INTERNATIONAL WORKSHOP
Air Quality in Asia-Impacts of Land Cover/Land Change on Green House Gasses/SLCP Emissions and Aerosols
Bogor, August 4-7th, 2015

VNREDSat-1 satellite: active cooperation in disaster management in Asia, and remote sensing activities in Viet Nam

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CONTENT

• VNREDSat-1 Satellite
  – VNREDSat-1 Overview
  – International cooperation in disaster management in Asia

• Remote sensing activities in Viet Nam
  – Applications
  – Study and workshop
VNREDSat-1 Overview

VNREDSat-1 Satellite
(Vietnam Natural Resource, Environment & Disaster monitoring Satellite)

Owner: VAST

Launch date: 07/5/2013 from Kourou, French Guiana
Resolution: PAN (2.5m) and 4 MS (10m)
Orbit: SSO, 680 km altitude
Revisit time: 3 days
LTAN: 10:42 PM
Mass: ~120 kg
Lifetime: min 5 years
Imaging mode: single shot, scanning, stereo
Swath: 17.5 km
Length: 823 km (PAN + MS)
Scenes/day: 100 scenes
Agility: +/- 35 degrees
VNREDSat-1 Overview

VNREDSat-1 satellite overview
VNREDSat-1 Overview

VNREDSat-1 System Structure
VNREDSat-1 Overview

Operation cycle
VNREDSat-1 Overview

Imaging capabilities

Push-Broom

TDI for stereo mode
VNREDSat-1 Overview

VNREDSat-1 access corridors over 1 day

VNREDSat-1 access corridors over 3 days: whole world coverage
### VNREDSat-1 Overview

#### Spectral bands

<table>
<thead>
<tr>
<th>Band</th>
<th>Name</th>
<th>Lower Band Edge (µm)</th>
<th>Upper Band Edge (µm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panchromatic</td>
<td>PAN</td>
<td>0.45 +/- 0.02</td>
<td>0.75 +/- 0.02</td>
</tr>
<tr>
<td>Blue</td>
<td>B1</td>
<td>0.45 +/- 0.02</td>
<td>0.52 +/- 0.02</td>
</tr>
<tr>
<td>Green</td>
<td>B2</td>
<td>0.53 +/- 0.02</td>
<td>0.59 +/- 0.02</td>
</tr>
<tr>
<td>Red</td>
<td>B3</td>
<td>0.625 +/- 0.02</td>
<td>0.695 +/- 0.02</td>
</tr>
<tr>
<td>Near-Infrared</td>
<td>B4</td>
<td>0.76 +/- 0.02</td>
<td>0.89 +/- 0.02</td>
</tr>
</tbody>
</table>
VNREDSat-1 Overview

VNREDSat-1 Image Products

• Basic Product
  – Level 1A
  – Level 2A
  – Pan-shaperning

• Advanced Product
  – Level 3
  – DEM generation
VNREDSat-1 Overview

VNREDSat-1: 2 years in orbit

- In total: **34,000 scenes**
- **Vietnam**: 18,325 scenes (9,050 MS and 9,175 PAN)
VNREDSat-1 Overview

First images from VNREDSat-1
Applications of VNREDSat-1

- Land use mapping
- Agriculture (land, rice, ....)
- Forest management
- Environment and territory (oil spill, water, atmospheric pollution,...)
- Island and costal management
- Disaster management: monitoring, early-warning, assessment,...

VNREDSat-1 image dated 4/10/2013 over Nghe An Province.
International cooperation of VNREDSat-1 in disaster management in Asia

Vietnam: a member of UNESCAP (UN Economic and Social Commission for Asia and the Pacific), since 23 August 1954.

STI is contact point for Space technology
International cooperation in disaster management

• Space Technology Institute (STI), a member of Vietnam Academy of Science and Technology (VAST) since 2006,
• STI: an advanced research institute on space technology in Vietnam.
• STI is responsible for
  ➢ Fundamental and advance researches
  ➢ Development of technology and applications
  ➢ Tech-transfer, training and consultant service
  ➢ R&D, and international cooperation
International cooperation in disaster management

Organization structure

Human resources
Total members: ~60 persons
(Prof, Dr, Msc, Engineer)
International cooperation in disaster management

Images for disaster management in Asia

Haiyan Typhoon, Tacloban, the Philippines, 15/11/2013

Floods in India and Pakistan, 09/2014.

Srinagar_India

Muzaffargarh_Pakistan
International cooperation in disaster management

“HUDHUD” cyclones, VNREDSat-1 image in 23/10/2014, causing mud flooding in Visakhapatnam, India
International cooperation in disaster management

VNREDSat-1 images: flood, landslide in the Philippines (Hagupit typhoon (07/12/2014))
International cooperation in disaster management

- VNREDSat-1: joint with GISTDA in search for data sharing possibilities between VNREDSat-1 and THEOS (Thaichote) systems.
- Jointly imaging in search for missing MH370 airplane (Malaysia Airlines) in 2014.
Remote sensing activities in Viet Nam

Typical applications of remote sensing
- Urban management
- Nature resource management
- Hazards and disasters monitoring

Others activities
- Research and studies
- Workshops
Applications: Urban management

Urbanization

- Urbanization in Hanoi: filling up or ...

$$ UI = \left( \frac{B7 - B4}{B7 + B4} + 1.0 \right) \times 100 $$
Applications: Urban management

Urban Heat Island

- Understand the Past
- Predict the Future: Temperature of land surface in Hanoi would rise 0.54° C in 2022.
Applications: Urban management

Urban planning

- Urban green space management and city planning
- Distribution, density, and green space reservation
Applications: Natural Resource management

Forest management
Assessment on change of forest cover, REDD (Reducing Emissions from Deforestation and Degradation) project in Viet Nam
Applications: Natural Resource management

Forest fire

U Minh Thuong national park
3000ha of primary melaleuca forest burnt in 16 days

LANDSAT-ETM image on 4/2/2002  SPOT image on 28/9/2002
Applications: Natural Resource management

Drought monitoring

- Drought monitoring in Phu Tho province, upper stream of Red river delta area.
- Results was use for cultivation planning and soil degradation countermeasure.
Applications: Hazard and Disaster

**Hazard**
- Oil spill found since 30 Jan until 11 April, 2007
- 500km coastal line effected

ALOS image received on 9 Feb 2007
Applications: Hazard and Disaster

Disaster

- Flooding monitoring and assessment in Hue and Mekong river delta in 2008
- Risk, damage, vulnerability, warning
- Strategic environment assessment for economic development planning, especially, in coastal region – coastal zone development
Applications: Hazard and Disaster
Applications: Hazard and Disaster

Monitoring of flood area in the Lower Mekong Delta
Applications: Hazard and Disaster

Integration and modeling of remote sensing information in GIS for Cau River basin, disaster management
Other activities

• Studies on
  – Satellite technology and ground station developments
  – RS sensors: Spectrometer

• Workshop
Other activities on Space technology and RS

**Satellite technology and ground station**

- Pioneer in research, design and manufacture of receiving stations for polar and geo-stationary metrological satellites.

*Images of various receiving systems.*

- WEAFAX APT receiving system
- GMS/MT-SAT/FY-2 receiving system
- NOAA receiving system
Other activities on Space technology and RS

Optical & Near-infrared spectrum

Spectrometer (manufactured by STI) used for measuring the reflective spectrum of the natural objects
Other activities on Space technology and RS

**Spectrometer**

*VIS-NIR Spectrometer*

*Spectrometer onboard UAV*
Workshops

“Space technology and application 2010” 16-17/12/2010, organized by Space Science and technology program and STI
“Applications of space technology for socio-economic benefits”
by UNOOSA/ESA/Viet Nam
Ha Noi 10-14/10/2011
Workshops

20th Asia-Pacific Regional Space Agency Forum (APRSAF-20), Hanoi 03-06/12/2013
THANK YOU VERY MUCH