

# Introduction of Chinese High Resolution Satellite TH-1

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# TH-1 Profile



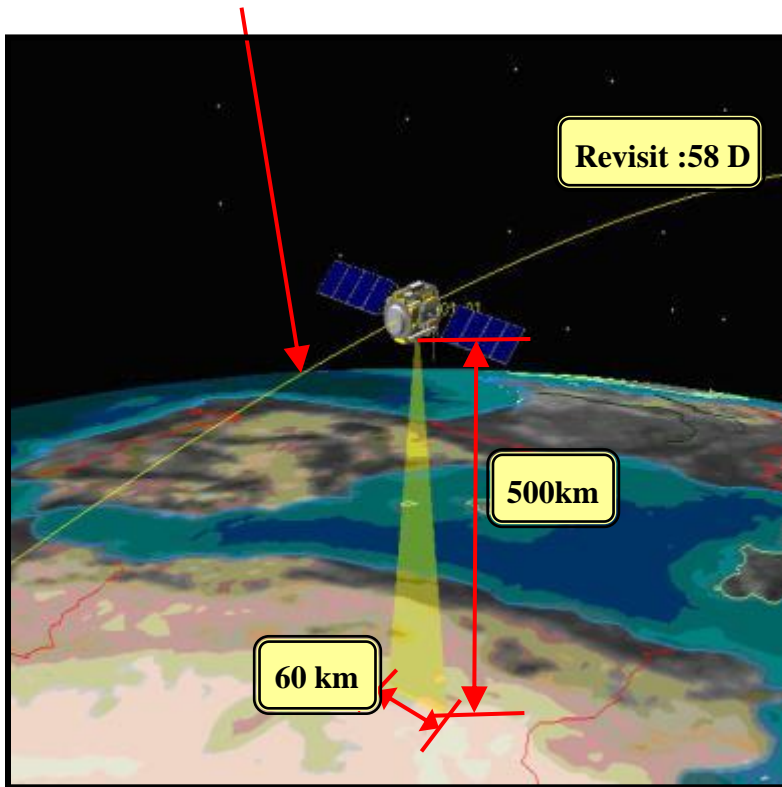
Satellite TH-1-01 was launched on 24<sup>th</sup>, Aug., 2010, and TH-1-02 was launched on 5<sup>th</sup>, June, 2012.

The constellation of 2 satellites network and capture imagery together seamlessly, with 2m Pan, 5m Triplet stereo, 10m Multispectral imagery camera.

**The TH-1-03 will be launched in 2015. It's designed for higher quality of imagery and more precise accuracy.**

# TH-1 Profile

Synchronous nearly round the sun



## Specification

Orbit period : **58 days**

Orbit altitude : **500 km**

Single satellite swath width : **60 km**

2 satellites revisit shortest interval:  
**1 day**

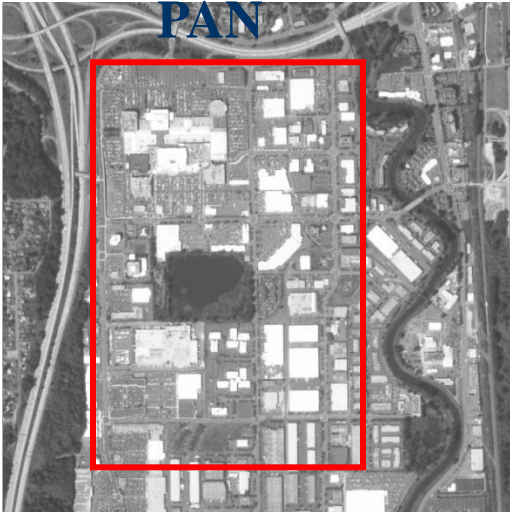
Accuracy (no GCP) :  
**25 m CE90**

# TH-1 Profile

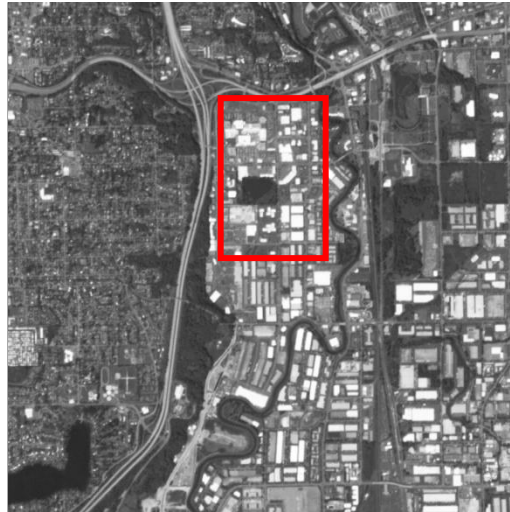
## Specification

**2 m**

**PAN**



**5 m triplet**



**10 m MSI**

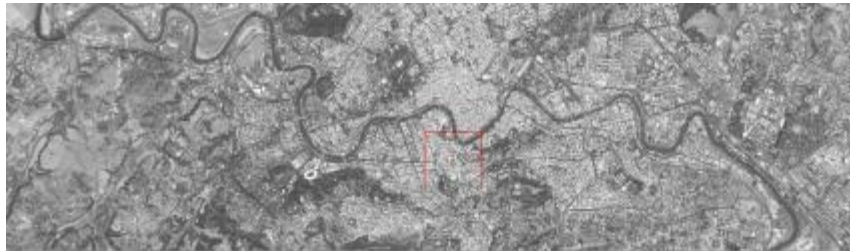


**Seattle, USA**

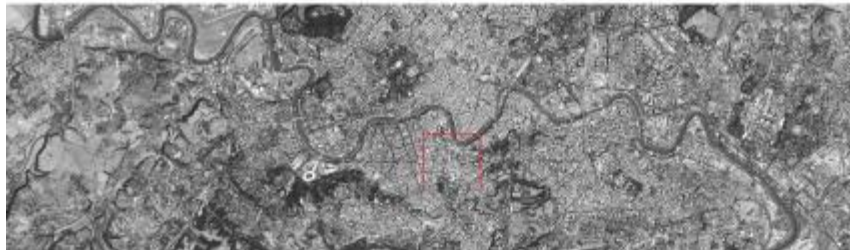
# TH-1 Profile

## Specification

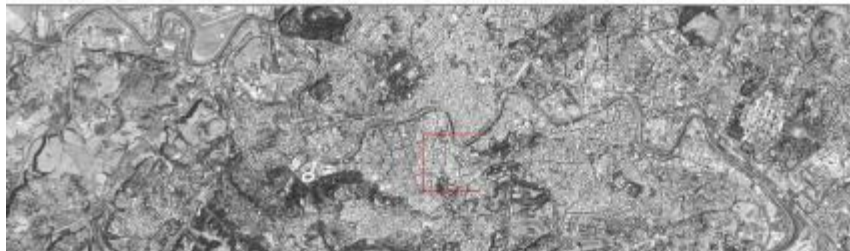
width: 60 km  
5 m Triplet image



Forward



Nadir



Backward

Vatican, Rome, Italy



# TH-1 Profile

## Specification

**Red**

**0.61-0.69um**

**Green**

**0.52-0.61um**

**Blue**

**0.43-0.52um**

**Near  
infrared**

**0.76-0.90um**

**MSI, Tianjin, China**

# TH-1 Profile

## Specification

Coverage with better than 60 km

64km



2 m PAN

60km



5 m Triplet

60km

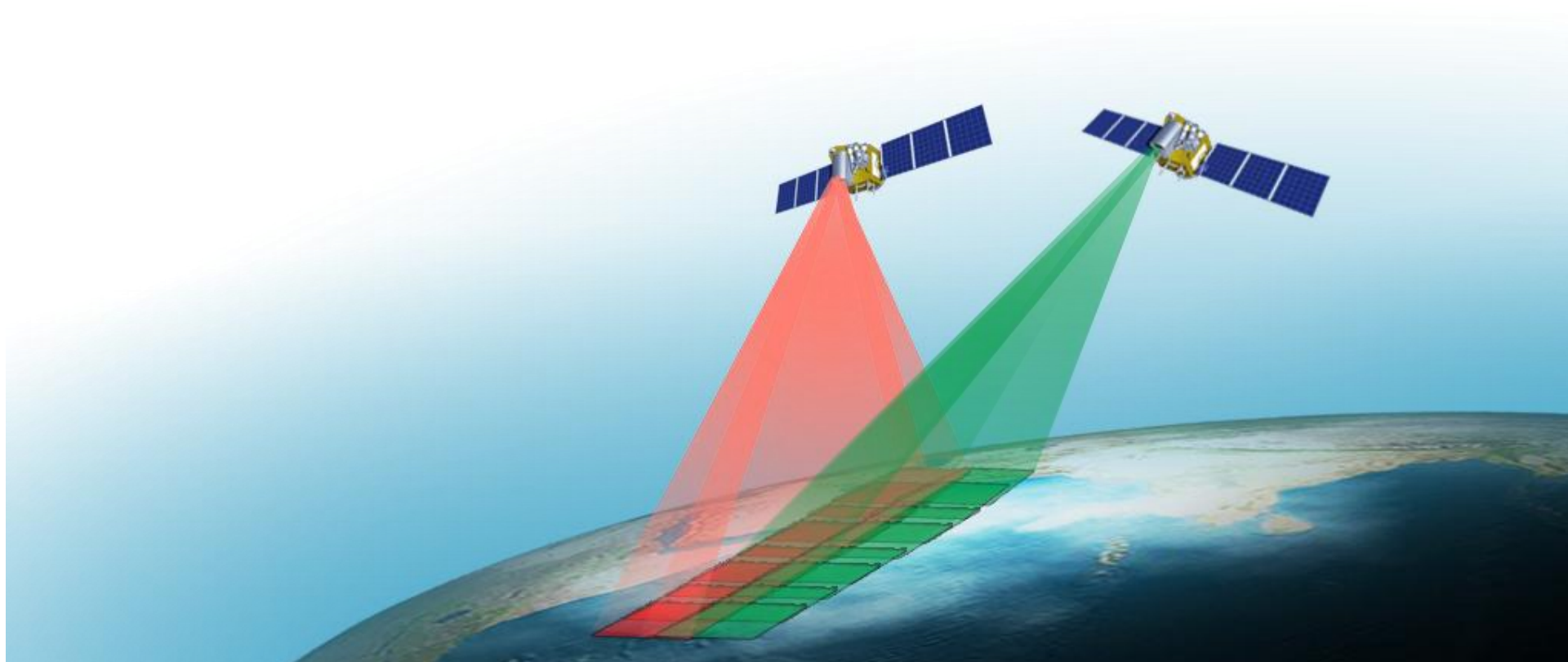


10 m MSI



# TH-1 Profile

**At least 2 satellite will be running in the space as a network, the image quality and precision will be improved step by step for meeting the multiple fields needs. `**



# Features

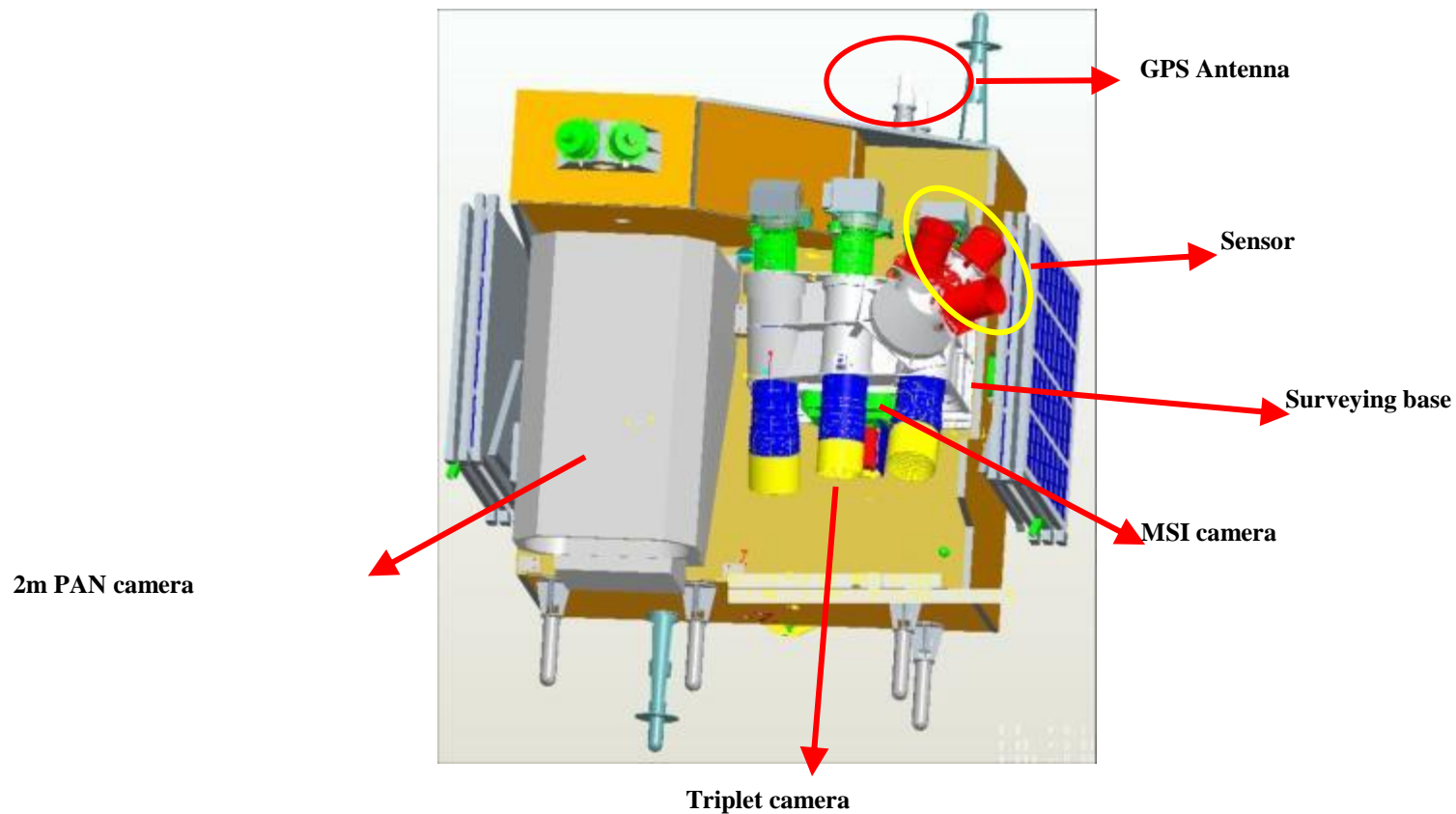
**Multiple payloads**

**Positioning precision**

**Data in set**

**Data acquirement**

## Multiple payloads



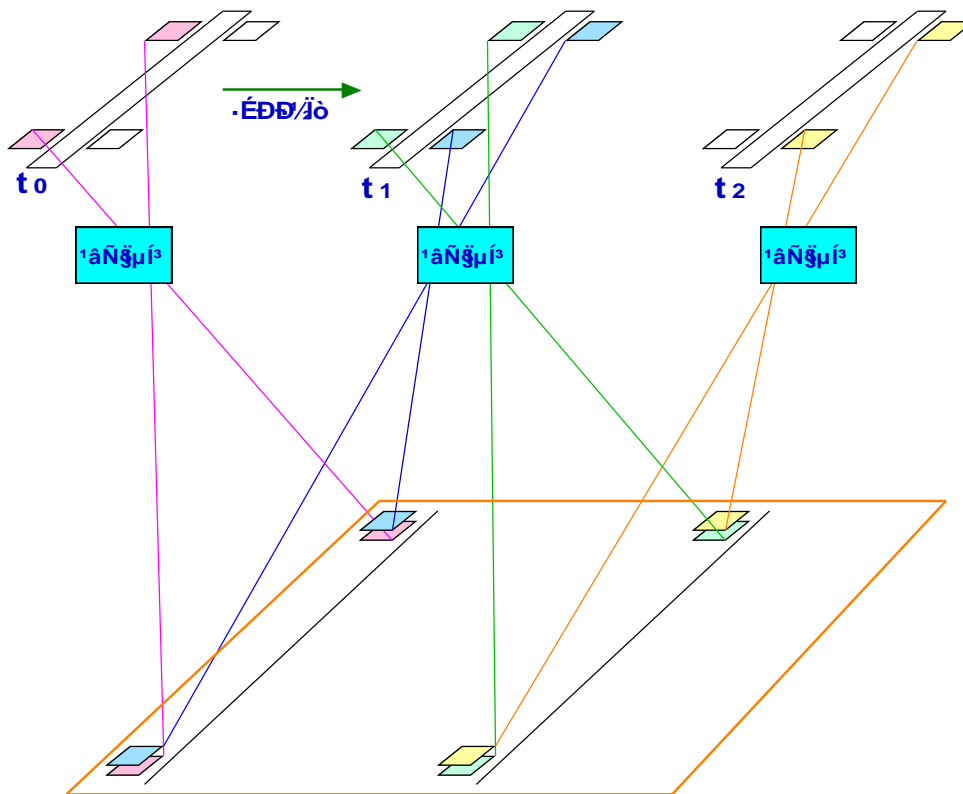
## High locating precision



**Camera** : Distortion  
standard should be less than  
0.03%, actually it has  
reached 0.005%.

**Lab calibration includes** :  
camera main point, margin,  
encounter angle, linear array  
parallelism, attitude control  
conversion matrix.

## High positioning accuracy



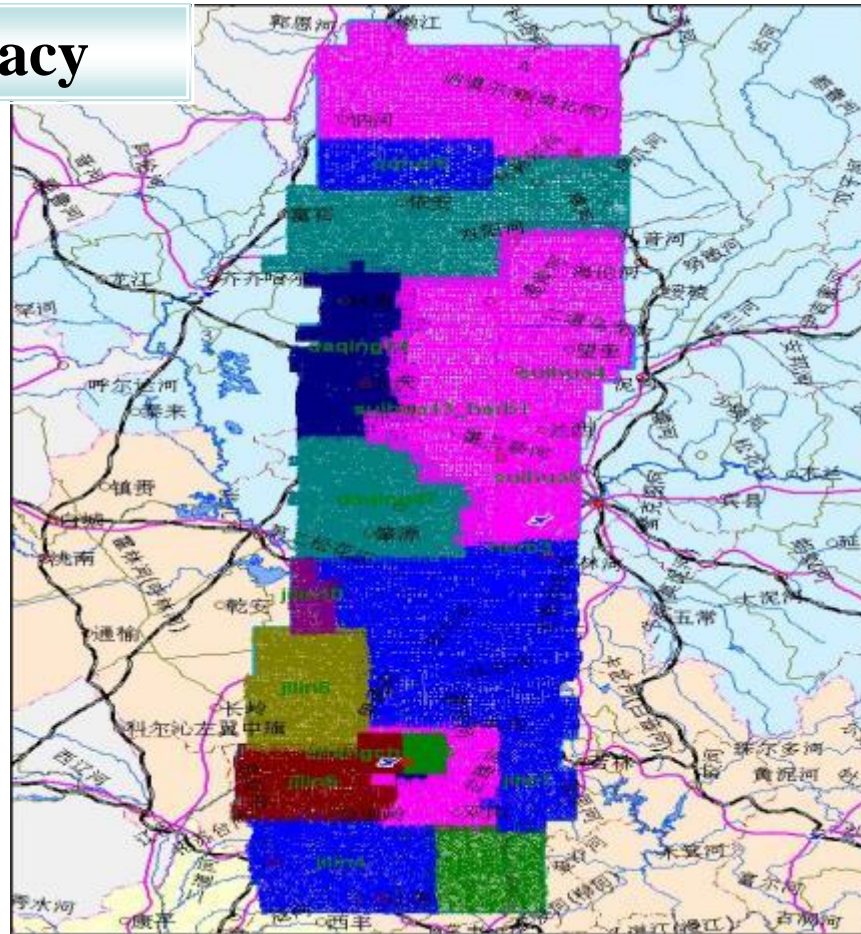
**Line-surface mixture CCD  
camera**



**Controlling the model  
torture to reach high  
vertical precision.**

## High positioning accuracy

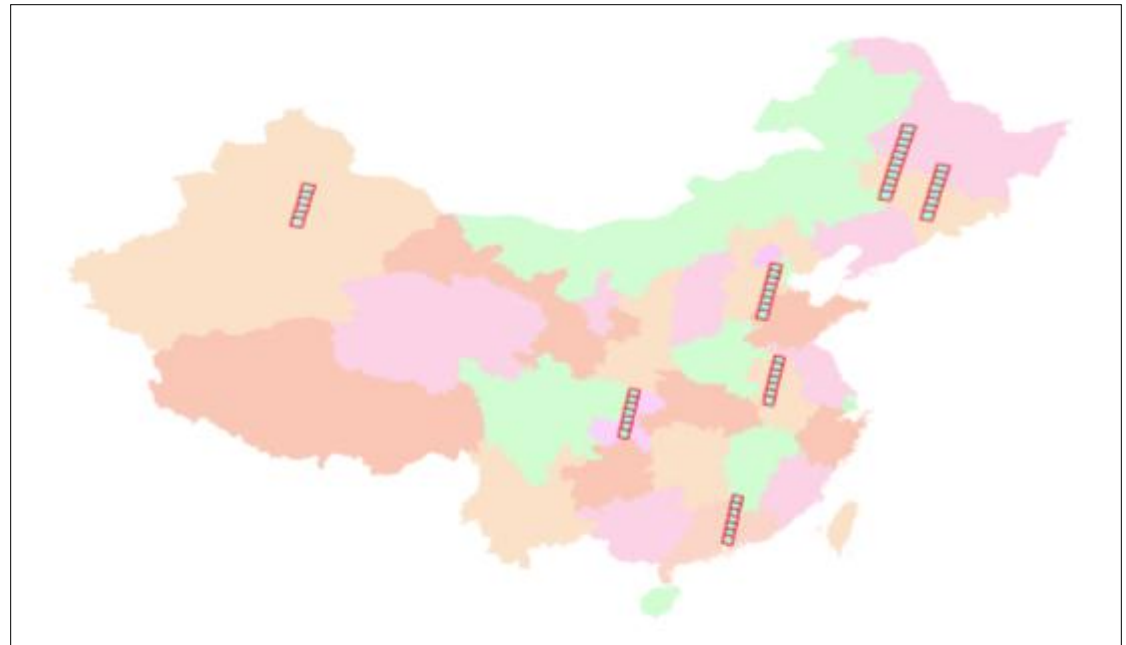
Long-term onboard measurement of the triplet camera parameters are committed by  $600 \text{ km} * 100 \text{ km}$  geometrical calibration.





## High positioning accuracy

**7 TH-1 satellite precision testing fields were built in China in 2011 and 2012 in China.**



**Testing fields distribution**

## High positioning accuracy

114 controlling points had been tested, the precision is better than 0.5 pixels.

Test items	results (m)
horizontal precision	10.3
Vertical precision	5.7
Positioning precision	11.8

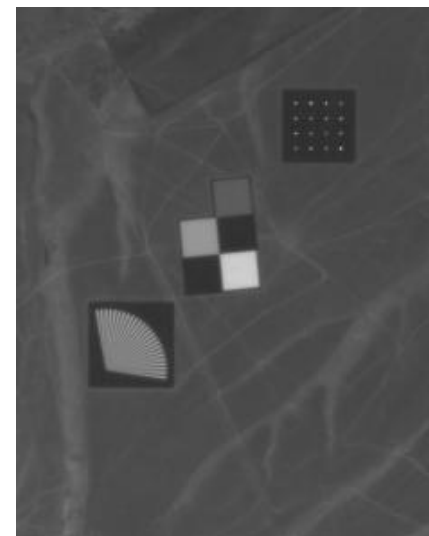
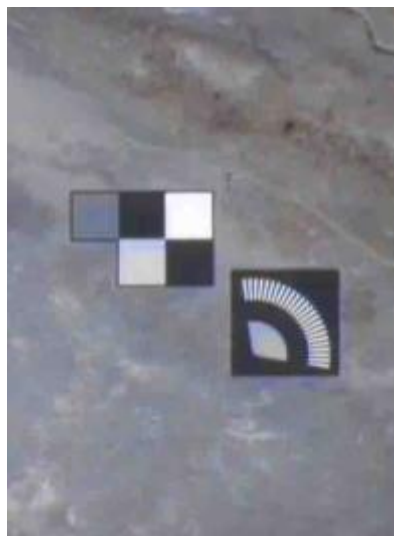
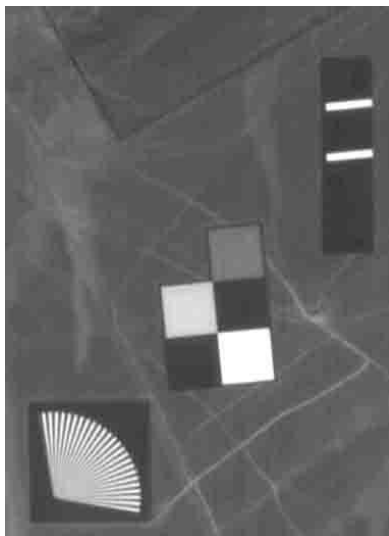
## **Data in set**

**Data are taken at the same time**

- \* Triplet forward, nadir and backward images**
- \* 2 m PAN**
- \* MSI**
- \* Orbit determination data**
- \* Attitude data**

## Data in set

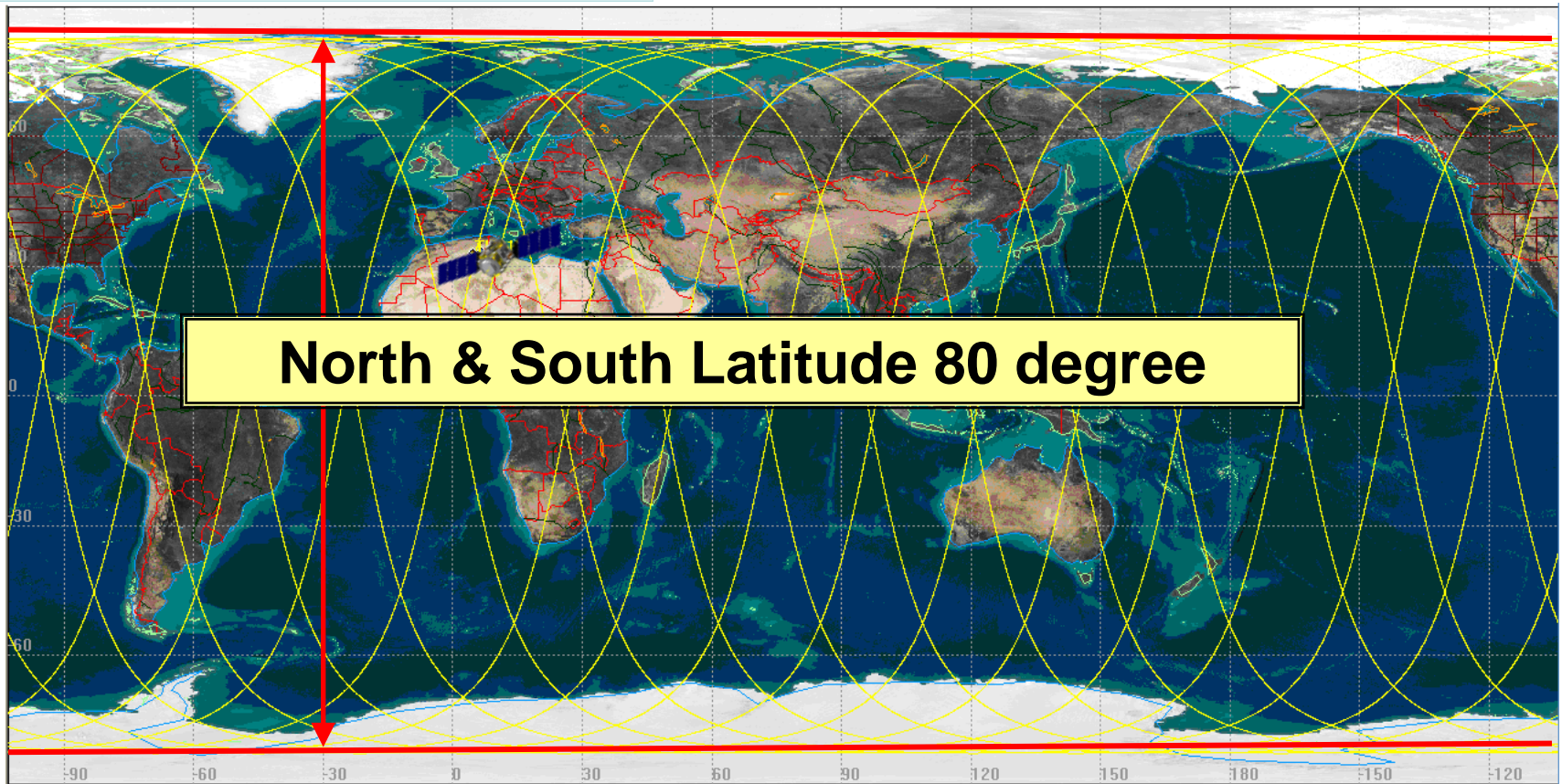
**Radiation test committed every year, offering definite radiation calibration and MTF parameters**



## High capacity of data acquisition

**Every single satellite could collect 1,500,000 km<sup>2</sup> every day images ( of PAN, MSI and triplet ) and 3,000,000 km<sup>2</sup> could be collected every day by 2 satellites.**

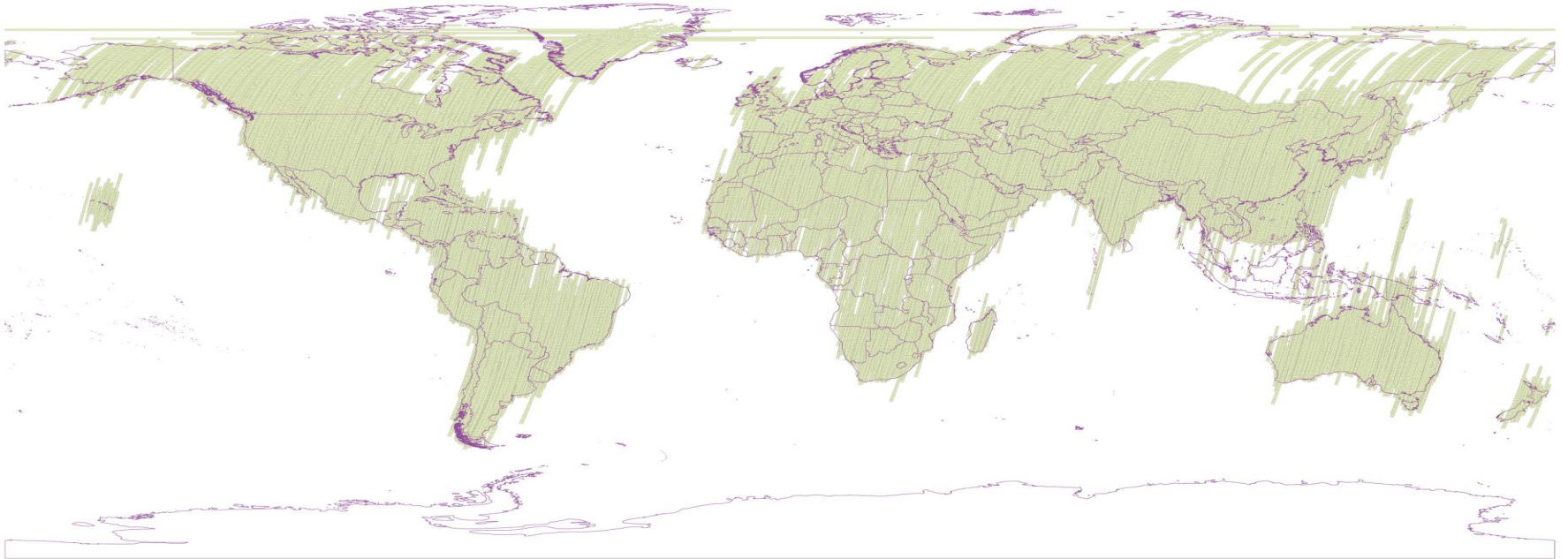
## Data acquisition



**Satellite Trajectory**



# TH-1 Features



World coverage by 28 Feb. 2014

# TH-1 Data Products

**1A**

**Result of radiometric correction based on 0 level image**

**1B**

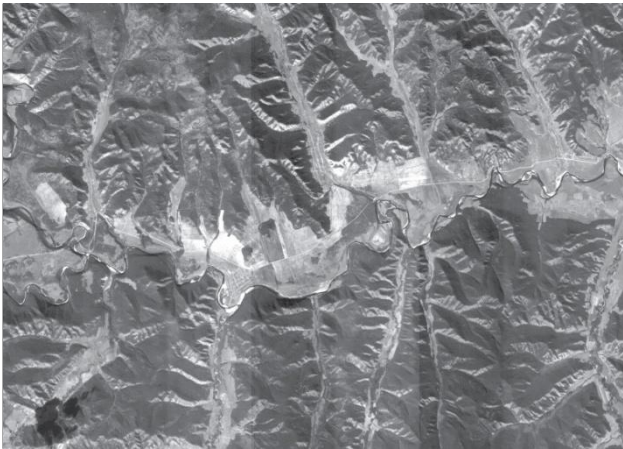
**Result of photogrammetry based on 1A level image**

**Orthophoto**

# TH-1 Data Products

**2 m PAN**

**Yakutsk, Russia**

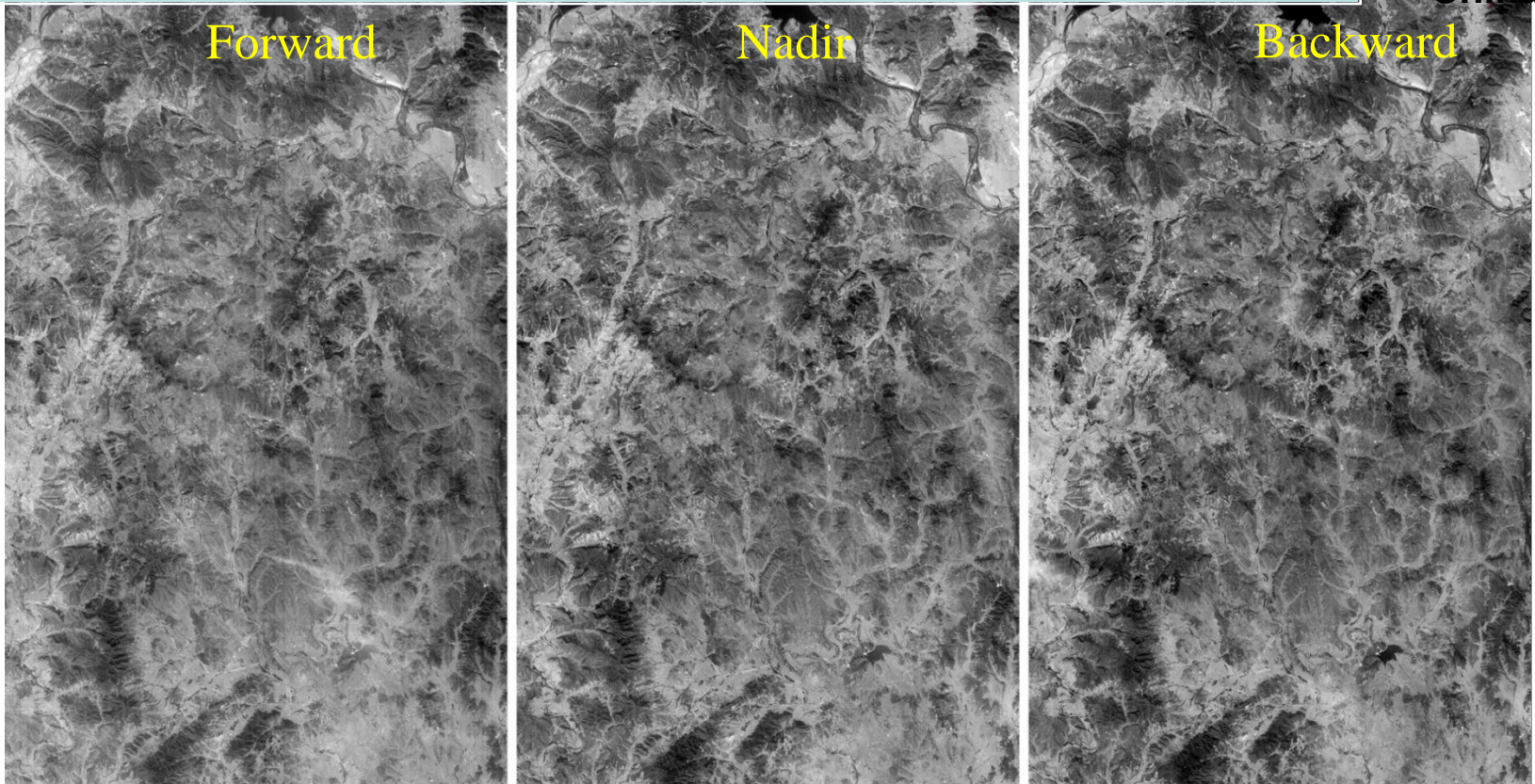


# TH-1 Data Products

## 5 m Triplet stereo images

3 sets of stereo pair acquisition provide more precise image than that by 2 sets

Tongling,  
China





# TH-1 Data Products

**10 m MSI**

**Tacoma, USA**



# TH-1 Data Products

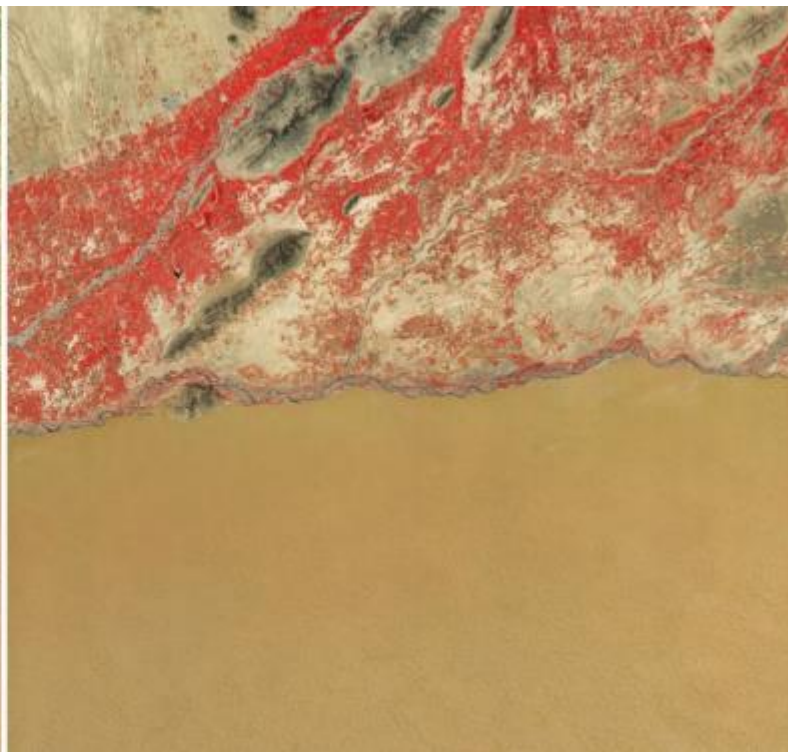
**10 m MSI**

**Kanimdahar, Afghanistan**

**Nature color**



**Color infrared**





# TH-1 Data Products

**2 m Fusion**



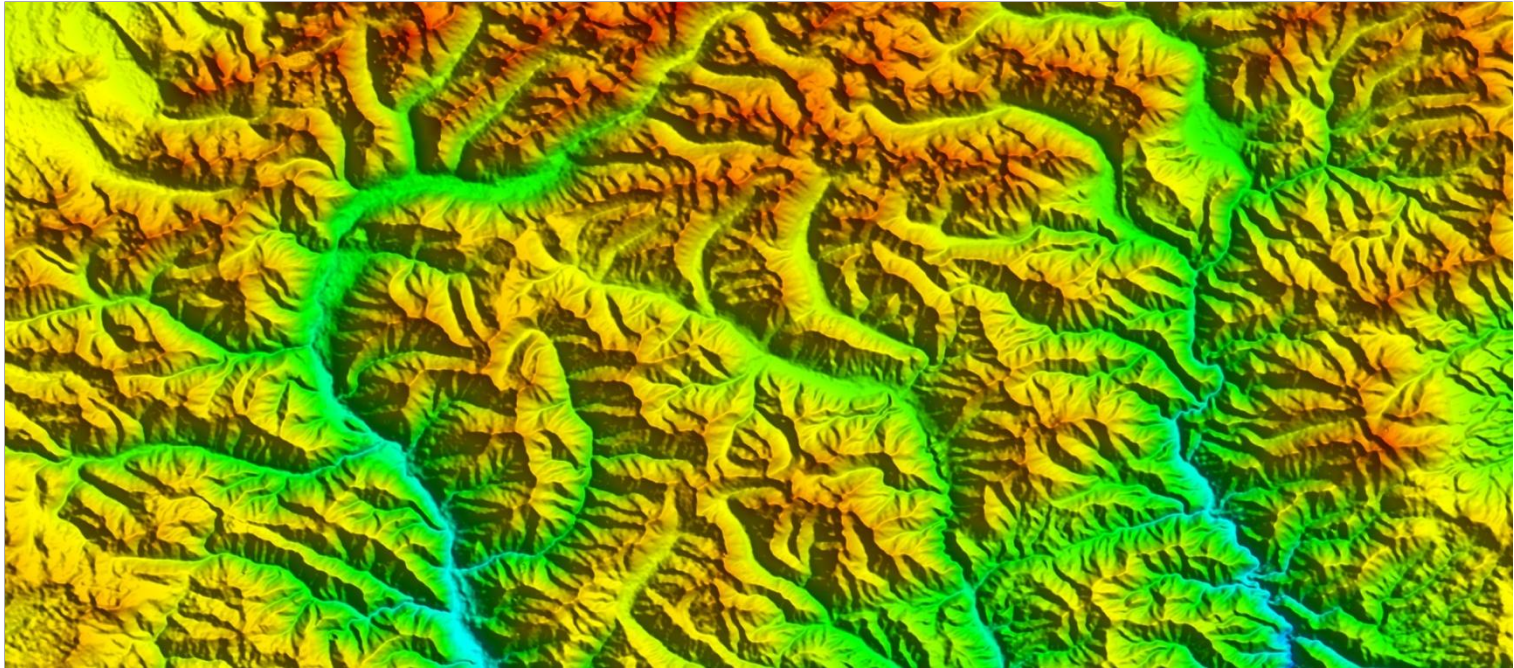
**Farmland,  
Brazil**

2012. 8. 24

# TH-1 Data Products

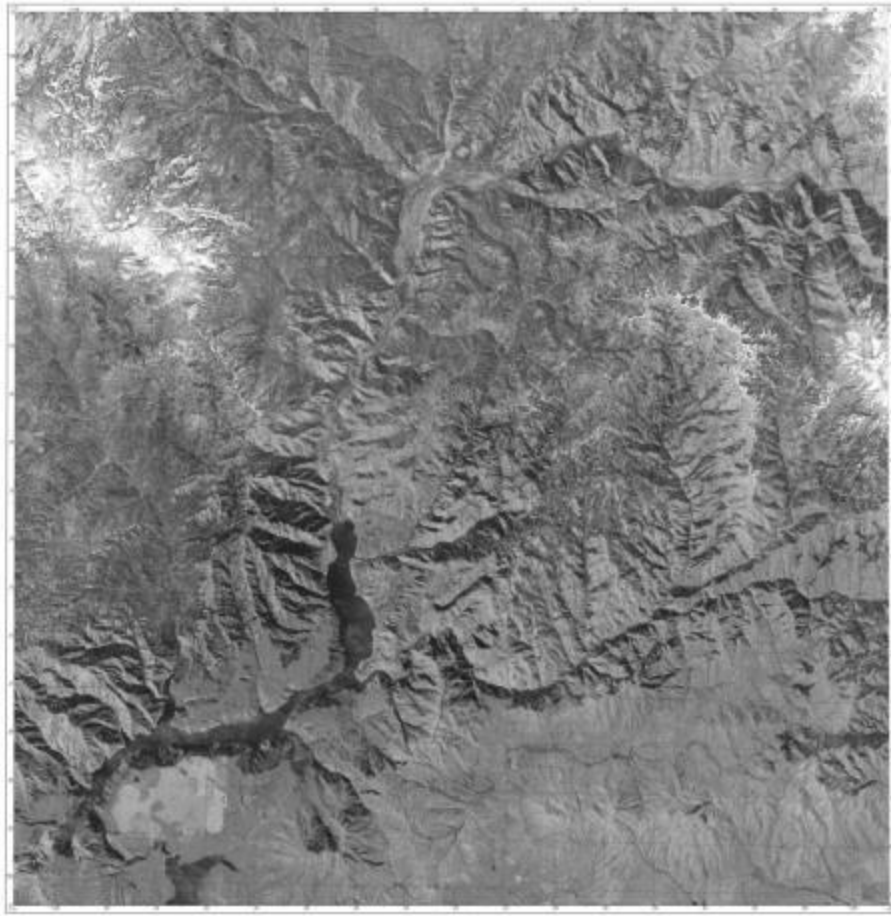
**DEM**

**Idaho, USA**



# TH-1 Data Products

## Orthoimage





# TH-1 Data Products

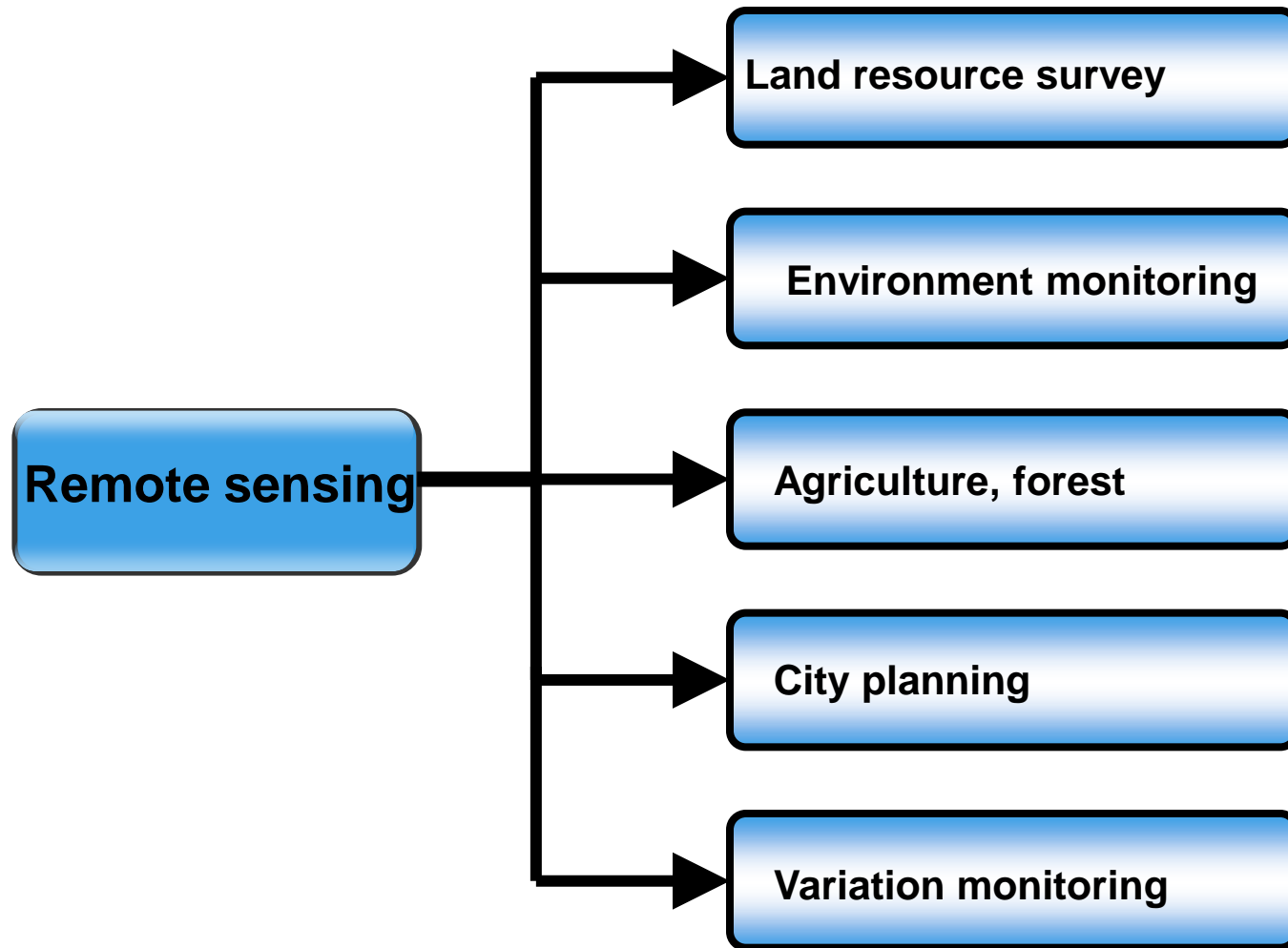
**1:50 000  
topographic map**



# TH-1 Application

**TH-1 offers precise, rich, reliable and dynamic geoinformation resources for the application of topography, land resources survey, environment monitoring, city planning, agriculture, forest, land use, water resources and geological survey.**

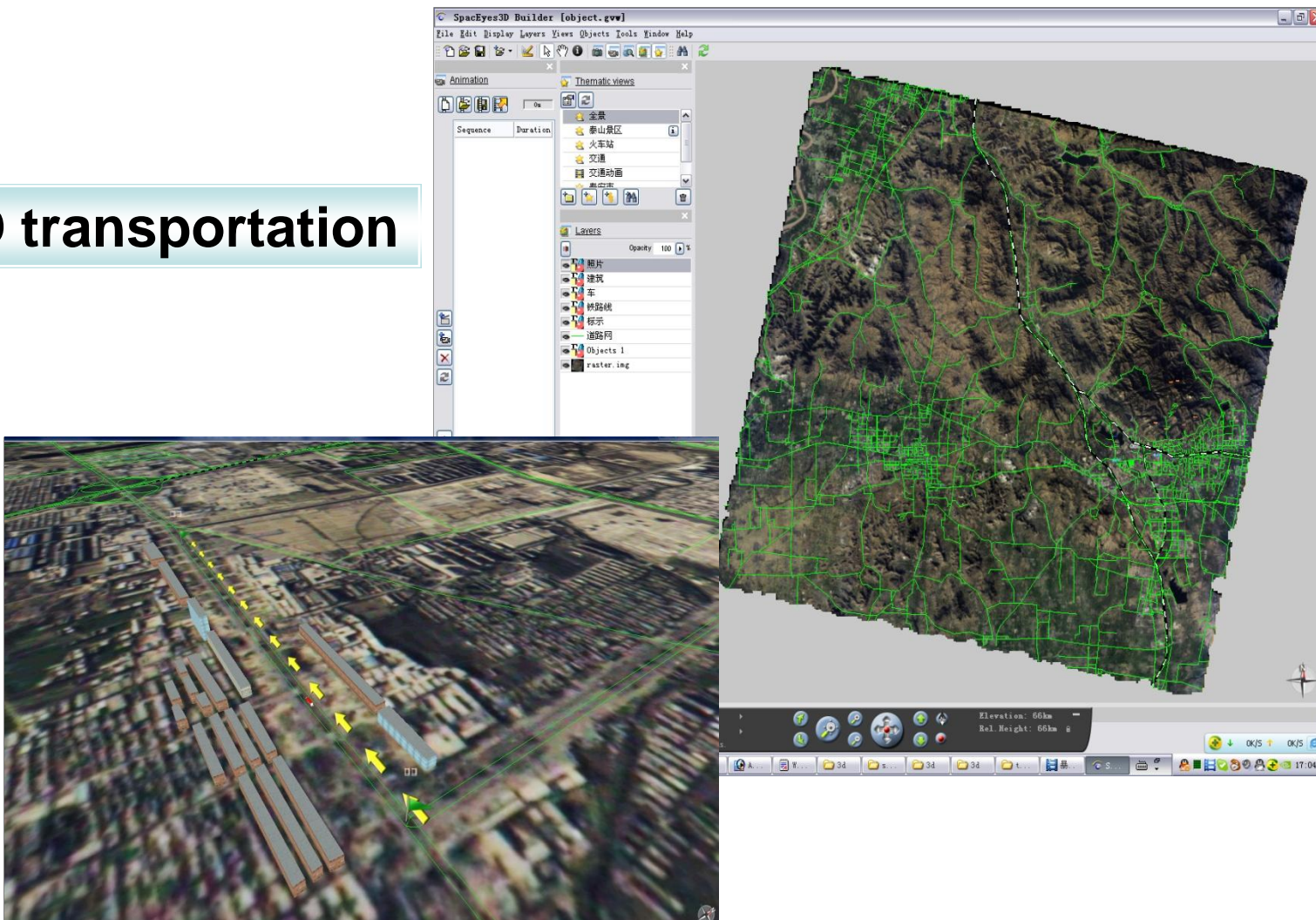
# TH-1 Application



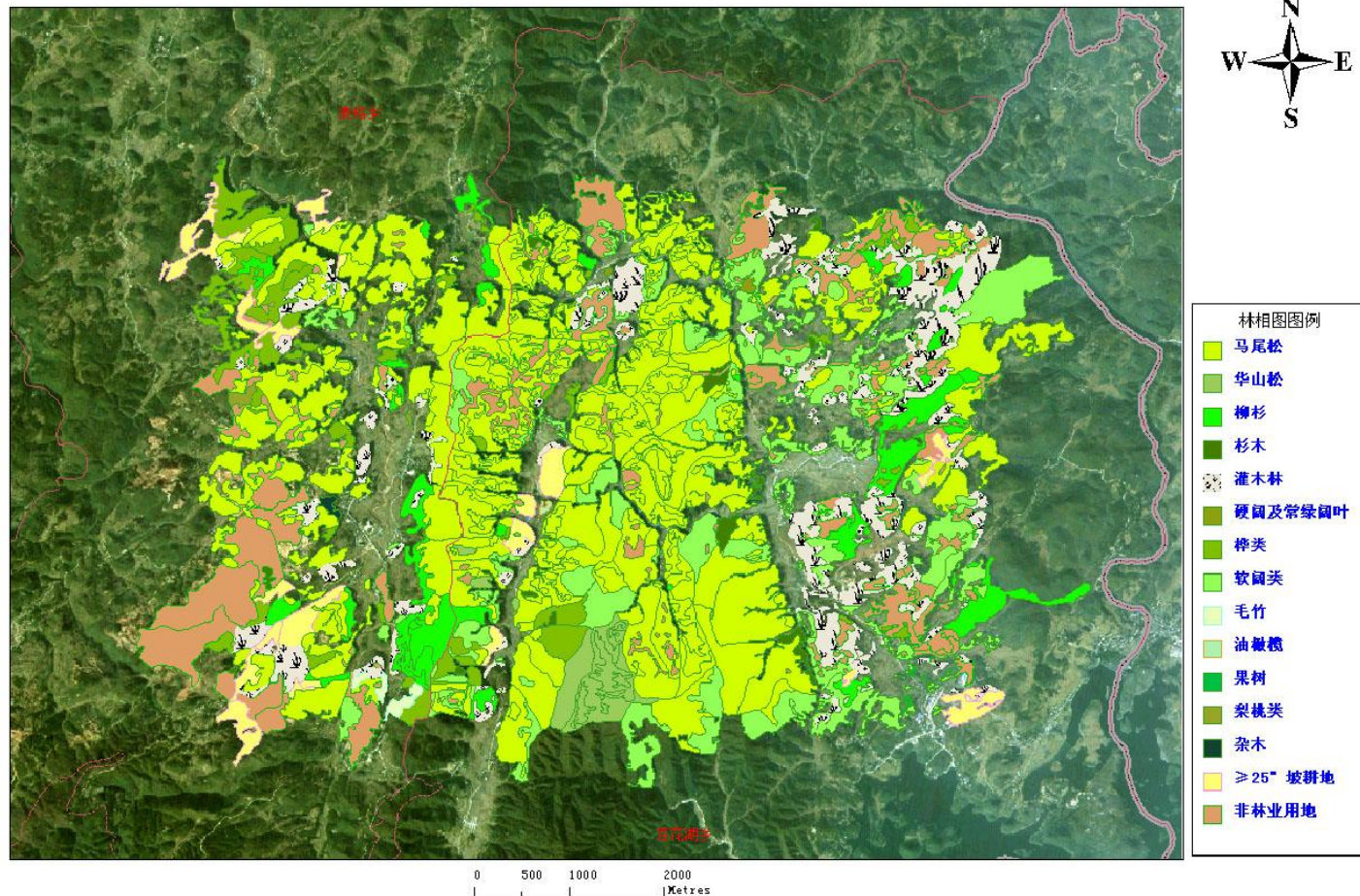


# TH-1 Application

3D transportation



# TH-1 Application

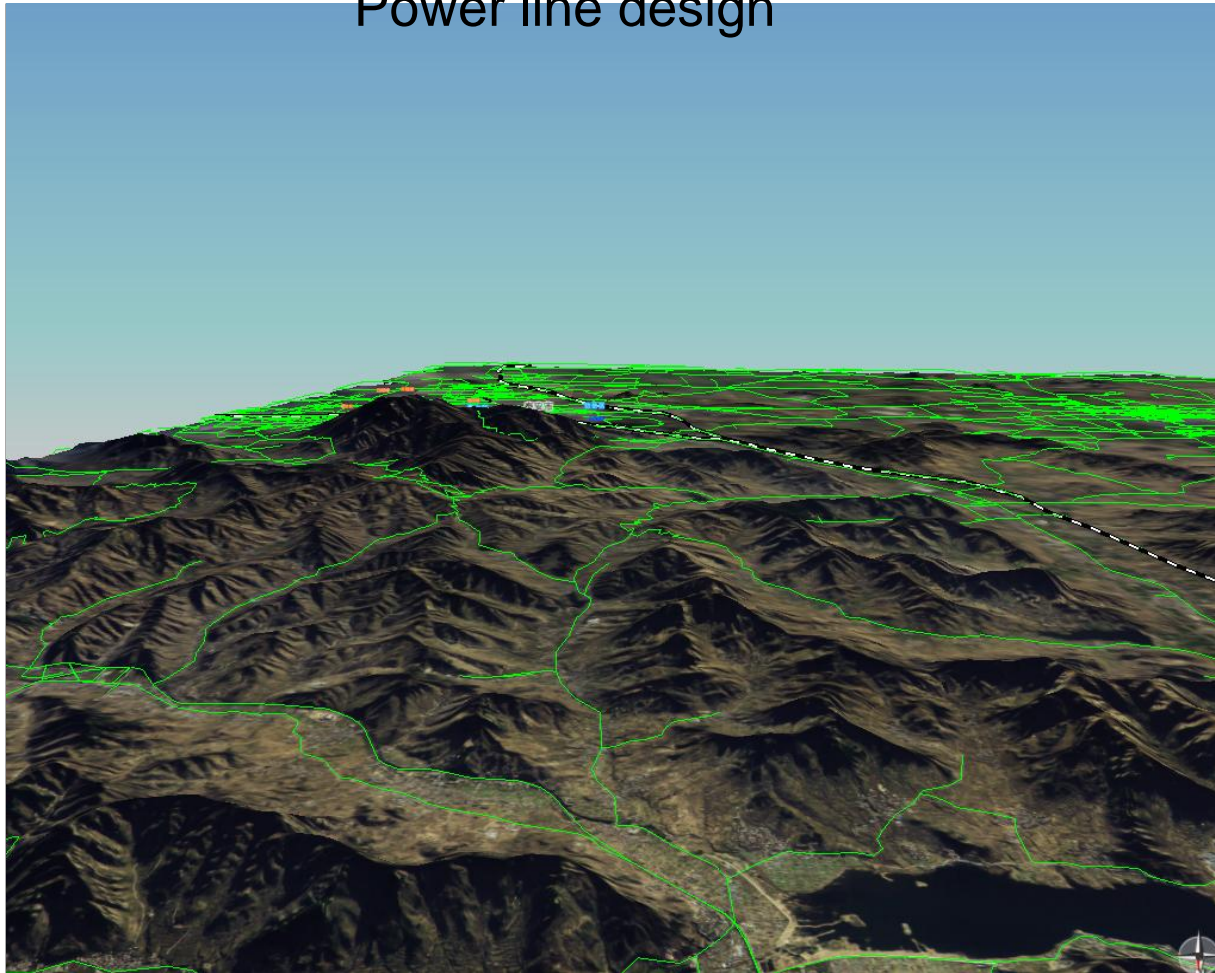


Forest resources map of Guizhou Province, China



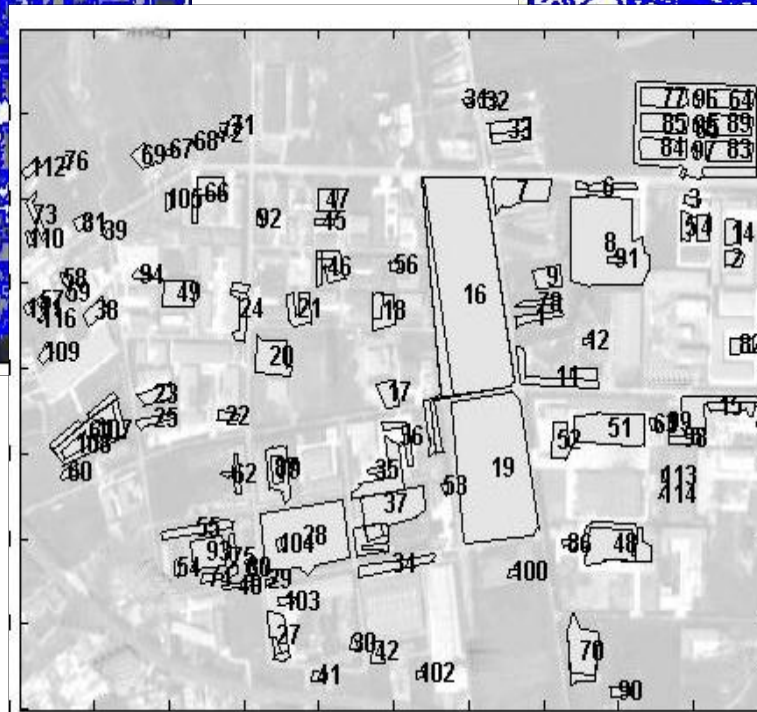
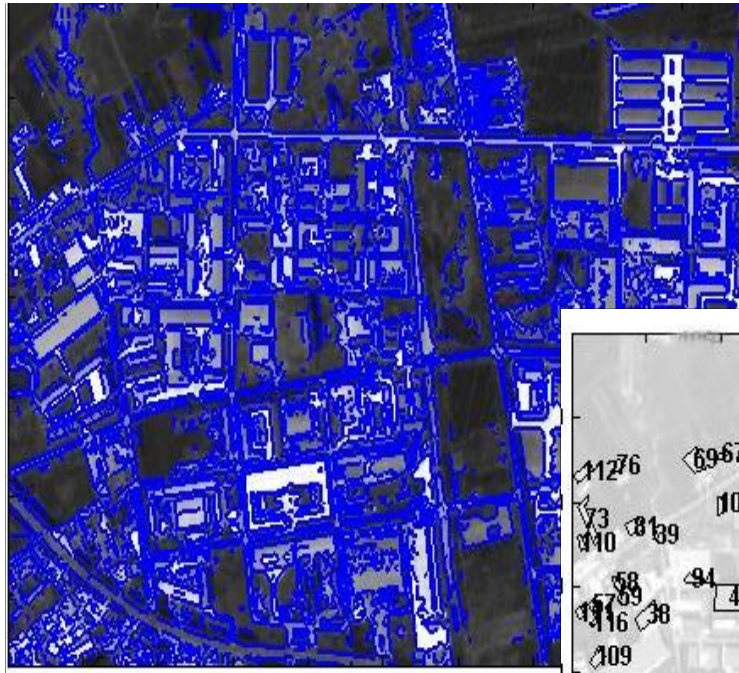
# TH-1 Application

Power line design



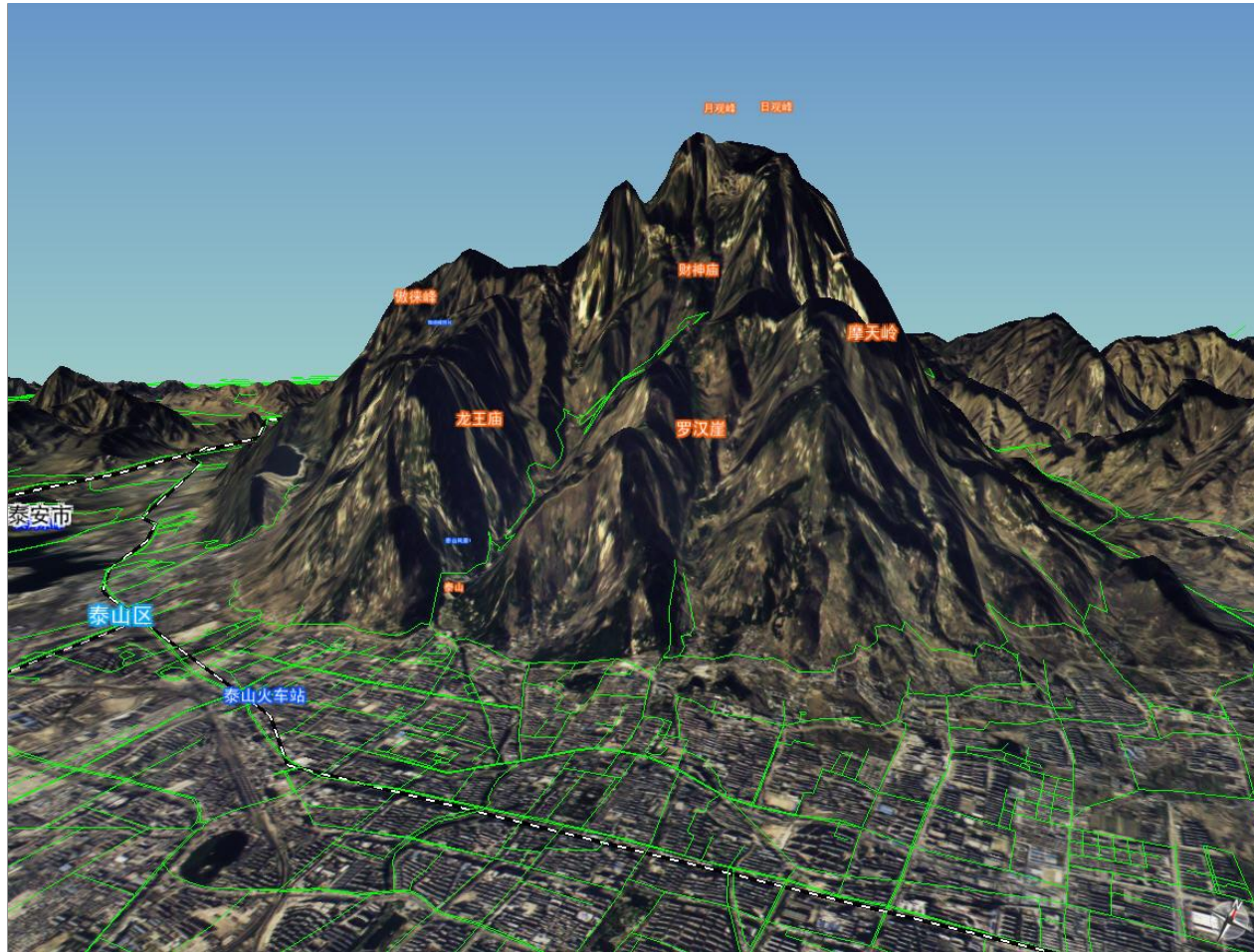
# TH-1 Application

## Automatic extraction of buildings



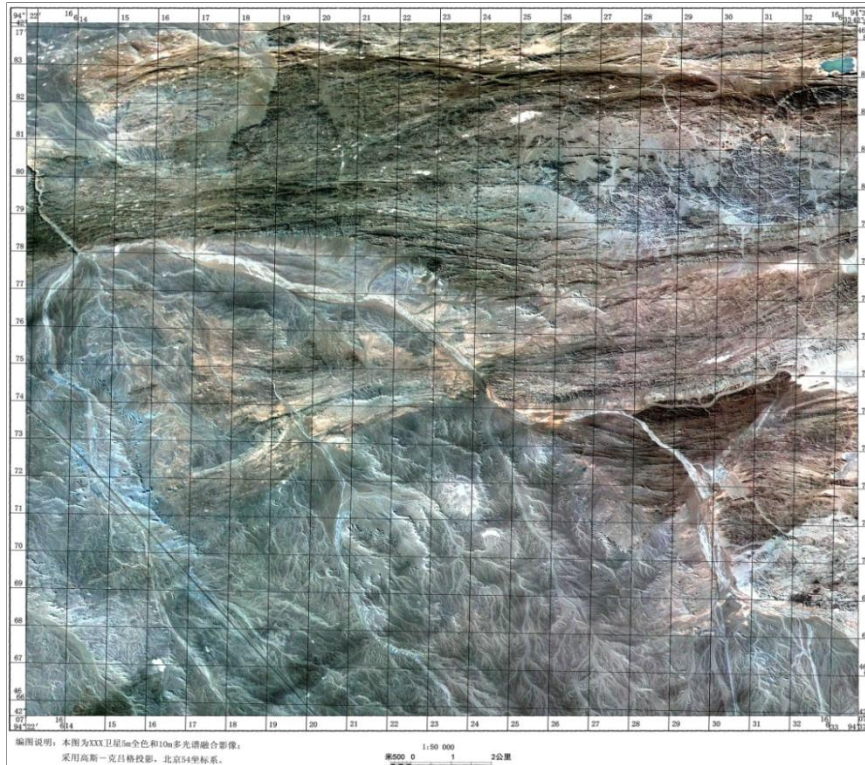


# TH-1 Application

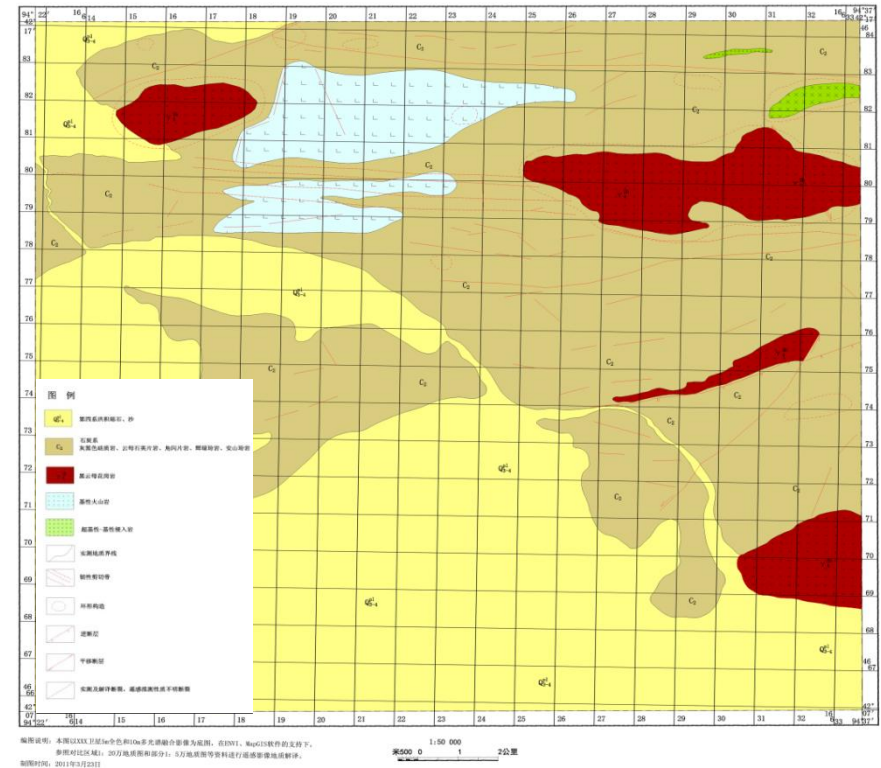


**3D image of tourist spot**

# TH-1 Application



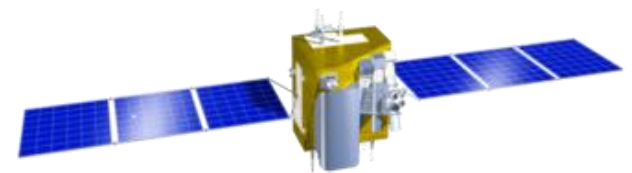
## Image of Xingjiang



## Geological interpretation

# Development Programme

TH-series satellites is a continuous Chinese earth observation project. TH-1-03 will be launched in 2015, and the optical 1 m (designed as 0.6 m) resolution satellite will be launched before 2020 with swath width of 40 km.





# Development Programme

Other TH satellites are under developing which includes INSAR, gravity, laser altimeter, magnetism, gravity gradient and ocean surveying to meet the multiple data needs.





**THANK YOU**