



**The Abdus Salam  
International Centre for Theoretical Physics**



1934-16

**Fourth ICTP Workshop on the Theory and Use of Regional Climate  
Models: Applying RCMs to Developing Nations in Support of Climate  
Change Assessment and Extended-Range Prediction**

*3 - 14 March 2008*

**Examples of seasonal prediction activities over South America: Paulo Nobre.**

NOBRE Paulo  
*Centro de Previsao de Tempo e Estudos Climaticos  
Instituto Nacional de Pesquisas Espaciais, INPE  
Rodovia Presidente Dutra Km 39  
SP 12630-000 Cachoeira Paulista  
BRAZIL*



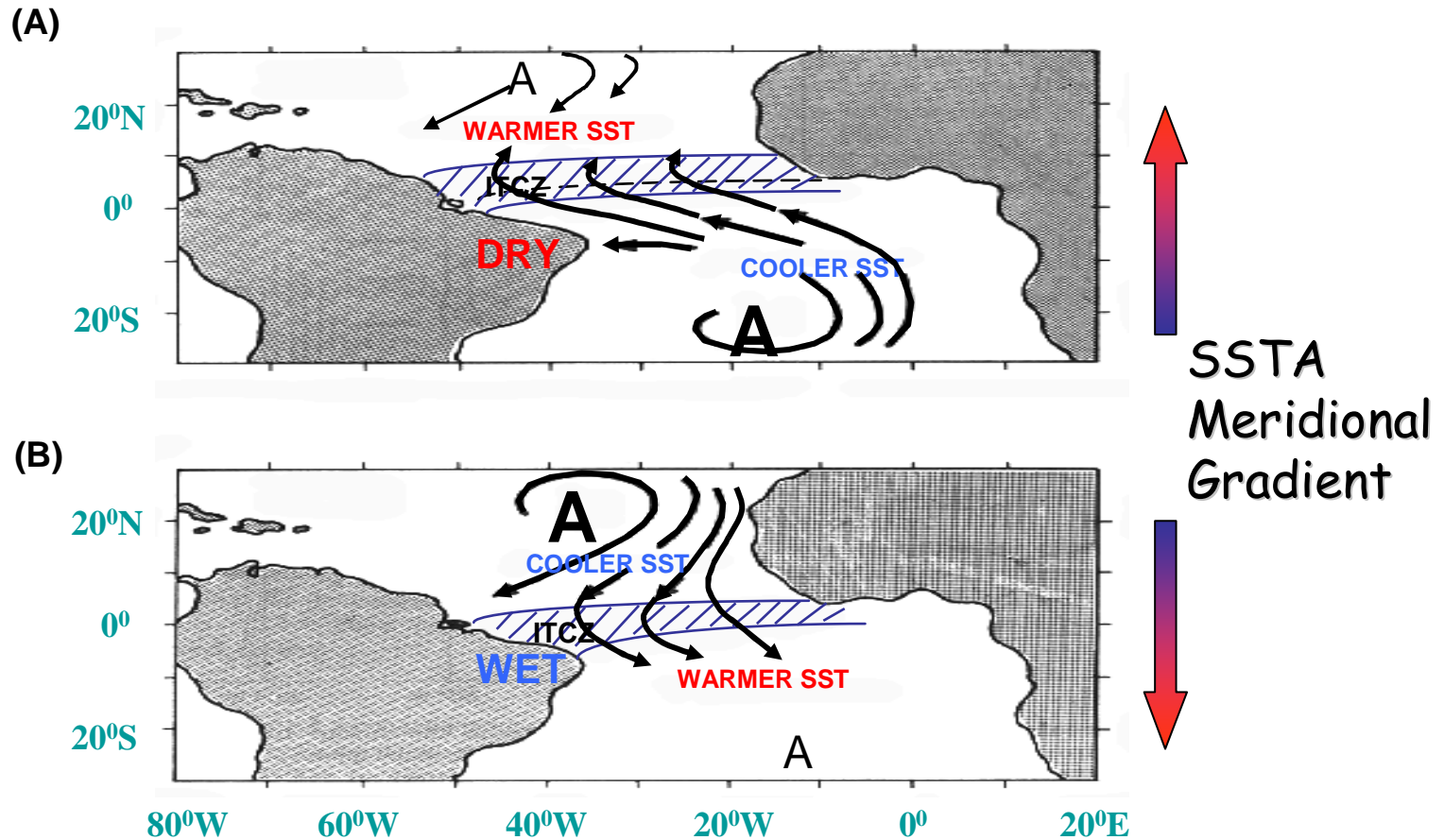
# Examples of Seasonal Climate Prediction Activities over South America

Paulo Nobre  
INPE-CPTEC

# Outline

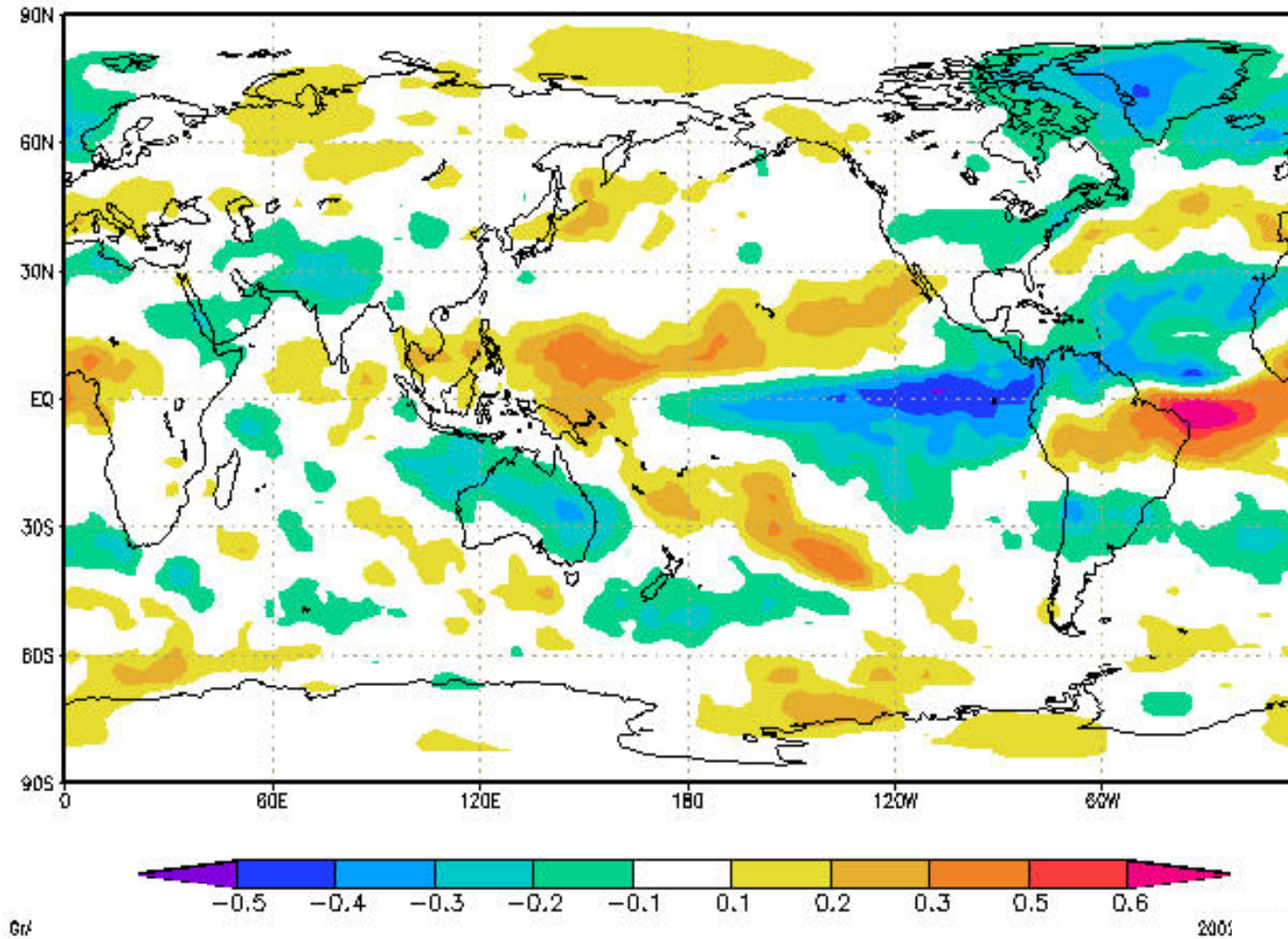
- Scientific Challenges
- CPTEC seasonal climate prediction suite
- State Bureaus of Meteorology network
- Seasonal climate prediction Fora
  - Hands-on demo of consensus seasonal forecast

# The ITCZ Influence



Adapted from: C. A. Nobre and L. C. B. Molion (1988)

# ATLANTIC ITCZ POSITION AND OLR ANOMALY CORRELATION

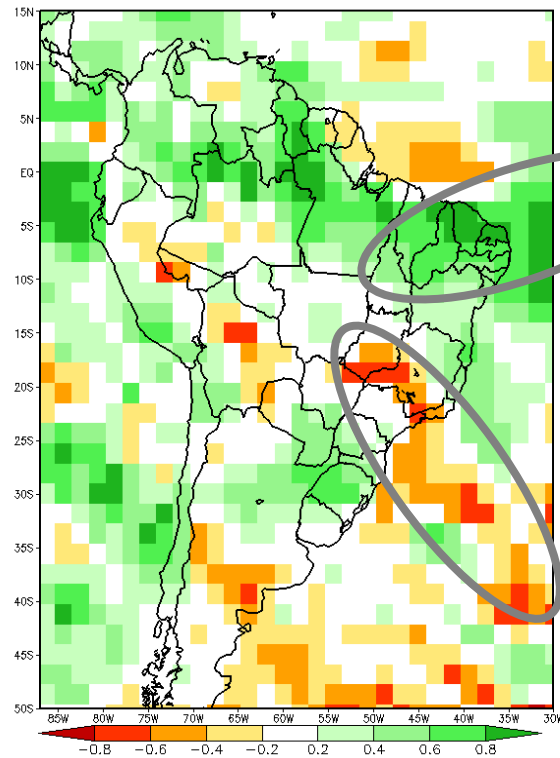


Paulo Nobre, RCM Workshop ICTP, March 2008

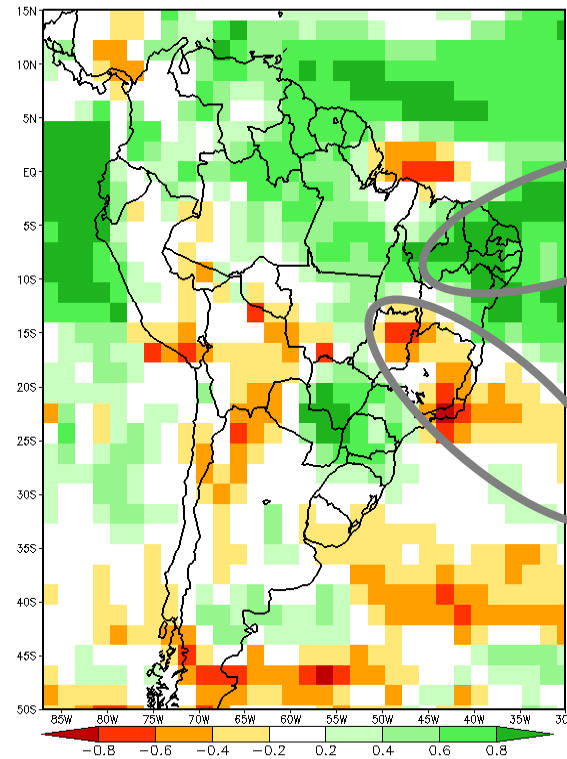


# Scientific Challenge: SACZ 2-tier low predictability

DJF



MAM

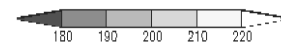
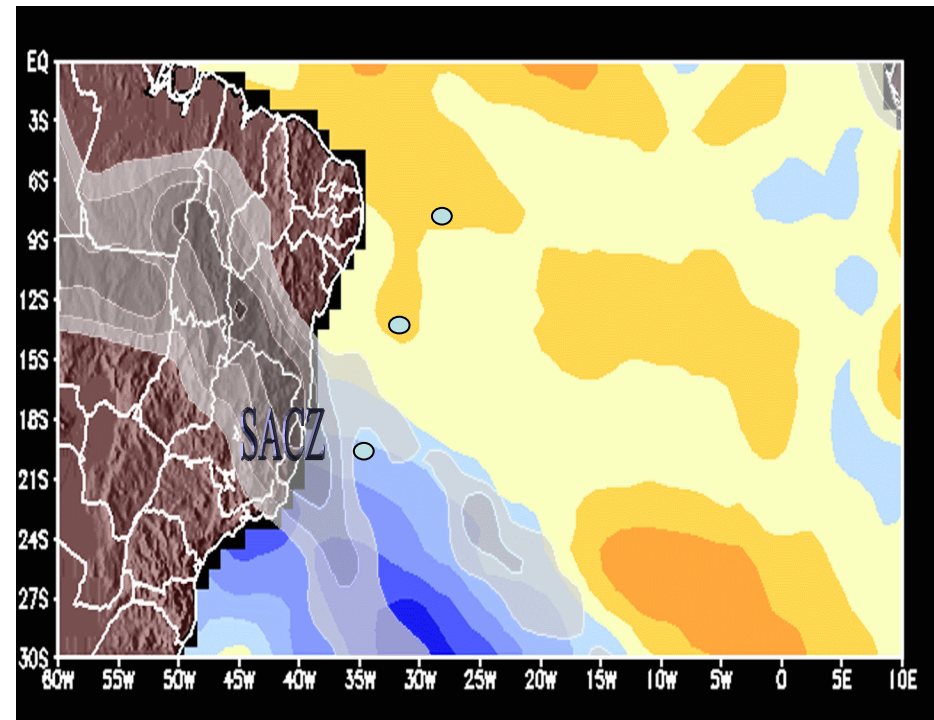


CPTEC AGCM, 50 years, 10 Member Ensemble, Kuo, T062L28, Obs SST

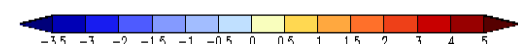
Marengo et al. (2002)

# Scientific Motivation: SACZ

- South Atlantic Convergence Zone (SACZ) formation over cold waters => Atmospheric forcing of underlying SST?
- Robertson and Mechoso (2002)
- Chaves and Nobre (2004)



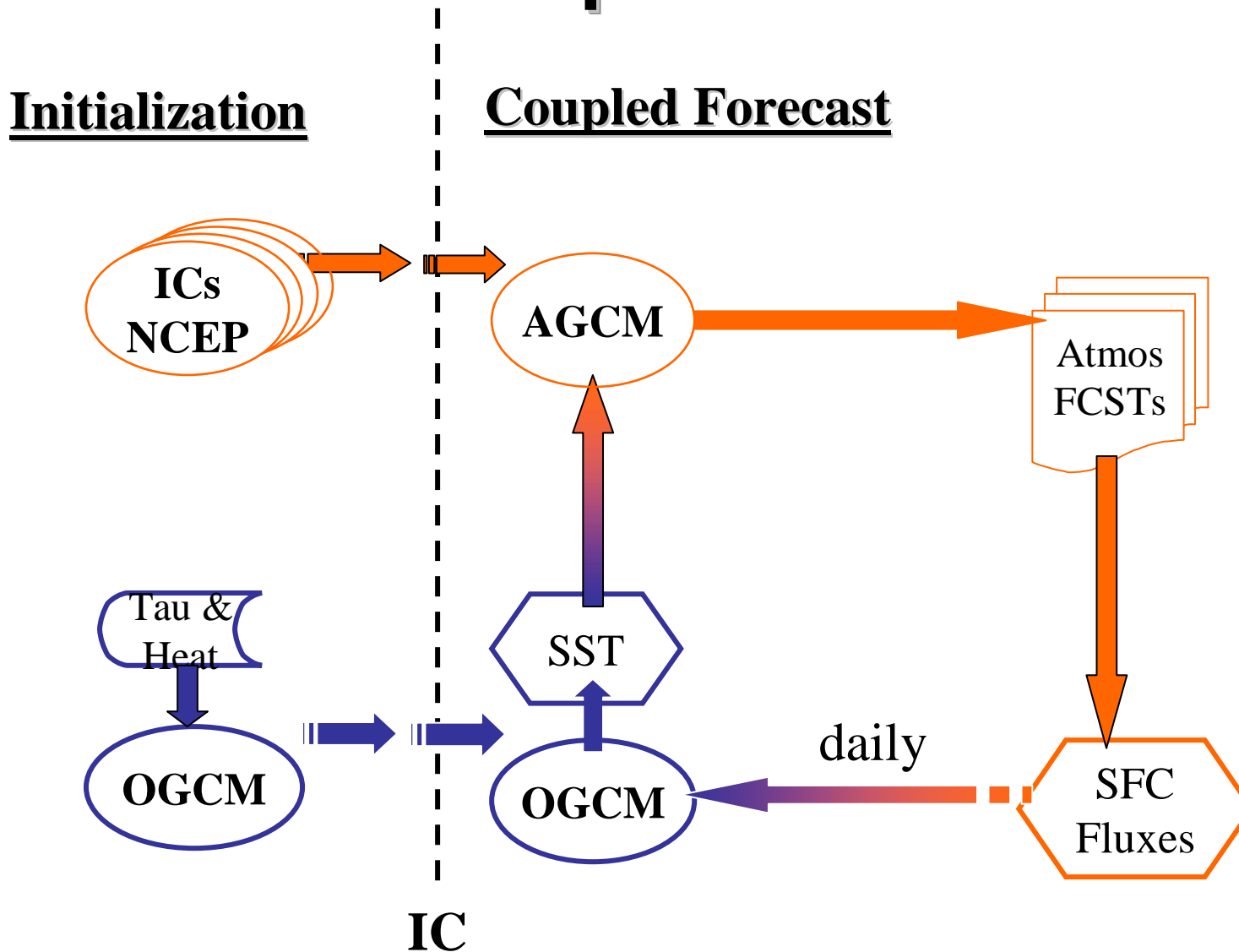
OLR



SSTA

OBS: 17-25 NOVEMBER 1999

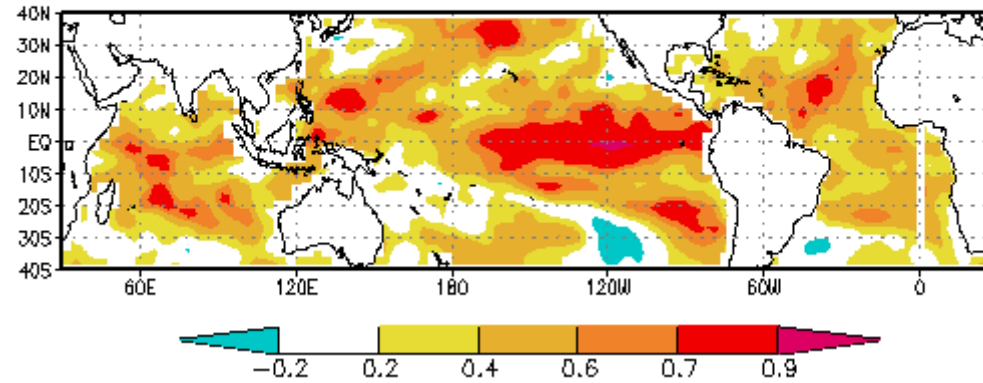
# CPTEC's Coupled GCM V.1.0



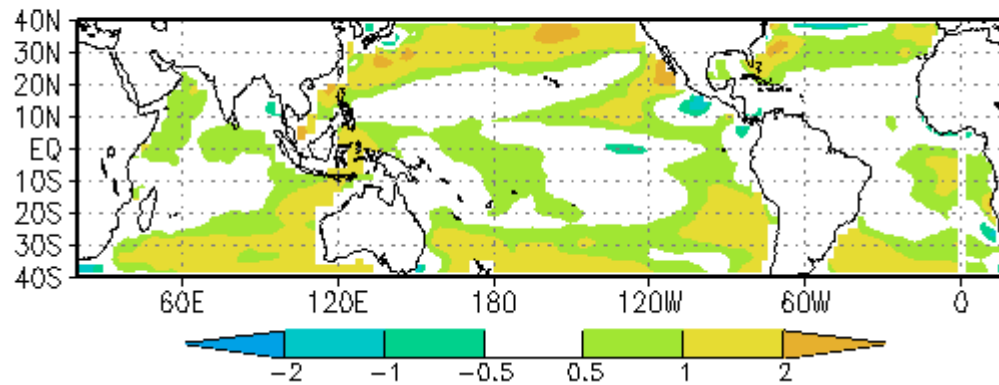


CPTEC CGCM x OISST DJF TEMP ACOR

NOV IC



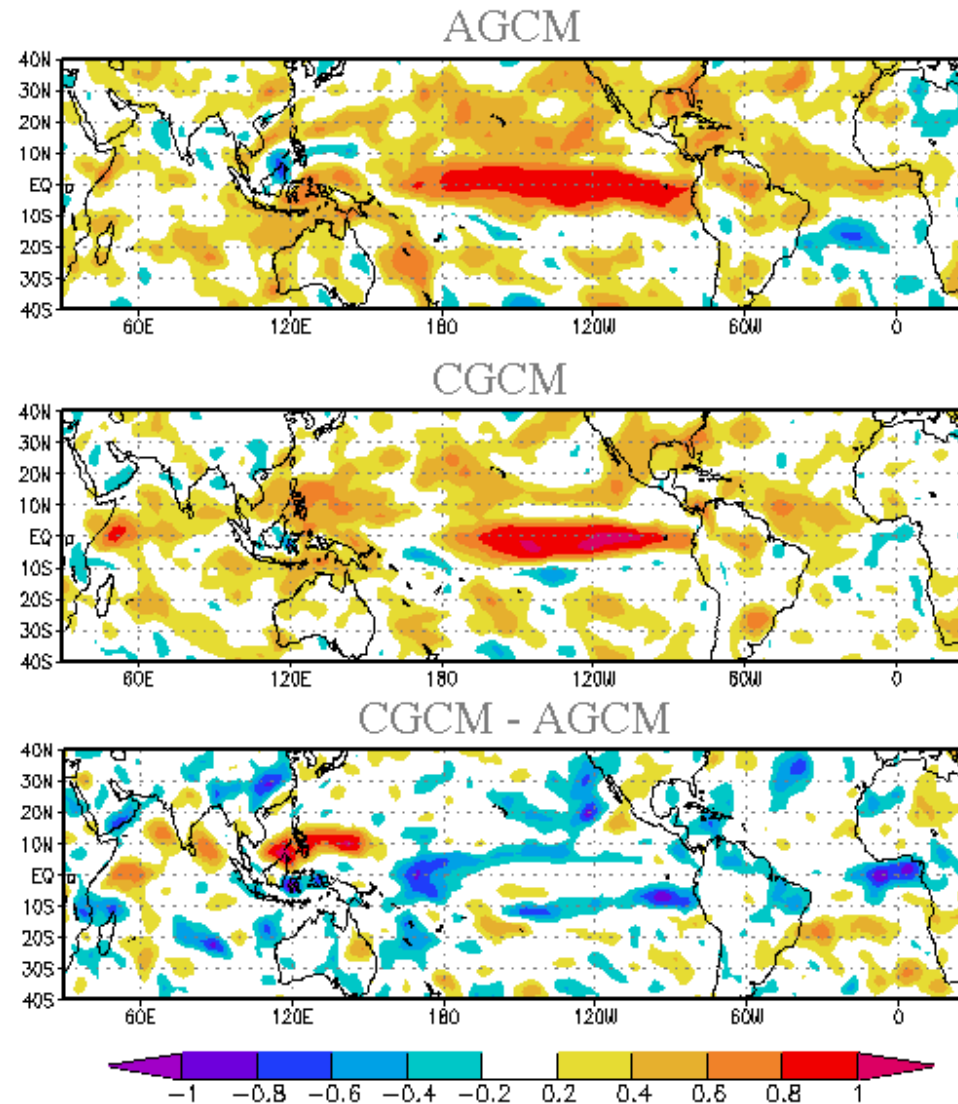
BIAS DJF TEMP (deg C) IC NOV  
CPTEC CGCM x OISST



# Scientific Motivation:

## Coupled Ocean-Atmosphere processes at play?

### DJF Precipitation Forecasts anomaly correlations

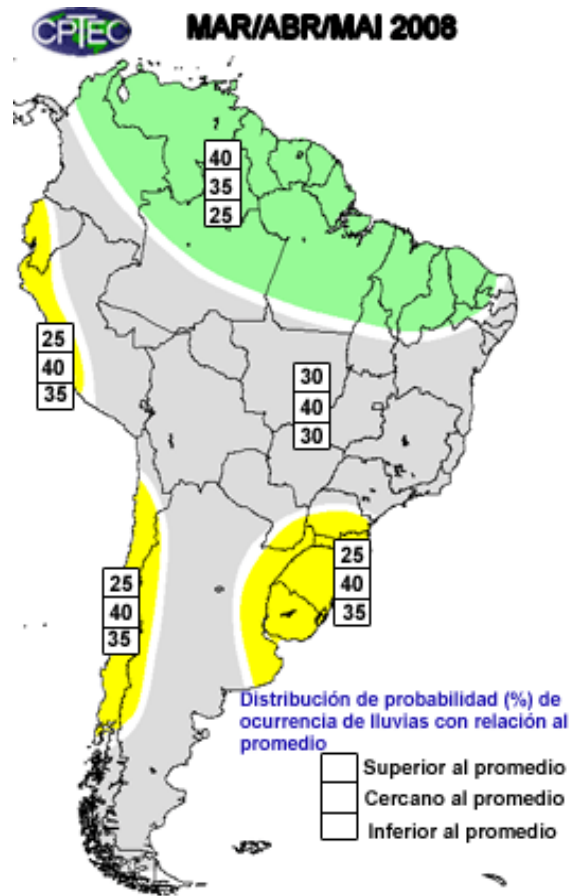


Nobre et al. (2008, in prep)

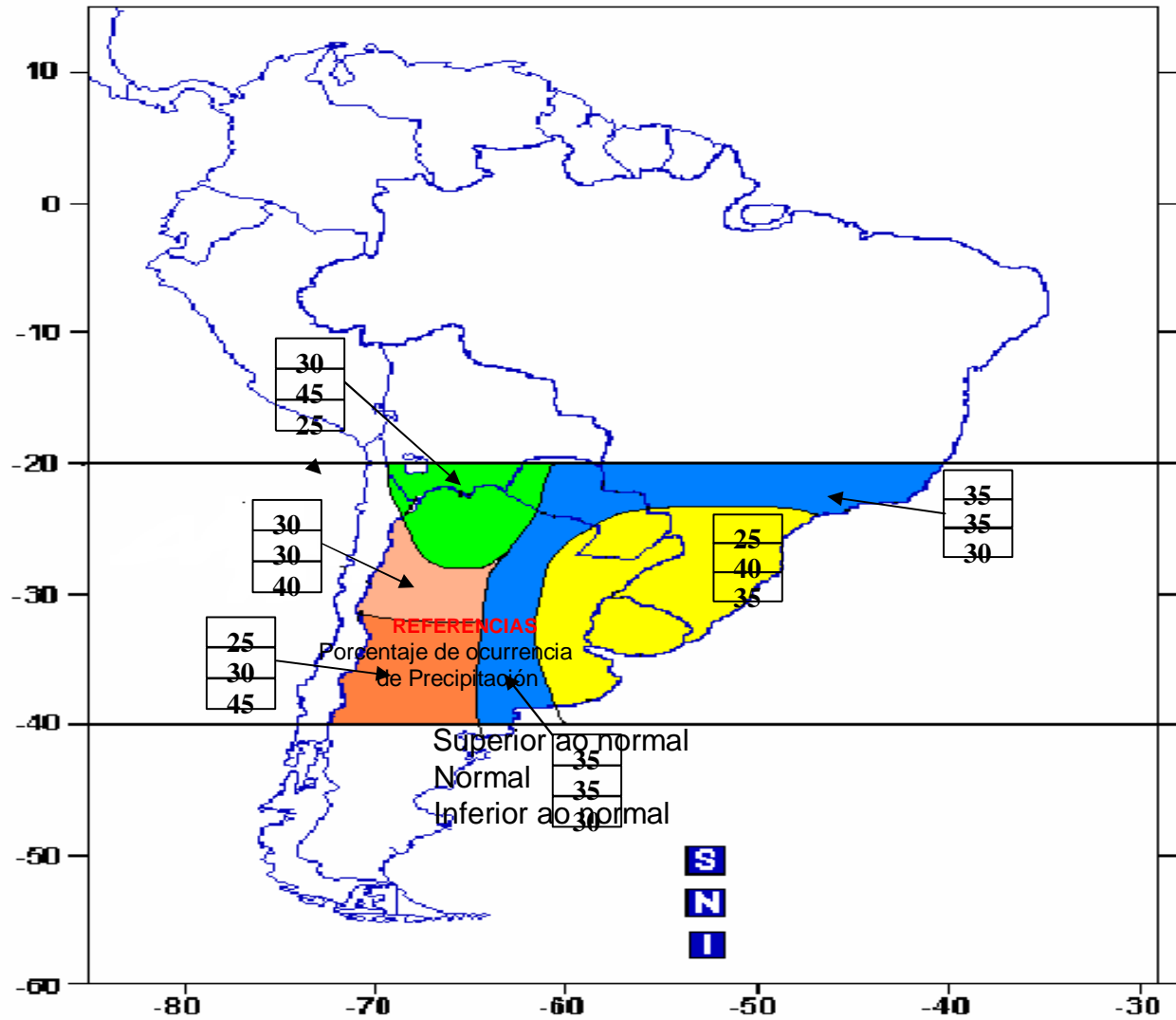
# Seasonal Climate Prediction at INPE-CPTEC

- Real-time monthly meetings encompassing several institutions from South America
- Ensemble of AGCM and CGCM runs done at CPTEC as well as those done at IRI
- Dynamical downscaling using RCMs nested at CPTEC and ECHAM4.5 AGCM outputs
- Consensus precipitation forecast in terciles: Above, Normal, Below
- Consensus temperature forecast Above/Below

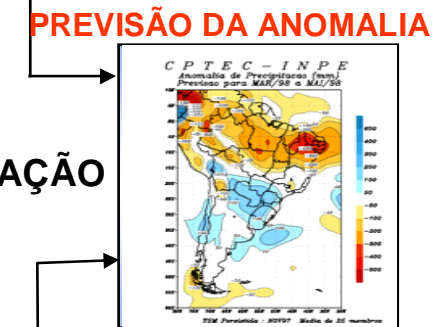
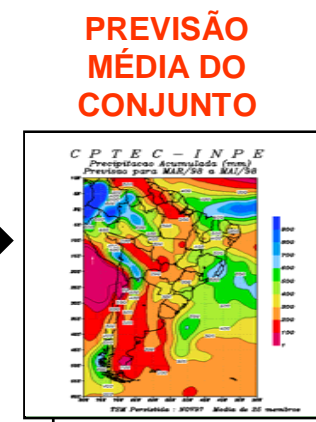
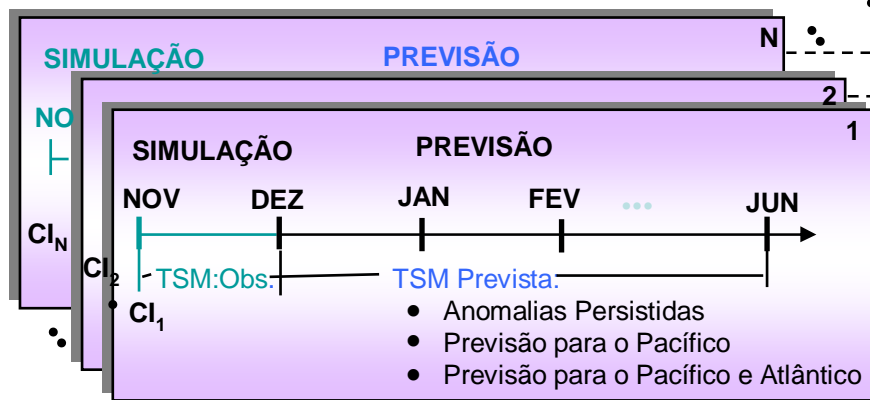
# March-April-May 2008 Consensus Precipitation Forecast



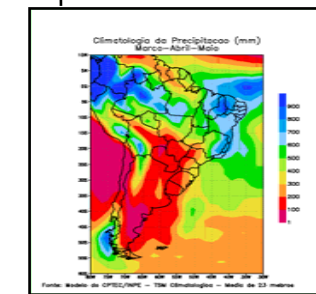
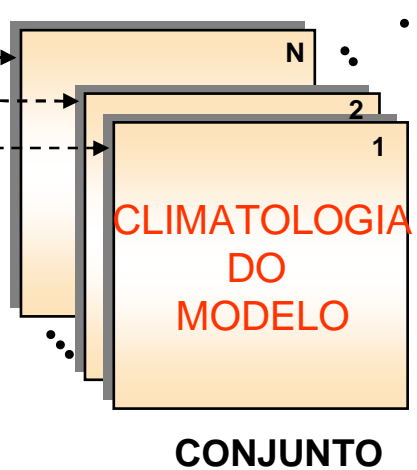
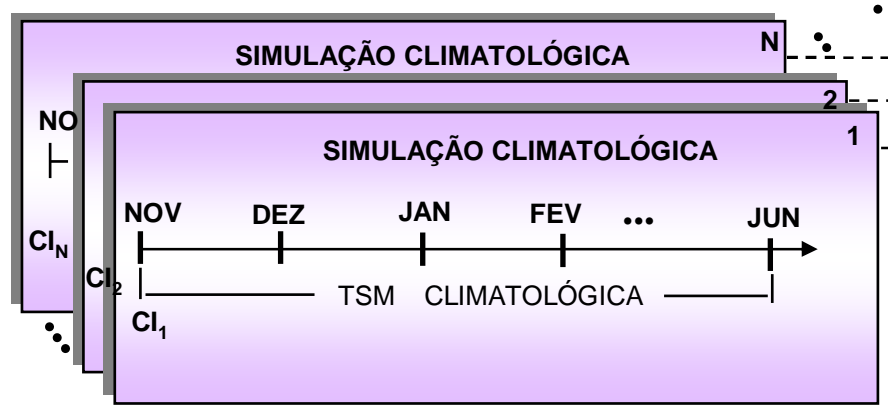
XX FORUM REGIONAL DE PERSPECTIVA CLIMÁTICA PARA EL SUDESTE DE AMÉRICA DEL SUR – CURITIBA 11/12/ 2003



# CPTeC Seasonal Forecast Suite

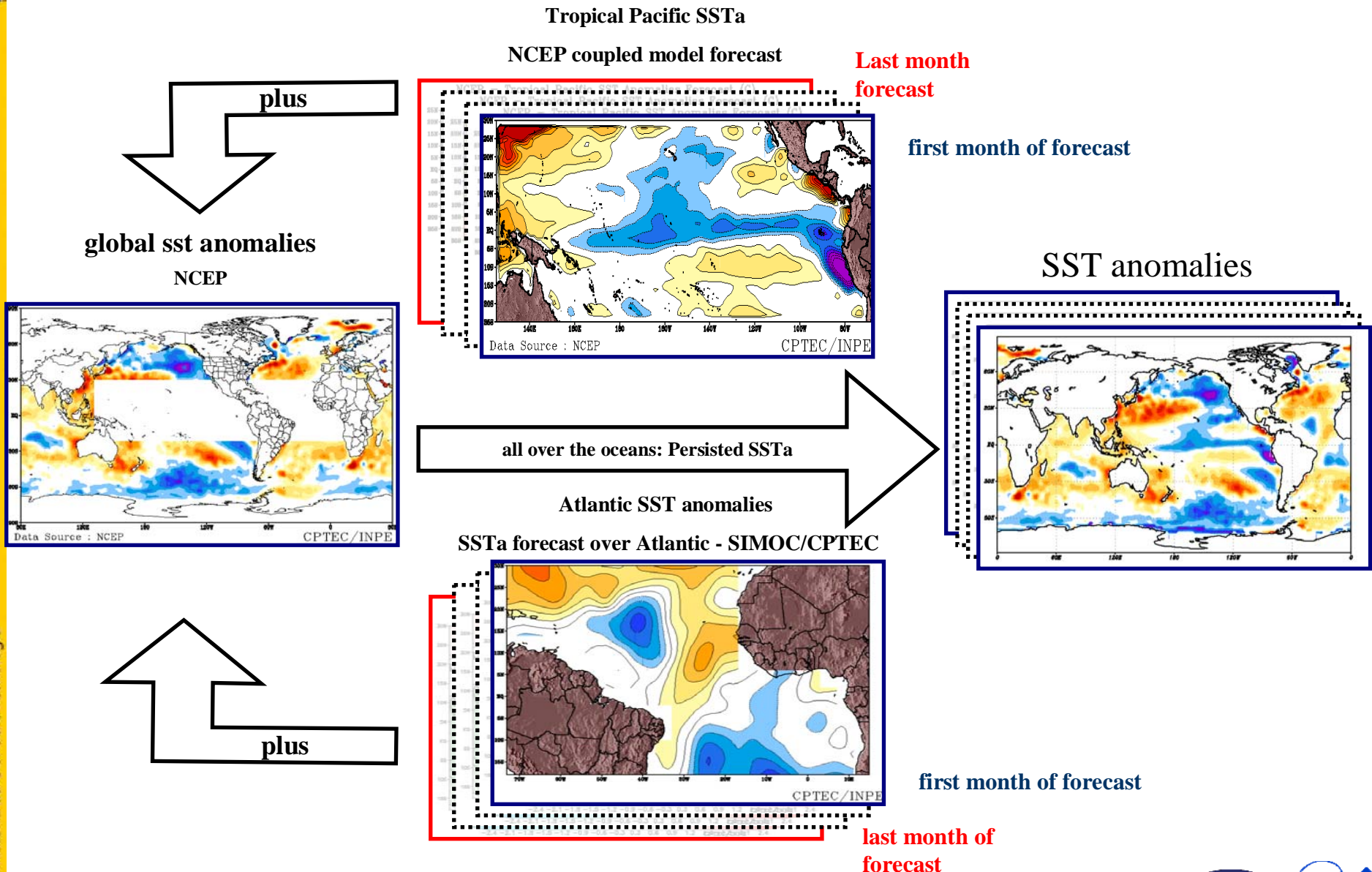


**SUBTRAÇÃO**





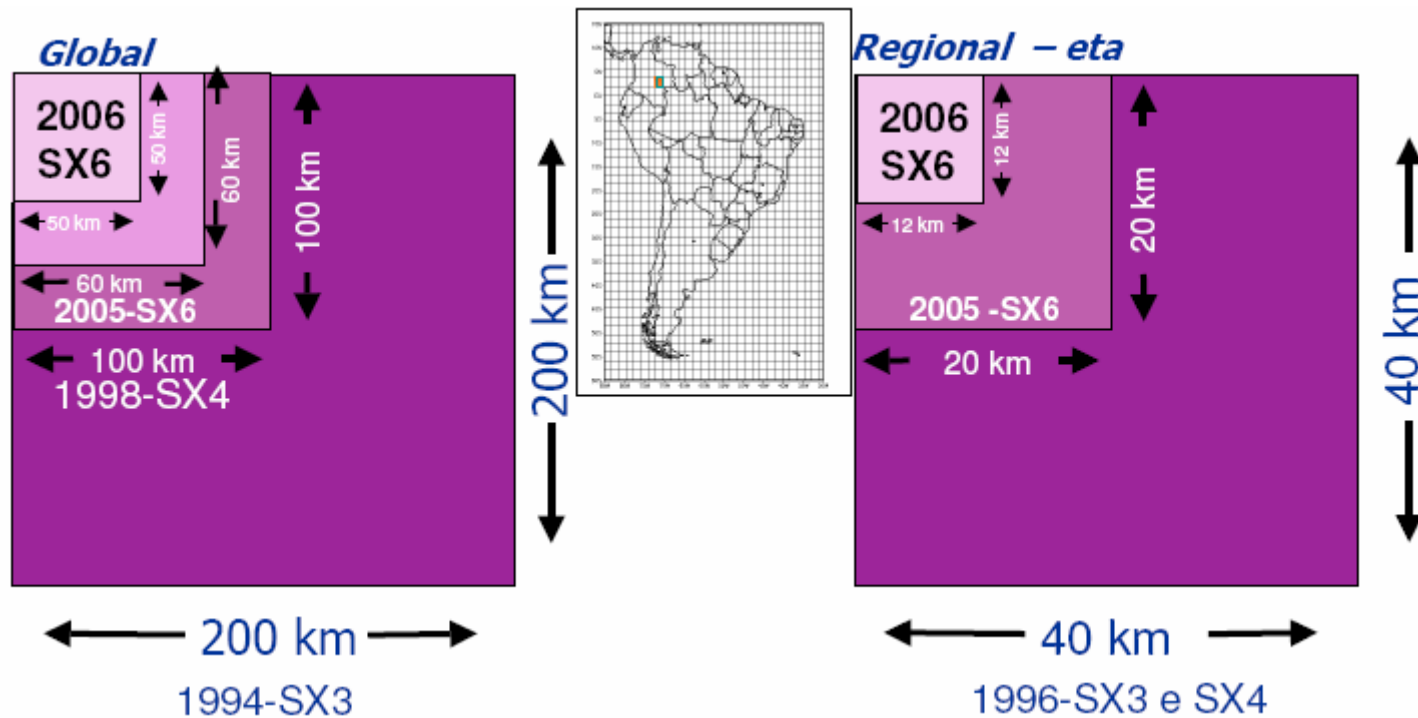
# bc's for CPTEC's AGCM



# CPTEC seasonal prediction operational runs (as of March/2008)

- **AGCM 1.7**
  - KUO, RAS, GRELL, DERF
  - FCST SSTA, PRESCRIBED SSTA
  - 15 Members each: 120 total
  - 4 months forecast
- **CGCM 1.0**
  - T062L28, RAS CPTEC AGCM
  - ¼ degree deep tropics, L20 MOM3 OGCM
  - 10 Members per month
  - 7 months forecast
- **CGCM 1.1**
  - T126L28, RAS,
  - 2 members per day
  - 30 days forecast
- **Eta**
  - 40 Km grid L38
  - AGCM T062L28, Kuo, LBC
  - 5 members
  - 4 months forecast

# CPTEC's Atmos Model Domain Evolution



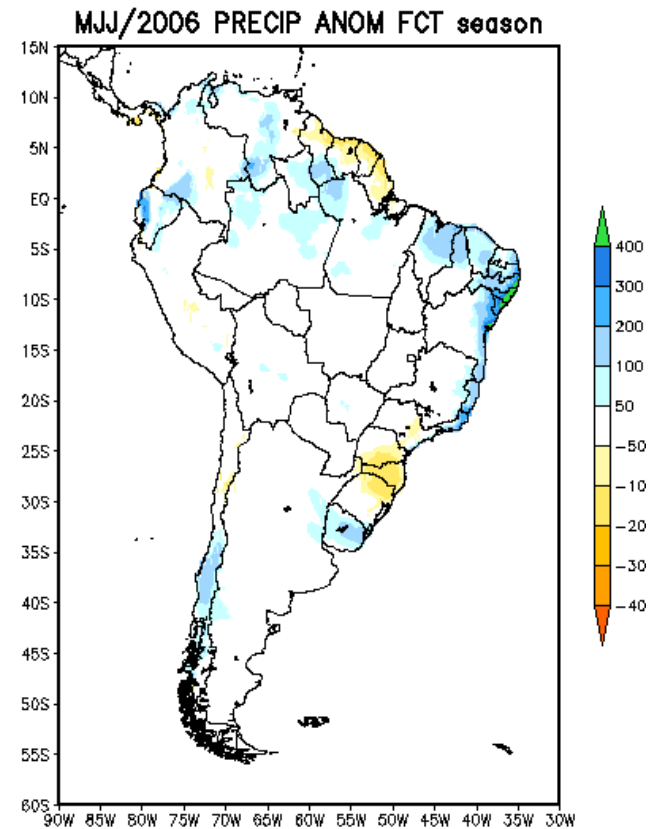
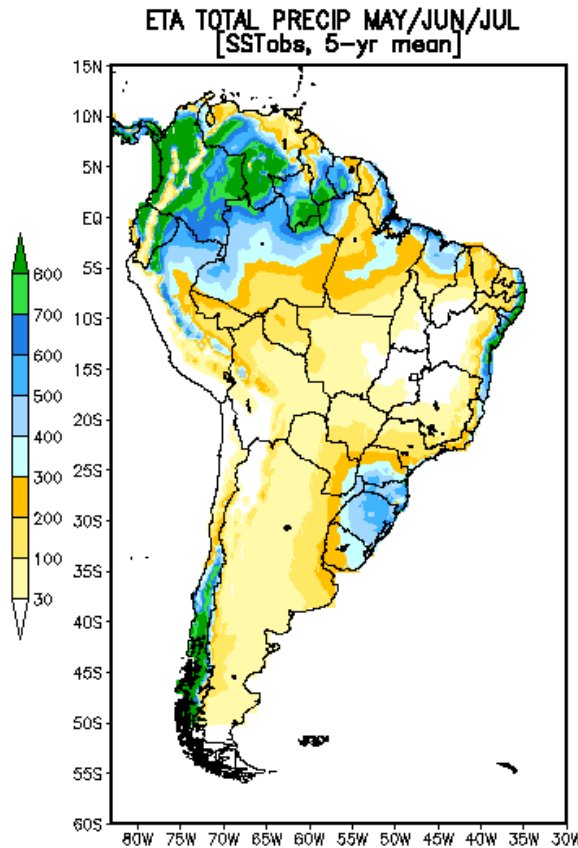
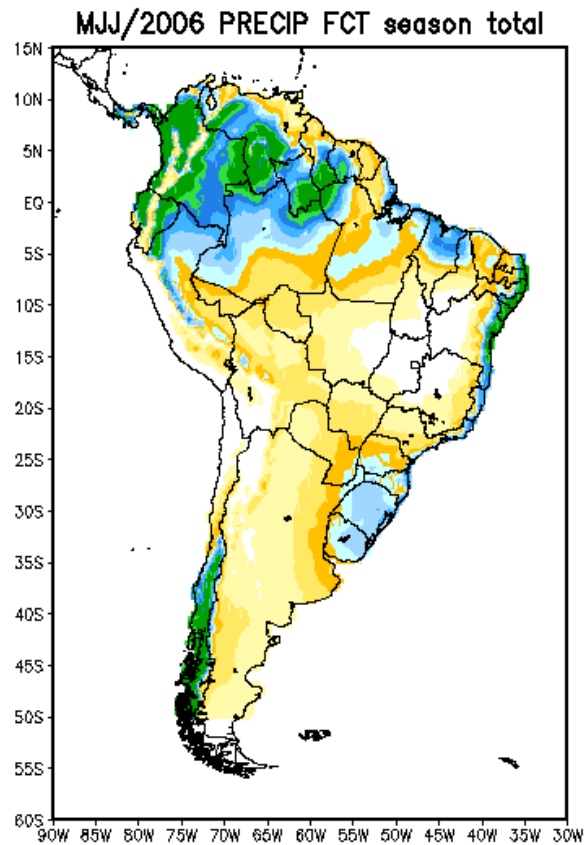
Vertical Levels:

- 1994 – 28
- 2005 – 42
- 2006 – 64

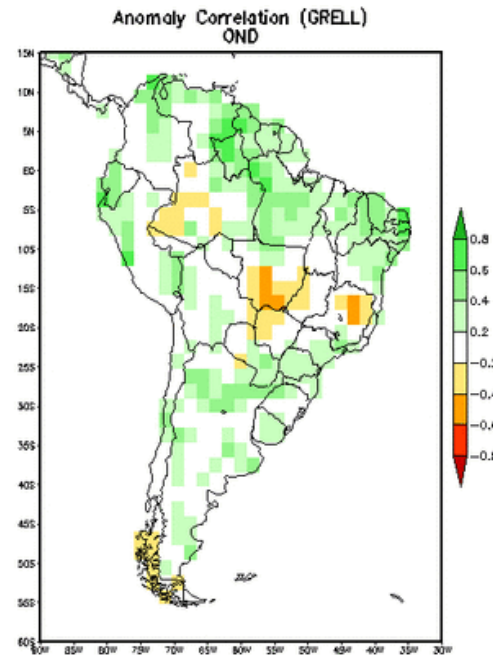
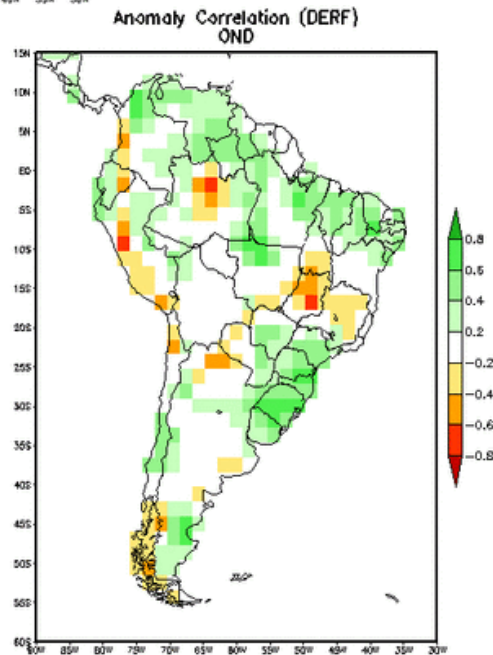
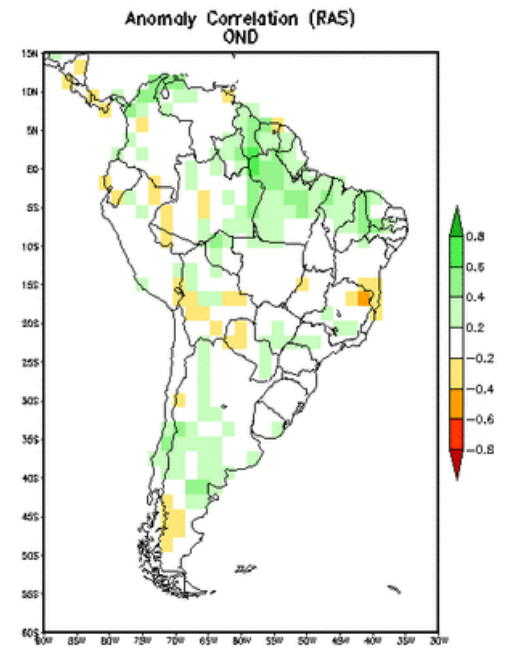
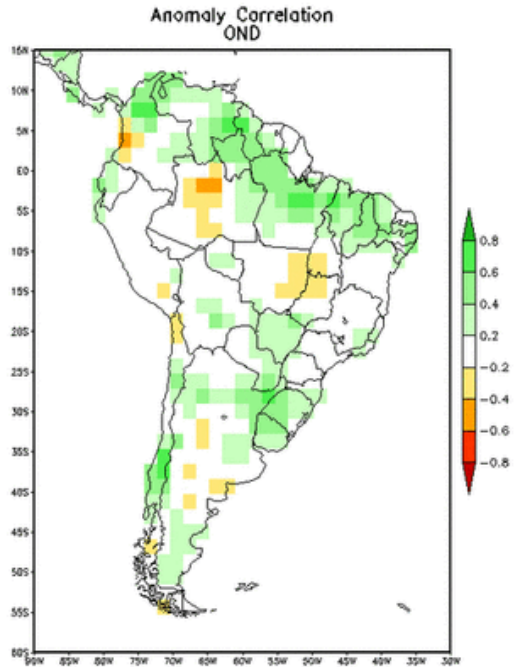
Vertical Levels:

- 1994 – 38
- 2006 – 50

# Seasonal Forecast eta



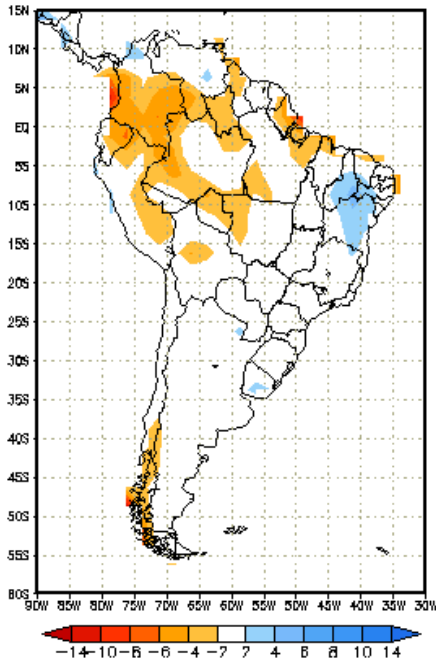
# Seasonal Forecast Anomaly Correlation



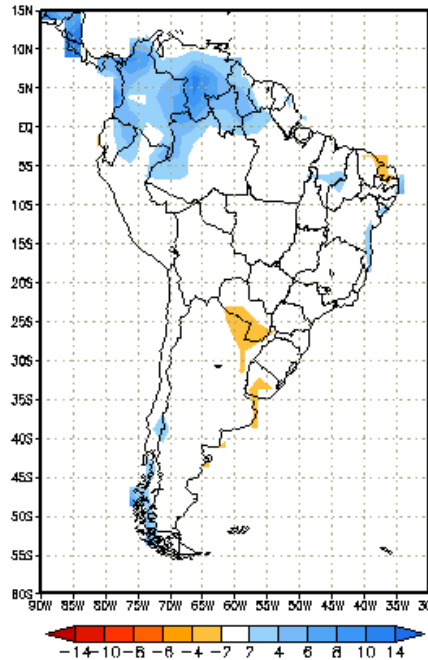


# Seasonal Forecast

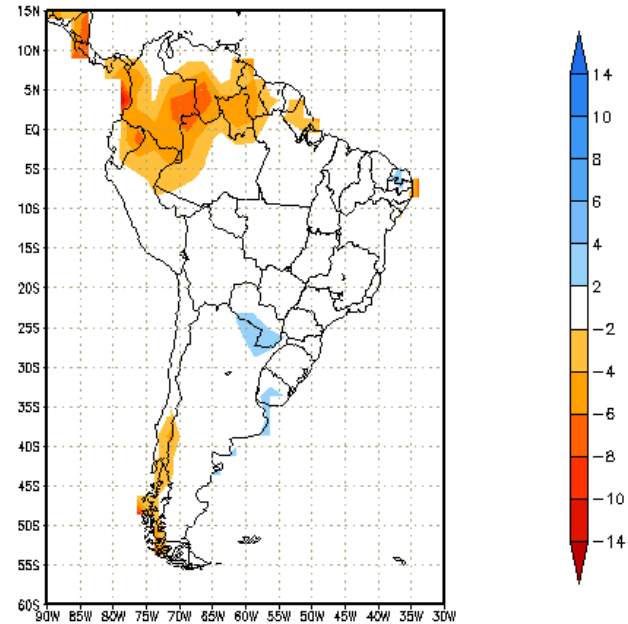
MJJ forecast – bias removed



MJJ forecast bias



obs precipitation anomaly (mm/day)  
MJJ



- assuming slight changes in the AGCMs seasonal forecast, bias of the last 3 forecasts are removed.

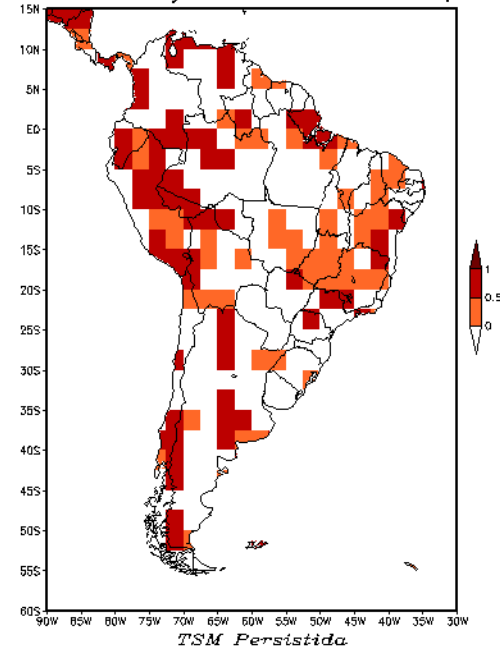
In this example, negative anomalies in northern South America were captured.



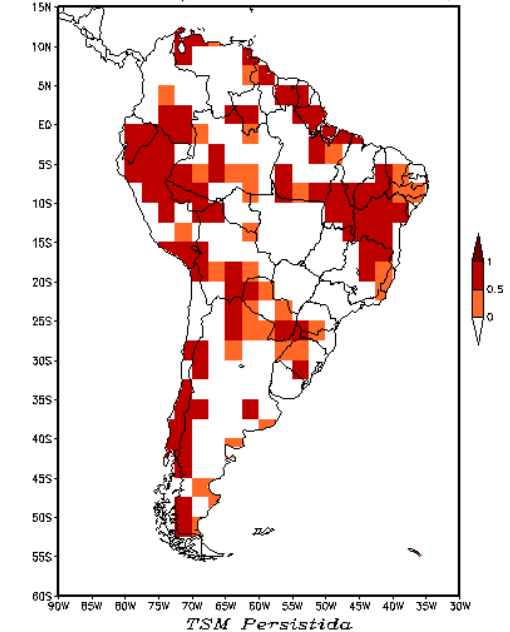
# Seasonal Forecast Evaluation

## Ranked Probability Skill Score (RPSS)

Ranked Probability Skill Score - RPSS AMJ/2005

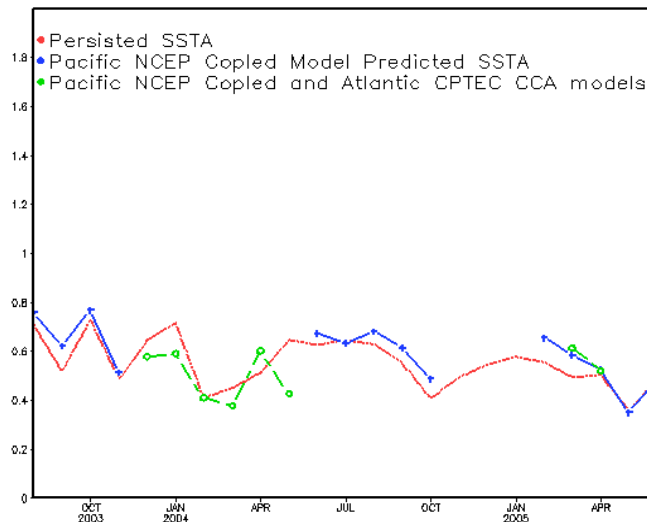


Ranked Probability Skill Score - RPSS MJJ/2005

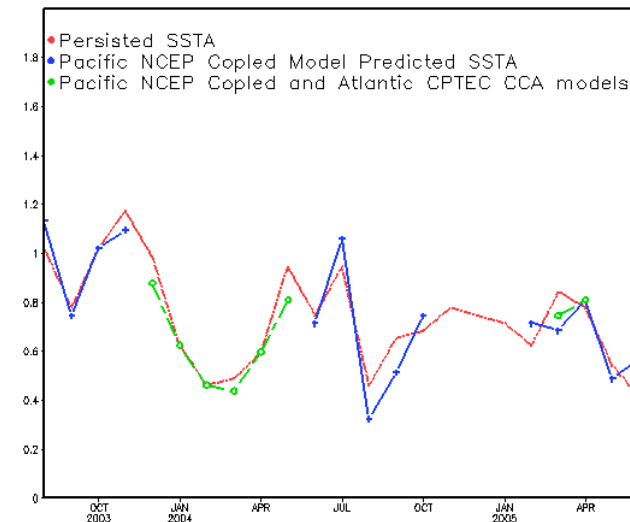


## Brier Score

Brier Score - Brazil

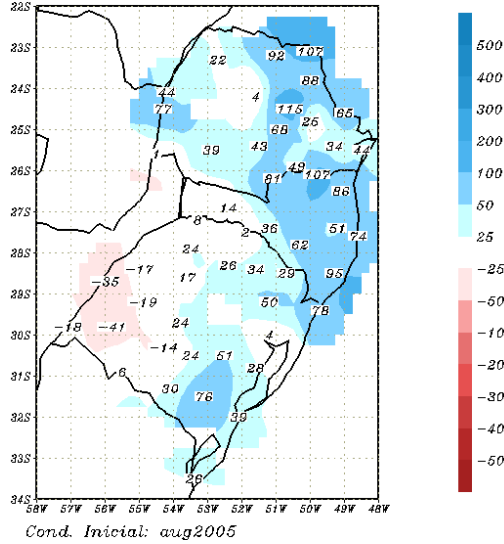


Brier Score - Northern Amazonas



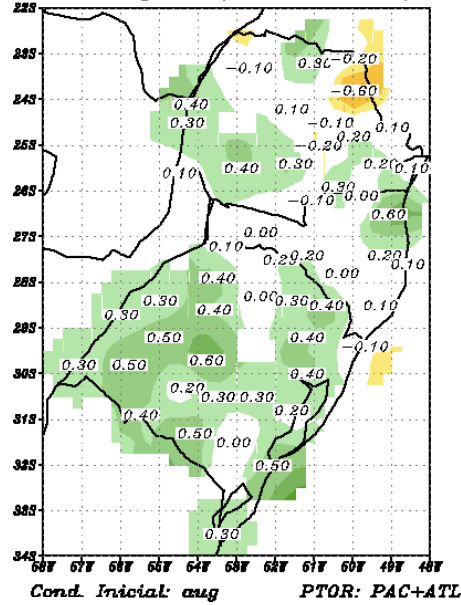


### SIMOC - PREVISAO DE ANOMALIAS DE PRECIPITACAO Valido para: (Out-Nov-Dez 2005) (mm)

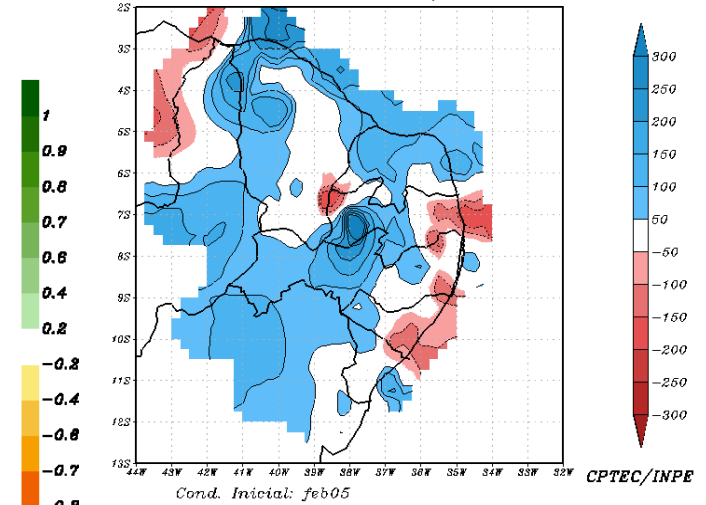


# Seasonal Forecast

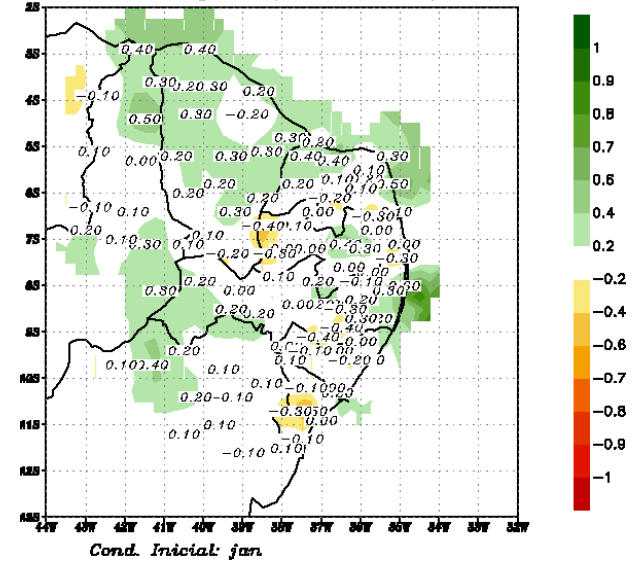
### SIMOC - MAPA DE CORRELAOES Valido para: (Out-Nov-Dez )



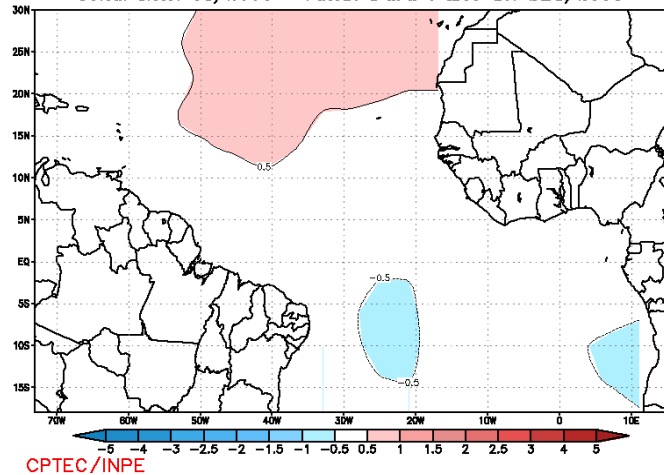
### SIMOC - ANOMALIA DE PRECIPITACAO PREVISTA Periodo : MAM 2005 (mm)



### SIMOC - MAPA DE CORRELAOES Valido para: (Mar-Abr-Mai)



### SIMOC - PREVISAO DE ANOMALIAS DE TSM (C) Cond. Inic: 08/2005 Valido Para o Mes de: SET/2005



# Info dissemination

CPTEC - Centro de Previsão de Tempo e Estudos Climáticos - Microsoft Internet Explorer

Endereço: <http://www.cptec.inpe.br>

Ministério da Ciência e Tecnologia

**CPTEC**  
Centro de Previsão de Tempo e Estudos Climáticos

Boletins de Tempo

Produtos do CPTEC

- Tempo
- Clima
- Previsões Numéricas

Clima - Microsoft Internet Explorer

Endereço: <http://www.cptec.inpe.br/clima/>

**Clima**

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

Quinta, 06 de Outubro de 2005

Produtos de Clima

- Monitoramento
  - Brasil
  - América do Sul
- Boletins
  - Infoclima
  - PrognClima
- Reunião Climática
  - Nordeste Brasileiro

Precipitação Acumulada

Tendências Climáticas

Tendência de primavera com temperaturas variando de normal a acima da média em todo o Brasil

O que você entende deste mapa?

OUT/NOV/DEZ/2005

Temp. Superfície do Mar

Clique na imagem para ver animação

Na primeira quinzena de setembro, as águas superficiais estiveram entre 0,5°C e 1,5°C acima da média no setor oeste do Pacífico Equatorial e em quase

El Niño e La Niña - Microsoft Internet Explorer

Endereço: <http://www.cptec.inpe.br/enos/>

**El Niño e La Niña**

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El Niño

O que é El Niño

El Niño é um fenômeno atmosférico-oceânico caracterizado por um aquecimento anormal das águas superficiais no oceano Pacífico Tropical, e que pode afetar o clima regional e global, mudando os padrões de vento a nível mundial, e afetando assim, os regimes de chuva em regiões tropicais e de latitudes médias. (Saiba Mais....)

Dados de El Niño

- Eventos Anteriores
- Efeitos Globais

La Niña

O que é La Niña

La Niña representa um fenômeno oceânico-atmosférico com características opostas ao El Niño, e que caracteriza-se por um esfriamento anormal nas águas superficiais do Oceano Pacífico Tropical. Alguns dos impactos de La Niña tendem a ser opostos aos de El Niño, mas nem sempre uma região afetada pelo El Niño apresenta impactos significativos no tempo e clima devido à La Niña. (Saiba Mais....)

Dados de La Niña

- Eventos Anteriores
- Efeitos Globais

Situação Atual

Monitoramento e Previsão

- Anom. TSM da última Semana
- Evol. Sem. Anom. TSM/Niño 12
- Evol. Sem. Anom. TSM/Niño 34
- Evol. Sem. Anom. TSM/Niño 4
- Evol. Anomalia TSM/IOS/Niño 3
- Temp. e Anom. Abaixo. Sup. Mar
- Evol. Mensal Anom. TSM
- Anom. TSM do último Mês
- Evol. dos Ult. El Niño e La Niña 3
- Evol. dos Ult. El Niño e La Niña 3,4
- Prev. para TSM do NCEP
- Anomalia TSM + Vento
- Anomalia PNM
- Anomalia ROL
- Anomalia Vento 850hPa
- Quick look

Os modelos dinâmicos e estatísticos de previsão oceânica indicam normalidade em relação ao fenômeno ENOS para os próximos meses.

Portal Energia - Microsoft Internet Explorer

Endereço: <http://www.cptec.inpe.br/energia/>

**Energia**  
Monitoramento Hidrometeorológico

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

Imagem de Satélite

Principais Bacias e Sub-Bacias do Brasil

Destaque de Mês

Os reservatórios do norte, como o de Tucuruí, apresentam volume útil inferior a 60%.

Perguntas Frequentes

- Podemos confiar na previsão climática (de longo prazo) para a região das Bacias Hidrográficas?
- De que forma a estiagem está relacionada com o problema da crise energética?
- Qual a ligação entre El Niño e chuvas na região das Bacias?

Envie sua Pergunta

Saiba Mais...

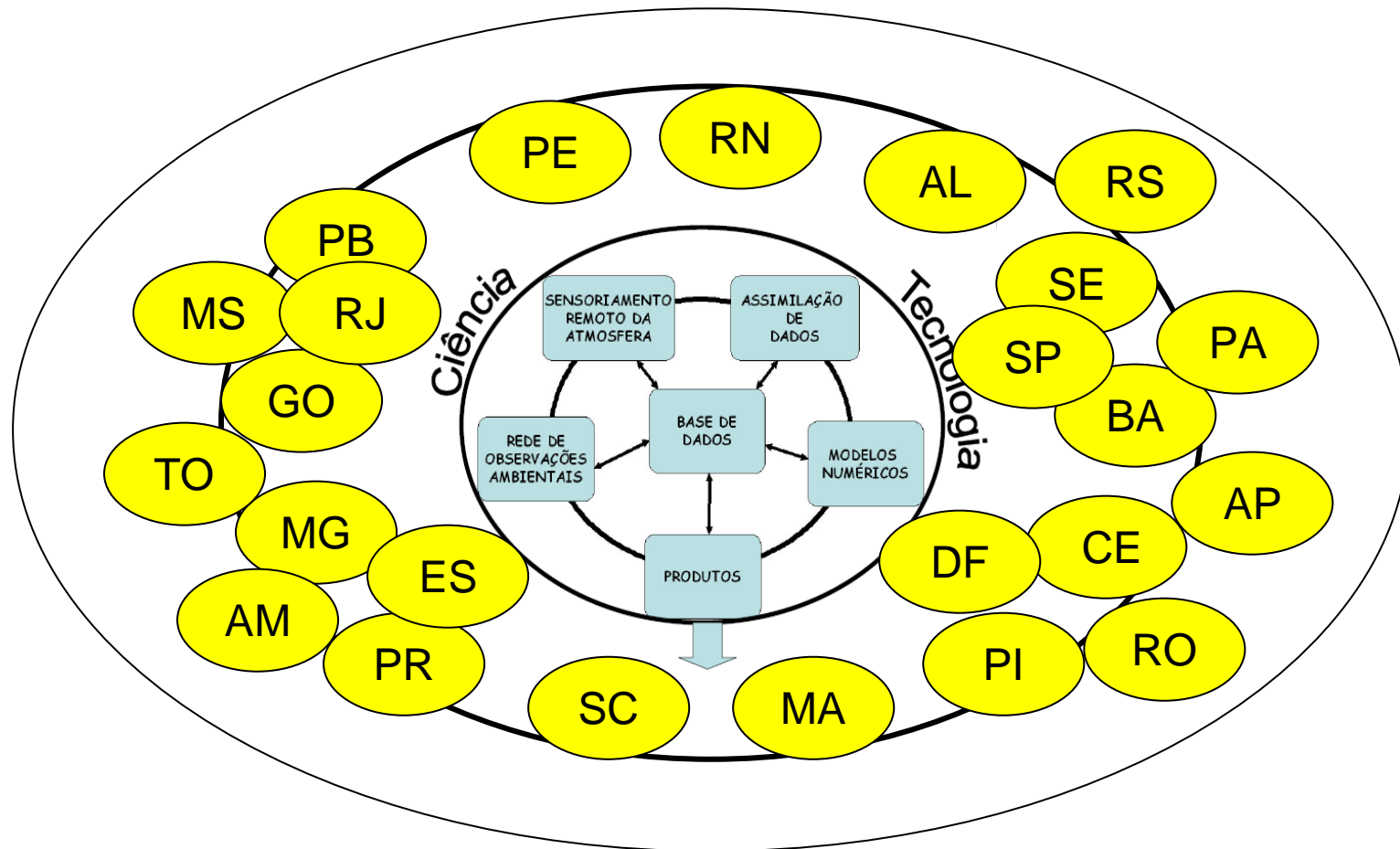
Informações climatológicas sobre a região

Desvios de Precipitação na Região Sudeste do Brasil

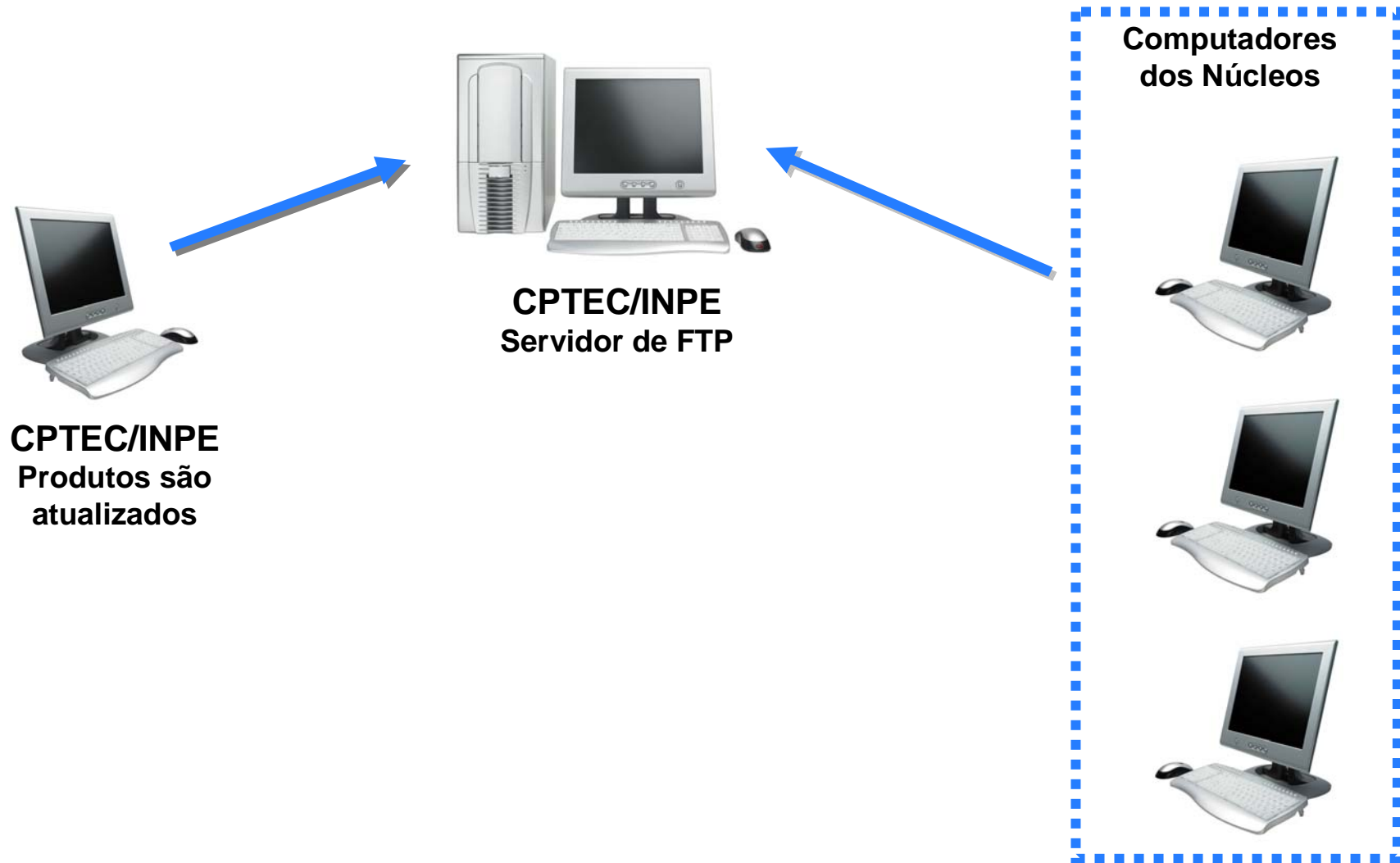
Destaque de Tempo

PANCADAS DE CHUVA EM GRANDE PARTE DO BRASIL

# State Bureaus of Meteorology in Brazil



# CPTEC's Data & Products Distribution Network





# WEB PAGES: State Bureaus of Meteorology

This collage displays a variety of web pages from state meteorology bureaus in Brazil. The pages include:

- TEMPO.AL**: A weather forecast page for Alagoas, featuring a satellite image and a forecast for the weekend of November 26-27, 2004.
- METEOROLOGIA**: The official website of the Government of Maranhão, showing a globe and navigation menus.
- SECTEC**: A page from the Secretariat of Science and Technology of Maranhão, listing various scientific and technological projects.
- FUNCEME**: The website of the Ceará State Meteorology Bureau, providing weather forecasts and a map of the state.
- ITEP**: A page from the Instituto Tecnológico de Pernambuco, focusing on environmental and technological news.
- SIMGE**: A page from the Instituto de Meteorologia de São Paulo, displaying weather forecasts and maps.
- SRH**: The website of the Superintendência de Recursos Hídricos de Pernambuco, providing information on water resources and hydrology.
- Epagri/Ciram**: A page from the Empresa Brasileira de Pesquisa Agropecuária, offering weather forecasts and agricultural information.
- Piauí**: A page from the Governo do Piauí, featuring news and information about the state.
- ASSECT**: A page from the Assessoria Especial para Assuntos de Ciência e Tecnologia de Mato Grosso do Sul, promoting a national week of science and technology.
- SRI**: The website of the Superintendência de Recursos Hídricos de Mato Grosso do Sul, providing information on water resources and hydrology.



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seasonal climate prediction  
Forum discussions demo in your  
computer, please access:

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