Detecting Tropical Deforestation with ALOS-PalSAR

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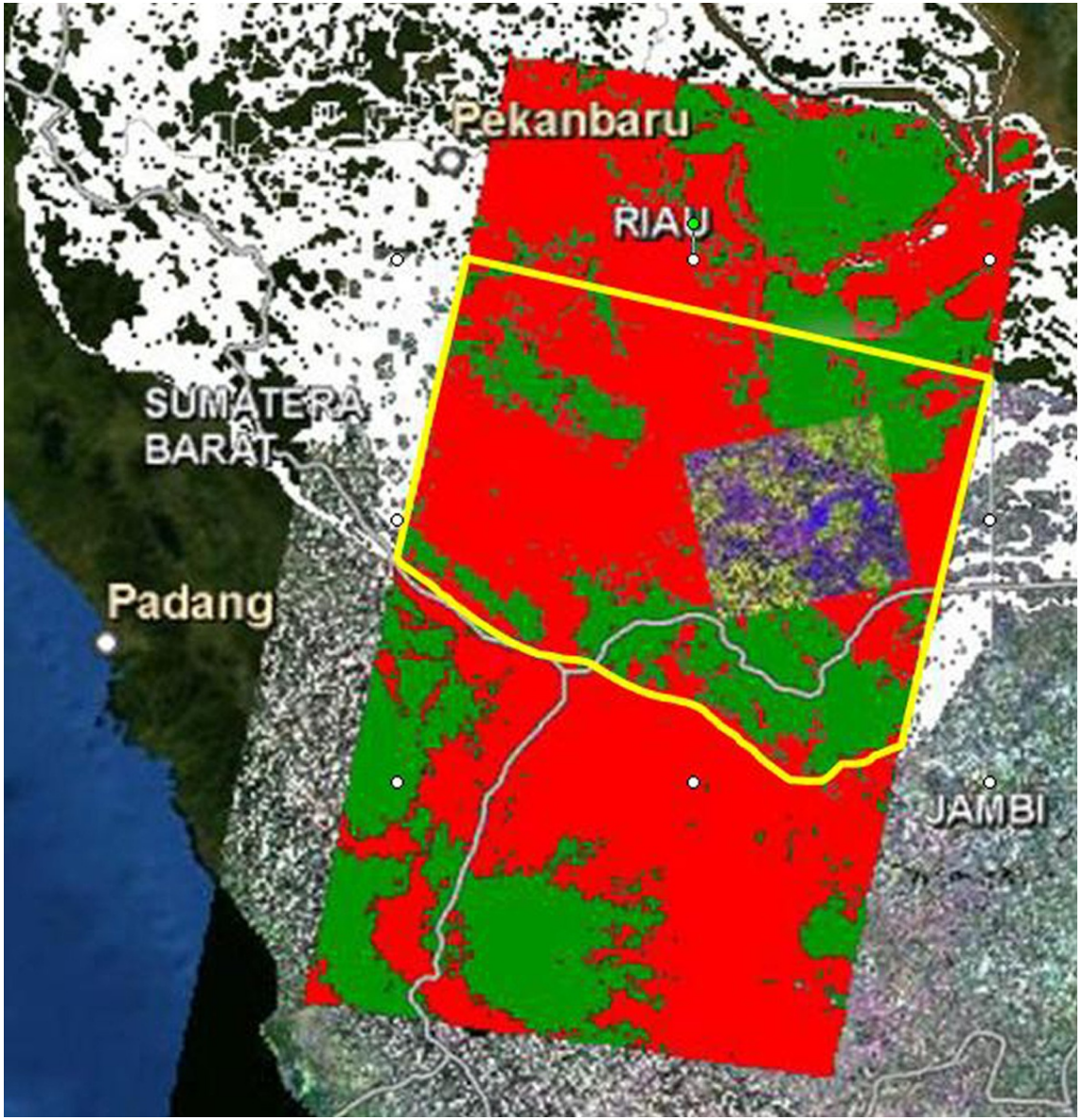
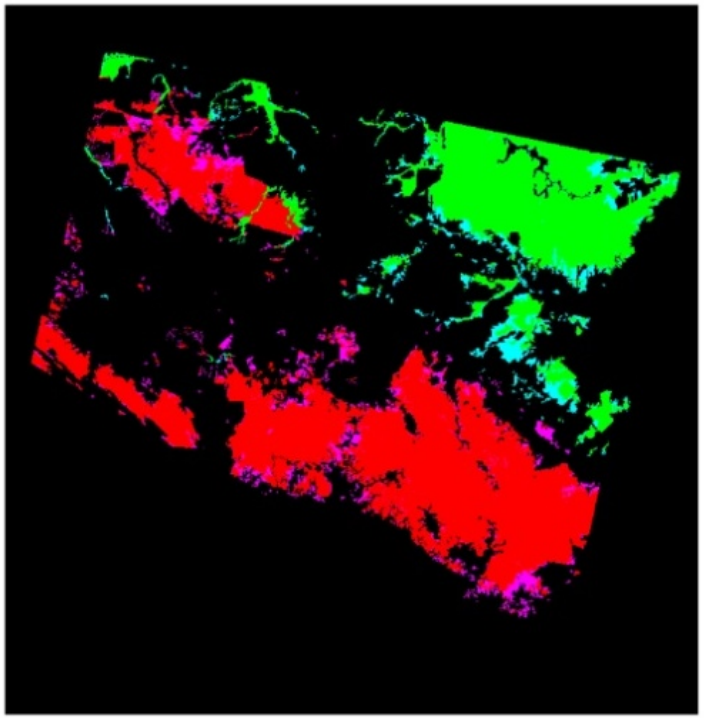
Content

1. Comparison of JAXA with SU-WWF deforestation methods
2. C-band vs L-band for forest monitoring

Data Coverage

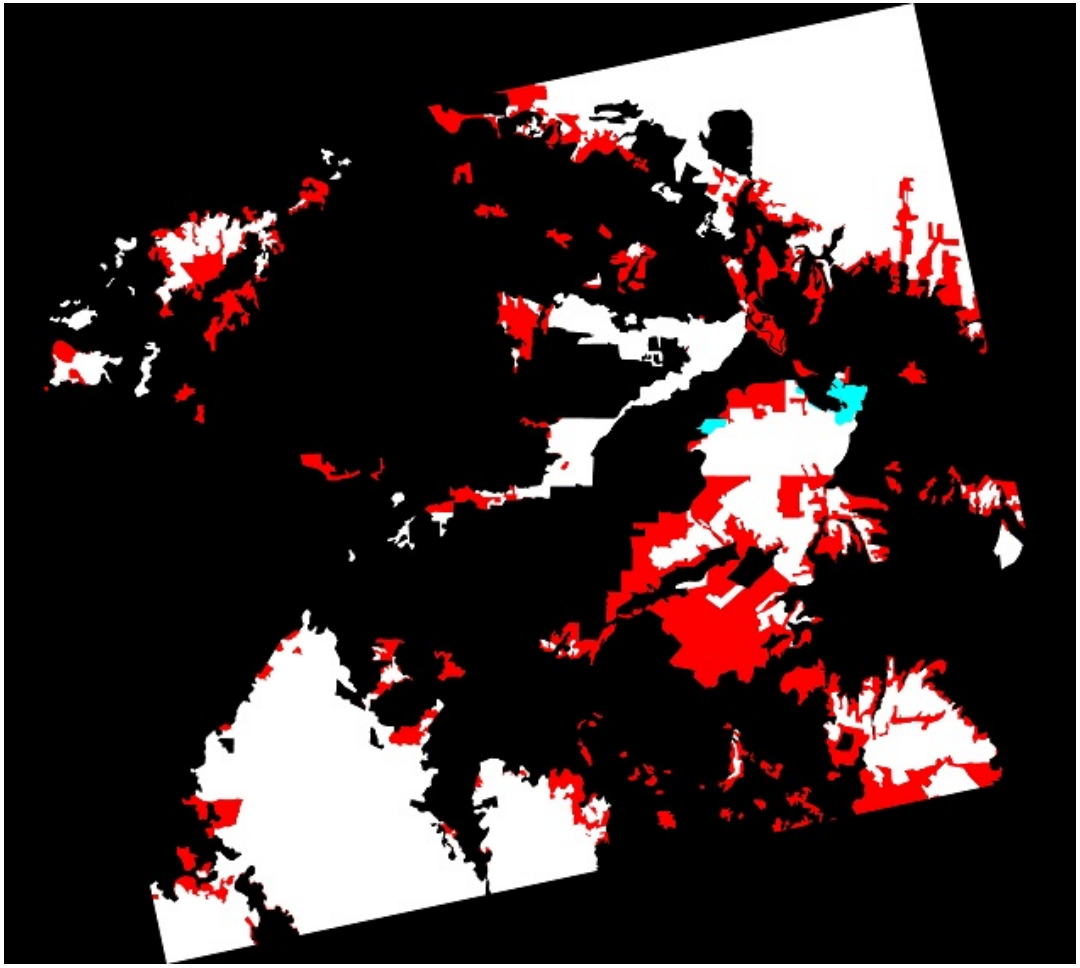


WWF databases



Forest types:
Red = dry, green = swampy.
Deforestation is shown in pink & light blue

WWF reference data



Forest change map derived from difference of 2008 & 2007 WWF maps

ALOS

HH & HV change detection

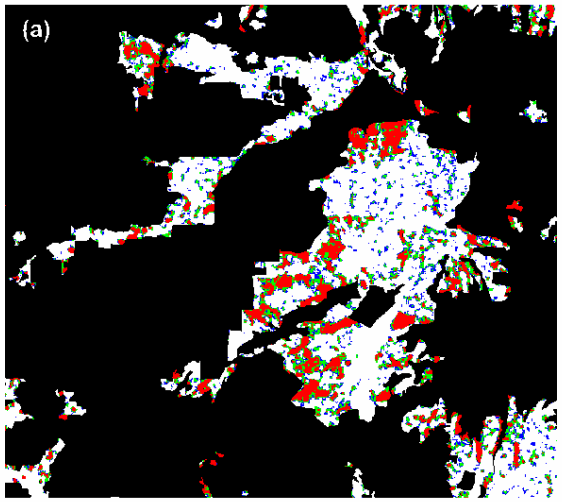
K&C Initiative
An international science collaboration led by JAXA

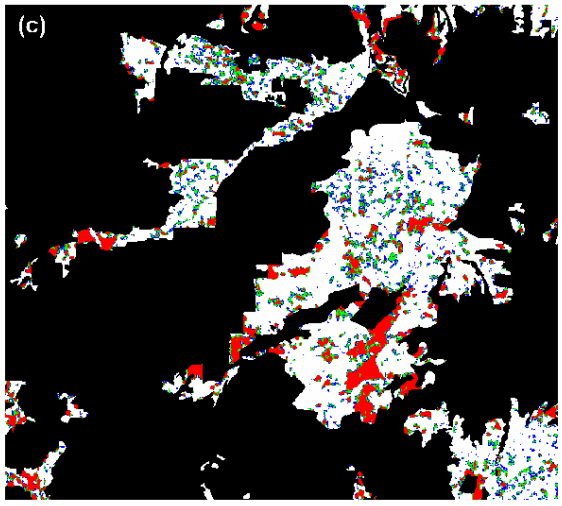
Increases

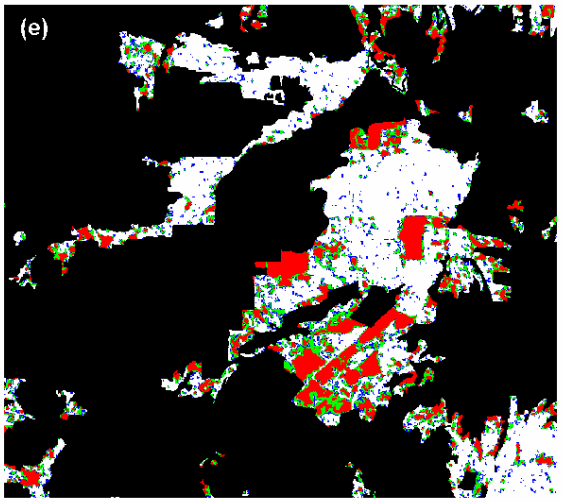
Decreases

Fusion

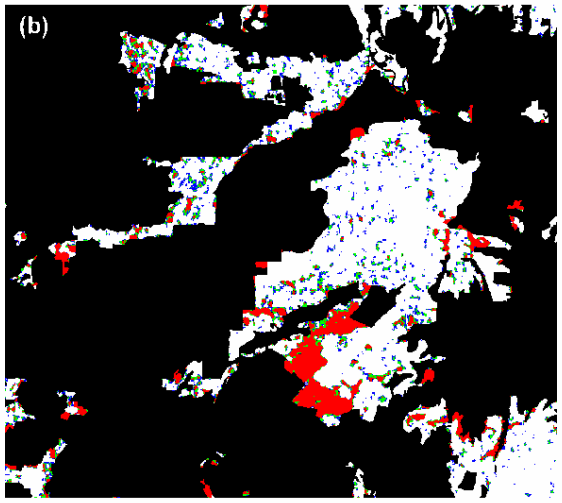
HH

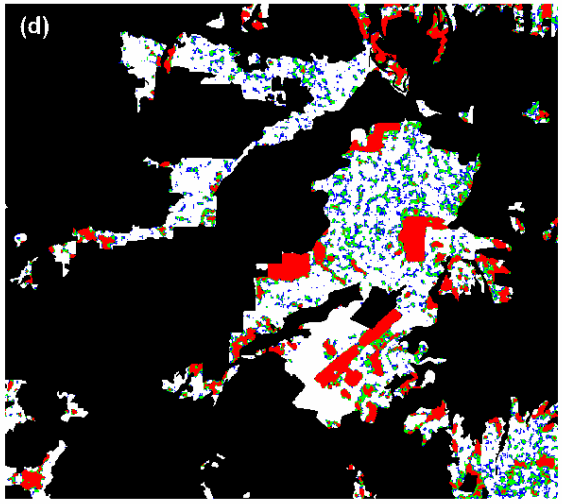




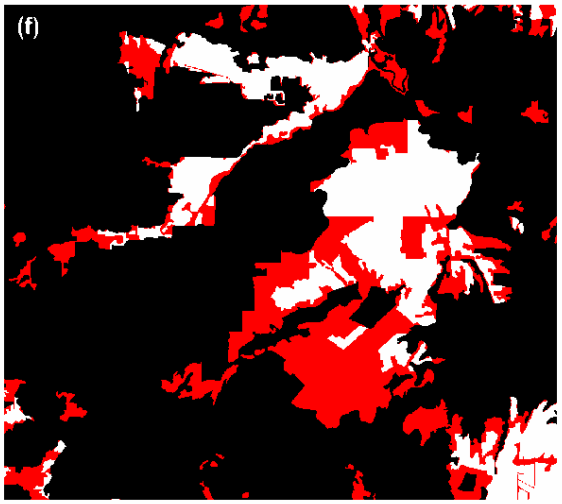


HV





WWF databases

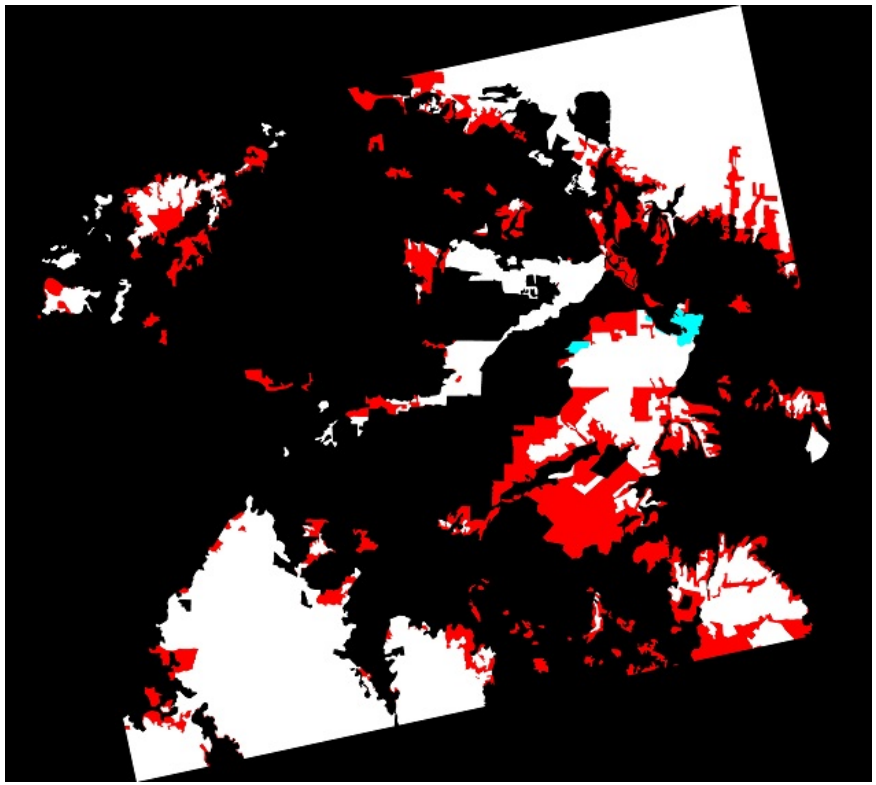


Detection Strategies

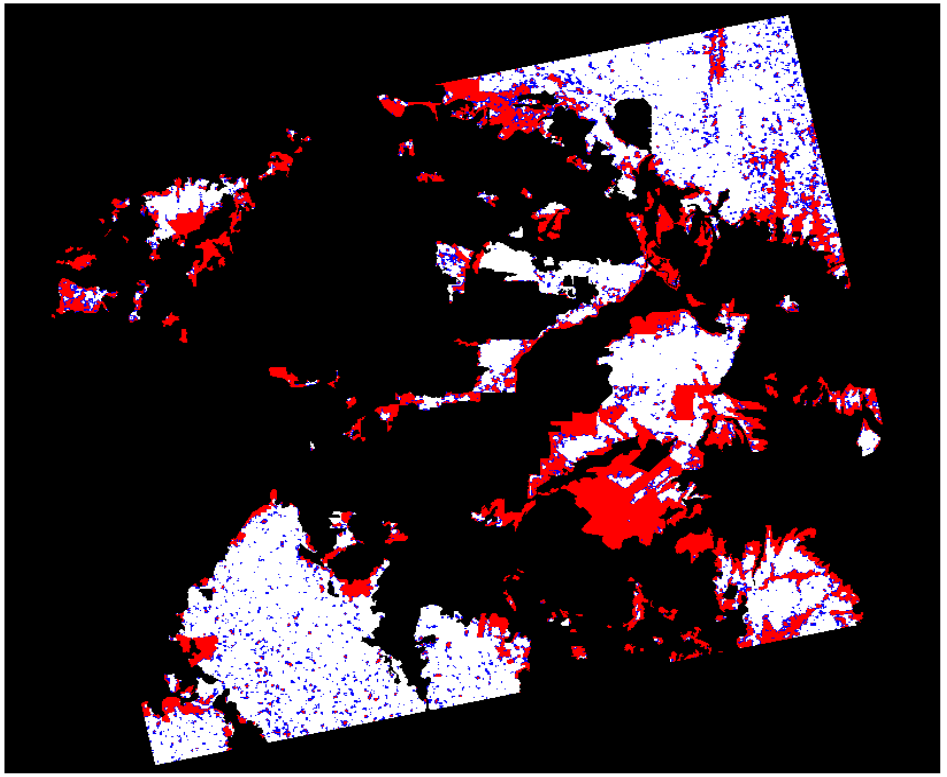
	Data	Method	Accuracy assessment	
JAXA	mosaics	HV decrease	sampling	high accuracy, low false detections
SU & WWF	FBD + ScanSAR	HV and HH increases & decreases (+ScanSAR)	full scenes using WWF databases	reasonable accuracy but trade off for false detections

	representative?	accurate?
JAXA	?	√
SU & WWF	√	?

WWF reference

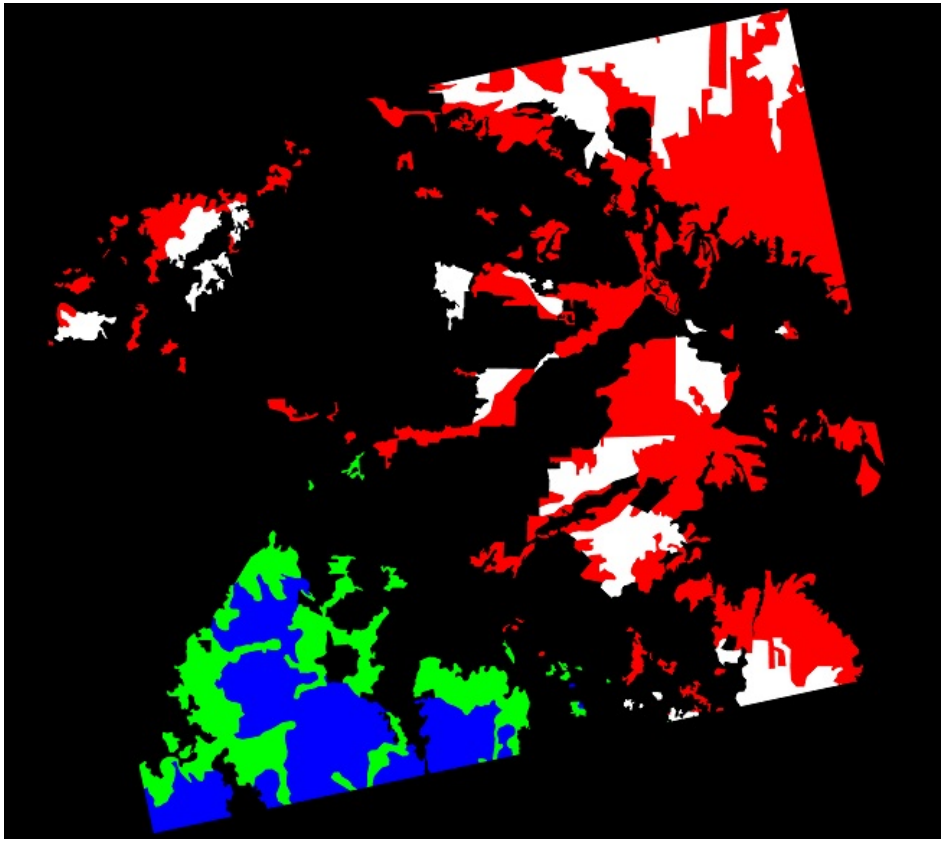


HH/VV thresholding



	HV change	HH/HV change	SU & WWF original method
Pfa = 10%	55%	77%	58%
Pfa = 20%	65%	86%	72%

Detection vs Forest Type



Red: swampy & open
Green: dry & open
White: swampy & closed
Bly: dry & closed

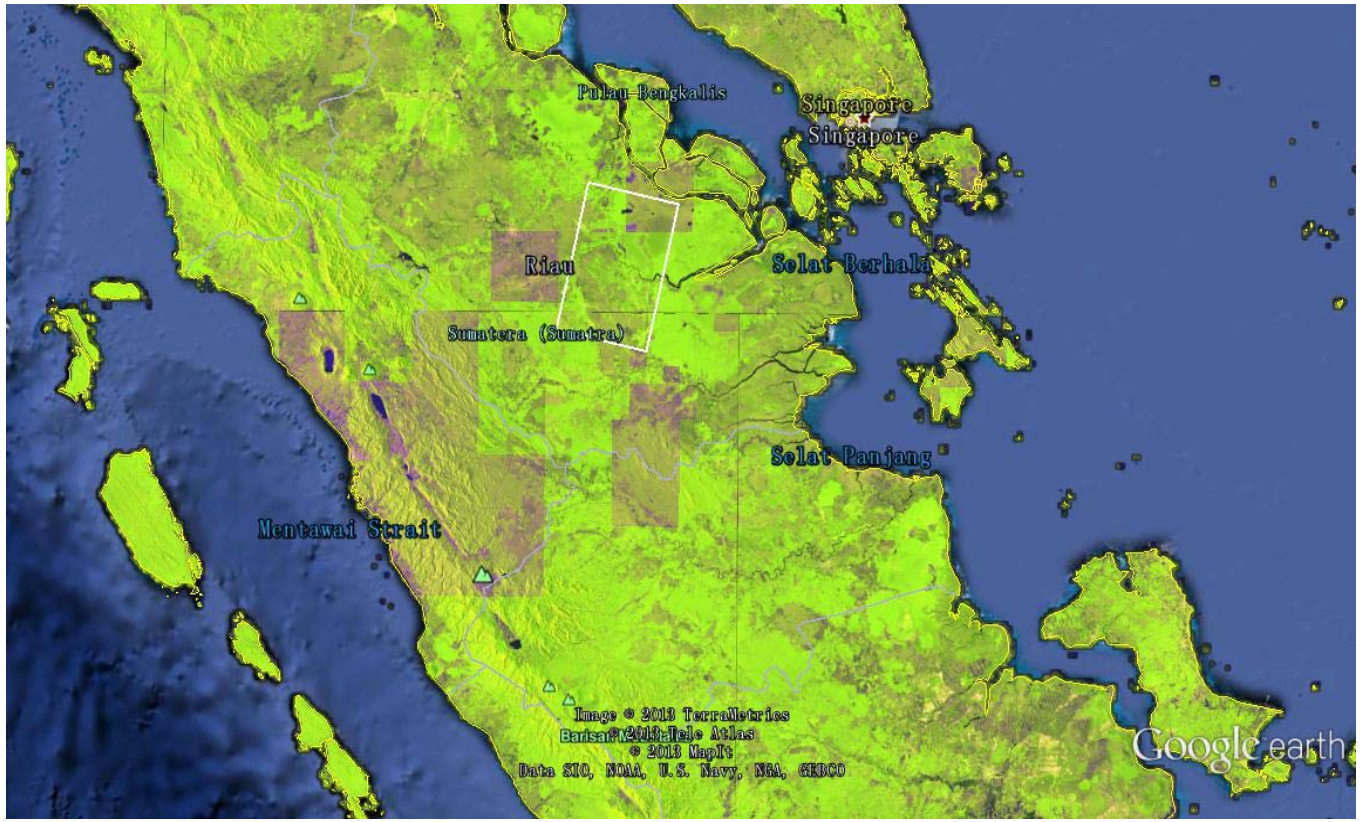
	Detection rate
Swampy & closed	85%
Swampy & open	79%
Dry & open	78%
Dry & closed	51%

Issues

- Currently can't obtain the K & C high quality mosaic
- Still learning the most effective methods of detecting deforestation
- Unresolved issues on accuracy of:
  - ALOS detection
  - WWF databases
- Accuracy of detecting deforestation will depend on forest type

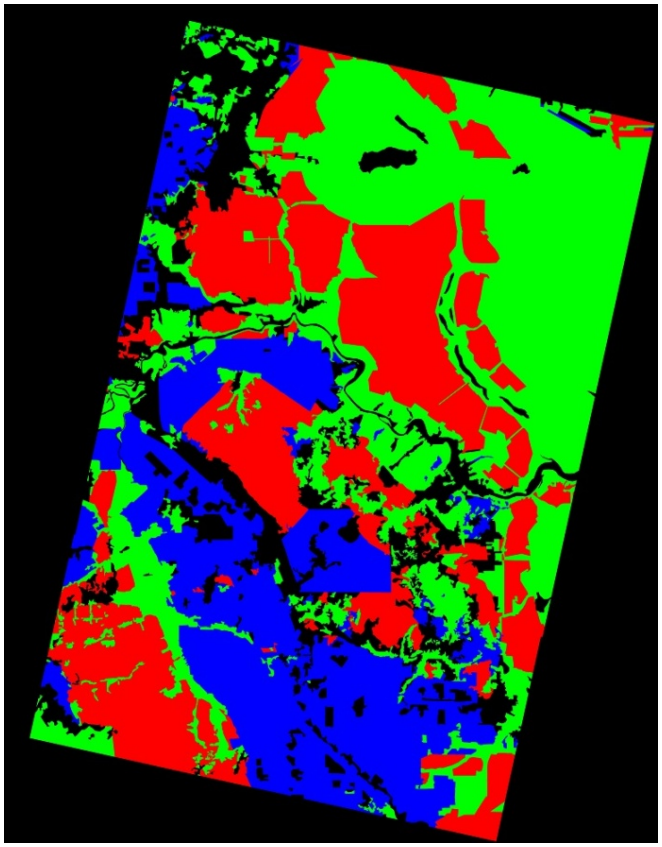
C- & L-band comparisons

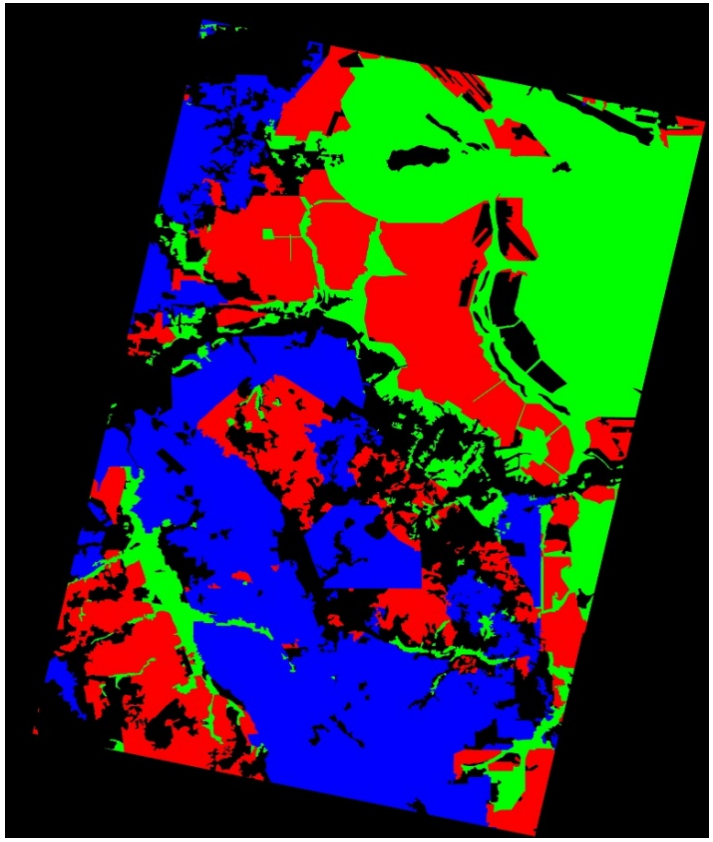
White box = ASAR APG scene



Context: Europe is about to launch the first Sentinel satellite, giving regular global coverage at C-band.

What will be its value relative to L-band for monitoring tropical forests?





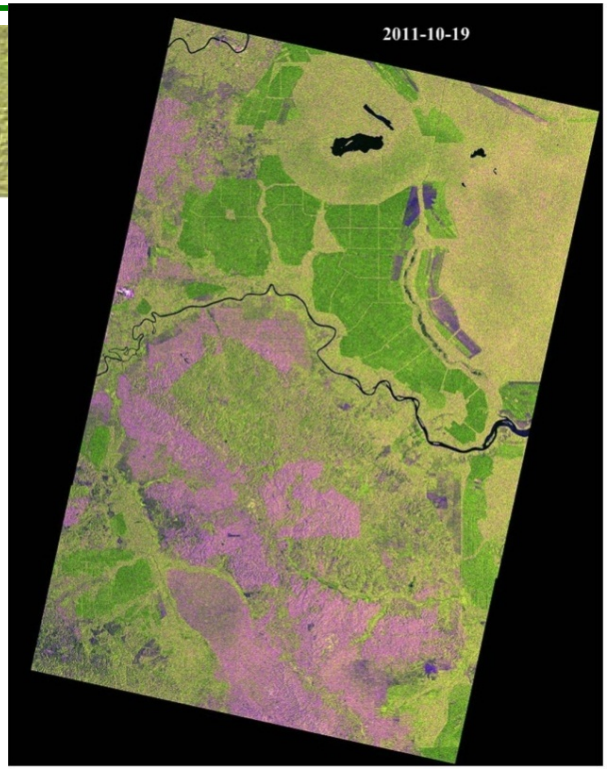
Red: acacia plantation
Green: natural forest
Blue: oil palm
Black: cleared or unidentified

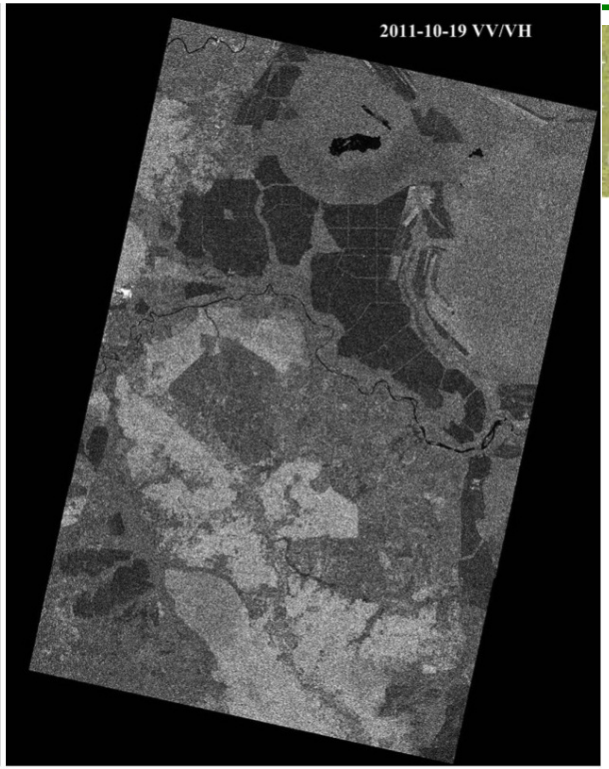
WWF 2007

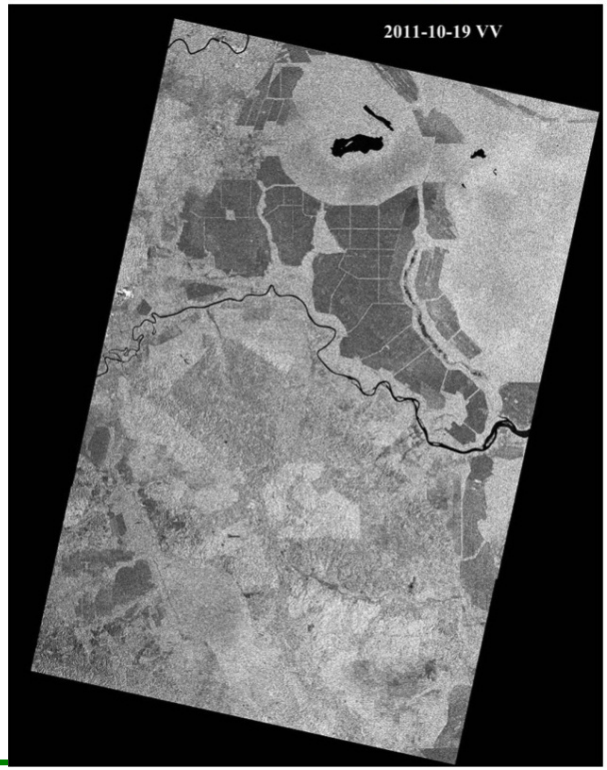
WWF 2011

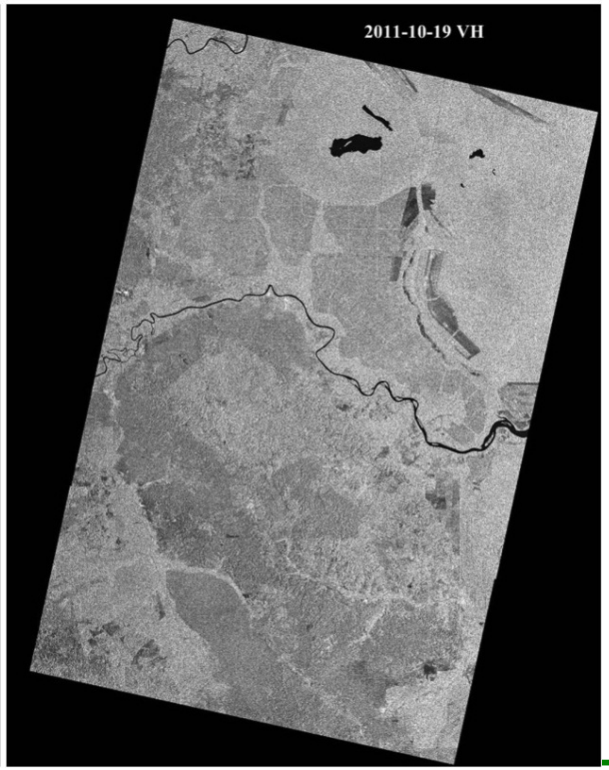
ALOS

nitiative
collaboration led by JAXA





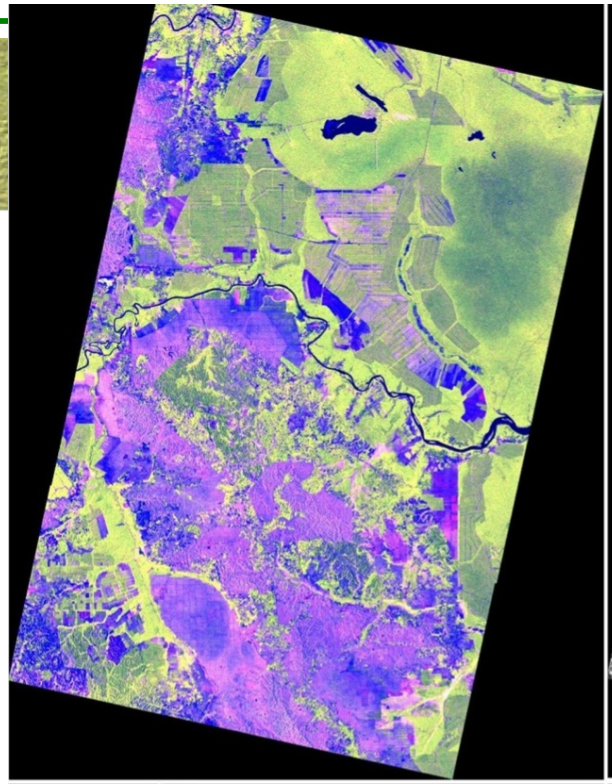


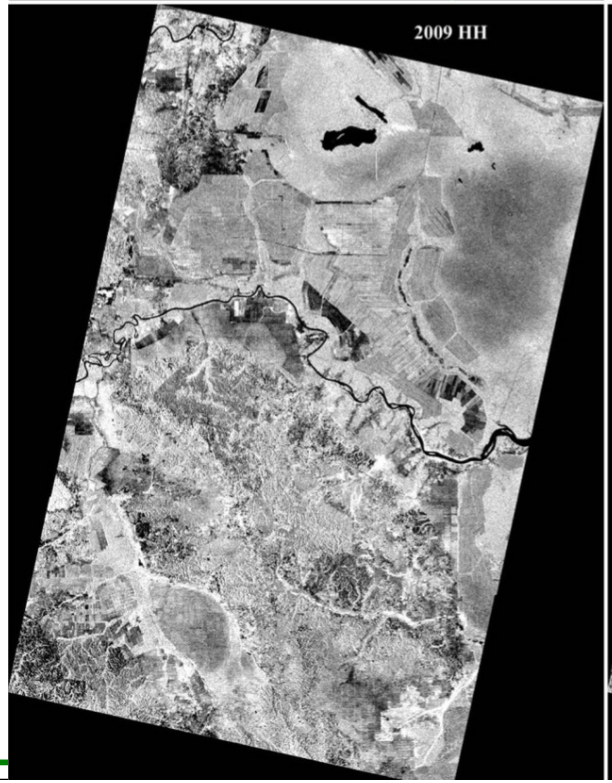


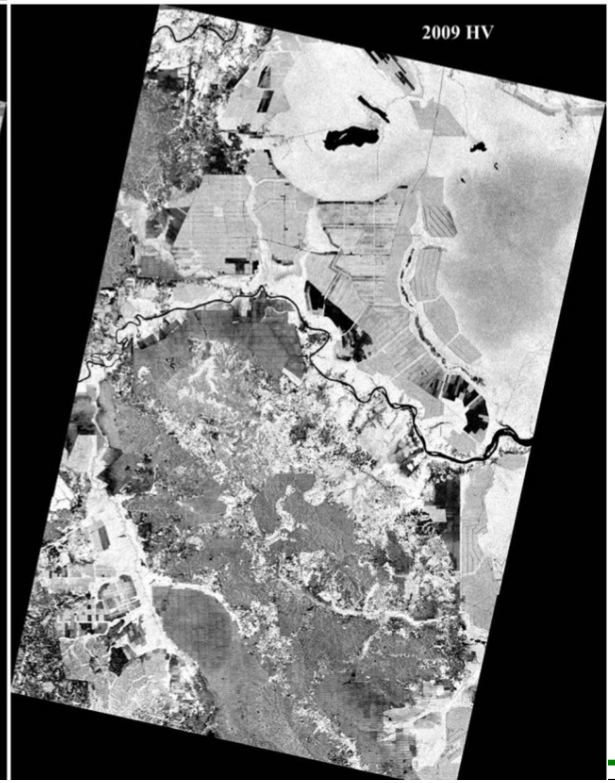
ESA APG
19 Oct 2011

ALOS

nitiative
collaboration led by JAXA

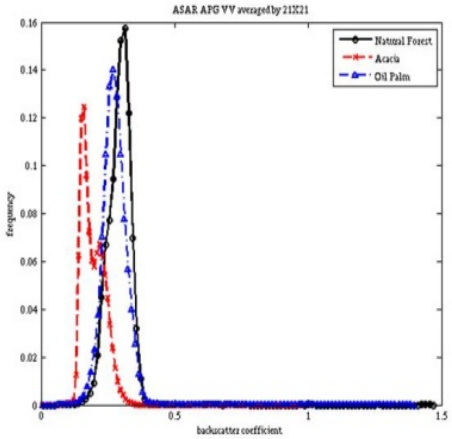




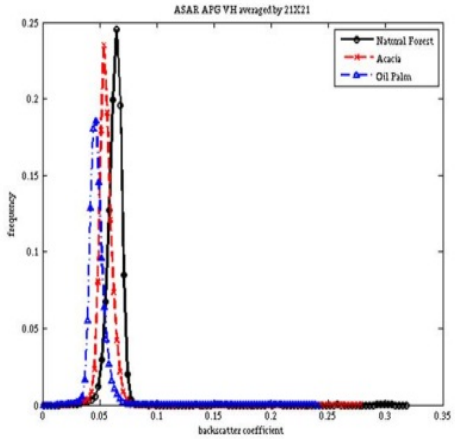


PALSAR 50 m
2009 mosaic

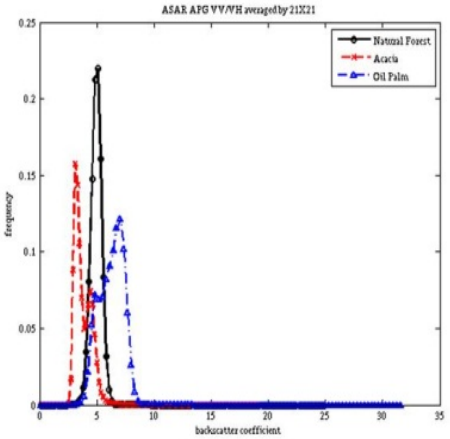
VV



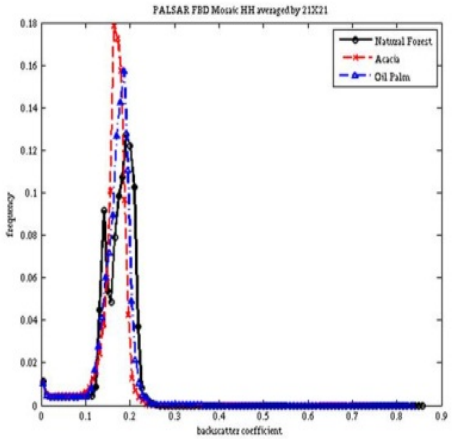
VH



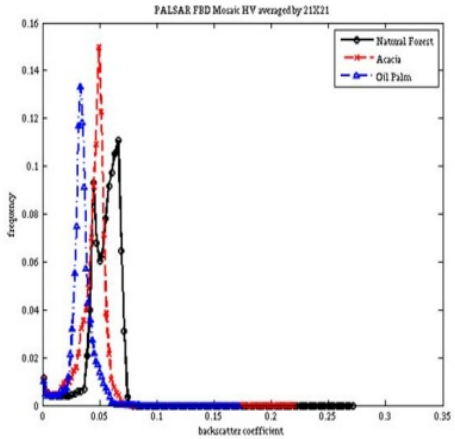
VV/VH



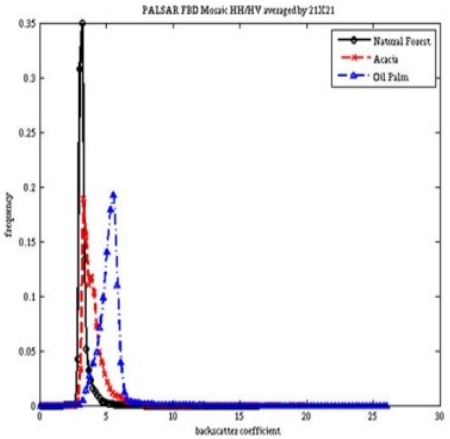
ASAR APG



HH



HV



HH/HV

PALSAR 50 m mosaics

Time series of ASAR APG images

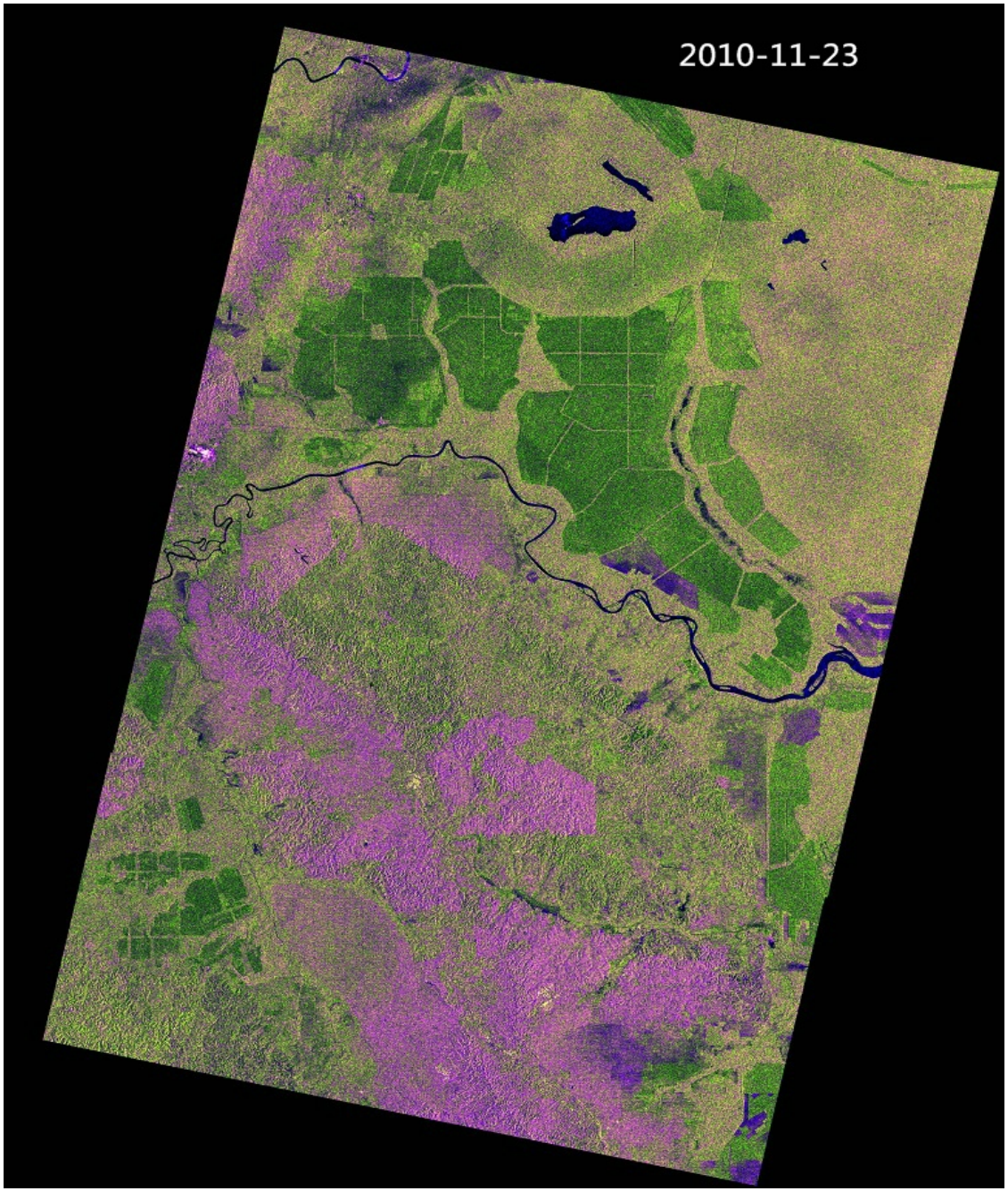
Land cover maps derived from WWF 2011 dataset

Green: Natural Forest

Red: Acacia

Blue: Oil Palm

SAR images are produced from ASAR APG mode (Alternative Polarization Geocoded), totally 9 images from 2010/11/23-2011/10/19.



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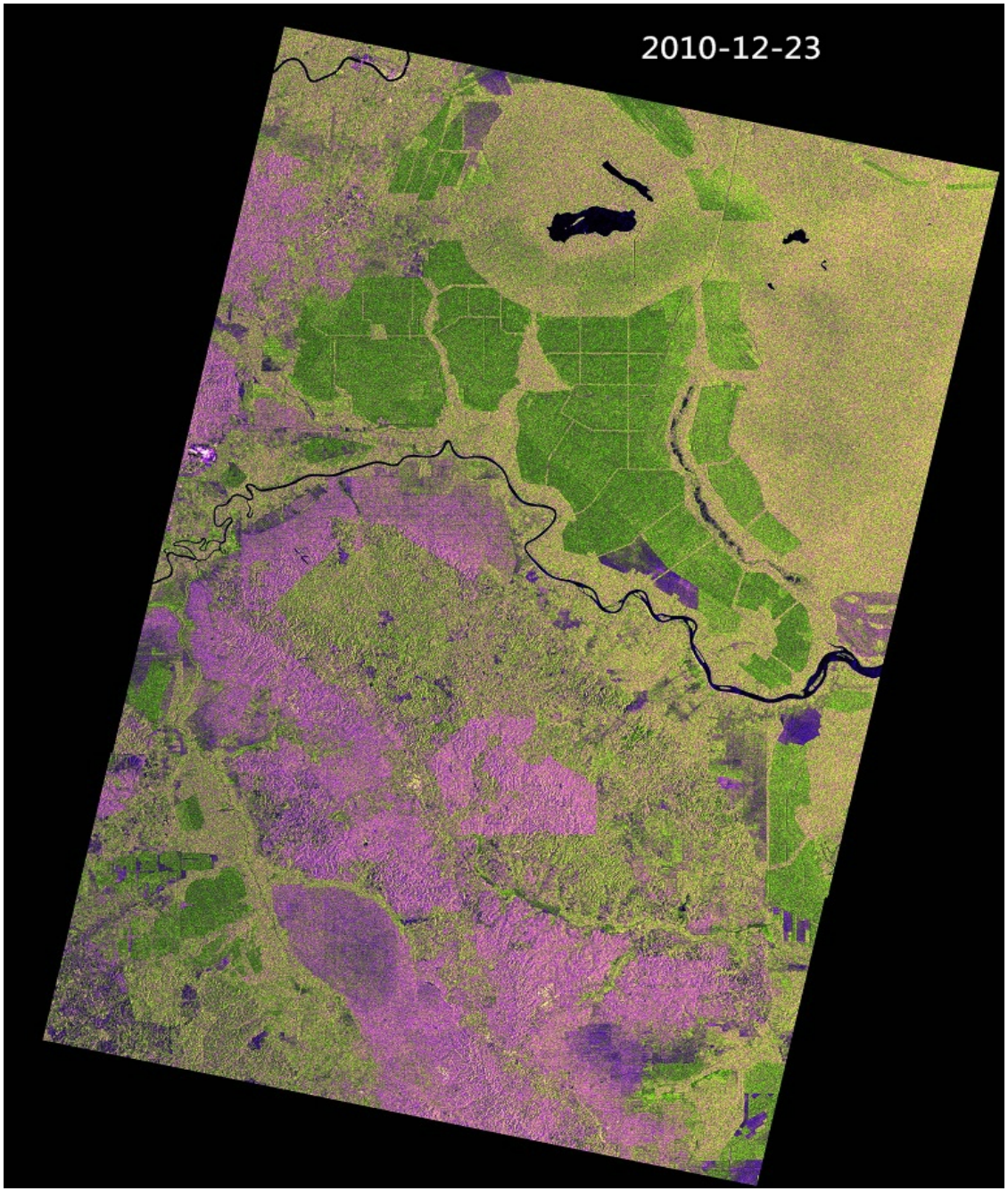

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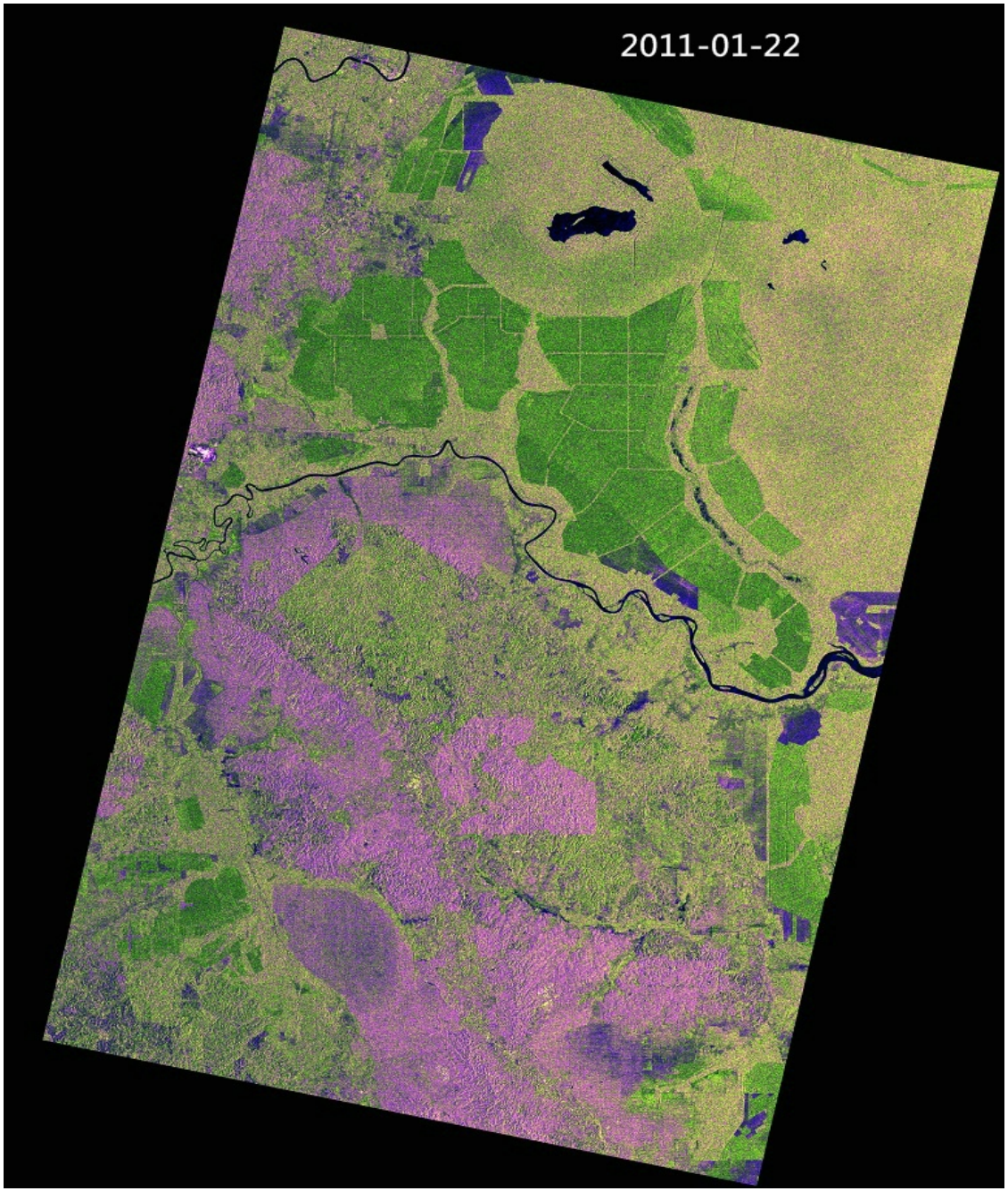

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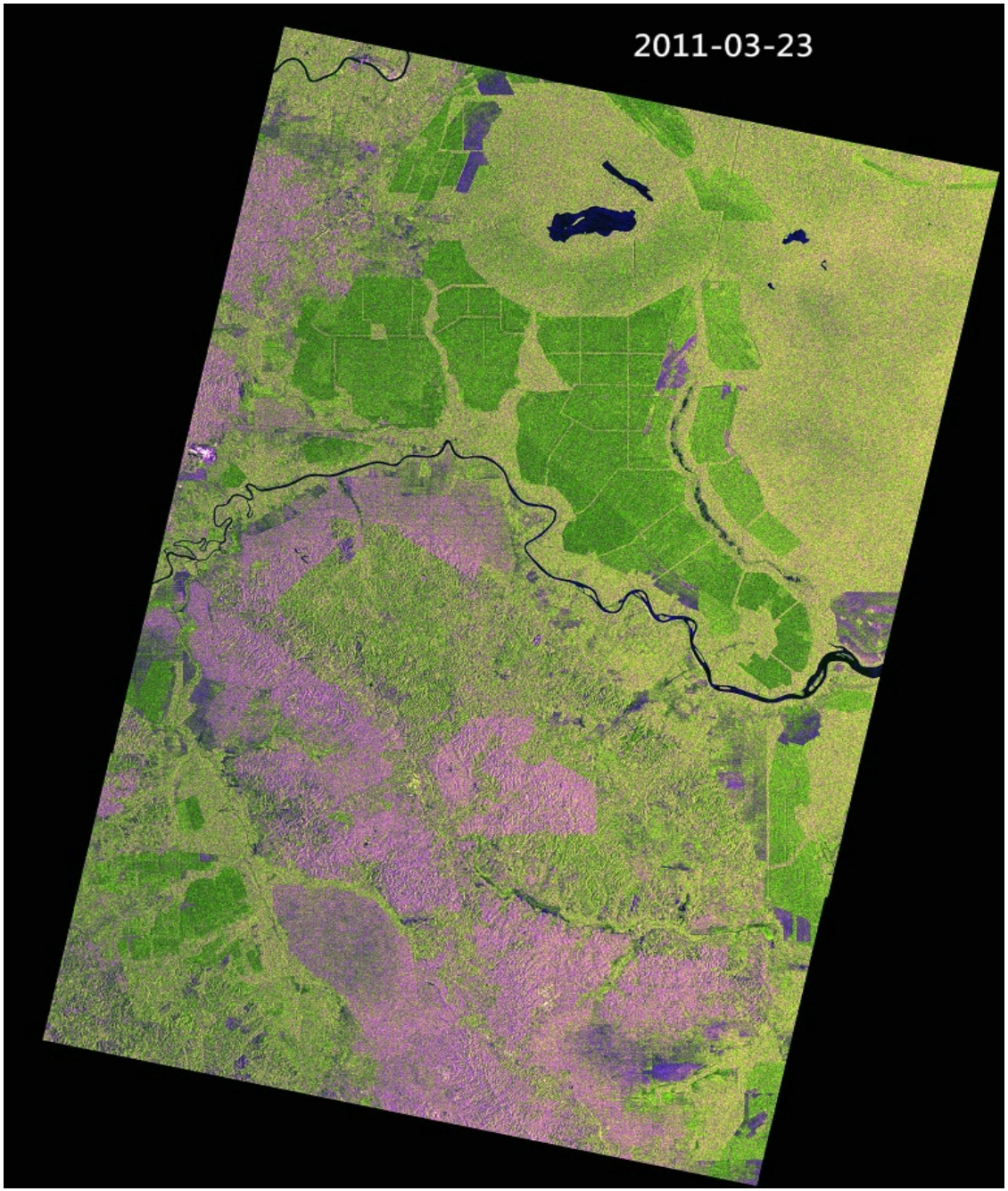

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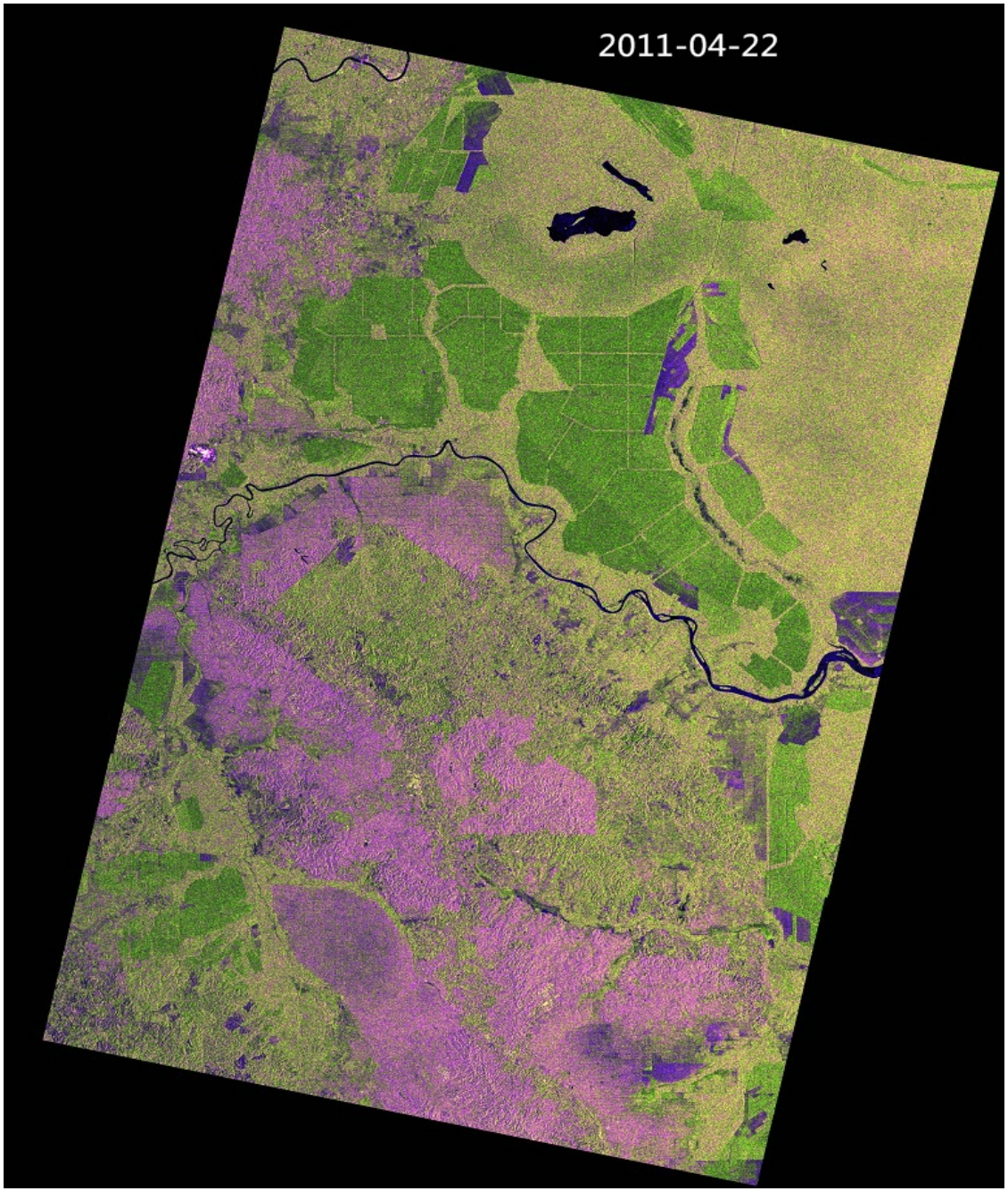

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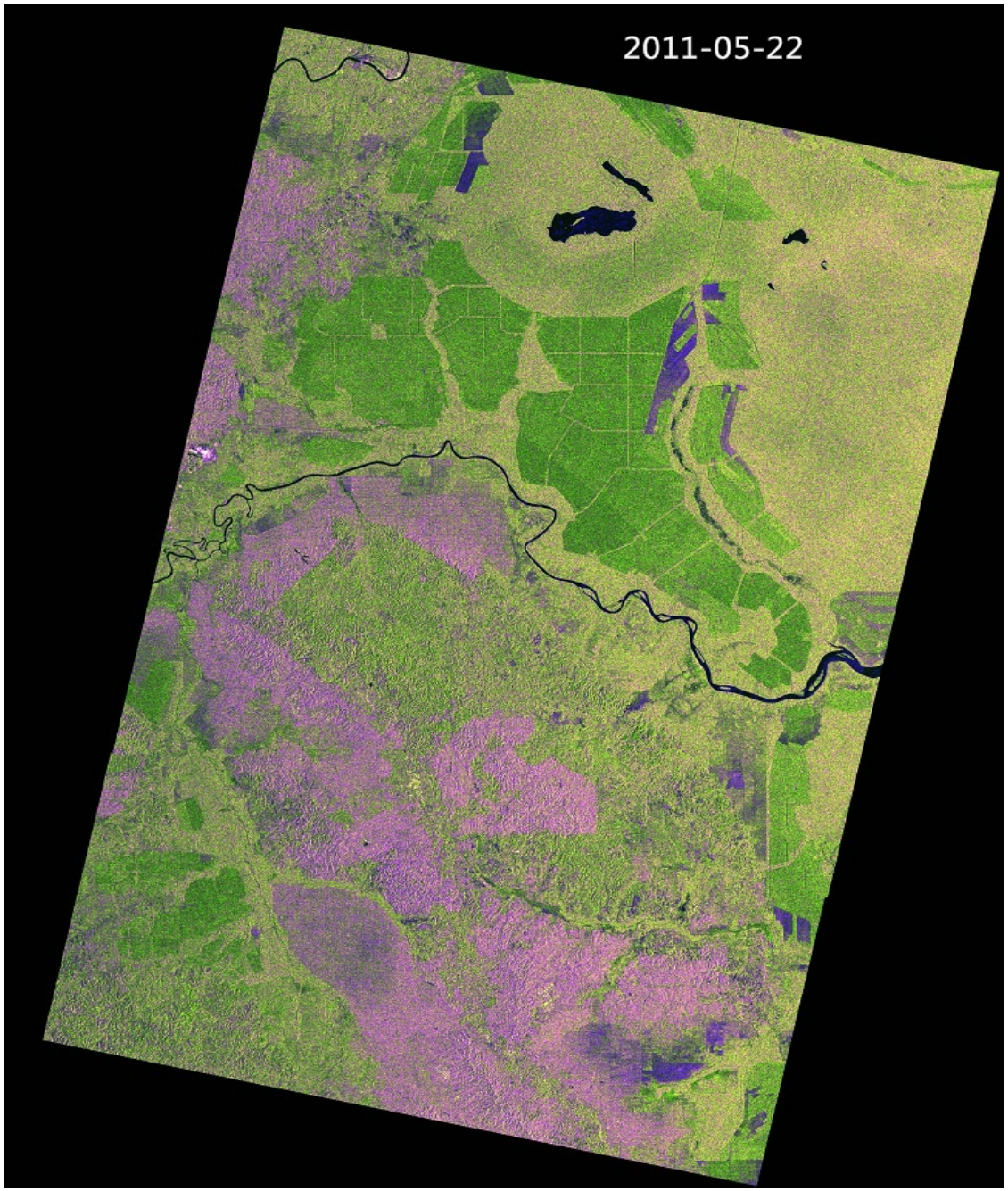

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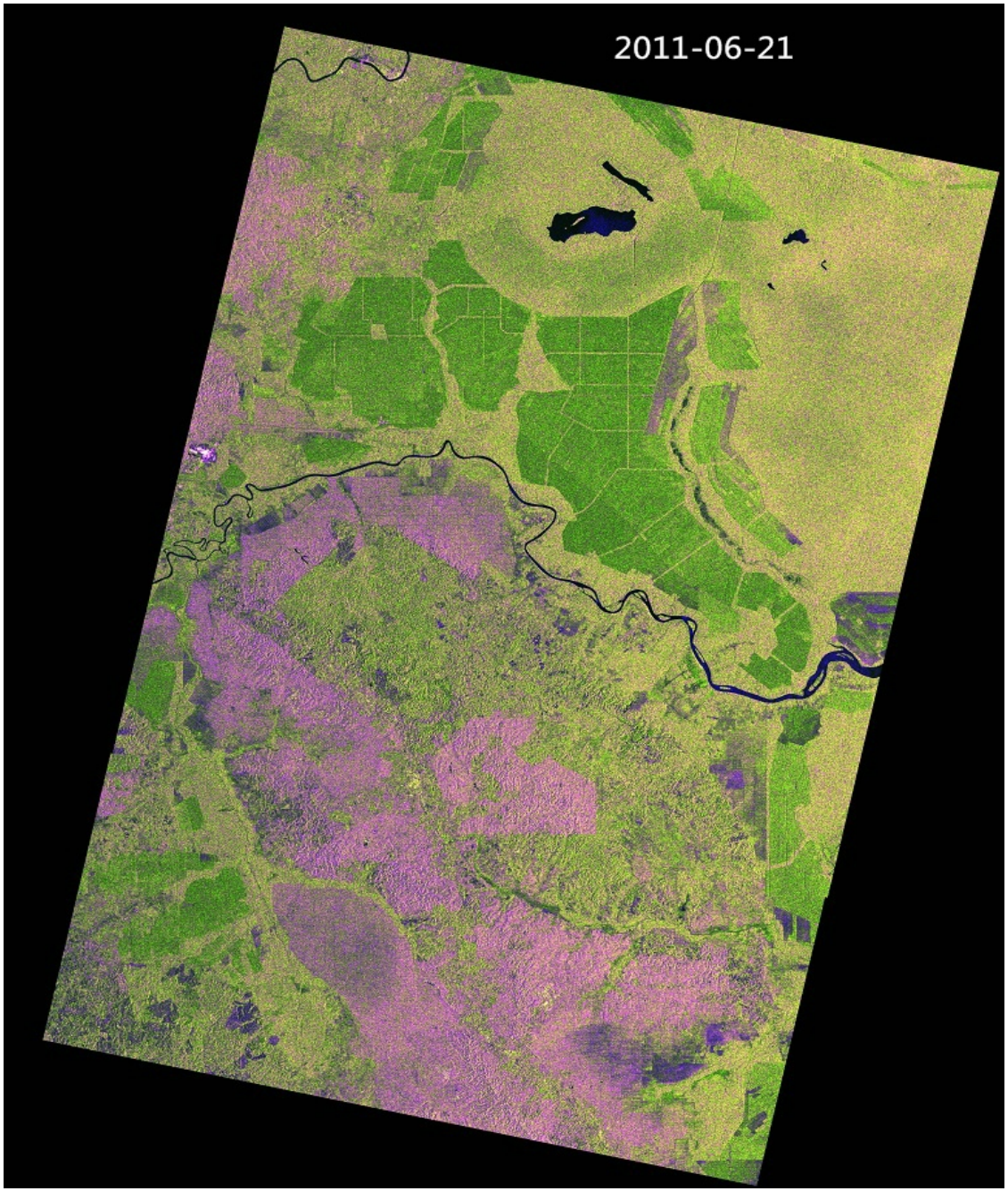

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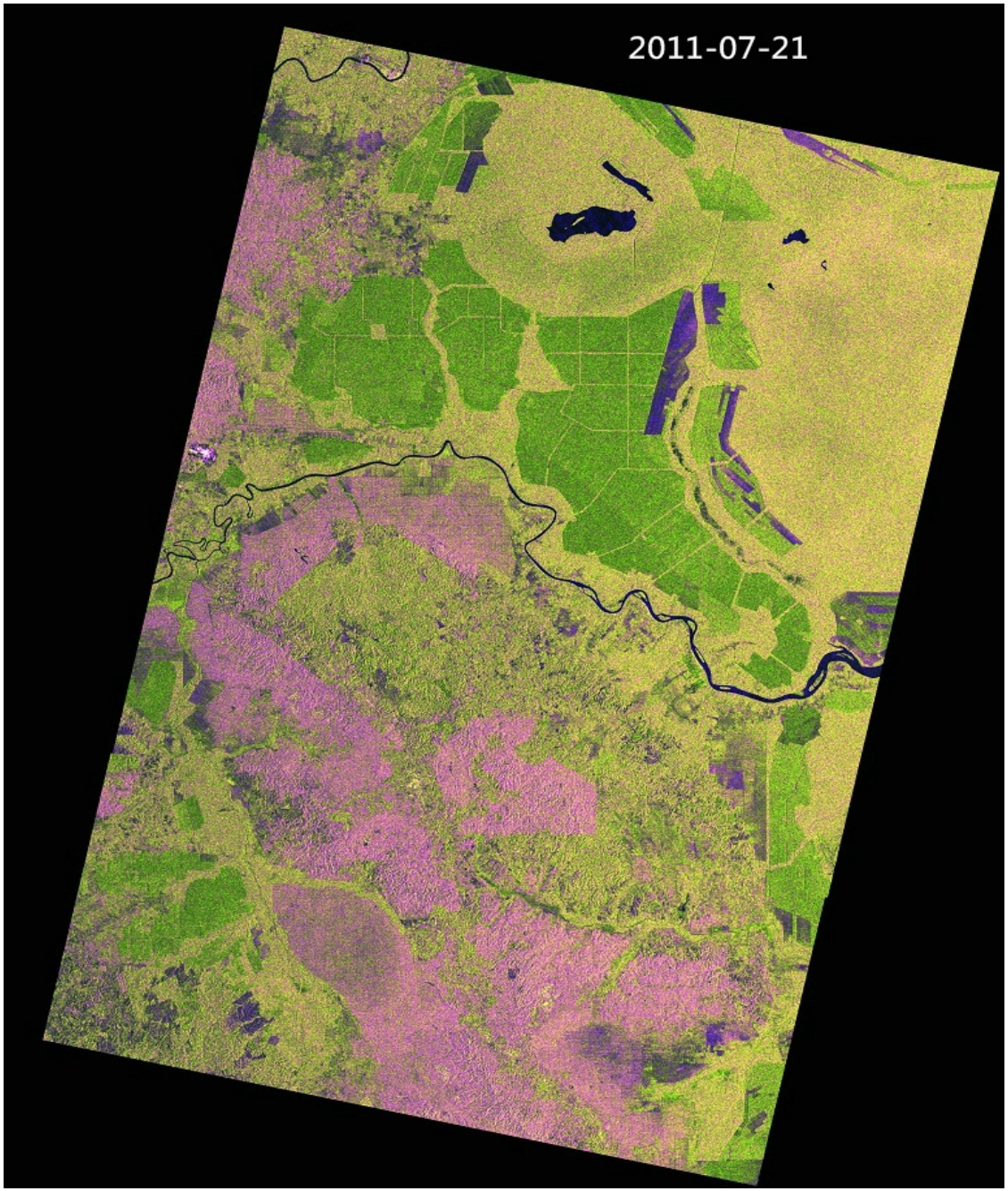

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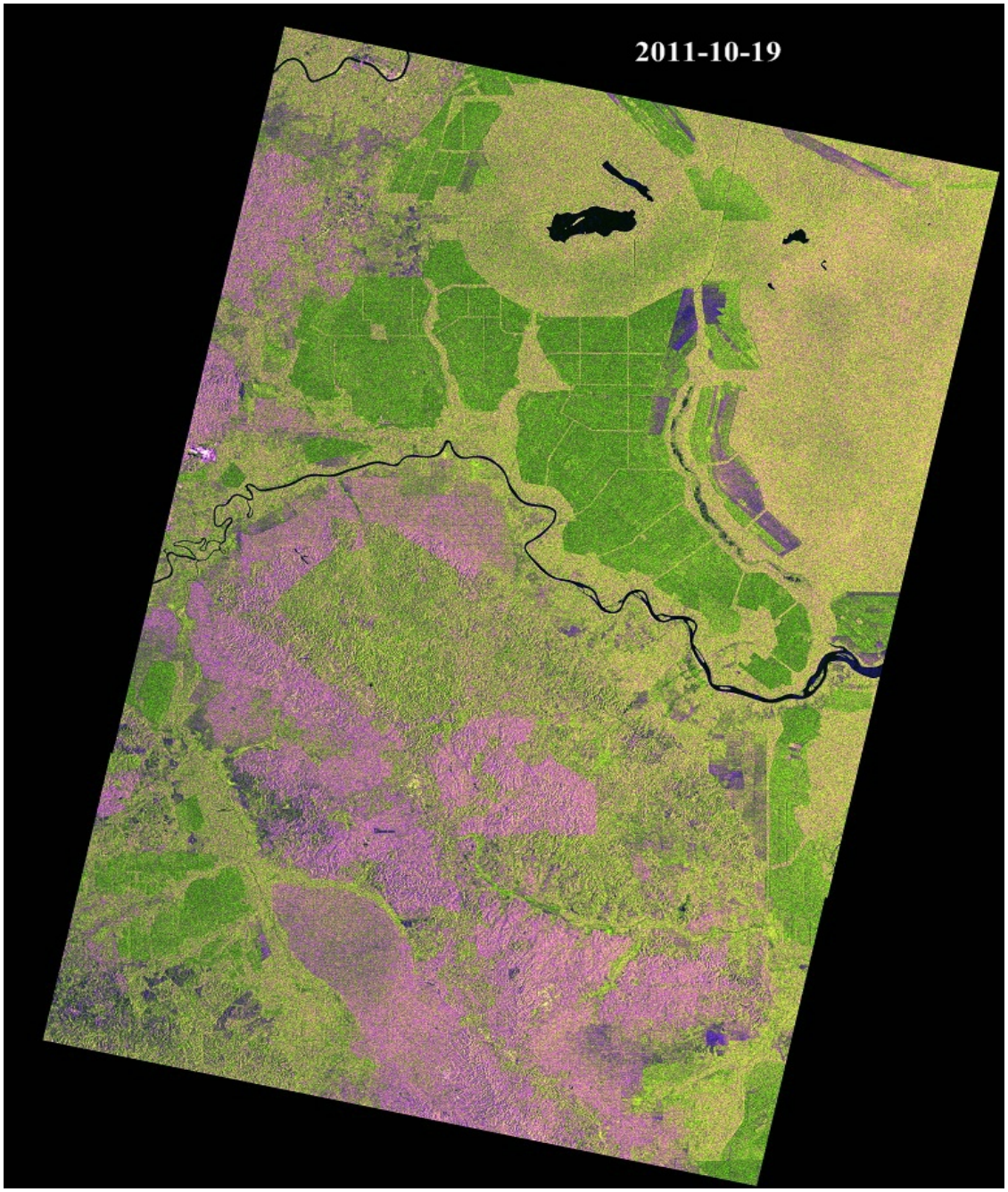


Time series of ALOS FBD 50m mosaics

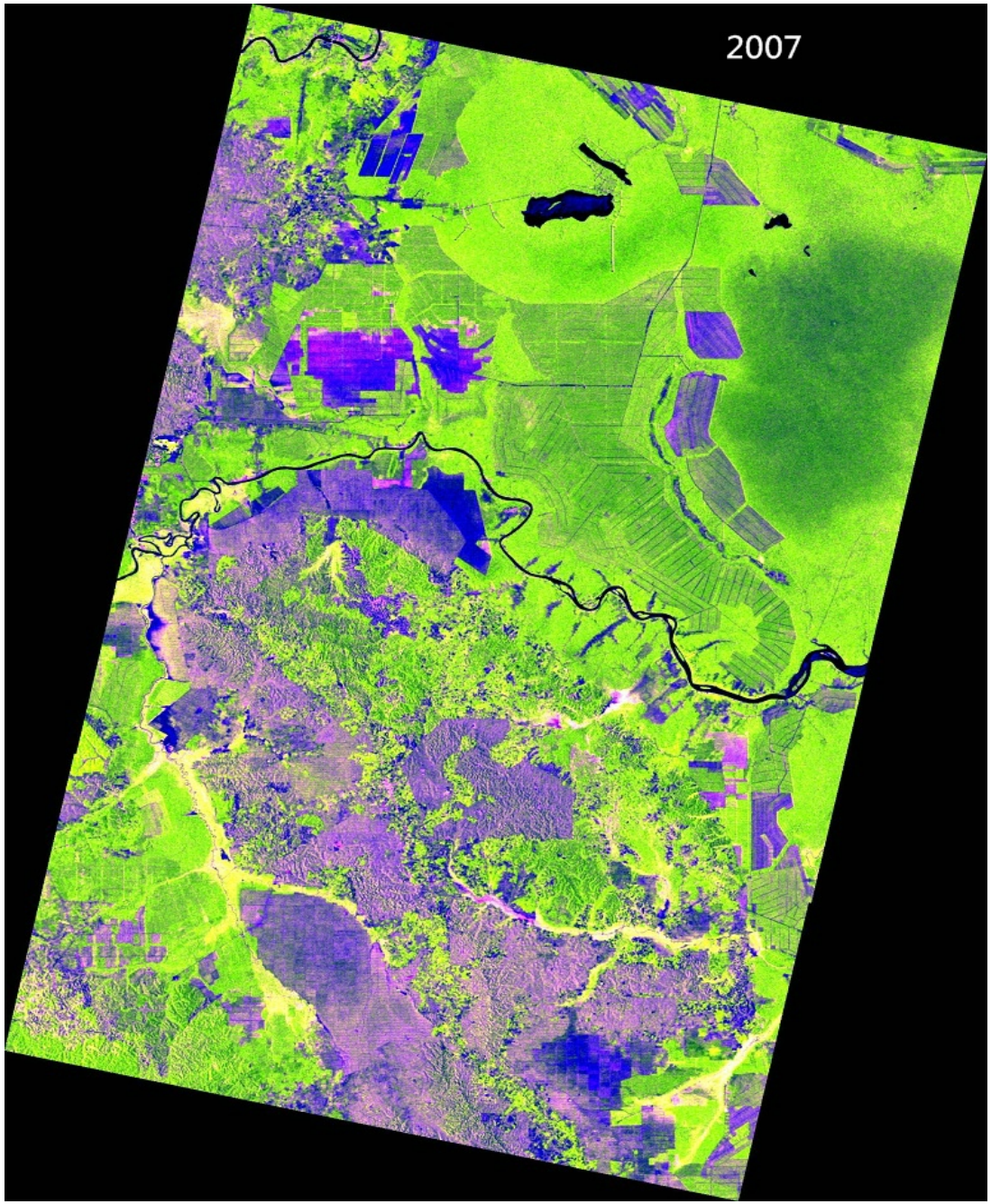
Land cover maps derived from WWF 2011 dataset

Green: Natural Forest

Red: Acacia

Blue: Oil Palm

SAR images are from ALOS PALSAR K&C mosaics (50m) for 2007, 2008 & 2009



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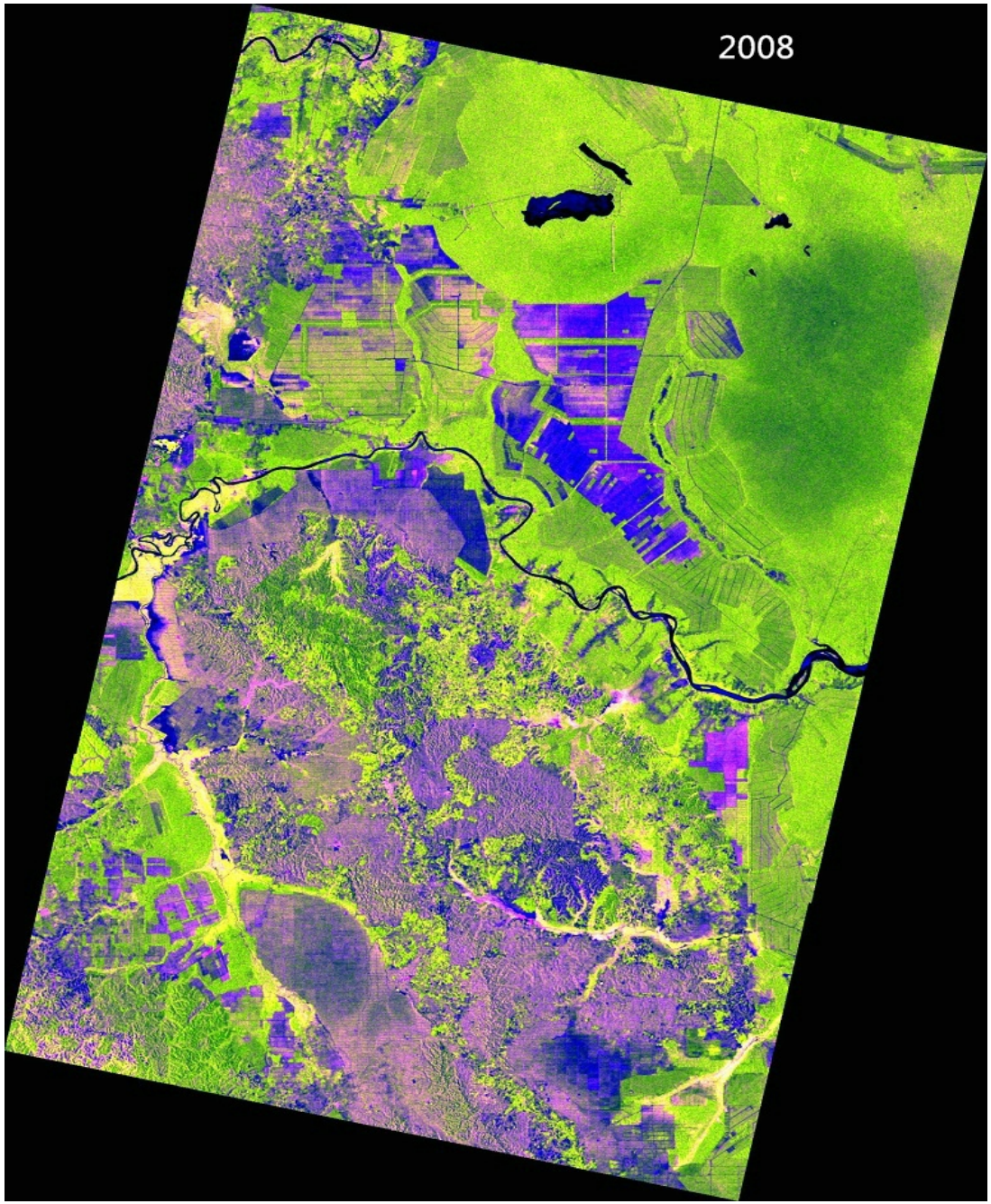

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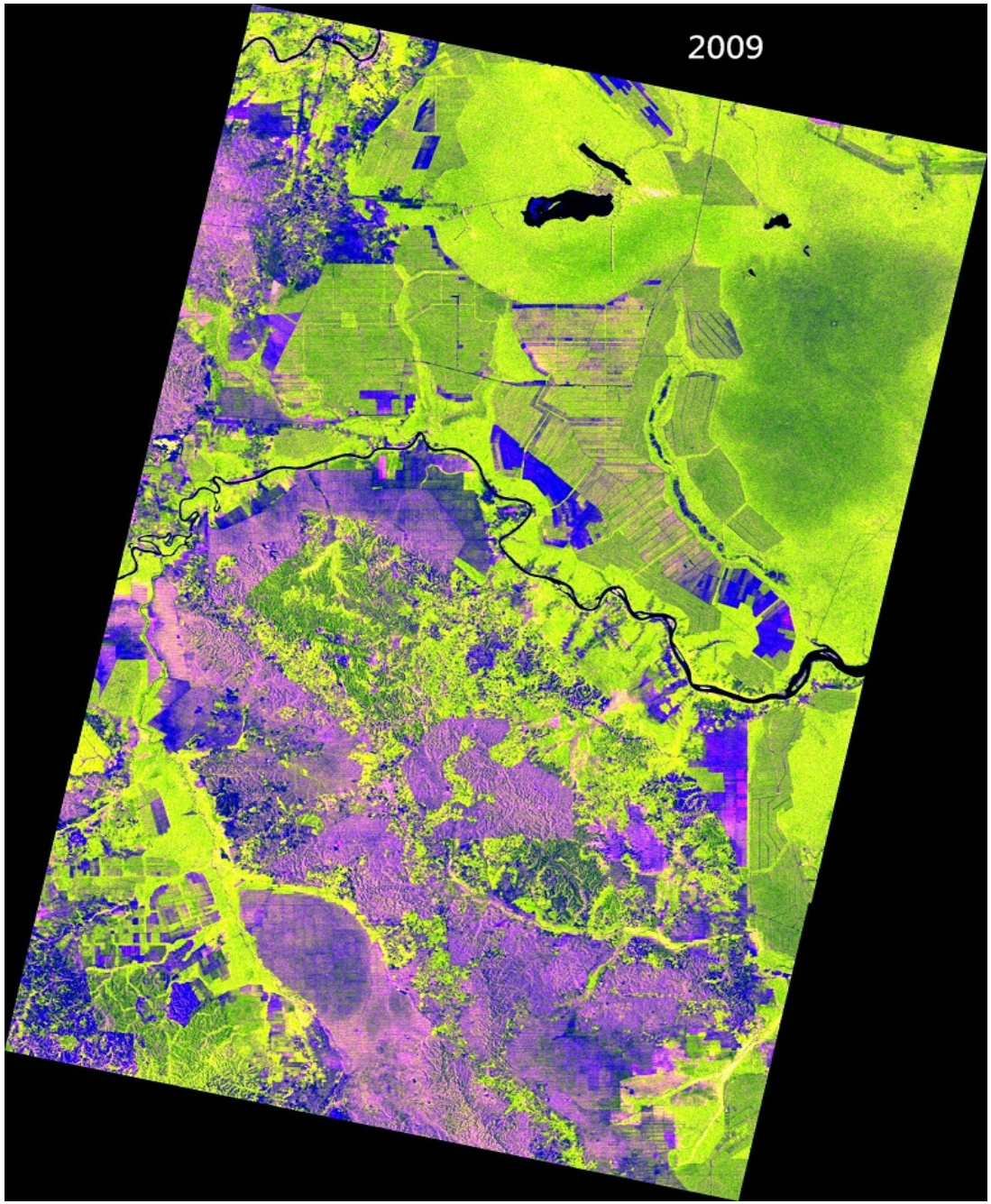

Time series of ASAR WS images

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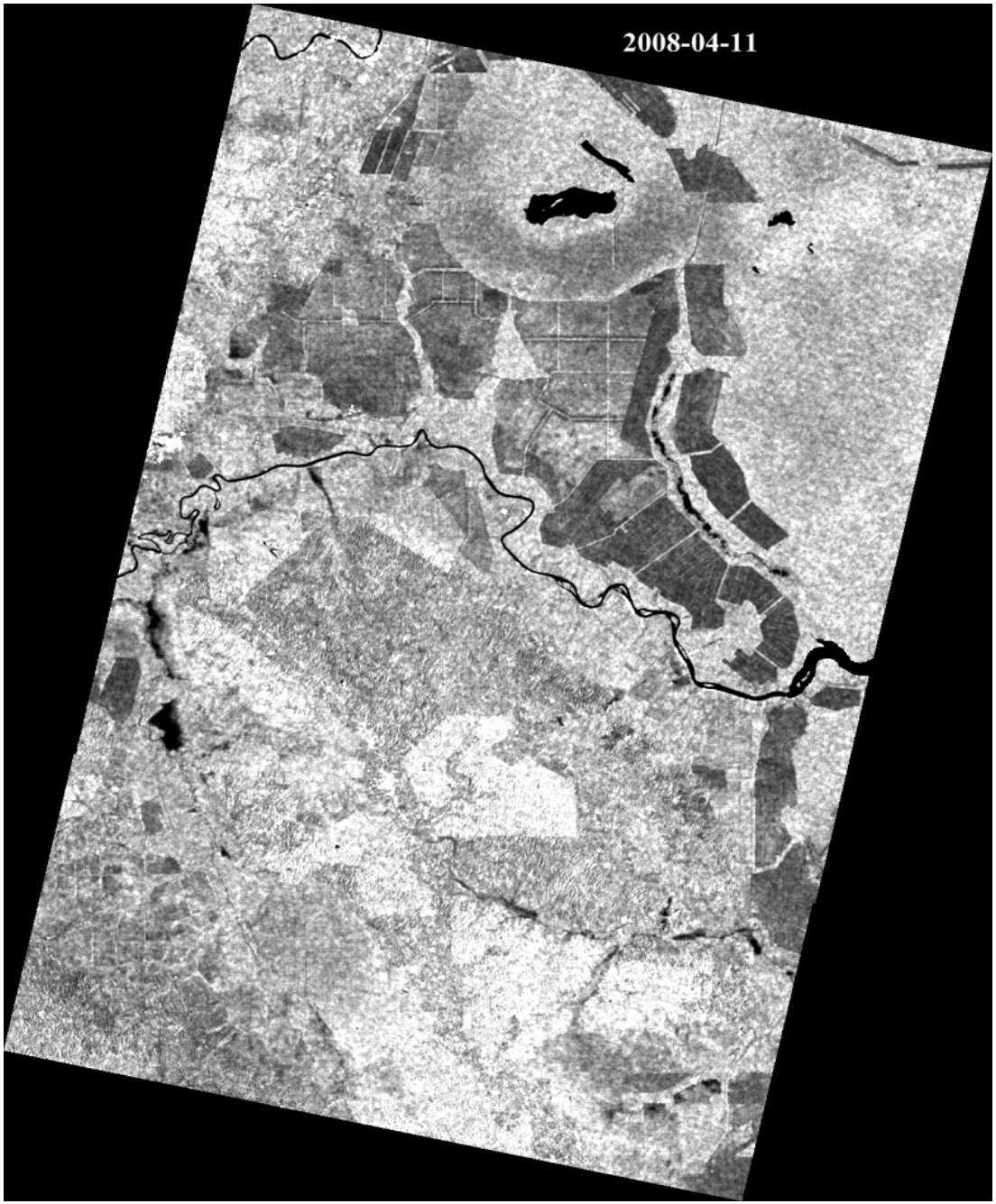

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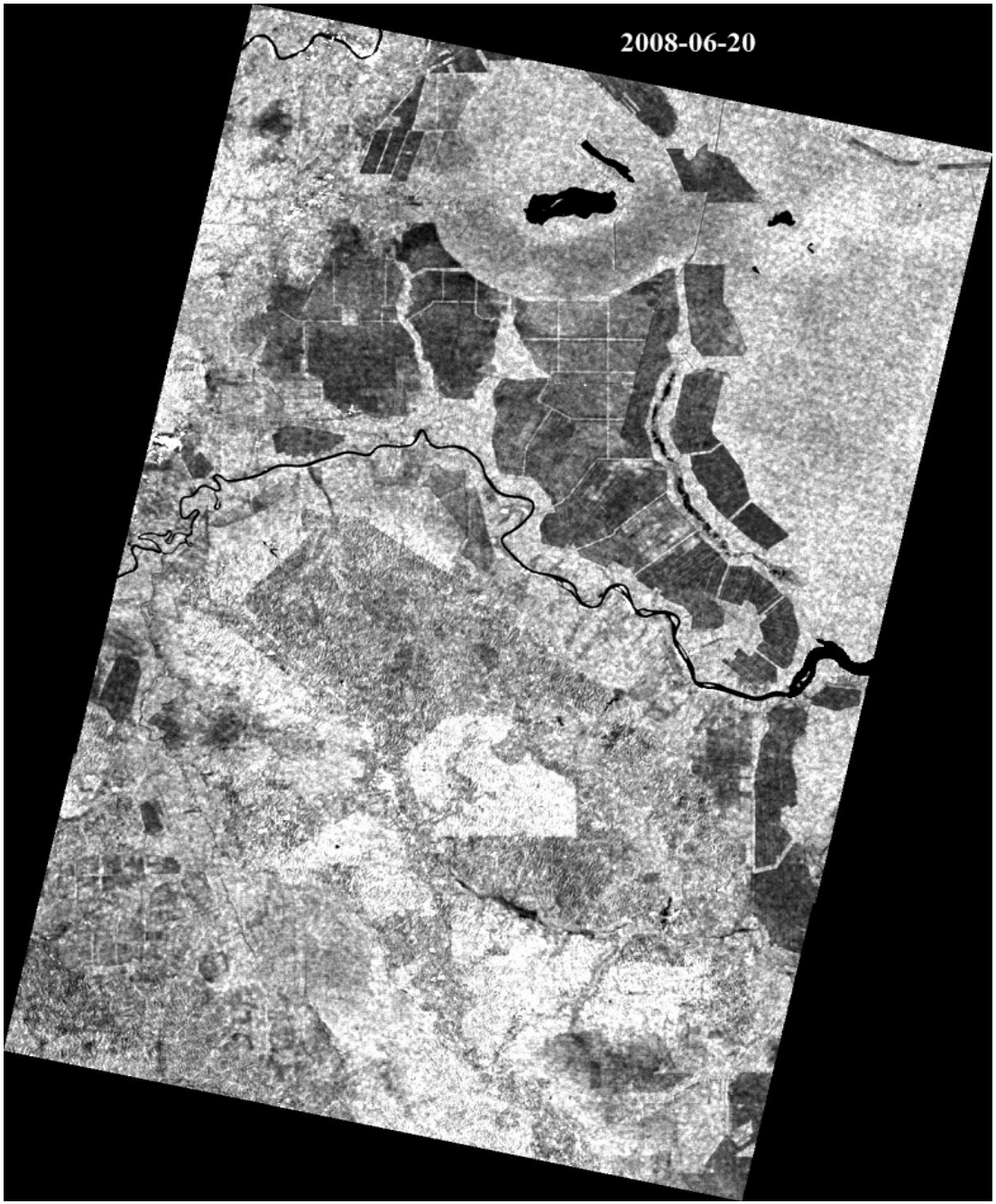

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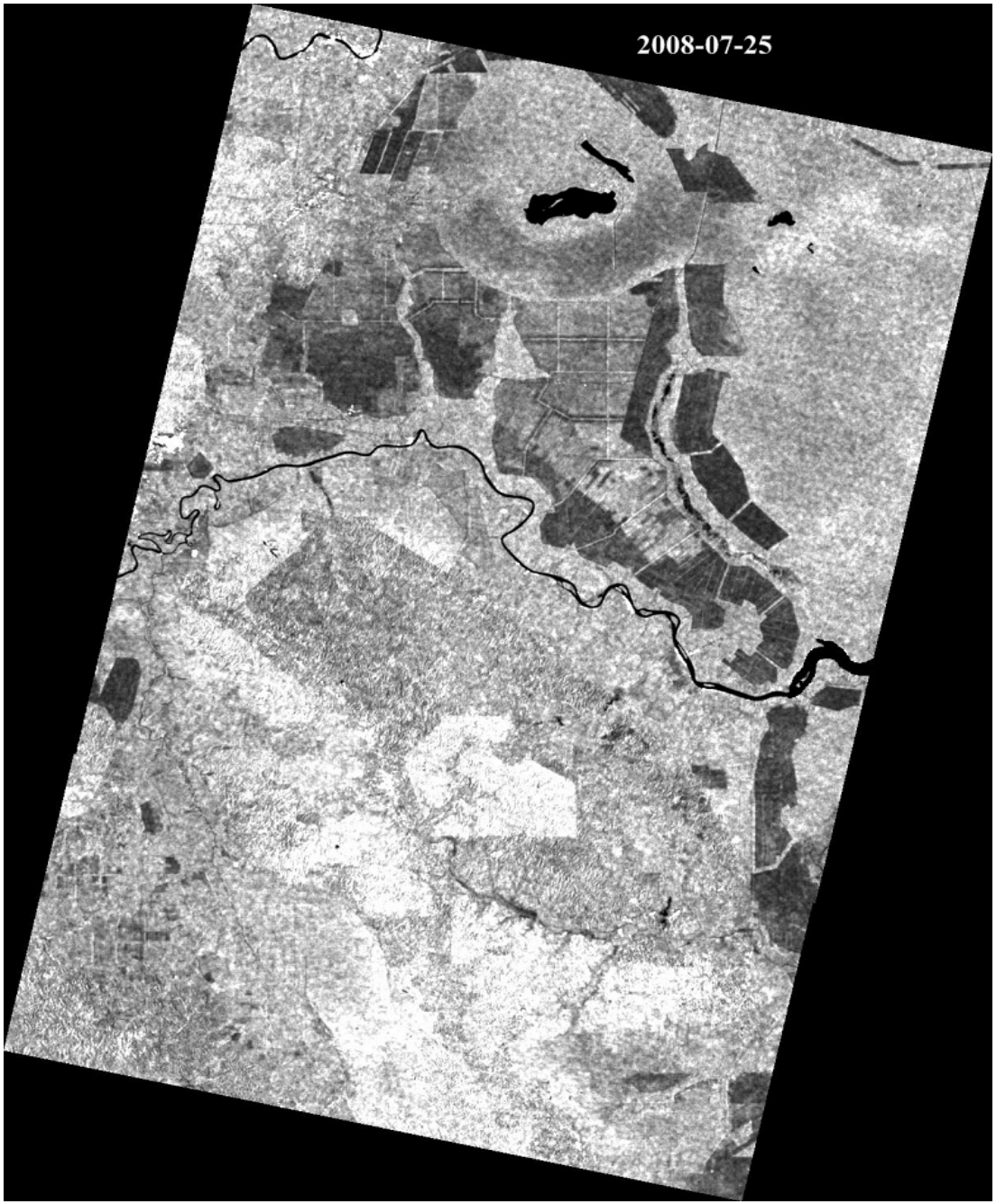

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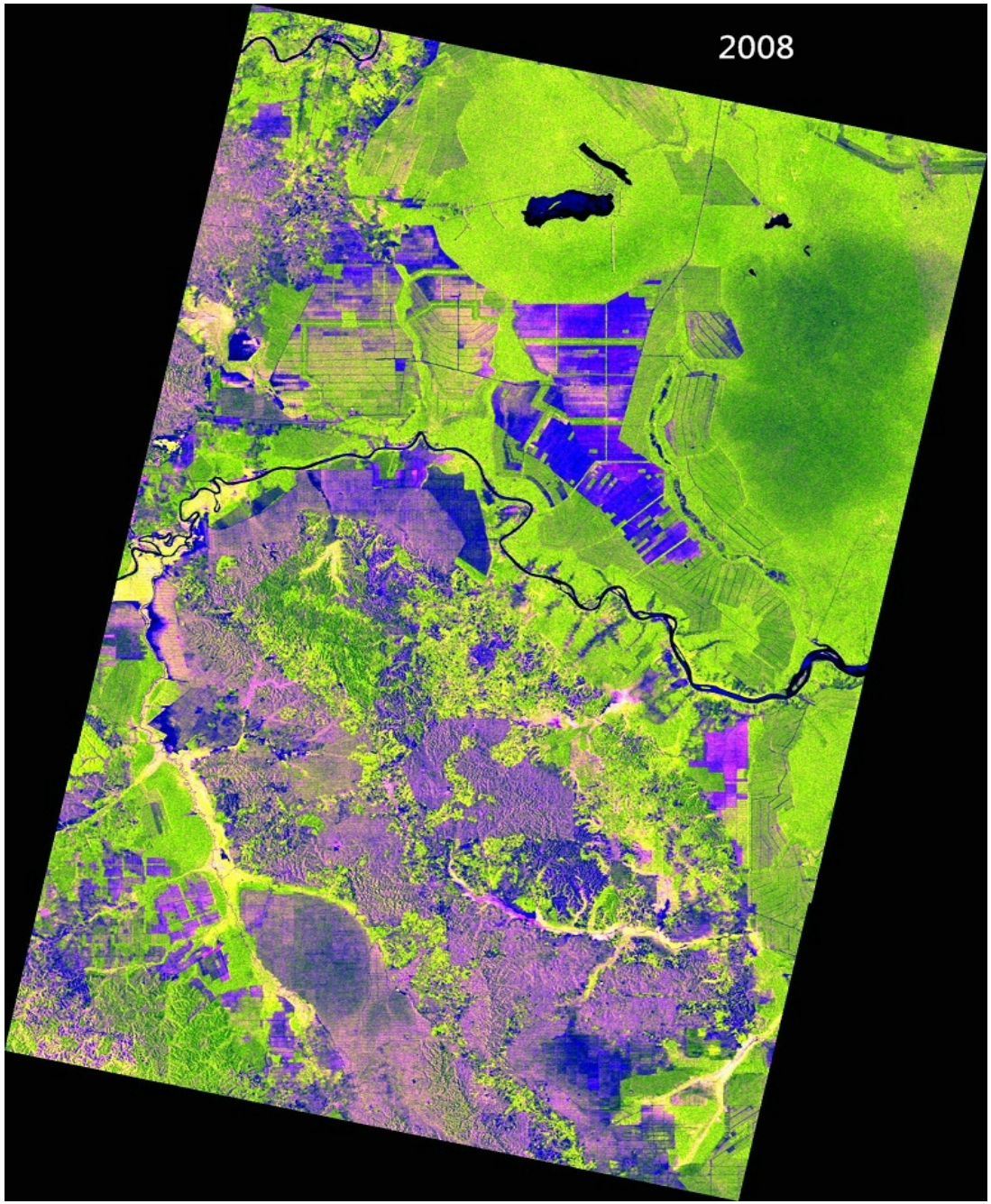

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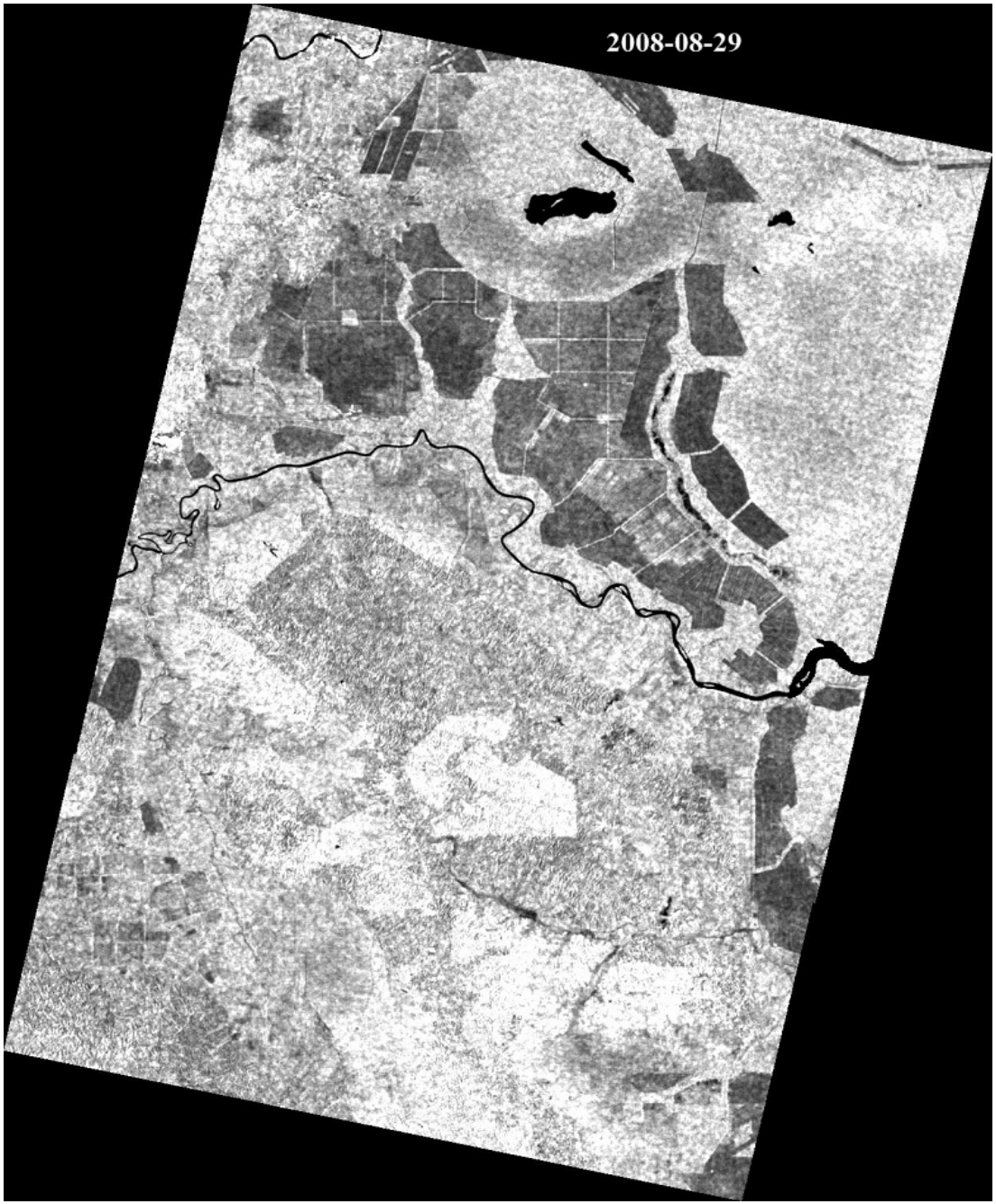

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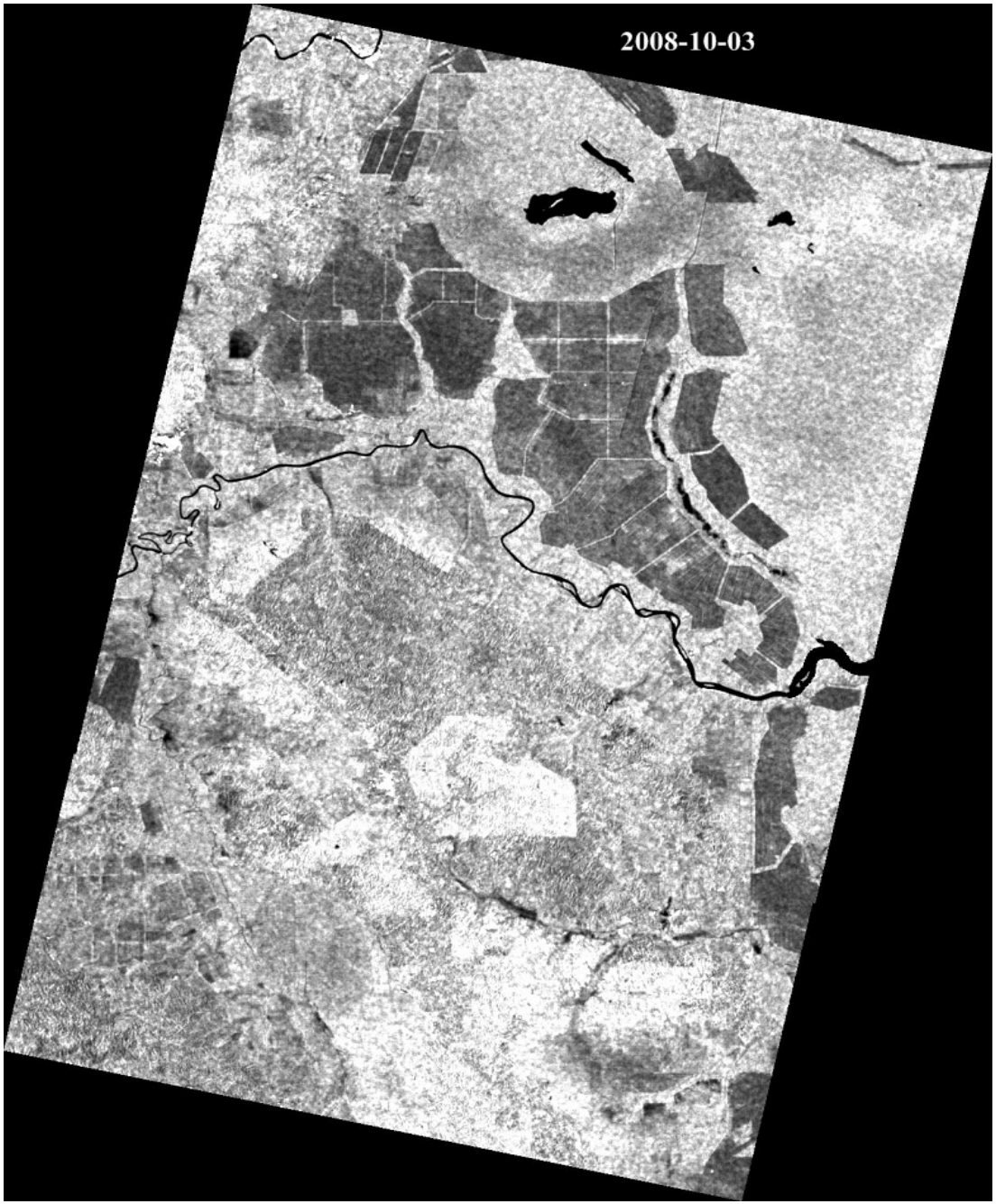

Summary C- vs L-band

- C-band seems particularly well suited to distinguishing plantations from natural forest & monitoring their dynamics
  - Acacia
  - Oil palm
- L-band gives less discrimination (& perhaps sees too much!)
- Significant apparent disagreement between satellite data and WWF data

Data Timelines

2007 2008 2009