

The La Plata Basin Continental Scale Experiment – LPB-CSE.

Monitoring the Convection: The Remote Sensing Contribution

Luiz A. T. Machado

Satellite Division and Environmental Systems

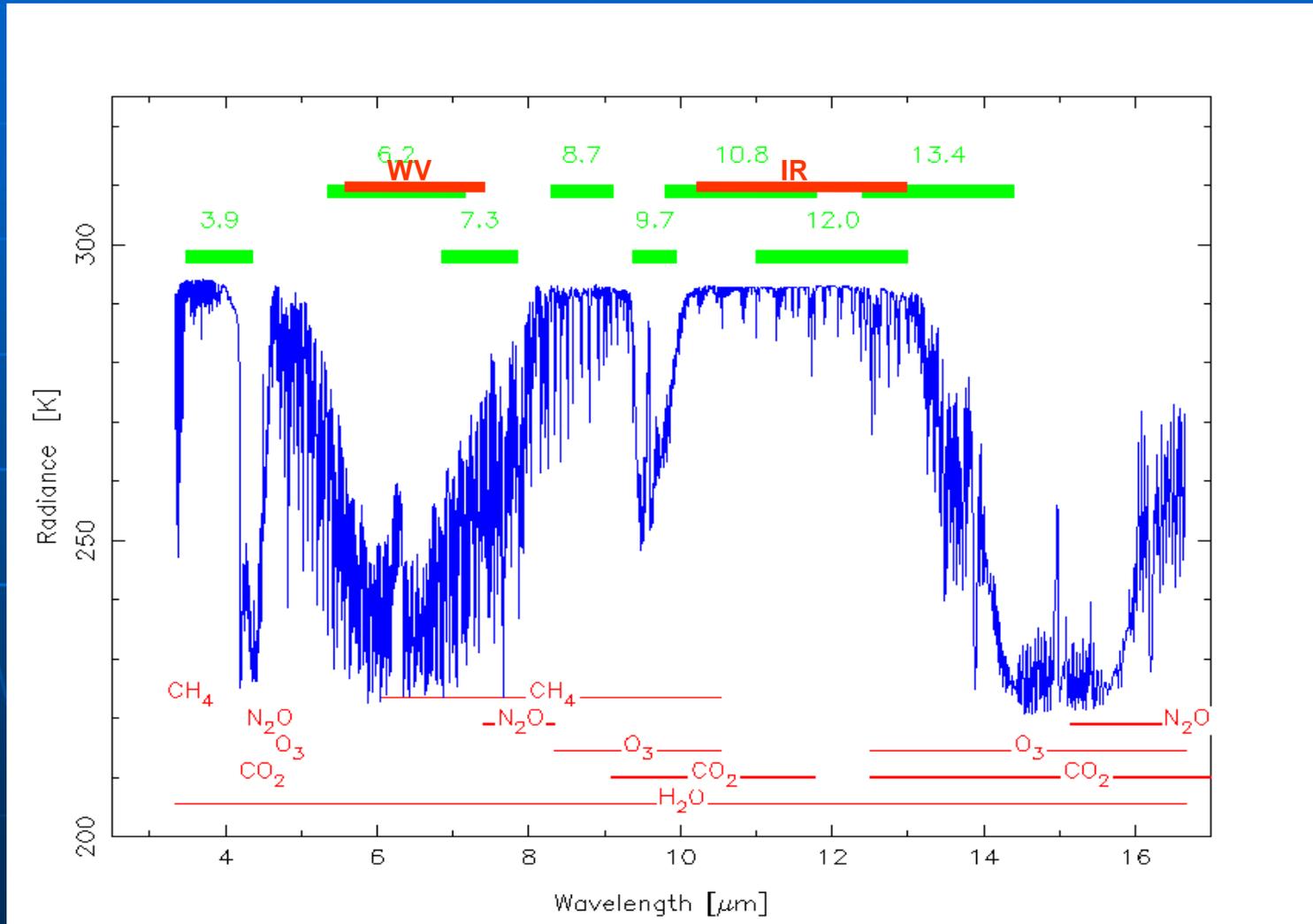
CPTEC/INPE

■ **First Meeting of the GEWEX/CLIVAR/VAMOS Steering Group.**

Outline

- The Satellite Images and Products and news perspectives.
- The Radar Network
- The Data Collect Platform and Lighting Data
- The Data Integration and the Use of A GIS.

News Satellites and Perspectives for South America Users in 2007



THE METEOSAT SECOND GENERATION

2004/03/27 16:12

CHO3 1.6

CHO2 0.8

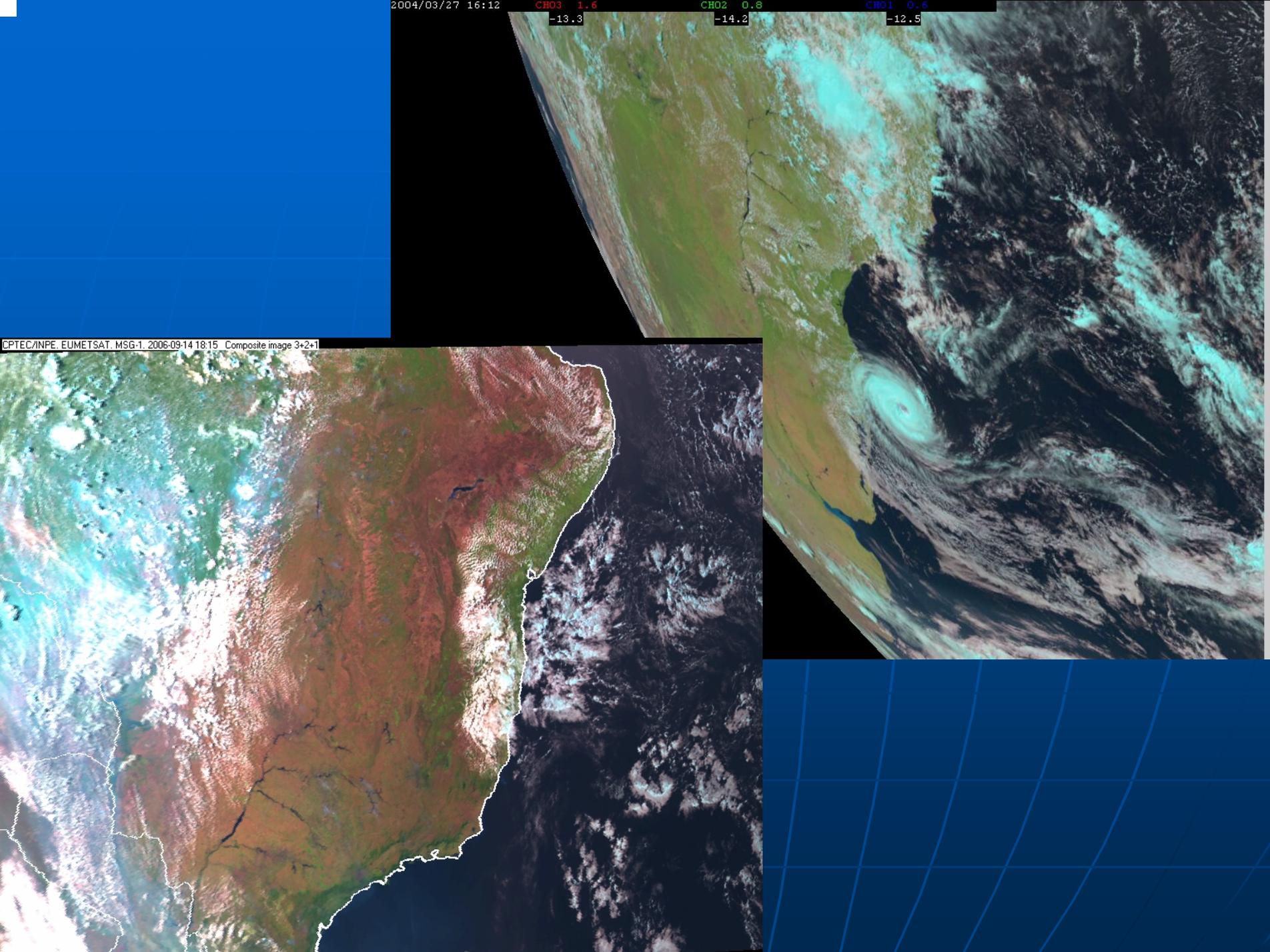
CHO1 0.6

-13.3

-14.2

-12.5

CPTEC/INPE, EUMETSAT, MSG-1, 2006-09-14 18:15 Composite image 3+2+1



GNSS (Global Navigation Satellite System) Receiver for Atmospheric Sounding

GRAS

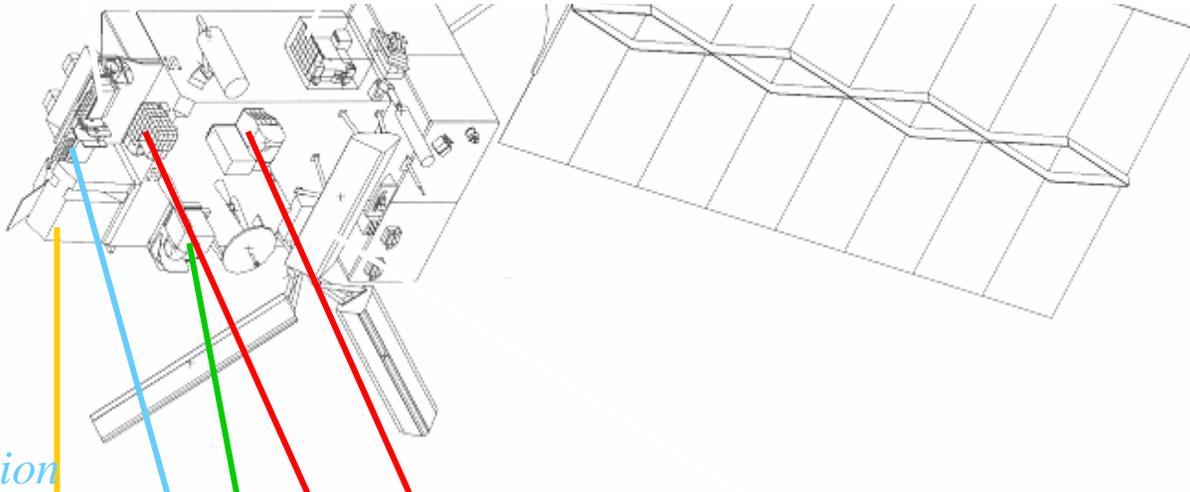
AVHRR

GOME

Global Ozone Monitoring Experiment-2

The METOP Satellite

To be launched in October – afternoon orbit



High Resolution Infra Red Radiation Sounder

HIRS

IASI

Infrared Atmospheric Sounding Interferometer

MHS

Microwave Humidity Sounder

AMSU-A1

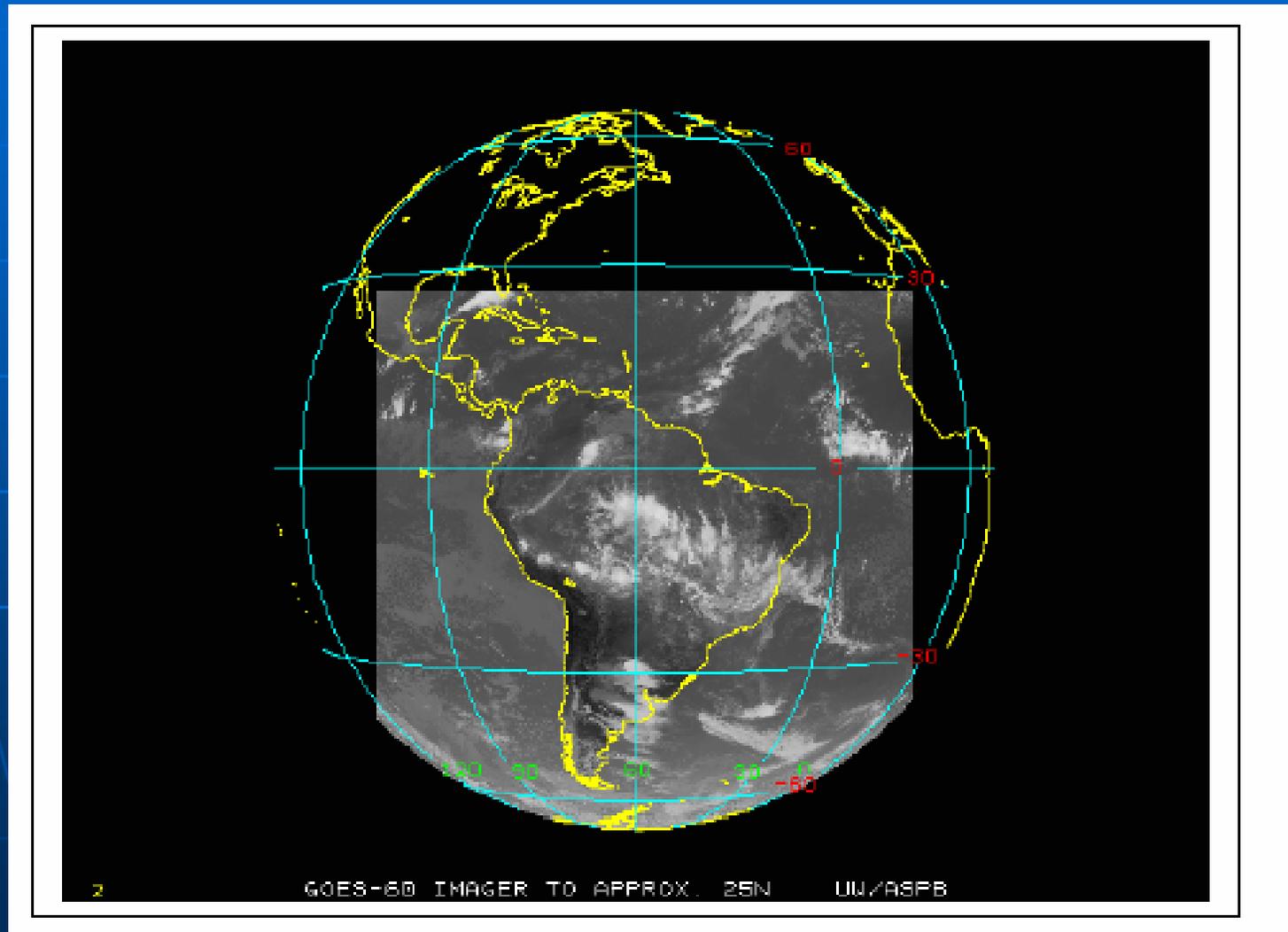
AMSU-A2

Advanced Microwave Sounding Unit - A

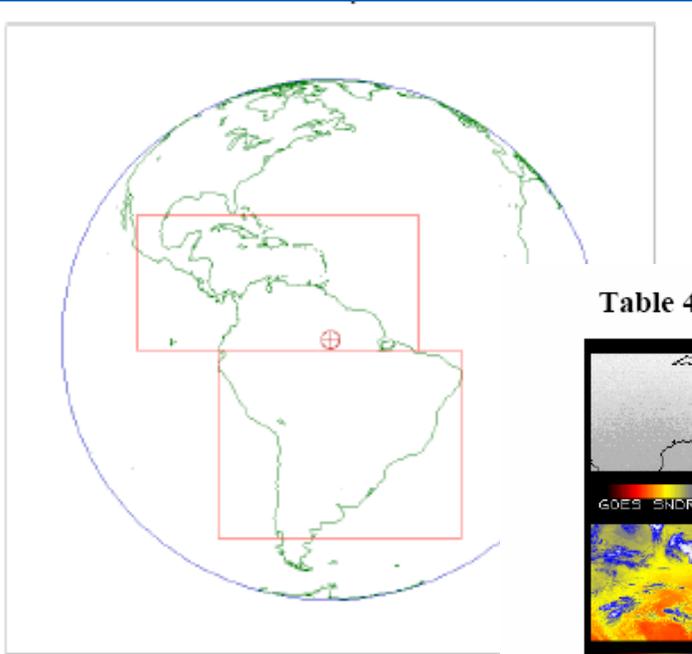
ASCAT

Advanced Wind Scatterometer

The GOES-10 - Image each 15 minutes

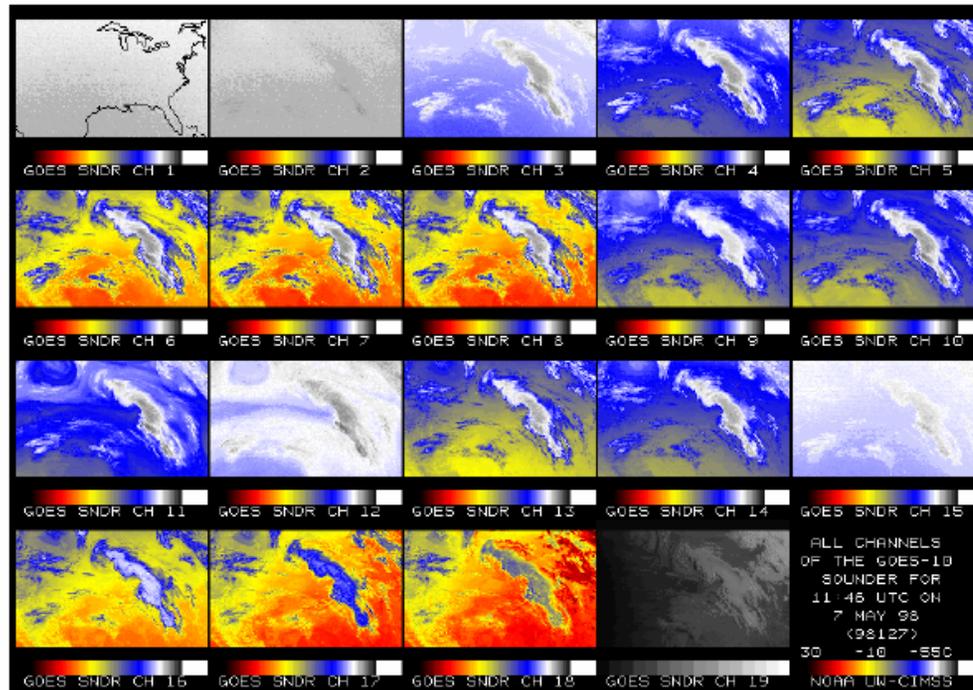


Sounding each two hours



North Scan Coordinates:

Table 4: Early GOES-10 Sounder multi-band image



Band Number	Central Wavelength (micron)
1	14.7
2	14.4
3	14.0
4	13.7
5	13.4
6	12.7
7	12.0
8	11.0
9	9.7
10	7.5
11	7.0
12	6.5
13	4.6
14	4.5
15	4.4
16	4.1
17	4.0
18	3.8
19	0.6

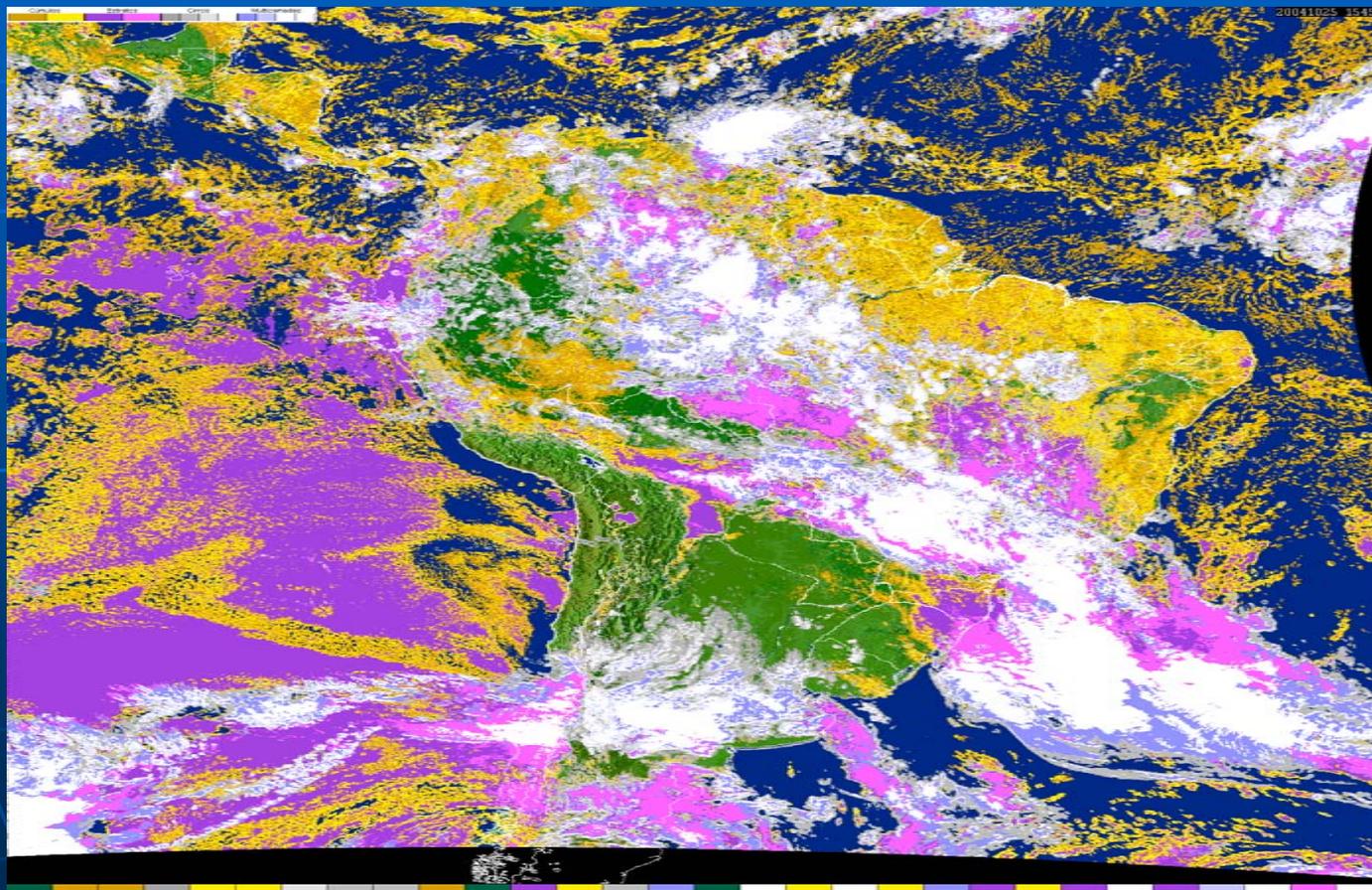
ALL CHANNELS
OF THE GOES-10
SOUNDER FOR
11:46 UTC ON
7 MAY 98
(98127)
30 -10 -550
NOAA UW-CIASS



Classificação de Nuvens

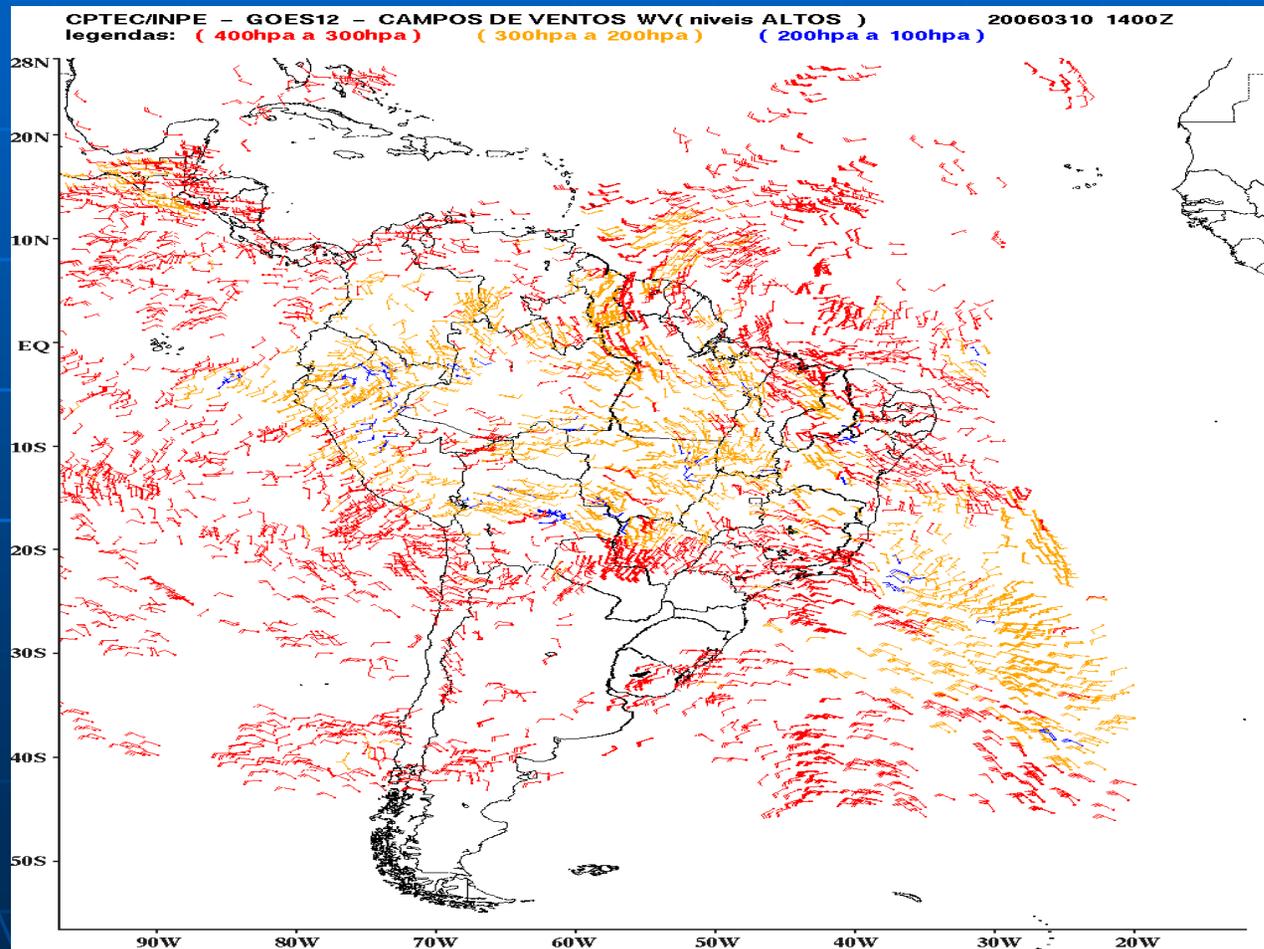


CLOUD CLASSIFICATION – GOES – Cloud Types



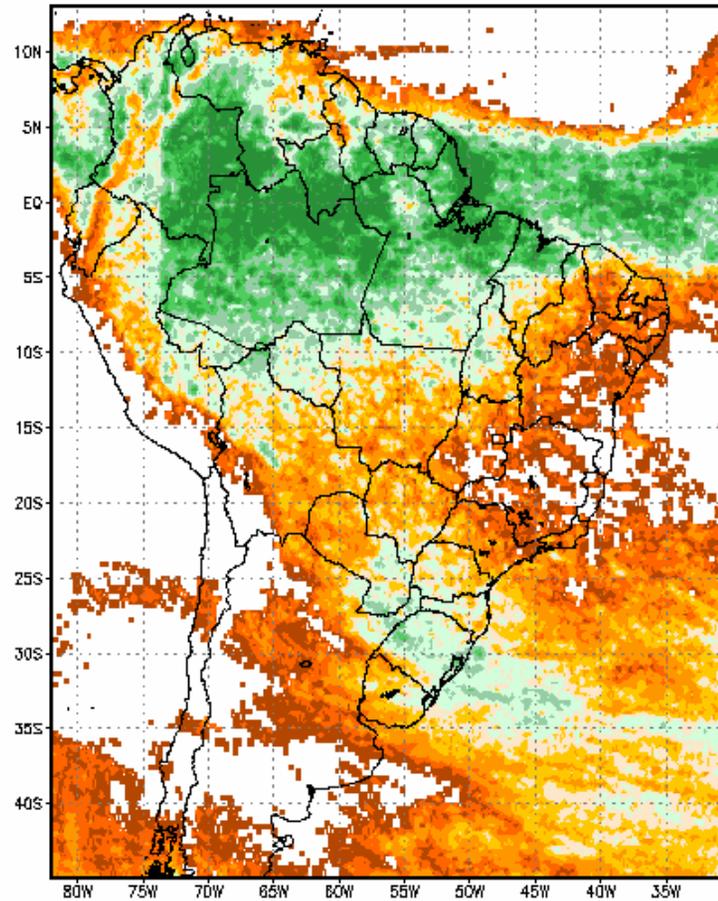
Cloud Drift Winds – IR, WV, 3,9 and Visible Channels

Will be improved by 15 minutes image – High Space and Time Resolution Data

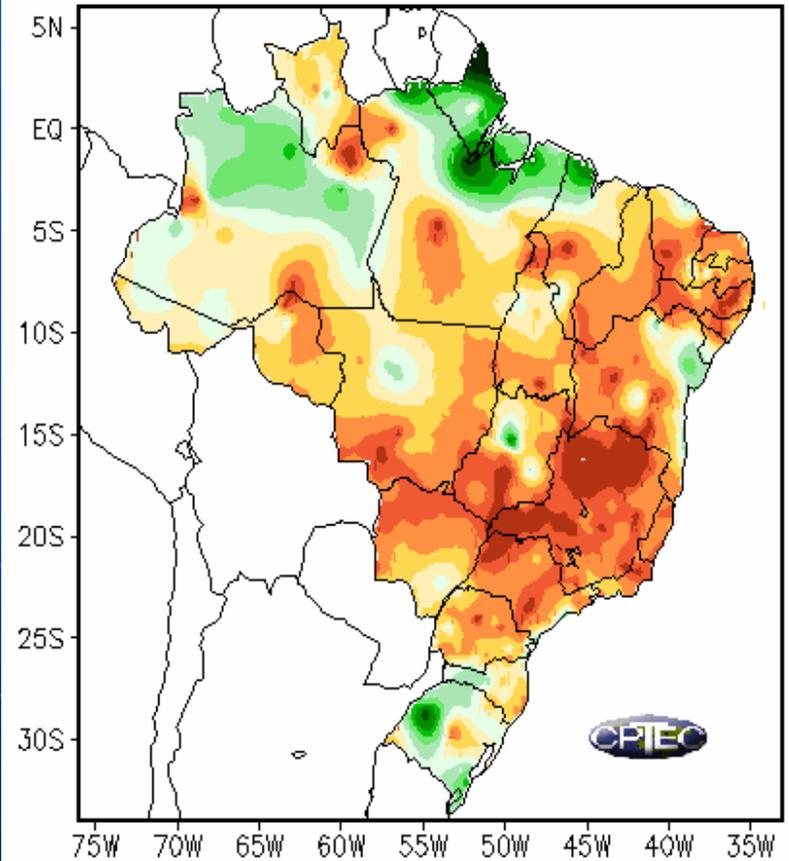


Precipitation from the Hydroestimator

Precipitacao Acumulada - APR/2005

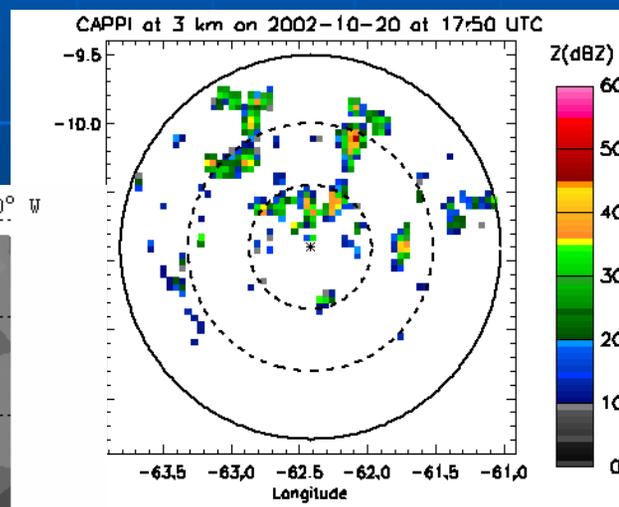
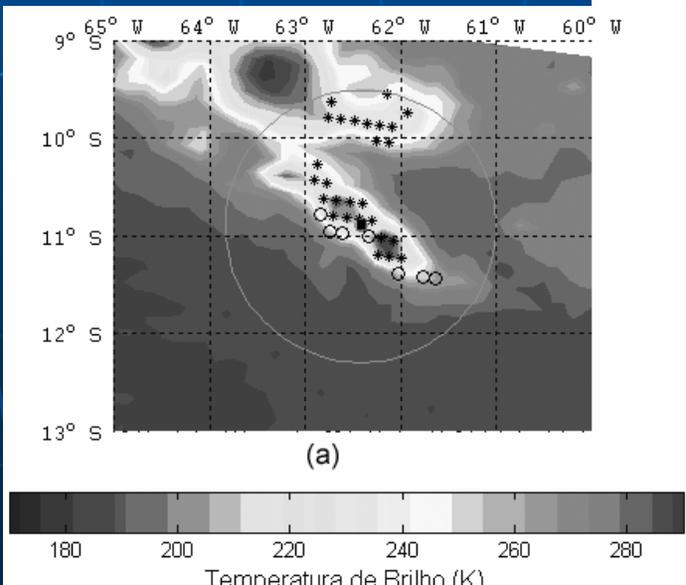
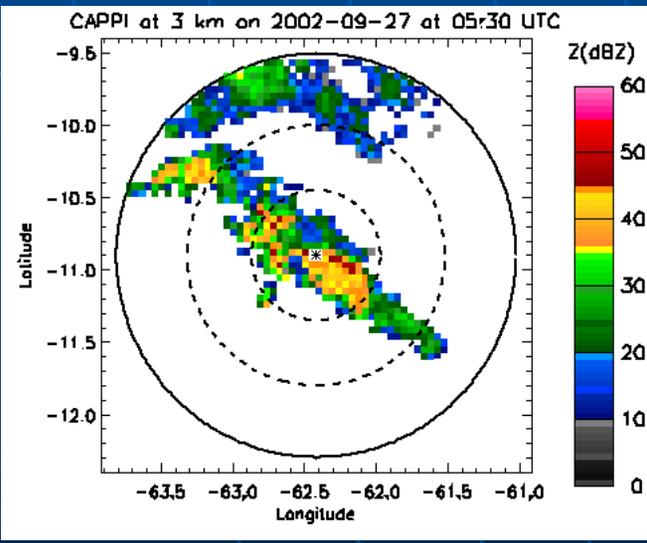
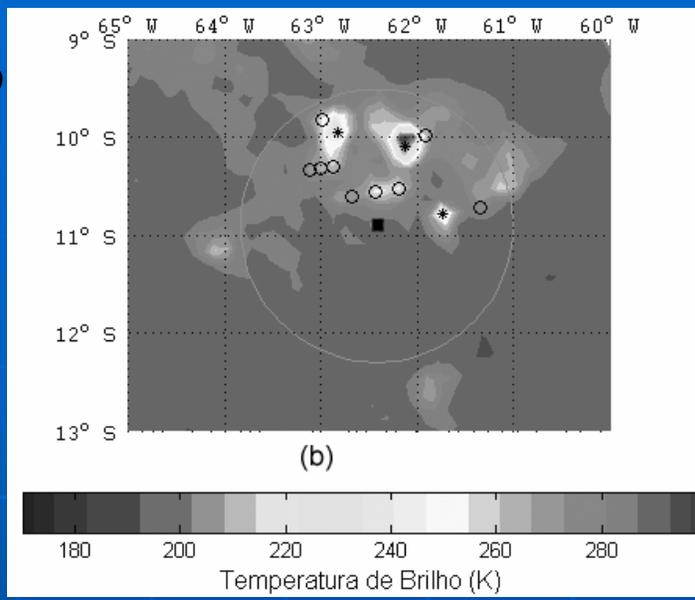
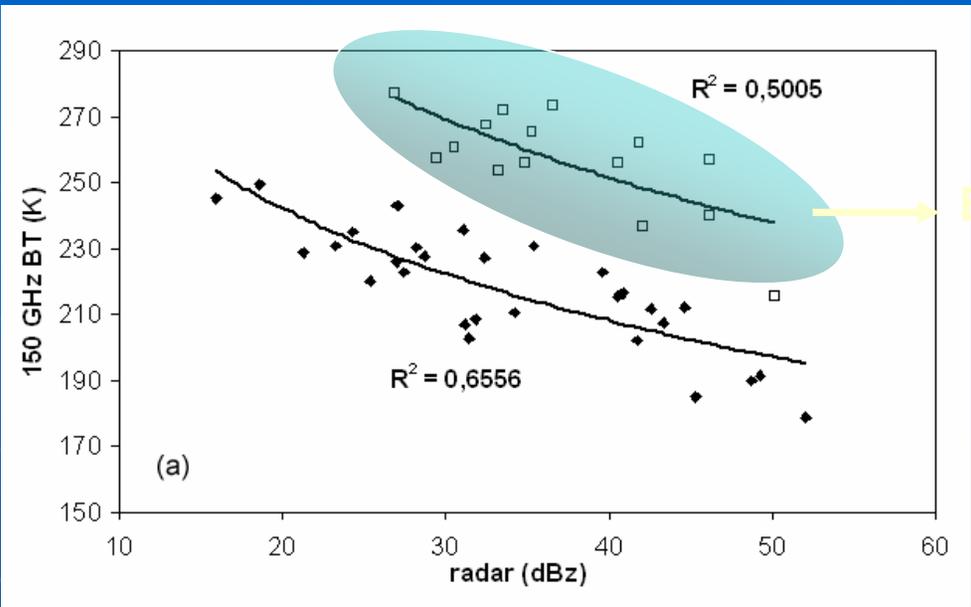


Precipitacao Acumulada em Abril (mm)
01 a 30/04/2005



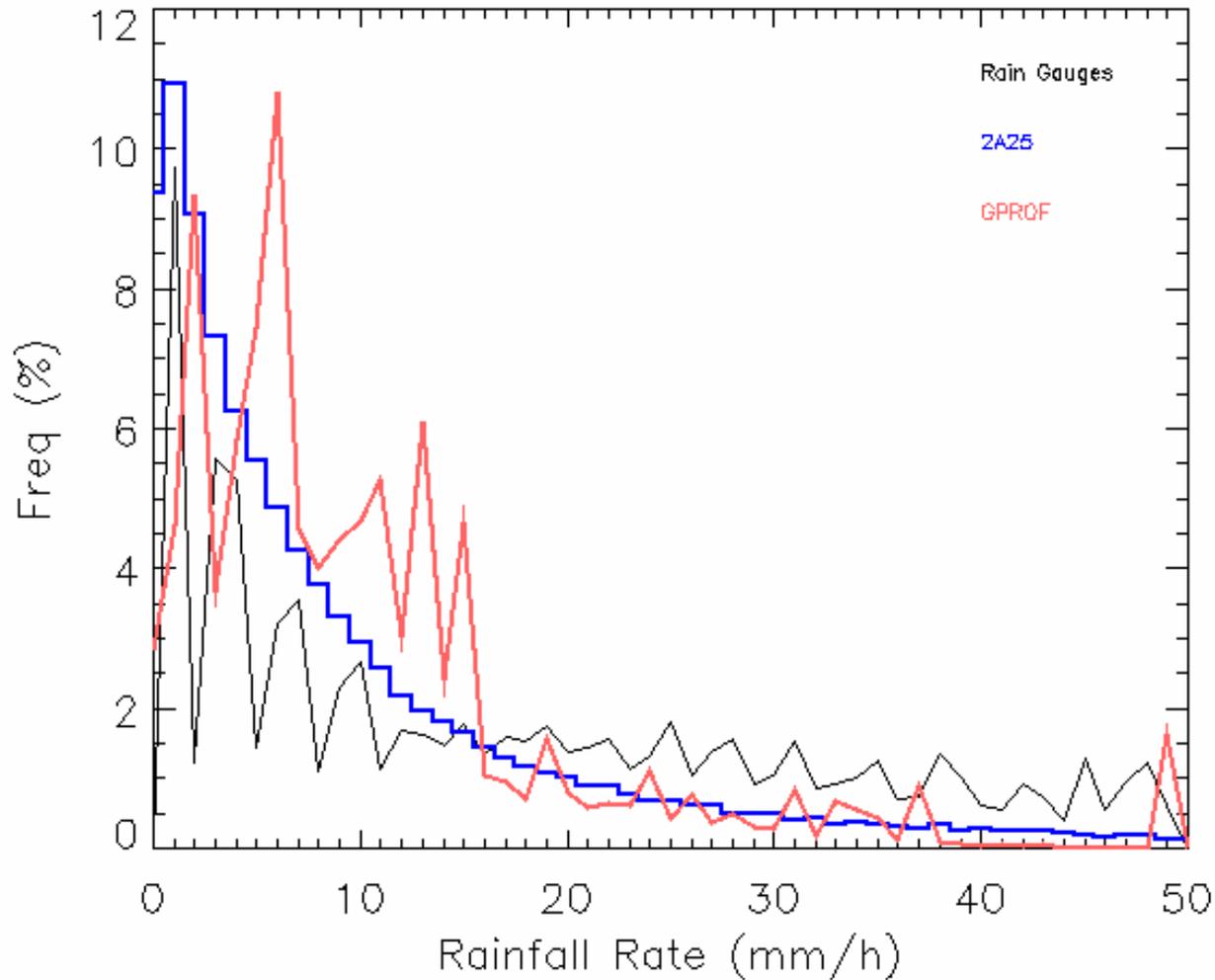
Fontes de dados: CPTec/INPE INMET FUNCEME/CE LMRS/PB ELDER/GO
EMPARN/RN DMRH/PE FUNCEME/CE DHME/PI CEPES/SE NMRH/AL COMET/RJ
SRH/BA CEMIG-SIMGE/MG SEAG/ES SIMEPAR/PR CLIMERH/SC

150 GHz on HSB



GPROF X PR X Rain Gauges

4 months of data over the Amazon Region



Rain Gauges

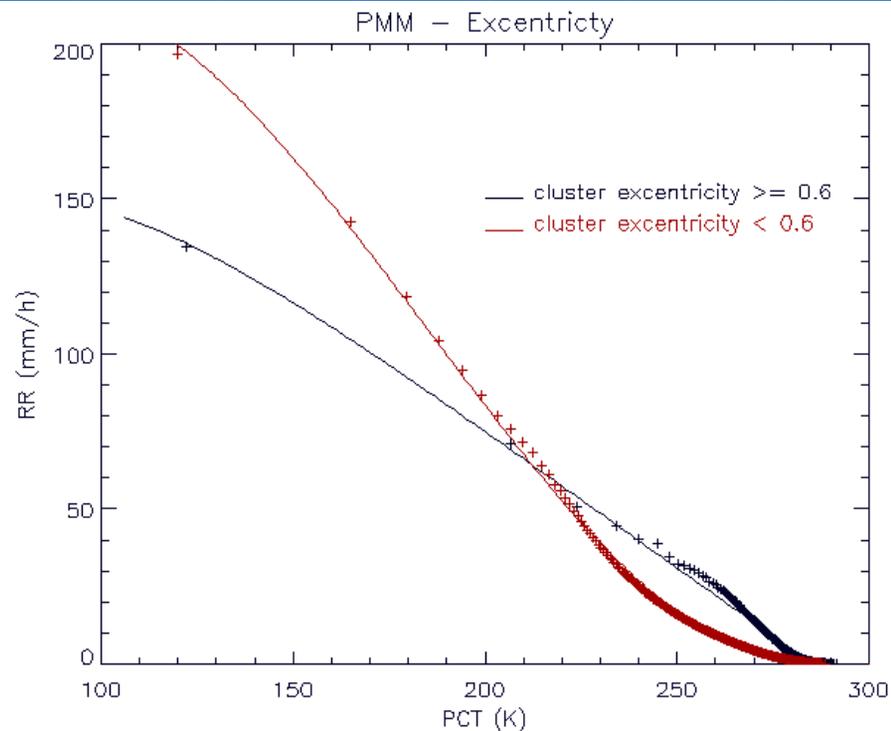
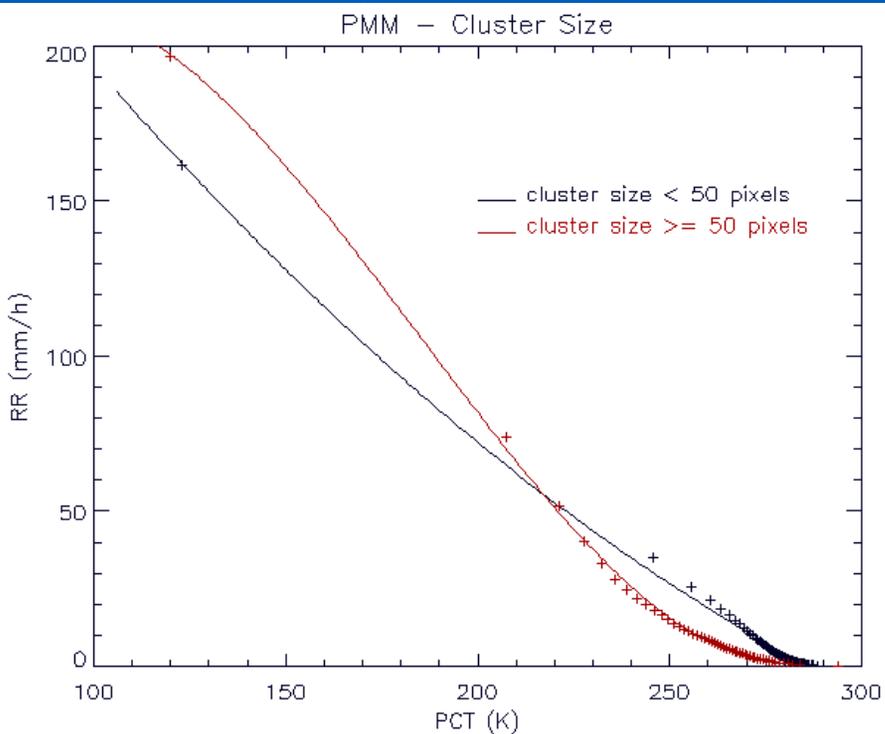
PR-2A25

GPROF-2A12-V6

C. Morales (USP)

Differences of Tb Polarization (85 GHz) x R relationships for precipitation systems size

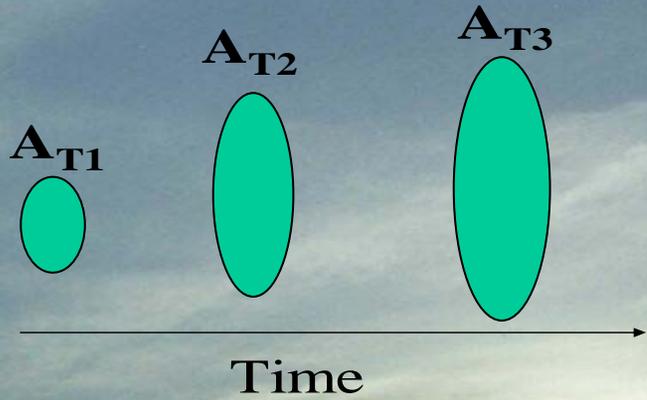
Synoptic and Mesoscale System Classification



Biscaro (CPTEC) and. Morales (USP)

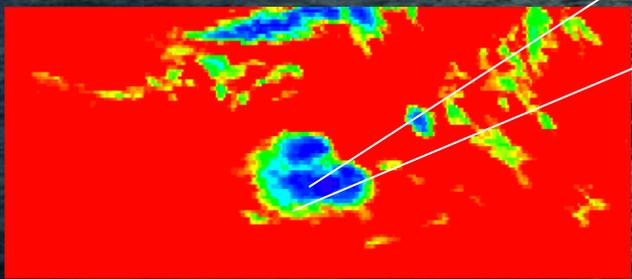
FORTRACC

Forecasting and Tracking of Cloud Clusters



A diagram of a cyan oval representing a cloud cluster. Four arrows point outwards from the oval, representing a vector field. Below the diagram is the equation for the area expansion rate:

$$AE = \frac{1}{A} \frac{\partial A}{\partial t} = \vec{\nabla} \cdot \vec{v}$$

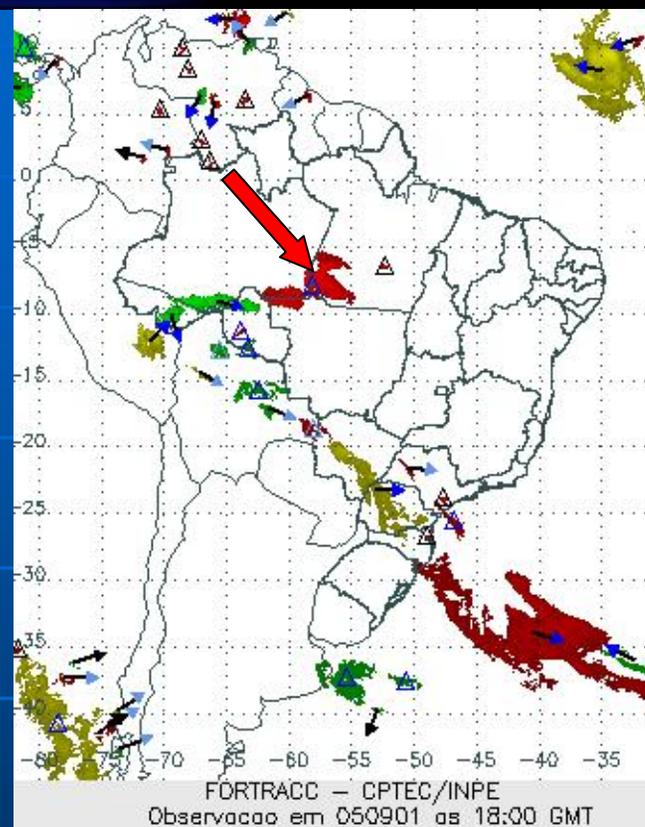
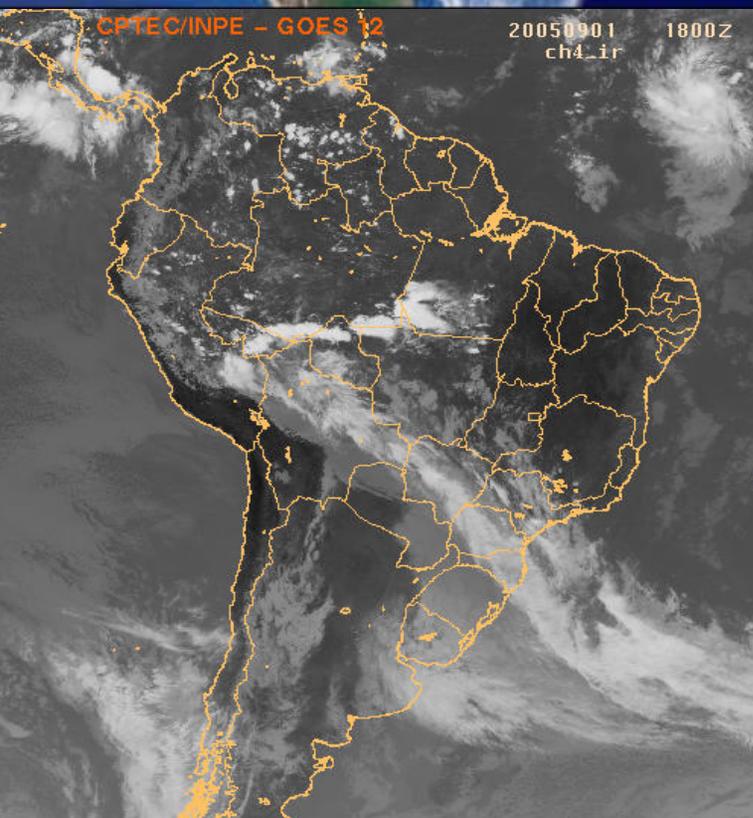




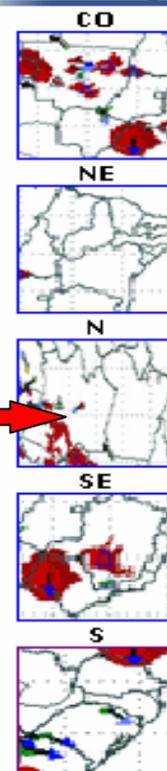
<http://moara.cptec.inpe.br/>

Fortracc

Previsão a Curto Prazo e Evolução dos Sistemas Convectivos



Selecione a região



Brightness Temperature $\leq 235K$

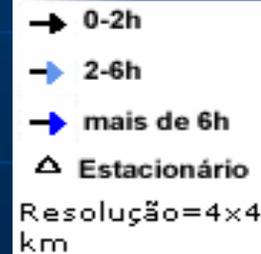
Minimum are = 150 pixels

dataset: GOES - 12 Channel 4

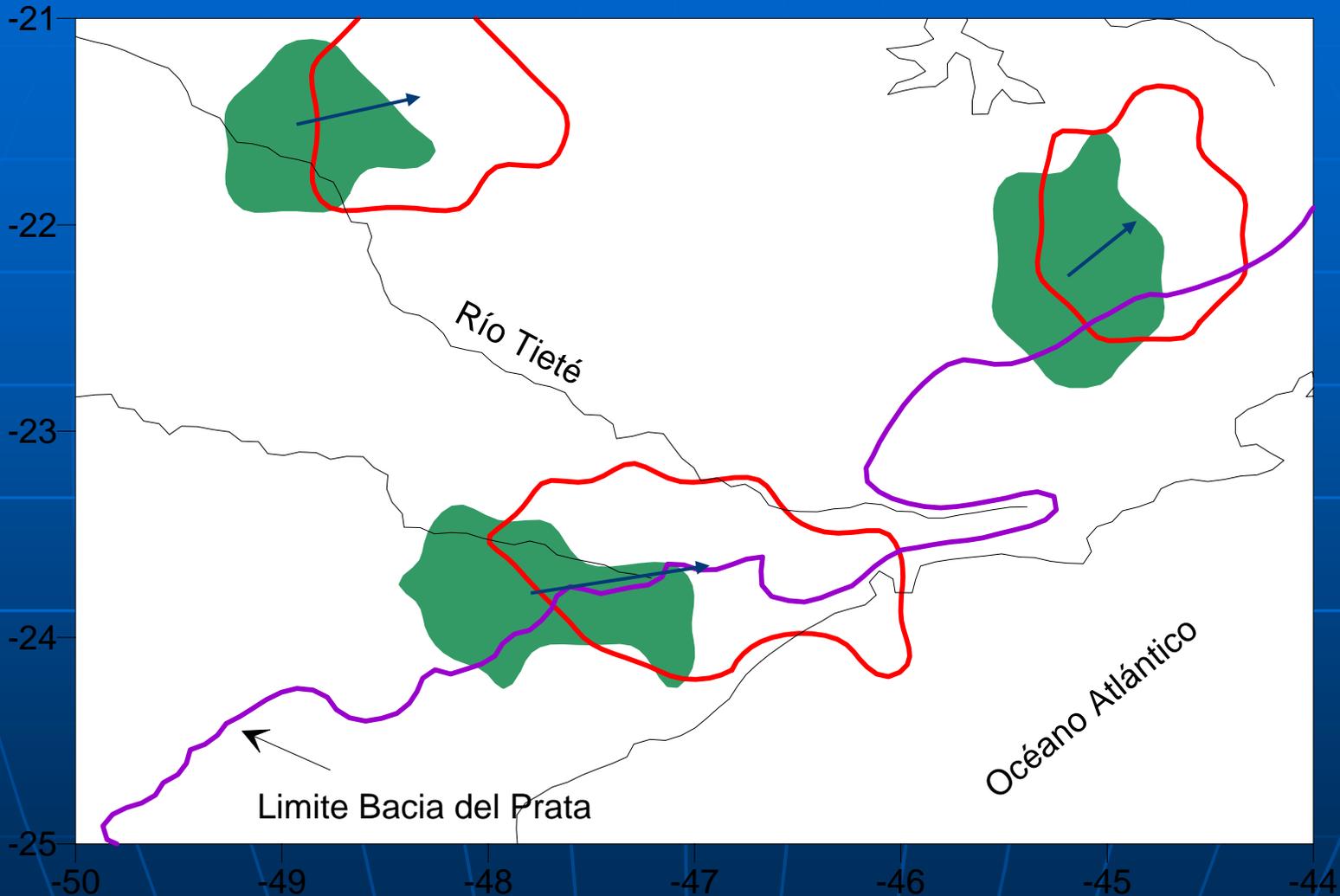
Fases do Ciclo de Vida do Sistema



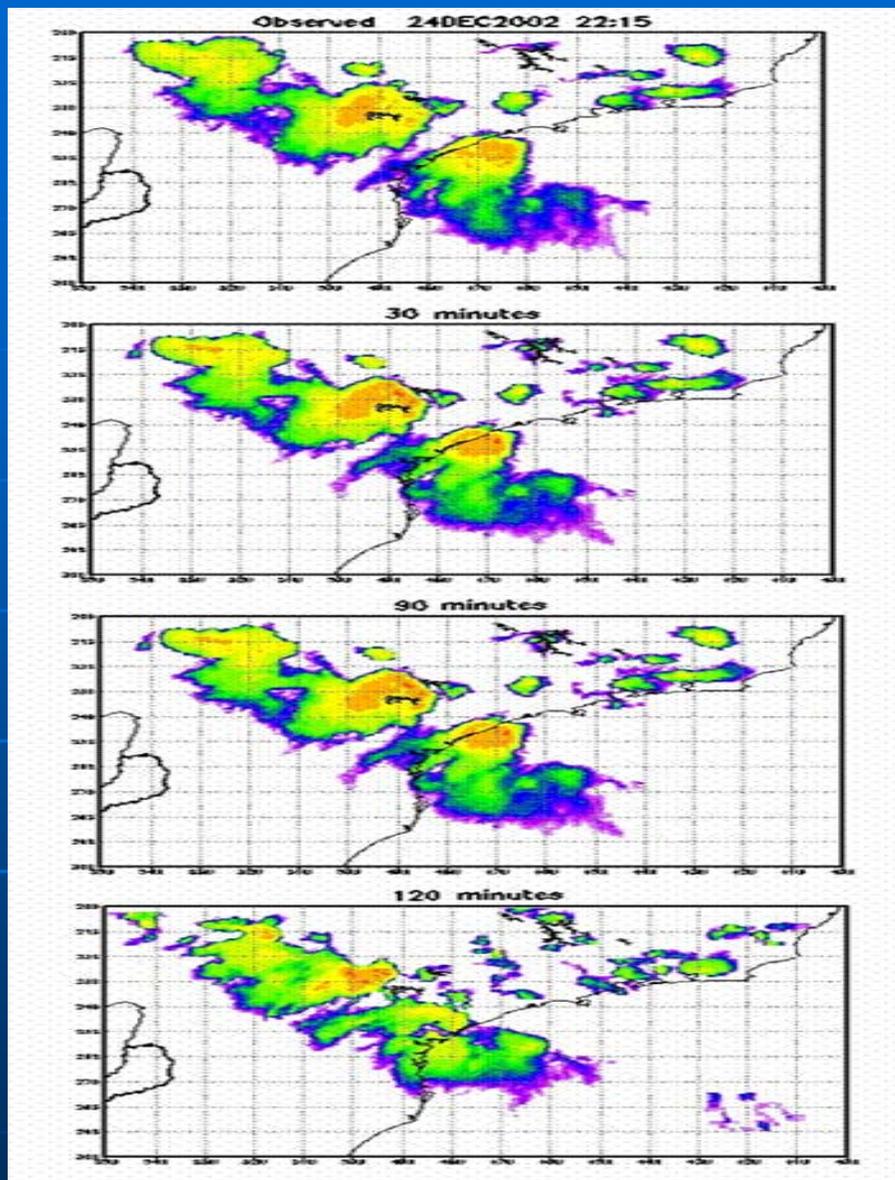
Duração prevista



Convective Systems



Nowcasting



Observed
24th December 2002 – 22:45 UTC

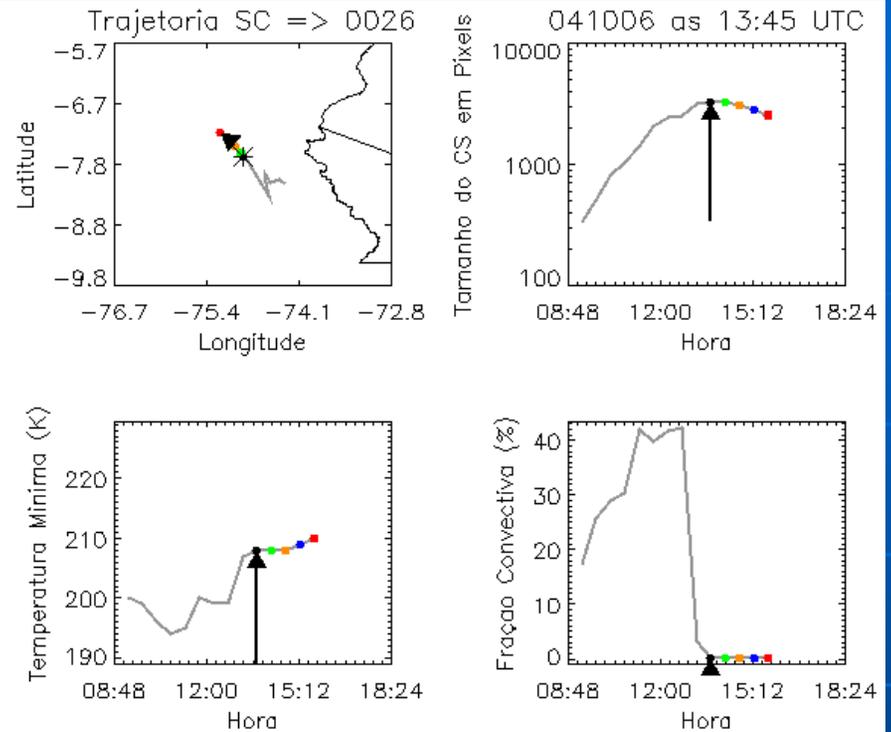
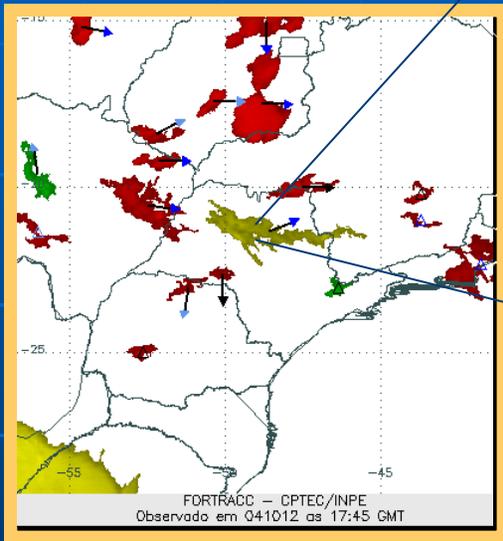
30 minutes – Forecast
initiated on 24th December 2002 – 22:15

90 minutes – Forecast
initiated on 24th December 2002 – 21:15

120 minutes – Forecast
initiated on 24th December 2002 – 20:45

**Validation process for 24th December 2002 – 22:45 UTC.
Image 1: observed image subset of southeastern Brazil;**

Nowcasting and Life History

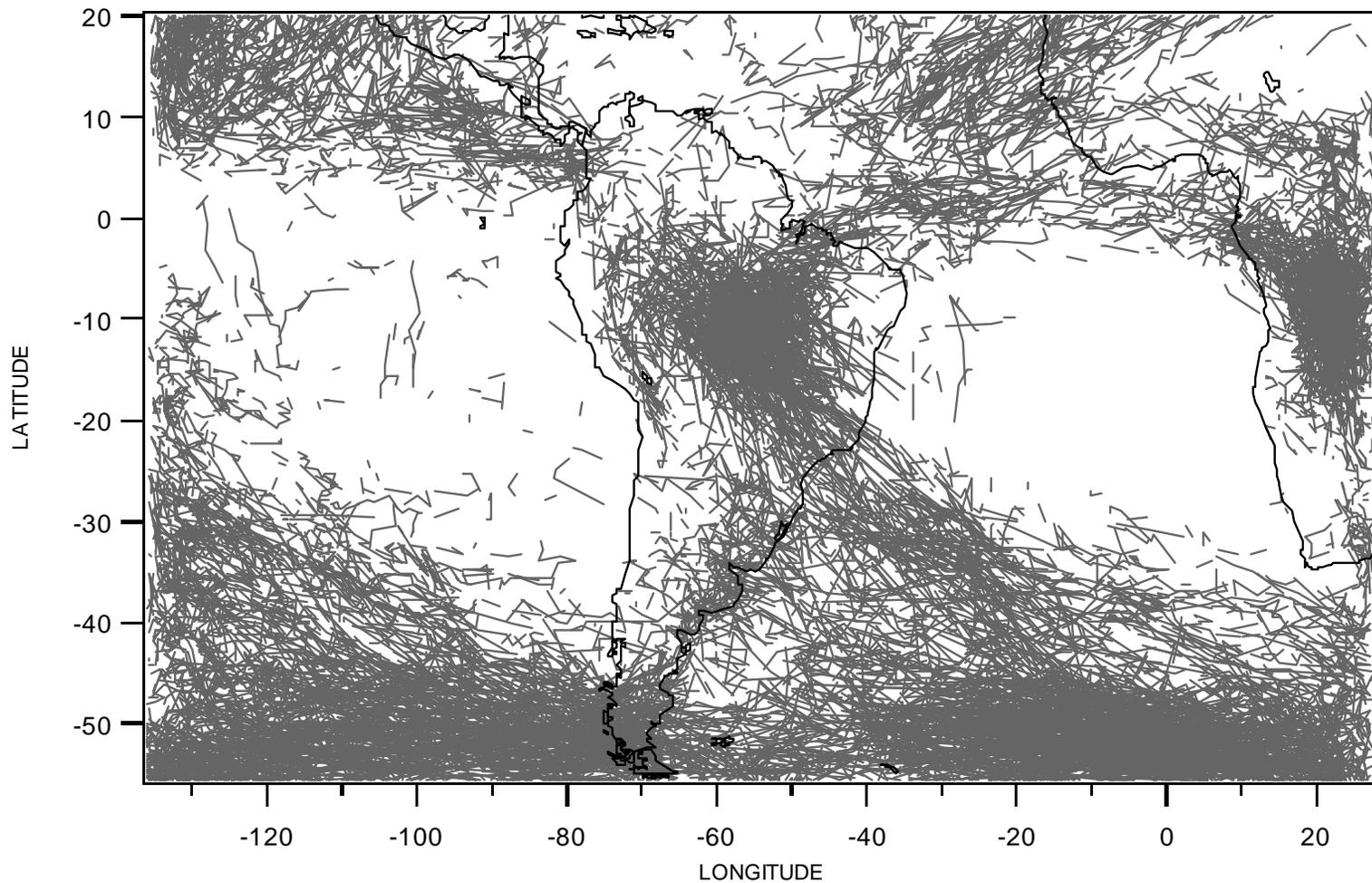


- LAST IMAGE
- ½ hour
- 1 hour
- 1½ hour
- 2 hours

Life Cycle Description – MCS Climatology

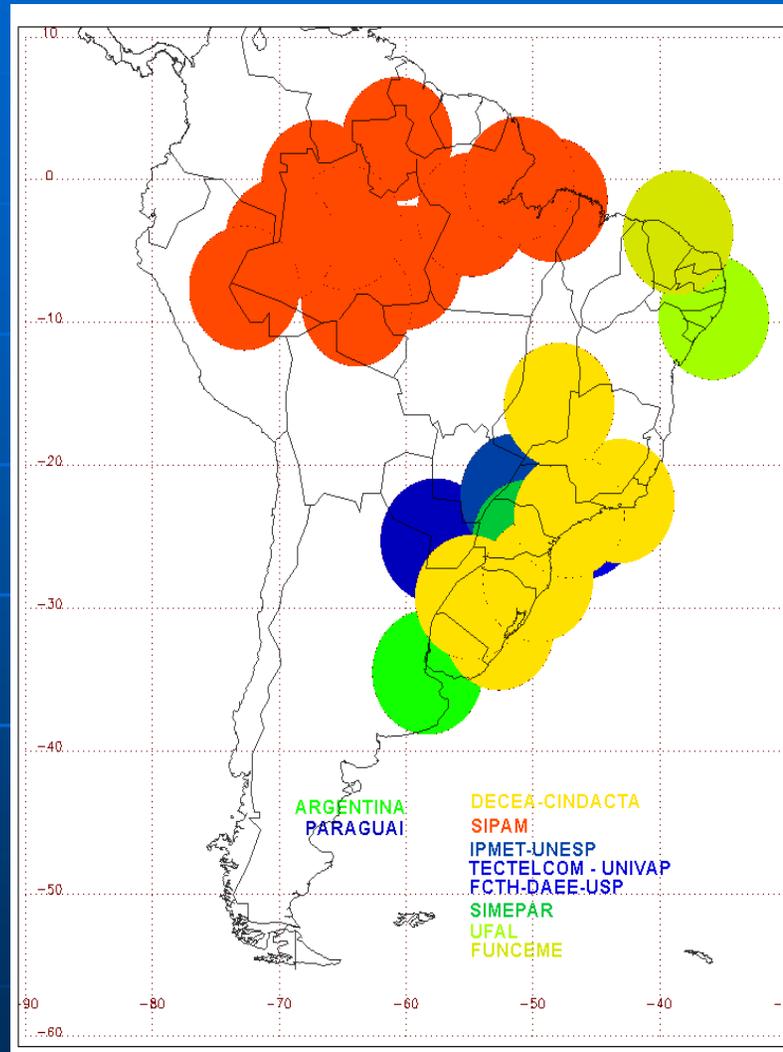
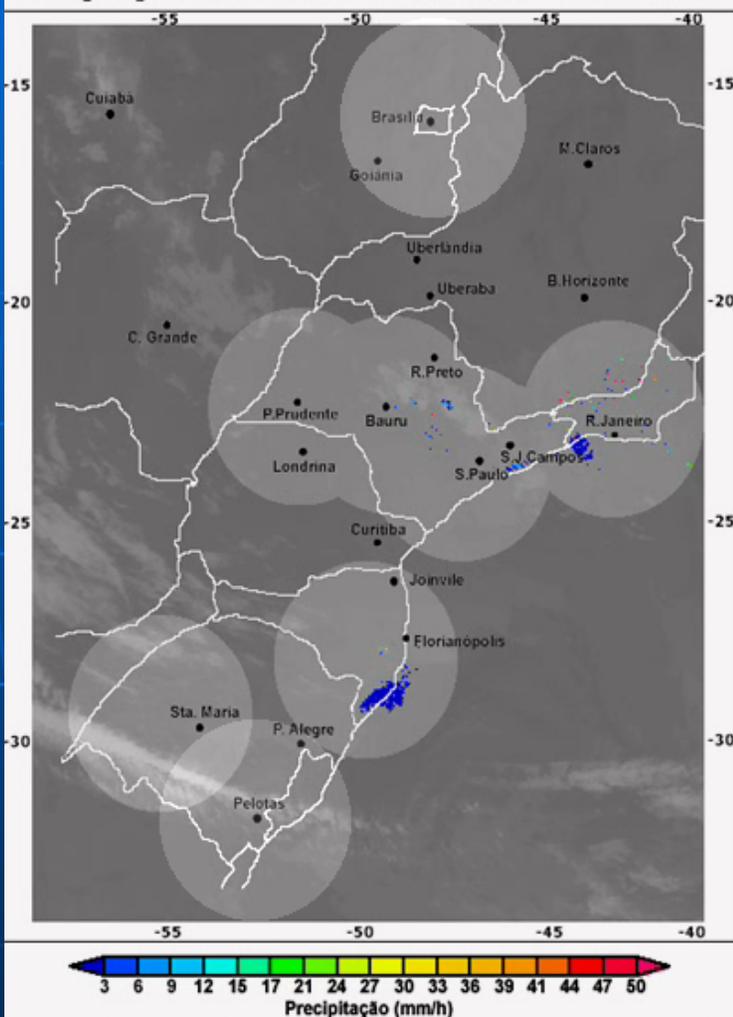
Southern South America MCS Atlas

TRACKING OF CLOUD ORGANIZATION IN SYNOPTIC SCALE - 1984 to 1990 JAN-FEB



The Radar Network

Precipitação Instantânea - 2005/10/10 07:00 GMT

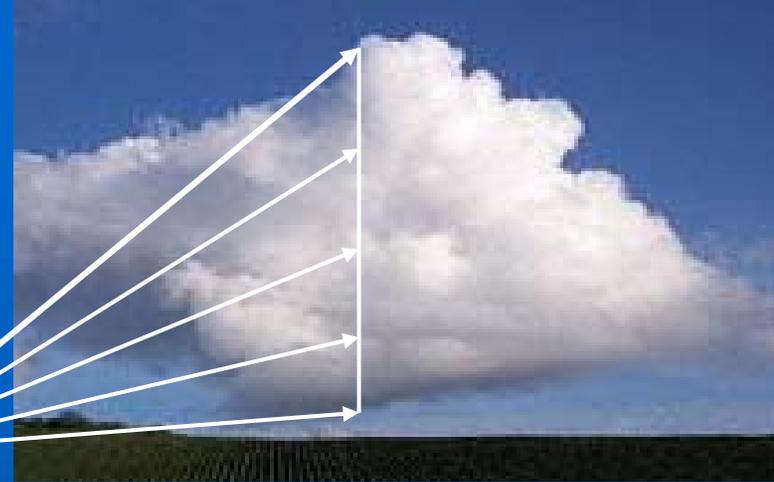
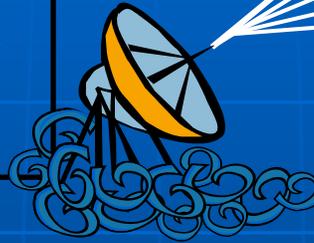


Manual Operation

MCA 105-XX

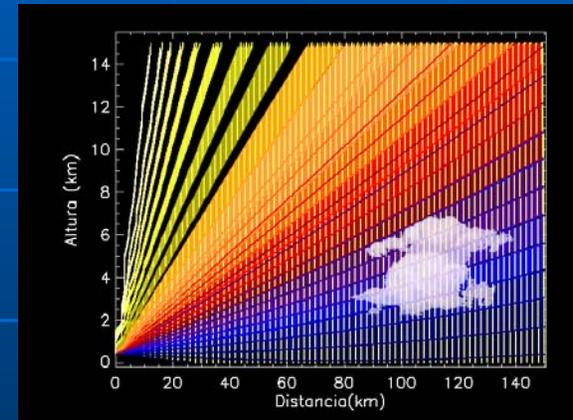
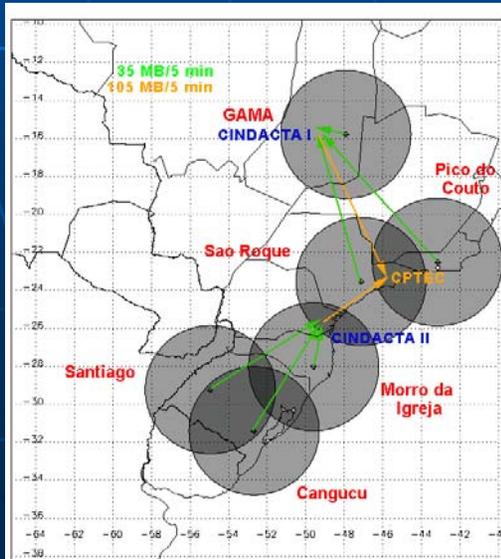
• **MANUAL DE PROCEDIMENTOS OPERACIONAIS DO RADAR METEOROLÓGICO 2006**

• Estratégias de varredura para Radares Meteorológicos

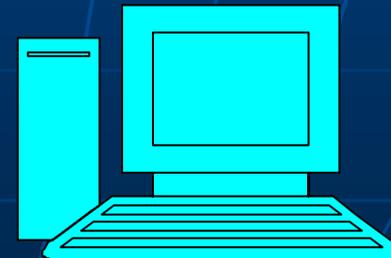


3D vol scan strategy

Data Transmission

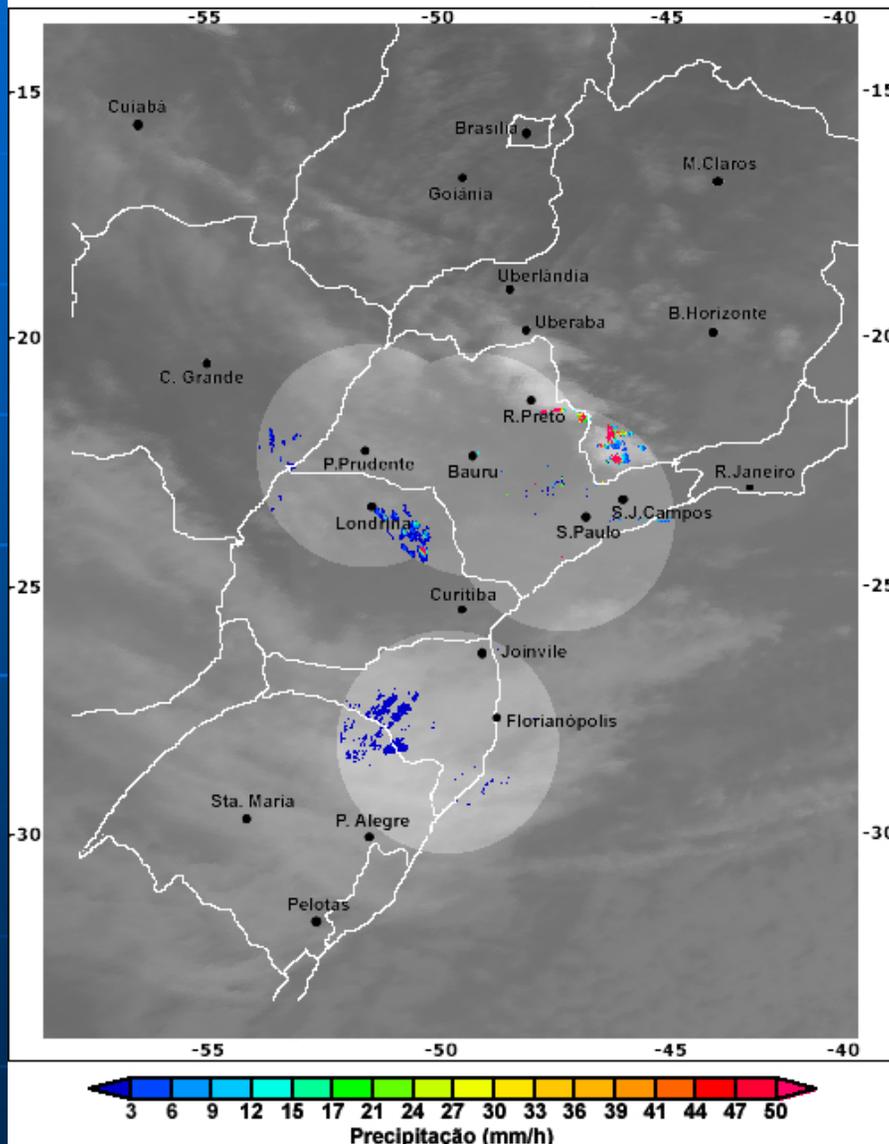


Data Recording and store



Radar Integration - I

Precipitação Instantânea - 2005/09/17 18:00 GMT



Scientific collaboration between INPE, USP, INMET, DEMET, IPMet/UNESP, TECSAT/UNIVAP allowed the integration of 9 weather radars.

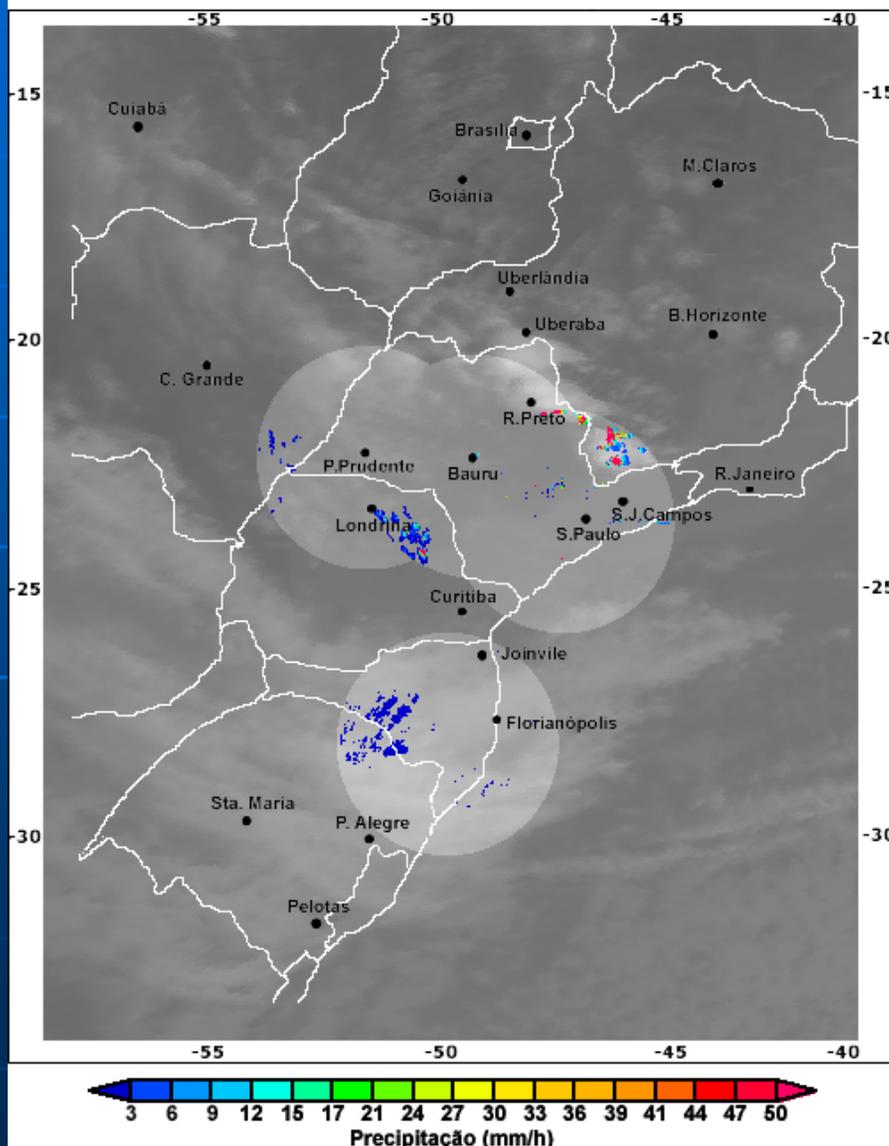
- 1) Volumetric 240 km data are stored, every 15 minutes;
- 2) CAPPIS are transmitted to CPTEC to produce rainfall mosaics;
- 3) Rain gauges are stored at CPTEC

Second Stage

- 4) Volumetric data will be transmitted to a database;
- 5) Radar re-processing;
- 6) Development of rainfall products;

Radar Integration - II

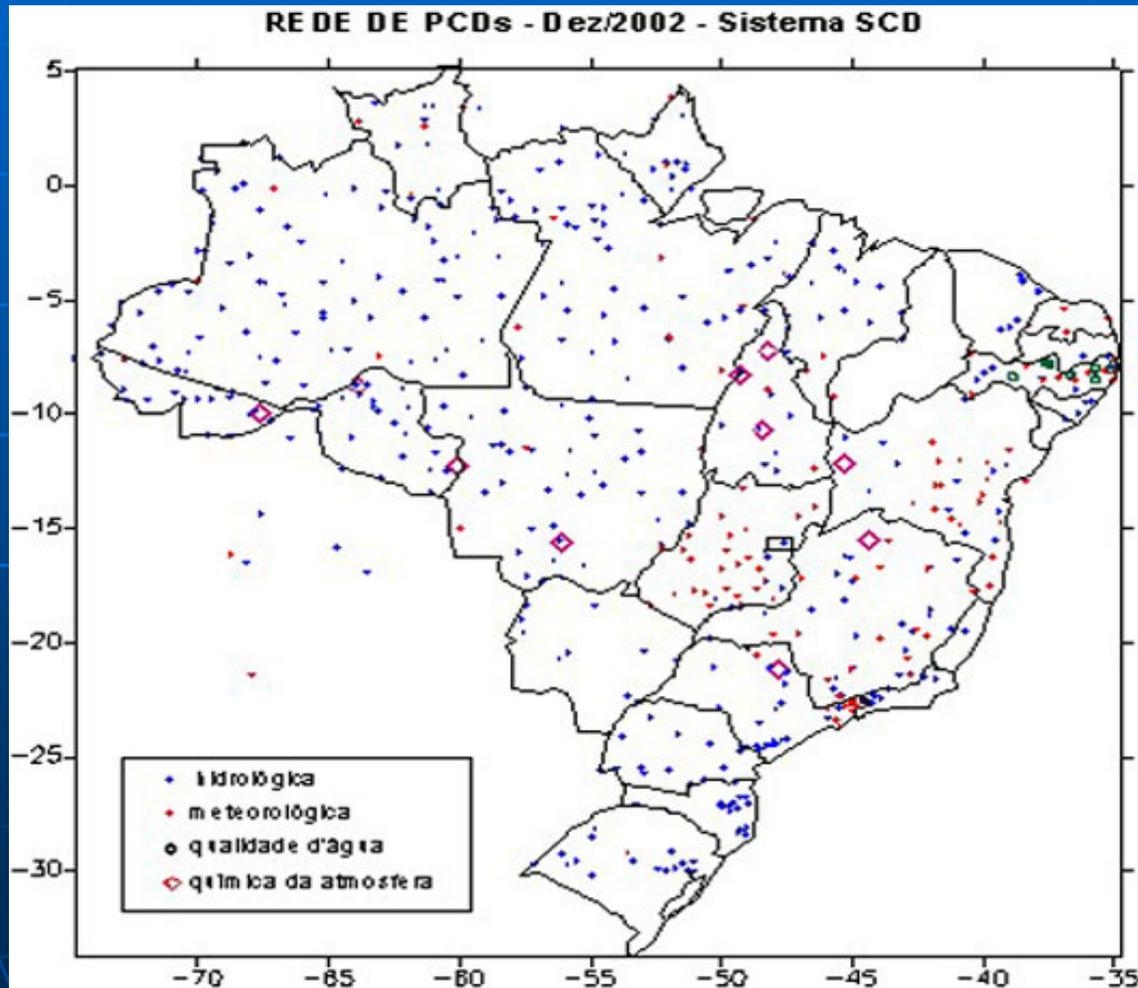
Precipitação Instantânea - 2005/09/17 18:00 GMT

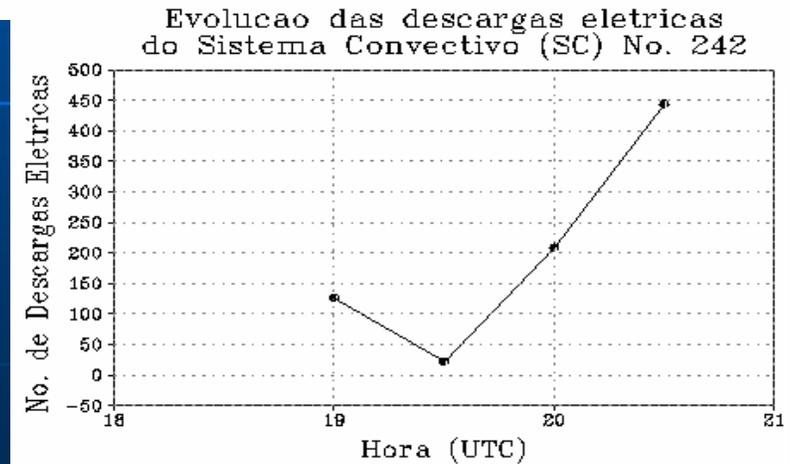
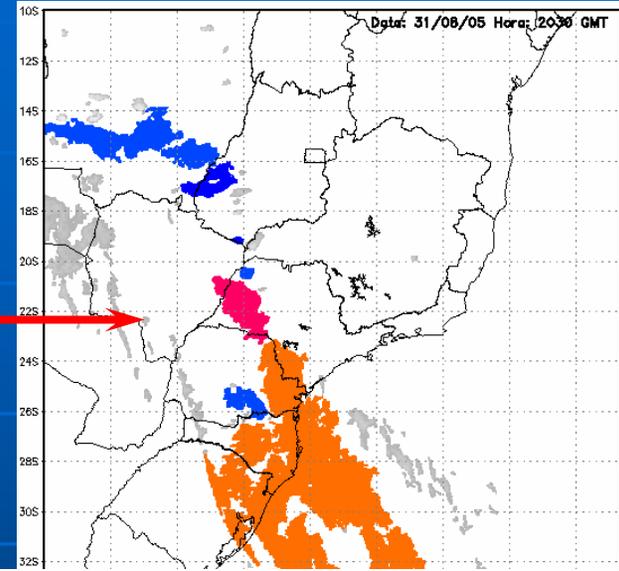
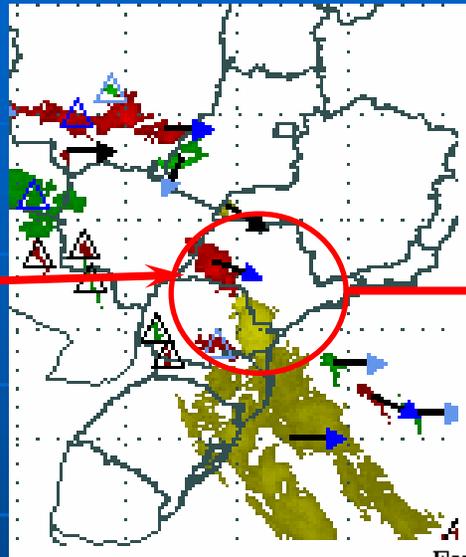
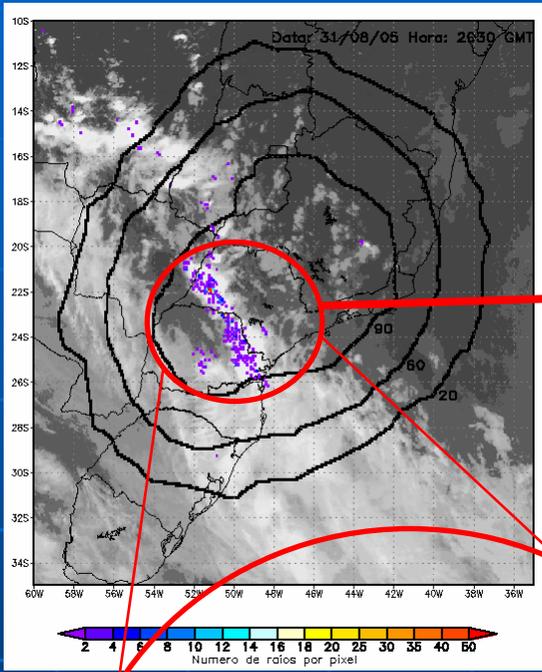


Third Stage

- 7) Other radar institutes are being invited to integrate the network;
- 8) Volumetric data will also be stored in the main database;
- 9) Hourly adjusted rainfall fields:
Radar + gauges + satellite rainfall estimation

Automatic weather stations transmitted to CPTEC-INPE





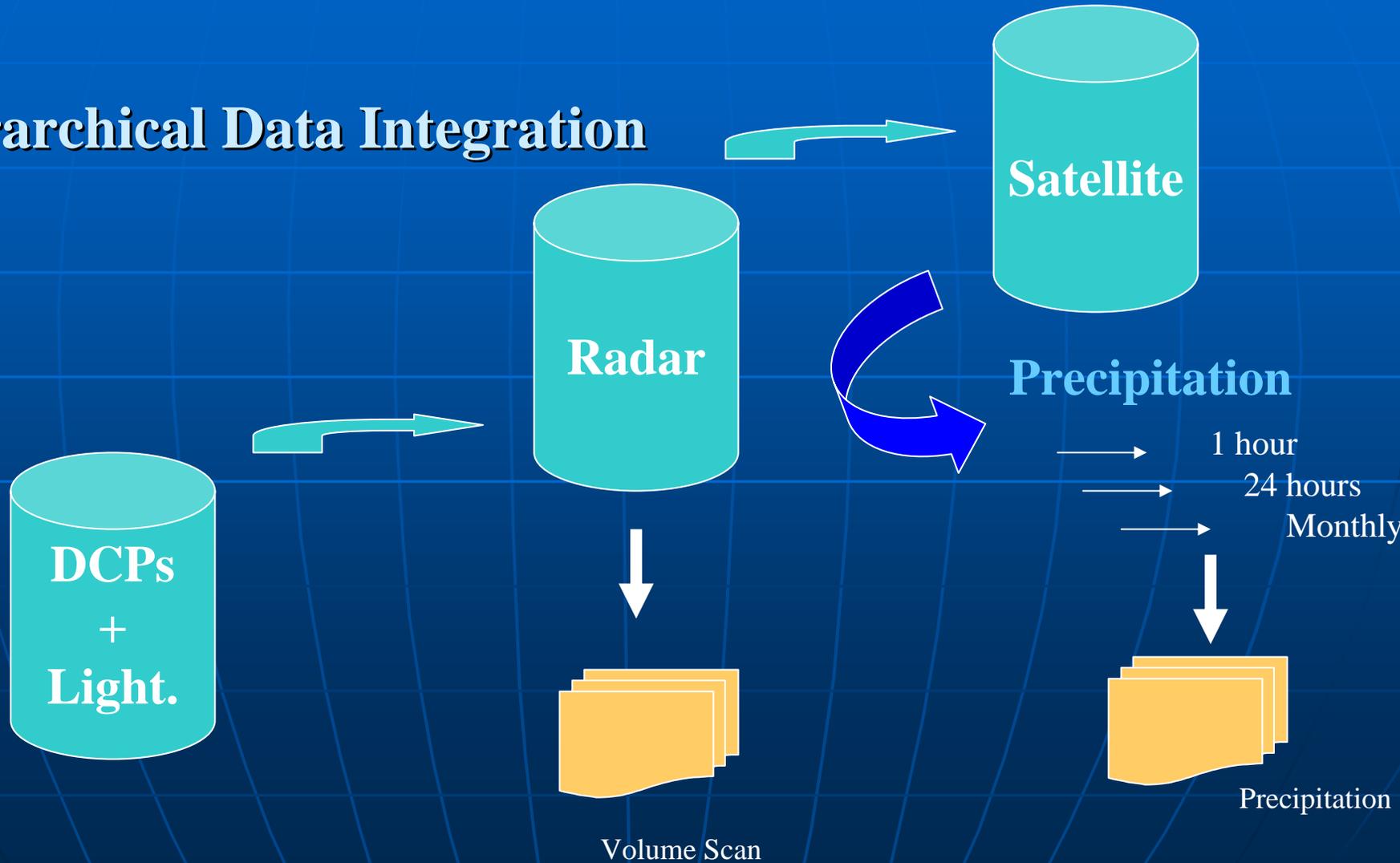
Lightning Detection –
RINDAT

MCS – Lightning Evolution

PERSPECTIVES

DATA INTEGRATION

Hierarchical Data Integration



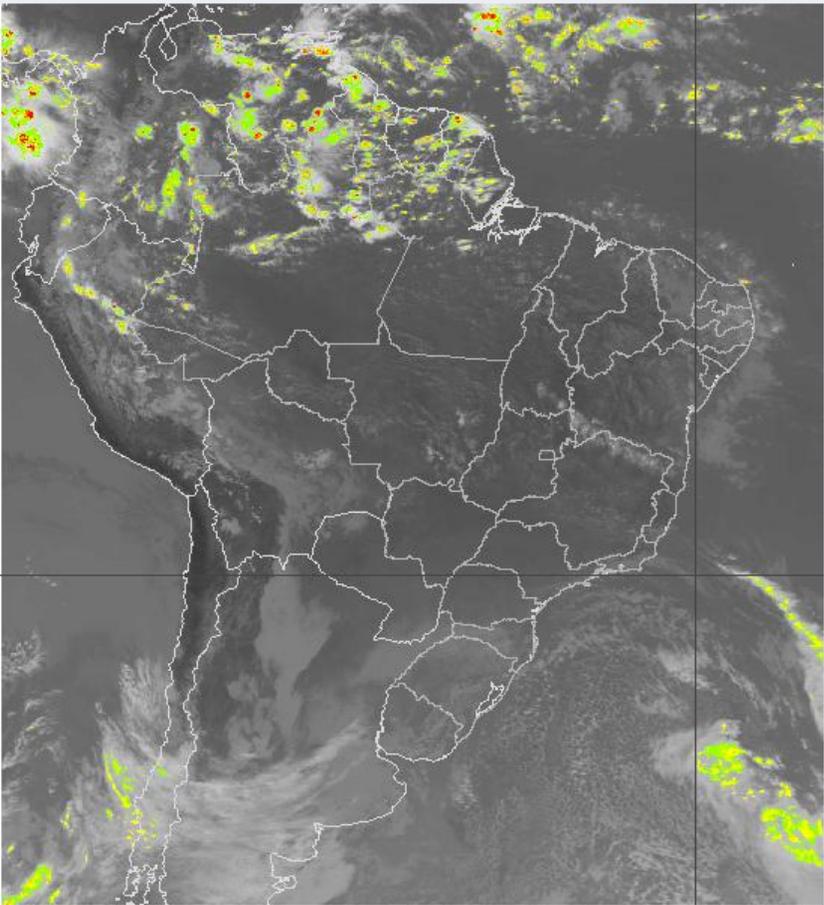
SIGMA: GIS for Environmental Applications

Ministério da Ciência e Tecnologia

Sistema de Informações Geográficas aplicado ao Meio Ambiente

Home CPTEC / Tempo / Clima / Previsões Numéricas / Satélite / Ondas / Energia / Dados Observacionais / Pesq. & Desenvolvimento / Pós-Graduação

MAPAS 550 x 600



0 KM

Selecione o que deseja visualizar

- Camadas**
 - Países
 - Estados
 - Capitais
 - Aeroportos
 - Ferrovias
 - Rodovias
 - Hidrografia
 - Municípios
 - Relevo
 - Mosaico Landsat
- Produtos**
 - Descargas Elétricas
 - Precipitação
 - Imagem GOES-CH4
 - Precipitação Instantânea Satélite
 - Precipitação Acumulada Satélite
 - Precipitação Instantânea Radar
 - Plataformas de Coleta de Dados
 - Queimadas
 - Radiação

Legenda

- Estados
- Países

Precipitação (mm/h)

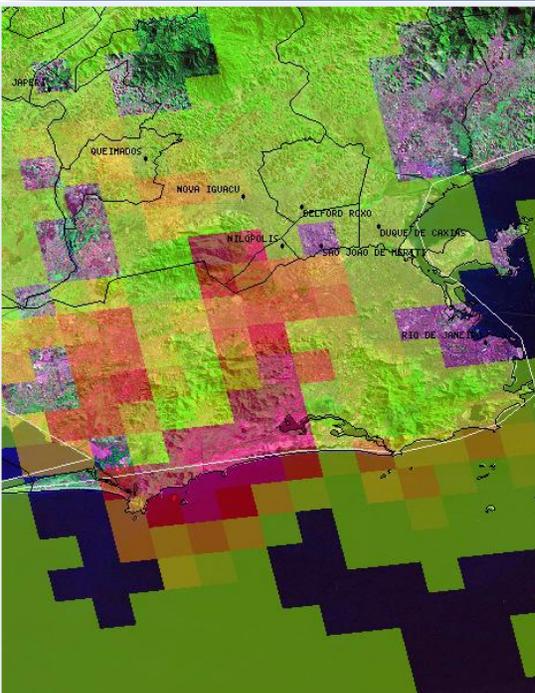
5 10 15 20 25 30 35 40 45 >50

Modelo Hidroestimador - DSA/CPTEC/INPE
Precipitação Instantânea
Data: 20060627 - Hora: 18:00 GMT

Longitude: -38.62 Latitude: -23.38

SIGMA: GIS for Environmental Applications

MAPAS



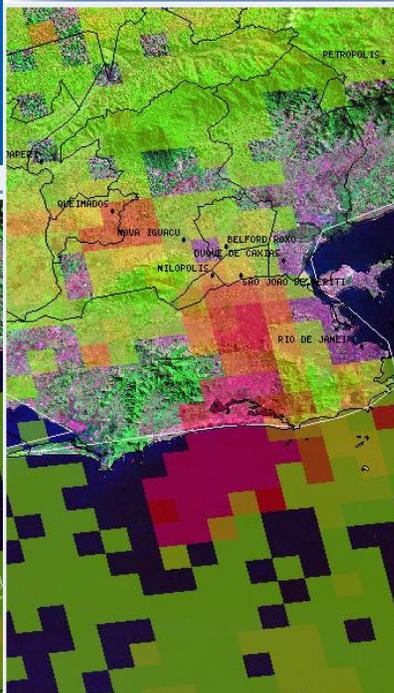
Rede de Radares DECEA - Convênio DECEA/CPTEC/INPE
Precipitação Instantânea - Data: 20060127
PC - 2030 GMT

Legenda

- Municípios
- ▮ Municípios
- ▮ Estados

Precipitação (mm/h)

MAPAS



Rede de Radares DECEA - Convênio DECEA/CPTEC/INPE
Precipitação Instantânea - Data: 20060127
PC - 2045 GMT

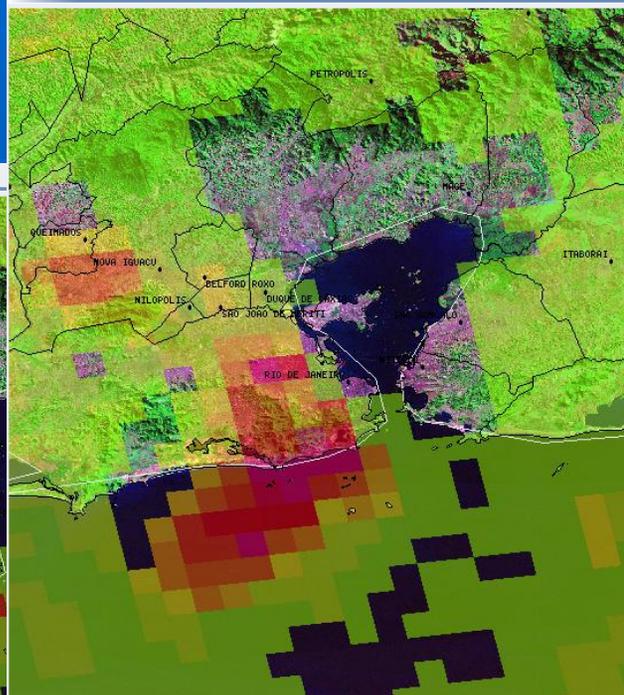
Legenda

- Municípios
- ▮ Municípios
- ▮ Estados

Precipitação (mm/h)

MAPAS

550 x 600



Rede de Radares DECEA - Convênio DECEA/CPTEC/INPE
Precipitação Instantânea - Data: 20060127
PC - 2100 GMT

Selecione o que deseja visualizar

Camadas

- Aeroportos
- Capitais
- Estados
- Ferrovias
- Hidrografia
- Municípios
- Malha Municipal
- Relevô
- Rodovias
- Mosaico Landsat

Produtos

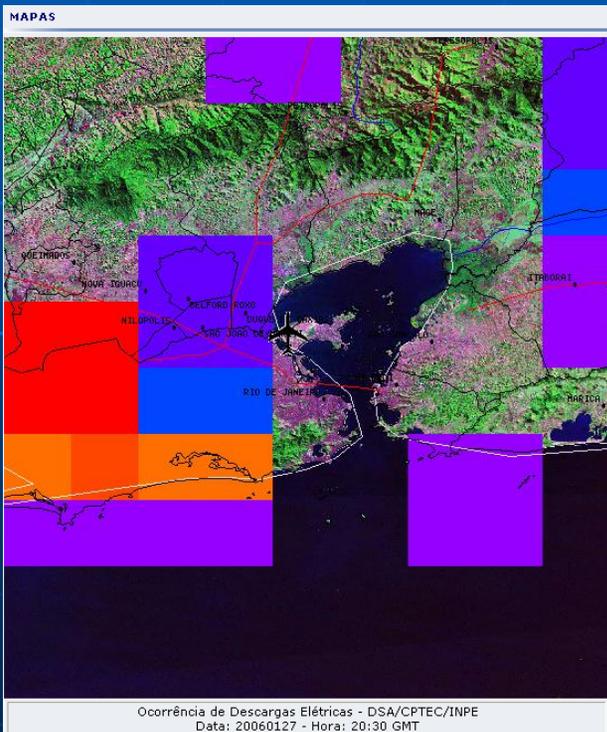
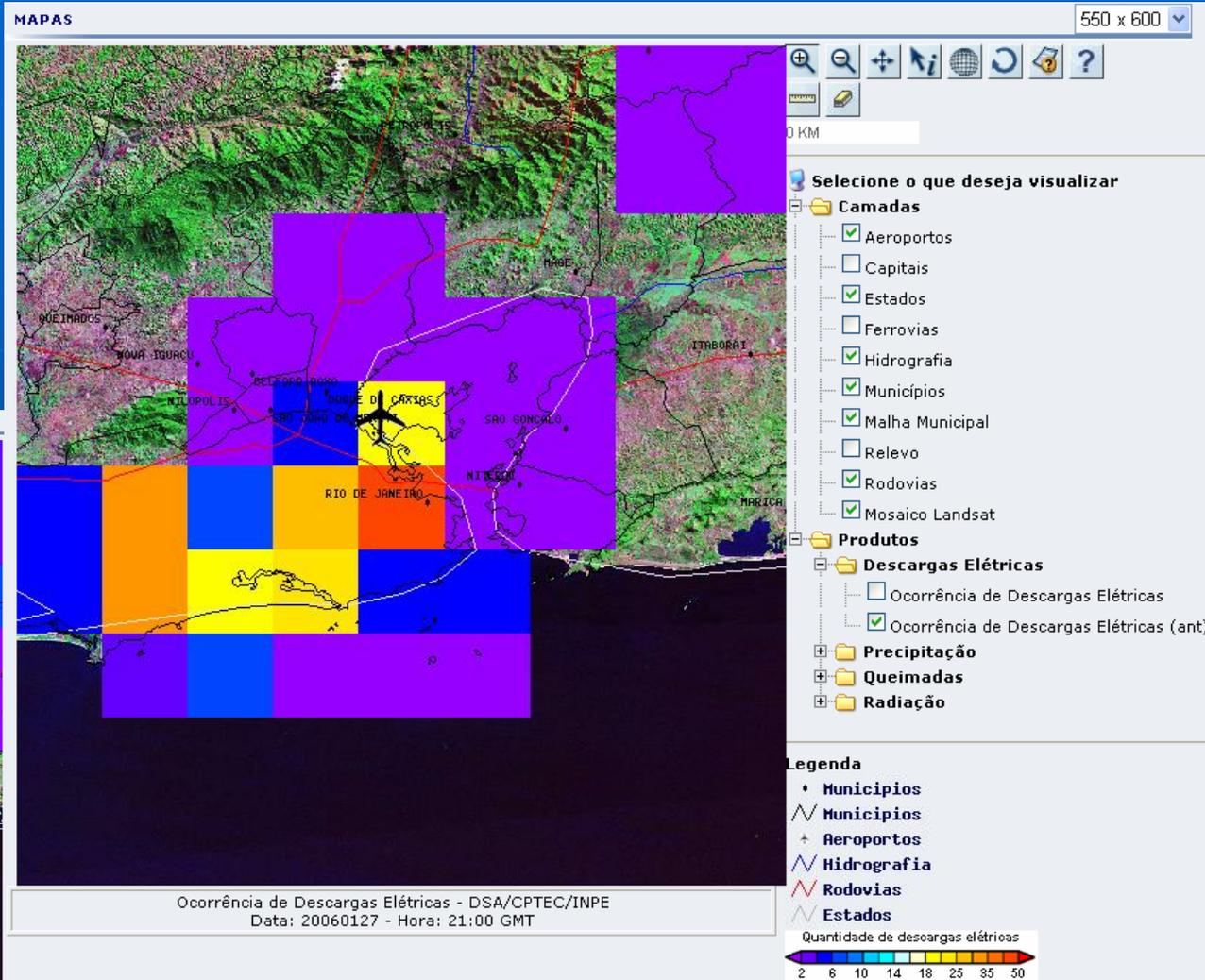
- Descargas Elétricas
- Precipitação
 - Imagem GOES-CH4
 - Precipitação Acumulada Satélite
 - Precipitação Instantânea Radar
 - Precip Instantânea Radar (ant)
 - Plataformas de Coleta de Dados
- Queimadas
- Radiação

Legenda

- Municípios
- ▮ Municípios
- ▮ Estados

Precipitação (mm/h)

SIGMA: GIS for Environmental Applications



Lightning data

SOS: Severe Weather Observation System

The use of nowcasting together with SIGMA allows the monitoring of severe weather conditions and emission of alerts when a critical situation is detected.

SOS: Severe Weather Observation System

Ministério da Ciência e Tecnologia

SOS
Severe Weather Observation System

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MAPAS

600 x 650



0 KM

Critérios de filtro

Camadas

- Estados
- Capitais
- Aeroportos
- Ferrovias

Imagem GOES-CH4

Precipitação Instantânea Satélite

Precipitação Instantânea Radar

Precipitação Acumulada Satélite

Ocorrência de Descargas Elétricas

Focos de Queima

Ice

Legenda

- ▲ Cachoeira Paulista
- △ Estados

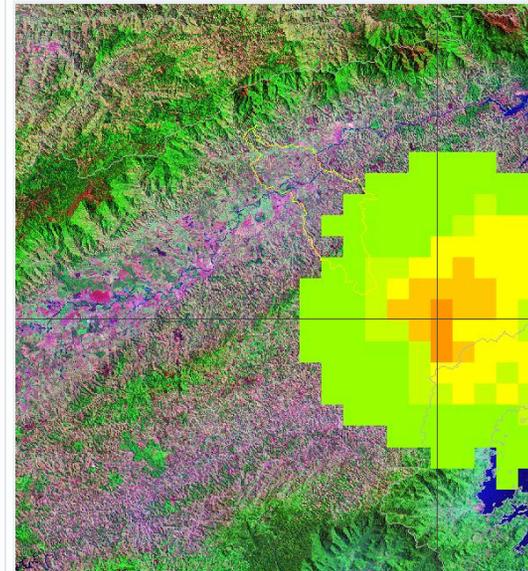
Ministério da Ciência e Tecnologia

SOS
Severe Weather Observation System

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MAPAS

600 x 650



0 KM

Critérios de filtro

Camadas

- Estados
- Capitais
- Aeroportos
- Ferrovias

Imagem GOES-CH4

Precipitação Instantânea Satélite

Última: 20051227 - Hora: 2000 GMT

Data: 20051227 - Hora: 1900 GMT

Data: 20051227 - Hora: 1830 GMT

Data: 20051227 - Hora: 1730 GMT

Precipitação Instantânea Radar

Precipitação Acumulada Satélite

Ocorrência de Descargas Elétricas

Focos de Queima

Ice

Legenda

- ▲ Cachoeira Paulista
- △ Estados

Precipitação (mm/h)

5 10 15 20 25 30 35 40 45 >50

Modelo Hidroestimador - DSA/CPTEC/INPE
Precipitação Instantânea

Longitude: -44.79 Latitude: -22.9

