Integrating Earth observations with user needs for biodiversity decision-making in Colombia

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BOSProject
Biodiversity Observation Support

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MAX-PLANCK-GESELLSCHAFT

GEO BON
Group on Earth Observations
Biodiversity Observation Network

Goals

To produce a Decision Support System for Biodiversity management and planning in Colombia according to user needs and partner priorities (IAvH).

To integrate EBVs derived from EOs into a BON-IN-A-BOX toolkit for facilitating biodiversity decision-making in Colombia and other BONs.

To test the system functionality through the application to a case study.

DATA

INFORMATION

KNOWLEDGE

DECISIONS

biodiversity conservation

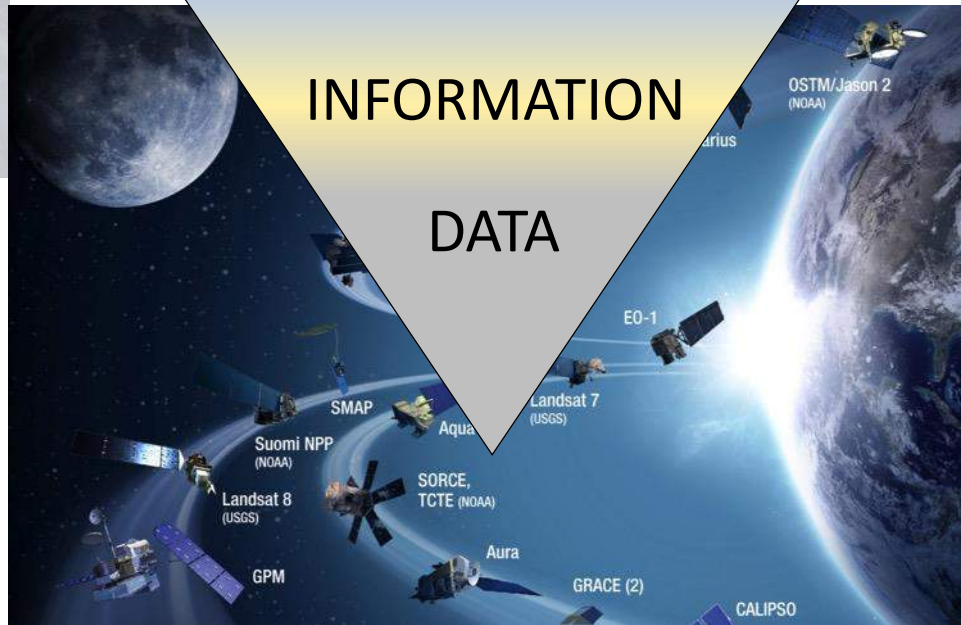
biodiversity conservation

DECISIONS

KNOWLEDGE

INFORMATION

DATA



Background

Semana

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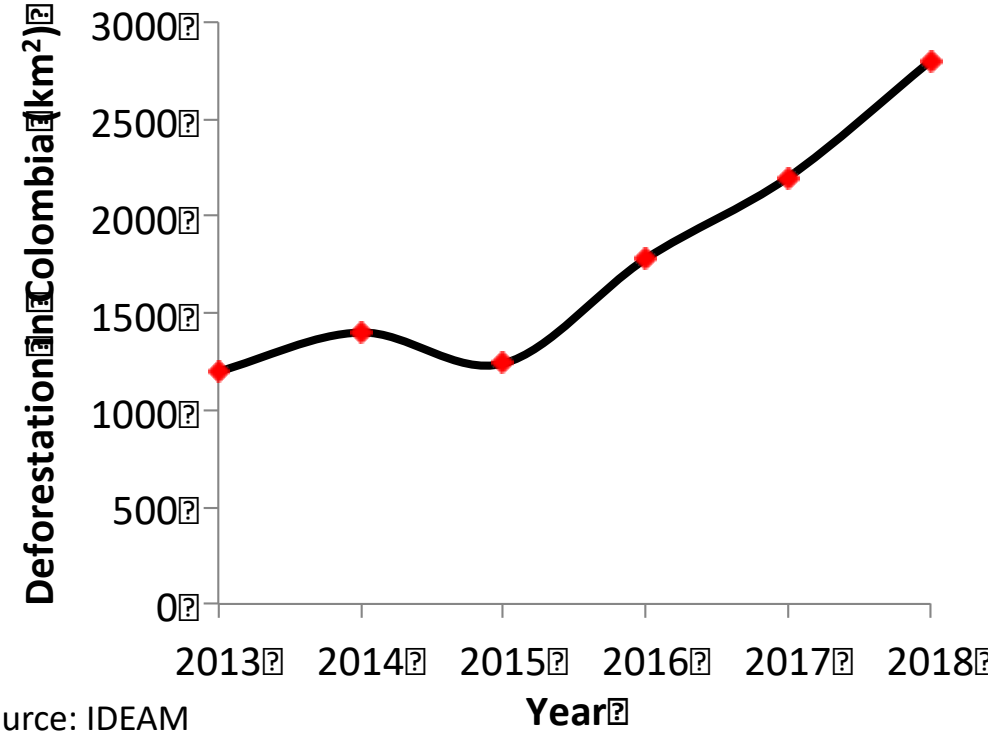
No hay cómo parar la deforestación



Source: IDEAM

National program for biodiversity offsets

Colombia has advanced substantially on conceptualizing a strategy to mitigate and offset impacts of development projects on biodiversity.

The strategy is relevant to projects involving:

- Infrastructural development
- Mining, fossil fuel extraction
- Dams
- Agrochemical use
- Forest logging
- Area subtraction from national reserves

as ecosystem:

- ☑ Type
- ☐ Size
- ☐ Composition
- ☐ Structure
- ☐ Function

National ecosystem map for Colombia

Biodiversity loss

Net biodiversity change

Biodiversity offsets

EBVs

as ecosystem:

☑ Type

Ecosystem extent → ☑ **Size**

Habitat structure → ☑ **Composition**

Community composition → ☑ **Structure**

Ecosystem function → ☑ **Function**

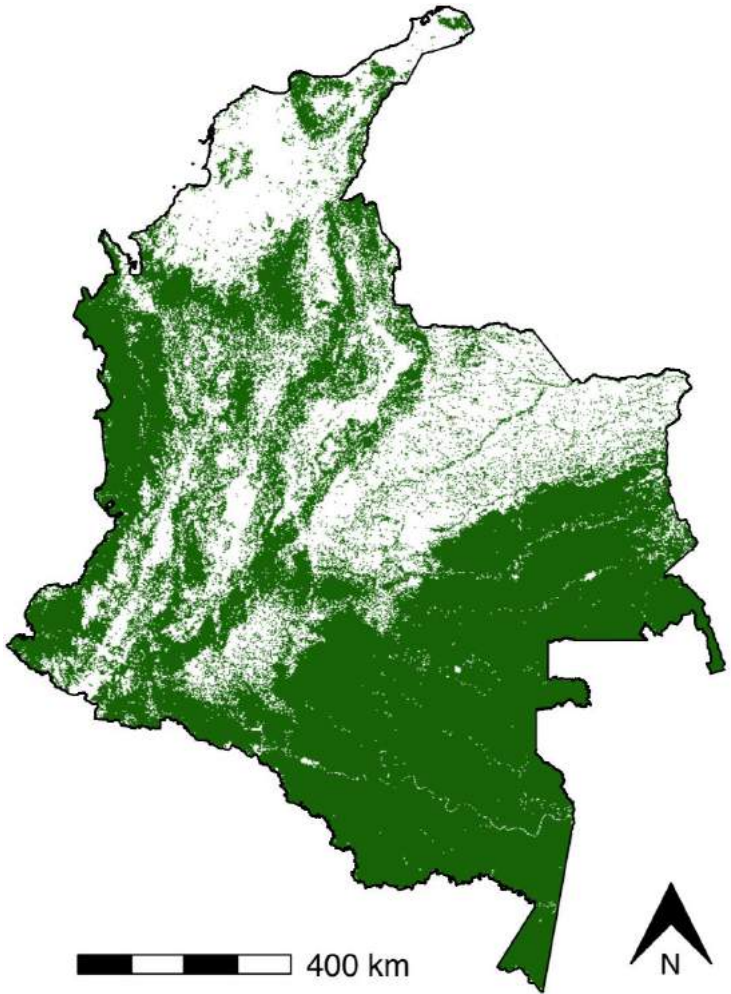
Net biodiversity change

Policy relevant research questions

- How can the best products derived from EOs inform biodiversity decisions considering data availability, resolution and uncertainties?

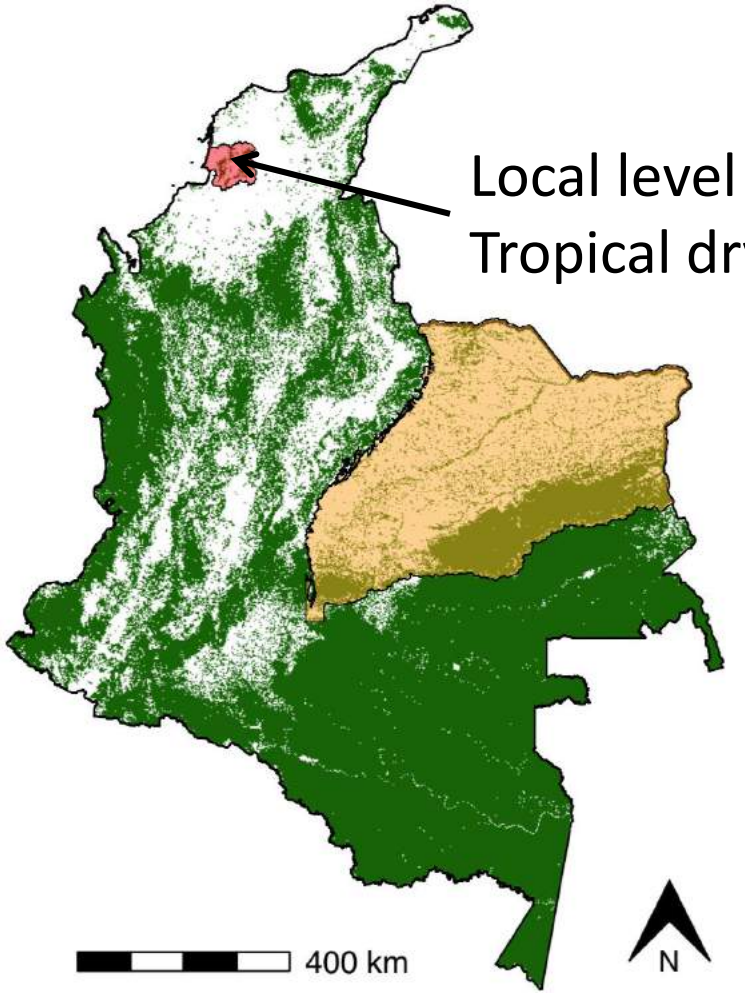
- What are the main gaps in measuring biodiversity change and how do they constrain biodiversity decision-making?

- What are the main priorities for operationalizing EBVs to inform biodiversity decision-making?



National level analysis
Colombian forests

Regional level analysis
Eastern tropical savannas



Local level analysis:
Tropical dry forests

PARTNERSHIPS FOR ENHANCED ENGAGEMENT IN RESEARCH (PEER)
DEVELOPMENT, SECURITY, AND COOPERATION
Policy and Global Affairs

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The National Academies of SCIENCES ENGINEERING MEDICINE

Funded Projects | PEER Cycle 7 Grant Recipients

Colombia - Project 275: Implementation of essential biodiversity variables for biodiversity assessment and monitoring at the subnational level in Colombia

PI: Maria Londoño, von Humboldt Institute

U.S. Partner: Victor Gutierrez-Velez, Temple University (funded by NASA)

http://sites.nationalacademies.org/PGA/PEER/PGA_188589

EBVs

Ecosystem structure

Habitat structure

Community composition

Ecosystem function

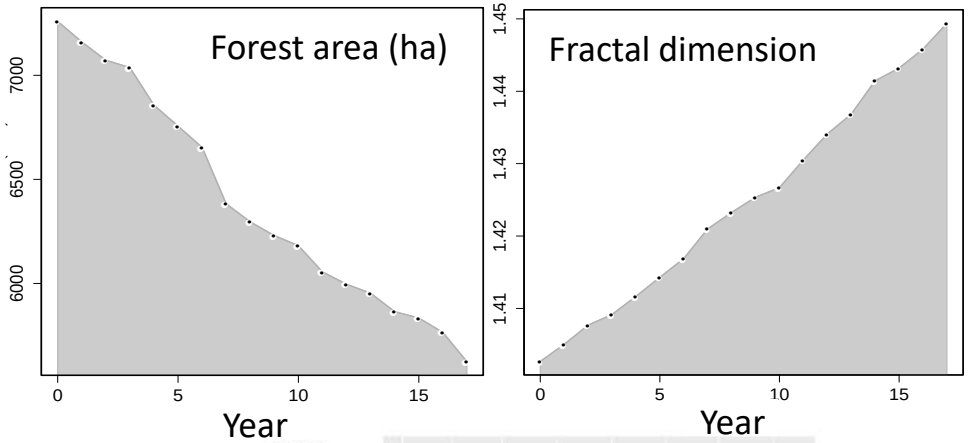
Computing Essential Biodiversity Variables from Global Forest Change Data

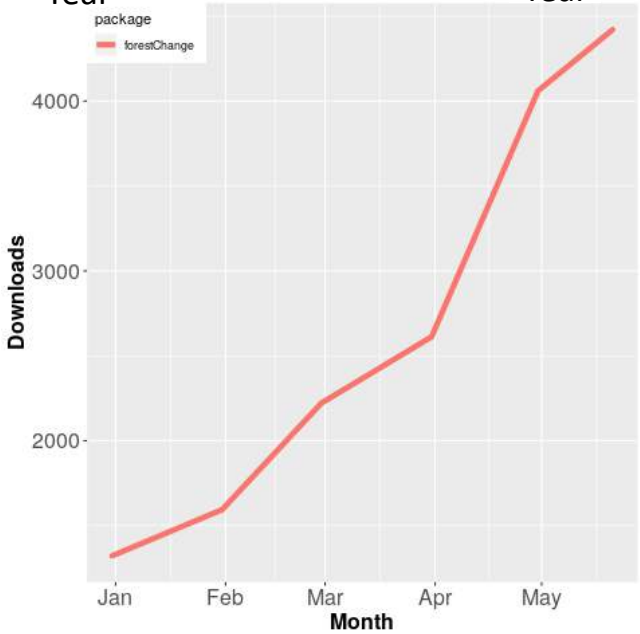
Documentation for package ‘forestChange’ version 0.7

- DESCRIPTION file.
- Package NEWS.

Help Pages

forestChange-package	Computing Essential Biodiversity Variables from Global Forest Change Data
EBVmetric	EBV metric
FCMosaic	Forest-Change Mosaic
FCPolygon	Forest-Cover Polygon
forestChange	Computing Essential Biodiversity Variables from Global Forest Change Data
getGADM	Get Geographic Adminitrative Unit
getWRS	Reference-system Polygon
GFCurls	URLs of GFC data
HansenUrltoExtent	Extents in GFC links
MaskCumLoss	Masks of cummulative loss
plot.EBVmetric	EBV-metric plot





Lara and Gutierrez-Velez 2018
based on Hansen et al 2013

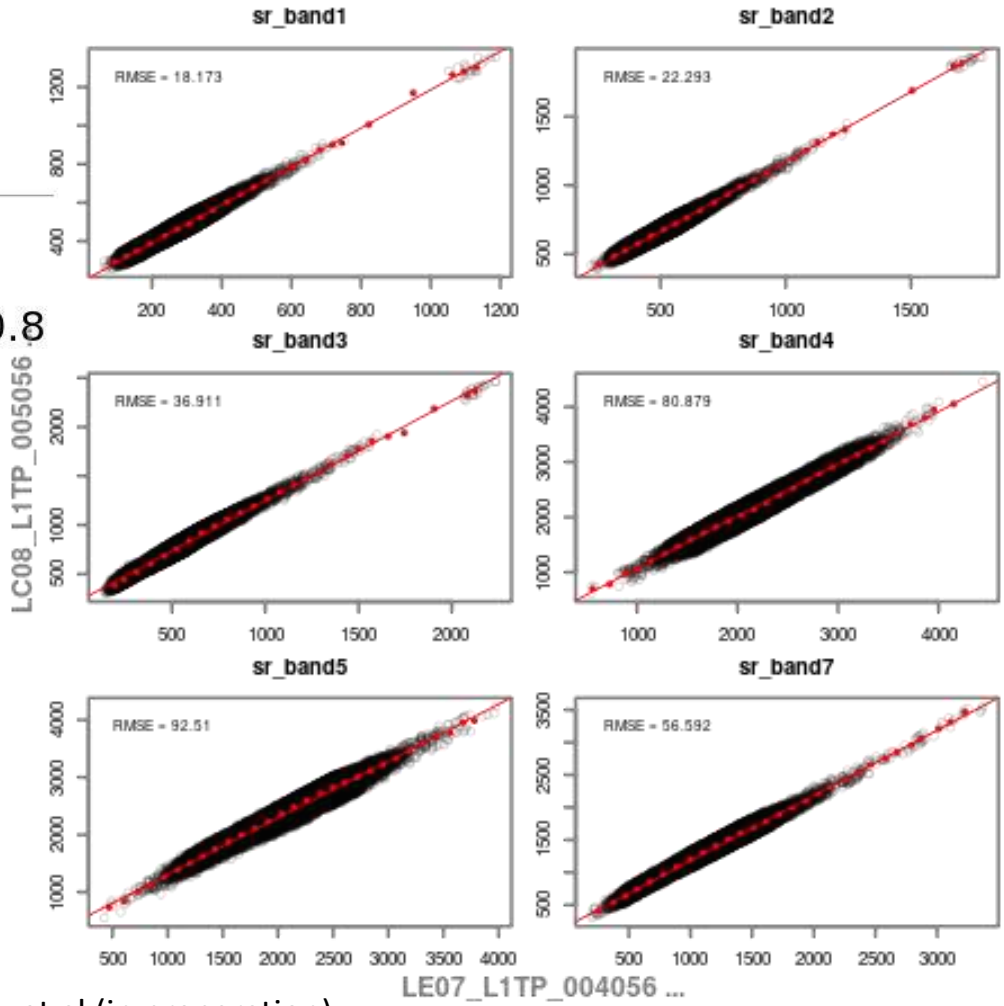
Automatic Radiometric Normalization

Documentation for package ‘aRn’ version 0.8

- DESCRIPTION file.

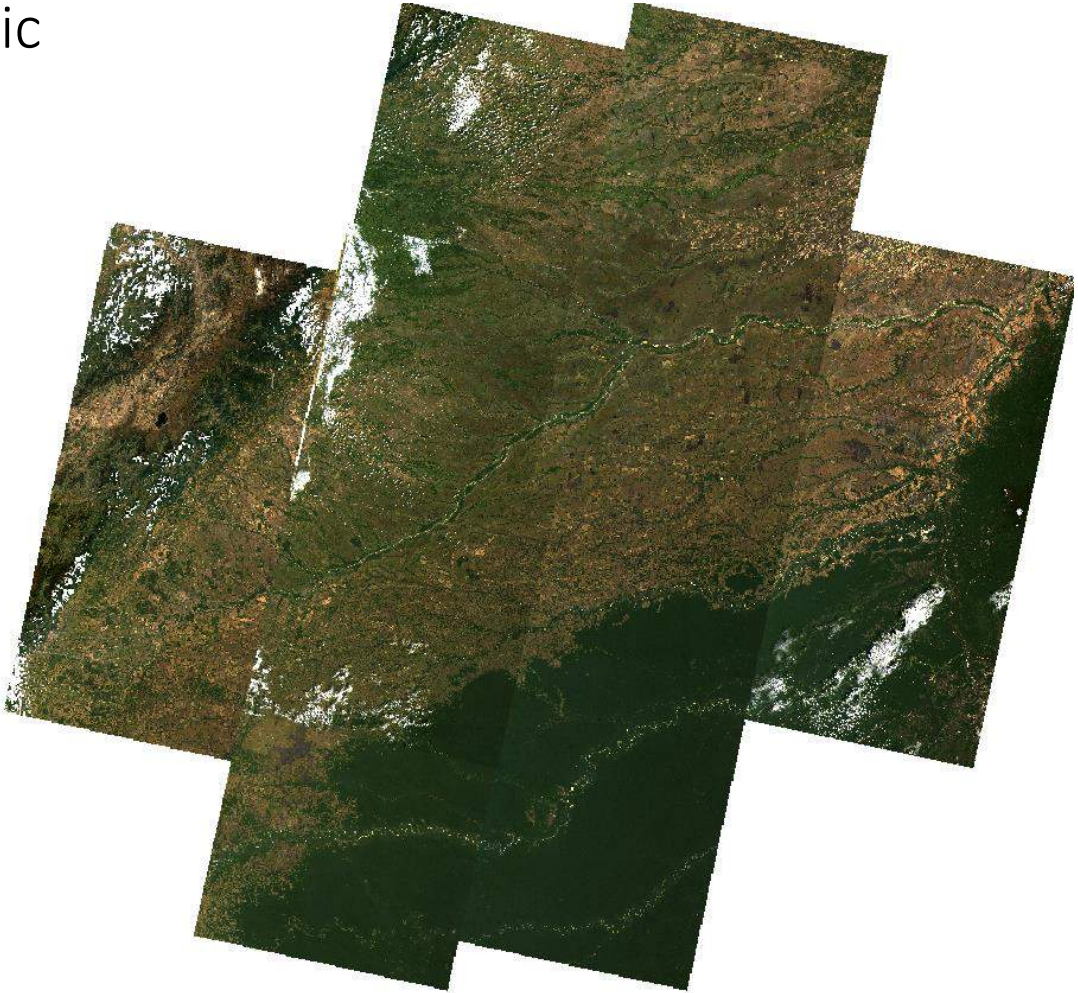
Help Pages

aRn-package	Automatic Radiometric Normalization
aRn	Automatic Radiometric Normalization
CalibrateRaster	Calibrate raster
calibrationParameters	Calibration parameters
classesInPIF	Classes in PIF
EEstackMeta	Stack EE data
EEstackWithoutMeta	Stack EE avoiding metadata
equateEEnames	Equate EE names
LBands	Landsat Band designations
nochg	Change and no change mask
PIFmodel	PIF modeling
plot.PIFmodel	PIF-model plots
PredictFromPIFmodel	DEPRECATED PIF-model prediction
RasterIntersection	Raster Intersection
rclMatrix	reclassification matrix



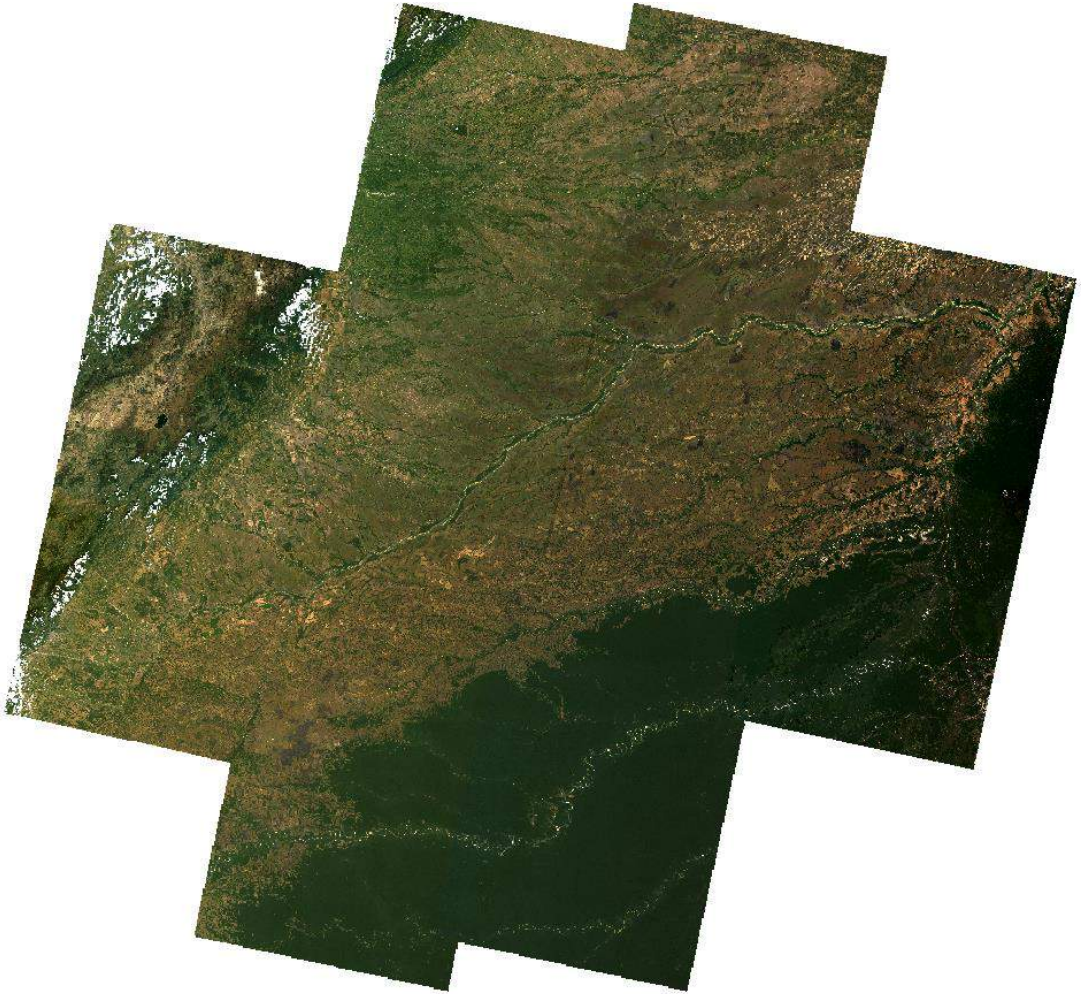
Gutierrez-Velez et al (in preparation)

Landsat 8 un-normalized mosaic
True color R:4, G:3, B:2

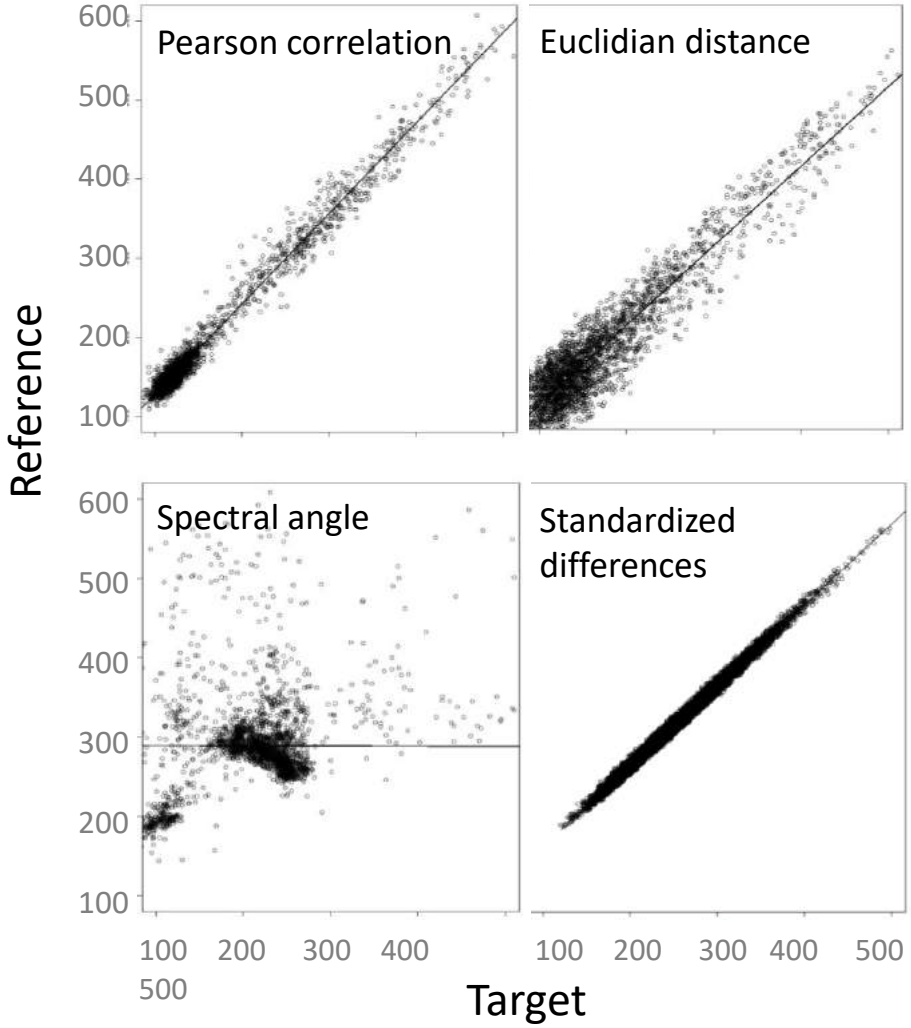


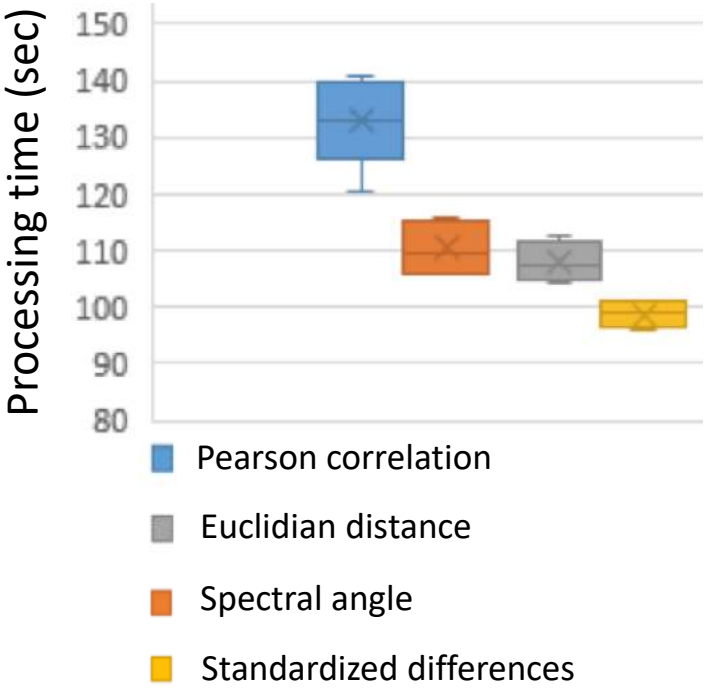
Rodriguez and Gutierrez-Velez (in prep.)

Landsat 8 normalized mosaic
True color R:4, G:3, B:2



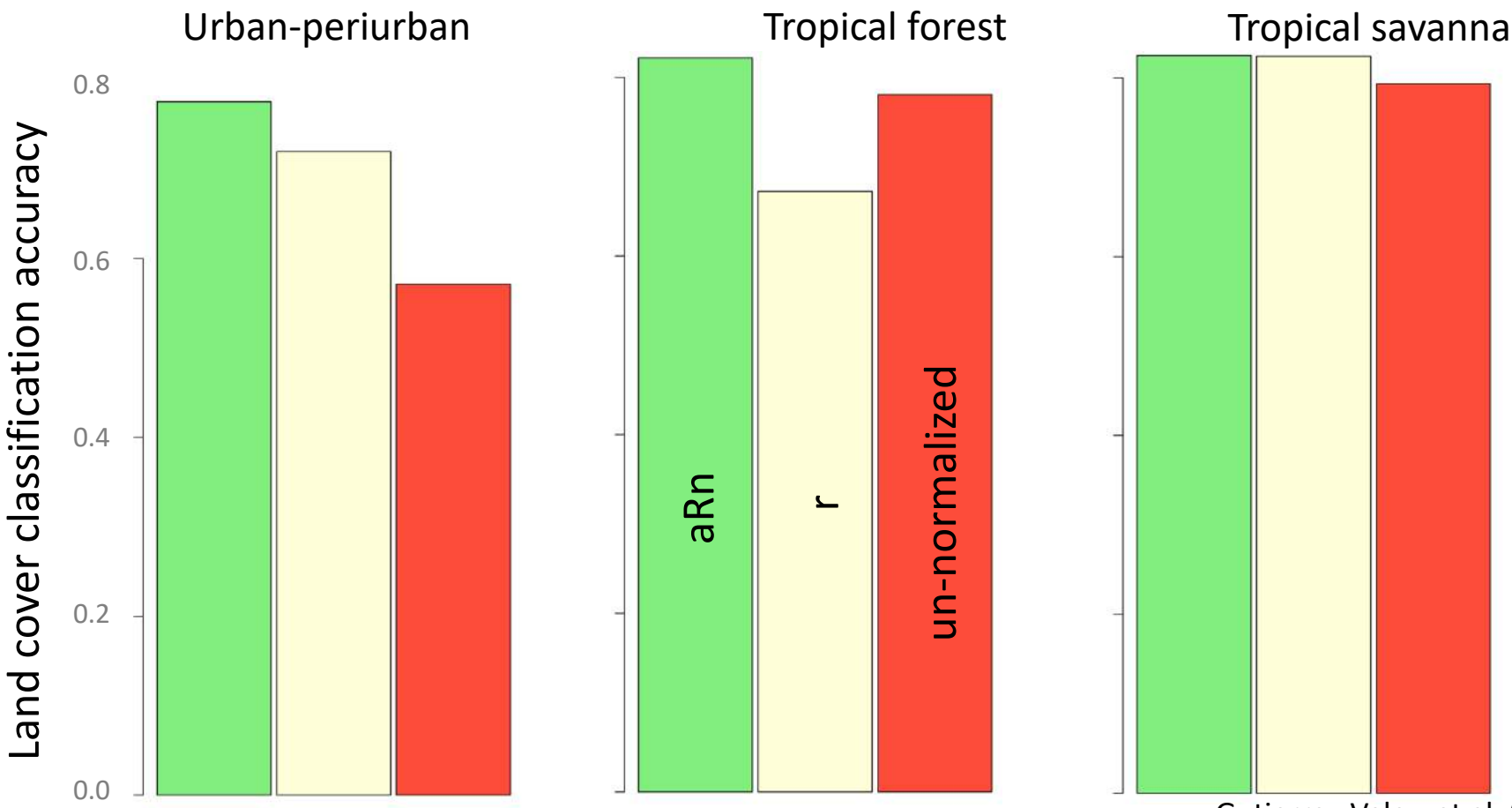
Rodriguez and Gutierrez-Velez (in prep.)





Rodriguez and Gutierrez-Velez (in prep.)

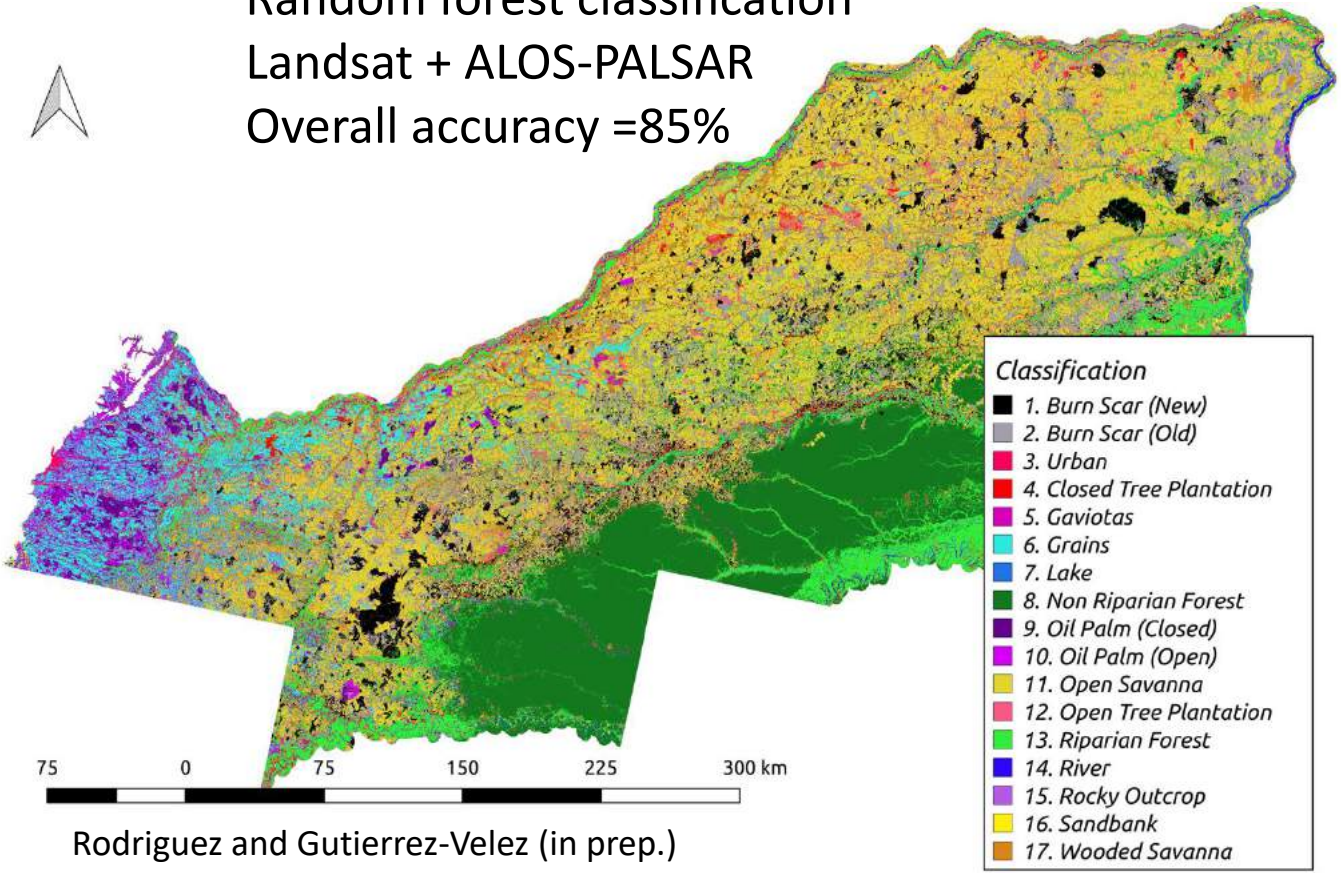
aRn accuracy is generally better than other radiometric normalization methods



Gutierrez-Velez et al (in prep.)

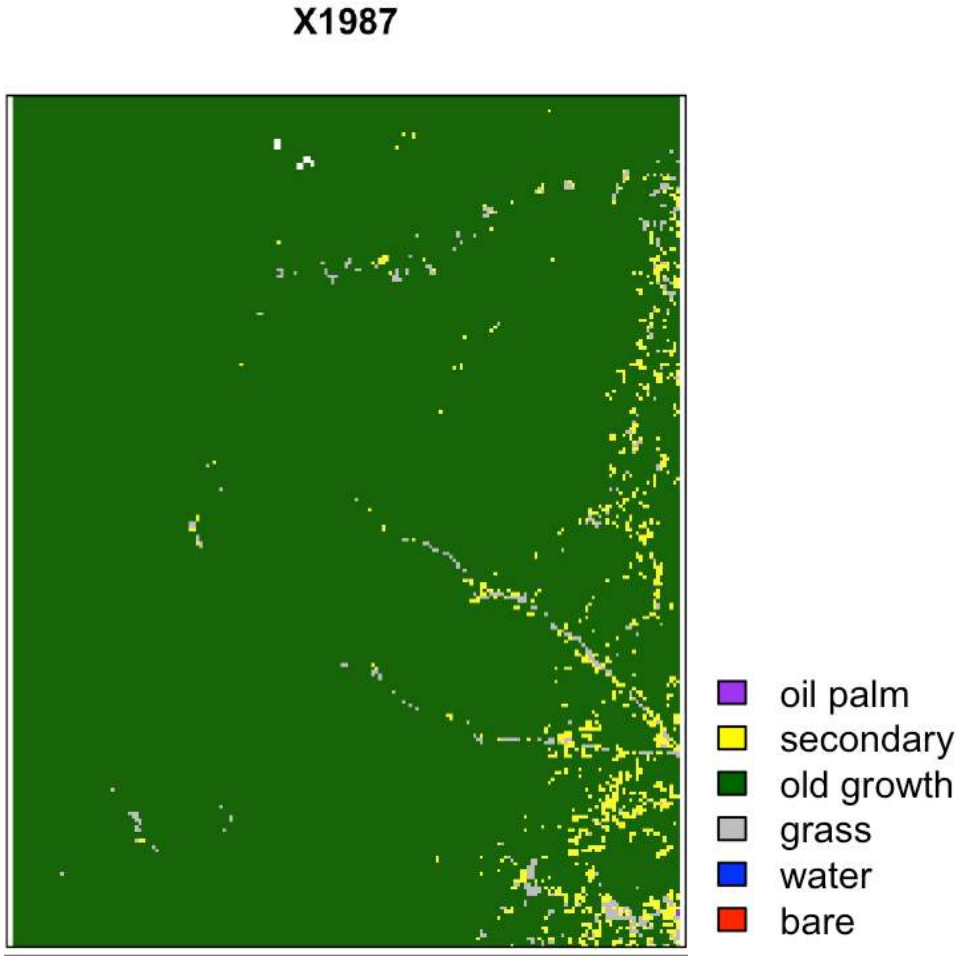
Land covers in tropical savanna for 2015

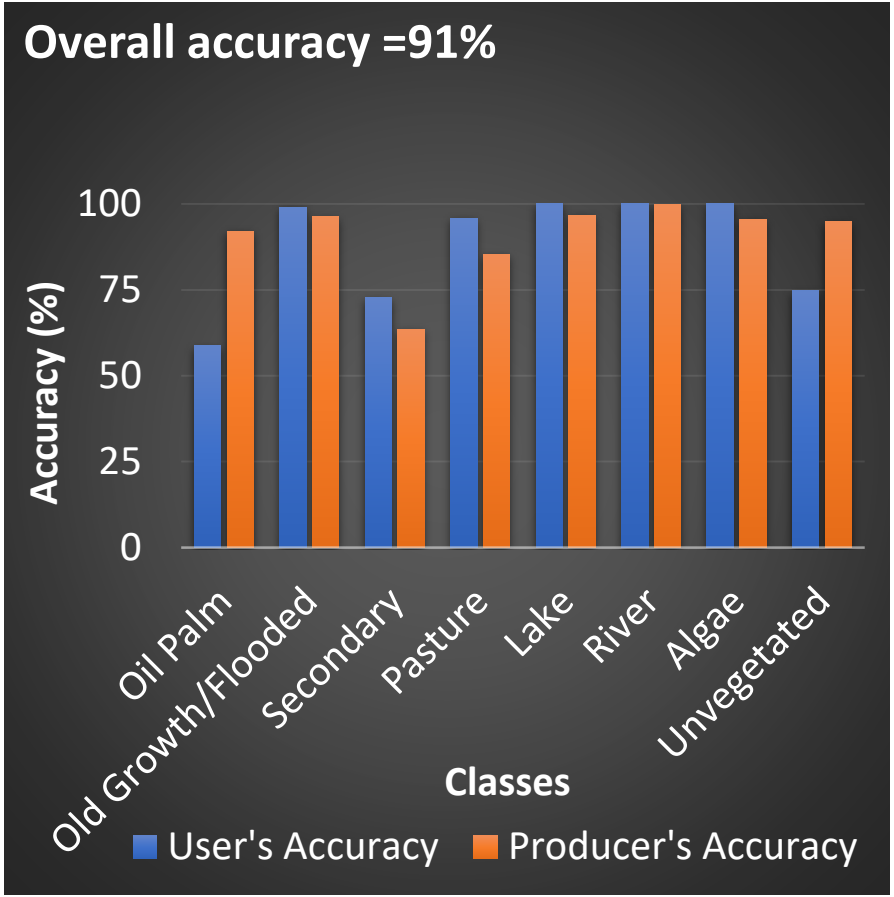
Random forest classification
Landsat + ALOS-PALSAR
Overall accuracy =85%



Rodriguez and Gutierrez-Velez (in prep.)

LC time series in Lowland Amazon forests



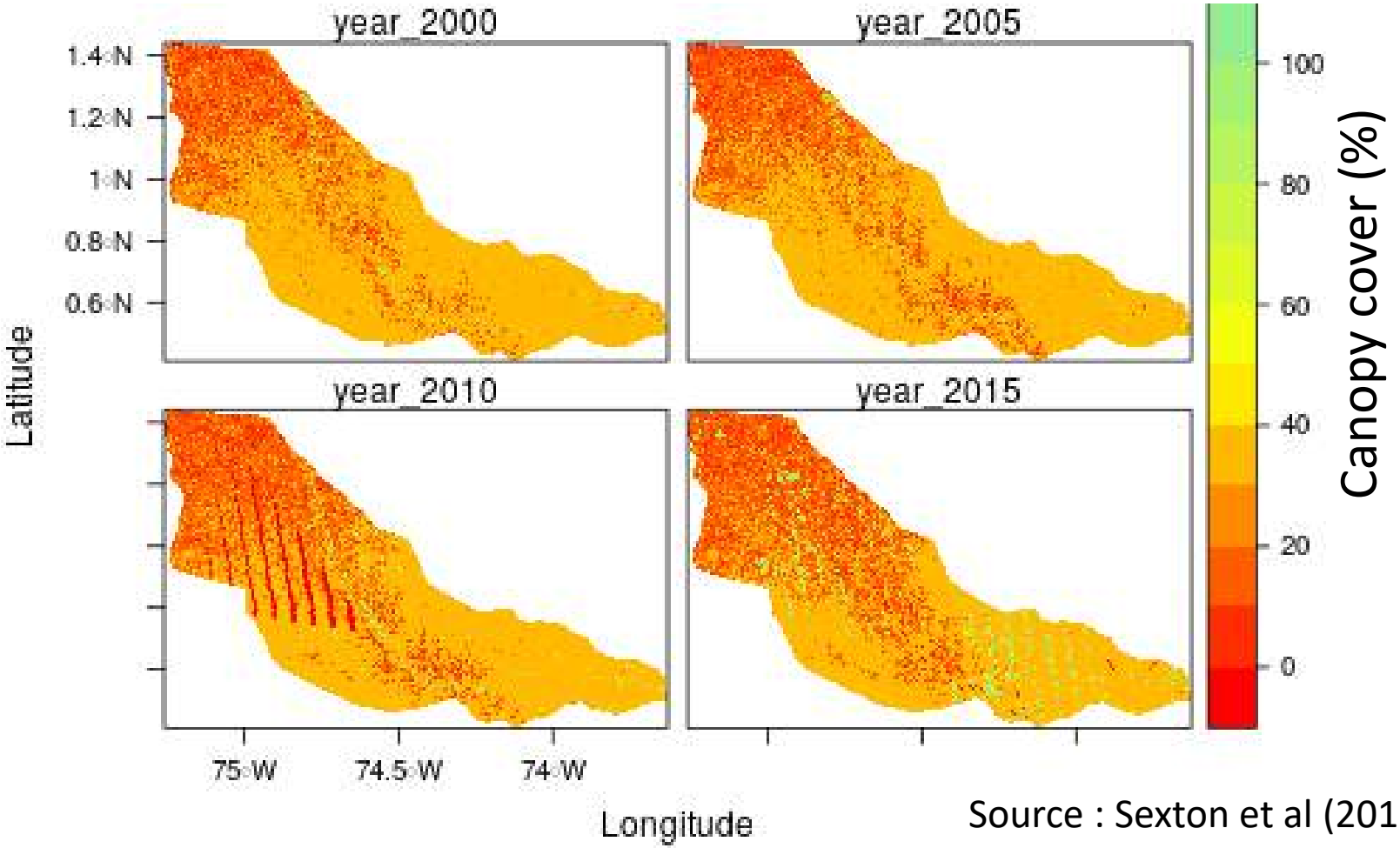


Marcus and Gutierrez-Velez (in prep.)

EBVs

Ecosystem extent
Habitat structure
Community composition
Ecosystem function

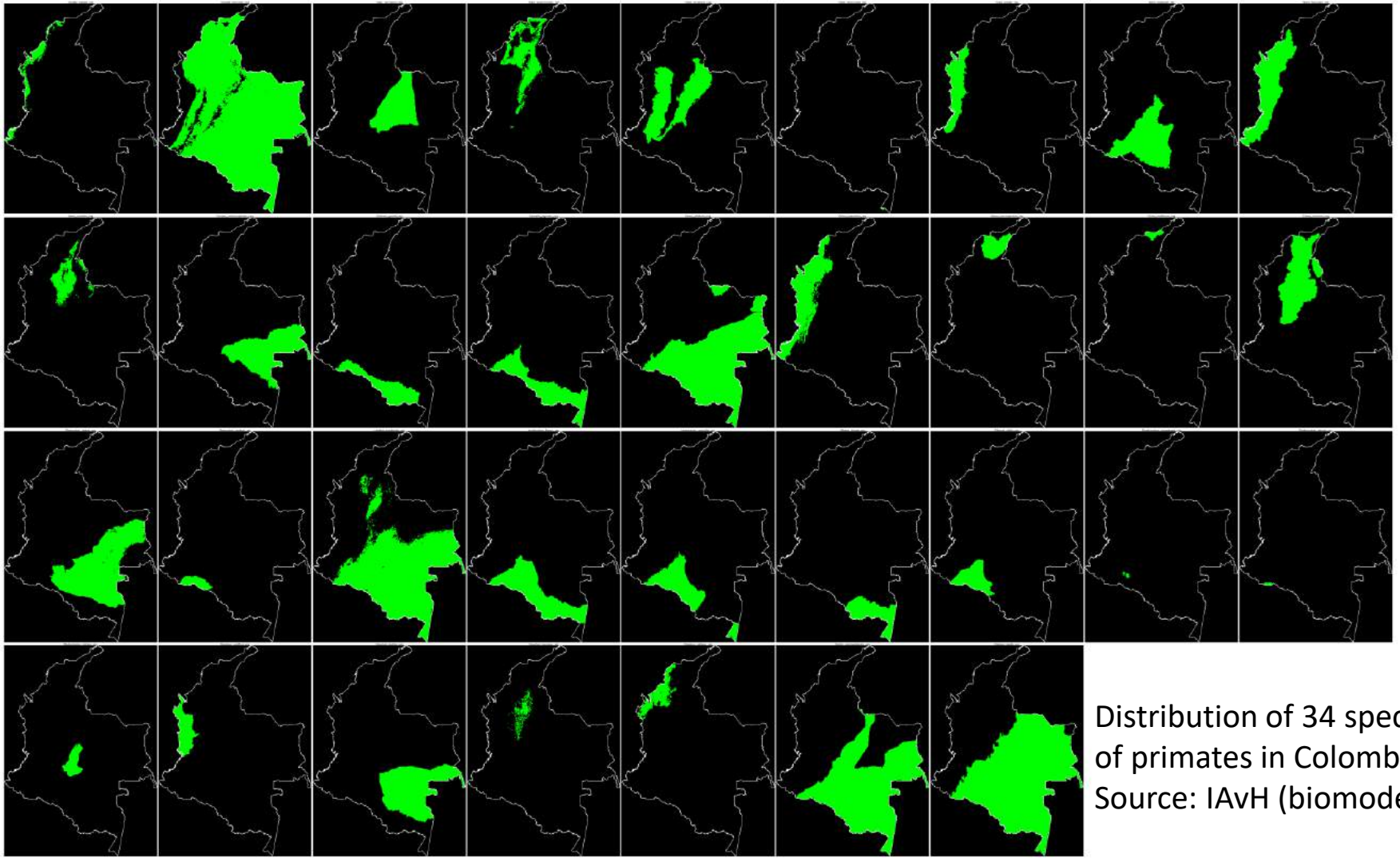
Cartagena del Chairá Municipality, Colombian Amazon



Source : Sexton et al (2013)

EBVs

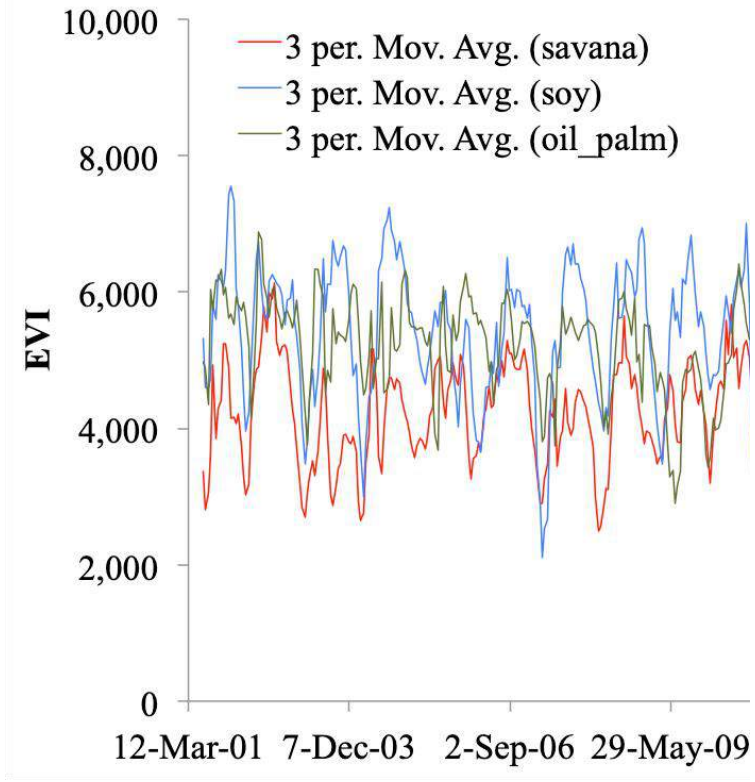
Ecosystem extent
Habitat structure
Community composition
Ecosystem function



Distribution of 34 species of primates in Colombia
Source: IAvH (biomodelos)

EBVs

Ecosystem extent
Habitat structure
Community composition
Ecosystem function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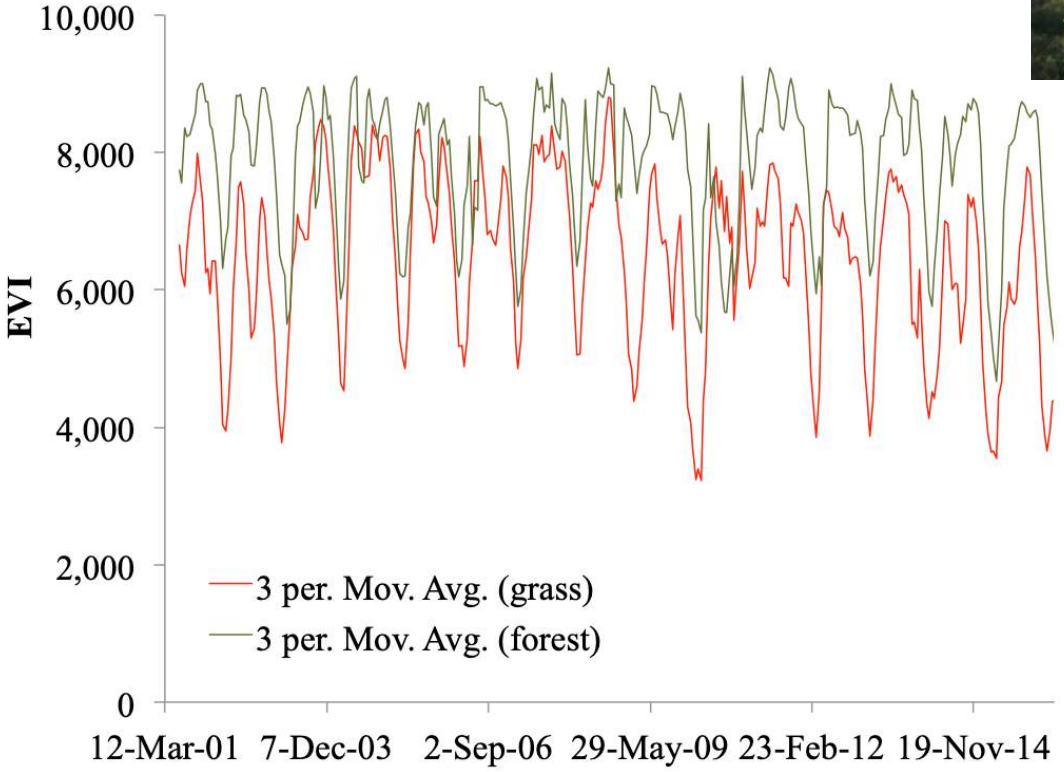
7-Dec-03
2-Sep-06
29-May-09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2,000
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EVI
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3 per. Mov. Avg. (forest)
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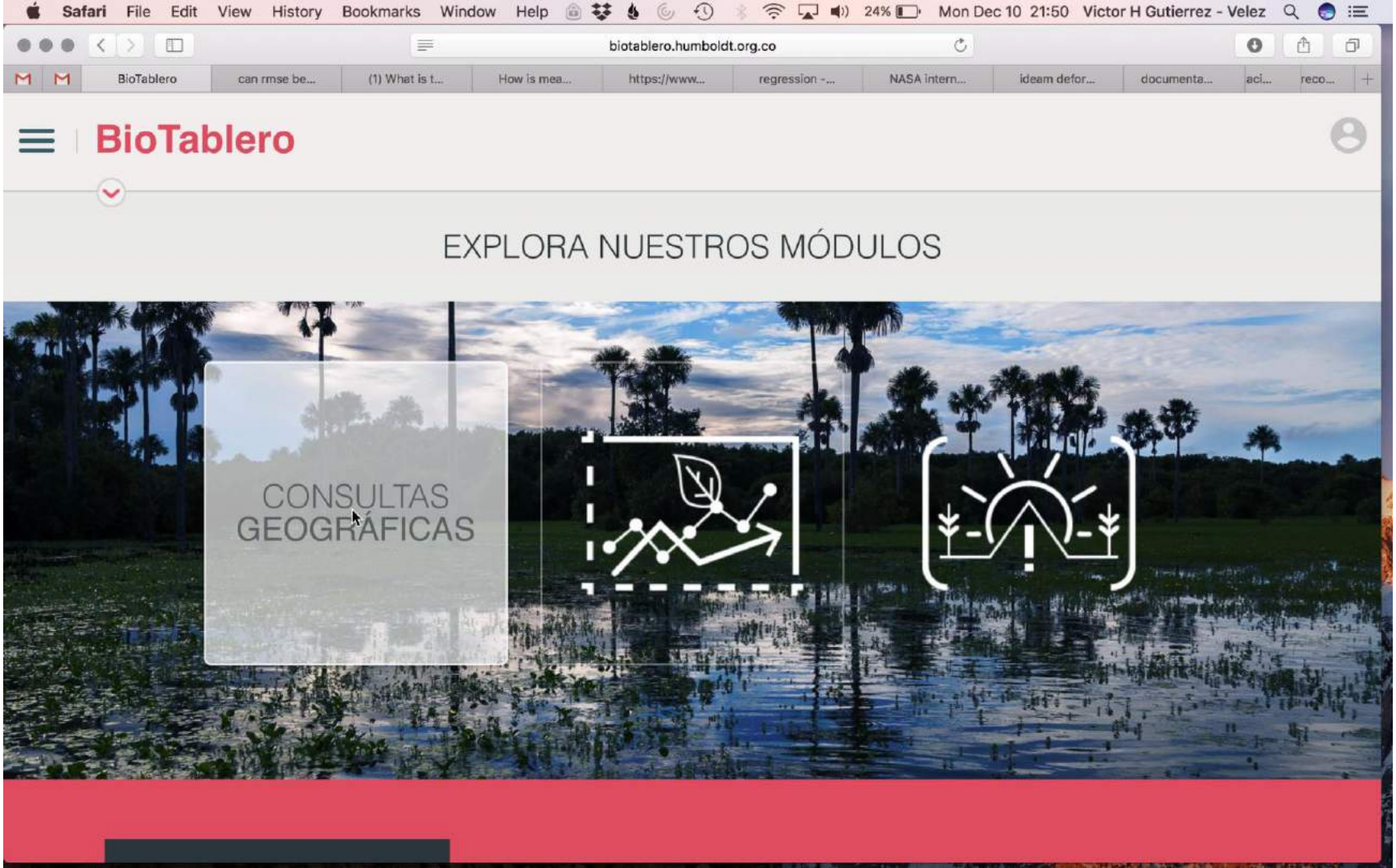
7-Dec-03
2-Sep-06
29-May-09
23-Feb-12
19-Nov-14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Victor H Gutierrez - Velez
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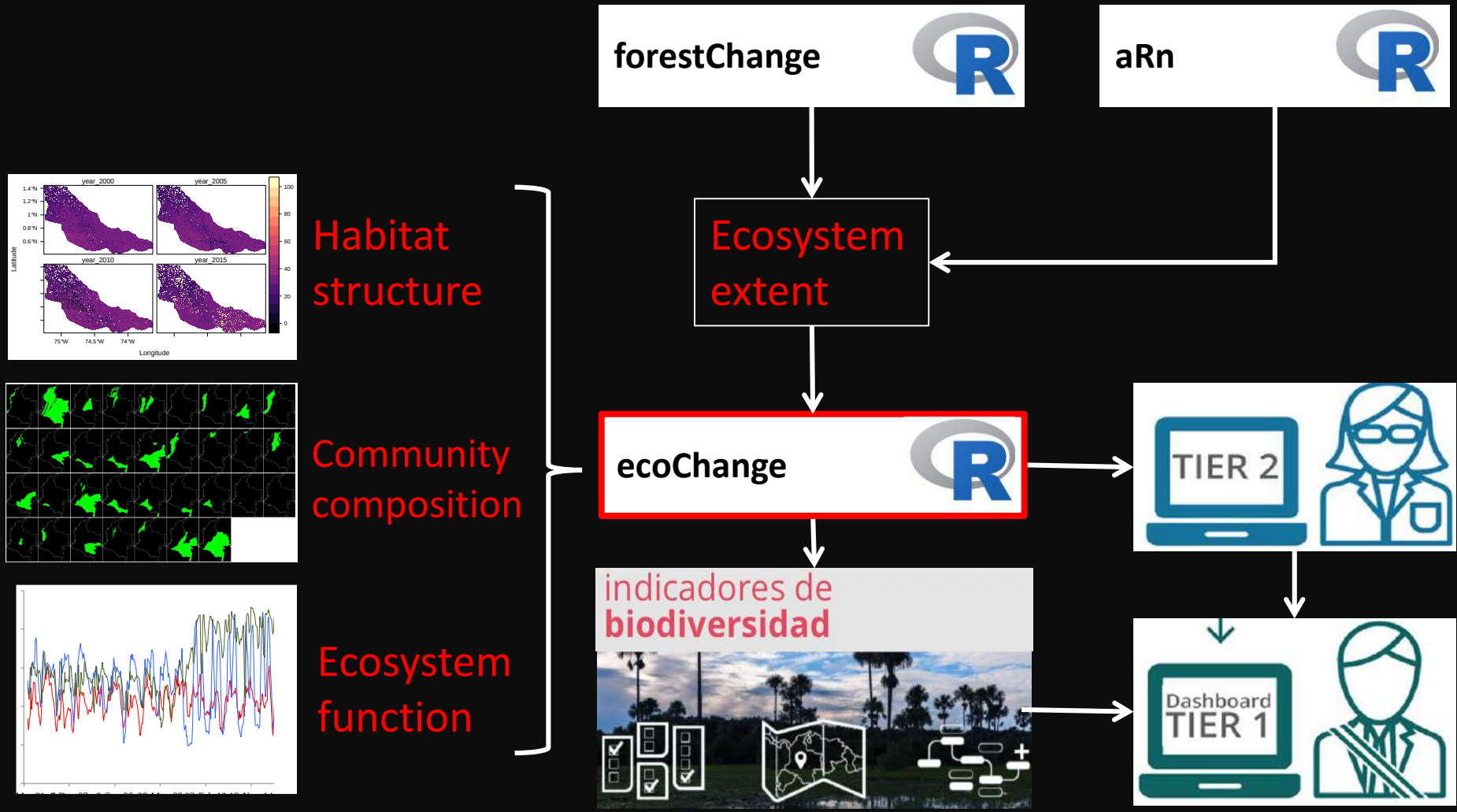
forestChange
aRn
Ecosystem extent
ecoChange
indicadores de biodiversidad
TIER 2
Dashboard TIER 1
Habitat structure
Community composition
Ecosystem function
year_2000
year_2005
year_2010
year_2015
Latitude
Longitude

Integrating Earth observations with user needs for biodiversity decision-making in Colombia

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BOSProject
Biodiversity Observation Support
www.bosproject.org

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