



## **Utilisation of VNREDSat-1 sensor on forest fire protection**

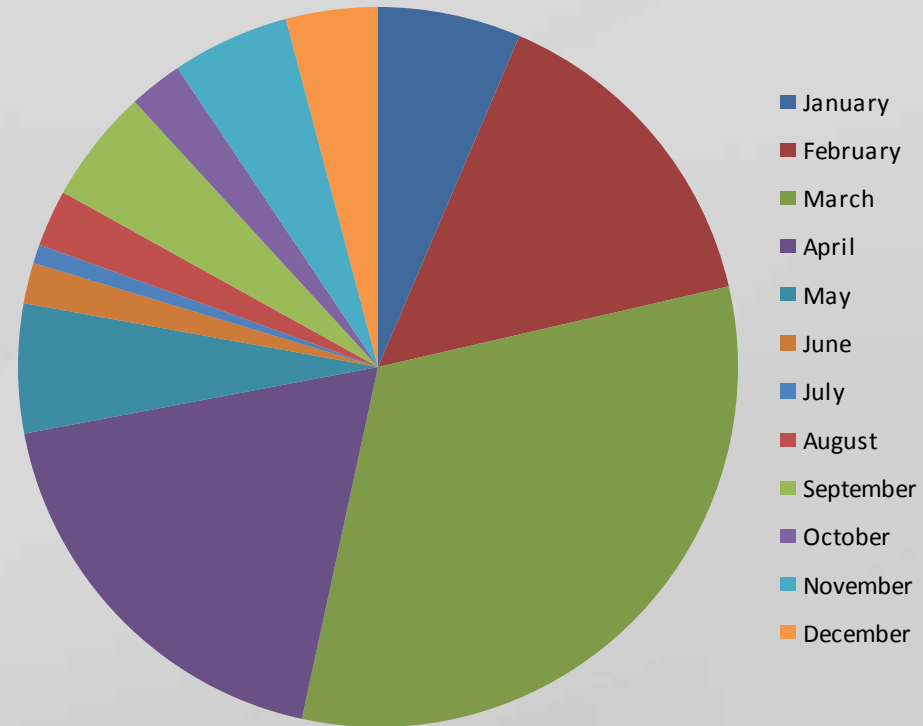
*Pham Dinh Thang*

*Optical Instrument Engineer, VNREDSat-1 system operation Department  
Space Technology Institute, Vietnam Academy of Science and Technology*

*Bangalore, April, 2014*

# Quick statistic of forest fire area in Vietnam in 5 years

	2008	2009	2010	2012	2013	Total
January	521	513	961	124	1071	3190
February	73	2201	2760	897	1498	7429
March	1594	1645	7028	1289	4321	15877
April	1325	614	4117	1780	1413	9249
May	329	219	1411	220	702	2881
June	130	125	188	58	406	907
July	160	32	61	154	14	421
August	168	119	707	267		1261
September	76	134	2114	223		2547
October	42	94	776	282		1194
November	56	118	1087	1359		2620
December	112	298	254	1382		2046
<b>Total</b>	<b>4586</b>	<b>6112</b>	<b>21464</b>	<b>8035</b>	<b>9425</b>	



## Forest in Vietnam

- Forest area: 14 millions hectares, cover ~40% land territory area.
- Various type of forest: coniferous forest, deciduous forest, tropical forest, mangroves, bamboo...
- Importance: maintenance of the ecosystem, green lungs, wood resources for the economic, flood prevention, means for people livelihood



Pine forest, Northern  
Vietnam



Mangrove forest, Southern  
Vietnam



Tropical Forest, Cuc Phuong  
National Park

## Forest in Vietnam is in danger.

- Climate change: extreme climate change: el nino, la nina....
- Forest fire
- Pest.
- Deforestation
- People livelihood
- .etc.



Forest fire in Hoang Lien Son National parks

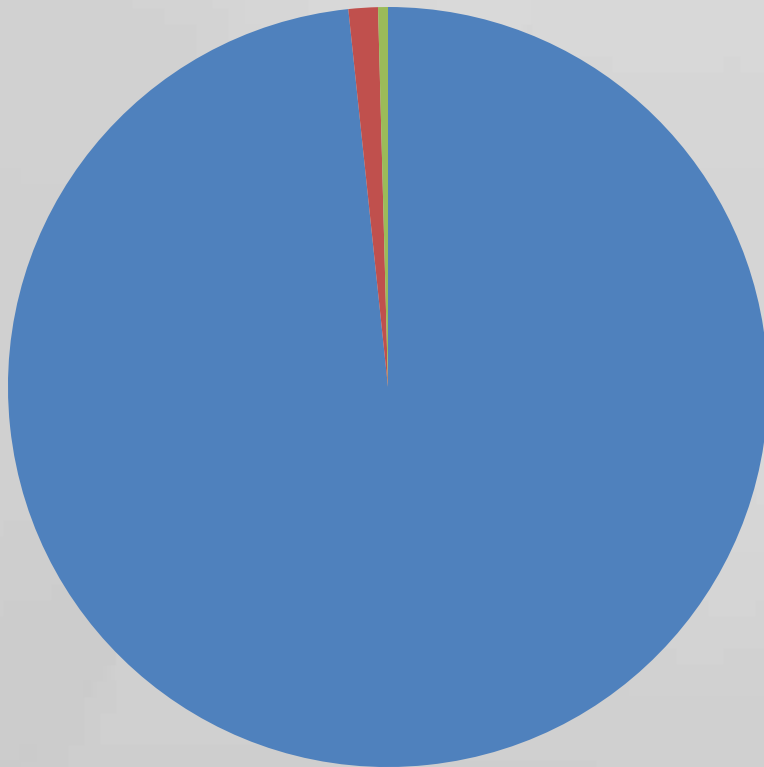


Deforest to make plant field in Northern Vietnam

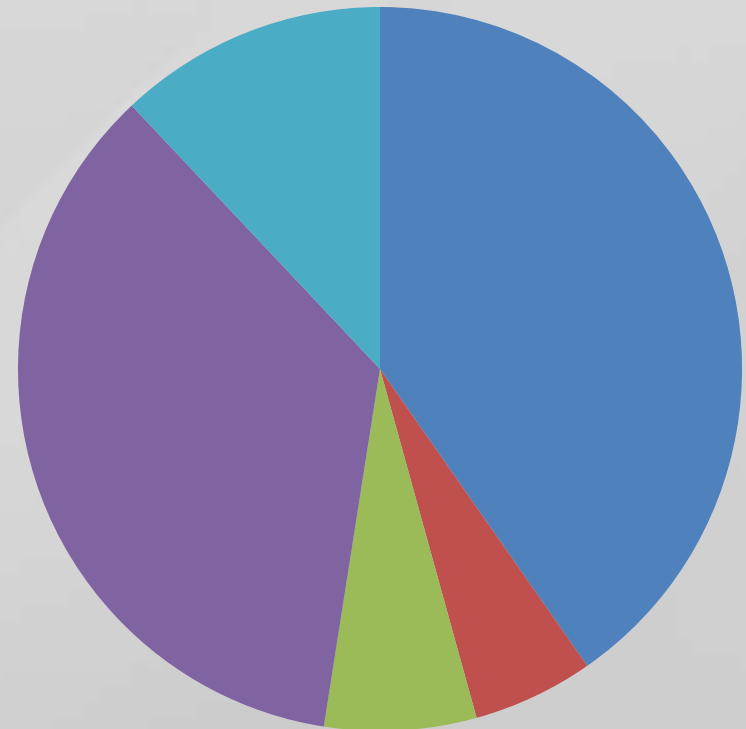


Deforestation in Central Highlands

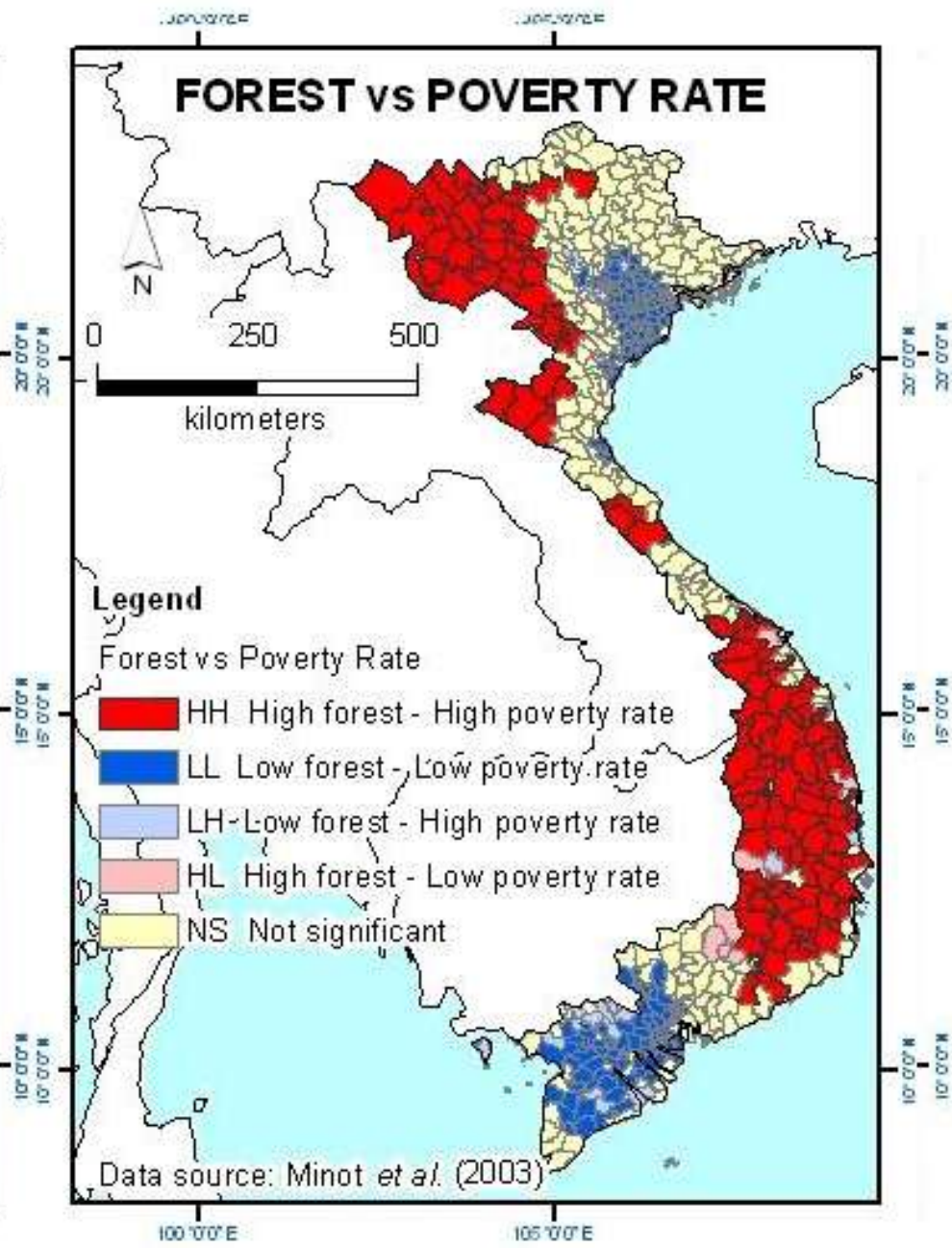
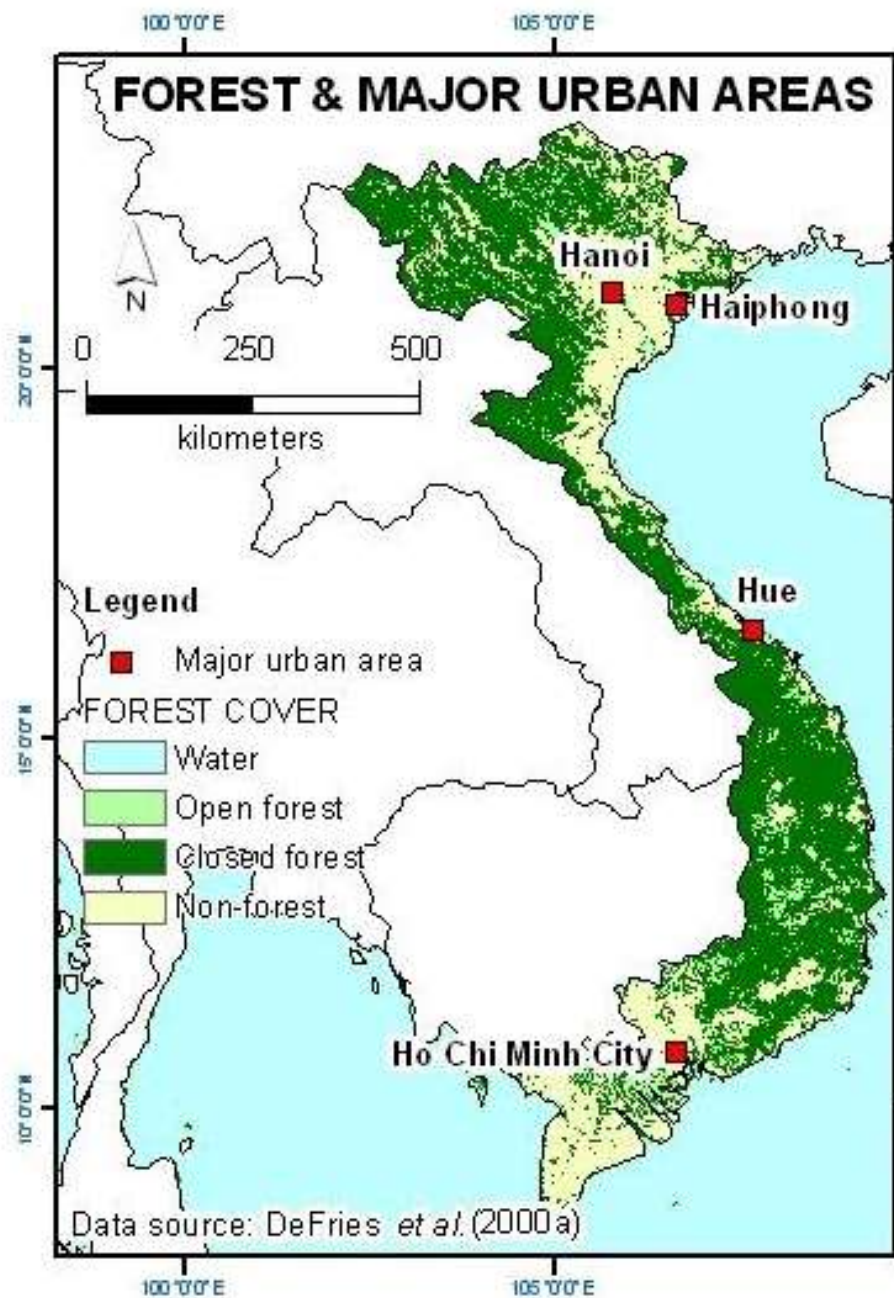
## Statistic of deforestation in Vietnam in 2012.



■ Total forest area: 13400000 
 ■ Reforestation area: 170000  
■ Deforestation area: 57000



■ Authorised Exploitation 
 ■ Forest fire  
■ Unauthorised Exploitation 
 ■ Deforest for plant field  
■ Others





*Smoking the bee hive for honey – Reason for forest fire*

## Current approach of forest management and forest fire protection

- Meteorological station for each forest area, providing information for forest fire alarms. Most stations were built since 1995s. Technology is outdated
- Forester.
- Forest firefighting equipments and infrastructure: rudimentary

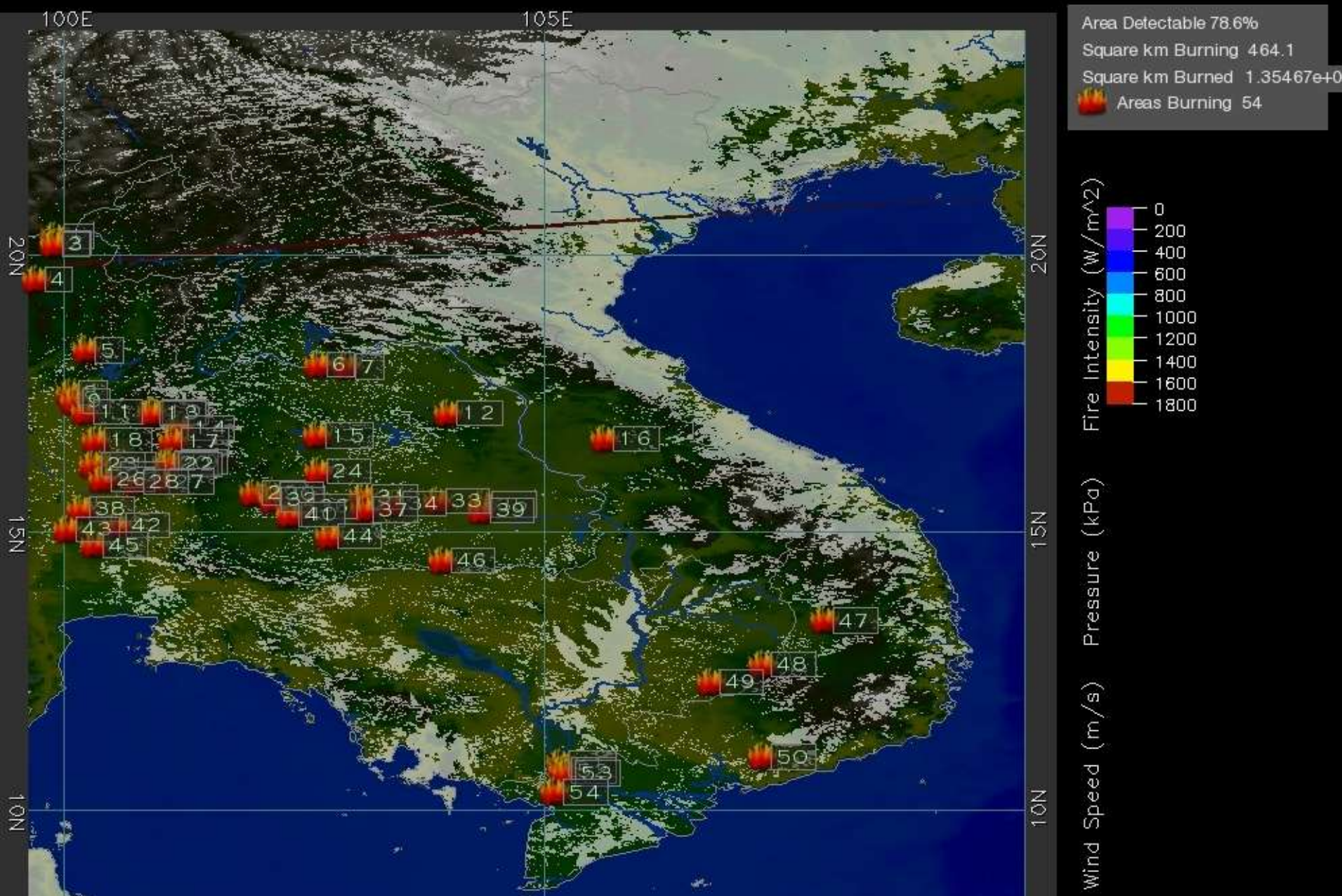


*Meteorological station  
in Son La, Vietnam*

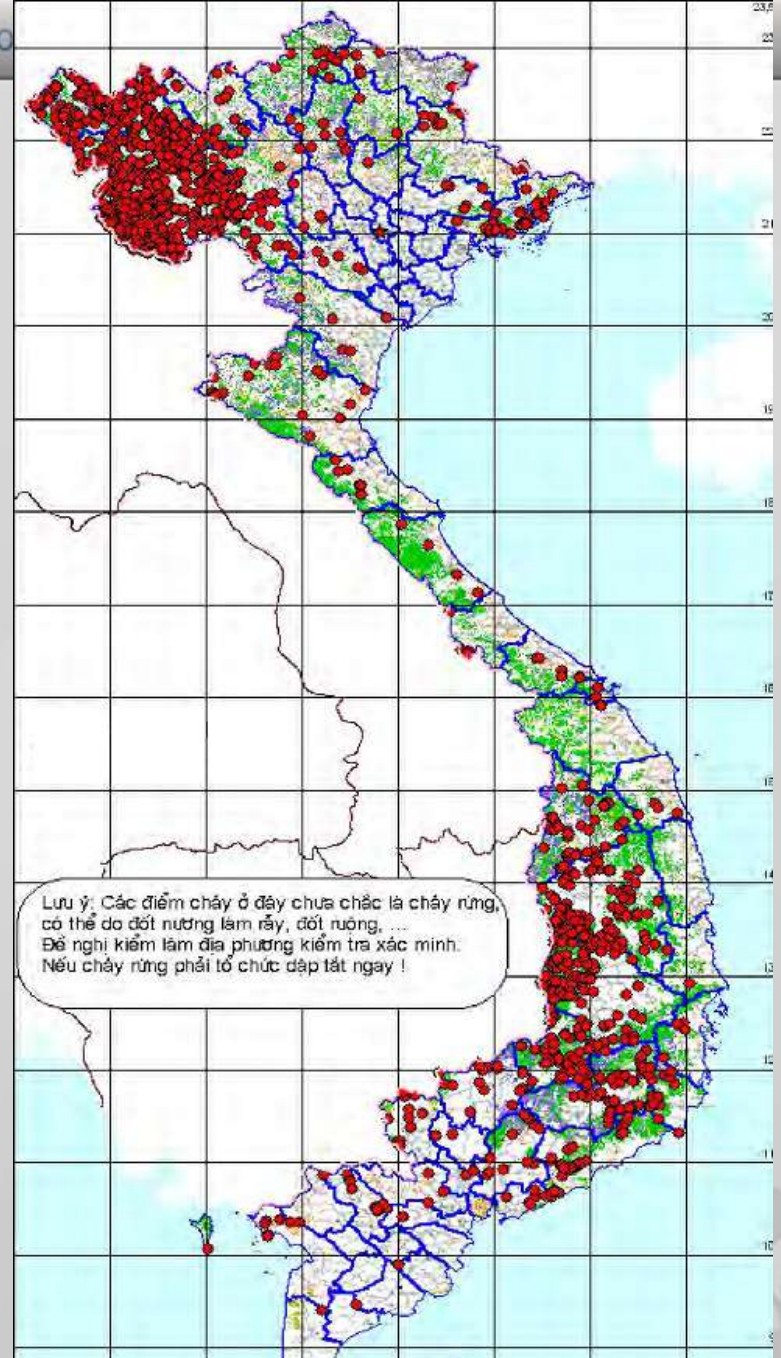
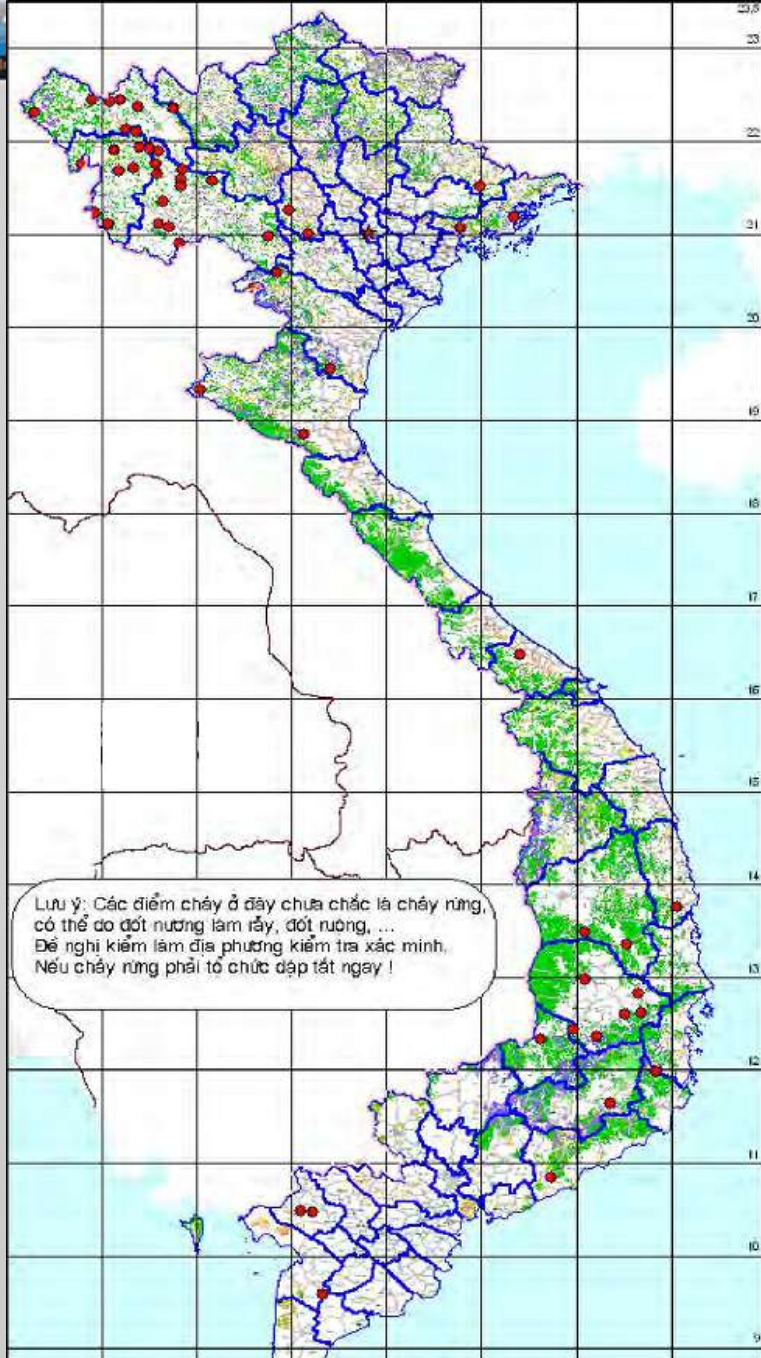


*Forest firefighting in Hoang Lien Son  
National parks*

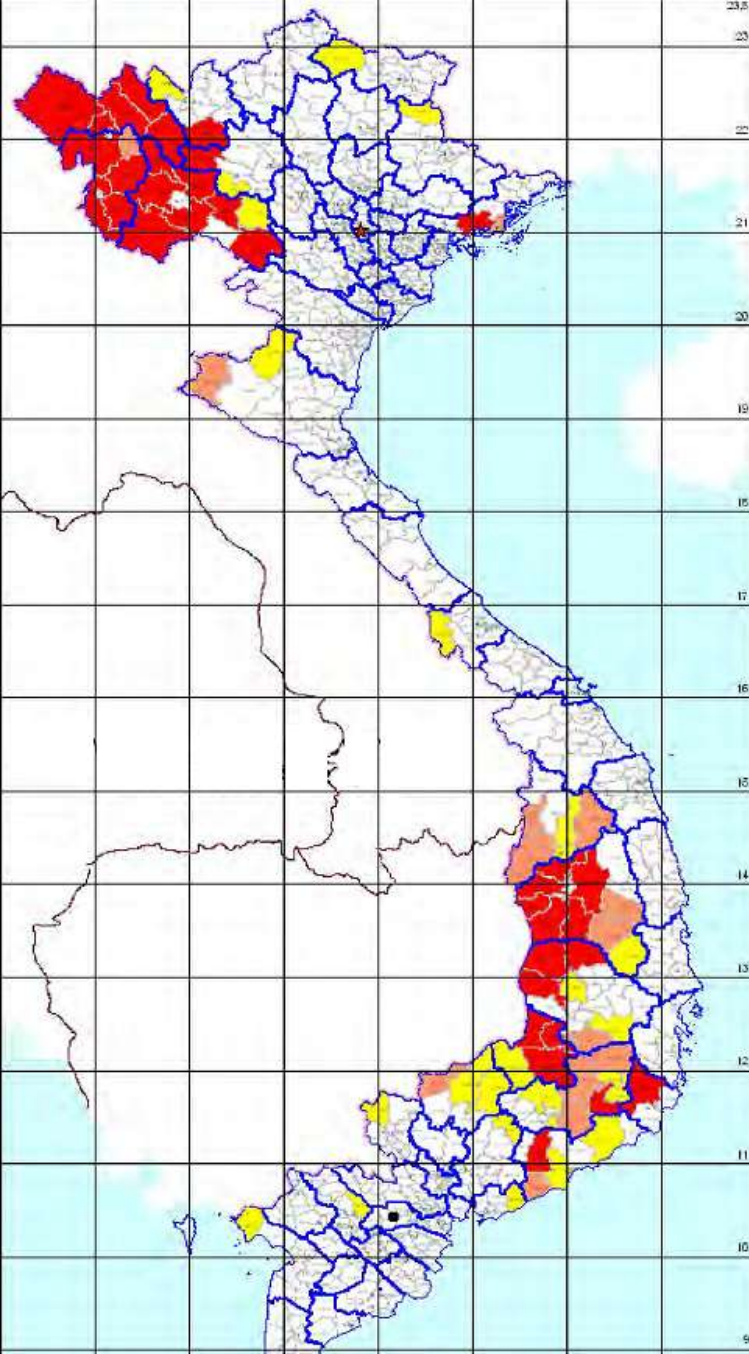









FireWatchVN system – based on MODIS image on 05/12/2013

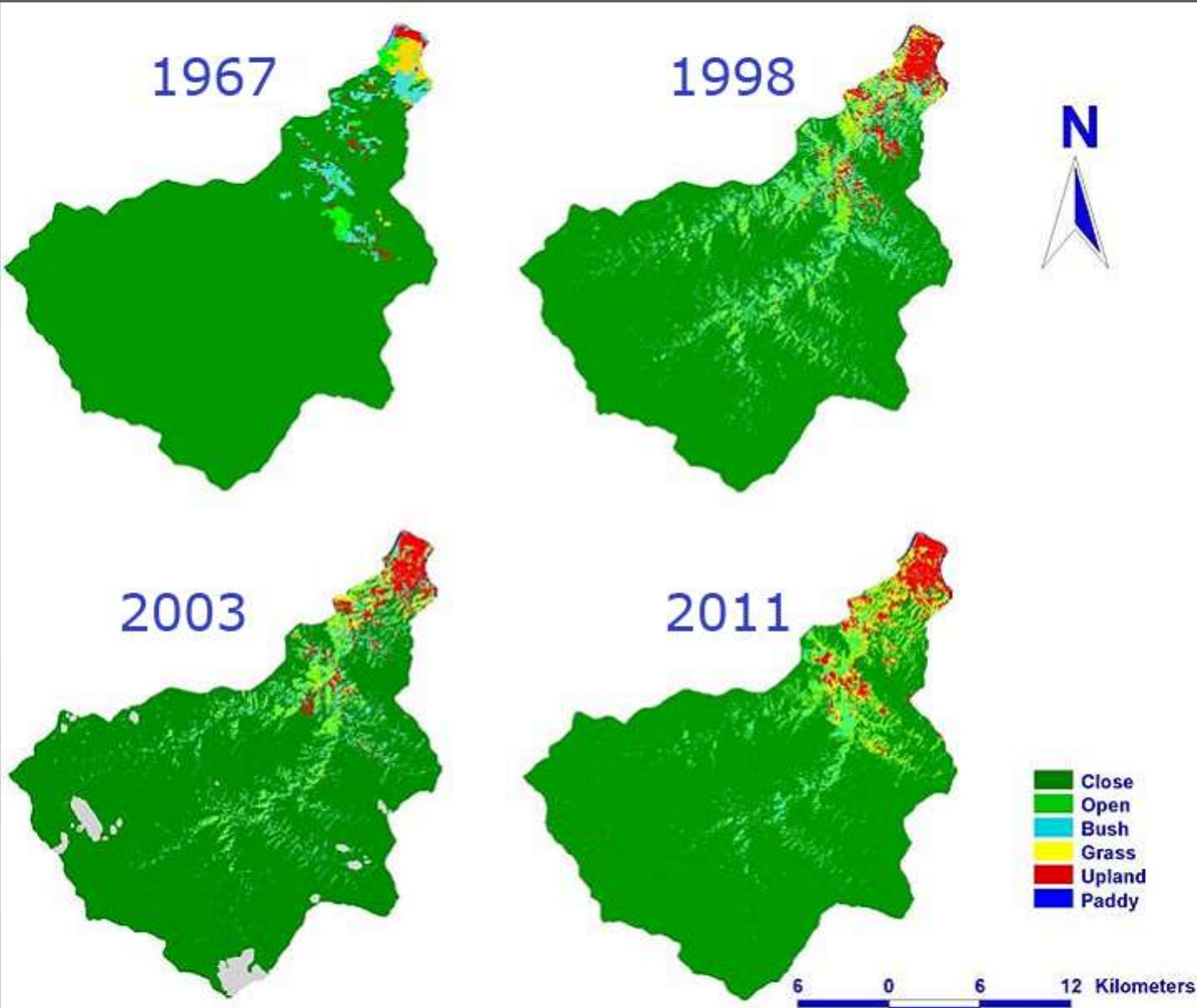


Statistic of forest fire in 2013 (left) and within 5 years (right)



-  Red: extremely high fire hazard
-  Orange: high fire hazard
-  Yellow: normal fire hazard
-  White: small fire hazard
-  Blue: no fire hazard

Forest fire hazard map in Vietnam – data for 2014



Expansion of Urban area in Con Cuong district, Nghe An province, Landsat Image

**On June/2013, the Ministry of Agriculture and Rural Development of Vietnam officialy issues:**

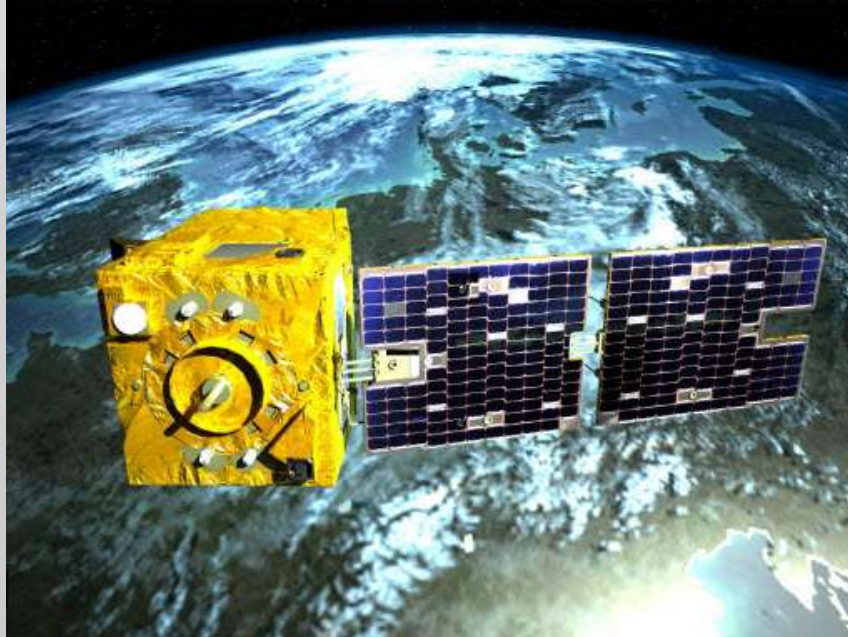
*"National programs for Capacity Building of forest fire protection, period 2013 – 2020"*

The main objectives of the programs are:

- Capacity building for forest management and forest fire protection staff, from central to local.
- Investment on firefighting equipments and infrastructure. Priority on building national firefighting force to deal with fire disaster at large scale.
- **Enhancement of forest management capacity, using modern technologies: information & telecommunication, remote sensing technology.**

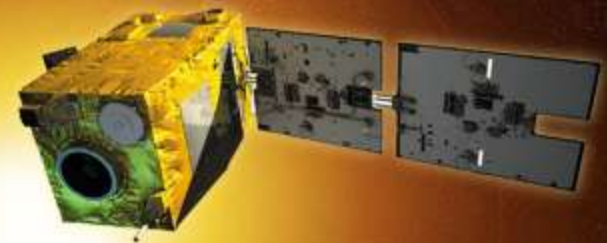
## Utilisation of VNREDSat-1 sensor on forest fire protection

- Research of forest using remote sensing technology and satellite image data (vnredsatsat1)
- Building of forest management and fire protection map
- Research of satellite sensor technology for FF.protection





# VNREDSat-1



## VNREDSat-1: Low earth orbit multispectral satellite. Launched on 07/05/2013

Orbit altitude:	680 (km)
Revisit time:	3 (days)
Sensor:	NAOMI 125
Spectral bands:	PAN: 449 – 743 (nm) B1: 451 – 522 (nm) - Blue B2: 532 – 596 (nm) - Green B3: 630 – 698 (nm) - Red B4: 765 – 885 (nm) - NIR
Ground Sampling Distance:	PAN: 2.5 (m), MS: 10 (m)
Swath Width:	17.5 (km)

### Standard products:

- ✓ Level 1A
- ✓ Level 2A
- ✓ Level 2A pan sharpened

### Advanced products:

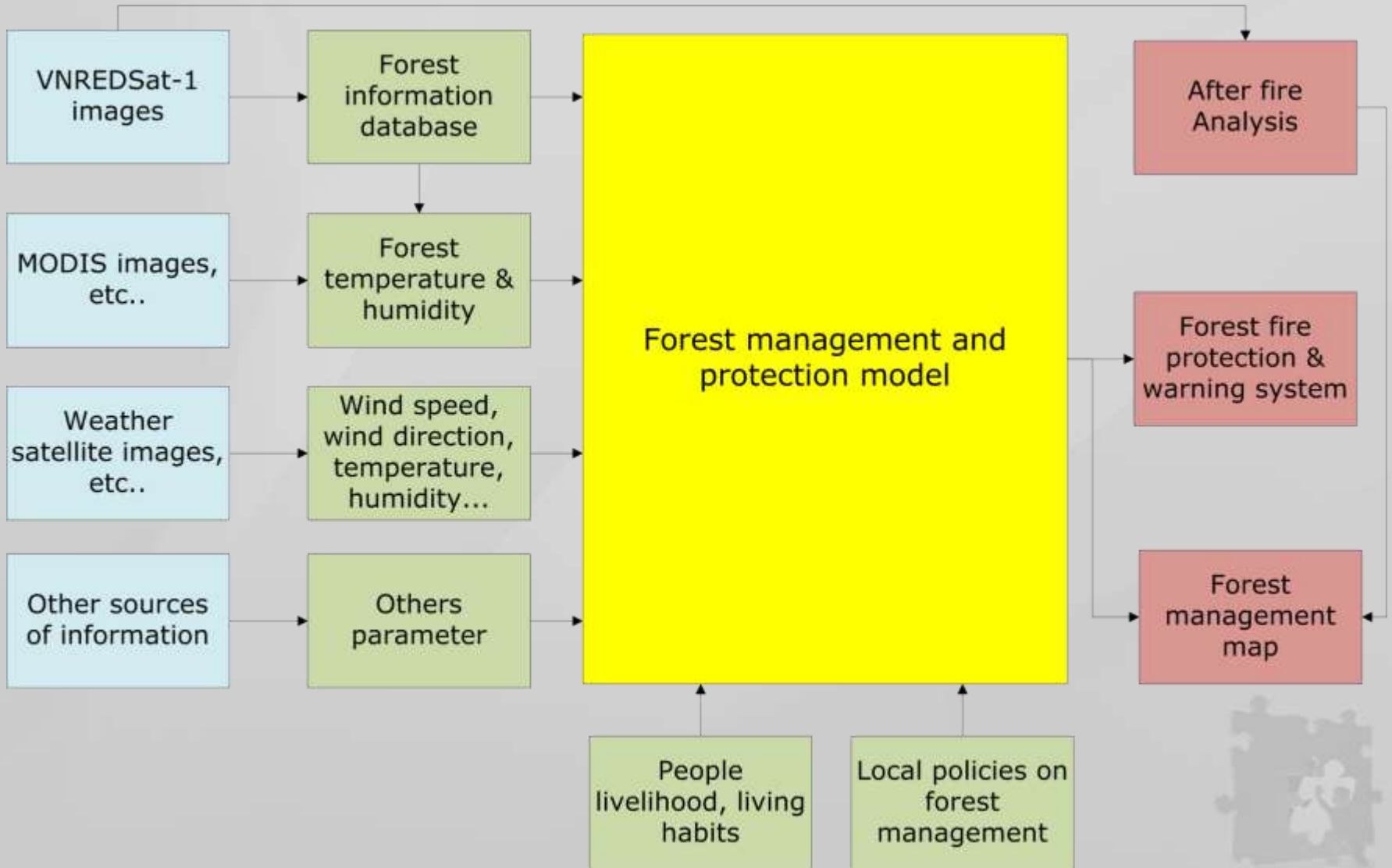
- ✓ Level 3
- ✓ DEM



*VNREDSat-1 images of deforestation in Dak Lak Province, Central Highlands, Vietnam*

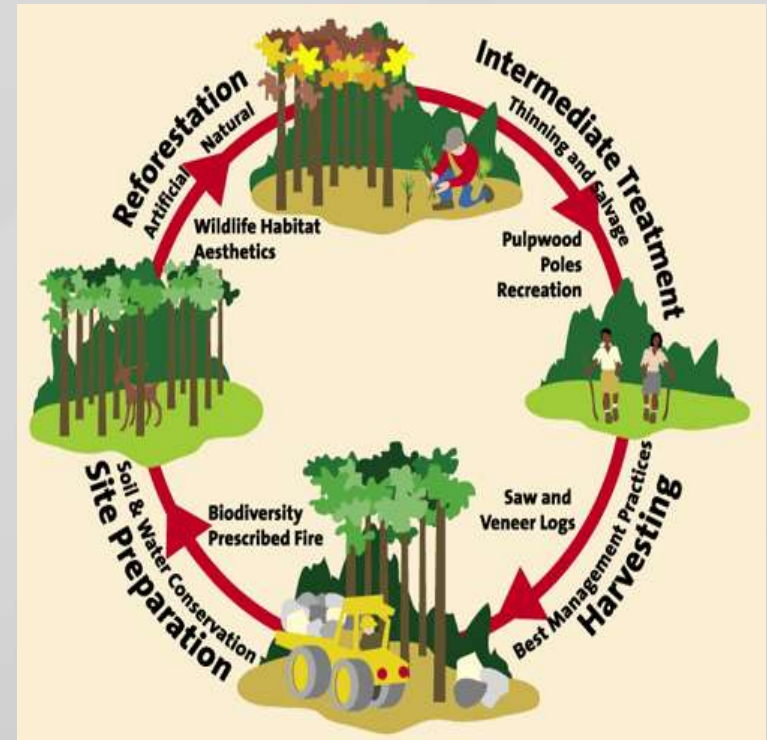


## Forest management model & map



## Benefications from the National Forest management map

- Systematically monitor of the forest information and statu
- Reforestation
- Efficiency exploitation of the forest resources
- Forest fire alarms & notifications
- Forest fire damage analysis
- .etc.



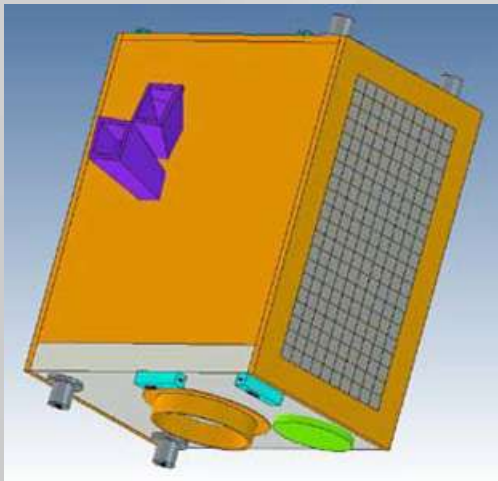
## Research of Satellite Sensor technology for Forest fire protection

Proposal for next satellites

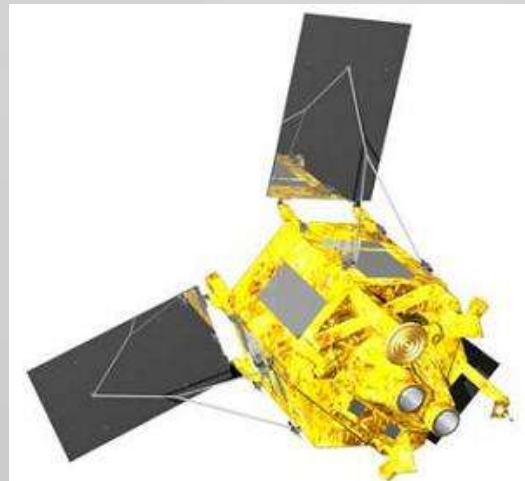
- ✓ VNREDSat-1B: hyper spectral, wide coverage, constellation with VNREDSat-1 for 2 days revisit.
- ✓ VNREDSat-2: very high resolution: 1.5m (PAN), 5m (MS)

Research of low resolution, wide coverage payload (currently budgeted 300.000\$ for period 2013-2015)

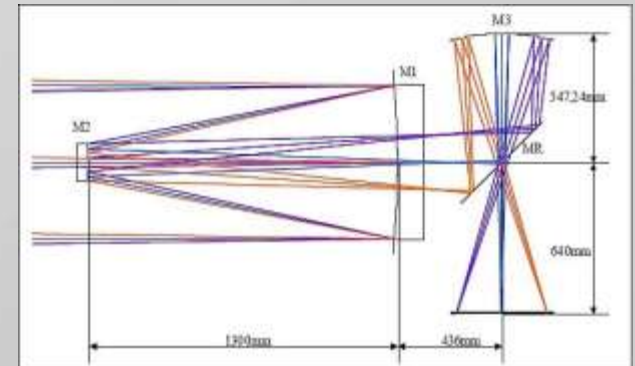
- ✓ 2013-2015: research or core technology & manufacture engineering models
- ✓ 2015-2018: qualification model
- ✓ 2018-2020: flight model.



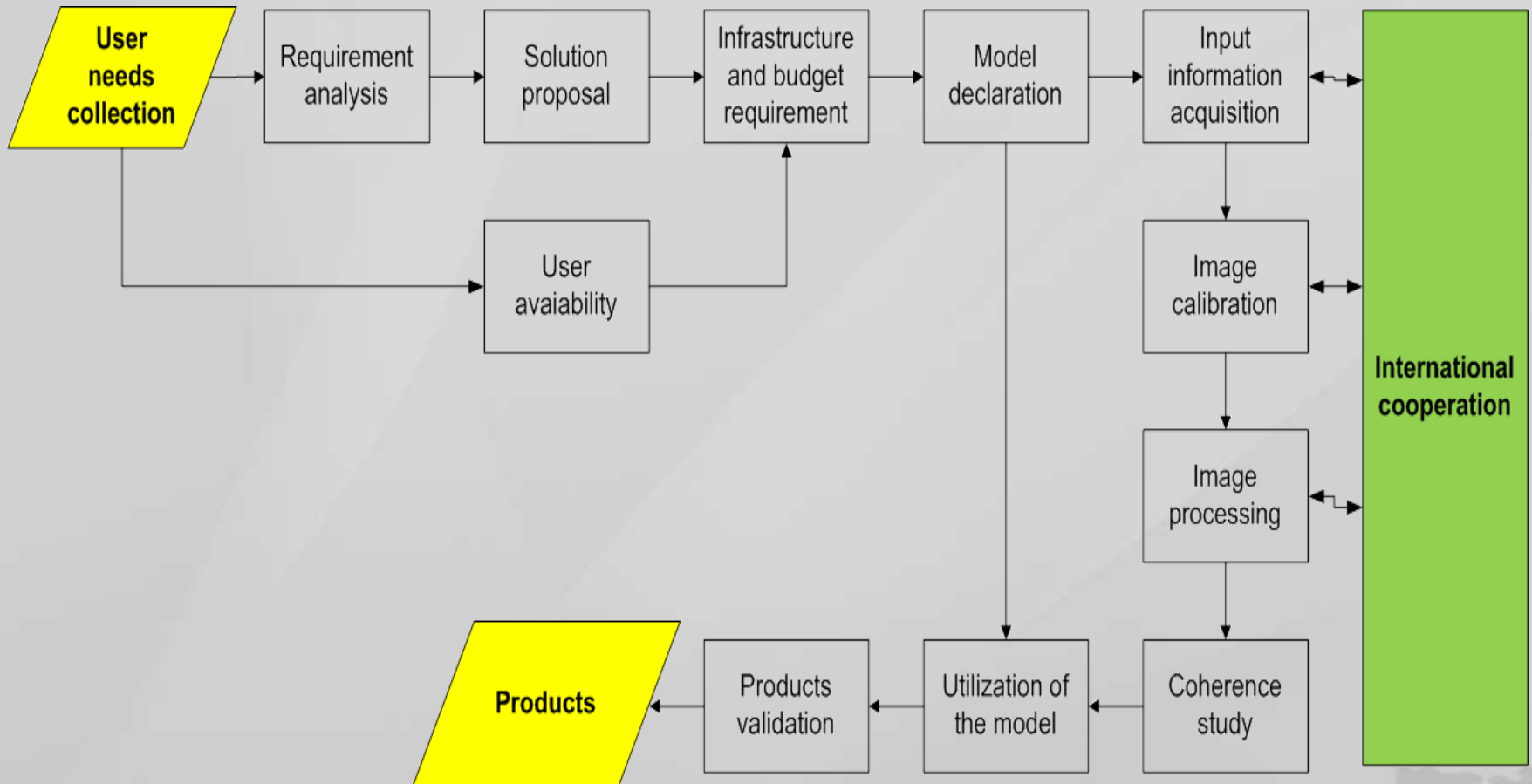
VNREDSat-1B



VNREDSat-2



## Project activities flow diagram



# International Cooperation

## 1. Image Acquisition

- Revisit time
- Spectral bands
- Image coverage
- .etc.

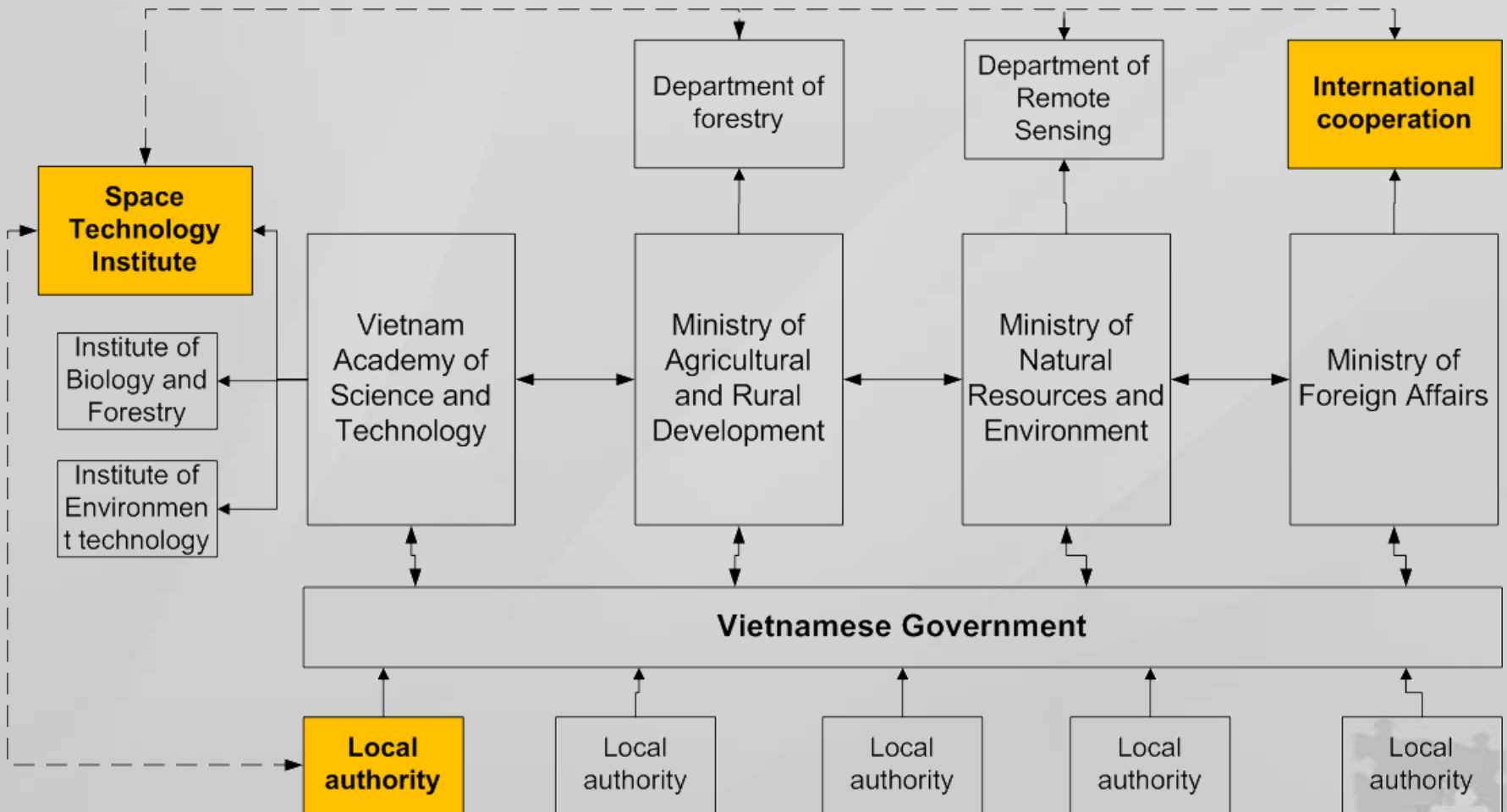
## 2. Image processing

- Sensor calibration data
- Image processing model
- Model utilization procedure

## 3. Other aspects

- Training
- Workshop
- Financial
- etc.

## Project organisation





**Established in 2006**

**Current staff: 57 people, in 5 scientific departments**

### **Research fields**

- Research the basic issues on space science and technology;
- Research and develop Earth observation small satellites;
- Independent science-technology programs on remote sensing, GIS and GPS for natural resource, environment and disaster management.
- International cooperating in the fields of space science and technology.

### **Current projects**

- Design, manufacture of reflection spectrometer for aircraft remote sensing.
- Design of Satellite Image storage and processing system for islands investigation and monitoring
- Research of methods for Attitude Determination and Control System of low earth orbit small satellite.
- .etc..



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*The 20<sup>th</sup> Asia – Pacific Regional Space Agency Forum, Hanoi, Vietnam, December 2013*



## Plan of Implementation

	T0	T0 +3	T0 +6	T0 +9	T0 +12	T0 +15	T0 +18	T0 +21	T0 +24
<b>Satellite image acquisition</b>	✓	✓	✓	✓	✓	✓	✓	✓	✓
<b>Satellite image processing &amp; map generation</b>		✓	✓	✓	✓				
<b>Forest survey and correlation database building</b>	✓	✓	✓	✓	✓				
<b>Buidling procedure for map utilisation</b>						✓	✓		
<b>Reasearch of small satellite sensor technology</b>	✓	✓	✓	✓	✓	✓	✓	✓	✓
<b>Forest fire monitoring and alarm</b>						✓	✓	✓	✓

## IV. Conclusion

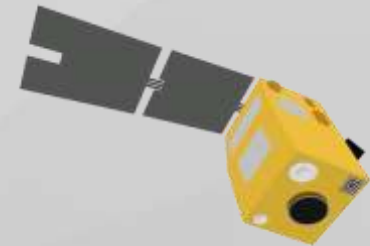
1. Forest in Vietnam are in danger of mass reduction in area.
2. Current forest management tools are underdeveloped, exposed many limitations and problems.
3. Proposal of the project: "Utilisation of VNREDSat-1 sensor data for forest management and forest fire protection".
4. STI's looking forward to an international cooperation for this project



**VAST**



**STI**



**VNREDSat-1**

Thank you !









## PROJECT SUMMARY

**Name: Utilisation of VNREDSat-1 sensor on forest fire protection**

**Objectives:**

- Capacity building for forest management.
- National forest management and forest fire protection map
- Research of small satellite sensor technology for forest fire protection

**Duration:** 2 years

**Estimated budget:** USD 250,000

## Estimated Budget

Total project budget: USD 250 000, of which.

- Satellite image acquisition and processing cost: around 200 000\$. 300 multispectral images scenes/year, 300\$/scenes  $\sim$  100 000\$/year x 2 years.
- 50 000\$: funding from other institutions and partners, for scientific research, human resources development and logistics expense.