MAZU 妈祖

MAZU
Multi-hazard Alert
Zero-gap and Universal

人工智能赋能全民早期预警倡议中国行动

China's Action on the "Early Warnings for All" Initiative Powered by AI

ZENG Qin

Director General
Department of International Cooperation
China Meteorological Administration

2025-07-26 Shanghai

中国气象局
China Meteorological Administration

为何 “妈祖”？ Why MAZU?

Early Warnings for All

MAZU
Multi-hazard Alert
Zero-gap and Universal

Lin Moniang, born on **23rd March**, 960 A.D.

She was honored as MAZU in China

Rescue Survivors during Severe Weather

MAZU
Multi-hazard Alert
Zero-gap and Universal

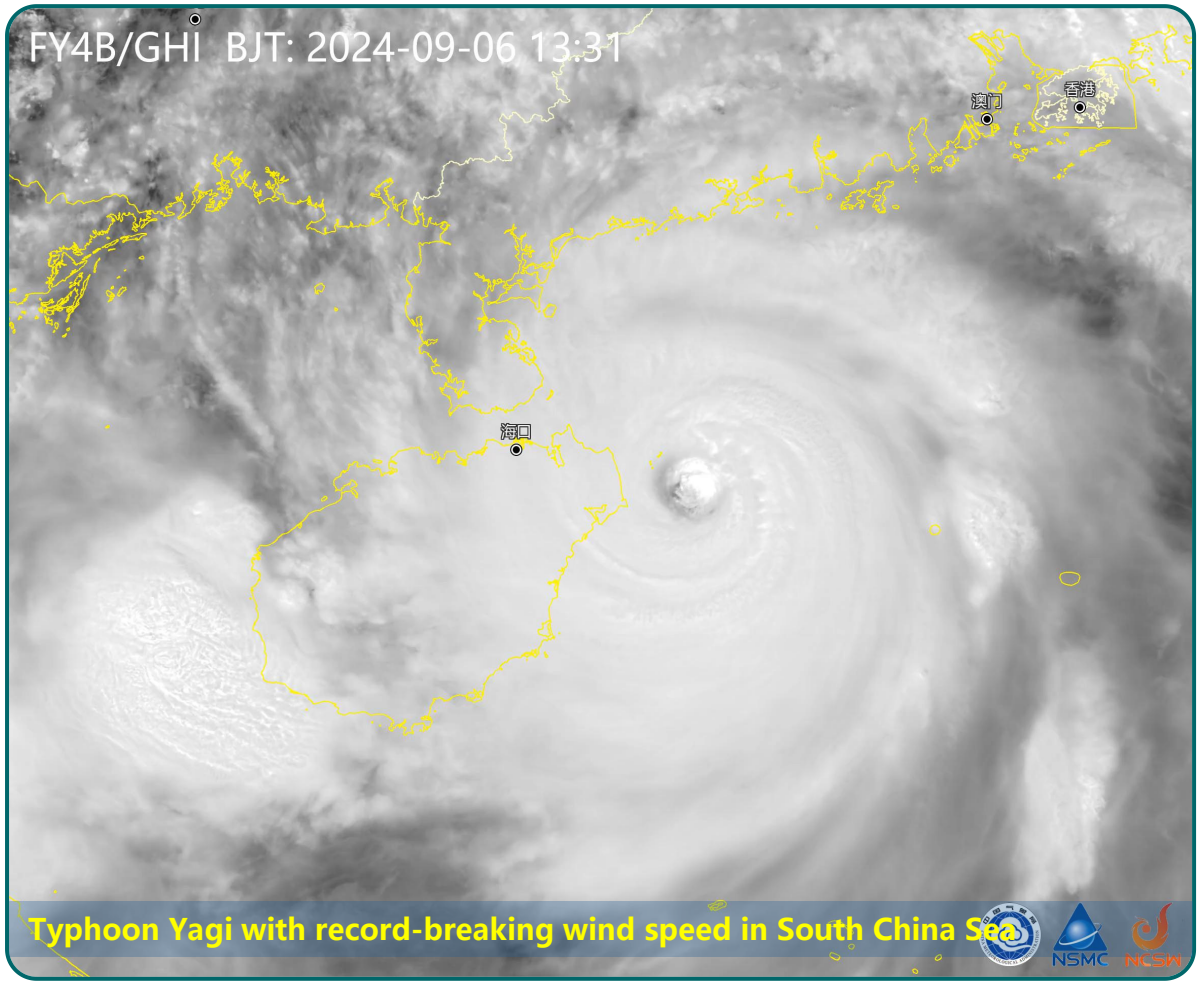
From Ancient Wisdom to Modern Technology

UNESCO

Intangible Cultural Heritage of Humanity for Safety and Peace

气候变化，极端天气肆虐
Climate Changes, Weather Rages

Record-breaking has become the new normal



Typhoon Yagi with record-breaking wind speed in South China Sea

Typhoon Bebinca
Strongest over 75 years in Shanghai

Flash Flood in northern China

Severe Drought in Southern China

Severe Flood in Pakistan

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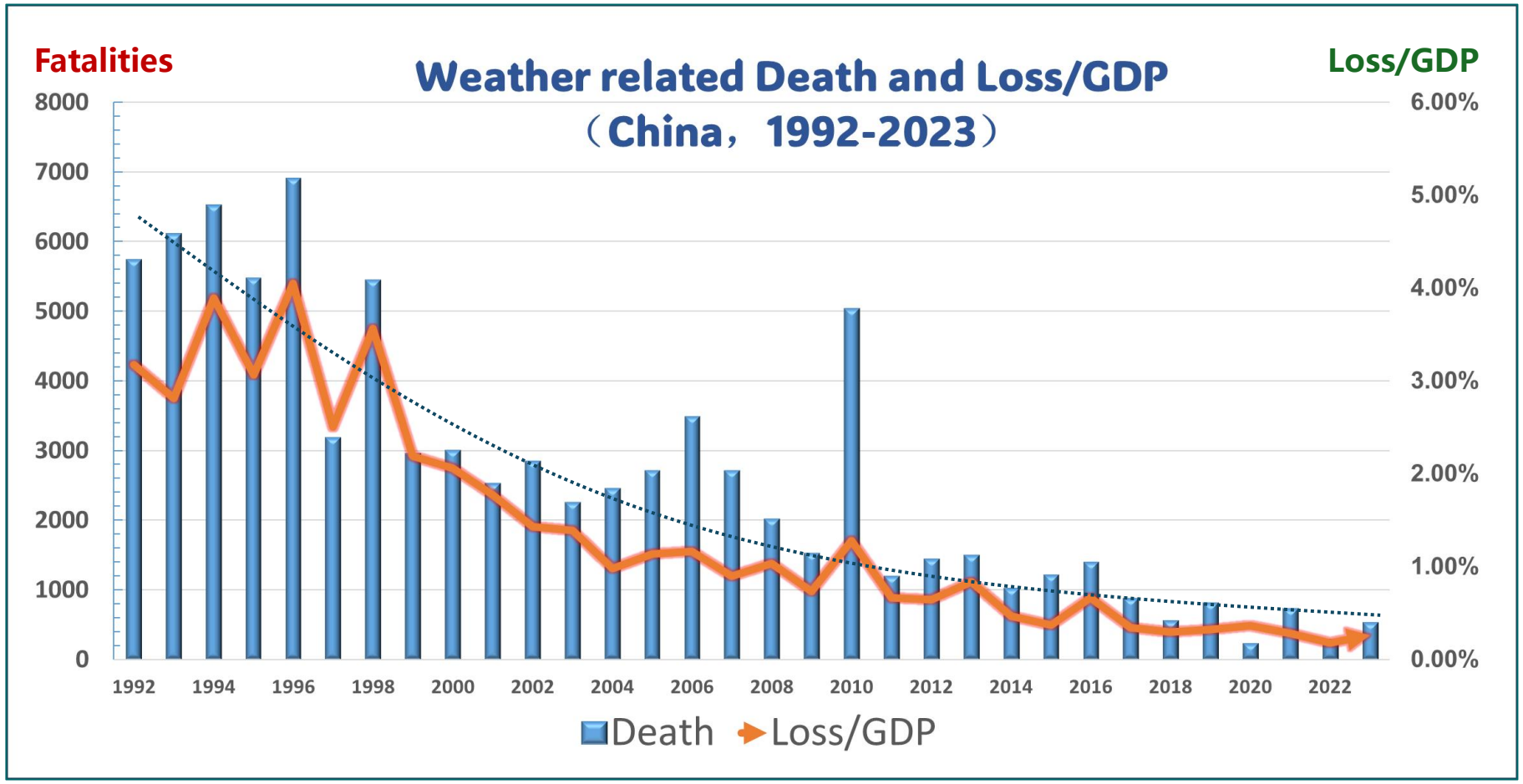
早期预警拯救生命
Early Warnings Save Lives

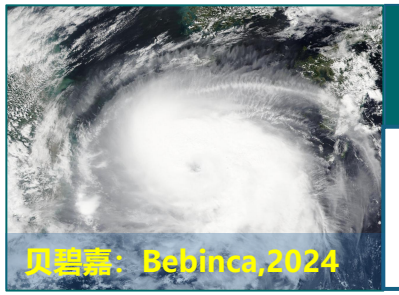
Early Warnings for All

MAZU Multi-hazard Alert Zero-gap and Universal

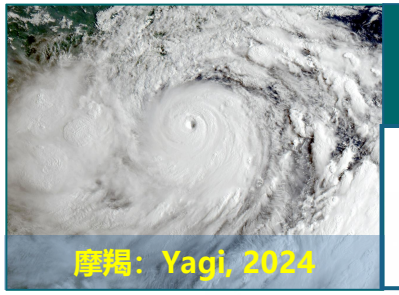
更精准的预警，更高效的协同，更小的损失
More Precise Warnings, More Effective Coordination, Smaller Losses



Fatalities
死亡人数
Zero
0



Fatalities
死亡人数
Zero
0



Fatalities
死亡人数
Four
4

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不让一人掉队，未来分秒必争！
No One Left Behind, No Time Wasted Ahead!

Early Warnings for All

MAZU Multi-hazard Alert Zero-gap and Universal

联合国全民早期预警倡议：WMO牵头行动

Early warning systems are effective measures against climate change, as extreme weather events are on the rise.

WMO leads the monitoring and early warning pillar. Moreover, it partly undertakes and supports the other three pillars, namely risk assessment, information dissemination, and emergency response.

Early Warnings for All

Everyone on Earth is protected by early warning systems by **2027**.

中国积极响应，提出三年行动计划

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China Meteorological Administration

AI全链赋能早期预警四大支柱

All-in AI Approach for the Four Pillars

Early Warnings for All

MAZU Multi-hazard Alert Zero-gap and Universal

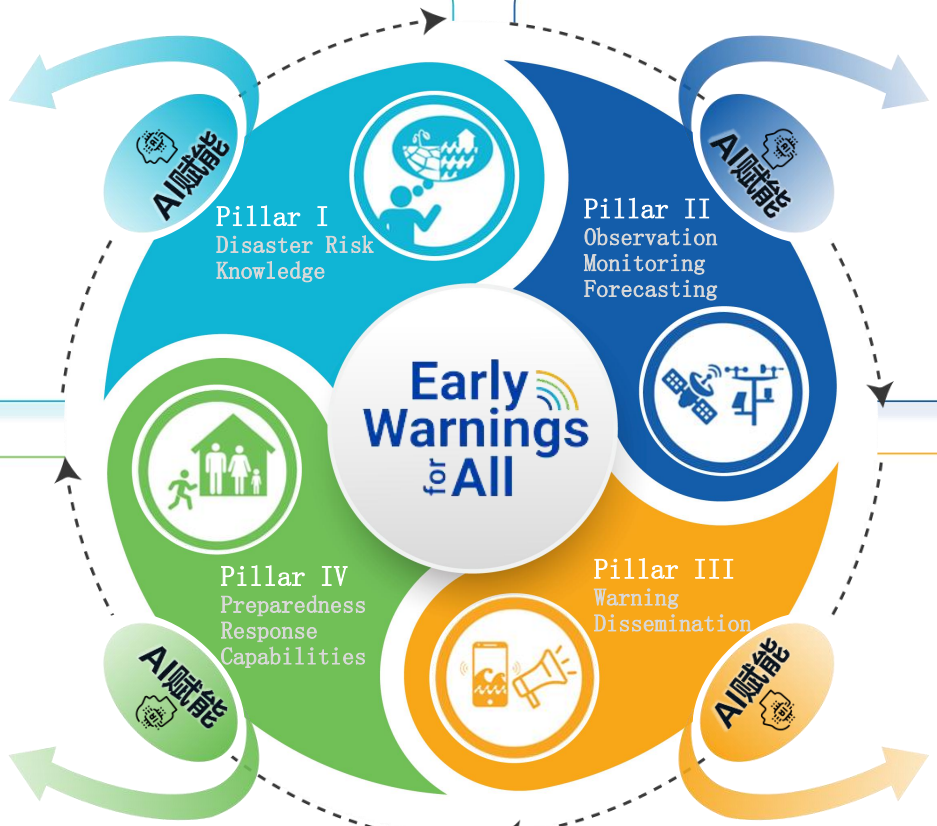
Power of AI : Acceleration; Connection; Exploration

智能底数

AI-integrated
Risk Knowledge
& Assessment

智能预警

AI-Powered
Monitoring &
Forecasting



智能联动

AI-Coordinated
Preparedness&
Response

智能触达

AI-automated
Targeted
Dissemination

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支柱1 智能底数：人工智能整合的风险知识与评估

Pillar I： Risk Knowledge & Assessment integrated by AI

Early Warnings for All

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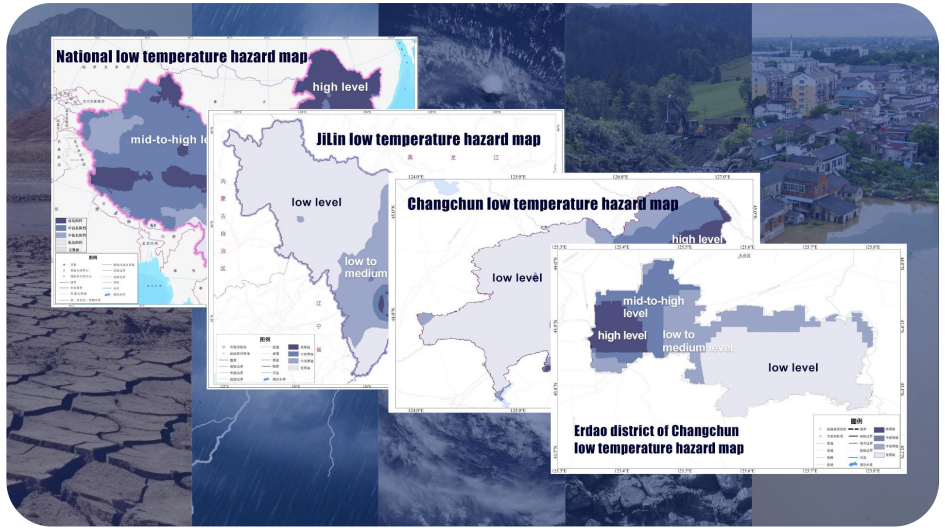
全国自然灾害风险综合普查
National Survey on Natural Disaster Risks



- Enhance understanding of historical disasters
- Create **digital hazard and risk mapping**
- Develop disaster assessment systems
- Enable impact-base forecast and risk warning

Why AI: Heterogeneous data fusion and Large Language Modeling

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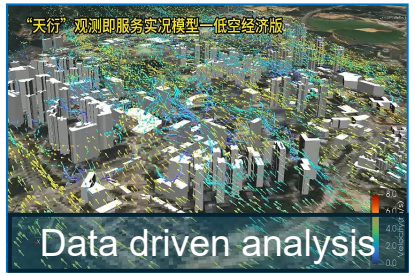
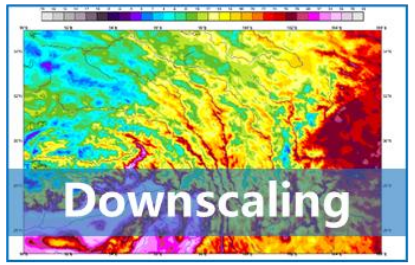
支柱2 智能预警：人工智能驱动的监测与预报

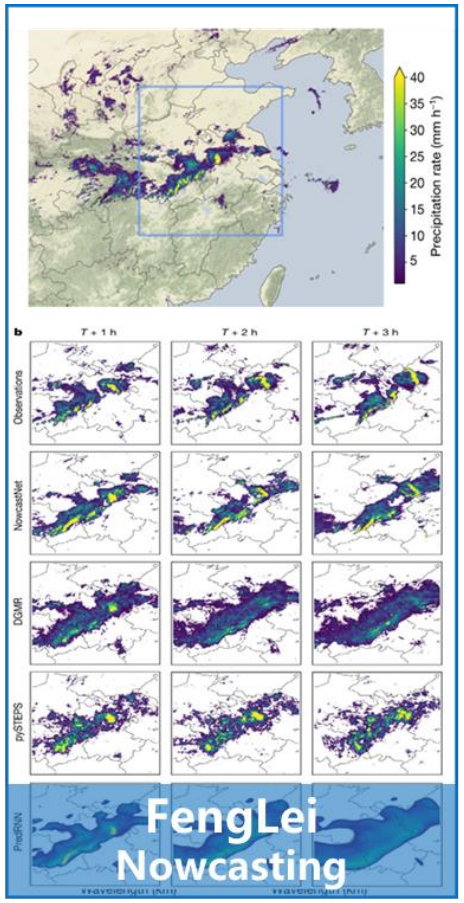
Pillar II：Monitoring & Forecasting Driven by AI

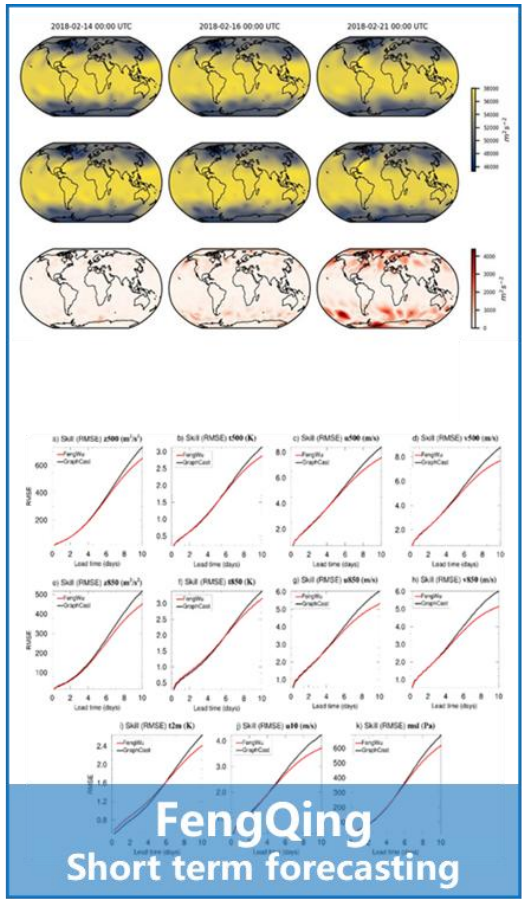
分钟到季节的无缝隙AI 预报体系：Seamless Integration from **minutes to seasons**

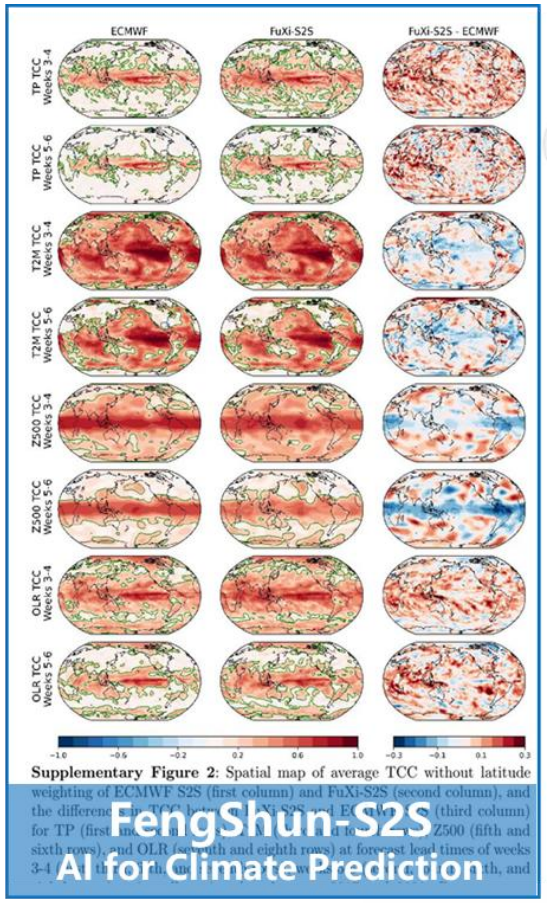
Now → Minutes → Hours → Days → Weeks → Months → Seasons











Why AI: Deep learning and temporal pattern recognition for predictive modeling

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支柱三 智能触达：人工智能自动化的靶向传播

Pillar III： Targeted Dissemination Automated by AI

Early Warnings for All

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Call response

Big data platform

Radio and TV

Broadcasting

Beidou

E-mail

Screens

0.49 million loud speakers

Social media

WeCom

WeChat official account

Weibo

SMS

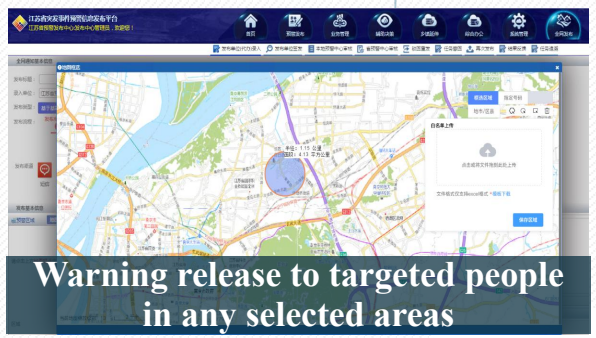
FENG HE： LLM based AI for Met-service

Precise

Targeted

Thermal identification of crowds to achieve accurate coverage

Electronic fence is applied to realize accurate circle drawing



Warning release to targeted people in any selected areas

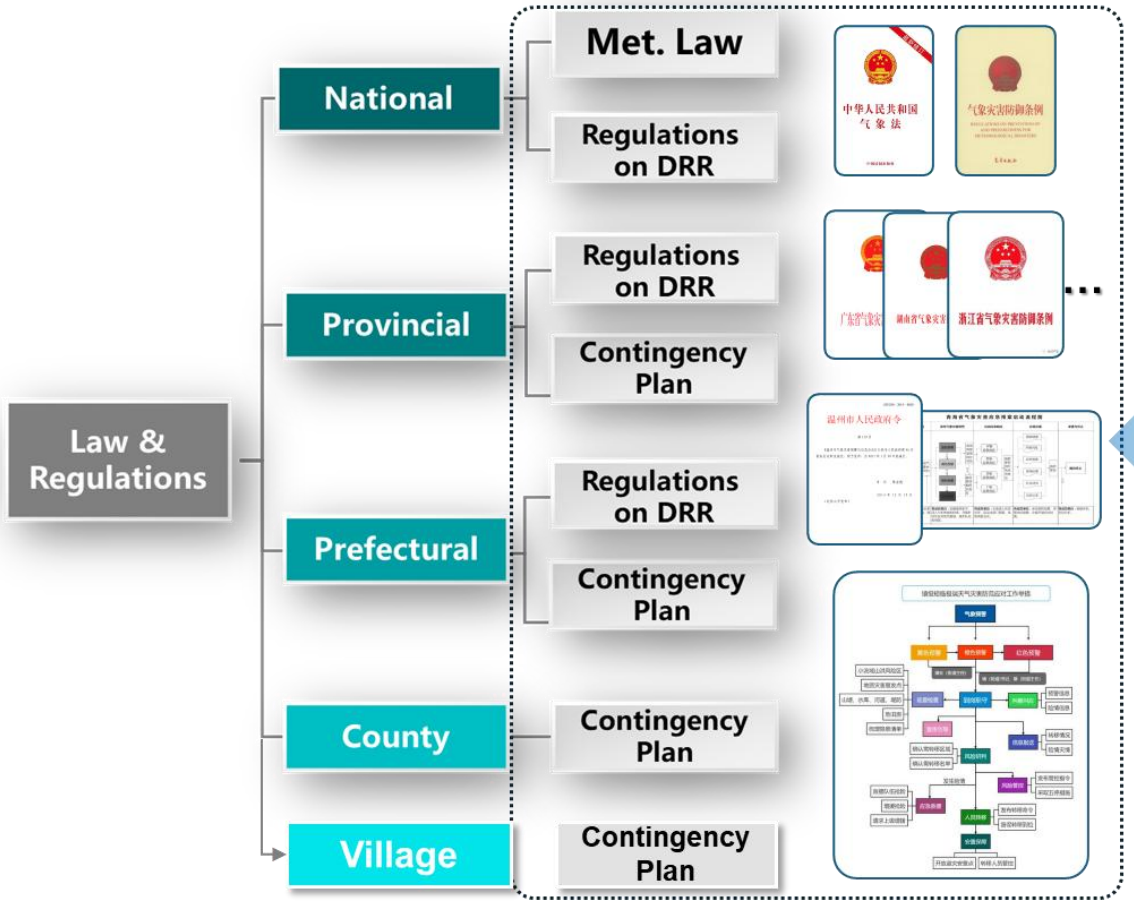
Why AI: Pattern Recognition, Risk Profiling & AIGC

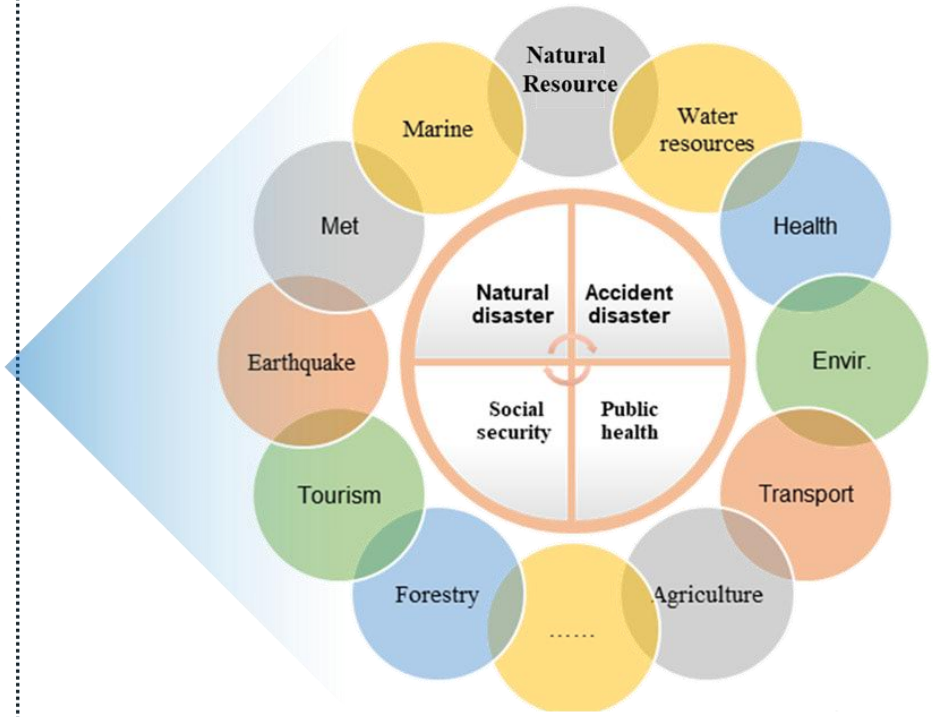
支柱4 智能联动：人工智能协同的备灾与响应

Pillar IV：Preparedness & response Coordinated by AI

法规条例：早期预警触发即时行动

Law & Regulation: Early warnings trigger immediate action





Why AI: regulatory knowledge mapping and rule-based logical inference

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中国方案：软措施，硬科技！

China’s Solution : Soft Methodology, Hard Technology!

Early Warnings for All

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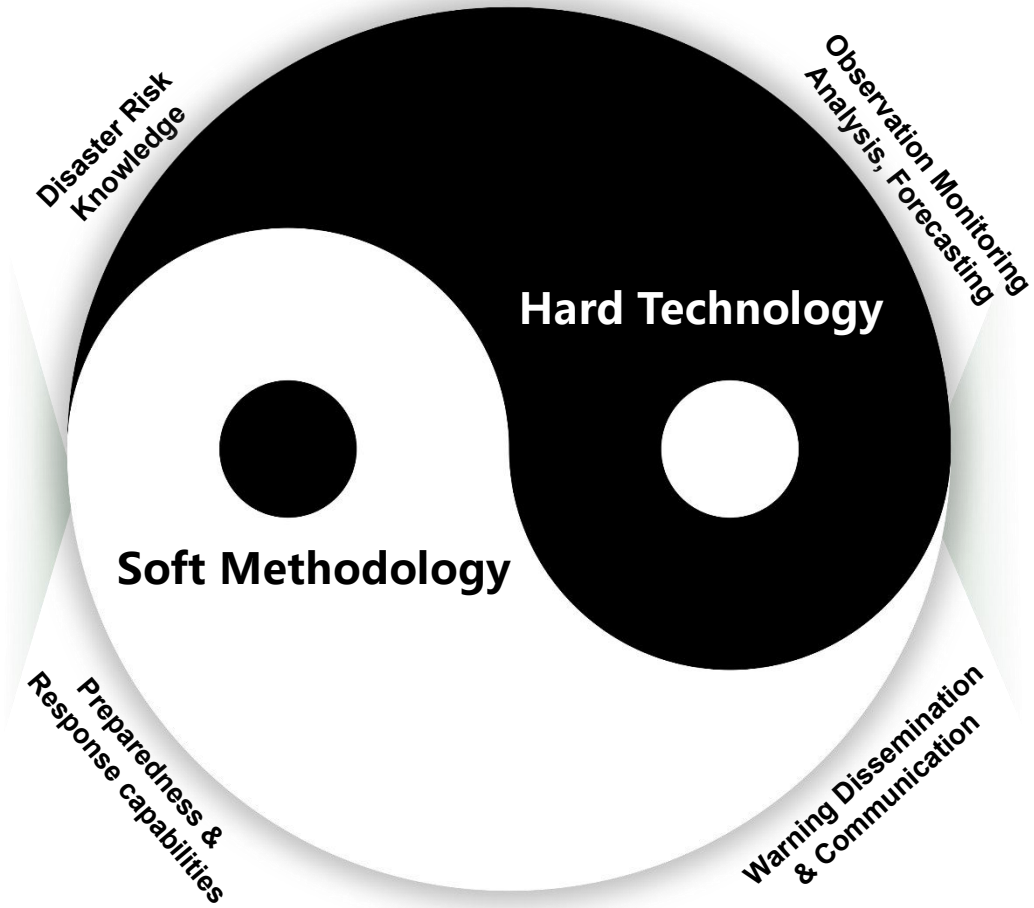
Pillar I,IV

EW4All Chinese practice

- Led by Government
- Warning go first
- People First
- Inter-dept coordination
- Societal Engagement



Pillar II,III

Early Warning System

Open Platform + Customized Toolbox

Knowledge-driven Model:
Reasoning & synthesis

Data-driven model :
Computing & prediction

Mutual Support

软措施：内化于大语言模型，亦诉诸于文字

Methodology: Encoded in LLM and documented in textbooks

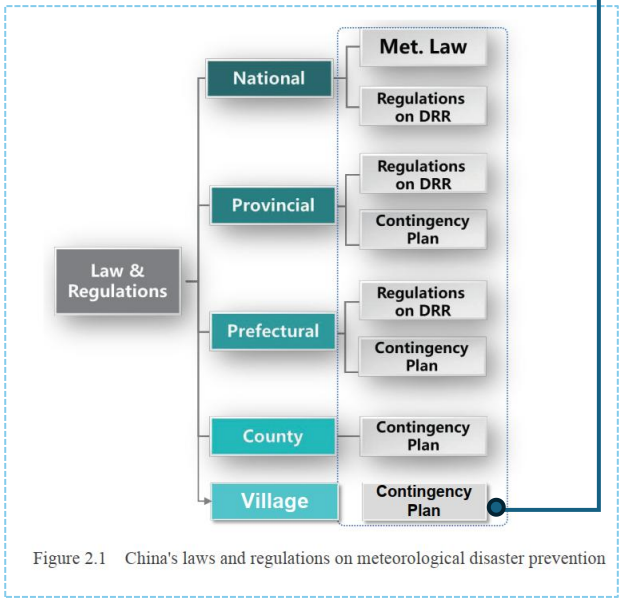


Figure 2.1 China's laws and regulations on meteorological disaster prevention

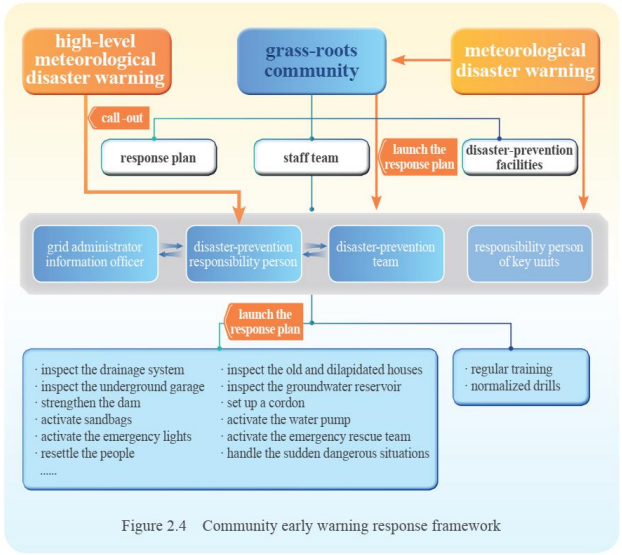
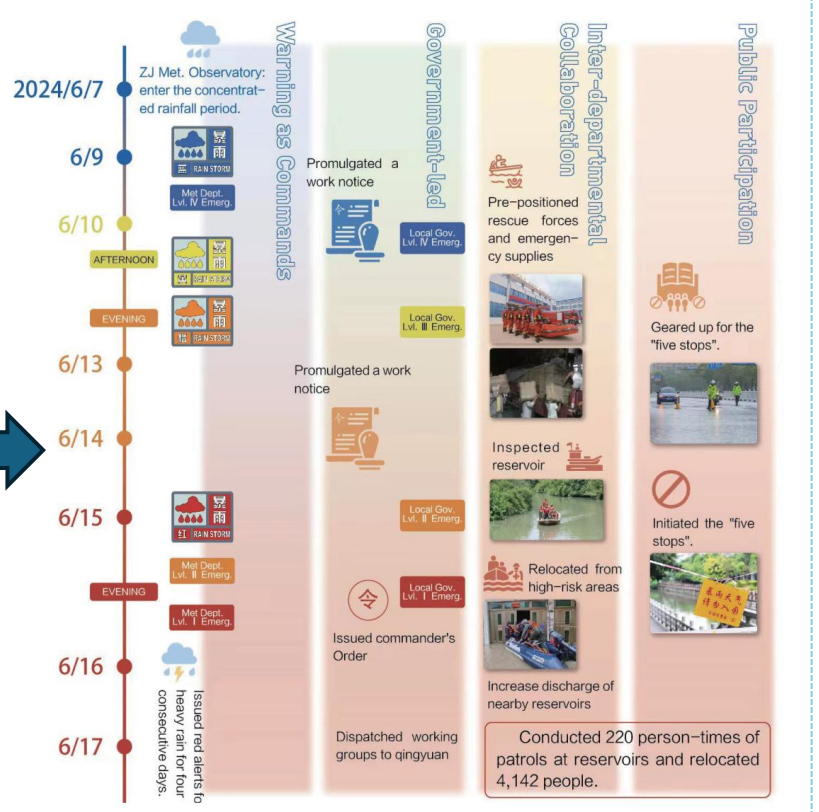


Figure 2.4 Community early warning response framework

China's working mechanism guided by early warning has withstood the test of multiple major natural disasters and successfully supported the enhancement of the country's disaster reduction capacity. Compared with the traditional "during and post-disaster response" model, this mechanism shifts the focus of disaster prevention to the front end. Through multi-level cross-department responses triggered by early warnings, it has achieved a transformation of the disaster prevention, reduction, and relief system from a passive to an active mode, significantly improving the efficiency of disaster response.

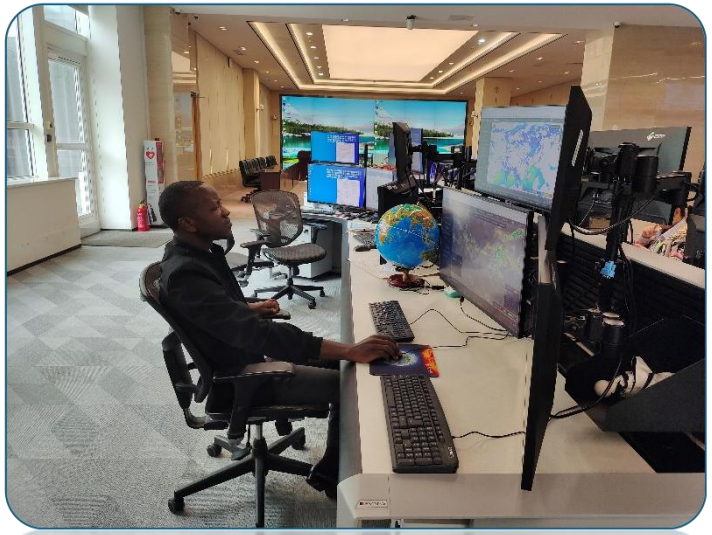


Appendix Figure 4.2 Flowchart of progressive early warning services for effectively responding to the strongest rainstorm during the plum rain season in 2024 in Qingyuan, Zhejiang province

软措施：能力建设与人才培养

Methodology: Capacity Building

Visting scholar from Cameron



50 long-term visiting scholars

Short-term Training Courses

2000 short-term training

Degree Scholarship

100 degree scholarships

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China Meteorological Administration

硬科技：云端早期预警系统

Early Warnings for All

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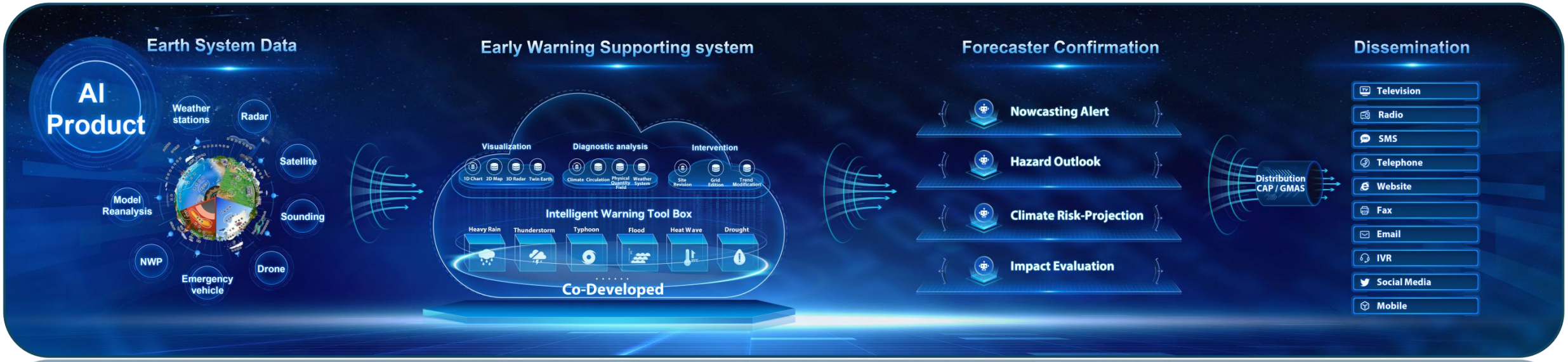
Technology: Cloud based Early Warning Systems

云端化、可配置、共研发、定制化，确保有效落地

Cloud-based, Configurable, Co-develop, Customized for effective implementation



云端化：最大限度提升可及性，弥合差距

Cloud-based： Maximizes the Accessibility, Bridges Gaps

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可配置：快速适配多样化需求

Configurable: Instant Adaptation to diverse Needs

Early Warnings for All

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Toolbox

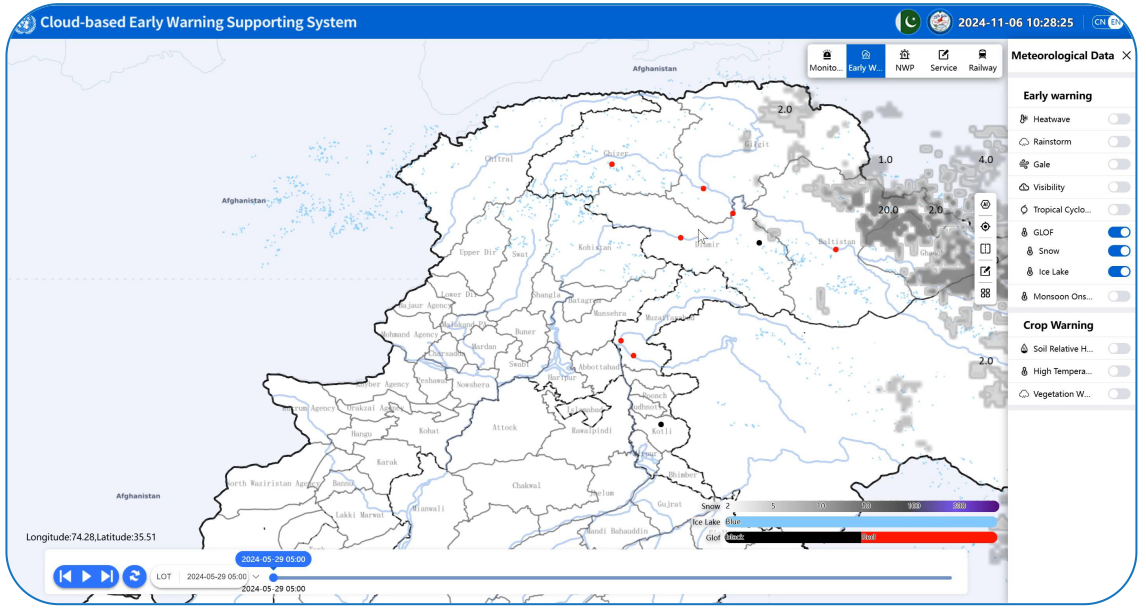
AI-based Customized Early Warning Toolbox

Country-Tailored Solutions

Coastal country

Country-Tailored Early Warning Toolbox

Plug-and-Play toolboxes enable diverse systems



Pakistan Meteorological Department (PMD) contributes to the **Glacier Lake Outburst Flooding** Early Warning toolbox.

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China Meteorological Administration

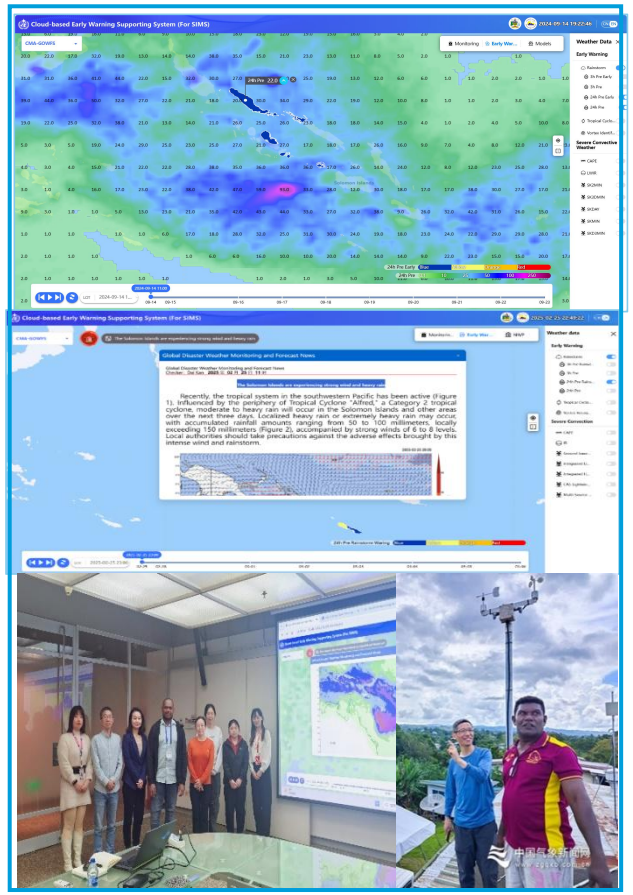
与合作伙伴共同研发、量身定制

Co-develop and Customize for our partners

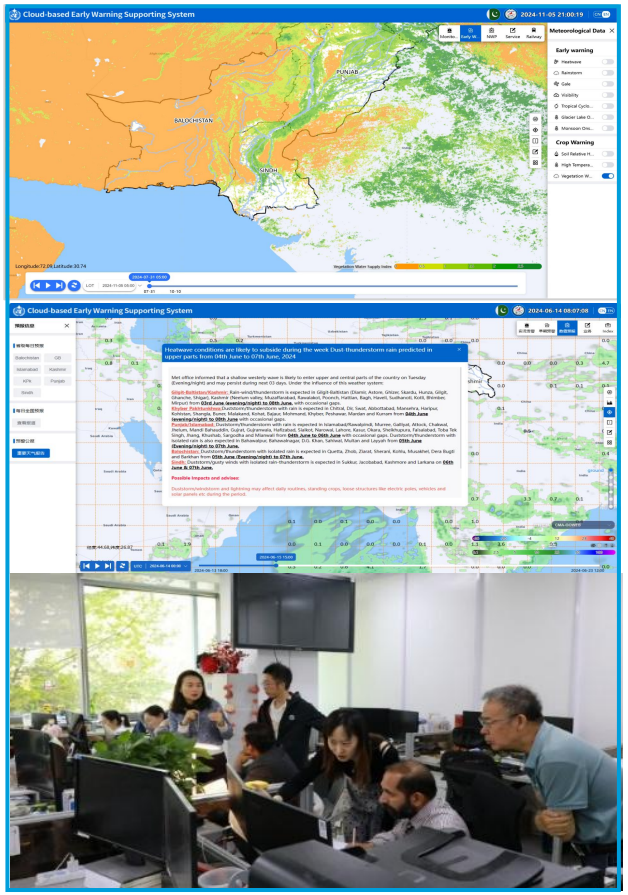
Early Warnings for All

MAZU Multi-hazard Alert Zero-gap and Universal

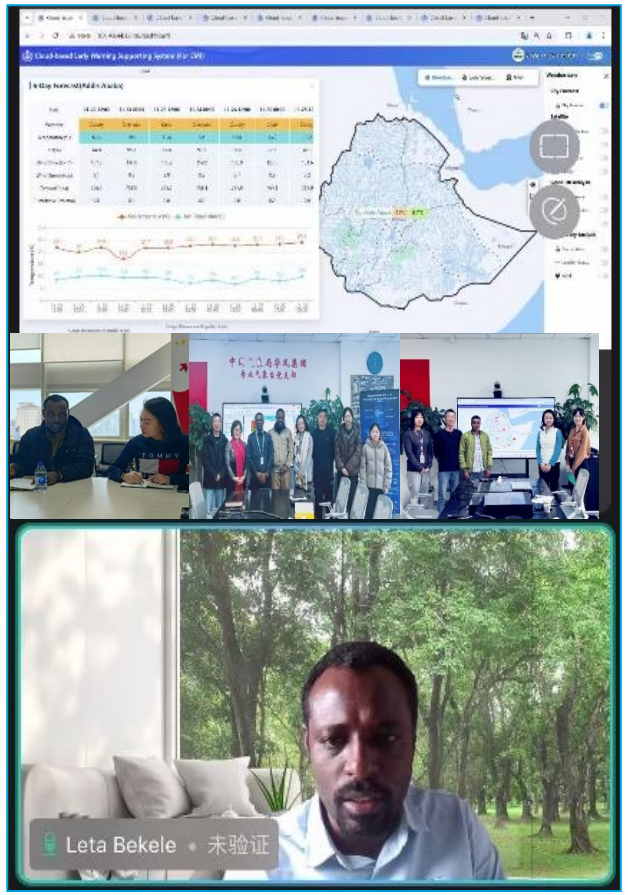
线上线下，携手共解难题！- **Online or On-site**，we work together to solve the problems!



Solomon Islands



Pakistan



Ethiopia

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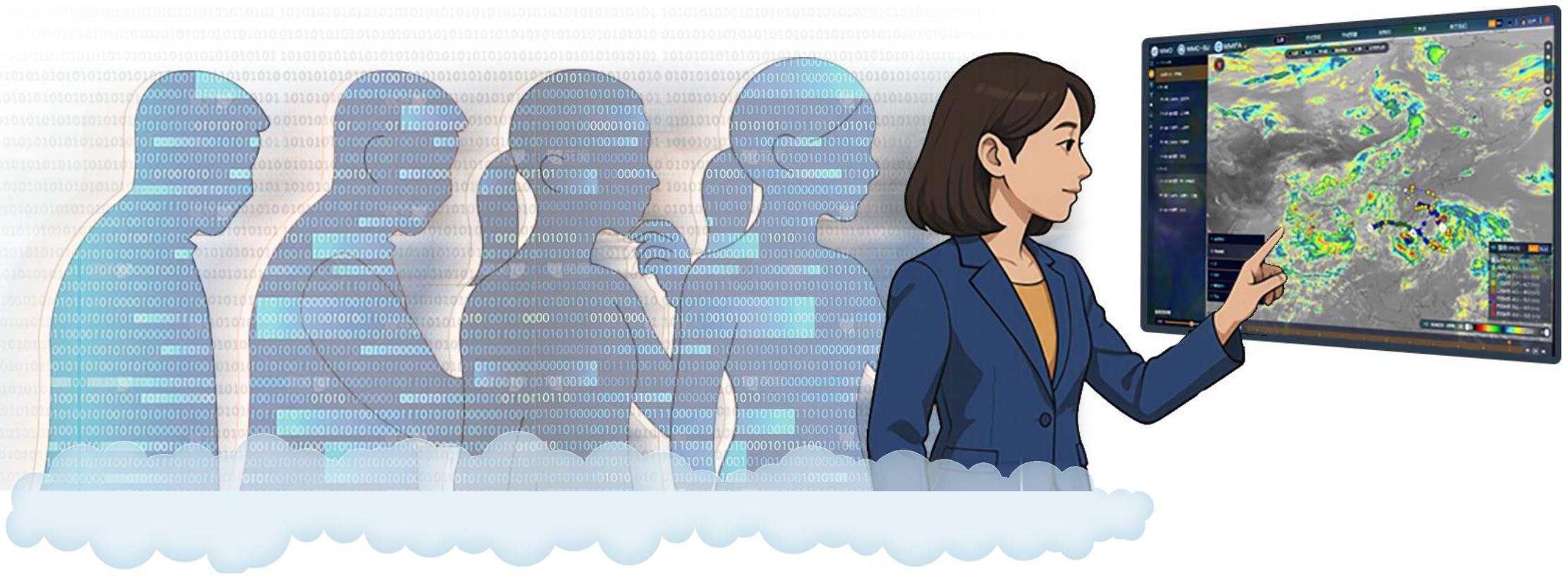
Digital Meteorologist：气象学家数字分身

Early Warnings for All

MAZU
Multi-hazard Alert
Zero-gap and Universal



智能体
Agent

- 跨界知识（Interdisciplinary）
- 不知疲倦（Tireless）
- 敏捷响应（Quick-response）
- 自我提高（Self-evolving）

- MAZU-Standard
- MAZU-Urban
- MAZU-Agriculture
- MAZU-Region-A
- MAZU-Region-B

谢谢！

Thank You!

妈祖

全民早期预警联合行动
共建早期预警全球网络

MAZU

Joint Action for UN Early Warnings for All
Part of Early Warnings Global Network

MAZU
Multi-hazard Alert
Zero-gap and Universal

谢谢！

Thank You!

妈祖

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