



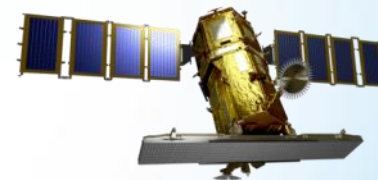
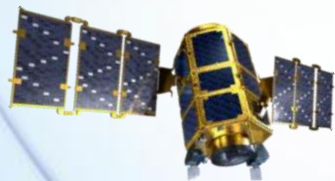
GISTDA

Fair Access to Space

KOMPSAT Workshop

- Discover the Earth at Sub-meter Resolution -

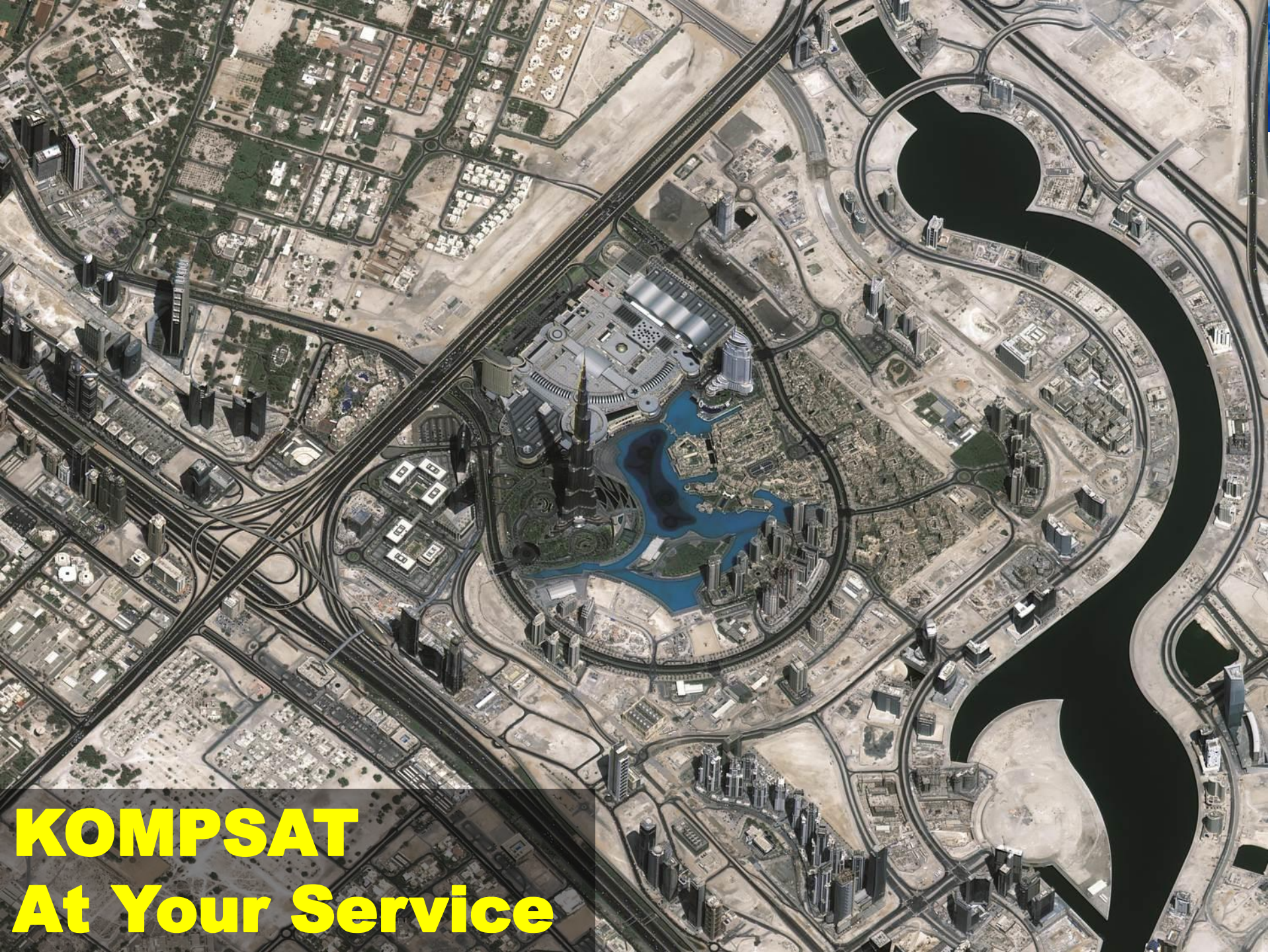
IV. Data Applications



March, 2015
SI Imaging Services

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KOMPSAT
At Your Service

Contents

I

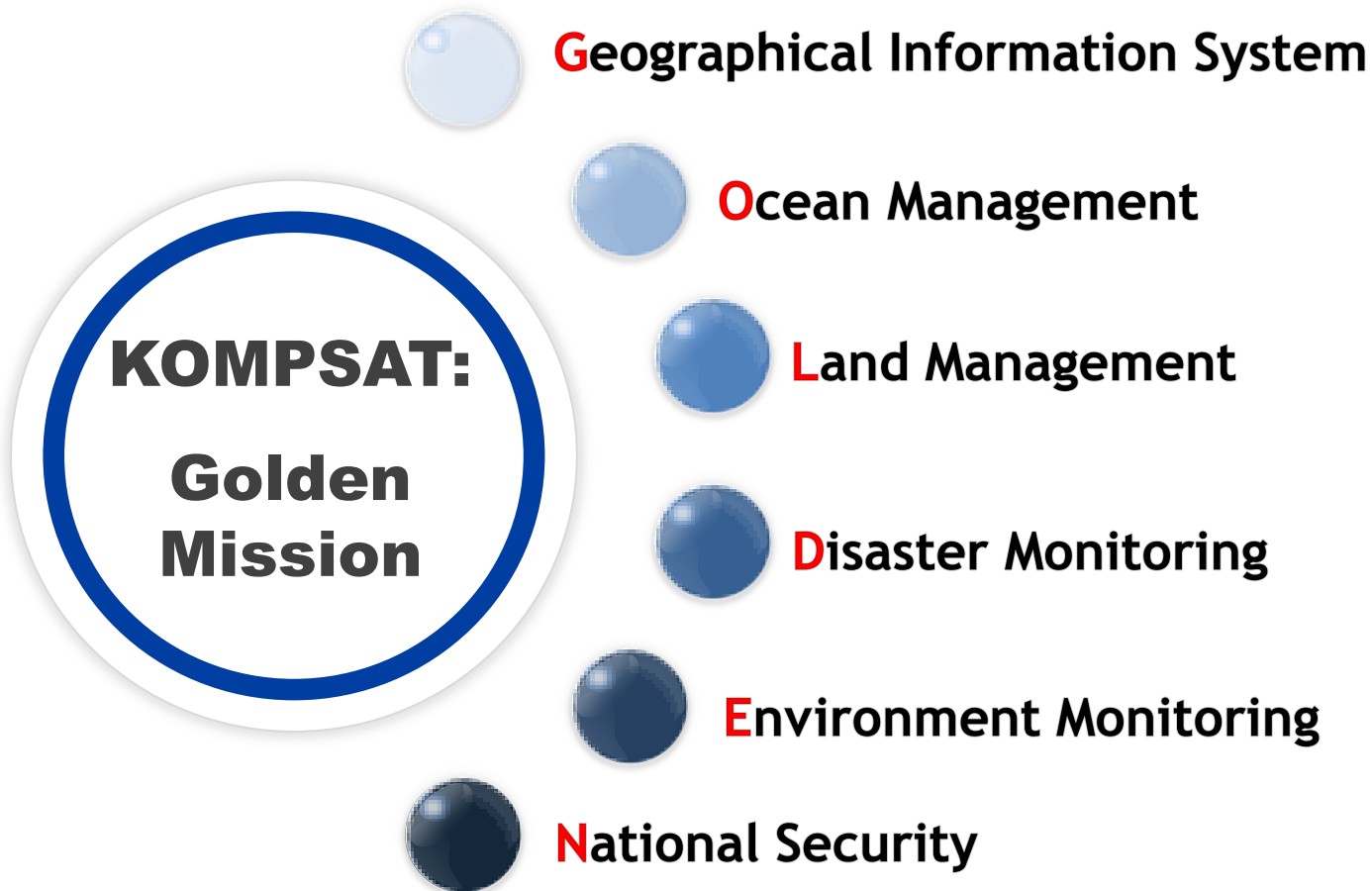
KOMPSAT applications

II

Worldwide projects with KOMPSAT

GOLDEN Mission

- ❖ The mission of KOMPSAT programs is to continuously provide satellite imagery for the applications such as:



Domestic Applications (1/2)

- ❖ **Ministry of Land, Infrastructure and Transport**
 - Map services
- ❖ **National Geography Information Institute**
 - Update digital maps
- ❖ **Ministry of Environment**
 - Land cover maps
- ❖ **Statistics Korea (KOSTAT)**
 - Cultivation acreage survey using satellite images by
- ❖ **National Institute of Environmental Research**
 - Water quality (Chl-a) monitoring system
- ❖ **Ministry of Unification**
 - National base map

Domestic Applications (2/2)

❖ Korea Forest Service

- Forest type mapping, monitoring forest damage, development planning

❖ National Disaster Management Institute

- Damage assessment

❖ Nuclear Safety and Security Commission

- Monitoring of nuclear power plant sites

❖ National Academy of Agricultural Science

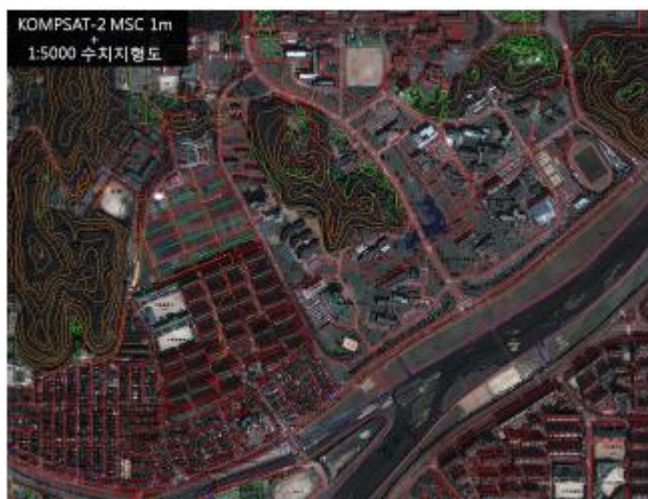
- Monitoring crop growth, crop damage assessment

❖ National Fishery & Development Institute :

- Inshore monitoring, algal bloom monitoring, water quality monitoring

Digital Mapping

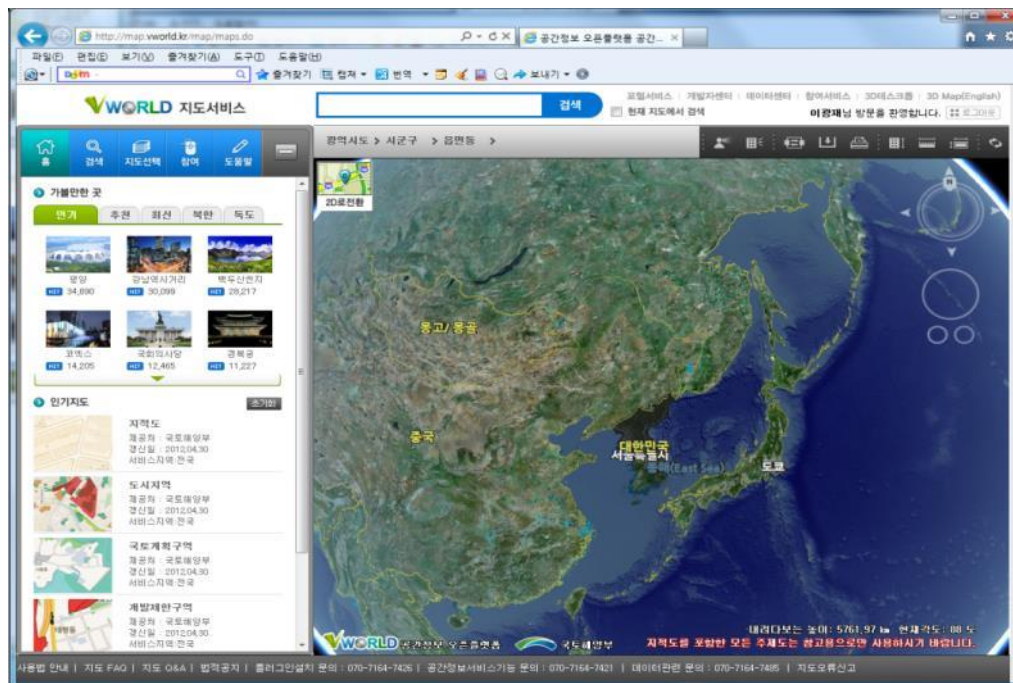
❖ KOMPSAT-2



Map Service

❖ Open Map API “V-world” by Ministry of Land, Infrastructure and Transport, Korea.

- Realization of 3D spatial information using KOMPSAT imagery



Urban Change Mapping

- ❖ Updating digital map by National Geography Information Institute, Korea



Land Information Management

❖ Land information management system based KOMPSAT imagery

- Long term urban planning, disaster management, property tax system, improving the efficiency of urban infrastructure investment

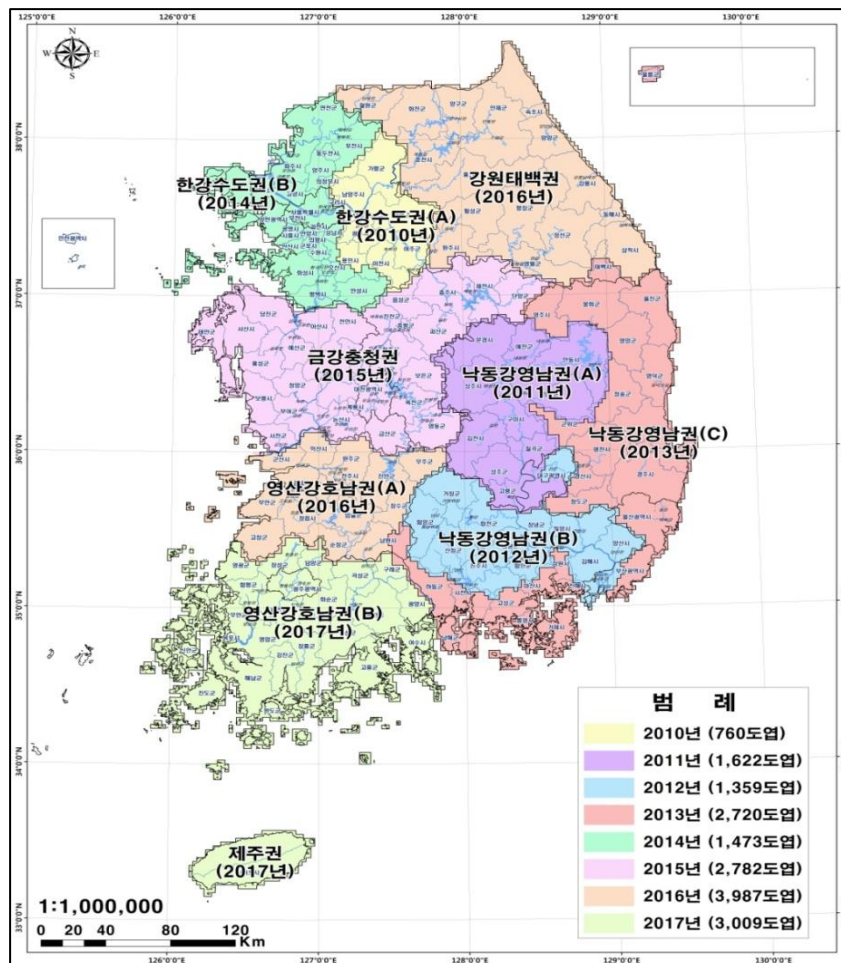


Courtesy of



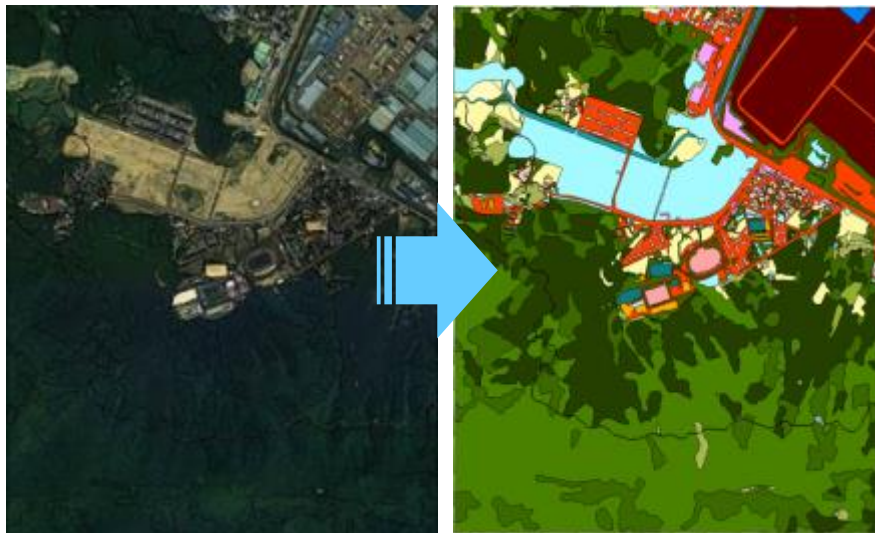
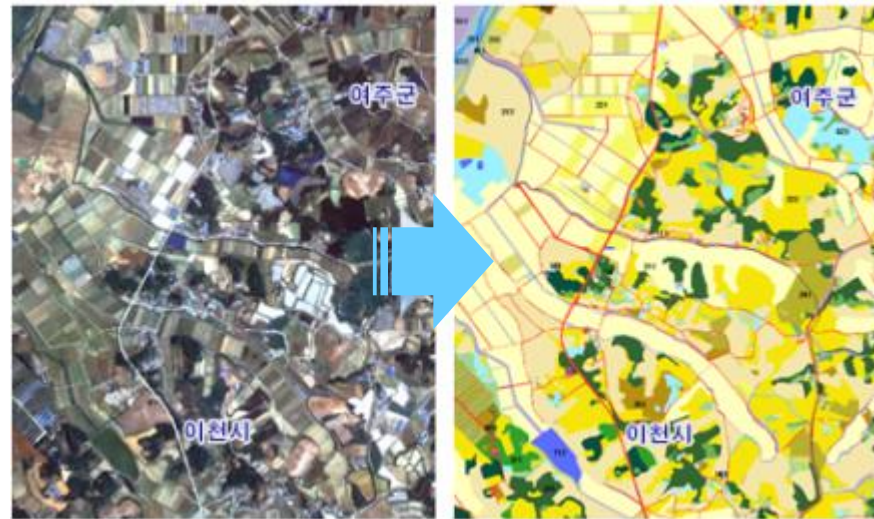
Land Cover Map

❖ Land Cover Map by Ministry of Environment, Korea



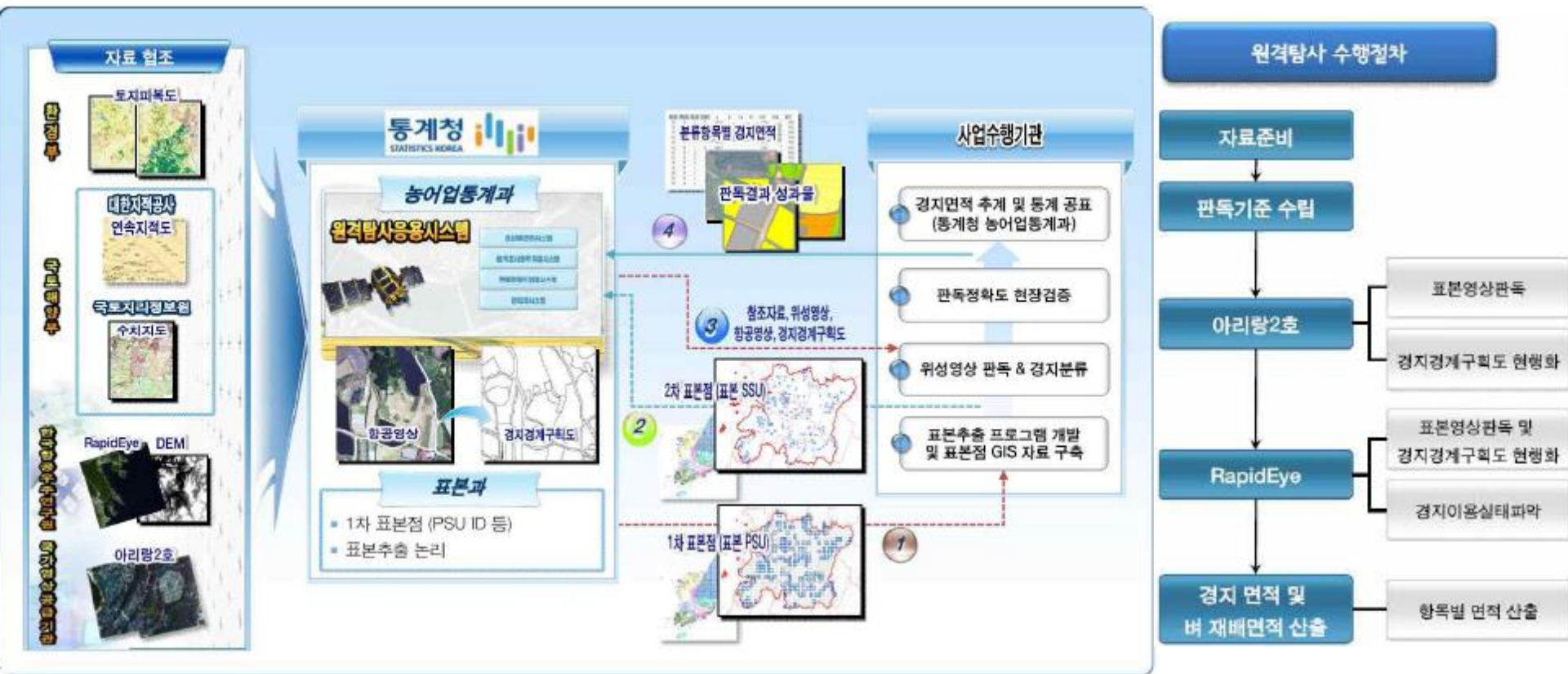
Nakdong river estuary

Land Cover Map



Agriculture Monitoring

❖ Cultivation acreage survey using satellite images by Statistics Korea (KOSTAT)



Agriculture Monitoring

❖ KOMPSAT-2, Rice Field [1]

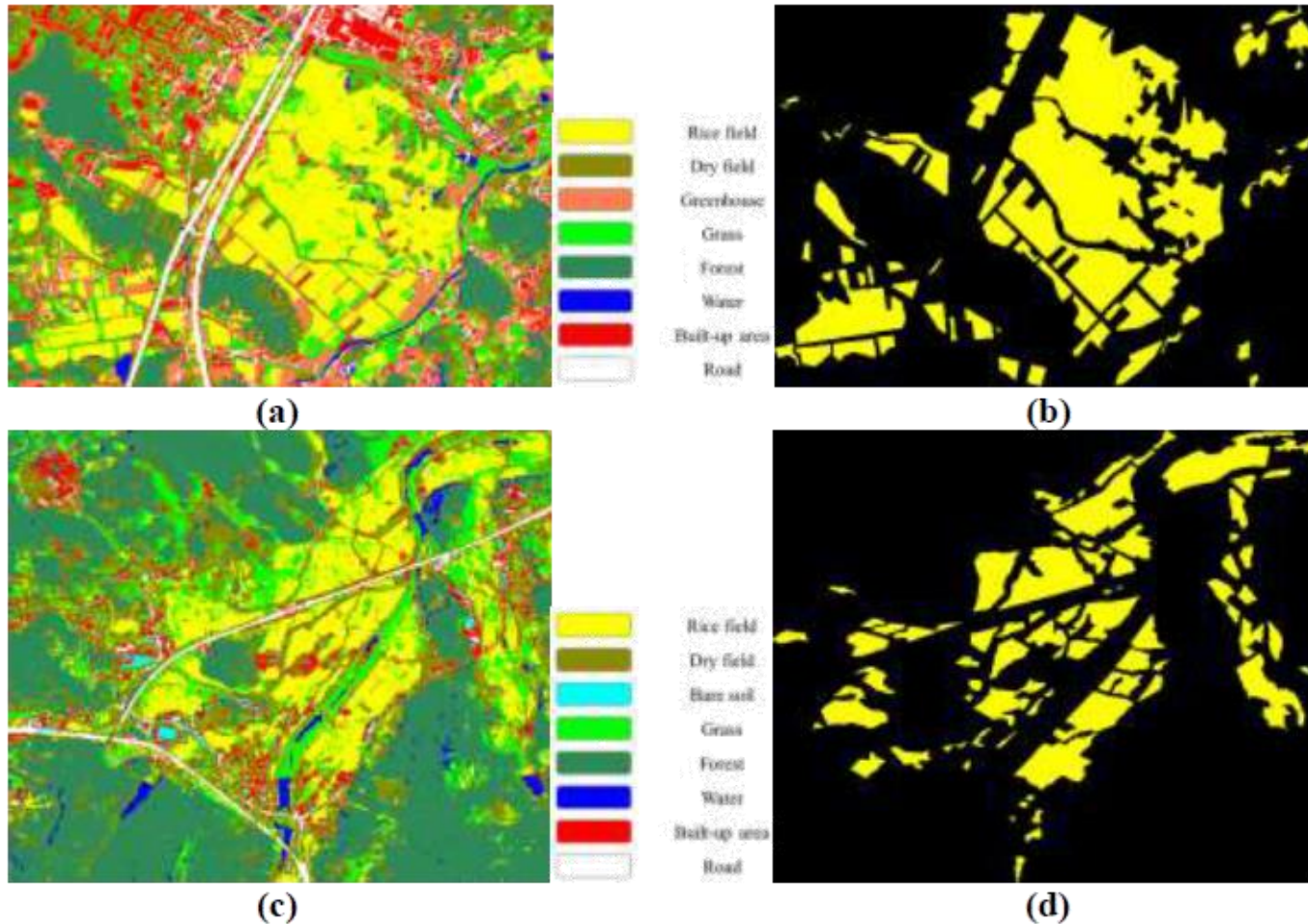
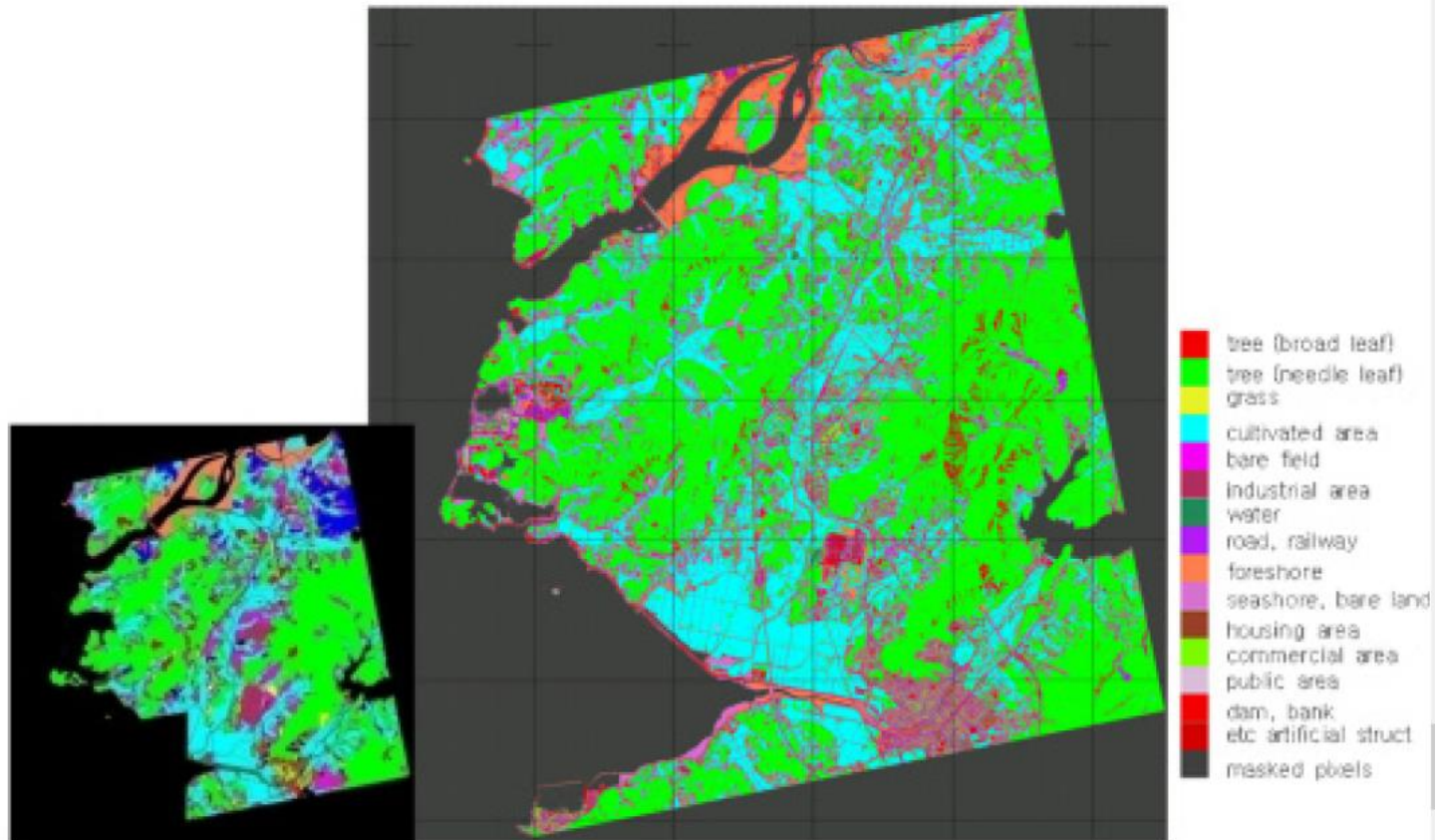


Fig. 4: Classification results and reference data of rice fields. (a) Daejeon (b) Reference in Daejeon (c) Gongju (d) Reference in Gongju

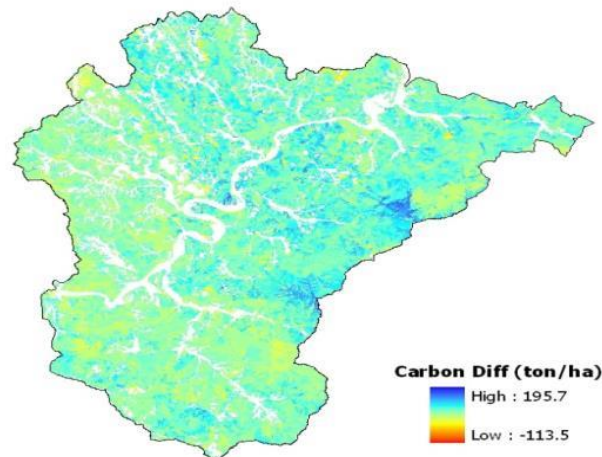
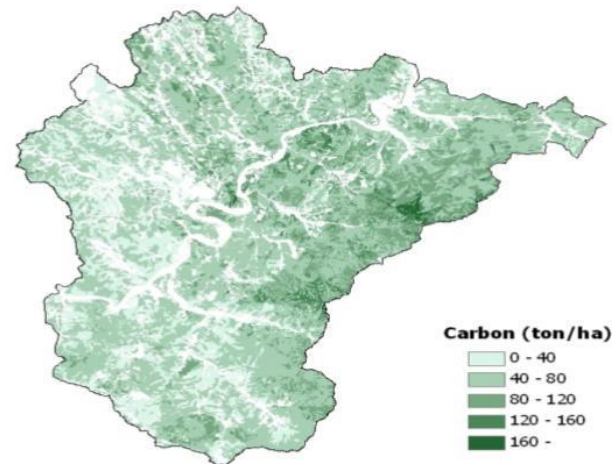
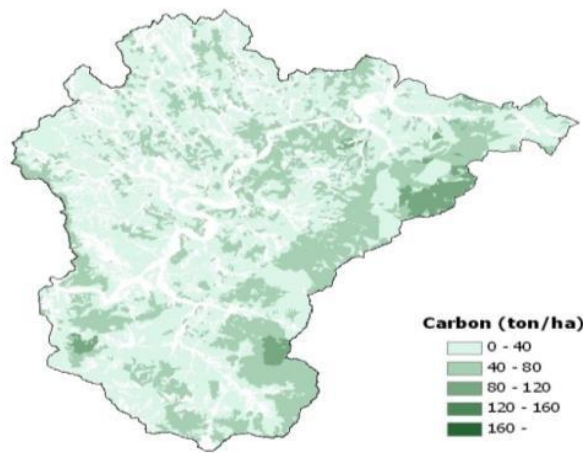
Forest Management

❖ APPLICATION OF KOMPSAT II IMAGERY FOR CARBON EMISSION INVENTORY MAP



Forest Management

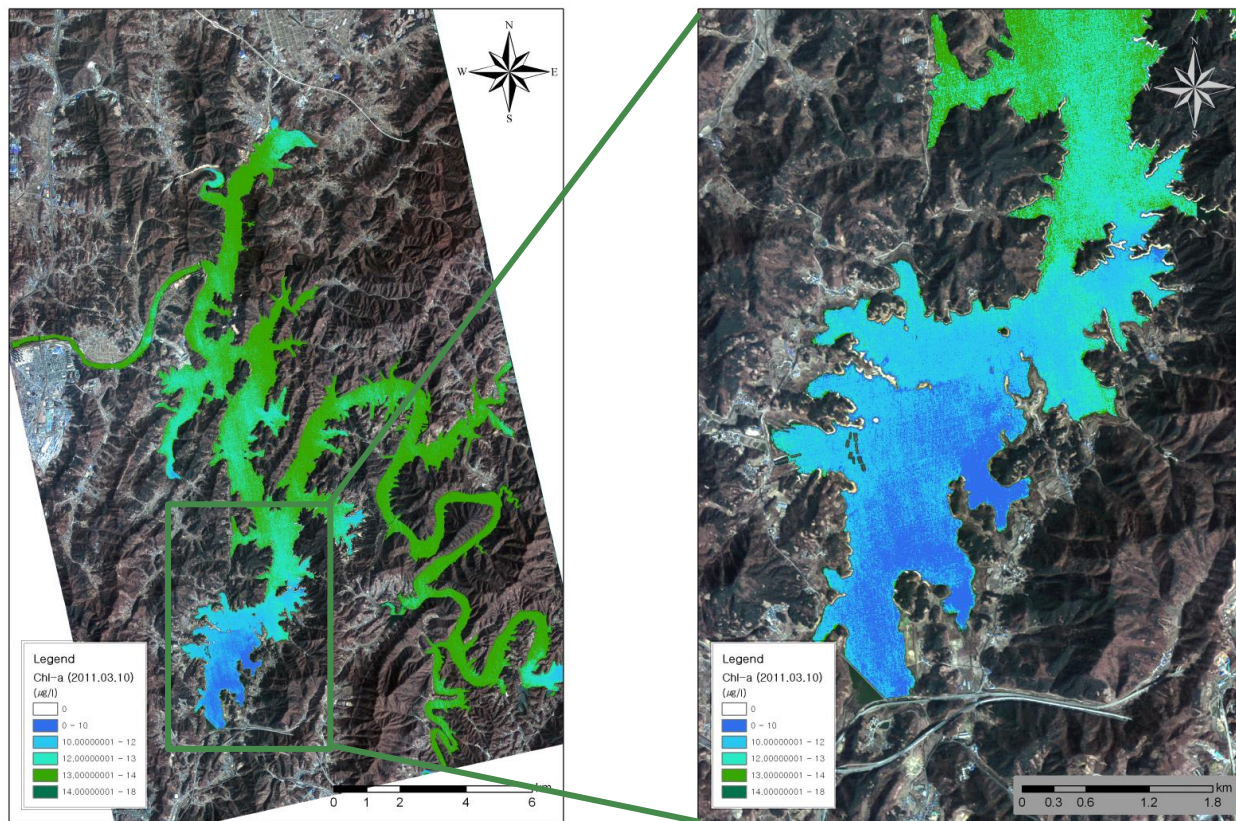
❖ Carbon Storage Estimation



Water Quality

❖ Water quality (Chl-a) monitoring system by National Institute of Environmental Research, Korea

- Utilize satellite images and in-situ data



(Note) KOMPSAT Optical Bands

❖ Compatible with Landsat-7

Landsat-7		KOMPSAT-2/3	
Band	Wavelength	Band	Wavelength
Band 1 - blue	0.45-0.52	Blue	0.45-0.52
Band 2 - green	0.52-0.60	Green	0.52-0.60
Band 3 - red	0.63-0.69	Red	0.63-0.69
Band 4 - Near Infrared	0.77-0.90	NIR	0.76-0.90
Band 5 - Short-wave Infrared	1.55-1.75		
Band 6 - Thermal Infrared	10.40-12.50 10.40-12.50		
Band 7 - Short-wave Infrared	2.09-2.35		
Band 8 - Panchromatic	0.52-0.90	Panchromatic	0.50-0.90

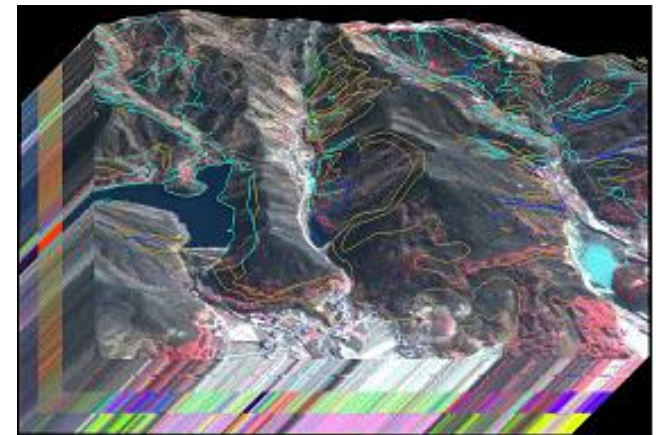
Disaster Management

❖ Strength

- Very high resolution
- Wide area imaging
- High revisit / unique imaging time combination
- SAR

❖ Application

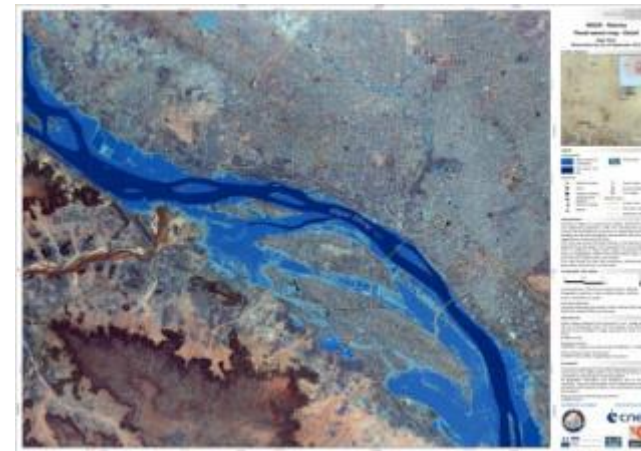
- International Charter : KOMPSAT-2 (KARI)
- Damage assessment
 - Earthquake, flood, tornado, typhoon, and so on
- Recovery monitoring



Disaster Management – Intl. Charter



KOMPSAT-2



Flood extent map by KOMPSAT-2 (Niger in Africa)



Landslide damaged map by KOMPSAT-2 (India)

Disaster Management – Damage Assessment

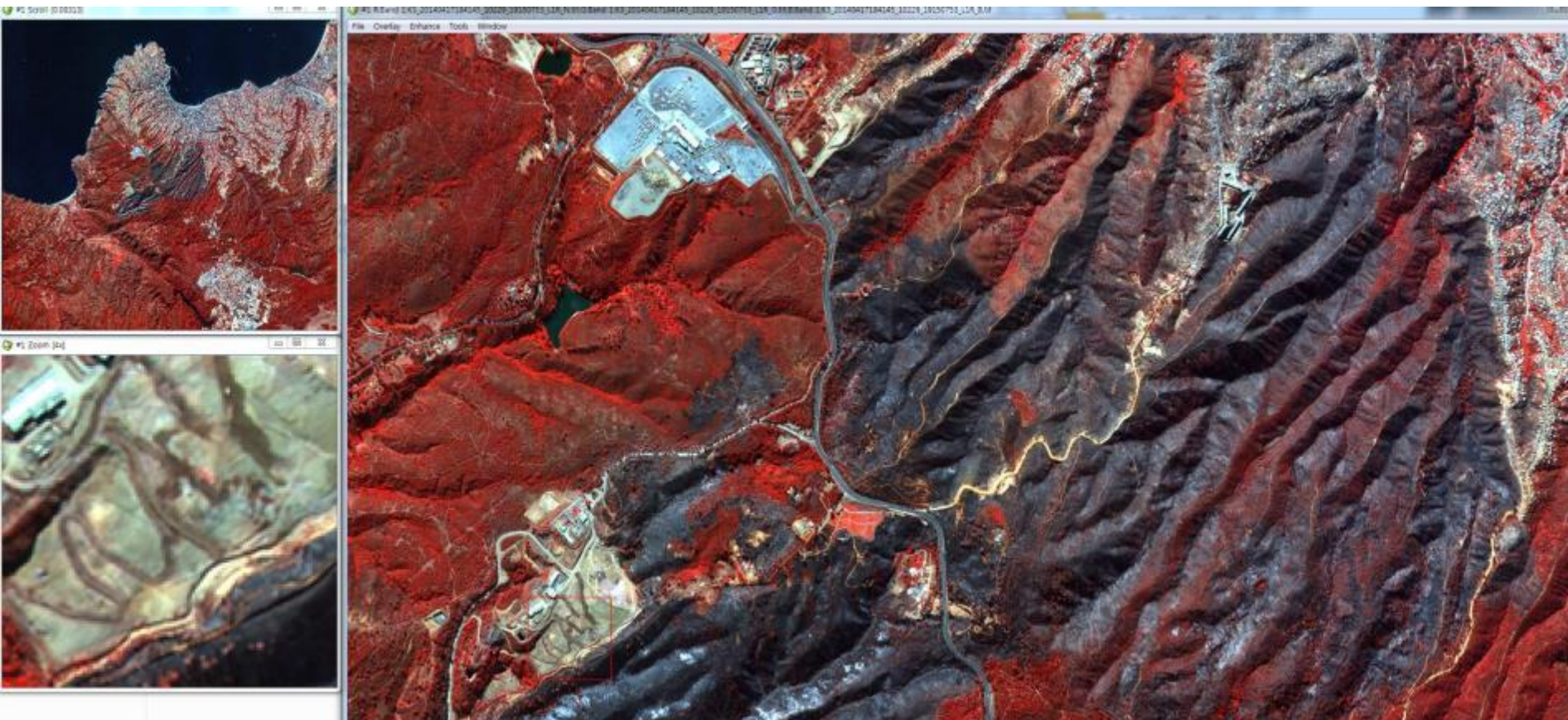


Disaster Management – Damage Assessment



Disaster Management – Damage Assessment

❖ Fire in Chile (14th of April, 2014)



KOMPSAT-3, 17-04-2014

Crash Site of Malaysia Airline MH17

Hrabove in Donetsk Oblast, Ukraine

48.138192N 38.639193E



Primary crash site
and debris field



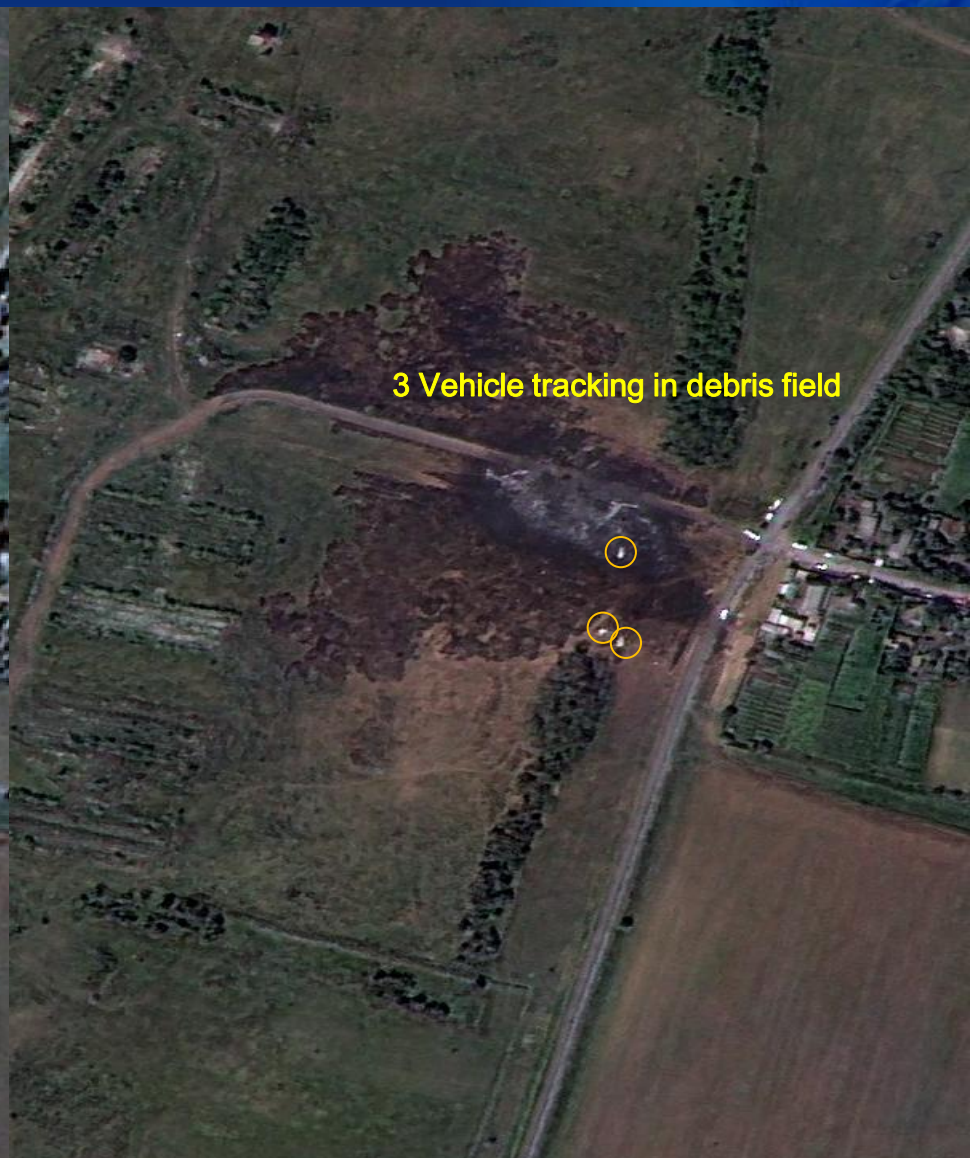
Secondary crash site
and debris field



MH17 tail piece



Change Detection within a day



KOMPSAT-2 Natural Color Imagery
UTC0 07:49:43 July 21, 2014

KOMPSAT-3 Natural Color Imagery
UTC0 09:51:52 July 21, 2014

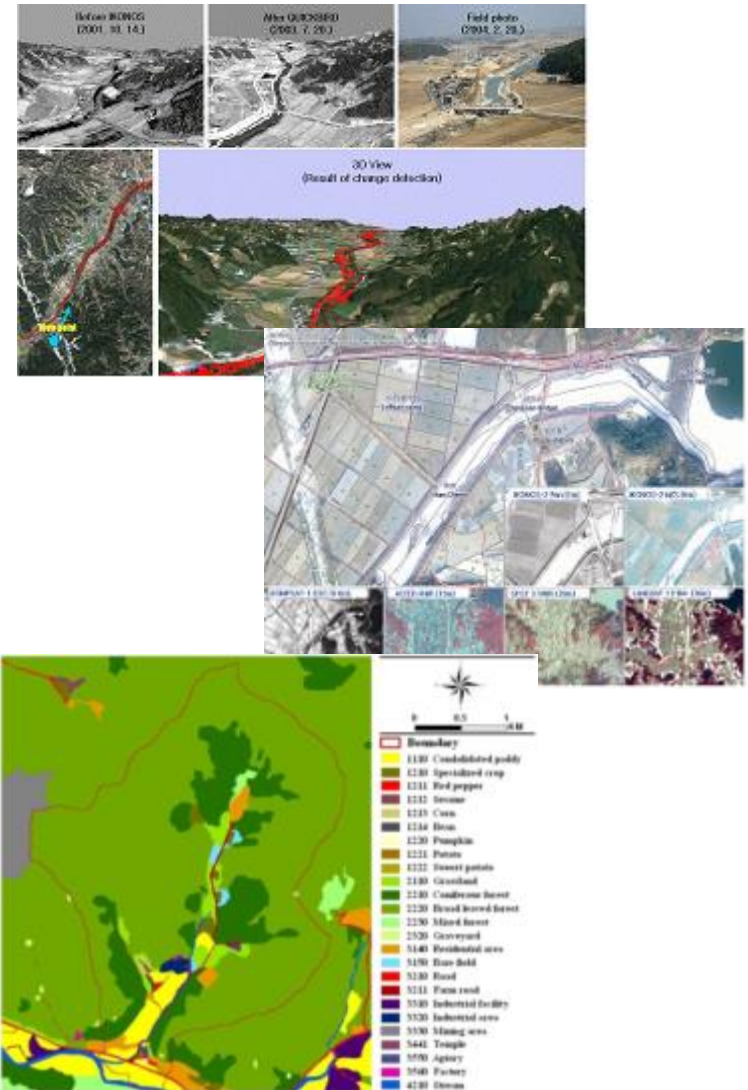
Natural Resource Management

❖ Strength

- Wide area imaging
- High resolution for precision agriculture and forest mapping
- High revisit for short imaging window
- Highest quantization for spectral analysis
- Huge archive / data continuity

❖ Applied to

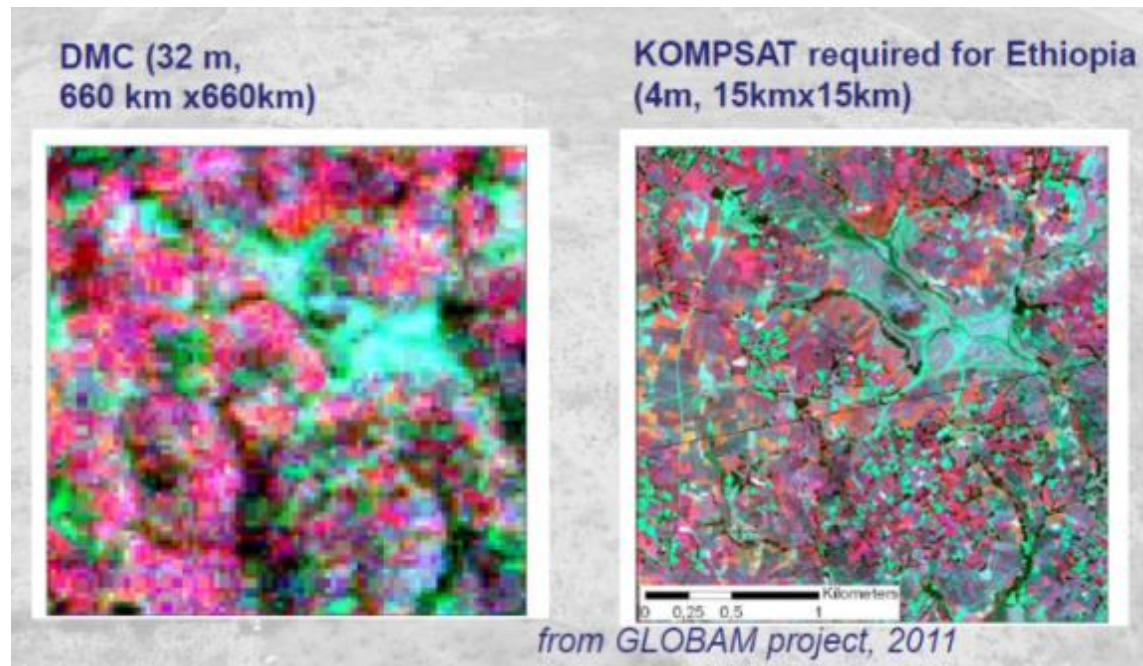
- Agriculture Monitoring
- Forest mapping
- Land cover mapping / change detection



Agriculture – precision agriculture

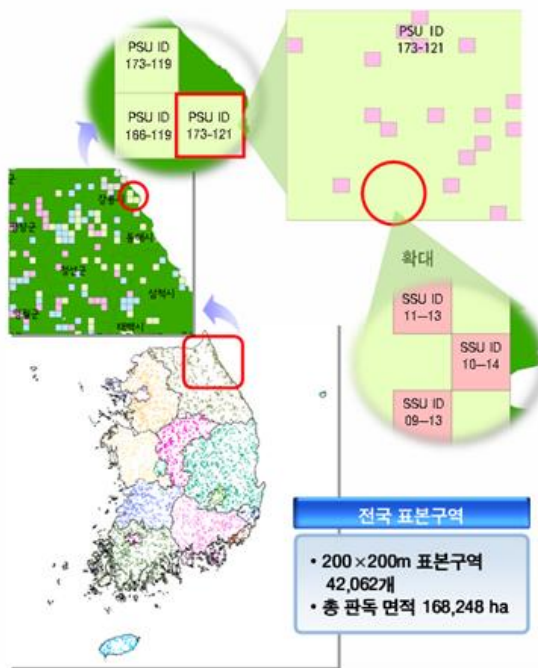
❖ GLOBAM project

- Agriculture monitoring by multi-sensors observations and crop growth modeling in Europe, China, and Ethiopia.
- KOMPSAT-2 imagery was used for **crop type mapping** in very fragmented landscape.



Agriculture – agricultural area survey

- ❖ Object: Calculation of agricultural area
- ❖ Executing organization: Statistics Korea
- ❖ Data: KOMPSAT-2, KOMPSAT-3 and Rapideye



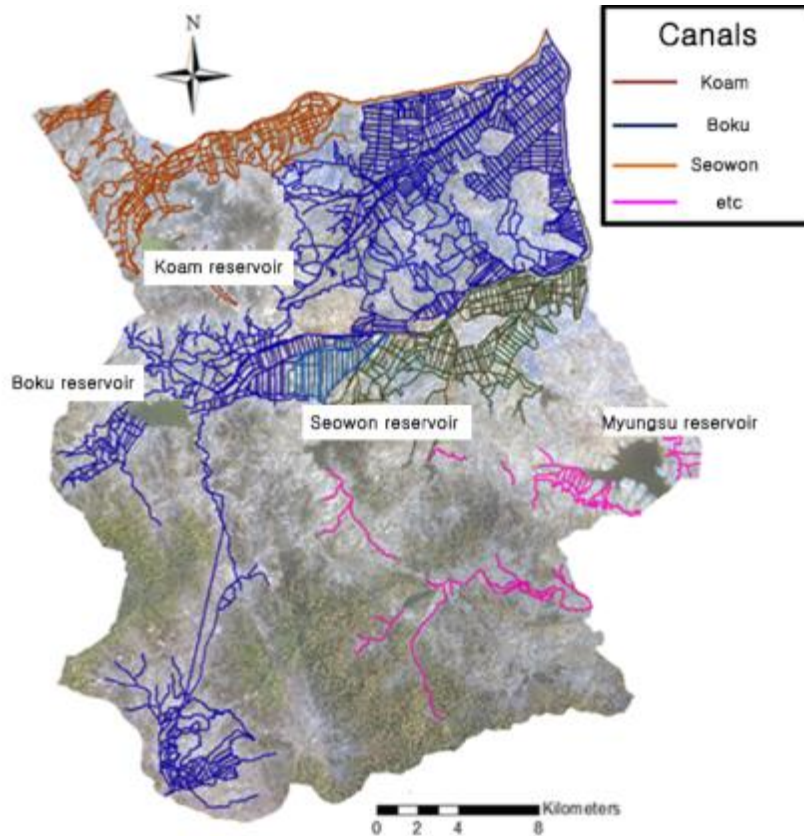
Extracting sample area



Calculating cultivated area

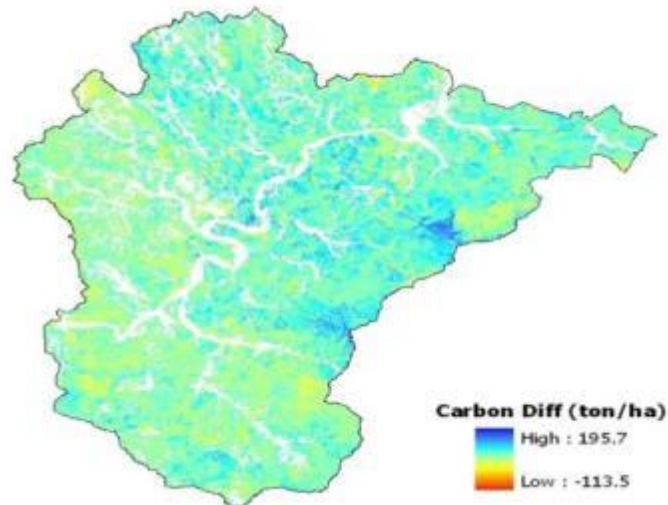
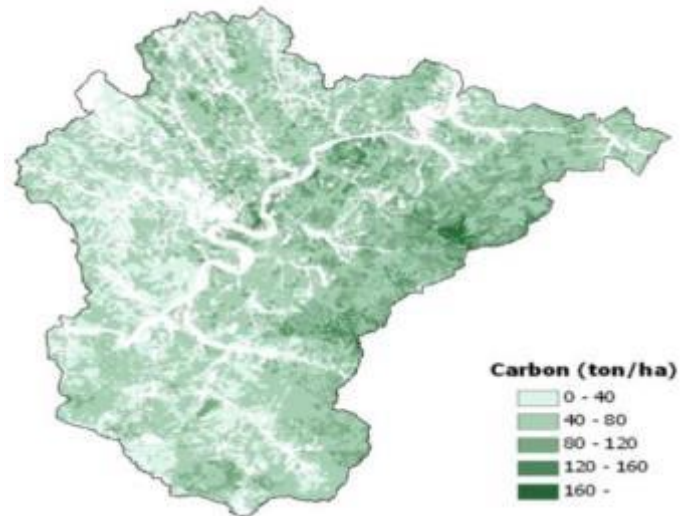
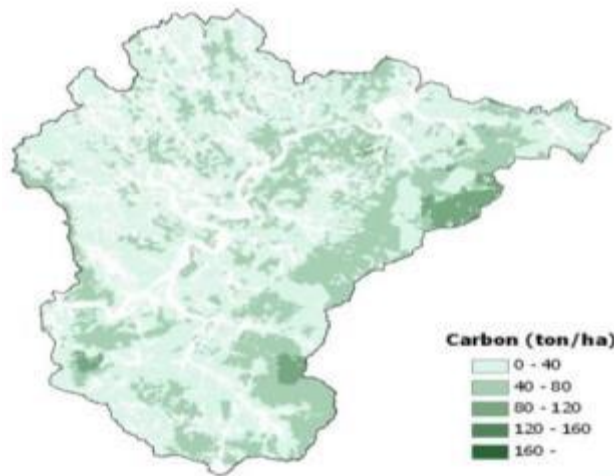
Agriculture - Infrastructure

❖ KOMPSAT-2



Forestry – Carbon Storage Estimation

❖ Carbon Storage Estimation



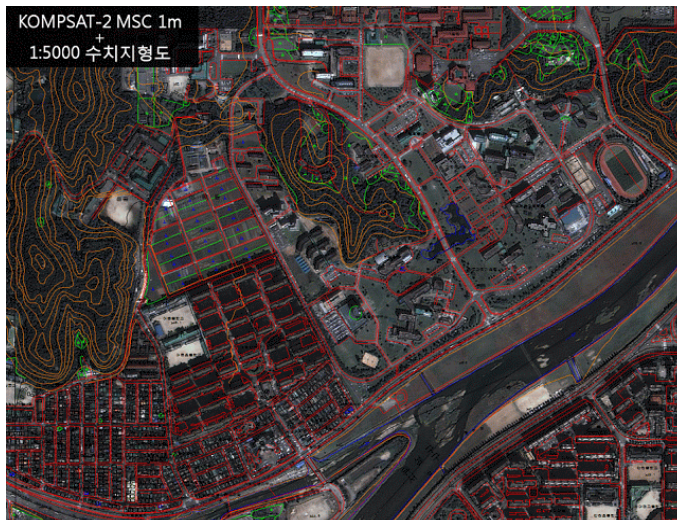
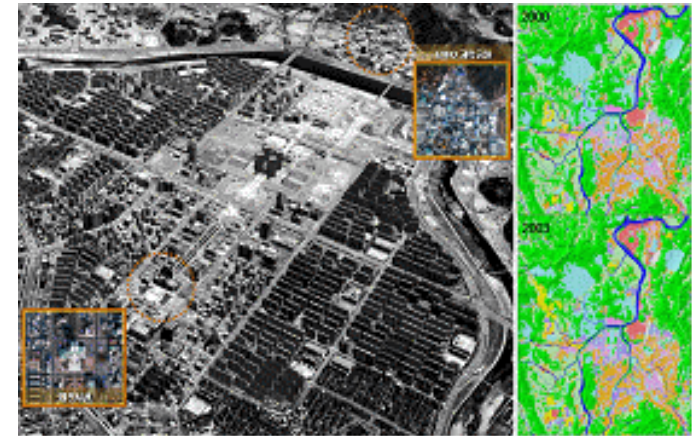
Infrastructure & Engineering

❖ Strength

- Very high resolution
- High revisit

❖ Application

- Land and urban planning
- Urban development monitoring



Infrastructure & Engineering - Sochi

❖ Difference Image

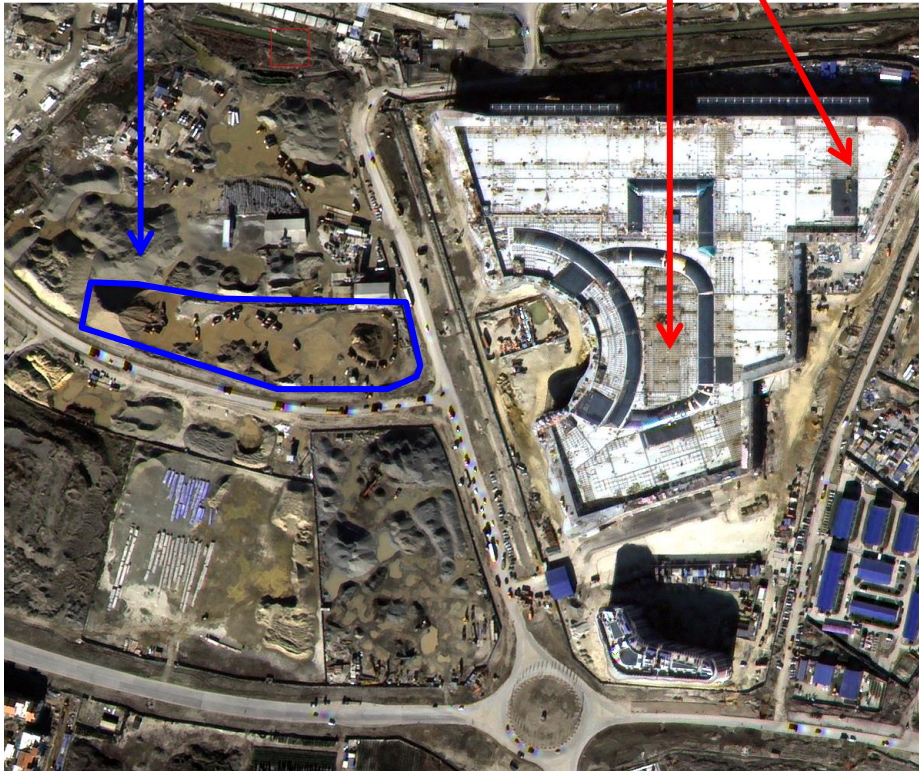
- Red : Feb 8, 2013 , KOMPSAT3- Red band
- Green : Mar 8, 2013 , KOMPSAT3- Green band
- Blue: Mar 8, 2013 , KOMPSAT3- Blue band



Infrastructure & Engineering - Sochi

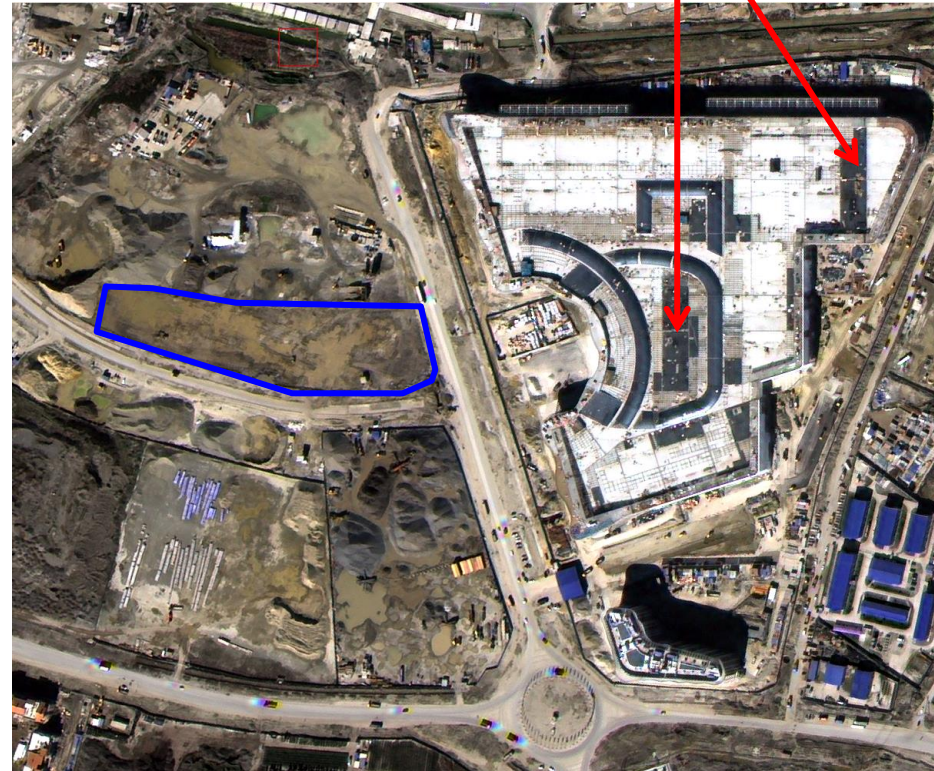
Materials storage
- increase

Metal structure set-up

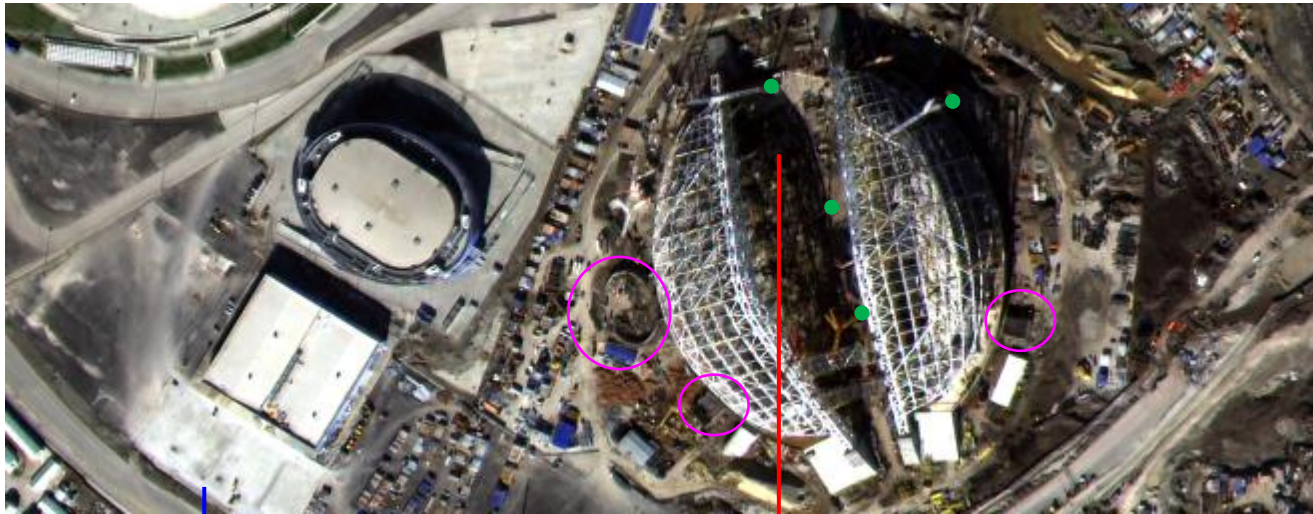


Materials storage
- Decrease

cement slab set-up

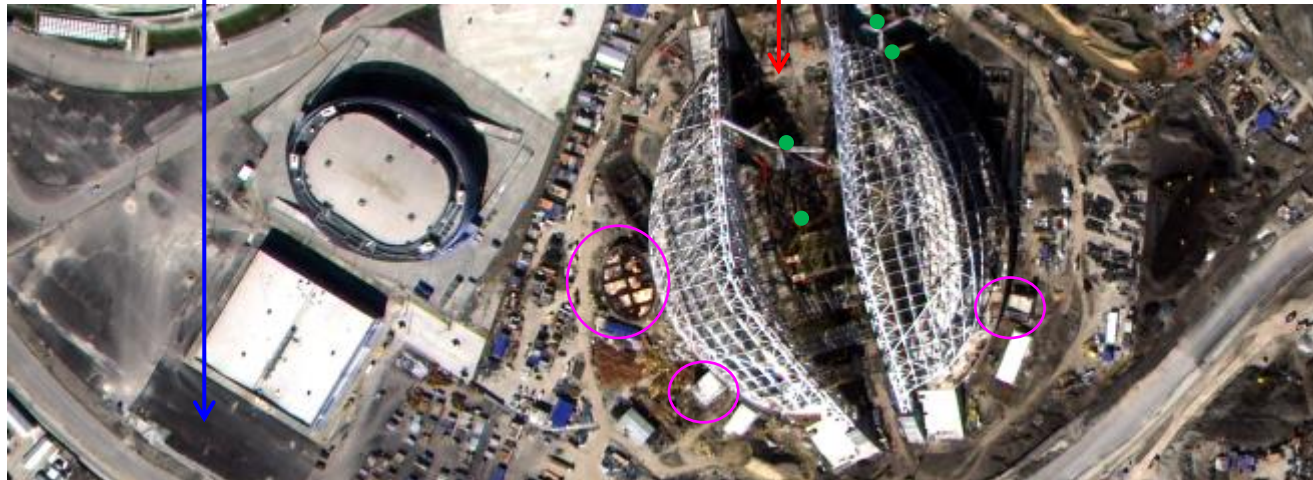


Infrastructure & Engineering - Sochi



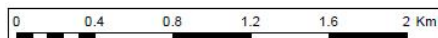
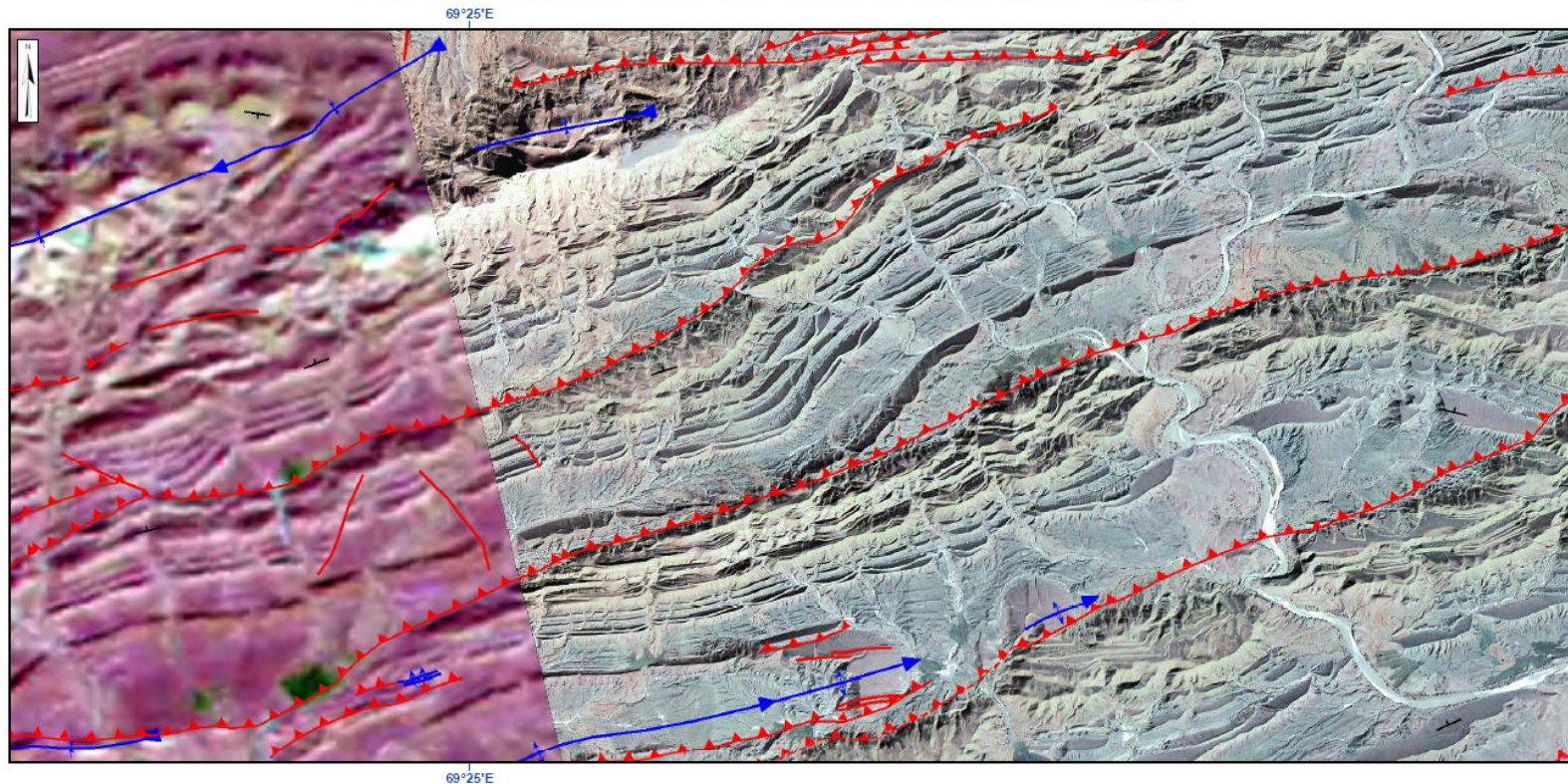
Bituminous coating

Mobile crane - moved



Geology (Oil & Gas)

Structural Interpretation of Kechi Kala Fold and Thrust Zone Pakistan
Based on 1m Resolution False Colour KOMPSAT and 15m Landsat 8 OLI Satellite Imagery



Kechi Kala Fold and Thrust Zone

The Kechi Kala Fold and Thrust Zone is a southward verging system of thrusts and associated folds developed between two major westward plunging anticlines consisting dominantly of sandstones. Southward verging thrusts are developed mainly in the thin-bedded shale dominated sequence (with interbedded thin sandstone and limestone) and share a common detachment located near the base of the shale sequence. To the west, the thrusts terminate into southward verging anticlines and synclines (fault-propagation folds) developed in the more competent limestone sequence. Overlying alluvial fan sediments are also folded in the western part of the area. Narrow zones of NE-SW trending folds and faults are developed in the southwestern part of the area and may be due to sinistral transpression along transverse faults in the subsurface.

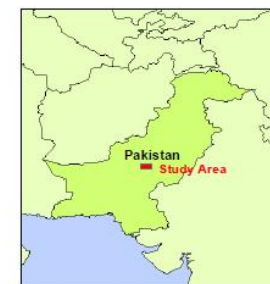
Legend

Bedding

- + horizontal
- shallow
- moderate
- steep
- vertical
- overturned

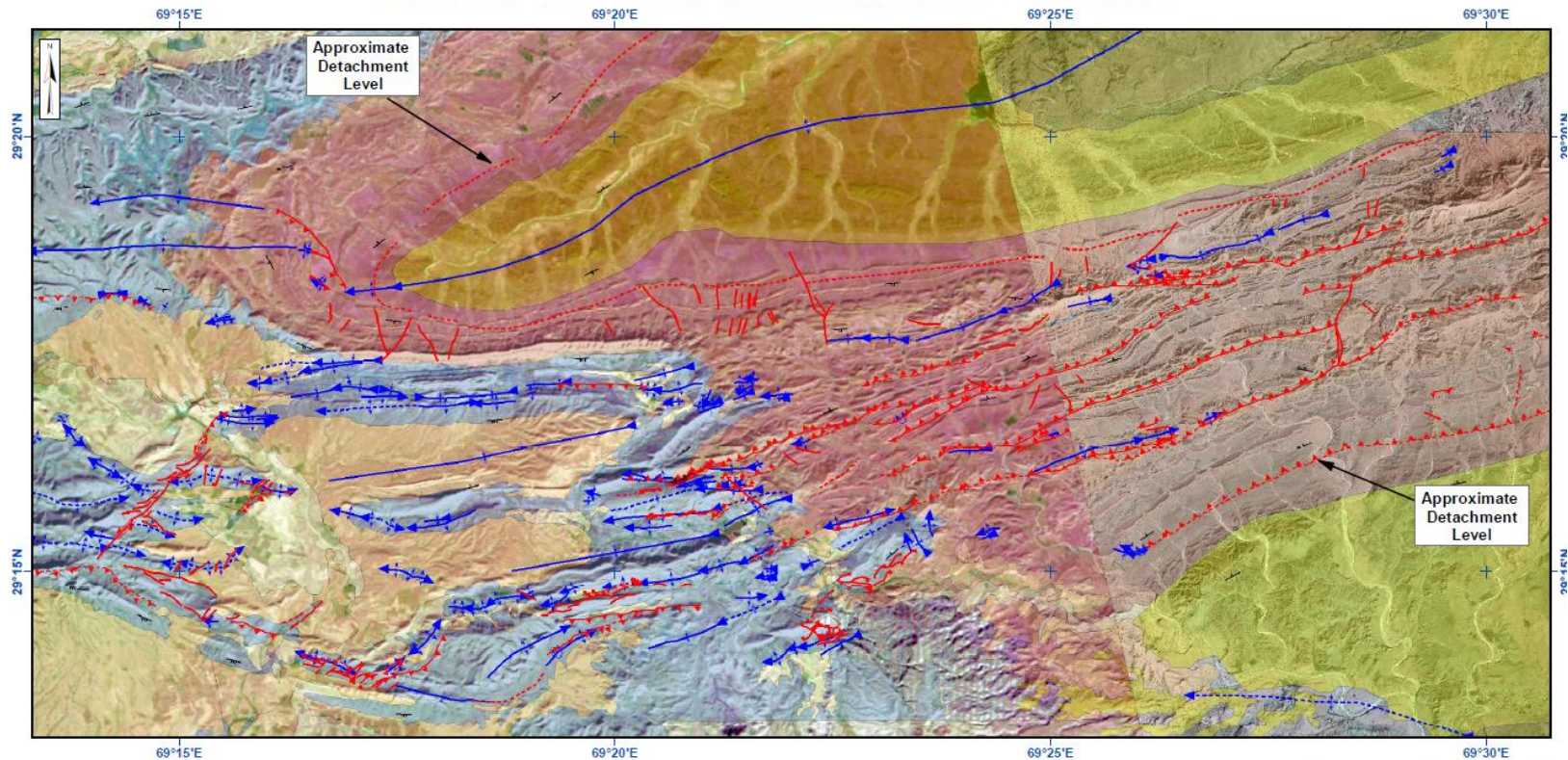
- Thrust Fault
 - certain
 - - - inferred
- Strike-slip Fault
 - certain
 - - - inferred
- Unclassified Fault
 - certain
 - - - inferred

- Anticline
 - certain
 - - - inferred
- Syncline
 - certain
 - - - inferred



Geology (Oil & Gas)

Structural Interpretation of Kechi Kala Fold and Thrust Zone Pakistan
Based on 1m Resolution False Colour KOMPSAT and 15m Landsat 8 OLI Satellite Imagery

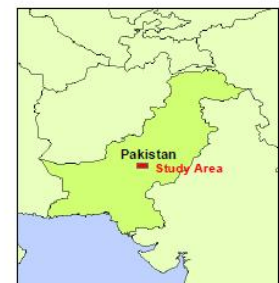


Kechi Kala Fold and Thrust Zone

The Kechi Kala Fold and Thrust Zone is a southward verging system of thrusts and associated folds developed between two major westward plunging anticlines consisting dominantly of sandstones. Southward verging thrusts are developed mainly in the thin-bedded shale dominated sequence (with interbedded thin sandstone and limestone) and share a common detachment located near the base of the shale sequence. To the west, the thrusts terminate into southward verging anticlines and synclines (fault-propagation folds) developed in the more competent limestone sequence. Overlying alluvial fan sediments are also folded in the western part of the area. Narrow zones of NE-SW trending folds and faults are developed in the southwestern part of the area and may be due to sinistral transpression along transverse faults in the subsurface.

Legend

Bedding	Thrust Fault	Anticline	Alluvium
+ horizontal	▲ certain	↔ certain	Alluvial Fan
— shallow	▲-▲ inferred	↔-↔ inferred	Limestone
— moderate	— Strike-slip Fault	↔ Syncline	Limestone collapse
— steep	— certain	↔ certain	Shale with sandstone and limestone
— vertical	— inferred	↔ inferred	Interbedded sandstone and shale
— overturned	— Unclassified Fault		Sandstone
	— certain		
	— inferred		



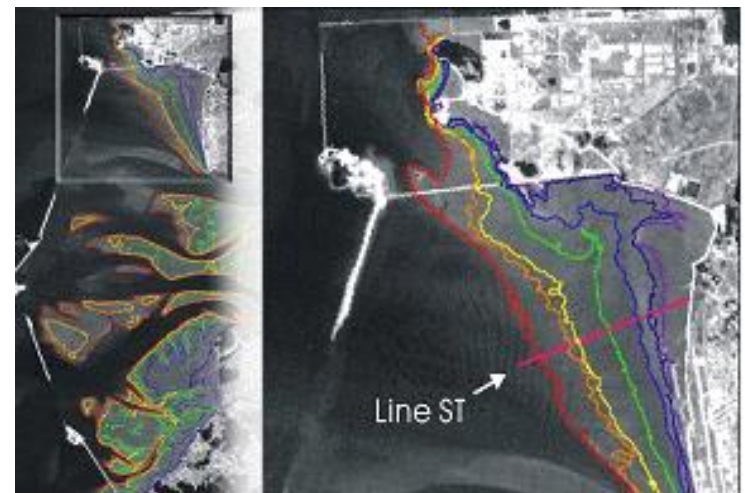
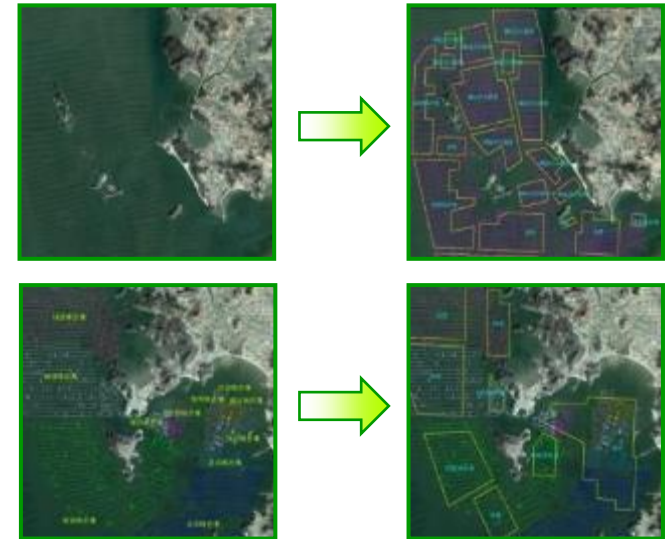
Maritime

❖ Strength

- Very high resolution
- Highest quantization for spectral analysis

❖ Application

- Bathymetry
- Sea grass Mapping
- Coral reef habitat monitoring
- Ship Detection and Tracking



Contents

I

KOMPSAT applications

II

Worldwide projects with KOMPSAT

Who is using KOMPSAT

- ❖ **Government project (ESA, Canada and etc.)**
 - As quality of KOMPSAT meets their requirements
- ❖ **Large area mapping**
 - Due to cost-effectiveness of KOMPSAT imagery
- ❖ **Regular monitoring worldwide**
 - Since KOMPSAT provides capacity with less conflicts

JRC CwRS Campaign 2015 (EU)

- ❖ Application: Crop monitoring and yield forecasting
- ❖ KOMPSAT-3 recorded as VHR Prime sensor



New Sensor: Kompsat-3

Kompsat-3 (launched May 2012)

- Resolution (pan/RGBN multispectral: 0.7/2.8m)
- Collection capabilities: 300,000 km² per day, stereo
- 14 bit depth (highest bits per pixel among the commercial in
 - Better color balancing
 - Data extraction from shadow areas
- Afternoon orbit (1.30 pm local time)
 - Approx. 2 hours later than other VHR satellites



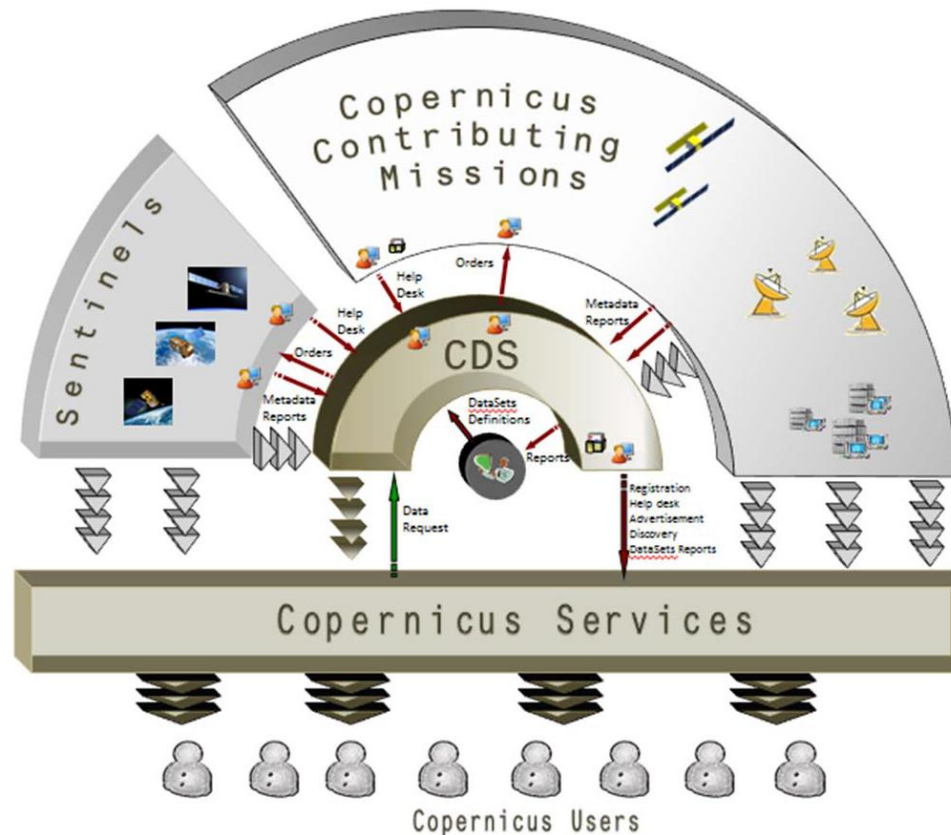
CERTIFIED

Benchmarking (by GAF & DLR):

- Preliminary tests showed results fully meeting the VHR Prime specifications
- Further testing and benchmarking currently ongoing

Copernicus Data Warehouse (EU)

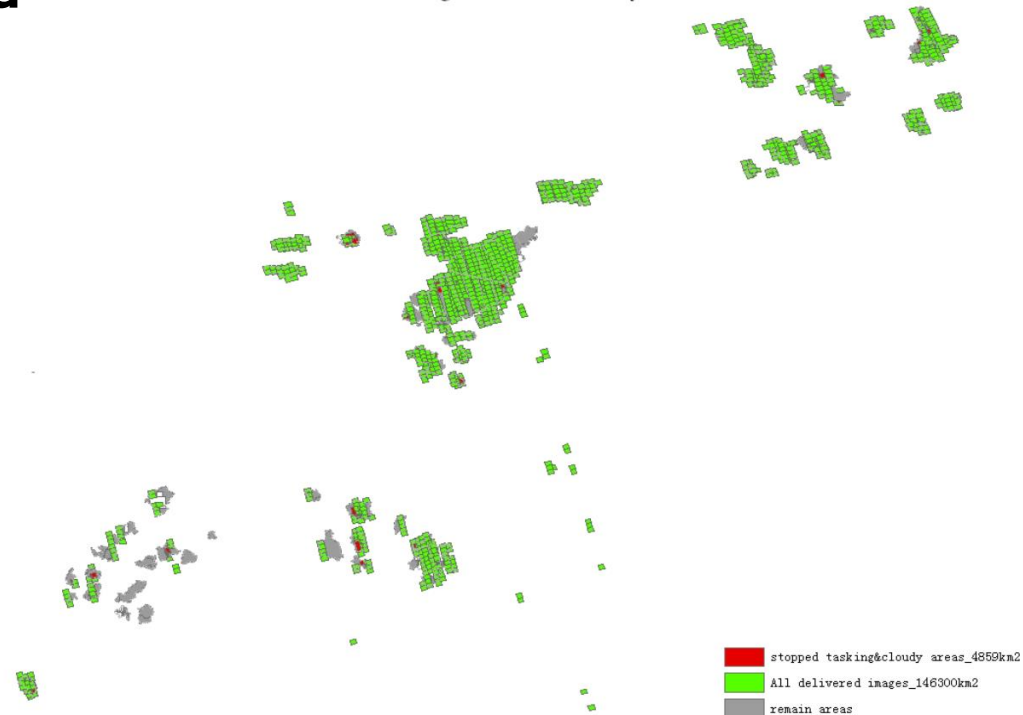
- ❖ Application: Global monitoring for environment and security
- ❖ Project period: 2014 ~ 2020
- ❖ Applied sensor: KOMPSAT-2, KOMPSAT-3, KOMPSAT-5



One Map Project (China)

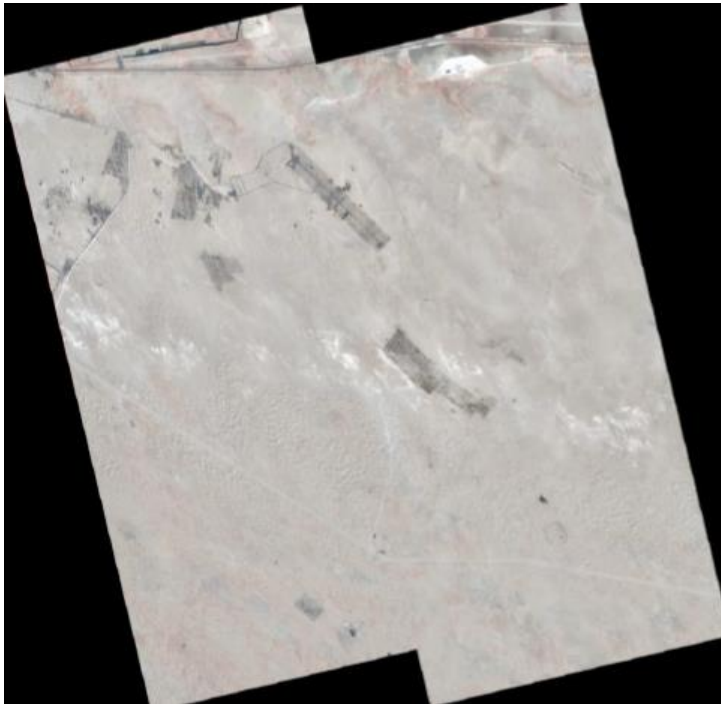
- ❖ Project period: Aug. 01 2014 ~ Nov. 20 2014
- ❖ Applied sensor: KOMPSAT-2, KOMPSAT-3
- ❖ Total tasking areas: 191,651 km²
- ❖ Successfully completed

MLR Project Summery

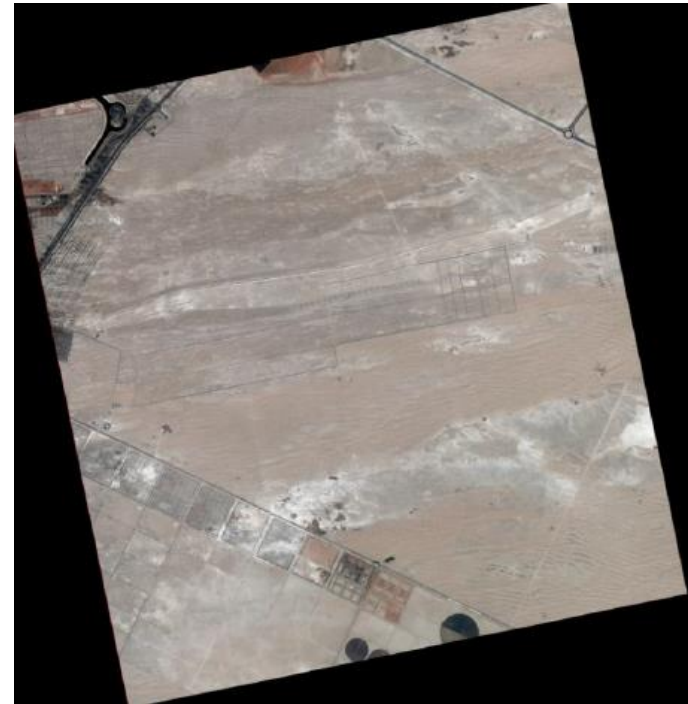


UAE Mapping Project (UAE)

- ❖ Application: satellite imagery based map over UAE
- ❖ Applied sensor: KOMPSAT-2, KOMPSAT-3



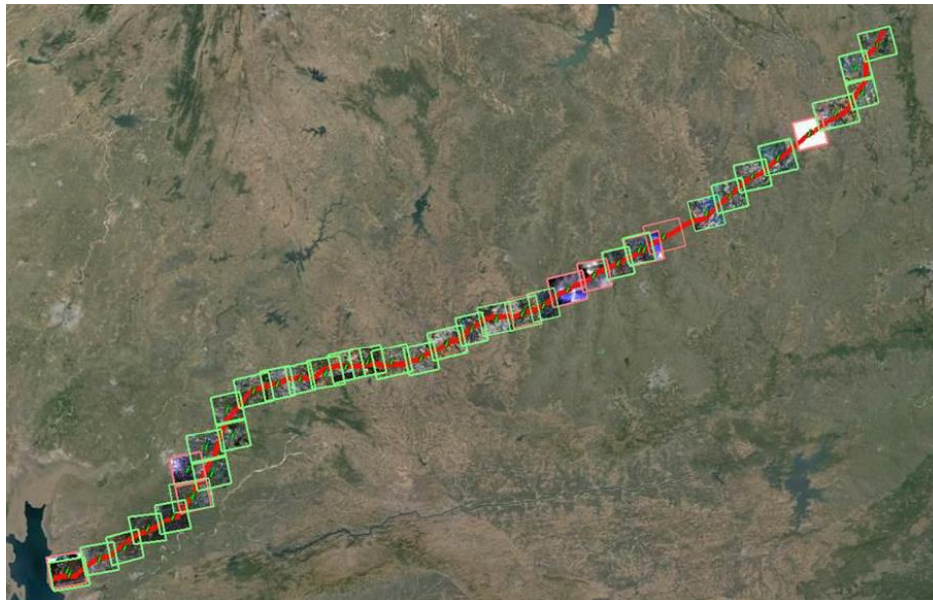
Mosaicking result using PCI



Dynamic range adjustment using PCI

GAIL project (India)

- ❖ Application: Infrastructure monitoring services (GAS pipeline)
- ❖ Project period: Jan. 1st 2015 ~ Dec. 31st 2015
- ❖ Applied sensor: KOMPSAT-2, KOMPSAT-3, DubaiSat-2
- ❖ Size of area: 1,804 km² (length: 601 km)



DOHA NEW PORT PROJECT

The New Port, Qatar

25.015273N 51.602266E



① Precast Yard

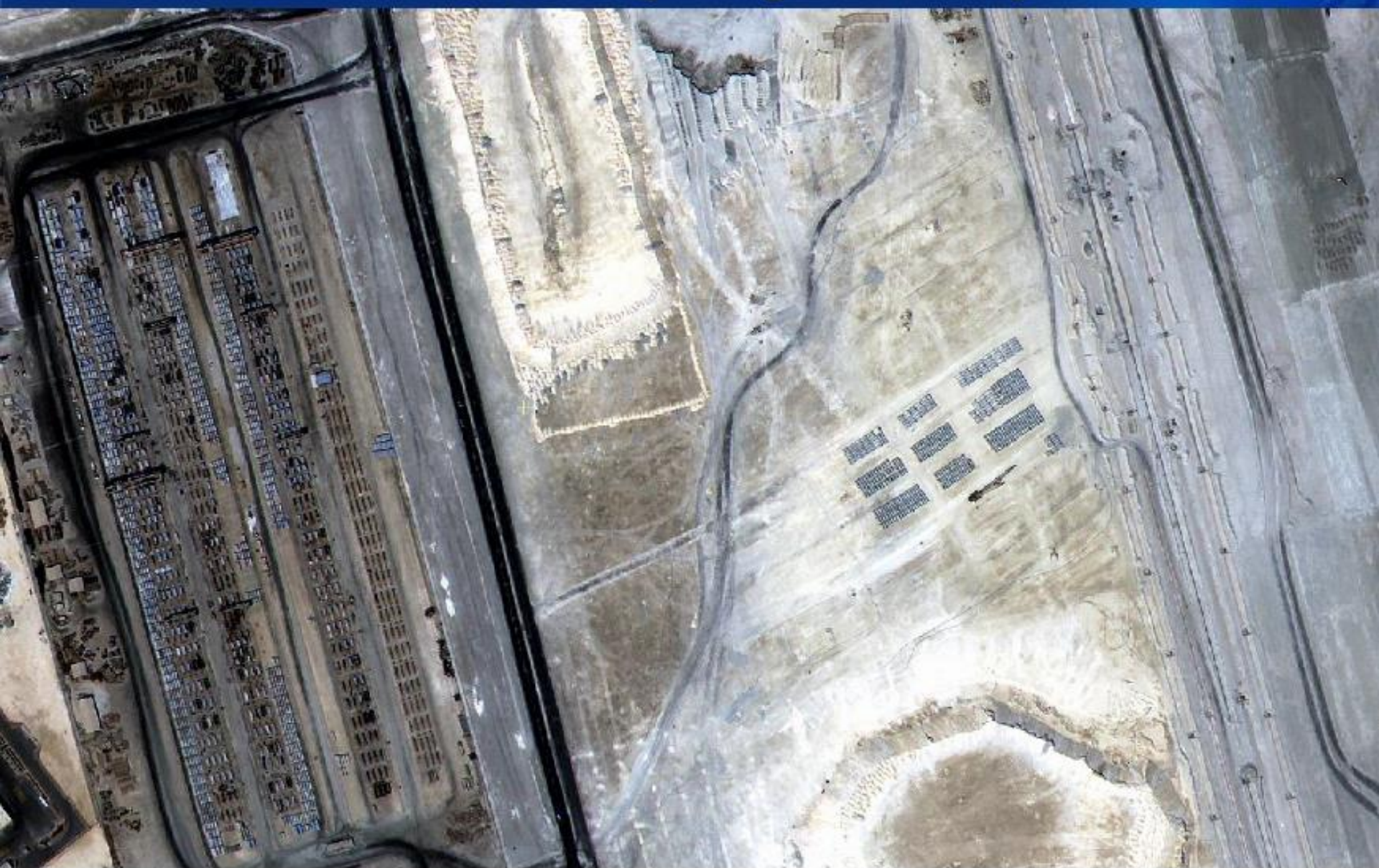
③ Container Terminal 1

④ Navy Base

Basin Excavation

② Coast Guard Terminal

PRECAST YARD (Sep 2014)



PRECAST YARD (Dec 2014)



PRECAST YARD (Jan 2015)



KOMPSAT-3 Natural Color Imagery. UTC0 09:35:02 Jan 5, 2015

Navy Base (Sep 2014)



KOMPSAT-3 Natural Color Imagery. UTC0 09:49:51 Sep 10, 2014

Navy Base (Dec 2014)



KOMPSAT-3 Natural Color Imagery. UTC0 09:47:44 Dec 5, 2014

Navy Base (Jan 2015)



KOMPSAT-3 Natural Color Imagery. UTC0 09:35:02 Jan 5, 2015

**We Are
At Your Service**

