

VTT Technical Research Centre of Finland

VTT IS

- The biggest multi-technological applied research organization in Northern Europe
- Not-for-profit organization

VTT HAS

- Multi-technological R&D covering different fields of technology from electronics to building technology
- Clients and partners: industrial and business enterprises, organizations, universities and research institutes

VTT CREATES

- New technology and science-based innovations in co-operation with domestic and foreign partners

REMOTE SENSING RESEARCH SINCE 1973

- Turnover 245 M€
- Personnel 3000
- 77% with higher academic degree
- 6,200 customers
- Established 1942
- Controlled by the Finnish government (Ministry of Employment and the Economy)
- VTT has been granted ISO9001:2000 certificate.

ReCover

for REDD and sustainable forest management

Science Based Remote Sensing Services to Support REDD and Sustainable Forest Management in the Tropical Region - ReCover

January 25, 2011

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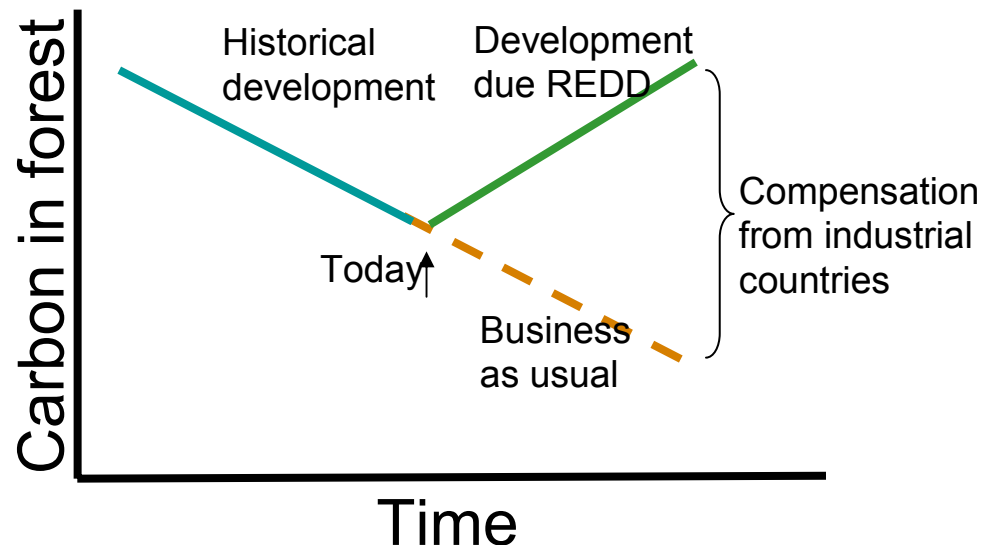
What is REDD

- REDD = The United Nations Collaborative Programme on **R**educing **E**missions from **D**eforestation and Forest **D**egradation in Developing Countries
- REDD is an effort to create a financial value for the carbon stored in forests, offering incentives for developing countries to reduce emissions from forested lands and invest in low-carbon paths to sustainable development.

<http://www.un-redd.org/>

What is REDD

- Reducing Emissions from Deforestation and Forest Degradation (REDD) is an effort to create a financial value for the carbon stored in forests, offering incentives for developing countries to reduce emissions from forested lands and invest in low-carbon paths to sustainable development.



What is REDD+

- “REDD+” goes **beyond deforestation** and **forest degradation**, and includes the role of conservation, **sustainable management** of forests and enhancement of forest carbon stocks.
- It is predicted that financial flows for greenhouse gas emission reductions from REDD+ could reach up to US\$30 billion a year.

ReCover-project

Full title:

Science based remote sensing services
to support REDD and sustainable forest
management in the ***tropical region***

ReCover-project

Full title:

Science based remote sensing services to support REDD and sustainable forest management in the ***tropical region***

- Objective: to develop beyond state-of-the-art service capabilities to support fighting deforestation and forest degradation in the tropical region.
 - Provision of a *monitoring system of forest cover and forest cover changes and biomass including a universal accuracy assessment.*
 - The capabilities are based on utilizing earth observation and *in-situ* data. The earth observation data are primarily from space-borne instruments which enables development of harmonized services.
- GMES FP7 Theme Space -funded project
- Duration 3 years starting in November, 2010
- Consortium of 9 research and industrial partners (Europe, Latin America)
- Total budget of 3.5 M€

Strategic reasoning of ReCover

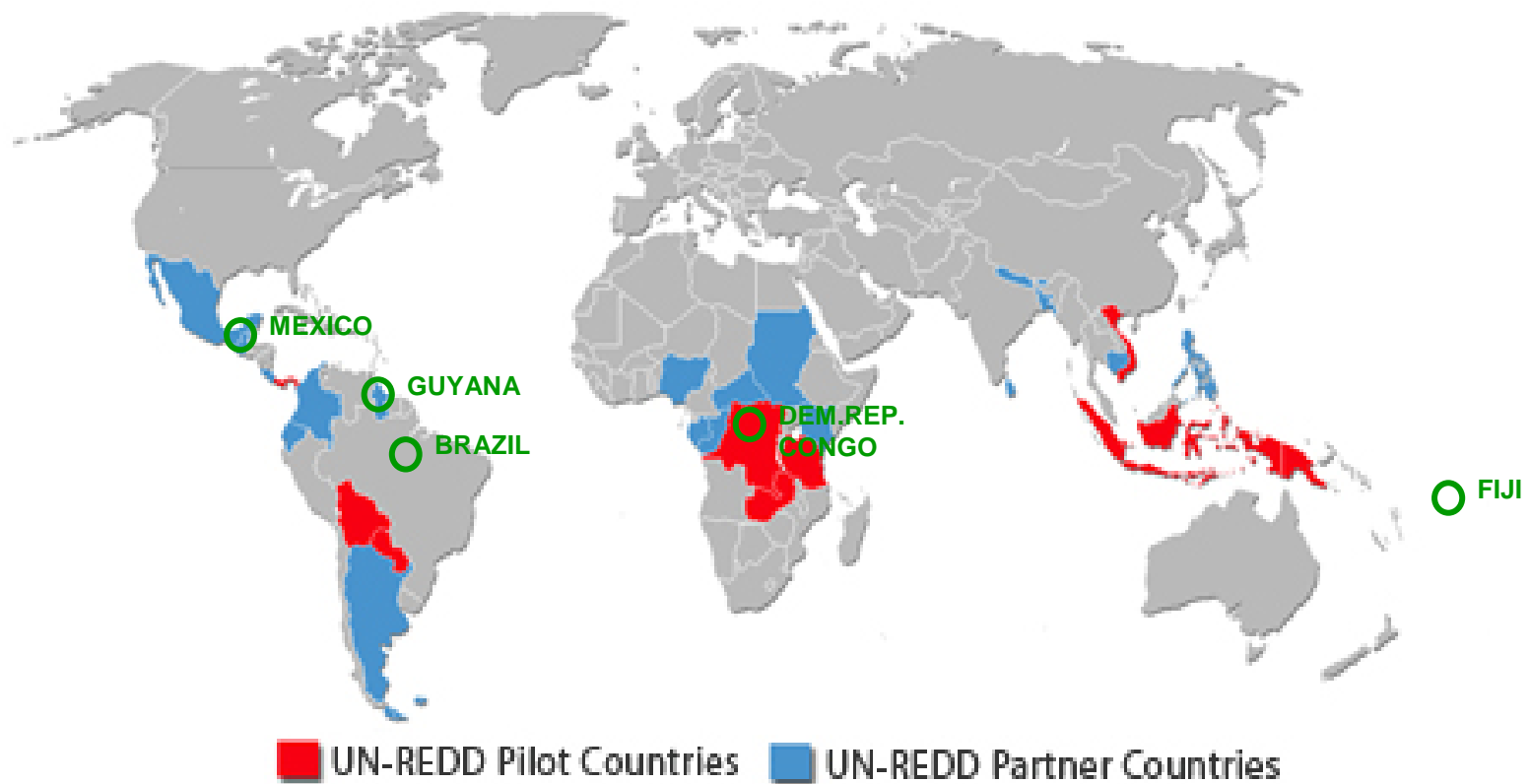
To realize and aid the existing and future policies

Problem	Policy	Present (EO) activities	Near future implementation
Climate change mitigation and adaptation Shortage of wood Food security vs. biofuels Droughts Non-sustainable use of resources Population growth	Kyoto protocol Post-Kyoto agreement UN environmental conventions Sustainable development strategies EU policies	Annex 1 country experiences FRA2010/Trees 3 GSE extension GEO forest tasks Worldbank Forest Carbon Partnership GOFC-GOLD	ReCover Science based remote sensing services to support REDD and sustainable forest management in tropical region

Research topics

- Building a standardized service system/chain for and with real users
 - Estimating biomass & carbon/ biomass change, degradation
 - REDD+ – sustainable forest management; socio-economic issues
 - Capacity building & service roll-out and expansion
-
- Sound statistical concept with a reliable validation procedure
 - Very high resolution satellite imagery to increase accuracy of principal measurement data
 - Defining the role of radar (SAR) imagery in REDD services

ReCover study sites



Users in ReCover

Mexico:

- Conafor (National Forestry Commission)
- PMC (Mexican Carbon Program)

Brazil:

- INPE

Guyana:

- Forestry Commission GFC

Fiji:

- Forestry Department

Central Africa:

- OSFAC GOFC-GOLD network

- The service development is defined and controlled by specific user requirements
- Service Level Agreements (SLA's)

Project partners

P1 - VTT Technical Research Centre of Finland (VTT, Espoo, Finland)

P2 - Albert-Ludwigs-Universität Freiburg ALU-FR FeLis, Germany

P3 – Arbonaut, Finland

P4 - Colegio de Postgraduados (ColPos), COLPOS, Mexico

P5 - El Colegio de de la Frontera Sur ECOSUR, Mexico

P6 – GMV, Spain

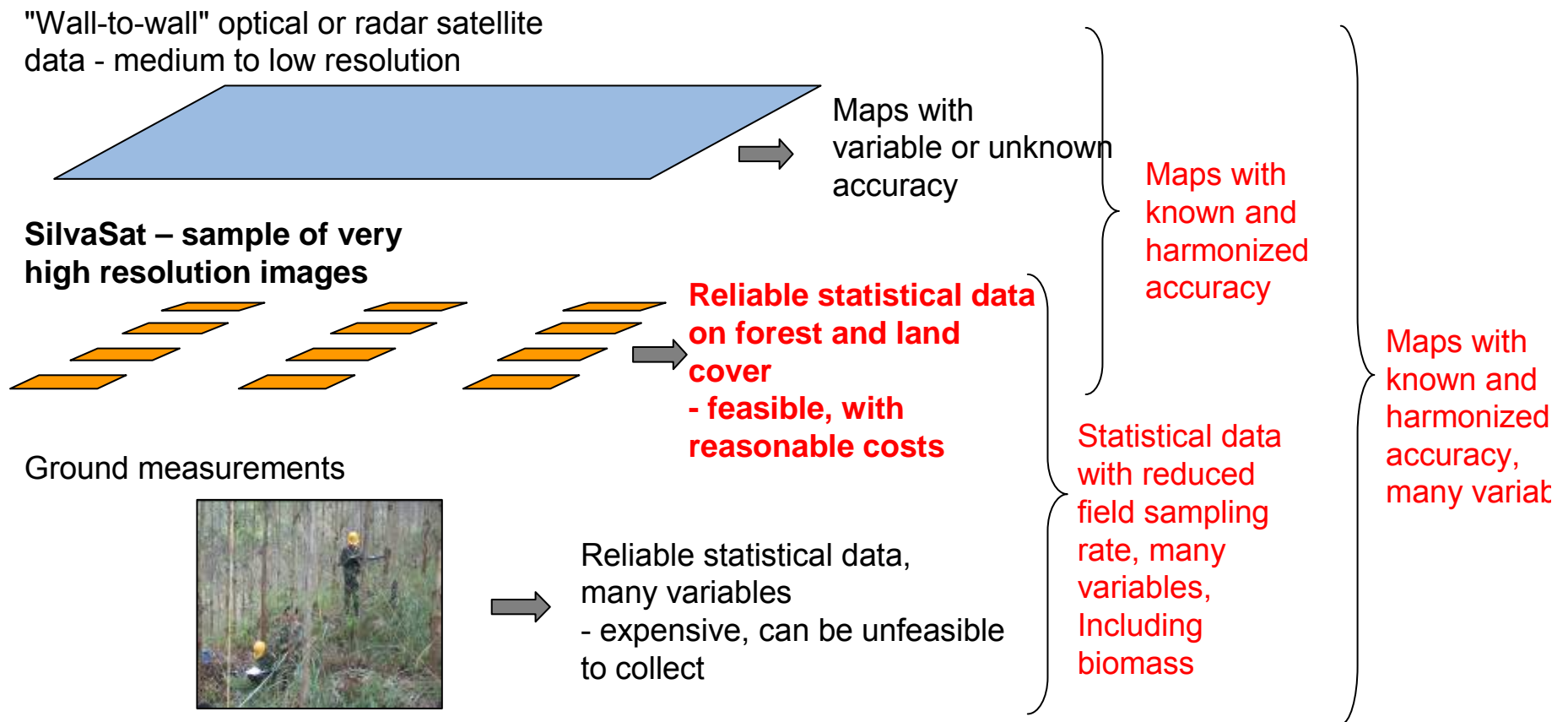
P7 - Norut - Northern Research Institute Tromsø AS, Norway

P8 - Wageningen Universiteit (WU), The Netherlands

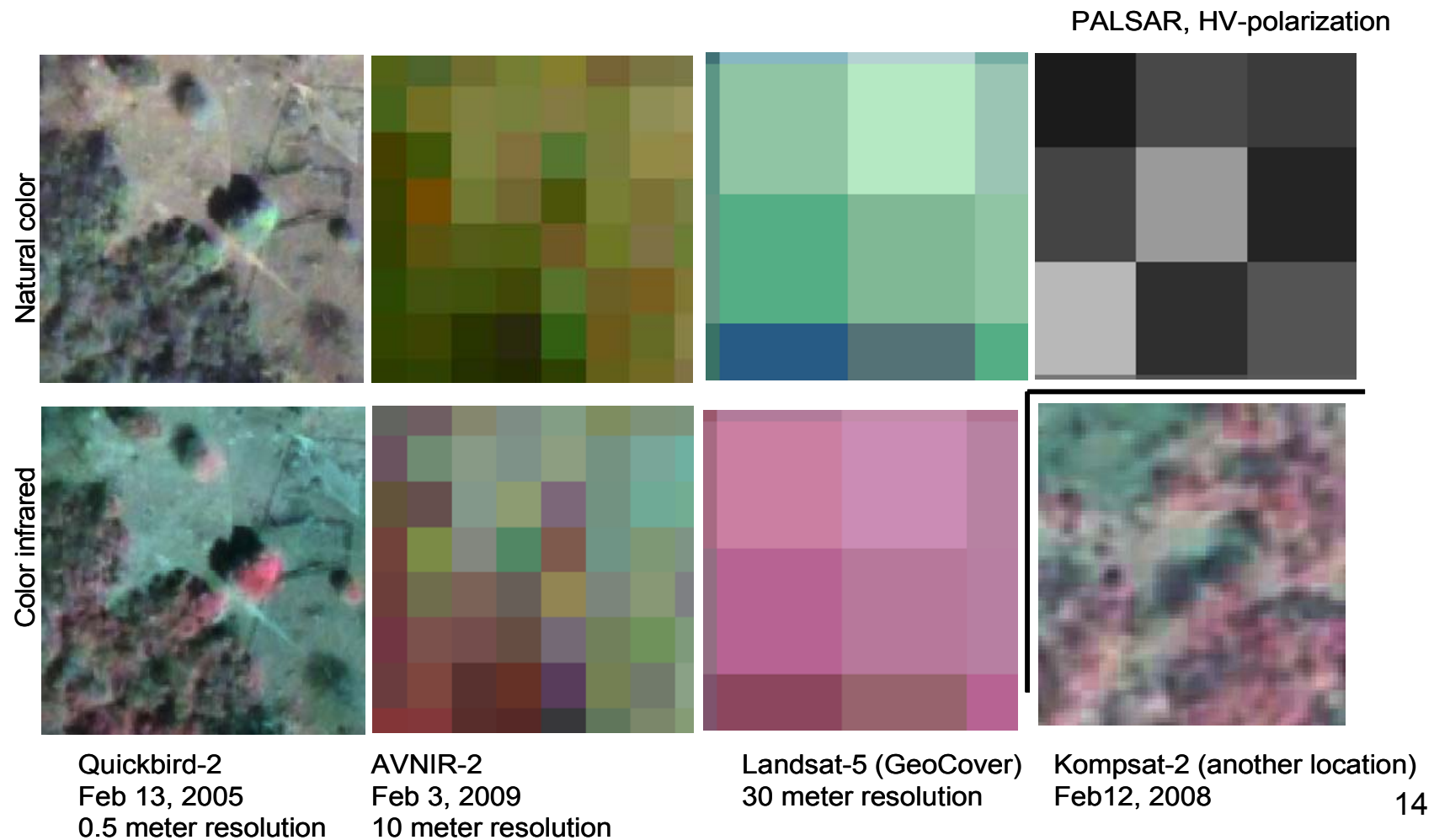
P9 - Brazilian Institute for Space Research INPE, Brazil

... and the users

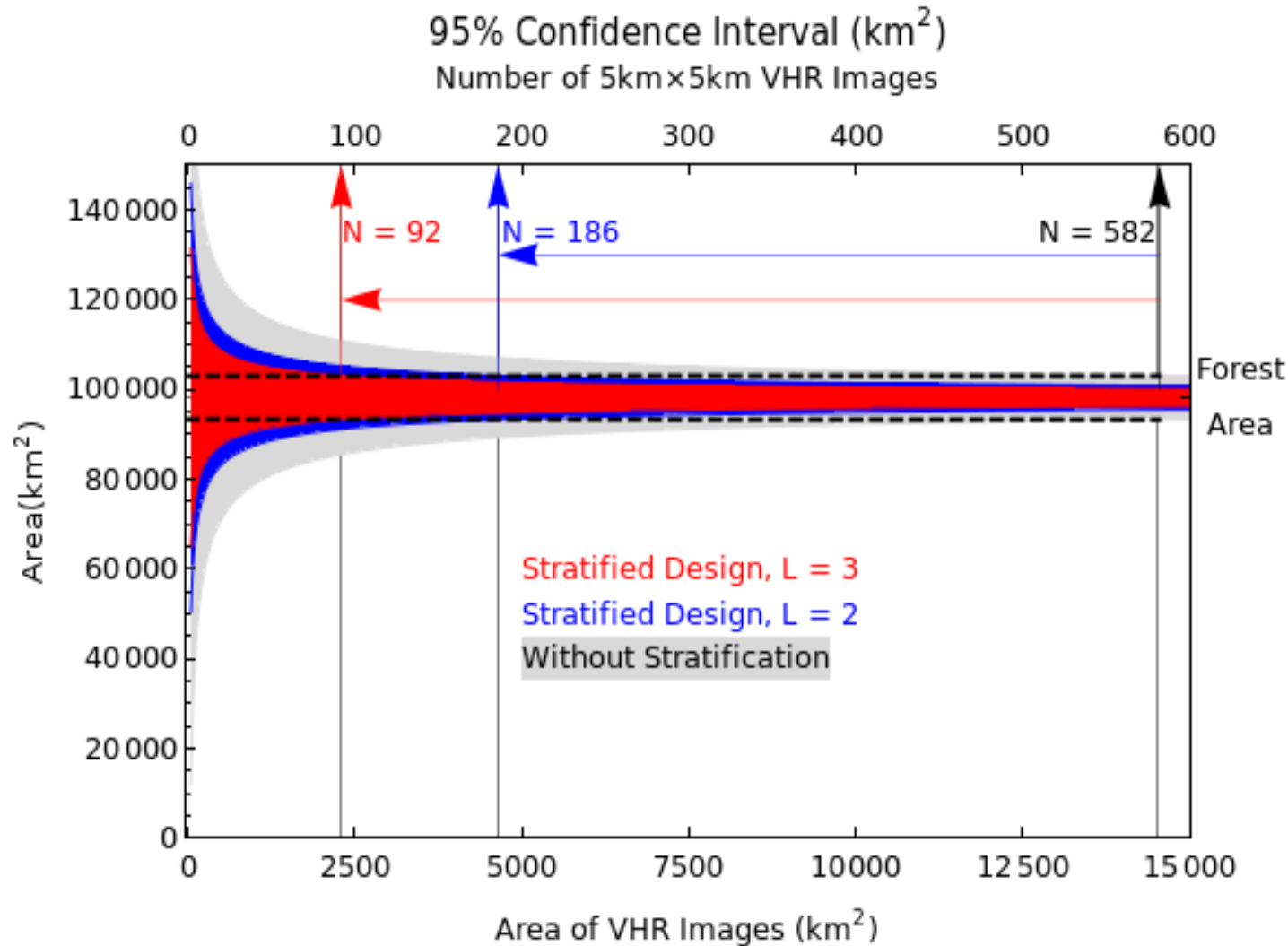
Baseline approach utilizing wall to wall and sample of VHR



Satellite images with different ground resolution from Laos



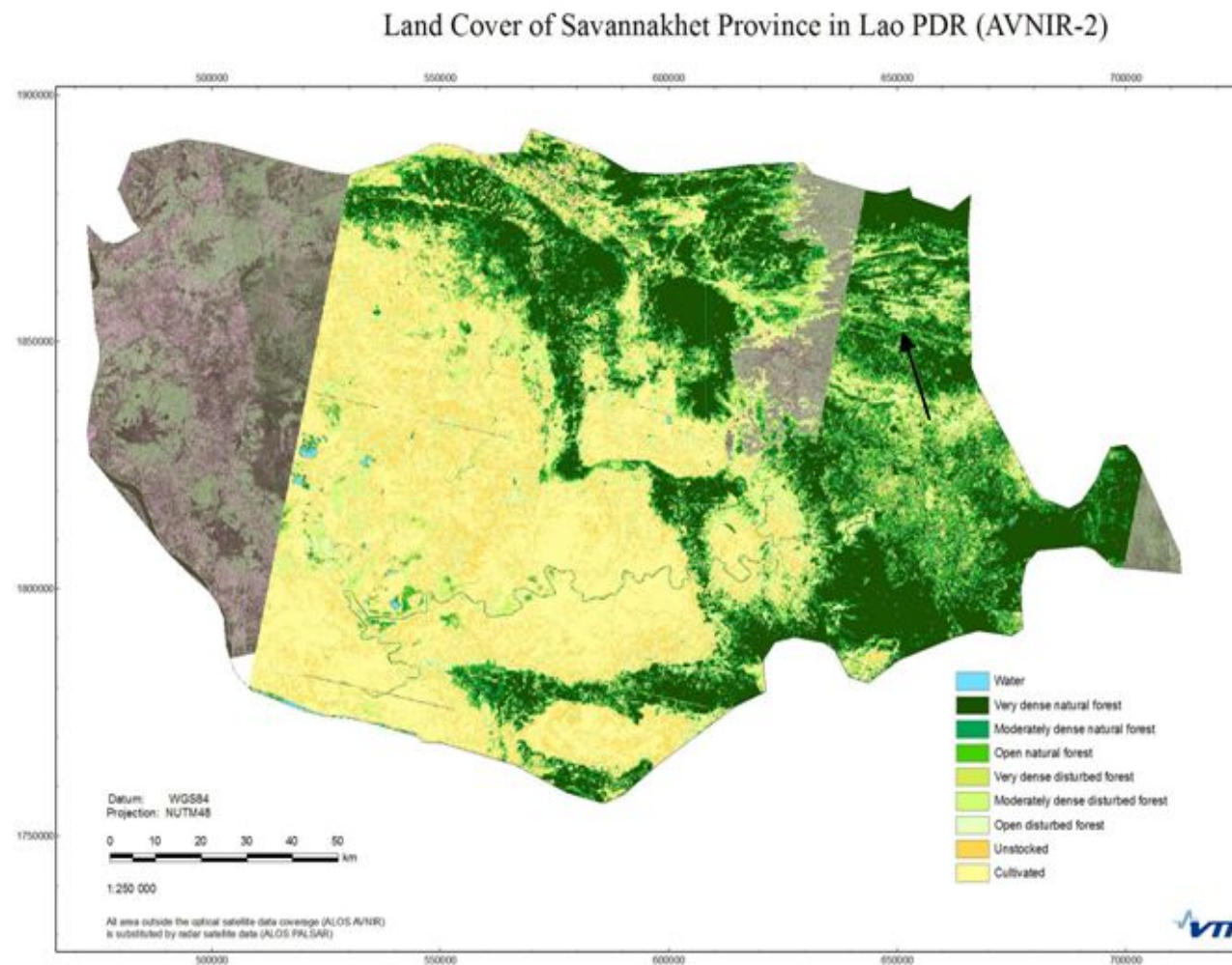
Accuracy (precision)



Forest proportion 43 %

- 95 % confidence interval for forest area (approximately 9.8 milj ha) for Lao PDR
- Stratification into three classes (L=3) gives same accuracy for forest area with 100 images as without stratification with 600 images
- Simulations are based on Globcover map of the European Space Agency

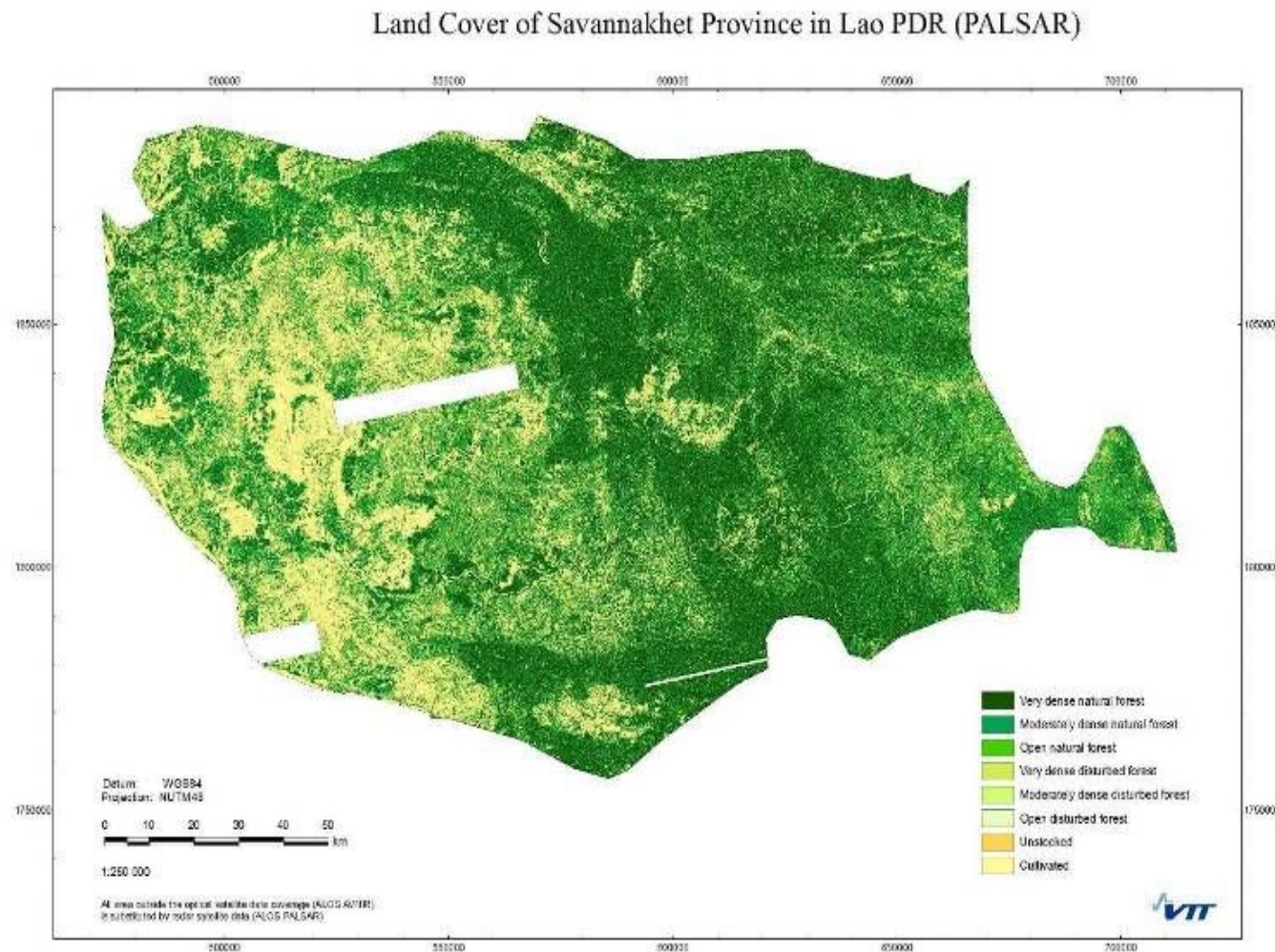
ReCover for REDD and sustainable forest management



Land cover map of Savannakhet province in Lao PDR from AVNIR optical image data. Missing image data are replaced by radar image.

Source: Häme, Kilpi, Ahola, Rauste, Sirro 2009. LaosSilva final report, VTT

ReCover for REDD and sustainable forest management



Radar data
tend to
overestimate
forest area

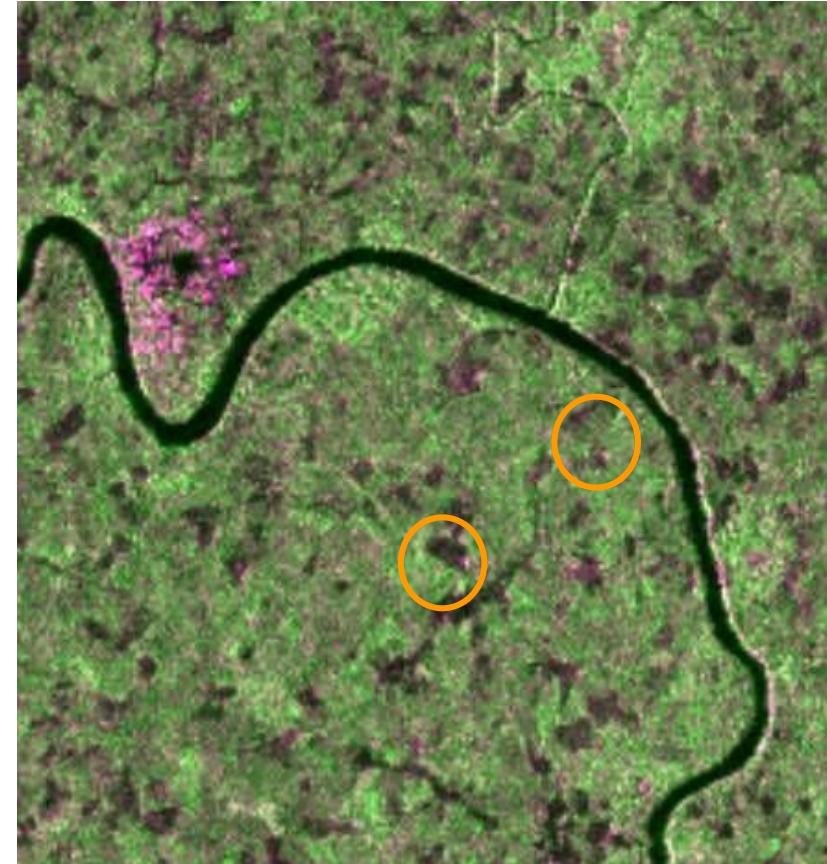
Figure 21. Land cover map of Savannakhet province in Lao PDR from PALSAR radar image data.

Optical and radar images from the same location in east Savannakhet
Area size 6 km x 6 km – one year time interval



ESA Cat 1 project 6213

AVNIR 2007, 10 m resolution



ESA Cat 1 project 6213

PALSAR radar 2008, ~25 m
resolution

Images indicate very dynamical landscape pattern

Radar mosaic 2006/2007 from French Guiana

- Purpose to support to fulfill the reporting obligations of the Kyoto Protocol
- Envisat ASAR images © ESA
- ESA GSE Forest Monitoring project
- Processing VTT

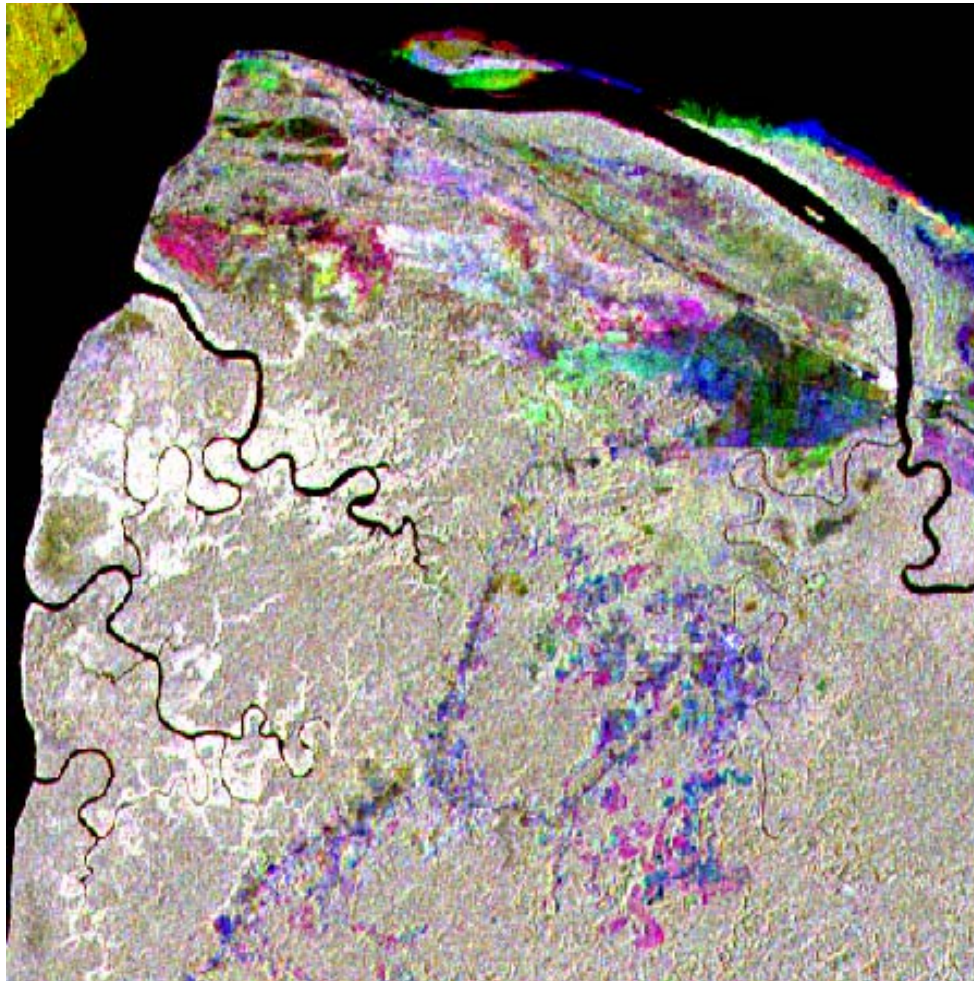
Land cover and forest cover map from French Guiana

Colors:

- green – forest/forest;
- yellow – non-forest/non-forest,
- red – forest/non-forest;
- grey- vegetation/water;
- light blue –water;
- white – water/water or outside region



Color composite of three average back-scattering features from the northwest part of Guiana

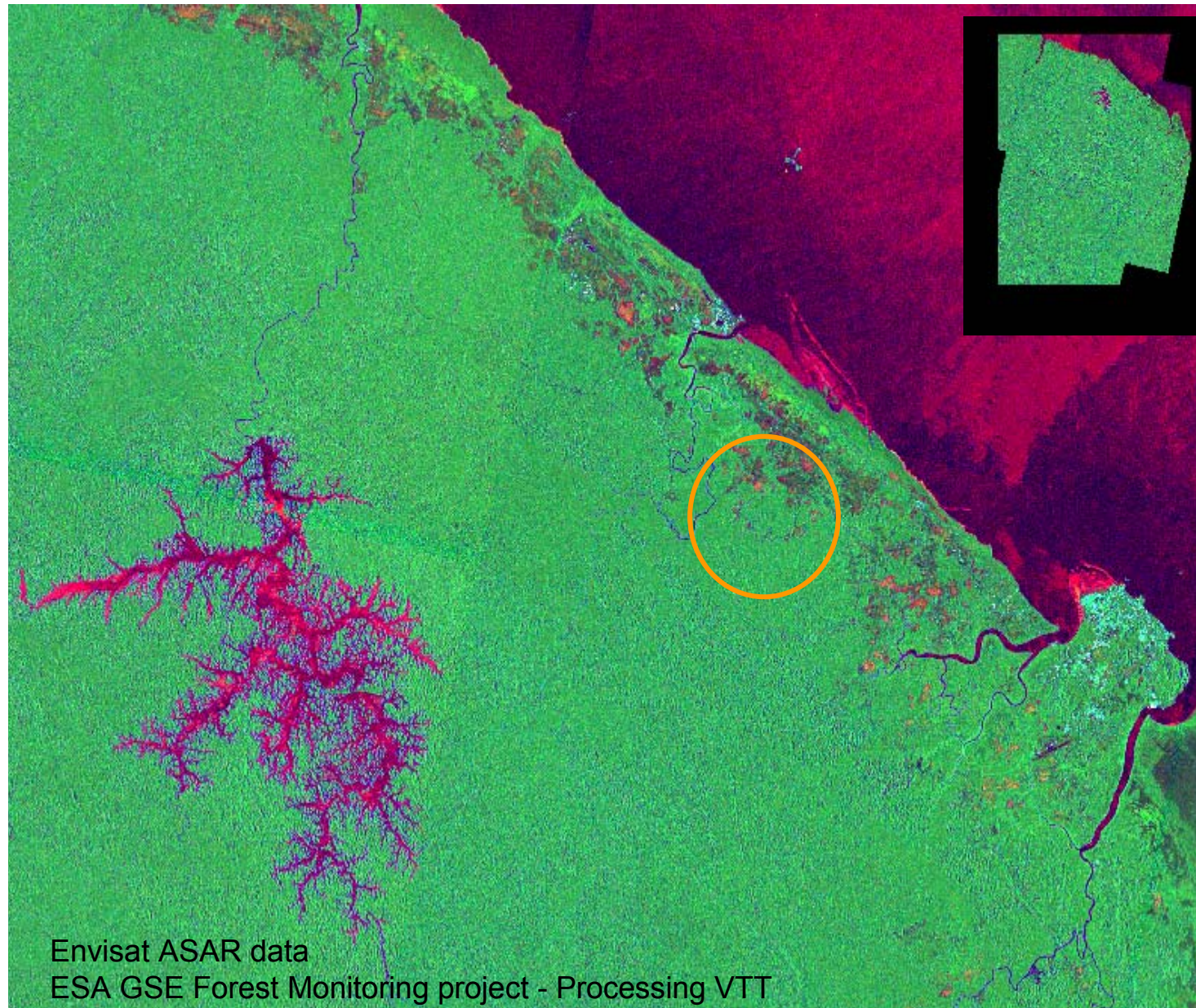


- Area size 28 km by 26 km

Channels

- 2003 red
- 2006 green
- 1993 blue

Northern part of ASAR mosaic 2006-2007 of French Guiana



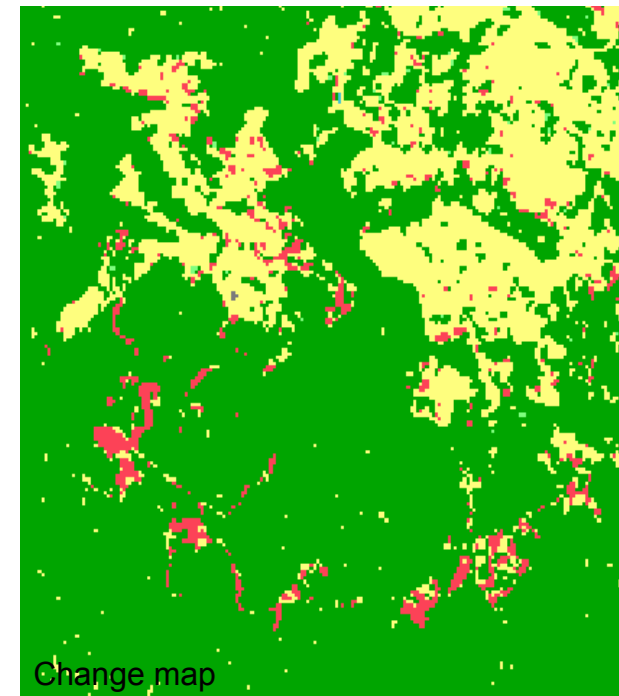
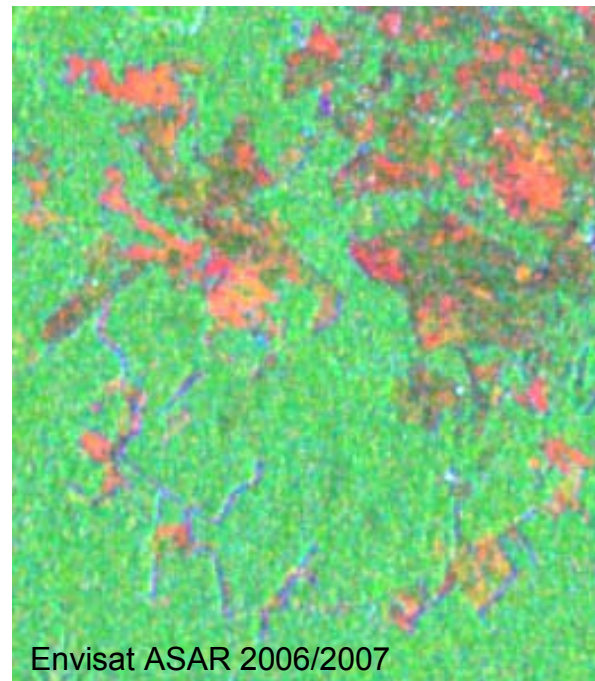
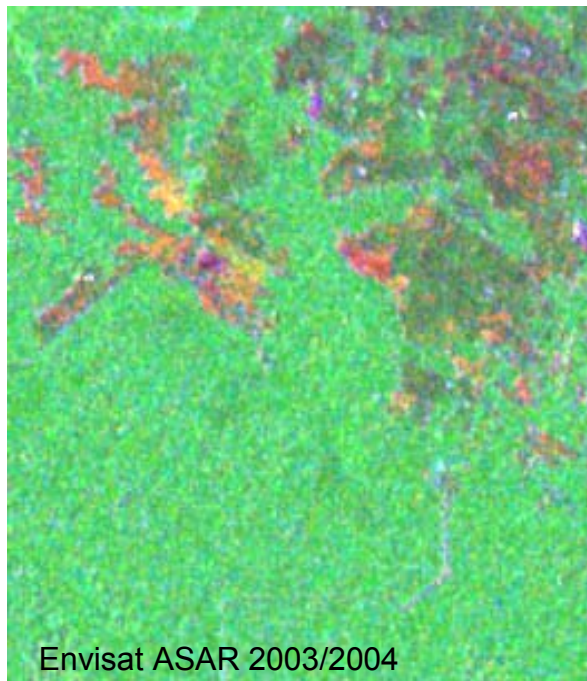
Red: temporal variability

Green:
Average
amplitude

Blue: Average
texture

Area size
approximately
115 x 90 km²

A detail from the change classification



Area size 9.5 km x 10 km

Colors: green – forest/forest; yellow – non-forest/non-forest, red – forest/non-forest; grey- vegetation/water; light blue –water; white – water/water or outside region

ReCover and K & C

- ReCover is a project for the user
- The user has no specific preferences to any data type but looks at cost/benefit
 - Monitoring, Reporting and Verification (MRV) for REDD needs reliable information that can be expressed in statistical terms
- SAR data important
 - L band data useful in particular
 - To alert on change
 - To augment optical data in cloudy regions
 - But requirement on multi-temporality a significant cost driver
- We want to clarify SAR data vs. optical data potential
- Hopefully good availability of PalSAR in study areas
- K & C can get carefully validated information on PalSAR potential for REDD
- K & C Phase 3
 - ReCover as a consortium will likely not apply - VTT considers
 - Easiest to contribute for methodology
 - Validation of JAXA maps
 - Ground reference data from users may be an issue