JAXA Earth Observation Satellites Program for Water Information

Earth Observation Research Center
JAXA
It is for the first time in the world for meteorological agencies to utilize satellite radar precipitation data such as DPR for numerical prediction.

Global Precipitation Observation at 3 Hour Intervals with GPM Core Satellite (DPR + GMI) and Constellation Satellites (microwave radiometers/sounders)

Core sat in cooperation with NASA
Ground radar calibration using spaceborne precipitation radar

Bias adjustment of ground radar using the spaceborne precipitation radar (GPM/DPR)

Histogram of near-surface radar reflectivity for the ground radar and the DPR using 10 cases.

APPARI site

VIRAC site

Bias:
+1.05

Bias:
+2.21

Composite of Satellite Radar and Ground Radar Data in the PHILIPPINES
After the meeting with the village officers, the Homepage of the Ogasawara Village started to link to the JAXA/EORC GSMaP Homepage on April 2016.

http://www.vill.ogasawara.tokyo.jp/

about 700 visits during 1month (Aug. 2016)
Overview of GSMAp

Microwave Imagers & Sounders

- GPM-Core GMI
- GCOM-W AMSR2
- DMSP SSM/I, SSMIS
- NOAA/MetOp AMSU

GSMaP Microwave Radiometer Retrieval Algorithm

Rainfall Data from each Microwave Radiometer

Merged Microwave Rainfall Data


IR Imagers

Geostationary Satellites

Microwave-IR Merged Algorithm (CMV, K/F)

Global Rainfall Map + Gauge-calibrated Rainfall Map (0.1 degree grid, Hourly)

Good: high-frequent (wide swath, multi-satellites)
Bad: cannot measure vertical structure (need info. from radar)

Precipitation Radars

TRMM PR

GPM-Core DPR

Data Base

http://sharaku.eorc.jaxa.jp/GSMaP/
Global Satellite Mapping of Precipitation (GSMaP) using GCOM-W, GPM, and others (European and US satellites)

GSMaP (Global) observed Hurricane Patricia and Olaf, and Typhoon Champi: 20-24 Oct. 2015, hourly animation

JAXA Global Rainfall Watch (4-hr delay): http://sharaku.eorc.jaxa.jp/GSMaP
JAXA Realtime Rainfall Watch (Himawari-area): http://sharaku.eorc.jaxa.jp/GSMaP_NOW
Typhoon No.8, July 8, 2014 (Daily Rainfall) calibrated by NTT-D (GSMaP-IF)
Improvement of the flood warning lead time from 3 days to 5 days. → Mitigation of loss of assets and damages

Direct distribution of information to the people by using cellular phones
Future Idea: Satellite-based Water Disaster Management in emerging countries in Asia

<Background>

1. Water Disasters; Shared issue in Asia
   Typhoon, Heavy Rain, Flood, and Drought

2. Lack of Sustainable Ground-based Rainfall Measurement in Emerging Countries
   Lack of archive, maintenance and calibration, and power shortage

3. Improved Capacity on Satellites in Emerging Countries
   > 1000 kg: THEOS 1 (Thailand), Razaksat 1 (Malaysia), Lotusat 1 (Viet Nam), TeLEOS1 (Sinagapore)
   > 100 kg: LAPAN A2 (Indonesia), Diwata-1 (Philippines)

4. Available Satellite-based Rainfall Data
   Free hourly rainfall data for 10 km x 10 km grid
   Global Satellite Mapping of Precipitation (GSMaP)

<Step 1> Asian Satellite Water Information Center

- Establishment of regional center which provides satellite based information and applications for water disaster management.
- Headquartered at XXX (TBD)
- Funding from donors and member countries

ASWI C

- Capacity development
- Knowledge Sharing

GSMaP Calibration for Whole region

Applications for water disaster mgt.

Users in each country (Meteorological agencies, Hydrological agencies, etc.)

<Step 2> Asian Small Precipitation Radar Constellation

ODA projects in each

(i) Small Precipitation Radar Satellite System
(ii) Strengthening ground-based sensor network
(iii) User applications for meteorology, hydrology, etc.
(iv) Capacity Development

ASPRC by Asian country

Orbit: Alt. 800km, inclination 20 deg.
Mass: Smaller than 800kg
Lifetime: More than 5 years
Payload: Ku band precipitation radar
Data: Precipitation intensity (mm/h)
Swath: around 800km
Resolution: around 10km x 10km
Minimum detection: around 1mm/h
Frequency: ave. 4-6 times/day by four satellites

Existing GPM Constellation

Improved GSMaP

ASWIC

Users
Our Visions

• JAXA will further strive to enhance space development activities under the new framework of the space strategy, focusing on technical innovation and international cooperation as on providing effective solutions to the society as a whole.

• Specifically, in the field of application, JAXA values technological advancement and continuous utilization of satellites for the improvement of the daily lives for humankind as observation infrastructure:
  ✓ Long-term observations by continual satellite missions
  ✓ Multiple satellite data utilization
  ✓ Involvement of the private sector

• For the Earth Observation Satellites, JAXA will clarify our role in the society and develop the system to further collaboration with Japanese government and other implementing organizations, so that we can realize the world which utilizes satellites to provide a benefit of human society as a part of observation infrastructure.

Looking forward to further fruitful collaboration with our partners around the globe.