

Satellite Information and JICA International Cooperation in Meteorological Services

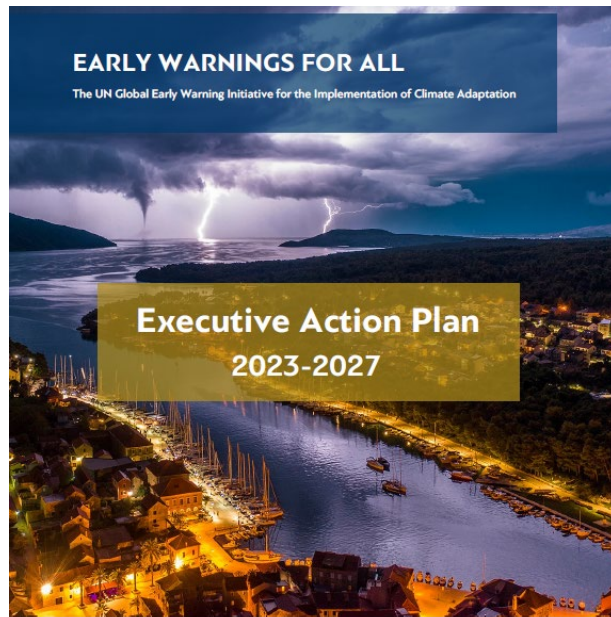


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QUAD Extreme Precipitation Workshop
2 March 2023, Tokyo

“Early Warnings for All”

United Nations tasked WMO



WORLD
METEOROLOGICAL
ORGANIZATION



WEATHER CLIMATE WATER

In March 2022, United Nations Secretary-General, António Guterres, announced that the United Nations would spearhead **new action to ensure every person on Earth is protected by early warning systems within five years.** He tasked the World Meteorological Organization to lead this effort and present an action plan to achieve the goal at the UN Climate Change Conference in Sharm El-Sheikh, COP27.

Early warning system:

An integrated system of hazard monitoring, forecasting and prediction, disaster risk assessment, communication and preparedness activities systems and processes that enables individuals, communities, governments, businesses and others to take timely action to reduce disaster risks in advance of hazardous events.

As defined 1 December 2016 by resolution 69/284, United Nations General Assembly

JICA's Projects for Meteorological Services

- What JICA has been done -

JICA's Cooperation Projects

- Since 1980s JICA has supported many countries to install early warning systems through the schemes of **grant aid** and **technical/Research cooperation projects**.
- One of the most effective tools to make early warning for severe precipitation is **weather radar**.

JICA Grant Aid for Met. Agencies

JICA has installations weather radar weather radar as early warning systems for precipitation disaster since 1986



JICA Technical Cooperation Projects for Met. Agencies

- Technical Transfer for meteorological services has been made since 1986, targeting improvement of weather observations, weather forecasting/warning and information dissemination.



●: on-going project

JICA Research Cooperation Projects in Meteorology

- Science and Technology Research Partnership for Sustainable Development (**SATREPS**) is conducted by JICA and Japan Science and Technology Agency (JST). Many universities, research institutes and met. agencies join the projects.

Thai SATREPS Prof. Oki 2015 – 2022

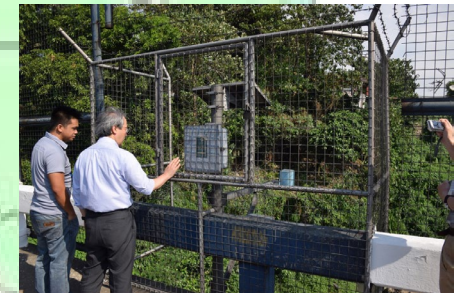
● **Philippine** SATREPS Prof. Takahashi 2017 - 2023

● **Malaysia** SATREPS Prof. Morimoto 2022 -

● Indonesia SATREPS Dr. Yamanaka 2010 - 2014

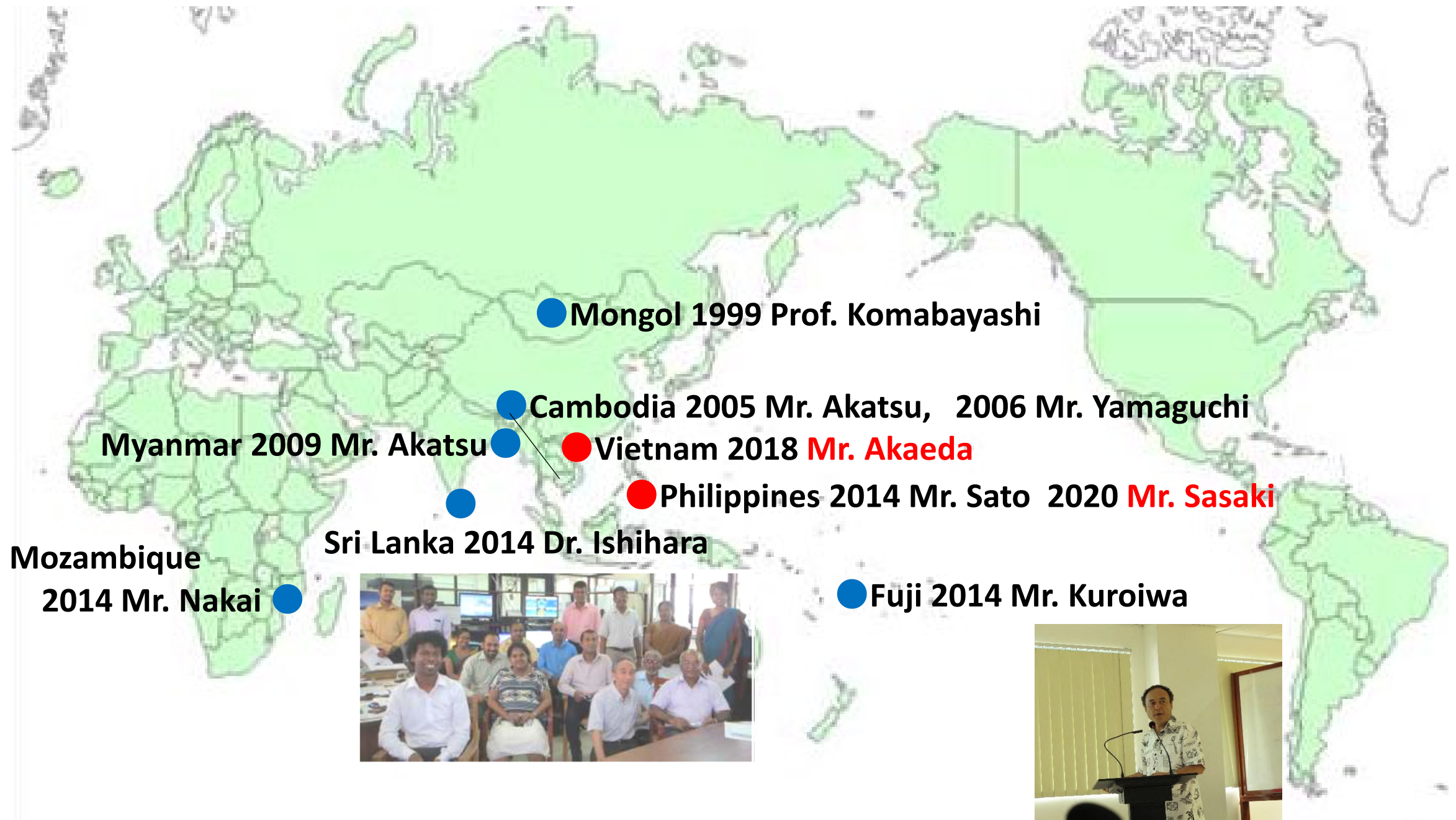
● **Argentina** SATREPS Dr. Miyoshi 2022-

● On-going project



JICA Long-term Experts for Met. Services

- Meteorological experts have been dispatched to met. agencies as technical and institutional advisors. They stay for several years in each country to make sustainable cooperation.

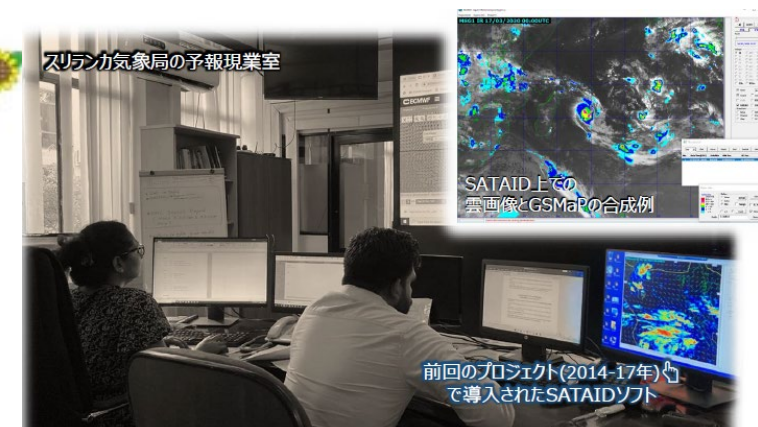
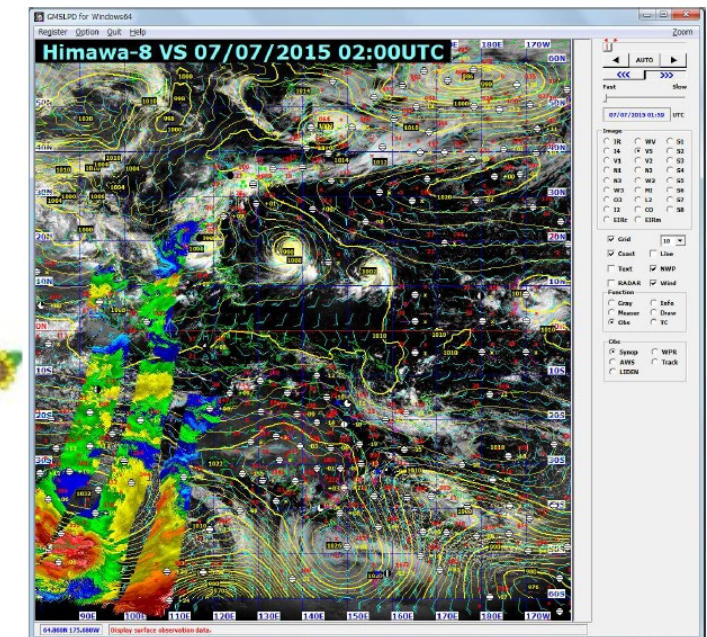
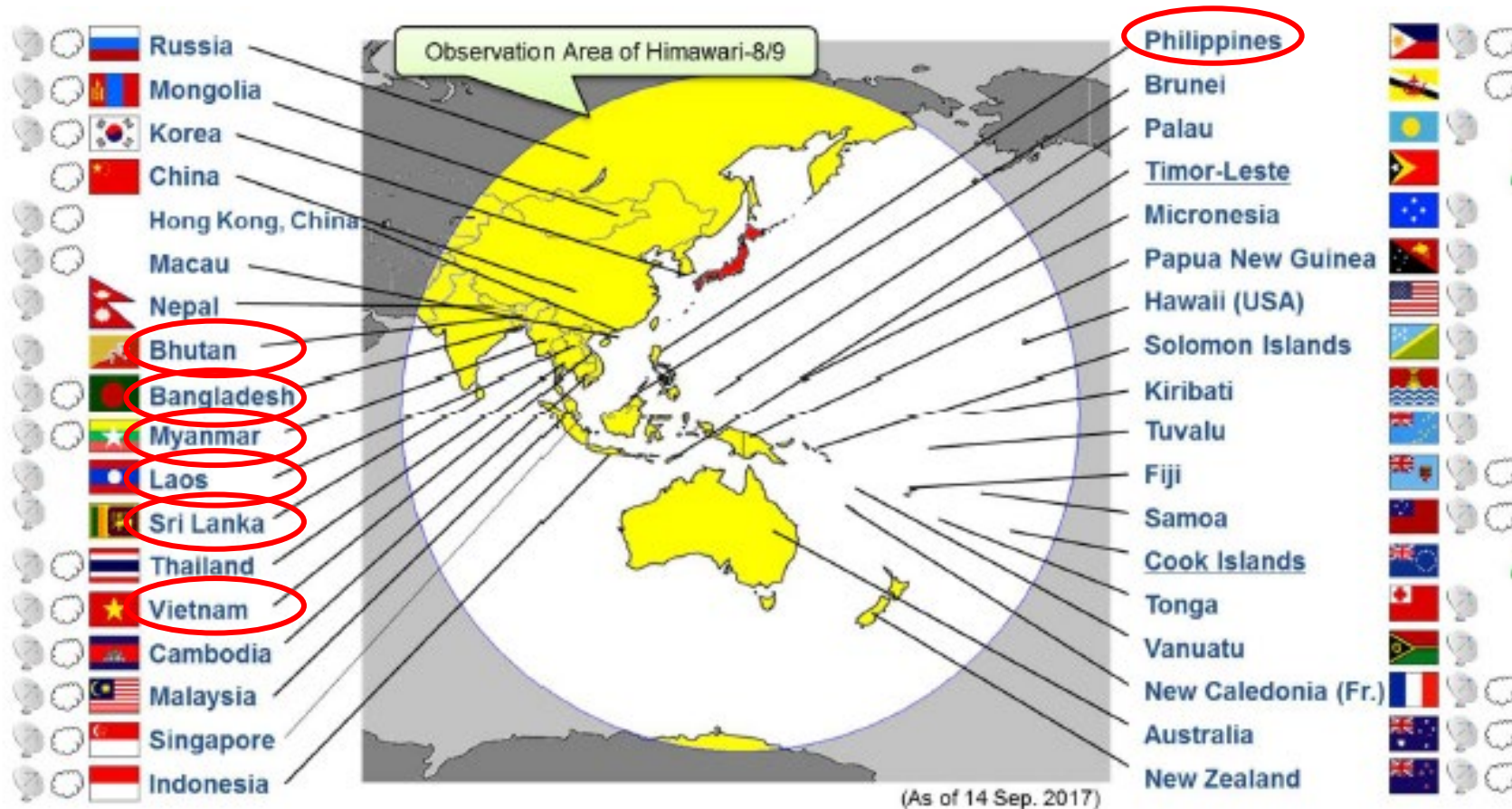


●: On-going Project

Satellites in JICA Meteorological Projects Focusing on Extreme Precipitation Events

JICA has transferred the skill to monitor clouds using **Himawari 8/9** images with **SATAID**

- JICA has promoted the application of Himawari images in the Technical Cooperation Projects using the SATAID Software with the full support of JMA.



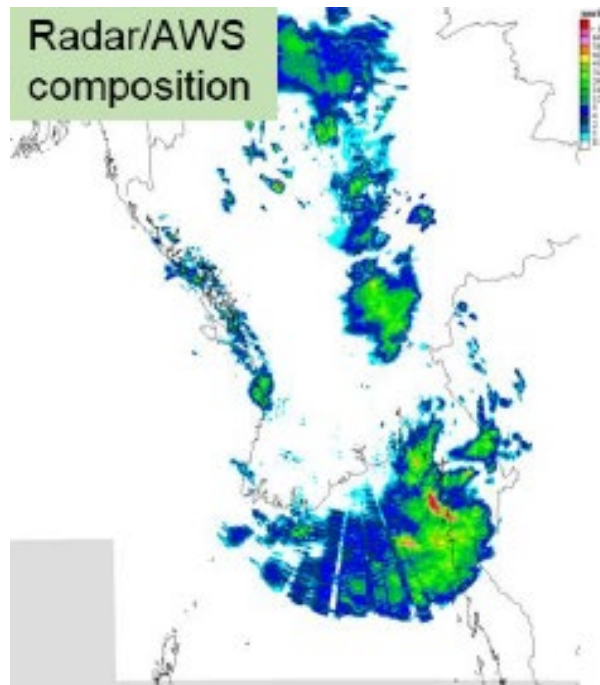
JICA has started to use **GSMaP** in the Technical Cooperation Projects

Two Targets

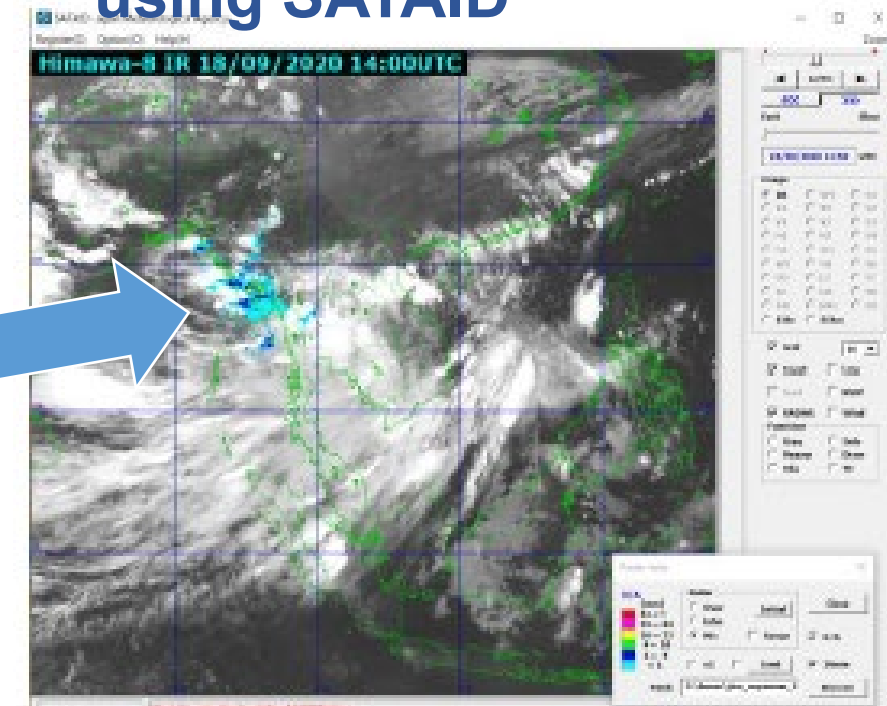
1. Monitoring of precipitation clouds in areas outside weather radar range: **Extended Area Precipitation Monitoring (EAPM)**
2. Monitoring of precipitation in areas without weather radars: **Blind Area Precipitation Monitoring (BAPM)**

EAPM: Extended Area Precipitation Monitoring using GSMaP on SATAID in Myanmar

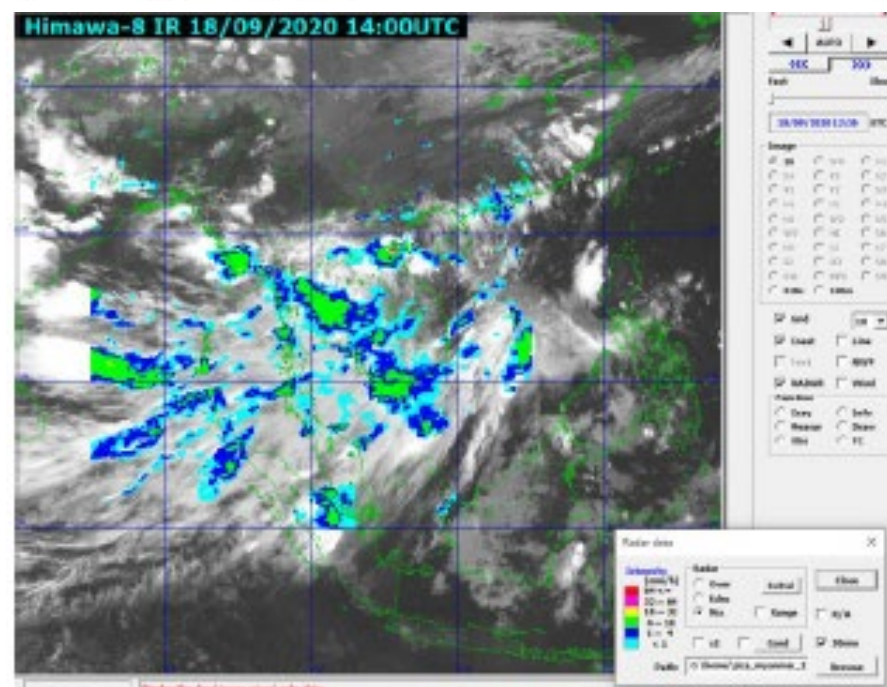
- Composite rainfall map with three weather radars and AWS rain-gauges.



- Rainfall map overlaid on HIMAWARI-8 cloud images using SATAID



- GSMaP overlaid on HIMAWARI-8 cloud images using SATAID

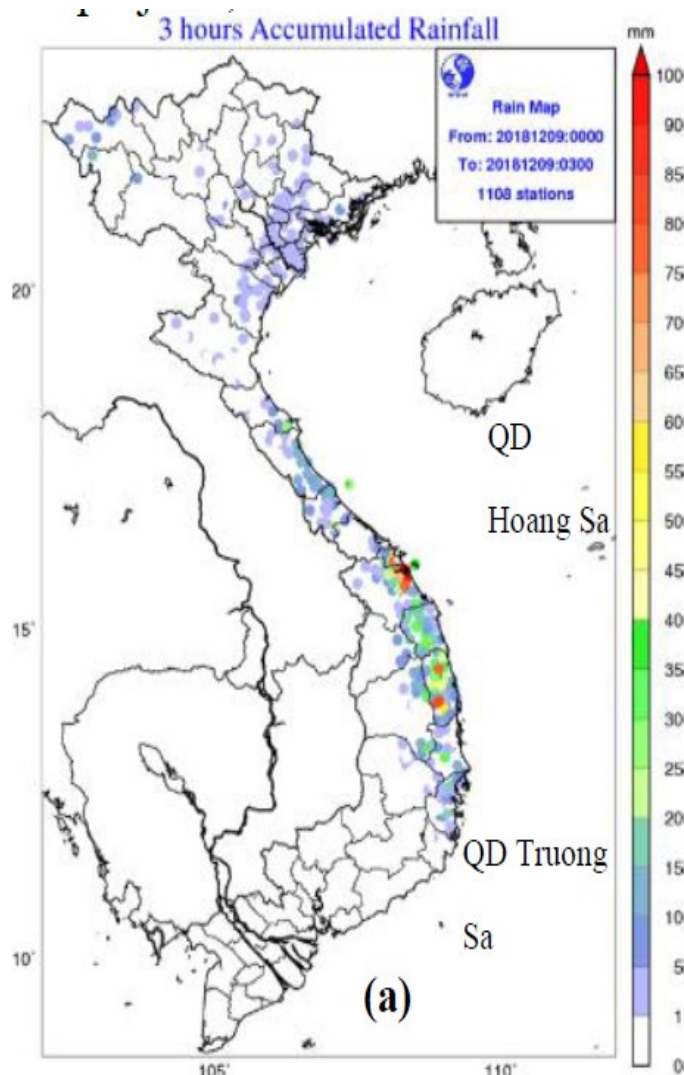


Source: Japan Meteorological Business Support Center

EAPM: Extended Area Precipitation Monitoring using GSMap in Vietnam

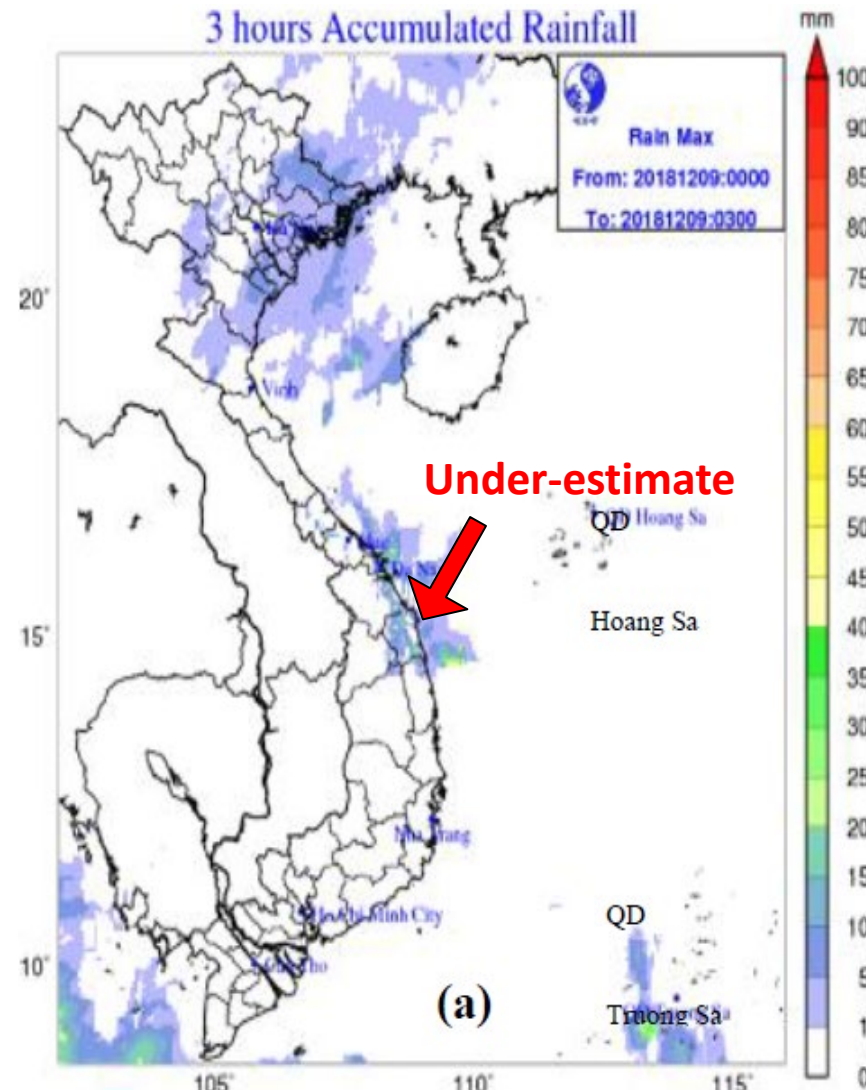
- Composite rainfall map with AWS rain-gauges, radars and GSMap

Rainfall map from AWS
rain-gauge data



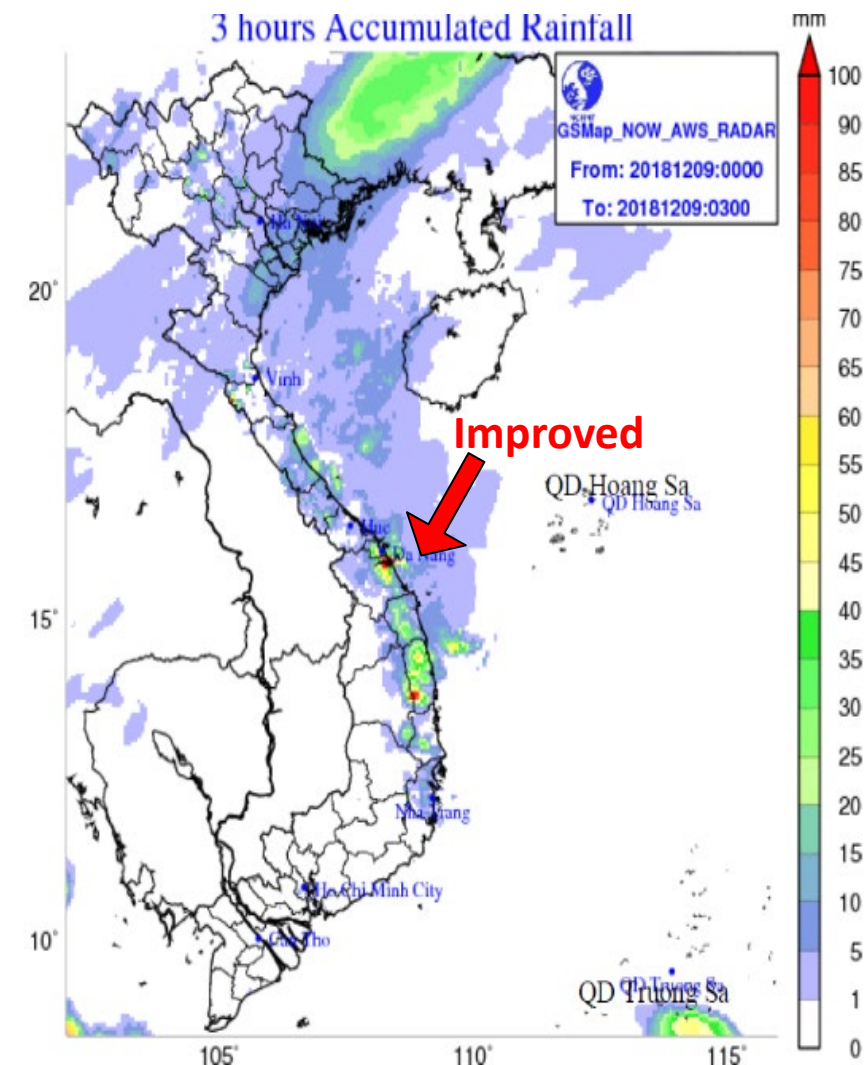
00-03UTC, December 9, 2018

Rainfall map from radar data



00-03UTC, December 9, 2018

Rainfall map composited with AWS
rain-gauge, radar and GSMap data

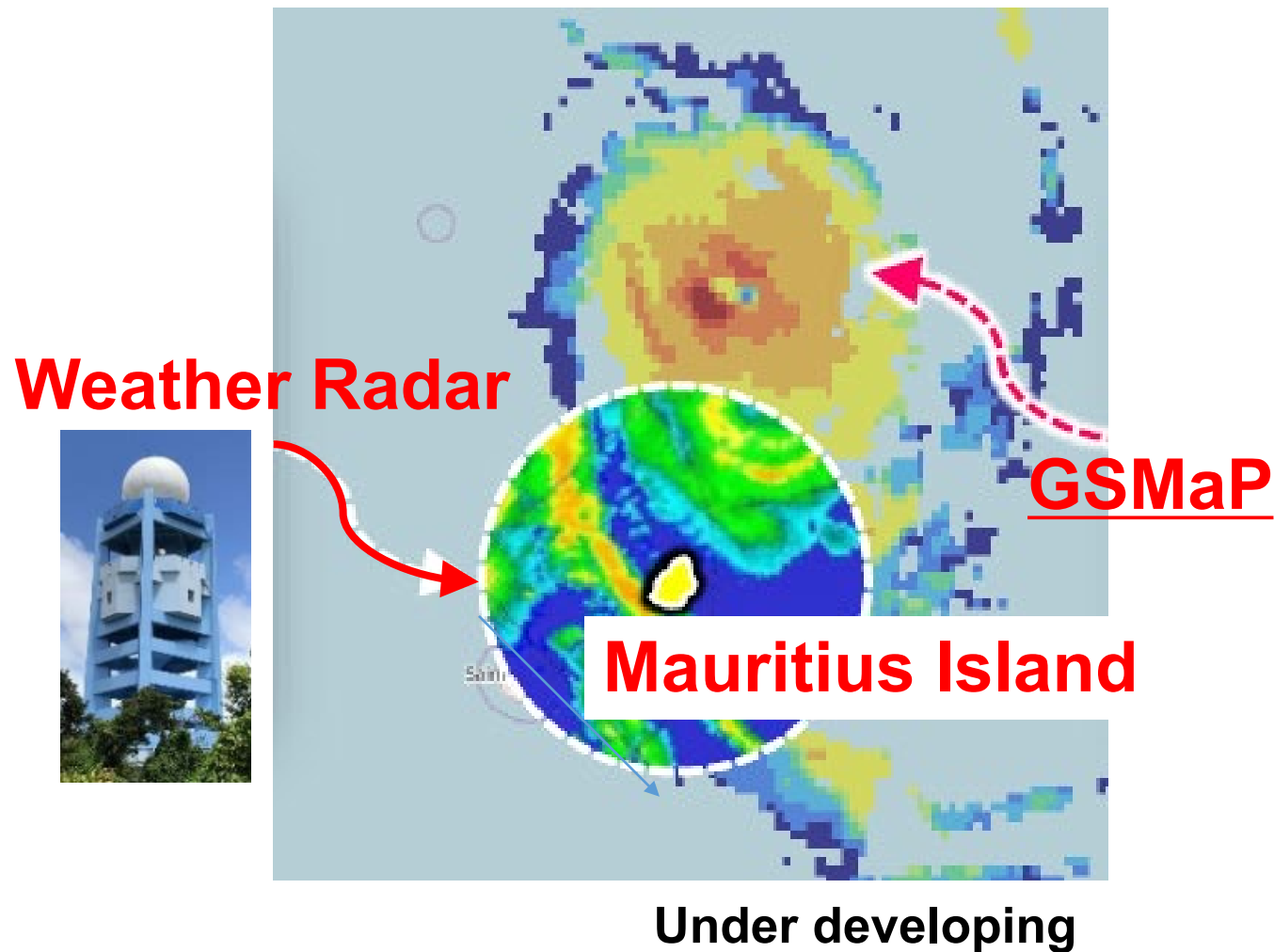


00-03UTC, December 9, 2018

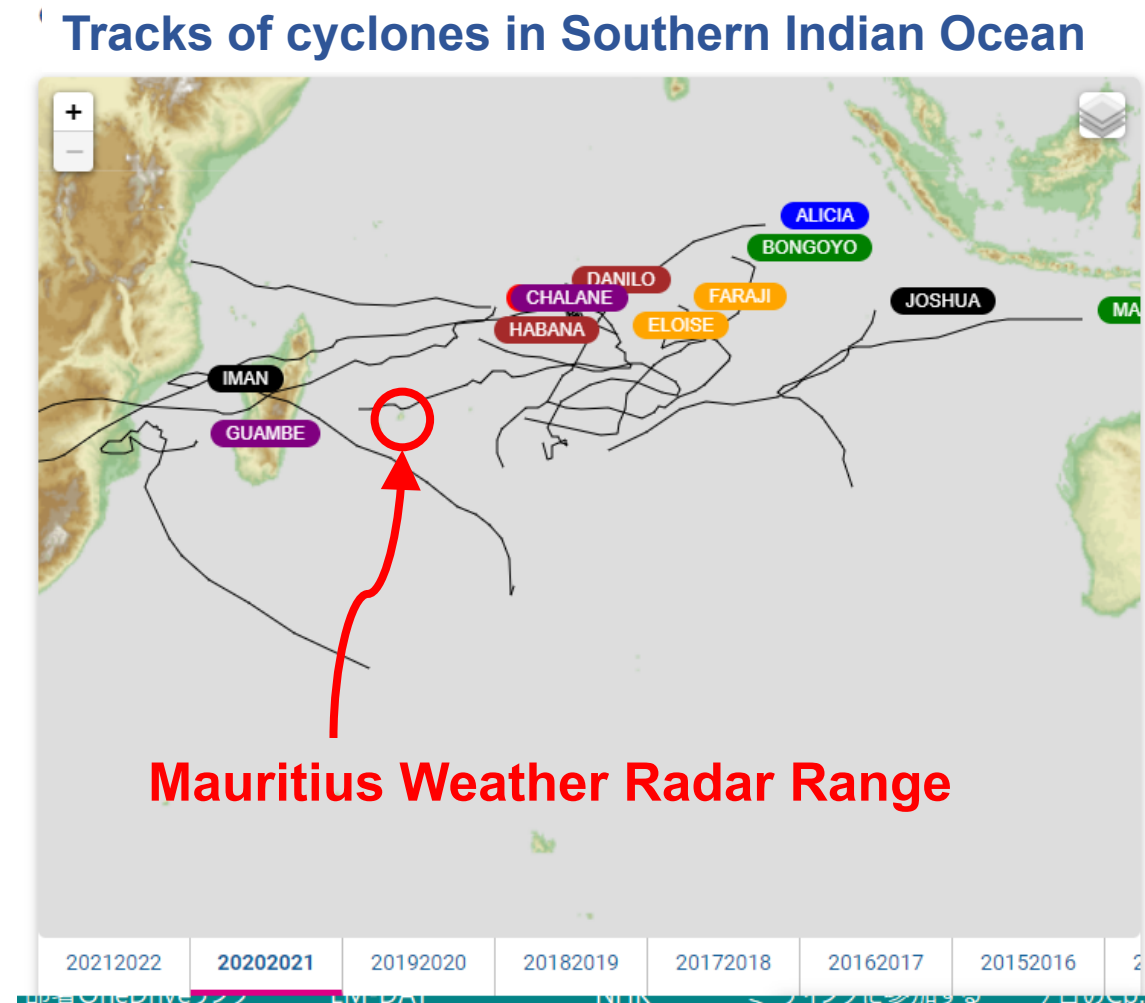
Source: Saito et al. (2020) and Yamachi (2022)

EAPM: Extended Area Precipitation Monitoring using GSMaP In Mauritius

- Cyclone monitoring using composite of weather radar image and GSMaP image in Mauritius has been developed.



Source: Japan Weather Association



CYCLONE et ACTIVITE CYCLONIQUE par Météo-France La Réunion (meteofrance.re)

BAPM: Blind Area Precipitation Monitoring using GSMaP in Sri Lanka

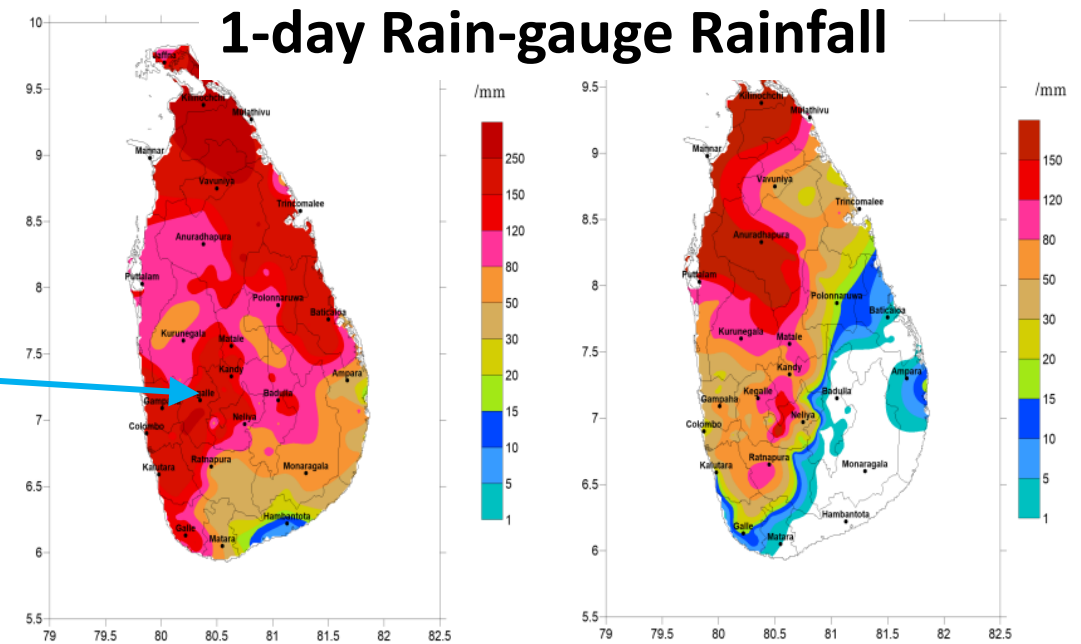
- Post analysis of a cyclone damage in Sri Lanka was made using GSMaP.



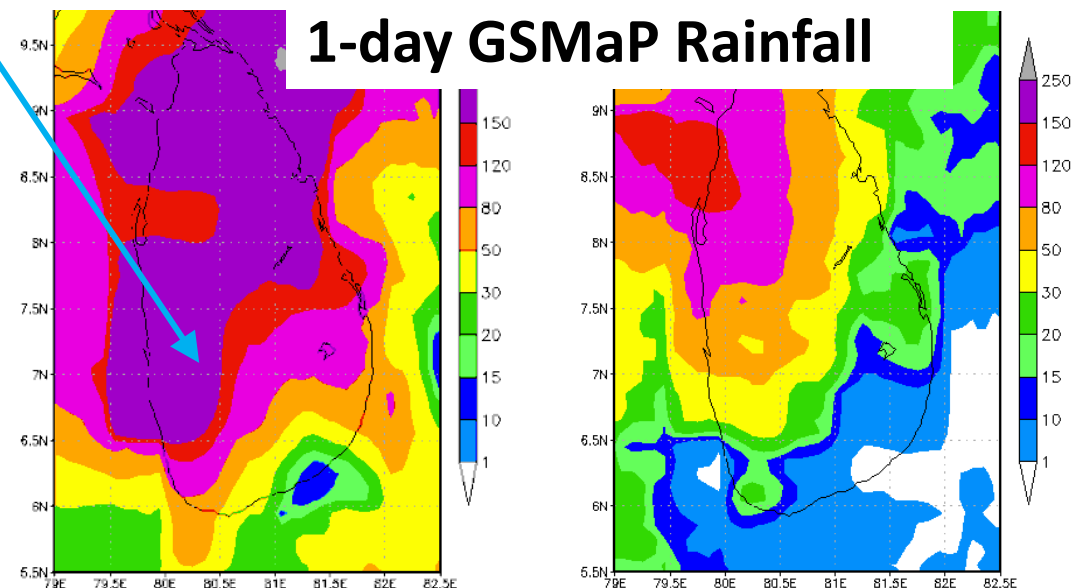
Heavy landslide damage in Arayanake on 16 May 2016 caused more than 200 fatalities.

- Correlation of 1-day rainfall distribution between rain-gauge and GSMaP was evaluated.
- It was shown that **GSMaP is useful** to monitor heavy rainfall, landslide and flood in this case.

Raingauges 0830-0830 SLLST 15 May Raingauges 0830-0830 SLLST 16 May



GSMaP 0530-0530 SLLST 15 May GSMaP 0530-0530 SLLST 16 May

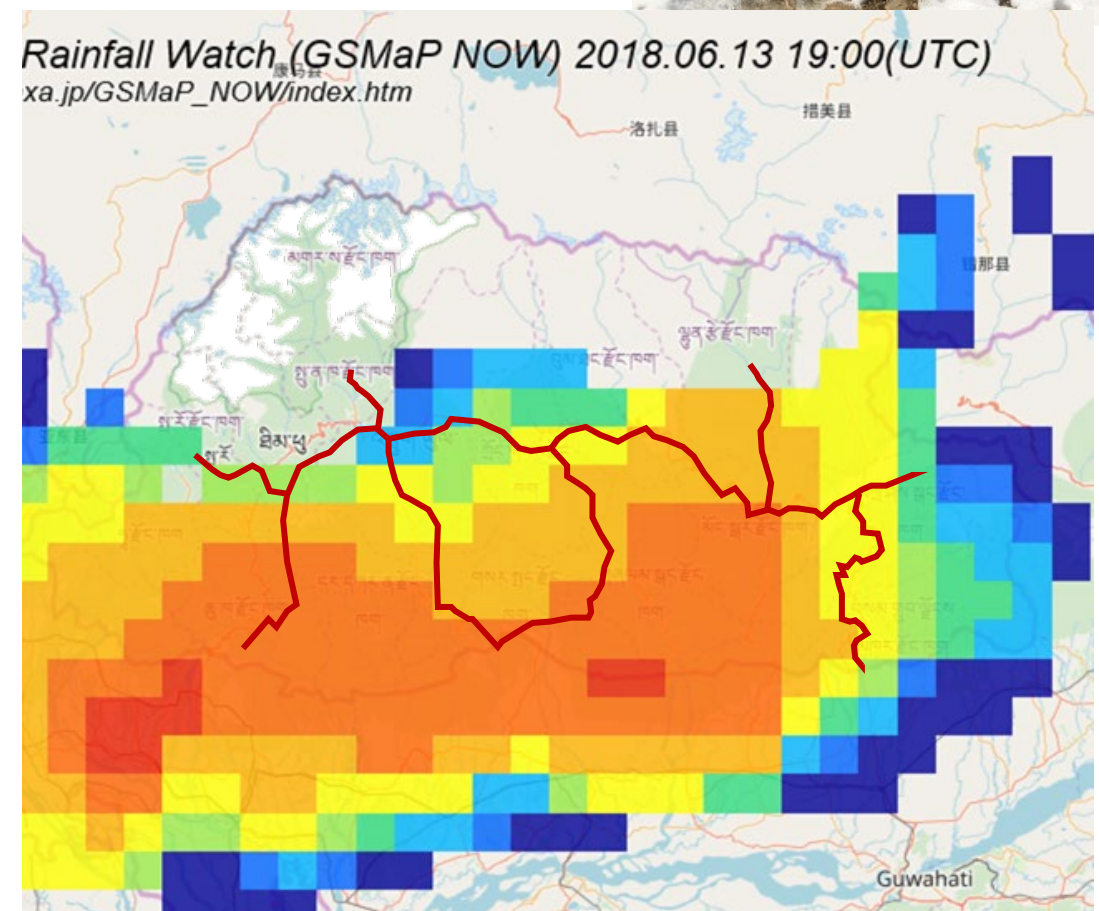


2016-05-28-14:28

BAPM: Blind Area Precipitation Monitoring using GSMaP

- Challenging target in **Bhutan** -

- Precipitation monitoring in Bhutan only depends on the rain-gauge network because of no weather radar.
- Spatially dense precipitation information is important to make safety road management (close/open gates) particularly in case of heavy rainfall.
- GSMaP is plan to be used to issue heavy rainfall information in combination with the existing rain-gauge network.



Issues to use Satellites in JICA Met. Project

Current Status

- HIMAWAR is widely used in Indo-Pacific JICA projects, and GSMP is just started to be used. We are on the mark to start to use GSMP.
- Combined use of GSMP with HIMAWARI, ground-based observations (e.g., weather radars, rain-gauges) and numerical model outputs is much effective for early warning of severe disasters (e.g., heavy rainfall, landslide, flood).

Issues

- Users of GSMP should well recognize its characteristics: accuracy of rainfall amount estimation over sea/land and spatial/time resolution) as well as its algorithm to estimate rainfall.
- Publishing a “practice guide for GSMP users” would be beneficial.

Request

- We hope the spatial resolution of GSMP (~ 10 km) could be a little improved to be compatible with high resolution numerical models or with the size of single-cell convective storm.
- Closer cooperation between GSMP provider and users would be beneficial for capacity building of users and for feedbacks on the accuracy information to provider.

Thanks for you