Implementing REDD: The Potential of ALOS/PALSAR for Forest Mapping and Monitoring

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GEOSS Asia-Pacific Symposium, April 15th 2008

Outline

- ALOS Pilot Studies in the Brazilian Amazon
- From Pilot to Large Scale: The Xingu Watershed Mapping 2007
- A first look in Africa and Bali
- Summary and Outlook

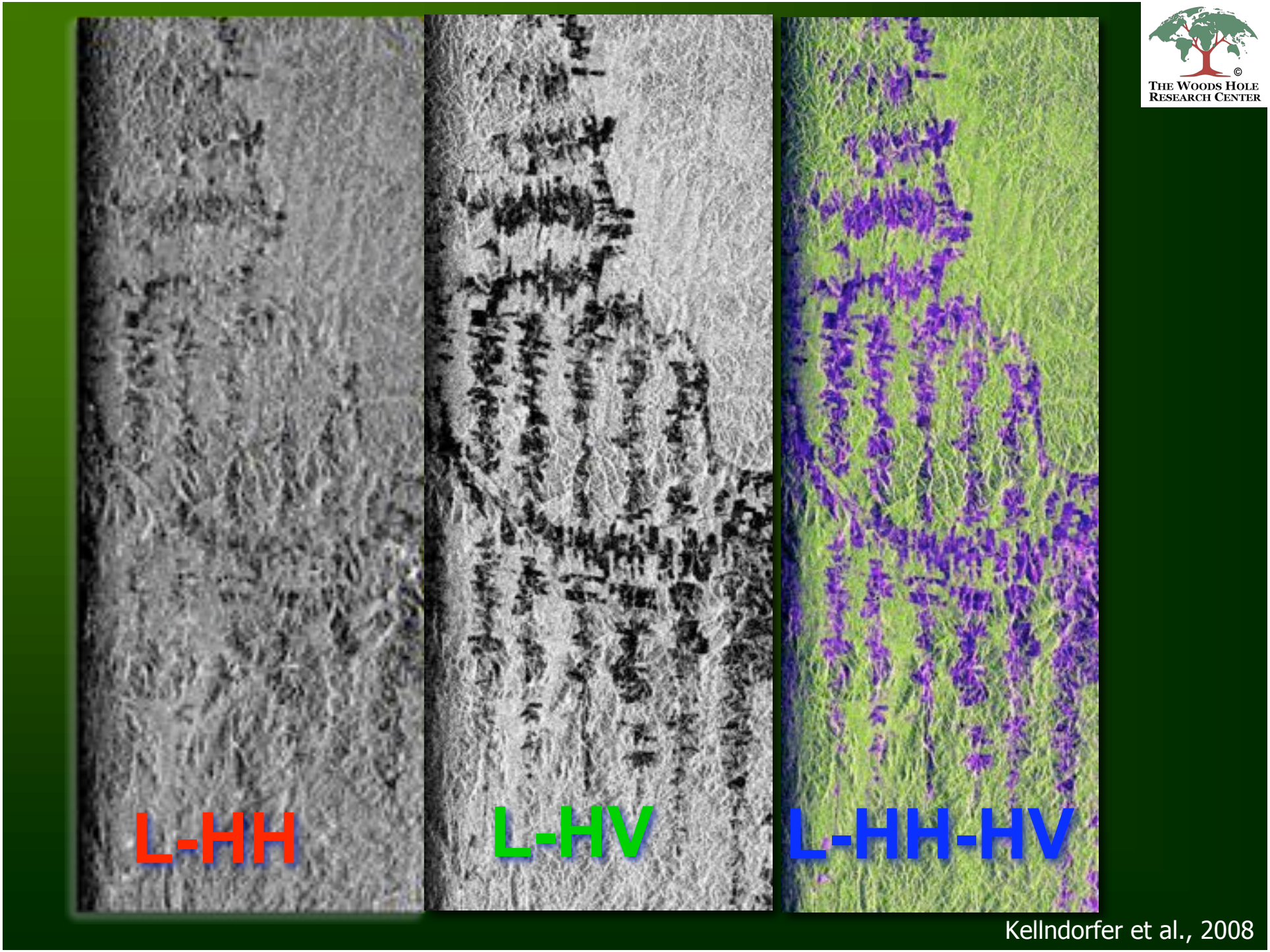
Kellndorfer et al., 2008

Amazon Pilot Studies

Kellndorfer et al., 2008

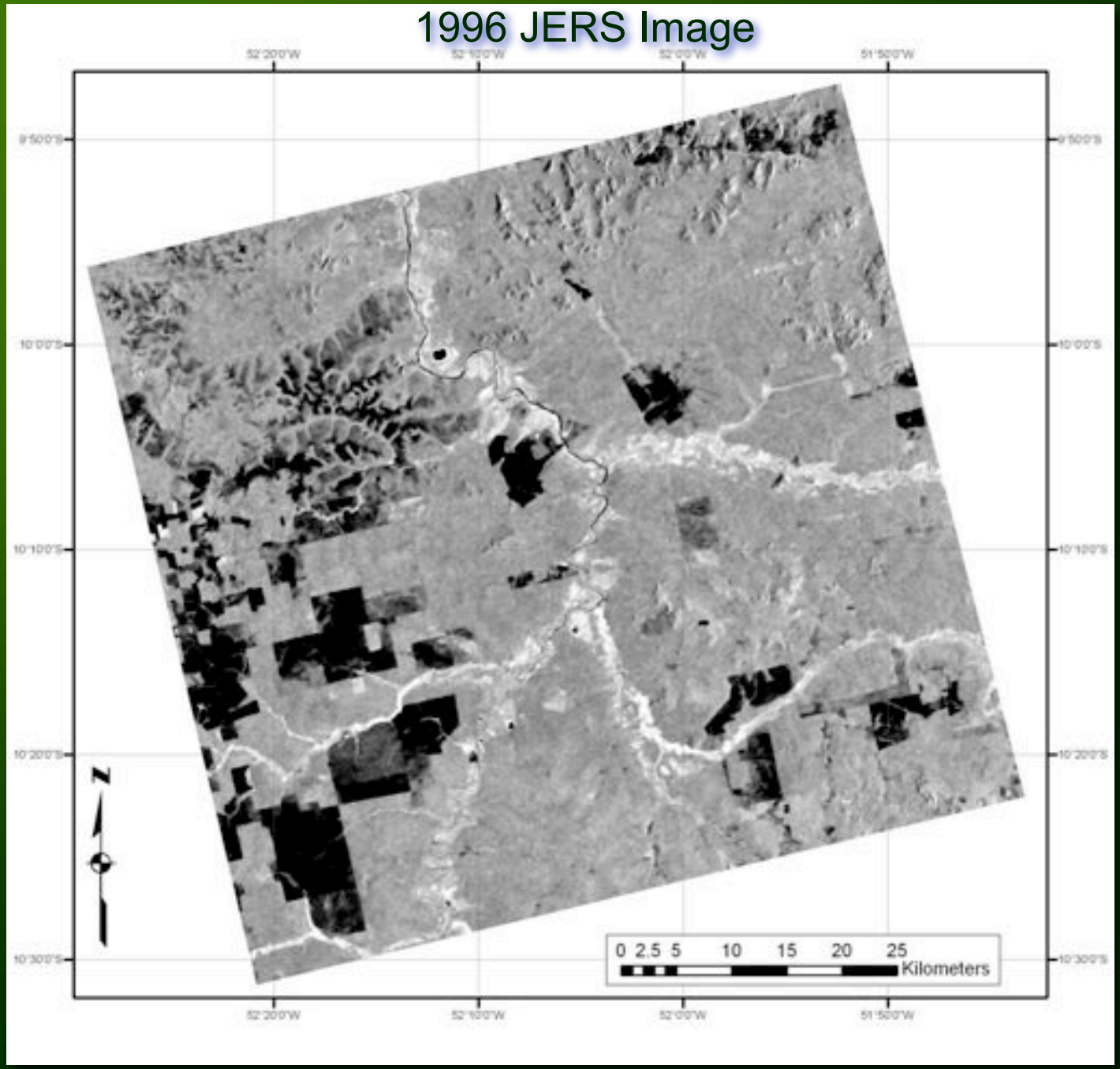
ALOS Polsar Scene 21-Oct-2006
Trans-Amazon Highway, Rurópolis

Kellndorfer et al., 2008



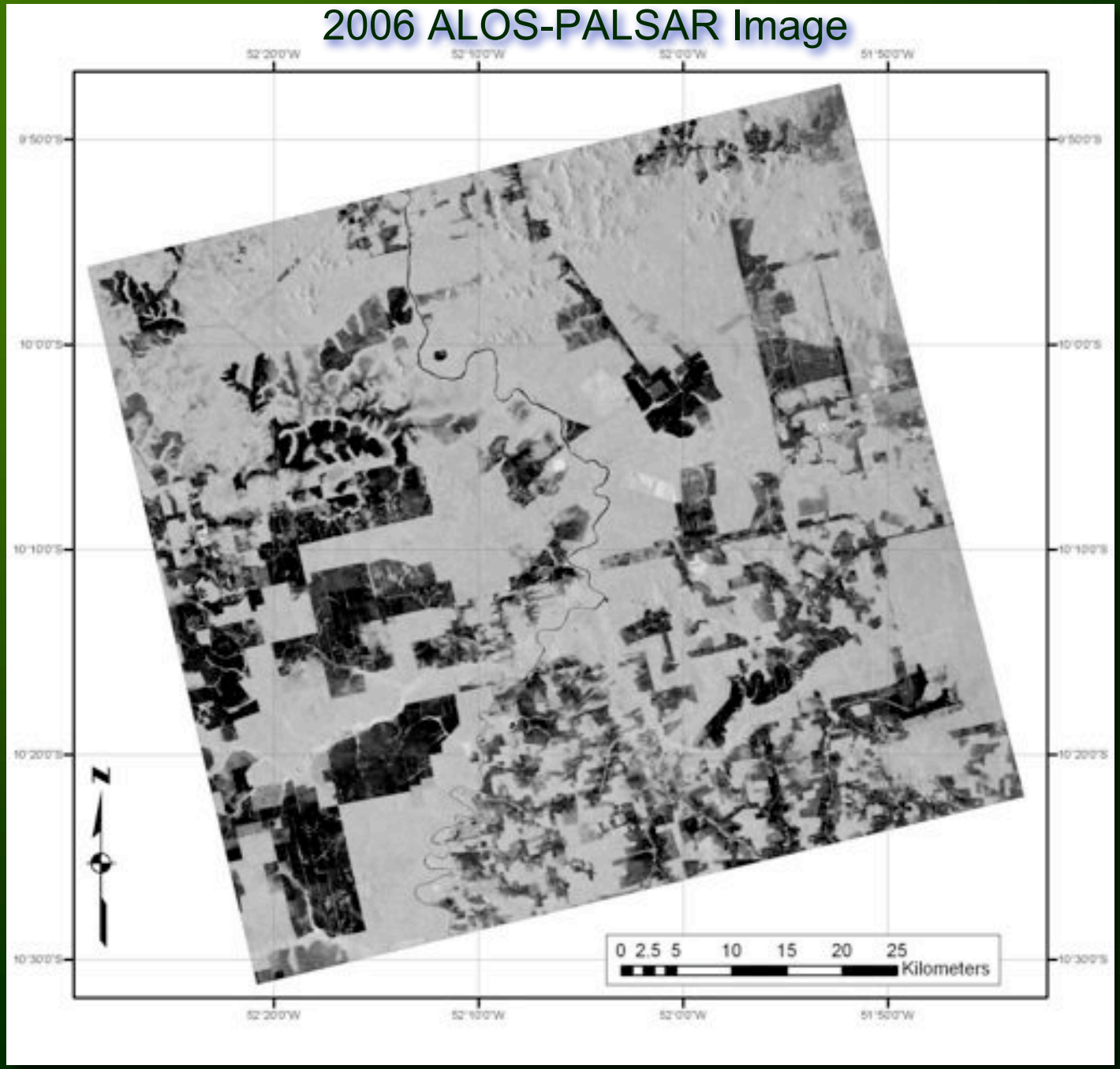
Kellndorfer et al., 2008

1996 JERS Image



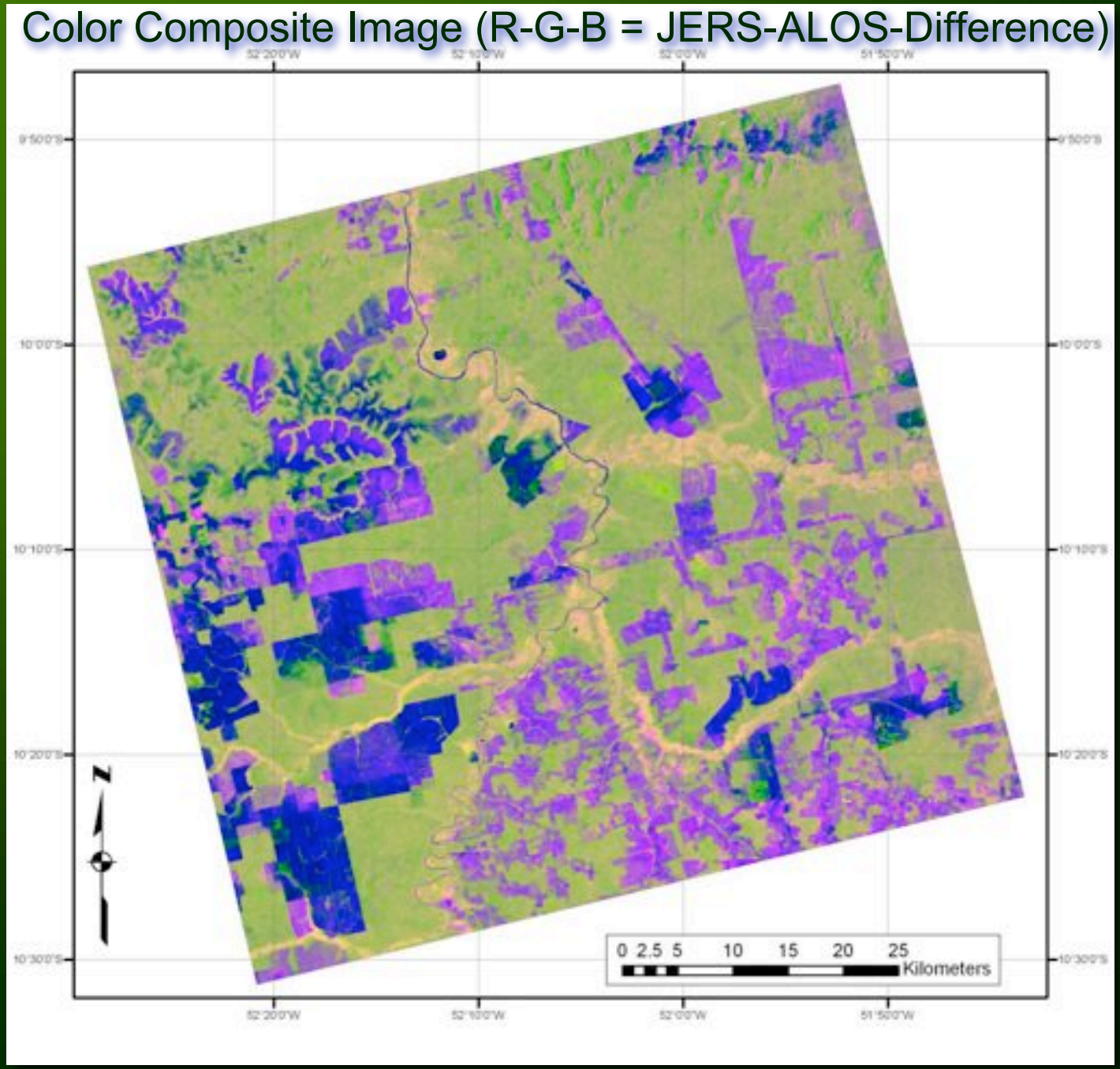
Kellndorfer et al., 2008

2006 ALOS-PALSAR Image



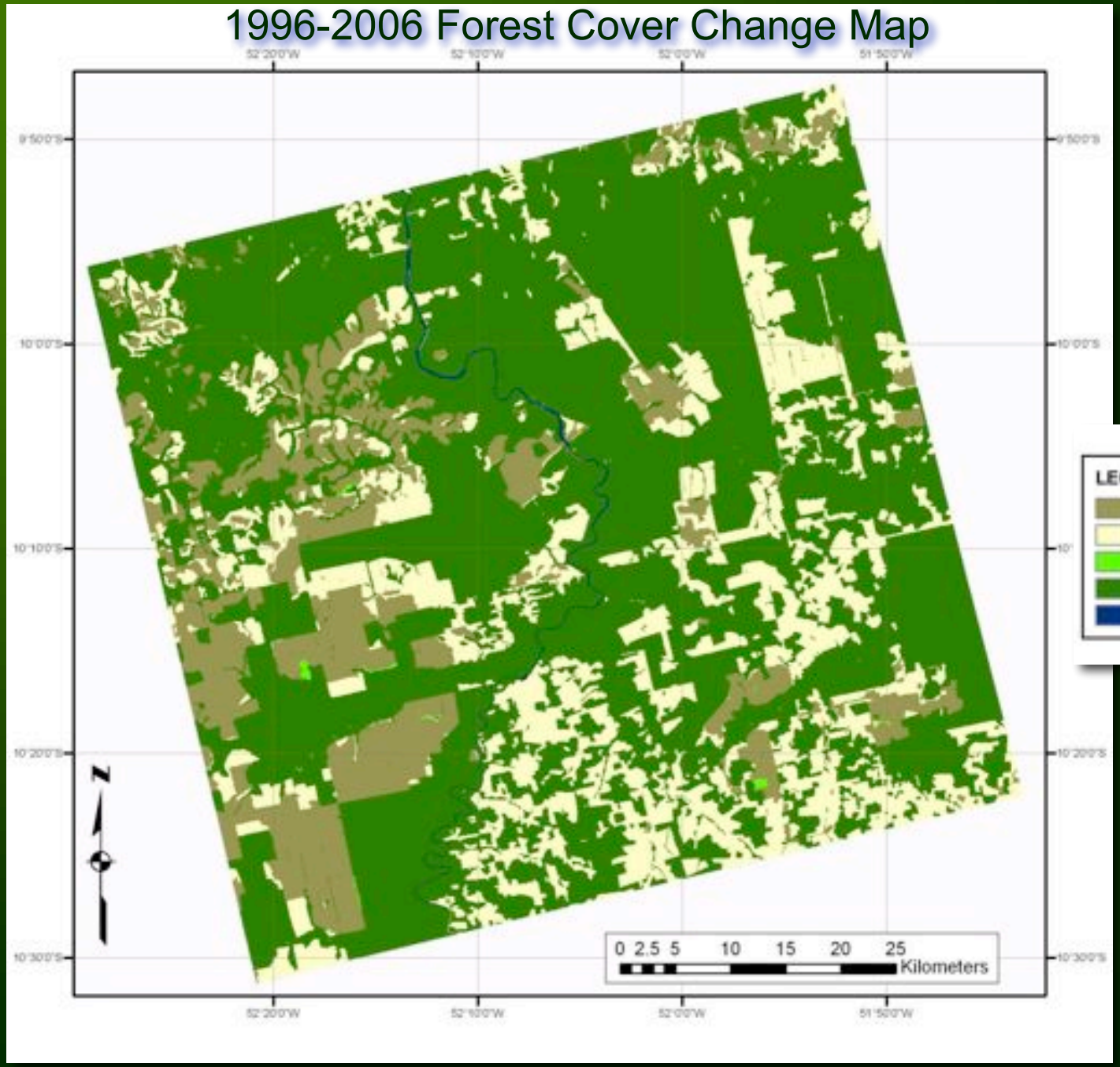
Kellndorfer et al., 2008

Color Composite Image (R-G-B = JERS-ALOS-Difference)



Kellndorfer et al., 2008

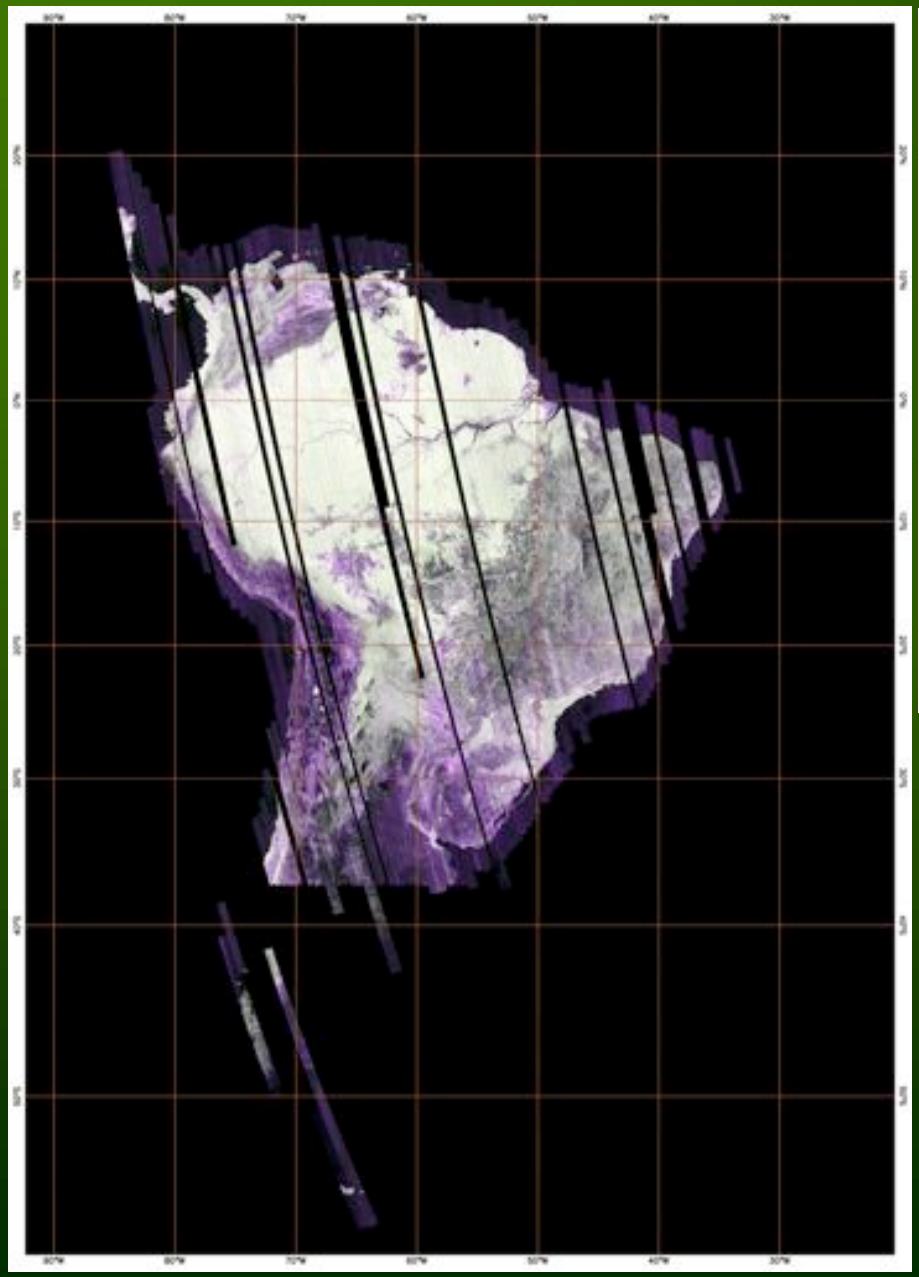
1996-2006 Forest Cover Change Map

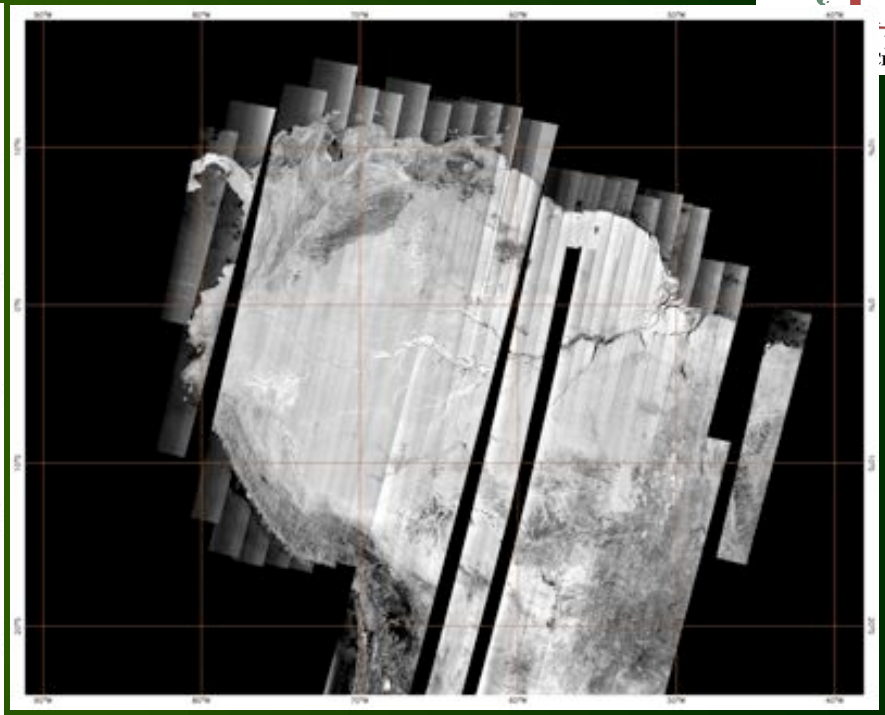


Kellndorfer et al., 2008

ALOS/PALSAR Dual-Pol Mosaic of the Xingu Watershed

Kelindorfer et al., 2008



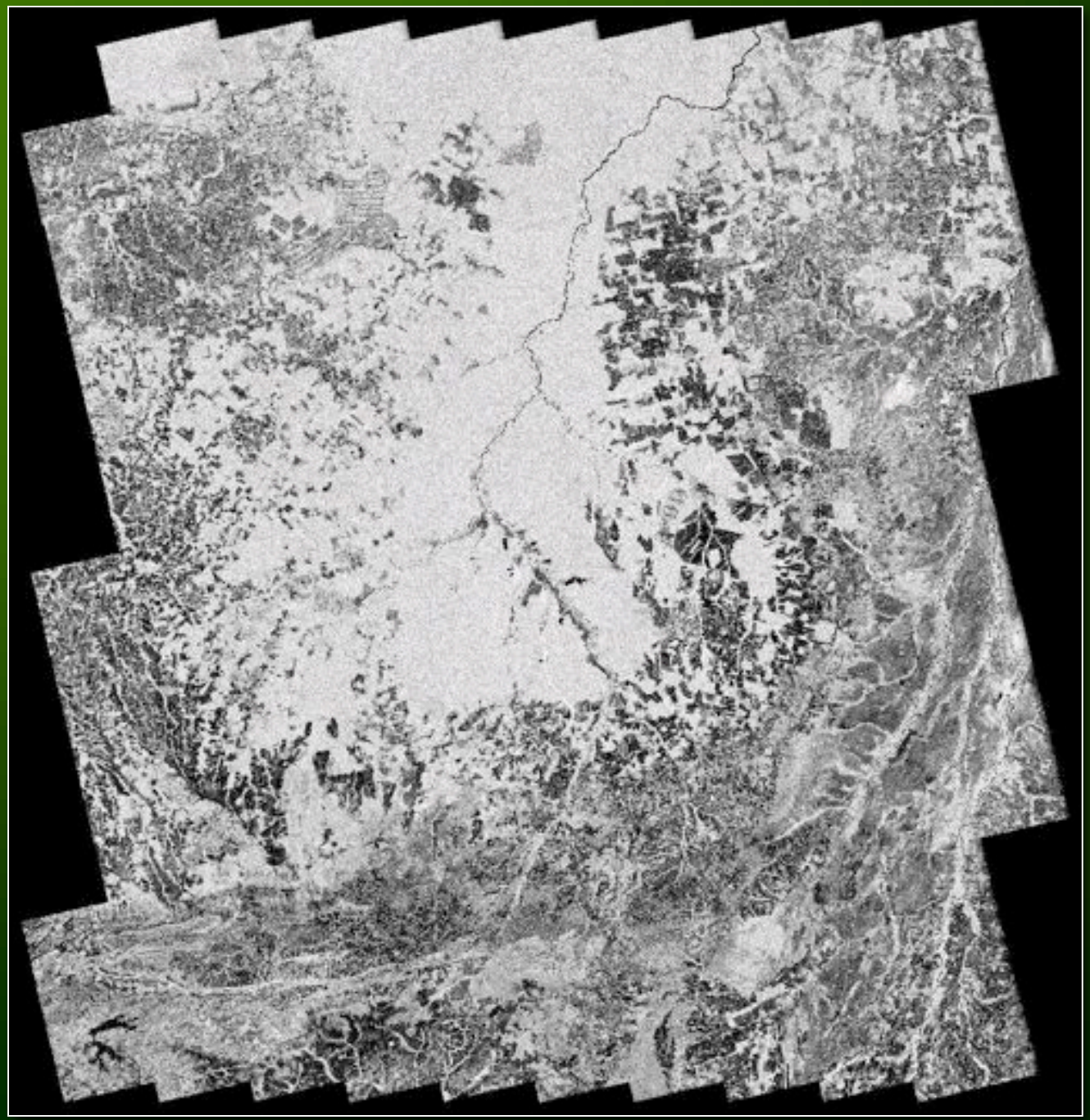


Kellndorfer et al., 2008

Coverage with ALOS/PALSAR Scenes

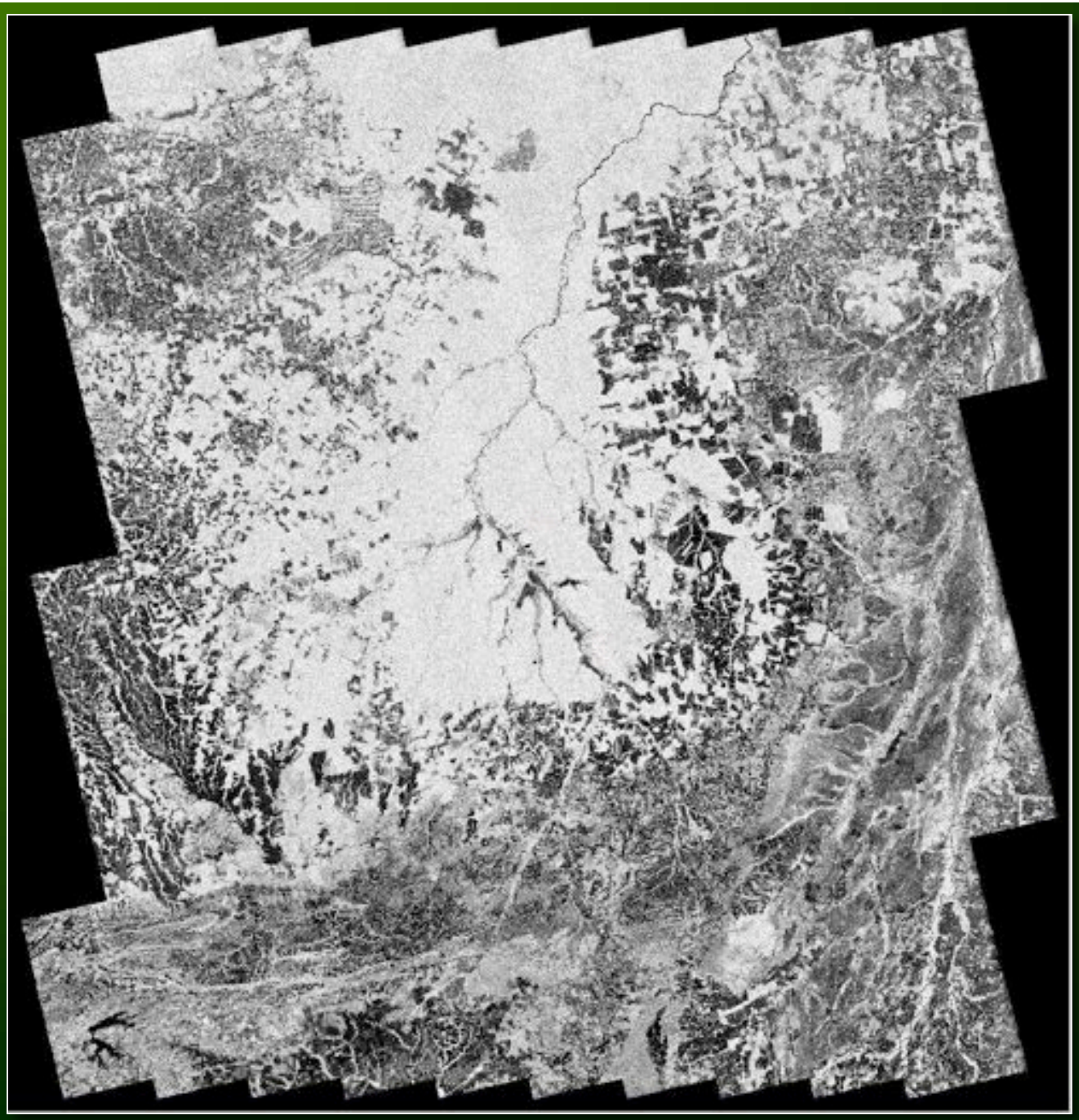
Acquistion Time Frame: June 6th to July 7th 2007
116 Scenes Selected

Kellndorfer et al., 2008



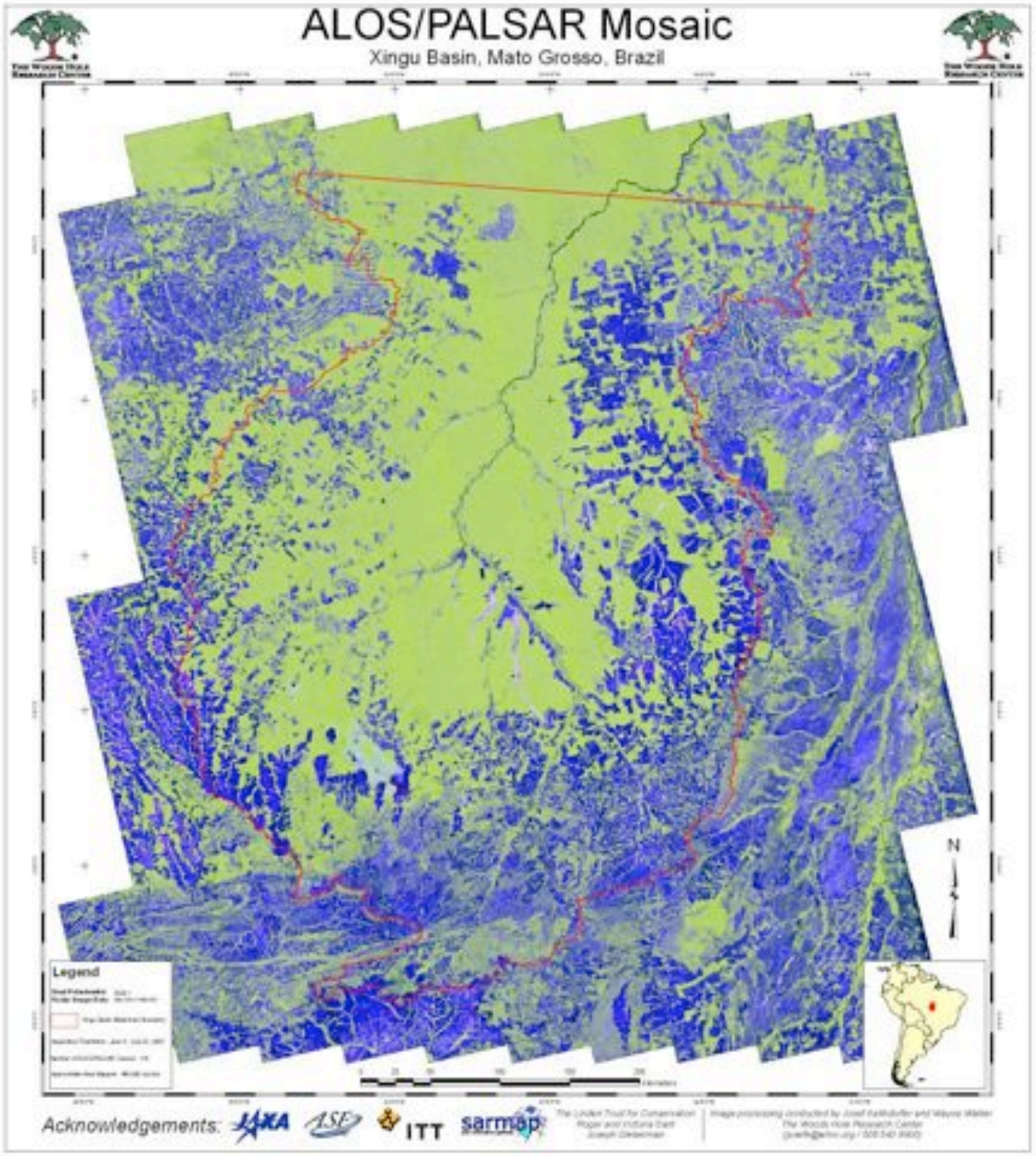
L-HH

Kellndorfer et al., 2008



L-HV

Kellndorfer et al., 2008



ALOS/ PALSAR Radar Image Mosaic of the Xingu Watershed

Data Acquistion:

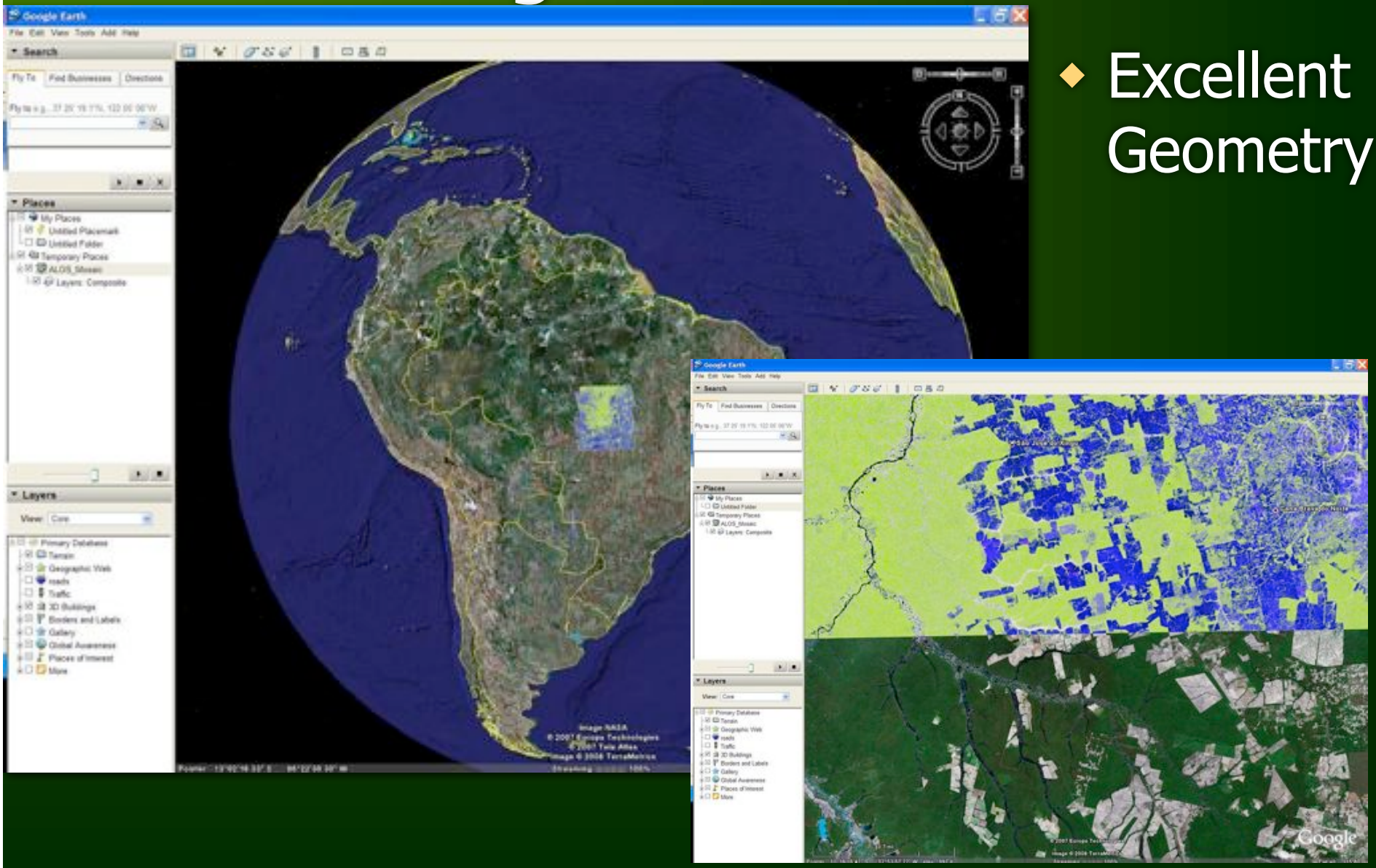
6/8-7/22 2007

Number of Scenes: 116

Spacing: 25 m

Kellndorfer et al., 2008

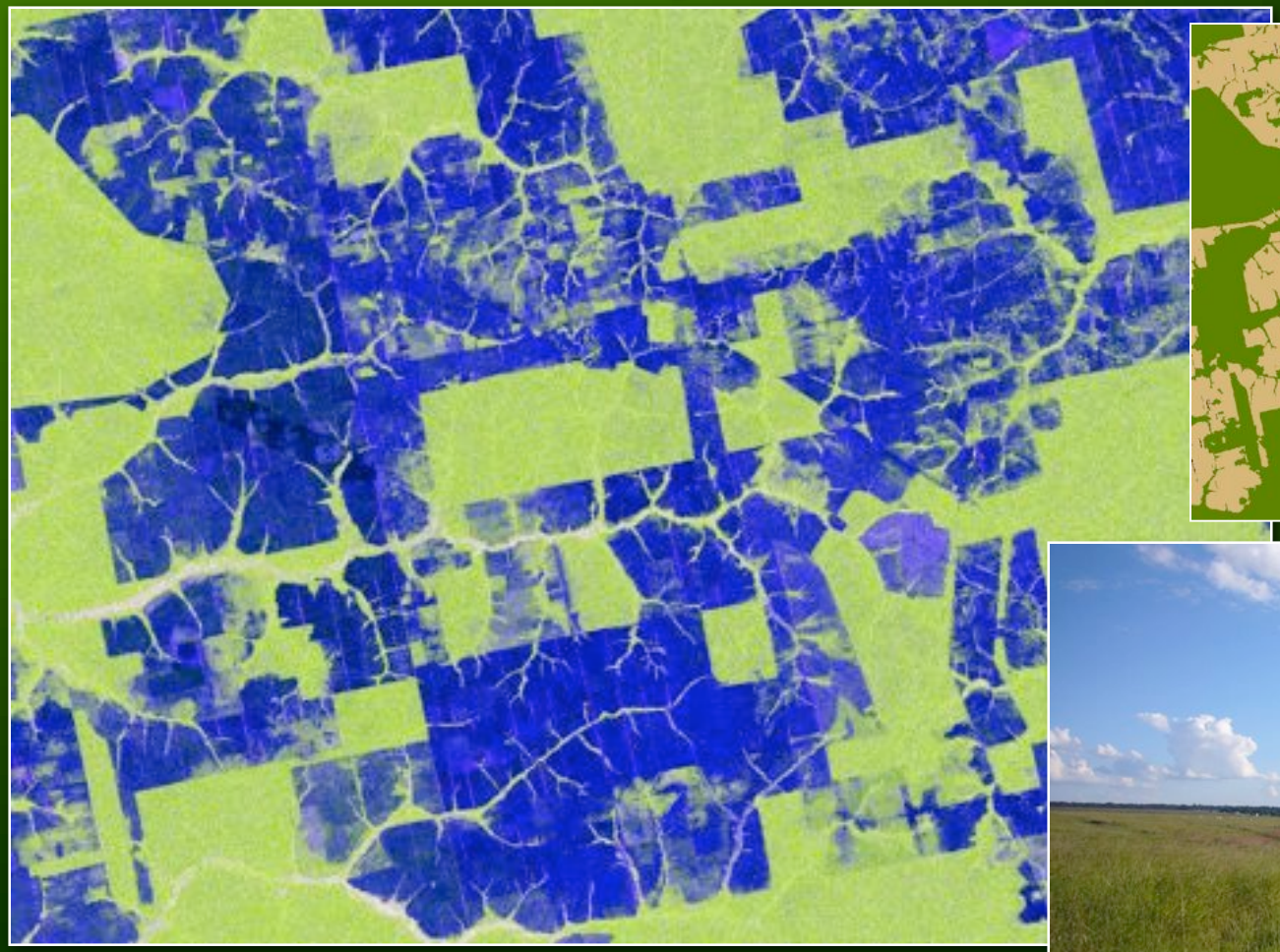
In Google Earth …



- Excellent Geometry

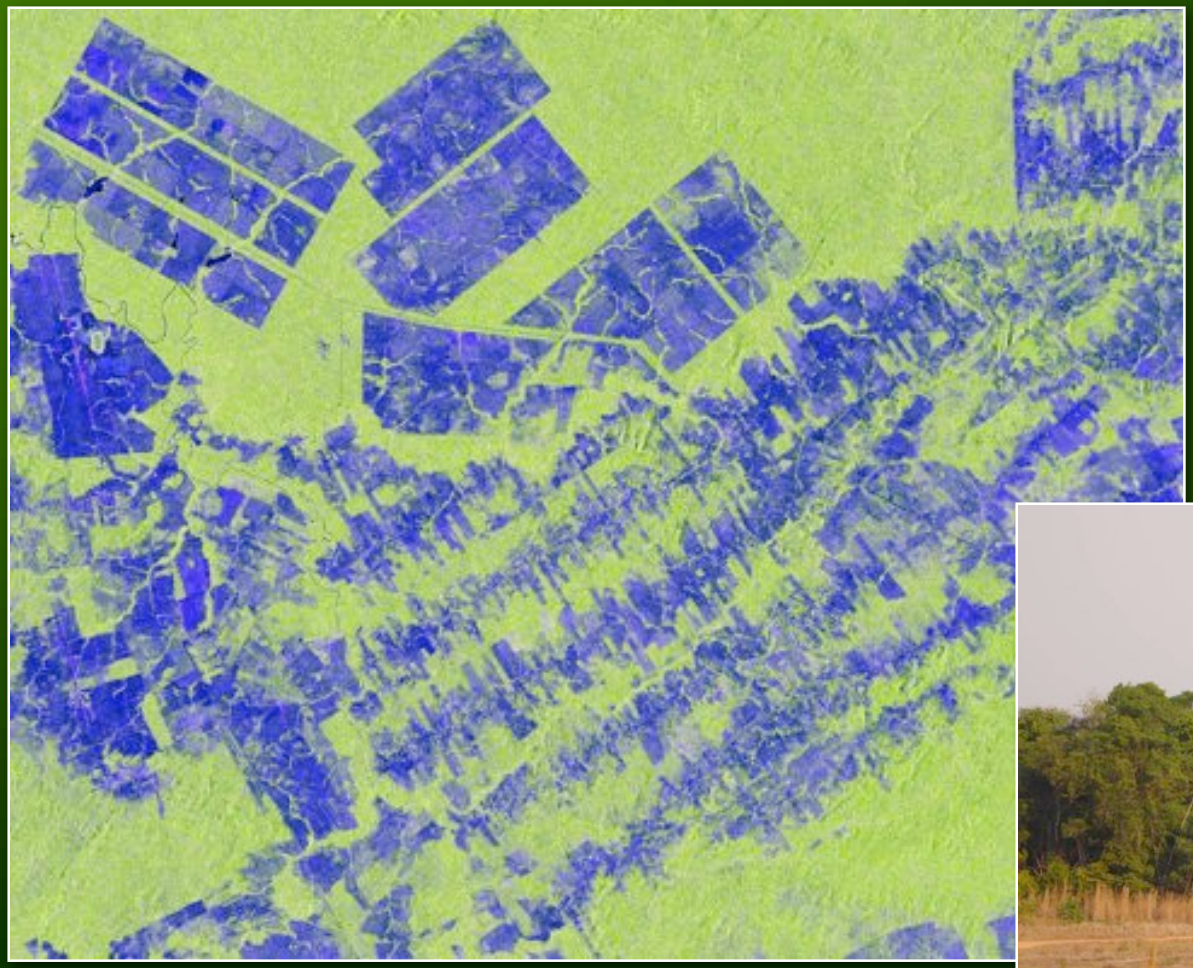
Kellndorfer et al., 2008

Large-Holder Pasture Expansion as seen by ALOS/PALSAR



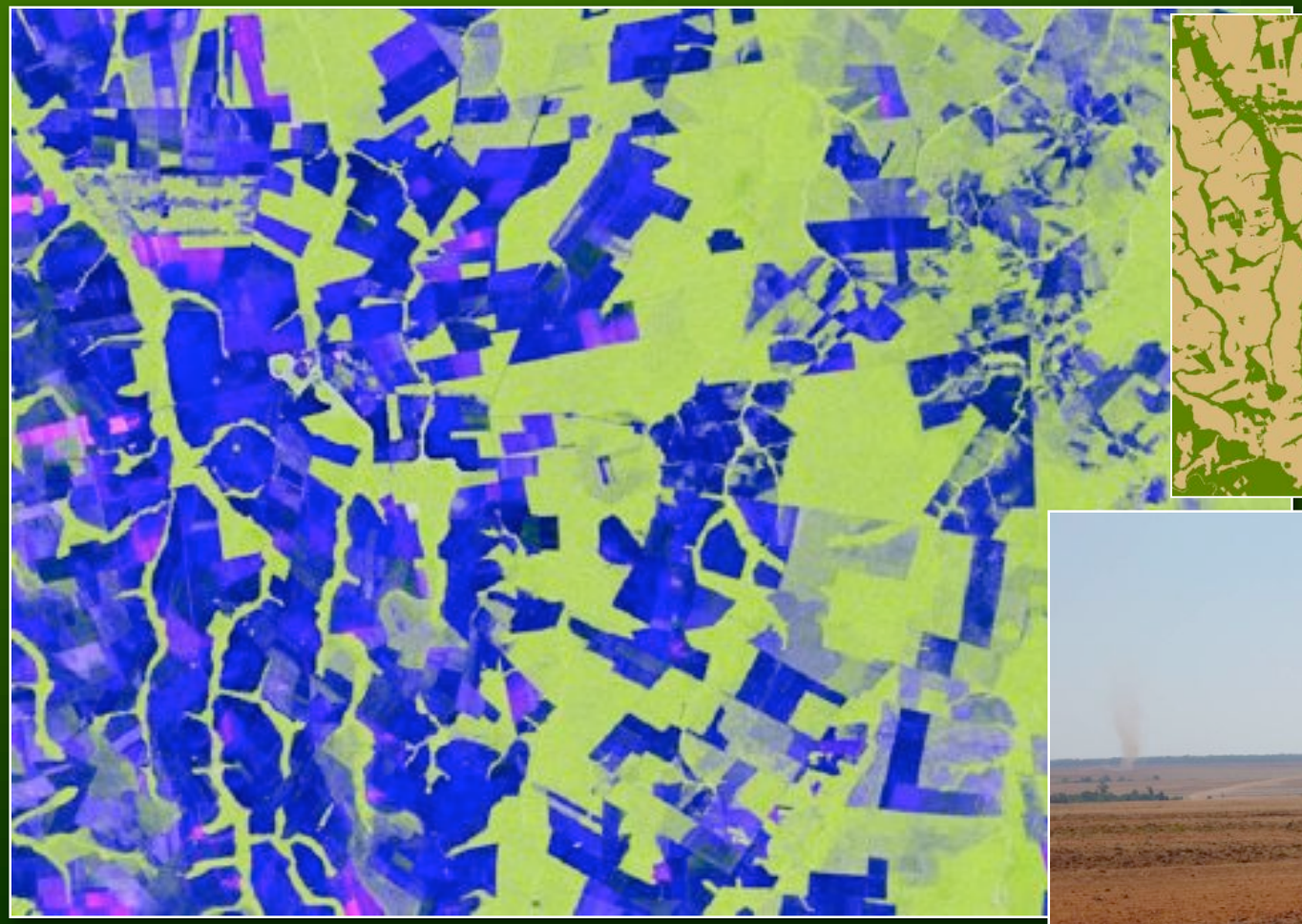
Kellndorfer et al., 2008

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

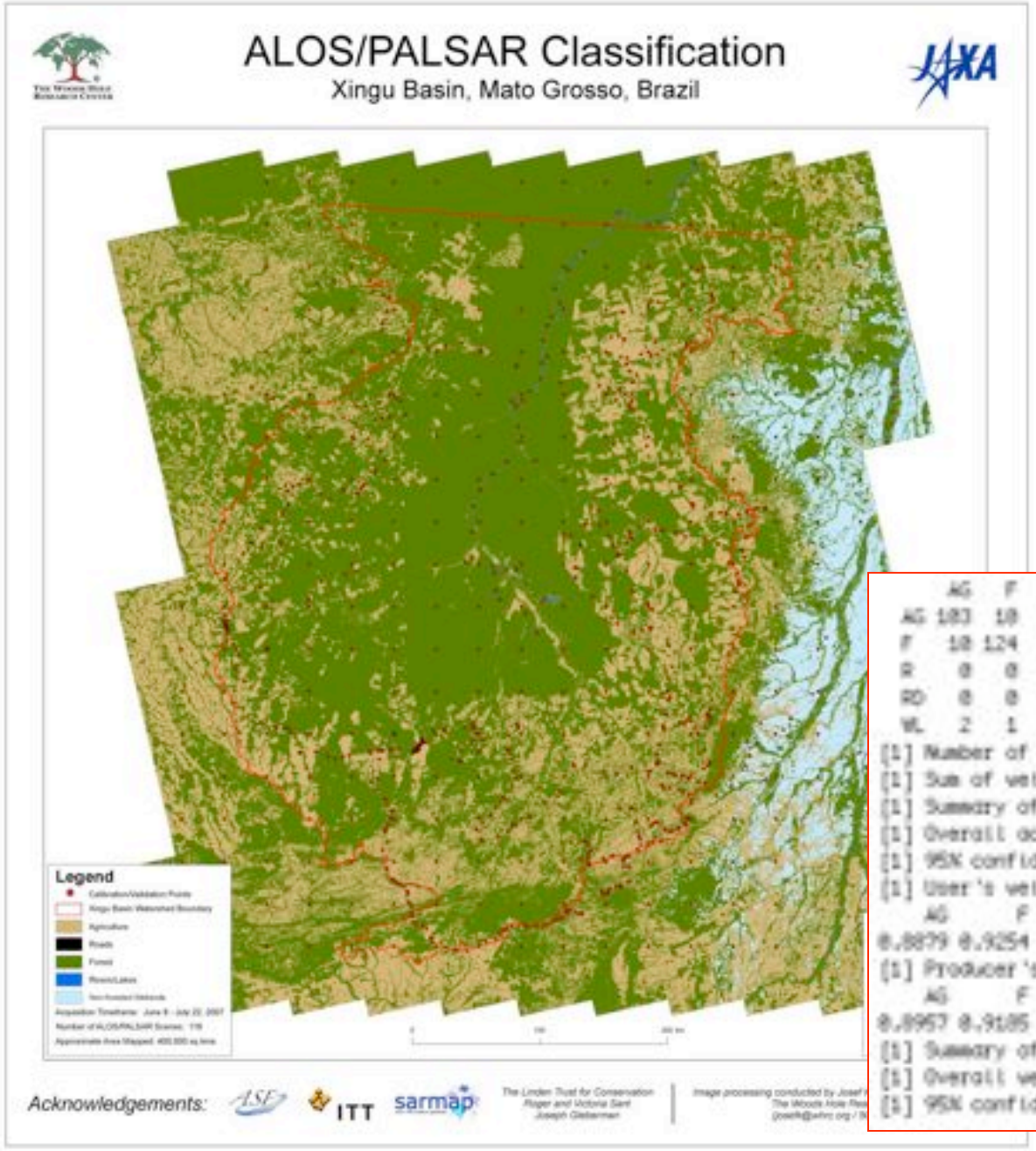


Kellndorfer et al., 2008

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



Kellndorfer et al., 2008



Classification Results

627 samples

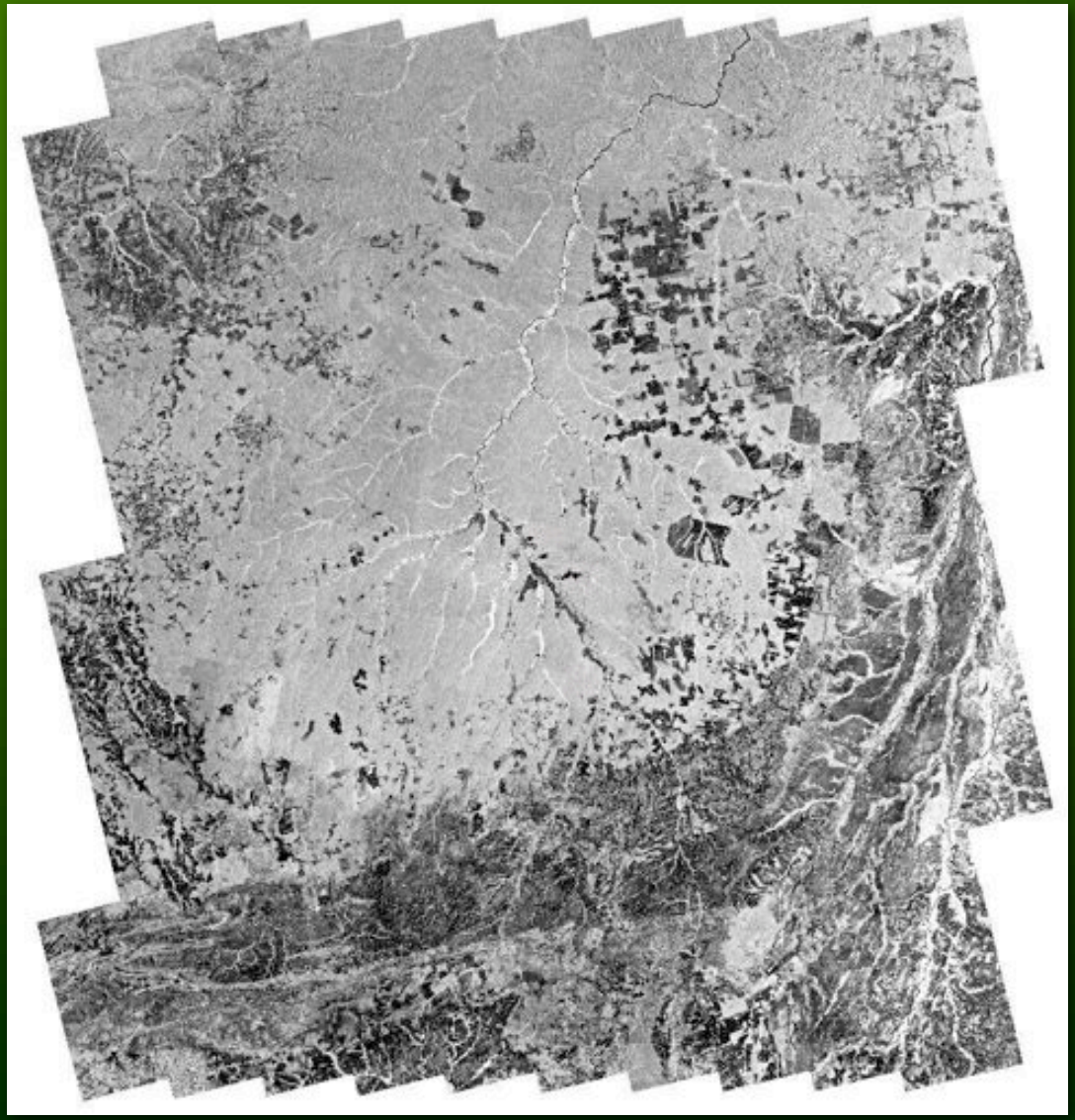
30% withheld for testing

```
     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 , 0.0385 , 3.6
[1] 95% confidence limits for weighted kappa: 0.7757...0.8988
```

91 % Overall (kappa 0.83)

Kellndorfer et al., 2008

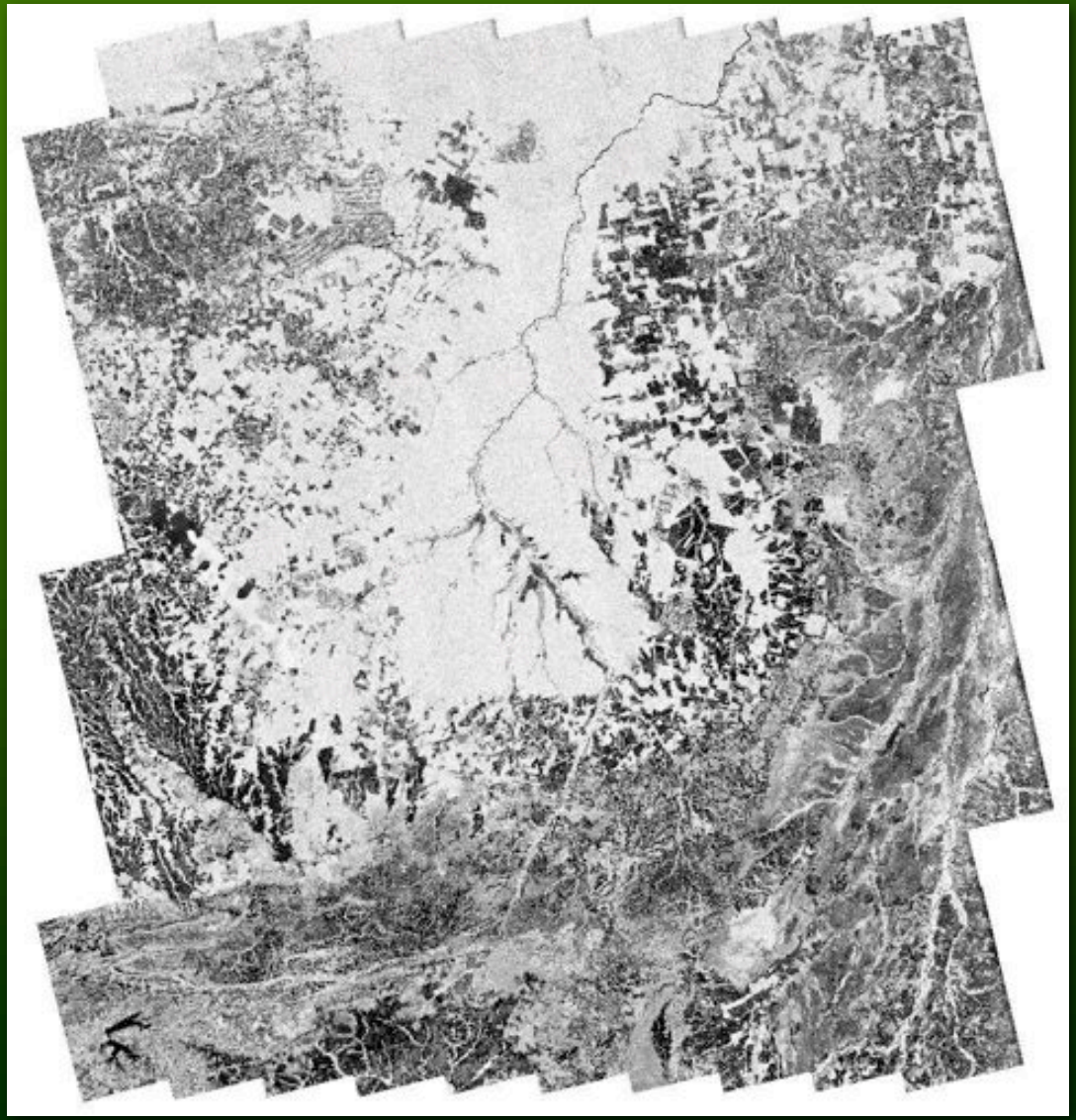
11 Year Change …



JERS-1 GRFM data 1996

Kellndorfer et al., 2008

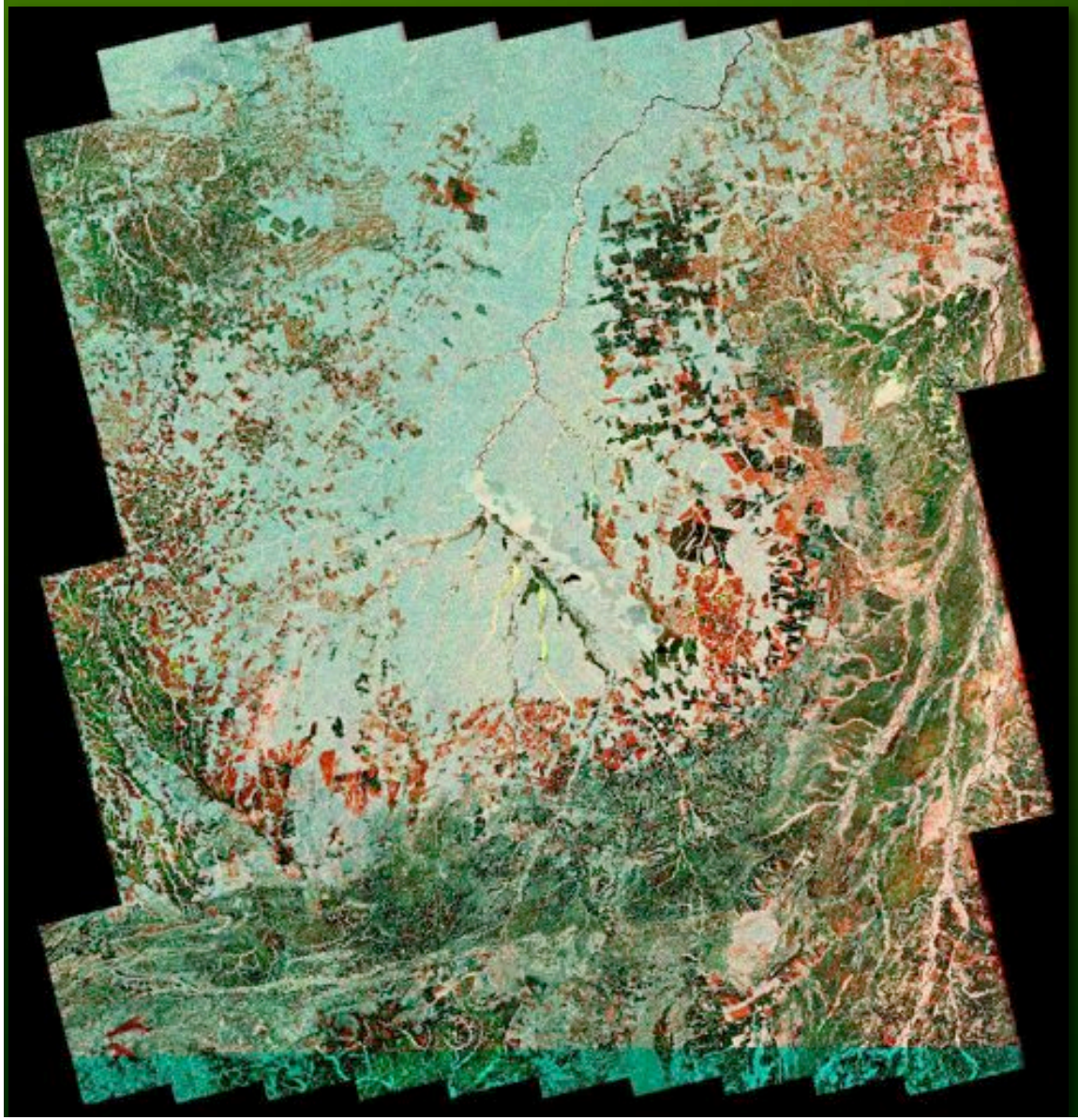
11 Year Change …



ALOS L-HV 2007

Kellndorfer et al., 2008

11 Year Change between JERS-1 and ALOS

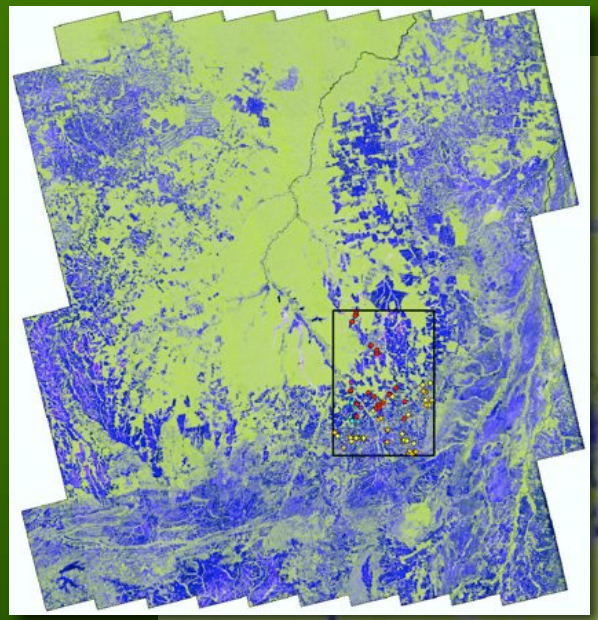


Red JERS-1 LHH
Green ALOS LHH
Blue ALOS LHV

Deforested Areas between 1996 and 2007 appear in red

Kellndorfer et al., 2008

Biomass Estimation



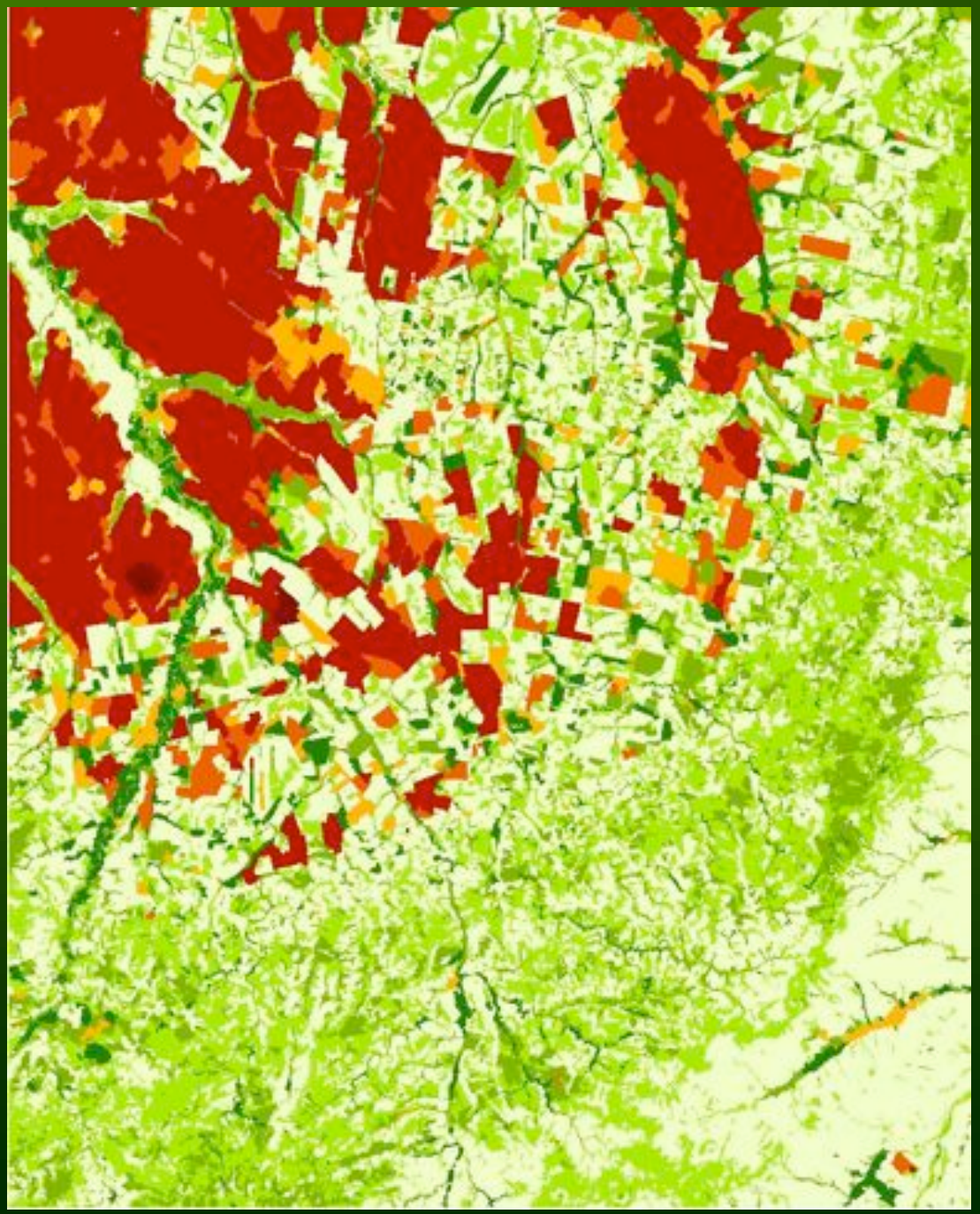
Survey of 77 Biomass Plots in 2007 and 2008

-secondary forest

-regrowth forest

-Cerrado

-Range 10-200 tons/ha



Biomass Map 2007

- Xingu Watershed, Mato Grosso, Brazil

Aboveground Biomass (tons/ha)
- 0 - 25
- 25 - 50
- 50 - 75
- 75 - 100
- 100 - 125
- 125 - 150
- 150 - 175
- 175 - 200+

Reinhoffer et al., 2008

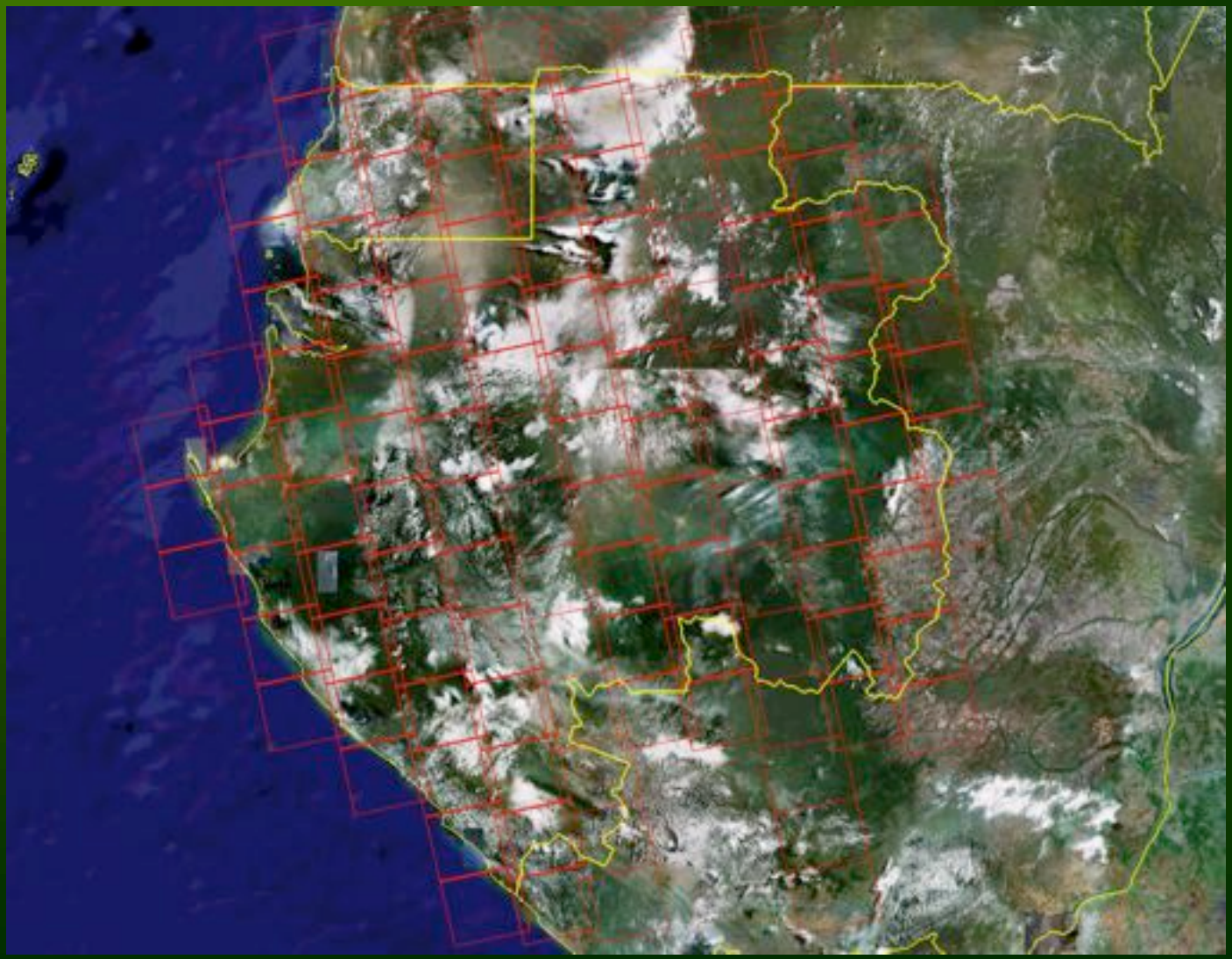
ALOS Maps Africa

Kellndorfer et al., 2008

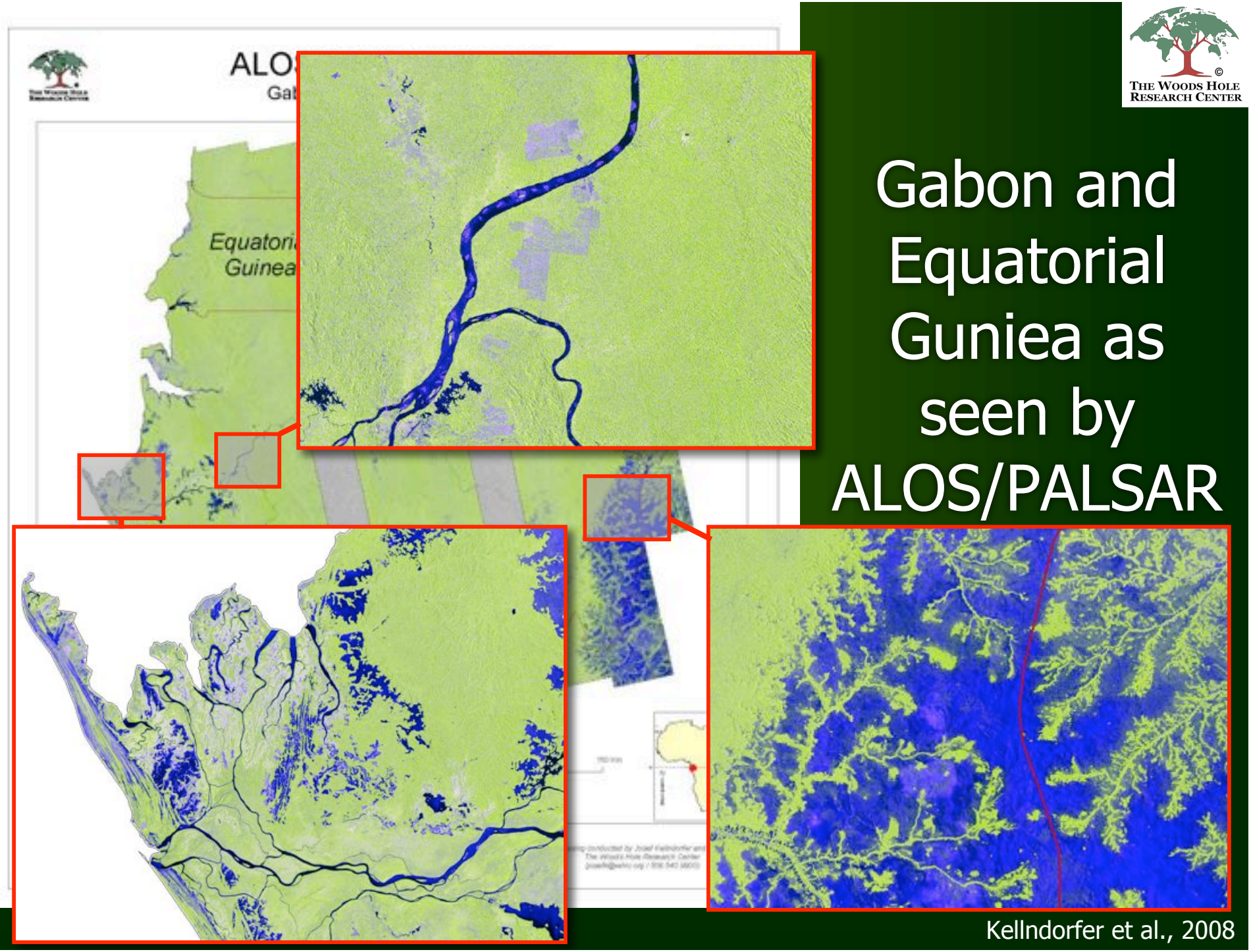
ALOS/PALSAR Dual-Pol Mosaic of Gabon and Equatorial Guniea

Kellndorfer et al., 2008

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

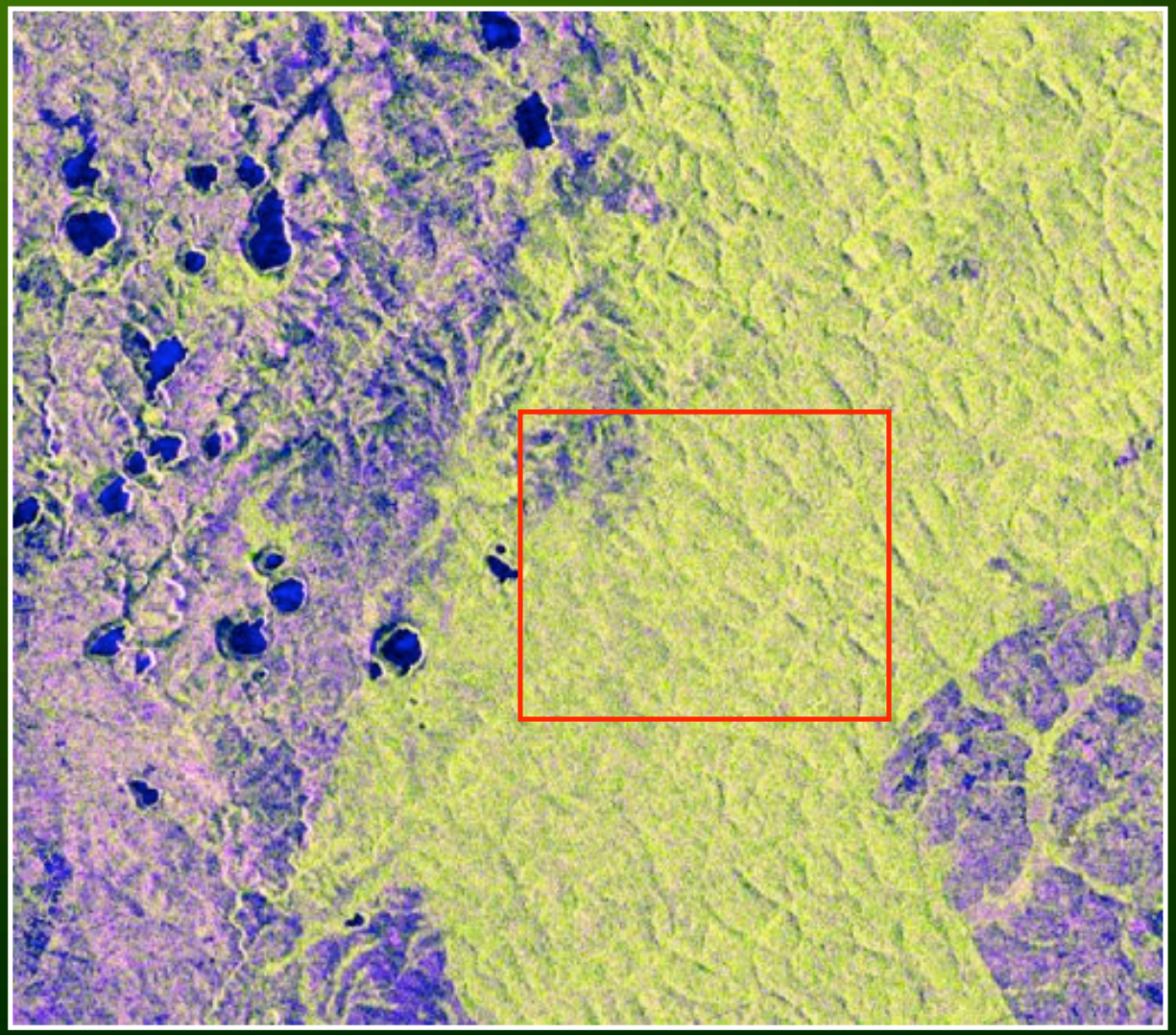


Kellndorfer et al., 2008


Gabon and Equatorial Guniea as seen by ALOS/PALSAR
THE WOODS HOLE RESEARCH CENTER
Kellndorfer et al., 2008

Kibale NP, Western Uganda

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



Kellndorfer et al., 2008

Kibale NP, Western Uganda

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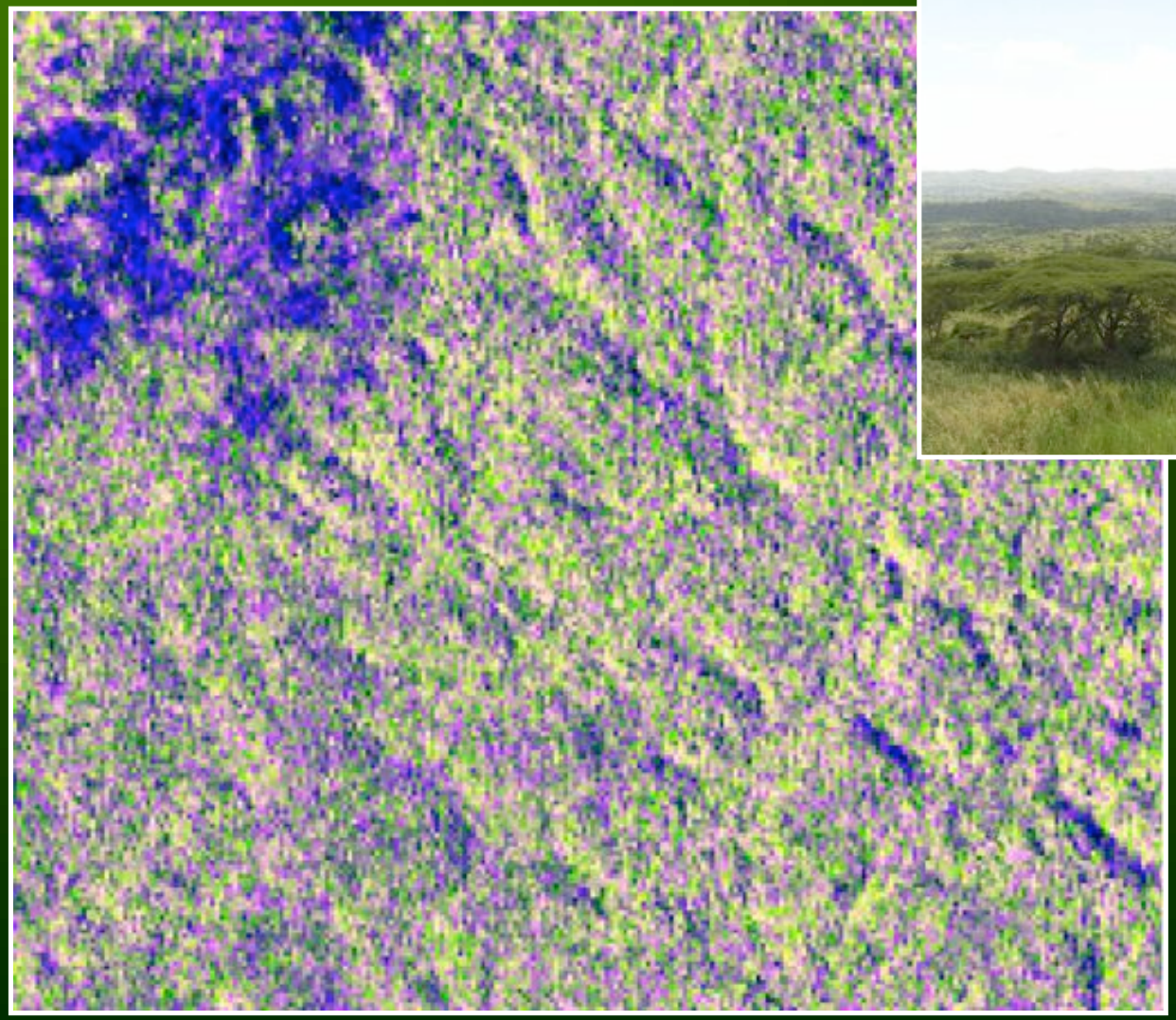
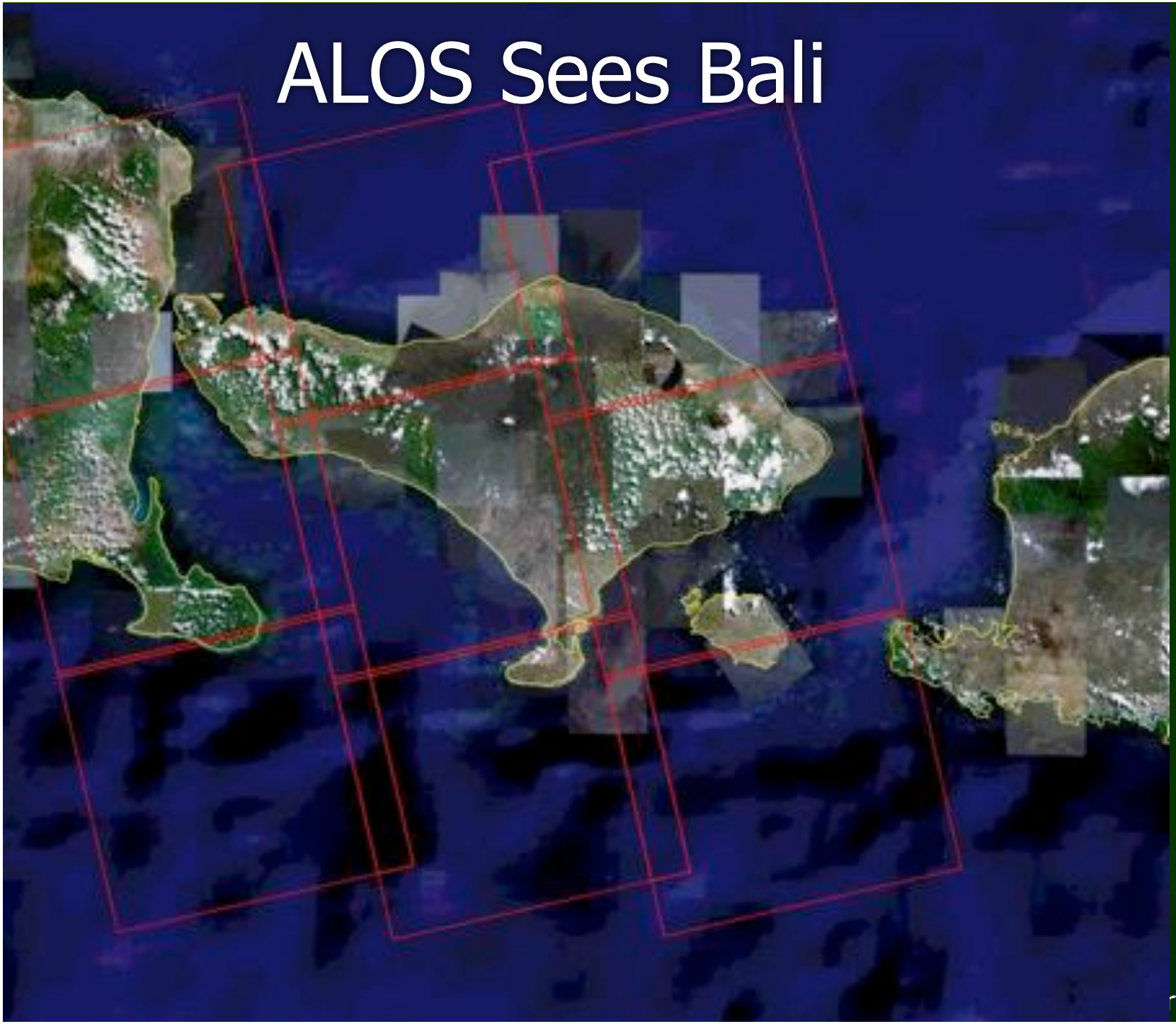


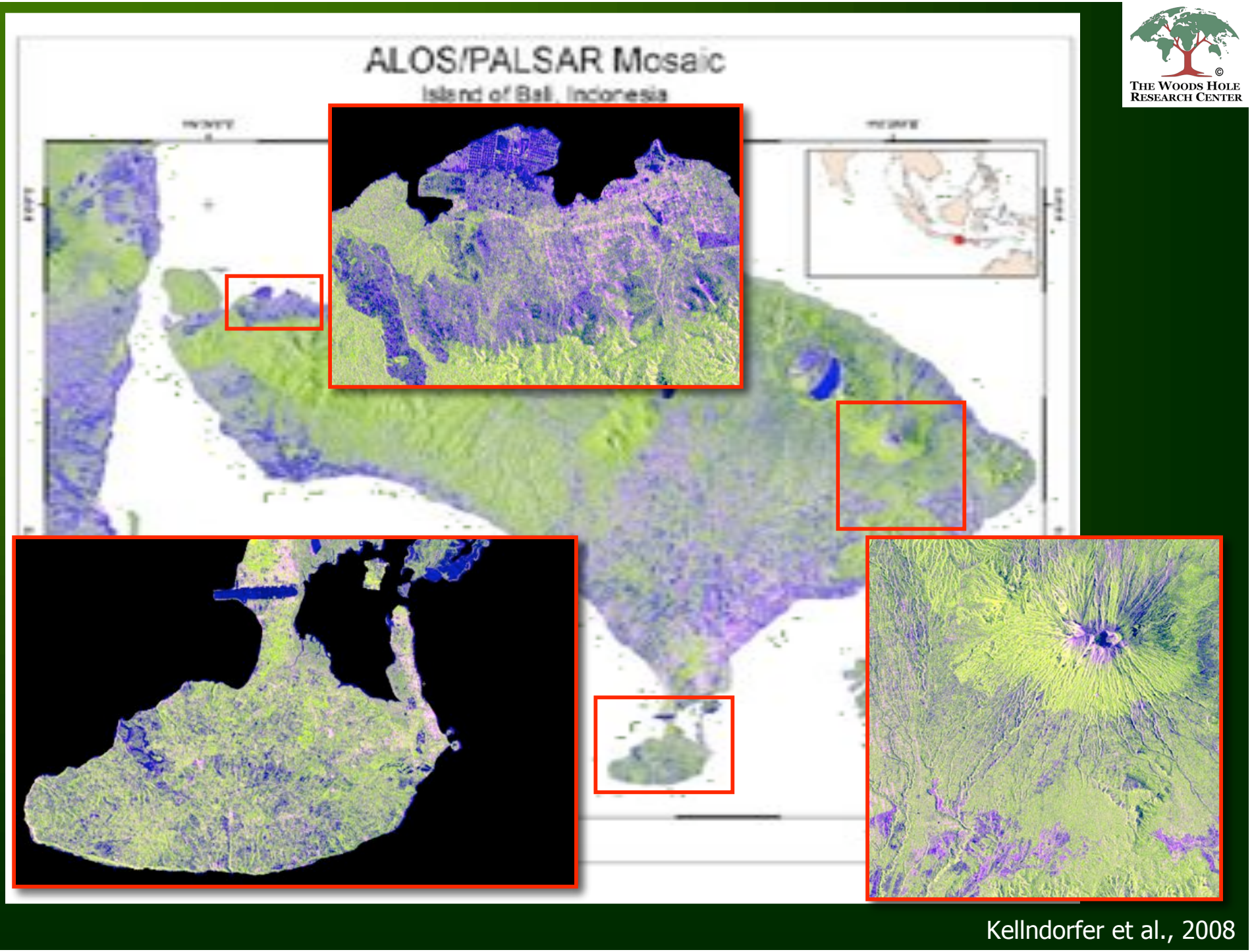
Kellndorfer et al., 2008

ALOS Sees Bali



The Woods Hole Research Center

rfer et al., 2008



Kellndorfer et al., 2008

Summary

- ALOS/PALSAR shows unprecedented potential for global forest mapping and monitoring - THANK YOU JAPAN AND JAXA!
- The systematic observation strategy is central to support REDD relevant observation needs
- Data continuity through follow-on missions is essential. Good news with ALOS follow-on, good outlook with U.S., German, Italian, Argentinean, and Brazilian EO plans with radar sensors
- FUSION: Combine Radar, optical, Lidar with ground reference data
- To streamline data-to-information: Important task for GEO to facilitate data interoperability AND data access within GEOSS

Kellndorfer et al., 2008

THANK YOU.

ALOS/PALSAR

& SRTM

BALI, Indonesia

Host to UNFCCC COP13

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