

Improving Biomass Estimation for the Brazilian Amazon

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GlobBiomass - User Worksshop
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General Information



Brazil

Area: 8,5 million de km²

Population: ~204 milion (2015)

Florest: 533 M ha (62%)

Natural : 526 M ha

Planted: 6,6 M ha (<1%)

Caatinga

Mata Atlantica

Biome	Area Remained Forest	Carbon (T=AGB+BGB) FRA, 2010
Amazon	3,546,265	143,12 (125,00 + 18,12)
Cerrado	673,973	61,96 (34,23 + 27,73)
Caatinga	499,800	37,49 (29,52 + 7,97)
Mata Atlântica	298,768	140,53 (119,09 + 21,44)
Pantanal	87,724	73,66 (34,17 + 39,49)
Pampa	32,211	140,53 (119,09 + 21,44)
Total	5,138,741	

Team: Componentes 6 and 7

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Diego Melo de Paula Gomes

Eloi Dalla Nora

Eric Görgens

Roberta Cantinho

Talita Assis

Marcos Longo

Pedro Valle

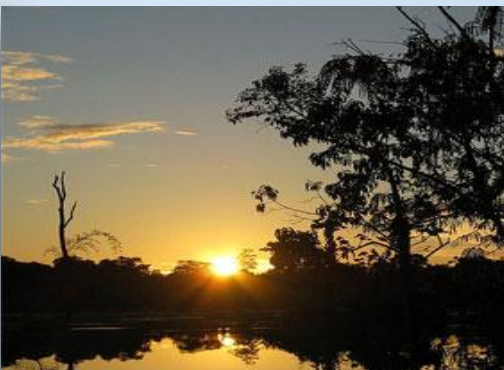
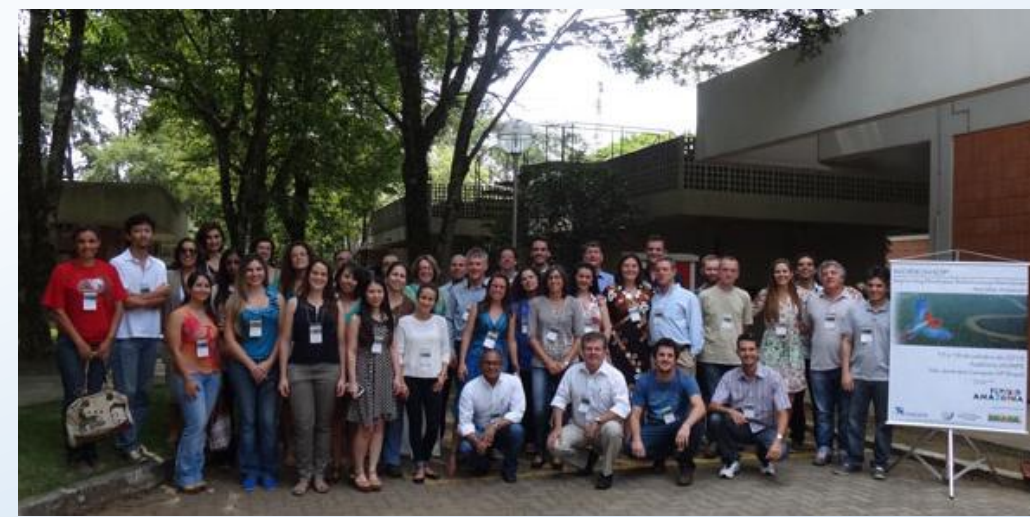
Rodrigo Avancini Teixeira

Ana Paula Aguiar

Pedro Andrade

Michael Keller

Sassan Saatchi

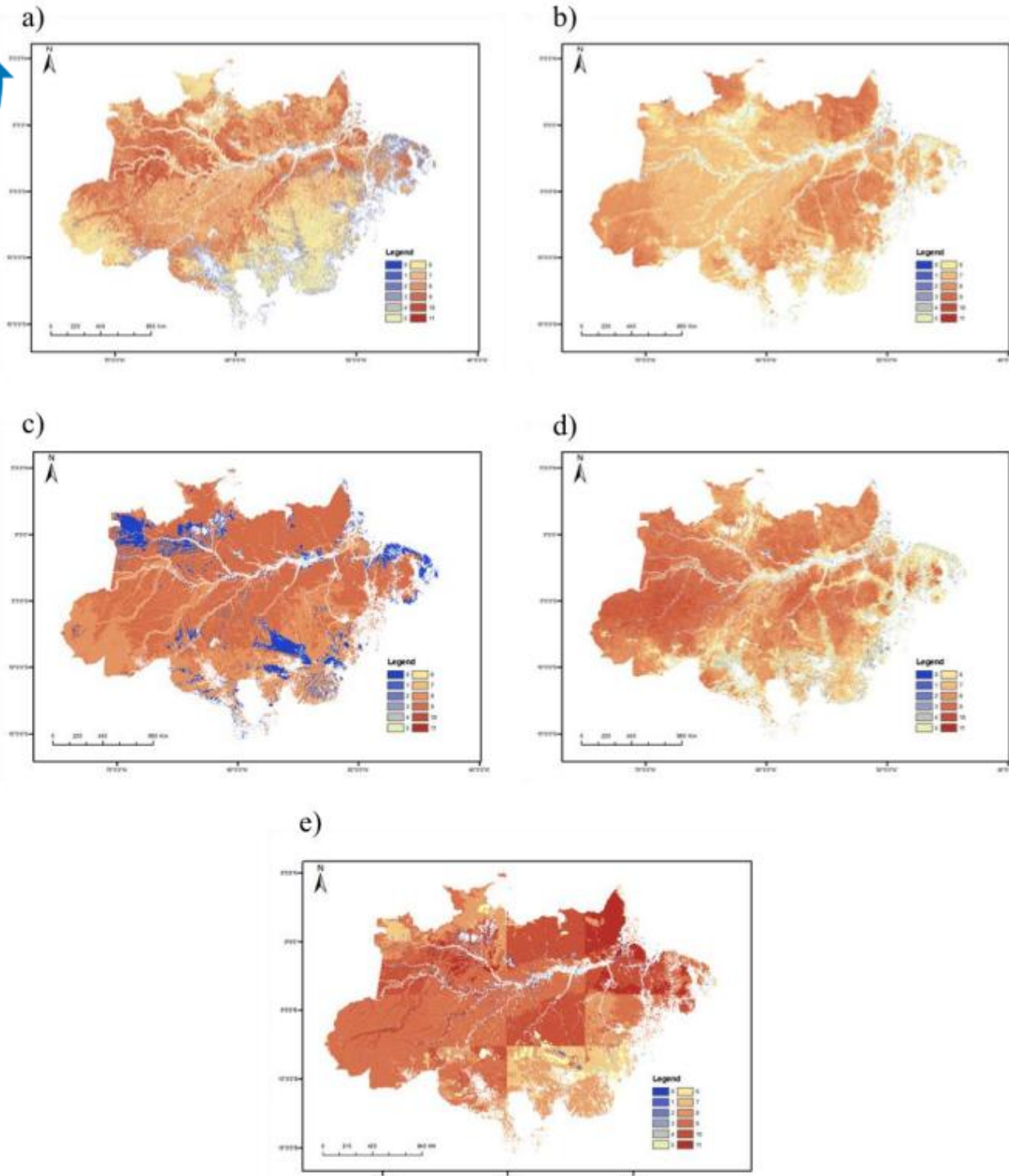




Project: Environmental Monitoring via Satellite in the Amazon Biome

1. Mapping out the use and coverage of land in the Legal Amazon over time;
2. Improvement and development of new features of the free software TerraAmazon;
3. Improvement on reception services, distribution, and use of remote sensing images of INPE;
4. Improvement of the monitoring system of forest fires and burn-offs;
5. Conducting studies on the processes and the trajectories of patterns in deforestation dynamics in the Amazon;
6. Improvement and development of modeling tools of changes in land use and land cover and estimated emissions;
- 7. Improvement of biomass estimation methods and emission estimation models for change of land use with data obtained with LIDAR uses sensors.**





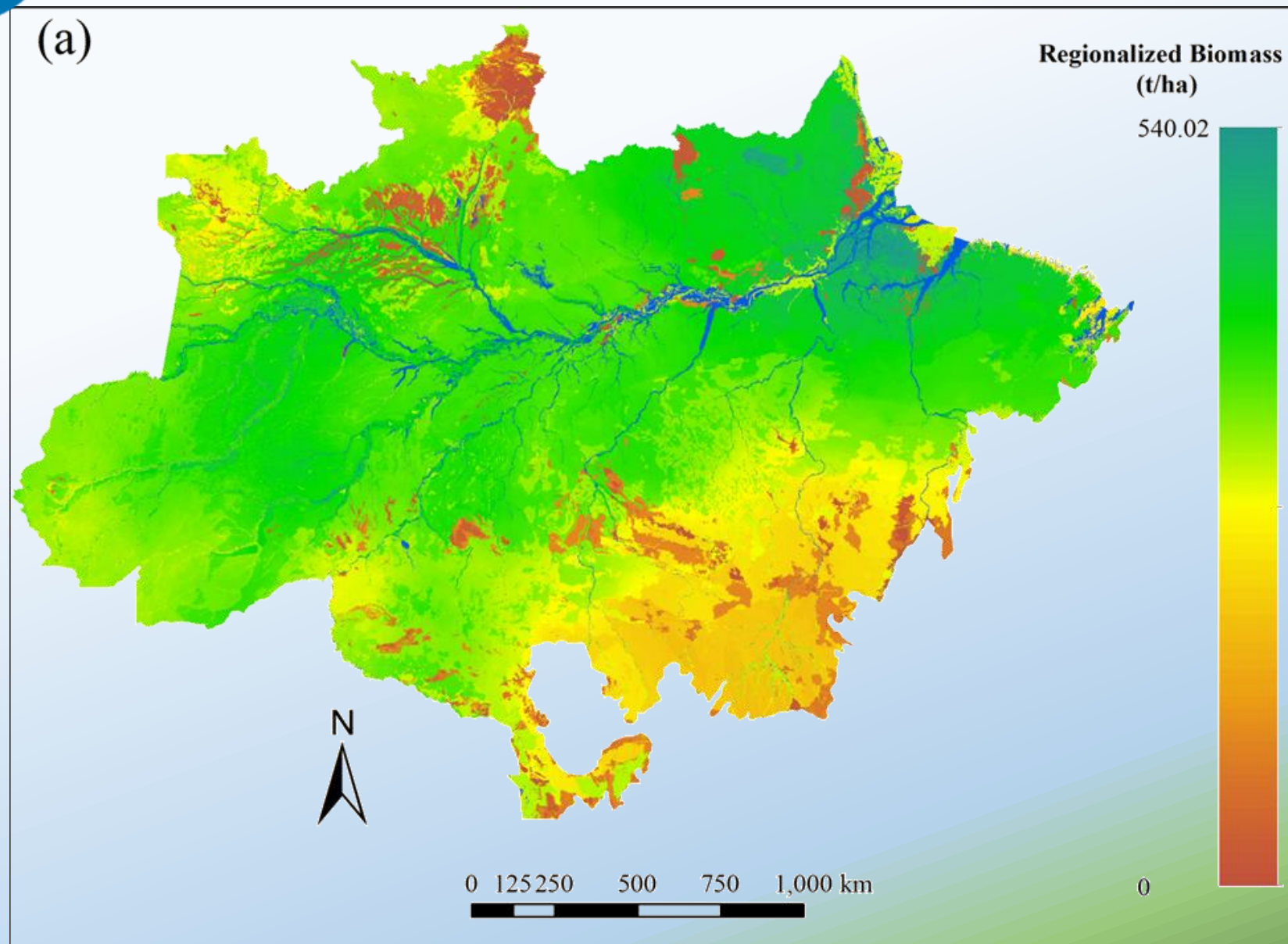
Amazon region biomass estimates

Warmer colors are representing higher biomass classes. a BS07 (Saatchi et al. 2007); b BS11 (Saatchi et al. 2011); c BN08 (Nogueira et al. 2008a, b); d BB12 (Baccini et al. 2012); e BM10 (MCT 2010)

**Biomass maps
with high
uncertainties**

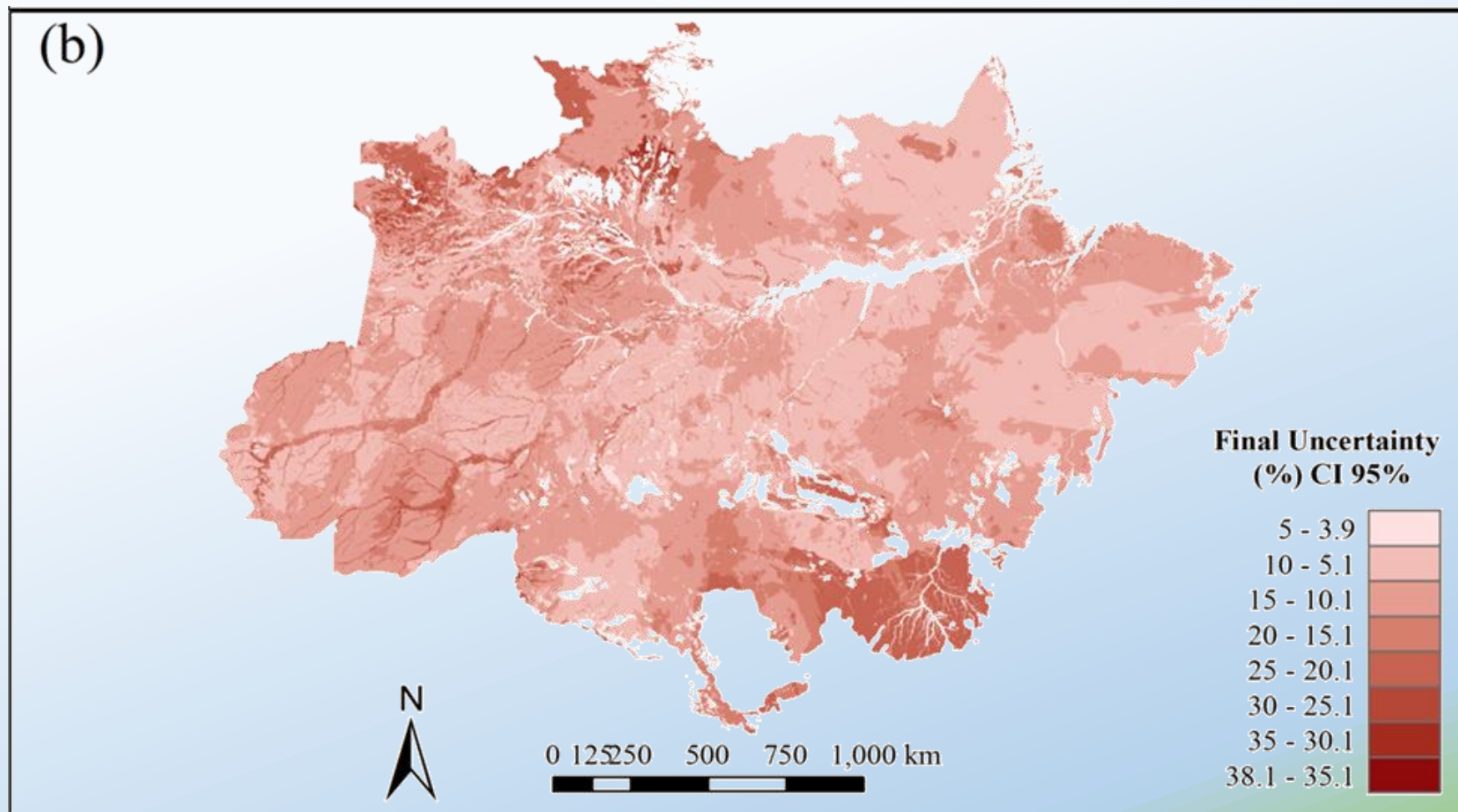


New potential biomass map proposed for the Third National Inventory of Greenhouse gases emissions and removals



Total biomass (above and belowground) map generated by Integrating RadamBrasil plots and literature review.

New potential biomass map proposed for the Third National Inventory of Greenhouse gases emissions and removals



Still presenting high uncertainties...

New initiatives to reduce uncertainties in biomass estimation now using Airborne Laser Scanning (ALS)

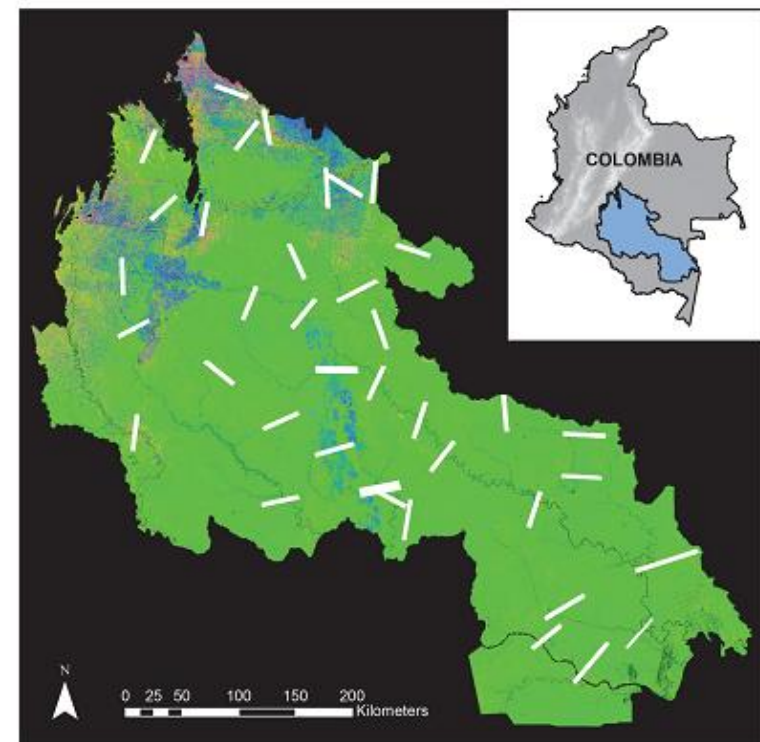
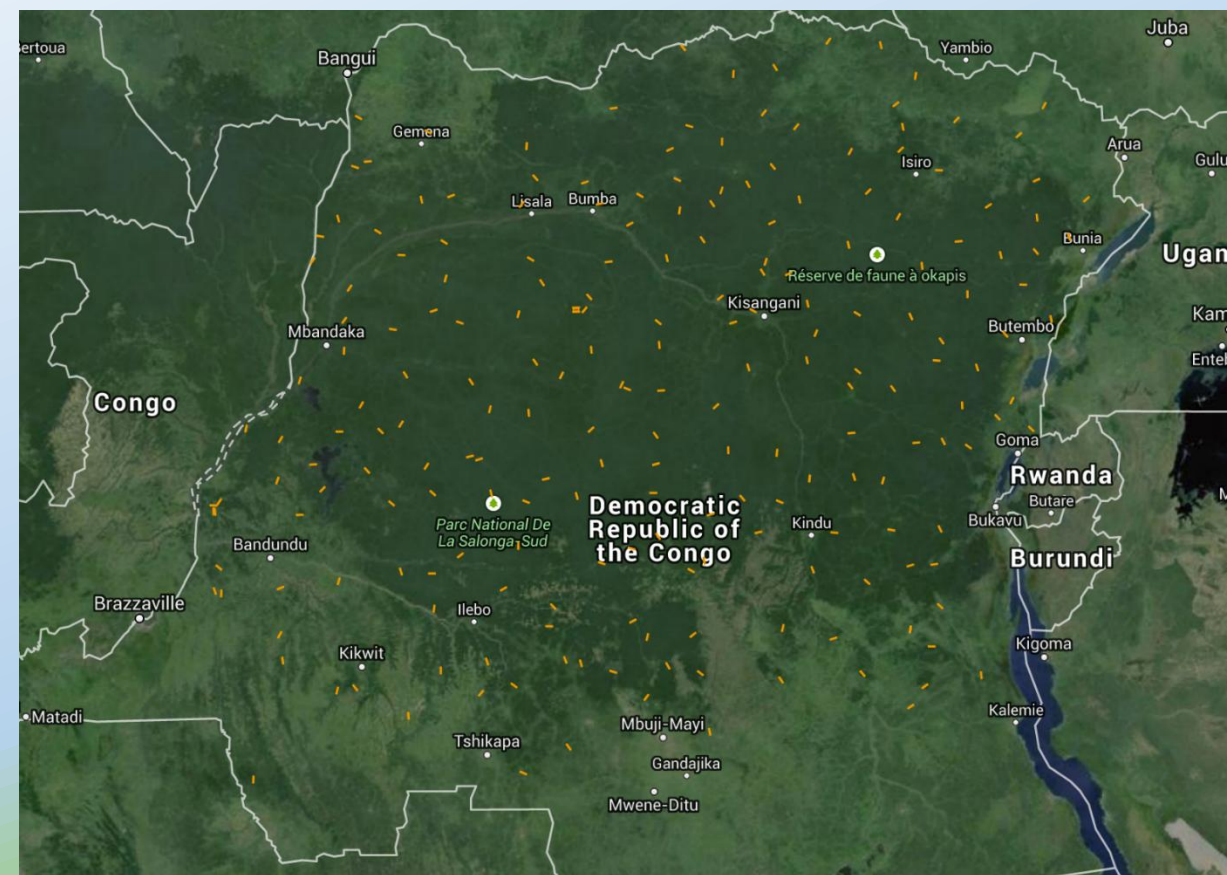


Fig. 1. A map showing the fractional cover of photosynthetic vegetation (PV; green), non-photosynthetic vegetation (NPV; blue) and bare soil (pink-red) throughout the 16.5 million ha study region in the Colombian Amazon (see inset). White polygons indicate 38 areas of airborne LiDAR samples, each up to 30 000 ha in size.

ASNER, G. P. et al. High-resolution mapping of forest carbon stocks in the Colombian Amazon. **Biogeosciences**, v. 9, n. 7, p. 2683-2696, 2012.

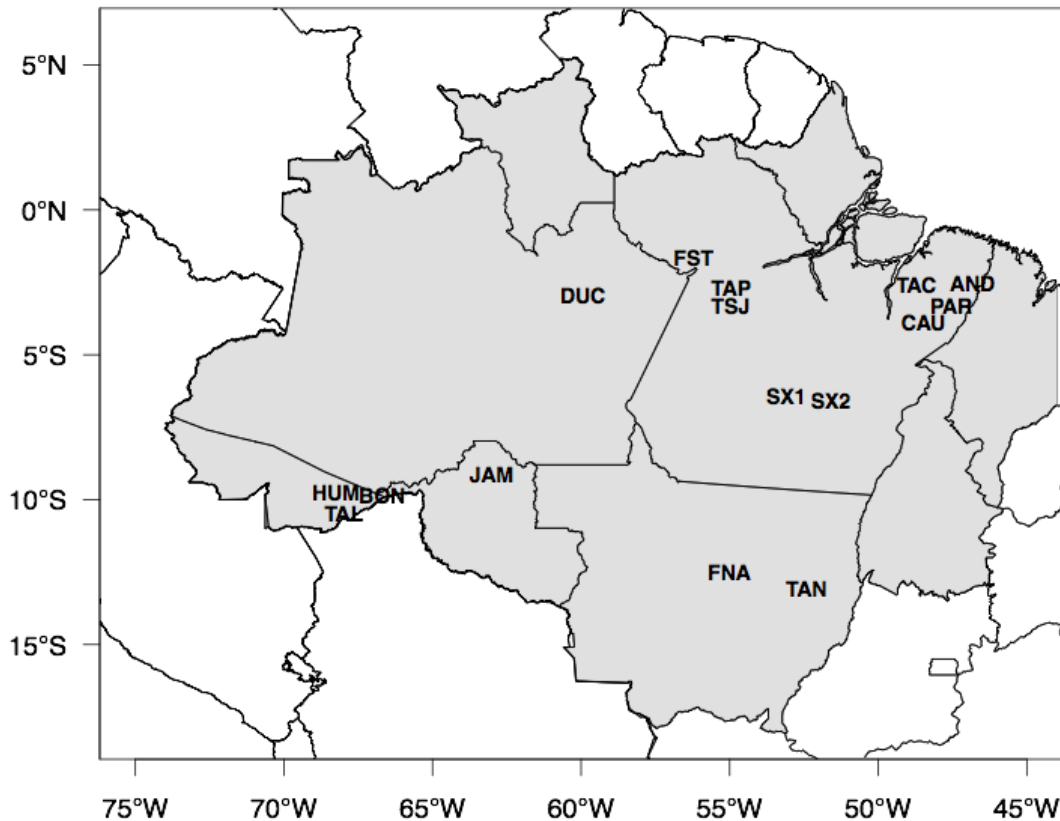
(38 transects - Up to 30.000 ha each transect)



Pers. Comm. Saatchi (2015)

(216 transects (1 x 20 km) - 2000 ha / transect)

Sustainable Landscapes Brazil database

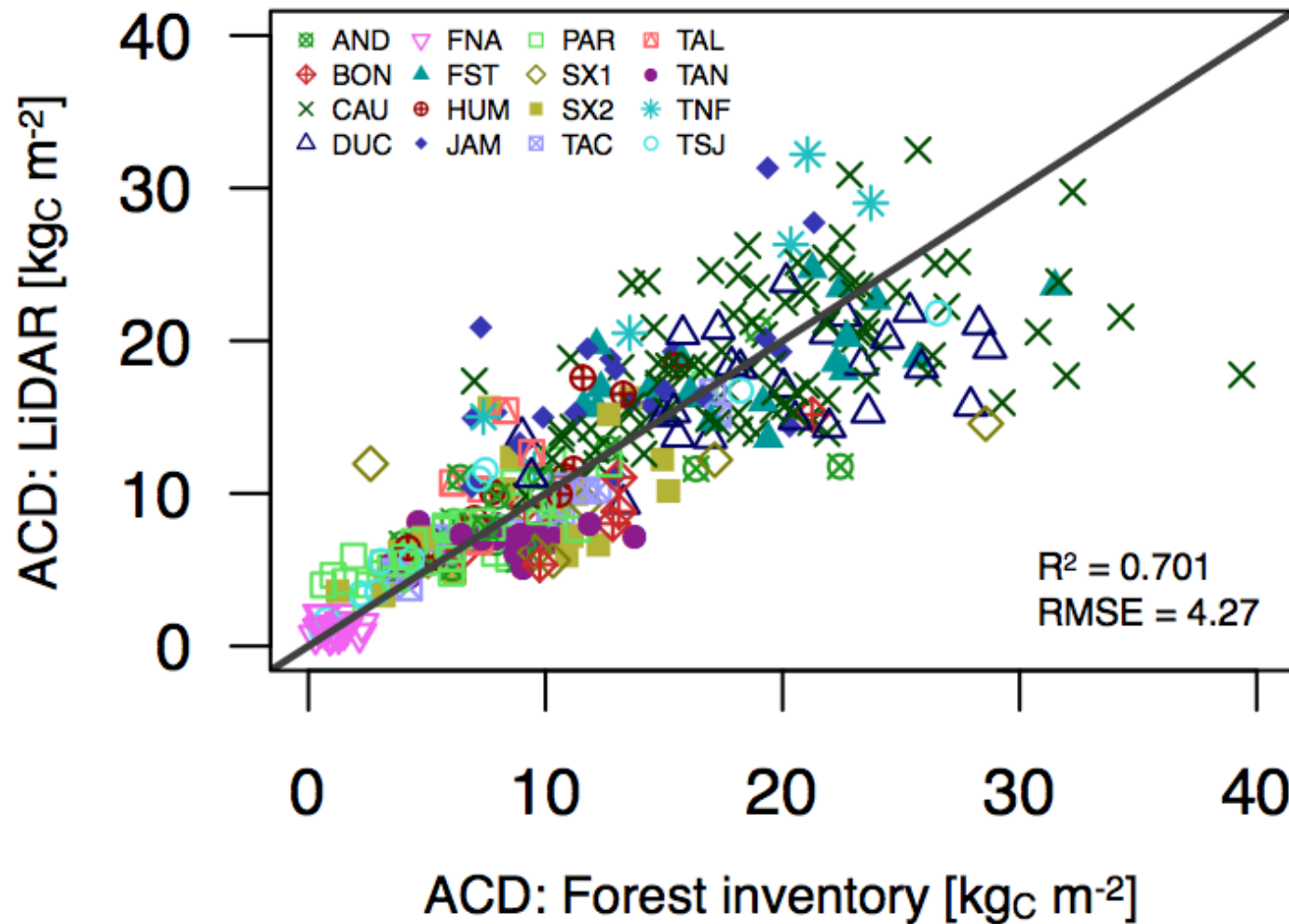


- 338 Inventory plots (~0.25 ha equivalent)
- 84.5 ha inventory area
- ~16000 ha total lidar survey area

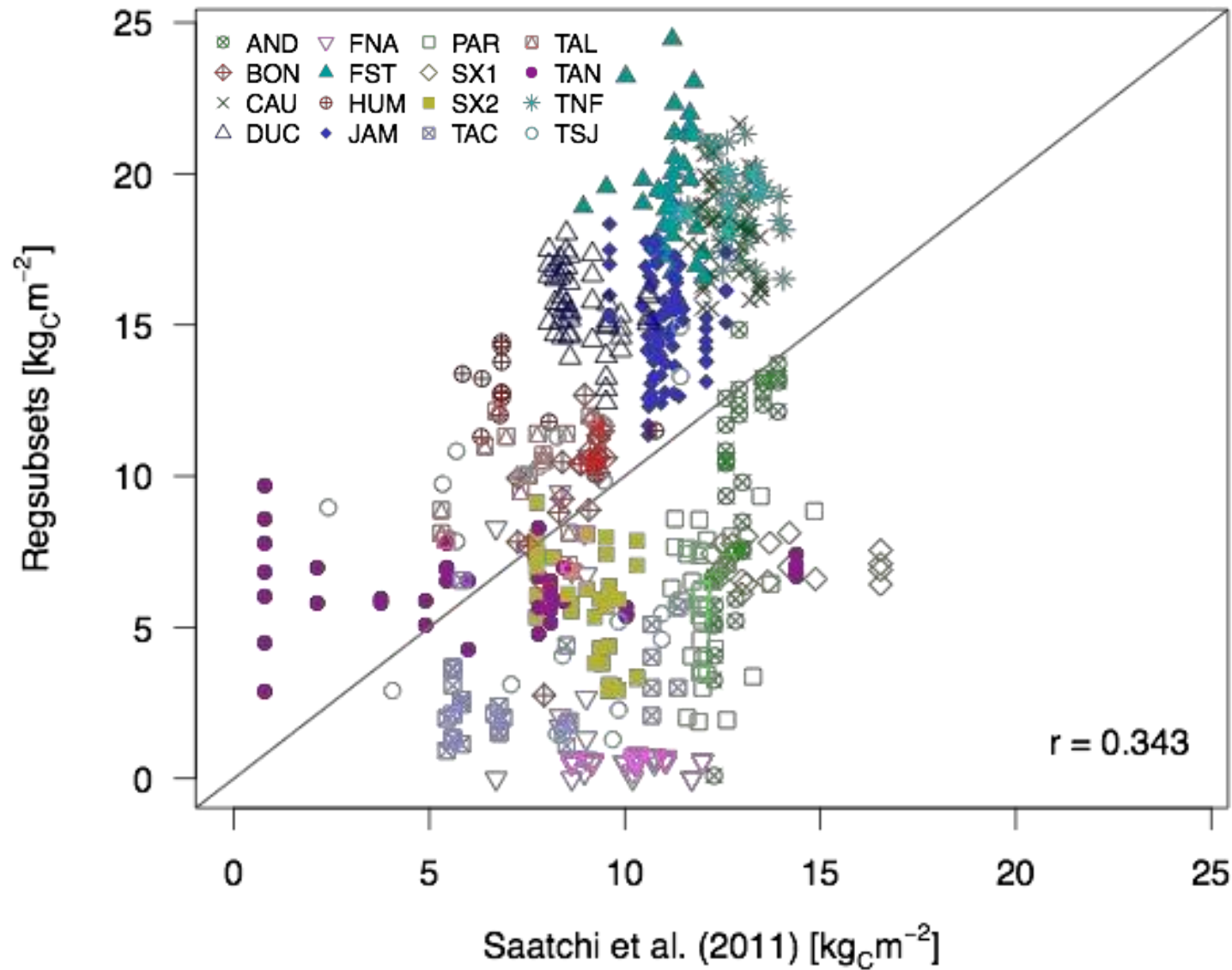
Site	Intact	Degraded	Secondary
AND		<input type="checkbox"/>	
PAR		<input type="checkbox"/>	<input type="checkbox"/>
CAU	<input type="checkbox"/>	<input type="checkbox"/>	
TAC			<input type="checkbox"/>
FST	<input type="checkbox"/>	<input type="checkbox"/>	
TAP	<input type="checkbox"/>		
TSJ		<input type="checkbox"/>	<input type="checkbox"/>
SX1		<input type="checkbox"/>	
SX2		<input type="checkbox"/>	
DUC	<input type="checkbox"/>		
HUM		<input type="checkbox"/>	
BON		<input type="checkbox"/>	
TAL		<input type="checkbox"/>	
JAM	<input type="checkbox"/>	<input type="checkbox"/>	
TAN	<input type="checkbox"/>	<input type="checkbox"/>	
FNA		<input type="checkbox"/>	

AGB calibration

$$\text{ACD}_{\text{SSR}} = 0.036(0.011) \mu_z^{2.02(0.11)} z_{75}^{0.04(0.08)} z_{10}^{-0.23(0.03)} \kappa_z^{0.40(0.07)}$$



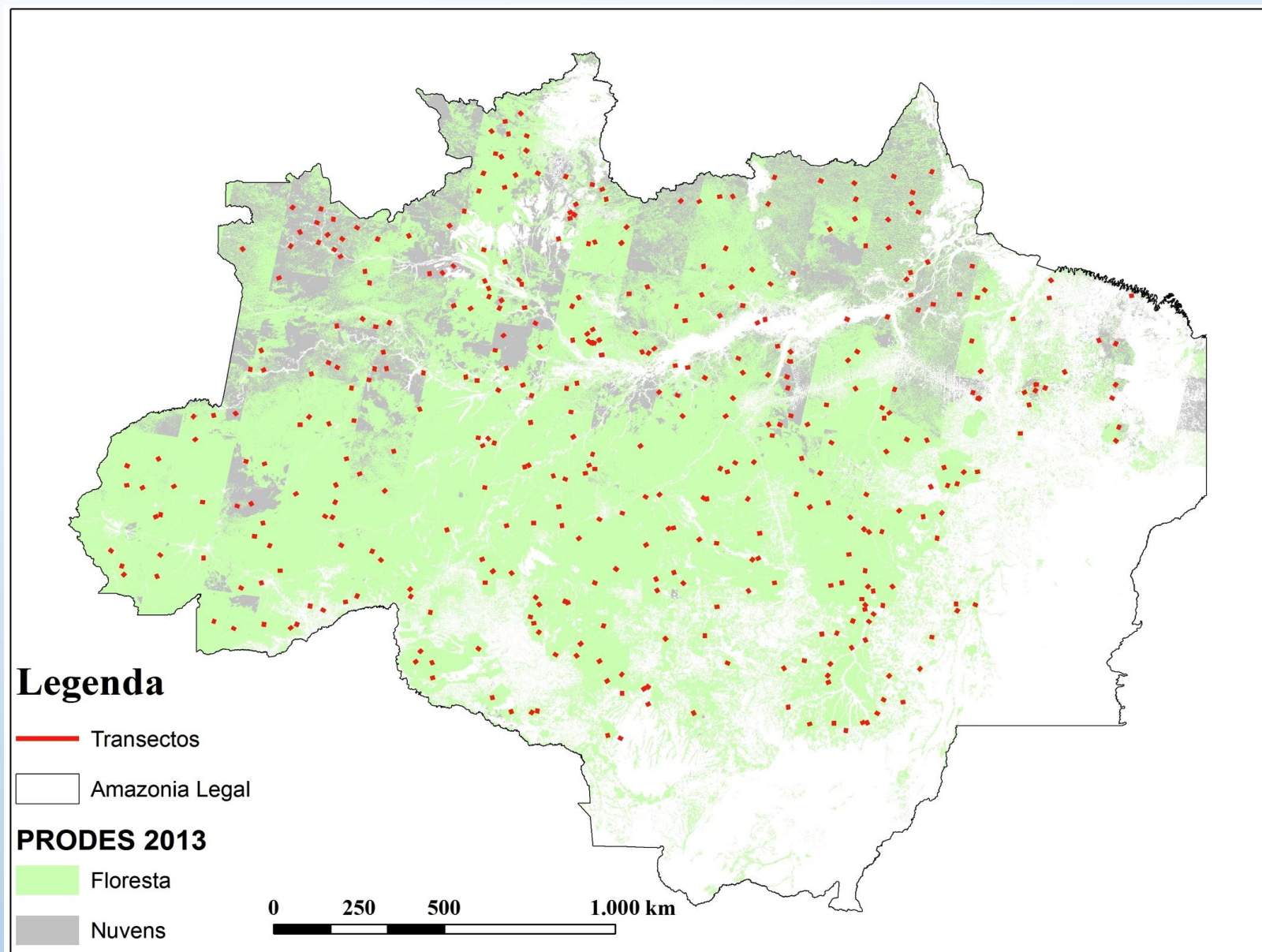
AGB Comparison –lidar x Saatchi





Sub 7 campaign

	Unit	Package 1
Amazon limits	km ²	5,217,423
Forested area	km ²	4,100,894
Secondary forest	km ²	172,189
Transect width	m	300
Transect length	km	12.5
Transect area	ha	375
Number of transects	transects	417
Area covered	ha	156,522
Full scan angle	°	15

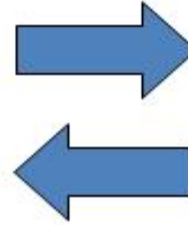
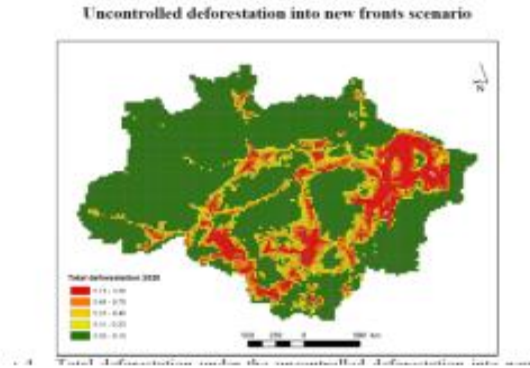


The first two overflights occurred on January 22nd and 23rd and collected data for 7 transects



CCST LUCC Modeling Group

**LuccME and
LuccABME:**
Spatially explicit
dynamic LUCC
models



INPE-EM
greenhouse emission
and secondary
forests dynamics
models

PRODUCTS:

Operational emission estimates

Land use and emission scenarios

Open source tools (LuccME, INPE-EM)



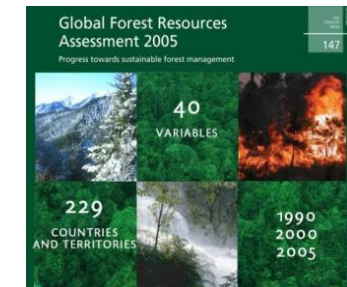
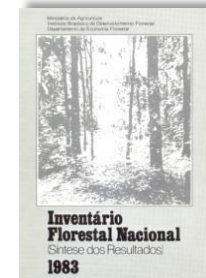
Environmental models and analysis:
vegetation, hydrological, diseases, climate



Information to society:
sites, reports, papers

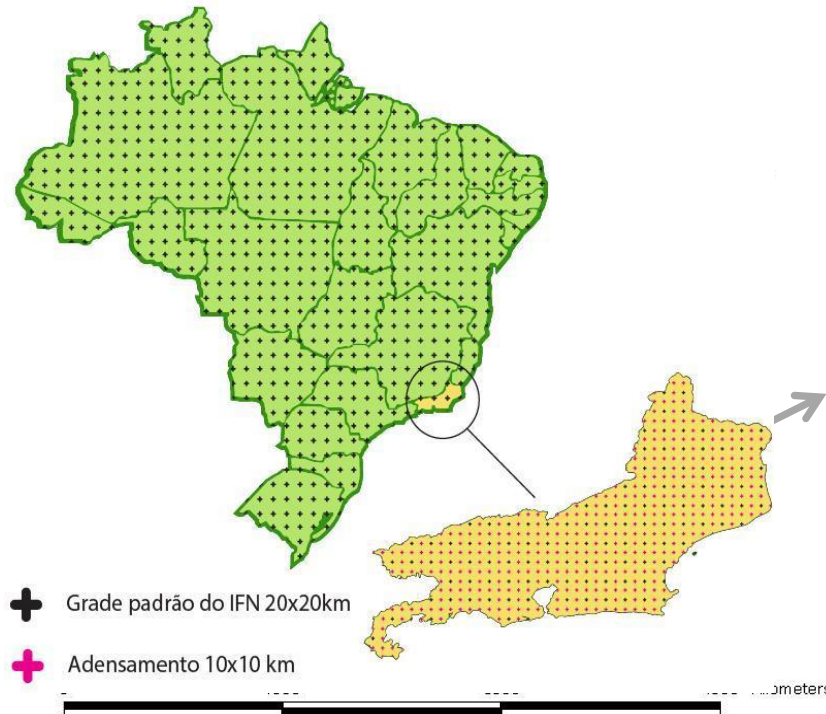
Introduction: motivation for the NFI

- Brazil is a forest country (54.4%)
- The national and global importance of forest
- Demand for accurate, reliable and updated information on forests at national level
- International agenda on Forests: reports, reports and reports
- 27 States: a need for a standard methodology
- NFI as participatory process
- Information for decision making and policies' design

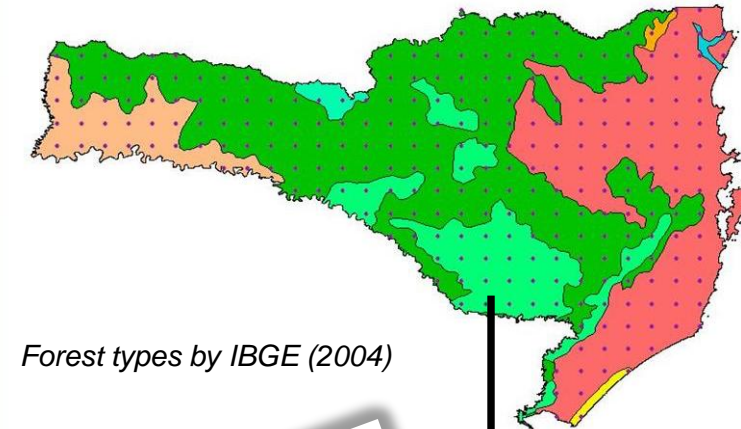


NFI Sampling design (Field Sample Plots)

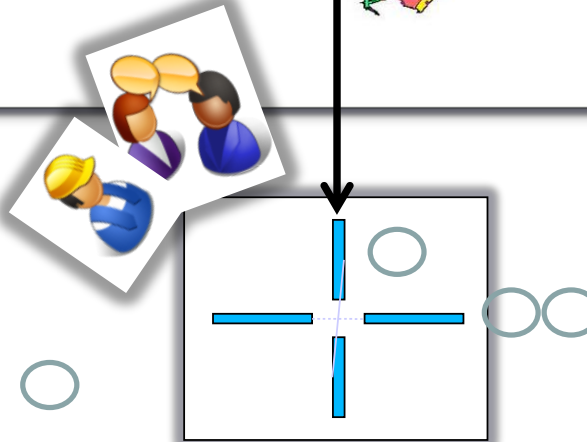
1 – A national grid of sistematic sample points : 20 km x 20 km



2 – All forest types sampled



Forest types by IBGE (2004)



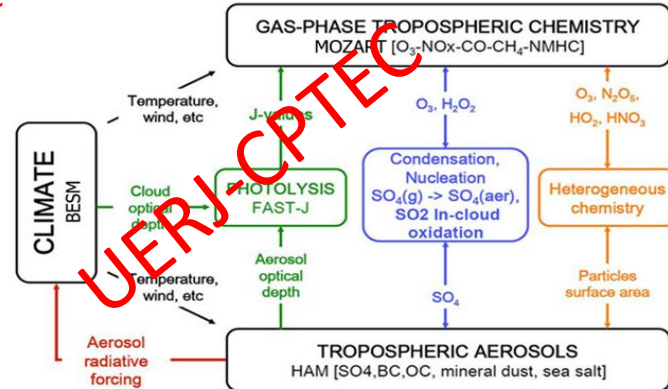
3 - Field Sample Plot for tree measurements and land use assessment

BESM Component Models

AEROSOL-CHEMISTRY (MAX PLANK)

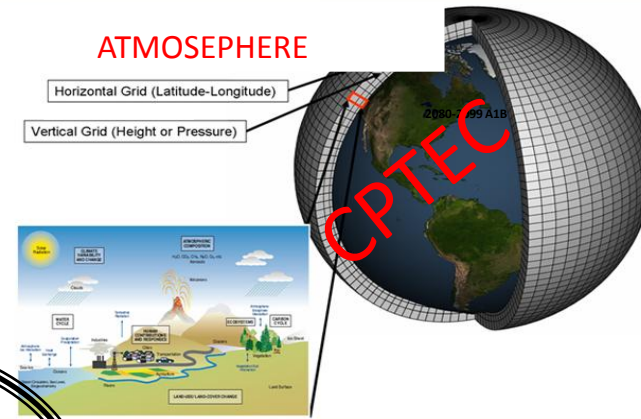
ATMOSPHERE (INPE/CPTEC)

ATMOSEPHERIC
CHEMISTRY



CO₂
Trace Gases
Particles
Heat
H₂O
CO₂

ATMOSEPHERE



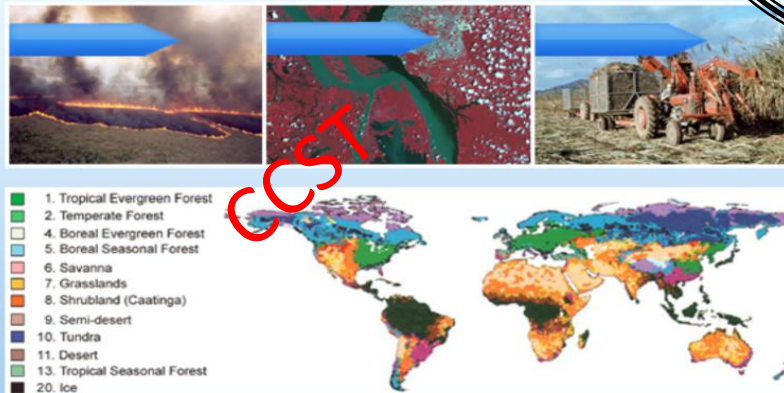
FMS
COUPLER

INLAND (INPE/CCST)

OCEAN (NOAA/GFDL)

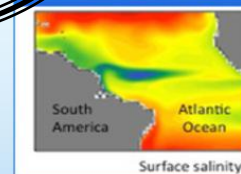
Hydrology

Land Use

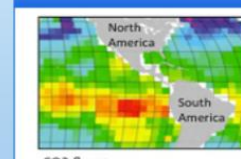


RIVERS

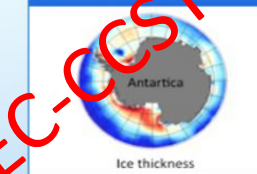
RIVER



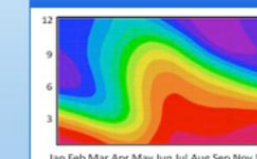
BioChemistry



ICE



Predictability



Simulações com o Modelo INLAND

Modelos CMIP5

(utilizados como condição de contorno para o modelo INLAND) :

- 1.CCSM4
- 2.CSIRO-Mk-3-6-0
- 3.GFDL-ESM2M
- 4.GISS-E2-R
- 5.HadGEM2-ES
- 6.IPSL-CM5A-LR
- 7.MIROC5
- 8.MRI-CGCM3
- 9.NorESM1-M

Simulações Realizadas:

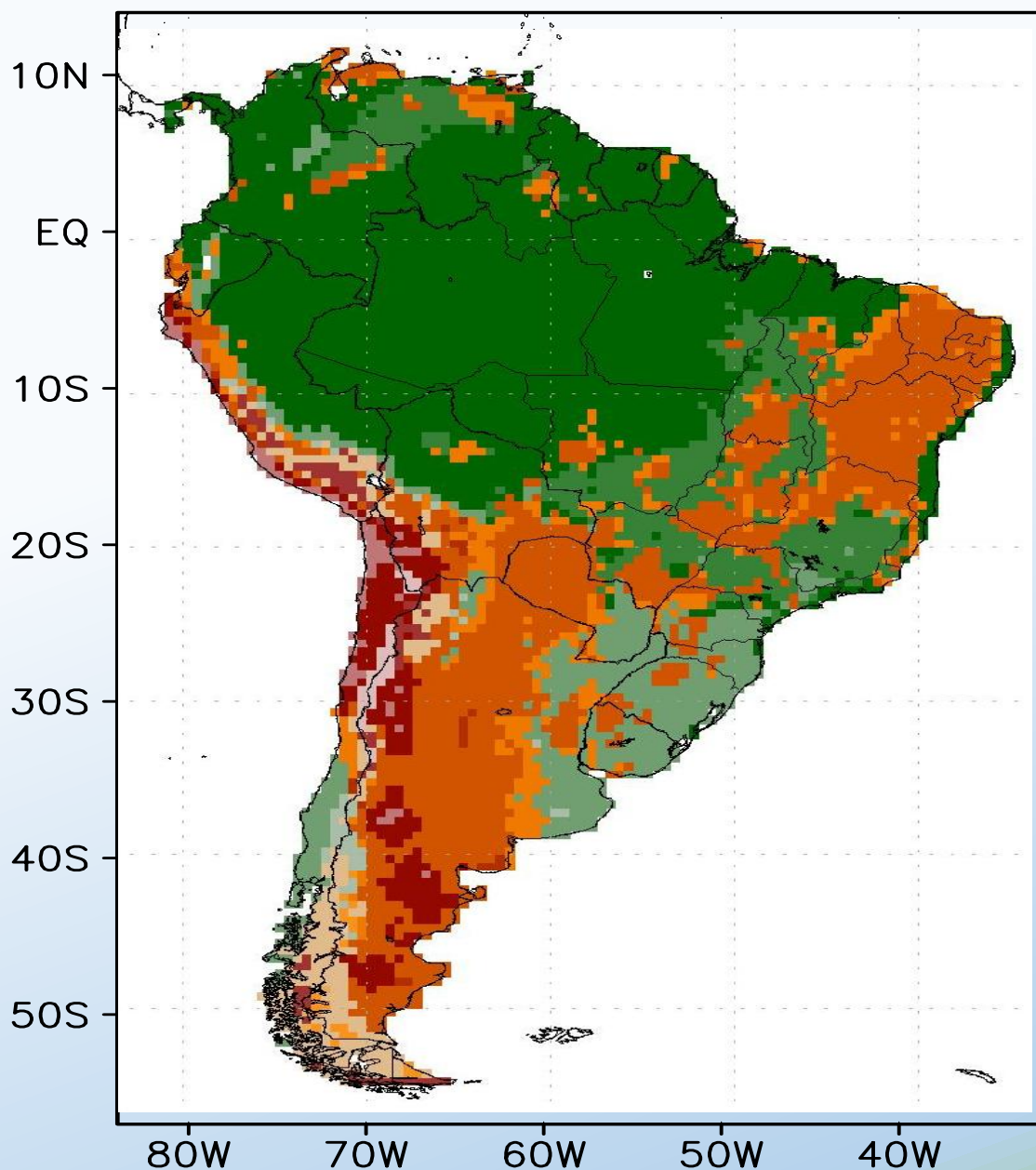
- 1 (v2l0f0) – Land Use: off, Fire: off
- 2 (v2l1f1) – Land Use: on, Fire: on

Land Use Scenario: Cenário C

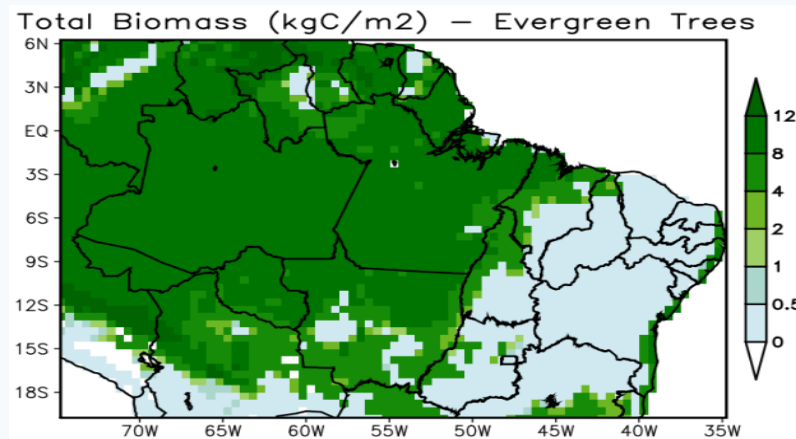
Cenário de Emissão de Gases: RCP 4.5

Período das simulações: 2005 - 2050

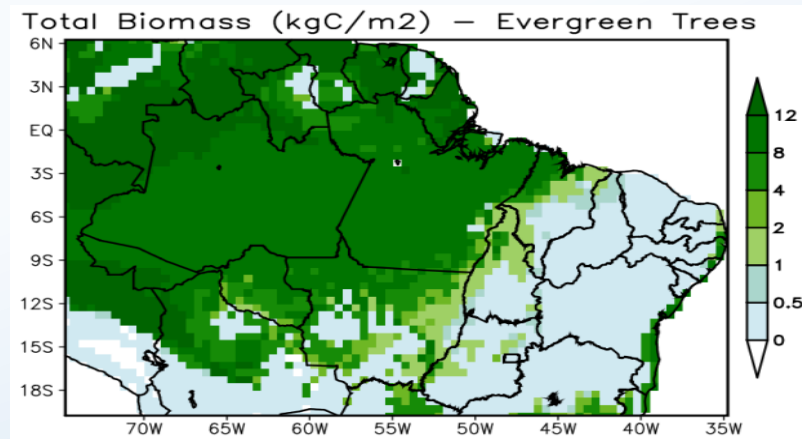
Natural Vegetation INLAND Model



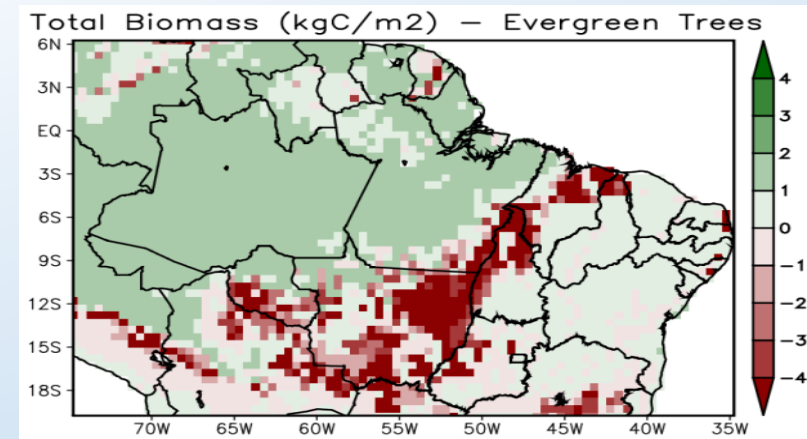
Control



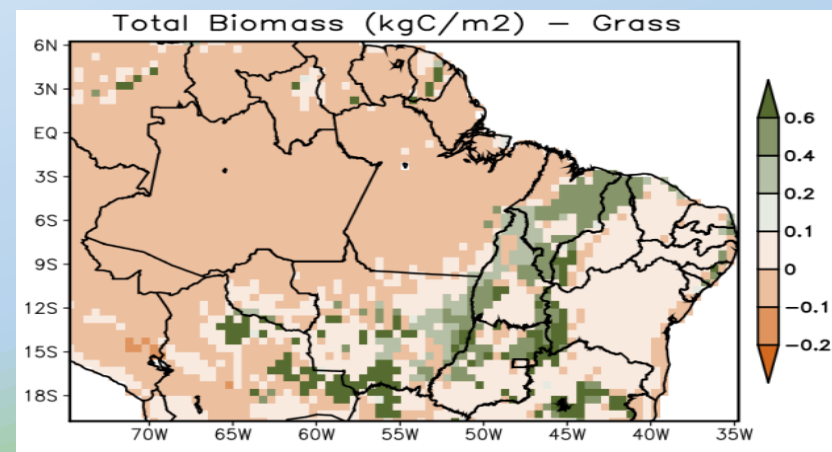
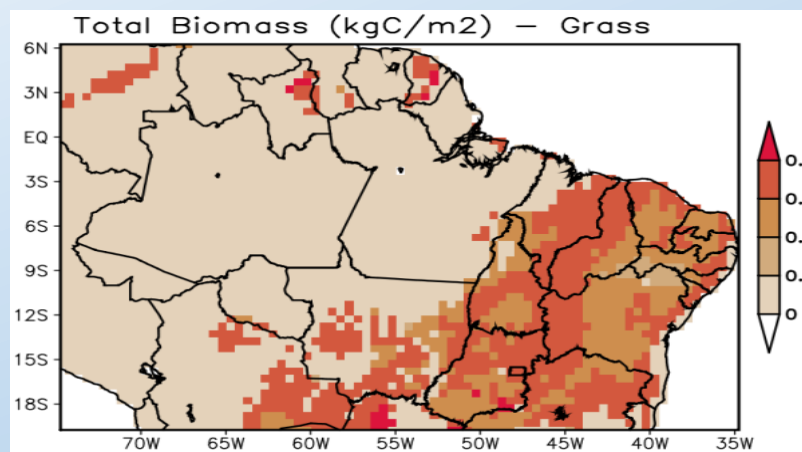
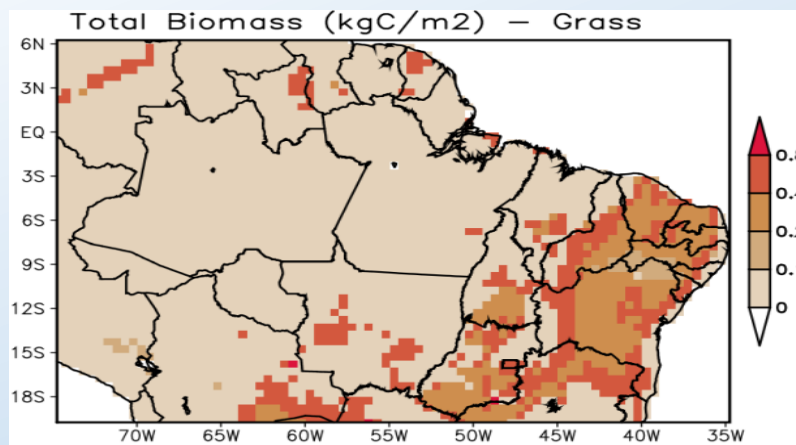
Fire



Fire-Control



Evergreen vegetation (trees)



Grasses