Update on forest monitoring using ALOS sensors for REDD

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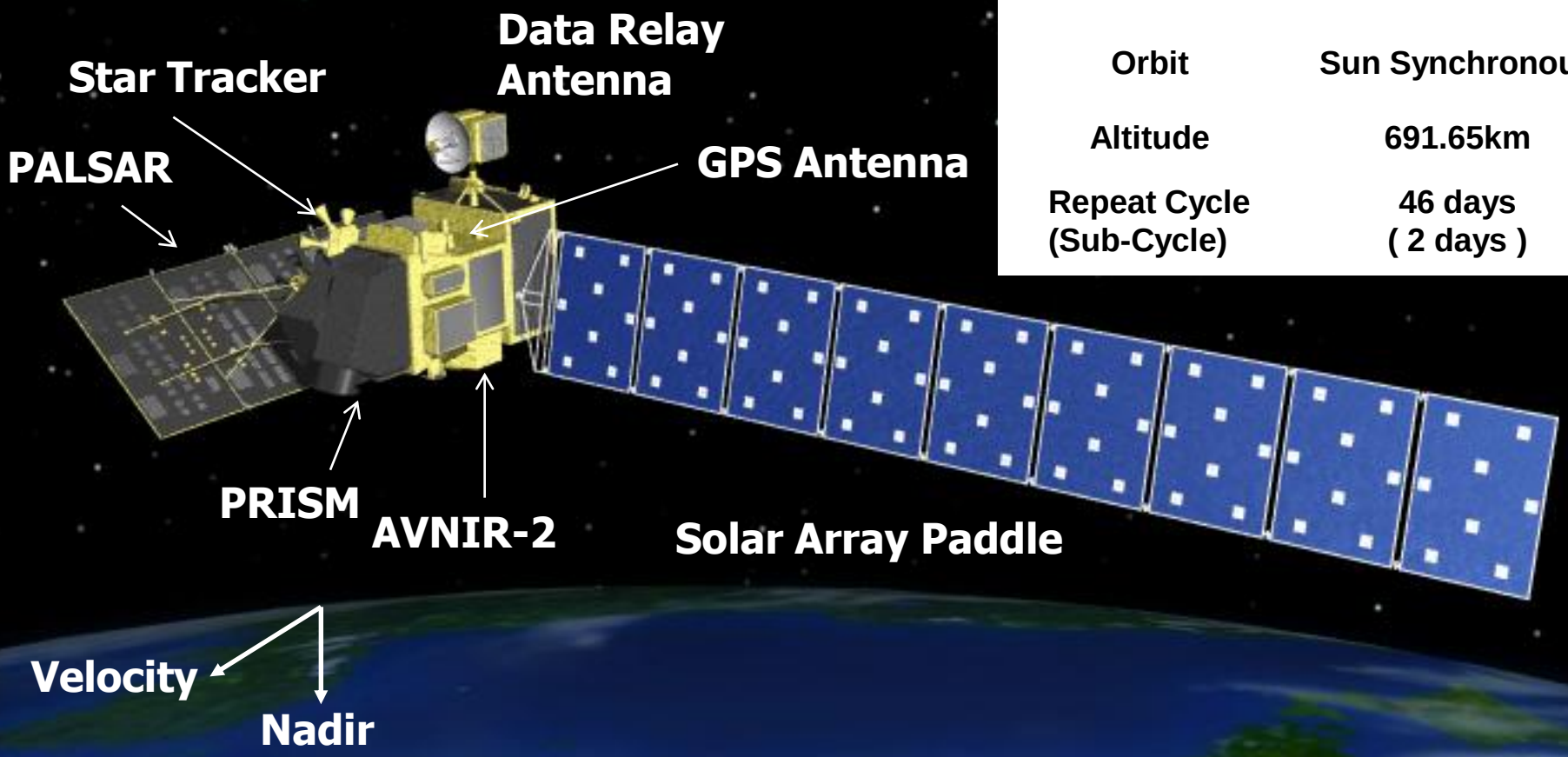
ALOS Satellite System

Launch Date	Jan. 24 2006
Launch Vehicle	H-IIA
Spacecraft Mass	about 4,000kg
Generated Elec. Power	about 7kW at EOL
Orbit	Sun Synchronous
Altitude	691.65km
Repeat Cycle (Sub-Cycle)	46 days (2 days)

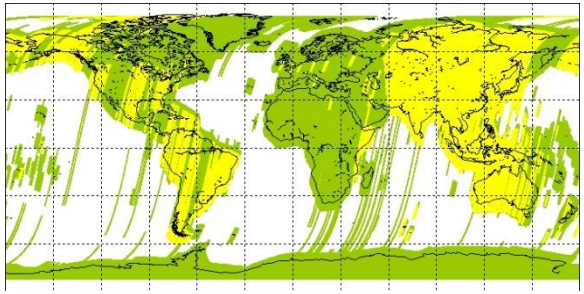


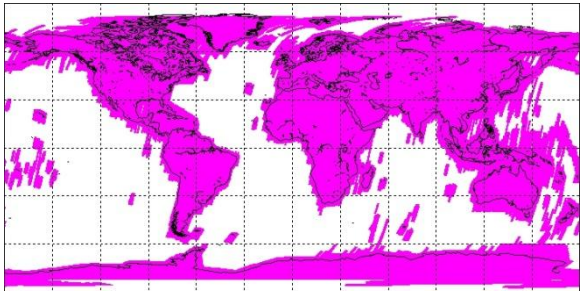
PRISM : Panchromatic Remote-sensing Instrument for Stereo Mapping
AVNIR-2: Advanced Visible and Near Infrared Radiometer type 2
PALSAR: Phased Array type L-band Synthetic Aperture Radar

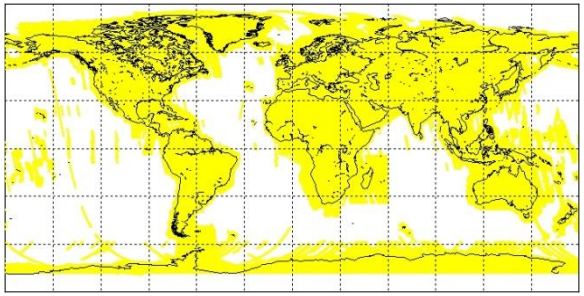
Mission Planning Status

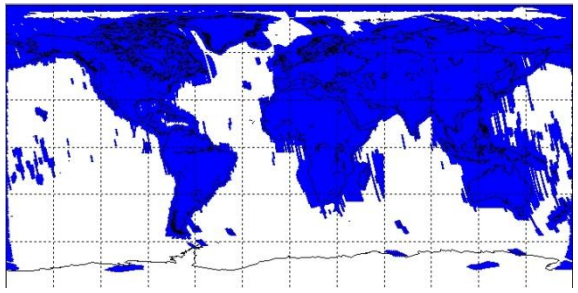
<Observation Result>
（May 16, 2006 – Sep. 30, 2009）

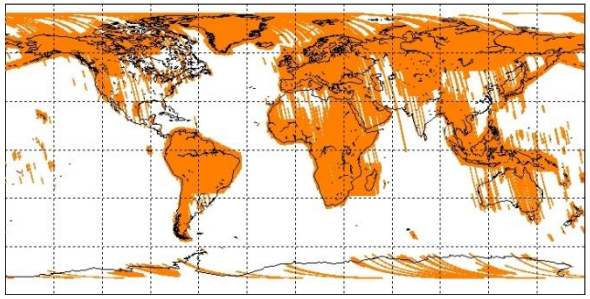
PRISM： 1,850,000 scenes (450k scenes increased from the prev. report)
AVNIR-2： 840,000 scenes (210k scenes increased from the prev. report)
PALSAR： 1,380,000 scenes (280k scenes increased from the prev. report)

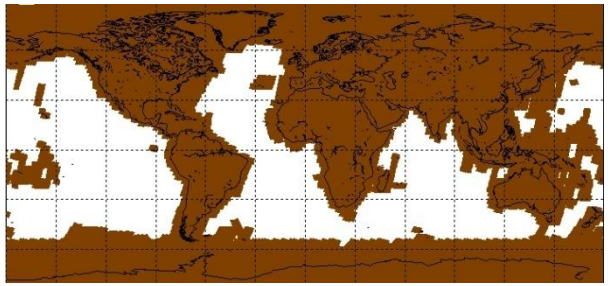

PRISM

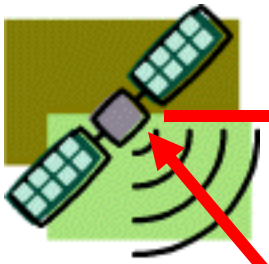

AVNIR-2


PALSAR(FBS)


PALSAR(FBD)


PALSAR(PLR)


PALSAR(WB1/WB2)



Within 24hrs
Raw data

Earth Observation
Center/JAXA

Within 24hrs
Raw data

DRTS

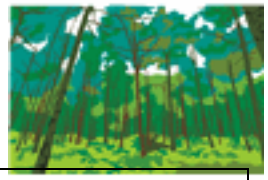
ALOS

PALSAR
Acquisition:3.5
hrs/day
350GB/day

110M scenes/
3 years

Earth Observation
Research Center/JAXA

Within 3~5days:
SCANSAR browse

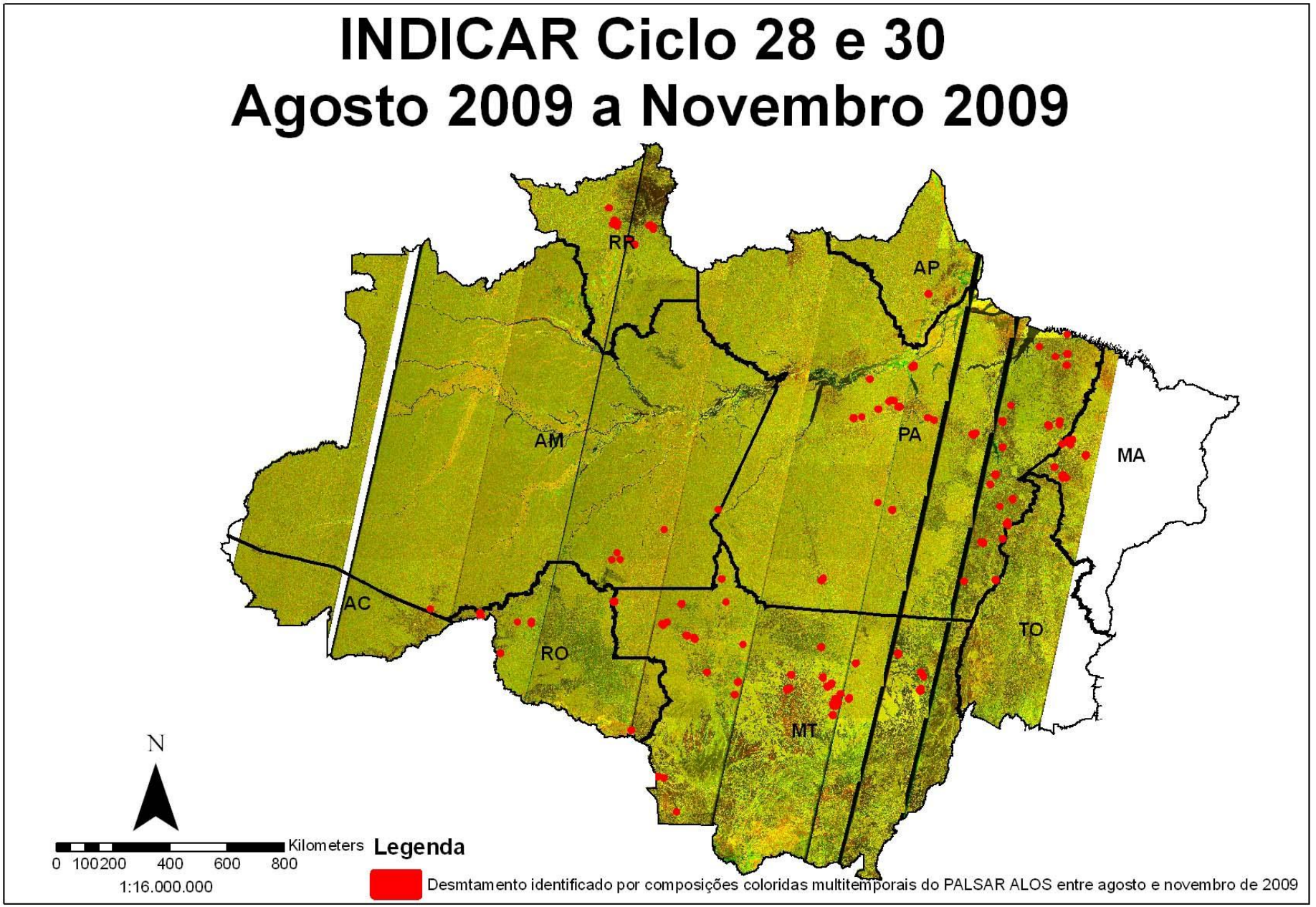


IBAMA

The Brazilian Institute of Environment and
Renewable Natural Resources

Quick Forest Observation Chain

Deforestation Detection by using PALSAR ScanSAR



Forest monitoring from Space：1988~

Annual deforestation at Brazil

Deforestation area：
１９０００km２（１９９６年～２００５年）
１２０００km２（２００７／８～２００８／７）
７０００km２（２００８／８～２００９／７）
４０００km２（２０２０年goal）

Environment Minister “Minc” said that the monitoring from space was very effective.

Total deforetation of south america：30000km2/year
Global deforestation:70000km2/year

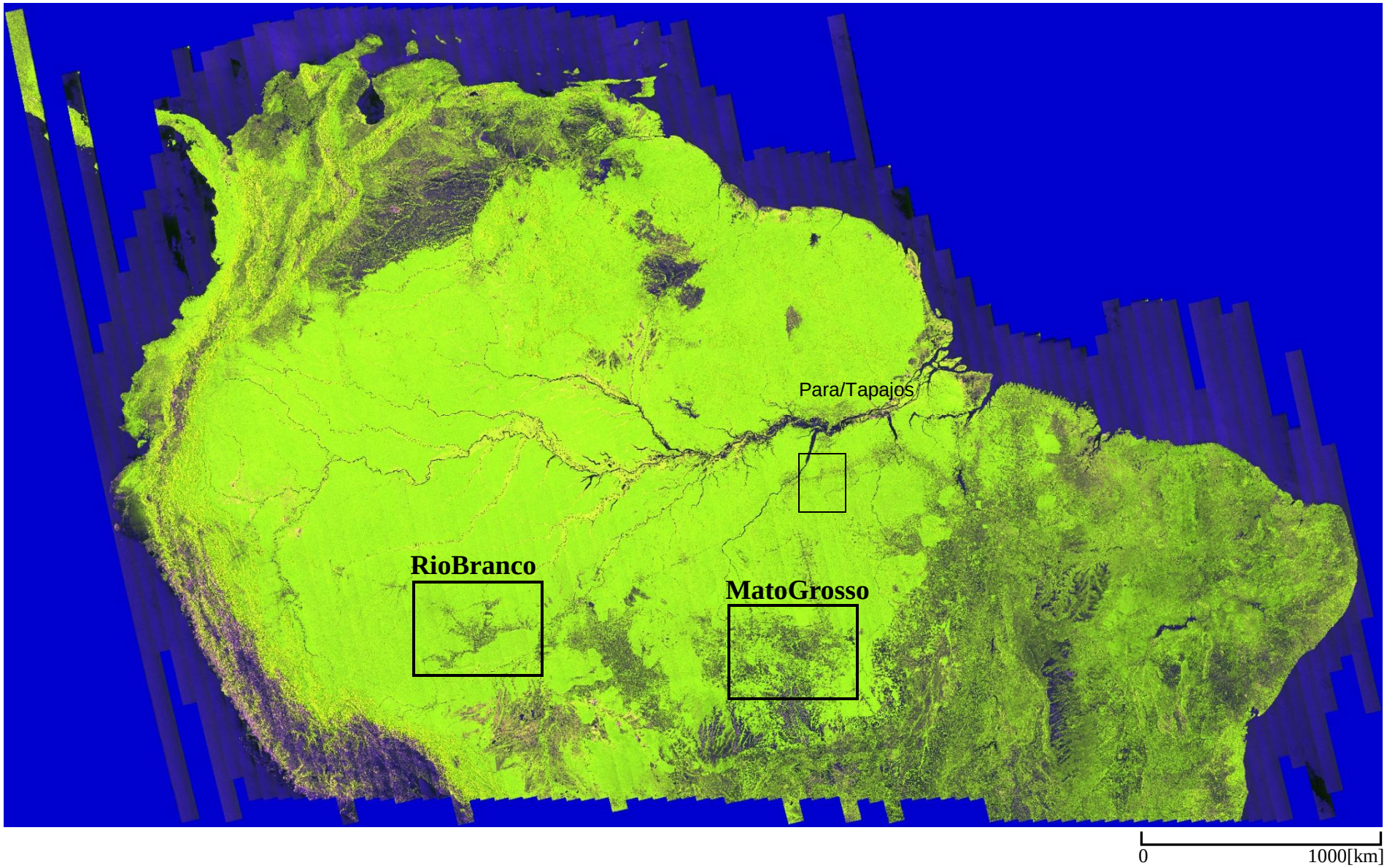
Global Mosaic examples

Summer of 2008

50m resolution

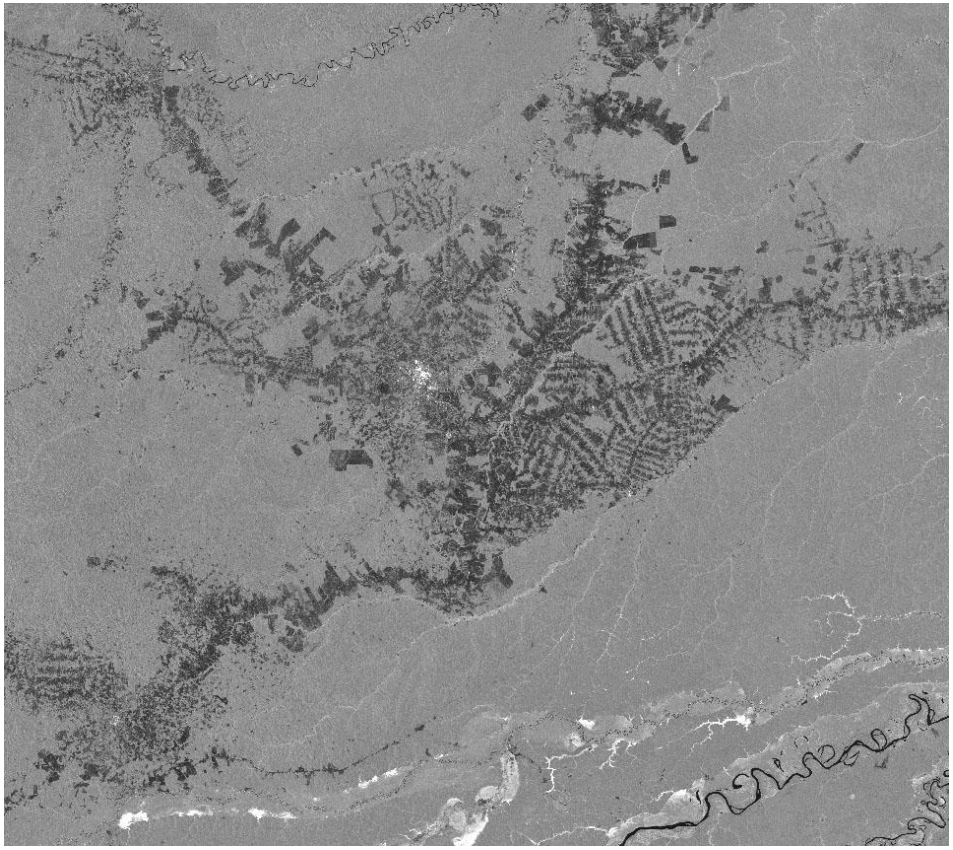
2. アマゾン地域の経年変化(Land cover change of Amazon for 14 years)

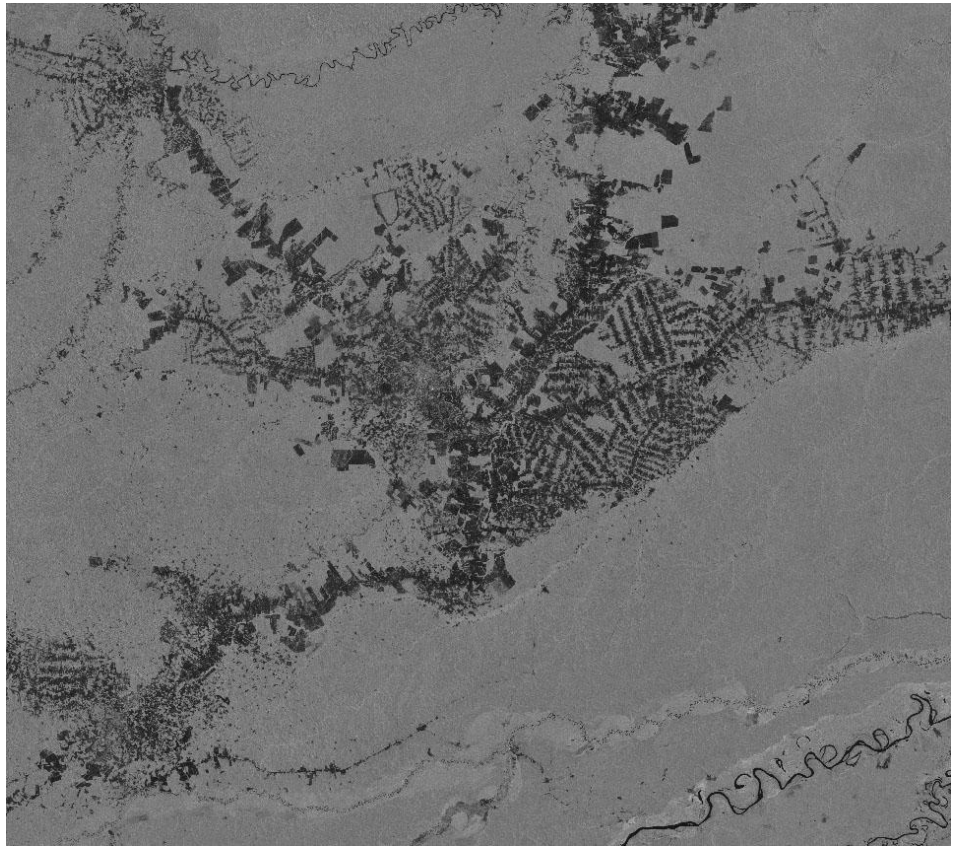
2. 1 2009年アマゾンモザイク (FBD34.3[deg]、Jun./July, 2009)



2009年アマゾンモザイクのRGB画像（G:HH, G:HV, B:HH/HV）

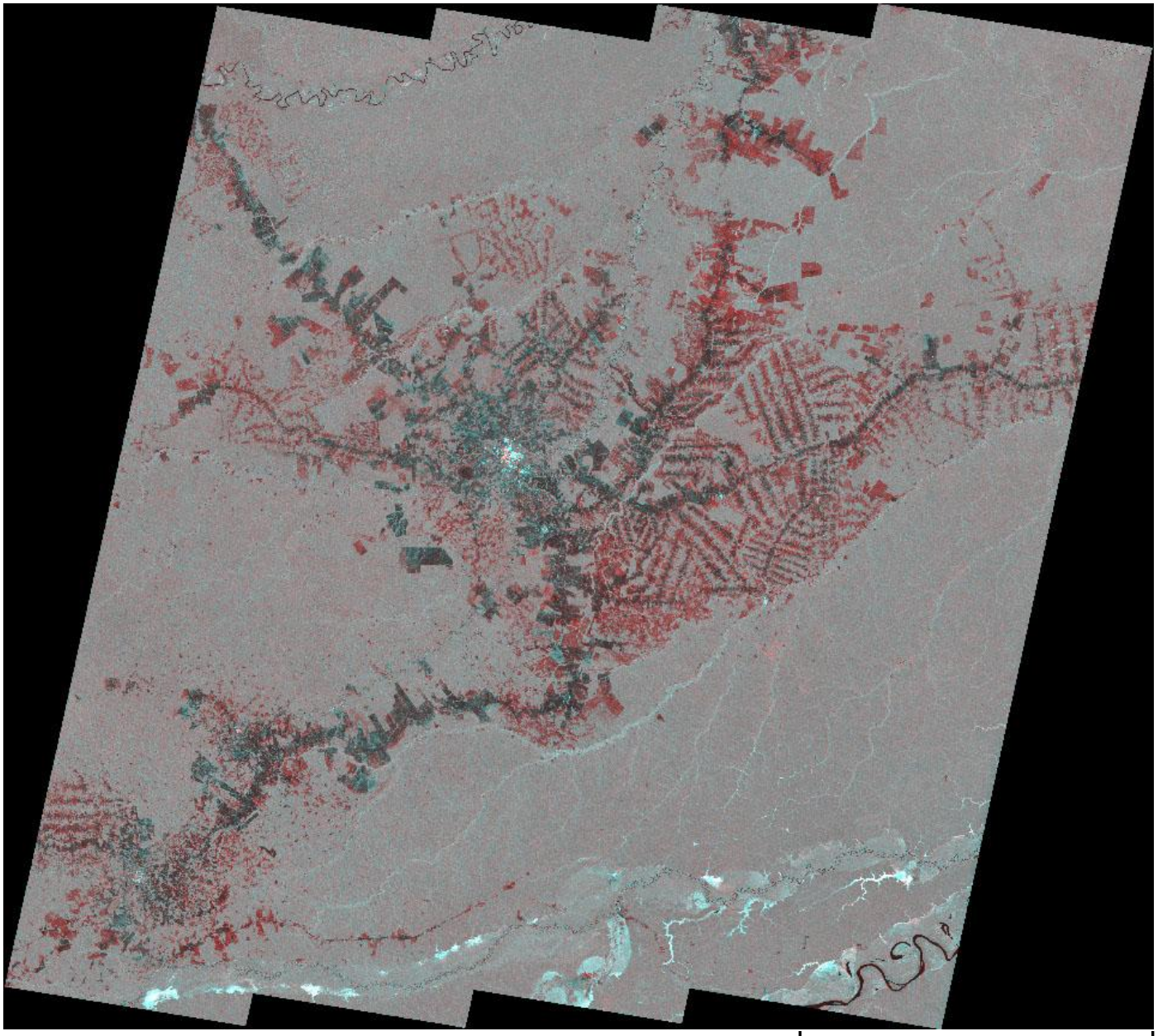
２．アマゾン地域の経年変化(Land cover change of Amazon for 14 years)
２．３ RioBrancoの経年変化(PALSAR, 2009年、左画像HH: 右画像:HV)



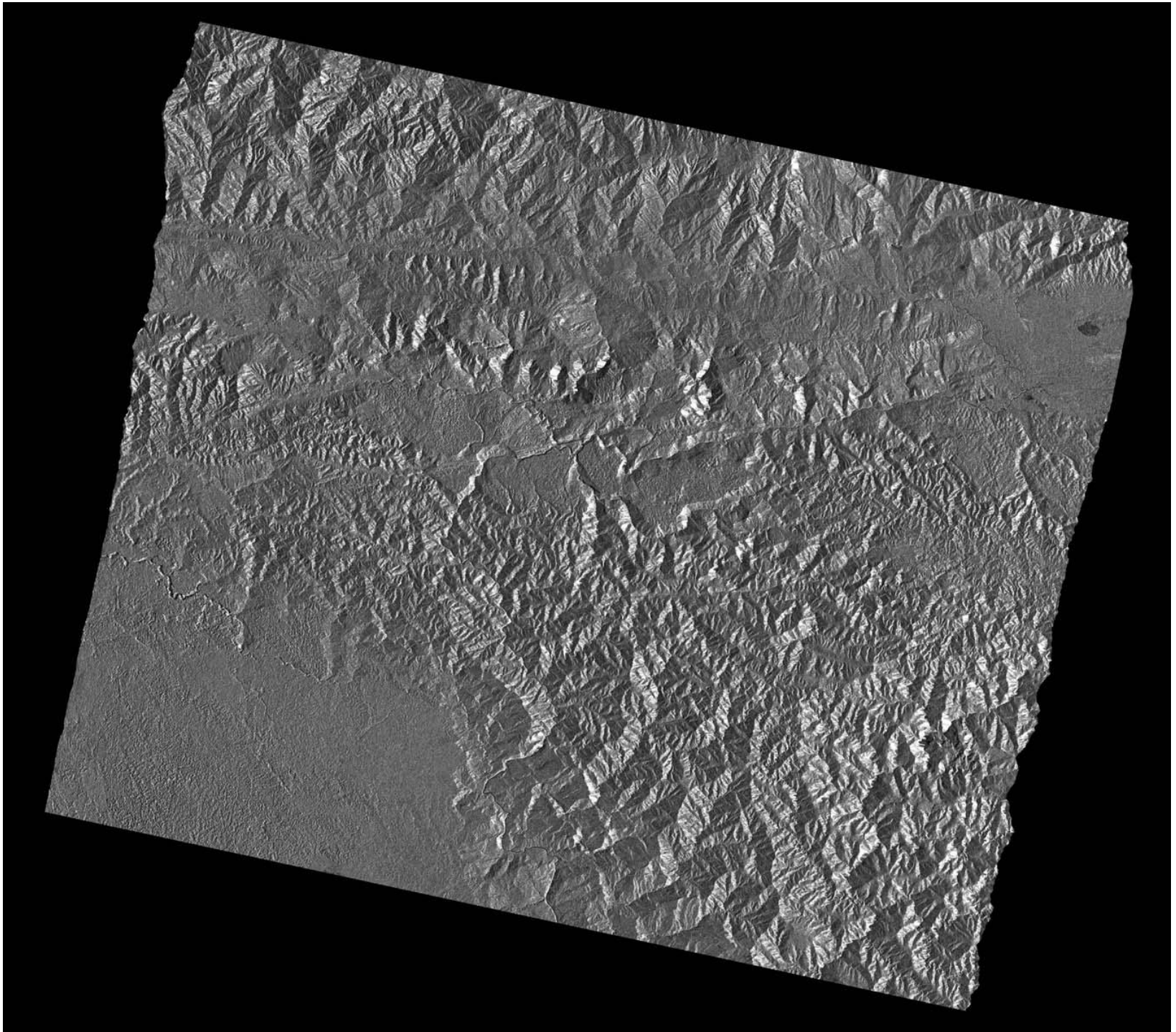


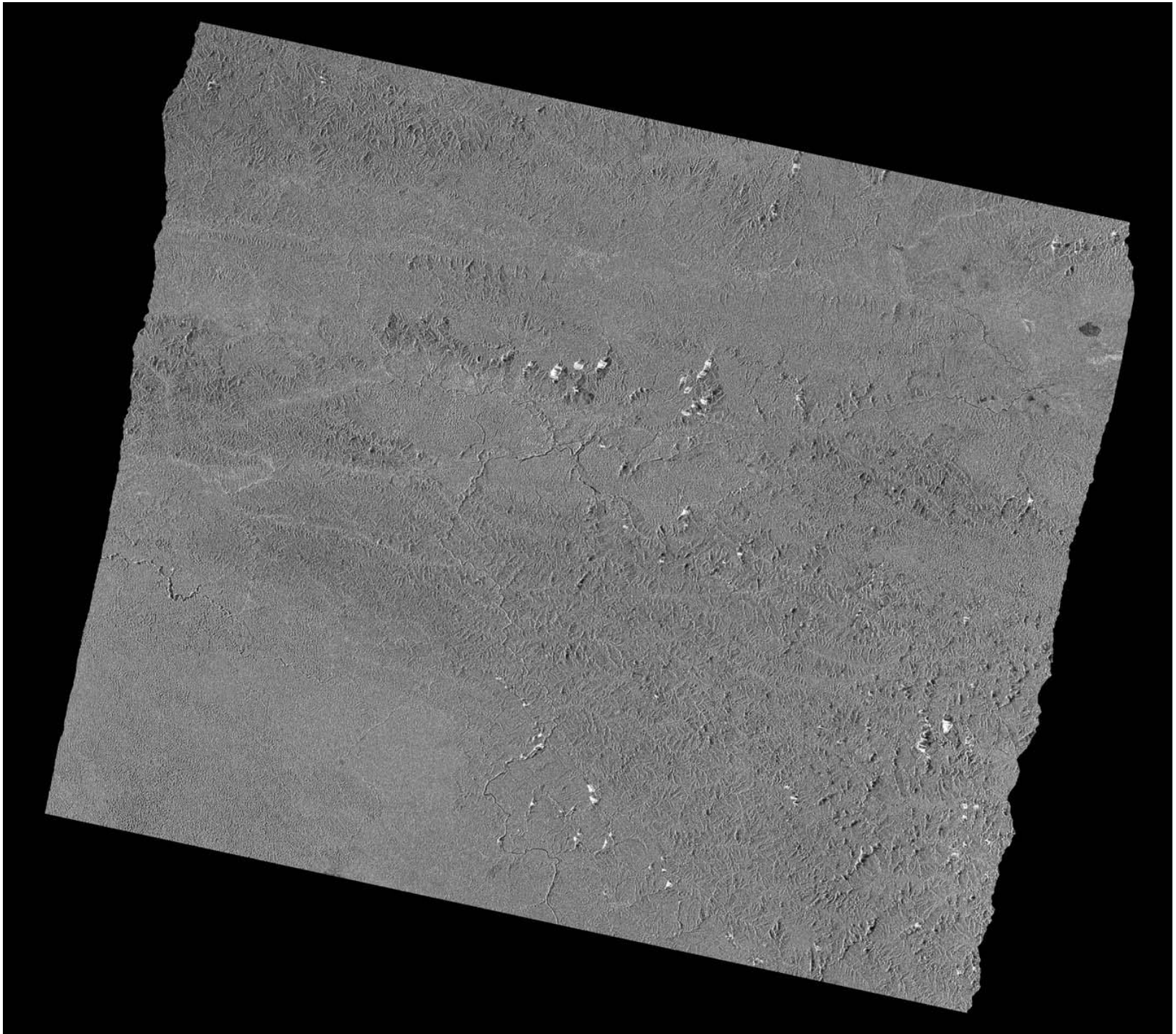
２．アマゾン地域の経年変化(Land cover change of Amazon for 14 years)

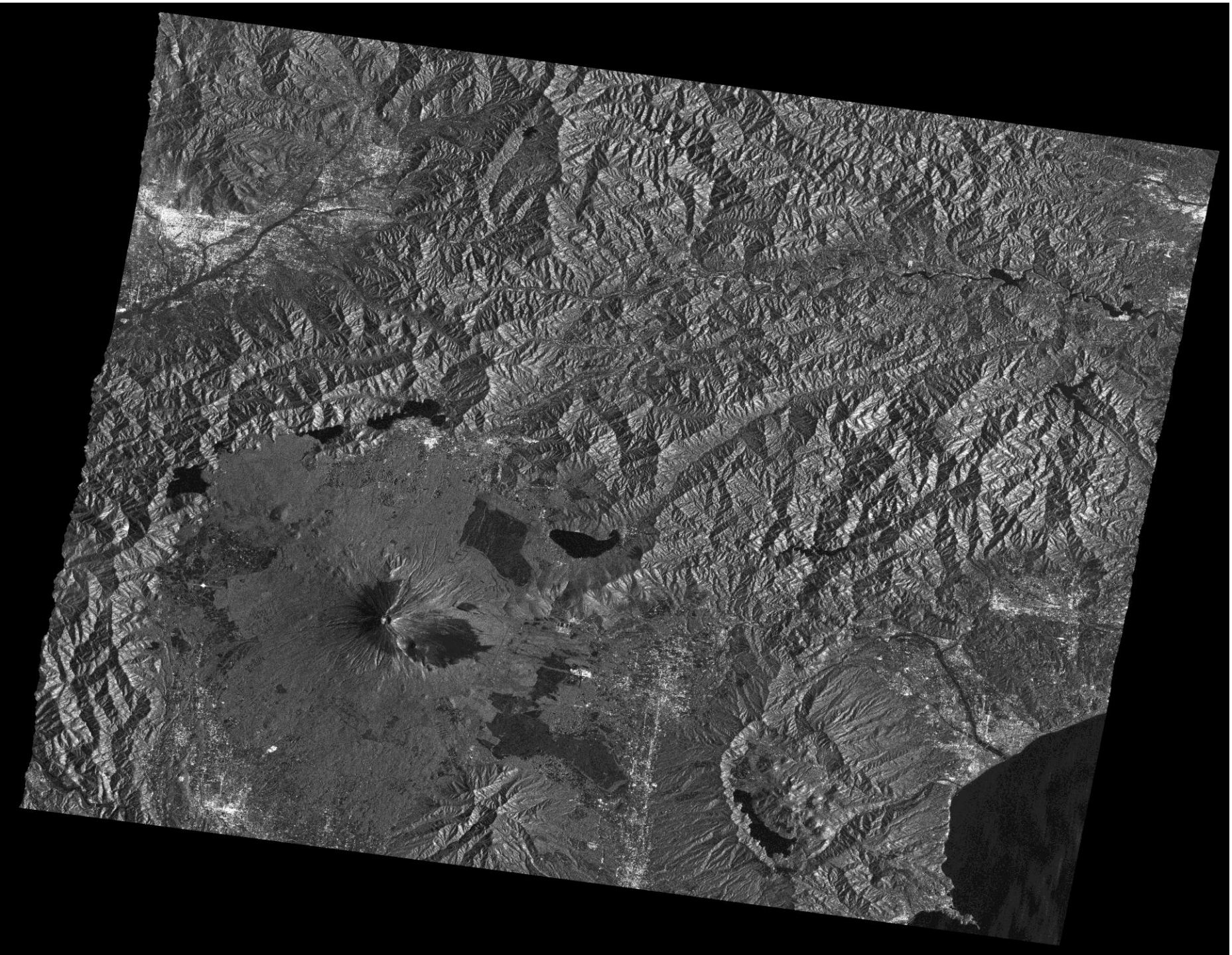
２．４ RioBrancoの経年変化のRGB画像(R:JERS-1(1995年), G/B:PALSAR HH(2009年))

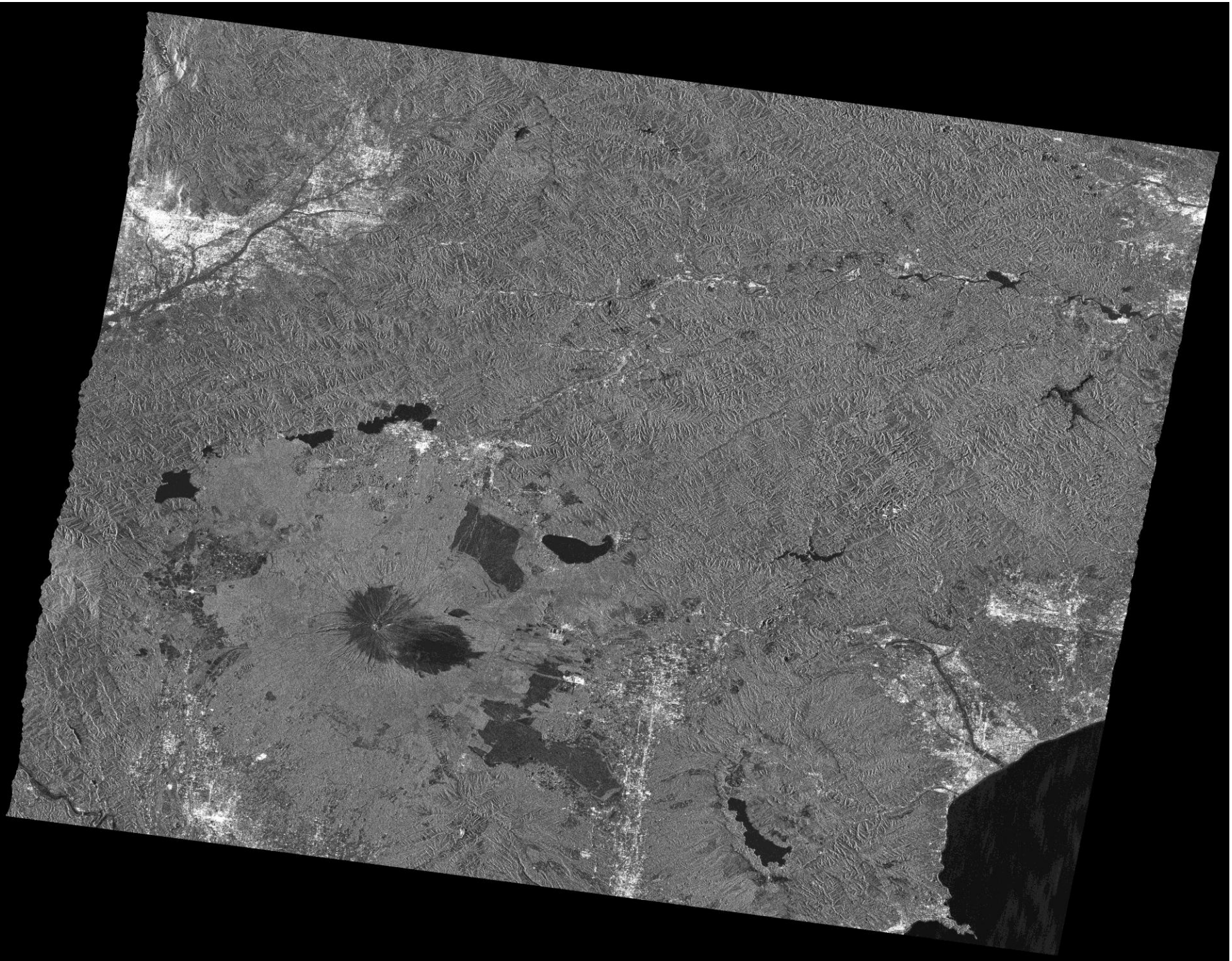


赤色の部分が
約14年間の変化領域
Red area shows the
change during 14 years

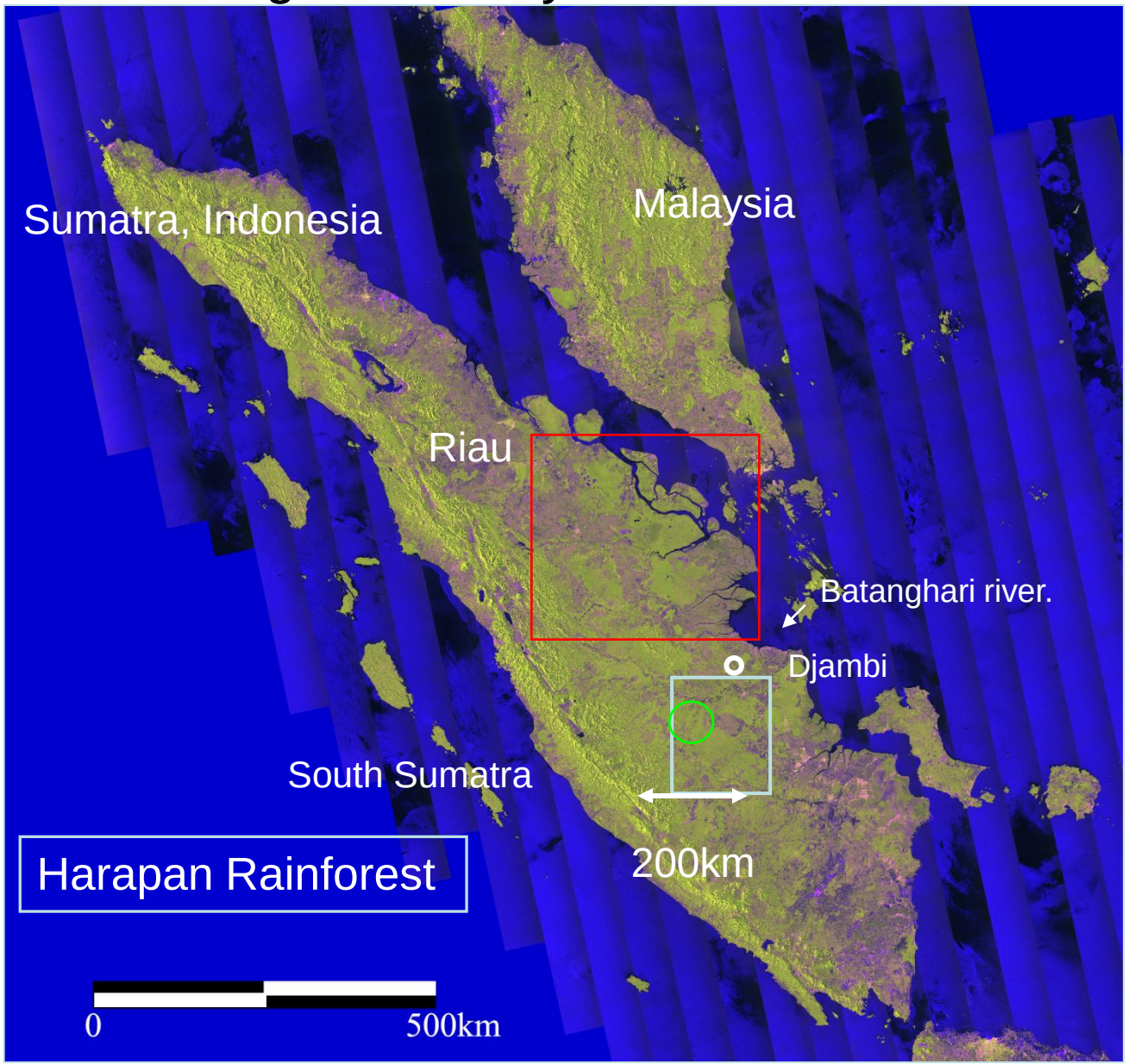








PALSAR Sumatra データ July, 2007 and change over 15 years



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

Coverage: Malaysia and Sumatra

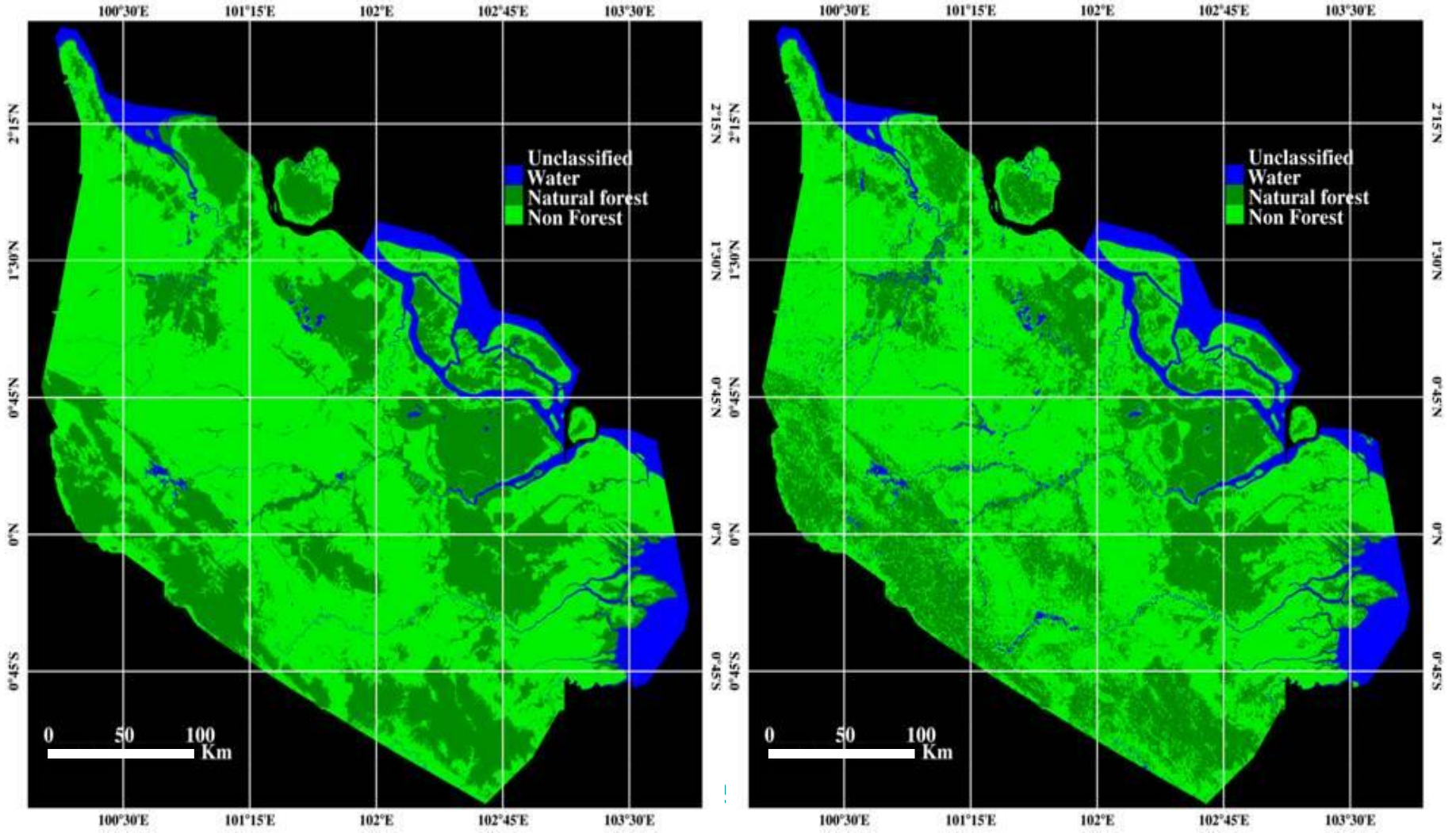
Green: forest
Purple:clear cut

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

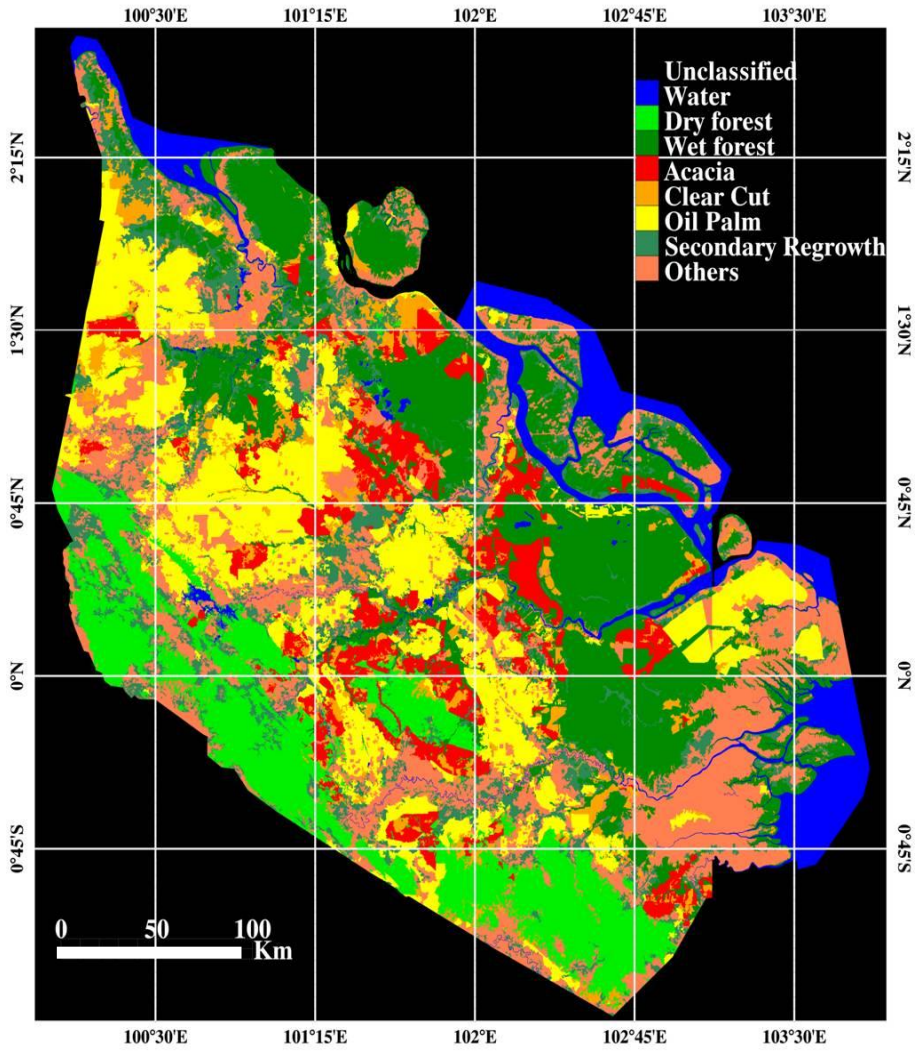
– Forest classification at 50m resolution over Riau province, Indonesia

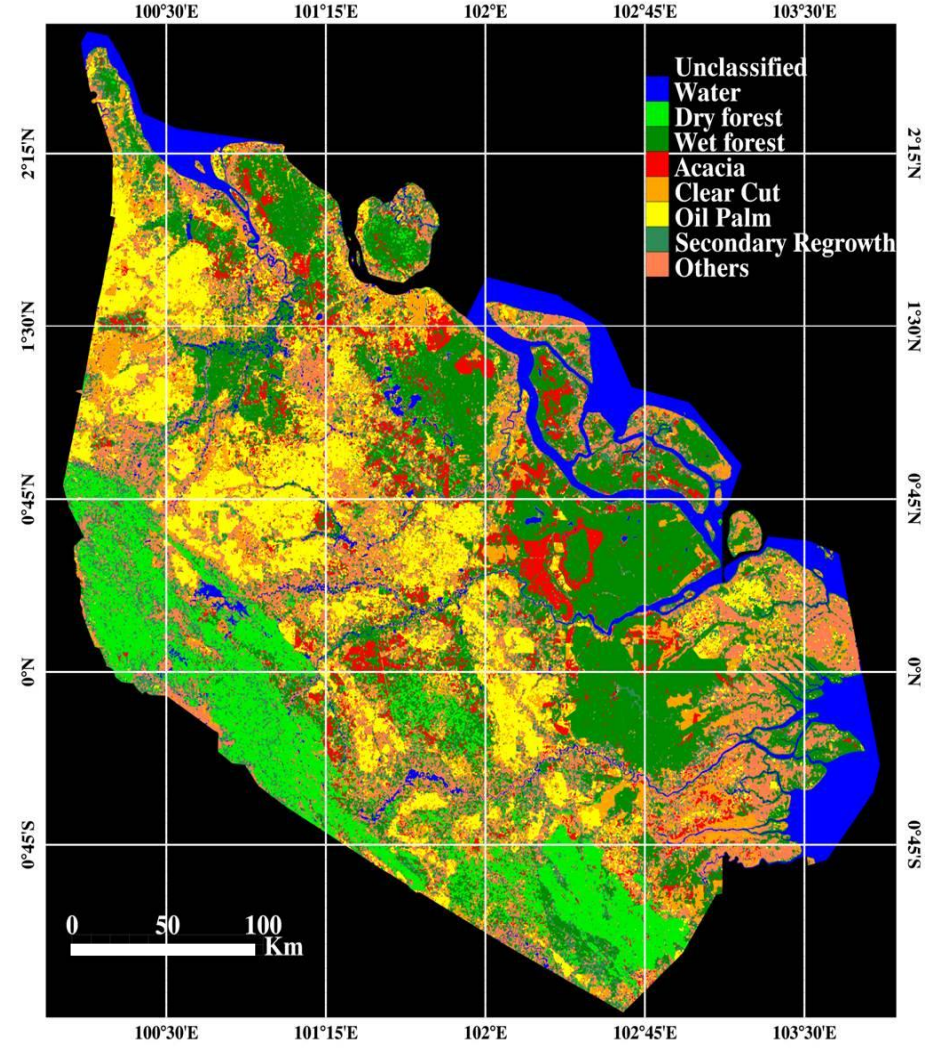
– Size: 111 186,5 km²

Accuracy 37.816.387 / 44.474.591 (85 %)

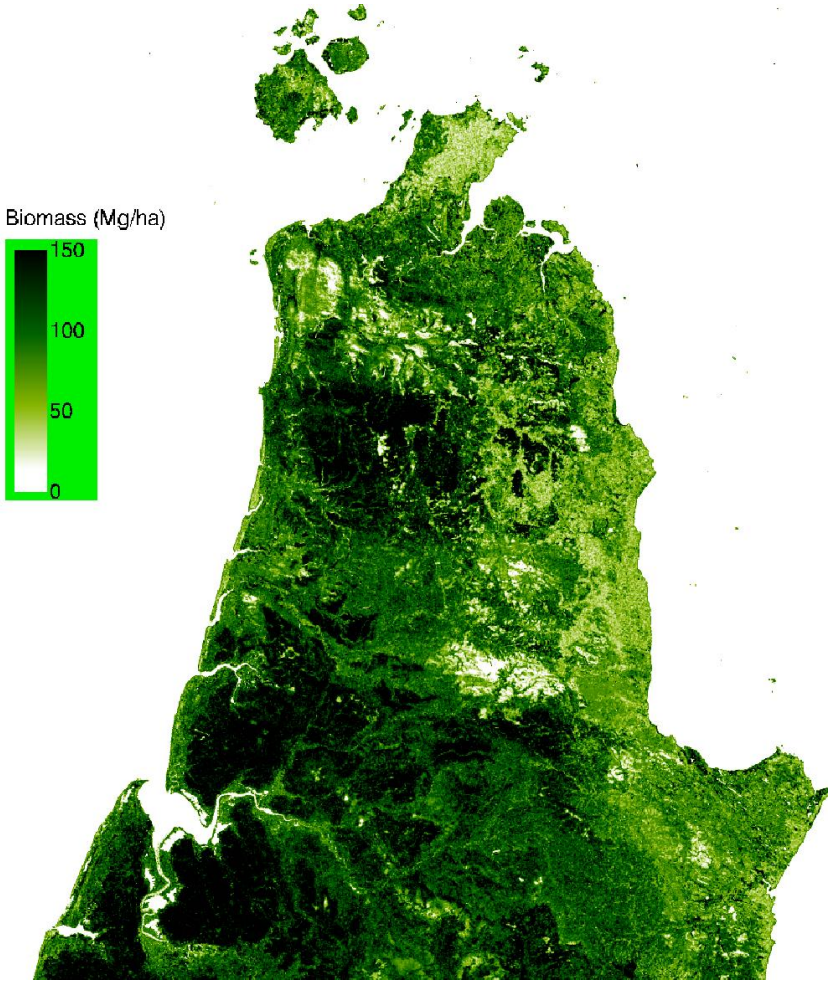


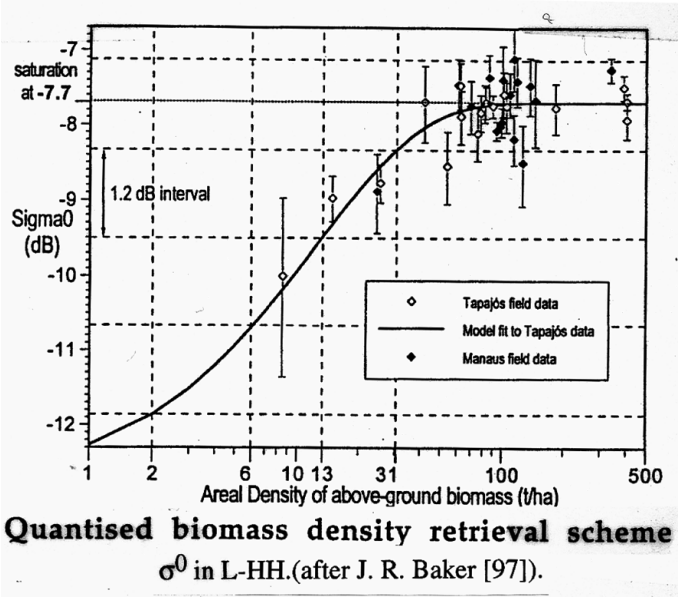
- Land cover classification at 50m resolution over Riau province, Indonesia
  - Important criteria: time consumption for the learning phase
    - Small training dataset (≈ 22 000 pixels) compared to data to process (≈ 44 000 000 pixels)





Estimation of the forest biomass under the KC initiatives



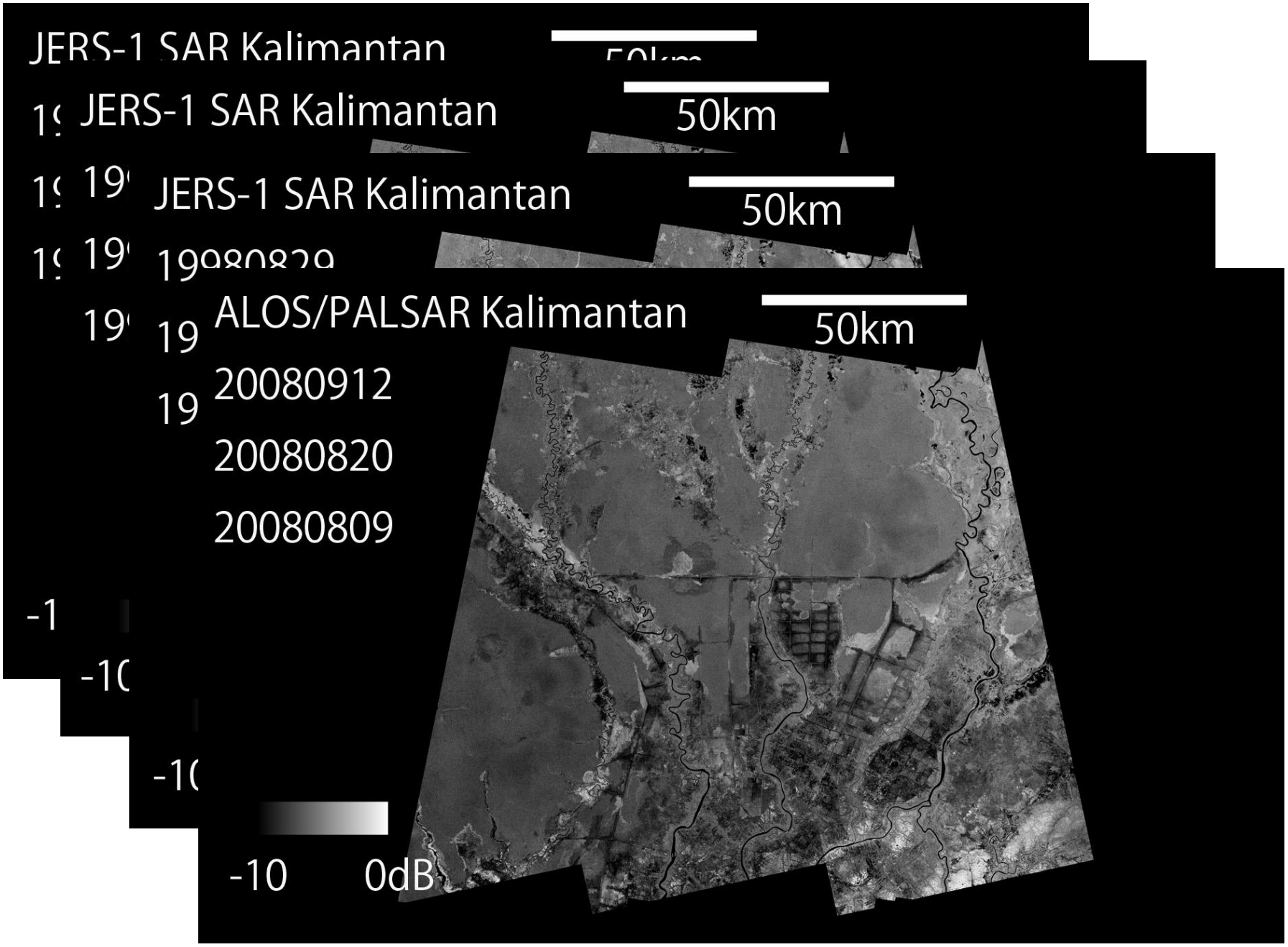


Quantised biomass density retrieval scheme

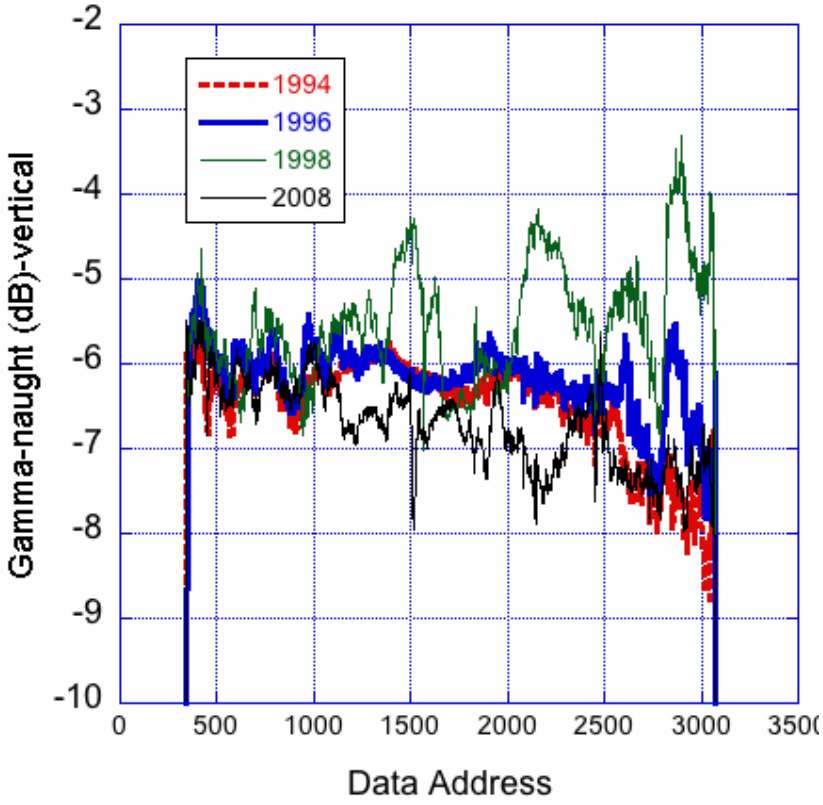
σ^0 in L-HH.(after J. R. Baker [97]).

Courtesy to R. Lucas

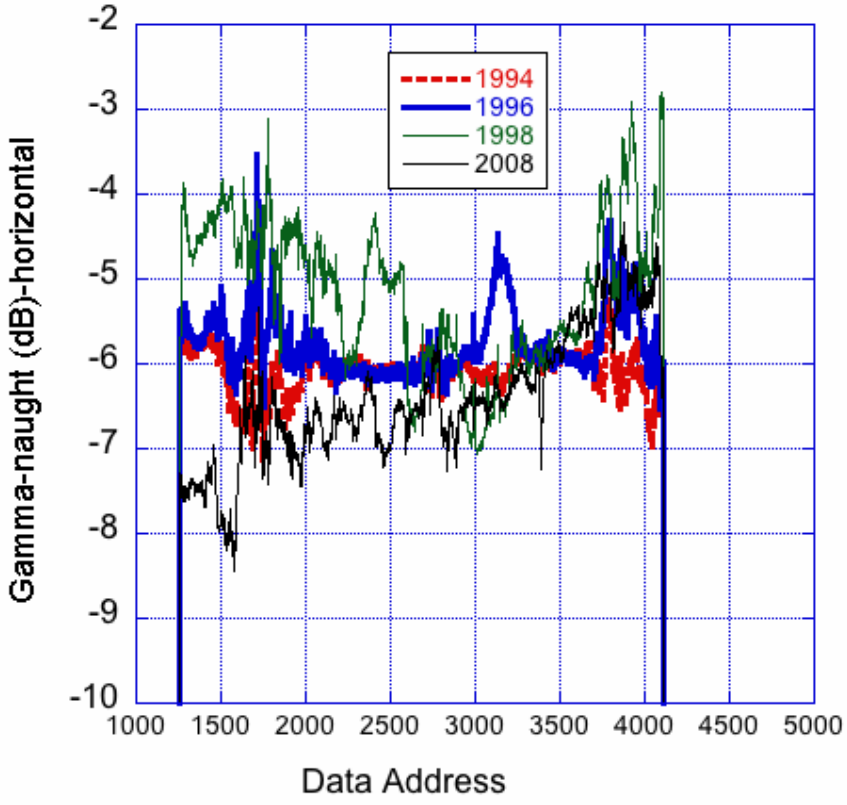
Biomass estimation was expanded to 200t/ha using the HV polarizations.


JERS-1 SAR Kalimantan
50km
JERS-1 SAR Kalimantan
50km
JERS-1 SAR Kalimantan
50km
ALOS/PALSAR Kalimantan
50km
20080912
20080820
20080809
-10
0dB

10 years variation of gamma-naught at Kalimantan

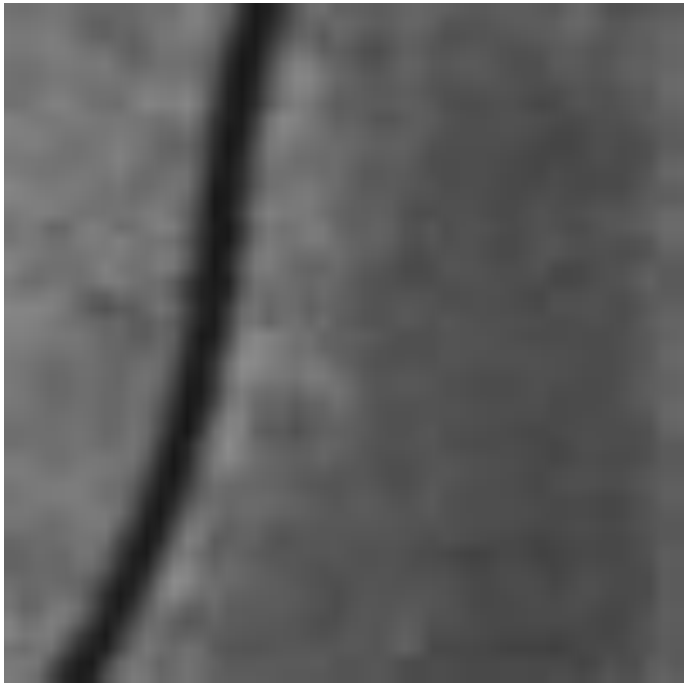


Vertical

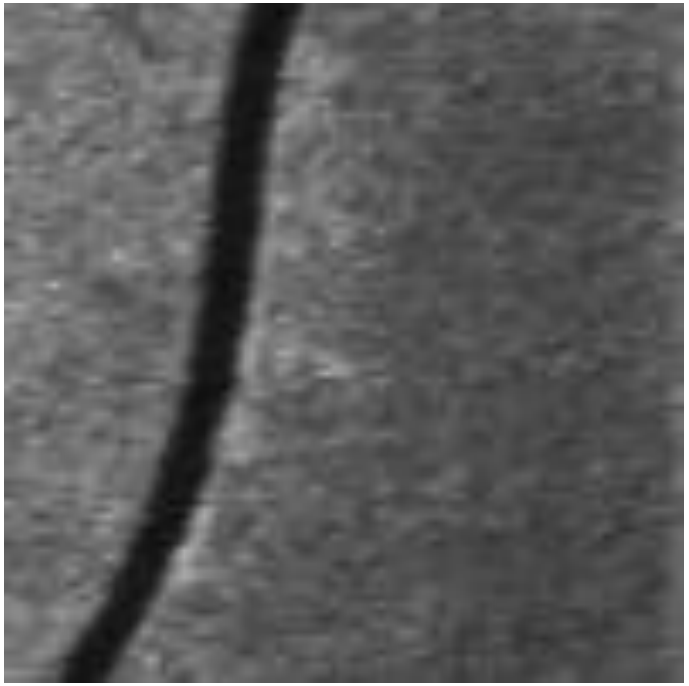


Horizon

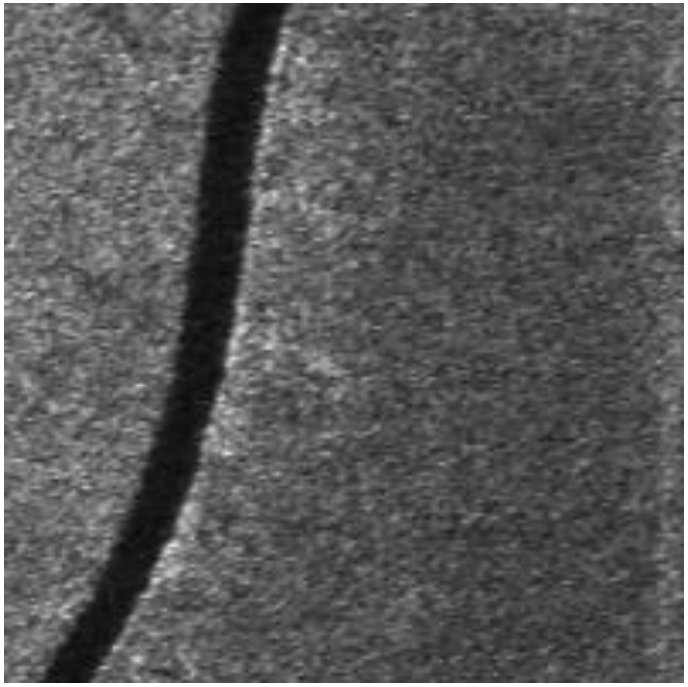
50m
解像度



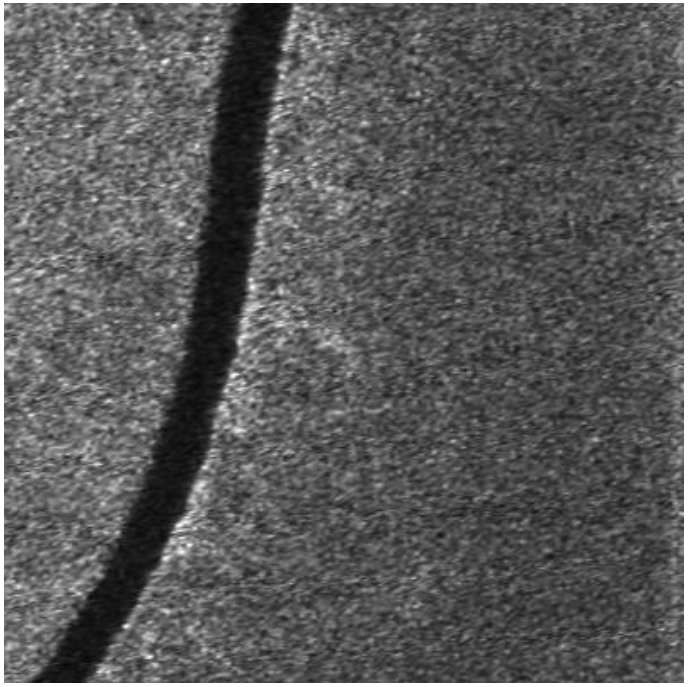
25m
解像度



12.5m
解像度



6.25m
解像度



※画像は2.5km四方

Publications

IEEE TGRS of ALOS Special Issue is prepared for publication of Nov. E, 2009.

It contains 17 papers.

QuickTimeý Ç²
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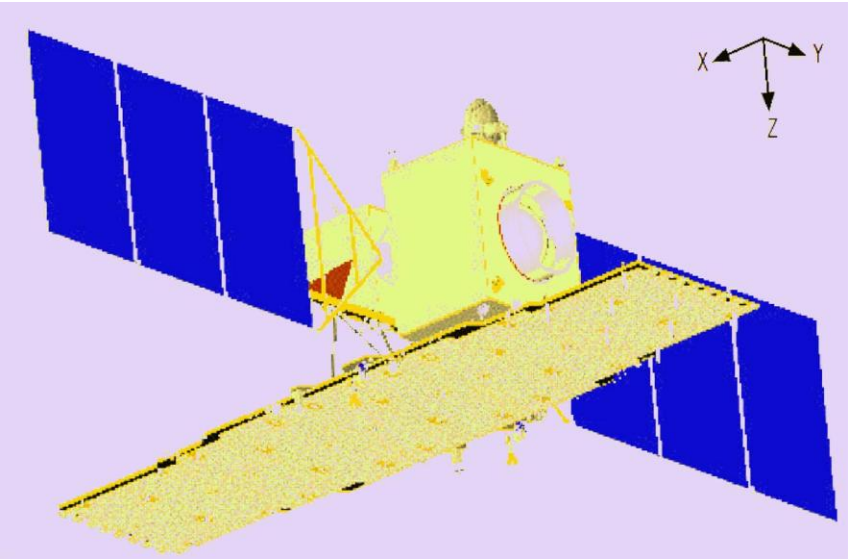
ALOS-2

JAXA's future planning



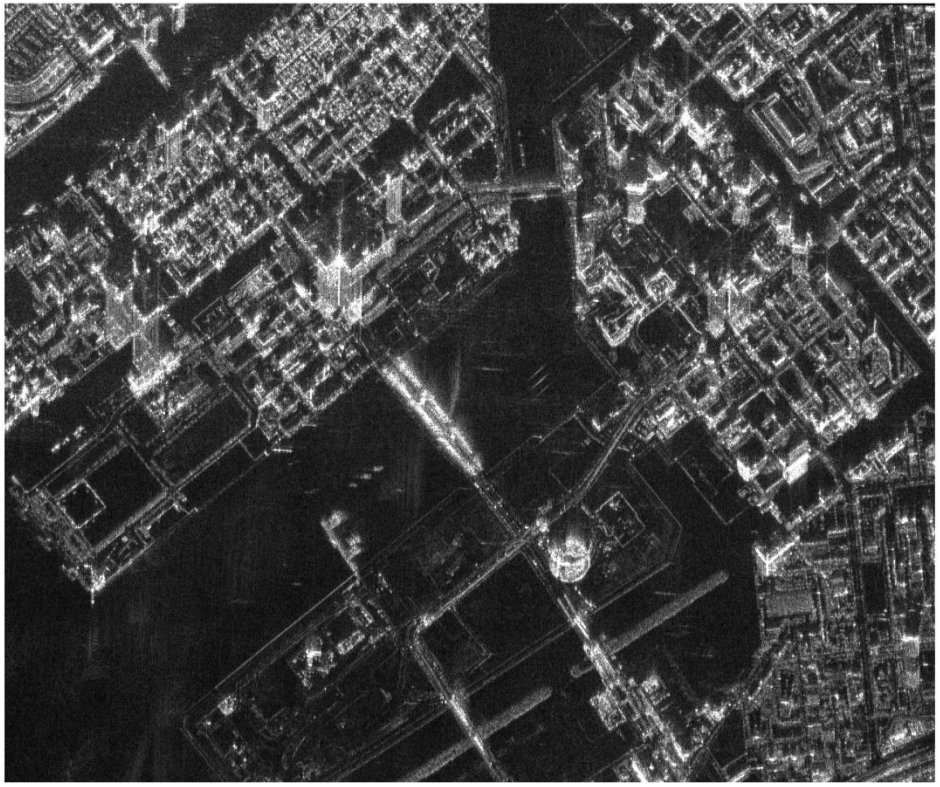
Moving direction

Artistic view

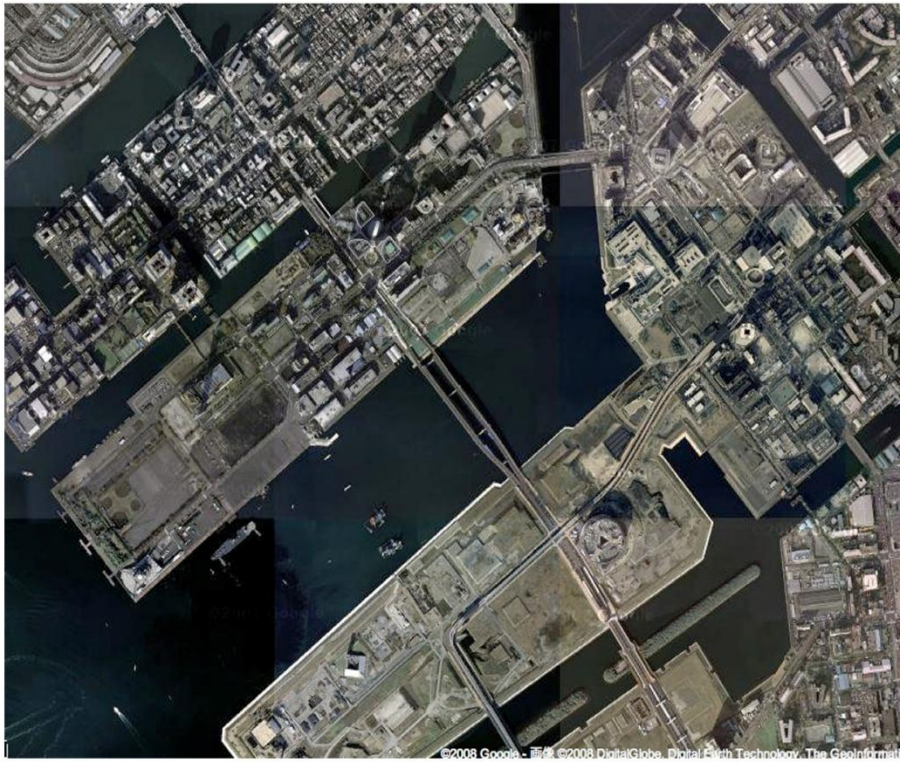
orbit	type	sun synchronous
	height	~630km
	LST	12：00（local noon） descending
Designed life		Five years
Launch	time	Winter, JFY2012
	Launcher	H-2A
satellite	mass	2 ton type
	paddle	2 paddles
Mission data		Direct transmission and Ka band DRTS
SAR frequency		Lband (1.2 GHz)
Main observation modes	High resol.	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

Comparison of Pi-SAR image and optical image

While Pi-SAR(2x5m:HV)image is affected by the sidelobes, the image interpretation is almost the same with the high resolution optical image.



HV image for Harumi, Tokyo © JAXA



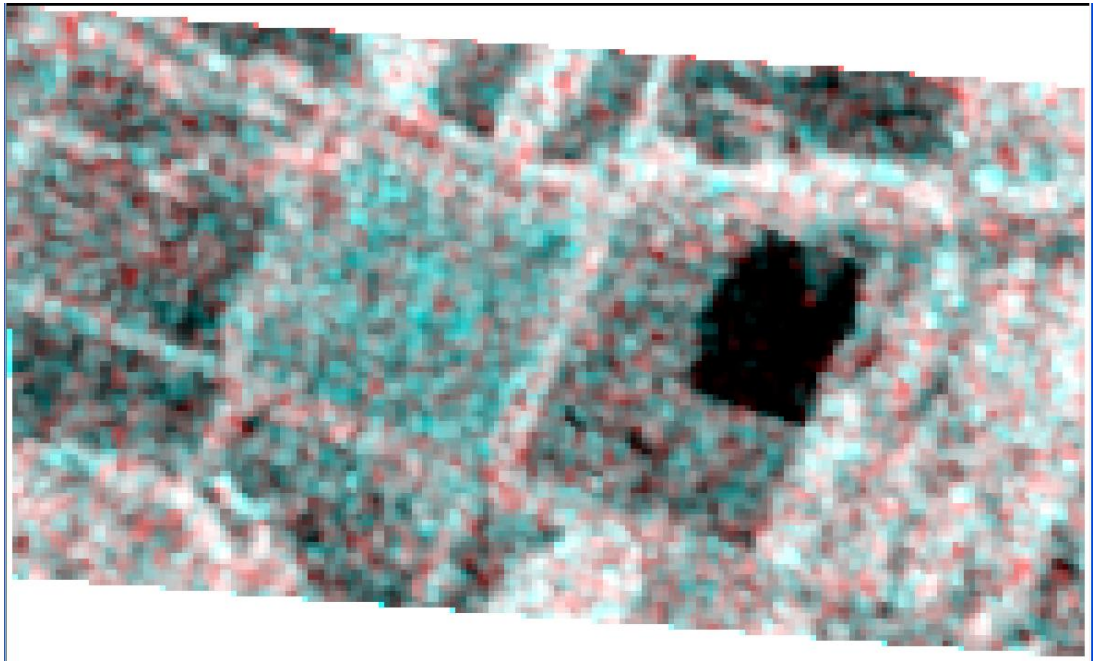
Google Map

Forest/Nonforest

Comparison of the two seasons data

ーHV偏波画像より、斜面勾配補正ありのデータを用いて、 2時期の変化をカラー合成により確認した（下図）

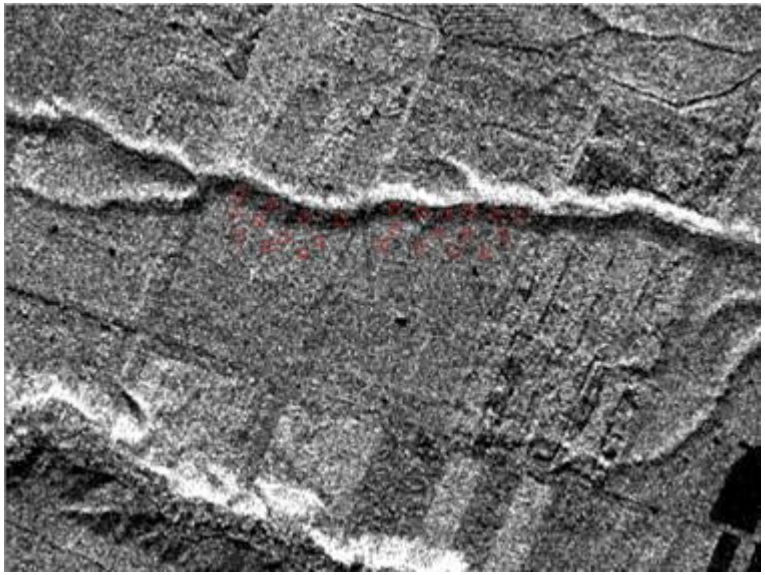
ーR:2009年、GB：2007年のHV偏波であることから、97林班に関して、2007年の後方散乱係数のほうが大きいことが分かった



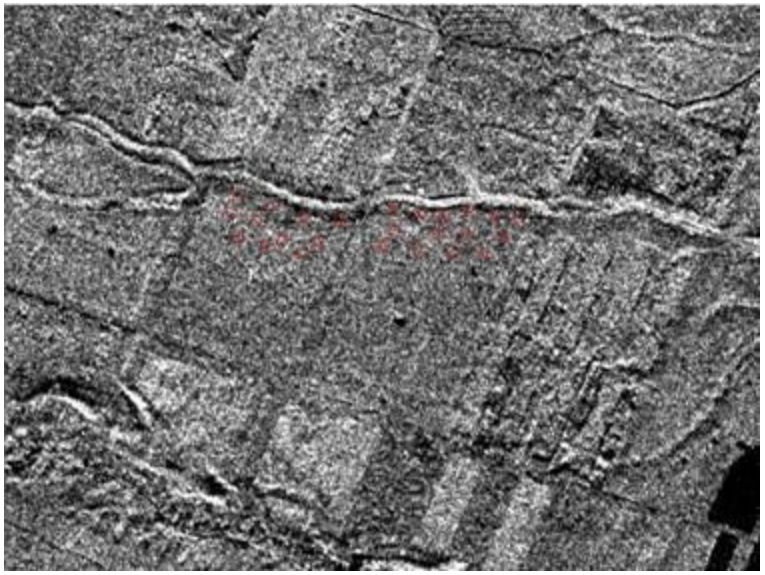
R:2009/9/16、GB：2007/9/21
両画像とも斜面勾配補正有のHV偏波

Biomass vs. gamma-naught at Tomakomai

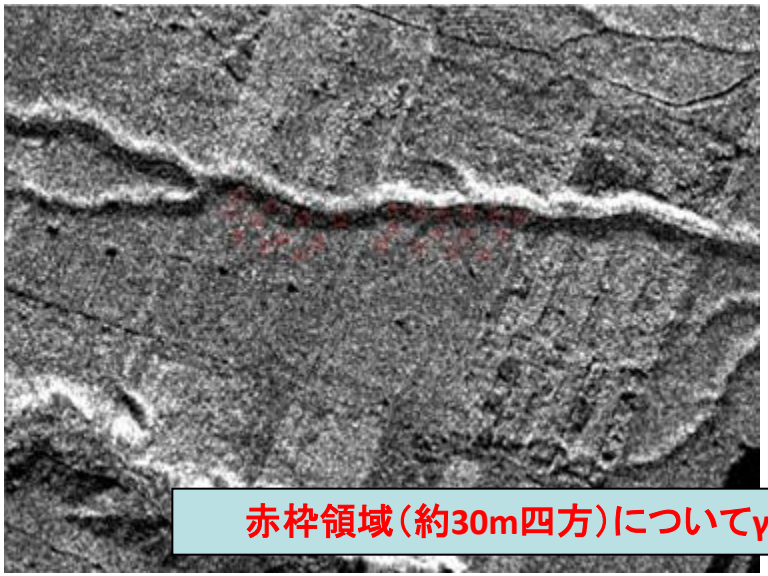
- 傾斜地／平坦地における後方散乱係数（γ0）の比較



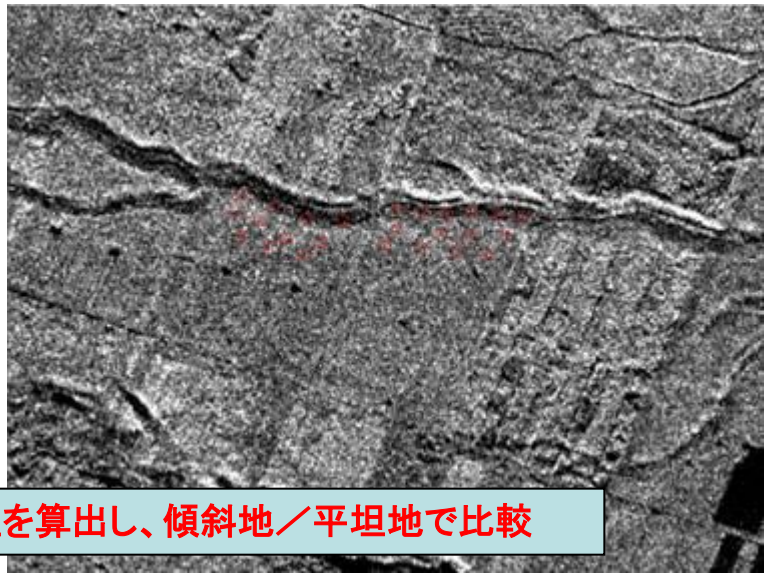
L06910（2003年8月20日観測） 斜面勾配補正なし（HV偏波）



L06910（2003年8月20日観測） 斜面勾配補正あり（HV偏波）



L07906（2004年8月3日観測） 斜面勾配補正なし（HV偏波）



L07906（2004年8月3日観測） 斜面勾配補正あり（HV偏波）

赤枠領域（約30m四方）についてγ0の平均値を算出し、傾斜地／平坦地で比較

Summary

ALOS condition is OK.

Deforestation monitoring in Brazil is in progress

Mosaic generation is in progress

Gamma-naught characteristics at Kalimantan

Forest classification