Monitoring Program for Amazon and Other Biomes

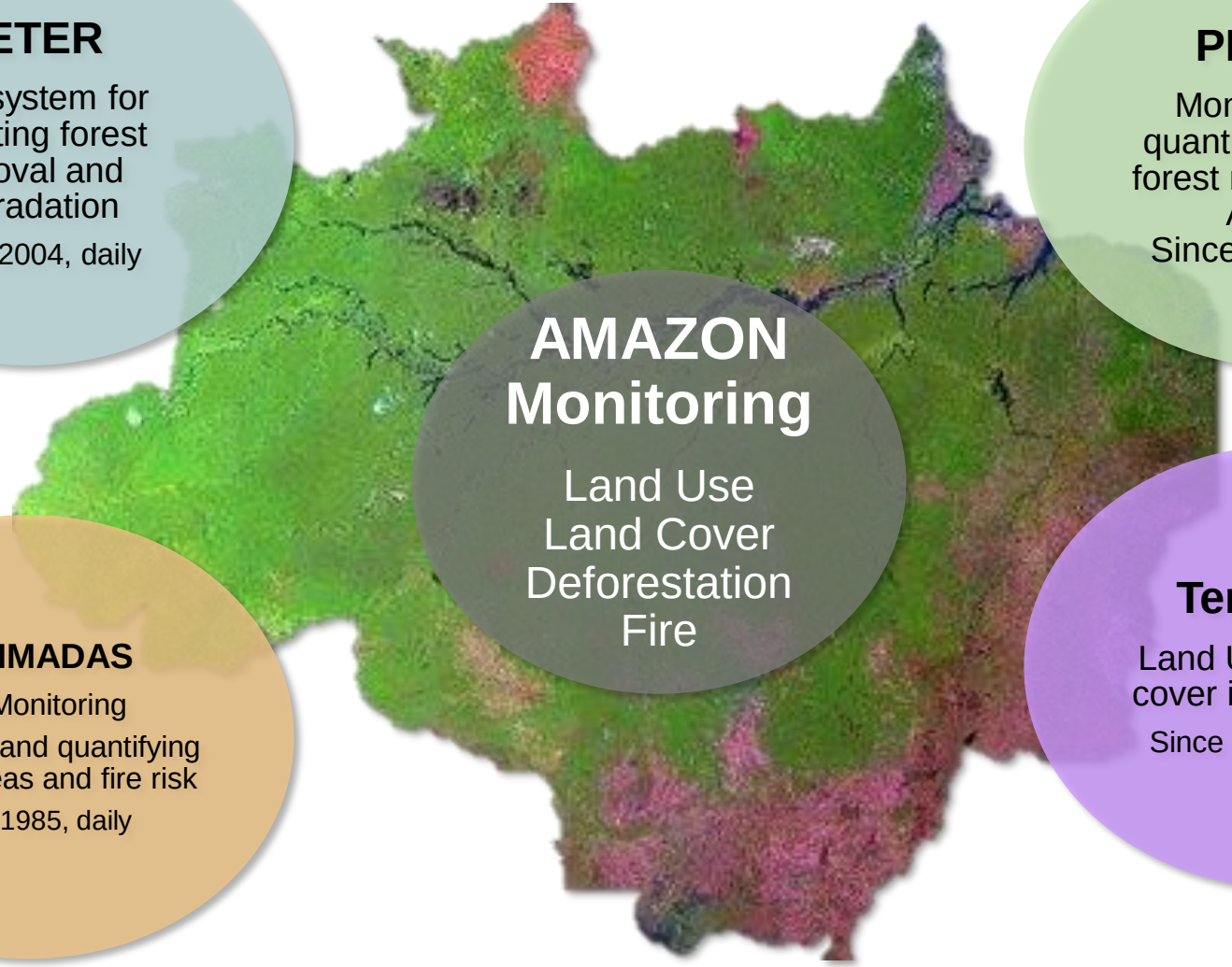
Advances and Perspectives of the Monitoring System of INPE

MINISTÉRIO DA CIÊNCIA, TECNOLOGIA, INOVAÇÕES E COMUNICAÇÕES
INSTITUTO NACIONAL DE PESQUISAS ESPACIAIS

MINISTÉRIO DA CIÊNCIA, TECNOLOGIA, INOVAÇÕES E COMUNICAÇÕES
PÁTRIA AMADA BRASIL GOVERNO FEDERAL

1. Monitoring Projects
    1. PRODES
    2. DETER
    3. TERRACLASS
2. Evolution

Monitoring Projects



DETER

Alert system for detecting forest removal and degradation

Since 2004, daily

PRODES

Monitoring and quantifying primary forest removal in the Amazon

Since 1988, anual

AMAZON Monitoring

Land Use
Land Cover
Deforestation
Fire

QUEIMADAS

Fire Monitoring

Identifying and quantifying burned areas and fire risk

Since 1985, daily

TerraClass

Land Use and Land cover in the Amazon

Since 1991, >2 years

Guide

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PRODES Project

Starting dry season
(~july)

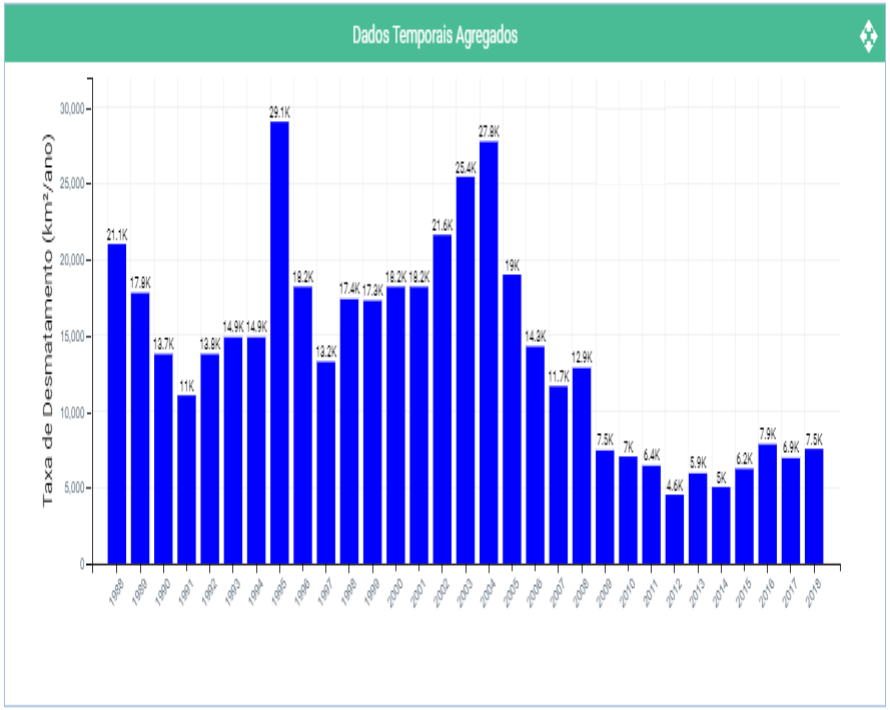
Ending dry season
(~september to november)

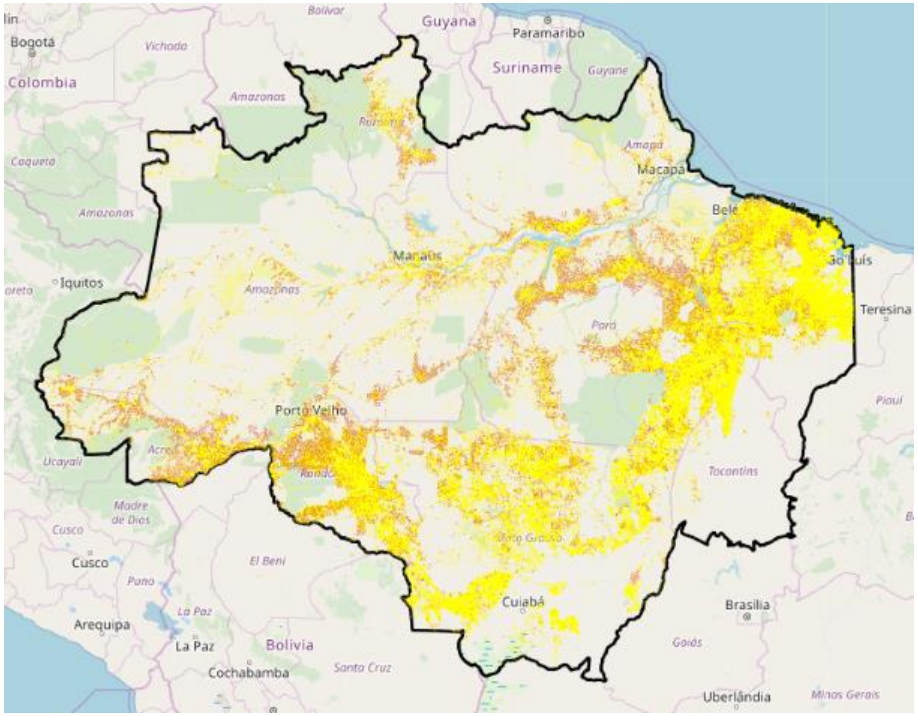
annual increase of deforestation
medium resolution (Landsat class ~ 20-30 m)
minimum mapping unit 6.25 ha

Visual interpretation
Team with extensive experience

Clear-cut deforestation
until 2019 ≅ 796.000 km² (19,9%)

http://terrabrasilis.dpi.inpe.br





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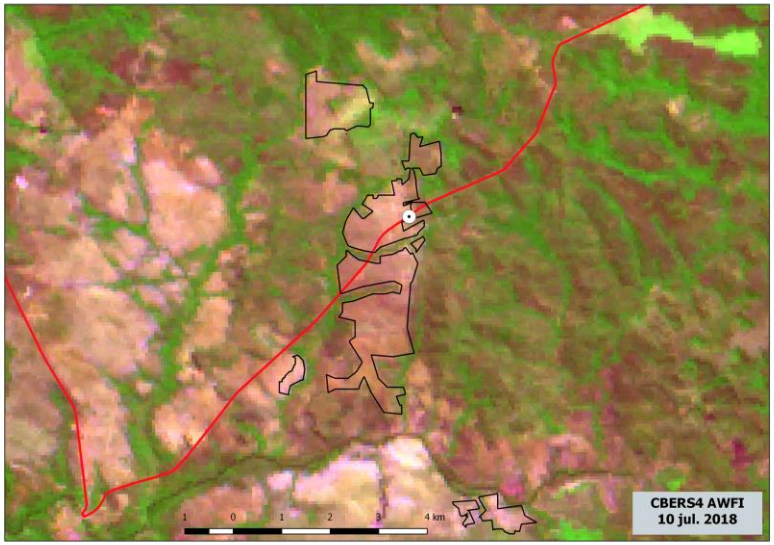
DETER Project

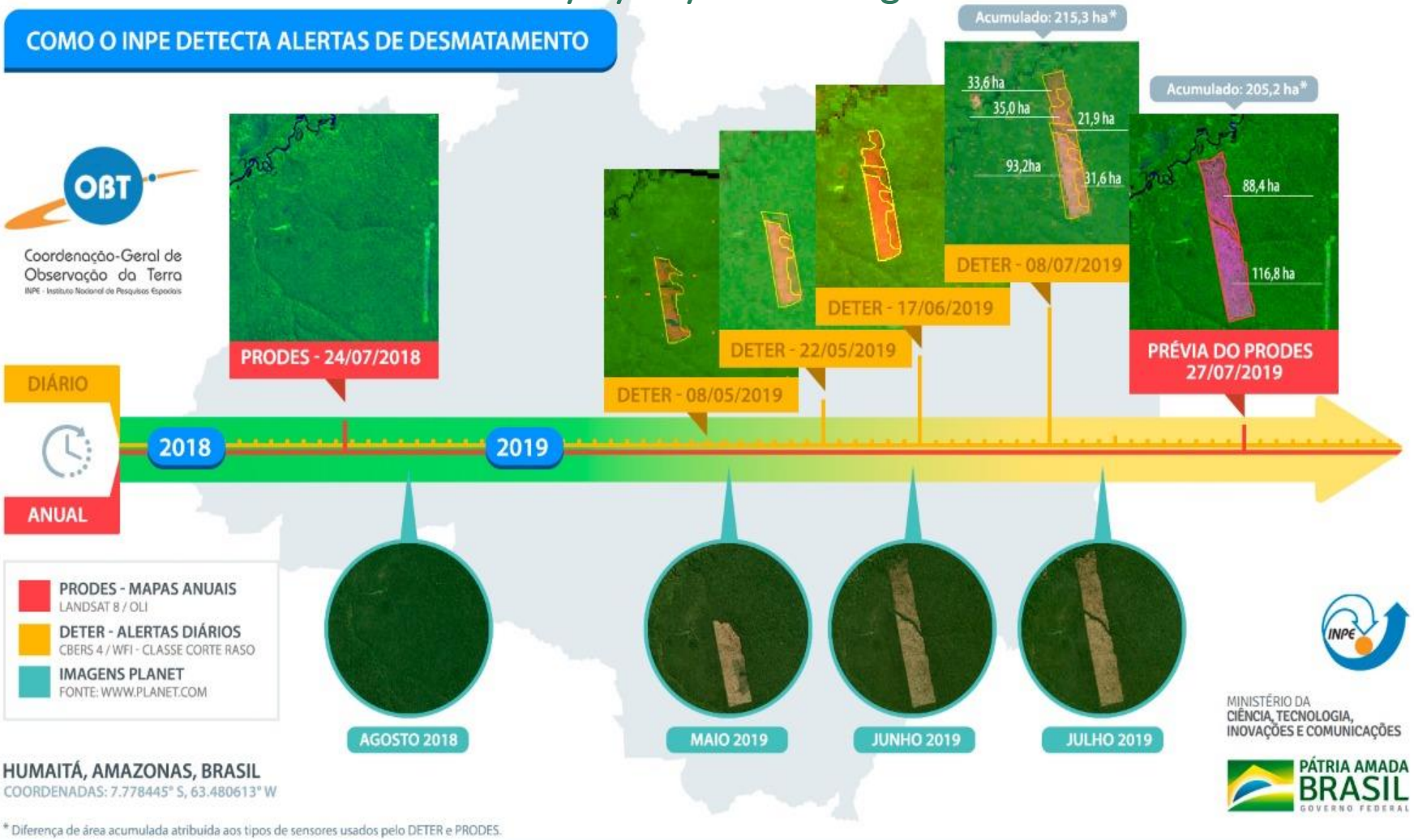
daily increase of deforestation
low resolution (~ 60 m)
minimum mapping unit 3 ha

Visual interpretation
Team with extensive experience



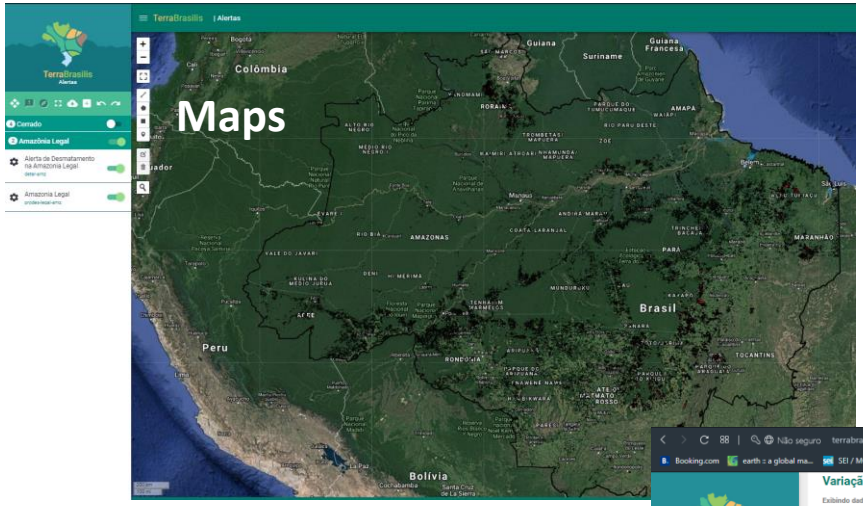
DETER Project

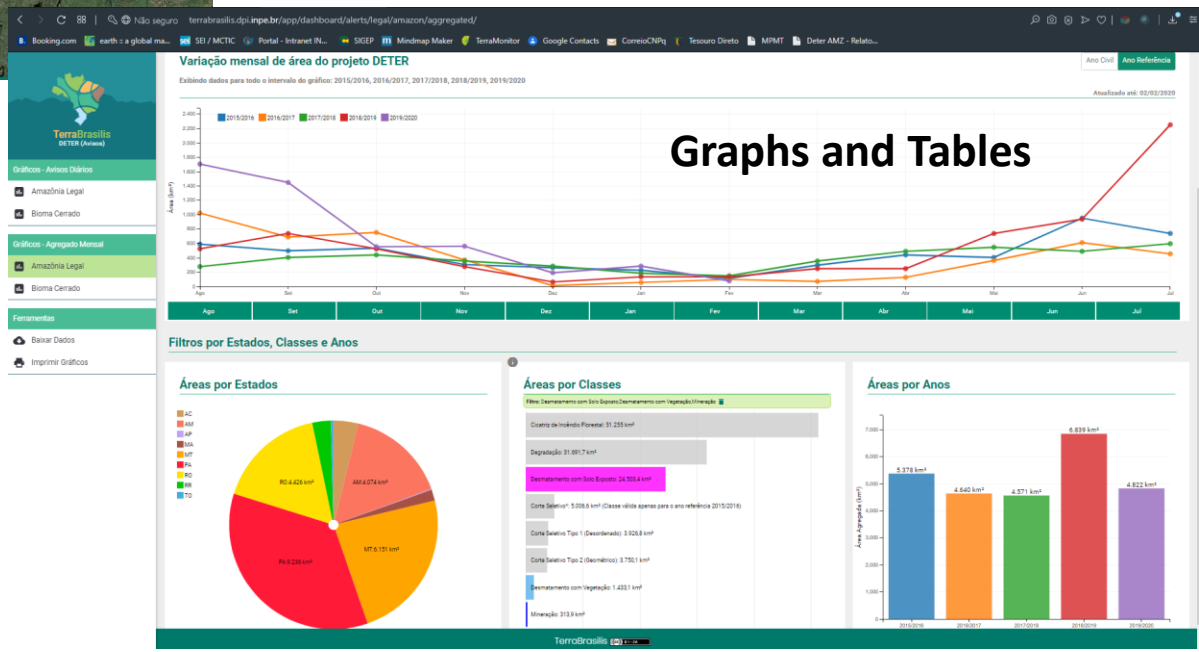
Day by day monitoring



DETER Project

Data dissemination





http://terrabrasilis.dpi.inpe.br

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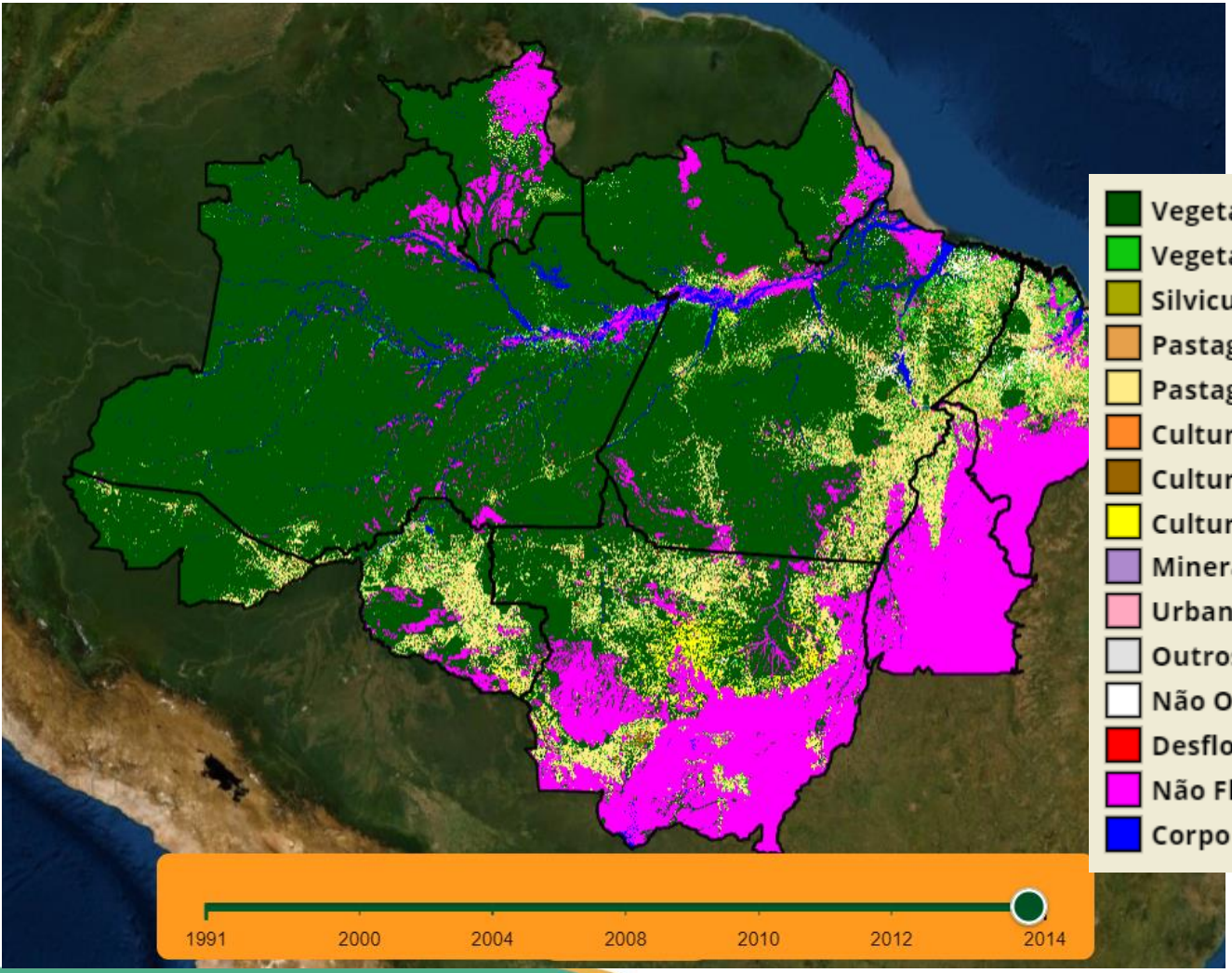
TerraClass Project (INPE + EMBRAPA)

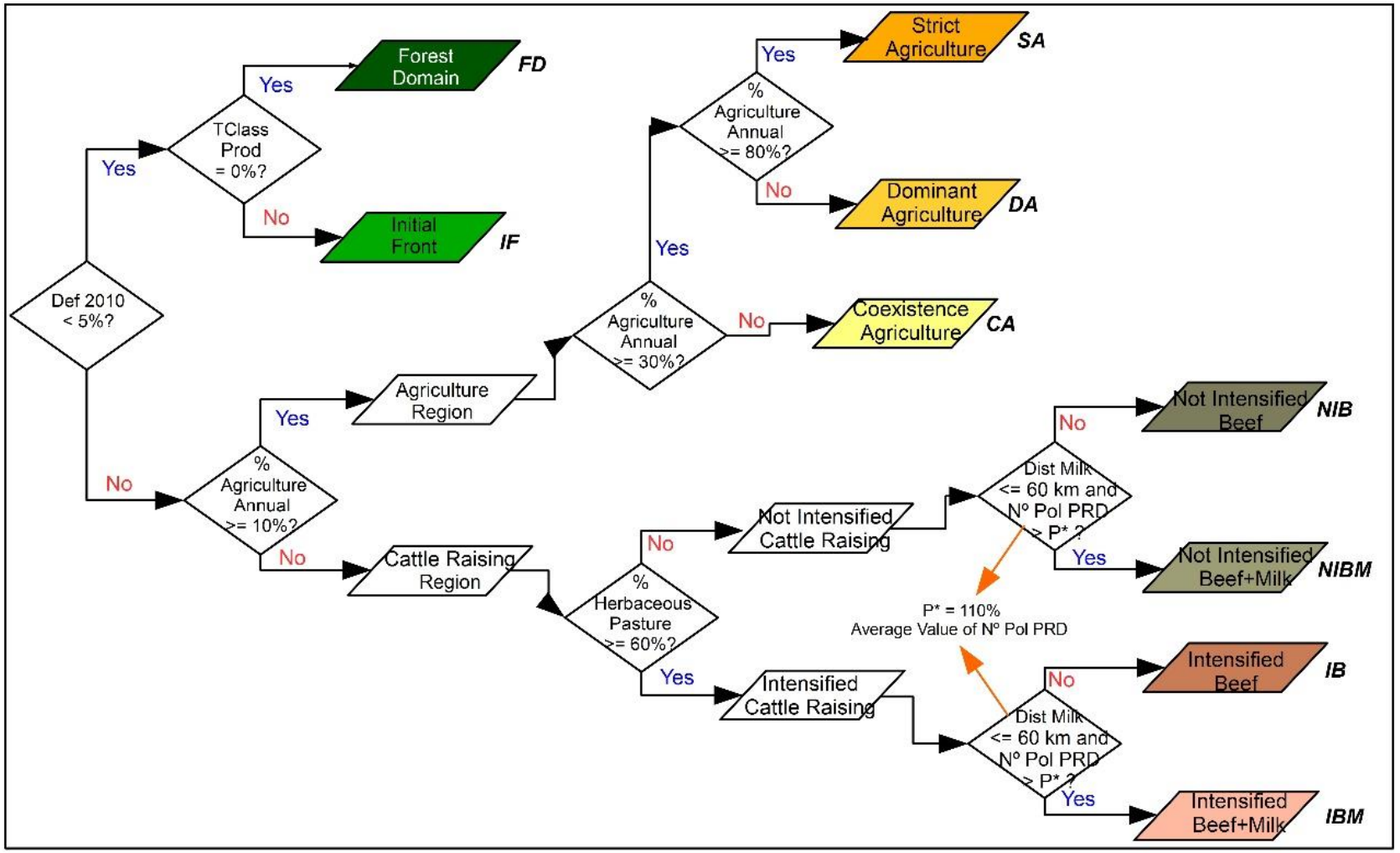
Land Use and Land Cover in Amazon



www.terraclass.gov.br

- Vegetação Natural Florestal Primária
- Vegetação Natural Florestal Secundária 24,0%
- Silvicultura 0,4%
- Pastagem Cultivada Arbustiva 13,7%
- Pastagem Cultivada Herbácea 49,6%
- Cultura Agrícola Perene 0,2%
- Cultura Agrícola Semiperene 0,3%
- Cultura Agrícola Temporária 5,6%
- Mineração 0,2%
- Urbanizada 0,7%
- Outros 0,9%
- Não Observado 3,9%
- Desflorestamento No Ano 0,6%
- Não Floresta
- Corpo D'água

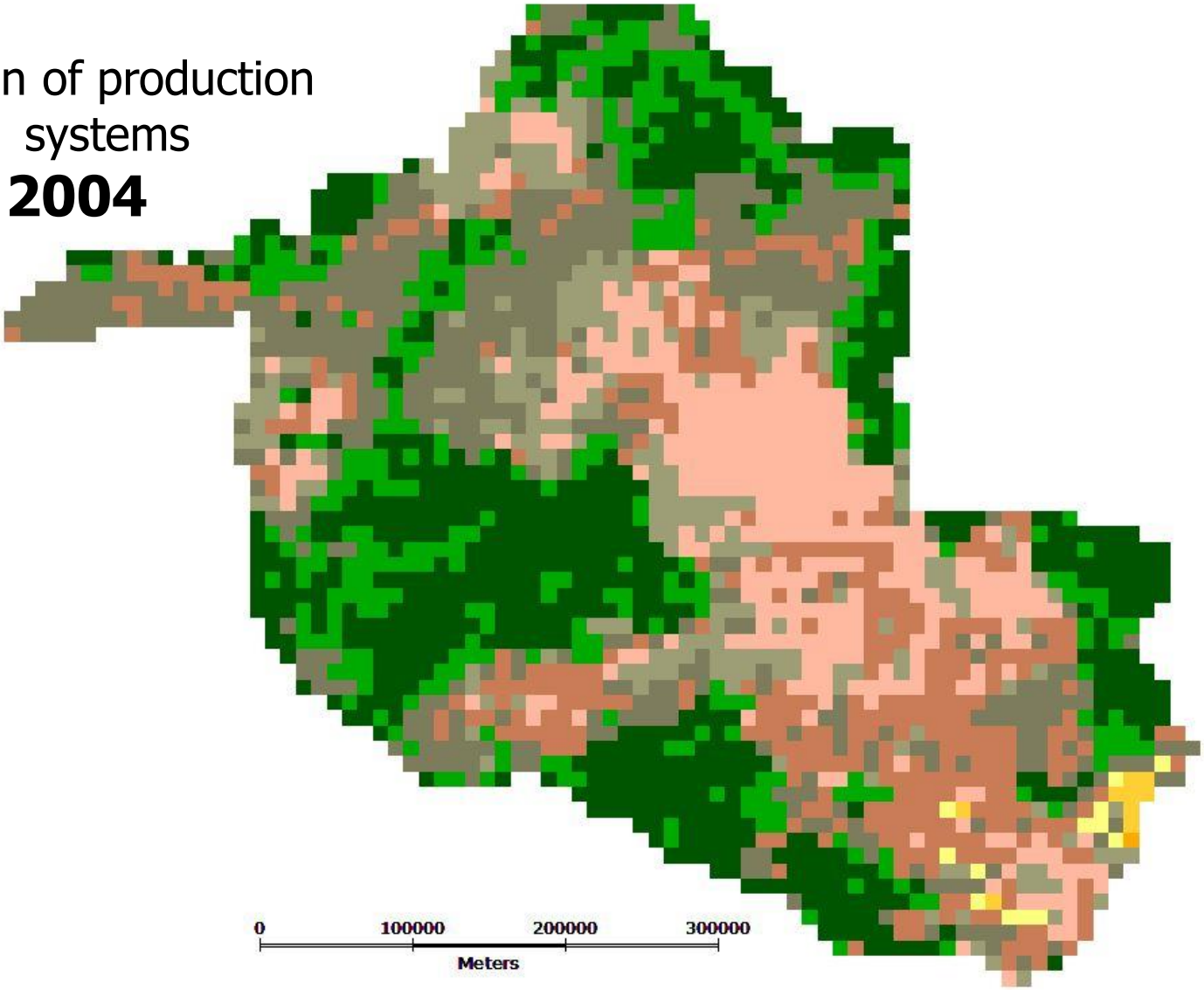
Landscape Analysis
classification at cell scale



TerraClass Project (INPE + EMBRAPA)

Evolution of production systems

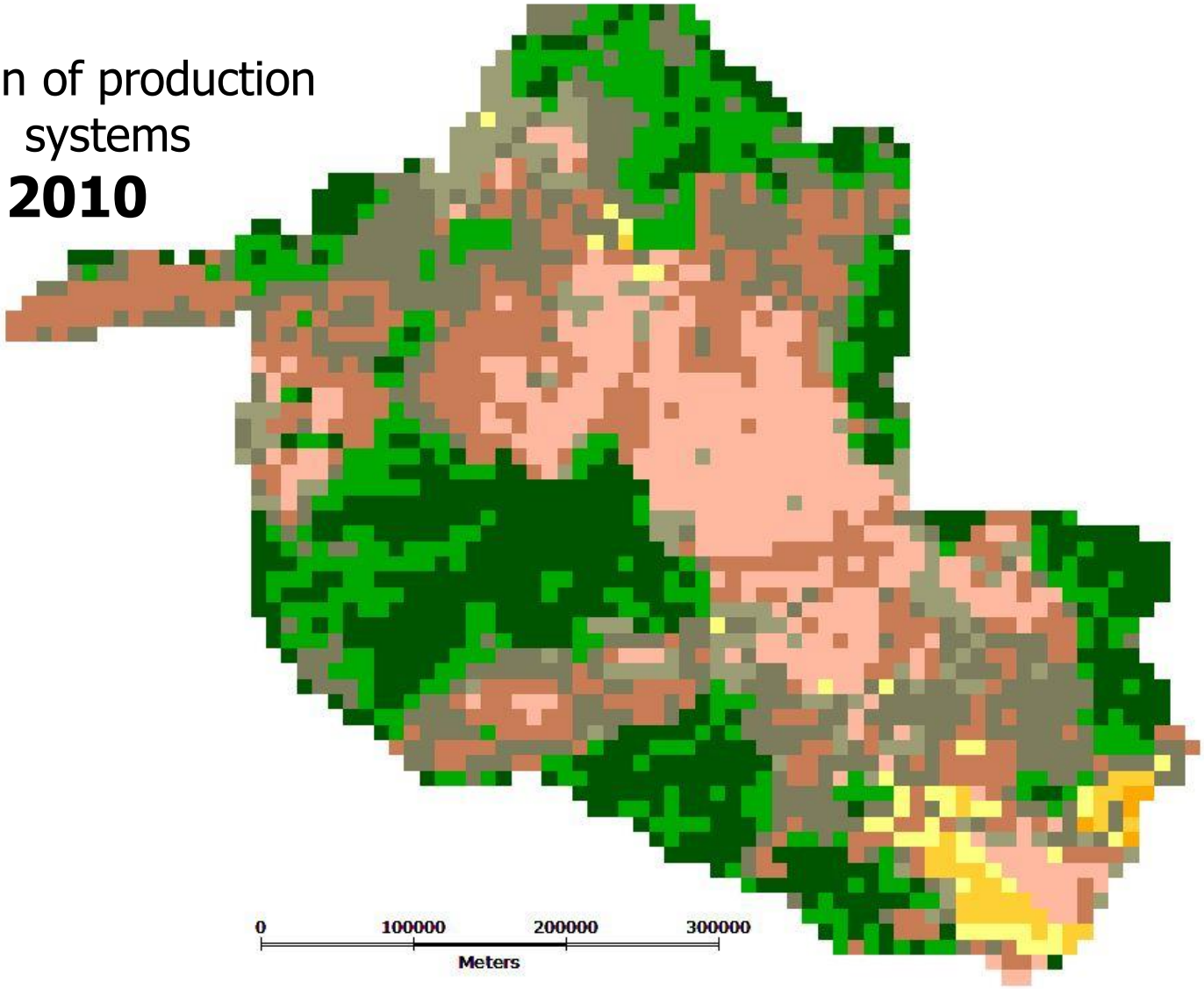
2004



TerraClass Project (INPE + EMBRAPA)

Evolution of production systems

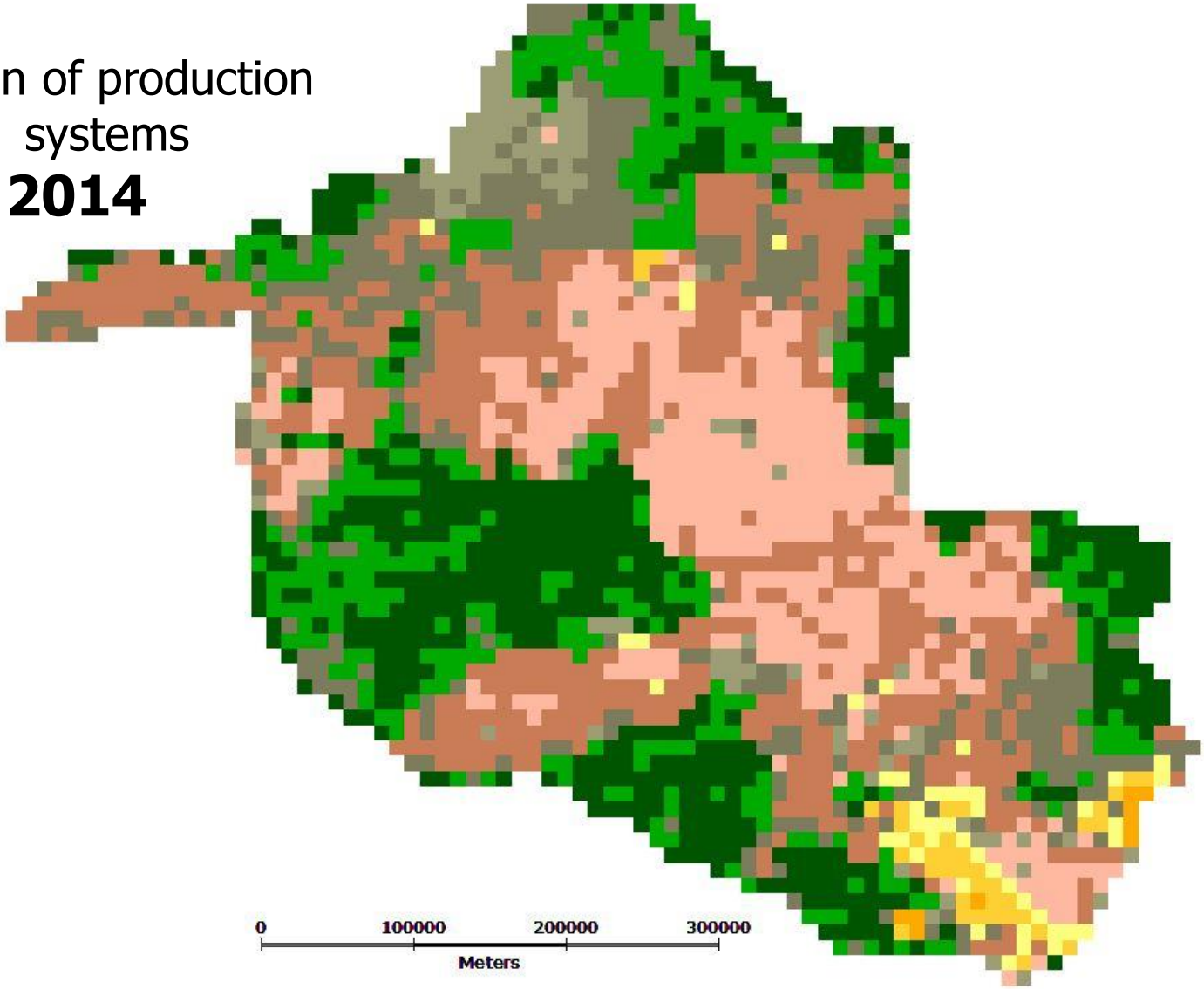
2010



TerraClass Project (INPE + EMBRAPA)

Evolution of production systems

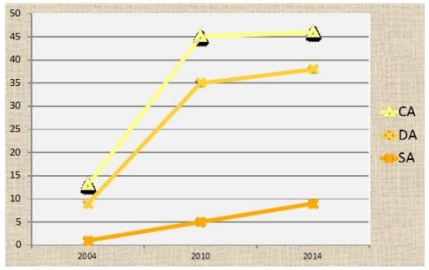
2014

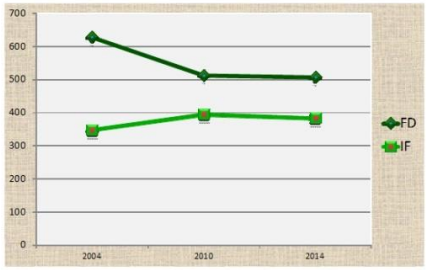


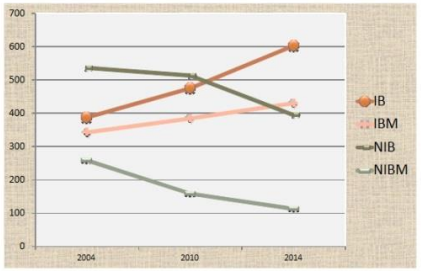
TerraClass Project (INPE + EMBRAPA)

Evolution of production systems **2004 - 2014**

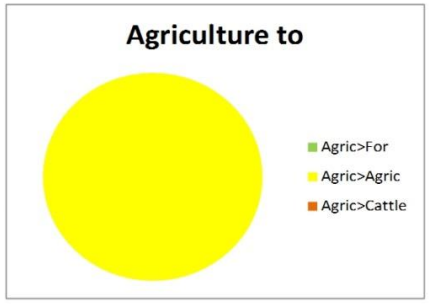
2004 - 2014

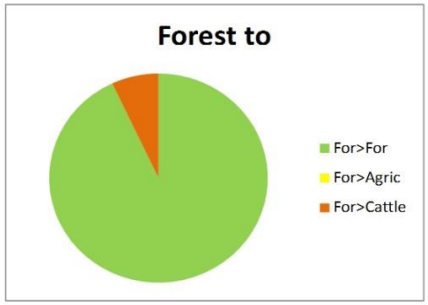


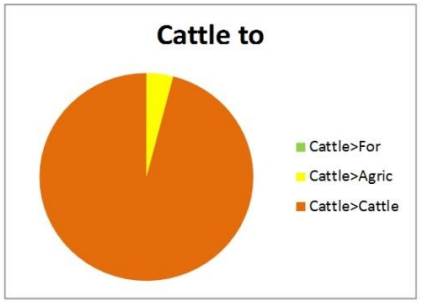




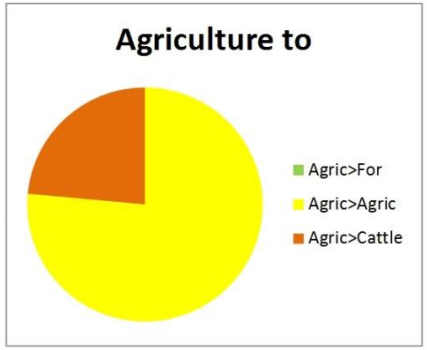
2004 - 2010

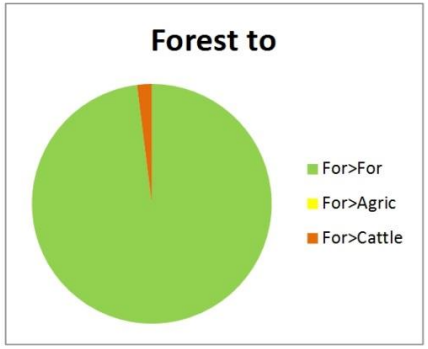


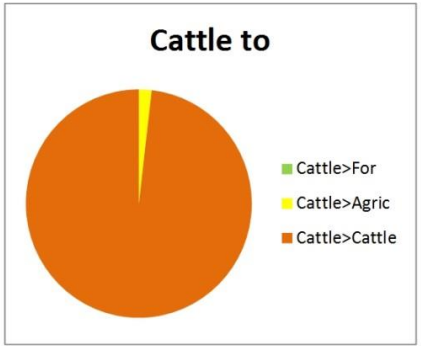




2010 - 2014

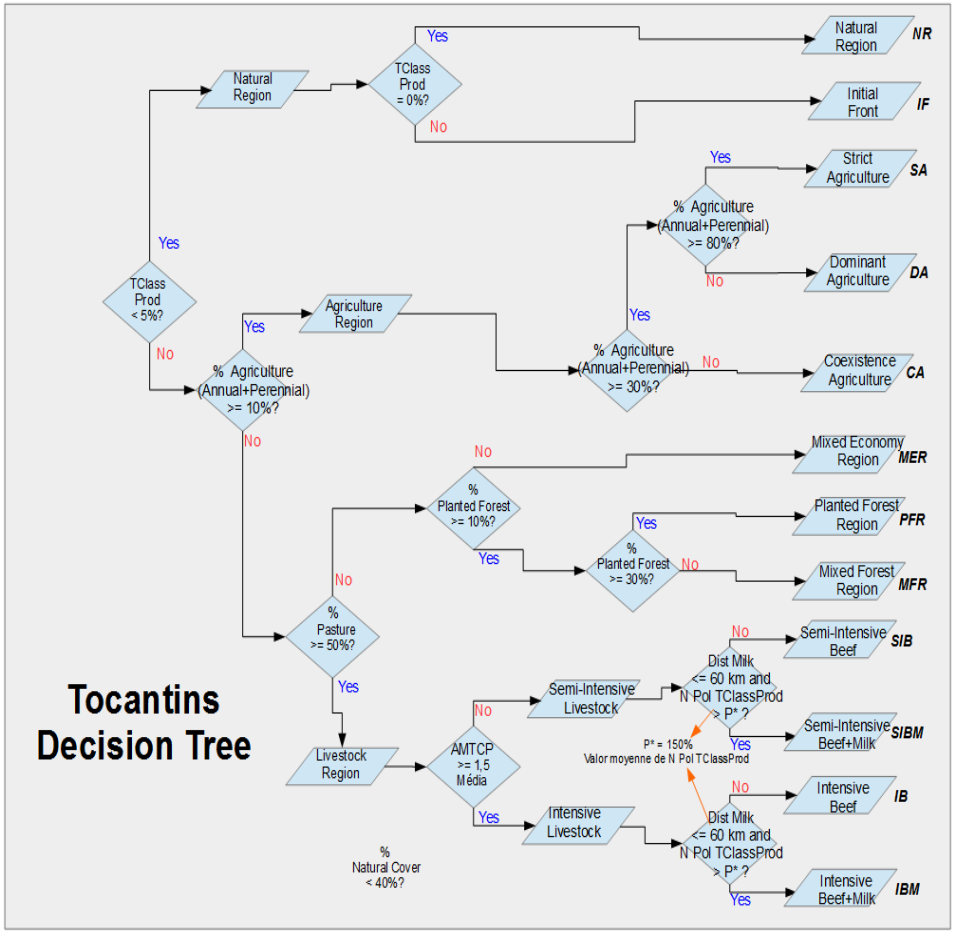


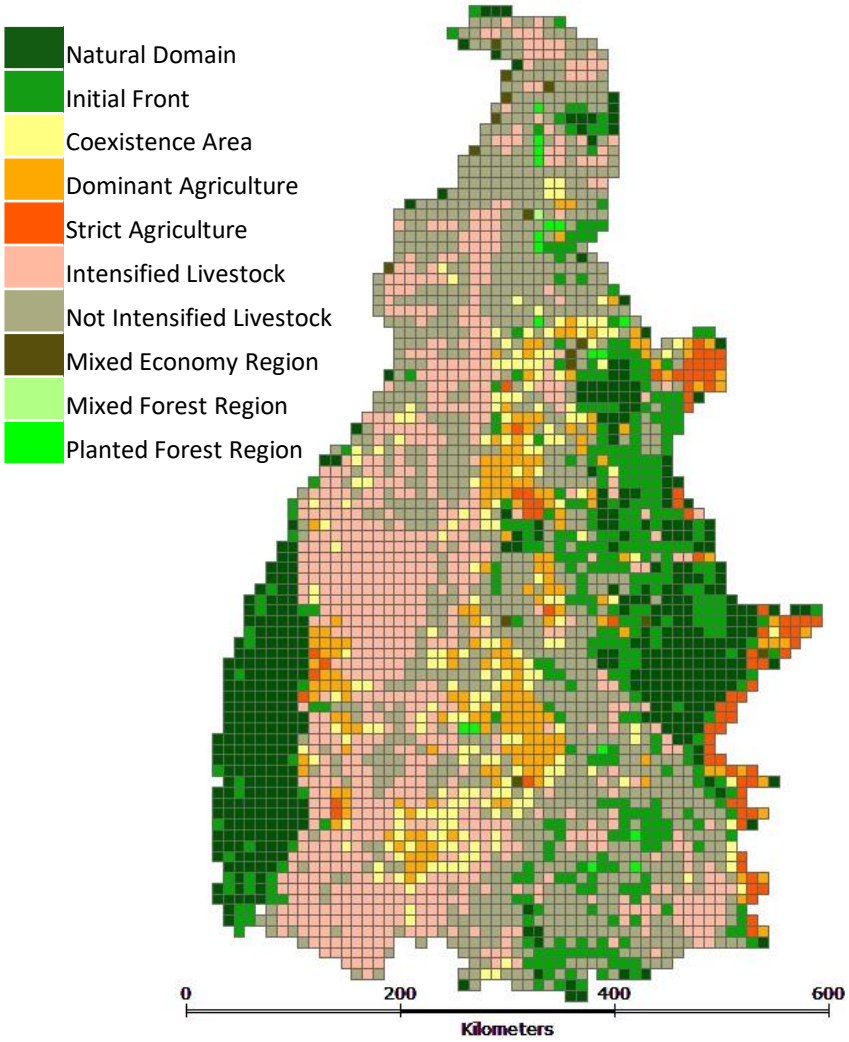




TerraClass Project (INPE + EMBRAPA)

Adapting Decision Tree Tocantins





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Images

coordinates 3.9106, -51.9559 (Lat, Long) during december/2019

Image	Data do imageamento						
Cbers-4 - MUX	6						
Cbers-4 - WFI	3	12	15	18	23	26	29
Landsat-8 - OLI	1	17					
Sentinel-2 - MSI	5	10	15	20	25	30	

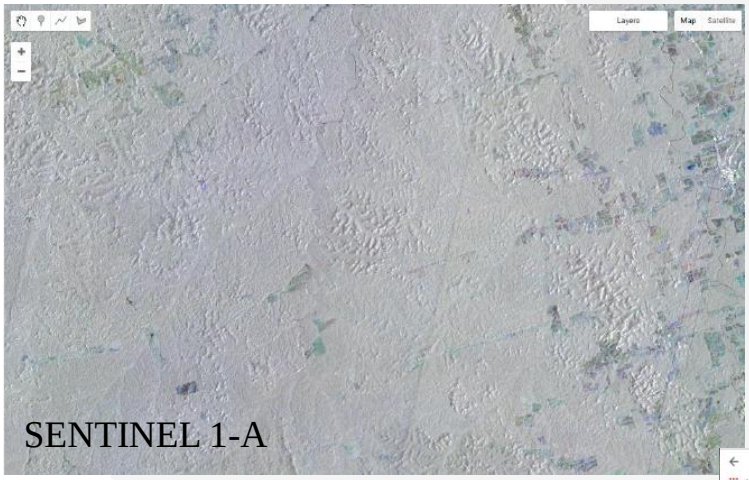
+

CBERS-4A

AMAZÔNIA-1

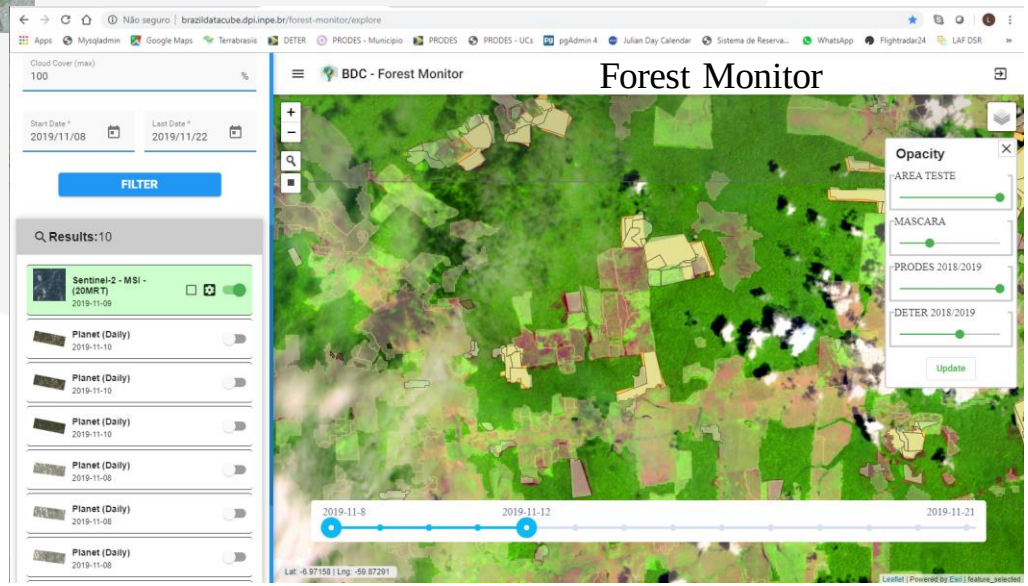
Evolution

methodologies



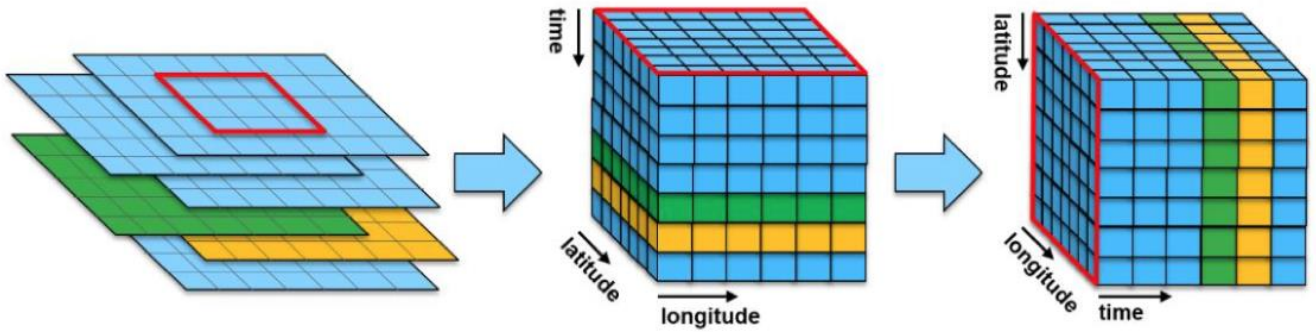
Cor	Sequencia	Interpretação
Azul		Aumento T3
Verde		Aumento T2, queda T3
Vermelho		Queda T2
Amarelo		Queda T3
Magenta		Queda T2, volta T3
Ciano		Aumento T2
Preto		Sem sinal
Branco		Sem variação
Cinza		Sem variação

	Forest Monitor		Deter	
mês	# polígonos	área km2	# polígonos	área km2
nov/19	852	203.5	277	36.6
dez/19	252	12.2	81	11.6
Total	1104	215.7	358	48.3

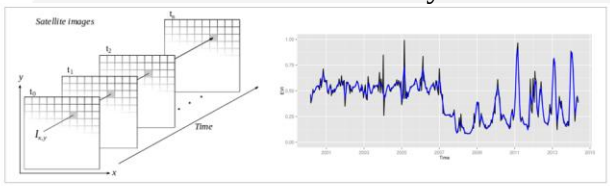


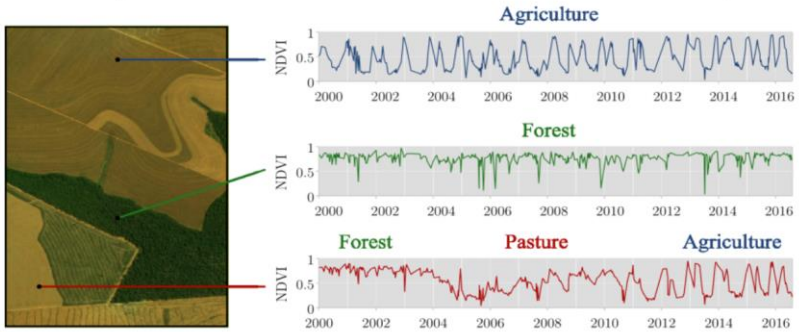
Technology

Brazilian Data cube

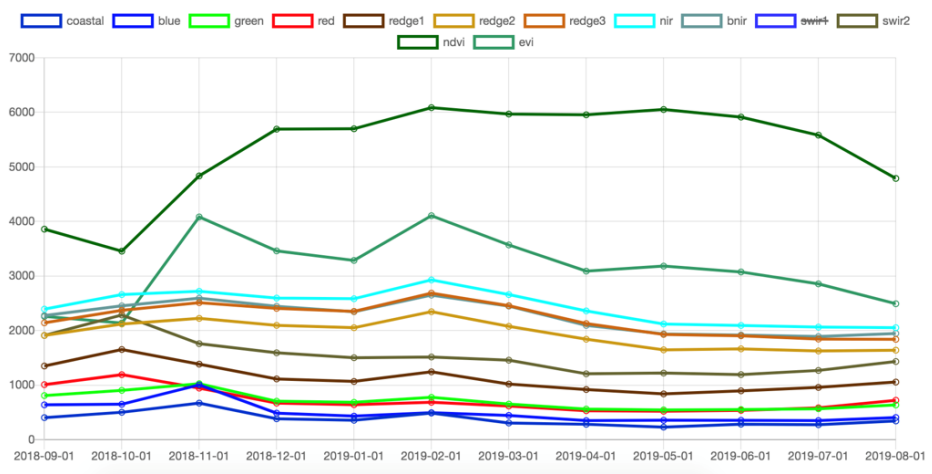


Time series analysis





Big Data

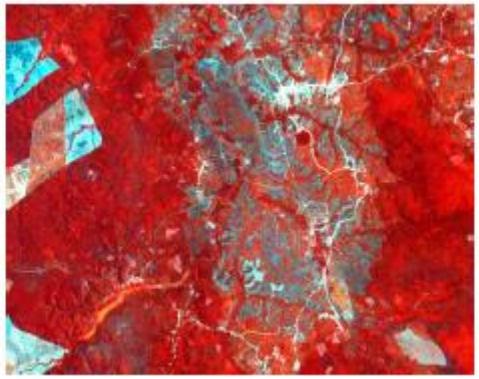


Technology

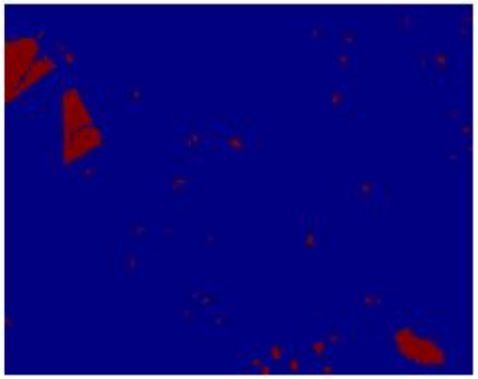
deep learning techniques

Evaluation of Deep Learning techniques for deforestation detection in the Brazilian Amazon and Cerrado biomes from remote sensing imagery

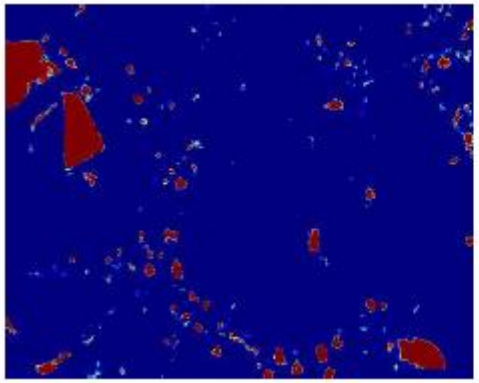
T1 - 2017



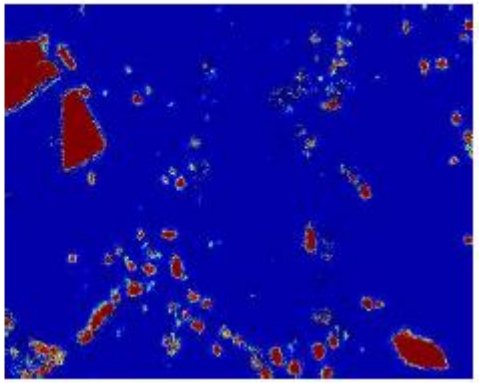
T2 - 2018



Reference



Siamese Network



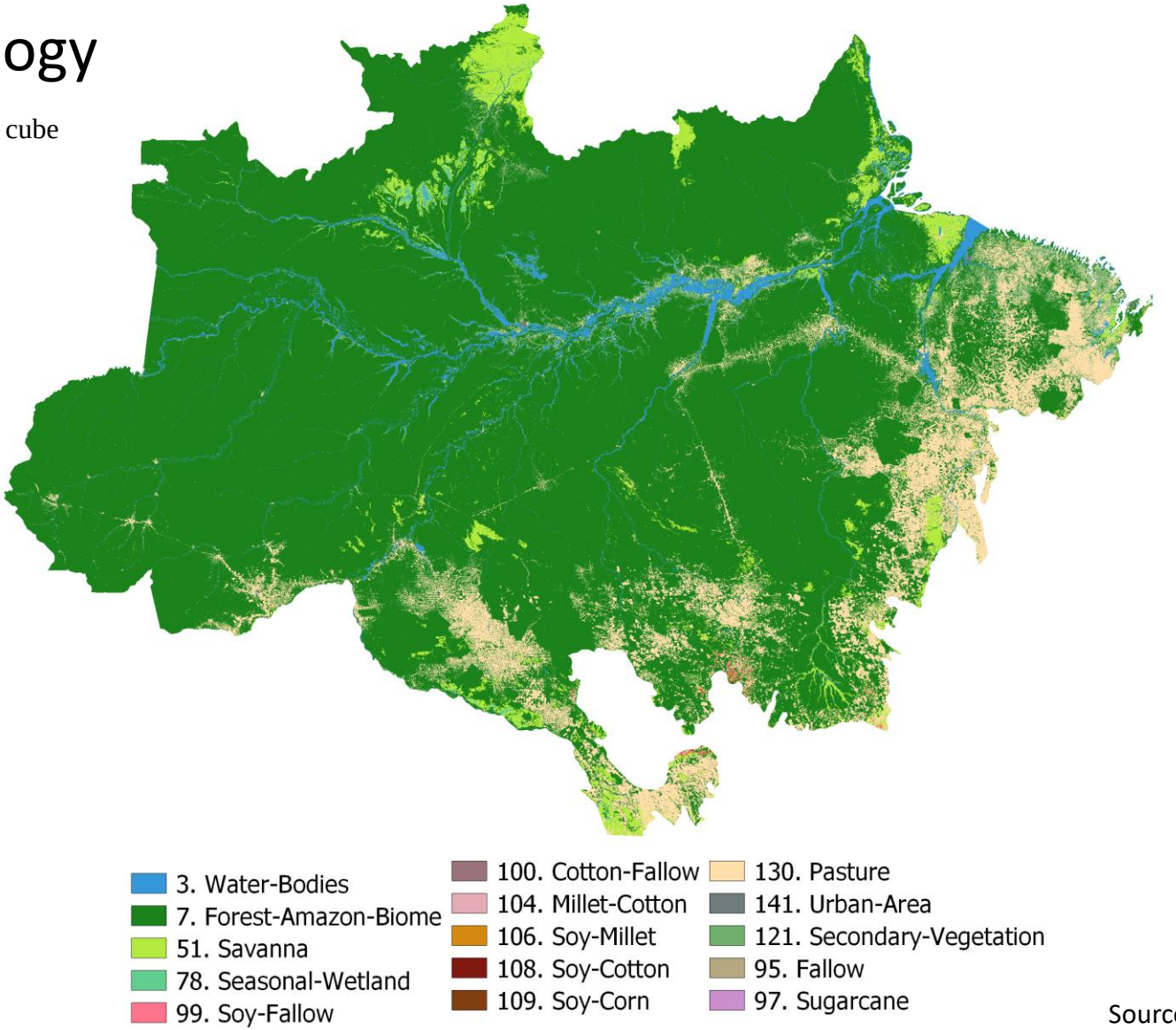
Convolutional SVM

Source: Ortega et al. (2020)

Technology

Brazilian Data cube

2001

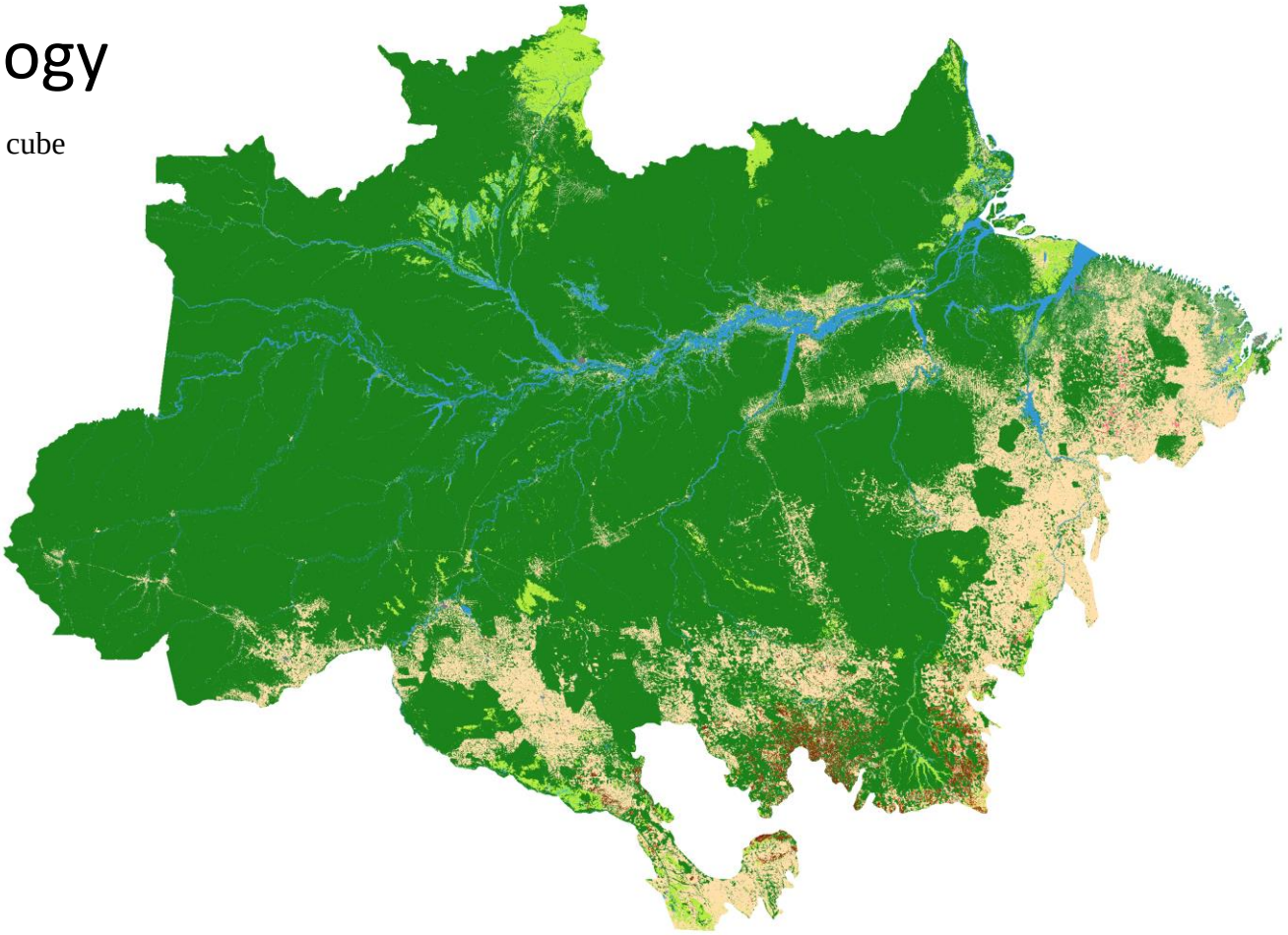


Source: Camara et al. (2020) and Simoes et al. (2020b)

Technology

Brazilian Data cube

2018



3. Water-Bodies
7. Forest-Amazon-Biome
51. Savanna
78. Seasonal-Wetland
99. Soy-Fallow
100. Cotton-Fallow
104. Millet-Cotton
106. Soy-Millet
108. Soy-Cotton
109. Soy-Corn
130. Pasture
141. Urban-Area
121. Secondary-Vegetation
95. Fallow
97. Sugarcane

K-fold = 0,96

Source: Camara et al. (2020) and Simoes et al. (2020b)


Thank you for your attention!
Questions? Remarks?