Committee on the Peaceful Uses of Outer Space
Scientific and Technical Subcommittee, 50th session
Vienna, 11-22 February 2013

THE PRACTICAL USES AND APPLICATION STATUS OF SATELLITE IMAGE IN KOREA
(FOCUSING KOMPSAT SERIES)

Dr. Bang-Yeop KIM, KARI, KOREA

Contents

I. Introduction to KARI, Korea Aerospace Research Institute

KARI's Space Development Program

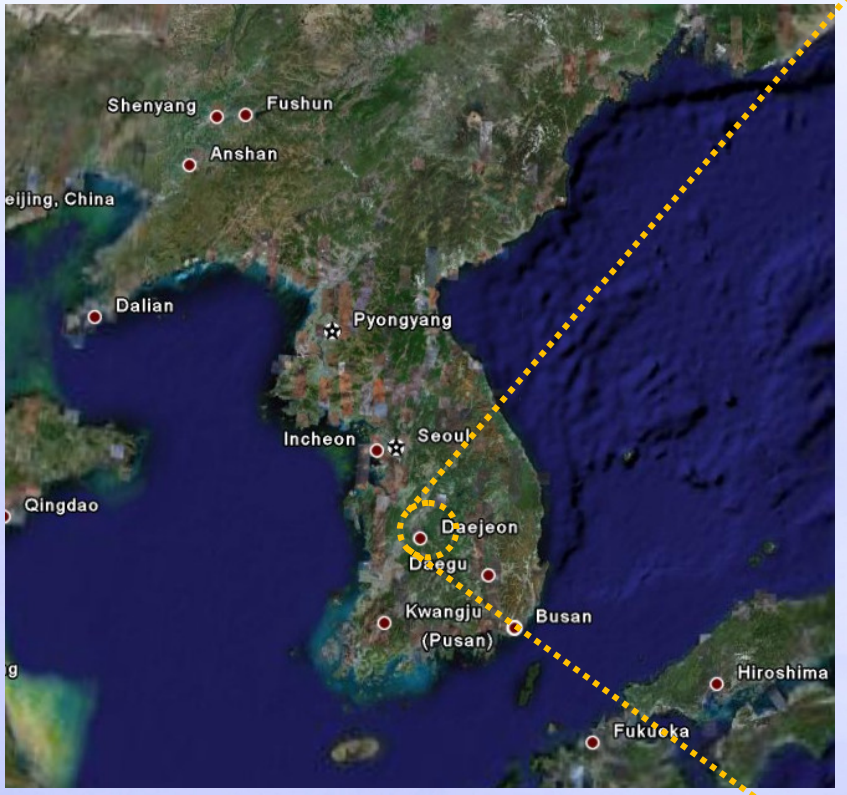
Korea Aerospace Research Institute

- Established in 1989 by the Government based on the Space Law
- KARI with its 800 Engineers/Scientists plays the Central Role in the Aeronautic and Space Development in KOREA
- In 2009, KARI used more than $ 300million in the Aerospace R&D sector and the Investment is still increasing

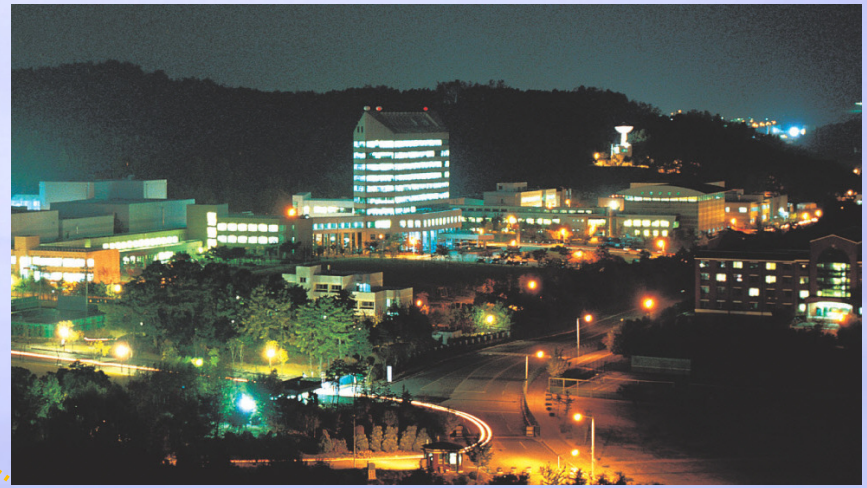
Research & Development

- Satellites (LEO, GEO)
- Space Launch Vehicle
- Aeronautics & Aerospace Safety & Certification
- Korean Astronaut Program
- Technology Research

Introduction to KARI



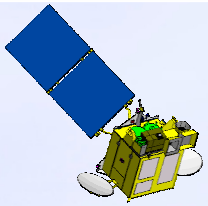
Korean Peninsula



KARI

II. Introduction to KOMPSAT Series

Chronology of Earth Observing Sat. in Korea



COMS

GEO

KOMPSAT-1

KOMPSAT-2

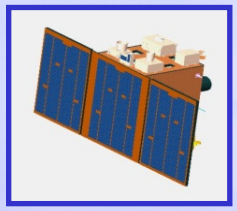
KOMPSAT-3

KOMPSAT-5

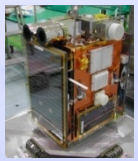
LEO

KITSAT-1

KITSAT-2



KITSAT-3



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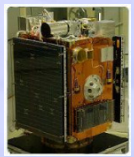
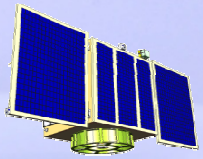


STSAT-2

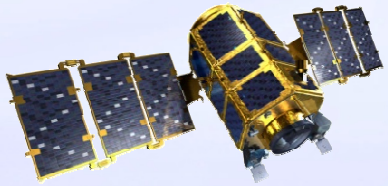


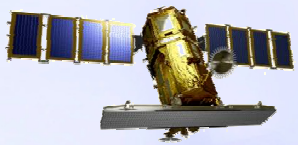
STSAT-3

Small

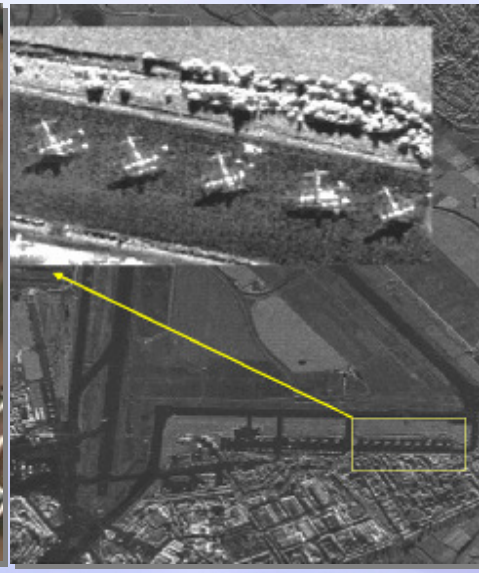
'92 **'93** **'99** **'03** **'06** **'09** **'10** **'11** **'12**

Comparison of KOMPSAT images





KOMPSAT-1 (retired]	KOMPSAT-2 (in orbit]	KOMPSAT-3 (in orbit)	KOMPSAT-5 (ready for launch)
6.6m Panchromatic	1m Panchromatic 4m Multispectral	0.7m Panchromatic 2.8m Multispectral	1m, 3m, 20m X band SAR

KOMPSAT-3, Launched 2012 May

Mission duration: 4 years

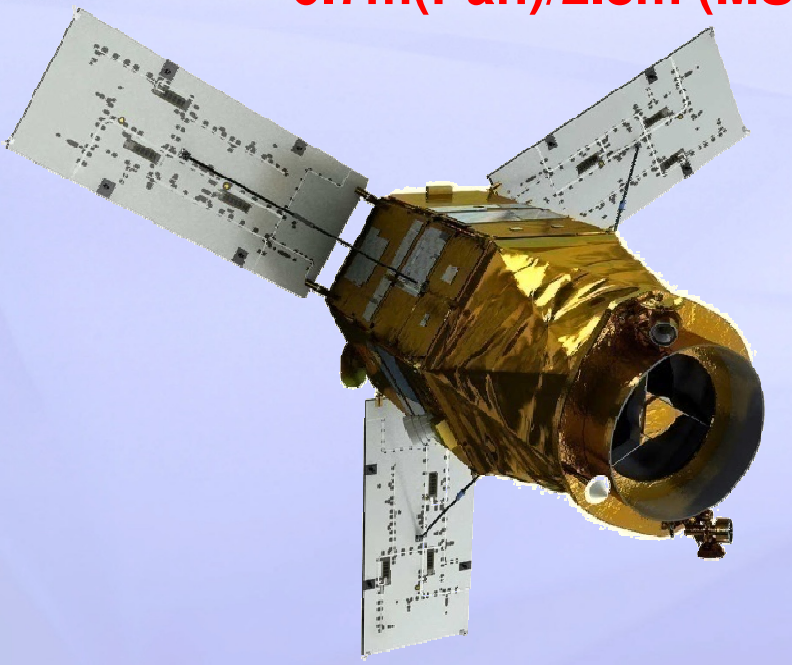
Launch Vehicle: H-IIA (Japan)

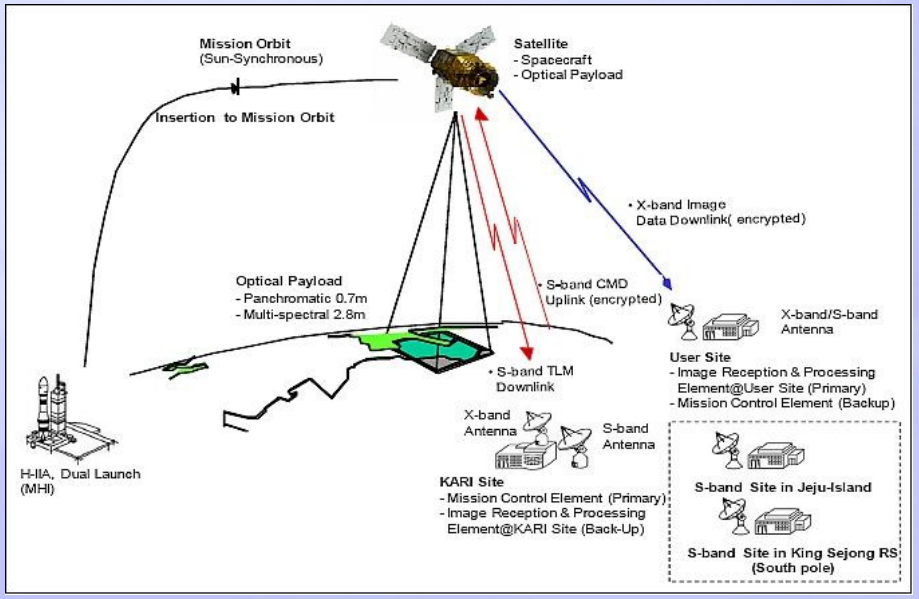
Orbit: Sun-synchronous

Altitude: 685 km mean altitude

Payload: Panchromatic and Multi Spectral

0.7m(Pan)/2.8m (MS) with 15km swath





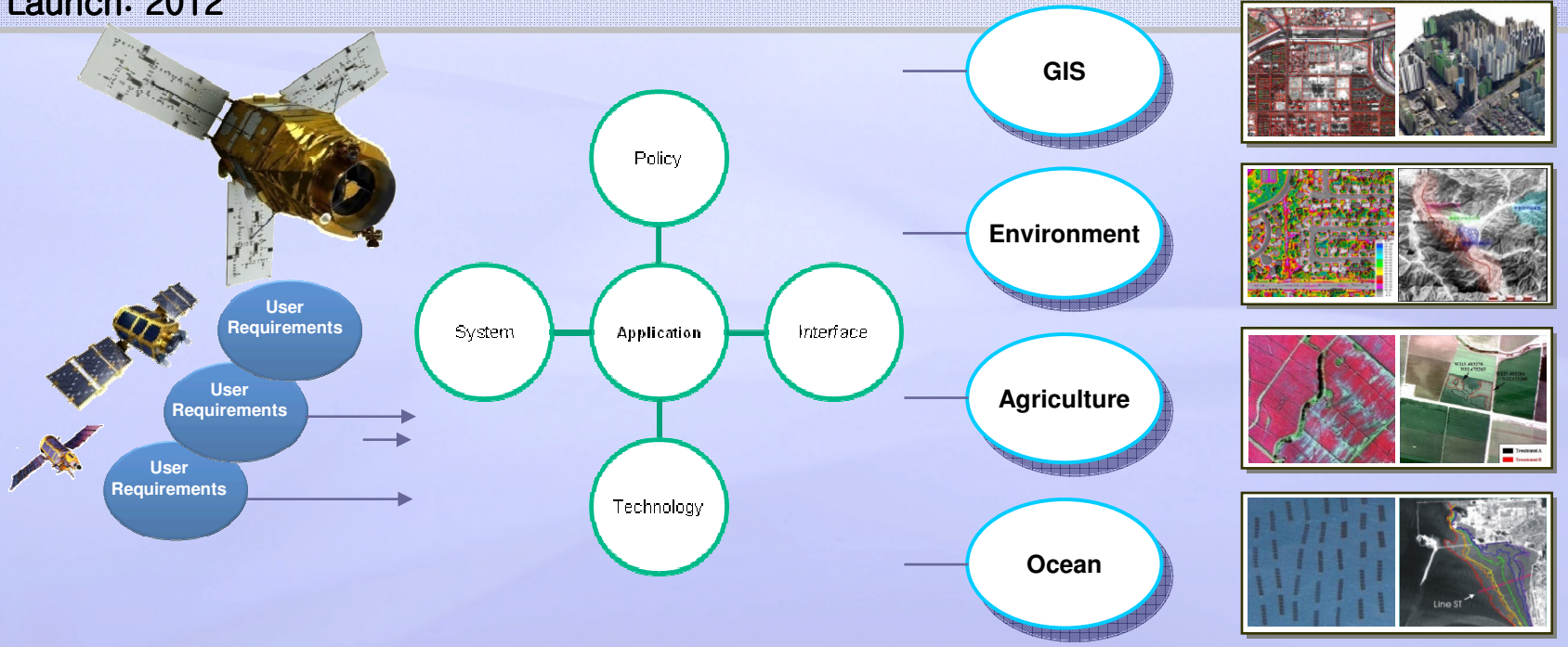
Introduction to KOMPSAT-3

- Mission objectives

– Continuation of satellite earth observation after KOMPSAT-1 and KOMPSAT-2 to meet national need

– Provision of the high-resolution EO (Electro-Optical) image required for GIS establishment and the applications for environmental, agriculture and ocean monitoring

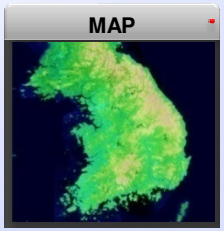
- Development period: 2004 – 2011
- Main payload: Advanced Earth Imaging Sensor System (Panchromatic and multispectral image)
- Launch: 2012

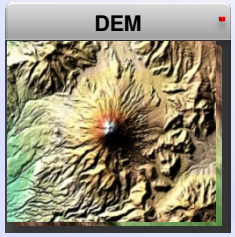


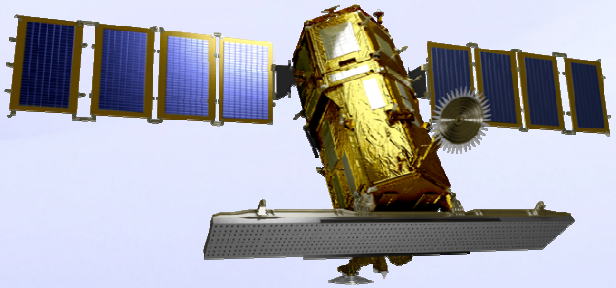
Introduction to KOMPSAT-5

GIS (Geographic Information Systems)

Map Production

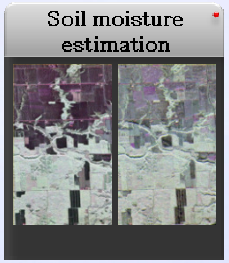


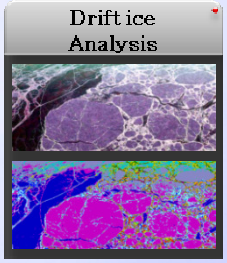




Environment Monitoring

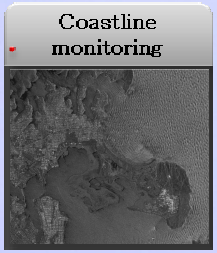
Monitoring environmental change





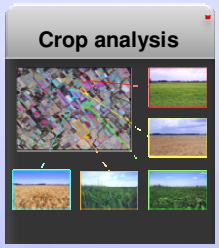
Ocean Monitoring

Ocean Monitoring/Analysis



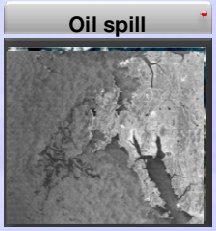
Land Monitoring

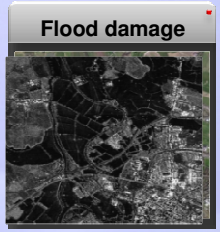
Image analysis for Surface observations



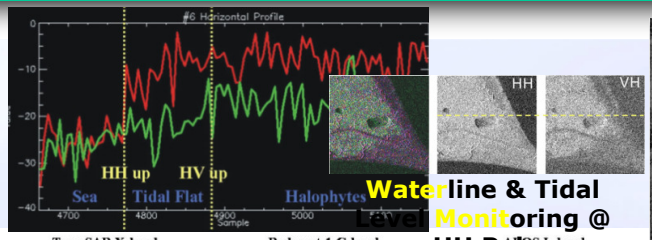
Disaster Monitoring

Disaster Area Detection/ Analysis

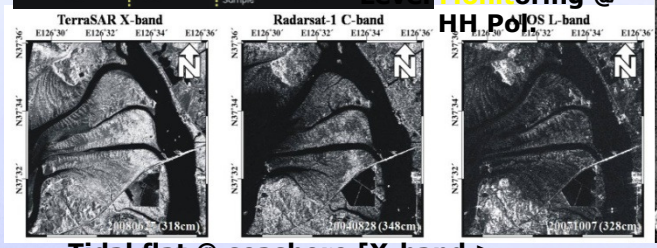




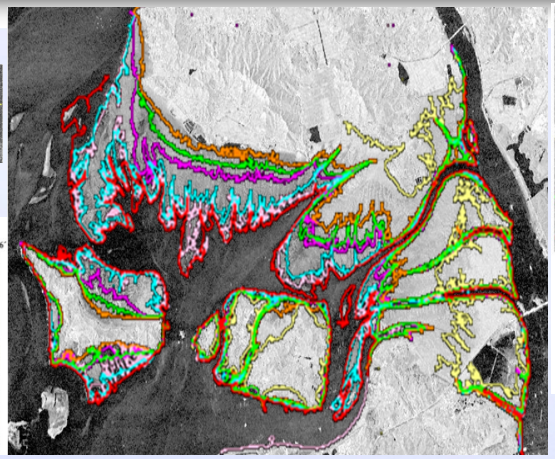
KOMPSAT-5 Ocean Application Examples

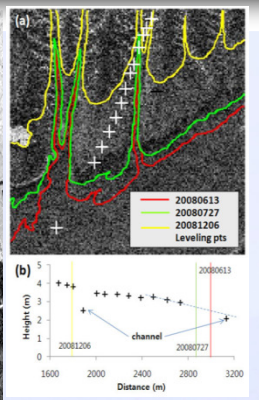


Waterline & Tidal Level Monitoring @ HH Pol.

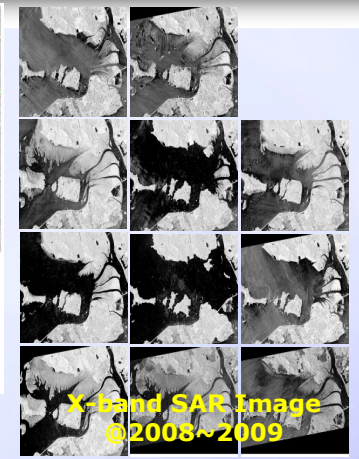


Tidal flat @ seashore [X-band > C-band > L-band]

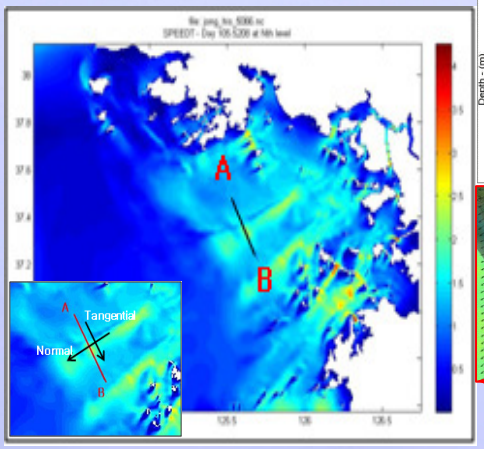


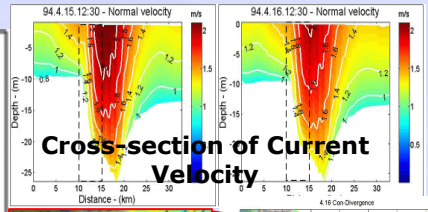


Waterline & Tidal Level Monitoring

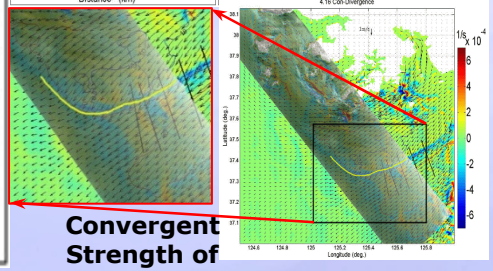


Waterline & Tidal Flat



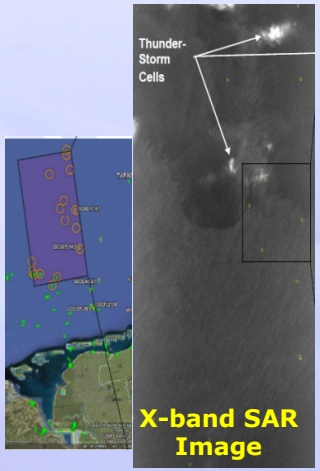


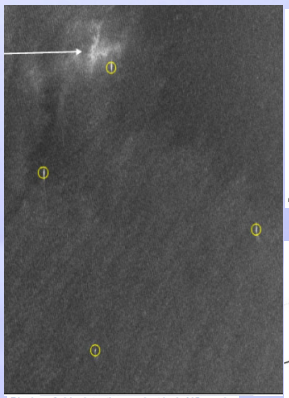
Cross-section of Current Velocity

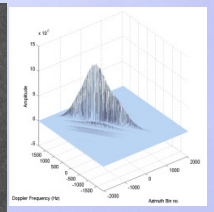


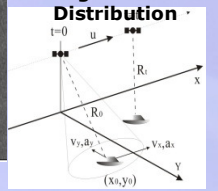
Convergent Strength of Tidal Current Channel

Coastal Currents



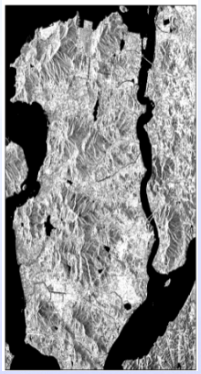




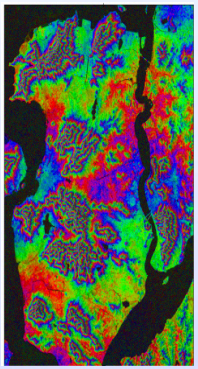


Ship Monitoring

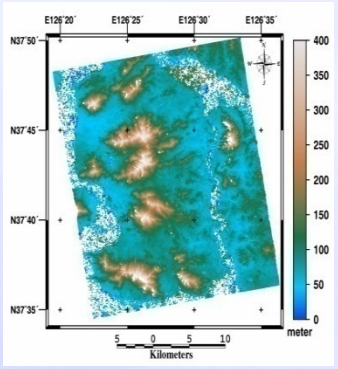
KOMPSAT-5 Land Application Examples



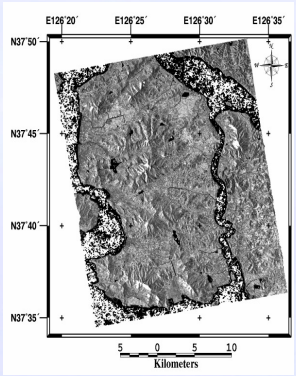
X-band SAR Amplitude



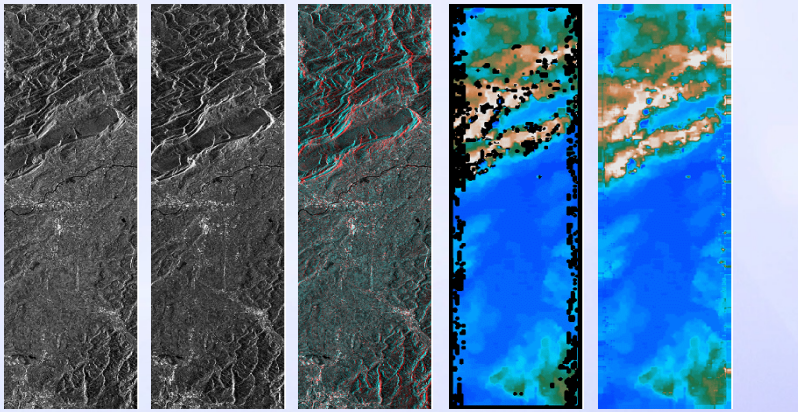
X-band SAR Interferogram



Geocorded DEM from X-band SAR



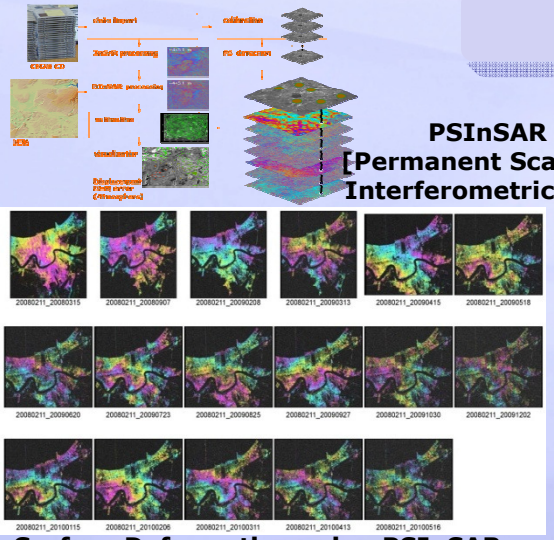
Geocorded Master Amplitude using X-band SAR



(a) 35.8° (b) 21.5° (c) Anaglyph (d) Initial DEM (e) Interpolated DEM

X-band SAR Radargrammetric Pair

DEMs

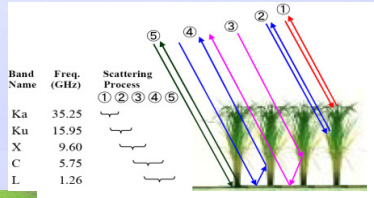


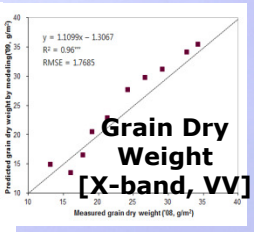
PSInSAR [Permanent Scatterer Interferometric SAR]

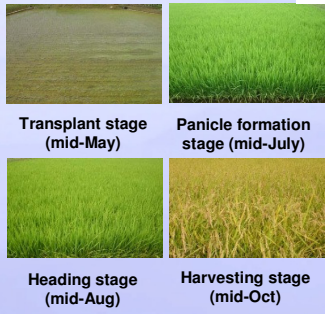
Surface Deformation using PSInSAR

Surface Deformation

Backscattering Process @ rice canopy





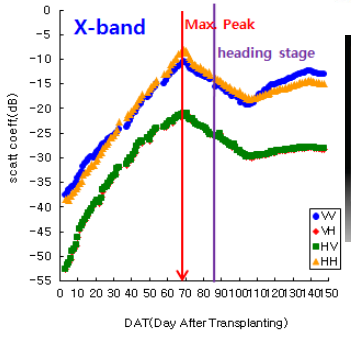


Transplant stage (mid-May)

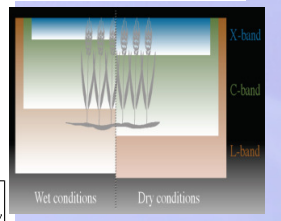
Panicle formation stage (mid-July)

Heading stage (mid-Aug)

Harvesting stage (mid-Oct)



Rice Growth per stage



Penetration into Crops

Backscattering Variation (45°)@ growing period

Crop Growth & Classification

Compare KOMPSAT 3 & 5

	KOMPSAT - 3	KOMPSAT - 5
Objective	Earth Observation (electro-optical)	Earth Observation (radar)
Organization	KARI	KARI
Payload	High-resolution electro-optical camera(AEISS)	Image radar(COSI) Dual-frequency GPS(AOPOD)
Orbit	Sun synchronous orbit	Dawn-Dusk orbit
Resolution	0.7m(B & W)/2.8m(Color)	High-resolution(1m) Standard resolution (3m) Broad area marine (20m)
Swath width	15Km or more	High-resolution(5km) Standard resolution (30km) Broad area marine(100km)

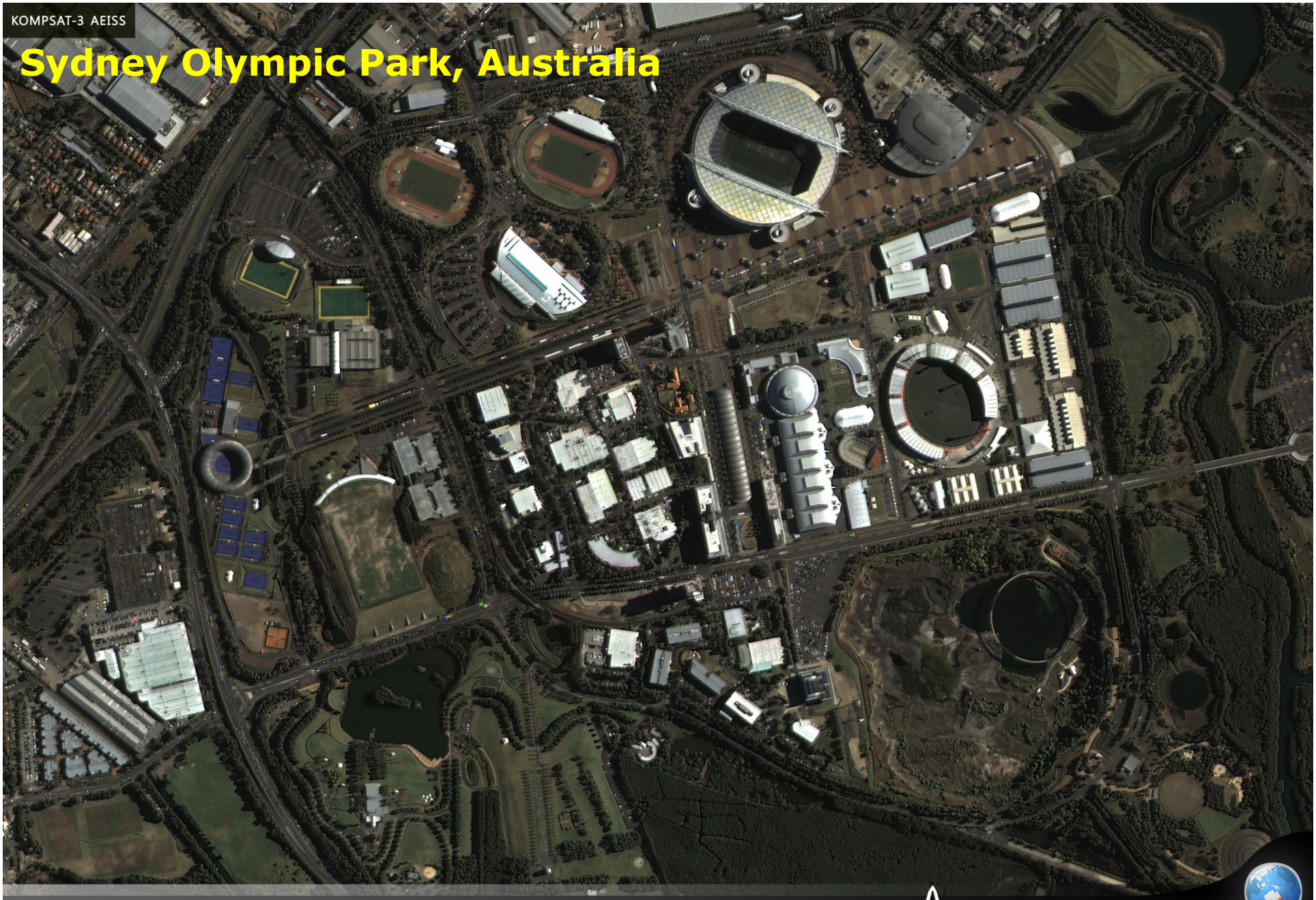
III. KOMPSAT Image Applications

KOMPSAT-3 Test Images

KOMPSAT-3 Test Images

KOMPSAT-3 AEISS

Sydney Olympic Park, Australia

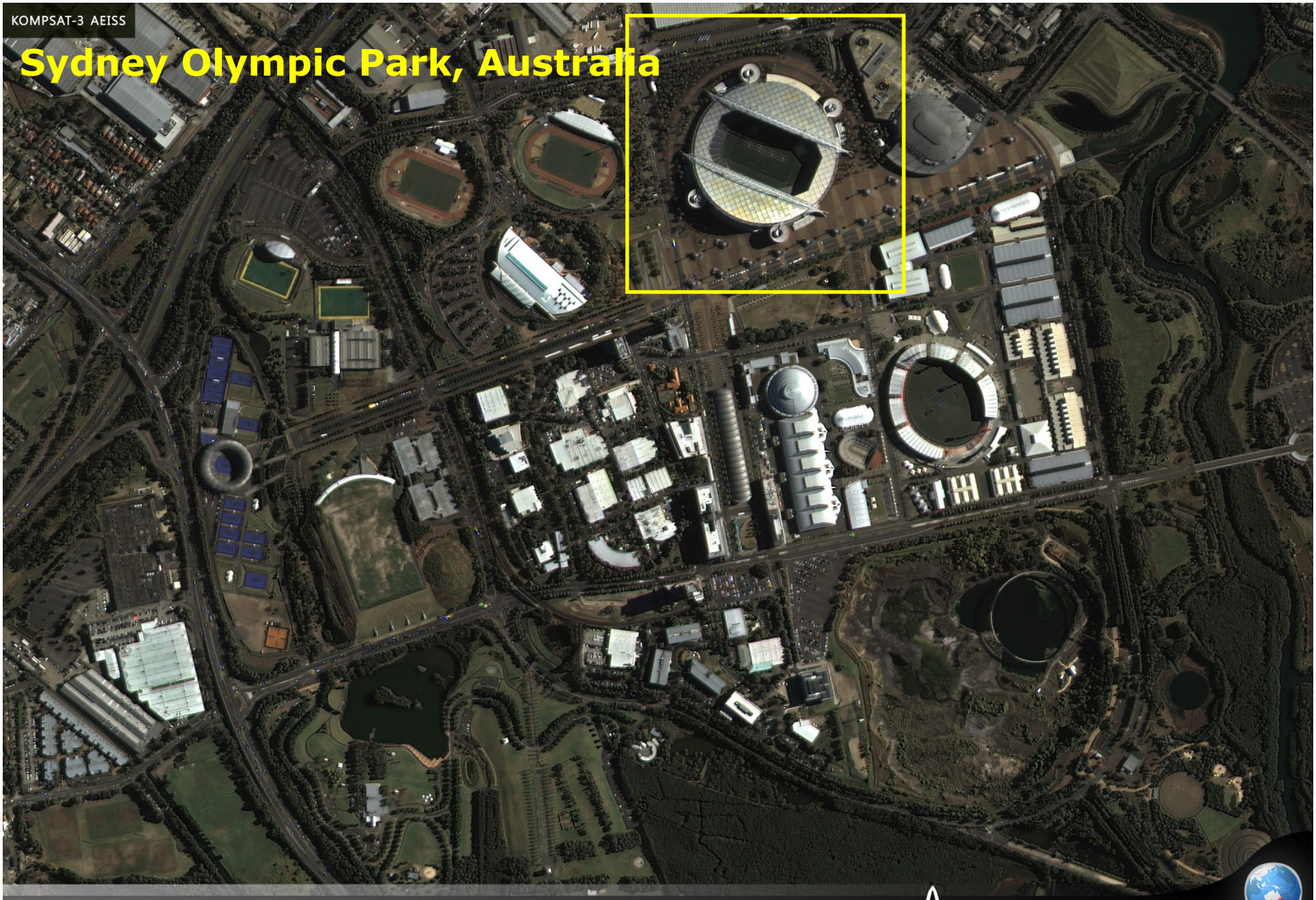


> 아리랑위성 3호로 촬영한 'Sydney Olympic Park, Australia'

KARI Korea Aerospace Research Institute

KOMPSAT-3 AEISS

Sydney Olympic Park, Australia

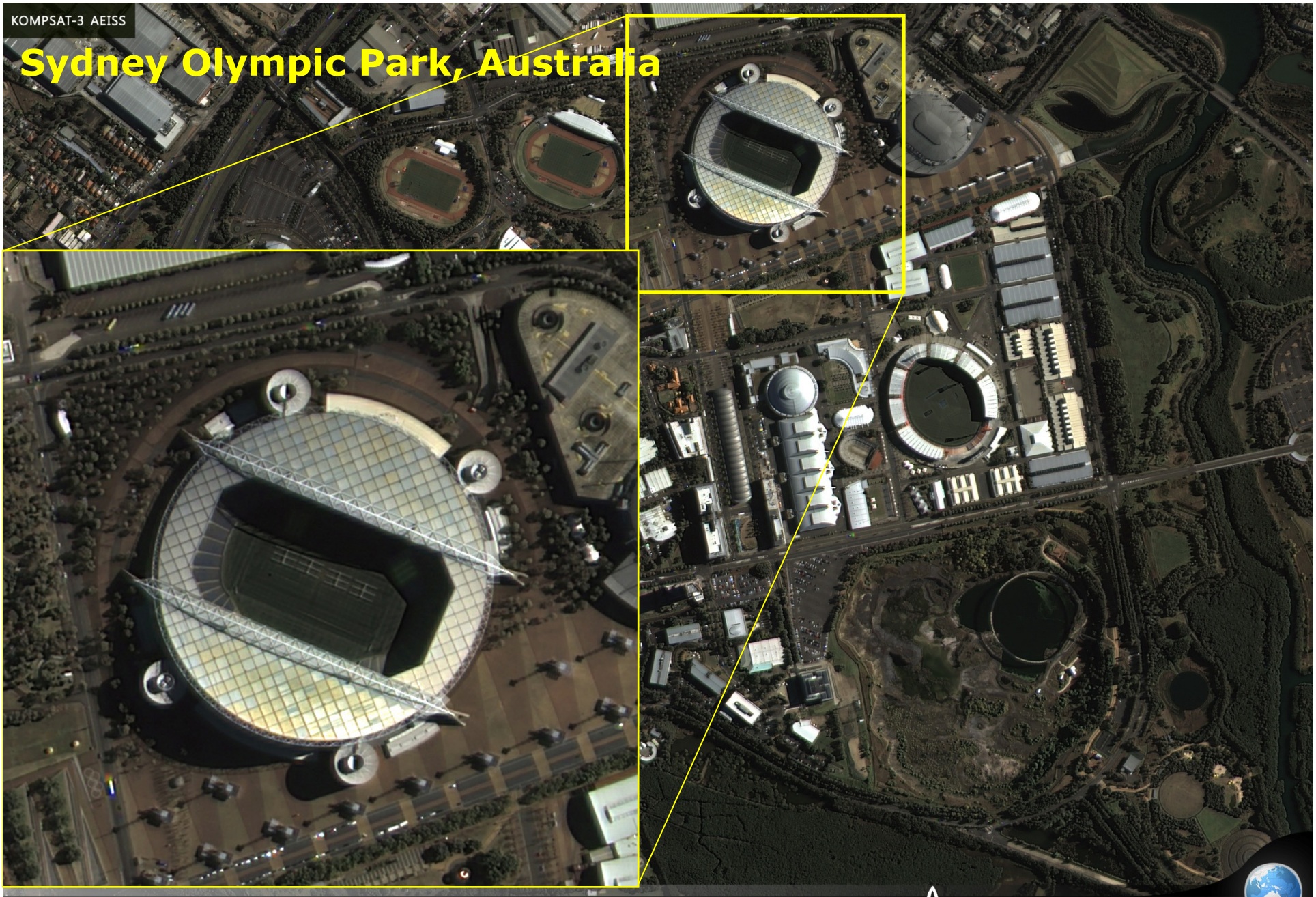


> 아리랑위성 3호로 촬영한 'Sydney Olympic Park, Australia'

KARI Korea Aerospace Research Institute

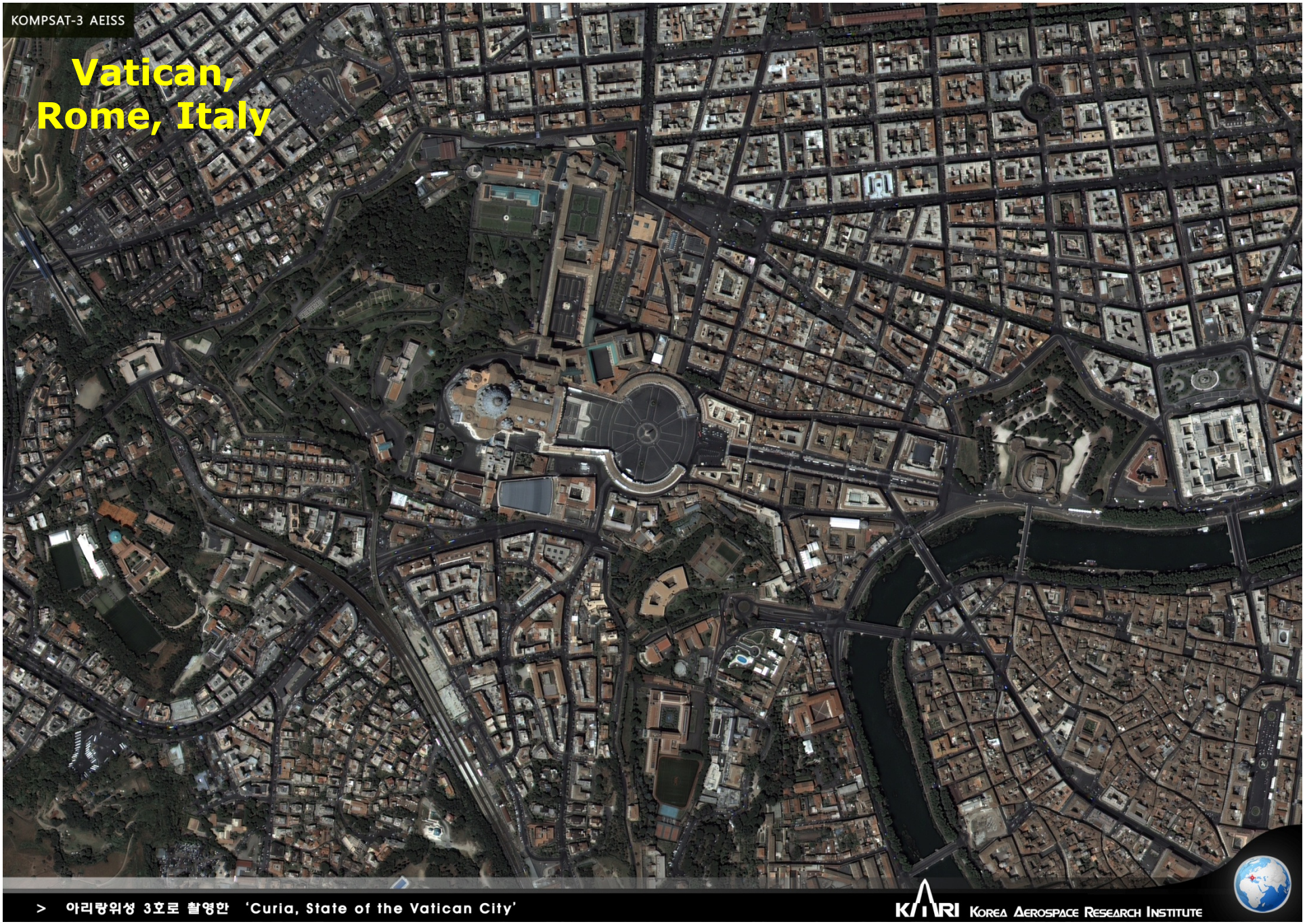
KOMPSAT-3 AEISS

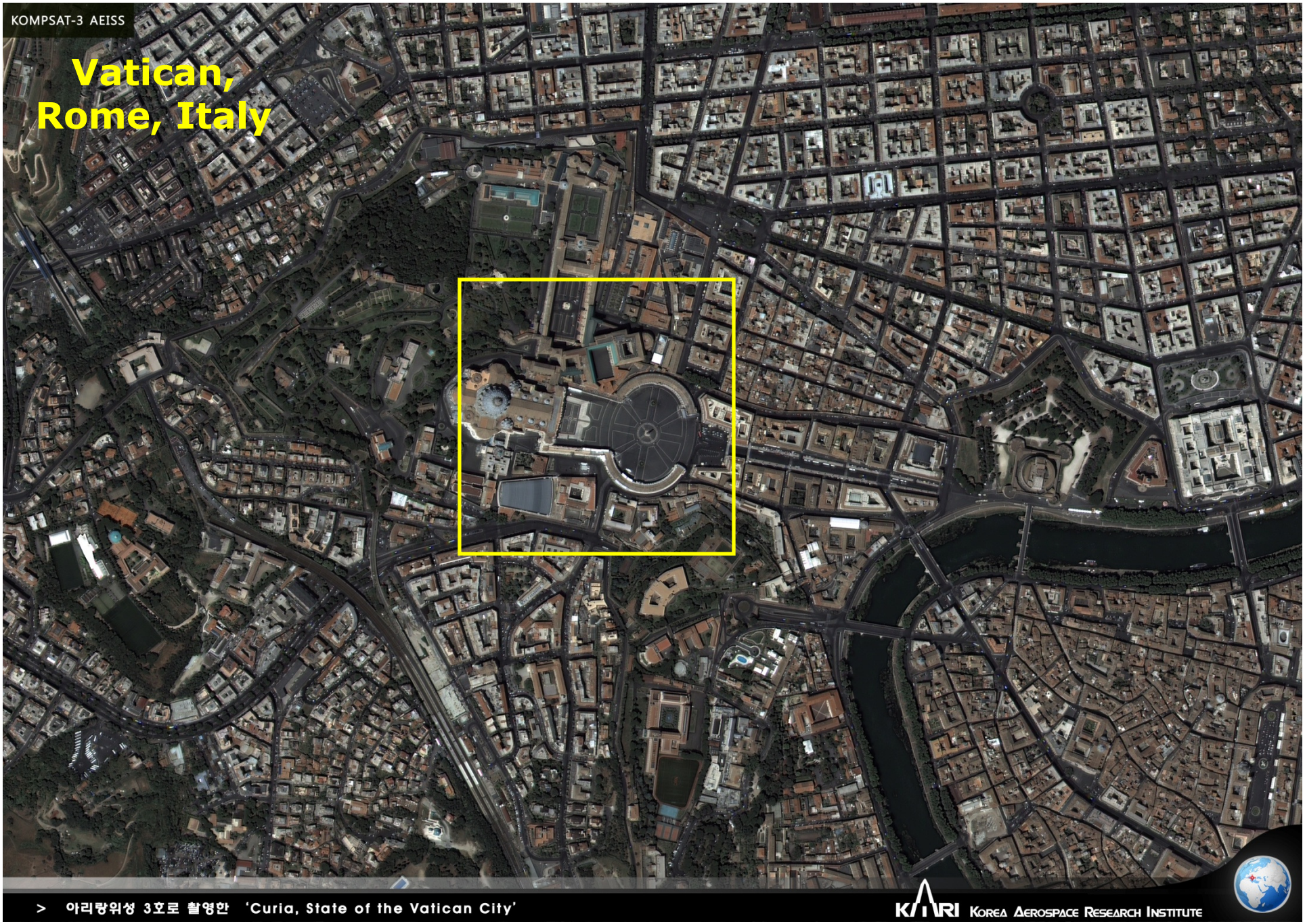
Sydney Olympic Park, Australia



> 아리랑위성 3호로 촬영한 'Sydney Olympic Park, Australia'

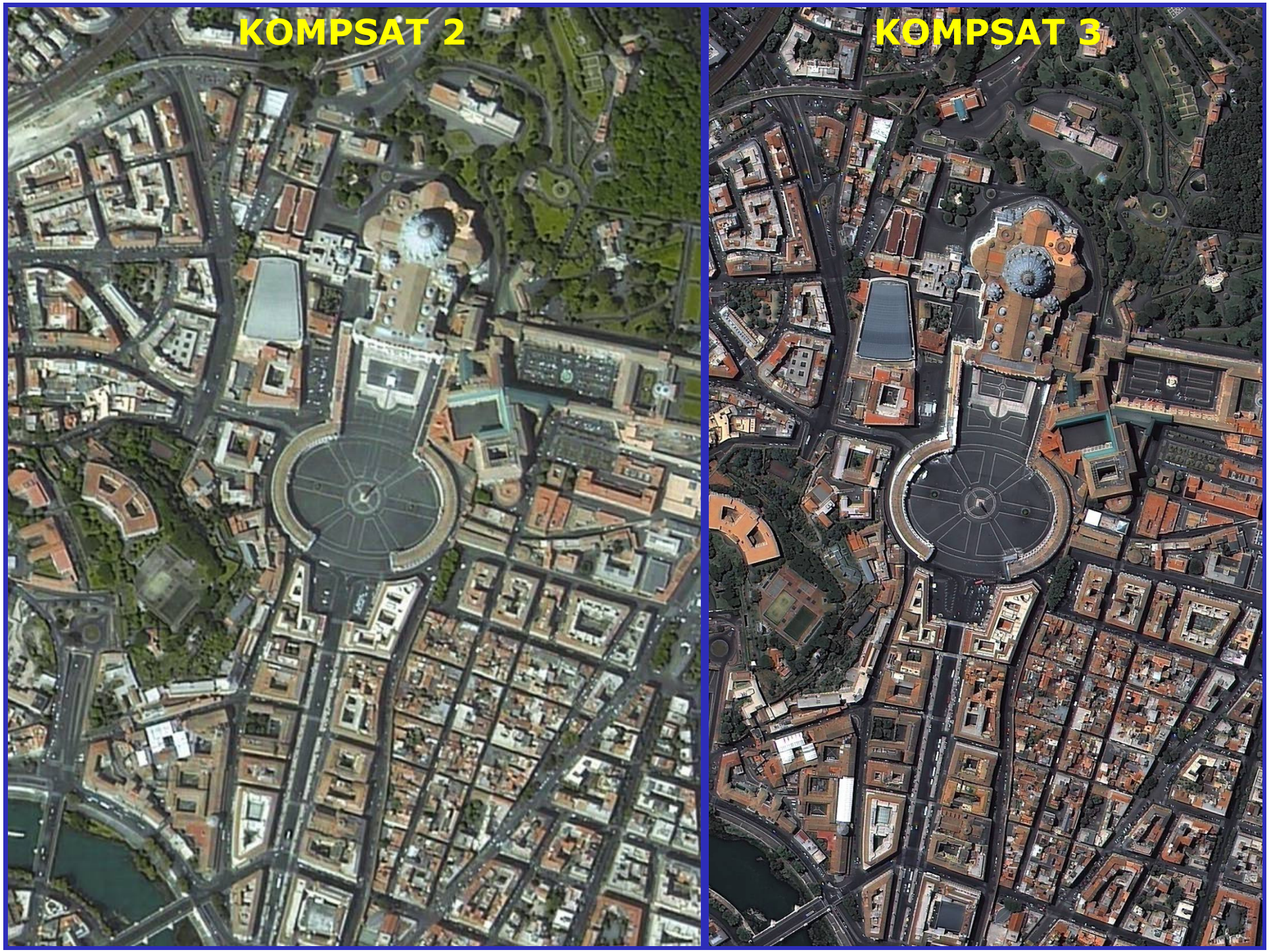
KARI Korea Aerospace Research Institute


KOMPSAT-3 AEISS
Vatican,
Rome, Italy
> 아리랑위성 3호로 촬영한 'Curia, State of the Vatican City'
KARI KOREA AEROSPACE RESEARCH INSTITUTE

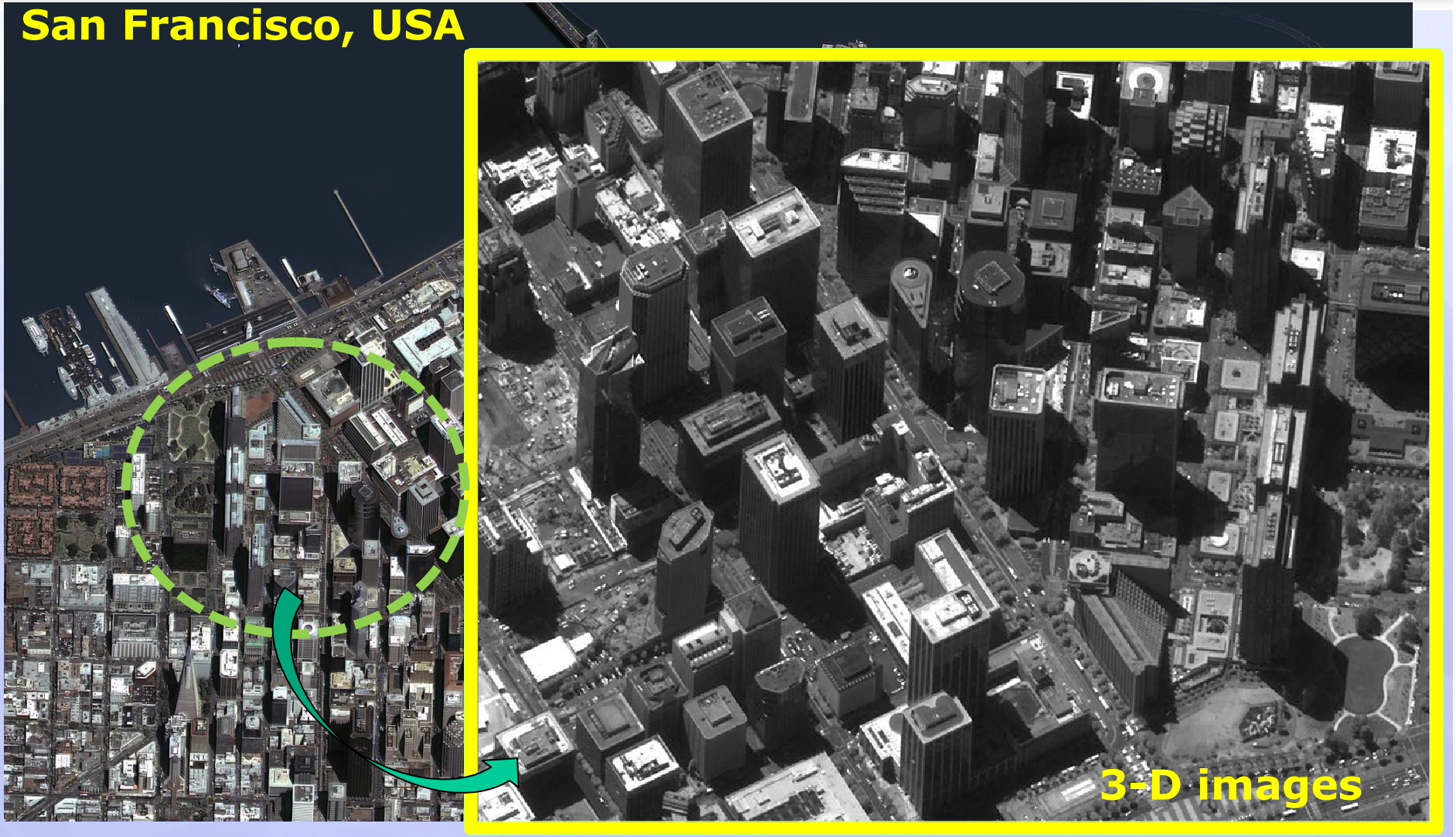

KOMPSAT-3 AEISS
Vatican,
Rome, Italy
> 아리랑위성 3호로 촬영한 'Curia, State of the Vatican City'
KARI KOREA AEROSPACE RESEARCH INSTITUTE

> 아리랑위성 3호로 촬영한 'Curia, State of the Vatican City'

KARI Korea Aerospace Research Institute


KOMPSAT 2
KOMPSAT 3

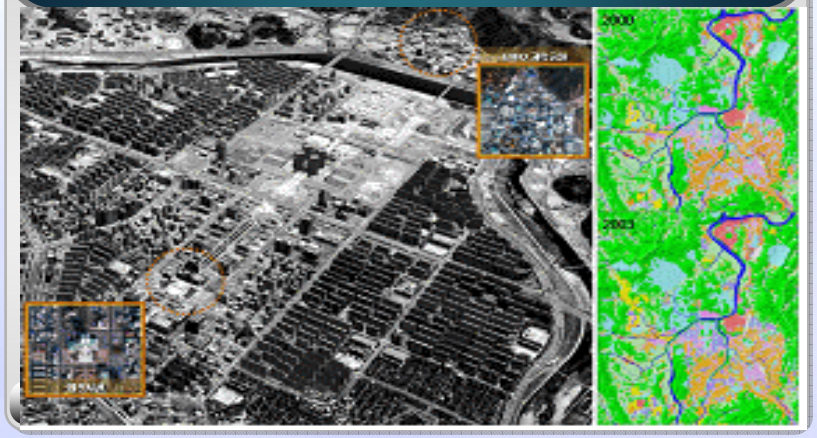
KOMPSAT-3 Test Images



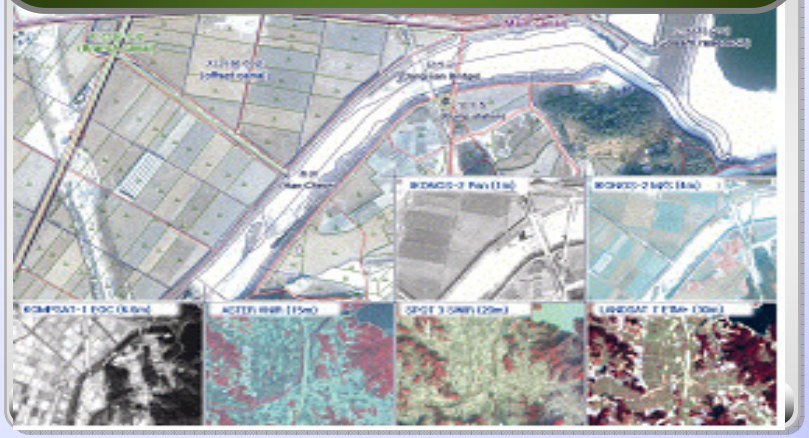

San Francisco, USA
San Francisco (with MTFC), 2012.08.10

Image Application

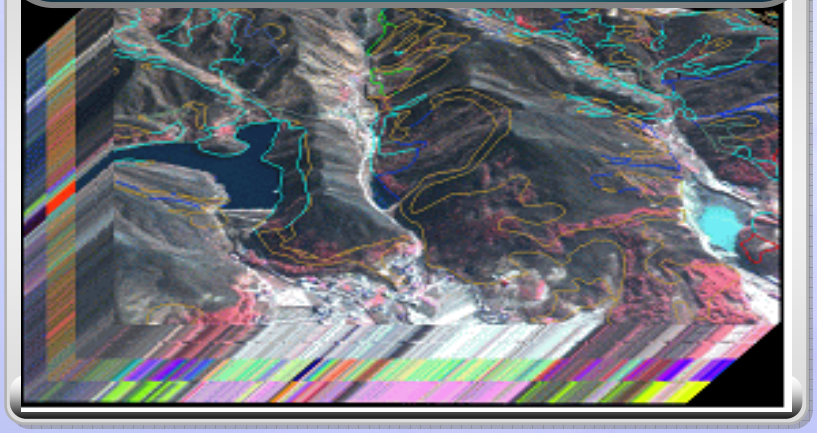
Land & Urban Planning



Agriculture & Forestry



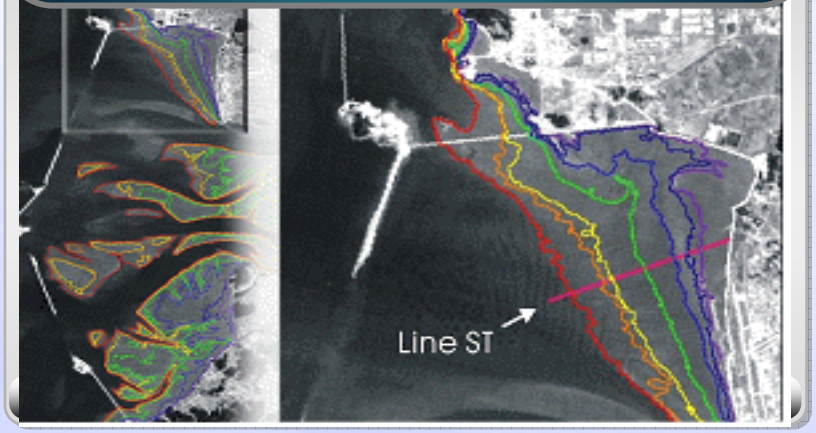
Natural Disaster Monitoring



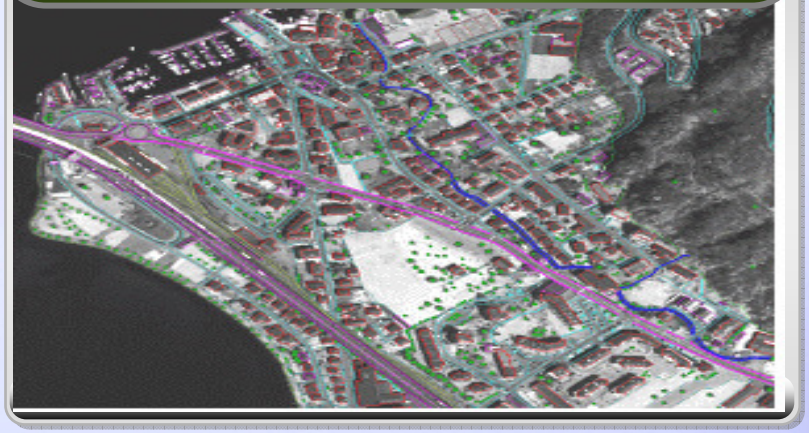
Geological & Resource

Image Application

Ocean & Water Resource



Geo Information System



Mapping

National Defense

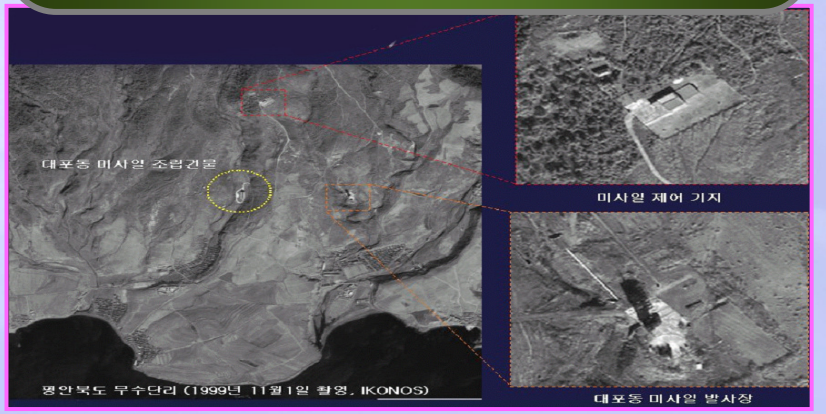
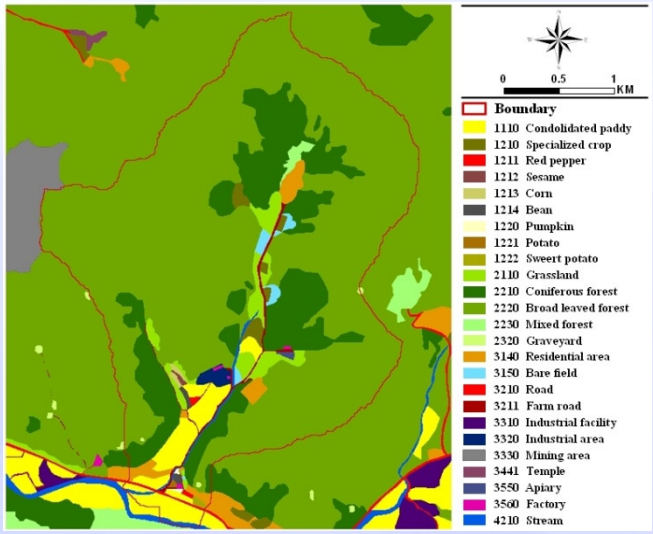


Image Application

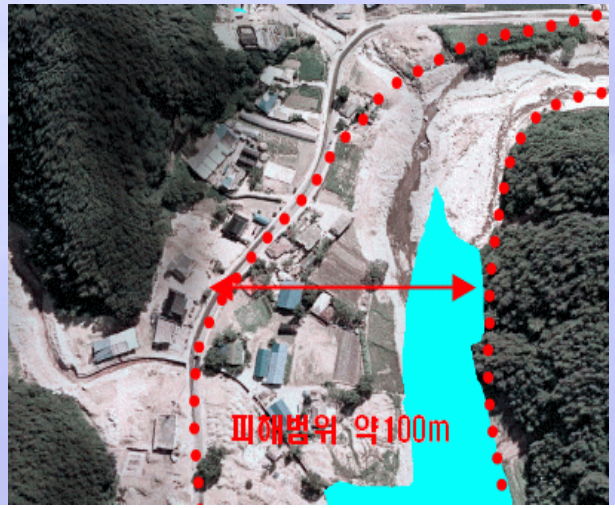
Land Use



Cartography

Wild Fire

Estimation of Flood Area



IV. Disaster Monitoring by Satellites

Oil Spill Monitoring

Flood Monitoring

Earthquake

2008.

2011

V. COMS Applications

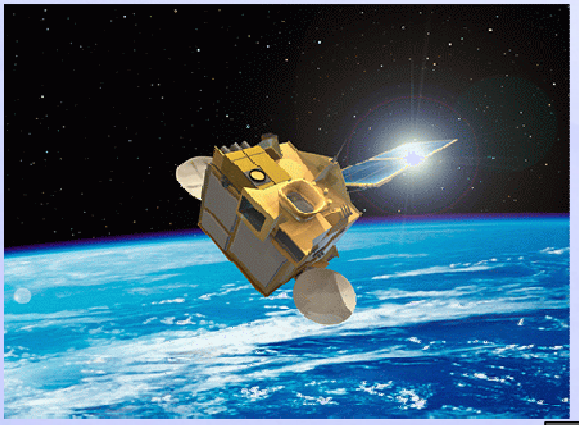
COMS, The first domestic developed GEO.

Mission duration: 7 years

Launch: June 28 2010 (by Ariane-5)

Orbit: Geo-Stationary

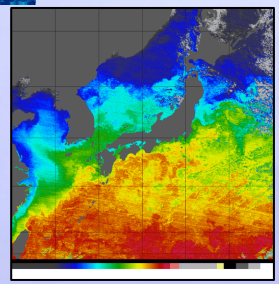
Mission: Meteorological Observation

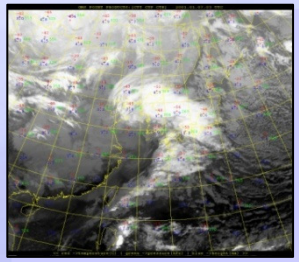


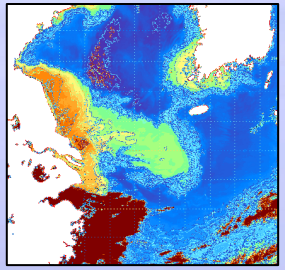
- Continuous monitoring of imagery and extracting of meteorological products
- Early detection of special weather such as storm, flood, yellow sand
- Monitoring of long-term change of sea surface temperature and cloud

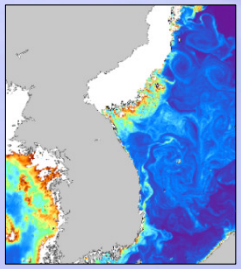
Ocean Color Monitoring

Ka-band Communication Experiment



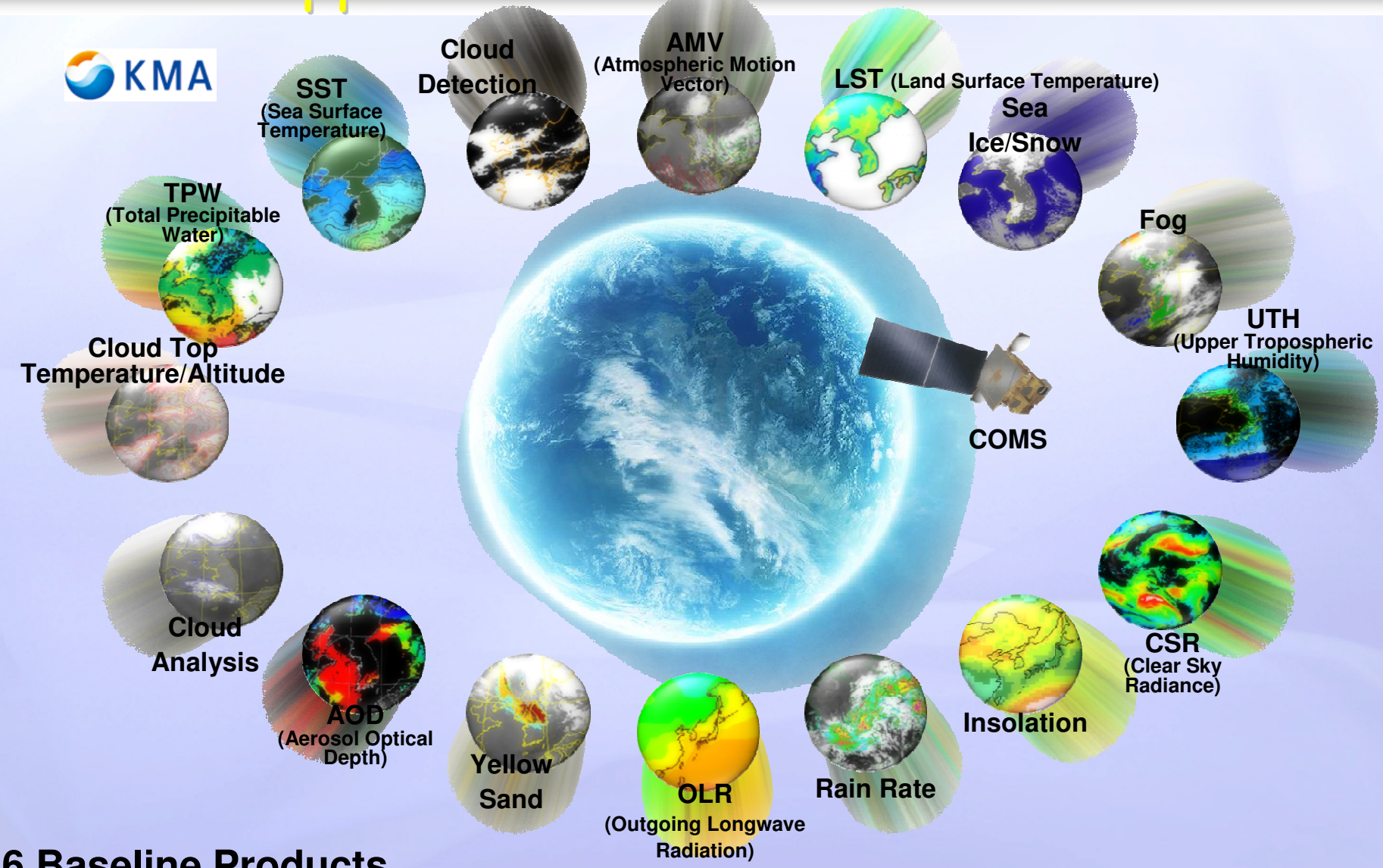






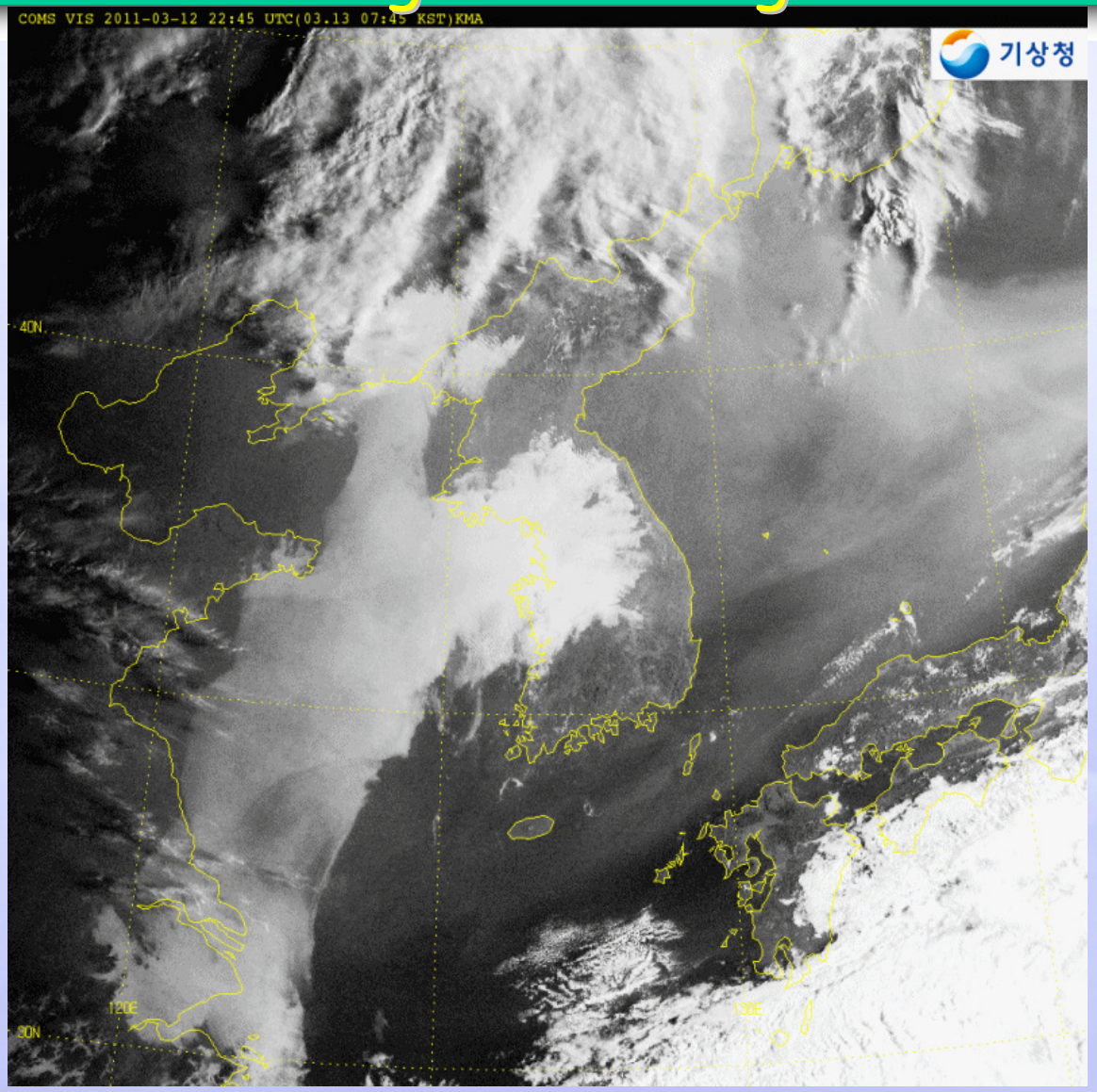
COMS's Meteorological Imager's Application

COMS's Meteorological Imager Application - Level 2 Products

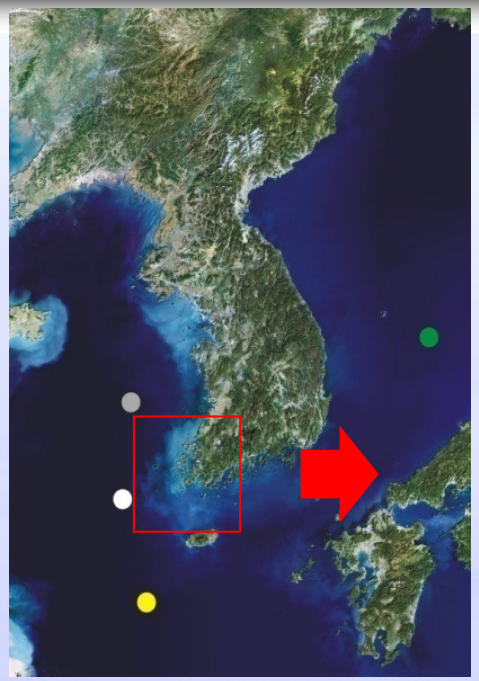


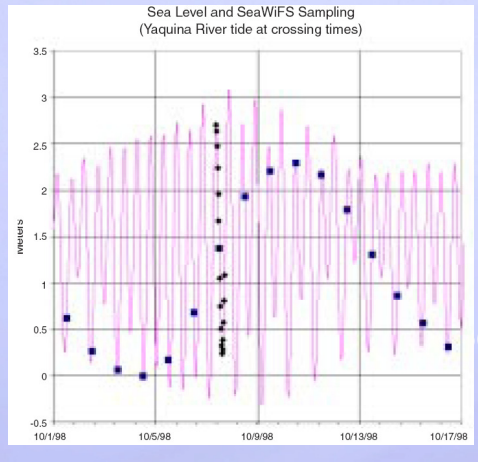
16 Baseline Products

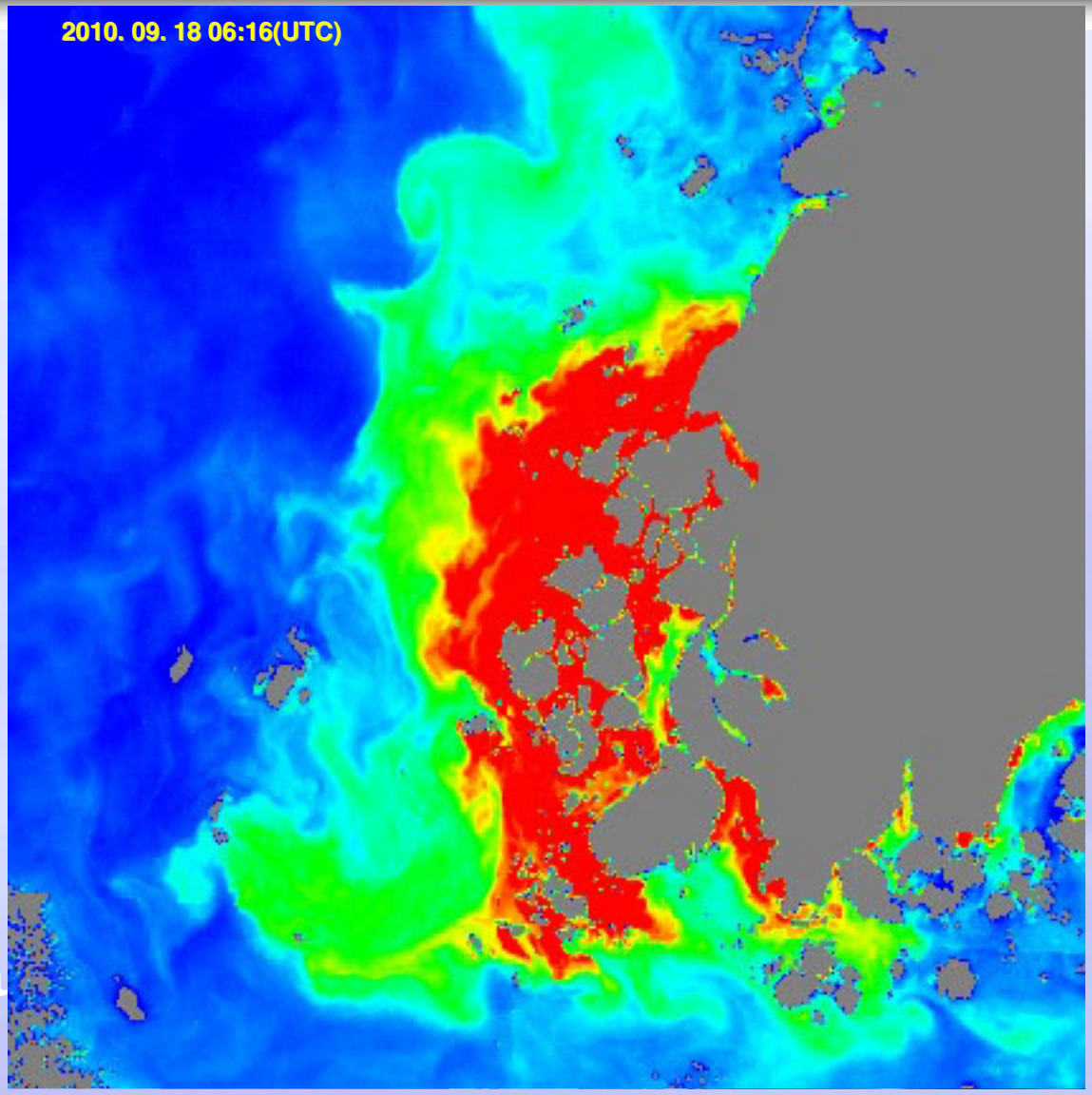
COMS's Meteorological Imager Application
Fog monitoring



COMS's Ocean Color Imager Application

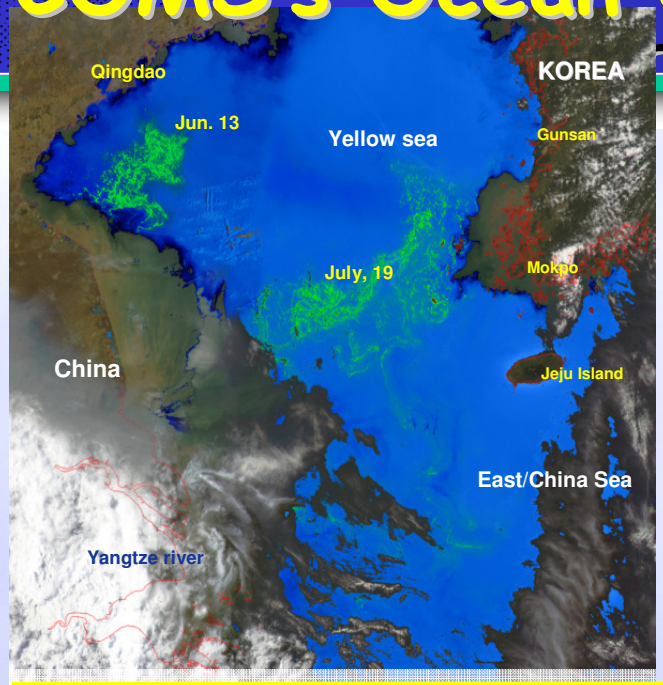






© courtesy by KIOST

COMS's Ocean Color Image Application



(a) June. 10, 2011 in south sea of Korea
Picture by Onnuri research ship of KORDI

(b) June. 16, 2011 : West south sea
Location: 31N, 125E
Picture by KORDI and Nagasaki Univ.

(c) June. 21, 2011
Location : (34N°31.9, 125E°27.8)
Picture by Mugunghwa -2 ship of Jeonnam Univ.

VI. Conclusions

Conclusions

- Variety of satellite sensors required for efficient use of satellite resources
- After the 2013, Korea will have the ability to operate optical(resolution: 1m, under 1m), imaging radar(SAR) and infrared(IR) satellite including Communication, Ocean, and Meteorological Satellite independently
- Based on Korea's satellite resource, international collaboration and disaster prevention of the Korean Peninsula and surrounding areas will be expansion


Thank You !