Facing challenges of Meteorology in tropical South America

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National Institute for Space Research – INPE
ITWG – 16
Angra dos Reis

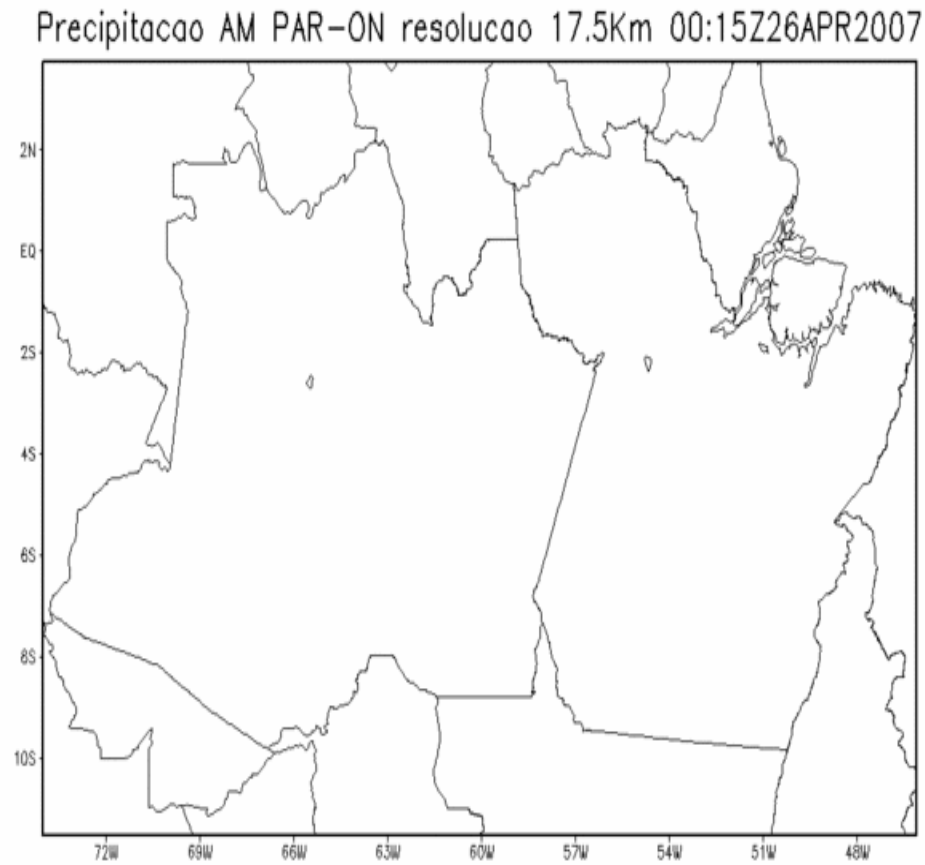
- Convection
  - Diurnal cycle
  - Upscale evolution: from single clouds to MCS
- Aerosol impacts
  - Surface energy budget
  - Cloud microphysics
- Evolution in data access and data assimilation

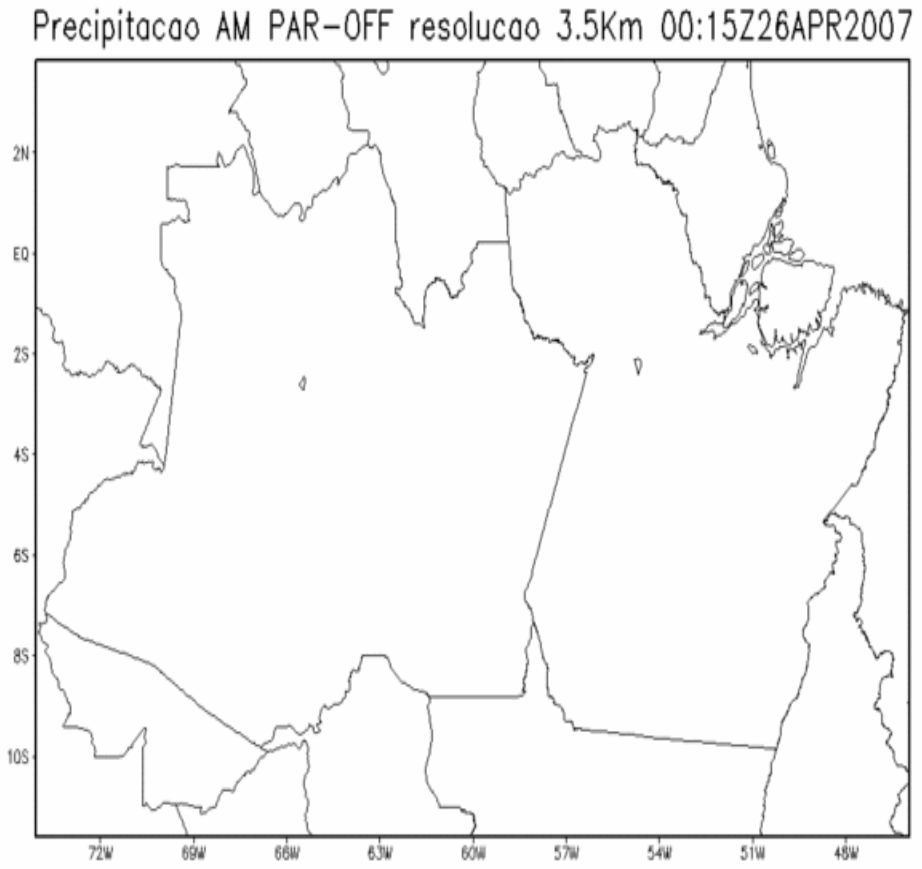
Clouds in the Amazon

Imagens do GOES-10

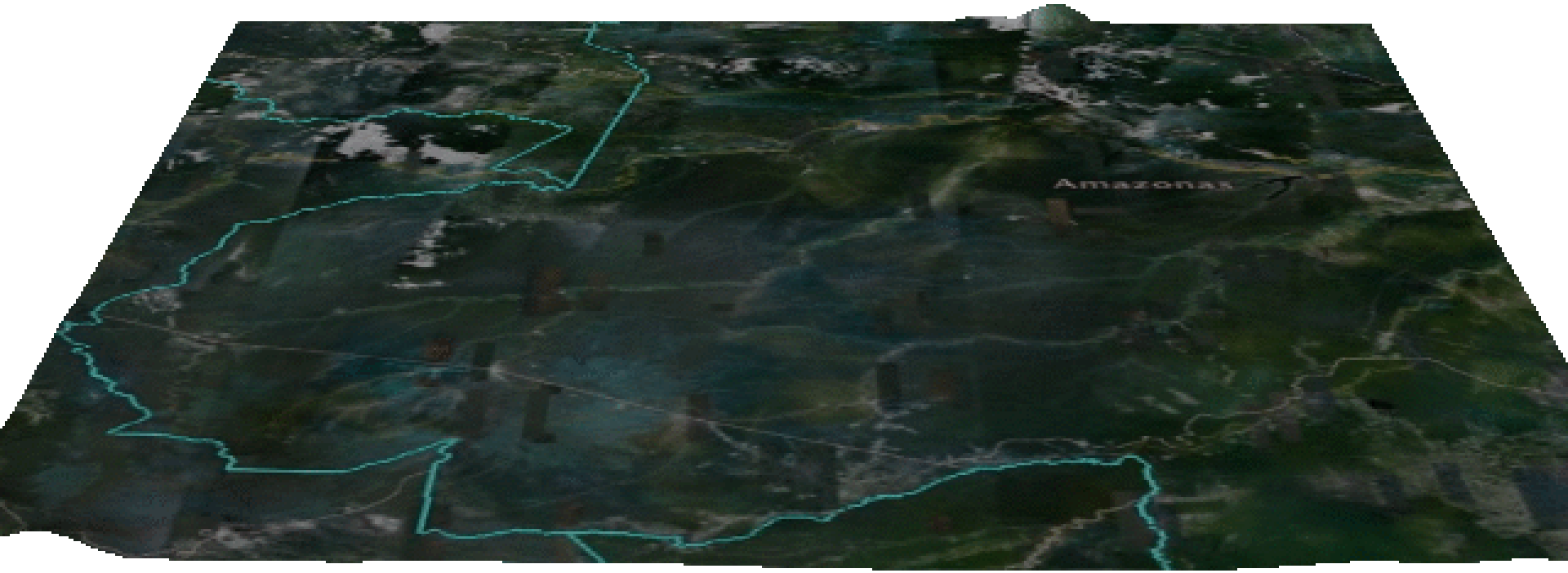
Model CATT-BRAMS

17.5 km resolution 3.5 km



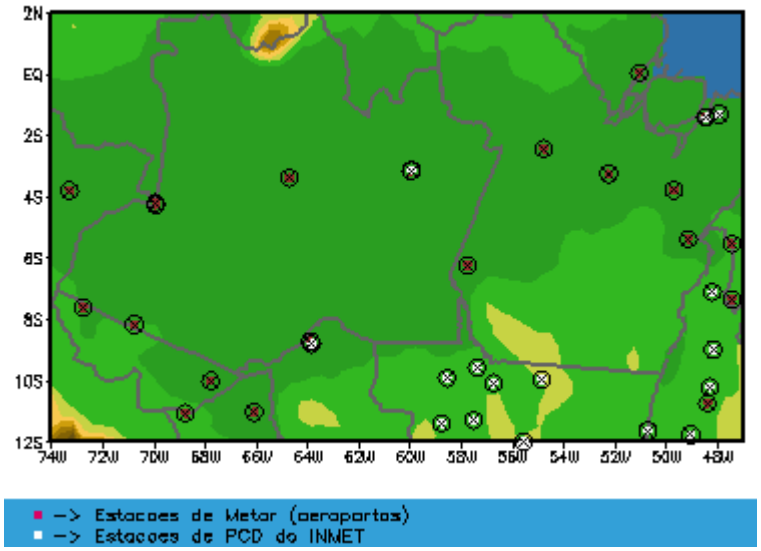


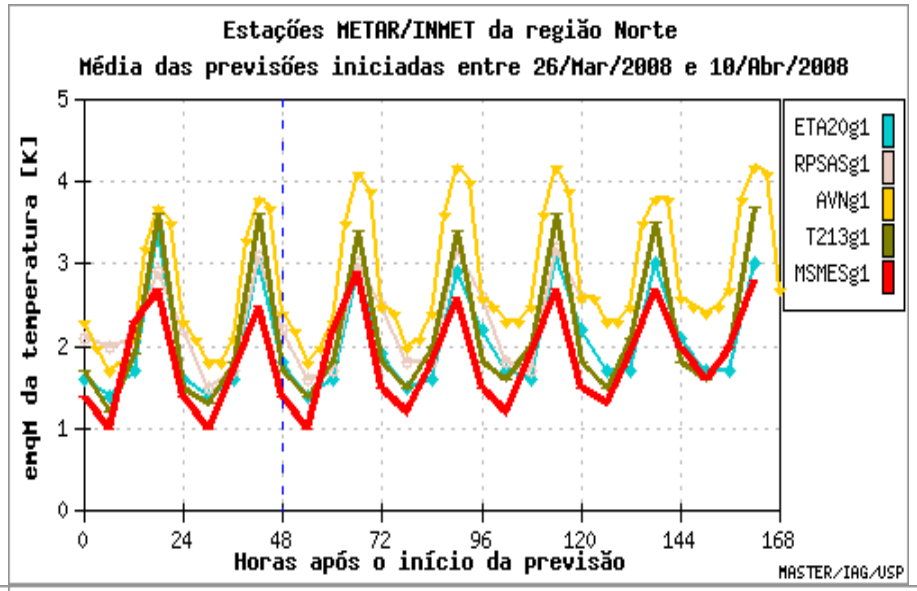
00:00:00
26 Apr 2007
1 of 16
Thursday

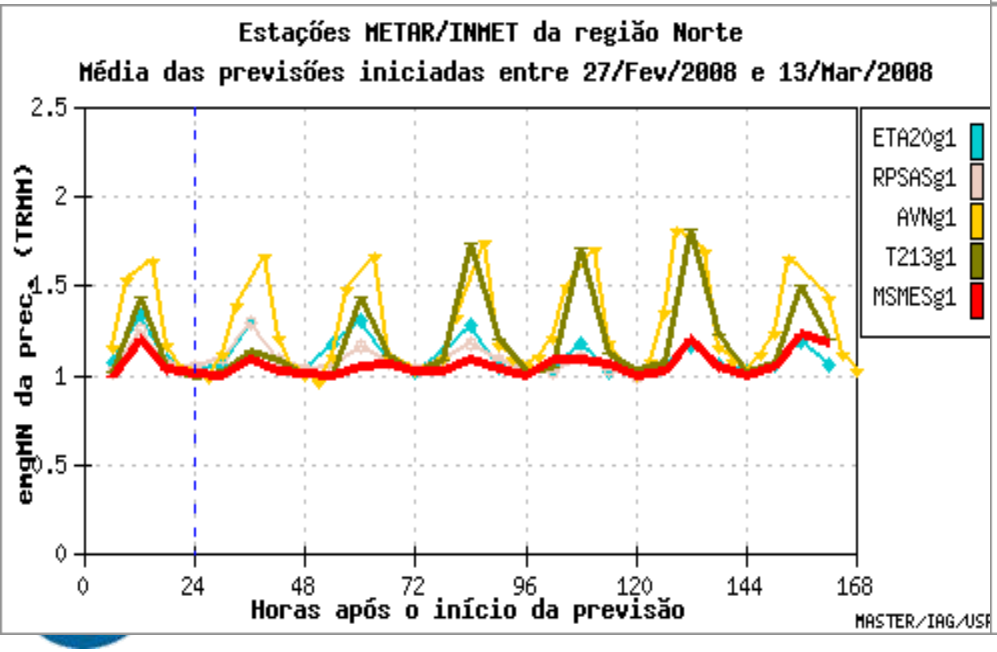


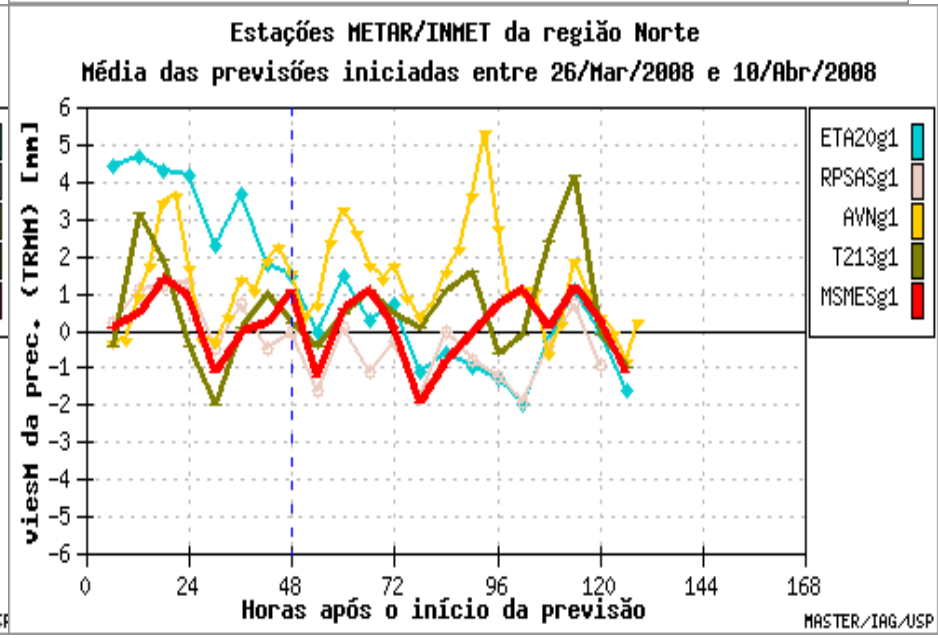
Diurnal cycle

Model errors in the Amazon

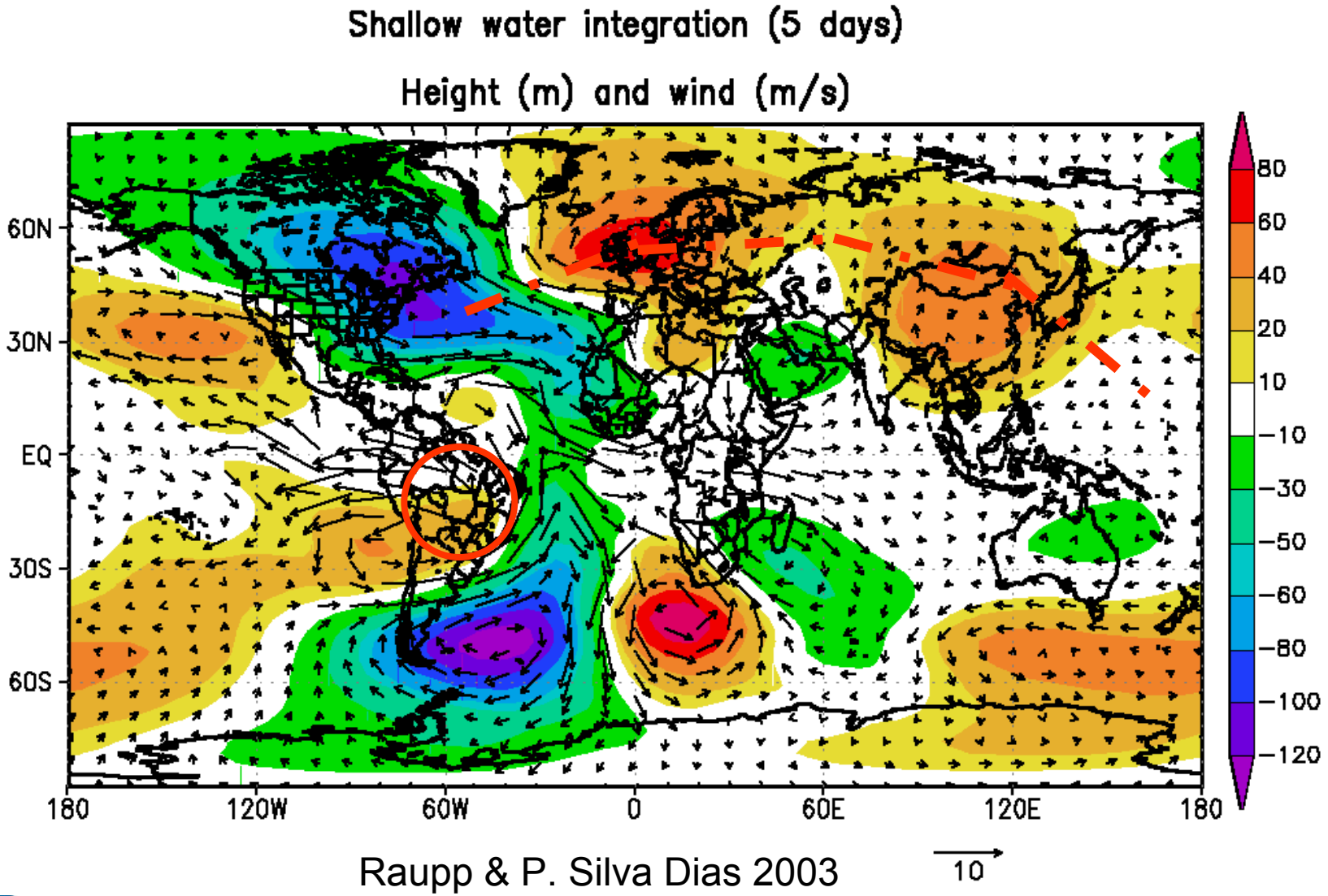






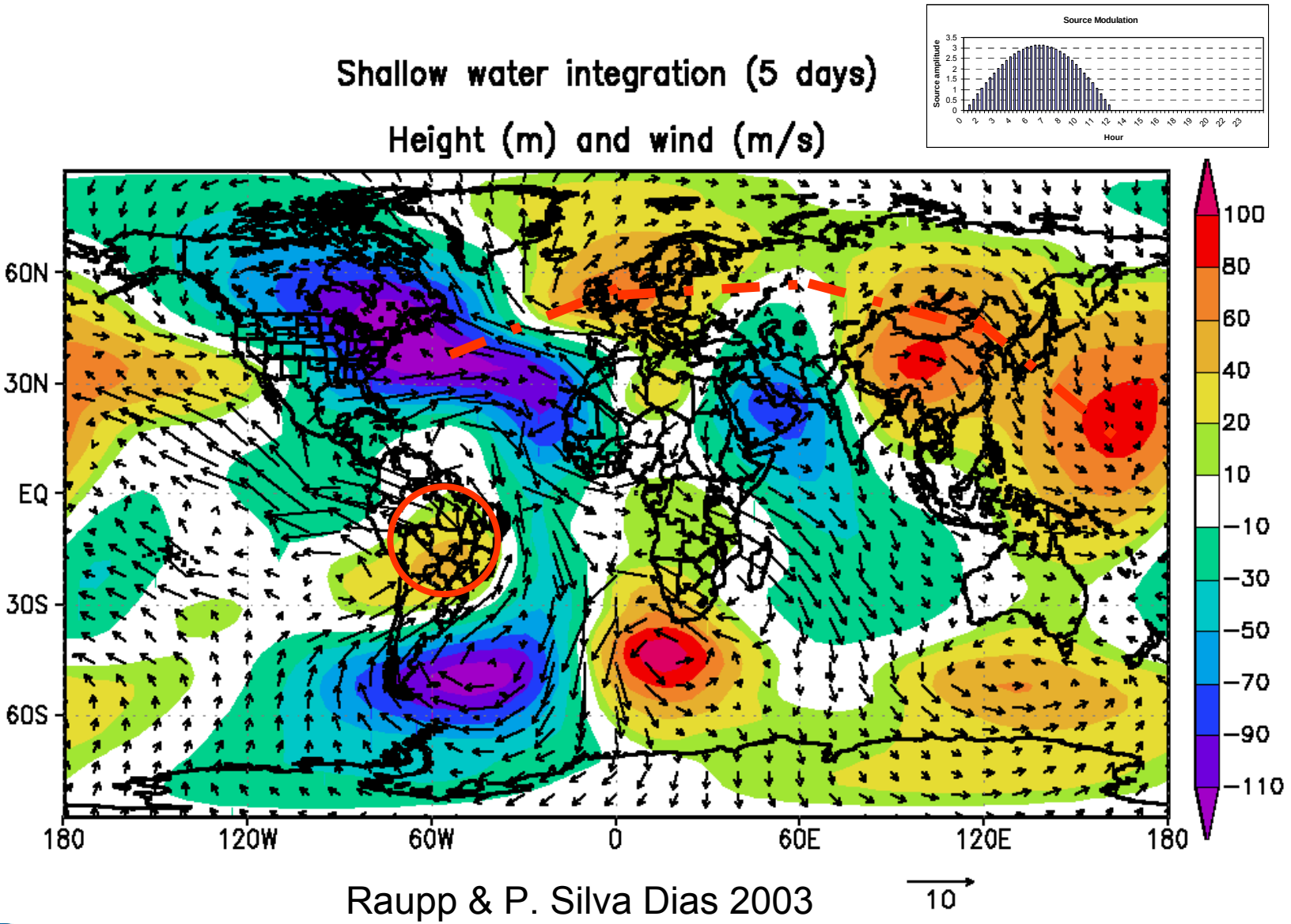


Global effect of **stationary** tropical heat source in the Amazon Basin (5 days)



Raupp & P. Silva Dias 2003

Global effect of **diurnal variation** of tropical heat source in the Amazon Basin (5 days)



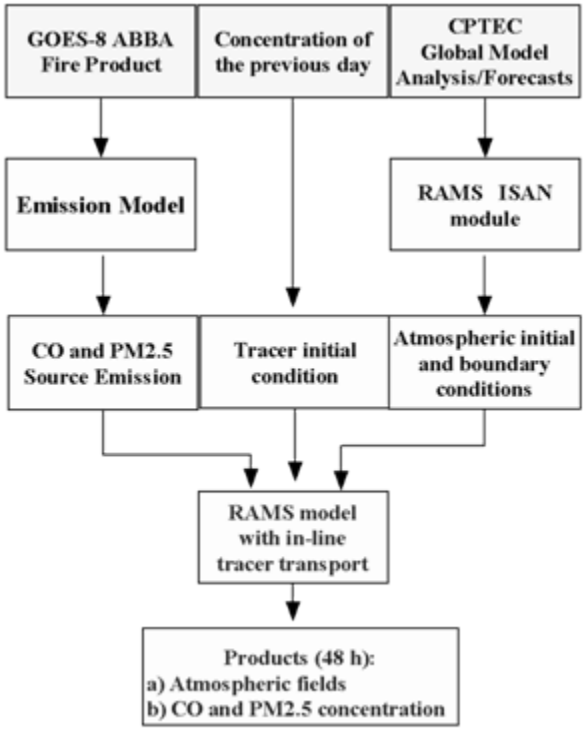
Raupp & P. Silva Dias 2003

Tropical Heat Source

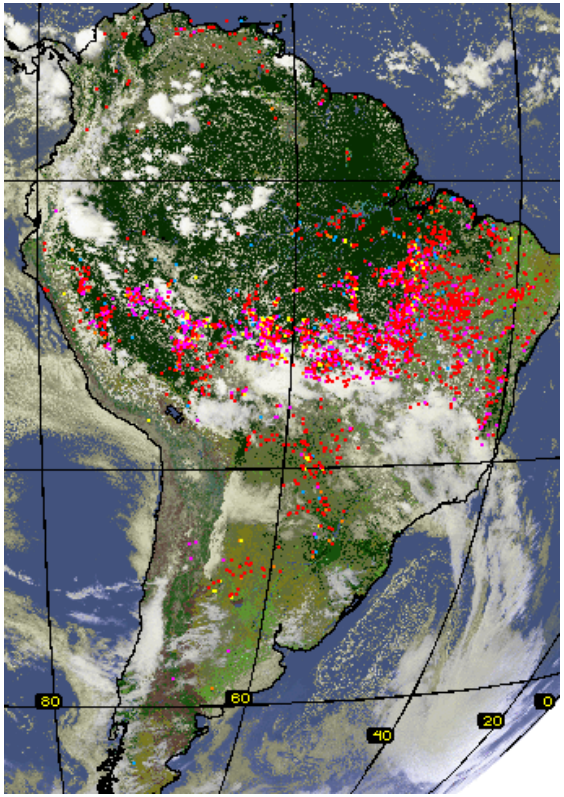
- **impact of diurnal variation of the Amazon heat source is strong in the Eurasian teleconnection pattern**
- **diurnal variation has a strong link to the biosphere (vegetation features, aerosol optical depth, ...)**

Aerosol effect in the radiation budget

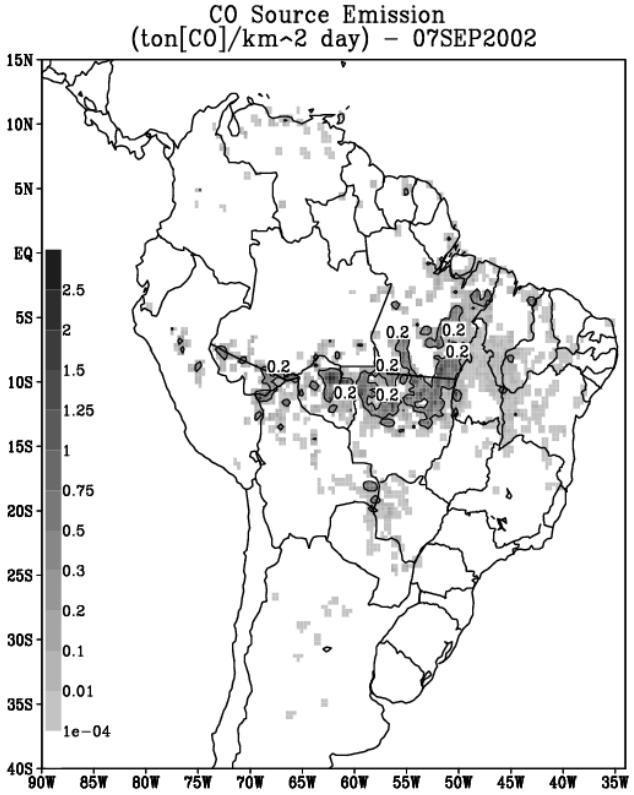
Real time monitoring of the transport of biomass burning emissions in South America. http://meioambiente.cptec.inpe.br



General flow of the real time monitoring the transport of biomass burning emissions in South America. Vegetation map: 1 km IGBP 2.0. RAMS grid 40 Km.



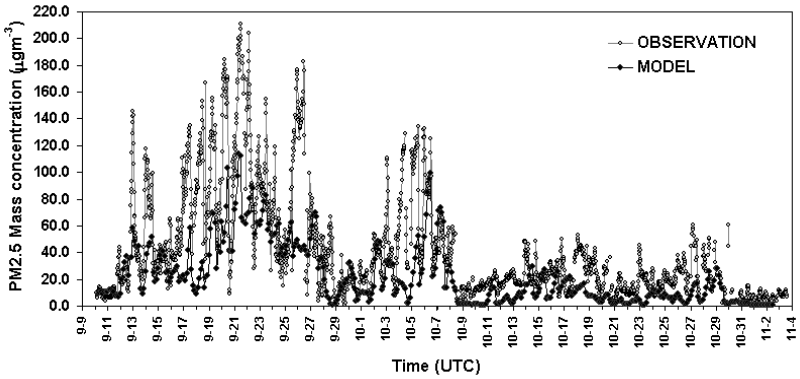
The GOES-8 ABBA Fire Product on 1745Z September 7, 2002, depicting the vegetation fires on South America. GOES resolution is 1 Km in the visible channel, 7 and 14 Km for infrared.



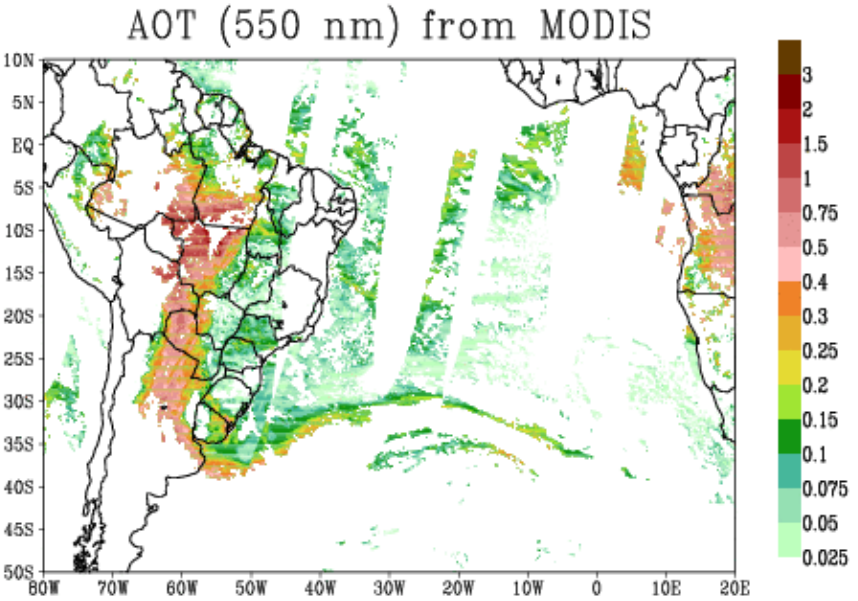
The parameterized CO source emission for September 7, 2002. Some places on Brazil with forest biomes emitted over 2 ton km^{-2} of carbon monoxide.

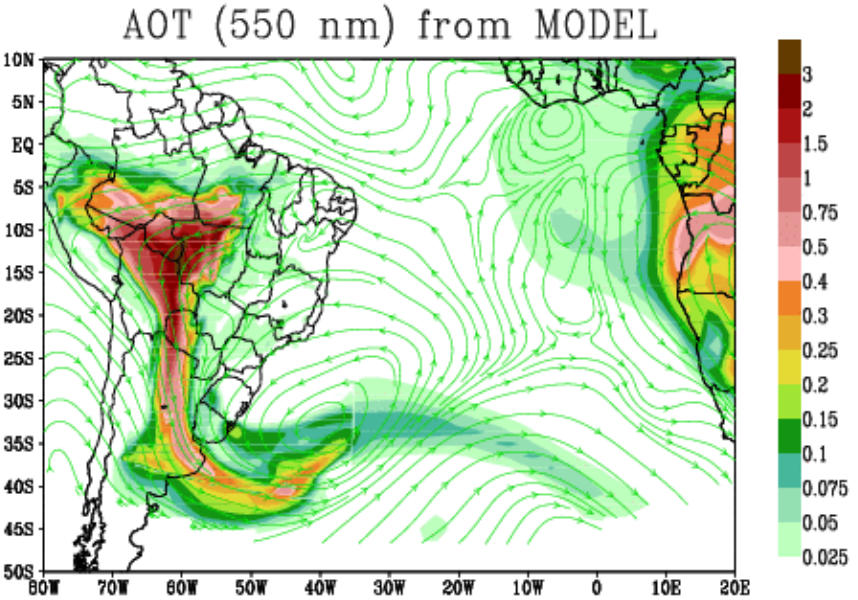
Source: Saulo Freitas and Karla Longo

Modeling the distribution of smoke using high resolution CATT-BRAMS + GOES fire spots+ emission factors



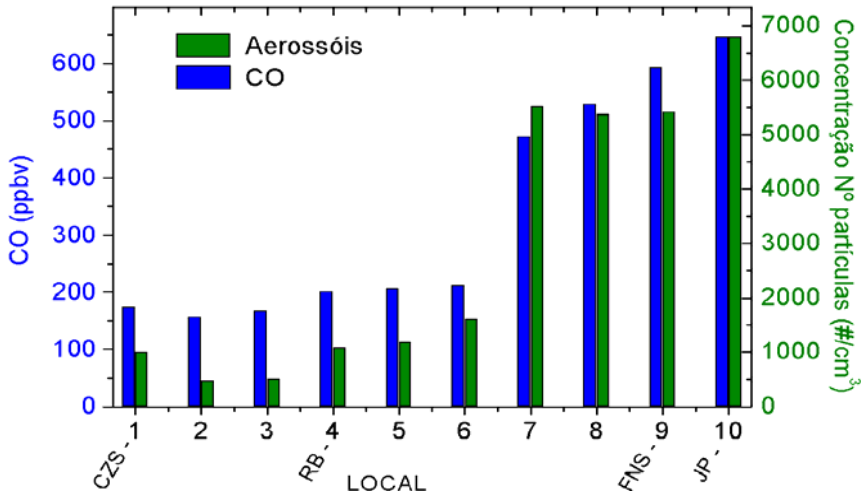
Time series of $PM_{2.5}$ mass concentration ($\mu g\ m^{-3}$) as simulated by the model (black) and measured at surface (gray) on Ji-Paraná site, Rondônia.



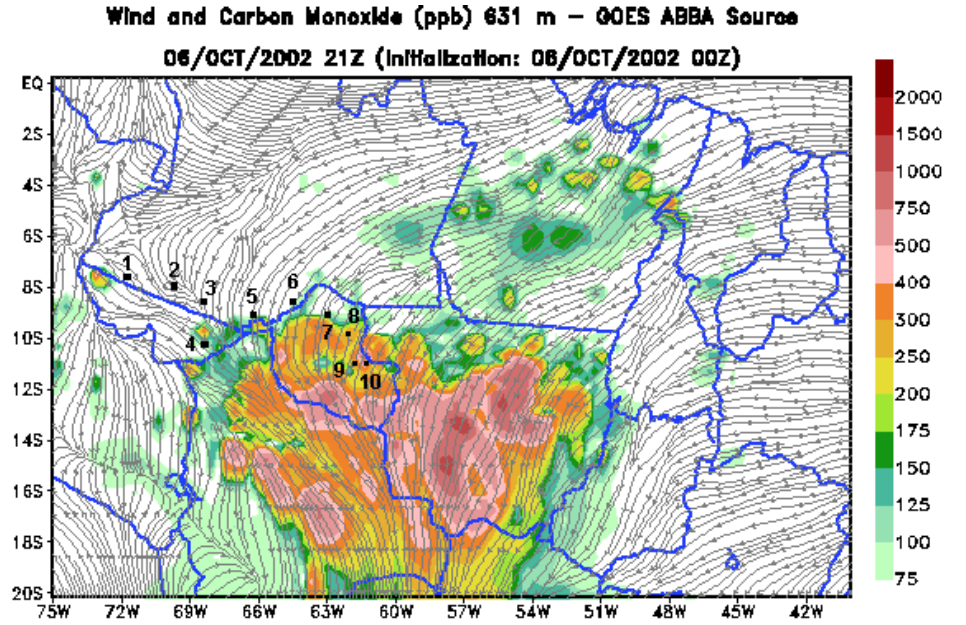


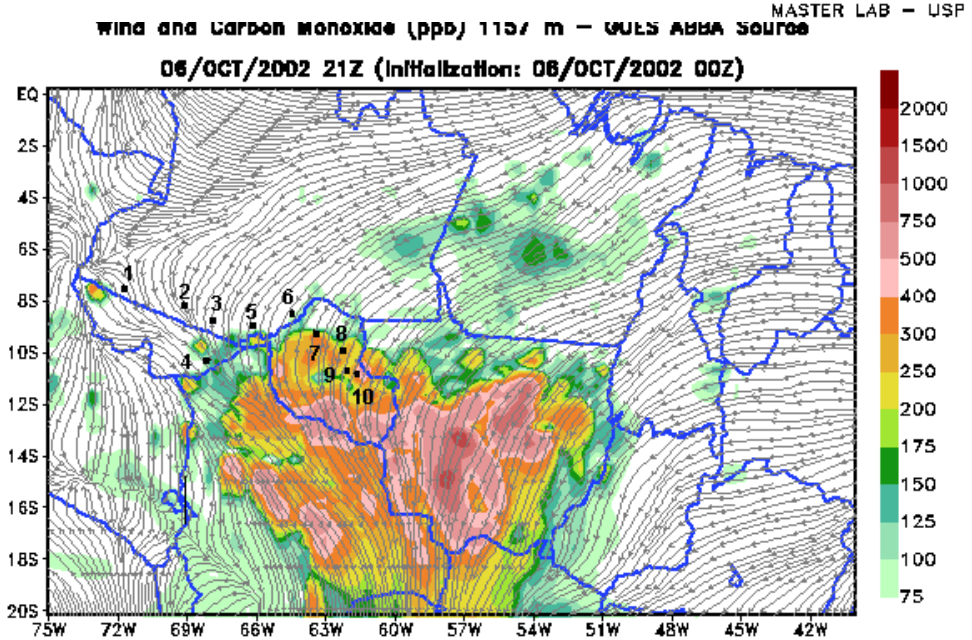
Source: Saulo Freitas and Karla Longo

Model validation from low to high smoke areas



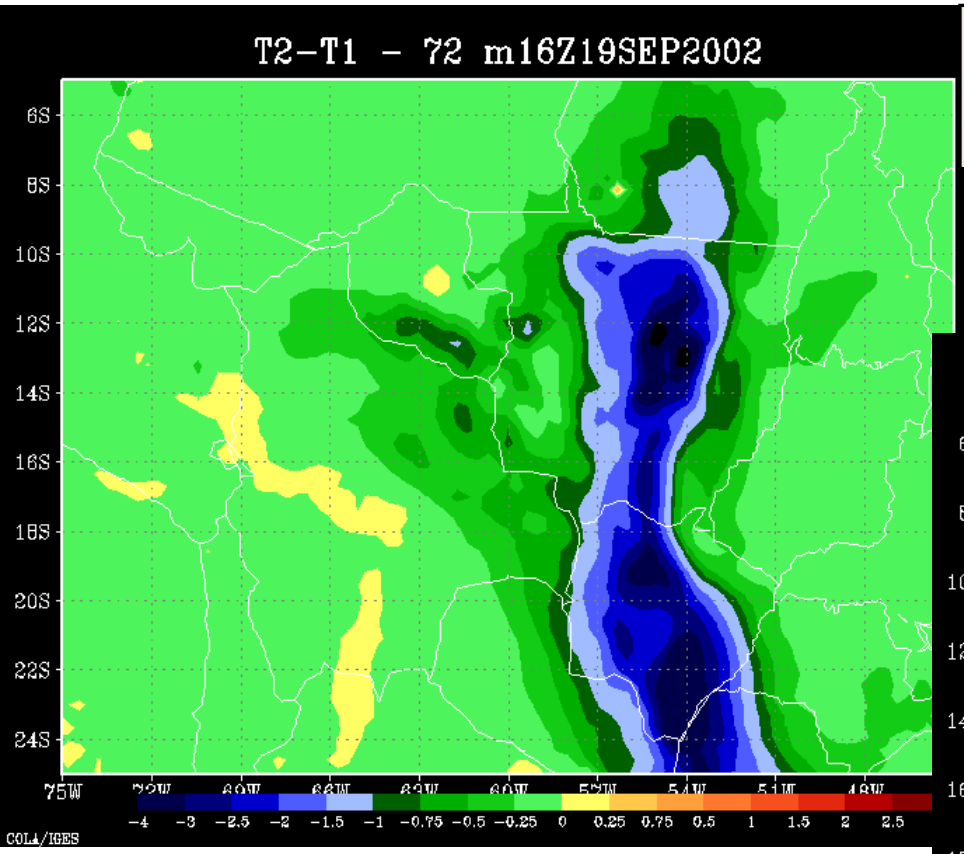
CO and particle number concentrations measured at 1,000 m altitude from Acre to Rondonia.





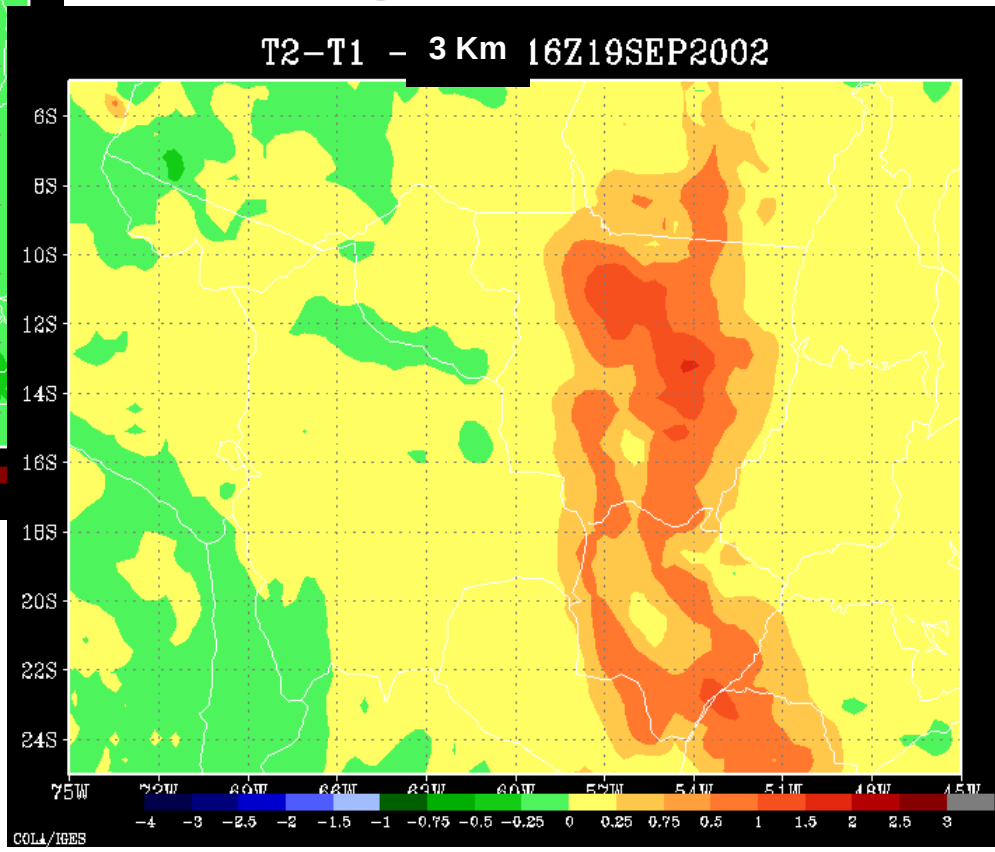
Δtemperature – 16Z19sep2002

surface



T2 = temperature with aerosol
T1 = temperature without aerosol

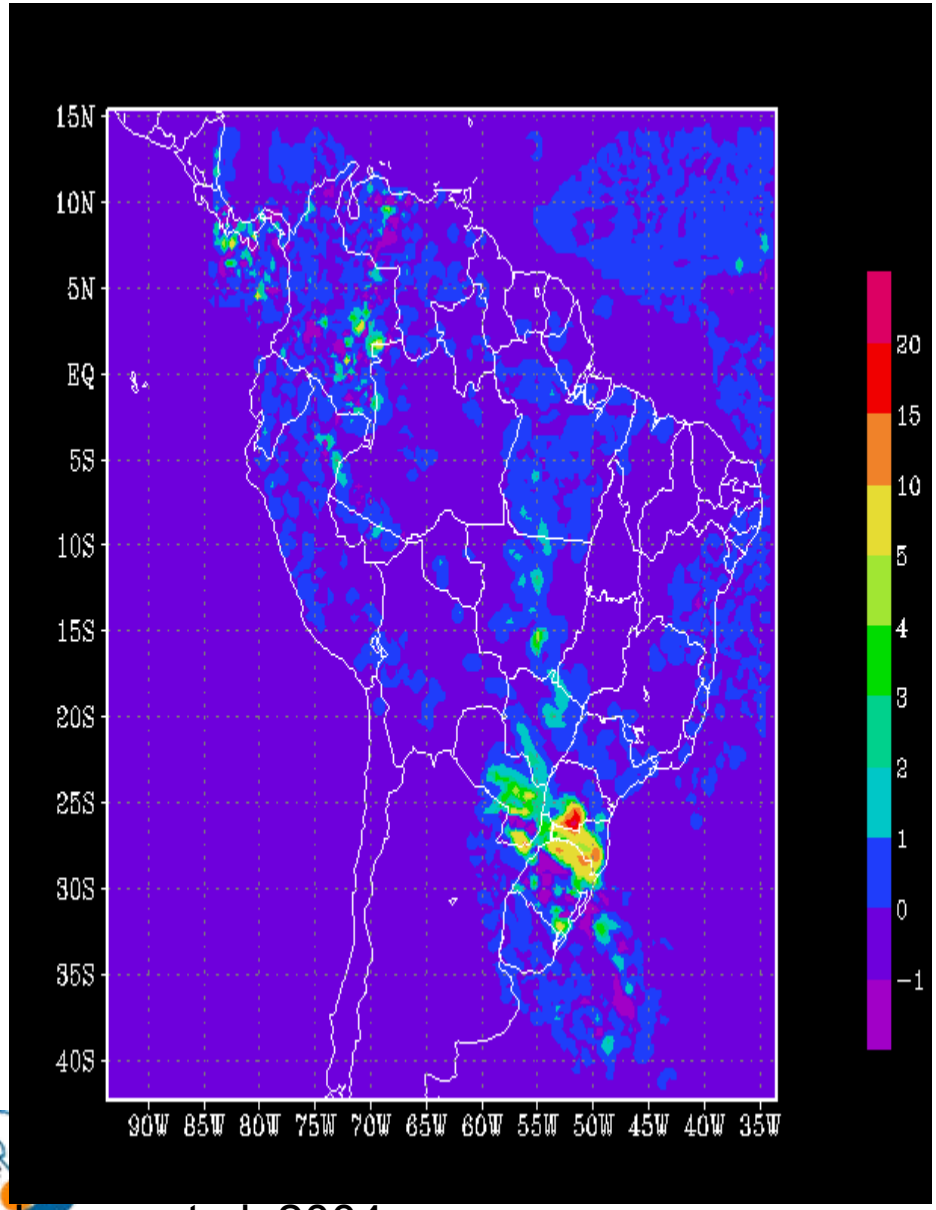
3km

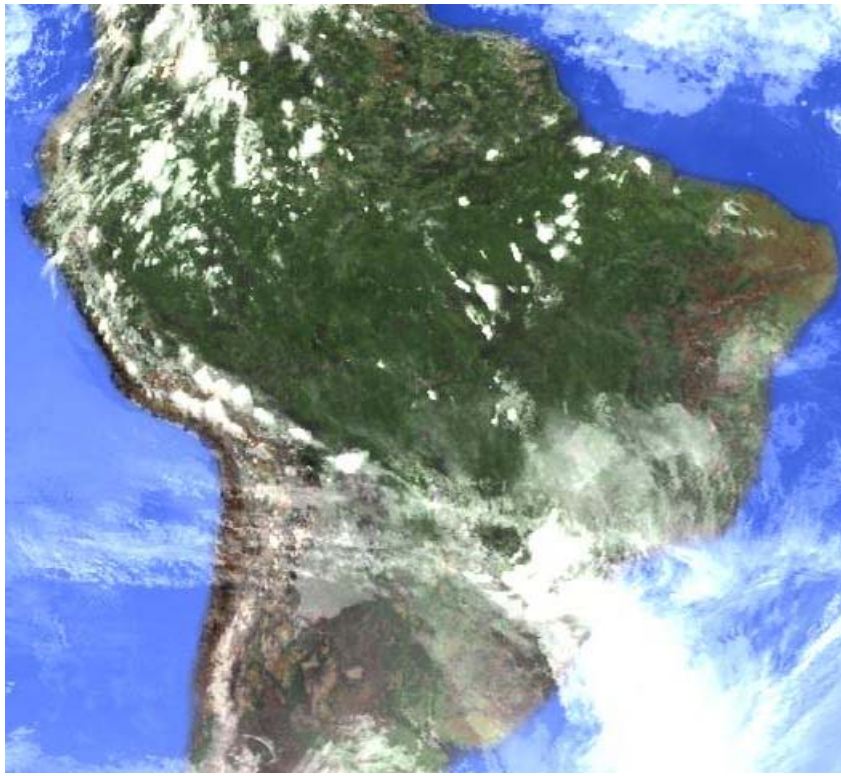


Longo et al. 2004

Reduction on the Convective precipitation (mm)

$$\Delta P = (P - P_{aer})$$



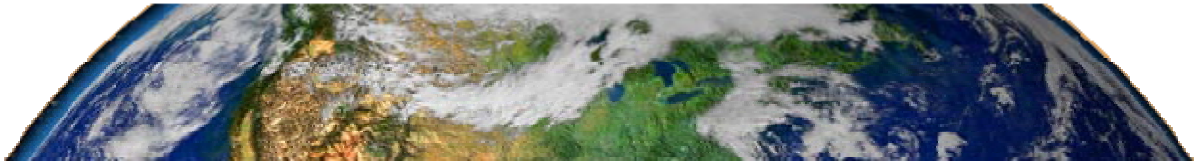


Longo et al. 2004

Present status of satellite data access and data assimilation

Numerical Weather Forecast

1950 1960 1970 1980 1990 2000 2010 2020



Very simple models of the atmosphere

Atmosphere

Atmosphere
Sufacce

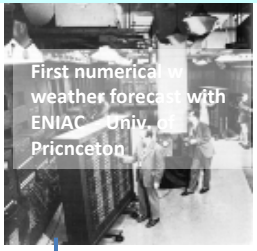
Atmosphere
Superface
Oceann ane ocean ice

Atmosphere
Superface
Oceann ane ocean ice
Aerosol
Carbon

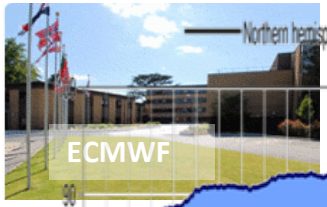
Atmosphere
Superface
Oceann ane ocean ice
Aerosol
Carbon
Vegetation Dunamics
Atmospheric Chemistry

Evolution of numerical Modelling components

Anomaly correlation of 500hPa height forecasts



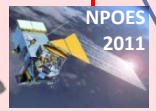
Beginning of assimilation of Satellite data in NWP



1950 1960 1970 1990 2010 2020

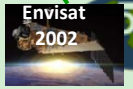
Satellites

Polar Orbit Operacional



Geoestacionary Orbit

Polar Órbit For research Used Operacionally



CPTEC

- MODELING AND DEVELOPMENT DIVISION
- OPERATIONS DIVISION
- ENVIRONMENTAL SATELLITES APPLICATION DIVISION
- CLIMATE AND ENVIRONMENT DIVISION

CPTEC Operations and Research

MODELS

CPTEC Atmospheric Global Model

Regional Model (ETA)

Mcoupled Ocean Atmosphere Model

Environmental Model

Ensemble weather forecast (15 days – 15 members)

Seasonal climate forecast(3 – 6 mo. -25 members)

Ingestion, Processing and Geration of Satellite Products

Images Vis, IR, WV

Soundings TOVS , ATOVS, GOES 10

Vegetation indexT

Sea Surface Temperature

Ultraviolet index

Fires

Solar and terrestrial radiation

Cloud classificatin

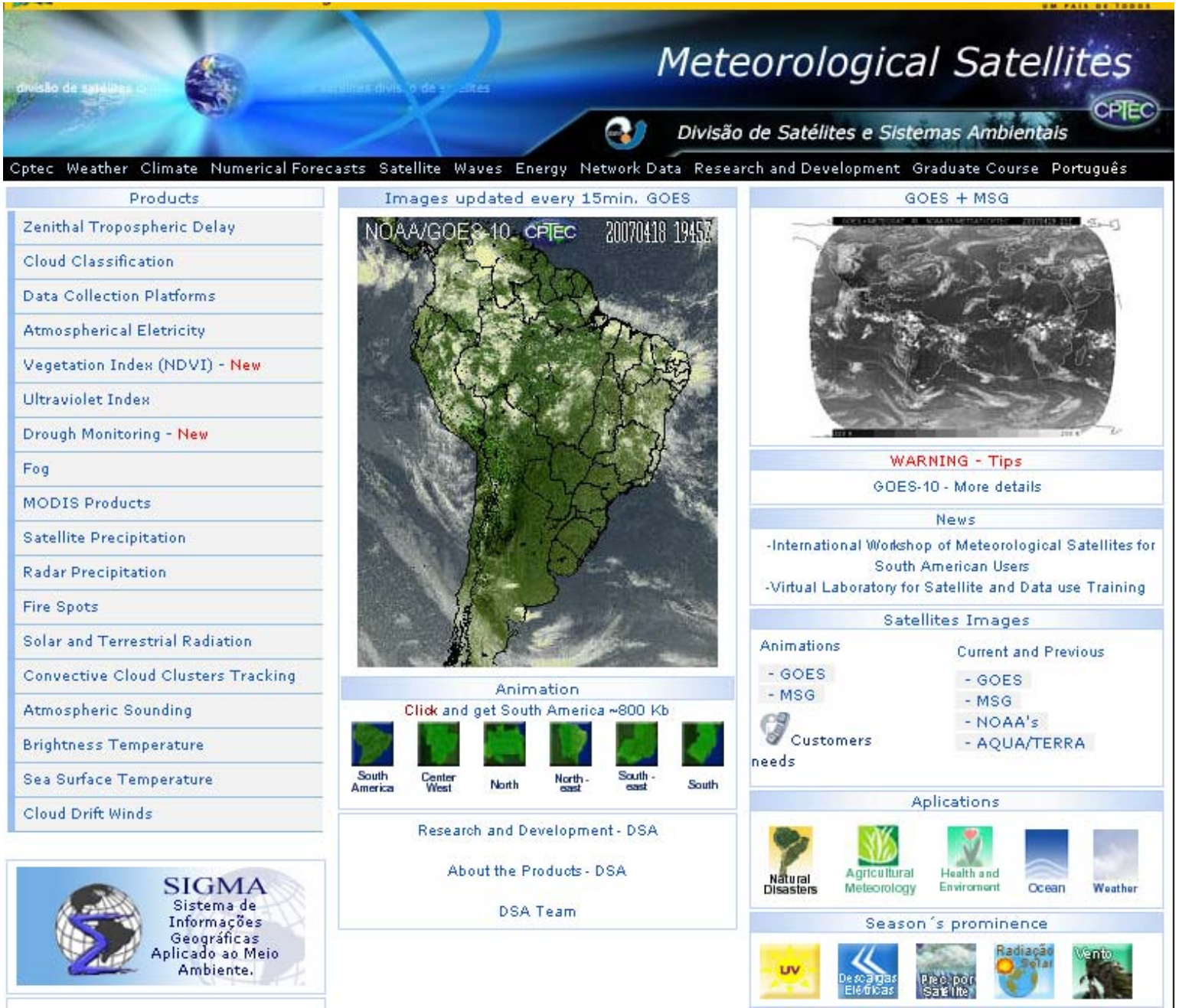
Sat winds

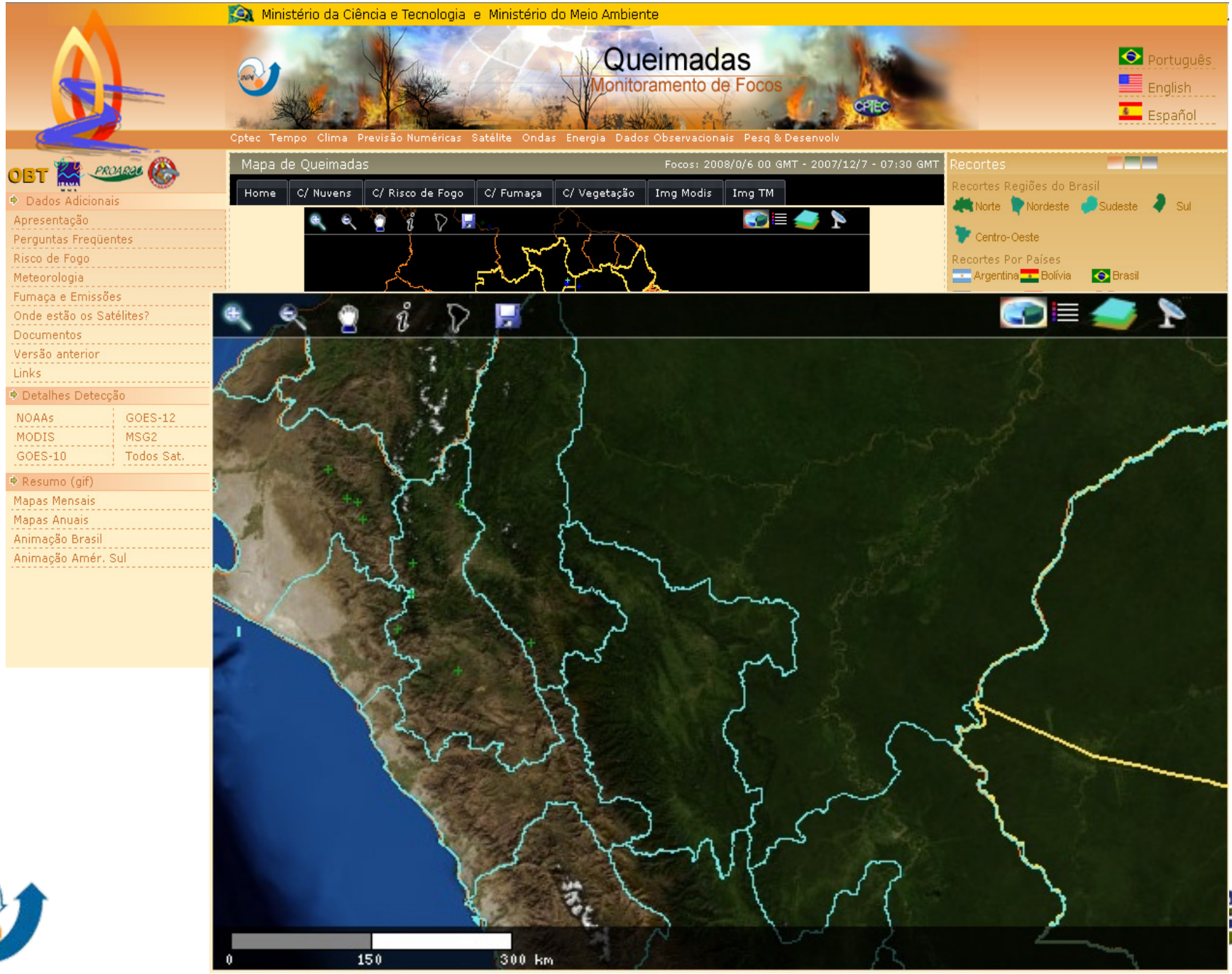
Precipitation estimates

Detection and nowcasting of MCS

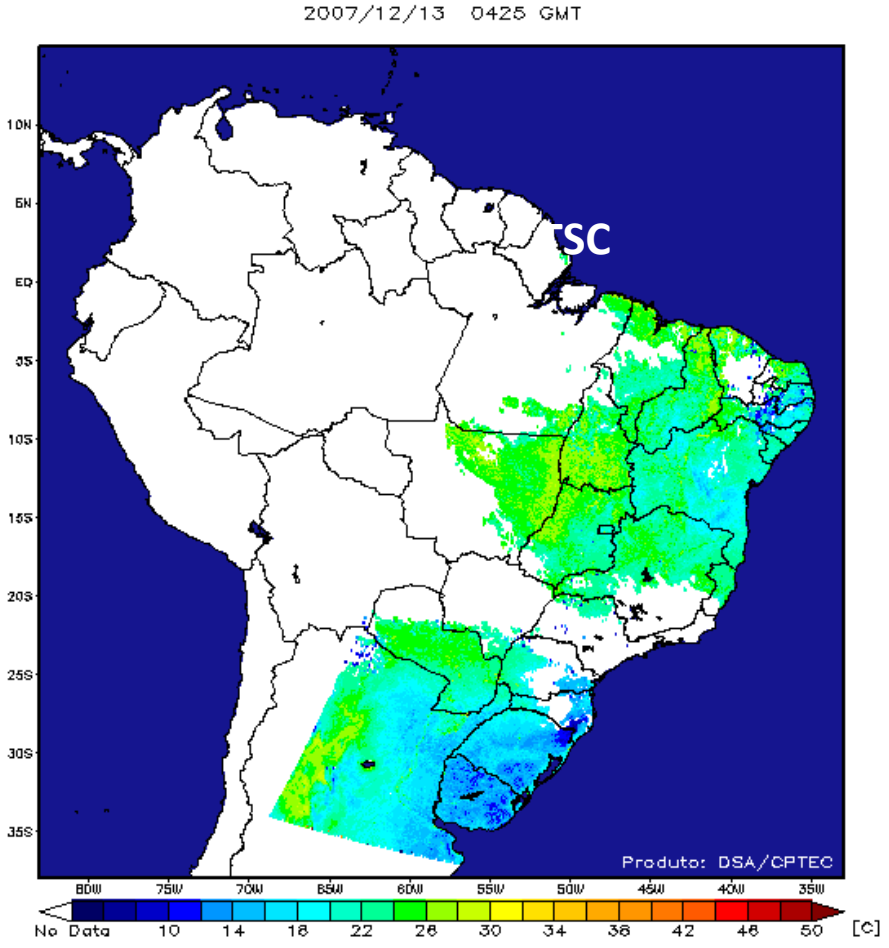
GPS Tropospheric Delay

http://satelite.cptec.inpe.br



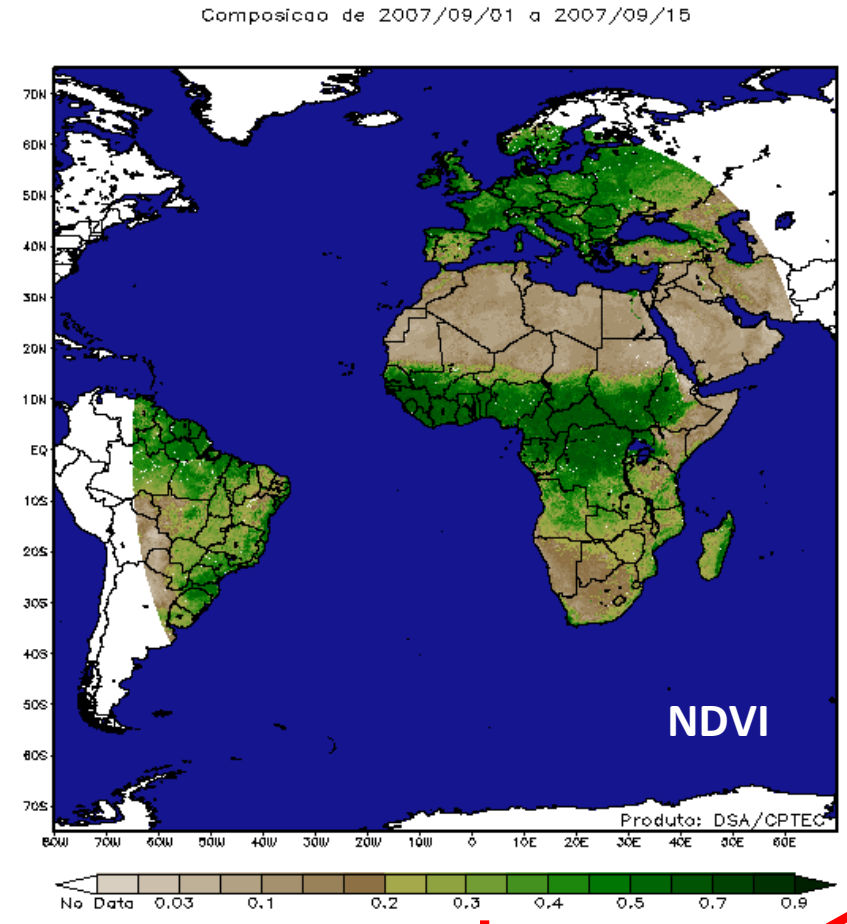

Ministério da Ciência e Tecnologia e Ministério do Meio Ambiente
Queimadas
Monitoramento de Focos
Português
English
Español
Cptec Tempo Clima Previsão Numéricas Satélite Ondas Energia Dados Observacionais Pesq & Desenvolv
OBT
Dados Adicionais
Apresentação
Perguntas Freqüentes
Risco de Fogo
Meteorologia
Fumaça e Emissões
Onde estão os Satélites?
Documentos
Versão anterior
Links
Detalhes Detecção
NOAAs
GOES-12
MODIS
MSG2
GOES-10
Todos Sat.
Resumo (gif)
Mapas Mensais
Mapas Anuais
Animação Brasil
Animação Amér. Sul
Mapa de Queimadas
Focos: 2008/0/6 00 GMT - 2007/12/7 - 07:30 GMT
Home
C/ Nuvens
C/ Risco de Fogo
C/ Fumaça
C/ Vegetação
Img Modis
Img TM
Recortes
Recortes Regiões do Brasil
Norte
Nordeste
Sudeste
Sul
Centro-Oeste
Recortes Por Países
Argentina
Bolívia
Brasil
0
150
300 km

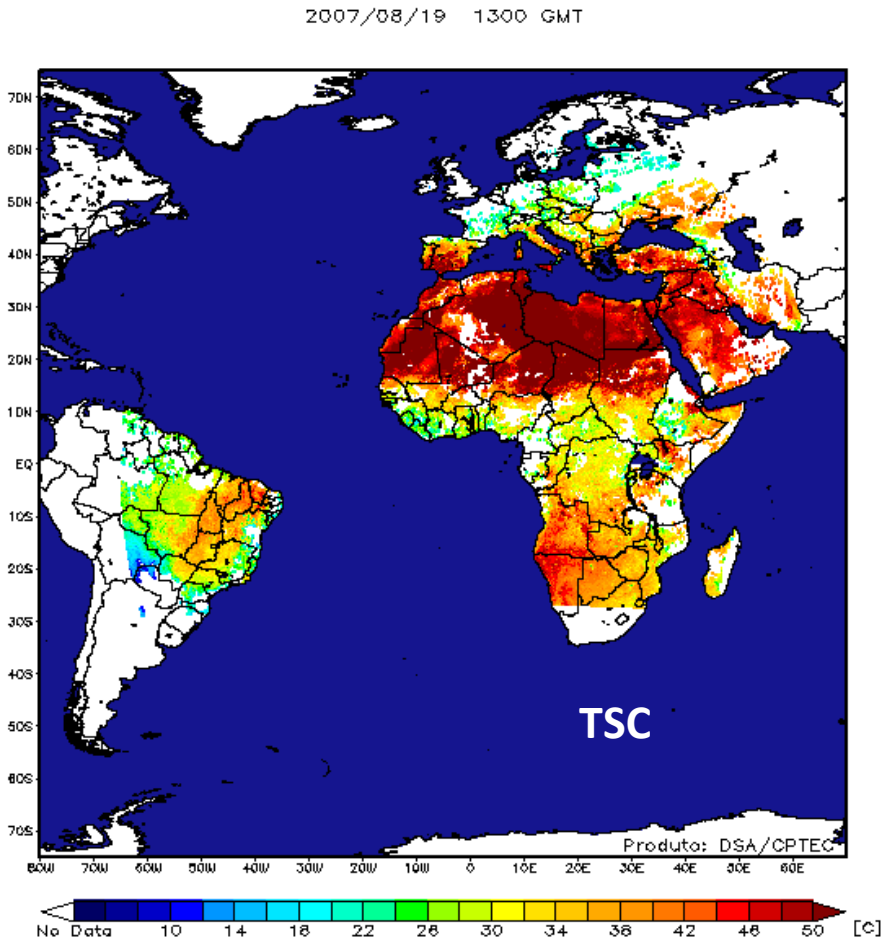
Produtos NDVI e TSC - NOAA-18



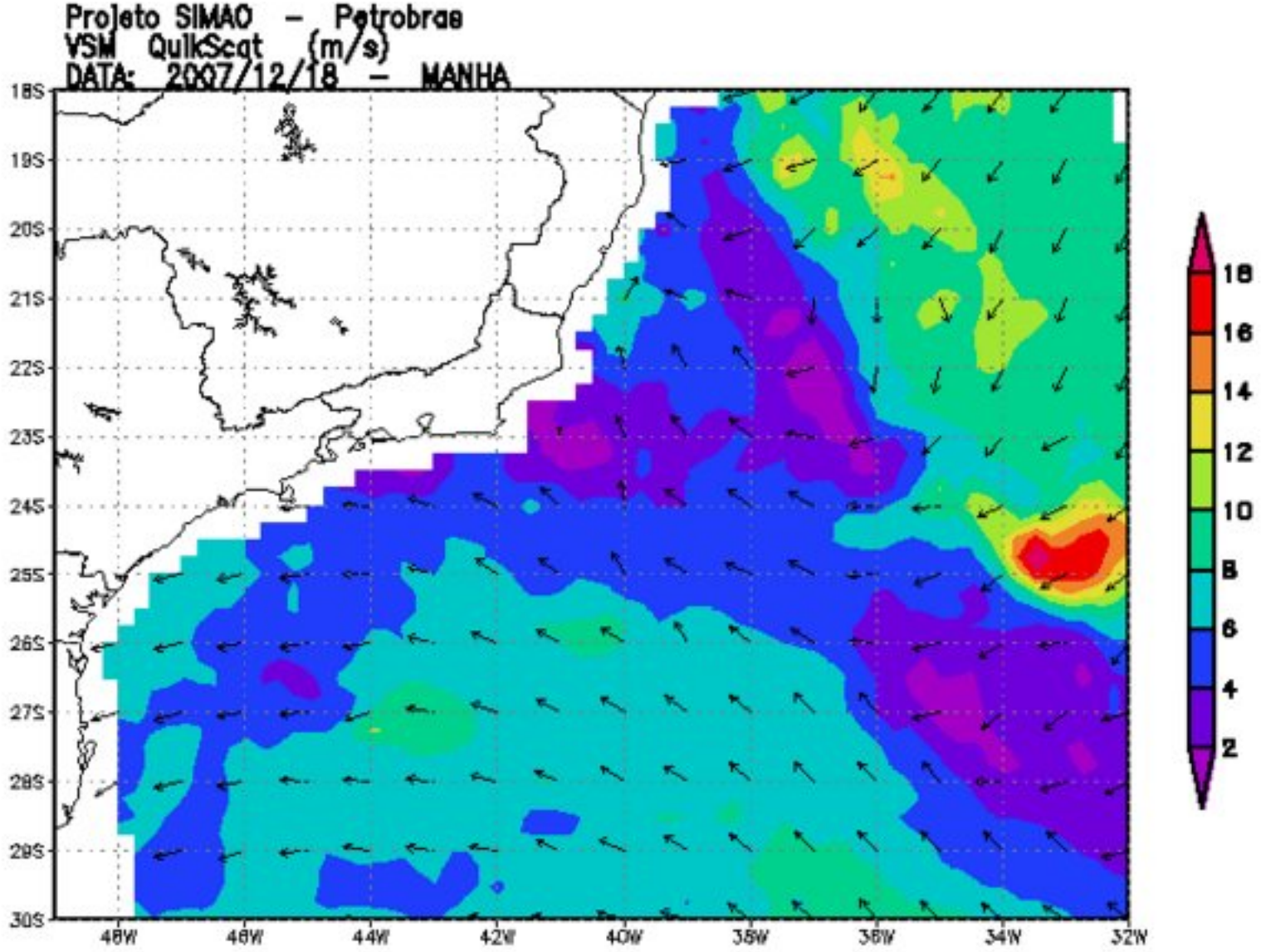
Emissividade

Produtos NDVI e TSC - MSG





Emissividade


Projeto SIMAO - Petrobras
VSM QuikScat (m/s)
DATA: 2007/12/18 - MANHA
18S
19S
20S
21S
22S
23S
24S
25S
26S
27S
28S
29S
30S
48W
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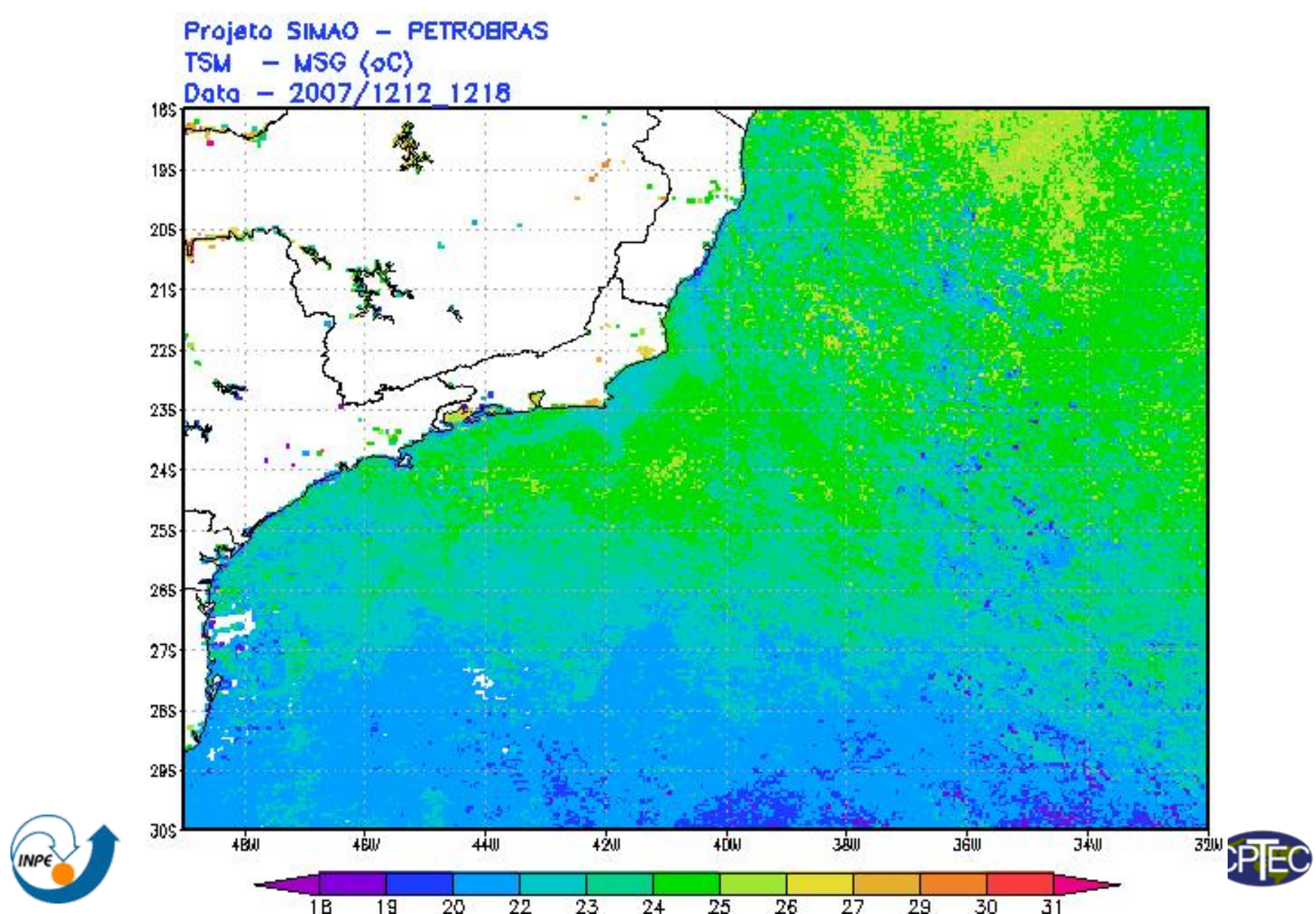
Projeto SIMAO - PETROBRAS
TSM - MSG (oC)
Data - 2007/1212_1218
18S
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24S
25S
26S
27S
28S
29S
30S
48W
46W
44W
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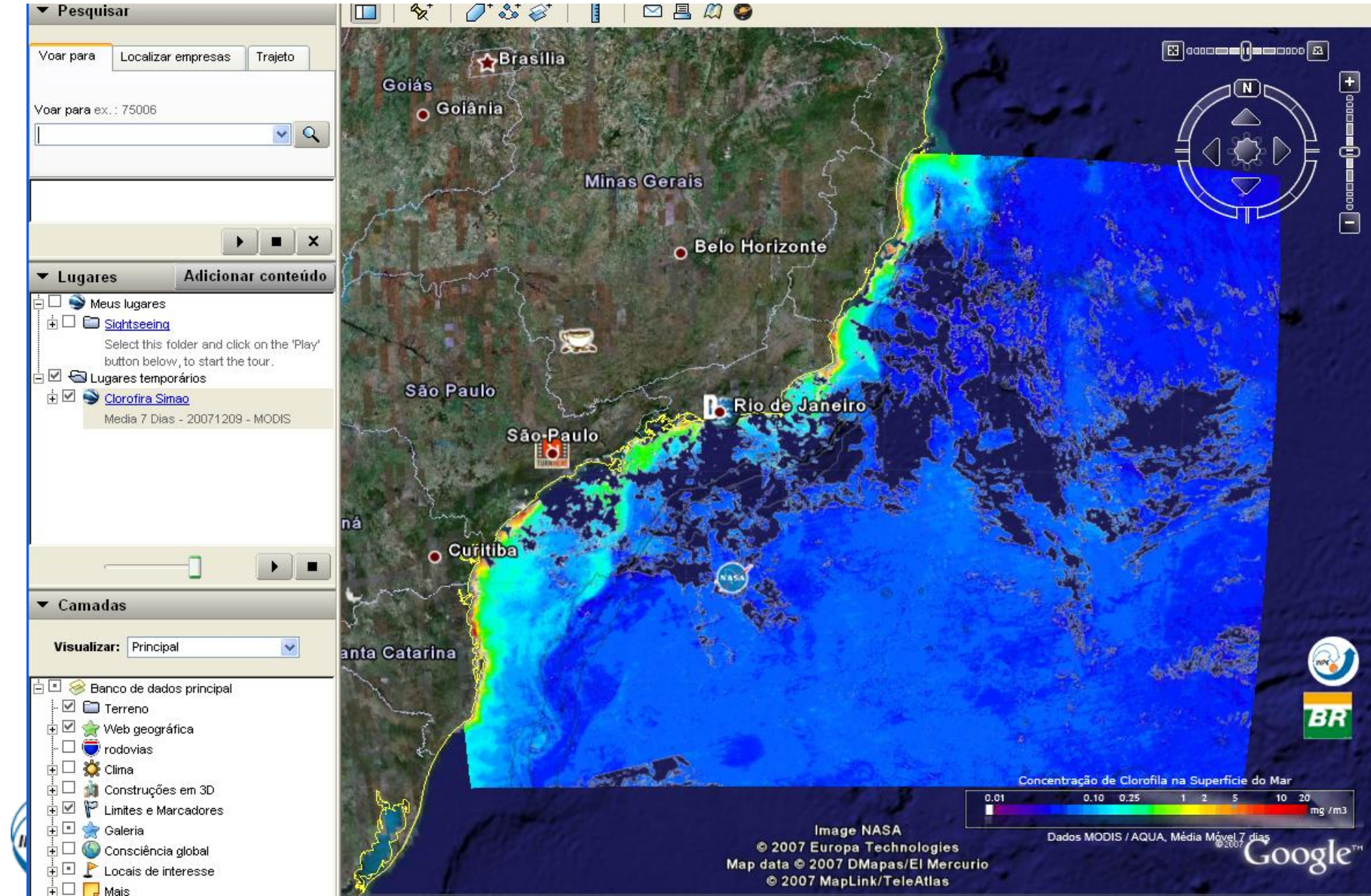
Pesquisar
Voar para
Localizar empresas
Trajeto
Voar para ex.: 75006
Lugares
Adicionar conteúdo
Meus lugares
Sightseeing
Select this folder and click on the 'Play' button below, to start the tour.
Lugares temporários
Clorofira Simao
Media 7 Dias - 20071209 - MODIS
Camadas
Visualizar:
Principal
Banco de dados principal
Terreno
Web geográfica
rodovias
Clima
Construções em 3D
Limites e Marcadores
Galeria
Consciência global
Locais de interesse
Mais
Brasília
Goiás
Goiânia
Minas Gerais
Belo Horizonte
São Paulo
Rio de Janeiro
São Paulo
Curitiba
anta Catarina
N
Concentração de Clorofila na Superfície do Mar
0.01
0.10
0.25
1
2
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20
mg /m3
Dados MODIS / AQUA, Média Móvel 7 dias
Image NASA
© 2007 Europa Technologies
Map data © 2007 DMapas/El Mercurio
© 2007 MapLink/TeleAtlas
Google

Ministério da Ciência e Tecnologia

Sondagens

Divisão de Satélites e Sistemas Ambientais

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Imagens

Produto

Temperatura de Brilho Ch12 JPG

Data Inicial

Data Final

Somente dia atual

Consultar

Imagens Disponíveis

	Data	Hora
☐	2007-12-01	16:31:00
☐	2007-12-01	17:30:00
☐	2007-12-01	18:27:00
☐	2007-12-01	20:00:00
☐	2007-12-01	20:31:00
☐	2007-12-01	21:28:00

183 , 184

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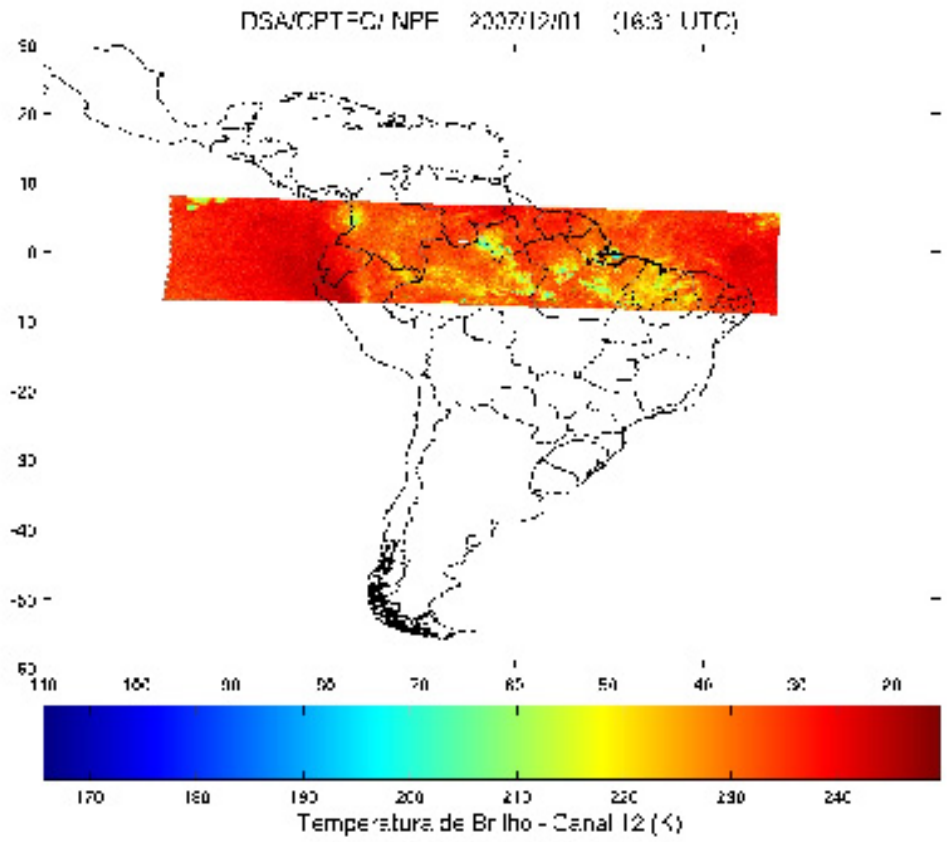
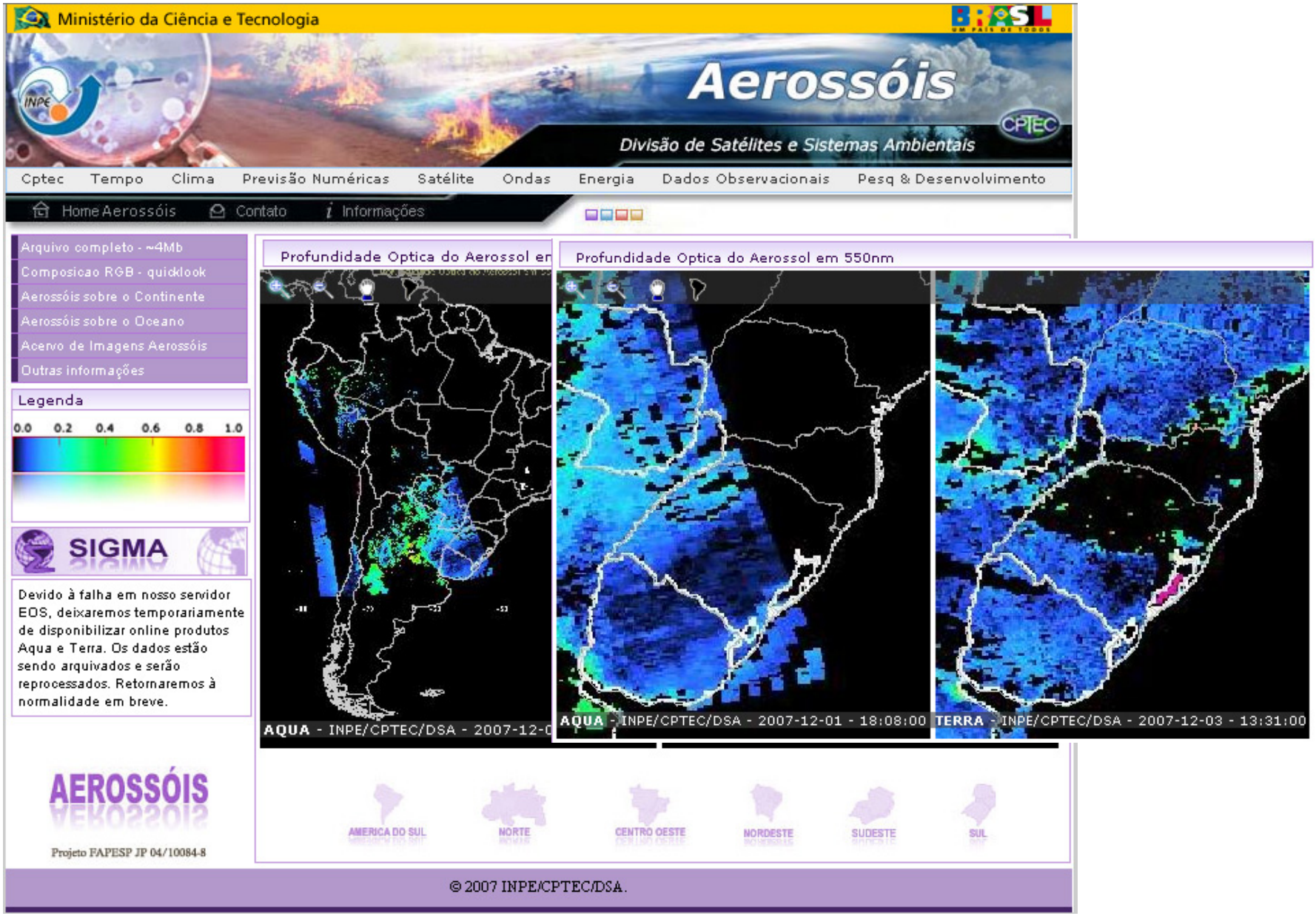
Visualização de Imagens

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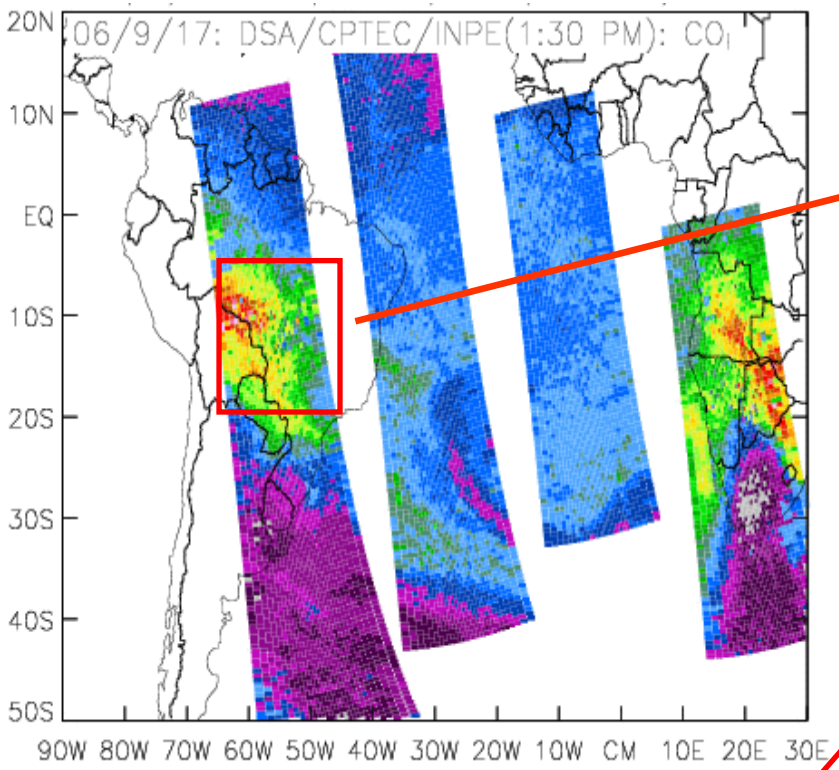
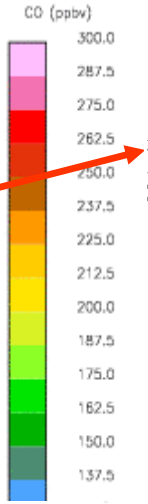
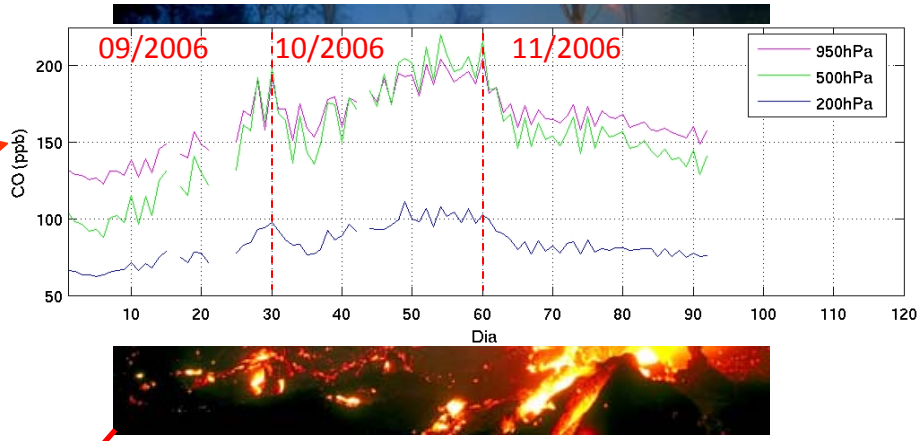
Aerossóis
Divisão de Satélites e Sistemas Ambientais
Cptec Tempo Clima Previsão Numéricas Satélite Ondas Energia Dados Observacionais Pesq & Desenvolvimento
Home Aerossóis Contato Informações
Arquivo completo - ~4Mb
Composicao RGB - quicklook
Aerossóis sobre o Continente
Aerossóis sobre o Oceano
Acervo de Imagens Aerossóis
Outras informações
Legenda
0.0 0.2 0.4 0.6 0.8 1.0
SIGMA
Devido à falha em nosso servidor EOS, deixaremos temporariamente de disponibilizar online produtos Aqua e Terra. Os dados estão sendo arquivados e serão reprocessados. Retornaremos à normalidade em breve.
Profundidade Optica do Aerossol em
Profundidade Optica do Aerossol em 550nm
AQUA - INPE/CPTEC/DSA - 2007-12-01 - 18:08:00
TERRA - INPE/CPTEC/DSA - 2007-12-03 - 13:31:00
AEROSSÓIS
Projeto FAPESP JP 04/10084-8
AMERICA DO SUL
NORTE
CENTRO OESTE
NORDESTE
SUDESTE
SUL
© 2007 INPE/CPTEC/DSA.

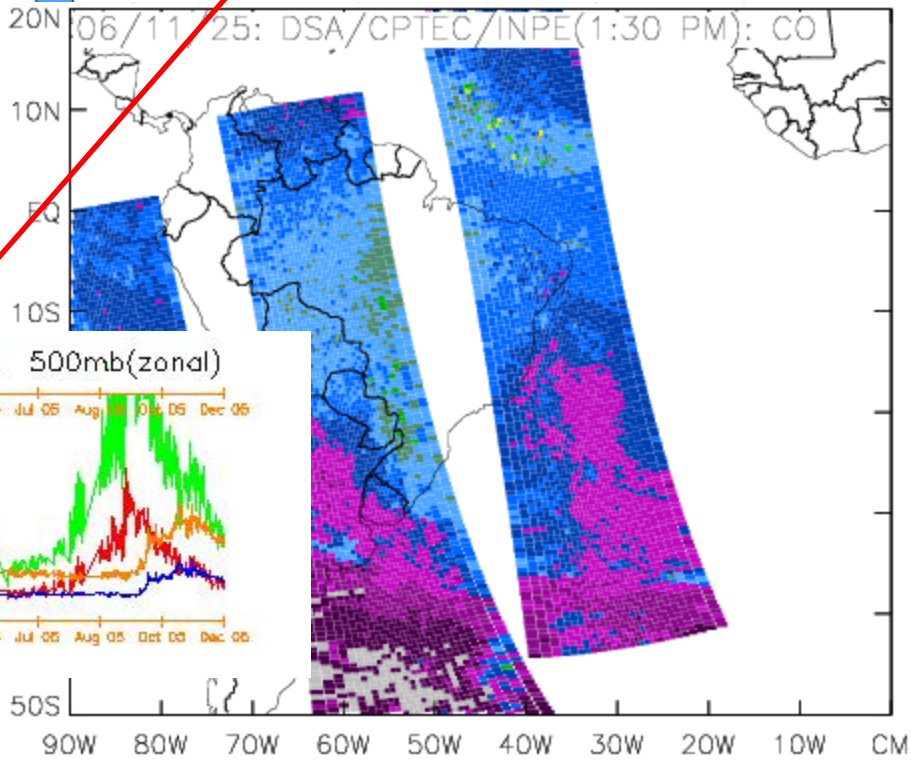
Carbon Monoxide(CO)

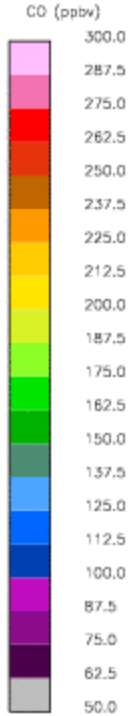


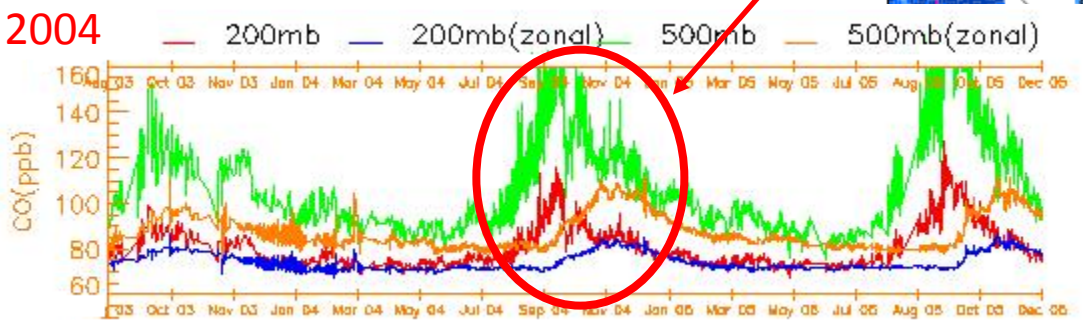


(-25 ≤ lat ≤ -5 , -65 ≤ lon ≤ -50)

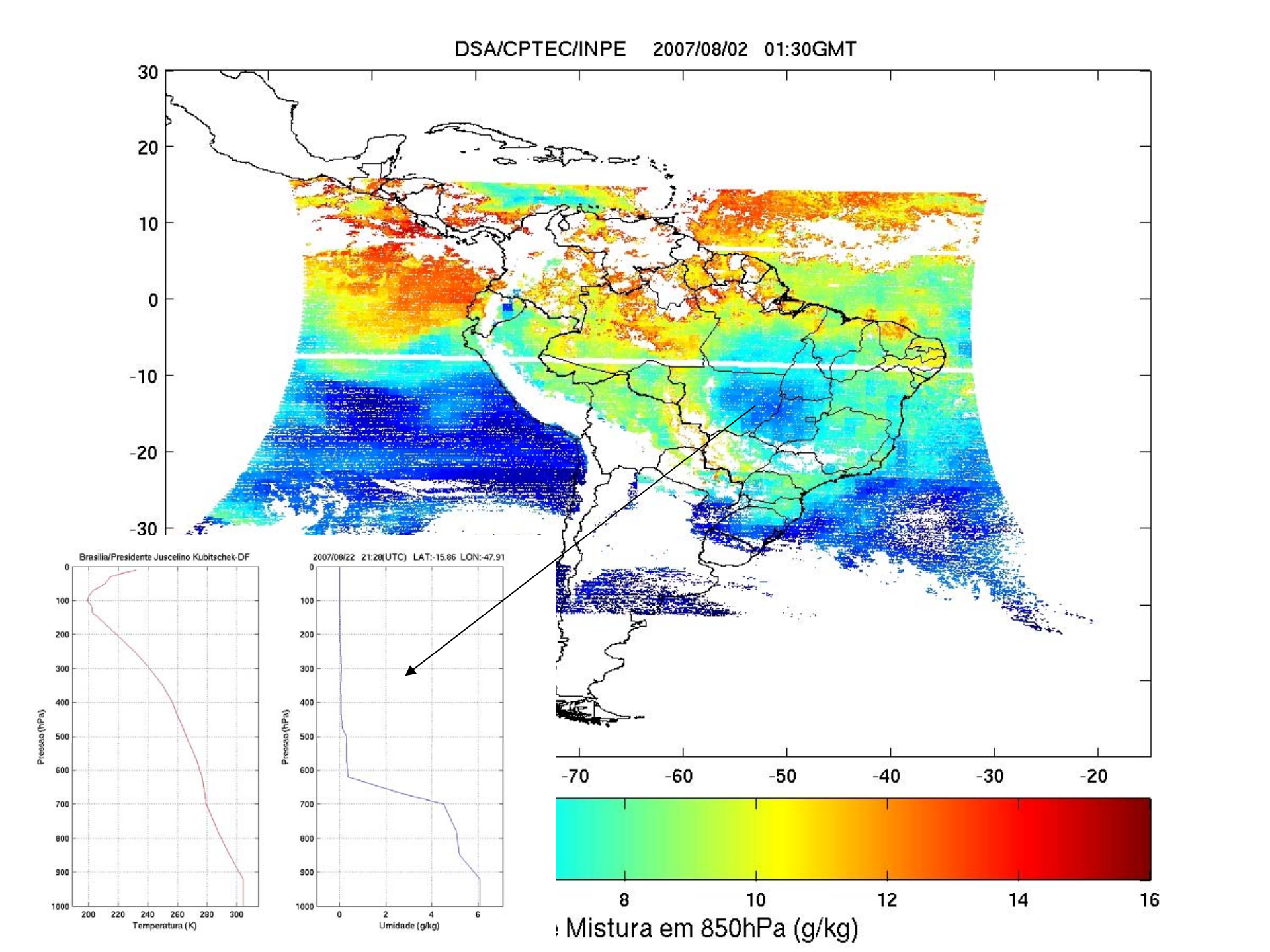




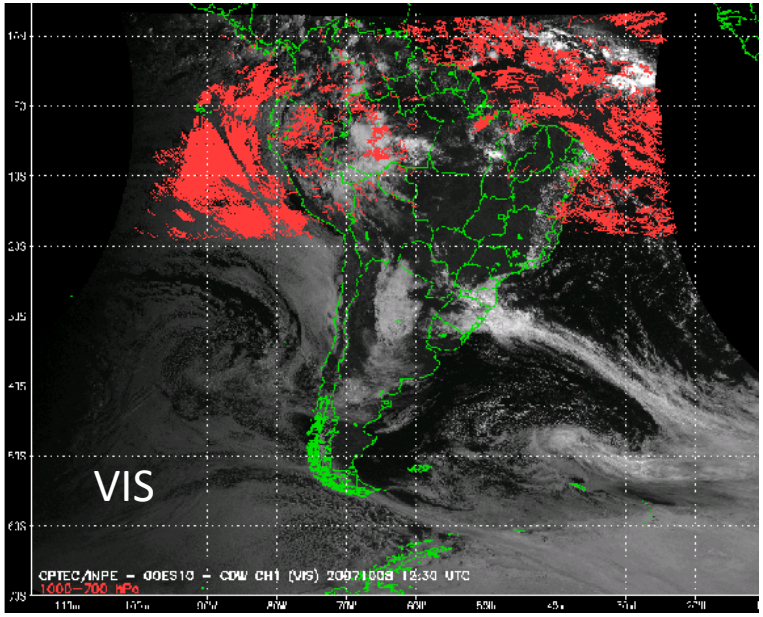


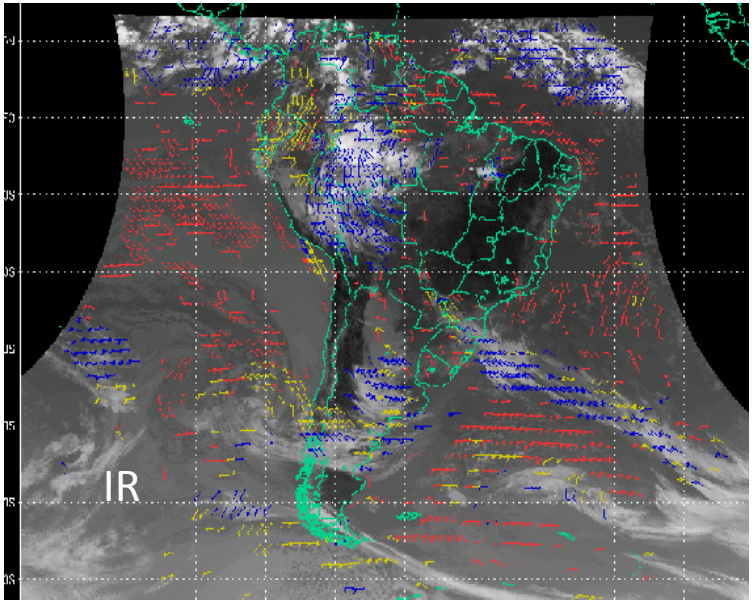


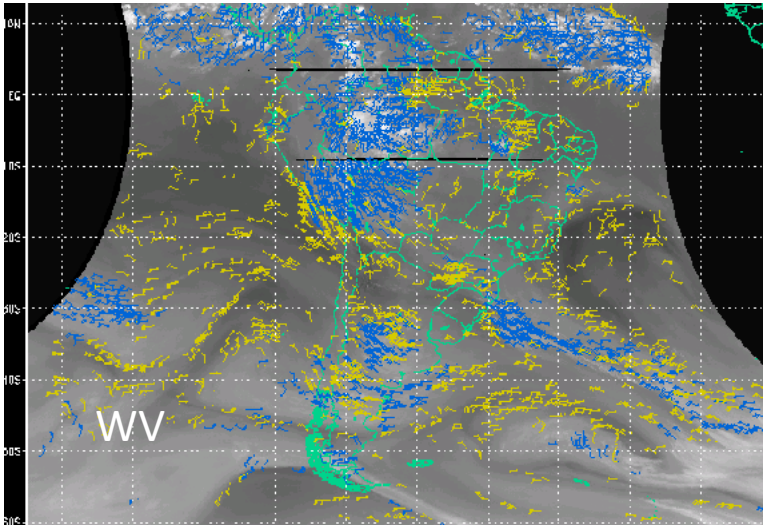
(-25 ≤ lat ≤ EQ , -70 ≤ lon ≤ -40)

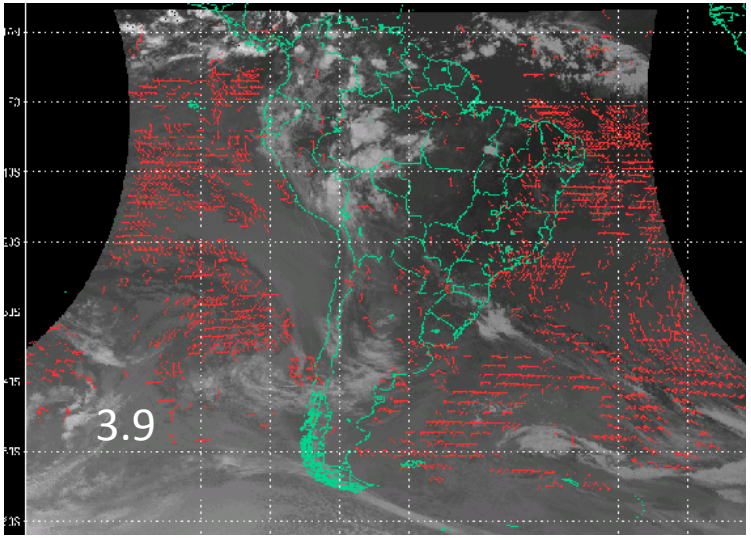

DSA/CPTEC/INPE 2007/08/02 01:30GMT
30
20
10
0
-10
-20
-30
-70
-60
-50
-40
-30
-20
8
10
12
14
16
Mistura em 850hPa (g/kg)
Brasilia/Presidente Juscelino Kubitschek-DF
2007/08/22 21:28(UTC) LAT:-15.86 LON:-47.91
Pressao (hPa)
0
100
200
300
400
500
600
700
800
900
1000
200
220
240
260
280
300
Temperatura (K)
Pressao (hPa)
0
2
4
6
Umidade (g/kg)

Vento em 4 canais





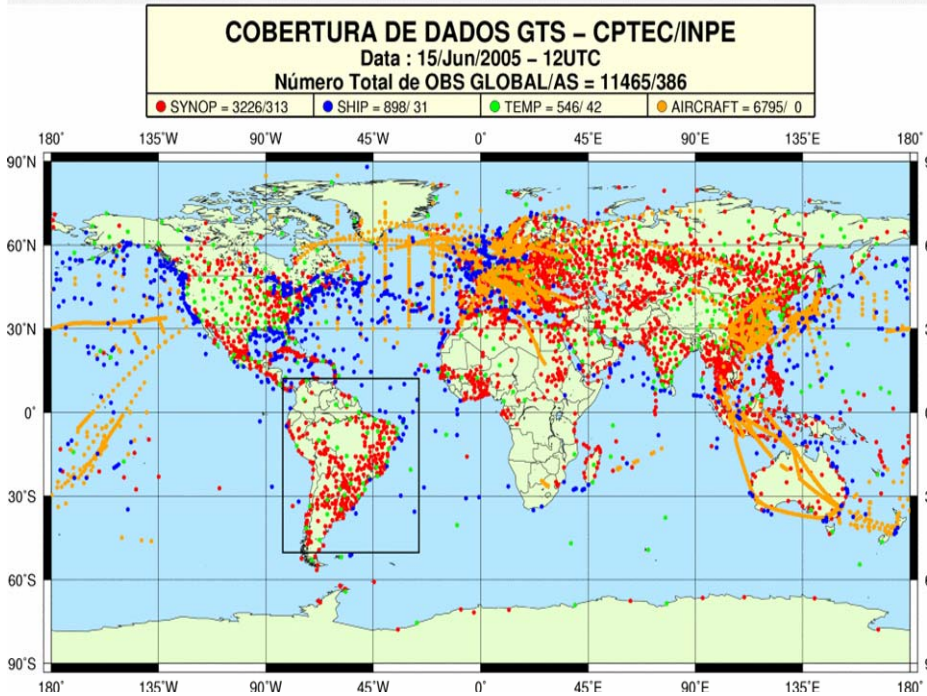




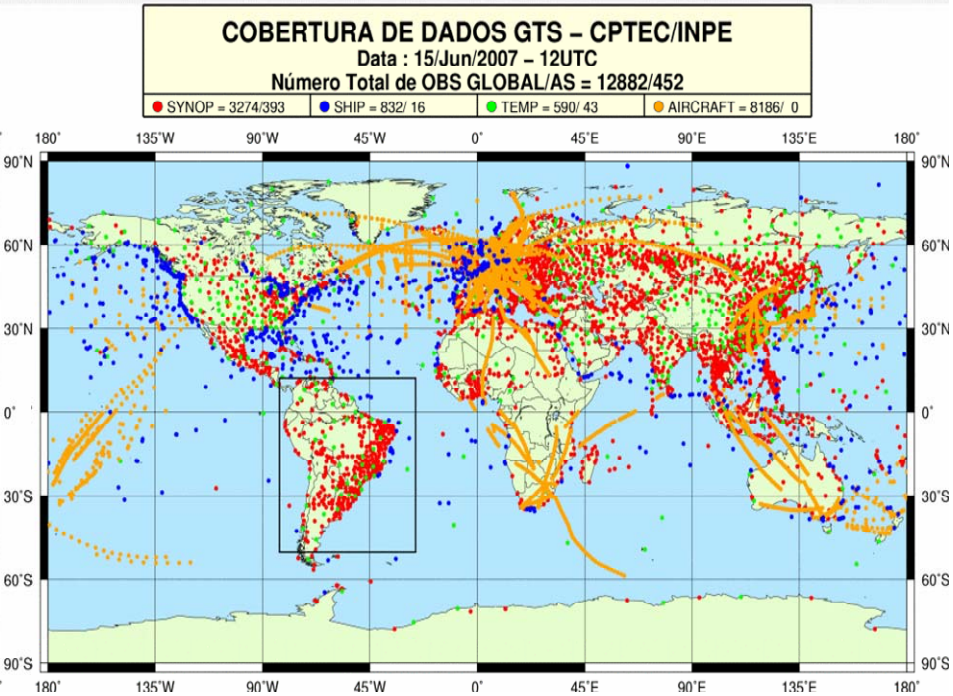
Data Assimilation

Conventional Data Coverage

14 June 2005 1200 UTC



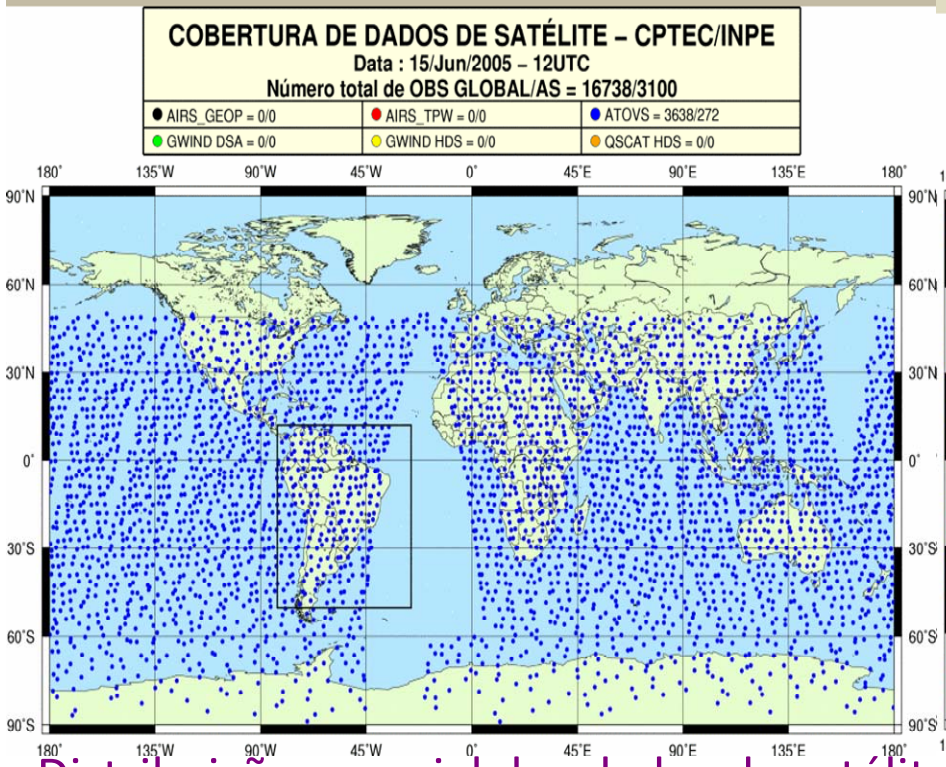
14 June 2007 1200UTC



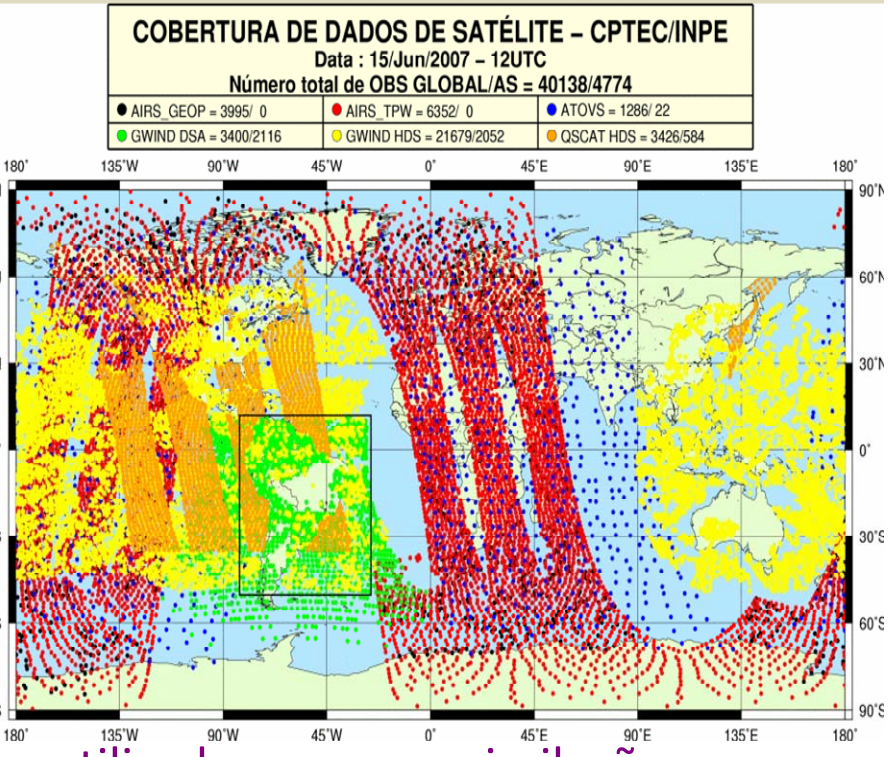
Distribuição espacial dos dados provenientes de instrumentos em bases terrestres disponível para a assimilação no CPTEC-INPE para o dia 14 de junho em 2005 (a) e em 2007 (b) às 12:00 UTC: estações meteorológicas de superfície (SINOP), sensores em navios (SHIP), radiossondagens (TEMP), e a bordo de aviões (AIRCRAFT)

Satellite Data Coverage

14 June 2005 1200 UTC

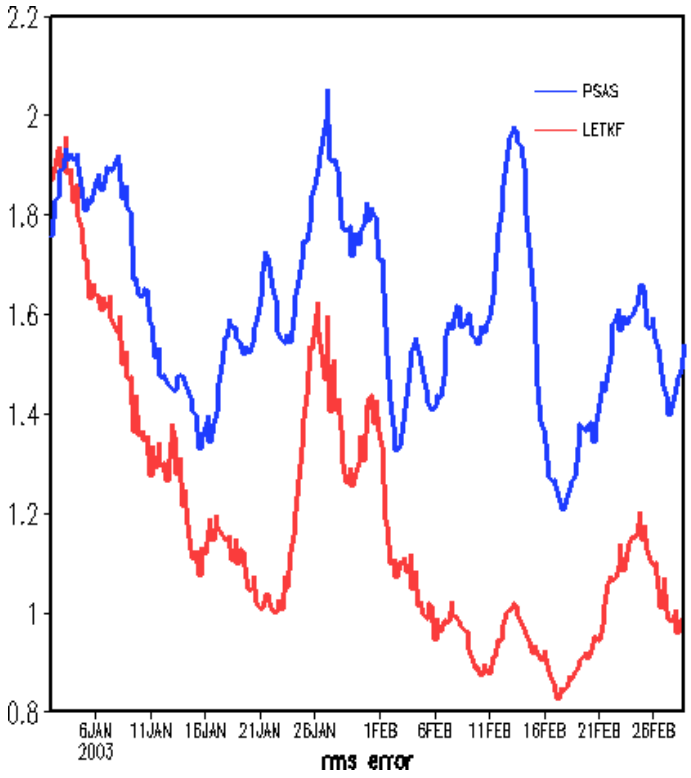


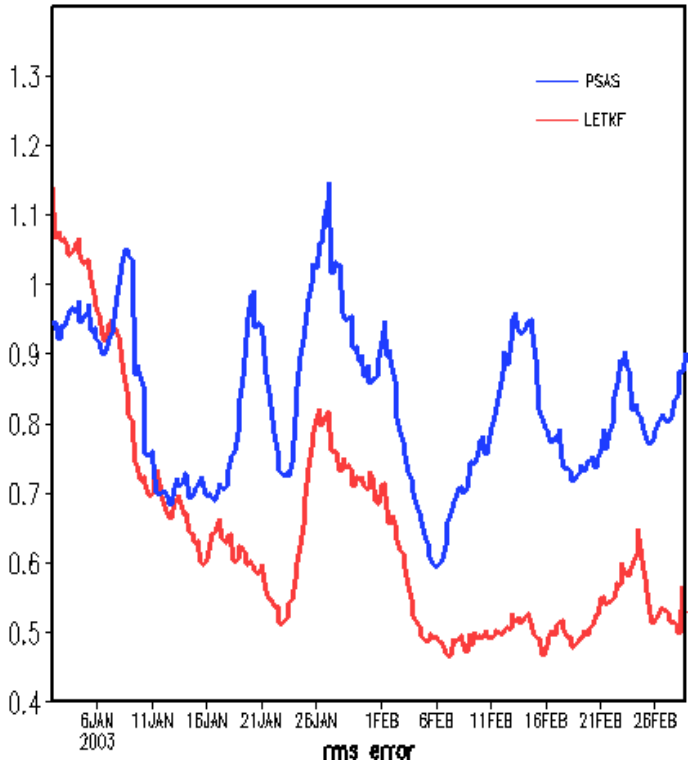
14 June 2007 1200UTC



Distribuição espacial dos dados de satélites utilizados para a assimilação operacional no CPTEC-INPE para o dia 14 de junho em 2005 (a) e em 2007 (b) as 12:00 UTC. Os pontos em preto e vermelho se referem aos perfis de geopotencial e valores do TPW do AIRS/AMSU, respectivamente, os pontos em azul se referem aos perfis do ATOVS, os valores do vento por satélites gerados na DSA são plotados em verde enquanto que os obtidos via GTS são plotados em amarelo. Os dados do QuikSCAT são plotados em laranja

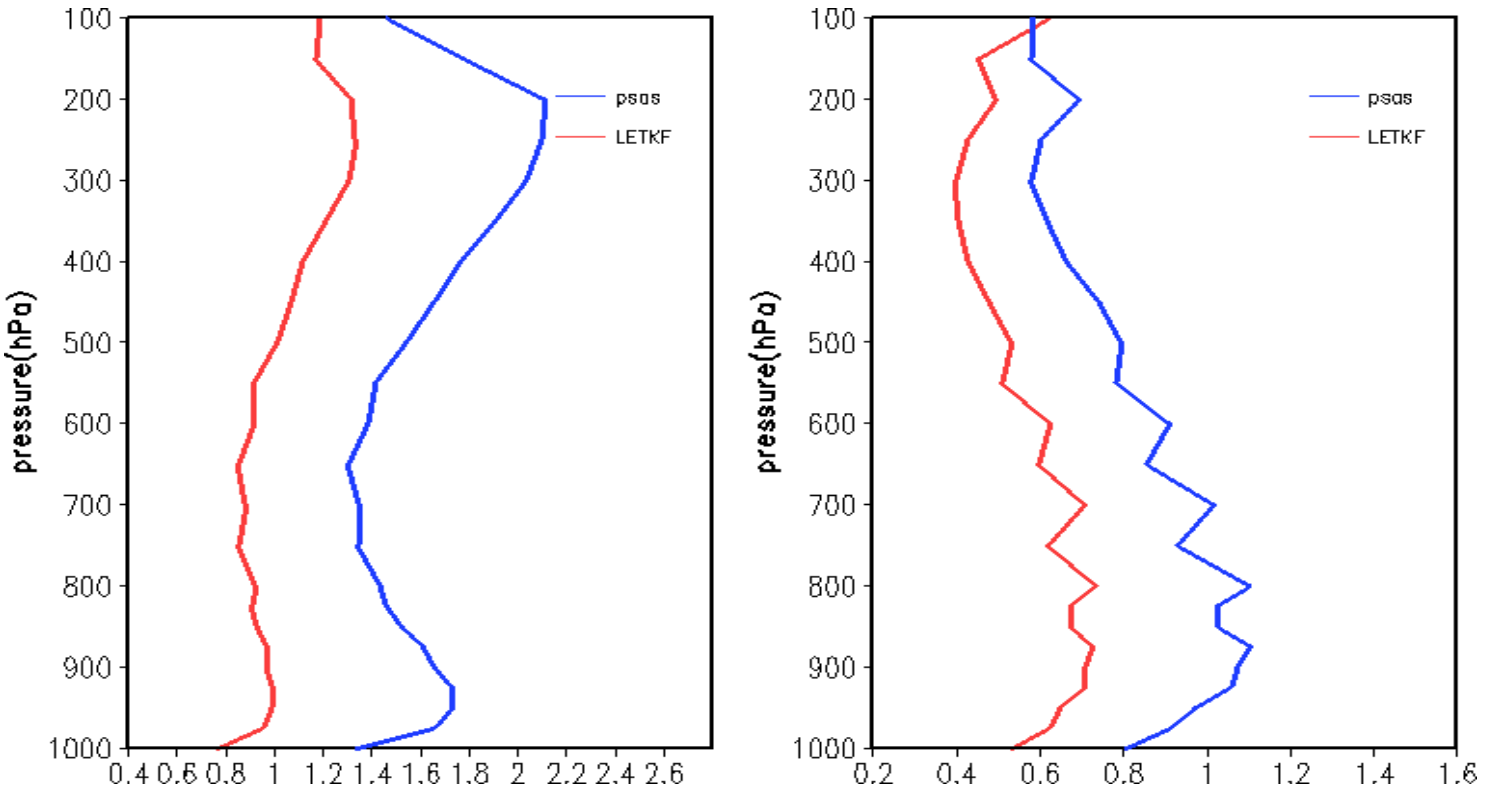
PSAS → LETKF





RMS em 500 hPa (média global) para o vento zonal (a) e para temperatura (b), para o período de janeiro/fevereiro de 2003

PSAS → LETKF



RMS em diferentes níveis na vertical (média global) para o vento zonal (a) e para temperatura (b), para o período de fevereiro de 2003

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