



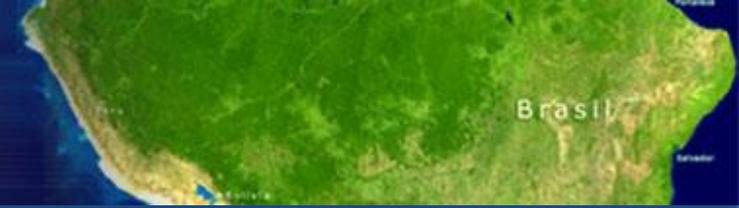
# **FUTURE CLIMATE CHANGE IN BRAZIL: PROGRESS AND CHALLENGES TOWARDS ENVIRONMENTAL GOVERNANCE**

Lincoln Muniz Alves, PhD  
Researcher CCST/INPE

United Nations/Austria Symposium  
Graz, Áustria, 14/Sep/ 2016

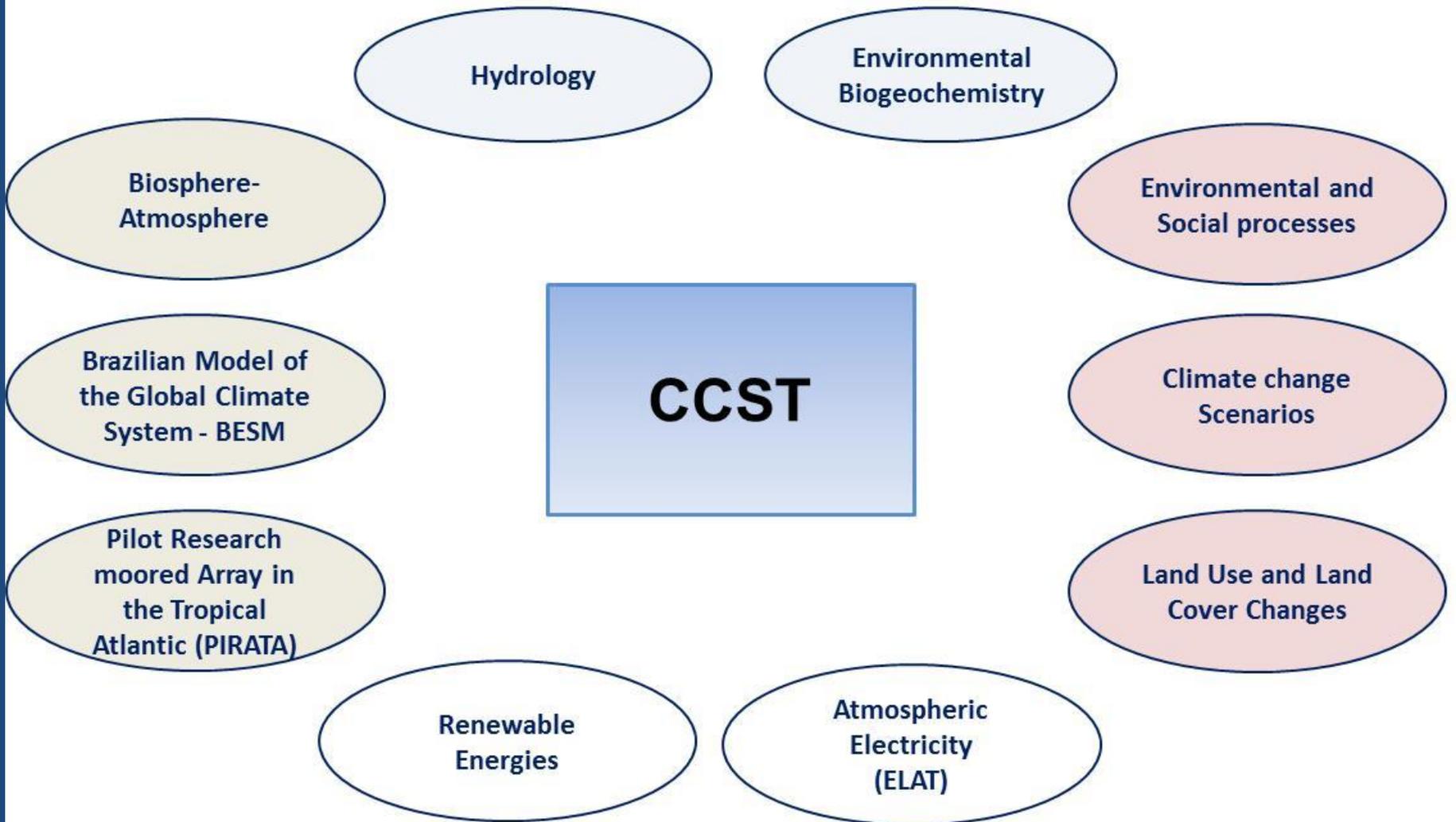


National Institute For Space Research

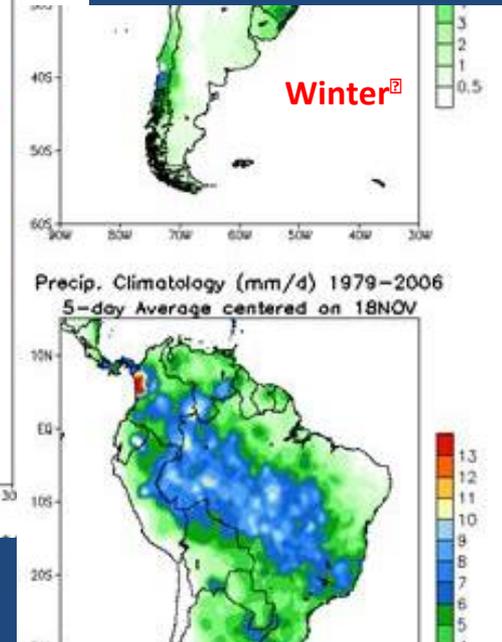
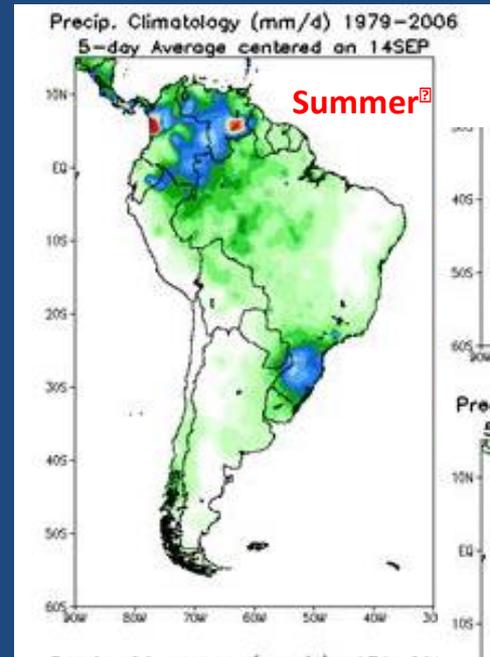
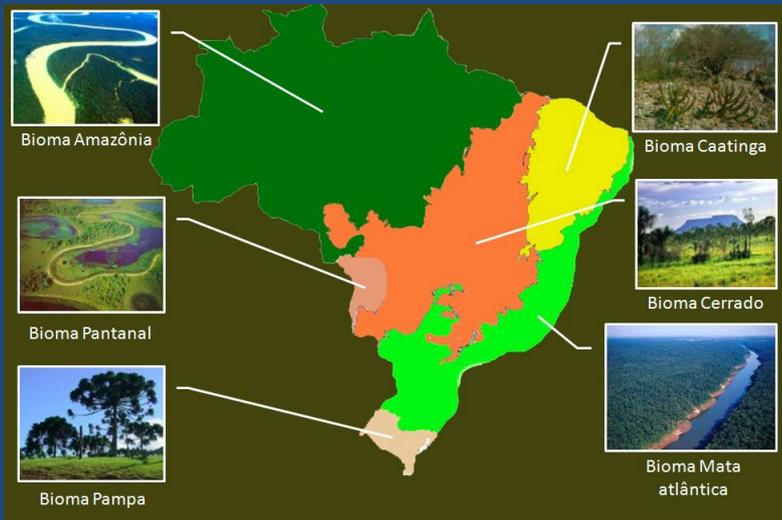


- Space Engineering and Technology
- Satellite Tracking and Control Center
- Integration and Testing Laboratory
- Space and Atmospheric Sciences
- Earth Observation
- Weather Forecast and Climate Studies
- Earth System Science Center

# THEMATIC AREAS



# Brazil & Climate Change: a country profile



- Brazil is susceptible to various hazards depending on its geography and climate conditions (e.g. El Niño)
- Extreme events are frequent
- Economic & Social losses for each of these has been enormous

# Fostering the concept of public-good data

## **Brazil, 2004**

INPE set a free data policy for CBERS in Brazil  
CBERS data available free of charges on the Web  
Impacts on EO consulting and services in Brazil  
Increasing EO data distribution for society

## **South Africa, 2007**

Announcement of the CBERS for Africa Initiative  
Extension of CBERS free data policy for Africa

## **America, 2008**

USGS adopted a free data policy for Landsat  
Landsat image data also available free of charges

## **Europe, 2009**

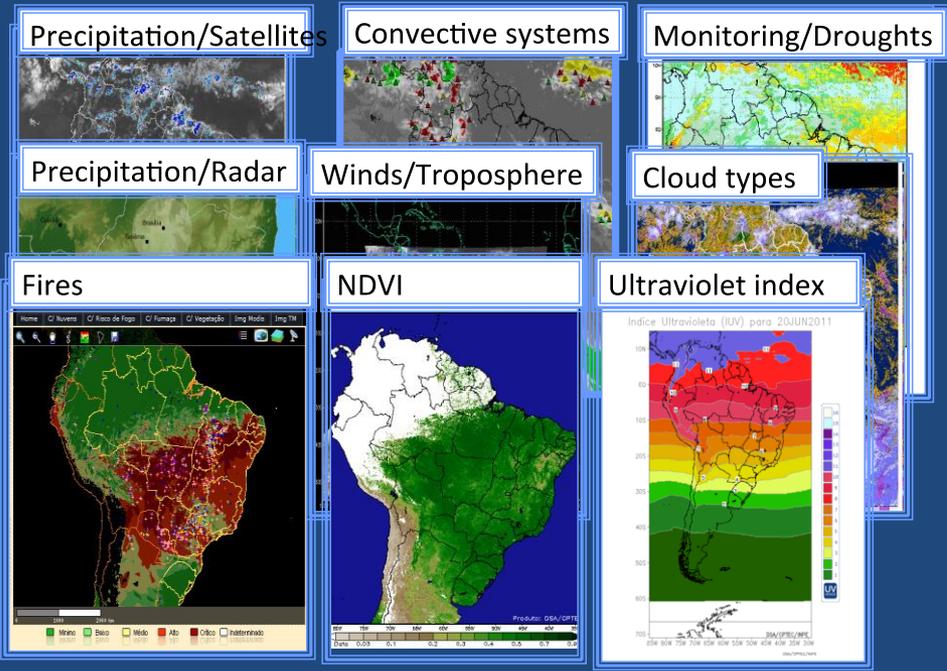
ESA announced a free data policy for Sentinels

# CBERS distribution under free data policy

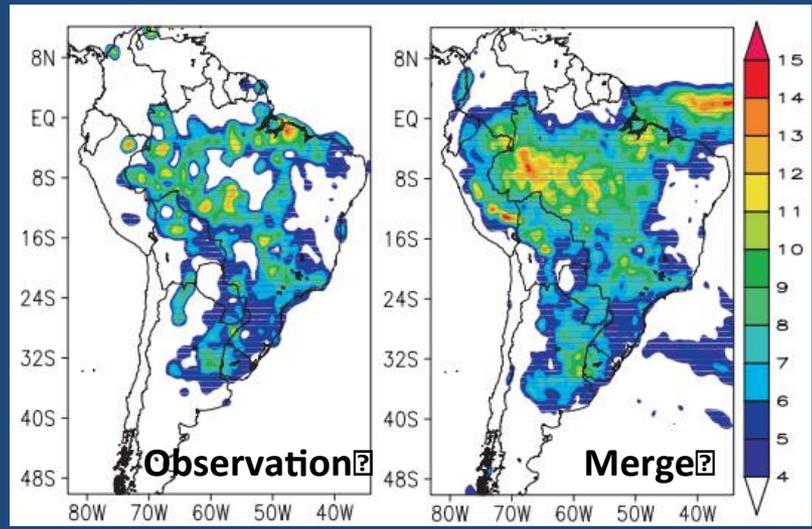
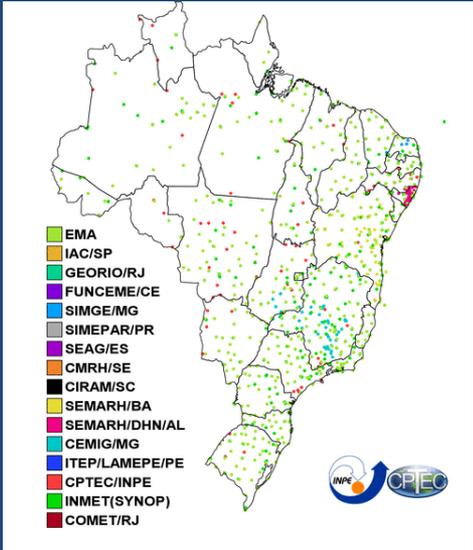
SATELLITE	CAMERA	DOWNLOADS 2008	DOWNLOADS 2009
CBERS-2	IRMSS	3,043	2,490
	CCD	56,529	23,009
	WFI	258	116
CBERS-2B	HRC	46,360	119,676
	CCD	61,895	60,058
	WFI	1,207	1,224
NUMBER OF USERS		16,118	19,807

Source: Gilberto Câmara

# Monitoring Weather & Climate



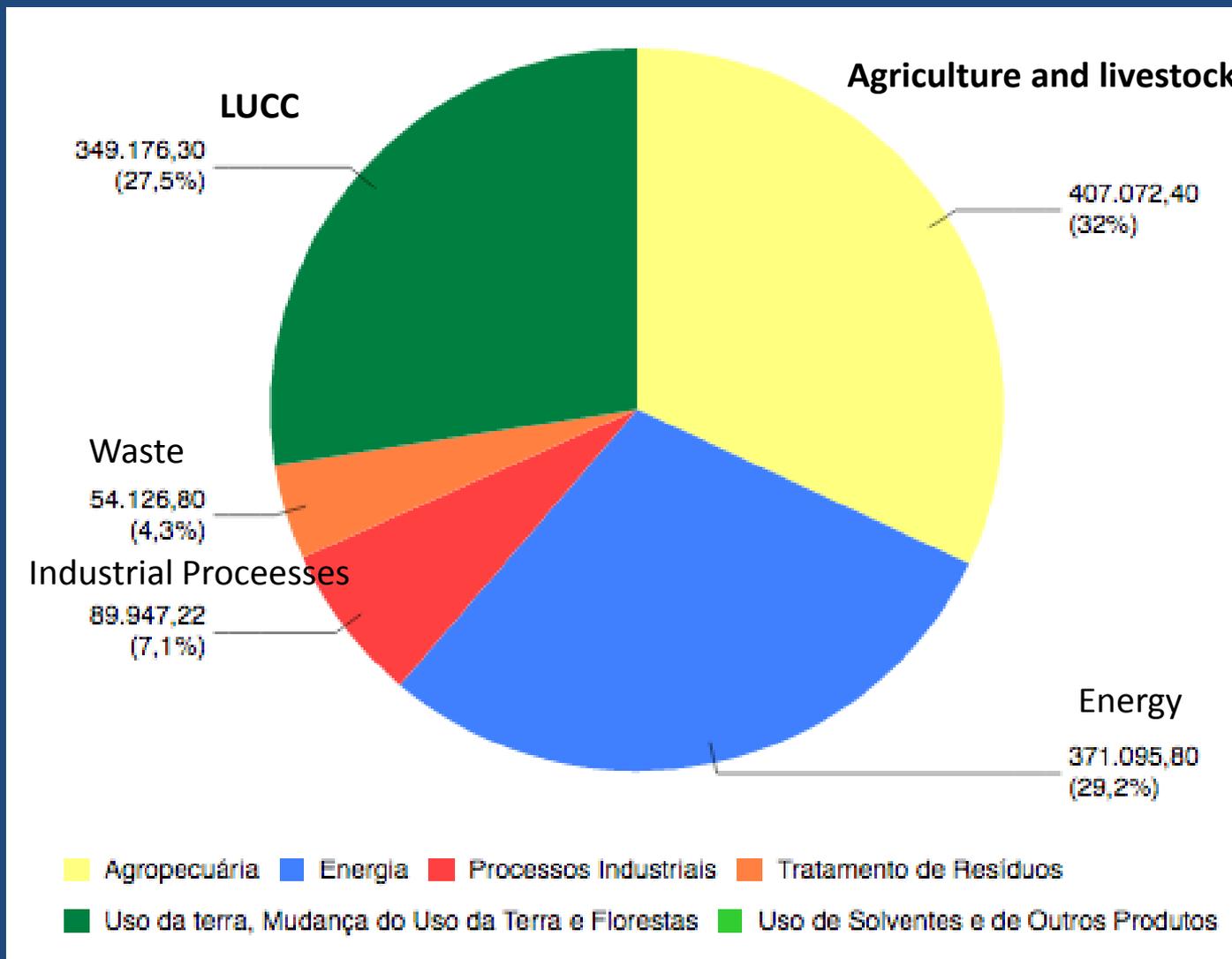
Source: INPE/CPTEC/DSA



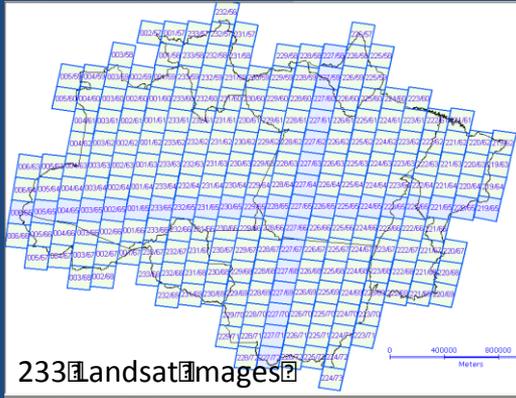
Combining TRMM and Surface Observations of Precipitation

Rozante et al. (2010)

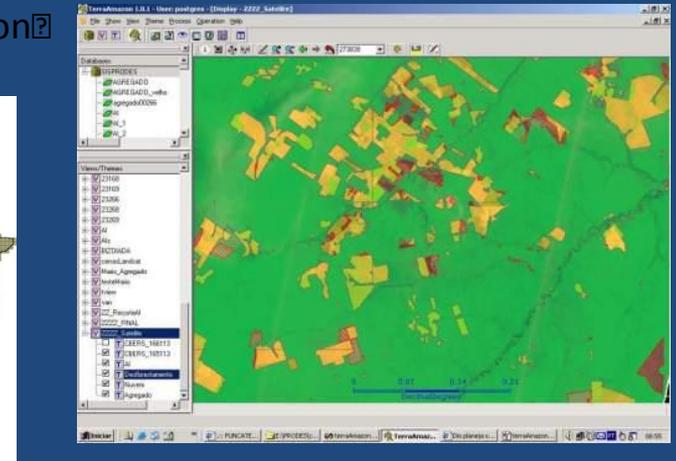
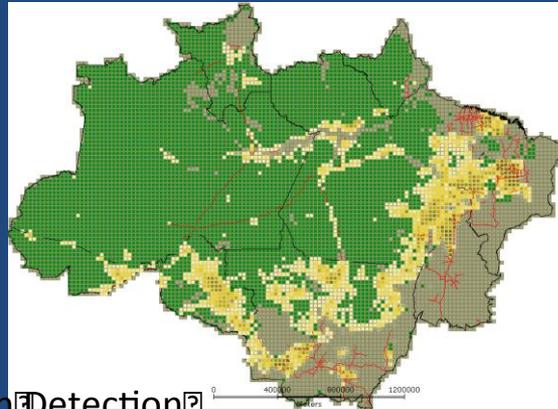
# GHG Emissions of Brazil per sector 2010 (MtCO<sub>2</sub>e)



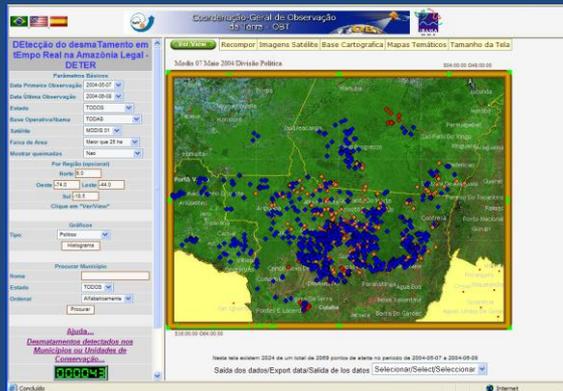
# Forest Monitoring in the Amazon



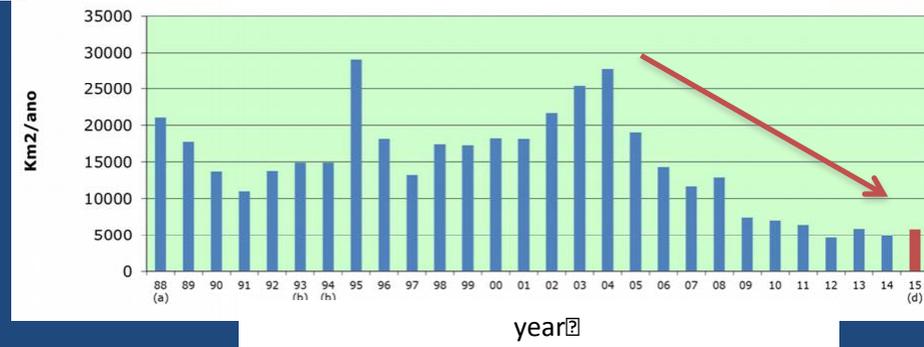
## PRODES: Amazon Deforestation Monitoring



## DETER: Near Real Time Deforestation Detection

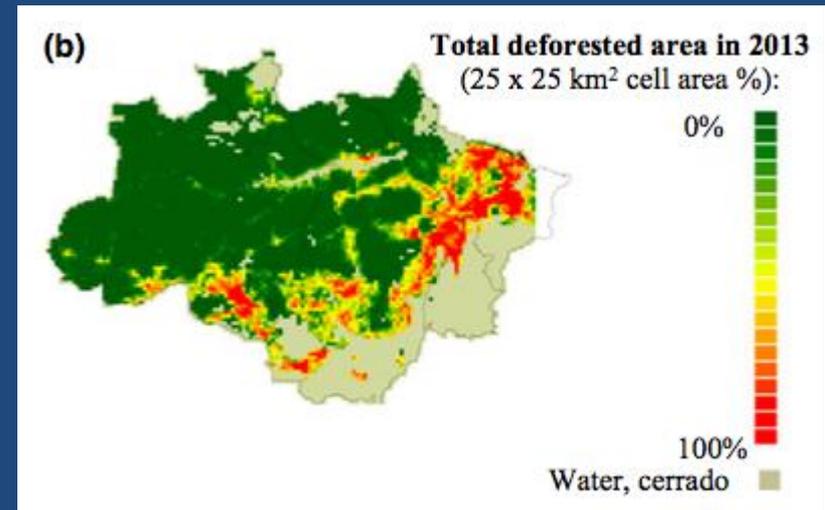
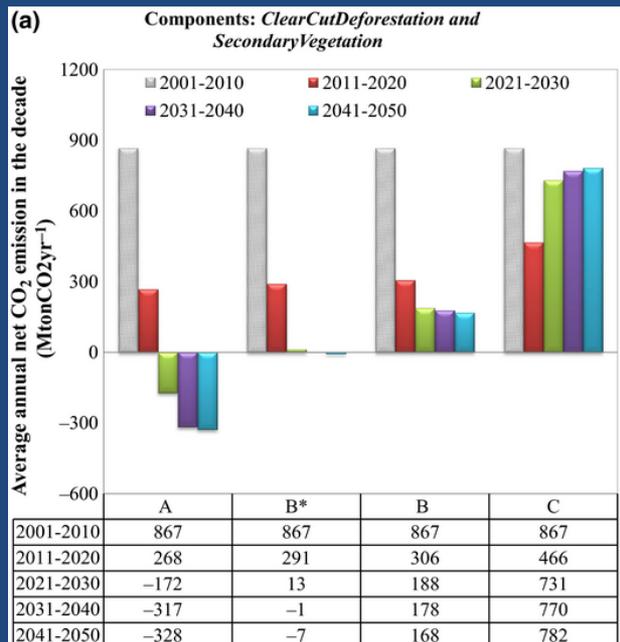
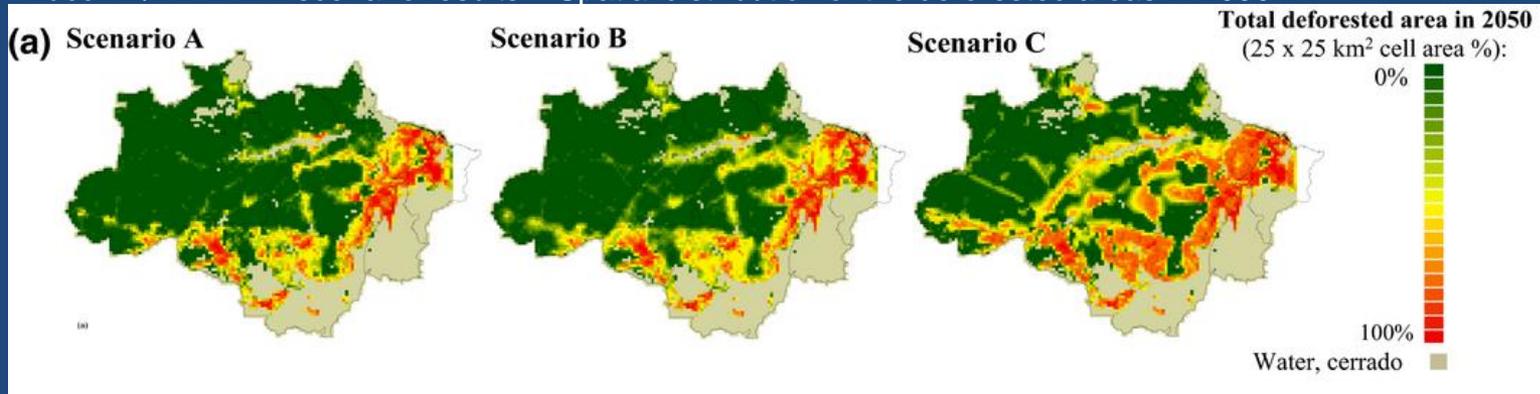


## Deforestation Rate in the Amazon Rainforest



# Land use change and emissions scenarios

LuccME/INPE-EM scenario results – Spatial distribution of the deforested areas in 2050



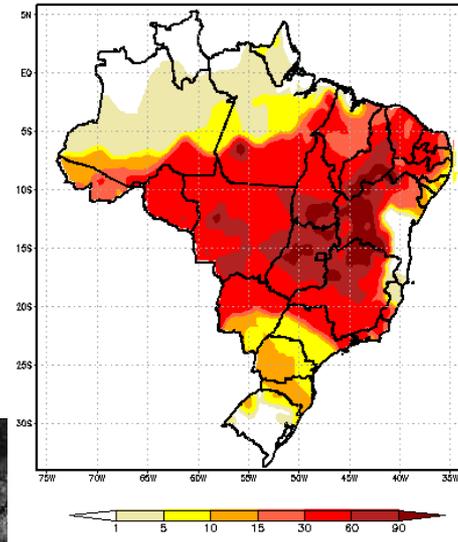
Total deforested area in 2013 (source: PRODES)

Aquiar et al. (2016)

# Monitoring of Vegetation Fires – with satellites in near real-time

**Deteccões na 3ª.f. 26/Jul no Brasil:**  
**729 deteccões Satélite Refer.**  
**9.680 com todos 8 satélites**

Numero Consecutivo de Dias sem Chuvas  
 ate o dia 26JUL2016



www.jcnet.com.br/Regional/2016/07/com-base-em-monitoramento-de-satélite-e-descoberta-queimada.html

**ICNET**  
 .com.br

Bauru e grande região - Quinta-feira, 14 de julho de 2016 ☀️ máx. 34° / mín. 19°

**Notícias**

- Política
- Economia
- Geral
- Polícia
- Bairros
- Esportes
- Regional
- Cultura
- Nacional
- Internacional

**Canais**

- Classificados
- Agendinha
- Cinema
- Bauru Pocket
- Carnaval 2016

**Colunas**

- Tribuna do Leitor
- Entrevistas
- Em Confiança
- Horoscopo
- Programação de TV

**Serviços**

- Falecimentos
- JC na escola
- Loterias
- Atendimento JC

**Serviços**

- No JC

**13/07/2016 07:00 - Regional**  
**Com base em monitoramento de satélite é descoberta queimada**

Divulgação

A Polícia Militar Ambiental autou nesta terça-feira (12) um proprietário rural na cidade de Promissão (120 quilômetros de Bauru), por provocar uma queimada que causou degradação ambiental em três sítios no Bairro Agrovia Imã Doroty.

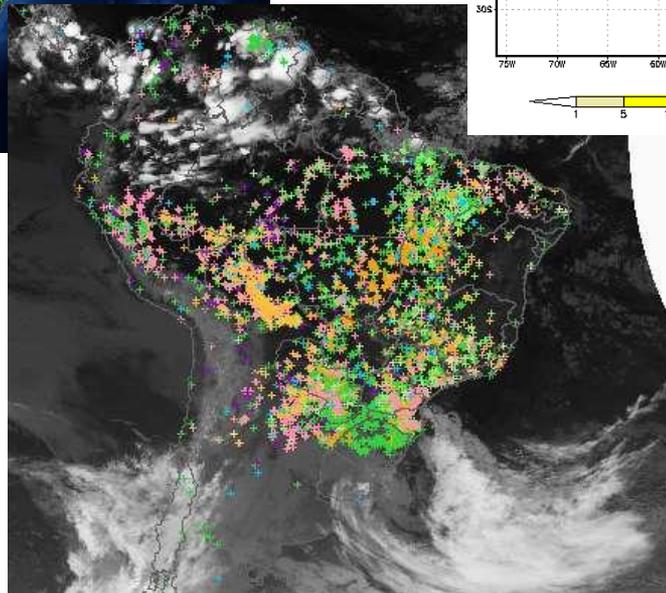
Pelo sistema de monitoramento dos satélites do Instituto Nacional de Pesquisas Espaciais (Inpe), o qual mostra os focos de queimadas no Estado de São Paulo, a equipe de policiamento ambiental chegou ao bairro e constatou uma área de 24,7 hectares, degradada mediante uso de fogo, sendo que 1,51 hectares de uma área que foi queimada causou degradação ambiental em três sítios na Agrovia Imã Doroty.

área que estava em processo de reflorestamento.

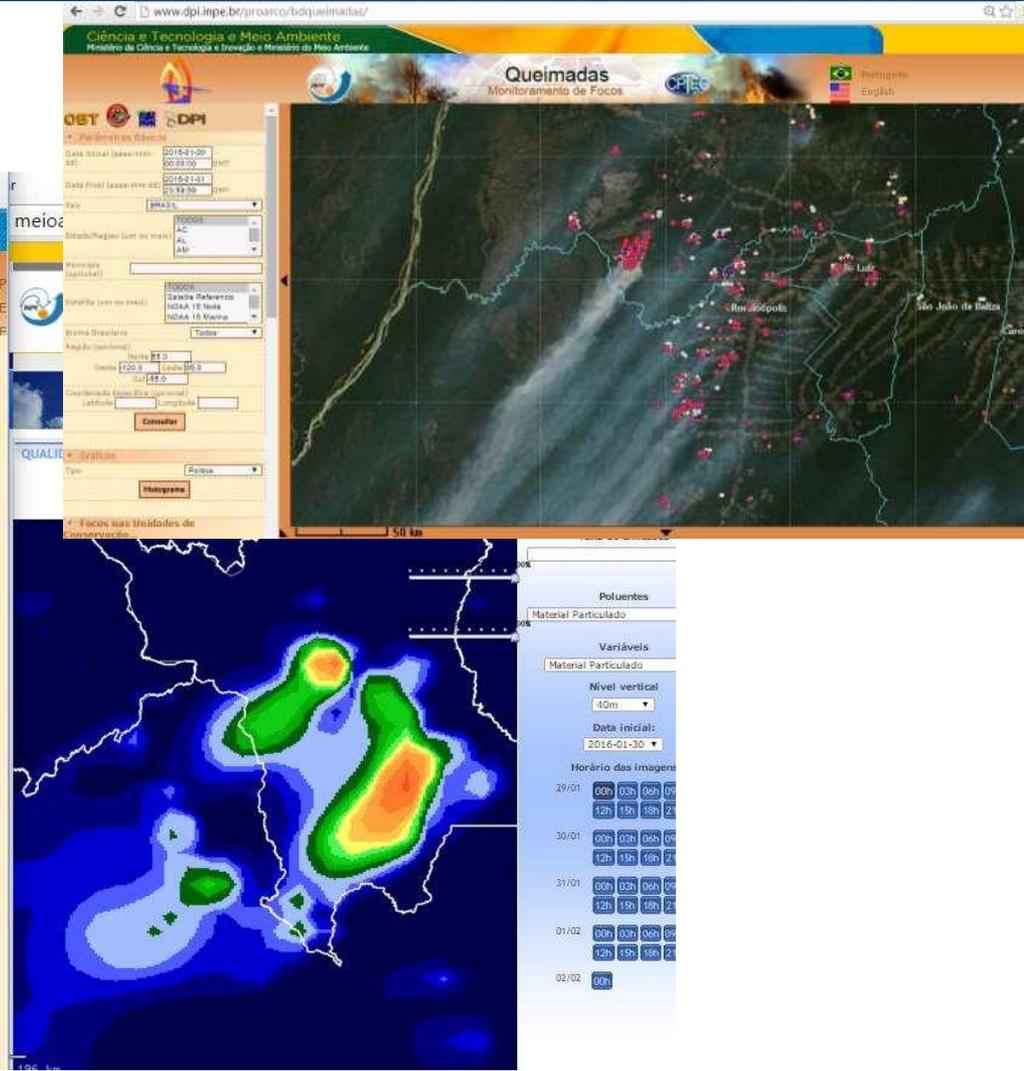
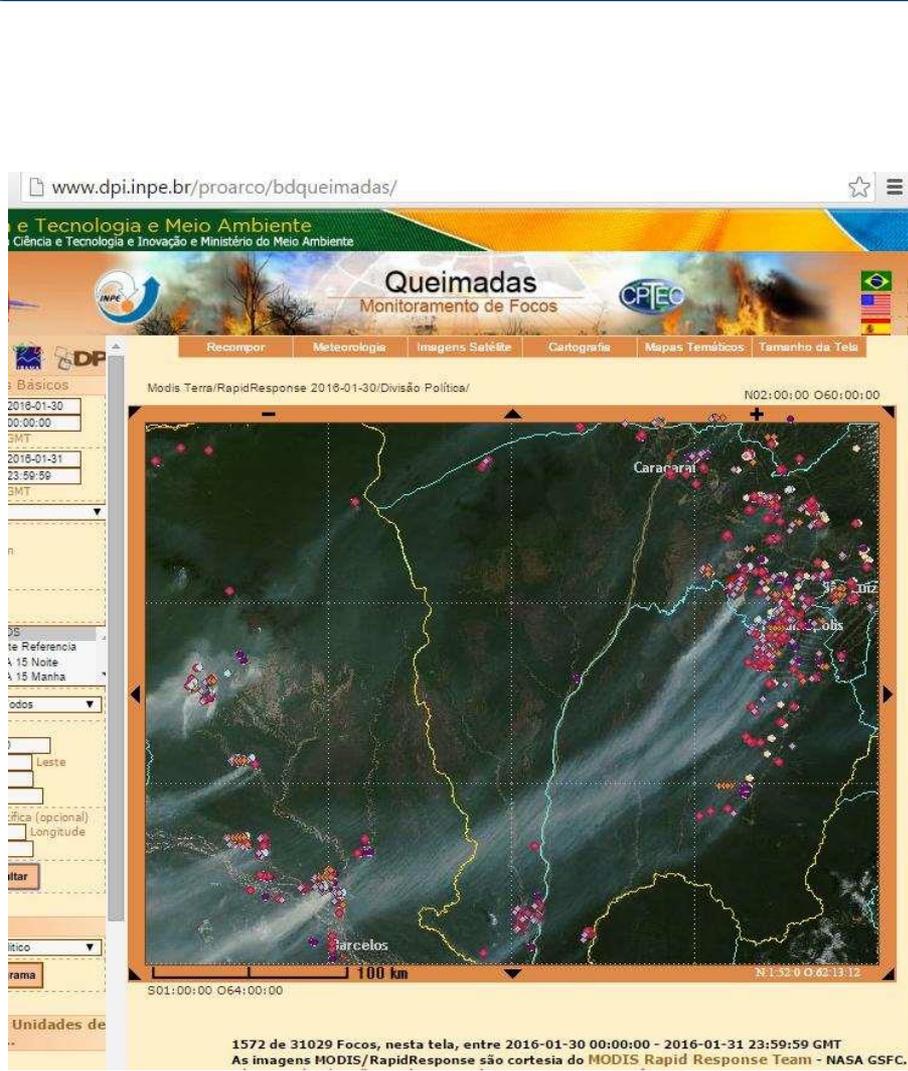
Durante a fiscalização, policiais verificaram que três sítios foram atingidos, em contato com um dos proprietários, este confessou que utilizou do fogo para realizar a limpeza de pasto do seu sítio, mas acabou perdendo o controle do fogo que atingiu outras duas propriedades.

Diante do constatado, o proprietário rural recebeu dois autos de infração ambiental, um no valor de R\$ 22.960,00 por fazer uso de fogo em áreas agropastoris e outro no valor de R\$ 11.325,00 por destruir espécimes nativas plantadas, autuação referente à área de reflorestamento.

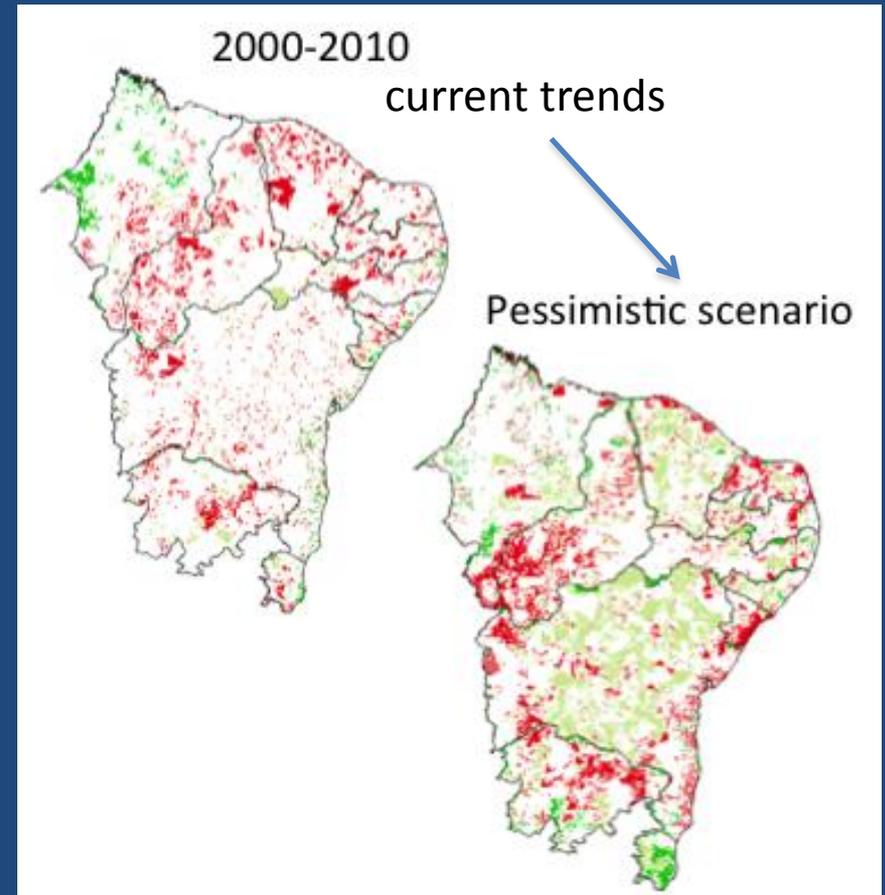
A Polícia Civil será oficiada para abertura de inquérito policial e apuração de responsabilidades no tocante a parte criminal, a pena para quem comete esse crime é de reclusão de 2 a 4 anos e multa.



# Smoke plumes from fires

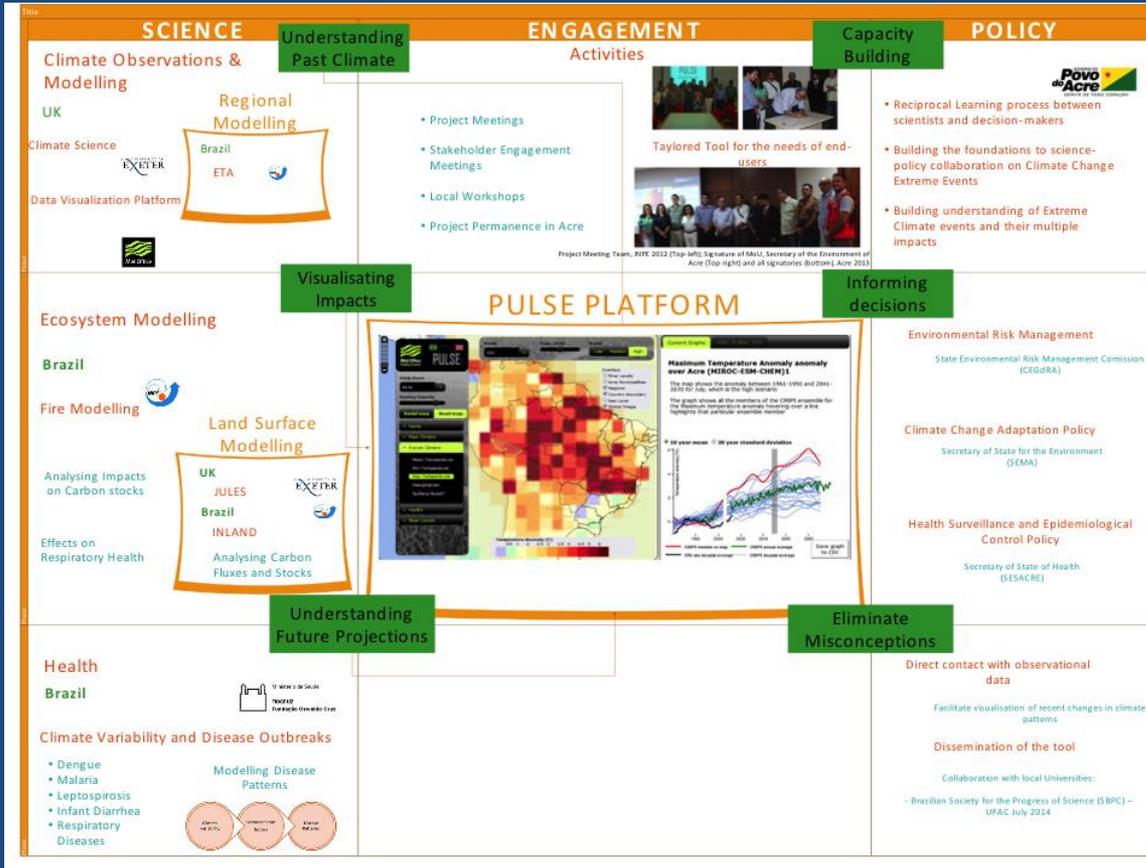


# Susceptibility to degradation/desertification in the Brazilian semi-arid



Rita Vieira (2015)

# PULSE-BRAZIL



PULSE is Platform for Understanding Long-term Sustainability of Ecosystems for analyzing, visualizing and understanding the interactions between climate, ecosystems and human health in Amazonia, designed for supporting decision-makers on climate adaptation policies in Brazil

# METROPOLE: An Integrated framework to analyze vulnerability and adaptive capacity to climate change and sea level rise: community case studies in Brazil (Santos city), UK and USA



Slums bordering the São Jorge River



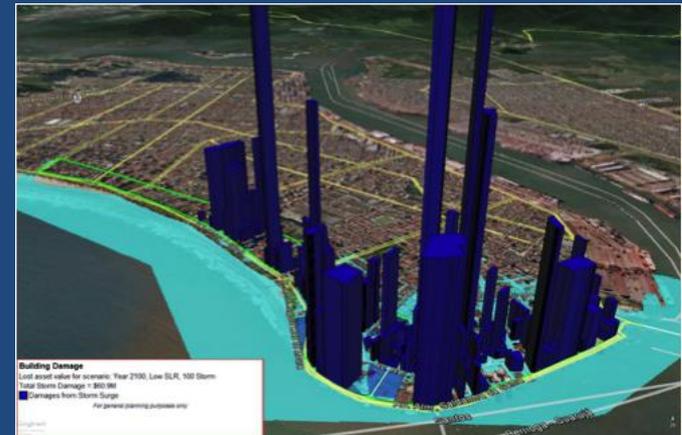
Coastal inundation that affected a parking lot in NW Area



Strong storm surge associated with high tide in Sept. 2009

Building damage at a particular location, for this particular one-time event or SLR for the Southeast region. The height of each blue bar indicates the amount of damage at that. If the bar is high, the floodwater is deep or the building is very valuable, or both

The **CO**astal **A**daptation to **S**ea level rise **T**ool (COAST) is software that models flooding damage to assets from storm surge and sea level rise over time



## Comments and Final Remarks

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- Brazil has undergone some significant climate changes in recent years
- It is essential to accept that Brazil is vulnerable to global warming
- Brazil has been utilizing space technology to provide the environment-related information to all the stakeholders and society
- We have a vital role to play in providing information: Integrated and Interdisciplinary approach (observation-IAV analysis-modelling)
- Enhancing civil society engagement and institutional capacity-building

Thank you  
Obrigado

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