

# INPE Report to WGCV-36



## WGCV 36

Hosted by AOE, CAS: Key Lab of Quantitative Remote Sensing Information Technology, and Key Lab of Computational Optical Imaging Technology  
13-17 May

Leila Fonseca  
Head, Image Processing Division at INPE  
[leila@dpi.inpe.br](mailto:leila@dpi.inpe.br)



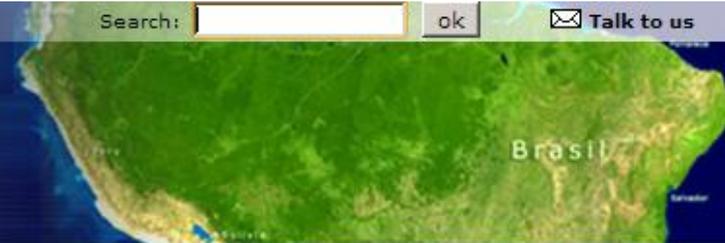
# INPE – Brazilian National Institute for Space



National Institute For Space Research

Search:  ok

Talk to us



English | Português A A A

:: Thursday, May 16, 2013

## INSTITUCIONAL

- :: About INPE »
- :: Who is Who »
- :: Research and Development
- :: Regional Centers »
- :: History
- :: Mission, Vision and Values
- :: Strategic Goals
- :: Facilities

## PRODUCTS AND SERVICES

- :: Satellites »
- :: Satellite Data »
- :: Amazonia »
- :: Northeast
- :: Forest Fires
- :: Weather and Climate
- :: Astronomical Observations »
- :: Space Weather

:: Domestic Cooperation

:: International Cooperation



### Brazil to share experiences of environmental monitoring during international event

11/19/2012

Geotechnologies like satellites are useful in monitoring crops, water resources, natural disasters and in registering properties, besides other applications. In Foz do Iguaçu (PR), on Tuesday (11/20),...

full story »

### Foz do Iguaçu to host meeting on Earth Observation. GEO Plenary for the 1st time in Brazil

11/14/2012



Lightning  
cional/about\_inpe/history.php

### structure for monitoring the ionosphere in South America will be discussed on February at INPE

/2012

Registration for the workshop Monitoring Ionosphere Over America (MIMOSA) is already open (new deadline: January and is free of charge. The workshop MIMOSA wi...

full story »

## WEATHER FORECAST

City	min.	máx.	cond.
Salvador	22°C	28°C	
Recife	23°C	29°C	
Brasília	16°C	28°C	

17/05/2013 [Other Cities ±](#)

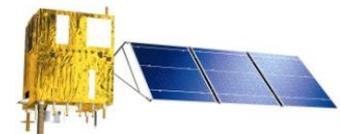
## HIGHLIGHTS

### :: LIT - Integration and Testing Laboratory



It develops highly specialized activities on component qualification and space systems ...

:: On line INPE's Library



# INPE's Research & Development

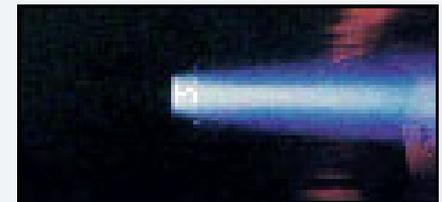
## Space and Atmospheric Sciences



A pioneer at INPE, this area comprehends the physical and chemical investigation of phenomena occurring in the atmosphere and outer space of interest for the country. It runs researches and experiments in the fields of Aeronomy, Astrophysics, and Space Geophysics.

## Associated Laboratories

An area focused on basic researching and on the technological development in INPE related fields. It encompasses activities in the fields of Sensors and Materials, Plasma, Computing and Applied Mathematics, Combustion, and Propulsion.



# INPE's Research & Development

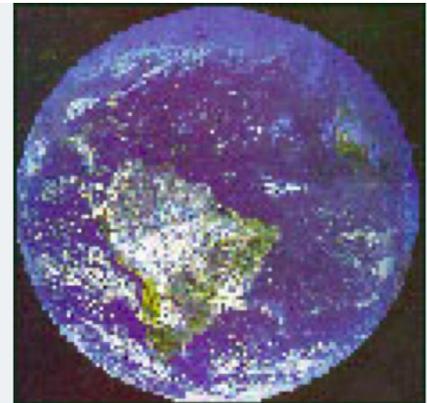
## Space Engineering and Technology



An area focused on the development on space systems and technologies intended for a number of applications, such as the execution of projects and construction of satellites and land-based systems. It carries out development actions in the fields of Space Mechanics and Control, Aerospace Electronics, Ground Systems and Manufacturing.

## Weather Forecast and Climate Studies

Develops researching and activities in the fields of Meteorological Sciences, Meteorology by satellite, Weather Forecasting, and Climate. The operational activities for weather and climate forecasting are carried out with the operation of a supercomputer, which renders possible reliable weather and climate forecasting within a reasonable notice.



# INPE's Research & Development

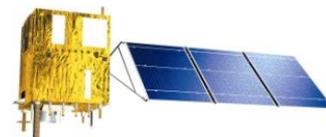
## Satellite Tracking and Control Center



It comprises the development of control systems for satellites on low orbit and geostationary satellites. It encompasses activities carried out at the São José dos Campos Campus, and at the Earth Stations in Cuiabá – Mt, and Alcântara – MA.

## Integration and Testing Laboratory

It develops highly specialized activities on component qualification and space systems, making development, assembly, integration and tests on space systems, as well as qualification and analysis of failures on components for both space and industry use in the country, under international standards.

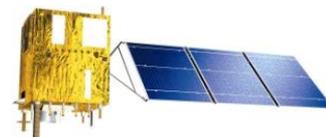


# INPE's Research & Development

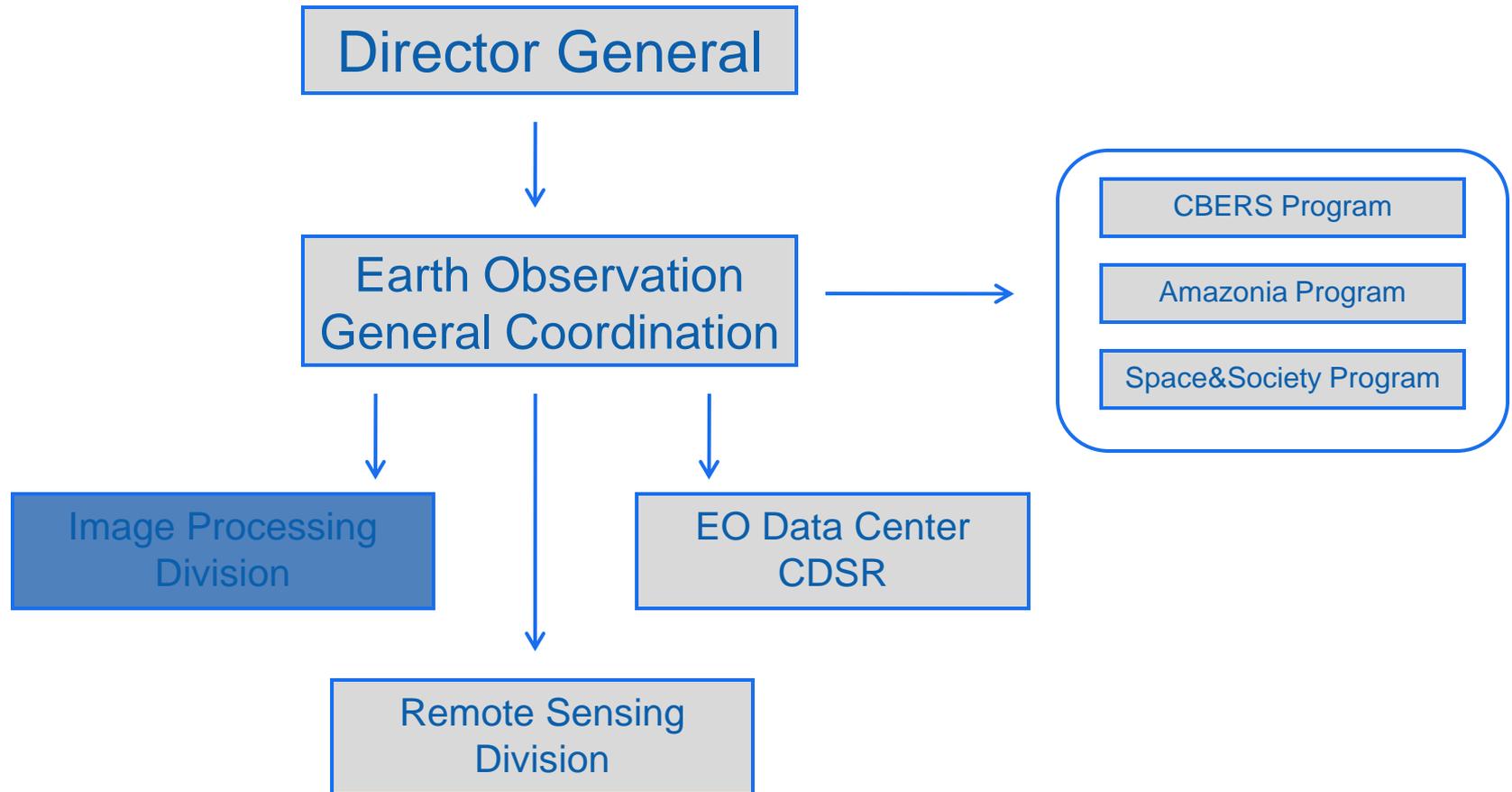
## Earth Observation



Involves scientific and technological knowledge in the fields of remote sensing and geoprocessing, natural resources survey and environmental monitoring. It carries out activities in the fields of researching, development and applications in the areas of Remote Sensing and Digital Image Processing



# EO internal hierarchical structure



# INPE's agenda in GEO

INPE represents Brazil in GEO

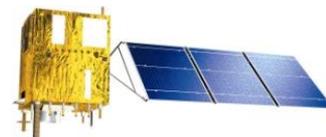
INPE participates in CB and IDTT GEO Tasks

INPE participates in CB for Disaster Management

INPE participates in CB in CBERS for Africa

INPE leads IDTT Open Source Software Tools (GEO ID-02)

INPE and CRESDA lead IDTT CBERS for Africa



# INPE's agenda in CEOS

INPE was the CEOS chair in 2010

Participation in WGCV ([Leila Fonseca e Flavio Ponzoni](#))

Participation in WGISS ([Lubia](#))

INPE is the current Chair of the WGCapD ([Hilcea Ferreira](#))

INPE is co-chair of the LSI ([Julio DAAlge](#), with USGS and ISRO)

INPE has a scientific participation in PC ([Luiz Augusto Machado](#))

INPE has a scientific participation in OCR ([Milton Kampel](#))

WGC (Working Group on Climate) [Daniel Vila](#)

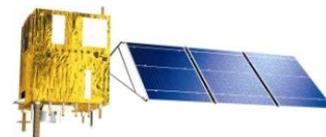
INPE has hosted 4 CEOS meeting:

CEOS Plenary 2010

CEOS WGCV 2009

CEOS LSI 2010

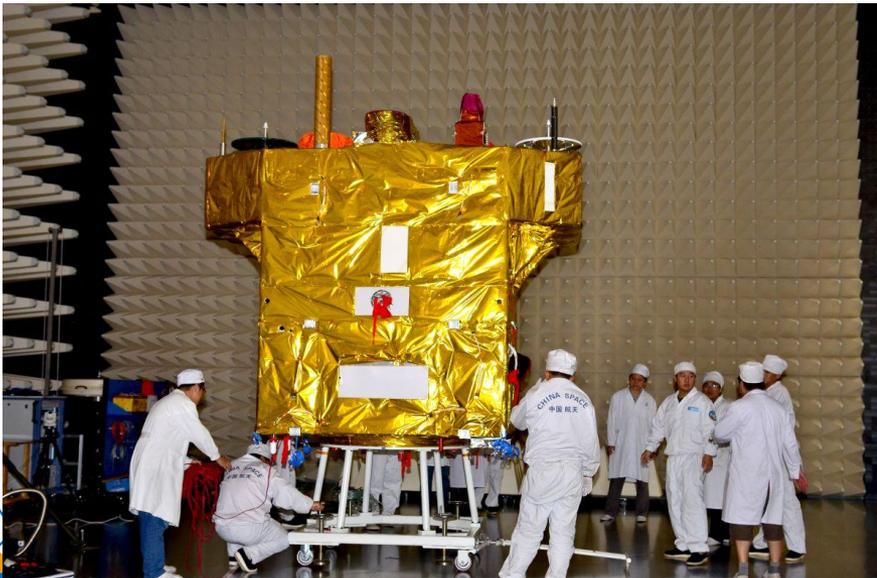
CEOS WGISS 2013



# CBERS 3 launch schedule

After evaluating failures in some AC/DC converters (MDI - Modular Devices Incorporated, USA) in the satellite power system, it was decided that CBERS-3 will be launched from China in **September 2013**.

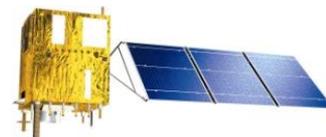
Launch from China using a Long March rocket



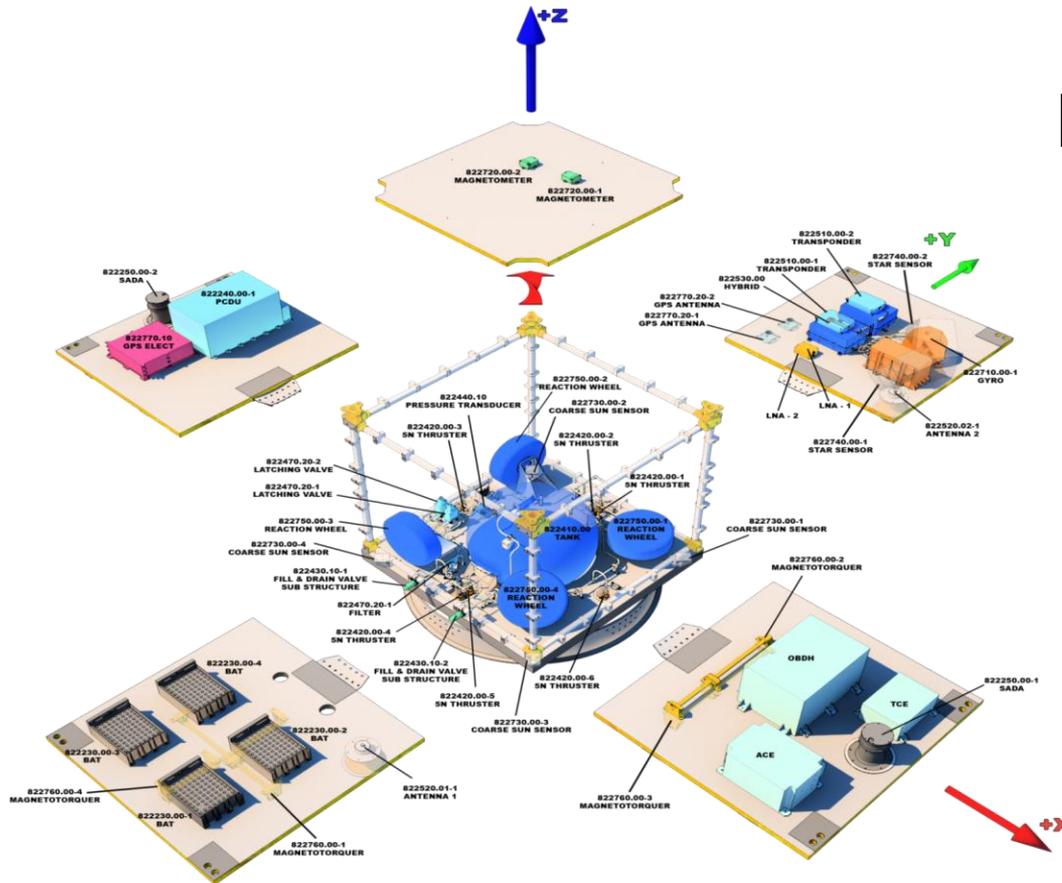
# CBERS-3/4 Cameras

Sensors	Resolution	Bands	Swath	Revisit	bits/pixel
MUX	20 m	B, G, R, NIR	120 km	26 days	8
PAN	5 m 10m	PAN G, R, NIR	60 km, off nadir (32°)	52 days	8
WFI	73 m	B, G, R, NIR	866 km	5 days	10
IRS	40m 80m	NIR, MIR, TIR	120 km	26 days	8

**Onboard recorder for MUX, PAN, IRS and WFI**



# The Multi Mission Platform – MMP



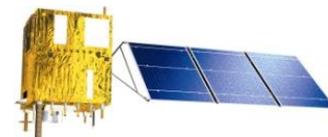
## Payload (sensors)

Mass < 280 kg

Average Power

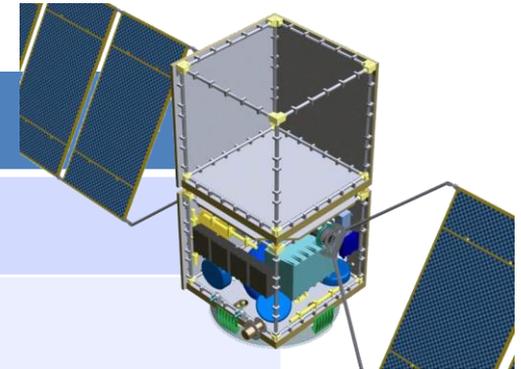
225 W, max 900 W

Equatorial & Quase-Polar orbit (600 to 1200 km)

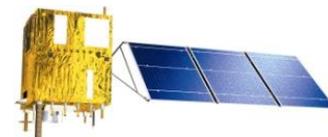


# Amazonia 1 – Advanced WFI camera

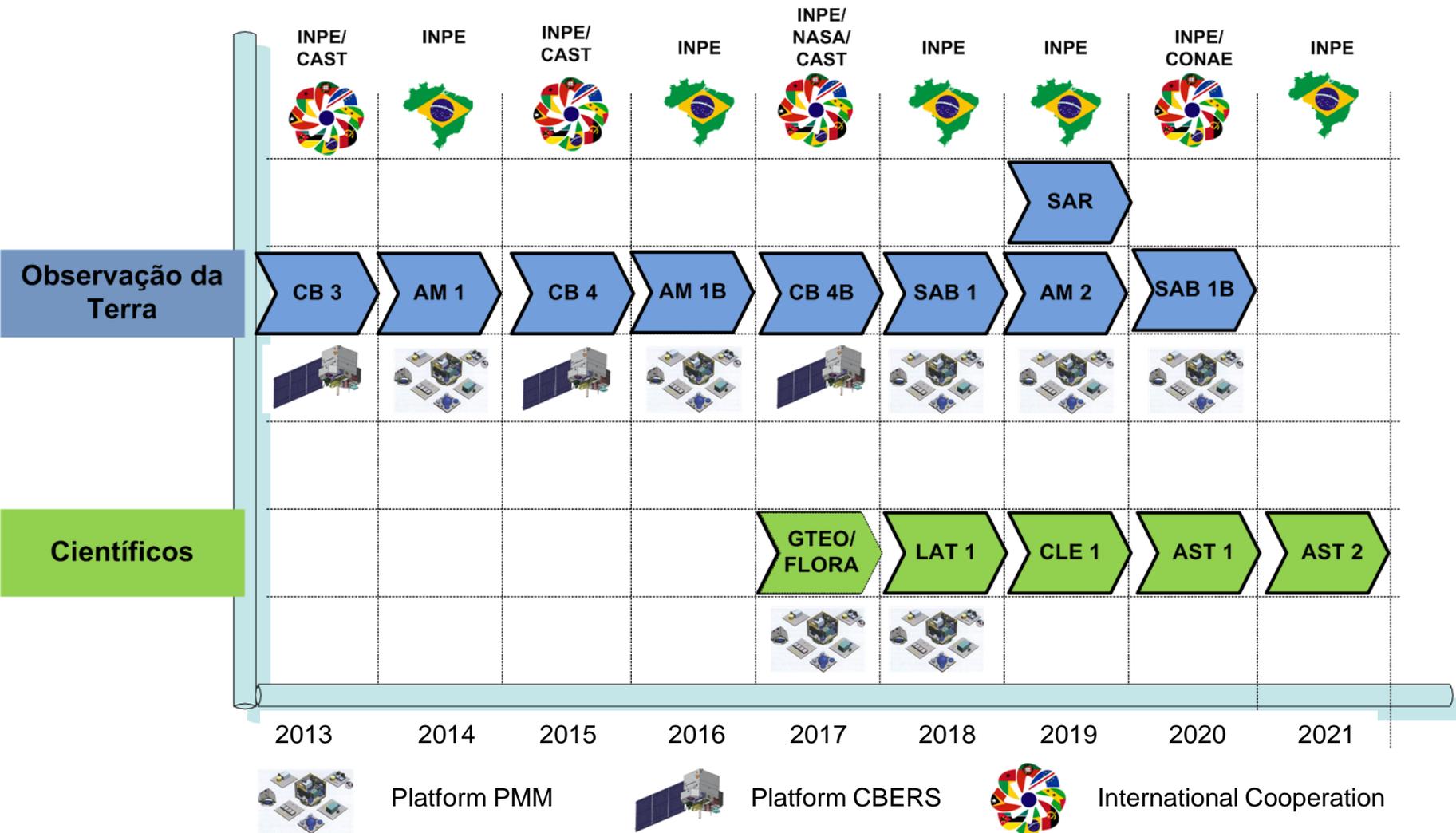
Parameter	AWFI
Band 1	0.45 - 0.52 $\mu\text{m}$
Band 2	0.52 - 0.59 $\mu\text{m}$
Band 3	0.63 - 0.69 $\mu\text{m}$
Band 4	0.77 - 0.89 $\mu\text{m}$
Resolution	40 m
Swath width	700 km
Revisit time	5 days



Forest Monitoring mission  
US\$ 100M (Amazônia-1 + PMM)

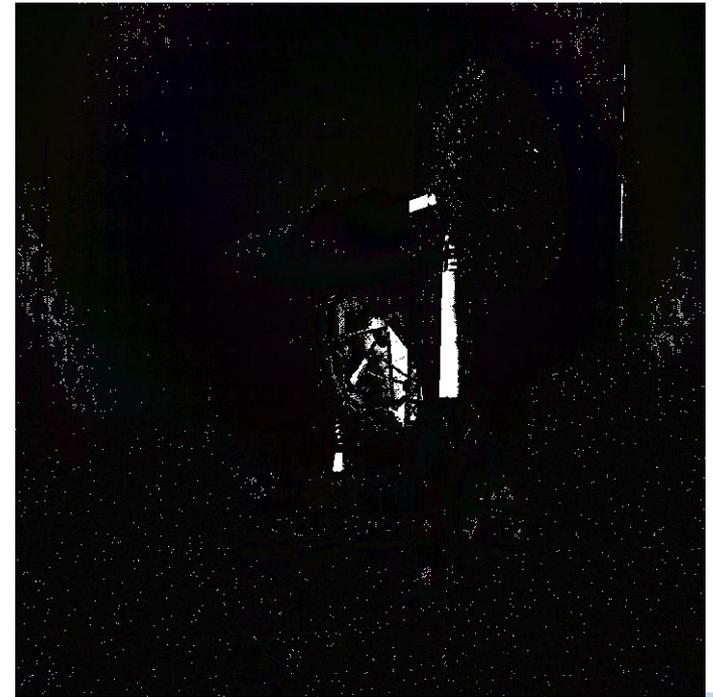


# Brazilian Space Missions scenario



# Remote Sensing Data Center at INPE

**CDSR** : Receive, archive, process and distribute satellite data from different space missions (EO, Meteorological, Scientific)



# EO Data Center

CDSR has stored more than 700 TB of historical satellite data: CBERS, LANDSAT, AQUA, TERRA, GOES METEOSAT, NOAA, ENVISAT, RADARSAT, UK-DMC-2, S-NPP and RESOURCESAT-1

Currently receives AQUA, TERRA, UK-DMC-2, RESOURCESAT-1, GOES-12, GOES-13, LANDSAT-7, NOAA-15, NOAA-16, NOAA-18, NOAA-19, MetOp-B, S-NPP and METEOSAT-9

Ready to receive CBERS-3, LANDSAT-8, FY-3, RESOURCESAT-2 and GOES-R, FORMOSAT-7/COSMIC-2

Data is freely distributed in the INPE's catalogue  
<http://www.dgi.inpe.br/CDSR/>





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

## S-NPP(VIIRS) images



# Technologies in Geoinformatics

## GIS and Image Processing Systems



# GIS software implementation – TerraLib

INPE DPI

**TerraLib**

- DOCUMENTATION
- DOWNLOAD
- CHANGELOG
- EXTENSIONS
- FORUM
- LIST OF PROJECTS

about wiki partners search for  in the Site

RELATED SITES

**TerraView**

**WHAT IS TERRALIB?**

**TerraLib** is a GIS classes and functions library, available from the Internet as open source, allowing a collaborative environment and its use for the development of multiple GIS tools. Its main aim is to enable the development of a new generation of GIS applications, based on the technological advances on spatial databases.[more]

**News**

[2010-12-16] **New release of TerraLib 4.0.0**

- Support included in the SLD and TerraOGC TerraLib;
- Drive for SQL Server 2008 Spatial;
- Support for KML theme.

[2010-10-22] **New release of TerraLib** TerraLib 3.6.0 is available, and is now considered the latest stable release of TerraLib. It comes with the beginning of distribution of TerraOGC extension of TerraLib, used for implementing OGC web services.

[2010-05-05] **TerraLib 3.5.0 is available** TerraLib 3.5.0 is launched. It fixes the bugs found in the previous release and is now considered as the latest stable release of TerraLib.

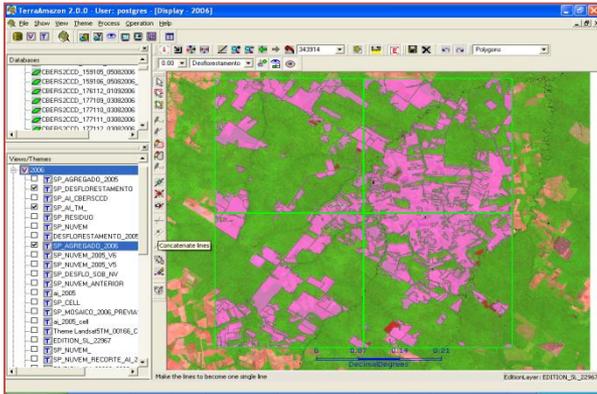
[2010-05-05] **TerraLib 3.4.0 is available** TerraLib 3.4.0 is launched. It fixes the bugs found in the previous release and is now considered as the latest stable release of TerraLib.

[2010-01-28] **TerraLib/TerraView software repository migrated to SVN** The Source Code Management System used with TerraLib was changed to Subversion, also known as SVN. In order to access a SVN repository, you must install a

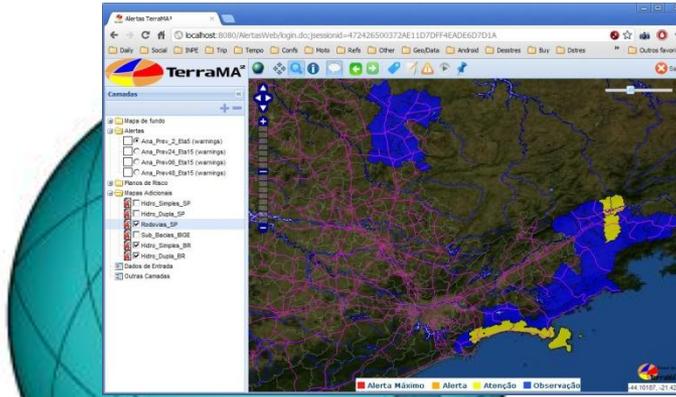


# Open source geotechnologies based on TerraLib ([www.dpi.inpe.br](http://www.dpi.inpe.br))

## TerraAmazon



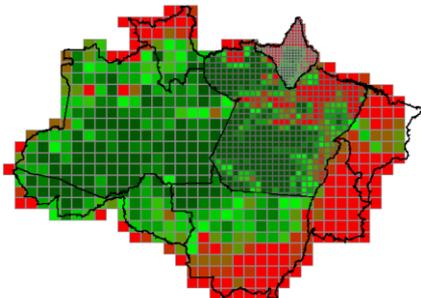
## TerraMA<sup>2</sup>



## GeoDMA



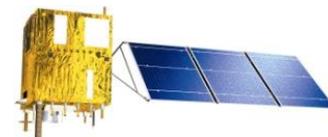
## TerraME



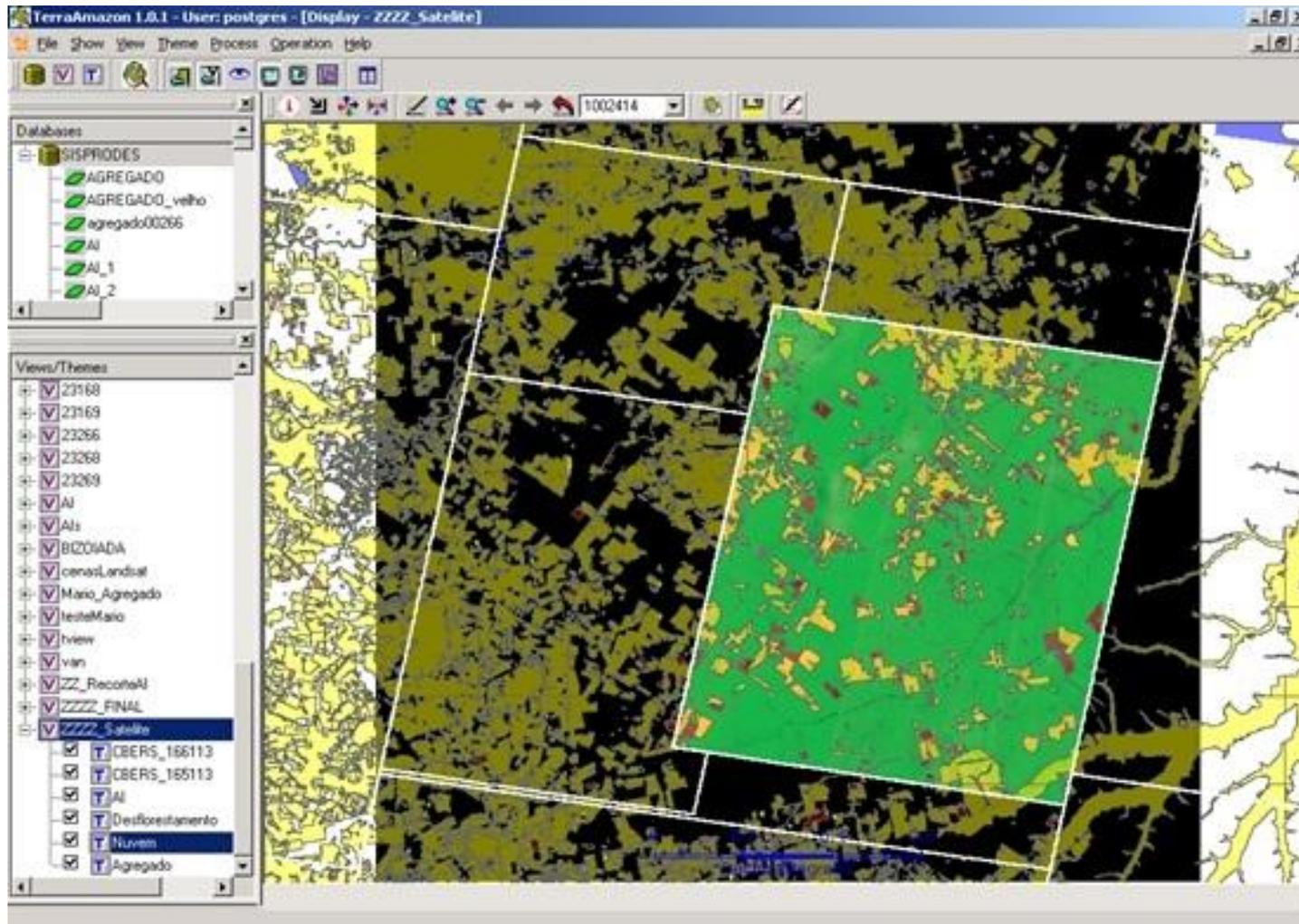
## TerraPixel



## InterIMAGE



# Database management – TerraAmazon



# Deforestation alerts – MODIS and AWiFS

The screenshot displays the DETER (Sistema de Detecção de Desmatamentos em Tempo Real) web application. The interface includes a search panel on the left with the following parameters:

- Data Inicial (aaaa-mm-dd): 2004-05-7
- Data Final (aaaa-mm-dd): 2004-05-20
- País: BRASIL
- Estado: TODOS
- Satélite: MODIS 01
- Faixa de Área: Maior que 25 ha
- Mostrar queimadas: Não
- Por Região (opcional): Norte 15.0, Oeste -90.0, Leste -30.0, Sul -40.0

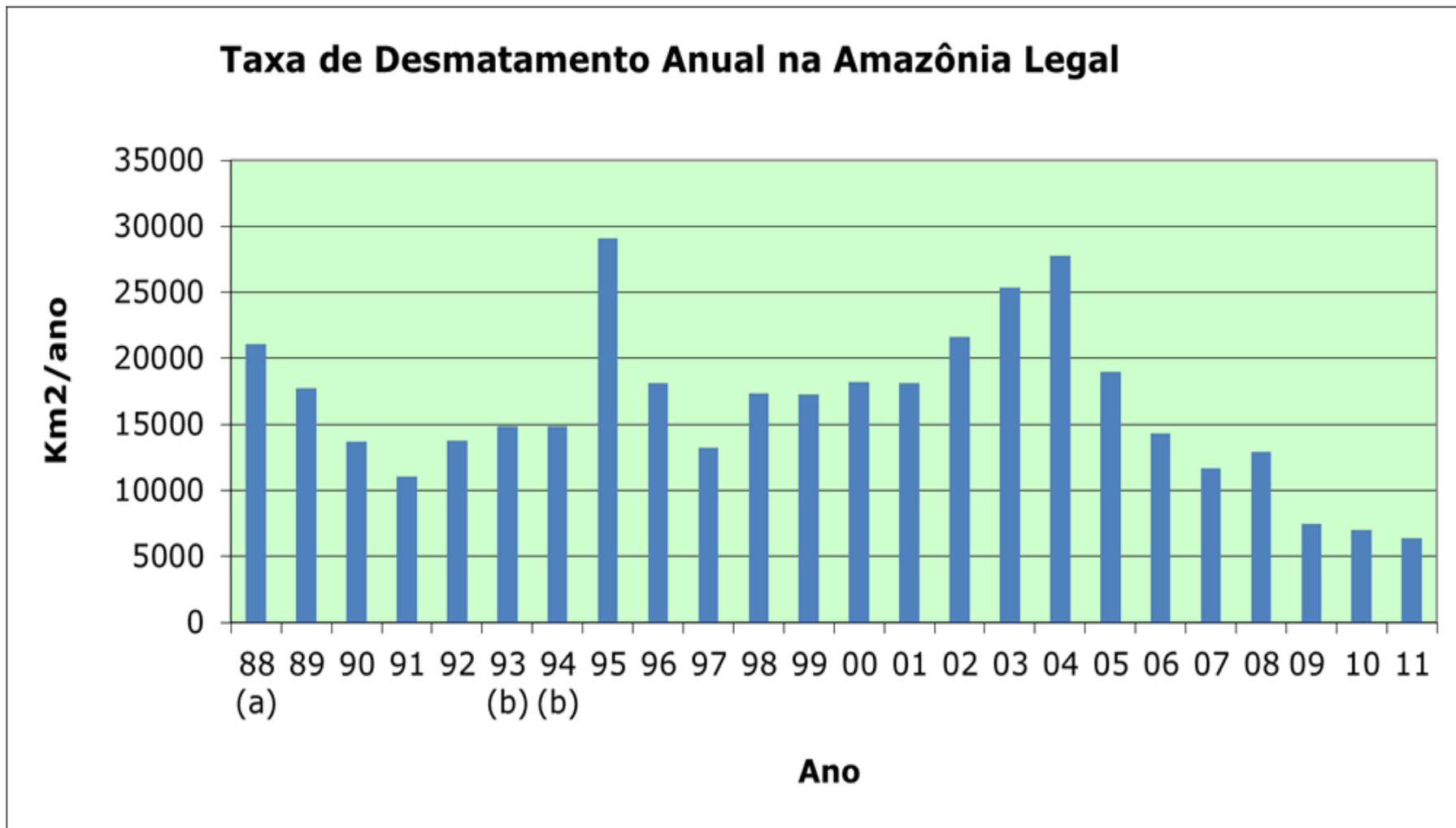
The main map area shows a satellite mosaic of a region in Brazil, with deforested areas highlighted in pink. A red arrow points from a specific pink area on the map to a data table in a smaller browser window titled "Cadastro".

MPO	VALOR
Lat	-11.6270
Long	-56.4583
LatGMS S	11 37 37.35
LongGMS O	56 27 29.72
Area Km2 / Ha	3.2 / 318.3
Data-Hora/Date-Time/Fecha-Hora	2004-05-07 12:00:00
Satélite/Satellite/Satélite	MODIS-01
Município/City/Localidad	Porto dos Gaúchos
Estado/State/Provincia	MT
Station Unit/Área de Conservación	
Tamanho arquivo/formato Shape	0.18 MBytes
Download	<a href="#">Alerta_20040507_shp.zip</a>



# Deforestation rates series since 1988

## PRODES



# Monitoring, Analysis and Alert – TerraMA<sup>2</sup>



Ministério da Ciência e Tecnologia

Destaques do governo



## Monitoring, Analysis and Alert



Home

Download

Architecture

Documents

News

Examples

Team

Contact

Av dos Astronautas, 1.758  
Jd. Granja - CEP: 12227-010  
São José dos Campos - SP  
Brasil  
Tel: 55 (12) 3945-6500

TerraMA2 (old SISMADEN) is a software product, a computational system, based on a Service Oriented Architecture (SOA), which provides the technological infrastructure required to develop operational systems for environmental risks monitoring and alert. TerraMA2 provides services to gather updated data through internet and to add it to the alert system database; services to manipulate/analyze new data in real time and check if a risk situation exists by comparing with risk maps or a defined model; services to execute/edit/create new risk and alert models; services to create and notify alerts to system users; and other basic and advanced services.

### System Operation

The alert system operation requires access to updated data from observations and forecasts, in addition to risk maps of the targeted areas or mathematical models that define the risks.

- **System Operators:** The system operators are organizations that monitor the possibility of disaster events.
- **Alert Clients:** The alert clients are agents with capability to execute preventive actions to reduce losses if the disaster occurs.

### Database

- **Dynamic Data** - report on the condition of variables obtained at intervals time.
- **Static data** - contain information about the pre-conditions for the occurrence of a disaster. Your update should be performed whenever a pre-condition is changed or when the model of occurrence of the disaster is updated.
- **Additional data** - other information to aid the location of risk areas and populations vulnerable to disaster or equipment examined.



### News

**New data ETA15km Forecast Model.**

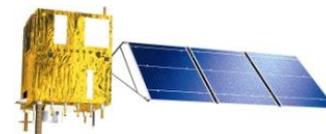
The ETA models 20 and 40km will be discontinued from October 30, 2011.

### Links



TerraLib

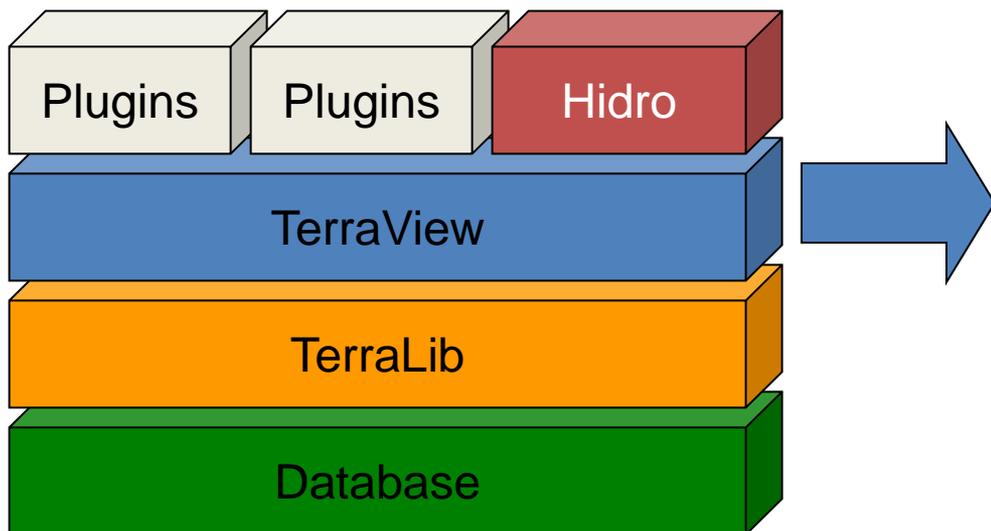
TerraView





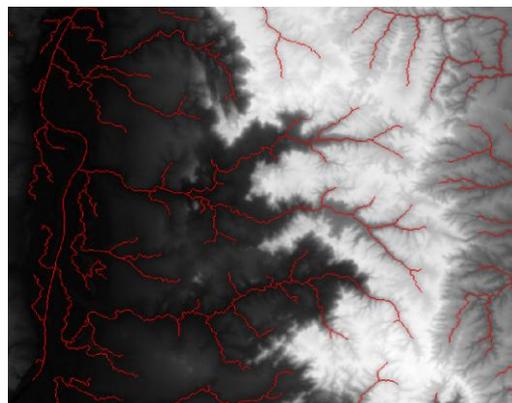
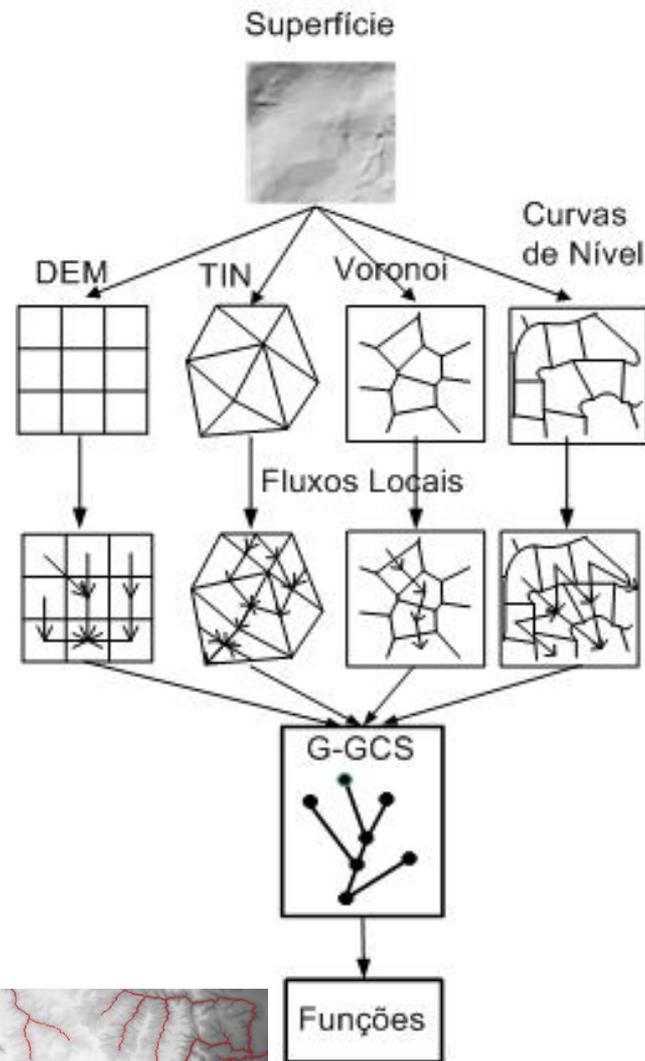
# TerraHidro

## hydrologic applications



Graph -> hydrologic network

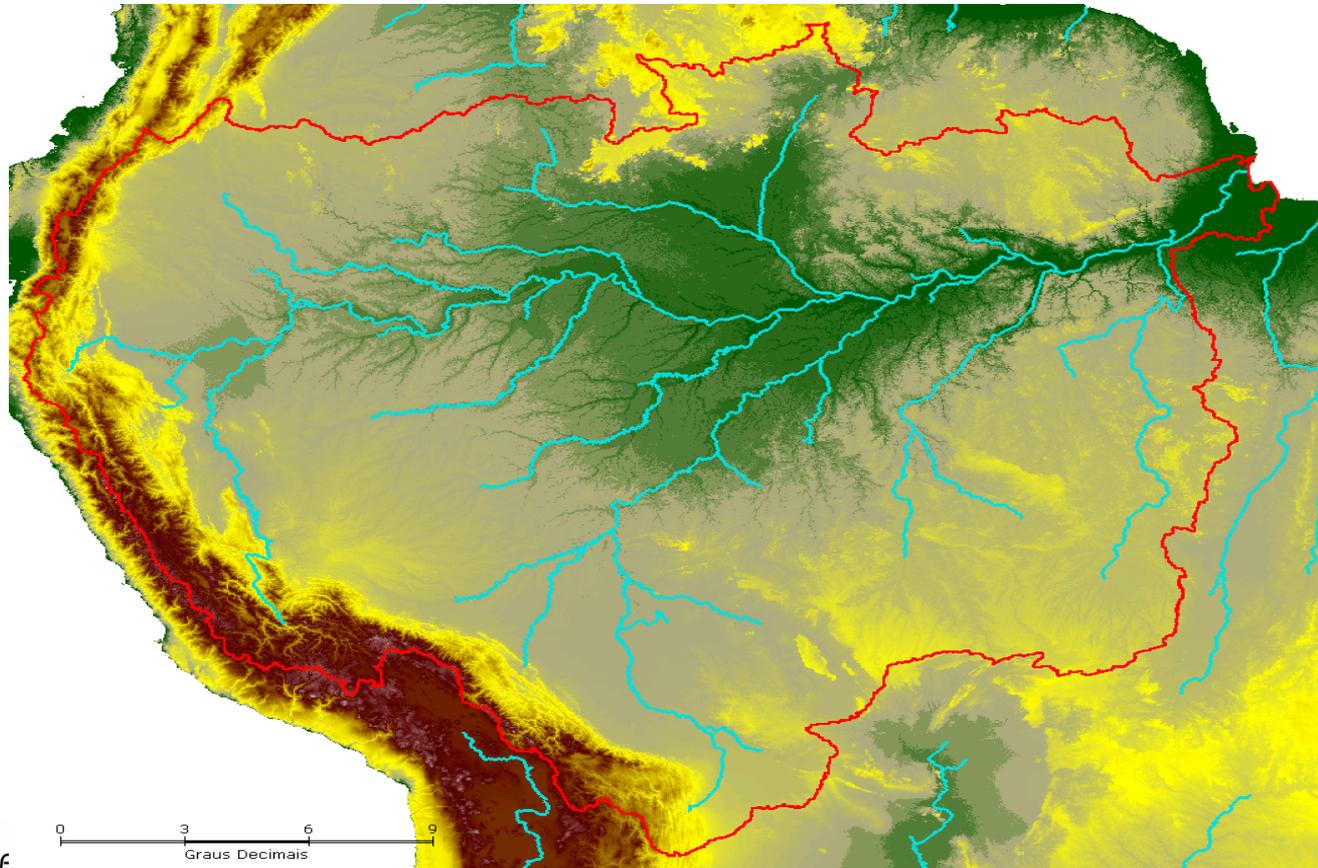
Boost Graph Library - BGL



# TerraHidro – Example Basin and Drainage (SRTM)

**Red:** Basin delimitation

**Blue:** drainage of main Rivers, extracted from accumulation area



# Activities on Capacity Building

Extension of PRODES and DETER methodologies and training to other countries

Indonesia, countries in the Equatorial Africa

GIS and Remote Sensing capacity building in Africa (GEO CB task)

Mozambique, South Africa

Extensive use of free and open source software



**CEOS-WGCapD joint workshop on digital elevation modeling  
and derived applications using remotely sensed data**

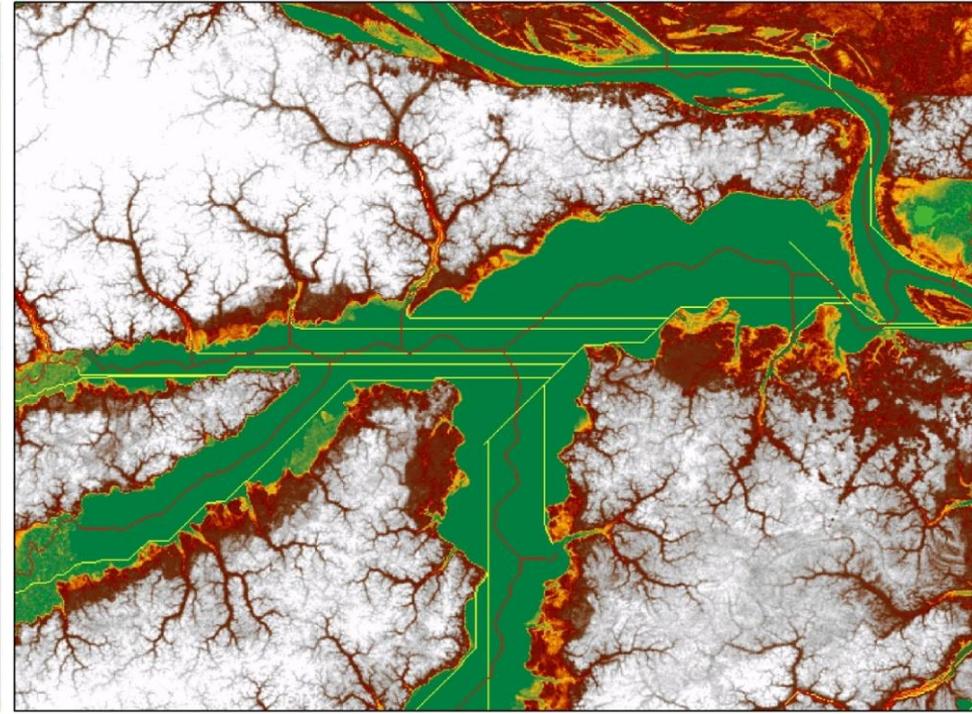
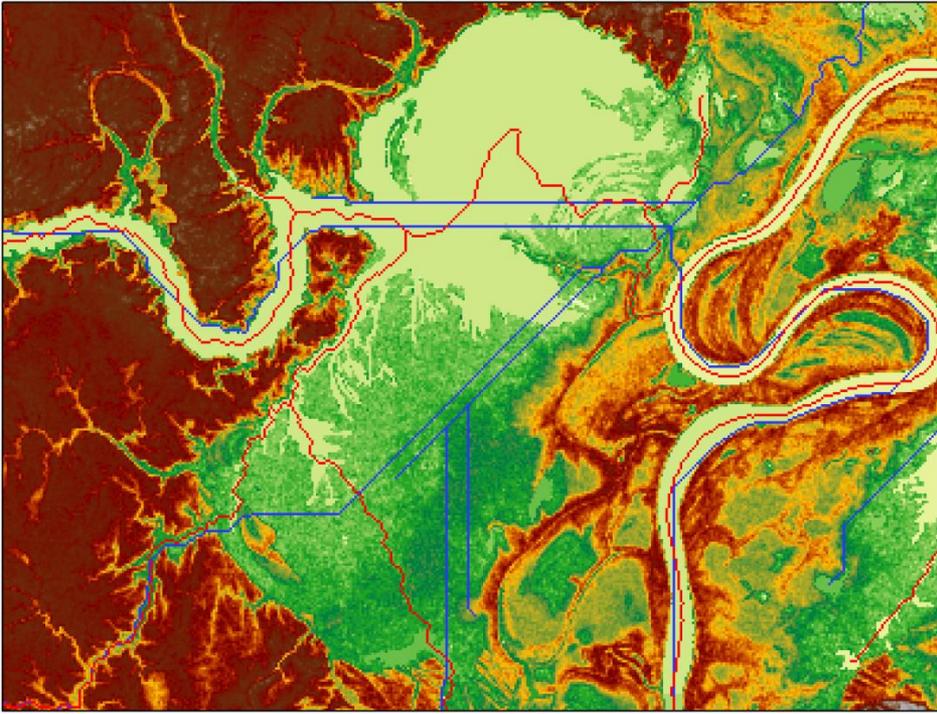
**TERRAHIDRO – a Distributed Hydrological System  
Nairobi, Kenya (6-10 May 2013)**

**Blue lines: ArcGis**

**Yellow lines: ArcGis**

**Red lines: TerraHidro**

**Red lines: TerraHidro**



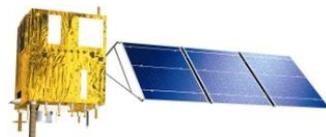
**TerraHidro X ArcGis Hydro Tools**

**Purus River**

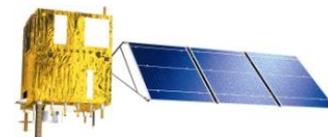
# Radiometric Calibration Site in Brazil

There is not “official” test sites in Brazil

- ❖ The calibration campaigns are performed in a farm
- ❖ Depends the availability of the area (farmer)
- ❖ The soil is prepared by the farmer
- ❖ Time window: August-October

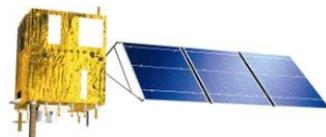


# Reference Surface: agriculture area after soil preparation



# Absolut Calibration Campaign

- ❖ Planned for August/September 2013
- ❖ Local: nearby Luiz Eduardo Magalhães (Bahia, northeast of Brazil): coordinate  $12^{\circ} 23' 15.82''$  s and  $46^{\circ} 7' 38.51''$   
Fazenda Marechal Rondon
- ❖ Mission: Calibrate Landsat 8 and compare the results with the ones obtained by USGS
- ❖ Method: Vicarius including uncertainties in all procedures



# Comments

- ❖ INPE has already participated in three campaigns outside Brazil: Atacama (Chile), Gobi (China) and Toz Golu (Turkey)
- ❖ CBERS direct downlink at USGS – EROS in 2006 and 2008 for cross-calibration with Landsat data
- ❖ CBERS onboard data recorder used over Antarctica for the Dome-C experiment (QA4EO – WGCaVal)
- ❖ INPE would like to participate in other calibration campaigns organized by Cal/Val group
- ❖ Certainly INPE must be more involved in the WGCV activities (IVOS, LPV, LandNet) and OCR



- Thanks!
- [leila@dpi.inpe.br](mailto:leila@dpi.inpe.br)

