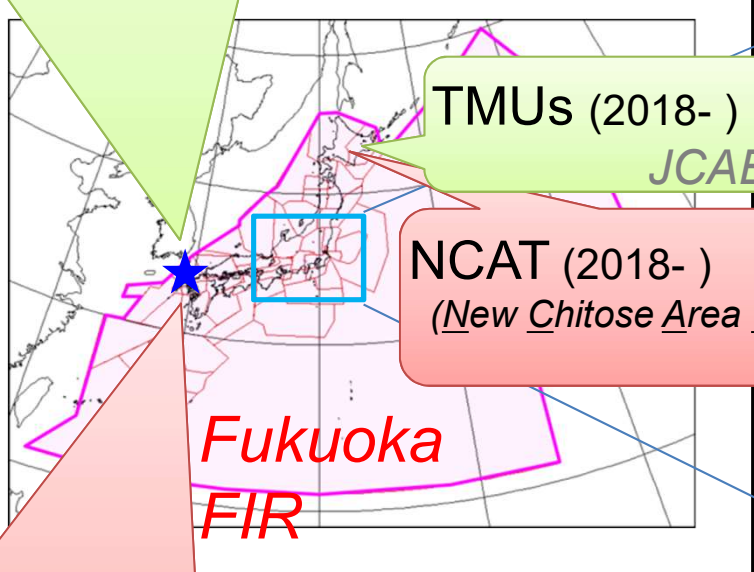
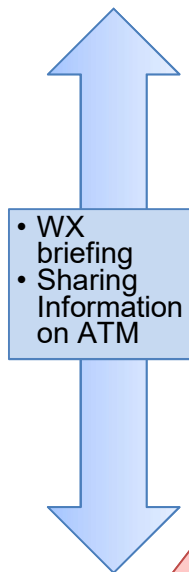
At Fukuoka city

ATMC (2005-)
(Air Traffic Management Center)
JCAB (Japan Civil Aviation Bureau)



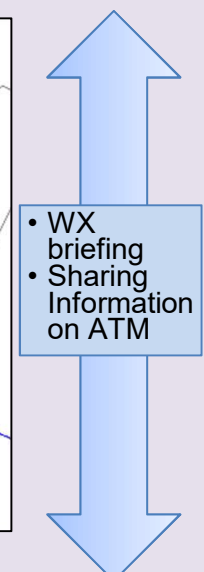
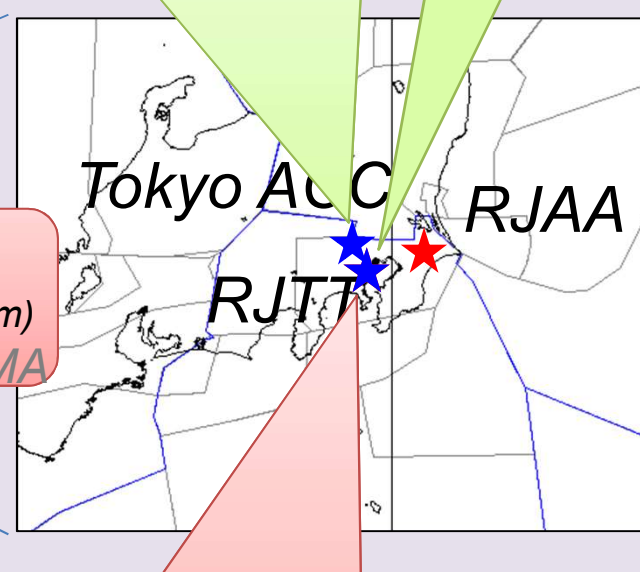
Organized branch facilities in Tokyo metropolitan area

TMUs (2011-)
(Traffic Management Unit)
JCAB



TMUs (2018-)
JCAB

NCAT (2018-)
(New Chitose Are Team)
JMA



ATMetC (2005-)
(Air Traffic Meterorology Center)
JMA (Japan Meteorological Agency)



TMAT (2014-)
(Tokyo Metropolitan Are Team)
JMA

Overview

Technical background - JMA's NWP models for aviation forecast

	Local Forecast Model (LFM)	Meso-Scale Model (MSM)	Global Spectral Model (GSM)
Grid size and/or number of grids	2 km/ 1581 x 1301	5 km/ 817 x 661	0.1875 deg. (TL959) ~20km
Vertical levels/Top	58/ 20.2 km	76/ 21.8 km	100/0.01 hPa
Forecast range (Initial time)/number of ensemble members	9 hours (hourly)	39 hours (00, 03, 06, 09, 12, 15, 18, 21 UTC)	84 hours (00, 06, 18 UTC) 264 hours (12 UTC)
Initial condition	3D-Var Analysis	4D-Var Analysis	4D-Var Analysis
Operation	2012 -	2001 -	2014 -

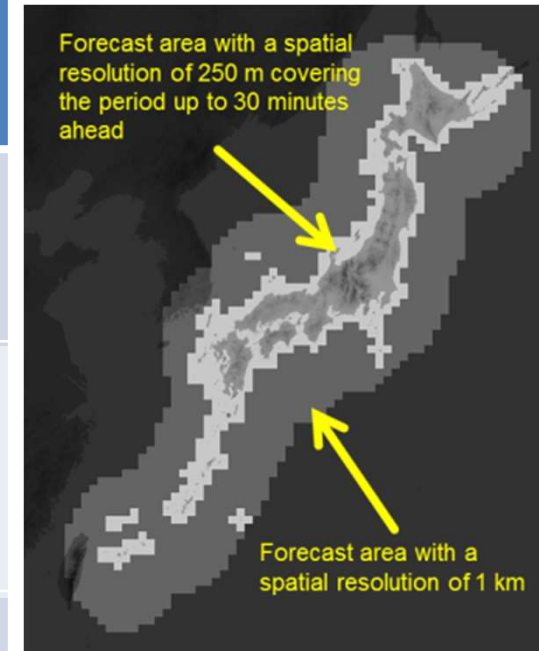


Terrain of the central region of the Main Island of Japan used for the LFM (left, 2-km horizontal resolution) and for the MSM (right, 5-km horizontal resolution)

Overview

Technical background - JMA's Nowcast products

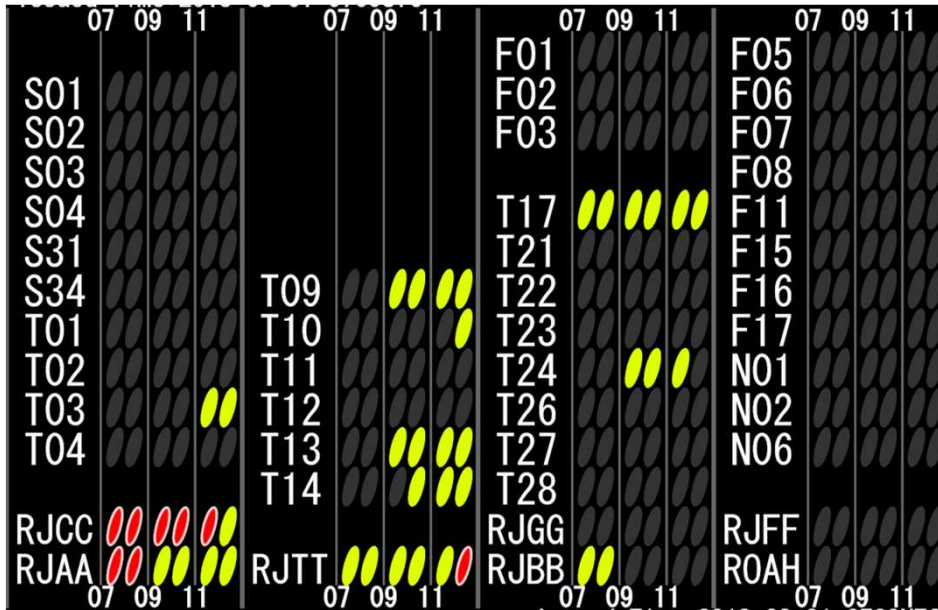
	Precipitation Nowcasts	Thunder and Hazardous Wind Potential Nowcasts	High-resolution Precipitation Nowcasts
Phenomenon	Precipitation intensity	Thunder, lightning strikes and tornadoes	Precipitation intensity
Resolution	1 km	-	250 m or 1 km (up to 30 min) 1 km (35-60 min)
Forecast range (update frequency)	1 hour (every 5 minutes)	1 hour (every 10 minutes)	1 hour (every 5 minutes)
Operation	2011 - (1st gen 2004)	2011 -	2014 -



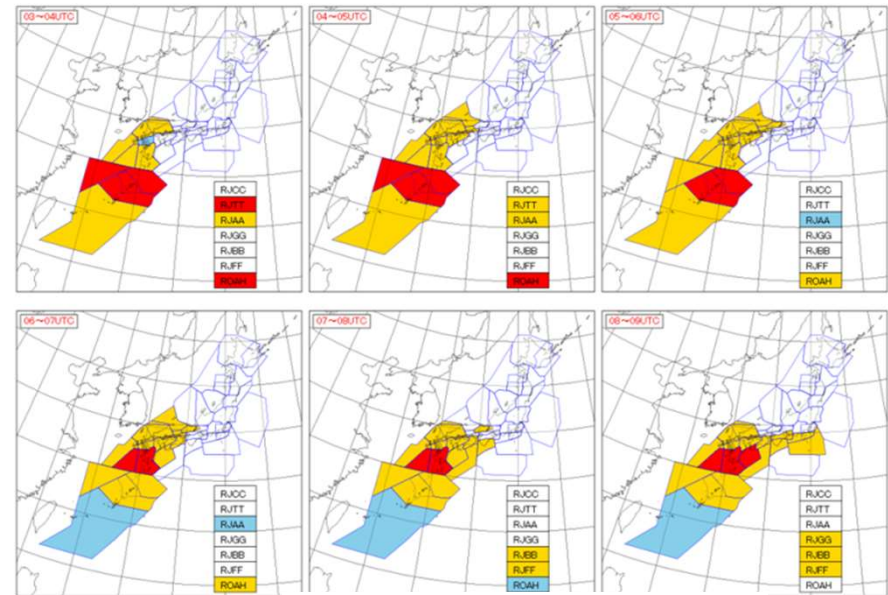
Overview

About ATMetC (JMA)

Air Traffic Meteorological category forecast



(Tabular Form)



(Map Type Form)

show the area and time of probability (red > yellow > blue > no color)
that significant weather will affect air traffic flow.

CDM video conference



Weather Briefing



Sharing Information frequently !

Overview

Criteria of the ATMet category forecast (ATMetC product)

target area color code	RJTT	RJAA	RJGG	RJBB	RJFF	ROAH	RJCC	ATC SECTOR
RED	wind speed ≥ 40 kt							the proportion occupied with CB (top \geq FL300) in the sector $\geq 50\%$
	cross wind component to runway ≥ 30 kt							
	cross wind component to runway ≥ 25 kt with moderate or heavy precipitation							
		wind direction 030~060° or 210~240° and gust ≥ 30 kt					visibility < 800m with snow	
	visibility < 600m	visibility < 400m					ceiling < 400ft with snow	
	ceiling < 300ft					visibility < 1000 with blowing snow		
	TS OHD							
	snow fall rate ≥ 1 cm/1h						snow fall rate ≥ 5 cm/3h	
wind speed at surface ≥ 30 kt and wind speed below 5000ft ≥ 60 kt	wind speed below 3000ft ≥ 60 kt					snow fall rate ≥ 2 cm/3h when wind direction 120~240°		
YELLOW	wind speed ≥ 34 kt with gust ≥ 50 kt							CB exists on selected airway or on selected area
	cross wind component to runway ≥ 25 kt							
	cross wind component to runway ≥ 20 kt with moderate or heavy precipitation							the proportion occupied with CB (top \geq FL300) in the sector $\geq 20\%$
		wind direction 030~060° or 210~240° and gust ≥ 25 kt						
	TS							
	CB in HANEDA sector	CB in NARITA sector					visibility < 400m	
		ceiling < 200ft					visibility < 1600m with snow ceiling < 600ft with snow	
		moderate or heavy snow					snow fall rate ≥ 3 cm/3h when wind direction 250~110°	
wind speed at surface ≥ 30 kt and wind speed below 5000ft ≥ 50 kt	wind speed below 3000ft ≥ 50 kt							
BLUE	TS in TAF but CB doesn't exist in the aerodrome							the proportion occupied with CB (top \geq FL300) in the sector $\geq 10\%$
						wind speed ≥ 20 kt with snow ceiling < 200ft		

Note: it may differ from present criteria due to continual improvement

About TMAT (JMA)

Operation room



TMAT
(Tokyo Metropolitan Area Team, JMA)

Info. weather condition

Info. impact on ATM

TMUs (Traffic Management Unit, JCAB)

Forming safe and efficient air traffic flow by setting CAPA.

Overview

About TMAT (JMA)

Video Conference

Telephone

Online chat

Weather Briefing



Tokyo Metropolitan Area Weather Bulletin for ATM

Issued at 0000UTC 06 Oct 2014
ATMetC Tokyo Metropolitan Area TEAM, JMA

[Keywords]
Tropical Cyclone, Strong Wind, Convection
[RJTT]
Wind, Convection in APCH area
[RJAA]
Wind, Convection in APCH area
[sectors]
Convection

Sector/Time(UTC)	19	20	21	22	23	00
	30 40 50	0 10 20 30 40 50	0 10 20 30 40 50	0 10 20 30 40 50	0 10 20 30 40 50	0 10 20 30 40 50
T03	CB	CONV				
T03_W_NW Conv						
T03_W_NE Conv						
T03_W_SW Conv						
T03_W_SE Conv						
T07	CB	CONV	CONV			
T07_NW Conv						
T07_SW Conv						
T07_EAST Conv						
RJAA	TS	TS CONV	CONV			
RJAA-1 Conv						
Wind						
Cross						
Gust						
VIS						
CIG						
TS						
SN						
blw3000 Wind						
RJAA-2 Conv						
RJTT	BD-CROSS TS CONV	TS	CONV			
RJTT-1 Conv						
Wind						
AC_Cross						
BD_Cross						
VIS						
CIG						
TS						
SN						
blw5000 Wind						
RJTT-2 Conv						
RJTT-3 Conv						
T14		CONV				
T09		CONV				
T12						
T13						
T13_NW Conv						
T13_NE Conv						
T13_SW Conv						
T13_SE Conv						



UTC	0000	0100	0200	0300	0400	0500	0600
RJTT	→	→	→	→	→	→	→
	270	300	300	320			
	14	14	14	14			
	2	7	7	2			
	13	13	13				
	8000	9999	9999				
	3000+	3000+	3000+				

Tokyo Metropolitan Area
Weather Bulletin for ATM

ATM Categorized Impact of weather Element prediction

Issued at 1930UTC 20 May 2015
ATMetC Tokyo Metropolitan Area TEAM, JMA

Sector/Time(UTC)	19	20	21	22	23	00
	30 40 50	0 10 20 30 40 50	0 10 20 30 40 50	0 10 20 30 40 50	0 10 20 30 40 50	0 10 20 30 40 50
T03	CB	CONV				
T03_W_NW Conv						
T03_W_NE Conv						
T03_W_SW Conv						
T03_W_SE Conv						
T07	CB	CONV	CONV			
T07_NW Conv						
T07_SW Conv						
T07_EAST Conv						
RJAA	TS	TS CONV	CONV			
RJAA-1 Conv						
Wind						
Cross						
Gust						
VIS						
CIG						
TS						
SN						
blw3000 Wind						
RJAA-2 Conv						
RJTT	BD-CROSS TS CONV	TS	CONV			
RJTT-1 Conv						
Wind						
AC_Cross						
BD_Cross						
VIS						
CIG						
TS						
SN						
blw5000 Wind						
RJTT-2 Conv						
RJTT-3 Conv						
T14		CONV				
T09		CONV				
T12						
T13						
T13_NW Conv						
T13_NE Conv						
T13_SW Conv						
T13_SE Conv						

ATM CIEL
ATM Categorized Impact of
weather Element prediction

About TMAT (JMA)

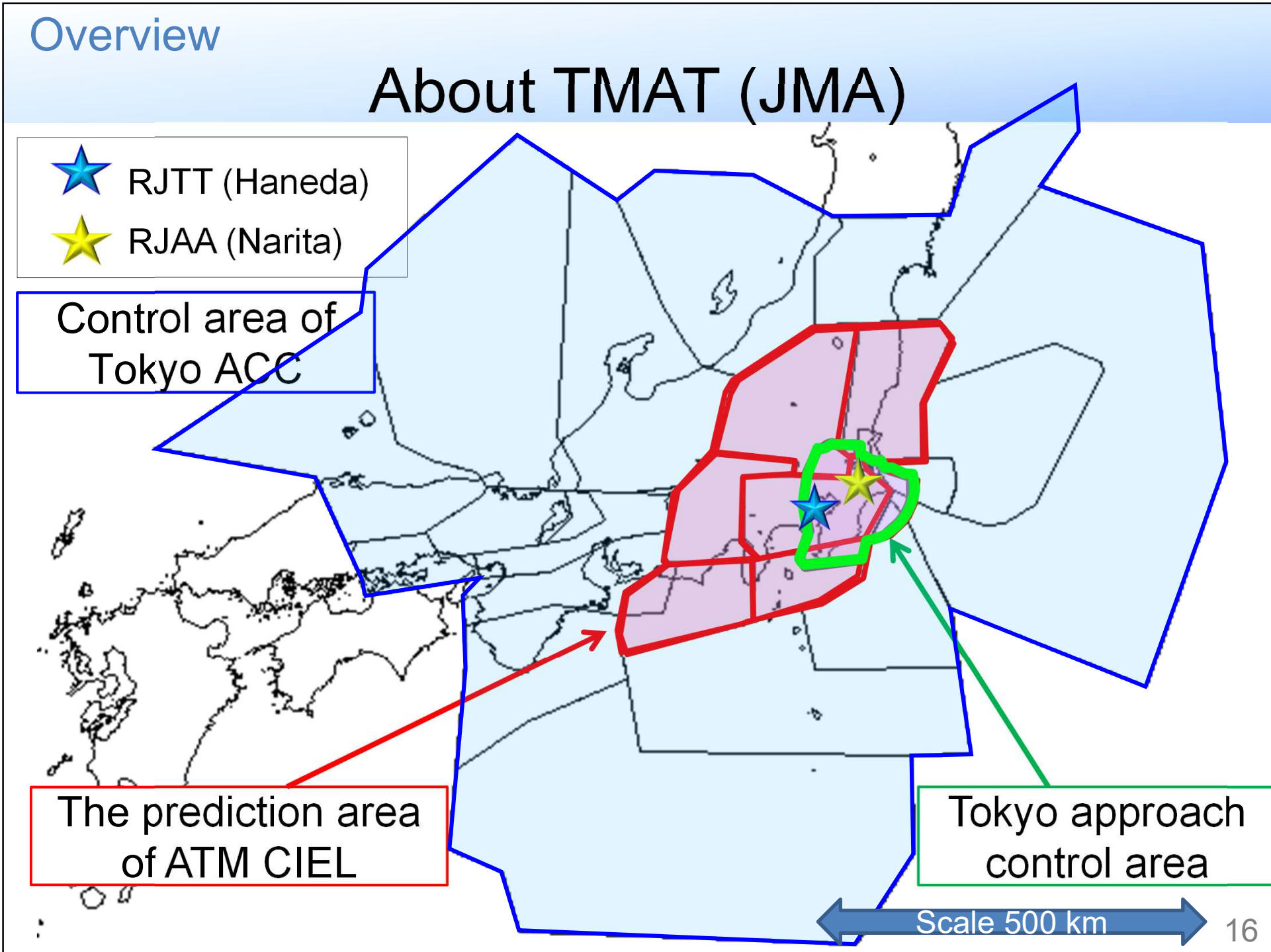
- ★ RJTT (Haneda)
- ★ RJAA (Narita)

Control area of Tokyo ACC

The prediction area of ATM CIEL

Tokyo approach control area

Scale 500 km



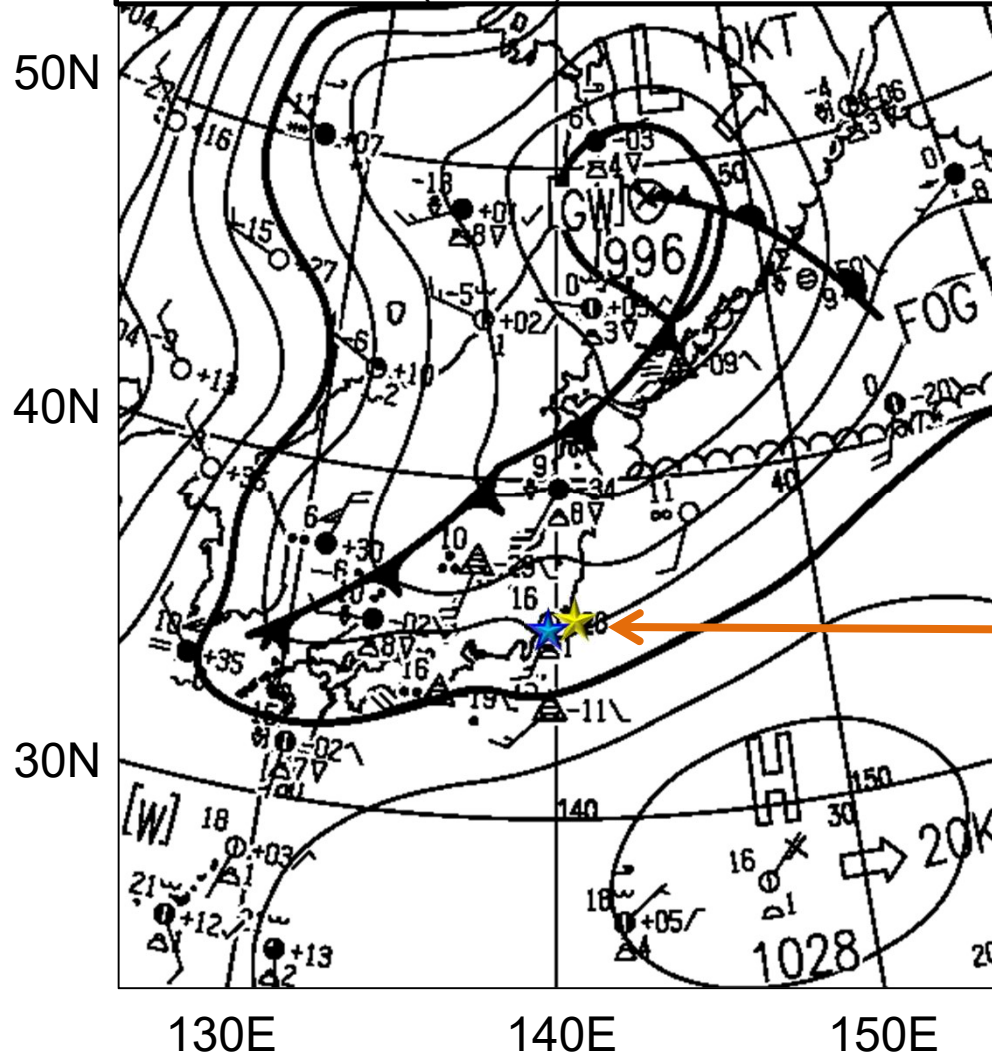
Contents

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- **Forecast & ATFM measures**
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- Conclusion

Case study 17th Feb 2017

Surface analysis chart

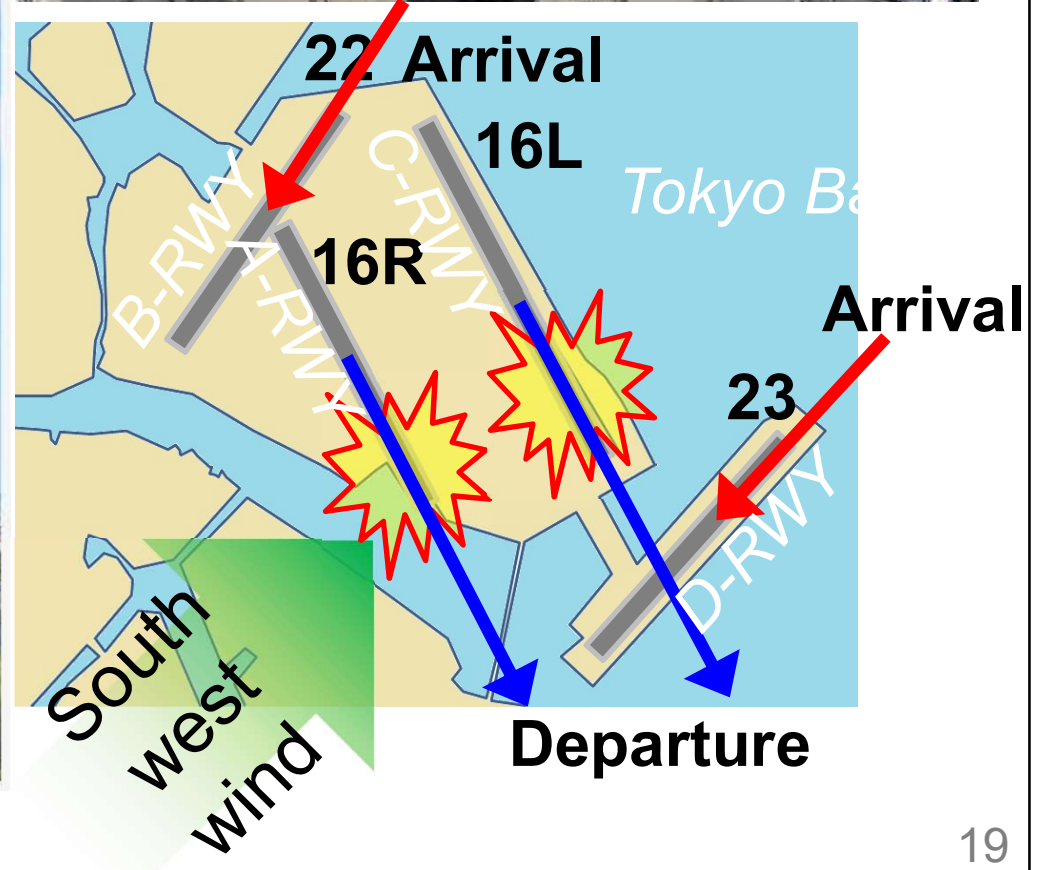
00 UTC (09 LT) 17th Feb 2017



An example of impact on air traffic flow by strong wind from south west.

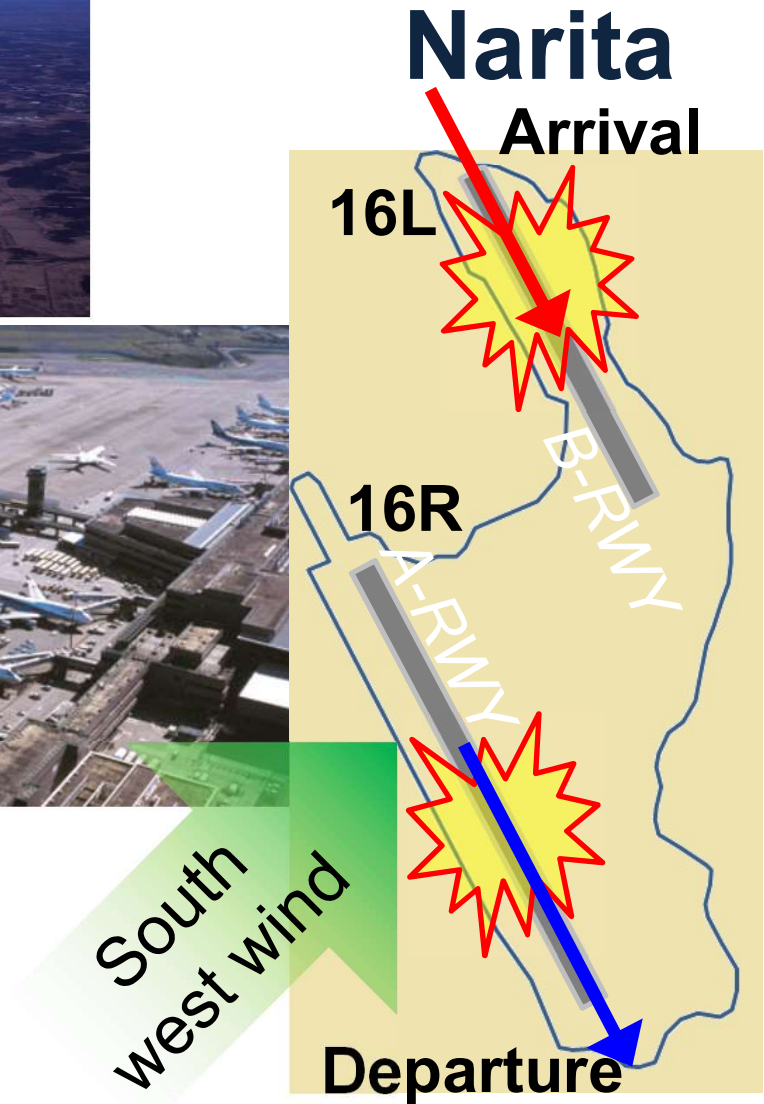
RJTT & RJAA

Outline of HANEDA (RJTT)



Forecast & ATFM Measures

Outline of NARITA (RJAA)



Forecast & ATFM Measures

Regular briefing at 2030/2250 UTC about strong wind
(0530/0730 LT)

Sequential forecast		16th		17th					[UTC]	
		22	23	00	01	02	03	04	05	06 → 09
RJTT (Haneda)	Wind direction	220 deg								
	Wind speed	24G34KT		34G44KT					24G 34KT	
	Crosswind component to departure runway	22KT		31KT					22KT	
RJAA (Narita)	Wind direction	220 deg								
	Wind speed	10KT	12KT	14KT	22G35KT		28G45KT			
	Crosswind component to runway	9KT	11KT	13KT	20KT		26KT			

- **Haneda Strong southwest wind (Peak of wind speed is around 03 UTC)**
<Possible weather phenomena>
 Wind shear, Increase of crosswind component at departure runways
- **Narita Strong southwest wind (Peak of wind speed is after 03 UTC)**
<Possible weather phenomena>
 Wind shear, Increase of crosswind component

Forecast & ATFM Measures

ATM CIEL issued at 2330 UTC 16th Feb 2017 (0830 LT)

ATM Categorized Impact of weather ELEMENT prediction

Issued at 2330UTC 16 Feb 2017

ATMetC Tokyo Metropolitan Area TEAM JMA

Sector/ UTC	23			00						01		03						04								
	30	40	50	00	10	20	30	40	50	00	10	40	50	00	10	20	30	40	50							
T03																										
T07																										
RJAA				WIND											GUST											
RJTT	WIND CONV											CROSS														
T14				CONV																CONV						
T09																										
T12																										
T13																										

Level of Impact to ATM

NONE	SLIGHT	MEDIUM	HIGH
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RJAA : Narita
RJTT : Haneda

Regular CDM Conference

2345z 16th - document image -
(0845 LT)

Topics

RJTT 00~ Cross wind 30kt or more

~01 Approach area CB

RJAA 03~ Southwestern wind 25kt or more & Gust

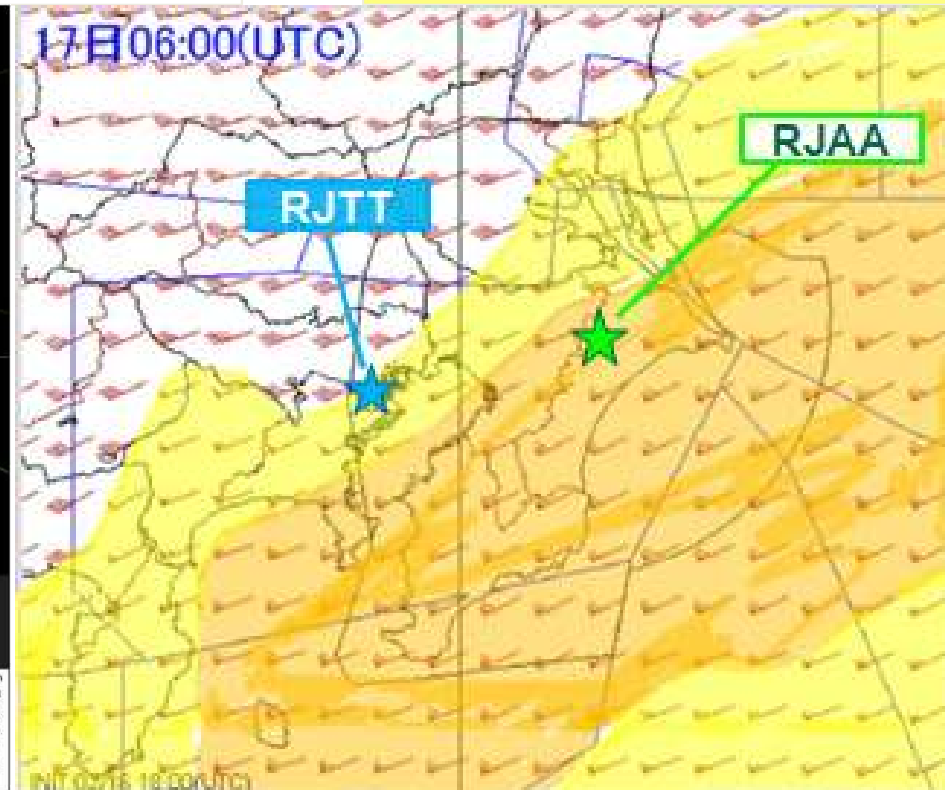
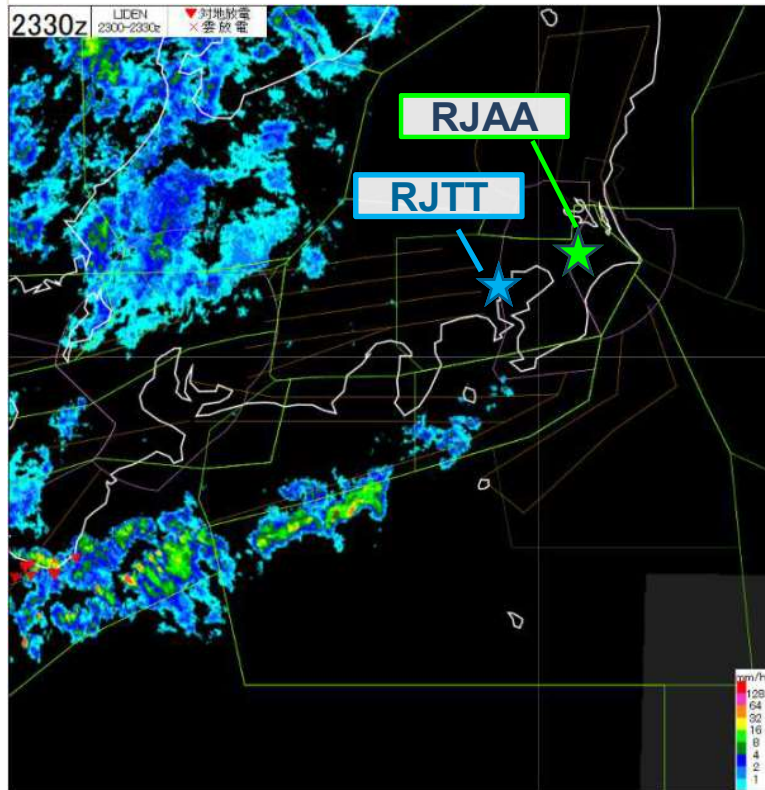
Cross wind 25kt or more

RJTT Approach area Strong Southwestern wind

KANTO Region -- Kii Peninsula: CB, SAN-IN Region: CB

Wind at 5000 ft

Yellow 50 kt+, Orange 60 kt+



ATM Operations Plan

After CDM Conference, 2345z 16th and 0620z 17th
(0845 LT) (1520 LT)

ADP : ATFM
Daily Plan

```

*** ATM OPERATIONS PLAN ***

VALID 2017/0217/0010 THRU 0545

-CAPACITY (CAPA) & CONSTRAINTS-
RJTT : 2100-0000 CAPA=14.3
      0000-0100 CAPA=13.5
      0100-0600 CAPA=13.0
      2330-0600 SPC=8 RJTT -1
T17 : 2330-0500 96% WX

-ROUTE COORDINATION-
NONE

-FLOW CONTROL INITIATIVE-
RJTT : 2140-0500 EDCT
ROAH : 2315-0300 EDCT
F05 : 2325-0200 EDCT
G585 : 0000-0220 35MINIT @SAPRA TO ACFT FOR ZSQD
G585 : 2250-0700 EDCT FOR CHINA AND BEYOND
      (EXC ZSYT, ZSWH, ZSJN, ZSYN, ZHCC AND ZYTL)

<POSSIBLE>
RJAA : 0230-0600 EDCT
T01 : 0130-0230 DEP INTVL FM RJCC OR RJAA
F02 : 0245-0450 EDCT
F02 : 0430-0515 DEP INTVL FM RJFF
NO2 : 0410-0510 DEP INTVL FM ROAH

-OTHER-
NONE

NEXT CDM CONFERENCE 2017/0217/0620

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*** ATM OPERATIONS PLAN ***

VALID 2017/0217/0630 THRU 1220

-CAPACITY (CAPA) & CONSTRAINTS-
RJAA A/B : 0400-0900 CAPA=9.0
RJTT : 0250-0800 CAPA=14.0
      : 0800-1200 CAPA=14.3
RJTT : 0540-0800 SPC=7MIN (RJTT -1, T09 -1)
      : 0800-1200 SPC=8MIN (T09 -1)
T17 : 2230-1100 96

-RTE COORDINATION-
T24 : 0640-0850

-FLOW CONTROL INITIATIVE-
RJAA : 0100-1030 EDCT
RJAA : 0500-0800 230KT 12MIT @BINKS, MELON
RJTT : 2140-1300 EDCT
G585 : 2250-0700 EDCT FOR CHINA AND BEYOND
      (EXC ZSQD, ZSYT, ZSWH, ZSJN, ZSYN, ZHCC AND ZYTL)
G585 : 0130-0750 8MINIT @ SAPRA TO ACFT FOR CHINA AND BEYOND
      (EXC ZSQD, ZSYT, ZSWH, ZSJN, ZSYN, ZHCC AND ZYTL)
M750 : 0540-UFN 5MINIT @MOLKA FOR RJAA FM VHHH/RCTP
Y51 : 0540-UFN 5MINIT @LANAT FOR RJAA

<POSSIBLE>
T24 : 1000-1040 DEP INTVL FM RJTT
F02 : 0950-1040 DEP INTVL FM RJFF

-OTHER-
RJAA : 0143- ダイバートが必要となる手段
A593 : 0540-UFN 5MINIT @ONIKU FOR RJAA
A593 : 0600-1000 FOR ZSPD FL330 AND ABV NOT AVBL

NEXT CDM CONFERENCE 2017/0217/2345

```

Some aircrafts
changed
destination

Forecast & ATFM Measures

17th Feb, Time Line of HANEDA

Direction												
Direction	Forecast	220	220	220	220	220	220	220	220	220	220	220
Speed(kt)	@16 2130z 34	24G34	34G44	34G44	34G44	34G44	34G44	34G44	34G44	24G34	24G34	24G34
Cross Wind		22	22	31	31	31	31	31	31	22	22	22
ATMetC Briefing & Actual Situation	B	B	B b			b			B b B bb	b		bb b
	B:Regular Briefing b:Temporary Briefing	Aerodrome Gale Warning 2352 – 0800 Z Cancelled at 0727Z										
UTC	21~	22~	23~	00~	01~	02~	03~	04~	05~	06~	07~	08~
ATFM Measure		EDCT 2140-1300										
Capacity Reference Value 14.8/30min		Reduced capacity setting by 12%										
Inter-national ATFM Measure												
Situation												
		g : go around (Because of the wind)										
					g					g		g

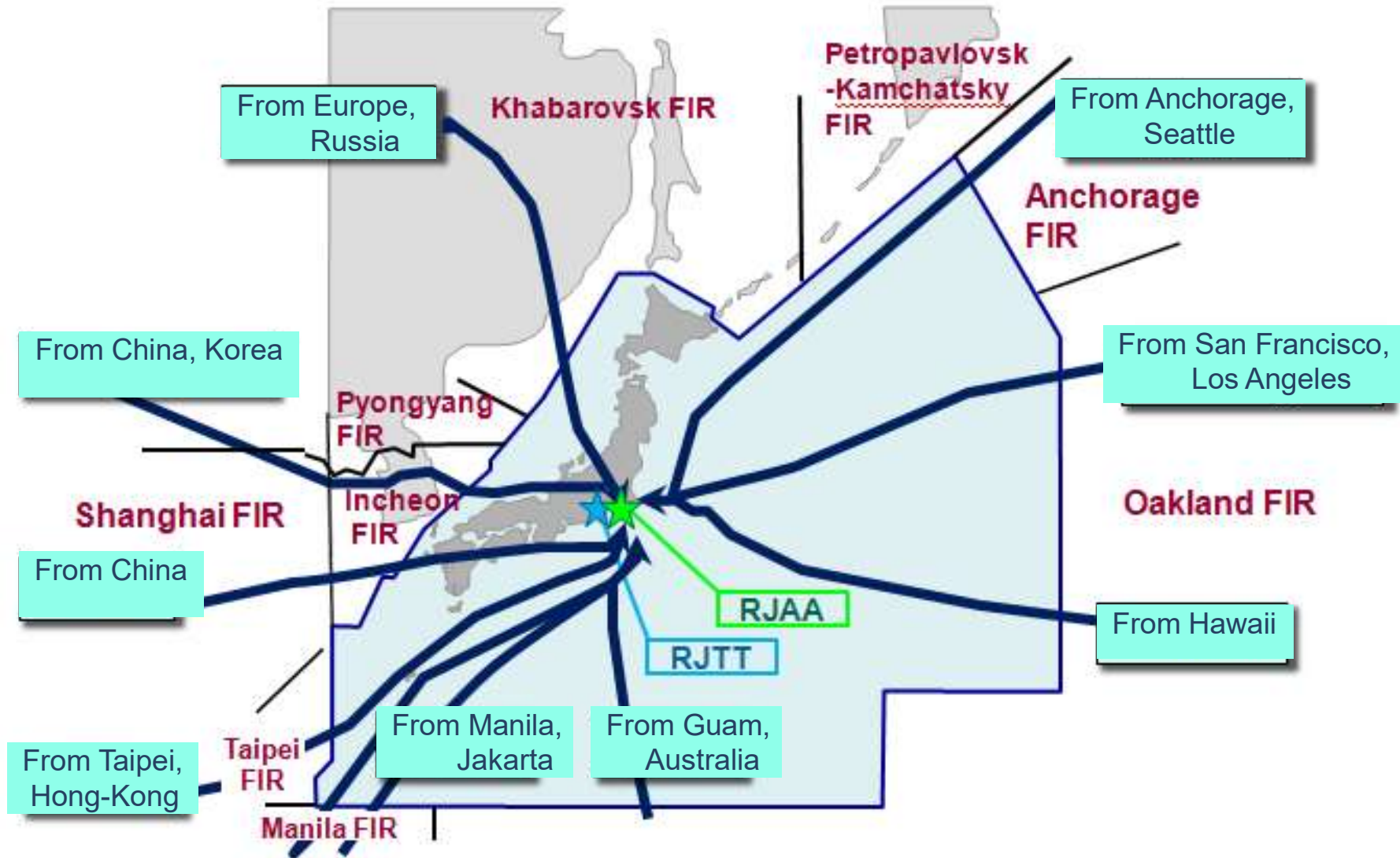
Forecast & ATFM Measures

17th Feb, Time Line of NARITA

Direction												
Direction	Forecast	220	220	220	220	220	220	220	220	220	220	220
Speed(kt)	@16 2130z	10	12	14	22G35	22G35	28G45	28G45	28G45	28G45	28G45	28G45
Cross Wind		9	11	13	20	20	26	26	26	26	26	26
ATMetC Briefing & Actual Situation	B	B	bB	bb		b bb		B	B		b	bb
	B:Regular Briefing b:Temporary Briefing											
UTC	21~	22~	23~	00~	01~	02~	03~	04~	05~	06~	07~	08~
ATFM Measure												
Capacity Reference Value 15ac/30min												
Inter-national ATFM Measure												
Situation												

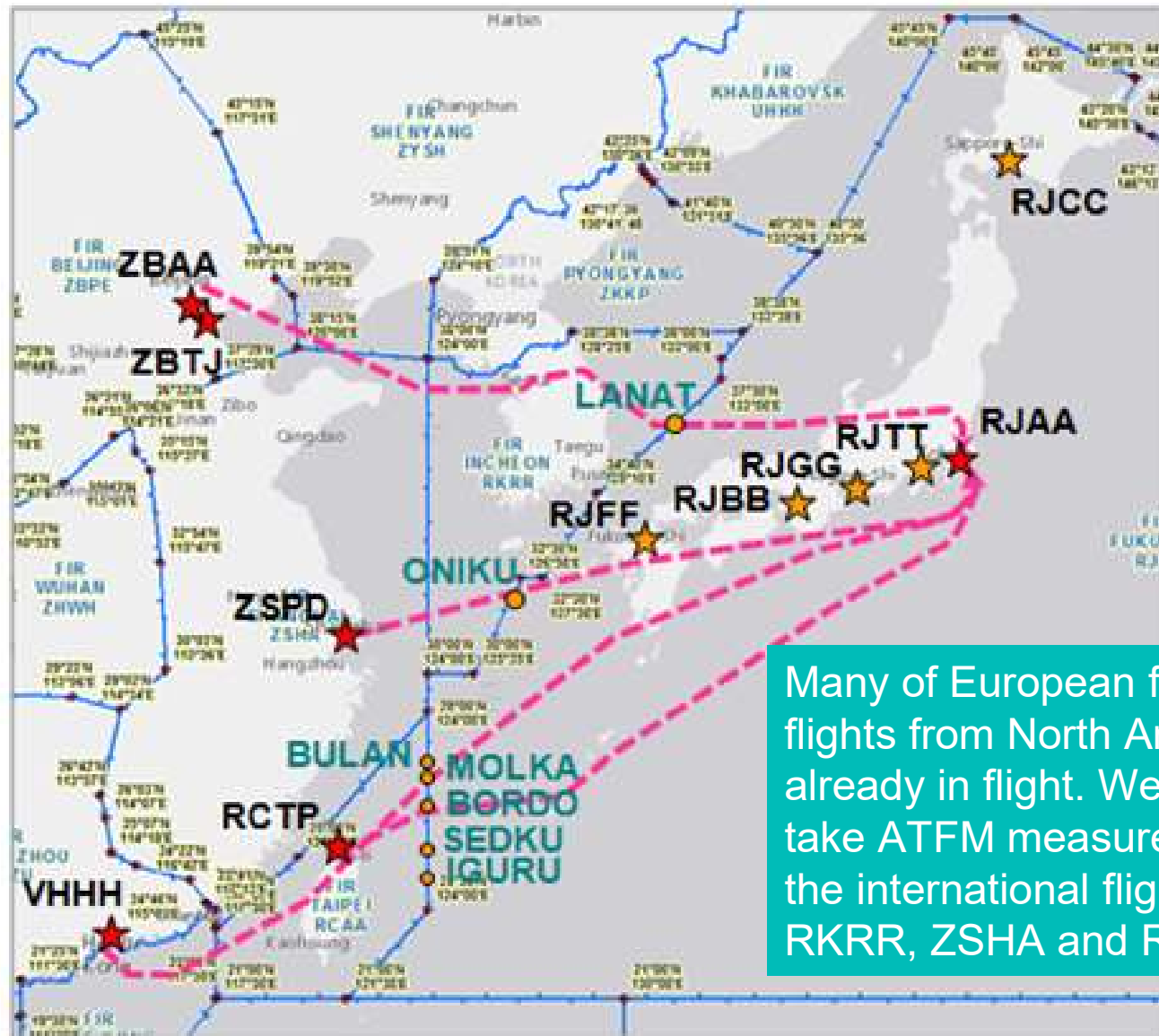
Traffic Flow to NARITA

- International Air Traffic Flow -



Traffic Flow to NARITA

- Route from Beijing/Shanghai/Hong Kong -



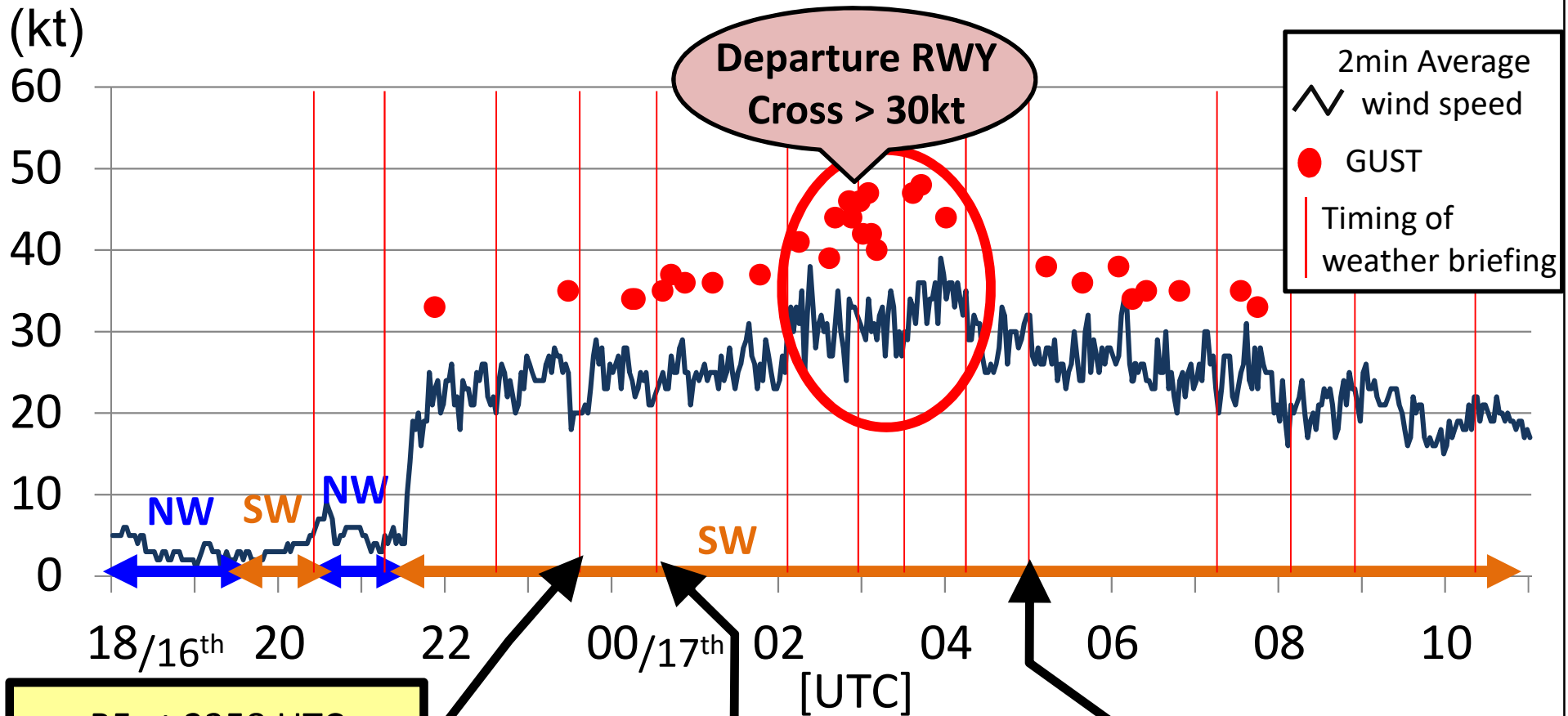
Many of European flights and flights from North America were already in flight. We decided to take ATFM measures against the international flights from RKRR, ZSHA and RCAA.

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- Conclusion

Situation of The Day

Observation of wind at HANEDA & Weather BFs to TMU



BF at 2358 UTC
Wind speed of 34G44KT will continue until 06 UTC.

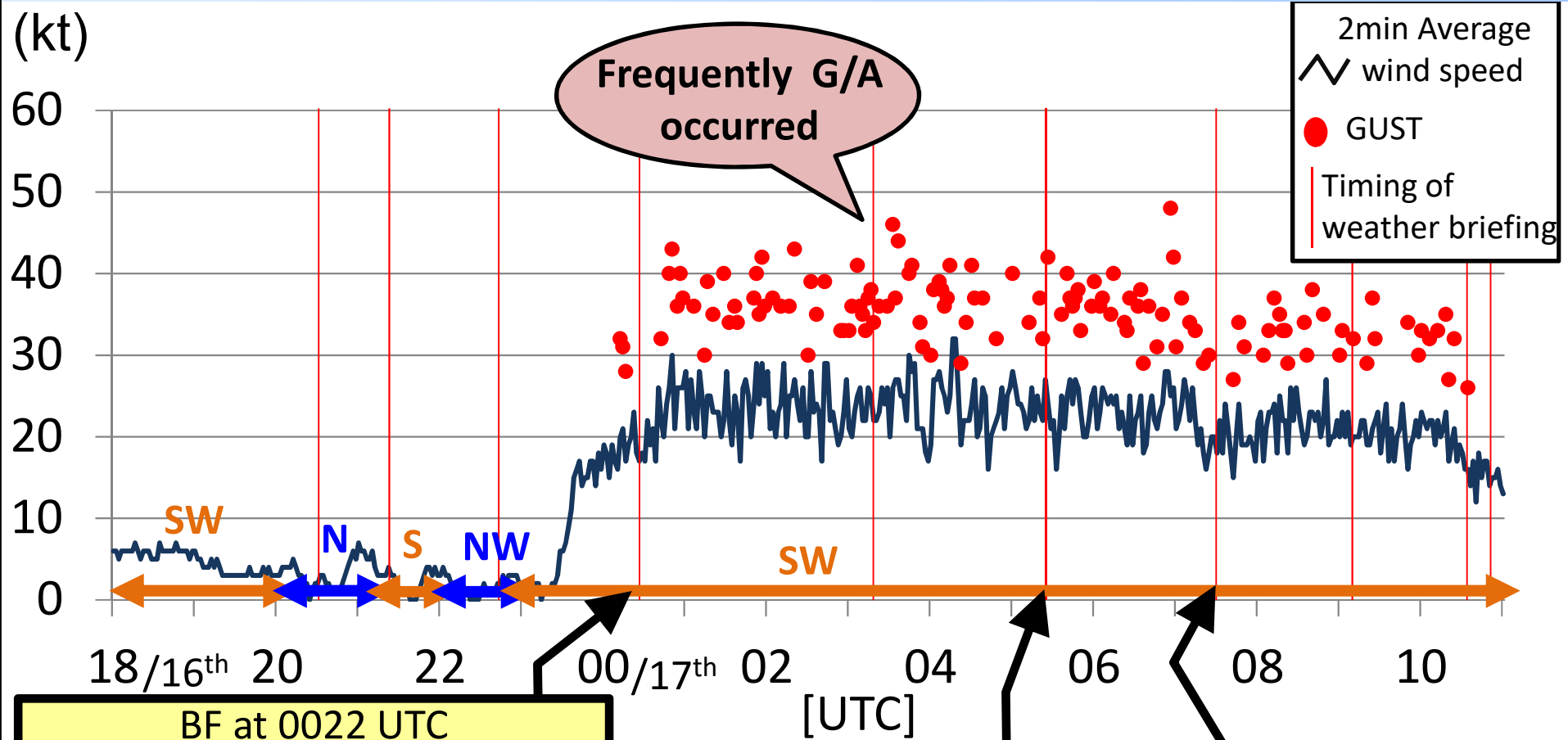
BF at 0050 UTC
Wind will become particularly strong from 02 to 04 UTC. And G/A began to occur at Narita.

BF at 0510 UTC
Cross wind component of above 30 kt will continue until about 08 UTC.

G/A : go around

Situation of The Day

Observation of wind at NARITA & Weather BFs to TMU



BF at 0022 UTC
Wind got strong and WS often began to occur earlier than the previous forecast. Cross wind component will be over 25 kt until 08 UTC.

BF at 0510 UTC
Strong wind with gust will continue until 09 UTC.

BF at 0739 UTC
Peak of strong wind finished.

G/A : go around

Situation of The Day

17th Feb, When a gusty wind blew



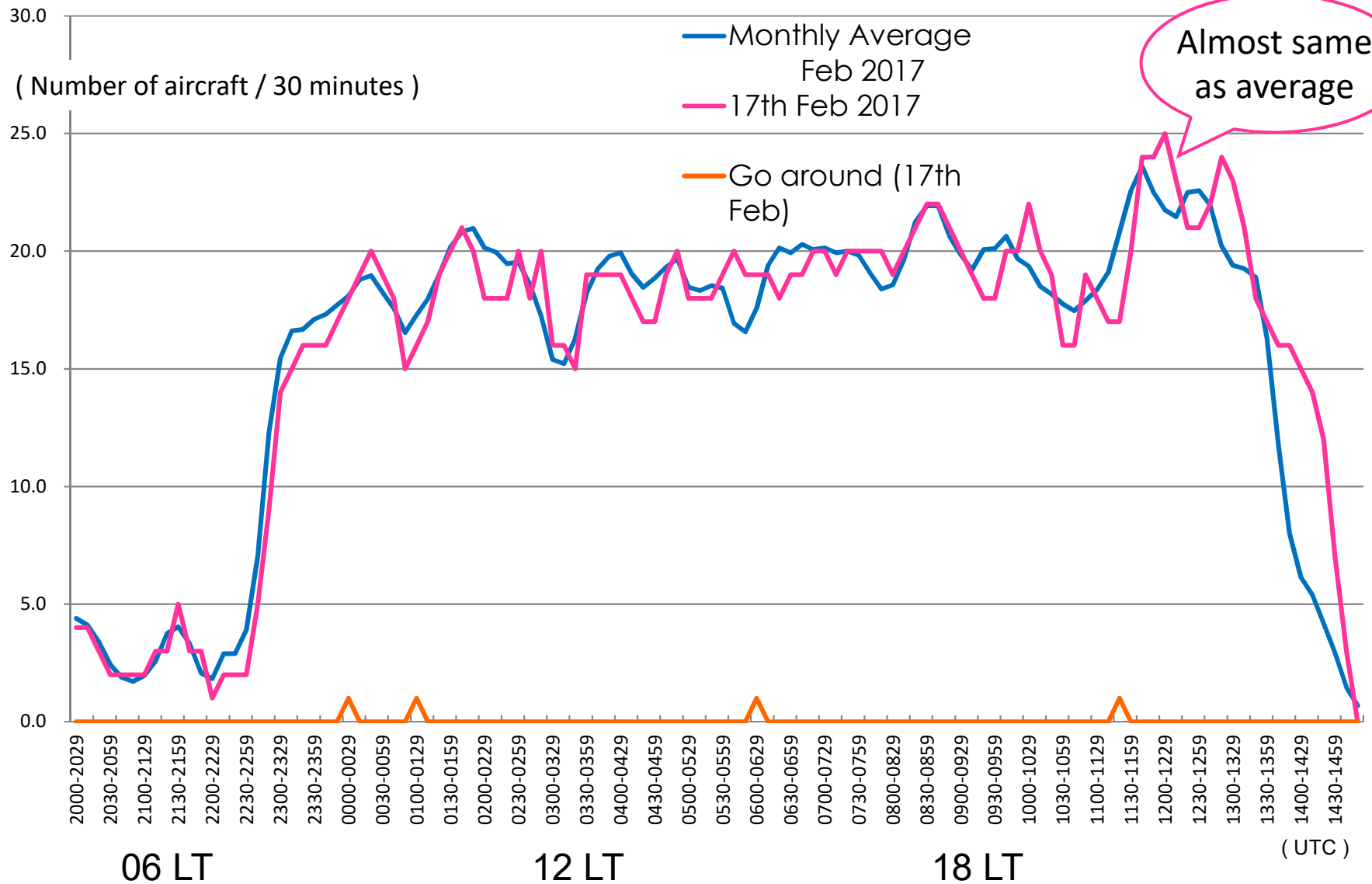
Situation of The Day

17th Feb, When a gusty wind blew



Situation of The Day

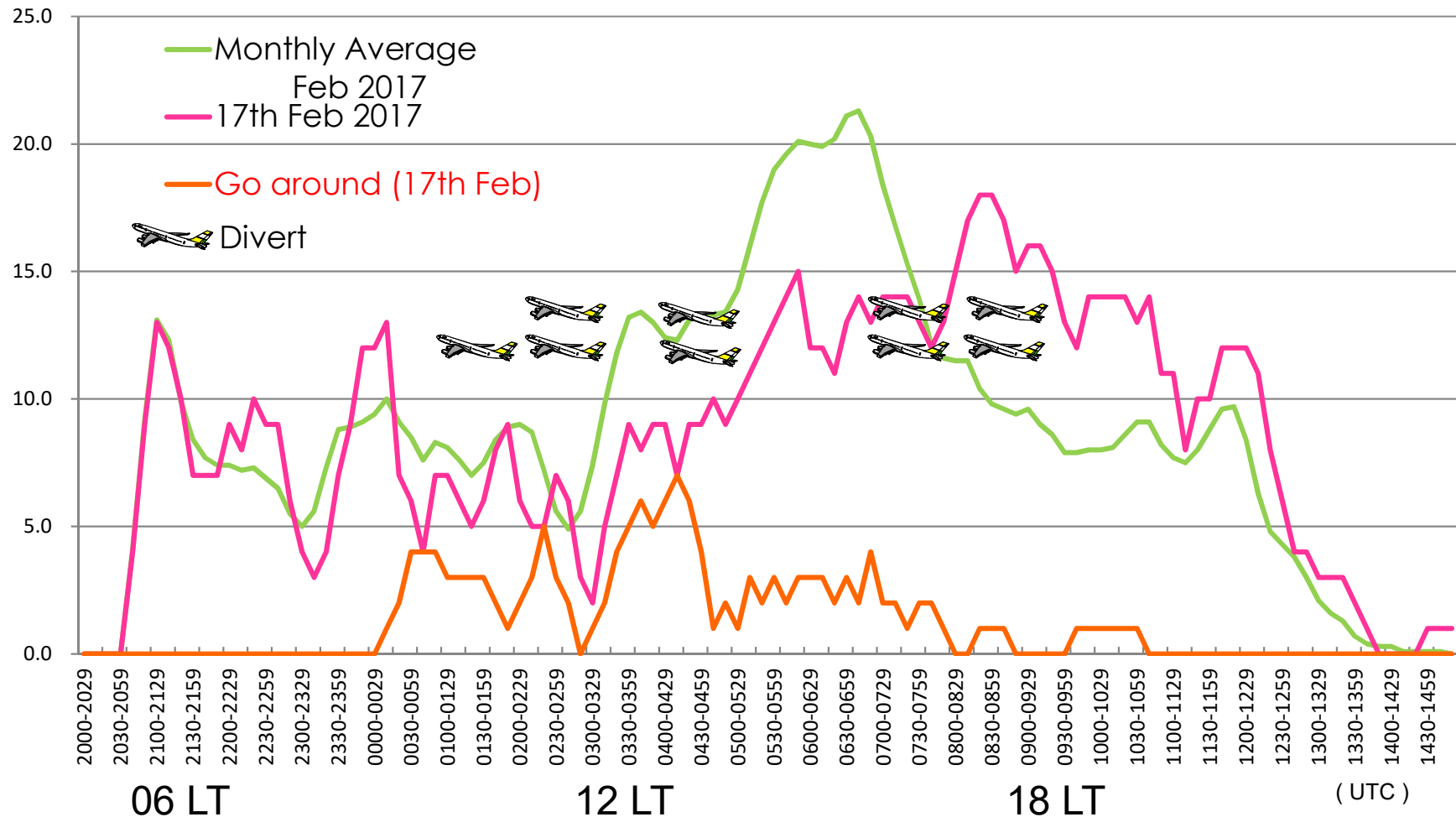
The Number of aircraft arrived at HANEDA



Situation of The Day

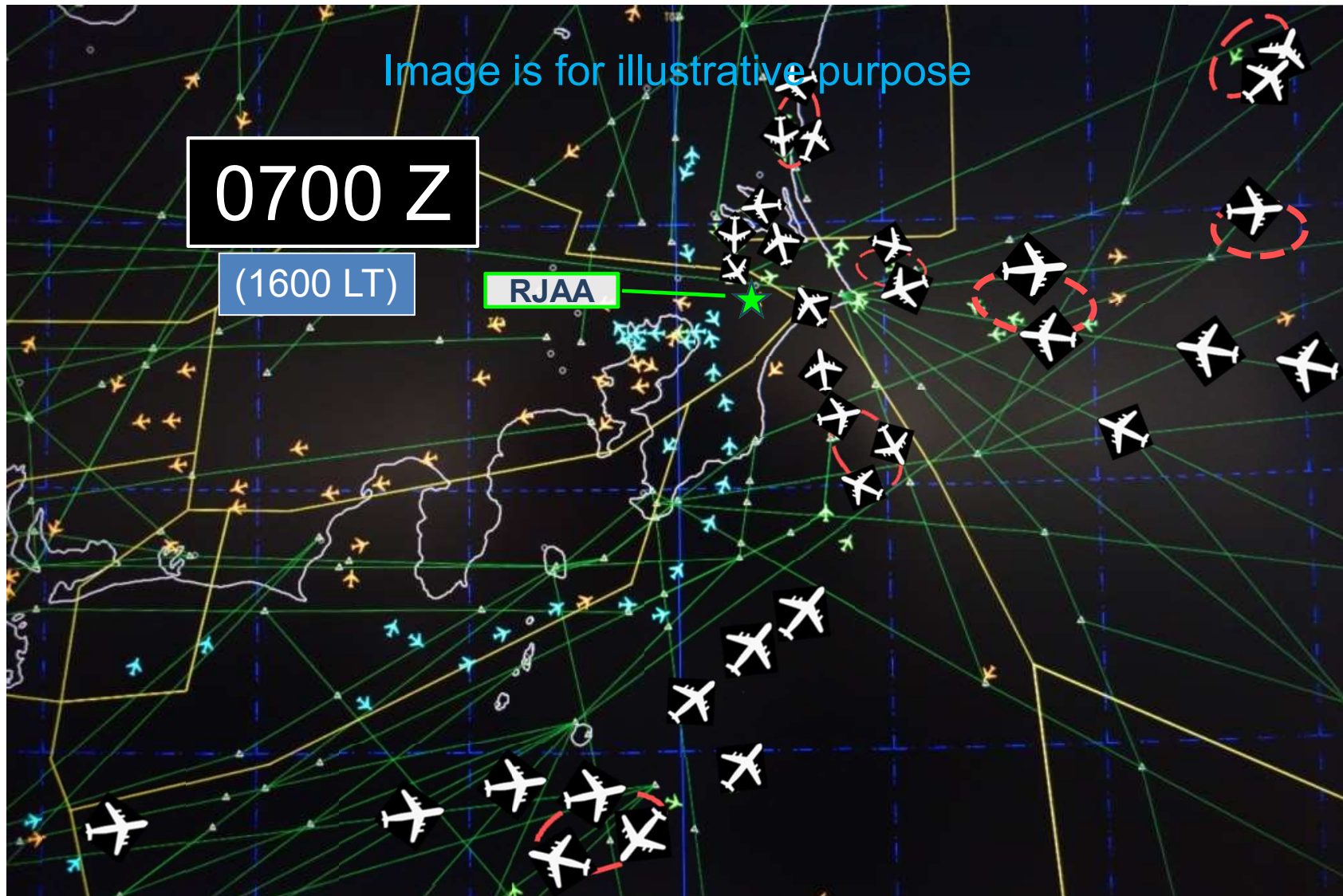
The Number of aircraft arrived at NARITA

(Number of aircraft / 30 minutes)



Situation of The Day

Arrival aircraft for NARITA



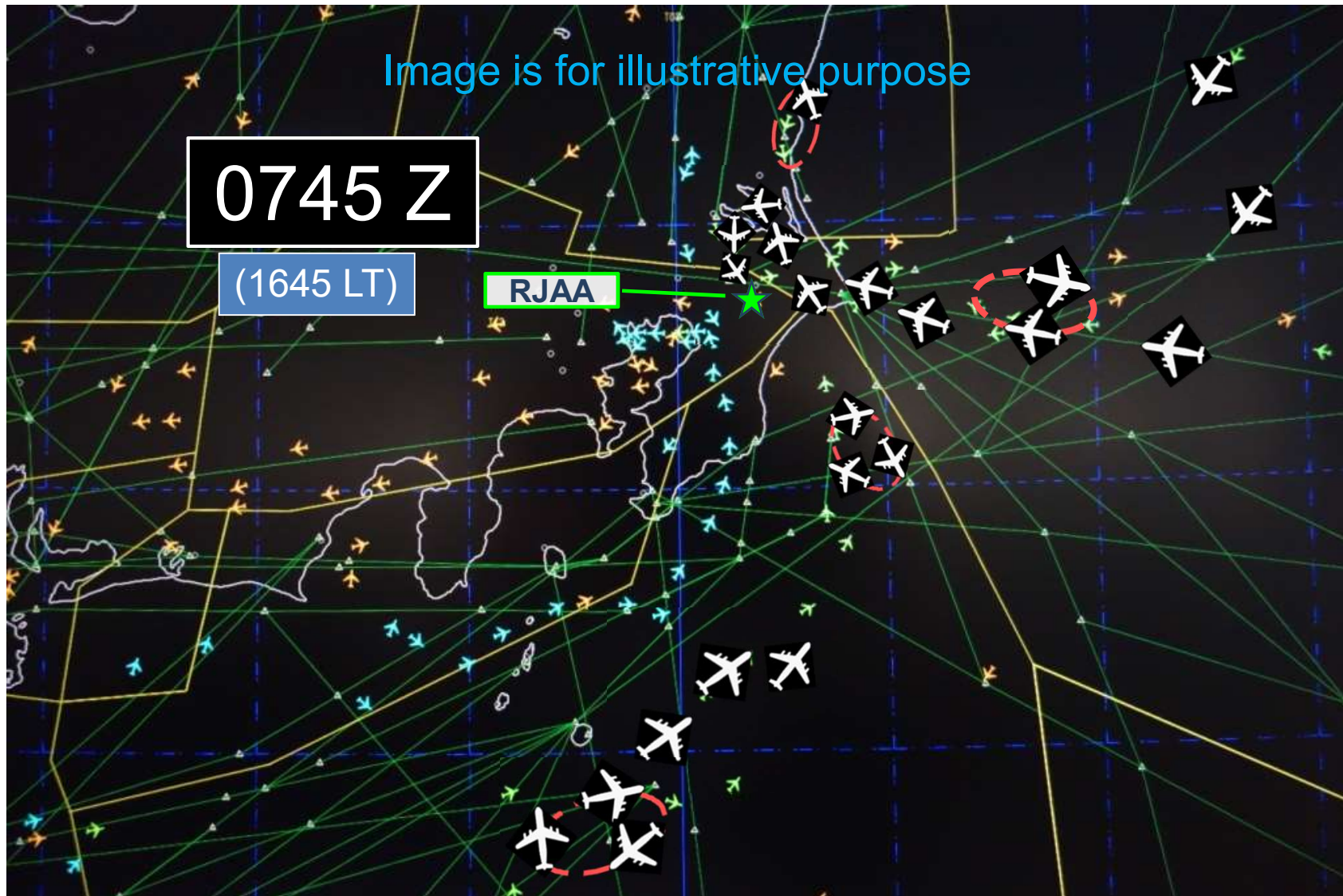
Situation of The Day

Arrival aircraft for NARITA



Situation of The Day

Arrival aircraft for NARITA



Situation of The Day

Arrival aircraft for NARITA



Situation of The Day

If Severe Restriction was Imposed ...



The Impact on Air Traffic Flow

Haneda : G/A occurred three times.

Although the crosswind component exceeded 30kt, there was not much influence.

- Strong wind was intermittent.
- An impact on air traffic flow was **minimized because traffic volume was controlled by reducing CAPA** in consideration of weather information TMAT provided.

Narita : G/A occurred frequently by wind shear.

Numerous aircraft diverted.

- TMAT and TMU were able **to prevent excessive concentration of traffic volume and confusion over airspace by reducing CAPA** in the period when air traffic volume increased.

Contents

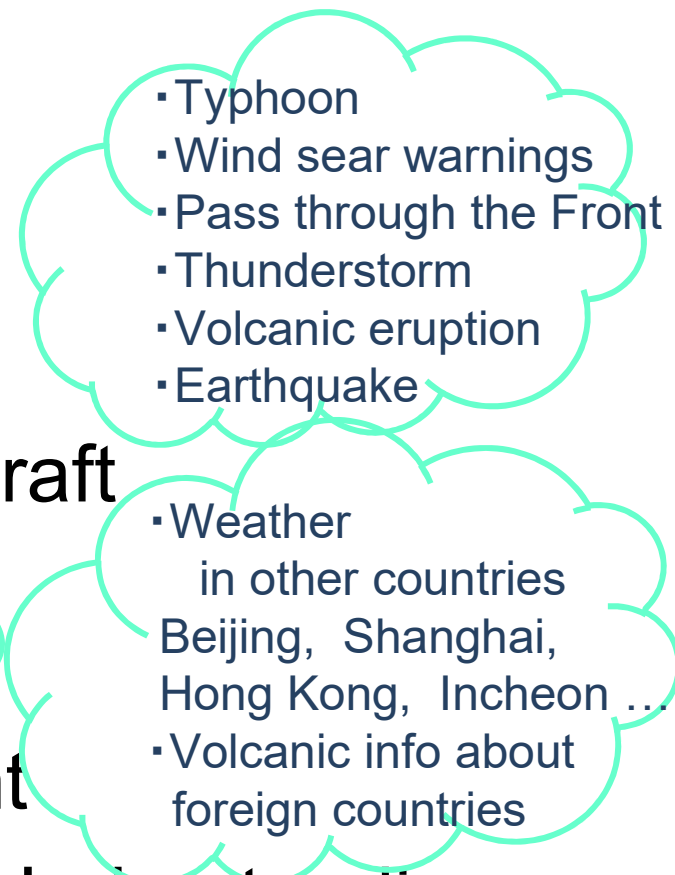
- Overview
- Forecast & ATFM measures
- Situation of the day
- **Conclusion**

Summary

- TMAAT updates forecast on significant weather which may affect ATM in response to changing weather conditions and provides precise MET information to TMU in a timely manner.
- MET information is shared with ATMC immediately and utilized to minimize impact of significant weather on air traffic flow.

MET supports ATM operations and contributes to forming safe and efficient air traffic flow.

Conclusion

- The latest information enables us to respond to various events quickly.
 - The specific information enables us to deal with the aircraft that is even in a faraway country before its take-off.
 - Information sharing is important ways of Safety, Efficiency and Understanding each other. Especially, share the situation and collaborate with meteorological officers.
- 
- The image features two thought bubbles on the right side of the slide. The top bubble contains a list of weather and volcanic events: Typhoon, Wind sear warnings, Pass through the Front, Thunderstorm, Volcanic eruption, and Earthquake. The bottom bubble contains a list of weather and volcanic information: Weather in other countries (Beijing, Shanghai, Hong Kong, Incheon ...), and Volcanic info about foreign countries.
- Typhoon
 - Wind sear warnings
 - Pass through the Front
 - Thunderstorm
 - Volcanic eruption
 - Earthquake
- Weather in other countries
Beijing, Shanghai, Hong Kong, Incheon ...
 - Volcanic info about foreign countries



Thank you !
謝謝 !