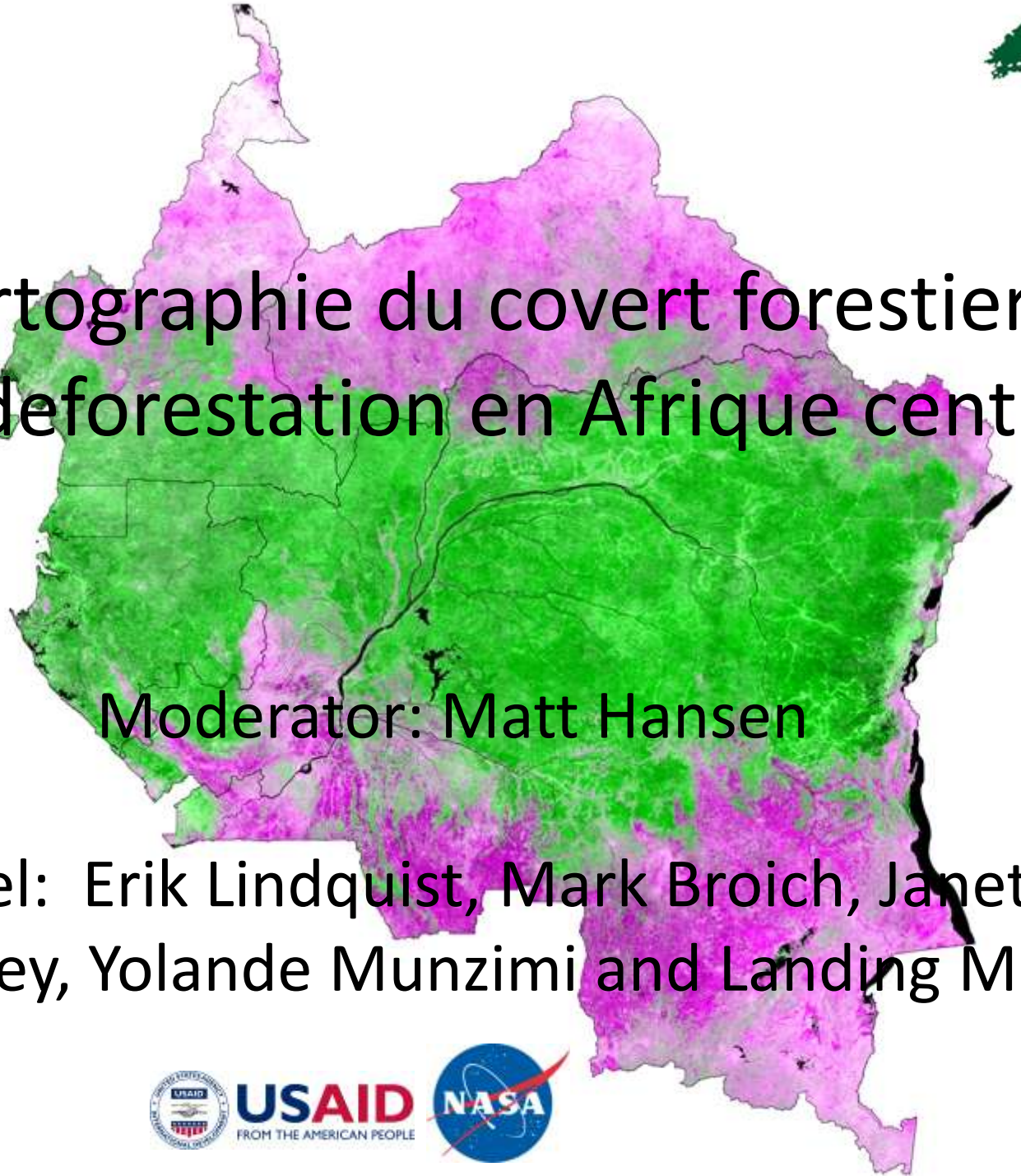


La cartographie du covert forestier et de la deforestation en Afrique centrale

Moderator: Matt Hansen

Panel: Erik Lindquist, Mark Broich, Janet Nackoney, Yolande Munzimi and Landing Mane

Mapping Central Africa

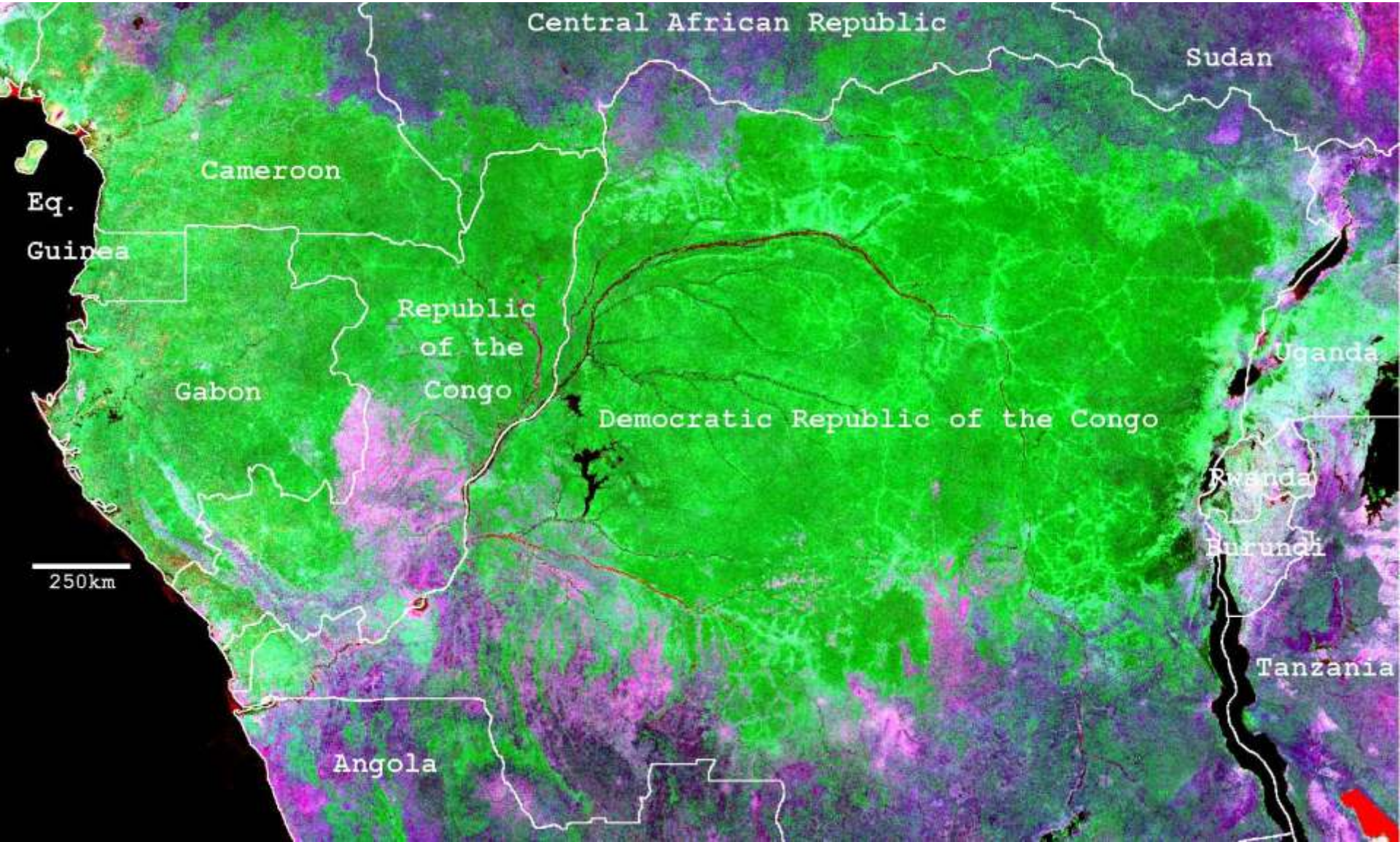
- Initial results on establishing forest extent and change with Landsat and MODIS data – Erik Lindquist
- New methods exploiting newly opened Landsat archive – Mark Broich
- Applications using Landsat inputs to improve environmental monitoring – Bwangoy Bankanza, Janet Nackoney, Yolande Munzimi
- Transition of methods to OSFAC and plans for operational product generation – Landing Mane

Use MODIS forest cover maps to drive exhaustive change mapping with Landsat data

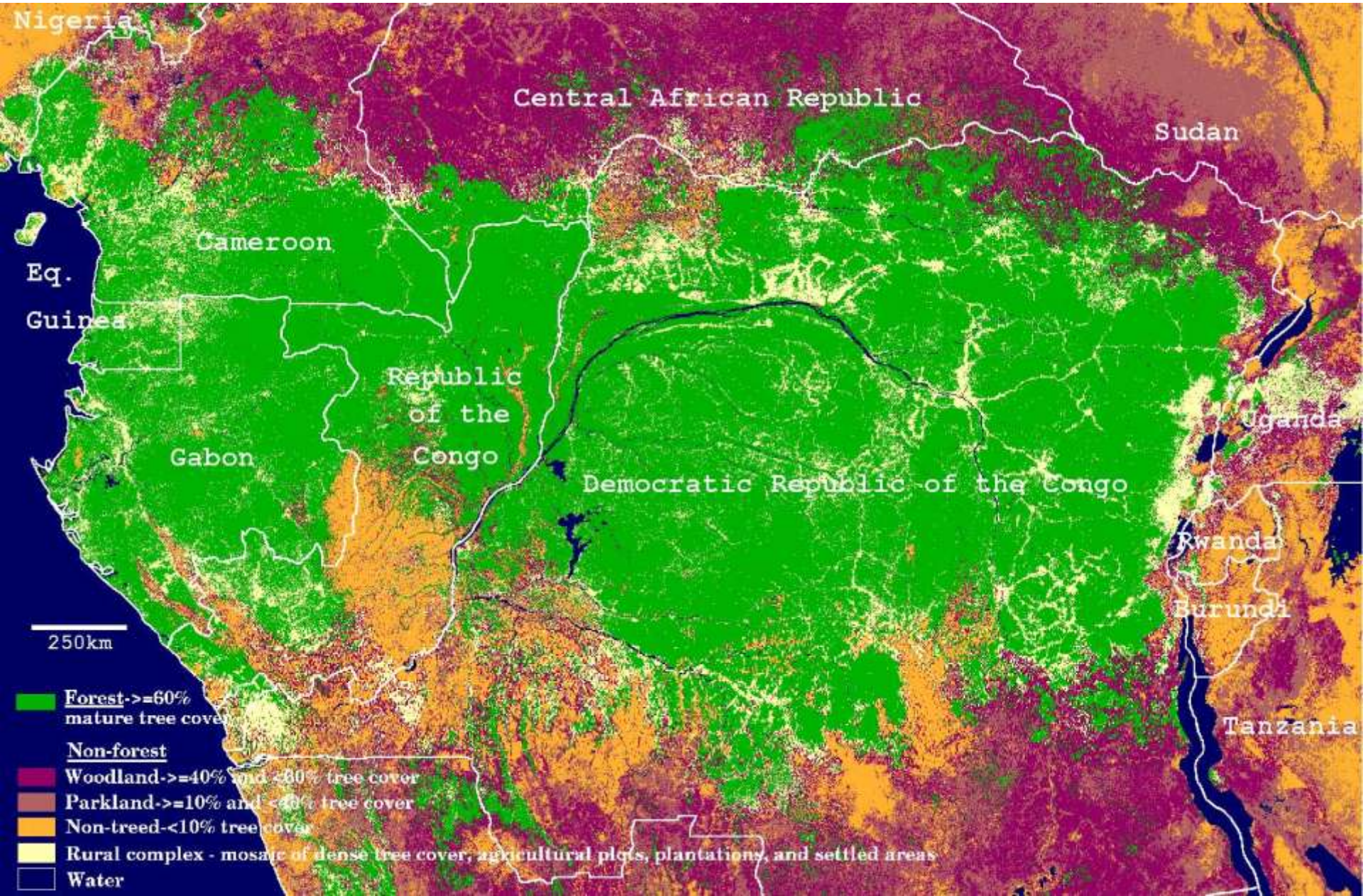
Erik Lindquist, SDSU/FAO

- Use MODIS tree cover maps to drive high-resolution mapping of forest change
- Automate method to allow for repeatable, comparable product generation through time
- Improve the internal consistency of region-wide high-resolution deforestation map products
- Retain global consistency while generating locally relevant products

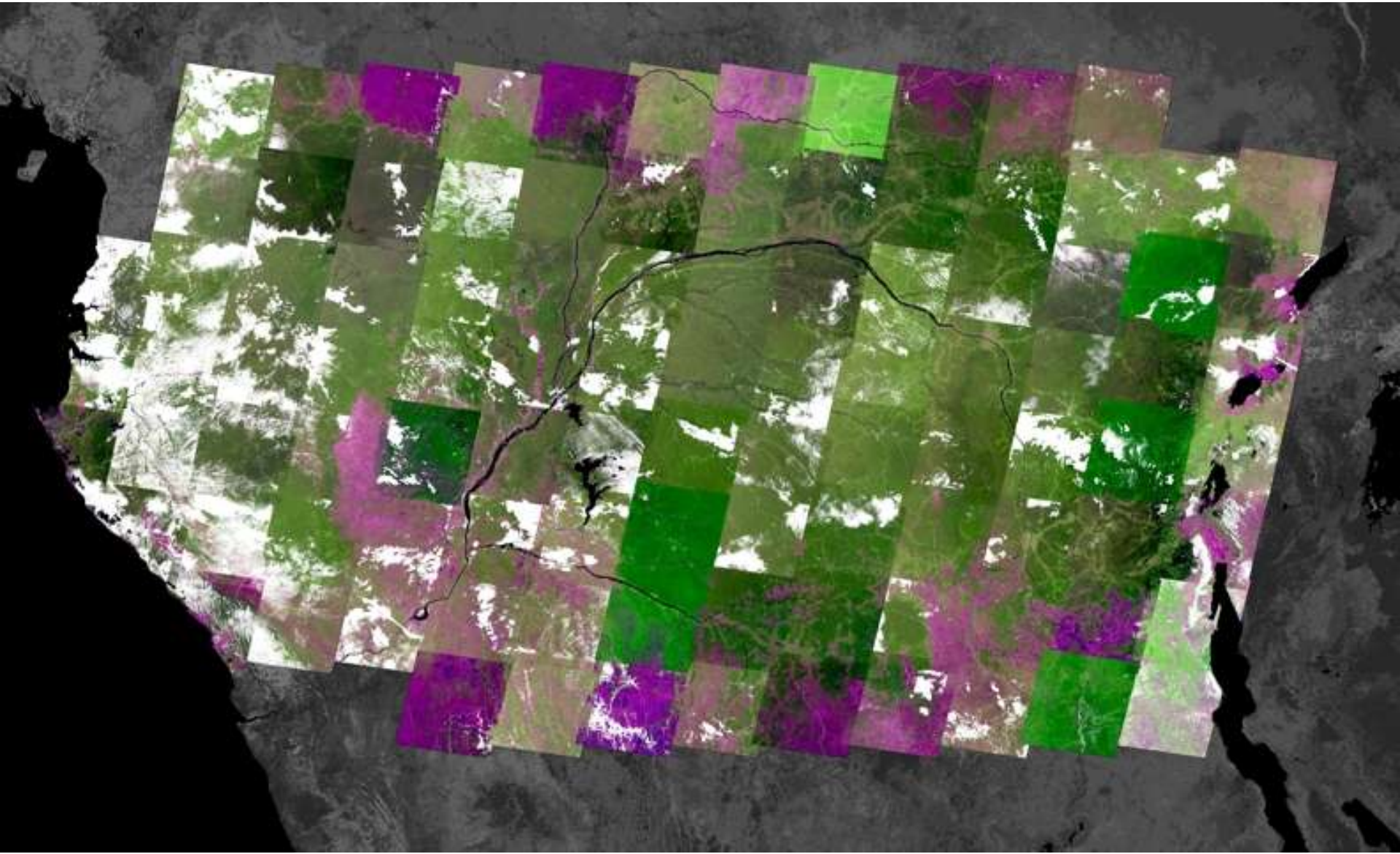
MODIS forest cover maps as inputs for automated mapping at finer scales in Central Africa



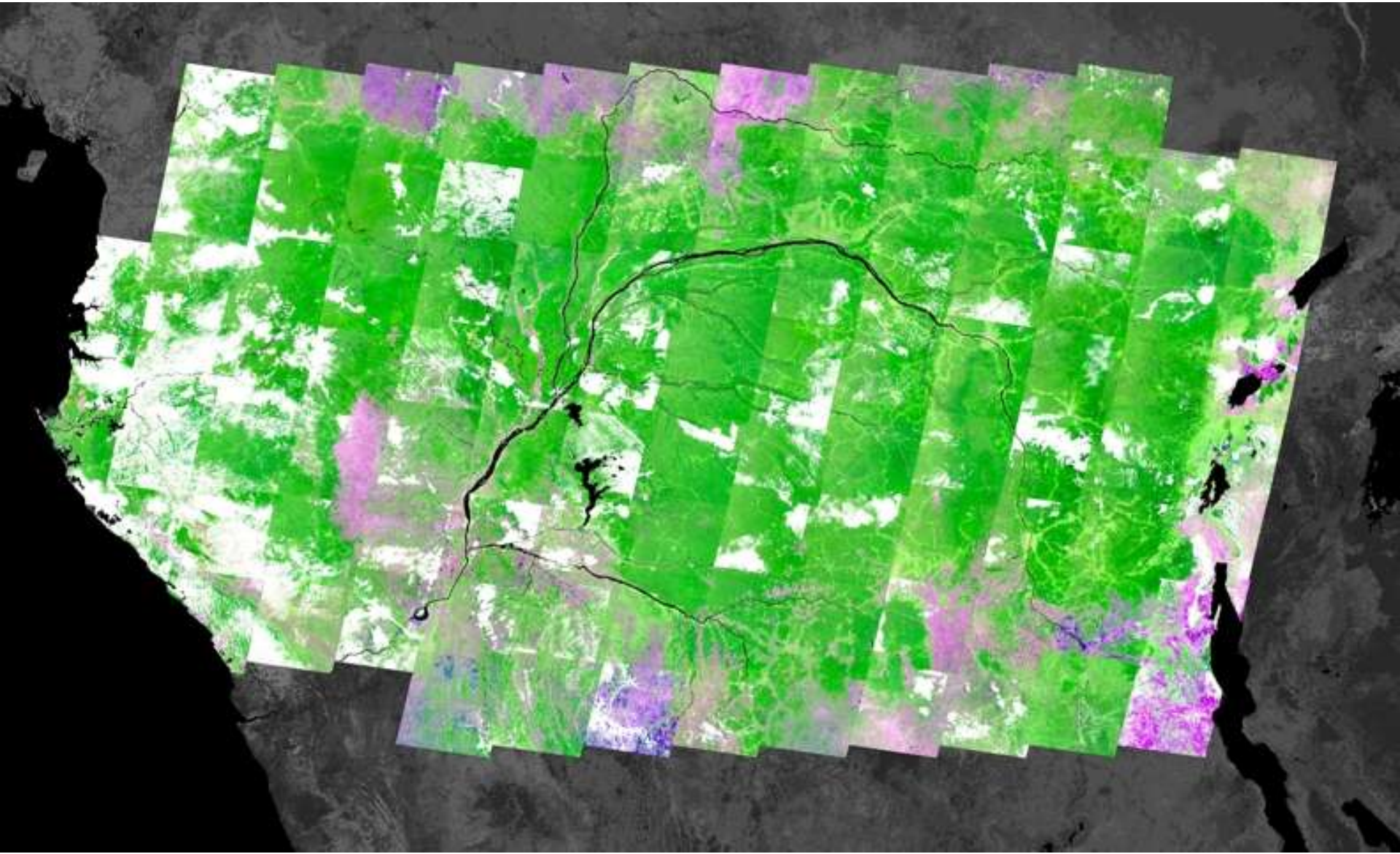
MODIS forest cover



2000 Global Land Survey



Bias-adjusted



Anisotropy-correction

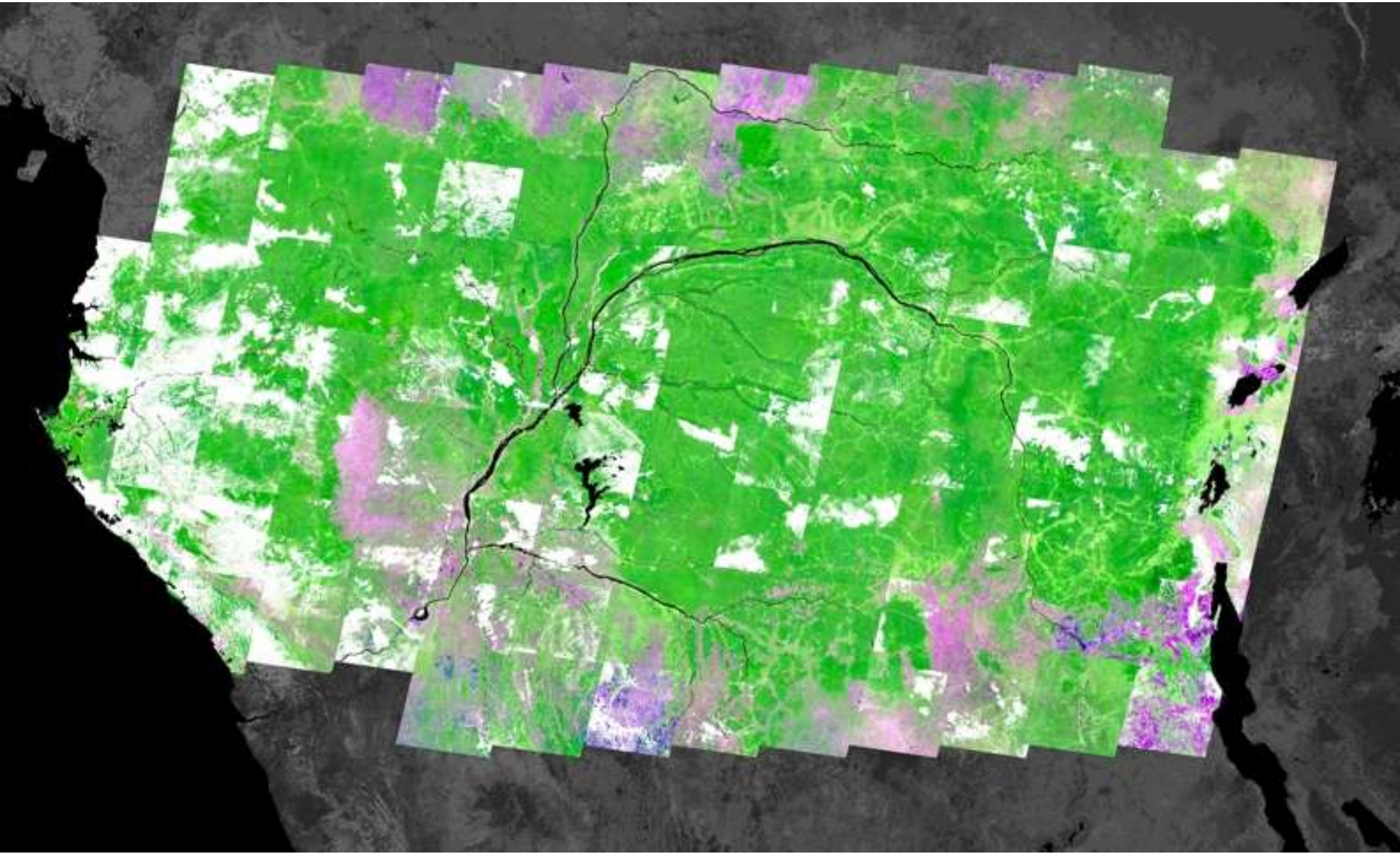
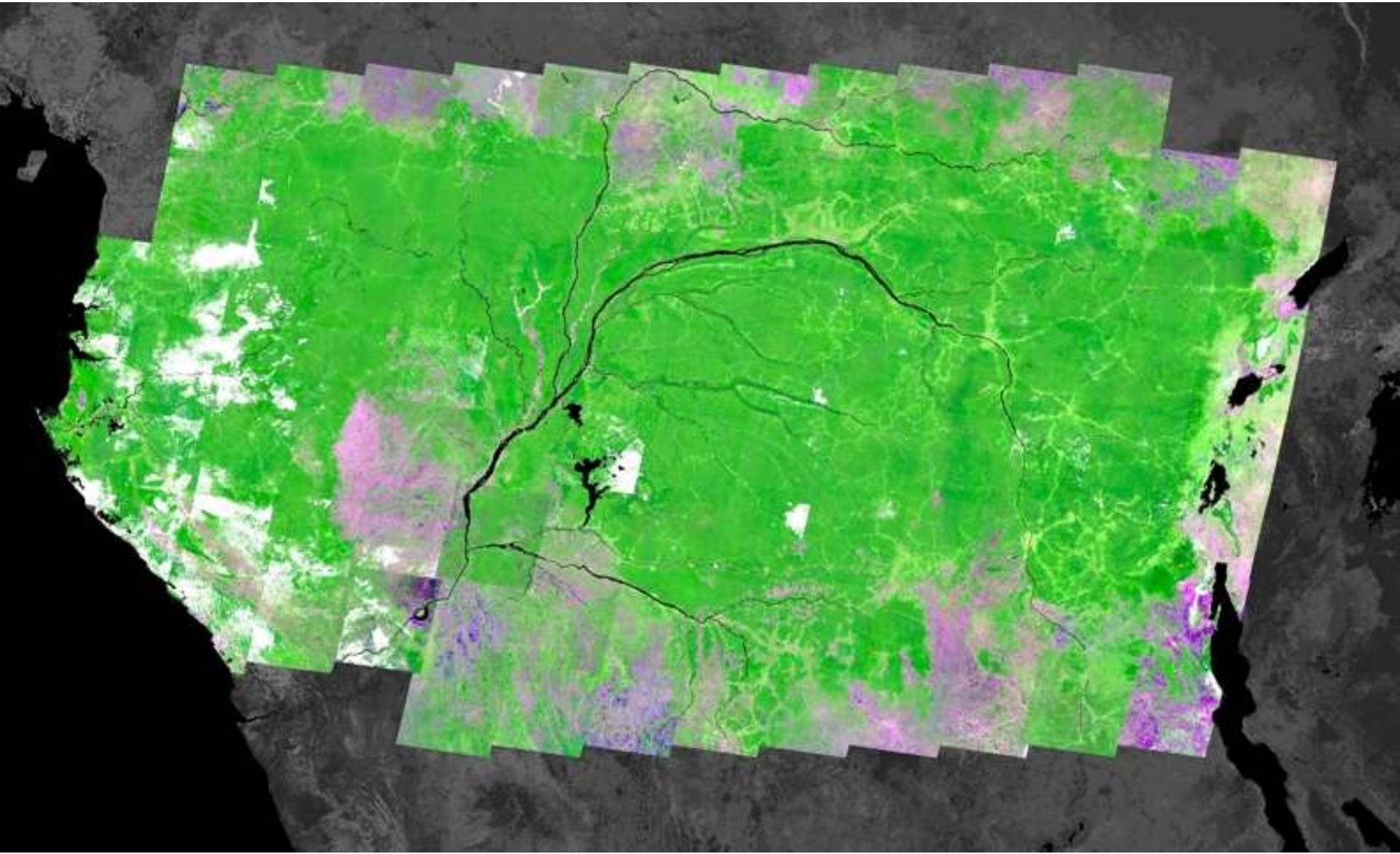
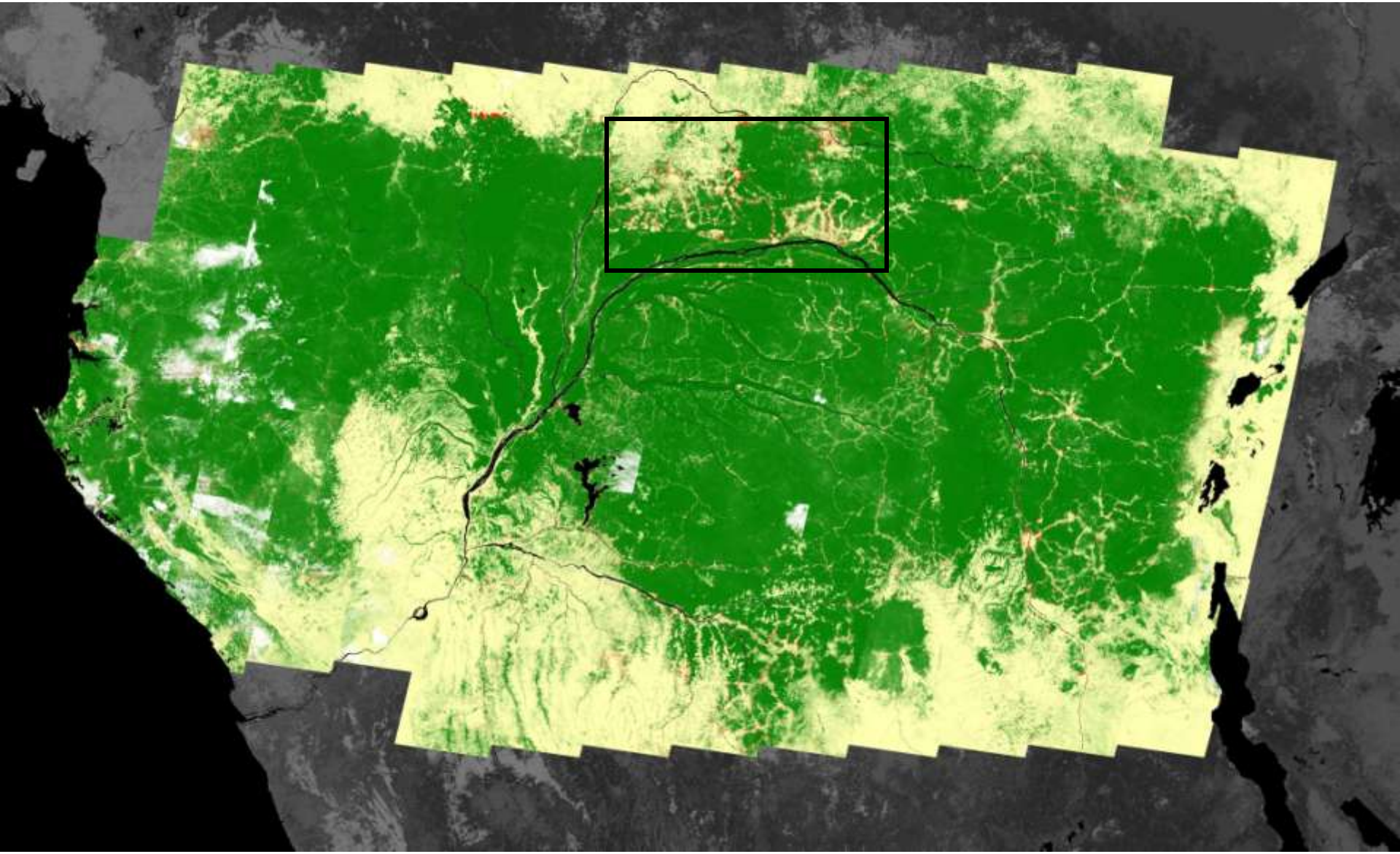


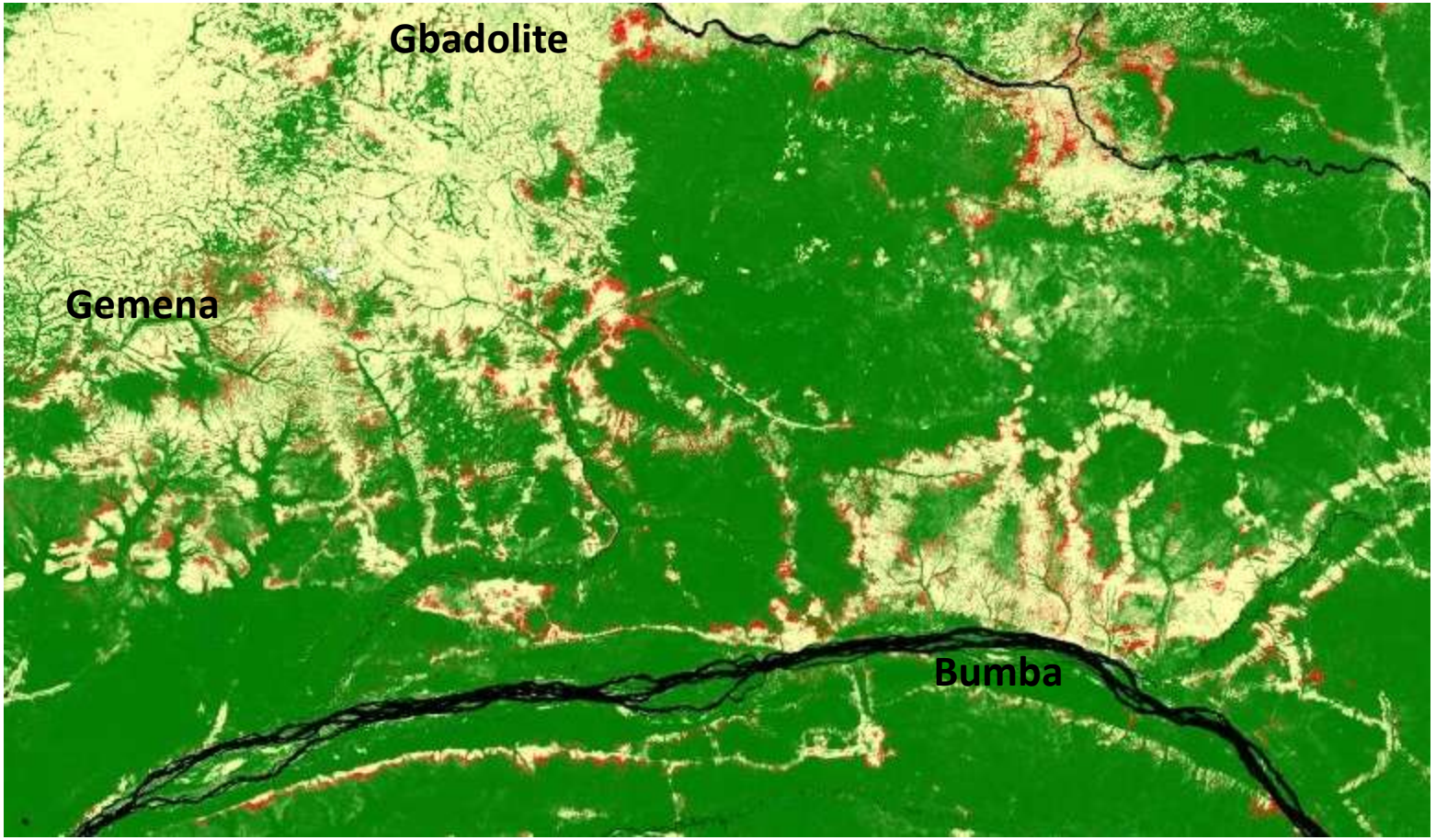
Image composite
(3-5 images per path/row)



Forest cover and change

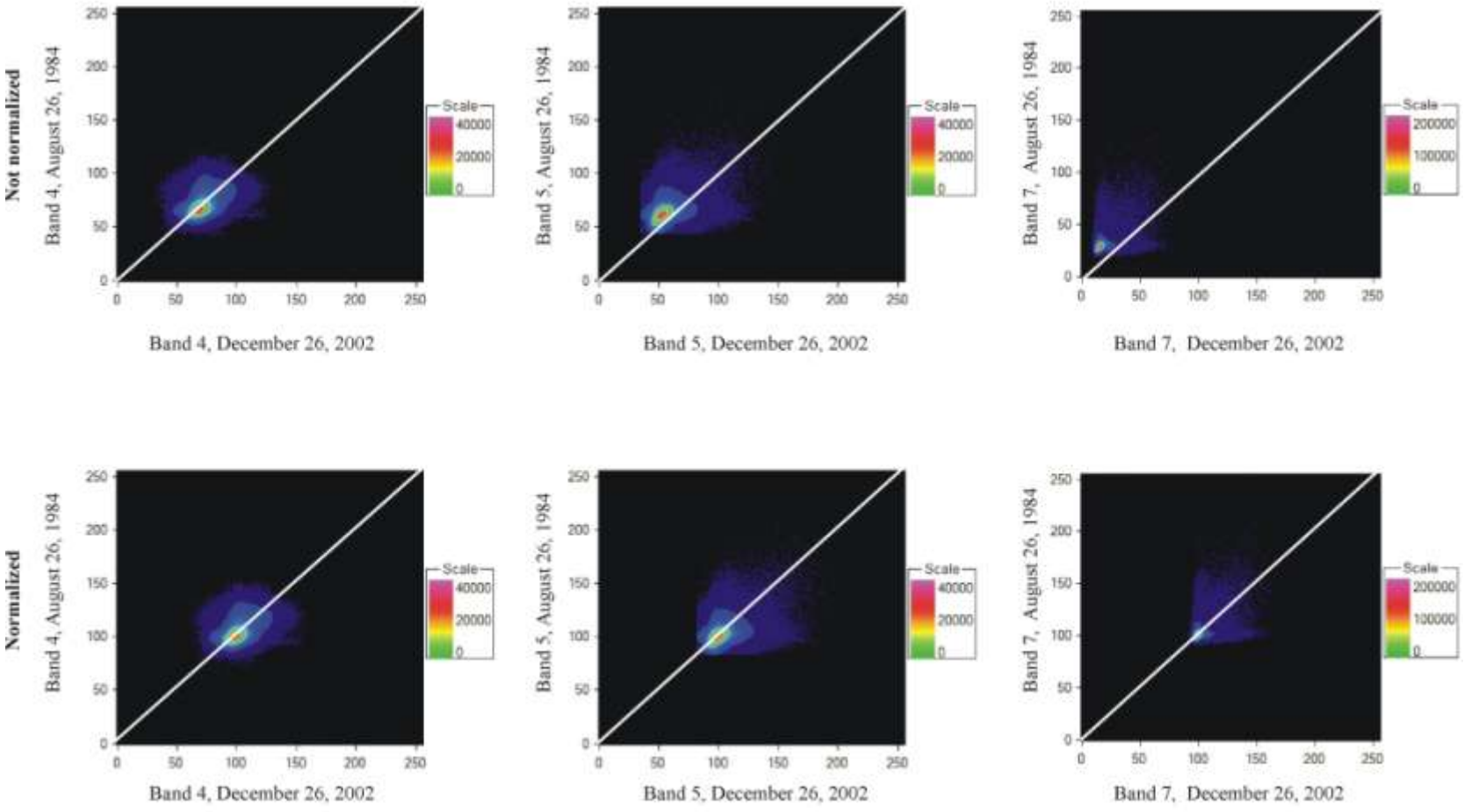


Full-resolution

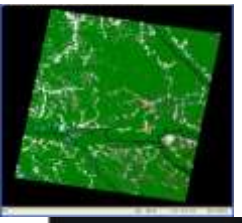


red = forest cover loss

MODIS VCF used to normalize input Landsat imagery via simple bias adjustment

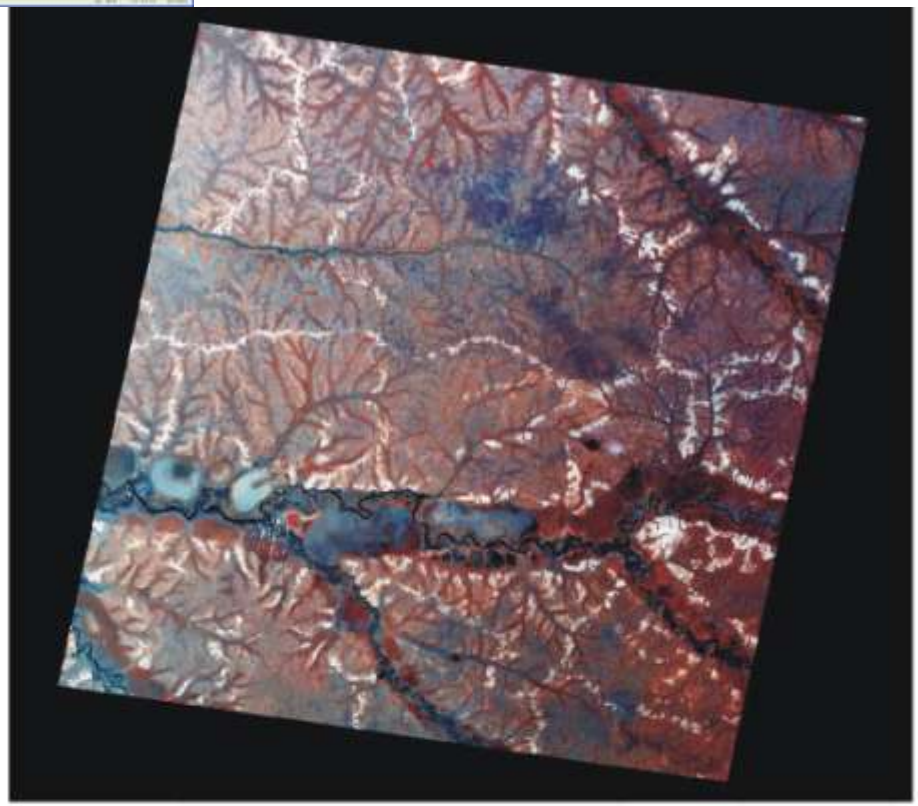


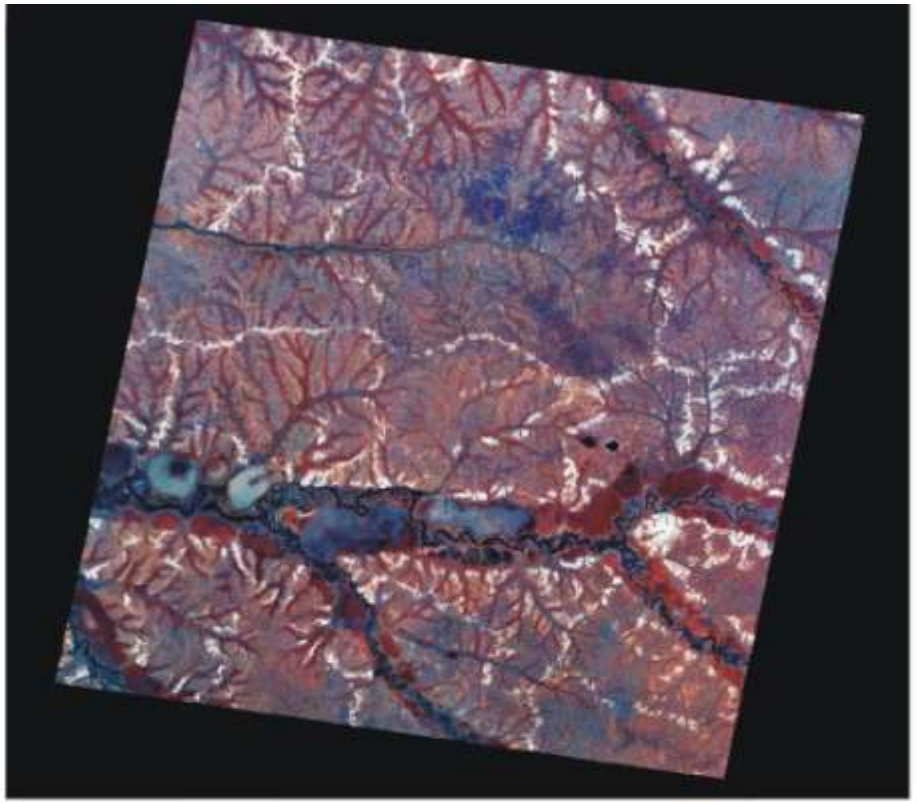
MODIS forest

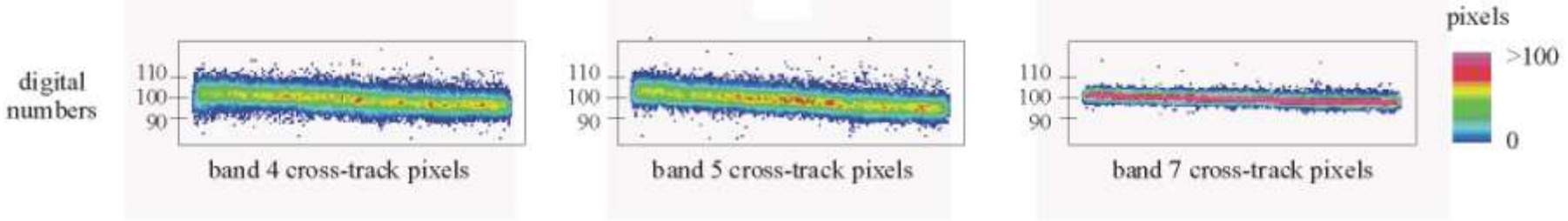


First-order anisotropy correction

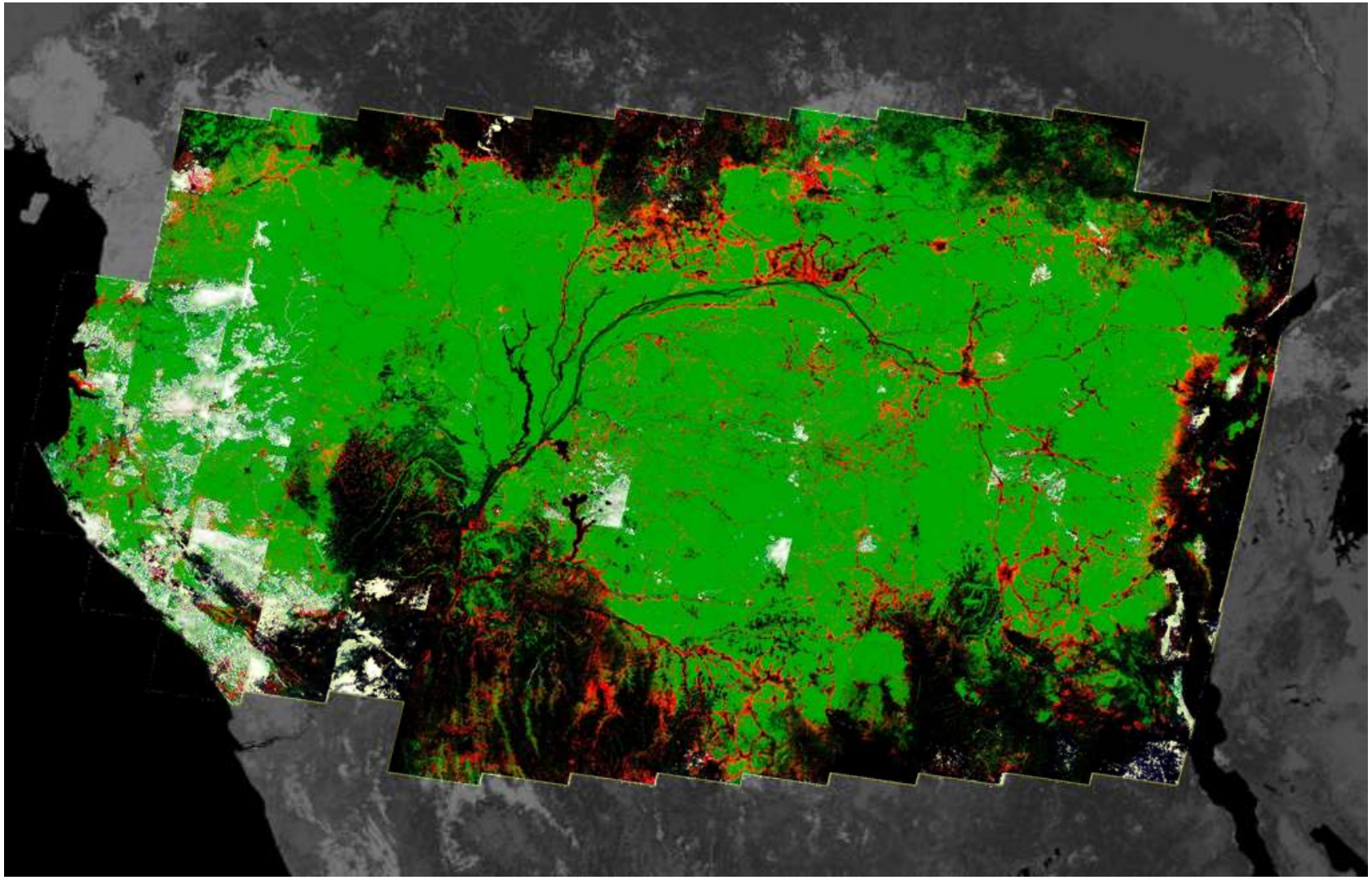
March 5, 2000, 179/060 ETM+







Congo Basin-wide Forest Cover and Change 1990-2000



Annual Forest Clearing (%)

Central Africa Humid-Tropics	1990-2000	2000-2005
	0.14	0.12

Country	1990-2000	2000-2005
Cameroon	0.079	0.045
RCA	0.275	0.444
Congo	0.061	0.042
RDC	0.183	0.170
Eq. Guinea	0.101	0.025
Gabon	0.069	0.062

Annual Forest Clearing (%)

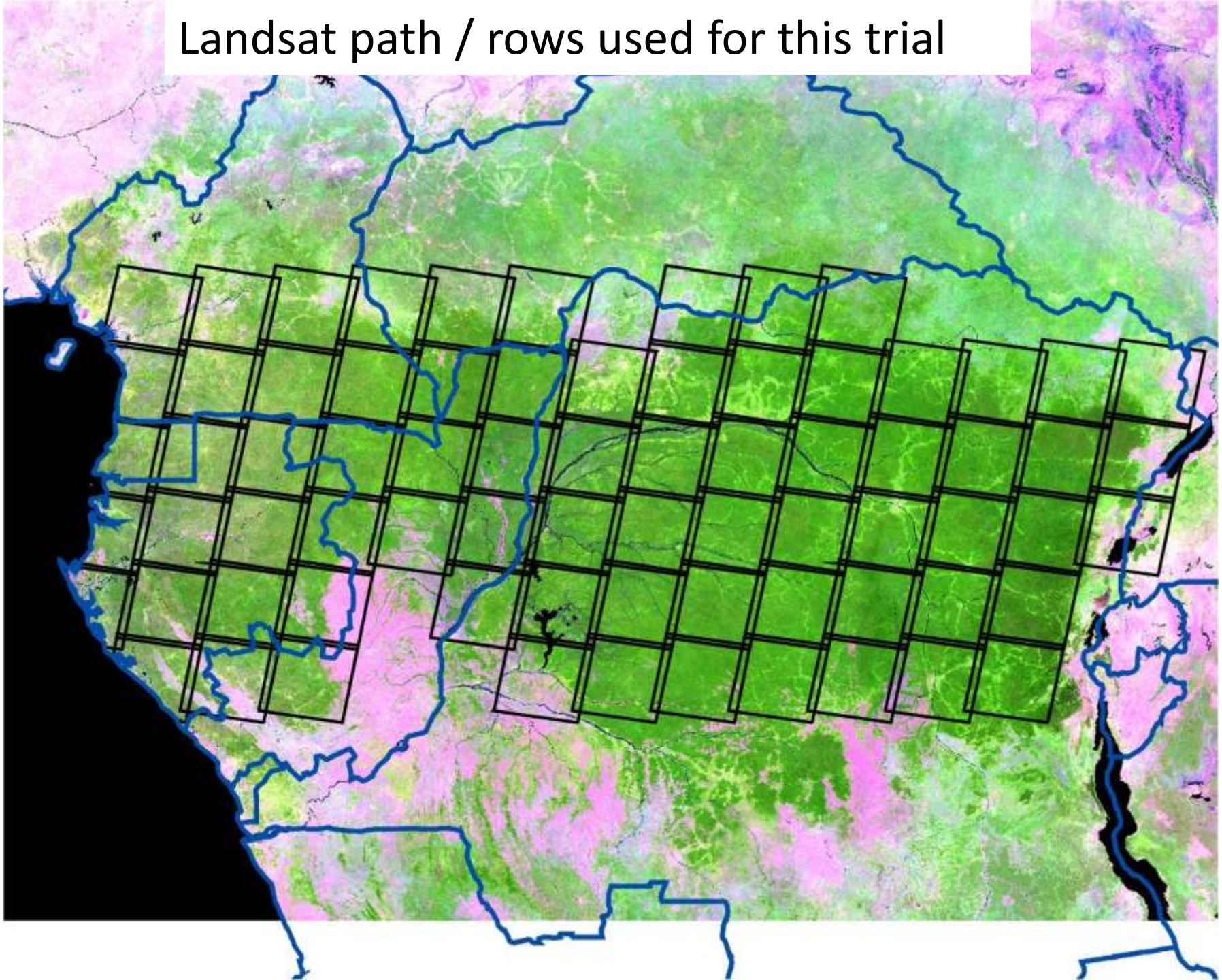
Landscape	1990-2000	2000-2005
Monte Alén-Monts de Cristal	0.049	0.030
Gamba-Mayumba-Conkouati	0.157	0.061
Lopé-Chaillu-Louesse	0.059	0.151
Dja-Odzala-Minkébé Tri-National	0.018	0.060
Sangha Tri-National	0.018	0.030
Léconi-Batéké-Léfini	0.152	0.030
Lac Télé-Lac Tumba	0.093	0.054
Salonga-Lukenie-Sankuru	0.037	0.039
Maringa-Lopori-Wamba	0.088	0.063
Maiko-Tayna-Kahuzi Biega	0.107	0.105
Ituri-Epulu-Aru	0.054	0.054
Virunga	0.652	0.237

Next steps

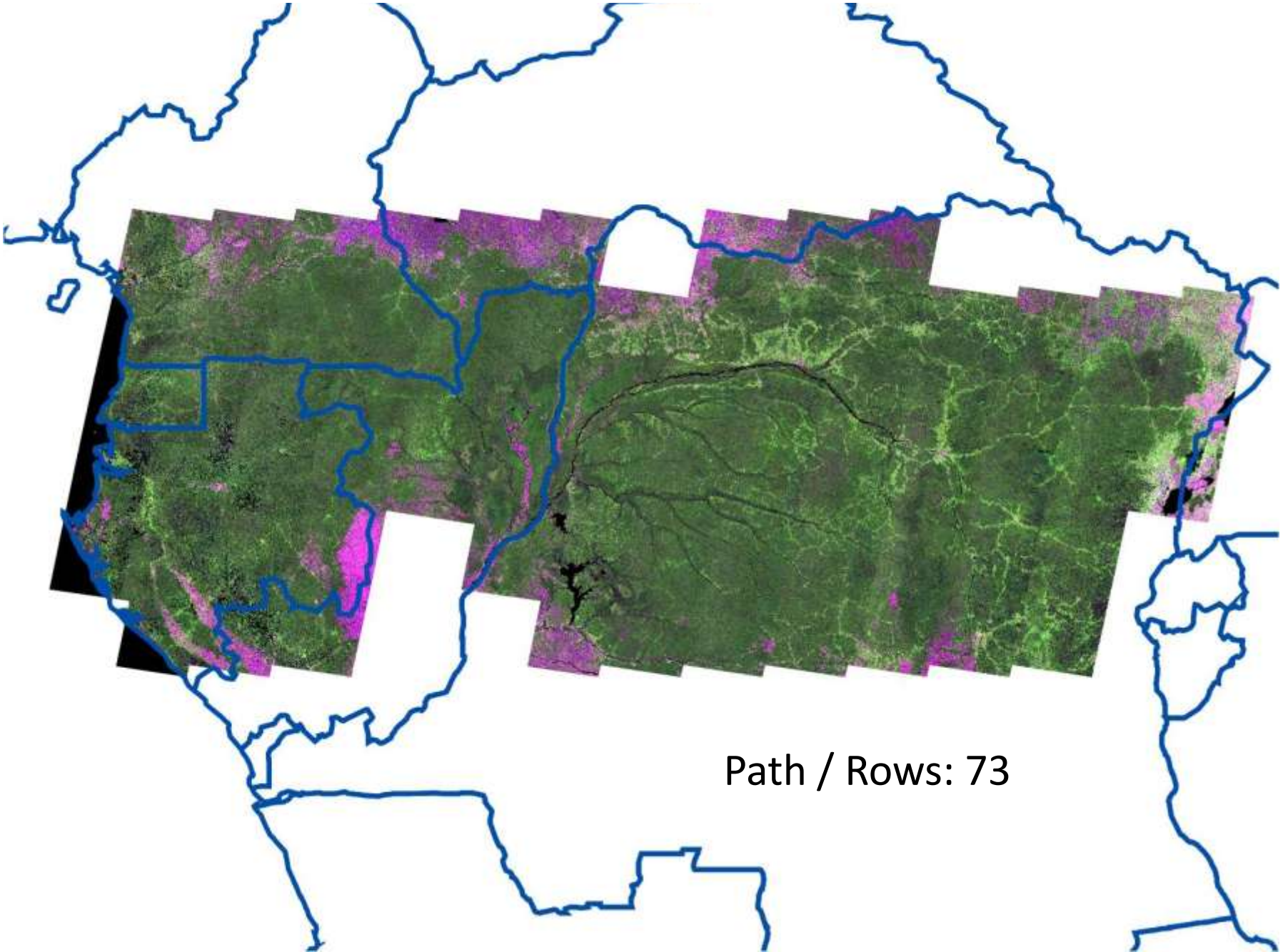
Mark Broich, SDSU

- Landsat archive is now open and all imagery are available at no cost
- Previously, we used the data we could afford, not the data we needed
- With free data, an exhaustive mining of the archive is now possible
- Initial results will be modified as a new approach is implemented

Landsat path / rows used for this trial



Landsat composite for 2001 (5/4/7)



New opportunities with the opening of the Landsat archive

Number of images per composite:

(with < 50% ACCA cloud cover in any quarter)

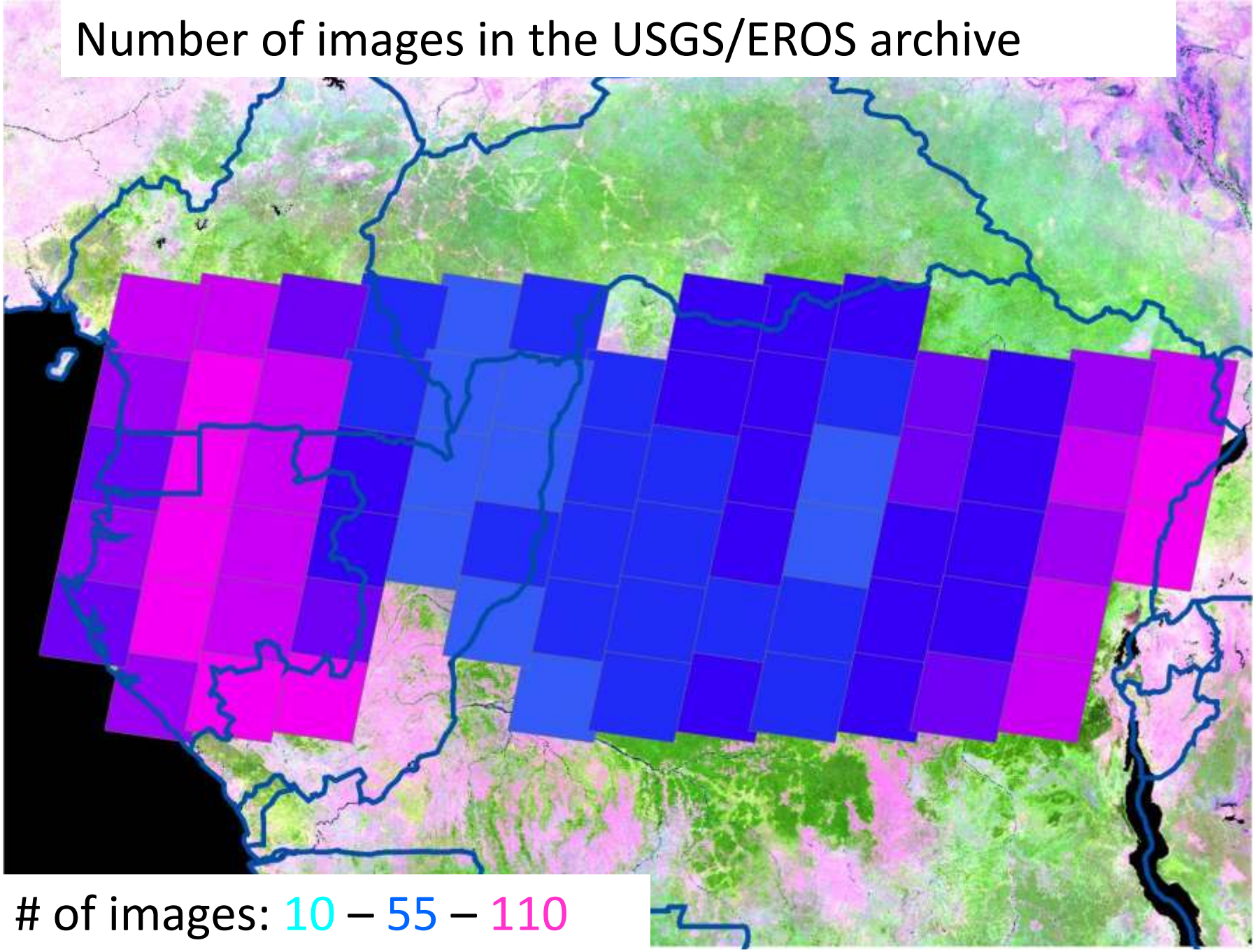
2000-02	1,272
2003-05	1,258
2007-08	1,200

Total number over 73 path/rows (2000-08):

3,730

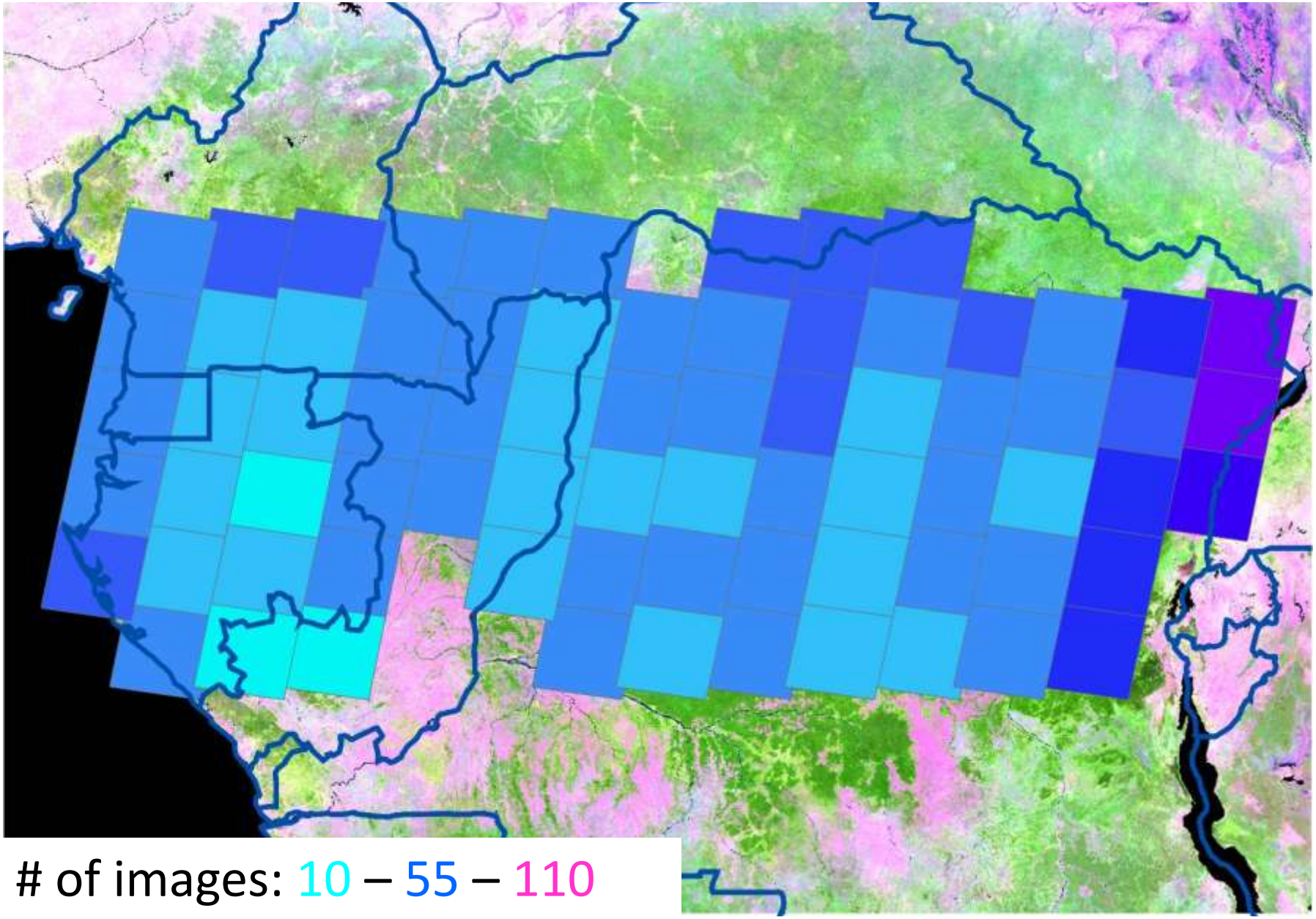
or 1.5 TB

Number of images in the USGS/EROS archive



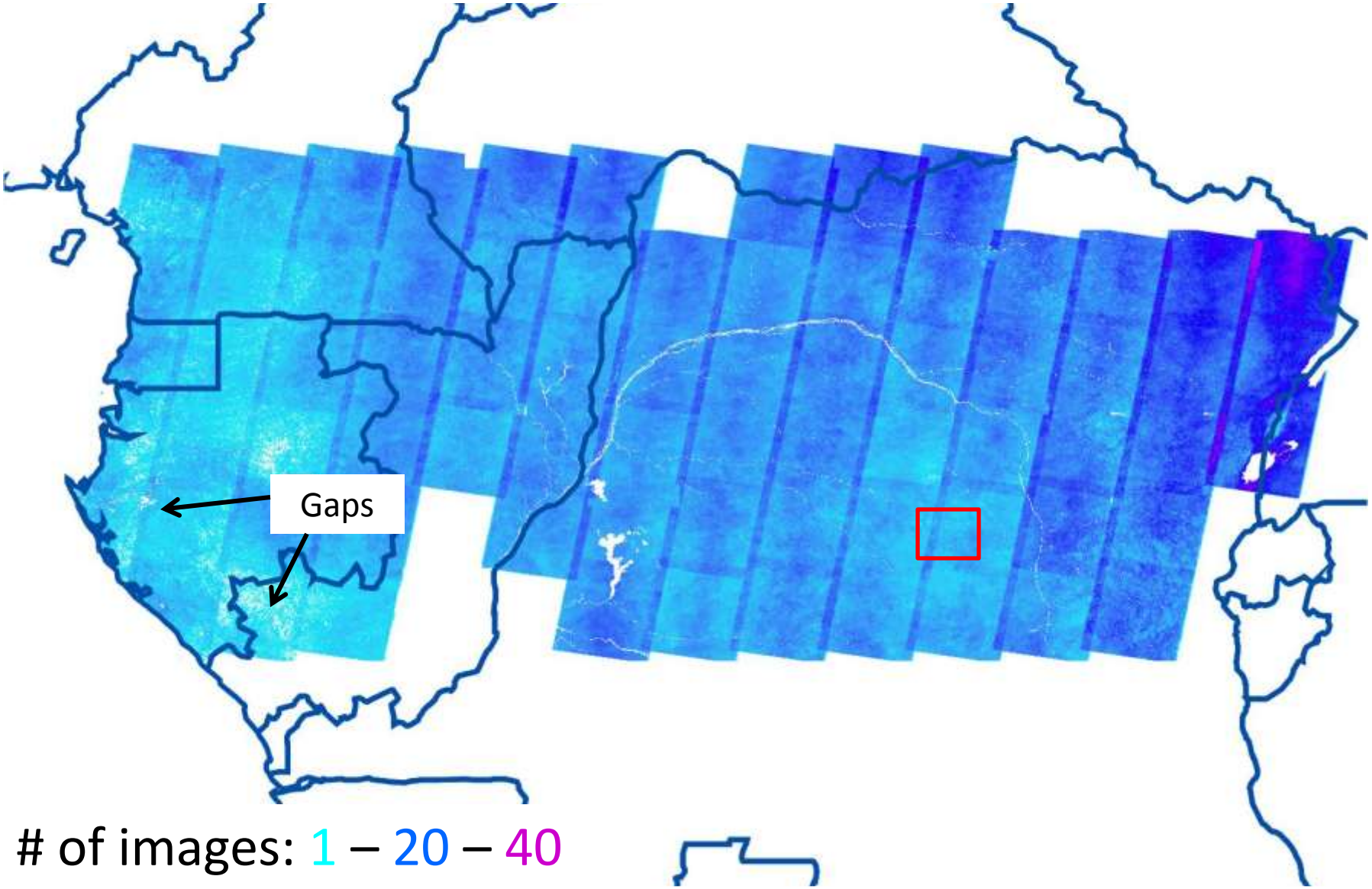
# of images: 10 – 55 – 110

Number of images with < 50 ACCA cloud cover

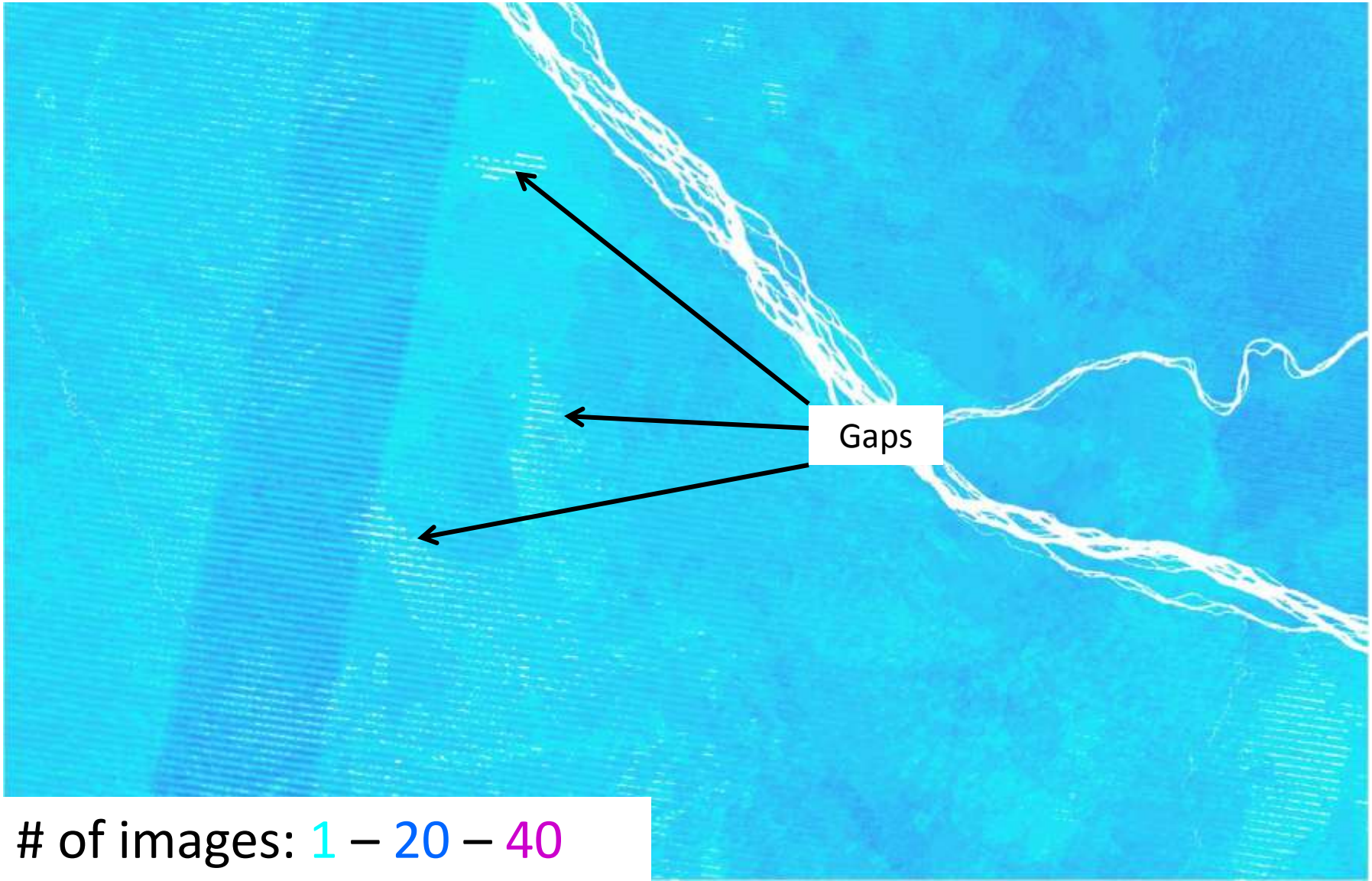


# of images: 10 – 55 – 110

Number of good observations per pixel for 2003-2005 composite

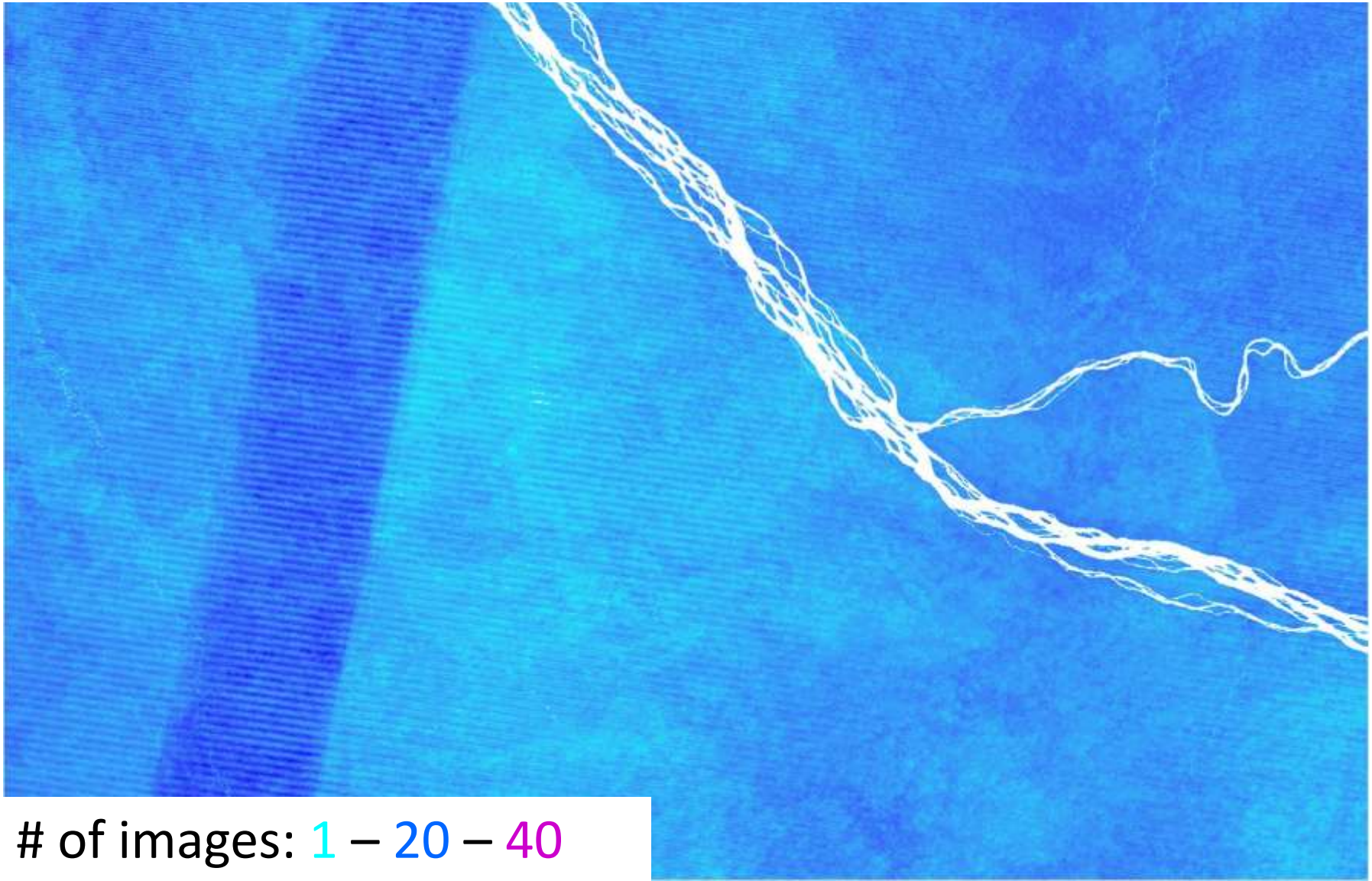


Number of good observations per pixel for an **annual** composite (2004)



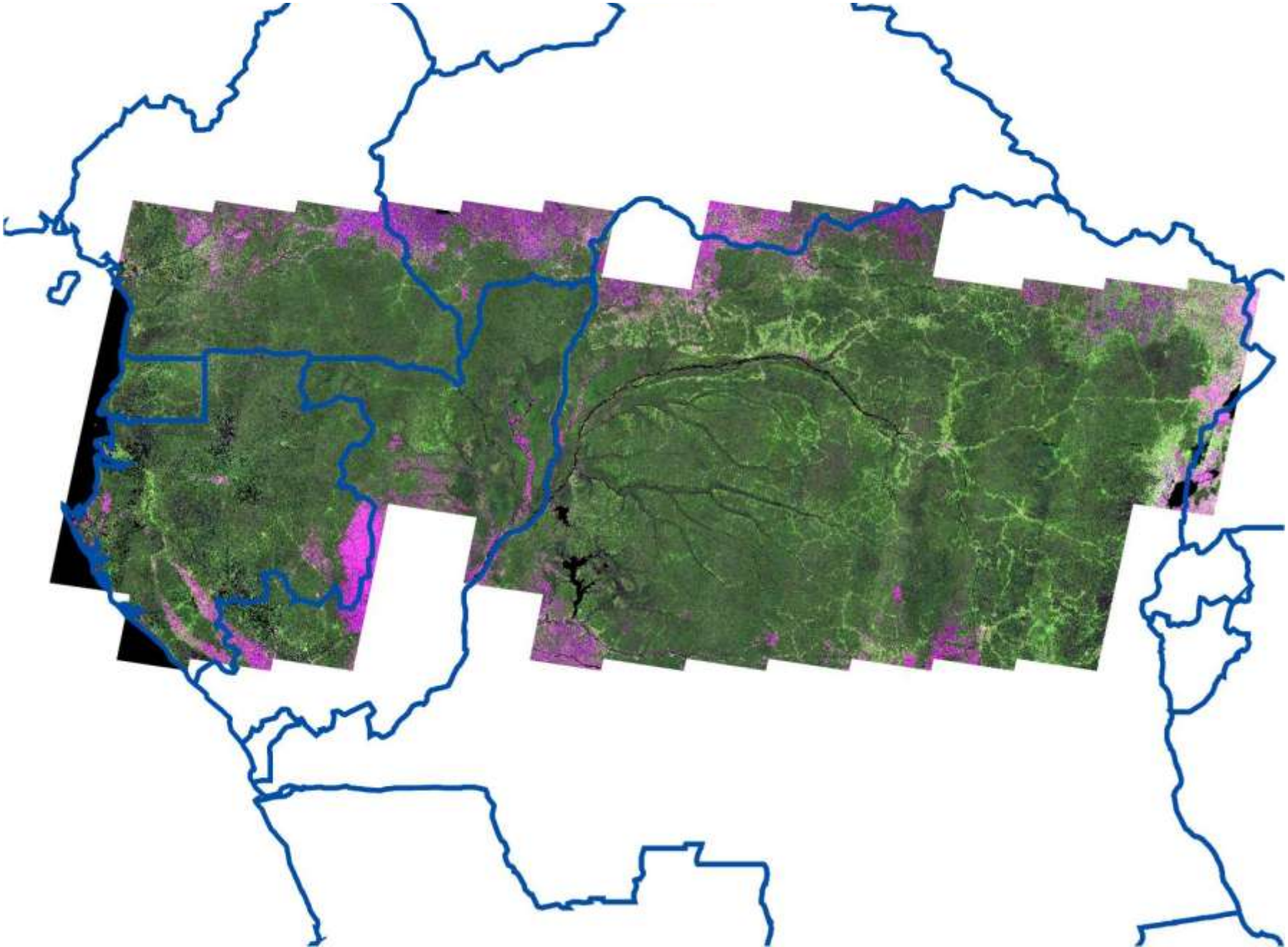
# of images: 1 – 20 – 40

Number of good observations per pixel for 2003-2005 composite

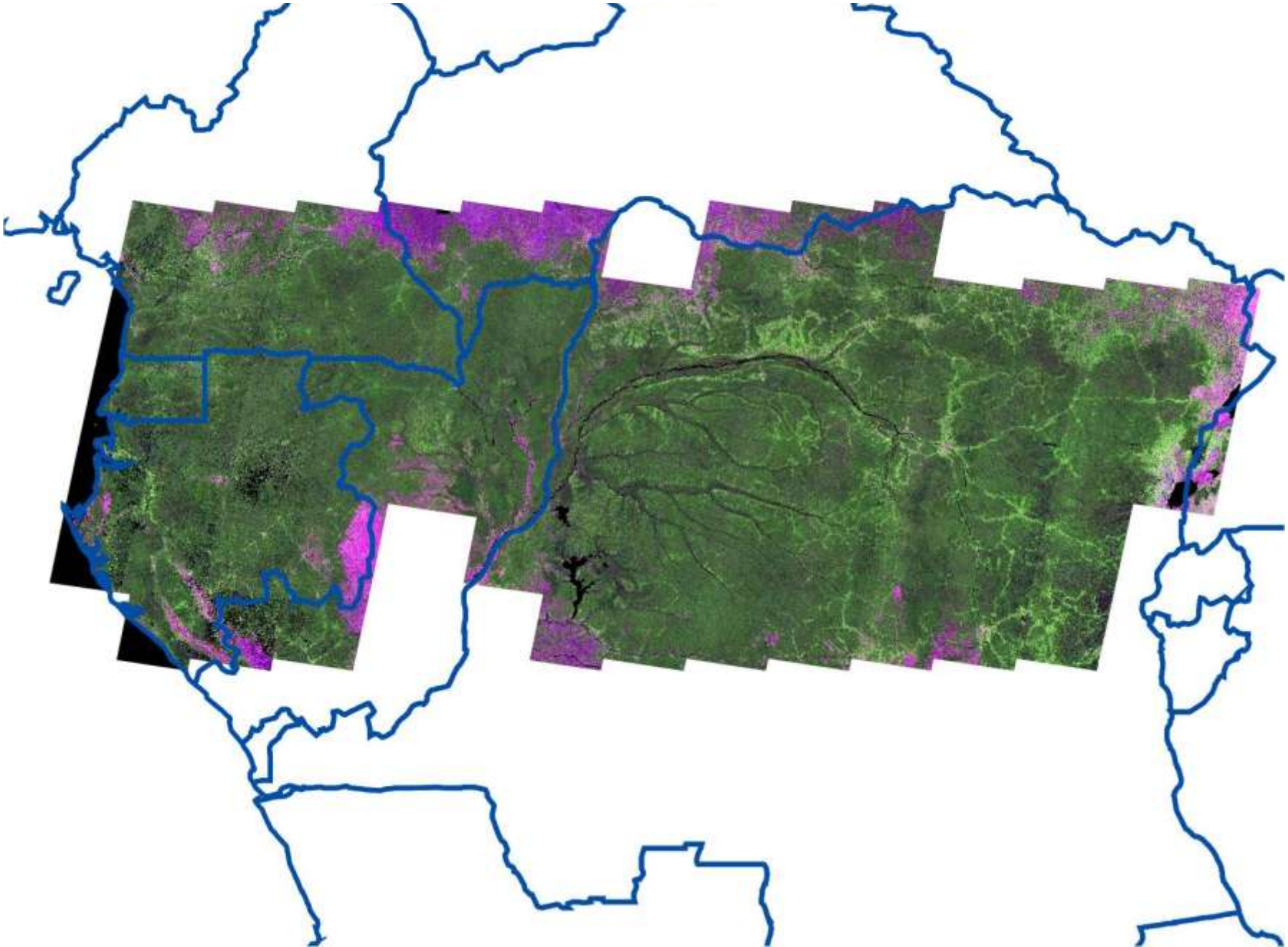


# of images: 1 – 20 – 40

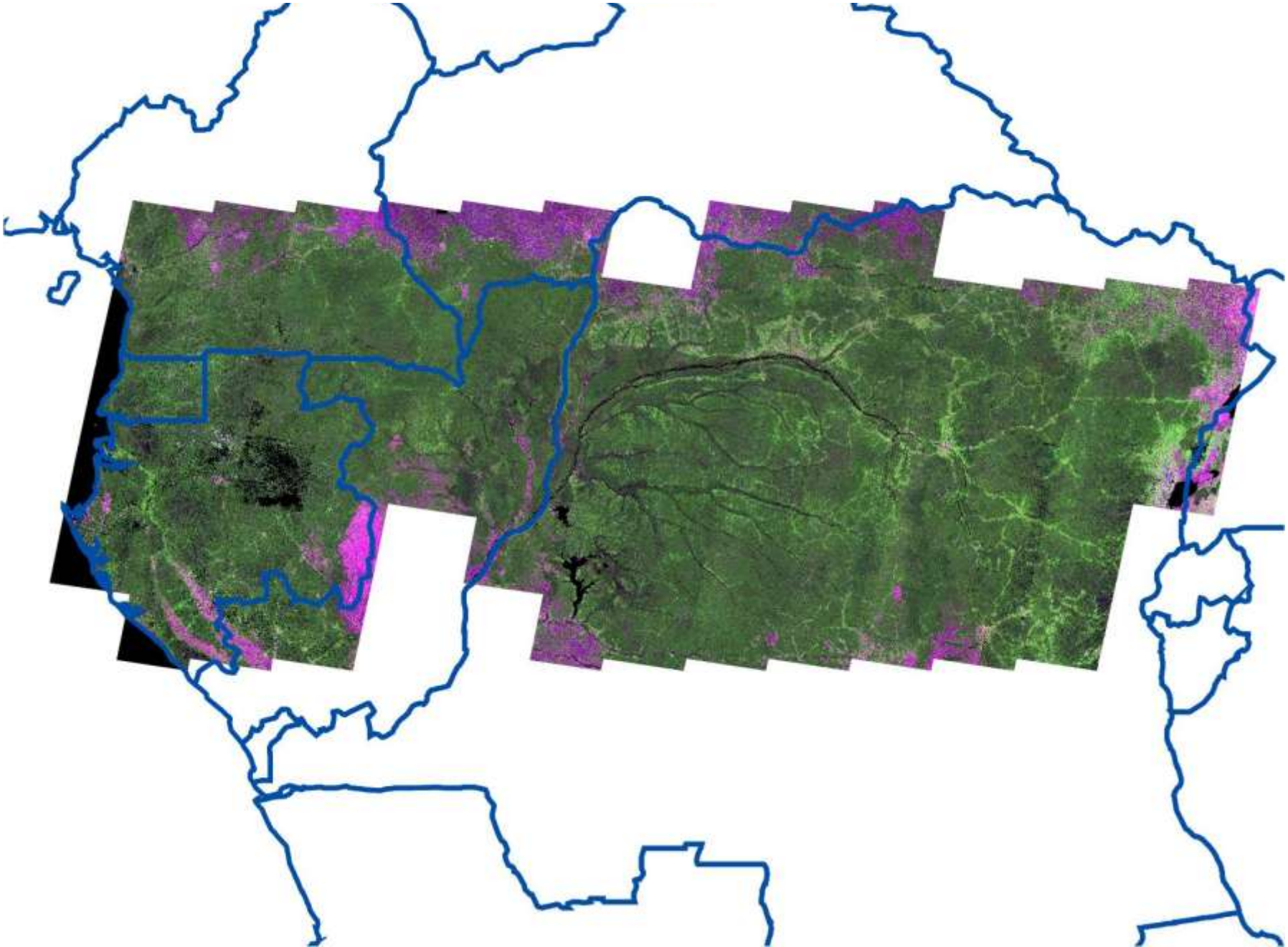
Landsat composite for **2001** (5/4/7) – 1,272 images



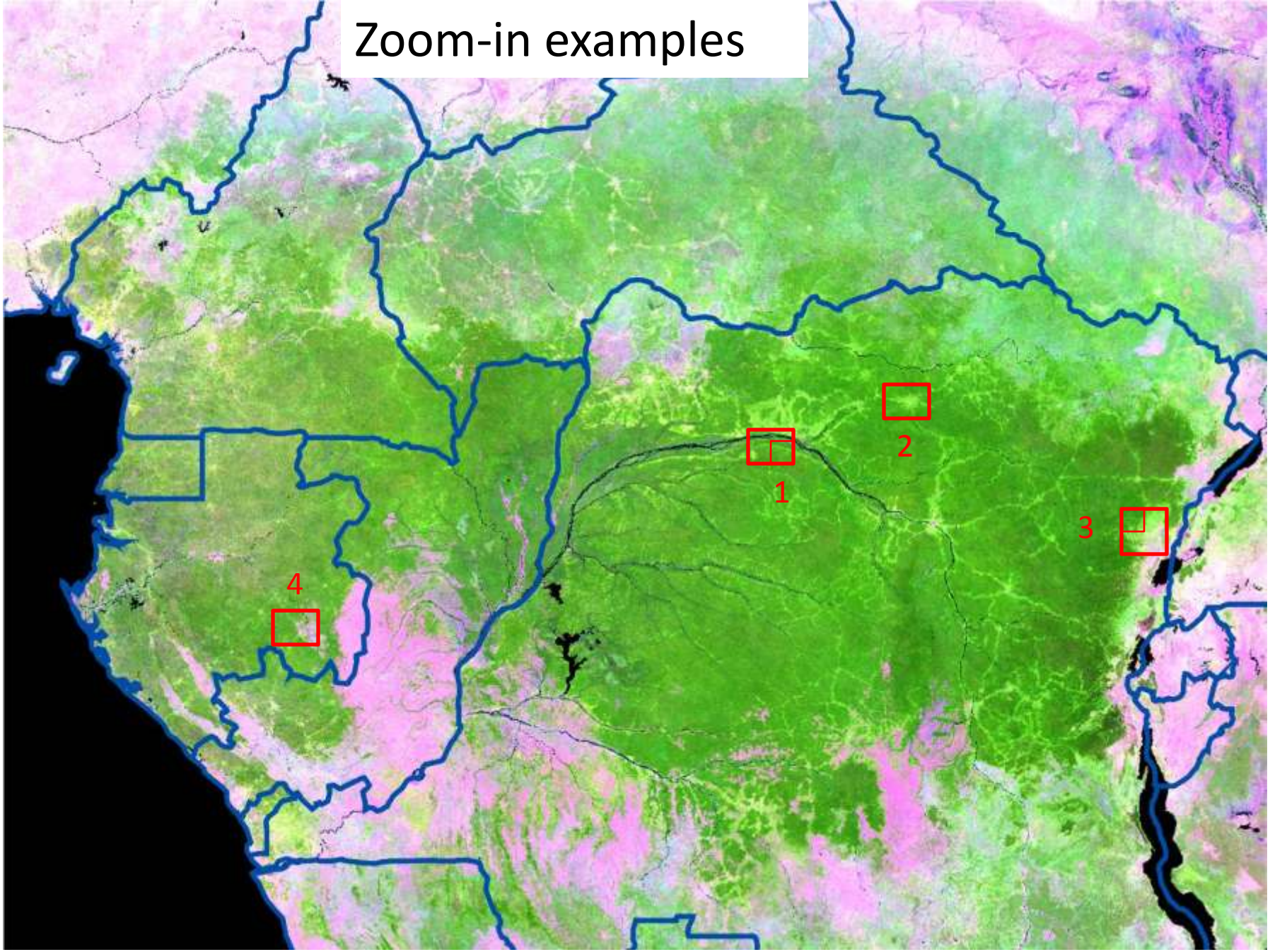
Landsat composite for **2004** (5/4/7) – 1,258 images



Landsat composite for **2007** (5/4/7) – 1,200 images

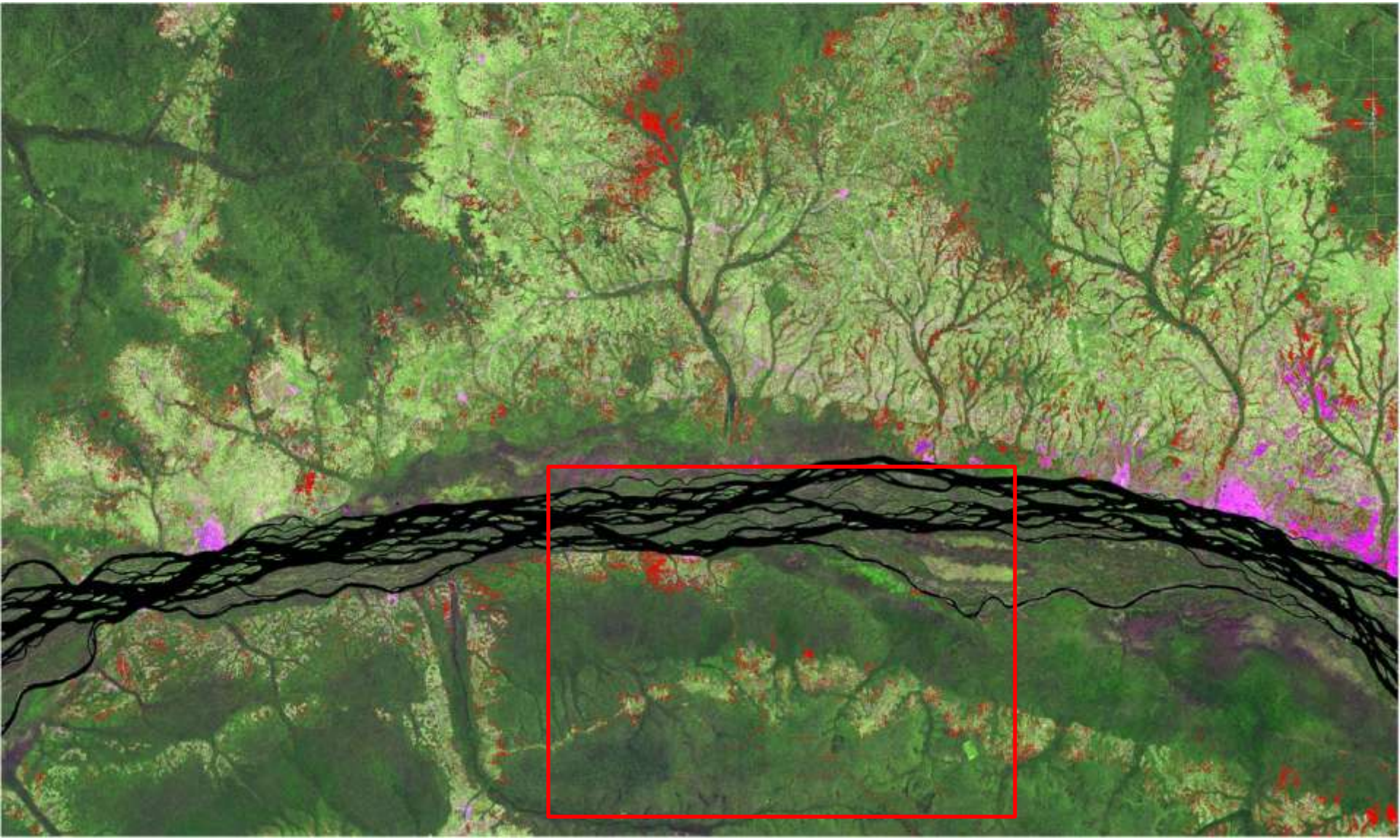


Zoom-in examples



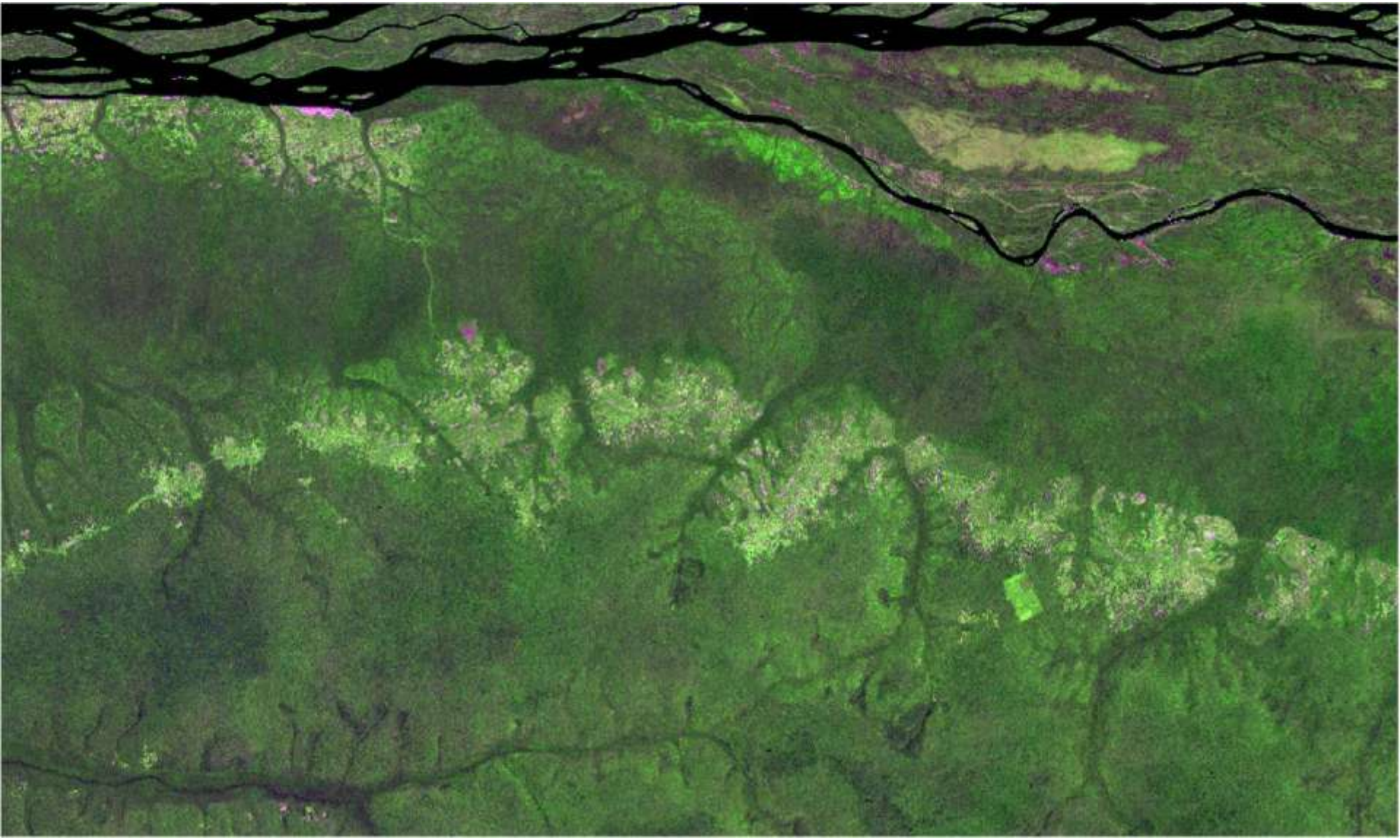
MODIS annual matrices

1) Deforestation 2001-2007



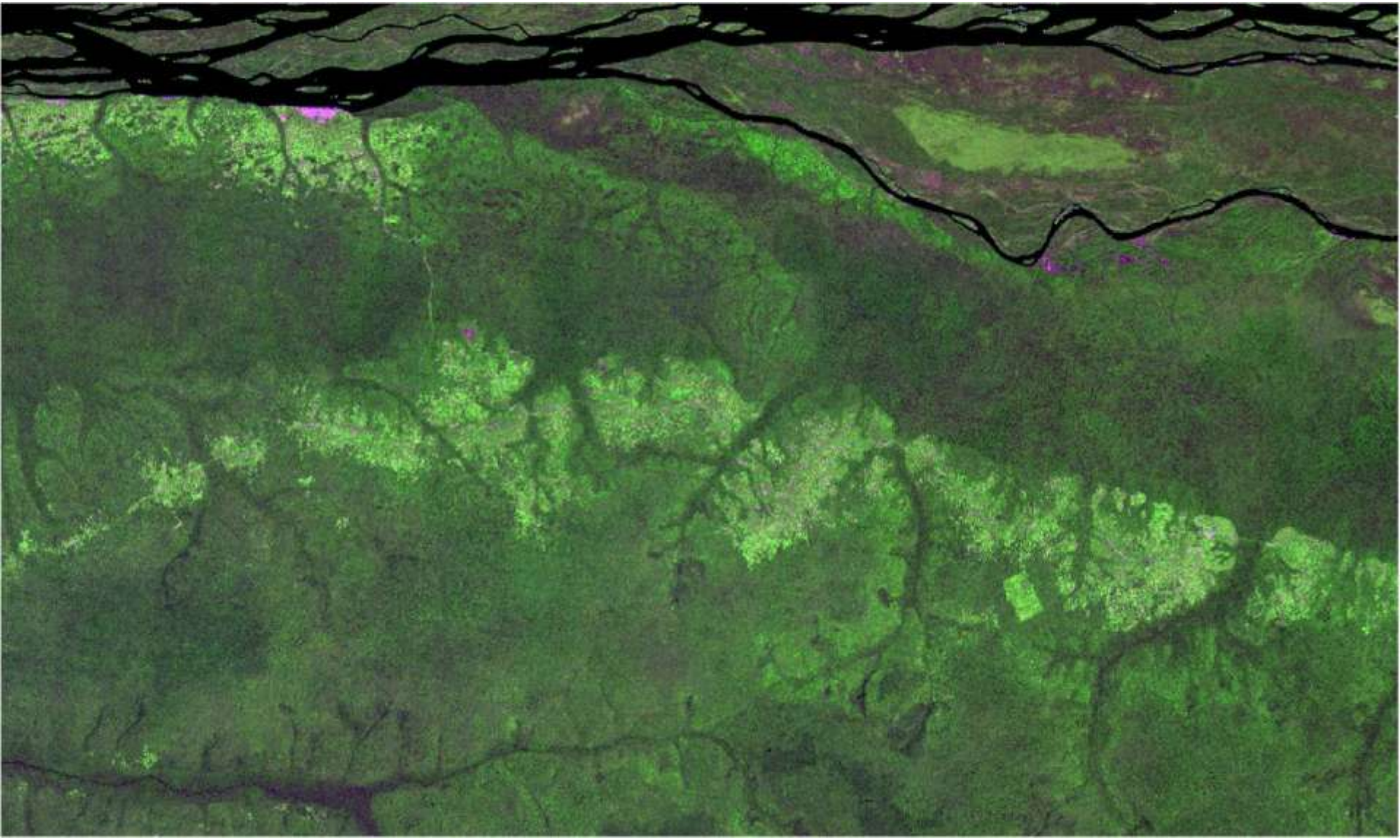
Congo River, between Lisala and Bumba, DRC

Landsat composite for **2001** (5/4/7)



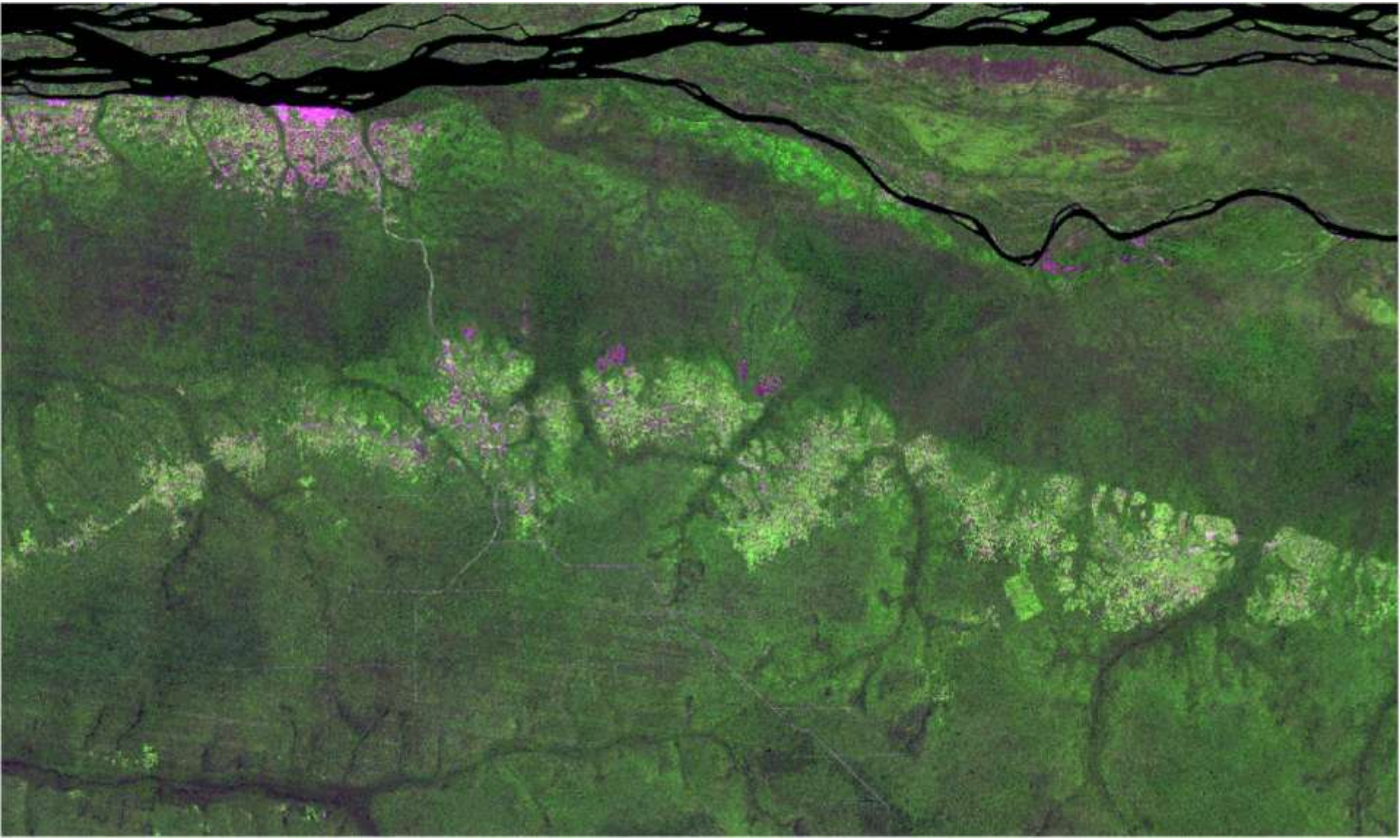
South of the Congo River near Yakata, DRC

Landsat composite for **2004** (5/4/7)



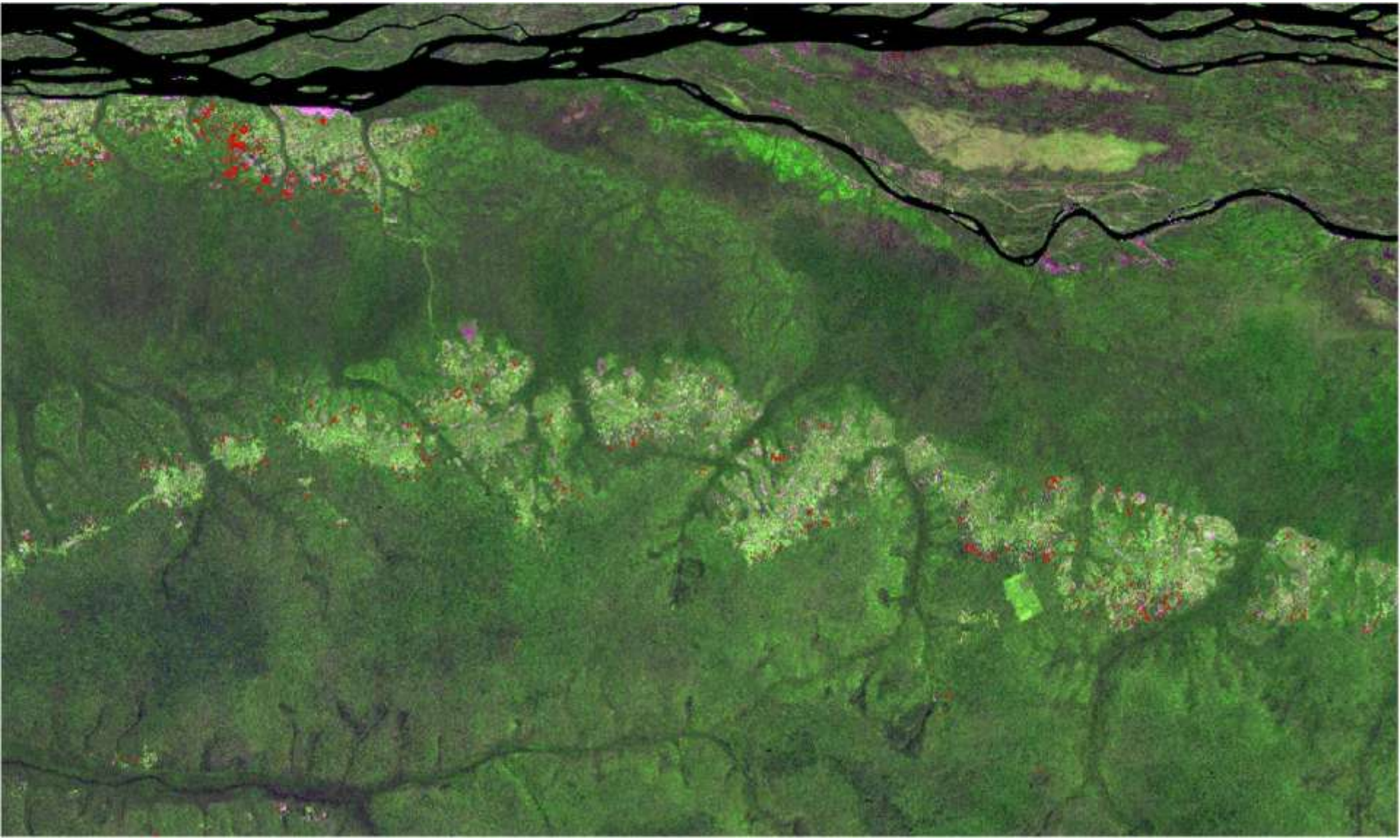
South of the Congo River near Yakata, DRC

Landsat composite for **2007** (5/4/7)



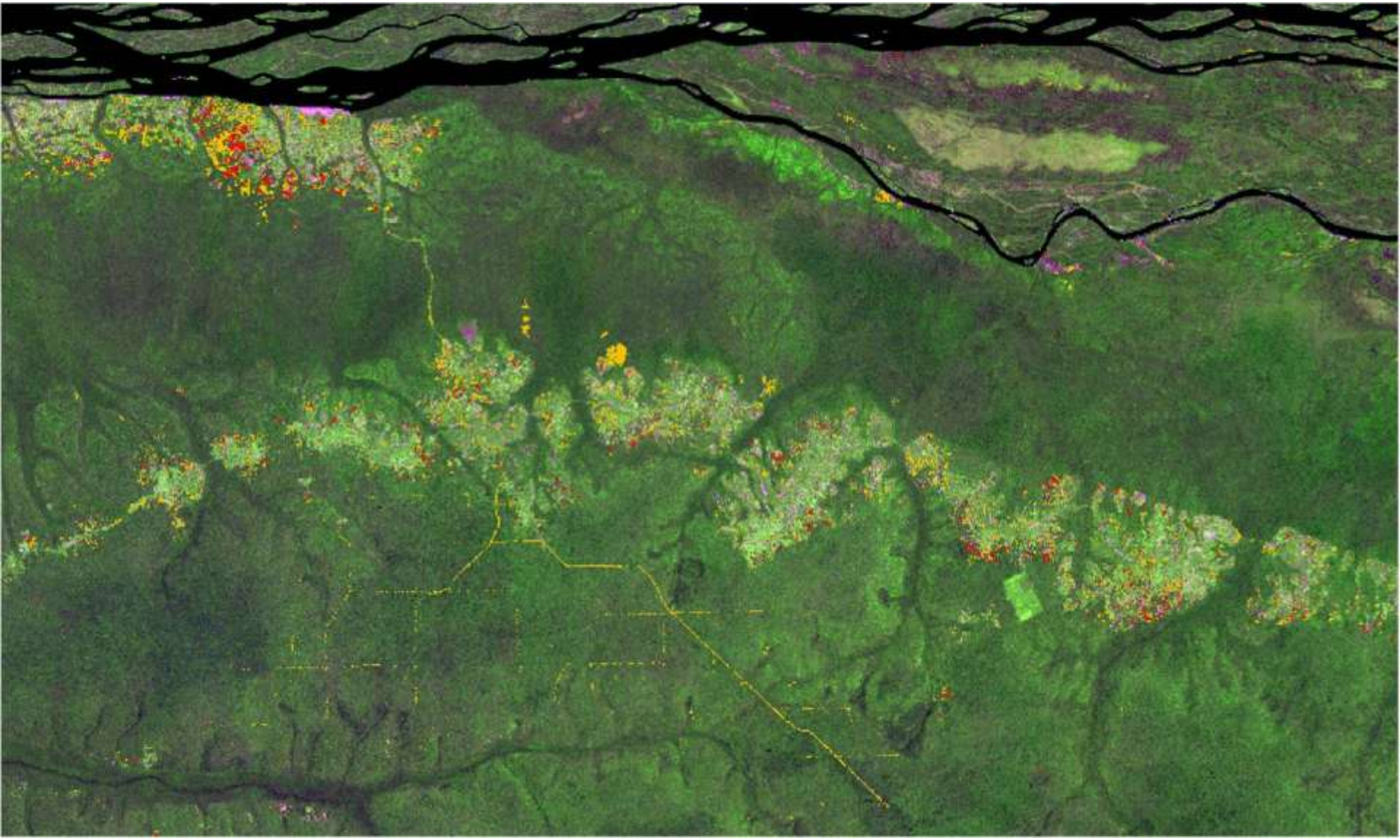
South of the Congo River near Yakata, DRC

Deforestation 2001-2004



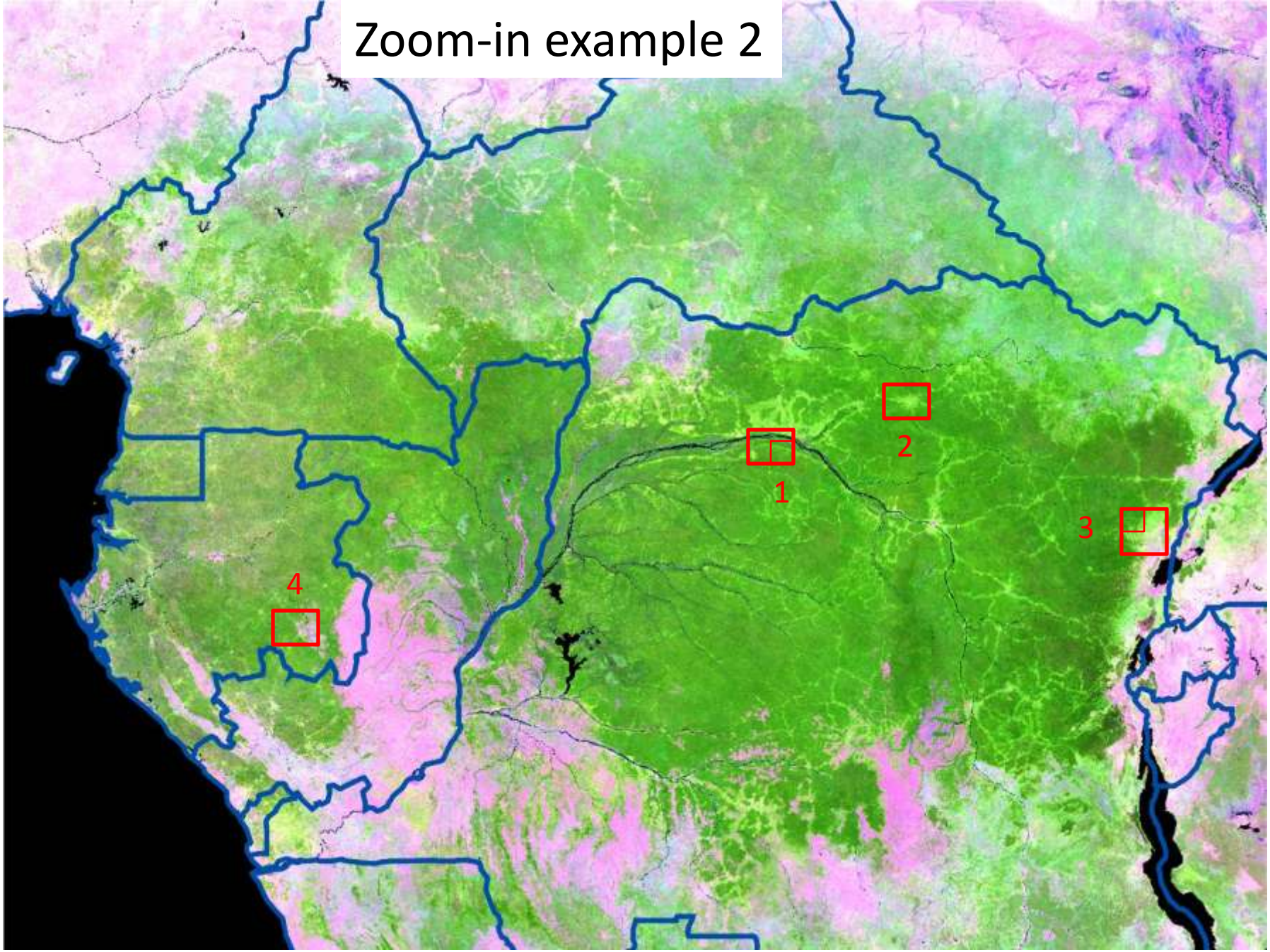
South of the Congo River near Yakata, DRC

Deforestation 2001-2004 & 2004-2007

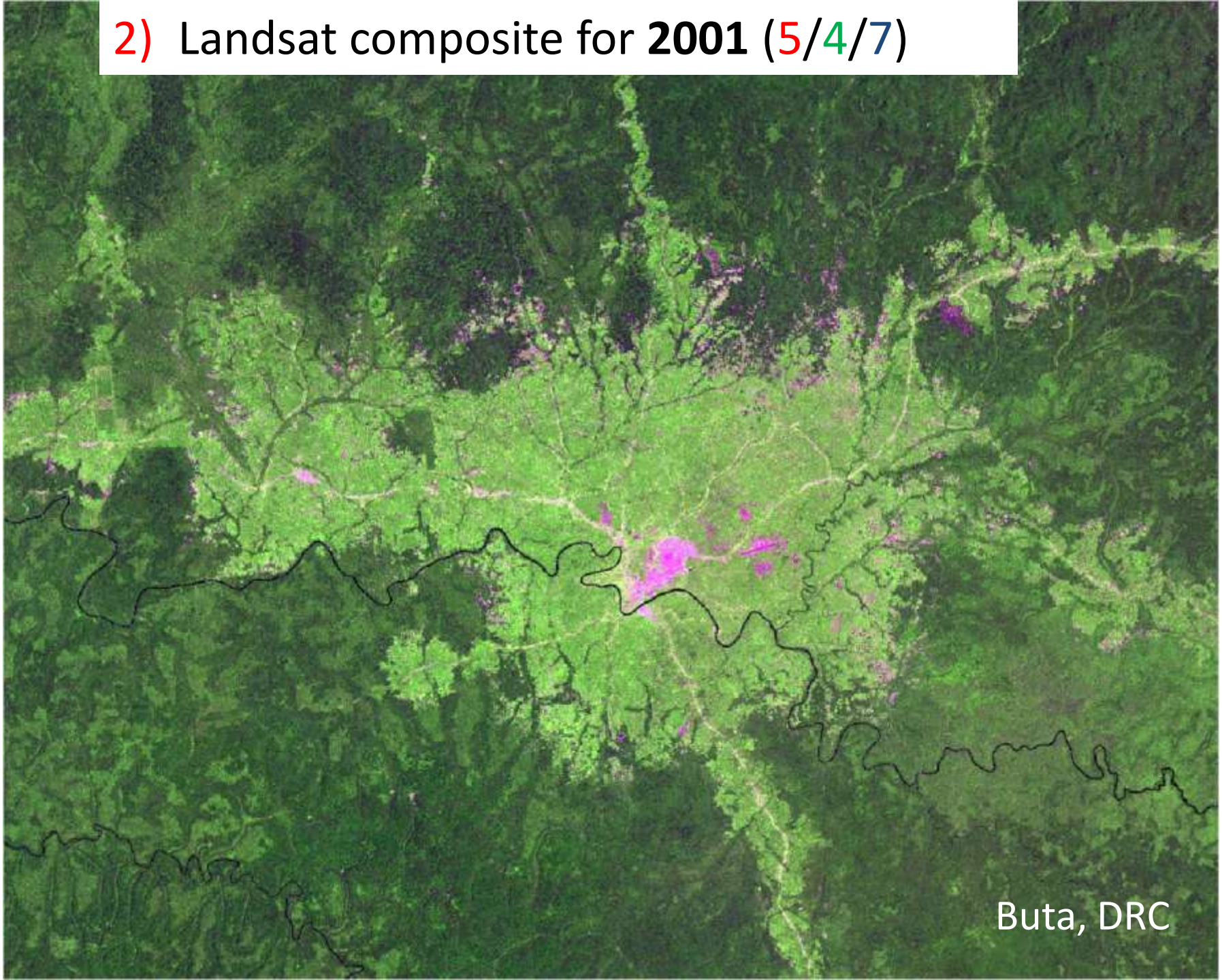


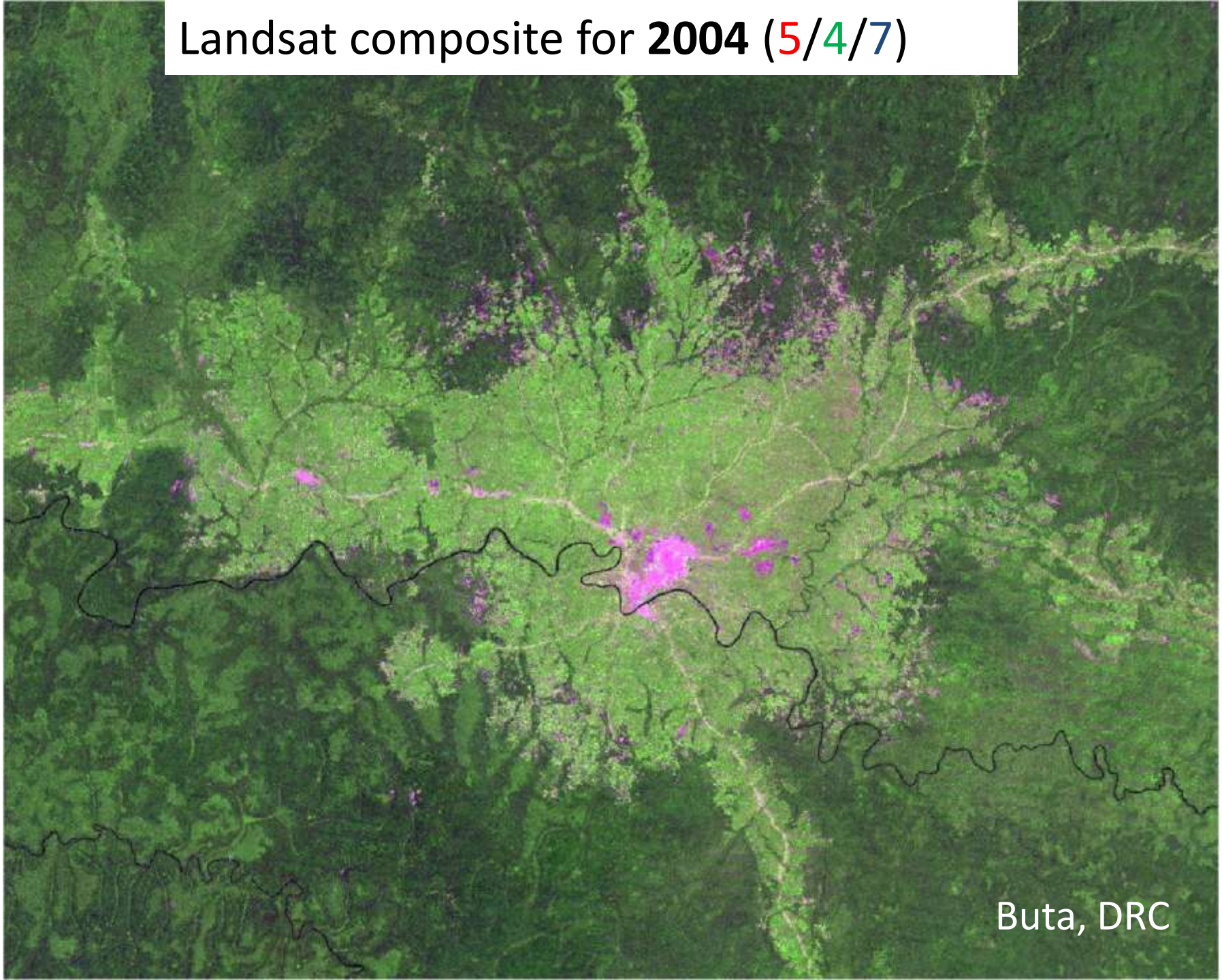
South of the Congo River near Yakata, DRC

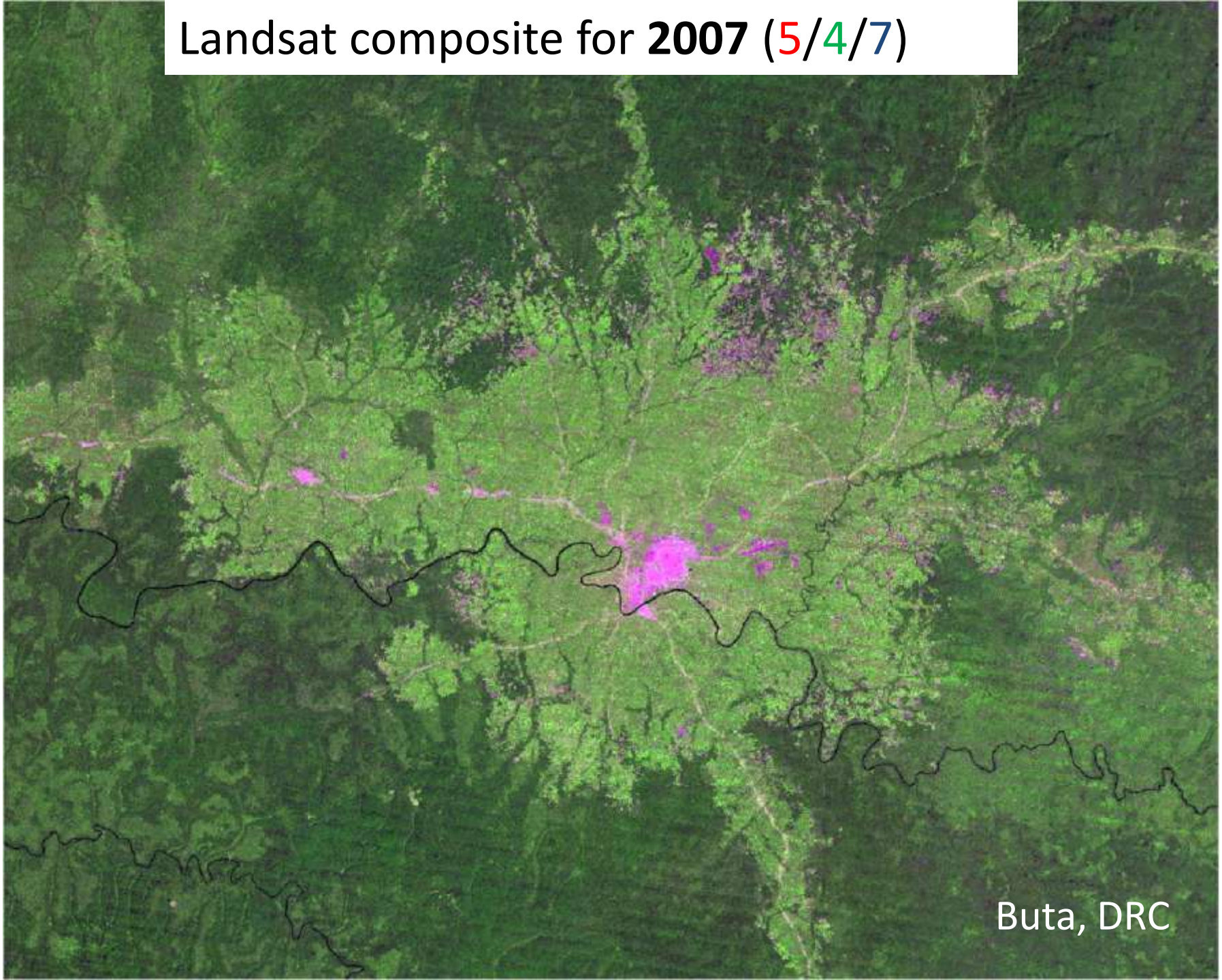
Zoom-in example 2

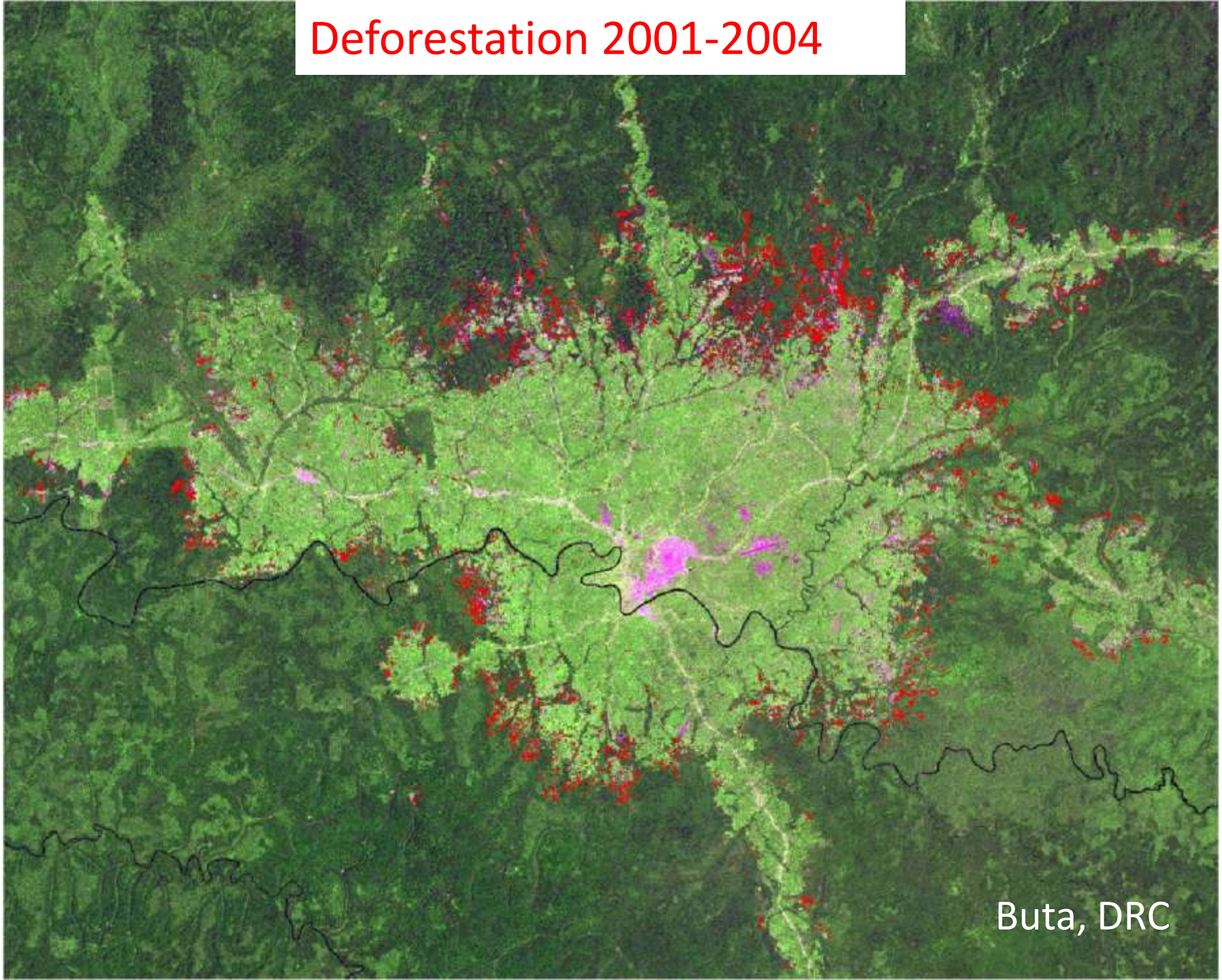


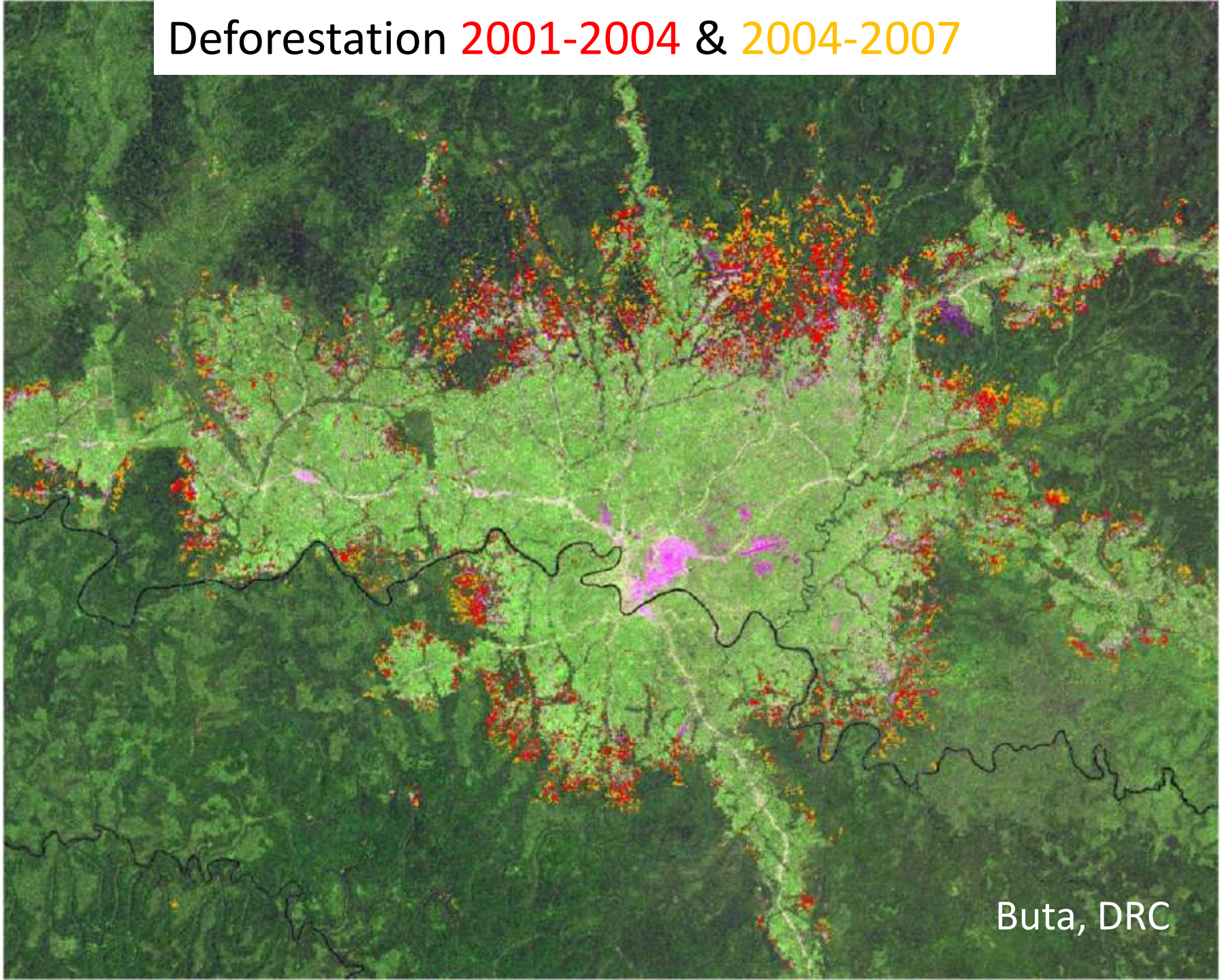
MODIS annual matrices


2) Landsat composite for **2001** (5/4/7)
Buta, DRC

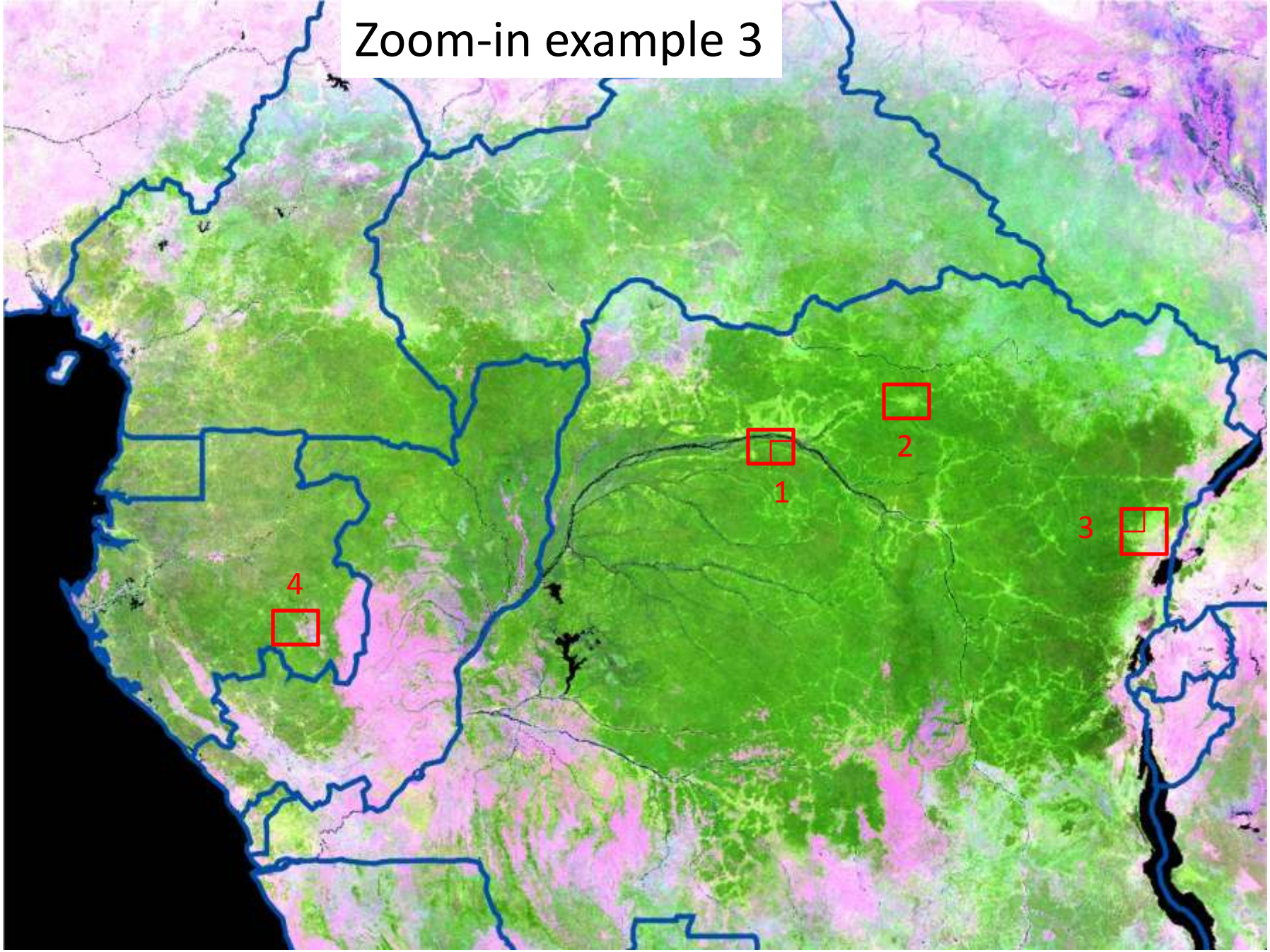

Landsat composite for **2004** (5/4/7)
Buta, DRC


Landsat composite for **2007** (5/4/7)
Buta, DRC


Deforestation 2001-2004
Buta, DRC

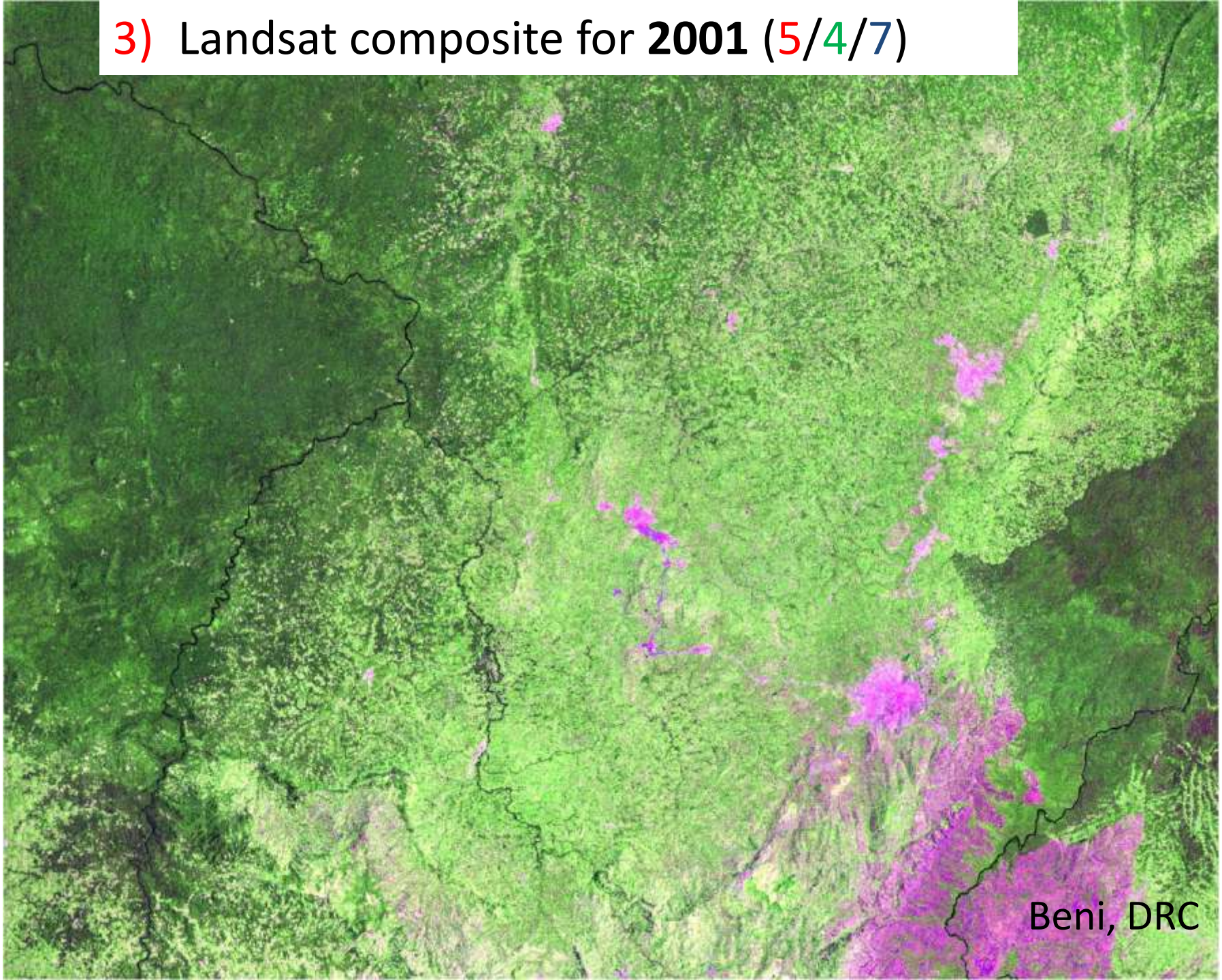

Deforestation 2001-2004 & 2004-2007
Buta, DRC

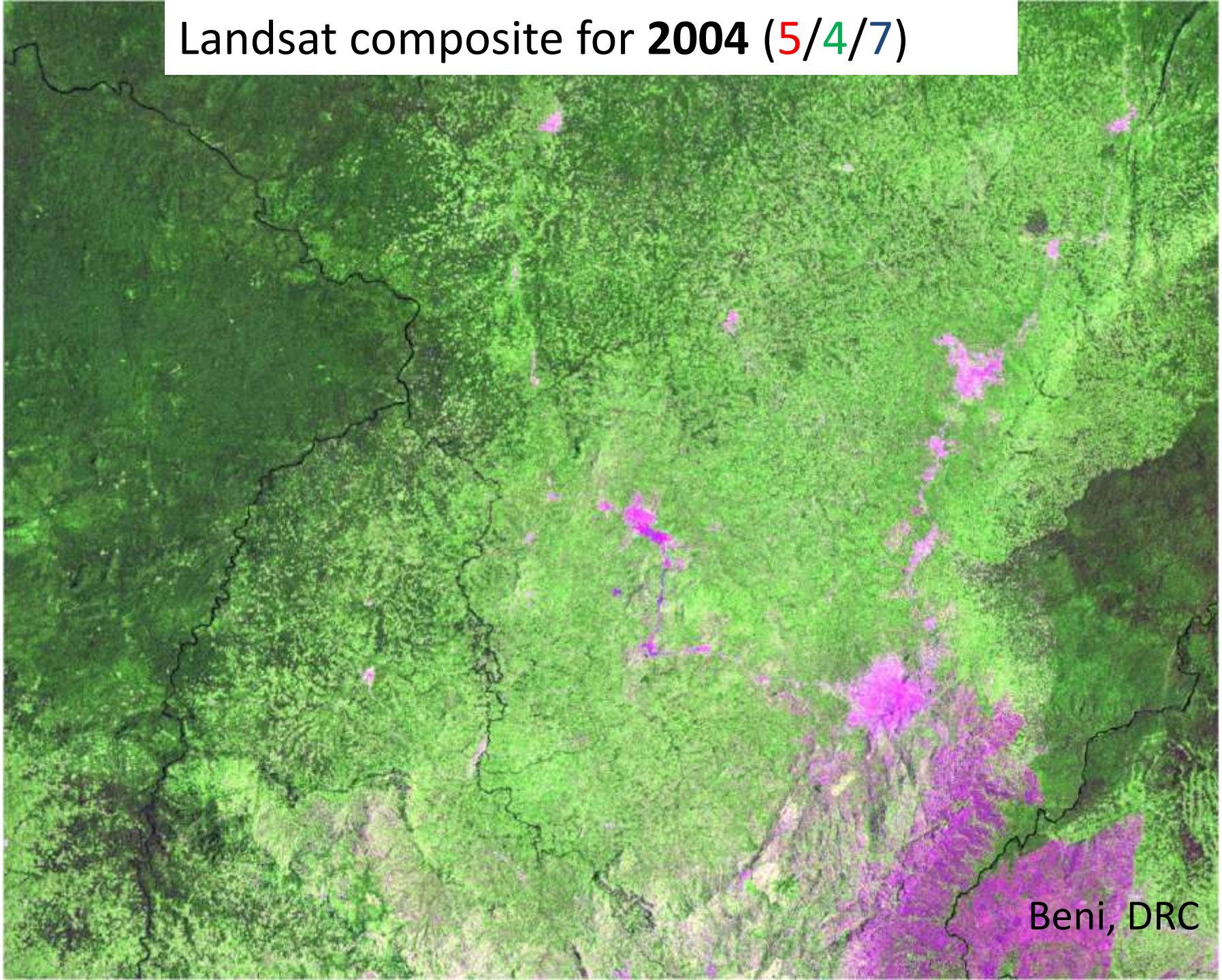
Zoom-in example 3

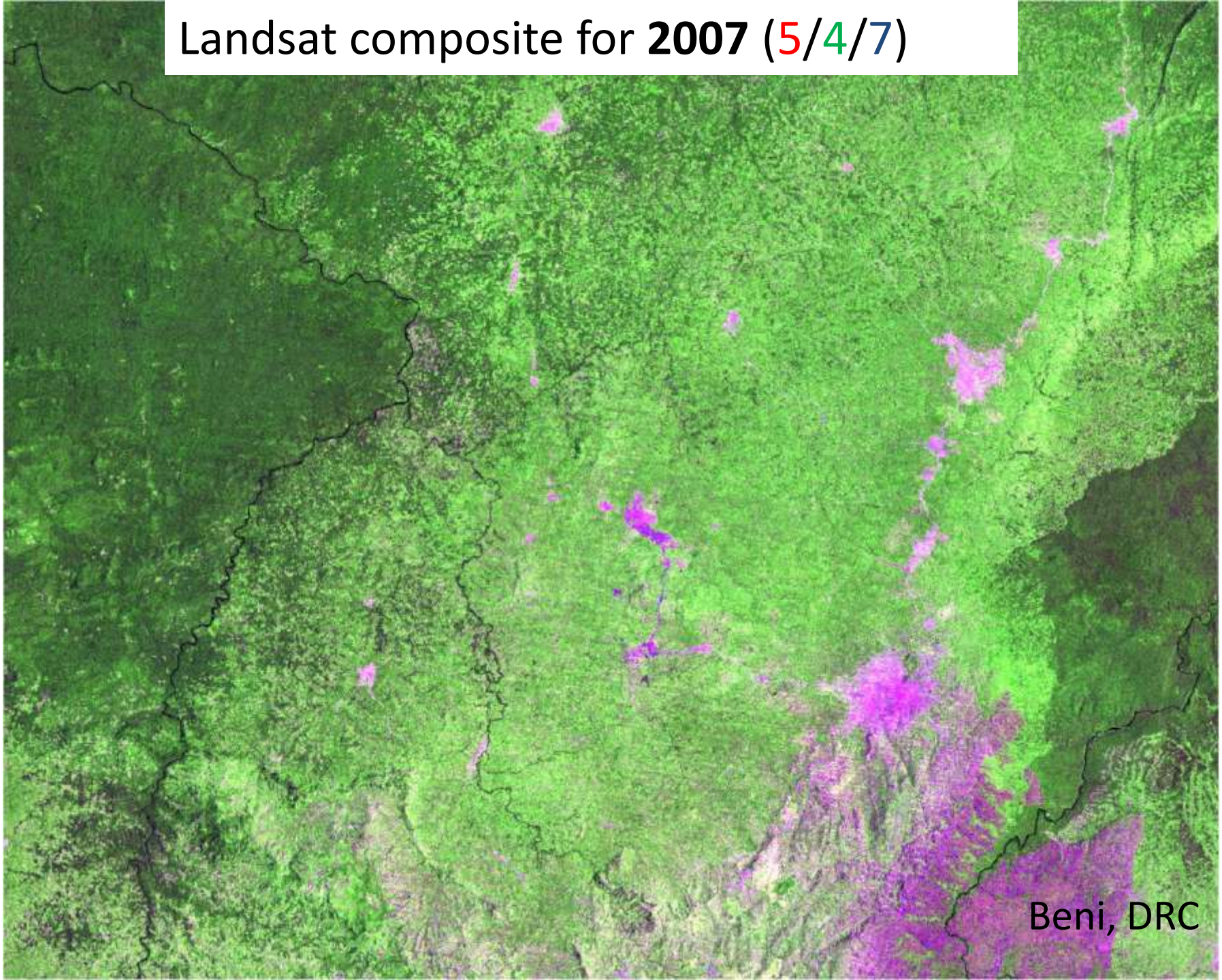


MODIS annual matrices

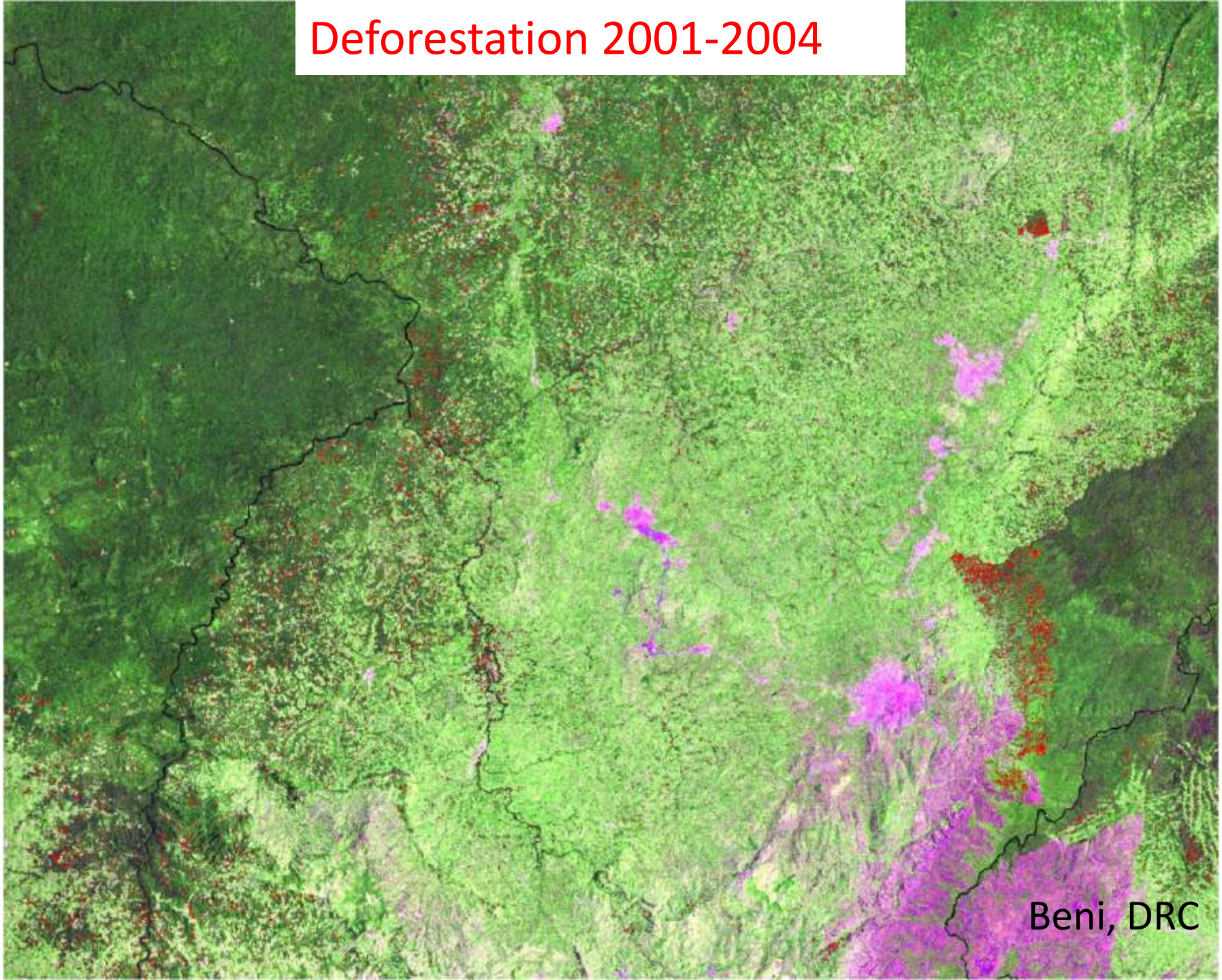
3) Landsat composite for **2001** (5/4/7)

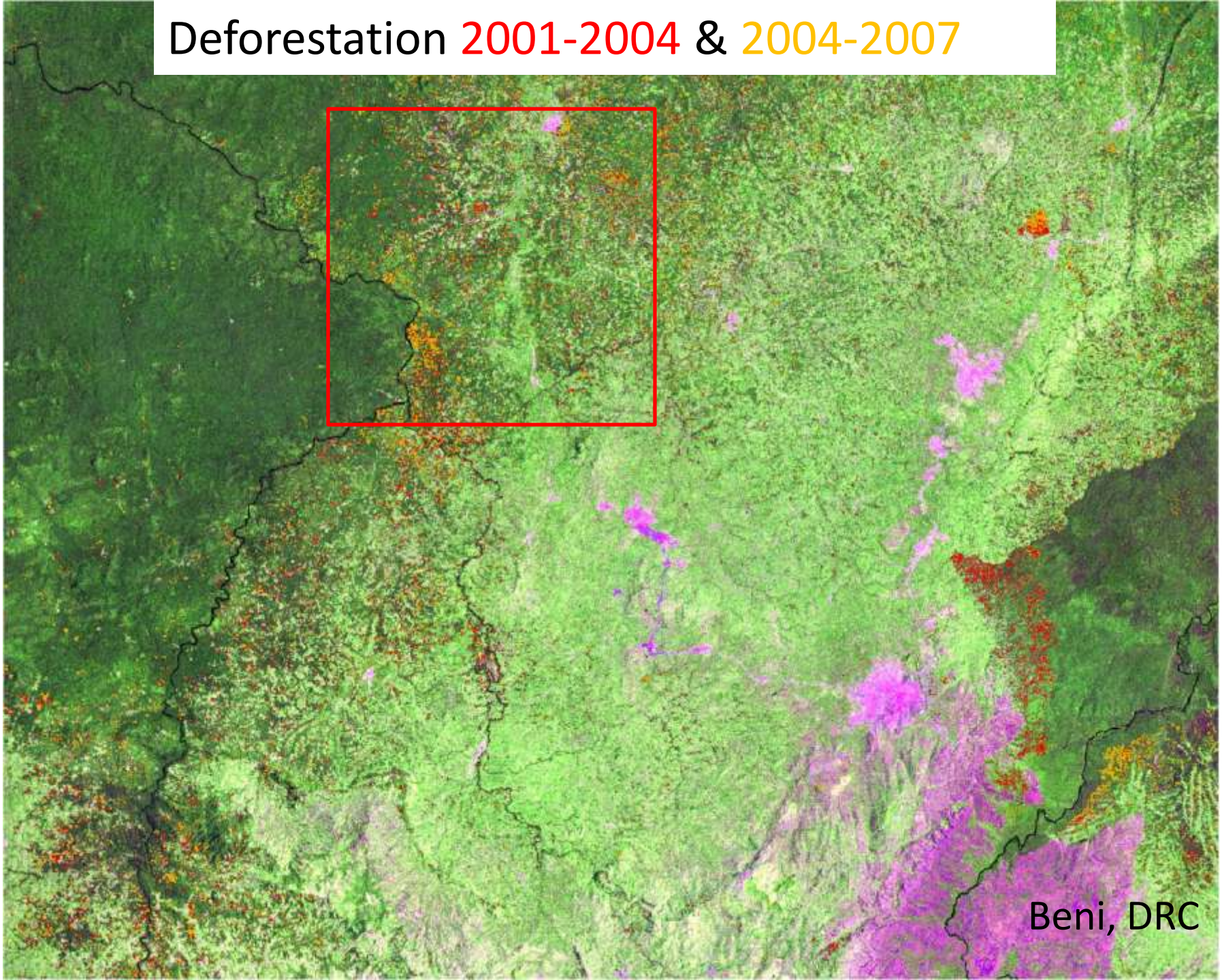


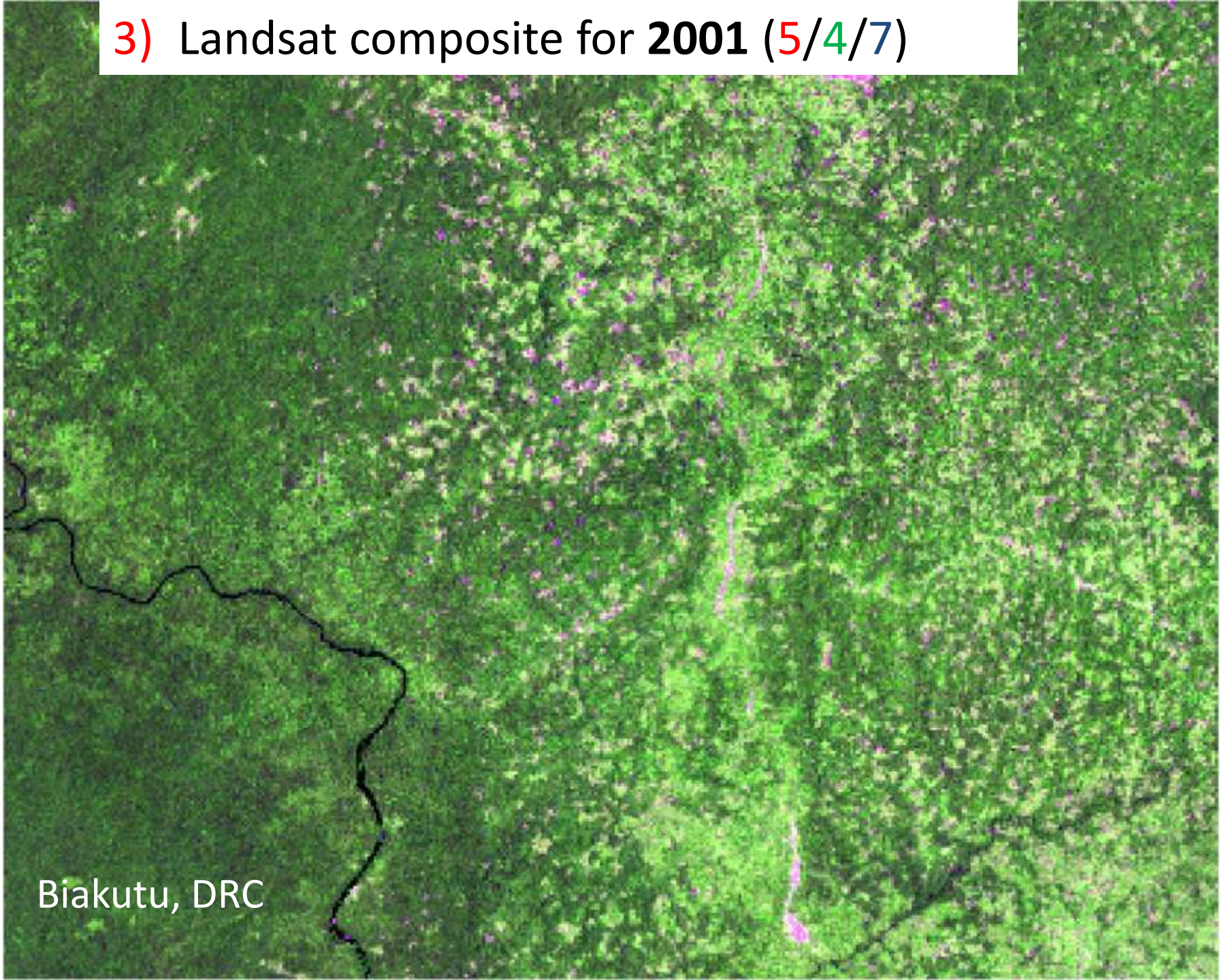

Landsat composite for **2004** (5/4/7)
Beni, DRC

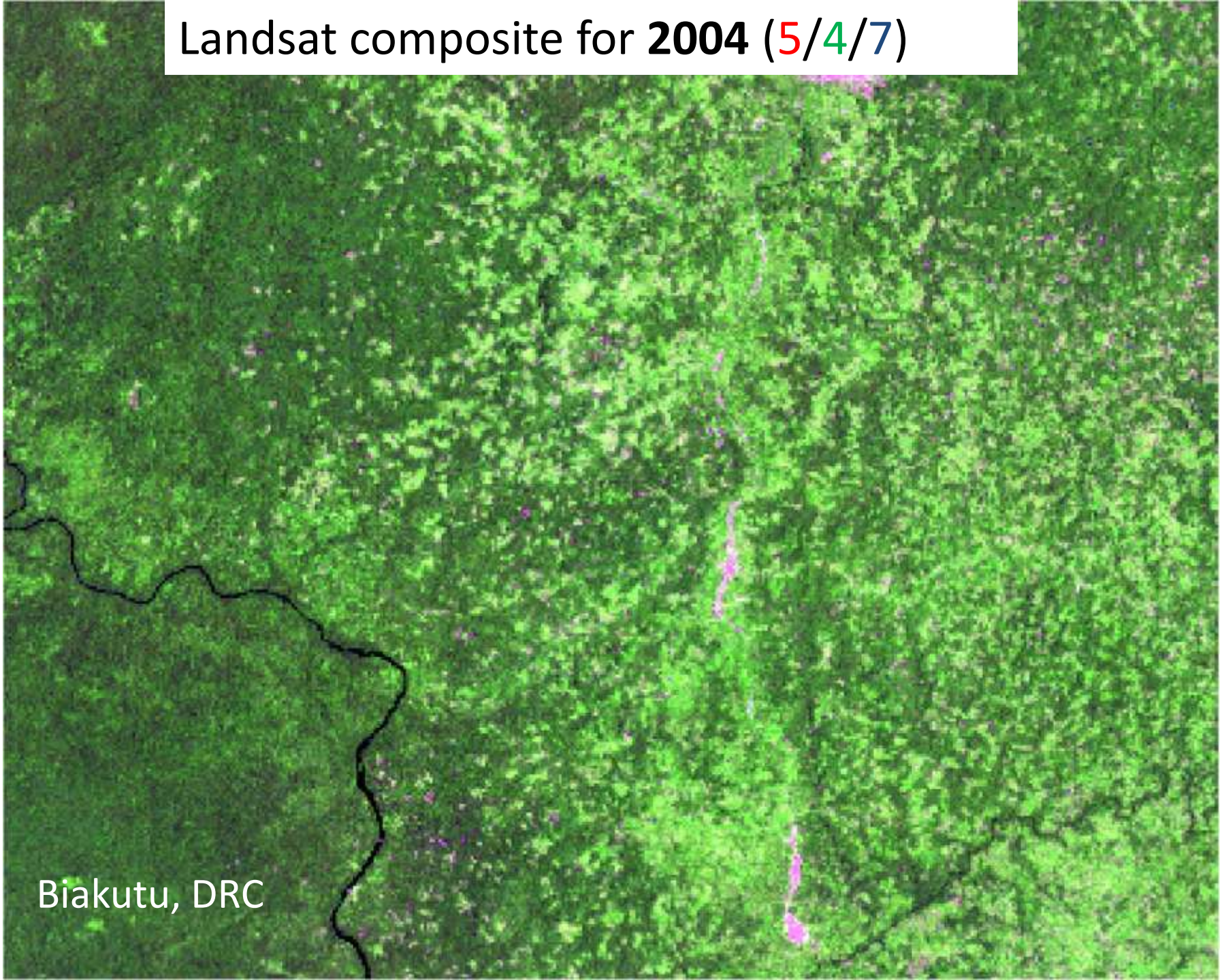

Landsat composite for **2007** (5/4/7)
Beni, DRC

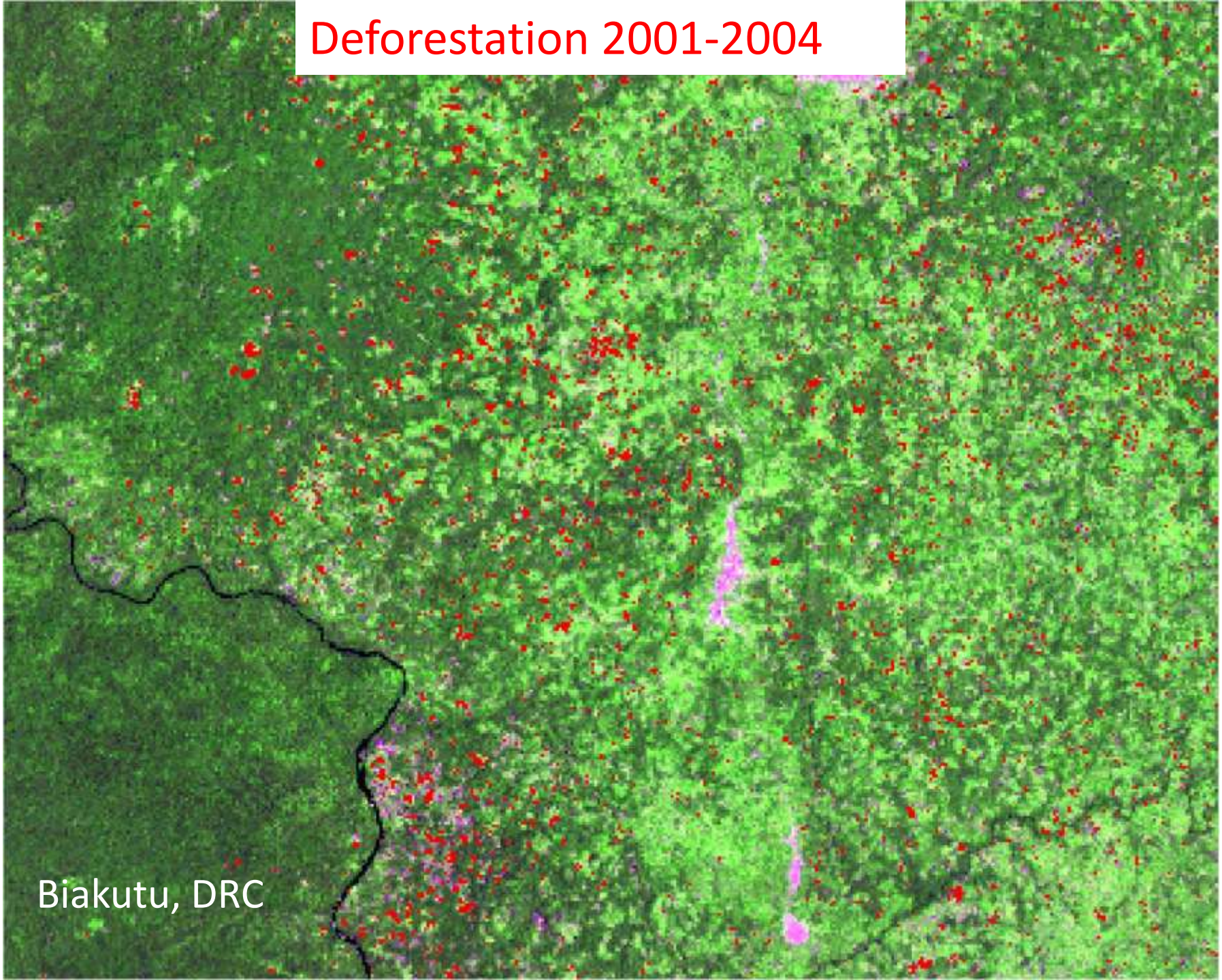
Deforestation 2001-2004

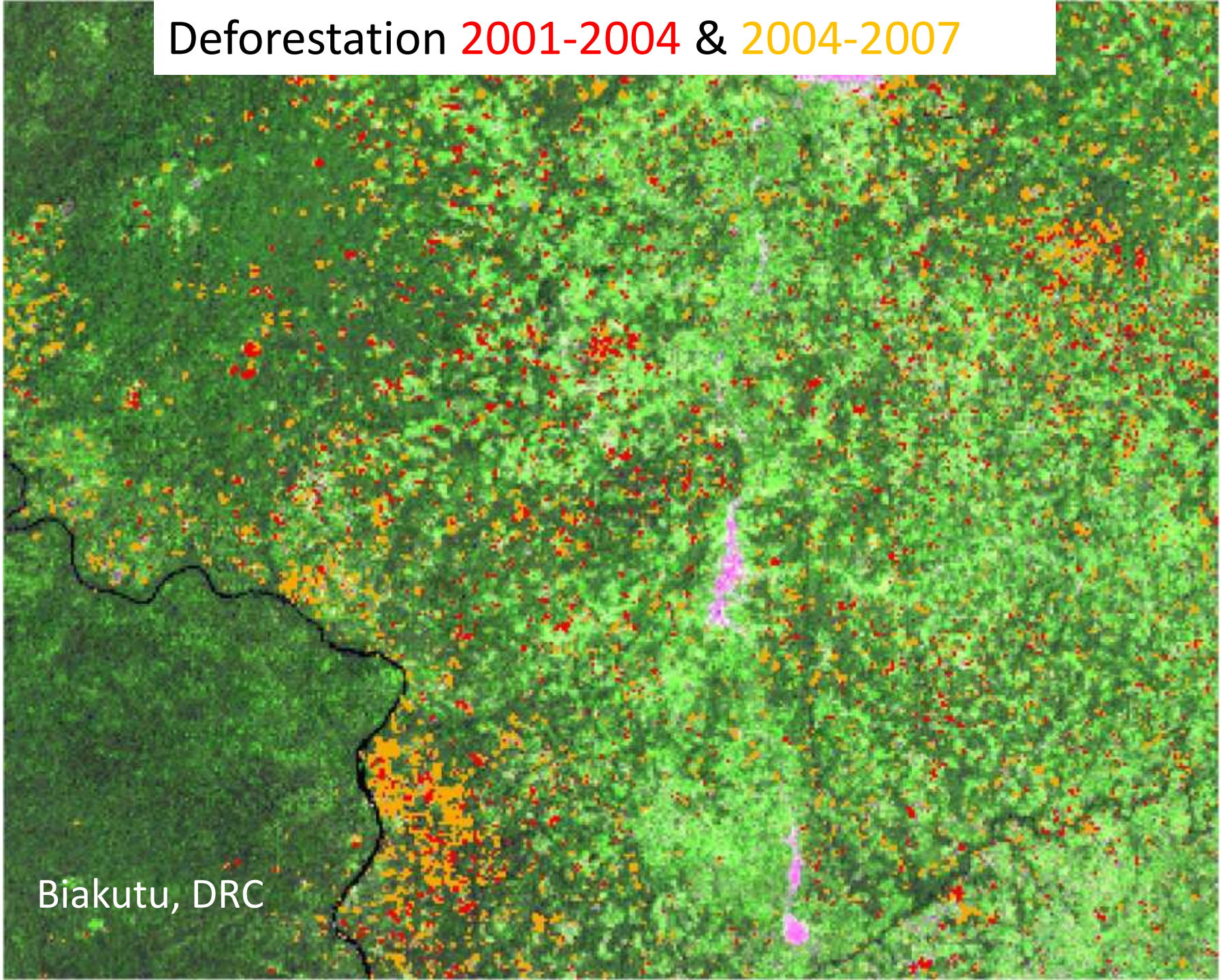



Deforestation 2001-2004 & 2004-2007
Beni, DRC

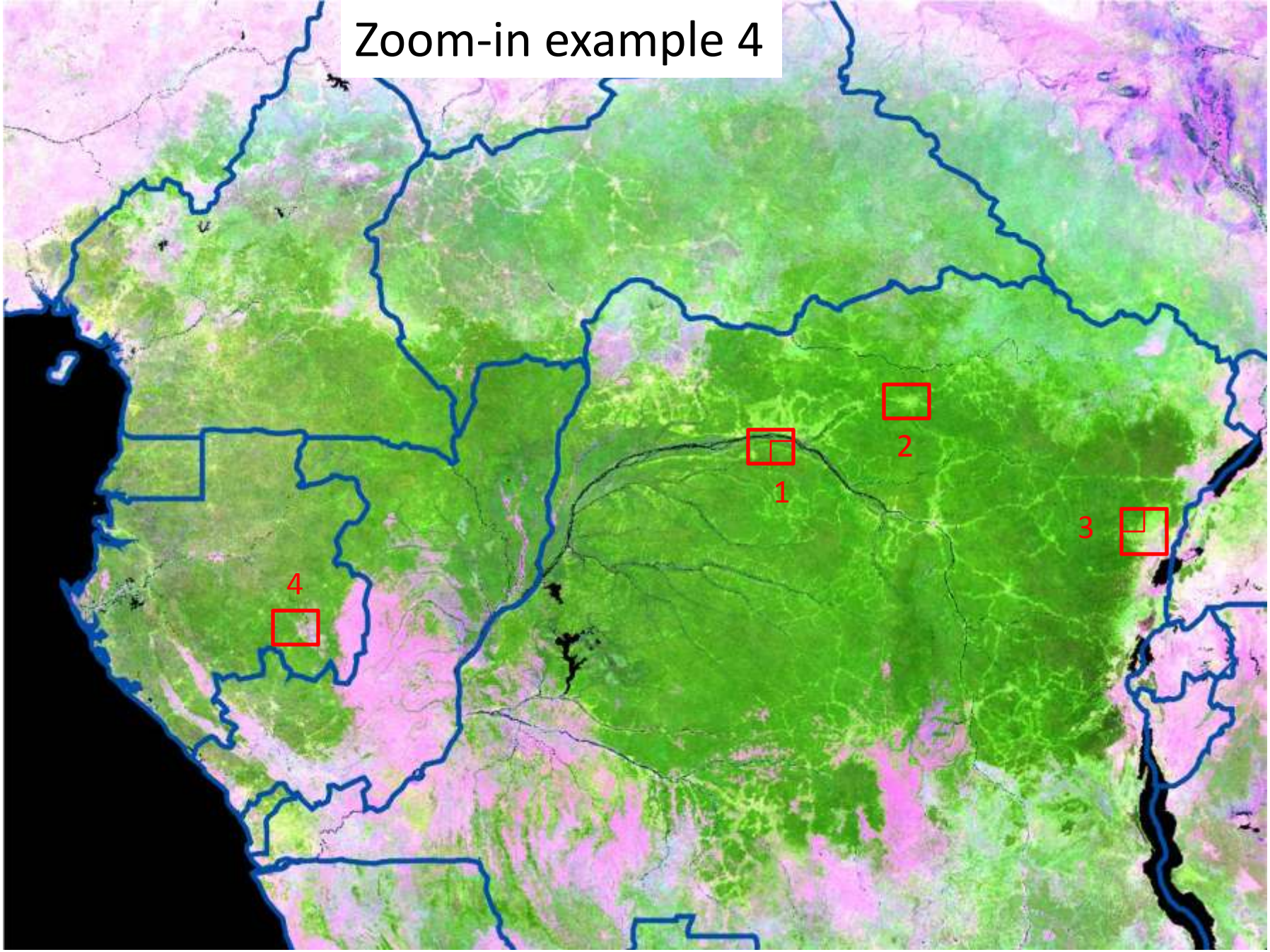

3) Landsat composite for **2001** (5/4/7)
Biakutu, DRC


Landsat composite for **2004** (5/4/7)
Biakutu, DRC


Deforestation 2001-2004
Biakutu, DRC

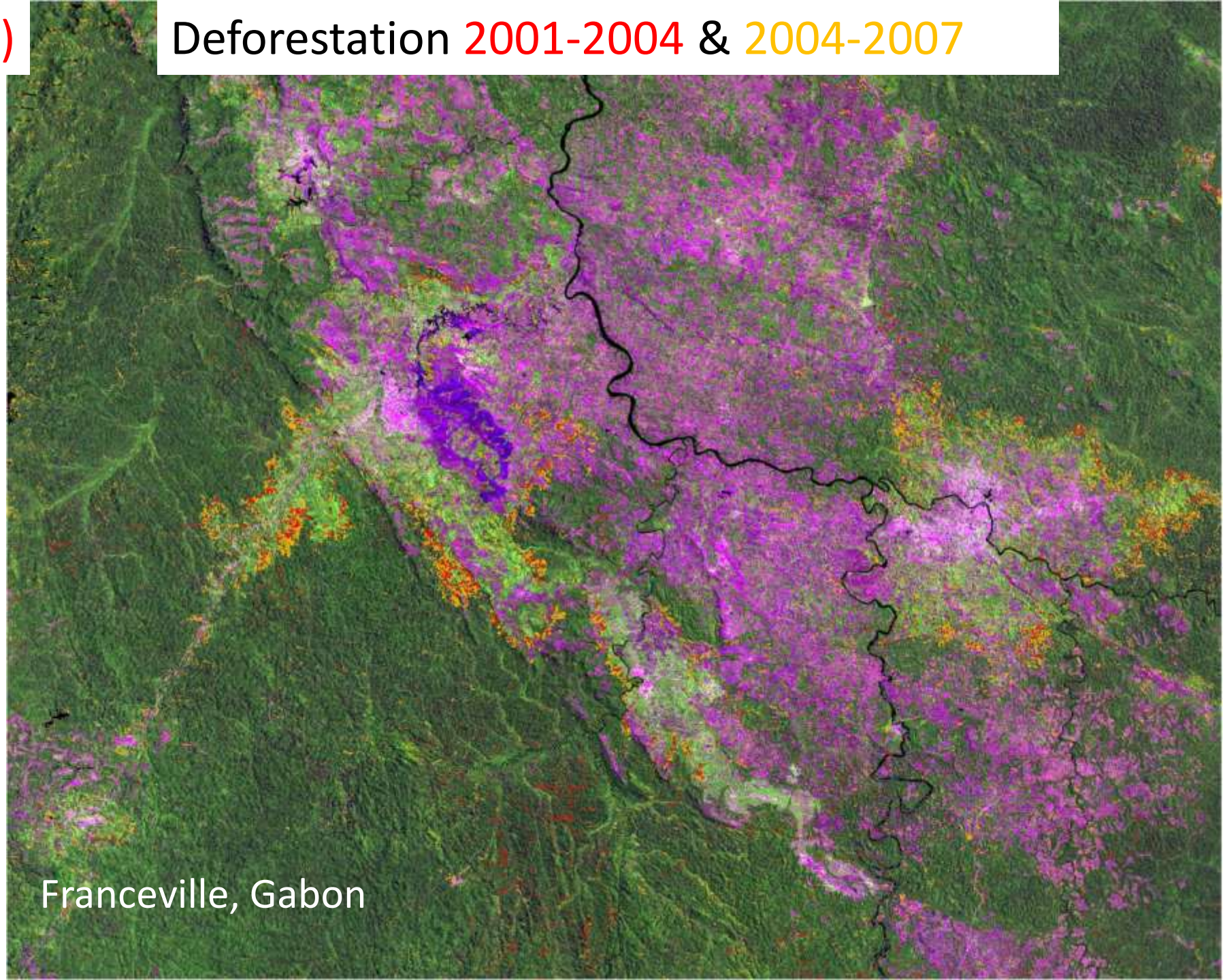

Deforestation 2001-2004 & 2004-2007
Biakutu, DRC

Zoom-in example 4

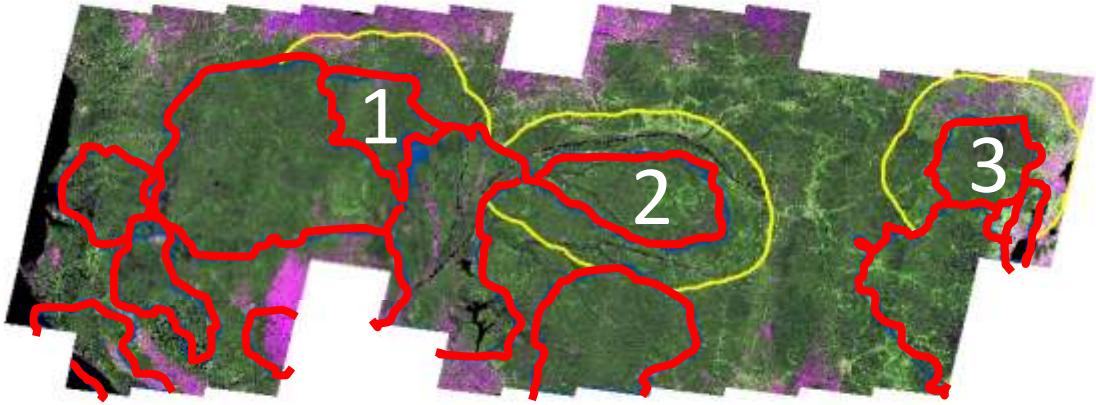


MODIS annual matrices

4) Deforestation 2001-2004 & 2004-2007

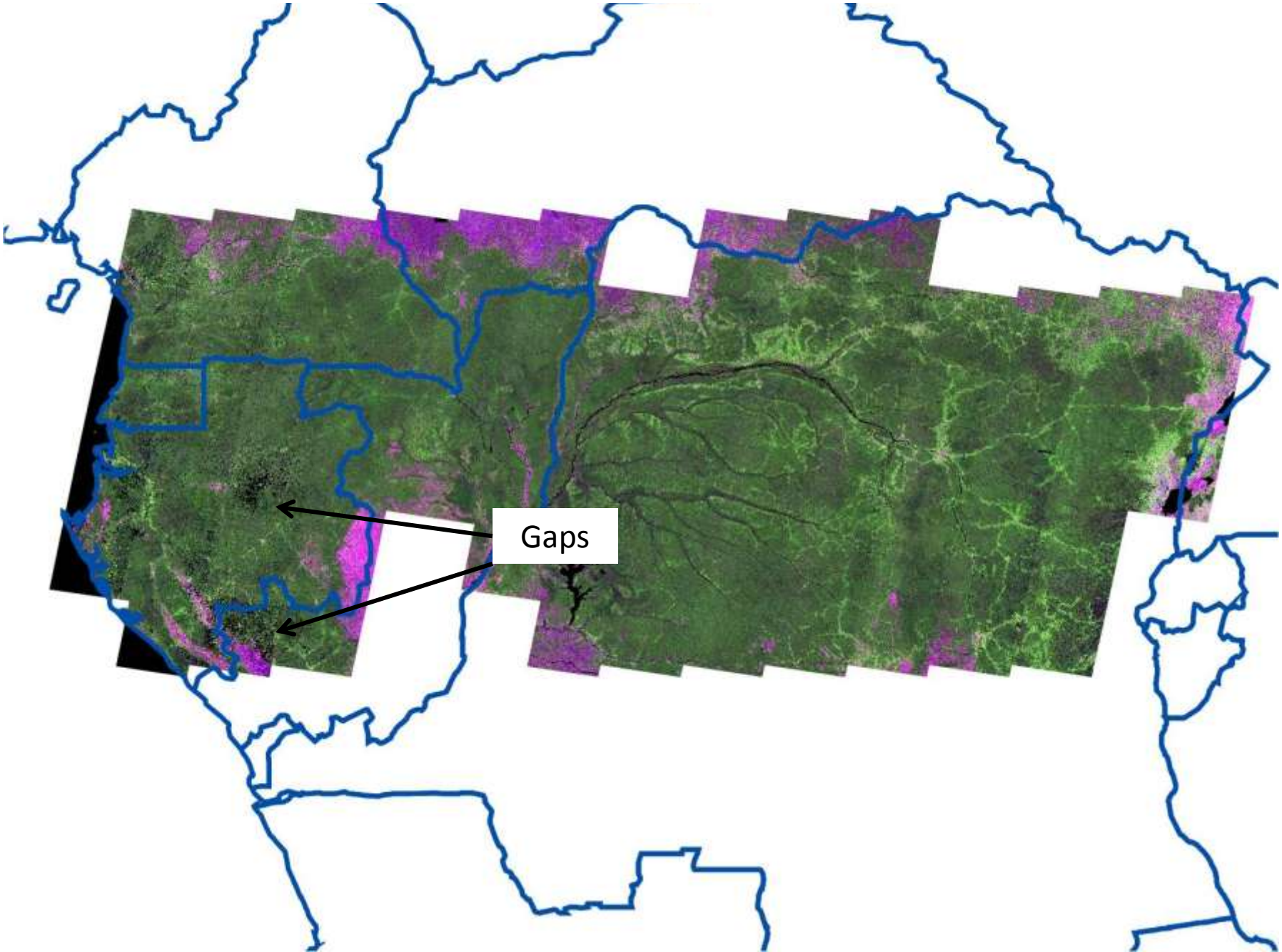


Deforestation in three Landscapes
and in their 100 km buffer

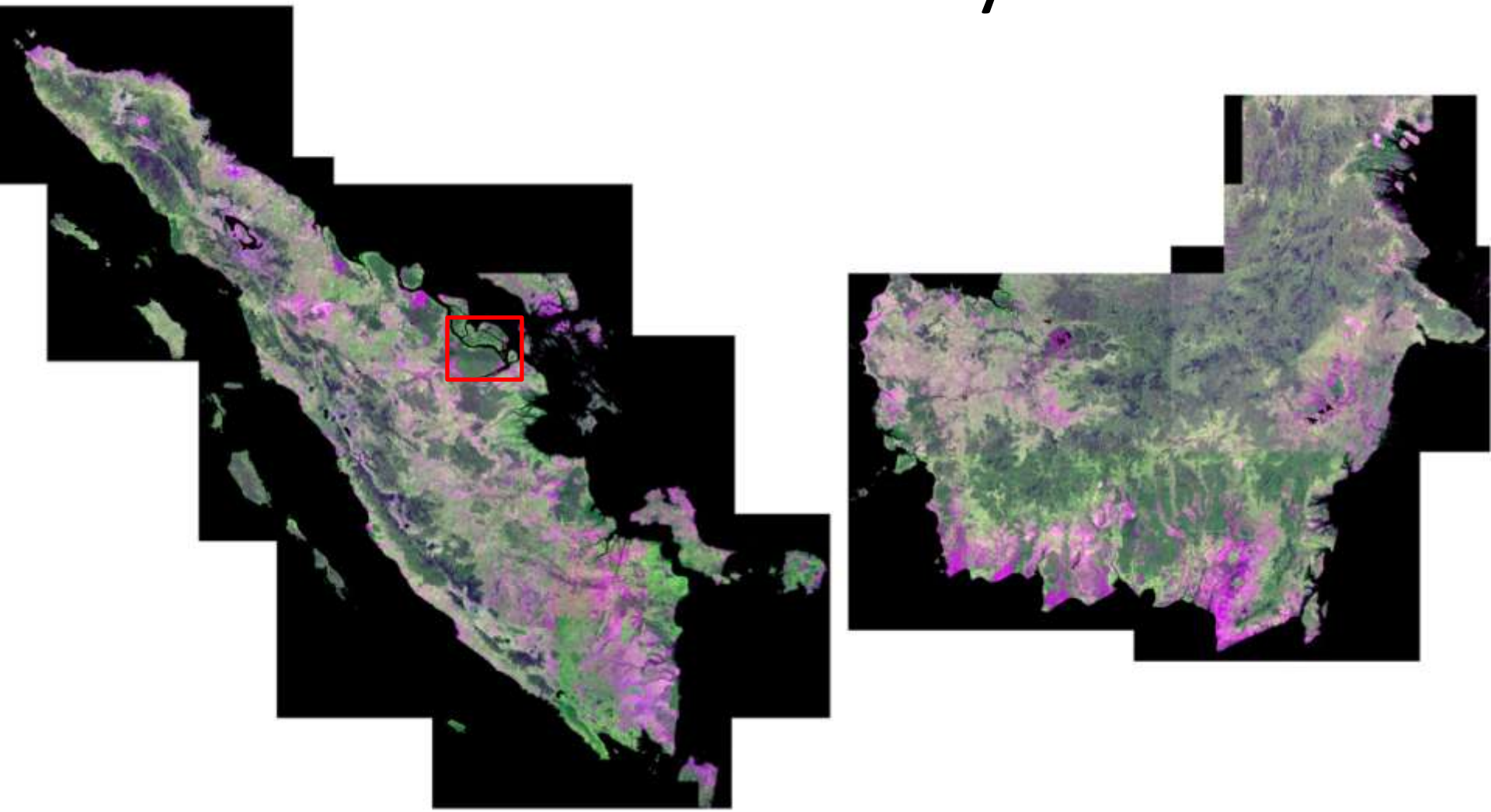


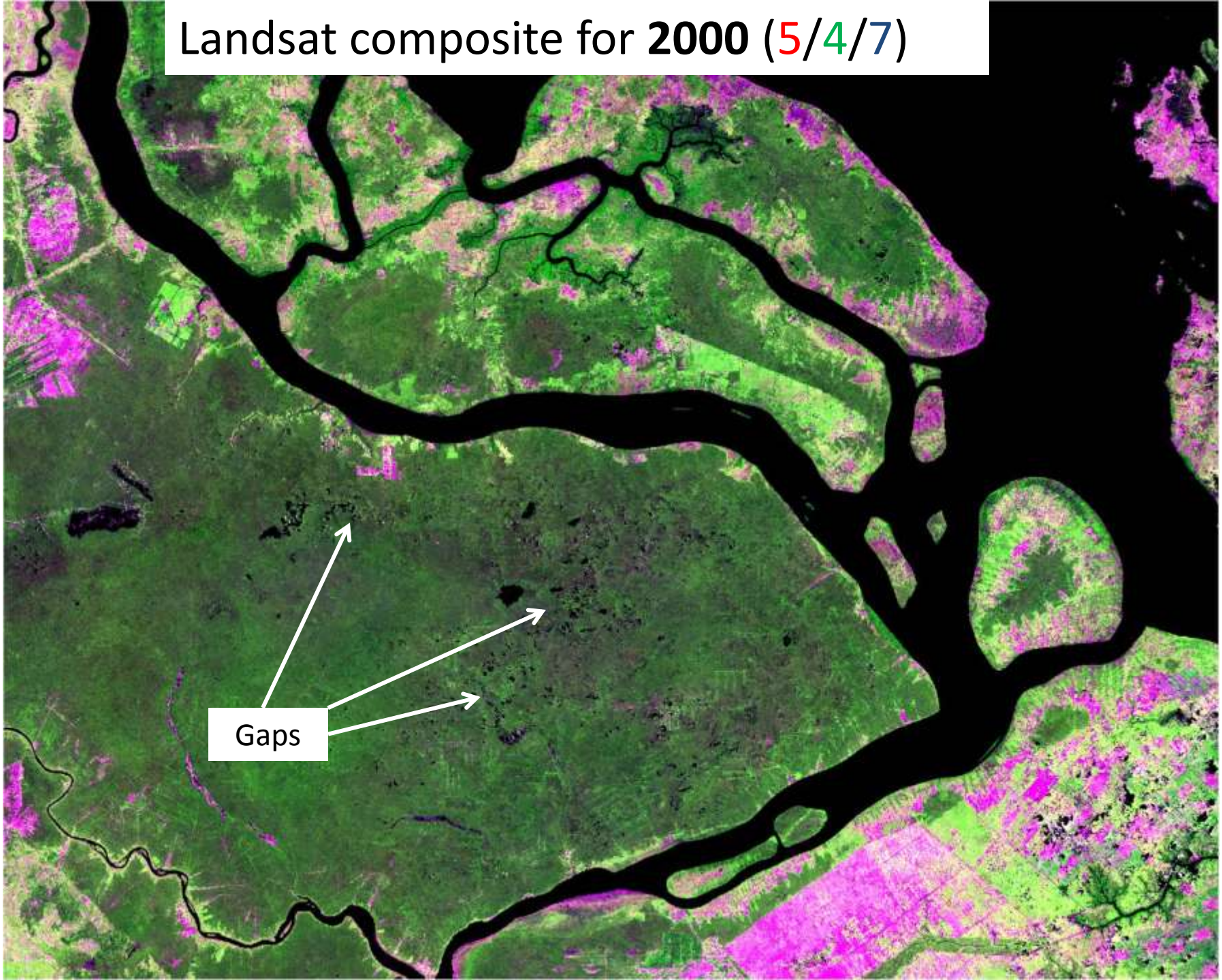
Landscape name	Percent deforestation per year 2001-2007	
	inside	outside
1) Sangha Tri-National	0.12 %	0.11 %
2) Maringa-Lopori-Wamba	0.13 %	0.23 %
3) Ituri-Epulu-Aru	0.16 %	0.25 %

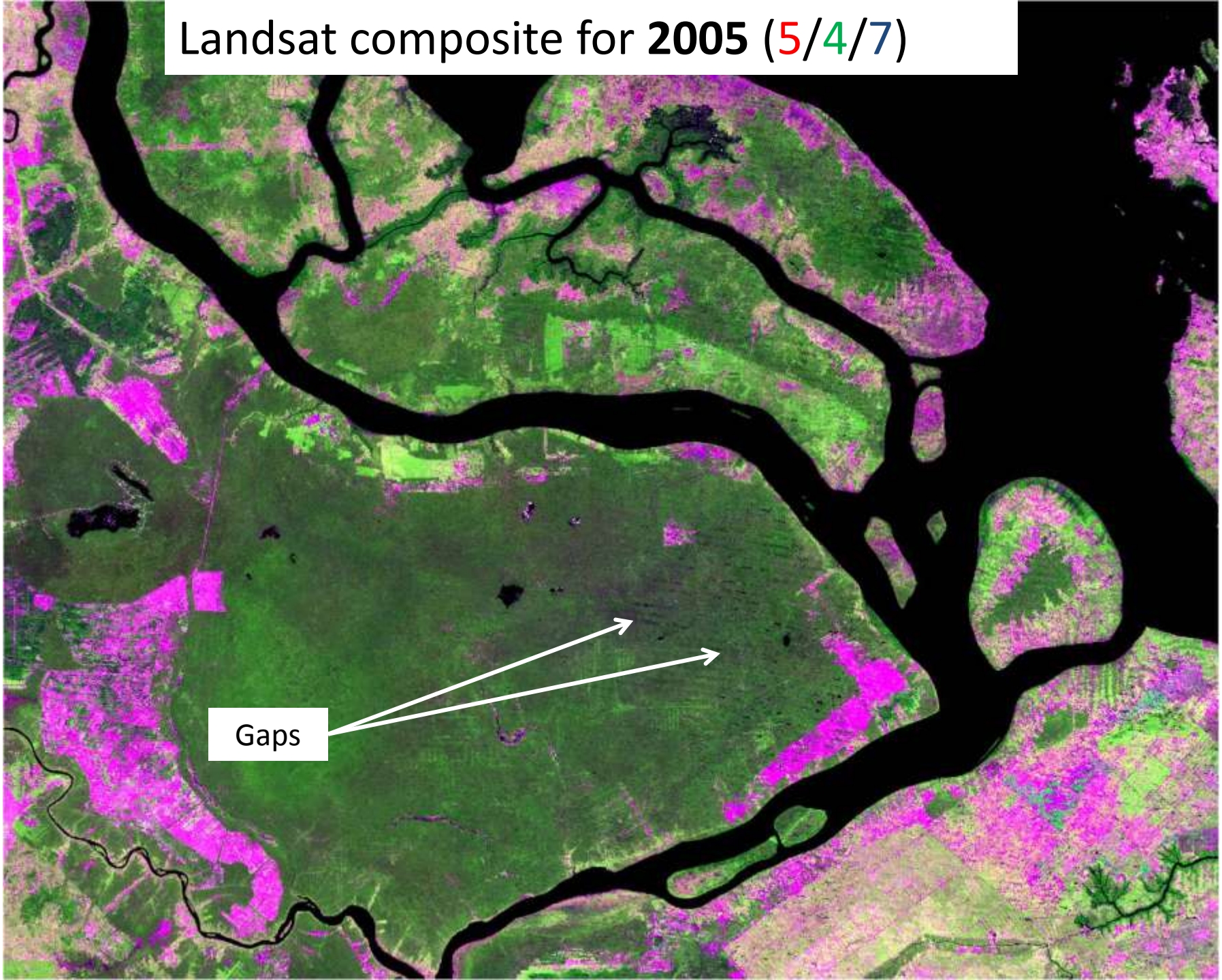
But what about data gaps?

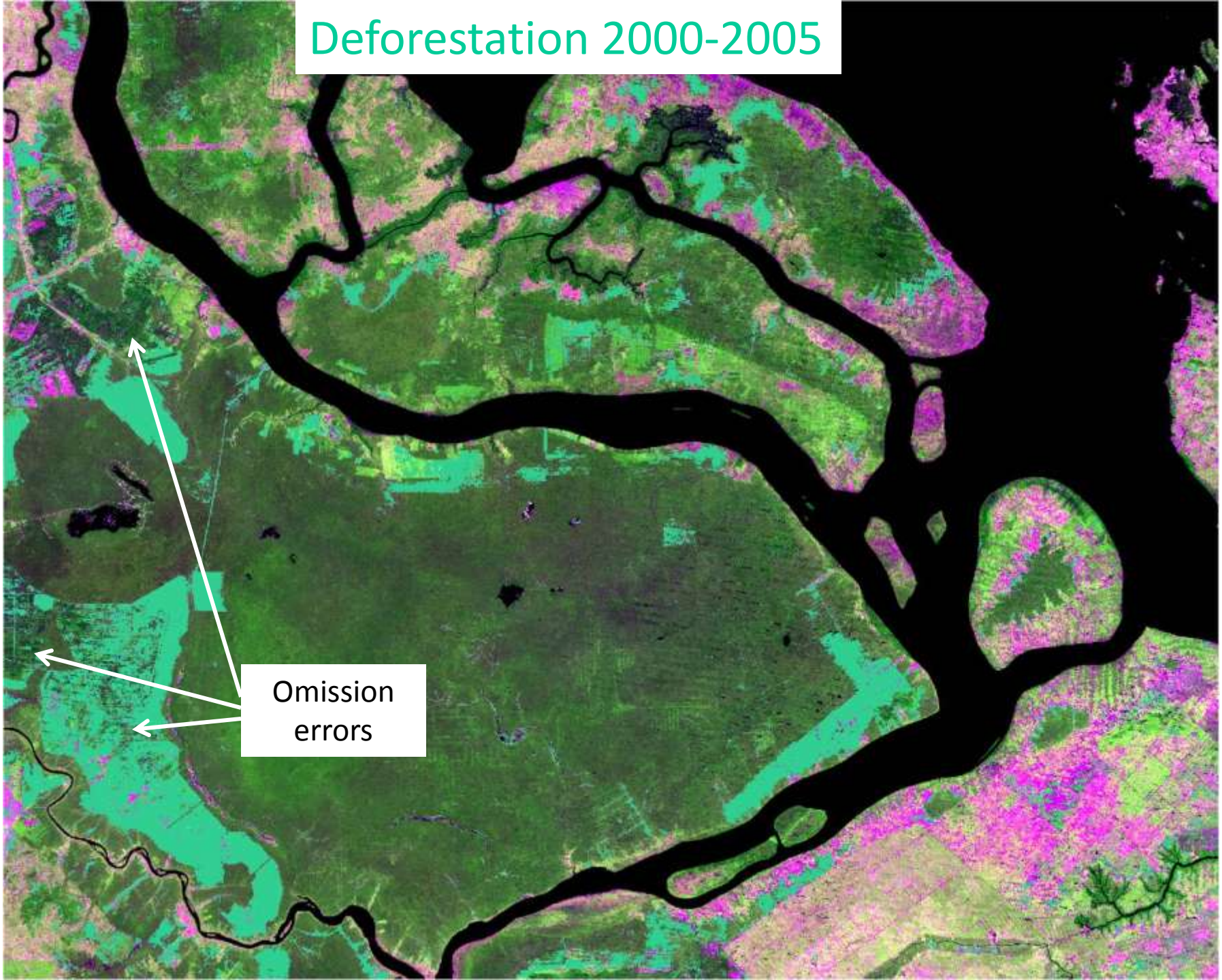


Indonesia
-time series analysis-

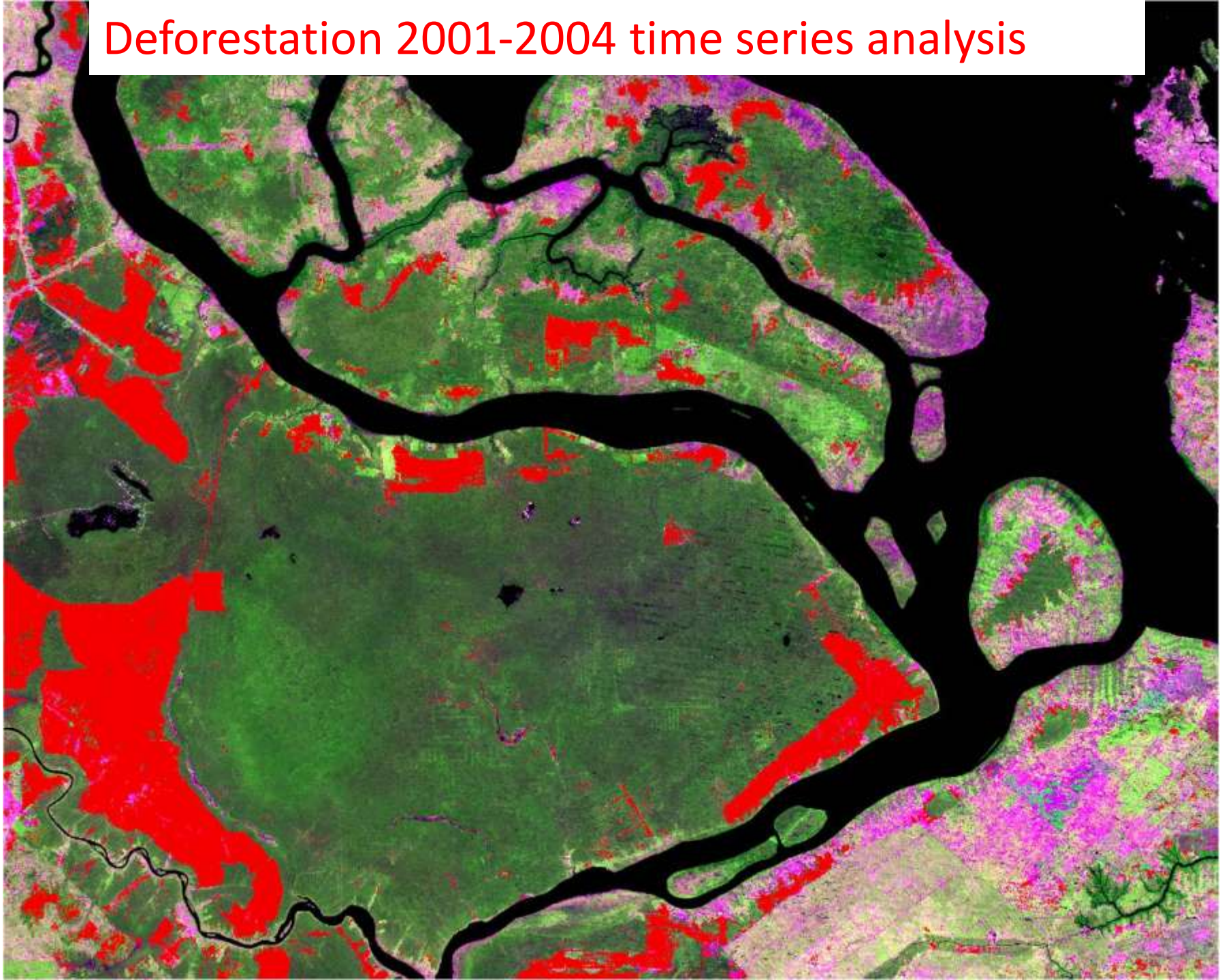



Landsat composite for **2000** (5/4/7)
Gaps

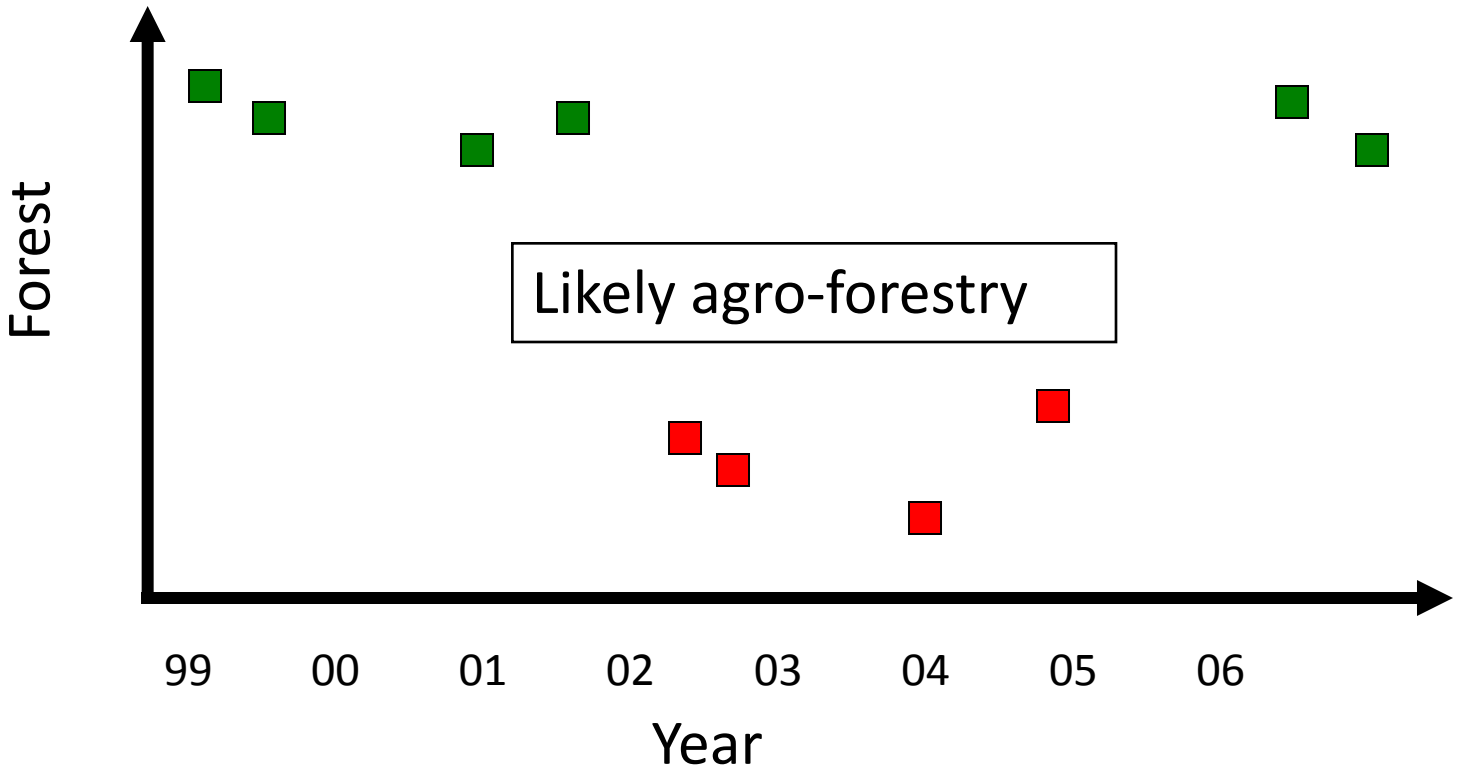

Landsat composite for **2005** (5/4/7)
Gaps


Deforestation 2000-2005
Omission errors

Deforestation 2001-2004 time series analysis

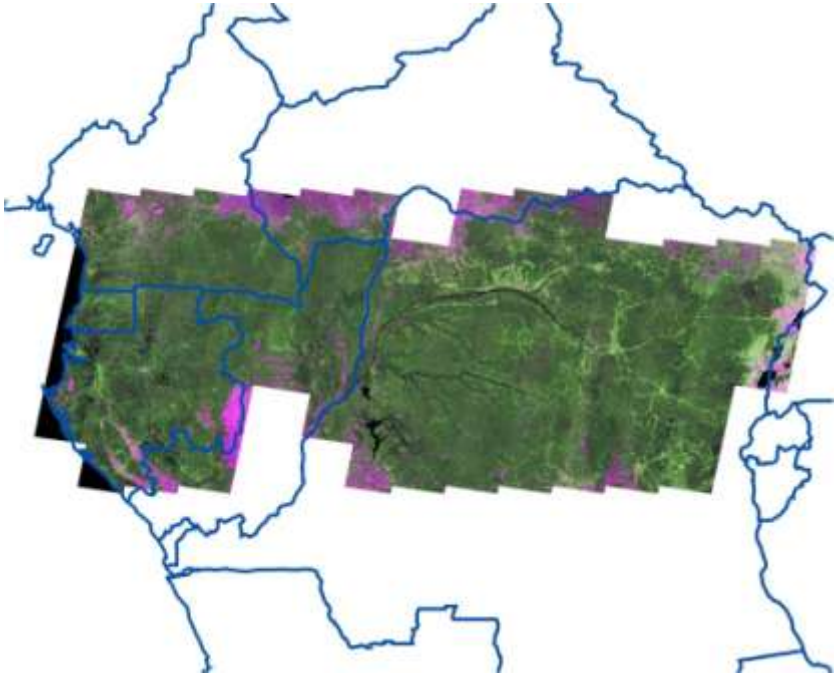


Per –pixel time series analysis using all good observations



Summary: Landsat open archive

- Opportunity and need to develop new methods
- Composites have multiple use and reduce data volume -interval is flexible
- Per-pixel time series analysis



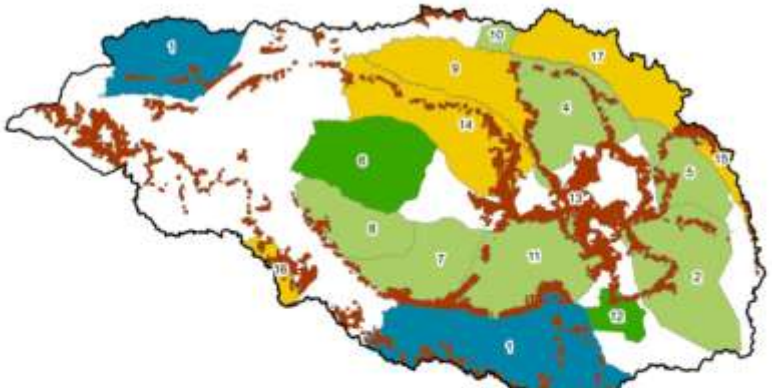
- Deforestation will be quantified for entire study area at shortest possible interval

Applications using regional Landsat forest cover

- Wetlands mapping – Bwangoy Bankanza

wcs-congo.org

- Land use planning and change modeling – Janet Nackoney



- Characterizing Congo River Basin hydrology – Yolande Munzimi