APRASAF-19
KUALA LUMPUR, MALAYSIA (11-14/12/2012)

SPACE TECHNOLOGY DEVELOPMENT OF VIETNAM IN 2011-2012

Assoc. Prof. Dr. Doan Minh Chung, Director
Space Technology Institute (STI)
Vietnam Academy of Science and Technology (VAST)

MILESTONES IN SPACE TECHNOLOGY DEVELOPMENT OF VIETNAM

On 14/11/2006, Prime Minister approved the "Strategy for Space research and applications until 2020" of Vietnam. To implement the Strategy, a series of activities on Space technology has been accomplished as follows:

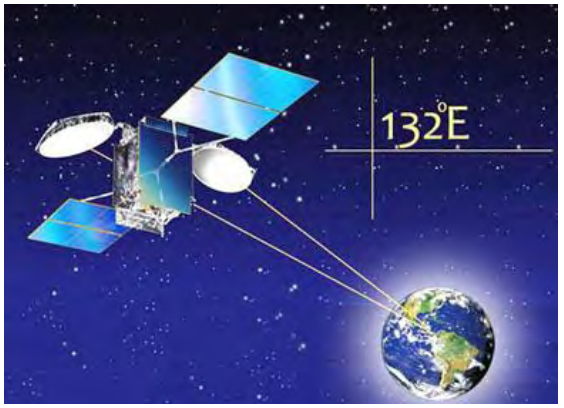
* Establish Space Technology Institute (STI), VAST – 11/2006

** Establish Vietnam Space Committee (VSC), GOV – 09/2010

1. Satellite technology development
    1. VINASAT-2 (VNPT)
    2. VNREDSat-1 (VAST*)
    3. VNREDSat-1B (VAST)
2. Vietnam National Satellite Center
3. National Research Program for Space Science & Technology
4. Space Technology Applications of VAST
5. Conclusions

*(VAST – Vietnam Academy of Science & Technology)

Satellite Communication satellite
VINASAT-2



- At 5h13', 16th May 2012, VINASAT-2 (VNPT-Lokheed Martin USA) launched by Arian 5; Bus A2100, 30 transponders at 36MHz of Ku-band ; Budget ~ 280 Mil.USD.
- Covers far mountain areas, islands, South East Asia & neighbor countries.
- Accompanied with VINASAT-1 as a satellite system provide adequate capacity, stability for different services (TV, Mobile phone, teleconference, education, treatment)
- Recover budget time ~10 years; Life time 15 years.

1st EO: VNREDSat-1 Project

(**V**iet**N**am small satellite for natural **R**esource, **E**nvironment & **D**isaster management)

Project Owner: Vietnam Academy of Science and Technology (VAST)

Implementation period: 2010 – 2014

Finance source: French ODA

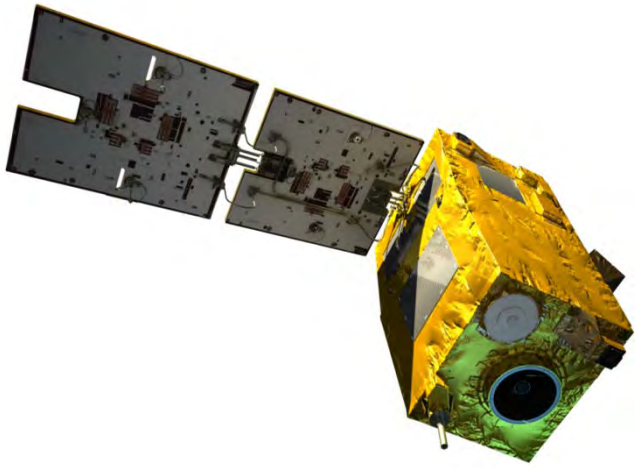
Prime contractor: EADS Astrium

Main Items:

1. **Design, manufacture and launch** of VNREDSat-1 satellite.
2. Establish **Satellite Ground Control Station**
3. Upgrade the **Ground Receiving Station** (Vietnam National Remote Sensing Center, MONRE)
4. Build satellite image **calibration site**
5. Procurement of **Launch and Insurance services** for VNREDSat-1 satellite.
6. Setting up a Communication **links between Ground Stations**.
7. **Training and Transfer** of Small Satellite Technology

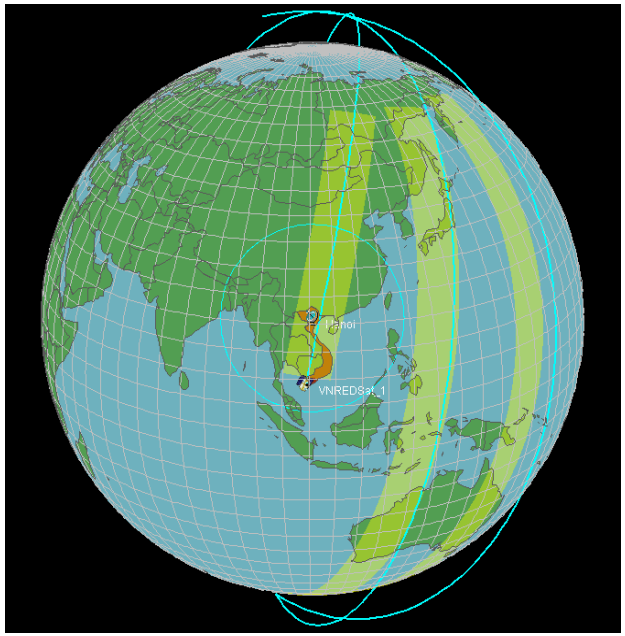
VNREDSat-1 Project

- The 1st Vietnam EO satellite
  - Optical payload with spatial resolution **10m/Multispectral** and **2.5m/Panchromatic**
  - Revisit time: **3 days**
  - **Sun synchronous** orbit, altitude **680 km**
  - Mass: ~ **120kg**
  - Life time : **5 years**



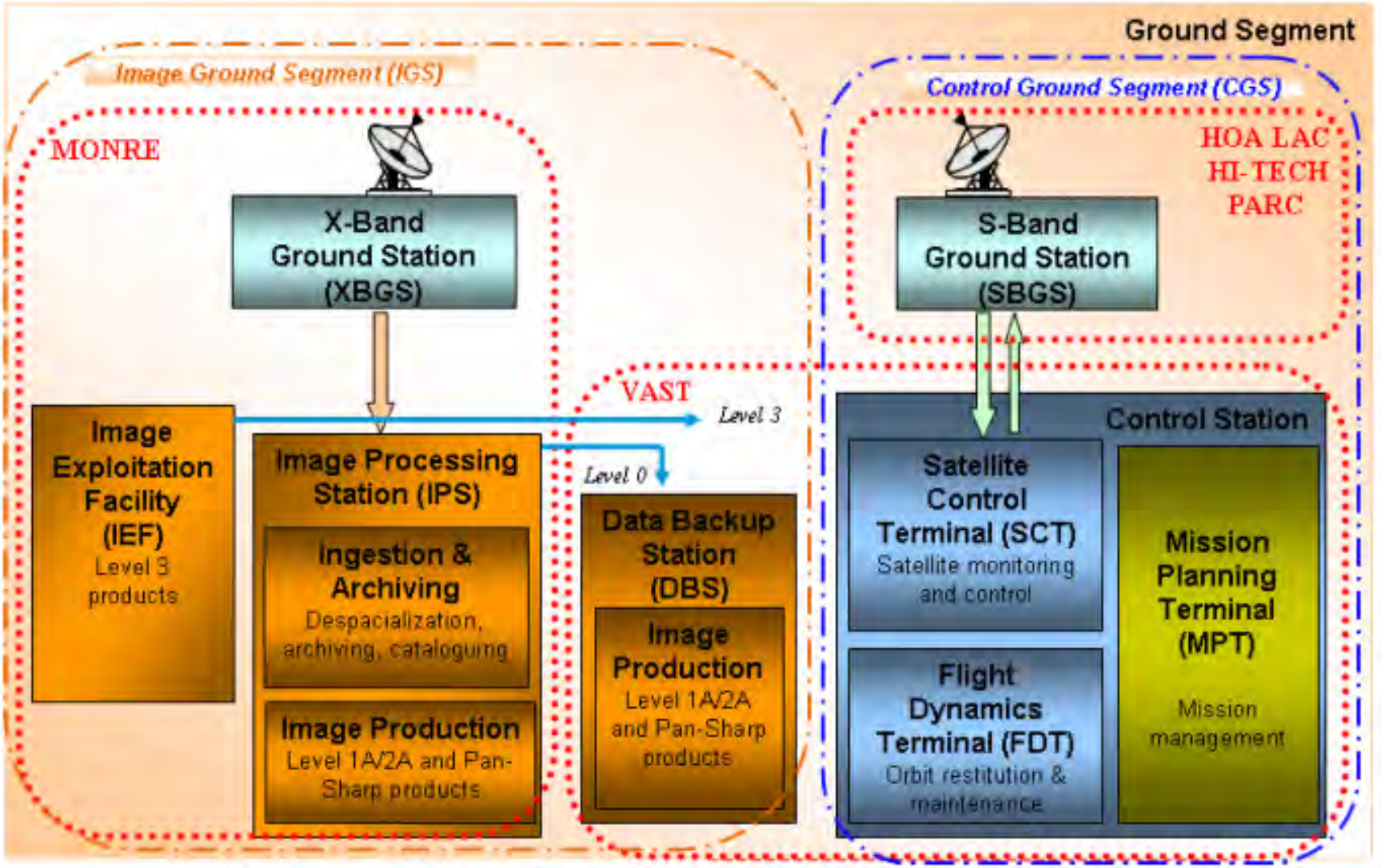
-15 VN engineers have been trained in Astrium Corp., Toulouse from 8/2011 – 11/2012

- Tentative launch: Apr. 2013



VAST's delegation & STI trainees of VNREDSat-1 project in Astrium, Toulouse, 2011

VNREDSat-1 Ground segment architecture



S-band Station in Hoa Lac Hi-tech park

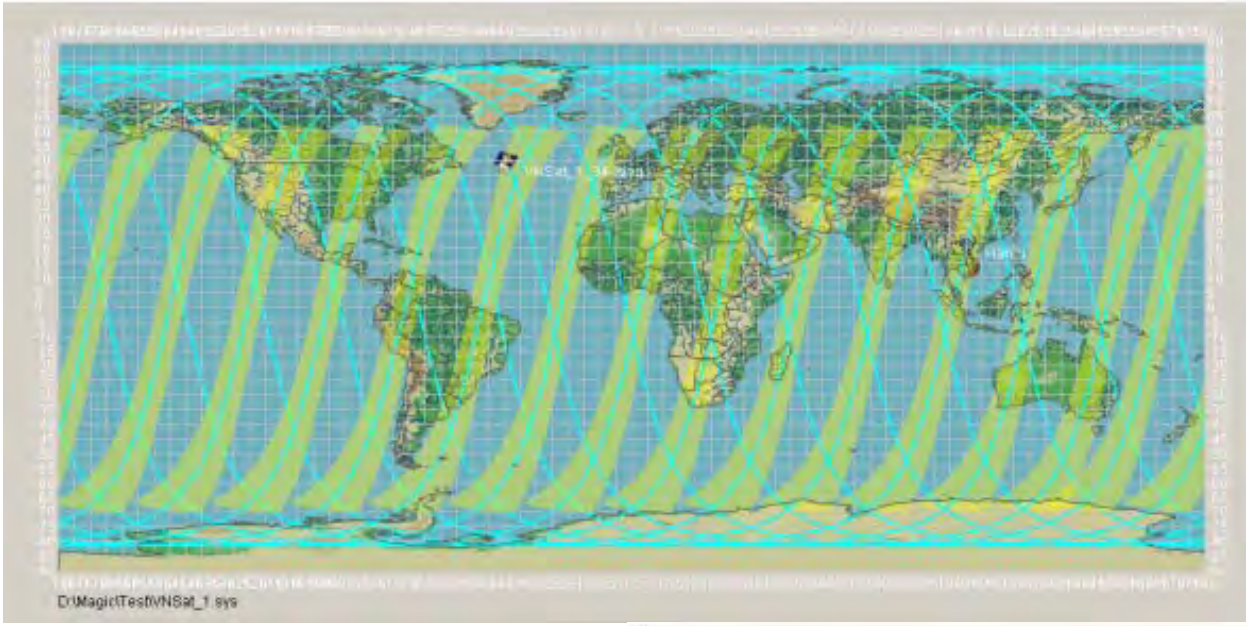
Ground Segment
S-Band Ground Station (SBGS)

- Installation at Hoa Lac site
  - Monday 01/10/2012: The pedestal and parabola anten have been placed on top of the Hoa Lac Station, and assembled
  - Installation is completed on 19/10/2012

National Remote Sensing Center (NRSC) – MONRE – used for VNREDSat-1 GRS

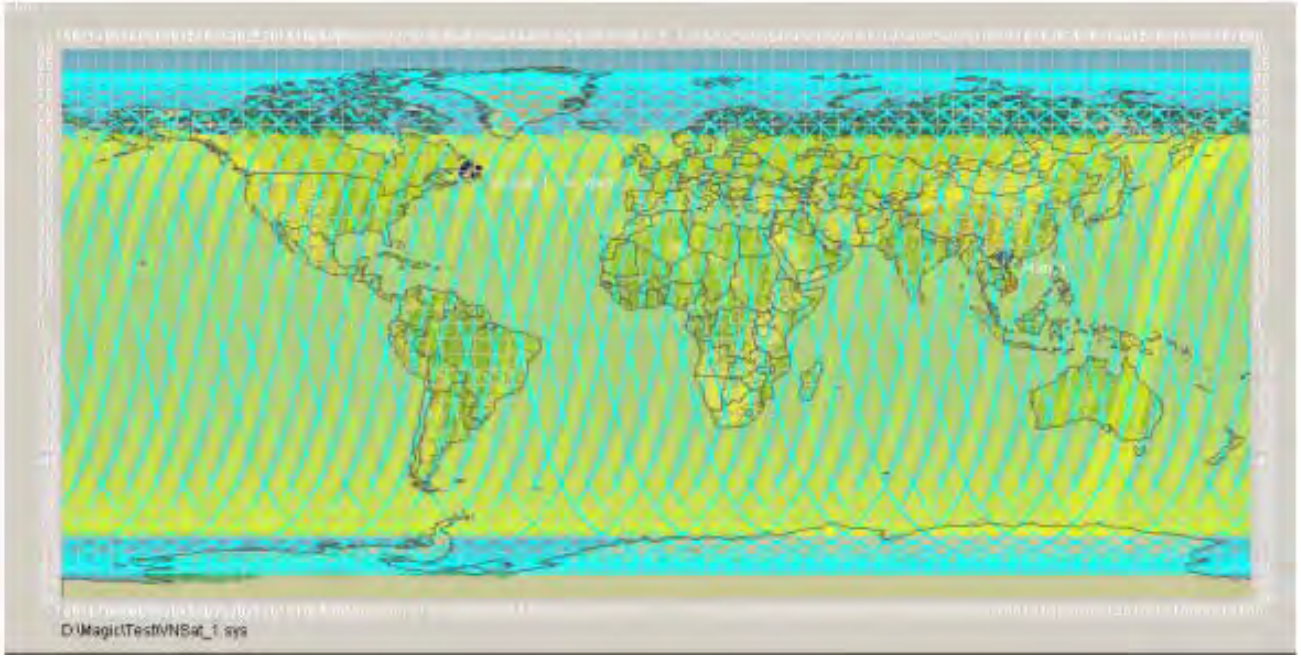
Data received at the Station is used for disaster monitoring including Oil spill; Flooding.

VAST



VNREDSat-1 access corridors over 1 day

VNREDSat-1 access corridors over 3 day: Whole world coverage



VNREDSat-1 Overview

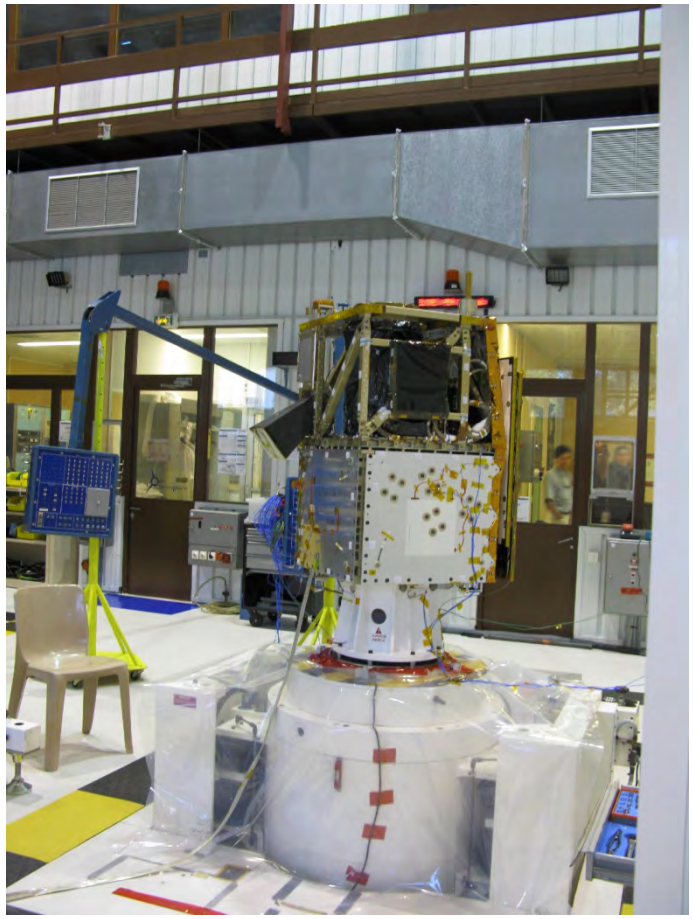
Platform engineering & procurement& AIT

PF reference tests

AIT

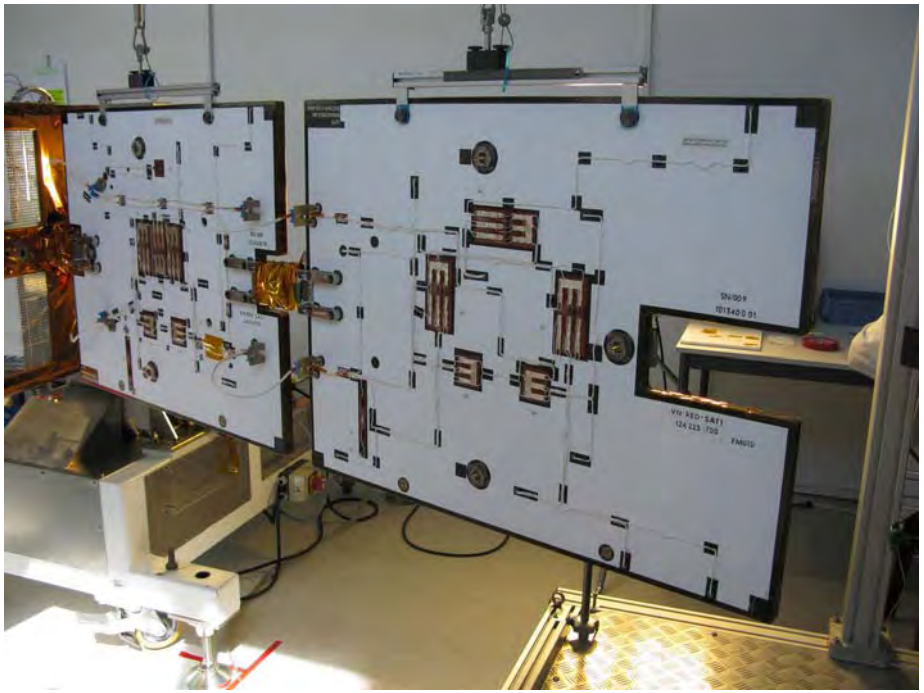
TV test

AIT



Vibrations set-up

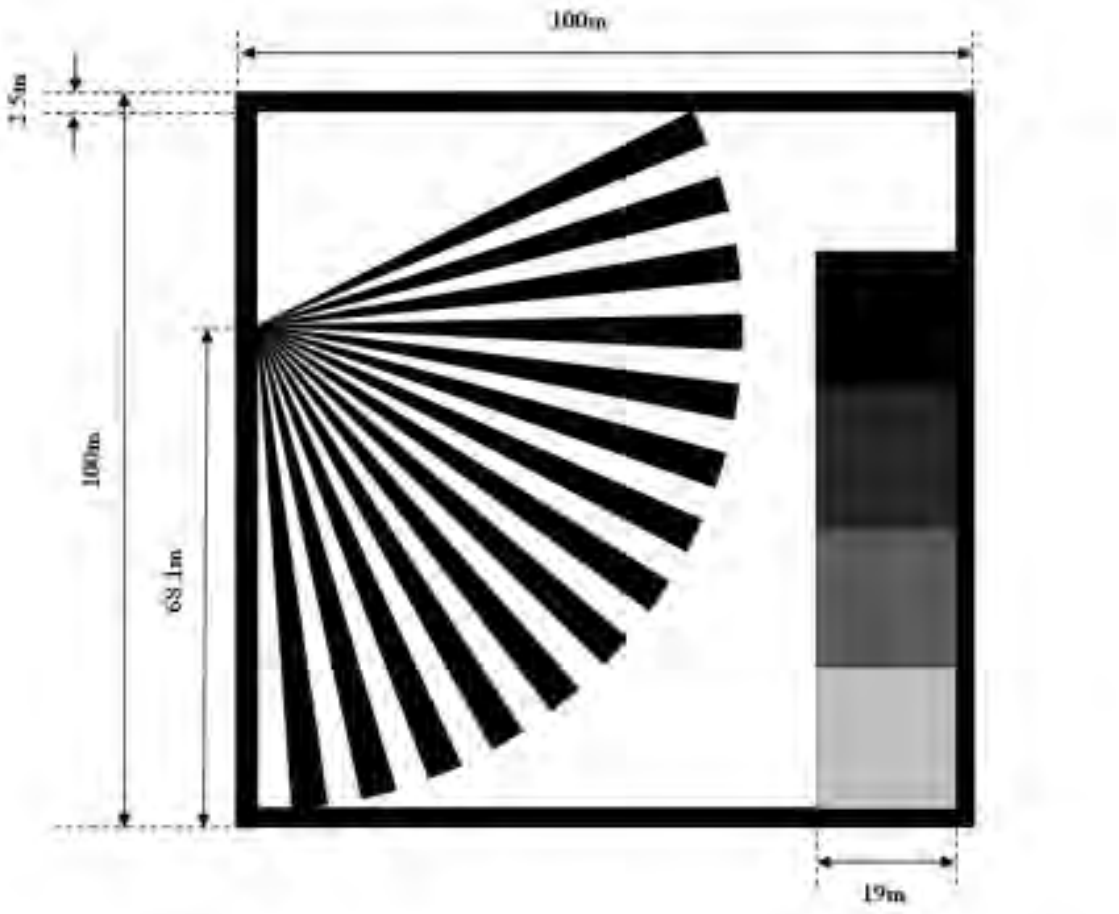
AIT



Solar Array test set-up & completion

Image calibration site

- Area: 1ha (10.000 m^2) far from Hanoi 50km

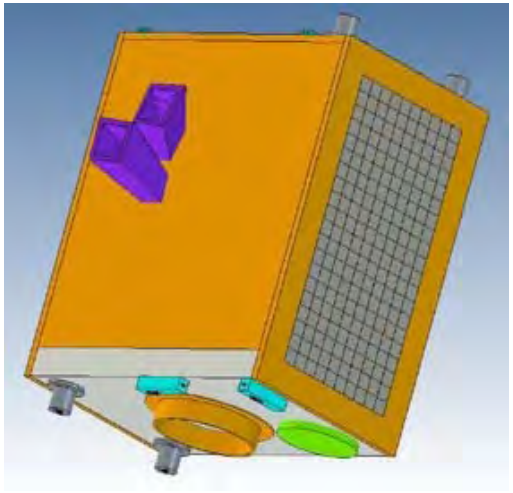


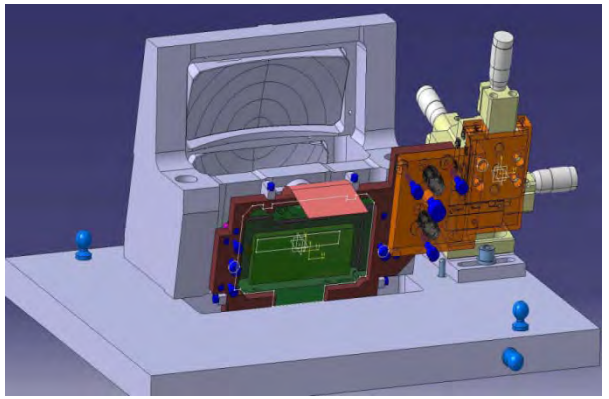
Launcher compatible to VNREDSat-1

		
SOYUZ Authority: Arianespace Launch sites: Kourou (French Guiana)	**PSLV** Authority: ISRO Launch site: Sriharikota (India)	**ROCKOT** Authority: Eurockot Launch site: Plesetsk (Russia)
		
COSMOS 3M Authority: Cosmos Space System Launch sites: Pletsetsk – Kaputsin Yar (Russia)	**DNEPR** Authority: ISC Kosmotras Launch sites: Yasny (Russia) Baikonur (Kasakhstan)	**VEGA** Authority: Arianespace Launch site: Kourou (French Guiana)

2nd EO: VNREDSat-1B proposal

- Finance source: Belgium ODA.
- Orbit characteristics: SSO, altitude ~600km
- Platform: Proba, highly flexible
- Compact Hyper-spectral Imager Breadboard (CHIB)
- Number of spectral bands: 80-100
- Spectral range: 400 – 830nm
- On-board memory: 64 Gbits
- S-band: Telemetry and Telecommand
- X-band: image downlink, 32 Mbps
- Revisit time: 3 days
- Ground station located in Hanoi with 3-4 satellite contacts/day
- Wide swath width: 250-300 km





APRSAF – Nano Satellite

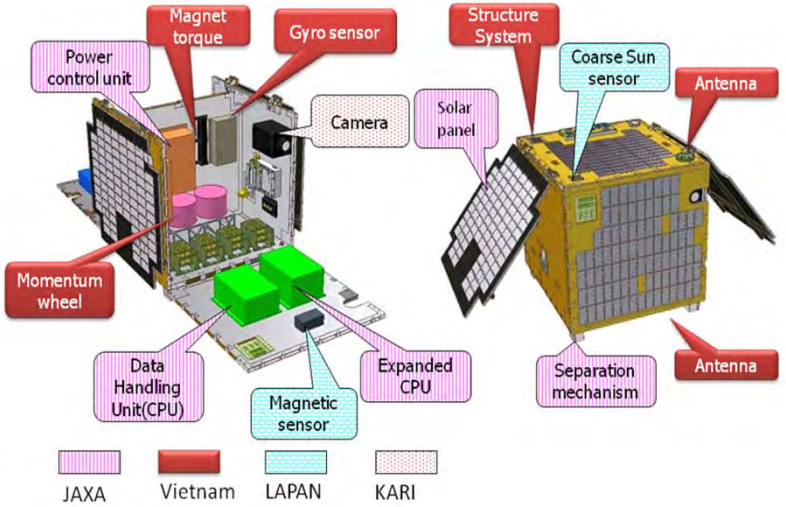
Regional cooperation initiatives

With the support of JAXA

APRSAF/STAR-UNIFORM Program:

STI/VAST/VIETNAM jointed this program;

- Training for Asia-Pacific Regional Space Agency to design & manufacture a Nano-Satellite (APRSAF-Sat ~ 10kgs)



VIETNAM NATIONAL SPACE CENTER PROJECT

- *Project:* Vietnam National Space Center
- *Place:* Hoa Lac Hi-tech Park
- *Area:* 09 ha
- *Duration:* 2012 - 2020
- *Capital:* 54.400 billion JY – Japanese ODA
- *Owner:* Vietnam Academy of Science and Technology
- Investor: Vietnam National Satellite Center, VAST

The Project consists of three main components:

- ✓ **Facility and Equipments**
  - Assembling, integration & test facility
  - Data image receiving and processing facility
  - Research and education facility
- ✓ **Satellite**
  - 02 SAR Observation Satellite (JV-LOTUSat 1&2)
- ✓ **Capacity building**
  - Small satellite development
  - Remote sensing technology

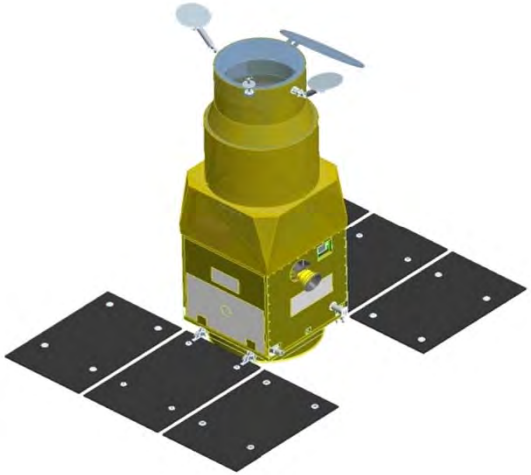
VIETNAM NATIONAL SATELLITE CENTER

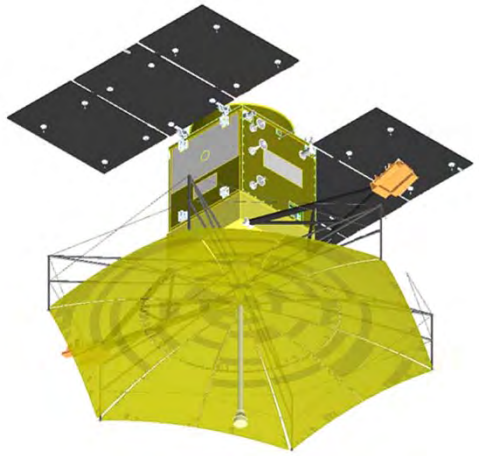
Viet Nam Space Center Project

Facility

Radar satellite projects
(in accompanied with VSC project)

- Finance source: Japan ODA
- JV-LOTUSat-1: Vietnam-Japan joint-development of a radar satellite (assembly in Japan), launched in 2017
- JV-LOTUSat-2 : development of 2nd satellite, in parallel with infrastructure establishment for assembly and test in Hoa Lac, launched in 2020
- Training for satellite assembly, integration and testing will be performed in Hoa Lac after the infrastructure is completed.
- Instrument: X-band SAR
- Ground sampling distance: ~1m
- Total weight: <500kg
- Life-time: 5 years
- Dimensions: 2.6m x 3.5m x 3m

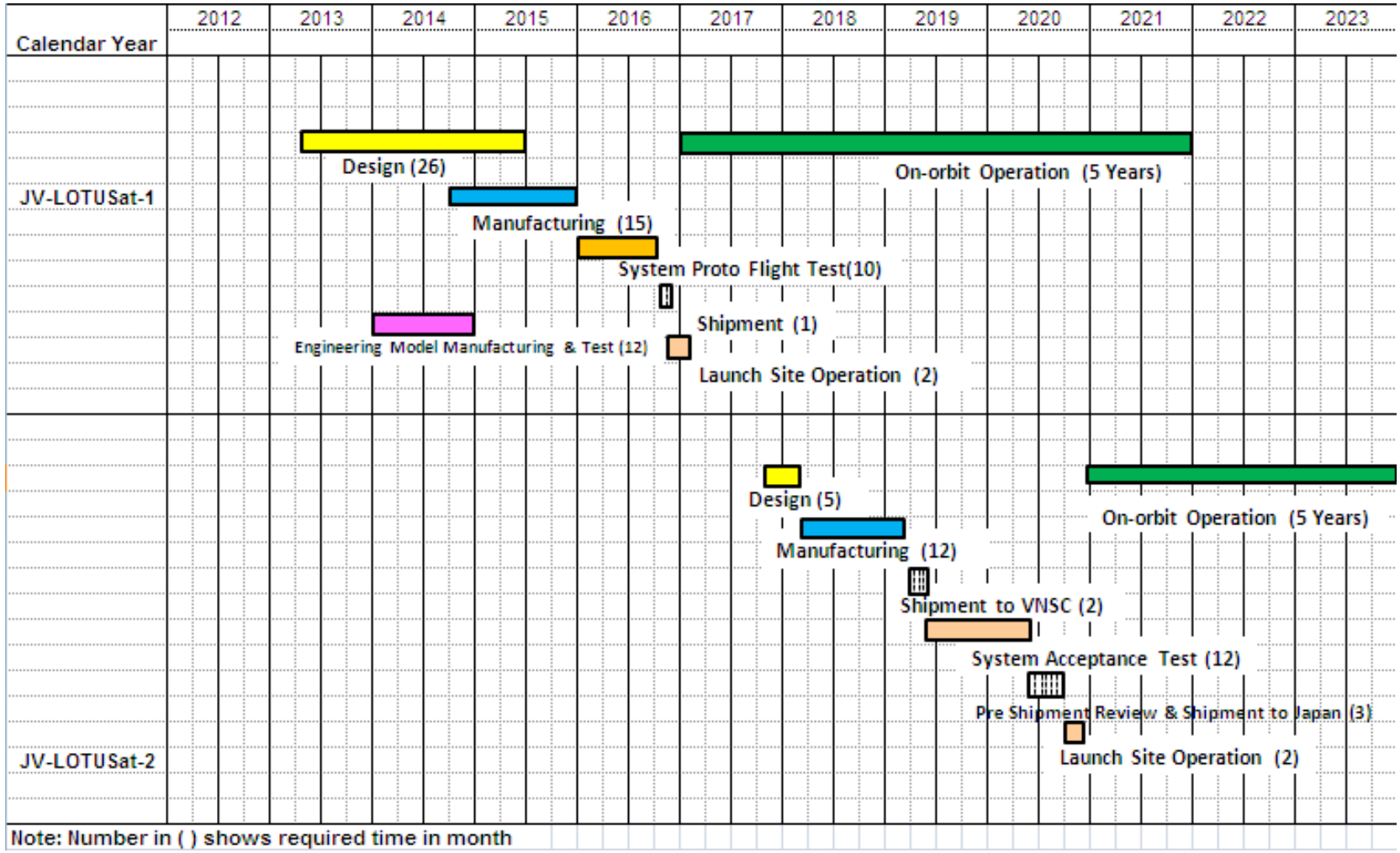




VIETNAM NATIONAL SATELLITE CENTER

Viet Nam Space Center Project

JV-LOTUSat Development Schedule



APPLICATIONS OF SPACE TECHNOLOGY

National Research Program on Space S&T - VAST

Main topics of the program in the period 2nd /2012-2015:

- Small satellite, GNSS, GRS technologies.
- Launching technique.
- Applications of RS,GIS,GPS and communication satellite for economic development; natural resource, environment and disaster monitoring, transportation, sea navigation;
- Fabrication equipments and low cost meteorological ground receiving station.
- Fundamental research for space technology applications (medical-biology in space; material science in space environment).
- Legal basis for peaceful use of outer space.

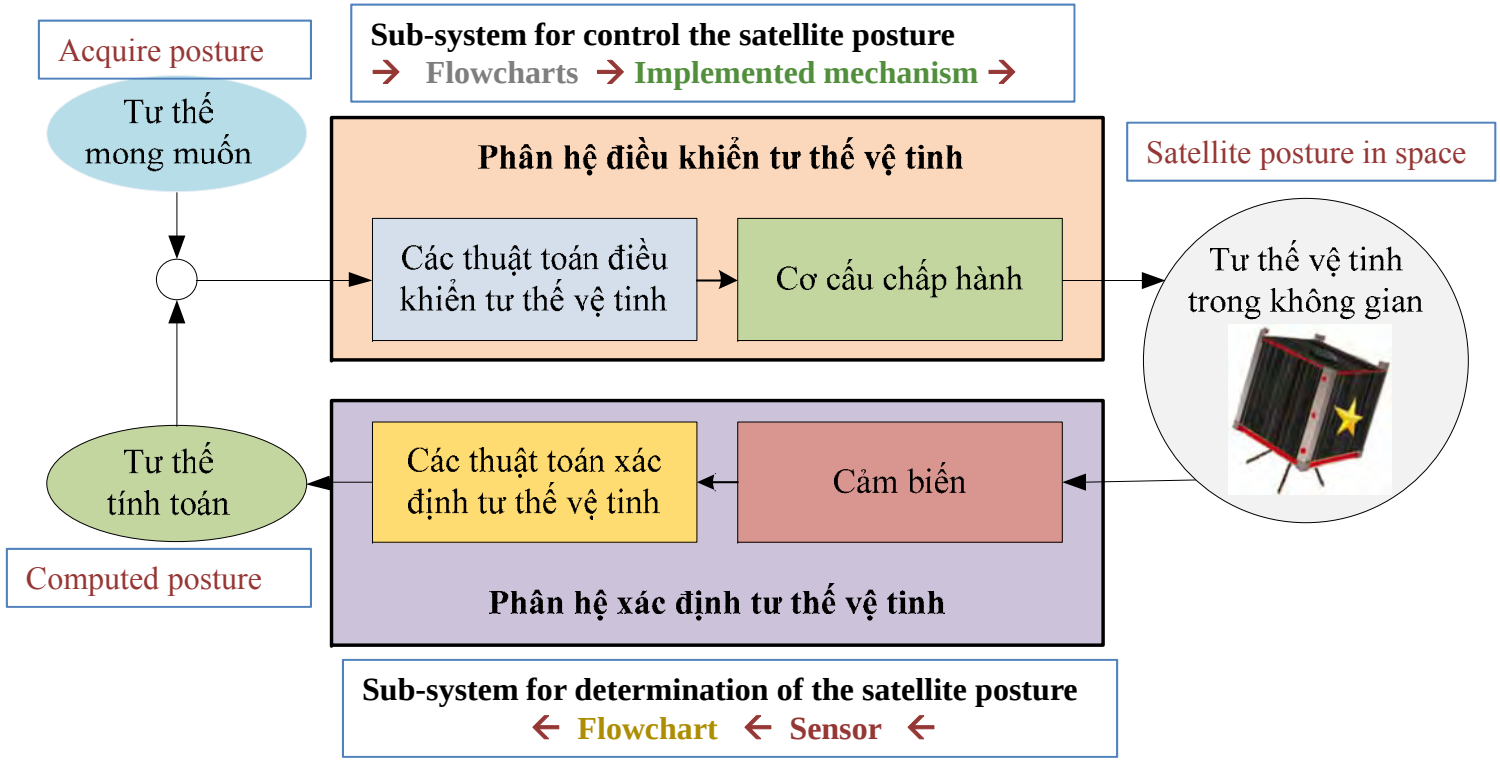
SPACE TECHNOLOGY APPLICATIONS OF VAST

VAST has 34 research institutes in which 10 institutes & center directly involved to space technology applications

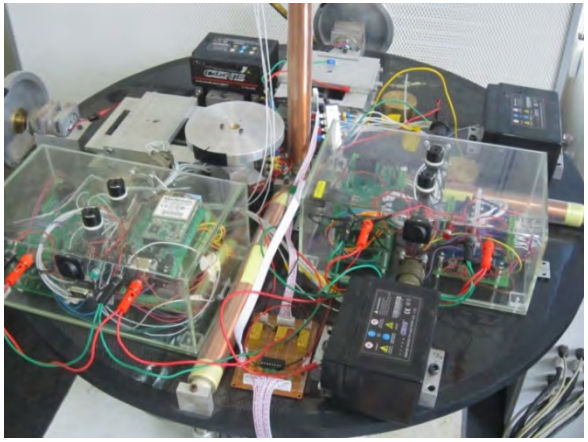
1. Space Technology Institute
2. Institute of Geography
3. Institute of Geological Sciences
4. Institute of Marine Geology & Geography
5. Institute of Marine Resource & Environment
6. Institute of Geophysics
7. Institute of Physics
8. Institute of Information Technology
9. HCMC Institute of Resources Geography
10. National Satellite Center

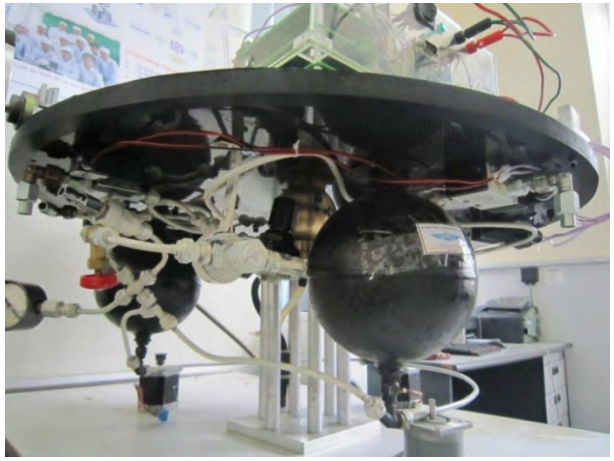
Project of the National Program on Space S&T – implemented by STI

Design & development of the System for Automatic Determination & Control the posture of the Satellite (ADCS):

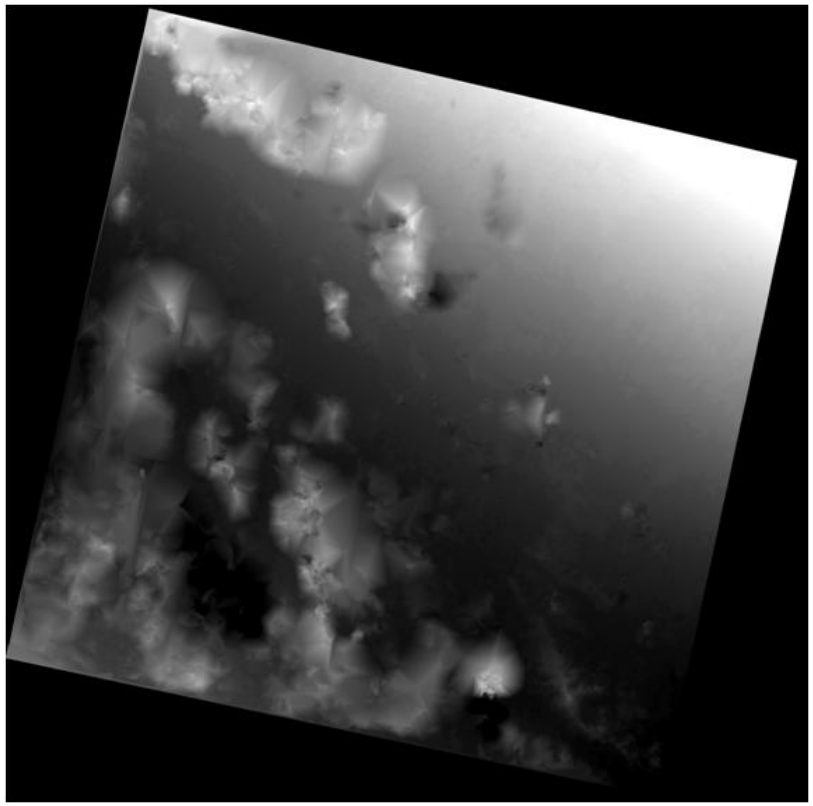


TEST BED FOR SIMULATION OF THE ADCS

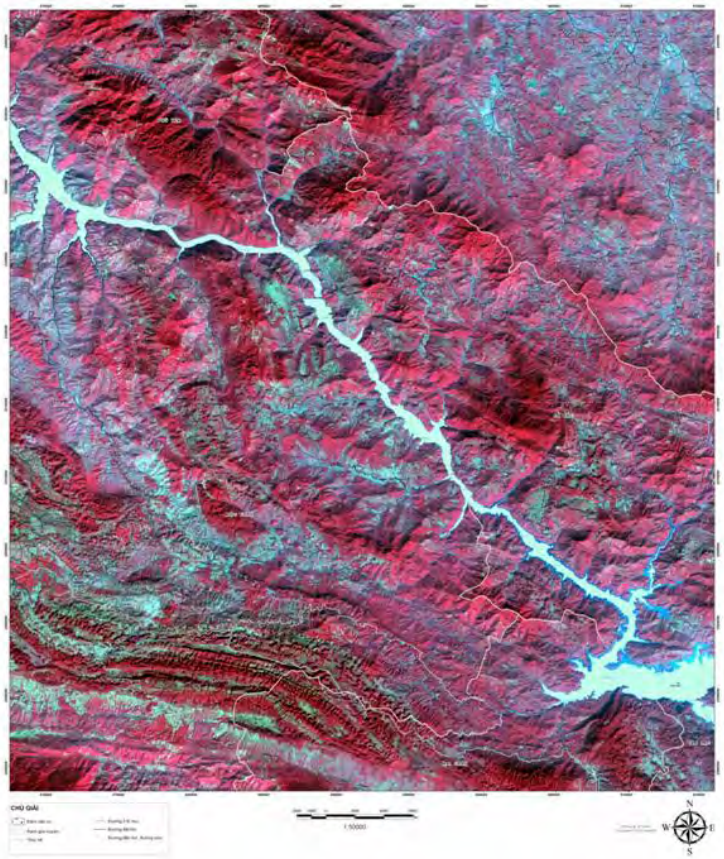




Development of the software open source GRASS for processing of the RS images

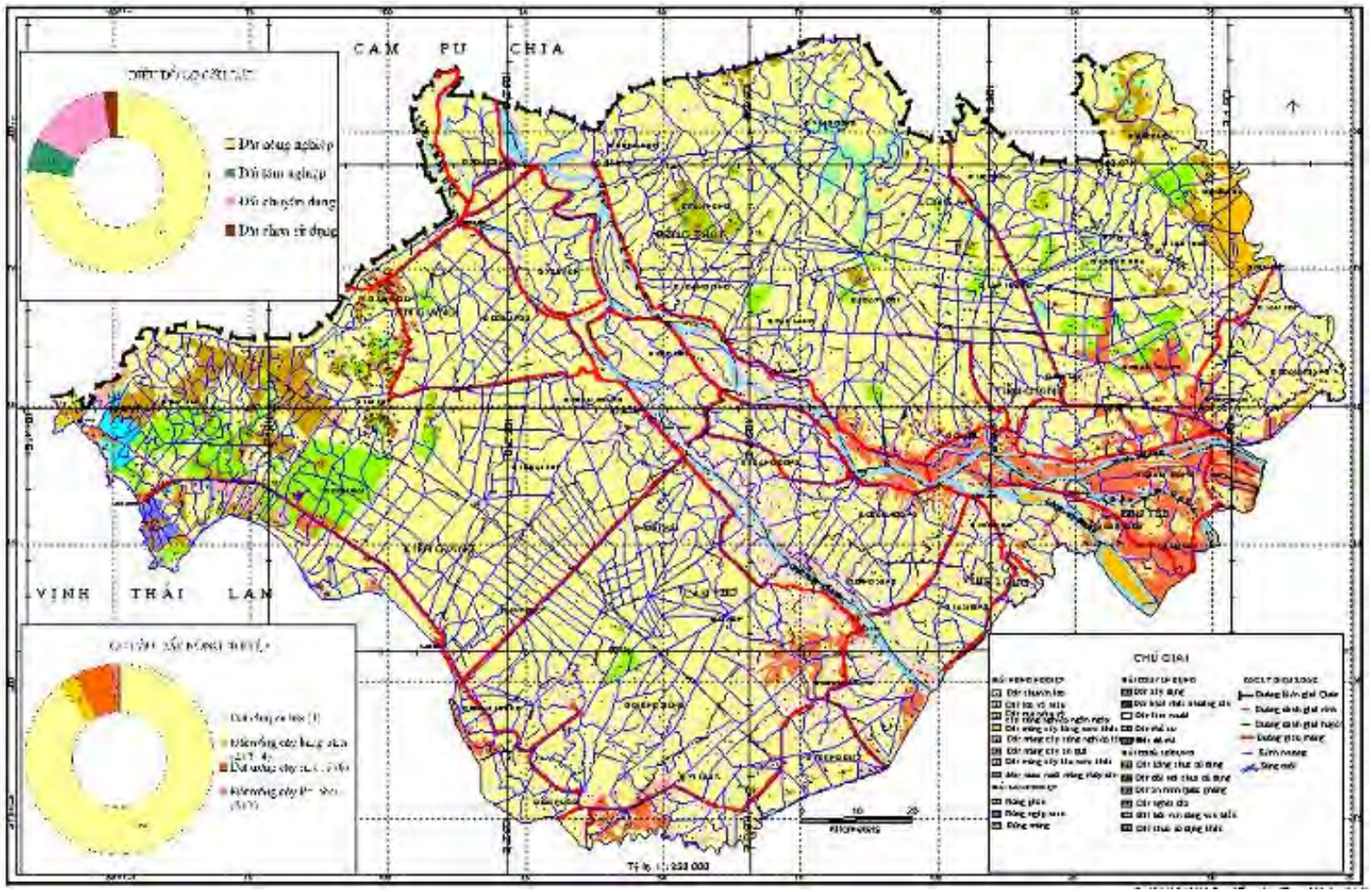


Digital Elevation Model (DEM) from MODIS

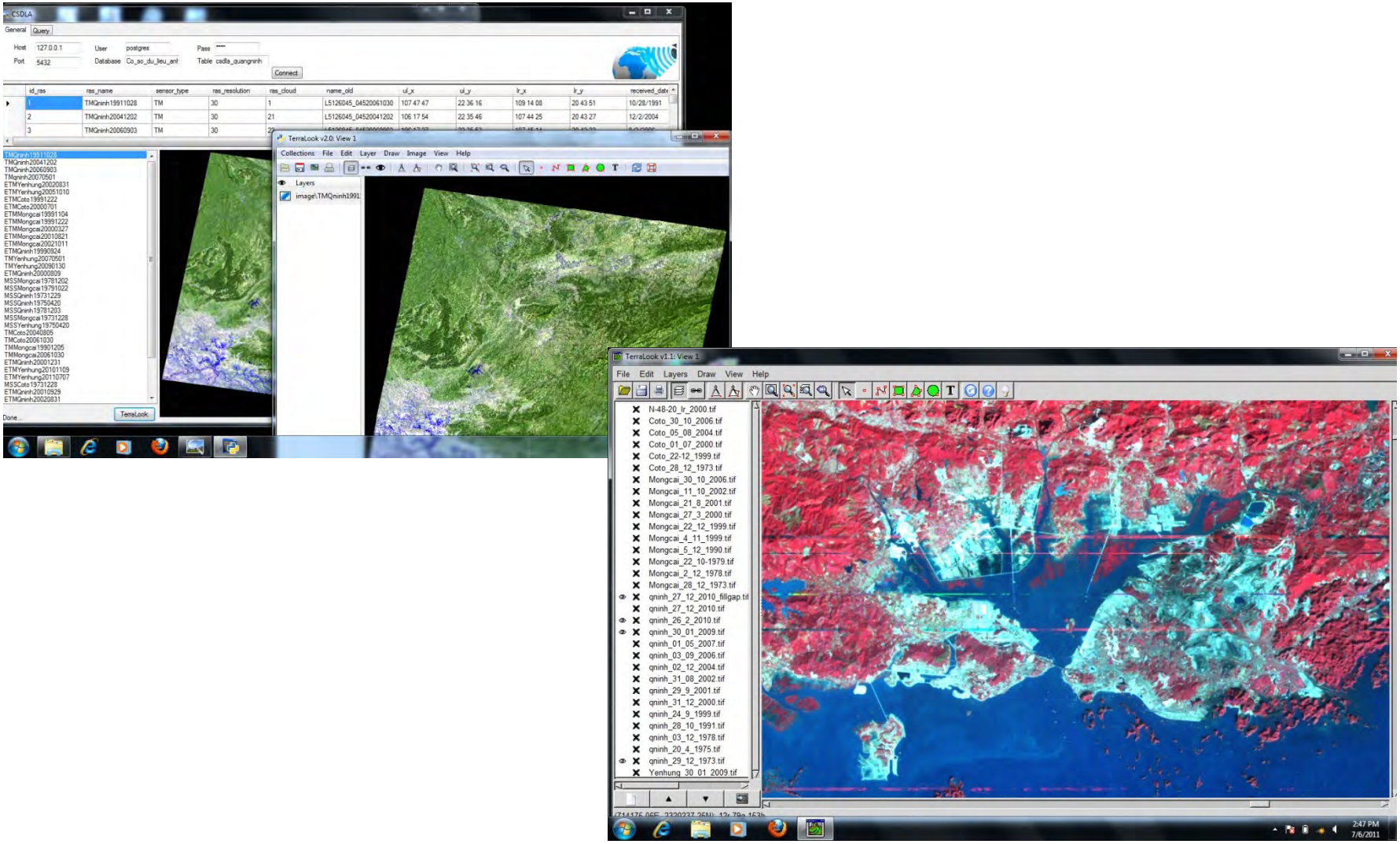


AVNIR-II image after cross correction

Land-use Map of Mekong Delta 2000



Development of the software for the satellite image database management of the coastal zone (Quang Ninh prov.)



Satellite image database on the Terralook 1.1

Passive MW RS on soil moisture, vegetation, sea surface temperature & salinity

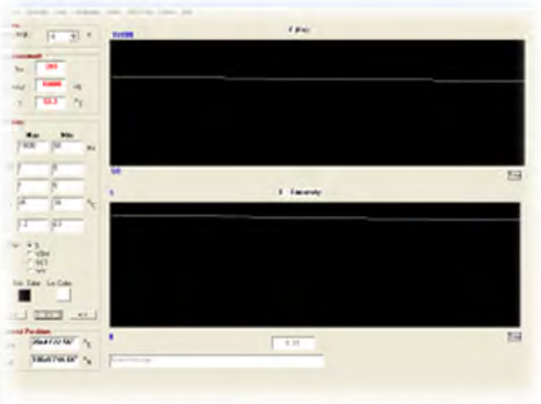
- Design and manufacture 3 passive microwave radiometers (L, C, X bands).
- Utilizations of MW radiometers and passive MWRS methods to determine SMC, biomass, SST, SSS, etc.
- Conduct and promote Space education for junior students and children (water rocket, space poster competitions, etc.)

L band microwave Radiometer

Data process in the Microwave Laboratory

To measure soil moisture content (SMC) on crop fields

To determine biomass on corn field



Software for RDM data receiving and processing

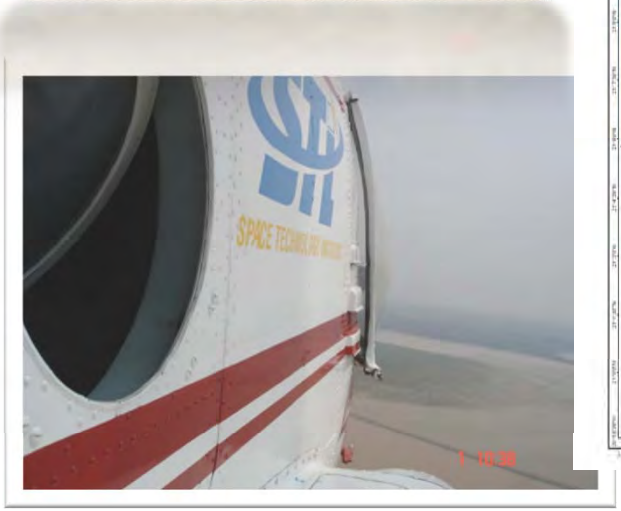
AERIAL REMOTE SING FOR SOIL MOISTURE MAPPING

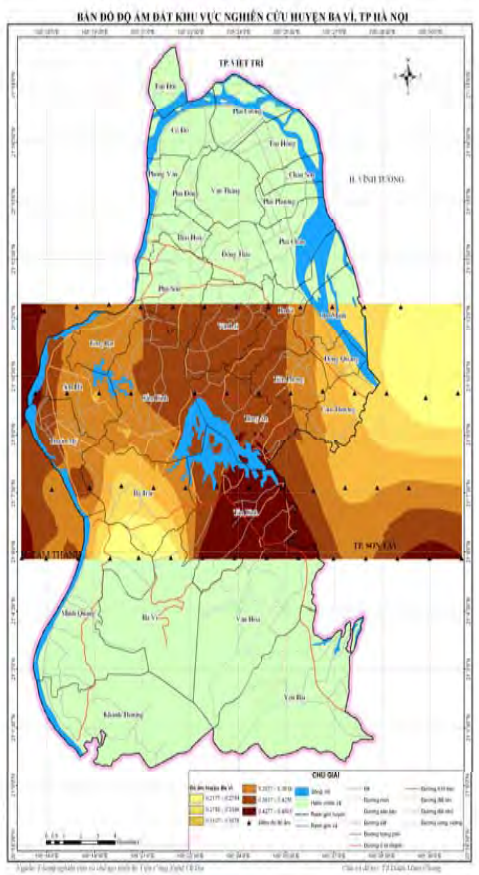
SPACE TECHNOLOGY INSTITUTE

VAST

Radiometer calibration with Blue sky

Aerial Remote Sensing for soil moisture mapping





Validation SST with MODIS image

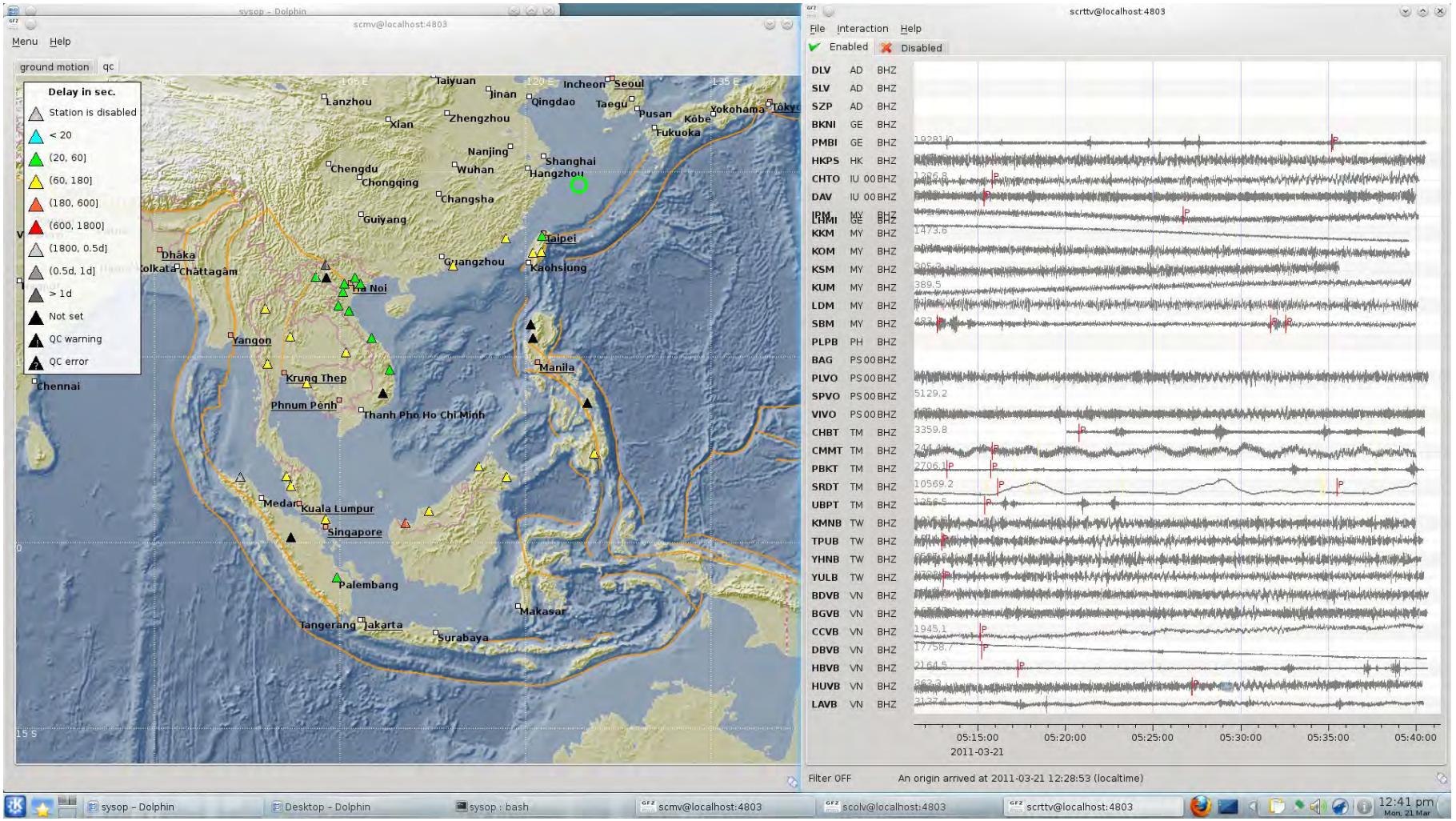
INSTITUTE OF GEOPHYSICS - VAST

Earthquake Information & Tsunami Warning Center

The center functions 24/24 hours per day, 7/7 days per week

Real-time seismic network in Vietnam and Southeast Asian region

At present, in Vietnam : 12 stations. Southeast Asian region: > 20 stations



Seiscomp 3 software for acqusition, earthquake location, data processing

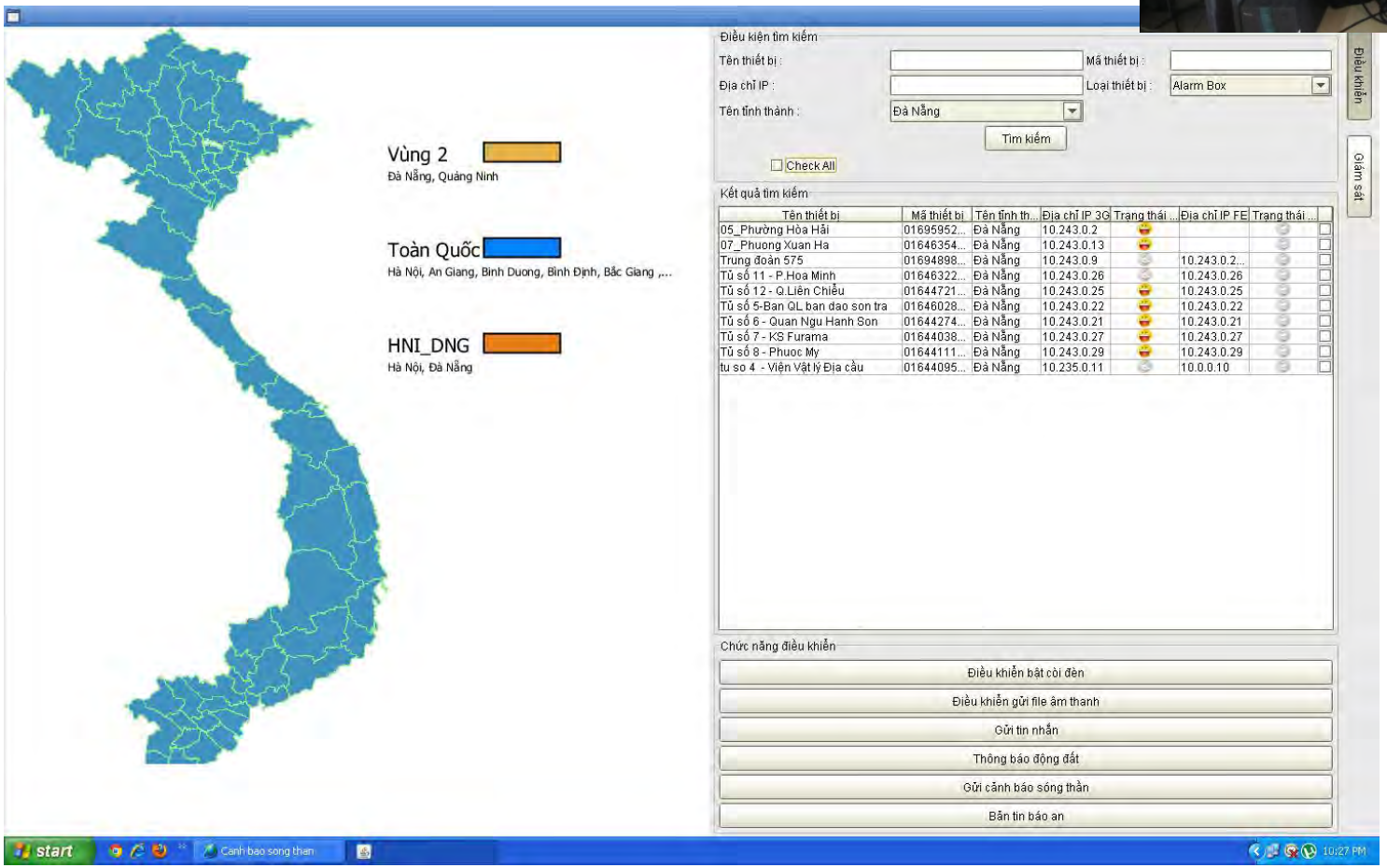
Son La seismic station

Siren tower, 30 m of the height

-Loudspeaker (800 W)
-Lamp (200 CD)

Control box

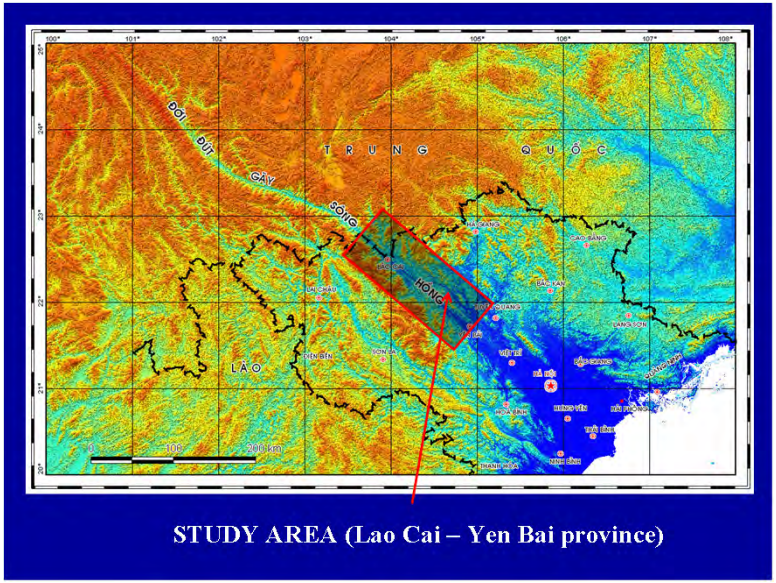
Equipment and software for sending the alert signal from the Earthquake Information and Tsunami warning Center, VAST to siren towers in the coastline



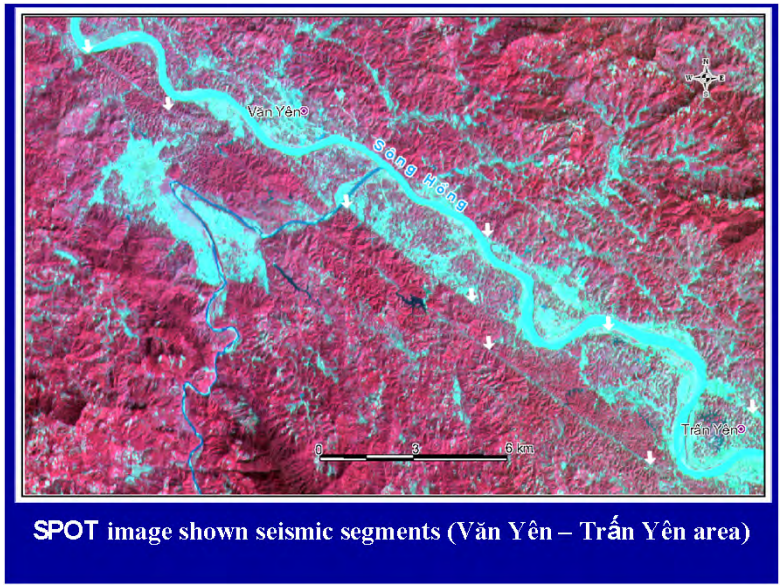
INSTITUTE OF GEOLOGICAL SCIENCES - VAST

Applications of Remote sensing & GIS for estimation potential of the Earthquake along Red river fault zone, Vietnam

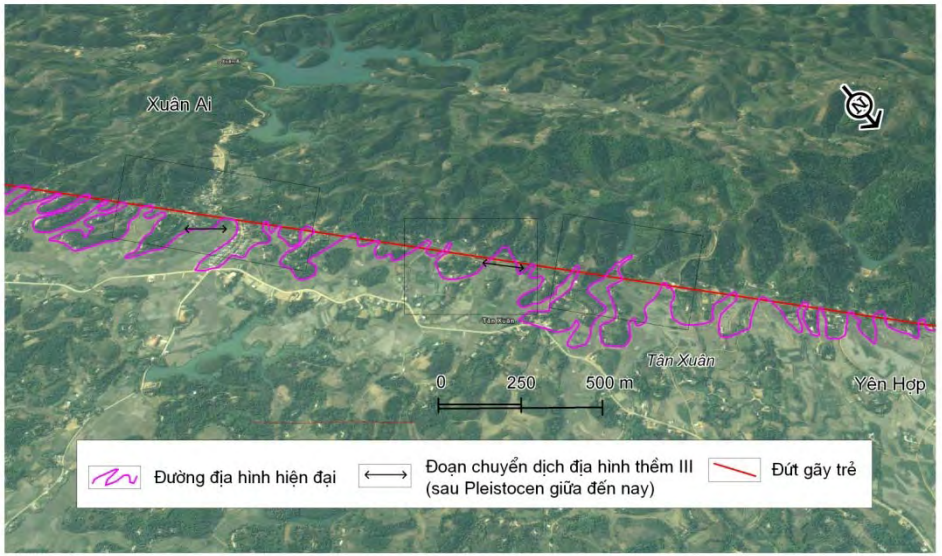
Red River Faults Zone is a large structure and popularly referred to the boundary between Indochina and South China plates.



STUDY AREA (Lao Cai – Yen Bai province)



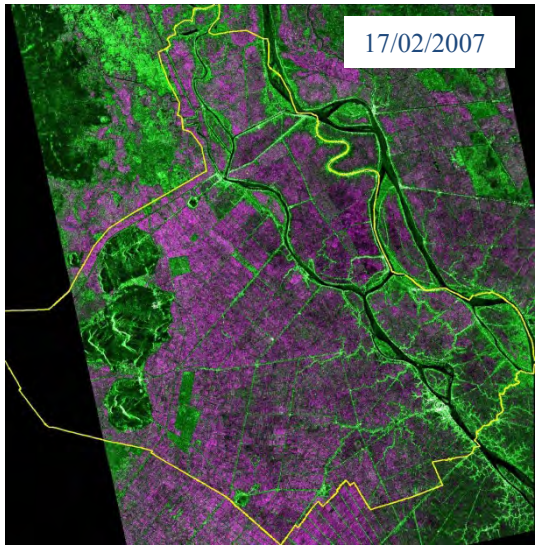
SPOT image shown seismic segments (Văn Yên – Trấn Yên area)



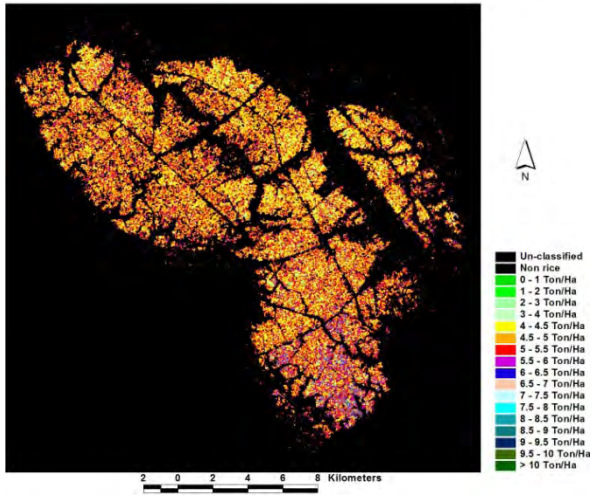
HCMC Institute of Resources Geography – VAST

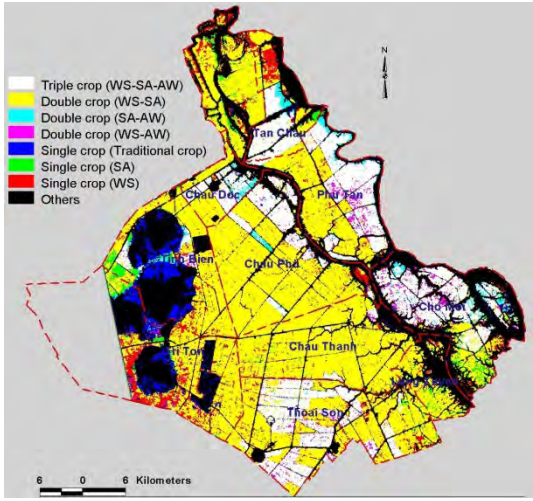
RICE CROP MAPPING IN THE MEKONG RIVER DELTA USING TERRASAR-X RADAR REMOTE SENSING DATA

Lam Dao Nguyen, Hoang Phi Phung
GIS and Remote Sensing Research Center
HCMC Institute of Resources Geography – VAST Vietnam
Juliane Huth , German Remote Sensing Data Center
DLR, Germany



- To evaluate the use of new generation SAR data in **rice mapping** and **yield estimation**, towards **an operational system** for rice crop inventory in the Mekong River Delta.





RICE MONITORING IN THE MEKONG DELTA, VIETNAM

Nguyen Lam-Dao • VAST, Vietnam
Thuy Le-Toan • CESBIO, France
Armando Apan • USQ, Australia
Juliane Huth • DLR, Germany
Phung Hoang-Phi • VAST, Vietnam

Research projects:

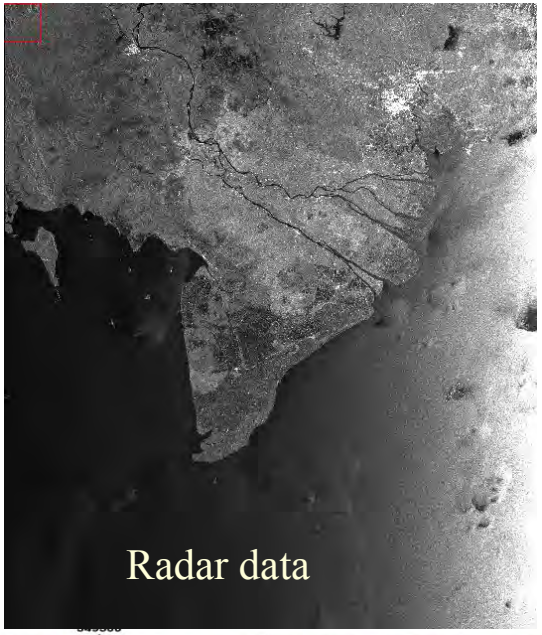
RICEMAN: Rice & Mangrove monitoring in Southern Vietnam (TerraSAR-X & ENVISAT-ASAR, 2010-2011)

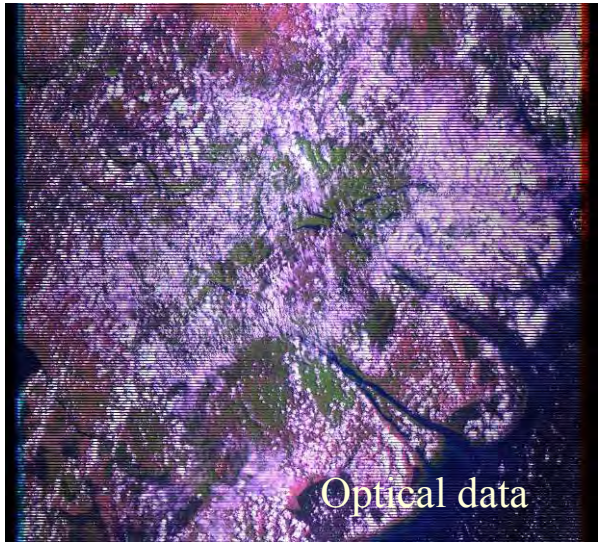
Radar data

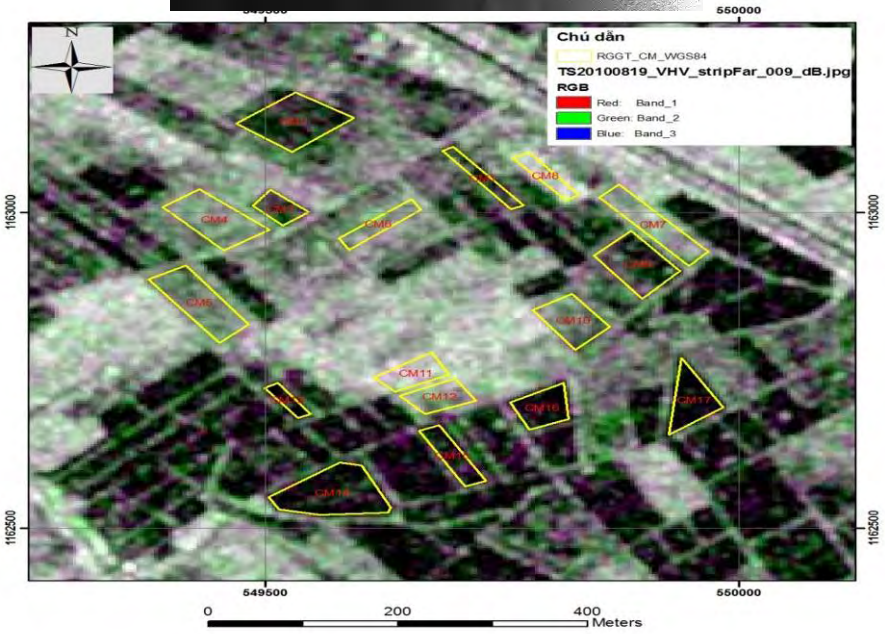
Rice crop monitoring using new generation synthetic aperture radar (SAR) imagery (ENVISAT-ASAR, 2007-08)

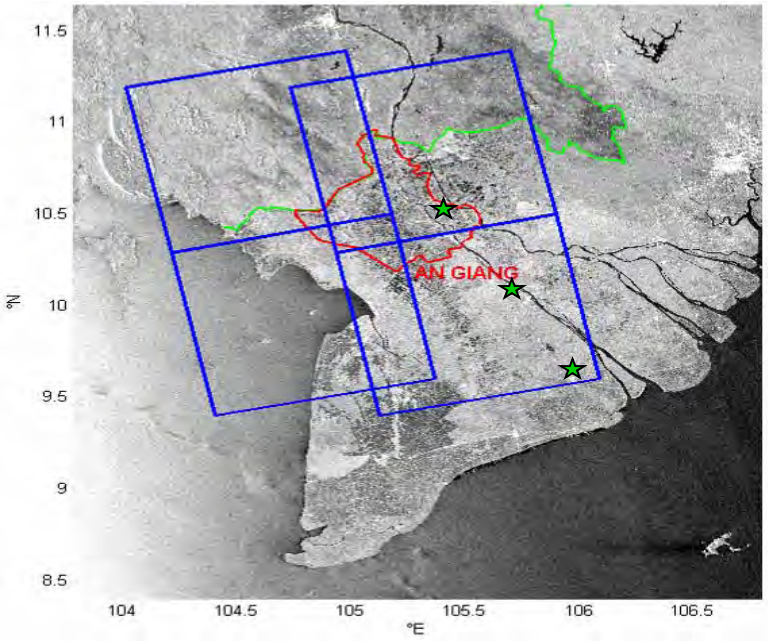
Utilisation of SAR data for rice crop monitoring (ERS2-SAR, 1997-98)

Optical data









Sample rice fields in Cho Moi (An Giang)

THE USE OF REMOTE SENSING TO DETECT LANDCOVER CHANGE AND INUNDATION IN CENTRAL CAN THO CITY

Phạm Thị Mai Thy[1], Venkatesh Raghavan[2],
N.J.Pawar[3], Shinji Matsumoto[4]

Hoa Binh Street

[1] GIS and Remote Sensing Research Center, Institute of Resources Geography, HCM city, Vietnam
[2] Graduate School for Creative Cities, Osaka City University, Japan
[3] Shivaji University, India
[4] Graduate School of Science, Osaka City University, Japan

THANK YOU FOR YOUR ATTENTION !

Contact: dmchung@sti.vast.ac.vn
chung_sti@yahoo.com
Website: www.sti.vast.ac.vn