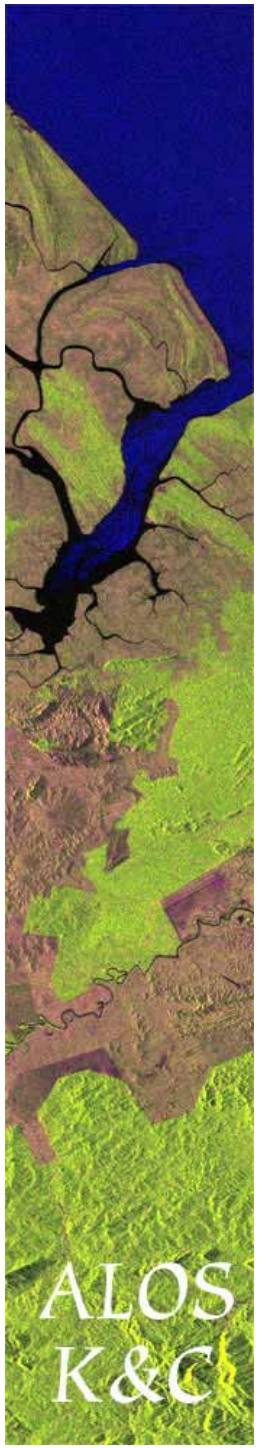
Monitoring the forest using the ALOS

M. Shimada

JAXA/EORC

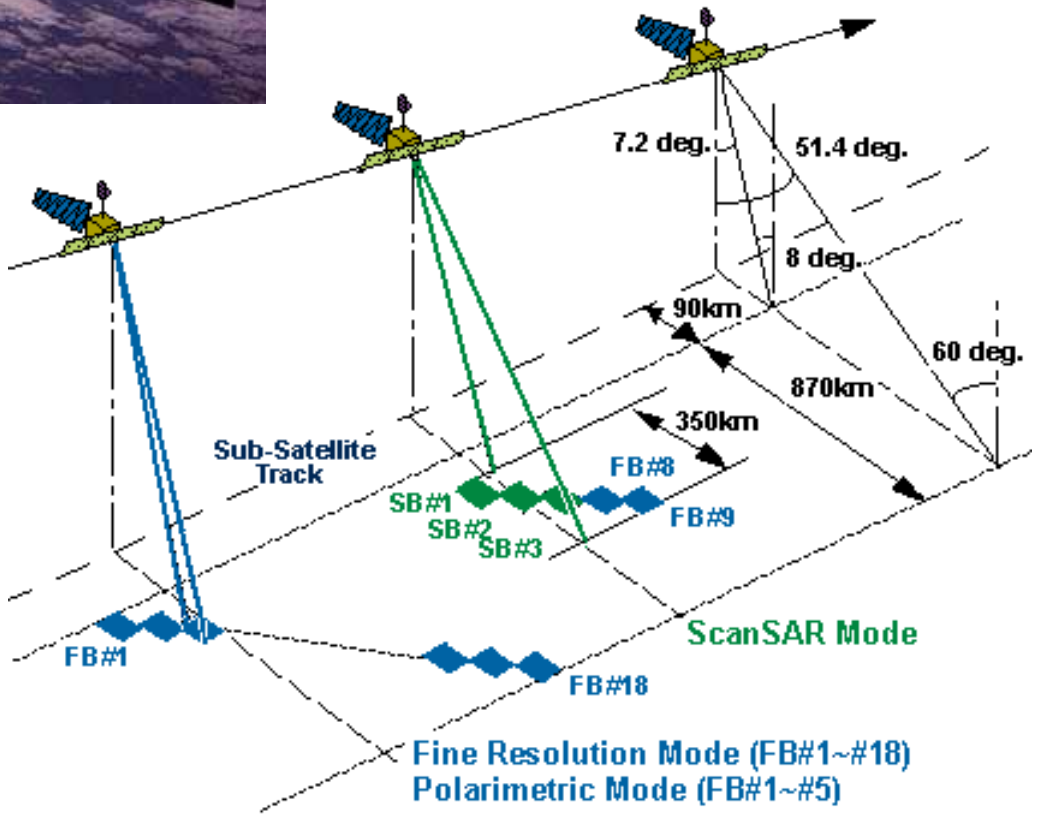
Feb. 5 2009



The Advanced Land Observation Satellite - ALOS

PALSAR
L-band (23.6 cm)
Synthetic Aperture Radar
Polarimetry
Dual Polarization
SCANSAR

Launch:
24 Jan. 2006



Forest monitoring and the K&C initiative

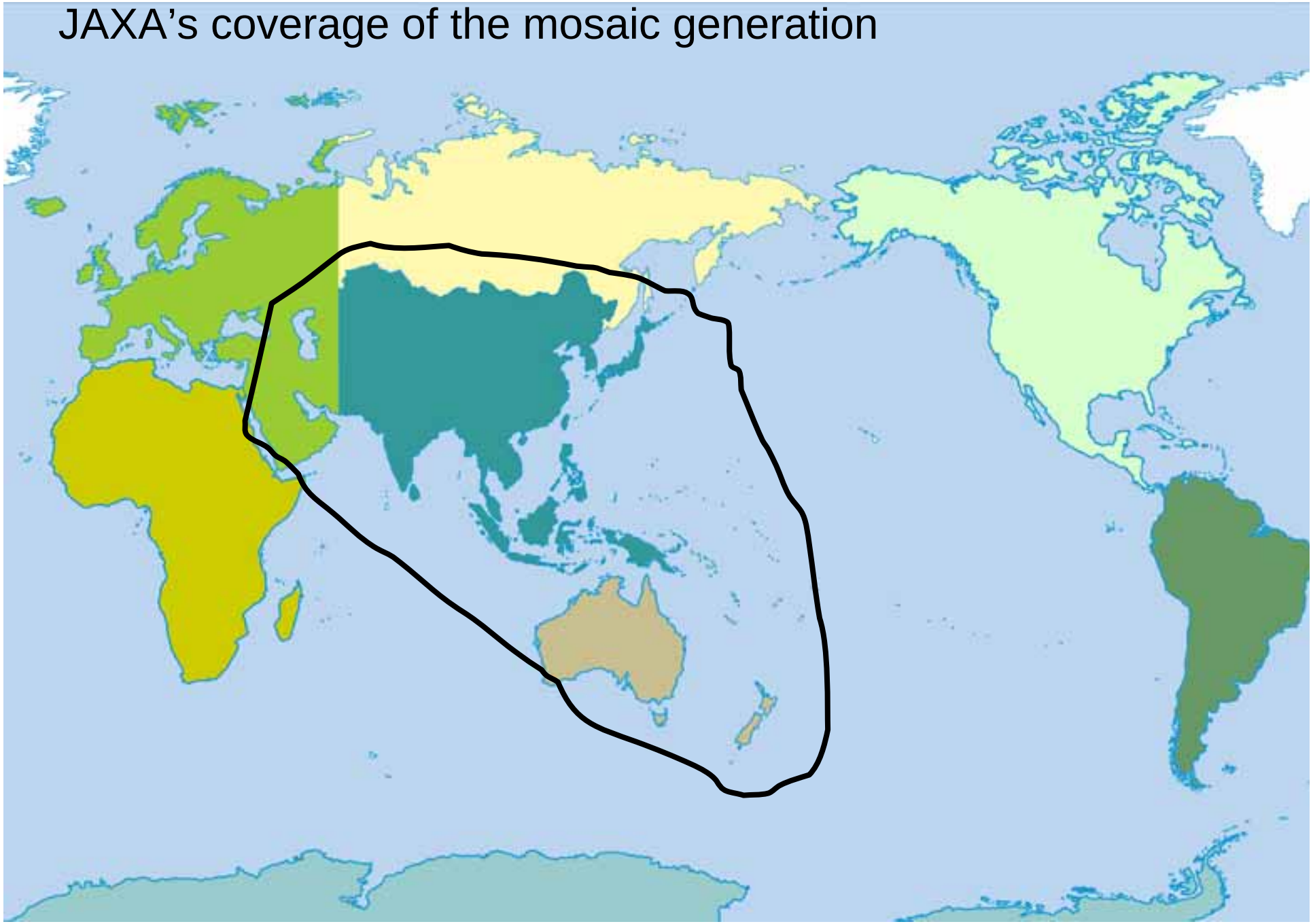
The Kyoto & Carbon Initiative is an international collaborative project forming the continuation and extension of the JERS-1 SAR GRFM/GMFM project into the end of the Advanced Land Observing Satellite-ALOS and as far as possible.

Aims to support information needs posed by the “3C’s”
-The terrestrial Carbon cycle science community (CO2 & CH4 sources and sinks);
-Multinational Environmental Conventions and Declarations:
-UNFCCC Kyoto protocol (Forest and land cover change)
-Ramsar Convention (wetland characteristics and disturbances)
-UN Millennium Declaration & UNCCD(water supply and desertification)
-Environmental Conservation

Feature of the L-band SAR on ALOS

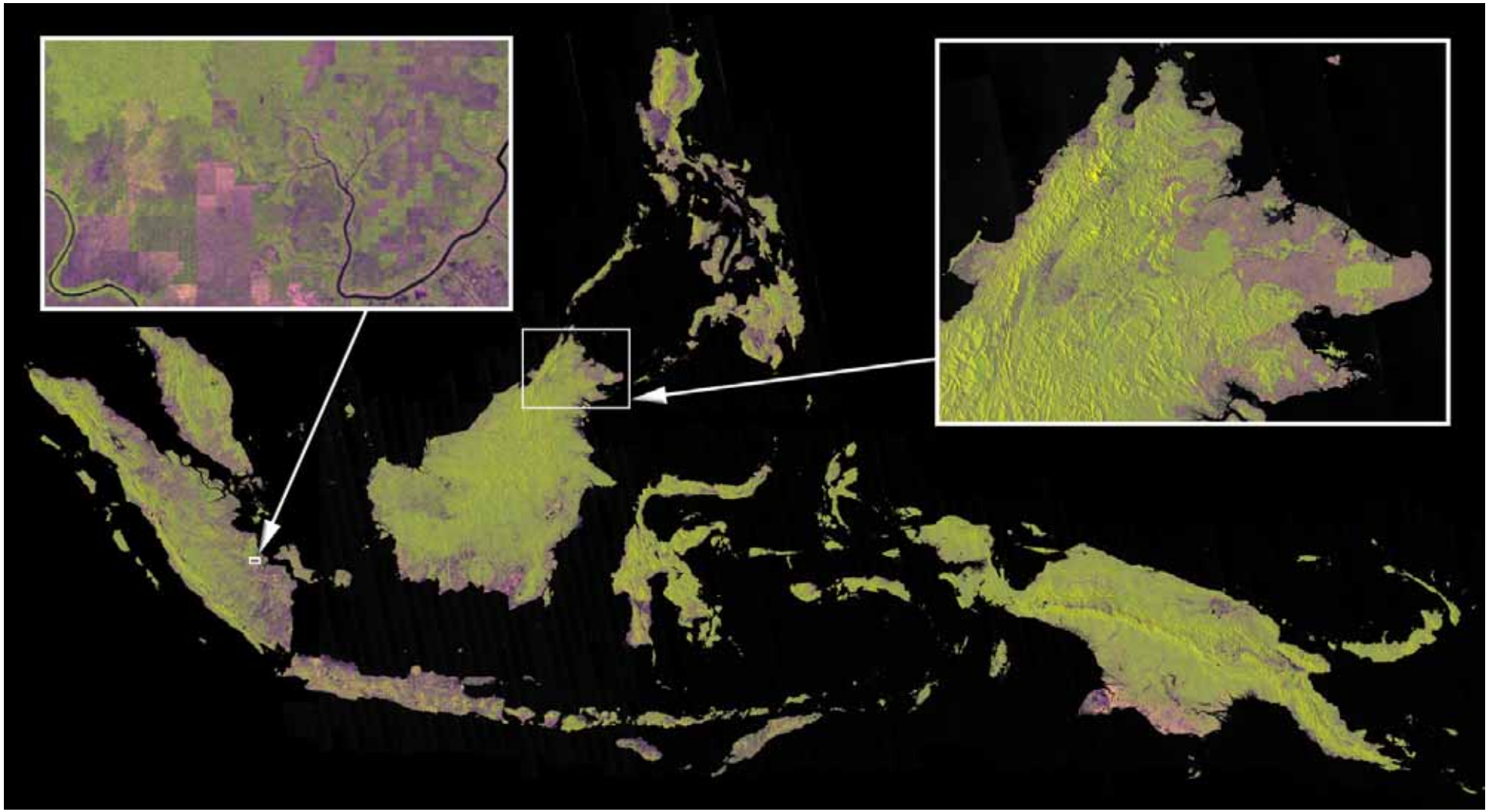
Longer wave length and better discrimination of the forest clear cut.

JAXA’s coverage of the mosaic generation

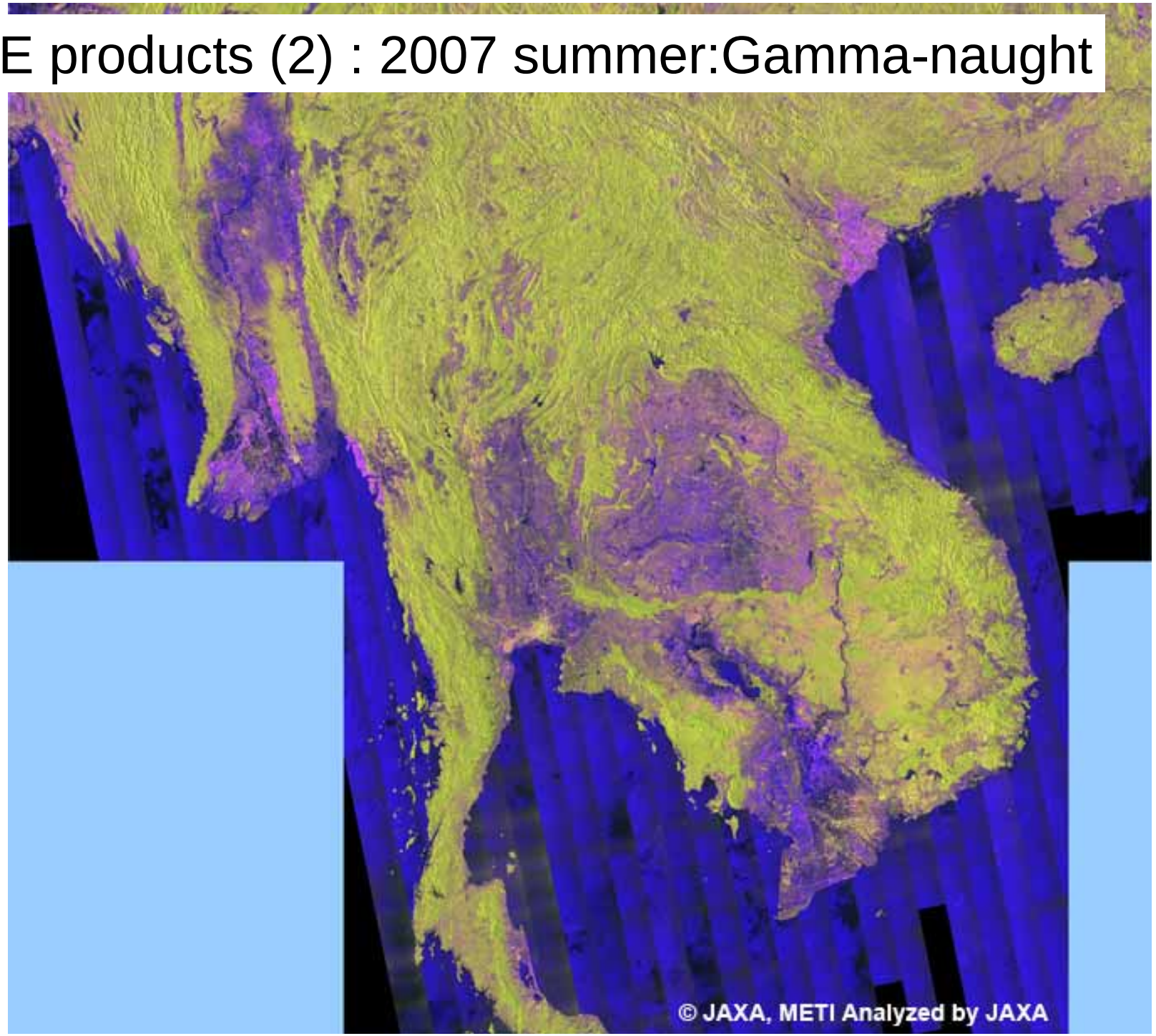


SE products (1): 2007 summer: Sigma-naught

HH, HV, HH/HV

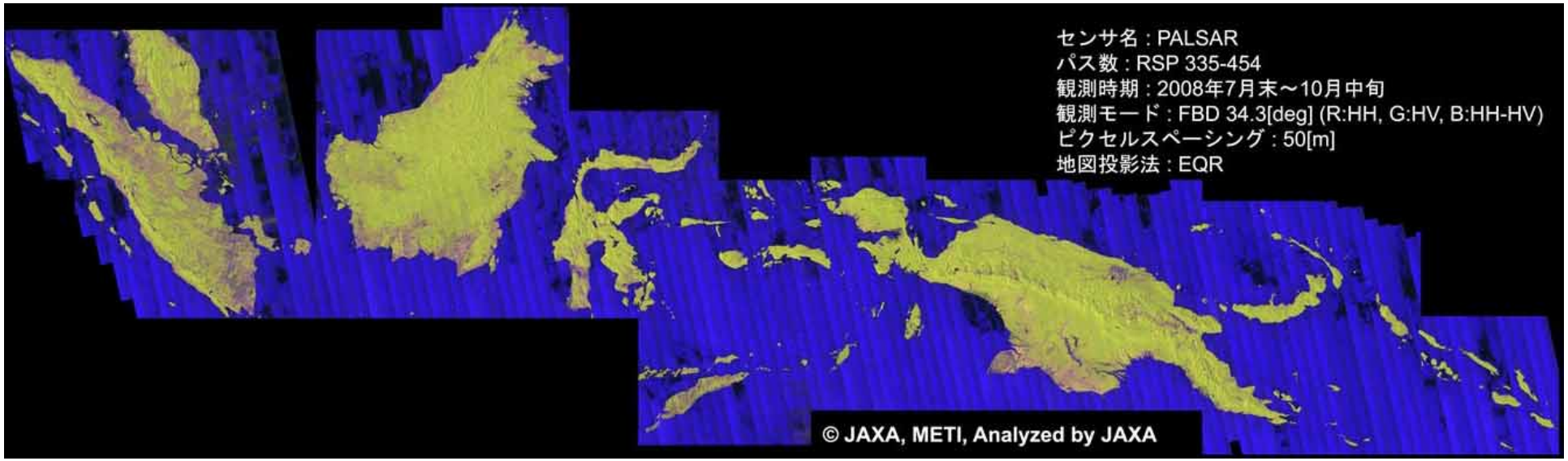


SE products (2) : 2007 summer:Gamma-naught



3．2．2．4　Forest mosaic

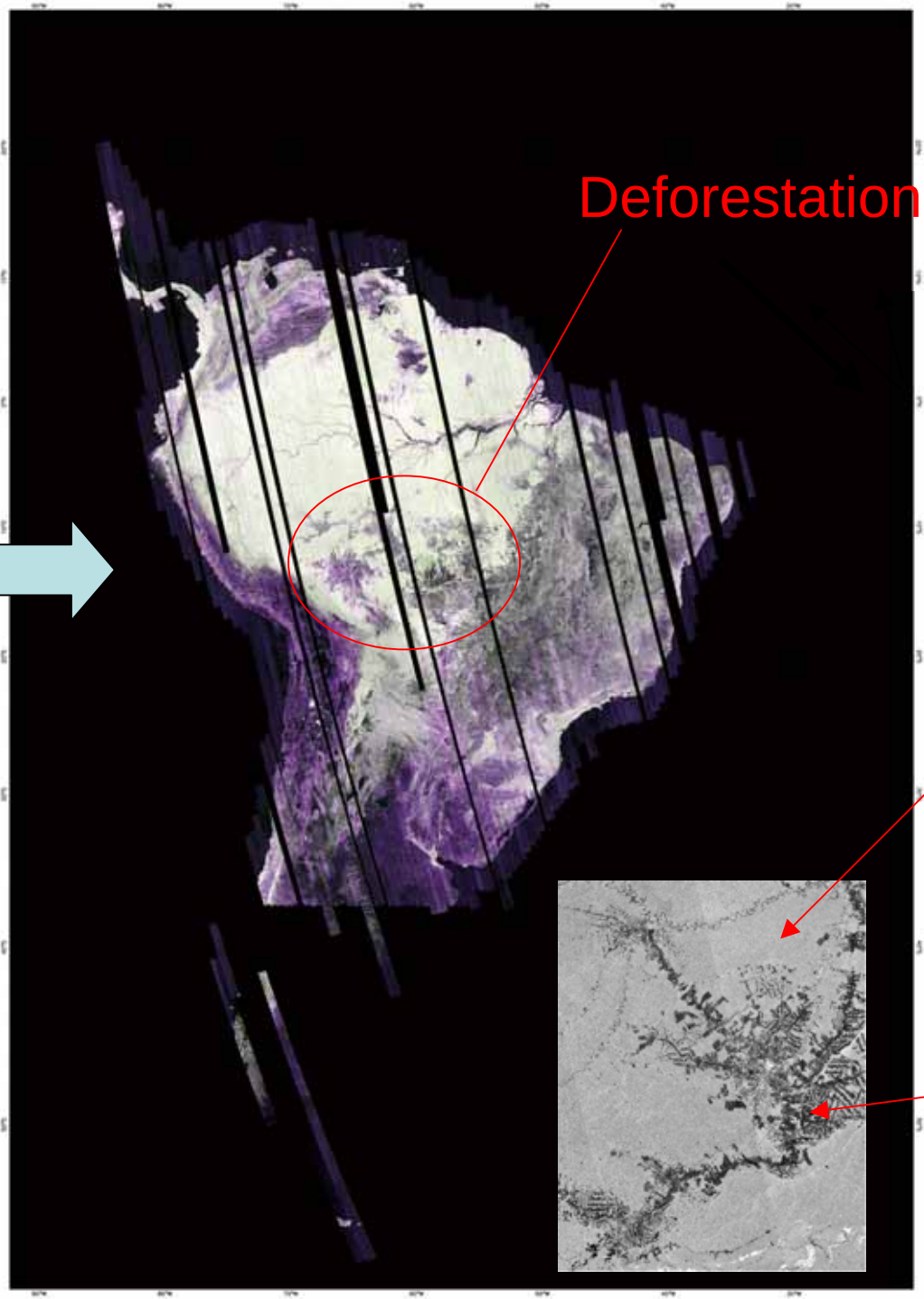
South east asis mosaic 2008

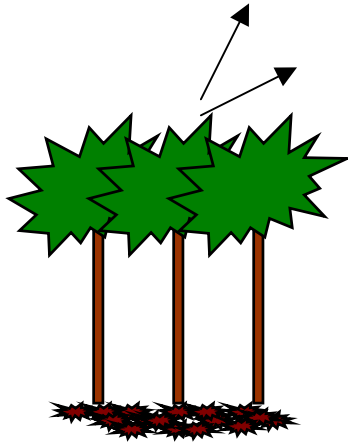


Forest monitoring

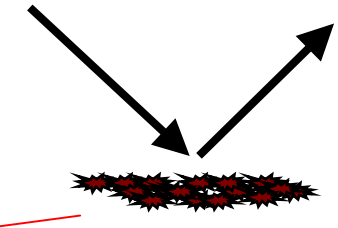
2000km

1パスデータ





Dense forest



Clear cut

Amazon Deforest Watch (Santarem) JERS-1 & ALOS

Acquisition Term

1993/6/26
～2007/9/13

JERS-1
- 1993/6/26
- 1997/5/4
- 1997/7/31

ALOS
- 2007/6/13
- 2007/9/13

Lat : S 2 ° 34
Lon : W 54 ° 45

SCANSAR Examples

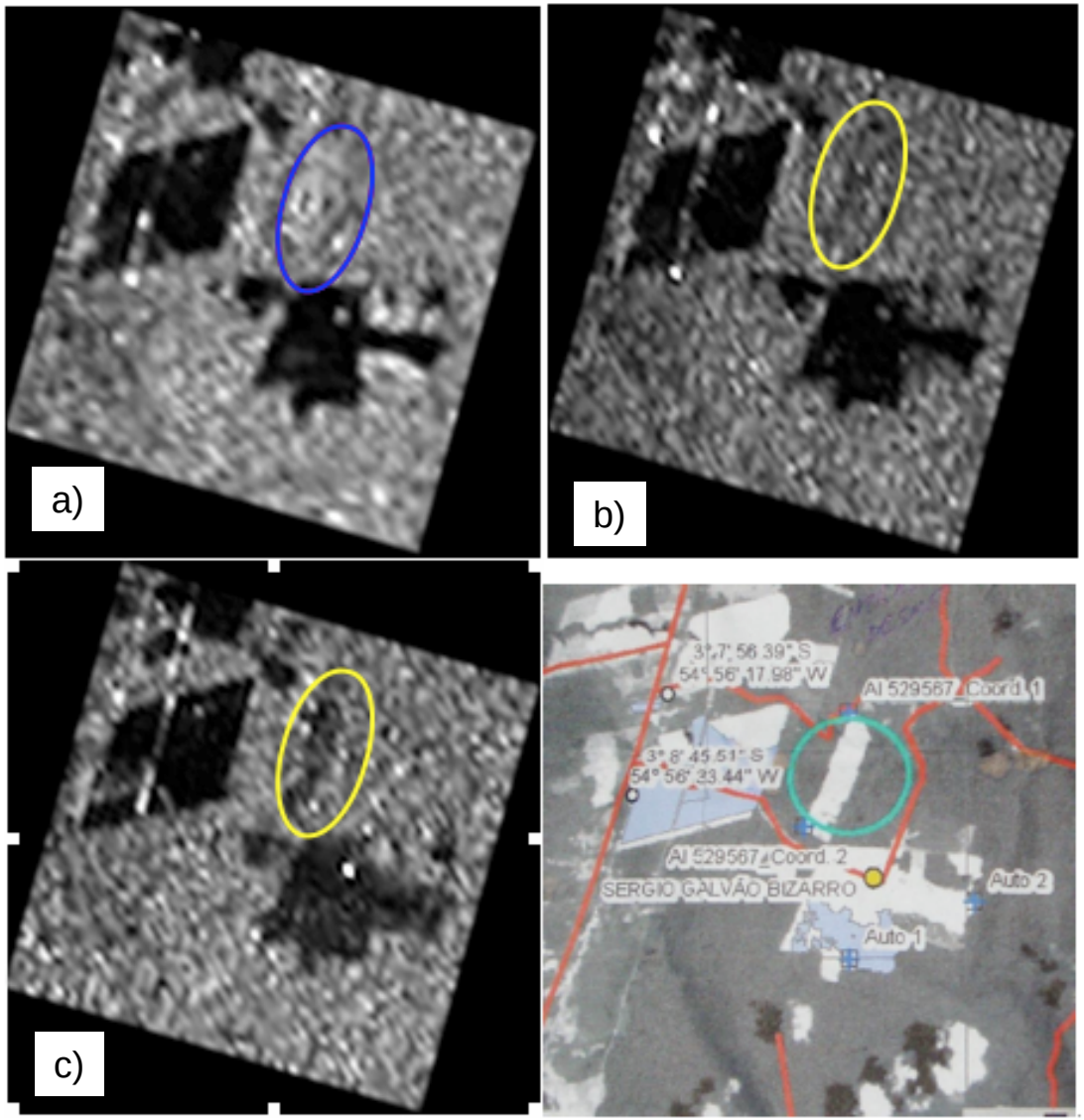


図 5　左上 RSP406　2008/8/30　WB1、　右上 RSP406　2008/10/15　WB1、
左下 RSP406　2008/11/30　WB1、　現地図（まるでかこったところが伐採があったところ）

a)before logging, b) mid of the cutting,c) after cutting.

These images are provided to IBAMA and use for the monitoring the logging.

Tapajos,PARA State, Brasil

Logging place

ALOS

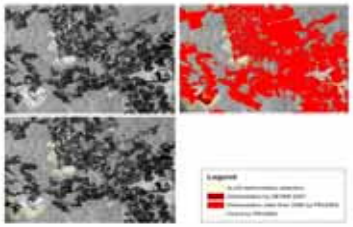
K&C Initiative
An international science collaboration led by JAXA

Law Enforcement Deforestation Assessment- Mid-term results

ヘリコプター写真

Project objectives

The Palsar ALOS data will assist the identification of very recent deforestation activities and also where the cloud cover is a limiting factor for the use of optical remote sensing as a resource to support field activities.



Results

The first operational results are presented, it is the beginning of use of PALSAR data to identify new polygons of deforestation.

K&C Science Team members

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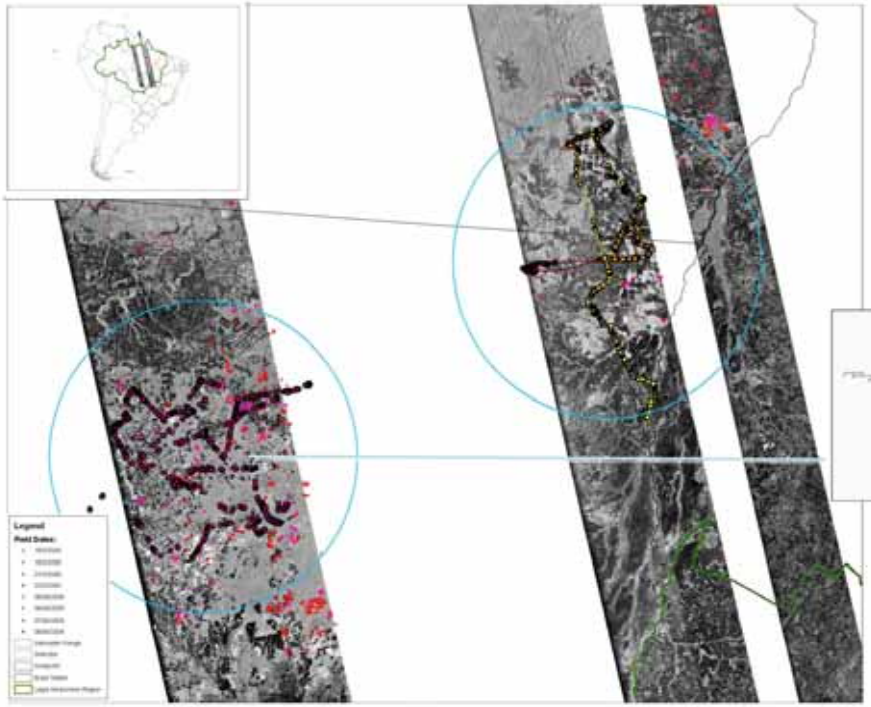
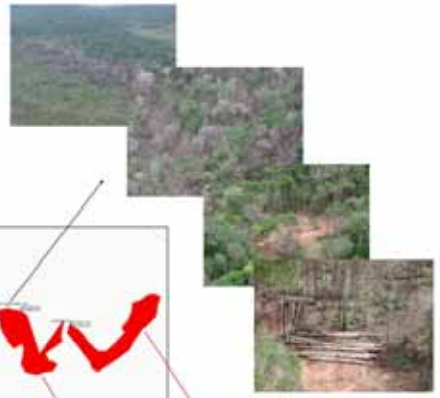
Federal Police Department - DPF, Brazil



ALOS PALSAR data used
WB1 & FBS HH (50m)

Other data sources
CBERS-2, 2b & LandsatTM



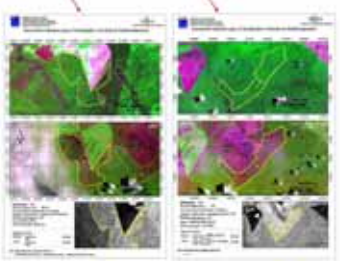


Image captions

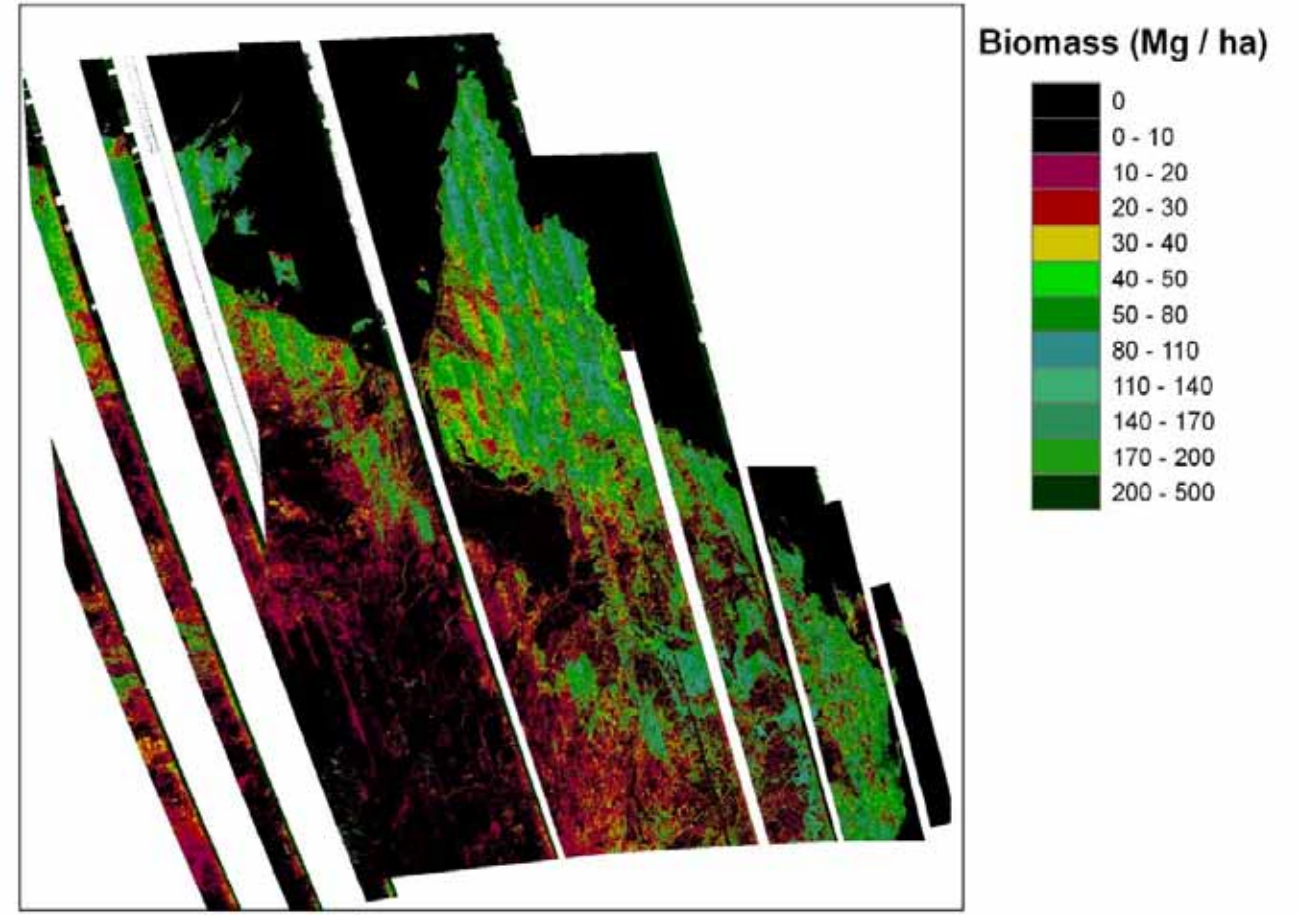
	ALOS x DETER	Overall	%
January	45	45	6.07%
February	13	58	7.83%
March	1	59	7.96%
April	65	124	16.73%
May	13	137	18.49%
Total	137	423	

	Analyzed	Selected	%
Strip 16060	215	22	10.23%
Strip 16062	100	35	35.00%
Strip 16063	13	-	-
Strip 16069	290	57	19.66%
Strip 16070	77	28	36.36%
Strip 16071	56	24	42.86%
Total	751	166	

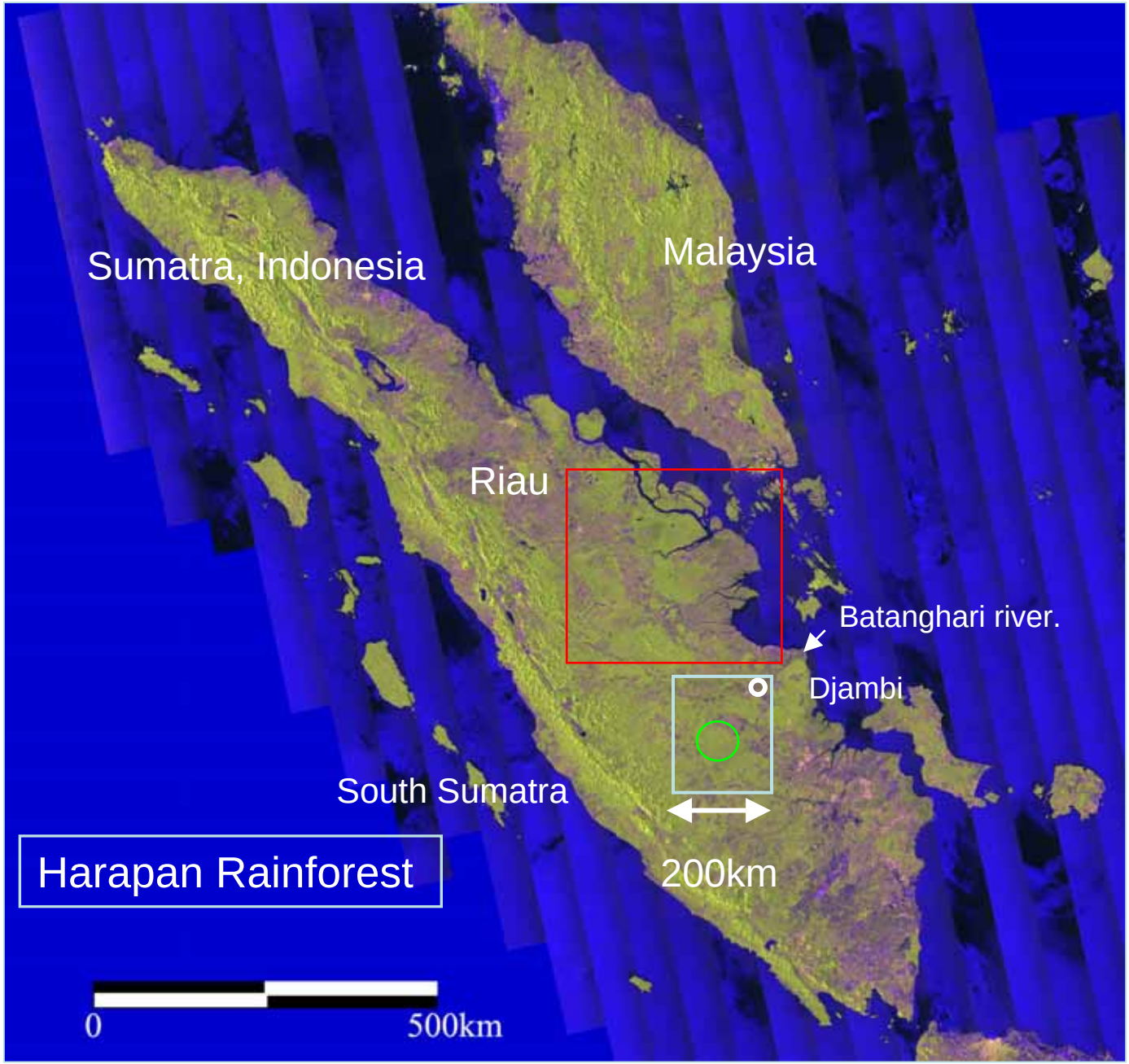
IBAMA MMA CEMAM

3.2.2.6 Biomass map

There are two ways for estimating the biomass. 1) use the relationship between NRCS of forest in HH and HV and biomass gives the distribution of the biomass. The below figure shows the biomass map of the north australia ffrom the PALSAR data. 2) the height estimation of the forest using the polarimetric SAR ineterferometry.



PALSAR Sumatra mosaic July, 2007 and change over 15 years



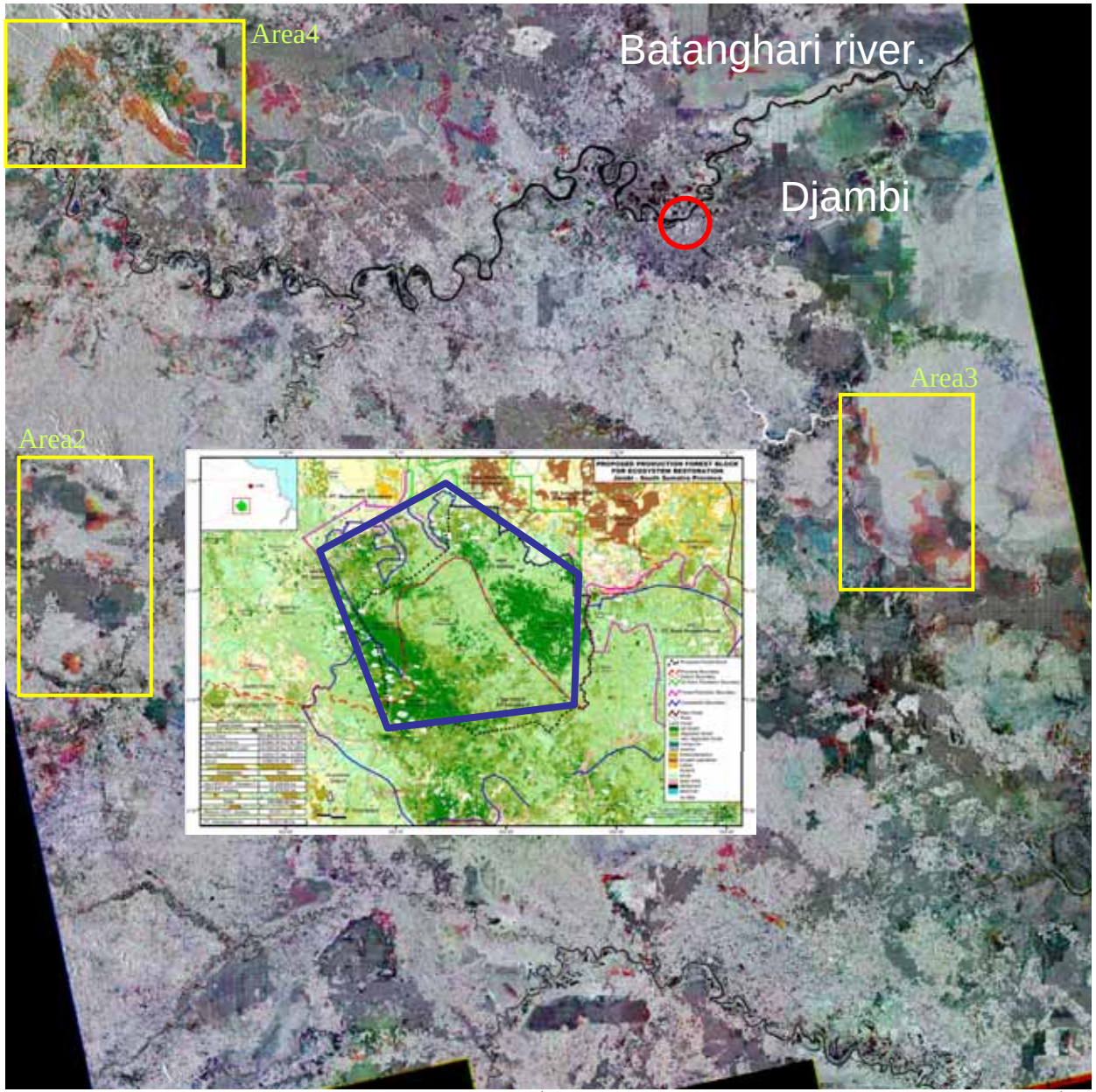
One season mosaic colored with three values, HH, HV, HH/HV.

Coverage: Malaysia and Sumatra

Green: forest
Purple:clear cut

PALSAR : FBD(Fine beam dual, 10m resolution)

Forest Change Detection between June 2007~Sept 2008



Sensor: PALSAR
Polarization:HV

Color assignment
R:June/July, 2007
G:June/July, 2008
B: Aug./Sept., 2008

Red: deforestation between 2007 and 2008
Yellow : recent deforestation in 46 days (between June,2008 and Sept.,2008)
Blue/Green: Regrowth or recover this year.
Dark gray: deforestation as of June 2007
Bright gray:Forest as of Sept., 2008

4.3.4.2 Forest,, wet land, desert, and mosaic

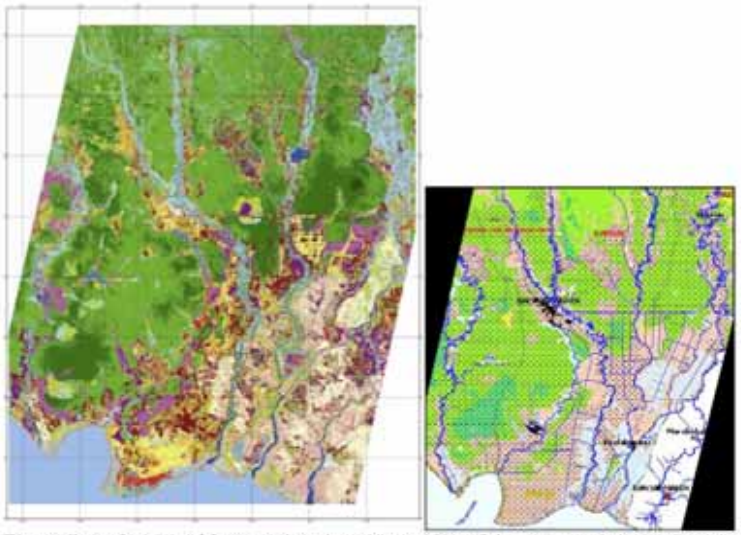
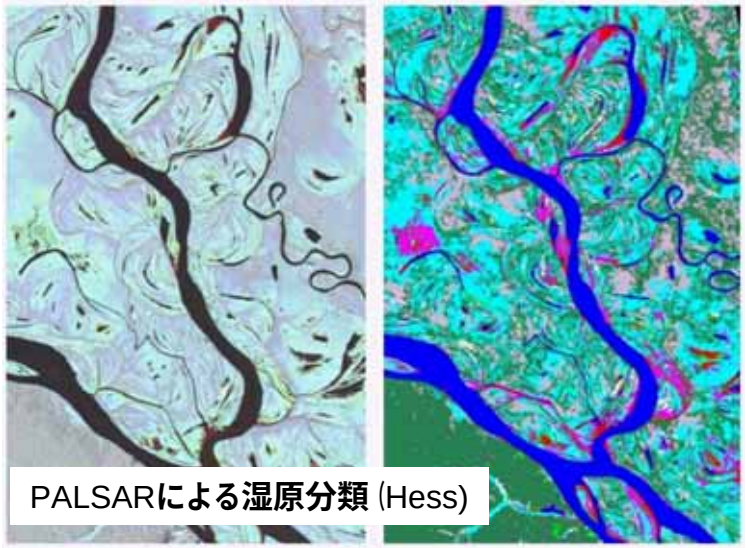
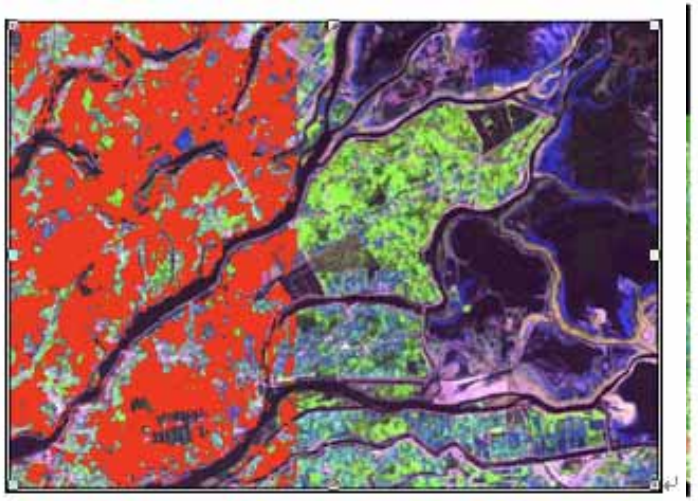


Figure 7. (Left) Map of forest and land use/cover 2007 of the main product development area (the EMRP project area and Sebangau) in Central Kalimantan based on FBD and WB1 HH data (K&C mid-term product 1). (Right) The official Indonesian Ministry of Forestry map dates from 2003, and is less detailed and less accurate.

左) PALSAR**による土地利用分類、右**) **公開分類図** ((Heakman)



PALSAR**による湿原分類** (Hess)



中国ポーヤン湖近くの稲作地帯抽出 (**赤が稲作地帯**) : Salas

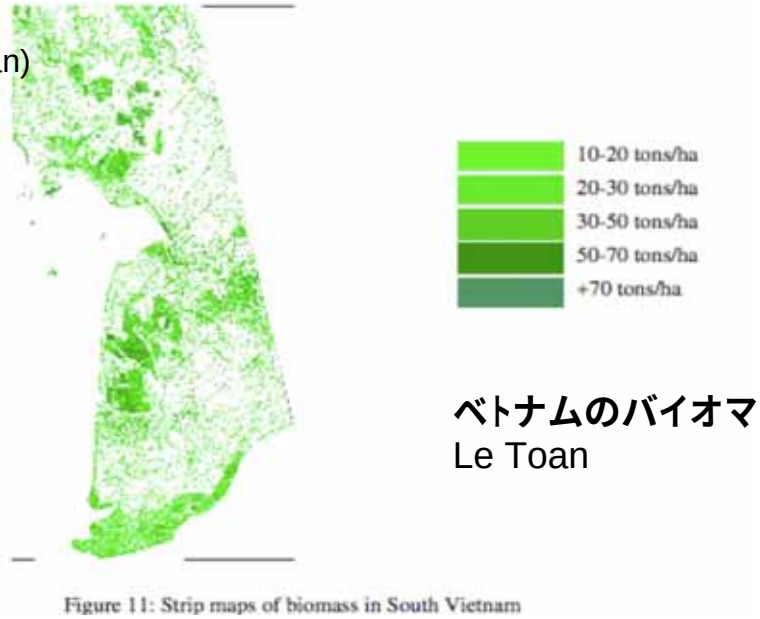
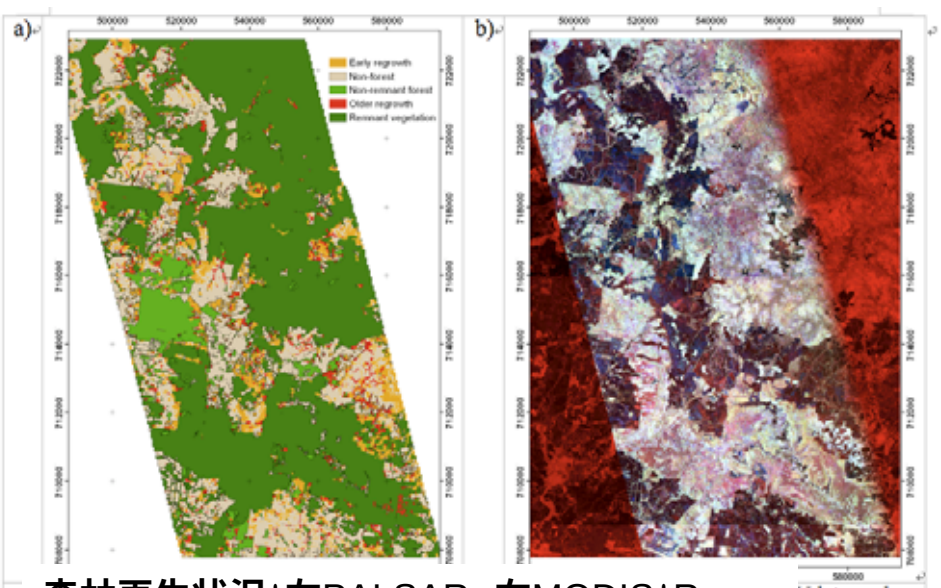


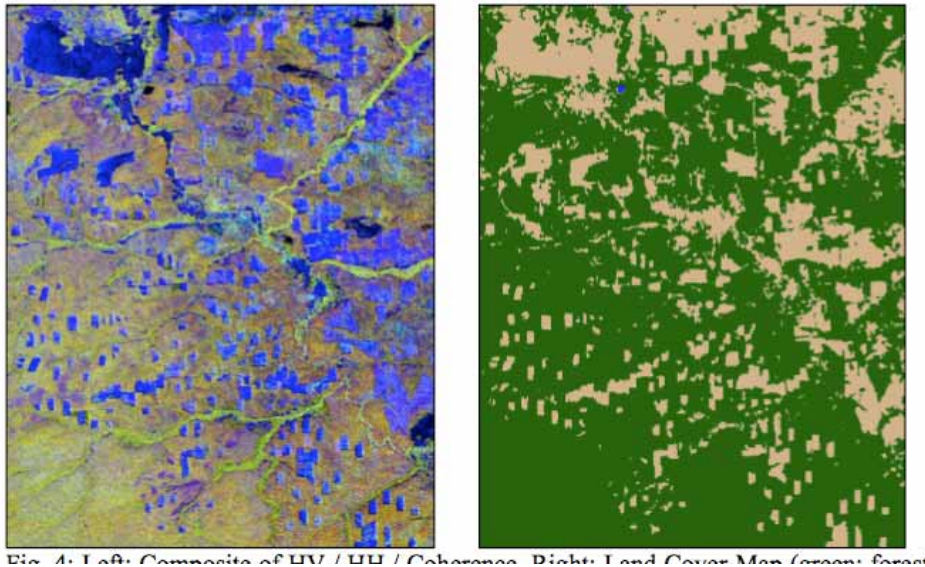
Figure 11: Strip maps of biomass in South Vietnam

ベトナムのバイオマス分布
Le Toan

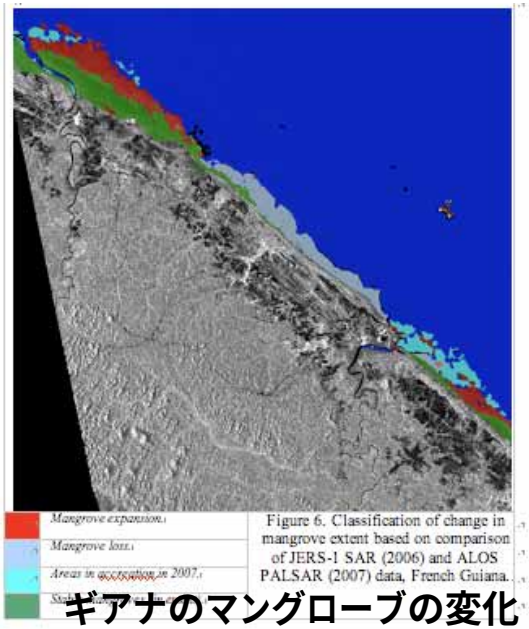
4.3.4.2 Examples (2)



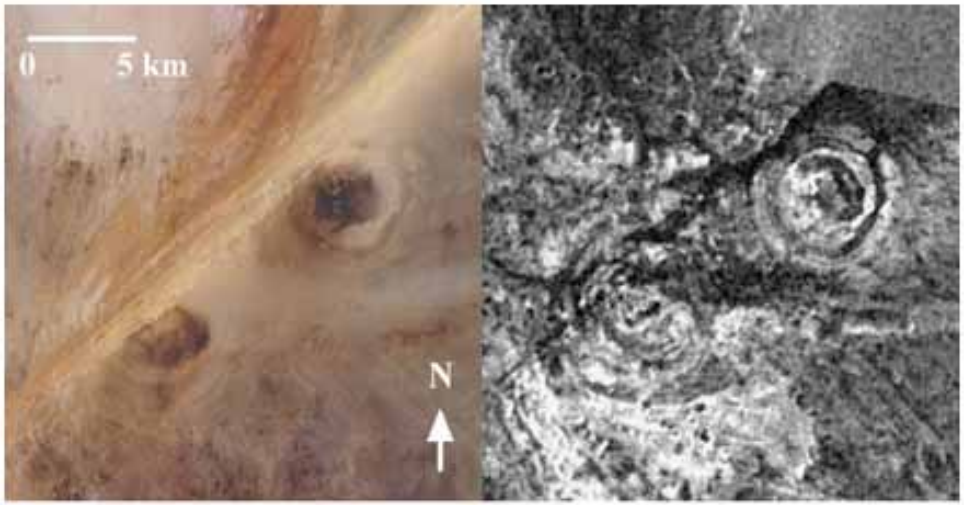
森林再生状況：**左**PALSAR、**右**MODIS：Rucas



Deforestation monitor in siberia：**青が伐採地** (Schimuulius



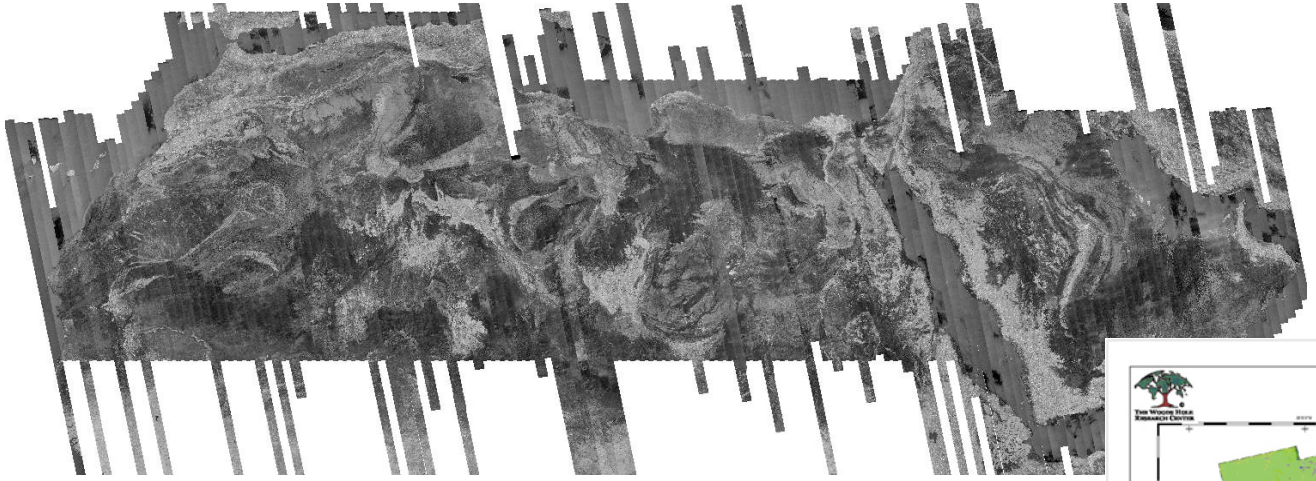
ギアナのマングローブの変化 (Lucas)



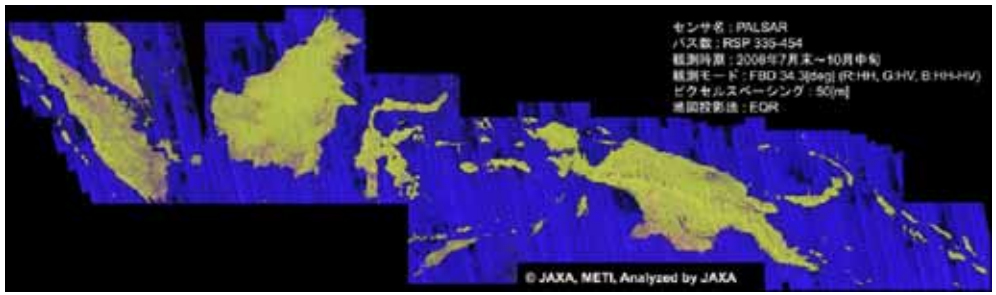
A double impact crater in southeast Libya

PALSAR**によるサハラクレーターの検出** (Paillou)

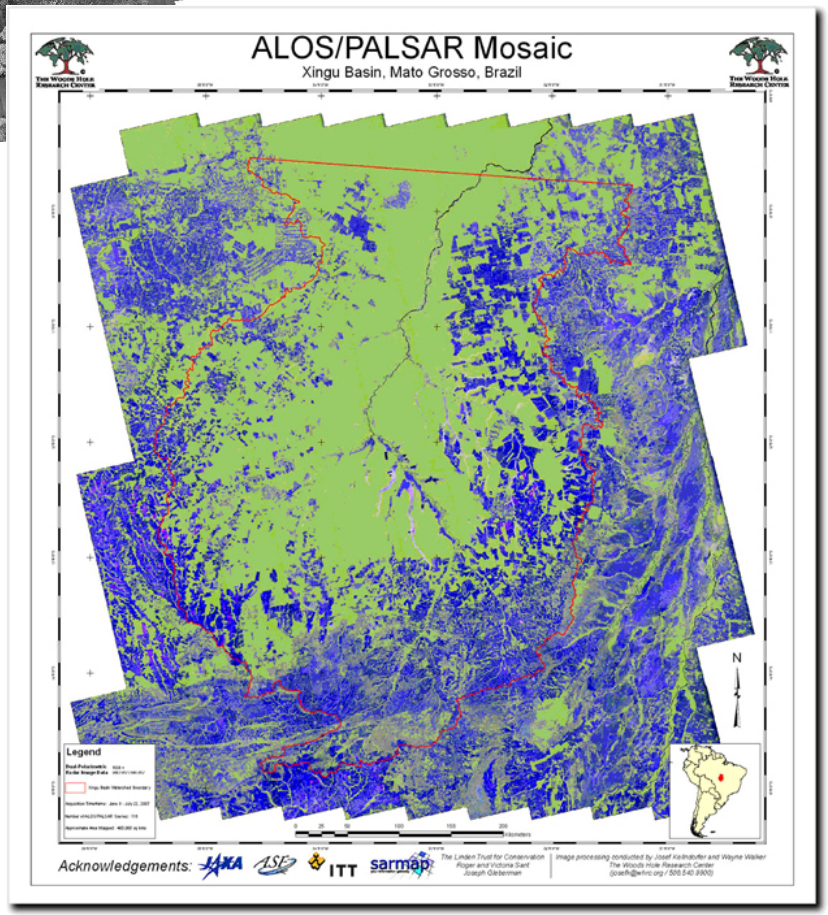
4.3.4.2 モザイク画像／伐採状況図



サハラ砂漠のモザイク画像：白く見えるのが比較的水分を多く含む可能性がある場所 (Paillou)



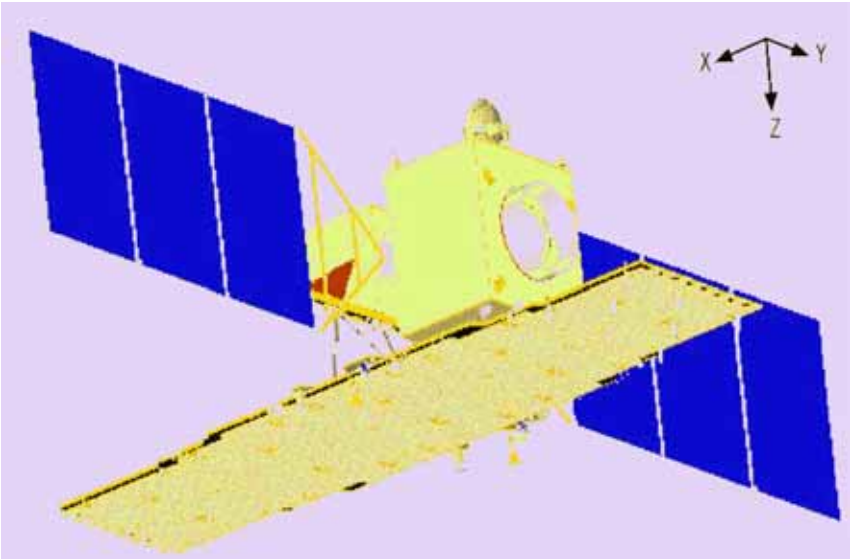
東南アジアモザイク２００８年夏期 (JAXA)



アマゾン中部シング地区の森林伐採状況(Kellndorfer)

ALOS-2

2009.01A
JAXA/ALOS-2



Moving direction

Artistic view

orbit	type	sun synchronous
	height	~630km
	LST	12：00 (local noon)　descending
Designed life		Five years
Launch	time	Winter, JFY2012
	Launcher	H-2A
satellite	mass	2 ton type
	paddle	2 paddles
Mission data		Direct transmission and Ka band DRTS
SAR frequency		Lband (1.2 GHz)
Main observation modes	High resol.	1～3m、swath25km
	Basic obs.	3m、swath：50km
	Wide obs.	100m、swath：350km
Main target areas		Deformation, volcano, change detection, resource finding.
		Forest, Sea ice, river, rice field monitoring

Conclusions

1) ALOS/PALSAR and systematic observation proceed the global forest monitoring and earth environment monitoring (K&C initiatives)
2) Dual polarization of PALSAR shows better sensitivity for the deforestation than like pol., and the both pol. Shows the distribution of the biomass quantities up to 200ton/ha.
3) Forest degradation and the future strategy for expressing the forest products are under evaluations.
4) JAXA produced three 50m PALSAR ortho mosaics of SEA in 2008 and continue to produce for the further forest investigations.
5) JAXA started the neal real time production of the SCANSAR images withn 5 days after the data reception and quck distribution to the IBAMA in 2007 and 2008. JAXA will make the similar system to the SEA in 2009.

K&C support to the GEO Task on Forest Carbon Tracking

At the recent K&C meeting (KC#11, Jan. 2009), the Science Team were asked to support the GEO Task through

1. **Advice on optimal SAR data modes and thematic products for annual, medium resolution forest-cover change monitoring**
2. **Guidelines to CEOS agencies for the development of sensor synergistic SAR data acquisition strategies to support the GEO Task**
3. **Standards for the generation of annual, ortho-rectified, terrain illumination corrected regional-scale SAR mosaics**
4. **Methodologies for forest change & trend monitoring using SAR, that is interchangeable with optical methods (e.g. PRODES/Brazil, NCAS/Australia), and corresponding accuracy assessment.**
5. **Demonstration projects for "near-real time annual" SAR monitoring of deforestation and degradation, to show at COP15.**

The Science Team is interested and able to contribute. Points 1, 2 & 3 already on-going.

Close collaboration with the GEO Task leaders required. Time is short!