Sentinel Asia is leading by the APRSAF (Asia-Pacific Regional Space Agency Forum) to share Disaster information in the Asia-Pacific region by the Sentinel Asia System and to make the best use of Space Technology such as Earth Observation Satellites data for disaster responses in the Asia-Pacific region.
**What is APRSAF**

Established in 1993 after the Asia-Pacific International Space Year Conference (APIC) in 1992 to enhance the development of space programs in the Asia-Pacific region and promote regional cooperation in the field of space technology and its applications.

**Participation**
Space agencies, related governments, regional and international organizations, institutions responsible for applying space technology.

**Organizers**
MEXT, JAXA and co-host organizations
- Past co-organizers: Government entities of Mongolia, Malaysia, The Republic of Korea, Thailand, Australia, Indonesia, India.

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**Contribution from Space Infrastructure**

- 500km~
- 13km
- 4.6km

- Wide Coverage
- 24h Observation
- All Weather
- Borderless

**Optical Imagery**
2006/4/29 (same date)

**Radar Imagery**
Current Participating EO Satellites

ALOS
PRISM: 2.5m Pan
AVNIR-1: 10m Multi
PALSAR: 10-100m L-Band

Resourcesat-1
LISS-4: 5.8m Pan
LISS-3: 23.5m Multi
AWIFS: 56m Multi

Coming soon...

THEOS
PAN: 2m Pan
Multi: 15m

KOMPSAT-1
EOC: 6.6m
OSMI: 1km

History of Sentinel Asia

- **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 and initiated STEP2 activities
  > ISRO joined Emergency Observation
- **Dec 2008**: APRSAF-15, Hanoi, Vietnam
  > To be reported the latest status of Step-2.
Members of Sentinel Asia

Sentinel Asia organize Joint Project Team (JPT), and JPT consists of 59 organizations and including 51 agencies from 20 countries and 8 international organizations. Also, Sentinel Asia cooperate with ADRC and their members (27 Member Countries, 5 Advisor Countries, 1 Observer) closely, and they are also member of Sentinel Asia as well.

Concept of Sentinel Asia

- Contribution from space community (APRSAF) to the disaster management in the Asia-Pacific region
- To promote utilization of disaster-related information obtained by space and remote sensing technology in order to mitigate and prevent damages caused by natural disasters
- To succeed and strengthen Step 1 considering findings and achievements of Step 1 and user’s needs
- Voluntary initiative through the new Joint Project Team for Step-2
- 5 year project start from 2008 through to 2012
**Sentinel Asia**
Disaster Management Support System in the Asia-Pacific Region

### Design of Sentinel Asia Framework

#### Observation
- Space Agency
- Earth Observation Satellite
  - Value-added Information
  - Disaster Information

#### Utilization
- Communication Satellite
- Disasters
  - Disaster Information-sharing System
  - Disaster Information-sharing Platform
  - Disaster Information-sharing (Web)
- End User

#### User Expansion
- User Expansion
  - Governmental Organization (ADRC members)
  - Local Governmental Organization

### Human Network
Capacity Building - Outreach

### Application of WINDS for Sentinel Asia

< From Step-2 phase >

- Observation System
- Observation Data
- Archived Data
- Value-added Products
  - Earthquake
  - Volcano
  - Wildfire
  - Tsunami

- Disaster Information-sharing Platform
- Web site contents Transmission through WINDS
- High Speed Communication (10Mbps - 155Mbps)
- Disaster Management Agencies in the Asia-Pacific Region

- Narrow Band Problems
**Sentinel Asia**
Disaster Management Support System in the Asia-Pacific Region

**Framework**

- **APRSAF***
  - Content
  - Satellite Image
  - Promotion of Utilization
  - Capacity Building

- **Joint Project Team (JPT)**
  Join Project Team consists of total 59 organizations including 51 agencies from 20 countries and 8 international organizations as of October 2008.

- **ADRC**
  **Member Countries**
  - Content
  - Disaster Information Utilization (User)

**Sentinel Asia**
Disaster Management Support System in the Asia-Pacific Region

**Enhancement and Expansion in Step 2**

1° **Participation of Various Satellites**
- EO satellites: ALOS (JAXA), MTSAT-1R (JMA), IRS (ISRO)
  -------------------------------near future-----------------------------
- 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
Enhancement and Expansion in Step 2

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

4° Expansion of Disaster Scope
- To extend STEP1’s focus on Wildfires and Floods
- To include monitoring during signs before disasters happen and environmental change
- For new WG, some activities were proposed in the 1st JPTM: Glacier and Glacial Lake Monitoring, Capacity Building, Irrigation, etc.

5° User Expansion
- To expand users to local disaster authority in cooperation with UNESCAP

Information Sharing

Disaster information shared by “Sentinel Asia Website”, and activities and contents mainly consist as follows;

(1) Emergency Observation
(2) Wildfire Working Group
(3) Flood Working Group
(4) Capacity Building
(5) Web Forum
(6) Emergency Observation Request
Main Activities

- Emergency Observation
- Wildfire Monitoring
- Flood Monitoring
- MTSAT Imagery
- Capacity Building
- Emergency Observation Request

Sentinel Asia responded 29 disasters (as of November 4, 2008) from Oct. 24, 2006, and those disaster imageries are disseminating via Sentinel Asia Website.

Emergency Observation

Sentinel Asia responded 29 disasters (as of November 4, 2008) from Oct. 24, 2006, and those disaster imageries are disseminating via Sentinel Asia Website.
### Emergency Observation

<table>
<thead>
<tr>
<th>Date</th>
<th>Country</th>
<th>Event</th>
<th>Image</th>
<th>Product</th>
<th>GIS</th>
<th>Google Earth</th>
<th>Photo</th>
<th>Disaster Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008/05/18</td>
<td>Nepal</td>
<td>Flooded</td>
<td>📸</td>
<td>🧐</td>
<td>🪖</td>
<td>🪖</td>
<td>🪖</td>
<td>ACRC</td>
</tr>
<tr>
<td>2008/06/11</td>
<td>Laos F.D.R.</td>
<td>Flooded</td>
<td>📸</td>
<td>🧐</td>
<td>🪖</td>
<td>🪖</td>
<td>🪖</td>
<td>ACRC</td>
</tr>
<tr>
<td>2008/07/24</td>
<td>Japan</td>
<td>Earthquake</td>
<td>📸</td>
<td>🧐</td>
<td>🪖</td>
<td>🪖</td>
<td>🪖</td>
<td>ACRC</td>
</tr>
<tr>
<td>2008/07/21</td>
<td>Philippines</td>
<td>Typhoon</td>
<td>📸</td>
<td>🧐</td>
<td>🪖</td>
<td>🪖</td>
<td>🪖</td>
<td>ACRC</td>
</tr>
<tr>
<td>2008/08/14</td>
<td>Japan</td>
<td>Earthquake</td>
<td>📸</td>
<td>🧐</td>
<td>🪖</td>
<td>🪖</td>
<td>🪖</td>
<td>ACRC</td>
</tr>
<tr>
<td>2008/08/04</td>
<td>Indonesia</td>
<td>Storm Surge</td>
<td>📸</td>
<td>🧐</td>
<td>🪖</td>
<td>🪖</td>
<td>🪖</td>
<td>ACRC</td>
</tr>
</tbody>
</table>

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**Sentinel Asia**

Disaster Management Support System in the Asia-Pacific Region

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Cyclone Nargis hit Myanmar in May 2, 2008
Tropical Storm hit Indonesia, in June 4, 2008

Typhoon hit Philippines, in June 21, 2008
Typhoon hit Philippines, June 21, 2008

Flood occurred in LAO, August 10, 2008
Flood occurred in NEPAL, August 18, 2008

Collapse of Embankment

Flood occurred in Viet Nam, October 31-, 2008
Flood occurred in Viet Nam, October 31, 2008
Framework of Wildfire Monitoring

Main Activities

- Establishment and Improvement of Early Wildfire Detection based on MODIS
- Development of Wildfire Expansion Forecasting
- Serving Value-Added Information to Forest Fire Control Agency

Sentinel Asia
Disaster Management Support System in the Asia-Pacific Region

Satellite observation network

Wildfire map of Asia

Hokkaido Univ. (Japan)

AIT/Tokyo Univ. (Thailand)

CRISP (Singapore)

CSIRO (Australia)
Flood Monitoring

Observation

- Rainfall Monitoring & Flood Forecasting
  - Rainfall Measurement by Satellite (TRMM, GPM, AMSR-E)
  - Downscaling in Time and Space
    - Precipitation Map
    - Heavy Rainfall Information
    - Flood Forecasting Information

Processing

- Land Observation by Satellite (ALOS, MODIS, AMSR-E)
  - Land Analysis
    - Flood Inundation Map

Integration

- Image Analysis
  - Sentinel Asia
    - Social Economic Data
    - Map Data
  - Observations of Heavy Rainfall and Flood Inundation Area
    - Precipitation and Flood Inundation on Web GIS
    - Flood Alert for Specific River Basins

Users

- Residents in Flood-prone Area
- Disaster Management Organizations
  - Planning
  - Warning
  - Evacuation
  - Rescue
  - Remediation

Disaster Management Organizations

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

Observation Processing Integration

- Rainfall Measurement by Satellite
- Rainfall Data
- Land Image
- Precipitation Map
- Flood Inundation Map

Rainfall Detection & Situation Analysis

- Observation Processing Integration
- Land Observation by Satellite
- Disaster Management Organizations

- Rainfall Measurement by Satellite (TRMM, GPM, AMSR-E)
- Rainfall Data
- Land Image
- Precipitation Map
- Heavy Rainfall Information
- Flood Forecasting Information

- Flood Inundation Map

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

To enable utilization of earth observation images which provided under the Sentinel Asia, we are providing several capacity building opportunities in terms of building capacity for interpretation of earth observation images and how to operate Sentinel Asia System as well.

(1) Capacity Building Announcement
    Several capacity building announcement release on this page
    - Sentinel Asia System (SAS) Operation Training Guideline for Applications
    - Announcement about Mini-Projects (GIC/JAXA)

(2) Dissemination of Capacity Building Materials
    - Achievement of Mini Project JFY2007
    - Sentinel Asia System Operation Training Textbook
    - Sentinel Asia Project Outline
    - Overview of Sentinel Asia System
    - Activities of Asia Branch
    - Continue Increase of Disaster Risk and Activities of ADRC
    - Utilization of Information for Disaster Risk Management
    - Practical Data Use for Disaster Management in Thailand
    - Examples of ALOS Disaster Observation

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Capacity Building

(1) Sentinel Asia System Operation Training (3 days)
    > Organize 2 times / Year at South East Asia
    > Around 20 trainees invited per course
    > SA System Operation hands on training
    > R/S data handing hands on training
    *ADRC Member have been attended.

(2) R/S Application Mini Project for Disaster (2 month)
    > Organize a times / Year at Asia Institute of Technology (AIT)
    > Around 20 trainees invited per course
    > R/S data handling hands on training
    > R/S data analysis hands on training
    > Consultation for development of thematic map
    *ADRC Member have been attended.
    *Basic R/S knowledge is required.
Emergency Observation Request Flow

http://dmss.tksc.jaxa.jp/sentinel/contents/EOEn.html

Emergency Observation Request Flow

Disaster Occurrence

ADRC Member
JPT Member

Online or via e-mail

via Tel, Fax

Coordination

Space Agencies

Feed Back from users

We secretariat ask details of utilization as a “Feed Back Survey” when Sentinel Asia responded, and feed back from users are quite important for improvement of service and system update in future. Also, secretariat ask to support field survey over the affected area for build up better understanding between satellite imageries and actual situation.

User Feed Back
Next Generation
Milestone of Sentinel Asia

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>STEP1 Development</td>
</tr>
<tr>
<td>2007</td>
<td>APRSAF-13</td>
</tr>
<tr>
<td>2008</td>
<td>APRSAF-14 APRSAF-15</td>
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<tr>
<td>2009</td>
<td>APRSAF-16 APRSAF-17</td>
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<tr>
<td>2010</td>
<td>ALOS</td>
</tr>
<tr>
<td>2011</td>
<td>WINDS</td>
</tr>
<tr>
<td>2012</td>
<td>STEP2 Operation</td>
</tr>
</tbody>
</table>

Operation:
- Emergency Observation
- Wildfire Monitoring
- Flood Monitoring
- GFAS
- Meteorological Imagery
- IRS Wildfire Monitoring
- GFAS
- Meteorological Imagery
- Irrigation
- Wind Monitoring
- WINDS
- Utilization of WINDS
- Preparation
- Full Operation
- IRS Wildfire Monitoring
- GFAS
- Meteorological Imagery
- Irrigation
- Wind Monitoring
- WINDS
- Utilization of WINDS
- Preparation
- Full Operation
- IRS Wildfire Monitoring
- GFAS
- Meteorological Imagery
- Irrigation
- Wind Monitoring
- WINDS
- Utilization of WINDS
- Preparation

System:
- STEP1 System Development
- STEP2 System