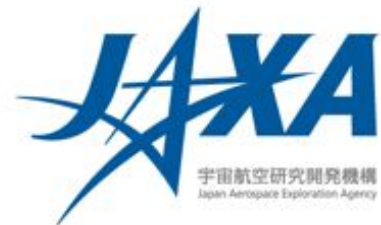


DISASTER MANAGEMENT ACTIVITY IN ASIA-PACIFIC REGION BY SENTINEL ASIA

Dr. Masahiko Nagai

Japan Aerospace Exploration Agency (JAXA)
Asian Institute of Technology (AIT)



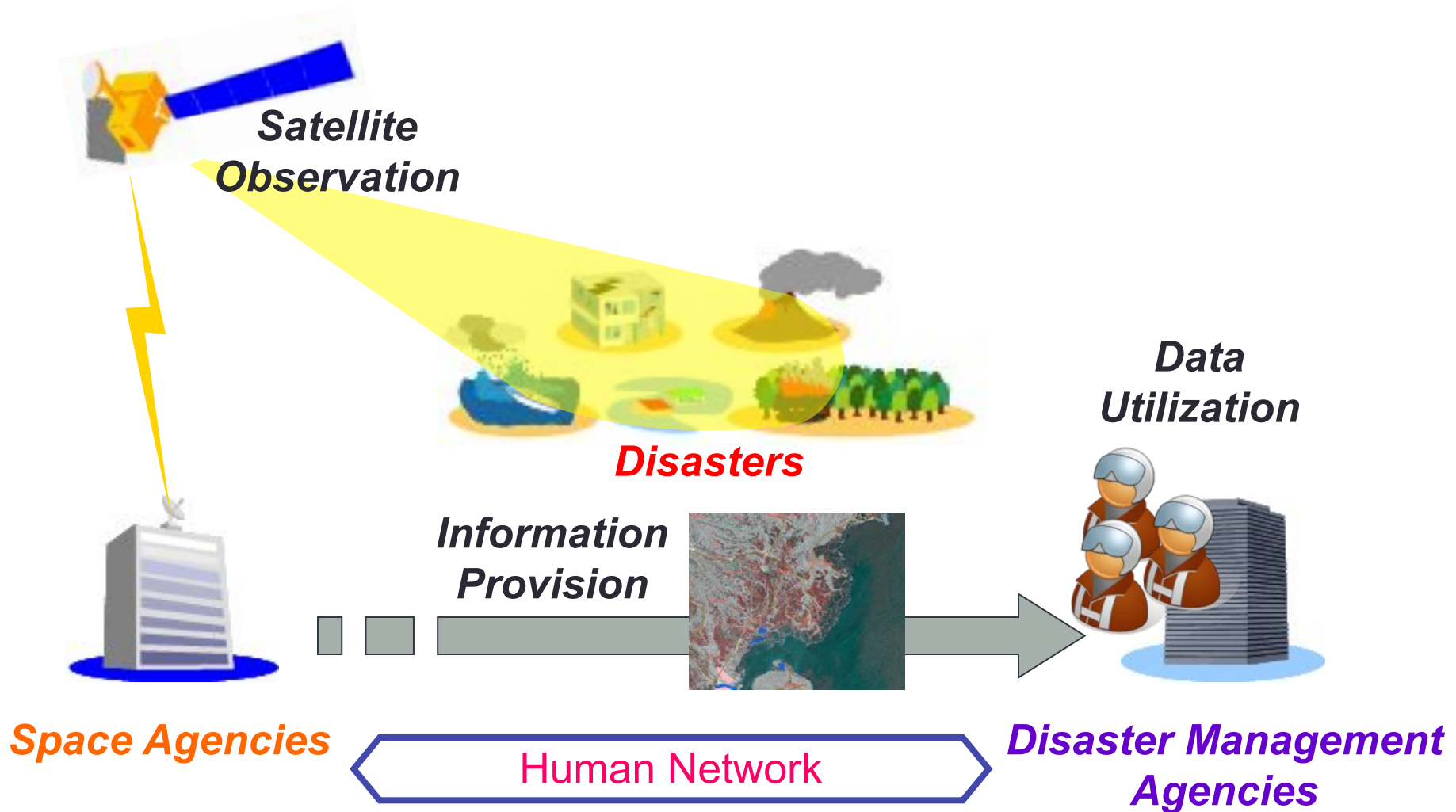
4th ATRANS Symposium on 26th August 2011



AIT
Asian Institute of Technology



Sentinel Asia





What is **Sentinel Asia**

The Sentinel Asia initiative is the international cooperation led by APRSAF (Asia-Pacific Regional Space Agency Forum) to assist disaster management by **Remote Sensing** and **Web-GIS** technologies in the Asia-Pacific region.

To make effective activity, Sentinel Asia collaborates with **Sapce Agencies** and **Disaster Management Agencies**.

Sentinel Asia 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.**



Sentinel Asia

Members of Sentinel Aisa

Sentinel Asia organizes Joint Project Team (JPT), and JPT consists of **66 organizations from 24 countries & regions and 10 international organizations.**

Also, Sentinel Asia cooperates with **ADRC and their members** (29 Member Countries, 5 Advisor Countries, 1 Observer) closely, and they are also member of Sentinel Asia as well.

JPT +
m e m b e r s




Current Participating EO Satellites

ALOS

The image shows the ALOS satellite in orbit, featuring a long, thin solar panel array and a central body with various instruments.

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

Resourcesat-1

The image shows the Resourcesat-1 satellite in orbit, with a central body and two large solar panel arrays.


LISS-4: 5.8m Pan
LISS-3: 23.5m Multi
AWiFS: 56m Multi

KOMPSAT-1

The image shows the KOMPSAT-1 satellite in orbit, with a central body and two large solar panel arrays.


EOC: 6.6m
OSMI: 1km

THEOS

The image shows the THEOS satellite in orbit, with a central body and two large solar panel arrays.

PAN: 2m
Multi: 15m

FORMOSAT-2

The image shows the FORMOSAT-2 satellite in orbit, with a central body and two large solar panel arrays.

PAN: 2m
Multi: 8m



Latest List of Emergency Observation

SENTINEL Asia
UserID: password:

HOME Announce About Sentinel Asia JPT Member FAQ Contact US Links Site Policy

WEB GIS
Emergency Observation
Wildfire Monitoring
Flood Monitoring
MTSAT Imagery
Capacity Building
Library

Emergency Obs. Request List

Country: ALL Disaster Type: ALL Search

Emergency Obs. ID	Occurrence Date (UTC)	Country	Disaster Type	Status	Product	WEB-GIS	Detail	Disaster Inf.
ERADRC000010	2011/07/29	Japan	Flood	Active			link	ADRC
ERPPIVS000010	2011/07/26	Philippines	Flash food	Active			link	ADRC
ERKGAG000014	2011/07/20	Kyrgyzstan	Earthquake	Active			link	ADRC
ERICIND000013	2011/07/18	India	Flood	Active			link	ADRC
ERICIND000012	2011/07/16	Nepal	Flood	Active			link	ADRC
ERADRC000009	2011/07/01	Nepal	Flood	Active			link	ADRC
ERTJES000006	2011/06/13	Tajikistan	Flash food	Active			link	ADRC
ERIDLPO00031	2011/05/06	Indonesia	Flash food	Active			link	ADRC
ERKZNC000001	2011/04/12	Kazakhstan	Flood	Active			link	ADRC
ERADRC000008	2011/03/24	Myanmar	Earthquake	Active			link	ADRC



WEB GIS

-  [Emergency Observation](#)
-  [Wildfire Monitoring](#)
-  [Flood Monitoring](#)
-  [MTSAT Imagery](#)
-  [Capacity Building](#)
-  [Library](#)

Welcome To Sentinel Asia Web Site

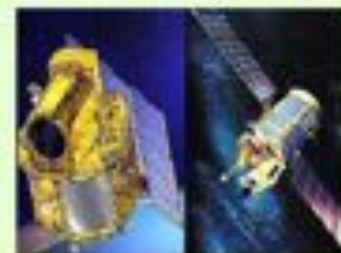
Sentinel Asia is a voluntary basis initiative led by the APRSAF (Asia-Pacific Regional Space Agency Forum) to support disaster management activity in the Asia-Pacific region by applying the WEB-GIS technology and space based technology, such as earth observation satellites data.

Emergency Observation

-  [29/Jul/2011 Flood in Japan](#)
-  [26/Jul/2011 Flash flood in Philippines](#)
-  [20/Jul/2011 Earthquake in Kyrgyzstan](#)
-  [18/Jul/2011 Flood in India](#)
-  [16/Jul/2011 Flood in Nepal](#)
-  [01/Jul/2011 Flood in Nepal](#)
-  [13/Jun/2011 Flash flood in Tajikistan](#)
-  [06/May/2011 Flash flood in Indonesia](#)
-  [12/Apr/2011 Flood in Karakhetan](#)
-  [24/Mar/2011 Earthquake in Myanmar](#)

[more...](#)
Current Topics

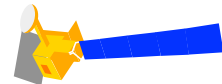
-  [10/Mar/2011 Indonesia Regional Server is opened !
 \[link...\]\(#\)](#)
-  [22/Dec/2010 Fiji Regional Server is opened !
 \[link...\]\(#\)](#)
-  [30/Nov/2010 Vietnam Regional Server is opened !
 \[link...\]\(#\)](#)
-  [19/Nov/2010 Nepal Regional Server is opened !
 \[link...\]\(#\)](#)
-  [29/Sep/2010 Mongolia Regional Server is opened !
 \[link...\]\(#\)](#)
-  [29/Sep/2010 Taiwan Regional Server is opened !
 \[link...\]\(#\)](#)
-  [29/Sep/2010 Philippine Regional Server is opened !
 \[link...\]\(#\)](#)
-  [29/Sep/2010 Thailand Regional Server is opened !
 \[link...\]\(#\)](#)

[more...](#)


Requesting Organization (RO)

**ADRC Members
JPT Members**

International Charter



ADRC

Data Provider Node (DPN)

**JAXA
ISRO
GISTDA
KARI
NARL**

Data Analysis Node (DAN)

**AIT, ADRC
CRISP, CAIAG
LAPAN, SD/Sri Lanka
MONRE, ICIMOD,
Sri Lanka MoDM, CEA**

Disaster Occurrence

Support

Emergency Observation Request

Disaster Information

Sentinel Asia Step 2 System

Disaster Management Agencies in Asia

Feedback

Analyzed Products

Own Data

Digital Camera Images
Satellite Images & Disaster Information

Archive Images
Images by Emergency Observation

Analyzable Data

**JAXA
Asia Branch
(Bangkok)**

Support

International Charter

An International **agreement** among Space Agencies to **support** with space-based data and information **relief** efforts in the event of emergencies caused by major disasters.

- Disaster **response**
- Multi-satellite data acquisition **planning**
- Data **processing** at pre-determined level
- Space Agency **contribution** in image/data
- Space Agency initiative for **value-added-data** fusion.






















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

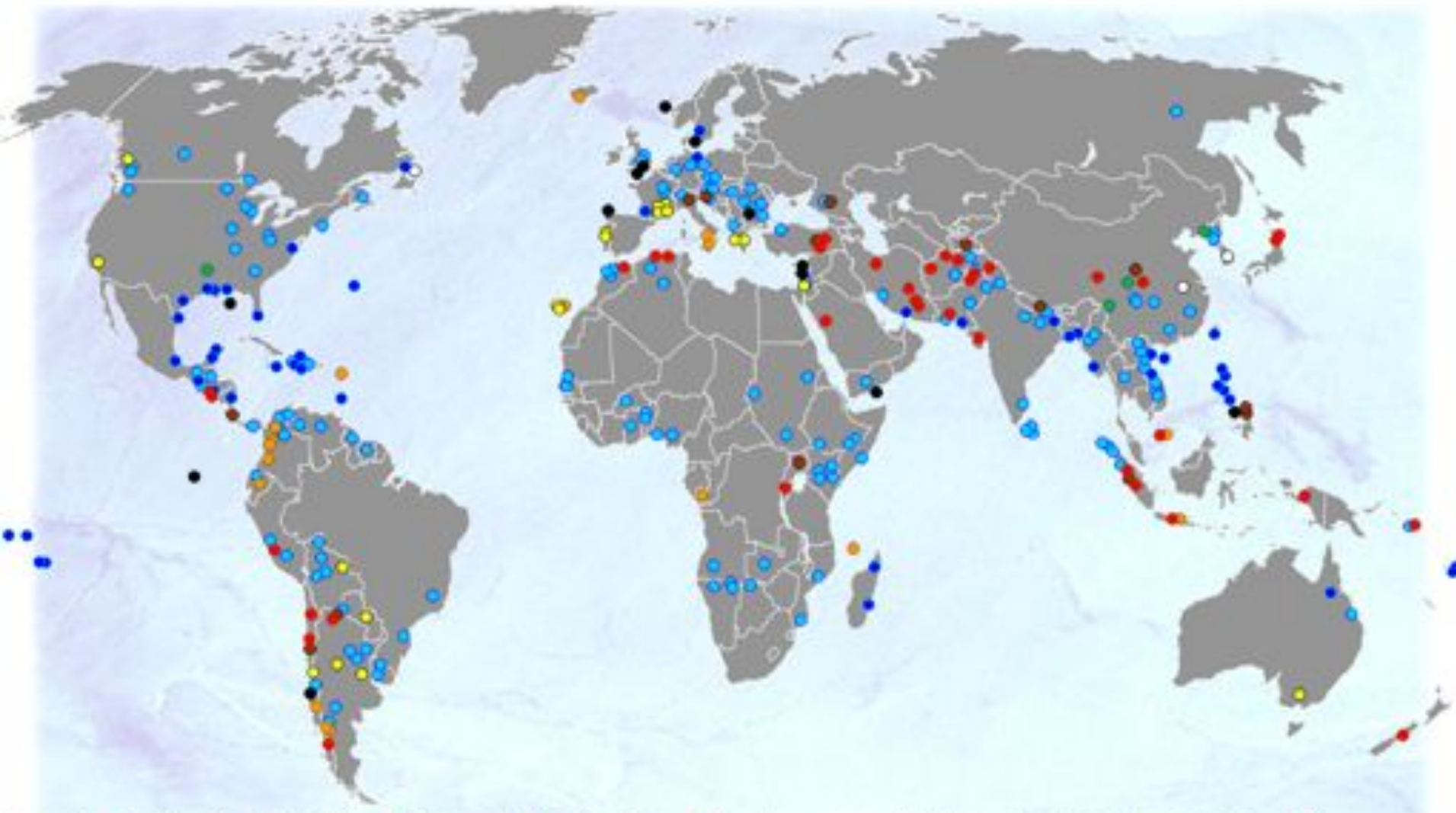
GIC/AIT has been working for the Charter.

Charter Member Agencies



	<u>European Space Agency</u> (ESA)	ERS, ENVISAT
	<u>Centre national d'études spatiales</u> (CNES)	
	<u>Spotimage</u>	SPOT
	<u>NSPO</u>	Formosat
	<u>Canadian Space Agency</u> (CSA)	RADARSAT
	<u>Indian Space Research Organisation</u> (ISRO)	IRS
	<u>National Oceanic and Atmospheric Administration</u> (NOAA)	POES, GOES
	<u>Argentina's Comisión Nacional de Actividades Espaciales</u> (CONAE)	SAC-C
	<u>Japan Aerospace Exploration Agency</u> (JAXA)	ALOS
	<u>United States Geological Survey</u> (USGS)	Landsat
	<u>DigitalGlobe</u>	Quickbird
	<u>GeoEye</u>	GeoEye-1
	<u>DMC International Imaging</u> (DMC)	
	<u>Centre National des Techniques Spatiales</u> (Algeria)	ALSAT-1
	<u>National Space Research and Development</u> (Nigeria)	NigeriaSat
	<u>TÜBİTAK-BİLTEN</u> (Turkey)	BİLSAT-1
	<u>UK Space Agency</u> (UK)	UK-DMC
	<u>China National Space Administration</u> (CNSA)	FY, SJ, ZY satellite series
	<u>German Aerospace Center</u> (DLR)	TerraSAR-X, TanDEM-X

Activation Distribution



Legend: ● Earthquake ● Landslide ● Volcano ● Storm/hurricane ● Flood/ocean wave ○ Ice/snow hazard ● Fire ● Oil spill ● Other



INTERNATIONAL CHARTER SPACE AND MAJOR DISASTERS

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[Activating the Charter](#)

[Charter Members](#)

[Charter for Schools](#)

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Search



The International Charter The International Charter aims at providing a unified system of space data acquisition and delivery to those affected by natural or man-made disasters through Authorized Users. Each member agency has committed resources to support the provisions of the Charter and thus is helping to mitigate the effects of disasters on human life and property.

[More](#) [Charter Members](#) [Text of the Charter](#)

Latest Charter Activation



Flood in Niigata, Japan

Saturday, July 30, 2011

Local governments in Niigata and Fukushima prefectures on Friday issued evacuation advisories to thousands of residents due to record rainfall in the two prefectures.

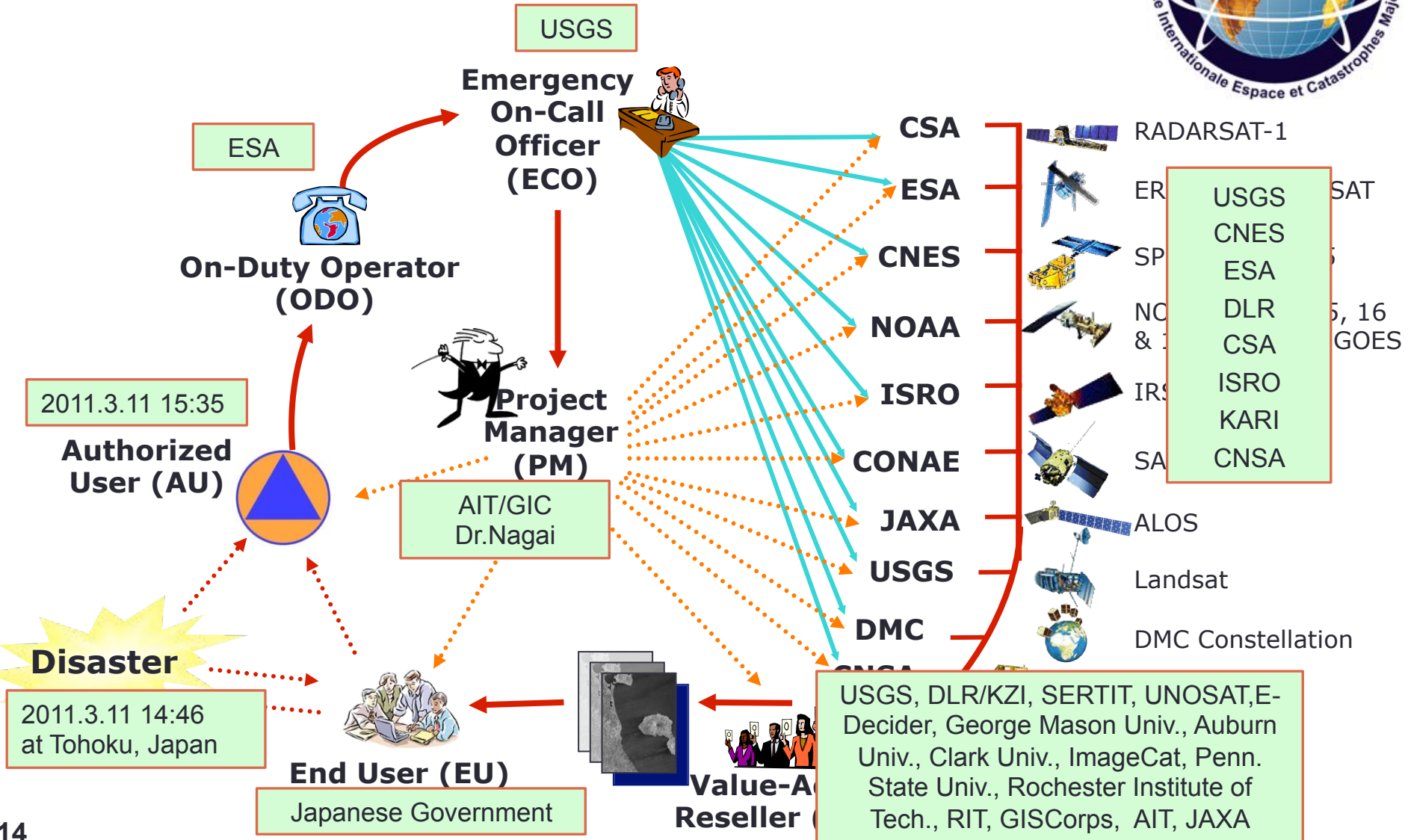
[Read more](#)

[RSS](#) [RSS](#)

Recent Activations

- [Flood in Niigata, Japan](#)
- [Landslide in Seoul and Chuncheon, Rep. of Korea](#)
- [Puyehue volcano in Chile and Argentina](#)
- [Flood in Colombia](#)
- [Fire in the Province of Alberta, Canada](#)
- [Activations Archive](#)



International Charter

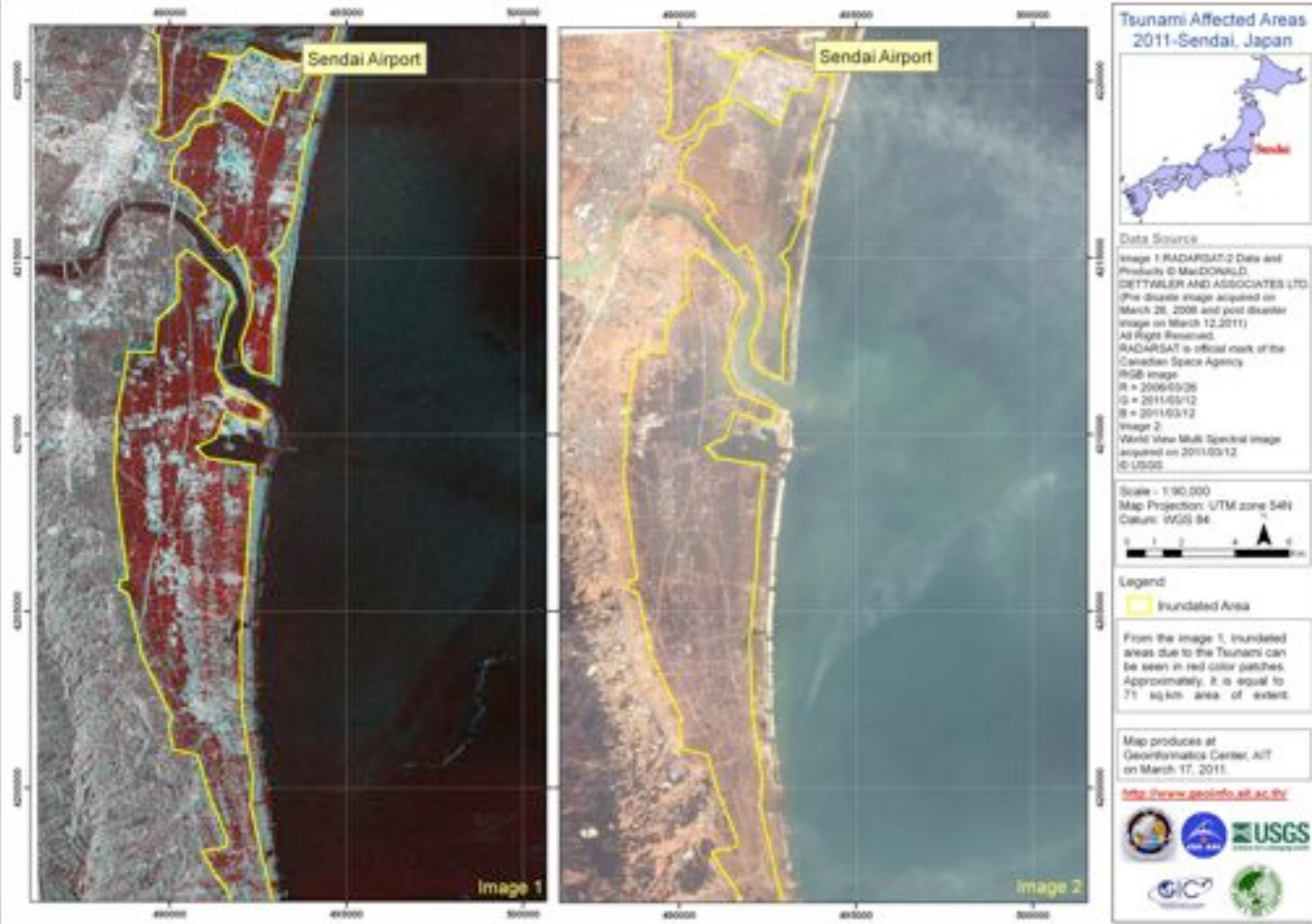


Sentinel Asia and International Disaster Charter Time table of Satellite Observation for Japan's Earthquake, March, 2011

Date	Satellites
12 Mar.	ALOS(AV2, PSM), FORMOSAT-2, THEOS, IKONOS, WorldView-2, GeoEye-1, RapidEye, LANDSAT-7, SPOT-5, TerraSAR-X, Radarsat
13 Mar.	ALOS(PSR), FORMOSAT-2, THEOS, WorldView-2, RapidEye, EO-1, LANDSAT-5, SPOT-5, TerraSAR-X
14 Mar.	ALOS(AV2, PSR), FORMOSAT-2, Cartosat-2, KOMPSAT-2, GeoEye-1, RapidEye, SPOT-5, HJ
15 Mar.	FORMOSAT-2, SPOT-4, DubaiSat-1
16 Mar.	ALOS(AV2,PSR), FORMOSAT-2, QuickBird-2
17 Mar.	ALOS(AV2), FORMOSAT-2, SPOT-5
18 Mar.	ALOS(PSR), FORMOSAT-2, EO-1, SPOT-5, DEIMOS-1
19 Mar.	ALOS(AV2), FORMOSAT-2, KOMPSAT-2, WorldView-2, GeoEye-1, RESURS-DK
20 Mar.	ALOS(AV2, PSR), FORMOSAT-2, IKONOS, WorldView-2, LANDSAT-5, RESURS-DK

Overview of Satellite Data Utilization

ALOS	<ul style="list-style-type: none">➤ Capturing overall situation➤ Evaluation of water-covered area by Tsunami➤ Detecting landslide in mountain area➤ Detecting crustal deformation by PALSAR interferometry
Sentinel Asia	<ul style="list-style-type: none">➤ Capturing overall situation➤ Evaluation of water-covered area by Tsunami (daily FORMOSAT-2 data, etc) <p>Cartosat-2 (Sendai)</p> 
International Charter	<ul style="list-style-type: none">➤ Capturing overall situation➤ Evaluation of water-covered area by Tsunami (SPOT-4/5, Radarsat, TerraSAR-X, etc)➤ Detail analysis of specific area by sub-meter satellite image (GeoEYE, Quickbird-2, etc)  <p>Worldview-2 (Nuclear Plant)</p>



**Tsunami Affected Areas
2011-Sendai, Japan**



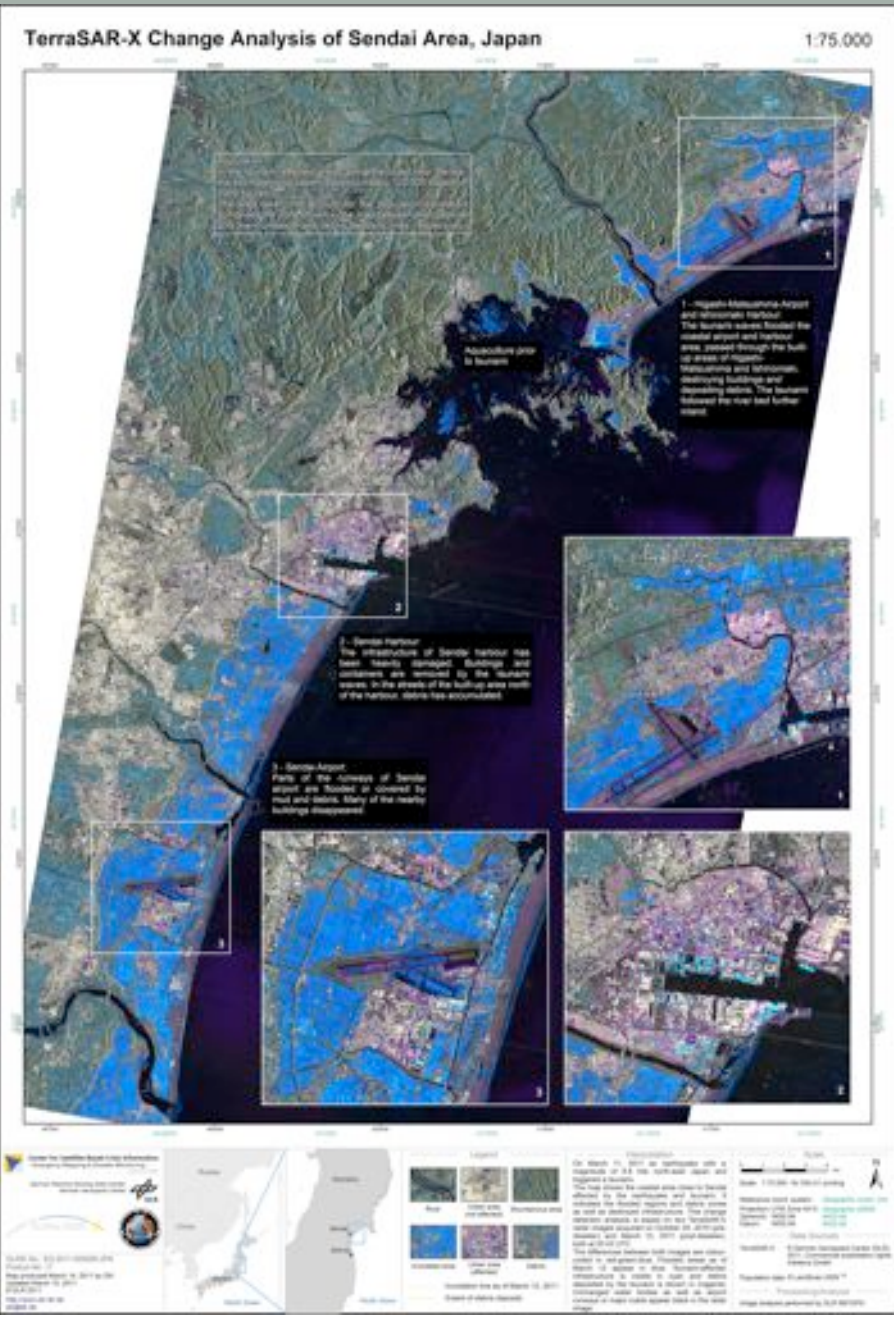
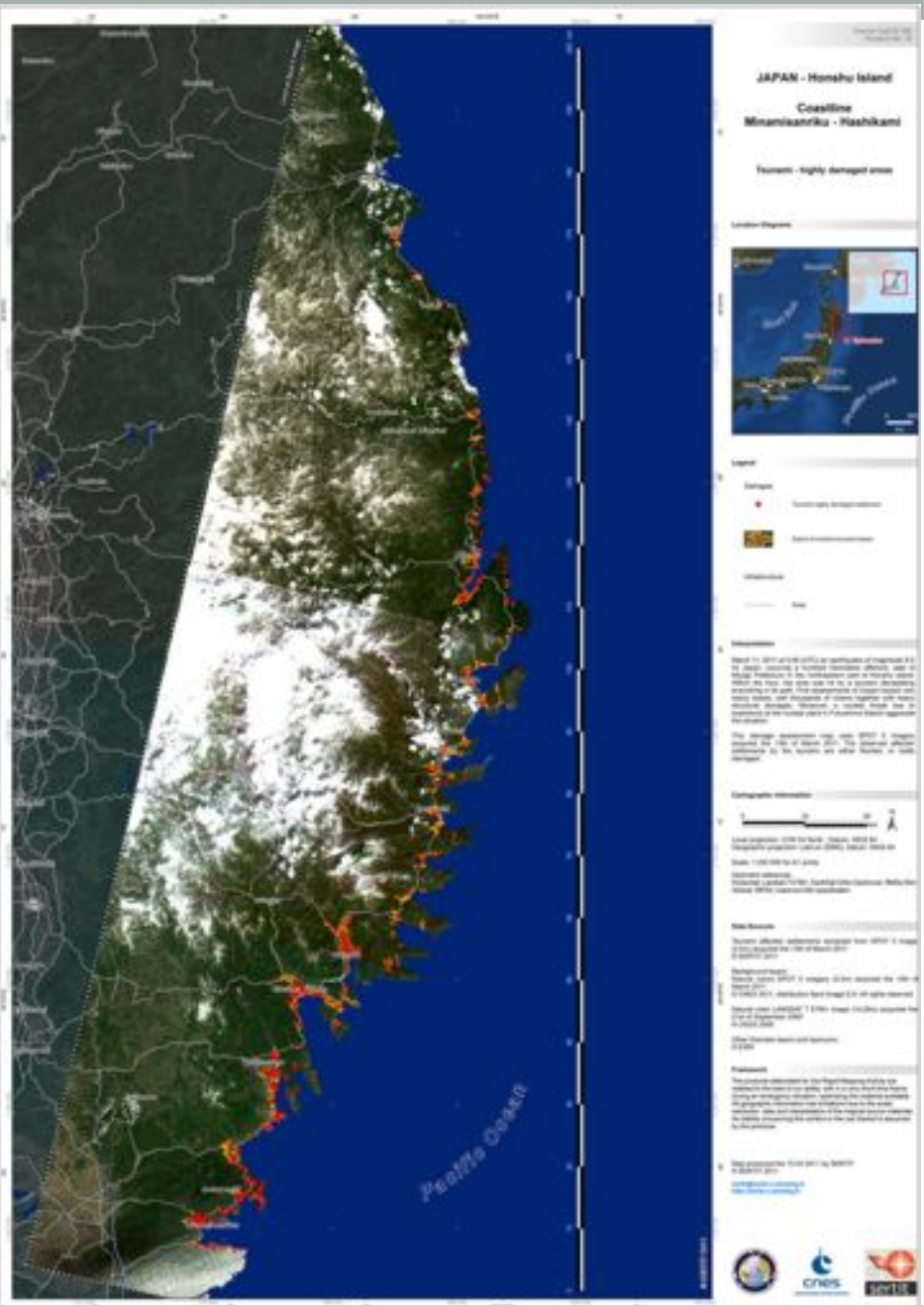
Data Source
 Image 1 RADARSAT-2 Data and Products © MacDONALD CATTWELL AND ASSOCIATES LTD (Pre disaster image acquired on March 26, 2006 and post disaster image on March 12, 2011) All Right Reserved. RADARSAT is official mark of the Canadian Space Agency
 RGB Image
 R = 2006/03/26
 G = 2011/03/12
 B = 2011/03/12
 Image 2
 World view Multi Spectral image acquired on 2011/03/12
 © USGS

Scale - 1:90,000
 Map Projection: UTM zone 54N
 Datum: WGS 84

Legend
 Inundated Area
 From the image 1, inundated areas due to the Tsunami can be seen in red color patches. Approximately, it is equal to 71 sq.km area of extent.

Map produces at
 Geoinformatics Center, AIT
 on March 17, 2011.
<http://www.geoinfo.ait.ac.th/>





Fukushima Dai-ichi Nuclear Power Plant
Ōkuma, Fukushima Prefecture, Japan



Post-Explosions
17 March, 2011
Worldview2 High-Res pan



Post-Explosions
19 March, 2011
GeoEye 1



Cartographic Information

Local Projection: Geographic
Coordinate System:
Datum: WGS84



Interpretation

The images show the damage to the
reactor plant from two different perspectives:
17 March image from overhead
19 March image shows oblique view from the West

Analyses by Rochester Institute of Technology

Disclaimer

The products delivered for the Planet Mapping Activity are
delivered to the best of our ability, within a very short time frame,
utilizing the material available.
All geographic information has limitations due to the scale,
resolution, date and interpretation of the original source
materials. No liability concerning the content or the use thereof
is assumed by the producer.

Data Source

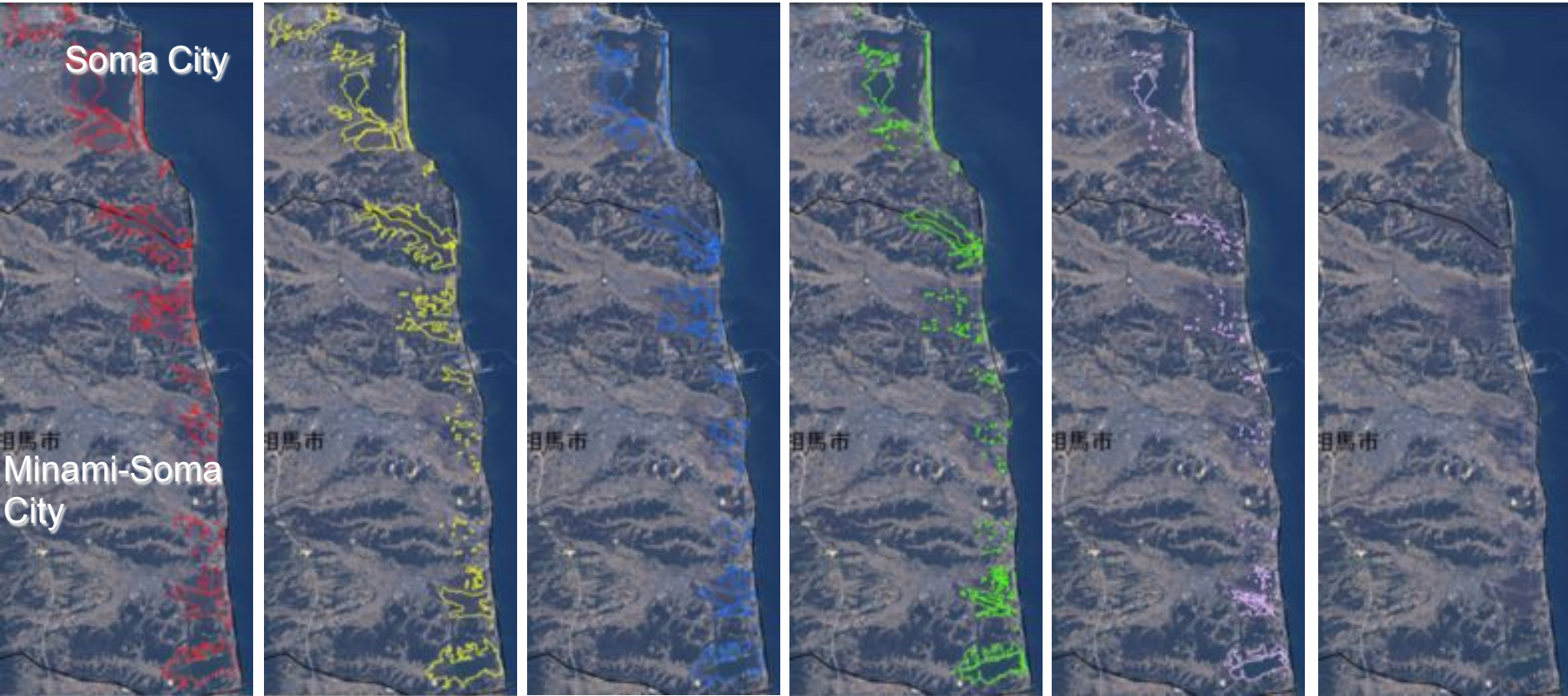
Left Image: Oblique view damage images from
WorldView2 on 17 March 2011 at 21:54:47 local GMT
Note: damage to structures adjacent to reactor buildings
© DigitalGlobe

Right Image: View from the West of Gas unit Plant from
GeoEye1 acquired on 19 March 2011 at 01:38:50 GMT
© GeoEye

Was produced by Rochester Institute of Technology
Digital Imaging and Remote Sensing Laboratory
as part of the International Charter Space and Major Disasters
23 March, 2011



Baseline image: April 17, AVNIR-2



March 14	March 19	April 5	April 10	April 17	April 20
25.902 [km ²]	21.521 [km ²]	13.943 [km ²]	11.025 [km ²]	5.847 [km ²]	0.094 [km ²]

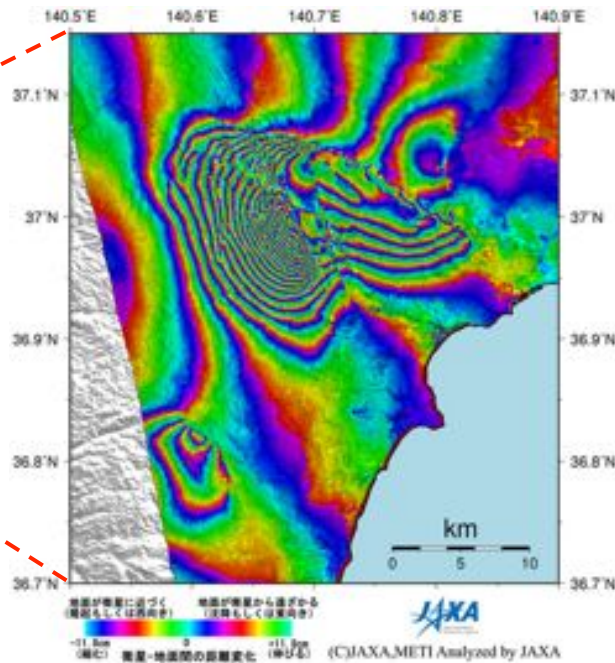
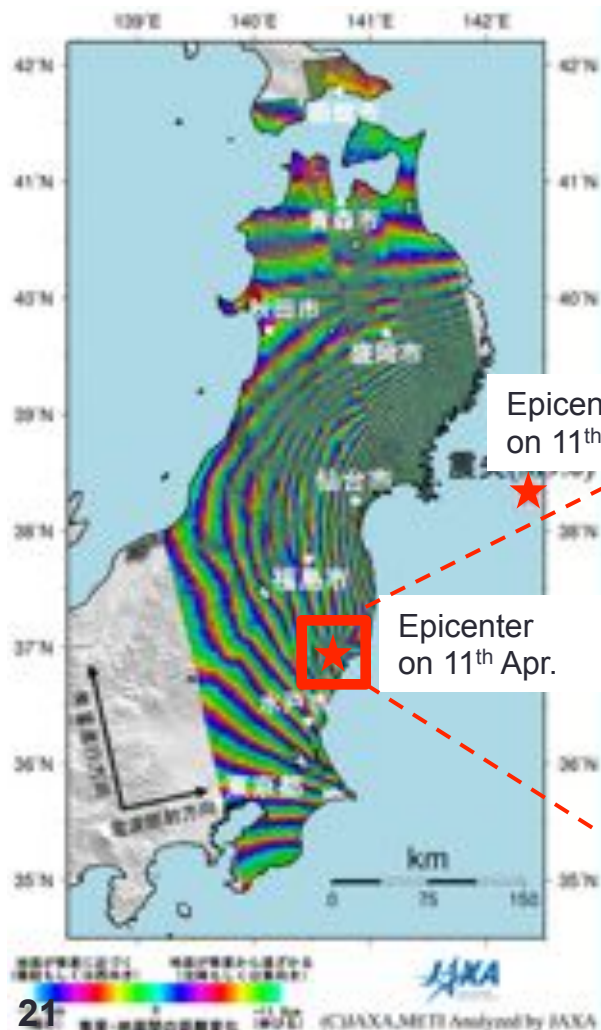
Areas:
Fukushima Pref.

Flooded Areas
 Decreasing
 as time goes by

The changing of water-covered area was evaluated mainly by radar sensor data (ALOS, TerraSAR-X, Radarsat, etc). The result of evaluation was provided to MLIT.

The huge crustal deformation was detected by differential InSAR. In the result we could find not only the deformation caused by main quake on 11th Mar. but also the deformation caused by afterquakes.

About 4 m ground surface shift around Oshika Peninsula.



About 2 - 3 m ground surface shift caused by afterquake on 11th April.



I just noticed your email before turning in. I emailed my research associate who noticed this, and she says the coordinates (in decimal degrees) are approximately long: 141.439 / lat: 38.450). I've attached a JPG of the post- image that she prepared. We'll put together a proper pre/post in the morning. Interestingly, this is in an area just above the worst of the tsunami damage ? just where you'd expect to find survivors.

Looking at these images, the devastation is so pervasive, but we don't see people ? just debris. And yet here is a very human cry for help ... visible from space! I so hope they're ok.

Concluding Remarks

- Sentinel Asia
- International Disaster Charter
- 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