

WMO AI for nowcasting pilot project (AINPP)

AINPP Steering Group

Sept 2025



WORLD
METEOROLOGICAL
ORGANIZATION

AI for nowcasting Pilot project (AINPP)



Motivation

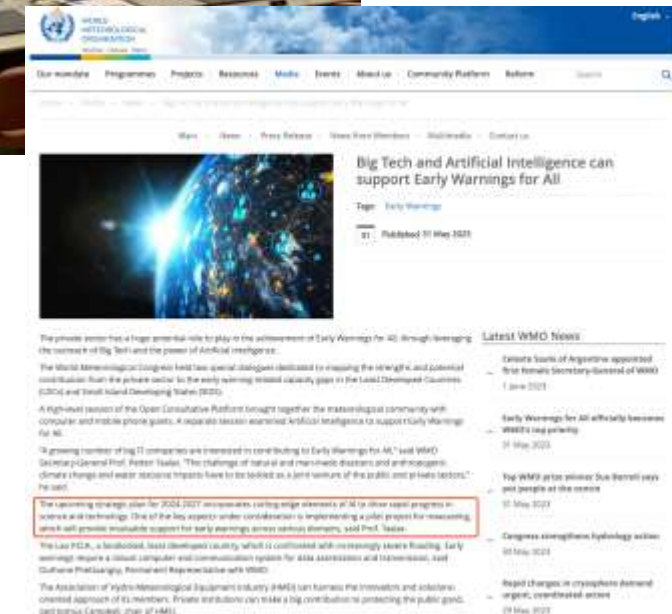
- Support the EW4ALL Initiative
- Support and strengthen earth system prediction with AI
- Narrow the AI capacity gap between WMO Members
- Promote Public-Private Engagement (PPE) on AI

Expected Outcomes

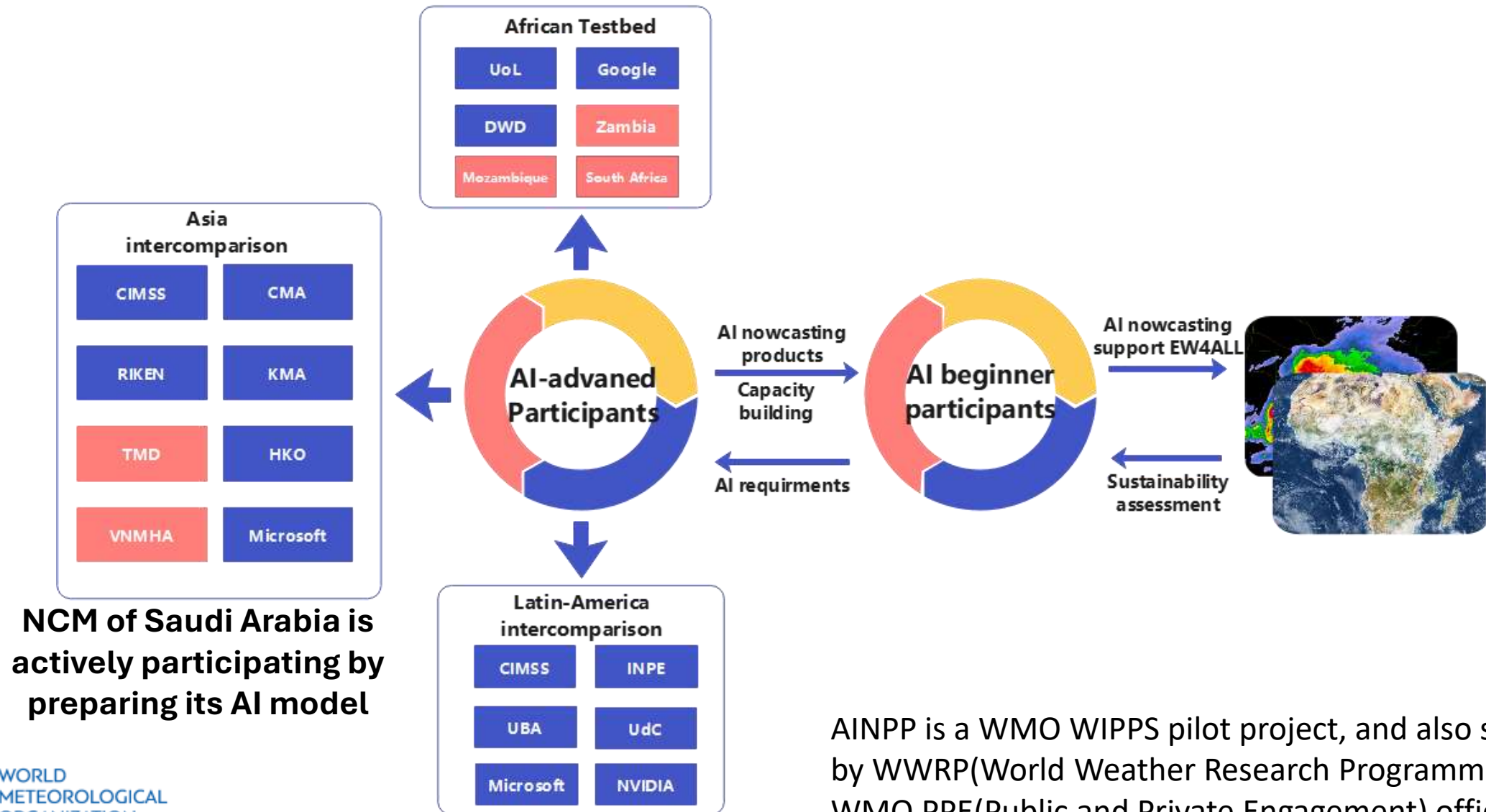
- New WMO Regional nowcasting centers
- Operational AI-based Nowcasting Products, including satellite cloud prediction, lightning, rainfall, etc..
- Best practice case of AI for nowcasting
- AI Guidelines and AI benchmark datasets



AINPP was highlighted by WMO SG during WMO congress19 in May 2023



The Structure of AINPP



AINPP Participants (Sept 2025)

NHMS

9

- DWD (German)
- CMA (China)
- HKO (Hong Kong, China)
- NOAA(US)
- KMA (South Korea)
- VNMHA (Vietnam)
- TMD (Thailand)
- NCM(UAE)
- NCM(Saudi Arabia)

Academia

7

- NSF NCAR (USA)
- University of Leeds(UK)
- RIKEN (Japan)
- Universidad de Colima(México)
- Universidad de Buenos Aires(Argentina)
- Universidade de São Paulo (Brazil)
- INPE(Brazil)

Private Sectors

3

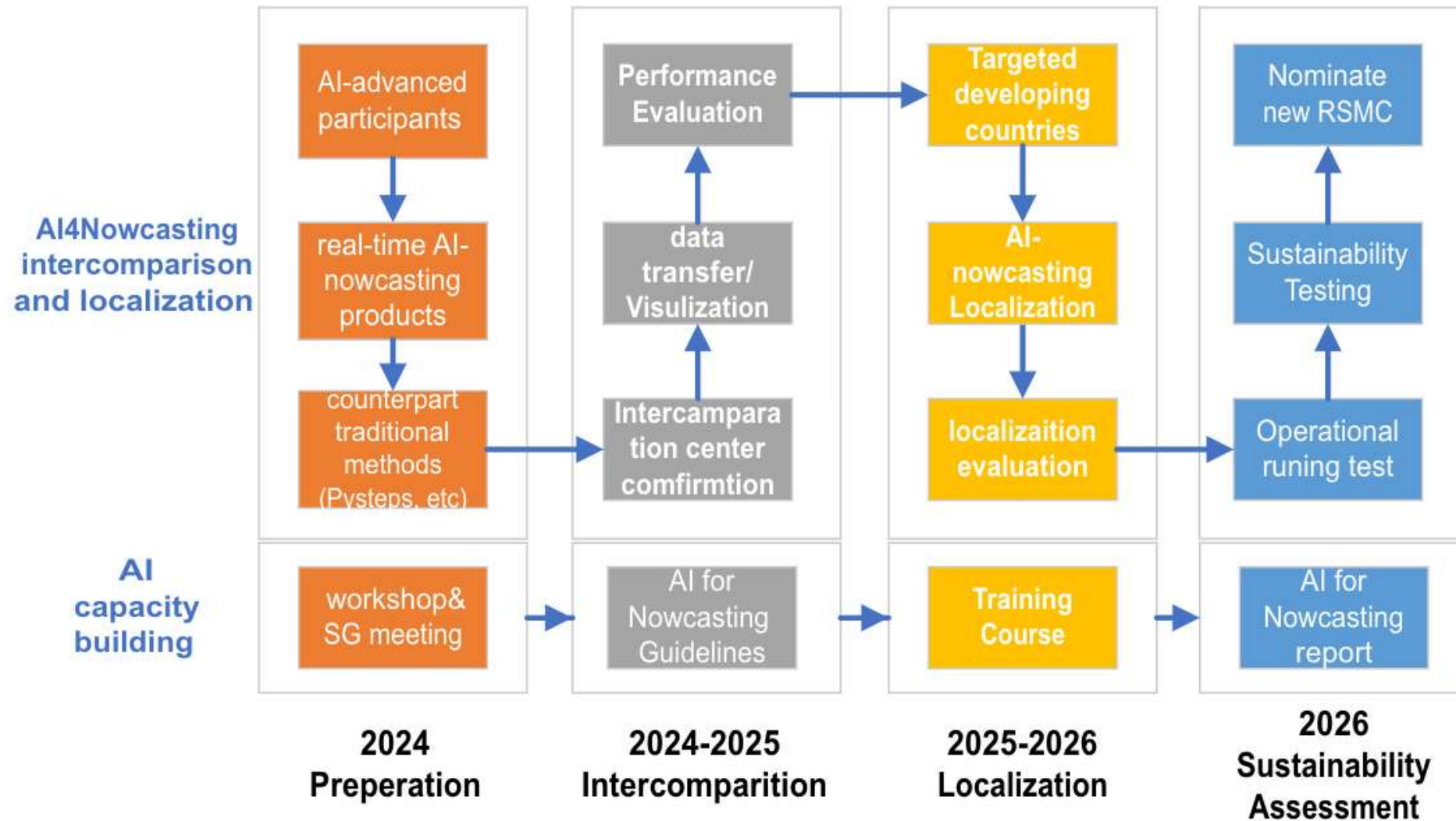
- Microsoft
- Google
- NVIDIA

UN initiative

1

- Global Initiative on Resilience to Natural Hazards through AI Solutions

Timeline of AINPP





Artificial Intelligence for Nowcasting Pilot Project Asian Nowcasting intercomparison

Latin America



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[Observation](#)

[AI Nowcasting](#)

[Evaluation](#)

[News](#)

[Achievements](#)

[Introduction](#)

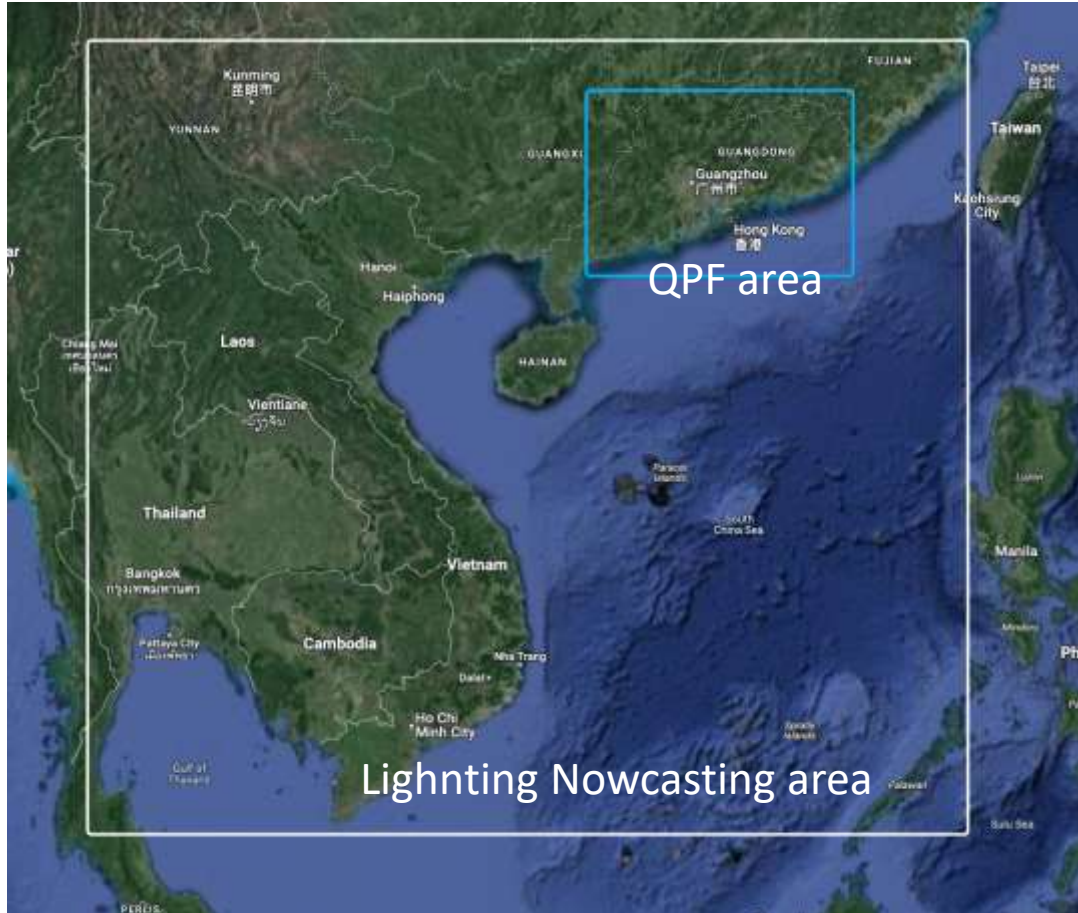
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Asian AI Nowcasting Intercomparison Launches Successfully



Asia intercomparison design



■ Time

- May to July 2025(extended to Nov 2025)

■ Intercomparison area

- Lightning nowcasting:
99 ~ 120°E, 8 ~ 28°N
- QPF & Radar echo extrapolation:
109 ~ 118°E, 20 ~ 26°N

■ Products type

- Lightning nowcasting:
99 ~ 120°E, 8 ~ 28°N
- QPF & Radar echo extrapolation:
109 ~ 118°E, 20 ~ 26°N

■ Participants

- CMA, NOAA(CIMSS), Microsoft, HKO, KMA, RIKEN, VNMHA, TMD, NCM(Saudi Arabia)

The Asian intercomparison platform

<https://www.wmc-bj.net/ainpp/>

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WORLD METEOROLOGICAL CENTRE BEIJING
Weather + Climate + Water

Home Monitoring Models Verification Severe Weather Training Events News

Monitoring

- Fengqing Model update information
- The Solomon Islands are experiencing strong wind and heavy rain

Weather Models

- CMA-RA
- Weather Analysis
- Climate Index

Climate Model

- CMA-GFS
- CMA-GEPS
- CMA-WW3
- CMA-TYM

Early Warning Support Mechanism

Belt&Road City Forecasts

Hangzhou-RDP

AI for Nowcasting Pilot Project (AINPP)

Pilot Project partners

Weather Forum

Documents

About us

Hot Link

RAIN24.PROB(%) ≥ 10 mm

2025030400 UTC Forecast 1-024 CMA-GEPS

Products

FY-4F AGRI

Total precipitation (mm)

450 hPa relative humidity (%)

600 hPa wind (m/s)

Tue 04 Mar 2025 06:30 UTC

Tue 04 Mar 2025 06:00 + 00h UTC

Tue 04 Mar 2025 06:00 + 00h UTC

Tue 04 Mar 2025 06:00 + 00h UTC

Artificial Intelligence for Nowcasting Pilot Project
Asian Nowcasting intercomparison

Home Observation AI Nowcasting Evaluation News Achievements Introduction Contact

Intercomparison

Radar QPF Lightning

Observation

Rain (ART)

AI Nowcasting

QPF (CMA)

Evaluation [2025/6/1 00:00 to 2025/7/1 11:00]

ETS	TS	POD	PAR	POFD	SR	BIAS
1. Microsoft 0.363	1. Microsoft 0.388	1. SZMB 0.509	1. Microsoft 0.230	1. BMDN 0.155	1. Microsoft 0.764	1. OpticaFlow 1.303
2. SZMB 0.33	2. SZMB 0.347	2. OpticaFlow 0.523	2. CHA 0.355	2. OpticaFlow 0.039	2. CHA 0.640	2. WRFM 1.178
3. CMA 0.315	3. CMA 0.333	3. Microsoft 0.482	3. SZMB 0.488	3. SZMB 0.092	3. SZMB 0.602	3. SZMB 1.094
4. GDMO 0.305	4. OpticaFlow 0.294	4. GDMO 0.432	4. GDMO 0.108	4. CHA 0.034	4. GDMO 0.402	4. GDMO 0.983
5. OpticaFlow 0.293	5. GDMO 0.292	5. CMA 0.408	5. OpticaFlow 0.198	5. GDMO 0.032	5. OpticaFlow 0.402	5. CMA 0.932
6. BMDN 0.174	6. WRFM 0.23	6. BMDN 0.346	6. WRFM 0.104	6. Microsoft 0.025	6. BMDN 0.296	6. Microsoft 0.571

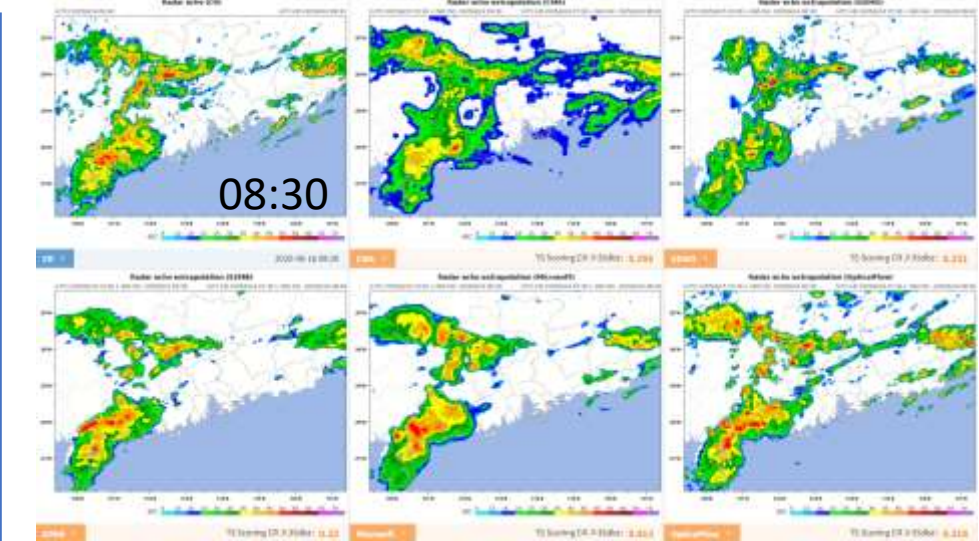
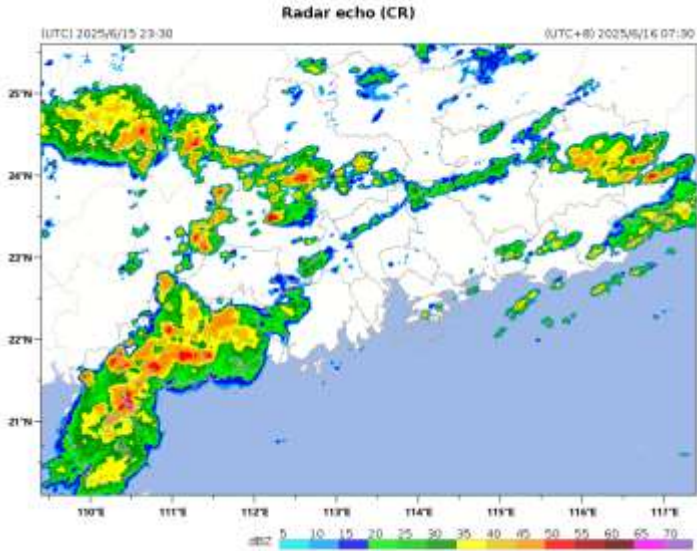
QPF ETS Scoring Station ≥ 0.1 mm

■ CMA ■ GDMO ■ SZMB ■ Microsoft ■ WRFM ■ OpticaFlow

0.0 0.2 0.4 0.6 0.8 1.0

Asia Nowcasting Intercomparison-Radar Reflectivity nowcasting (16th June)

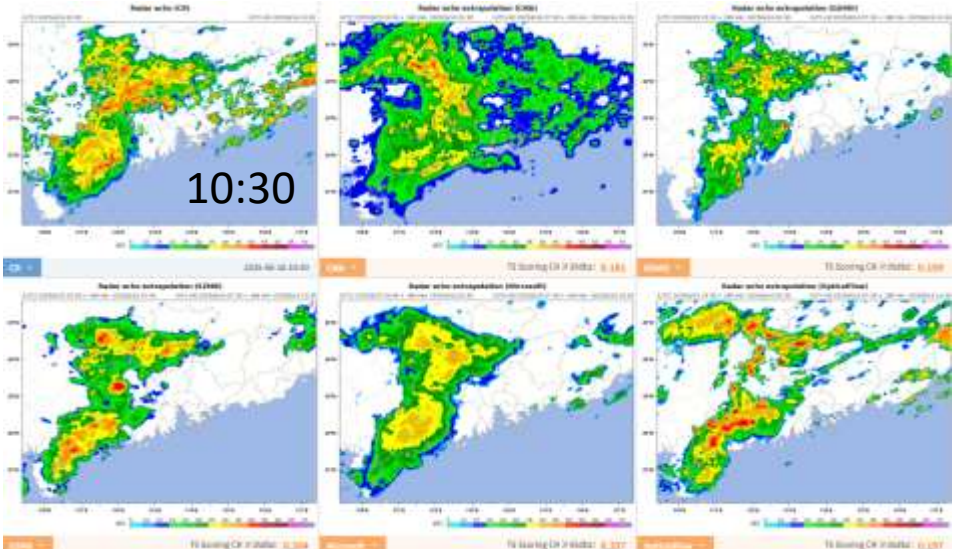
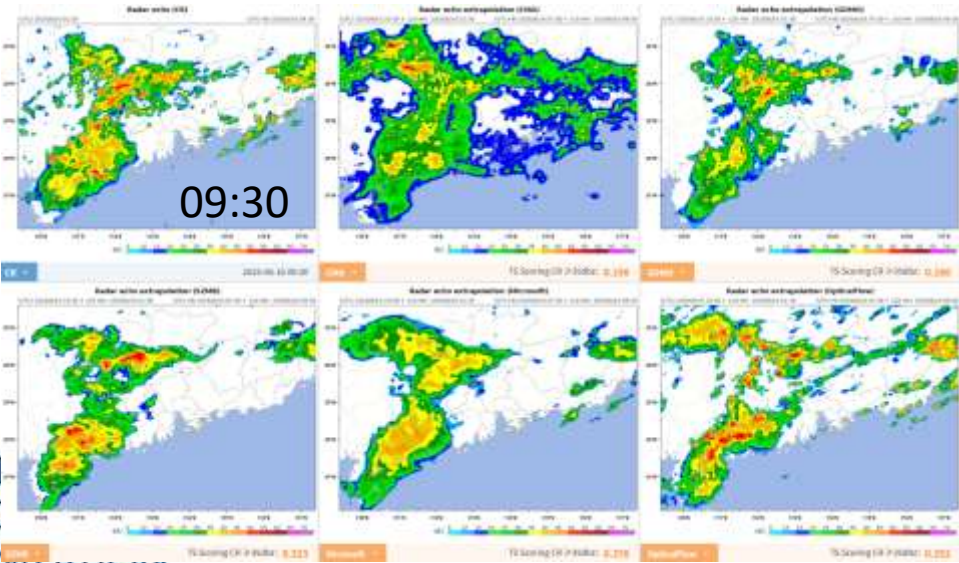
Input
07:30



1h lead

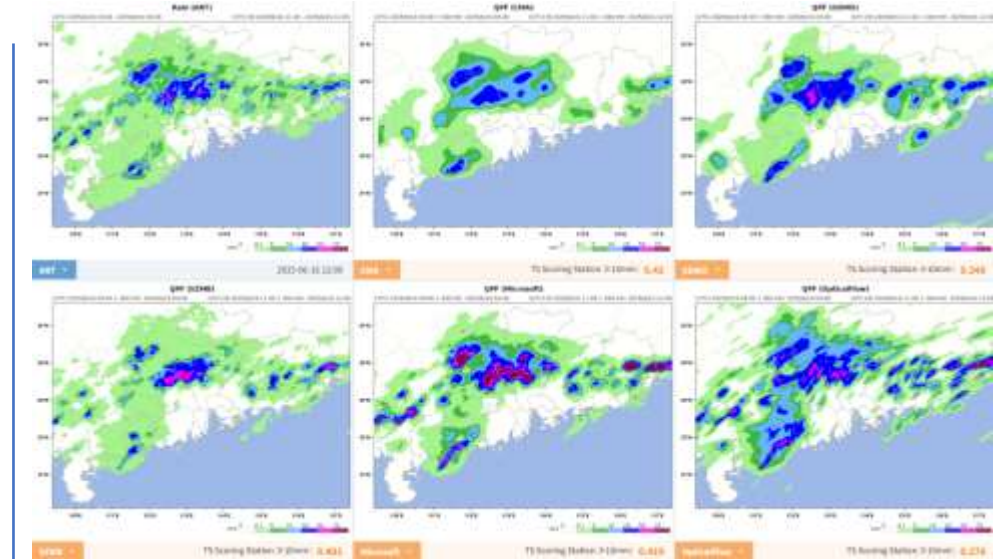
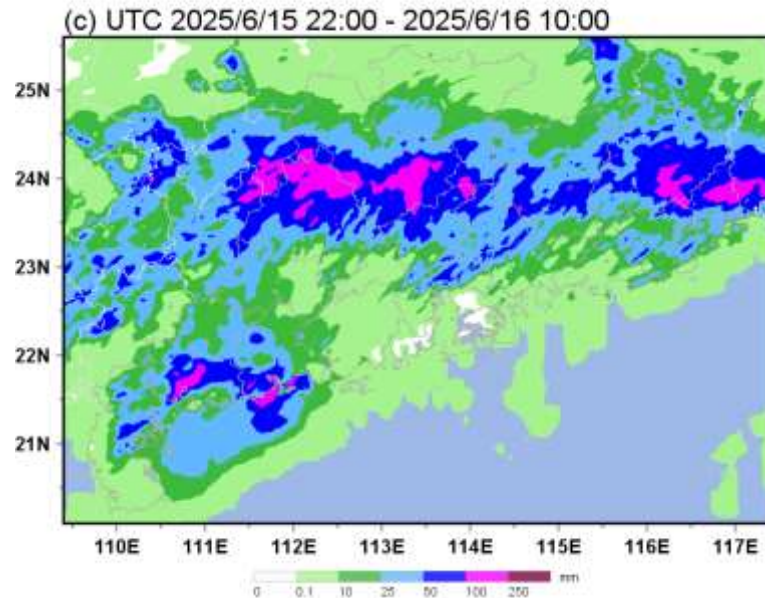
2h lead

3h lead



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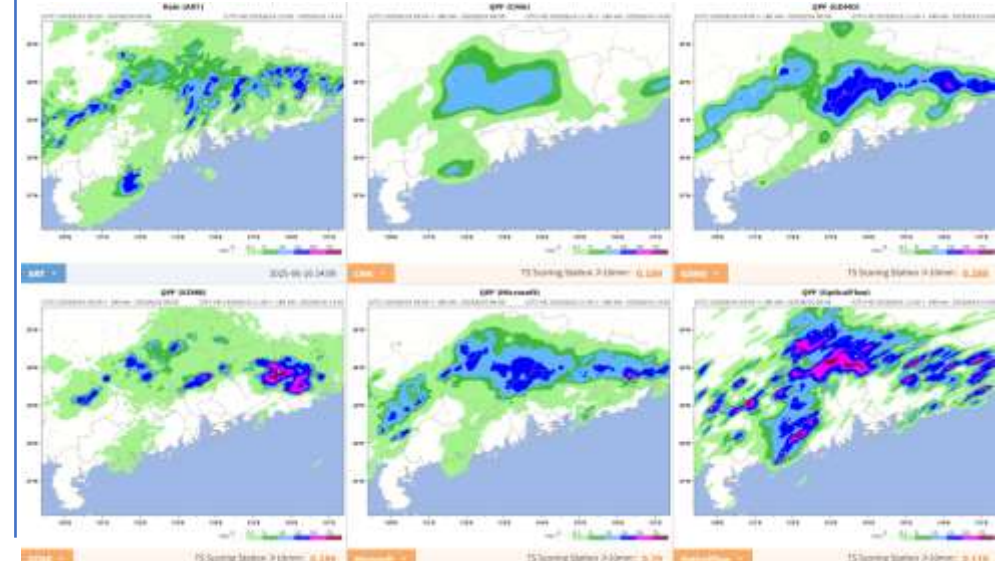
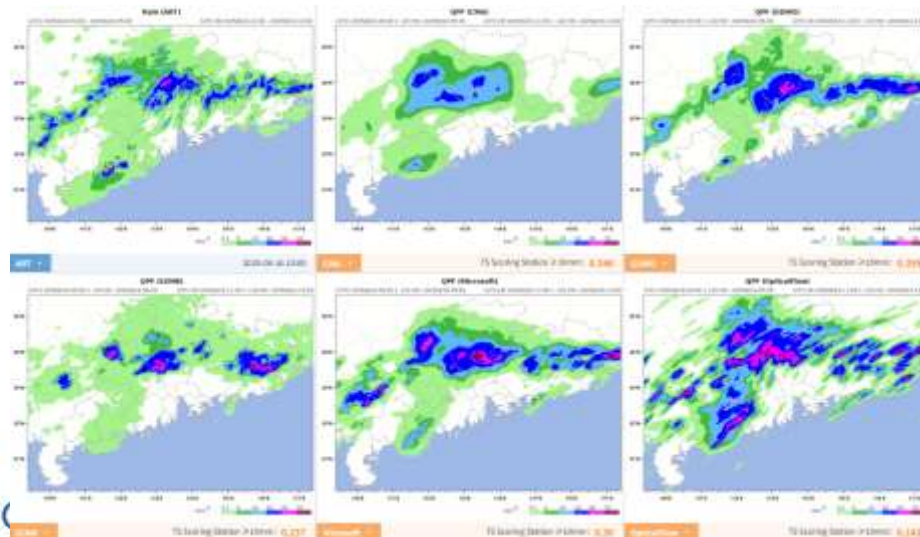
AINPP Asia Nowcasting Intercomparison-QPF case (16th June)



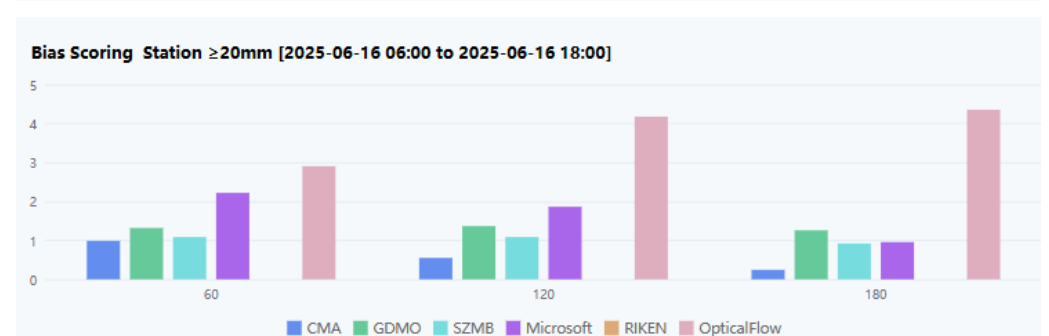
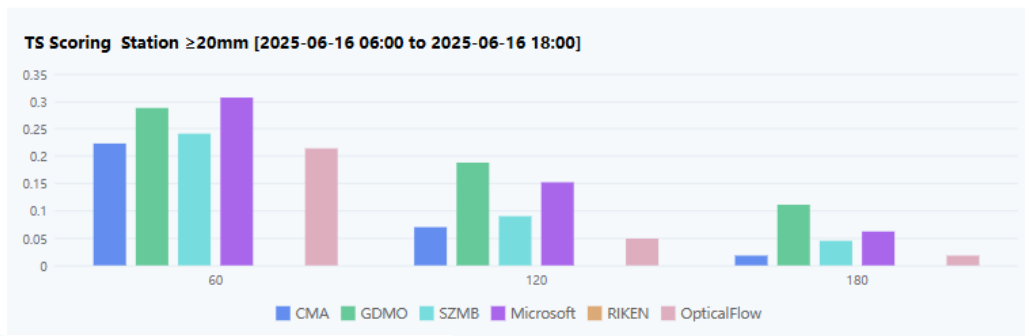
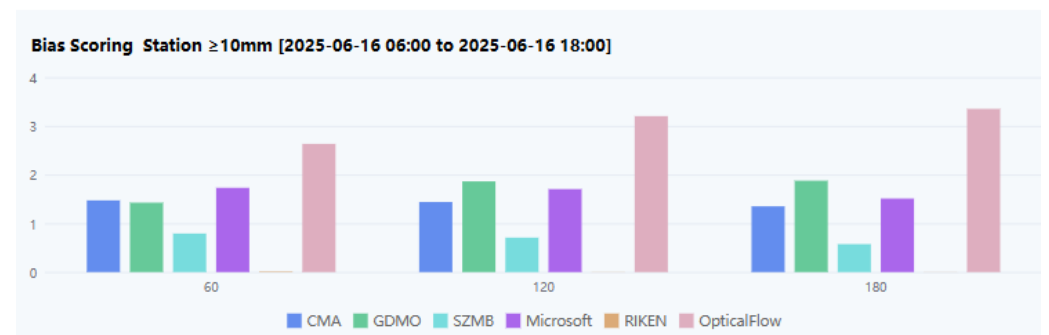
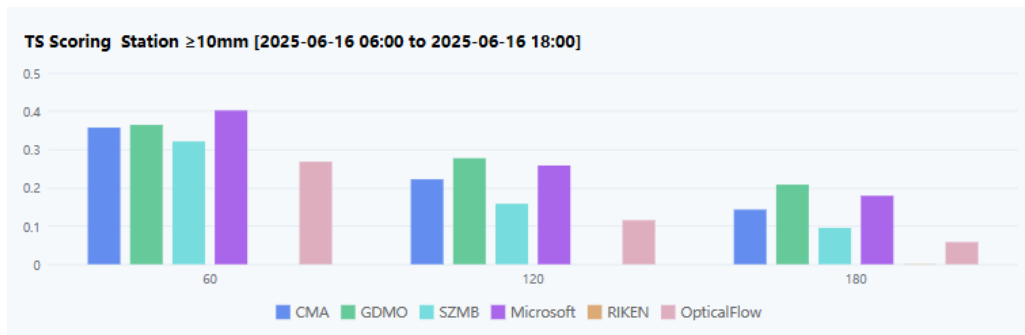
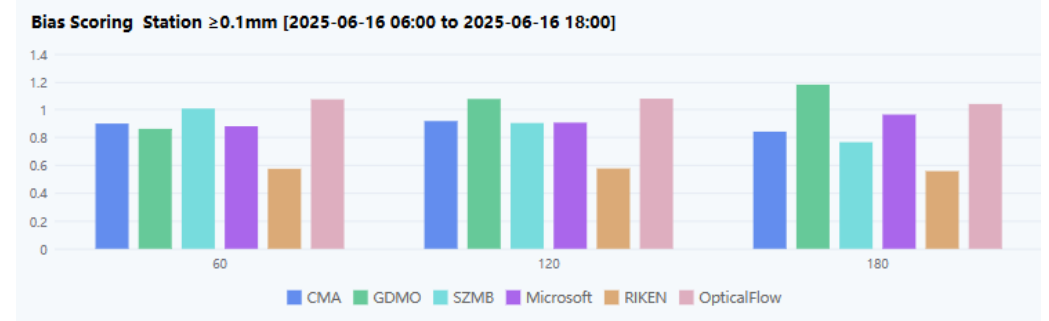
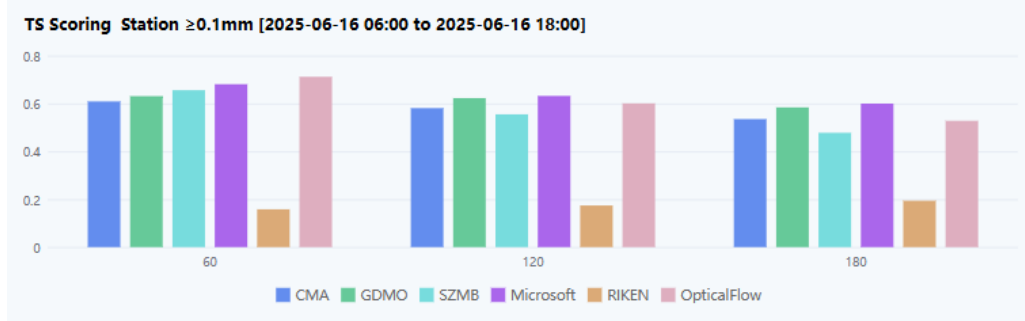
1h lead

2h lead

3h lead



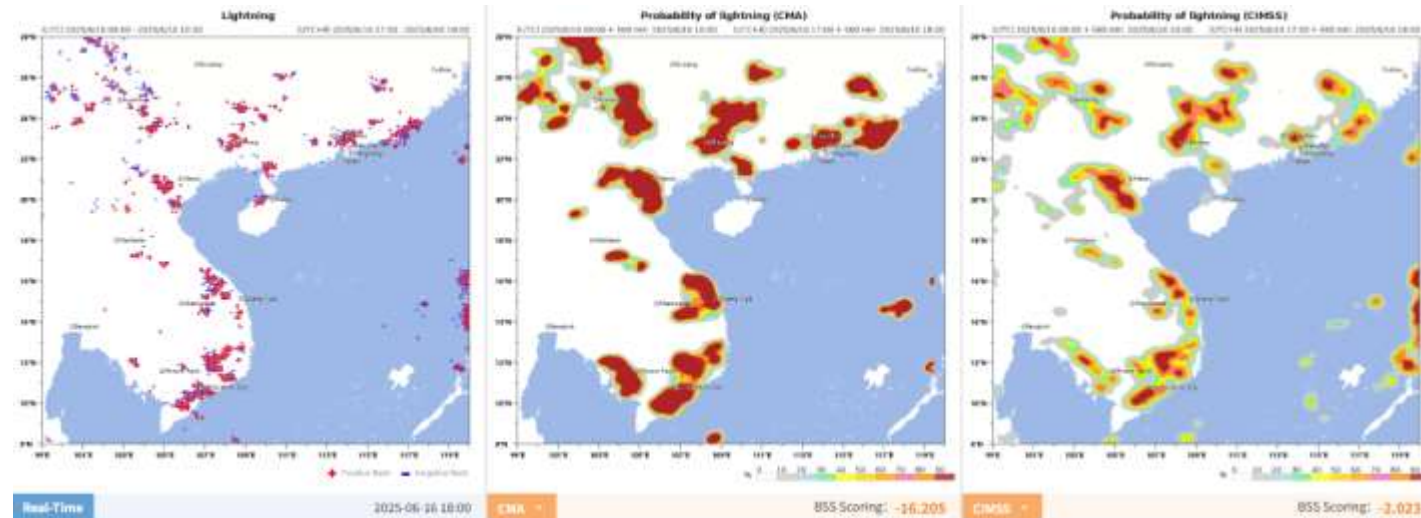
AINPP Asia Nowcasting Intercomparison-QPF case (16th June)



AI methods show advantages in heavy rainfall prediction.

AINPP Asia Nowcasting Intercomparison- Lightning Nowcasting

- Participating algorithms:
 - NOAA/CIMSS (ProbSevere LightningCast)
 - Himawari-9 data inputs
 - 1-hour/8km resolution
 - CMA
 - FY4B data inputs
 - 10-min/4km resolution
- Ground truth data
 - Global lightning location data



Asian Intercomparison Next Steps

May-July, 2025

- Objective verification
- Subjective verification
- A questionnaire to collect forecasters' comments.

Aug- Oct, 2025

- Asian Intercomparison final report
- Choose AI-based nowcasting products for Developing countries

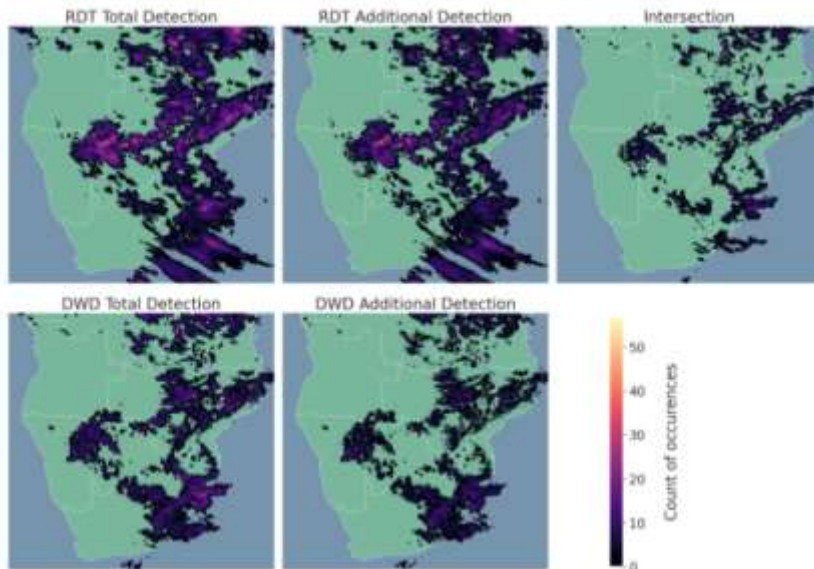
Nov, 2025

- Apply the intercomparison products for the 15th National Games of China
- Run AI-nowcasting products in Developing countries

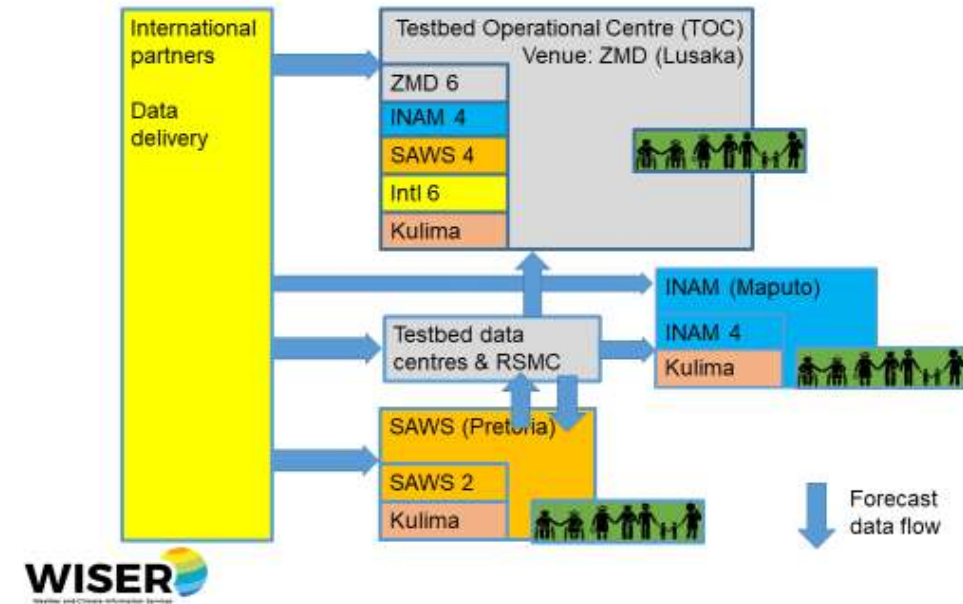
1st Testbed in Africa- Lusaka 29th Jan – 9th Feb 2024



The nowcasting products on the testbed website



DWD's thunderstorm nowcasting products in the testbed

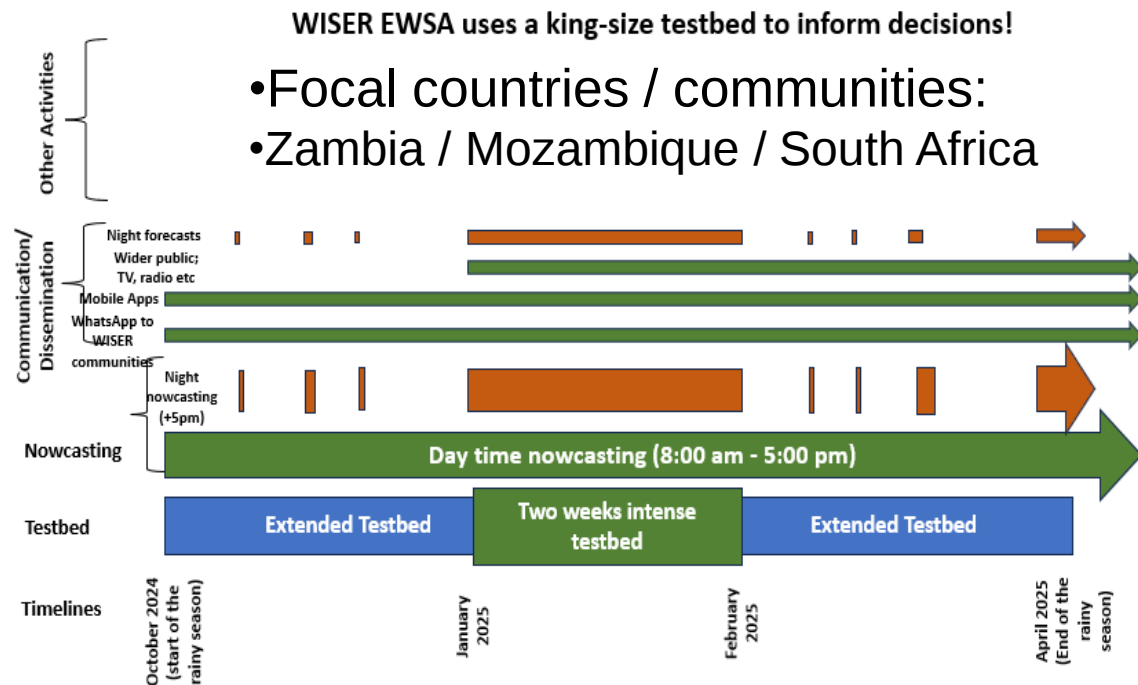


The overall workflow of the testbed

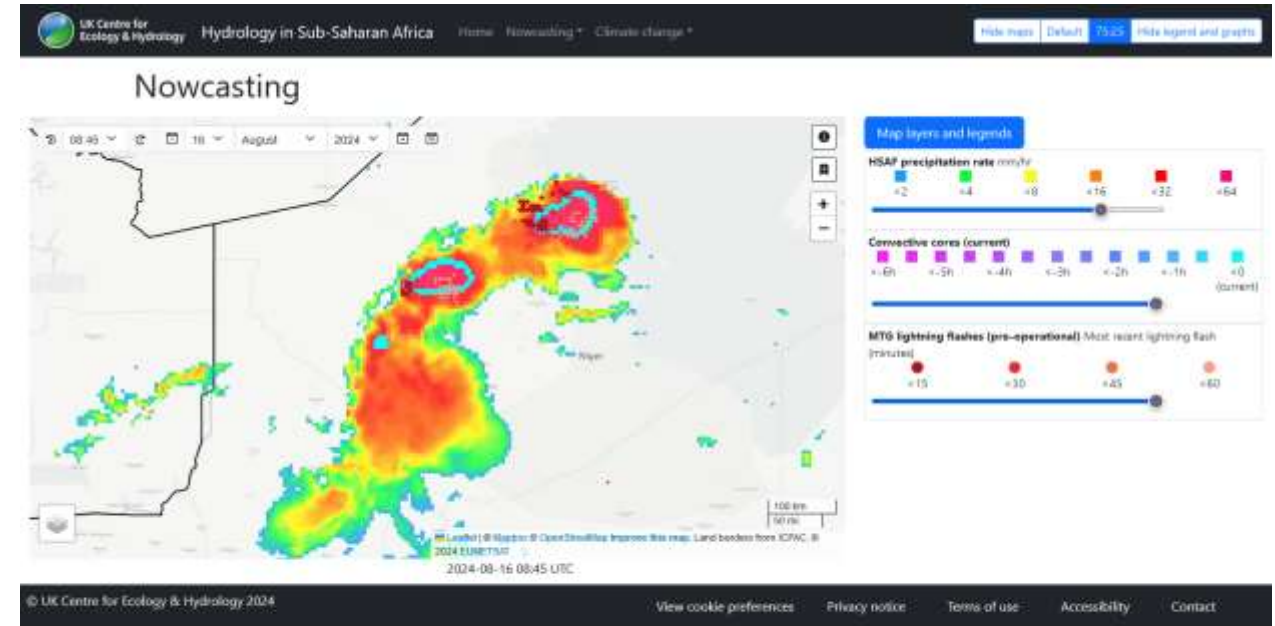
AINPP inclusion:

- NCAS-Leeds, WMO (partners)
- DWD (thunderstorm product)
- Google (active visitors)

2nd Testbed in Africa- 01 October 2024 – 30 April 2025



The Africa King-size testbed time schedule



New products

- MTG lightning
- DWD and Google AI-based methods. Others.
- Rain over Africa AI-based rainfall shown here (Chalmers University, Sweden)

Testbed in Africa

- <https://www.wiser-ewsa.org/testbed/>
- <https://www.wiser-ewsa.org/testbed/portal/>
- <https://www.wiser-ewsa.org/testbed/intercomparison/>
- <https://ml-env-for.leeds.ac.uk/ainpp/>

[Severe Thunderstorm Impact Table](#)

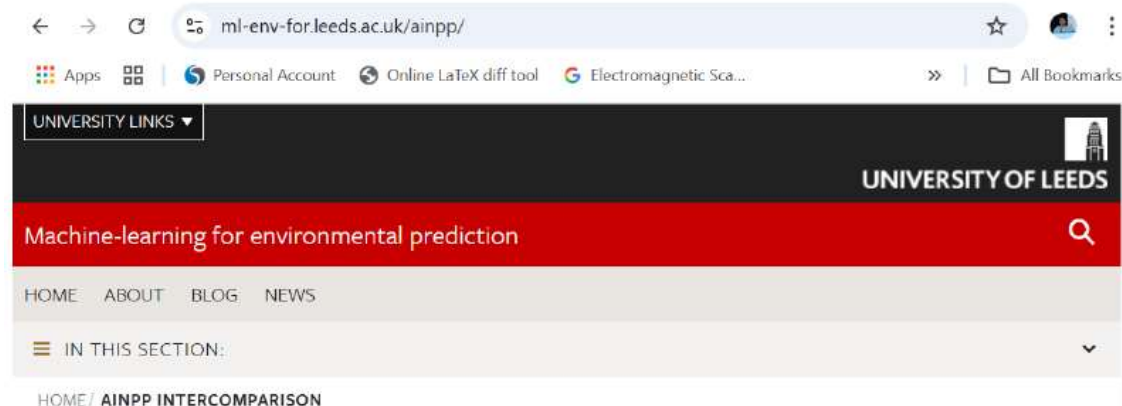
[WISER-EWSA web pages](#)

[WMO Guidelines for Satellite Nowcasting](#)

[GCRF African SWIFT](#)



Intercomparison products



AINPP Intercomparison

Intercomparison and evaluation of nowcasting products during WISER-EWSA Testbed 2



[Rain over Africa](#)

[FASTA \(web version\)](#)

[WISER-EWSA Data Catalogue](#)

[EUMetsat](#)

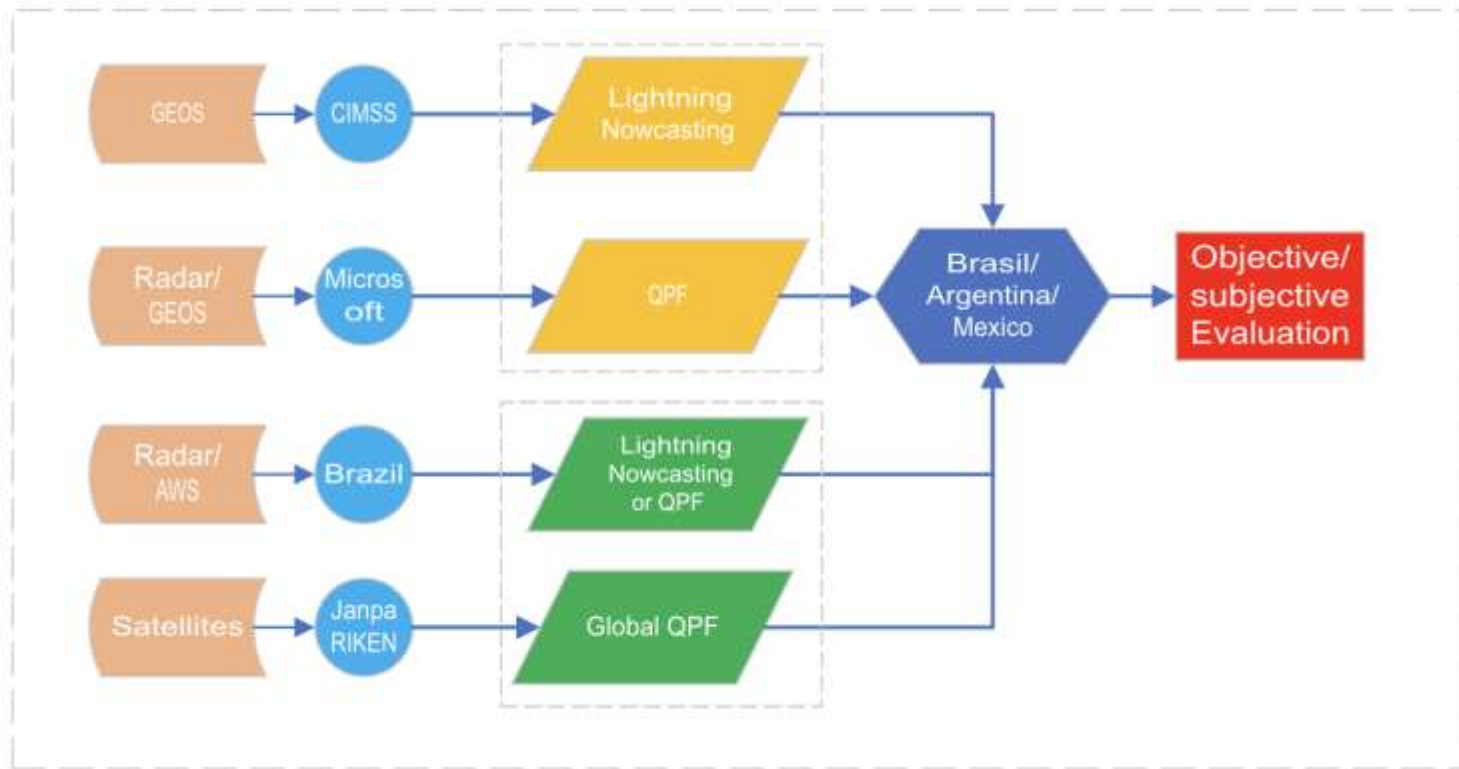
[NFLICS Portal](#)

[EUMetview](#)

[NWC-SAF ADAGUC](#)

In-situ Observations

Intercomparison in Latin America



Participants: CIMSS, Microsoft, RIKEN, INPE(Brazil), USP (Brazil), UBA (Argentina), Universidad de Colima (Mexico)

Hindcast:

- Lightning nowcasting: 30days from September 2023~February 2024(South America) and 30days from April 2024~September 2024(Mexico).
- Rainfall nowcasting: Active season for Precipitation from El Nino 2023-2024;



Nowcasting Area1



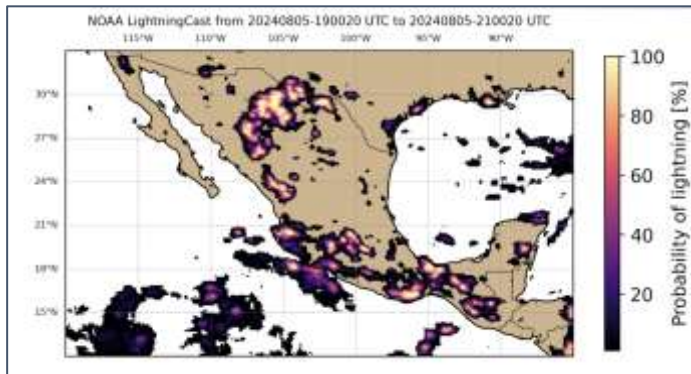
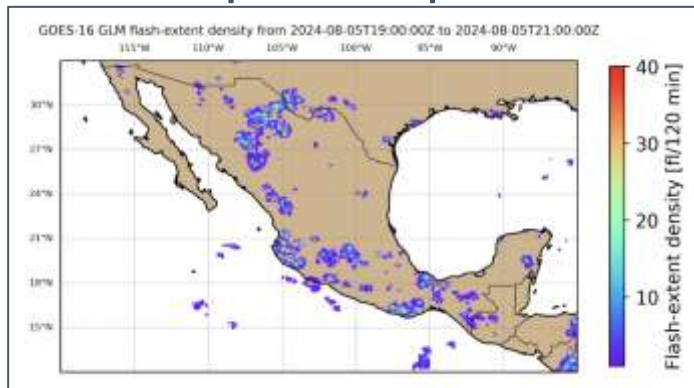
Nowcasting Area2



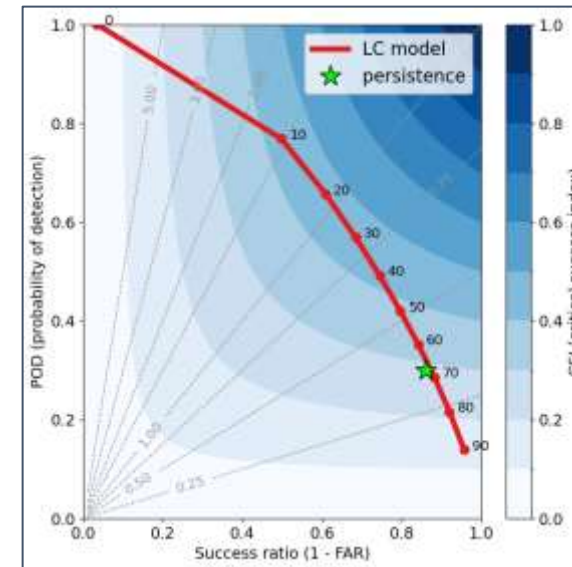
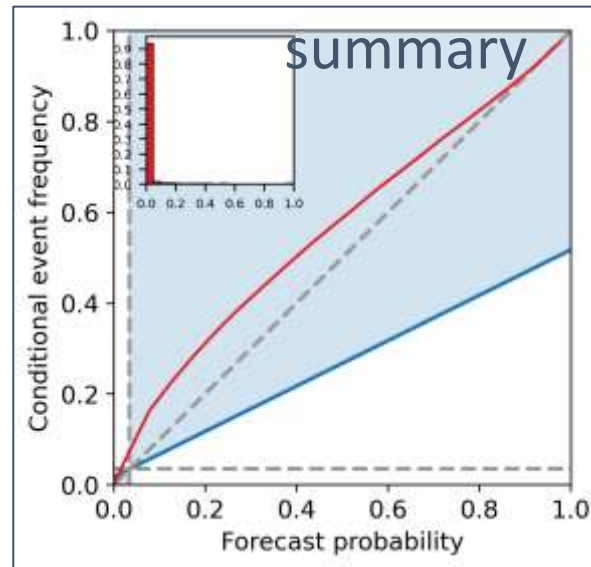
Lightning nowcasting intercomparison in Latin-America

- NOAA/CIMSS model (LC) and Persistence have been evaluated for Mexico and South America
- Public GitLab repository established
 - Contains code, a link to the dataset on Zenodo, and notebook exercises

Example sample



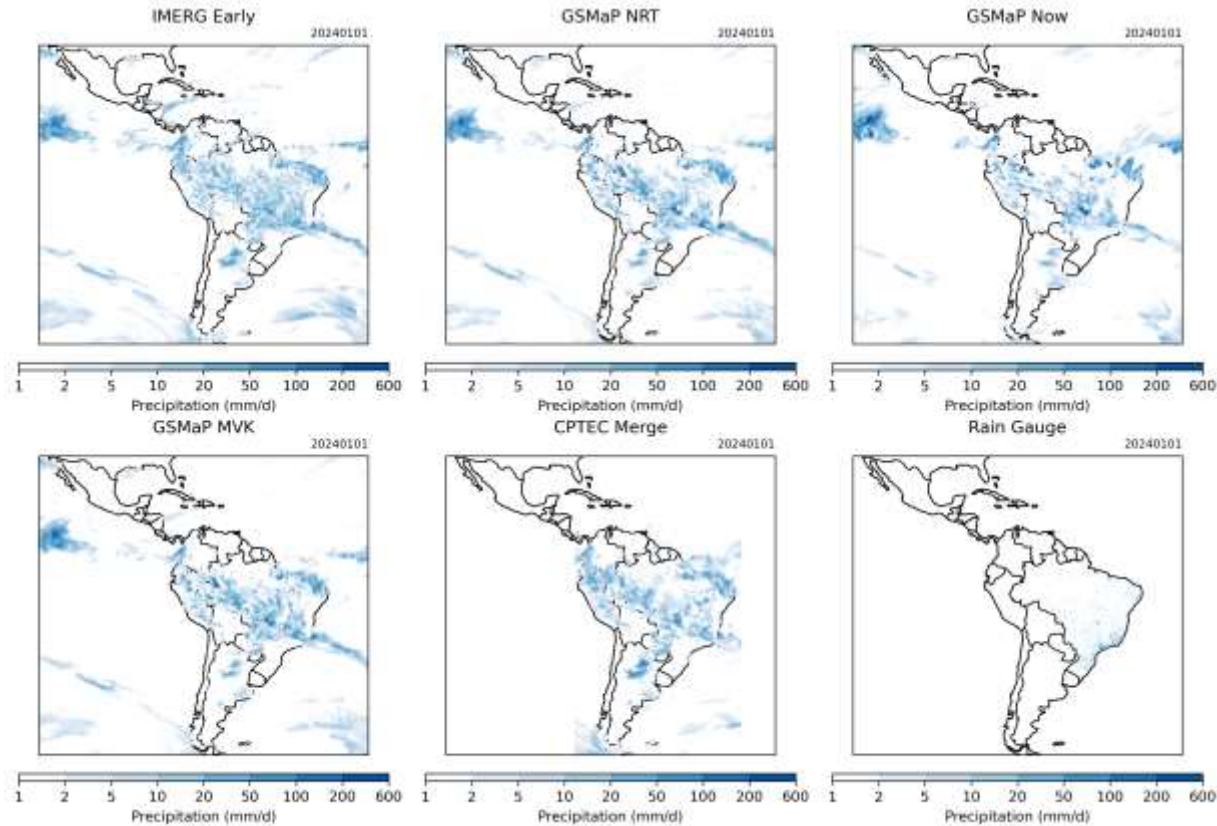
Mexico evaluation



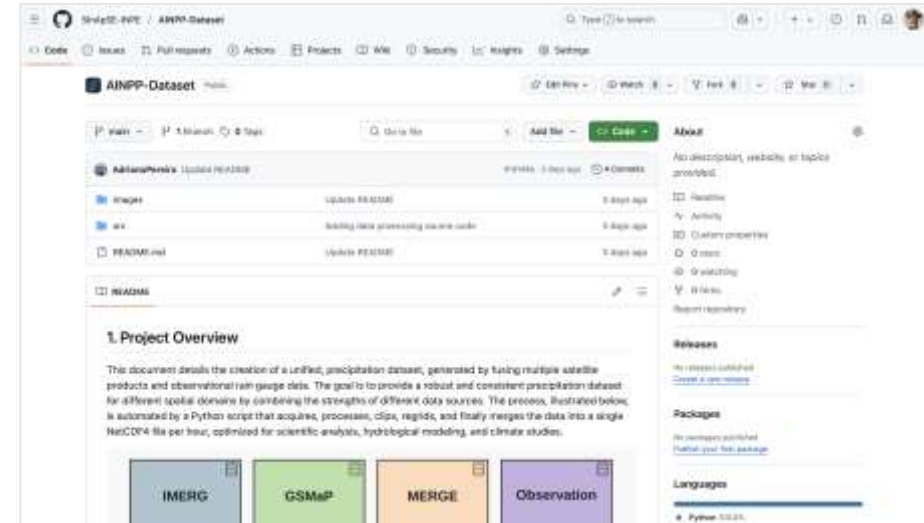
GitLab repo



Rainfall nowcasting intercomparison in Latin-America



Standardized dataset for validation



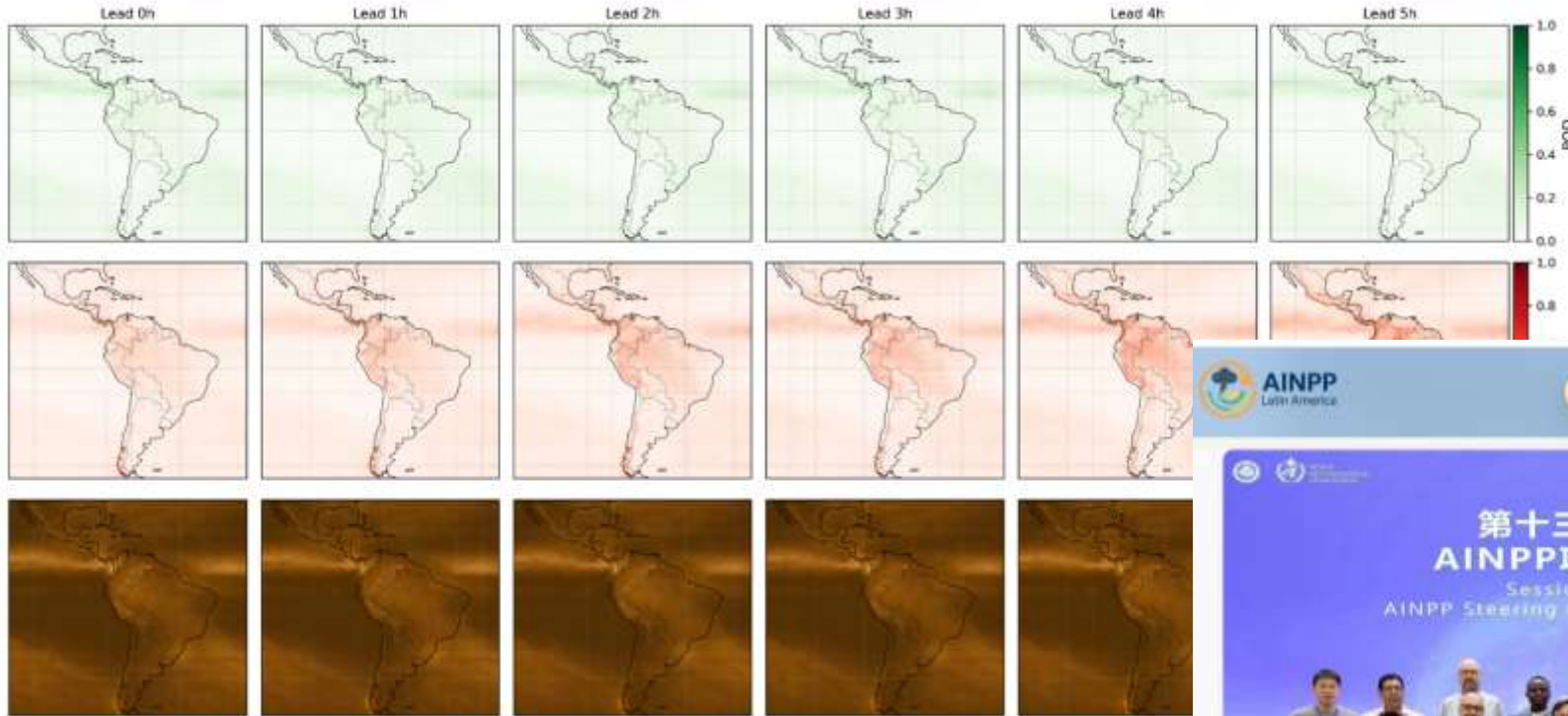
<https://github.com/SnApSE-INPE/AINPP-Dataset/tree/main>



<https://datamap.pcs.usp.br/app/datasets/09760610-246a-4208-886f-fdab6ddca1fe>

Rainfall nowcasting intercomparison in Latin-America

Accumulated Verification Metrics by Lead Time (U-Net_GTI vs GSMaP_MVK)



Example: Fine-Tuning U-Net
(Trained with GSMaP MVK and NRT as INPUT for Validation)

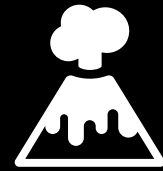
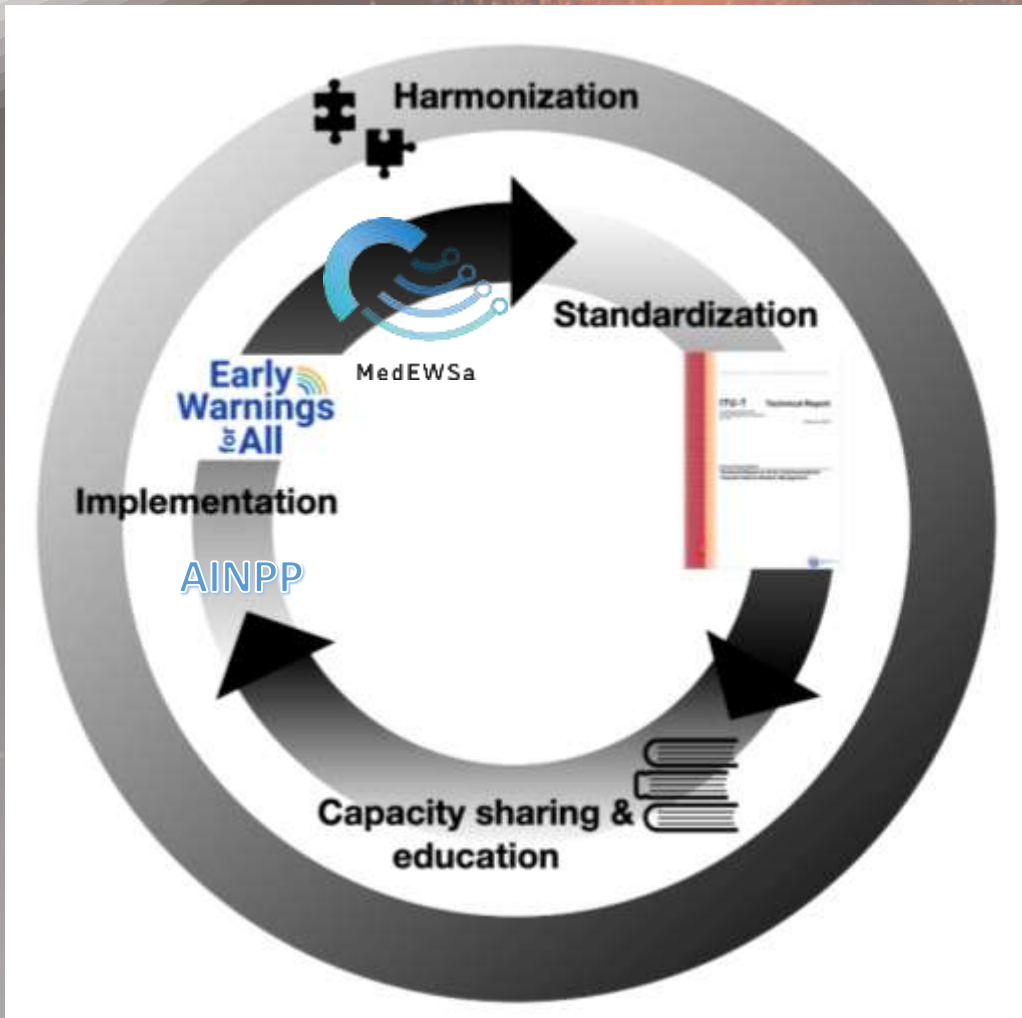


Testbed: AINPP WEB Page and Tracking, Forecasting and Validation (In progress)

AI-based Nowcasting products for developing countries

Region	Products Type	Product Providers	Source data	Leading time/ hour	Spatial-temporal resolution	Targeted Product Receivers
Asia	Thunder-storm	CMA	FY4B	2	15min/4km	VNMHA, TMD, etc.
		CIMSS	Himawari9	2	10min/2km	
	QPF (Quantitative precipitation forecast)	Microsoft	FY4/Himawari9/radar	2	4min/1km	VNMHA, TMD, etc
		HKO	FY4/Himawari9/radar	4	10min/2km	
		KMA	GK2A/radar/AWS	6	10min/1km	
		CMA	FY4/radar	3	10min/1km	
		Japan RIKEN	GSMaP (microwave satellites, composite IR)	6	60min/10km	
Latin America	Thunder-storm	CIMSS	Geos	2	10min/2km	Brazil\ Argentina\ Mexico
	QPF	Microsoft	Geos/ radar	2	4min/1km	Brazil\ Argentina\ Mexico
		Japan RIKEN	GSMaP (microwave satellites, composite IR)	6	60min/10km	
Africa	Thunder-storm	DWD	MTG/MSG	2	15(10)min/ 5(3)km	Zambia, Mozambique, South Africa, etc
	QPF	Microsoft	MTG/MSG/ radar	2	4min/1km	
		Google	MTG/MSG	TBD (potentially up to 24)	15min/5km	
		Japan RIKEN	GSMaP	6	60min/10km	

Link to Global Initiative on Resilience to Natural Hazards through AI Solutions



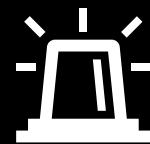
Branch out

- Add new use cases
- Explore new (related) technologies



Build on

- Update technical reports
- Deep dive on selected topics



Scale up

- Support capacity sharing
- Develop / realize **implementation projects** that test standards and target **EW4All** priority countries

Welcome to join us!

The **AINPP Workshop 2025** will be held from
24th-26th September 2025 in Jeju, South Korea.

<https://wmo.int/events/workshop/wmo-artificial-intelligence-nowcasting-pilot-project-ainpp-workshop>



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