



MINISTÉRIO DA CIÊNCIA E TECNOLOGIA
INSTITUTO NACIONAL DE PESQUISAS ESPACIAIS

GEO Capacity Building Workshop, May 2006

The CBERS satellite, data policy and social benefits

Gilberto Câmara

Director, National Institute for
Space Research

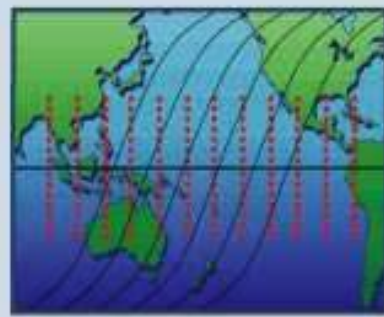
From EO to societal benefits

Downlink Speed

Petabytes 10^{15}

Multi-platform, multiparameter, high spatial and temporal resolution, remote & in-situ sensing

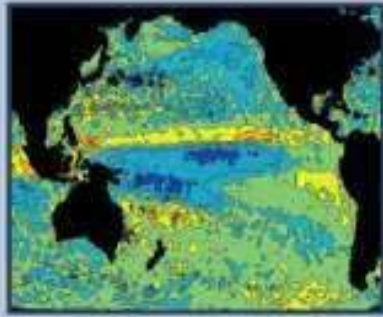
Advanced Sensors



Terabytes 10^{12}

Calibration, Transformation To Characterized Geo-physical Parameters

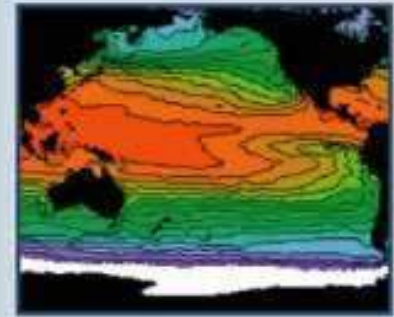
Data Processing & Analysis



Gigabytes 10^9

Interaction Between Modeling/Forecasting and Observation Systems

Information Synthesis



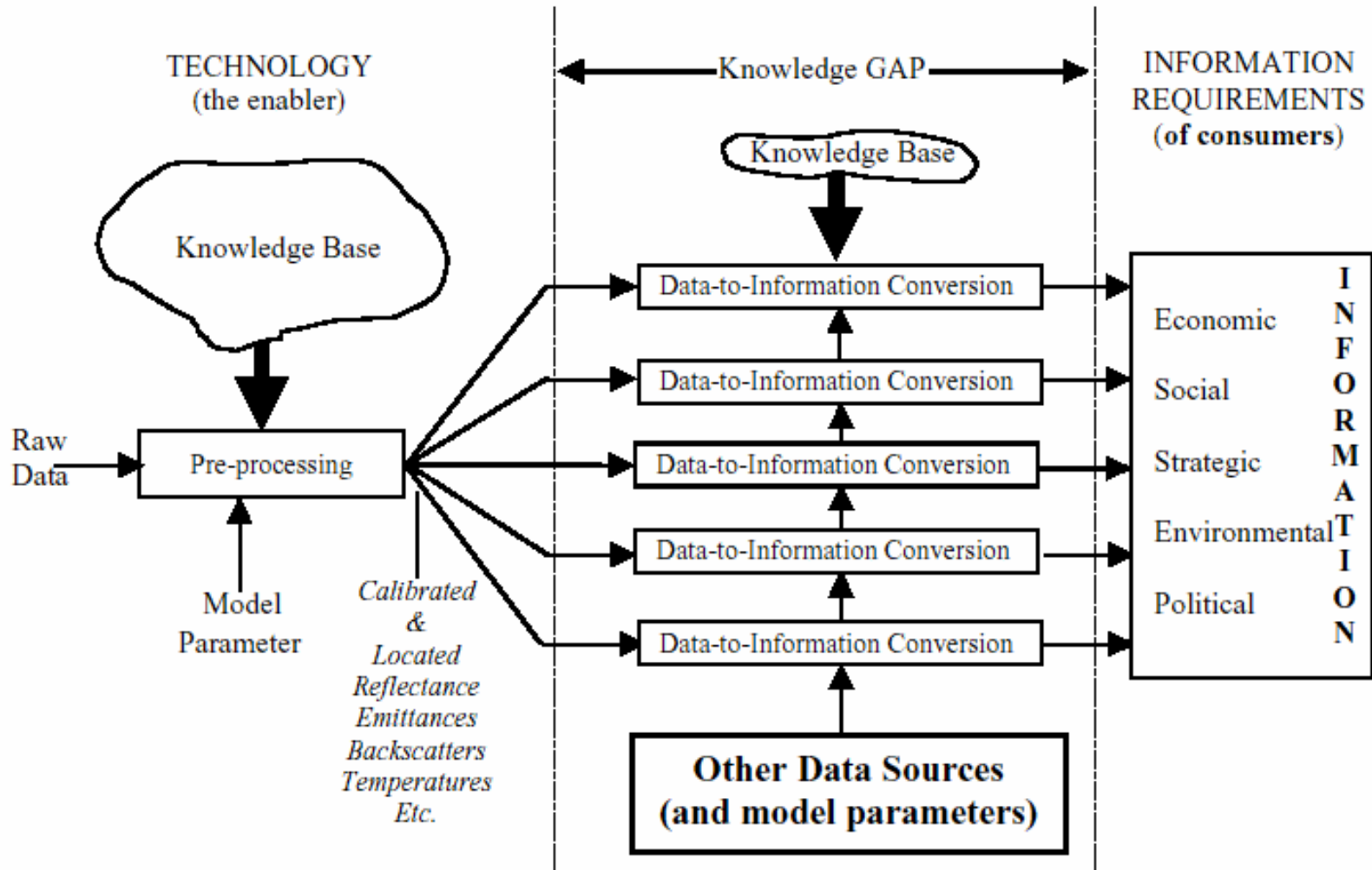
Megabytes 10^6

Interactive Dissemination and Predictions

Access to Knowledge



Knowledge gap in Earth Observation





The key question

How do we build capacity building in Earth Observation?

- Our answer: Make all sectors of society use publically funded EO data...
- ...by removing the barriers to entry!



Barriers to entry in Earth Observation

- Lack of data
 - Much EO data is expensive or unavailable

- Lack of tools
 - Good software is required to explore EO data

- Lack of expertise
 - We need to build capacity at a massive scale



Removing the barriers to entry

- Lack of data
 - Make EO data free!

- Lack of tools
 - Produce good open source software for EO data handling!

- Lack of expertise
 - Provide open access to on-line training and to scientific literature!



The “White-Box” Model

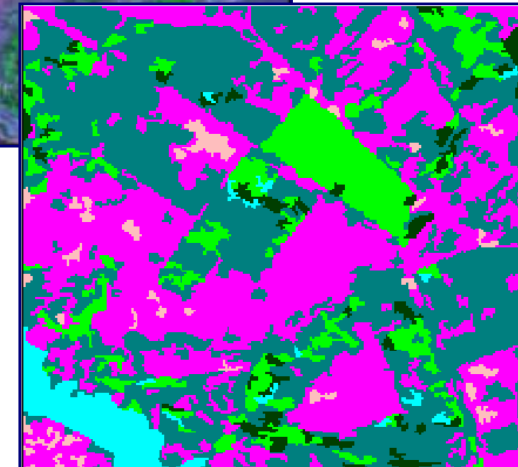
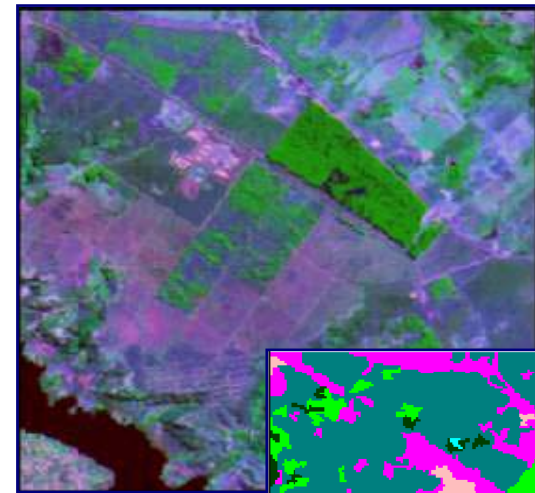
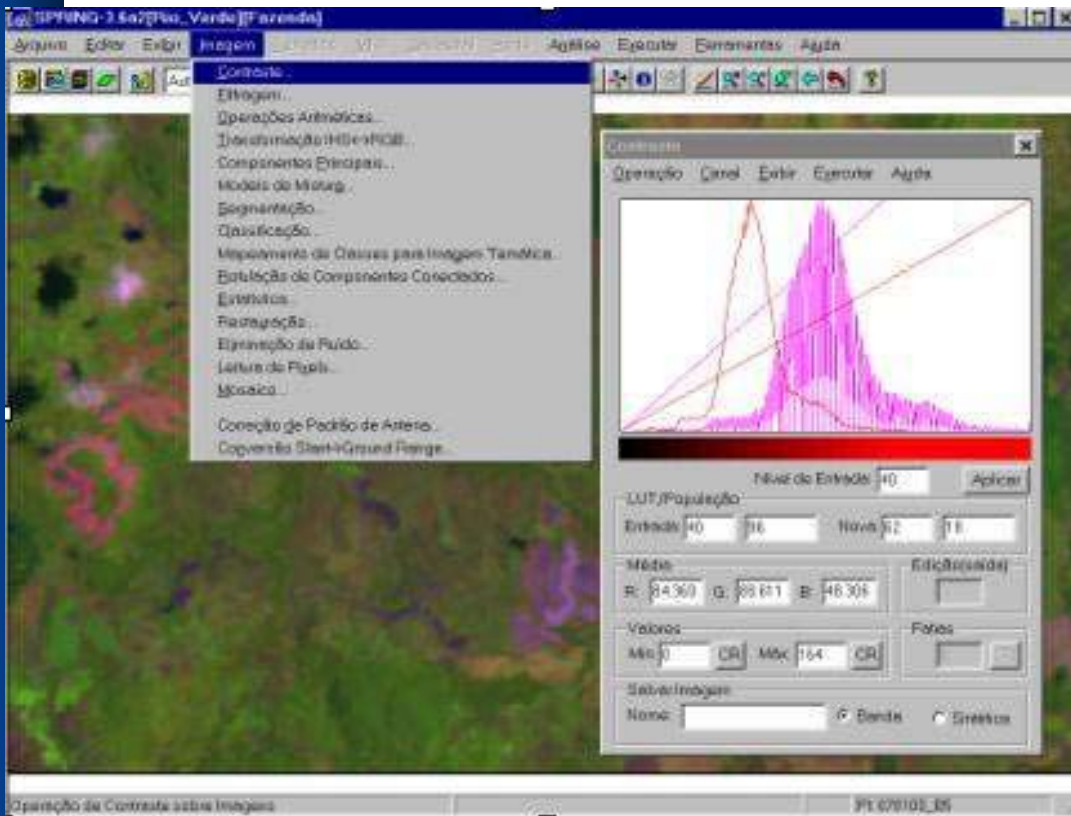
results = people + data + software

- People
 - “Learning by Doing” x “Learning by Using”
- Data
 - Timely and free geospatial data sets
- Software
 - Adequate data analysis and Integration

Tools Challenge

■ SPRING – Image processing and GIS software.

- Multi-platform (Windows, Linux, Solaris)
- Web: <http://www.dpi.inpe.br/spring> (25.000 downloads)





Tools Challenge

- Why Open-Source GIS?
- “Deadlock” situation
 - Small size of commercial earth observation market
 - Not enough income for R&D investment
 - Improvements on information extraction
 - Needed for the market to grow
- Knowledge extraction procedures
 - very little technological innovation
 - limited academic research in EO-GIS integration



The Expertise Challenge

- Academic institutions in US and Europe
 - producing qualified personnel for developing world
 - graduates of these institutions have initiated their own research groups in their native countries
 - needed and useful: Should continue
 - provides only a limited capacity to respond to developing world needs



The Expertise Challenge

- Research system in the developed world
 - discourages the production of training material
 - there are good books on GIS and Remote Sensing!
 - unfortunately, these books are in English and are expensive

- Need for innovative responses
 - Open-source (on-line) books in many languages

- Brazilian experience
 - three-volume set (“Introduction to GIS”, “Spatial Analysis”, “Spatial Databases”)



The need for global land observation

- The world is changing rapidly
 - Climate Change is here to stay

- Global land observation is a crucial need for the world, but its future is uncertain
 - MODIS is very useful, but has no future
 - What will happen to LANDSAT?

- Global land observation systems are a public good



Uncle Scrooge and the Internet

- Uncle Scrooge:
“A penny saved is a penny earned”

- The anti-Uncle Scrooge principle:
“A pixel saved is a penny wasted”

- Why is that so?
 - “Value comes from use”



The Internet paradox

- The Internet has reduced the cost of data distribution to very close to zero
- Society responds very quickly to open availability of free data and good on the Web



Brazilian and Chinese Strategy for CBERS

- CBERS images received in Brasil are freely available on the Internet for Brazilian and Latin American users
- CBERS images received in China are freely available on the Internet for Chinese users
- A high-quality image processing software (SPRING) is also available free on the Internet in Brazil



CBERS: China-Brazil Earth Resources Satellite

■ Brief History

- Initial agreement signed in July 6th, 1988, covering CBERS-1 and 2.
- In 2002, both governments decided to expand the initial agreement by including CBERS-3 and 4.

■ Program objectives

- Build a family of remote sensing satellites to support the needs of users in earth resources applications
- Improve the industrial capabilities of space technology in Brazil and China



CBERS Program Timeline

	Launc h Date	2005	2006	2007	2008	2009	2010	2011
CBERS-1	1999							
CBERS-2	2003							
CBERS-2B	2007							
CBERS-3	2008							
CBERS-4	2012							



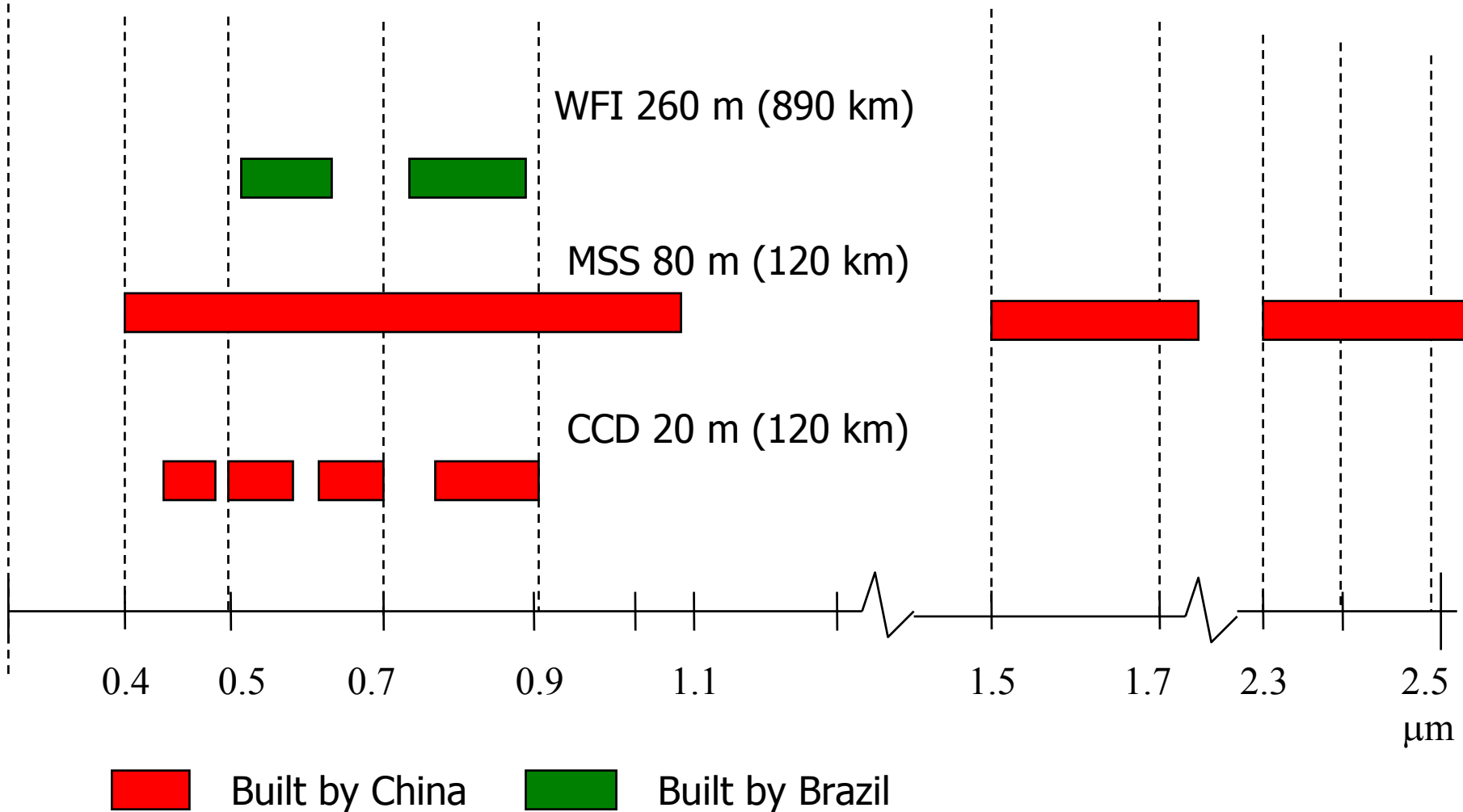
CBERS-2



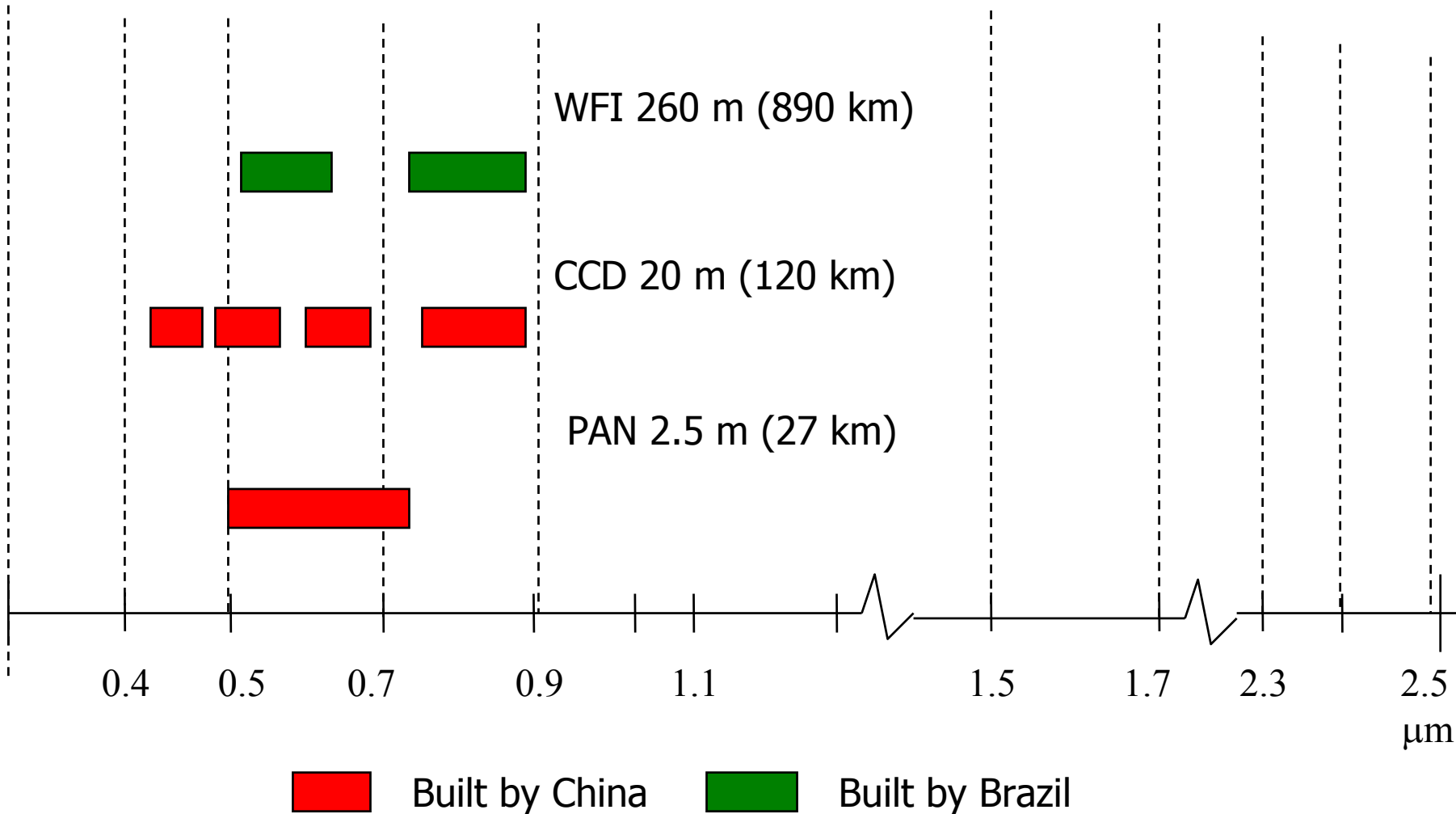
CBERS-2 Launch
(21 October 2003)



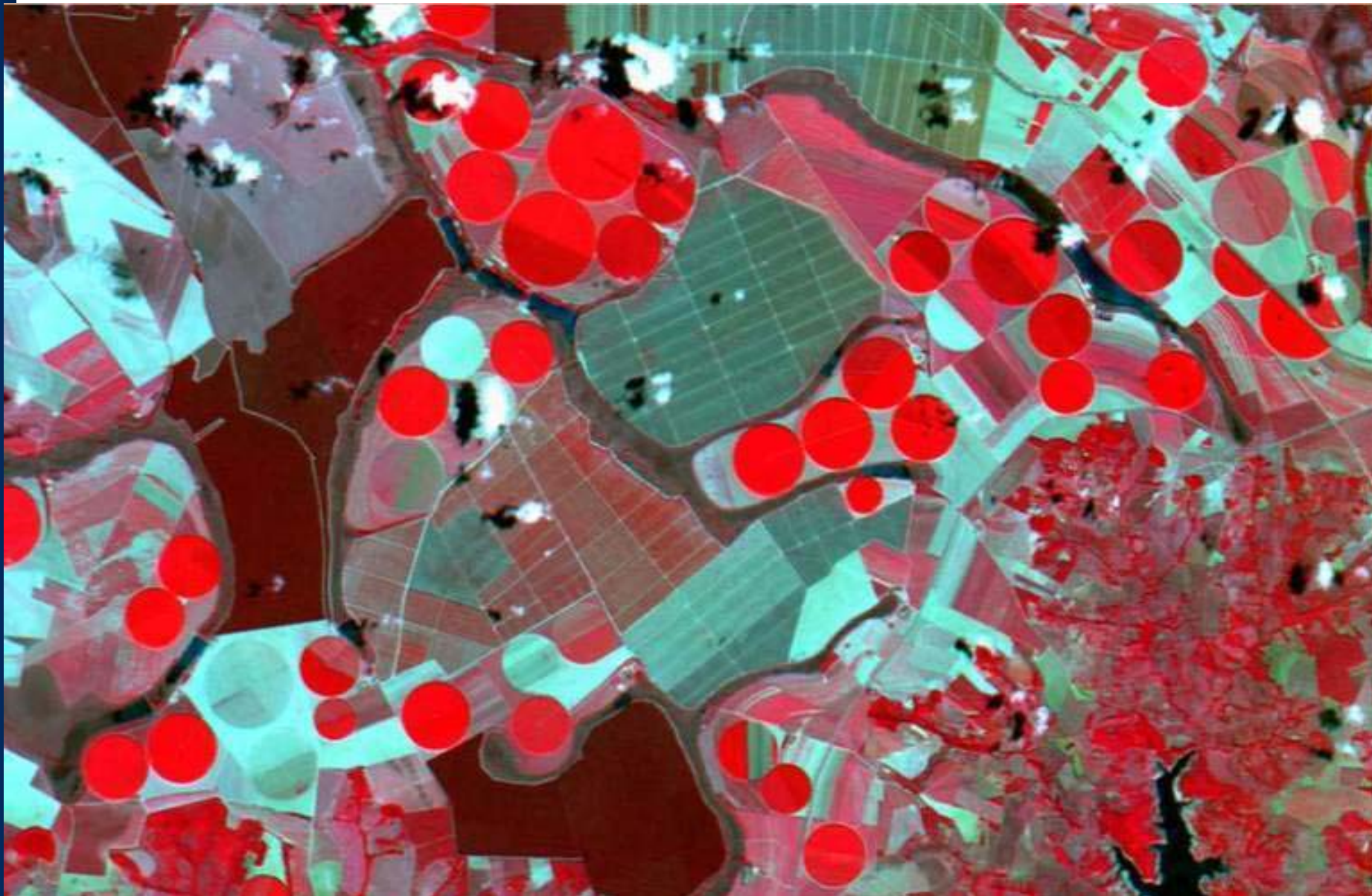
CBERS 1,2 Sensor Configuration



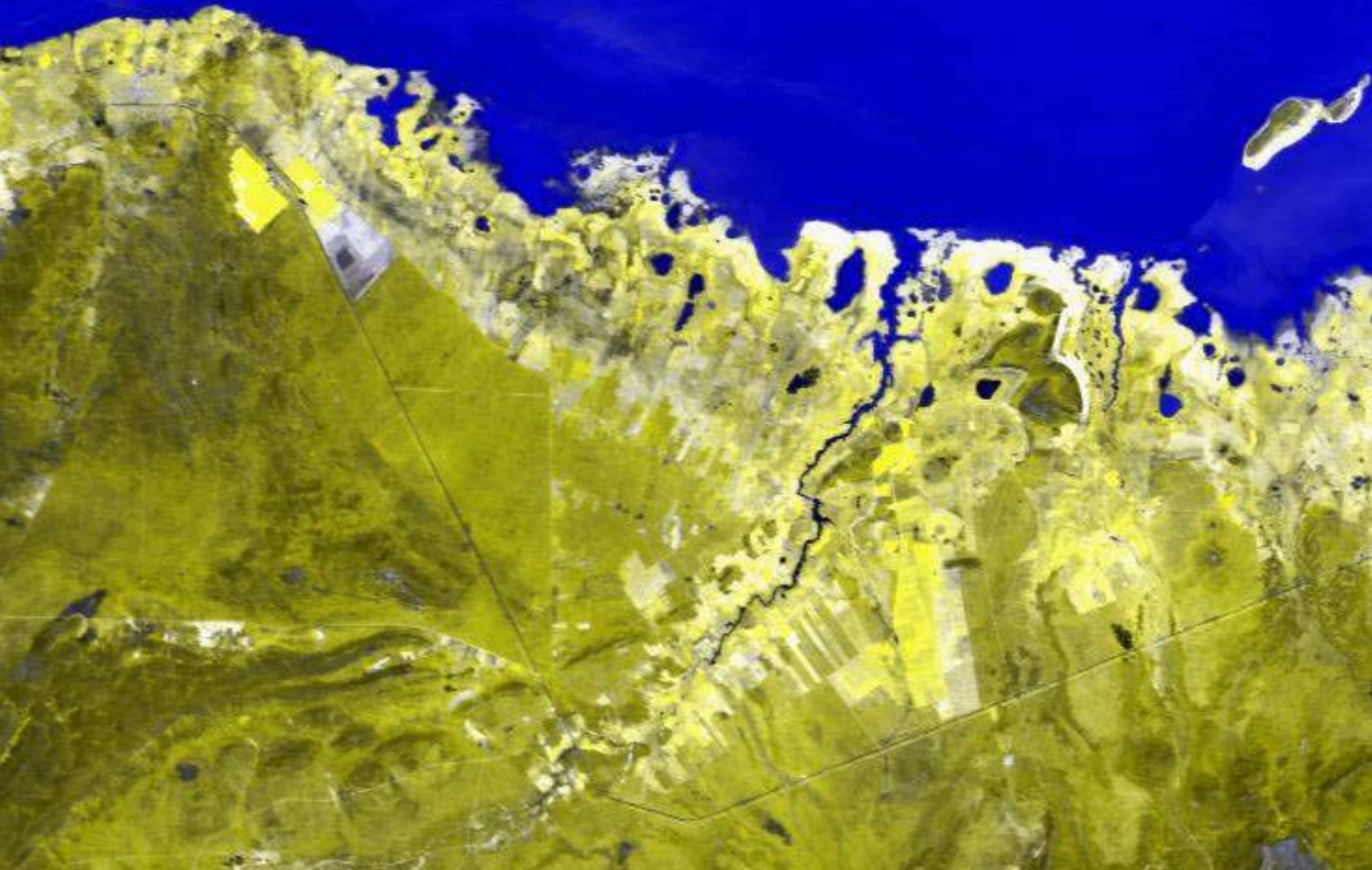
CBERS-2B Sensor Configuration



CBERS-2 CCD, Minas Gerais, Brazil



CBERS-2 CCD Sobradinho Dam, Brazil Dez 2003



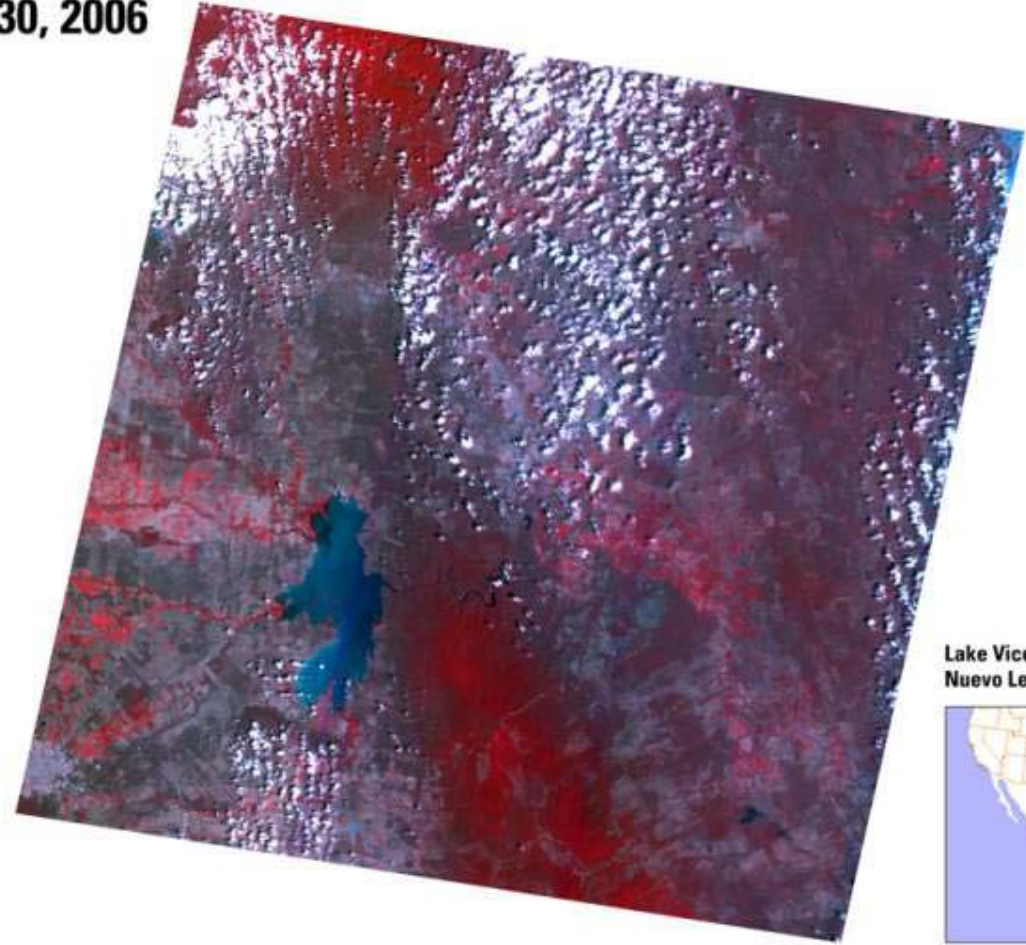
- CBERS-2 image from Louisiana, EUA
- Obtained from on-board data recorder



CBERS-2 data downlinked to USGS EROS

Path 218, Row 73

March 30, 2006

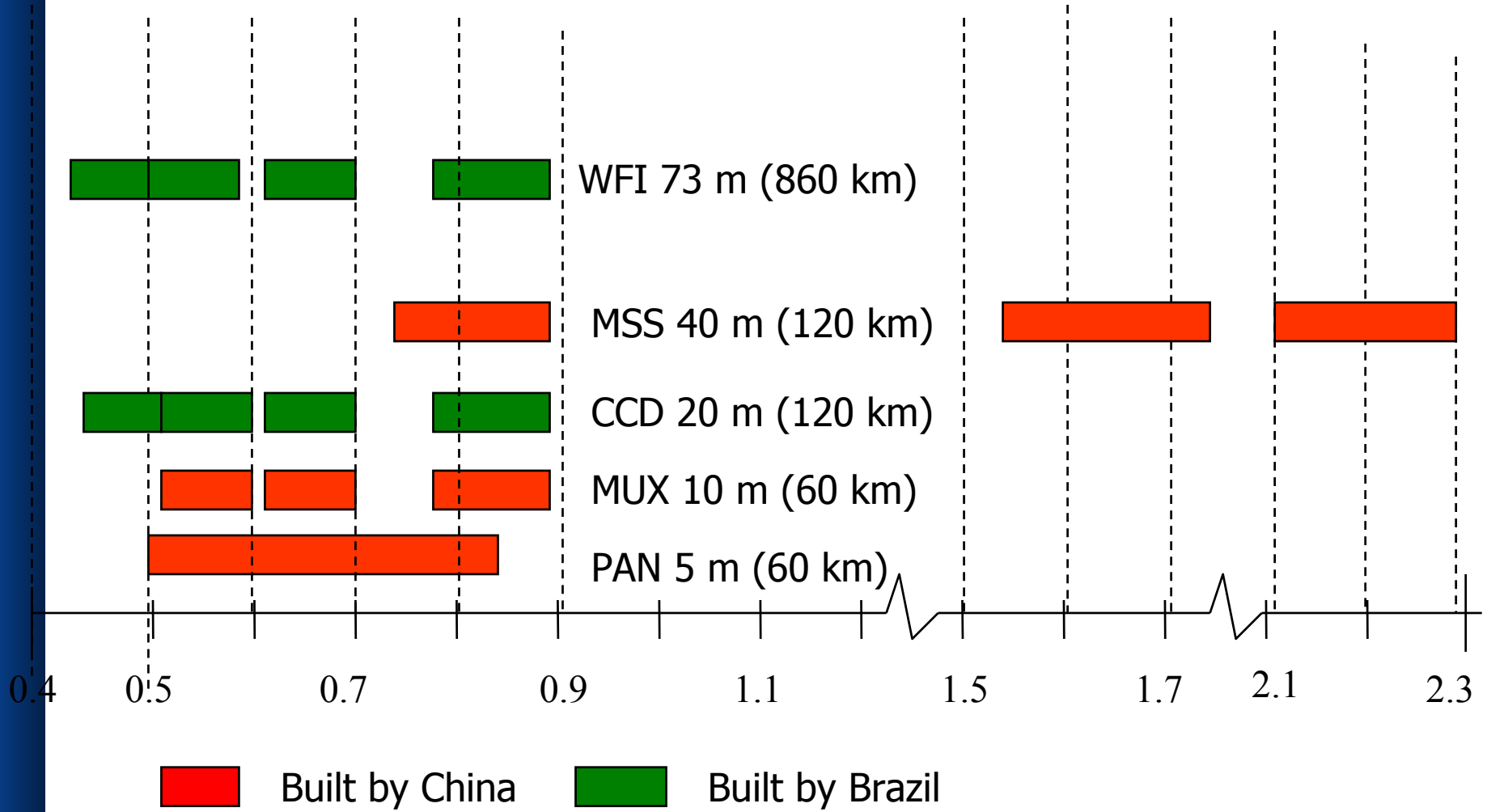


Lake Vicente Guerrero,
Nuevo Leon, Mexico





CBERS 3 – 4 Sensor Configuration



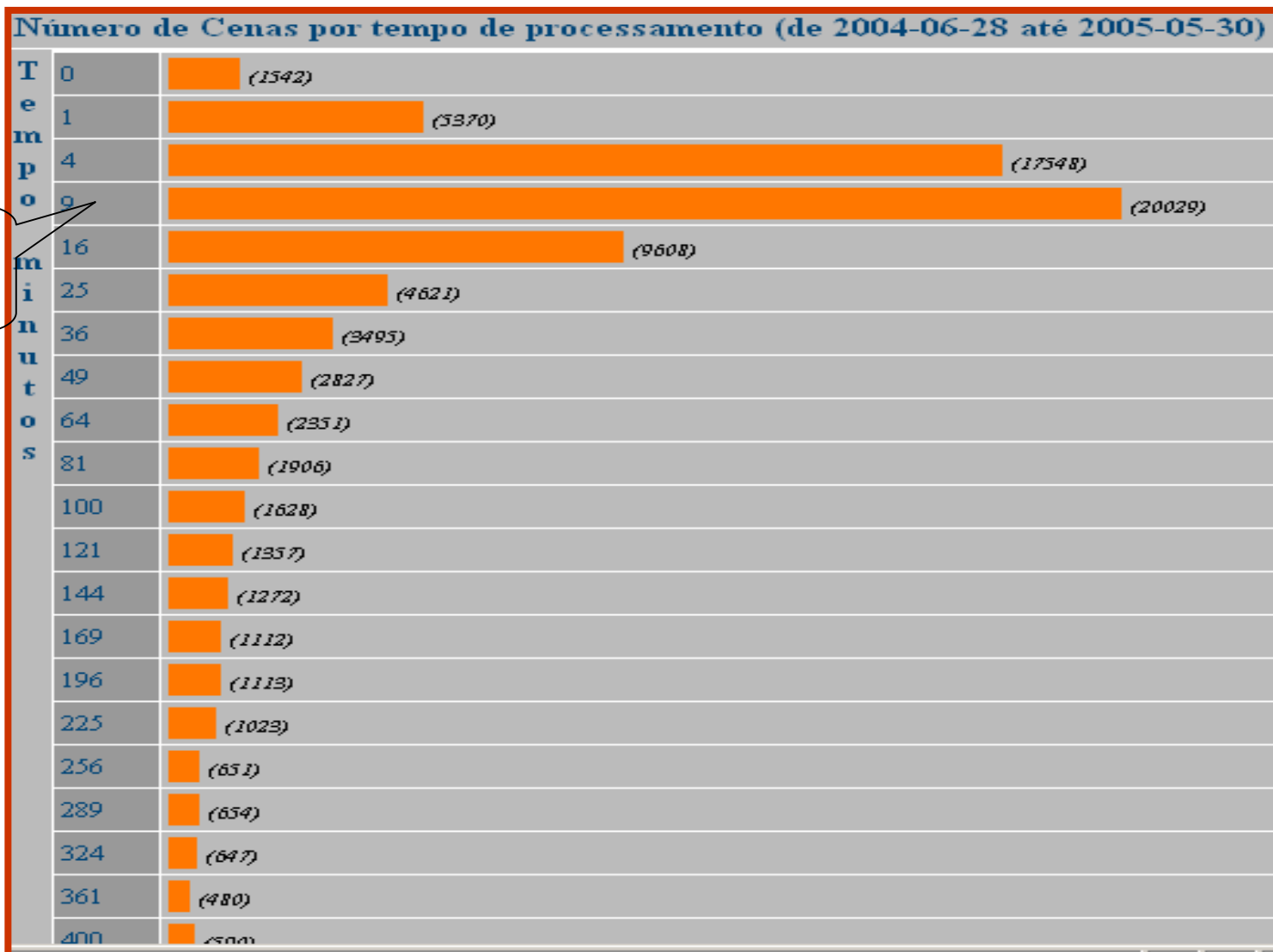
μm



CBERS Image Distribution in Brazil (1st May 2004 to 1st May 2006)

Total number of full CCD scenes distributed (145 Mb/scene)	210,000
Number of institutions and companies	4,500
Number of scenes produced per week	2170
Average time to process a user request	10 min
Production environment	8 PCs/Linux

Time to respond an image request



9 minutes

Parâmetros Básicos

Satélite:

Instrumento:

Intervalo de Tempo: Sazonal

De: /

Até: /

Cobertura de Nuvens Máxima

Click Look: Pequeno Grande

Município: Estado:

Órbita **Ponto**

Até: De: Até:

Por Região

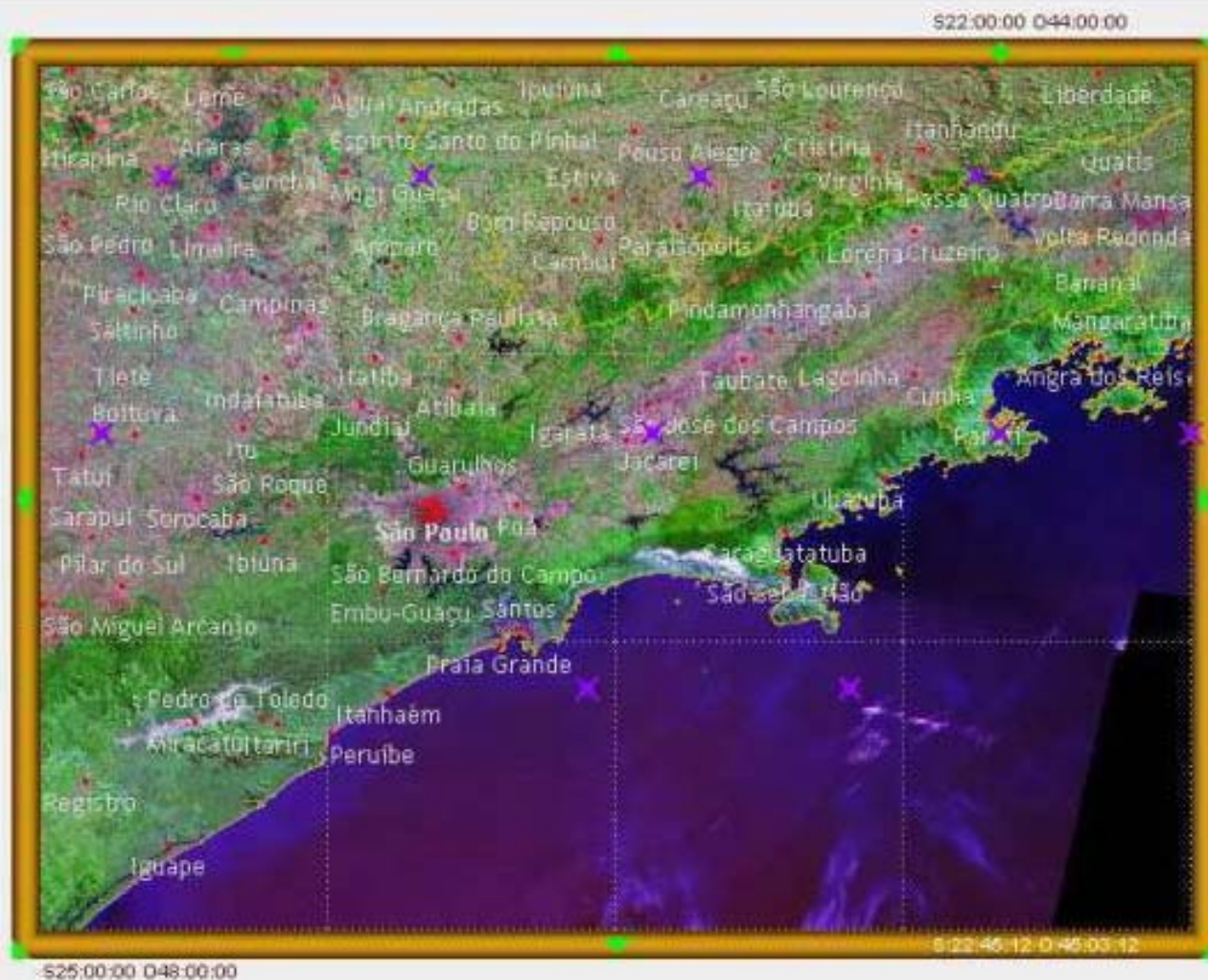
Norte:

Oeste: Leste:

Sul:

Interface Gráfica

Lat: Lon:



Página 1

Parâmetros Básicos

Satélite:

Instrumento:

Intervalo de Tempo: Sazonal

De: /

Até: /

Cobertura de Nuvens Máxima

Click Look: Pequeno Grande

Município: Estado:

Órbita: Até: Ponto: De: Até:

Por Região




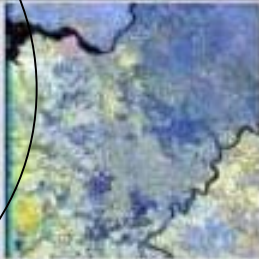

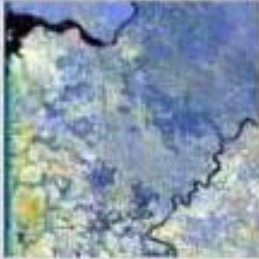





Norte:

Oeste: Leste:

Sul:

Interface Gráfica

Lat: Lon:

<p>CB2CCD 162/131-2004-04-16</p> 	<p>CB2IRM 162/131-2004-04-16</p> 	<p>CB2CCD 162/131-2004-03-21</p> 	<p>CB2IRM 162/131-2004-03-21</p> 
<p>CB2CCD 162/131-2004-02-24</p> 	<p>CB2IRM 162/131-2004-02-24</p> 	<p>CB2CCD 162/131-2004-01-29</p> 	<p>CB2IRM 162/131-2004-01-29</p> 
<p>CB2CCD 162/131-2004-01-03</p> 	<p>CB2IRM 162/131-2004-01-03</p> 	<p>CB2CCD 162/131-2003-11-12</p> 	

Satélite CB2
Sensor CCD
Órbita 162
Ponto 131

Data de Passagem 2004.02.24

Revolução 1814

Latitude Norte -27.13910

Longitude Oeste -56.19860

Latitude Sul 28.30930

Longitude Leste -55.32020

Tempo Central(GMT) 13:47:07

Orientação da Imagem 8.50435

Azimute Solar 65.218

Elevação Solar 55.1644

Perda de Bits

Varreduras Perdidas

Varreduras Perdidas (%)

Perda de Sincronismo

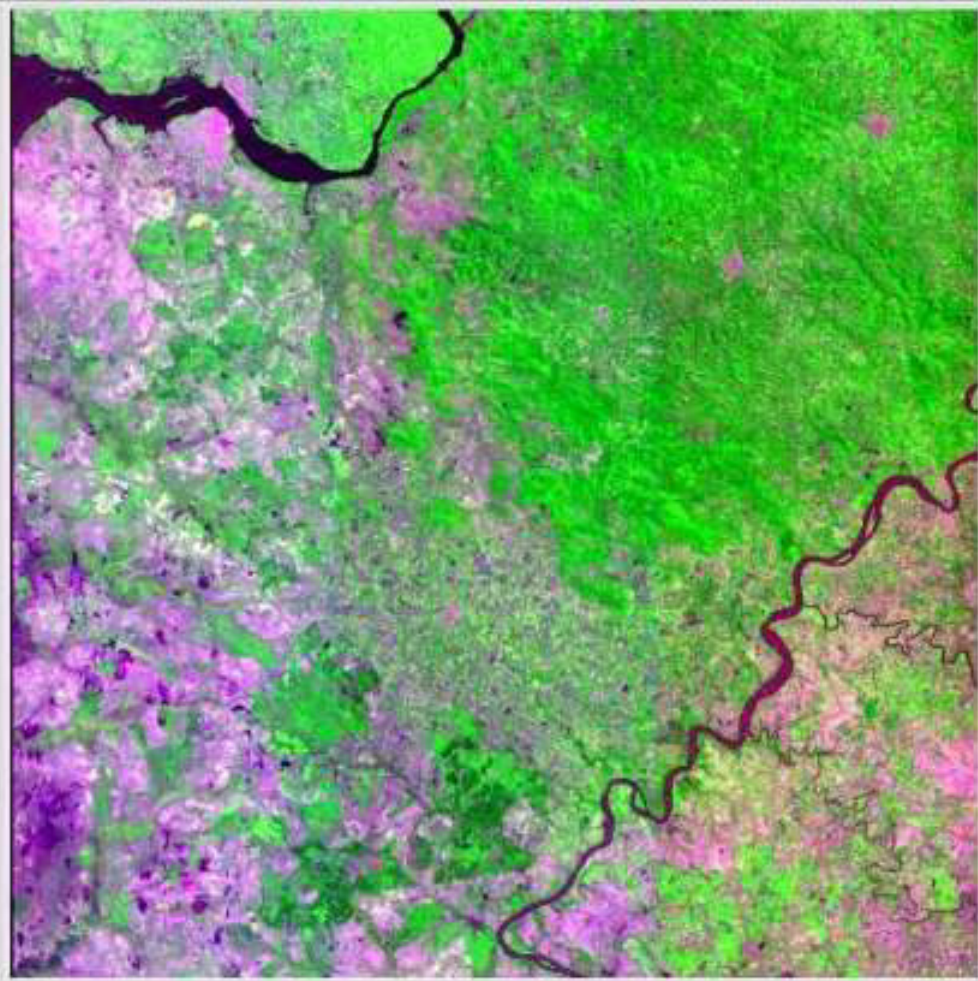
Cobertura de Nuvens

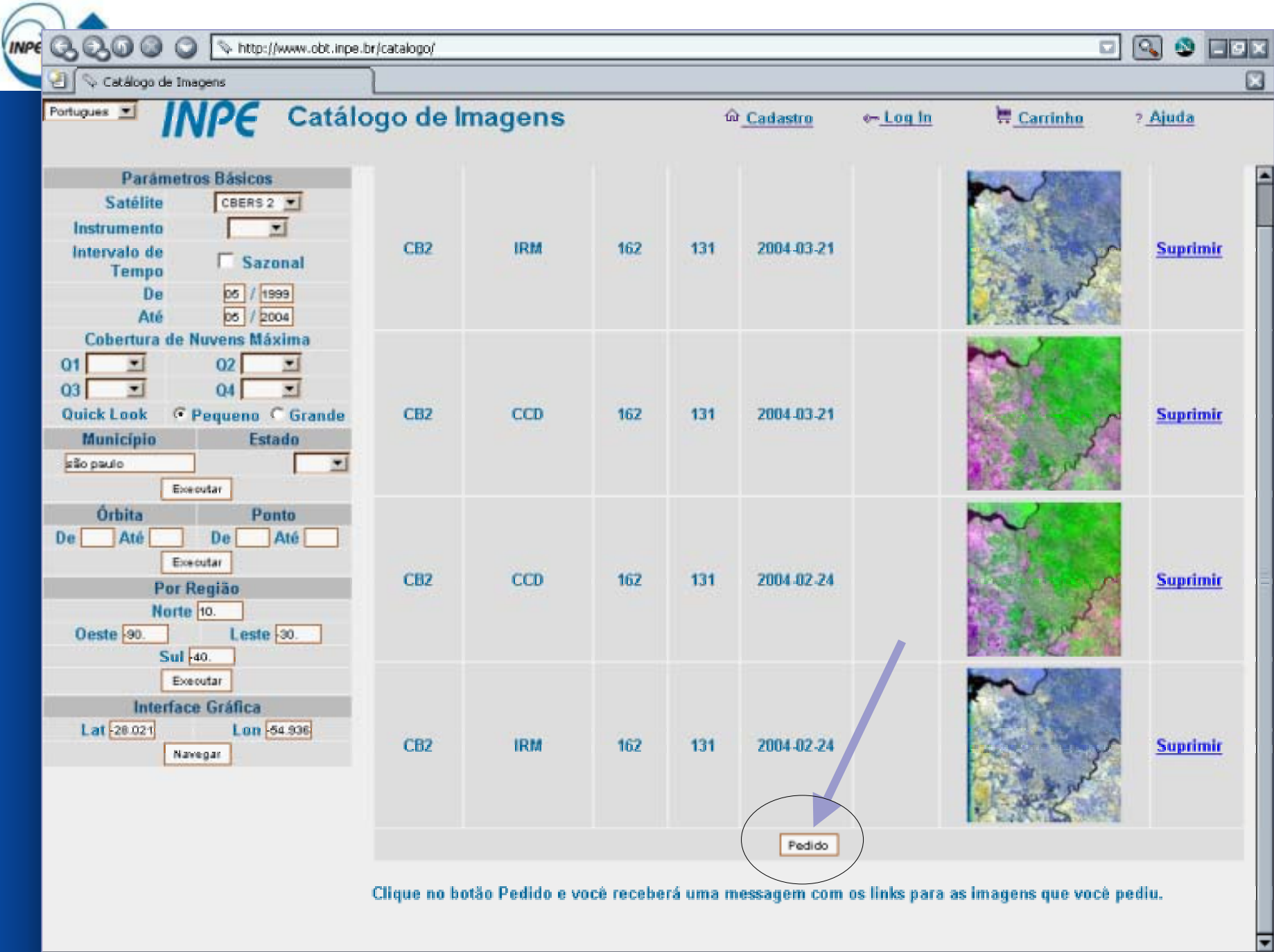
Q1 14 Q2 0

Q3 11 Q4 6

modo de Cobertura de Nuvem A

Colocar no Carrinho





INPE Catálogo de Imagens

Portugues

[Cadastro](#) [Log In](#) [Carrinho](#) [Ajuda](#)

Parâmetros Básicos

Satélite:

Instrumento:

Intervalo de Tempo: Sazonal

De: /

Até: /

Cobertura de Nuvens Máxima

Q1: Q2:

Q3: Q4:

Quick Look: Pequeno Grande

Município: Estado:

Órbita **Ponto**

De: Até: De: Até:

Por Região

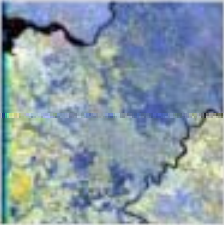



Norte:

Oeste: Leste:

Sul:

Interface Gráfica

Lat: Lon:

CB2	IRM	162	131	2004-03-21		Suprimir
CB2	CCD	162	131	2004-03-21		Suprimir
CB2	CCD	162	131	2004-02-24		Suprimir
CB2	IRM	162	131	2004-02-24		Suprimir
<input type="button" value="Pedido"/>						

Clique no botão Pedido e você receberá uma mensagem com os links para as imagens que você pediu.



FTP area for User

The screenshot shows a Netscape browser window with the address bar set to `http://www.dpi.inpe.br/catalogo/tmp/epiphanio416/`. The browser displays a directory listing for the path `/catalogo/tmp/epiphanio416`. The listing includes a 'Parent Directory' link and several files named 'CBERS 2 CCD1XS 20040...' and 'CBERS 2 IRM 20040225...'. A download dialog box is open, asking what to do with the file 'CBERS_2_CCD1XS_20040225_153_104_BAND3.tif.zip'. The 'Save this file to disk' option is selected. The status bar at the bottom indicates 'Document: Done (0.751 secs)'.

Name	Last modified	Size	Description
Parent Directory	25-Mar-2004 15:23	-	
CBERS 2 CCD1XS 20040...	18-Mar-2004 01:23	17.6M	
CBERS 2 CCD1XS 20040...	18-Mar-2004 01:23	15.0M	
CBERS 2 CCD1XS 20040...	18-Mar-2004 01:23	20.3M	
CBERS 2 IRM 20040225...	18-Mar-2004 01:30	1.5M	
CBERS 2 IRM 20040225...	18-Mar-2004 01:30	1.6M	
CBERS 2 IRM 20040225...	18-Mar-2004 01:30	1.5M	
CBERS 2 IRM 20040225...	18-Mar-2004 01:30	775k	

Apache/1.3.29 Server at www.dpi.inpe.br Port 80



User Distribution(%)

Government Institutions	23%
Educational Sector	26%
Private Companies	51%



Private Farm Management

ArcIMS Viewer - Microsoft Internet Explorer

Arquivo Editar Exibir Favoritos Ferramentas Ajuda

Endereço: <http://200.101.6.242/website/MT/viewer.htm>

Tecnomapas **MTWEB**

Mapa: -52°5'16.41427", -12°34'57.09899" - Imagem: 676 , 266

Powered by Tecnomapas

Internet

Areas

- Zoneamento
- Fotos de Cuiabá
- CBS 2004
 - 1694_2004.tif
 - 1695_2004.tif
 - 1696_2004.tif
 - 1697_2004.tif
 - 1698_2004.tif
 - 1699_2004.tif
 - 1700_2004.tif
 - 1756_2004.tif
 - 1757_2004.tif
 - 1758_2004.tif
 - 1759_2004.tif
 - 1760_2004.tif
 - 1813_2004.TIF
 - 1814_2004.TIF
 - 1815_2004.TIF
 - 1816_2004.tif
 - 1817_2004.tif
 - 1869_2004.TIF
 - 1870_2004.TIF
 - 1871_2004.TIF
 - 1922_2004.TIF
 - 1923_2004.TIF

1759_2004.tif é a camada Ativa agora

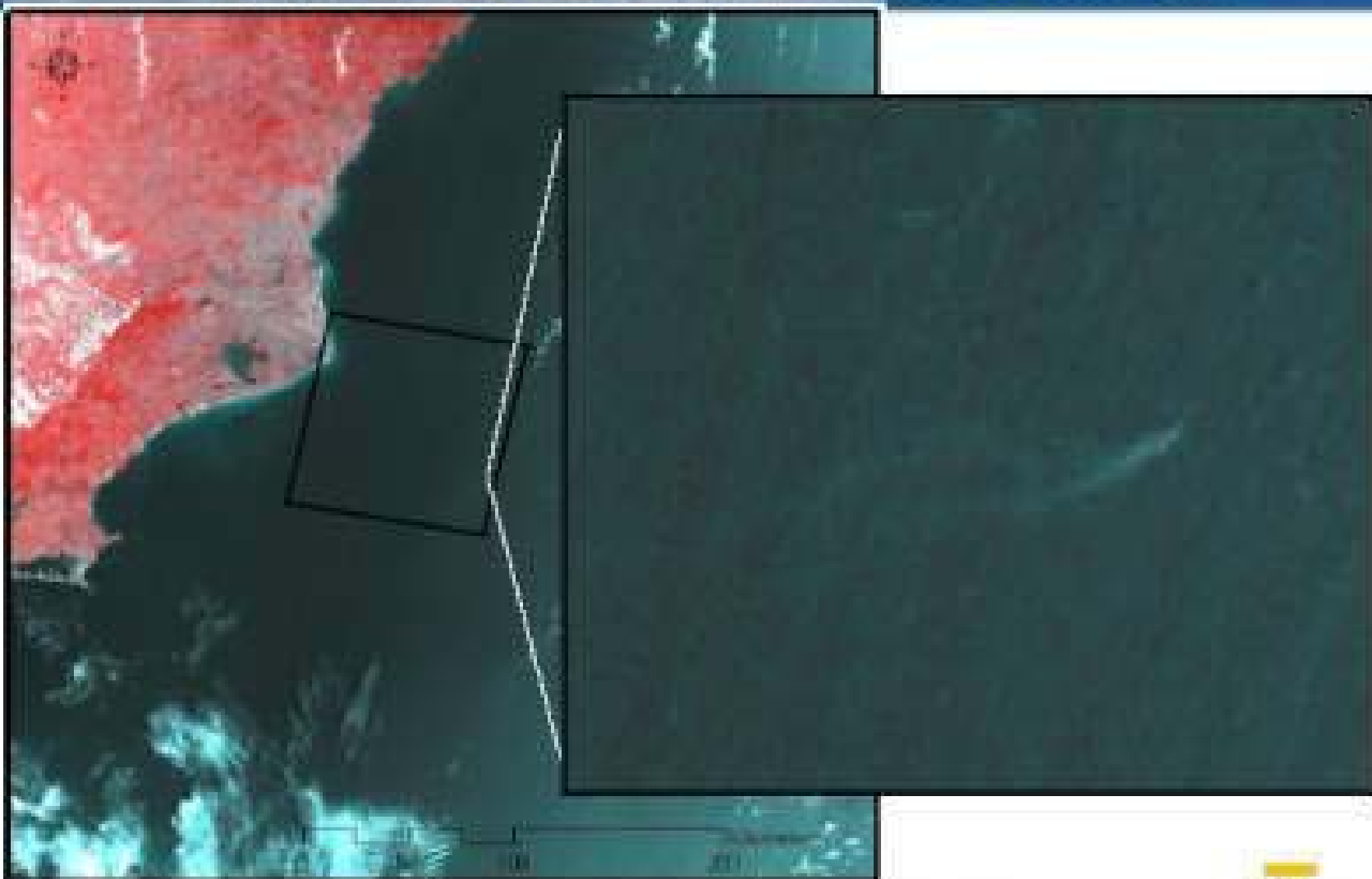
Tax Enforcement in Agriculture



Parque Nacional das Emas

Oil Spill Monitoring (Large Swath Data)

Imagem CBERS-2/WFI 2r1g1b, 26/11/2004 – 13:30 GMT



Propaganda and Marketing

ÍNDICE DE POTENCIAL DE CONSUMO

Permite visualizar tanto o índice de potencial de consumo como também a estimativa de valor mensal em reais das despesas para qualquer seleção de produtos e regiões geográficas. Essas informações são apresentadas em quantidades, bem como para 5 classes de renda domiciliar:

- Até 2 Salários Mínimos
- Acima de 2 até 3 Salários Mínimos
- Acima de 3 até 5 Salários Mínimos
- Acima de 5 até 10 Salários Mínimos
- Acima de 10 Salários Mínimos
- Total das famílias

121 itens de despesas agrupados em 24 categorias:

- Alimentação • Habitação • Vestuário
- Transporte • Educação
- Higiene e Cuidados Pessoais • Fués
- Recreação e Cultura • Saúde
- Outros Produtos • Serviços Pessoais
- Juros e Aluguéis
- Contribuição do Fornecedor
- Total Das Despesas Familiares

Plata de navegação

Usuário tem acesso para selecionar as opções do que deseja. Utiliza apenas o mouse para definir produtos e regiões desejadas, sem necessidade de digitar nenhum caractere.



Impressão de relatórios

Produto	Região	Índice	Valor Mensal (R\$)
Alimentação	Brasil	100	100
Habitação	Brasil	100	100
Vestuário	Brasil	100	100
Transporte	Brasil	100	100
Educação	Brasil	100	100
Higiene e Cuidados Pessoais	Brasil	100	100
Fués	Brasil	100	100
Recreação e Cultura	Brasil	100	100
Saúde	Brasil	100	100
Outros Produtos	Brasil	100	100
Serviços Pessoais	Brasil	100	100
Juros e Aluguéis	Brasil	100	100
Contribuição do Fornecedor	Brasil	100	100
Total	Brasil	100	100

Permite a impressão de relatórios com maior eficiência nas situações de maior volume das companhias.

Atualizações: As Atualizações sendo efetuadas, via download, no site da FECCOMERCIO, sempre que necessário.

Requisitos Mínimos

- Processador Pentium ou superior
- Sistema operacional Windows 98 ou superior
- 128 MB de memória RAM
- Resolução de vídeo 640 x 480

Recomendado

- Pentium 3 ou 4 GHz
- Sistema operacional Windows XP ou superior
- 256 MB de memória RAM
- 500 MB de espaço disponível em disco rígido

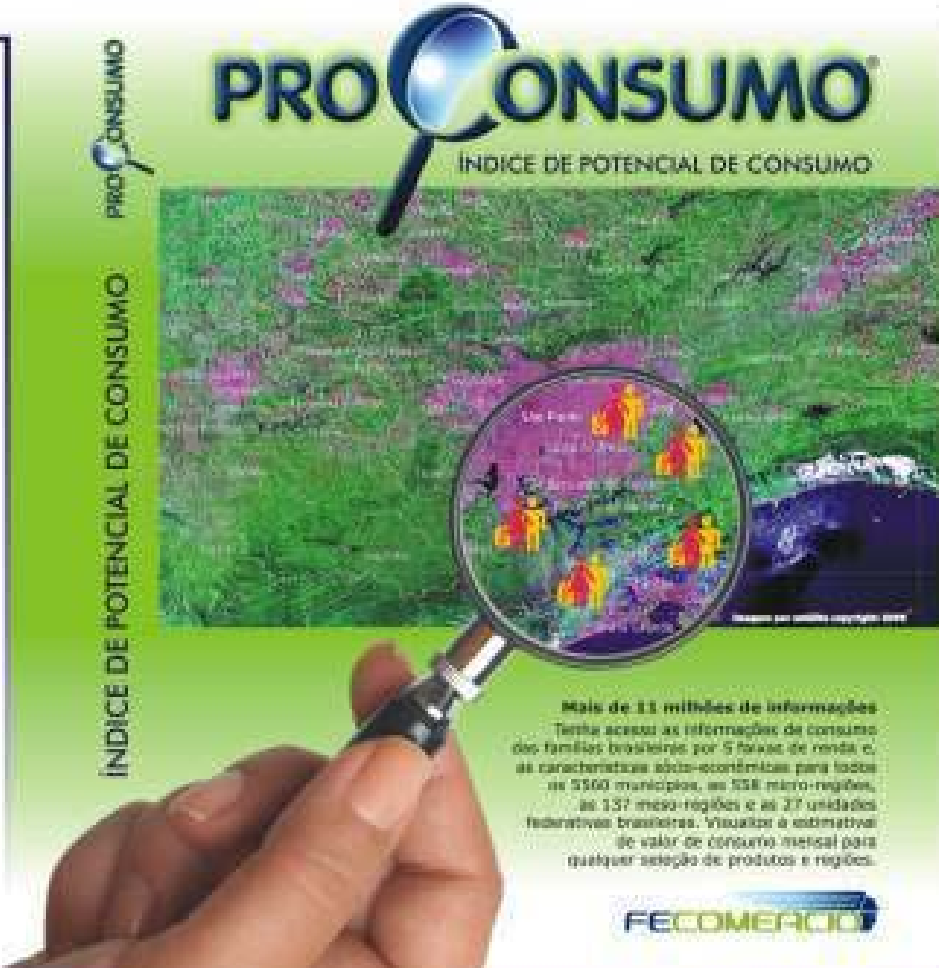
PRO CONSUMO
Índice de Potencial de Consumo

www.proconsumo.com.br

FECCOMERCIO

PRO CONSUMO

ÍNDICE DE POTENCIAL DE CONSUMO



ÍNDICE DE POTENCIAL DE CONSUMO

Mais de 13 milhões de informações

Tenha acesso às informações de consumo das famílias brasileiras por 5 faixas de renda e, as características sócio-econômicas para todos os 5560 municípios, as 538 micro-regiões, as 137 meso-regiões e as 27 unidades federativas brasileiras. Visualize a estimativa de valor de consumo mensal para qualquer seleção de produtos e regiões.

FECCOMERCIO

▲ Este é o seu número de série ▲

Uma poderosa ferramenta de marketing!



What do we get from free data?

- *“With zero cost data access, technology dissemination has a much greater impact.”*
- *“CBERS brought the freedom to have data immediately available when you need it.”*
- Free EO data and free EO technology create new users and new applications
- Increases the need for other types of EO data



What do the private companies say about free CBERS data?

- Enables new business development
- Facilitates trial uses for new clients
- Planning new applications becomes easier
- Creates jobs by reducing cost of data buys
- Increases work quality by adding data previously unavailable



What have we learned?

- There is an enormous demand for remote sensing data in developing countries
- Free on-line data access can significantly increase the number of users of earth observation data
- The CBERS data policy has been extremely well-received by government and society in Brazil

One world, one dream...



Free Earth Observation data for all!



One world, one dream...

- A consortium of Earth Observation satellites for global land observation (5m+)
- A network of cooperating ground stations
- EO data free on the Internet, with global weekly coverage

An aerial photograph of a lush, green forested landscape. A winding road or path is visible, and a river or stream flows through the lower right portion of the image. The terrain appears to be hilly or mountainous.

thank you !

谢谢！

São Paulo – Rio Janeiro
(WFI)