

Sentinel Asia

contributing to
Disaster Management Support in the Asia-Pacific Region



The 50th Session of Committee on the Peaceful Uses of Outer Space

6 -15 June 2007

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Space Applications and Promotion Center
Japan Aerospace Exploration Agency (JAXA)



Sentinel Asia Web Site

<http://dmss.tksc.jaxa.jp/sentinel/>



Contents

1. What's "Sentinel Asia"?

1-1. Background / Philosophy / Framework

1-2. Main Activities

1-3. Information to be provided

1-4. How it works (Information-sharing Platform)

2. Operation History

3. Future Plan



Natural Disaster Damages in Asia

Total number during 1975- 2005
 quoted from 'ADRC-Natural Disasters Data Book-2005'
 originated in CRED-EMDAT, 2005

■ Asia

➤ Number of Disaster

■ 3107

World : 8319



➤ Economical Damage

■ 55 Billion US\$

World :125 Billion US\$



➤ The Death Toll

■ 1251911

World : 2189116



➤ Victims

■ 47.5 Hundred Million

World : 53.4 Hundred Million



Asia-Pacific Regional Space Agency Forum

APRSAF

<http://www.aprsaf.org/>



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

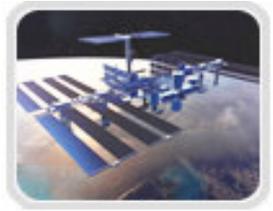
Working Groups



Earth Observation



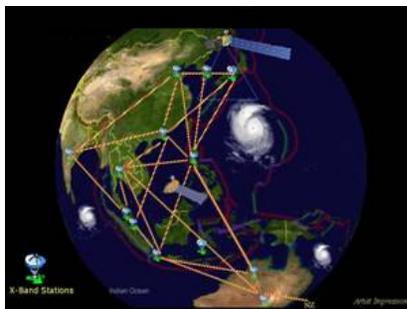
Communication Satellite Applications



ISS



Space Education & Awareness



Sentinel Asia Project
 establishing Disaster Management Support System



History

- APRSAF-12, Oct 2005, Kitakyushu, approved the plan to initiate the pilot project to contribute to disaster management support in the Asia-Pacific region.
- Joint Project Team (JPT) was organized and Sentinel Asia was initiated in the meeting in Feb 2006, Hanoi.
- Operations of Sentinel Asia have been commenced since Oct 2006 by opening its Web site.

(APRSAF: Asia-Pacific Regional Space Agency Forum)



Philosophy

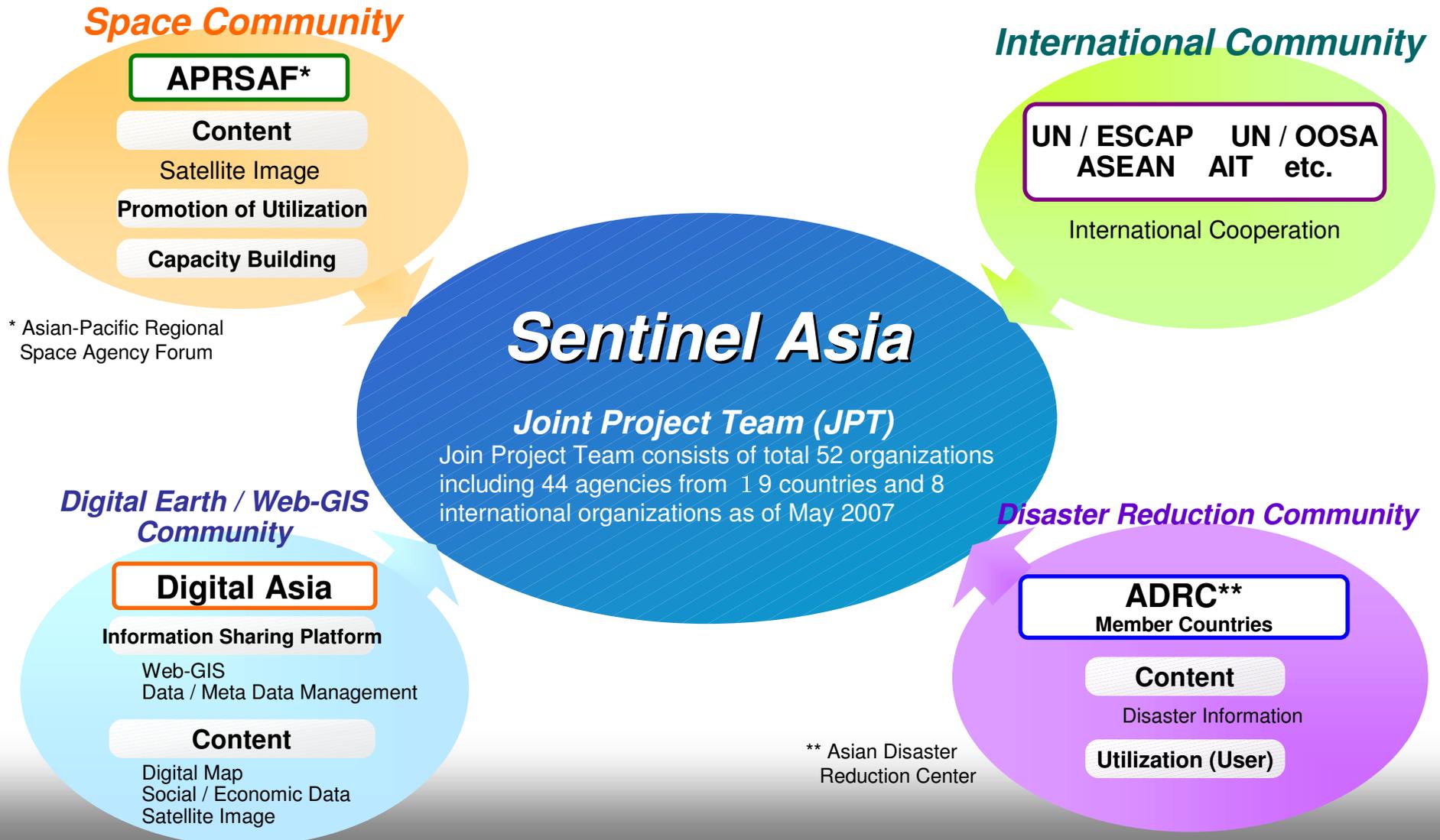
- APRSAF (Space community) should contribute to disaster management in the Asia-Pacific region aiming at:
 - To construct life first society by ICT and Space technology
 - To improve speed and accuracy for disaster preparedness and early warning
 - To minimize victims and social/economic losses
- Step-by-step approach:
 - Step1: Utilization of earth observation satellite data for disaster management, which is called “Sentinel-Asia Project” (2006-2007)
 - Step2: Utilization of satellite communications system besides earth observation satellites (2008-2009)
 - Step3: Establishment of comprehensive disaster management support system (2010-)
- Voluntary initiative by participating organizations

Framework

- Cooperation among APRSAF, ADRC, Digital Asia and international organizations
- Joint Project Team(JPT) consists of total 52 organizations including 44 agencies from 19 countries and 8 international organizations
- JAXA established two project offices in Tokyo and Bangkok



Framework of Sentinel Asia

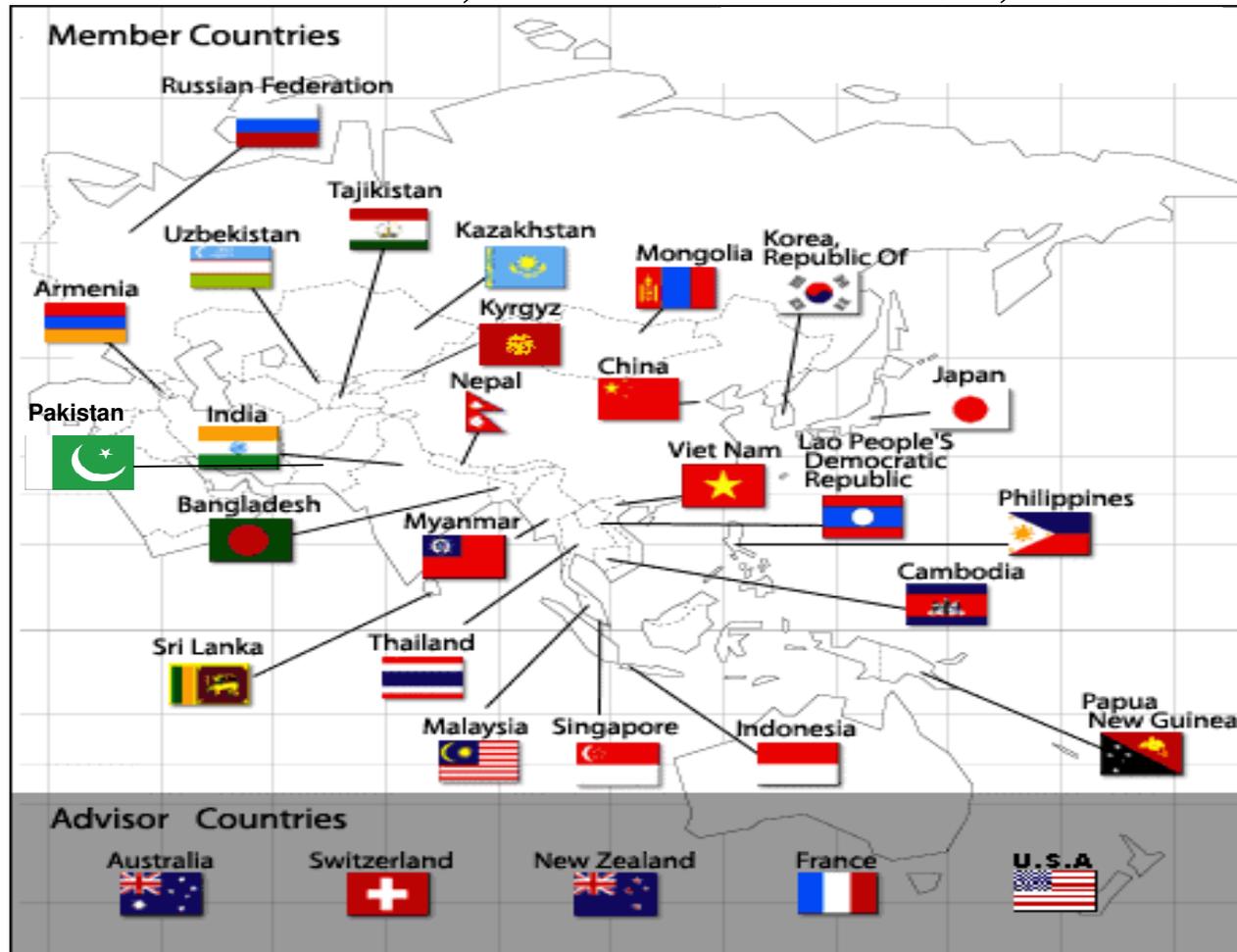


* Asian-Pacific Regional Space Agency Forum

** Asian Disaster Reduction Center

ADRC Member Countries

25 Member Countries, 5 Advisor Countries, 1 Observer

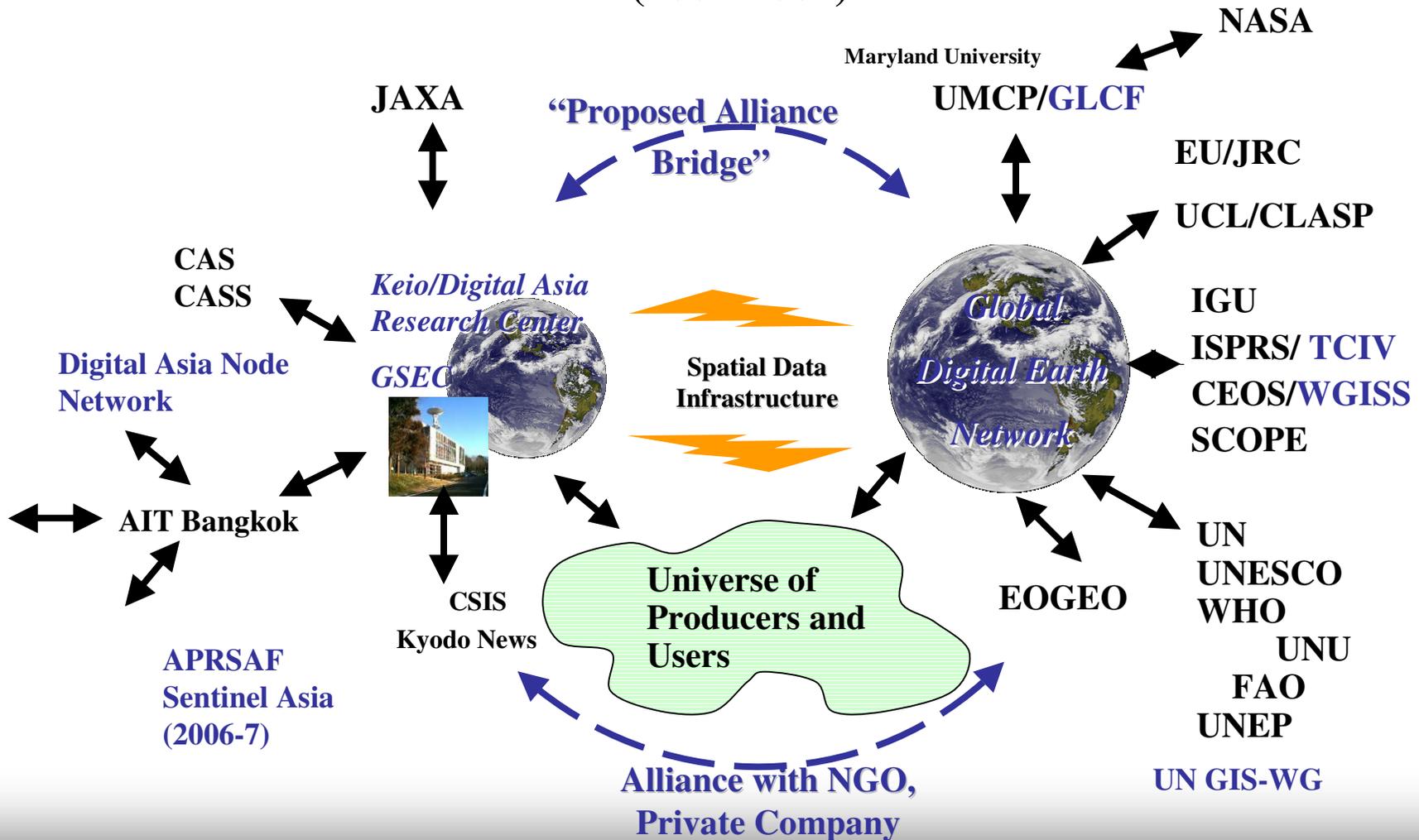


※Implement Various Projects in cooperation with UN/ISDR, UN/OCHA, UNESCO, UNU, WMO, UN/ESCAP, etc.



Digital Asia

promoted by Keio University
 under Academic Frontier Project, Matching Fund Subsidy from MEXT
 (2004-2009)





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Main Activities



Emergency observation in case of major disasters by ALOS and others based on observation requests from ADRC members and JPT members



Wildfire monitoring by MODIS and others



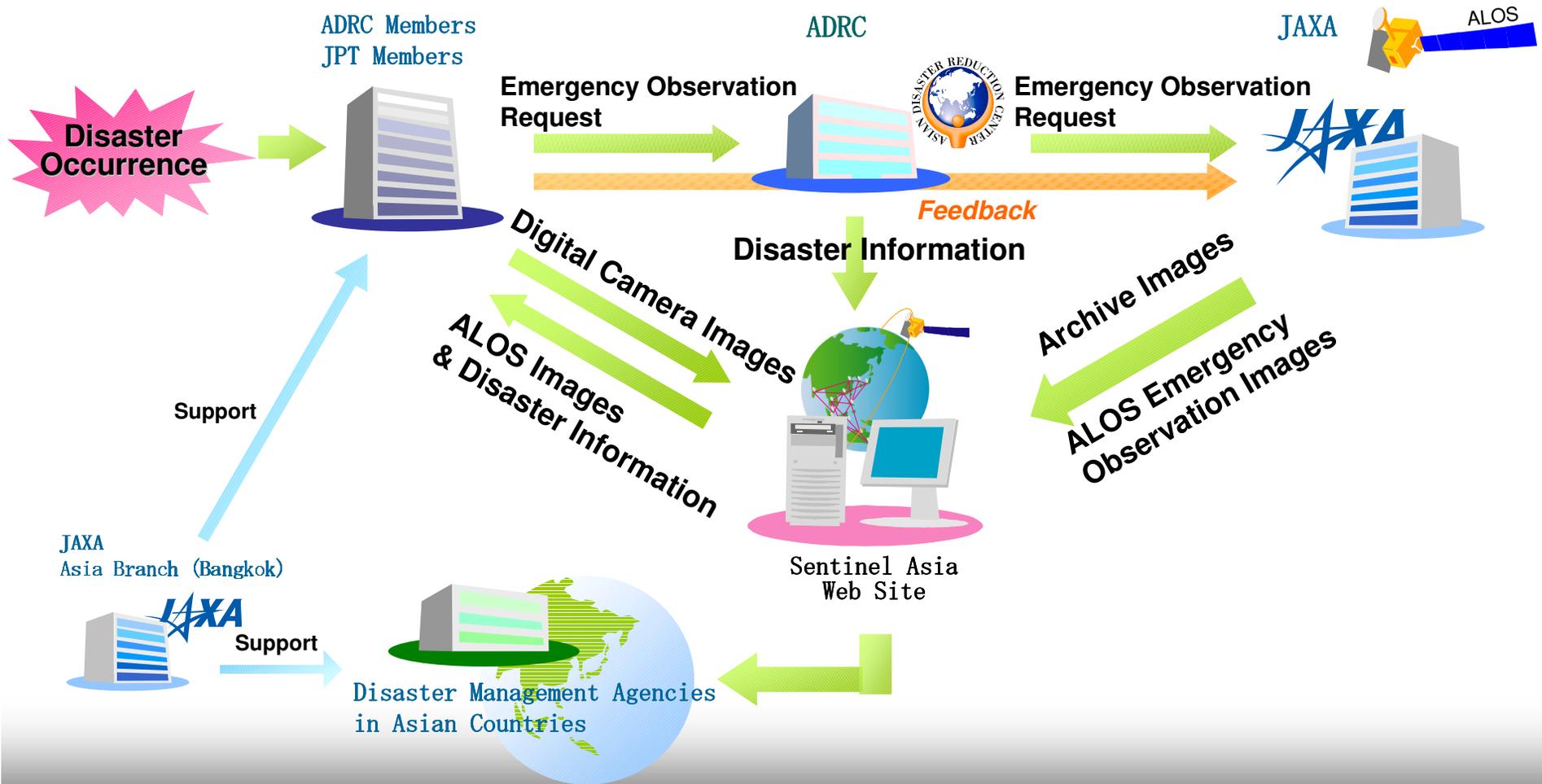
Flood monitoring by TRMM and AMSER-E



Capacity building for utilization of satellite images for disaster management



Flow of ALOS Emergency Observation and Disaster Information in Sentinel Asia



Sentinel Asia MODIS Wildfire Monitoring



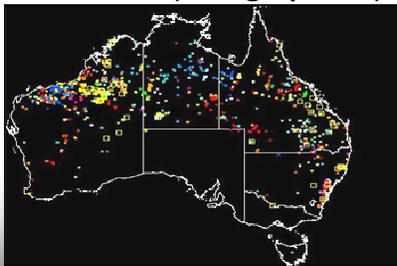
Hokkaido Univ. (Japan)



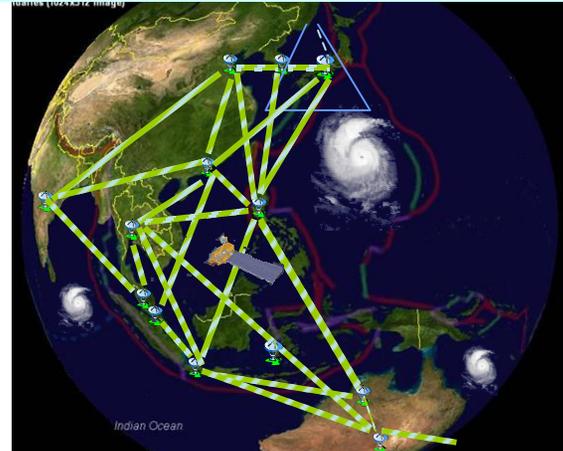
AIT/Tokyo Univ. (Thailand)



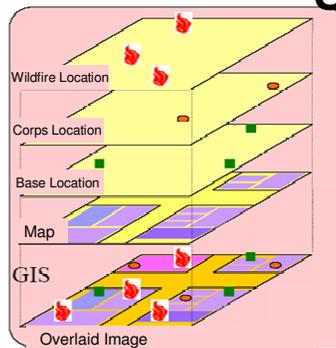
CRISP (Singapore)



CSIRO (Australia)



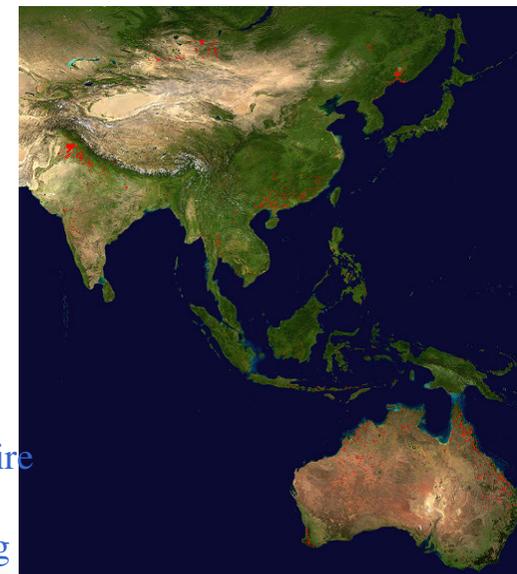
Satellite observation network



Integration by Digital Asia Web-GIS interface (Keio Univ.)

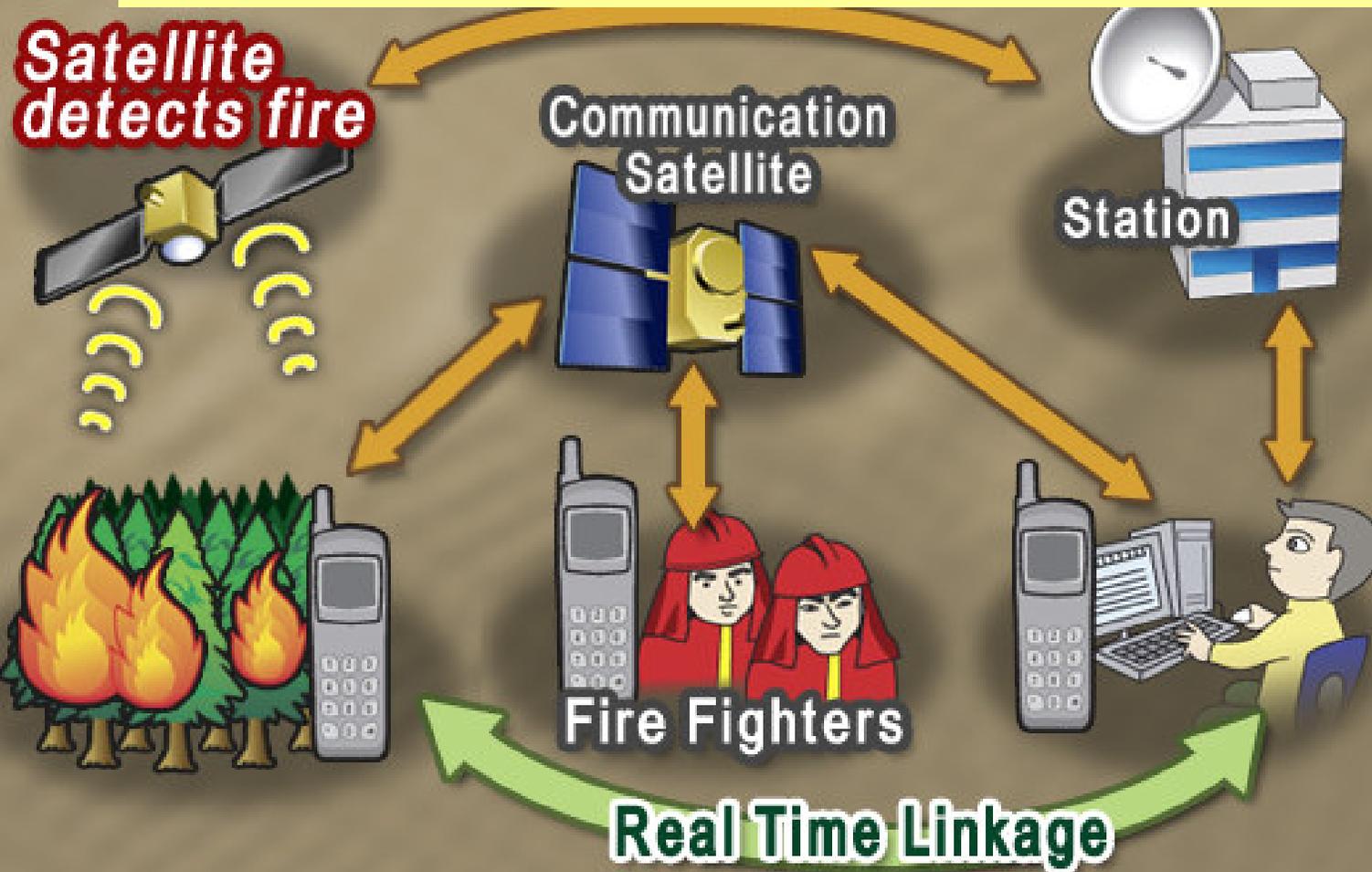
Main Activities

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



Wildfire map of Asia

Operational Goal of Sentinel Asia Wild Fire Control Initiative





Sentinel Asia Flood Monitoring

Observation

Processing

Integration

Rainfall Monitoring & Flood Forecasting

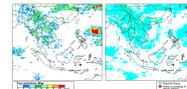
Rainfall Measurement by Satellite



TRMM, GPM, AMSR-E...

• Rainfall Data

Downscaling in Time and Space



GFAS*, IFAS**...

• Precipitation Map

• Heavy Rainfall Information
• Flood Forecasting Information

Sentinel Asia

- Social Economic Data
- Map Data



• Monitoring of Heavy Rainfall and Flood Inundation Area
• Precipitation and Flood Inundation on Web GIS
• Flood Alert for Specific River Basins

Flood Detection & Situation Analysis

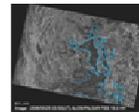
Land Observation by Satellite



ALOS, MODIS, AMSR-E...

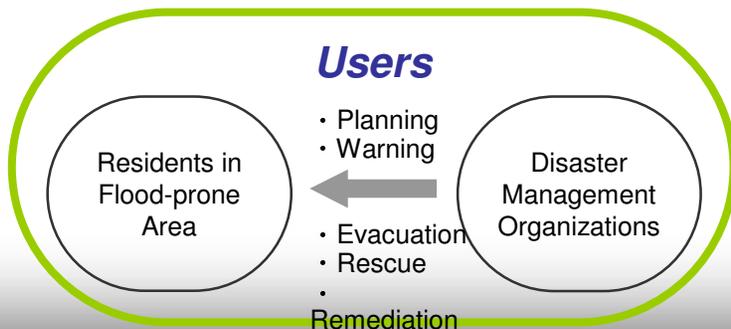
• Land Image

Image Analysis



JAXA, ICHARM, Dartmouth University...

• Flood Inundation Map



*GFAS : Global Flood Alert System (by IFNet)

**IFAS : Integrated Flood Analysis System (by ICHARM)



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Sharing Data

Various data related to disasters from space and ground

- Disaster information in the Asia-Pacific region provided by ADRC
- Digital maps data
 - A millionth digital map stored in Digital Earth server
 - Fine regional digital maps
- Satellite images of disaster area before and after disaster
- Satellite image products
- MODIS data for wildfire monitoring
- Precipitation data for flood monitoring
- On-site digital camera images
- Social/ economic data



List of Recent Disasters provided by ADRC

Sentinel-Asia Project - Disaster Management Support System - Microsoft Internet Explorer

http://ams.adrc.or.jp/adrc/MyMap/adrc/index.jsp

Sentinel-Asia Project Disaster Management Support System

Lang: English | User/Pass: | Login

The Latest Disaster Information

[Map]

GLIDE Number:

Event:

Duration: / ~ /

Region/Country: /

Comment Keywords:

Existence of satellite image and photo:

GLIDE Number	Event	Duration	Country	Comment	Provided by
FL-2006-000155-LKA	Flood and Landslide	2006/10/31	Sri Lanka	Due to torrential rains, some parts of the country are experiencing floods and landslides. The most affected districts are Gampaha, Puttalam, Kalutara and Colombo. Around 72,000 families have been affected and 25 deaths were reported by the District and divisional authorities in the affected areas.	ADRC
TC-2006-000153-PHL	Typhoon	2006/10/30	Philippines	Typhoon Gimaron battered the northern Philippines on Monday, killing at least 10 people in a barrage of landslides and flooding, officials said.	ADRC
FL-2006-000147-MMR	Flood	2006/10/11	Myanmar	On 11 October, the worst monsoon floods in more than a decade are sweeping through Myanmar and Thailand. At least 13 people have been killed over the last few days in army-ruled Myanmar.	ADRC
FL-2006-000147-THA	Flood	2006/10/09	Thailand	More than 32 dead in Thai floods since August 2006, reported on October 10.	ADRC
TC-2006-000144-VNM	Typhoon	2006/10/01	Viet Nam	At least 15 people in Vietnam are now known to have died as a result of Typhoon Xangsane, which buffeted central provinces over the weekend (by Oct 1, 2006).	ADRC
TC-2006-000144-PHL	Typhoon	2006/09/27	Philippines	On September 28, 2006, at least eight people have been killed and several are missing in the Philippines after Typhoon Xangsane brought fierce winds and rain.	ADRC
LS-2006-000143-PHL	Landslide	2006/09/22	Philippines	At least eight people were killed and 14 were injured when a landslide slammed into a narrow mountain road in the northern Philippines, local disaster officials said on Friday.	ADRC
TC-2006-000142-JPN	Typhoon	2006/09/17	Japan	The strong typhoon, Shanshan, to strike southwestern Japan has killed at least seven people caused tornado and flash floods.	ADRC

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インターネット



Photos of disaster

Sentinel-Asia Project - Disaster Management Support System - Microsoft Internet Explorer

ファイル(E) 編集(E) 表示(V) お気に入り(A) ツール(T) ヘルプ(H)

戻る 検索 お気に入り

アドレス(D) http://arrs.adrc.or.jp/adrc/MyMap/adrc/index.jsp

Disaster Management Support System

[About DMSS](#) |
 [Home](#) |
 [Search Photo](#) |
 [Search Satellite Images](#) |
 [Help](#)
Lang: English
User/Pass: [Login](#)

[Photo Details](#)

GLIDE Number:	TC-2006-000144-VNM	
Event:	Typhoon	
Duration:	2006/10/01	
Country or District:	Viet Nam	
Posted Date:	2006/10/16 14:47:16	
Photo Date:	2006/10/01 00:00:01	
Provider:	Vietnam News Agency	
Title:	Cay bat goc	
Location:	Lat: 16d 3m 1.689s N, Lon: 108d 13m 20.329s E	

At least 15 people in Vietnam are now known to have died as a result of Typhoon Xangsane, which buffeted central provinces over the weekend (by Oct.1,2006).

This photo was shot at Da Nang city.

Photo

[\[Download this Original Photo \]](#)
[\[Back \]](#)

Satellite images before and after disaster

Sentinel-Asia Project - Disaster Management Support System - Microsoft Internet Explorer

ファイル(E) 編集(E) 表示(V) お気に入り(A) ツール(T) ヘルプ(H)

戻る 検索 お気に入り

アドレス(D) http://arrs.adrc.or.jp/adrc/MyMap/adrc/index.jsp 移動

Disaster Management Support System

[About DMSS](#) |
 [Home](#) |
 [Search Photo](#) |
 [Search Satellite Images](#) |
 [Help](#)
Lang: English
User/Pass: Login

Satellite Image Details

Observation Date:	2006/10/12 16:03:24	Satellite:	PALSAR	Sensor:	PALSAR	Observation Mode:	FBS-HH
Flight Direction:	Ascending	Product:	L1.5	Pointing Angle:	41.5	Scene Center Lat. / Lon.:	15.6075/100.1778
Comments:	ALOS/PALSAR image (HH-ALPSRP038160290-HI.5GUA)						

Satellite Image

Legend:

User Layers:

[ALOS/PALSAR Thai Flood on O](#)

[ALOS/PALSAR Thai Flood on O](#)

Recommended Layers:

Base Map:

[DEM\(GTOP030\)](#)

[DEM\(ETOPO2\)](#)

[LAND COVER\(GLCC\)](#)

[Population 1990\(GPwv3\)](#)

[Population 1995\(GPwv3\)](#)

[Population 2000\(GPwv3\)](#)

[Population 2005\(GPwf\)](#)

[Population 2010\(GPwf\)](#)

[Population 2015\(GPwf\)](#)

DCW(Vmap0):

Reference

Political Boundaries

[Add Layers][Redraw]

Lat: 15d 36m 27s N, Lon: 100d 10m 40.091s E

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Satellite images and Land Cover Data

Sentinel-Asia Project - Disaster Management Support System - Microsoft Internet Explorer

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戻る 検索 お気に入り 移動

アドレス(D) <http://arrs.adrc.or.jp/adrc/MyMap/adrc/index.jsp>

Sentinel-Asia Project
Disaster Management Support System

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Lang: English User/Pass: Login

Satellite Image Details

Observation Date:	2006/10/12 16:03:24	Satellite:	PALSAR	Sensor:	PALSAR	Observation Mode:	FBS-HH
Flight Direction:	Ascending	Product:	L1.5	Pointing Angle:	41.5	Scene Center Lat. / Lon.:	15.6075/100.1778
Comments:	ALOS/PALSAR image (HH-ALPSRP038160290-H1.5GUA)						

Satellite Image

Legend:

User Layers:

- ALOS/PALSAR Thai Flood on O
- ALOS/PALSAR Thai Flood on O

Recommended Layers:

Base Map:

- DEM(GTOPO30)
- DEM(ETOPO2)
- LAND COVER(GLCC)
- Population 1990(GPwv3)
- Population 1995(GPwv3)
- Population 2000(GPwv3)
- Population 2005(GPwfe)
- Population 2010(GPwfe)
- Population 2015(GPwfe)

DCW(Vmap0):

Reference

- Political Boundaries

Lat: 15d 36m 27s N, Lon: 100d 10m 40.091s E

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MODIS Hotspots Data on GIS

Sentinel Asia - Wildfire Monitoring - Microsoft Internet Explorer

ファイル(E) 編集(E) 表示(V) お気に入り(A) ツール(T) ヘルプ(H)

戻る 検索 お気に入り 移動 リンク

アドレス(D) http://arrs.adrc.or.jp/adrc/MyMap/wildfire/index.jsp

WildfireMonitoring

About This Page

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

Display Data

Time Span (UT)

Today

Yesterday

By Date (Last 3 Weeks)

From

To

MODIS Hotspots

Hokkaido Univ (Japan)

KARI (Korea)

IIS.U-Tokyo (Japan)

MACRES (Malaysia)

CRISP (Singapore)

LAPAN (Indonesia)

COSSAVGA (Australia)

AIT (Thailand)

Satellite Images / Date

[Printout] [Output to PDF]

Original Data: Data Processing: Copyright: 2007. JAXA

Redraw

インターネット



GFAS Precipitation Data on GIS

Sentinel Asia - Flood Monitoring - Microsoft Internet Explorer

ファイル(E) 編集(E) 表示(V) お気に入り(A) ツール(T) ヘルプ(H)

戻る 検索 お気に入り

アドレス(D) http://arrs.adrc.or.jp/adrc/MyMap/flood/index.jsp 移動 リンク >>

Sentinel Asia
FloodMonitoring

About This Page
Printout
Output to PDF

Observation Date
2007-5-29

< 2007 . 5

Su	M	Tu	W	Th	F	Sa
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

Overlays

U (Upper View) L (Lower View)

24hr Accumulated Precipitation

Heavy Rain Information (5-year)

Heavy Rain Information (10-year)

Map Data

DCW (VMap0)

GSI DM25000 (Japan only)

Other Information

Landsat

DEM

Land Cover

Population

Redraw

Original Data: NASA 3B42RT Data Processing: IFNet/IDI Copyright: 2006. IFNet/IDI, NASA, JAXA

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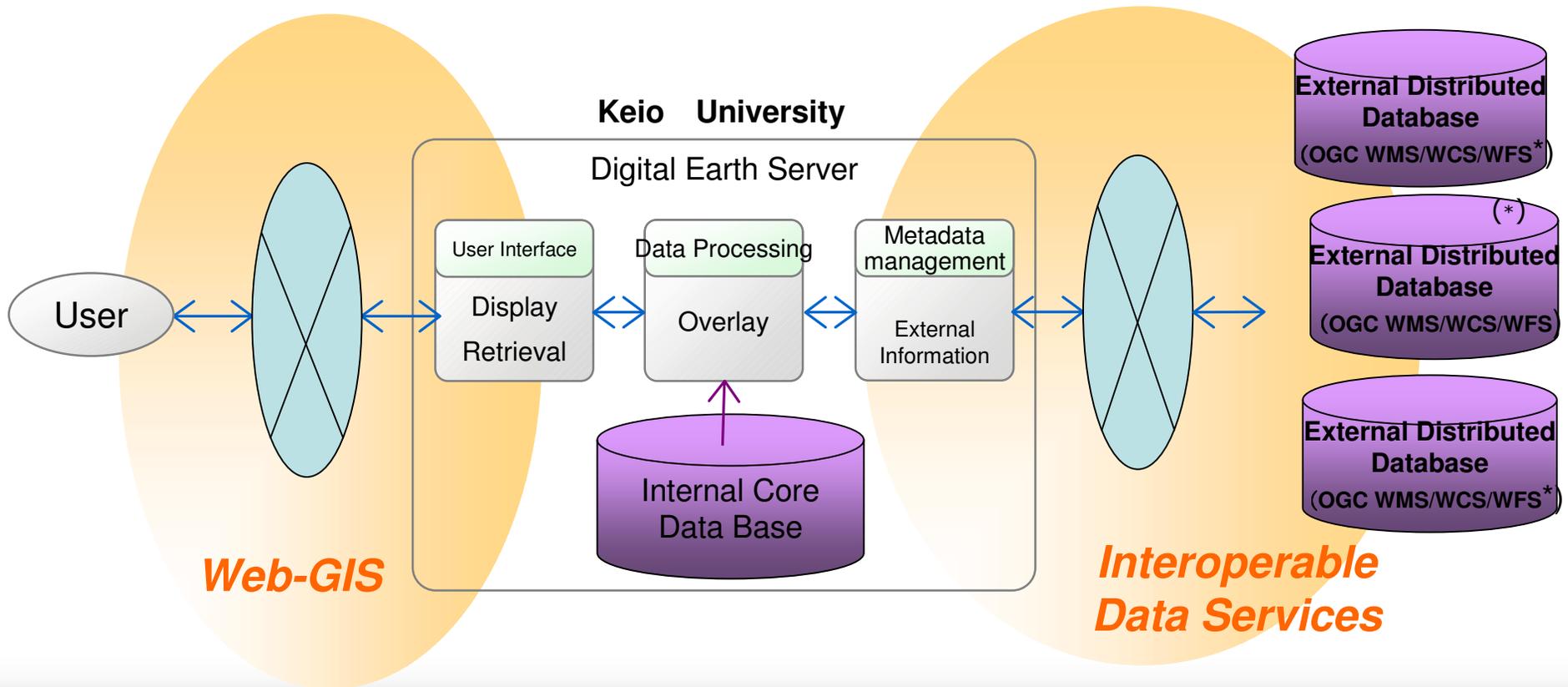
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2. Operation History

3. Future Plan

Digital Asia

Internet Web-GIS Dispersed Data Servers





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Operation History

Emergency Observation by ALOS:

- Dec. 2006 : Mudslide at Mt. Mayon, Philippines
activated by IC (International Disaster Charter); observed by ALOS/AVNIR-2
- Feb. 2007: Flood in Jakarta, Indonesia
activated by SA (Sentinel Asia); observed by ALOS/PULSAR
- March 2007: Earthquake in West Sumatra, Indonesia
activated by SA and IC; observed by ALOS/AVNIR-2(Cloudy)
- March 2007: Earthquake in Noto, Japan
activated by JAXA; observed by ALOS/PRISM/AVNIR-2
- April 2007: Earthquake in Solomon Islands
activated by SA and IC; observed by ALOS/AVNIR-2/PULSAR



Mudslide at Mt. Mayon, Philippines

Sentinel-Asia Project - Disaster Management Support System - Microsoft Internet Explorer

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アドレス(D) http://arrs.adrc.or.jp/adrc/MyMap/adrc/index.jsp?condition=has_type%3D1 移動 リンク >>

Sentinel-Asia Project
Disaster Management Support System

Home | Search Photos | Search Sat. Images | Help

Lang: English

User/Pass: Login

GLIDE Number:	MS-2006-000179-PHL	At least 146 people have been killed in mudslides and the death toll could rise after the Philippines was battered by its fourth typhoon in as many months.
Event:	Mudslide	
Duration:	2006/12/1	
Country or District:	Philippines	

Related Locations of Satellite Images and Photos

Related Recent Photos

	Thumbnail	Date/Provider/Title	Comments
focus		2007/01/15 adrc mudslide	railway

View all images

Related Satellite Images

	Thumbnail	Observation Date/Provider	Satellite	Sensor	Product	Comments
focus		2006/12/05 02:27:00 JAXA	ALOS	AVNIR-2	L1 B2	Philippines, Typhoon and Mudslide
focus		2006/12/03 02:44:00 JAXA	ALOS	AVNIR-2	L1 B2	Philippines, Typhoon and Mudslide

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Satellite Images before and after Disaster

Sentinel-Asia Project - Disaster Management Support System - Microsoft Internet Explorer

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アドレス(D) http://arrs.adrc.or.jp/adrc/MyMap/adrc/index.jsp?condition=has_type%3D1 移動 リンク >>

Sentinel-Asia Project
Disaster Management Support System

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Lang: English User/Pass: Login

Satellite Image Details

Observation Date:	2006/12/05 02:27:00	Satellite:	ALOS	Sensor:	AVNIR-2	Observation Mode:	OBS
Flight Direction:	Descending	Product:	L1 B2	Pointing Angle:	10.44	Scene Center Lat. / Lon.:	13.20375/123.700096
Comments:	Philippines, Typhoon and Mudslide						

Satellite Image

Displayed and Overlaid Data

Map Data

DCW(Vmap0):

GSI DM25000 (Japan only):

Satellite Image (After Disaster)

ALOS AVNIR-2(2006/12/03 02:44)

ALOS AVNIR-2(2006/12/05 02:27)

Satellite Image (Before Disaster)

LANDSAT(2003/01/01 00:00)

LANDSAT(2005/01/01 00:00)

Other Information

DEM

LAND COVER

Population

Add Other Information

[\[Output to PDF\]](#)

Lat: 13d 12m 34.176s N, Lon: 123d 35m 57.412s E

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Digital Camera Image of Damaged Area

Sentinel-Asia Project - Disaster Management Support System - Microsoft Internet Explorer

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アドレス(Ⓜ) http://arrs.adrc.or.jp/adrc/MyMap/adrc/index.jsp?condition=has_type%3D1 移動 リンク

Sentinel-Asia Project
Disaster Management Support System

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Lang: English User/Pass: Login

Photo Details

GLIDE Number:	MS-2006-000179-PHL	At least 146 people have been killed in mudslides and the death toll could rise after the Philippines was battered by its fourth typhoon in as many months.
Event:	Mudslide	
Duration:	2006/12/1	railway
Country or District:	Philippines	
Posted Date:	2007/04/24 18:08:24	
Photo Date:	2007/01/15 12:52:15	
Provider:	adrc	
Title:	mudslide	
Location:	Lat: 13d 25m 33.658s N, Lon: 123d 34m 55.451s E	

Photo

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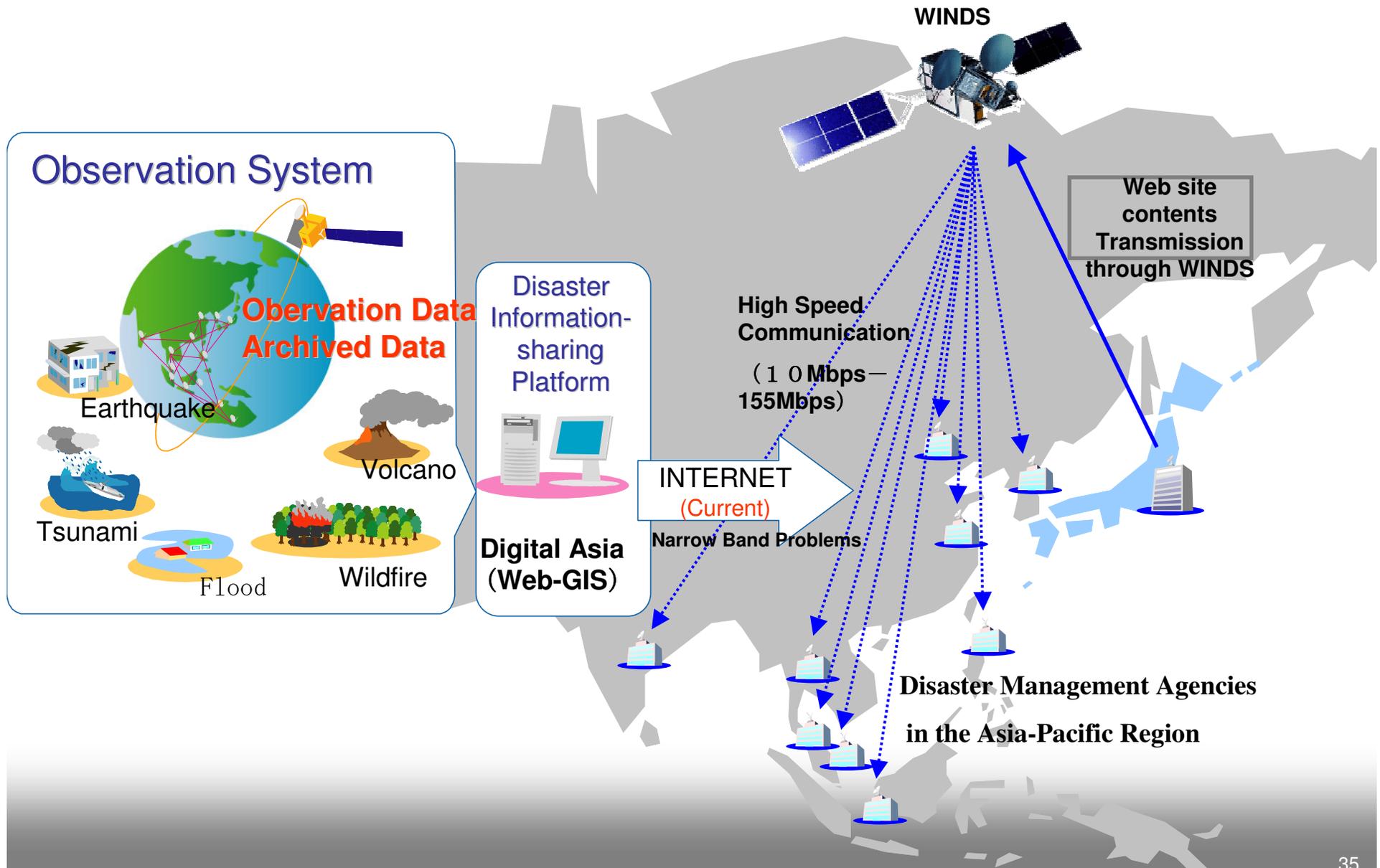


Results/Lessons Learned through half a year operation

- Human relations between space and disaster communities is about to be established
- More data are expected:
MTSAT imagery will come soon
ISRO (India) and GISTDA (Thailand) will join soon
- For narrow band area in Asia, utilization of JAXA/WINDS (Wideband INternetworking engineering test and Demonstration Satellite) is expected, which will be launched early next year



Application of WINDS for Sentinel Asia





Thank you for your attention.

Please visit Sentinel Asia at
<http://dmss.tksc.jaxa.jp/sentinel/>

Japan Aerospace Exploration Agency
Space Applications and Promotion Center
Sentinel Asia Project Office
E-mail : sentinel.asia@jaxa.jp

