

# GISTDA & THEOS: Thailand Earth Observation System

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Chiang Mai, Thailand



# GISTDA Experience

- Participated in Earth observation programme since early 1970s
- Established the Ground Receiving Station in 1981
- Many-year experienced in satellite data acquisition, processing, disseminating and application development of data from various sources (e.g. LANDSAT, MOS-1, JERS, ERS-1, IRS-1C, IRS-1D RADARSAT-1, SPOT-2 )
- Currently operating the Ground Station for Landsat-5, Radarsat-1, SPOT—2, SPOT-4, SPOT-5, with local partner for IKONOS
- ALOS Ground Station Upgrade under development



We are moving forward in  
operationalizing remote sensing to  
Thailand's benefits,.....

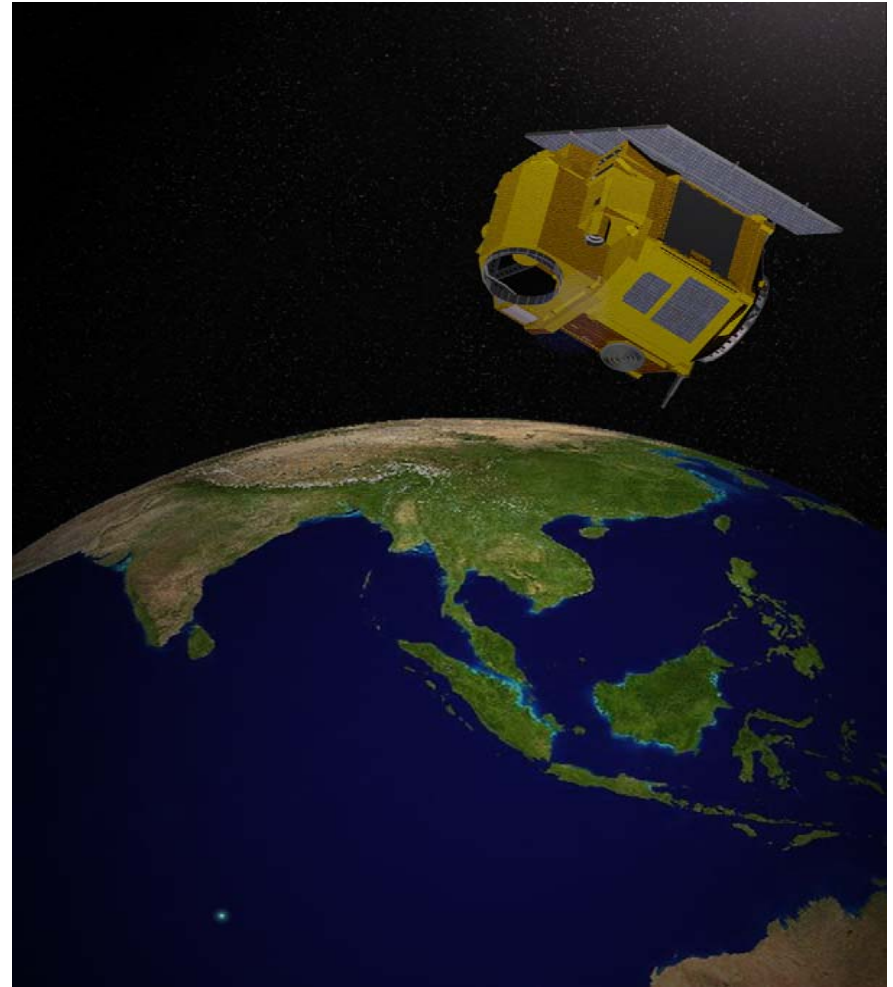


# Thailand Earth Observation System (THEOS)

First Earth Observation Satellite  
designed to work at operational  
level for Thailand.

THEOS Contract Signed July  
19, 2004.

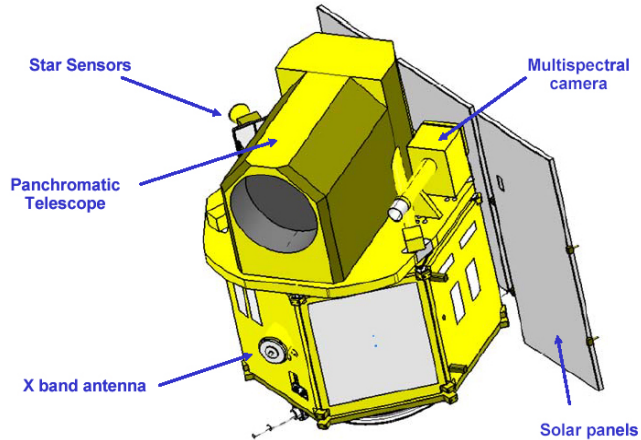
THEOS Scheduled to be  
launched around August 2007.



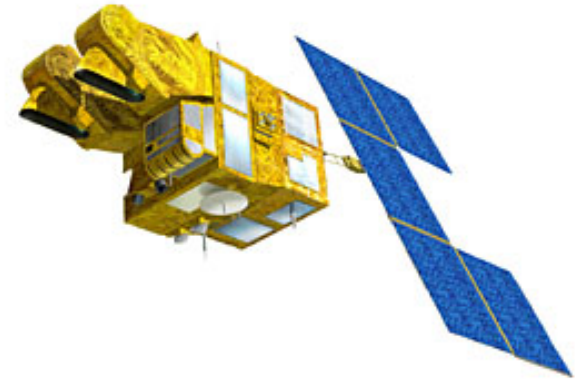


# THEOS Program

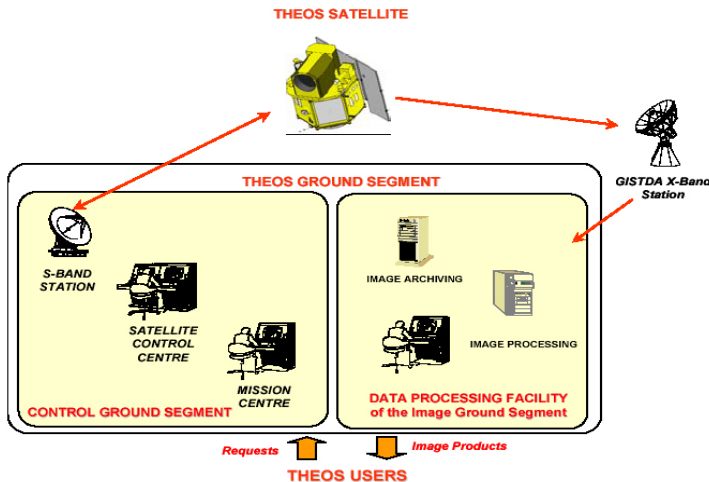
## THEOS Mission



## SPOT Mission

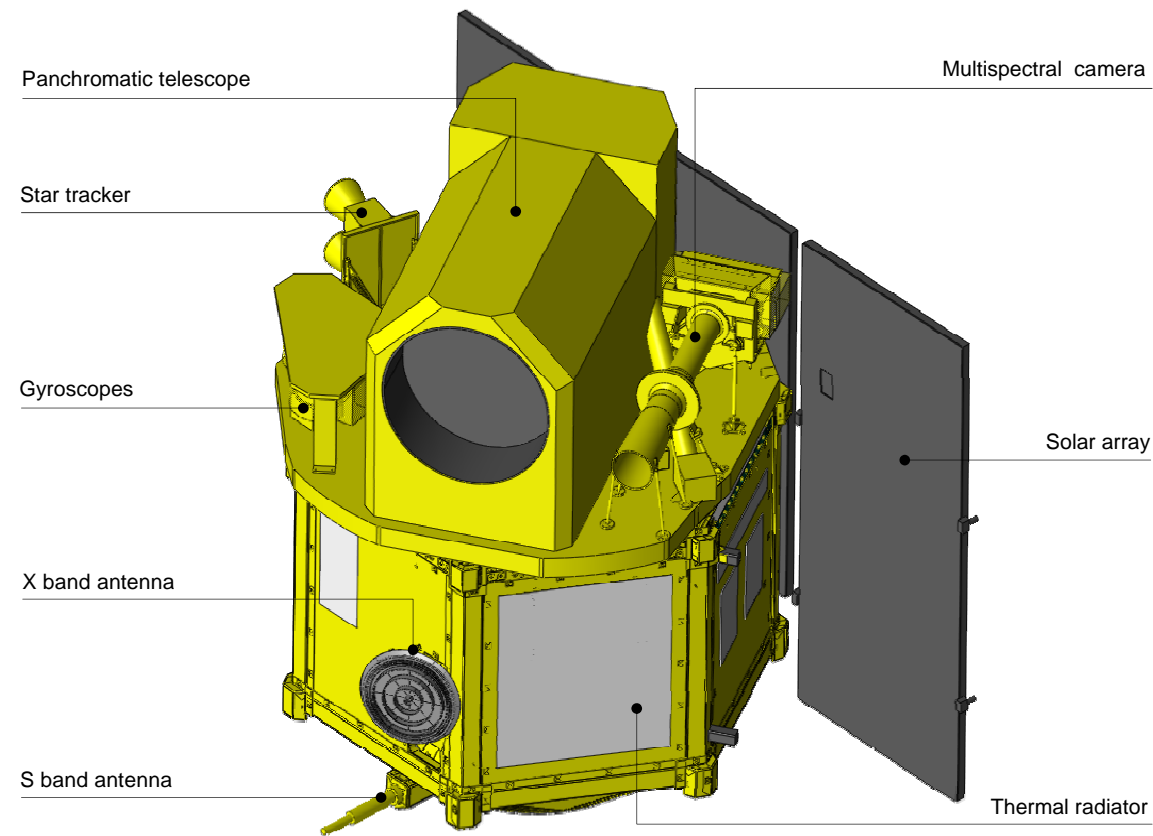


## THEOS Control Ground Segment



## On-job Training & Long Term Education

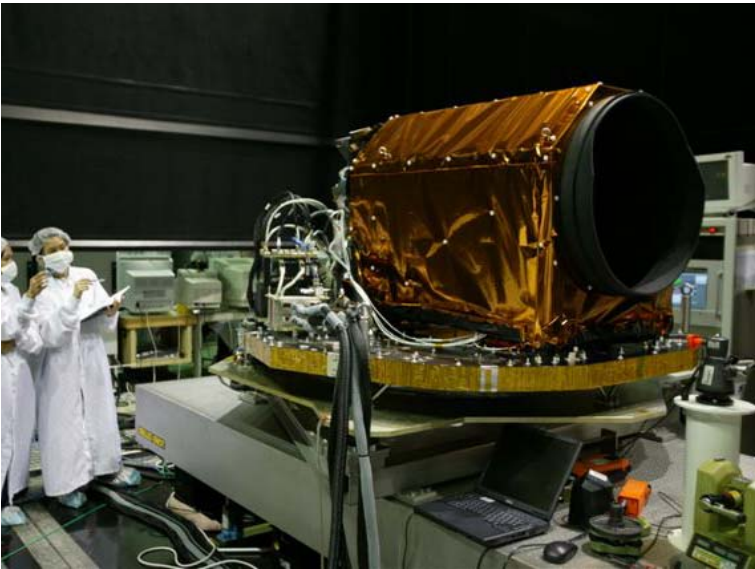




- **Mass:** 750 kg.
- **Orbit:** Sun Synchronous
- **Altitude:** 822 km.
- **Inclination:** 98.7
- **Repeat Cycle:** 26 days
- **Mean Local Time:** 10.00 a.m.
- **Payload:**
  - Panchromatic telescope
  - Multi-spectral camera
- **On-board Memory:** 51Gb
- **Mission Data:** X-band Link
- **TT&C:** S-band Link
- **Attitude Orbit Control and Orbit Determination:**
  - 3-axis stabilized, Star Tracker, Gyro, GPS, Magnetic Torque, Sun Sensor
- **Design Life Time:**
  - At least 5 Years



# THEOS Payload



**Resolution**  
**Spectral band**

**PAN**

2 m

**MS**

15 m

P: 0.45-0.90  $\mu\text{m}$

Blue: 0.45-0.52  $\mu\text{m}$

Green: 0.53-0.60  $\mu\text{m}$

Red: 0.62 –0.69  $\mu\text{m}$

NIR: 0.77-0.90  $\mu\text{m}$

**Swath Width**

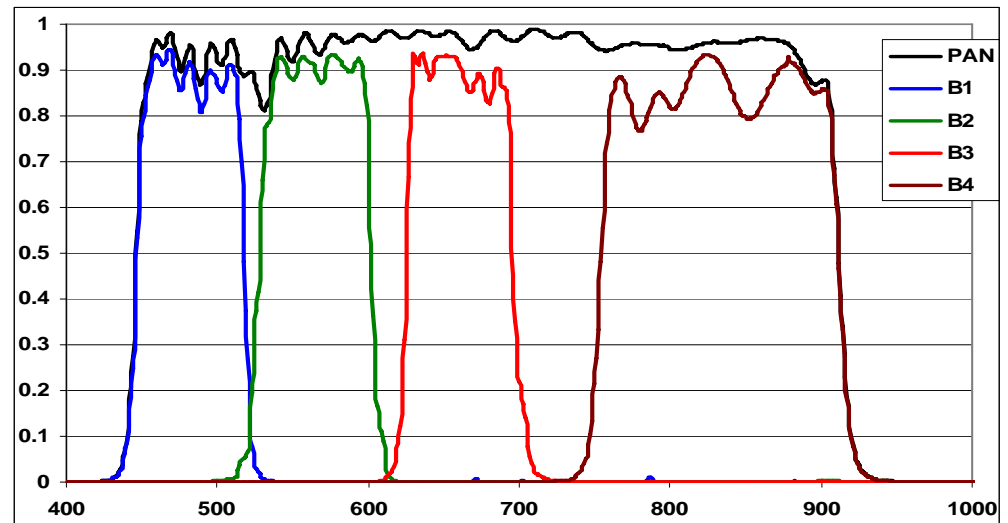
22 km

90 km

**Off-nadir viewing**

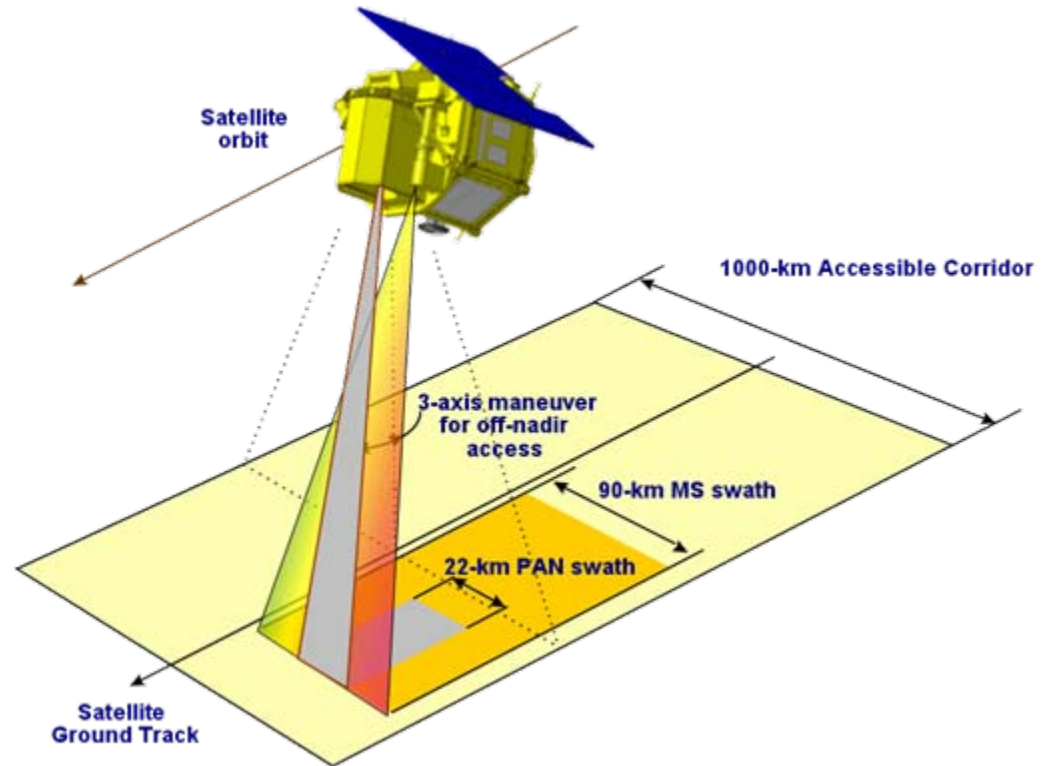
$\pm 50$  degree

$\pm 50$  degree



# THEOS Imaging (1)

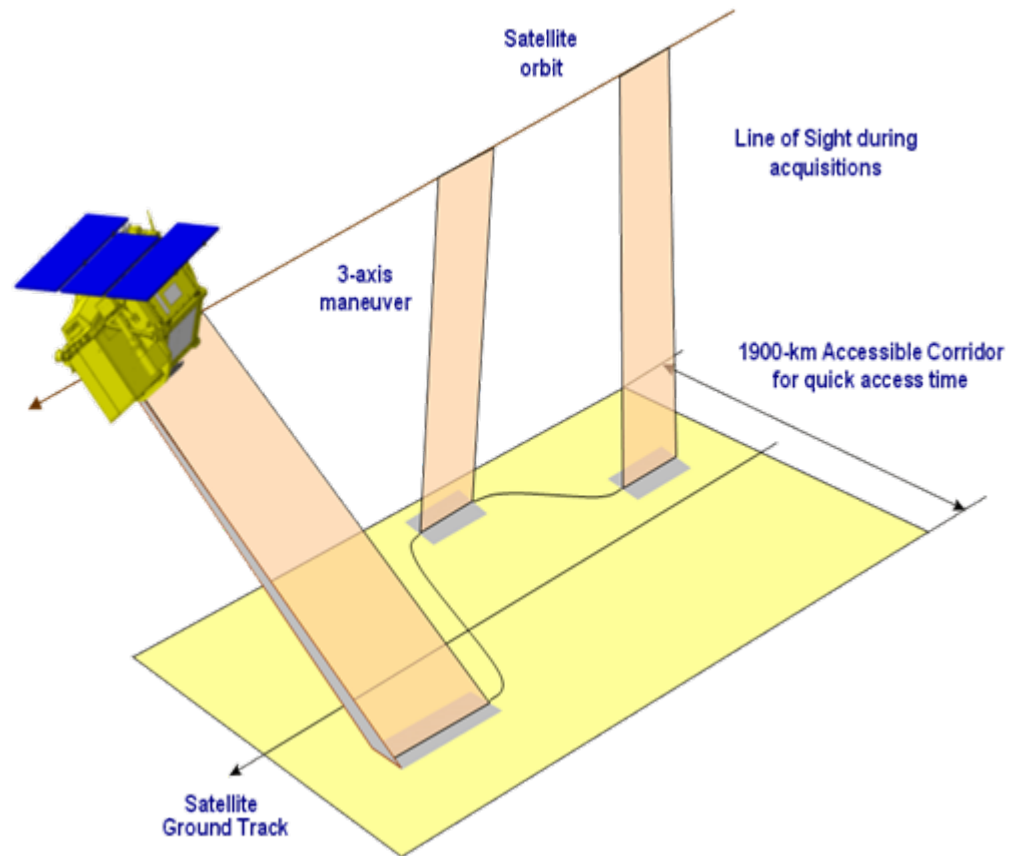
THEOS Panchromatic telescope and Multi-Spectral Camera, with roll-axis maneuvering capability, can take imagery simultaneously along satellite ground track within 1,000-km. accessible corridor for





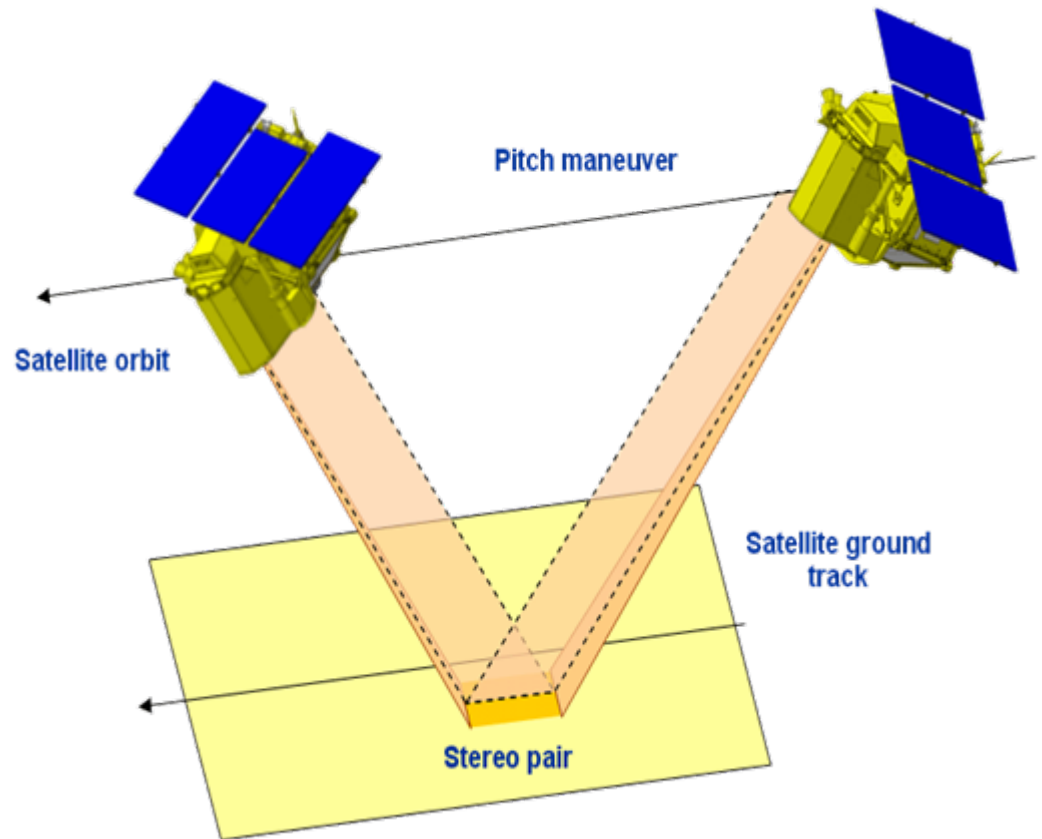
# THEOS Imaging (2)

- THEOS can take imagery at single imaging mode within 1,900-km. accessible corridor



# THEOS Imaging (3)

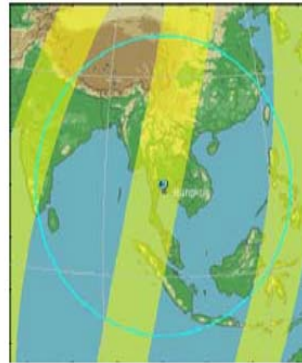
For topographic mapping purpose, THEOS is able to program for taking stereo image pair to meet user's specific requirement.



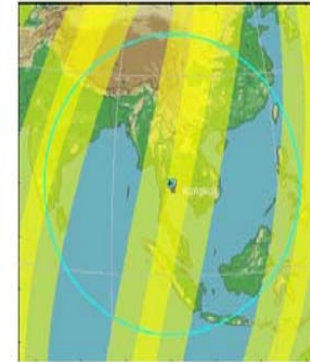
# THEOS Global Accessibility

- THEOS can take any imagery globally within 1-5 days

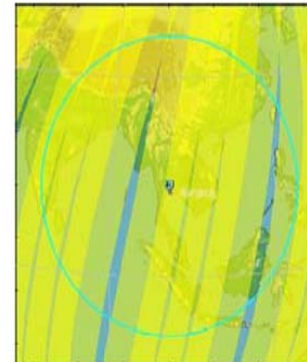
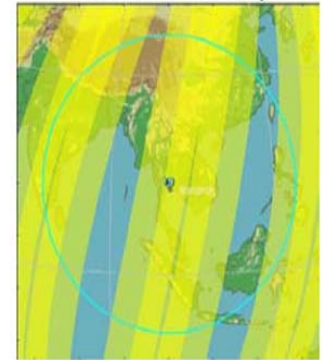
1st day



2 consecutive days



3 consecutive days



4 consecutive days



5 consecutive days





# THEOS Requirements

THEOS is able to fulfill a number of Earth Observation requirement

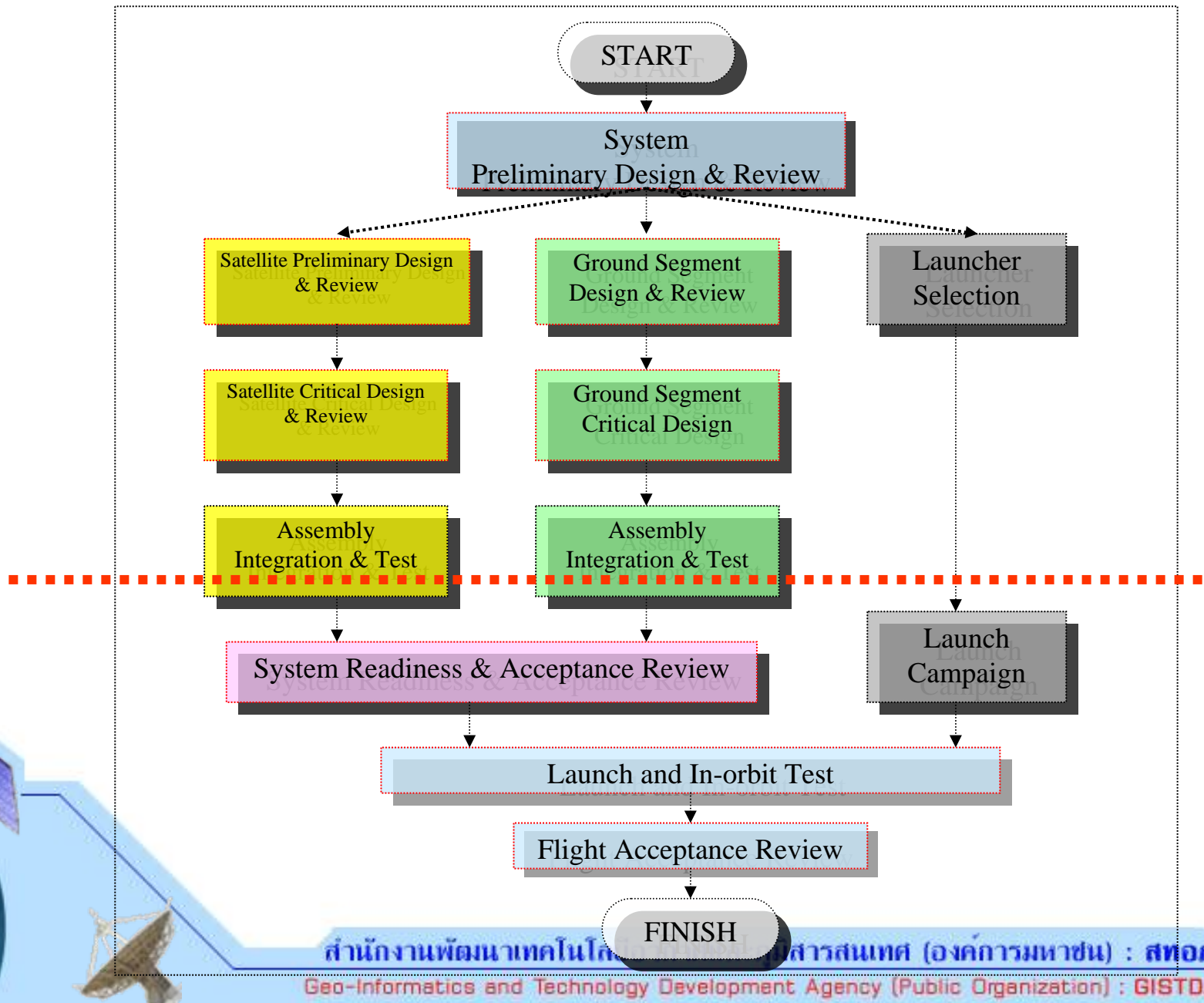


- Local and Global Observation
- Routine monitoring and periodical update
- Frequent revisit
- Fast access to areas
- Classification capacity





# THEOS Development Chart



# THEOS Products



PAN and Multi-Spectral

Products Available at Different levels

**Level 1A** - Radiometric correction

**Level 2A** - Radiometric and Geometric correction with UTM projection

**Level 2B** – Geometric correction with Ground Control Points and Map Projection

**Ortho Image** - Geometric correction with DEM

**Pansharpened image**

Output Format: DIMAP (GeoTIFF)

Output Product: CD/DVD



# THEOS Scene Characteristics

	PAN	MS
Number of bands;	1	4
Spatial resolution;	2m	15 m
Pixels per line;	12000	6000
Number of lines;	12000	6000
Image Area (at nadir);	22 km x 24 km.	90 km. x 84 km.
Data volume (approx.);	144 Mbytes	36 Mbytes each band





# THEOS Simulation Image



PAN



PAN-Sharpned

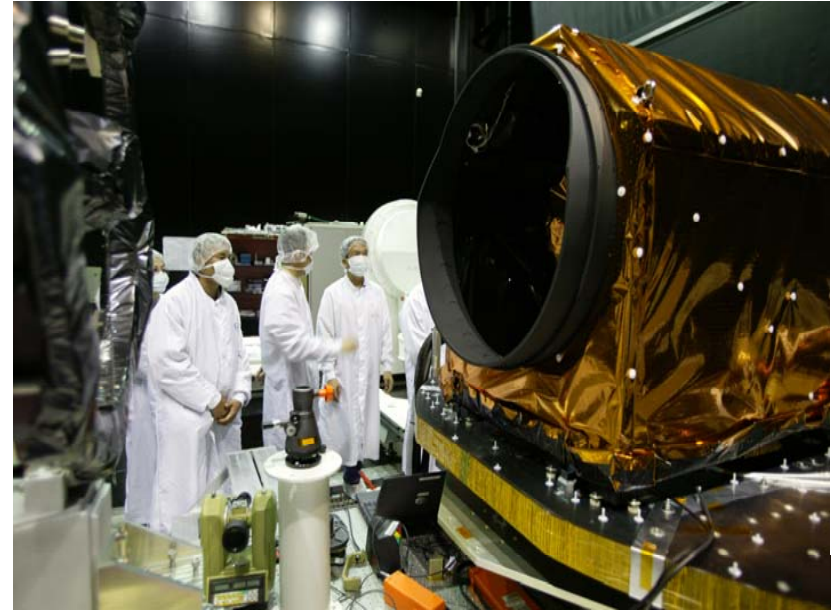




# THEOS Overall Progress



# THEOS Development Progress



- The development of THEOS satellite and its ground segment have been well-progressed, in accordance with the planned schedule.
- The Satellite Critical Design Review has been performed in April 2006.



# Satellite development

Bus units are  
mechanically  
and electrically  
integrated





# Payload Development: PAN

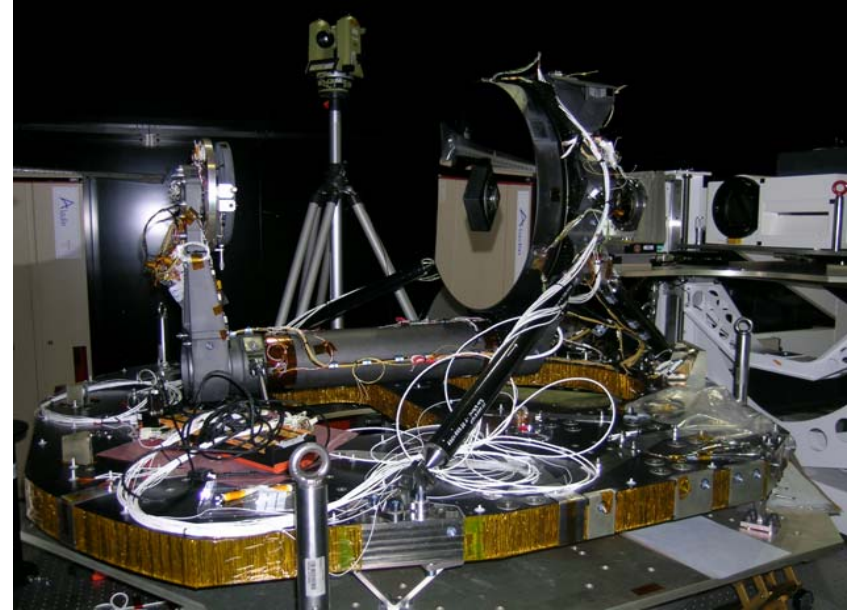
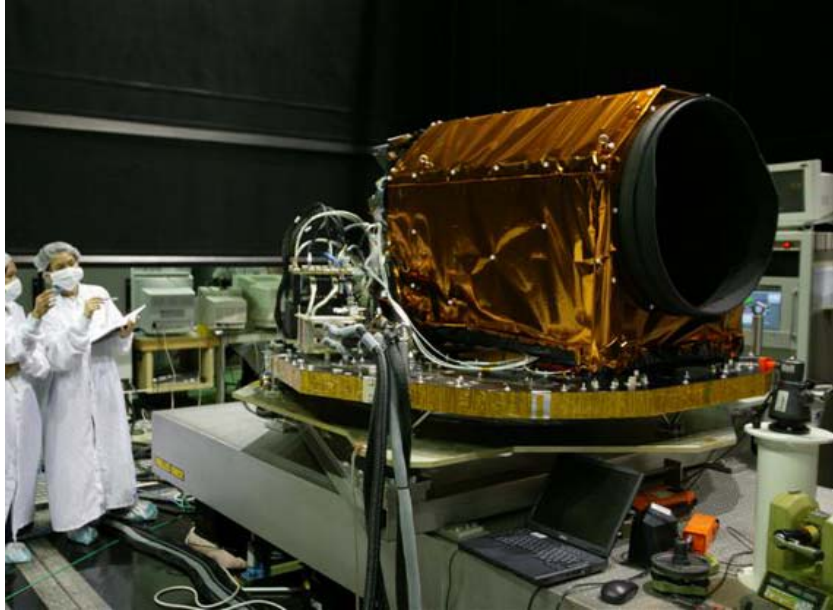


Payload development  
Panchromatic  
camera made from  
SiC ensuring good  
stability and light weight.





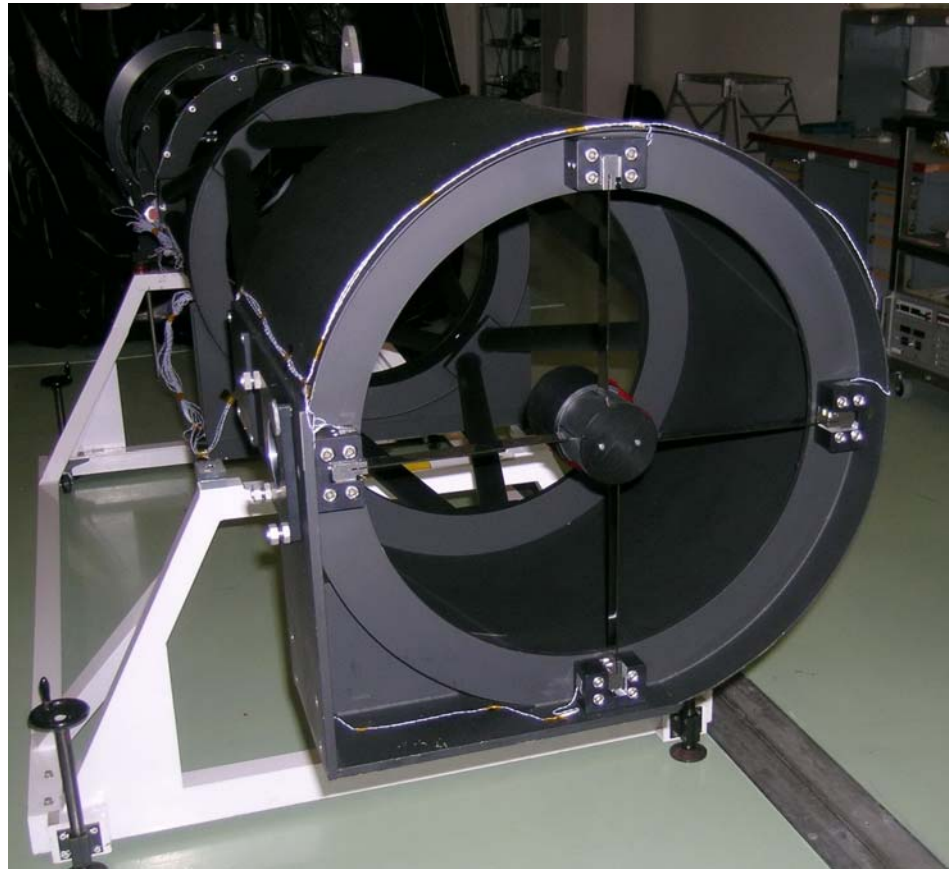
# Payload Development: PAN



PAN integration successfully completed  
All testing completed



# Payload Development: MS



Collimator Integration and Test Completed



Bus and panchromatic camera coupled on June 8,  
with THEOS trainees  
participation







## Control Ground Segment:

In the process of  
Assembly Integration  
and Validation







Ground Segment:

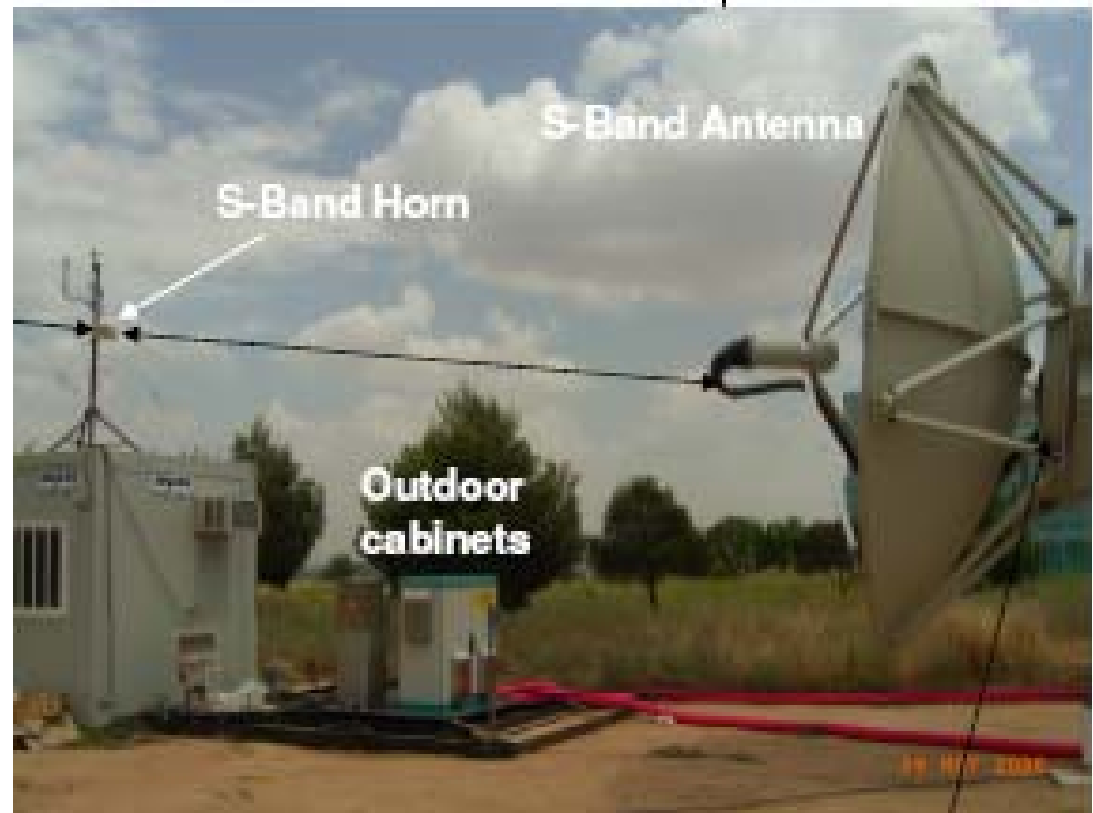
Image Ground Segment  
In Plan Acceptance  
Review (IPAR)  
completed early June



# S-band station:

In Plant Acceptance Review completed

(supplier: INDRA, Spain)



# Human Resource Development



Thai Engineers are involved in satellite development at EADS Astrium, Toulouse, France





# Human Resource Development



## On-the-job training

Thai engineers attend theoretical and practical training for 2.5 years



# THEOS Applications Development and Promotion



## THEOS Pilot Projects:

Workshops were held with participants from various agencies.

The first series of pilot projects focus on:

- Forestry
- Water Resource
- Agriculture
- Cartography



# THEOS Data Policy





# THEOS Data Policy

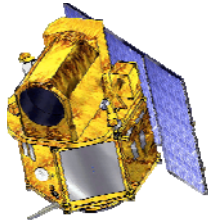
- THEOS Operational Data Use in Thai Government Sector.
- Independence of Information in Security
- Domestic and International User Accessibility to THEOS Data and Archives.
- THEOS data distribution and applications internationally through international ground stations and commercial distribution channels.
- Move to the Geospatial Business Development with Public & Private Partnership Promotion for Thailand



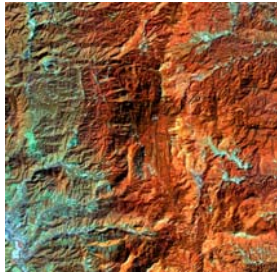
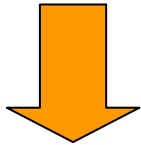
# THEOS BUSINESS DEVELOPMENT



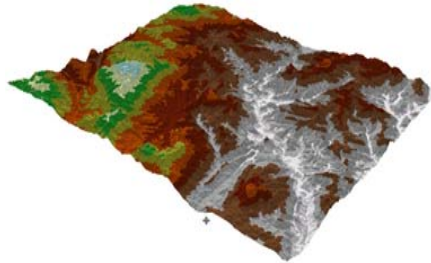
# THEOS Value Chain



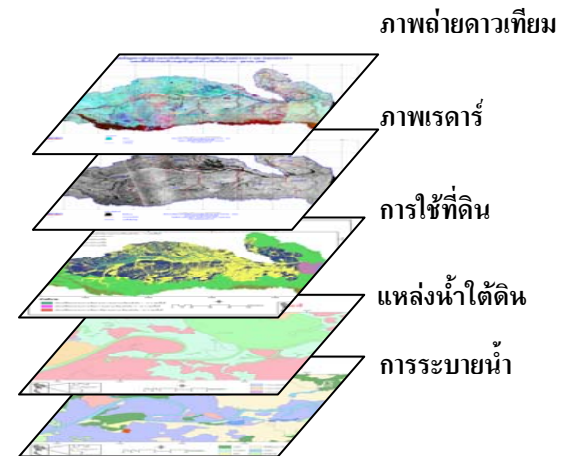
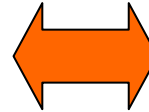
**THEOS Satellite**



**Image Data**



**Value Added Image &  
Image Intelligence**

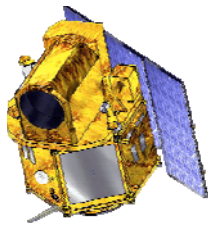


**Geospatial Data &  
Information**

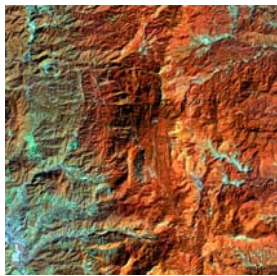
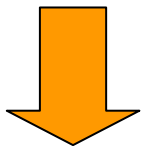




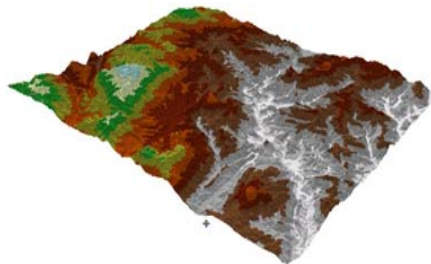
# THEOS Data Supply Chain



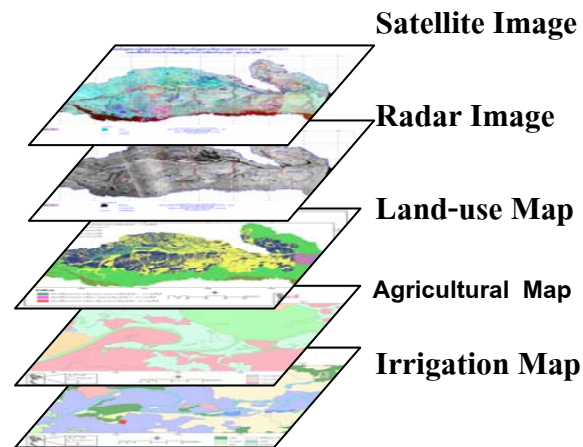
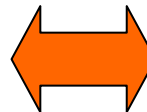
**THEOS Satellite**



**Image Data**



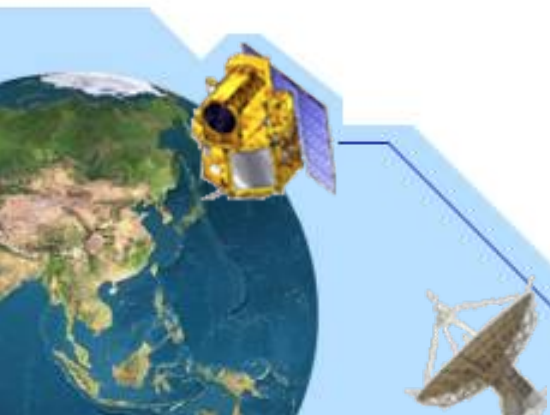
**Value Added Image &  
Image Intelligence**



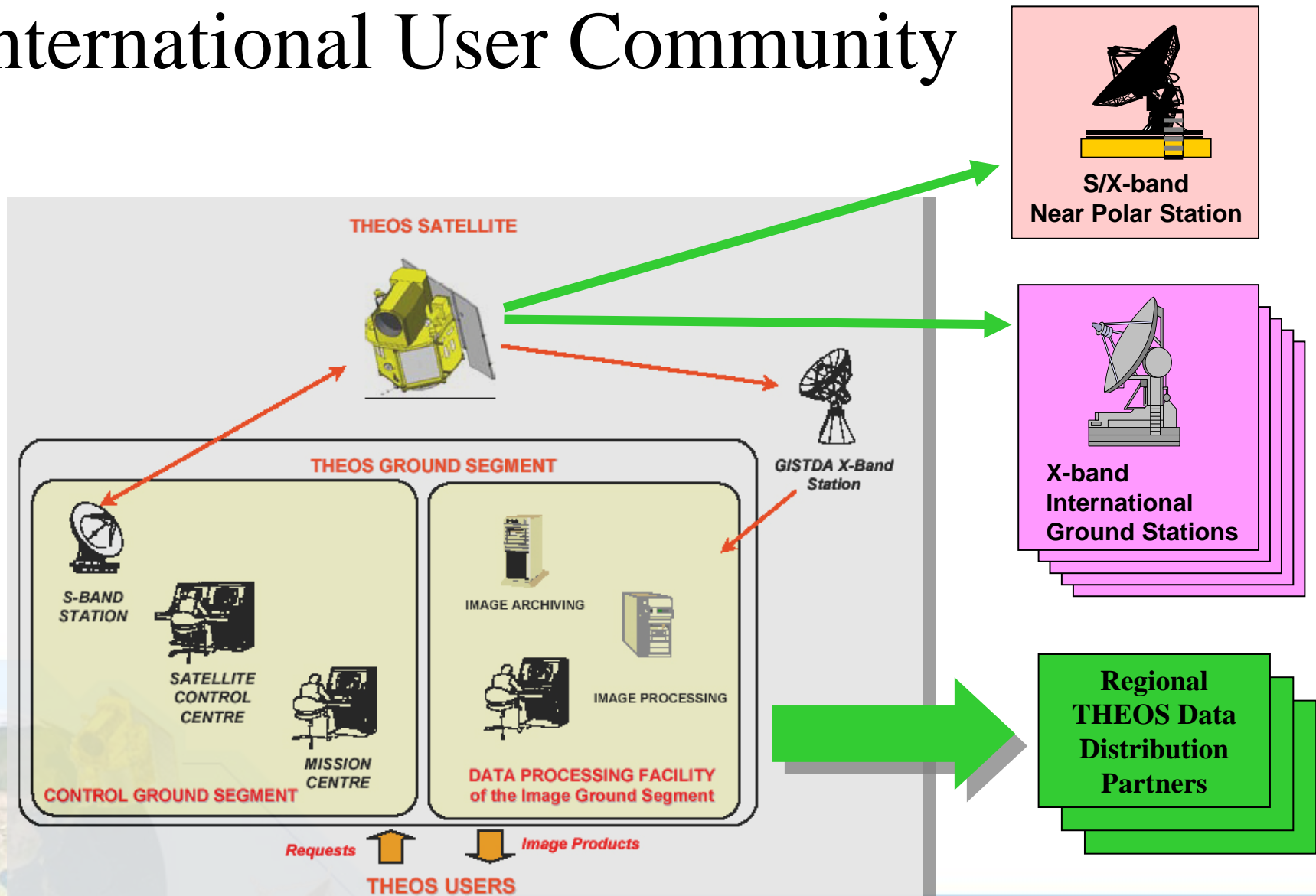
**Geospatial Data &  
Information**

Commercial Companies as Value  
Added Resellers and Service  
Provider)

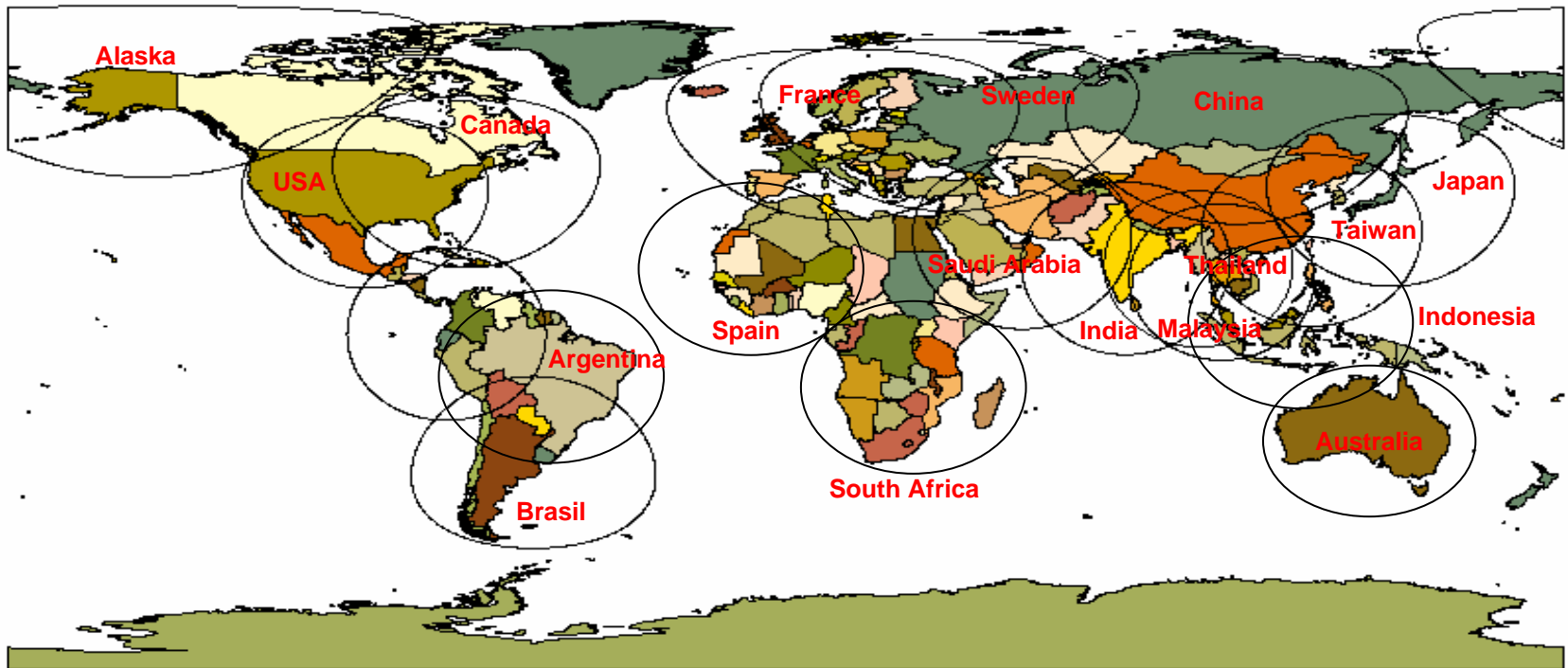
Commercial Companies as SI and  
Geospatial Service Providers and  
Consultancy



# THEOS System for International User Community



# Data Dissemination: Worldwide



THEOS is capable of providing high-resolution imagery globally.





# Conclusion

- THEOS is an opportunity for Thailand to strengthen national capability for knowledge based economy
- GISTDA can play a significant role to service and data delivery to EO user nationally and internationally in this region.



# Thank You Very Much !!!



[www.gistda.or.th](http://www.gistda.or.th)

