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# JAXA Satellite Missions Addressing Water Issues

APWF Side Event for the Asia Water Forum 2022,  
Pathways for quality-oriented growth through a resilient  
and water-secure Asia and the Pacific,  
August 8, 2022

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# Water related disasters in Asia Pacific Region / Earth Observation Satellite

Average annual deaths per 100,000 population

Country or Region	Number of annual deaths per 100,000 population	Rank
		World
Philippines	1.217	10
Thailand	0.180	44
India	0.133	58
Japan	0.090	70
U.S.A.	0.080	76
Indonesia	0.059	85
Korea	0.057	86
China	0.047	92
Taiwan	0.025	117
Italia	0.020	123
France	0.019	124
Germany	0.005	152
U.K.	0.005	154
Canada	0.004	156
Netherlands	0.003	160

Courtesy of Japan Society of Civil Engineers

Advantages of Earth Observation Satellite



- Wide Coverage
- Globally Consistent
- Borderless
- Not affected by disasters





**Completed**

**MOS-1/MOS-1b**  
1987-1990/1995-1996

**JERS-1**  
1992-1998

**ADEOS 1996-1997**  
**ADEOS-II 2002-2003**

**TRMM/PR**  
1997-2015

**ALOS**  
2006-2011

**Aqua/AMSR-E**  
2002-2015

**In Operation**

**GOSAT**  
MOE/JAXA/NIES  
2009-

**GCOM-W**  
2012-

**GPM/DPR**  
2014-

**ALOS-2**  
2014-

**GCOM-C**  
2017-

**GOSAT-2**  
MOE/JAXA/NIES  
2018-

**To be Launched**

**ALOS-3**  
2022-

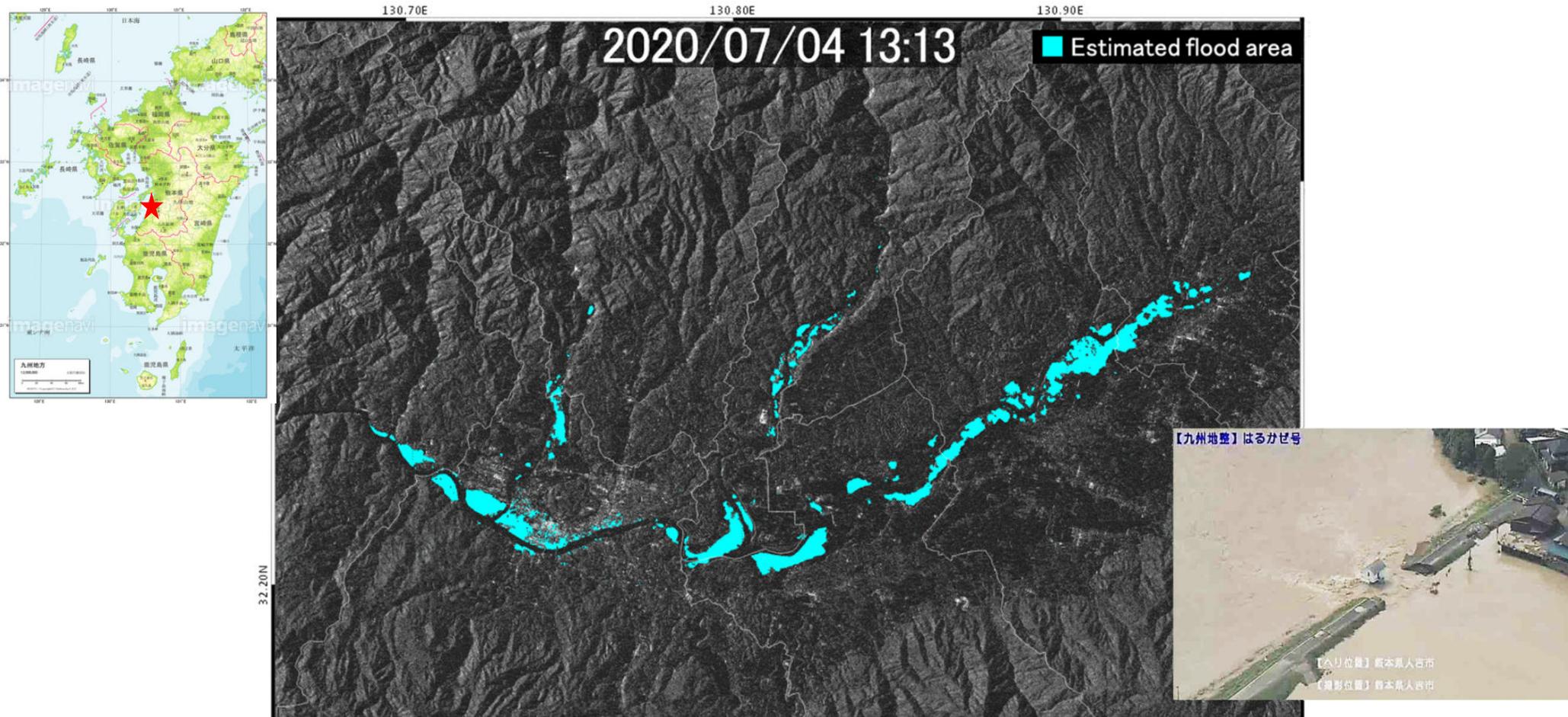
**ALOS-4**  
2022-2023

**EarthCARE**  
esa  
2023-2024

**GOSAT-GW**  
MOE/JAXA/NIES  
2023-2024



# Contribution to Disaster Management: “DAICHI-2” (ALOS-2) observation



Inundated area around the Kuma river (July 2020)

Photo by Ministry of Land, Infrastructure, Transport and Tourism, Kyusyu Regional Development Bureau

# GSMaP and Short-term and Long-term Applications

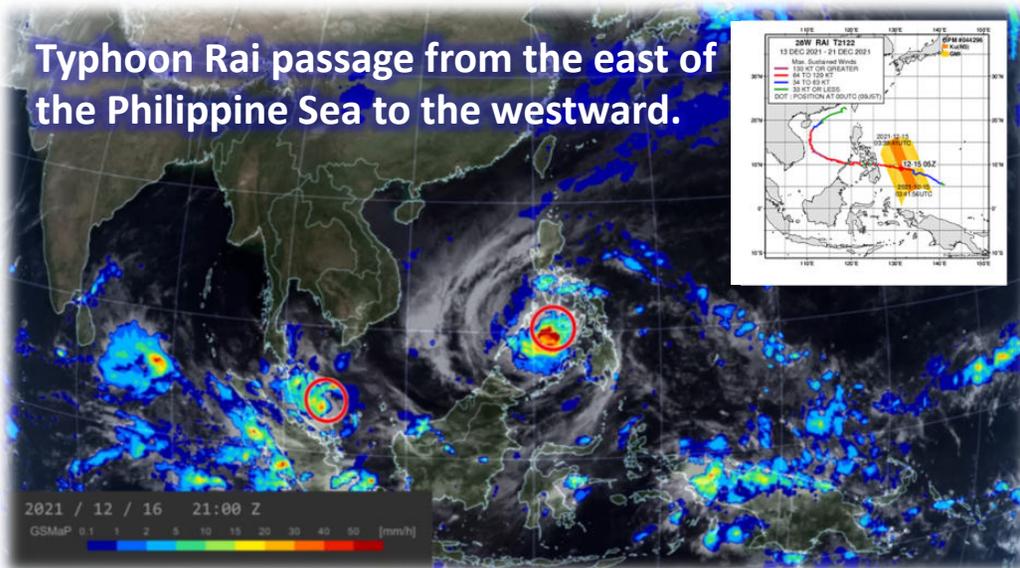


## Global Satellite Mapping of Precipitation (GSMaP)

- Space-based global rainfall map
- 11 x 11km spatial resolution
- Hourly rainfall data for 22 years (since 2000)



Typhoon Rai passage from the east of the Philippine Sea to the westward.



Precipitation from December 13 to 20, 2021 based on GSMaP

- Cyclone/Heavy rainfall monitoring as supplement to ground-based observations
- GSMaP utilization trainings for Asia pacific regions



- Drought monitoring by JAXA Climate Rainfall Watch  
[https://sharaku.eorc.jaxa.jp/GSMaP\\_CLM/](https://sharaku.eorc.jaxa.jp/GSMaP_CLM/)

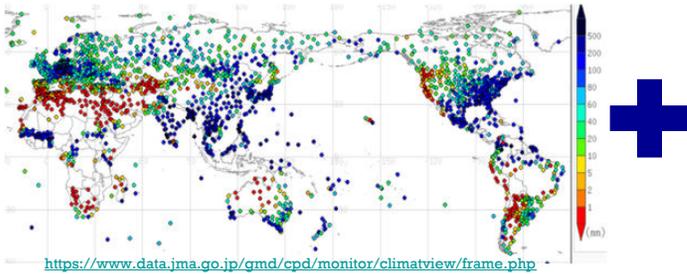


- Contribution to the WMO's Space-based Weather and Climate Extremes Monitoring (SWCEM)  
<https://public.wmo.int/en/programmes/wmo-space-programme/swcem>
- Agro-met monitoring by JAXA's Satellite based Monitoring Network system for FAO AMIS Market Monitor (JASMIN)  
<https://suzaku.eorc.jaxa.jp/JASMIN/index.html>

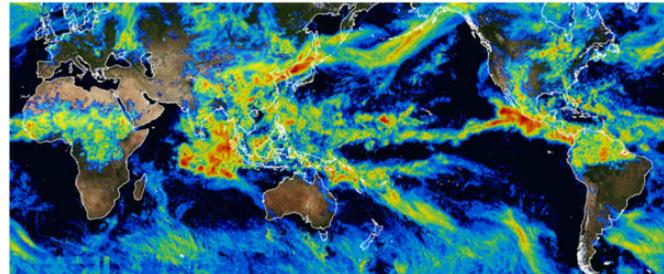
# Flood Prediction Realized by Integration of GSMaP and Ground Observations



### Ground observations



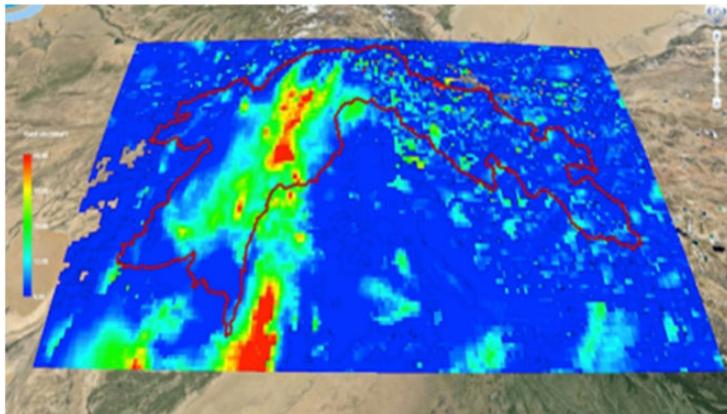
### Satellite precipitation (GSMaP)



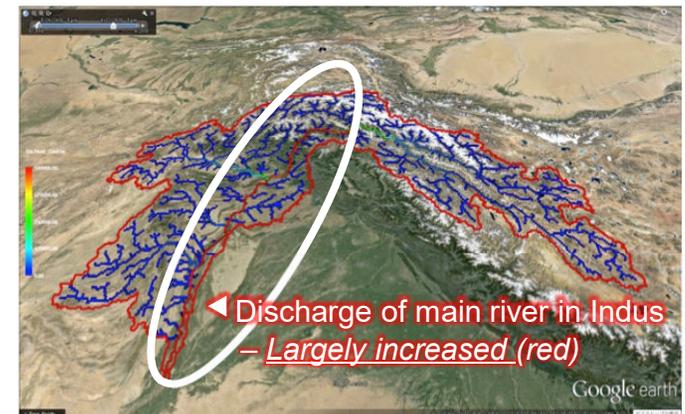
Partners



### Rainfall over the river basin during flood in Pakistan



### River discharge using GSMaP by Integrated Flood Analysis System (IFAS)



(Images provided by ICHARM)

# Global Terrestrial Hydrological Simulation System: Today's Earth



**Forcing Data Preparation:**  
Satellite obs. and JMA reanalysis/forecast data

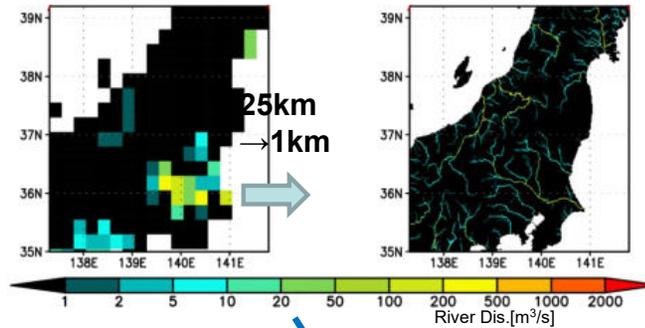
**Model Simulation:**  
LSM + River Routing Model

**Data Provision:**  
Various hydrological parameters with risk indices

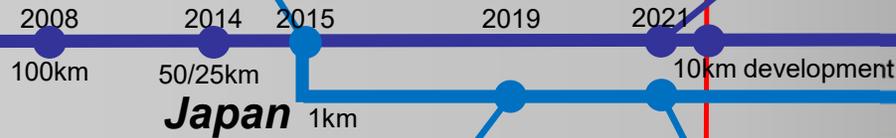
Validation

Accuracy Improvement

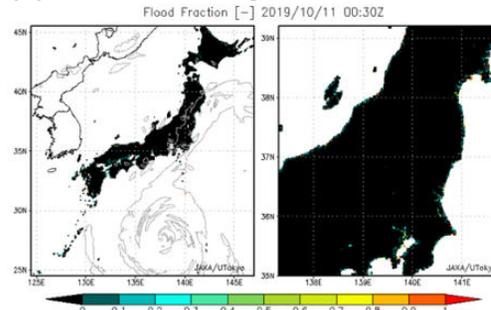
## Development of Regional ver.



Global



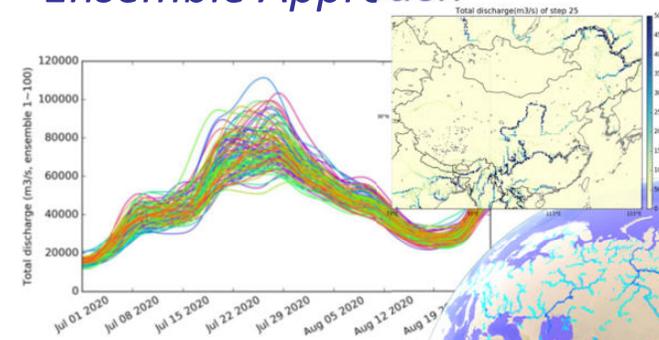
## Typhoon Hagibis Forecast



Ma et al., 2021

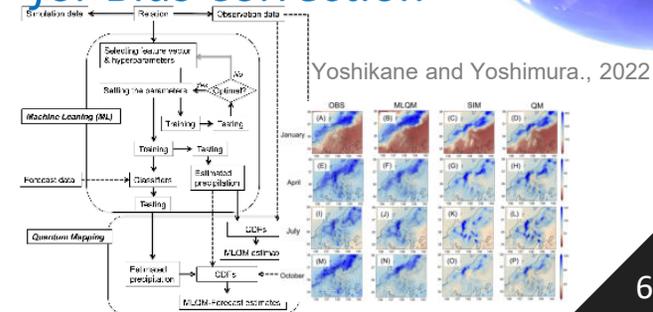
**91.6% of the flooded locations are predicted!**

## Ensemble Approach



Super High-Resolution model(1km)

## Machine Learning for Bias Correction



# Future Earth Observation Missions in JAXA



2022-

2022-2023

2023-2024

2023-2024

Future

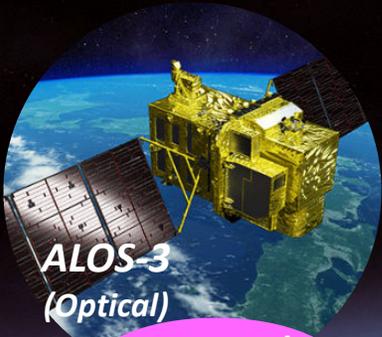
ALOS-3

ALOS-4

EarthCARE

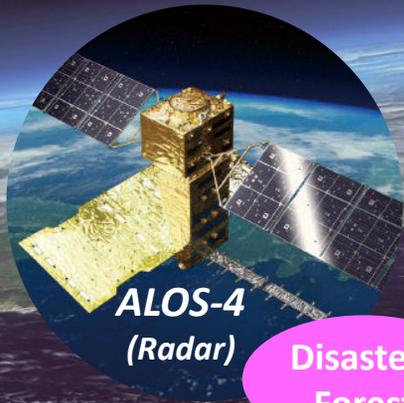
GOSAT-GW

Precipitation Measuring Mission (PMM)



ALOS-3  
(Optical)

Disaster/  
Mapping



ALOS-4  
(Radar)

Disaster/  
Forest



Cloud/Aerosol/  
Radiation Budget



(JAXA Mission)

Water  
Cycle

Greenhouse  
gases

(MOE Mission)



Convection

Precipitation

Precipitation  
/Convection

A central image of a globe showing green continents and blue oceans, partially obscured by white clouds. Several satellites with solar panels are shown in orbit around the globe, connected by glowing blue lines representing orbital paths. The background is a dark blue gradient.

*Thank you for your attention.*