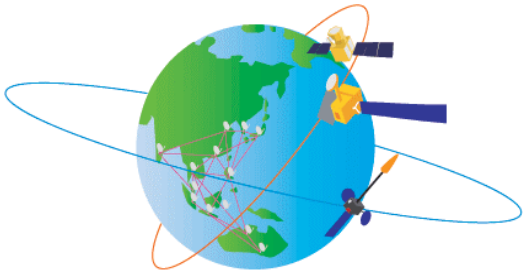

Concept of Sentinel Asia and its latest activities

The 3rd GEOSS Asia-Pacific Symposium in Kyoto, Japan
5 February 2009

Japan Aerospace Exploration Agency
Kazuya Kaku

Contents

1. What's "Sentinel Asia"?
   Background / History / Concept / Framework

2. Main Activities
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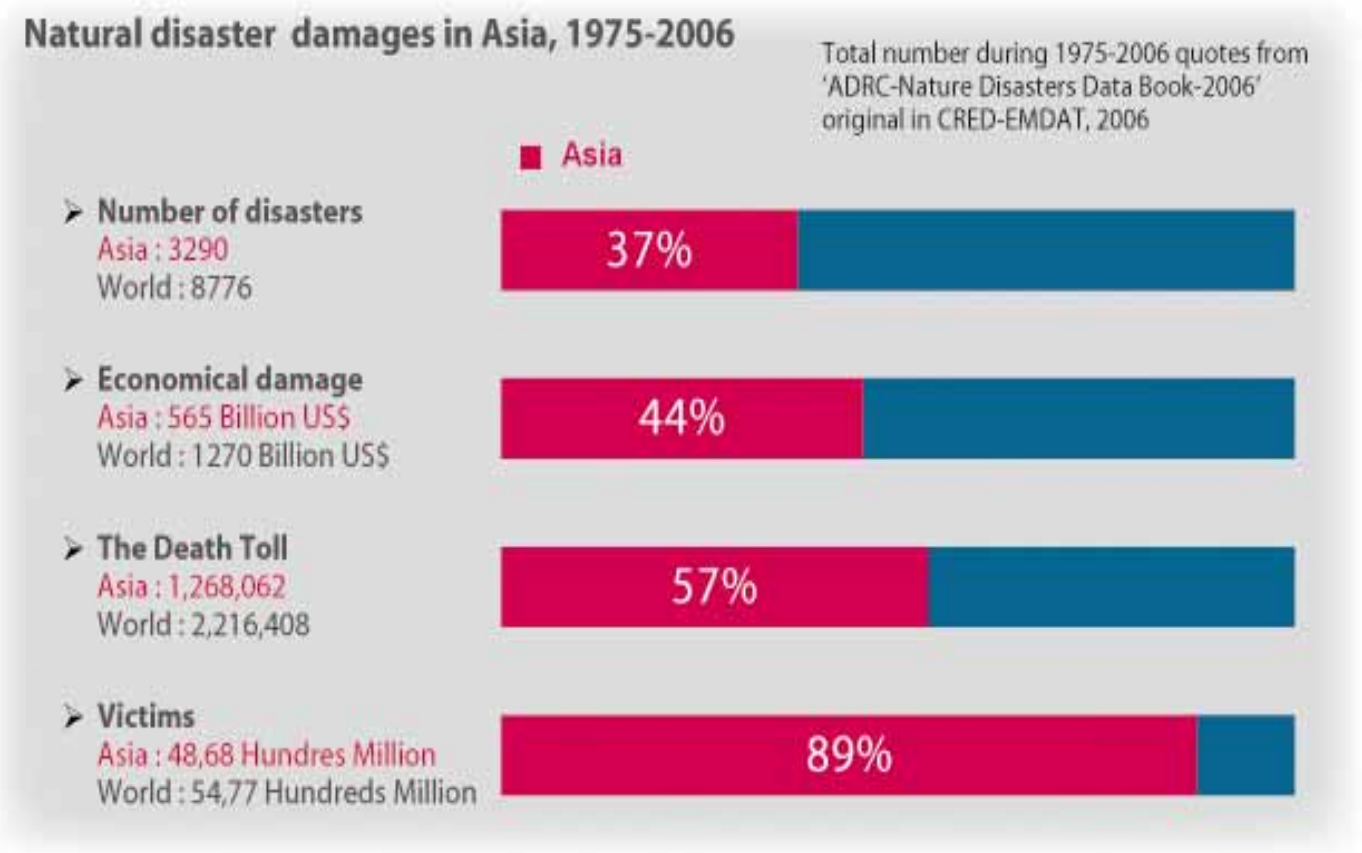
   Flood Monitoring / Capacity Building

3. Future Plan
   Sentinel Asia Step2

Background of Sentinel Asia



The Asia region has been seriously damaged by natural disasters over the last 30 years.

Asia-Pacific Regional Space Agency Forum

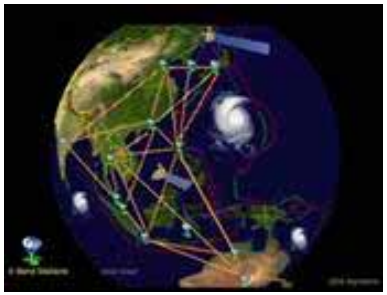
Asia-Pacific Regional Space Agency Forum
APRSAF

[History] Established in 1993 after the Asia-Pacific International Space Year Conference (APIC) in 1992

[Organizers] MEXT, JAXA and co-host organizations

- **Past co-organizers: Government or related entities of Mongolia, Malaysia, Republic of Korea, Thailand, Australia, Indonesia, India, Vietnam**

Sentinel Asia
establishing Disaster Management Support System



Working Groups

Earth Observation

Communication Satellite Applications

ISS

Space Education & Awareness

http://www.aprsaf.org

History

- **Oct 2004**: APRSAF-11, Canberra, Australia, Sentinel Asia project proposed and conceptualized
- **Oct 2005**: APRSAF-12, in Kitakyushu, Japan, approved the plan to initiate the pilot project.
- **Feb 2006**: Joint Project Team (JPT) was organized and implementation of Sentinel Asia was initiated in the meeting in Hanoi, Vietnam
- **Oct 2006**: Operations of Sentinel Asia commenced by opening its Web site. JAXA also started to provide ALOS data and accept ALOS observation requests.
- **Nov 2007**: APRSAF-14, Bangalore, India, it was confirmed that:
  - Step1 achieved its overall goals as a good demonstrator project
  - Step2 was agreed
  - ISRO joined Emergency Observation
- **June 2008**: 1st JPTM for Step2, Kobe, Japan was held and Step 2 was initiated

1st JPTM for Step2 in Kobe, Japan in June 2008

The 1st JPTM with participants 18 Asian countries and 7 international organizations, initiated the Step2.

Concept of Sentinel Asia

The Sentinel Asia (SA) initiative is a collaboration between space agencies and disaster management agencies, applying remote sensing and Web-GIS technologies to assist disaster management in the Asia-Pacific region. It aims to:

- Improve safety in society by ICT and space technology
- Improve speed and accuracy of disaster preparedness and early warning
- Minimize the number of victims and social/economic losses.

Concept of Sentinel Asia

A step-by-step approach for implementation:

- Step1 (2006-2007)

  Implementation of the backbone Sentinel Asia data dissemination system as a pilot project, to showcase the value and impact of the technology using standard internet dissemination systems.

- Step2 (2008-2012)

  Expansion of the dissemination backbone with new satellite communication systems, and enhancement of activities based on experiences in Step1 and new requirements

- Step3 (2013 onwards)

  Establishment of a comprehensive disaster management support system

Framework of Sentinel Asia Step2

Sentinel Asia

Space Community

APRSAF*

- Data Provision
- Promotion of Utilization
- Capacity Building

* Asian-Pacific Regional Space Agency Forum

Disaster Management Community

ADRC**
Member Countries

- Utilization (User)

** Asian Disaster Reduction Center

International Community

UN / ESCAP UN / OOSA
ASEAN AIT etc.

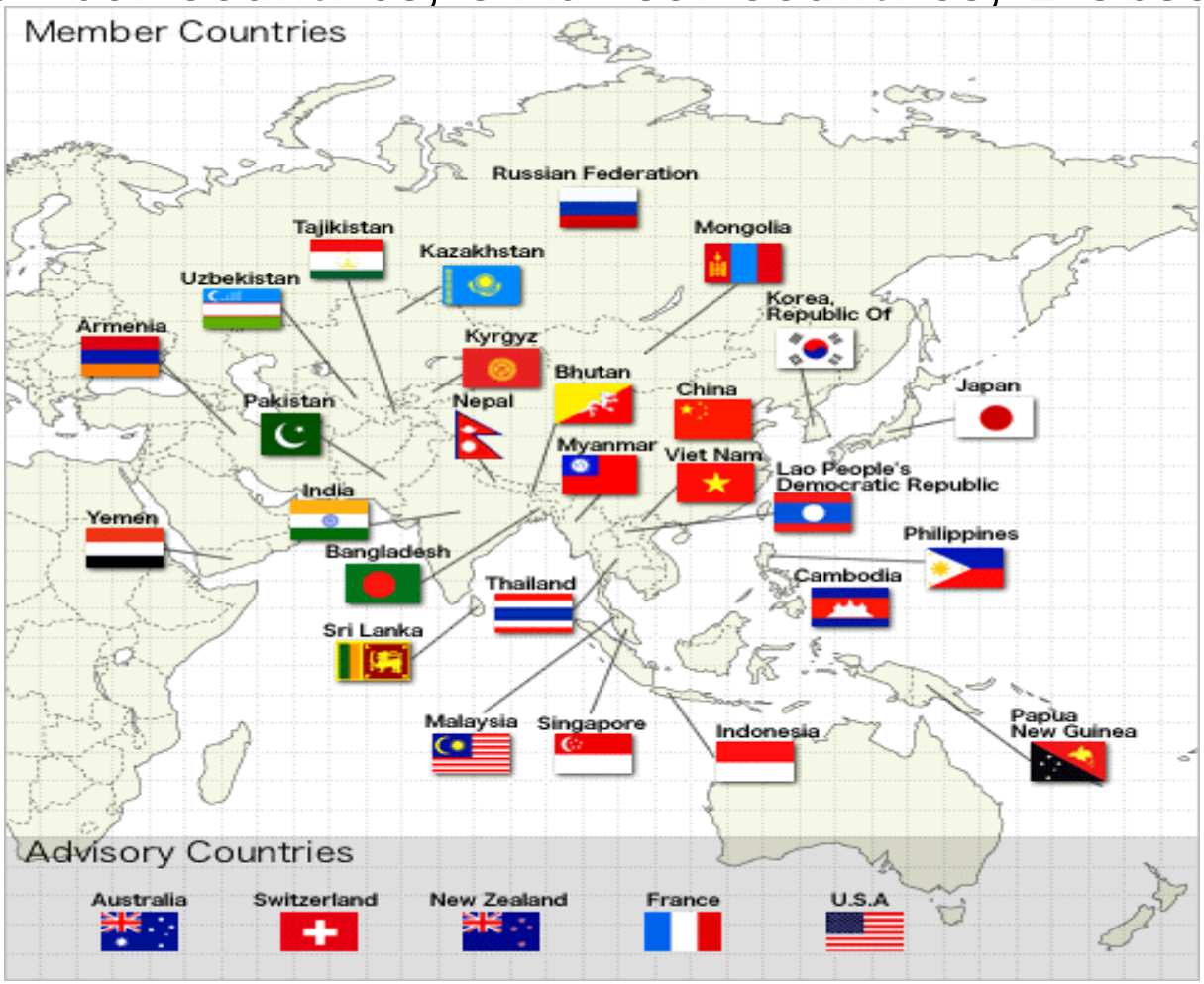
- International Cooperation

Joint Project Team (JPT)

Join Project Team consists of total 59 organizations including 51 agencies from 20 countries and 8 international organizations as of January 2009

ADRC Member Countries

27 Member Countries, **5** Advisor Countries, **1** Observer



※Implement Various Projects in cooperation with UN/ISDR, UN/OCHA, UNESCO, UNU, WMO, UN/ESCAP, etc.

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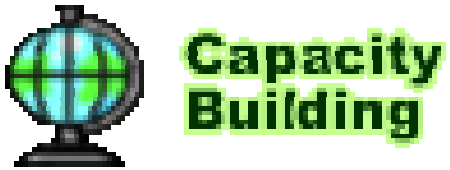
Main Activities

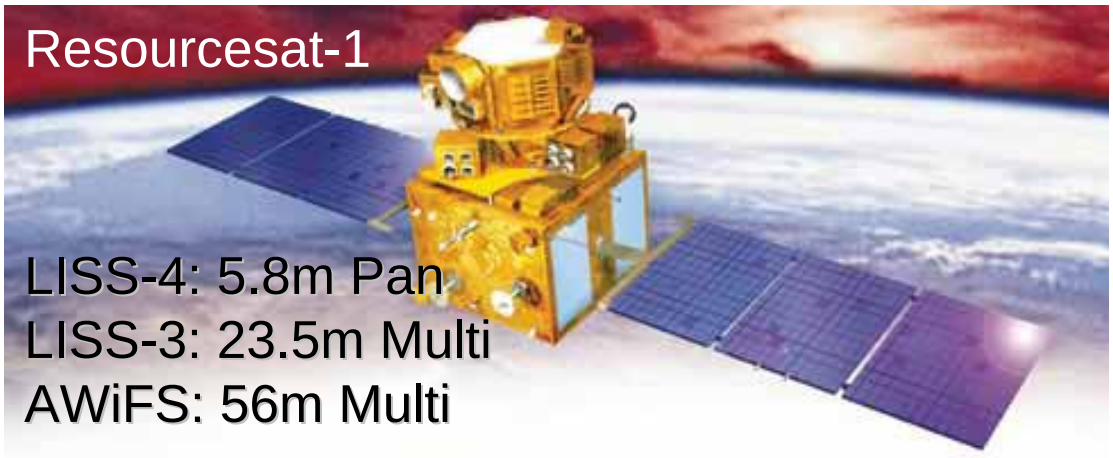
The main activities of SA are as follows:

- **Emergency observation** in case of major disasters by Earth observation satellites via observation requests of Asian countries
- **Wildfire monitoring** and **flood monitoring**
- **Capacity building** for utilization of satellite images for disaster management.



Flow of Emergency Observation

Contributing EO Satellites to Emergency Observation



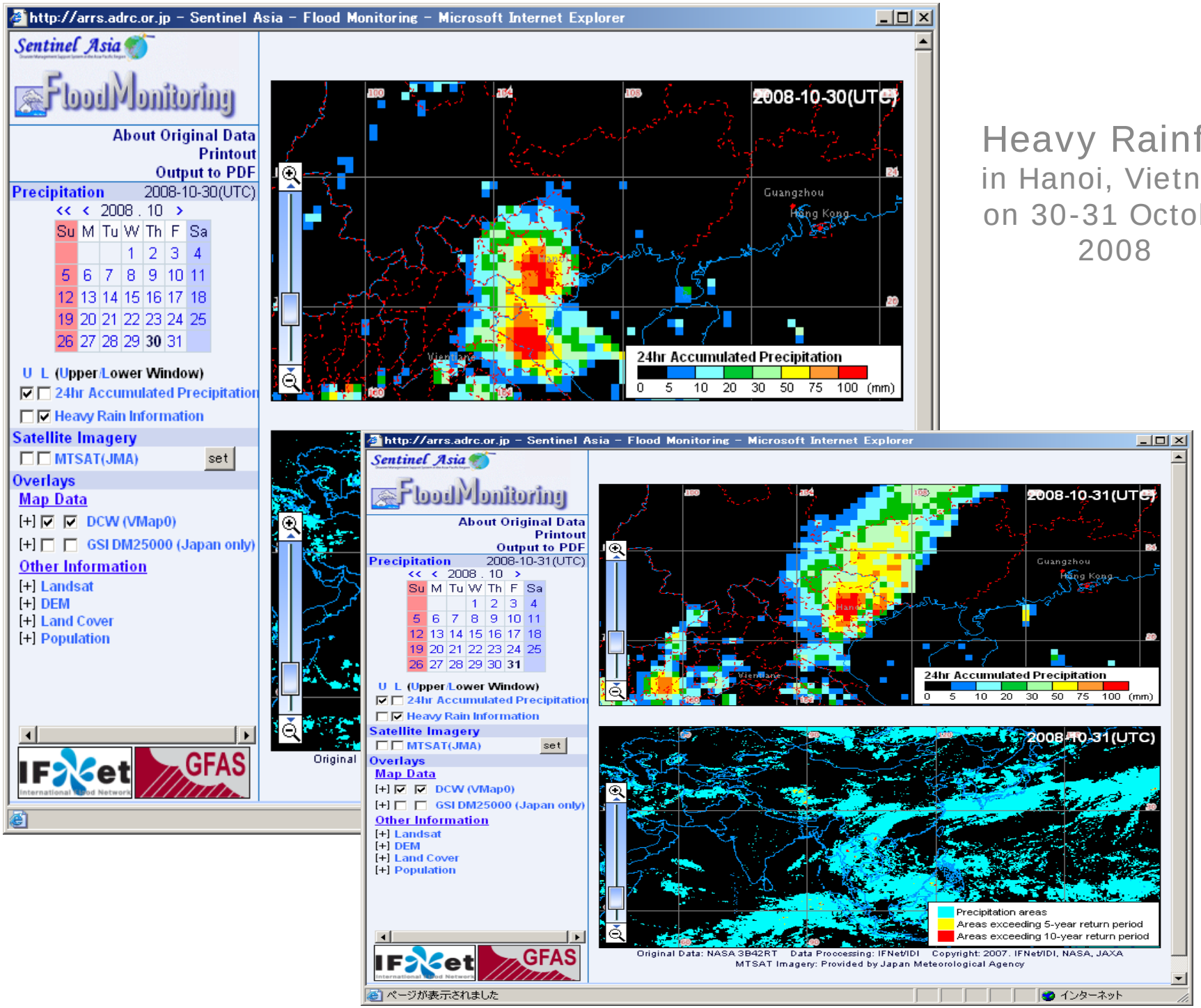
Coming soon...

Emergency Observation in Sentinel Asia

Number	Time	Place	Type of disaster
1	Feb. 2007	Jakarta, Indonesia	Flood
2	March 2007	West Sumatra	Earthquake
3	April 2007	Solomon Islands	Earthquake
4	May 2007	Nepal	Snowstorm
5	June 2007	Bangladesh	Landslide
6	July 2007	Pakistan	Tropical Cyclone
7	July 2007	Indonesia	Volcano Eruption
8	July 2007	Tajikistan	Earthquake/Landslide
9	July 2007	Indonesia	Flood/Landslide
10	July 2007	Bangladesh	Flood
11	Sep. 2007	Indonesia	Earthquake
12	Sep. 2007	Thailand	Flood
13	Oct. 2007	Vietnam	Flash Flood/Flood
14	Nov. 2007	Vietnam	Flash Flood/Flood
15	Nov. 2007	Bangladesh	Tropical Cyclone
16	Jan. 2008	Australia	Flood
17	Feb. 2008	Indonesia	Flood

Emergency Observation in Sentinel Asia

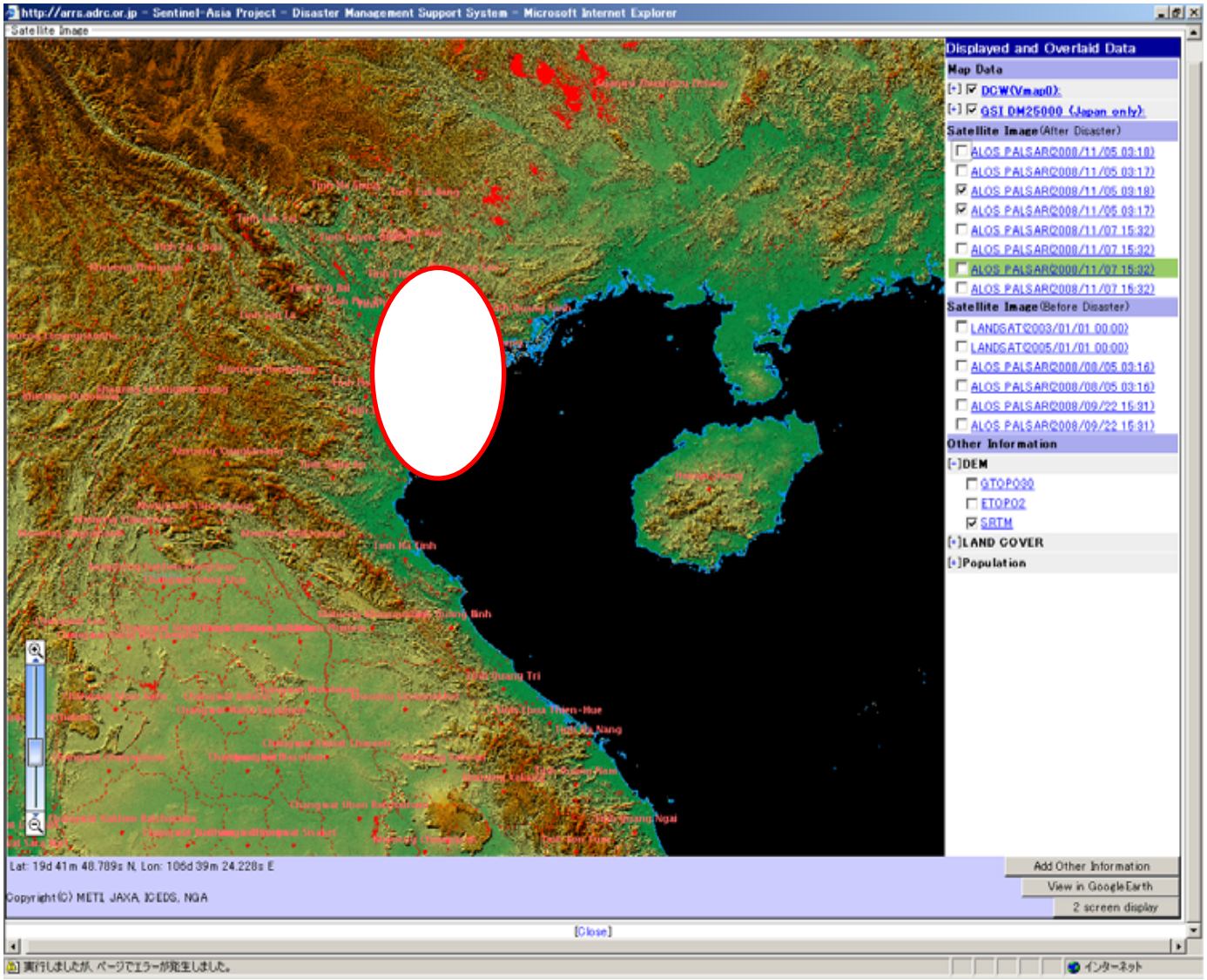
Number	Time	Place	Type of disaster
18	May 2008	Myanmar	Cyclone/Flood
19	May 2008	China	Earthquake
20	June 2008	Indonesia	Storm Surge
21	June 2008	Japan	Earthquake
22	June 2008	Philippines	Typhoon/Flood
23	July 2008	Japan	Earthquake
24	Aug. 2008	Lao PDR	Flood
25	Aug. 2008	Nepal	Flood
26	Sep. 2008	Thailand	Flood
27	Sep. 2008	Nepal	Flood
28	Oct. 2008	Pakistan	Earthquake
29	Nov. 2008	Vietnam	Flash Flood
30	Nov. 2008	Thailand	Flood
31	Dec. 2008	Thailand	Flash Flood
32	Jan. 2009	Indonesia	Earthquake/Tsunami
33	Jan. 2009	Philippines	Flood



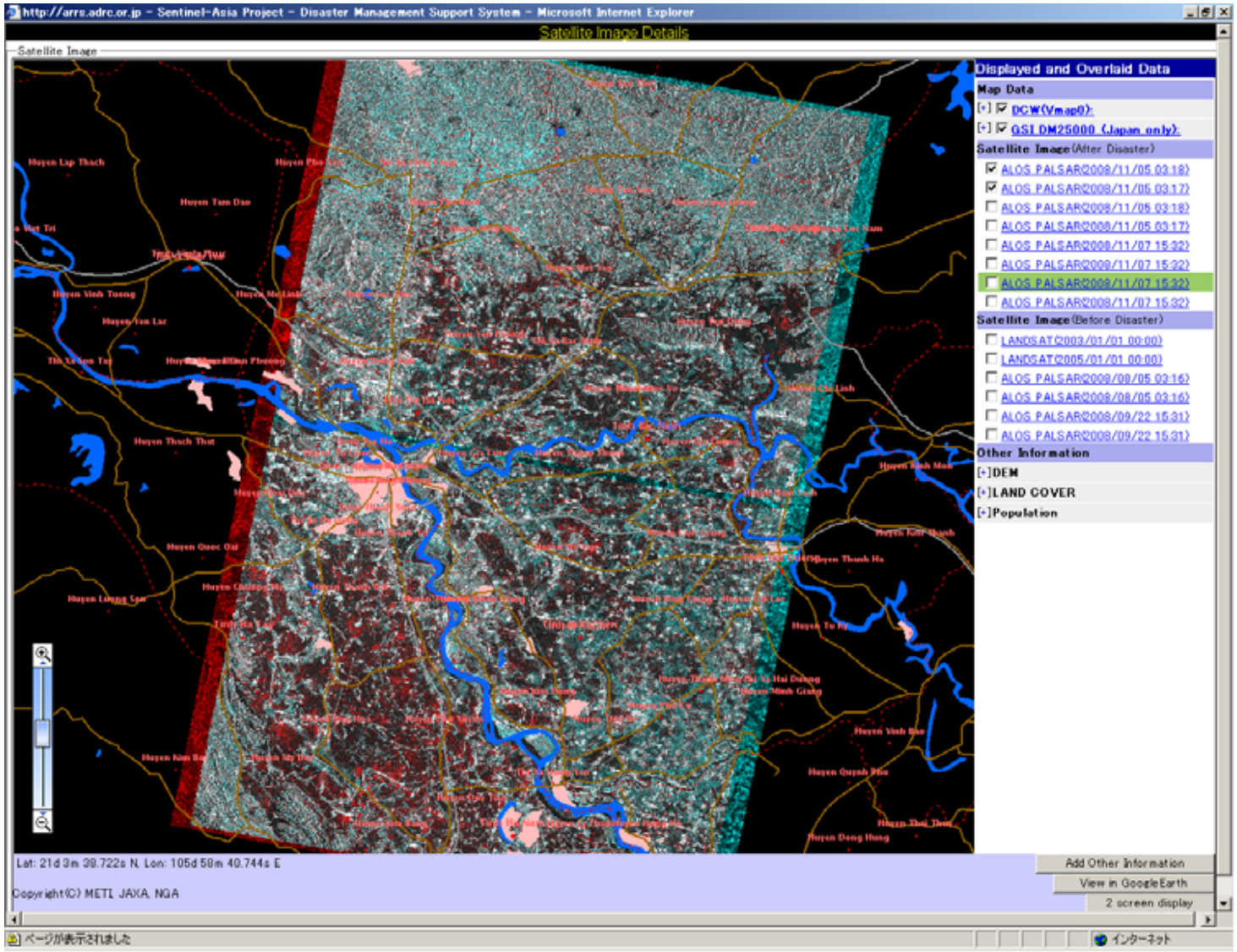
Heavy Rainfall

in Hanoi, Vietnam on 30-31 October 2008

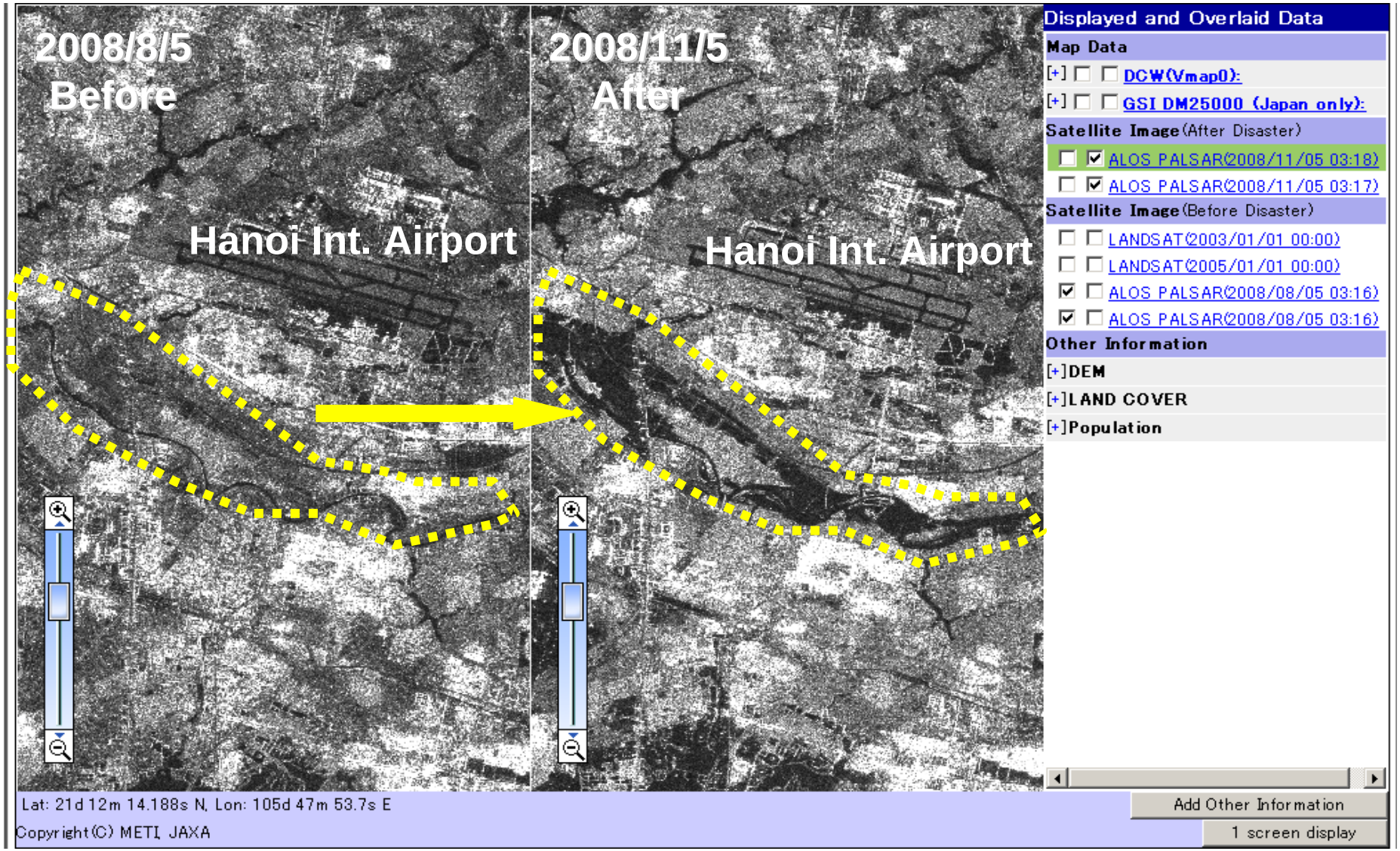
ALOS/PALSAR Imagery on 5 Nov 2008



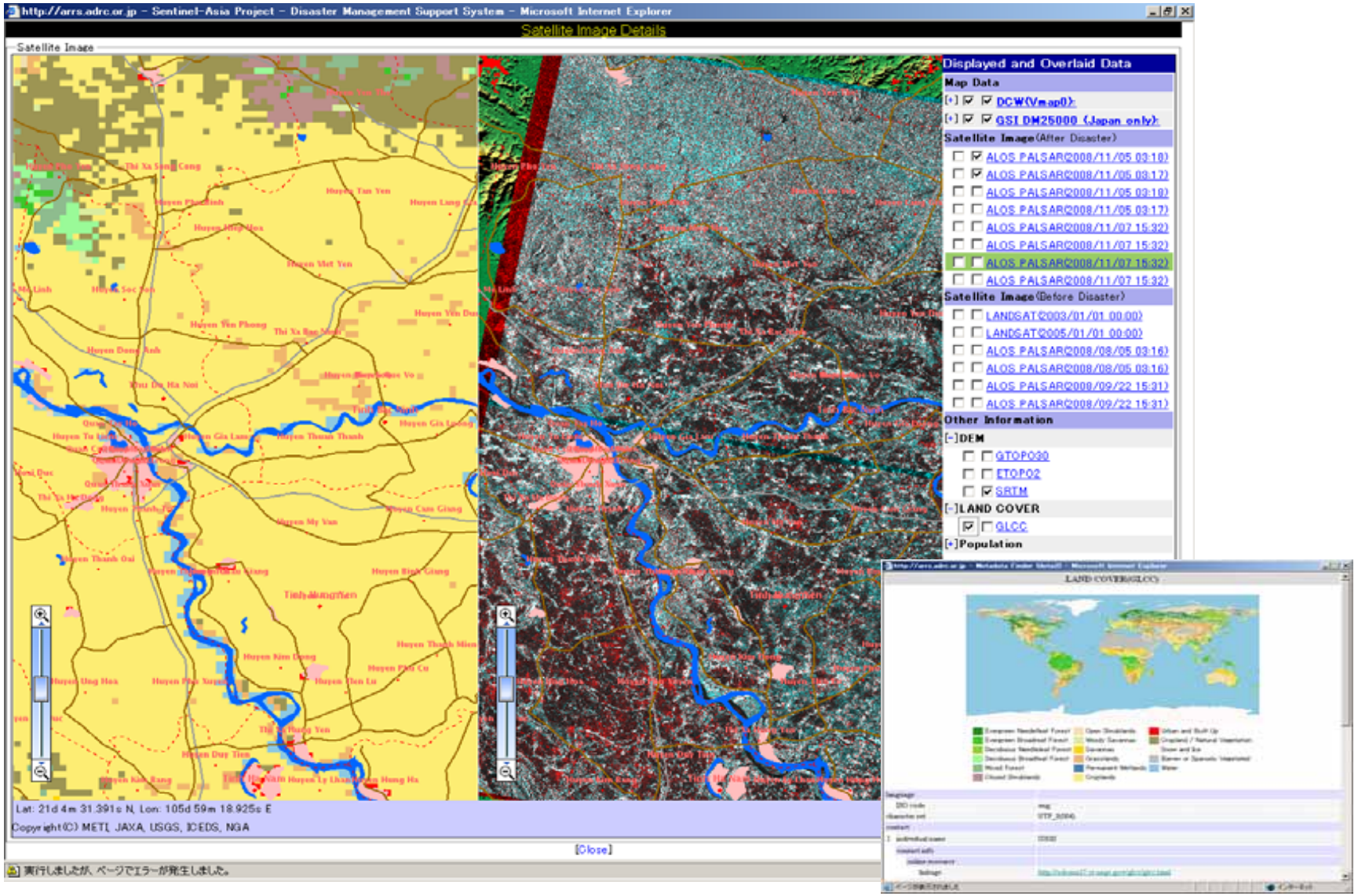
Flash Flood around Hanoi observed by ALOS/PALSAR on 5 Nov 2008



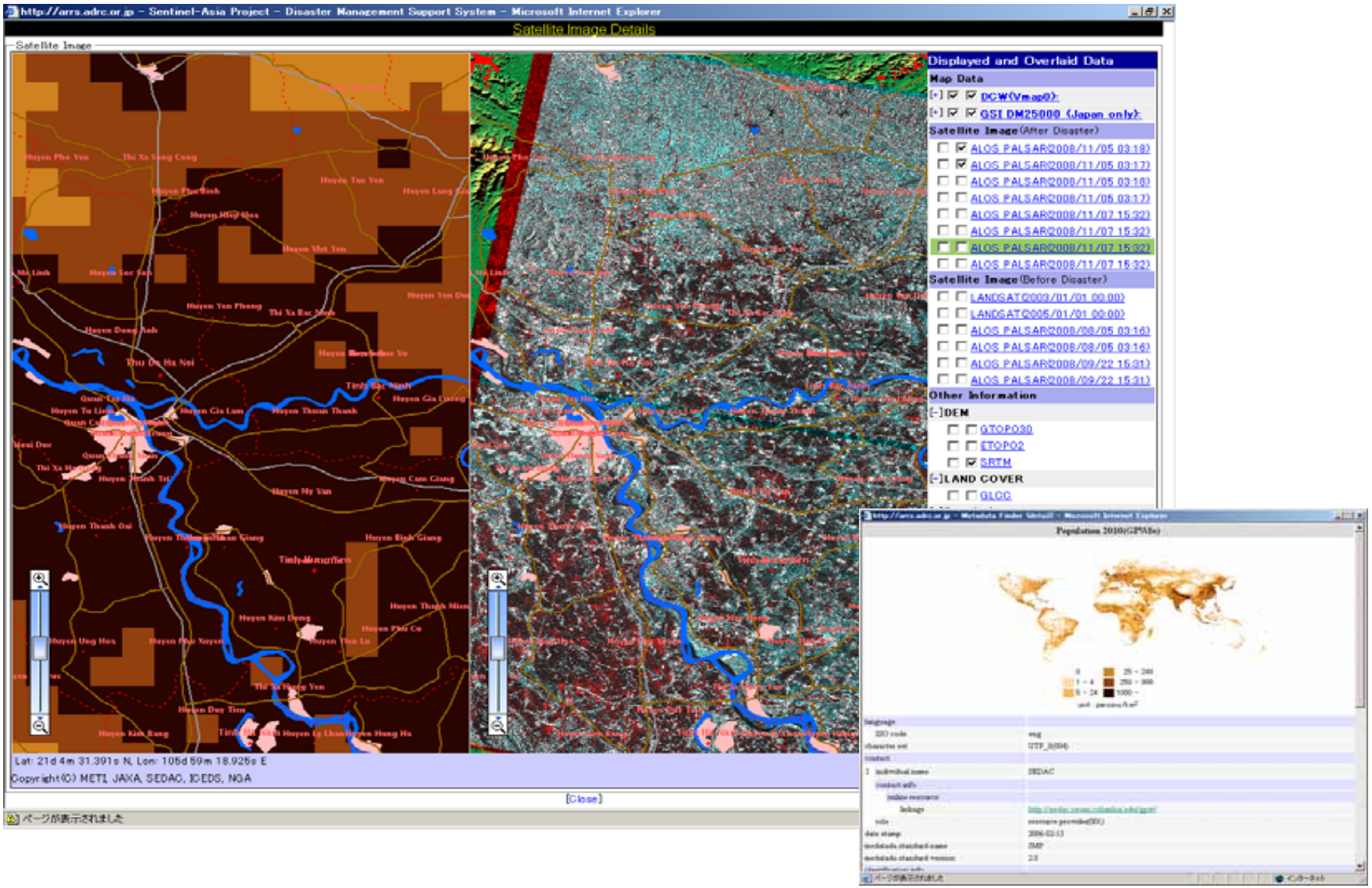
Flood in Vietnam in October 31-, 2008



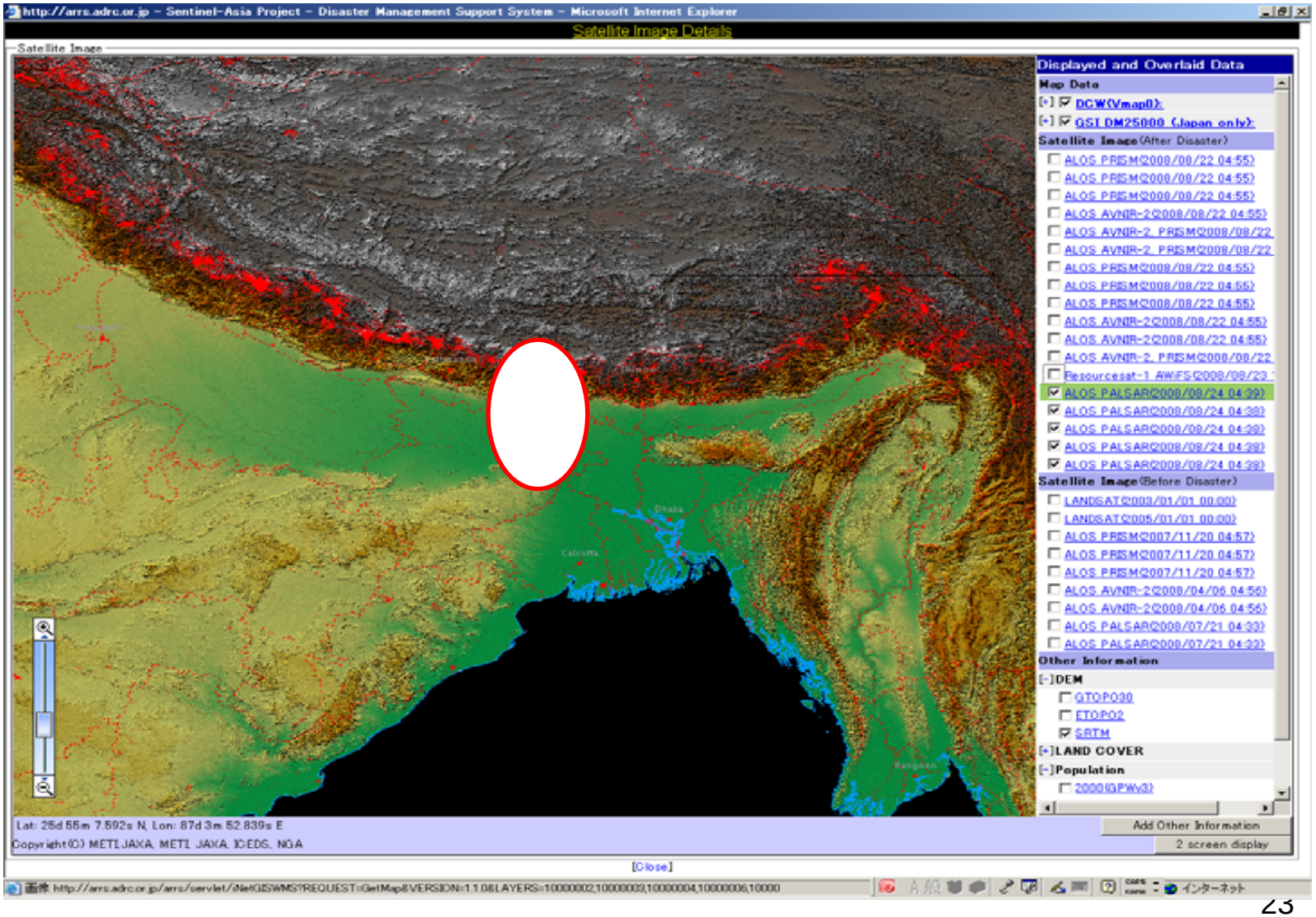
Land Cover Data and ALOS/PALSAR Image



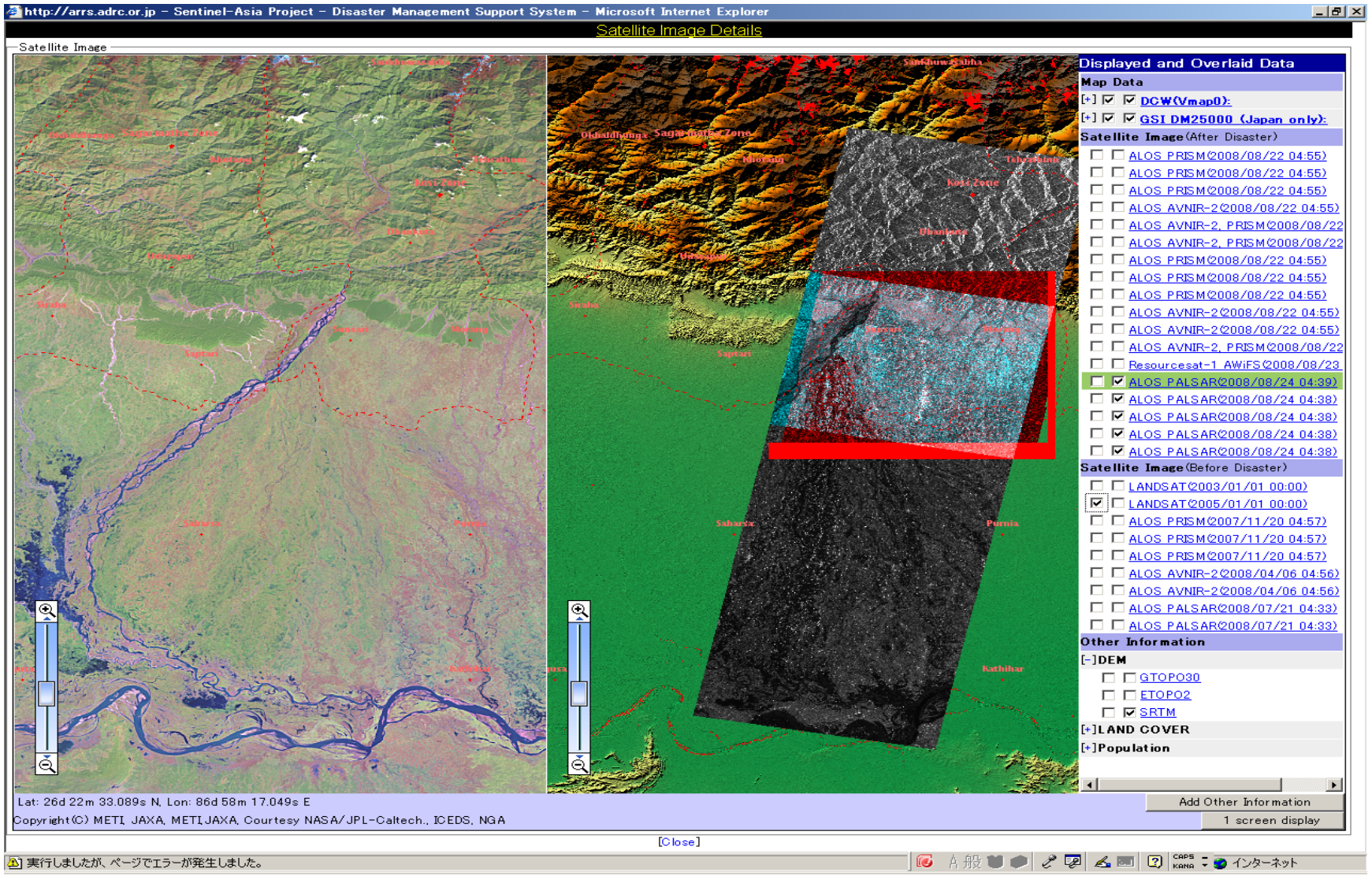
Population and ALOS/PALSAR Image



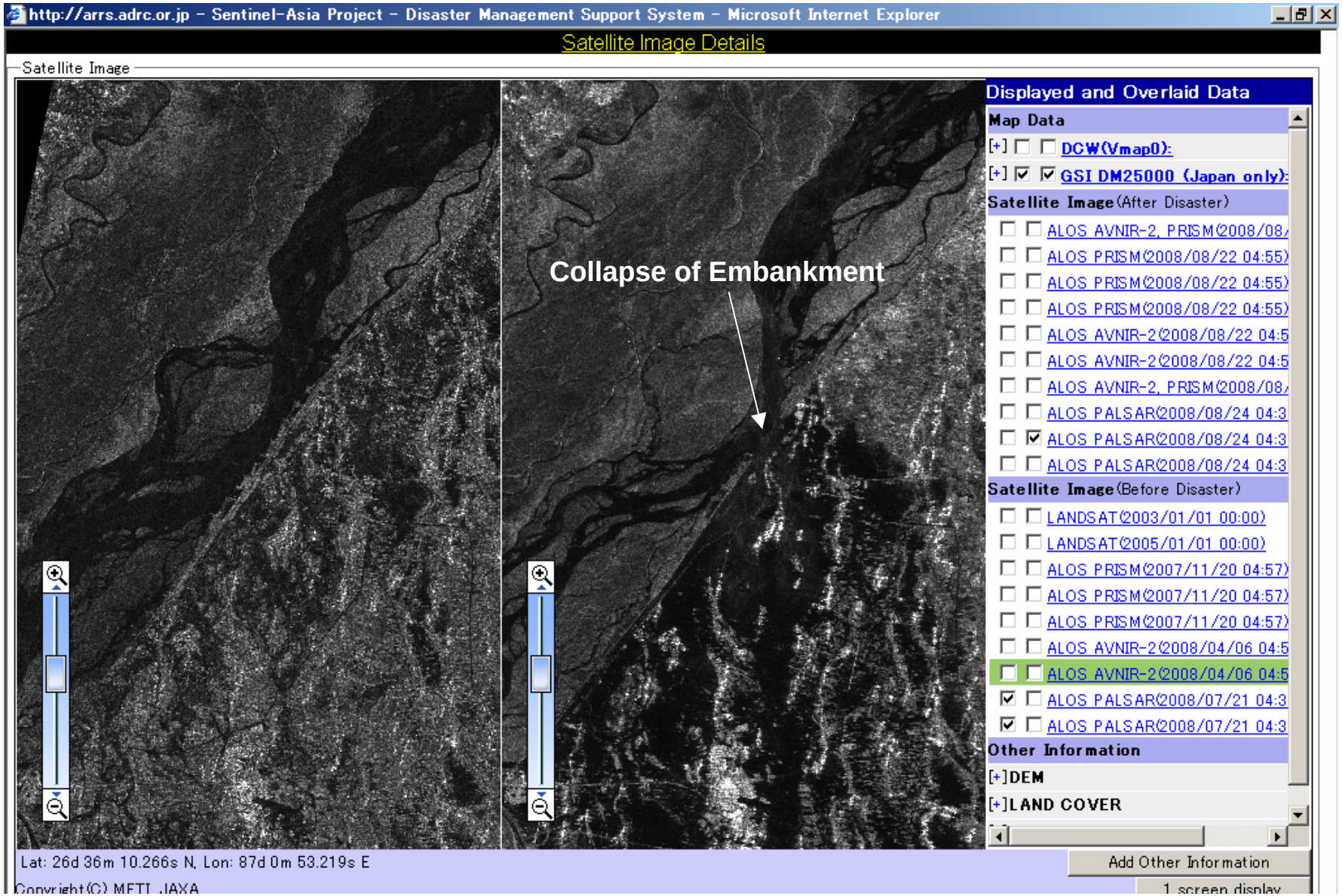
Flood in Nepal in Aug. 2008



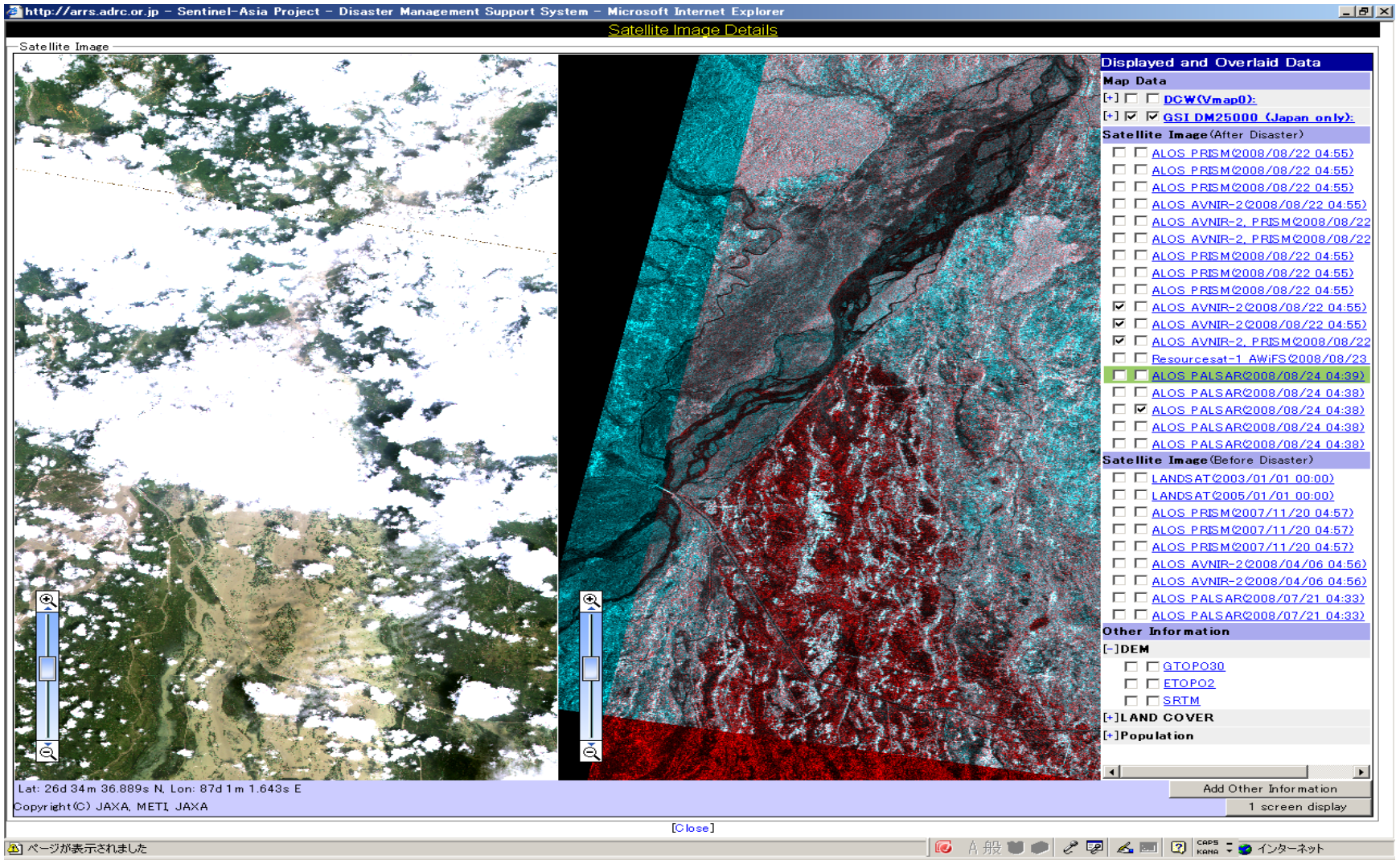
LANDSAT Image and ALOS/PALSAR Image on SRTM



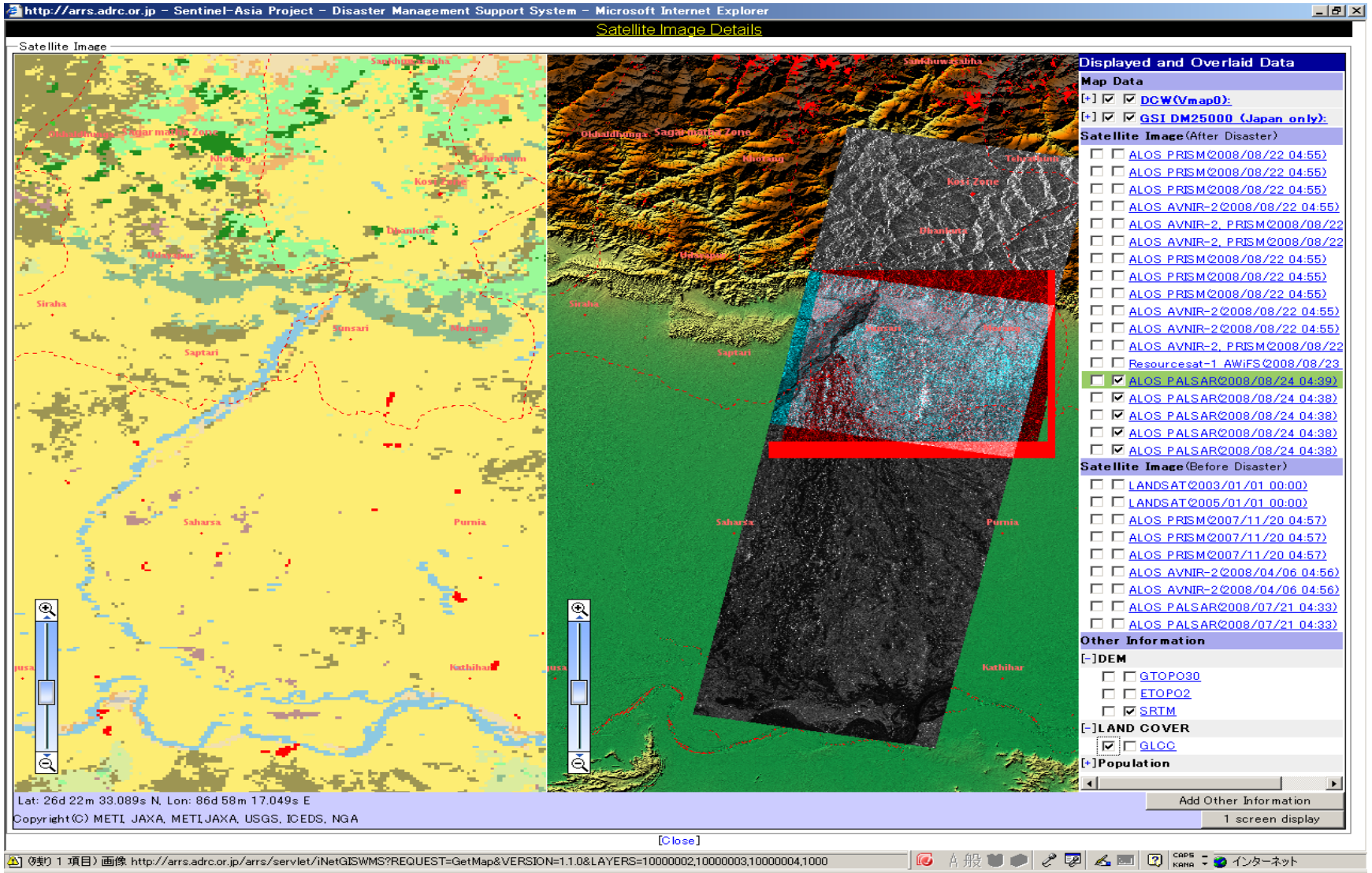
Flood in Nepal in August 18, 2008



ALOS/AVNIR2 and PALSAR Images



LAND Cover Data and ALOS/PALSAR Image on SRTM



Objective of Sentinel Asia Wildfire Monitoring and Control Initiative

Contribution to the Asia-Pacific region for Wildfire Management and Control:

- Mitigation of Wildfire Damage to Infrastructure and Forest Resources
- Contribution to Global Environment:

  Mitigation of global warming

  Impact to future global warming

  Carbon Cycle: Sink → Source

  Emitted CO_2 from wild fire: 2～4 Gt (IPCC report 2007)

  Contribution to Kyoto Protocol REDD (Reducing Emissions from Deforestation and Degradation in Developing countries)

- Sustainable Forest Management

Fire Management Cycle

Fire Warning (Fire Danger Warning)

Early Fire Detection

Forecasting Fire Expansion

Early Fire Control

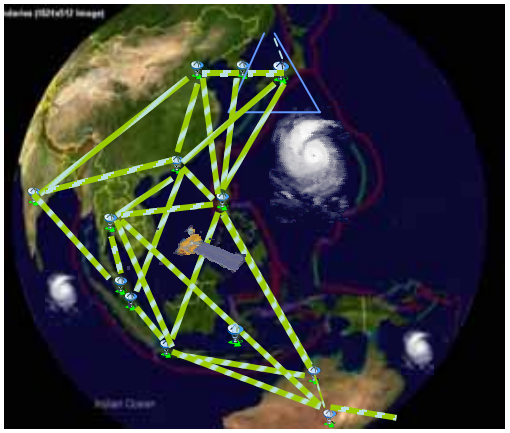
Full Suppression

Restoration of damaged forest

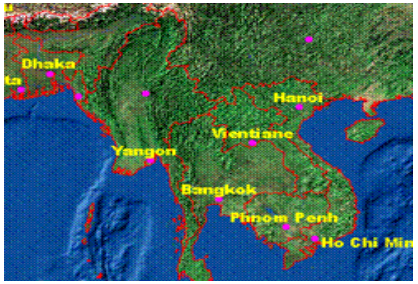
Sentinel Asia

Sentinel Asia (MODIS Wildfire Monitoring)

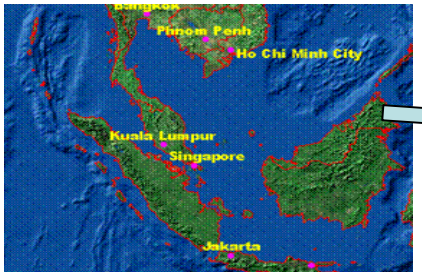
University of Tokyo (Japan)



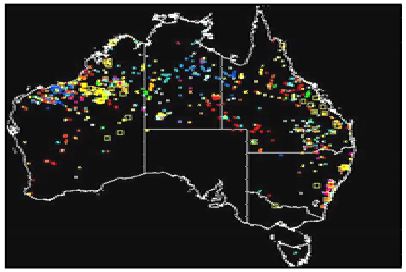
Satellite observation network



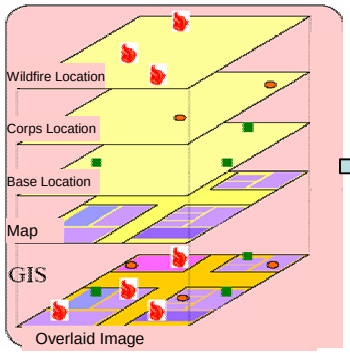
AIT/Univ. of Tokyo(Thailand)



CRISP (Singapore)



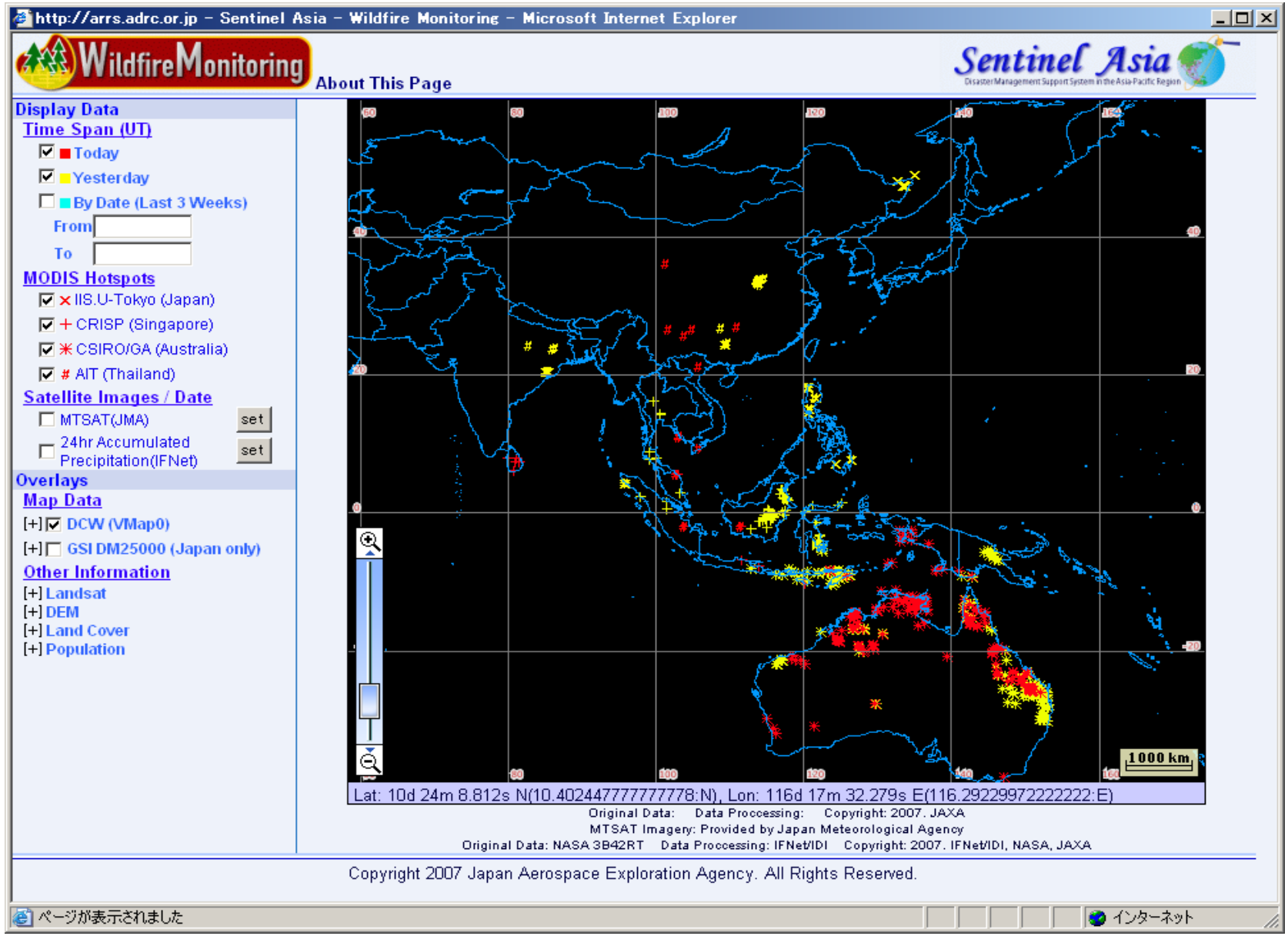
CSIRO (Australia)



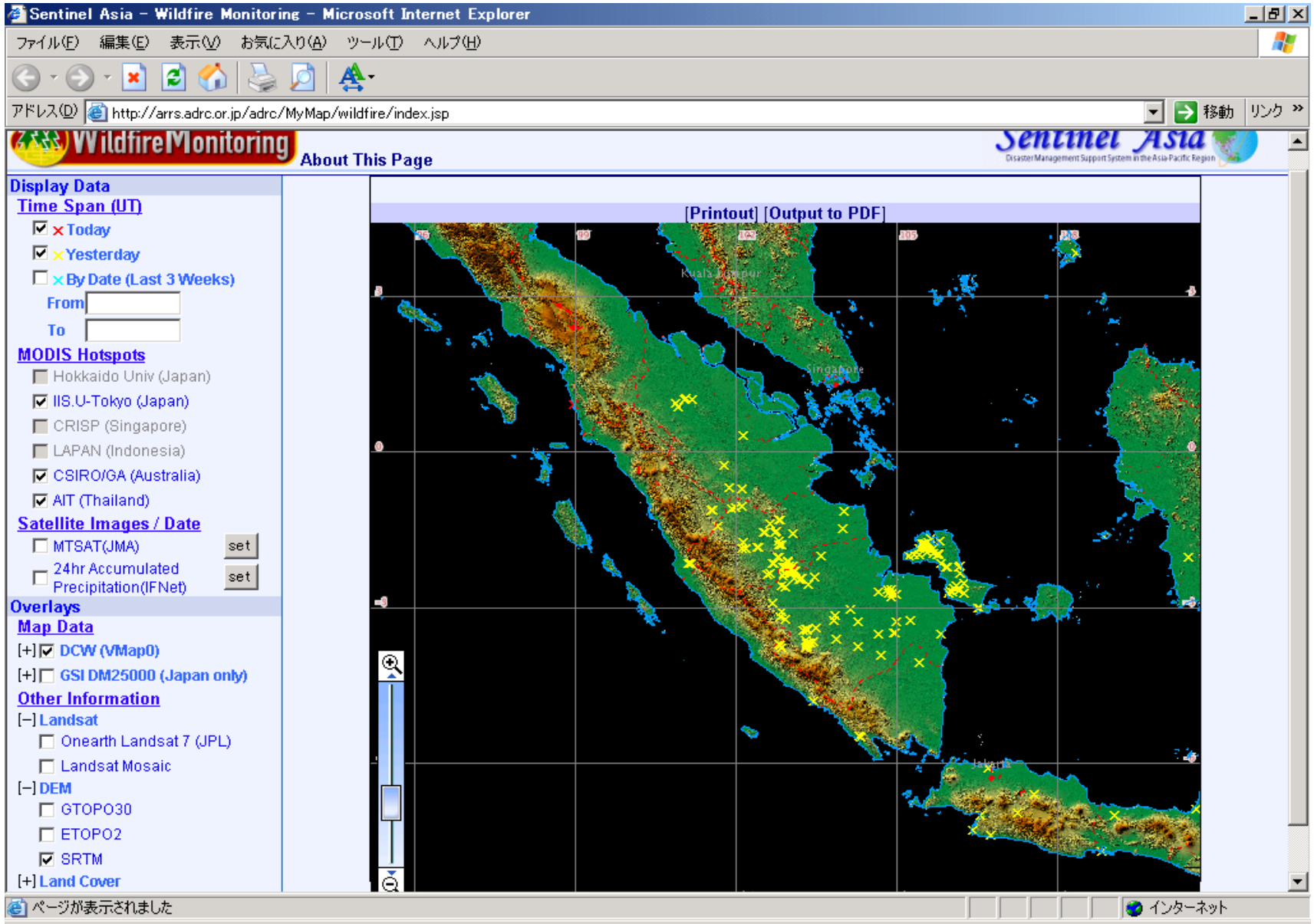
Web-GIS interface

Hotspot map of Asia

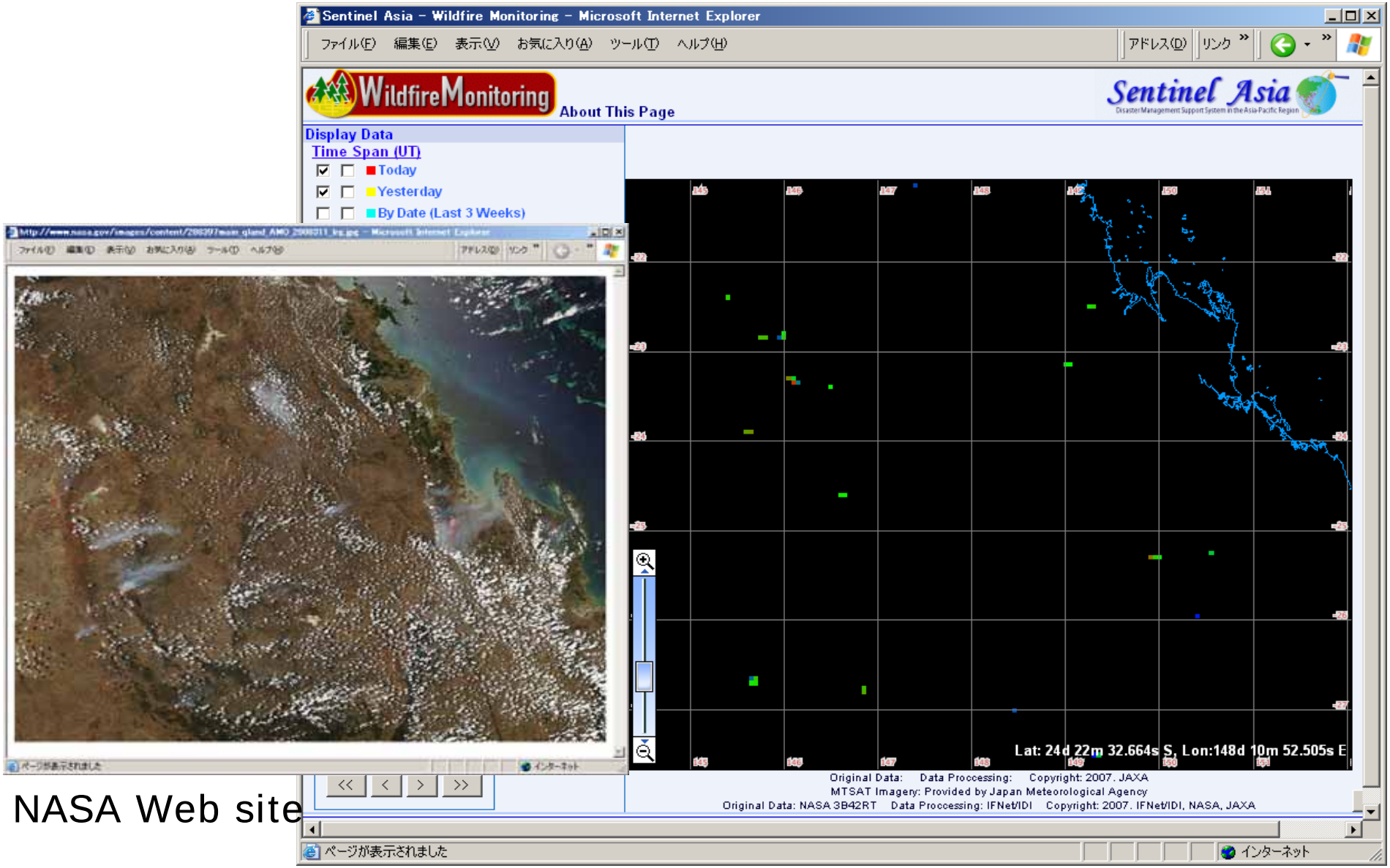
MODIS Hotspots on GIS



MODIS Hotspots on SRTM/ DEM

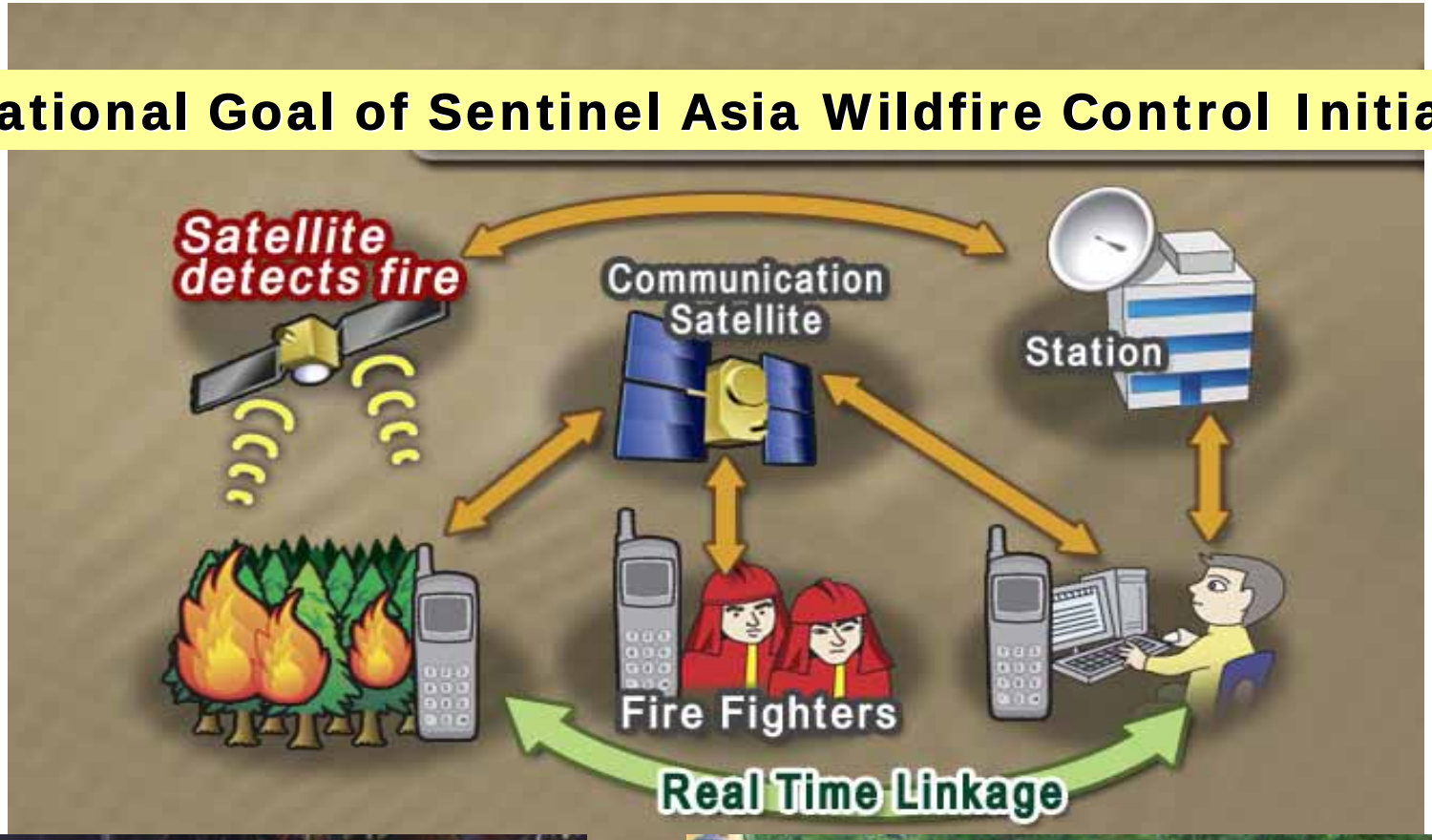


MTSAT Hotspot and MODIS Imagery on 6 Nov 2008, in Queensland, Australia



NASA Web site

Operational Goal of Sentinel Asia Wildfire Control Initiative



Regional Cooperation in Step2

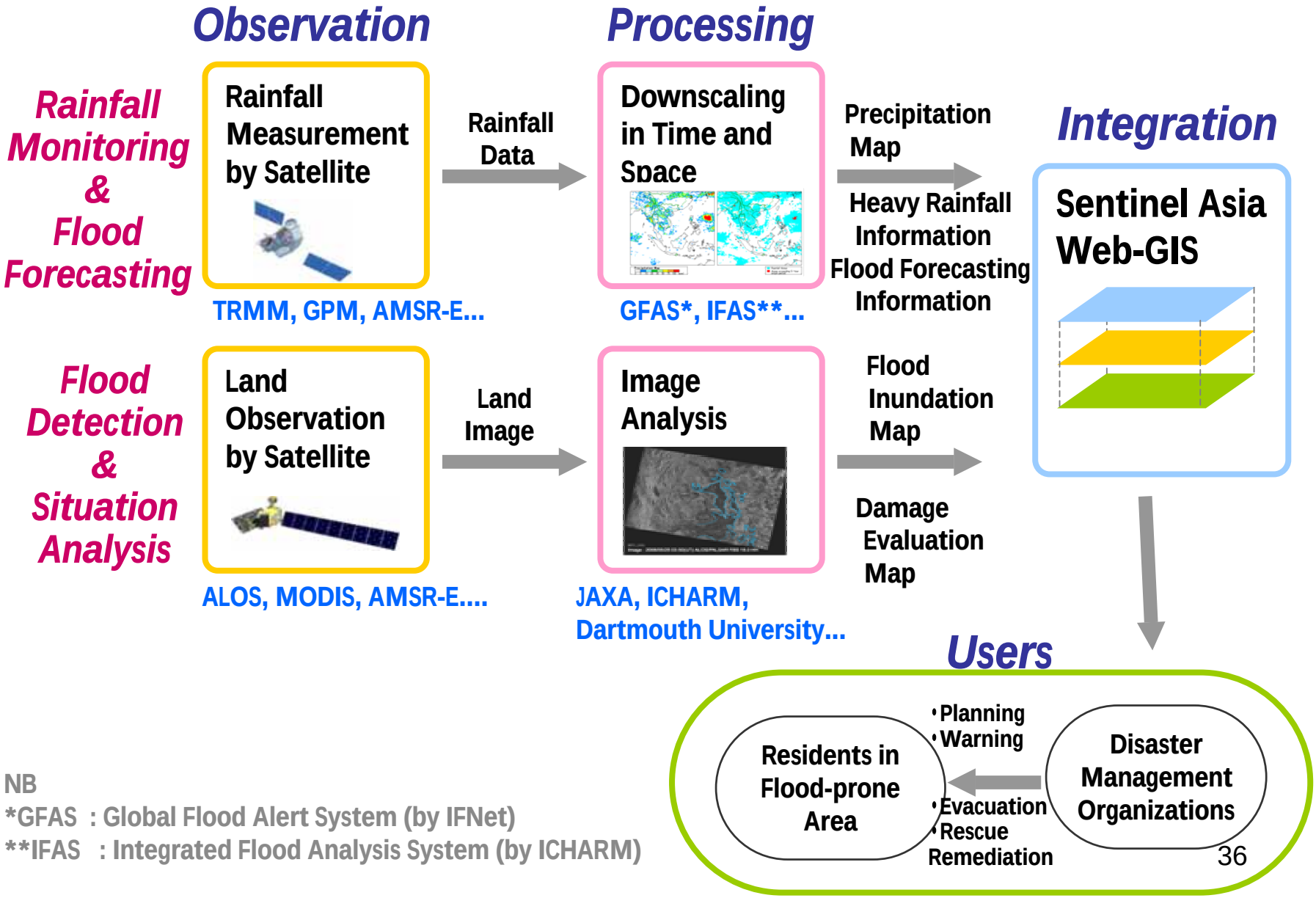
JST/JICA Project “Wildfire and Carbon Management in Kalimantan, Indonesia”

Objective of Flood Monitoring

To contribute to the mitigation of flood disasters in Asia through:

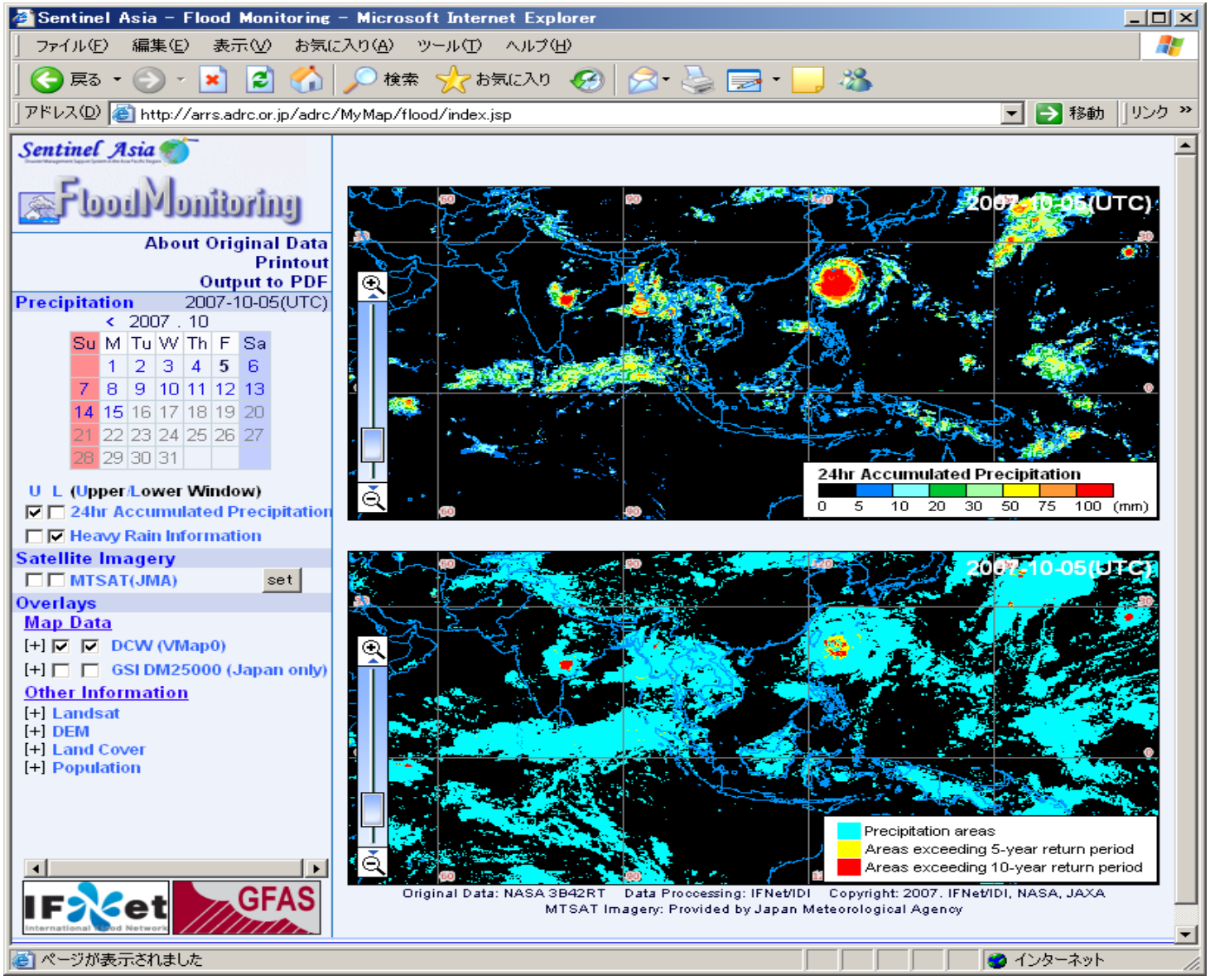
- utilizing satellite, GIS and information network technologies as much as possible,
- enhancing the development of the basis for sharing information on flood risks and disasters among national and international organization in relation to flood management,
- and realizing the above concepts on the Sentinel Asia network system

Sentinel Asia Flood Monitoring

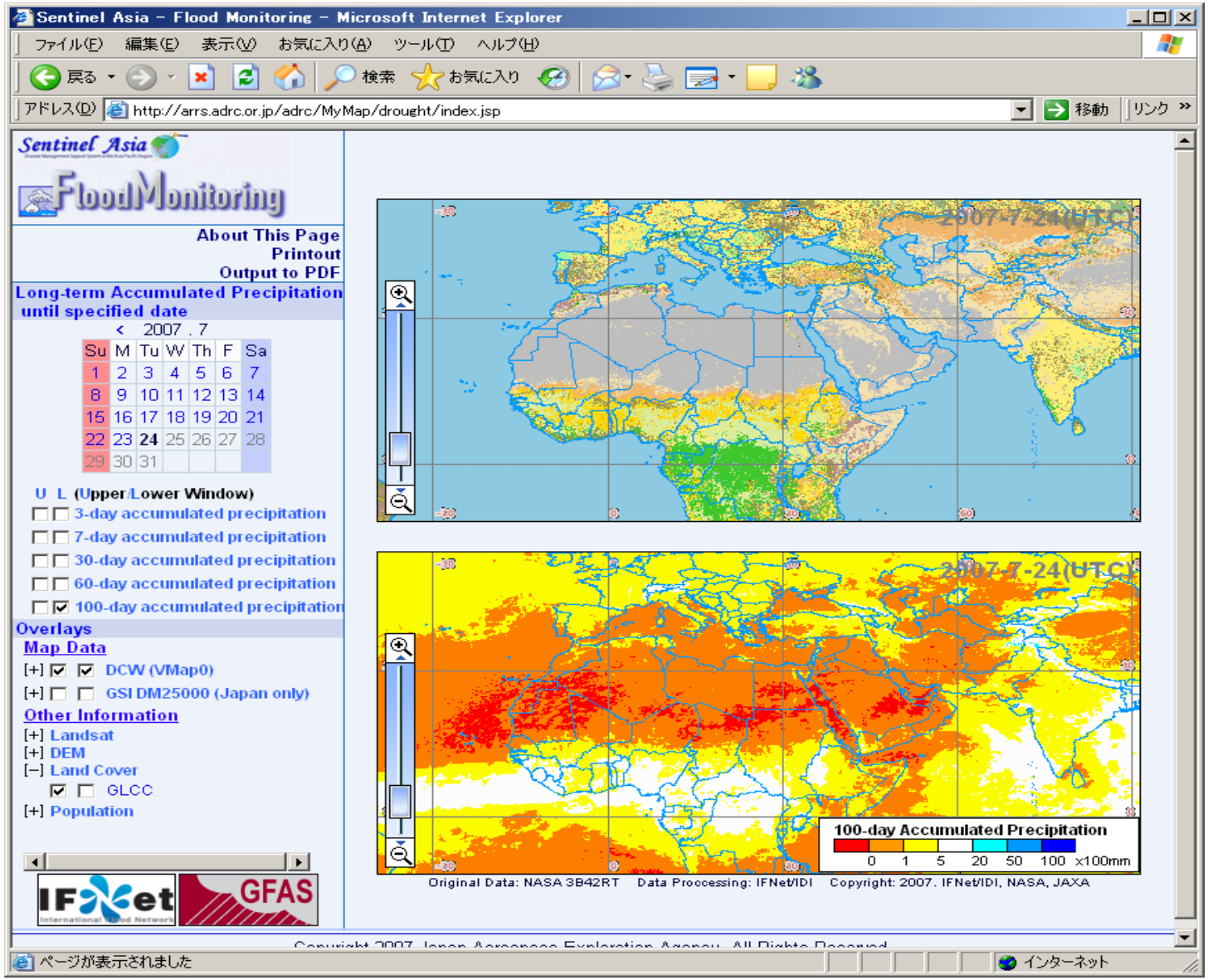


NB
*GFAS : Global Flood Alert System (by IFNet)
**IFAS : Integrated Flood Analysis System (by ICHARM)

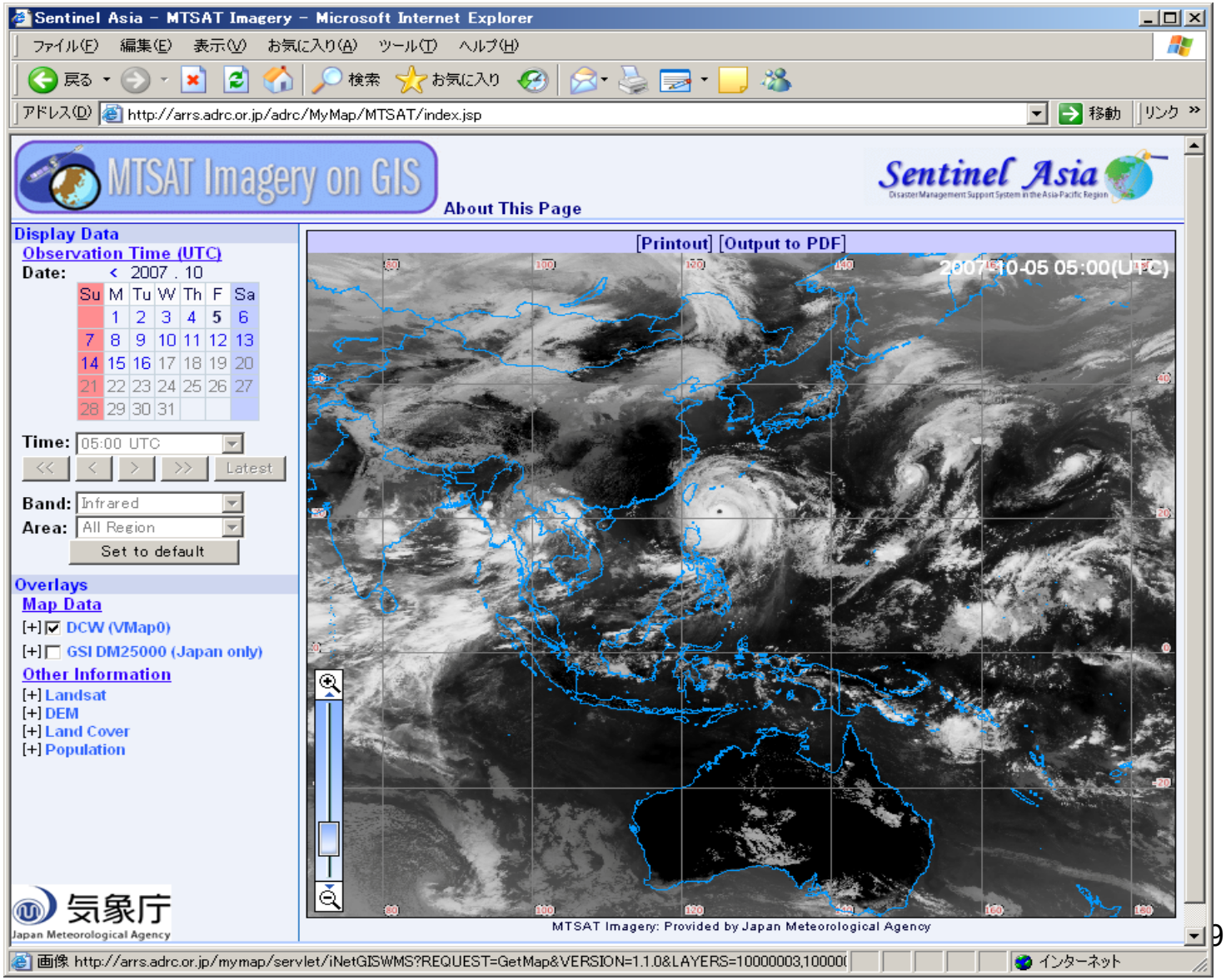
GFAS Precipitation Data on GIS



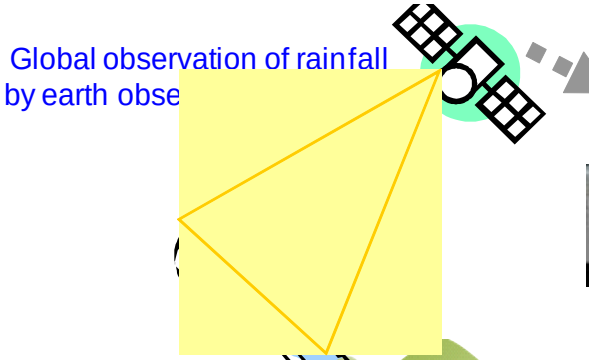
Long-term Accumulated GFAS Precipitation data and Land Cover data



MTSAT Imagery on GIS

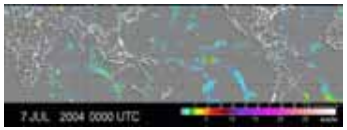


Regional Cooperation in Step2 applying Integrated Flood Analysis System (IFAS)



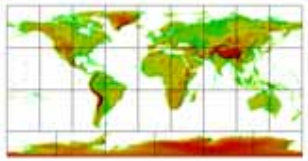
Global observation of rainfall by earth obse

Satellite-based near real-time rainfall data

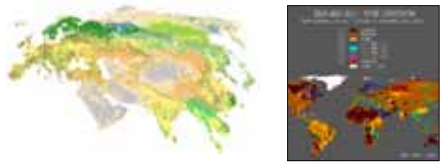


Ex.) IFNet-GFAS, NASA-3B42RT, JAXA-GSMaP

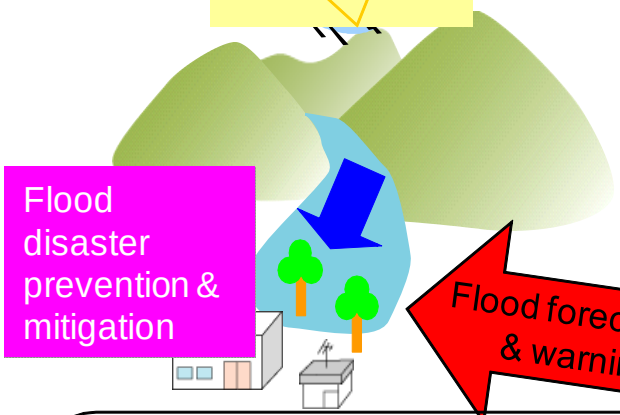
Topographic data



Other GIS data for runoff mode (Land use, soil, etc.)



Data download through Internet, free of charge

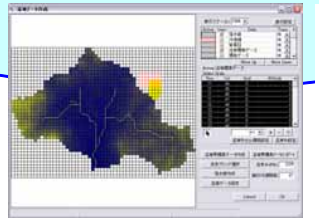


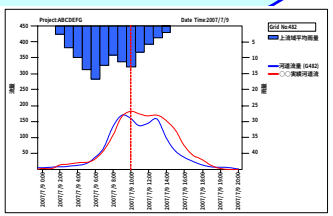
Flood disaster prevention & mitigation

Flood forecasting & warning

IFAS *(A basis for flood forecasting/warning system)*

Real-time input: Satellite & ground rainfall
GIS data input for setting parameters
GIS analysis to build runoff model
Runoff analysis and flood simulation
User-friendly interfaces for output





Current situation

Despite of the needs for flood forecasting/warning,
No rainfall, GIS data, nor analytical tools
→ Required much money & time for implementation

After the application of IFAS:
Prompt & efficient implementation
No need to develop original core system
Step-by-step improvement of accuracy with hydrological observational network

User can utilize advanced technology as easily and effectively and autonomously as possible with the sense of local ownership

Capacity Building and Human Network

The 3rd Sentinel Asia System Operation Training by JAXA
in cooperation with
AIT, ISRO, ADRC
in September 2008

The 4th Sentinel Asia System Operation Training is planned in Lao PDR in February 2009

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   Capacity Building

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   Sentinel Asia Step2

Results of Step1

Sentinel Asia Step1 has achieved its overall goals:

- The website of Sentinel Asia has operated since October 2006. It has served as a good demonstrator project, to share disaster-related information obtained by several earth observation satellites such as ALOS, MTSAT-1R, Terra & Aqua
- It also demonstrates recent advances in web-mapping technologies and ICT systems

Following findings are to be worked on at Step2:

- There are narrow band areas where it is hard to see Web-GIS information
- More robust and user-friendly website system is required
- Users request GeoTiff data (by Space agency or Institutes) and easily comprehensible interpretations from images (by Disaster management organization)

Enhancement and Expansion in Step2

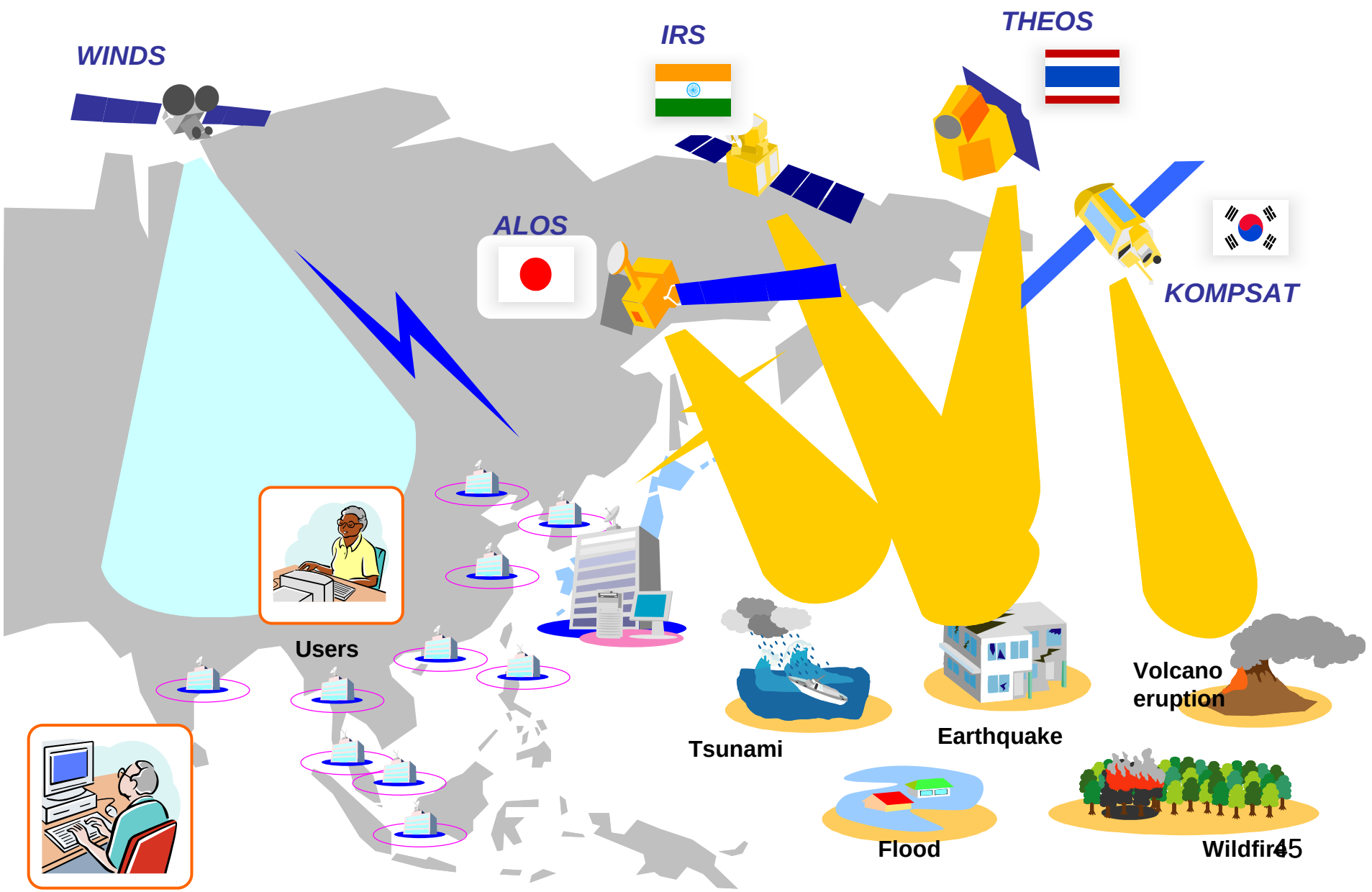
1°Participation of Various Satellites
- EO satellites: ALOS (JAXA), MTSAT-1R (JMA), IRS (ISRO), KOMPSAT (KARI), THEOS (GISTDA), etc.
- Communications satellites: WINDS (JAXA) etc.

2°Improvement of Accessibility to Information
- From data sharing (Step 1) to data sharing and transmission
- Facilitate access to disaster-related information through various means including satellite communication using WINDS

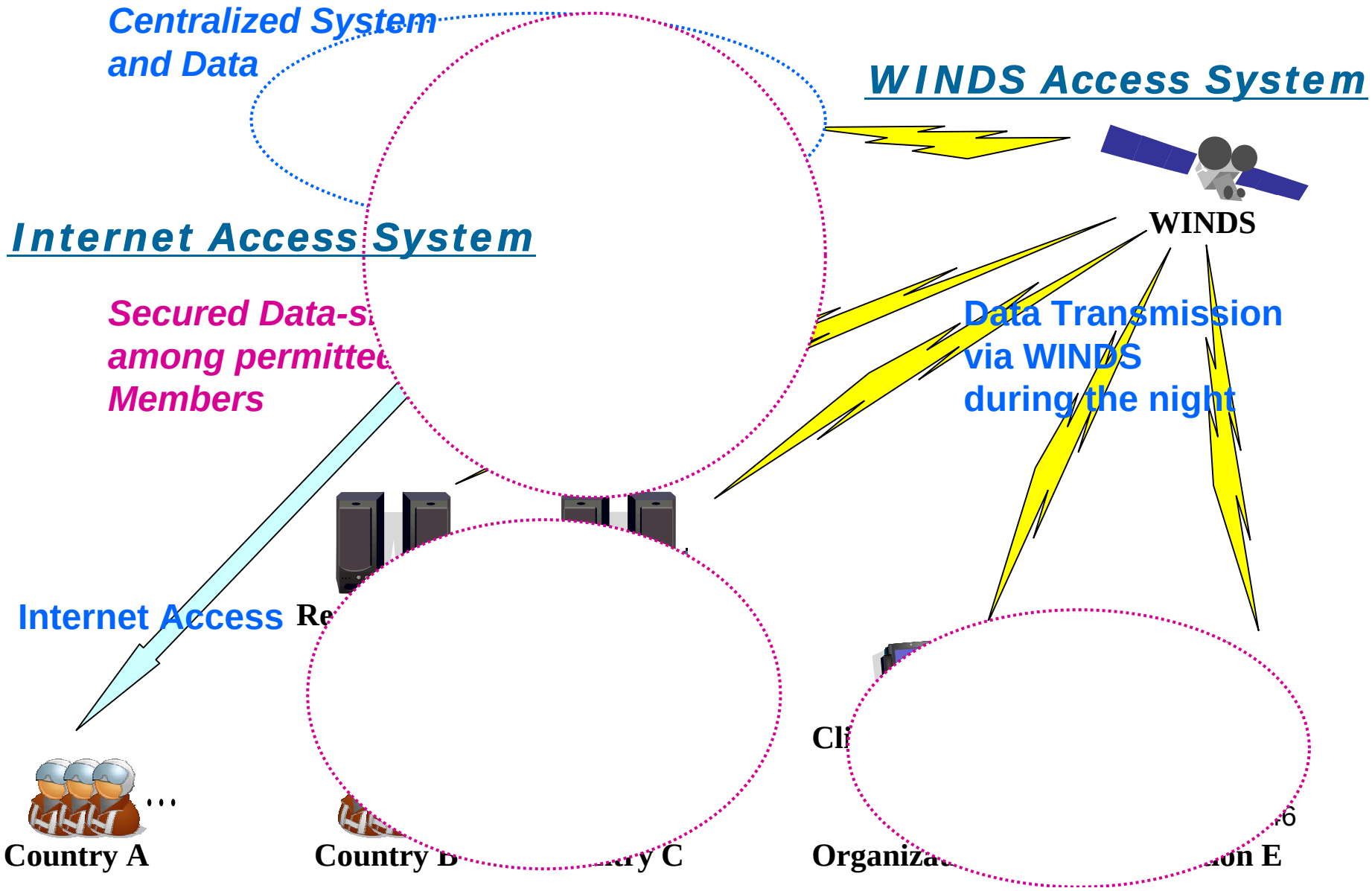
3°Value-added Data
- To provide analyzed images and easily comprehensible interpretations from images
- To organize framework of data analysis node

4°User Expansion
- To expand users to local disaster authority in cooperation with UNESCAP

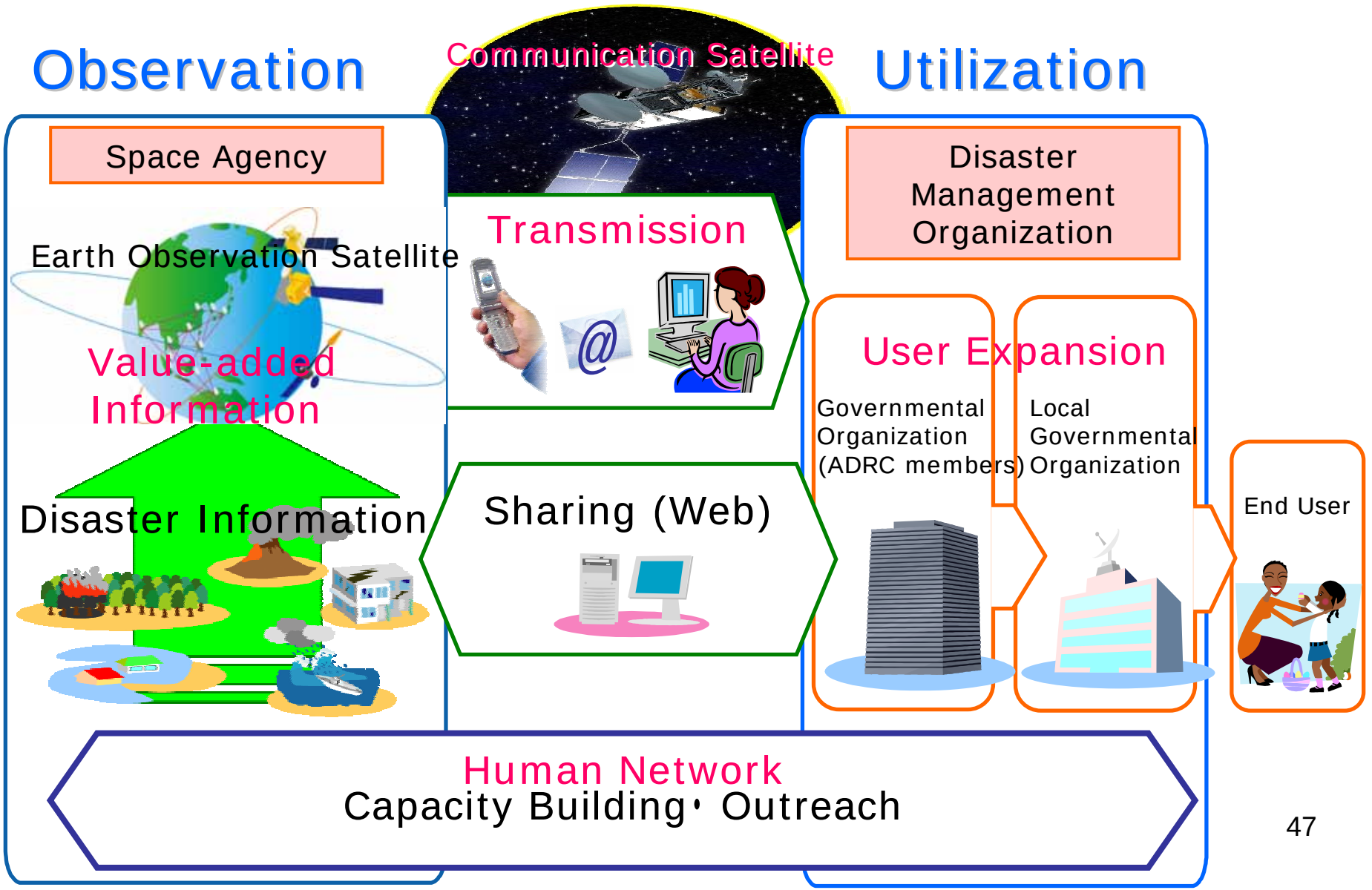
Emergency Observation



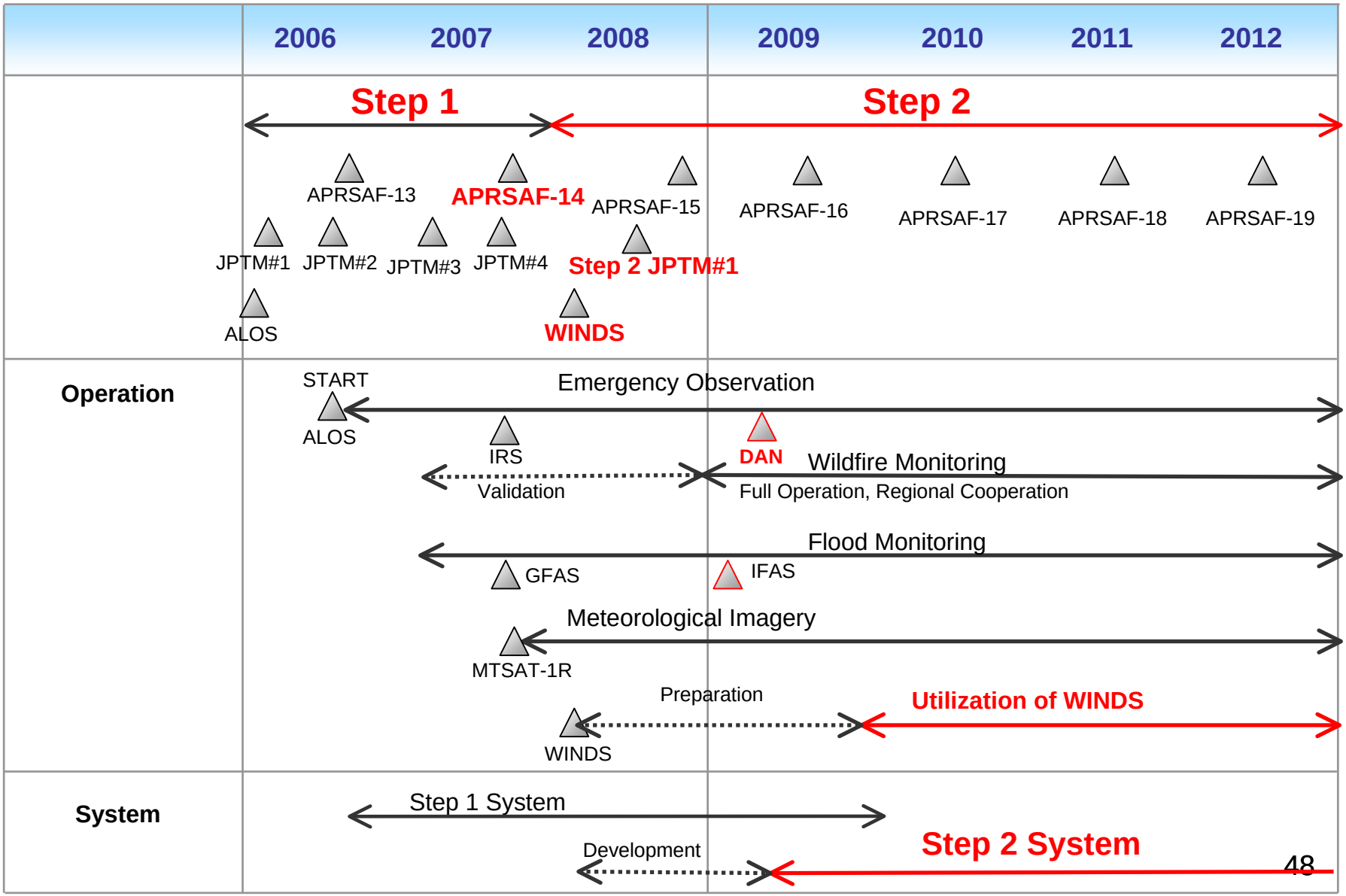
Sentinel Asia Step2 System



Concept of Sentinel Asia Step2



Sentinel Asia Milestone



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