MINISTÉRIO DA CIÊNCIA, TECNOLOGIA E INOVAÇÃO
INSTITUTO NACIONAL DE PESQUISAS ESPACIAIS

Tools and techniques for outreach and popular engagement in eScience

Rafael Santos

Microsoft eScience Workshop 2012

Actually..

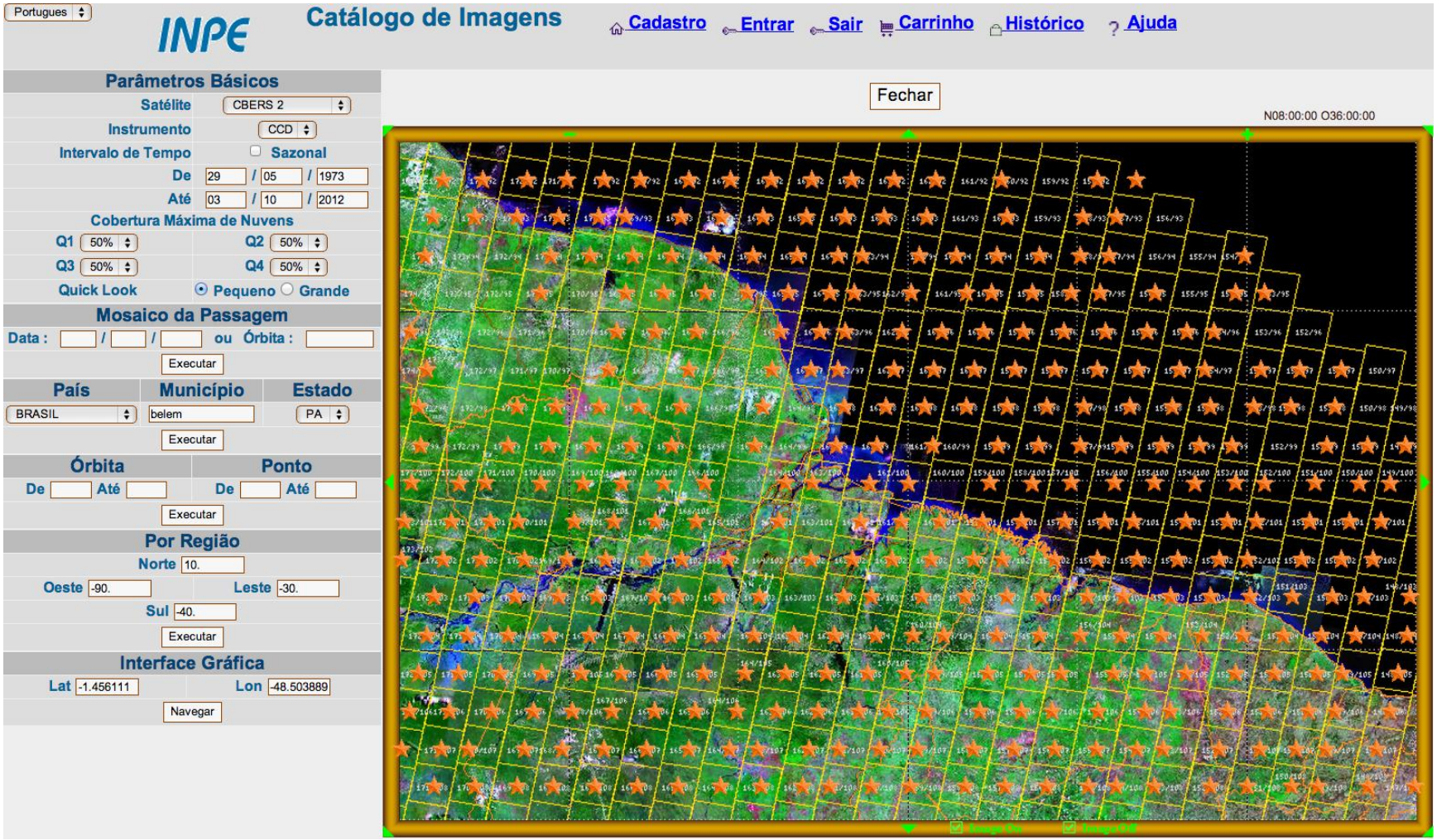
- INPE's ongoing projects related with citizen science, outreach and lots of data.
- Some additional possibilities.
- Cooperation with Johns Hopkins University.
- A wish list.

We have lots of data!

About INPE

- Brazilian National Institute for Space Research.
- Mission: foster science and technology in earth and space context.
- Offer products and regular services in benefit of the country.
- Several activities related to collection, processing and distribution of environmental data.

Data at INPE


Portugues
INPE
Catálogo de Imagens
Cadastro
Entrar
Sair
Carrinho
Histórico
Ajuda
Parâmetros Básicos
Satélite
CBERS 2
Instrumento
CCD
Intervalo de Tempo
Sazonal
De
29 / 05 / 1973
Até
03 / 10 / 2012
Cobertura Máxima de Nuvens
Q1 50%
Q2 50%
Q3 50%
Q4 50%
Quick Look
Pequeno
Grande
Mosaico da Passagem
Data :
ou Órbita :
Executar
País
Município
Estado
BRASIL
belem
PA
Executar
Órbita
Ponto
De
Até
De
Até
Executar
Por Região
Norte 10.
Oeste -90.
Leste -30.
Sul -40.
Executar
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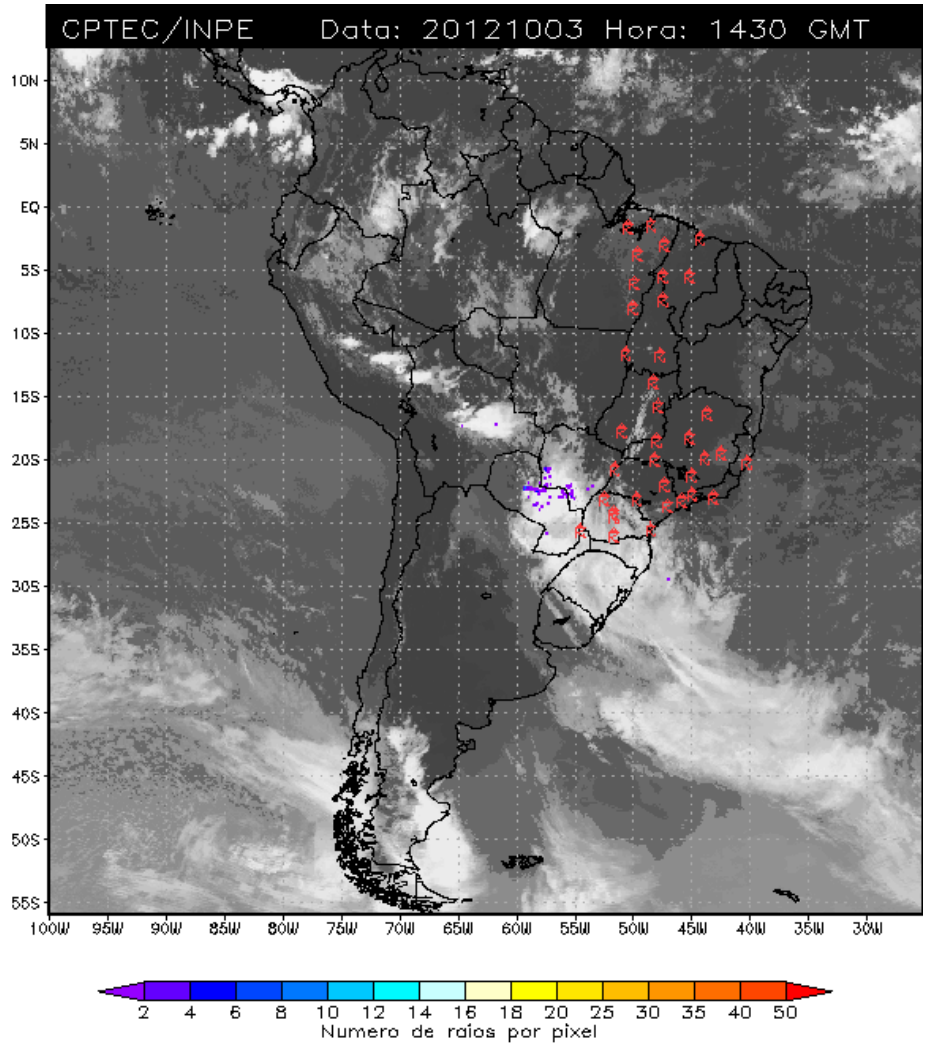
Lon -48.503889
Navegar
Fechar
N08:00:00 O36:00:00

Data at INPE


CPTEC/INPE Data: 20121003 Hora: 1430 GMT
10N
5N
EQ
5S
10S
15S
20S
25S
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35S
40S
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50S
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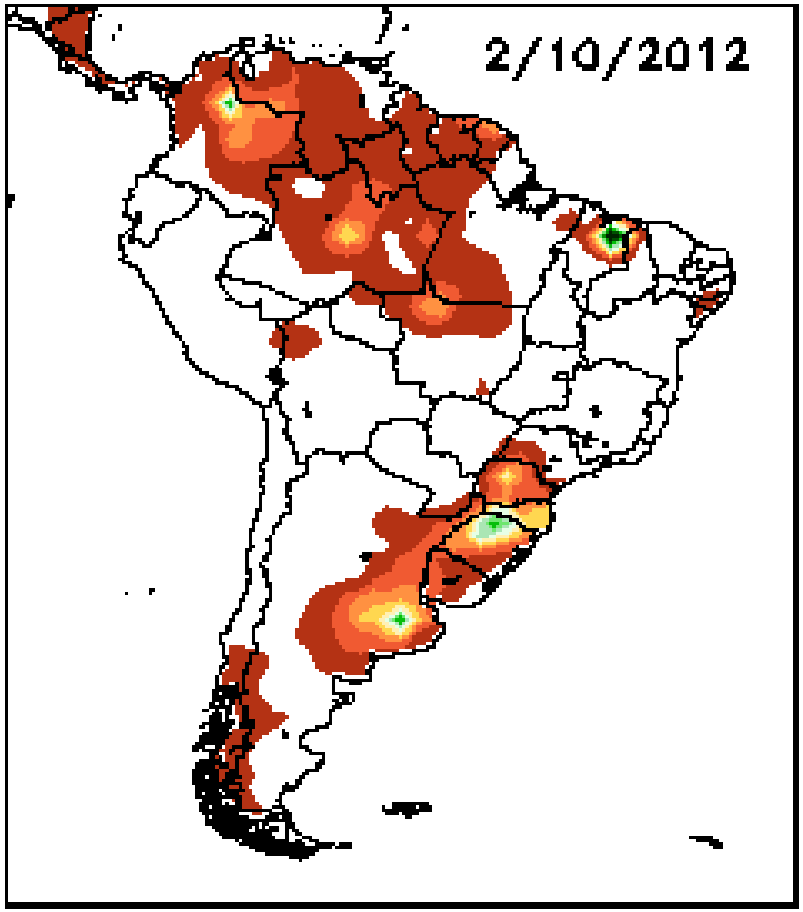
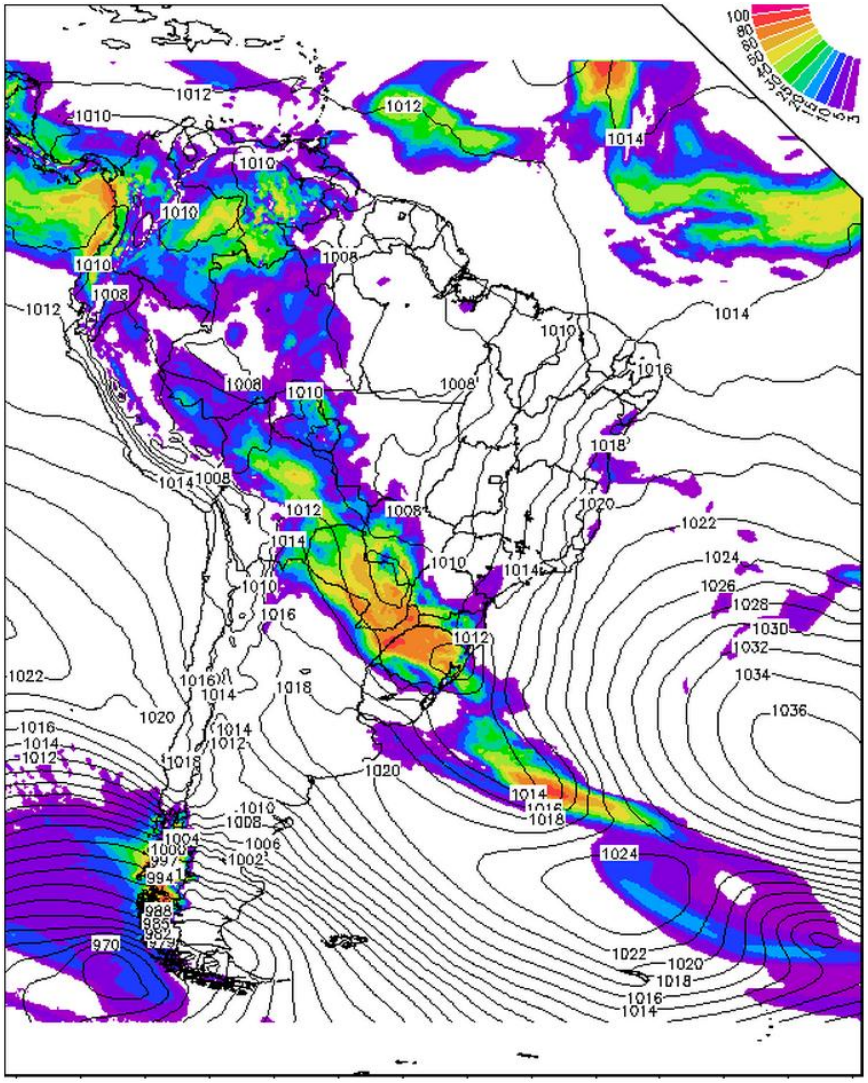
2 4 6 8 10 12 14 16 18 20 25 30 35 40 50
Numero de raios por pixel


2/10/2012

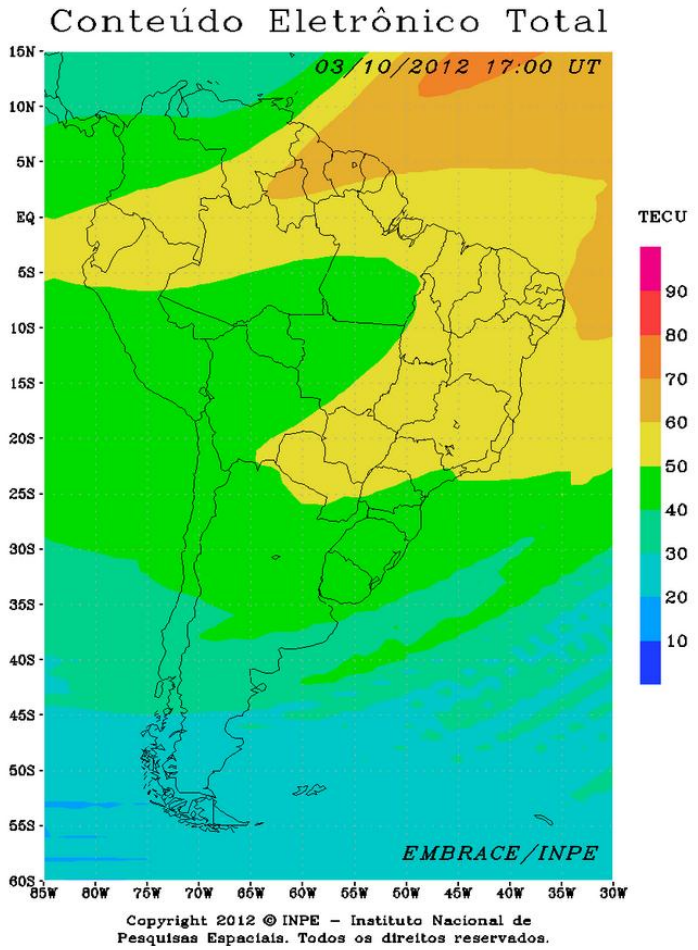
Data at INPE

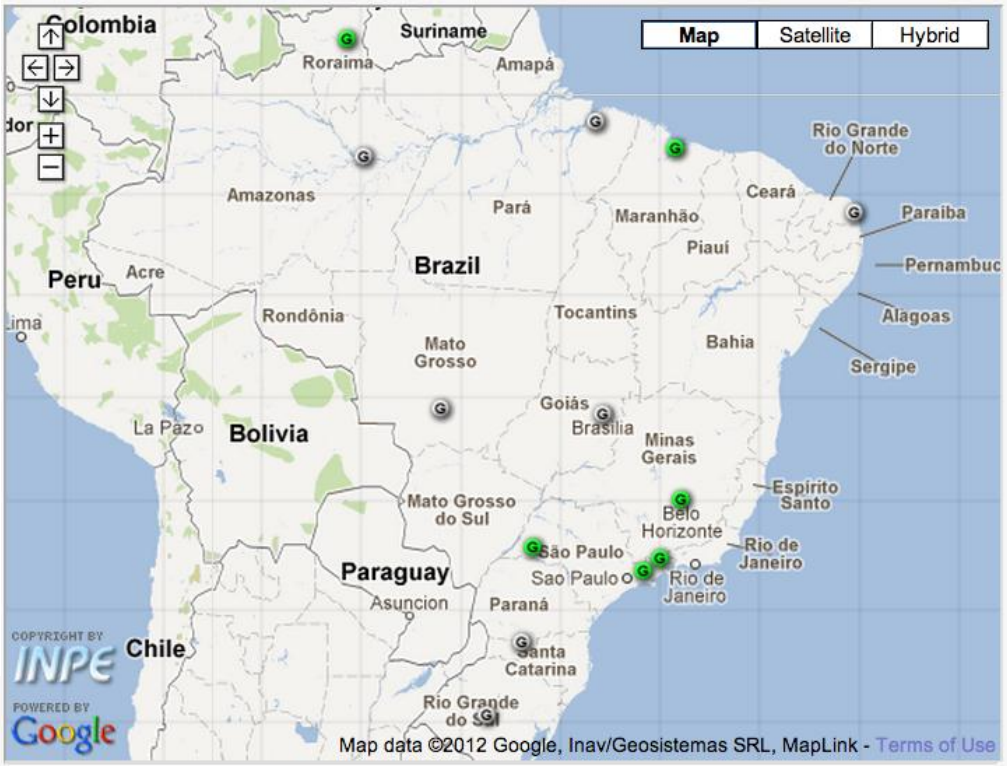



Máximas - Quarta
CPTEC/INPE
03/10/2012
°C


Previsão para 03/10/2012
www.cptec.inpe.br

Data at INPE


Conteúdo Eletrônico Total
03/10/2012 17:00 UT
TECU
90
80
70
60
50
40
30
20
10
EMBRACE/INPE
Copyright 2012 © INPE – Instituto Nacional de Pesquisas Espaciais. Todos os direitos reservados.


Map
Satellite
Hybrid
Colombia
Suriname
Roraima
Amapá
Rio Grande do Norte
Amazonas
Pará
Ceará
Maranhão
Paraiba
Piauí
Brazil
Peru
Acre
Pernambuc
Rondônia
Tocantins
Alagoas
Bahia
Mato Grosso
Sergipe
Goiás
Brasília
La Paz
Bolivia
Minas Gerais
Espirito Santo
Mato Grosso do Sul
Belo Horizonte
São Paulo
Rio de Janeiro
Paraguay
Sao Paulo
Asuncion
Paraná
Chile
Santa Catarina
Rio Grande do S
COPYRIGHT BY INPE
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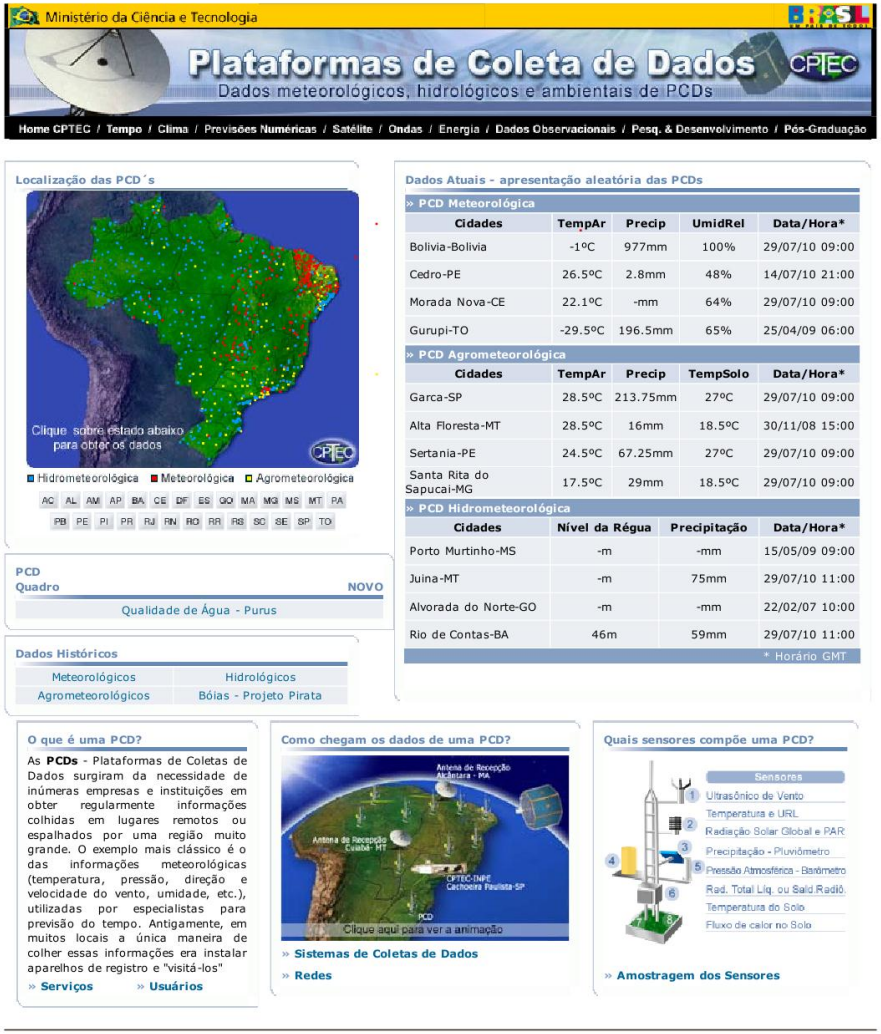
Data at INPE

- Most of the data is public.
- Available through web sites related to the activities of the institute/centers.
  - Web sites designed to *show* the information (human consumption).

Data at INPE

- What about the raw data?
- How can we allow non-scientists access and tools to play with this data?
  - How can we know what they want?

Case Study: CPTEC/PCDs



DataHora	Pluvio	PressaoAtm
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2010-06-20 15:00:00.0	0.25	
2010-06-20 12:00:00.0	0.25	
2010-06-20 09:00:00.0	0.25	
2010-06-20 06:00:00.0	0.25	
2010-06-20 03:00:00.0	0.25	
2010-06-20 00:00:00.0	0.25	
2010-06-19 21:00:00.0	0.25	
2010-06-19 18:00:00.0	0.25	
2010-06-19 15:00:00.0	0.25	
2010-06-19 12:00:00.0	0.25	
2010-06-19 09:00:00.0	0.25	
2010-06-19 06:00:00.0	0.25	
2010-06-19 03:00:00.0	0.25	
2010-06-19 00:00:00.0	0.25	
2010-06-18 21:00:00.0	0.25	
2010-06-18 18:00:00.0	0.25	
2010-06-18 15:00:00.0	0.25	
2010-06-18 12:00:00.0	0.25	
2010-06-18 09:00:00.0	0.25	
2010-06-18 06:00:00.0	0.25	
2010-06-18 03:00:00.0	0.25	
2010-06-18 00:00:00.0	0.25	
2010-06-17 21:00:00.0	0.25	
2010-06-17 18:00:00.0	386.25	
2010-06-17 15:00:00.0	256.0	
2010-06-17 12:00:00.0	288.5	
2010-06-17 09:00:00.0		
2010-06-17 06:00:00.0	0.25	
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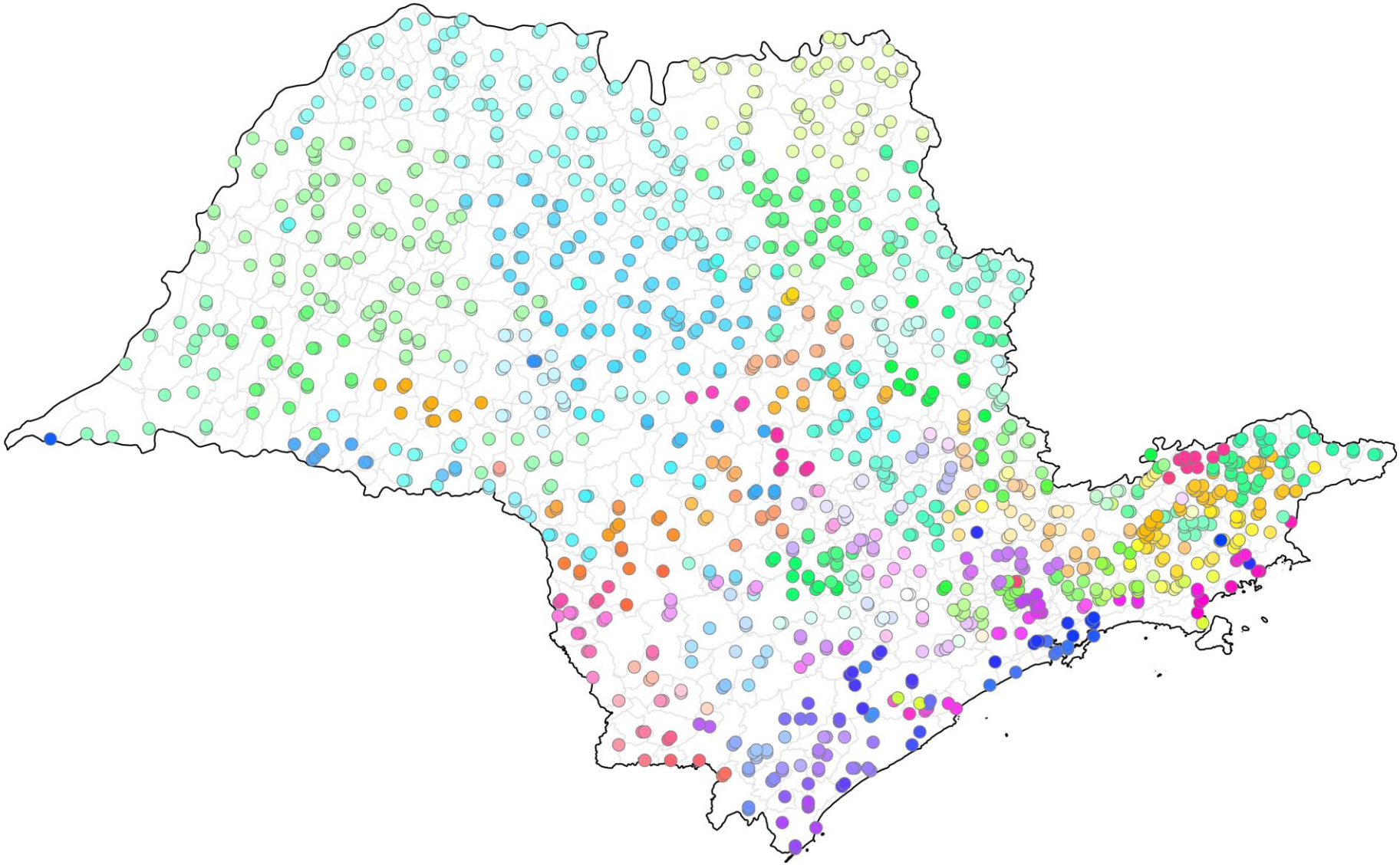
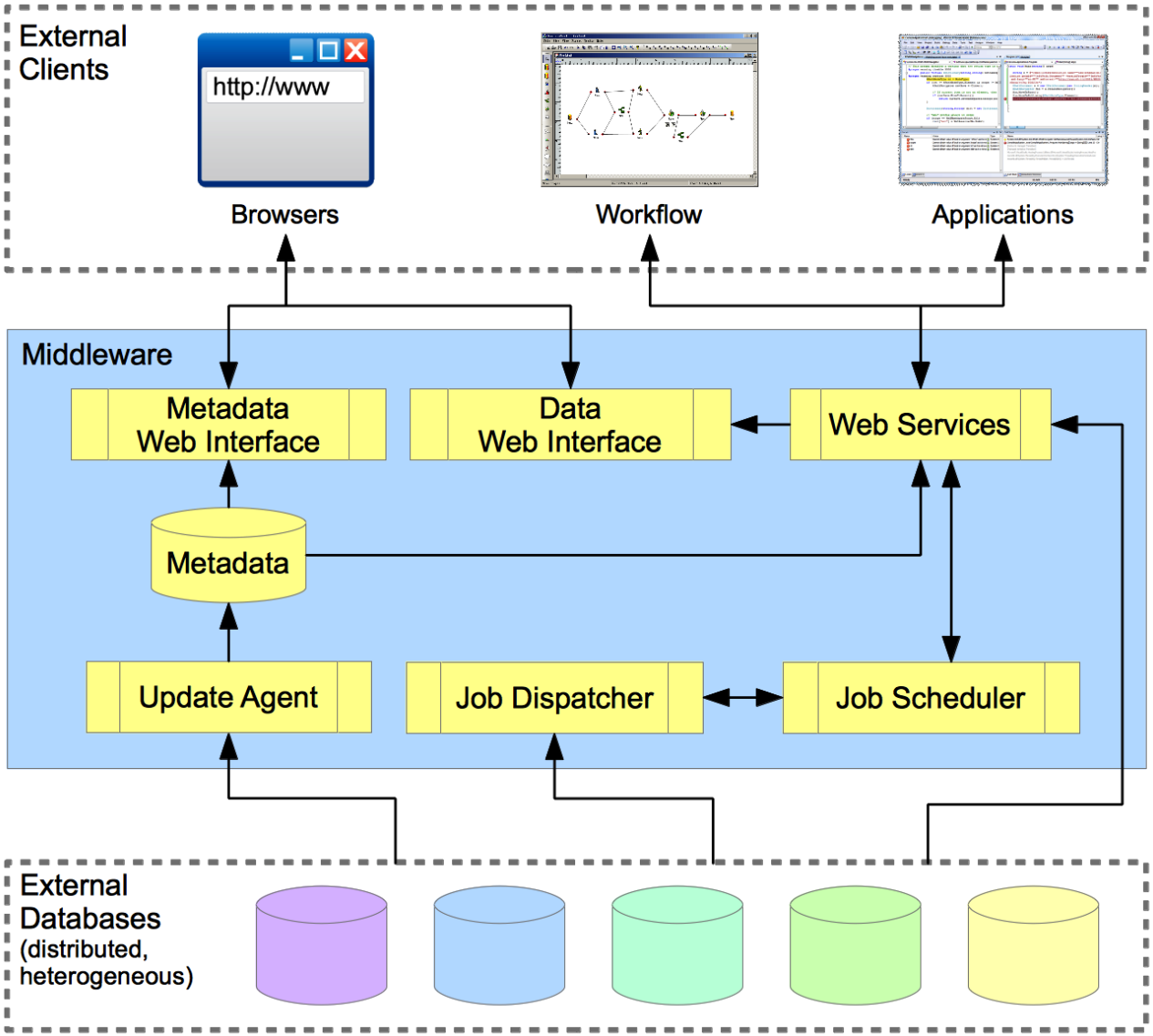
2010-06-17 00:00:00.0	0.25	
2010-06-16 21:00:00.0	0.25	



Case Study: CPTEC

- Compare the rainfall in a specific city for the month of October in two given years.
- Can we get a comparison between the last five years of rainfall for a town?
- People complain that the end of this fall is colder than usual, is it correct?
- Where was the coldest recorded temperature in the winter of 1990 in São Paulo State?
- Which is the highest ever rainfall in a day registered in Porto Alegre city and in Rio Grande do Sul State in general?
- Is there any city in Minas Gerais State where, in most of the summer days, there isn't any rainfall at all?
- Considering cities close to the equator line, which has the highest average rainfall?

Data Access Integration



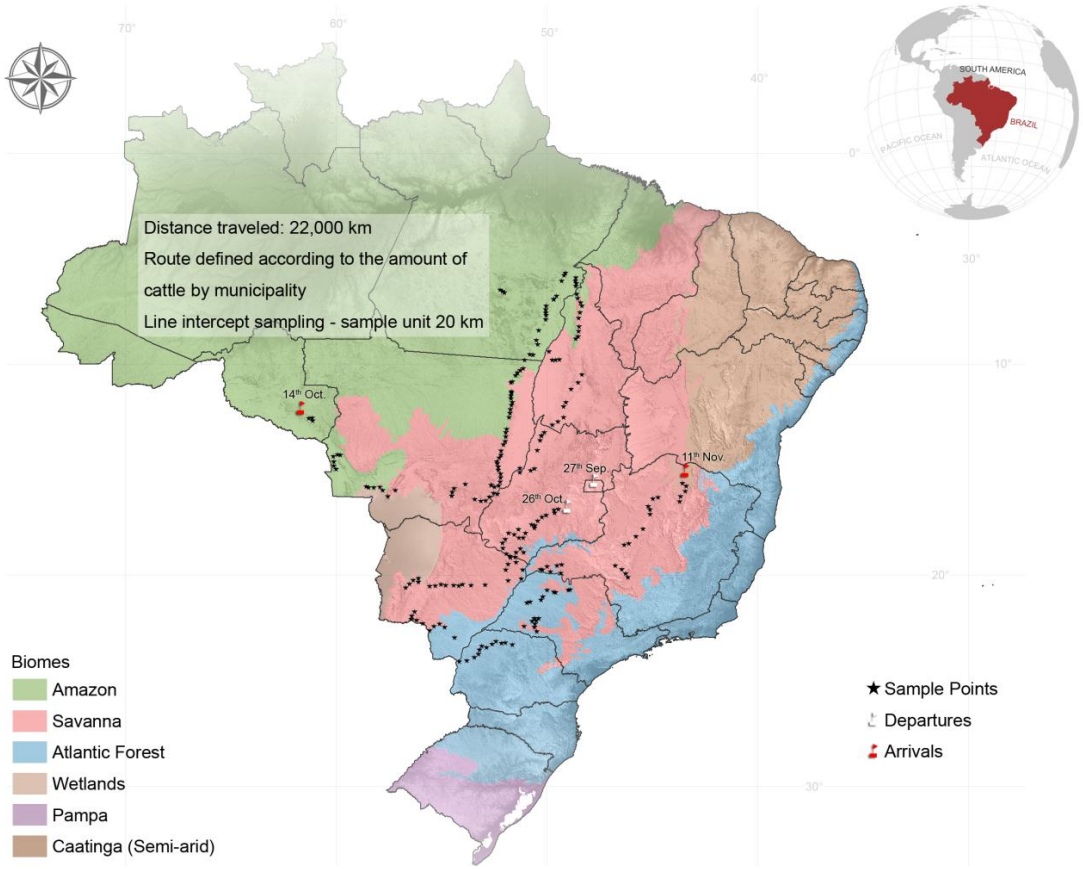
How?

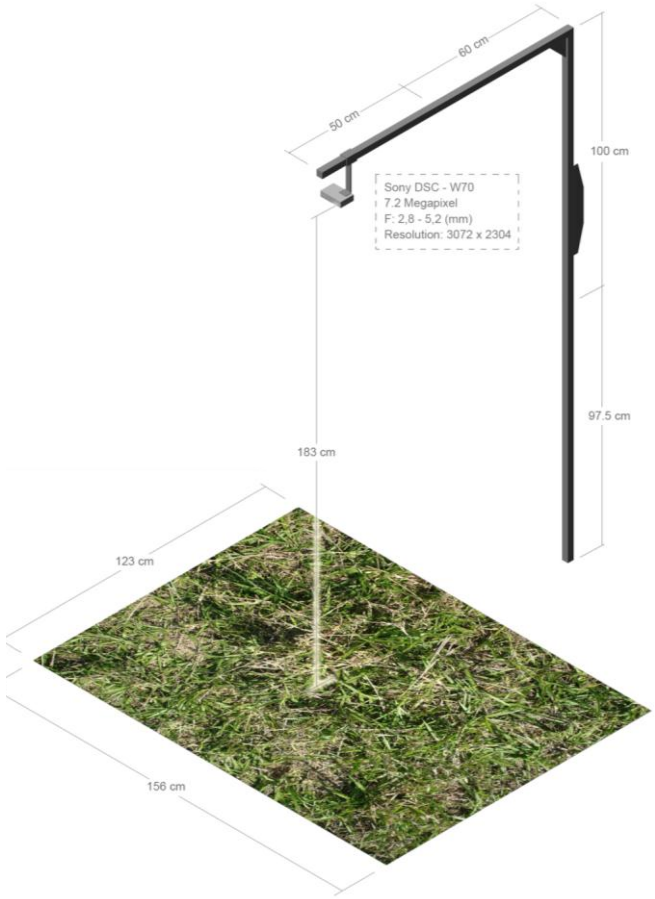
- Metadata/coverage extraction.
- No data replication.
- Different access modes.
- Inspired by JHU’s SDSS / MyDB / CasJobs.

We could use some help!

Pasture quality evaluation

Daniel Alves de Aguiar et al.





Small-scale Citizen Science?











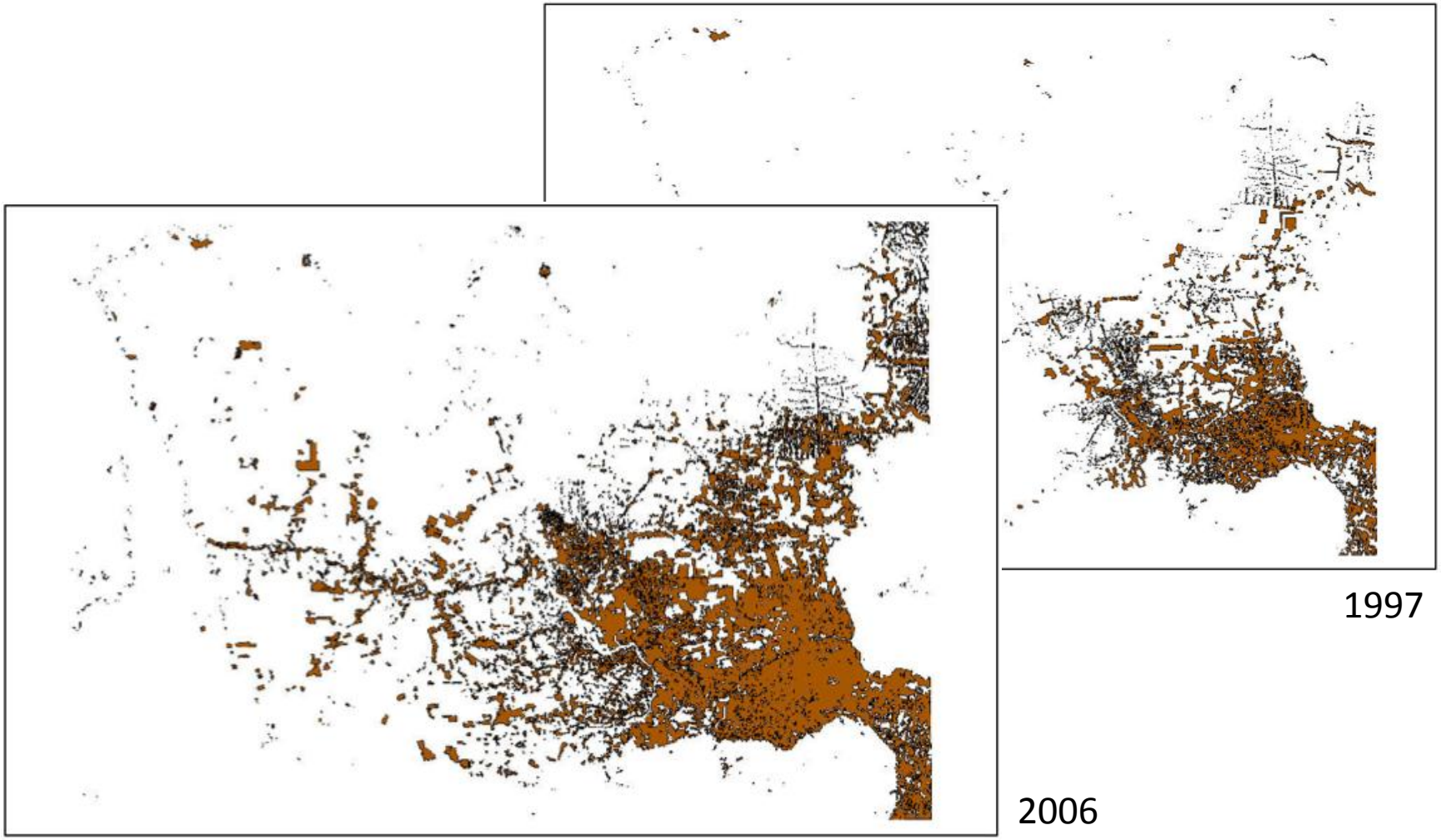

www.samplepoint.org

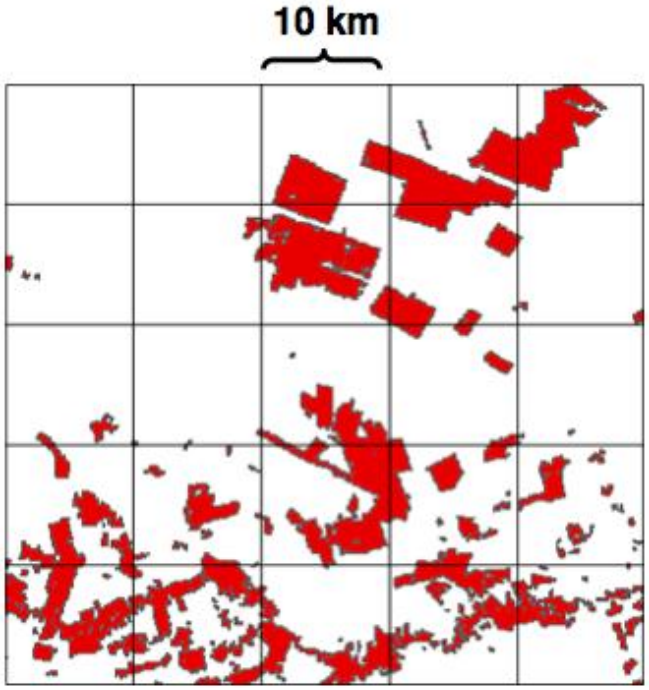
Effort

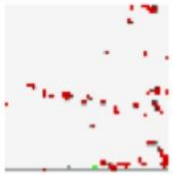
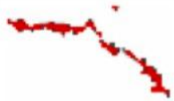
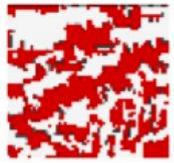
- 2403 images, soon 1300 more.
- 36 sample points per image.
- 2 minutes to label each image.
- 5 experts, 23 hours each.
- Distinction sometimes difficult.

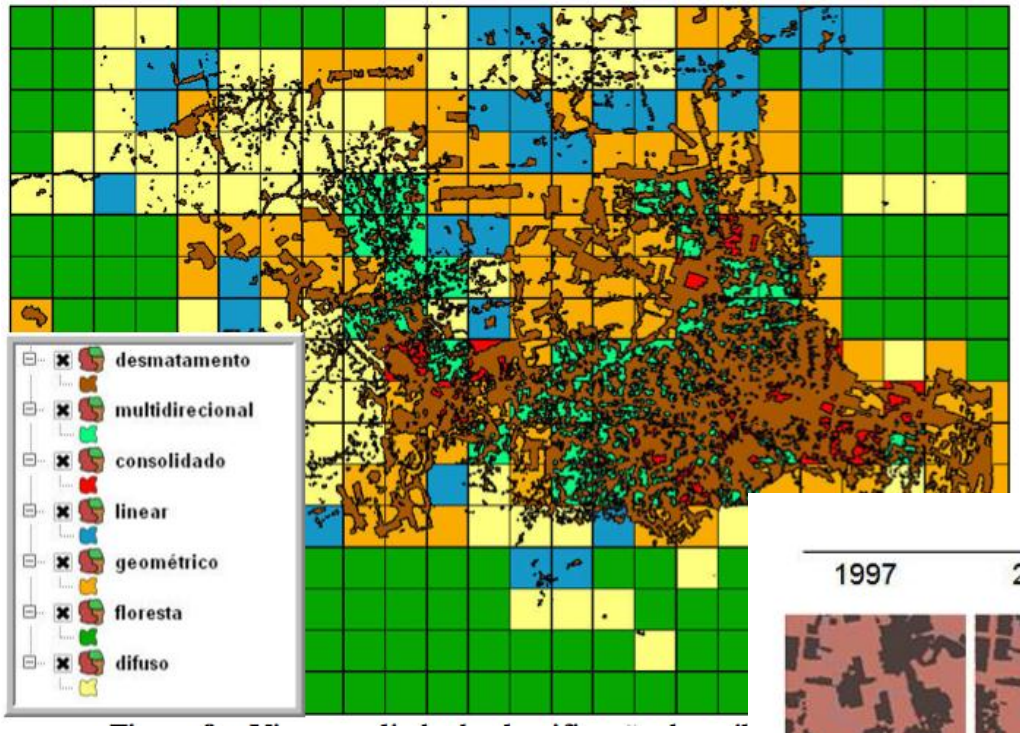
Land Use Shape/Patterns/Evolution

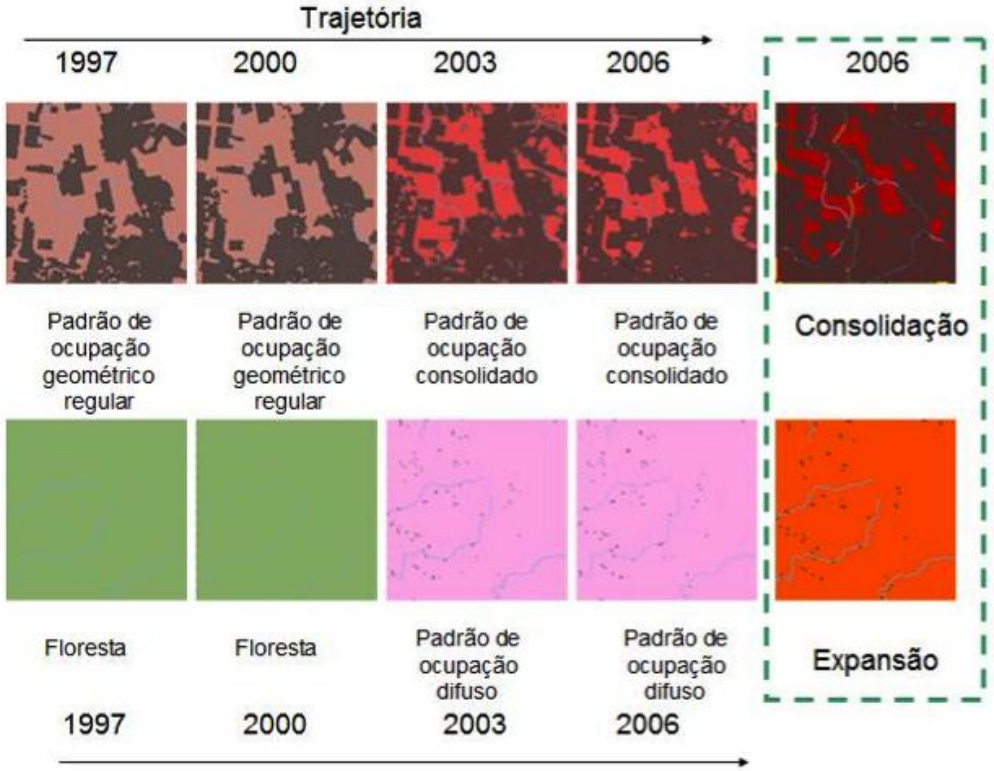
Maria Isabel Escada et al.





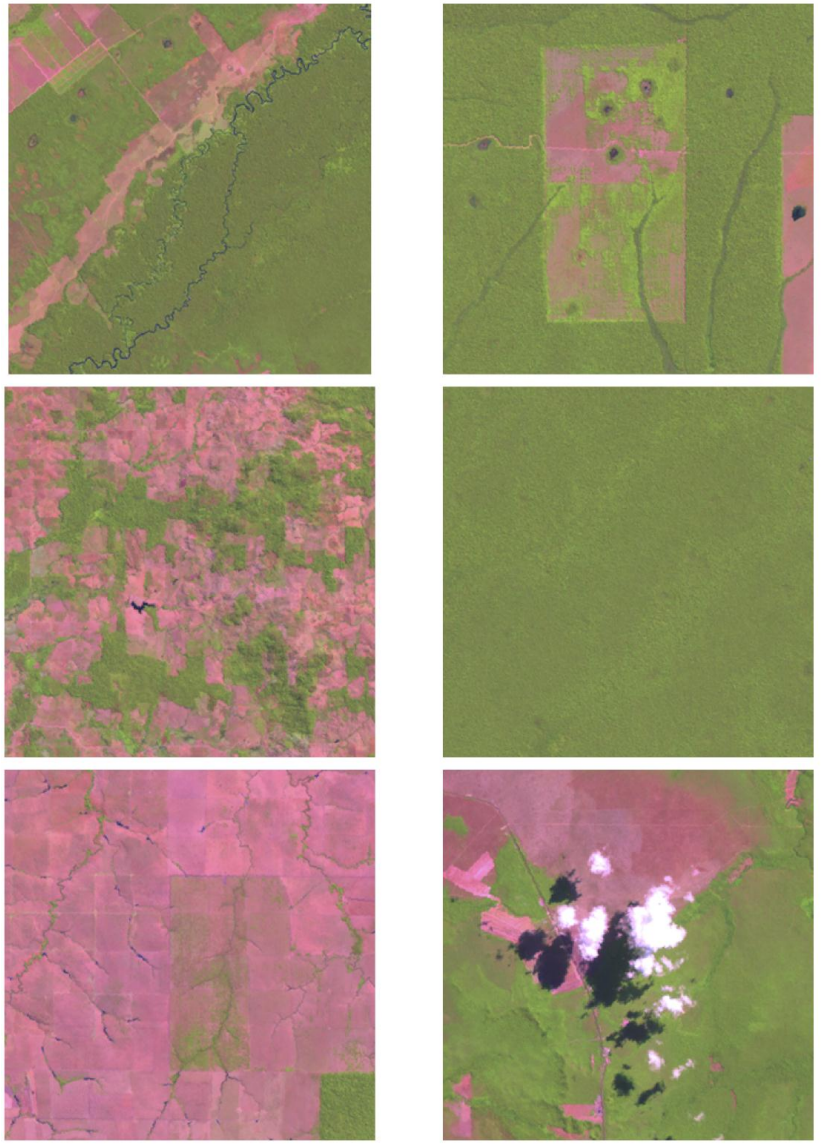
Pattern	Type	Description	Semantic
	Diffuse	• Small spots • Isolated spots • Low to medium density • Uniform distribution	• Beginning of human occupation • Spontaneous (unplanned) occupation • Small producers and farmers • Riverside population
	Linear	• Long and continuous spots • Low density • Unidirectional	• Start of occupation along roads • Spontaneous (seldom planned) occupation • Small rural producers
	Geometric	• Medium to large spots • Regular geometric shape • Low to medium density	• Initial occupation stages • Medium to large farms
	Multidirectional, unordered	• Small to medium spots that were joined together • Different shapes (irregular, geometric, linear) • Medium to high density • Multidirectional	• Expanding occupation, initially spontaneous • May have concentration of land owners • Small to medium rural producers
	Consolidated	• Large and continuous spots • Low density and regions of remaining forest • Compact and continuous spots	• Advanced occupation stages • Concentration of farmers • Small, medium and large rural producers • Consolidated occupation
	Forest	• Absence of deforestation	• No signs of human occupation


desmatamento
multidirecional
consolidado
linear
geométrico
floresta
difuso


Trajetória
1997
2000
2003
2006
2006
Padrão de ocupação geométrico regular
Padrão de ocupação geométrico regular
Padrão de ocupação consolidado
Padrão de ocupação consolidado
Consolidação
Floresta
Floresta
Padrão de ocupação difuso
Padrão de ocupação difuso
Expansão
1997
2000
2003
2006

Effort

- 2.1 million tiles (@10km^2).
- 330.000 tiles (@25km^2).
- Too much for analysts: projects in small regions, manual/automatic labeling.
- Classes are fuzzy.
- Zooniverse!



Wish List

Organize!

- Ad-hoc development $\rightarrow$ make it official as institutional R&D.
- Involve more graduate students.
- Investigate open data possibilities.

Get people involved!

- 80M+ Internet users.
- Mathematics Olympics, Astronomy Olympics.
- S,T&I Ministry “S&T Week”.
- K-12 Computer, Environment, Science projects.