



Impact-based meteorological information to support ATM operation

Japan Civil Aviation Bureau
Japan Meteorological Agency

ICAO APAC MET/ATM Seminar

28 April 2025

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- Drivers of ATM-tailored MET services provision
- MET services to support ATM in Japan

2. Translation from MET condition to impact on ATM

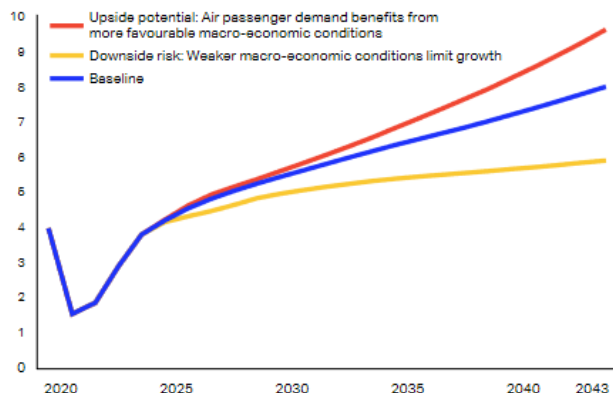
3. Case Study: operational capacity management utilizing impact-based MET information

1. Introduction

Drivers of ATM-tailored MET services provision

Growing demand on air traffic

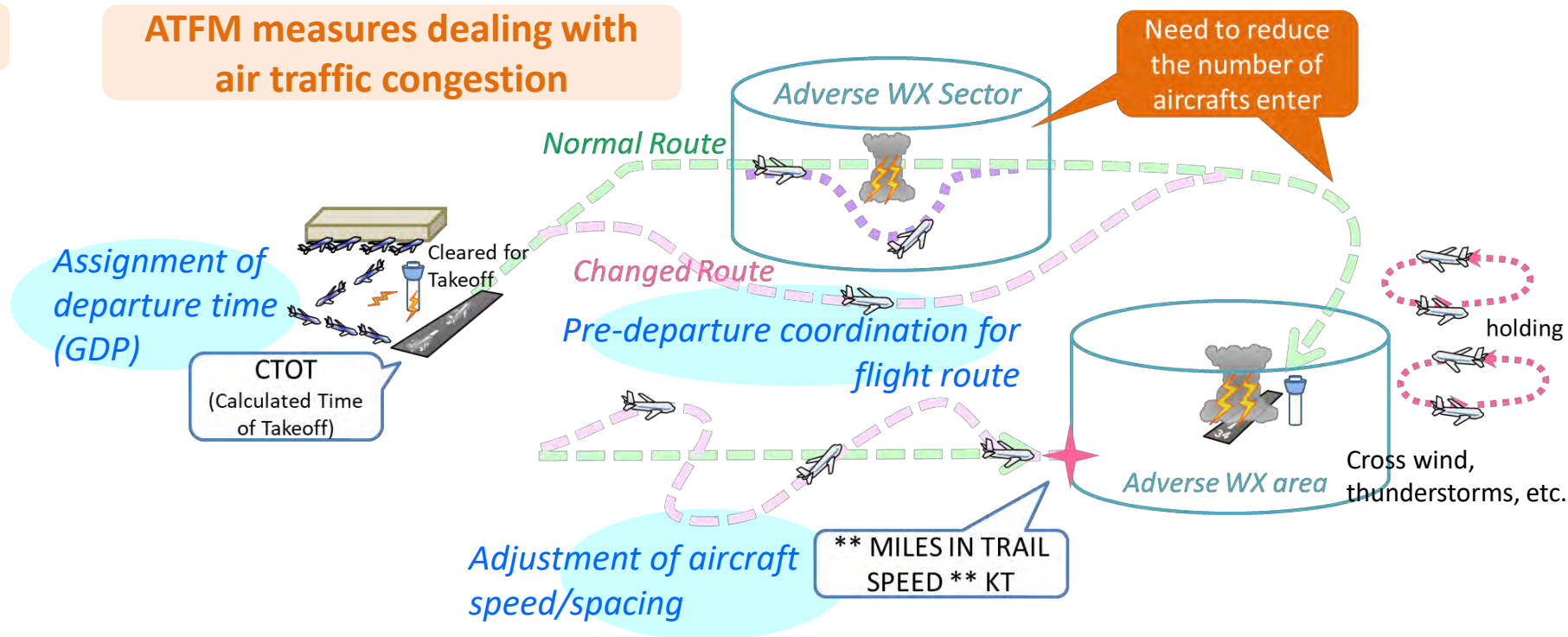
Chart 14: Global air passenger journeys, billion



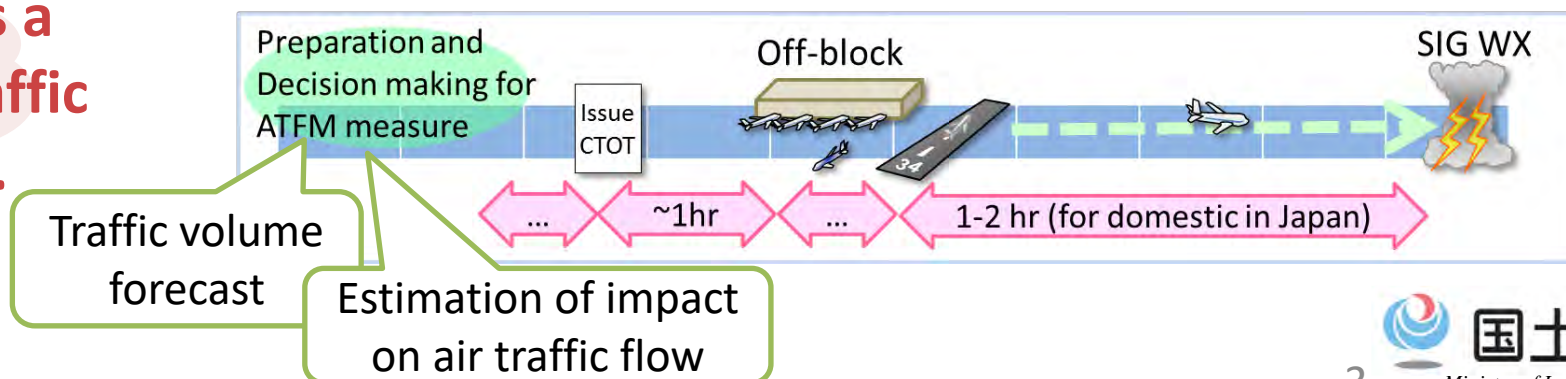
Source: Air Passenger Forecasts, February 2024 update

Global Outlook for Air Transport (IATA 2023)

ATFM measures dealing with air traffic congestion



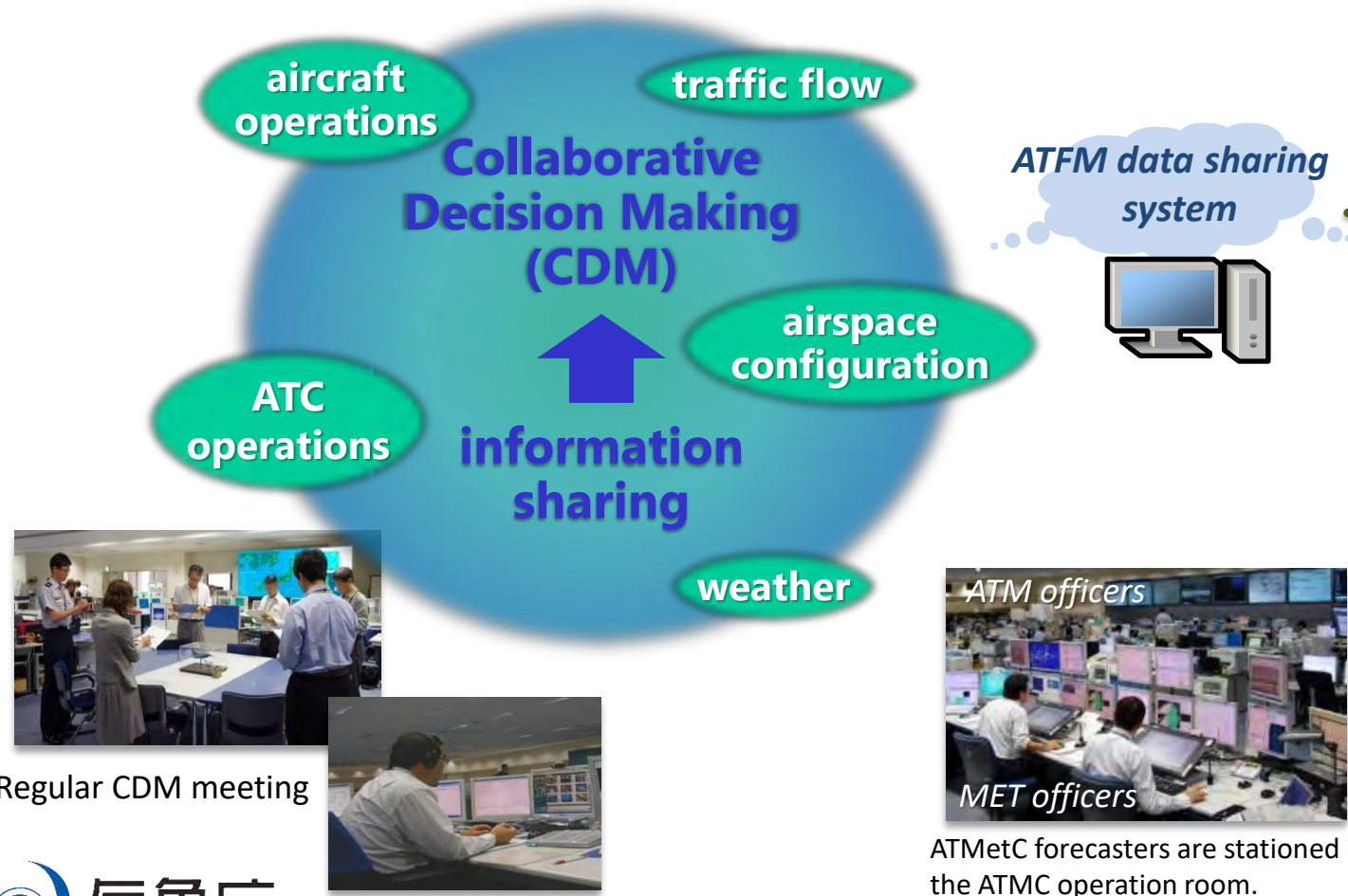
Meteorological condition is a major factor which affect traffic flow forecast uncertainty.



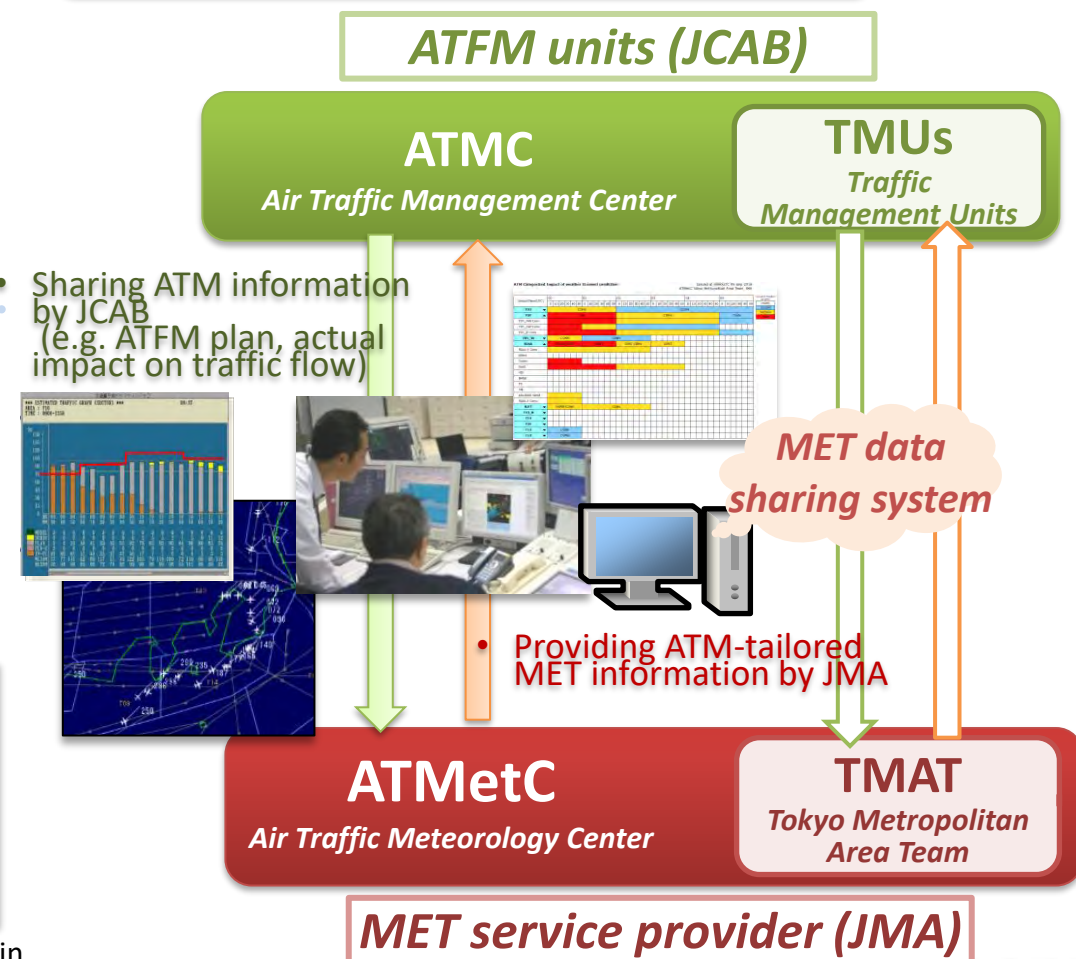
1. Introduction

MET services to support ATM in Japan

Contribution to the CDM for ATM decision making



Dedicated MET services for ATFM units



ATMetC forecasters are stationed in the ATMC operation room.

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2. Translation from meteorological condition to impact on ATM

Impact based MET information to support ATM decision making

ATM CIEL (ATM Categorized Impact of weather Element prediction)

on **capacity management**

➤ Forecast for next 6 hours in 10-min resolution

➤ Target phenomena:

ATC sectors: Convective clouds including CBs, other types of clouds that affect air traffic flow

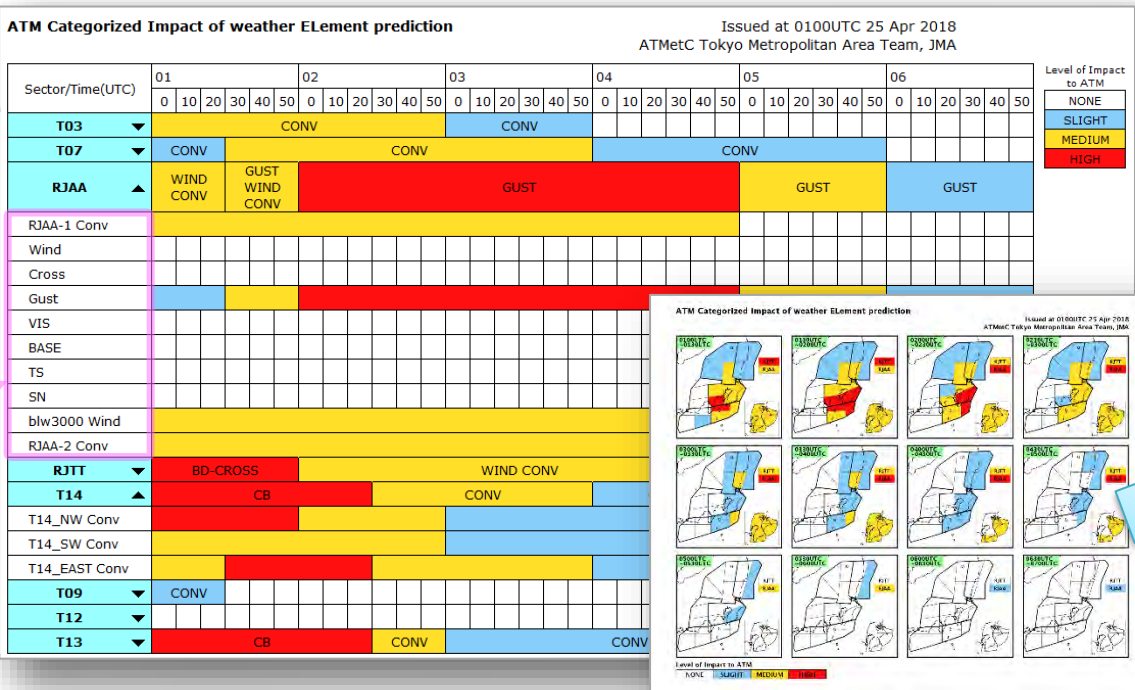
Approach control areas:

CBs, Convective clouds and Wind

Airports: Thunderstorms, Visibility, Ceiling, Wind, etc.

ATC sectors & airports

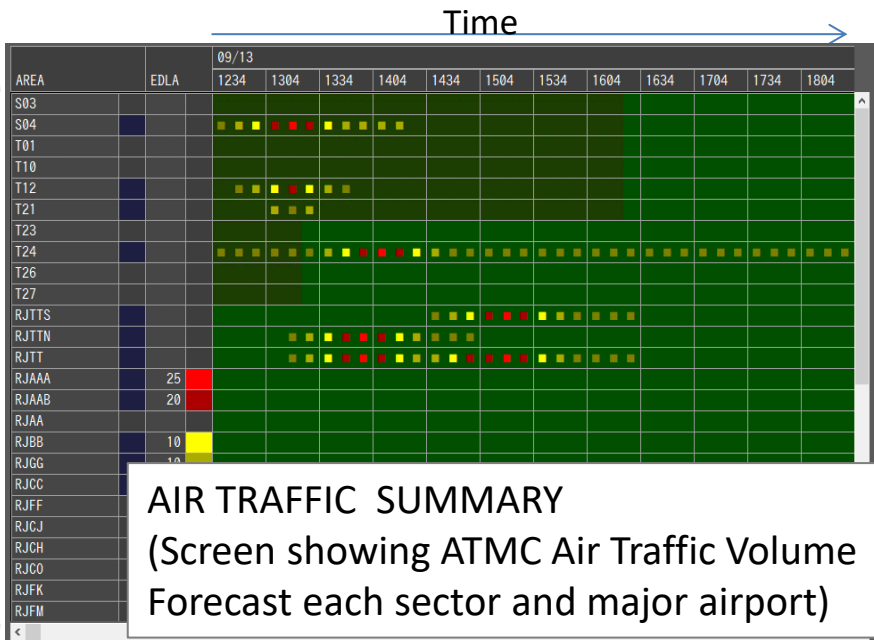
• Phenomena
• Sub-sectors of approach control area



Level of expected impact on ATM (capacity reduction)

High	Need to <i>reduce Capacity</i> significantly
Medium	Need to <i>reduce Capacity</i>
Slight	Need to <i>reduce Capacity</i> slightly
None	Not need to <i>reduce Capacity</i>

ATC sectors & airports



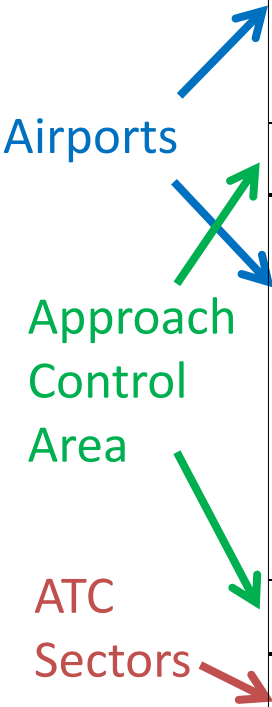
2. Translation from meteorological condition to impact on ATM

- Criteria for the Categories – ATM CIEL

Criteria are set for each airport and its Approach Control Area, as weather conditions that affect ATM depend on characteristics of local meteorological condition, airspace and runway configurations, etc.

The criteria for ATM Categorized Impact of weather ELEMENT prediction (ATM CIEL)

As of 19th JUL 2025



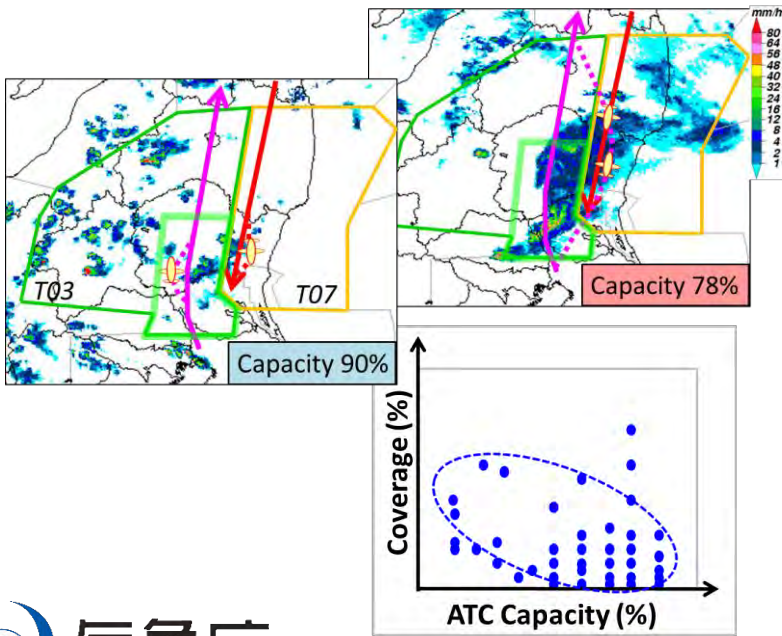
Target area	Elements	Abbreviations	Color code		
			SLIGHT	MEDIUM	HIGH
RJTT A RWY 34L-16R (3000m) B RWY 04-22 (2500m) C RWY 34R-16L (3360m) D RWY 05-23 (2500m)	Change of wind direction	WIND-CHG		Sudden changes in wind direction from south to north	
	Wind speed	WIND			≥ 40kt
	Crosswind component of Wind speeds to runway	AC-CROSS		≥ 29kt	≥ 33kt
	Crosswind component of Wind speeds to runway with moderate or heavy precipitation	or BD-CROSS			≥ 25kt for non-grooved runway ≥ 20kt
	Crosswind component of Wind speeds to runway	D-CROSS		≥ 29kt	
	Crosswind component of Wind speeds to runway with moderate or heavy precipitation	(for DEP only)		≥ 25kt for non-grooved runway ≥ 20kt	
	Visibility	VIS	< 2000m with FG, DZ or BR without precipitation		< 550m
	Cloud Base	BASE	SCT < 200ft		BKN or OVC < 200ft
	Thunderstorm	TS		TS	TS OHD
	Snow	SN		wet snow (snow cover)	heavy wet snow fall
Tokyo Approach Control Area RJTT Sector	Wind speed below 5000ft	WIND		≥ 50kt	
	Convective clouds	CONV	out of STARs	on STARs	
RJAA A RWY 34L-16R (4000m) B RWY 34R-16L (2500m)	Wind speed	WIND			≥ 40kt
	Crosswind component of Wind speeds to runway	CROSS		≥ 29kt	≥ 33kt
	Crosswind component of Wind speeds to runway with moderate or heavy precipitation				≥ 25kt for non-grooved runway ≥ 20kt
	Maximum wind gust speeds when wind direction 360 - 060° or 180 - 250°				
		GUST	≥ 25kt	≥ 31kt	≥ 37kt
	Visibility	VIS	< 2000m with FG, DZ or BR without precipitation		< 550m
	Cloud Base	BASE	SCT < 250ft		BKN or OVC < 200ft
	Thunderstorm	TS		TS	TS OHD
Tokyo Approach Control Area RJAA Sector	Snow	SN		wet snow (snow cover)	heavy wet snow fall
	Wind speed below 3000ft	WIND		≥ 50kt	
	Convective clouds	CONV	out of STARs	on STARs	
ATC sectors: T34, T35, T36, T38, T39, T40, T41, T42	Coverage of significant clouds in the detection area of each ATC sector	SIG-CLD	≥ 1%	≥ 10%	
		CB			≥ 30% including CB

2. Translation from meteorological condition to impact on ATM

How to translate?

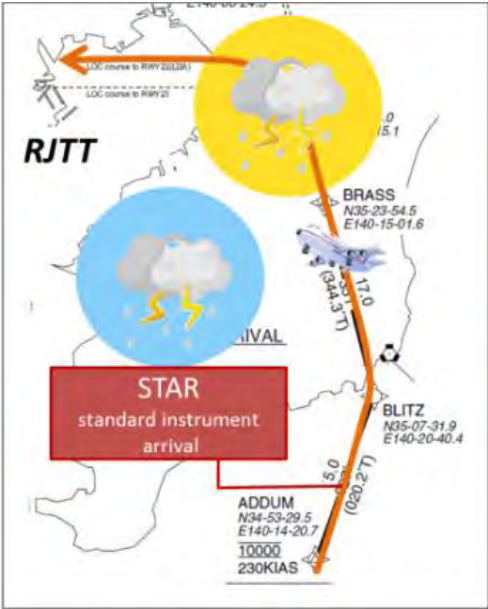
Statistical assessment

e.g., correlation between convective clouds coverage rate in the specific airspace of ATC sector and impacts on ATC capacity



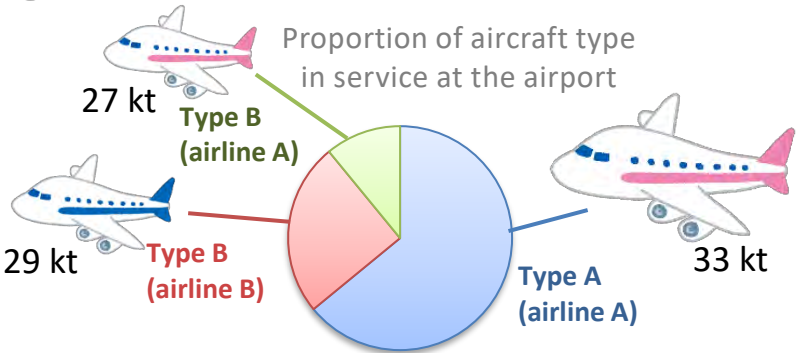
Based on the situation that affect aircraft operations

e.g., whether convective clouds are on the arrival route or not



Utilizing threshold of aircraft operations

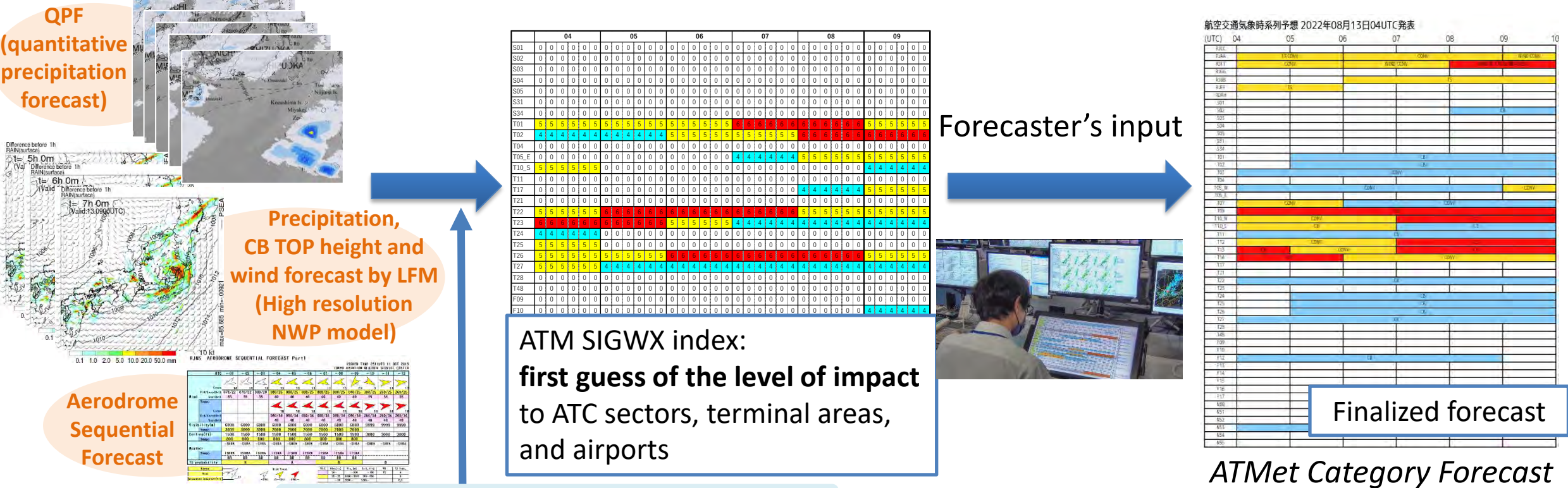
e.g., cross wind limitations of aircrafts



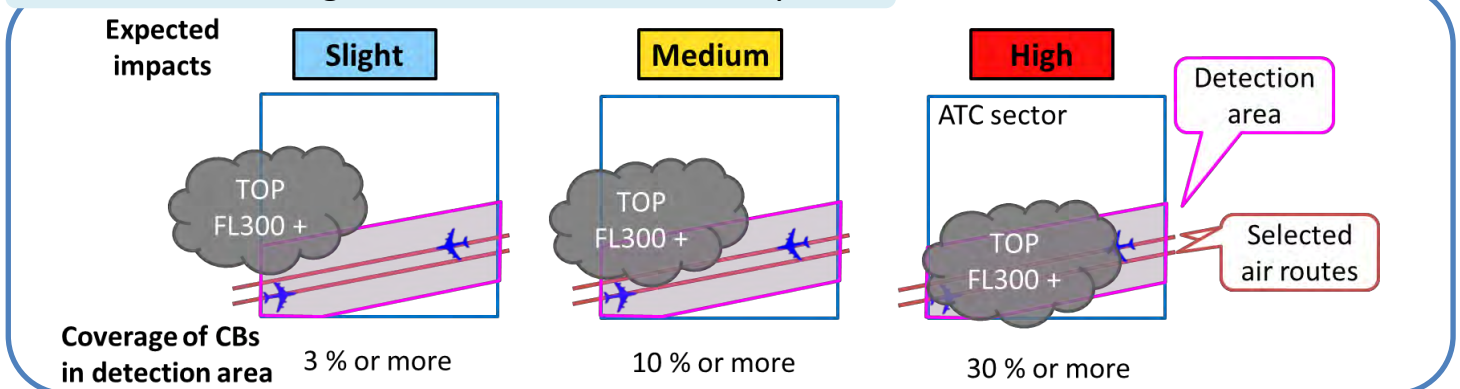
Level of impact	Cross wind component to the RWY (Tokyo Int'l)	
	Dry condition	Wet condition
High	33 kt or above	25 kt or above
Medium	29 kt or above	-
Slight	-	-
None	Below 29 kt	Below 25 kt

2. Translation from meteorological condition to impact on ATM

- Procedure of creating category forecast to show SIGWX impact to ATFM



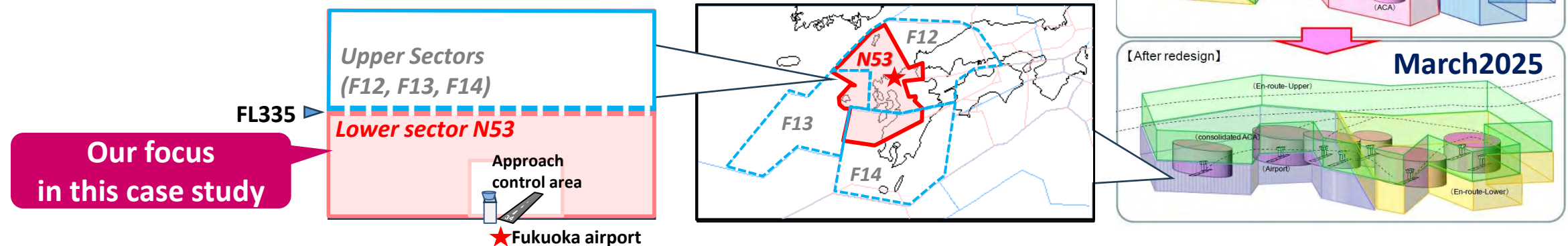
Criteria for categorization of estimated impact



Ref.
ICAO APAC MET/R WG/7 [IP/05](#)
ICAO APAC MET/R WG/12 [IP/03](#), [SP/12](#)

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 - Stage 2. Beginning of ATMO duty
 - Stage 3. Taking ATFM measures



3. Case Study – operational capacity management utilizing impact-based MET information

Stage 1. WX briefing before the ATMO on duty

JMA forecasters input to ATMO about overview of current and forecast meteorological situation within their duty:

- ✓ SIG-CLOUDs and turbulence was estimated to impact on lower sectors' air traffic.

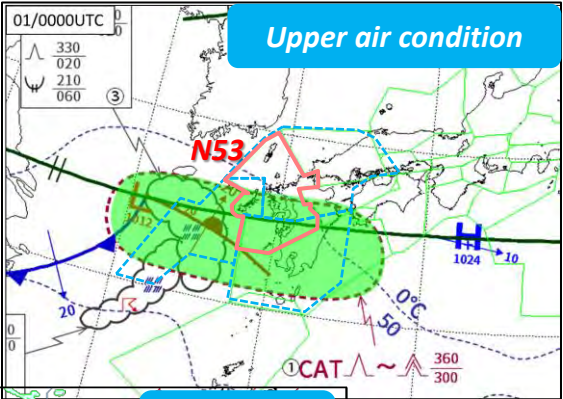
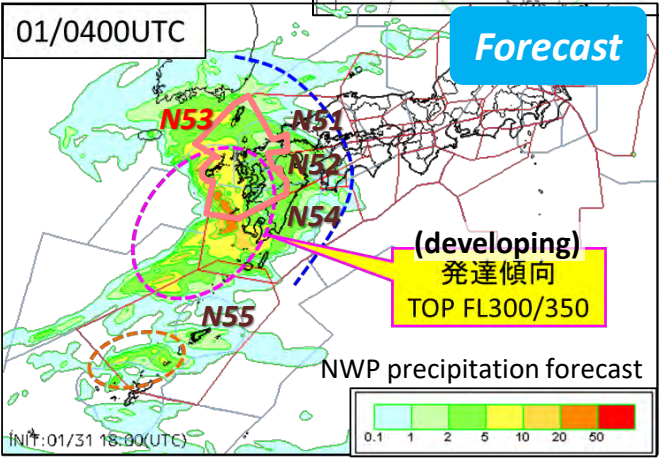
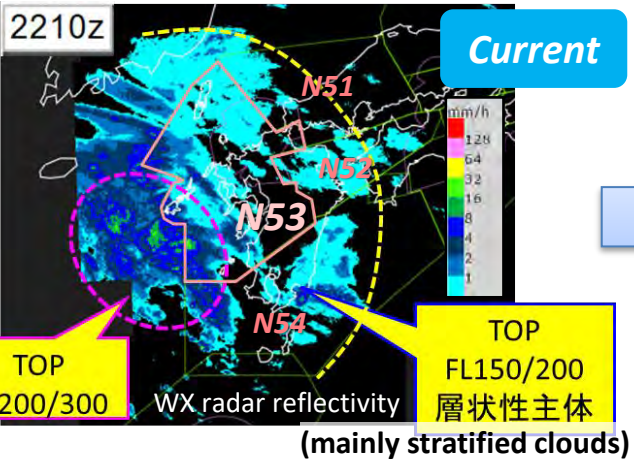
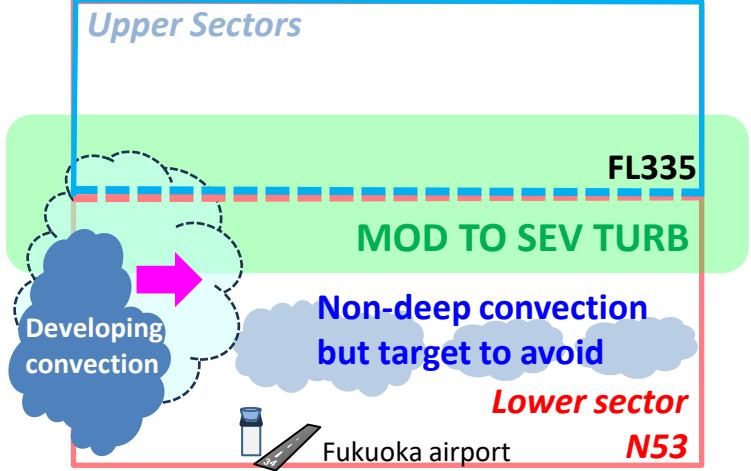


Image of this case



- ✓ Developing convective clouds and non-deep convection at middle level of atmosphere was expected to be obstacles for the flights in lower altitude.
- ✓ Turbulence could affect aircrafts to select flight altitude.

ATMet Category forecast 23 UTC 31 Jan 2025 issue

(UTC)	23	00	01	02	03	04	05
N51							
N52							
N53						SIG-CLO	
N54						SIG-CLO	

Level of impact to ATM: HIGH MEDIUM SLIGHT NONE



TMAT to TMU @Tokyo



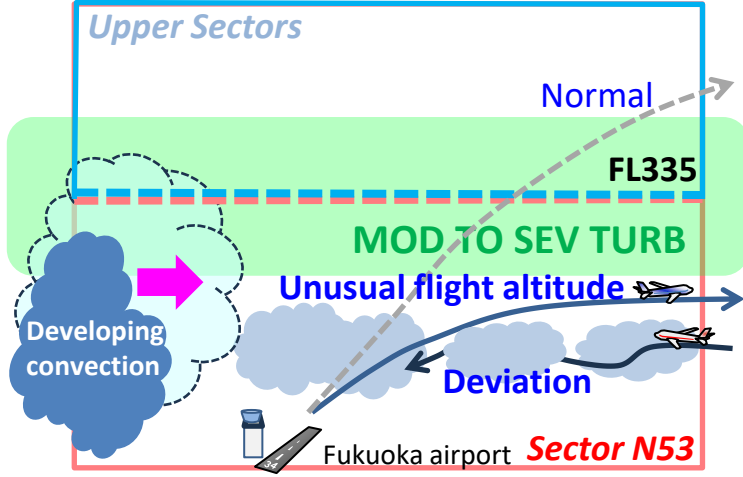
ATMetC to ATMC @Fukuoka

3. Case Study – operational capacity management utilizing impact-based MET information

Stage 2. Beginning of ATMO duty



Image of this case



Being aware of possible congestion and increase in ATCO workload within the lower sector N53, ATMO on duty:

- ✓ checked actual impact on ATCO operations
- ✓ adjusted the Airspace Capacity

ATMet Category forecast 23 UTC 31 Jan 2025 issue

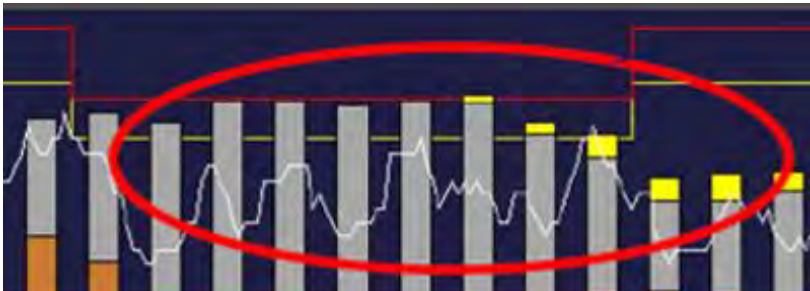
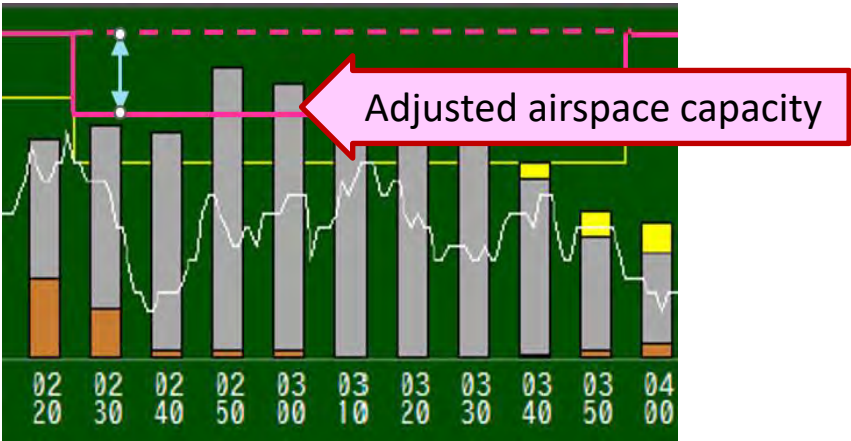
(UTC)	23	00	01	02	03	04	05
N51							
N52							
N53						SIG-CLD	
N54						SIG-CLD	

Level of impact to ATM: HIGH MEDIUM SLIGHT NONE

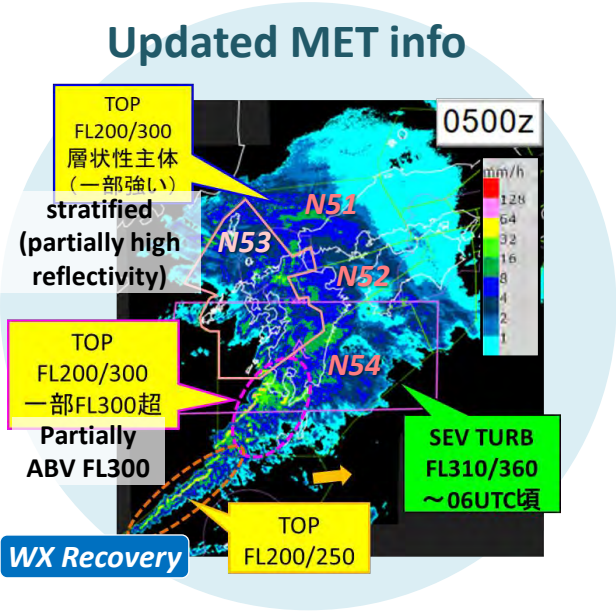
Hourly refresh “at-a-glance information” to grasp overview of MET impact to multiple ATC sectors/airports within the target period.

3. Case Study – operational capacity management utilizing impact-based MET information

Stage 3. Taking ATFM measures



An ATFM measure was implemented according to the adjusted airspace capacity.



- ✓ ATMO consider severe weather forecasts and real-time information provided by MET, as well as aircraft flight status and plans, and determined airspace capacity in coordination with ATCO.
- ✓ After coordination with the ATCO, the ATMO will implement the ATFM measures for ACC sectors that are expected to exceed airspace capacity.
- ✓ ATMO consider restoring airspace capacity based on weather recovery forecasts and real-time information provided by MET, and restore airspace capacity while checking the actual operational status of ATCO.
- ✓ If the actual weather conditions differ from the forecast, MET will update the forecast. In addition to updating the forecast, ATMO also adjusts airspace capacity by taking into account the pre-forecast commentary, real-time weather information, and aircraft flight status.

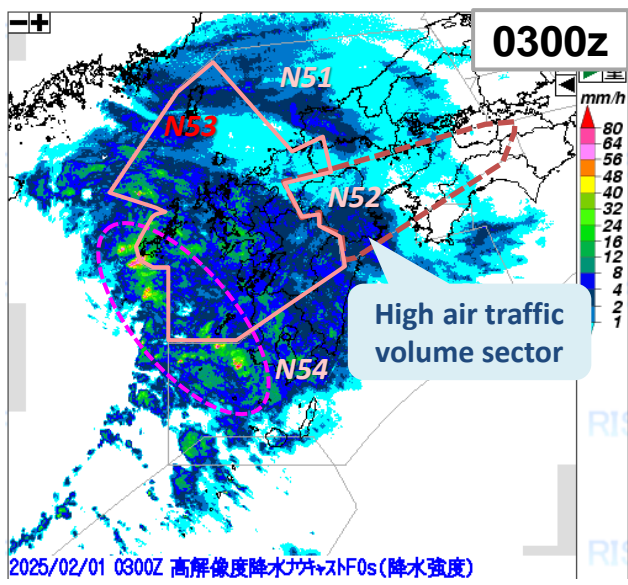
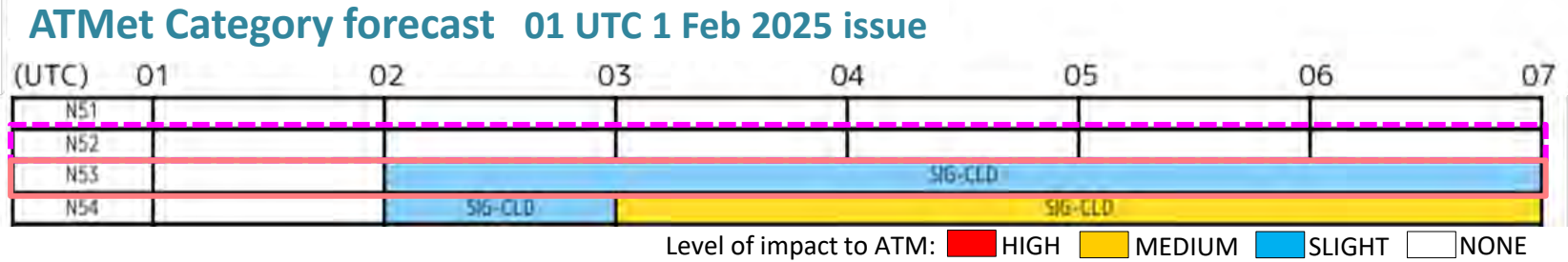
ATMet Category forecast 01 UTC 1 Feb 2025 issue

(UTC)	01	02	03	04	05	06	07
N51							
N52							
N53							
N54							

Level of impact to ATM: HIGH MEDIUM SLIGHT NONE

3. Case Study – operational capacity management utilizing impact-based MET information

Stage 3. Taking ATFM measures



MET/ATM joint review

N53: Forecast of meteorological impact was reasonable.

N52: There was a room for refinement; the forecast did not show possible meteorological impact, but ATFM measure was taken.

- JMA has developed impact-based MET information in coordination with JCAB and related stakeholders.
- Currently, the impact-based MET information (e.g. ATMET Category Forecast) support ATMO's overviewing the situation within the target period.
- Forecaster's verbal weather briefing provide necessary focus of adverse weather condition which affect to ATM. This essentially supports ATMO's decision making on adjustment of ATC capacity and taking effective ATFM measures.
- Based on the identified issue through the MET/ATM joint review, two parties are working together to refine the criteria for conversion of meteorological condition to the impact on ATM operation, aiming at more accurate MET/ATM translation.

Close coordination between MET/ATM is essential to deliver effective ATFM.



Thank you!