Development of an integrated on-demand observing system

Seiichiro KIGAWA
Japan Meteorological Agency

Integrated on-demand Japanese boxed lunch …
Bento!

3

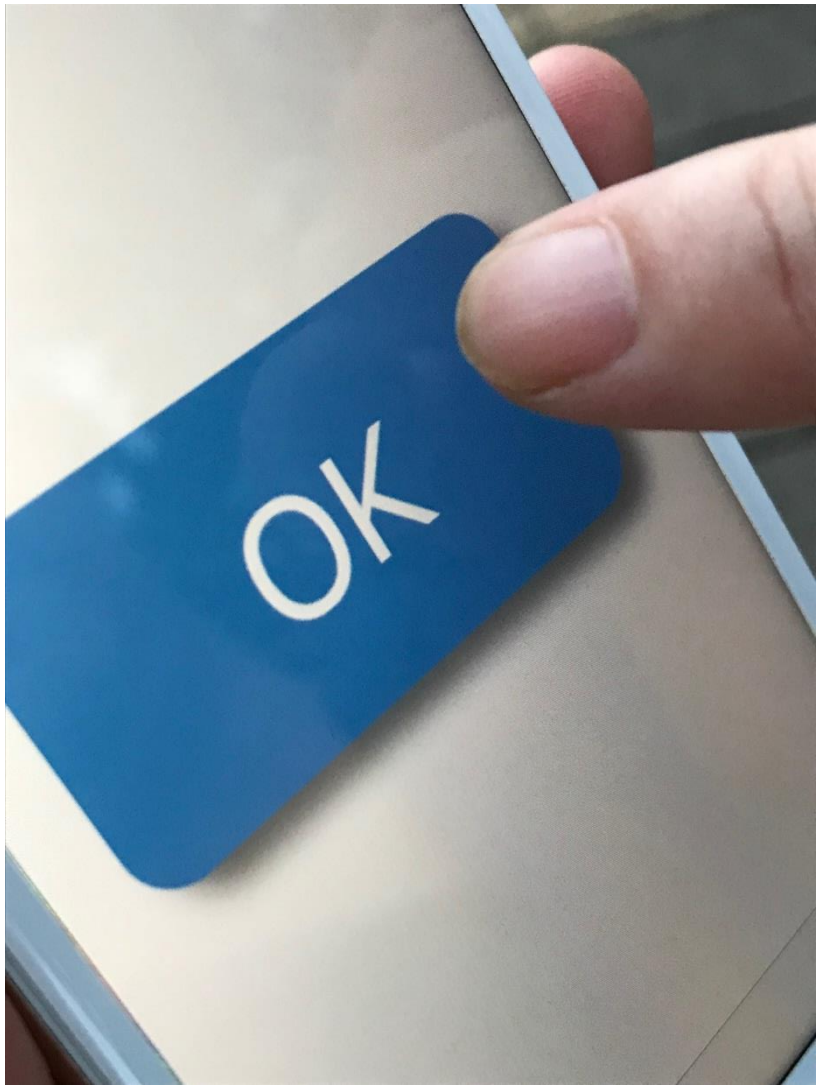
The ease with which photographs can be taken and shared today is owed to developments in the field of information communication technology.

4 Such advances have also produced an unprecedented variety of meteorological observation tools.

5

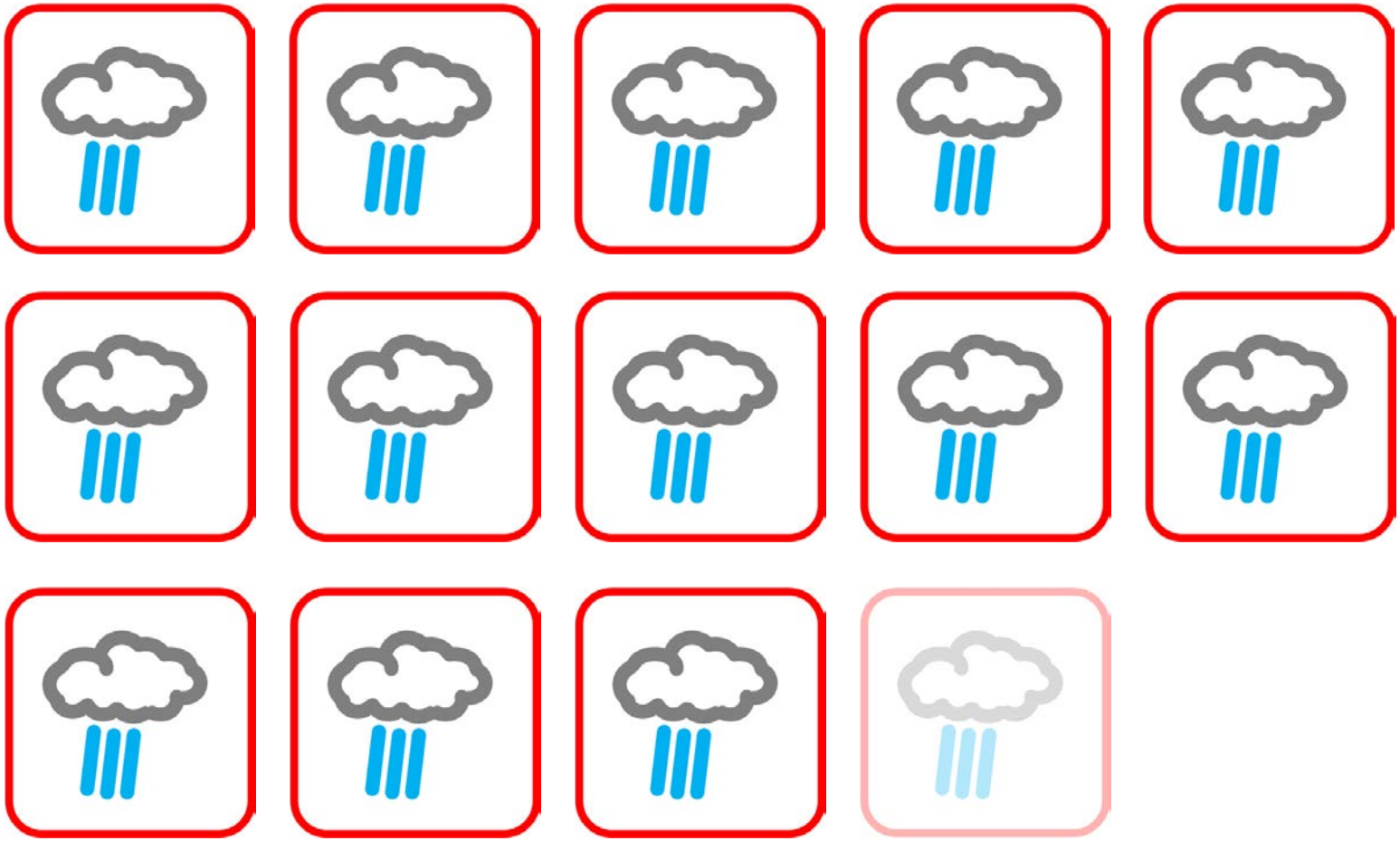
Against such a background, data from extensive surface observations conducted by national meteorological services and other organizations …

using various networks are expected to be available at increasingly lower cost in the future.

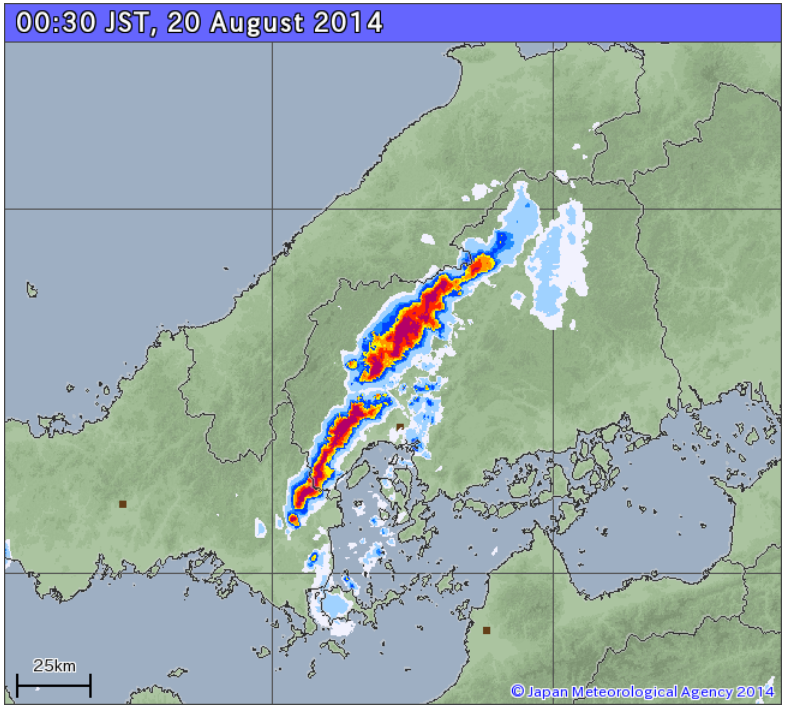


The provision of meteorological information may become a necessity as an incentive to such data collection via networks.

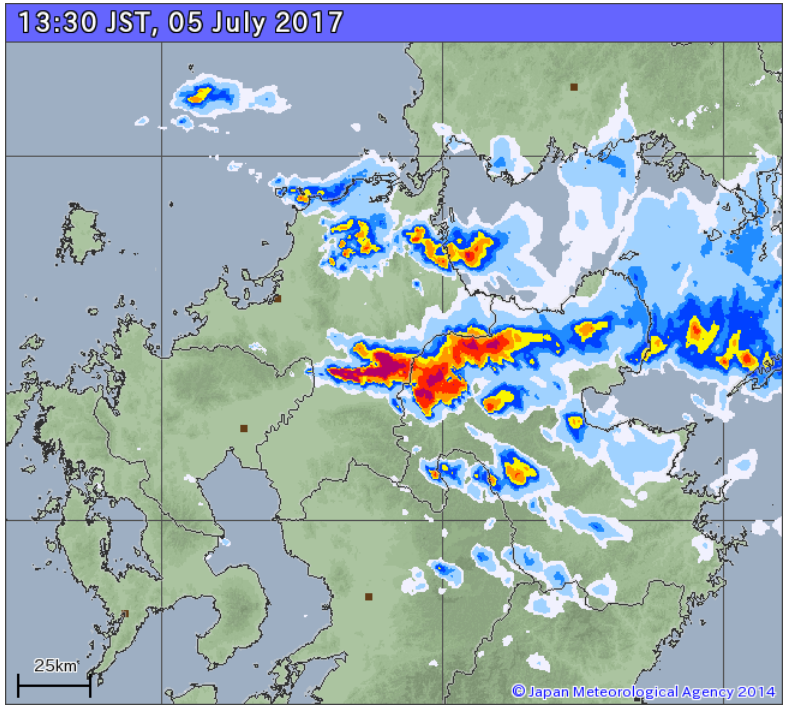
Although new approaches may be required for quality control of these data, the ability to collect such vast amounts of information offers great promise for future development.



The high frequency of torrential rain events in Japan gives rise to a need for focus on disaster prevention.



In 2014, 77 people died as a result of localized heavy rain in Hiroshima.



In Fukuoka, even a 2017 daytime heavy rain event on a weekday resulted in more than 40 fatalities and washed away numerous houses.

11-day Rainfall [mm]

(28 June - 08 July)

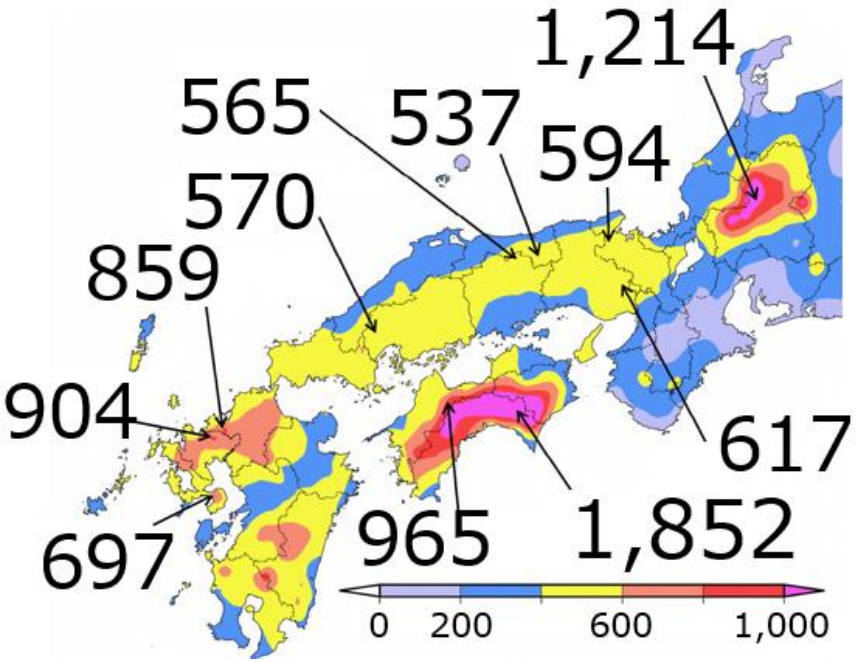


Photo: http://www.mlit.go.jp/river/bousai/pch-tec/pdf/H3007_TEC-FORCE_ph_180710.pdf

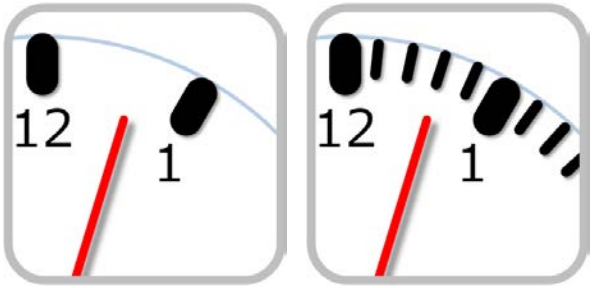
In 2018, over 220 people died due to the extensive effects of heavy rain in western Japan.

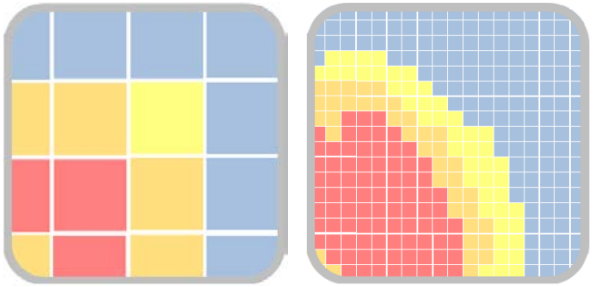
In this way, localized intensification of weather-related disasters has become prominent in the country.

Improve (*Kaizen*)

Against this background, JMA works to support the monitoring of localized characteristics of extreme events and to improve the provision of related information.

High-frequency & High-resolution

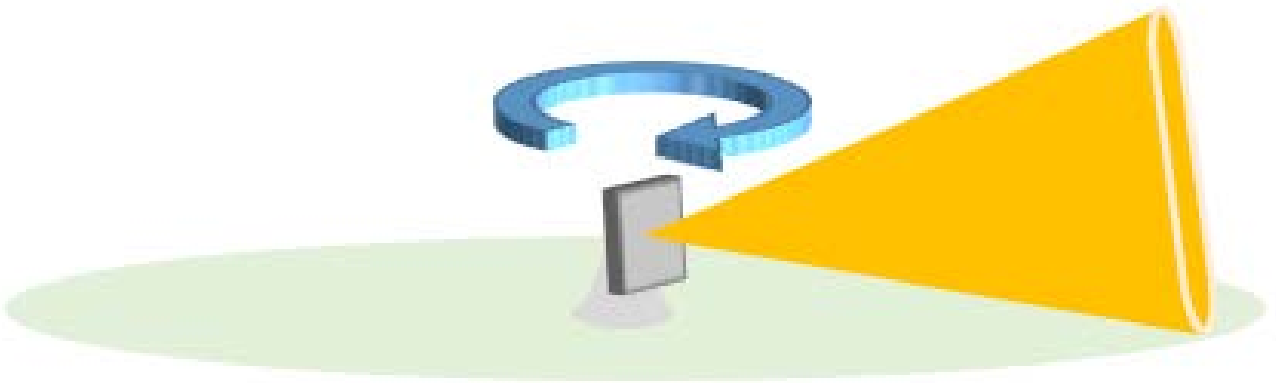




→ **Improve (*Kaizen*)**

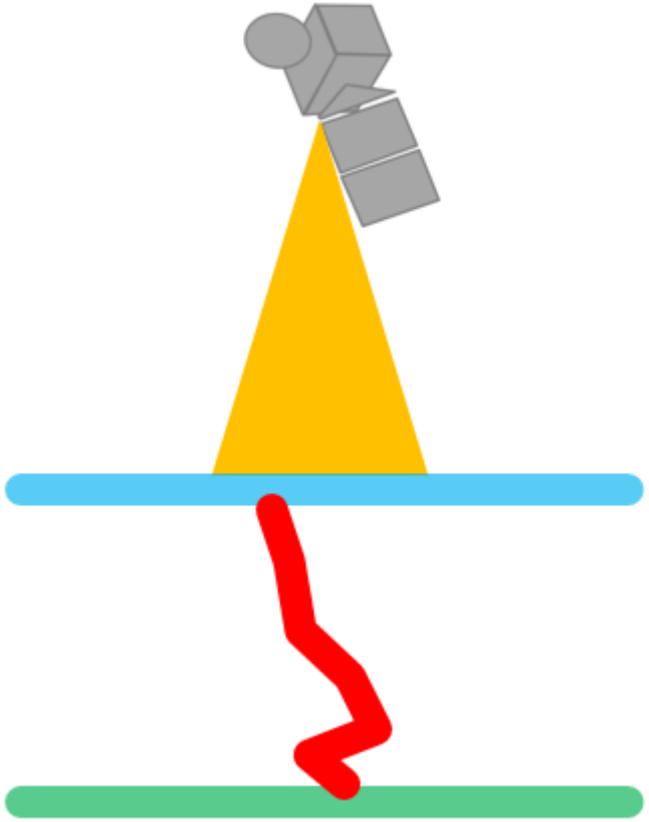
Future plans involve focus on high-frequency, high-resolution three-dimensional monitoring using advanced equipment …

High-frequency & High-resolution



such as phased-array radar and …

High-frequency & High-resolution



hyperspectral sounders for improved monitoring and prediction.

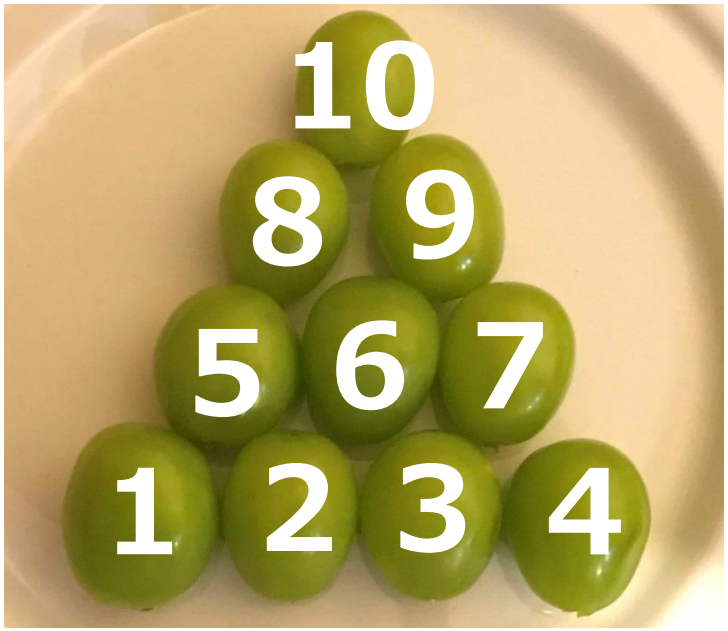
High-frequency & High-resolution

→ **Challenge**

When surface or sky observations areas are expanded, thereby intensifying spatial density, a new challenge emerges, …

High-frequency & High-resolution

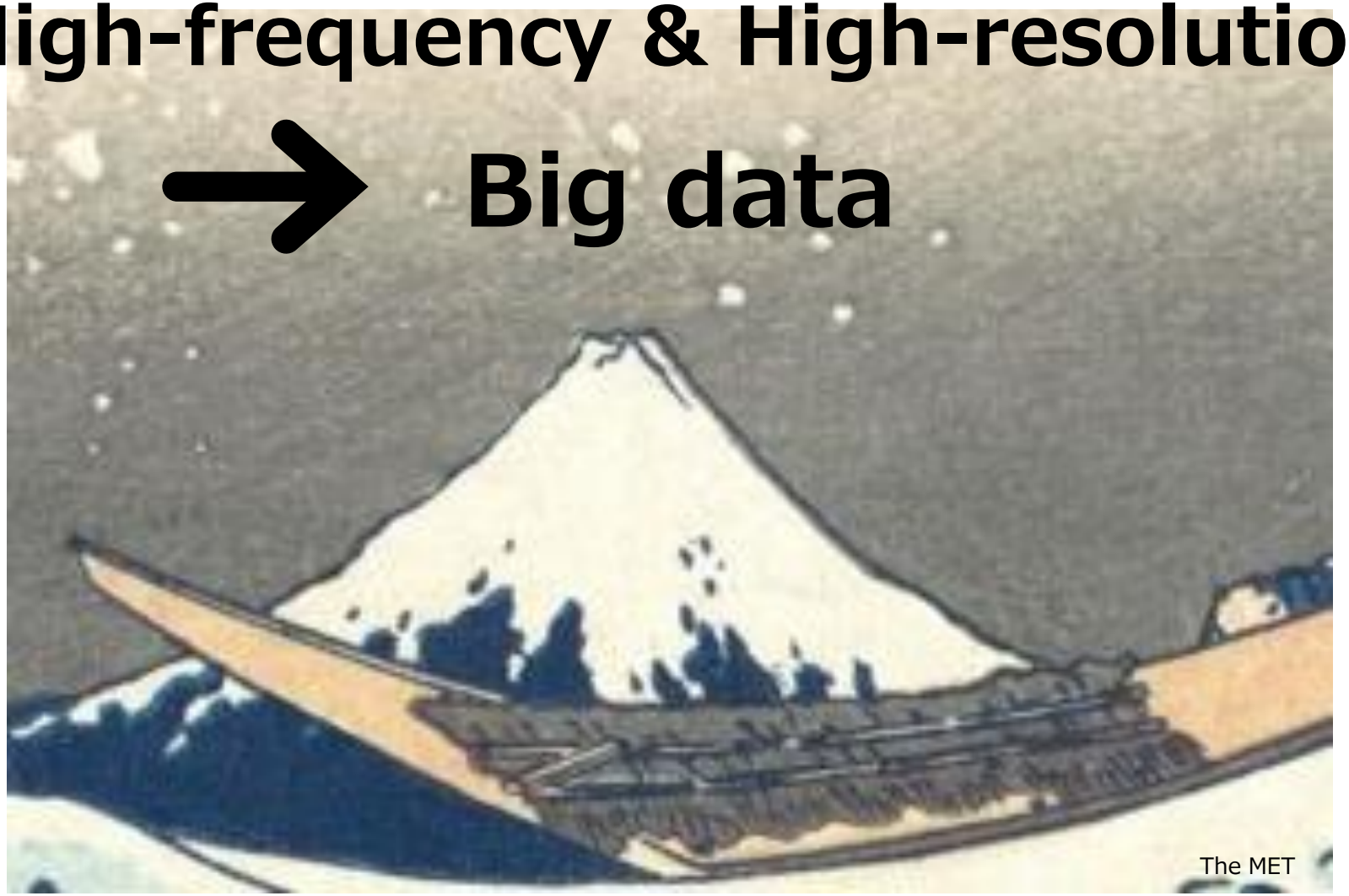
→ **Big data**



because massive data may be generated, adding at least one order of magnitude to the amount of observation data currently collected.

High-frequency & High-resolution

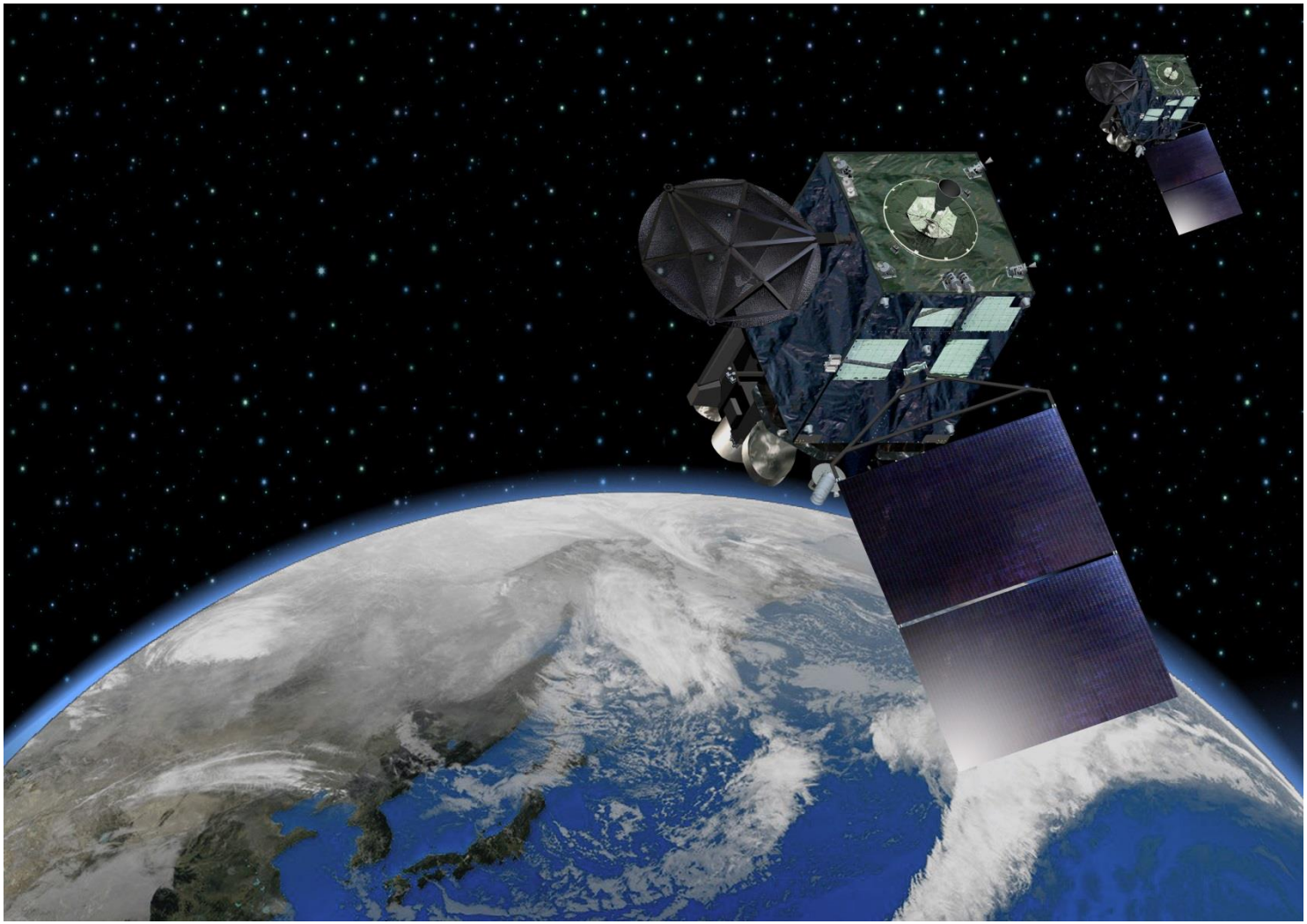
→ Big data



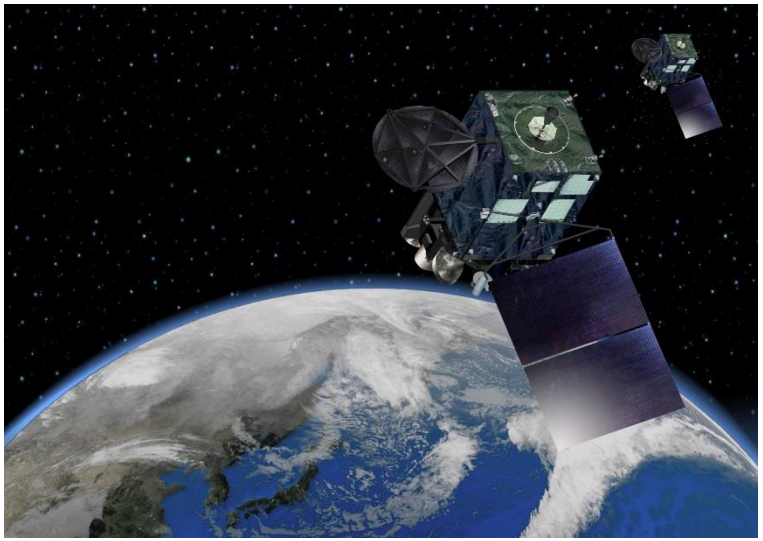
Furthermore, the body of meteorological big data produced by surface and remote-sensing observation continues to grow quickly, …

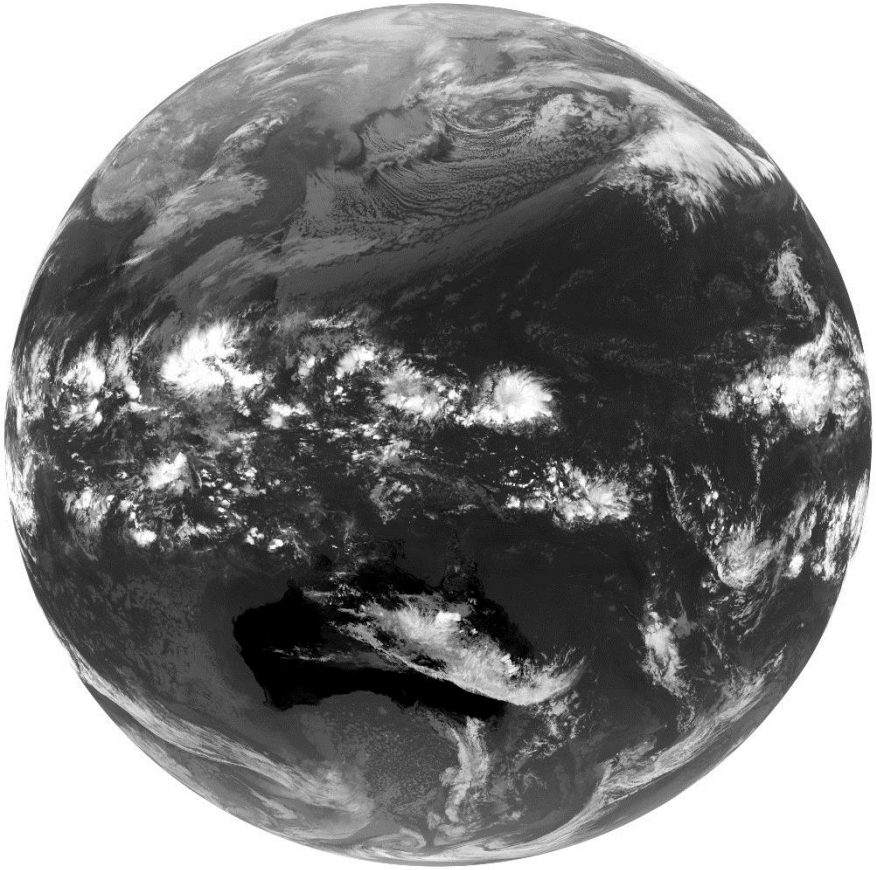
thus, the development of a cost-effective system to accommodate the resulting high volume of information is a current challenge.

To address this challenge, JMA works to enhance radar and satellite observation via methods enabling the acquisition of detailed observation data with focus on specific regions.



The first such initiative is the HimawariRequest service introduced in early 2018.

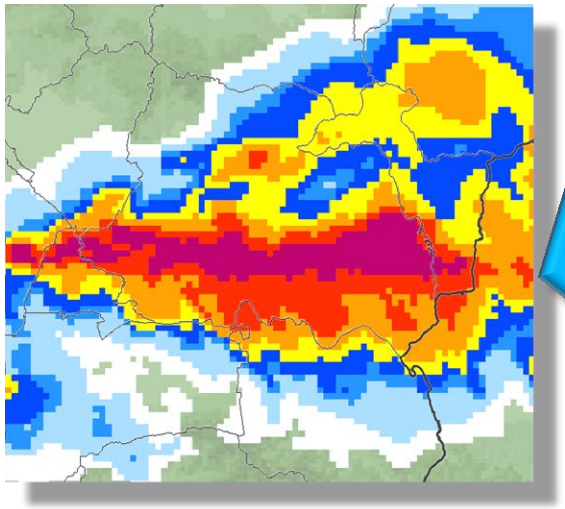


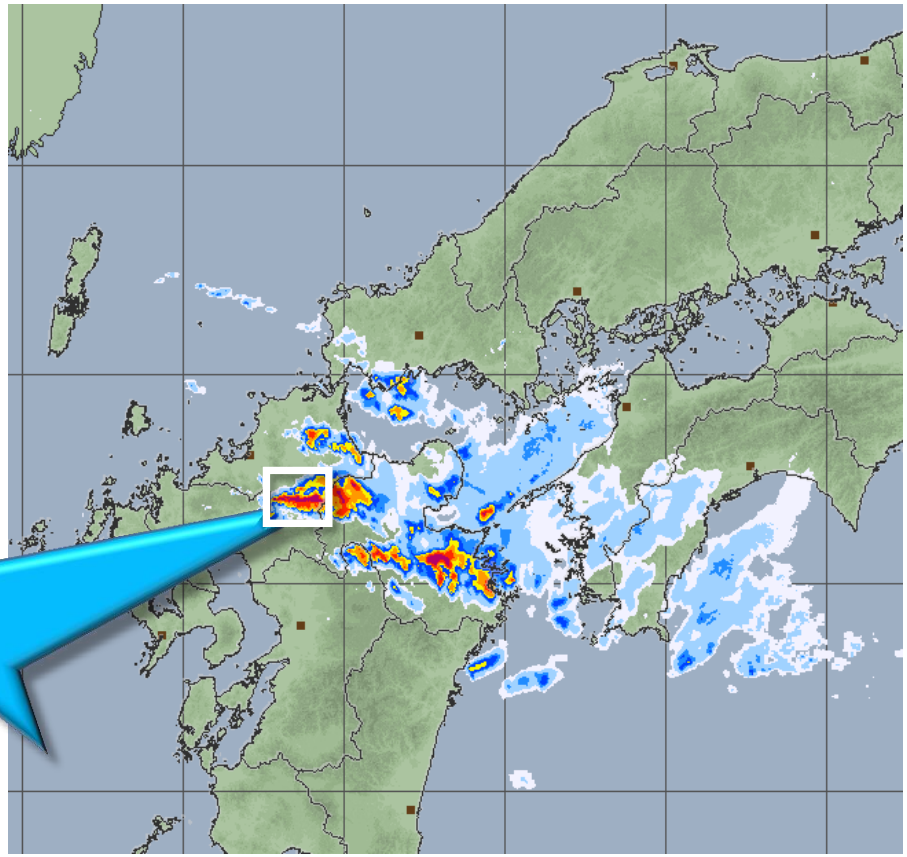


Under this initiative, Himawari-8/9 is the world's first geostationary meteorological satellite to provide high-resolution full-disk images …

On-demand observing system

and rapidly updated regional images simultaneously based on requests from users in Asia/Pacific regions.





JMA is also in the process of upgrading its operational radars to enable high-resolution observation of certain regions …

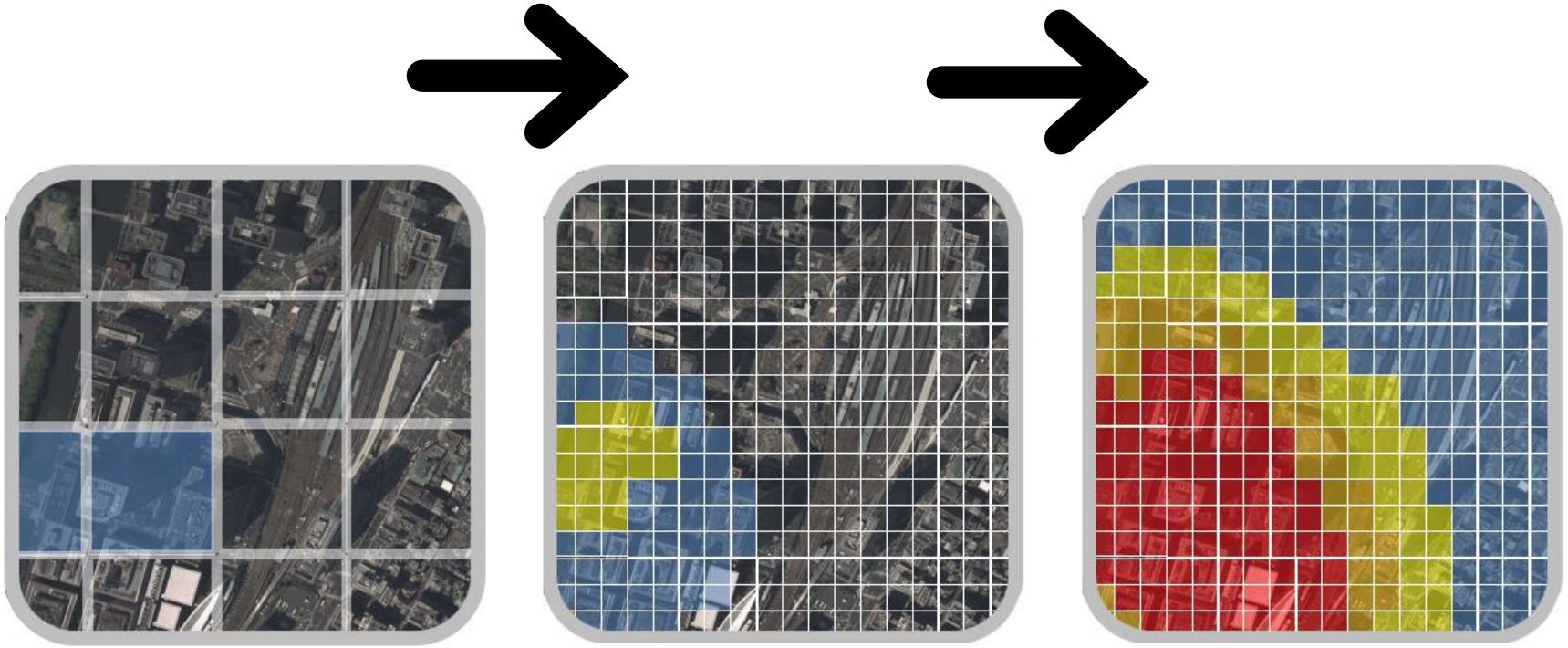
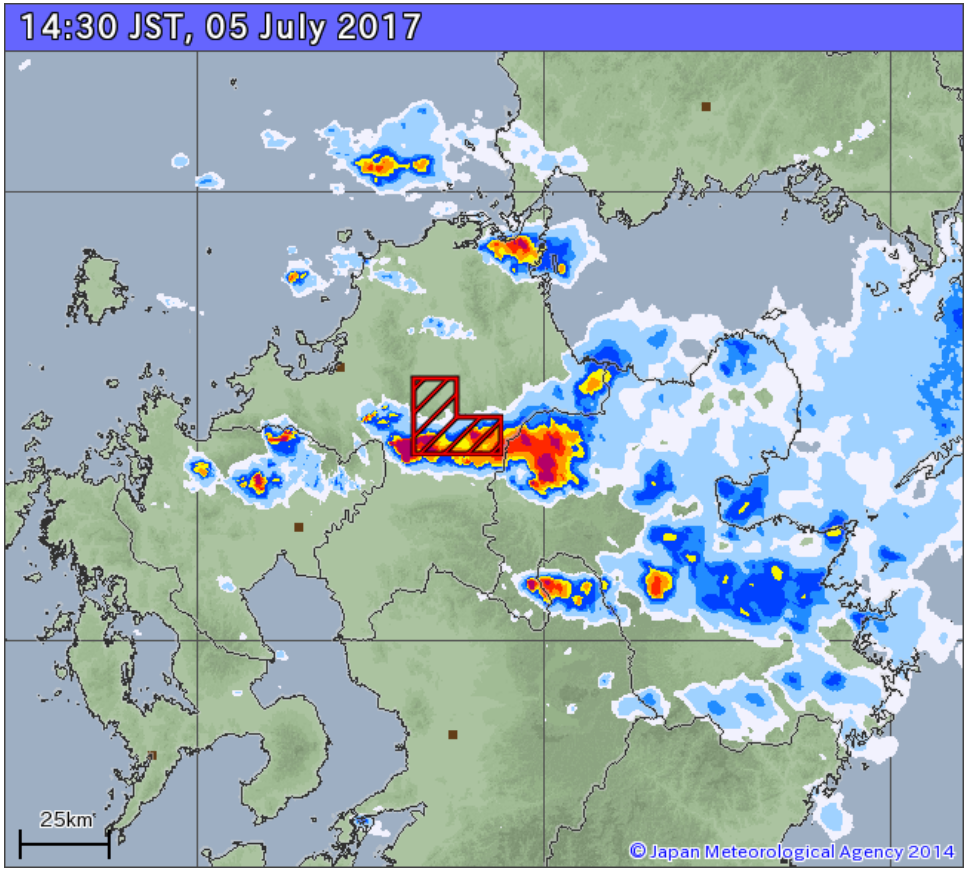


Photo: Geospatial Information Authority of Japan

and provide analysis data with a spatial resolution of 50 m around the radar site.

On-demand
observing system

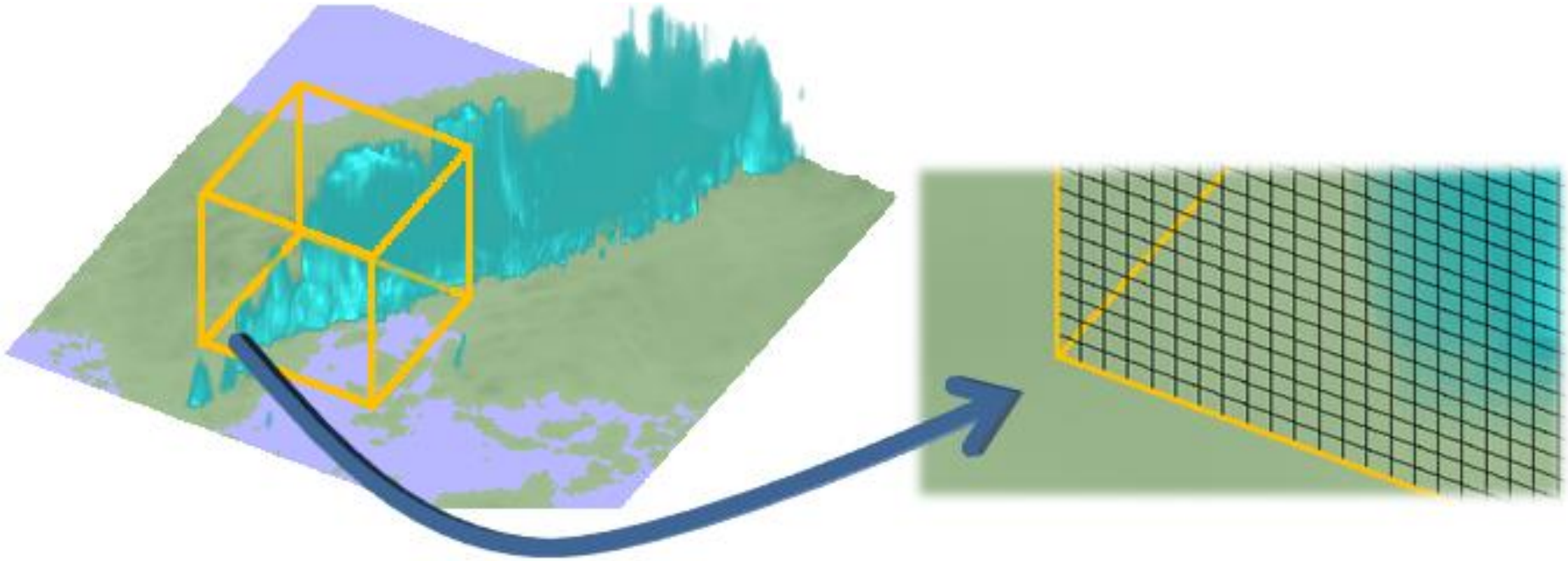


Once the upgrade is complete, synchronized radars in the relevant area will enable more flexible observation.

Technological development is also expected to support on-demand surface observation. In situations where mobile phones are used to provide observation data …

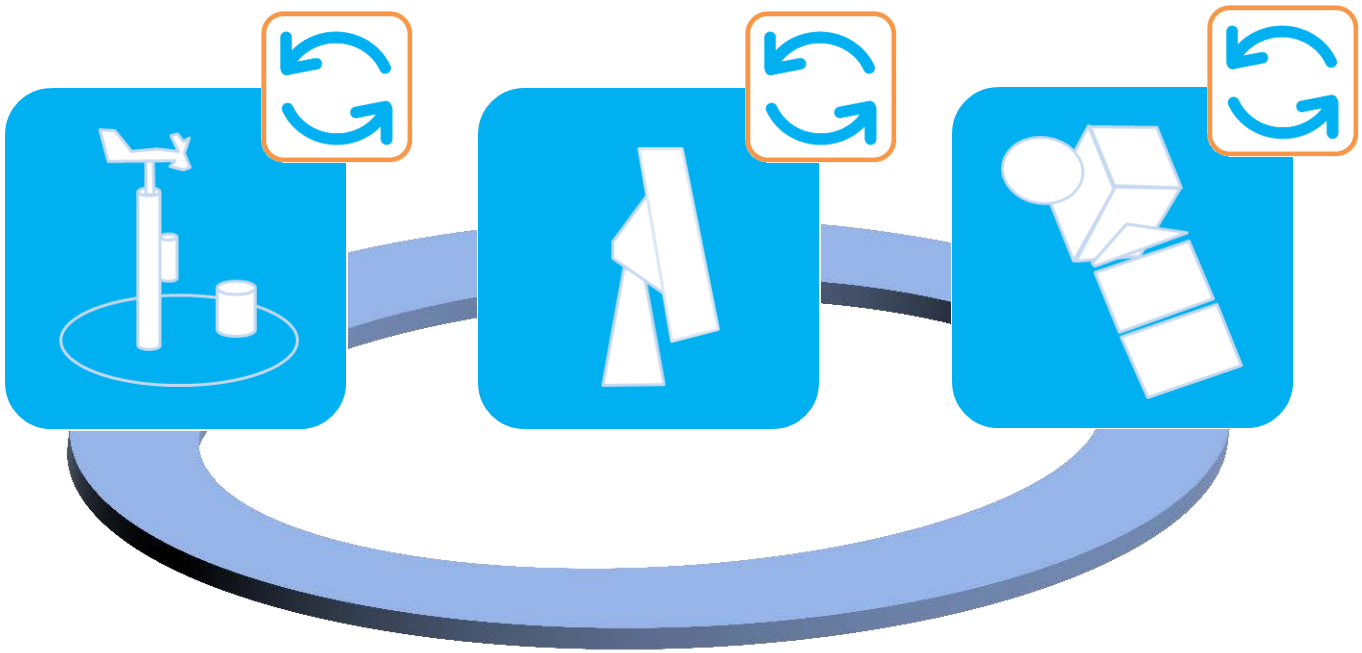
On-demand observing system

and receive weather information, for example, it may be possible to introduce a mechanism by which the frequency of observation varies depending on the information received.

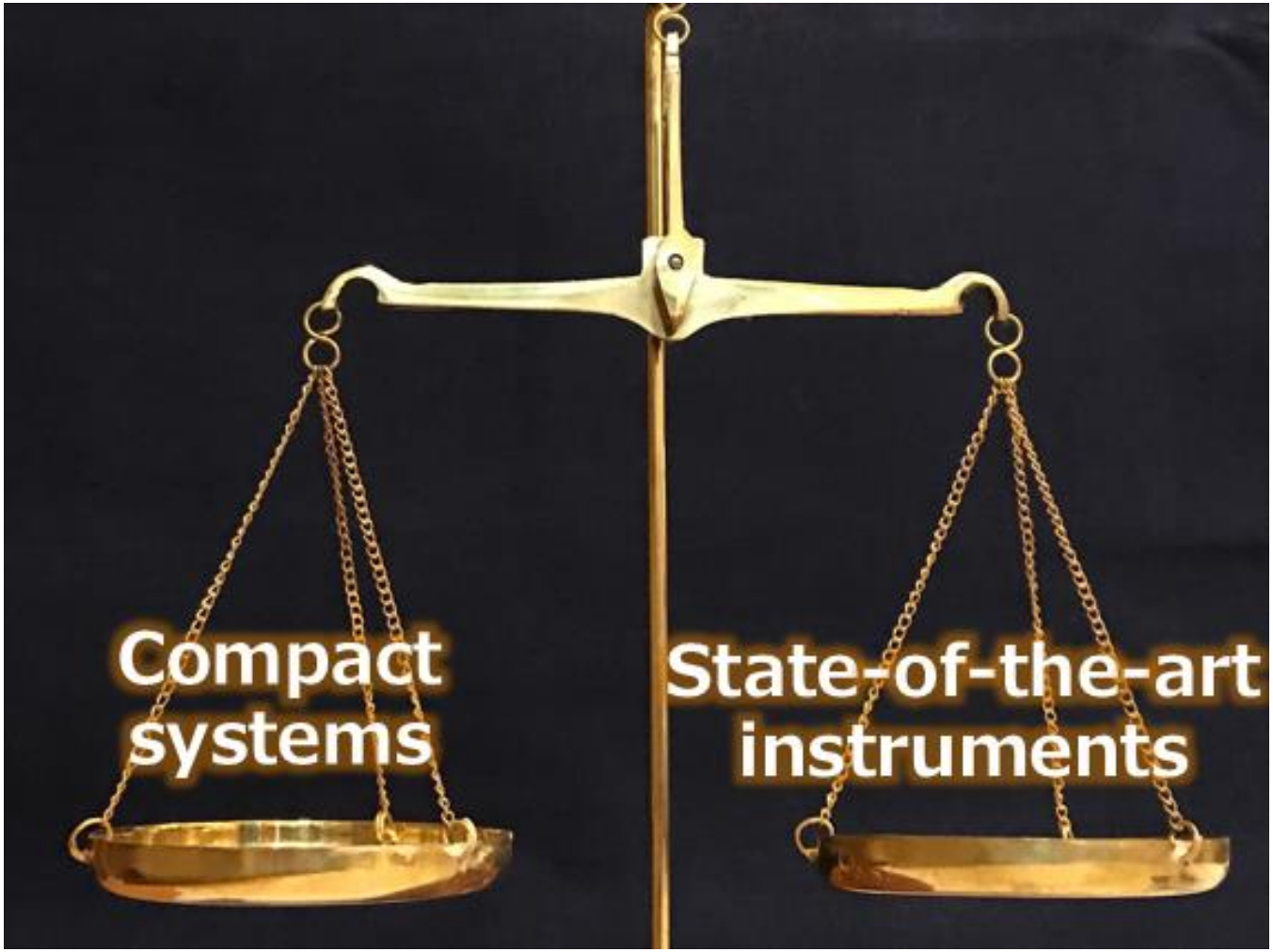


Specifying regions at high risk of heavy rain and focusing on related observation with higher resolution and frequency will help to minimize data volumes.

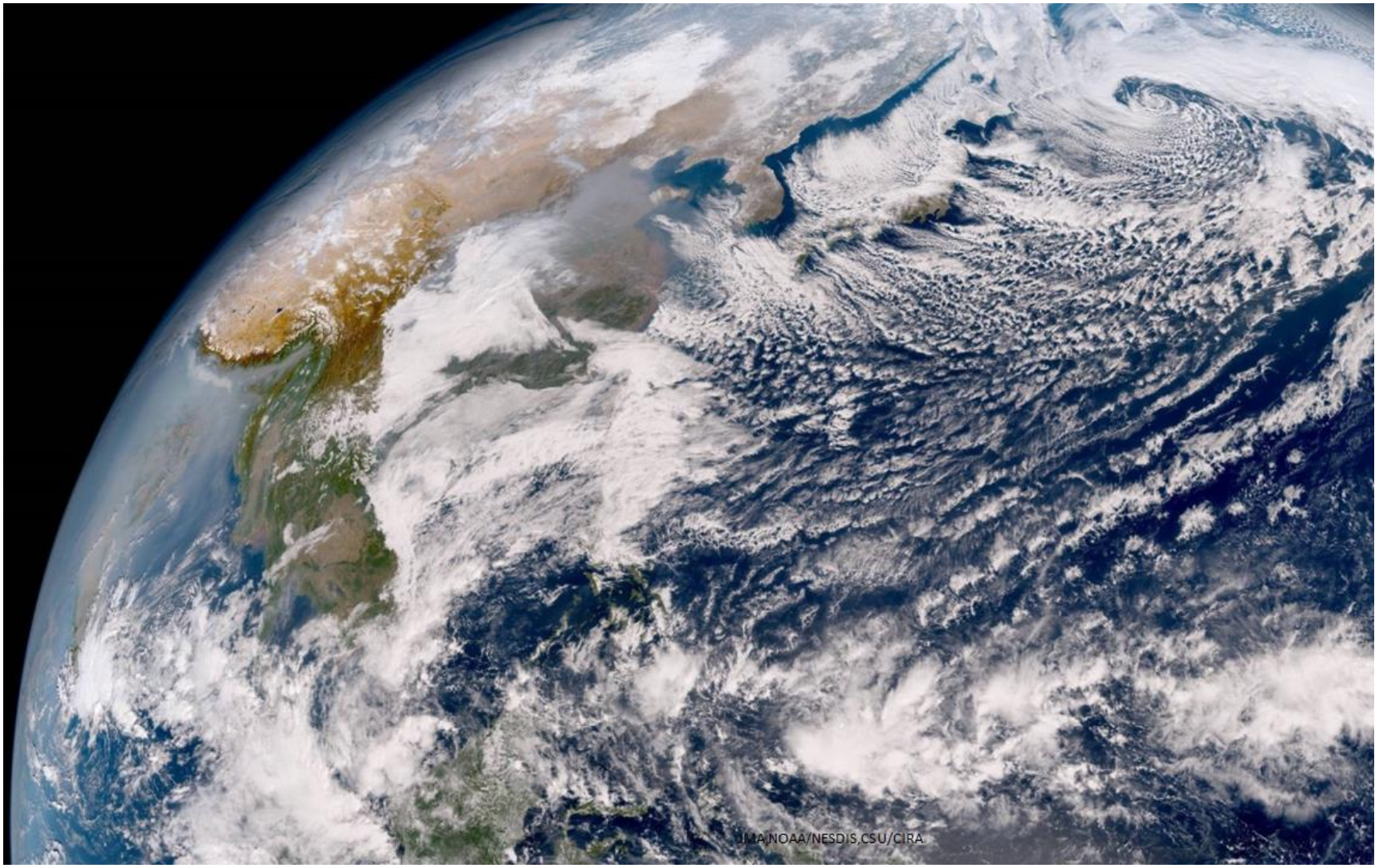
Integrated
On-demand
observing system



Synergistic benefits are also anticipated from integrative operation of land-based instruments, radar and satellites. Such operation is expected to support …

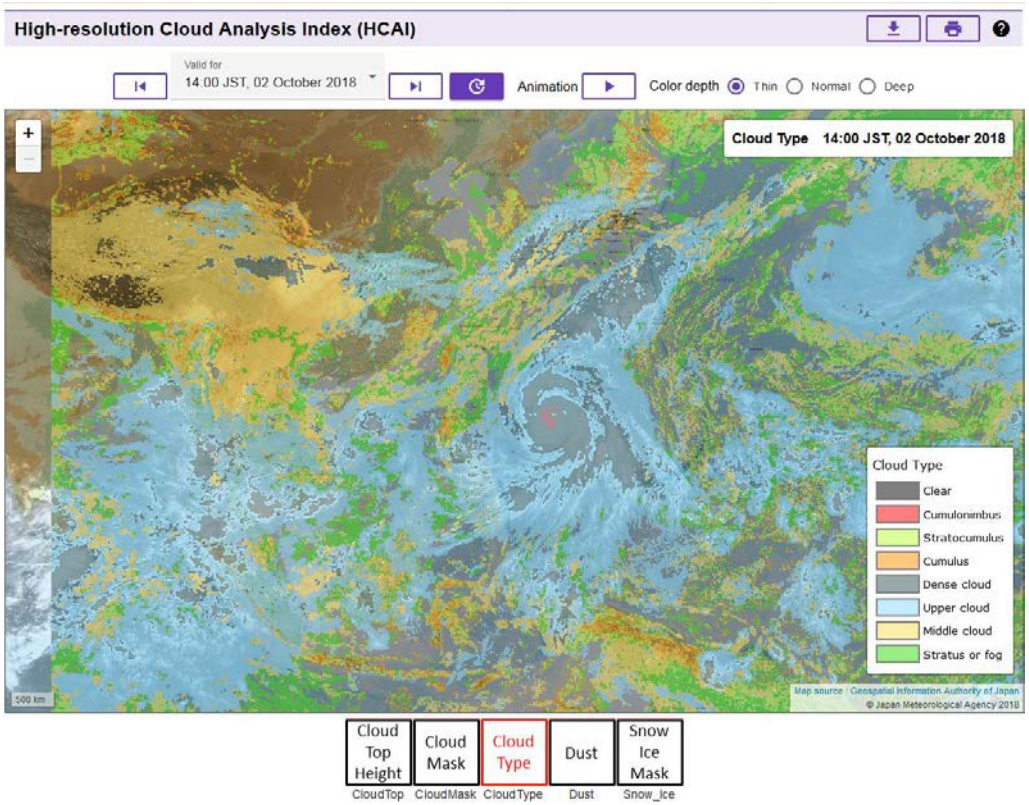


a favorable balance between the introduction of high-resolution state-of-the-art observation instruments and the implementation of compact observation systems.



JMA plans to promote the transfer of this effective and efficient observation system technology in the Asia/Pacific region …

Open in December 2018



in its role as a Regional Specialized Meteorological Centre (RSMC) for Nowcasting.

Training & support

Quality Management

JMA is also scheduling regional WIGOS center pilot phase operation to commence in 2019.

37

In consideration of regional WIGOS center work in the provision of technical training to other nations, …

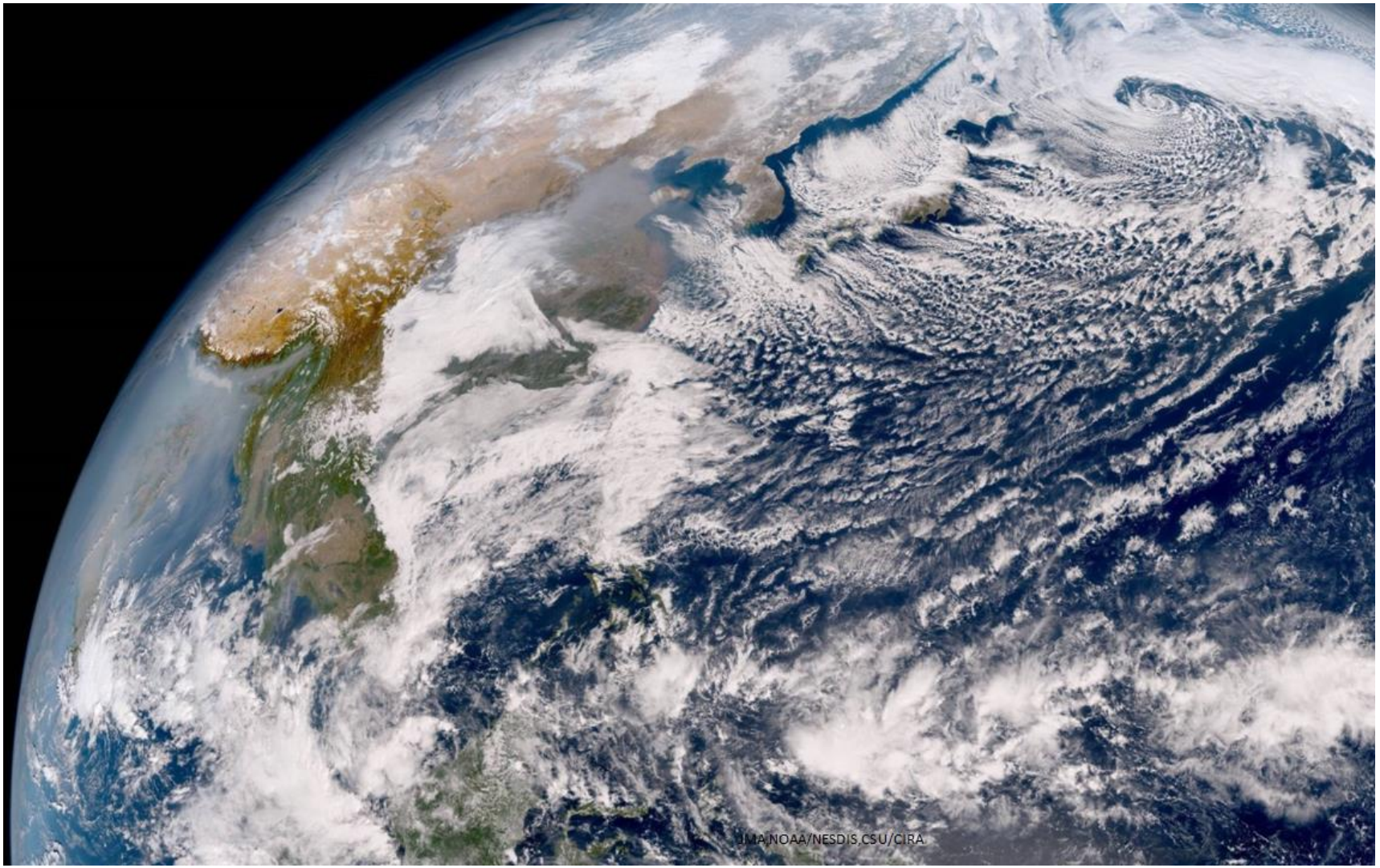
Product development

Training & support

JMA combines the development of RSMC nowcasting products with such training to provide expertise in integrative on-demand observing system usage.

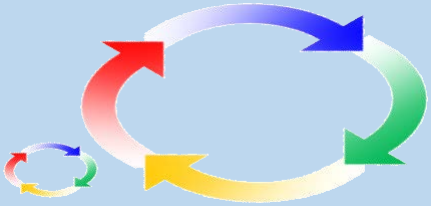
Disaster Risk Reduction

The development of such products is expected to improve capacity for disaster risk reduction (DRR) on an international scale.



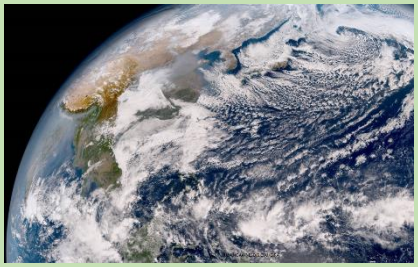
In product development, JMA plans collaboration with national meteorological and hydrological services in the region.

2020



Collaborative quality improvement

2023



QPE/QPF/ Lightning nowcast in Asia

2028

Severe storm alert content in Asia

The plan comprises three phases toward the development of a high-level nowcasting product created using data from land-based instruments, radar and satellites.

WORKING TOGETHER

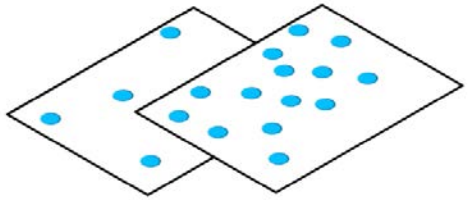
2020

Devise and implement training on quality improvement

2023

Improve quality management

2028

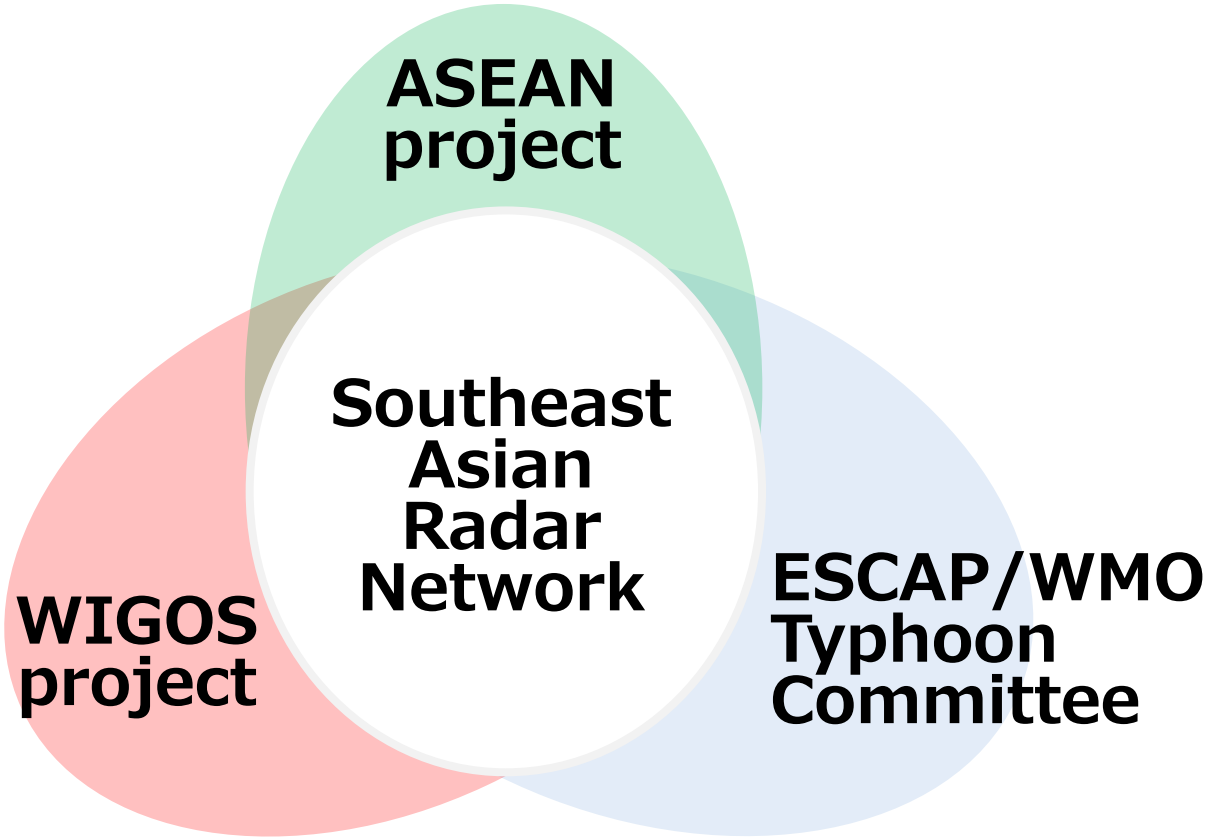


Enhance observation networks

42

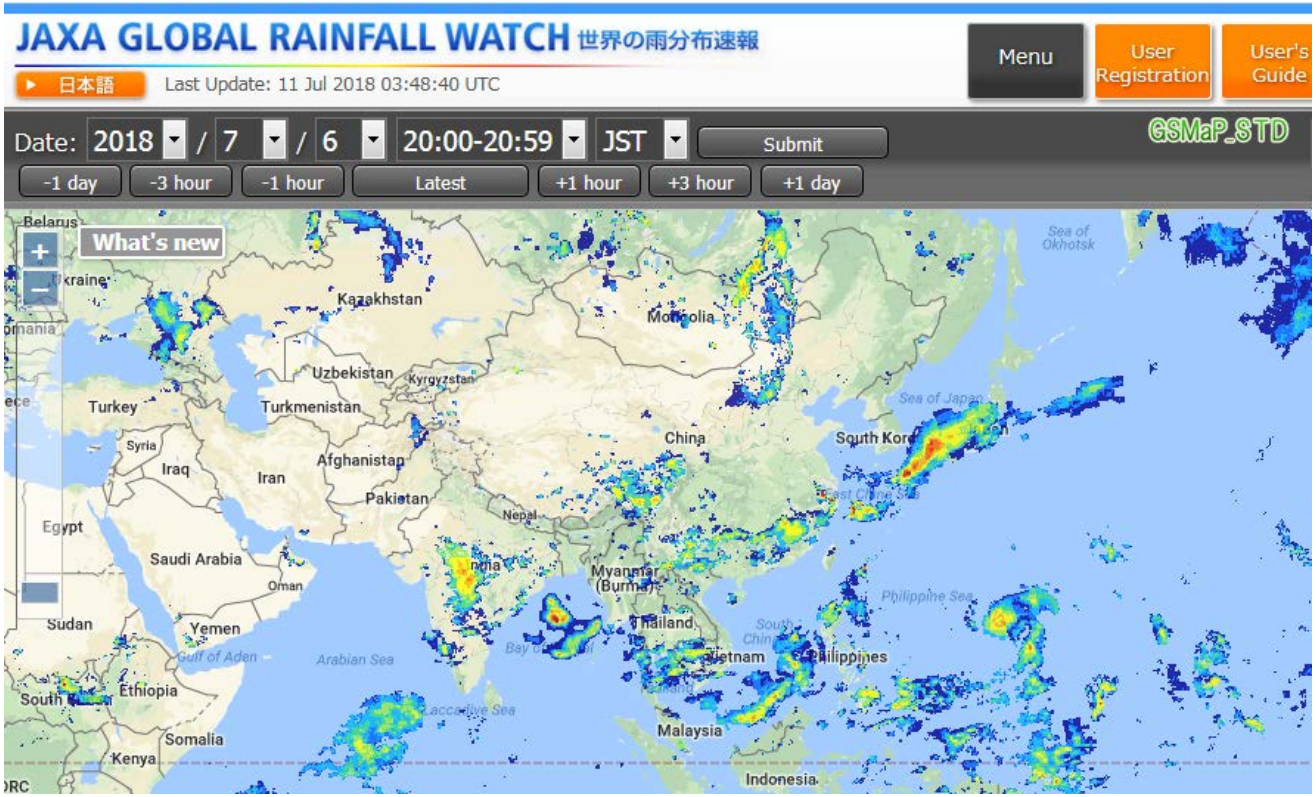
JMA collaborates with Asian nations under the Tokyo Action Plan 2018 (TAP2018) regarding surface observation instruments, …

WORKING TOGETHER



works with many nations to the Southeast Asian Radar Network regarding radar, …

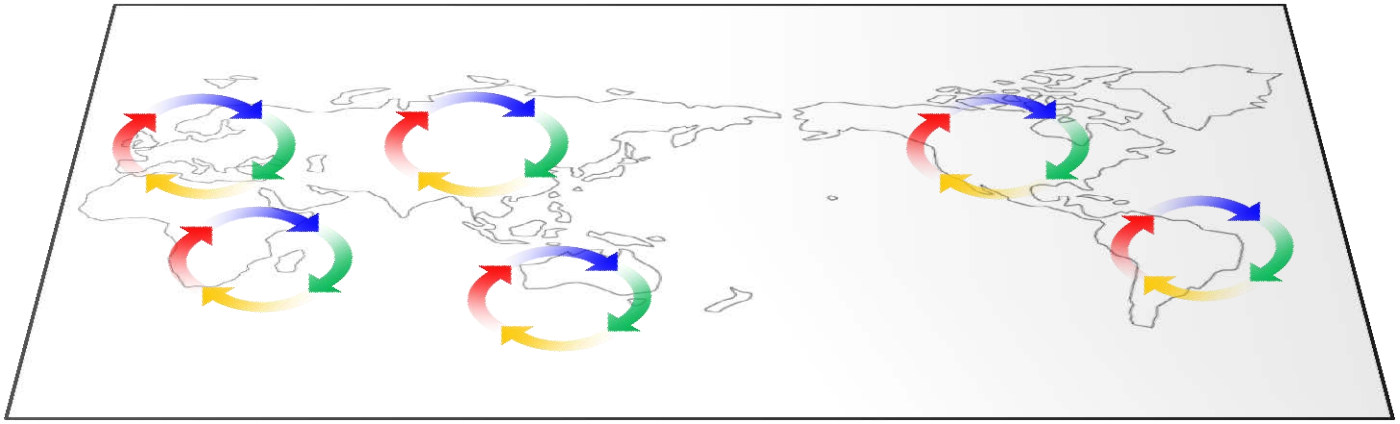
WORKING TOGETHER



http://sharaku.eorc.jaxa.jp/GSMaP/index.htm

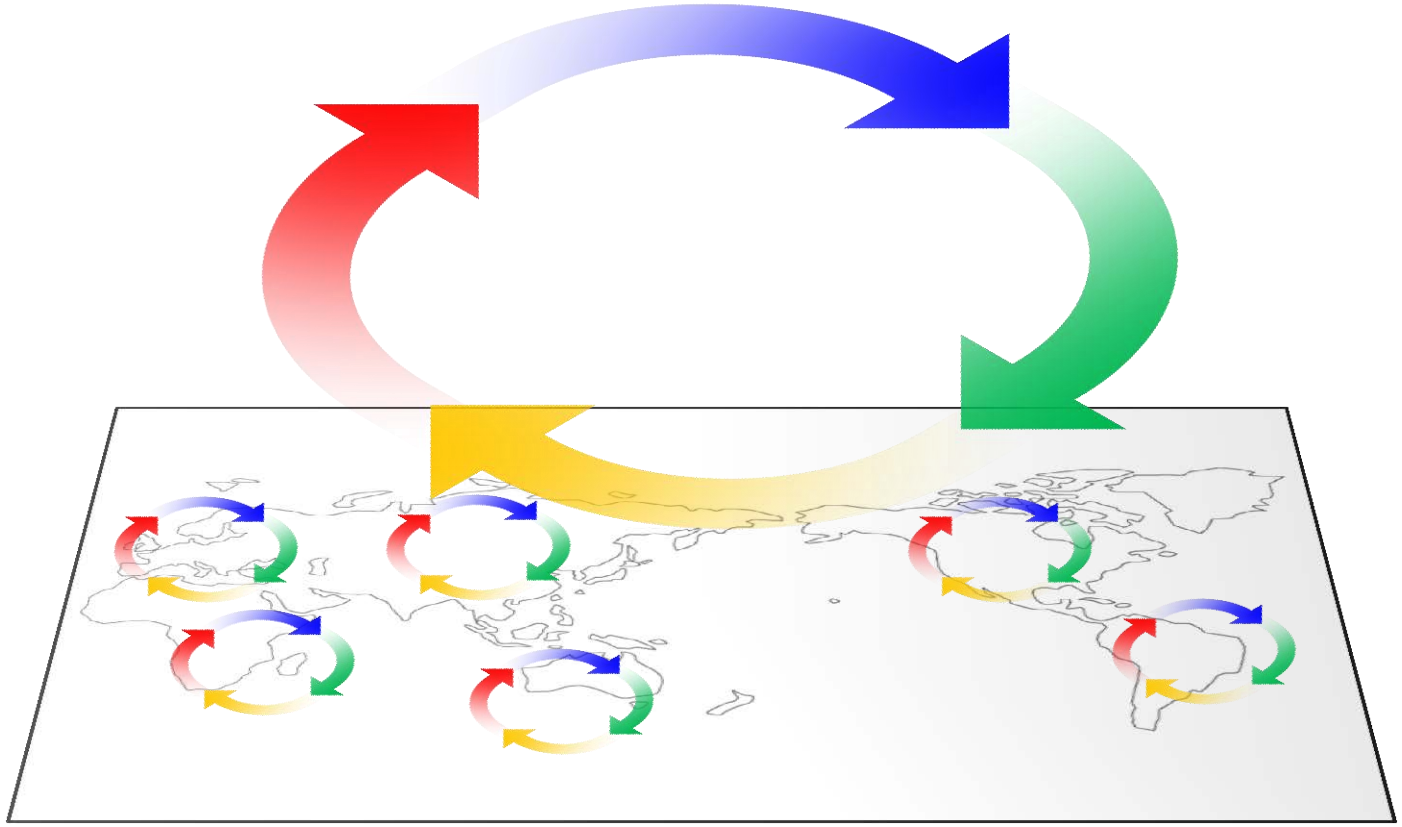
and collaborates closely with the Japan Aerospace Exploration Agency (JAXA) on satellite-related matters.

WORKING TOGETHER



The Agency also works closely with Deutscher Wetterdienst (DWD; the European RSMC for nowcasting).

WORKING TOGETHER



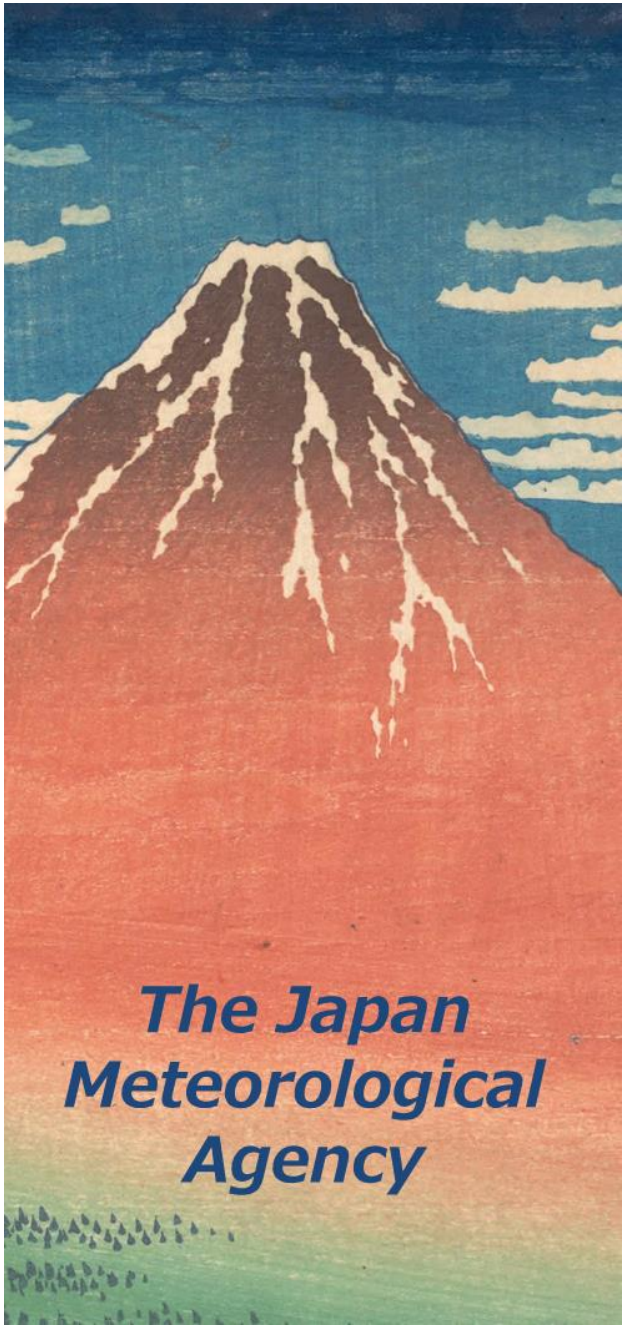
Inter-regional collaboration is expected to help enhance worldwide activity in this area.

Integrated on-demand observing system

Collaborative consideration and development are essential characteristics of the integrated on-demand observing system.

For more information

Thank you for your attention


The Japan
Meteorological
Agency

2030 Vision: Twin Challenges

1 Technological development for better observation and prediction

Pursuing technological development
with incorporation of the latest scientific techniques
via industry-academia-government partnerships
incorporating international collaboration
for information and data provision
with a sound technological base

Synergetic Achievement

Promoting weather services for disaster mitigation, daily living and economic activity

Promoting actions and assistances for disaster prevention

Raising public awareness of disaster prevention with focus on weather services
as a relevant governmental body

2 Promotion of effective weather information usage

Promoting usage of information as part of social infrastructure by facilitating data access/application and building user literacy in related usage

The Japan Meteorological Agency 2030 Vision

A Safe, Resilient and Dynamic Society

Appropriate Response to Extreme Weather

Providing highly accurate meteorological information and data to various independent bodies to enable appropriate disaster mitigation efforts

Vitality in Everyday Living For All

Improving quality of life and convenience by providing information for various situations in daily living

Innovation in Economic Activity and Elsewhere

Improving productivity and providing a range of services based on the combination of weather information with various types of big data and advanced technology

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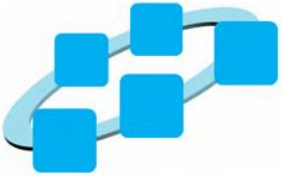
Three Areas of Focus

Observation & Data Usage

1 Operation/improvement of JMA's basic observation network

2 Integrated usage of observation data collected by various bodies



3 Meteorological observation big data

JMA
Government/ Municipalities
Universities/ Researchers
Private Sector

Diverse application by various entities

Disaster Risk Reduction
Industry
Daily Living
Transport Safety

2030 Vision: Goal Focus

Prediction Lineup from Nowcast to 100 years ahead

Reference time scales for related phenomena

100 years	Global warming
Months	Seasonal climates
Weeks	Extreme weather
Days	Typhoons
Hours	Heavy rain
1 hour	Nowcast

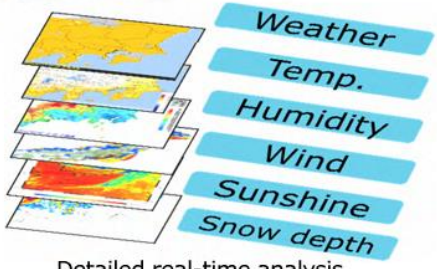
to urge immediate evacuation and improve daily living

Meteorological Nowcasts

1-hr. prediction updated every 5 or 10 min.

Severe storm alert

Providing accurate predictions of extreme phenomena such as heavy rain, lightning and wind up to an hour in advance



Detailed real-time analysis of current weather conditions

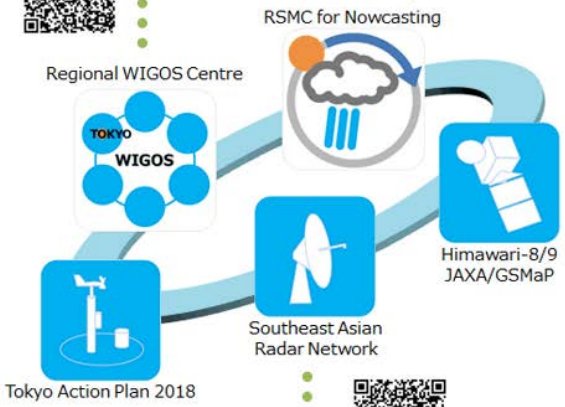
Accurate, well-timed and actionable

JMA presentations

at CIMO TECO-2018

O4_4
Development of an integrated on-demand observing system

O1_10
Interlaboratory Comparison (ILC) in RA-II, V and VI

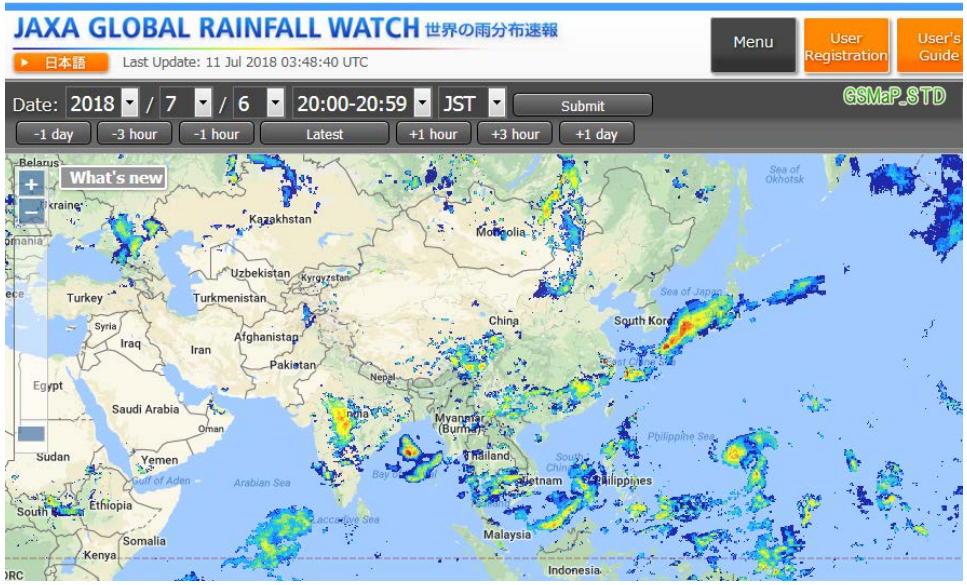


P4_12
Southeast Asian Radar Network (Regional WIGOS Project)

P3_2
Summary of JMA/WMO Workshop on Quality Management of Surface Observations – RA II WIGOS Project

FY		2018	2019	2020	2021	2022	2023-2027
		Phase I		Phase II			Phase III
Provision of materials and training for users		• Draw up product specifications for Phases II and III • Provide user manual		• Standardize product specifications • Provide training			• Provide mobile training centers
		• Engage in activities for technical/development transfer					
Satellite	Identification of Rapidly Developing Cumulous Areas (RDCA)	• Conduct evaluation to determine detection uncertainty • Improve detection accuracy		• Develop regional lightning nowcasting in Asia			• Develop severe storm alert content for Asia
	Himawari products (HCAI & HRPA)	• Launch Phase I website in December 2018		• Develop regional integrated QPE/QPF in Asia			
	JAXA/GSMaP	• Conduct evaluation to determine uncertainty in rainfall analysis and prediction					
Radar	Southeast Asian Radar Network -Regional WIGOS Project	• Improve quality checking techniques • Expand and enhance international exchange of observation data					
Surface	Tokyo Action Plan	• Devise and implement training on quality improvement		• Improve quality management			• Enhance observation networks

JMA's RSMC 10-year plan for nowcasting



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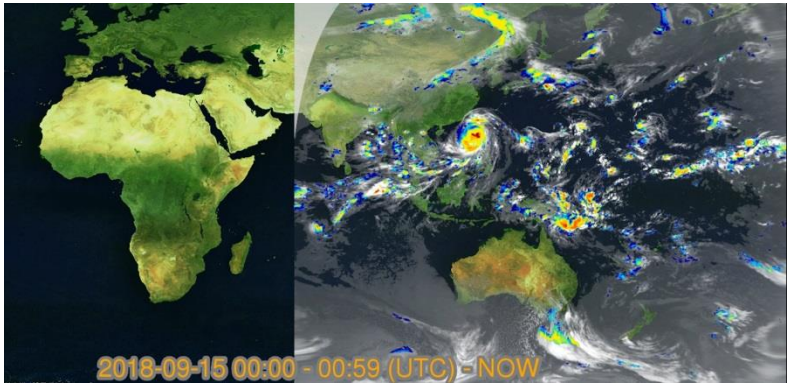
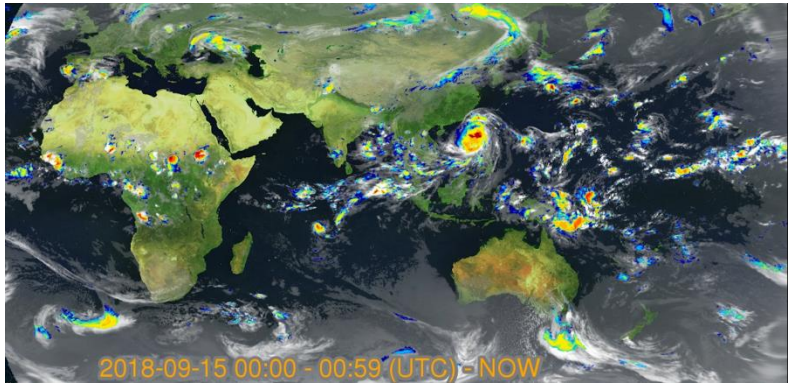




GSMaP realtime product domain will be extended this October.

P4_12

Southeast Asian Radar Network

Regional WIGOS Project

1 Koichiro KAKIHARA and Hiroshi YAMAUCHI
Japan Meteorological Agency

Challenges

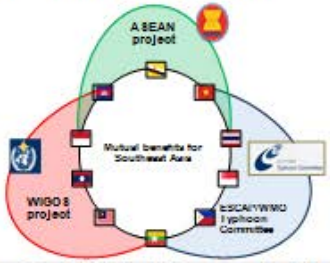
2 Disaster risk reduction (DRR) is a major consideration in Southeast Asia. In particular, floods, landslides and other natural disasters caused by heavy rain have significant regional impacts there.

WIGOS project

Capacity Building in Radar Techniques in the Southeast Asia : 2017 – 2020

3 This regional WIGOS Project is conducted in line with the Jakarta Declaration concluded at the Joint RA II/RA V workshop on WIGOS for Disaster Risk Reduction.

Three frameworks



4 Radar projects in Southeast Asia are conducted under the frameworks of WMO/WIGOS, ASEAN and the ESCAP/WMO Typhoon Committee. These three organizations work toward unified goals.

Benefits

5 Radar network development contributes to related observation/operation expertise and directly supports capacity building for radar observation techniques in each country.

Coming soon

WORKING TOGETHER

6 The next technical meeting will be held on 22-26 October, accompanying with newly participating countries.

Southeast Asian Radar Network
Regional WIGOS Project

JMA/WMO Workshop on Quality Management in Surface, Climate and Upper-air Observations in RA II (Asia)

JMA/WMO Training Workshop on Calibration and Maintenance of Meteorological Instruments in RA II (ASIA)

JMA/WMO Workshop on Quality Management of Surface Observations - RA II WIGOS Project

2010 2013 **March 2018**

Tokyo Action Plan 2018 *Proposal*

Short term -2020	Middle term -2023	Long term -2028
• Increase the number of reporting stations and observation resolution (every three hours or hourly). • Conduct research to determine optimal observation network configuration. • Encourage all countries to implement WDQMS and other tools. • Improve QC techniques in instrument calibration, field inspection and other areas. • Implement standard operating procedures (SOPs) for AWS maintenance, including methods for instrument inspection after extreme events. • Engage in post-workshop activities, including newsletter issuance and provision of e-mail-based support. • Encourage OSCAR surface training in all countries.	• Enhance integrated quality management. • Establish special environments/appropriate exposure around observing stations. • Develop guidance on integrated observing systems for surface observation with remote sensing. • Provide further training on instrument maintenance and calibration.	• Improve observation resolution. • Increase station observation network density. • Develop computerized QC methods for correction of historical data. • Establish collaboration among international agencies/academics/ engineers for improved observation capability.

- Regional WIGOS Centre related
- Observation capability related