



**VNU**  
ĐẠI HỌC QUỐC GIA HÀ NỘI  
Vietnam National University, Hanoi



UNIVERSITY OF  
MARYLAND



# Cyber-infrastructures - geopolitics, research and education

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- Prof. Christopher Justice, University of Maryland**
- Prof. Mai Trong Nhan, National Senior Expert, VNU**

# Outline

- Geopolitics Context of LMR (Lower Mekong River)
- Information sharing needs in LMR
  - Infrastructures, Policy, Technologies, Human resources
  - Mechanism: Legal, coordination mechanisms , Cooperative
- Current status and challenges
  - Human resources, mechanism, policy
  - Computational infrastructures: Spatial data infrastructure(SDI), Data, Remote sensing in Vietnam
- Suggestions
  - Regional and international should be proposed
  - Making forum for developer technologies
  - Data, Data standard, Spatial data infrastructures (SDI)
  - Financial - Fund
  - VINAREN-based mechanism start-up
  - VINAREN – MRC (Mekong River Committee)
  - SERVIR (USAID)
- Earth Observation Development in Vietnam
- Current activities in Vietnam National University (VNU), Hanoi
  - Activities, partners
  - ICARGC, FIMO

# Geopolitics Context of LMR

- Basin- based view: Resources use, Environment protection in basin view
  - Regional integrated (Interdependence development)
  - Water resources security
- Regional View:
  - ASEAN countries
  - ASEAN's initiatives (but not effective )
- Global view:
  - Climate change
    - Global scale issues
    - Regional scale
    - Information-sharing needs
  - Food security
    - Two big rice export's countries in LMR (Thailand, Vietnam)

**Conclusion: Purpose = information-sharing for Suitable development in LMR**

# Information and data-sharing needs in the LMR

**Al Gore's speech (1998): Most of information for management of the World are Geo-information**

- **Information, data demand**
  - Environment resources, and hazard information
  - Water resources
  - Food agriculture information
  - Regional integrated information development: Railway system, waterway, road
  - Human resources exchange
  - humanitarian aid operations information
  - Migration
- **Standardized information, data demand**
  - Spatial data standards
  - Attribute standards
  - Metadata standards
  - Data exchange standards
- **Information infrastructure need**
  - ICT infrastructure
  - Data infrastructure, computing and data exchange
- **Information-sharing for suitable development**



# Current status

- Global:
  - Big data resources: USGS, NASA, ESA, JAXA
  - Satellite systems:
    - NOAA, MODIS, LANDSAT, SENTINEL, ALOS II,...
  - Cooperative achievement:
    - Satellite Sentinel Program
    - MODIS, NOAA
    - ASIA RICE
    - GEOGLAM, LCLUC
- Regional:
  - MRC
  - ASEAN
  - THEOS, VNRedSAT-1
- Issues:
  - Absence of common infrastructure
  - Intergovernmental cooperation?
  - Absence National SDI, Regional SDI

# Suggestions

- Cooperative mechanism
- Cyber-Infrastructure Construction
- VINAREN-based mechanism startup
- VINAREN – MRC ?
- International finance sources : USAID, JICA, ADB, WB,..
- Local finance sources.

# Earth Observation Development in Vietnam

- A historic insight
- Local Needs and Contribution of Earth Observation
- Lesson learned from Landsat to VNREDSats

# A historic looking back

- 1979:
  - VAST project with Inter-cosmos program of COMECON
  - Creation of Space Center 1979 Landsat and MKF6 data used
- 1980's:
  - First project funded by UNDP and FAO in Forestry Inventory, first Landsat Data used
  - 1980 Vietnamese Astronaut on board of Salyut 6, Project funded by UNDP in VAST, Passive Radar Salinity and Soil Moisture
  - 1984 first project funded by France VAST in 1991
- 1996 GlobeSAR and Radarsat project in Rice Monitoring in 1999-2000
- 1997 First Forest Fire project funded by MOST and supported by GVM in Join Research Center of Europe in Ispra, NOAA data use

# A historic looking back

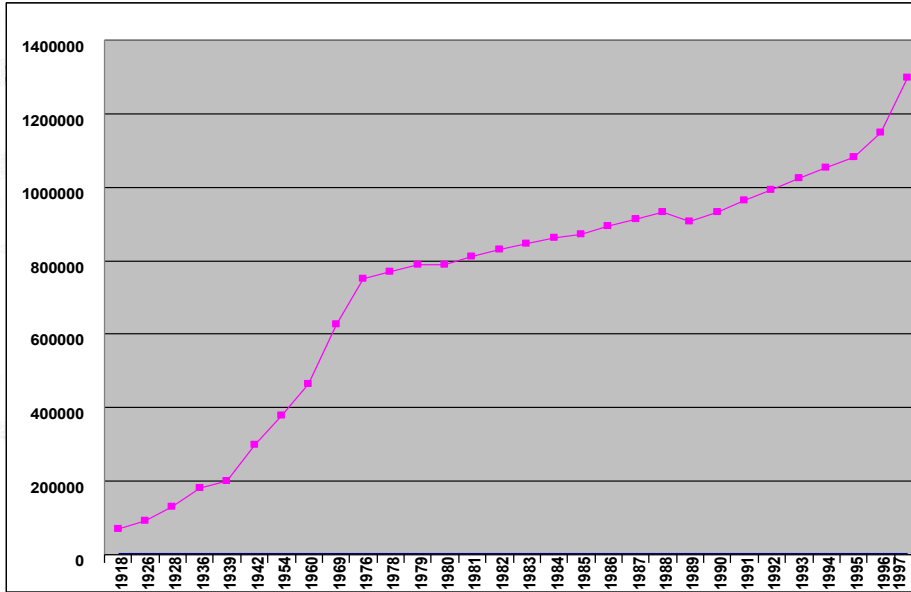
- 2006:
  - Approval of Remote Sensing Master Plan of Vietnam and Installation of Receiving Station in MONRE
  - Establish Space Technology Institute (STI), VAST – 11/2006
- 2010:
  - Establish Vietnam Space Committee (VSC), GOV – 09/2010
  - 2010: Small Satellite Program
  - 2011: Vietnam National Satellite Centre establishment and Japan Cooperation in Small Satellite fabrication

# Local Needs

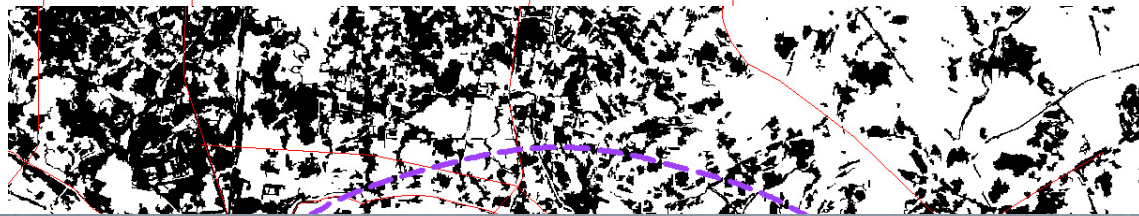
- Natural Resources Monitoring
- Land Use and Land Cover Monitoring
- Disaster Mapping
- And Decision Making Support

# CONTEXTE

## CROISSANCE DÉMOGRAPHIQUE









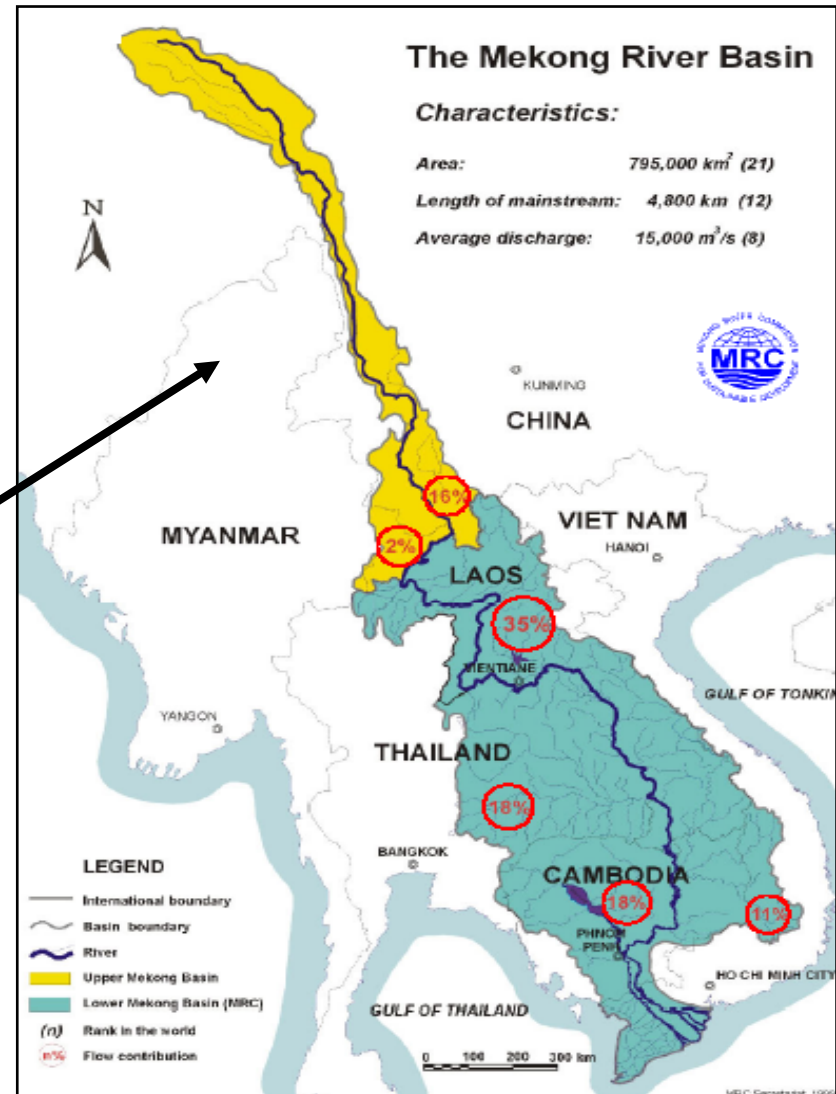
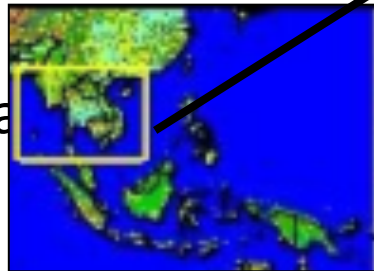
# Deforestation Vrs Reforestation



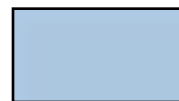
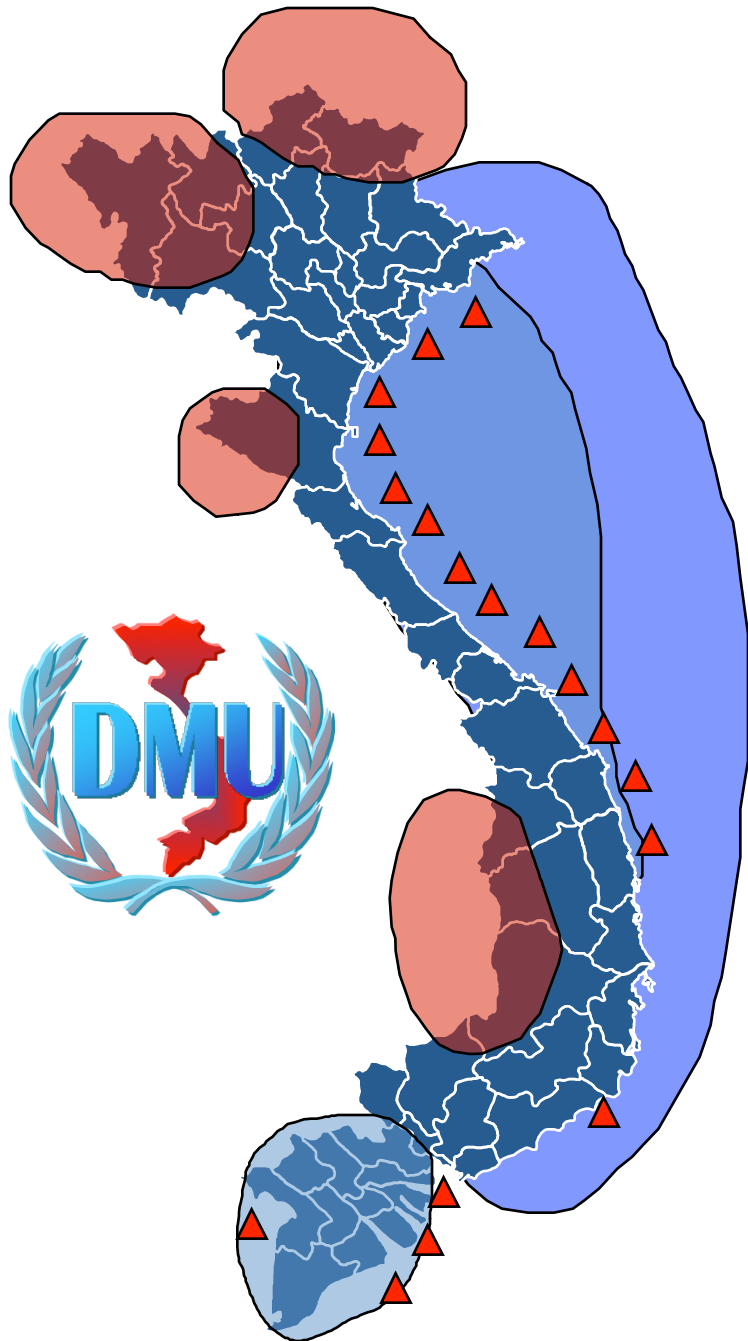
- In the mountain provinces of Vietnam, forest is progressively replaced by tea, coffee and mulberry plantations
- These plantations do not trap water nor protect soil as well as the forest did before
- The frequency of disastrous floods is increasing and erosion accelerates

# Rice, Flood of Vietnam in Mekong Basin

- Large
- Multinational
- Monsoon Asia



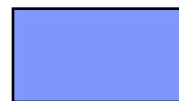
# Natural Disasters in Vietnam



River Flooding



Flash floods



Typhoons



Storm Surges

Not on map:

- Droughts
- Salt water intrusion
- Forest fire

# Food Security and Rice Information Need

## Vietnam Rice Exports: Seasonal Trends

© Oryza

WWW.VIETFOOD.ORG.VN

World News

= **The Express Tribune: "Rice exports: Pakistan has potential of \$4b but barely touches \$1b" (02/10/2012)**

= **Manila Standard: "Govt may reduce rice imports to 100,000 MT" (02/10/2012)**

= **Business World: "2013 duty-free rice imports seen lower" (02/09/2012)**

= **TANN: "Democrat MP Cautions Govt on Rice Price Program" (08/24/2011)**

= **TANN: "Com. Min. Rejects Request to Increase Packaged Rice Price" (08/24/2011)**

= **Japan Times: "Back to the rice futures trade" (08/25/2011)**

= **Jakarta Globe: "Thai, Vietnam Rice Gain on Hoarding, Indonesia Demand" (08/24/2011)**

= **The Nation: "Pledging scheme could cut rice exports in half" (07/28/2011)**

= **The Nation: "High rice price may end kingdoms export leadership" (07/28/2011)**

= **PTI: "Thomas requests finmin to hike rice export floor to \$500" (07/28/2011)**

Thursday, 02/21/2013

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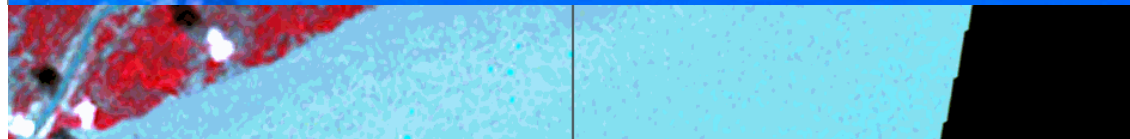
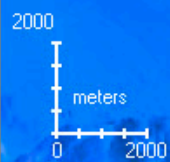
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# What is Earth Observation Contribution since 1980

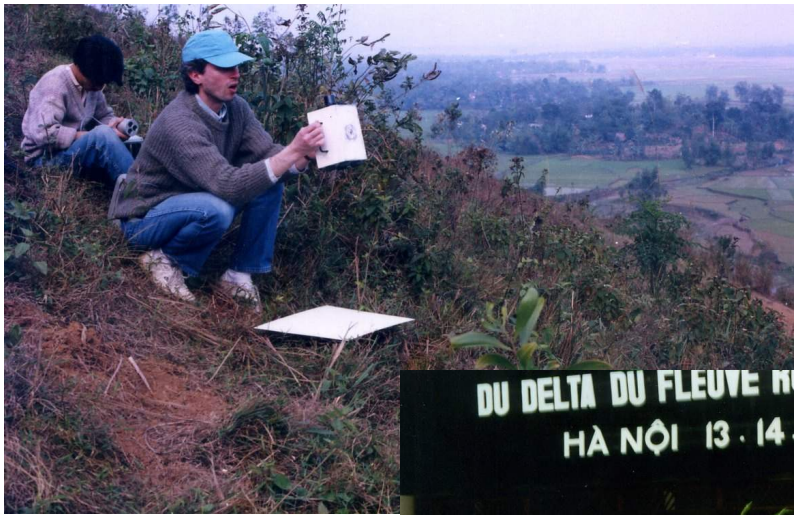
- First and most used is Landsat in forest inventory (early 1980's) and then Land use Mapping (by 1995) and now SPOT 5 in Forest Inventory
- Disaster mapping (started Mid 80's with Landsat and then Radarsat) and forest fire monitoring (started in 90's with NOAA and now with MODIS)
- Since 1990's applications in all economic sectors
- Remote Sensing Education in Universities and Human Resources



2003







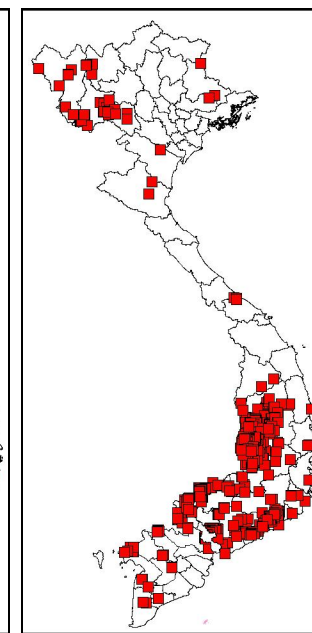
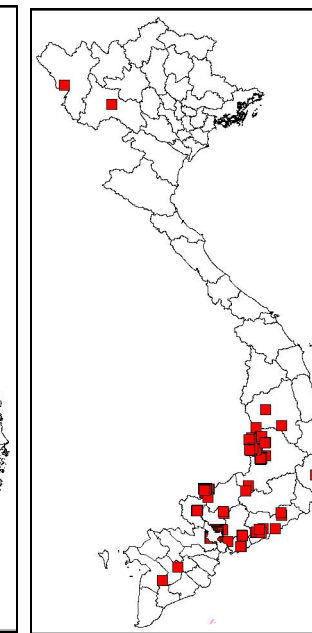
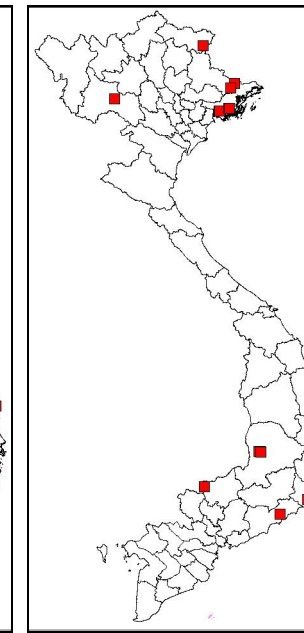
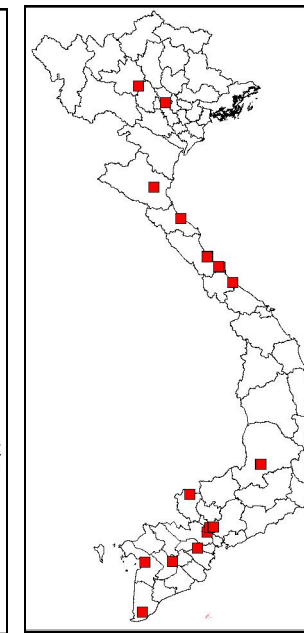
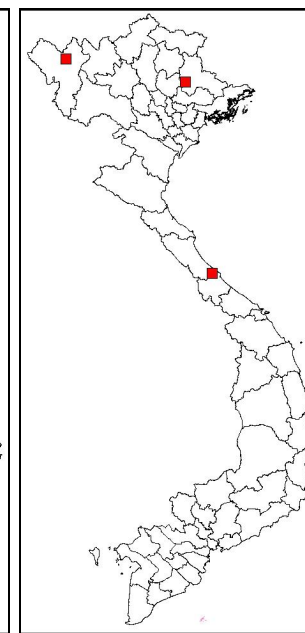
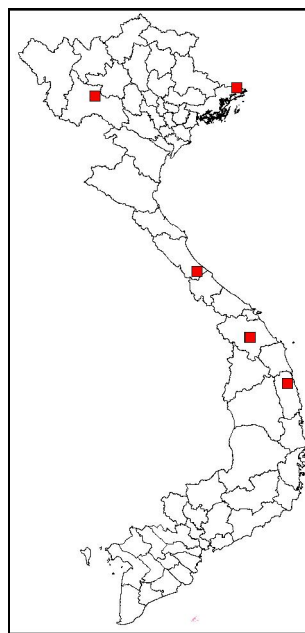
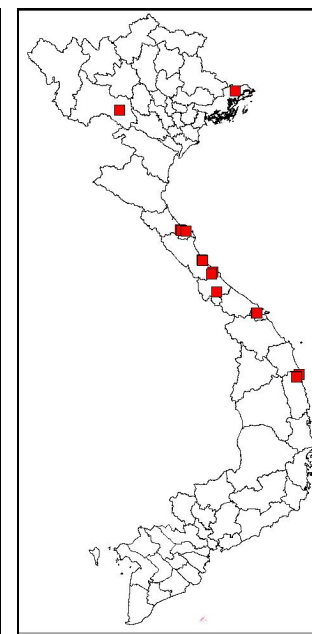
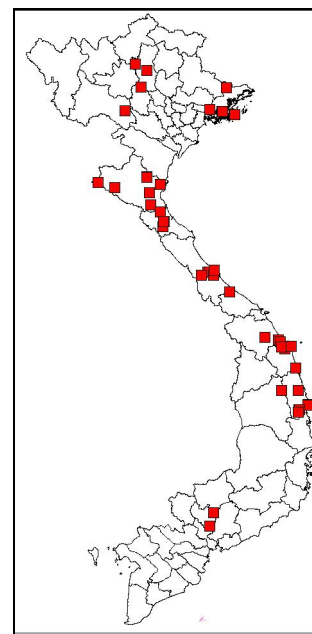
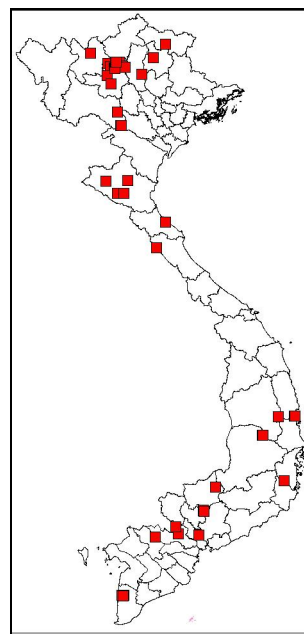
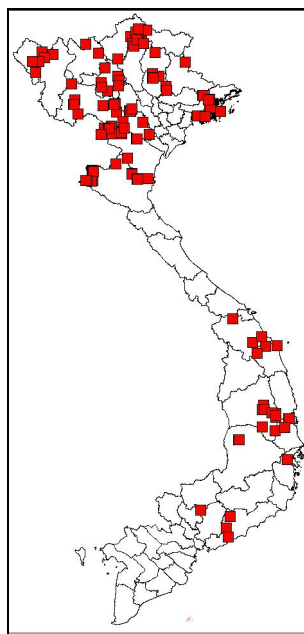
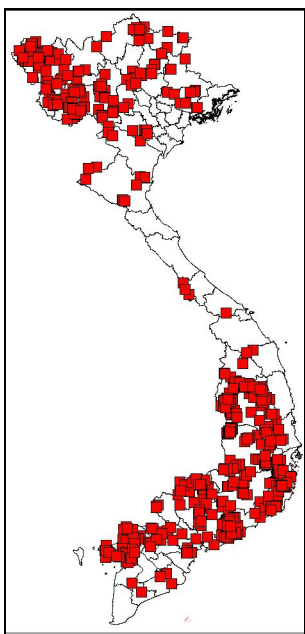
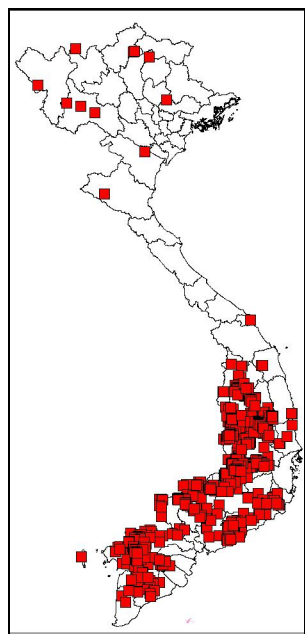




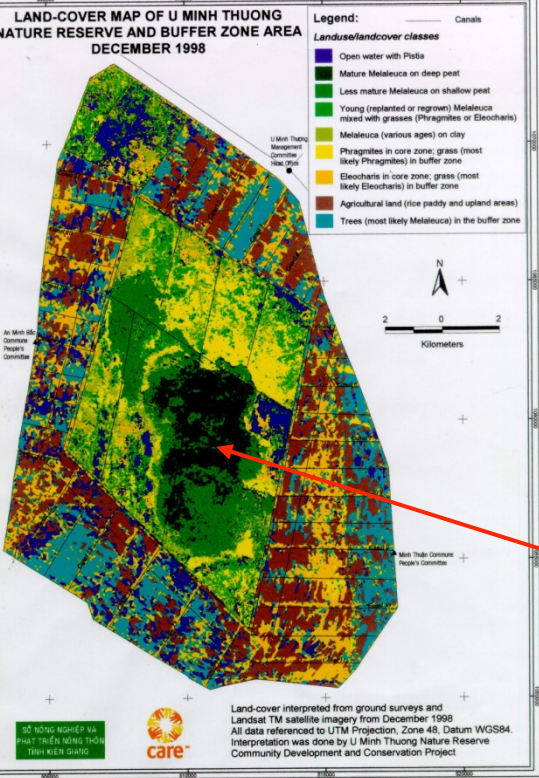
First Fire Detection with NOAA Portable Receiver  
Test Site is Dien Bien Phu Valley  
(Jean Paul Malingreau, Jean Marie Gregoire et Al.)



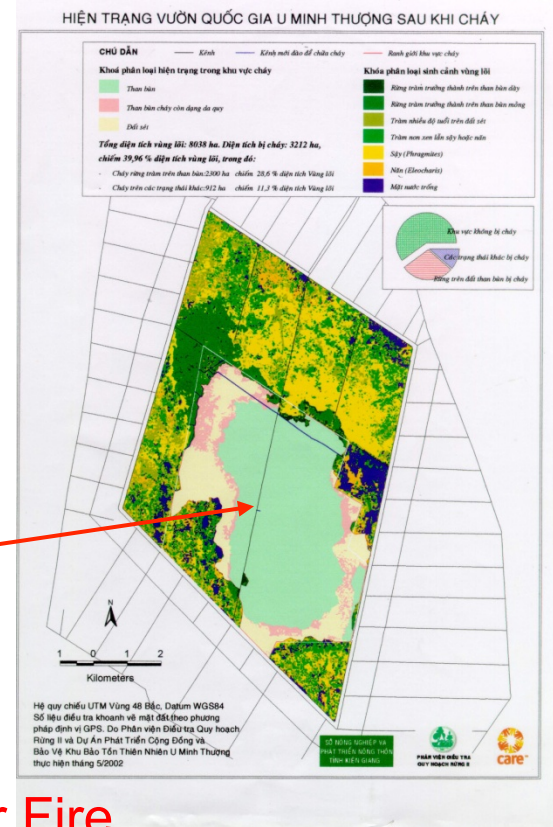
# Diễn biến cháy từ tháng 3/2003 đến đầu năm 2004







Before Fire



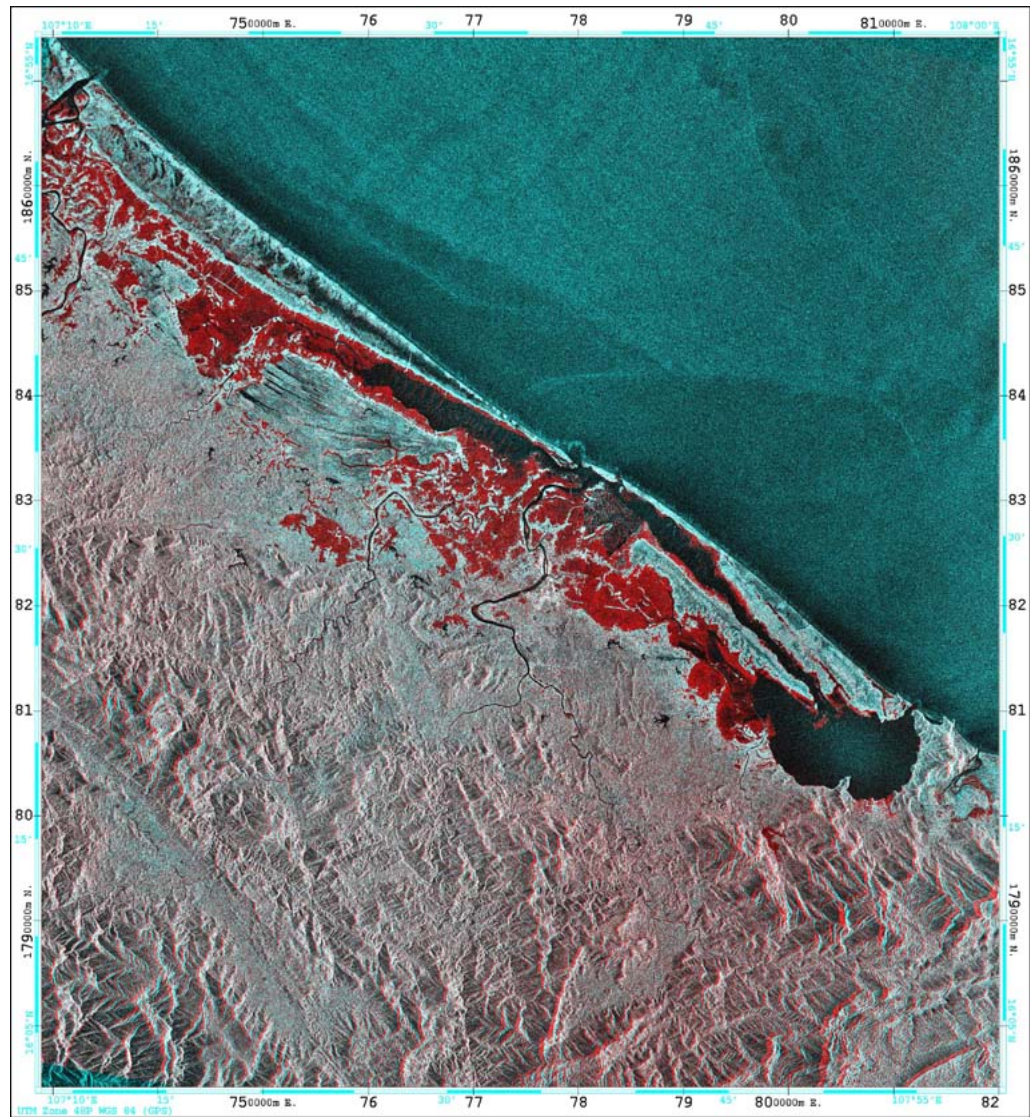
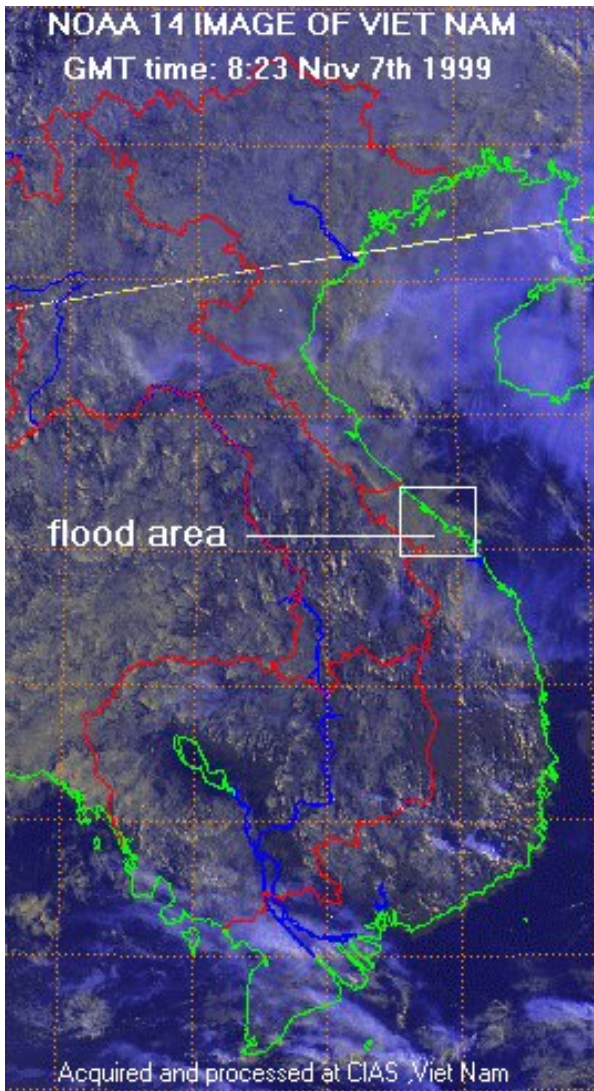
After Fire



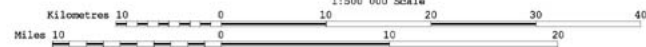


# Flood Disaster Mapping (Radarsat)

(example of Nov. 1999)



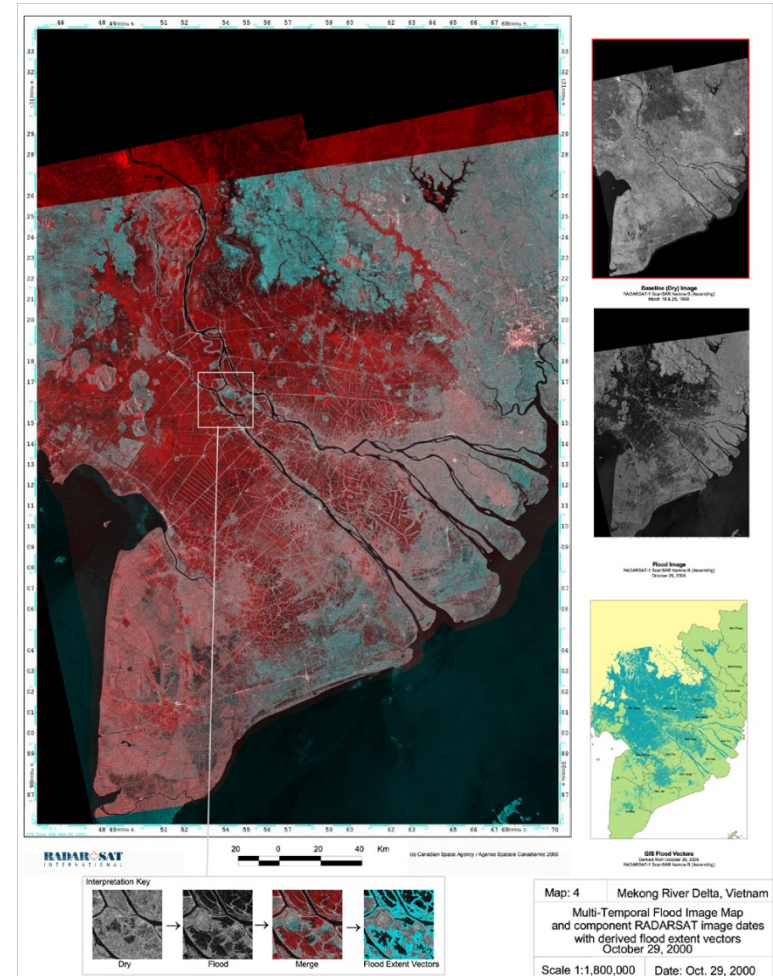
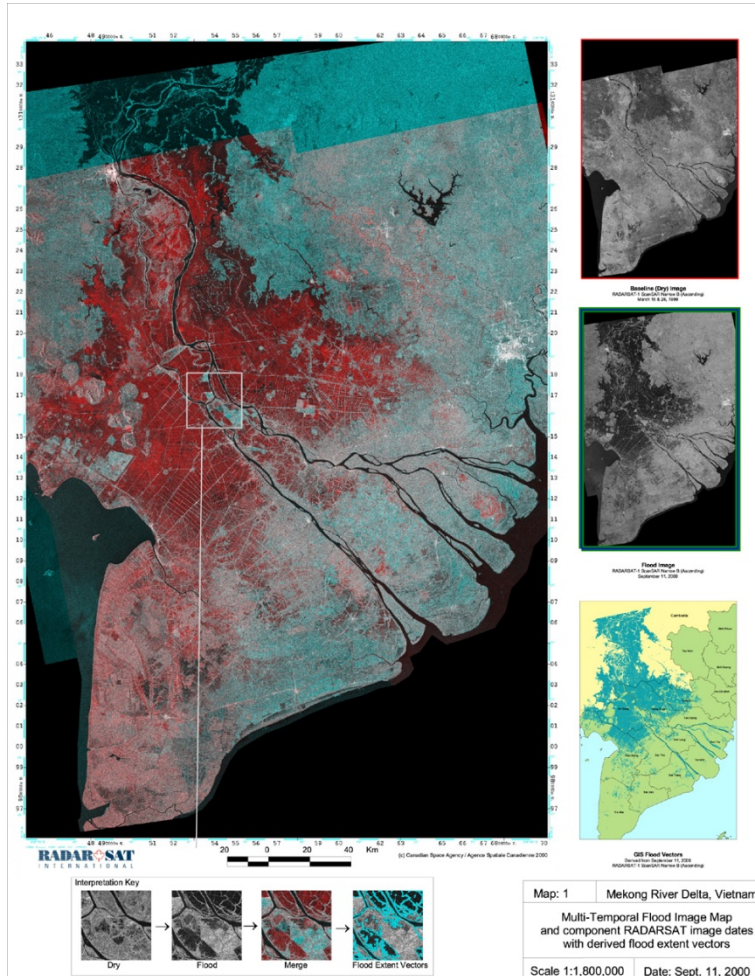
Hue Province, Vietnam  
Wide 2 (Nov.06/1999), Standard 7 (Feb. 10/1998)





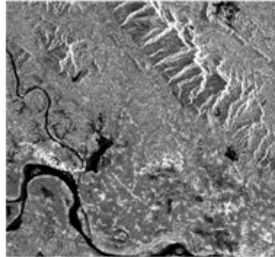
# Flood Mapping with Radarsat data 2000

## Mekong Delta



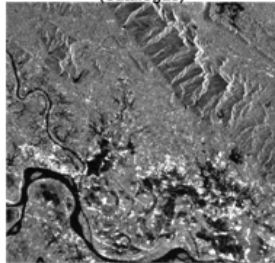
# RAPID MAP MAKING

**Requested data**  
(ESA, Sentinel Asia, International Charter)



Before Flood

**Archived data**  
(Catalogue)

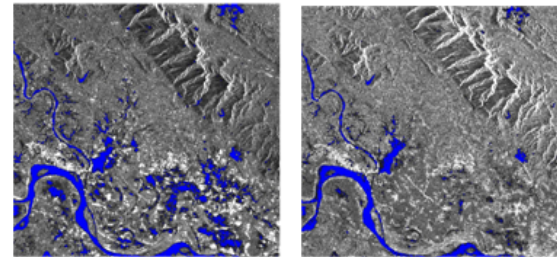


After Flood

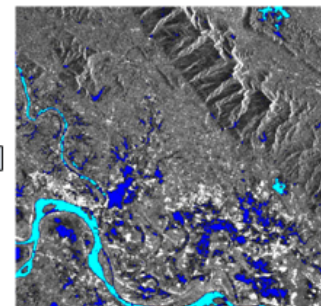
**Rapid Map Flowchart**  
To be done in less than 6 hours



**Water Extraction**



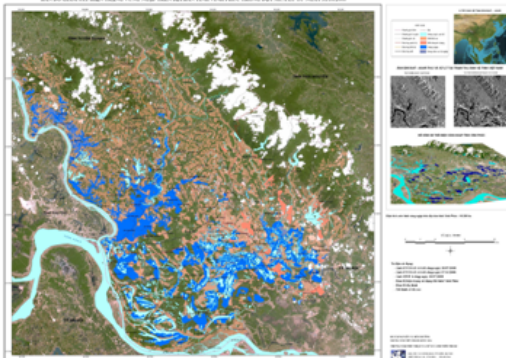
**Flooded area**



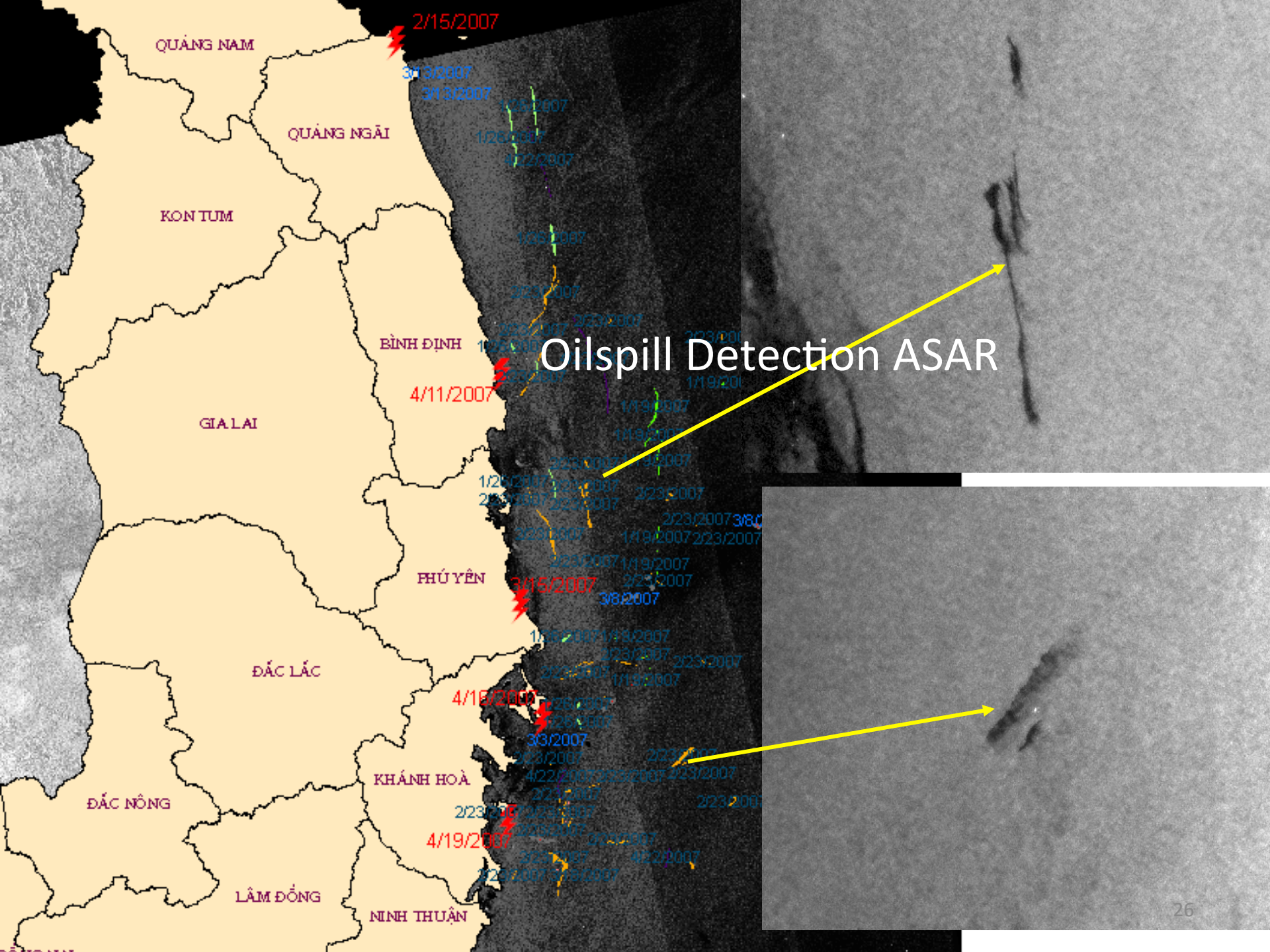
**Integrated with  
Optical and GIS data**



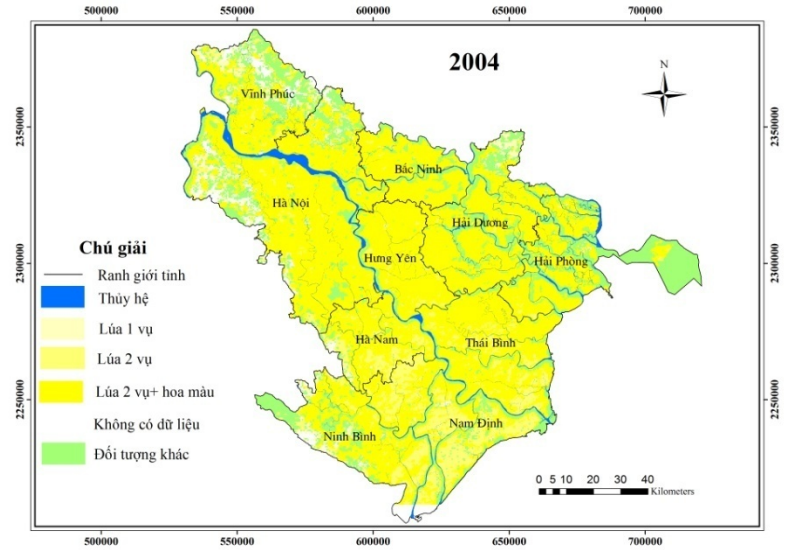
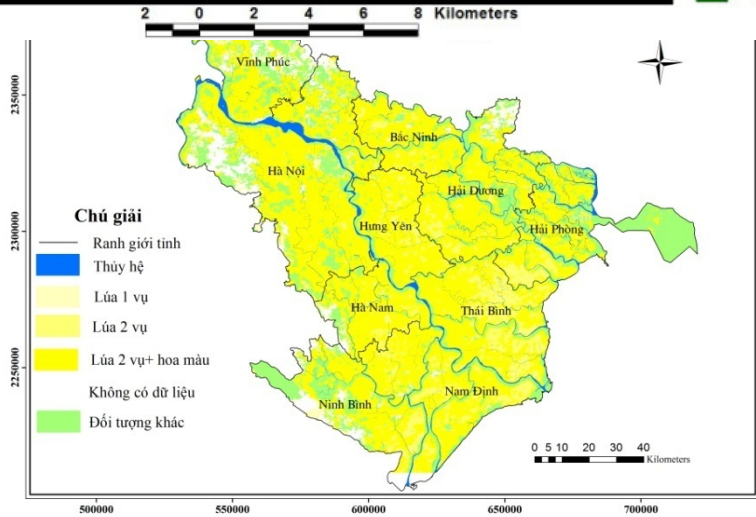
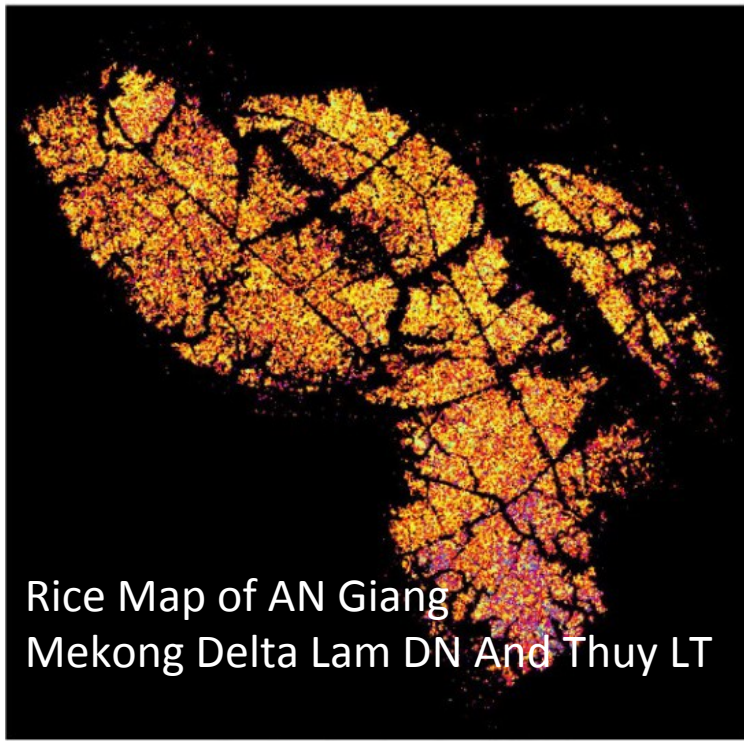
**Rapid Map  
Production**



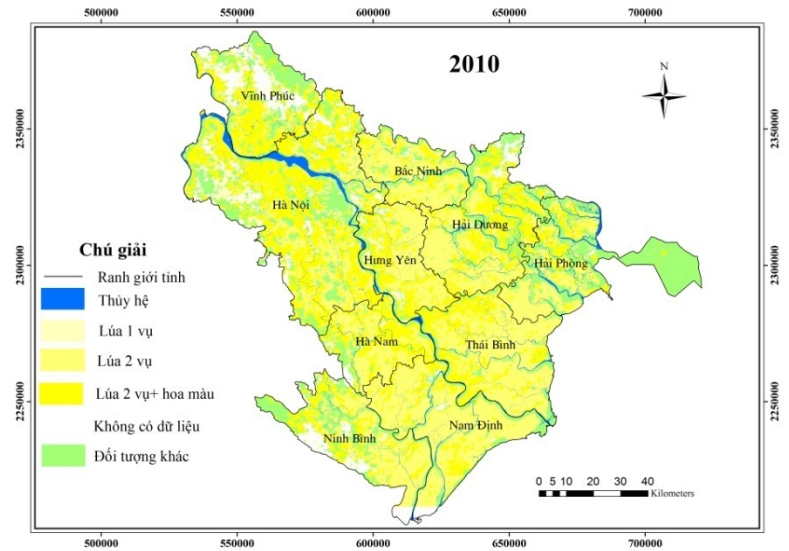




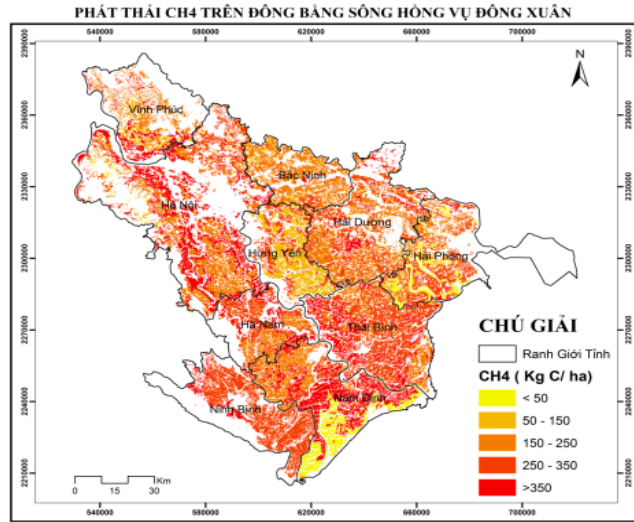
# Oilspill Detection ASAR



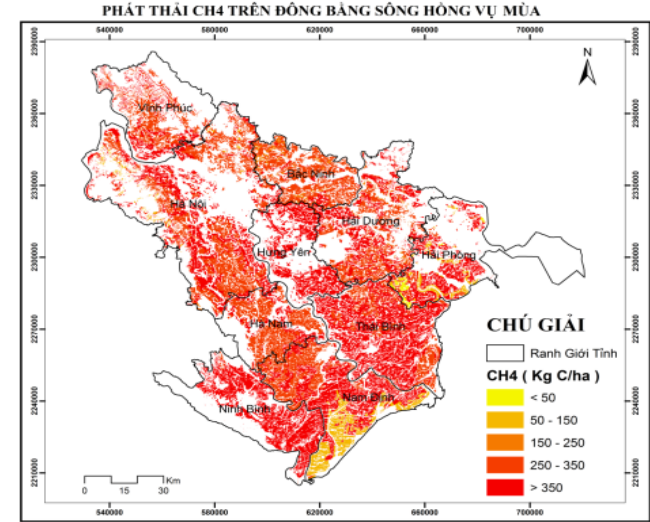
## Rice Maps Red River Delta ICARGC 2014





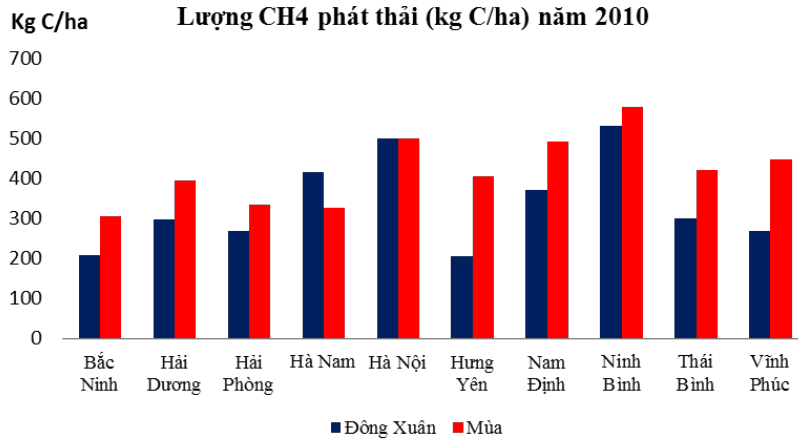


**a**



**b**

**Methane emission of rice cultivation on Winter-Spring (a) & Summer-Autumn season**

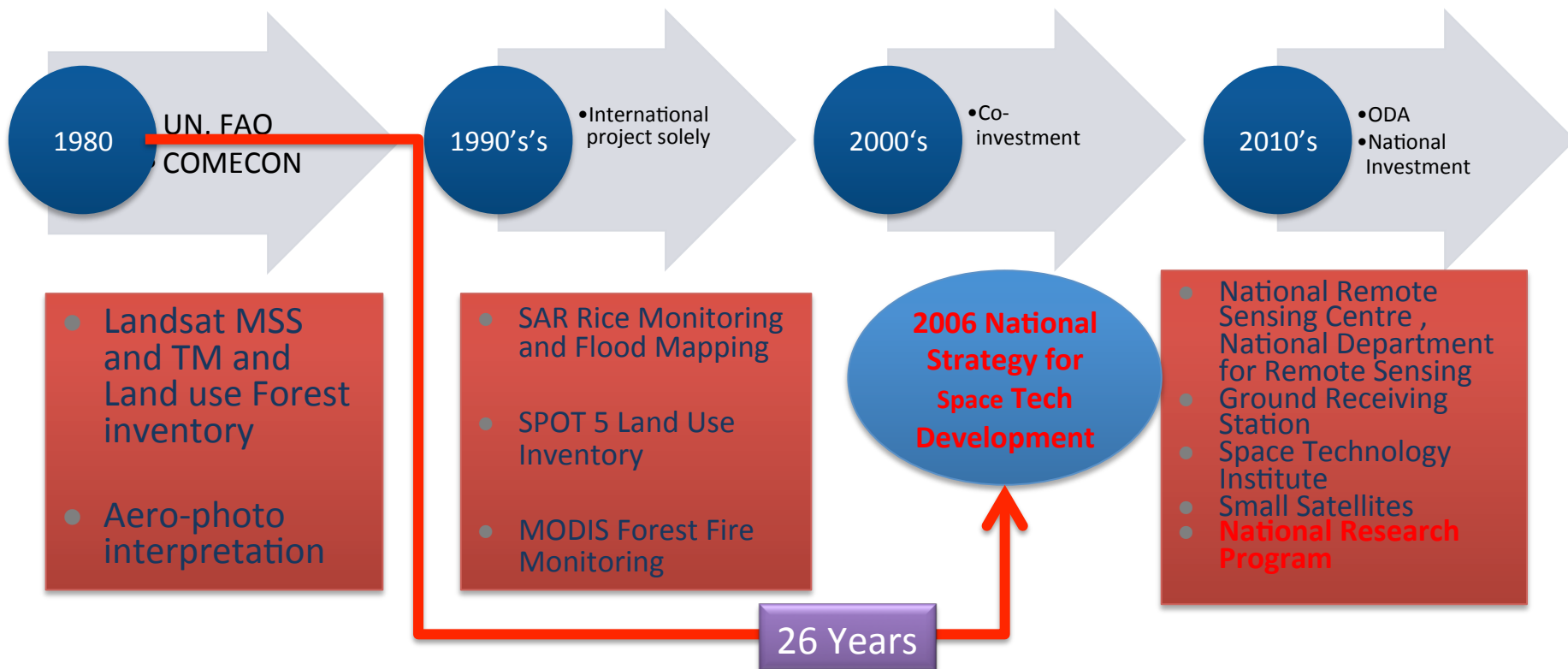


**Methane emission by province, on (a) season and (b) season**

**Results of Belspo Project ICARGC 2013**

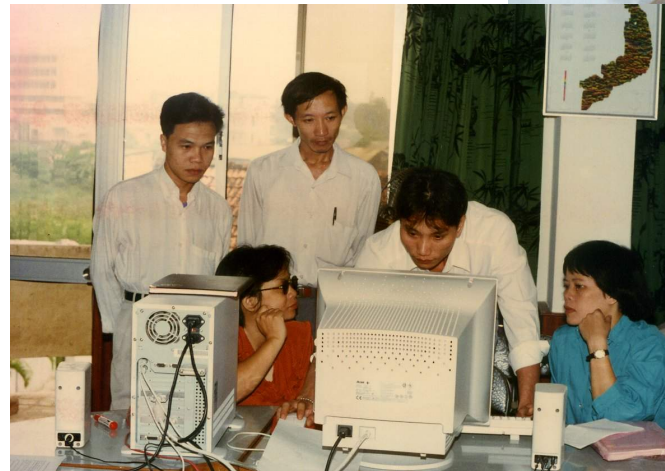


# Important Milestones and Lessons learned

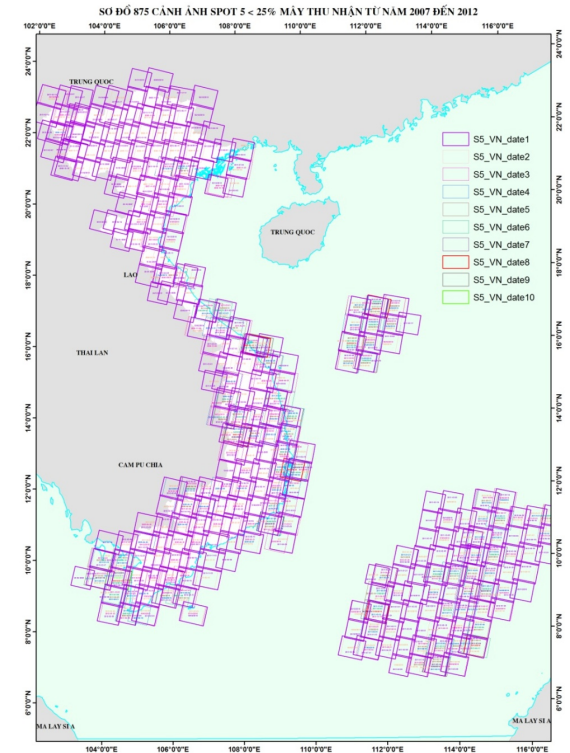
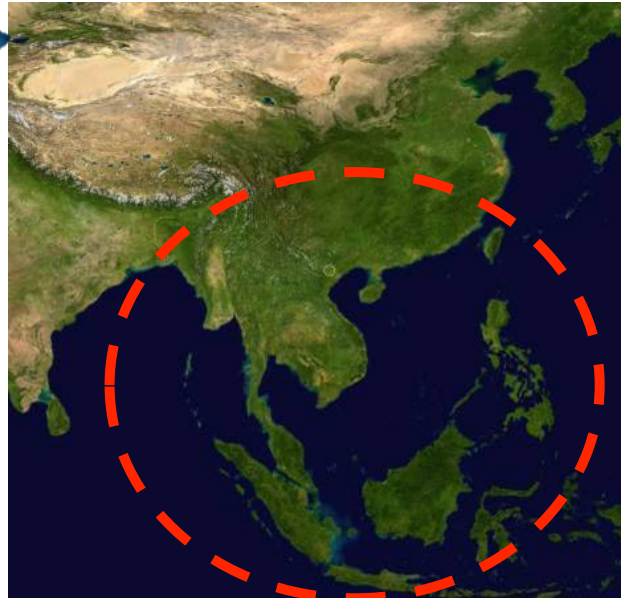
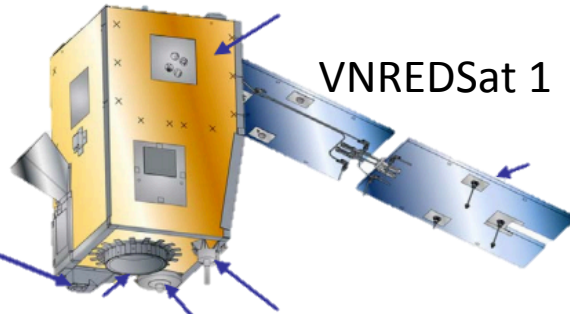


# Earth Observation Education – A Component of Successful Application

- Started early in 80's but tardily developed
- First Satellite Remote Sensing Course in Hanoi University was in 1996
- Curriculum adapted
- Postgraduate and internship mostly in Europe (Netherland, France, Belgium, Germany) and Asia (Japan, AIT and India)



# New Instrument Requires New Human Resources and Newer Policy



# International Cooperation – Key of Success



CSA, ESA, JAXA, NASA  
And Inter-university Projects,  
Collaboration with Industry

# **The Challenges still Remain!**

- **High Tech Importation or Development?**
- **Application Driven Approach and Spontaneous development**
- **Absence of National GIS Infrastructures and Impacts of Added Value Creation**
- **Salary and Research Funds and Brain Drain**

# Current activities at VNU

- **Activities:**

- Field Monitoring projects
- Field Monitoring Center (FIMO)
- Comprehensive infrastructure :
  - MODIS/NPP ground station.
  - High Performance Computers
  - Huge storage
  - Data Visualization devices

- **International cooperations:**

- University of Maryland, NASA
  - FIRMS Installation at VNU University of Engineering and Technology
- Asia Rice
- National Institute of Environment Study
- VUB (Belgium)
- The University of Tokyo
- Kyoto Univeristy:
  - Landslide project
- Chiba Univeristy
  - Global Land cover classification system



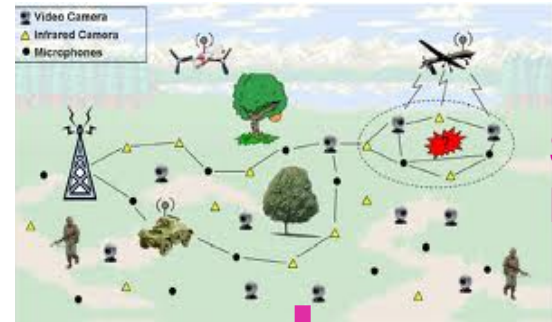
# VNU Computational Infrastructure



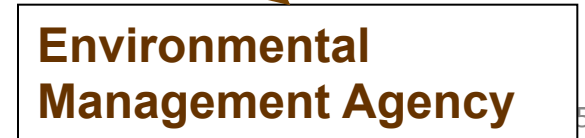
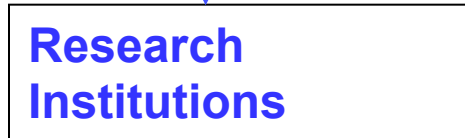
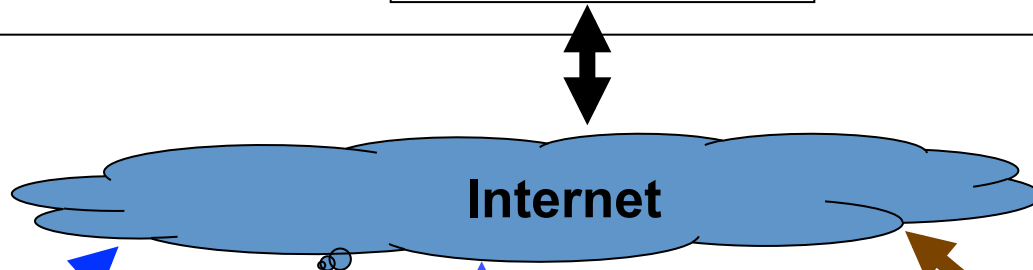
Ground Station



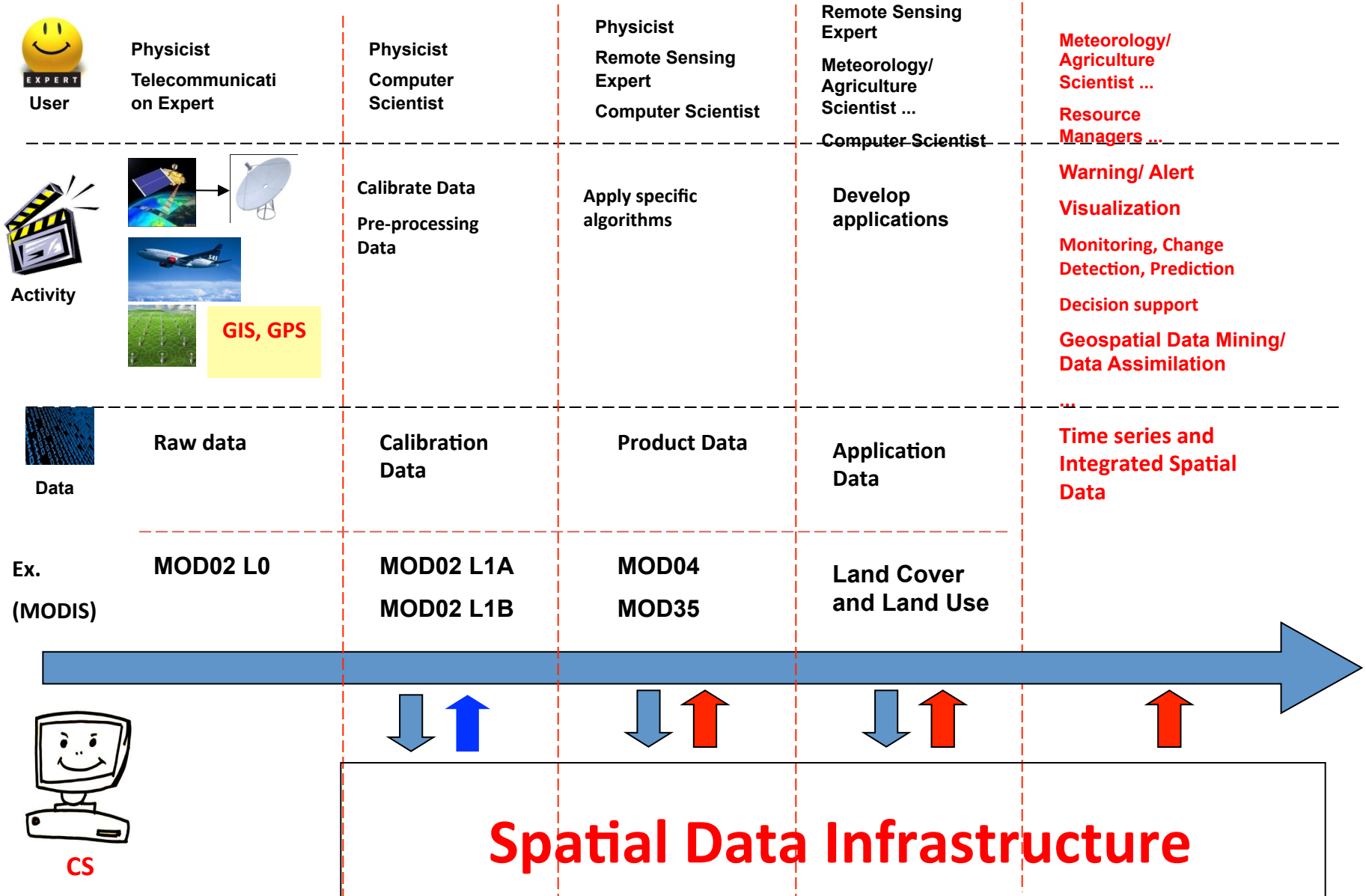
Open sensing data source



Sensor Networks

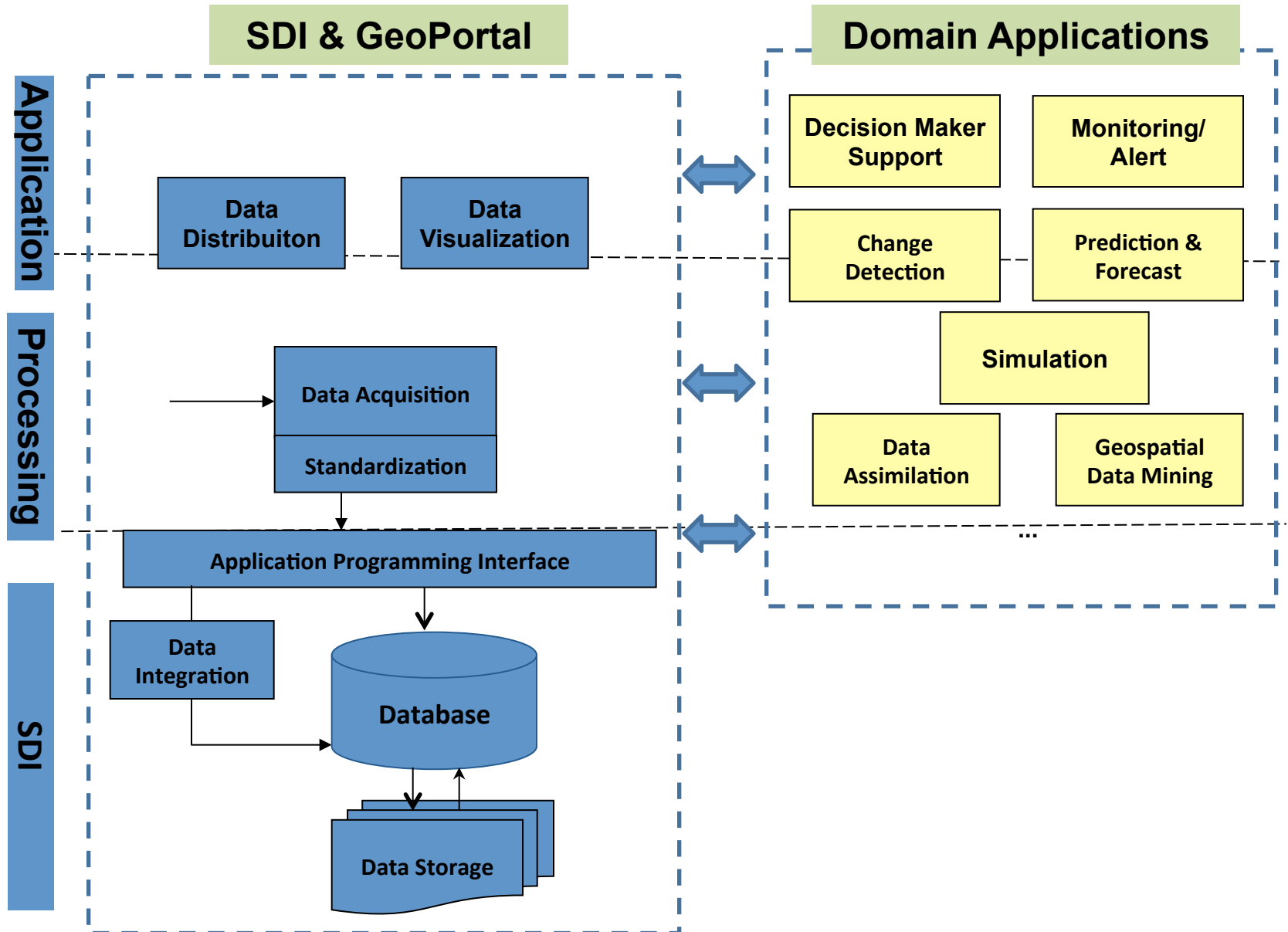


# SDI in context





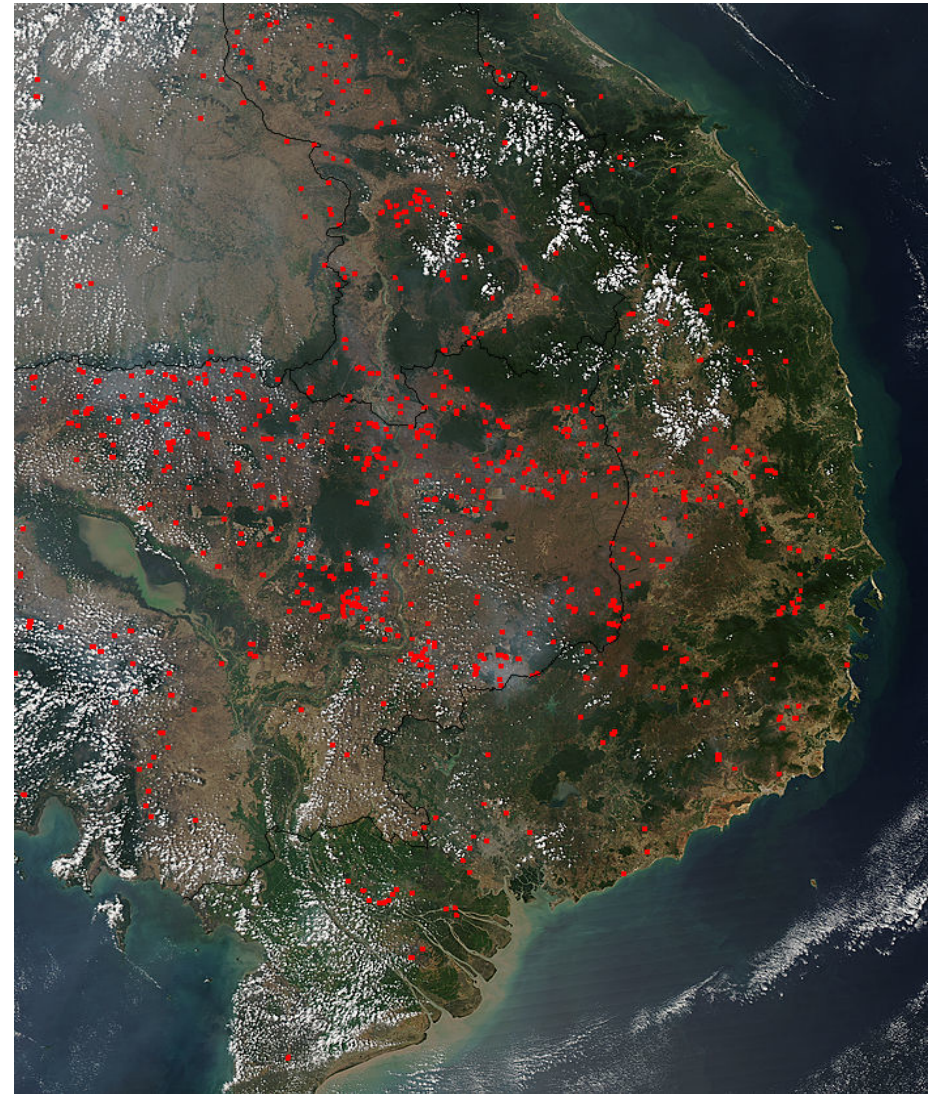
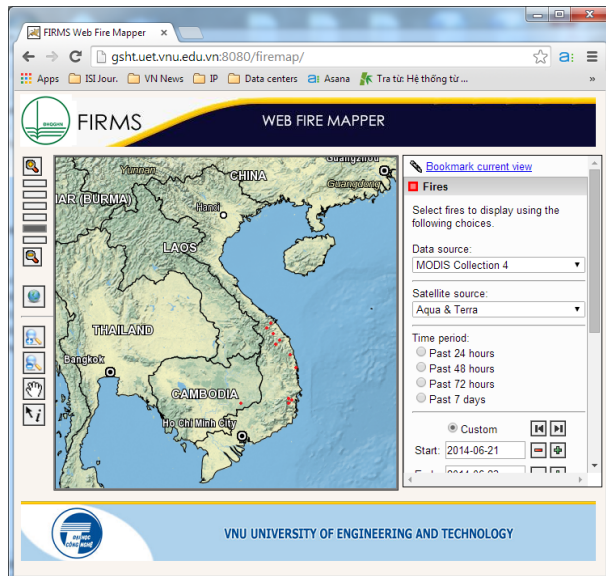
# SDI architecture



Antenna, E3, 144  
Xuan Thuy, Hanoi



Processing systems  
and storage (600TB)



FIRMS installation VNU-UET (June 2013)

# Conclusions

- Problems in the LMR
- Construction of cyberinfrastructure
- International supports