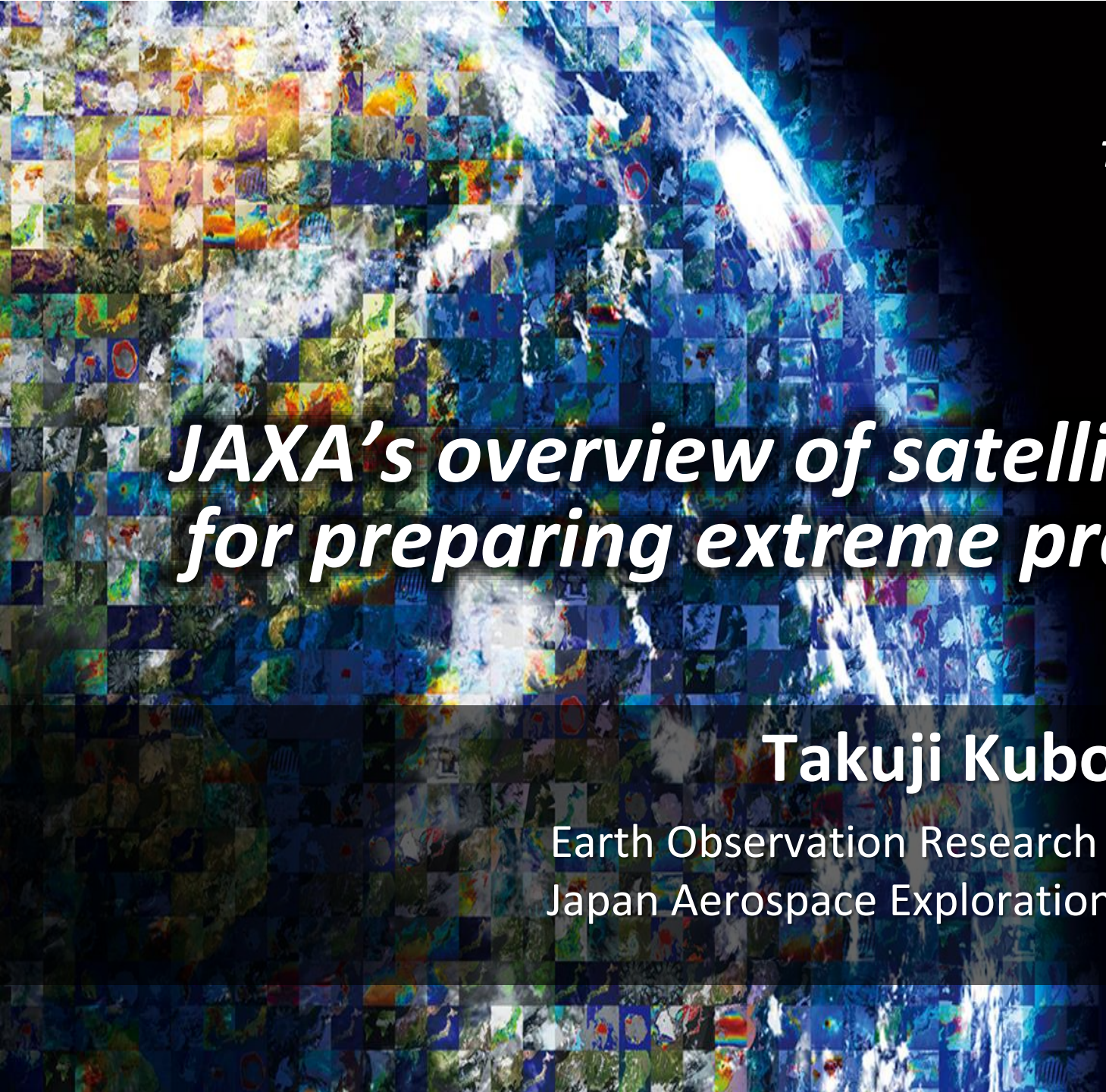


Tackling Extreme Precipitation Events Workshop
-Indo-Pacific region-
1st March 2023, Online

JAXA's overview of satellite data utilization for preparing extreme precipitation events

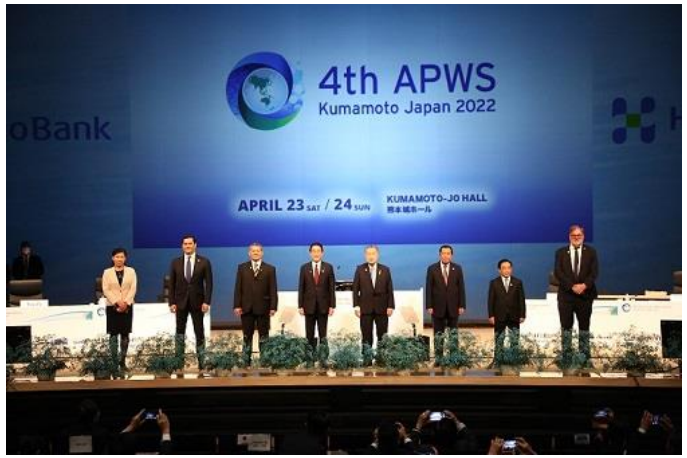
Takuji Kubota

Earth Observation Research Center(EORC),
Japan Aerospace Exploration Agency(JAXA)

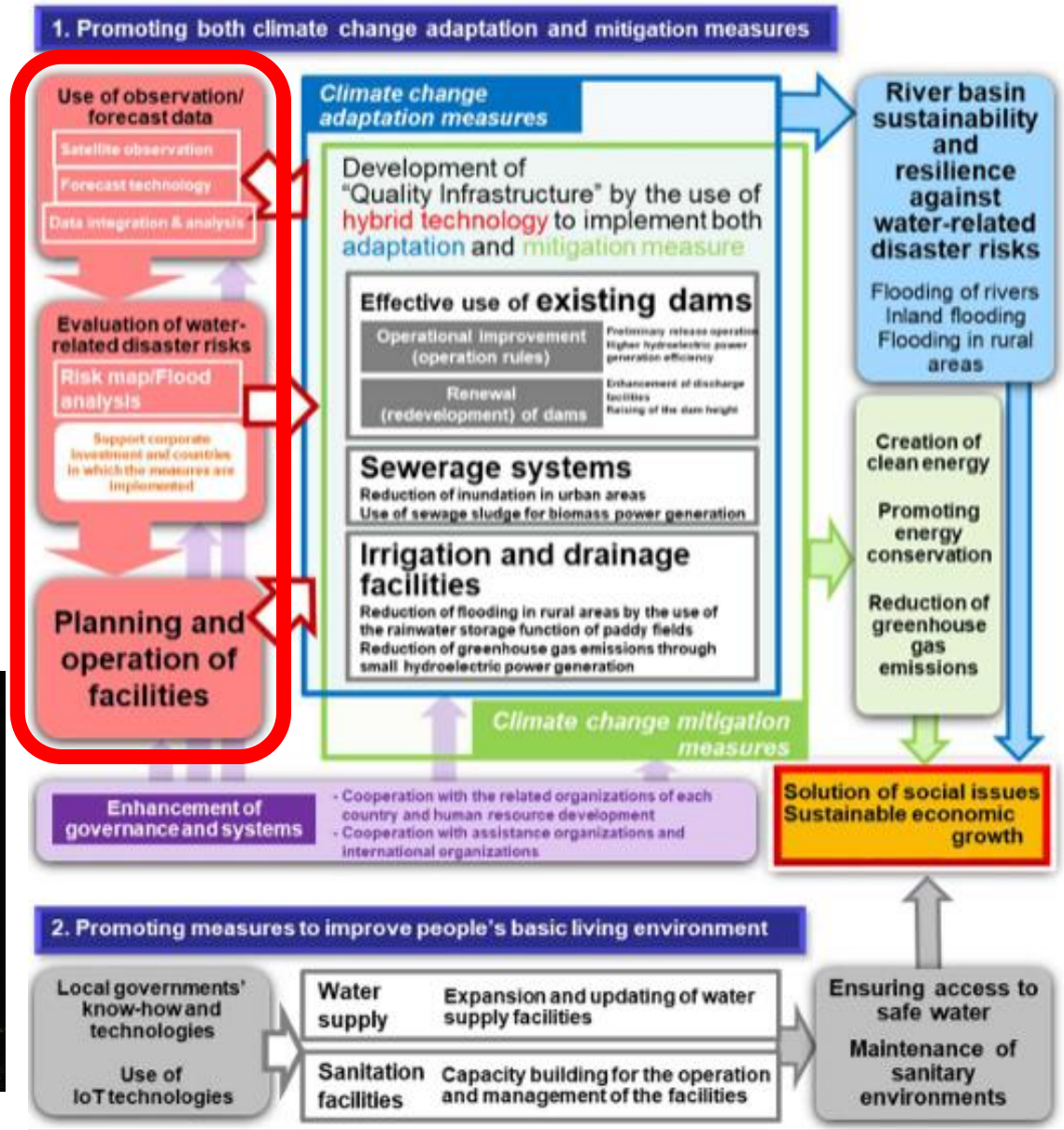
Kumamoto Initiative for Water

- 4th Asia-Pacific Water Summit (APWS) in Kumamoto, Japan, April 23-24, 2022
  - JAXA hosted an official side event “Space Technologies for addressing Water Issues”
- Japanese’s Prime Minister Kishida announced the "Kumamoto Water Initiative" as Japan's contribution to water issues.
  - 1 (2). Contribution to fill gaps of observation data
    → *Himawari, ALOS-2, GPM*
  - Kumamoto Initiative for Water Reference Materials

→ GSMaP



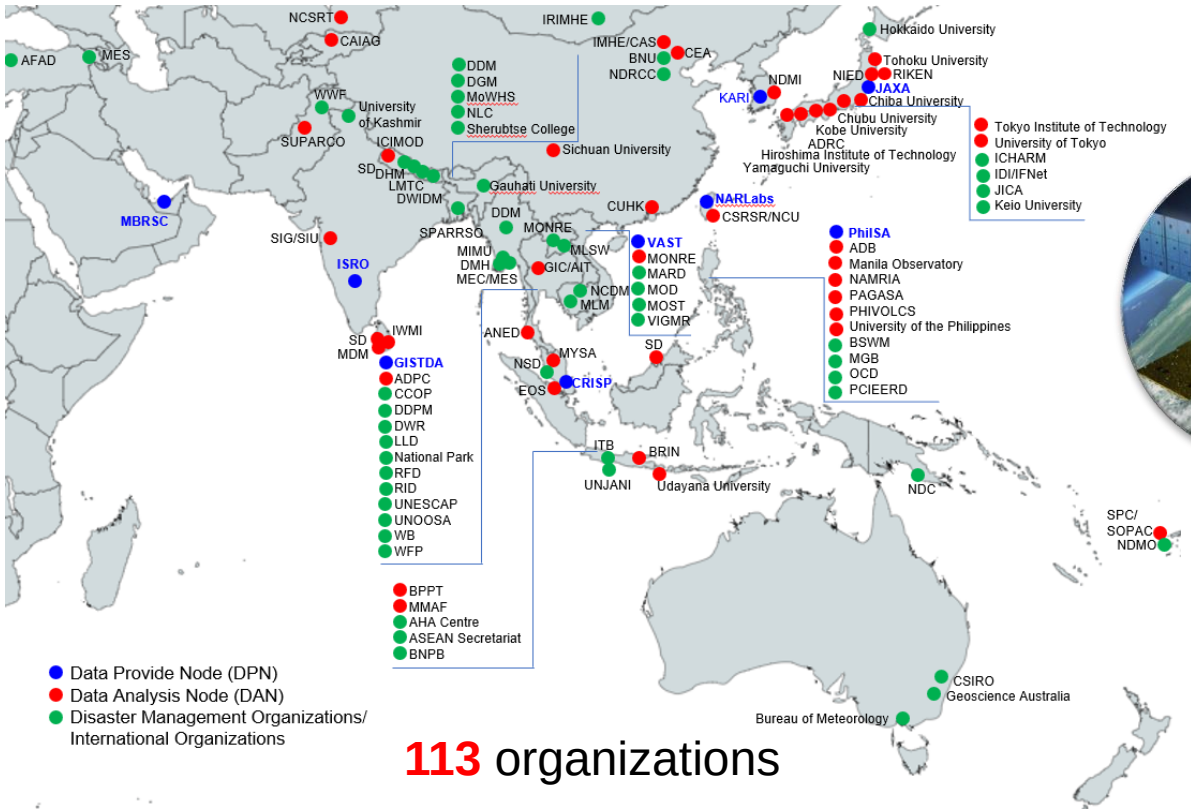
https://www.mlit.go.jp/mizukokudo/mizsei/mizukokudo_mizsei_fr2_000034.html



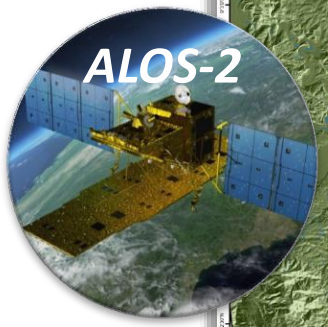
https://www.mlit.go.jp/mizukokudo/mizsei/content/001479358.pdf

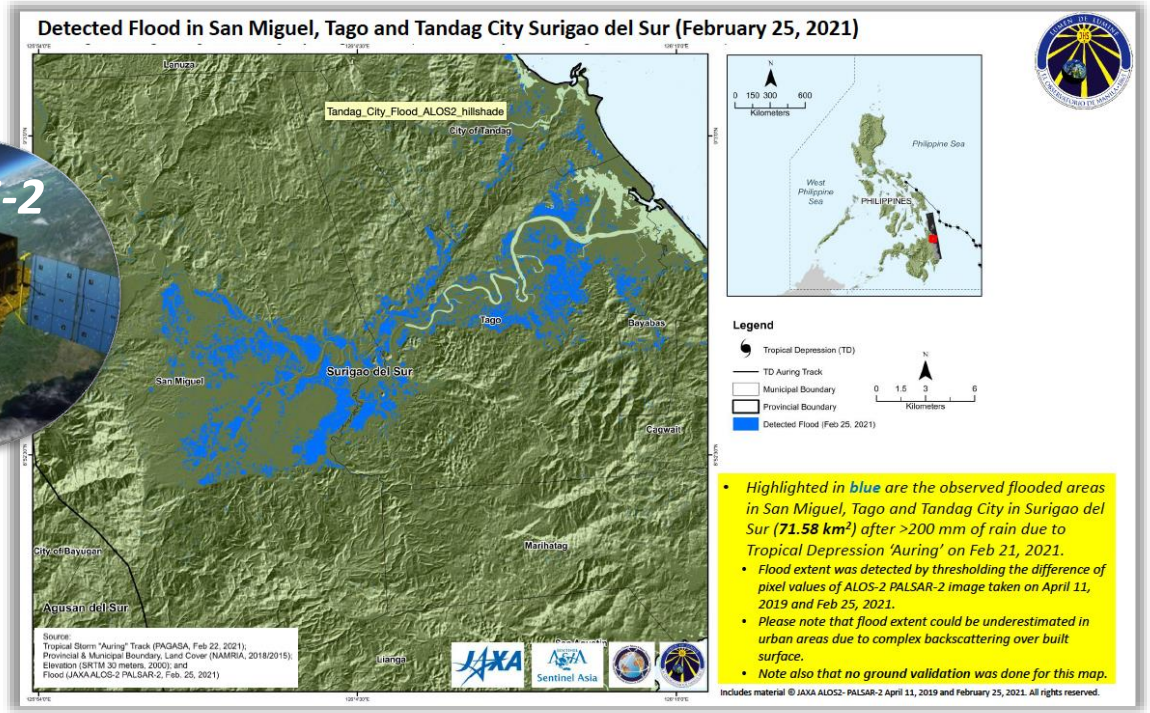
Space-based international Cooperation

- Sentinel Asia is an initiative aiming space-based international cooperation for disaster management in the Asia-Pacific region
- In February 2006, Sentinel Asia was established in accordance with the recommendation at APRSAF-12 in October 2005
- Sentinel Asia is expected to implement not only emergency observation but activities covering entire disaster management cycle including mitigation/preparedness and recovery phase after a disaster



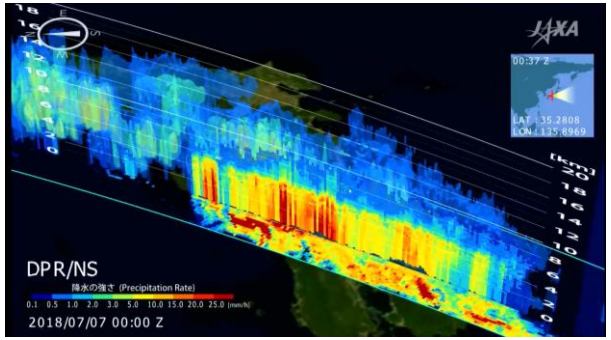
113 organizations



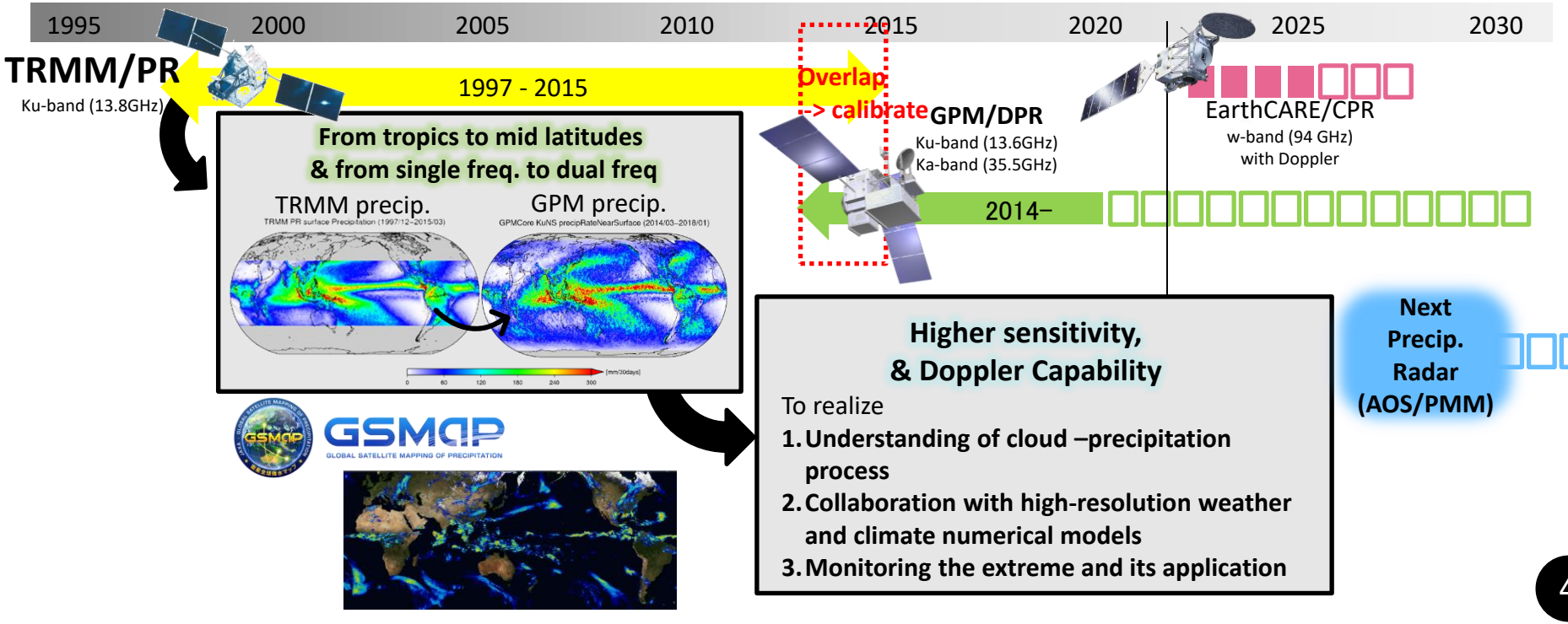


Spaceborne precipitation radar by JAXA

- Spaceborne precipitation radar can provide unique information such as 3-D precipitation measurement. JAXA has large heritage of the spaceborne precipitation radars in the Japan-US (NASA) missions, i.e., TRMM and GPM, and the data record of spaceborne precipitation radars is more than 20 years.
- JAXA is planning the Precipitation Measuring Mission (PMM) for the Spacecraft carrying the Ku-band Doppler Precipitation Radar targeting the launch of JFY2028 (April 2028 to March 2029), with participation of NASA's AOS constellation.



GPM/DPR 3D precipitation on 00UTC 7th July 2018: heavy rainfall in July 2018, causing serious damage in western part of Japan.



Spaceborne passive microwave radiometer by JAXA

- Spaceborne passive microwave radiometer (PMW) has big advantages in observation of water-related parameters inside clouds or in sea and land surface through clouds, and the PMW has been used in precipitation retrievals.
- JAXA has developed and operated a series of passive microwave imager, called the Advanced Microwave Scanning Radiometer (AMSR) series. The AMSR series has a ~2m diameter size real aperture antenna that enables observation with high-spatial resolution among the previous passive microwave imagers.

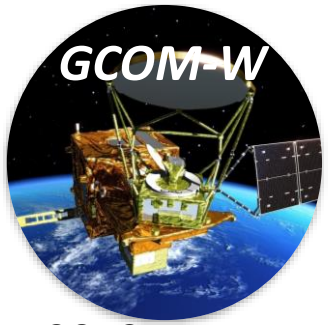
1987

MSR

2002-2011

AMSR

AMSR-E



2012-present

Succeed AMSR-E observation

AMSR2

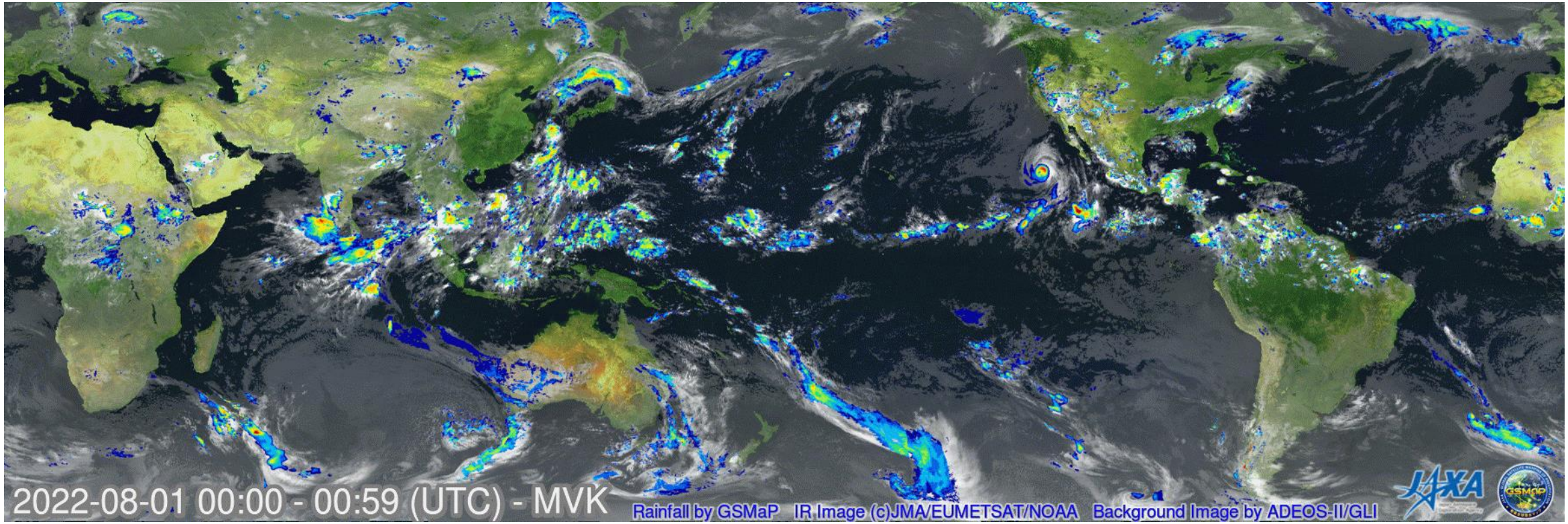
JFY2024

Continue & improve AMSR-E/AMSR2 observation

AMSR3

Global Satellite Mapping of Precipitation (GSMaP)

- **Global Satellite Mapping of Precipitation (GSMaP)** is the Japanese precipitation product, and Graphical User Interface of the "JAXA Global Rainfall Watch" website (https://sharaku.eorc.jaxa.jp/GSMaP/index.htm) is available based upon the GSMaP product.
  - GSMaP is a blended Microwave-IR product and has been developed in Japan for the GPM mission (Kubota et al. 2020).

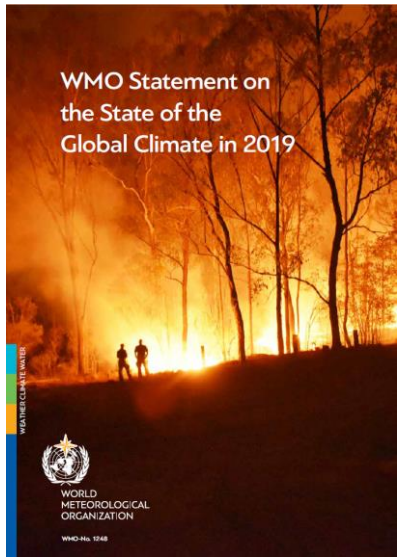


Space- based Weather and Climate Extremes Monitoring

- JAXA attends WMO Space-based Weather and Climate Extremes Monitoring (SWCEM) project and provide the GSMaP product with about 22yr-climate data to National Meteorological and Hydrological Service in Asia and Pacific regions.

https://public.wmo.int/en/programmes/wmo-space-programme/swcem

Eleventh ASEAN Climate Outlook Forum and WMO SEMDP Workshop & Steering Group Meeting
29 October - 2 November 2018
Kuala Lumpur, Malaysia

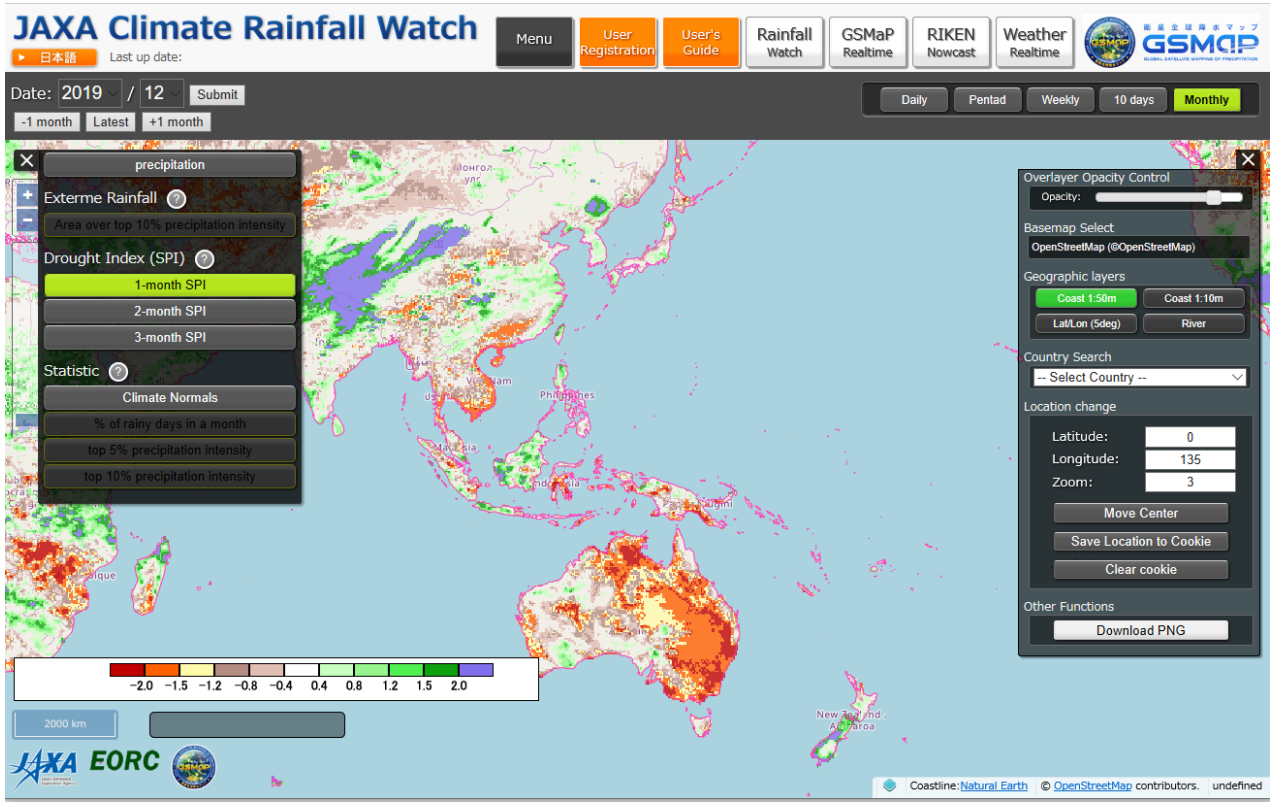


Based upon results of this WMO project, results including JAXA GSMaP were described in the 2019 Australia drought article of the WMO Statement on the State of the Global Climate 2019.

WMO Secretary-General Petteri Taalas at UN headquarters in New York (11th Mar. 2020)

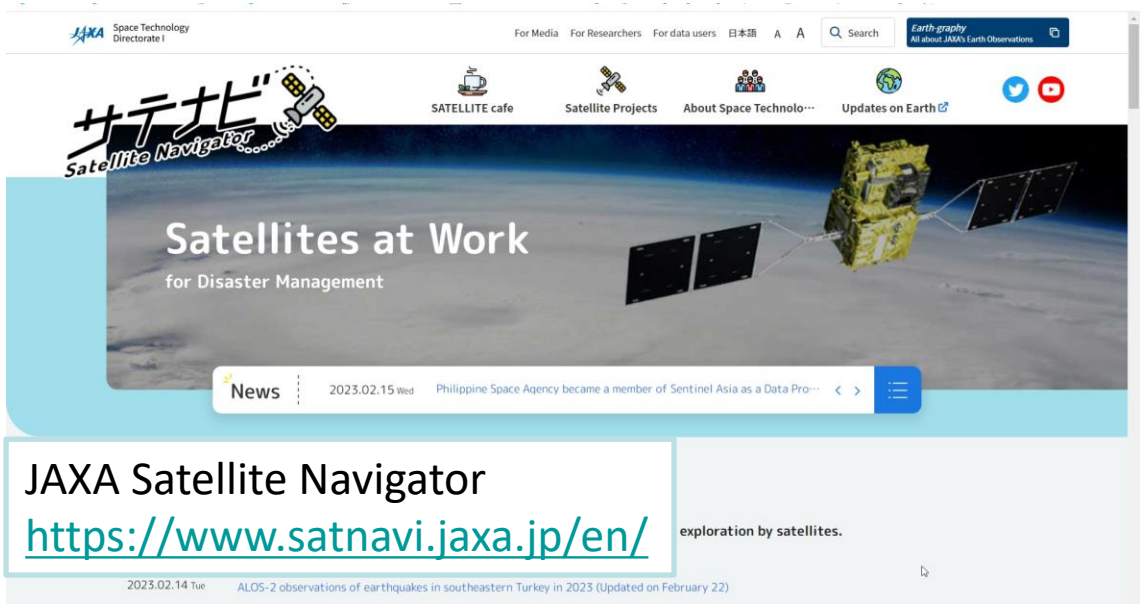
https://public.wmo.int/en/media/news/state-of-climate-report-released-un-and-wmo-chiefs

Based upon experiences in the WMO SWCEM, the JAXA has operated our homepage "JAXA Climate Rainfall Watch" since Mar. 2020, which shows the heavy rainfall/drought indices with the GUI.

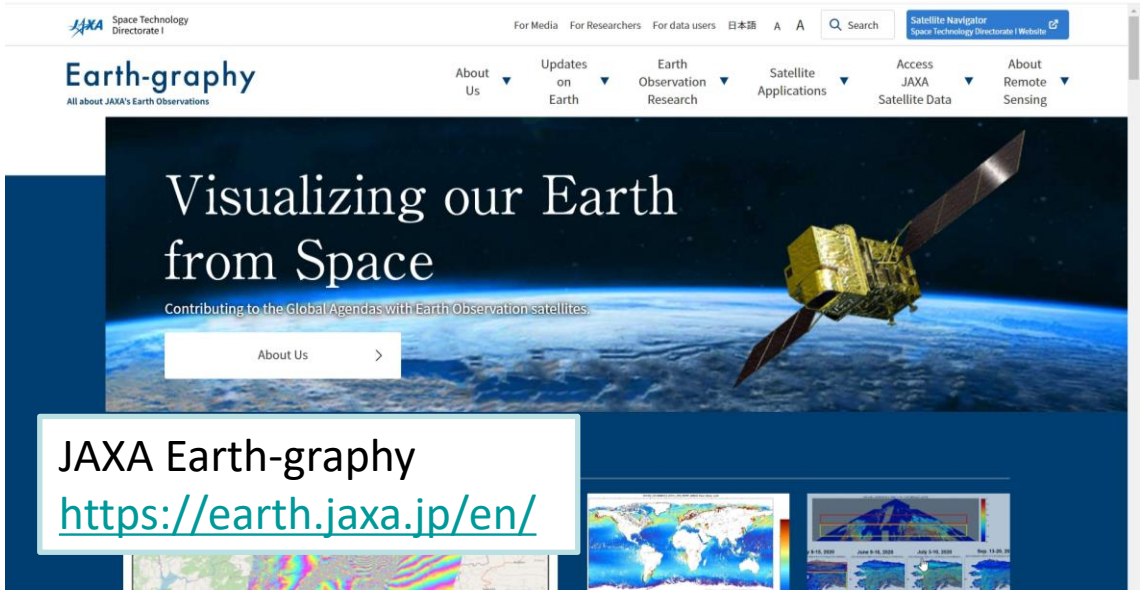


https://sharaku.eorc.jaxa.jp/GSMaP_CLM/index.htm

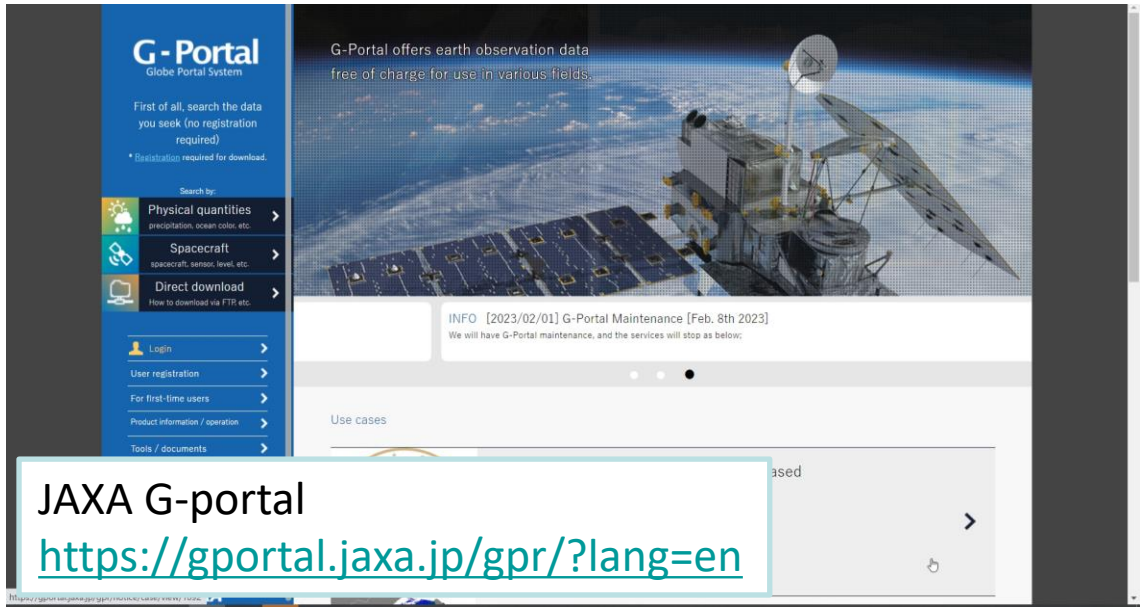
How can users get information? (how to distribute?)



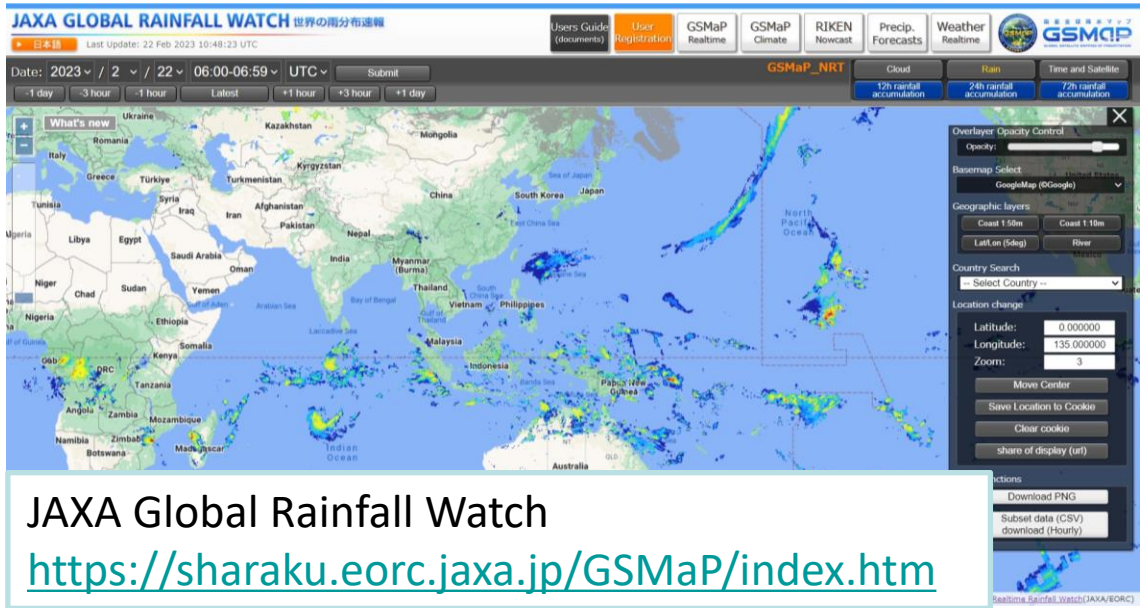
JAXA Satellite Navigator
https://www.satnavi.jaxa.jp/en/



JAXA Earth-graphy
https://earth.jaxa.jp/en/



JAXA G-portal
https://gportal.jaxa.jp/gpr/?lang=en



JAXA Global Rainfall Watch
https://sharaku.eorc.jaxa.jp/GSMaP/index.htm

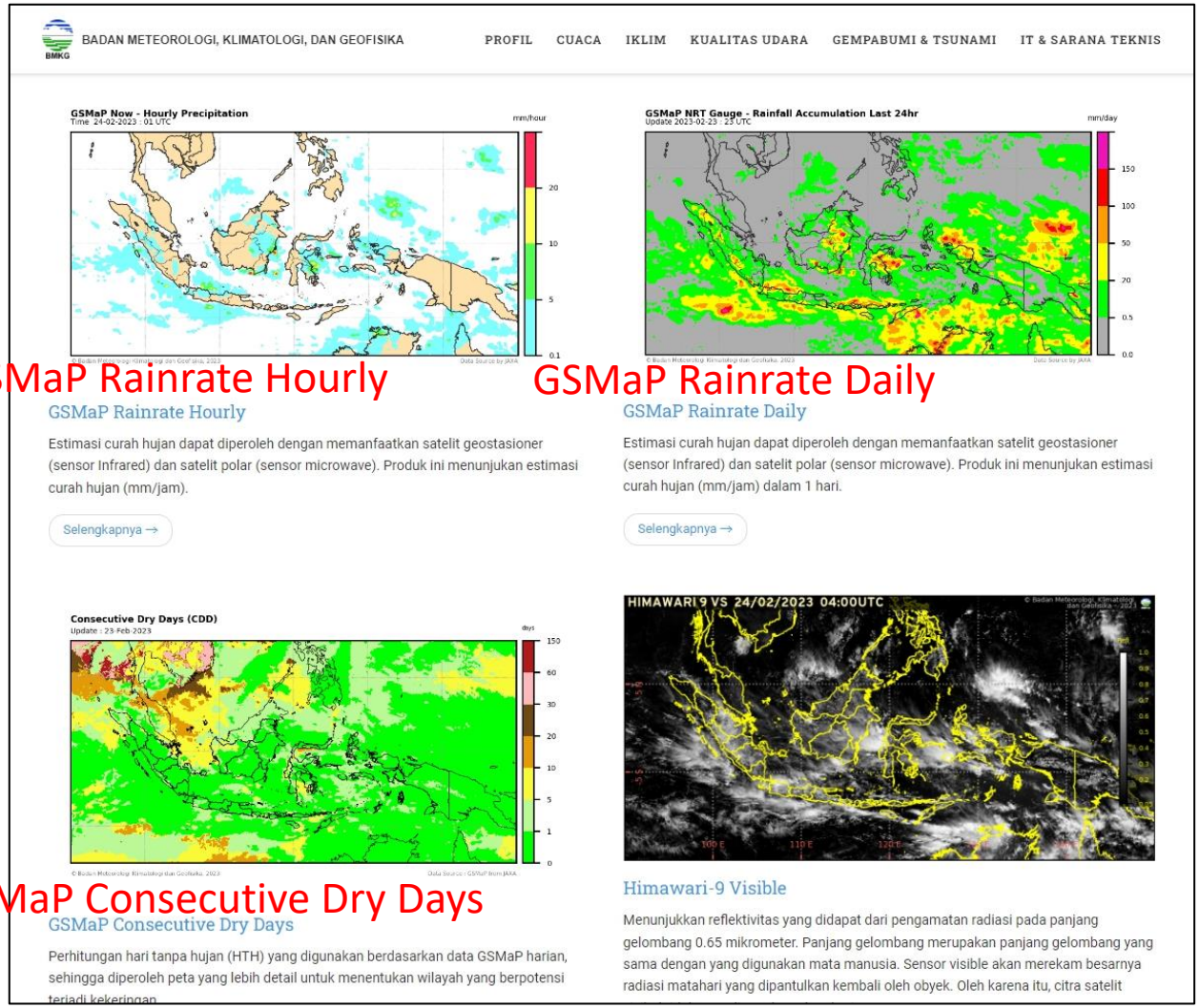
What kind of tools (website, toolkit etc.) are available?

https://www.youtube.com/watch?v=0JanK-fZMt4

What is benefit of users in the Indo-Pacific region?

- **BMKG, Indonesia**, obtains GSMaP data in binary files and displayed as an image for Indonesia region.
- GSMaP are used for analysis of hourly and daily rainfall accumulation to verify weather forecast. It has been also used for hydro-meteorological hazards analysis.
- To support operational weather forecasts and warnings, development of GSMaP derived products has been extended for other purposes such as MJO (Madden Julian Oscillation) onset and propagation, Drought and Forest Fire Potential Monitoring

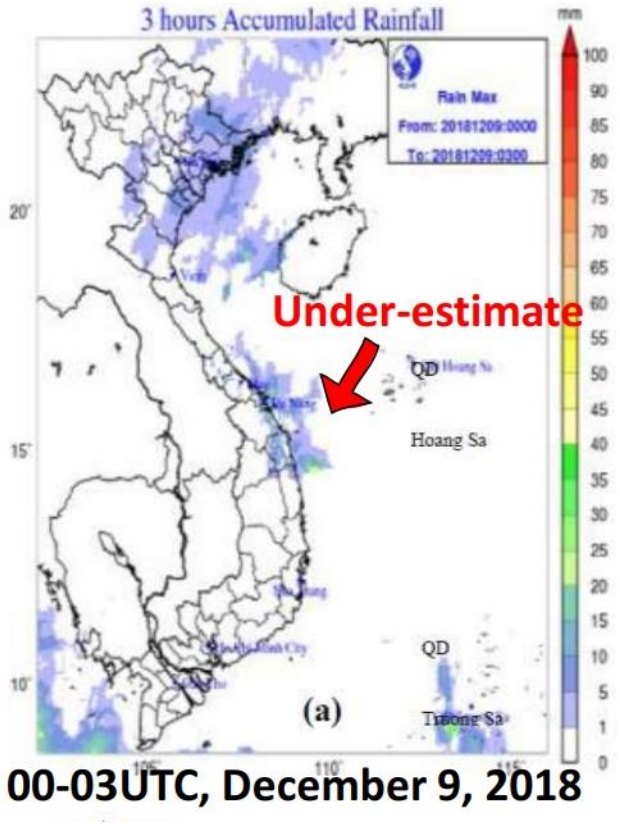
BMKG homepage
(https://www.bmkg.go.id/satelit/)



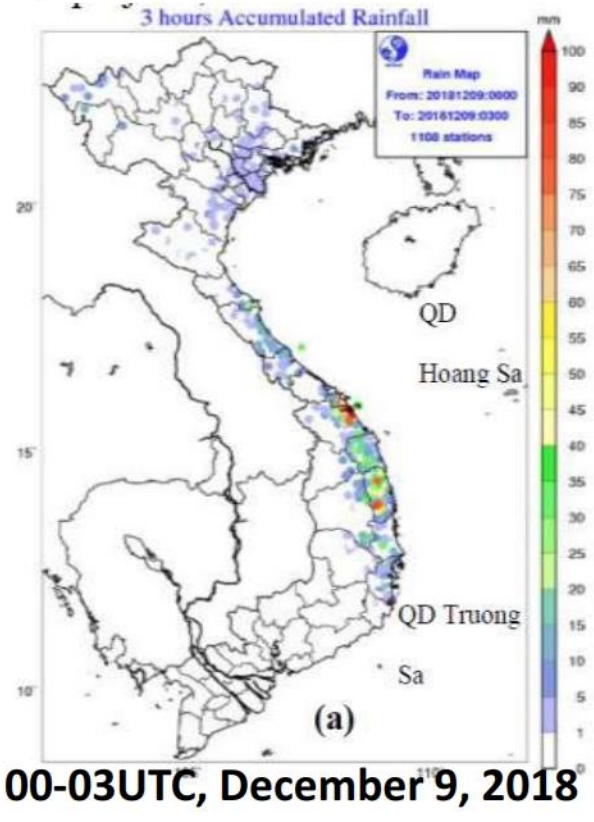
What is benefit of users in the Indo-Pacific region?

- VietNam Meteorological and Hydrological Administration (VNMHA) uses GSMaP data for quantitative precipitation estimation (QPE), leading to improve the under-estimation.

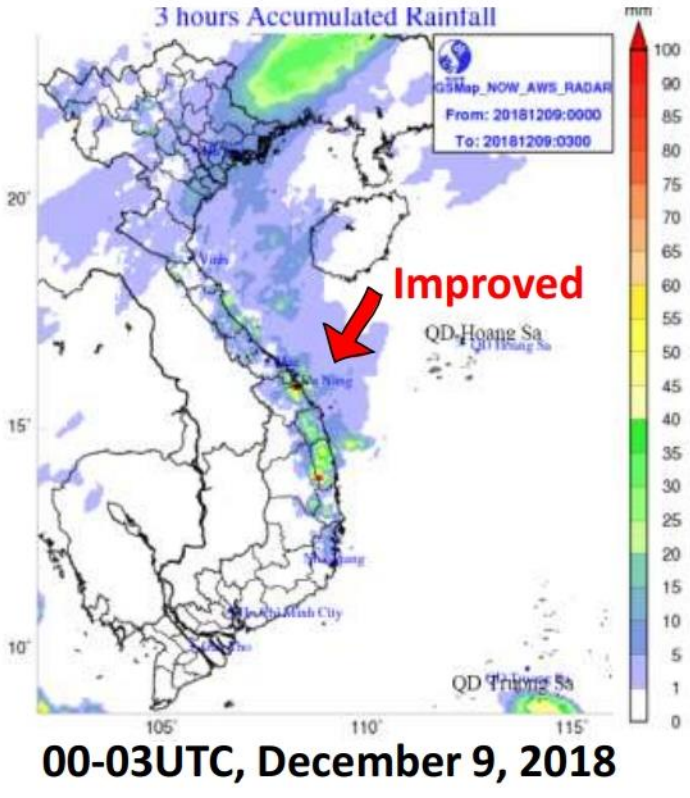
Precipitation analysis by VNMHA



RainGauge precipitation by automated weather stations



Modified precipitation analysis using AWS and radars with GSMaP data



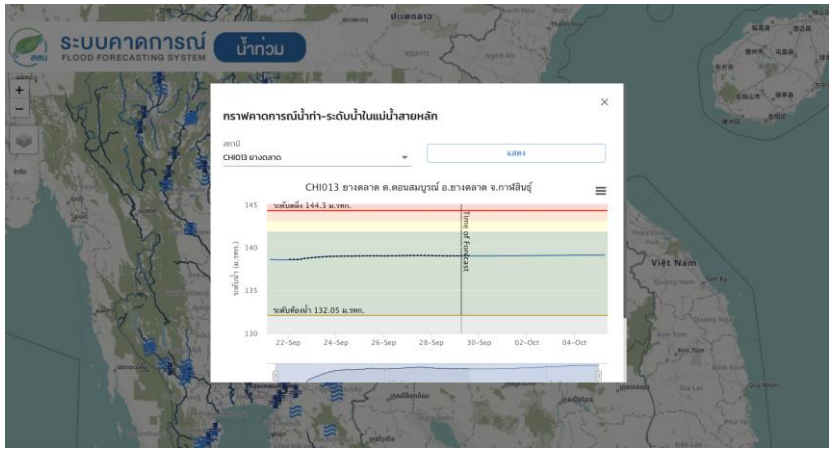
Saito et al. 2020, Heavy rainfall in central Viet Nam in December 2018 and modification of precipitation analysis at VNMHA. VN. J. Hydrometeorol., https://doi.org/10.36335/VNJHM.2020(5).65-79

What is benefit of users in the Indo-Pacific region?

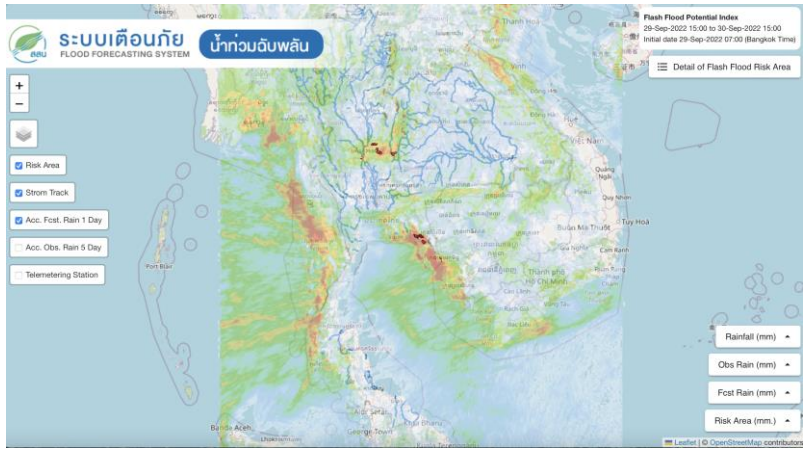
- Since January 2017, **Hydro-Informatics Institute (HII), Thailand** has developed methods to use GSMaP products as input in their flood forecasting system (Chi and Mun river basins) to simulate more realistic runoff and generate areal rainfall for early warning monitoring system.
- In 2019, GSMaP-NOW data are used as input for flash flood potential index calculation and rainfall monitoring system. HII's applications from GSMaP products are used by stakeholders and water related agencies to support water resource management and flood early warning in Thailand.

https://www.thaiwater.net/weather/rainfall
https://www.thaiwater.net/floodforecast
https://www.thaiwater.net/FlashFlood
http://live1.hii.or.th/product/latest/rain/gsmap_now/gsmap.html

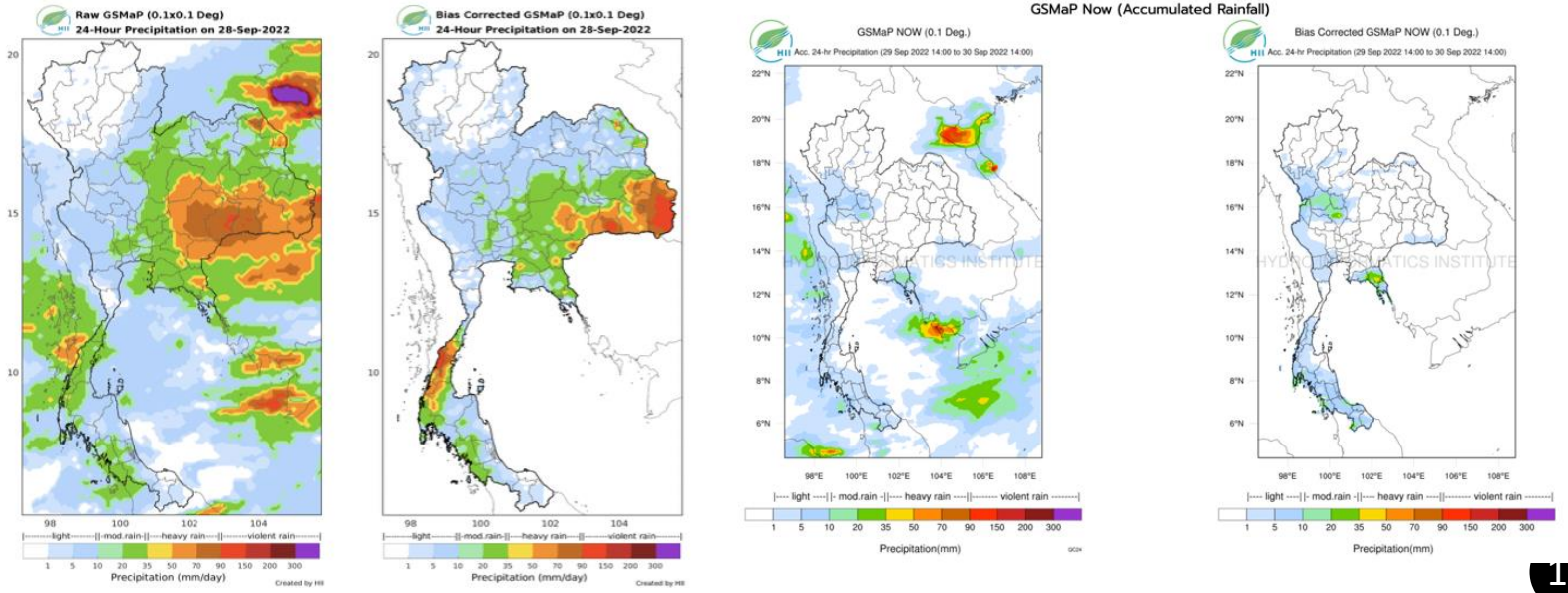
Satellite Rainfall for Flood Forecasting System



GSMaP-NOW for Flash Flood Potential Index



Rainfall Monitoring System

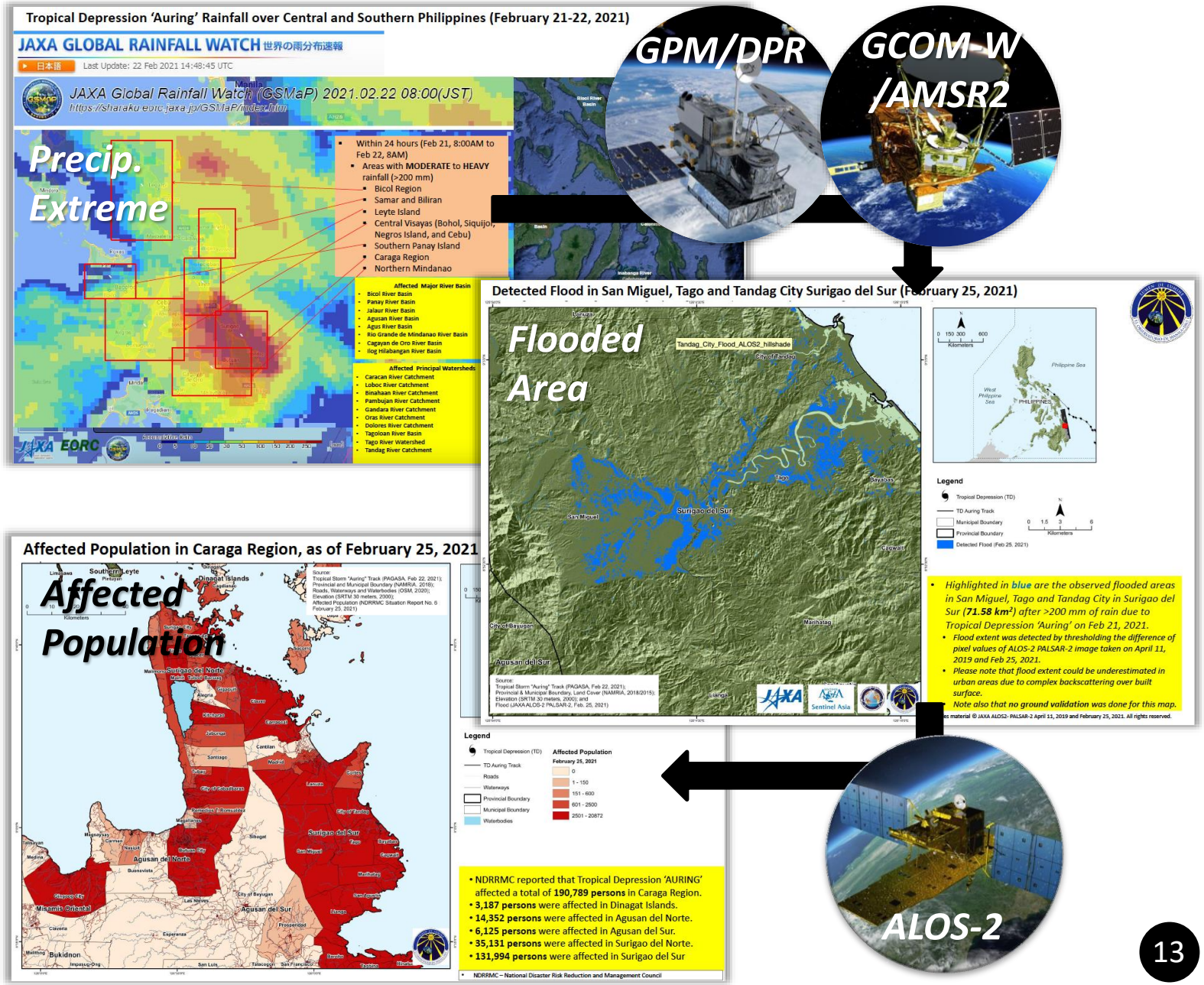


What is benefit of users in the Indo-Pacific region?

Case Study: TD Auring, 2021

- This is a case study in which the **accumulated precipitation by GSMaP was monitored before the disaster**, and **emergency observations by ALOS-2** (land remote sensing) **were made after the disaster** occurred to understand the damage situation.
- **Based on the observation, the Manila Observatory visualized the impacts of the TD** in the Eastern Visayasand Caraga Region in terms of affected population as well as flooded infrastructure and land cover.
- These results were shared with the Philippines National Disaster Risk Reduction and Management Council (NDRRMC) and local government.

https://www.observatory.ph/2021/03/08/mapping-the-impacts-of-tropical-depression-dujuanauring-in-the-eastern-visayasand-caragaregion/



Any opportunities for training to use these information or tools?

Global Precipitation Mission (GPM) Asia-Oceania Workshop

- We held the GPM Asia workshop in TMD, Thailand (Jan 2017) & BMKG, Indonesia (Jan 2018).
- The 8th GPM Asia-Oceania Workshop was planned in the PAGASA, Philippines. Although it was postponed due to the COVID-19 pandemic, we will hold it in future.

International Precipitation Working Group (IPWG) of the Coordination Group for Meteorological Satellites (CGMS)

- Training lectures are held during the IPWG meetings.
- **The next IPWG meeting is planned at Tokyo, Japan in 2024.**

Future plans:
Virtual training systems

Please enjoy the coming training session in Day-3 of this workshop!