



The Abdus Salam  
International Centre  
for Theoretical Physics



# Investigating the effects of topography and land cover on atmospheric variables over South and Southeast Brazil

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# Objectives

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graph TD; A[Objectives] --> B[Investigate the influence of topography on atmospheric variables]; A --> C[Investigate the impact of different land cover on atmospheric variables];
```

Investigate the **influence of topography** on atmospheric variables

Investigate the **impact of different land cover** on atmospheric variables

# Methodology

We have run the RegCM4 model with default configuration as a control run followed by two different experiments, which are:

## Experiment 1 - Topography

- a) Limiting the maximum altitude
- b) The reduction of attitude towards the coastline, in a proportional rate.

## Experiment 2 - Land Cover

Land cover change

Investigating the impacts on:

Precipitation

Sea Level Pressure

Surface Pressure

Surface Temperature

# Experiment general description

## **NAMELIST file:**

### **Period**

(Spinup: 2 days - 20151128)

Start date: 2015120100

End date: 2016033100

### **Coordinates**

clat: 23 °S

clon: 42 °W

**dS:** 60 km

**dT:** 120 s

## **DOMAIN file:**

The variables “topo” and “landuse” were edited, for experiment 1 and 2, respectively.

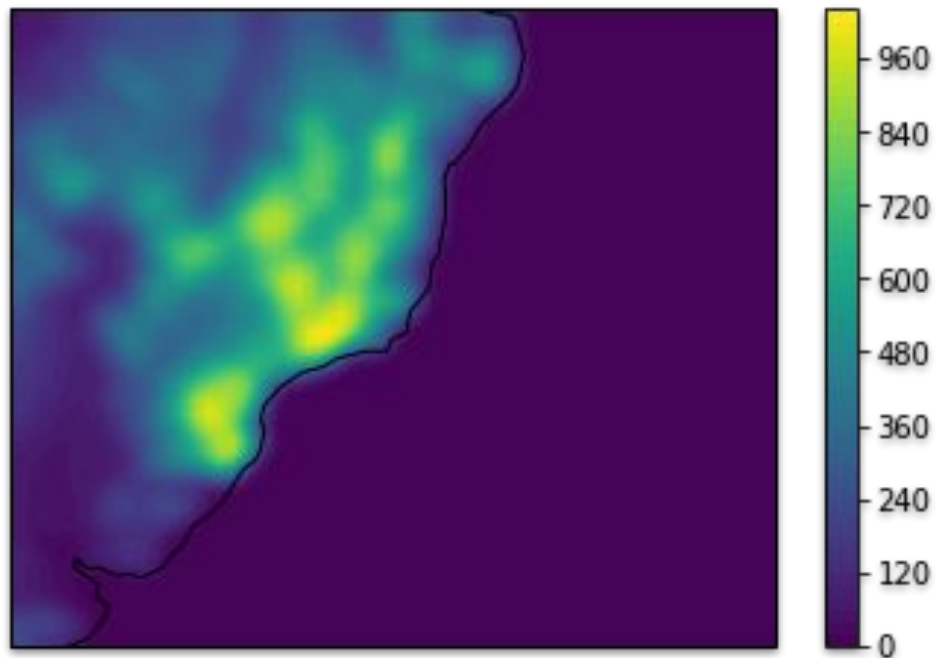
**For experiment 1.a:** The variable “topo” was edited to limit the maximum altitude in 600m

**For experiment 1.b:** The variable “topo” edited in experiment 1.a was edited by applying a proportional reduction rate towards the coastline. The initial reduction rate is 90% (westernmost region). From west to east, the initial reduction rate is gradually increased by 25%. ( $r = 10 * 1.25^x$ )

**For experiment 2:** The variable “landuse” was edited by switching the areas of “Forest” (code: 19) to “Grassland” (code: 2)

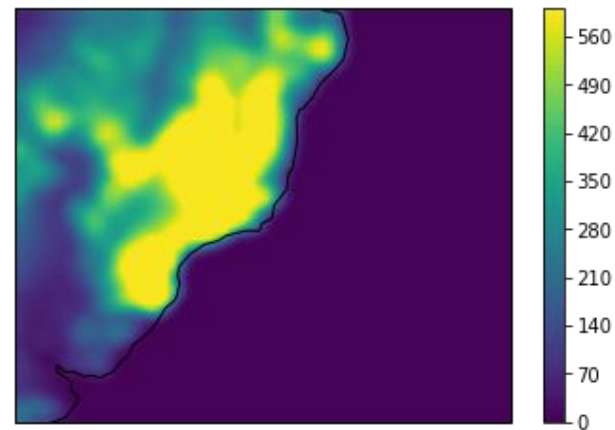
# Experiment 1 - Description

Terrain Default (m)



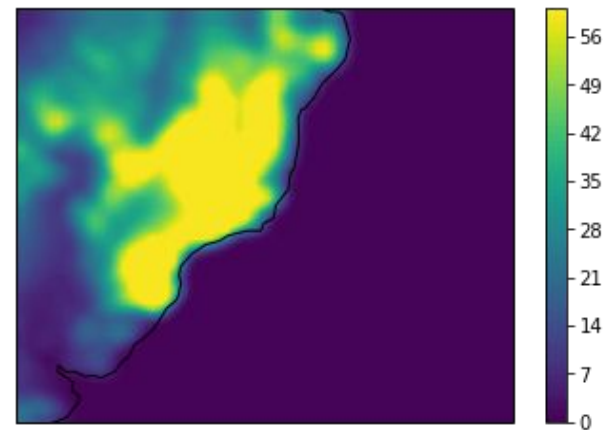
Altitude limited ( $H < 600$  m)

A)



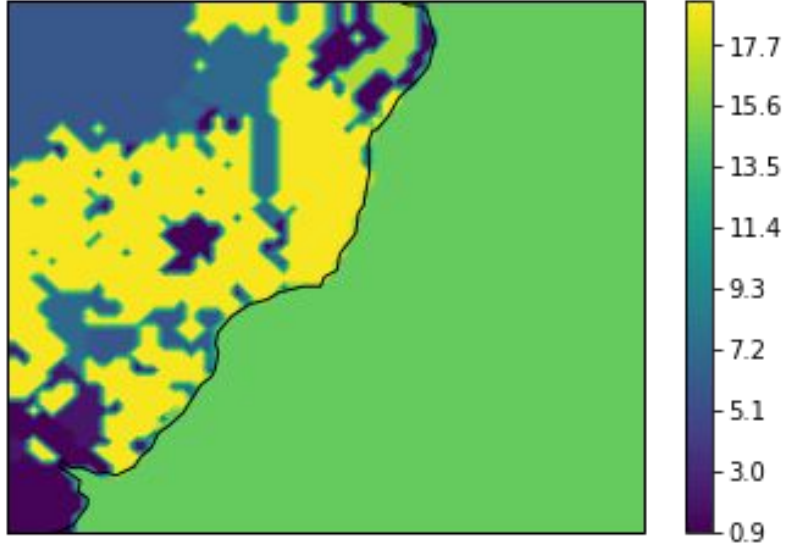
Altitude proportional reduction (m)

B)

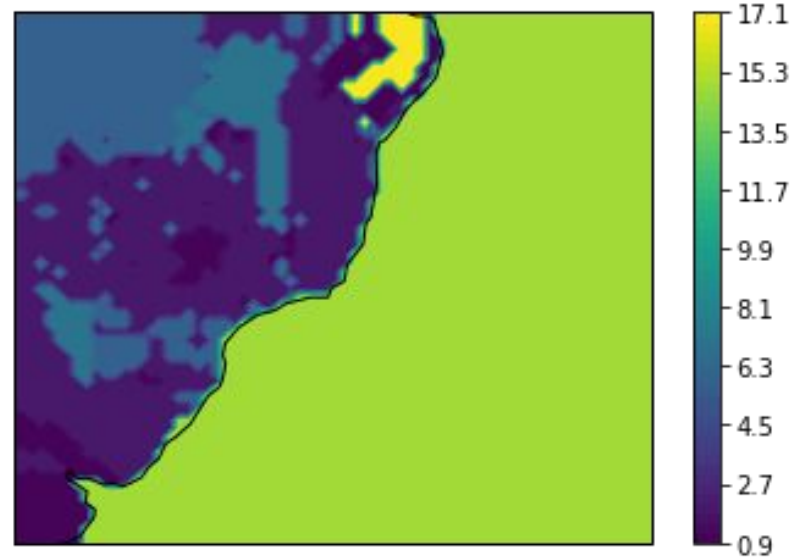


# Experiment 2 - Description

Default Land Cover



Land cover changed:  
from Forest to Grassland



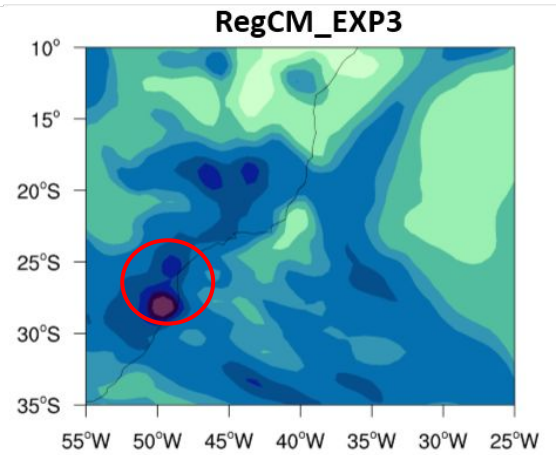
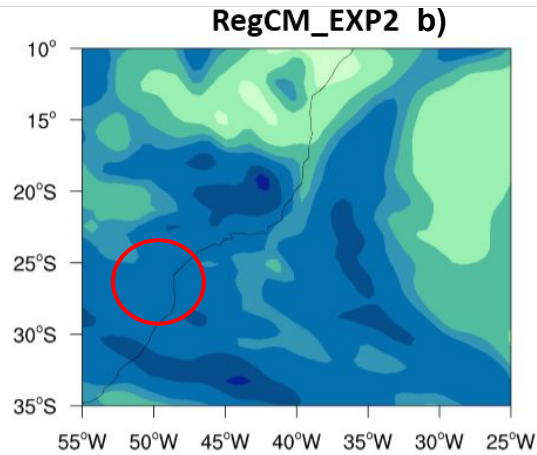
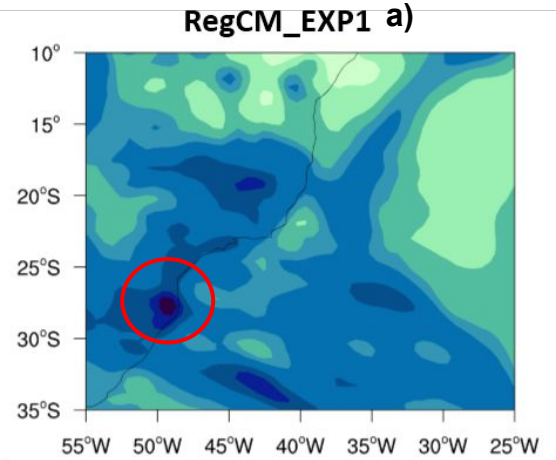
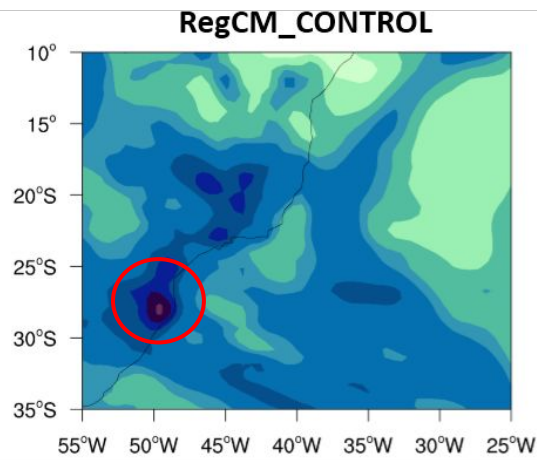
# Results

## Precipitation

Experiment 1 - reduction

Experiment 2 - Intense reduction

Experiment 3 - Increased



Precipitation (mm/day)



Control	H < 600m	2
H Proportional Reduction	Forest > Grassland	4

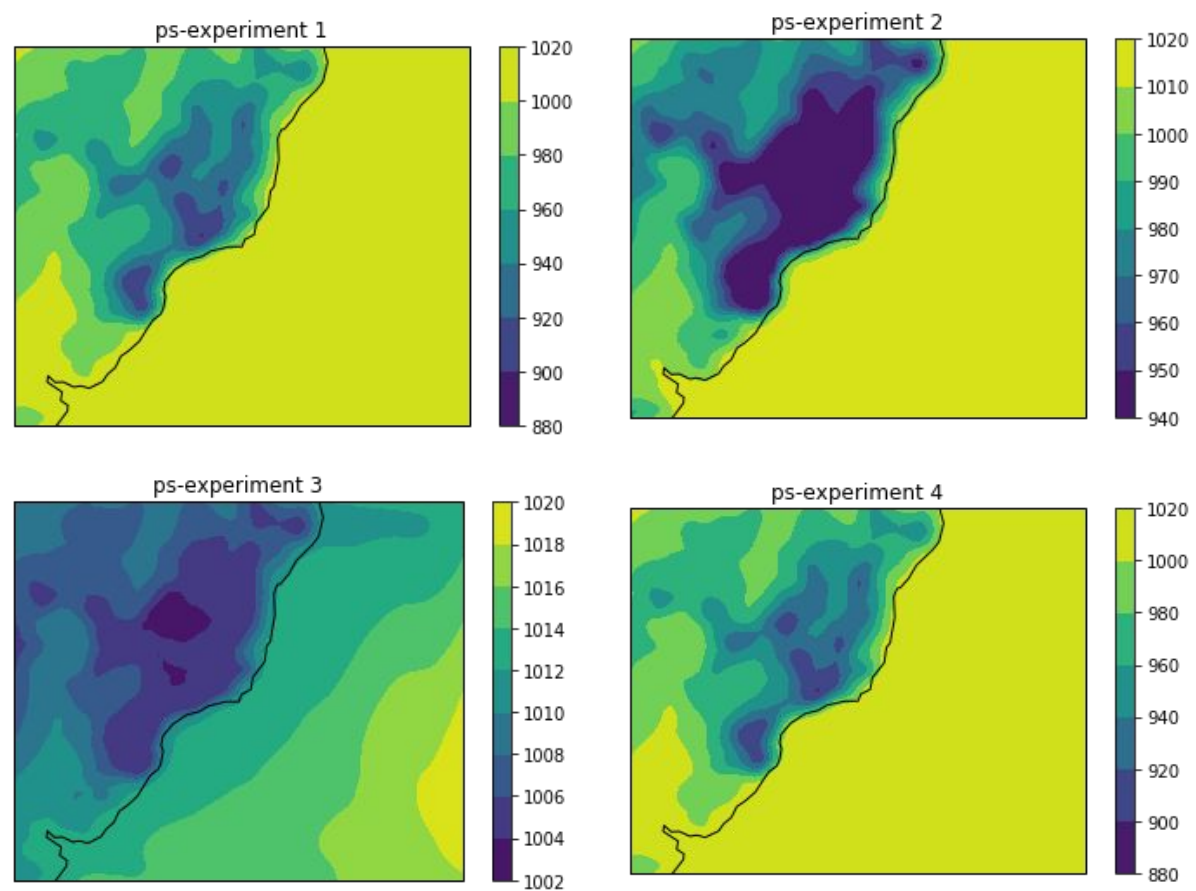
# Results

## ☐ Surface Pressure

Experiment 2 - Intensive increase

Experiment 3 - Increase

Experiment 4 - Similar behavior



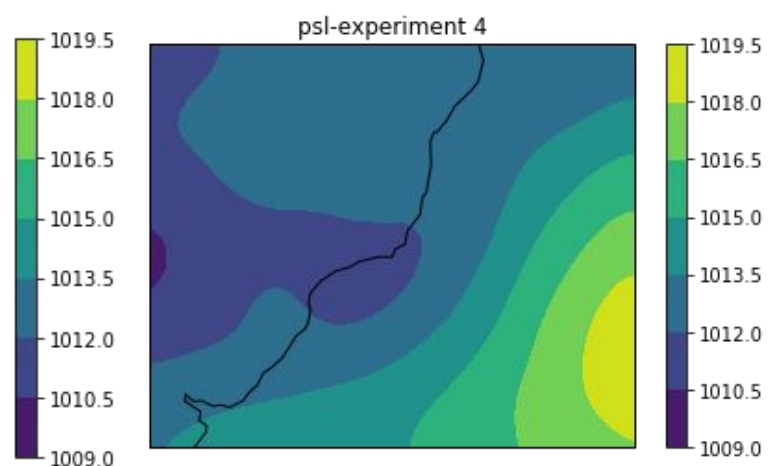
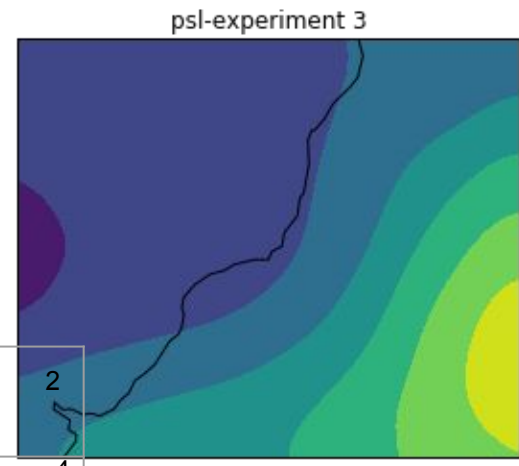
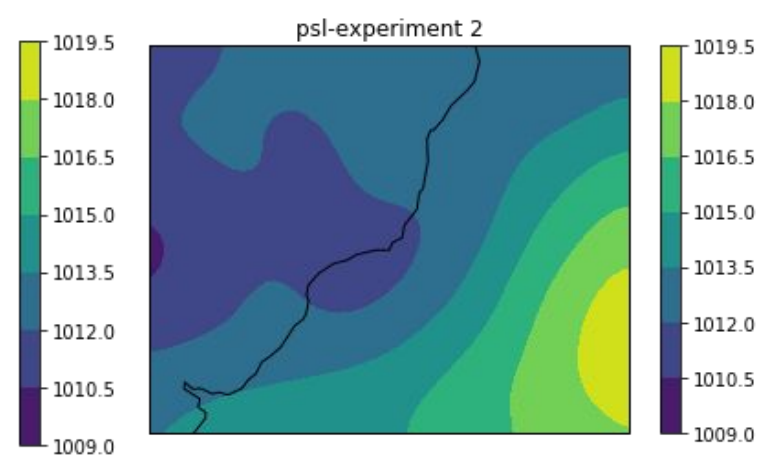
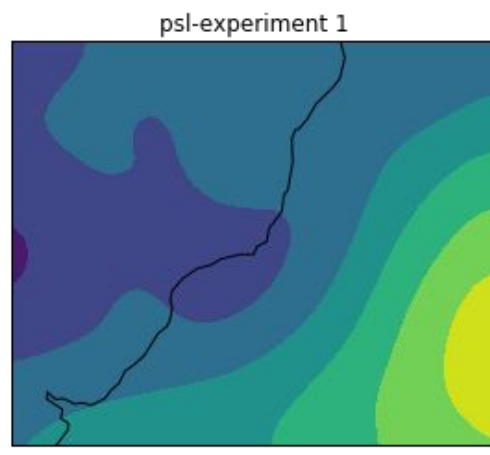
Control	H < 600m	2
H Proportional Reduction	Forest > Grassland	4



# Results

## Sea Level Pressure

Similar spatial patterns between the experiments.



Control	H < 600m
H Proportional Reduction	Forest > Grassland

2

3

4

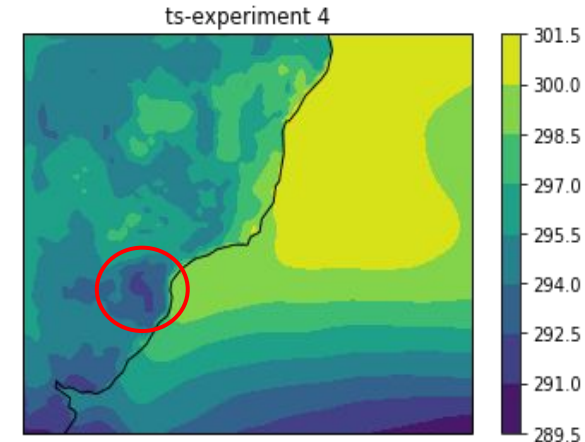
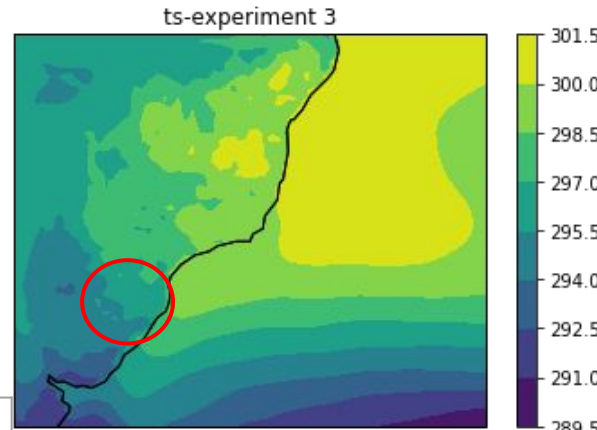
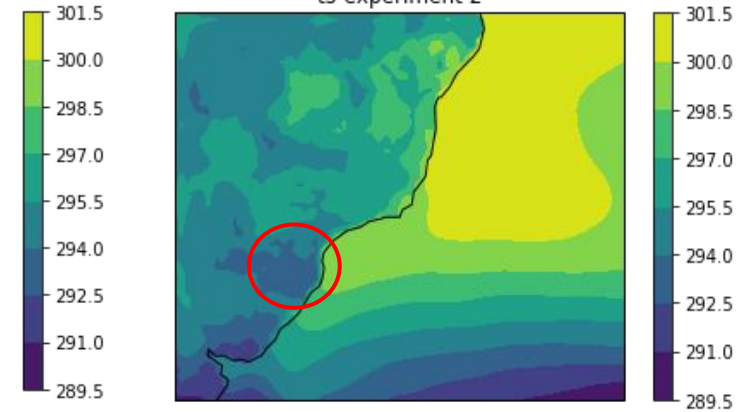
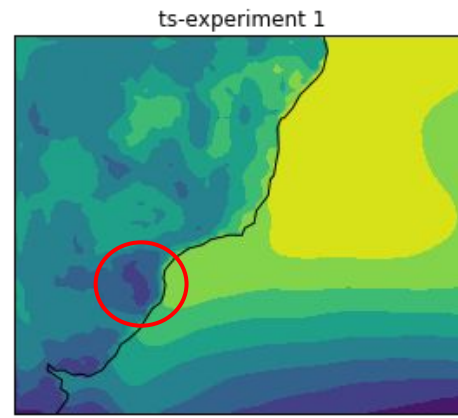
# Results

## Surface Temperature

Experiment 2 - Similar with fewer reduction

Experiment 3 - Increase

Experiment 4 - Similar spatial pattern

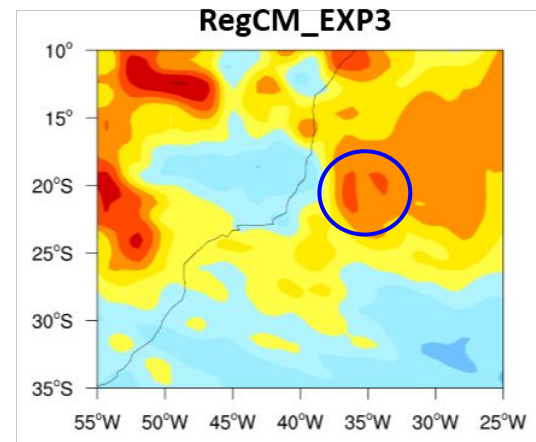
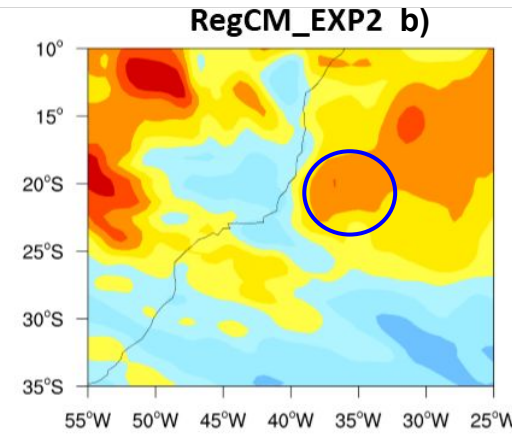
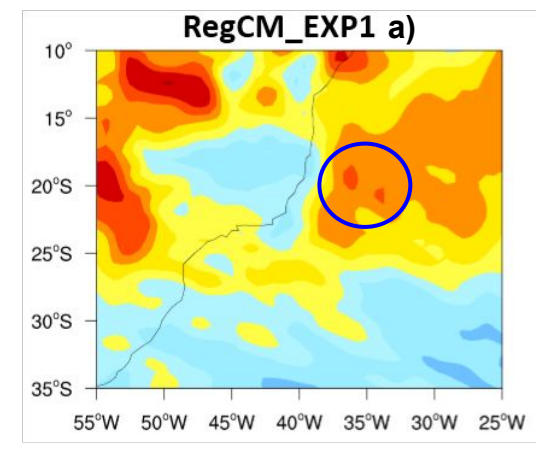
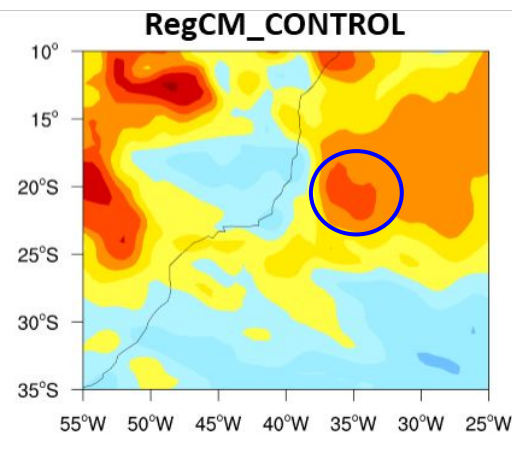


Control	H < 600m	2
H Proportional Reduction	Forest > Grassland	4

# Results

## Convective Precipitation

Similar spatial patterns with few variation in the percentage.



**Convective Precipitation (%)**



Control	H < 600m	2
H Proportional Reduction	Forest > Grassland	4

Obrigado!

Thanks!

Gracias!

Grazie!