ALOS K&C Project updated

Thuy Le Toan
CESBIO, France

1. Forest products: forest and biomass maps
2. Wetlands products: rice maps
   inundation maps

Forest and forest biomass maps

K&C product(s):

- Algorithms for biomass mapping using multitemporal PALSAR FBD data
- Algorithms for regional forest mapping with PALSAR WB1
- Assessment of repeat pass interferometry in Northern latitudes
- Synthesis of the algorithms
- Biomass maps at representative study regions.

Intended use: Assessment of carbon budgets in forests
(carbon sources and sinks, in particular related to post-disturbance forests),
in conjunction with in situ and climatic data and ecological modelling.

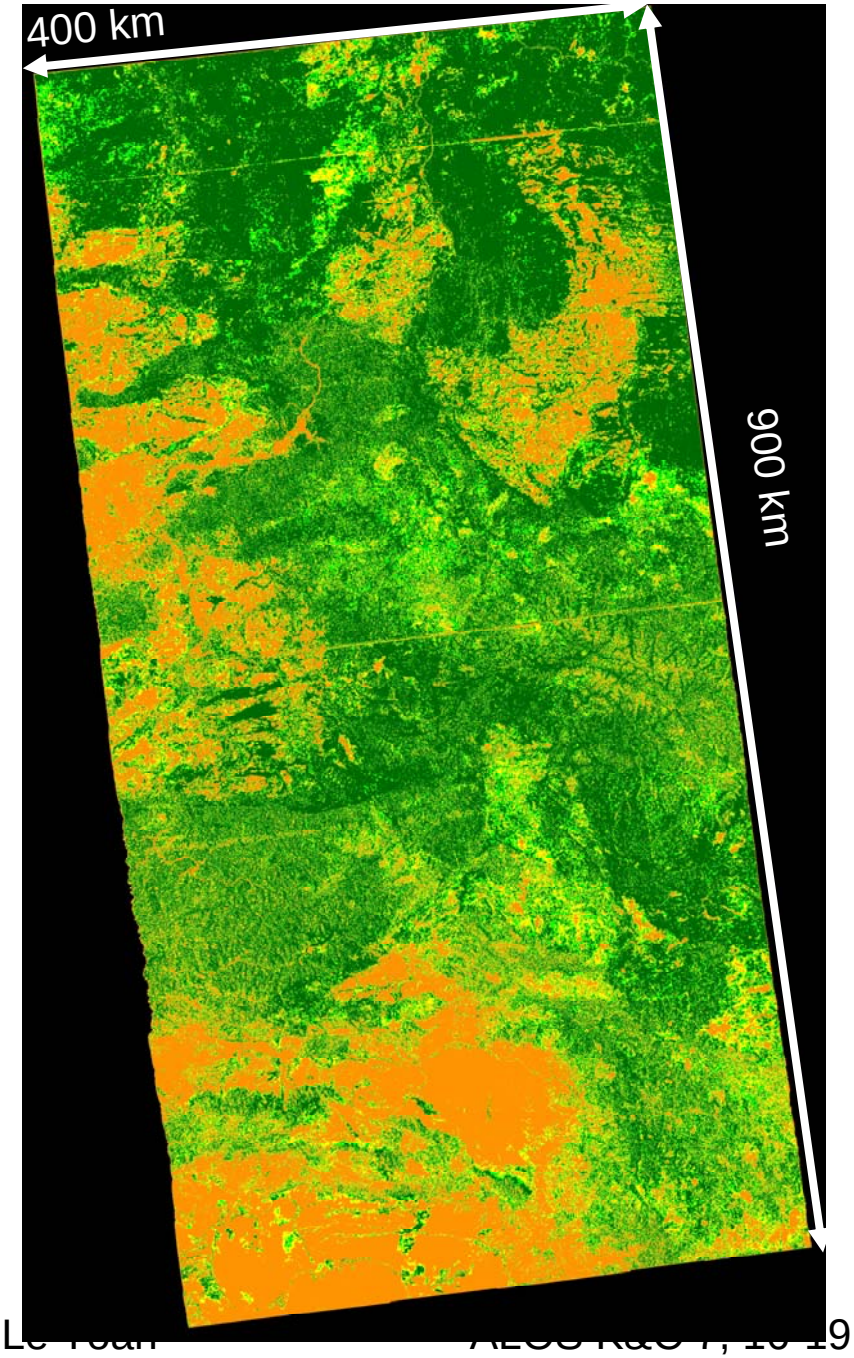
Prototype areas: Individual sites in

- France
- Siberia: collaboration C. Schmullius and Gamma
- Canada: collaboration A. Beaudoin
- UK: collaboration S. Quegan

} Products to be delivered

- Sweden: collaboration H. Olson
- Finland: collaboration M. Hallikainen
- Brasil :collaboration N. Valerano
- Australia: collaboration R. Lucas

} Collaboration for algorithm synthesis



Forest and biomass classes by ENVISAT ASAR WideSwath

Siberia-2 region

Water

Agriculture, bogs, grass

Open forest, cut, fire

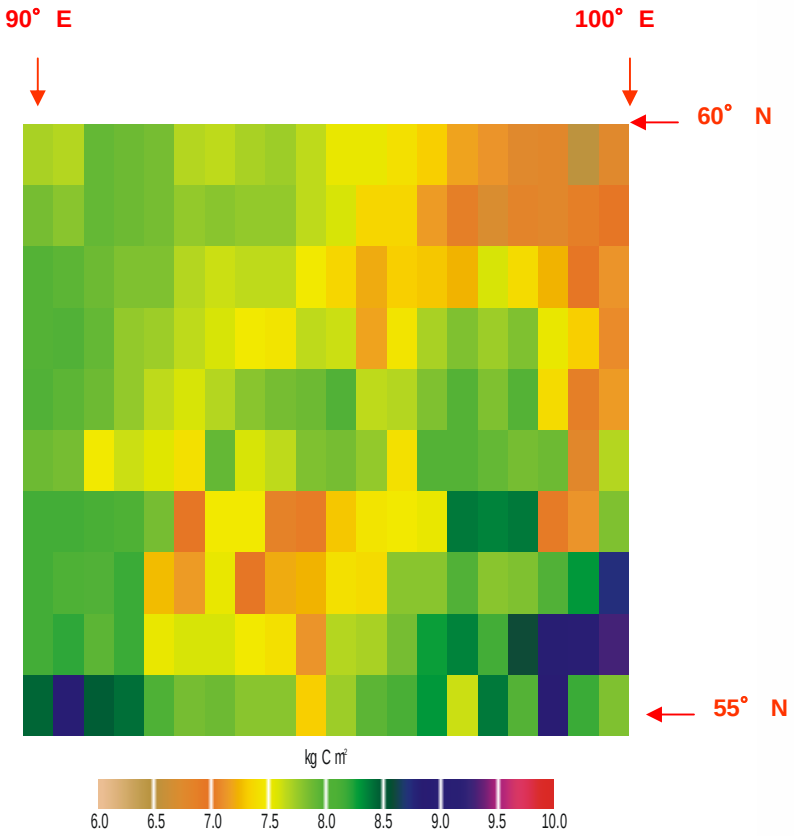
Forest 10-30 t/ha

Forest 30-50 t/ha

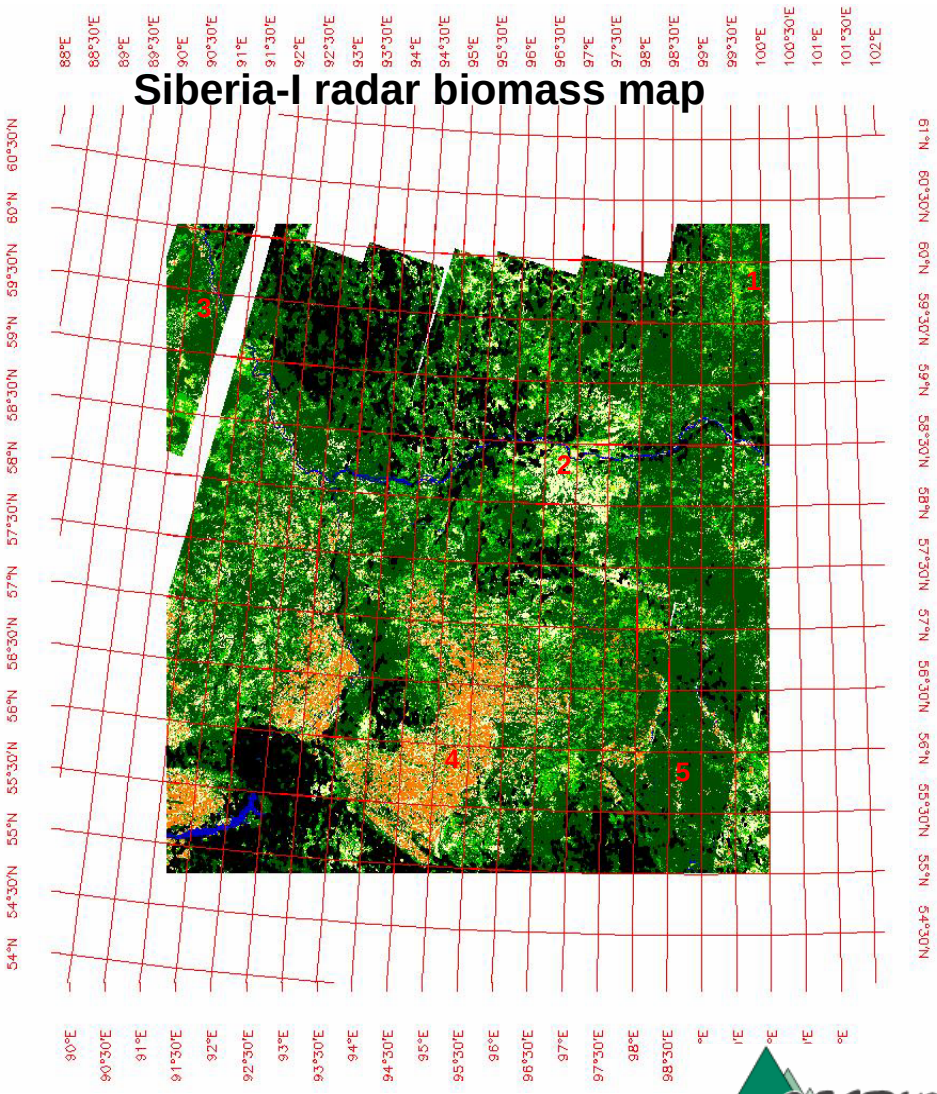
Forest> 50 t/ha

Modelling: need to use EO for testing

Sheffield Dynamic Vegetation Model



Siberia-I radar biomass map



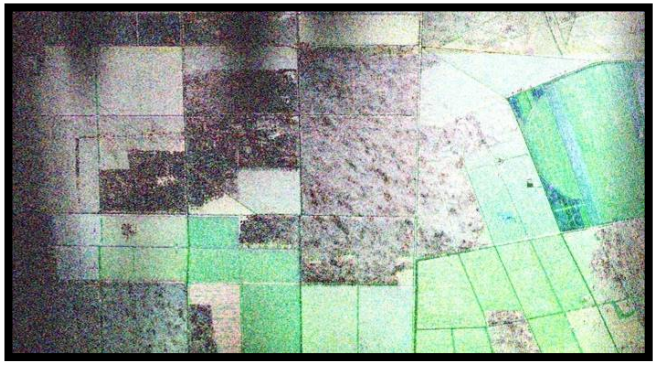
Le Toan et al., 2004
J. of Climatic Change

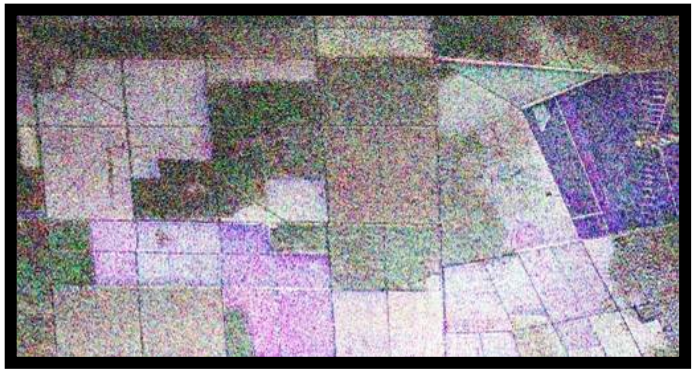
Ground data updated in 2006-2007 in les Landes forest (preparation P-band BIOMASS)

L-band P-band

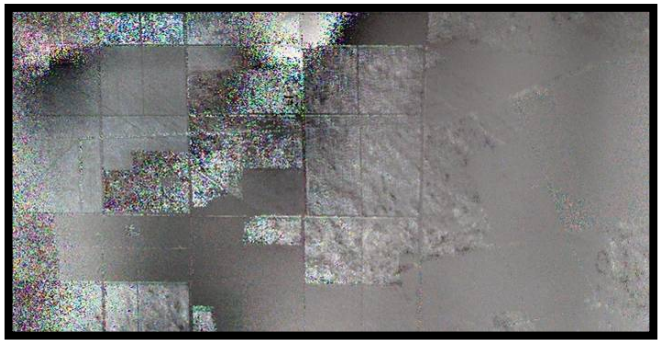
Intensity

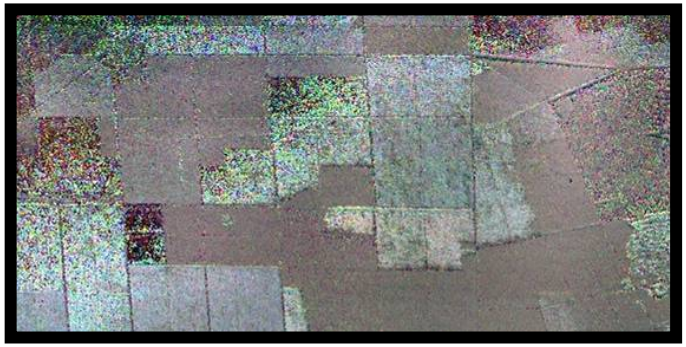
Coherence





Phase





Evaluation of Proposals for the 3rd Core Earth Explorer Mission

- Biomass mission ranked 1st (highest priority) of the 6 mission concepts recommended for further assessment at pre-Phase A level

- BIOMASS can provide key contribution to understanding and quantification of terrestrial part of carbon cycle
- Schedule and cost of mission within boundary conditions of third ESA EE core mission cycle
- Results from experiments including airborne campaigns have demonstrated that P-Band SAR can lead to reliable quantitative products
- Success of mission to offer important tool for compliance with Kyoto commitments

BIOMASS: areas to be clarified

Algorithms

- Robustness and limitations (e.g. saturation) of intensity relationship with biomass

- Feasibility of extending retrieval biomass range using PolInSAR techniques

- Added-value P-Band SAR with respect to L-Band SAR

Exploitation

Use of BIOMASS products for data assimilation within carbon modelling

Regional irrigated rice fields

K&C product(s):

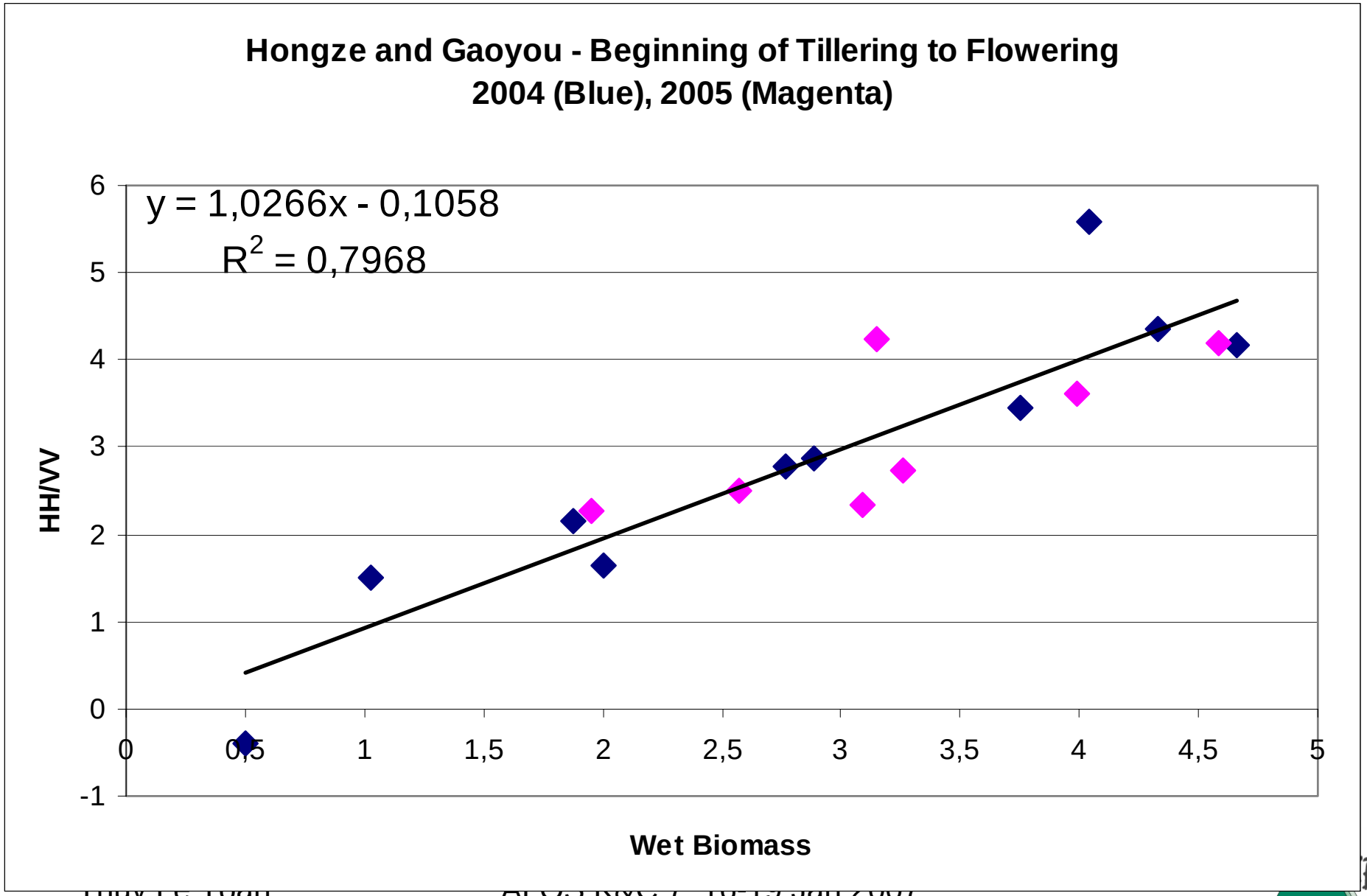
- Algorithms for rice mapping using multitemporal PALSAR FBD data
- Algorithms for regional mapping using multitemporal WB1 data
- Synthesis of the algorithms at different test areas
- Rice maps at representative study regions.

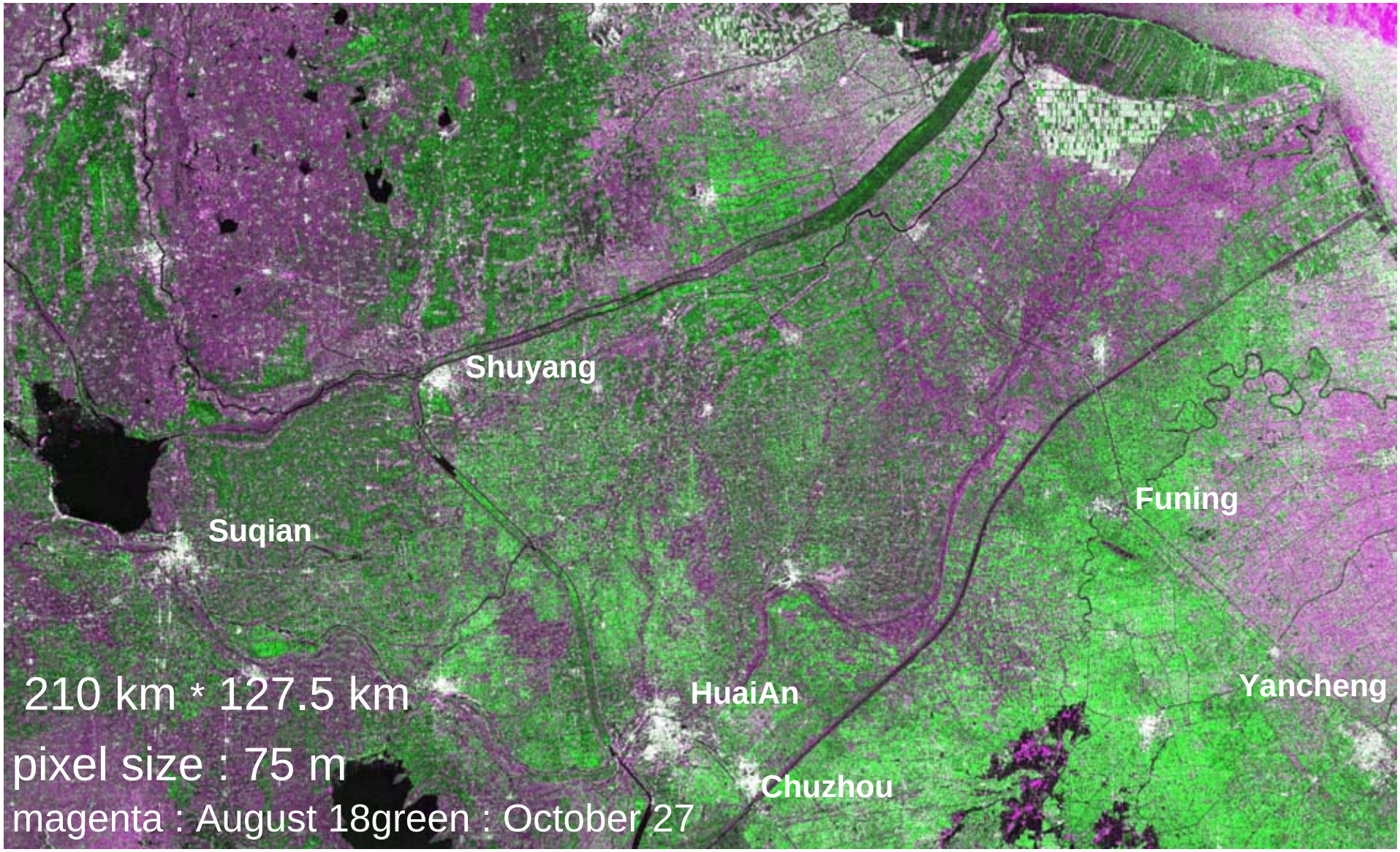
Intended use: Assessment of regional rice production and methane emission in conjunction with in situ, climatic data and ecological modelling

Prototype areas: Individual sites in

- Vietnam
- China
- Thailand: collaboration W. Salas
- India: collaboration W. Salas

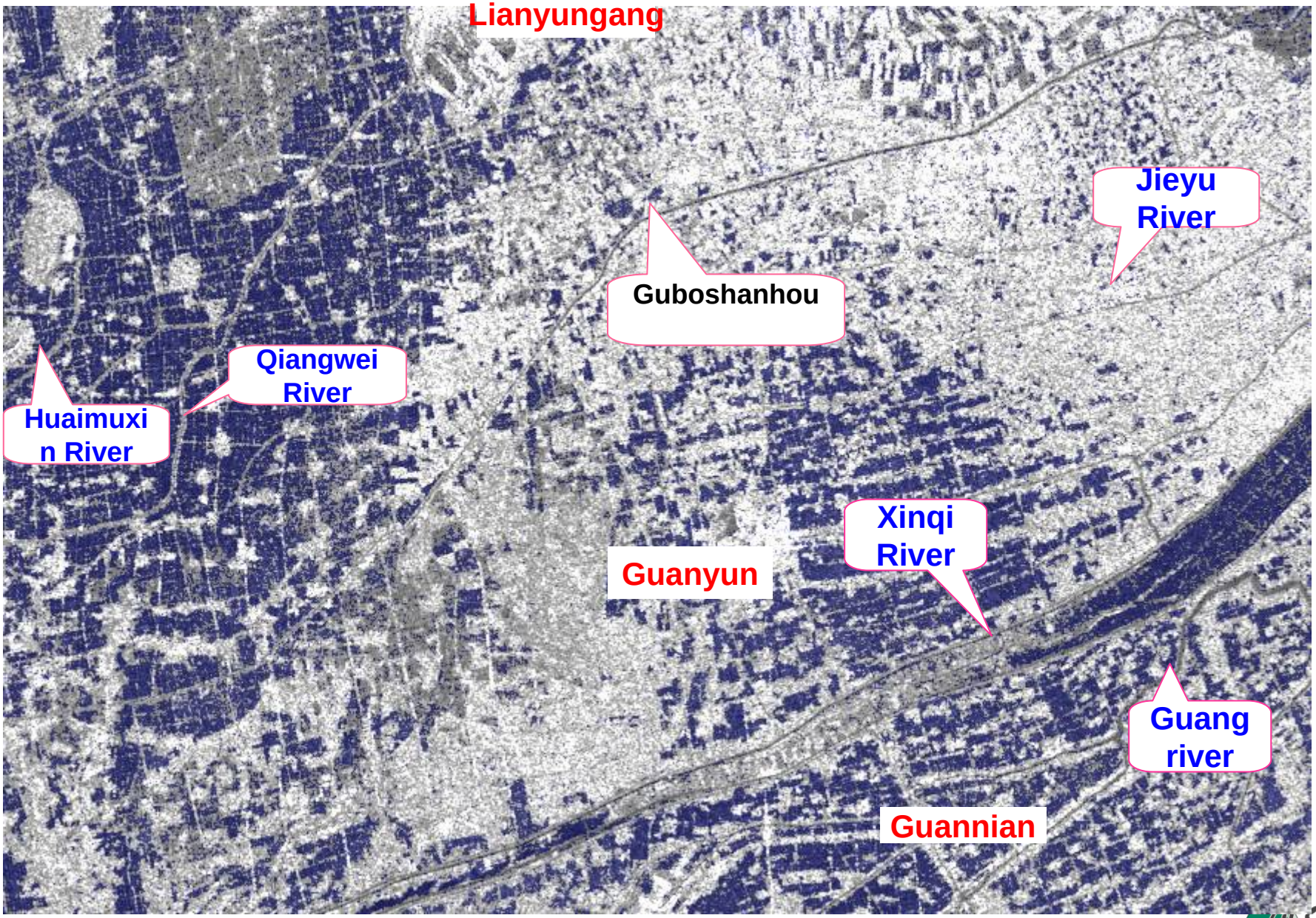
Relation ASAR HH/VV and rice wet biomass





ASAR WSM region North of Qingjiang Jiangsu province

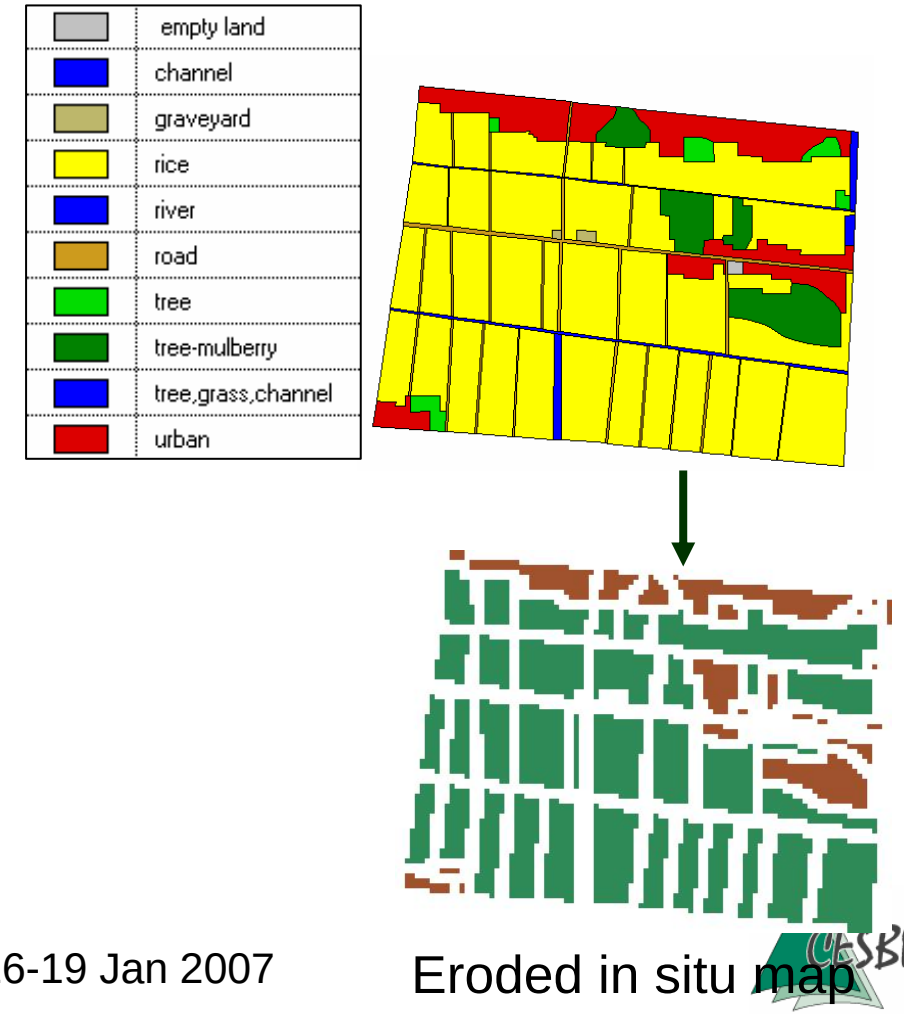
Rice mapping using WSM ASAR data



Ground campaign for biomass and mapping validation

In situ mapping of 1km x 1km samples with DGPS (October 2005)

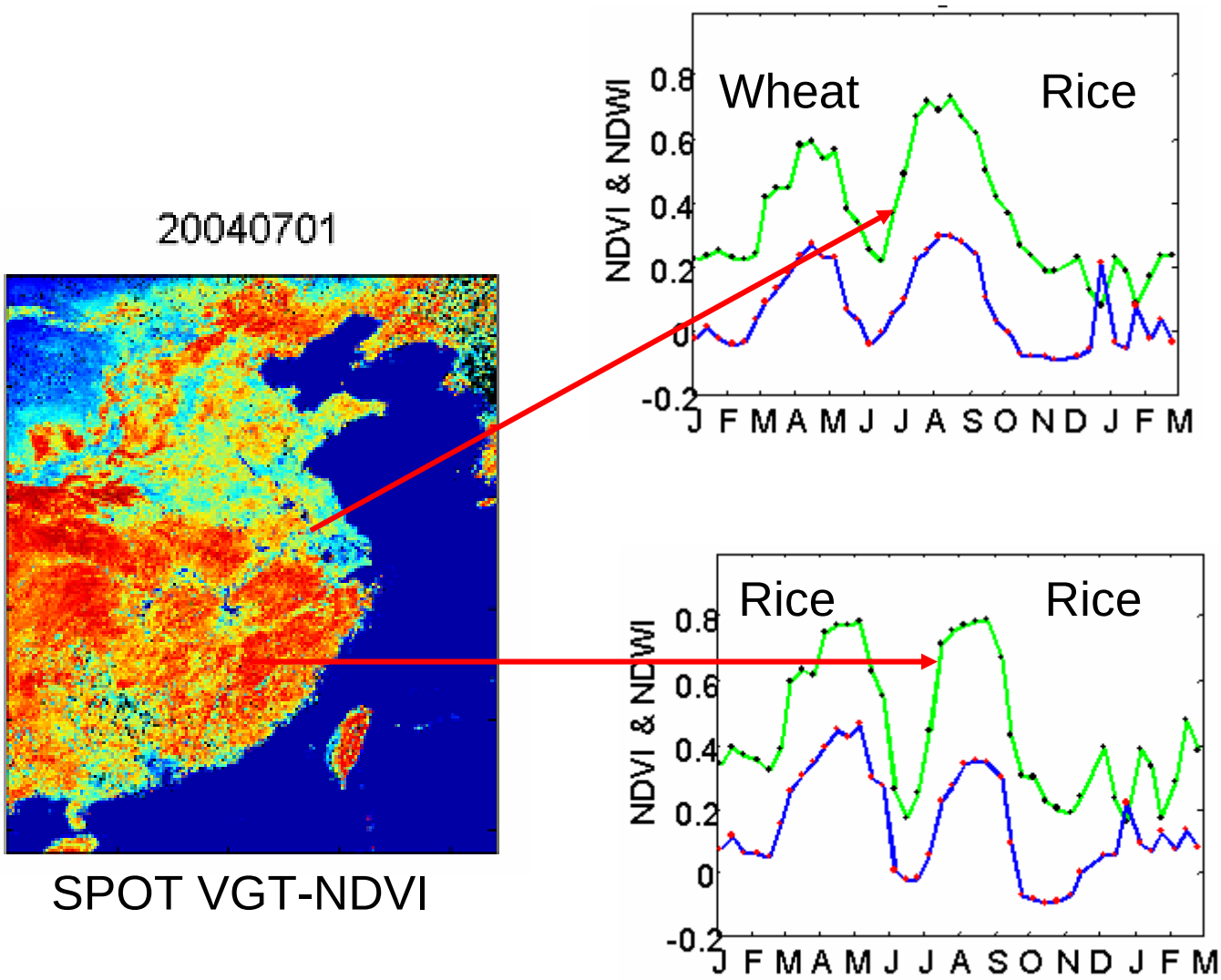
Overall accuracy: 86-88%



Eroded in situ map

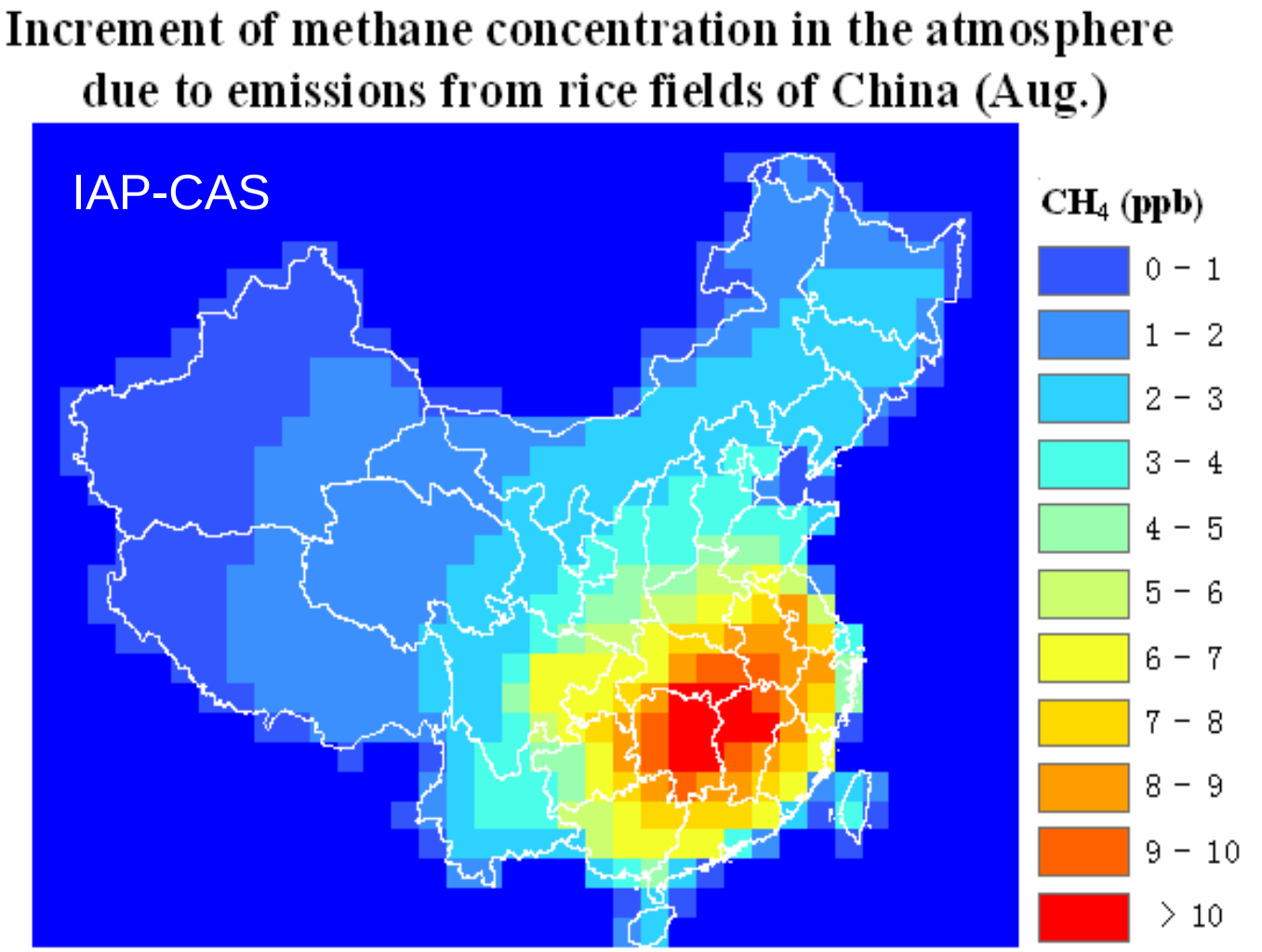
Ground campaign in 2007
- China (Dragon project)
- Vietnam, for ASAR project

Regional mapping
using SPOT VGT (1 km, 10 days)



SPOT VGT-NDVI

Estimation of Methane emission from ricefields



Institute of Atmospheric Physics, Beijing

In June and August, the extreme high tropospheric CH_4 enrichment appeared over central China

In addition: flood dynamics in tropical wetlands

K&C product(s):

- Algorithms for mapping flood dynamics using multitemporal FBD and WB1 data
- Maps at representative study regions.

Prototype areas: Individual sites in
Amazone floodplains (Curuai, Januaca and Maranon)
Collaboration : KC team

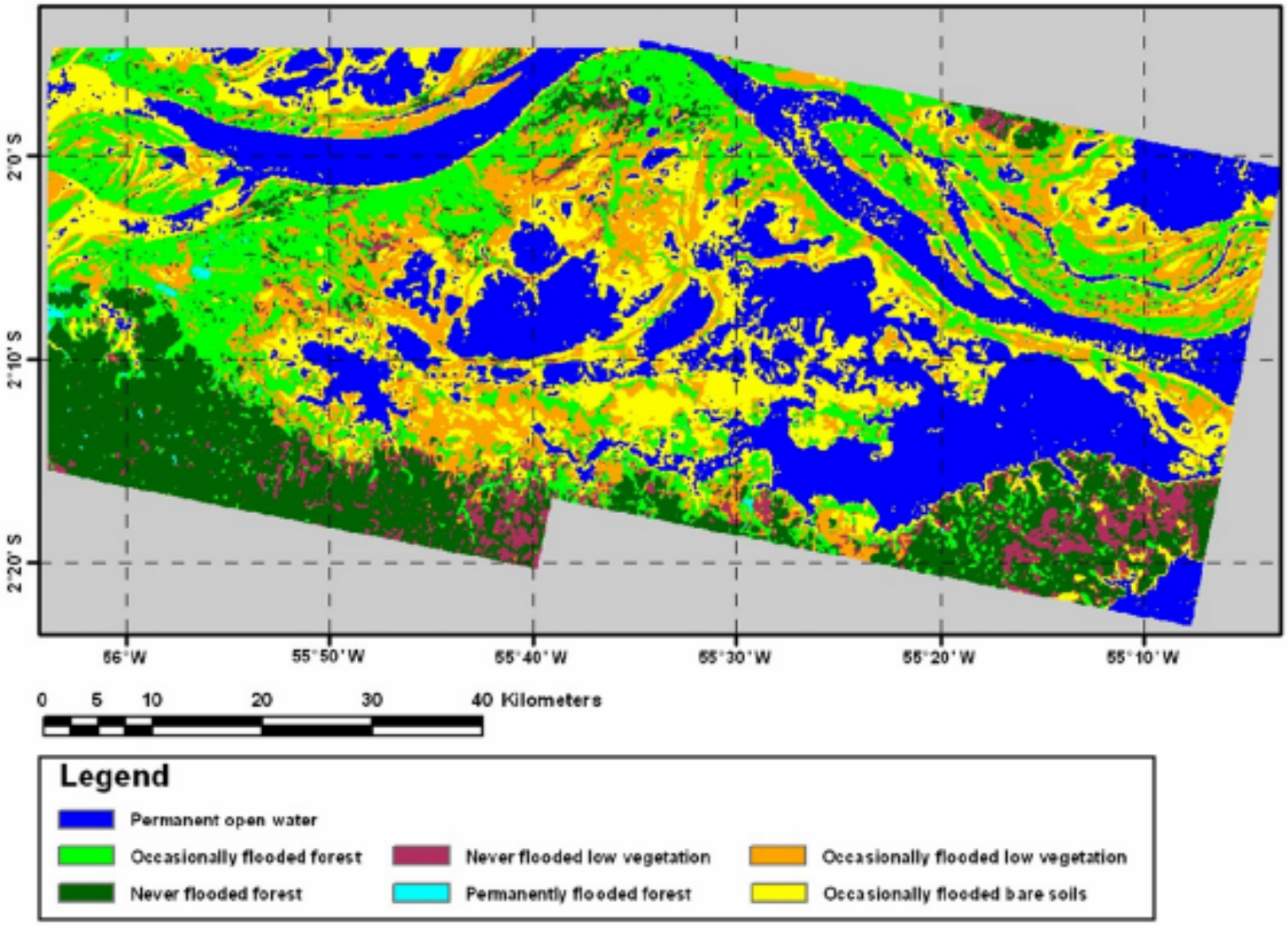


Fig. 9. Map of the Óbidos floodplain derived from the multitemporal classifier using 21 J-ERS images. The map attributes a status to each pixel in accordance with the flood condition (never, occasionally, always flooded) and its broad vegetation type: bare soils (e.g. pastures or clear cut); low vegetation (savannahs and pioneer formations); forest.

Ground measurements available (JM Martinez, IRD)

Practicabilities

- ALOS-PALSAR for biomass mapping: National funding when the data will be received
- PALSAR for evaluating L band versus P-band: post-docs at CESBIO working on BIOMASS

- PALSAR for rice monitoring:
  China: Ph.D working on Dragon project
  Vietnam: Ph.D from Vietnam
- PALSAR for wetlands: work by Jean Michel Martinez

Preliminary analysis of PALSAR data samples

Thuy Le Toan, Alexandre Bouvet
CESBIO, Toulouse, France

Jean Michel Martinez
LMTG, Toulouse, France

Data and analysis

FBS HH 34.3° 22 July 2006 over Japan:

HH backscatter of rice

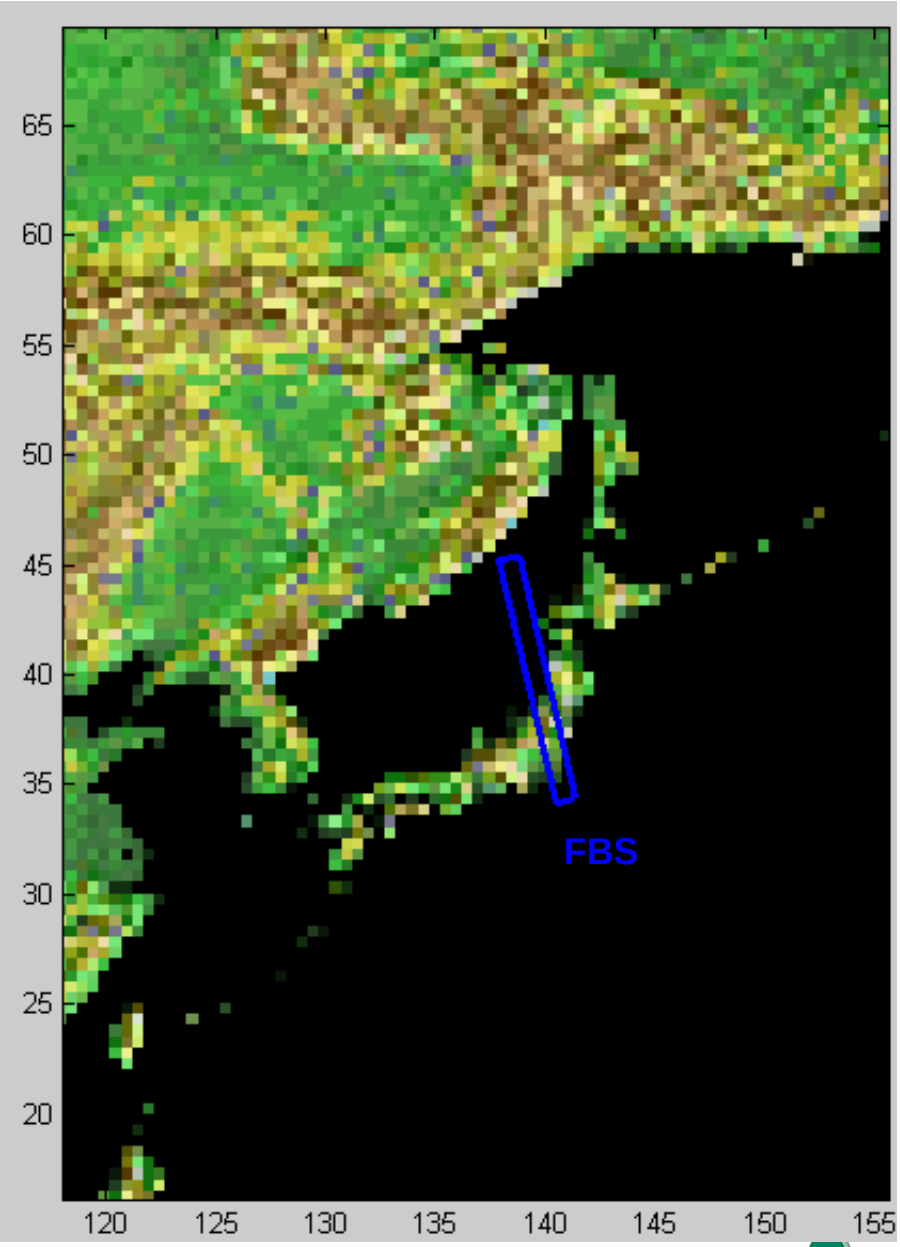
FBD over Amazon: HH HV of deforestation areas

HH HV of wetland forests

WB1 over S America:

HH backscatter of forest plantation

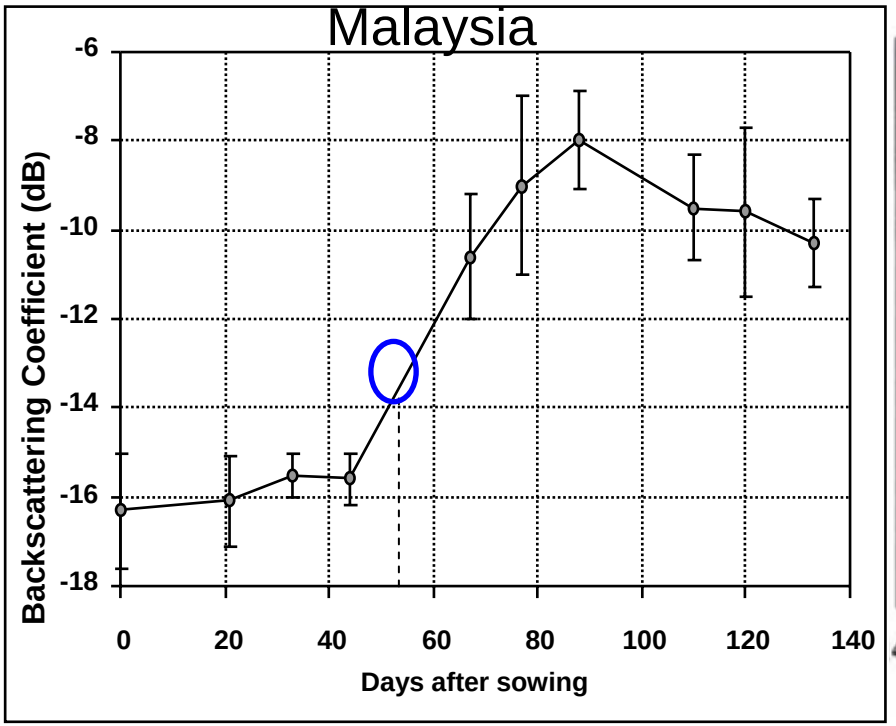
RICE



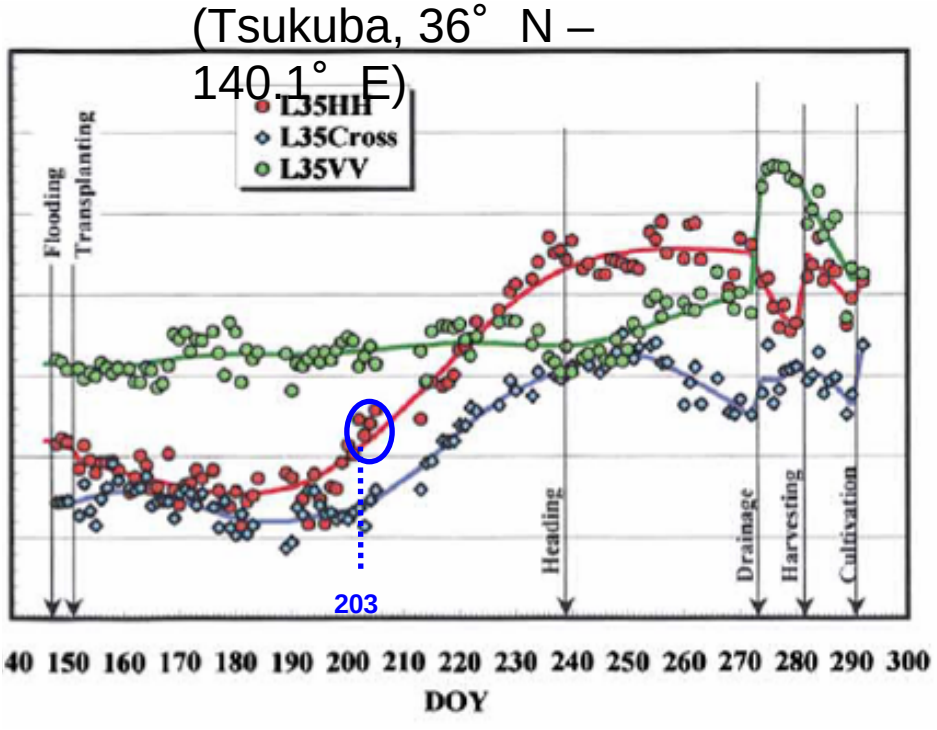

Rice fields Akita - Japan
40° N – 140° E
Hitochi
2007 Europa Technologies
nage © 2007 TerraMetrics


PALSAR FBS
22/07/2006
-15dB < HH < -12dB

Backscatter from rice fields



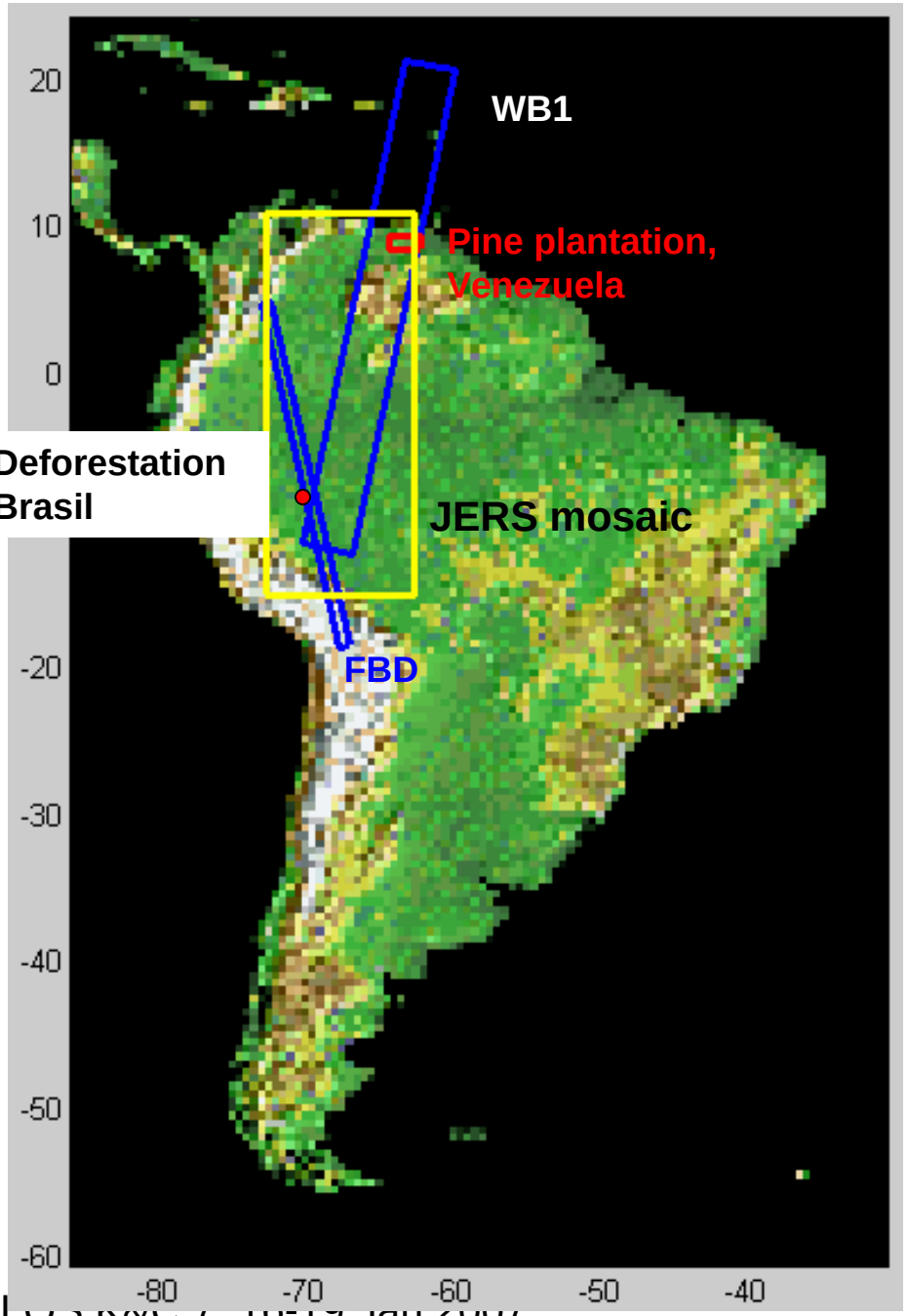
(Tsukuba, 36° N – 140.1° E)

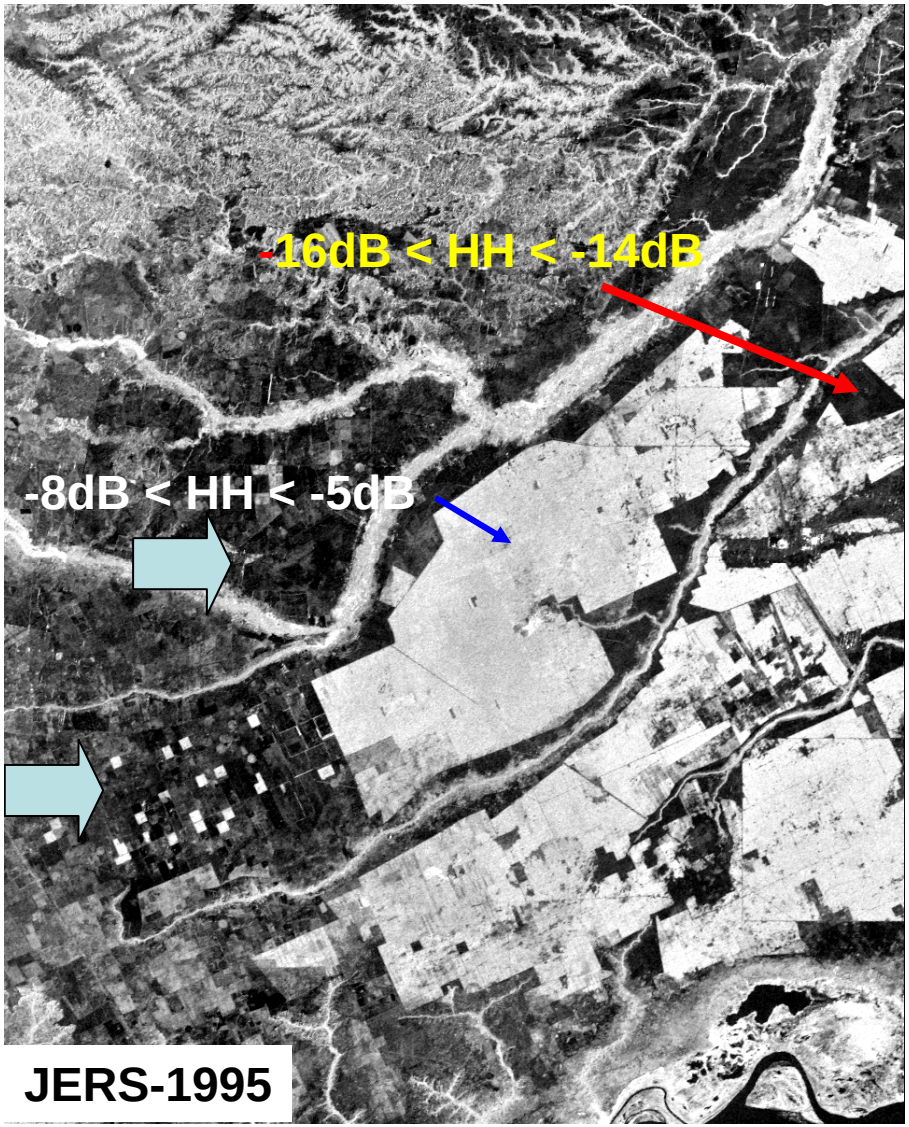


PALSAR [12 dB, -14 dB], 50-60 days after sowing:
Similar range of rice backscatter HH, 35° from JERS (Rosenquist & Oguma, 1995) and from ground based data (from Inoue et al., 2002)

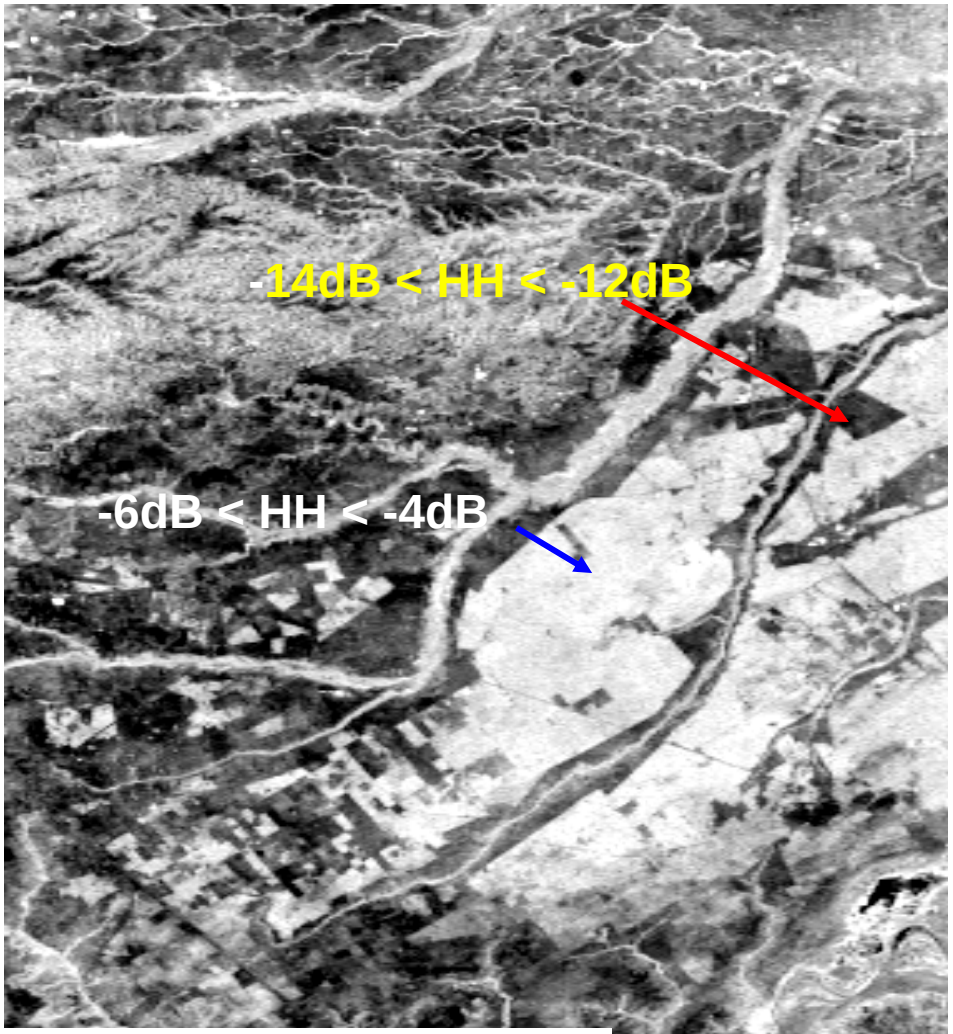
⇨ need data during critical stage (end of tillering-flowering) for methodology development

FOREST THEME





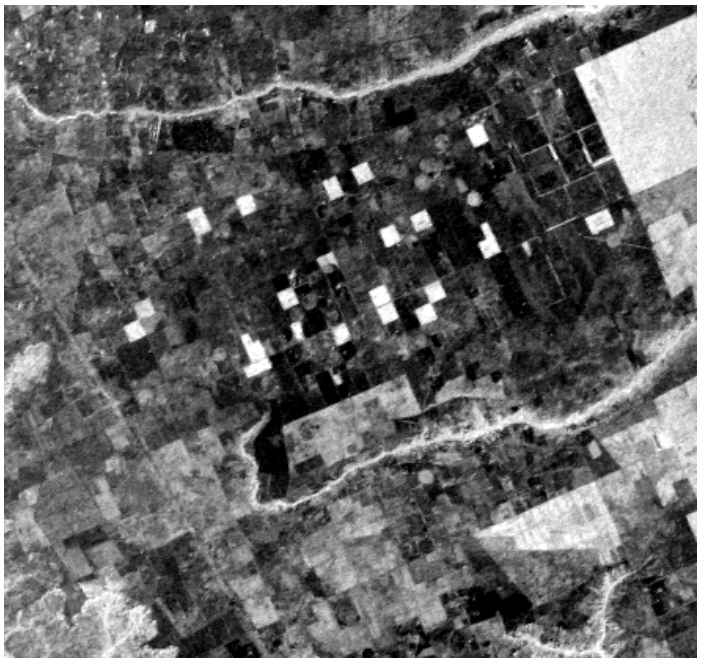
JERS-1995



PALSAR WB1 19/11/2006

- **Change in plantation of *Pinus caribaea var. Hondurensis, Venezuela* (8° 29'-9° 25'N, 62° 30'-64° 40'W)**
- **Forest dynamic range HH, 34.2° : 8 dB**

CESBIO



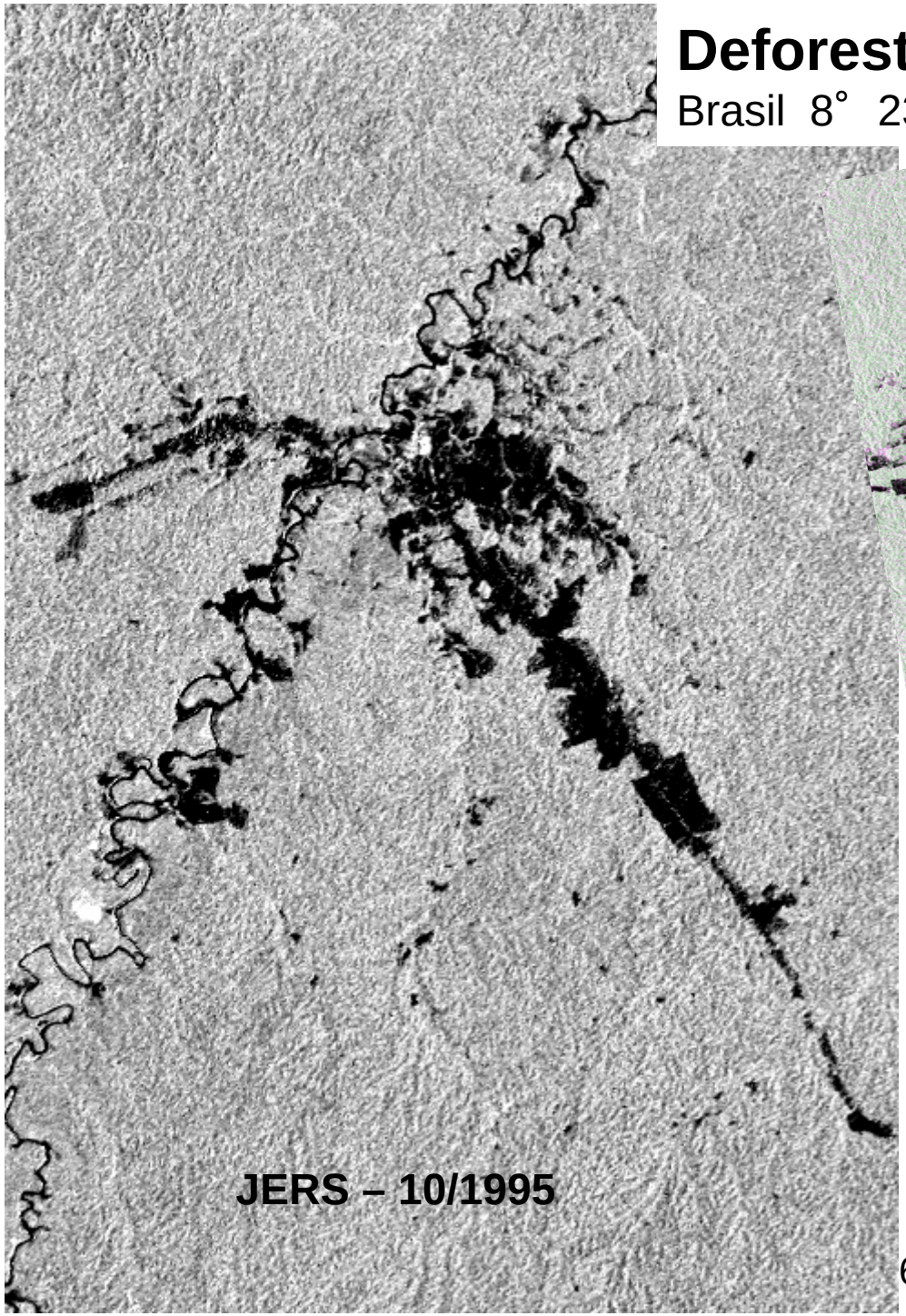
JERS-1995

PALSAR-WB1 November 2006

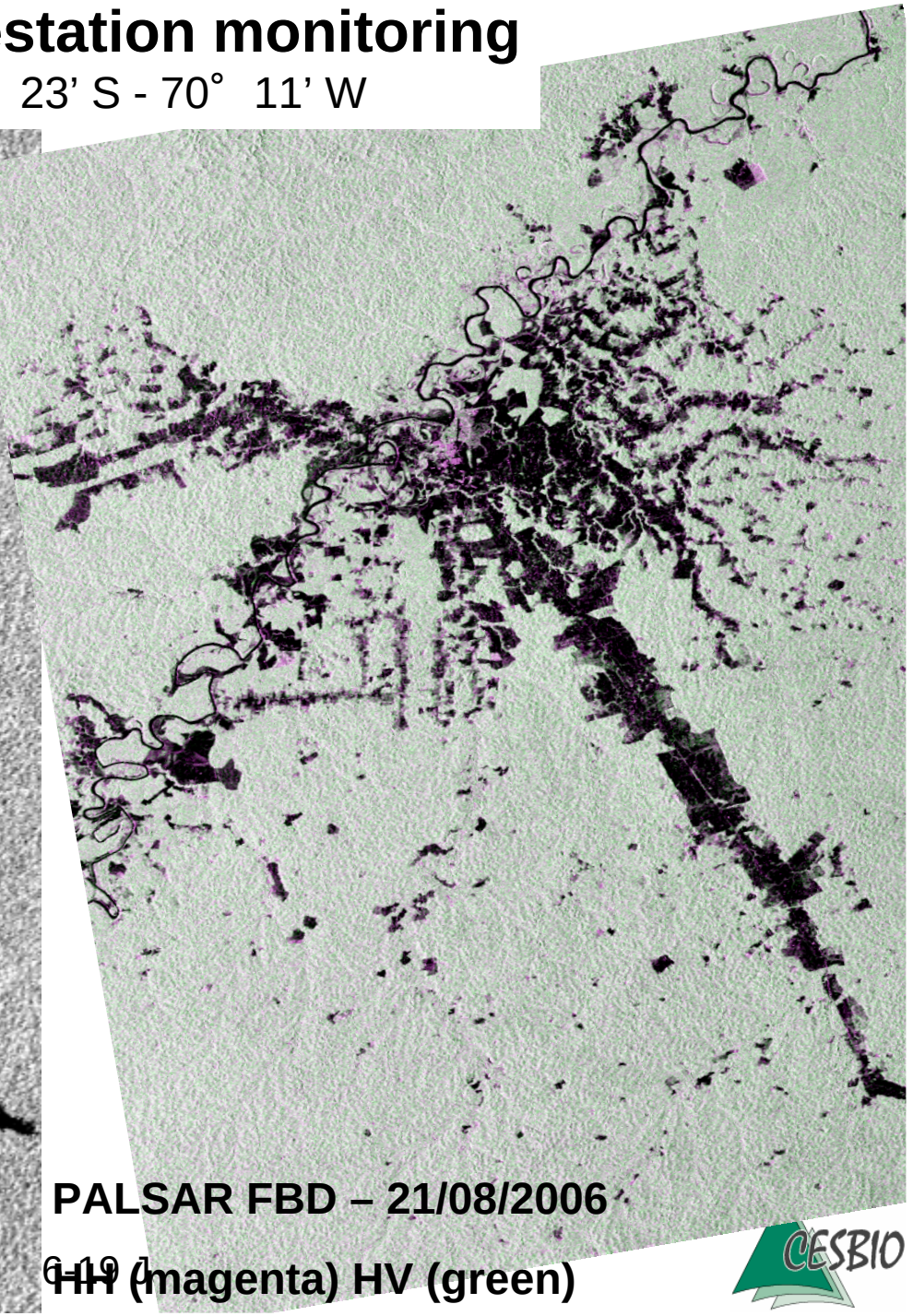
10 year biomass variation in forest stands due to logging and regrowth

Deforestation monitoring

Brasil 8° 23' S - 70° 11' W

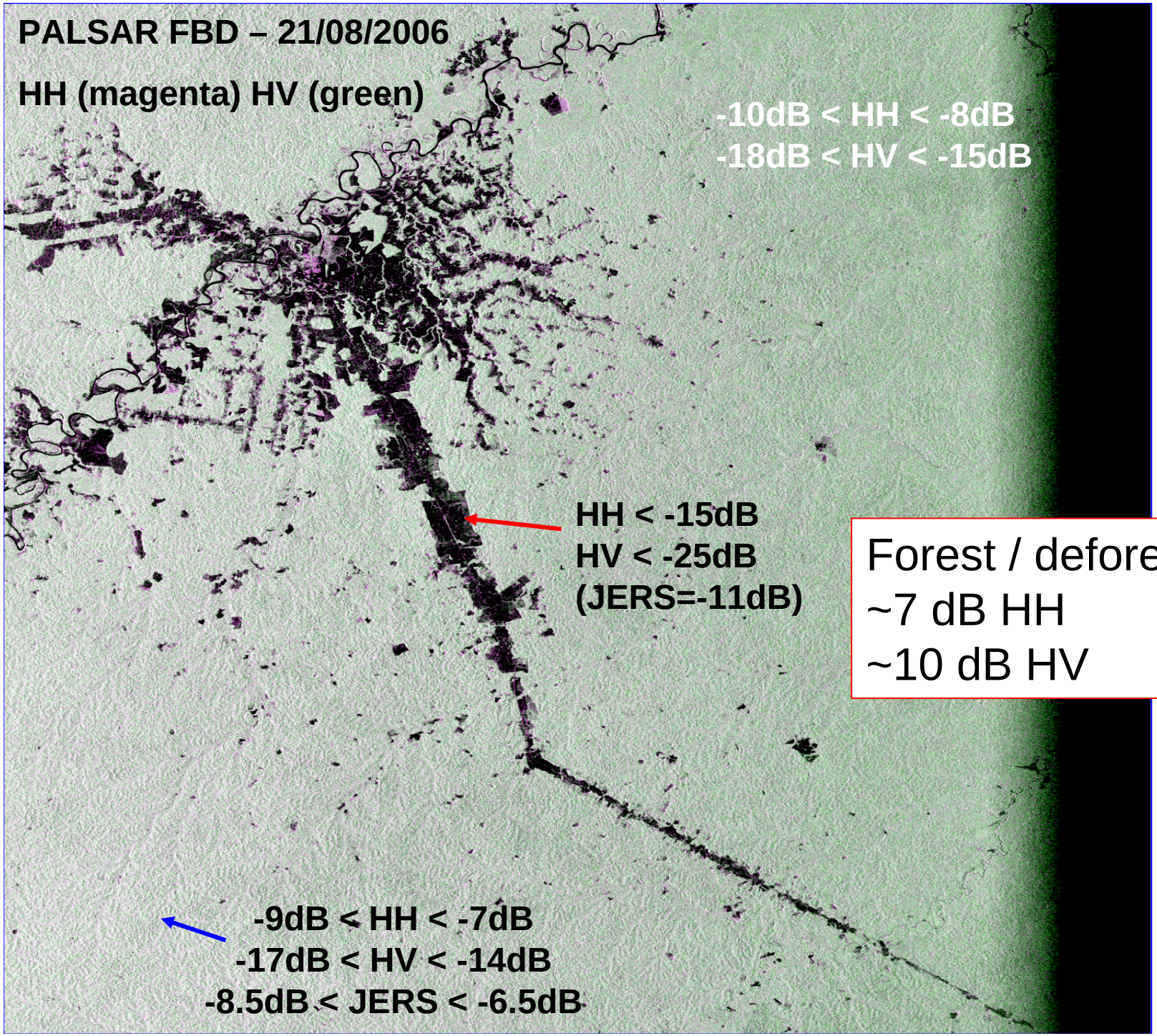


JERS – 10/1995



PALSAR FBD – 21/08/2006

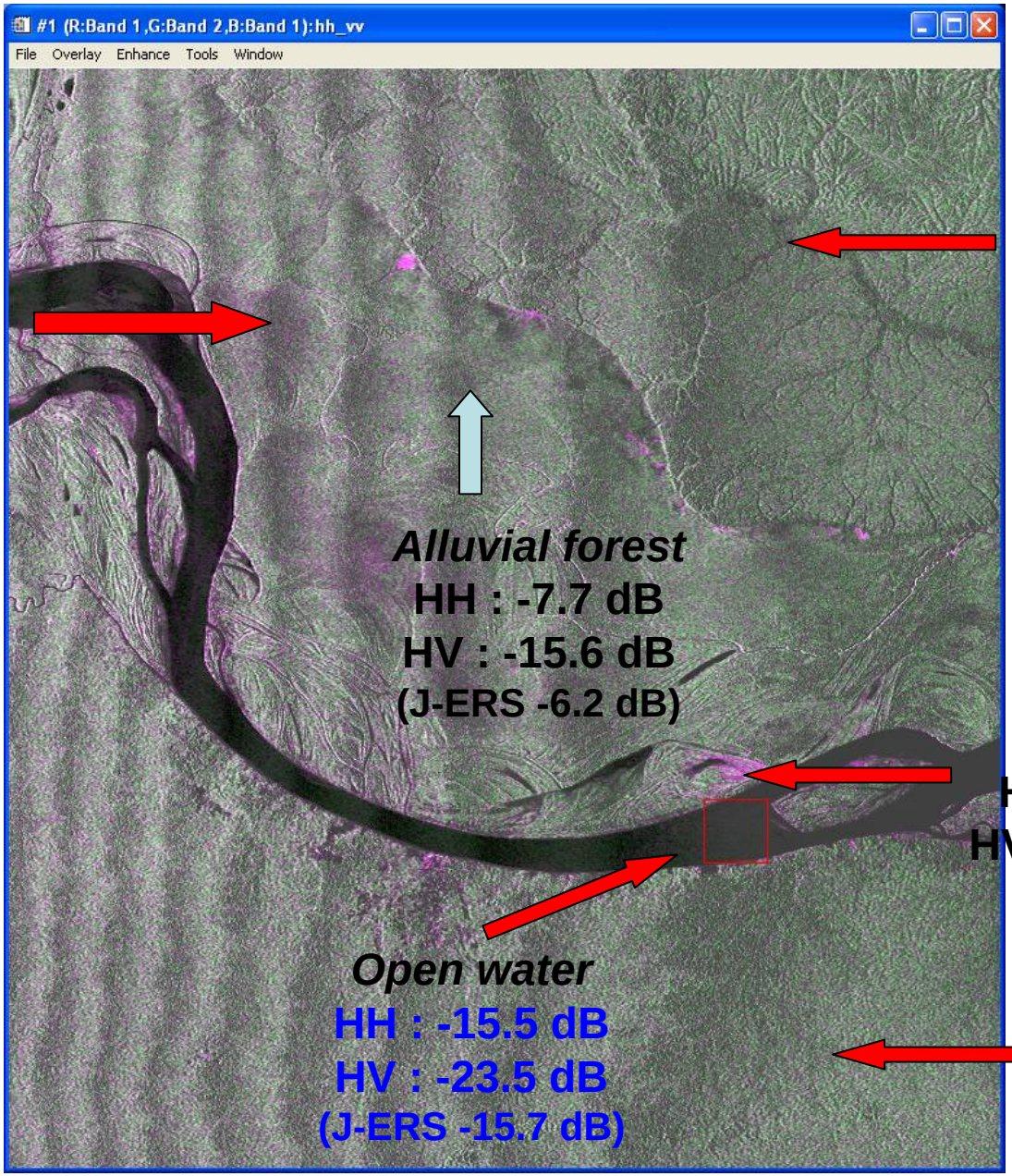
HH (magenta) HV (green)



Forest / deforested area
~7 dB HH
~10 dB HV

CESBIO

PALSAR dualpol mode over the *Amazon river floodplain (ortho path)*



Alluvial forest
HH : -7.7 dB
HV : -16 dB
(J-ERS -6.8 dB)

Terra firme forest
HH : -8.7 dB
HV : -16.2 dB
(J-ERS -6.8 dB)

Alluvial forest
HH : -7.7 dB
HV : -15.6 dB
(J-ERS -6.2 dB)

Marsh
HH : -6 dB
HV : -15.8 dB

Open water
HH : -15.5 dB
HV : -23.5 dB
(J-ERS -15.7 dB)

Terra firme forest
HH : -8.2 dB
HV : -16 dB
(J-ERS -7.1 dB)

Thuy Le Toan

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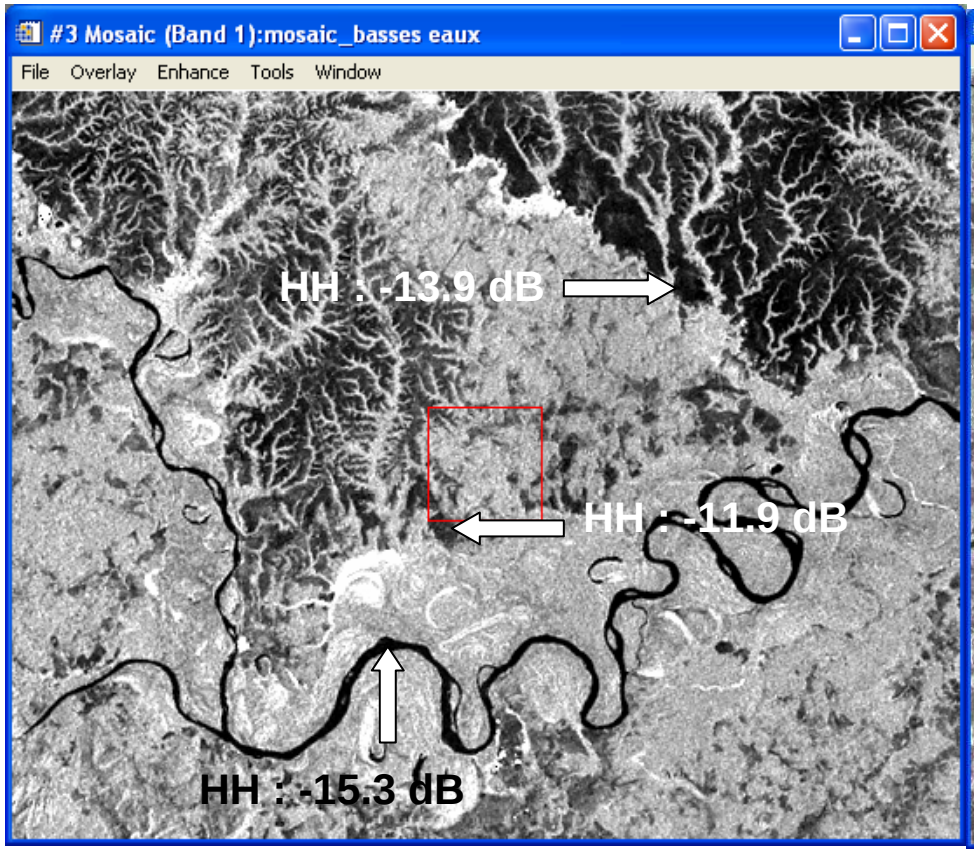
Wetlands

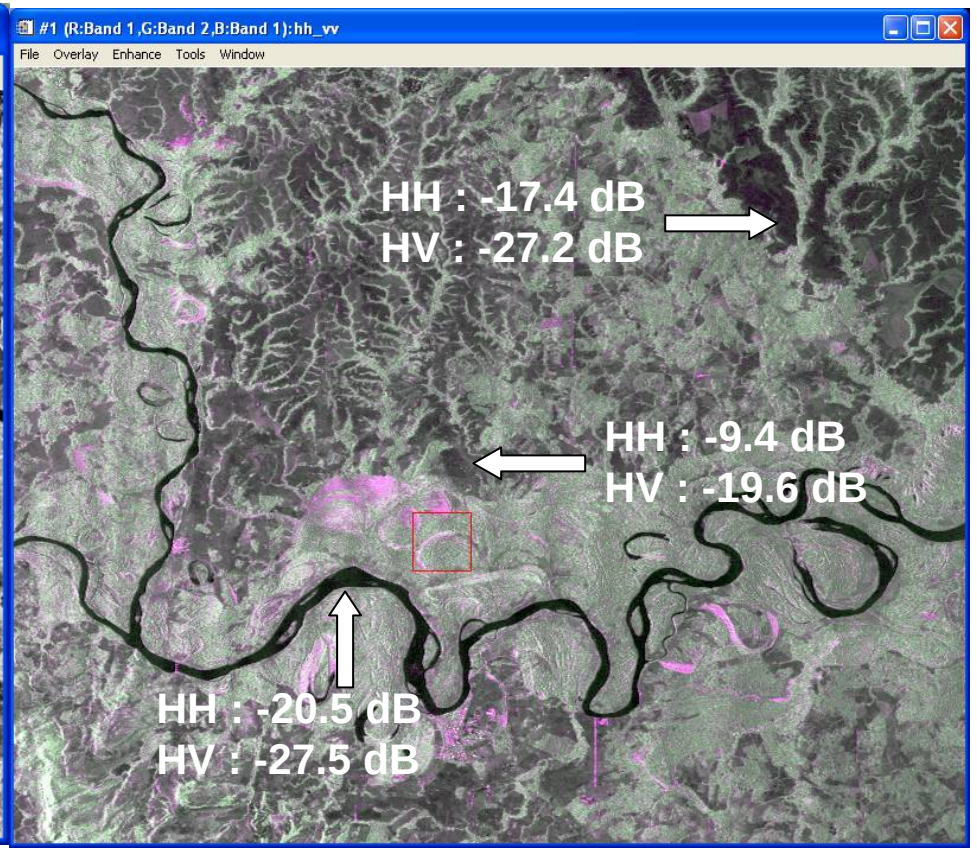
Changes in the river morphology

PALSAR dualpol mode and J-ERS over the *Gaviare River (Colombia)*

J-ERS



PALSAR

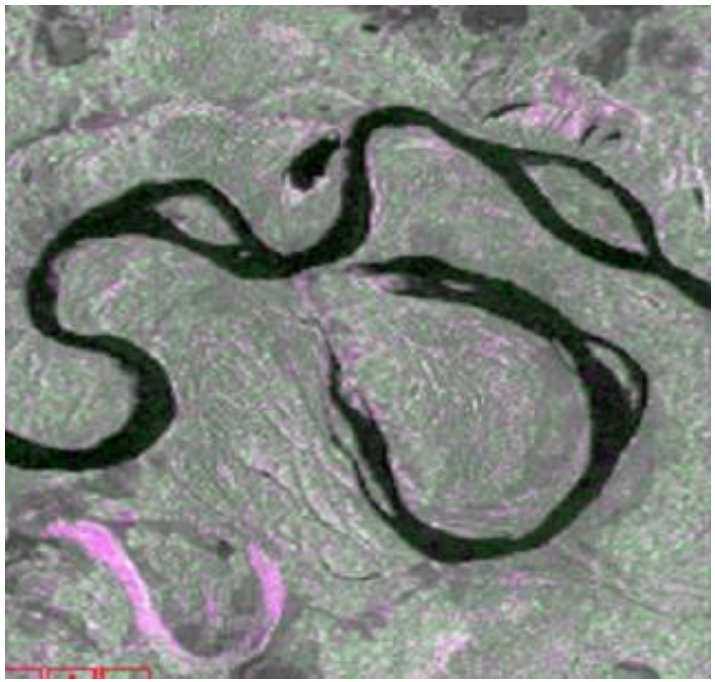


Red : HH
Green : HV
Blue : HH

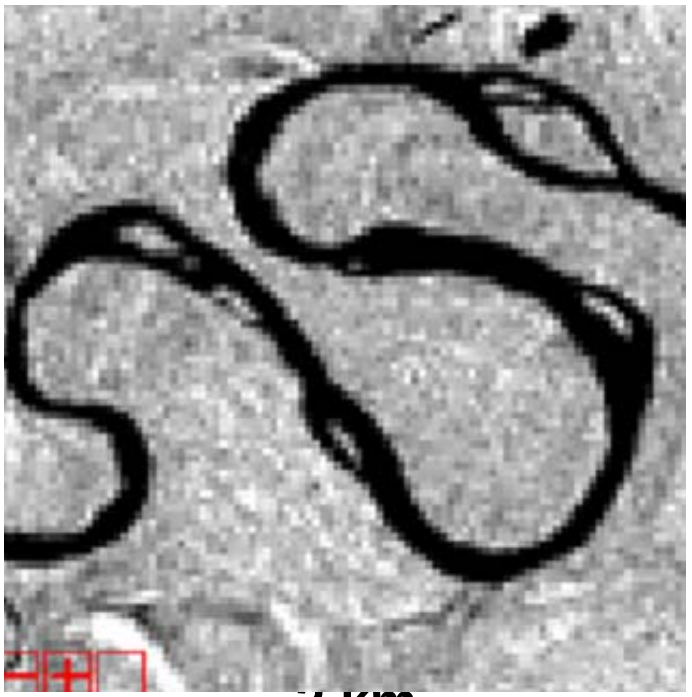
PALSAR dualpol mode and J-ERS over the *Gaviare River (Colombia)*

Monitoring of changes in the river morphology

PALSAR FBD – 08/2006



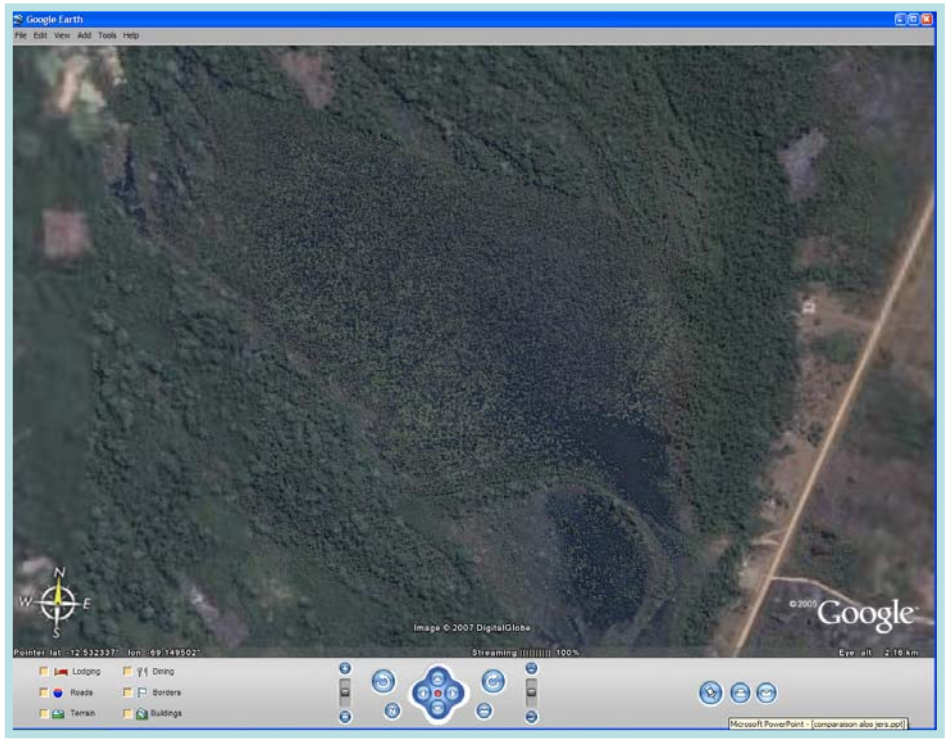
J-ERS - 10/1995



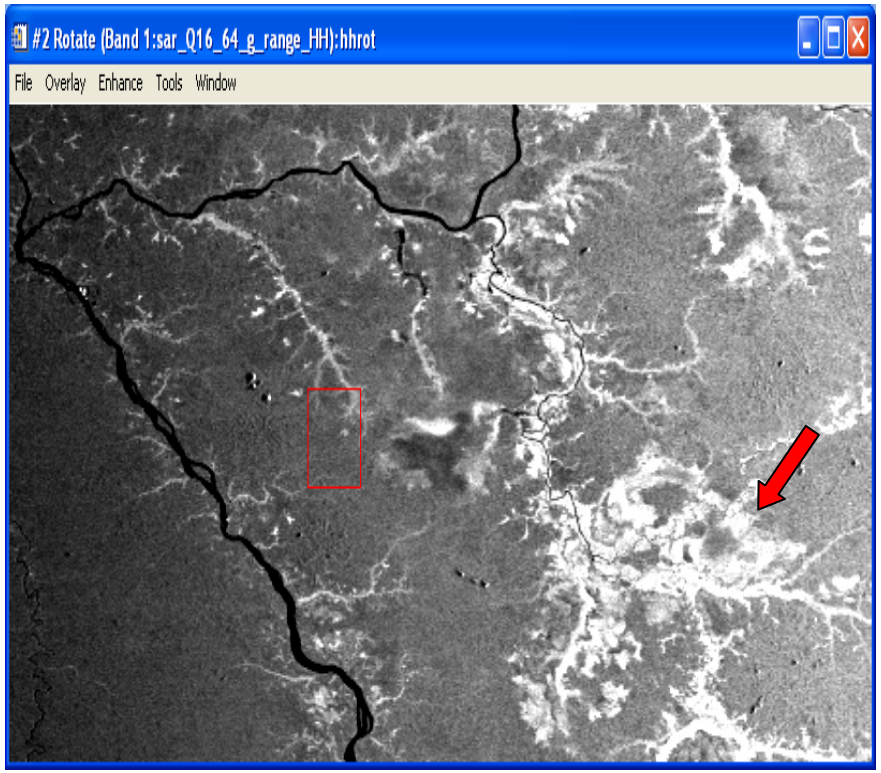
2 km

PALSAR dualpol mode over swamps and bogs

Madre de Dios River (Peru)



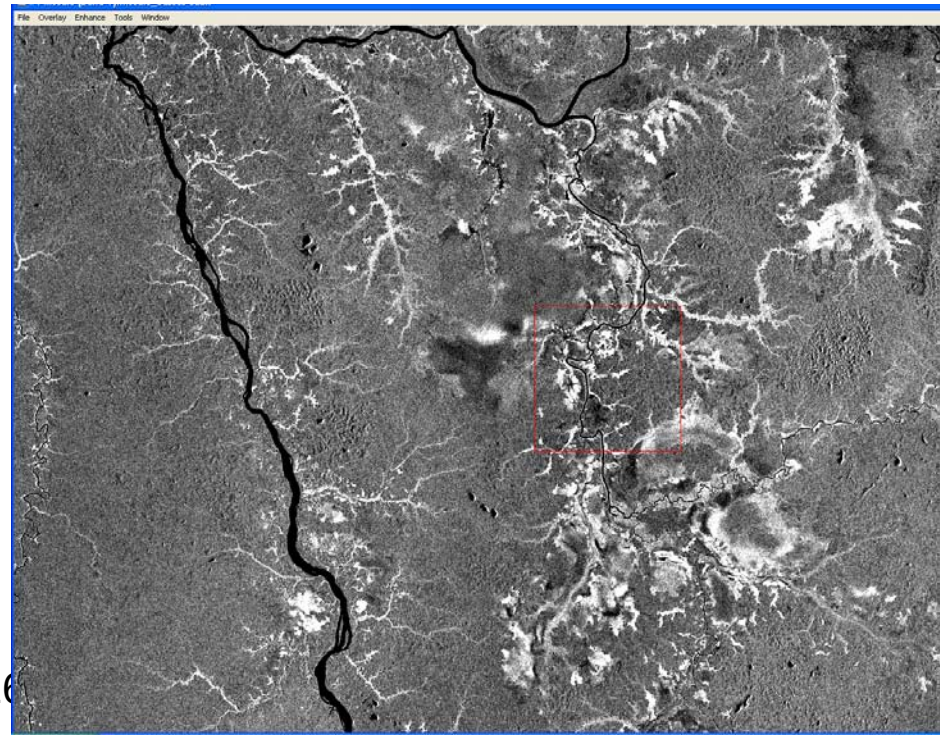
HH : 5 dB !
HV : -15 dB
(J-ERS : –1.6 dB)



2-3 dB increase of HH channel over flooded vegetation

PALSAR

Mode WB1
Pol. HH
Casiquiare Channel



J-ERS

Thuy Le Toan

ALOS K&C 7, 16

Summary of the preliminary analysis

- Good calibration of PALSAR data on samples analysed
- Good dynamic range
- Some pattern problems

- Tropical forest: stable response compatible with JERS, small distinction forest types, e.g. alluvial, terra firme
  Deforestation:contrast 5-10 dB, HV (slightly) higher than HH
  Potential monitoring forest logging/ regrowth in forest plantation
- Wetlands: potential monitoring changes in river morphology
- Rice: HH at 1 date in agreement with previous data.