

# Local and remote climatic impacts due to land use degradation in the Amazon “Arc of Deforestation”

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Geography USP

SILVA, MES; PEREIRA, G ; DA ROCHA, RP. Local and remote climatic impacts due to land use degradation in the Amazon Arc of Deforestation. Theoretical and Applied Climatology, p. 1-15, Jun, 2015.

2016 WORKSHOP REGCM4 UNESP São Paulo

## OBJECTIVE

# TO UNDERSTAND THE CLIMATIC IMPACT DUE TO DEFORESTATION

- more realistic projected deforestation
- greater domain

## SIMULATION SETUP

**REGCM3**

**BATS**

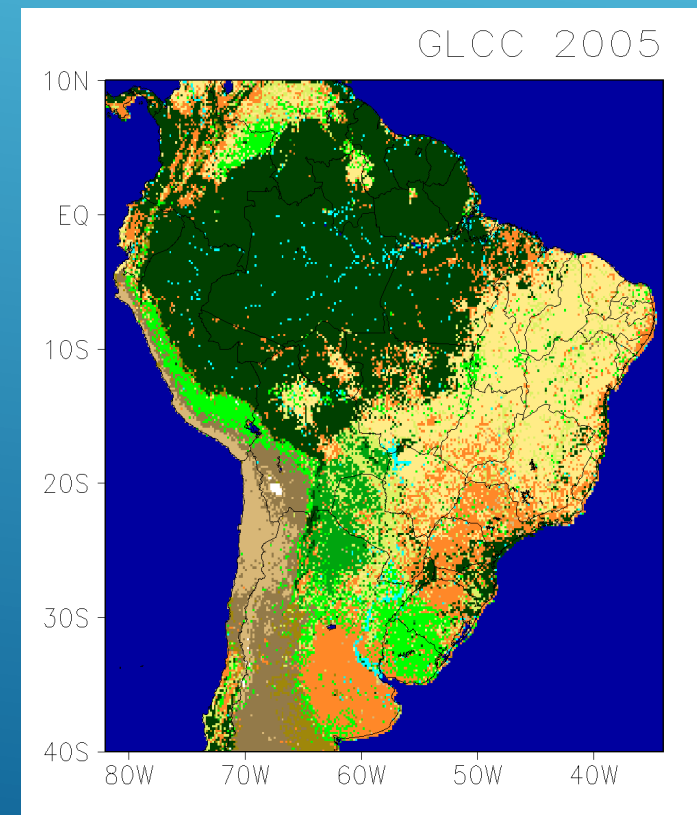
**SOUTH AMERICA**

**GLCC 2005**


**2001-2006 RAINNY SEASON**

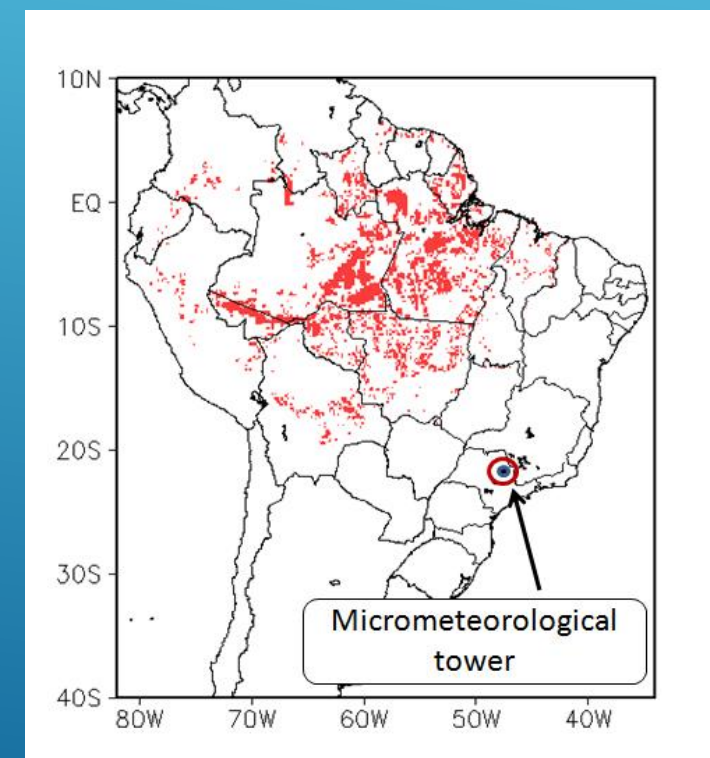
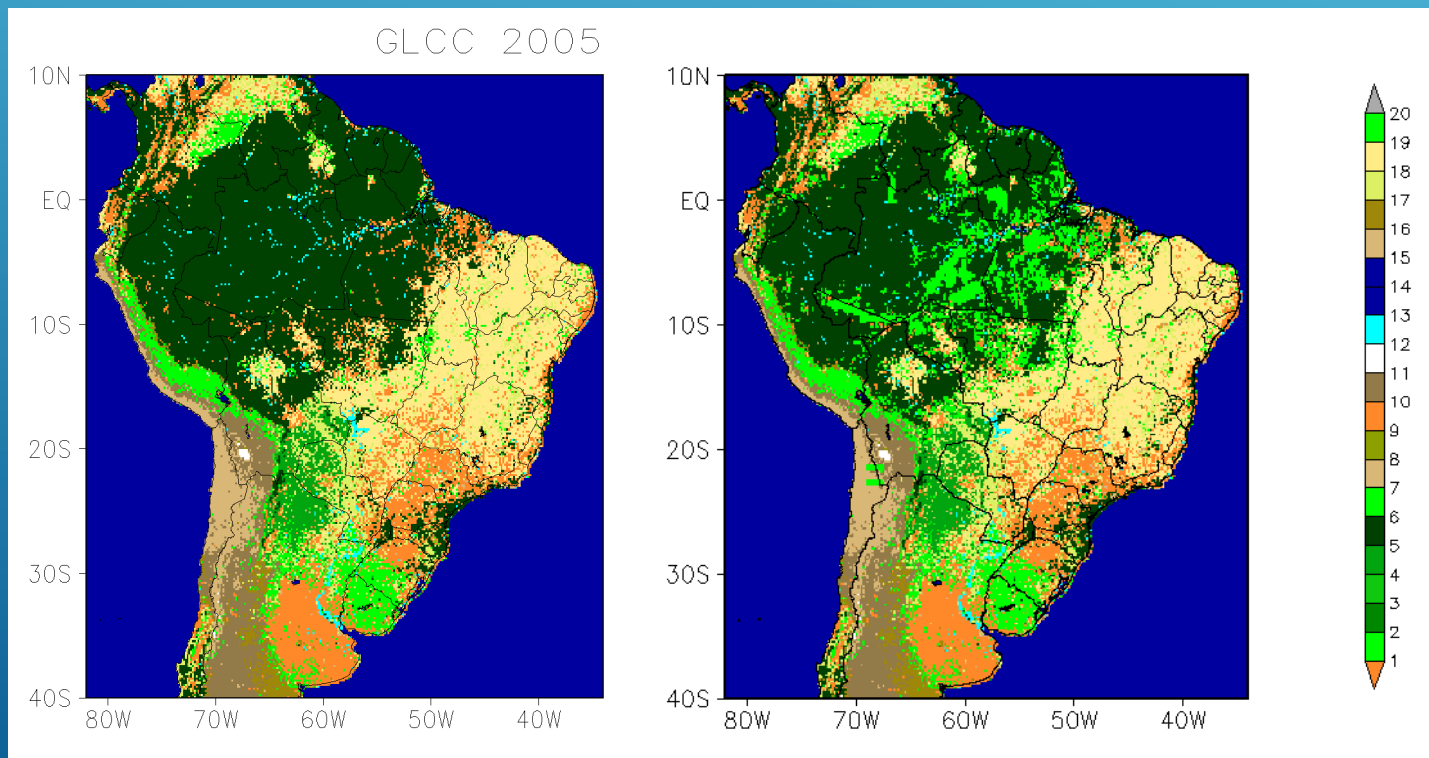
**50 km resolution**

**GREEL SCHEME – cumulus conv.**



**REPLACING RAINFOREST**  **SHORT GRASS**

**following SOARES-FILHO et al. (2006)**  **extrapolation for 2050**



2001-2006 RAINY SEASONS MEAN

REGCM3

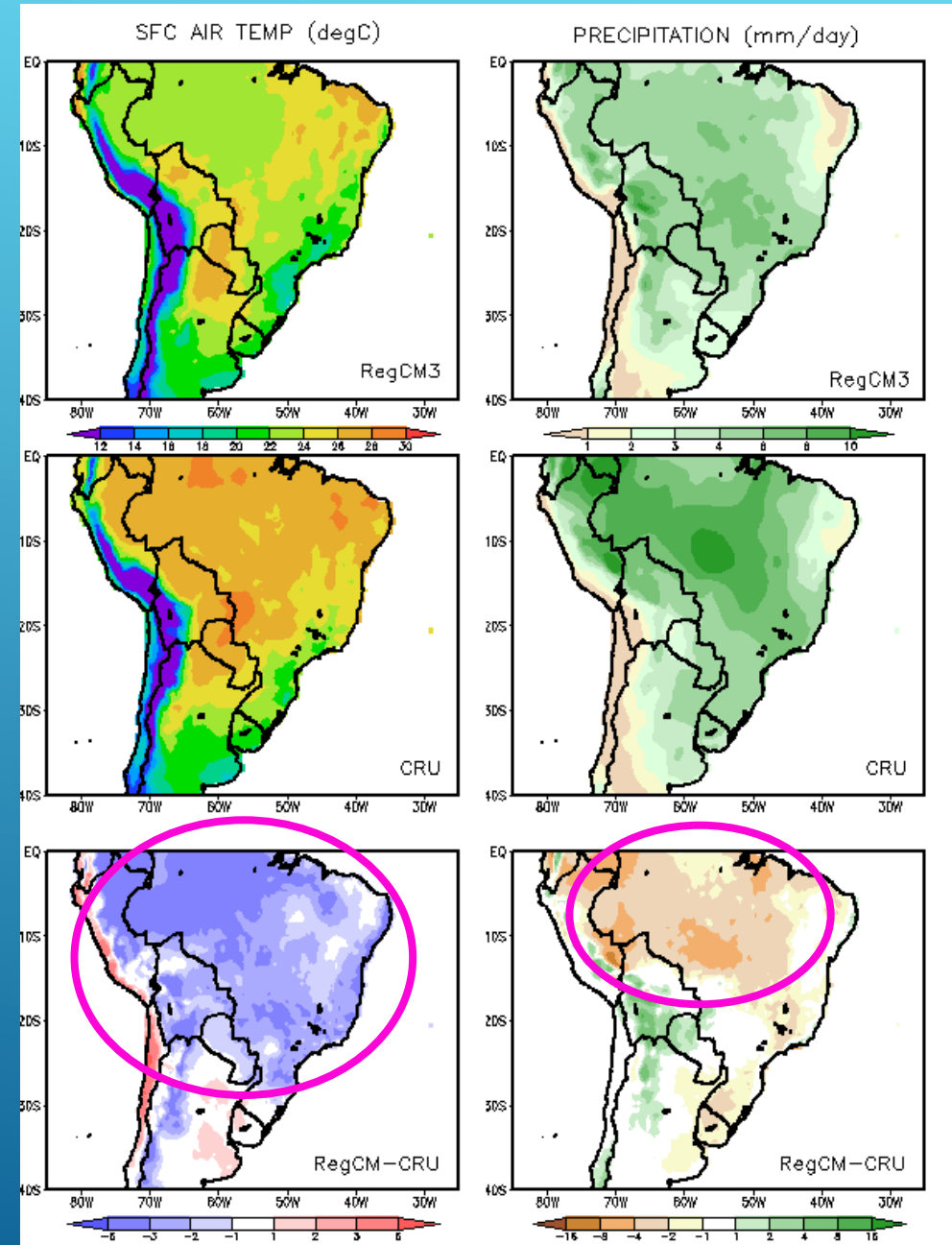
VALIDATION

CRU  
LOCAL DATA

CRU

REGCM3 - CRU

UNDERESTIMATION TEMPERATURE AND PRECIPITATION



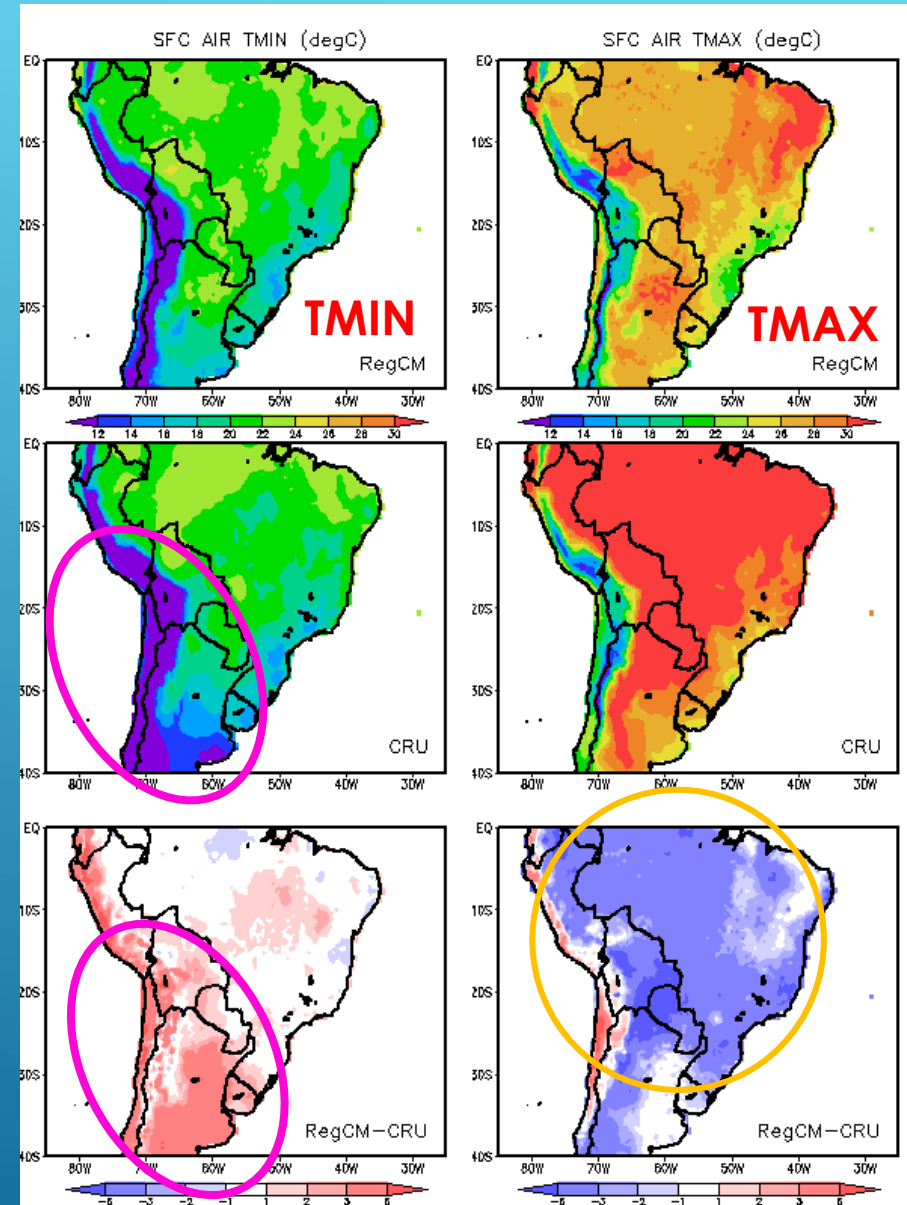
# VALIDATION

REGCM3

CRU

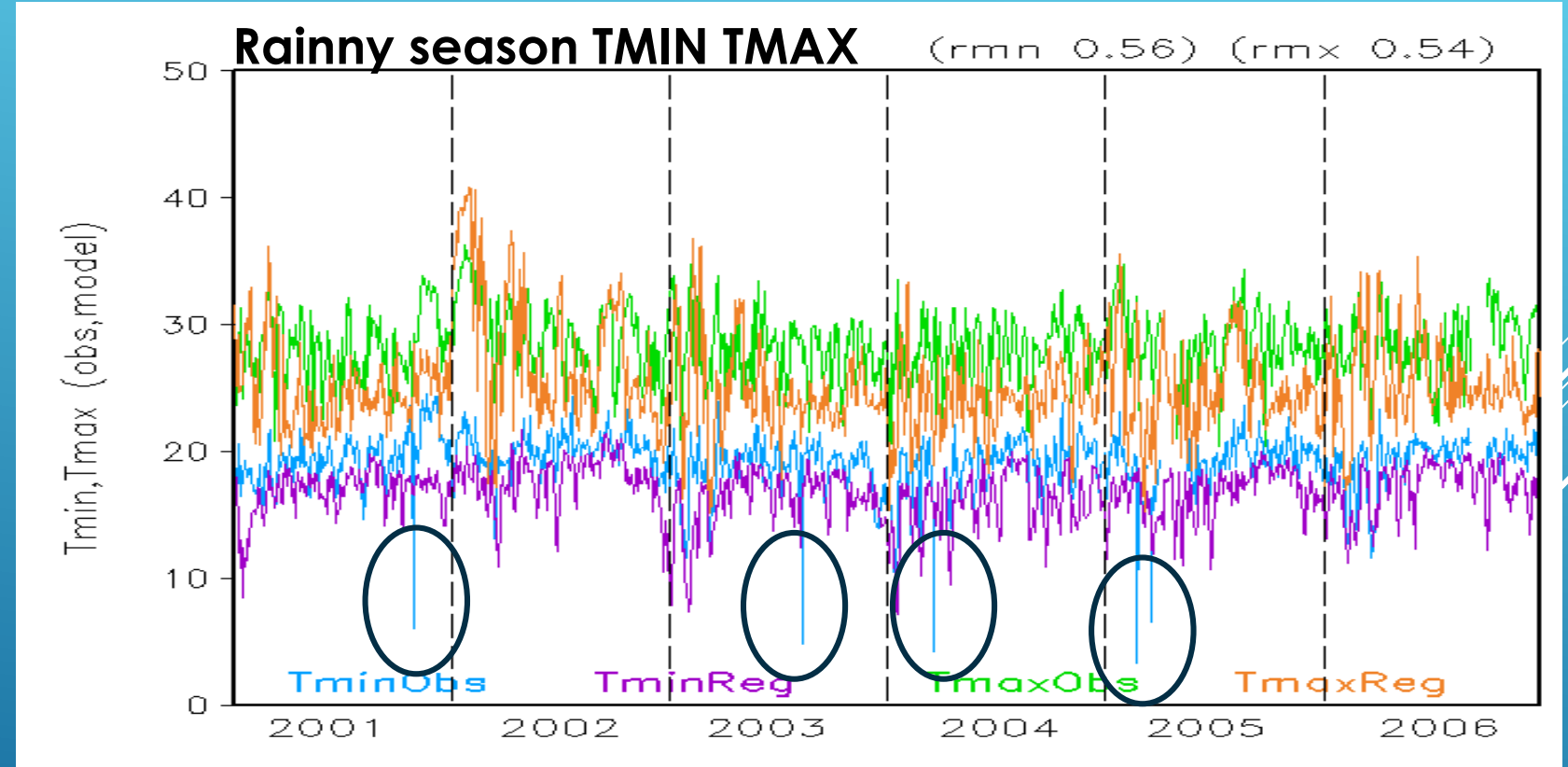
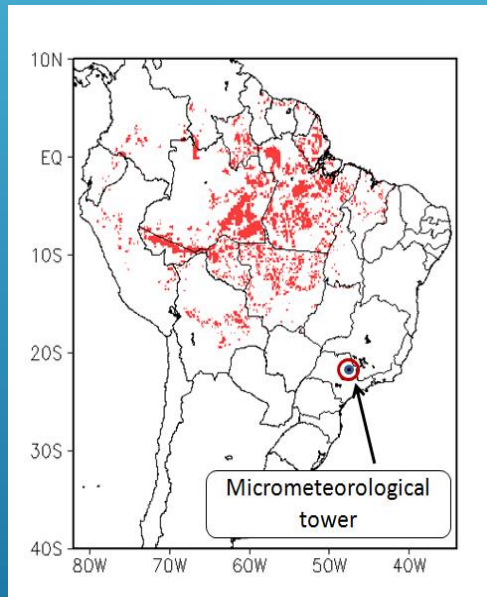
REGCM3 - CRU

OVERESTIMATION SFC MIN TEMP ← FEW COLD INCURSIONS  
UNDERESTIMATION SFC MAX TEMP  $\Delta t = 3-6\text{ }^{\circ}\text{C}$



# VALIDATION

## Local data



**REGCM3 DOES NOT WELL SIMULATE MIN TEMPERATURE**

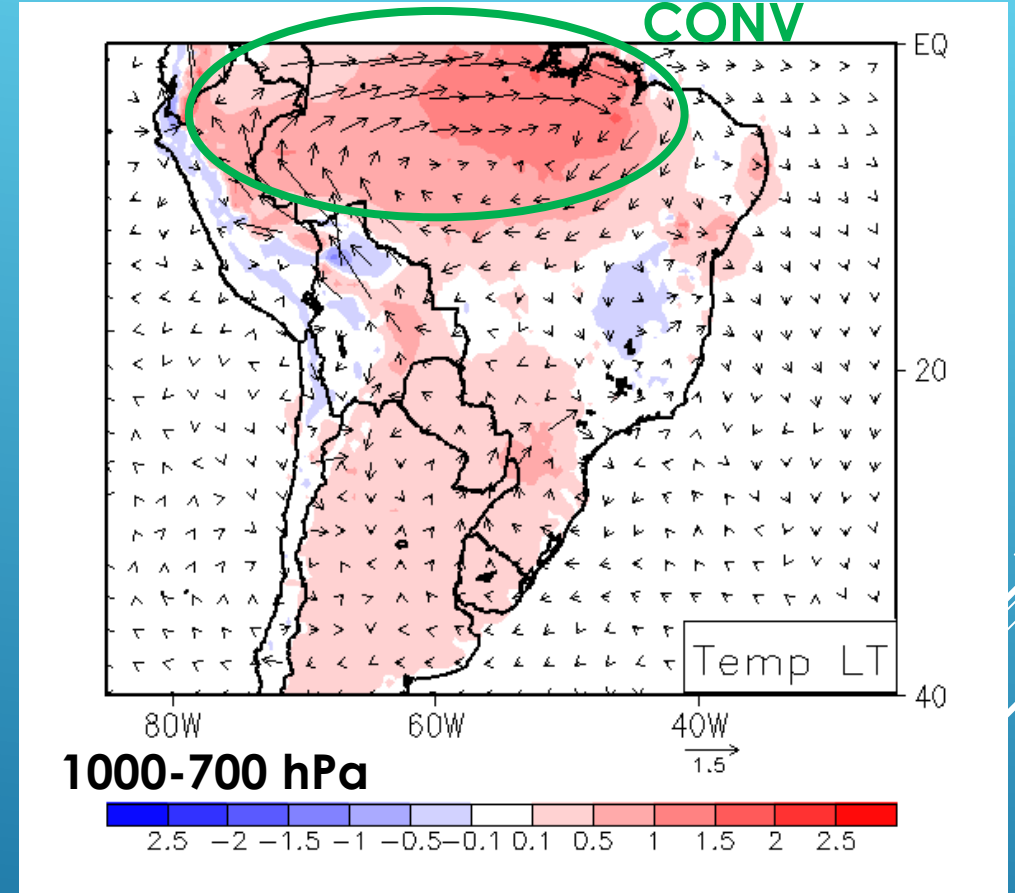
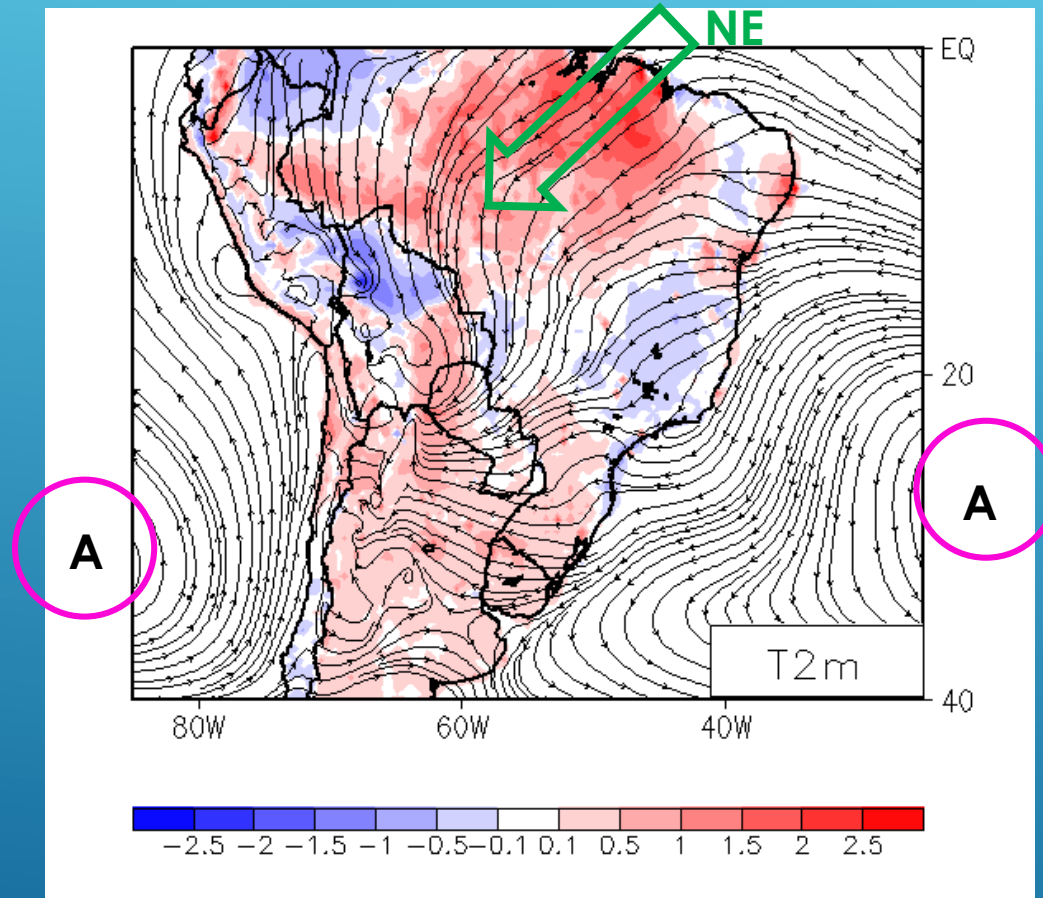


## RESULTS

CONTROL EXPERIMENT - CTRL  
DEFORESTATION EXPERIMENT – DEFOR

$$\sum_{2001}^{2006} (DEFOR - CTRL)_{year}$$

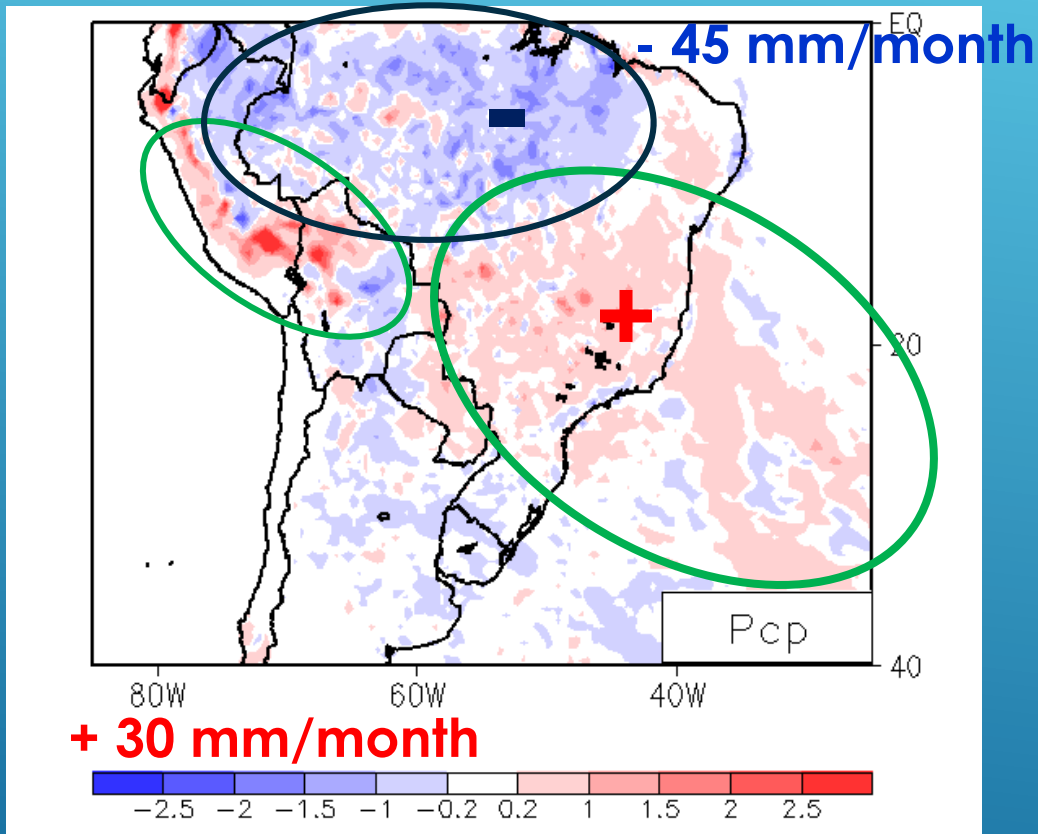
## DEFOR - CTRL



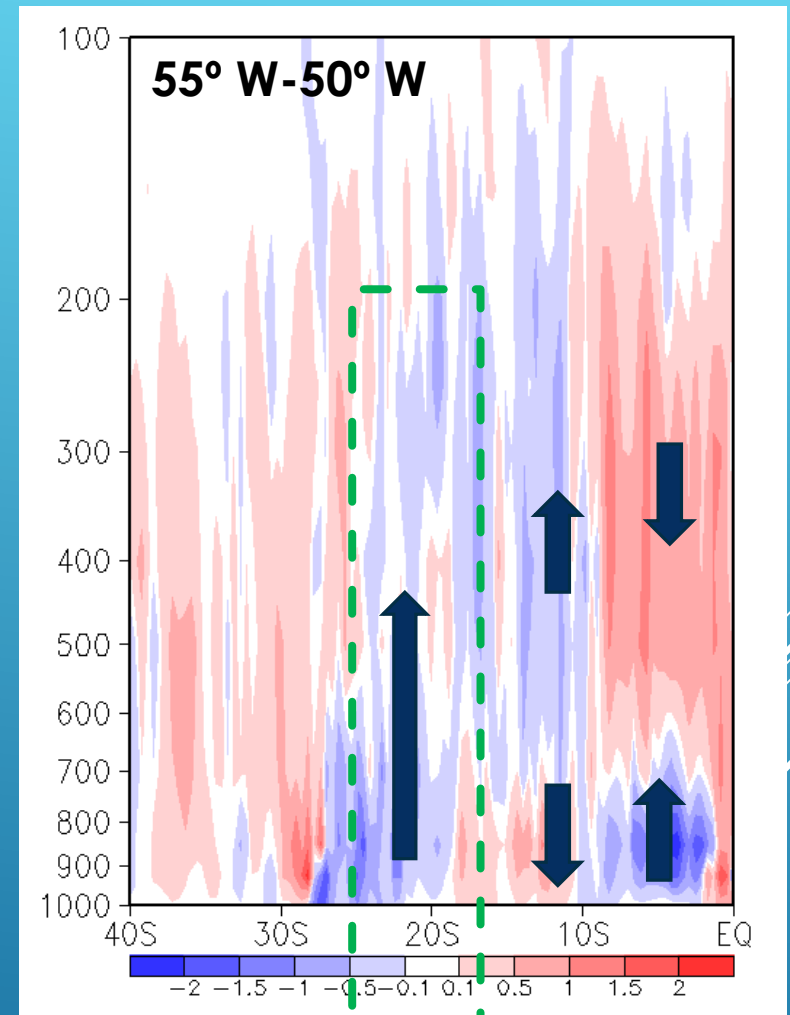
- **TEMPERATURE INCREASE SPREADED OVER SOUTH AMERICA**
- **CONVERGENCE OVER THE NORTHERN AREA**
- **WEAKENING OF NORTHEASTERLY WIND**



## PRECIPITATION

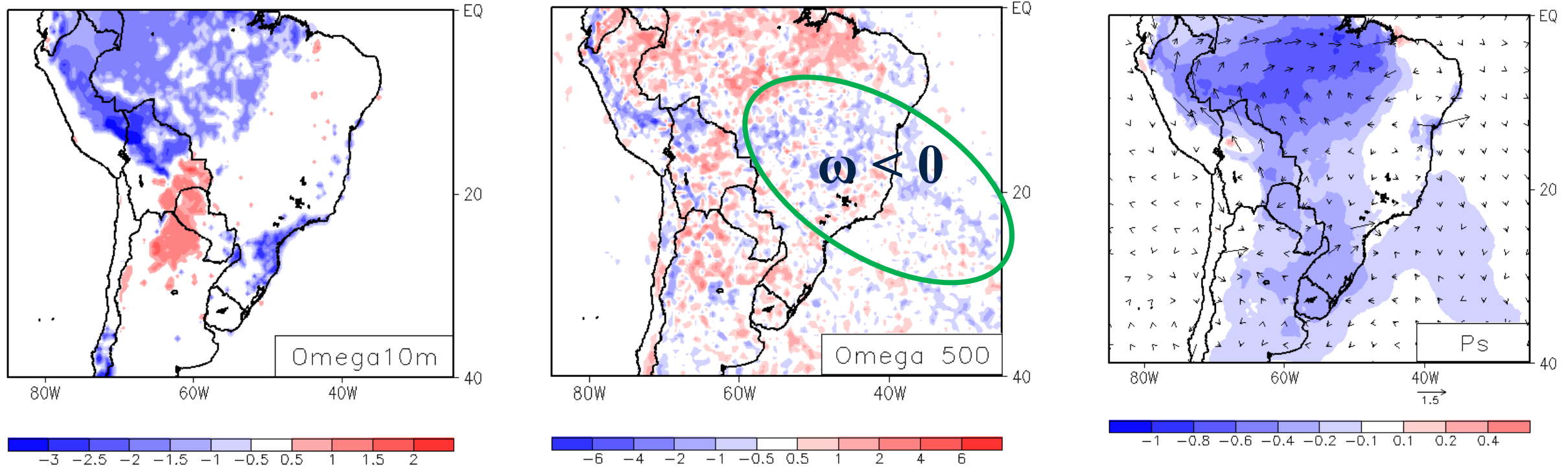


## VERTICAL MOVEMENT



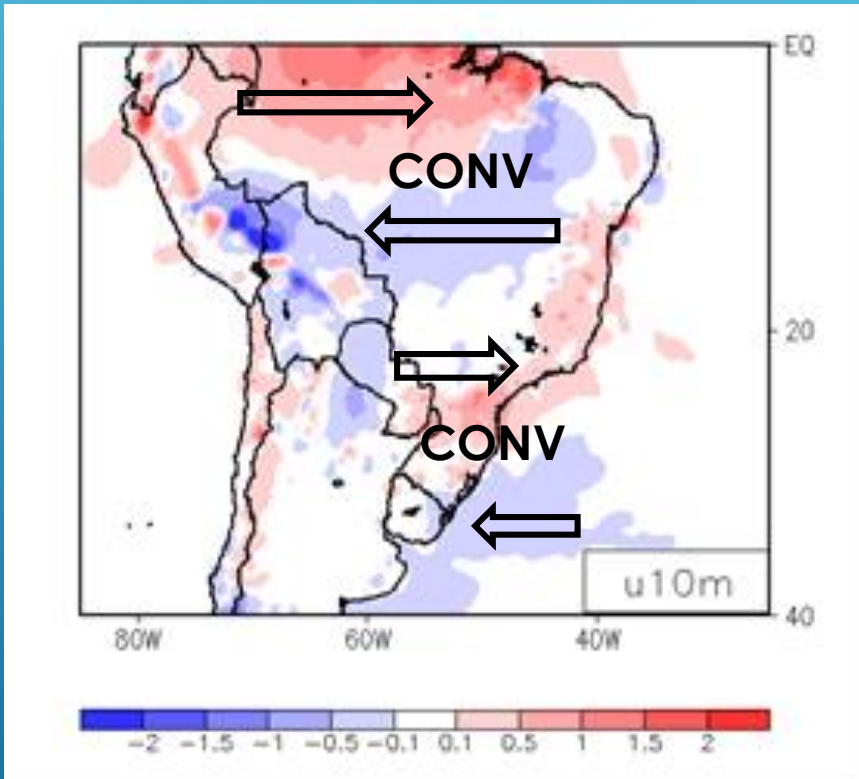
- PRECIPITATION DECREASE OVER NORTH OF SOUTH AMERICA
- PRECIPITATION INCREASE ONVER THE SOUTHEASTERN REGION

WHAT DOES CAUSE THE PRECIPITATION INCREASE?

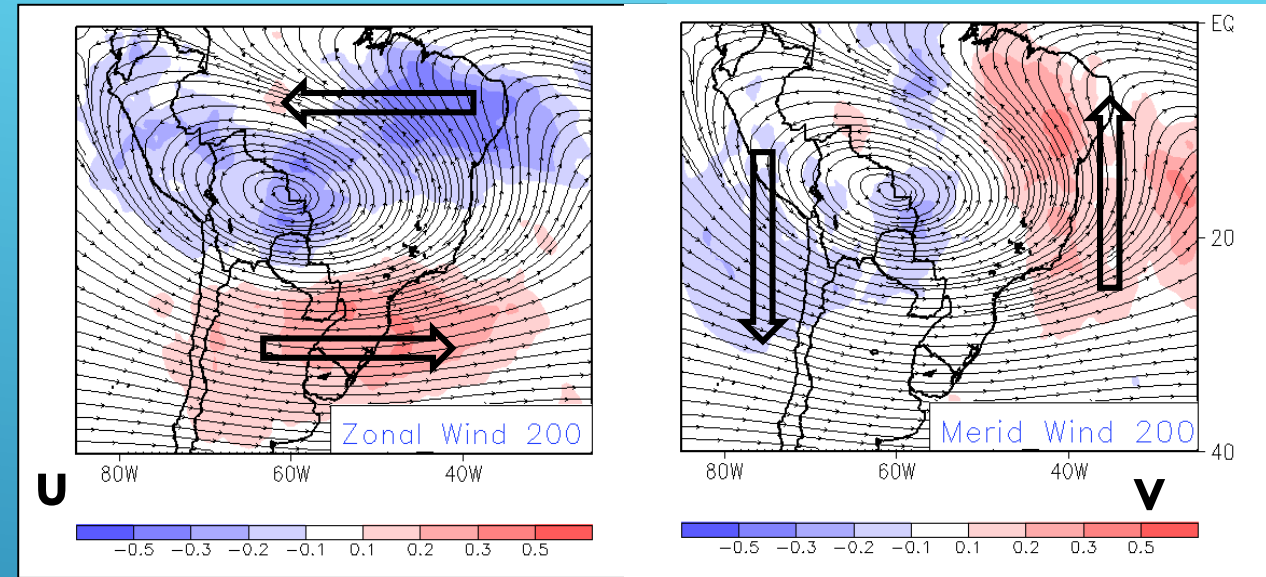


- **DECREASE OF Ps OVER GREAT PART OF SOUTH AMERICA**
- **INCREASE OF UPWARD MOVEMENT AT 500 mb OVER THE EASTERN SA**

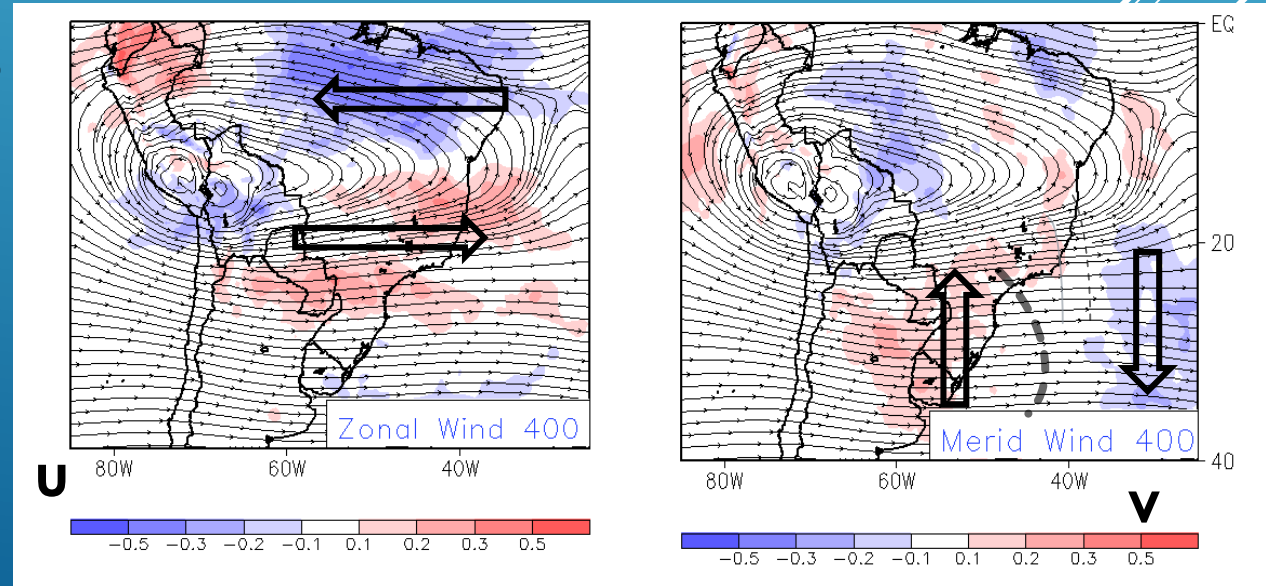
Diff u 10 m



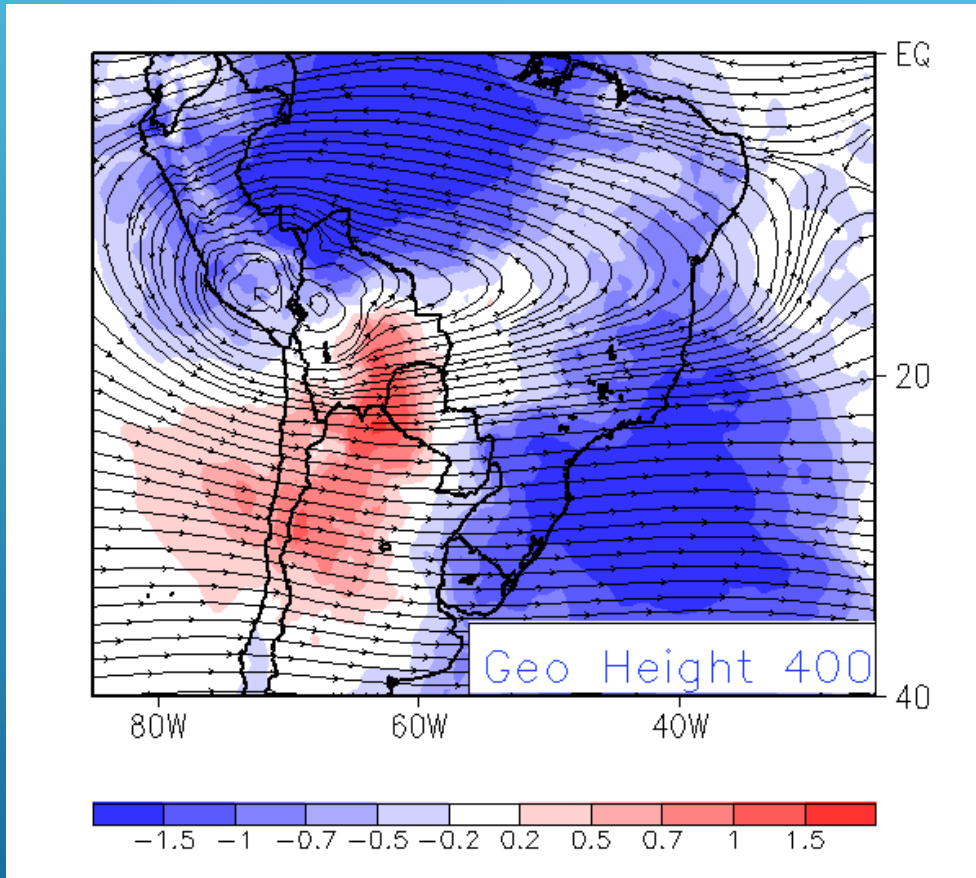
200 mb



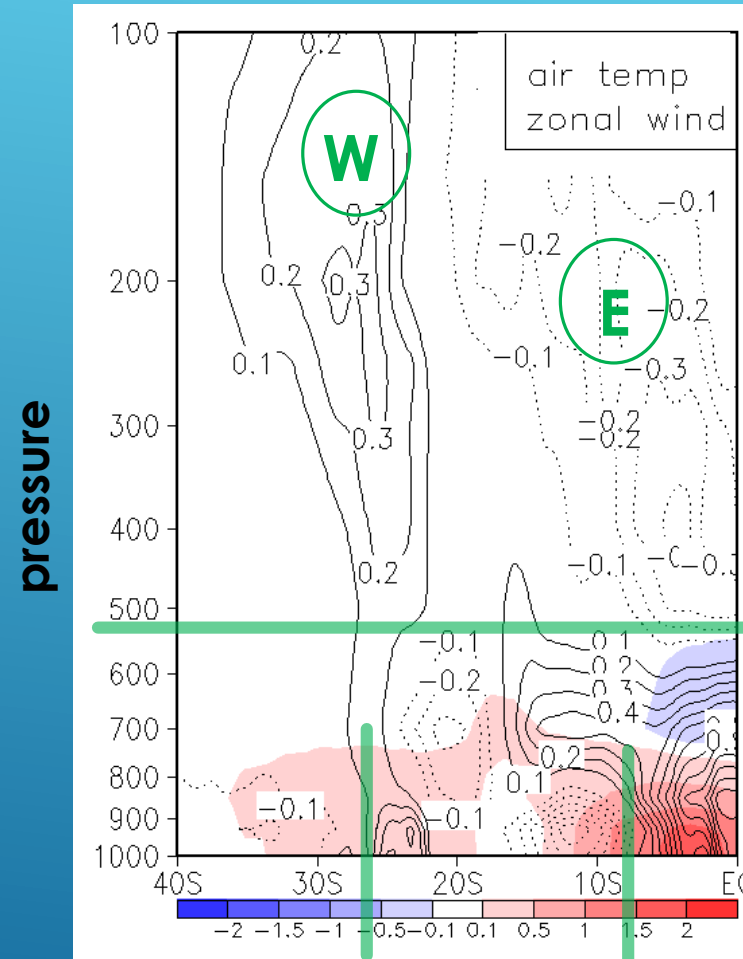
400 mb



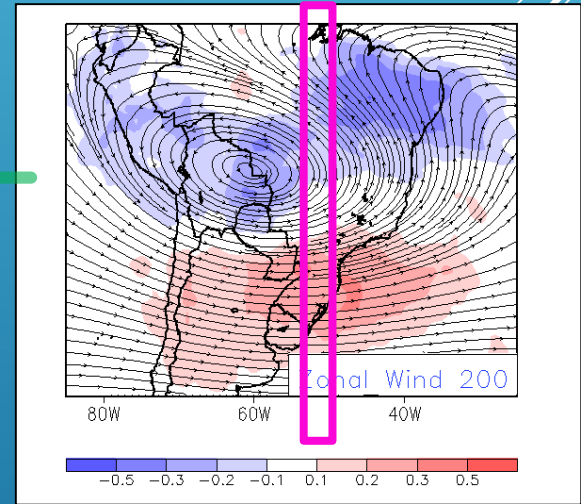
### GEPOTENTIAL HEIGHT 400 hPa DIFF



### ZONAL WIND/TEMPERATURE DIFF VERTICAL PROFILE



Bolivian High Intensification



South - North

## CONCLUSION

**CONSIDERING SPATIAL RESOLUTION OF 50 km AND A MORE REALISTIC DEFORESTATION EXTRAPOLATED TO 2050:**

- 1. DEFORESTATION OVER THE AMAZON REGION PROVIDES LESS PRECIPITATION AND TEMPERATURE INCREASE OVER THE DEFORESTED AREAS AS SHOWN IN MOST STUDIES**
- 2. OVER THE SOUTHEASTERN SOUTH AMERICA, DEFORESTATION PROVIDES PRECIPITATION INCREASE RELATED TO THE BOLIVIAN HIGH AND TROUGH EAST TO THE BH INTENSIFICATION**



QUESTIONS TO BE ANSWERED

1. **VERIFY THE PERFORMANCE OF OTHERS MODELS (REGCM4) IN RELATION TO DEFORESTATION AND FINE SPATIAL RESOLUTION**
2. **VERIFY THE IMPACT OF DEFORESTATION FOR DISTINCT CLIMATIC PERIODS**
3. **TO UNDERSTAND THE DIFFERENCES BETWEEN CLIMATIC IMPACTS DUE TO CLIMATE CHANGE AND DEFORESTION PROCESSES**