National Institute for Space Research – INPE
Earth System Science Center – CCST

PROJECTIONS OF CLIMATE CHANGE FOR THE MEGACITIES OF SÃO PAULO AND RIO DE JANEIRO

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Ministério da
Ciência e Tecnologia

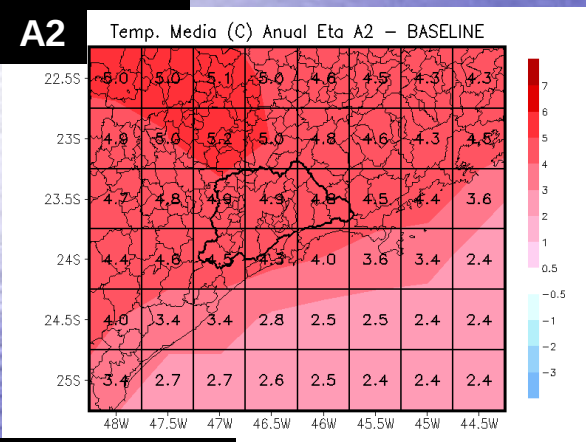
BRASIL
UM PAÍS DE TODOS
GOVERNO FEDERAL

METROPOLITAN REGION OF SÃO PAULO

Anomalies of Mean Annual Temperature (ºC)
2071-2100 minus 1961-1990

Eta Model

A2



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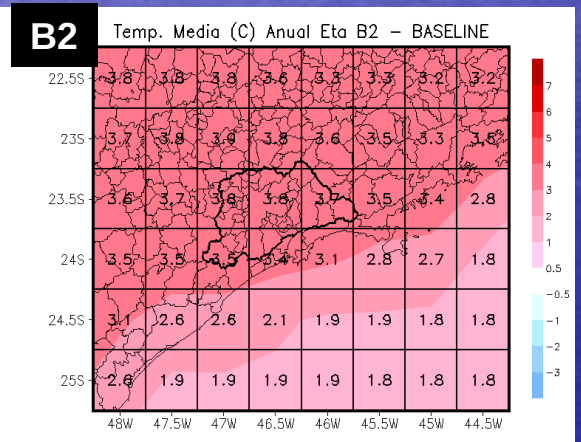
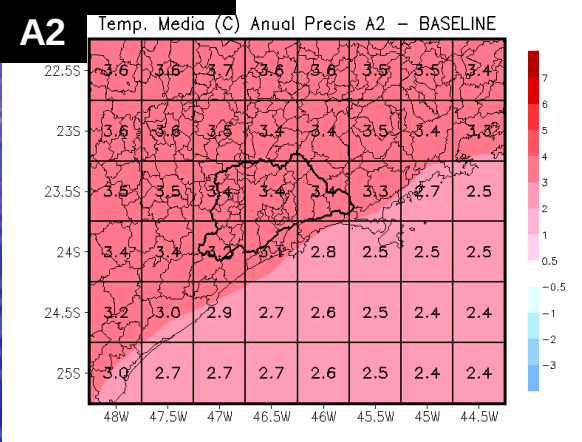


Precis Model

A2



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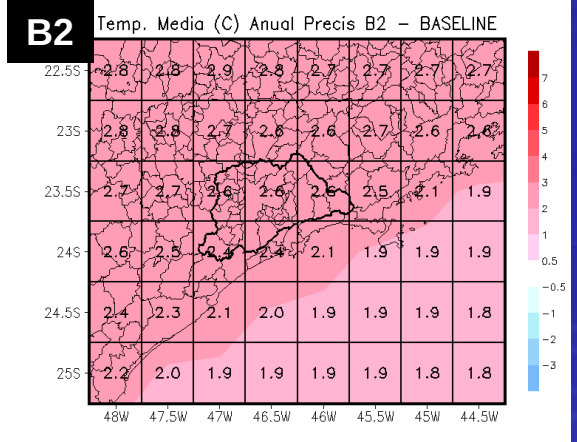


Regarding to the mean temperature, both models cope with an increase of temperature in the annual and seasonal scale, reaching up to ~ 3 ºC in the optimistic scenario and ~ 4 ºC in the pessimistic scenario. Among the seasons, the greatest increase is projected to happen in summer

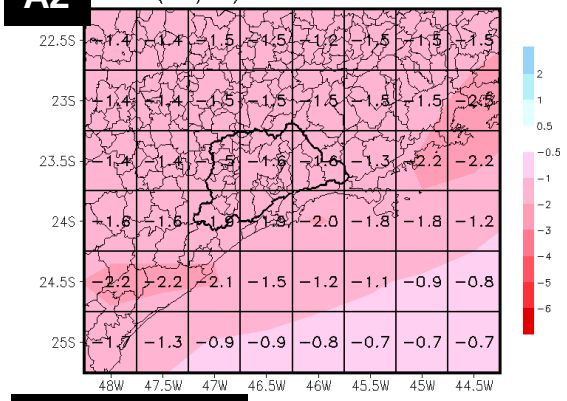
METROPOLITAN REGION OF SÃO PAULO

Anomalies of Mean Annual Rainfall (mm/dia)

2071-2100 minus 1961-1990

Eta Model

A2



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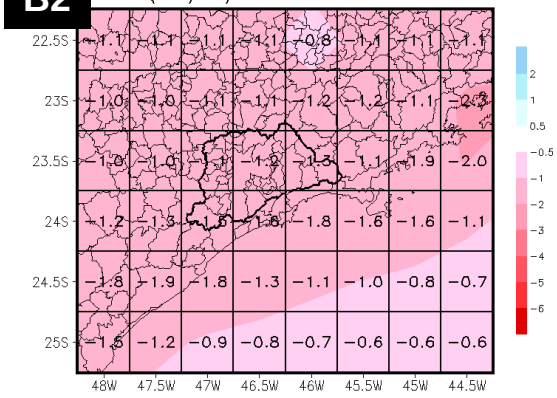

Precis Model

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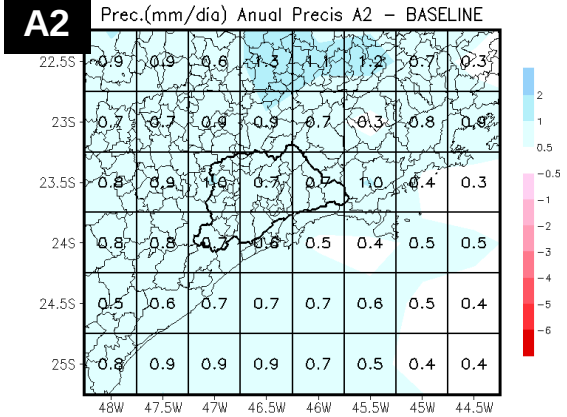

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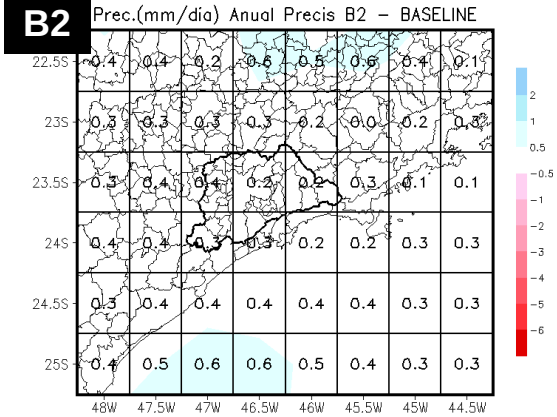


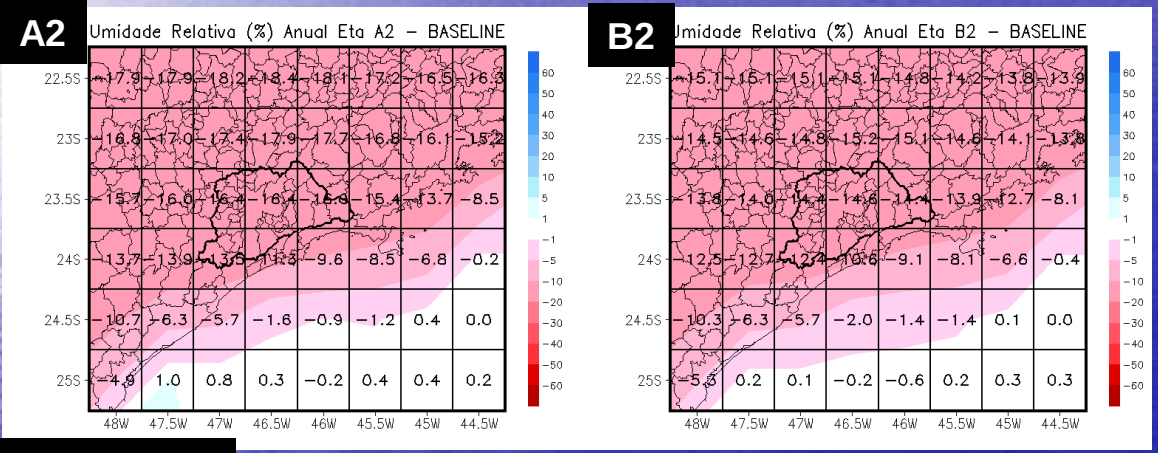
Analysing the projected changes in the mean annuam precipitation, the Eta model indicate a decrease in rainfall of about 2mm/day and the Precis Model a slight increase of aproximately 0.5 mm/day

METROPOLITAN REGION OF SÃO PAULO

Anomalies of Mean Annual Relative Humidity (%)
2071-2100 minus 1961-1990

Eta Model

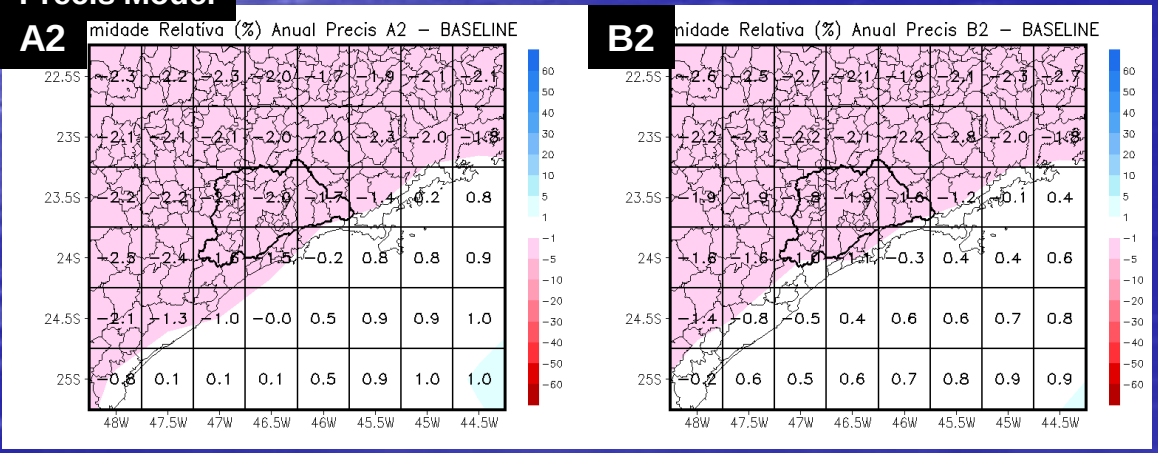
A2



B2

Precis Model

A2



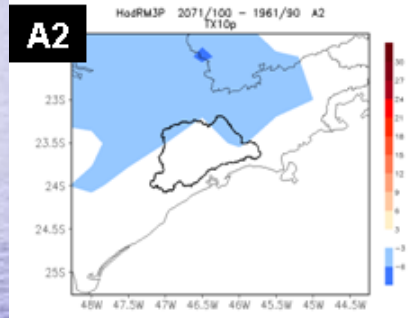
B2

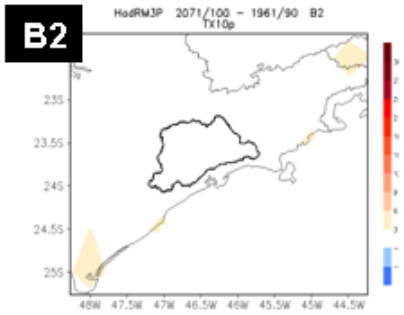
The regional climate models indicate with great deal a decrease in the relative humidity of about 5 to 15% by the end of this century

METROPOLITAN REGION OF SÃO PAULO

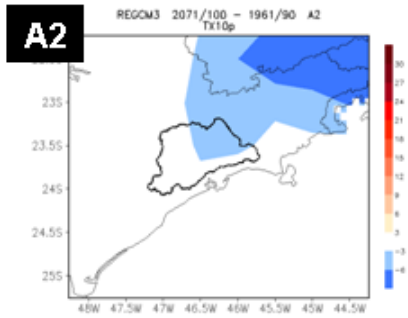
Cold Days – TX10p

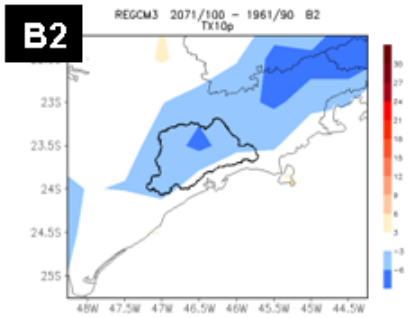
Modelo Precis





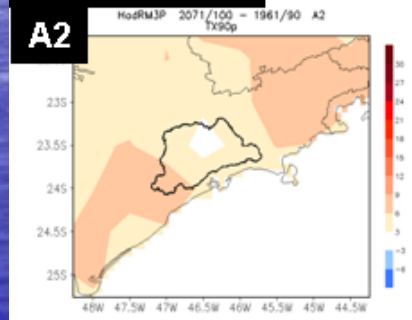
Modelo Regcm3

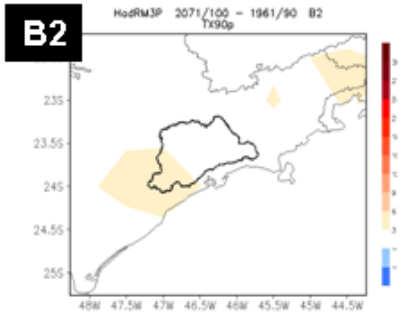




Hot Days – TX90p

Modelo Precis





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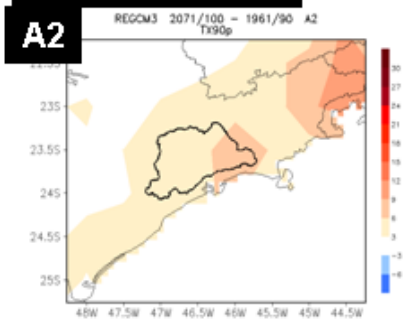
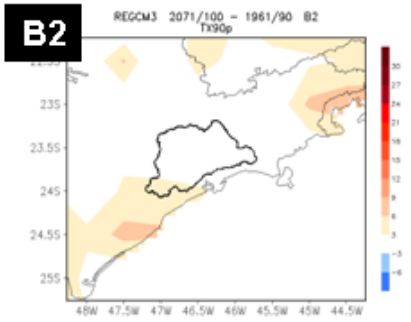


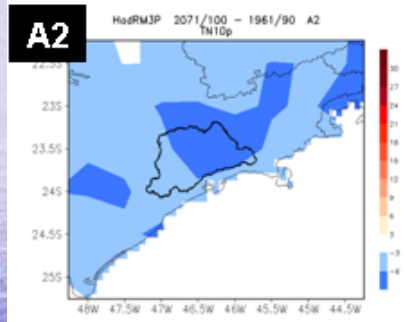


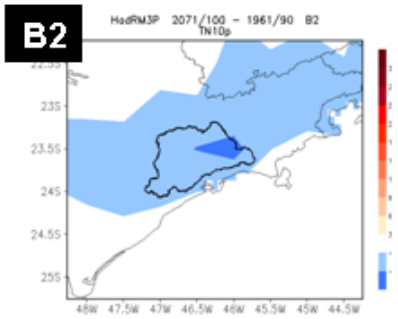
The climate models project a decrease in the number of cold days and an increase of hot days

METROPOLITAN REGION OF SÃO PAULO

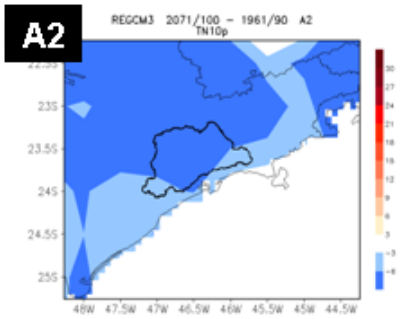
Cold Nights – TN10p

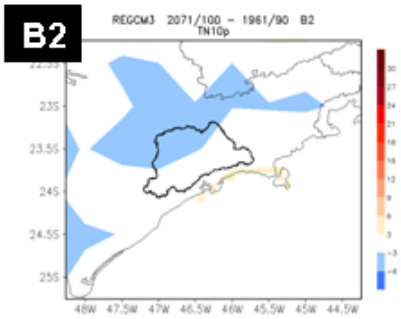
Modelo Precis





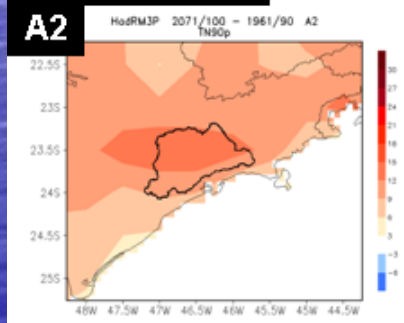
Modelo Regcm3

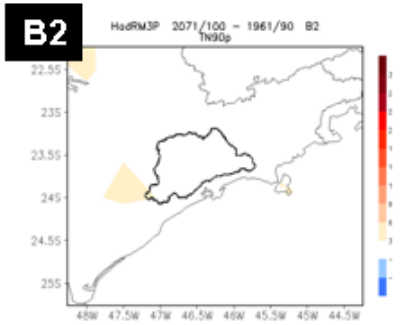




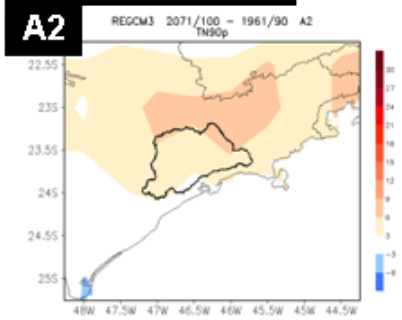
Hot Nights – TN90p

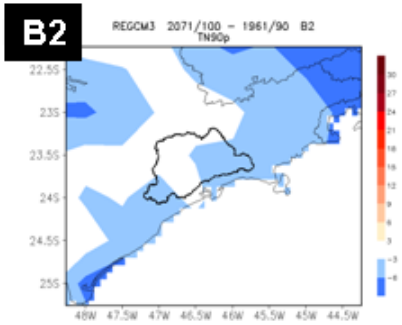
Modelo Precis





Modelo Regcm3





Regarding to the extreme temperature events, the models indicate a decrease in the number of cold nights and a possible increase in the hot nights

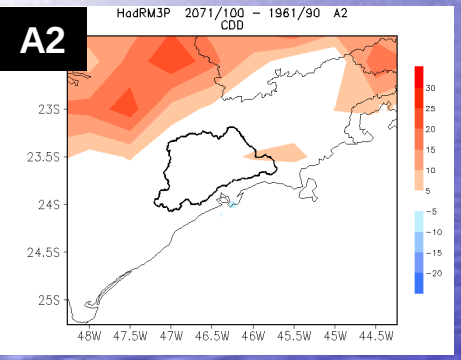
Mudanças Climáticas

METROPOLITAN REGION OF SÃO PAULO

Consecutive Dry Days - CDD

Modelo Precis

A2



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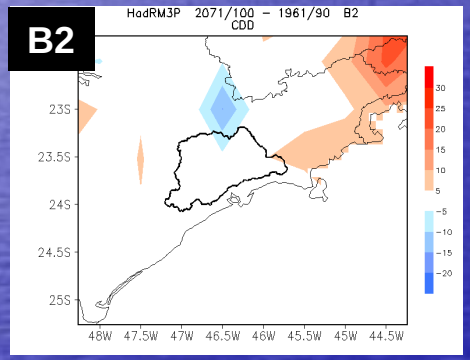

Modelo Regcm3

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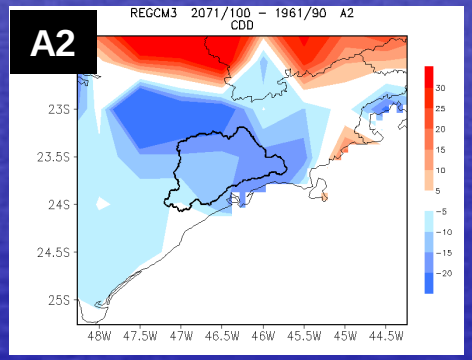

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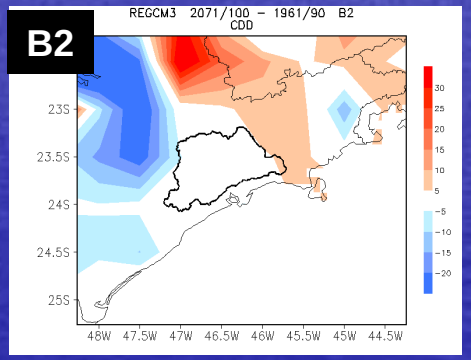

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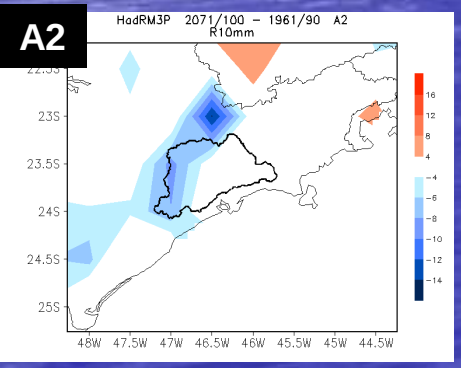

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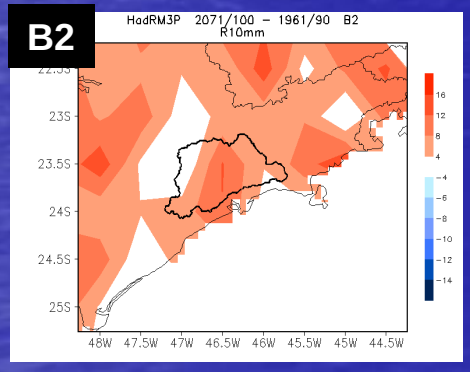

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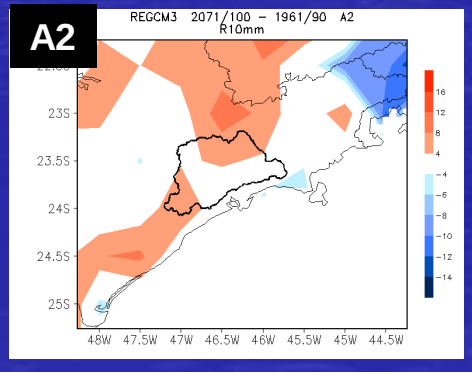

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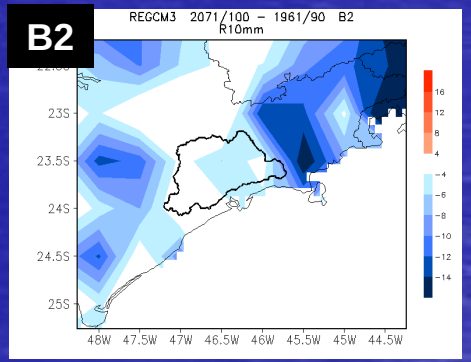


Number of Days with Precipitation Greater then10mm - R10mm

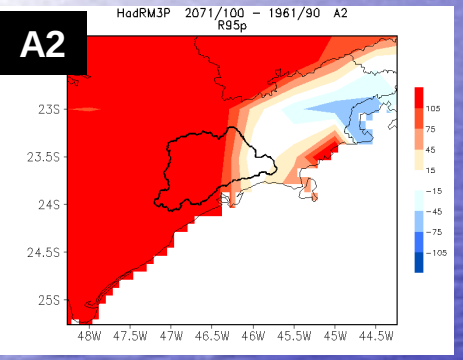
Mudanças Climáticas

METROPOLITAN REGION OF SÃO PAULO

Heavy Precipitation - R95p

Modelo Precis

A2



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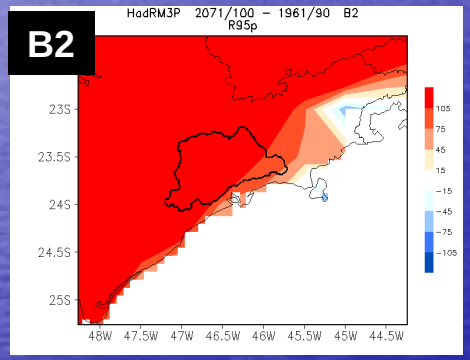
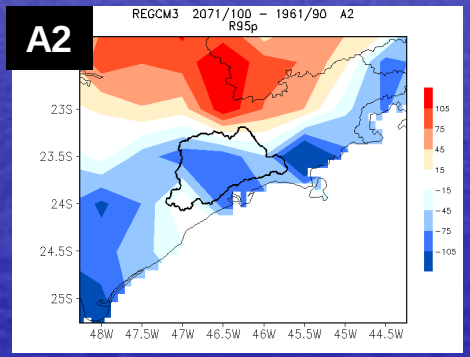


Modelo Regcm3

A2



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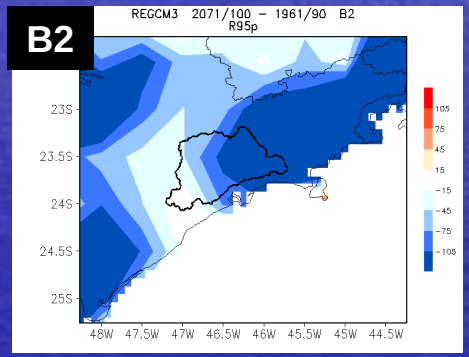

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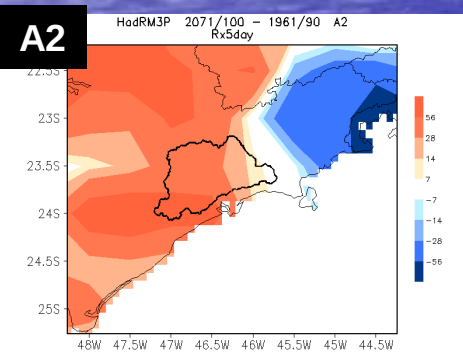

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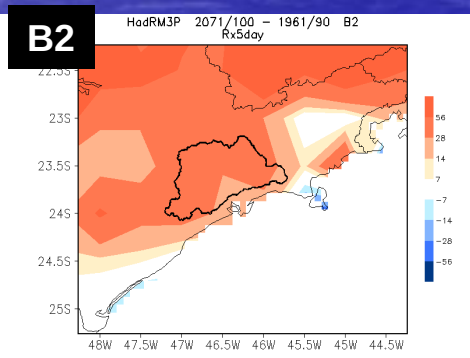

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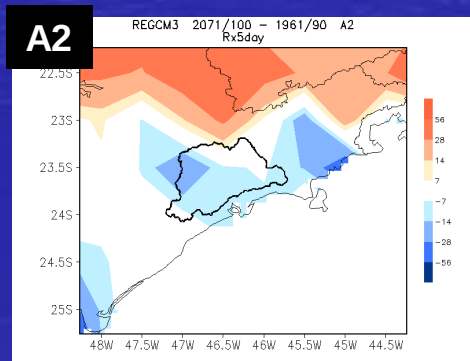

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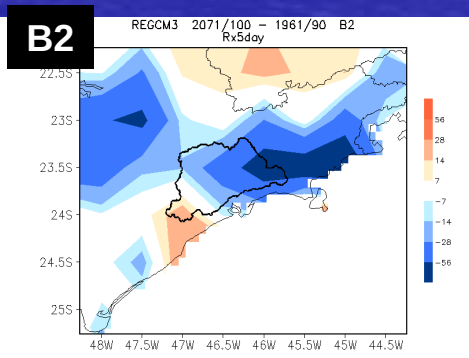


Precipitation Acumulated in 5 days – RX5day

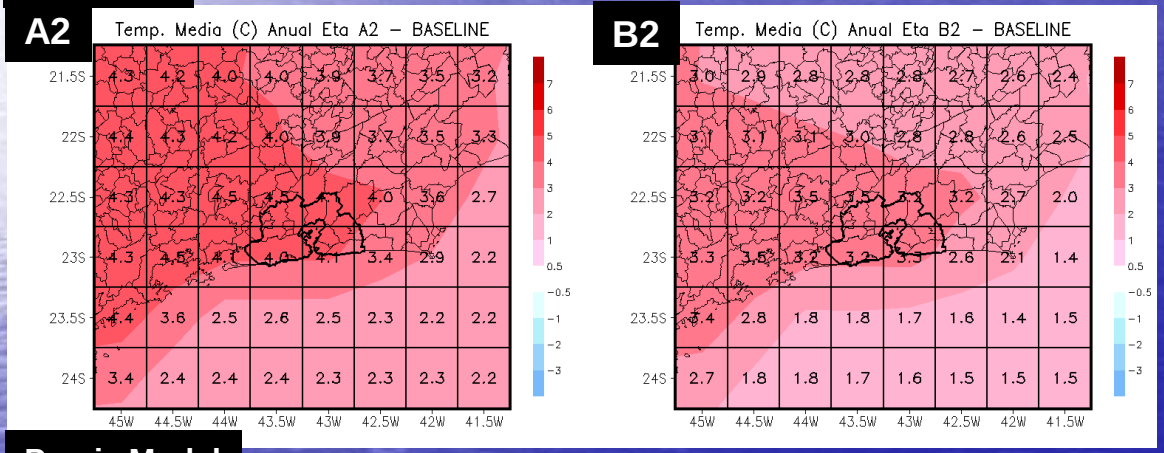
Mudanças Climáticas

METROPOLITAN REGION OF RIO DE JANEIRO

Anomalies of Mean Annual Temperature
2071-2100 minus 1961-1990

Eta Model

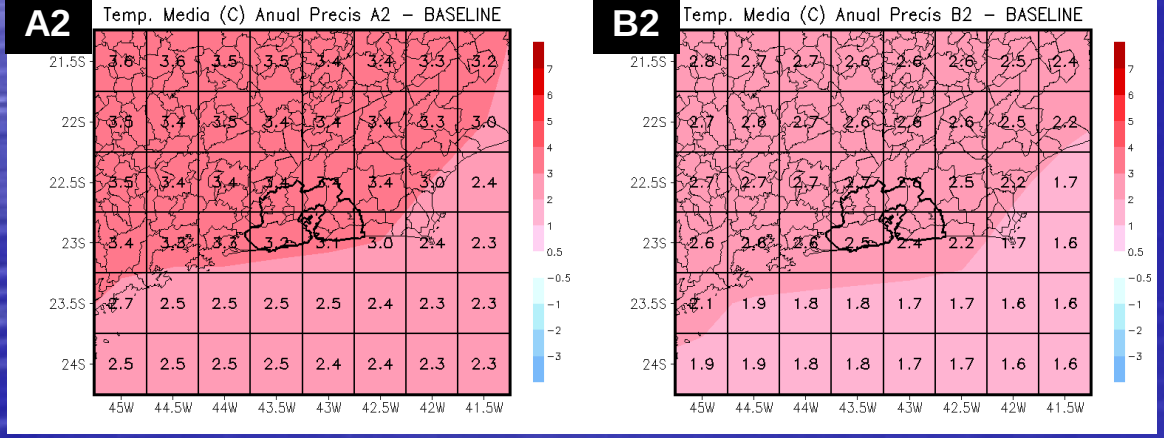
A2



B2

Precis Model

A2



B2

Regarding to the mean temperature, both models show a temperature increase in the annual and seasonal scale, reaching aproximately 3 ºC in the pessimistic scenario and about 4 ºC in the optimistic scenario. Among the seasons, the greatest increase is projected to happen during summer

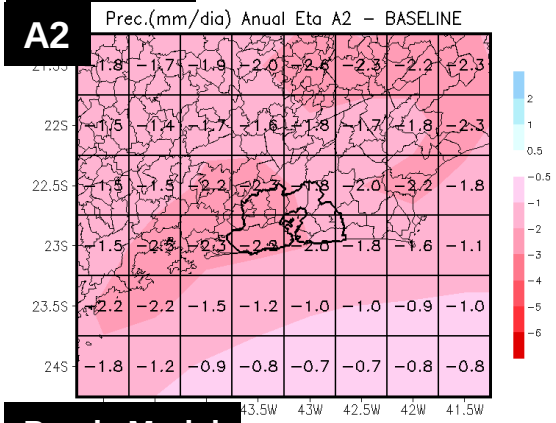
Mudanças Climáticas

METROPOLITAN REGION OF RIO DE JANEIRO

Anomalies of Mean Annual Rainfall (mm/dia)
2071-2100 minus 1961-1990

Eta Model

A2



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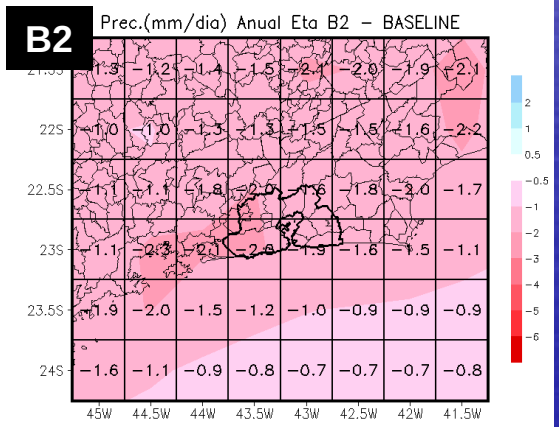

Precis Model

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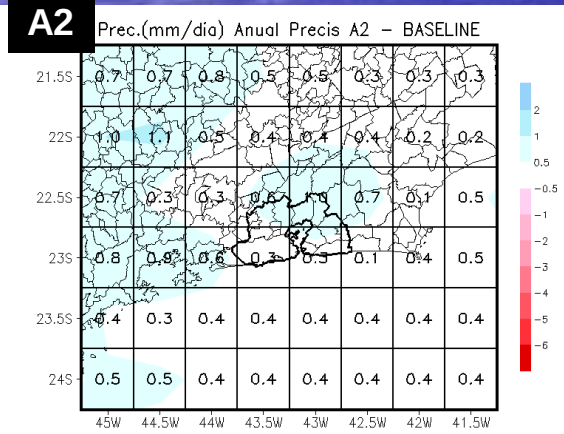

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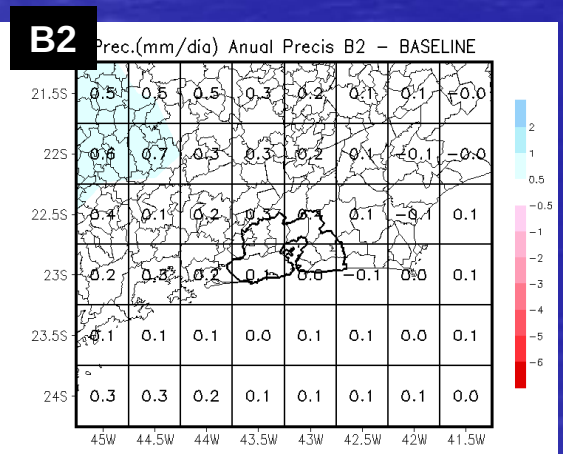


Analysing the projected changes in the mean annual precipitation, the Eta model indicate a decrease of about 2 mm/day and the Precis Model a little increase of about 0,5 mm/day by the end of the XXI century

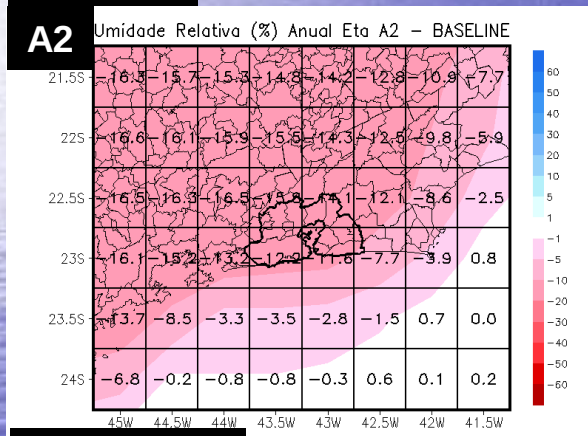
METROPOLITAN REGION OF RIO DE JANEIRO

Anomalies of Mean Annual Relative Humidity (%)

2071-2100 minus 1961-1990

Eta Model

A2



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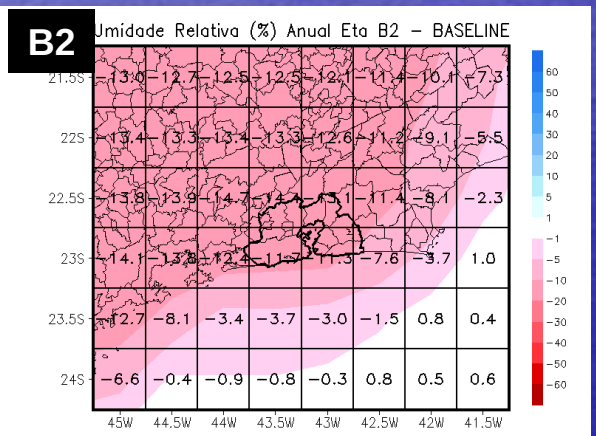

Precis Model

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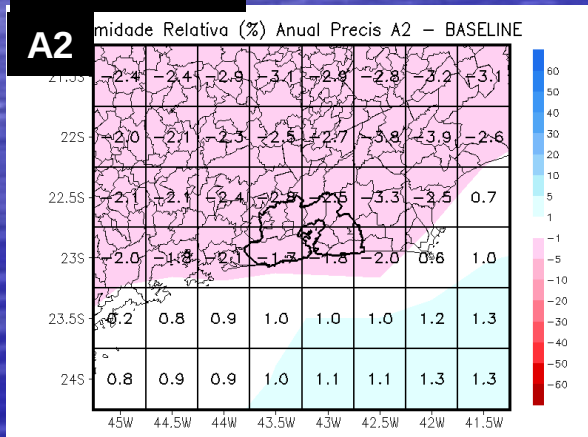

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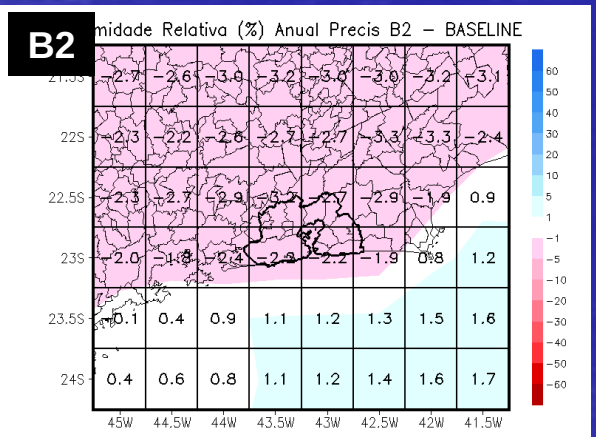
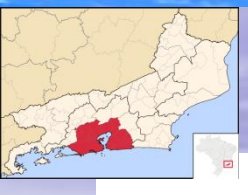


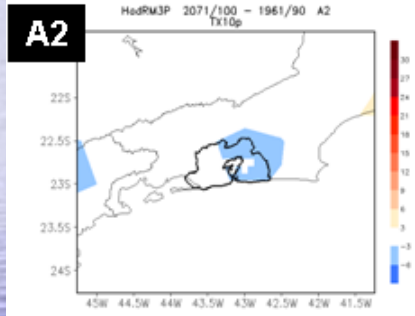
Models project a decrease in the mean annual relative humidity of 5 to 15% by the end of the XXI century

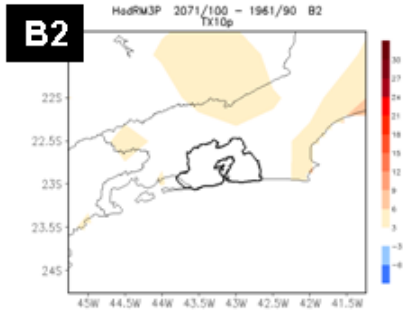


METROPOLITAN REGION OF RIO DE JANEIRO

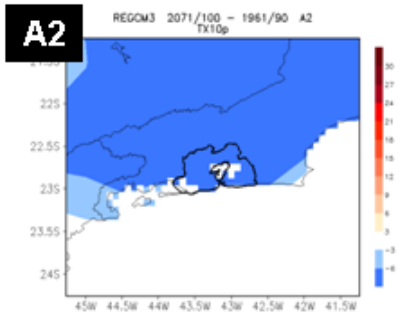
Cold Days – TX10p

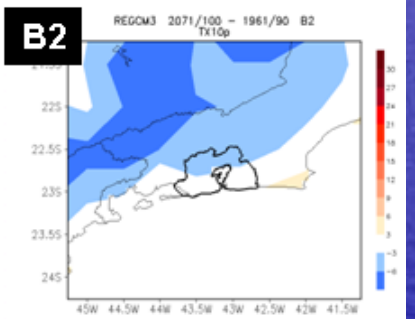
Modelo Precis





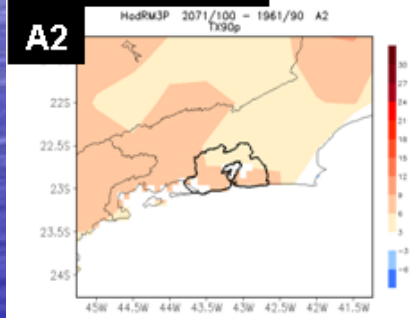
Modelo Regcm3

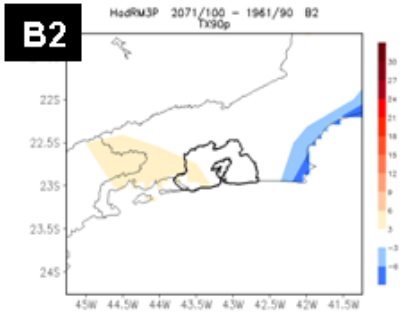




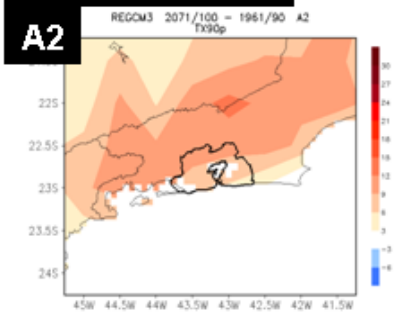
Hot Days – TX90p

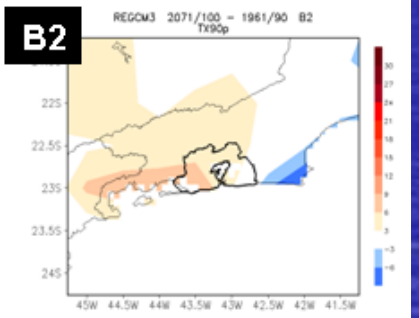
Modelo Precis



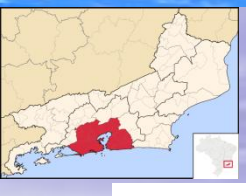


Modelo Regcm3





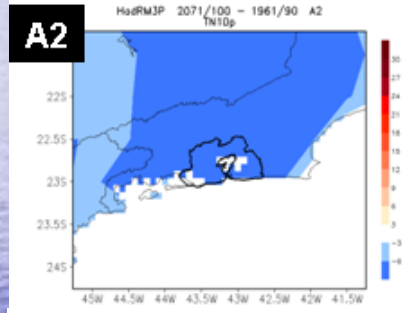
Models indicate a decrease in the number of cold days and an increase of hot days

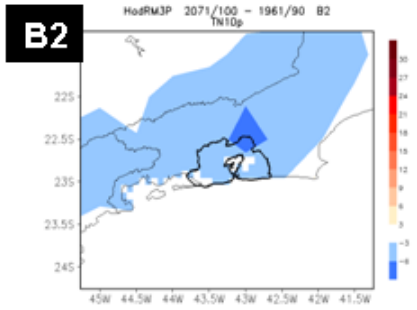


METROPOLITAN REGION OF RIO DE JANEIRO

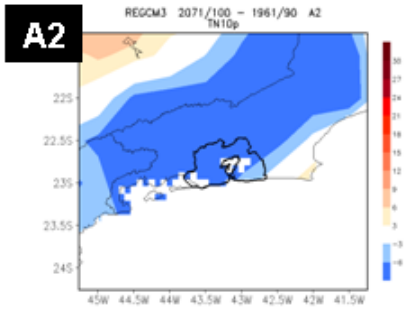
Cold Nights – TN10p

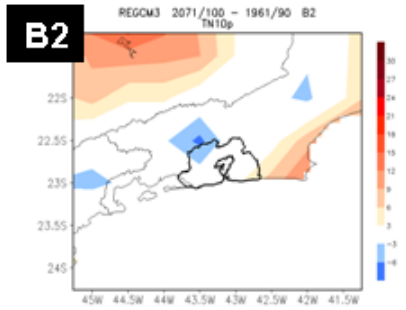
Modelo Precis





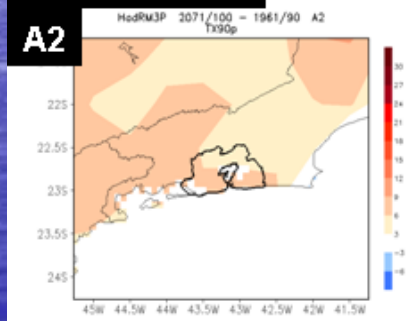
Modelo Regcm3

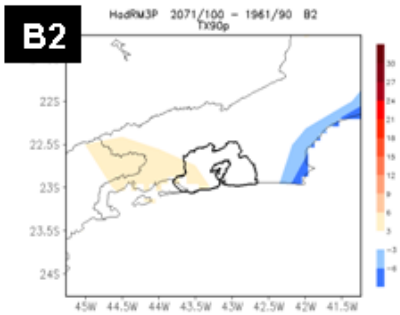




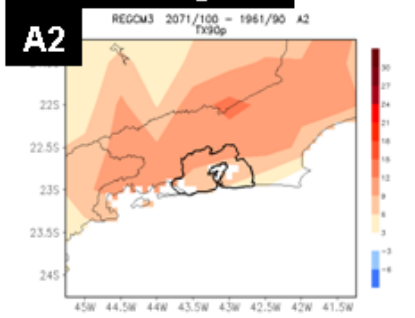
Hot Nights – TN90p

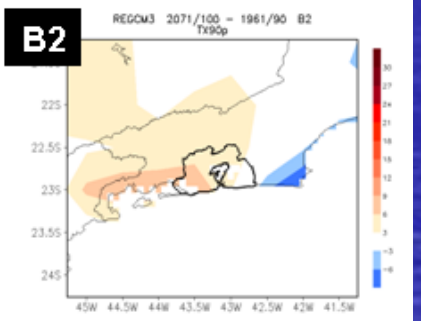
Modelo Precis



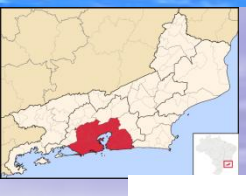


Modelo Regcm3





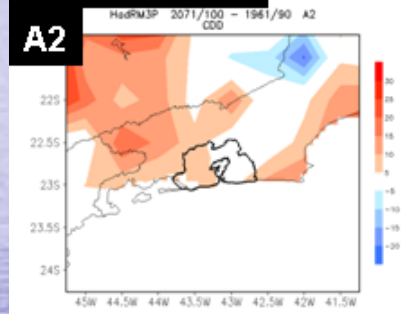
Regarding to the temperature extremes, model indicate a decrease in the number of cold nights and an increase of hot nights

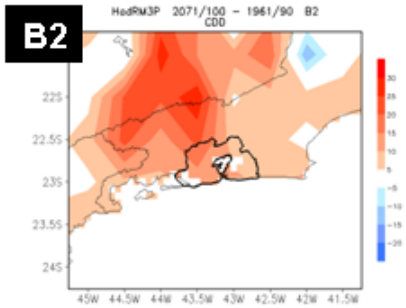


METROPOLITAN REGION OF RIO DE JANEIRO

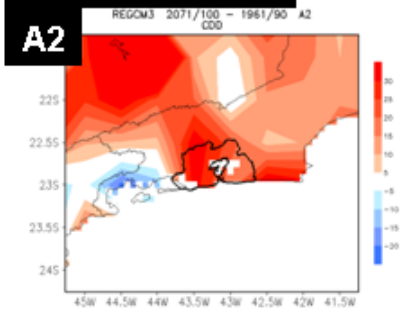
Consecutive Dry Days - CDD

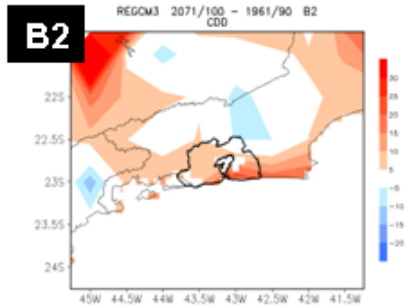
Modelo Precis





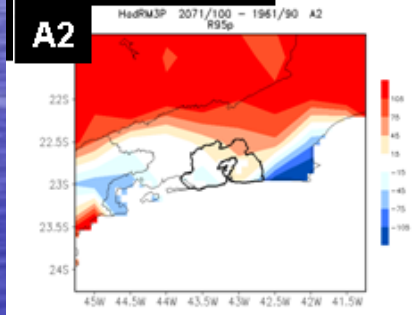
Modelo Regcm3

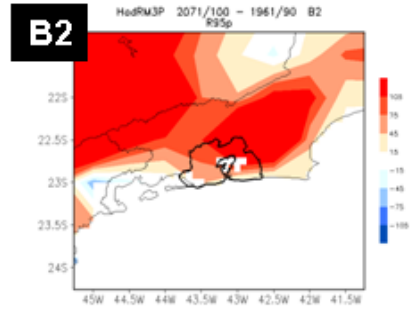




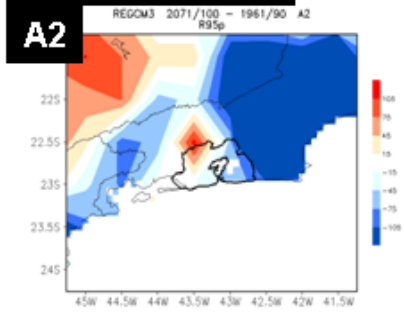
Number of Heavy Rainfall

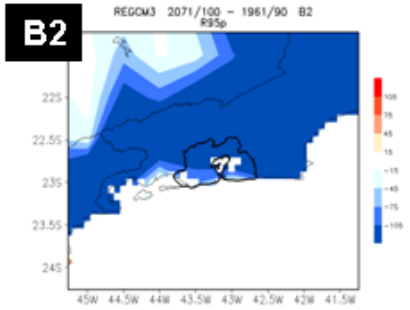
Modelo Precis





Modelo Regcm3





By the end of this century models show a great deal in project an increase in the number of consecutive dry days and a possible increase in the number of days with heavy or extreme rainfall

SUMARY AND CONCLUSIONS

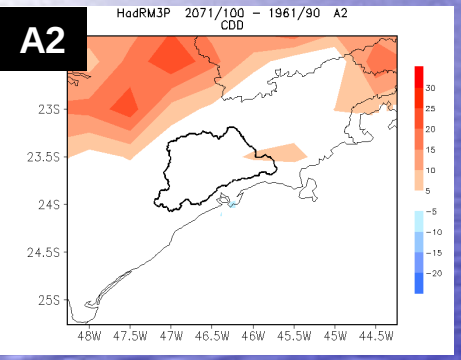
- Regarding to the mean temperature, both models indicate with great confidence an increase of temperature in both annual and seasonal scale, reaching up to 3 ºC in the optimistic scenario and ~ 4 ºC in the pessimistic scenario. Among seasons, the greatest increase is projected to happen during summer;
- Analysing the projected changes in precipitation for the Metropolitan Regions of Rio de Janeiro and São Paulo, in the seasonal scale, the regional climate models in general agree with a little decrease in rainfall of about -0.5 mm/day in the optimistic scenario B2 and ~0.8 mm/day in the pessimistic scenario A2, mainly during winter. In the mean annual precipitation, the Eta Model show a decrease of aproximately 2 mm/day and the Precis Model indicate a slight increase of ~0.5 mm/day;
- The temperature extreme indexes show an increase in the number of hot days and nights and a reduction in the number of cold days and nights;
- Models indicate an increase in the number of heavy precipitation events concentrated in short periods for the Metropolitan Region of Rio de Janeiro.

Mudanças Climáticas

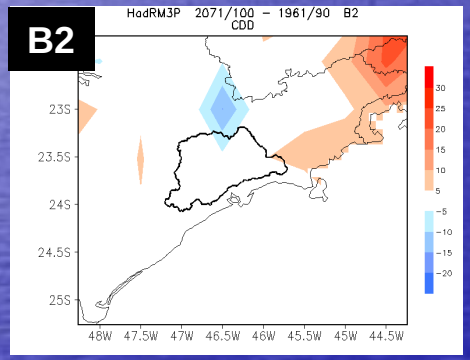
Dias Secos Consecutivos - CDD

Modelo Precis

A2

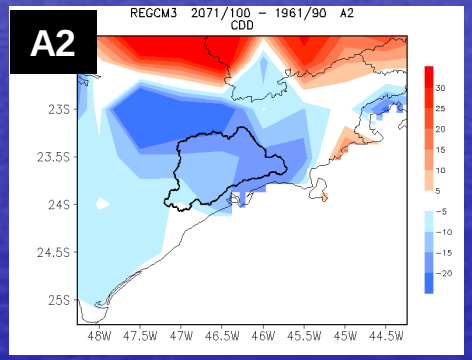


B2

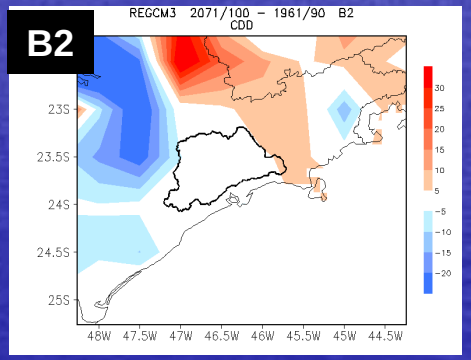


Modelo Regcm3

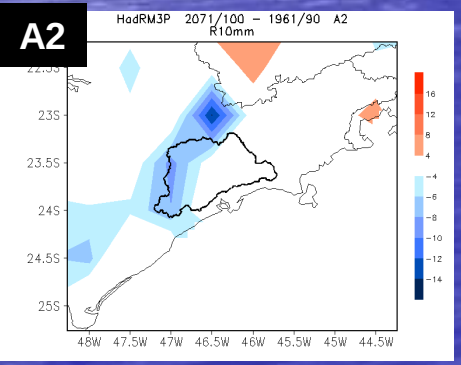
A2



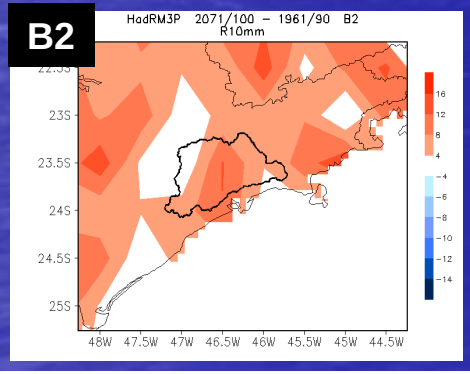
B2



A2



B2



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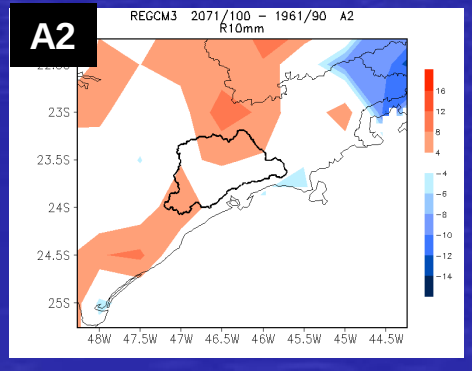
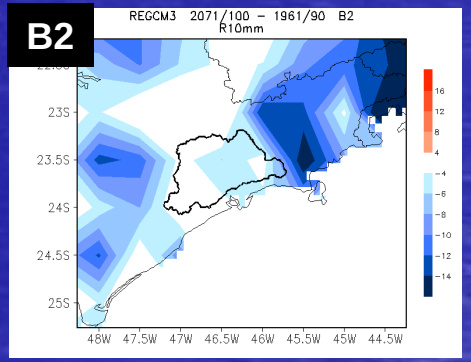


B2



N^0 de dias com precip. maior a 10mm - R10mm