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
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• Conclusion
Overview

About ATMC (JCAB)
Overview

About ATMC (JCAB)

- In Operation room -

Oceanic ATS

Flight Data

Large information monitor

ATM officers
ATFM / ASM

AIM specialist

JSDF liaison

Met Agency

Engineering specialist

Overview
Overview

About ATMC (JCAB)

- In Operation room -

Air Traffic Management Officer

Mt. AAA!? How high is the V/A !?

When will wind direction change?

Oh! bound for BBB, 30minutes interval...

Meteorological Officer

Flash report !! Mt. CCC Erupted !

Wind direction will change …

DDD’s wx will …
About ATMC (JCAB)

- Daily Weather Briefing -

Overview

REGULAR WEATHER BRIEFING

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

About ATMC (JCAB)
- Daily Weather Briefing -

REGULAR WEATHER BRIEFING

2000 UTC (0500 LT) in Operation room
2200, 0445 and 1200 UTC in Pre-operation briefing

AD HOC

if necessary

IN CDM CONFERENCE

2045 and 0620 UTC (0545, 1520 LT)
Overview

Organization of JMA to support ATM

At Fukuoka city

**ATMC (2005-)**
*(Air Traffic Management Center)*

**ATMetC (2005-)**
*(Air Traffic Meteorology Center)*

**NCAT (2018-)**
*(New Chitose Area Team)*

**TMUs (2011-)**
*(Traffic Management Unit)*

**TMAT (2014-)**
*(Tokyo Metropolitan Area Team)*

Organized branch facilities in Tokyo metropolitan area

**Fukuoka FIR**

**Coordination**

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**JMA (Japan Meteorological Agency)**

**JCAB (Japan Civil Aviation Bureau)**
## Overview

**Technical background - JMA's NWP models for aviation forecast**

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

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

<table>
<thead>
<tr>
<th>Phenomenon</th>
<th>Precipitation Nowcasts</th>
<th>Thunder and Hazardous Wind Potential Nowcasts</th>
<th>High-resolution Precipitation Nowcasts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution</td>
<td>1 km</td>
<td>-</td>
<td>250 m or 1 km (up to 30 min) 1 km (35-60 min)</td>
</tr>
<tr>
<td>Forecast range</td>
<td>1 hour (every 5 minutes)</td>
<td>1 hour (every 10 minutes)</td>
<td>1 hour (every 5 minutes)</td>
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<tr>
<td>Operation</td>
<td>2011 - (1st gen 2004)</td>
<td>2011 -</td>
<td>2014 -</td>
</tr>
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</table>
About ATMetC (JMA)

Air Traffic Meteorological category forecast

| S01 | S02 | S03 | S04 | S31 | T01 | T02 | T03 | T04 | RJC | RJAA | RJCC | RJTT | F01 | F02 | F03 | F05 | F06 | F07 | F08 | F11 | F15 | F16 | F17 | N01 | N02 | N06 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|     |     |     |     |     |     |     |     |     |     |     |      |      |     |     |     |     |     |     |     |     |     |     |     |     |

(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)

<table>
<thead>
<tr>
<th>Color Code</th>
<th>RJTT</th>
<th>RJAA</th>
<th>RJGG</th>
<th>RJBB</th>
<th>RJFF</th>
<th>ROAH</th>
<th>RJCC</th>
<th>ATC Sector</th>
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<tbody>
<tr>
<td><strong>Red</strong></td>
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<tr>
<td></td>
<td>moderate or heavy precipitation</td>
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<tr>
<td></td>
<td>wind direction 030°~060° or 210°~240° and gust ≥ 30kt</td>
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<td>snow fall rate ≥ 5cm/h</td>
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<td>gust ≥ 50kt</td>
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<td>cross wind component to runway ≥ 25kt</td>
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<td>cross wind component to runway ≥ 20kt with</td>
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<td>moderate or heavy precipitation</td>
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<td>wind direction 030°~060° or 210°~240° and gust ≥ 25kt</td>
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<td>visibility &lt; 400m</td>
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<td>visibility &lt; 1800m with snow</td>
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<td></td>
<td>TS in HANEDA sector</td>
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<td>TS in HANEDA sector</td>
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<tr>
<td></td>
<td>TS in TAF but CB doesn't exist in the aerodrome</td>
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<tr>
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<td>visibility &lt; 400m</td>
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<td></td>
<td>visibility &lt; 1800m with snow</td>
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<td></td>
<td>ceiling &lt; 200ft</td>
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<td></td>
<td>wind speed ≥ 20kt with snow</td>
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<td></td>
<td>CB (top ≥ FL300) in the sector ≥ 10%</td>
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</tbody>
</table>

Note: it may differ from present criteria due to continual improvement
About TMAT (JMA)

TMAT
(Tokyo Metropolitan Area Team, JMA)

Operation room

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

ATM CIEL

ATM Categorized Impact of weather EEllement prediction
Overview

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

• Overview
• Forecast & ATFM measures
• Situation of the day
• Conclusion
An example of impact on air traffic flow by strong wind from south west.

RJTT & RJAA
Forecast & ATFM Measures

Outline of NARITA (RJAA)
### Forecast & ATFM Measures

#### Regular briefing at 2030/2250 UTC about strong wind

(0530/0730 LT)

<table>
<thead>
<tr>
<th>Sequential forecast</th>
<th>16th</th>
<th>17th</th>
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<tbody>
<tr>
<td></td>
<td>22</td>
<td>23</td>
</tr>
<tr>
<td><strong>RJTT</strong> (Haneda)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wind direction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wind speed</td>
<td>24G34KT</td>
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</tr>
<tr>
<td>Crosswind</td>
<td></td>
<td></td>
</tr>
<tr>
<td>component to</td>
<td></td>
<td></td>
</tr>
<tr>
<td>departure runway</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>RJAA</strong> (Narita)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wind direction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wind speed</td>
<td>10KT</td>
<td>12KT</td>
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<tr>
<td>Crosswind</td>
<td>9KT</td>
<td>11KT</td>
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<tr>
<td>component to</td>
<td></td>
<td></td>
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<tr>
<td>runway</td>
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</tr>
</tbody>
</table>

- **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

<table>
<thead>
<tr>
<th>Sector/UTC</th>
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<th>00</th>
<th>01</th>
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<tr>
<td></td>
<td>30</td>
<td>40</td>
<td>50</td>
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<td></td>
<td>00</td>
<td>10</td>
<td>20</td>
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<td></td>
<td>30</td>
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<td>T07</td>
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<td>RJAA</td>
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<td>WIND</td>
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<td>WIND CONV</td>
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<td>T14</td>
<td>CONV</td>
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<td>T09</td>
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<td>T12</td>
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<tr>
<td>T13</td>
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</tbody>
</table>

Level of Impact to ATM
- NONE
- SLIGHT
- MEDIUM
- HIGH

RJAA : Narita
RJTT : Haneda
Forecast & ATFM Measures

Regular CDM Conference

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

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

Wind at 5000 ft
Yellow 50 kt+, Orange 60 kt+
### ATM Operations Plan

After CDM Conference, 2345z 16\textsuperscript{th} and 0620z 17\textsuperscript{th}

#### Capacity (CAPA) & Constraints
- RJTTS: 2100-0000 CAPA=14.3
- 0000-0100 CAPA=13.5
- 0100-0600 CAPA=13.0
- 2330-0600 SPC=8
- RJTTS -1
- T17: 2330-0500 96% WX

#### Flow Control Initiative
- RJTTS: 2140-0500 EDCT
- ROAH: 2315-0500 EDCT
- F05: 2325-0200 EDCT
- G585: 0000-0220 35MIN @ SAPRA TO ACFT FOR ZSQD
- G585: 2250-0700 EDCT FOR CHINA AND BEYOND
  (EXC ZSQD, ZSJT, ZSWE, ZSJP, ZSYN, ZSYN, ZHCC AND ZYTL)

#### Other
- RJAA: 0230-0600 EDCT
- T01: 0130-0230 DEP INVL FM RJCC OR RJAA
- F02: 0245-0450 EDCT
- F02: 0430-0515 DEP INVL FM RJFF
- NO2: 0410-0510 DEP INVL FM ROAH

#### Other
- RJAA: 0143
- A593: 0640-UFN 5MINI @ ONIKU FOR RJAA
- A593: 0600-1000 FOR ZSPD FL330 AND ABV NOT AVAIL

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### ADP: ATFM Daily Plan

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Some aircrafts changed destination
### Forecast & ATFM Measures

**17th Feb, Time Line of HANEDA**

<table>
<thead>
<tr>
<th>Direction</th>
<th>220</th>
<th>220</th>
<th>220</th>
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<tr>
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<tr>
<td>Cross Wind</td>
<td>22</td>
<td>31</td>
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<td>31</td>
<td>31</td>
<td>31</td>
<td>22</td>
<td>22</td>
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<tr>
<td>ATMetC Briefing &amp; Actual Situation</td>
<td>B B B b</td>
<td>b</td>
<td>B b b B b</td>
<td>b b b b b</td>
<td>Aerodrome Gale Warning 2352 – 0800 Z Cancelled at 0727Z</td>
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<tr>
<td>UTC</td>
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<td>Inter – national ATFM Measure Situation</td>
<td>g : go around (Because of the wind)</td>
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# Forecast & ATFM Measures

**17th Feb, Time Line of NARITA**

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<td>ATFM Measure</td>
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<td>Inter-national ATFM Measure</td>
<td>D : Divert</td>
<td>--- : Holding</td>
<td>g : go around</td>
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<td>Aerodrome Gale Warning 0300 – 0820 Z 0736Z Cancelled</td>
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- **EDCT 0100-0930**
- **Speed adjustment**
- **Reduced capacity setting by 52%**
- **from RKRR 15min 5min**
- **from ZSHA 15min 5min**
- **from VHHH/RCTP 20min 5min**
Forecast & ATFM Measures

Traffic Flow to NARITA

- International Air Traffic Flow -

From Europe, Russia
From Anchorage, Seattle
From San Francisco, Los Angeles
From China, Korea
From Chicago
From China
From Taipei, Hong-Kong
From Hawaii
From Manila, Jakarta
From Guam, Australia
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.
• Overview
• Forecast & ATFM measures
• **Situation of the day**
• Conclusion
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.
Situation of The Day

Observation of wind at NARITA & Weather BFs to TMU

2min Average

Wind speed

GUST

Timing of weather briefing

Frequently G/A occurred

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

Looks Dusty • • •
Situation of The Day

The Number of aircraft arrived at HANEDA

( Number of aircraft / 30 minutes )

Monthly Average
Feb 2017

17th Feb 2017

Go around (17th Feb)

Almost same as average

Situation of The Day

The Number of aircraft arrived at HANEDA

( Number of aircraft / 30 minutes )

Monthly Average
Feb 2017

17th Feb 2017

Go around (17th Feb)

Almost same as average
Situation of The Day
The Number of aircraft arrived at NARITA

(Number of aircraft / 30 minutes)

Monthly Average
Feb 2017
17th Feb 2017

Go around (17th Feb)
Divert

The Number of aircraft arrived at NARITA:
- 06 LT
- 12 LT
- 18 LT

(UTC)
Situation of The Day

Arrival aircraft for NARITA

Image is for illustrative purpose

0700 Z
(1600 LT)

RJAA
Situation of The Day

Arrival aircraft for NARITA

Image is for illustrative purpose

0725 Z
(1625 LT)

RJAA
Situation of The Day

Arrival aircraft for NARITA

Image is for illustrative purpose

0745 Z
(1645 LT)

RJAA
Situation of The Day

Arrival aircraft for NARITA

0755 Z

(1655 LT)

Image is for illustrative purpose
Situation of The Day

If Severe Restriction was Imposed ...
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.
Summary

- TMAT 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.
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.

- Typhoon
- Wind shear 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！