

Incorporating AI/ML into Weather Forecasting

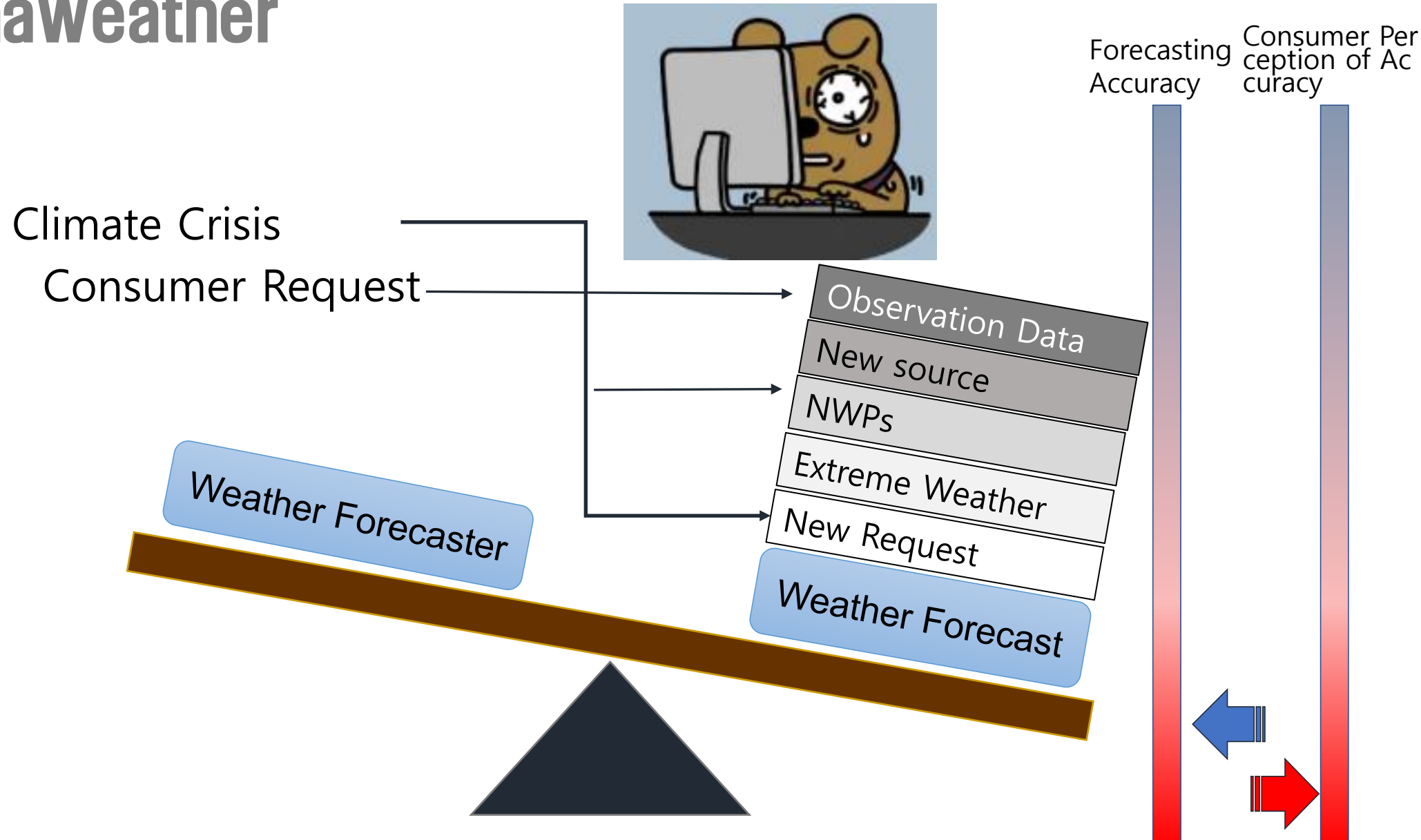
: Operational use and Forecaster feedback



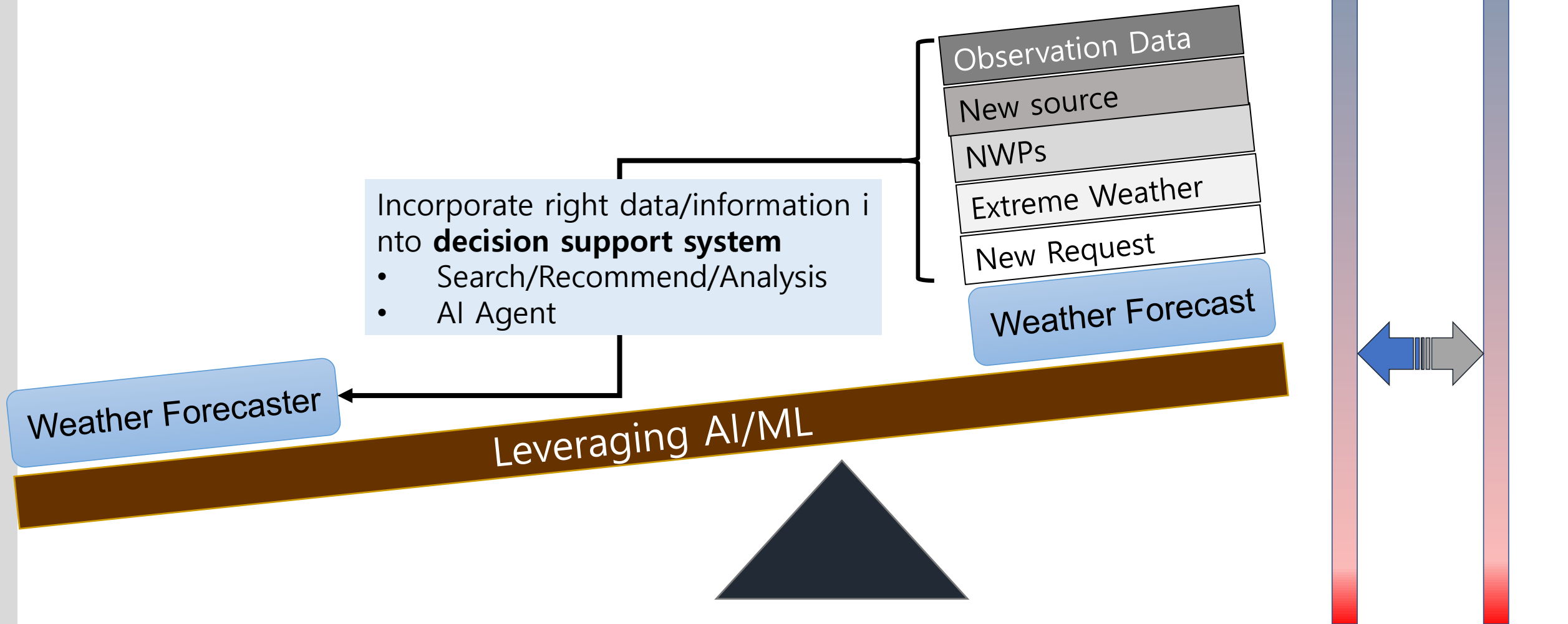
Hyesook Lee, Jeong Hoon Cho
NIMS/AI Meteorological Research Division



WHY AlphaWeather



WHY AlphaWeather



AlphaWeather is

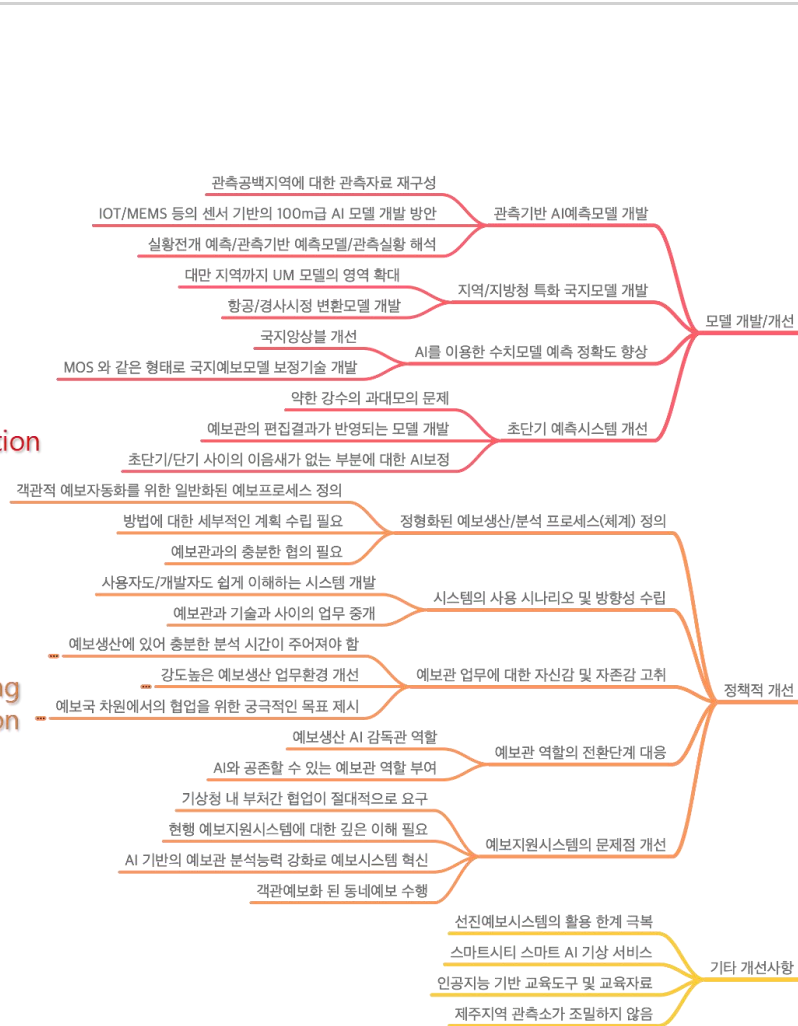
Intelligent AI-Agent :

- To be incorporated into
Next-Generation Forecast Decision Support System of KMA
- To be “**3) Quick & 4) Accurate**”
- Data/Information **2) Tailor**
- Minimization or **1) Automation** to support decision-making processes

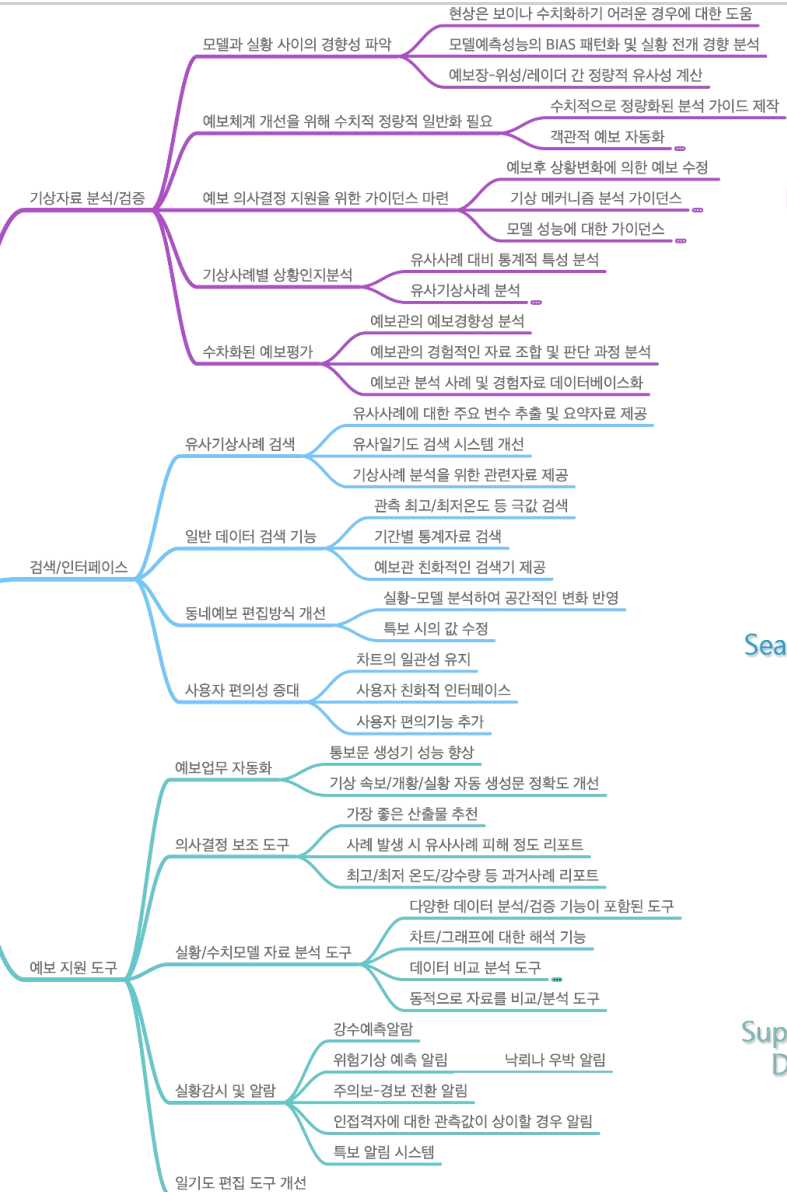
Collect the needs from Forecasters

AI/ML for Weather Prediction

Policy regarding NWS operation



예보관 인터뷰 결과



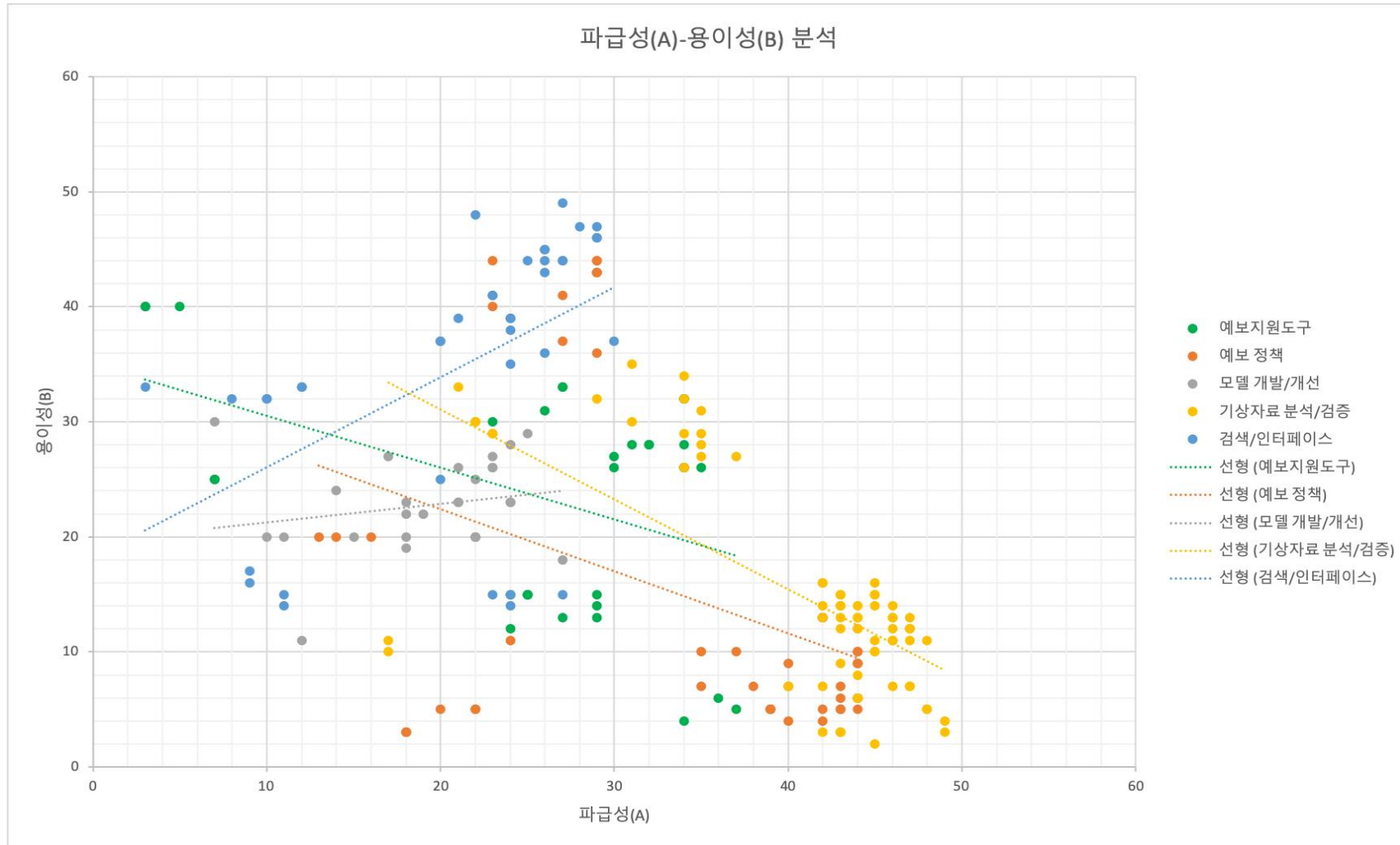
Data Analysis

Search Interface

Support Forecasters' Decision making

Collect the needs from Forecasters

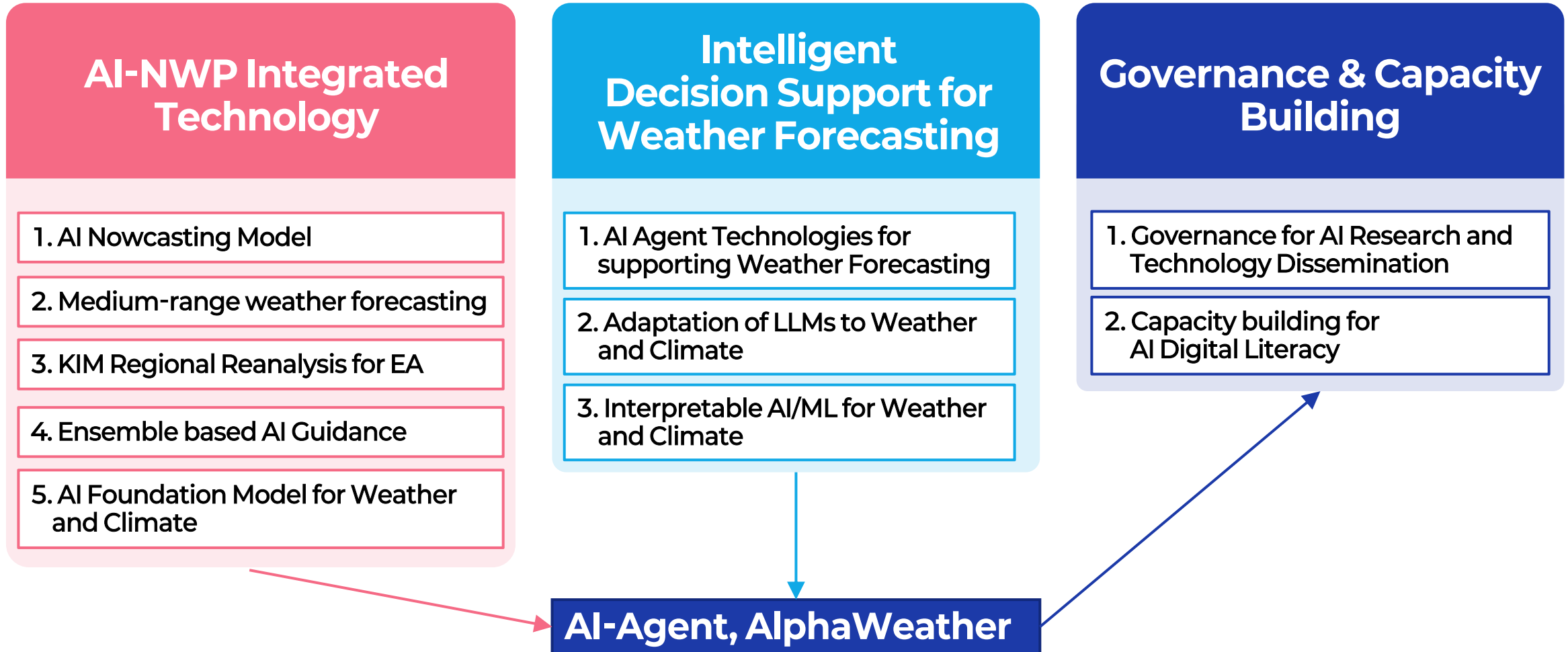
Ease of doing vs. Impact



Collect the needs from the field

AI/ML for Weather Prediction	Nowcasting, Medium-range forecast , Foundation model
Data Analysis	Trend analysis of Bias btw. NWP and Observations
Search Interface	Natural Language Processing-based Weather information Retrieval Engine
Support Forecasters' Decision making	Similar Case Retrieval System, Interpretable AI model for analyzing Meteorological Mechanism

Mid-term('25-'27) Implementation Plan



Intelligent Decision Support for Weather Forecasting

Selection Criteria of Cognitive Process

1. **Stability** : Process should NOT change very frequently
2. **Repetitiveness** : Process should REPEAT
3. **Reliability** : Process should be well-structured/-implement/-documented

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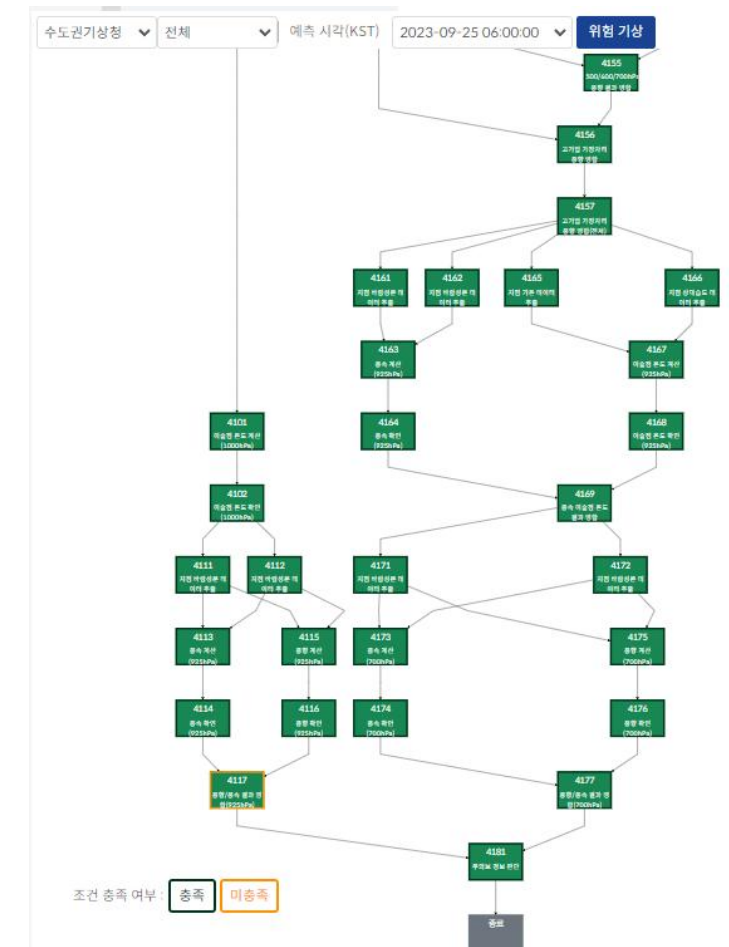
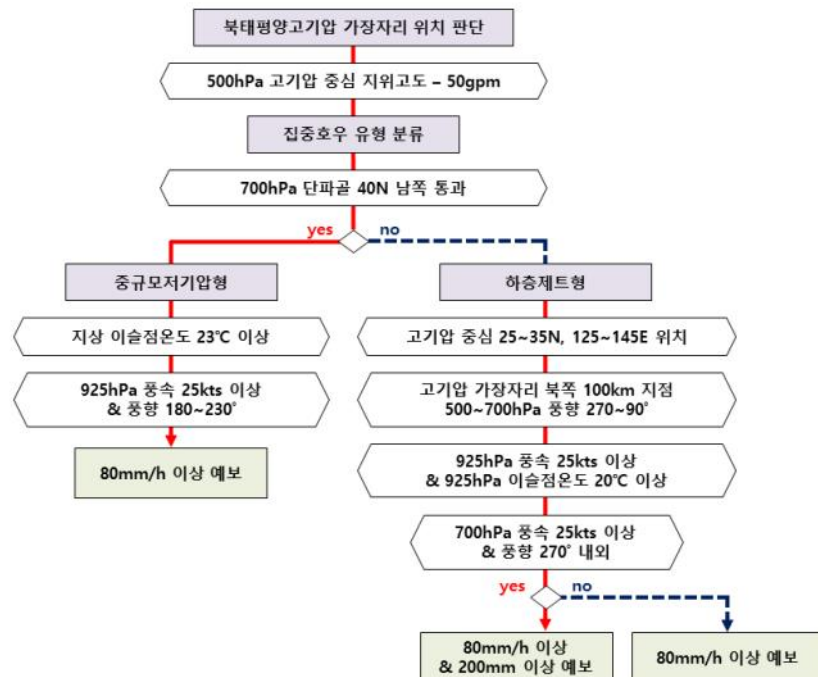
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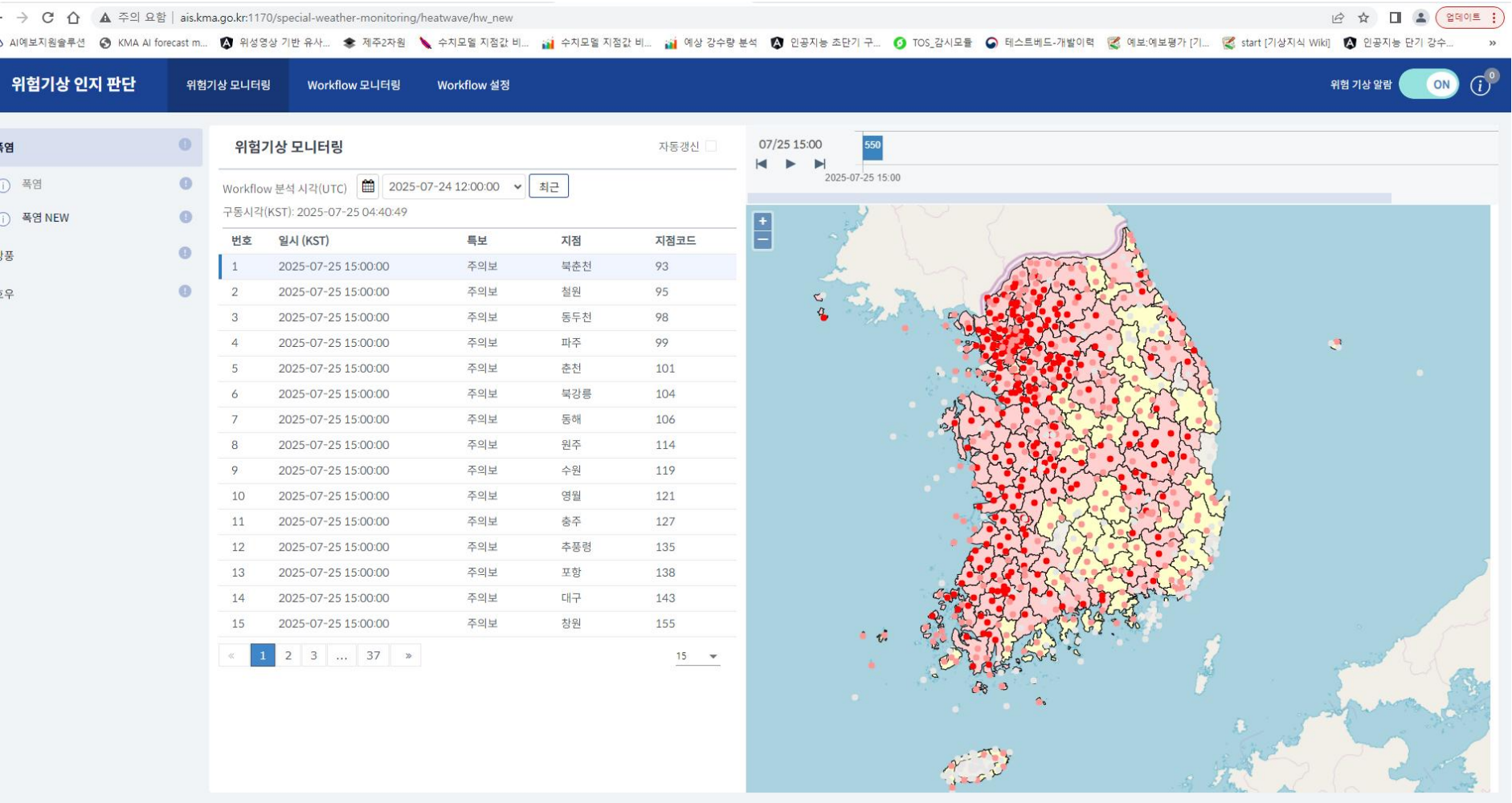
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Intelligent Decision Support for Weather Forecasting

Selection Criteria of Cognitive Process



Intelligent Decision Support for Weather Forecasting

Selection Criteria of Cognitive Process

← → ↻ ⌂ 주의 요함 | ais.kma.go.kr:1130/main

☁ AI예보지원솔루션 KMA AI forecast m... 위성영상 기반 유사... 제주2차원 수지모델 지점값 비... 수지모델 지점값 비... 영상 강수량 분석 인공지능 초단기 구... TOS_감시모를 테스트베드-개발이력 예보-예보평가 [기... start [기상지식 Wiki] 인공지능 단기 강수...

위성영상 기반 유사사례 검색기 V3.6.5(core V3.6.7)

기준 일시(UTC) 위성 GK2A (2019-07-24~2025-07-25) 관측 일시 2025-07-25 00:00 (UTC) Now -12h +12h

유사 사례 검색 조건 ☒ 전체 ☐ 기간 선택 2025-07-25 ~ 2025-07-25 그룹(분) 720 채널 IR105 ☐ 이미지 ☒ 영상 유사 사례 검색

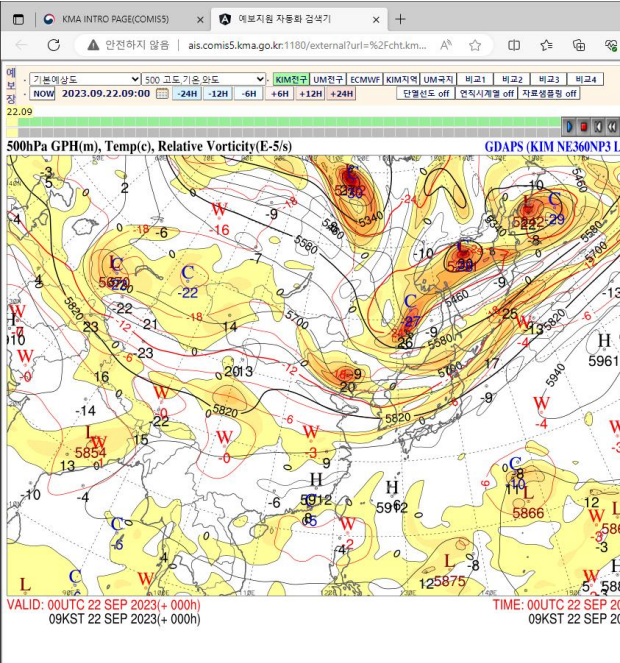
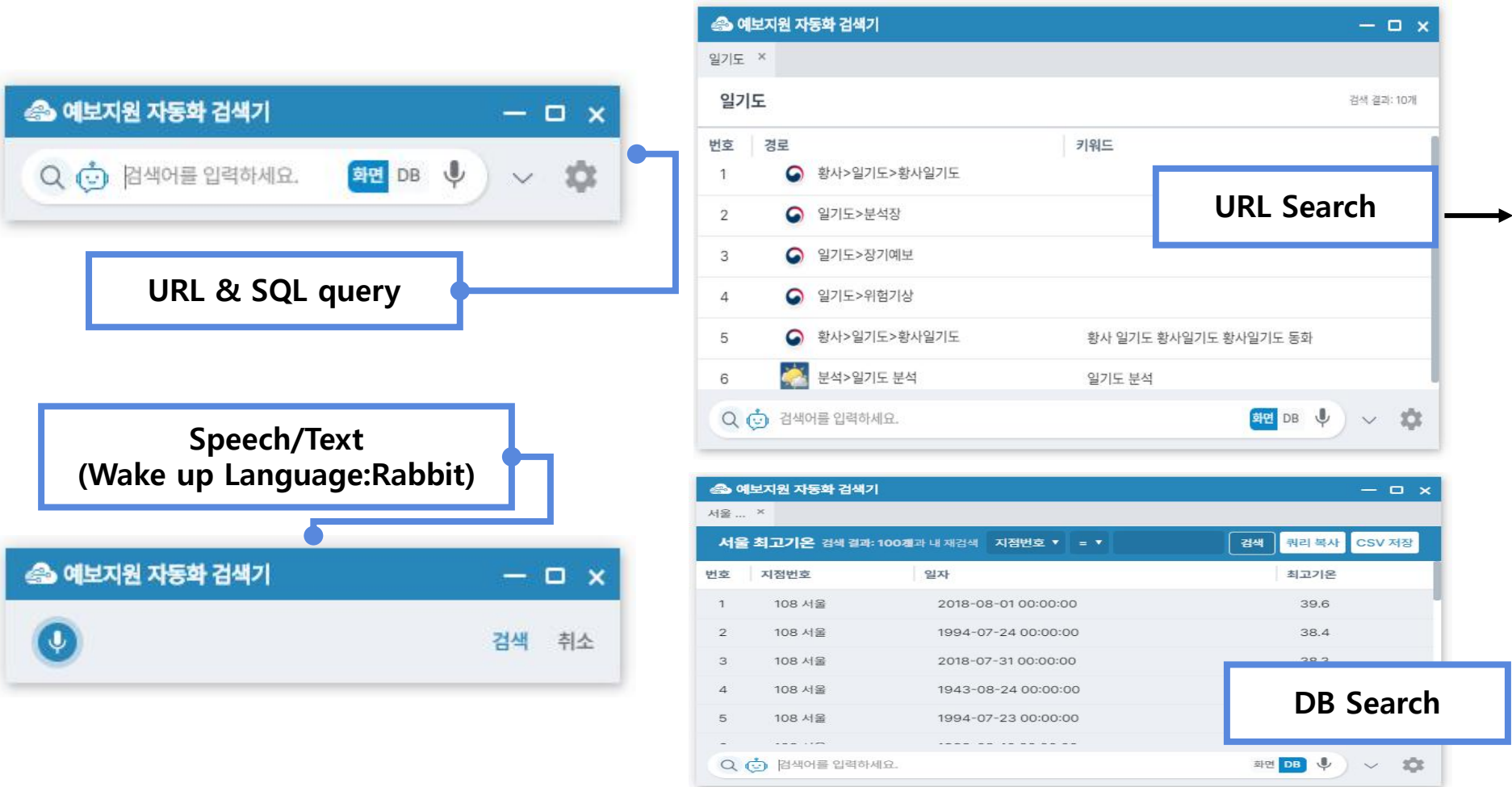
유사사례 검색 결과 관심영역 ? ☒ 동아시아(전체) ☒ 한반도 ☐ 중국북동 ☐ 몽골 ☐ 중국중부 ☐ 중국남부 LPIPS 검색

순위	DISTANCE	LPIPS	날짜(UTC)	위성	실행	일기도
1	0.0%(3.776)	99.9	2012-08-25 06:00	COMS	실행	일기도
2	0.0%(3.835)	99.9	2023-07-23 17:40	GK2A	실행	일기도
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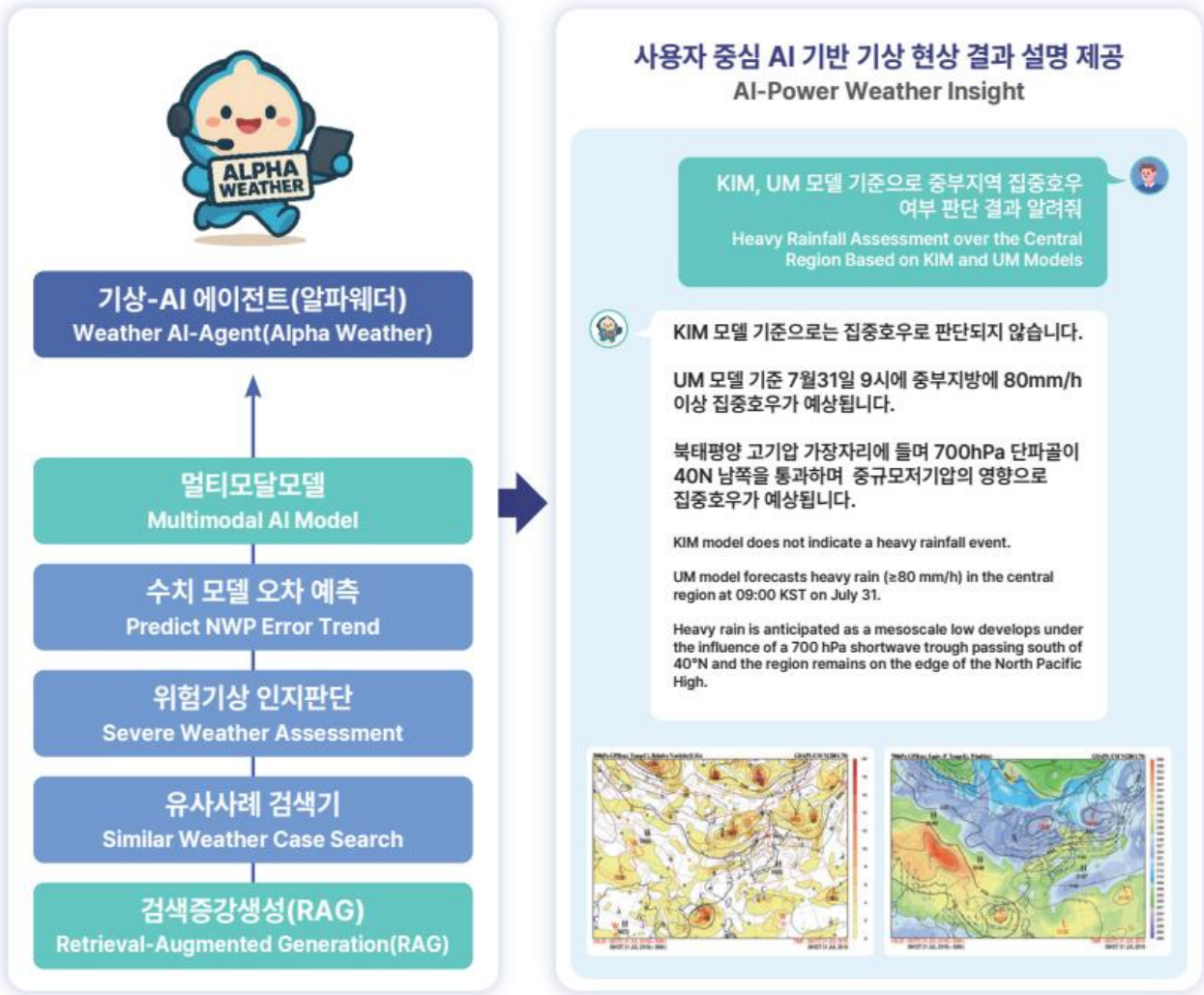
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유사 사례 위성영상 2012.08.25 05:30 05:45 06:00 06:15 06:30 > < 실행 일기도 IR01 COMS TP1 2012-08-25 05:00 UTC/06:25 10:00 KST/1000

Intelligent Decision Support for Weather Forecasting



Intelligent Decision Support for Weather Forecasting



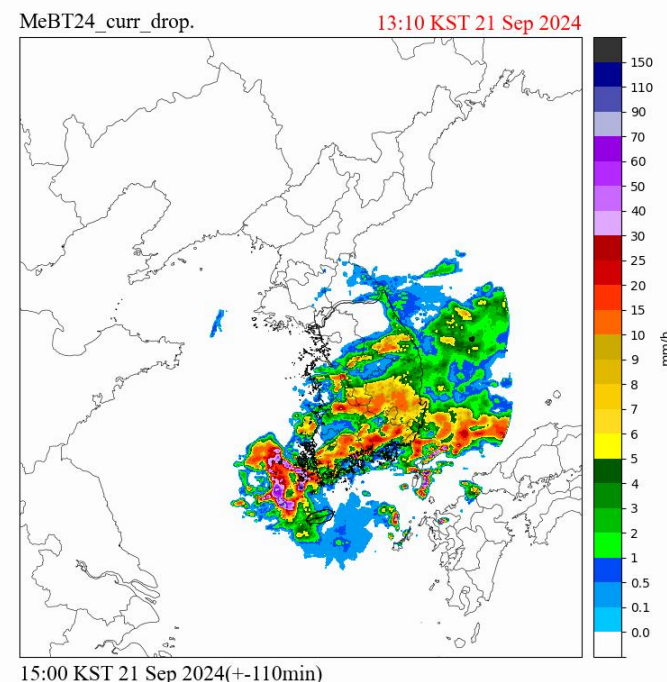
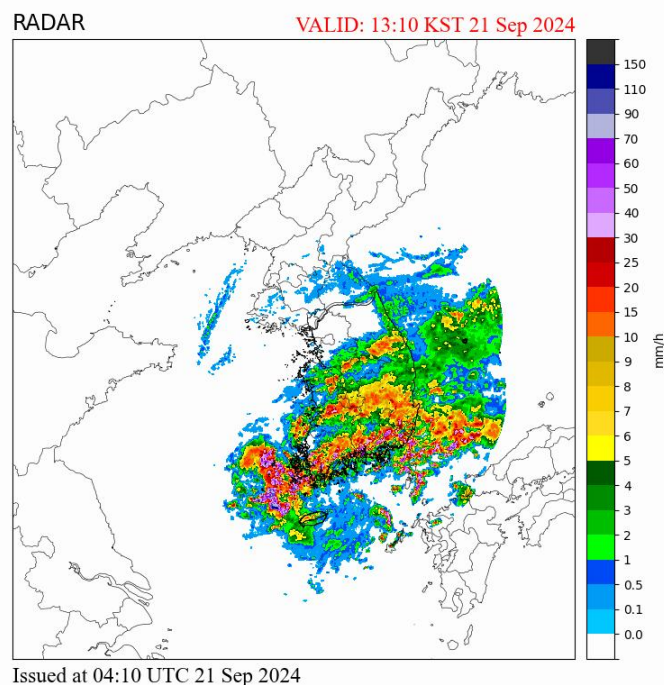
모델버전	파라미터	추론시간(s)	정확도 (유효수)							
			전체(100)	1과목(20)	2과목(20)	3과목(20)	4과목(20)	5과목(20)	텍스트(94)	멀티모달(6)
Phi-4 (text only)	14B	1.70642	0.54	0.7	0.5	0.4	0.65	0.45	0.56	0.17
Llama-3.3 (text only)	70B	1.9664	0.65	0.8	0.6	0.45	0.9	0.5	0.66	0.5
Llama-3.2-Vision	11B	1.37830	0.41	0.60	0.35	0.20	0.40	0.50	0.44	0.00
	90B	2.06714	0.62	0.65	0.6	0.55	0.75	0.55	0.66	0.00
Llama-3.1 (text only)	8B	0.30586	0.4	0.6	0.25	0.15	0.45	0.55	0.40	0.33
	70B	1.96224	0.65	0.65	0.6	0.55	0.8	0.65	0.66	0.5
Llama-3.1 (text only) (Q)	70B (8bit)	1.96423	0.65	0.65	0.6	0.55	0.8	0.65	0.66	0.5
	70B (4bit)	1.96352	0.65	0.65	0.6	0.55	0.8	0.65	0.66	0.5
Gemma-3	27B	1.7753	0.59	0.6	0.6	0.5	0.8	0.45	0.61	0.33
Qwen2.5 (text only)	32B	1.43841	0.6	0.7	0.55	0.6	0.6	0.55	0.62	0.33
	72B	2.96018	0.64	0.65	0.75	0.55	0.75	0.5	0.66	0.33
Qwen2.5 (text only) (Q)	32B	1.85767	0.59	0.7	0.45	0.55	0.65	0.6	0.61	0.33
	72B	2.83019	0.6	0.7	0.65	0.55	0.75	0.35	0.63	0.17
Qwen2.5-VL	32B	1.44588	0.61	0.65	0.55	0.55	0.75	0.55	0.64	0.17
	72B	3.05231	0.68	0.7	0.7	0.55	0.85	0.6	0.70	0.33
EXAONE-3.5	32B	2.87324	0.58	0.6	0.65	0.4	0.7	0.55	0.61	0.17
EXAONE-3.5 (Q)	32B	1.58598	0.54	0.55	0.6	0.35	0.7	0.5	0.55	0.33
DeepSeek-MOE (text only)	16B	17.48355	0.24	0.2	0.35	0.25	0.2	0.2	0.26	0.00

AI-NWP Integrated Technology : AI Nowcasting

Custom
developed
AI model



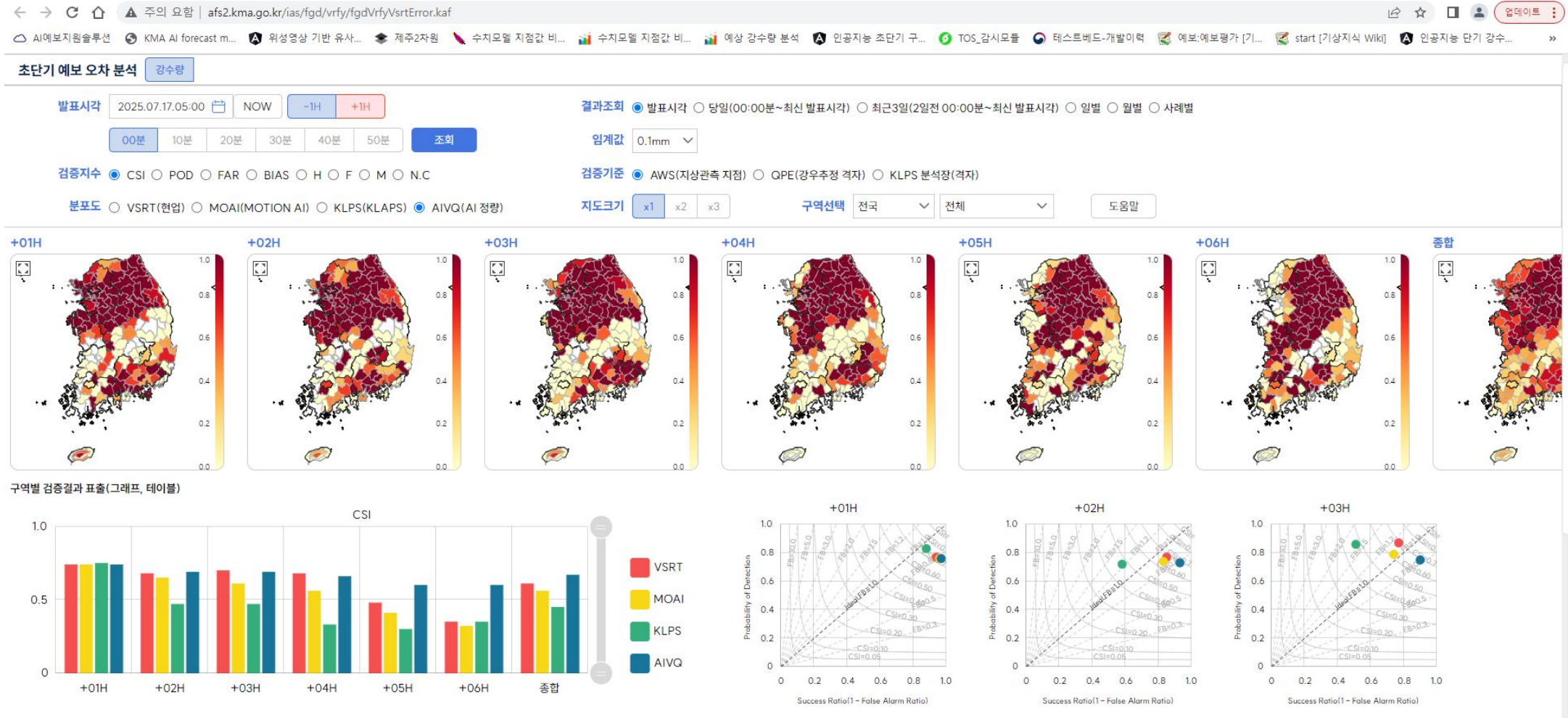
Observation
(Radar)



KMA
NowAlpha

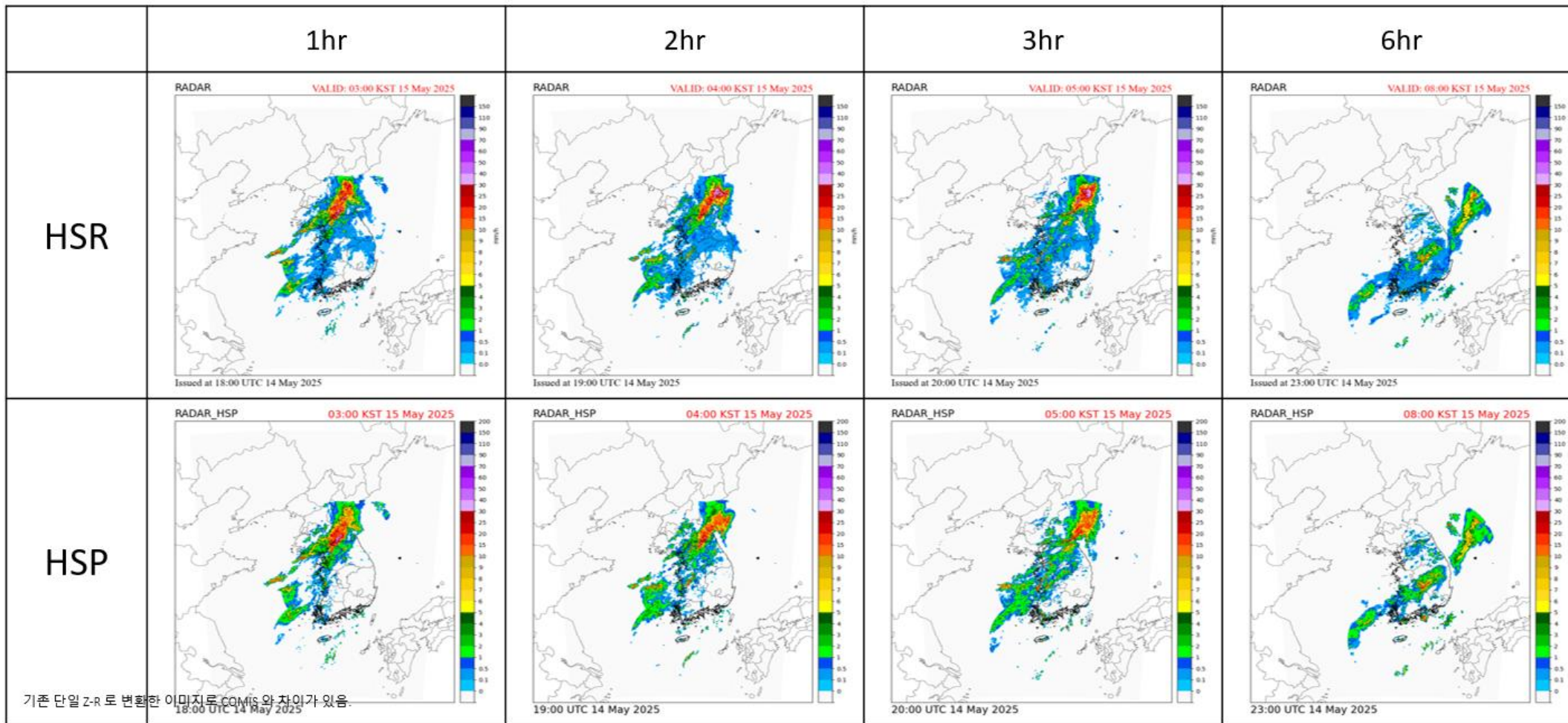
Transition phase (trial use by KMA forecasters, '25.2.~) to Operational use

AI-NWP Integrated Technology : AI Nowcasting



Transition phase (trial use by KMA forecasters, '25.2.~) to Operational use

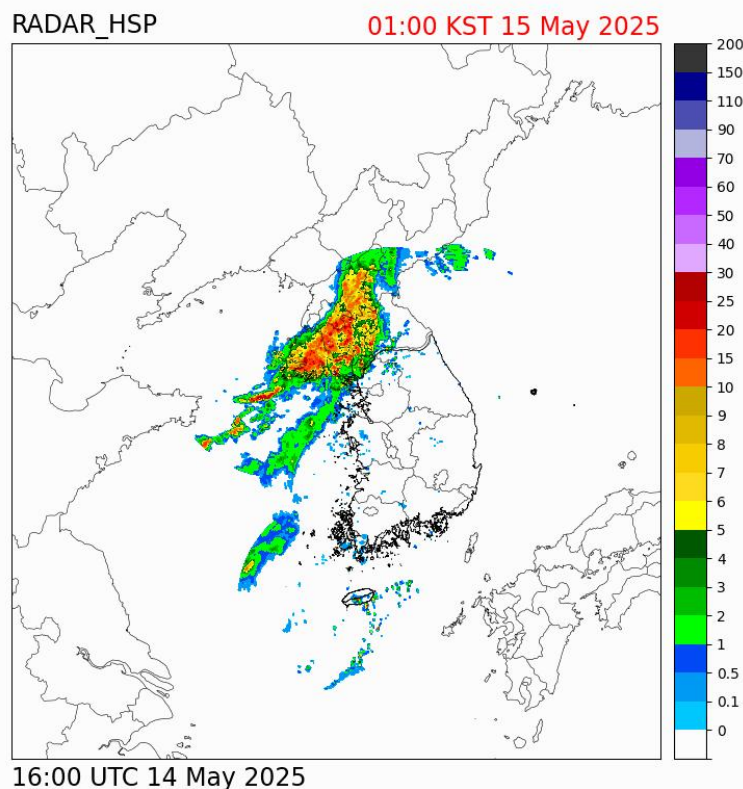
AI Nowcasting Model Drift : Radar QC upgrade



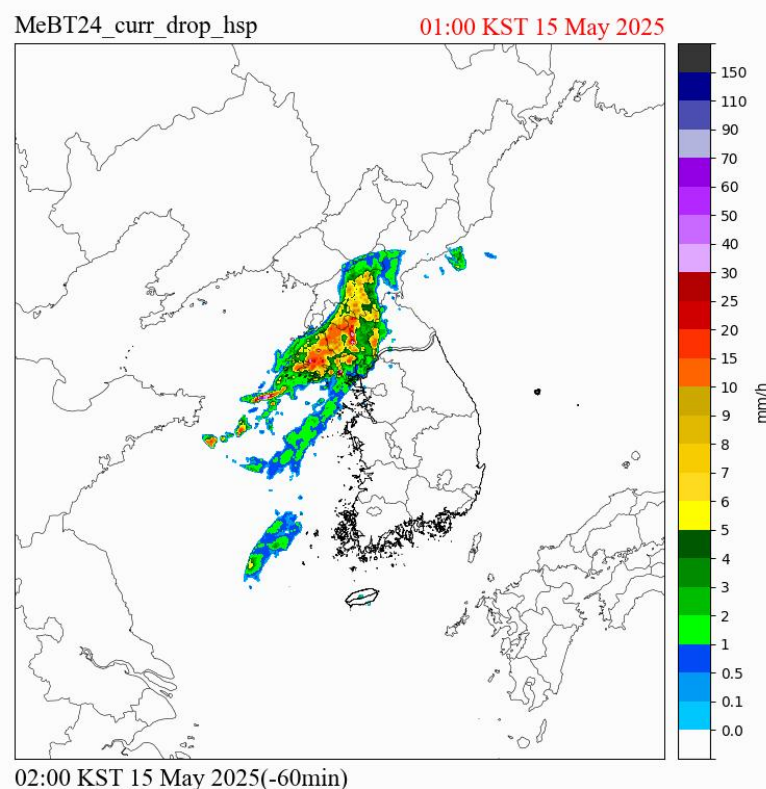
Transition phase (trial use by KMA forecasters, '25.2.~) to Operational use

AI Nowcasting Model Drift : Radar QC upgrade

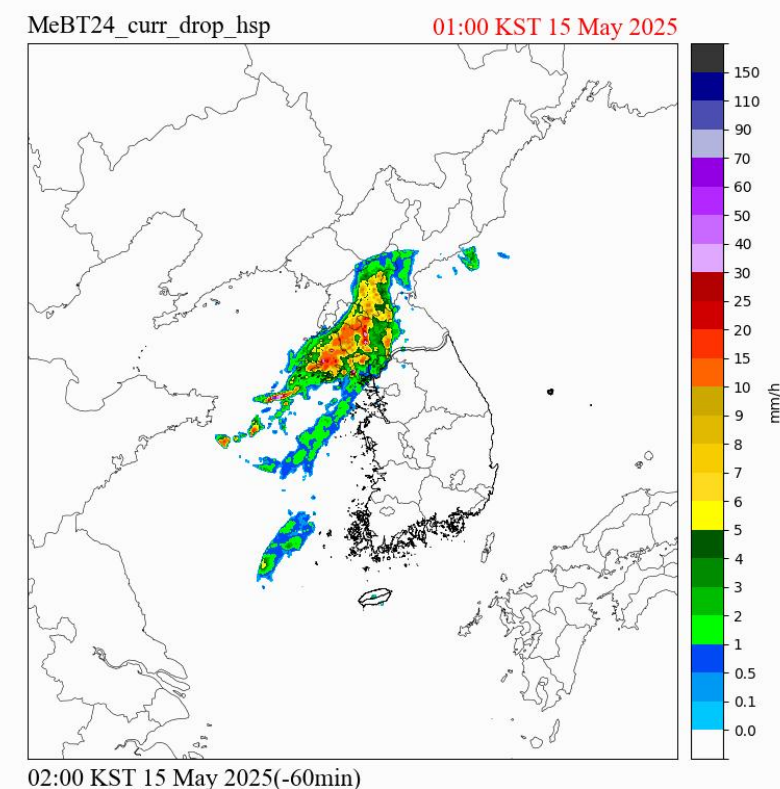
HSP RADAR



HSP AI



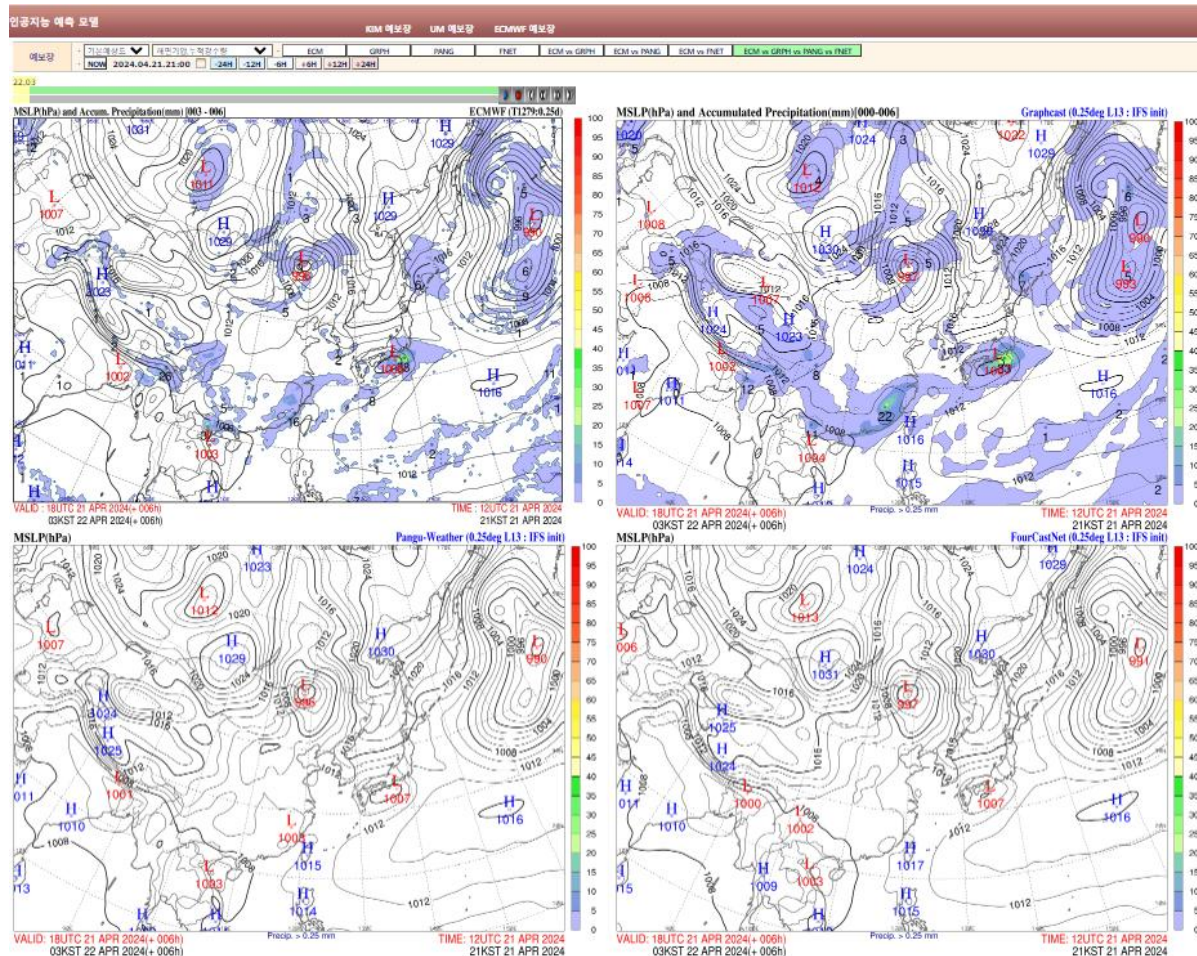
HSR AI



Transition phase (trial use by KMA forecasters, '25.2.~) to Operational use

AI-NWP Integrated Technology : Medium-range

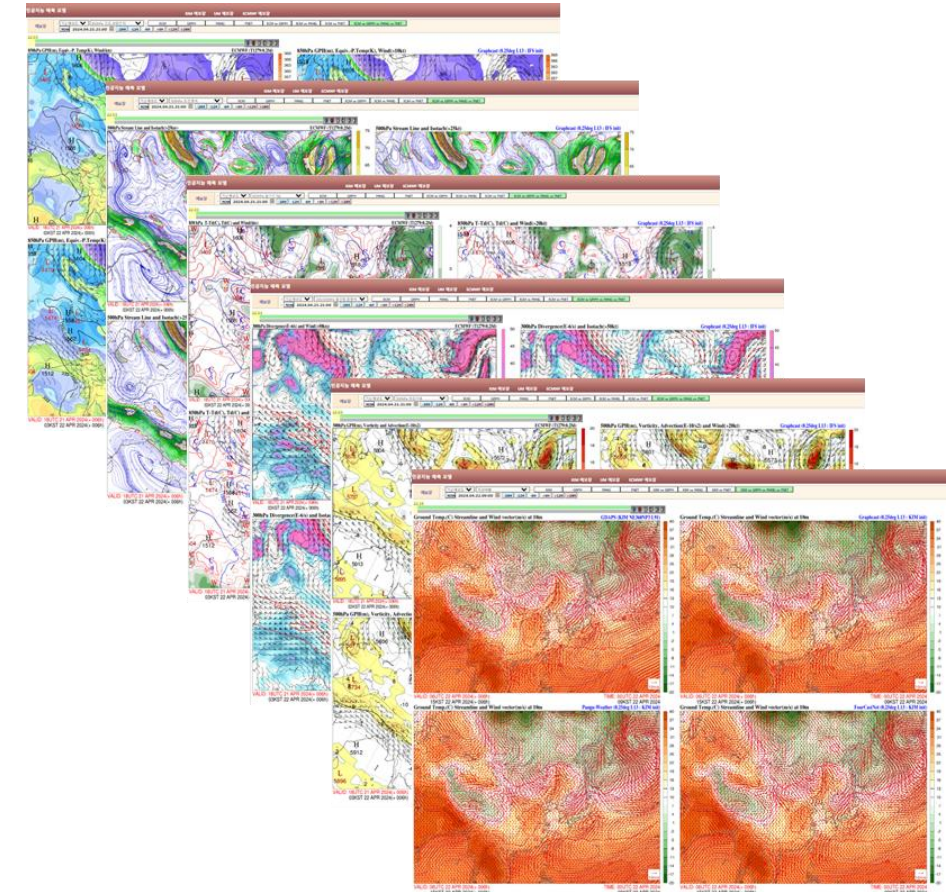
IFS



PW
(IFS)

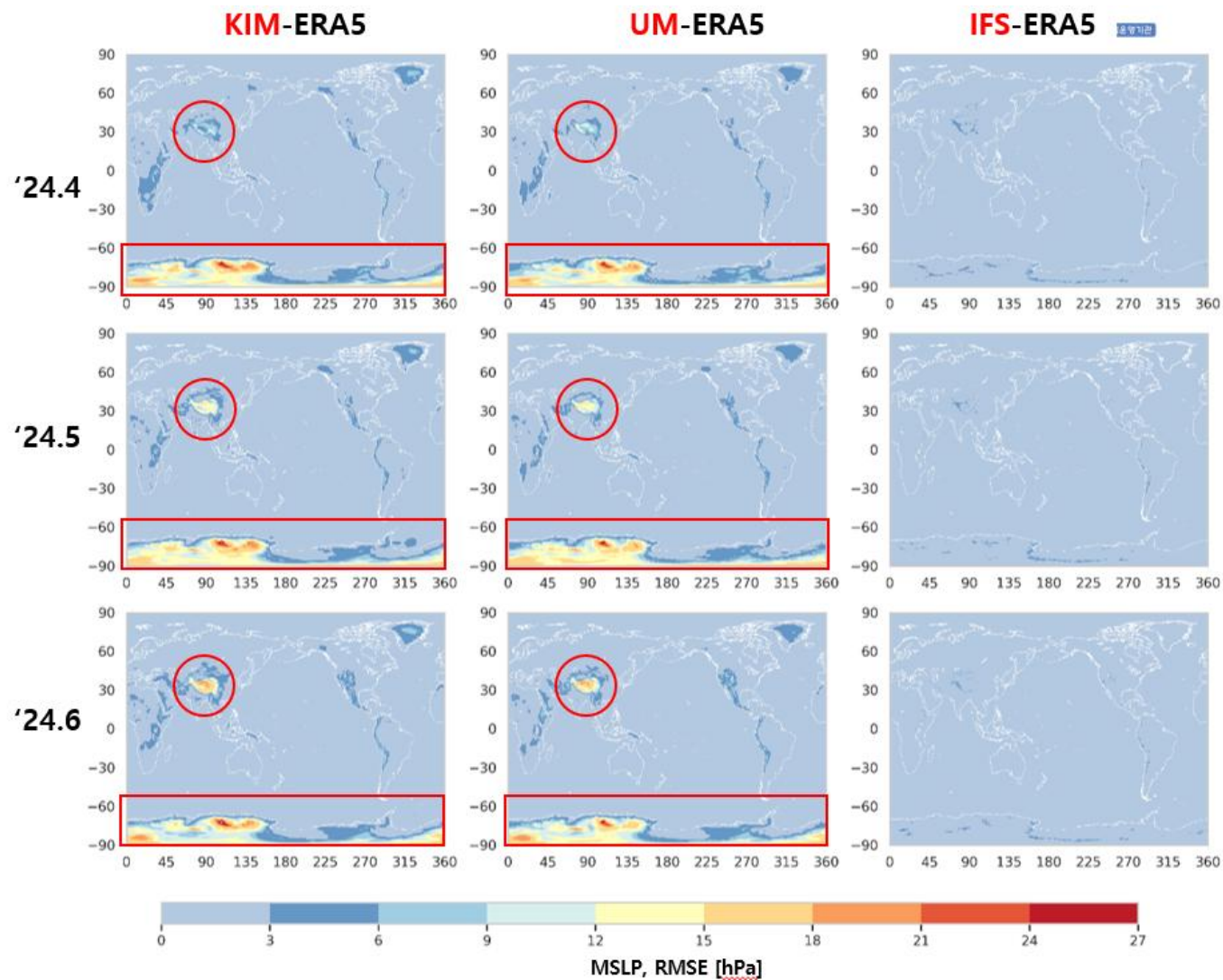
GC
(IFS)

FN
(IFS)



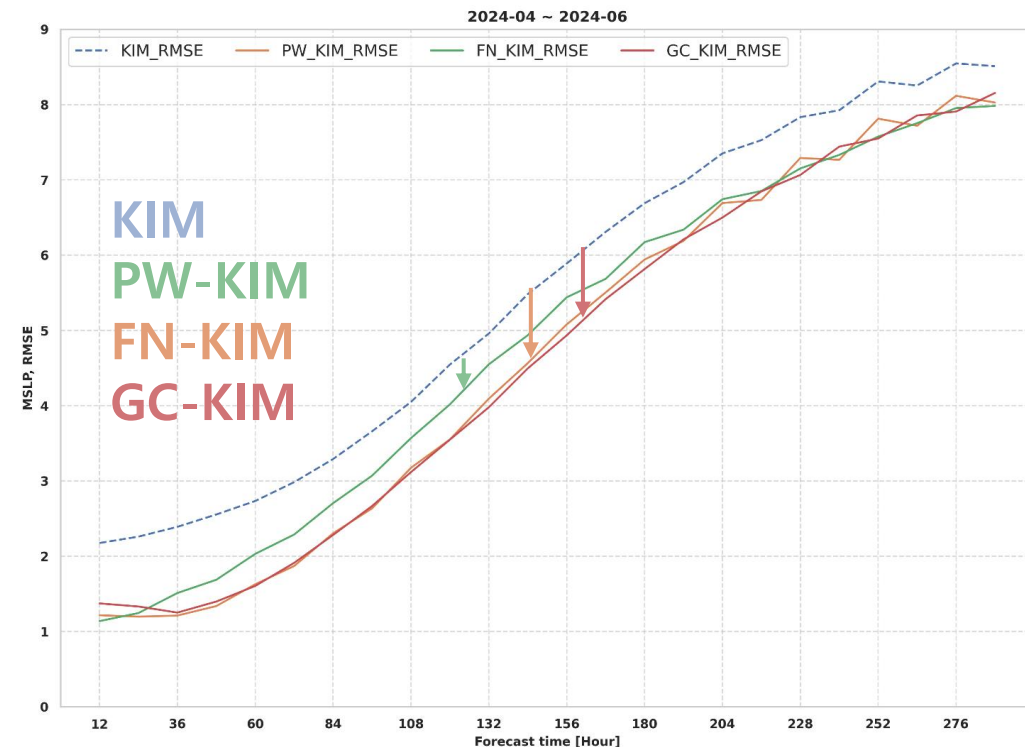
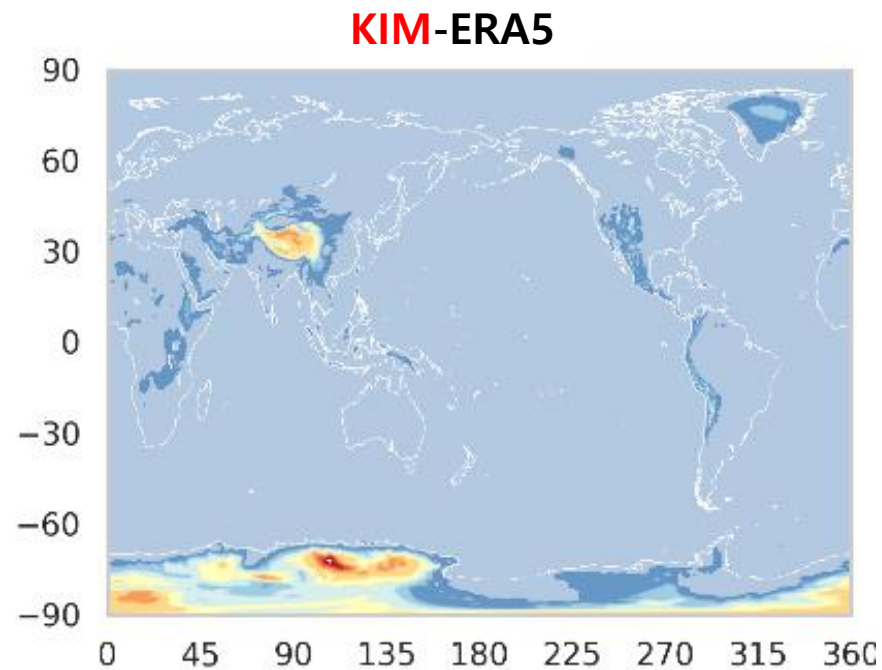
Example of real-time testbed of AI model

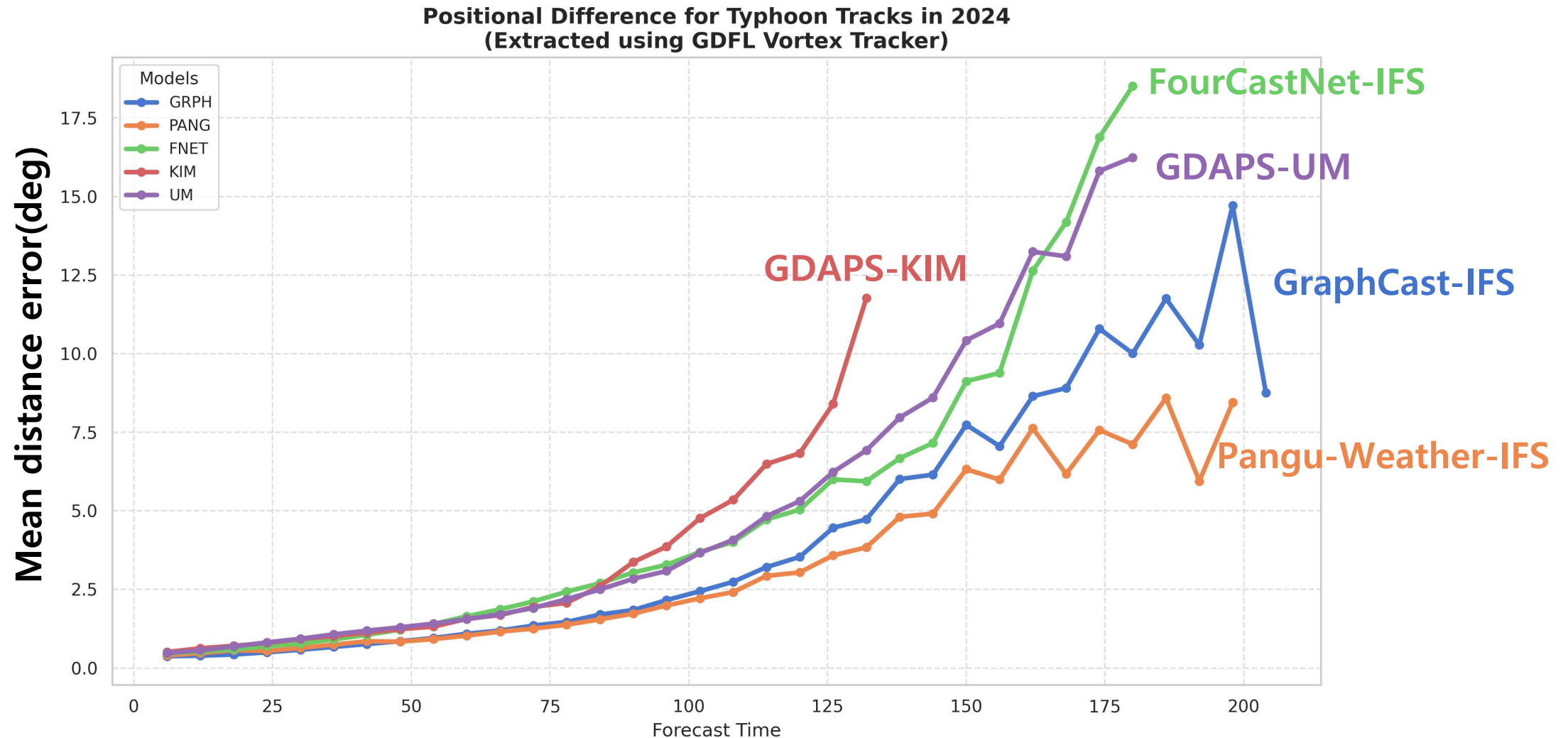
AI-NWP Integrated Technology : Medium-range



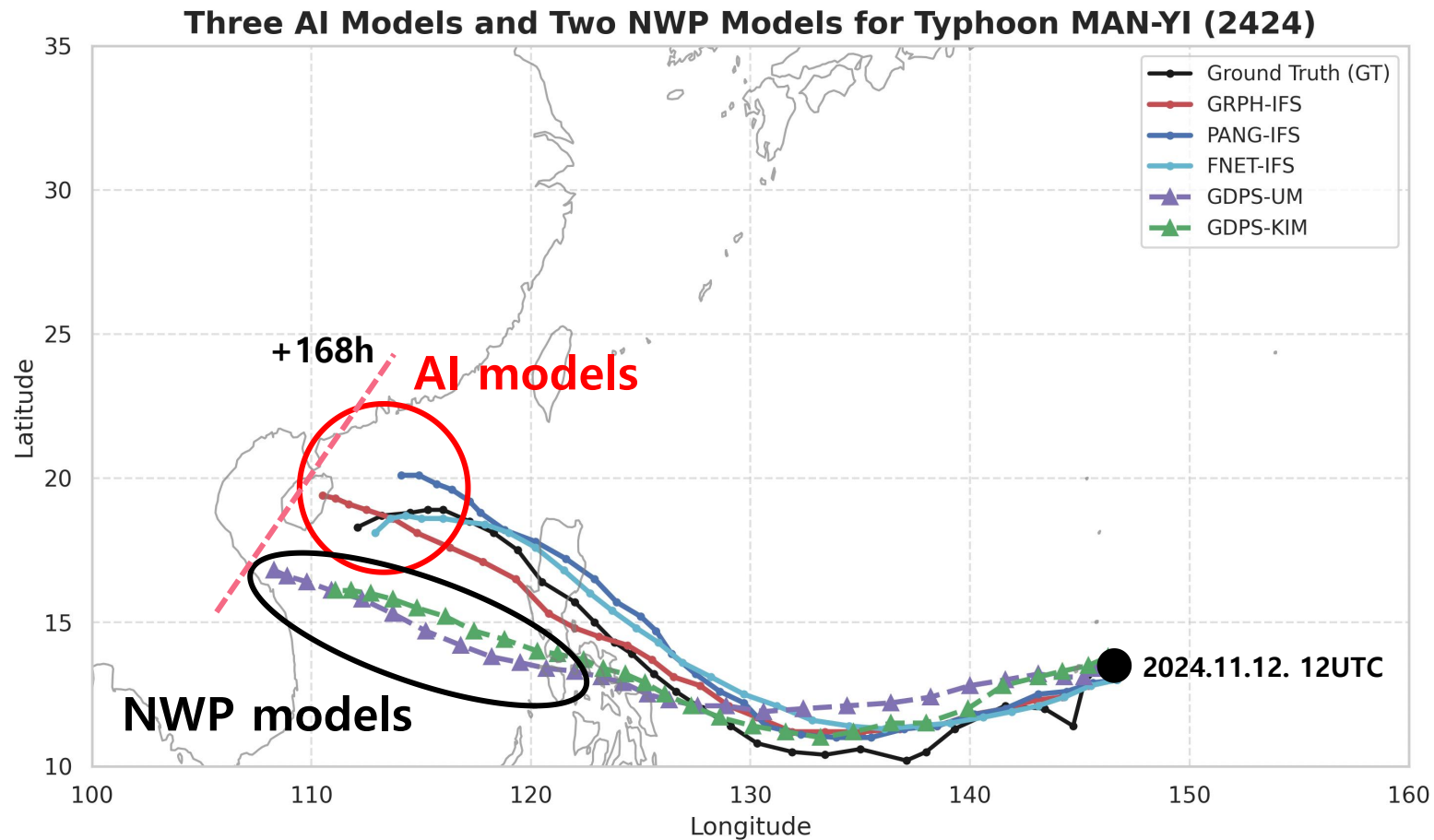
AI-NWP Integrated Technology : Medium-range

- Model-wise ability to correct large error ingested
 - ✓ **FourCastNet2 < Pangu-Weather ≤ GraphCast**





AI-NWP Integrated Technology : Medium-range





Thank You !

