



ICAO

INFORMATION PAPER

**Asia and Pacific (APAC)
Fifteenth Meeting of the Meteorological Requirements
Working Group (MET/R WG/15)**

Bangkok, Thailand 07 April – 10 April 2026

Agenda Item 3: Collaboration between MET and ATM stakeholders

**SUPPORTING AIR TRAFFIC FLOW MANAGEMENT USING QUANTIFIED
CONVECTIVE CLOUD PREDICTION INFORMATION**

(Presented by the Republic of Korea)

SUMMARY

This paper presents the quantitative convective cloud prediction information and the operational capacity guidelines developed for proactive ATFM in the event of convective clouds in the Incheon FIR, and covers application cases, outcomes.

1. INTRODUCTION

1.1 The purpose of this paper is to describe a newly developed convective area prediction chart and a three-level convective cloud risk assessment for the Jeju south sector. It also presents operational capacity guidelines and application cases based on quantified meteorological data, highlighting the linkage between weather forecasting and CDM-based decision-making.

2. DISCUSSION

Need for improved convective clouds prediction information

2.1 In ATFM decision making, it is essential to estimate operational capacity based on quantified weather forecasts, and for this purpose, it is very important to quantify the risk of airspace weather forecasts.

2.2 The convective cloud prediction information previously provided by the Aviation Meteorological Office (AMO) used strong colours such as amber or yellow even for low-altitude convective clouds with little impact on the control sector, which sometimes led to unnecessary flow management, detailed sectors and airways were not displayed. (Figure 1)

Agenda Item 3

07-10/04/2026

(Revision 1)

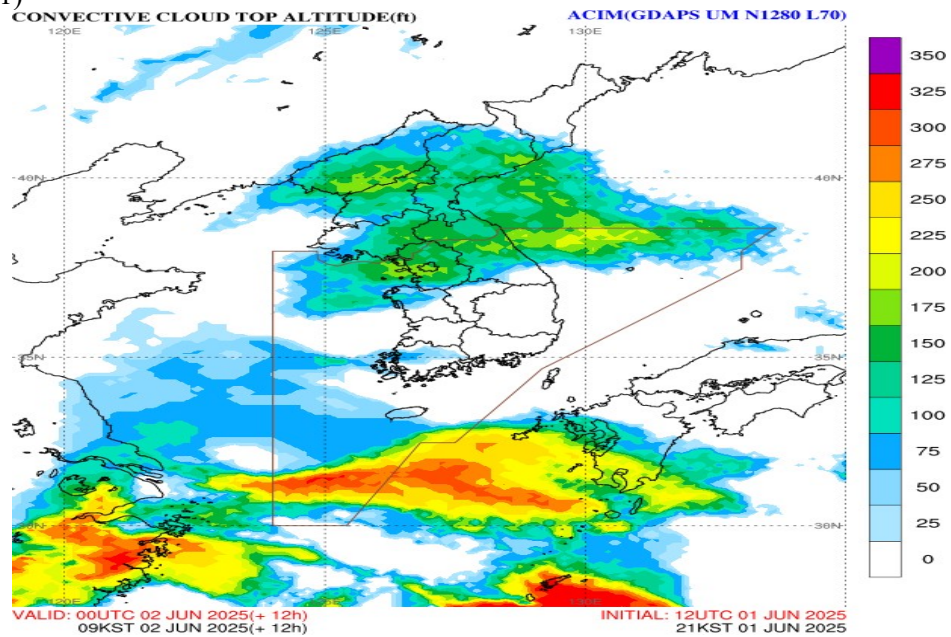


Figure 1. Convective cloud prediction information (before improvement)

2.3 For this reason, AMO developed a new convection area prediction chart and has provided it for Jeju south sector on a trial basis. Convective clouds below FL290 are displayed in light grey, while those at or above FL290 are shown in amber, allowing the level of risk relevant to flow management to be conveyed more intuitively and accurately. In addition, airways are included to provide tailored convective cloud prediction information. (Figure 2)

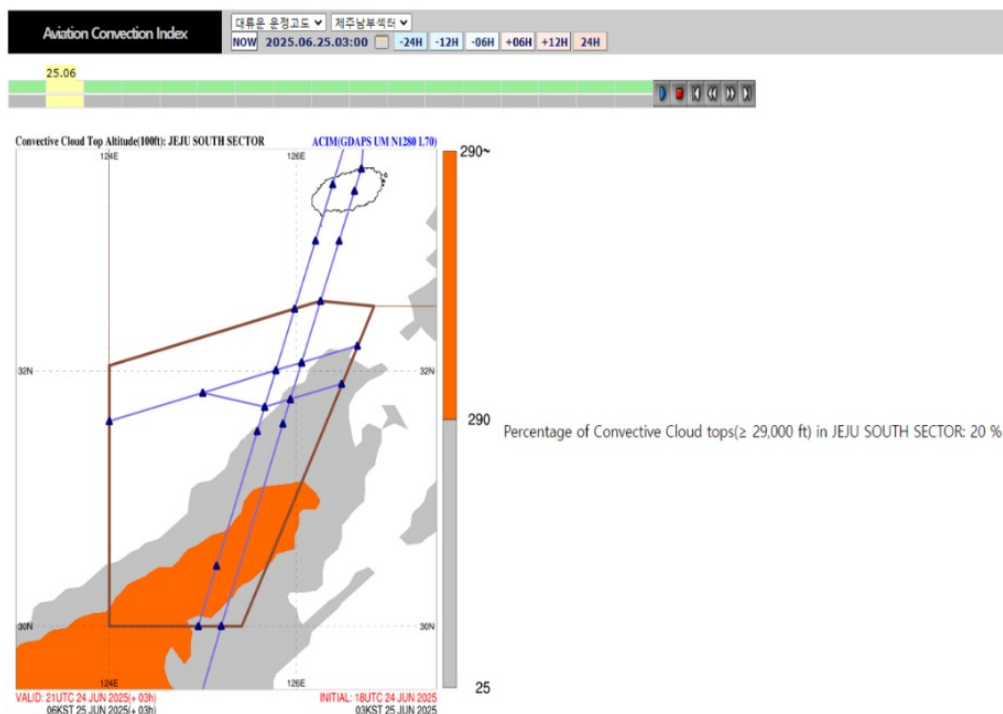


Figure 2. Convective area prediction chart

2.4 Furthermore, in the beginning, the areal coverage of convective clouds at or above FL290 within Jeju south sector is assessed by meteorologists, and the associated risk is classified into three levels. This information was provided during forecast briefings as ATFM weather. (Figure 3)

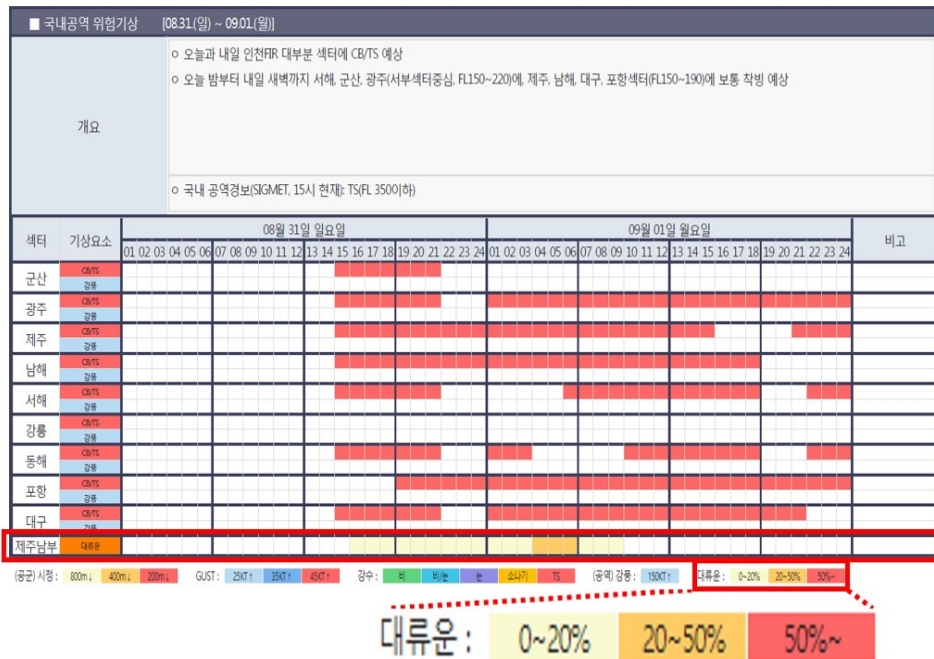


Figure 3. Three-levels convective clouds risk classification (Jeju south sector)

2.5 Figure 3 presents a case from August 31 to September 1, 2025. Figure 4 below is included for further explanation and shows the predicted distribution of convective clouds at or above FL290 within Jeju south sector from 21:00KST on August 31 to 09:00KST on September 1, together with radar observations at 05:00KST on September 1. According to Figure 3, the expected areal coverage of convective clouds at or above FL290 was categorized as Level 2 (20-50%) between 04:00KST and 06:00KST on September 1. Radar observation at 05:00KST on September 1 indicates that convective clouds were distributed over Jeju south sector as expected.

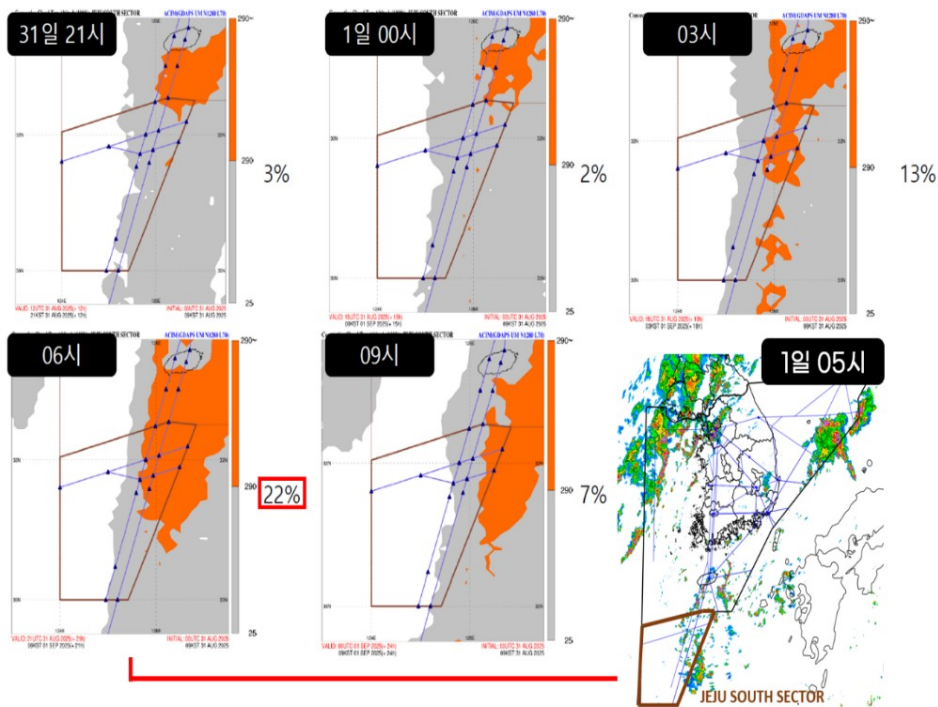


Figure 4. Predicted distribution of convective clouds at or above FL290 in the Jeju south sector (21:00KST, Aug31-09:00KST, Sep1) and radar image (05:00KST, Sep 1)

Agenda Item 3

07-10/04/2026

(Revision 1)

2.6 Since then, through development, the 5-level areal coverage of convective clouds prediction information (Figure 5) has been expanded and provided for all airspace sectors in the Incheon-FIR. In addition, meteorologists no longer manually assess and provide the convective clouds risk data, and the system automatically produces and provides data in the form of the dashboard. This information is also available on the AMO website (<https://global.amo.go.kr/operation/convective-cloud.do>).

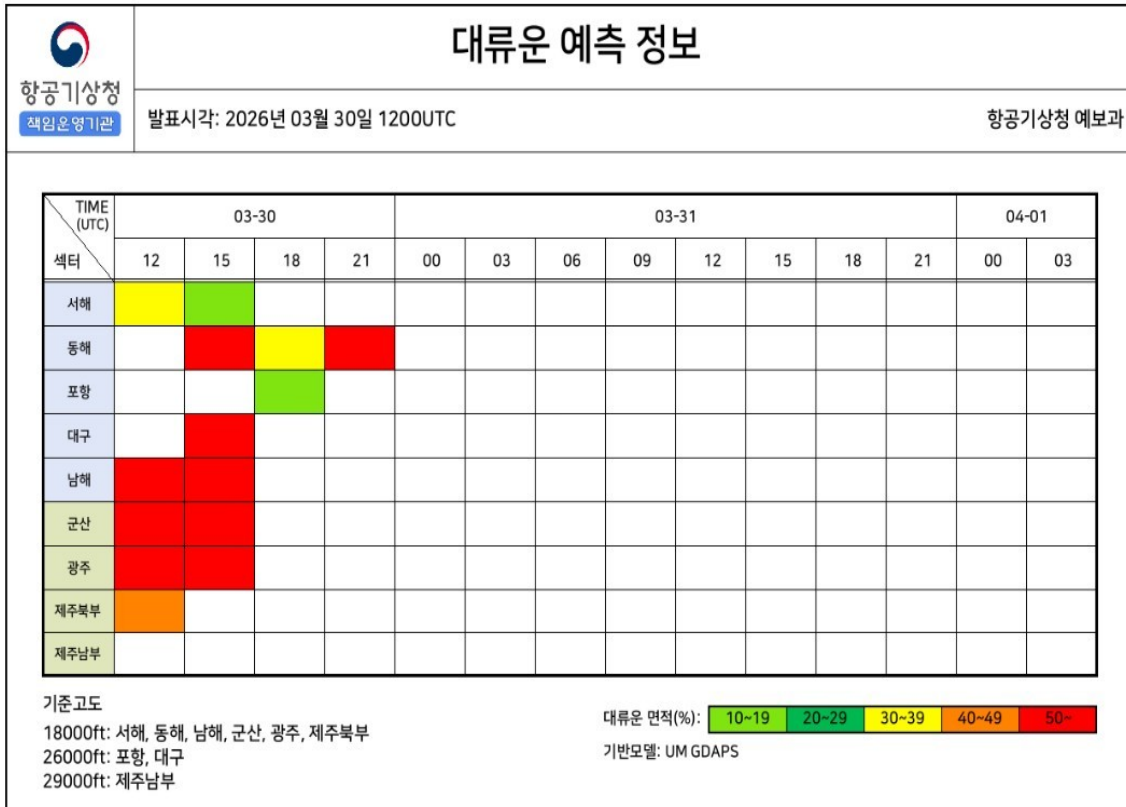


Figure 5. Convective clouds prediction information ('25.10.31.-)

Need for operational capacity assesment criteria linked to weather data

2.7 In establishing a data-driven decision-making procedure for effective ATFM, several constraints exist, including meteorologists' limited knowledge of ATFM, ATCs' and flow managers' lack of proficiency in utilizing meteorological data, and the absence of clear decision-making standards during hazardous summer weather or the need for their improvement. To address these limitations, the development of operational capacity guidelines linked with quantified meteorological data was deemed necessary.

2.8 First, as part of improvements to the operational capacity guidelines for Jeju south sector, it was necessary to subdivide and apply the operational capacity for each hazardous weather condition for flexible flow management in response to changes in traffic volume from Southeast Asia. ATFM Unit (ATMO) and Incheon Air Traffic Control Reginal Office (IATCRO) expanded the hazardous weather classification from three to five levels and adjusted the operational capacity accordingly, taking into account changes in traffic from Southeast Asia (Table 1 and 2). In this way, it was possible to promote precise flow management by subdividing the operational capacity according to the expected areal coverage of convective clouds at or above FL290.

Table1: Operational capacity guidelines for Jeju south sector during hazardous weather condition (ver1.1) -'25.5.31.

Entrance FIX	Ordinary	When hazardous weather is expected		
	Maximum capacity	Intensity of hazardous weather	Capacity adjustment	Operational capacity
ATOTI (Y722)	26	Yellow	80%	21
		Orange	65%	17
		Red	50%	13
SADLI (A593)	10	Yellow	80%	8
		Orange	65%	7
		Red	50%	5
ATOTI·SADLI (Simultaneous application)	35	Yellow	80%	28
		Orange	65%	23
		Red	50%	18

Table2: Operational capacity guidelines for Jeju south sector during hazardous weather condition (ver1.2) '25.6.1.-

Entrance FIX	Ordinary	When hazardous weather is expected	
	Maximum capacity	Intensity of hazardous weather	Operational capacity
ATOTI (Y722)	26	Level 1	21
		Level 2	19
		Level 3	17
		Level 4	15
		Level 5	13
SADLI (A593)	10	Level 1	8
		Level 2	7
		Level 3	6
		Level 4	5
		Level 5	4

2.9

Description of each level

- Level 1: Convective clouds at or above FL290 are expected to cover 10% or greater but less than 20% of the total area of Jeju south sector.
- Level 2: Convective clouds at or above FL290 are expected to cover 20% or greater but less than 30% of the total area of Jeju south sector.
- Level 3: Convective clouds at or above FL290 are expected to cover 30% or greater but less than 40% of the total area of Jeju south sector.
- Level 4: Convective clouds at or above FL290 are expected to cover 40% or greater but less than 50% of the total area of Jeju south sector.
- Level 5: Convective clouds at or above FL290 are expected to cover 50% or greater of the total area of Jeju south sector.

2.10

The detailed criteria for each level of the improved operational capacity guideline are defined based on the proportion of convective clouds at or above FL290 within the total area of Jeju south sector. The criteria for each level may be applied flexibly to ensure stable air traffic control operations at IATCRO. The threshold values for each level may be continuously revised through post-analysis, and if necessary, different levels of hazardous weather intensity may be applied for each entrance FIX.

Agenda Item 3

07-10/04/2026

(Revision 1)

2.11 The following covers the establishment of operational capacity guidelines for Daegu-Pohang sector. As shown in Figure 6, arrival traffic to Incheon Airport from Japan and Americas becomes congested in the afternoon peak, and the absence of decision-making criteria in the event of hazardous weather during the summer results in constraints on traffic flow management, demonstrating the need for determining operational capacity.

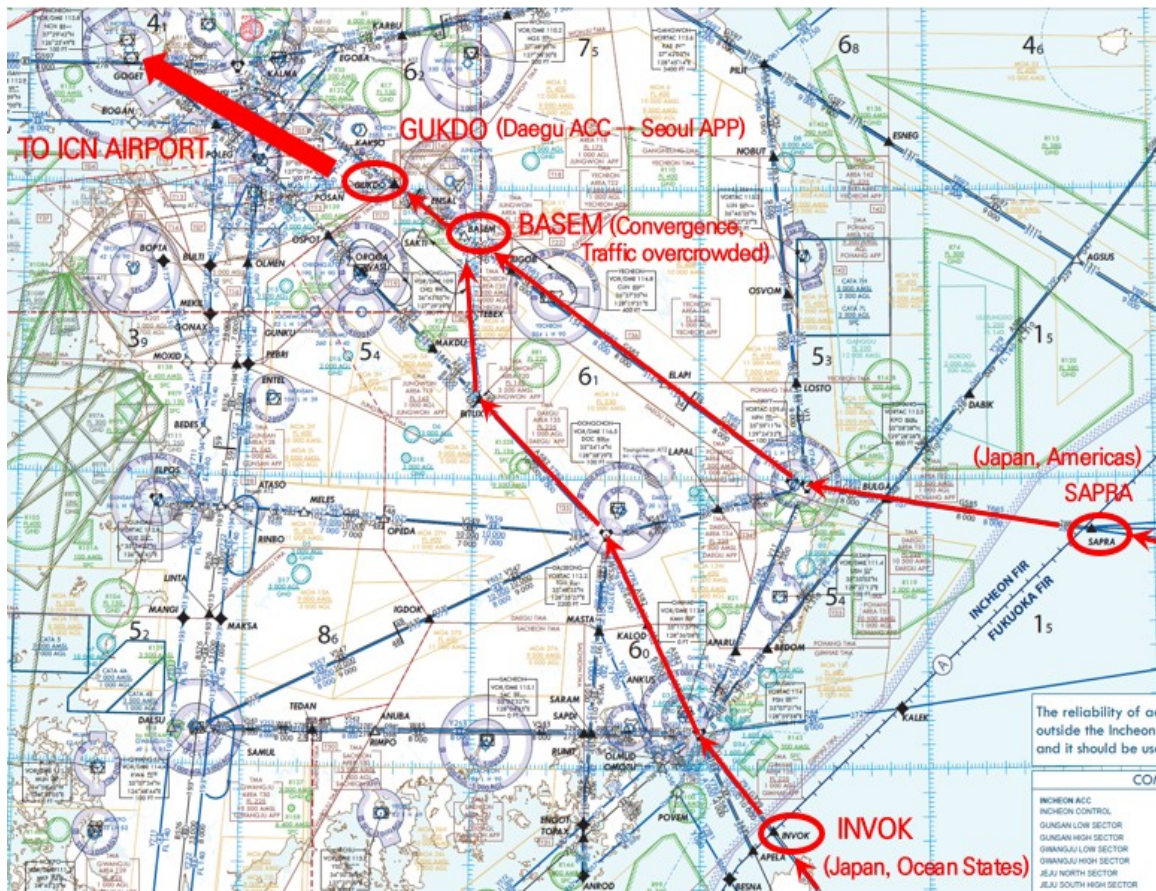


Figure 6. Traffic flow from Japan and Americas arriving at Incheon Airport

2.12 Accordingly, level-based operational capacity indicators were developed to enable data-driven and proactive decision-making by incorporating factors that increase controller workload, such as hazardous weather and it divided the each stage according to the estimated areal coverage of convective clouds at or above FL260 in Daegu-Pohang sector. The case of this sector, ATFM unit, ATC unit, and AMO jointly considered the features of the sector, they set FL260 as the standard because it was judged that convective clouds above the corresponding altitude have significant impacts on the control sector. (Table 3.)

Table 3. Operational capacity guidelines for Daegu-Pohang sector during hazardous weather condition ('25.12.8.)

Entrance FIX	Ordinary	Workload increasing factor	Capacity reduction
	Maximum capacity		
GUKDO (Incheon Airport arrival)	25	Estimated area of hazardous weather (Convection)	
		Level 1 (10-29%)	20-22 (84%)
		Level 2 (30-49%)	17-19 (72%)
		Level 3 (50%-)	13-15 (56%)

CDM Meeting Operational Procedures and Application Cases

2.13 CDM meetings are conducted at the discretion of the ATFM unit based on forecasts provided by AMO and may also be held at the request of ATC units or the Airport Operator. Participants include the ATFM unit, AMO, ATC units (RAMP, TWR, APP, ACC), Airport Operator, and national airlines.

2.14 The case presented here demonstrates the application of the operational capacity guidelines for the Jeju south sector. To manage the air traffic flow of aircraft arriving from Southeast Asia via ATOTI and SADLI during the morning peak period, MET-CDM meetings are held at 20:00 on the previous day to determine the operational capacity. (Figure 7) On September 9 and September 24, different flow management levels were applied for each FIX, allowing for more flexible and efficient air traffic flow management. (Table 4)

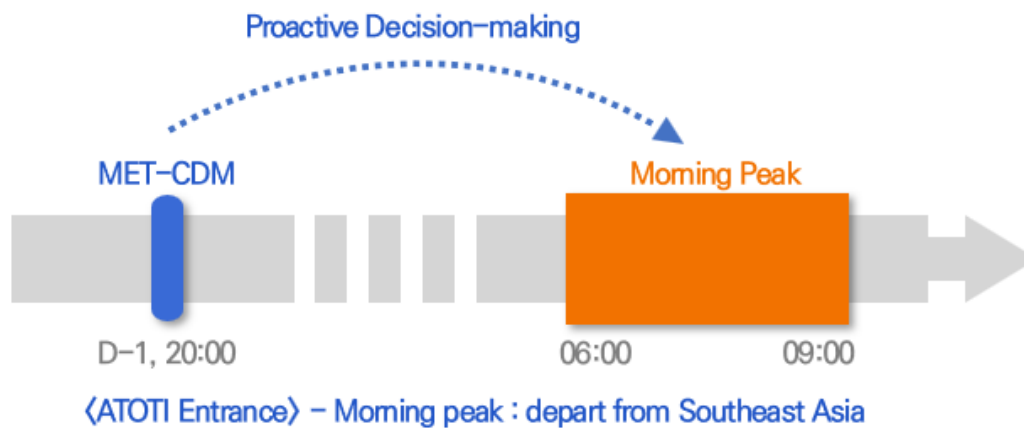


Figure 7. CDM Meeting Procedure

Table 4. Application Cases of Operational Capacity Guidelines for Jeju South Sector (2025)

CDM Meeting Time (Local Time)	Operational Capacity Determination (FIX Number-of-Aircrafts (ATFM Application Stage))	AFTM Application Period (Local Time)
Aug 11, 20:00	23 (ATOTI 17(3) / SADLI 6(3))	Aug 12, 04:30-08:30
Aug 31, 20:00	23 (ATOTI 17(3) / SADLI 6(3))	Sep 1, 04:30-08:30
Sep 9, 20:00	22 (ATOTI 15(4) / SADLI 7(2))	Sep 10, 04:30-08:30
Sep 19, 20:00	23 (ATOTI 17(3) / SADLI 6(3))	Sep 20, 04:00-09:00
Sep 24, 20:00	24 (ATOTI 17(3) / SADLI 7(2))	Sep 25, 05:00-07:30

Outcomes

2.15 By incorporating quantified weather forecasts into CDM decision-making, predictability and reliability were enhanced. As a result, more objective and timely decisions became possible, contributing to safe flight operations and proactive traffic management. Based on feedback from operational results, AMO will continue to optimize convective weather risk levels and operational capacity, and will also develop the operational capacity guidelines.

3. ACTION BY THE MEETING

3.1 The meeting is invited to note the information contained in this paper.
