Utilisation of VNREDSat-1 sensor on forest fire protection

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

<table>
<thead>
<tr>
<th>Month</th>
<th>2008</th>
<th>2009</th>
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<td>August</td>
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<td>November</td>
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<td>Total</td>
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<td>6112</td>
<td>21464</td>
<td>8035</td>
<td>9425</td>
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</table>

*Quick statistic of forest fire area in Vietnam in 5 years.*

- **January**
- **February**
- **March**
- **April**
- **May**
- **June**
- **July**
- **August**
- **September**
- **October**
- **November**
- **December**

CANEUS SSTDM 2014
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
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

Deforestation in Central Highlands

Deforestation to make plant field in Northern Vietnam
Statistic of deforestation in Vietnam in 2012.

- Total forest area: 134000000
- Reforestation area: 170000
- Deforestation area: 57000

- Authorised Exploitation
- Forest fire
- Unauthorised Exploitation
- Deforestation 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 Technology is outdated.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.
FireWatchVN system – based on MODIS image on 05/12/2013
Statistic of forest fire in 2013 (left) and within 5 years (right)
Forest fire hazard map in Vietnam – data for 2014

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

Vietnam Academy of Science and Technology
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 officially issues:

“The 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 (vnredsat1)
- Building of forest management and fire protection map
- Research of satellite sensor technology for FF.protection
**VNREDSat-1**: Low earth orbit multispectral satellite. Launched on 07/05/2013

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

**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

VNREDSat-1 images → Forest information database → Forest management and protection model → After fire Analysis

MODIS images, etc. → Forest temperature & humidity → Forest fire protection & warning system

Weather satellite images, etc. → Wind speed, wind direction, temperature, humidity... → Forest management map

Other sources of information → Others parameter

People livelihood, living habits

Local policies on forest management
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
Project activities flow diagram

User needs collection

Requirement analysis

Solution proposal

Infrastructure and budget requirement

Model declaration

Input information acquisition

International cooperation

User availability

Products

Products validation

Utilization of the model

Coherence study

Image calibration

Image processing
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.
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..
### Plan of Implementation

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<tr>
<td>Building procedure for map utilisation</td>
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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
Thank you!
Question and Answer
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 ~ 100 000$/year x 2 years.
- 50 000$: funding from other institutions and partners, for scientific research, human resources development and logistics expense.