



Global Precipitation Measurement (GPM): an international mission for measuring global precipitation



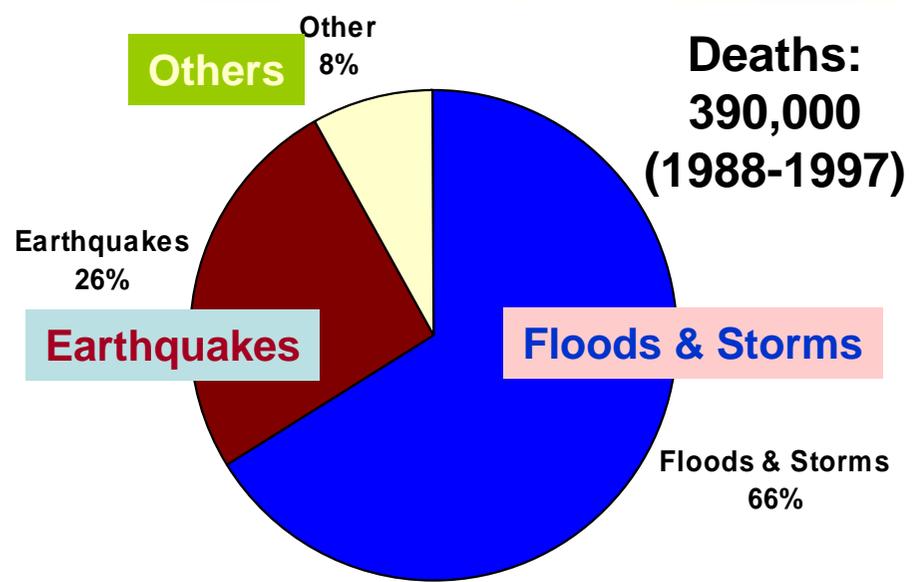
Keiji Imaoka
Japan Aerospace Exploration Agency

The 51st session of the Scientific and Technical Subcommittee of COPUOS

February 18, 2014

Vienna, Austria

Water Related Disasters: Asia



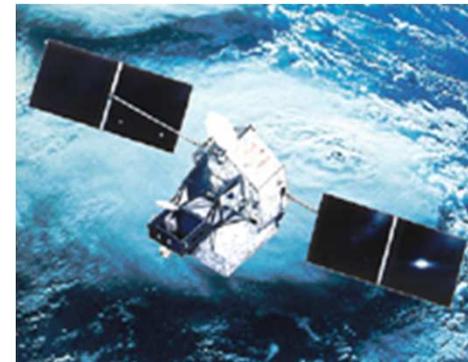
Based on World Water Council, 2000



Tropical Rainfall Measuring Mission (TRMM)



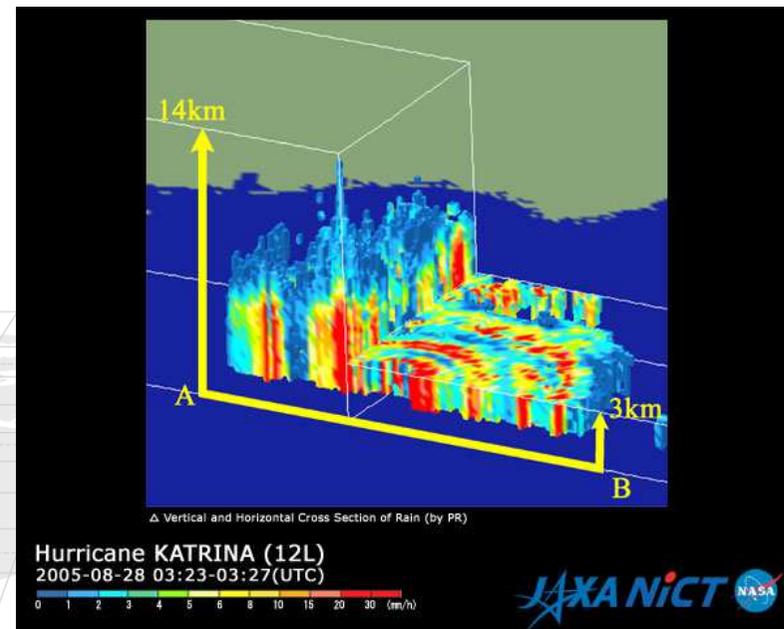
- * US-Japan joint mission to observe tropical precipitation.
- * Equipped with the first-ever spaceborne **precipitation radar (PR)** at Ku-band to perform 3-dimensional precipitation measurements.
- * Launched on Nov. 28, 1997 and has continued observations for the past 16 years.
- * GPM/DPR will provide more **accurate, high sensitivity, 3D** measurements.



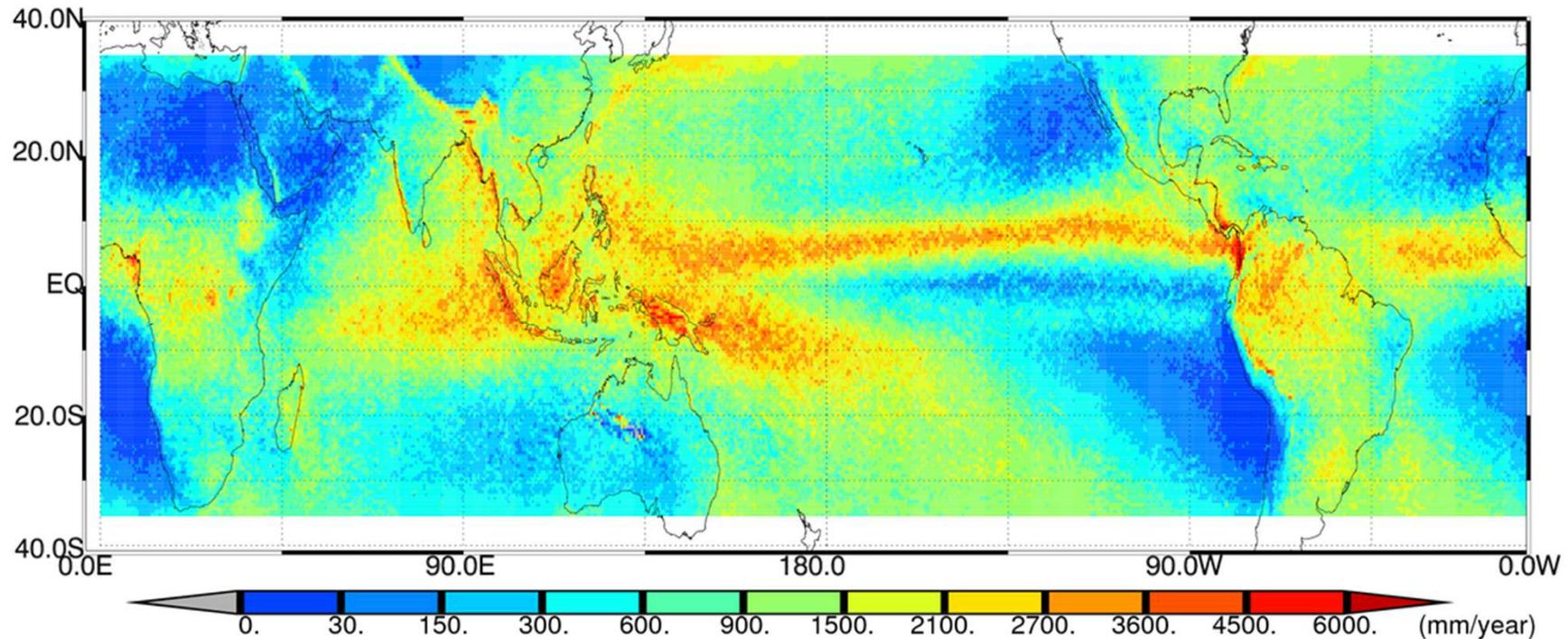
US-Japan joint mission

Japan: PR, launch

US: satellite, TMI, VIRS, CERES, LIS, operation



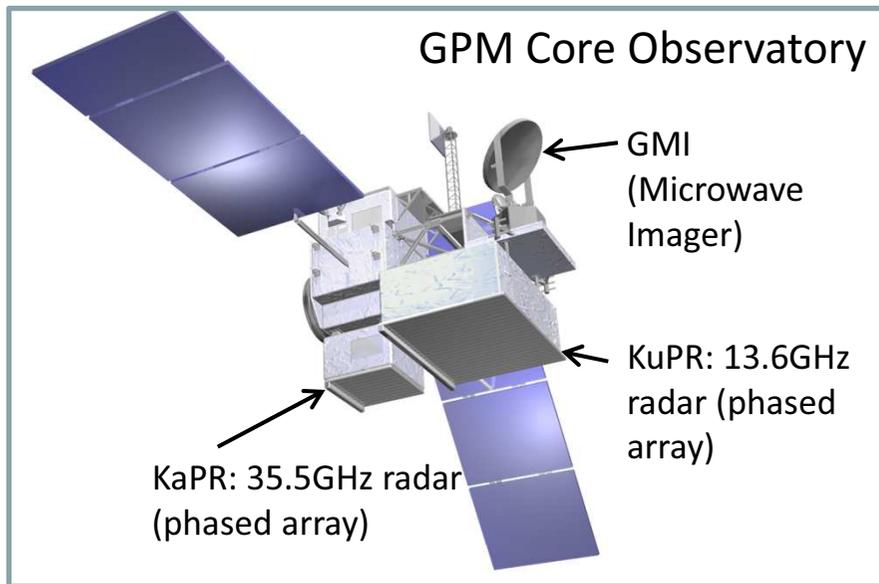
Rainfall Climatology by TRMM



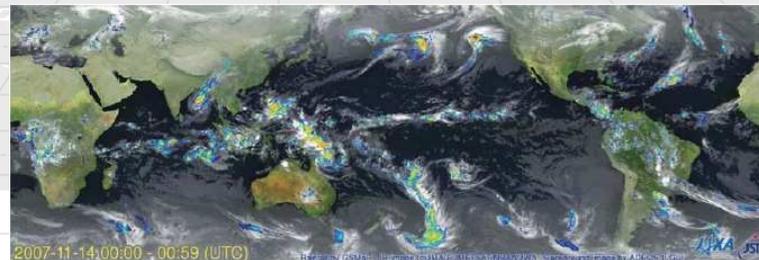
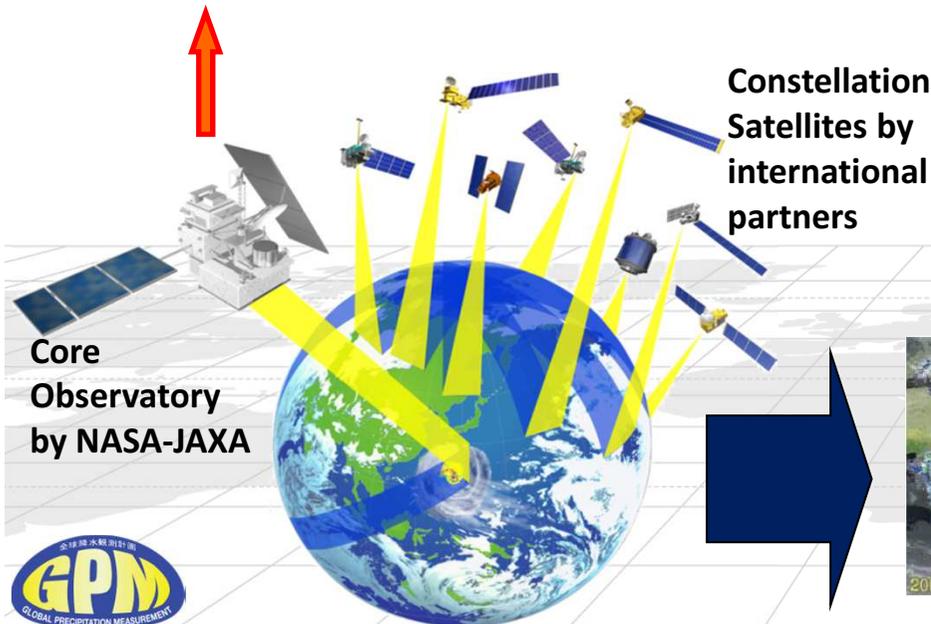
14 year-mean (from Jan. 1998 to Dec. 2011) surface rain observed by TRMM/PR



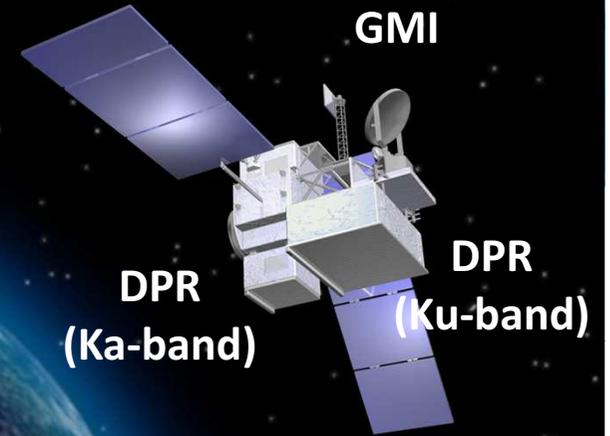
Global Precipitation Measurement (GPM)



- International mission for high accurate / frequent global precipitation observation.
 - Core Observatory: developed under NASA and JAXA equal partnership.
 - Constellation Satellites: utilization of international partners' satellites with precipitation measurement capability.
- **Dual-frequency Precipitation Radar (DPR)**
 - Developed by JAXA and National Institute of Information and Communications Technology (NICT)
 - DPR is composed of KuPR and KaPR
- GPM Core Observatory will be launched on **February 27th 2014 (UTC)**.



GPM Core Satellite



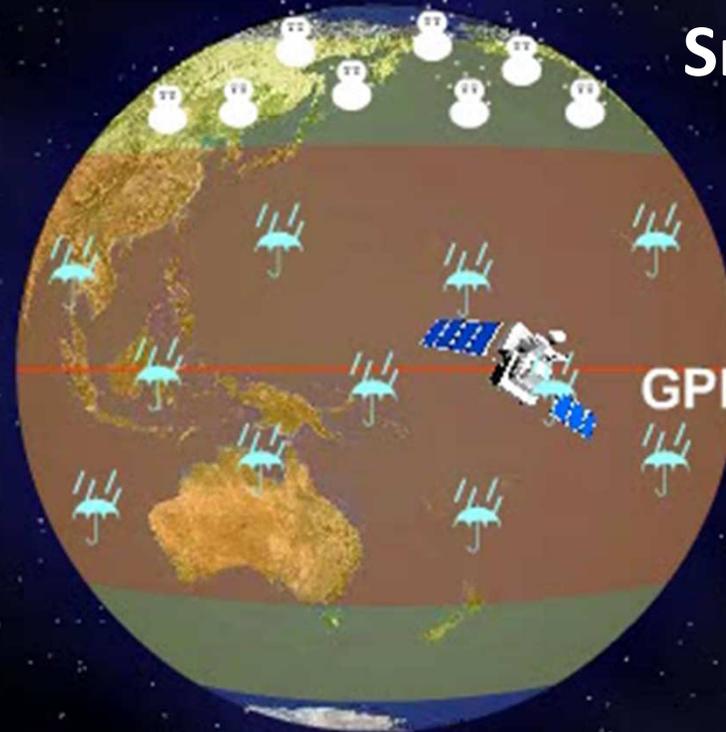
can observe rainfall by DPR (Ku and Ka) and GMI

From Tropics to Global



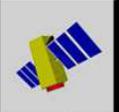
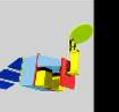
GPM TRMM

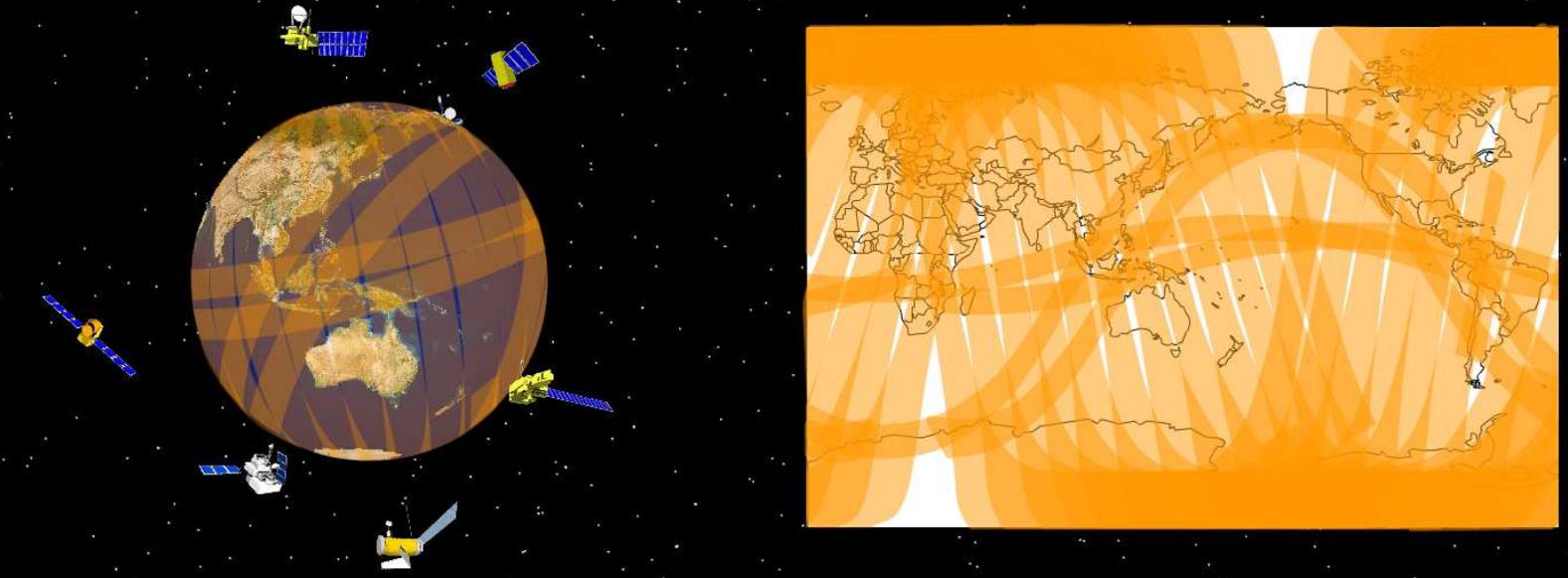
Rainfall



Snowfall

GPM主衛星

- | | | | | | | | | |
|-----|---|---|--|---|---|---|---|---|
| 衛星名 |  |  |  |  |  |  |  |  |
| 全衛星 | GPM | NOAA N19 | GCOM-W | MetOp-B | DMSF F19 | Megha-Trop | NPP | DMSF F20 |

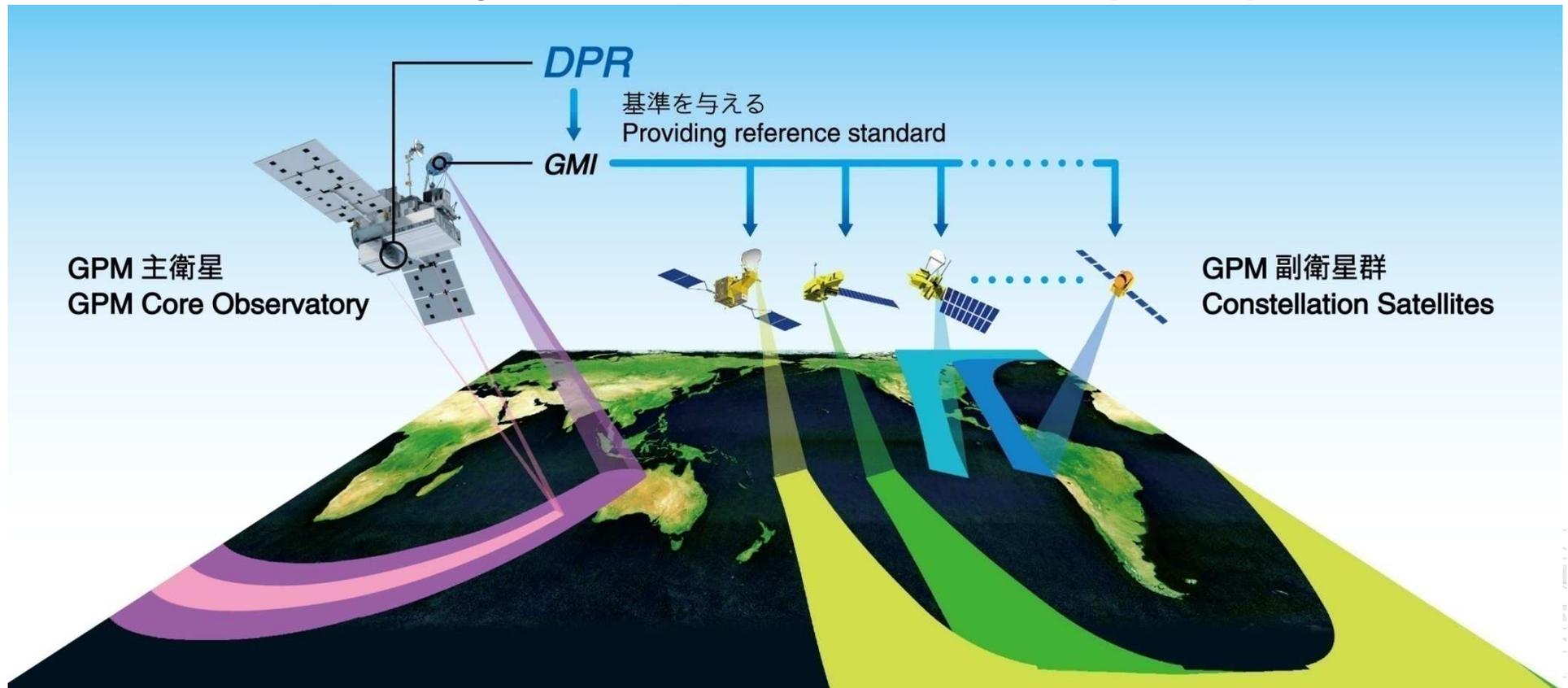


0 30 60 90 120 150 180 min

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DPR: “Reference Standard” of GPM

Accurate, High sensitivity, 3D Measurement by
Dual-frequency Precipitation Radar (DPR)



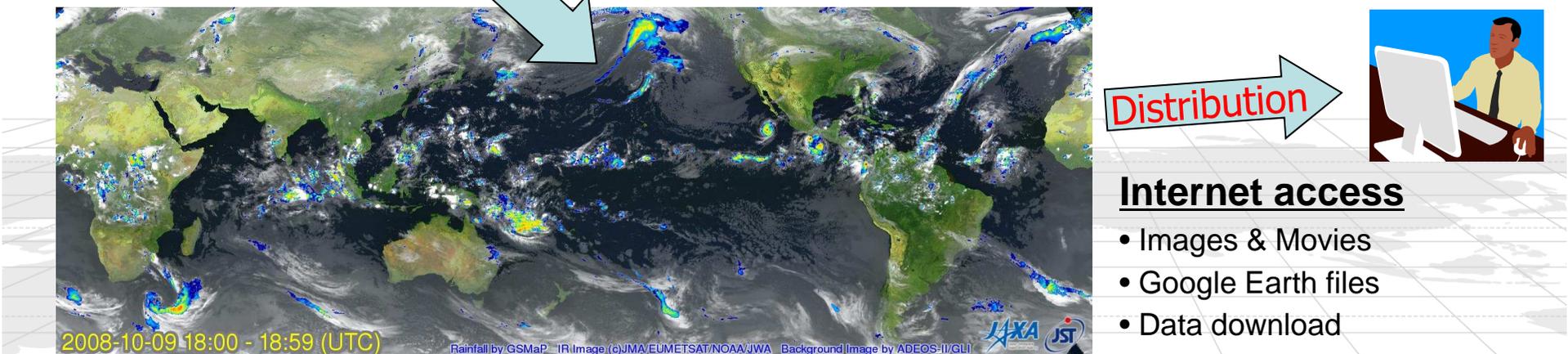
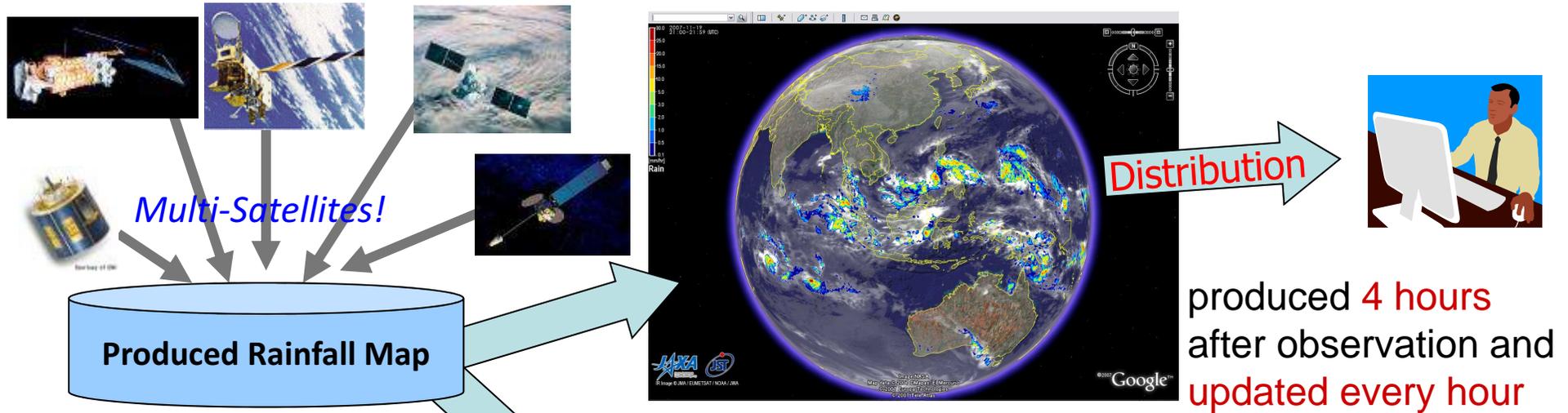
DPR will provide “**reference standard**” of worldwide satellites for the Precipitation measurement.



Global Satellite Mapping of Precipitation (GSMaP)

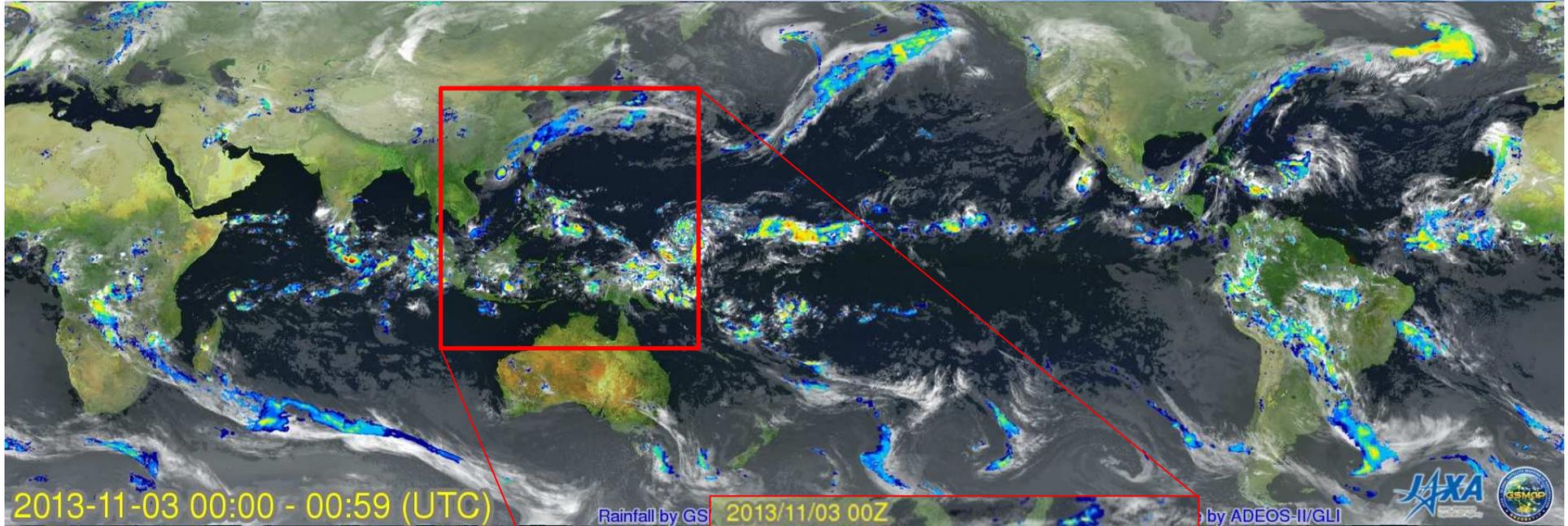


As one of GPM JAXA standard products, we have started to release hourly global rainfall data (GSMaP Product) in near real time (about **four hours** after observations).



<http://sharaku.eorc.jaxa.jp/GSMaP/>

Typhoon Haiyan observed by GSMaP



Strong typhoon Haiyan passing through the Philippines on Nov. 2013

3-hourly animation: From 00Z Nov. 3 to 06Z Nov. 9, 2013

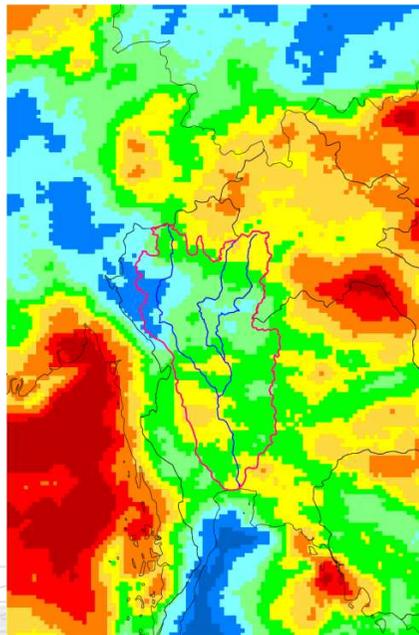


Analysis of GSMaP for Flood in Thailand in 2011



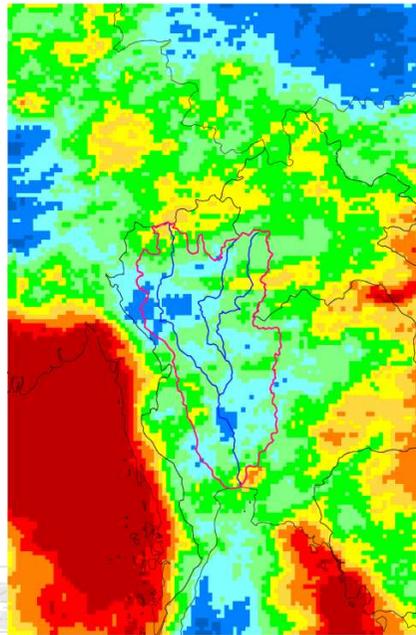
- By using satellite-monitoring data from GSMaP, 3 month's basin-average precipitation (July-September of 2008-2011) over the Chao Praya River was analyzed without using any ground-observed rainfall data.

2008



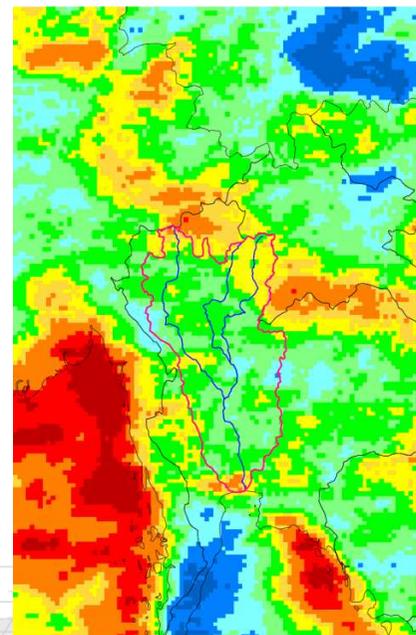
518mm

2009



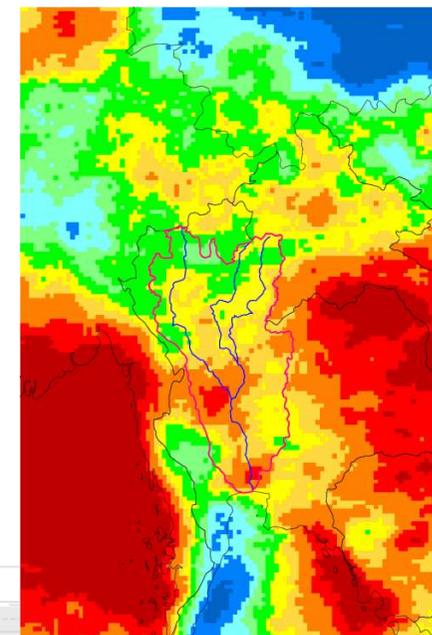
424mm

2010



527mm

2011

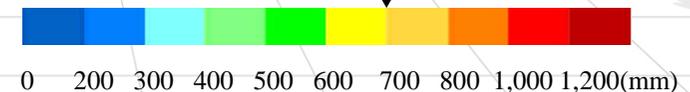


710mm
Average(Bangkok)

DATA/

GSMaP MVK(2008)

GSMaP NRT(2009-2011)



GSMaP and GPM Applications in Various Areas

* Weather forecast/monitoring

- * Japan Meteorological Agency (JMA) : NWP system, typhoon analysis
- * Meteorological Research Institute : Future NWP system
- * Japan Weather Association (JWA) : Mobile phone, weather information

* Flood warning/prediction

- * International Flood Network (IFNet), Infrastructure Development Institute (IDI) : Global Flood Alert System (GFAS)
- * International Centre for Water Hazard and Risk Management (ICCHARM) : Integrated Flood Analysis System (IFAS)
- * Japan Water Association : flood potential monitoring
- * UNESCO-IHP (Pakistan) : flood warning system using IFAS
- * Asia Development Bank (ADB) (Philippines, Bangladesh, and Viet Nam) : River management including flood risk
- * Japan International Cooperation Agency (JICA) (Nigeria, Mozambique, etc.) : Water resource management in river-basin, flood monitoring

* Agriculture

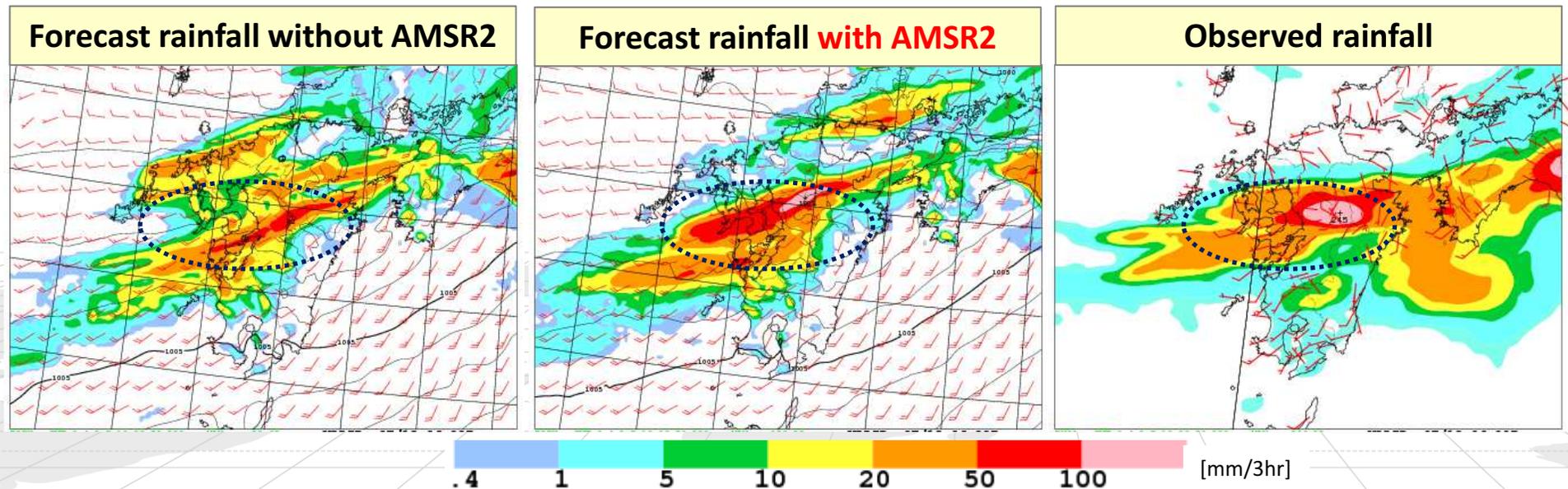
- * SAFE: drought monitoring in Cambodia and Indonesia, Chiba University : food security

* Education

Effect of Microwave Imager Data in the Numerical weather prediction (NWP)



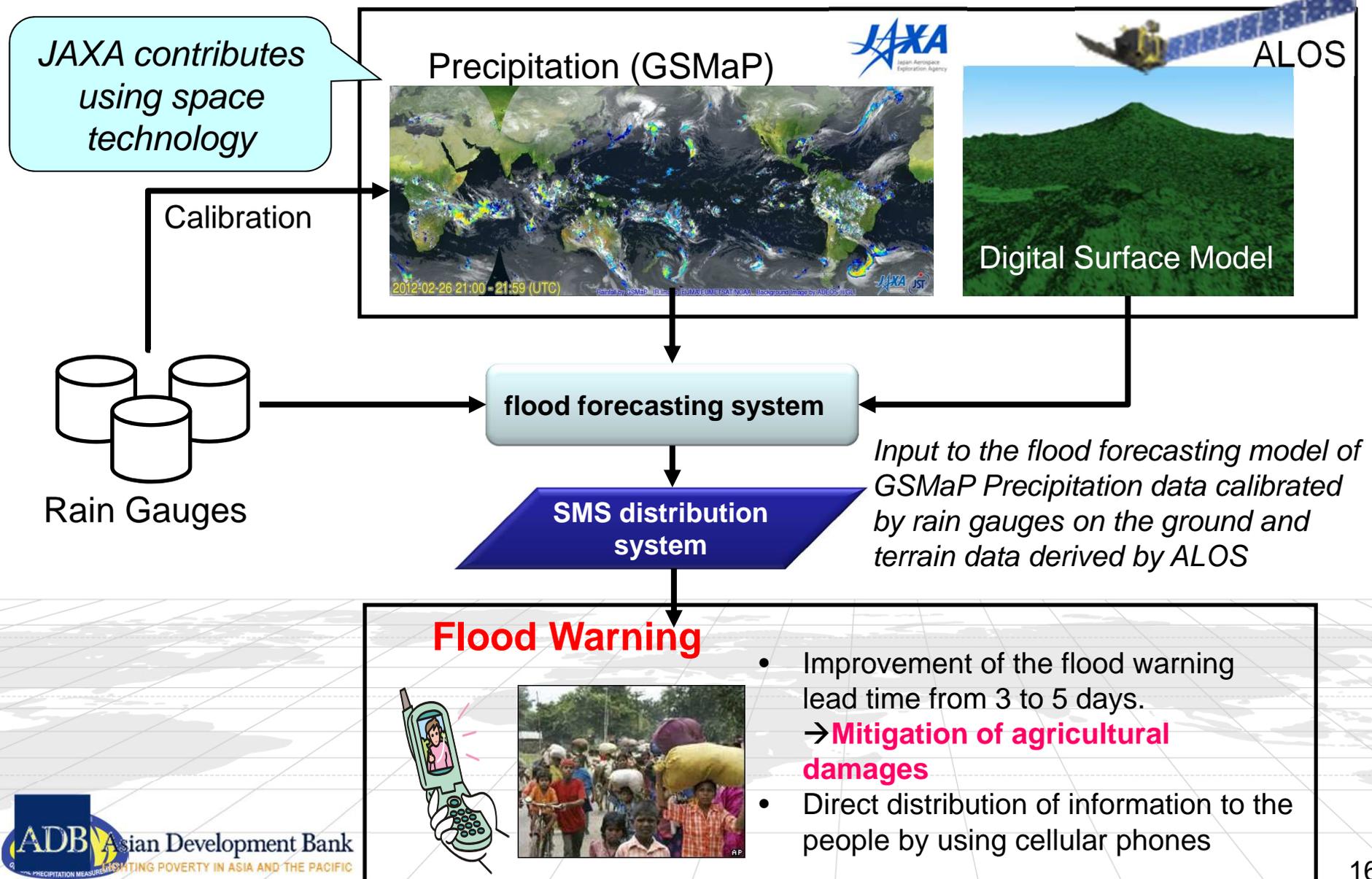
- ★ GCOM-W1/AMSR2 data was introduced to the NWP system on Sep. 12, 2013.
- ★ Impact study of introduction of AMSR2 into the JMA Meso Scale Model for the case of **Kyushu Heavy Rainfall in July 2012**.
- ★ Without AMSR2 data (left), heavy rainfall forecast in Kyusyu area is not very clear compared to the observation (right). When **introducing AMSR2** data in data assimilation (middle), **heavy rainfall is forecasted well**.
- ★ This result presumes that better water vapor analysis accuracy over the East China Sea with AMSR2 resulted in improving rainfall forecast accuracy.



3-hour rainfall at 6 JST on 12 July 2012. Forecast is 21 hour forecast with initial time of 9 JST on 11 July 2012.

ADB Technical Assistance Project “Applying Remote Sensing Technology in River Basin Management”

Participating countries: Bangladesh, the Philippines, and Vietnam



Summary



- * The GPM is an international mission for precipitation measurements worldwide
 - * Expected launch of the GPM Core Observatory by NASA and JAXA is **February 27th 2014 (UTC)**.
 - * Global Satellite Mapping of Precipitation (GSMaP): one of GPM JAXA standard products

* GPM Applications

- * Weather forecast/monitoring
- * Flood warning/prediction
- * Agriculture
- * Education
- *



Explore Science and Extend Applications



Floods

Gifu Prefecture

rainfall Map from

Forecast

Drought

Agriculture

ed to various a

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Rainfall by GSMaP IR Image (c)JMA/EUMETSAT/N