



Operational Capacity Guidelines

linked to

Weather Forecasts



MET/ATM Seminar and ATFM/SG/15

› Contents

- Need for ATFM and Proactive Decision-Making
- Development of Operational Capacity Guidelines
- MET-CDM Process and Real-World Example
- Implications



> Need for ATFM during Snowfall

During runway snow removal

→ Runway closure reduces capacity



Waiting for de-icing/anti-icing pads

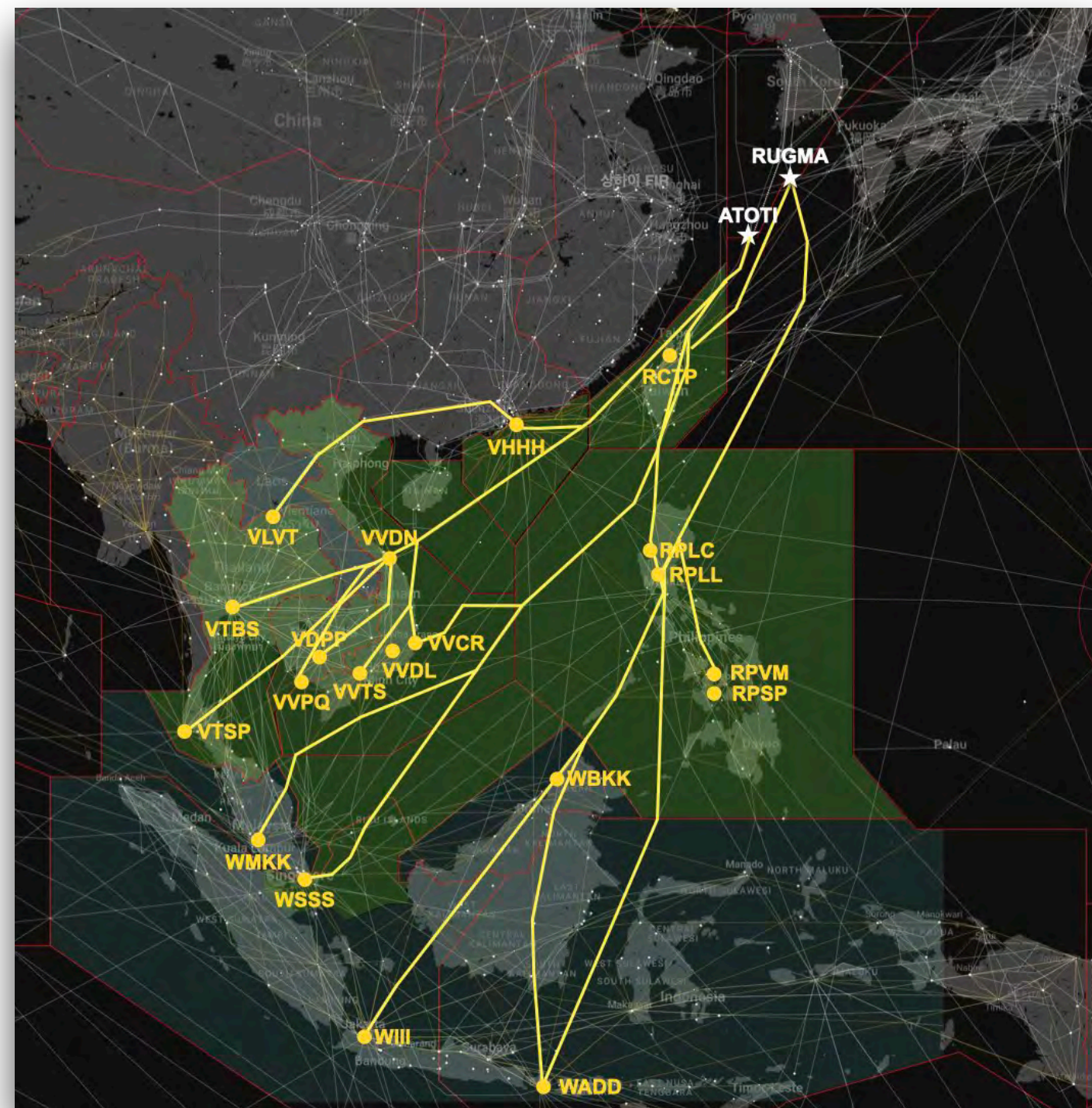
→ Ground congestion → Apron capacity reduction



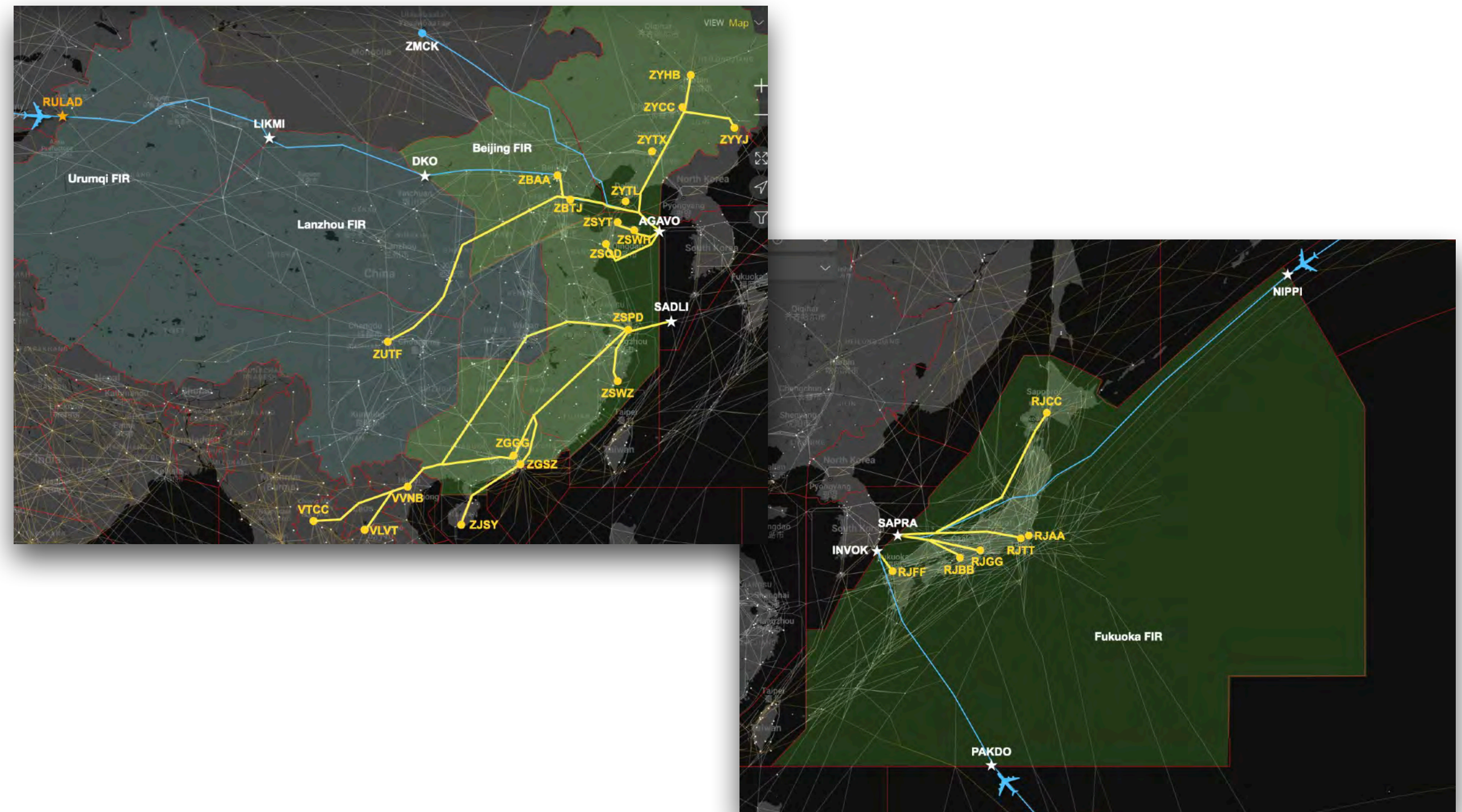
➤ Need for Proactive Decision-Making

To issue ATFM measures 2 hours before subject flight's EOBT

Flights from Southeast Asia (about 5 hours of duration)
→ Morning arrival peak

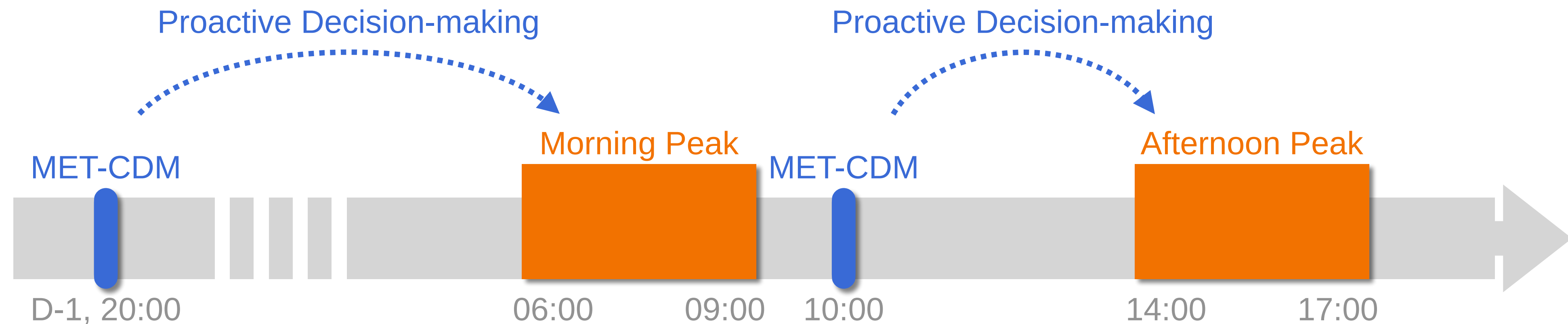


Flights from Northeast Asia (about 2 hours of duration)
→ Afternoon arrival peak



> MET-CDM meeting cycles

Setting MET-CDM meeting cycles based on flight durations by traffic flow



< RKSJ Arrival Traffic patterns >

- Morning peak : depart from Southeast Asia (about 5 hours of duration)
- Afternoon peak : depart from Northeast Asia (about 2 hours of duration)

➤ Need for Operational Capacity Guidelines linked to MET

Establishing a Data-Driven Decision-Making Procedure



MET-CDM Online Meeting

Decision-Making Limitation

- Meteorologists lack ATM expertise
Controllers/Flow managers lack meteorological knowledge
- Even with MET-CDM online meetings,
prompt and accurate capacity decisions based on weather forecasts are difficult

Solution

- Collaborative development of Operational Capacity Guidelines linked to Meteorological Data

➤ Development Process

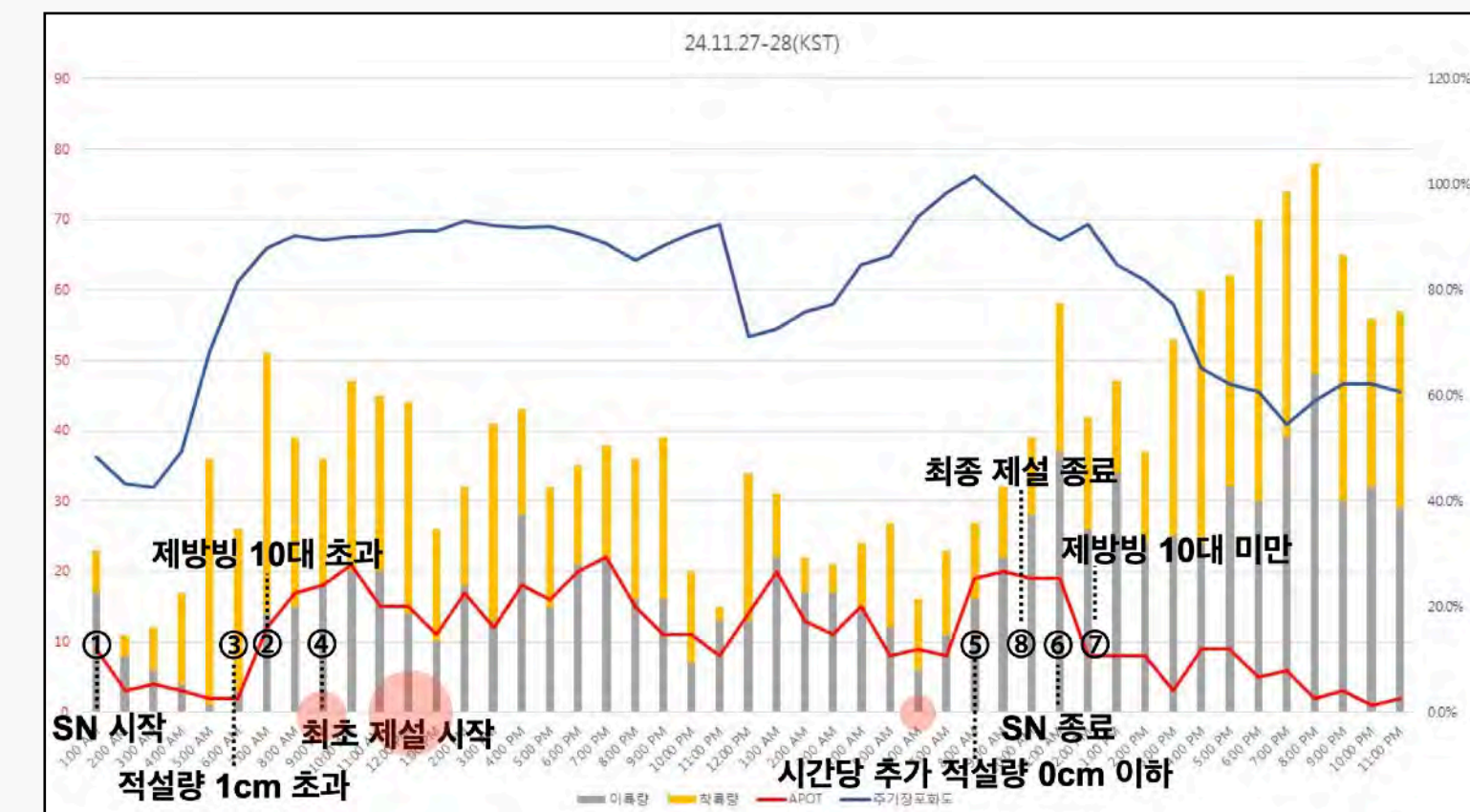
Data Integration and Collaborative Research by Agencies

Consolidated data from relevant agencies

- MET(AMO) : Weather data
- Airport Operator(IIAC) : Snow removal logs, A-CDM data
- ATFM(ATMO) : ATFM logs, Runway snow removal NOTAMs

Inductive Approach

- Inductive analysis of snowfall events over past 3 years
- Analyzed snow removal start/end times with concurrent weather data to identify patterns
- Applied observed patterns to predict future outcomes

[illegible]

› Key Findings

Key relationships between snow removal and weather data from real-case observations

- No snowfall when surface temperature $> 0^{\circ}\text{C}$
- Snow removal rare when hourly snowfall $< 1\text{ cm}$
- Snow removal consistent when hourly snowfall $> 1\text{ cm}$

> Operational Capacity Guidelines

Incheon Airport Operational Capacity Guidelines for Snow ATFM (version 1.1)

Stage	Surface temp	Hourly snowfall	Runway snow removal	Ground congestion due to de-icing	Hourly arrival capacity
1	Above 0°C	Any	Very low prob (Regardless of snowfall)	Very low prob (Regardless of snowfall)	44 aircraft
2	Below 0°C	0 cm	Very low prob	Smooth	40 ~ 44 aircraft
3	Below 0°C	0.1 ~ 0.9 cm	Low prob	Moderate	30 ~ 35 aircraft
4	Below 0°C	1 cm or more	High prob	Moderate	26 aircraft
5	Below 0°C	1 cm or more	High prob	Severe	20 or fewer aircraft

> Operational Capacity Guidelines

Detailed Guide for Intuitive Understanding and Easy Application by All Stakeholders

- **Stage 1** : when surface temperature is above 0°C, regardless of hourly snowfall, the probability of snow removal and de-icing is very low, allowing normal capacity.
- **Stage 2** : when surface temperature is below 0°C and hourly snowfall is 0 cm, snow removal probability is very low, and the scale of de-icing requests is at a manageable level, enabling smooth processing with a capacity of 40 ~ 44 aircraft.
- **Stage 3** : when surface temperature is below 0°C and hourly snowfall is 0.1 ~ 0.9 cm, snow removal probability is low, but increased de-icing requests require routine management, setting capacity at 30 ~ 35 aircraft.
- **Stage 4** : when surface temperature is below 0°C and hourly snowfall is 1 cm or more, snow removal probability is high, requiring a capacity of 26 aircraft based on single-runway arrival operations (if snow removal begins, this capacity must be maintained until the final snow removal is completed, regardless of subsequent forecasts).
- **Stage 5** : with intensified snowfall, ground handler de-icing capacity decreases, de-icing wait times increase, and apron/taxiway congestion rises, necessitating a capacity of 20 aircraft or fewer based on ground congestion levels.

> MET-CDM Process

MET-CDM Online meeting Process

- Receive weather forecast data from meteorologists
- Use guidelines to decide capacity
- Incorporate real-time site conditions and stakeholder input
- All stakeholders participate in capacity decisions

▶ 강수 및 시정 예보

요소	06	07	08	09	10	11	12	13	14	15	16	17
강수 형태	-	-	-	-	-	-	-	간헐	간헐	간헐	간헐	-
강수량(mm)	9999	9999	9999	9999	9999	9999	9999	1400	1400	1400	1400	9999
강수강(mm)	0	0	0	0	0	0	0	0	0.1	0.6	0.2	0
적설(cm)	0	0	0	0	0	0	0	0	0.1	0.6	0.2	0
어느비 가능성	없음 ▼	없음 ▼	없음 ▼	없음 ▼	없음 ▼	없음 ▼	없음 ▼	없음 ▼	없음 ▼	없음 ▼	없음 ▼	없음 ▼

▶ 기온 예보

요소	06	07	08	09	10	11	12	13	14	15	16	17
최상기온(℃)	-8.5	-8.4	-7.9	-6.6	-5.4	-4	-2.6	-1.8	-0.6	0	0.4	0.3
925hPa(℃)	-12.3	-11.5	-10.4	-10.3	-10.8	-9.7	-9.1	-8.8	-7.6	-6.5	-6.1	-7
850hPa(℃)	-16.4	-15.7	-14.7	-14.5	-14.2	-13.7	-13.4	-13.1	-13	-12.6	-12.4	-12.4

▶ 풍속 예보

요소	06	07	08	09	10	11	12	13	14	15	16	17
평균풍속(m/s)	5	5	5	5	8	8	8	18	18	18	18	8
최대순간풍속(m/s)							35	35	35	35		

Weather forecast data provided by MET team

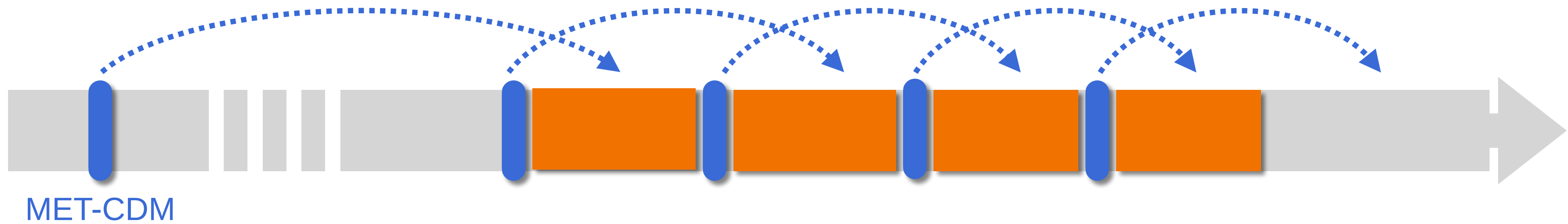
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Operational Capacity Guidelines

> Example of actual MET-CDM meeting schedule

Results of the January 31, 2025 MET-CDM

CDM Meeting Time (Local Time)	Operational Capacity Determination	ATFM Application Period (Local Time)
Jan 30, 20:00	26	Jan 31, 06:00–10:00
Jan 31, 06:00	30	Jan 31, 10:00–14:00
Jan 31, 09:00	40	Jan 31, 14:00–16:00
Jan 31, 11:00	40	Jan 31, 16:00–18:00
Jan 31, 15:00	ATFM lifted	ATFM lifted



➤ Implications

- Swift, accurate CDM decisions enhance predictability and trust
- Proactive ATFM reduces delays and regional disruptions
- Shared guidelines foster Asia/Pacific ANSP cooperation
- Ongoing research improves congestion models and forecast accuracy





Thank you!

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