



SENTINEL ASIA AND INTERNATIONAL DISASTER CHARTER FOR FLOOD IN THAILAND

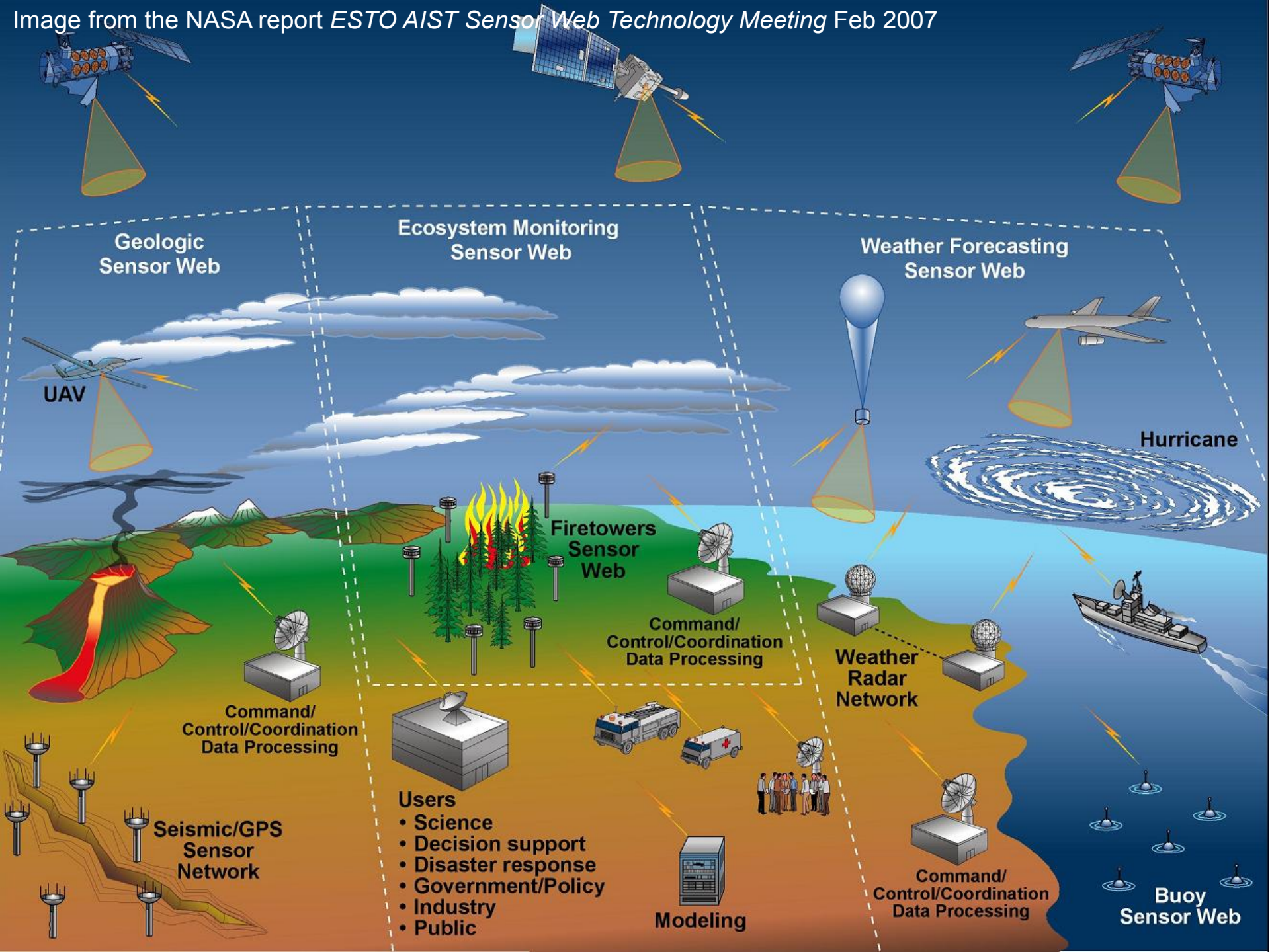
Dr. Masahiko Nagai

Asian Institute of Technology (AIT)

Japan Aerospace Exploration Agency (JAXA)

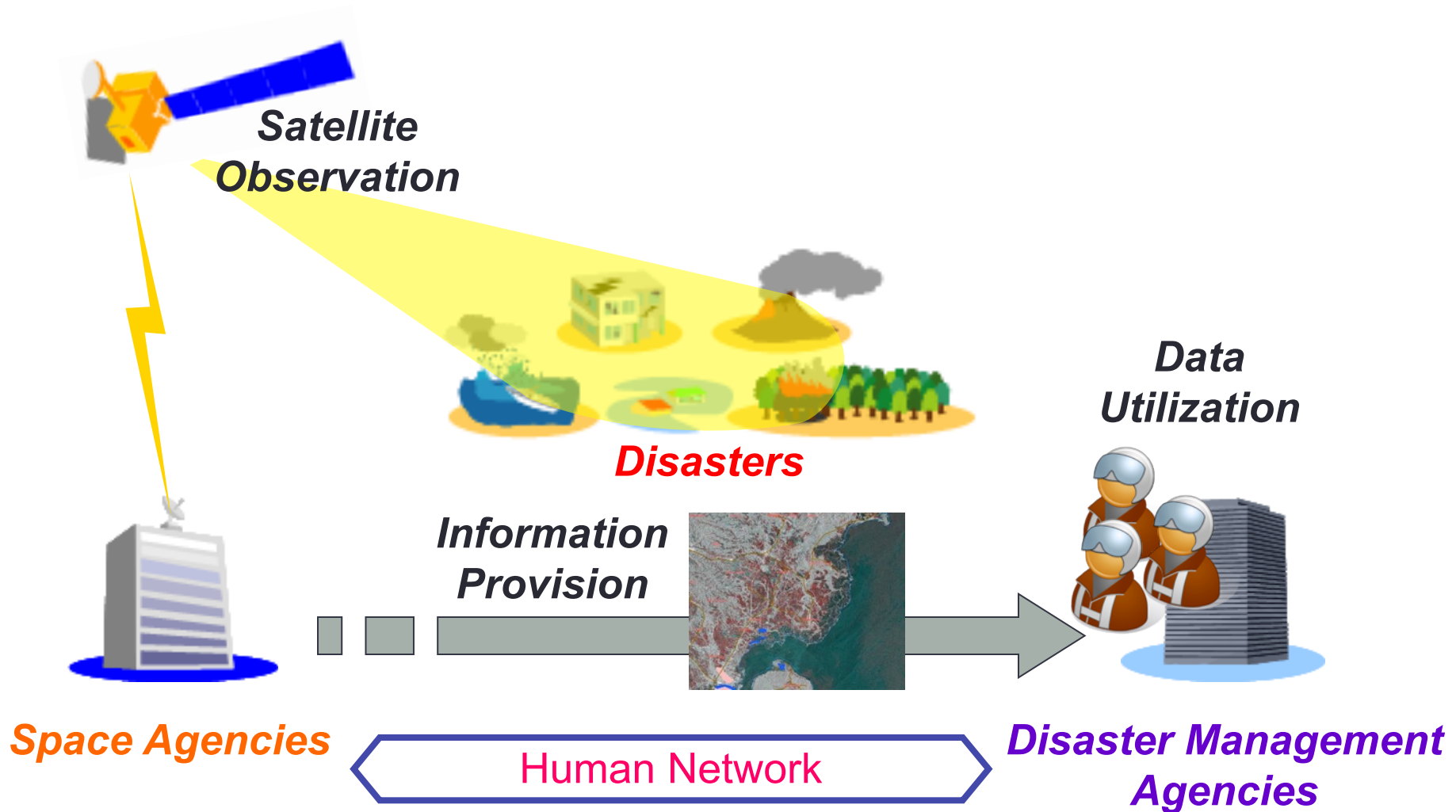
*Lessons Learned from Thailand Flood Disaster and Future Directions
for Flood Prevention and Mitigation*

Image from the NASA report *ESTO AIST Sensor Web Technology Meeting Feb 2007*





Sentinel Asia





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 **Space Agencies** and **Disaster Management Agencies**.

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.



Thailand	56	Geo-Informatics and Space Technology Development Agency (GISTDA)	
	57	Department of Disaster Prevention and Mitigation (DDPM)	
	58	Department of Water Resources(DWR)	
	59	Royal Forest Department (RFD)	
	60	National Park, Wildlife and Plant Conservation Department	
	61	Royal Irrigation Department (RID)	
	62	Land Development Department (LDD)	


Current Participating EO Satellites

ALOS

The ALOS satellite is shown in a 3D rendering against a black background. It features a central body with a parabolic antenna on top and two long, rectangular solar panel arrays extending outwards. The panels are blue with a grid of white dots.

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

Resourcesat-1

The Resourcesat-1 satellite is shown in a 3D rendering against a background of Earth from space. It has a central body with a large white dome-shaped antenna and two long, rectangular solar panel arrays.

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

KOMPSAT-1

The KOMPSAT-1 satellite is shown in a 3D rendering against a starry space background. It has a central body with two long, rectangular solar panel arrays extending outwards.


EOC: 6.6m
OSMI: 1km

THEOS

The THEOS satellite is shown in a 3D rendering against a blue space background. It has a central body with a large black circular antenna and two long, rectangular solar panel arrays.





















PAN: 2m
Multi: 15m

FORMOSAT-2

The FORMOSAT-2 satellite is shown in a 3D rendering against a background of Earth from space. It has a central body with a large white dome-shaped antenna and two long, rectangular solar panel arrays.

PAN: 2m
Multi: 8m

Latest List of Emergency Observation

Emergency Obs. ID	Occurrence Date (UTC)	Country	Disaster Type	Status	Product	WEB-GIS	Detail	Disaster Inf.
ERPHMO000004	2011/12/17	Philippines	Flood	Active			link	ADRC
ERIDLP000032	2011/12/11	Indonesia	Volcano eruption	Active			link	ADRC
ERVNMN000032	2011/11/06	Vietnam	Flood	Active			link	ADRC
ERICIM000015	2011/10/21	Myanmar	Flash flood	Active			link	ADRC
ERKHLM000004	2011/10/01	Cambodia	Flood	Active			link	ADRC
ERTHDP000007	2011/08/04	Thailand	Flood	Active			link	ADRC
ERVNMN000029	2011/10/04	Vietnam	Flood	Active			link	ADRC
ERPHMO000002	2011/09/27	Philippines	Flood	Active			link	ADRC
ERJPJX000020	2011/09/21	Japan	Flood	Active			link	ADRC
ERICIM000014	2011/09/18	India	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.

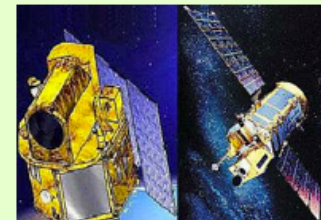
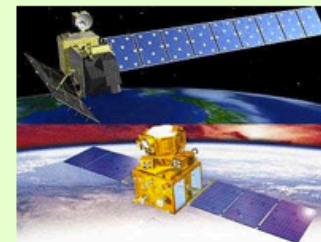
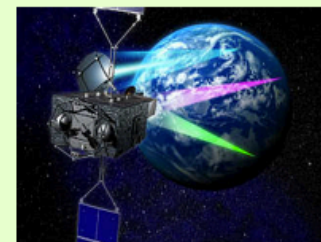
Emergency Observation

- 17/Dec/2011 Flood in Philippines
- 11/Dec/2011 Volcano eruption in Indonesia
- 06/Nov/2011 Flood in Vietnam
- 21/Oct/2011 Flash flood in Myanmar
- 01/Oct/2011 Flood in Cambodia
- 04/Aug/2011 Flood in Thailand
- 04/Oct/2011 Flood in Vietnam
- 27/Sep/2011 Flood in Philippines
- 21/Sep/2011 Flood in Japan
- 18/Sep/2011 Earthquake in India

[more...](#)

Current Topics

- 16/Dec/2011 Announcement of Opportunity "8th Sentinel Asia System Operation Training" [link...](#)
- 10/Mar/2011 Indonesia Regional Server is opened [link...](#)



Requesting Organization (RO)

**ADRC Members
JPT Members**

International Charter

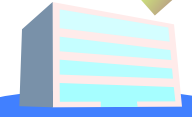
ADRC

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**



**JAXA
Asia Branch
(Bangkok)**



**Disaster Management Agencies
in Asia**



Support

Support

Emergency Observation Request

Emergency Observation Request

Emergency Observation Request

Feedback

Disaster Information

Digital Camera Images
Satellite Images & Disaster Information

Archive Images
Images by Emergency Observation

Analyzable Data

Analyzed Products

Own Data

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.



European Space Agency (ESA)



Centre national d'études spatiales (CNES)



Spotimage



NSPO



Canadian Space Agency (CSA)



Indian Space Research Organisation (ISRO)



National Oceanic and Atmospheric Administration (NOAA)



Argentina's Comisión Nacional de Actividades Espaciales (CONAE)



Japan Aerospace Exploration Agency (JAXA)



United States Geological Survey (USGS)



Digital Globe



GeoEye



DMC International Imaging (DMC)



Centre National des Techniques Spatiales (Algeria)



National Space Research and Development (Nigeria)



Tübitak-BILTEN (Turkey)



UK Space Agency (UK)



China National Space Administration (CNSA)



German Aerospace Center (DLR)

ERS, ENVISAT

SPOT

Formosat

RADARSAT

IRS

POES, GOES

SAC-C

ALOS

Landsat

Quickbird

GeoEye-1

ALSAT-1

NigeriaSat

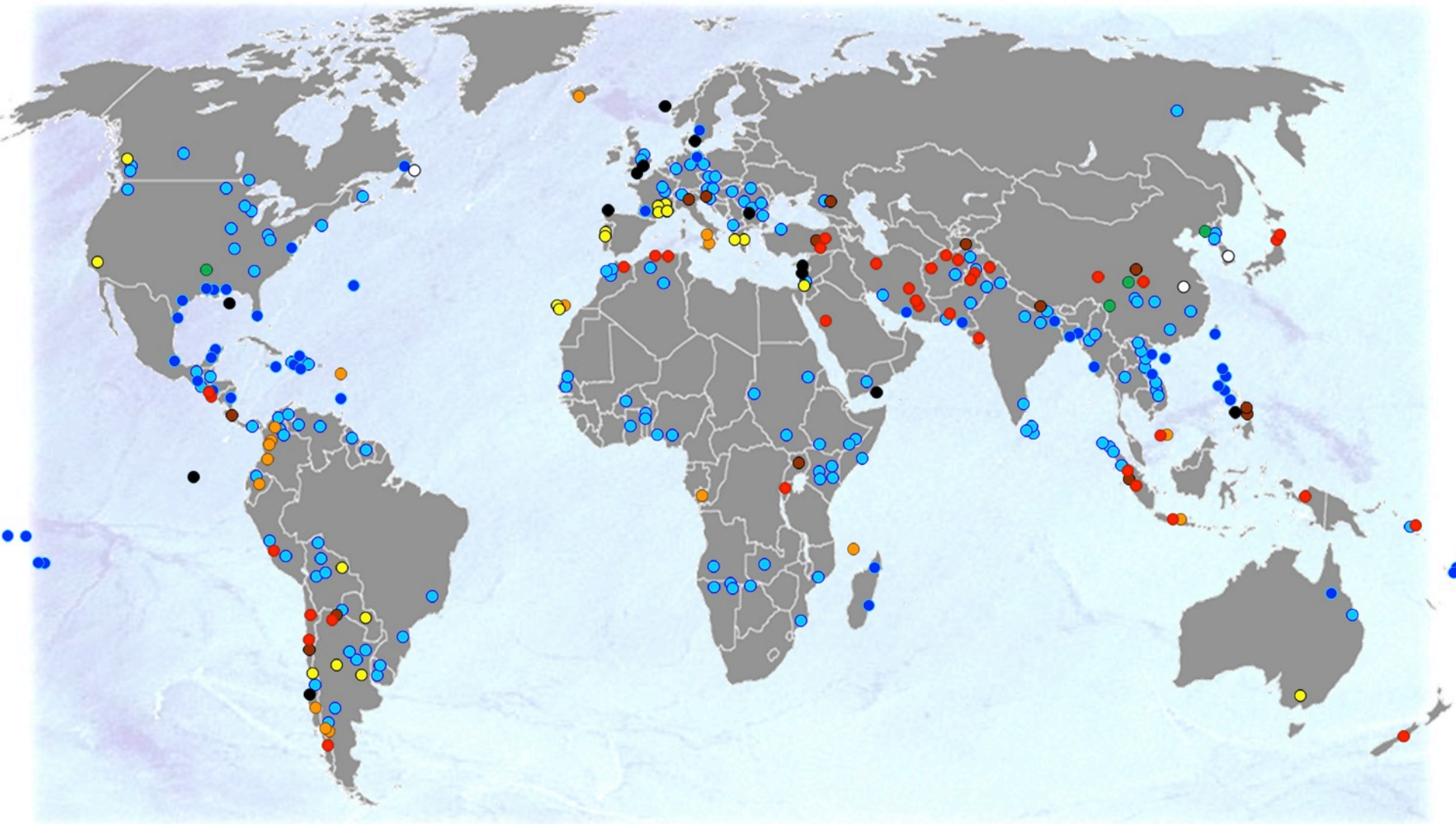
BILSAT-1

UK-DMC

FY, SJ, ZY satellite series

TerraSAR-X, TanDEM-X

Activation Distribution





INTERNATIONAL CHARTER SPACE AND MAJOR DISASTERS

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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



Floods, Landslides in Philippines

Friday, December 16, 2011
Typhoon Washi hit Iligan City, Philippines, on 16 December 2011. The typhoon triggered flash floods and landslides which killed more than 650 people and left 800 persons missing.

▶ [Read more](#)

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

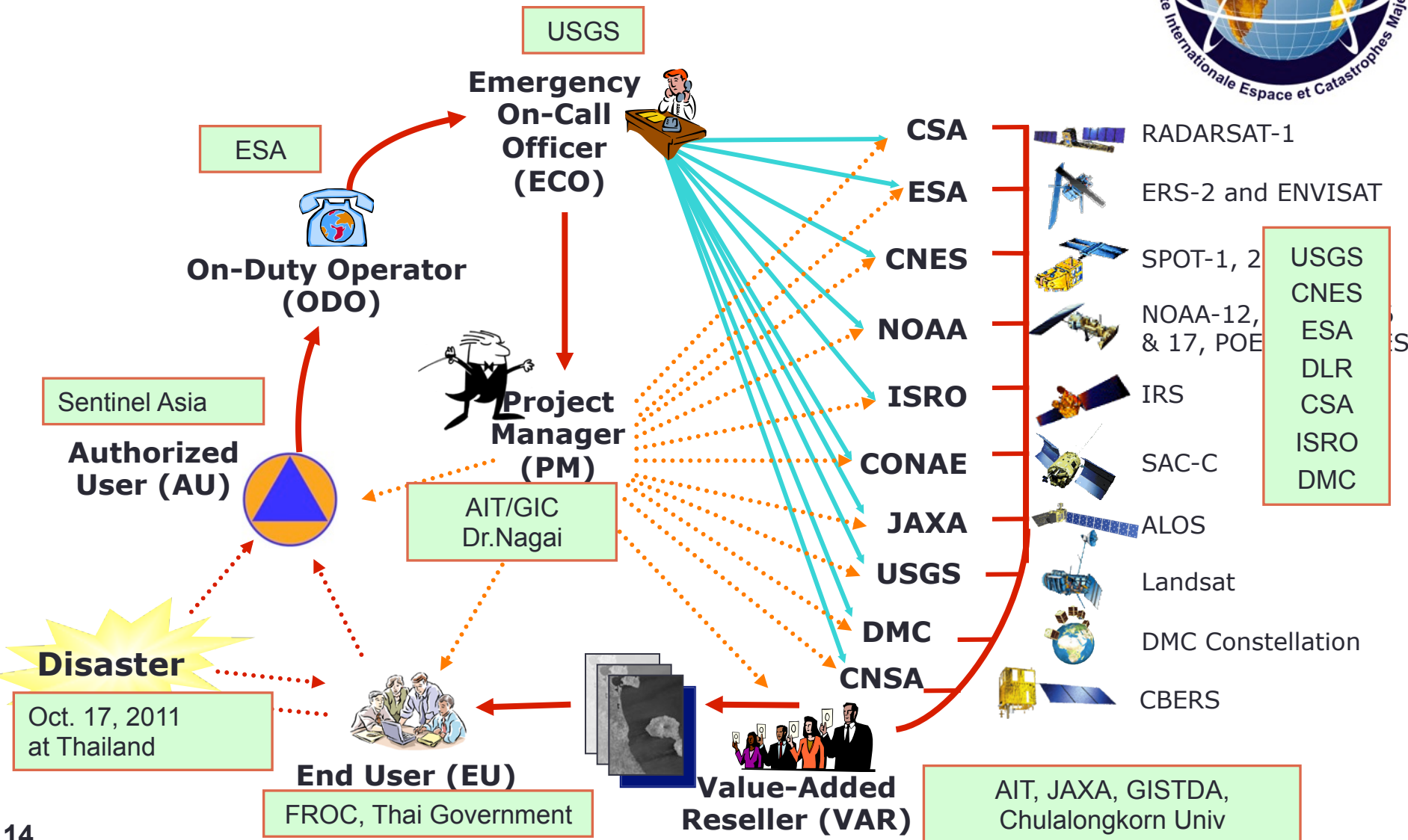
Recent Activations

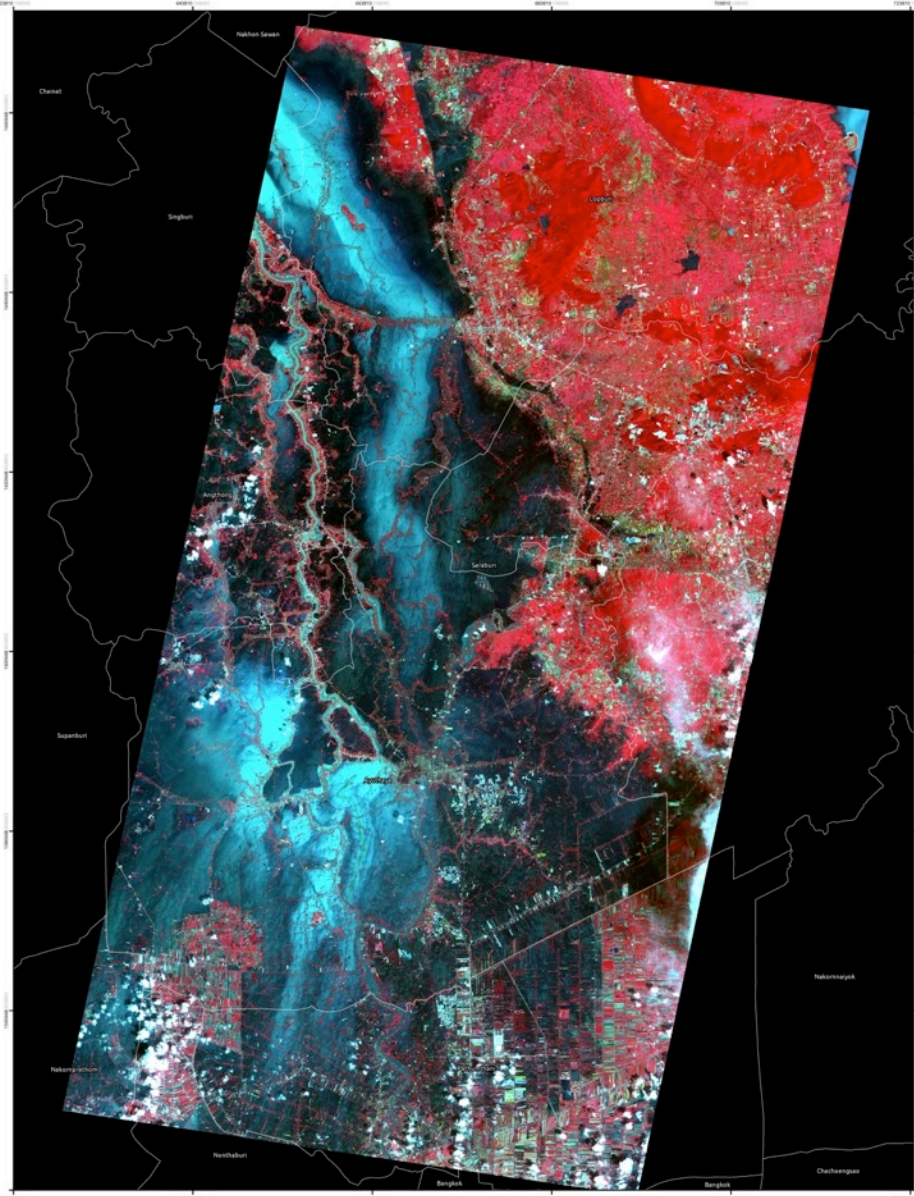
- [Floods, Landslides in Philippines](#)
- [Flood in Ghana](#)
- [Volcano in Chile](#)
- [Earthquake in Turkey](#)
- [Flood in El Salvador](#)
- [Activations Archive](#)

Latest Charter News

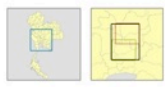
<http://www.disasterscharter.org/home>

International Charter





FLOODING IN CENTRAL THAILAND
 Observed by NASA'sTERRA Satellite on2011-10-23



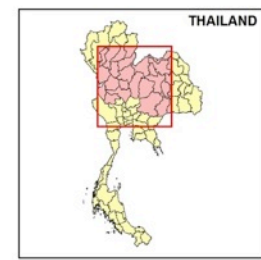
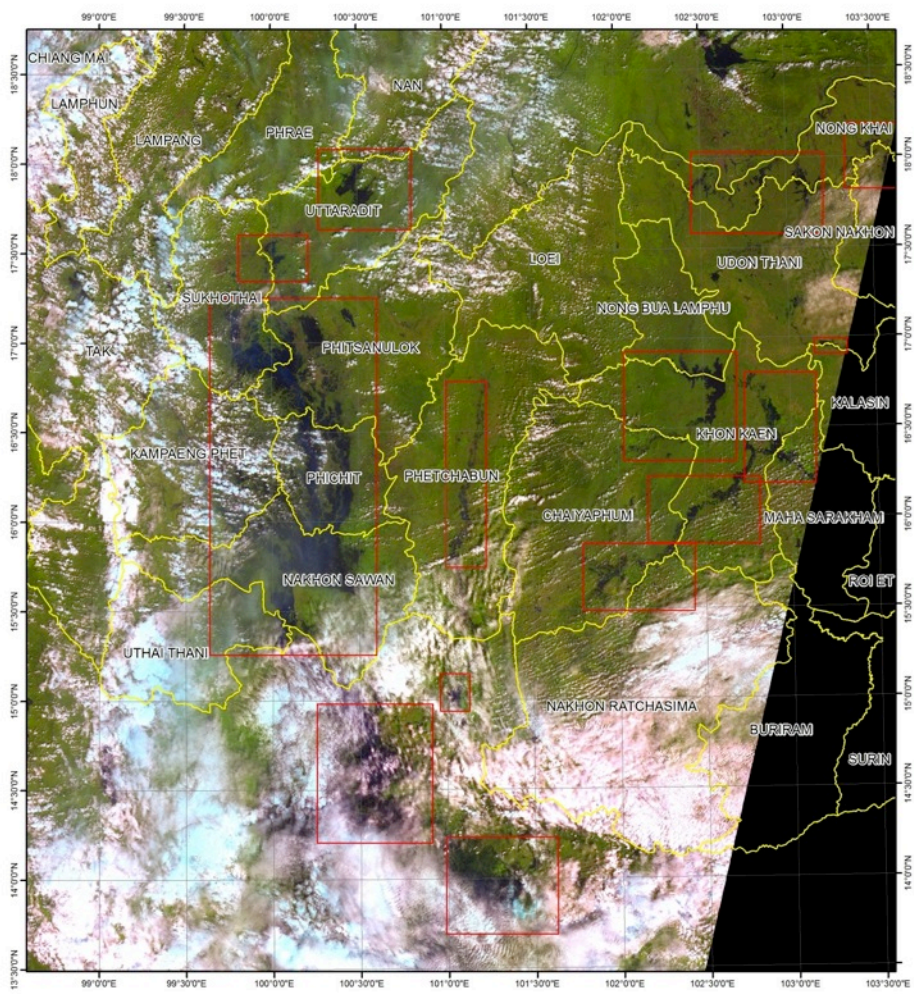
Cartographic Information
 Projection: UTM 47N
 Datum: WGS84

Data Sources
 Satellite: TERRA
 Sensor: ASTER
 Sensor Type: IRG
 Resolution: 15m
 Observation Date: 2011-10-23

Map Produced By
 Asian Institute of Technology
 Website: <http://www.ait.ac.th>



FLOOD IN NORTHEAST PROVINCES OF THAILAND



THAILAND

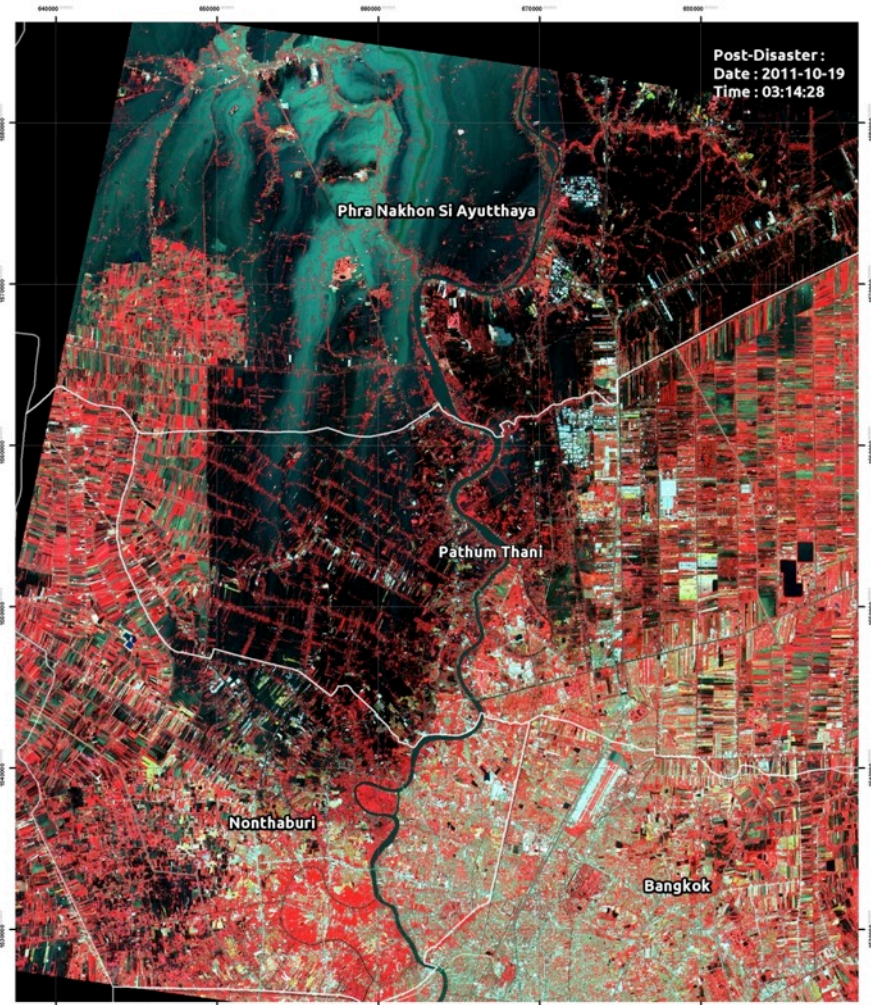
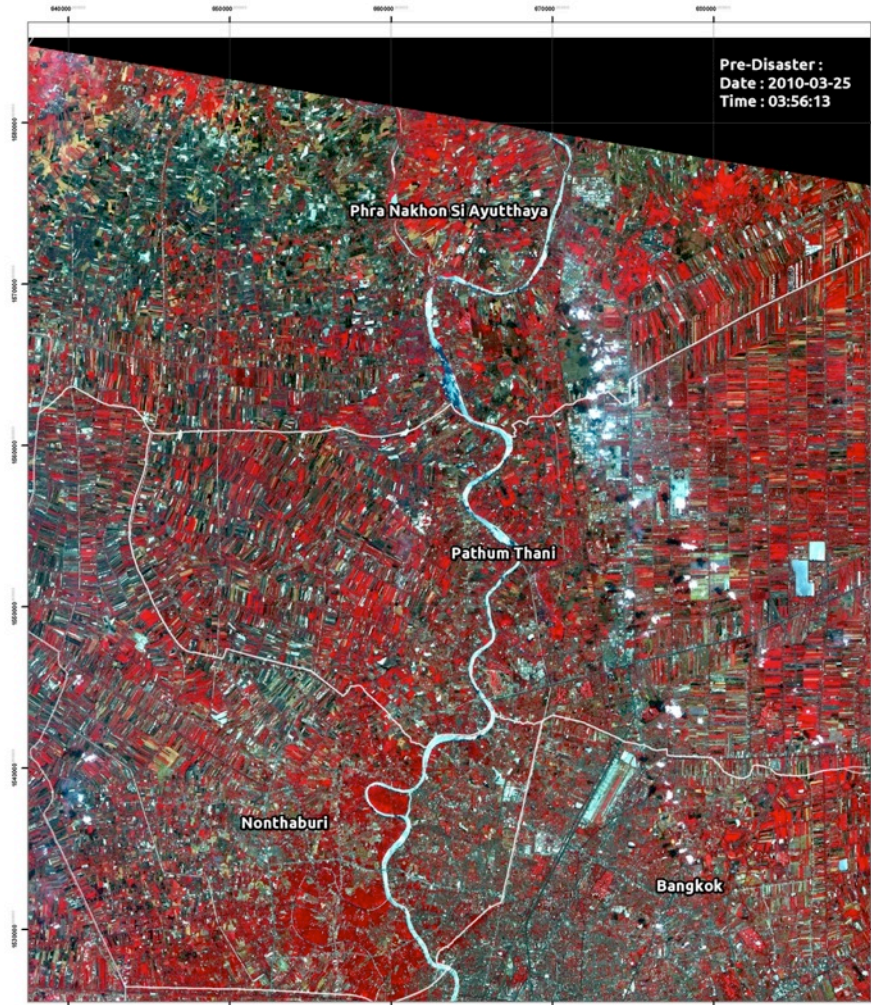
Cartographic Information
 SCALE 1:2,000,000
 0 25 50 100 Kilometers
 Map Projection WGS_1984_UTM_Zone_47Q

Legend
 Provincial Boundary
 Flood concerned area

Data Sources
 Satellite: IRS-R2
 Resolution: 56- 56m
 Obs. Date: 21-October-2011 11:31:28



Flooding in Central Thailand



Cartographic Information

Projection : UTM 47N
Datum : WGS84



Data Sources

Satellite : SPOT-5
Resolution : 10m
Observation date : (left) 2010-03-25, (right) 2011-10-19

Map Produced by Asian Institute of Technology.
Website : <http://www.ait.ac.th>



Flooding in Central of Thailand

Composite TerraSAR-X Images

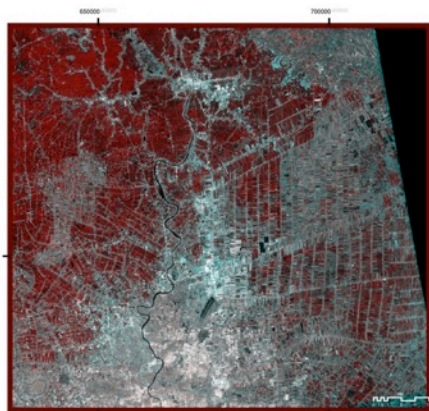


Image1. R:10-02-2011 G:26-10-2011 B:26-10-2011

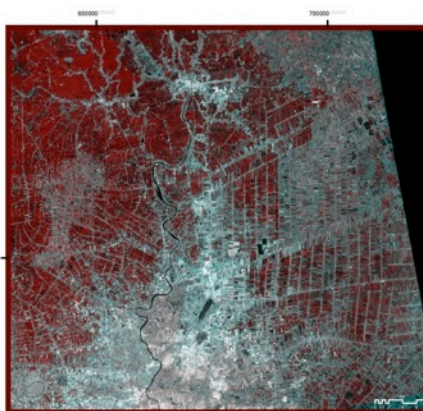


Image2. R:10-02-2011 G:06-11-2011 B:06-11-2011

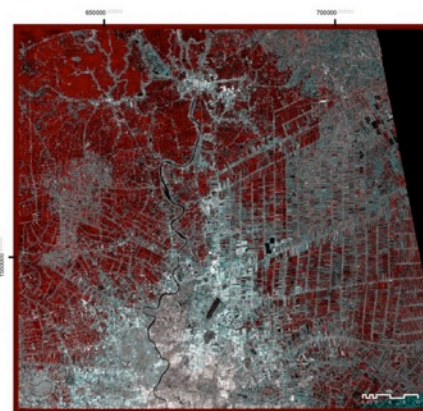


Image3. R:10-02-2011 G:12-11-2011 B:12-11-2011

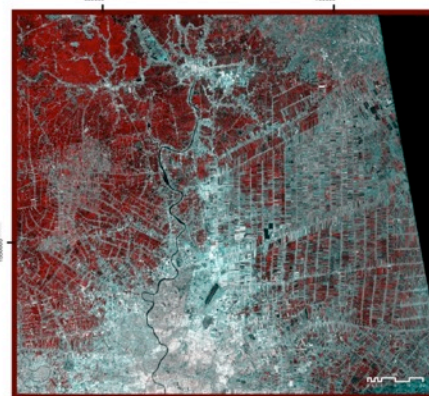


Image4. R:10-02-2011 G:17-11-2011 B:17-11-2011

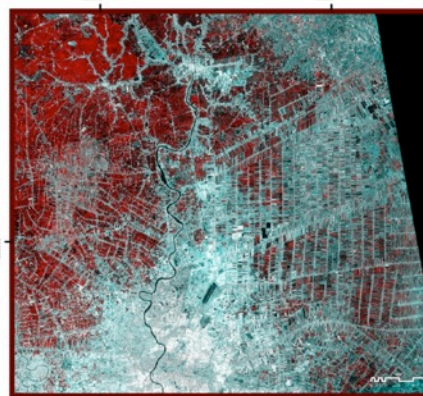


Image5. R:10-02-2011 G:28-11-2011 B:28-11-2011

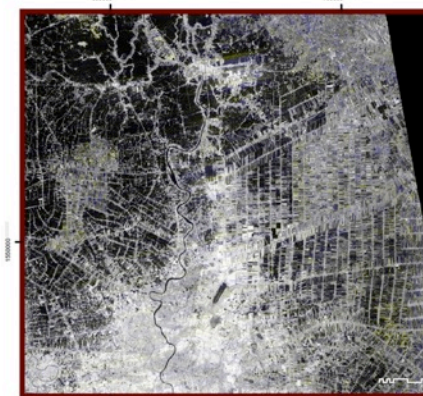


Image6. R:17-11-2011 G:28-11-2011 B:28-11-2011



MAP INFORMATION

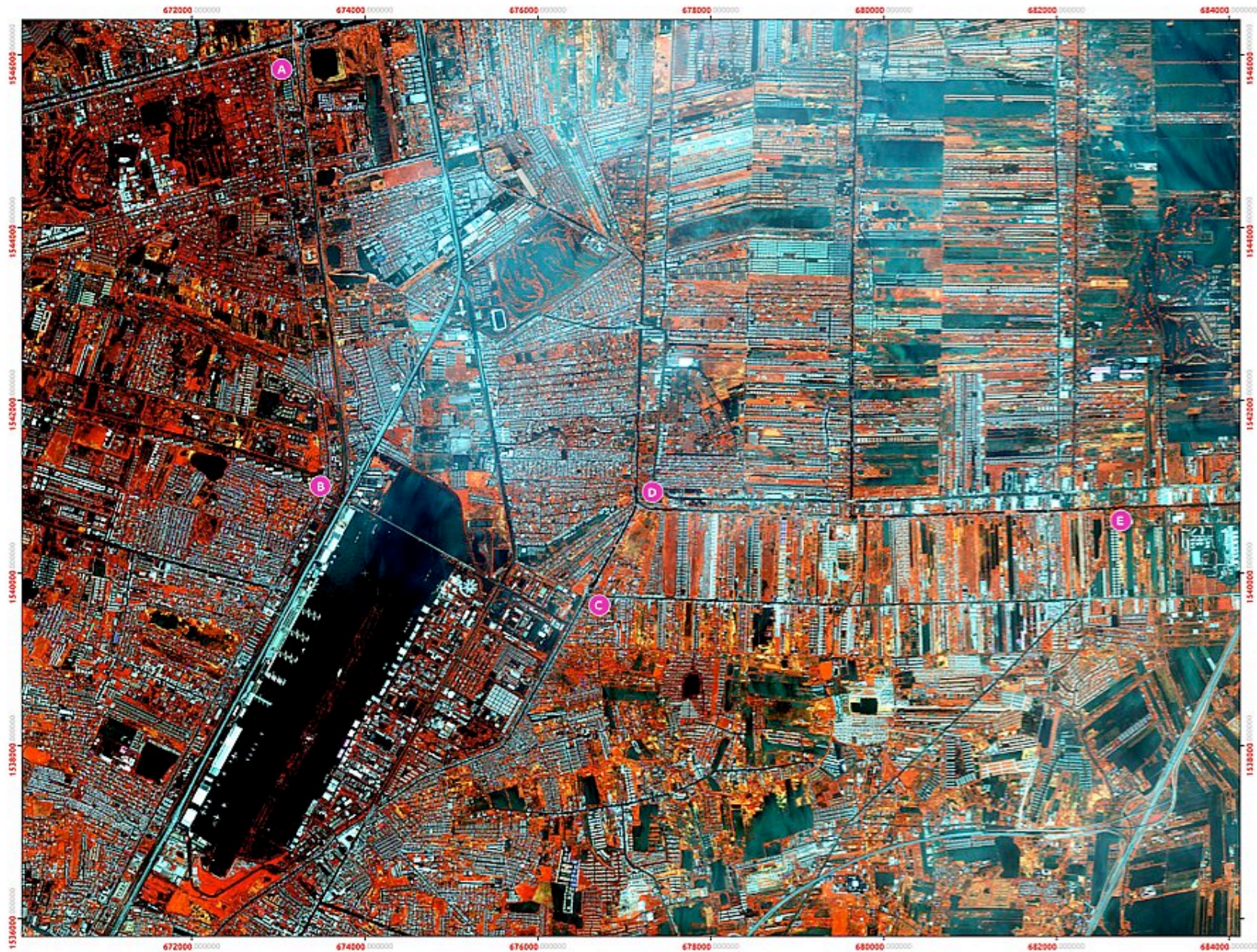
In image1, 2, 3, 4 and 5, inundated area due to flood are shown in red color patches. Image6, the inundated area on 28 November shown in red, black color patches shown the inundated of both date on 17 and 28 November. Result is not verified with ground truth data.

Data Source: TerraSAR-X Pre-Disaster image: Acquired on 10 February 2011 Post-Disaster image: Acquired on 26 October, 6 November, 12 November, 17 November and 28 November 2011 Map Projection: UTM WGS84 Zone:47N

Map Produced by: Asian Institute of Technology on 1 December 2011 Website: <http://www.ait.ac.th>

TerraSAR-X/TanDEM-X © German Aerospace Center (DLR) 2011, Commercial exploitation rights: Astrium GEO-Information Services





BIG BAG BARRIER

Observed by GeoEye-1 satellite on 2011-11-05 during the Thailand 2011 Historic Flooding.

Regarding flood control in Bangkok, the Flood Relief Operations Center revealed that the six-kilometer-long barrier, or the "Big Bag" floodwall, which had been set up recently, would help slow down the flow of water from the north of Bangkok to a certain extent. This would also enable the Bangkok Metropolitan Administration to drain water more efficiently. The setting up of the Big Bag floodwall is also being considered in Bang Kruei to slow down the water flow in the

western side of Bangkok (Source : Foreign Office, the Government Public Relations Department, 2011-11-07)

In this false-color-composite image, the barriers were shown as the white line segments started near the Lak Hok station (A) and followed the main road down to the Bangkok International Airport (B), Chantharuboksa road (C), Phaholyothin 54/1 road (D) and finally stopped at Sai Mai 85 road (E).

Cartographic Information

Projection : UTM
 Projection Zone : 47N
 Datum : WGS-84

Scale : 1:100,000



Data Sources

Agency : NGA
 Platform : GEOEYE
 Sensor : MSI
 Sensor Type : MS
 Acquisition Date : 2011-11-05
 Resolution : 1.65m

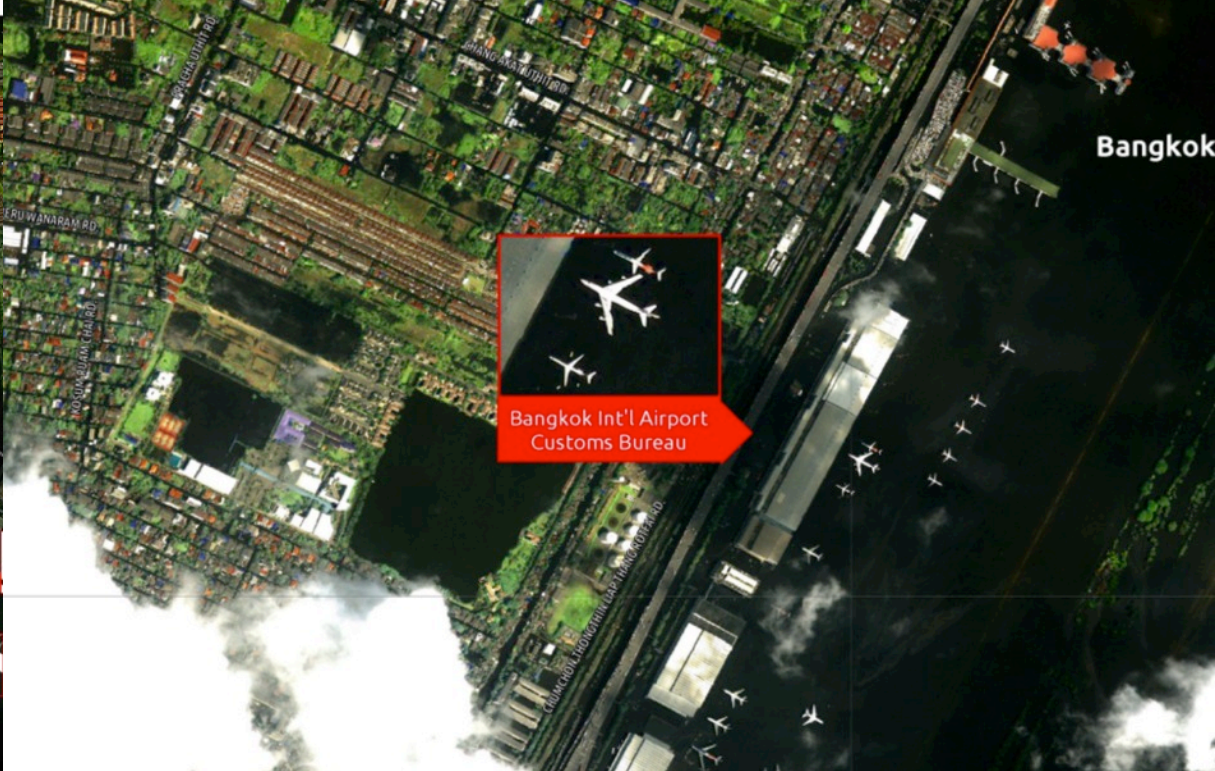
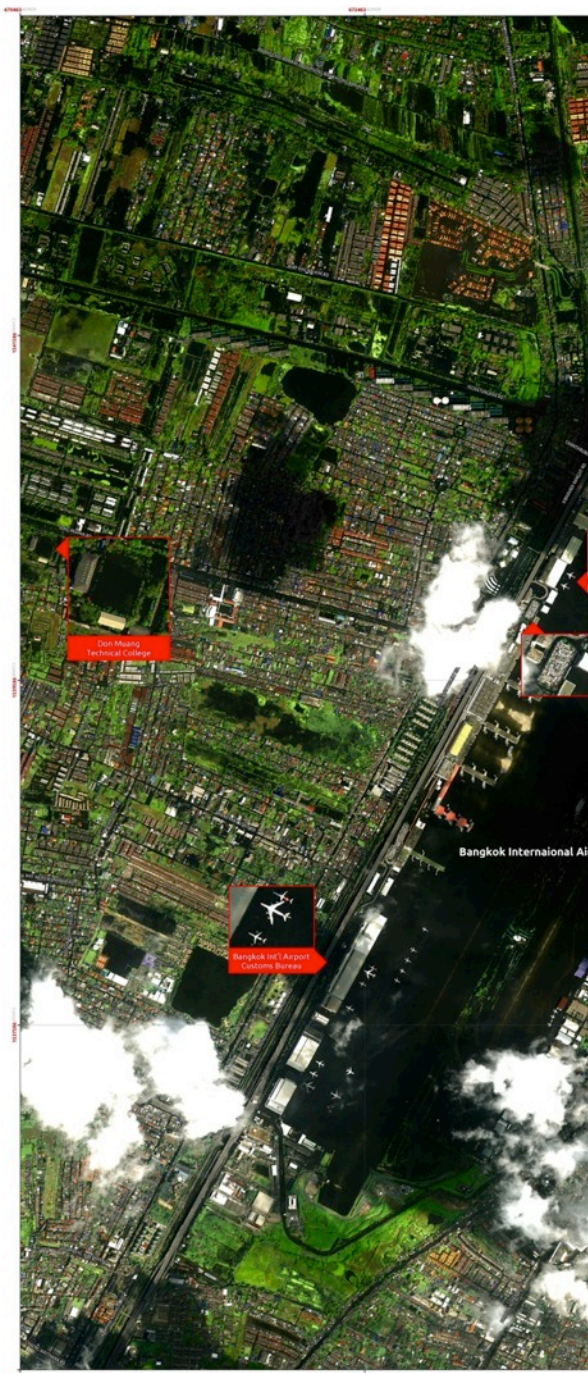


Sentinel Asia



GeoEye

Map Produced by Asian Institute of Technology
 Website : <http://www.ait.ac.th>, November 2011



Bangkok

BANGKOK International Airport UNDERWATER

A pan-sharpened, 1-meter, IKONOS image of the Bangkok International Airport during the historic flooding in October 2011. The data was observed on the 30th of October 2011.

During the crisis, the airport was used as the Flood Relief Operations Center (FROC). Later, on the 29th of October, the center was moved from Don Mueang to the Energy Building complex which is also houses the Energy Ministry and the PTT head office.



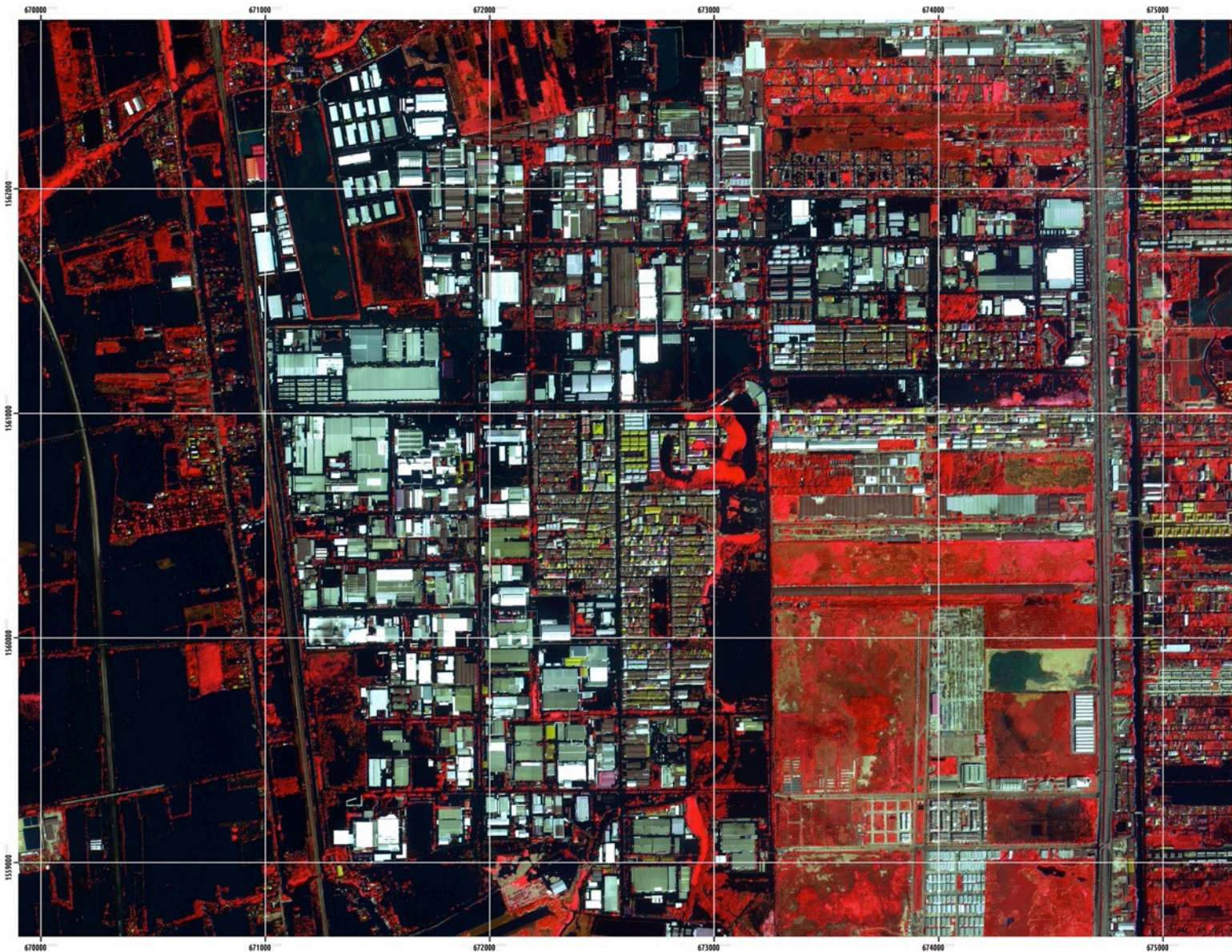
Cartographic Information

Projection: UTM 47N
Datum: WGS84
Data Source
Agency: MGA
Platform: IKONOS-2
Sensor: HQ and PAN
Resolution: 4m (HQ) and 0.8m (PAN)
Acquisition Date: 2011-10-30



Map Produced by Asia Institute of Technology, Website: www.aitech.ac.th

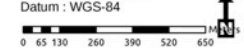
The NAVA NAKORN Industrial Estate : 2011-11-19



This was a pan-sharpened image of the Nava Nakorn Industrial Estate, located in Ayutthaya province of Thailand. It was inundated since the mid of October 2011.

Cartographic Information

Projection : UTM
Projection Zone : 47N
Datum : WGS-84



Data Sources

Agency : NGA
Platform : IKONOS-2
Sensors : MS and PN
Acquisition Date : 2011-11-19
Resolution : 4m and 1m



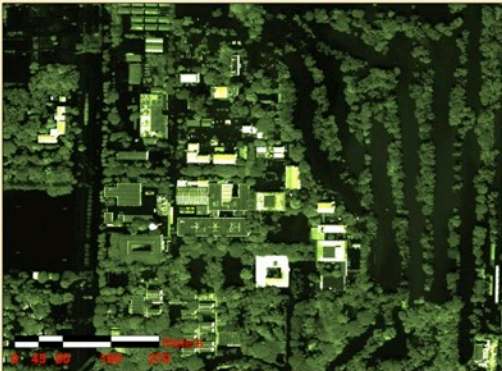
Map Produced by Asian Institute of Technology (AIT)
Website : www.ait.asia

NECTEC



Thailand's National Electronics and Computer Technology Center (NECTEC) is a statutory government organization under the National Science and Technology Development Agency (NSTDA), Ministry of Science and Technology. Its main responsibilities are to undertake, support, and promote the development of electronic, computing, telecommunication, and information technologies through research and development activities. Was Inundated during 2011 historic flood of Thailand.

AIT



The Asian Institute of Technology (AIT) is an international institution for higher education in engineering, advanced technologies, and management and planning. Founded in 1959 as "SEATO Graduate School of Engineering" and now it becomes an Intergovernmental Institute. More than 50 countries student study here. It get flooded on 21-22 Oct 2011 and water level reached around 2.0 m on all over campus.



(For generating this map predefined Color table "Green/White Exponential" used for contrast enhancing. Here DARK GREEN color shows WATER and LIGHT GREEN & WHITE color shows TREES and NON-INUNDATED AREA)

- a** Asian Institute of Technology (AIT)
- c** Thammasat University Rangsit Campus

- b** National Electronics and Computer Technology Center (NECTEC)
- d** Wat Phra Dhammakaya



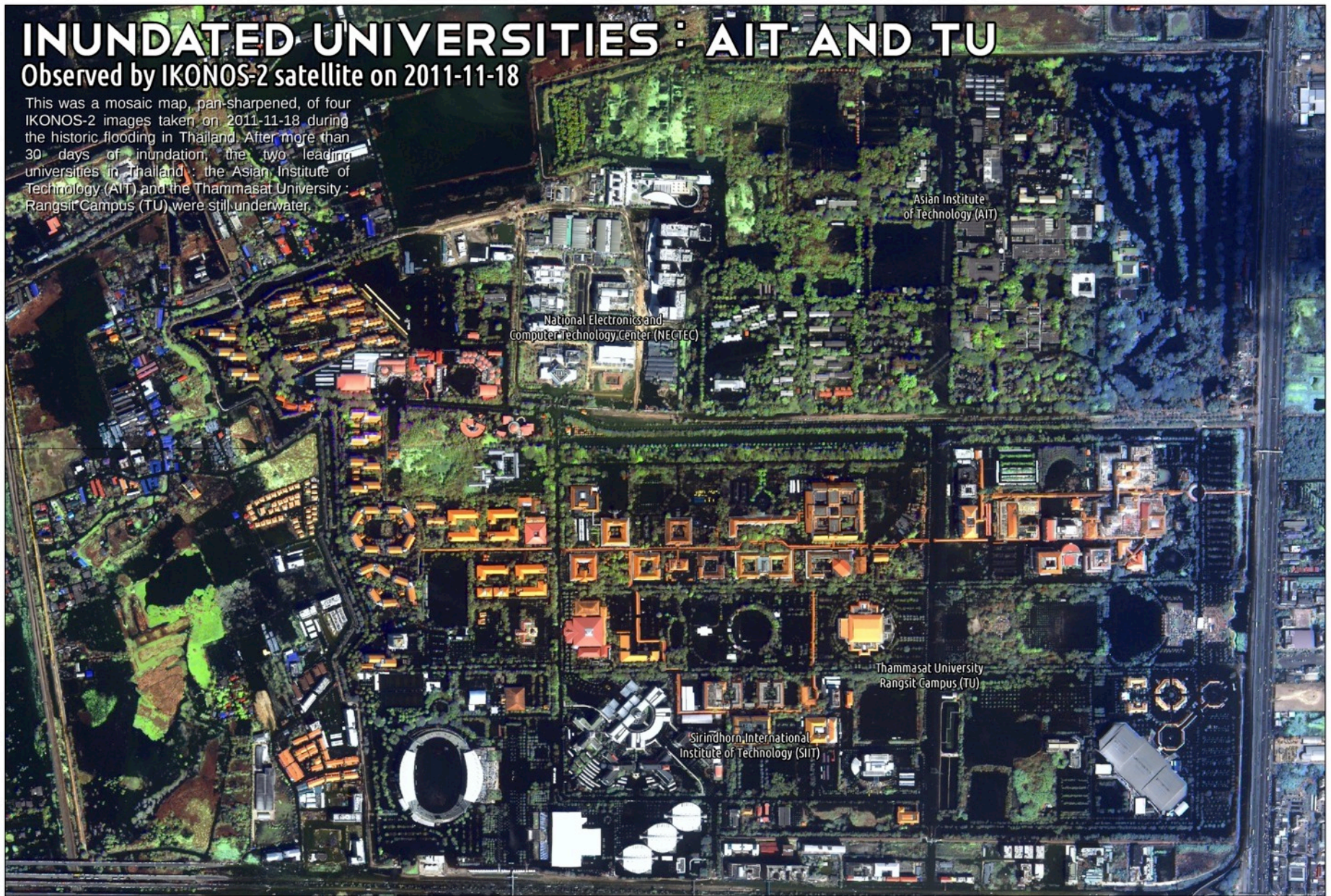
Thammasat University, Asian Institute of Technology (AIT) and Wat Phra Dhammakaya Inundated

Cartographic Information
 Projection: UTM 47N
 Datum: WGS84
Data Source
 Agency: NGA
 Platform: WorldView1
 Sensor: PAN (0.50-0.59m)
 Acquiring Date: 02 Nov 2011

INUNDATED UNIVERSITIES : AIT AND TU

Observed by IKONOS-2 satellite on 2011-11-18

This was a mosaic map, pan-sharpened, of four IKONOS-2 images taken on 2011-11-18 during the historic flooding in Thailand. After more than 30 days of inundation, the two leading universities in Thailand : the Asian Institute of Technology (AIT) and the Thammasat University Rangsit Campus (TU) were still underwater.



Cartographic Information

Projection : UTM, Projection Zone : 47N, Datum : WGS-84

Map Produced by Asian Institute of Technology (AIT). Website : www.ait.asia

Data Sources

Agency : NGA, Platform : IKONOS-2, Sensors : MS and PN, Acquisition Date : 2011-11-18, Resolution : 4m and 1m

0 50 100 200 300 400 500 Meters



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