



Characterizing post-deforestation land use intensity in the Brazilian Amazon using dense Landsat time series

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<http://www.hu-geomatics.de>



Study region Novo Progresso, Pará, Brazil

WRS-2 227/065

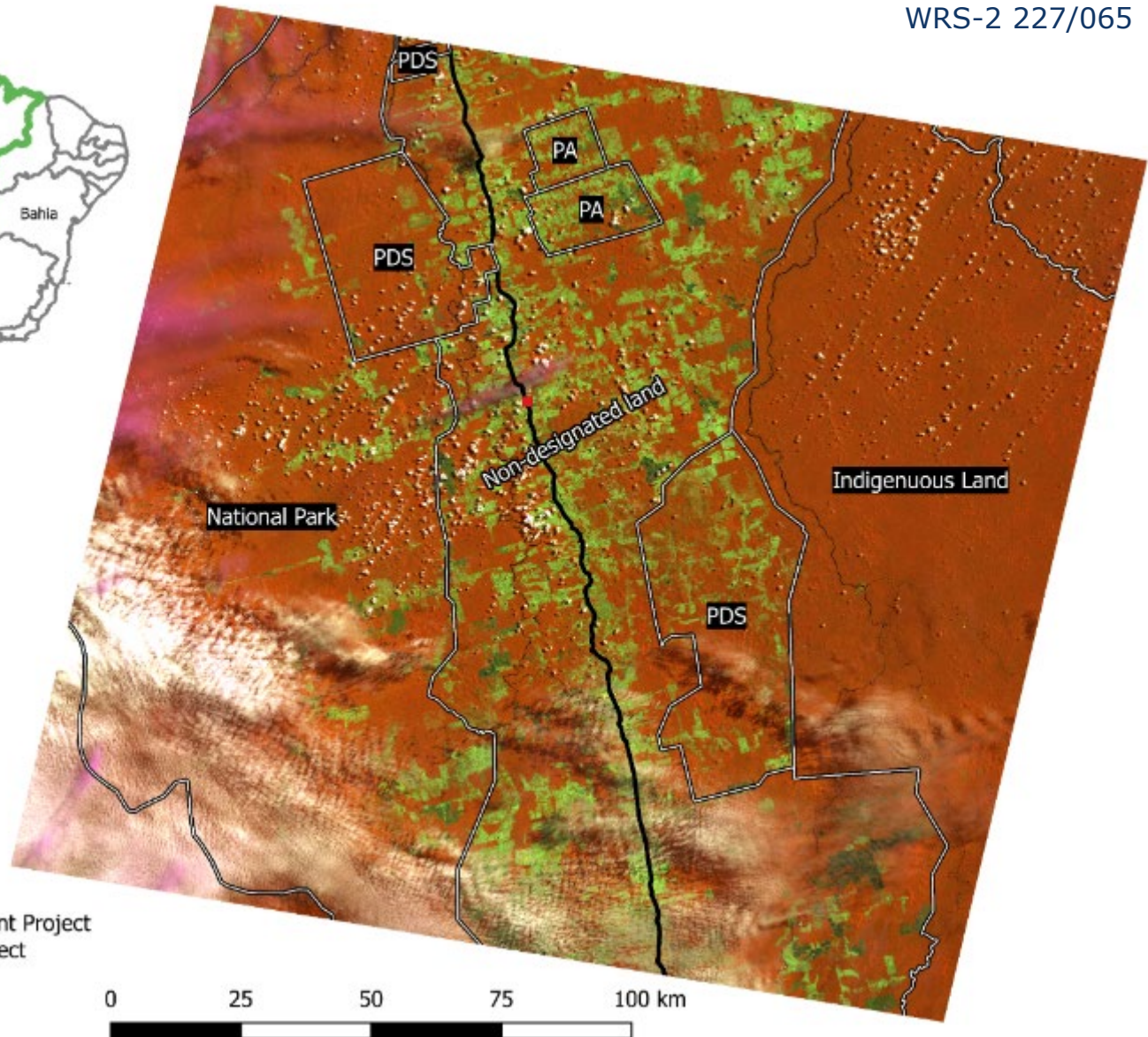


Brazil

- Study Region
- Legal Amazon
- Federal States
- BR-163

Study Region

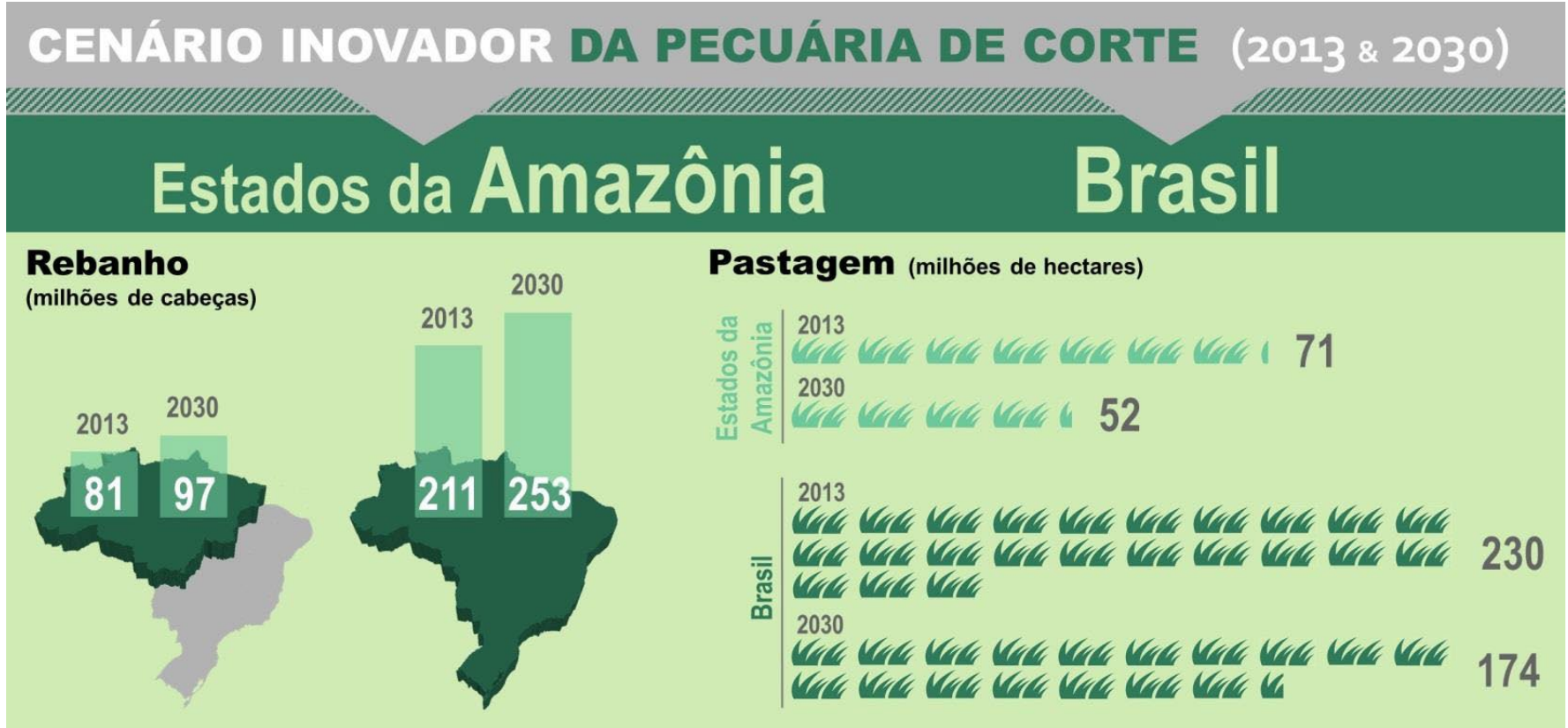
- Novo Progresso
- BR-163
- Administrative boundaries
- PDS = Sustainable Development Project
- PA = Federal Settlement Project



Background: Agricultural Intensification



Background: Agricultural Intensification



Barbosa, F. A., et al. (2015). *Cenários para a pecuária de corte amazônica*. Belo Horizonte, Centro de Sensoriamento Remoto da Universidade Federal de Minas Gerais.

Strassburg et al. (2014). *When enough should be enough: Improving the use of current agricultural lands could meet production demands and spare natural habitats in Brazil*. *Global Environmental Change*, 28, 84-97

Management on pasture land

R-G-B



2014-07-18 (L7)

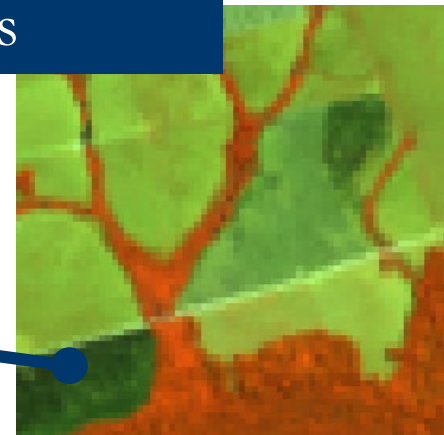
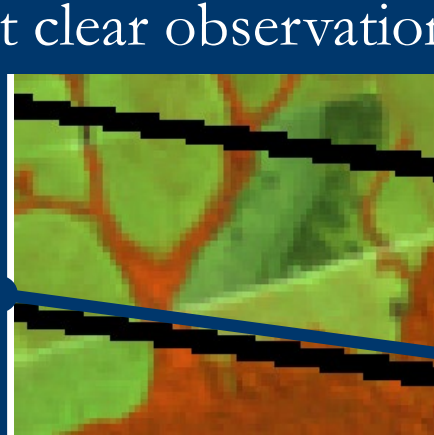


2014-07-26 (L8)

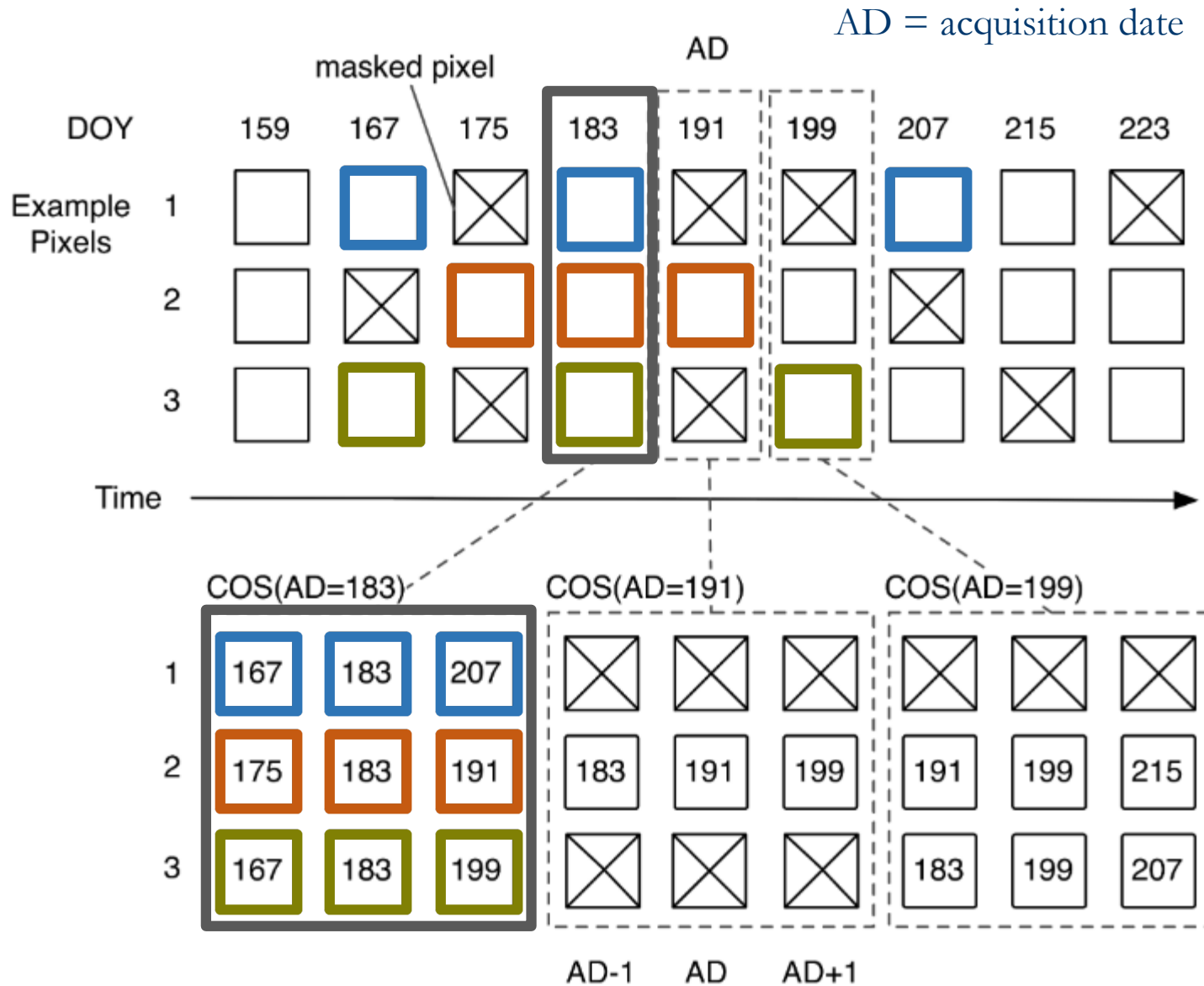


We classified burning and tillage from short dense image sequences, i.e. 3 subsequent clear observations

NIR-SWIR-R

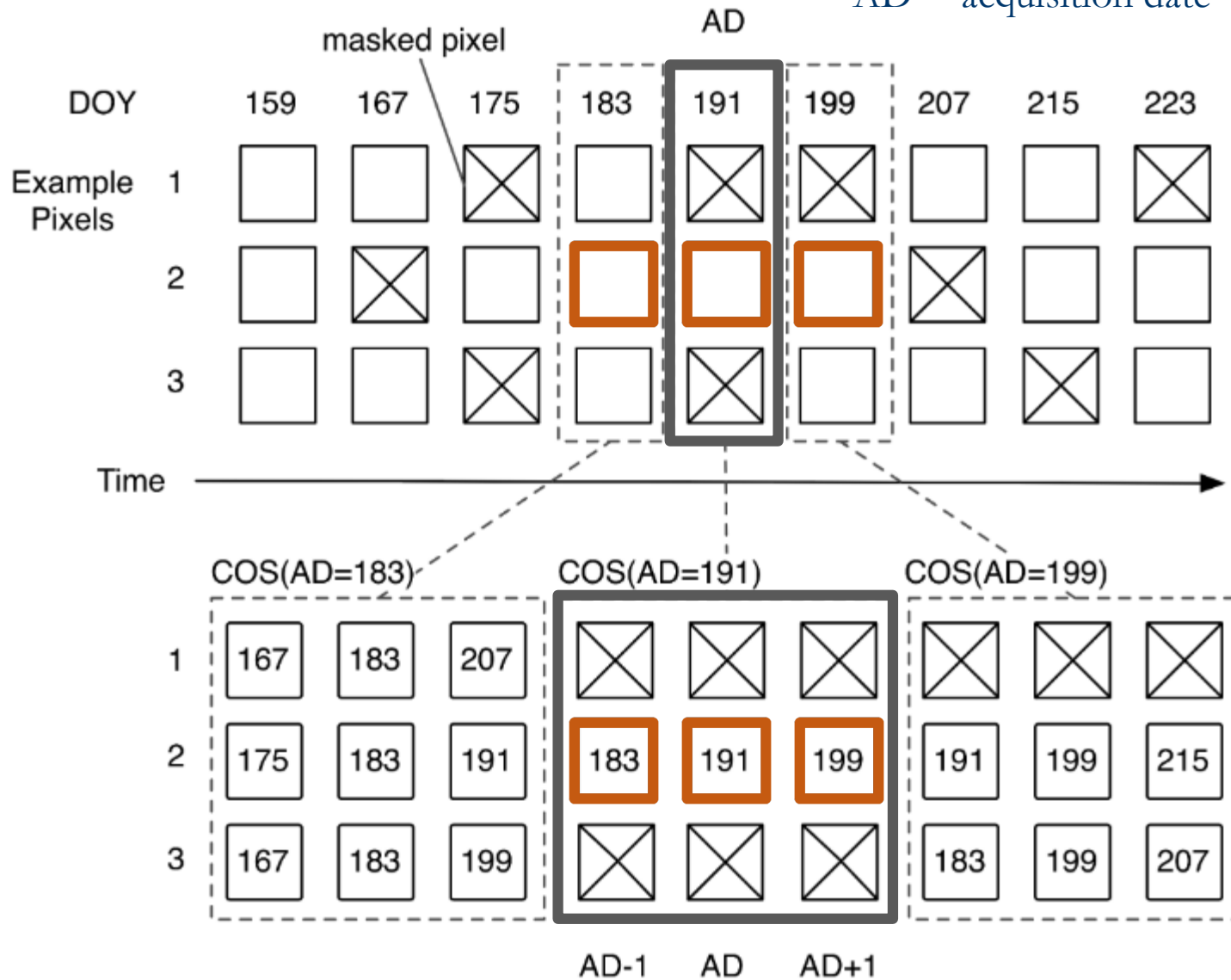


Clear Observation Sequences (COS)



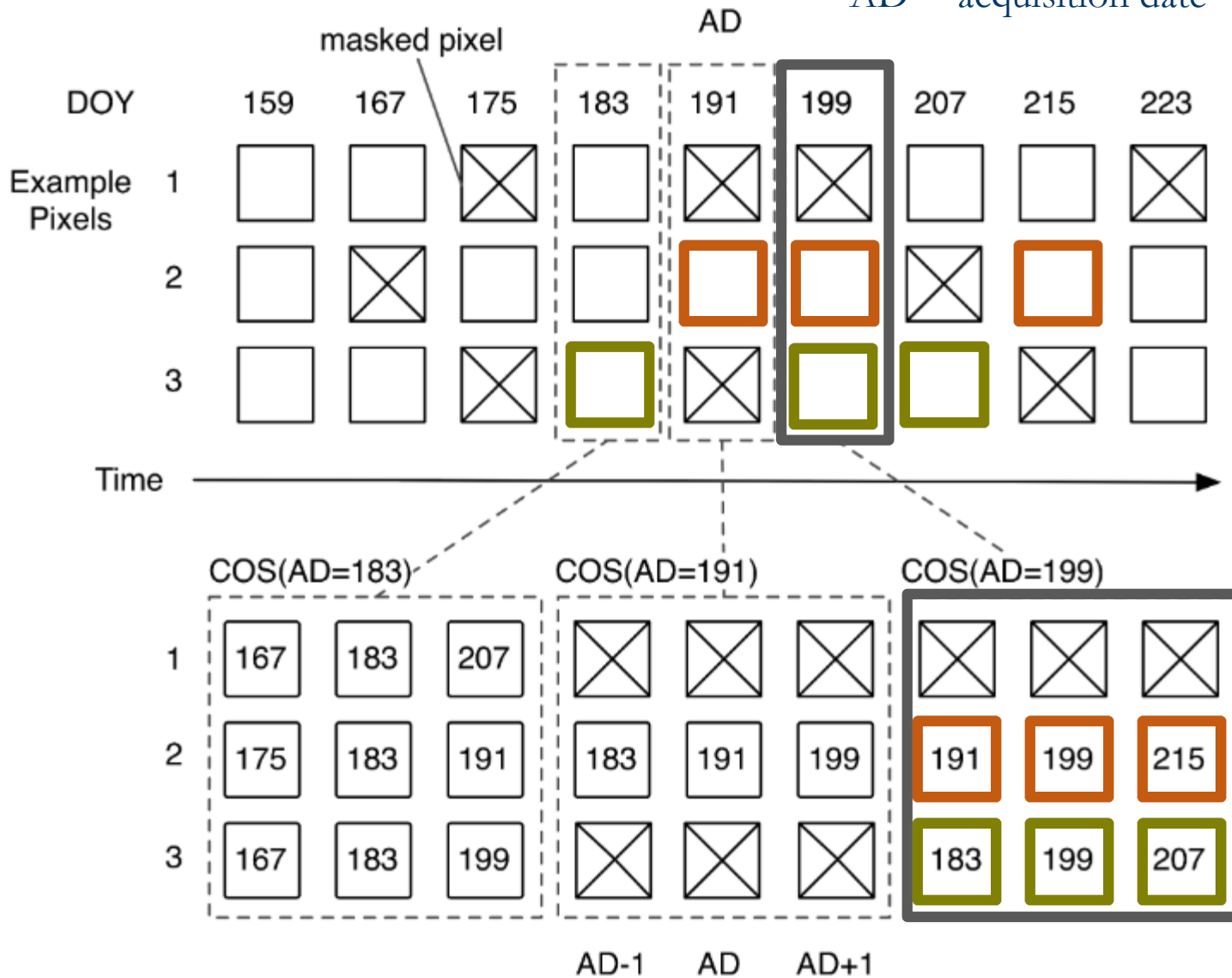
Clear Observation Sequences (COS)

AD = acquisition date

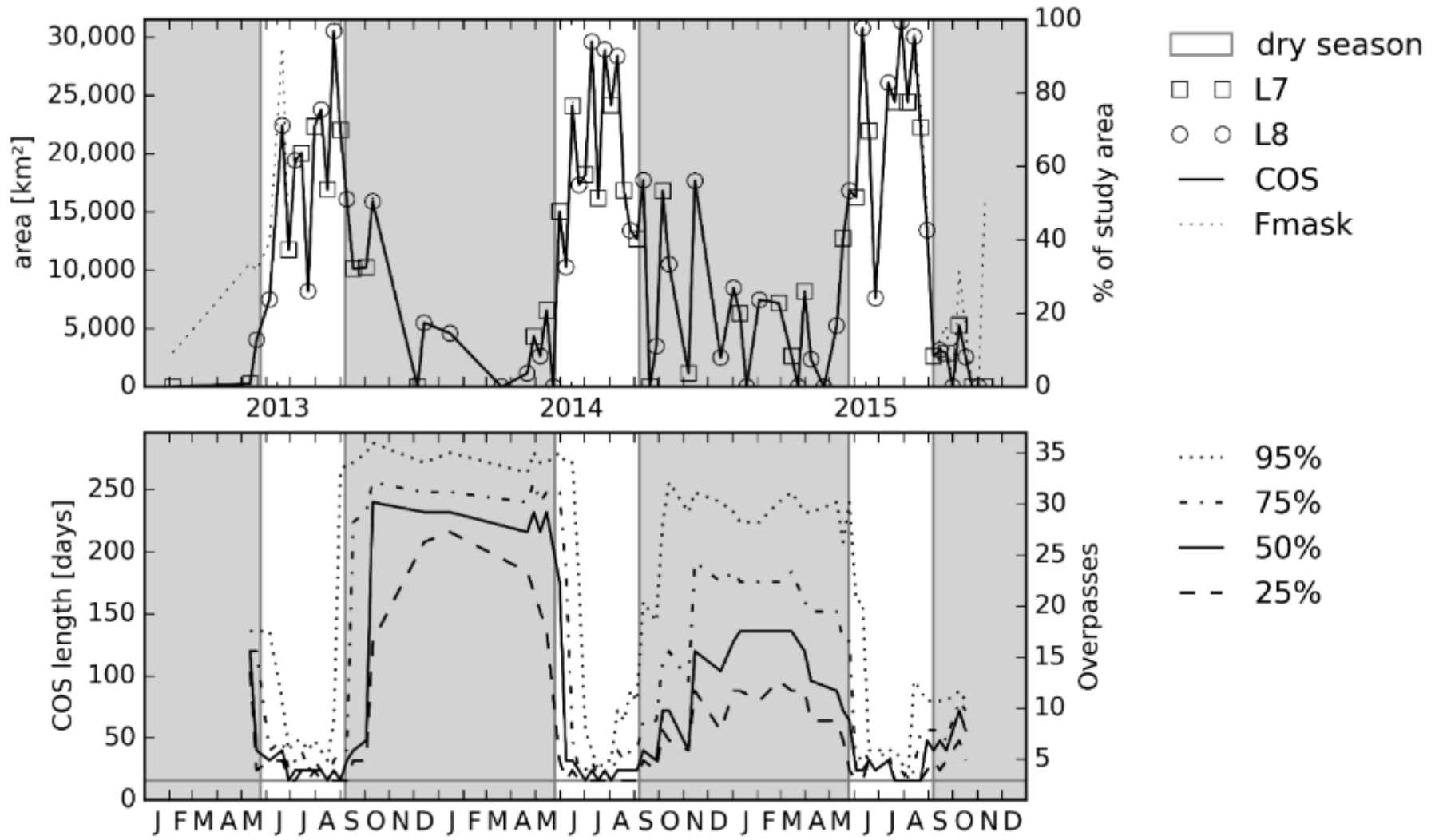


Clear Observation Sequences (COS)

AD = acquisition date



Clear Observation Sequences (COS)



Features extracted to describe each COS

13 Spectral Features derived for each of the 3 observation in the COS

NDVI, EVI, EVI2,
SAVI, GEMI, NDMI

Vegetation indices

NBR, NBR2, MIRBI,
BAIM

Burned area indices

TCB, TCG, TCW

Tasseled Cap Transformation components for brightness, greenness and wetness

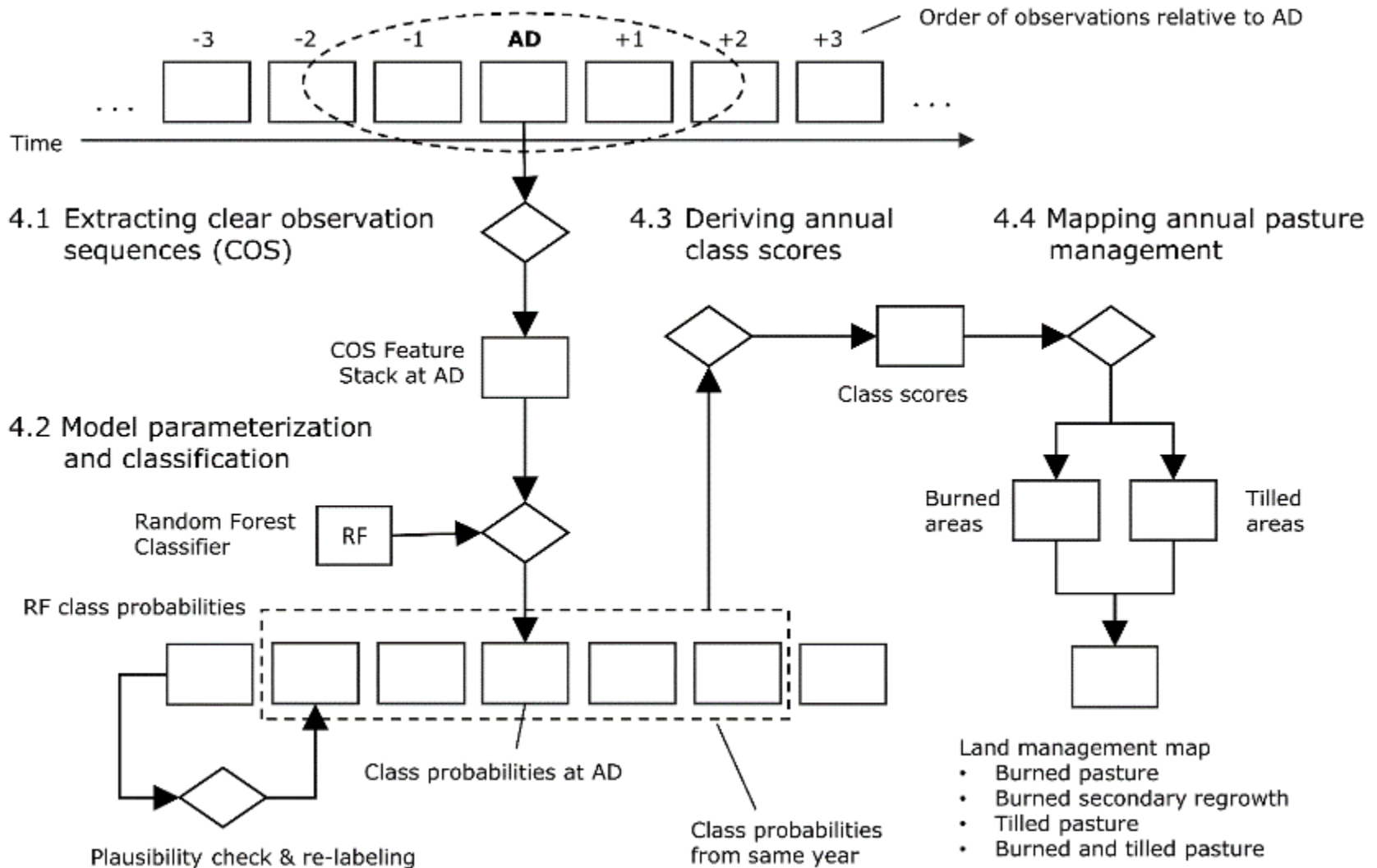
3 Temporal Features

DTIME-1 # days between AD and preceding clear observation
DTIME+1 # days between AD and following clear observation
DOY Day of Year of the AD

AD = Acquisition date

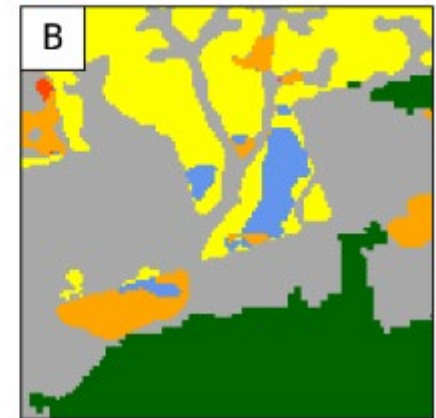
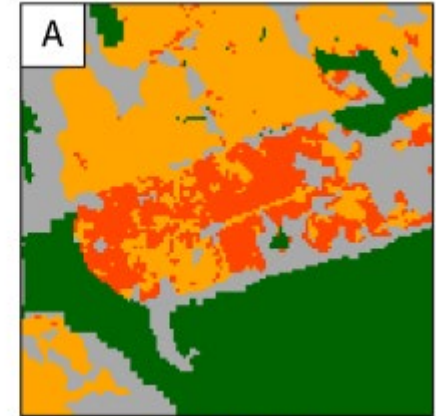
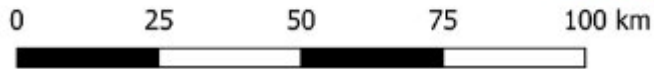
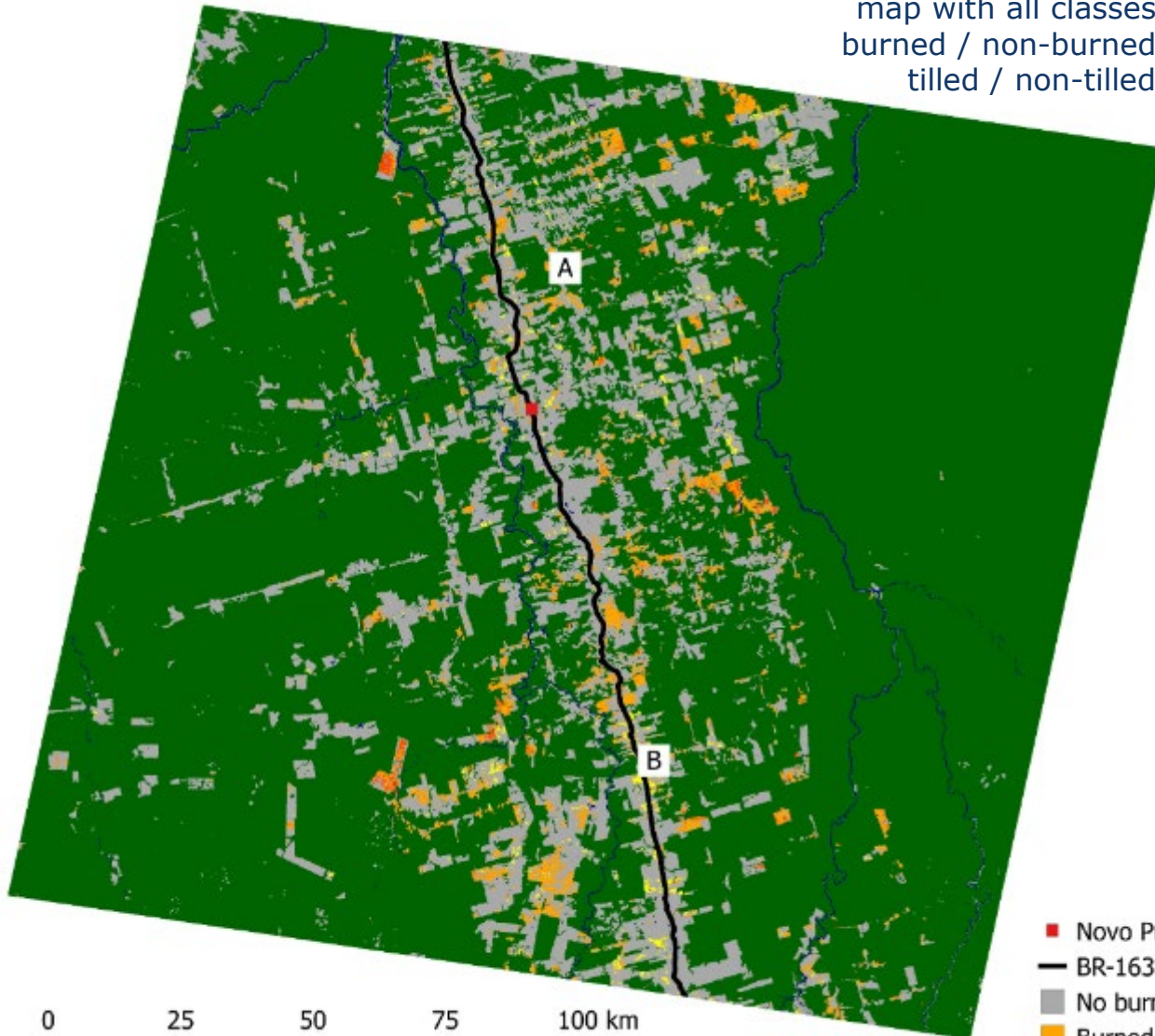
COS Feature Stack
= 3 x 13 spectral features
+ 3 temporal features
= 42 Raster Bands

Workflow



Land management on deforested land (2014)

Area adjusted overall accuracies
 map with all classes: 85 %
 burned / non-burned: 99 %
 tilled / non-tilled: 98 %



- Novo Progresso
- Tilled pasture
- BR-163
- Burned and tilled pasture
- No burning/tillage
- Primary Forest
- Burned pasture
- Water
- Burned secondary regrowth

Visualizing multi-sensor time series data

EO Time Series Viewer
2014-08-17
2014-08-20
2014-08

Cursor Location Values

Raster and Vector

Band/Field Value Description

2014-08-11_LC82270652014223LGN00_BOA.tif		
Pixel	3671,2492	
Band 4	3669	NIR
Band 5	2344	SWIR1
Band 3	659	R

Sensors / Products

Maps | 2

Map Properties

Width: 300px

Height: 300px

CRS: EPSG:32721 - WGS 84 / UTM zone 21S

Map Views

2 Infra Red

Contrast enhancement: Stretch to MinMax

RapidEye

Style: Multibandcolor

Plugins | All (22)

Search

- Coordinate Capture
- Coordtransform
- DB Manager
- EnMAP-Box (develop version)
- EO Time Series Viewer
- eVis
- First Aid
- Geometry Checker
- Georeferencer GDAL
- GPS Tools
- Lat Lon Tools
- MetaSearch Catalog Client
- OfflineEditing
- Plugin Builder 3
- Processing
- QuickMapServices
- QuickOSM
- SentinelHub
- Topology Checker
- VIPER_Experimental
- Virtual Raster Builder
- Visibility Analysis

EO Time Series Viewer

Visualization of multi-sensor Earth observation time series data.

Highlights

- Spatially synchronized maps for each observation date
- Multiple band combinations in parallel, e.g. True Color *and* SWIR bands
- Multi-sensor support: separate render settings for separate sensors/image products
- Visualization of Spectral and Temporal Profiles

Usage

1. "Files" > "Add images" to define the time series
2. "View" > "Add Map View" to create a new row of maps, e.g. for SWIR visualization
3. For each map view specify how each sensor should be rendered, e.g. RGB or single band color range
4. Optimize render settings, e.g. via map canvas context menu

Dependencies

- pyqtgraph (required)
- PyOpenGL (optional)

Install dependencies with `python -m pip pyqtgraph`

Category Raster

Tags remote sensing, raster, time series

More info [homepage](#) [bug tracker](#) [code repository](#)

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Installed version 0.6.201806121402

Temporal Profiles | 2D

Coordinate	Sensor	Style
0 <input checked="" type="checkbox"/> Forest	RapidEye	
1 <input checked="" type="checkbox"/> Forest	Landsat	
2 <input checked="" type="checkbox"/> Burned Past...	RapidEye	
3 <input checked="" type="checkbox"/> Burned Past...	Landsat	

Data Value(s)

100% Loaded 2 pixel from re_2015-09-18.tif.


Time Series | Spectral Library | Temporal Profiles | 2D

Conclusion & Outlook

- COS approach uses all useful observations
- Mapped patterns are in good accordance with field observations
- Better effective temporal resolution → better detection of short-term processes
- EO Time Series Viewer helps to visualize and label dense time series data efficiently

Next Steps

- Multi-Sensor approach: Landsat 7/8 + Sentinel 2 A/B



Thanks for your attention

Jakimow, B., et al. (2018). *Mapping pasture management in the Brazilian Amazon from dense Landsat time series*. *Remote Sensing of Environment* 205: 453-468.

Jakimow, B., et al. (in review). *Visualizing and labeling multi-sensor Earth observation data in QGIS: The EO Time Series Viewer*. *Environmental Modelling and Software*.

Jakimow, B., et al. (in prep.). *Patterns of land-use intensification in South-West Pará, Brazil*.