THE WOODS HOLE RESEARCH CENTER

Seeing REDD: ALOS’ Crucial Role to Help Slow Deforestation and Forest Degradation

Josef Kellndorfer

Wayne Walker, Dan Nepstad, Tracy Johns, Nadine Laporte, Claudia Stickler, Paul Lefebvre, Katie Kirsch

The Woods Hole Research Center (WHRC)

Collaboration with:

Masanobu Shimada, JAXA

Ake Rosenqvist , EC-JRC

What’s the News from Bali?

“We have a Roadmap!”

HIS EXCELLENCY Mr. RACHMAT WITOELAR, PRESIDENT, UN CLIMATE CHANGE CONFERENCE, Closing Statement

But not without Drama ...

South Africa rebukes first ...

Earth Negotiations Bulletin

The delegation from South Africa rebukes the United States saying their comments are "most unwelcome and without any basis."

What are the key achievements from Bali?

THE WOODS HOLE RESEARCH CENTER

- Launched a new negotiation process, designed to tackle climate change, with the aim of completing this by 2009
- Launch of the “Adaptation Fund”
- Charted a course forward on reducing emissions from deforestation, and on technology transfer, including an exciting new strategic program

REDD in the UNFCCC process

- 2005
  - December - Montreal - COP tasks SBSTA with 2 year process of analysis of RED
- 2006
  - August - Rome - 1st REDD workshop - focused on scientifc and technical issues
- 2007
  - March - Cairns - 2nd REDD workshop - focused on monitoring and policy issues
  - May - Bonn - SBSTA adopts draft decision text for REDD (most text in brackets)
  - Bali - SBSTA text encourages and instructs pilot activities, includes degradation, sets 2 year program of work to coincide with post-2012 policy process; Bali Action Plan includes REDD in its 2 year process toward post-2012 framework

REDD in the next 2 years

- 2008
  - 3rd SBSTA REDD workshop in late 2008, date tbd
  - December - Poznan - COP 14 - key meeting to frame REDD as a policy mechanism within UNFCCC
  - Likely tri-monthly meetings of post-2012 Ad Hoc Working Group (some will include REDD)
- 2009
  - Continuation of meetings of Ad Hoc Working Group
  - Likely additional SBSTA REDD workshops
  - December - Copenhagen - framework for Kyoto Protocol successor should be outlined, including role of REDD

Positions of Key Countries

THE WOODS HOLE RESEARCH CENTER

- USA - obstructive in Bali; in general try to focus on past activities and avoid any discussion of financing or developing countries taking meaningful action on climate
- EU - Annex I champion of REDD; supportive of range of approaches, pushing for pilot activities, national approach and funding for capacity building
- Brazil - supportive of REDD in general, opposed to market-based approach
- CfRN - drivers of REDD process; pushing for credit for early action, national approach, pilot activities, market mechanism with fungible credits

Coalition for Rainforest Nations

  - Bangladesh, Bolivia, Central African Republic, Cameroon, Chile, Congo, Colombia, Costa Rica, DR Congo, Dominican Republic, Ecuador, El Salvador, Fiji, Gabon, Ghana, Guatemala, Honduras, Indonesia, Kenya, Lesotho, Malaysia, Nicaragua, Nigeria, Panama, Papua New Guinea, Paraguay, Peru, Samoa, Solomon Islands, Thailand, Uruguay, Uganda, and Vanuatu

Country positions cont'd

THE WOODS HOLE RESEARCH CENTER

- African countries - COMIFAC countries strongly in favor of REDD; pushing for inclusion of degradation, range of approaches, capacity building
- India - supportive of REDD; seeking to include net accounting - credit for reforestation and regrowth
- China - neither strongly opposing nor supporting
- Mexico - aligned with several other latin countries (Ecuador, Panama, Colombia) in support of a project-based approach
- Japan - generally in support of REDD
- Canada - generally in support of REDD
- Australia - in support of REDD

REDD Positions

- Deforestation is significant contribution to anthropogenic GHG emissions
- Degradation also leads to emissions
- Early action already taken by some countries
- Complexity of problem with different national circumstances
- Urgent need for meaningful action
- Requires stable and predictable availability of resources
- Needs of local and indigenous communities need to be addressed

IPCC *Good Practice Guidance for LULUCF*: reporting tier options for UNFCCC Annex I country reporting

- Tier 1 - employs basic method provided in *IPCC Guidelines* and default emission factors provided in the *IPCC Guidelines*
  - usually use activity data that are spatially coarse, such as nationally or globally available estimates of deforestation rates, agricultural production statistics, and global land cover maps
- Tier 2 - applies emission factors and activity data which are defined by the country for the most important land uses/activities
  - can also apply stock change methodologies based on country-specific data
  - Higher resolution activity data are typically used to correspond with country-defined coefficients for specific regions and specialised land-use categories
- Tier 3 - higher order methods including models and inventory measurement systems tailored to address national circumstances, repeated over time, and driven by high-resolution activity data and disaggregated at sub-national to fine grid scales
  - may be GIS-based combinations of age, class/production data systems with connections to soil modules, integrating several types of monitoring

Positions are reflected in the Bali REDD Text

THE WOODS HOLE RESEARCH CENTER

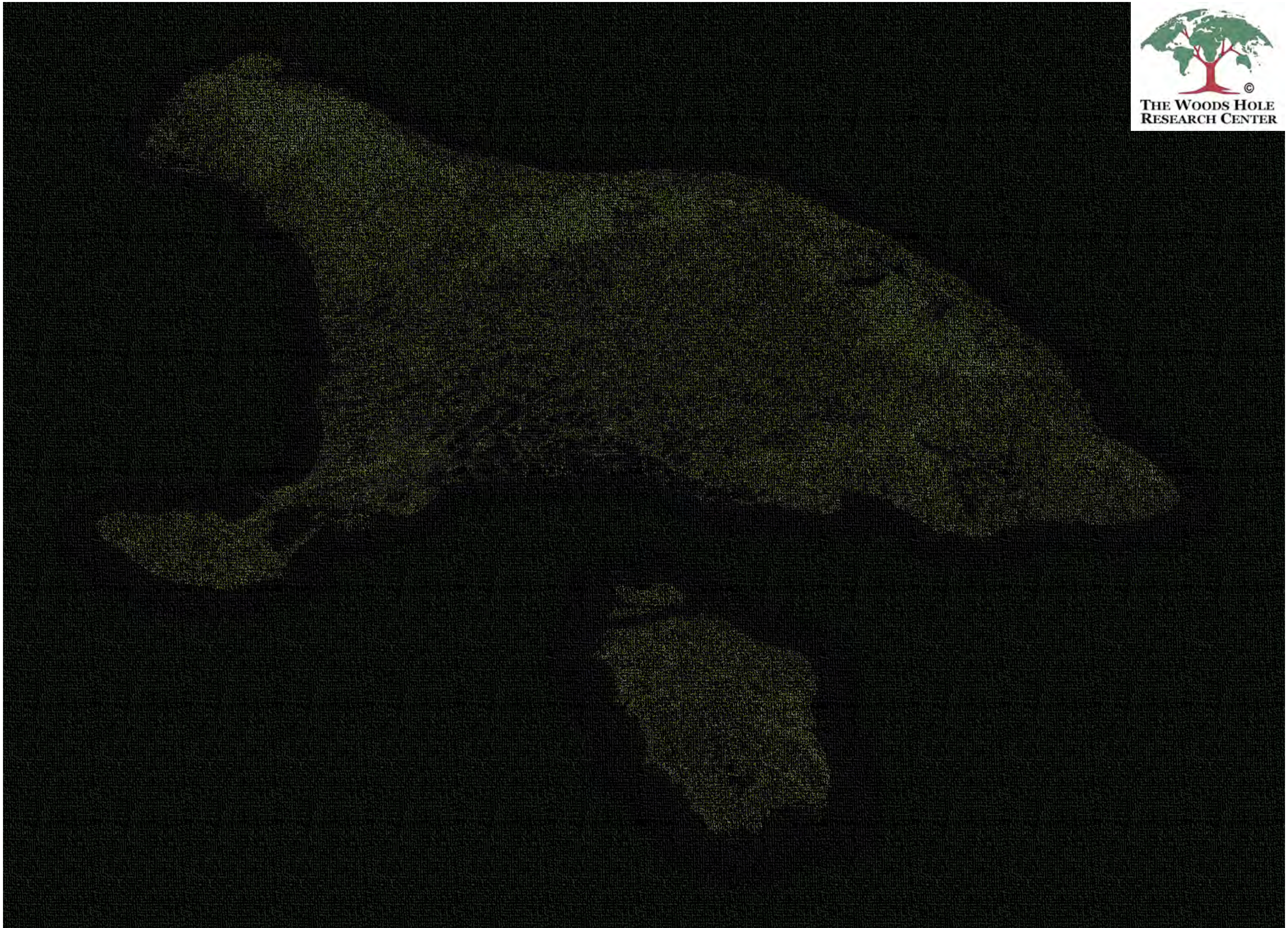
- Degradation is in (COMIFAC)
- Consideration of role of conservation, sustainable management of forests, and enhancement of forest carbon stocks in developing countries (India)
- Strengthen and support ongoing efforts to reduce emissions from deforestation and forest degradation on a voluntary basis (Brazil)
- Explore a range of actions, identify options and undertake efforts, including demonstration activities, to address the drivers of deforestation relevant to their national circumstances, with a view to reducing emissions from deforestation and forest degradation and thus enhancing forest carbon stocks due to sustainable management of forests
- Apply the Good Practice Guidance for Land Use, Land-Use Change and Forestry

Bali Text cont'd

- support capacity-building, provide technical assistance, facilitate the transfer of technology to improve, inter alia, data collection, estimation of emissions from deforestation and forest degradation, monitoring and reporting, and address the institutional needs of developing countries to estimate and reduce emissions from deforestation and forest degradation

The World Bank FCPF

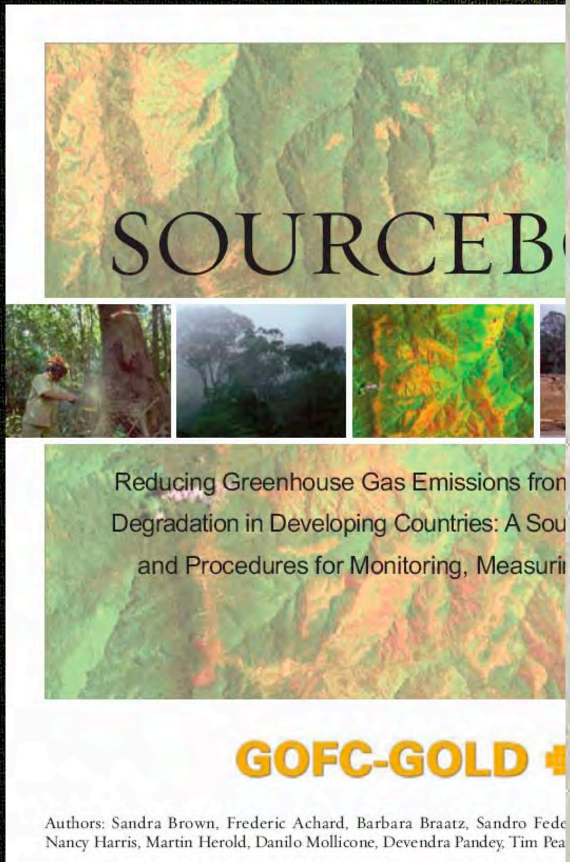
- Launched in Bali by WB President Zoelik
- Is a "Readiness Fund" to prepare nations to participate in REDD trading
- Contributions from
  - Germany $59M
  - UK: $30M
  - Netherlands: $22M
  - Japan, Australia: $10M
  - France, Switzerland: $7M
  - Denmark, Finland, Norway: $5M
  - TNC $5M



THE WOODS HOLE RESEARCH CENTER

GOFC-GOLD's REDD Sourcebook

THE WOODS HOLE RESEARCH CENTER



This sourcebook is the outcome of an ad-hoc REDD working group of "Global Observation of Forest and Land Cover Dynamics" (GOFC-GOLD), a technical panel of the Global Terrestrial Observing System. GOFC-GOLD provides an independent expert platform for international cooperation to formulate scientific consensus and provide technical input to the discussions. This first draft version provides a consensus perspective from the global community of earth observation and carbon experts on methodological issues relating to quantifying the green house gas impacts of implementing activities to reduce emissions from deforestation and degradation in developing countries (REDD). Based on the current status of negotiations and UNFCCC approved methodologies, this sourcebook aims to provide additional explanation, clarification, and methodologies to support REDD early actions and readiness mechanisms for building national REDD monitoring systems. Respective communities are invited to provide comments and feedback to evolve a refined technical-guidelines document in the future.

Table of Contents

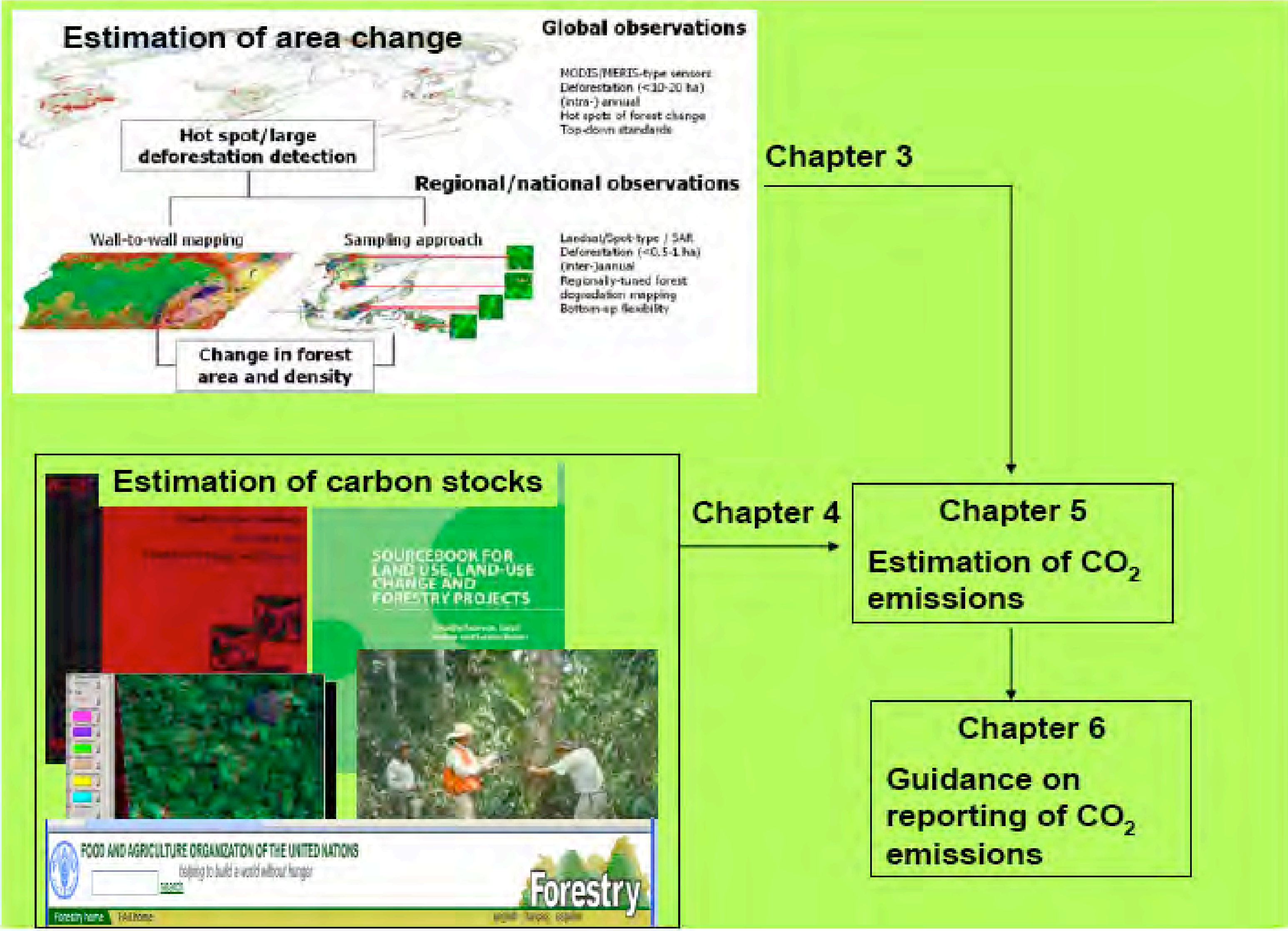
Activity data and Emission Factors

Activity data

WOODS HOLE RESEARCH CENTER

Emission Factors

n 2008


Estimation of area change
Global observations
MODIS/MERIS-type sensors
Deforestation (<10-20 ha)
(intra-) annual
Hot spots of forest change
Top-down standards
Hot spot/large deforestation detection
Regional/national observations
Wall-to-wall mapping
Sampling approach
Landsat/Spot-type / SAR
Deforestation (<0.5-1 ha)
(inter-)annual
Regionally-tuned forest degradation mapping
Bottom-up flexibility
Change in forest area and density
Chapter 3
Estimation of carbon stocks
SOURCEBOOK FOR LAND USE, LAND-USE CHANGE AND FORESTRY PROJECTS
FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
Forestry
Chapter 4
Chapter 5
Estimation of CO2 emissions
Chapter 6
Guidance on reporting of CO2 emissions

Radar in the Sourcebook

THE WOODS HOLE RESEARCH CENTER

Optical mid-resolution data have been the primary tool for deforestation monitoring. Other, newer, types of sensors, e.g. Radar (ERS1/2 SAR, JERS-1, ENVISAT-ASAR and ALOS PALSAR) and Lidar, are potentially useful and appropriate. Radar, in particular, alleviates the substantial limitations of optical data in persistently cloudy parts of the tropics. Data from Lidar and Radar have been demonstrated to be useful in project studies, but so far, they are not widely used operationally for tropical deforestation monitoring over large areas. Over the next five years or so, the utility of radar may be enhanced depending on data acquisition, access and scientific developments.

The Woods Hole Research Center

Seeing REDD: ALOS' Crucial Role to Help Slow Deforestation and Forest Degradation

Josef Kellndorfer

Wayne Walker, Dan Nepstad, Tracy Johns, Nadine Laporte, Claudia Stickler, Paul Lefebvre, Katie Kirsch

The Woods Hole Research Center (WHRC)

Collaboration with:

Masanobu Shimada, JAXA

Ake Rosenqvist , EC-JRC

From Pilot to Application

THE WOODS HOLE RESEARCH CENTER

Mapping 400,000 sqkm

Of the Arc of Deforestation with ALOS/PALSAR:

The Xingu Watershed in Mato Grosso, Brazil

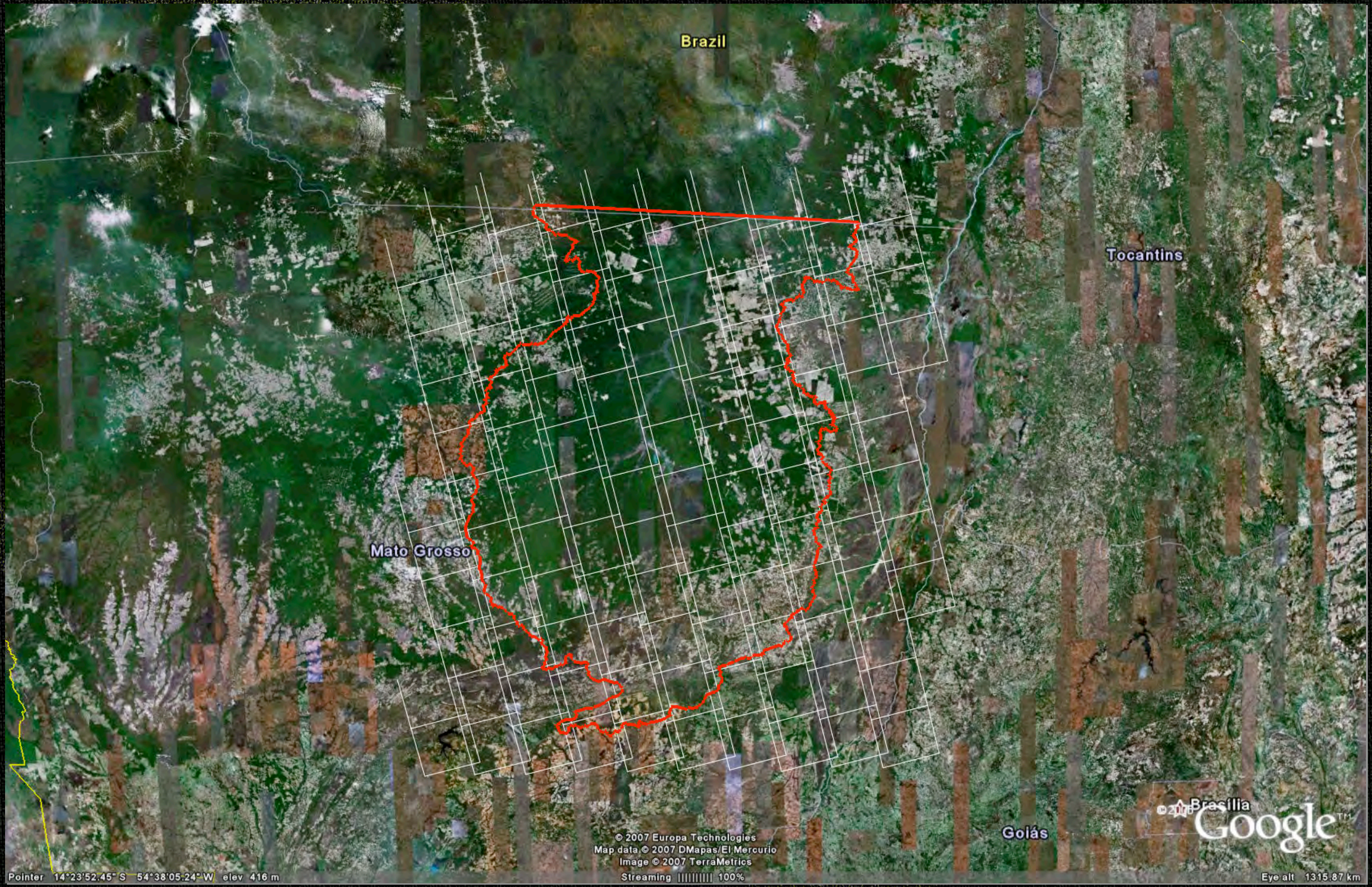
Mapping 300,000 sqkm

Gabon and Equatorial Guniea

ALOS/PALSAR Dual-Pol Mosaic of the Xingu Watershed

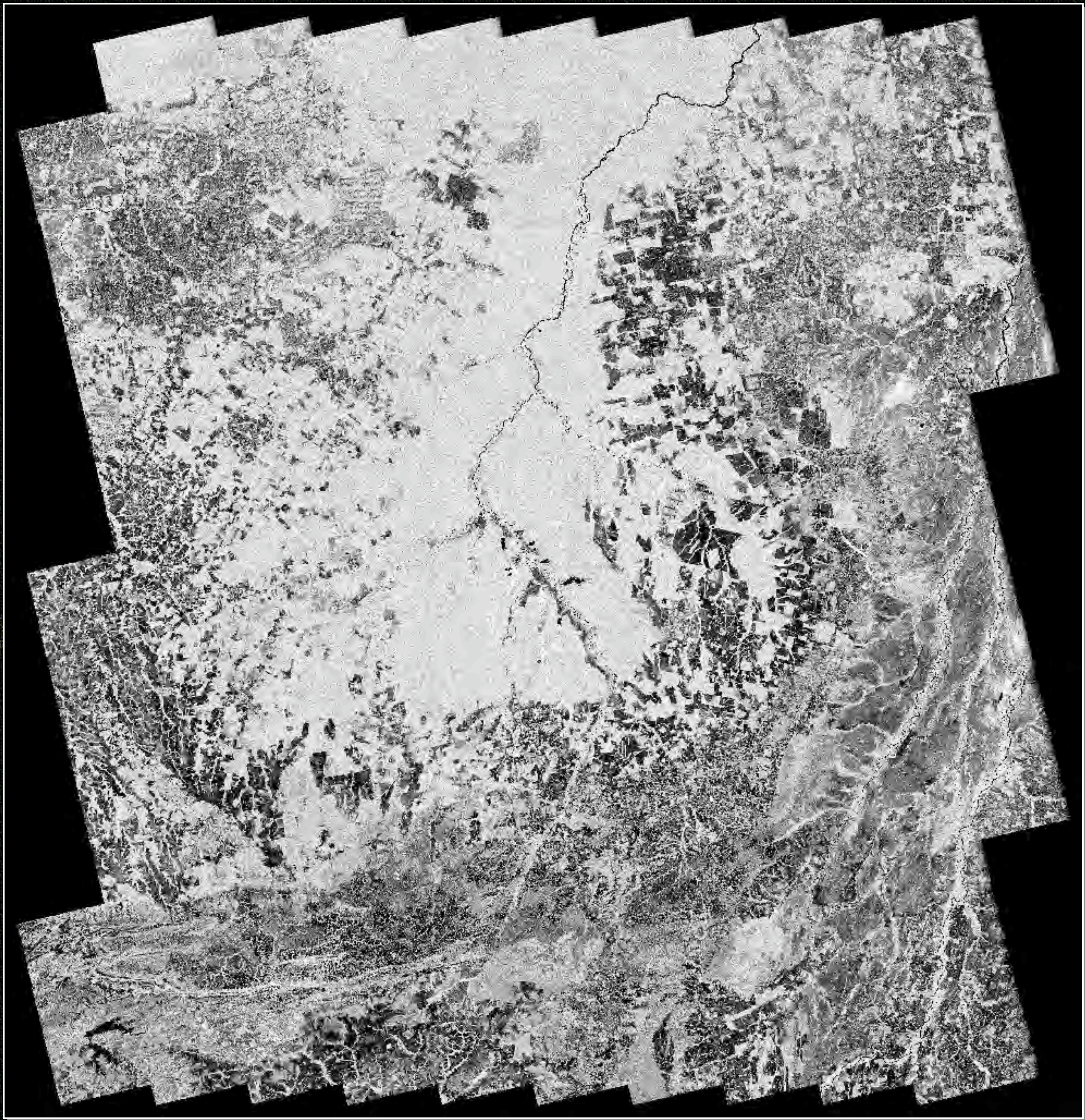
THE WOODS HOLE RESEARCH CENTER

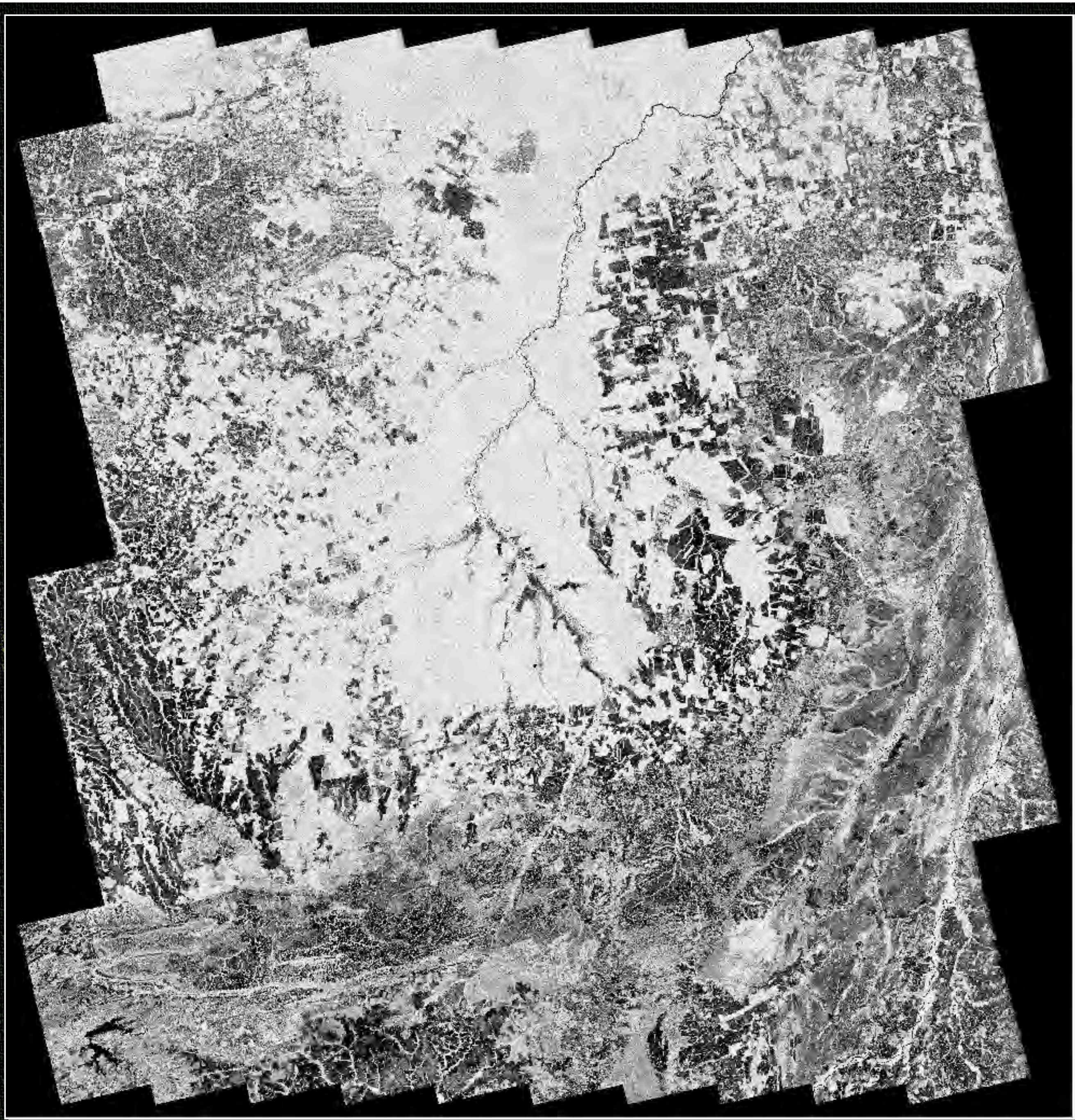
Coverage with ALOS/PALSAR Scenes



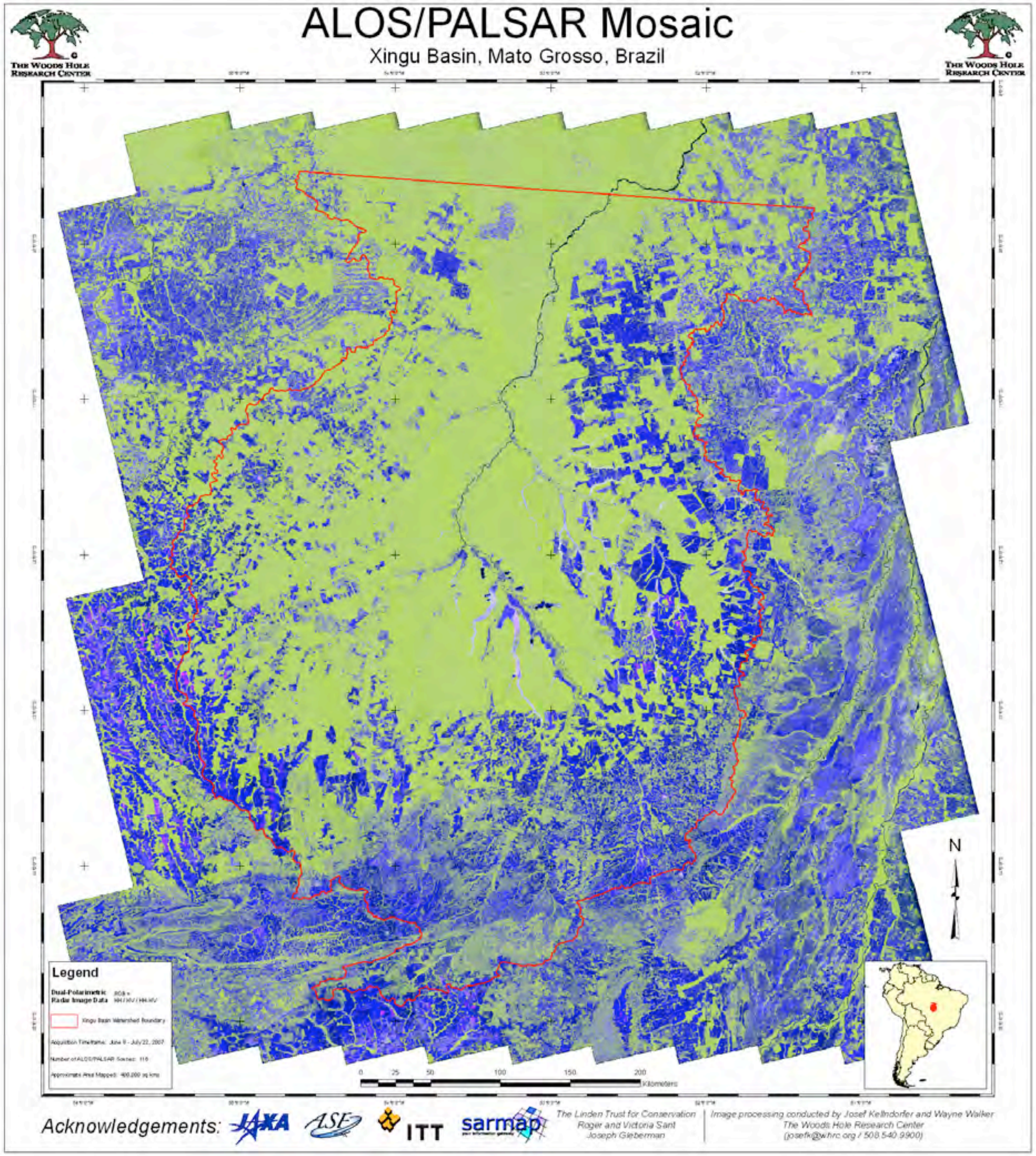
Acquistion Time Frame: June 6th to July 7th 2007
116 Scenes Selected

L-HH





L-HV



THE WOODS HOLE RESEARCH CENTER

ALOS/ PALSAR Radar Image Mosaic of the Xingu Watershed

Data Acquistion:

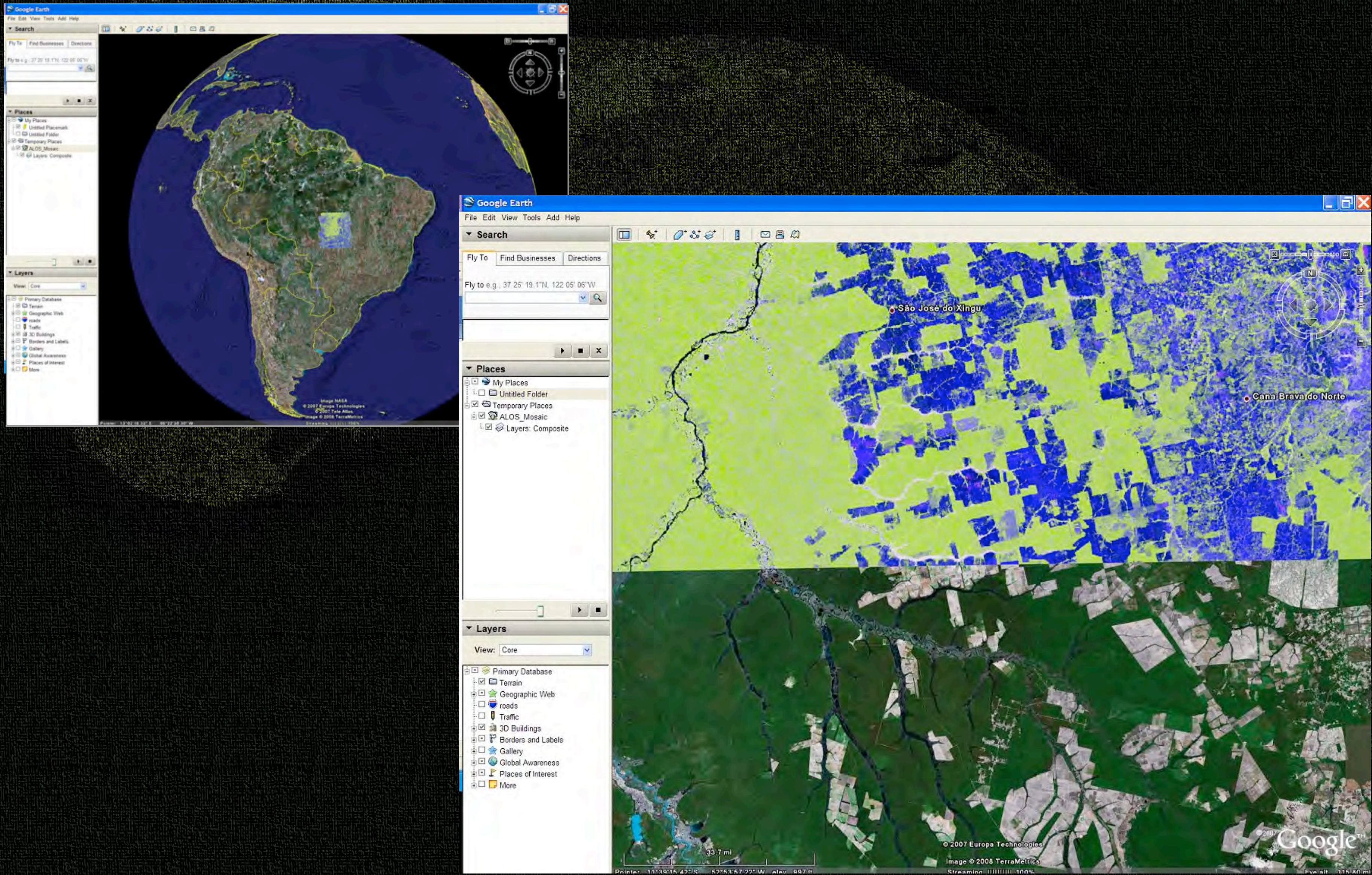
6/8-7/22 2007

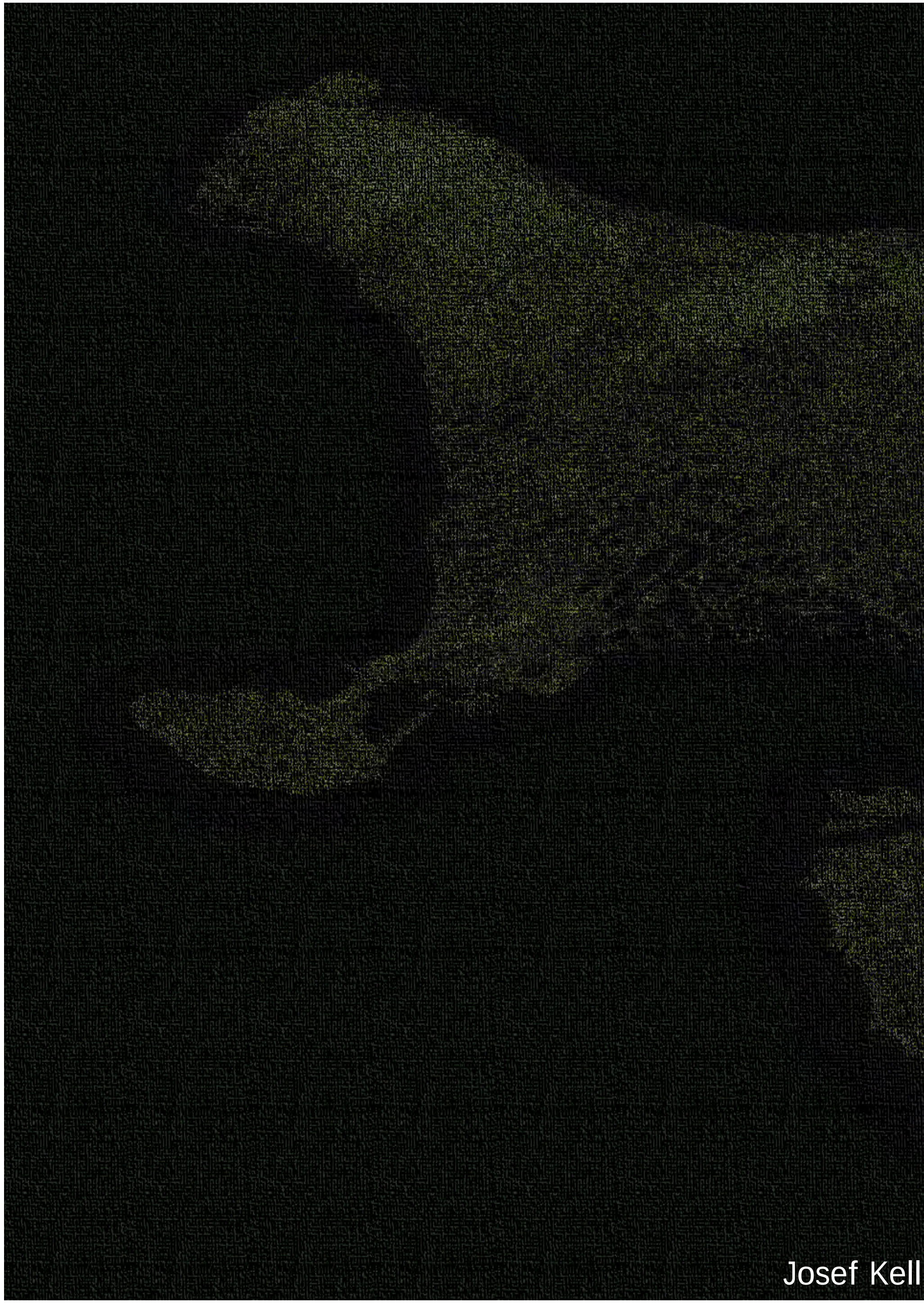
Number of Scenes: 116

Spacing: 25 m

In Google Earth ...

THE WOODS HOLE RESEARCH CENTER





Classification Results

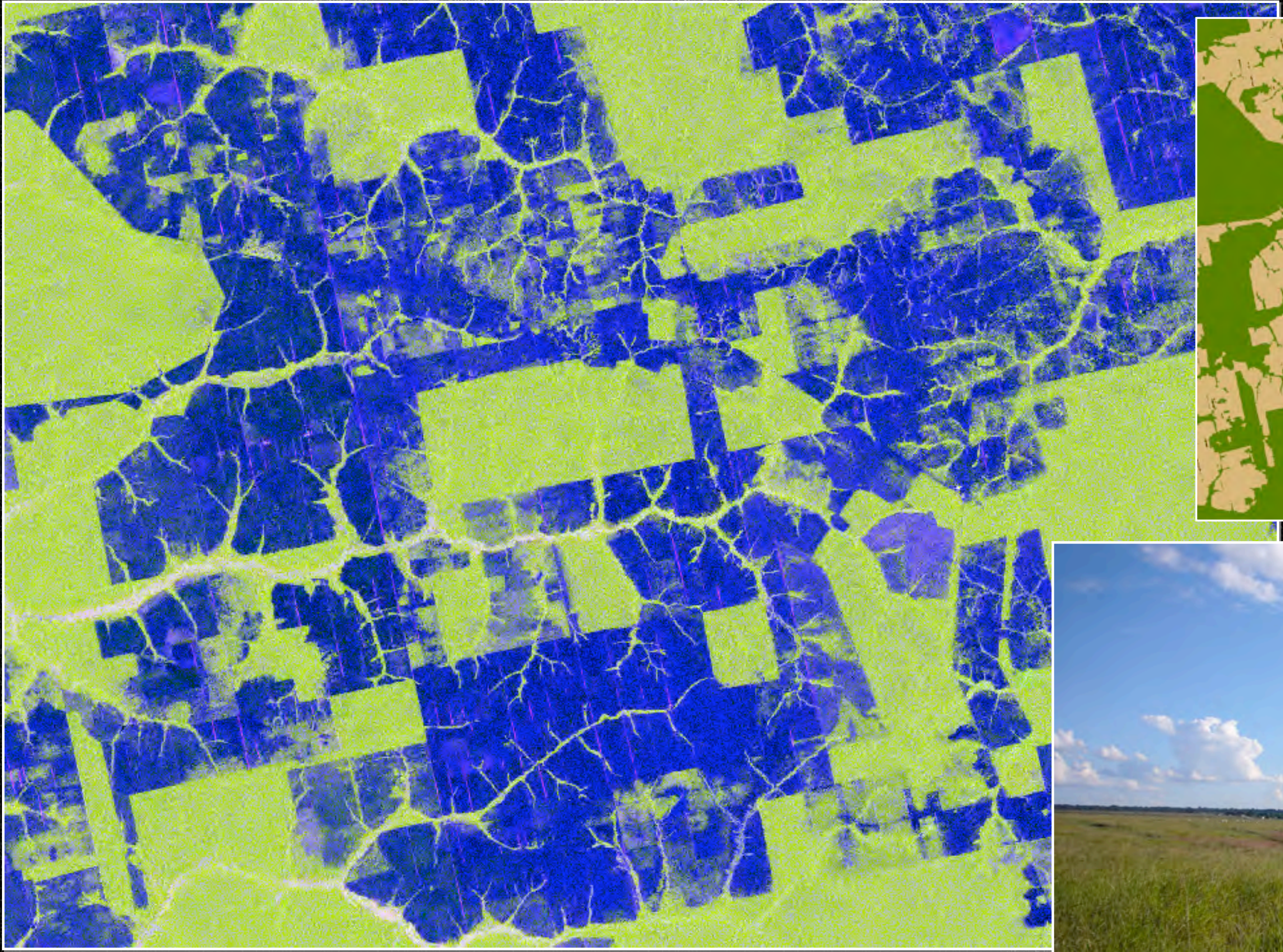
627 samples

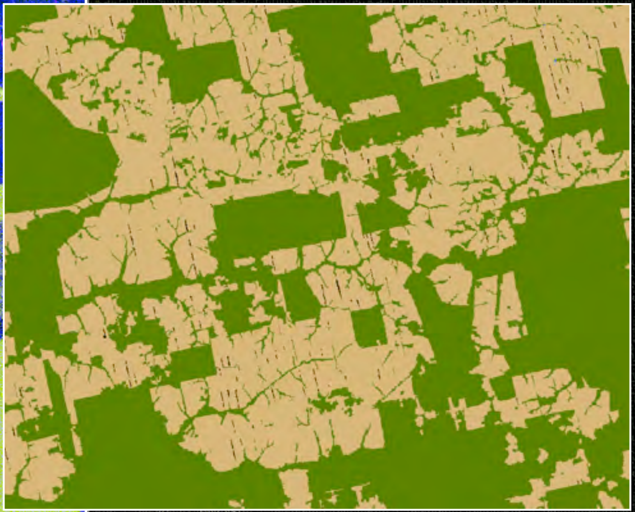
30% withheld for testing

	AG	F	R	RD	WL
AG	103	10	2	0	1
F	10	124	0	0	0
R	0	0	13	0	0
RD	0	0	0	3	0
WL	2	1	0	0	6

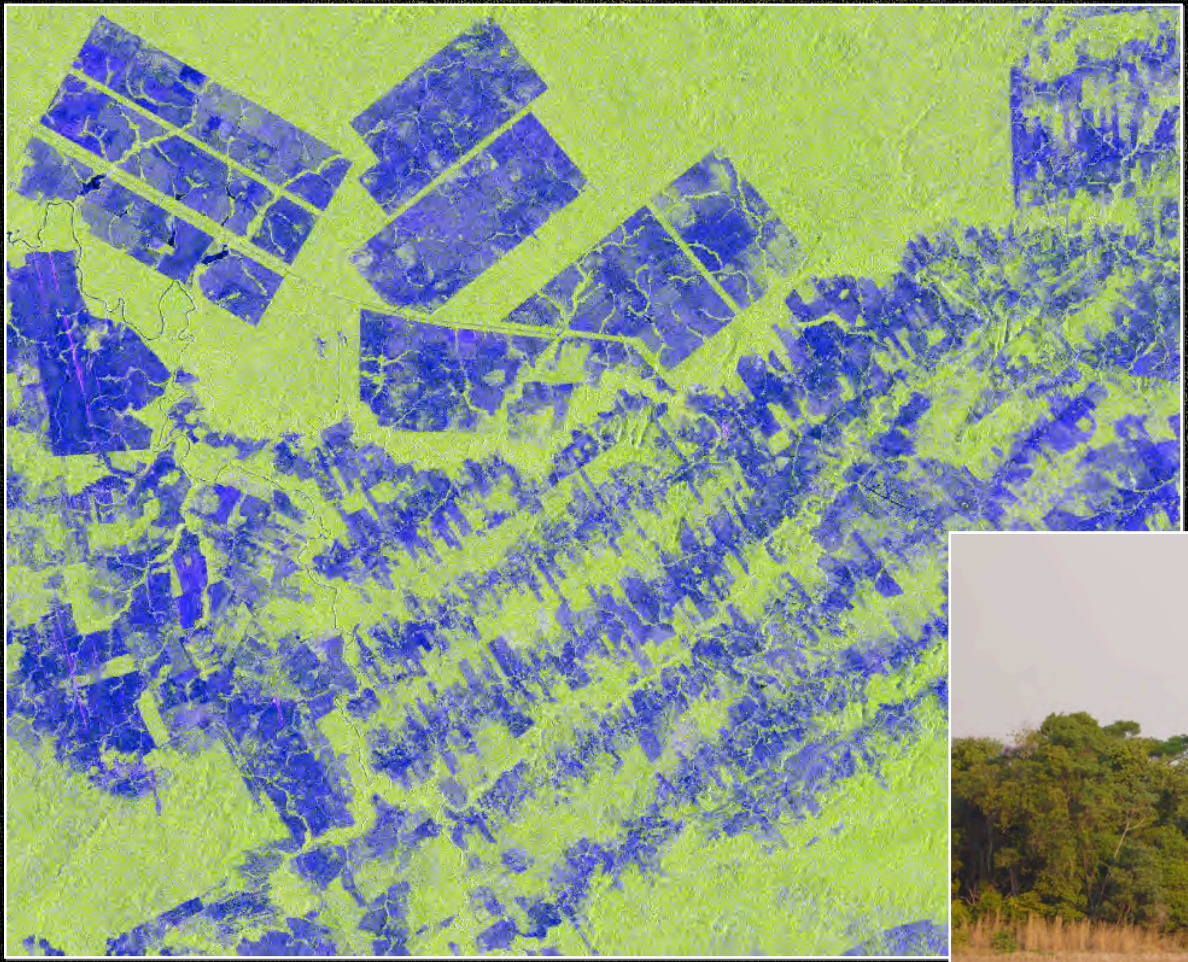
```
[1] Number of observations: 275
[1] Sum of weighted sum of row, column weights: 1 , 1
[1] Summary of weighted naive statistics
[1] Overall accuracy, stdev, CV%: 0.9055 , 0.0176 , 1.9
[1] 95% confidence limits for accuracy:0.8691...0.9419
[1] User's weighted accuracy
    AG      F      R     RD     WL
0.8879 0.9254 1.0000 1.0000 0.6667
[1] Producer's weighted reliability:
    AG      F      R     RD     WL
0.8957 0.9185 0.8667 1.0000 0.8571
[1] Summary of weighted kappa statistics
[1] Overall weighted kappa, stdev, & CV%: 0.8372 , 0.0305 , 3.6
[1] 95% confidence limits for weighted kappa:0.7757...0.8988
```

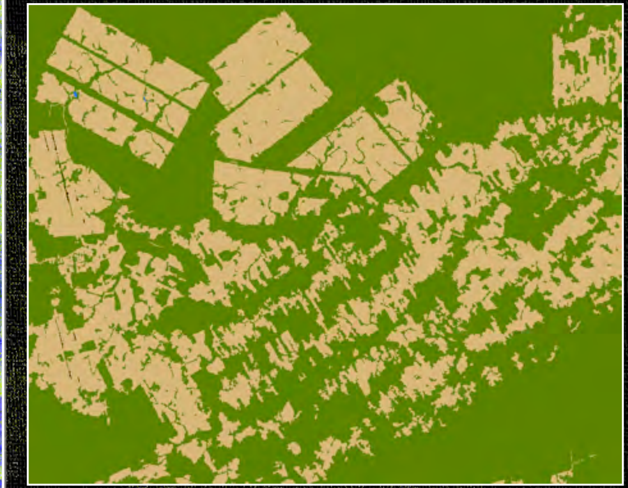
Large-Holder Pasture Expansion as seen by ALOS/PALSAR



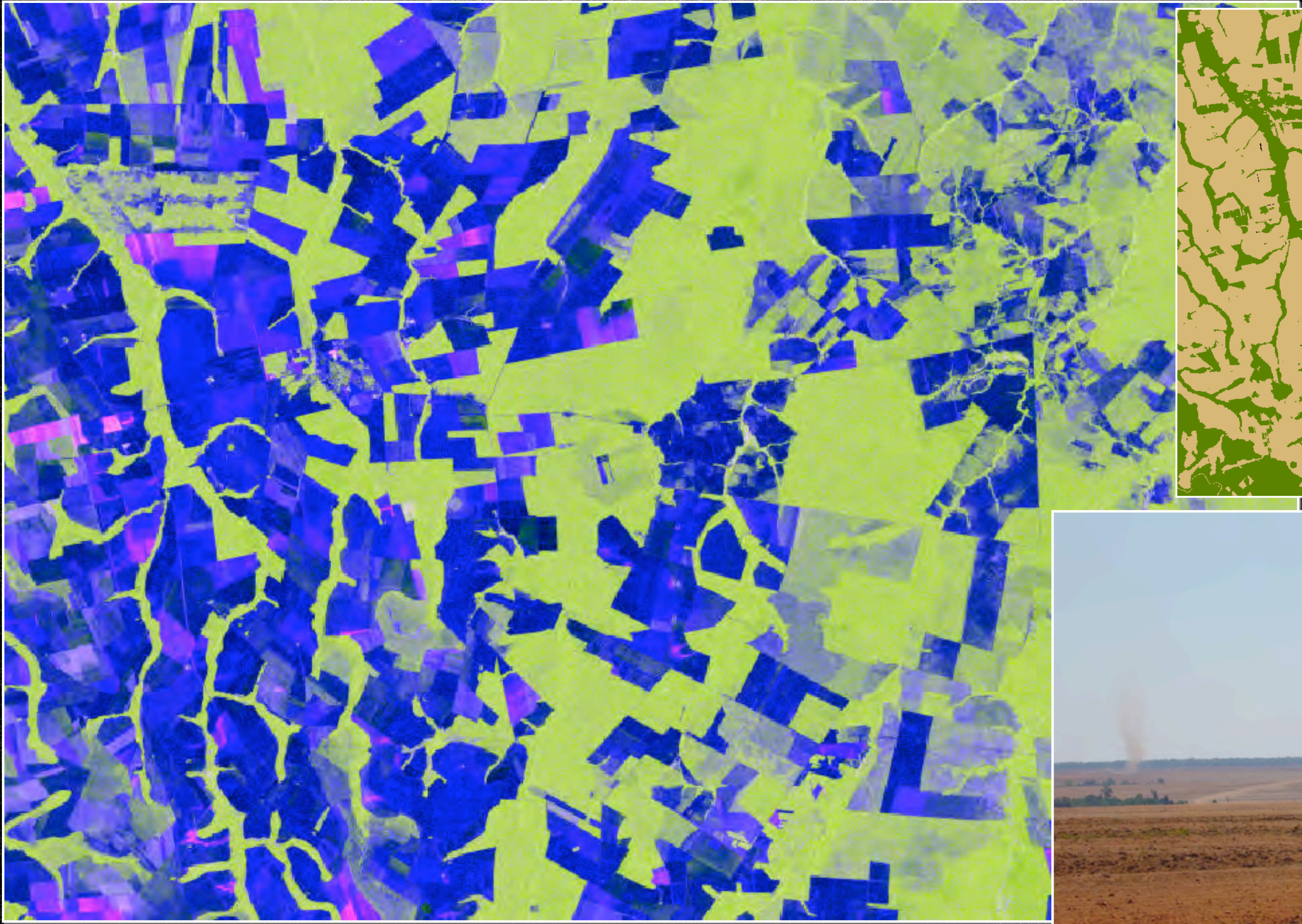


Small-Holder meets Large-Holder as seen by ALOS/PALSAR



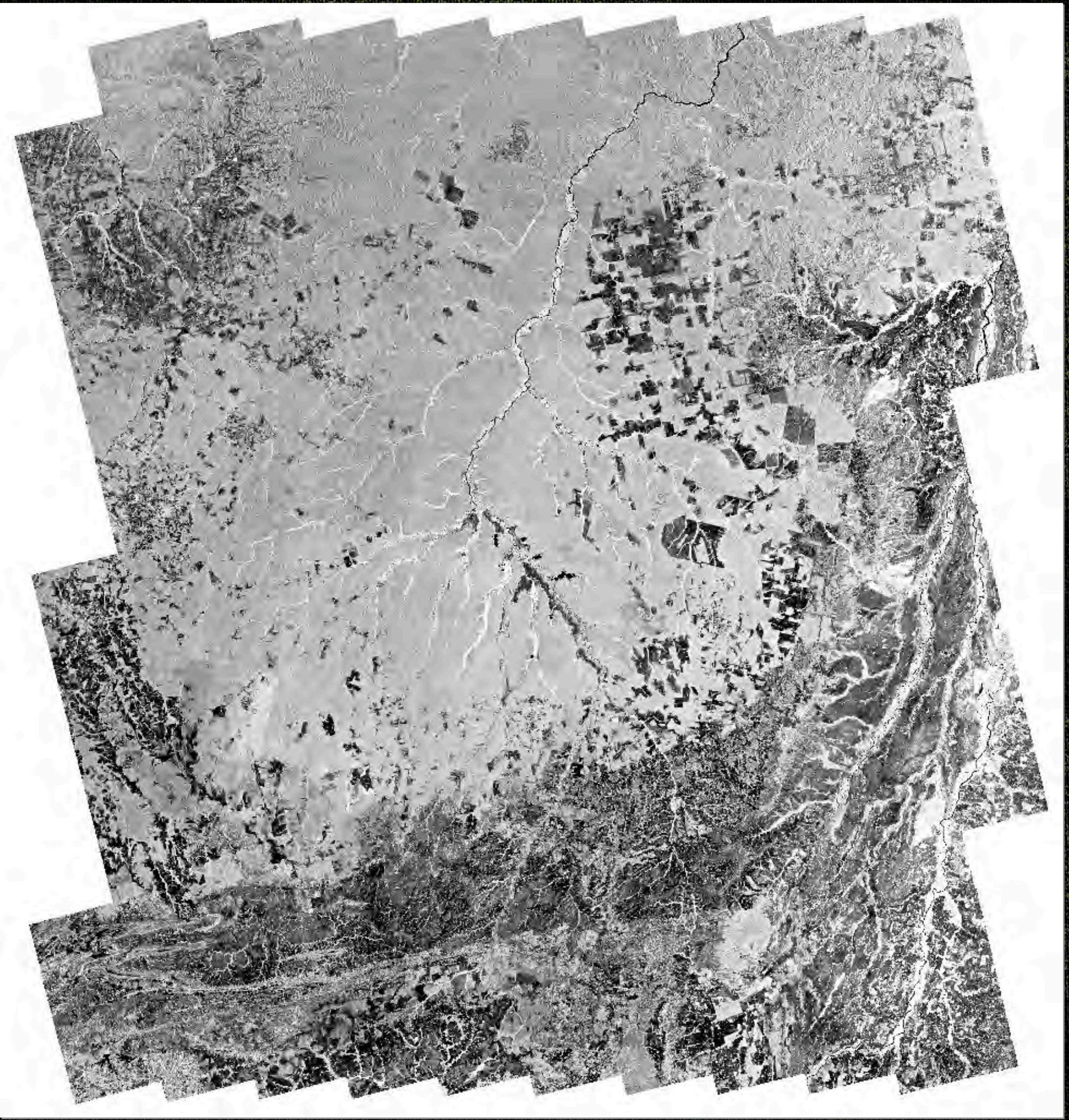


Large-Holder Soy-Field Expansion as seen by ALOS/PALSAR



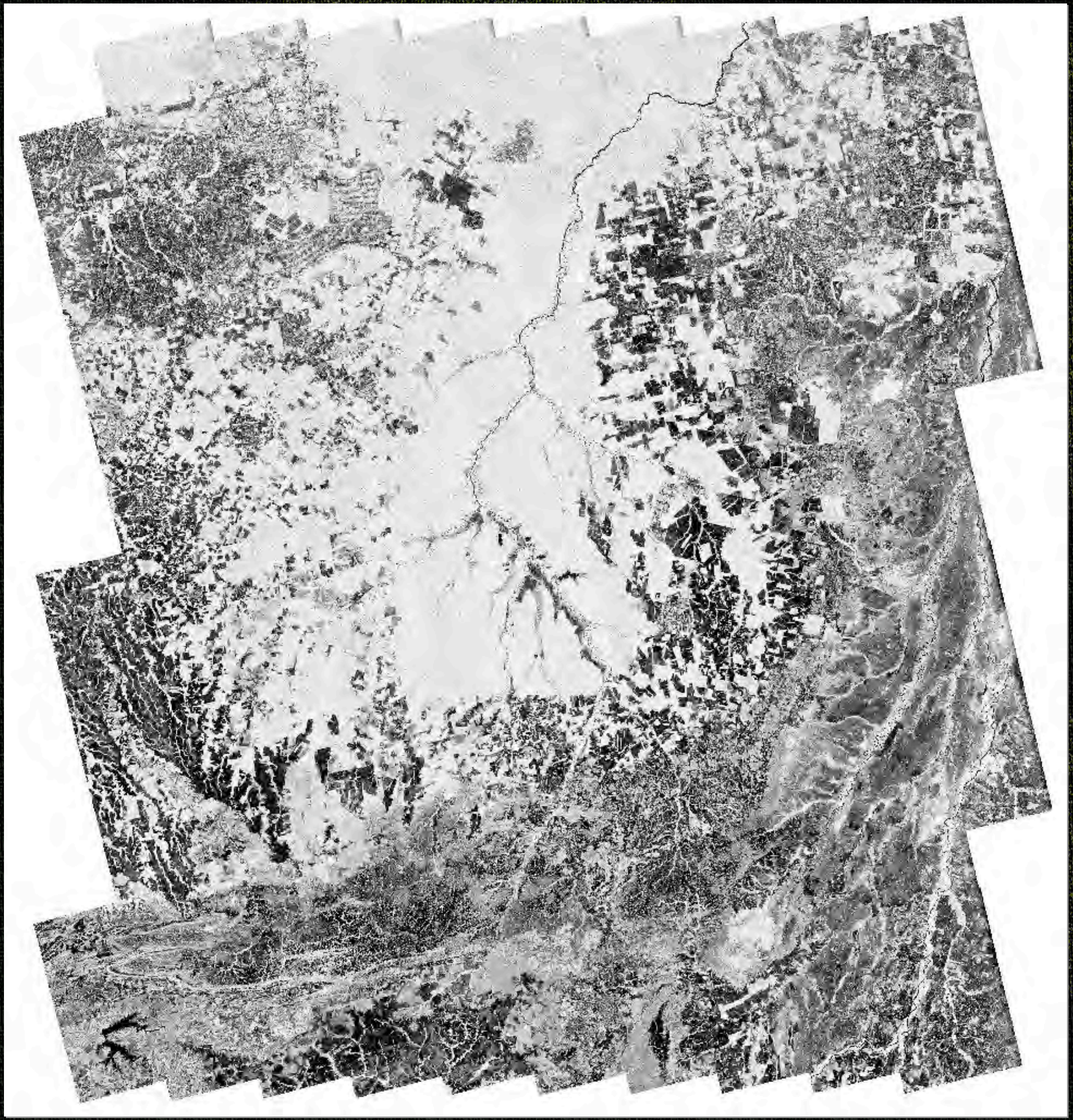
Josef Kellndorfer, WHRC , K&C9 Meeting , Tokyo, Jan 2008

11 Year Change ...



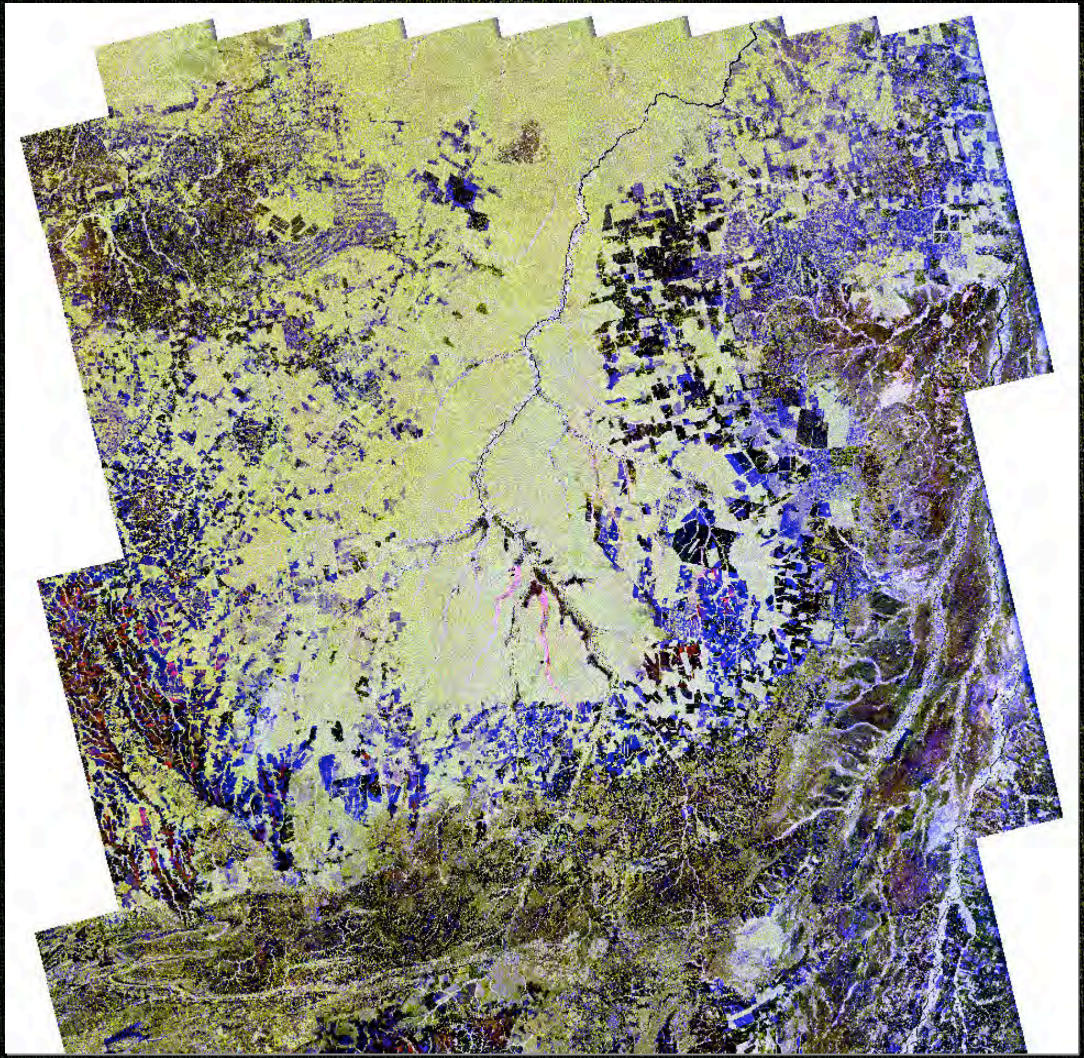
JERS-1 GRFM data 1996

11 Year Change ...



ALOS L-HV 2007

11 Year Change ...



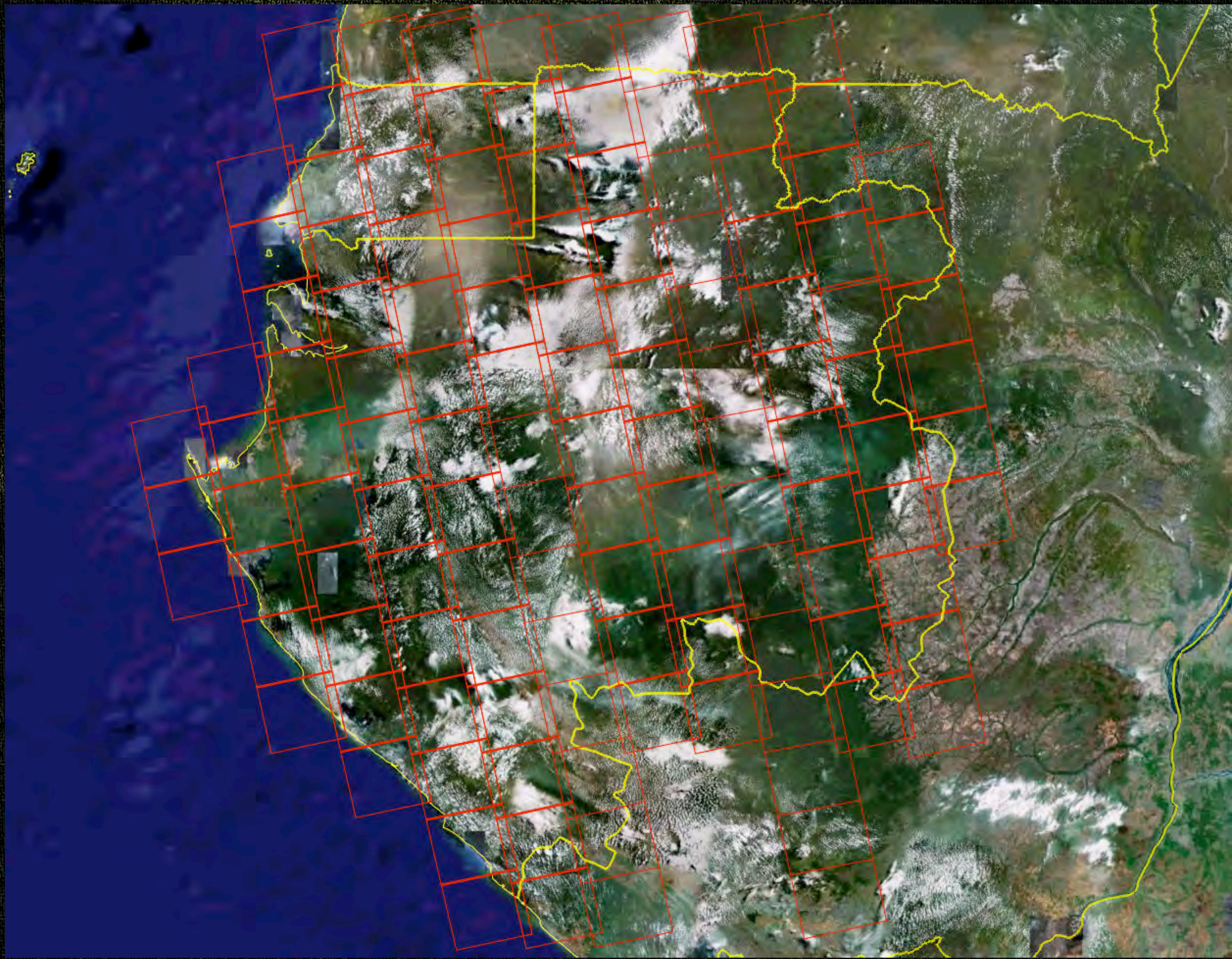
Red ALOS LHH
GREEN ALOS LHV
BLUE JERS-1 LHH

Blue colors indicate new deforestation

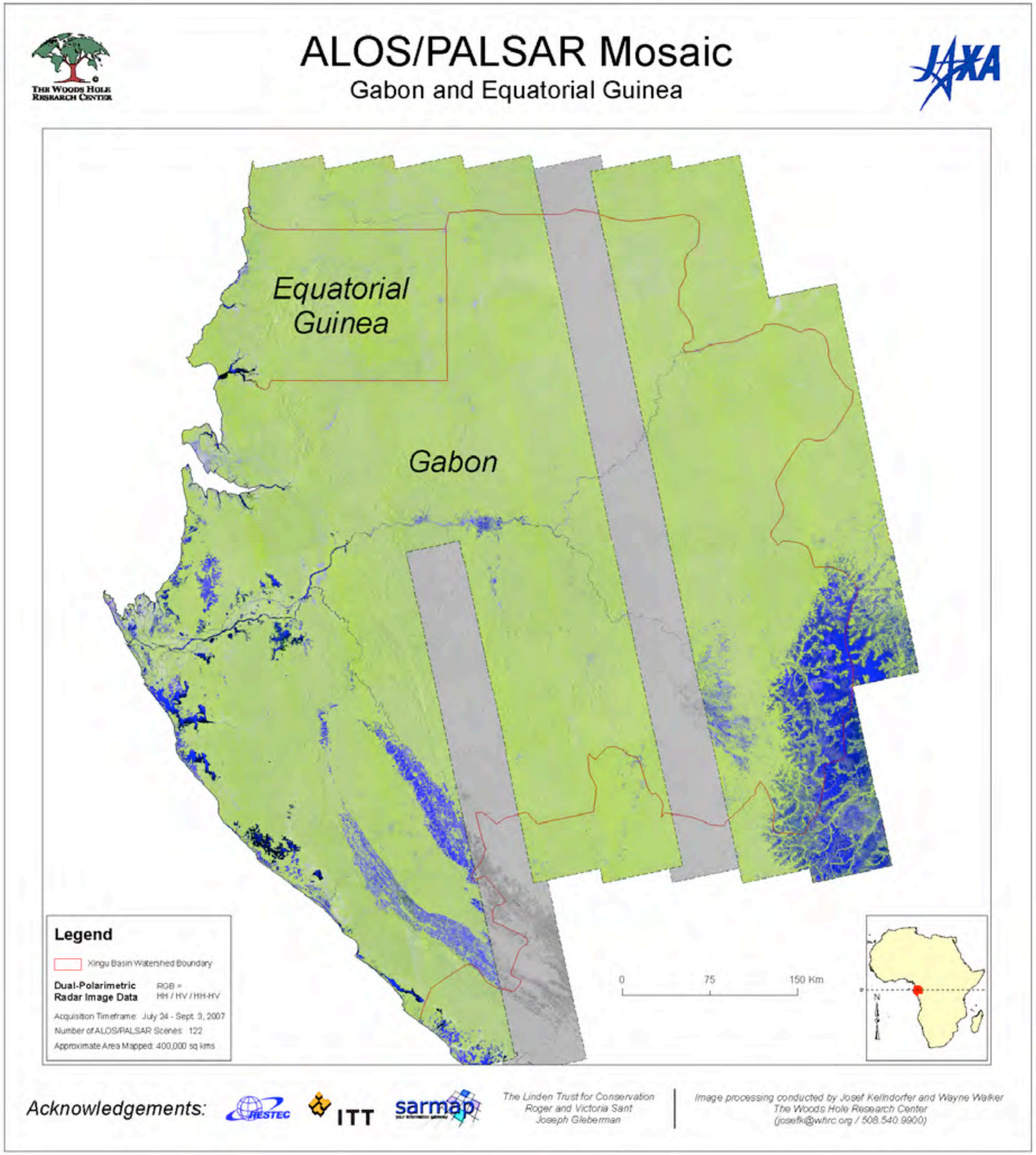
ALOS/PALSAR Dual-Pol Mosaic of Gabon and Equatorial Guniea

THE WOODS HOLE RESEARCH CENTER

ALOS/PALSAR Dual-Pol Mosaic of Gabon and Equatorial Guniea



Josef Kellndorfer, WHRC , K&C9 Meeting , Tokyo, Jan 2008



Gabon and Equatorial Guniea as seen by ALOS/PALSAR

Acquisition Dates:

Dual-Pol (103 Scenes):

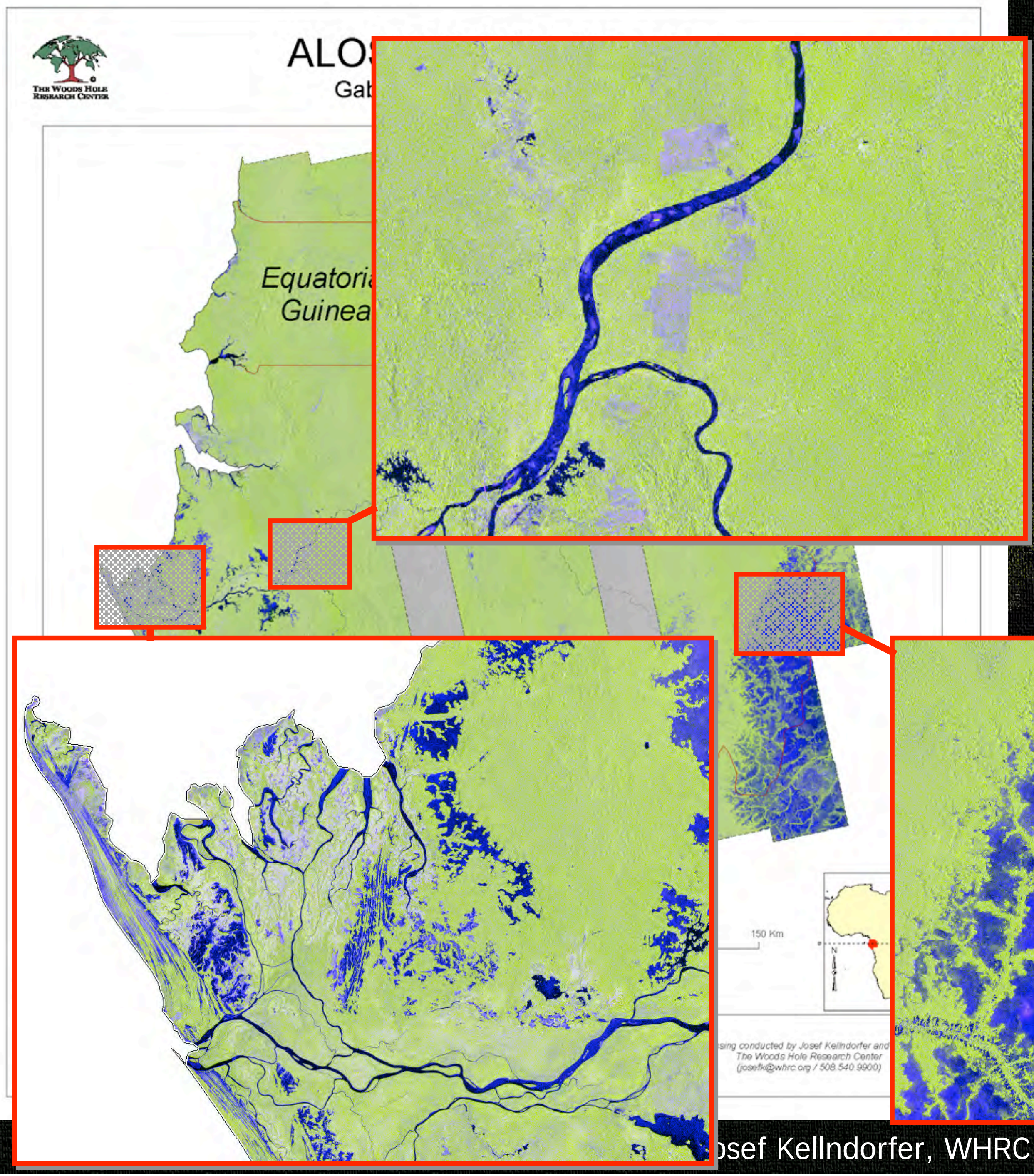
July 28 - Sep 4 2007

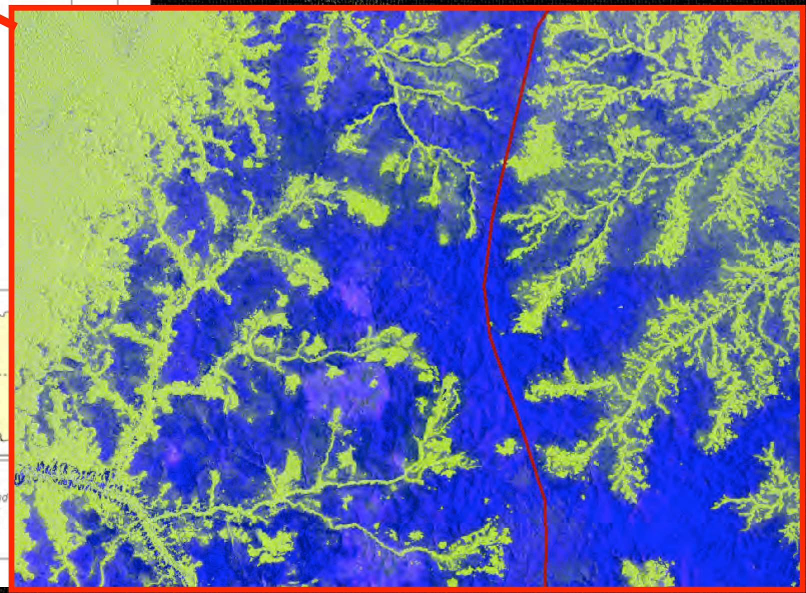
Single-Pol (24 Scenes):

Jan 28 - Feb 02

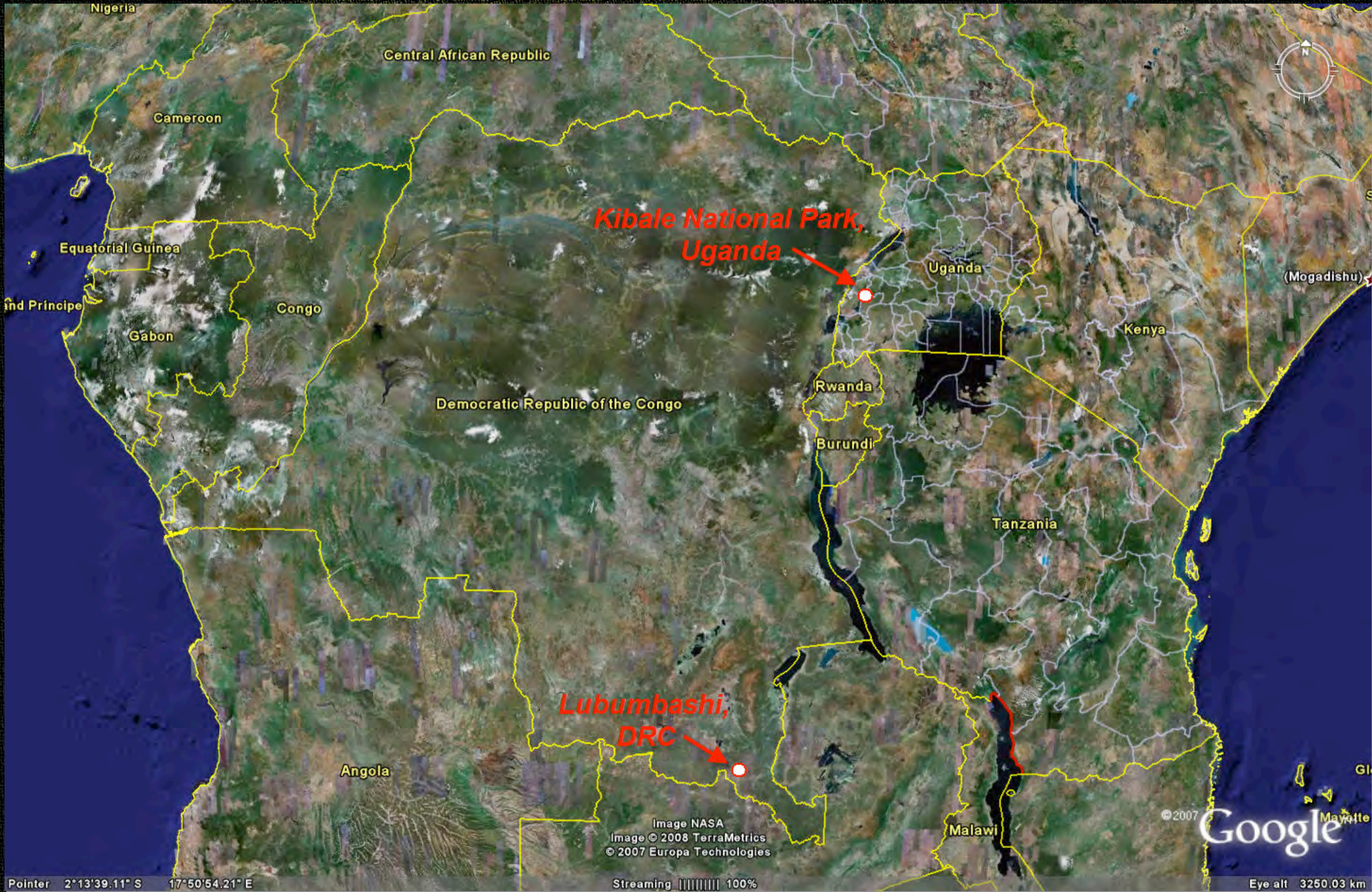
The Woods Hole Research Center

Gabon and Equatorial Guniea as seen by ALOS/PALSAR





Uganda/DRC First Looks

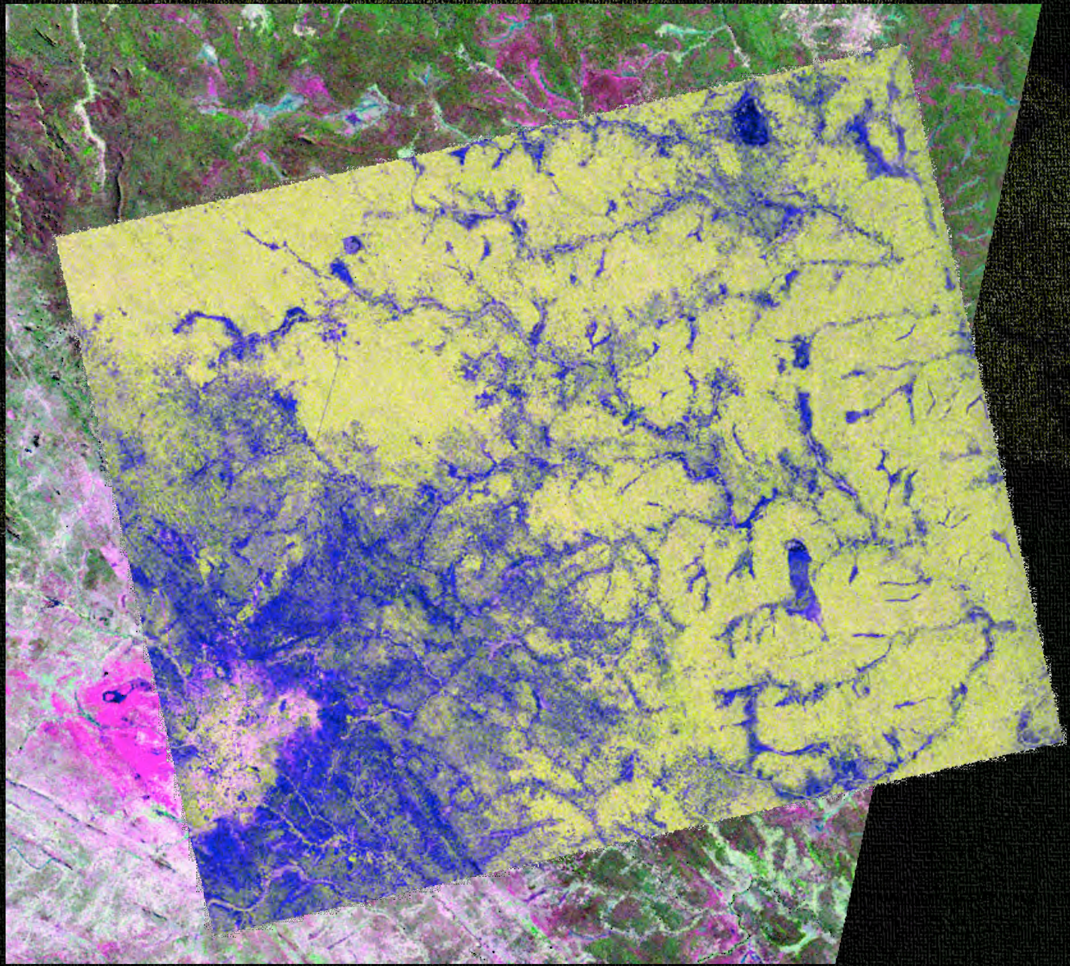


Josef Kellndorfer, WHRC , K&C9 Meeting , Tokyo, Jan 2008

Lubumbashi, Southern DRC

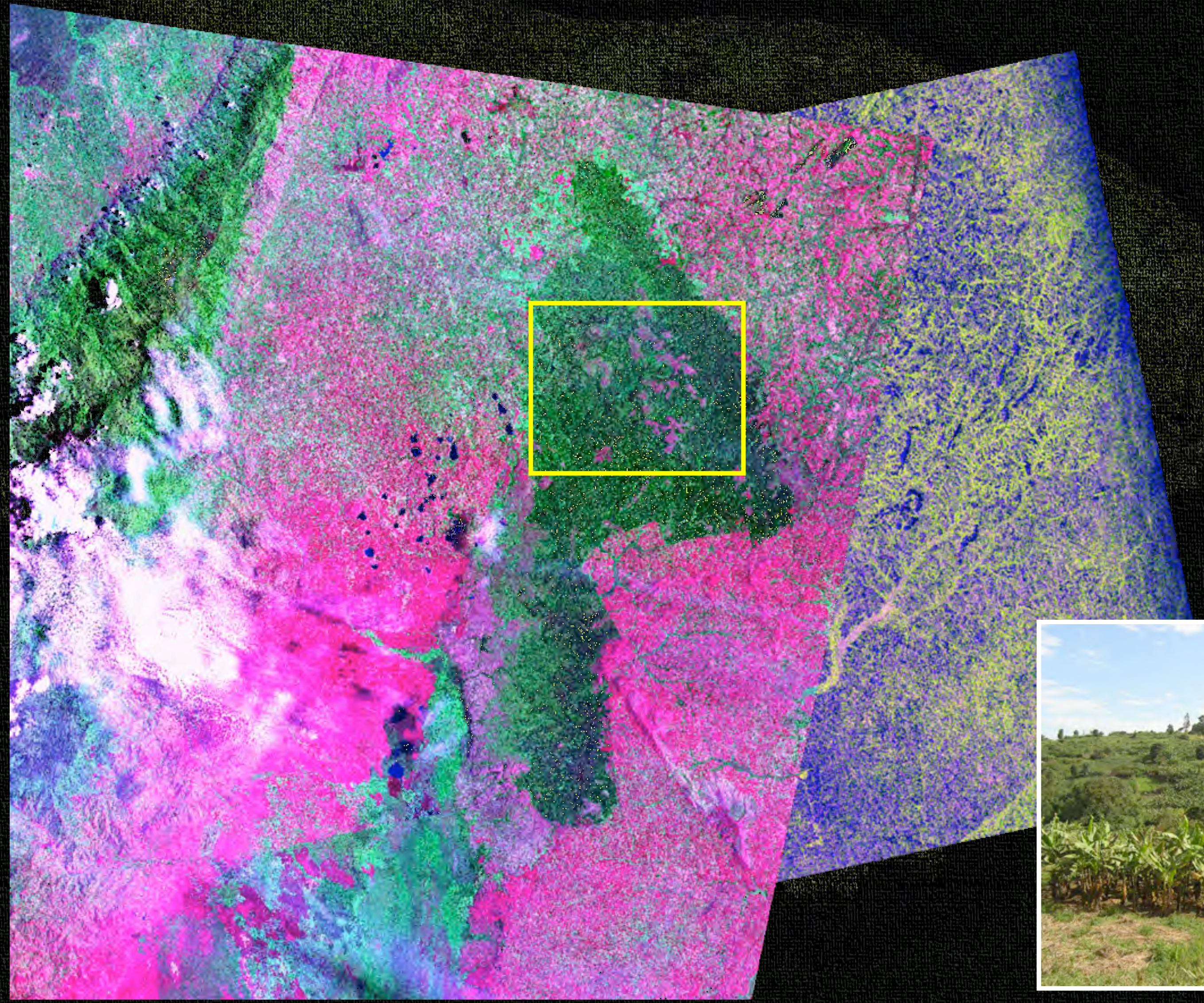
as seen by Landsat ETM (2001) and ALSO/PALSAR (2007)

THE WOODS HOLE RESEARCH CENTER



Kibale NP, Western Uganda

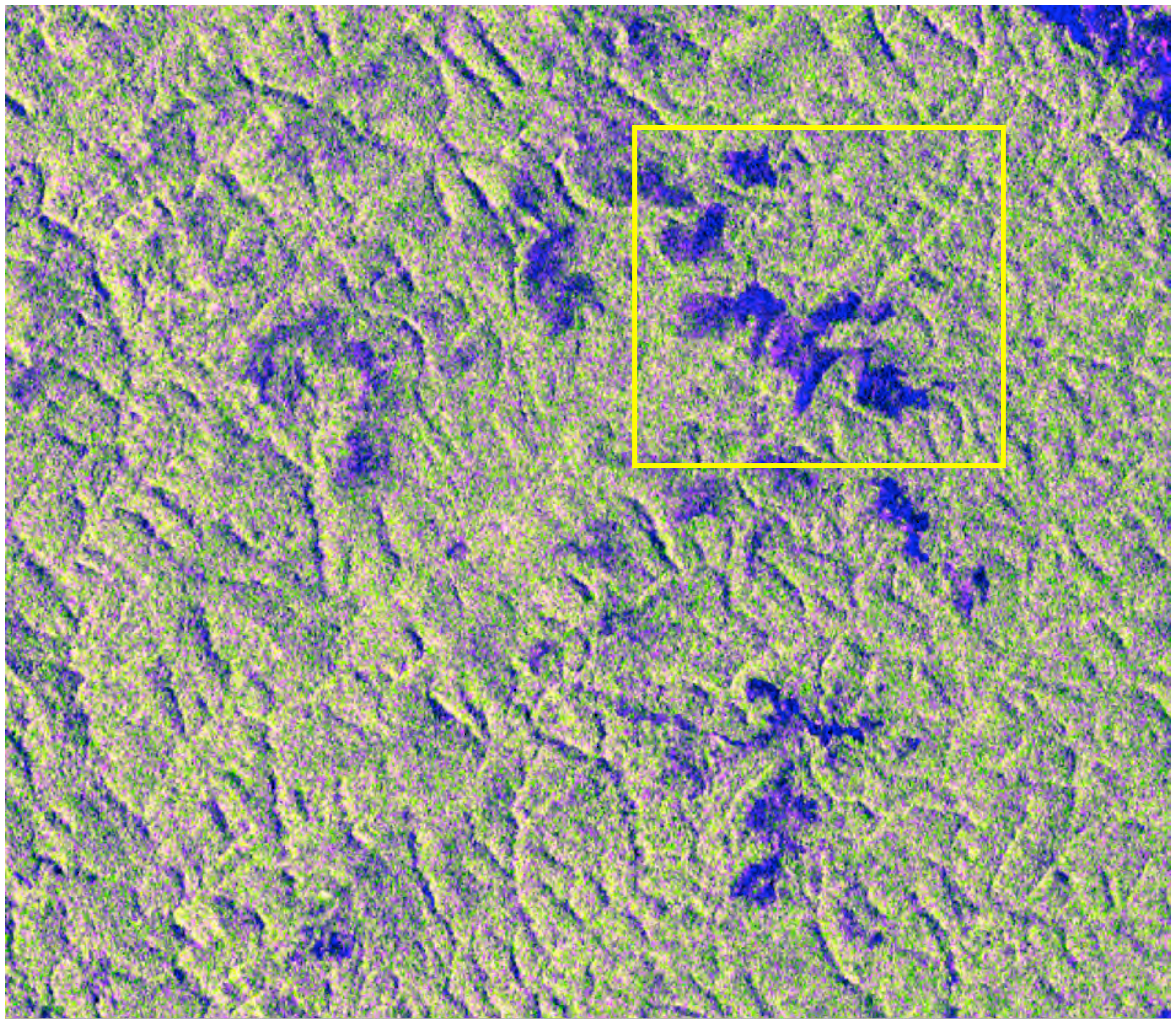
as seen by Landsat ETM (2001) and ALOS/PALSAR (2007)



Josef Kellndorfer, WHRC , K&C9 Meeting , Tokyo, Jan 2008

Kibale NP, Western Uganda

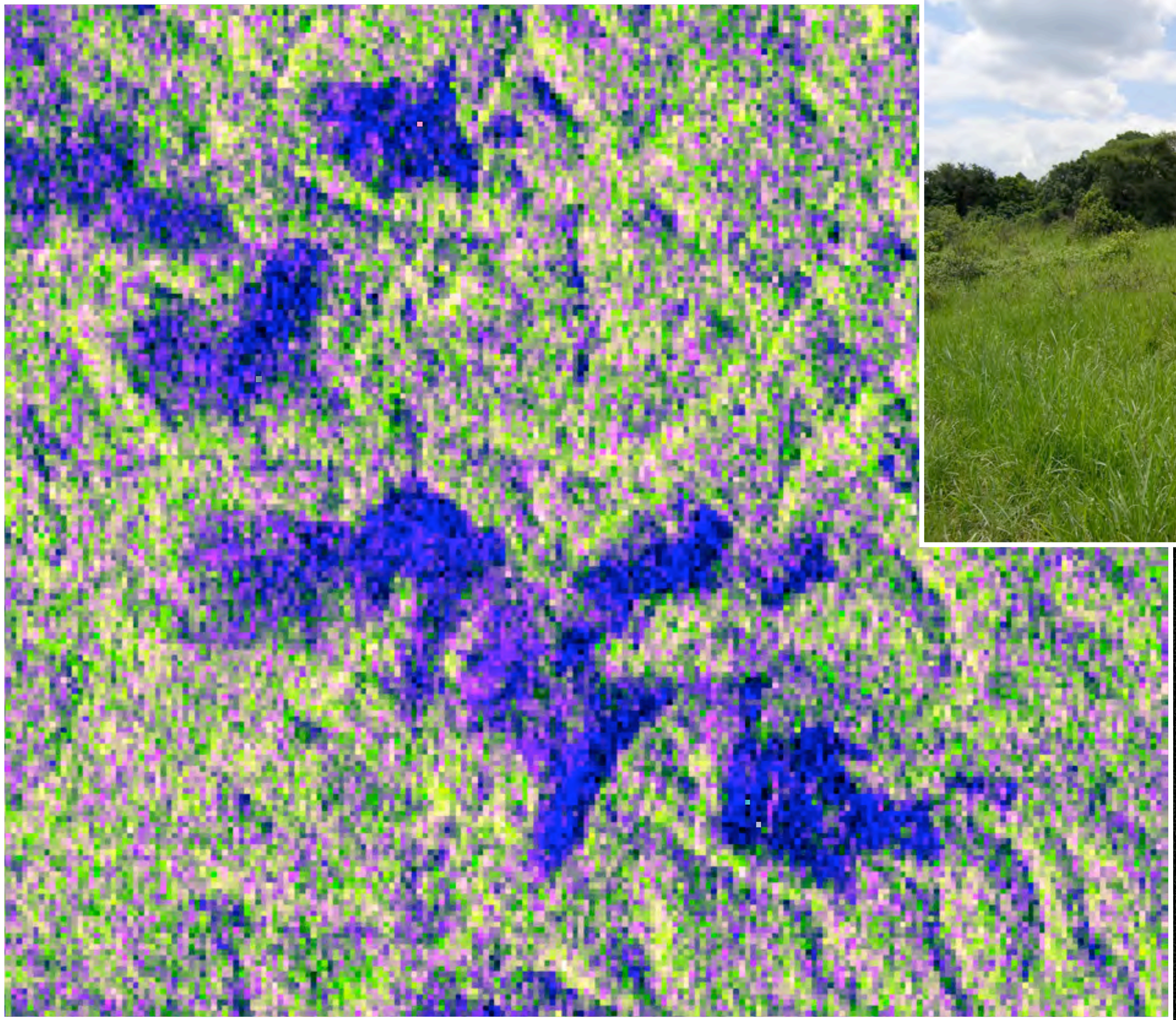
as seen by ASTER (2004) and ALOS/PALSAR (2007)



Kibale NP, Western Uganda

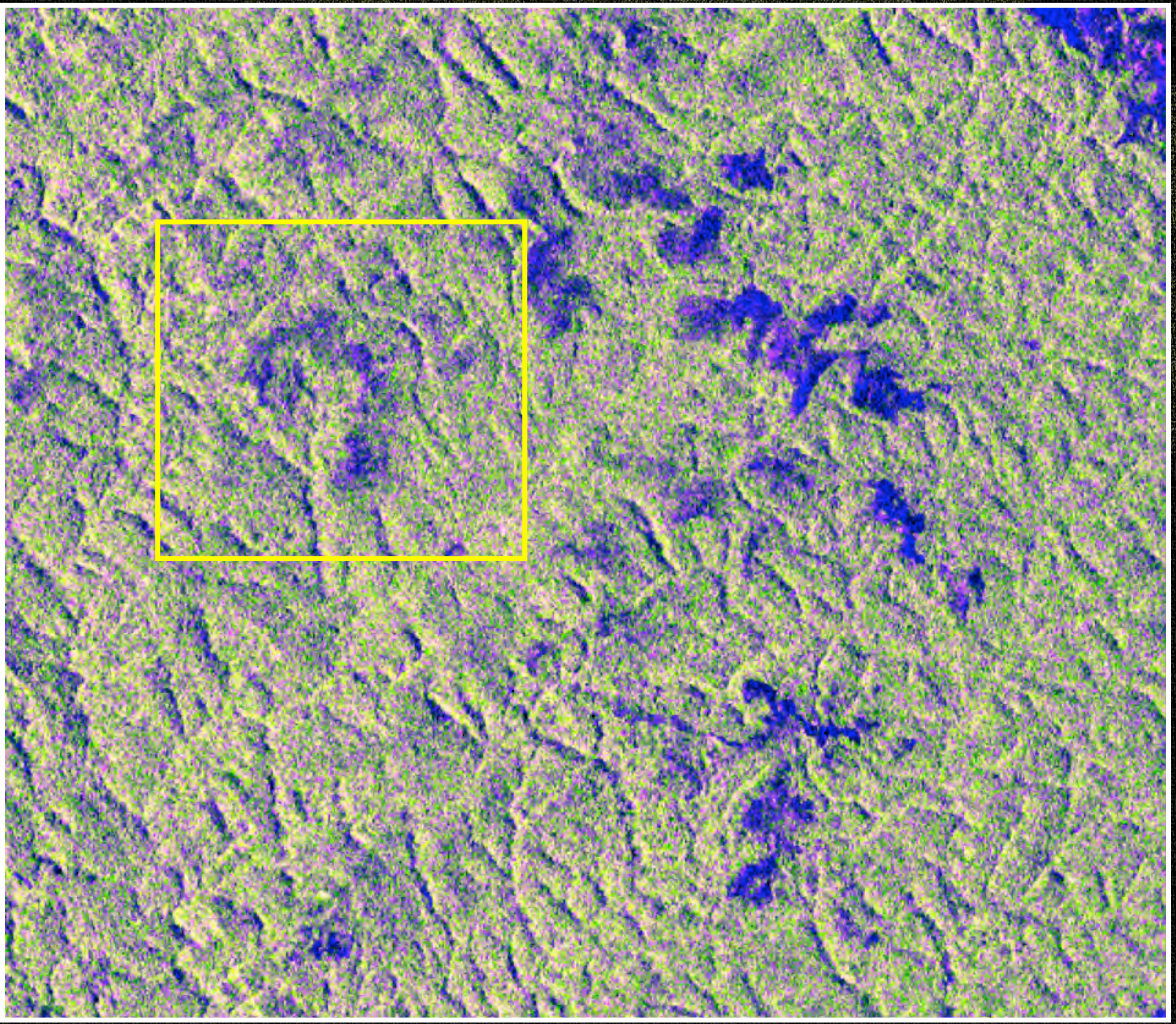
as seen by ASTER (2004) and ALOS/PALSAR (2007)

THE WOODS HOLE RESEARCH CENTER



Kibale NP, Western Uganda

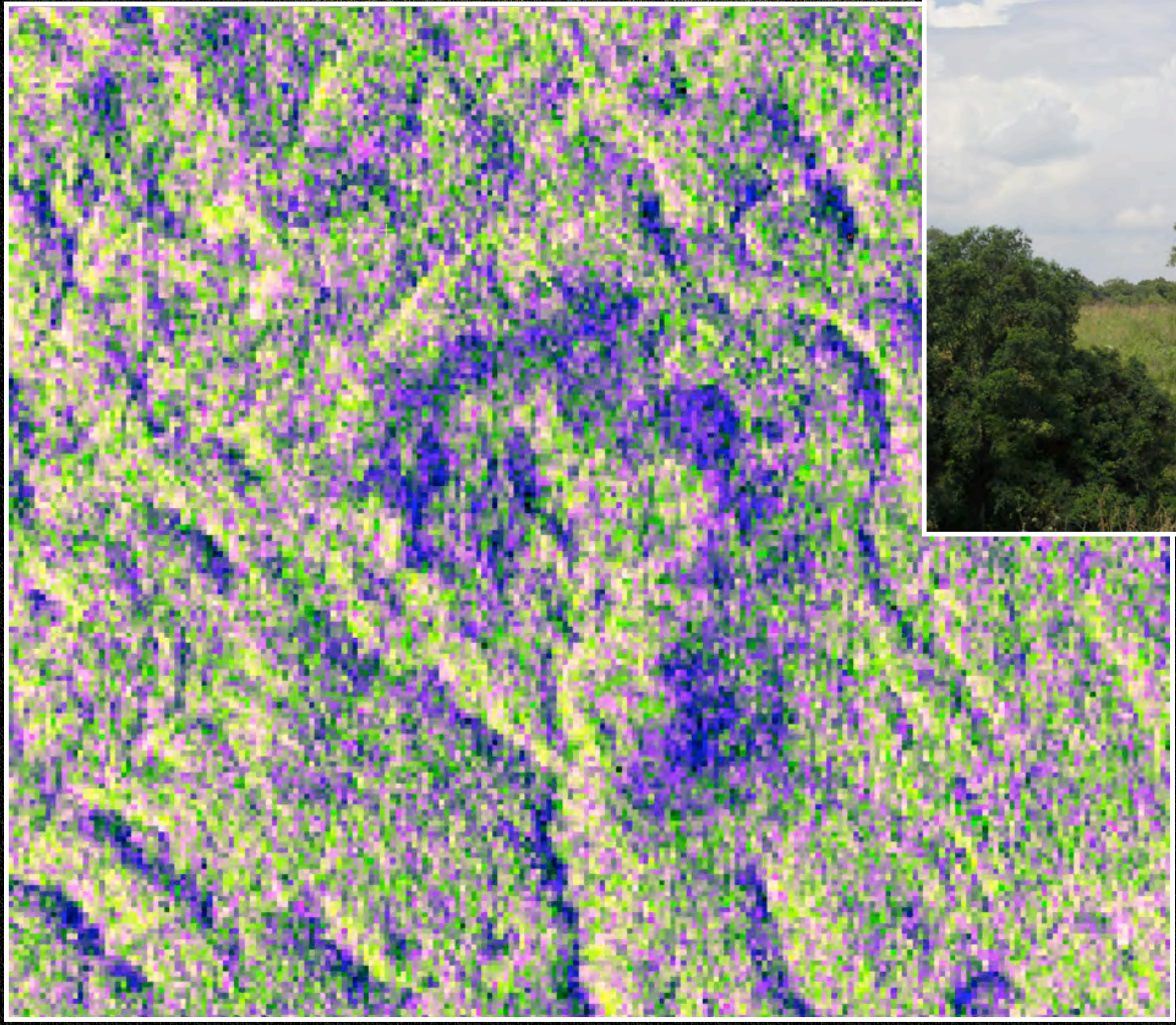
as seen by ASTER (2004) and ALOS/PALSAR (2007)



THE WOODS HOLE RESEARCH CENTER

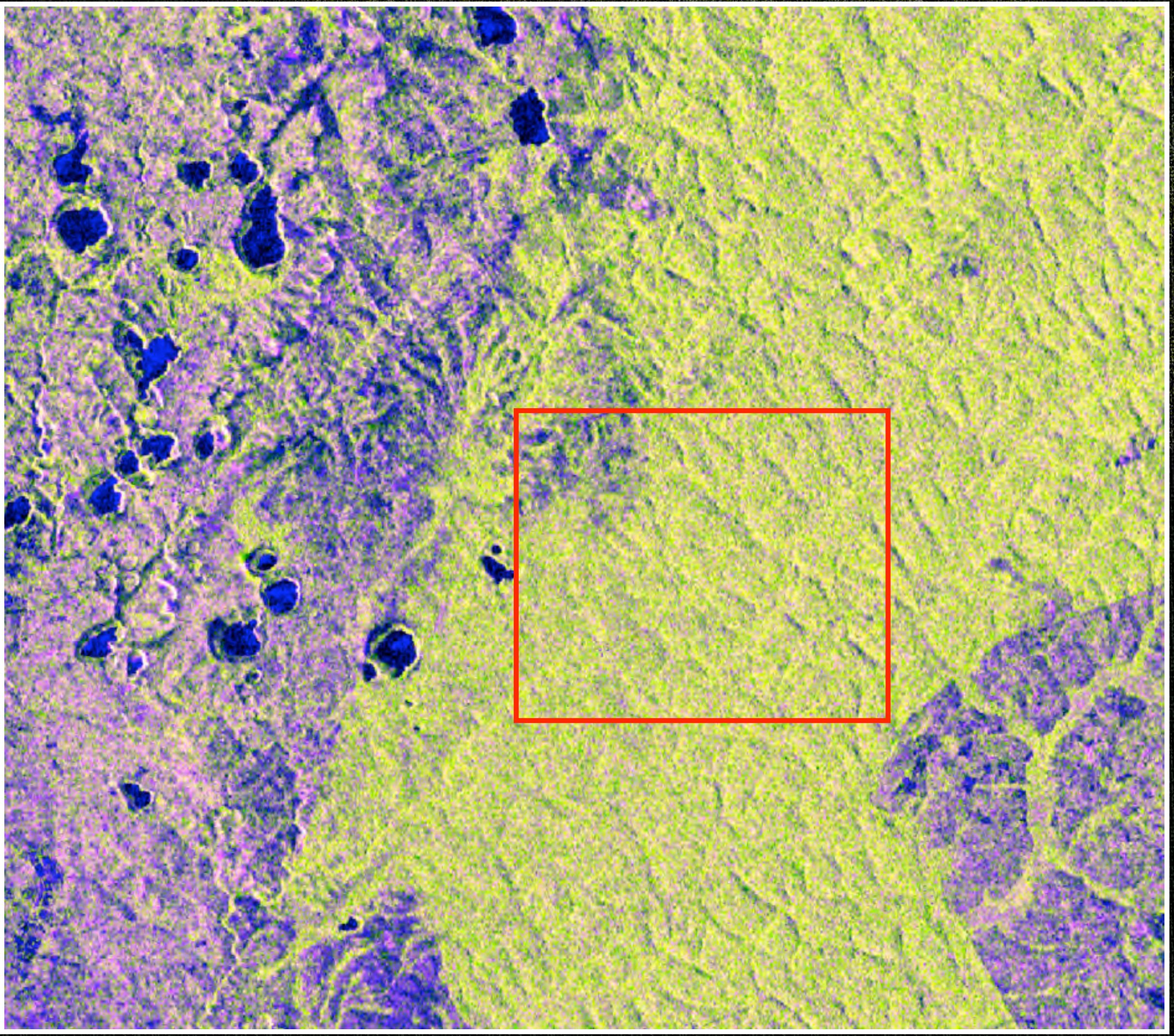
Kibale NP, Western Uganda

as seen by ASTER (2004) and ALOS/PALSAR (2007)



Kibale NP, Western Uganda

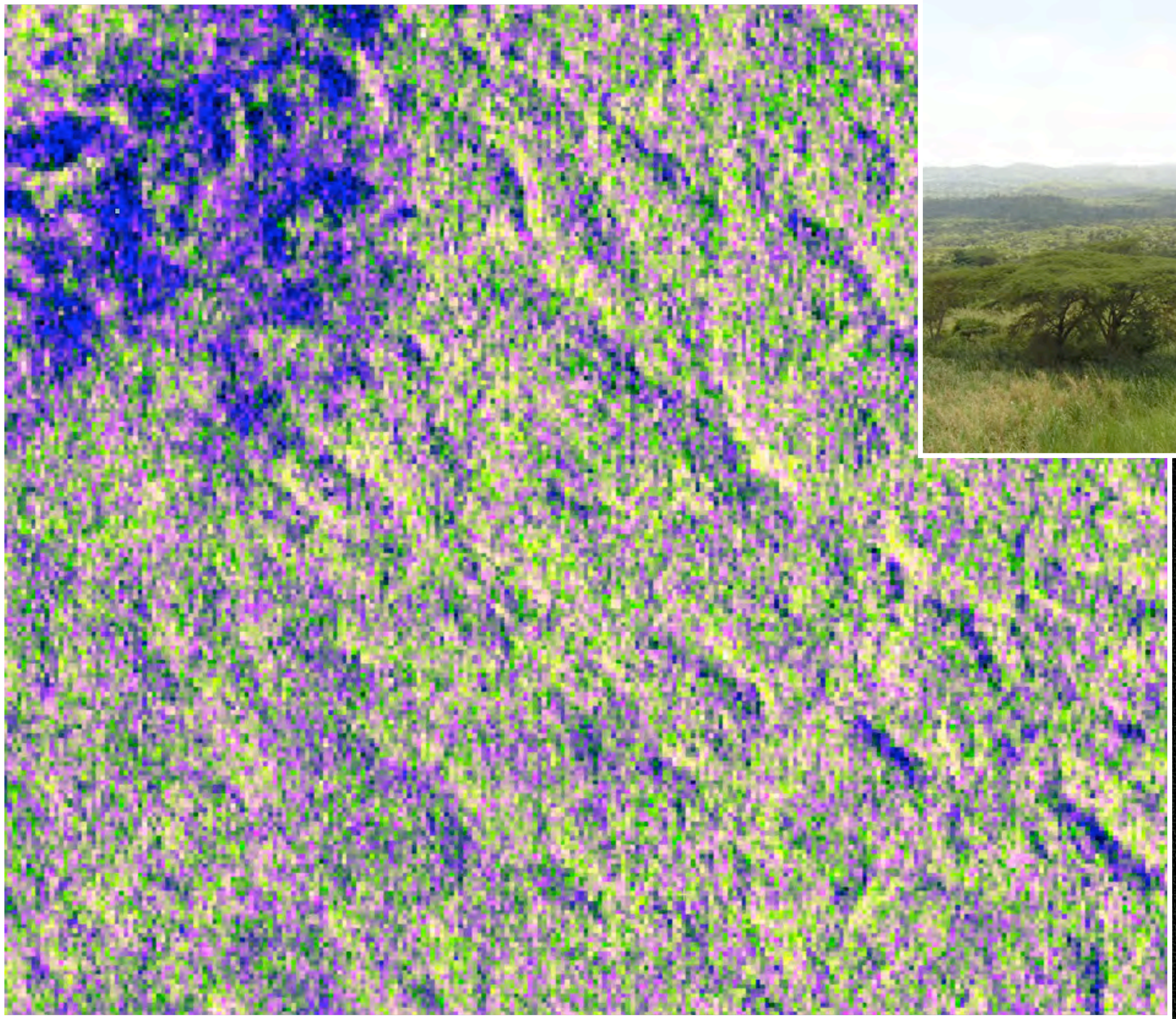
as seen by ASTER (2004) and ALOS/PALSAR (2007)



THE WOODS HOLE RESEARCH CENTER

Kibale NP, Western Uganda

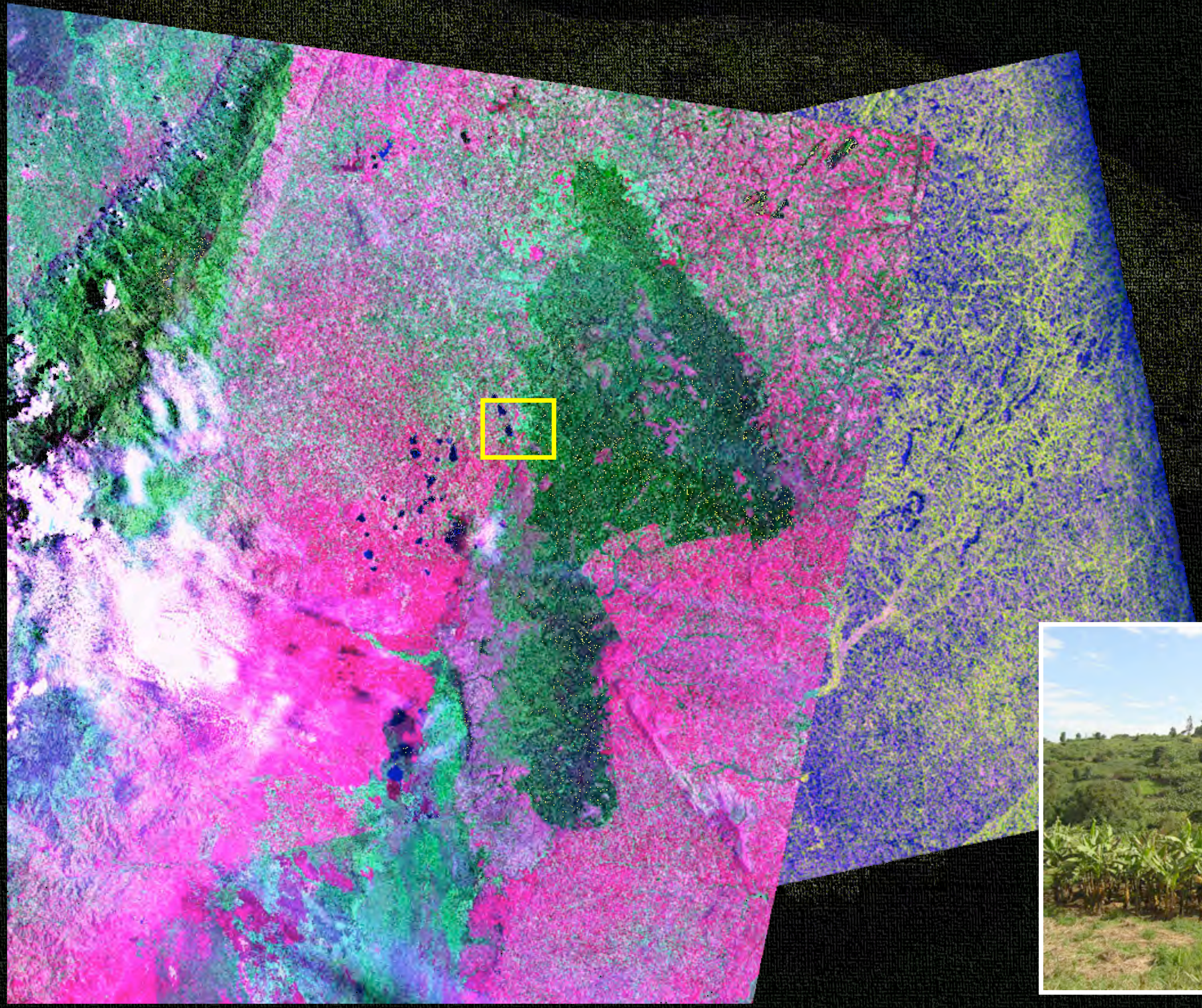
as seen by ASTER (2004) and ALOS/PALSAR (2007)



Kibale NP, Western Uganda

as seen by Landsat ETM (2001) and ALOS/PALSAR (2007)

THE WOODS HOLE RESEARCH CENTER

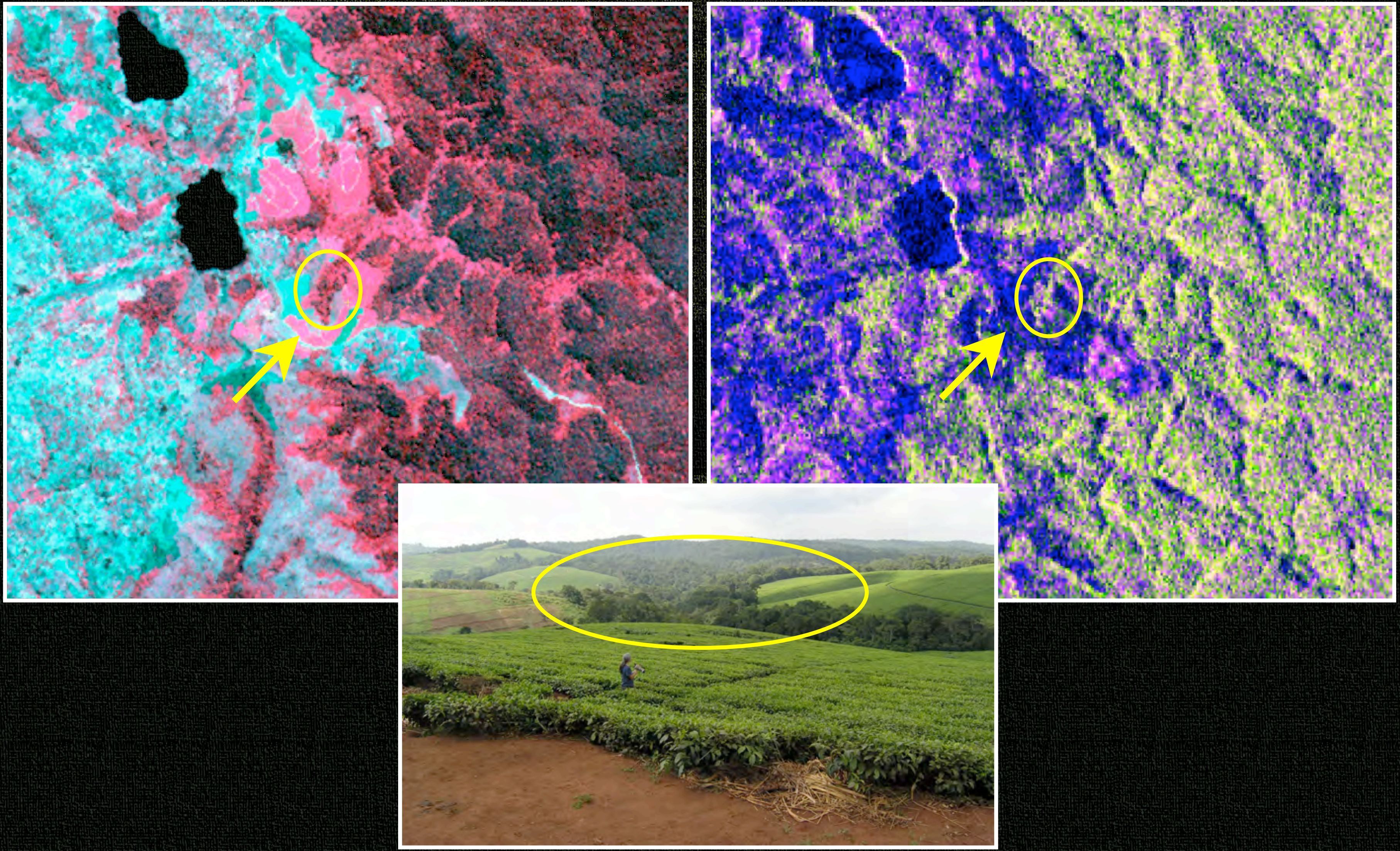


Josef Kellndorfer, WHRC , K&C9 Meeting , Tokyo, Jan 2008

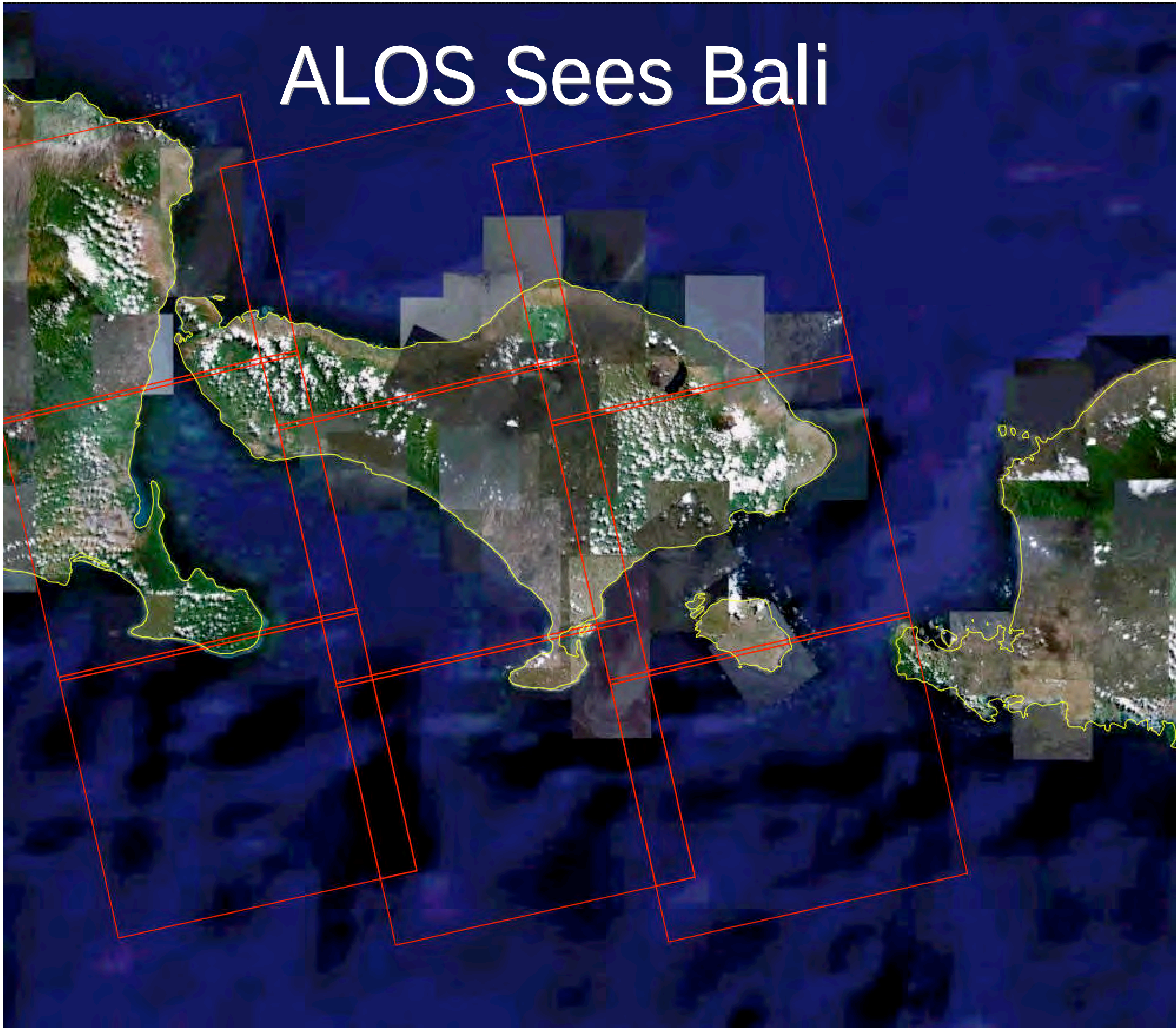
The Woods Hole Research Center

Kibale NP, Western Uganda

as seen by ASTER (2004) and ALOS/PALSAR (2007)

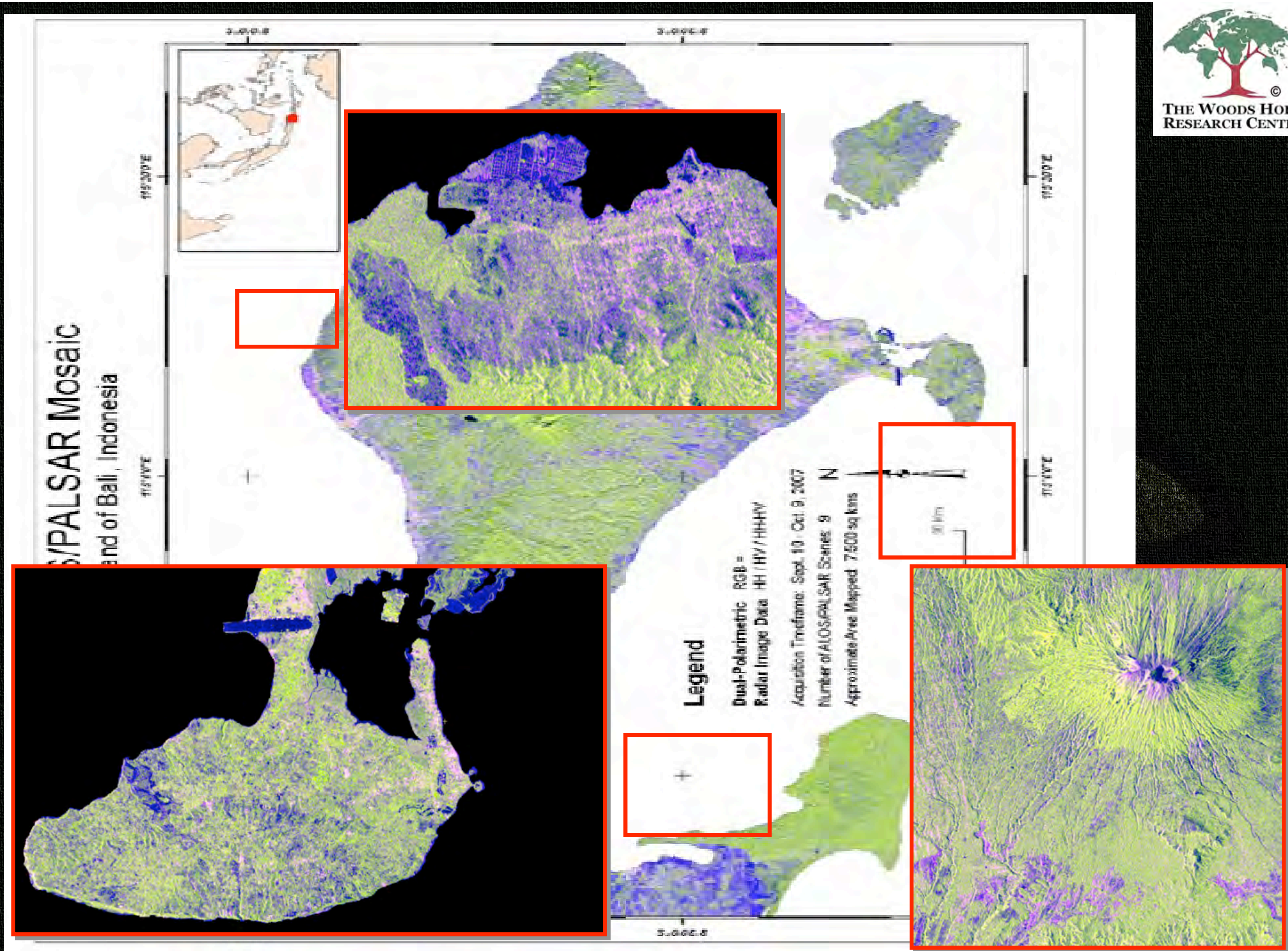


ALOS Sees Bali



The Woods Hole Research Center

yo, Jan 2008



THE WOODS HOLE RESEARCH CENTER


Bali, Indonesia
Sep 10 - Oct 9th 2007
Imaged by ALOS/PALSAR
Superimposed on SRTM
We were here -
Or maybe here ...
Dec 3rd - Dec 14th 2007

SCIENCE April 27 2007

©
THE WOODS HOLE RESEARCH CENTER

CARBON EMISSIONS

Improved Monitoring of Rainforests Helps Pierce Haze of Deforestation

Deforestation produces a significant amount of greenhouse gas emissions through burning, clearing, and decay. But exactly how much?

Twenty-five years ago, the best way for Brazilian scientists to gauge the rate of deforestation in the Amazon was to superimpose dots on satellite photos of the world's largest rainforest that helped them measure the size of the affected area. INPE, the government agency responsible for remote deforestation monitoring, didn't release regional maps and refused to explain its analytical methods. The result was data that few experts found credible.

Today, Brazil's monitoring system is the envy of the world. INPE has its own remote-sensing satellite, a joint effort with China launched in 1999, that allows it to publish yearly totals of deforested land that scientists regard as reliable. Using data from NASA's 7-year-old Terra satellite, INPE also provides automated weekly clear-cutting alerts that other tropical nations would love to emulate. And image-analysis algorithms have eliminated the need for measurement dots. "They've really turned things around," says forestry scientist David Skole of Michigan State University in East Lansing.

Generating good data on deforestation is more than an academic exercise. The process of cutting down forests and clearing the land—by burning the wood, churning soil for agriculture or grazing, and allowing the remaining biomass to decay—produces as much as 25% of the world's yearly emissions of greenhouse gases. That makes keeping tabs on deforestation a crucial issue for government officials negotiating future climate agreements—including a meeting next month in Bonn, Germany, and one next year in Bali to extend the 1997 Kyoto agreement after its 2012 expiration.

Despite solid improvements by scientists in monitoring deforestation, the uncertainties are still substantial. The gap between remote-sensing data and field measurements on the amount of deforested land is between 5% and 10%, say researchers. And the error bars on estimates of the amount of CO_2 released by clear-cutting those tracts, they note, are 25% to 50%. These errors, related to gaps in fundamental understanding of forest carbon, will make it harder for developing nations to verify the extent to which they have managed to reduce deforestation and, thus, reduce their output of greenhouse gases. In turn, the uncertainty undermines efforts to convince skeptical lawmakers in industrialized countries that efforts to diminish deforestation should be a part of future climate-change agreements.

"We need to get these error bars down," says climate negotiations veteran Annie Petsonk of Environmental Defense (ED), a New York City–based nonprofit. More precise satellite data for calculating carbon flux could also shed light on the role of trees in the global carbon cycle, a key ingredient in understanding whether global warming will accelerate.

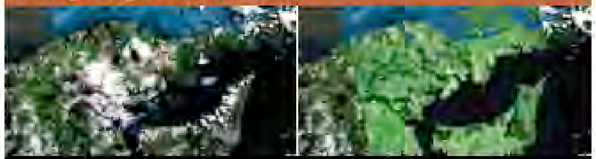
Margins of error

When negotiators in 2001 agreed on what the Kyoto treaty would cover, they omitted deforestation. One reason was fear that clear-cutting halted in one country trying to achieve its Kyoto goals would move to another country under less pressure to curb the practice. But uncertainty about the science didn't help. At the time, INPE was releasing only totals, not maps, and few nations had experience turning visual data from Landsat 5 and other satellites (see chart, left) into integrated totals. "You'd have [negotiators] saying that it's impossible to measure deforestation," says ecologist Paulo Moutinho of the Amazon Institute of Environmental Research at Para State, Brazil. "There was all this data but not enough know-how," adds regional ecologist Greg Asner of the Carnegie Institution of Washington in Stanford, California.

In the last 5 years, a growing cadre of researchers in rainforest nations has begun tapping satellite data to monitor their forests; the list includes India, Thailand, and Indonesia. In addition to Brazil's weekly alert system, experts across the Americas are making increased use of NASA's medium-resolution Terra, which can scan any point on Earth roughly each day, at a decent resolution.

Policymakers are taking notice of that increased capacity. A side presentation on detecting logging that Asner offered at the international climate meeting in Montreal in December 2005 drew hundreds of negotiators. There, Papua New Guinea and Costa Rica proposed including credit, after 2012, for efforts to curb deforestation. The idea has gathered momentum, and environmentalists are hoping that next month's meeting in Bonn, convened by a United Nations technical body, will lay the groundwork to measure and credit action against deforestation by developing countries. "The science has really driven the policy," says ED's Stephen Schwartzman.

Peering Through the Clouds



Not so hazy. An image of the Amazonian rainforest by Landsat 5 (left) includes clouds that obscure deforested areas visible on a radar image by ALOS (right). The two satellites are among a number of key sensors (below) that help researchers monitor deforestation in the tropics.

NATION	SATELLITE	SENSORS	RESOLUTION	FEATURES
U.S.	Landsat 5	Optical	30 m	This aging workhorse offers images every 16 days to any nation with satellite receiving station.
U.S.	Landsat 7	Optical	30 m	Some researchers have managed to use it effectively despite a crippled sensor.
India	IRS-2	Optical	6–56 m	Experimental craft shows promise, although images are hard to acquire.
Japan	ALOS	Radar	50 m	Researchers hope cloud-penetrating radar could be key to deforestation studies.
China/ Brazil	CBERS-2	Optical	20 m	Experimental; Brazil uses on-demand images to bolster their coverage.
U.S.	Terra	Optical	250–1000 m	Data easily available, almost daily.
France	SPOT	Optical	20 m	Indonesia, Thailand use alongside Landsat data.

Josef K

The Bonn delegates will confront a number of technical challenges. The first is how to reduce primary errors in detecting forest losses from space. Brazil's yearly survey, dubbed PRODES, is based on the situation each August, before fall clear-cutting season, and uses software that searches images for bare ground. But Landsat passes over any one forest area only twice in a month, and clouds can obscure areas during one or both passes. Any gaps are filled with data from July or September, massaged with algorithms. "You're providing the best of your knowledge," says mathematician Thelma Krug of INPE, which reported that 18,793 km^2 of Amazon forest, with a 4% margin of error, were destroyed in 2005. That figure includes only clear-cutting, because the satellites' 20- to 30-meter resolution cannot detect less dramatic disturbances.

One important omission is selective logging for timber, says Asner. In 2005, his team determined the fraction of green reflectance from each Landsat pixel, aided by considerable fieldwork to calibrate how nonvisual light frequencies could inform that calculation. They concluded that Brazil was omitting a whopping 12,000 km^2 or more of so-called selectively logged forest areas per year (*Science*, 21 October 2005, p. 480). Asner fears that any system rewarding efforts to halt deforestation could miss a substantial source of emitted carbon if selective logging is not included. Others believe that logging has less of an impact: Skole says Asner could have mistaken thin forests or wetlands for logged forests because their infrared image can "mimic … a logged forest." He also notes that many logged areas grow back. INPE estimates that the per-hectare emissions from selective logging are 2% of those from clear-cutting.

> "We need to **get these error bars down.**"
> —Annie Petsonk, Environmental Defense

Even if scientists improve their monitoring of activities on the ground, however, they have only crude methods of calculating how much carbon a particular area of rainforest will emit once cleared. Estimates of the Amazon's total organic stock of carbon—including living and dead trees—range from 60 billion to 120 billion tons. National estimates are equally uncertain: Brazil calculated that deforestation and loss of grassland had emitted roughly a billion tons of CO_2 into the atmosphere in 2004, plus or minus 30%. Several experts told *Science* that the margin of error is even larger.

One problem is the heterogeneity of forests and the inability to identify denser, taller forest areas within larger regions. Historical sampling measurements in western Brazil only include trees at least 10 cm in diameter. "We need more science," says geographer Ruth DeFries of the University of Maryland, College Park. One low-tech step, says ecologist Richard Houghton of Woods Hole Research Center in Massachusetts, would be repeated sampling of trunks and better biomass equations that encompass the whole tree. "We don't have many studies that have looked below ground at the roots," he says. Even within a 1-hectare site, he says, the variability is maddening.

Better eyes would also help. Japan's Advanced Land Observing Satellite (ALOS), launched last year, uses radar to see through the canopy and spot cleared sites that Landsat's cameras would miss. Initial results show decent contrast between forested and nonforested areas to a 50-meter resolution, says Woods Hole's Josef Kellndorfer. Upcoming ground studies in Brazil, Congo, and Uganda will aim to calibrate ALOS's ability to estimate biomass, aided by interferometry that could infer tree heights.

Radar would also be a boon to cloudy countries such as Gabon, whose rainforests have been largely hidden from satellites until now. And ALOS's youth is also welcome. Widely available and relied upon, Landsat 5 was built for a 3-year stint and is nearing a quarter-century of labor. It "could go any moment," worries DeFries. Christopher Justice of the University of Maryland, College Park, says that possibility highlights the need for "better international cooperation" to make sure data from other sources is just as easy to share.

Ground truth

DeFries says that those who care about rainforests shouldn't let the quest for improved detection stand in the way of making good use of what is already clearly visible. She's cheered by a campaign that has protected tens of thousands of square kilometers of Brazilian rainforest since 2004. A general trend of falling beef and soy prices has helped by cutting demand for land, environmentalists say. So has daily data from Terra, analyzed by INPE, that Brazilian officials have used to probe roughly 100 instances of possibly illegal deforestation, says INPE's Dalton Valeriano.

The government could step up its enforcement activities, says geographer Carlos de Souza Jr. of independent watchdog Imazon in Brazil, if its mapping work were more solid. Using the same data that INPE collects, de Souza has calculated monthly totals that exceed or fall short of the government's number by thousands of square kilometers. He fingers data-sampling techniques, clouds, or different aggregating methods as possible culprits. And he worries that the government is learning about some illegal clear-cutting belatedly, from the yearly PRODES survey. "The most important thing is stopping deforestation as it is happening, not after," says de Souza.

An international incentive system could strengthen Brazilian resolve, says Daniel Nepstad of Woods Hole. "If this is happening without a carrot, imagine what would happen with a carrot," he says. —ELI KINTISCH

Global Deforestation, 1990–2000

Going, going… Tropical deforestation, in hot spots including Brazil, Madagascar, Indonesia, and West Africa, is a big driver of rising CO_2 levels.

SOURCE: THE NATURE CONSERVANCY; CREDITS (LEFT TO RIGHT): JAXA

Excitement about ALOS


New Tool May Help in Fight to Curb CO2 - WSJ.com 1/15/08 8:12 AM

THE WALL STREET JOURNAL.

The Online Journal GET 2 WEEKS FREE SUBSCRIBE NOW
The Print Journal GET 2 WEEKS FREE SUBSCRIBE NOW

User Name: Password:
Remember Me Log In
Forgot your username or password? | Subscribe

As of Thursday, January 3, 2008

News | Today's Newspaper | My Online Journal | Multimedia & Online Extras | Mar

OTHER FREE CONTENT FROM THE WALL STREET JOURNAL

EDITORS' PICKS
- Circus With Serious Intent
- Angst in Michigan
- The Honesty Policy
- Earnings Cheat Sheets
- A Goodbye to Bill Gates

New Tool May Help in Fight to Curb CO2

Radar Enables Better Monitoring of Commitments to Preserve Forests

By TOM WRIGHT
January 3, 2008; Page B3

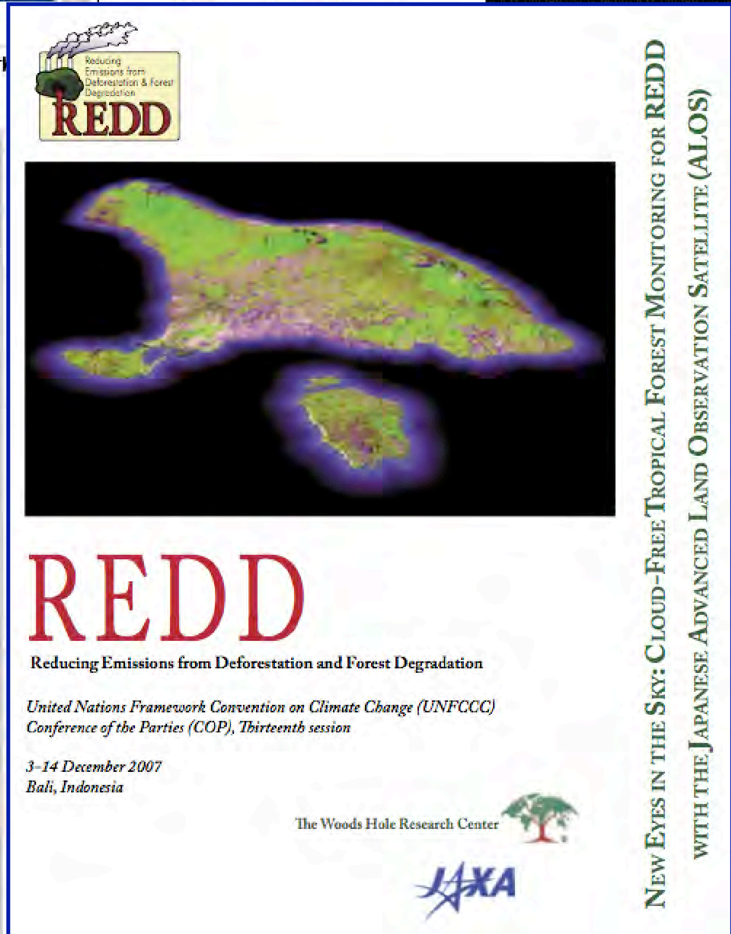
Jakarta, Indonesia

nge focuses on how
nts of carbon

emissions annually,
imate-change
a mechanism that
ign up to protect

chnology hurdle
w to determine
ernments are
heir conservation

world's tropical
n remote areas, like
azon basin or the
ew Guinea, north of
eavy cloud cover
t, heavy rain in
al regions make



http://whrc.org/bali

ScienceDaily

Web address:
http://www.sciencedaily.com/releases/2007/11/071127163739.htm

Print th

Your source fo

New In
Global

ScienceDa
discussion
Change C
on monito
role that re
developme
Deforestat
policies de
for avoidin

Using syn
over a six-
Land Obse
Woods Ho
the first-of
mosaic at 1
Amazon b
kilometers. Ima
timeframes prov
deforestation ac
monitoring prog
accurate observ
world

Dr. Josef Kellndorfer, who is leading the project for the Center, says, "The Japanese Space Agency JAXA has launched an amazing sensor which exhibits unprecedented geometric and radiometric

heat-trapping greenhouse gases. As part of this effort, Dr. Josef Kellndorfer and his colleagues are investigating the latest spaceborne remote

THE WOODS HOLE RESEARCH CENTER

Bloomberg.com

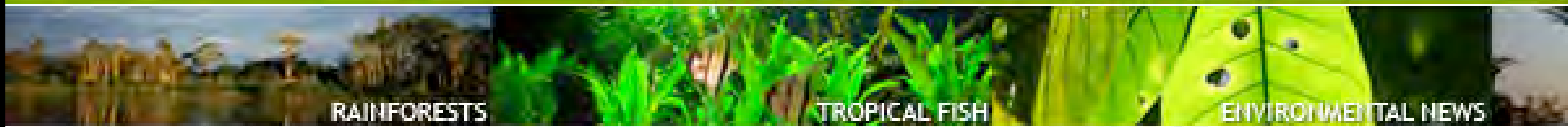
Deforestation accounts for 20 percent of global carbon dioxide emissions each year, the newspaper added.

To contact the reporter on this story: James Kraus in New York at **jkraus2@bloomberg.net** .

Last Updated: January 3, 2008 04:34 EST

MONGABAY.COM

About | Feeds | Newsletter | Interact



New satellite system will penetrate clouds to track deforestation
mongabay.com
December 5, 2007

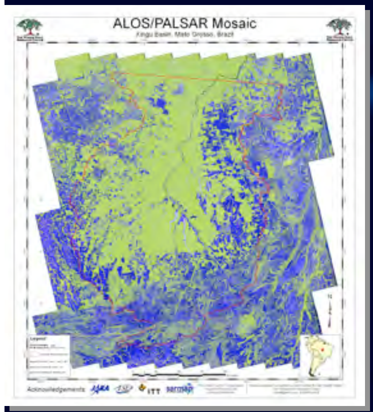
Conclusions

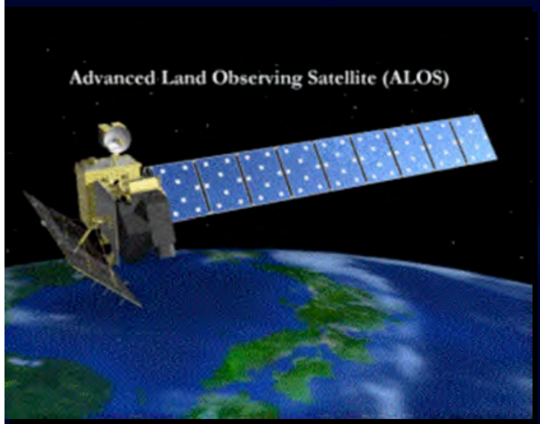
- ALOS/PALSAR emerges as a key remote sensing tool to support REDD - Thank you Japan and Jaxa!
- The big questions to answer
  - Scientific:
    - What can be delivered, what not for
      - deforestation and degradation monitoring and
      - biomass?
    - Cost function for improvements with time series
    - Synergy with optical systems
    - All analysis must be compatible with the IPCC definitions and guidelines
    - Should we reprocess JERS-1 GRFM with terrain correction?
  - Data Availability now:
    - Gaps in the observations - how can those be automatically detected and filed
    - Cost and access policy to the ALOS data
  - Data availability long term (in particular during the commitment period):
    - CONTINUITY, CONTINUITY, CONTINUITY
    - Revise/optimize observations strategy to meet REDD needs
    - Can the space agencies design a coordinated L-band SAR EO plan which meets the monitoring needs for REDD?

Conclusions cont'd

- We need now:
  - User-friendly explanation of "How Radar Sees a Forest?"
    - Simple data interpretation booklet with image examples.
    - Can we define standards for how to display data in RGB?
    - Can the team share image examples for that in the wiki?
  - Making data available in user-friendly form to include tropical nations in the mapping and monitoring process. At the end of the day, it needs to be their product.

Thank you!





Acknowledgements:
Alaska Satellite Facility
JAXA-EORC
ITTVIS/SARMAP
PCI Geomatics

UNFCCC, COP13, Bali, Indonesia, Dec 3-14, 2007

THE WOODS HOLE RESEARCH CENTER

Going to Scale

- Geometric Processing
  - Need Elevation Information (SRTM)
- Radiometric Processing (to calibrate Images in Terrain)
- Mosaicking
- Apply Enhancement Techniques specific to Radar (Can be easily learned)
- Apply some radar suitable classification algorithms