**INPE**

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

**ISRSE37** TSHWANE 2017

The 37th International Symposium on Remote Sensing of Environment
Earth Observation for Development and Adaptation to a Changing World
Tshwane, South Africa, 8 - 12 May 2017

# EARTH OBSERVATION AT INPE
## Towards Sustainable Development Goals (SDGs)

**Leila Fonseca**

Earth Observation Directorate

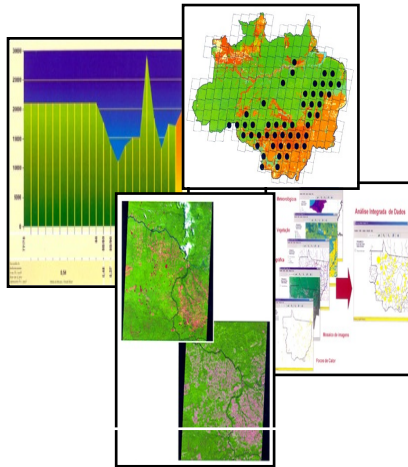National Institute for Space Research
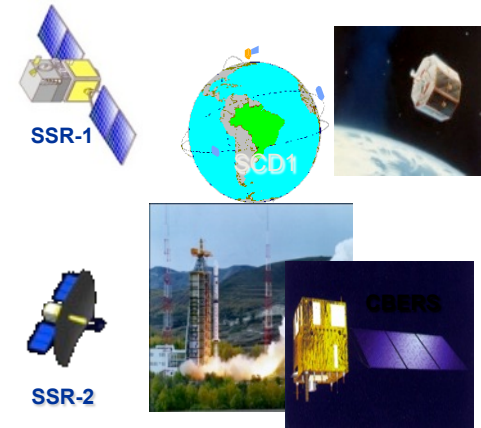
leila.fonseca@inpe.br

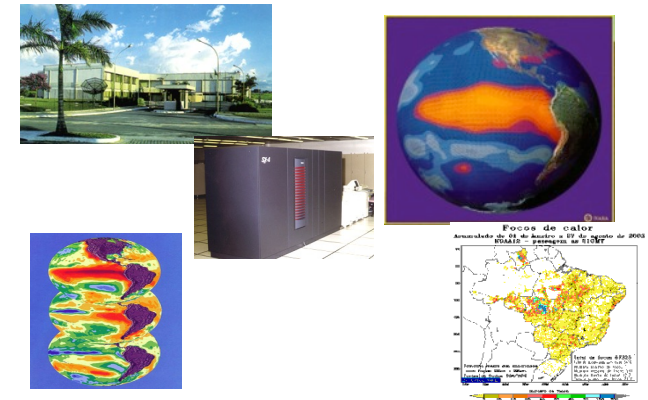# Research, Applications and Technological areas



Space Engineering & Technology

**Earth Observation**
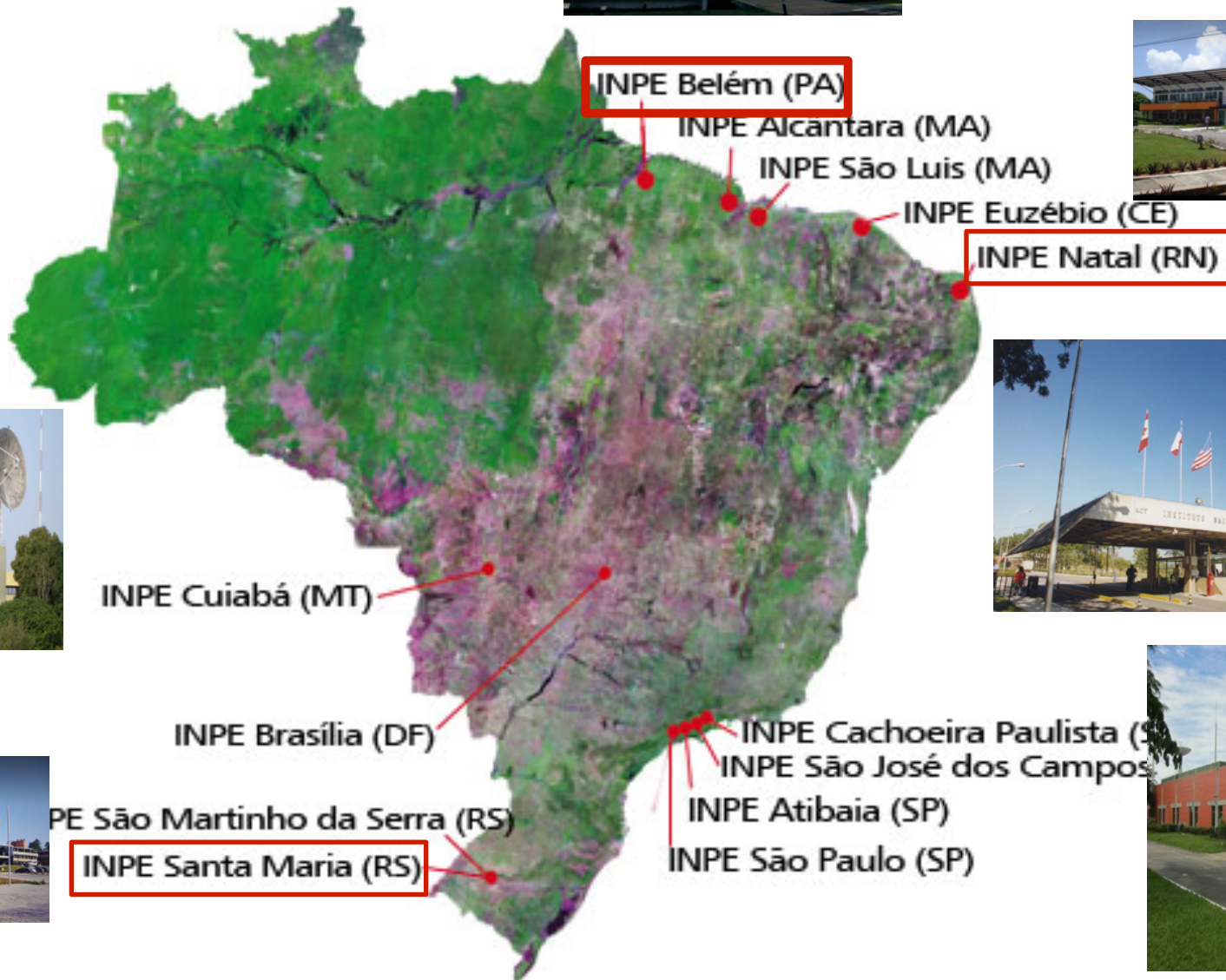
Space and Atmospheric Sciences

Earth System Sciences

Weather Forecast and Climate Studies

# INPE Facilities



INPE Belém (PA)

INPE Alcântara (MA)

INPE São Luis (MA)

INPE Euzébio (CE)

INPE Natal (RN)

INPE Cuiabá (MT)

INPE Brasília (DF)

INPE Cachoeira Paulista (S

INPE São José dos Campos

INPE Atibaia (SP)

PE São Martinho da Serra (RS)

INPE Santa Maria (RS)

INPE São Paulo (SP)

# People at INPE





**Personnel – 3000**

Staff: ~980
    Research: 17%
    Development: 47%
    Administrative: 36%

Qualification:
    MsC: 15%
    Dr: 22%

Scholarship
Graduate students
Trainees
Visiting Researchers
Outsourcing

# INPE's Earth Observation contribution to the Sustainable Development Goals



2 ZERO HUNGER

3 GOOD HEALTH AND WELL-BEING

4 QUALITY EDUCATION

6 CLEAN WATER AND SANITATION

10 REDUCED INEQUALITIES

11 SUSTAINABLE CITIES AND COMMUNITIES

14 LIFE BELOW WATER

15 LIFE ON LAND

**Biodiversity**

**Natural Disaster**

**Water Resources**

**Agriculture**

**Public Health**

**Urban Planning**

Regarding SDGs, earth observation applications deliver information for all citizens, organizations and governments, to help make appropriate decisions, and ultimately improve people's lives.

# Availability and access to data is necessary

**INPE provides EO data distribution under free data policy**

EO data is available through INPE's catalog at no cost (http://www.dgi.inpe.br/CDSR/)

**Data Center** Receives, archives, process and distribute satellite images: CBERS-4, LANDSAT-7,Landsat-8, Resourcesat-2, DMC, DEIMOS, NOAA-15, NOAA-18, NOAA-19, AQUA, TERRA, S-NPP, GOES-13,  MetOp-B, GOES-16 (GeonetCast)



More than 1.400.000 scenes distributed at no cost in the last 5  years
Total of 1,5 Pb stored
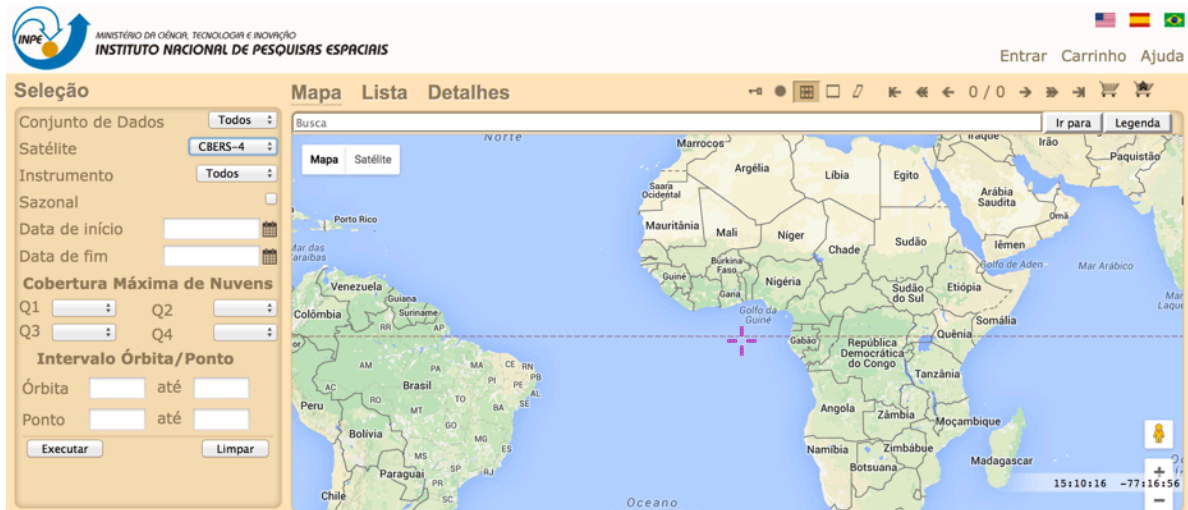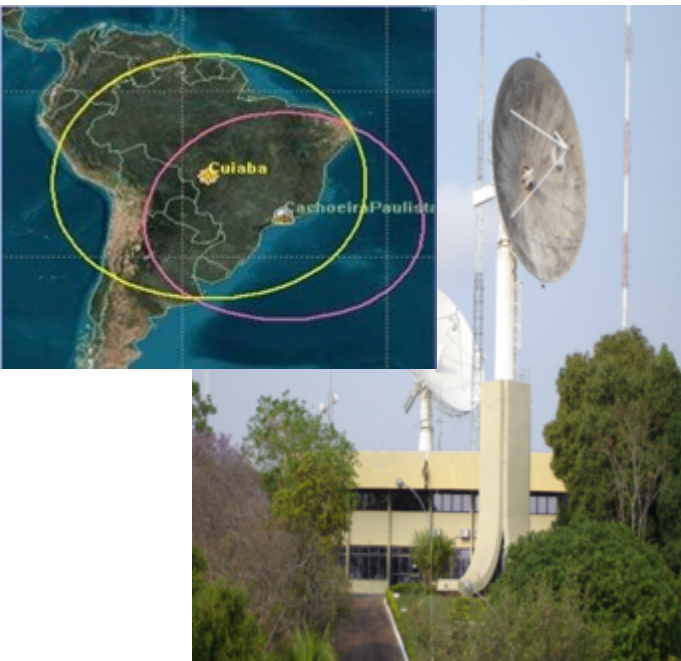
# An initiative for recording CBERS-4 images in Africa
whenever there is no conflit with Hartebeeshoek ground station that records CBERS-4 raw data
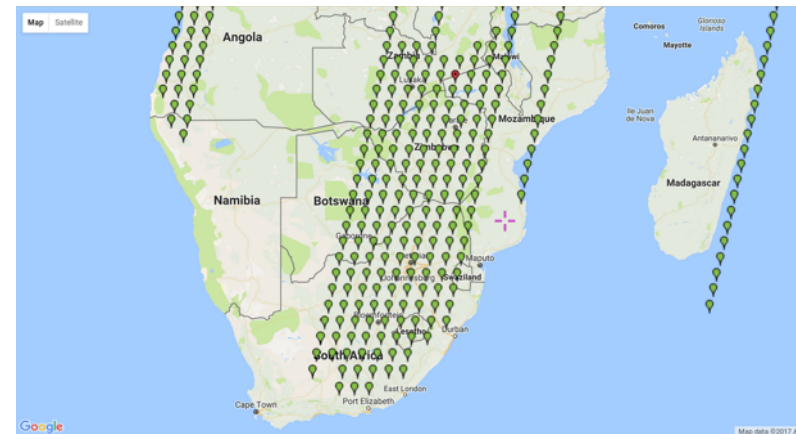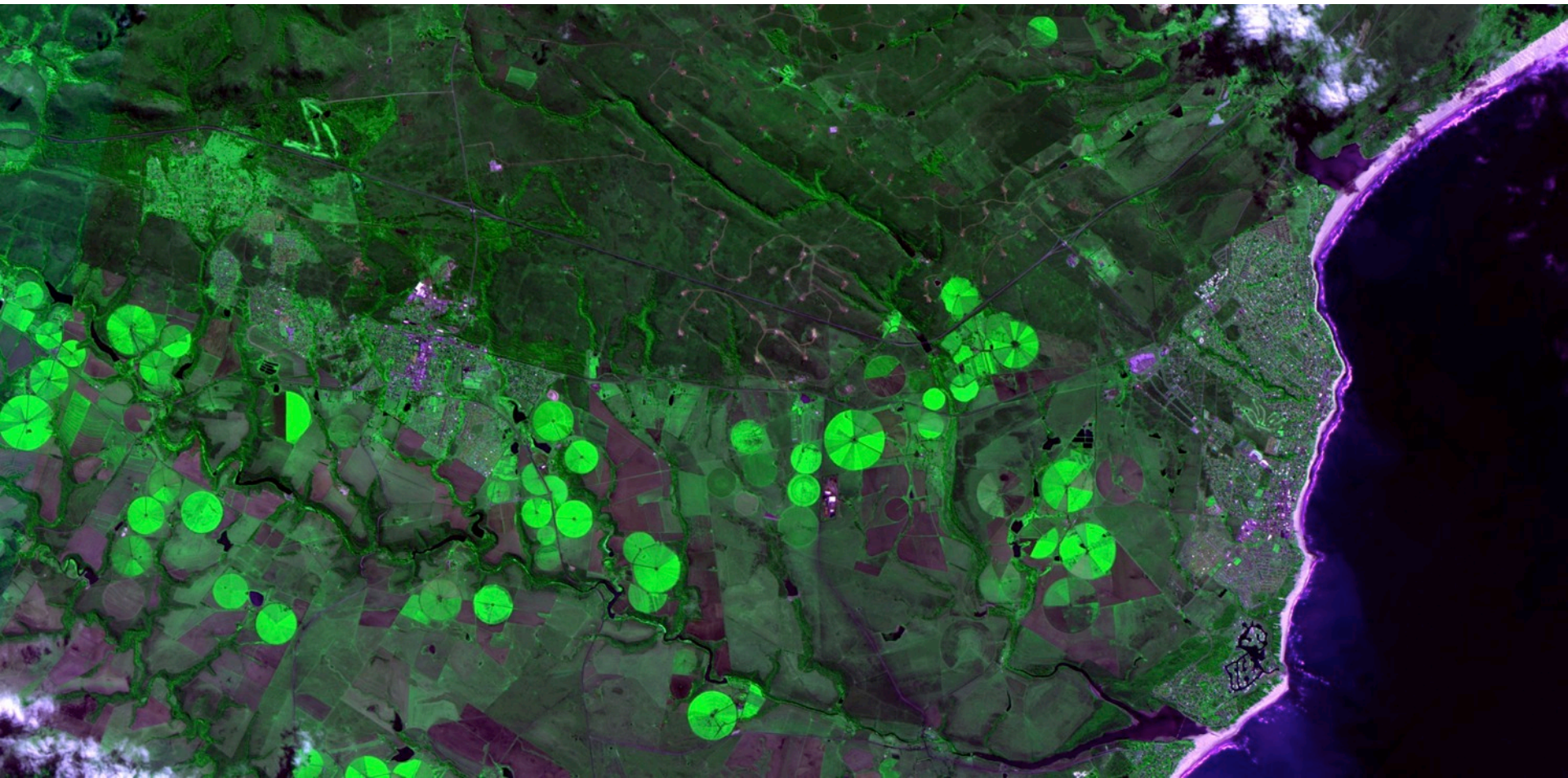
CBERS-4 AWFI
2015-03-15, RGB151613, Pretoria crop region

# CBERS-4  PAN10 (10 m)
# 2015-03-24, RGB342, Humansdorp, Jeffreys Bay

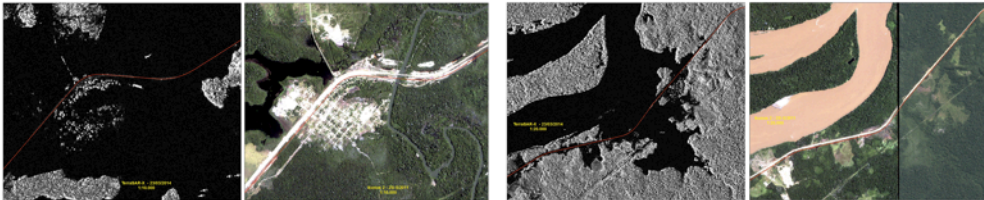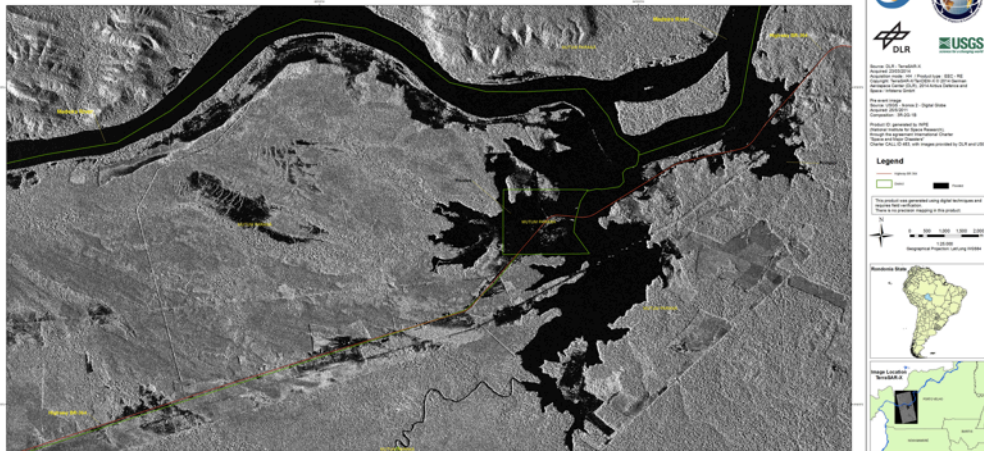# CHARTER- International Charter Space and Major Disasters

INPE is partner with CHARTER

CBERS-4 records image in emergency situations.

Brazil and China agreed to record satellite imagery and made it available through Charter.



BRAZIL - FLOOD - Porto Velho / RO - District Mutum-Paraná - MAR/2014

Flood in Madeira River, Brazil



Destruction and flooding caused by tropical cyclone Enawo, which struck Madagascar on 7 March, 2017

# Program for Satellite Monitoring of the Brazilian Amazon and Other Biomes



INPE provides data and information (land use and land cover mapping) to government (law enforcement) to prevent and control illegal deforestation activities in the Amazonia Forest since 1988.

PRODES: yearly clear-cut deforestation
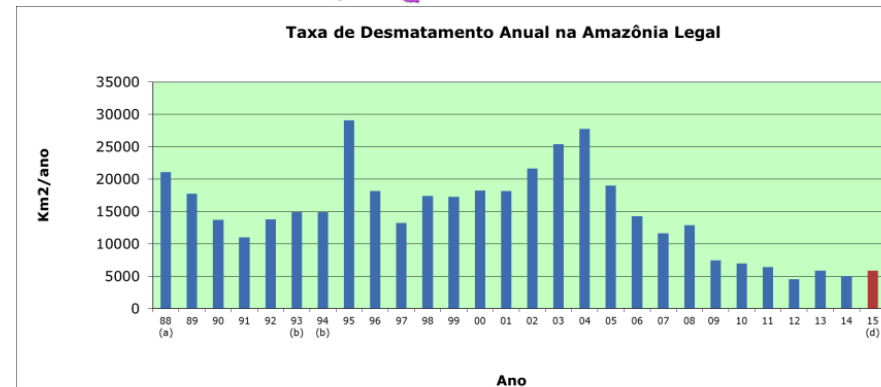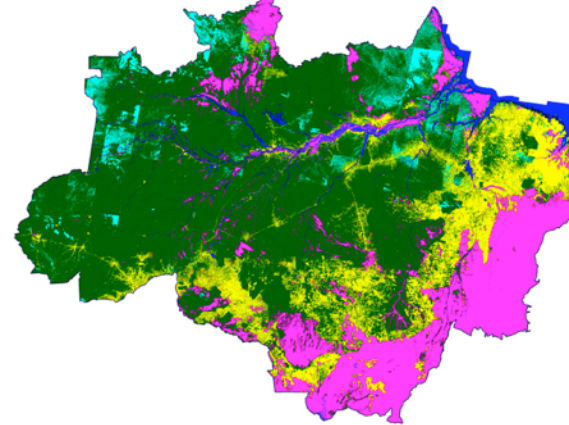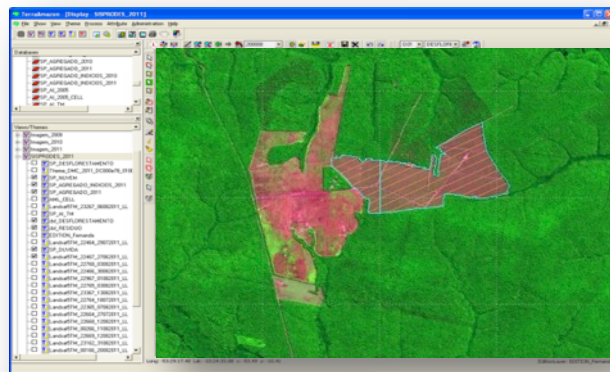
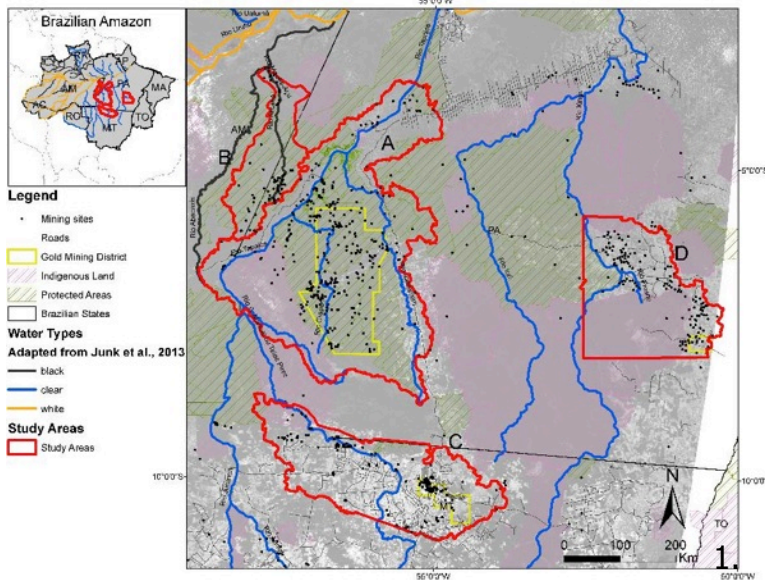# DETER- Early warning system of deforestation and forest degradation



INPE Delivers results to IBAMA* within 1-5 days after acquisition period
* Brazilian environmental law enforcement authority at the federal level
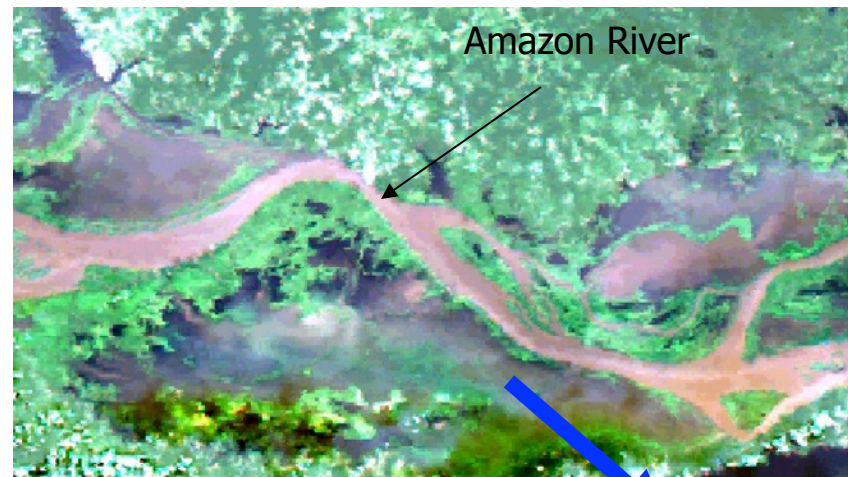
# Monitoring Amazon basin in Brazil

Water quality changes with excess of nutrient runoff from poorly managed crop fields and pastures, metal pollution from mining, organic pollution from discharge of untreated human and animal wastes, waterborne diseases.

Monitoring gold mining impact using multi-satellite images



Amazon River

Curuai Lake near Santarém

Algae bloom

MODIS true color composite

1. Active mining
2. Top soils dominated
3.  by inorganic fine particles
4. rivers detectable by medium/high
5.  spatial resolution images (≤30 m wide).

Amanã River, Peixoto de Azevedo River Xingu River.

Source: Lobo et al. 2017
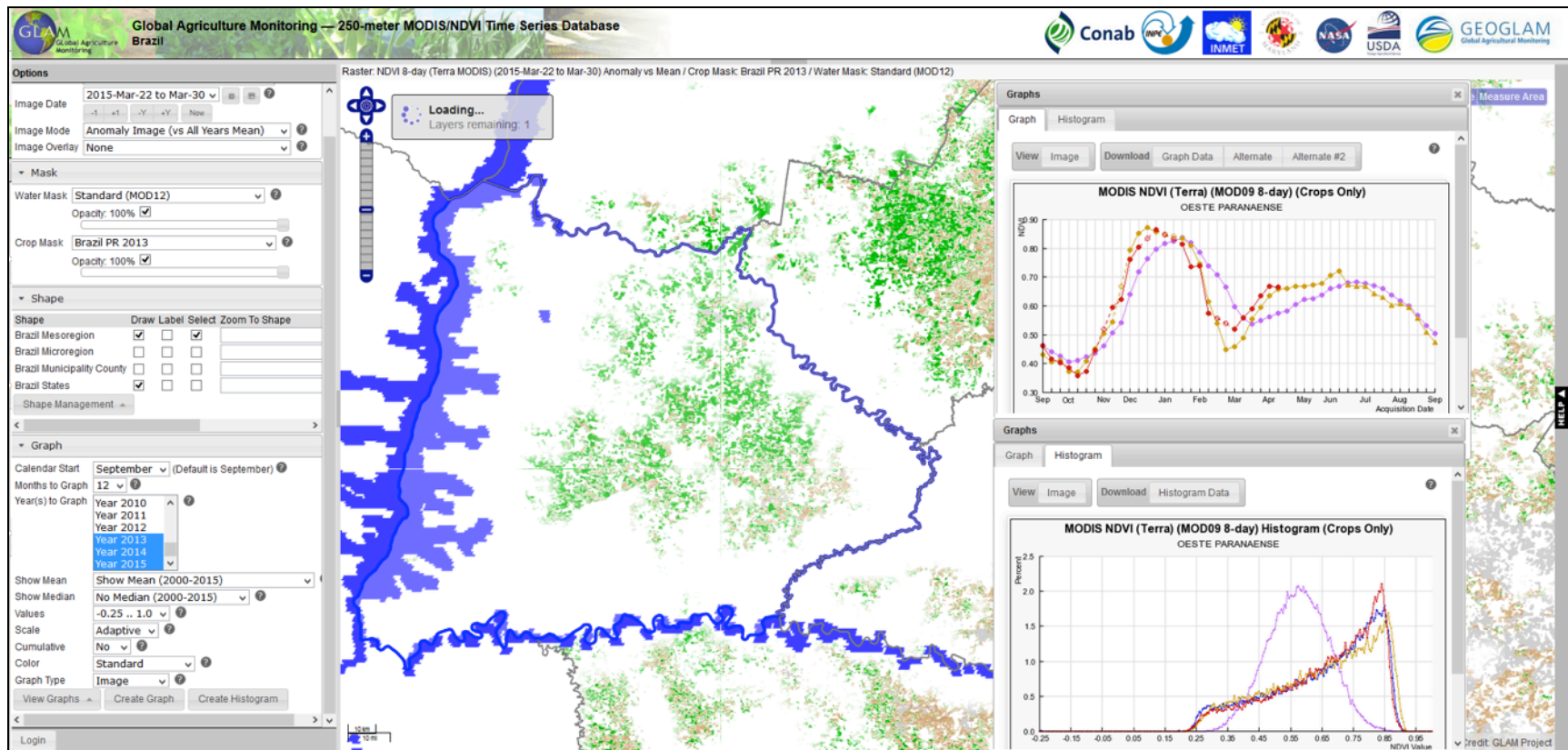
6 CLEAN WATER AND SANITATION
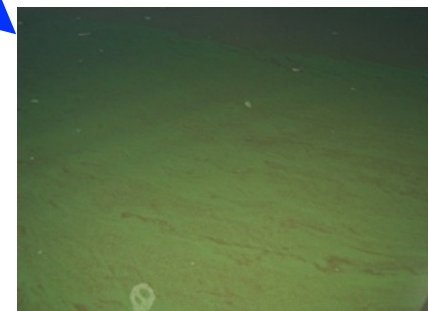
# GEOGLAM – Crop Monitor

INPE has and agenda for multilateral and bilateral cooperation.

In Brazil, CONAB (Brazilian National Food Supply Company) and INPE are part of the crop monitor assessment conducted by GEOGLAM.

# INPE provides Open Source Geotecnologies with no use of restrictions (www.dpi.inpe.br)

To ensure end users in Africa and other developing countries can fully exploit the EO data and SDGs applications.

General purpose GIS's

Library to develop geographical applications

Environmental Risks Monitoring, Analysis and Alert

Environmental Modelling System

Distributed Hidrological Modelling

Data Mining System

Remote sensing imagery vector editor

# Capacity Building in Africa



**Capacitree Program**: Program to train end users to use EO data, remote sensing and image processing methods for forest monitoring

Basic courses on remote sensing, digital image processing and geoprocessing

**TerraAmazon**: multiuser GIS plataform based on TerraLib library (open source) for large-scale land change monitoring.

**Tutorials and Instructors** (Portuguese, English, French an

South Africa, Algeria, Burkina Faso, Chad, Ghana, Kenya, Democratic Republic of Congo, Sao Tome and Principe, Morocco, Equatorial Guinea, Burundi, Central African Republic, Cameroon, Tanzania, Tunisia, Zambia, Guinea and Gabon
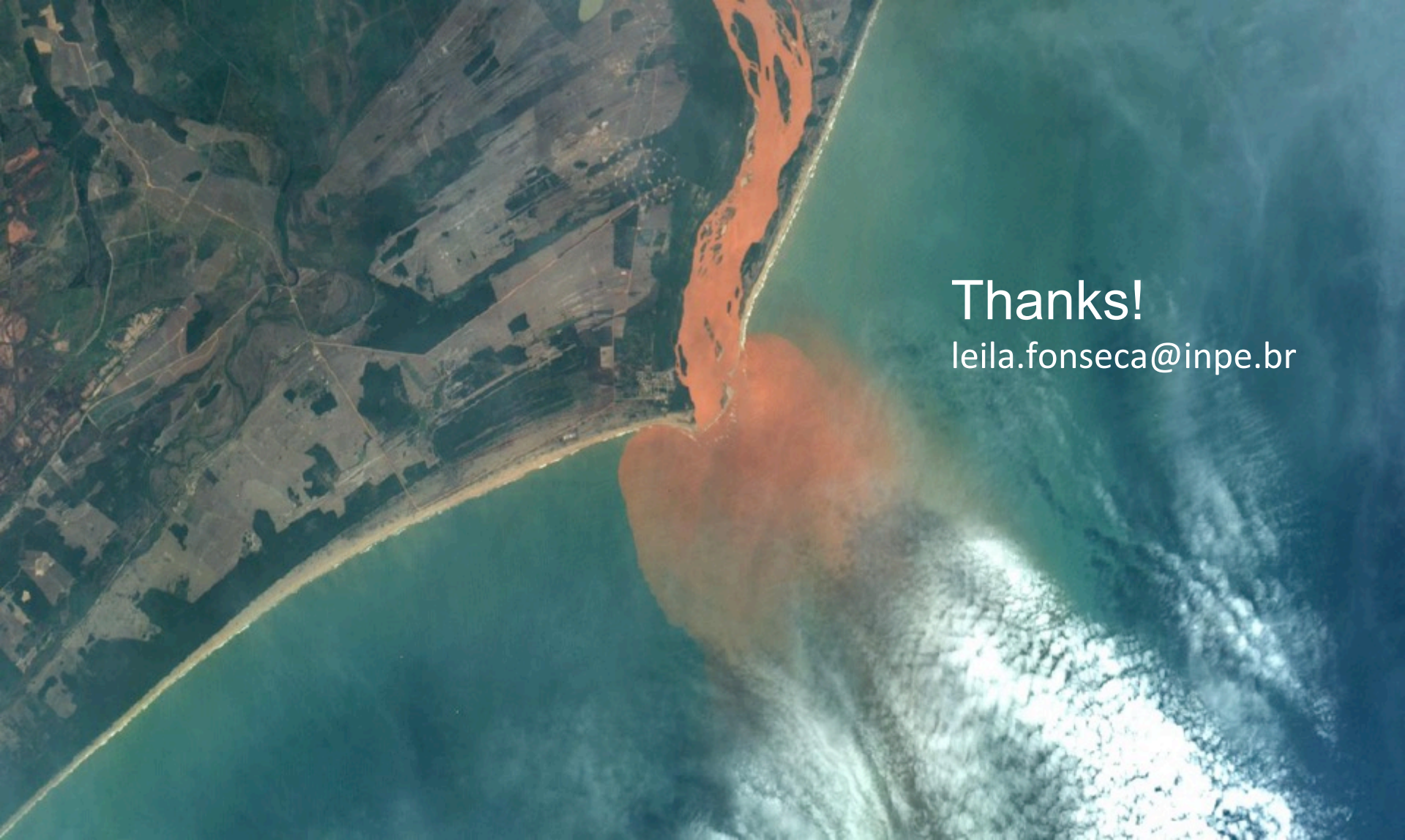
Thanks!
leila.fonseca@inpe.br

Satellite CBERS-4 MUX - 20 m, acquired on 12/7/2015, showing the ore debris from Samarco disaster flowing into the ocean via Rio Doce