Overview and update on remote sensing technology for REDD

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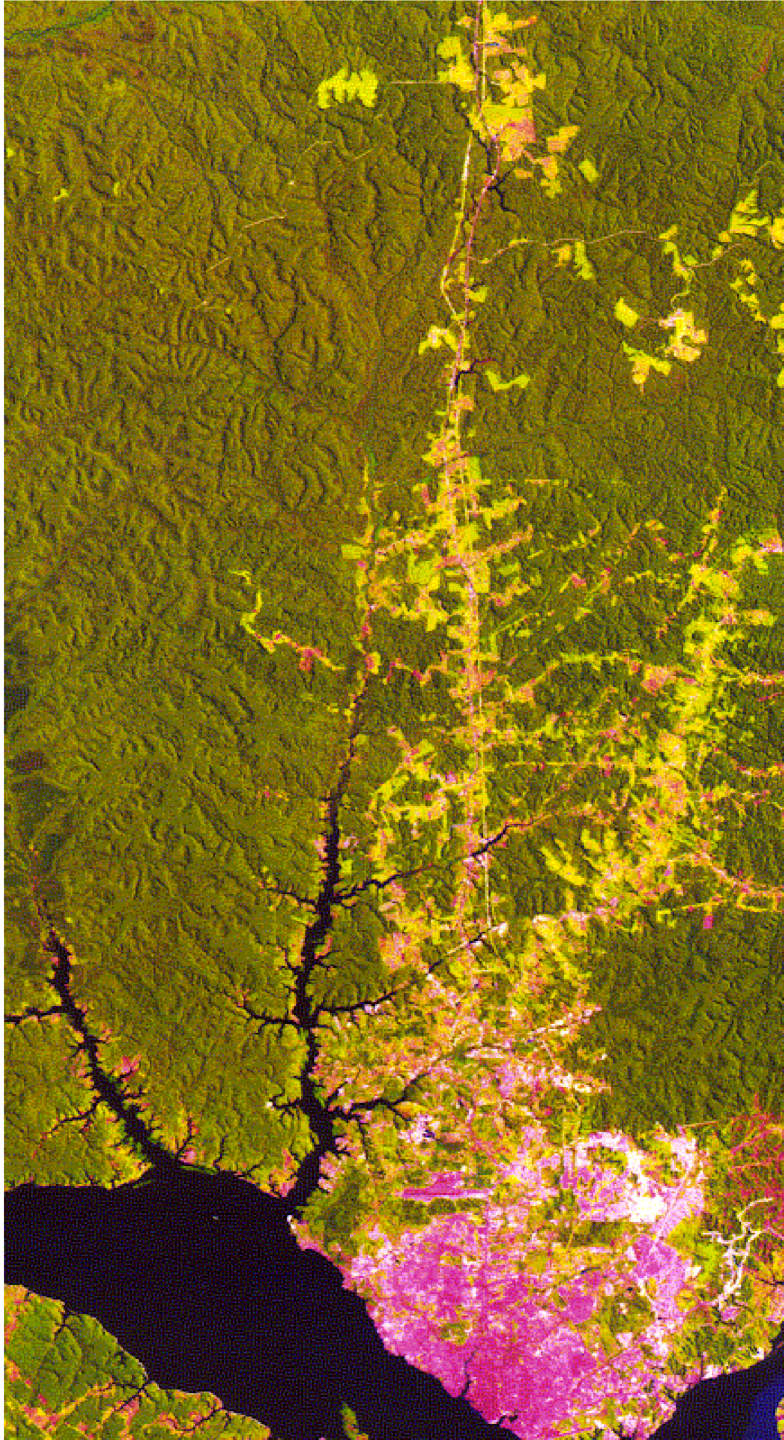
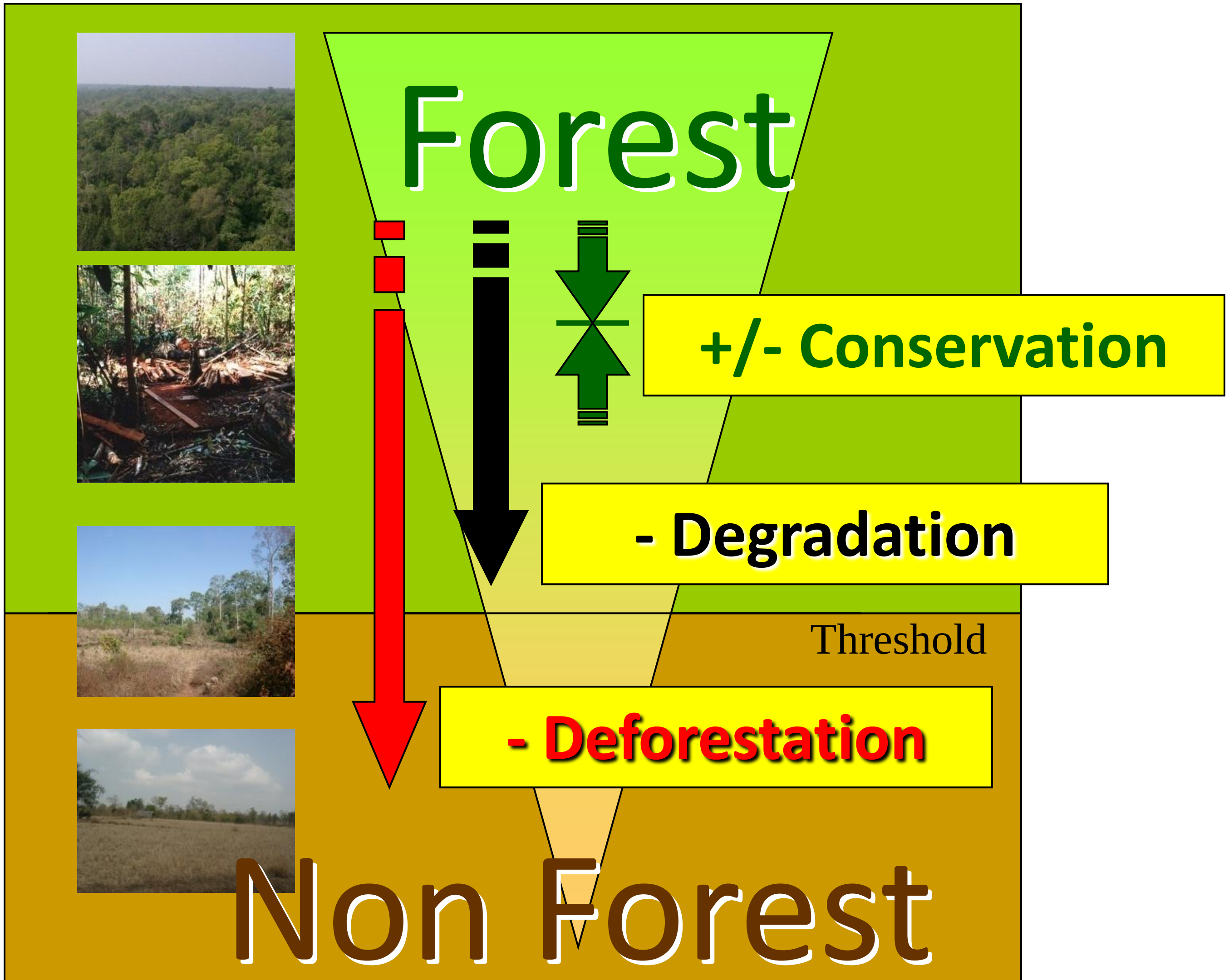
Forest monitoring using remote sensing

- Unique technique of forest monitoring widely and retrospectively.
- Essential tool for identify deforestation and forest degradation in developing countries



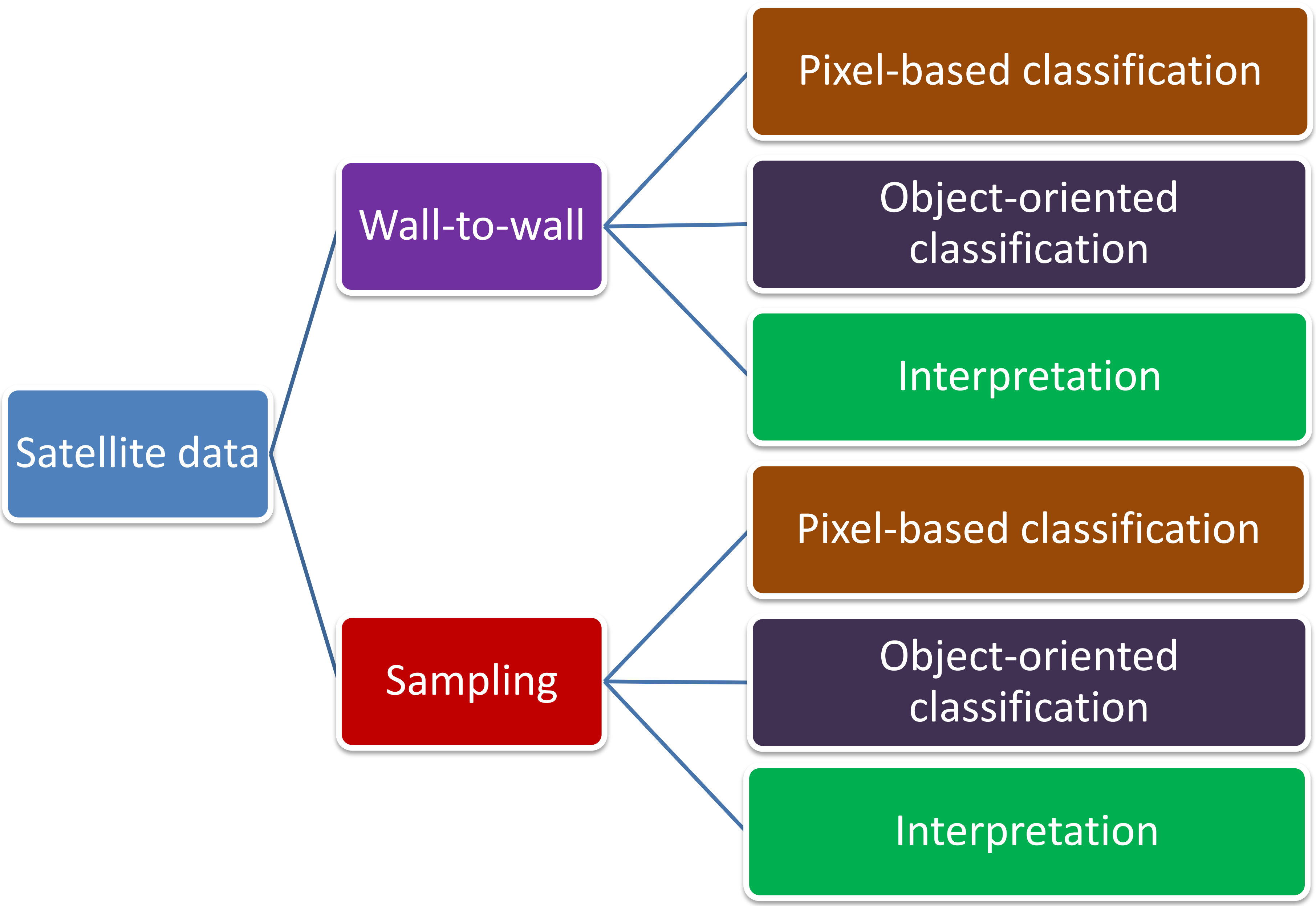
Satellite imagery in Manaus, Amazon

Gap between remote sensing and definitions of forest degradation and deforestation

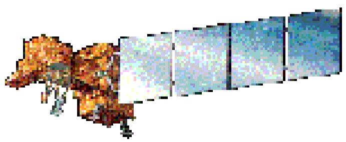


Observation Techniques toward REDD

Monitoring of forests by remote sensing



Forest monitoring using satellite remote sensing

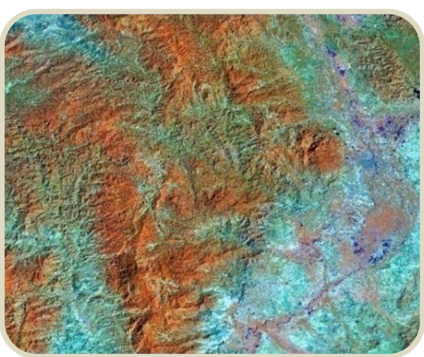


No leakage in the area.
Coat is large.
Difficulty of acquiring cloud-free data.
Applicability for local policy is large.

Wall-to-wall

Satellite data

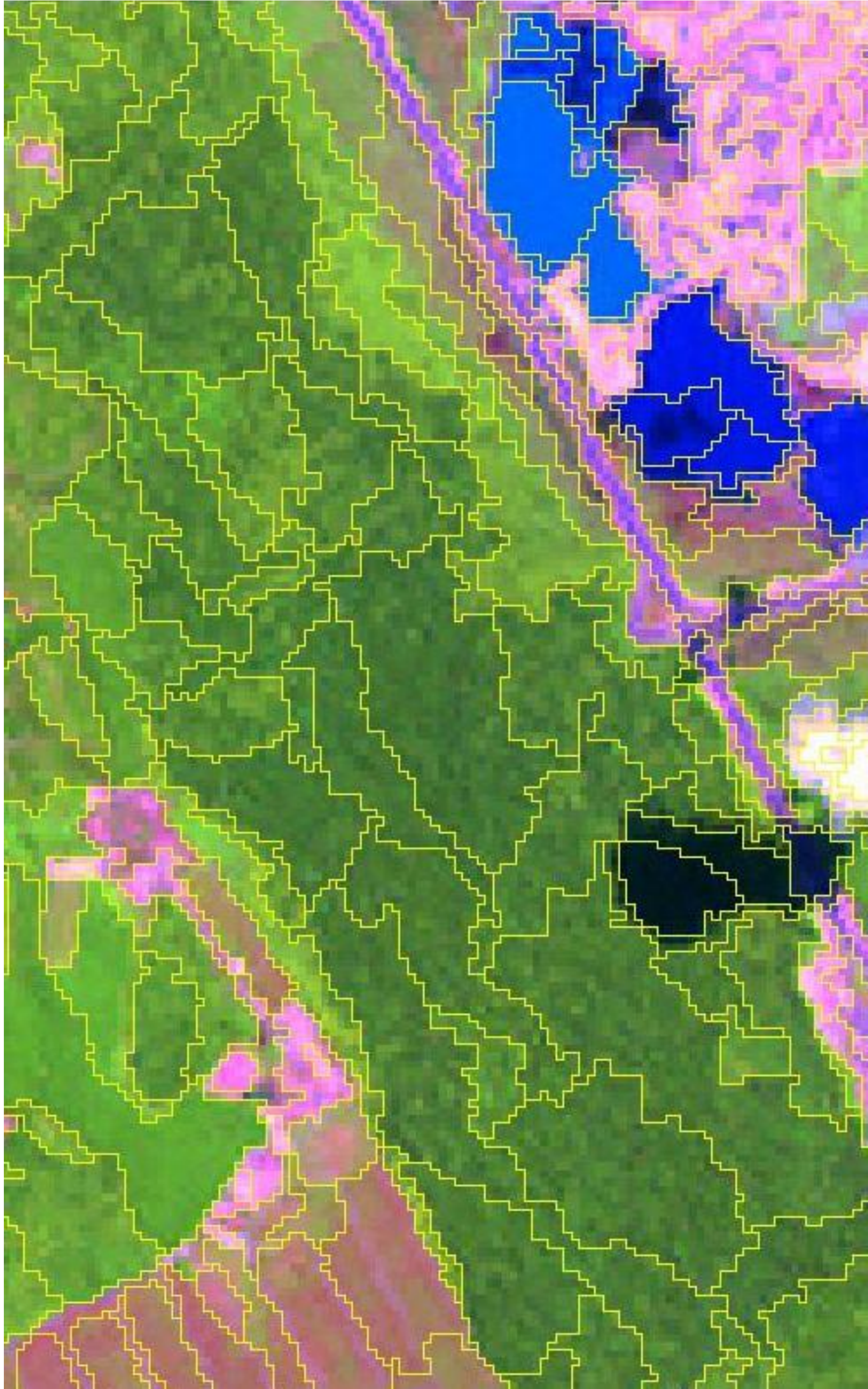
Sampling



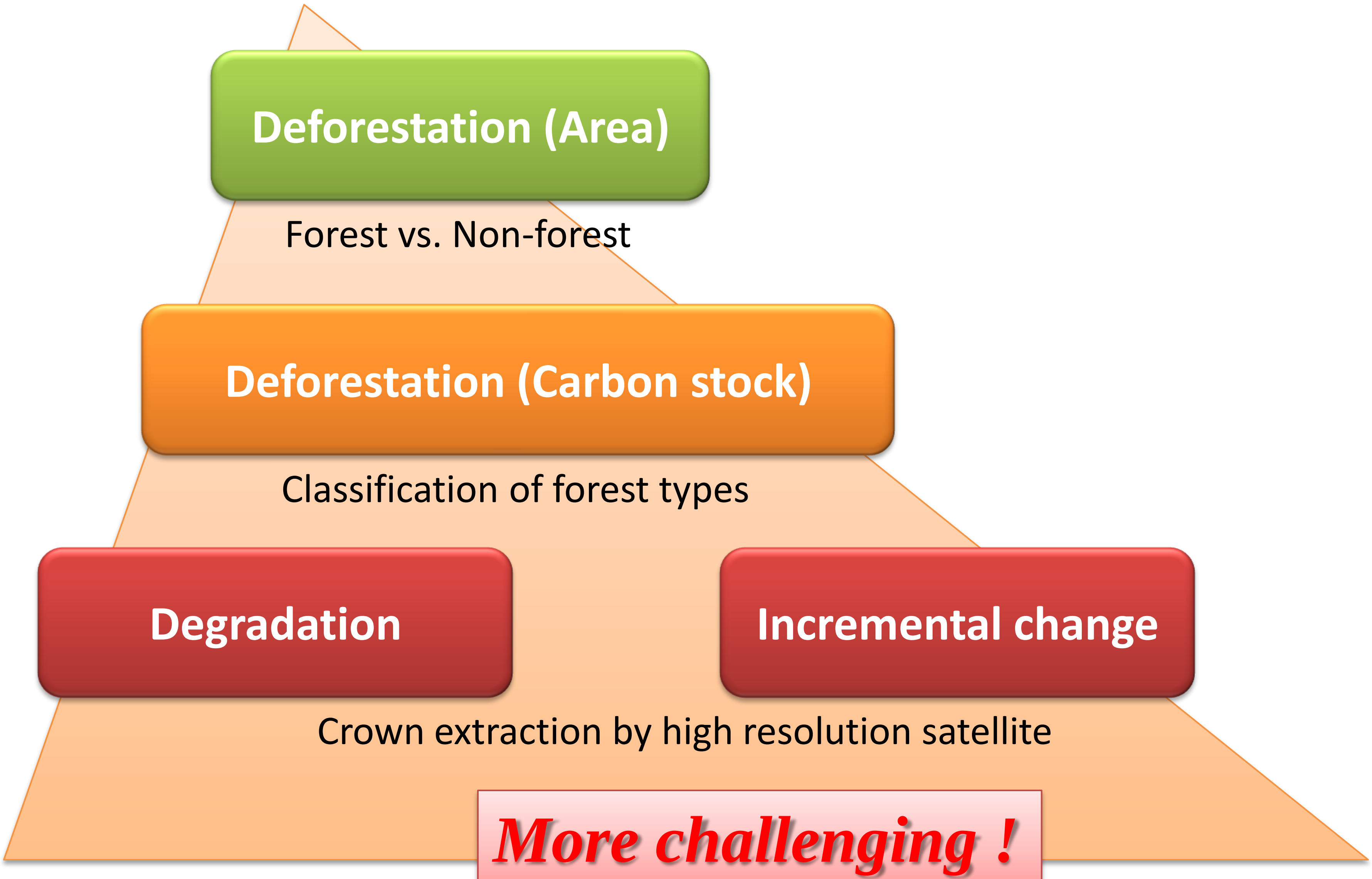
Accuracy for sampling rate.
Coat is effective.
Acquiring cloud-free data is relatively easy.
Applicability for local policy ?

Object-oriented classification

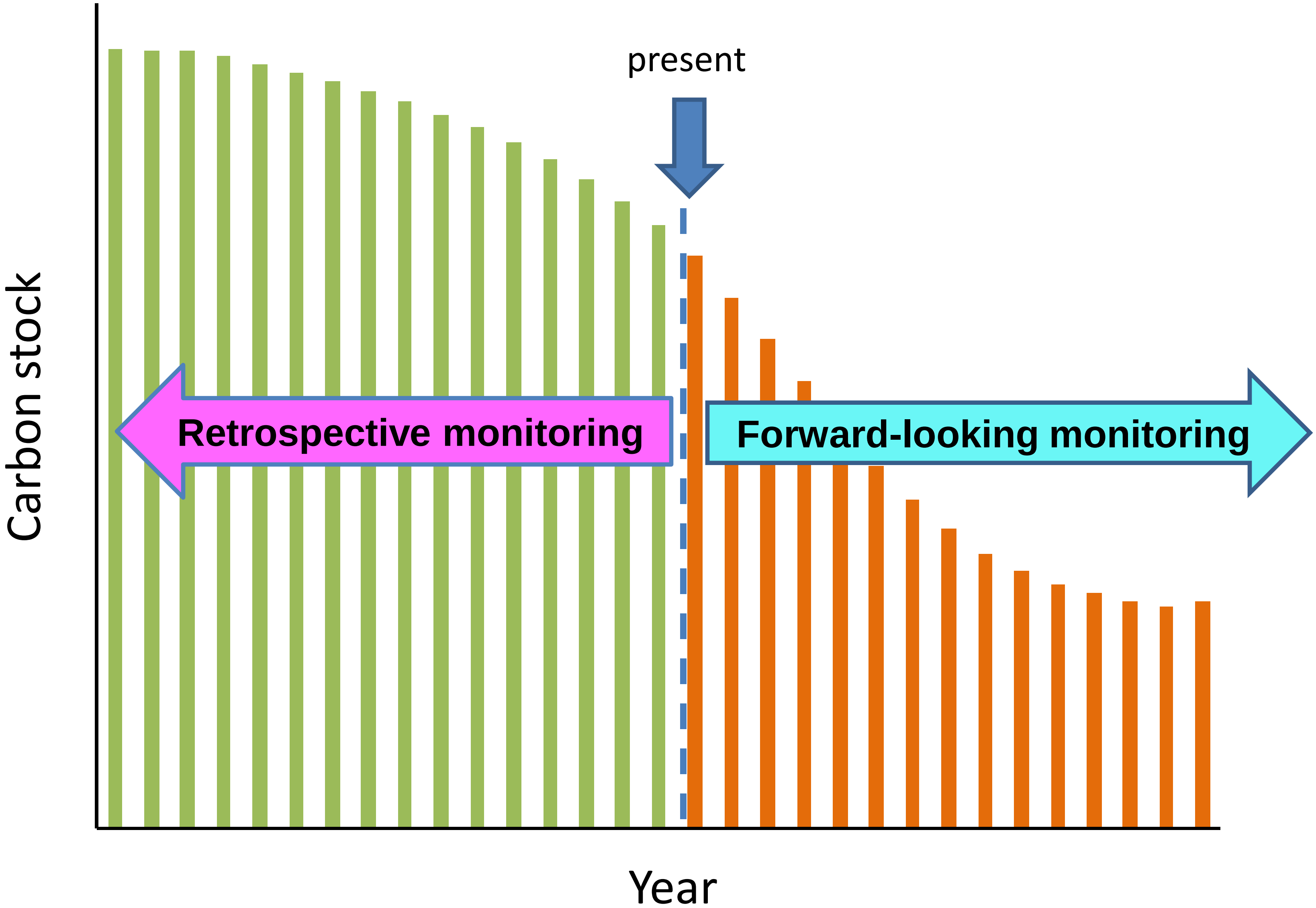
- The object-oriented approach is effective in segmenting an area that consists of various land cover types into objects with extensions of similar properties (Lamonaca et al. 2008).
- Classification results that is similar to human interpretation
- Advantage of handling by object （segment）



The challenges of forest monitoring

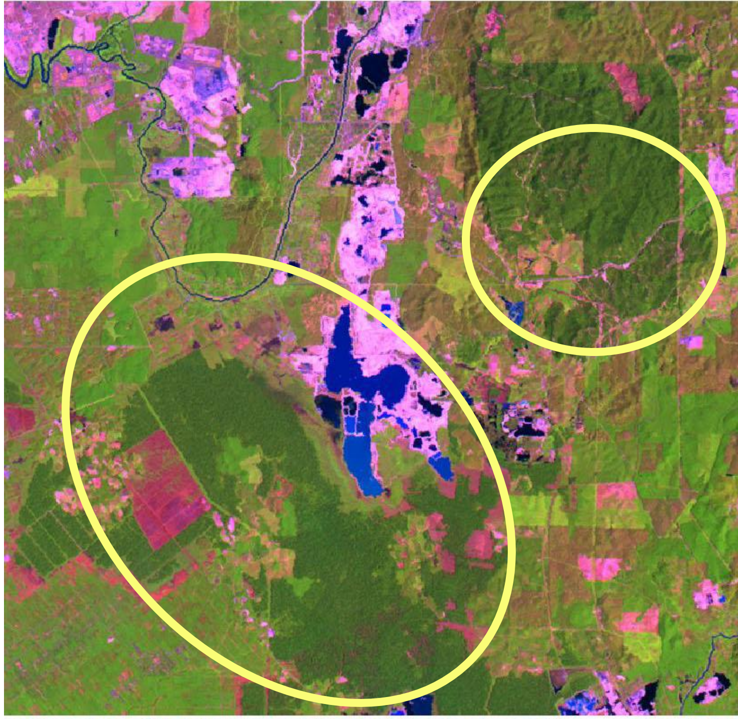


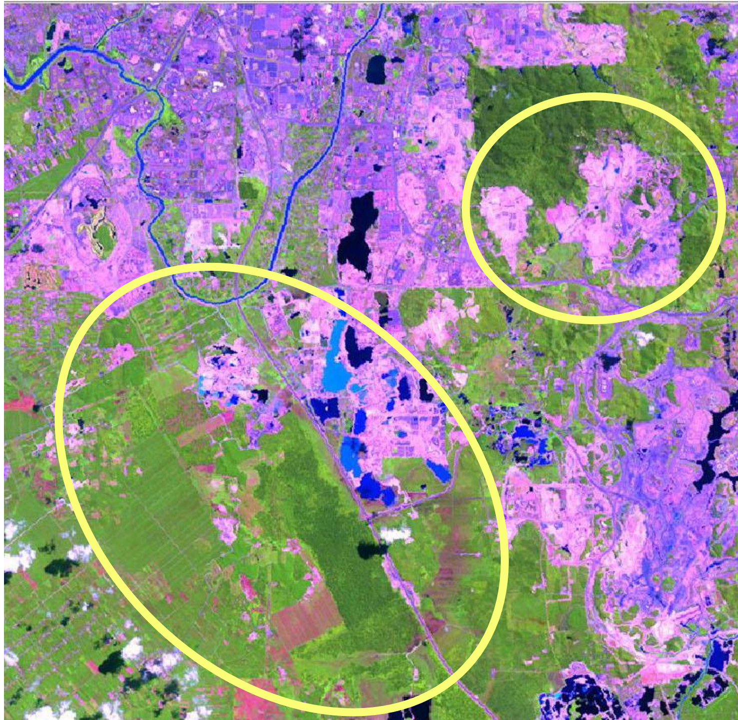
Two types of forest monitoring required for REDD



Monitoring of deforestation

- Extracting changes of land use category
- Using properties of reflectance of each category
- Comparing multi-temporal
- Available to identify forest type change



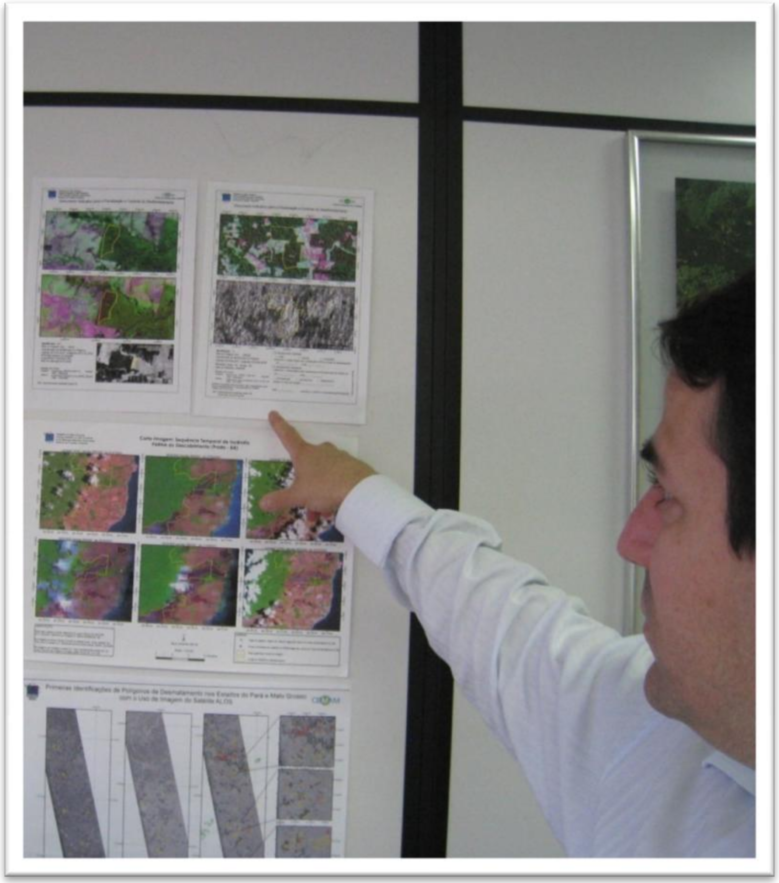


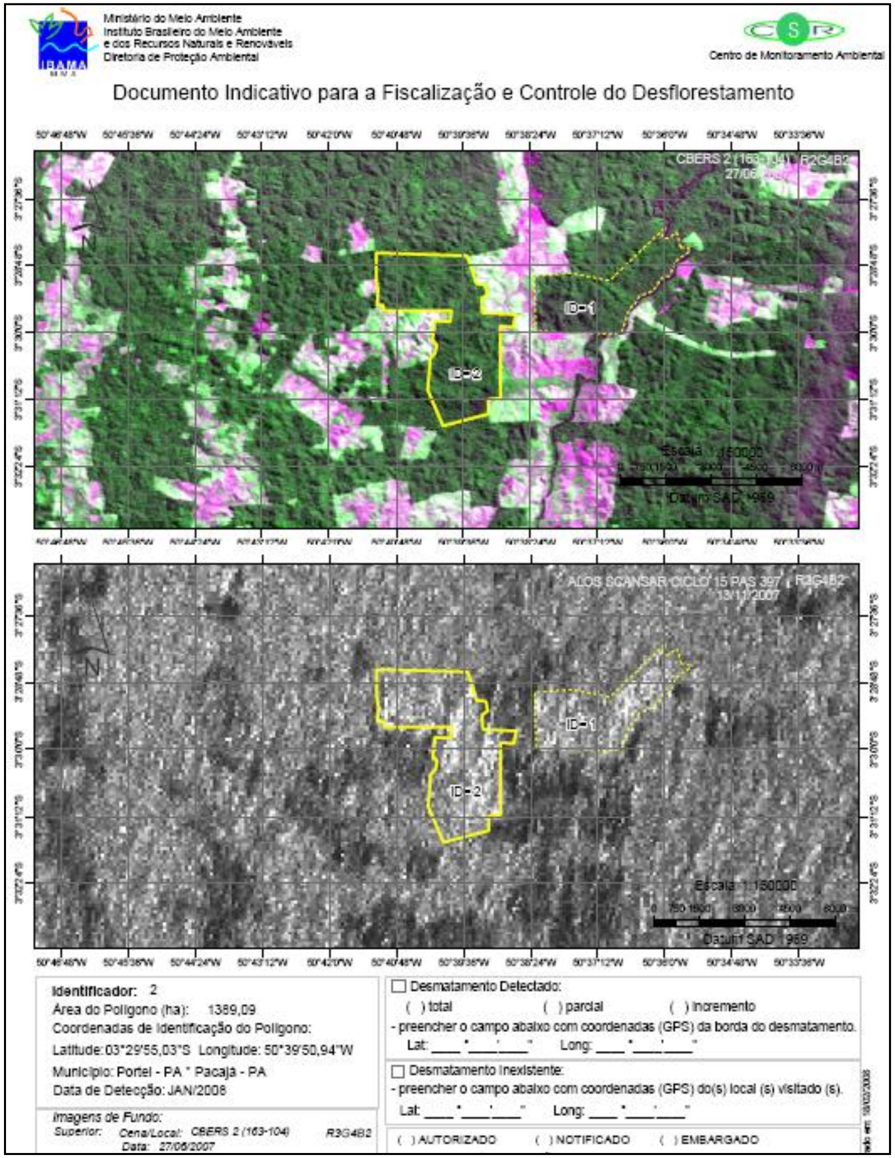
Deforestation in Malaysia
Landsat imagery
Upper 1989 yr, lower 2001 yr

Monitoring of forest degradation

- Various causes of degradation
  - Selective (illegal) logging
  - Forest fire
  - Intensive shifting cultivation
  - development
- Development of method as to each cause of degradation is required

Detection of illegal deforestation using ALOS-PALSAR





Monitoring of sifting cultivation by ASTER images

(provided Mr. Naoyuki Furuya, JIRCAS)

2002/2/9

2003/3/16

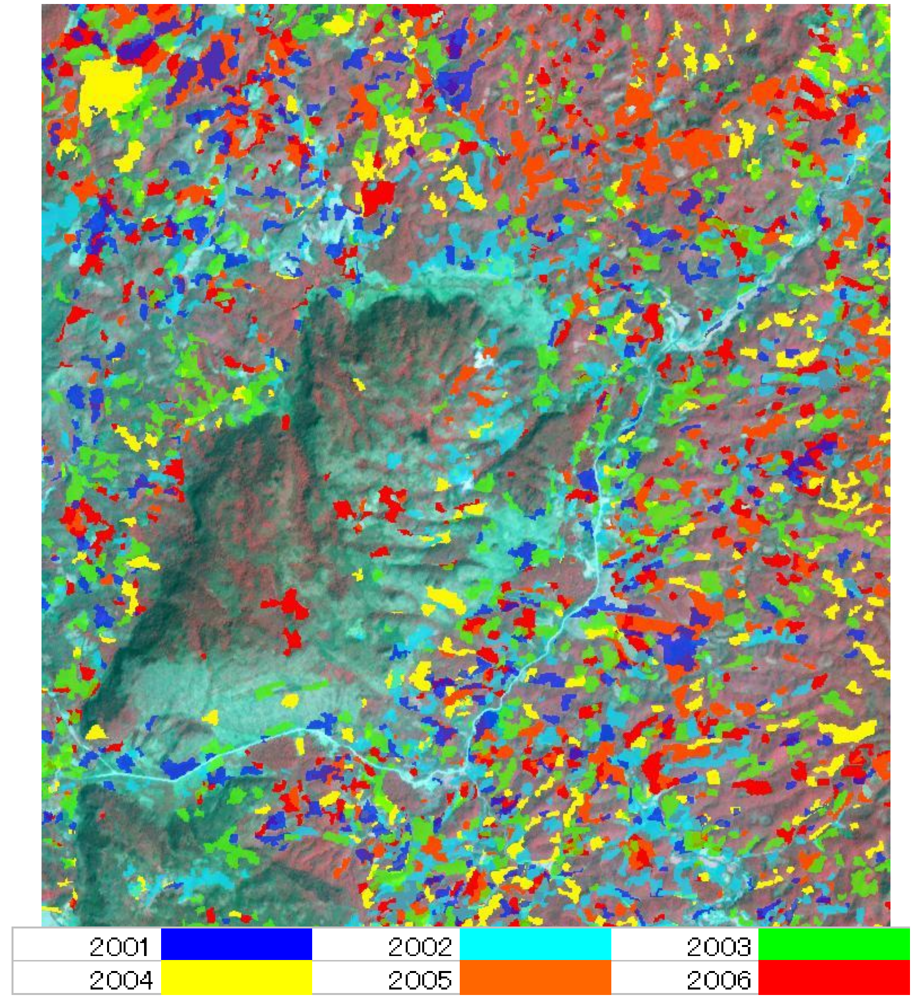
2005/2/1

2006/3/8

Image pre-processing

Object-oriented classification

6 years - shifting cultivation distribution map



Monitoring of sifting cultivation for six years

Monitoring of forest degradation

Technology **<u>already exists</u>** and many countries have been using such technologies to develop forest carbon inventories (for example, remote sensing technologies).

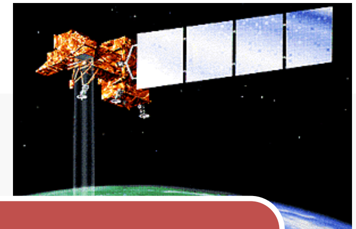
There is a need to expand these technologies for monitoring forest degradation and associated GHG emissions and changes in carbon stocks.

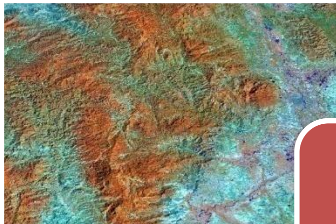
Although some gaps exist, waiting for replacement by <u>another promising technology</u> will be a <u>time-consuming process</u>.

Chair's Summary of Key Messages from the Informal Meeting of Experts on Methodological Issues relating to Reducing Emissions from Forest Degradation in Developing Countries

20 - 21 October 2008, Bonn, Germany

Which one do you select?

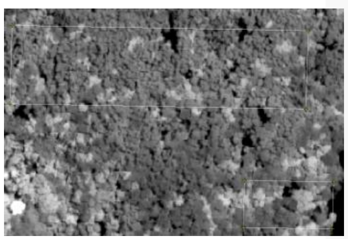


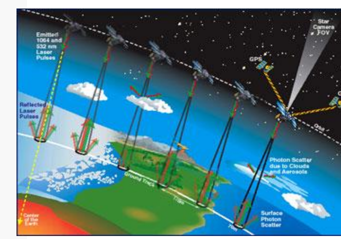


Conventional RS

Field survey

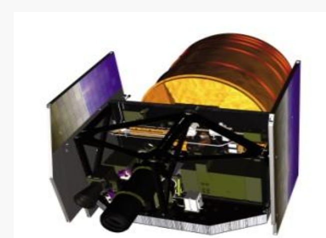
VHR satellite

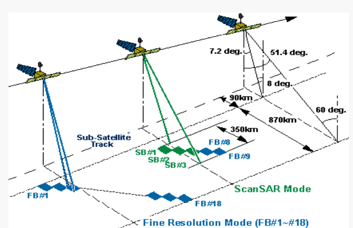




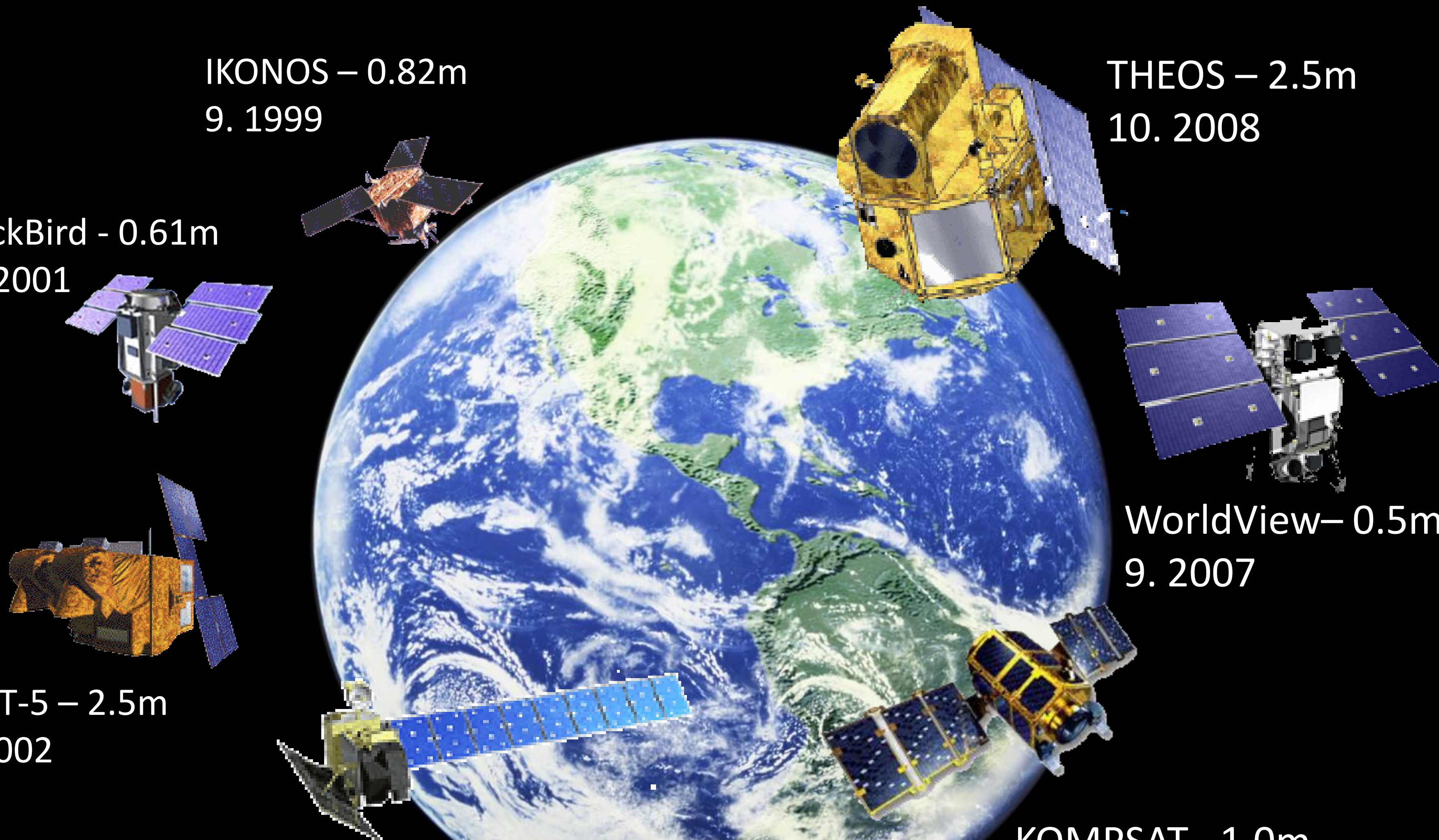
LiDAR

SAR





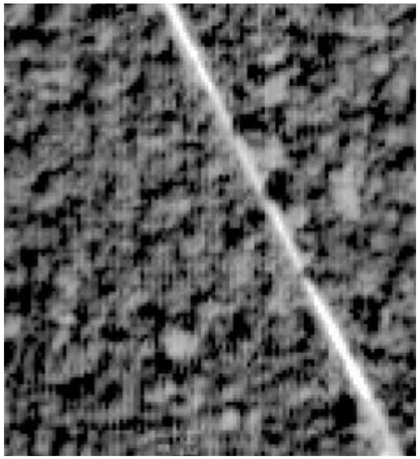
Keeping sharp eyes out for the Earth



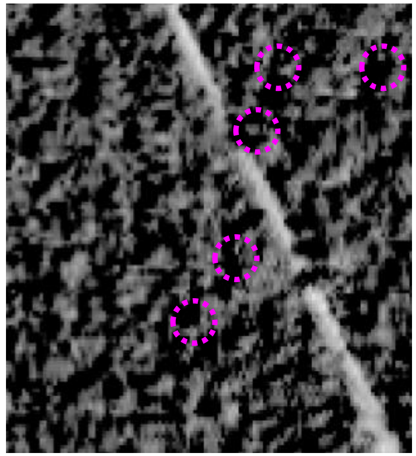
Forest degradation using high resolution satellite data

(provided Mr. Naoyuki Furuya, JIRCAS)

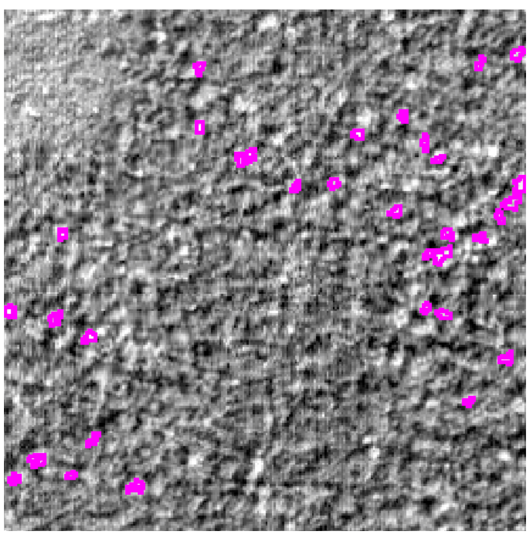
1. Mapping of illegal logging using multi-temporal 2.5 m-resolution satellite images



PRISM2006/11/27

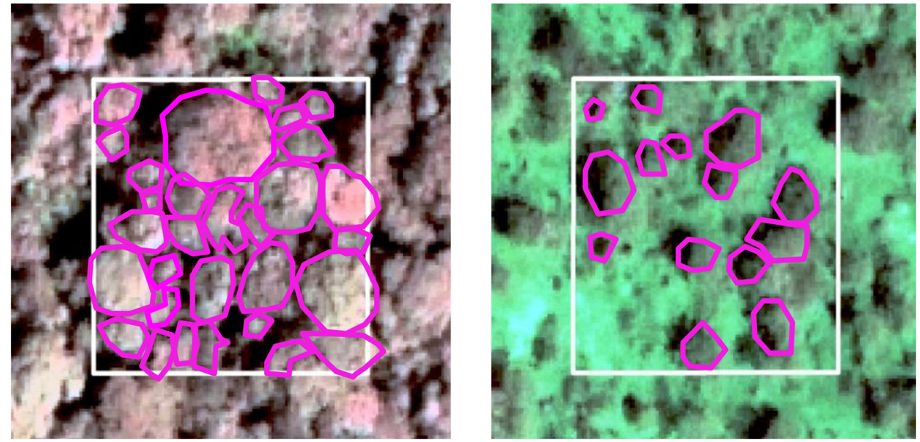


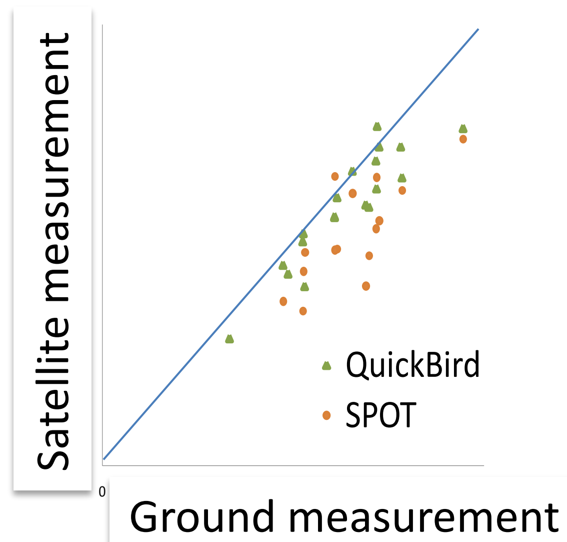
PRISM2008/3/1



Mapping of illegal logging

2. Estimating carbon stock from interpretation of QuickBird data



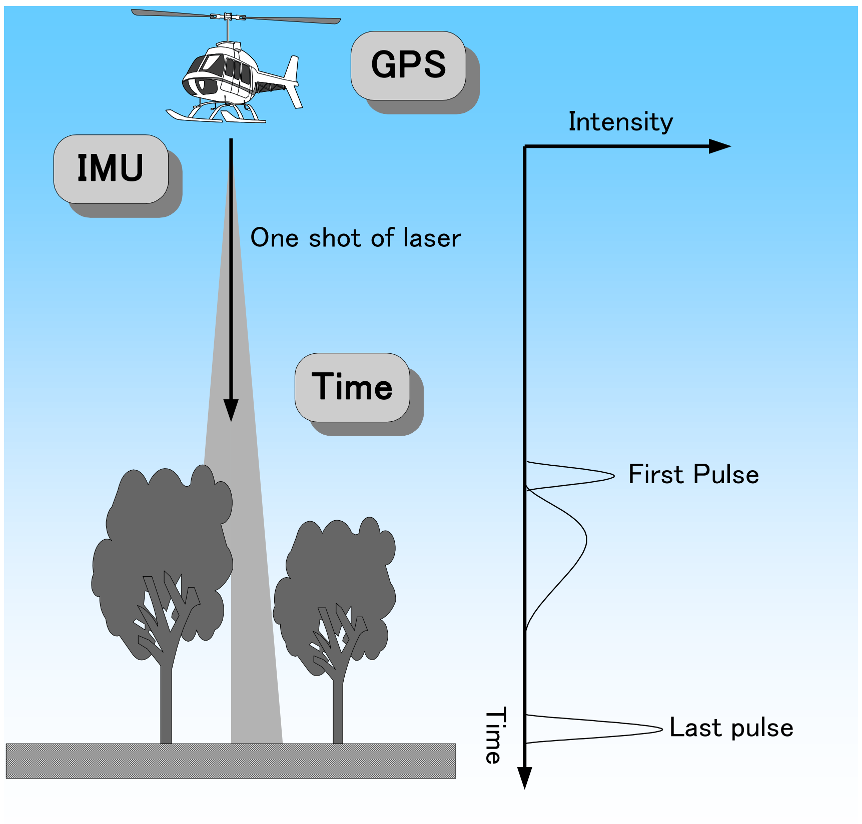


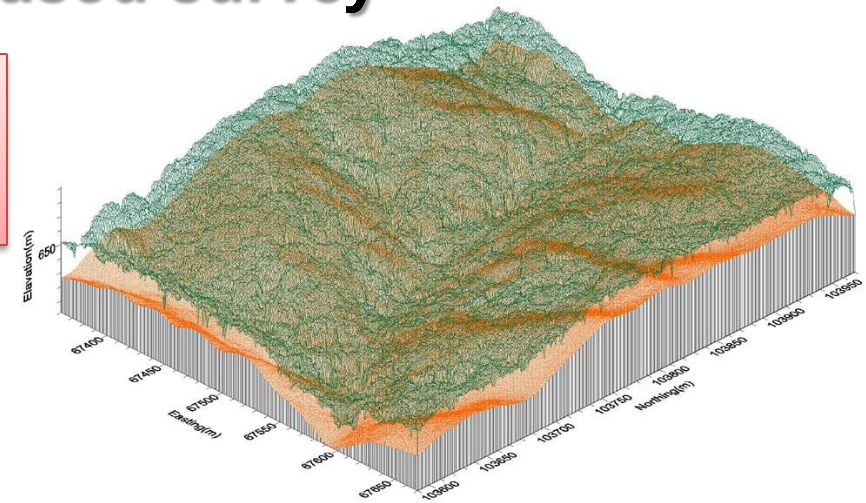
Comparison of CD between ground and satellite measurements

3-D forest measurement with LiDAR as alternative of ground-based survey

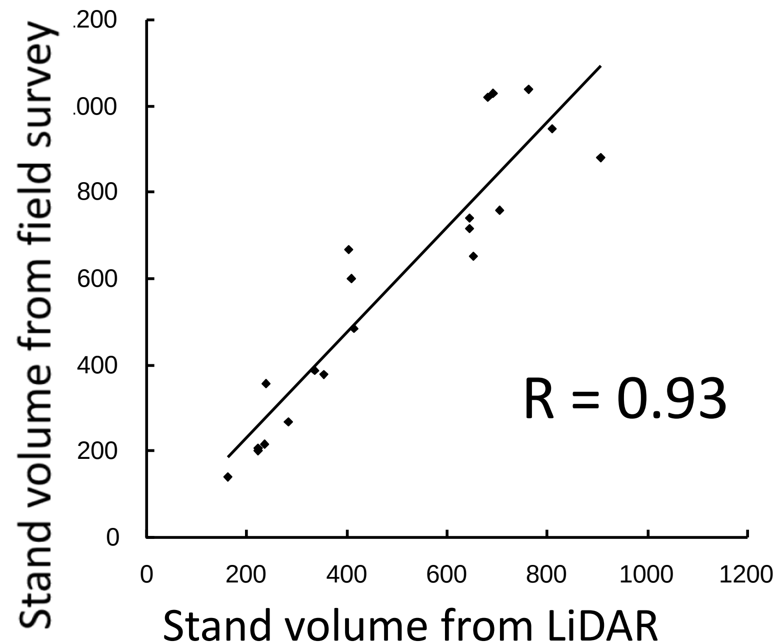
A part of the laser beam reflects on canopy .

The rest goes through canopy and reflects on the ground.





Measurement of ground and canopy surface



Source: Hirata et al (2008) *Journal of Forest Planning 14*

Combination of several factors

- Data availability
  - Acquisition (spatial, temporal), seasonality
- Data property
  - Ground resolution, optical vs. radar (vs. dimension)
- Monitoring cost
  - High resolution < very high resolution ?
- <u>Cause of forest degradation</u>

Thank you for your attention!