

Projeções de mudanças climáticas sobre São Paulo e a plataforma PROJETA



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PROJEÇÕES x PREVISÕES

Nas previsões, a partir de uma dada condição inicial, os modelos numéricos são utilizados para prever as condições de tempo ou climáticas num horizonte de tempo futuro.

Nas projeções, são incluídas suposições no futuro e os modelos são utilizados para representar o clima nestes cenários supostos, por exemplo, de diferentes taxas de emissão dos gases de efeito estufa ou diferentes forçantes radiativas (ex. RCP4.5W/m²).

O termo "projeção" é usado em dois sentidos na literatura sobre mudanças climáticas:

1- No uso geral, uma projeção pode ser considerada qualquer descrição do futuro e o caminho que leva a ela.

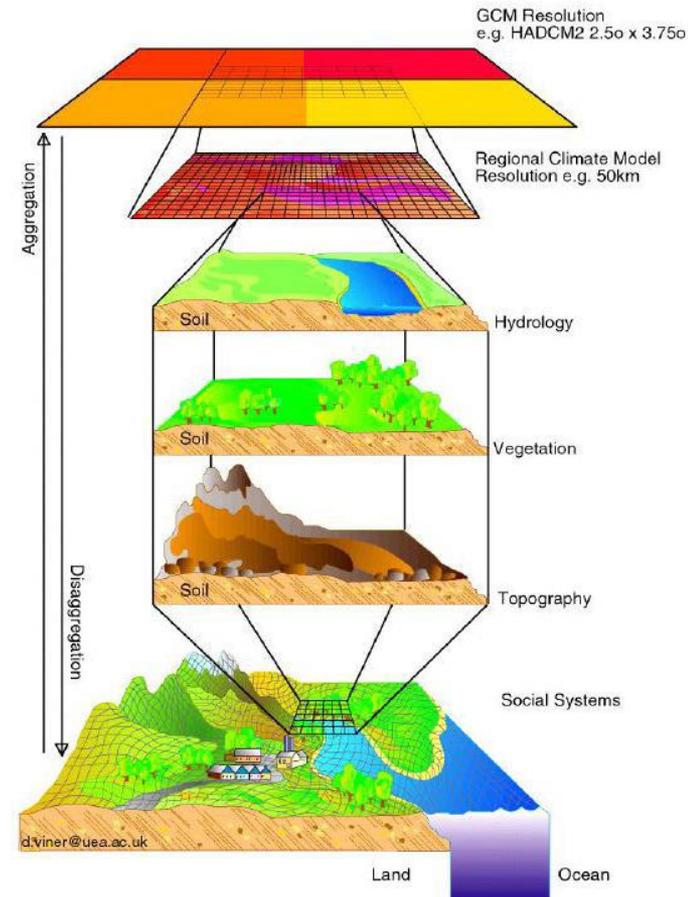
2- Uma interpretação mais específica foi anexada ao termo "projeção climática" pelo IPCC ao se referir a estimativas derivadas de modelos de clima futuro.

Projeções climáticas regionalizadas ?

Topografia, vegetação, solo e linha de costa são melhores representados com a regionalização.

Tomadores de decisão estão exigindo cada vez mais informações sobre o clima em escala regional ou local, além de querer entender os impactos da mudança climática em setores específicos.

Crucial para os estudos dos impactos porque se adapta melhor a resolução espacial/temporal desses setores: agricultura, segurança alimentar, hidrologia, recursos energéticos, economia, doenças e vulnerabilidade da população.



Experiência do INPE com Downscaling

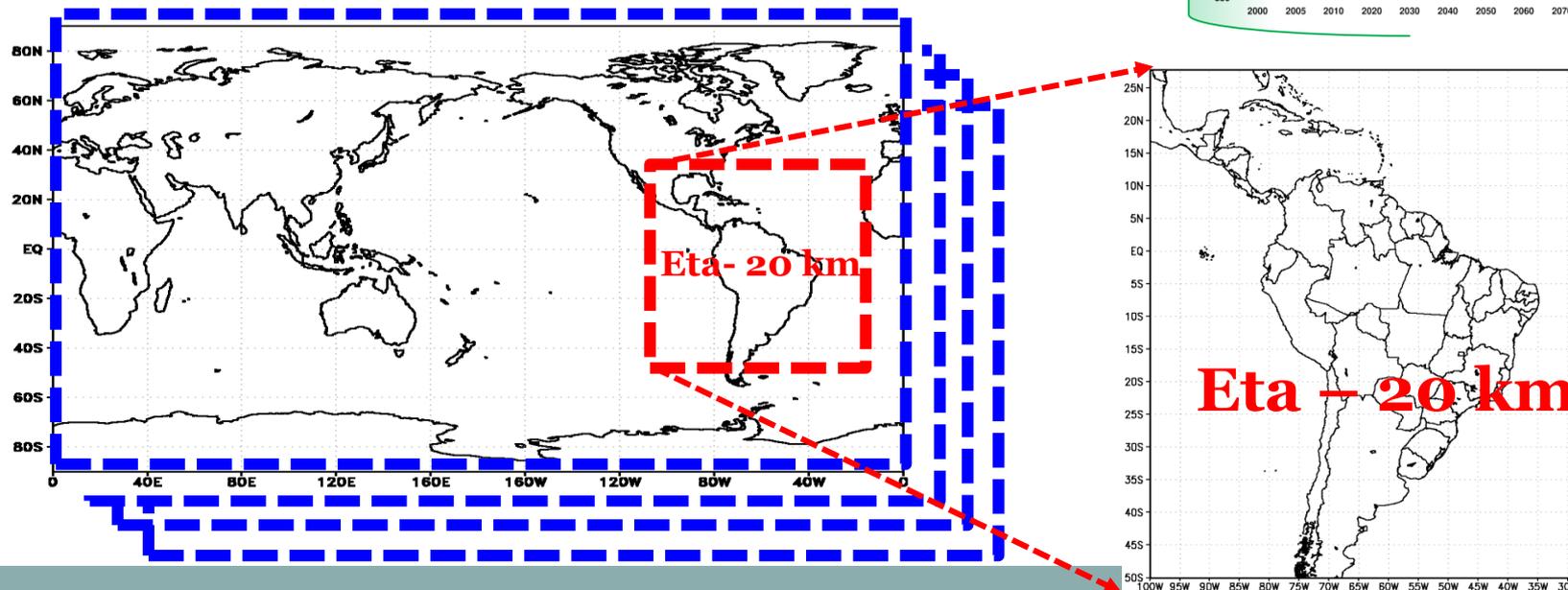
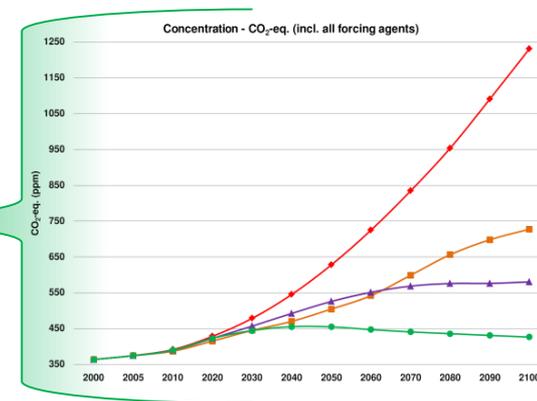
Apoio: da SAE, MMA e do MCTIC via PNUD

4 modelos globais como CC

1. HadGEM2-ES
2. MIROC5
3. BESM
4. CanESM2

2 cenários de emissão

1. RCP 4.5
2. RCP 8.5



Modelo Eta: 20km

Precipitação média 1961-1990 (mm/dia)

CRU x Eta-HadGEM2-ES x Eta-MIROC5 x Eta-CanESM2 x Eta-BESM

OBS
(CRU)

Eta-HadGEM2-ES

Eta-MIROC5

Eta-CanESM2

Eta-BESM

Precipitacao (mm/dia) CRU 0.5x0.5
Media Sazonal DJF (1961-1990)

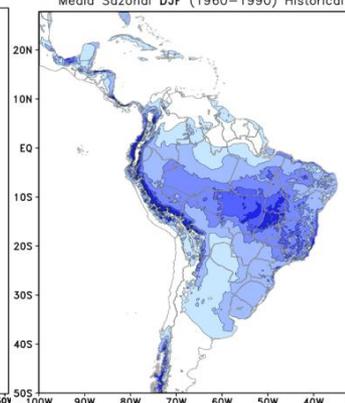
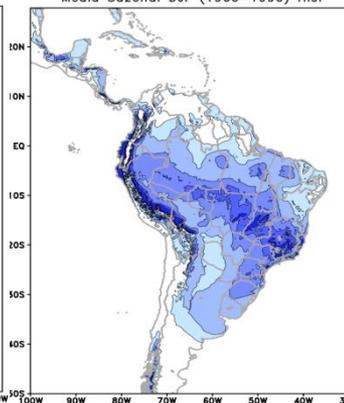
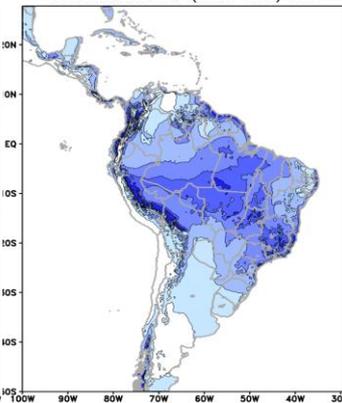
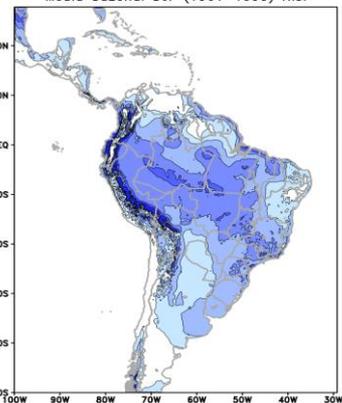
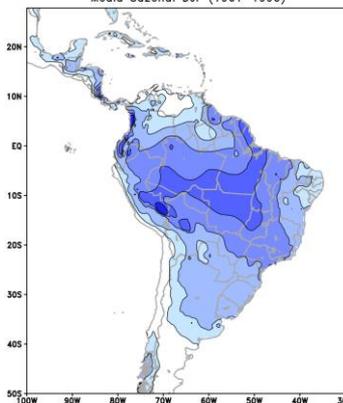
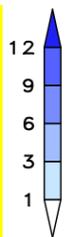
Precipitacao (mm/dia) Eta HadGEM2-ES 20km
Media Sazonal DJF (1961-1990) Hist

Precipitacao (mm/dia) Eta MIROC5 20km
Media Sazonal DJF (1961-1990) Hist

Precipitacao (mm/dia) Eta CanESM2 20km
Media Sazonal DJF (1960-1990) Hist

Precipitacao (mm/dia) Eta BESM 20km
Media Sazonal DJF (1960-1990) Historical

D
J
F



Precipitacao (mm/dia) CRU 0.5x0.5
Media Sazonal JJA (1961-1990)

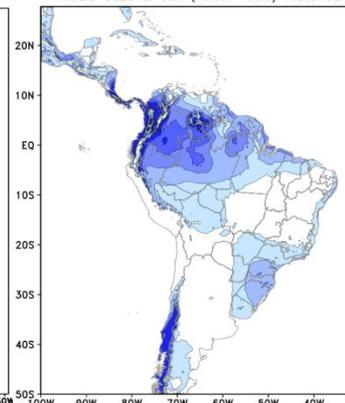
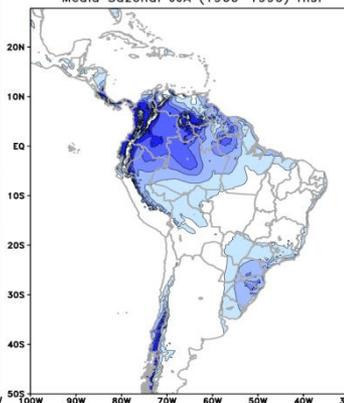
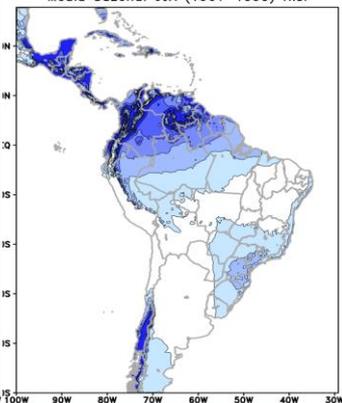
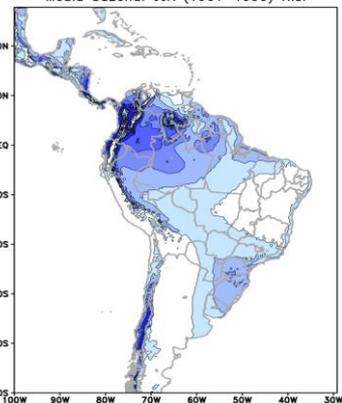
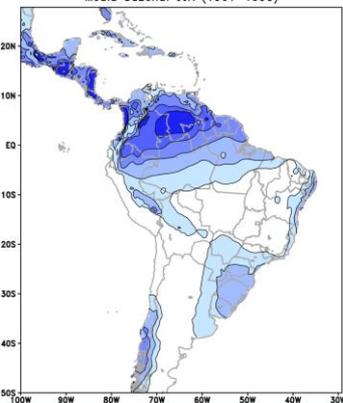
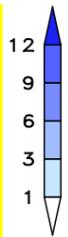
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Media Sazonal JJA (1961-1990) Hist

Precipitacao (mm/dia) Eta MIROC5 20km
Media Sazonal JJA (1961-1990) Hist

Precipitacao (mm/dia) Eta CanESM2 20km
Media Sazonal JJA (1960-1990) Hist

Precipitacao (mm/dia) Eta BESM 20km
Media Sazonal JJA (1960-1990) Historical

J
J
A



Modelo Eta: 20km

Temperatura média 1961-1990 (°C)

CRU x Eta-HadGEM2-ES x Eta-MIROC5 x Eta-CanESM2 x Eta-BESM

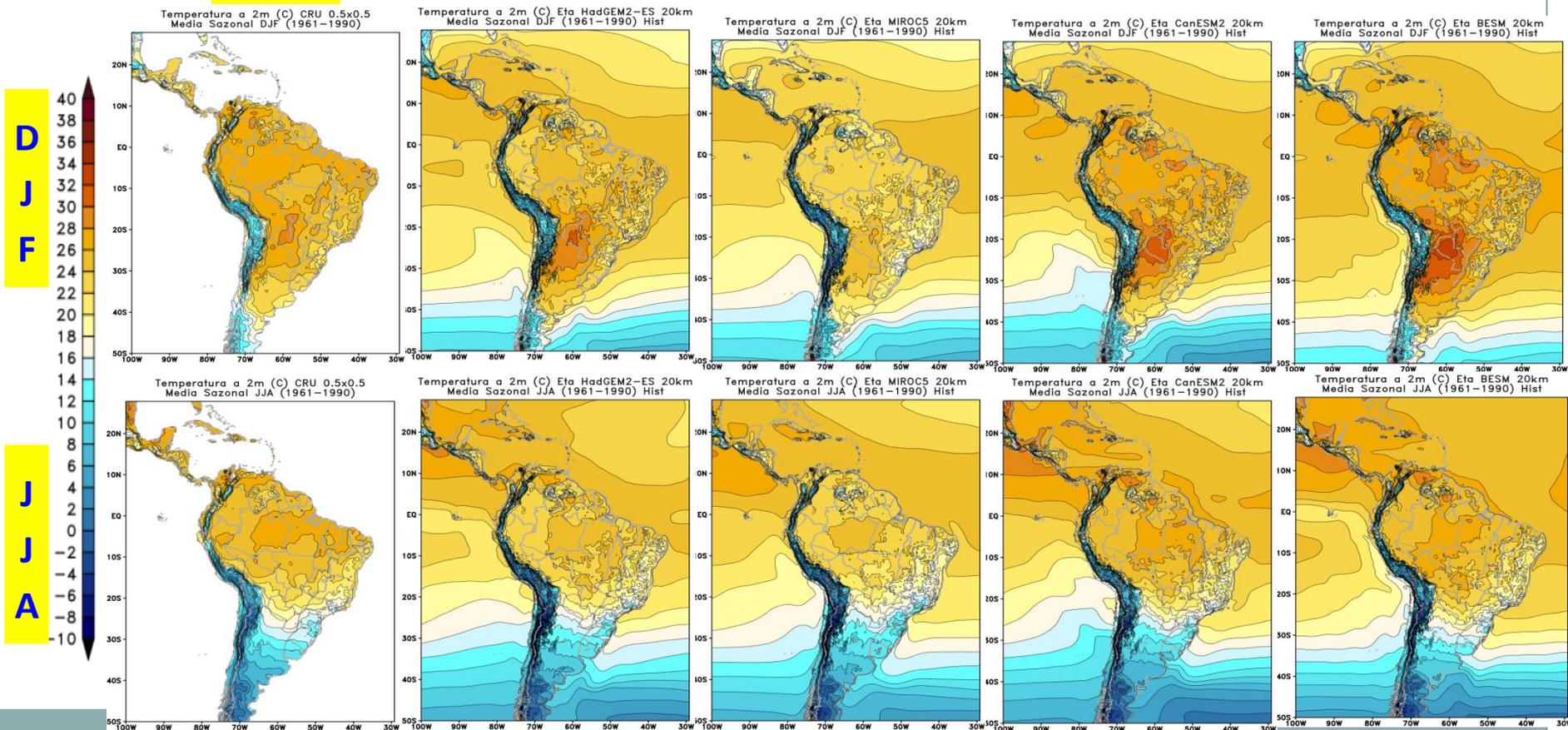
OBS
(CRU)

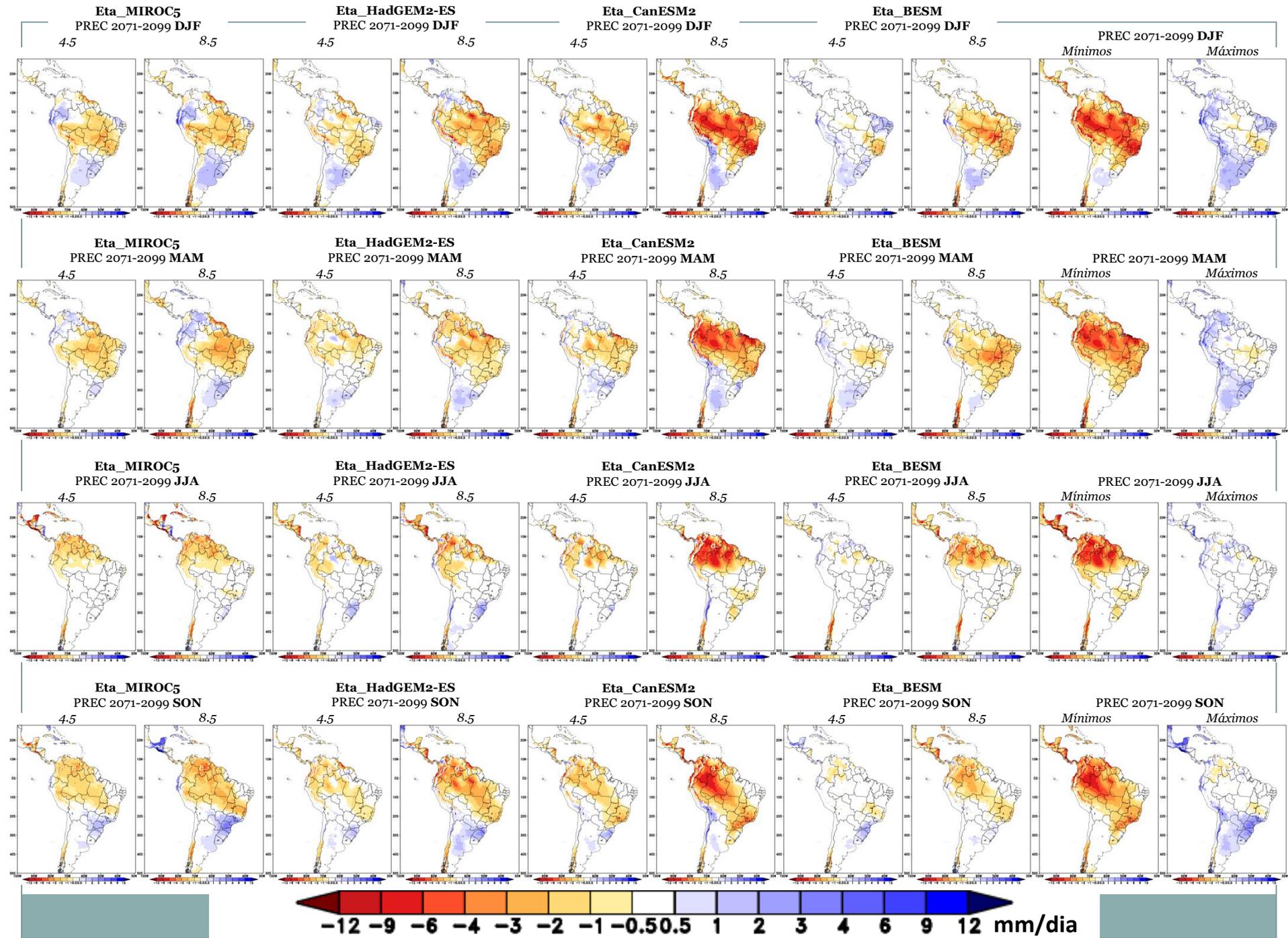
Eta-HadGEM2-ES

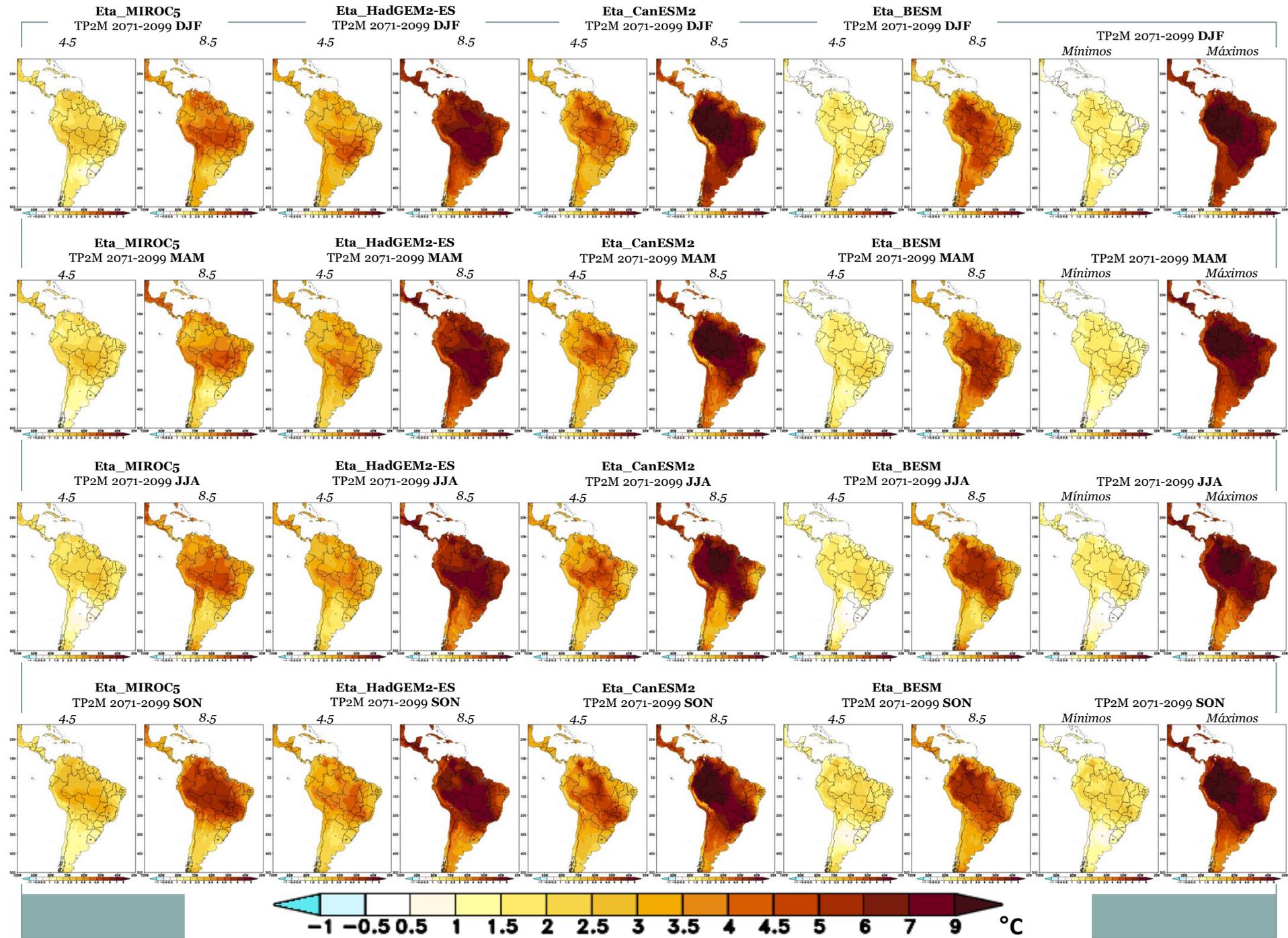
Eta-MIROC5

Eta-CanESM2

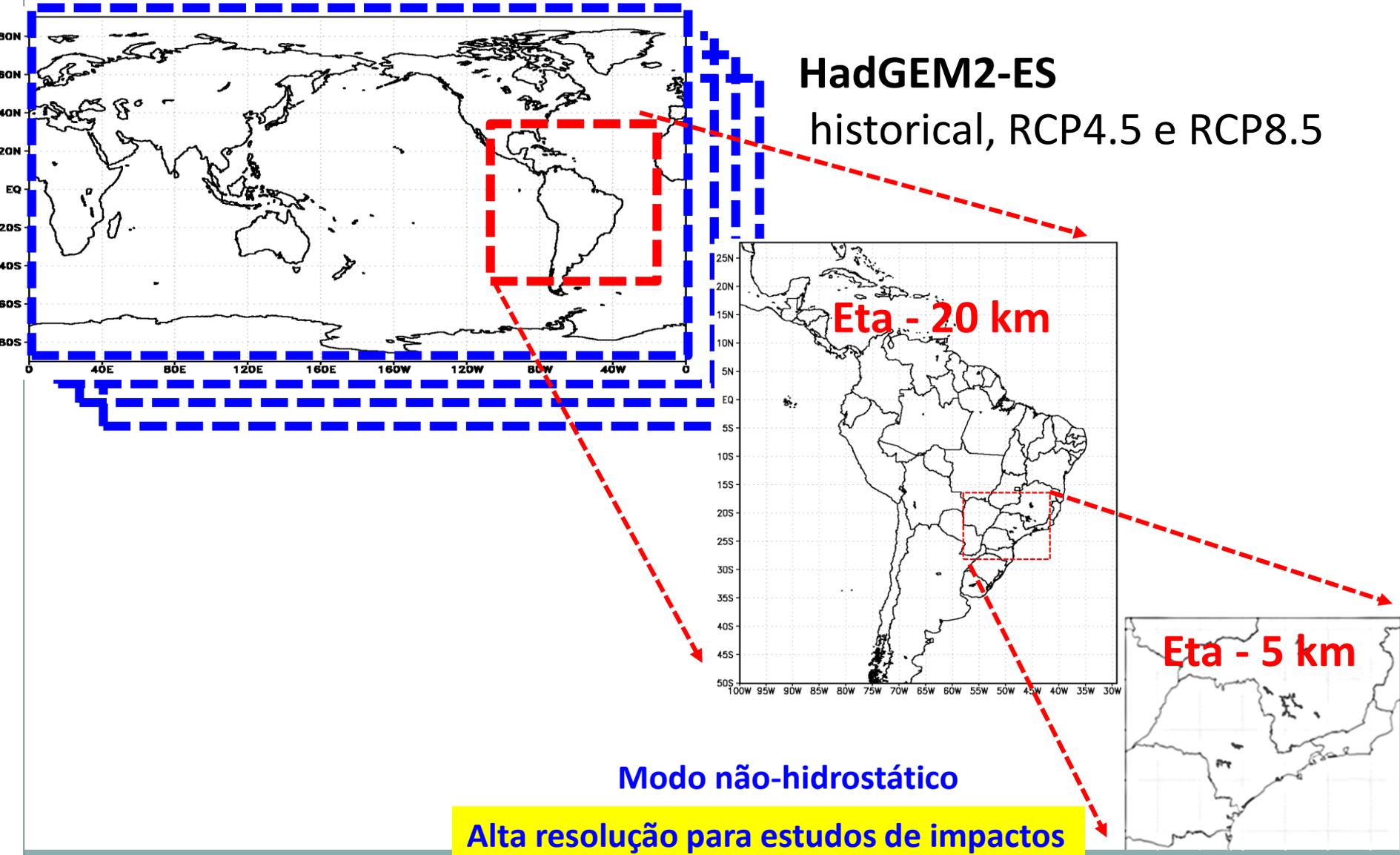
Eta-BESM







Downscaling dinâmico com o modelo Eta em alta resolução (5 KM) : Second level nesting

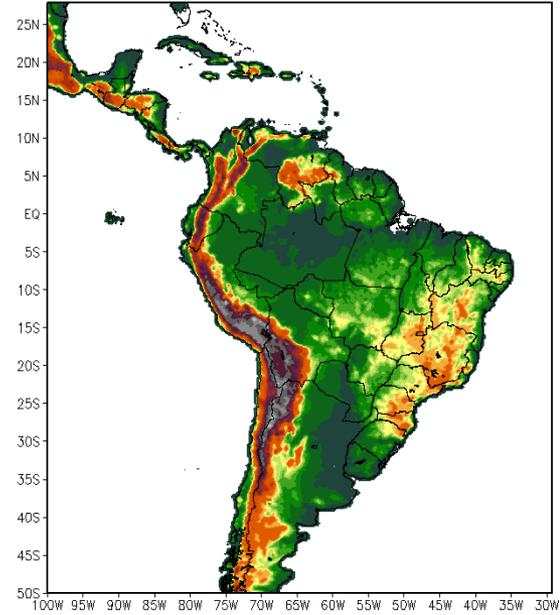
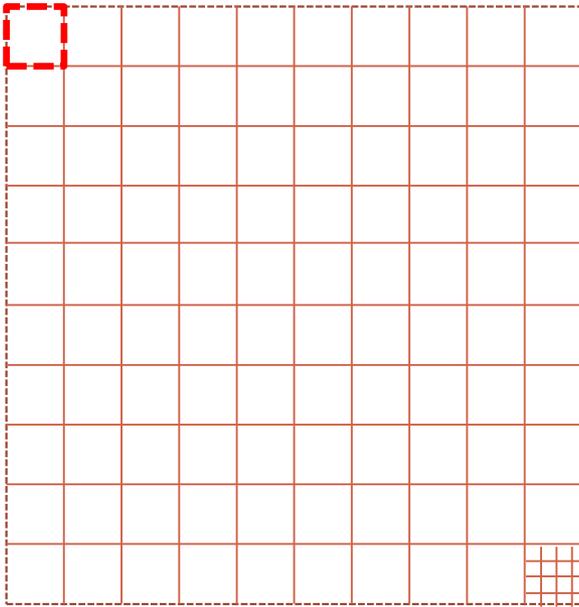


Modelos Climáticos Globais

200 km

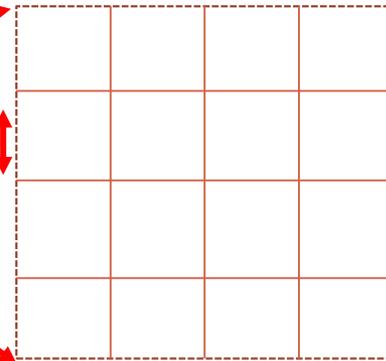
20 km

Modelo
Climático
Regional
Eta-INPE



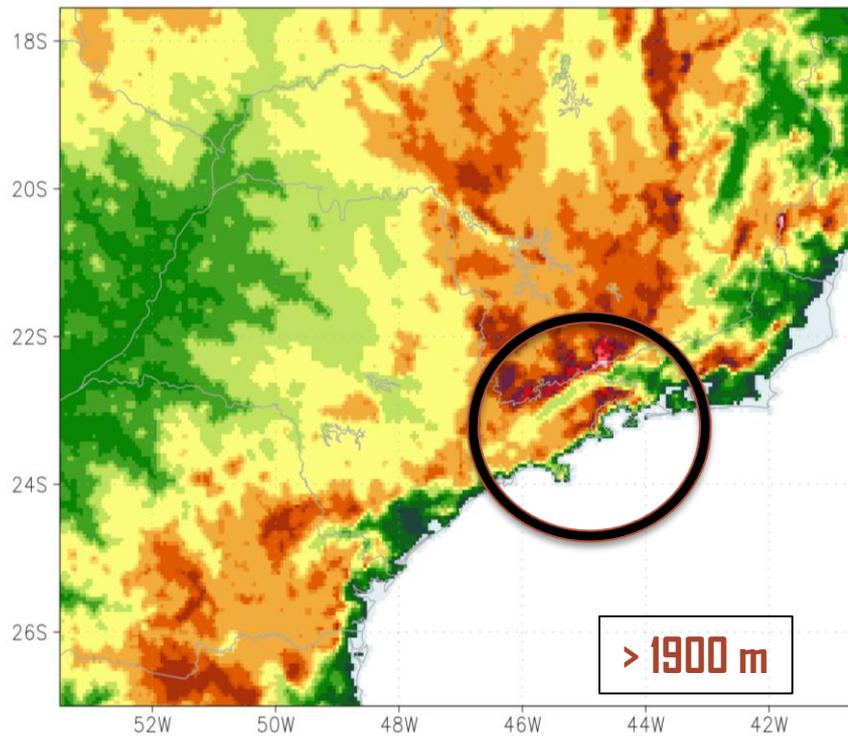
20 km

5 km

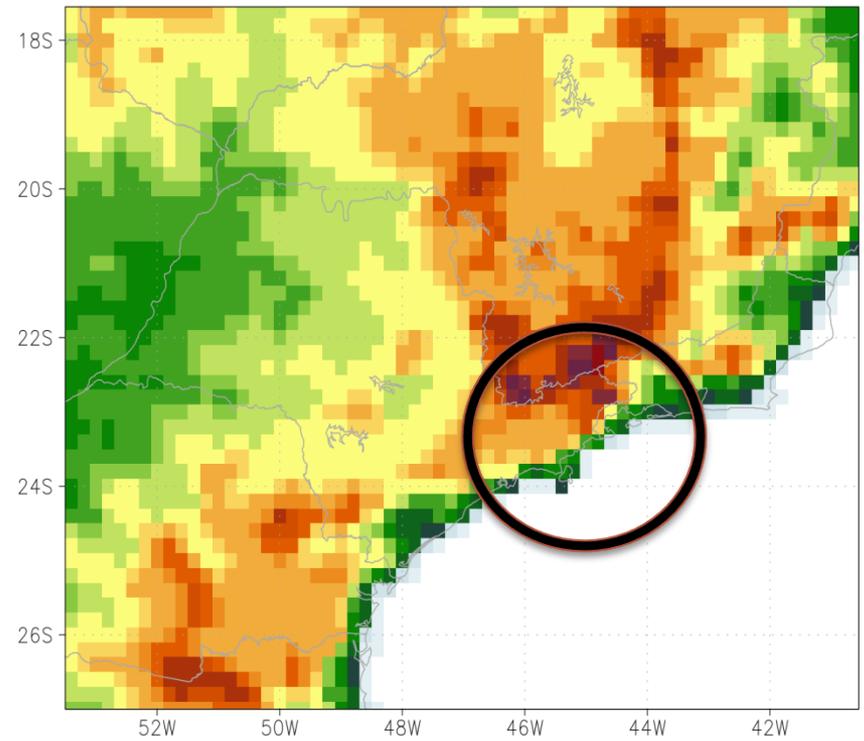


Topografia (m)

5 km



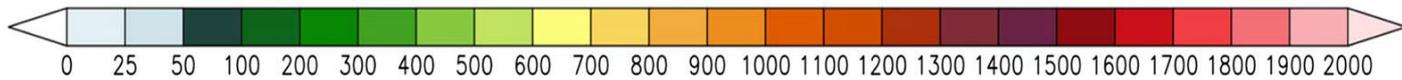
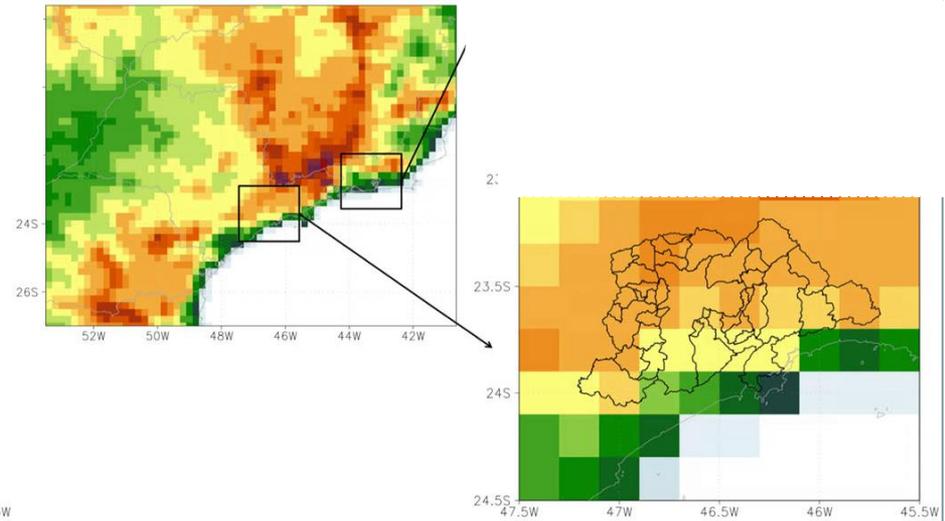
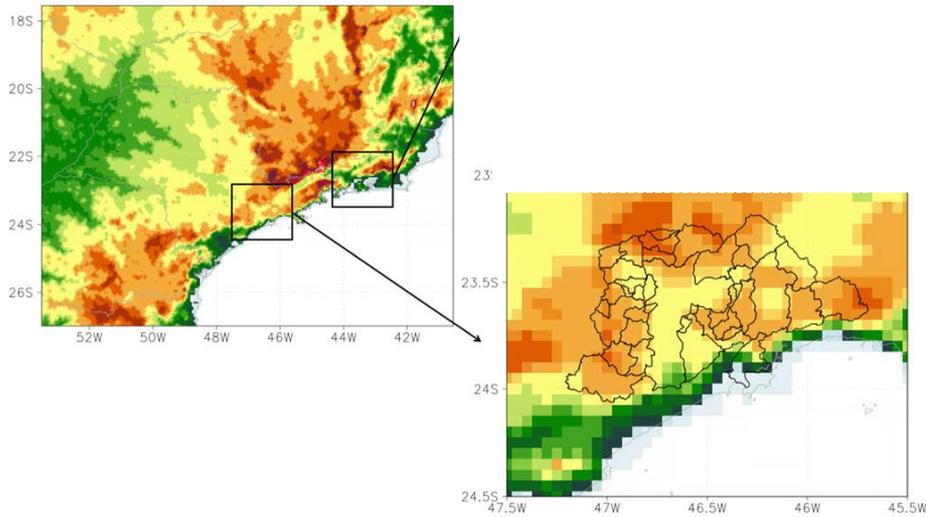
20 km



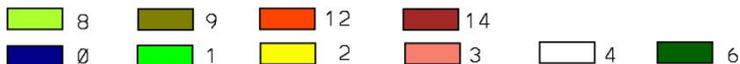
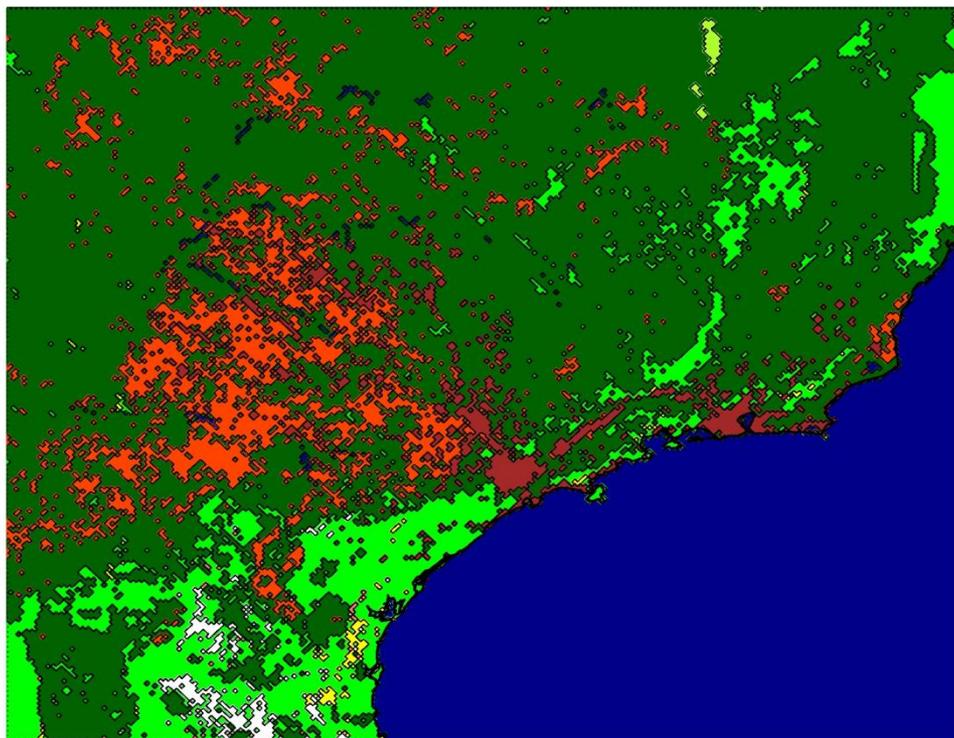
Topografia (m)

5 km

20 km



Vegetação



Índice	Classes de vegetação – Noah (DORMAN e SELLERS, 1989)
1	Árvores latifoliadas perenes
2	Árvores latifoliadas decíduas
3	Árvores latifoliadas/aciculadas
4	Árvores aciculadas perenes
5	Árvores aciculadas decíduas
6	Savana
7	Gramíneas e herbáceas, Cultivos
8	Arbustos latifoliados com cobertura herbácea perene
9	Arbustos latifoliados com solo exposto
10	Tundra
11	Solo exposto
12	Cultivos
13	Gelo
14	Urbano



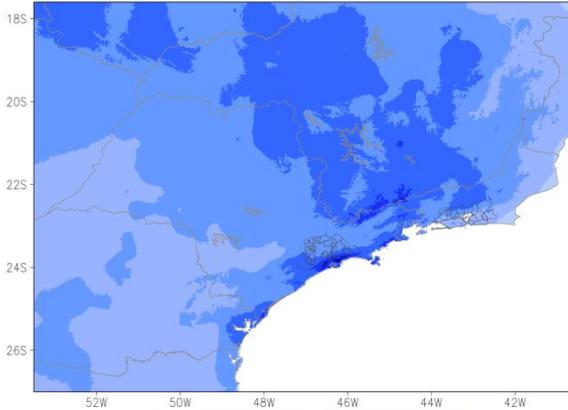
Mourão (2010) e Vieira et al. (2010)

CLIMA PRESENTE: Eta-5km – HadGEM2-ES

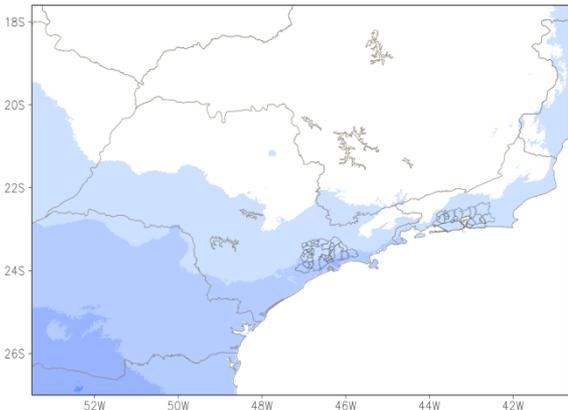
Precipitação (mm/dia)

Obs. WorldClim 1km

Precipitação (mm/dia) do WorldClimV1.4 30s
Média Sazonal DJF (1961–1990)

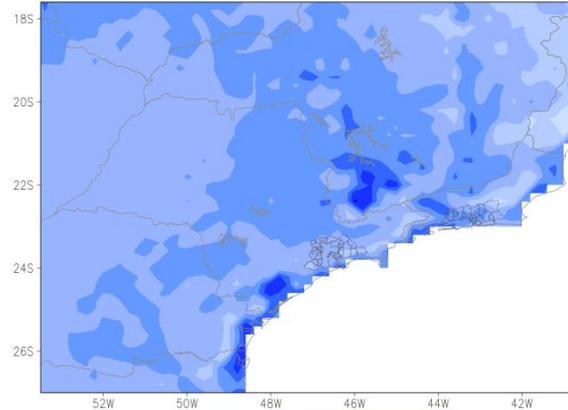


Precipitação (mm/dia) do WorldClimV1.4 30s
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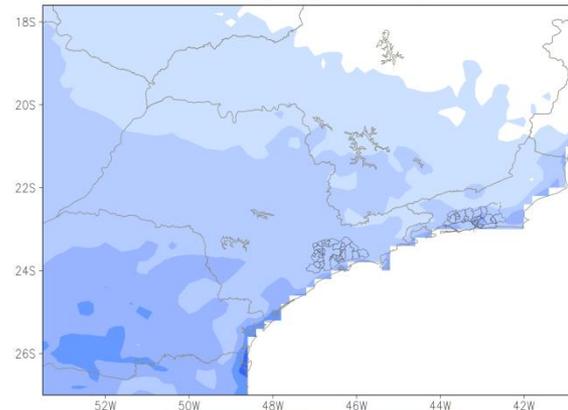


Eta-HadGEM2ES 20km

Precipitação (mm/dia) do Modelo Eta HadGEM2ES 20km
Média Sazonal DJF (1961–1990)

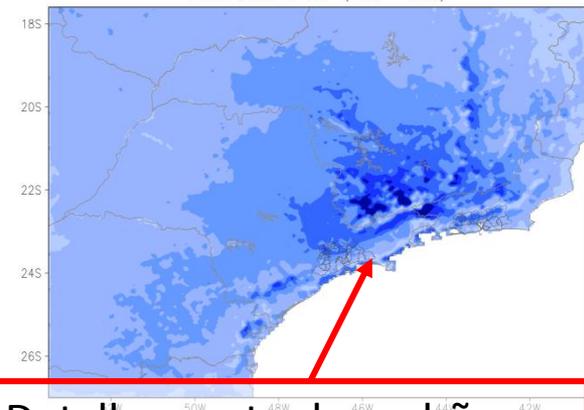


Precipitação (mm/dia) do Modelo Eta HadGEM2ES 20km
Média Sazonal JJA (1961–1990)



Eta-HadGEM2ES 5km

Precipitação (mm/dia) do Modelo Eta Eta-HadGEM2ES 5km
Média Sazonal DJF (1961–1990)



Detalhamento do padrão espacial das chuvas

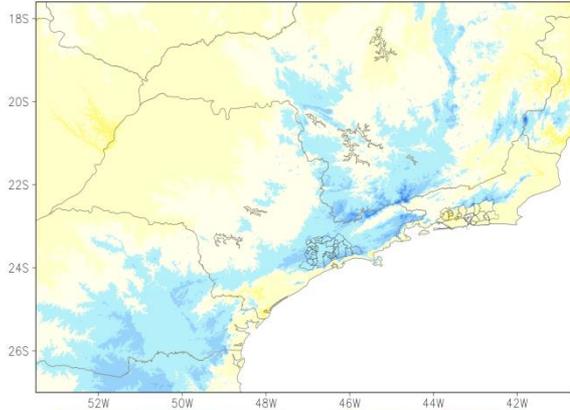


CLIMA PRESENTE: Eta-5km – HadGEM2-ES

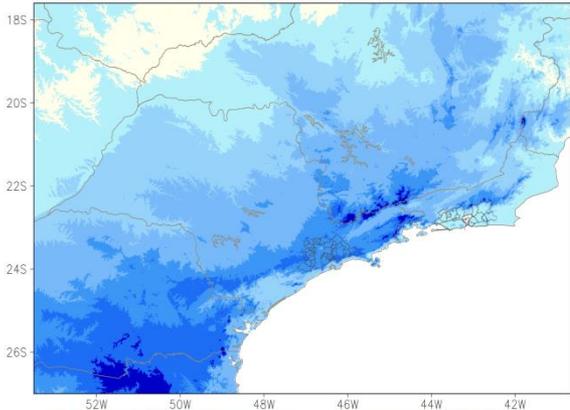
Temperatura (°C)

Obs. WorldClim 1km

Temperatura (C) do WorldClimV1.4 30s
Media Sazonal DJF (1961-1990)

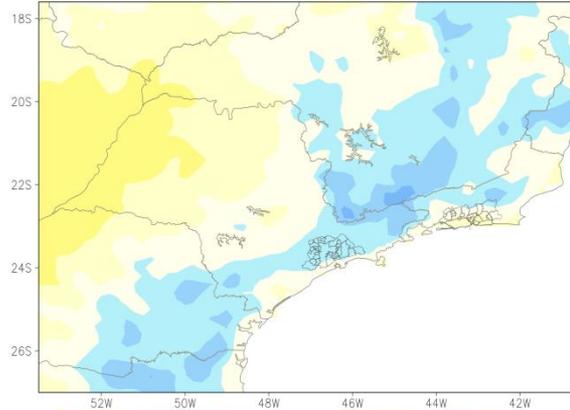


Temperatura (C) do WorldClimV1.4 30s
Media Sazonal JJA (1961-1990)

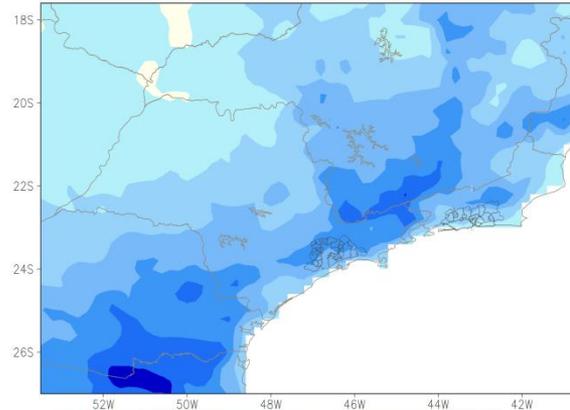


Eta-HadGEM2ES 20km

Temperatura (C) do Modelo Eta HadGEM2ES 20km
Media Sazonal DJF (1961-1990)



Temperatura (C) do Modelo Eta HadGEM2ES 20km
Media Sazonal JJA (1961-1990)



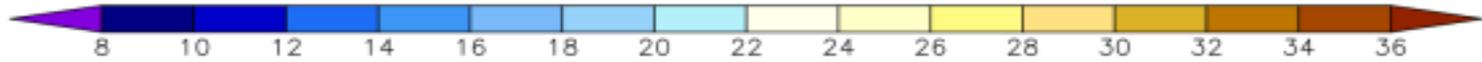
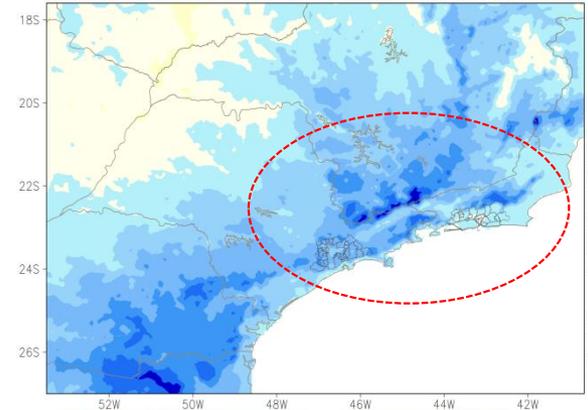
Eta-HadGEM2ES 5km

Temperatura (C) do Modelo Eta Eta-HadGEM2ES 5km
Media Sazonal DJF (1961-1990)



Mais detalhes,
concorda melhor
com observações

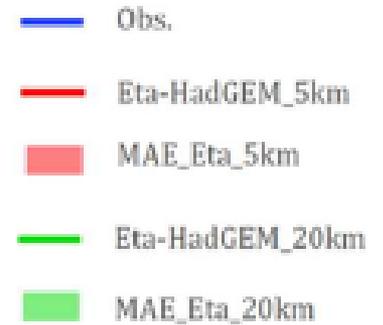
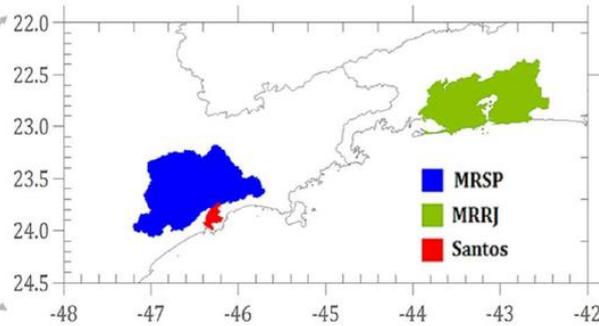
Temperatura (C) do Modelo Eta Eta-HadGEM2ES 5km
Media Sazonal JJA (1961-1990)



Eta 5km

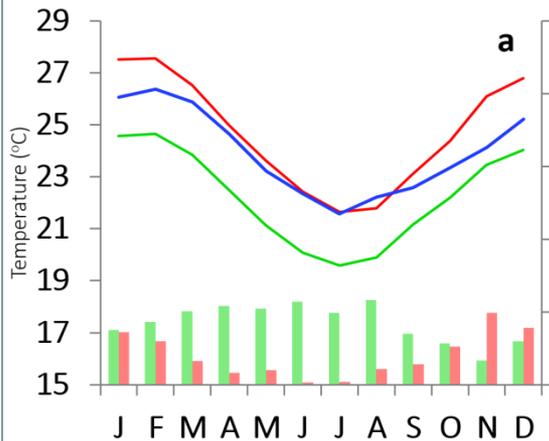


Eta - 5 km Non-hydrostatic

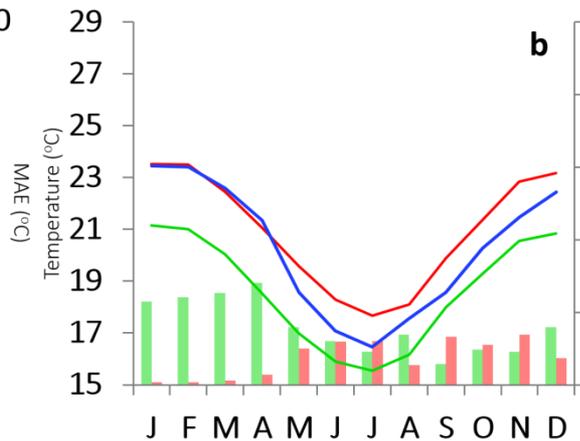


CLIMA PRESENTE: Ciclo Anual - Temperatura a 2 metros (°C)

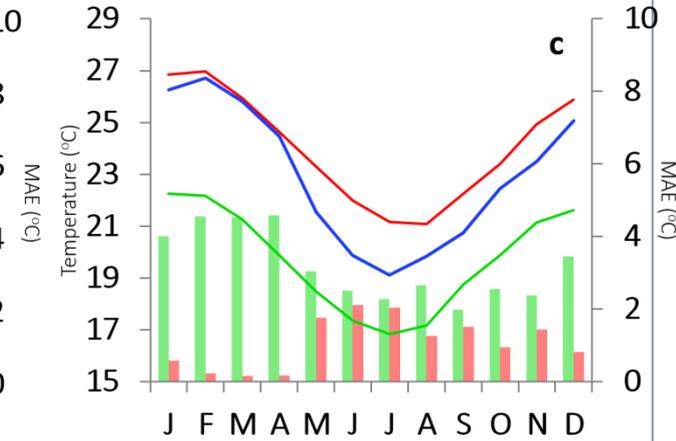
RMRJ



RMSP



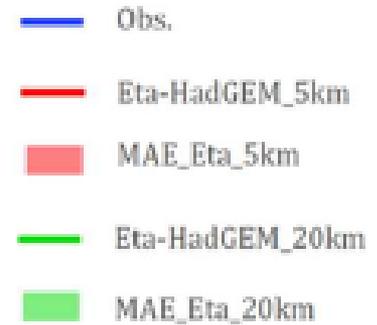
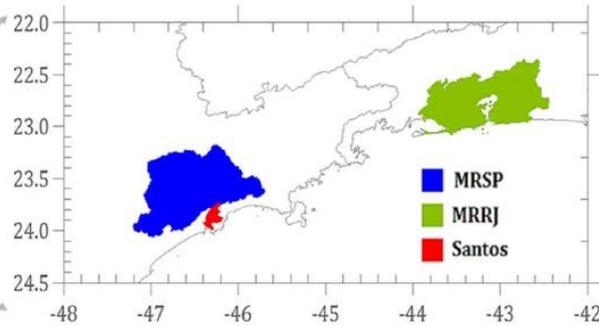
Santos



Eta 5km



Eta - 5 km Non-hydrostatic

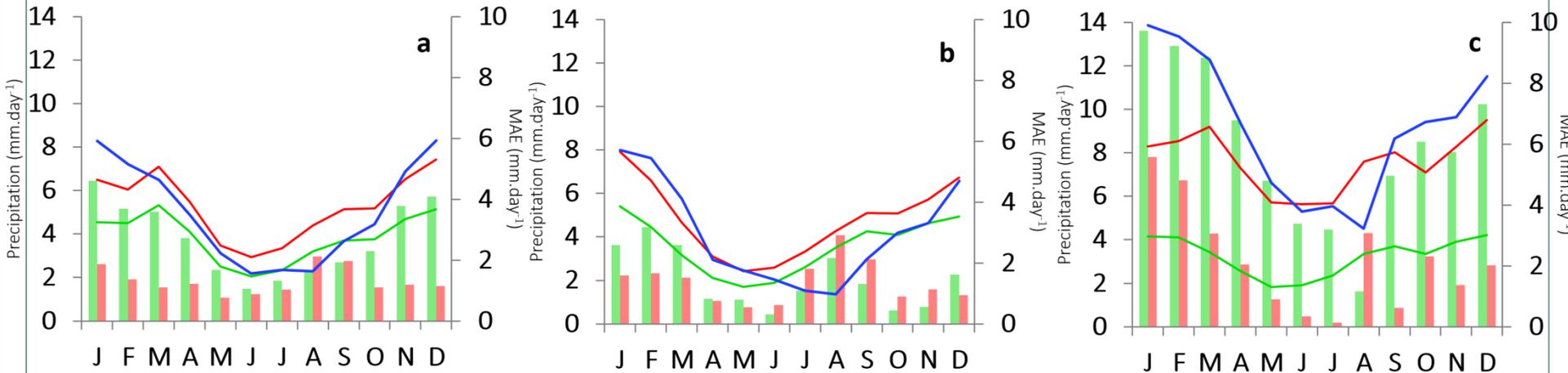


CLIMA PRESENTE: Ciclo Anual - Precipitação (mm/dia)

RMRJ

RMSP

Santos



Projeções climáticas – Eta 5km

DJF

Temperatura (°C)

JJA

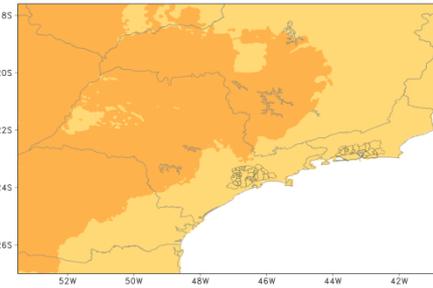
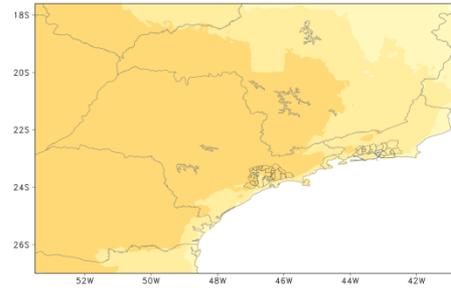
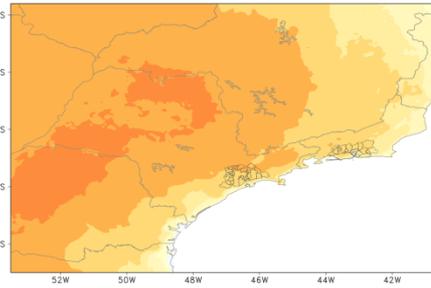
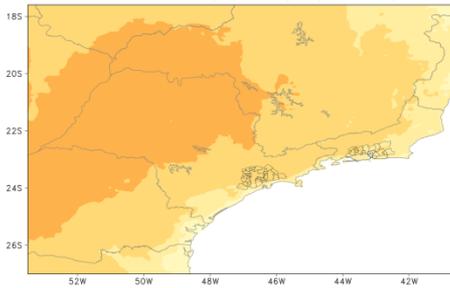
RCP4.5

RCP8.5

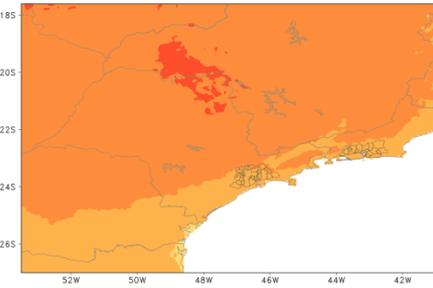
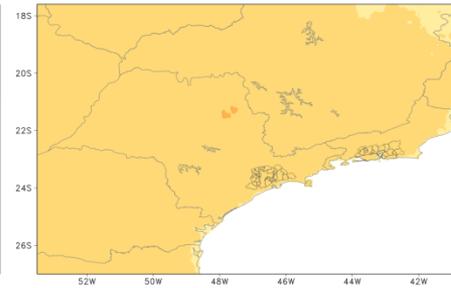
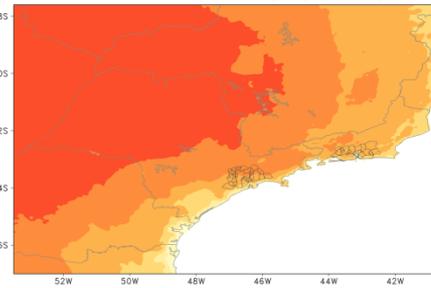
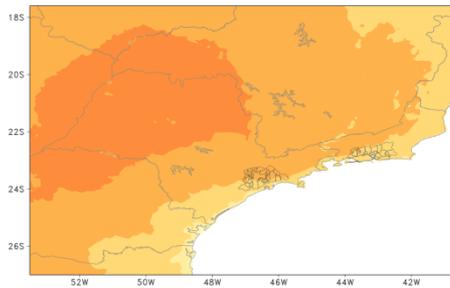
RCP4.5

RCP8.5

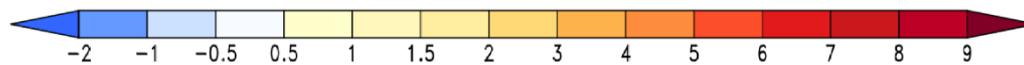
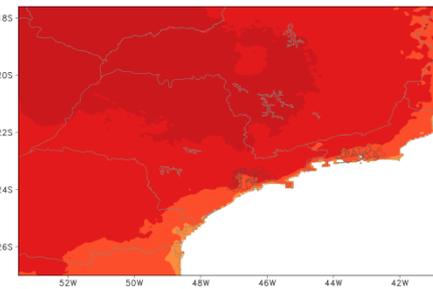
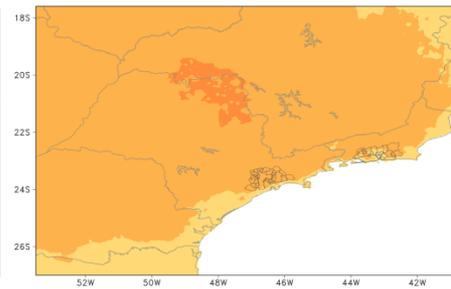
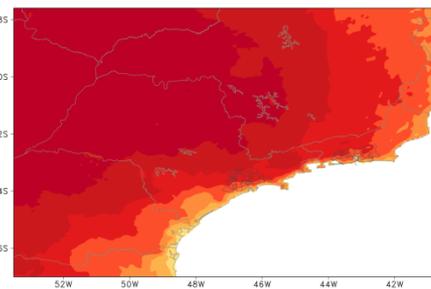
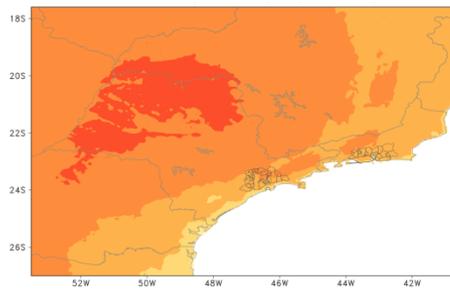
2011-2040



2041-2070



2071-2100



Projeções climáticas – Eta 5km

DJF

Precipitação (mm/dia)

JJA

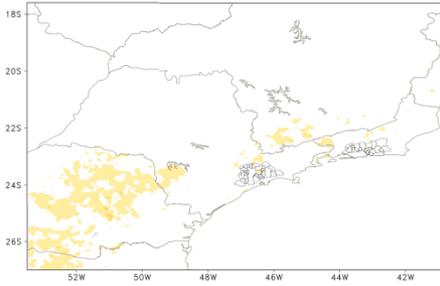
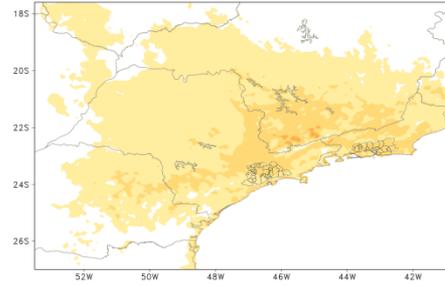
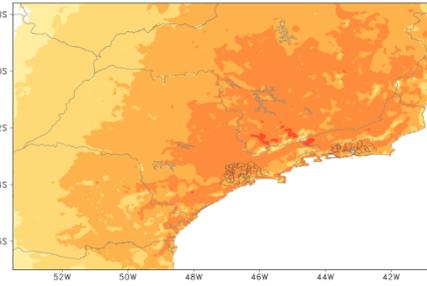
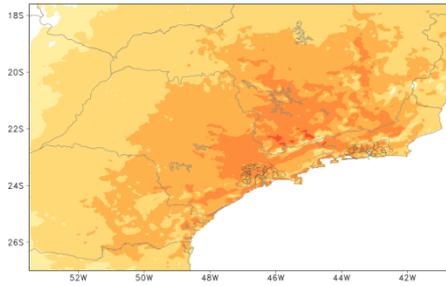
RCP4.5

RCP8.5

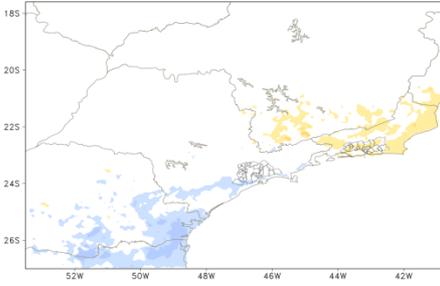
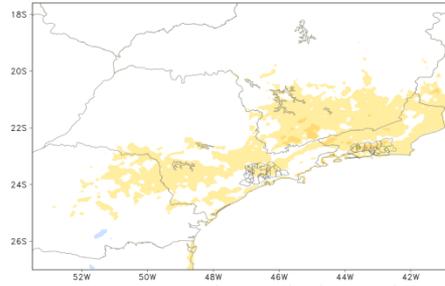
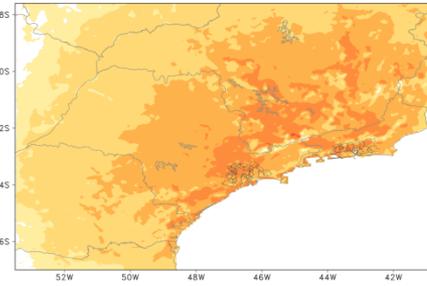
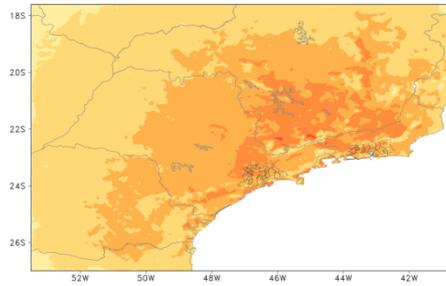
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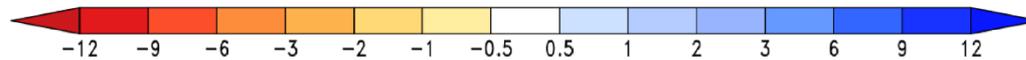
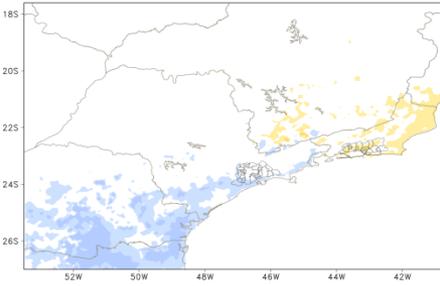
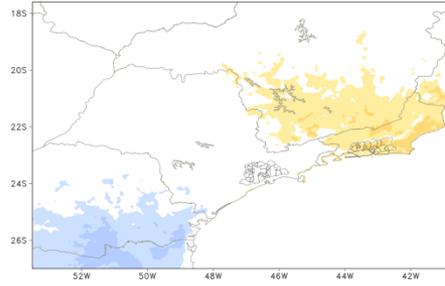
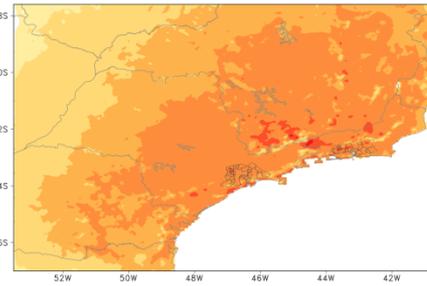
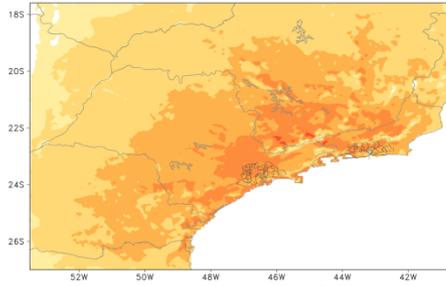
2011-2040



2041-2070



2071-2100



Projeções climáticas – Eta 5km

DJF

Temperatura (°C)

JJA

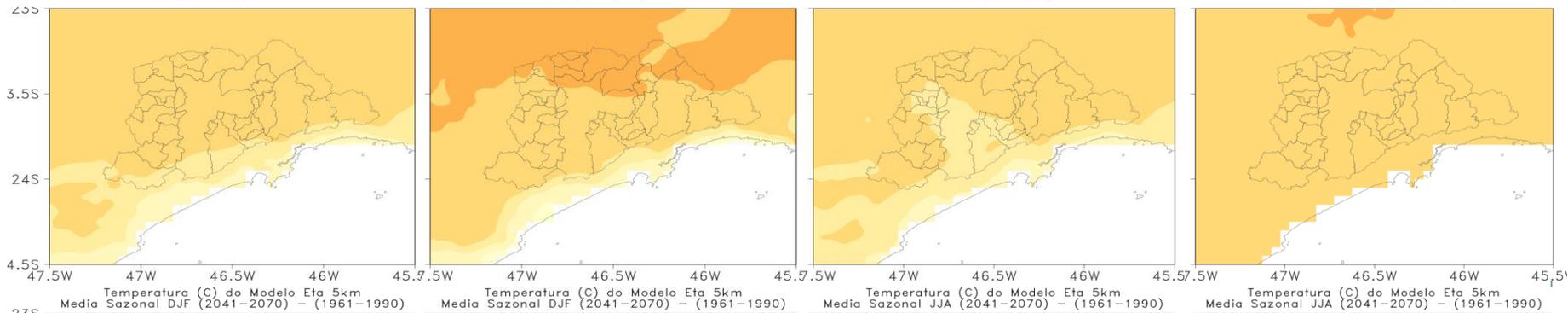
RCP4.5

RCP8.5

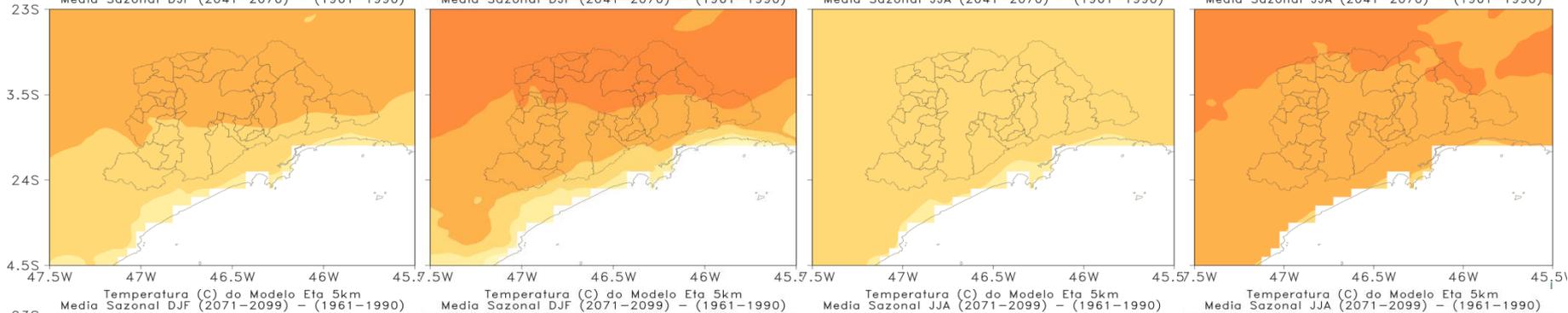
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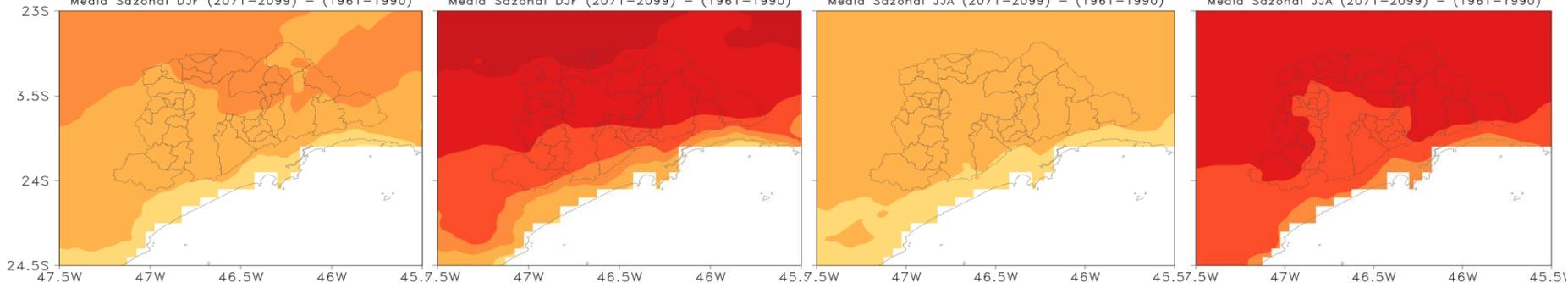
2011-2040



2041-2070



2071-2100



Projeções climáticas – Eta 5km

DJF

Precipitação (mm/dia)

JJA

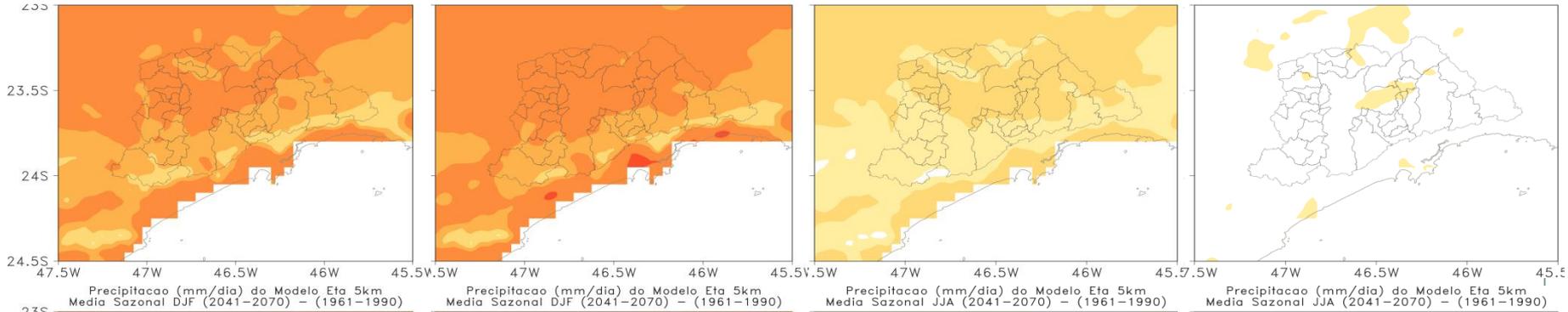
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RCP8.5

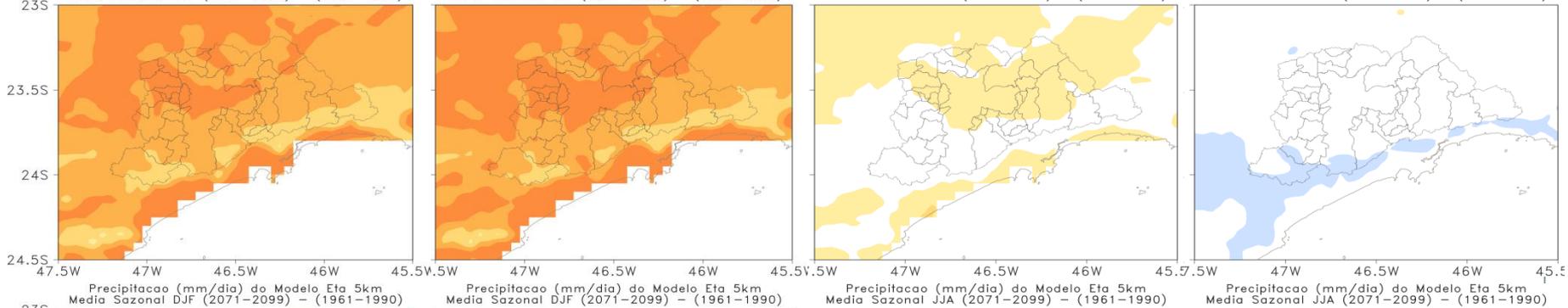
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RCP8.5

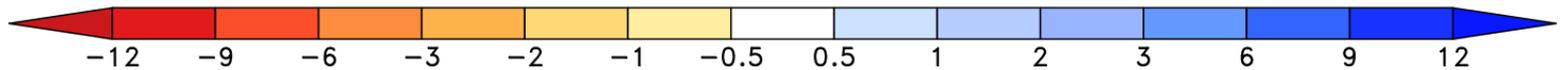
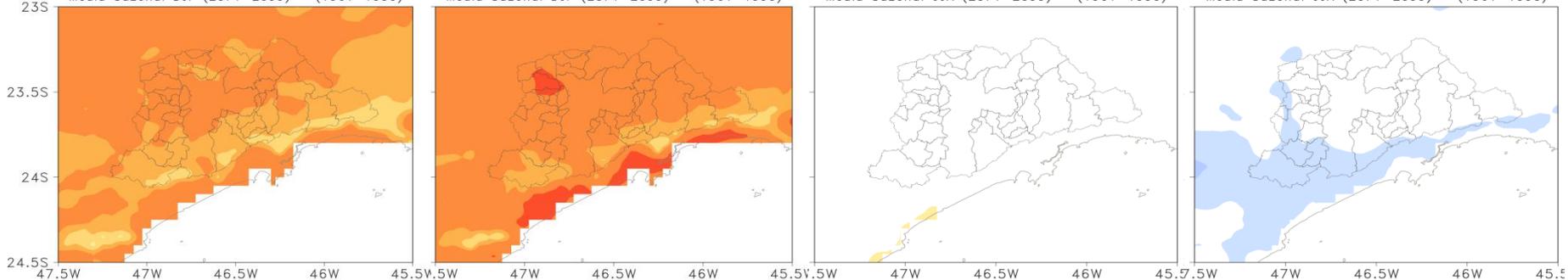
2011-2040



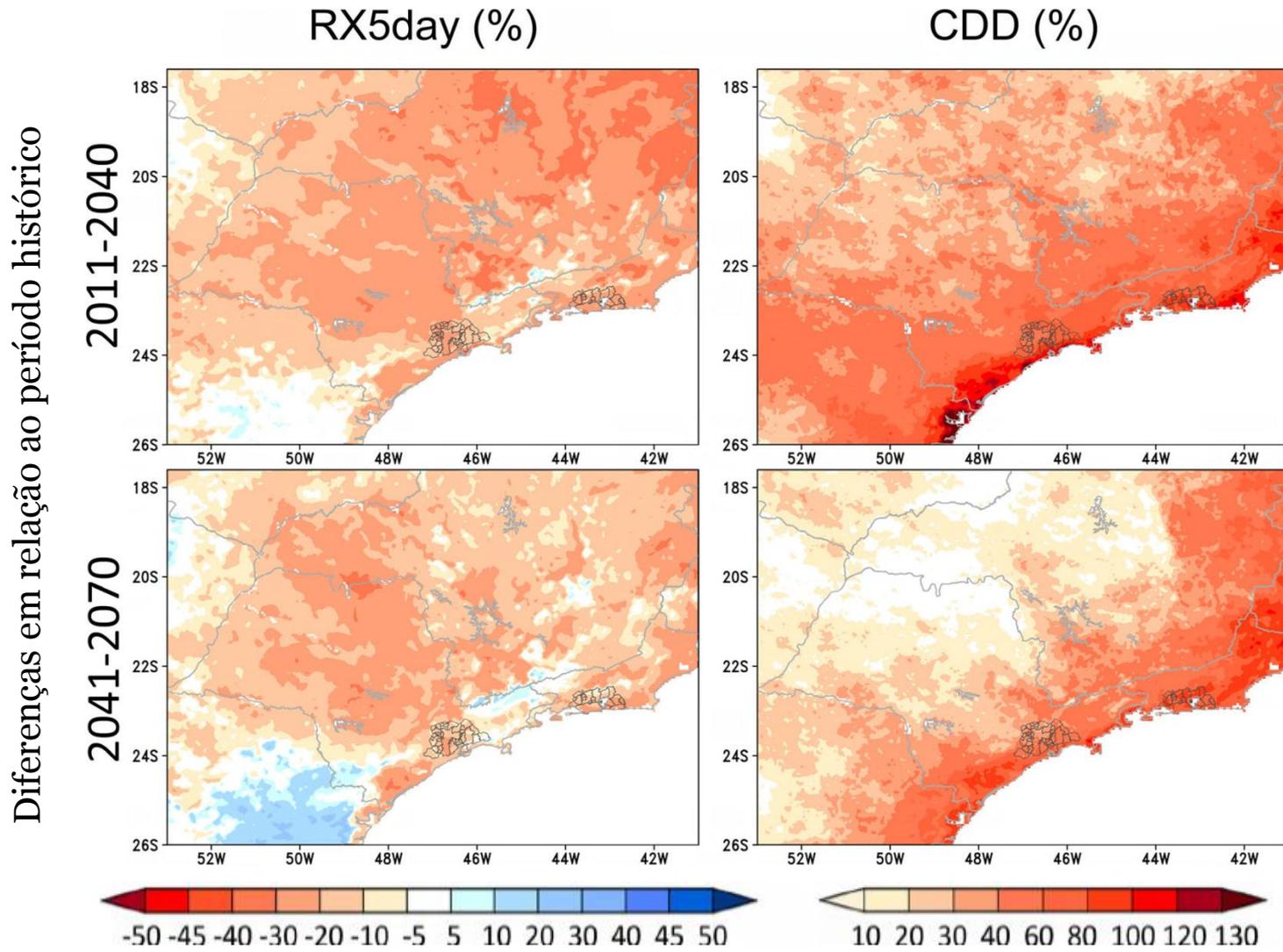
2041-2070



2071-2100



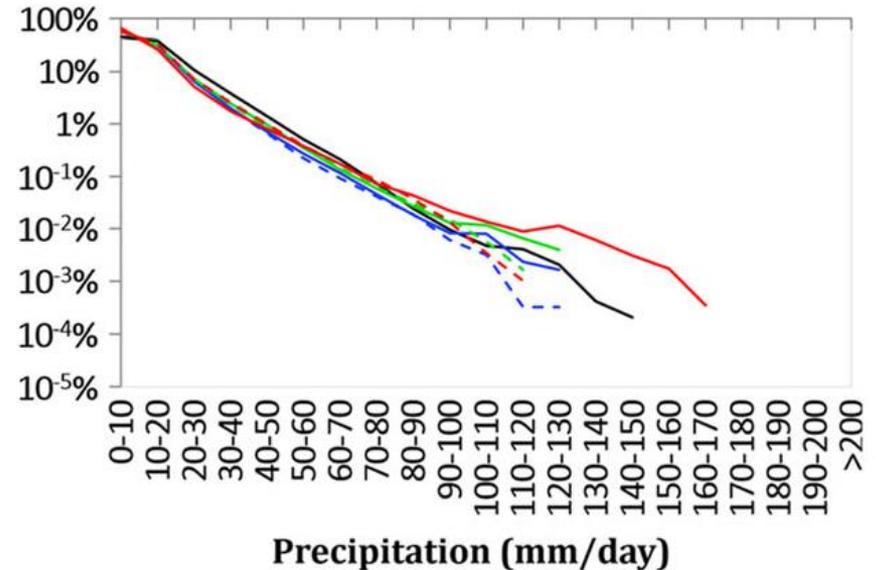
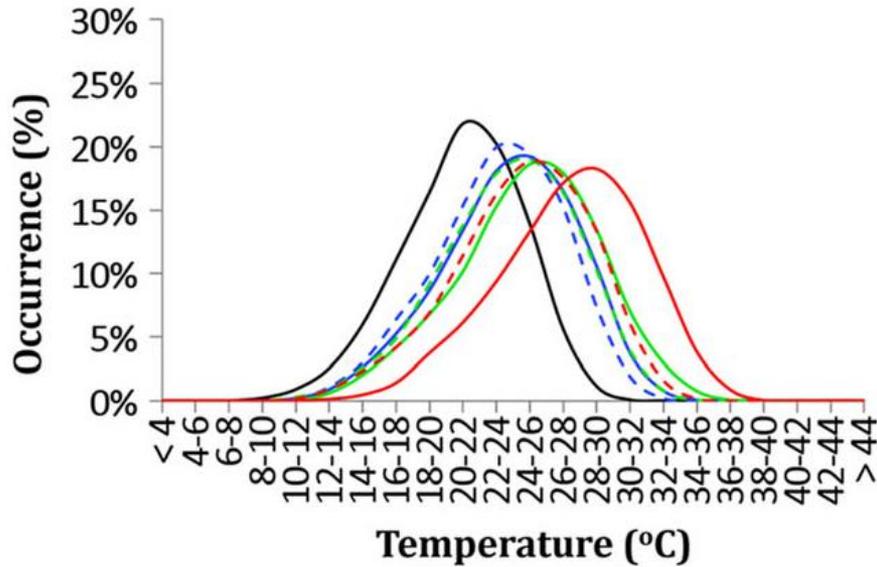
Projeções climáticas – Eta 5km



Projeções climáticas – Eta 5km

Distribuição de Frequência : 2011-2040, 2041-2070, 2071-2100

RMSP



— Eta-HadGEM_Historical - - - Eta-HadGEM_2011-2040_RCP4.5 - - - Eta-HadGEM_2041-2070_RCP4.5 - - - Eta-HadGEM_2071-2100_RCP4.5
— Eta-HadGEM_2011-2040_RCP8.5 — Eta-HadGEM_2041-2070_RCP8.5 — Eta-HadGEM_2071-2100_RCP8.5

Disponibilidade dos dados

O conjunto de dados está sendo disponibilizado através da plataforma **PROJETA** do INPE.



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



Realização do Programa Políticas sobre Mudança do Clima – PoMuC, iniciativa do Ministério do Meio Ambiente (MMA) em parceria com o Ministério Federal do Meio Ambiente, Proteção da Natureza e Segurança Nuclear (BMU) da Alemanha, com o apoio técnico da Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH. Executado pelo grupo de computação da Universidade de Passo Fundo (UPF) e meteorologia do Instituto Nacional de Pesquisas Espaciais (INPE) através do Centro de Gestão de Pesquisa, Desenvolvimento e Inovação (CGPDI).

Iniciativa:



Apoio:

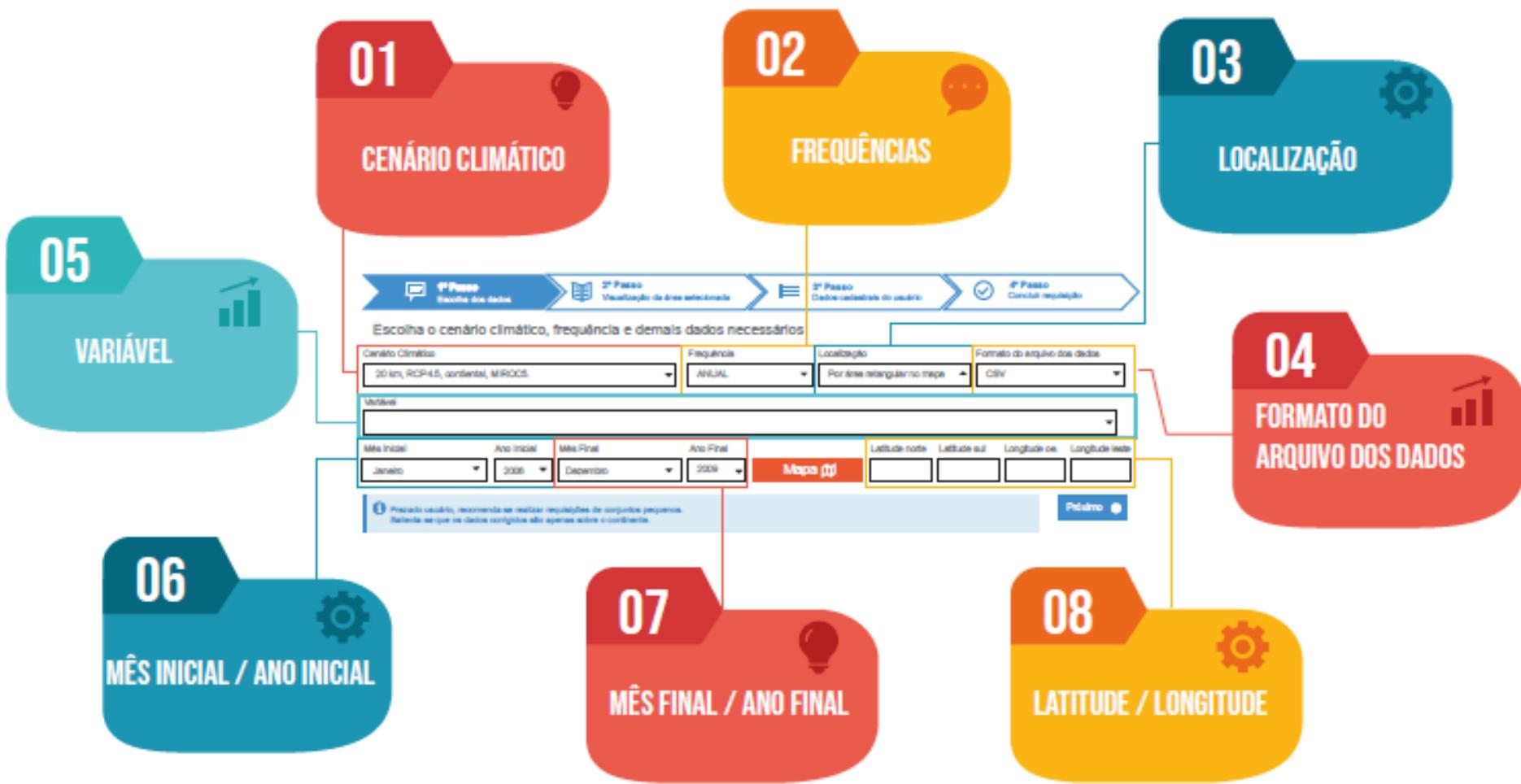




PROJEÇÕES DE MUDANÇA DO CLIMA PARA A AMÉRICA DO SUL REGIONALIZADAS PELO MODELO ETA

Objetivos:

- Automatização do processo de extração e disponibilização dos dados das projeções climáticas regionalizadas para Brasil, geradas pelo CPTEC/INPE.
- Permitir o acesso amplo e irrestrito a diversos parâmetros climáticos disponíveis.
- Atender as demandas dos usuários por acesso aos dados das projeções climáticas, tratados e compatíveis com programas e plataformas de análises setoriais.





PROJEÇÕES DE MUDANÇA DO CLIMA PARA A AMÉRICA DO SUL REGIONALIZADAS PELO MODELO ETA

REFERÊNCIAS:

"Dados gerados pelo CPTEC/INPE e disponibilizados na Plataforma PROJETA"

1. Chou, S.C, Lyra, A., Mourão, C., Dereczynski, C., Pilotto, I., Gomes, J., Bustamante, J., Tavares, P., Silva, A., Rodrigues, D., Campos, D., Chagas, D., Sueiro, G., Siqueira, G., Nobre, P. and Marengo, J. (2014) Evaluation of the Eta Simulations Nested in Three Global Climate Models. American Journal of Climate Change, 3, 438-454. doi:10.4236/ajcc.2014.35039.
2. Chou, S.C, Lyra, A., Mourão, C., Dereczynski, C., Pilotto, I., Gomes, J., Bustamante, J., Tavares, P., Silva, A., Rodrigues, D., Campos, D., Chagas, D., Sueiro, G., Siqueira, G. and Marengo, J. (2014) Assessment of Climate Change over South America under RCP 4.5 and 8.5 Downscaling Scenarios. American Journal of Climate Change, 3, 512-527. doi: 10.4236/ajcc.2014.35043.
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4. Terceira Comunicação Nacional do Brasil à Convenção-Quadro das Nações Unidas sobre Mudança do Clima (2016).

Obrigado !



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