Space Activities of JAXA

Next-Generation Earth Observation Satellite System

December 5, 2005

Sotaro Ito
Director, Bangkok Office
Japan Aerospace Exploration Agency (JAXA)

Outline of JAXA

the center for space development and promoting space utilization

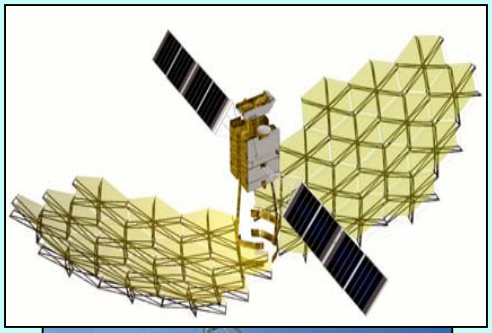
- **An Incorporated Administrative Agency**

  Established under the Law concerning Japan Aerospace Exploration Agency (Law No.161, 13th Dec. 2002)

- **President: Mr. Keiji TACHIKAWA**
- **Personnel: approx.1,700 (+3000)**
- **Budget: approx.180Ｂ Yen (1.7B US$)**
- **Mission: Aerospace-related**
  - **academic research (including education)**
  - **fundamental research**
  - **applied research**
  - **practical research and development**
- **Location of main office: Tokyo , Japan**

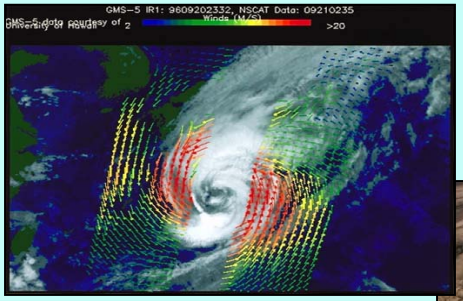
MISSION of JAXA

SP TRANSPORTATION



SATELLITES

SP UTILIZATION



EARTH OBSERVATION

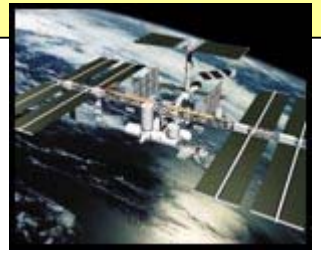
R & D, Education

JAXA Vision

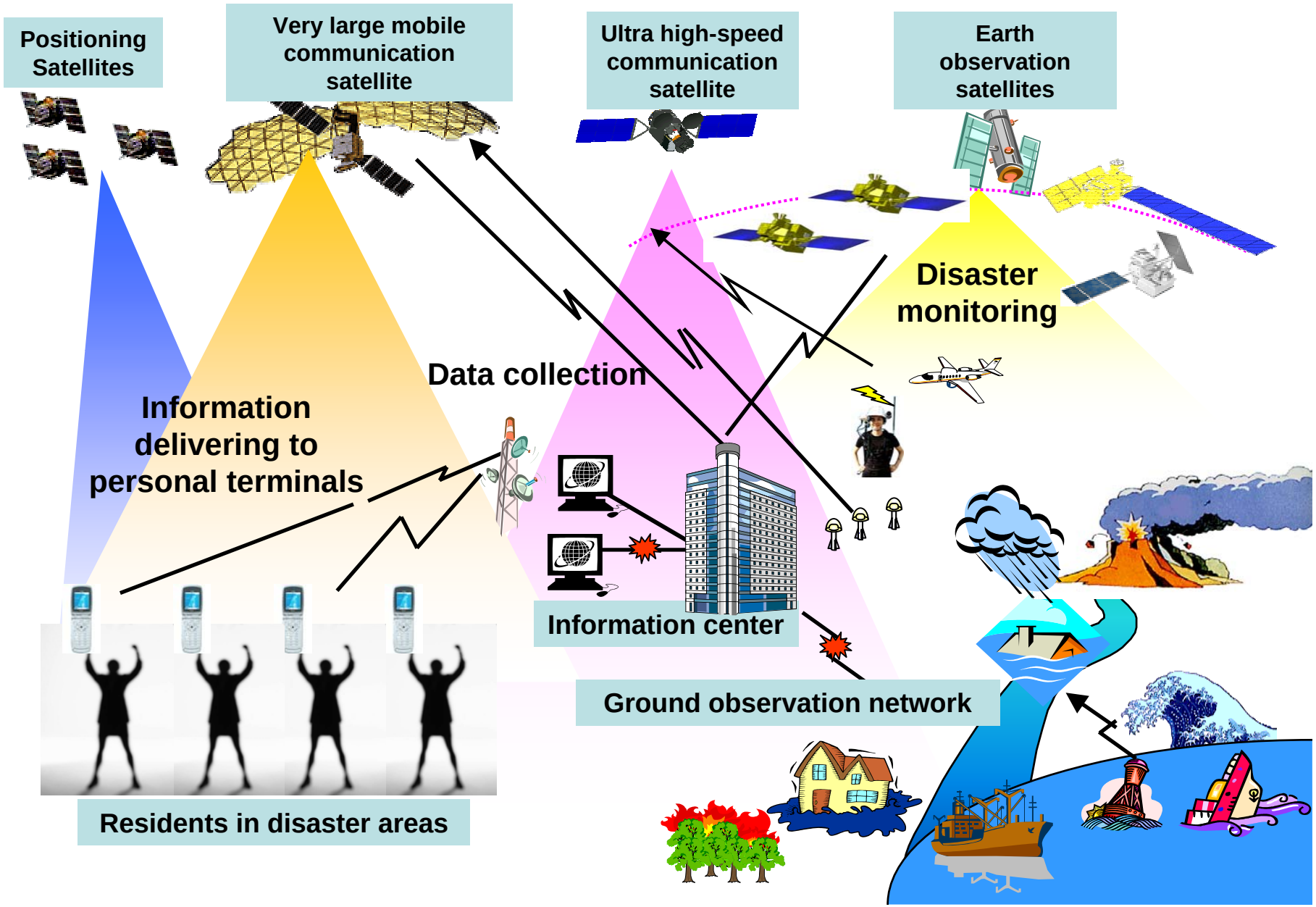
Space exploration and utilization for the next 20 years

- ✓ Develop launch vehicles and satellites with the highest reliability and world class capability, contributing to **the realization of a secure and prosperous society**.
- ✓ Promote “top science” in the field of space science while preparing for Japan’s own human space activities and the utilization of the Moon.
- ✓ Conduct flight demonstration of a prototype hypersonic vehicle with the cruising speed at Mach 5.
- ✓ With all of the above activities, contribute to turning the aerospace industry into a key industry.




Information Gathering and Warning System for Disaster and Crisis Management



Integrated global environmental observing system for environmental observations and predictions

Satellite observation network

LEO

GEO

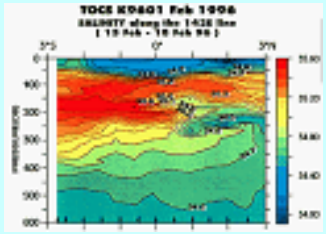
Communication satellites

Ground observation network

Process study and modelling on atomosphere, ocean, land, watercycles,and global warming by Earth observation data users

Direct data distribution to operational users and data archive

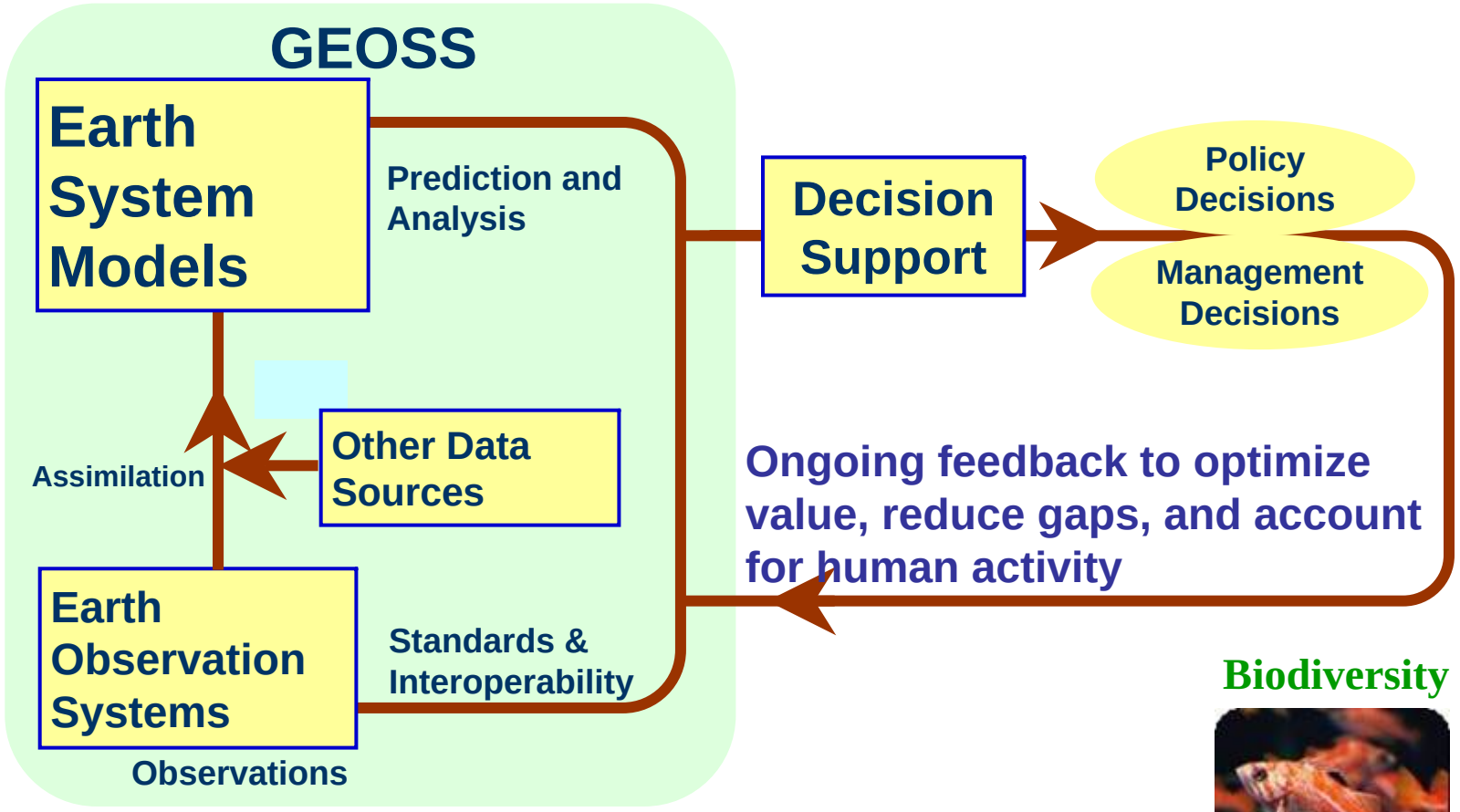
Predictions using models for climate, hydrological cycle change, and carbon cycle



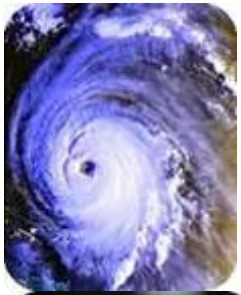
Assessment of impact from human activities

Tools for policy making

GEOSS
(Global Earth Observation System of Systems)



Disasters

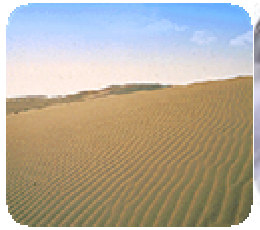


Biodiversity

9 Social Benefit Areas

Health

Energy



Climate

Water

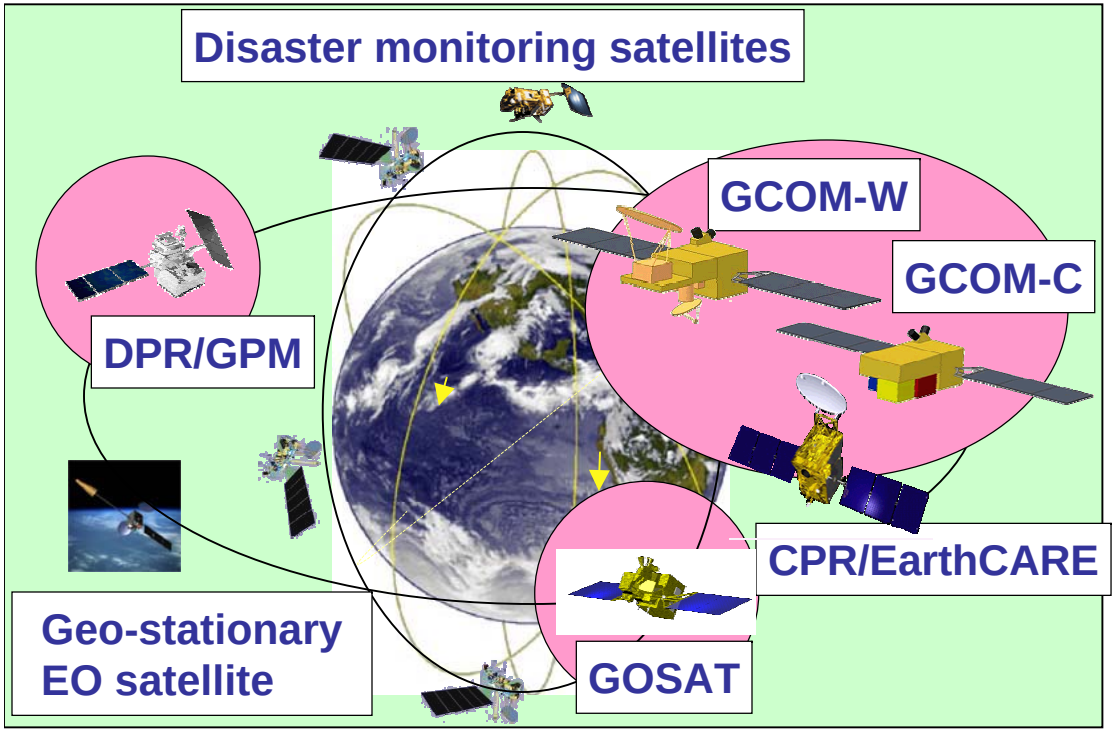
Weather

Ecosystems

Agriculture

JAXA Earth Observation Program for GEOSS

To develop and operate an Earth Observation System for GEOSS



A plan of advanced low Earth orbit satellites

Sea surface wind vector	AMSR F/O, Scatterometer (GCOM-W)
Sea surface temperature	AMSR F/O (GCOM-W)
Cloud structure	Cloud Profiling Radar (EarthCARE)
Aerosol	GLI F/O (GCOM-C)
CO_2 concentration	Greenhouse Gas Observation Sensor (GOSAT)
Precipitation	Dual-frequency Precipitation Radar (GPM)
Disaster monitoring	SAR (disaster monitoring), Optical Sensor (Geo-stationary)

Advanced Land Observing Satellite <ALOS>

Launch Date	Jan. 2006
Launch Vehicle	H-IIA
Spacecraft Mass	about 4,000kg
Generated Elec. Power	about 7kW at EOL
Orbit	Sun Synchronous
Altitude	691.65km
Repeat Cycle (Sub-Cycle)	46 days (2 days)

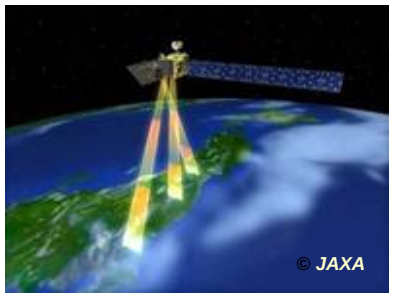
Japanese Earth Resources Satellite-1 (JERS-1)

Advanced Earth Observing Satellite (ADEOS)

Enhanced land-observation technology

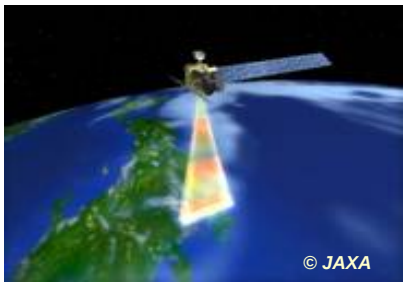
ALOS

- Disaster monitoring
- Cartography
- Regional observation
- Resources surveying



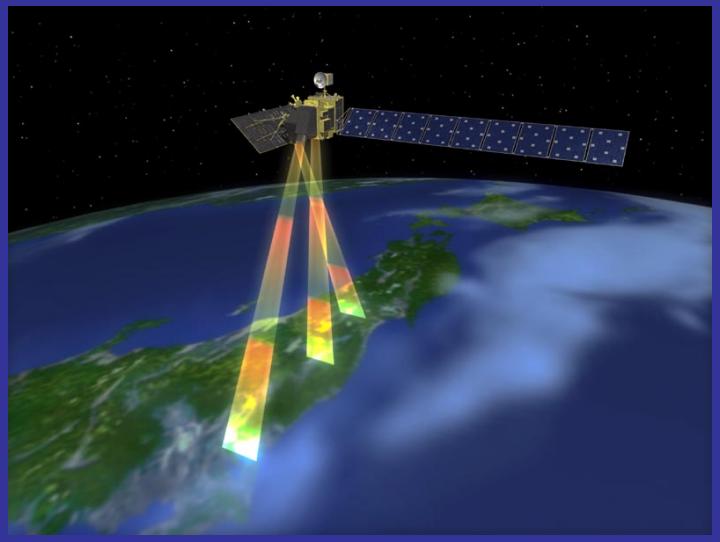
PRISM

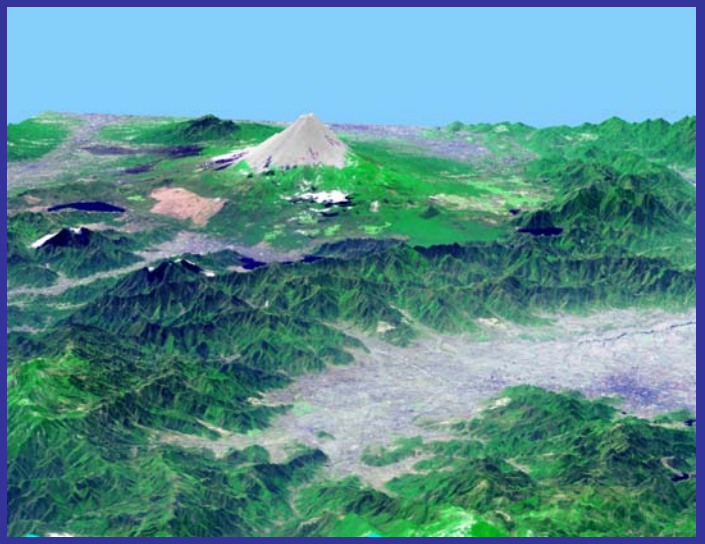
PALSAR



AVNIR-2

① PRISM



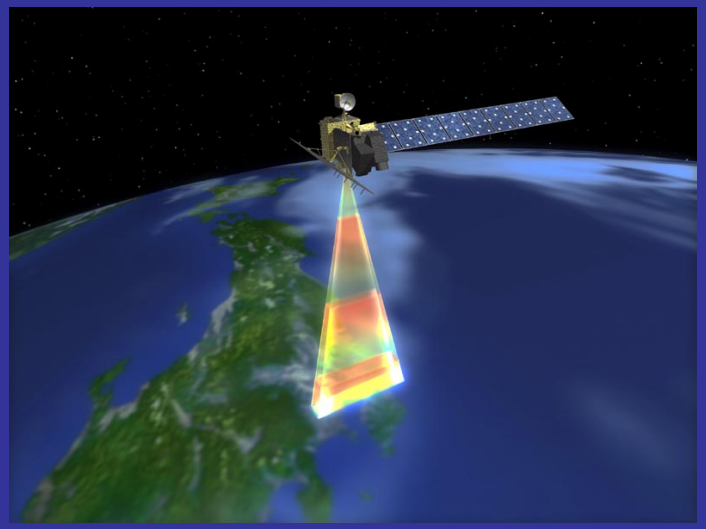


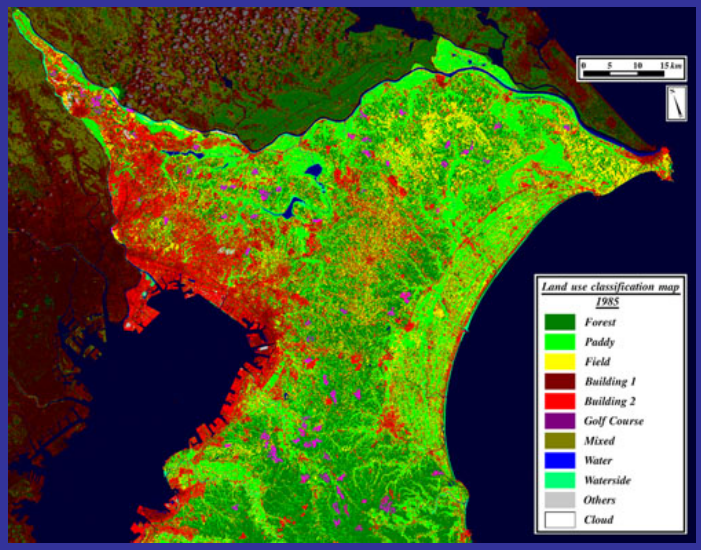
Mt. Fuji's terrain elevation map derived by JERS-1/OPS stereo.

Characteristics

- Optical (panchromatic)
- Three optical systems in order to obtain terrain data
- Spatial resolution: 2.5m
- Sensor field of view: 35km/70km
- Cross track pointing capability: -1.5°~1.5°
  -> Basically, 1 time/46 days observation.

② AVNIR-2



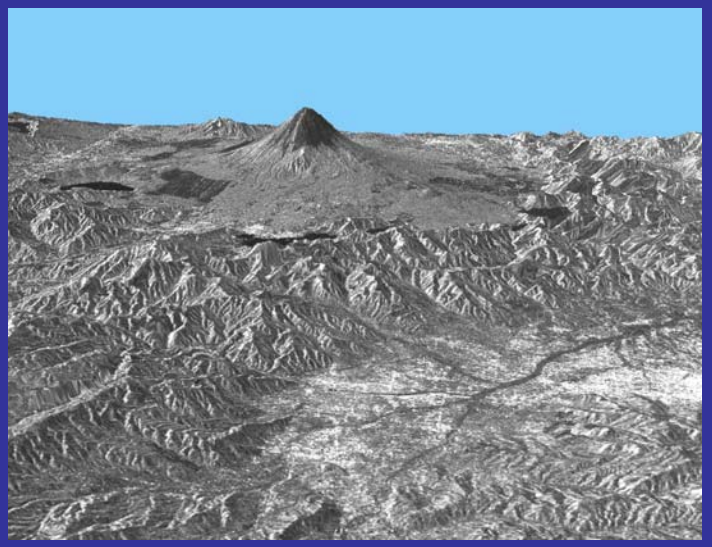


Land-use classification map in Chiba Pref., Japan using Landsat/TM.

Characteristics

- **Optical ~ infrared (4 band)**
- **Cross track pointing capability for disaster monitoring : -44°~44°**
- **Spatial resolution: 10m**
- **Sensor field of view: 70km**

③ PALSAR



Mt. Fuji's terrain elevation map derived by JERS-1/SAR stereo.

Characteristics

- Synthetic Aperture Radar (L band(1.27GHz))
- Cross track pointing capability: 10°~51°
- Spatial resolution: 10m
- Sensor field of view: 70km, 350km (Scan mode), etc…
- All-weather, day-and-night observation

Why ALOS is so unique?

◎ Two optical sensor(2.5m,10m) and one Rador sensor

1) Providing terrain elevation map with 3~5m altitude accuracy

- ✓ 2.5m resolution image.
- ✓ Triplet stereoscopic images with nadir, forward, and backward.

2) Highly accurate position and attitude determination to provide "Mapping without any Ground Control points".

- ✓ Exact satellite position information within 1 m accuracy.
- ✓ Precise “pointing” information within 0.0002° accuracy.
- ✓ Absolute time information for each pixel better than 0.37 ms.

3) Wide observation swath with 70km or wider.

⇔Conventional high resolution satellites have narrower swath width

4) Large capacity mission data handling

Disaster monitoring by ALOS

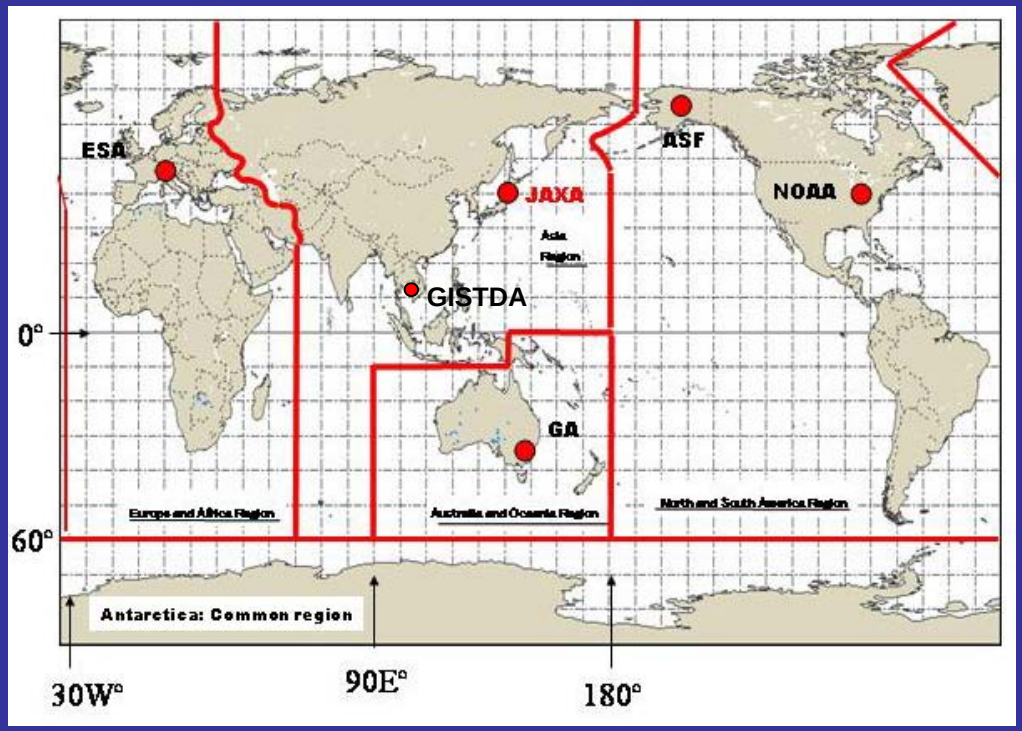
When disaster strikes, prompt monitoring is the most important.

（India Ikonos 29DEC04）

- The ALOS is capable of observation anywhere in the world;
  - ✓ **within 48 hours** after commanding and every 48 hours revisit.
  - ✓ **within 60 minutes** after data reception for “Quick Look” images.
  - ✓ **within 180 minutes** for “Geo and Radiometric Calibrated” images.
- **all-weather, cloud penetrating, day-and-night monitoring** using the ALOS’s PALSAR.

ALOS Data Distribution

- **ALOS data node concept**
  - ✓ Volume of ALOS data, downlinked to JAXA's ground station, will be 500 Giga byte to 1 Tera byte per day.
  - ✓ It is desirable to promote ALOS data worldwide.
  - ✓ **ALOS data node** will play a key role as a data processing and distribution center in the region specified.



➢ALOS data will be disseminated to users worldwide **at a low price** on a non- discriminative basis.

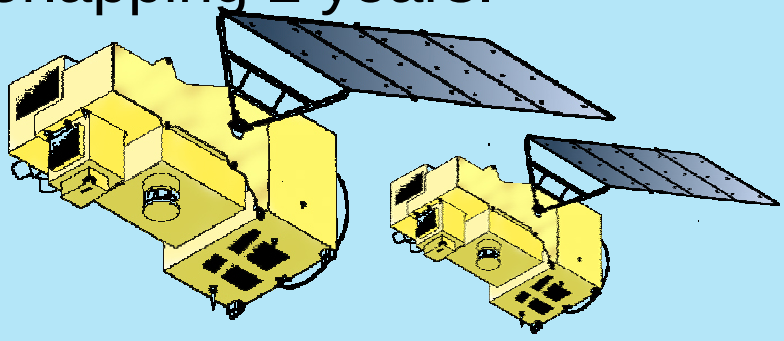
Current ALOS Status

GCOM *(Global Climate Observation Mission)*

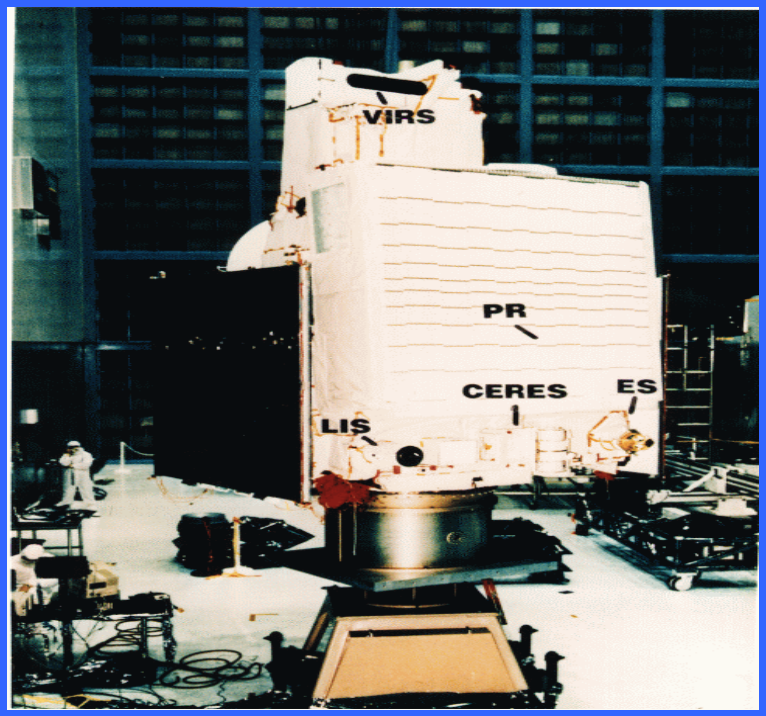
The series of satellites, GCOM (Global Climate observation Mission), consist of 2 satellite series:

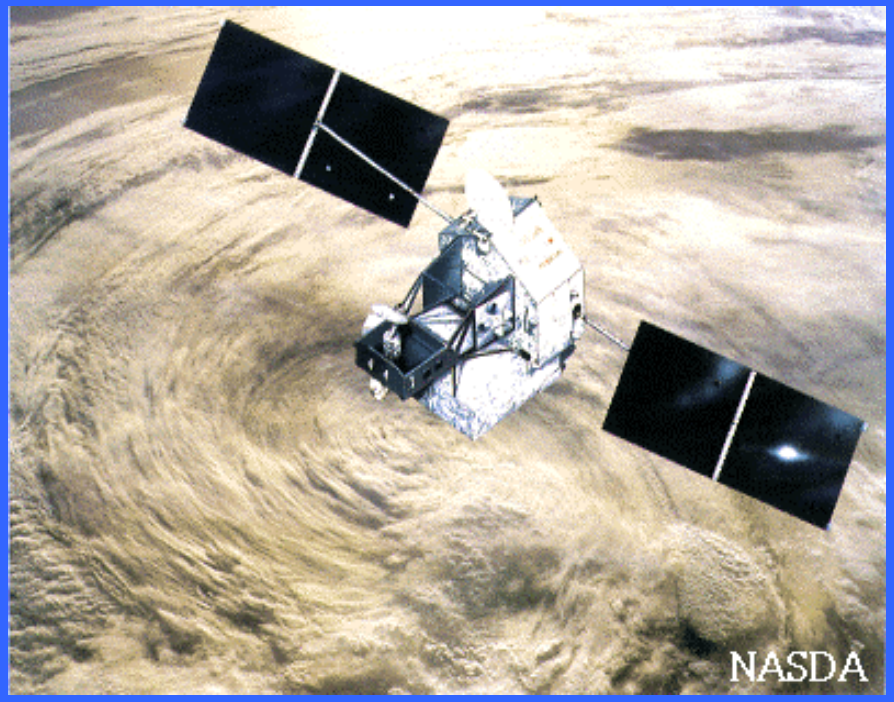
- The sea surface observation mission, so called **GCOM-W**, will have **AMSR F/O** and **SeaWinds**.
- The atmospheric and terrestrial observation mission, so called **GCOM-C**, will have **GLI F/O**.

– Each satellite series will have **3 satellites with 5 years** mission life to exceed 11 years which is a nominal period of solar cycle and is the longest period of climate change. The series totally covers 13 years overlapping 2 years.



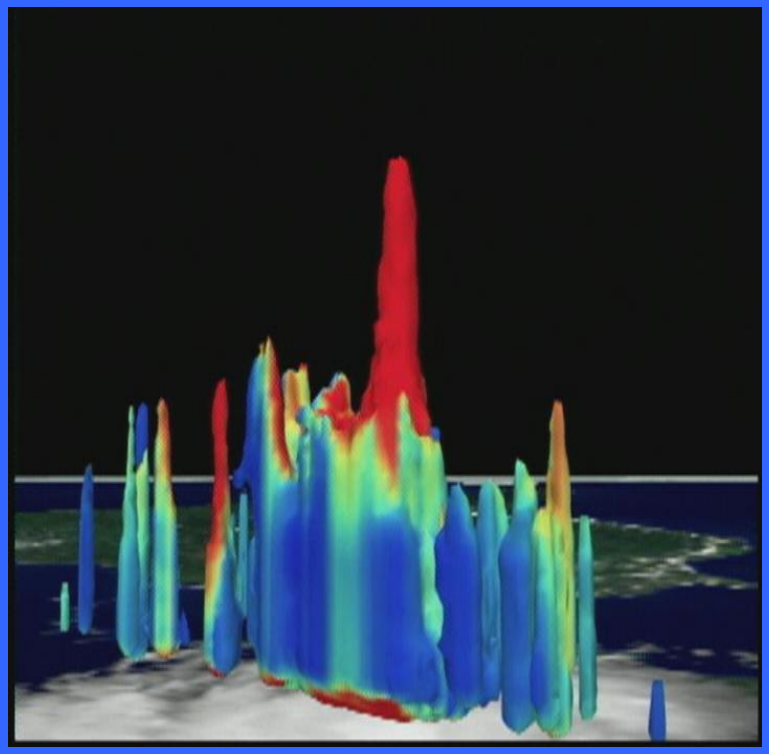
TRMM *(Tropical Rainfall Measuring Mission)*



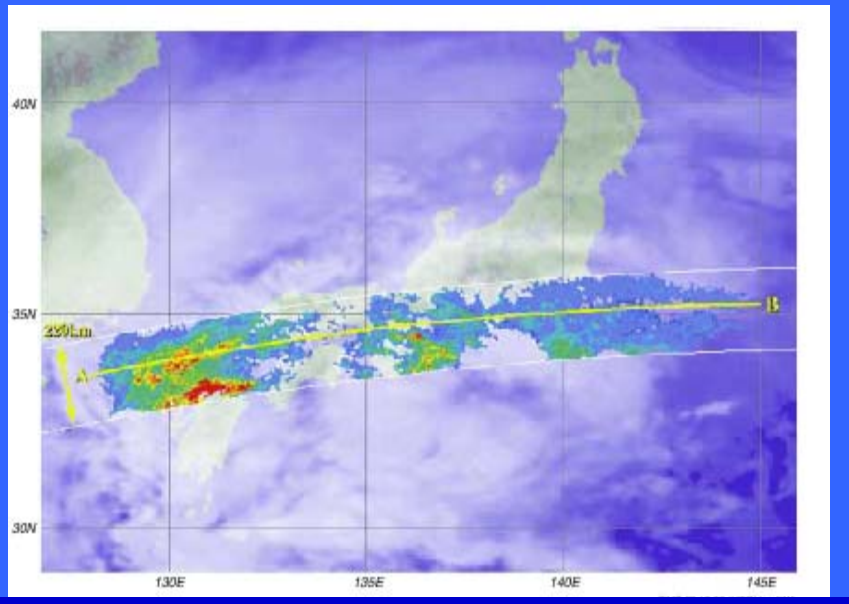


- *TRMM and the world-first-space-borne Precipitation Radar (PR) enables to observe rainfall directly from the space.*
- *Launch date: November 1997*
- *Altitude: 350km (before 2001) and 450km (after 2001)*

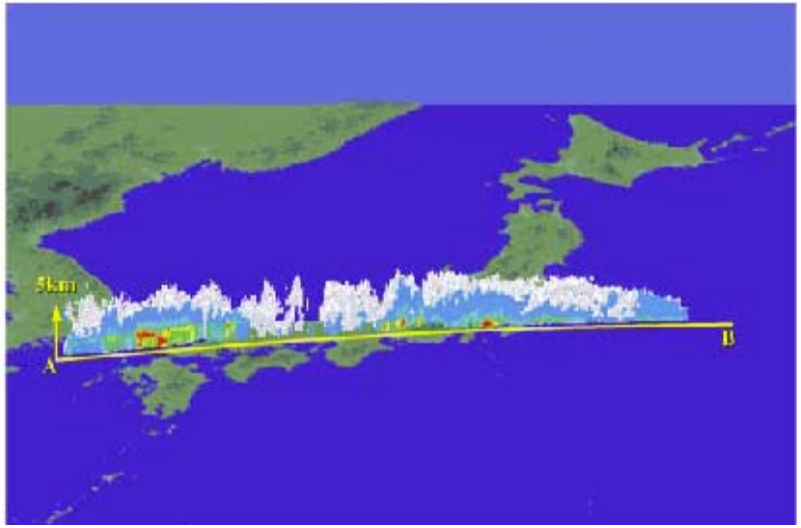
TRMM observes rain structure



Hurricane Nonnie 08/22/98



horizontal cross section at a height of 2.5km



3D Rain Structure

Fig.2 3-D Rain Structure

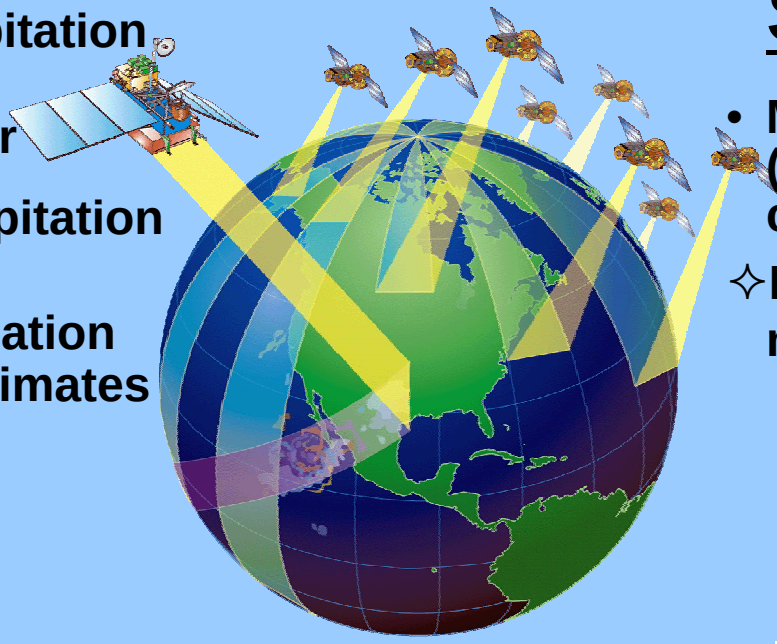
GPM (Global Precipitation Measurement)

Core Satellite

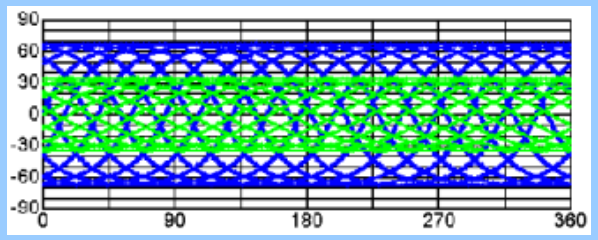
- Dual-frequency Precipitation Radar (DPR)
- Microwave Radiometer

✧Highly sensitive precipitation measurement

✧Calibration of constellation MRW precipitation estimates



JAXA (Japan) :
DRP, H-IIA（TBD)
NASA (US) :
Spacecraft, MWR



Blue: Inclination ~65º (GPM core)
Green: Inclination ~35º (TRMM)

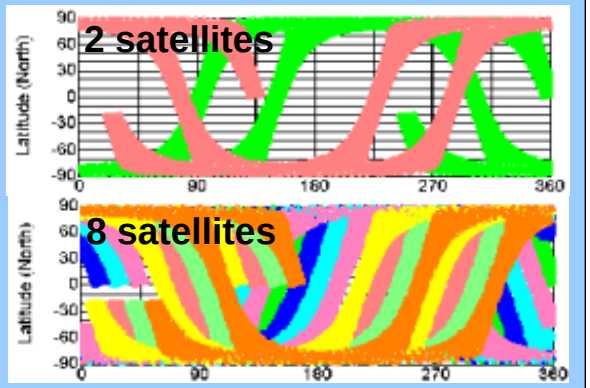
3-hourly global rainfall map

Constellation Satellites

- Microwave Radio-meters (MWR) installed on each country's satellite

✧Frequent precipitation measurement

Expected Partners:
NASA, NOAA (US), ESA (EU), JAXA, China, Korea, others

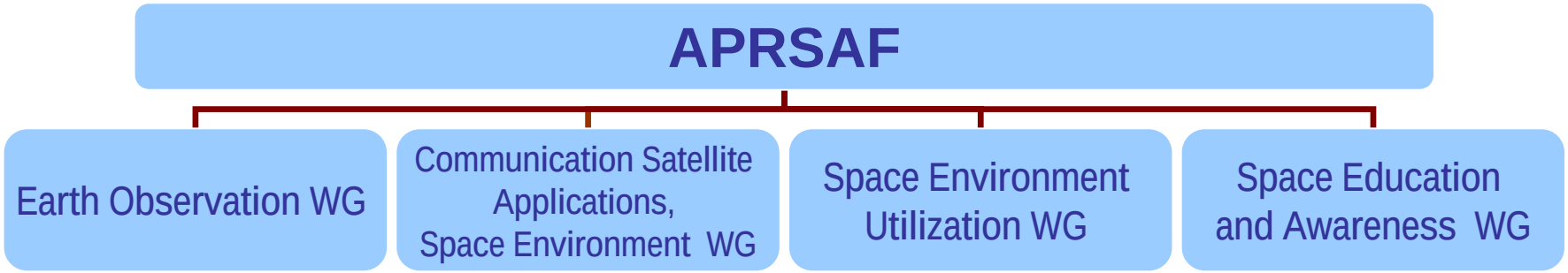


Knowledge Sharing & Int'l Coop.

The Asia-Pacific Regional Space Agency Forum (APRSAF)

APRSAF is an annual meeting initiated jointly by MEXT/JAXA

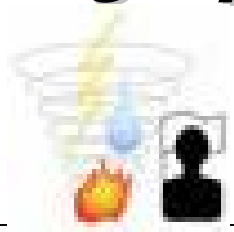
APRSAF-12 was held on October 11-13, 2005 in Kitakyushu, Japan



- Established in 1993
- Objective : to enhance the development of each country's space program and to exchange views toward the future cooperation in space activities in the Asia-Pacific region

[Members]
26 countries
+ 8 International Organizations

Concept of Disaster Management system using Space Technology in Asian countries



Disaster!

Request Image/Data

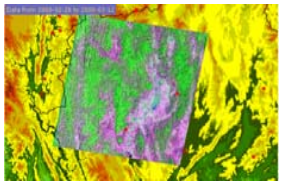
ASIAN Countries
Disaster Management Organizations

ADRC
Accept Order from Member Count.

Notify

WINDS

ALOS



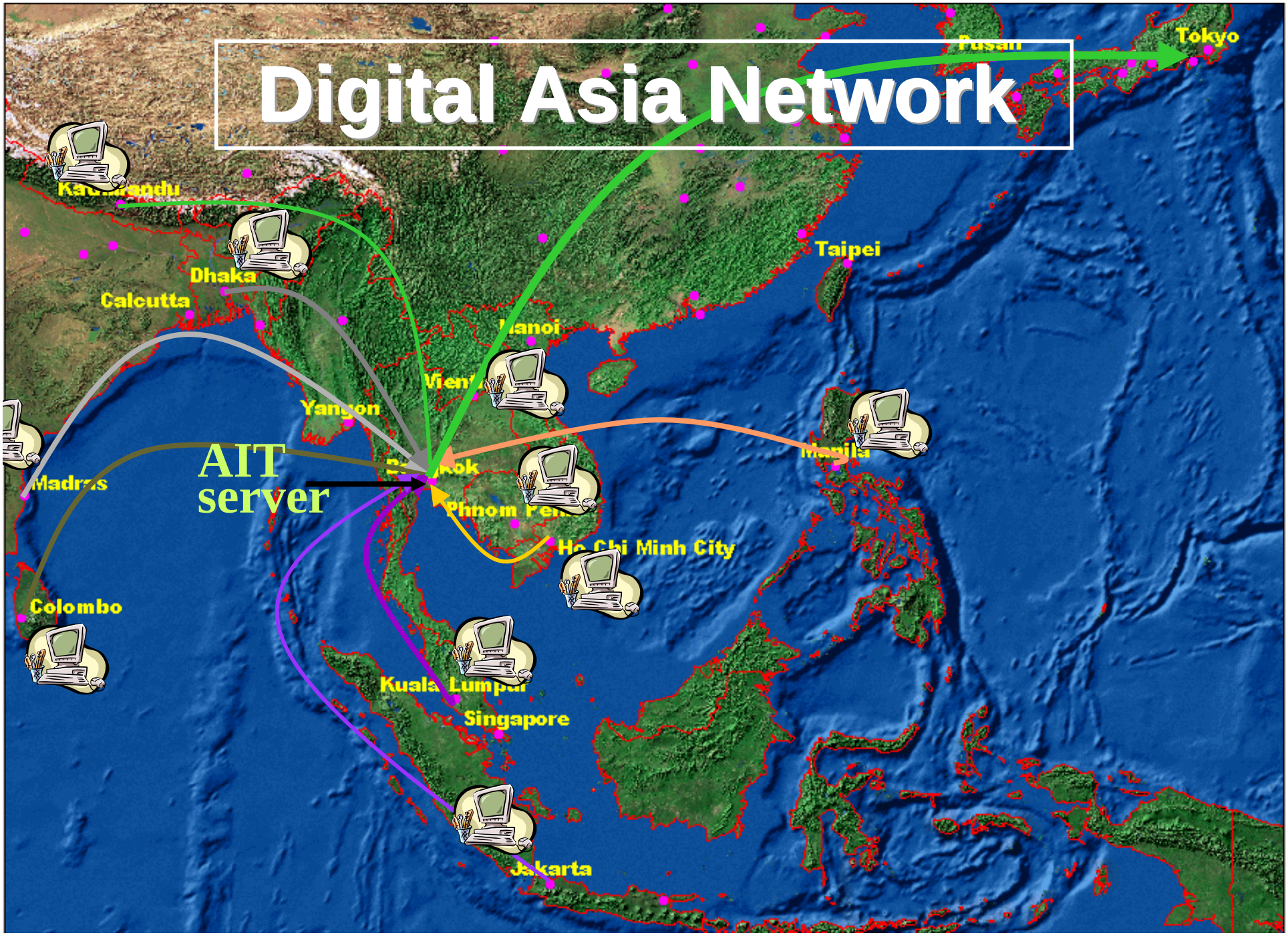
ADRC

Distribute Image/Data

Partner Agencies
to support Asian Countries

JAXA
Develop a plan of Action

Notify

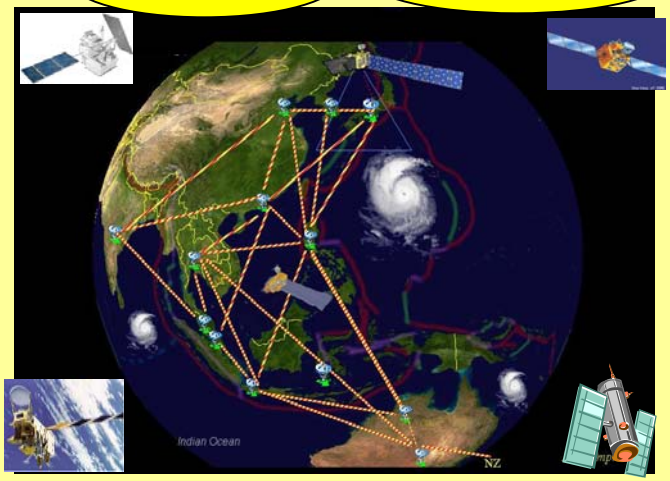

Digital Asia Network
Tokyo
Taipei
Dhaka
Calcutta
Hanoi
Yangon
AIT
server
Manila
Madras
Ho Chi Minh City
Colombo
Kuala Lumpur
Singapore
Jakarta

A Disaster Risk Management System in Asia-Pacific Region (2010-)

Space Safety Net Asia

Archive Data

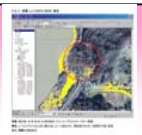
Observation Data



Earth Observation Satellites

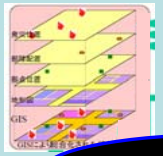
Data

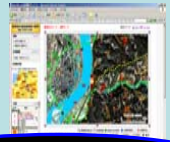
Knowledge Sharing



Information Sharing Platform

Data

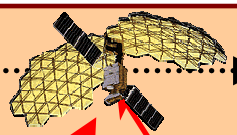




Web GIS

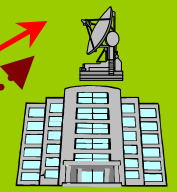
Data

Information Communication System



High speed transmission

Disaster Management Agencies



Disaster Prevention

Residents in disaster areas

Providing services directly to personal

Information center

Warning

Refuge

Rescue

JAXA's Knowledge Sharing at AIT

JAXA and **AIT** are promoting the following three types of knowledge sharing activates.

- **(1) Caravan Training Programs;**
- **(2) Workshops; and**
- **(3) Mini-Projects**

Mini-pilot project for disaster management

Training at AIT (2 weeks)
Survey and research at AIT (3 weeks)
OJT at home country (1 week)
Training and OJT at AIT(3weeks)

Participating countries

Vietnam, Nepal, Philippines, Sri Lanka・・・

JAXA will conduct its activities for the benefit of the people of Japan and all humankind, by devoting its capabilities and resources.

Japan Aerospace Exploration Agency

Thank You !!