CORDEX over South America: Assessment of multi-model simulations driven by ERA-Interim reanalysis

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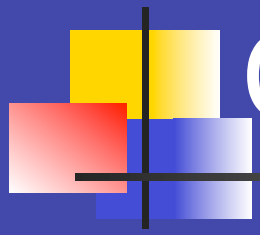
CIMA CONICET U B A

CORDEX Conference - Trieste, 21-26 March 2011



Outline

1. Context: The CLARIS-LPB contribution
2. Observational data and metrics
3. Evaluation of the Era interim driven simulations:
   - Capability of the regional model's ensemble in representing the observed climate, main shortcomings and strengths of RCMs over South America.
   - Uncertainty in simulating the South American climate.
4. Concluding remarks

1. Context

CLARIS-LPB

The EU FP7 CLARIS LPB project

Main goal: To predict the regional climate change impacts on La Plata Basin (LPB) in South America, and at designing adaptation strategies

- To provide an ensemble of regional hydroclimate scenarios and their uncertainties for climate impact studies.

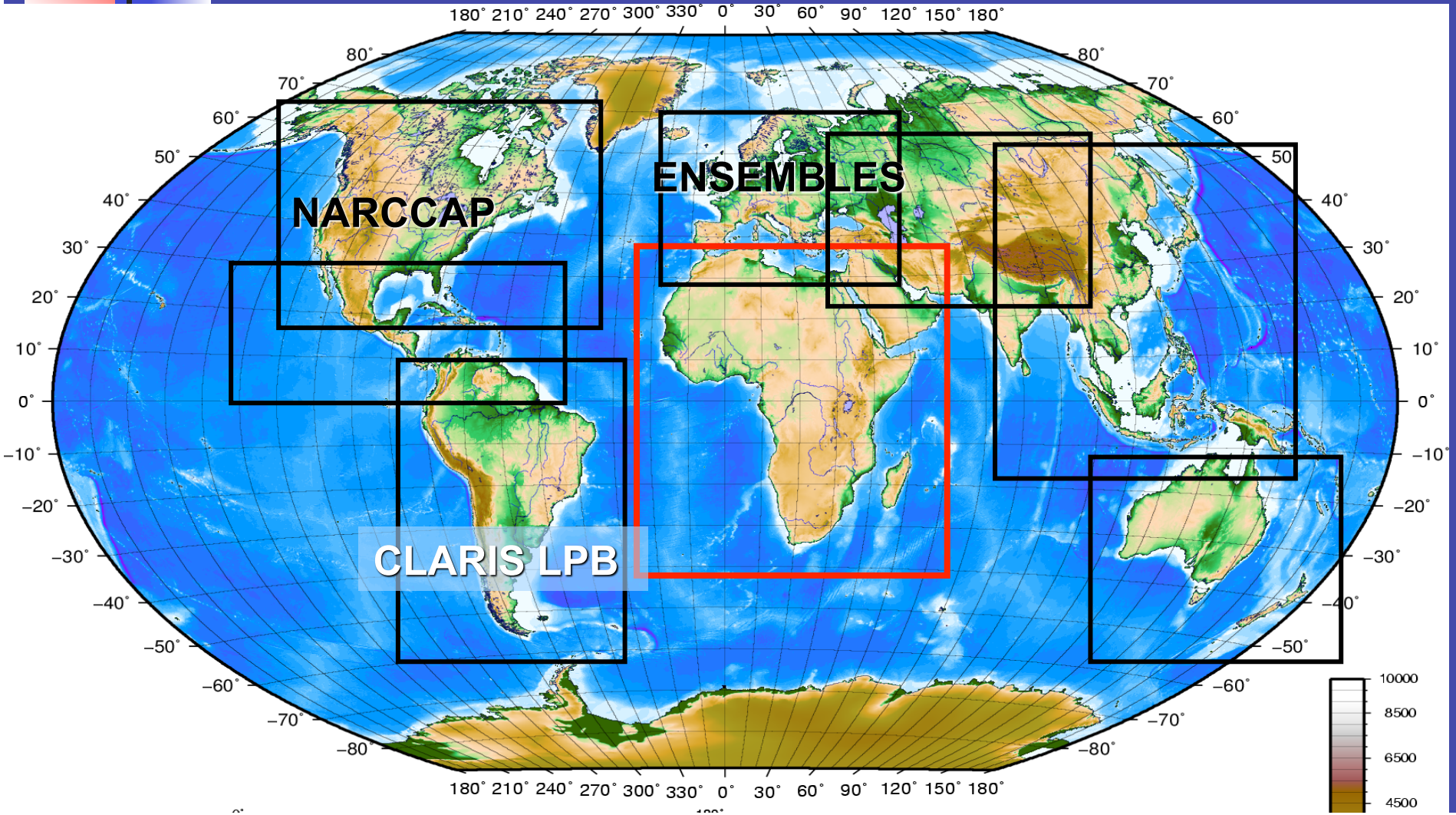
CORDEX

Initiative promoted by the TFRCD /WCRP

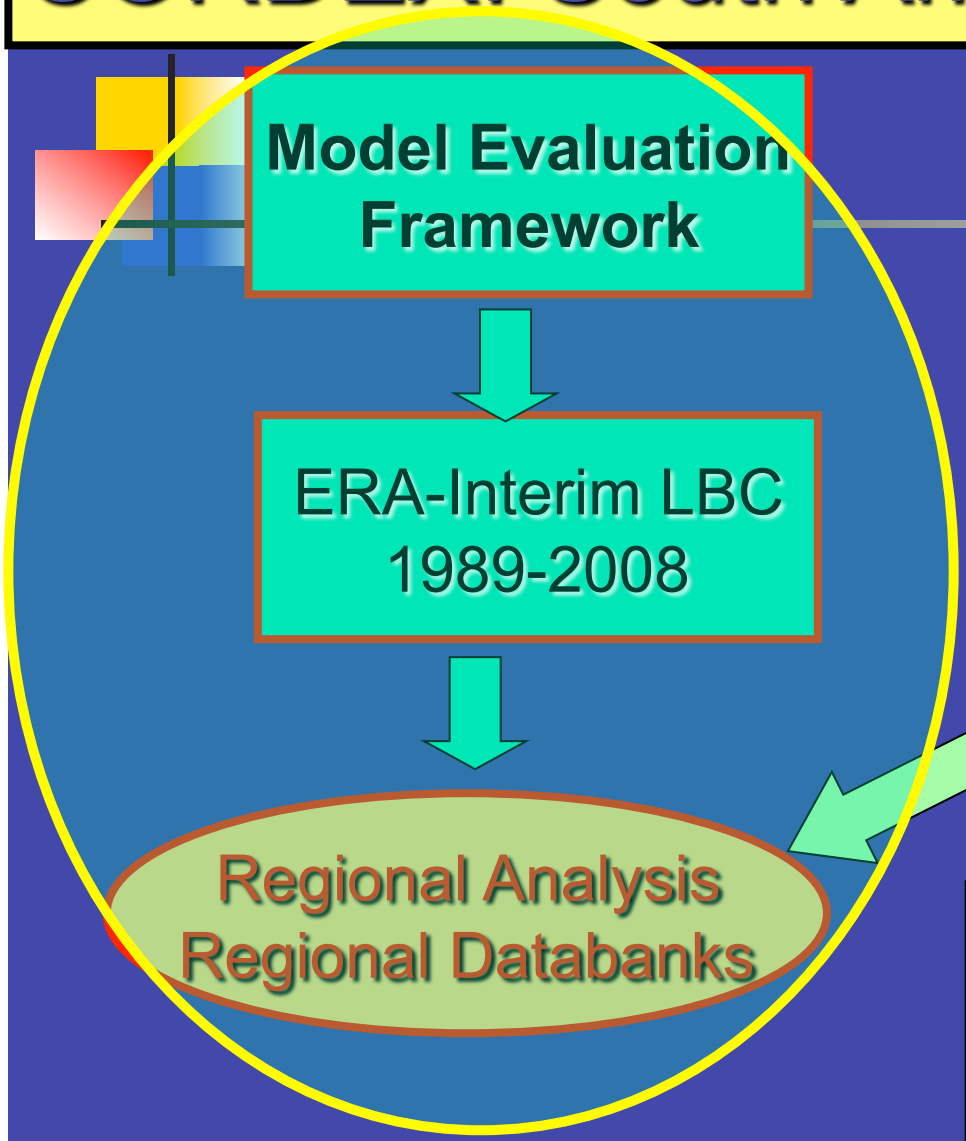
Main goal: To Provide a quality-controlled data set of RCD-based information for the recent historical past and 21st century projections, covering the majority of populated land regions on the globe.

- To Evaluate the ensemble of RCD simulations.

CORDEX Domains



CORDEX: South America/CLARIS-LPB



Model Evaluation Framework

ERA-Interim LBC
1989-2008

Regional Analysis
Regional Databanks

Climate Projection Framework

A1B
Continuous runs &
Timeslices
(2010-2040 and 2070-2100)

Multiple AOGCMs

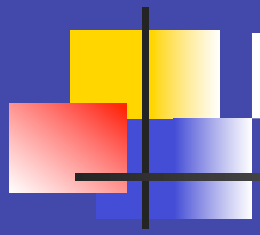
HadCM3-Q0, ECHAM5OM-R3, IPSL
Scheduled on April 2011!!!!

CLARIS-LPB coordinated experiments over South America: ERA-Interim boundary forcing

RCM/Institution	Country	Contact person
RCA/SHMI	Sweden	Patrick Samuelsson
MM5/CIMA	Argentina	Silvina Solman, Natalia Pessacg
RegCM3/USP	Brazil	Rosmeri Porfirio da Rocha
REMO/MPI	Germany	Armelle Reca Remedio, Daniela Jacob
PROMES/UCLM	Spain	Enrique Sánchez , R. Ochoa
LMDZ/IPSL	France	Laurent Li
ETA/INPE	Brazil	Sin Chou, José Marengo
WRF/CIMA	Argentina	Mario Nuñez

Matrix of RCMs simulations
A1B scenario: Continuous runs (1960-2100, XX) and 30-year time-slices (1960-1990; 2010-2040; 2070-2100, x)

RCM/Institution GCM	HadCM3-Q0	EC5OM-R3	IPSL
RCA/SHMI		XX (3)	
MM5/CIMA	x		
RegCM3/USP	x	x	
REMO/MPI		XX	
PROMES/UCLM	XX		
LMDZ/IPSL			X
ETA/INPE	x		

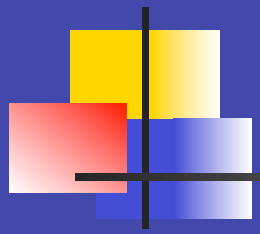


Databank

- Standardized output format following (as closely as possible) the ENSEMBLES protocol
- Relevant observational datasets for South America
- Databank at CIMA (Argentina)

2. Observational Data and metrics

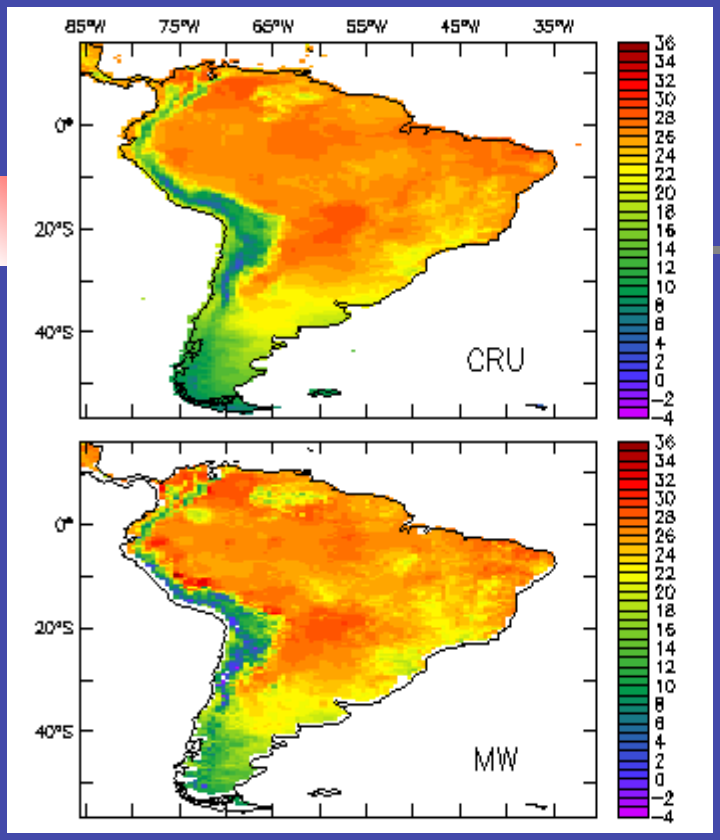
- Observational data
  - CRU (1990-2006)
  - Matsuura and Willmott (2009) (1990-2008) (0,5°; monthly)
  - CLARIS-LPB gridded Temp data over SA (0,5°; daily)
- Metrics (based on monthly means)
  - Bias; annual cycles; frequency distribution diagrams over target sub-regions; inter-model spread

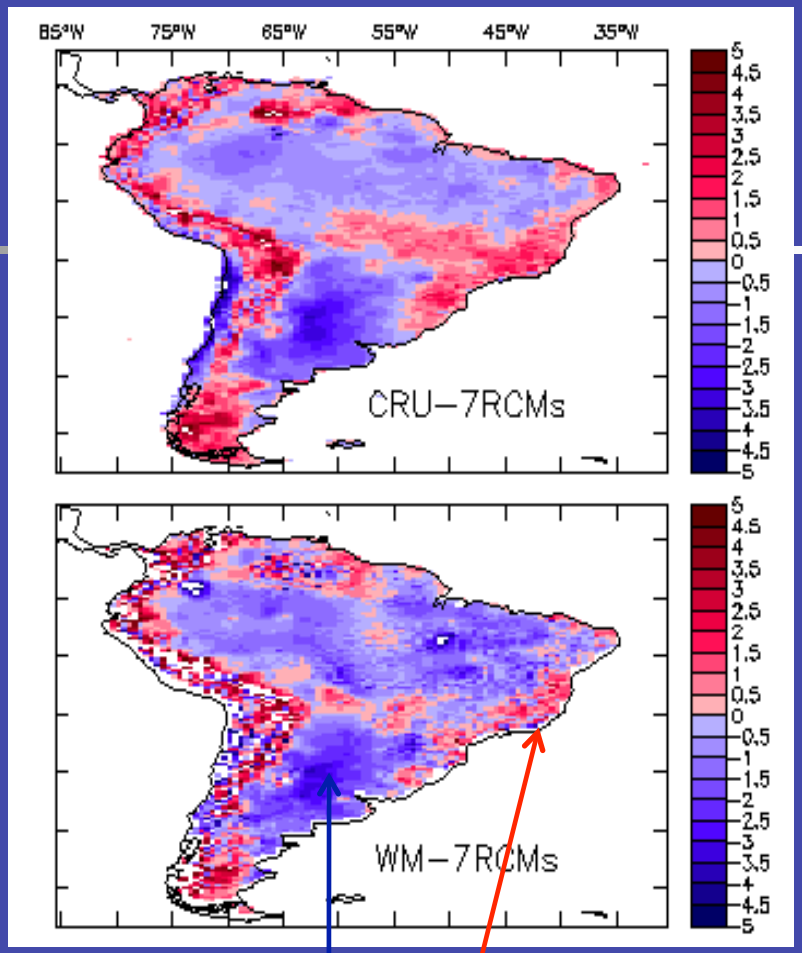


3. Evaluation of the Era interim driven simulations

Mean Temperature (DJF) 1990-2006

BIAS



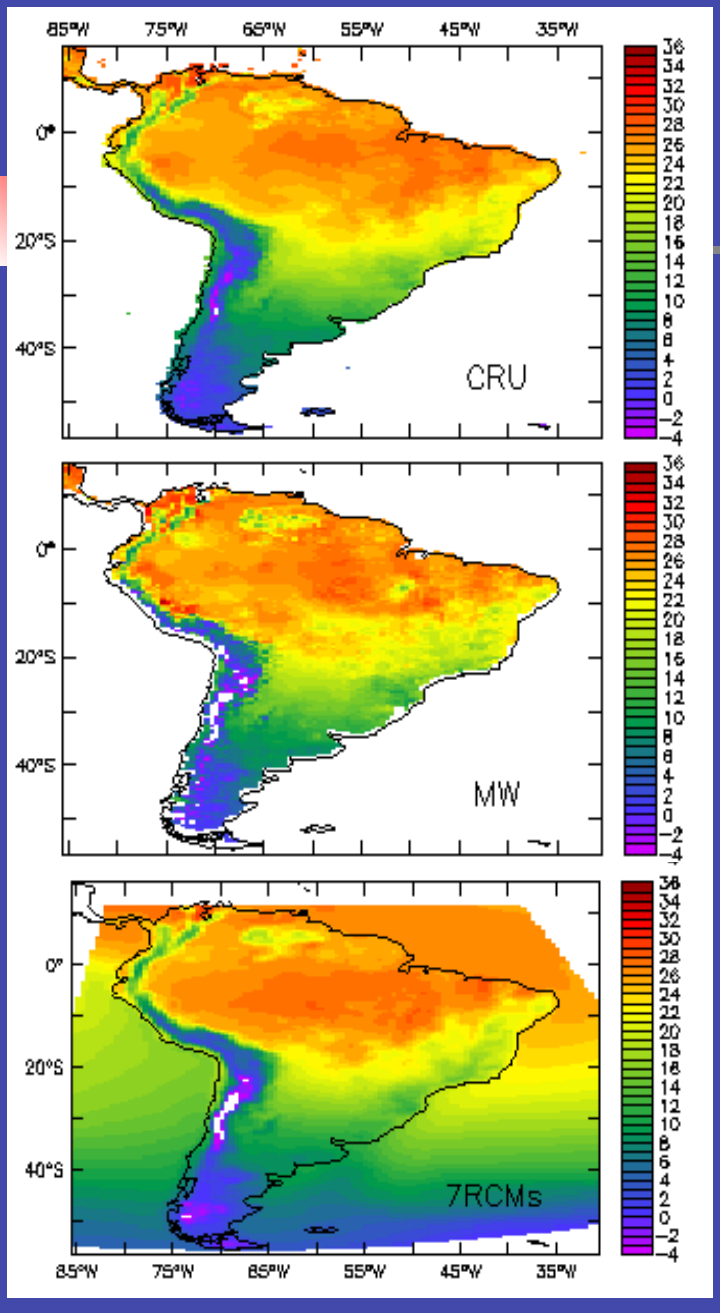


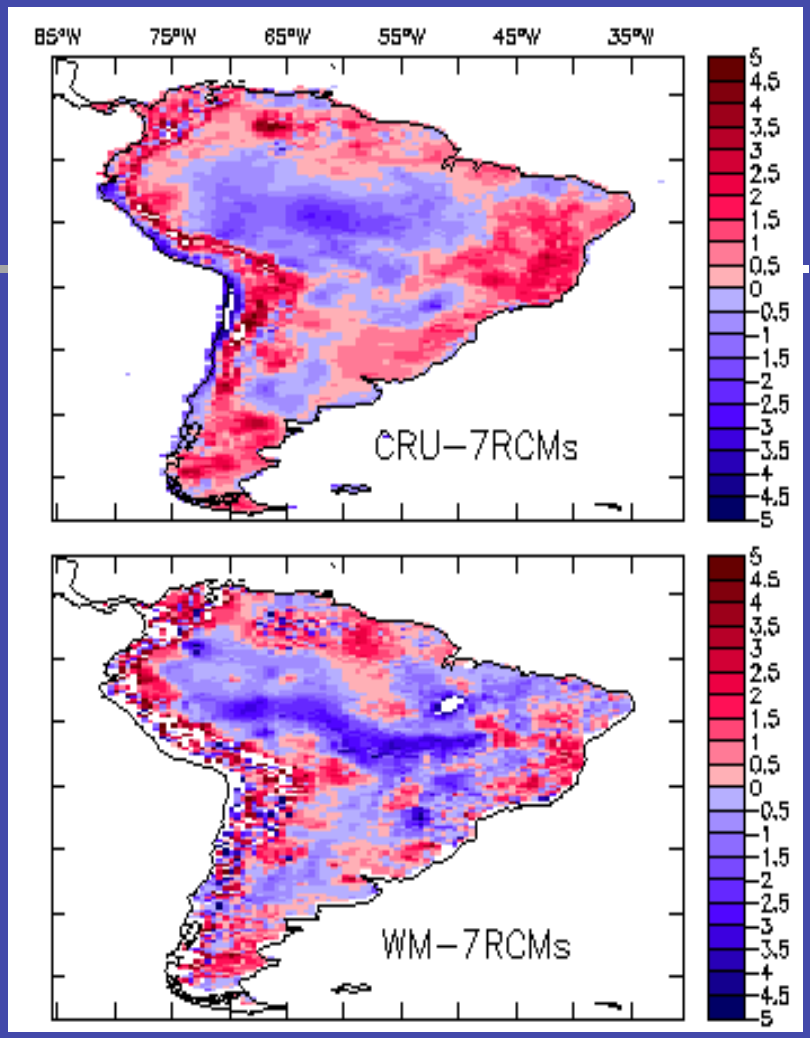
RCMs Ensemble

Warm/cold bias

Mean Temperature (JJA) 1990-2006

BIAS



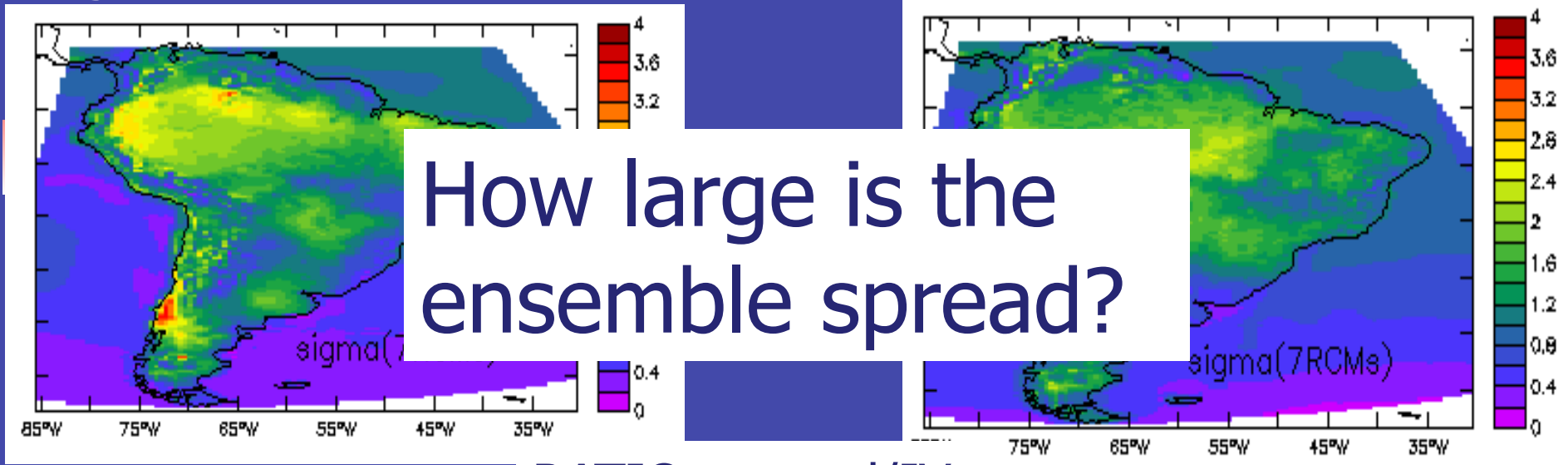


RCMs
Ensemble

Ensemble spread

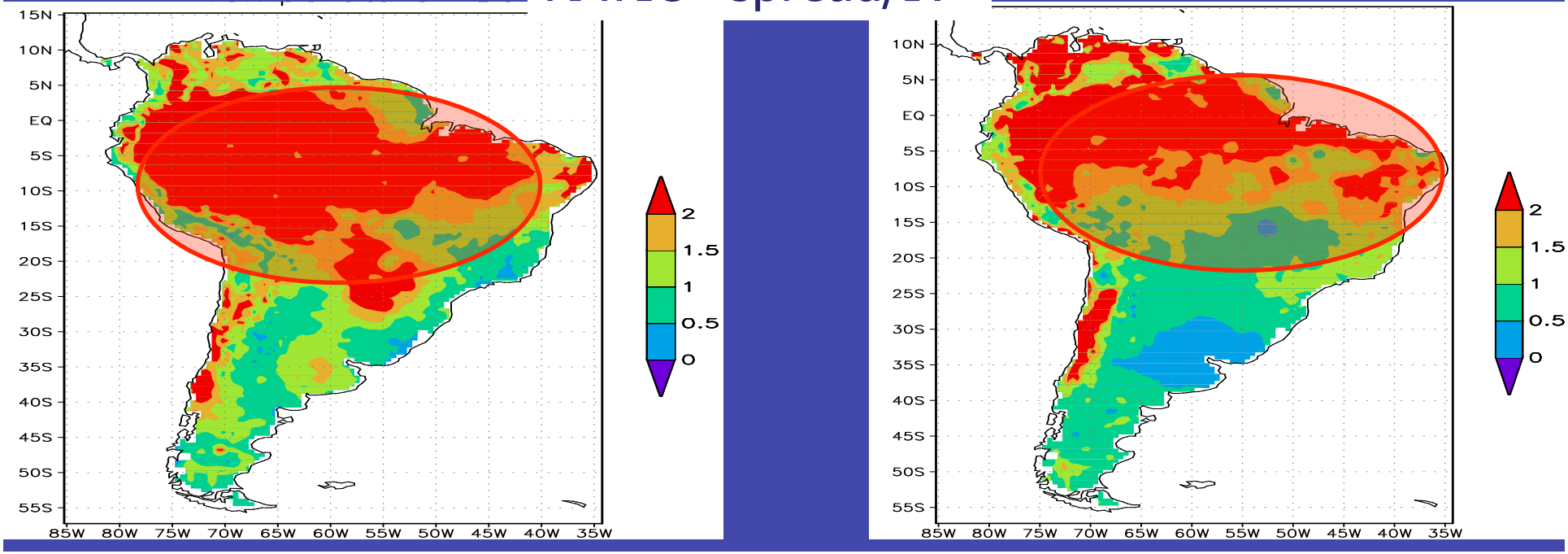
DJF

JJA

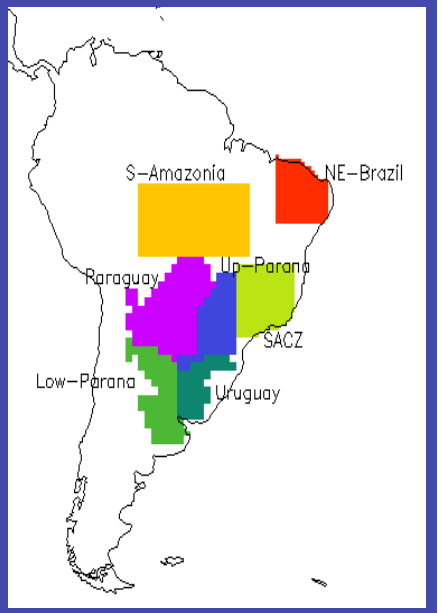


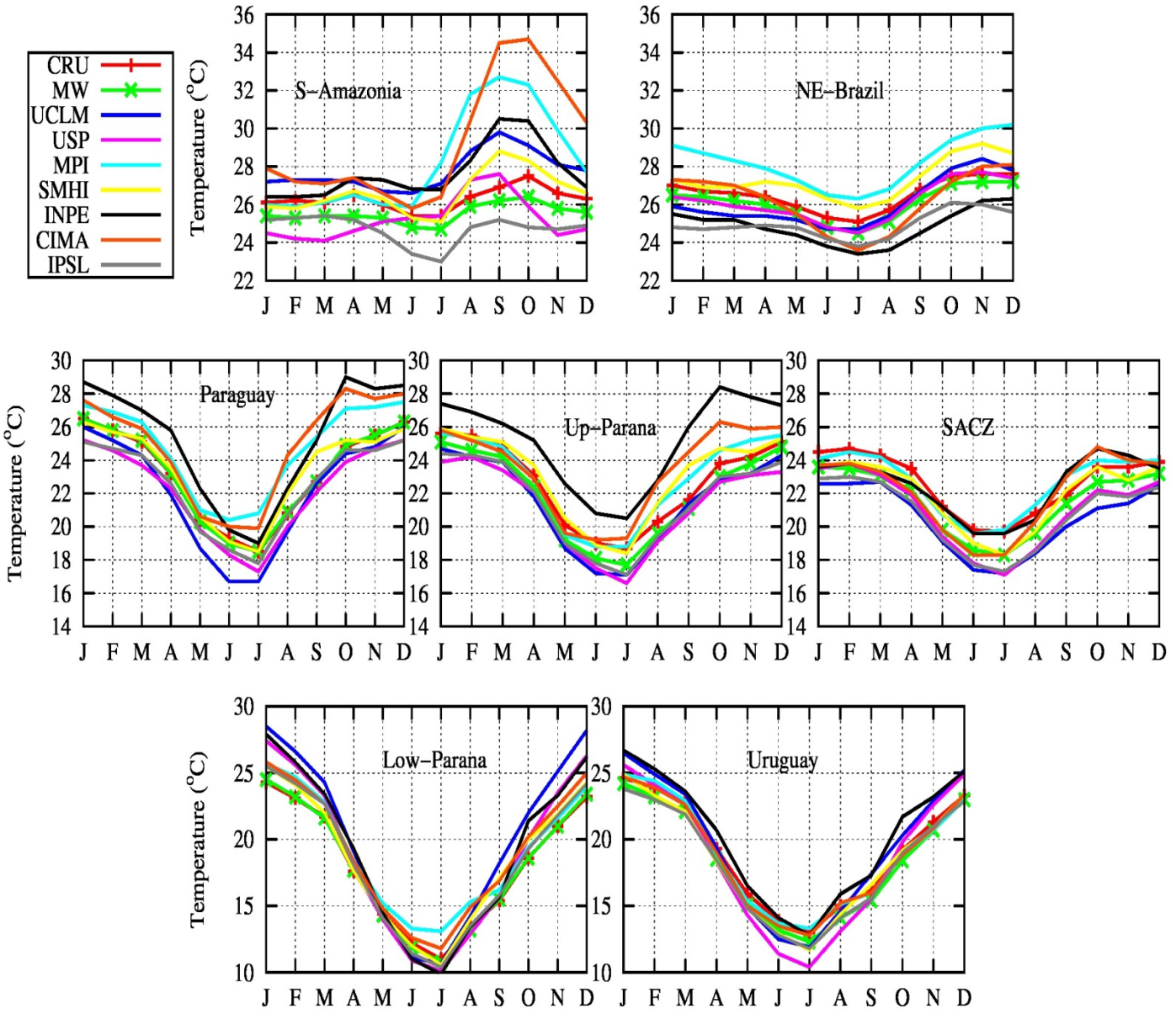
How large is the ensemble spread?

RATIO=spread/IV

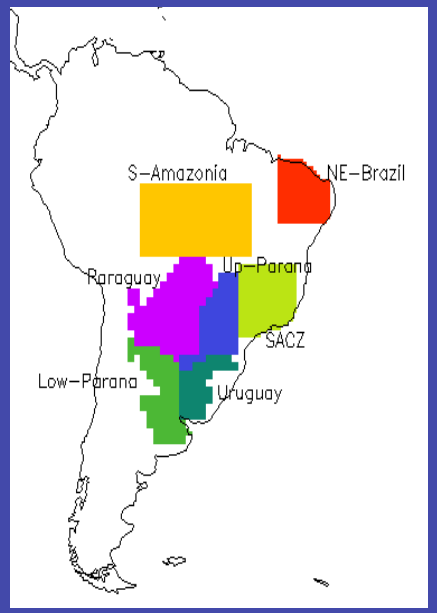


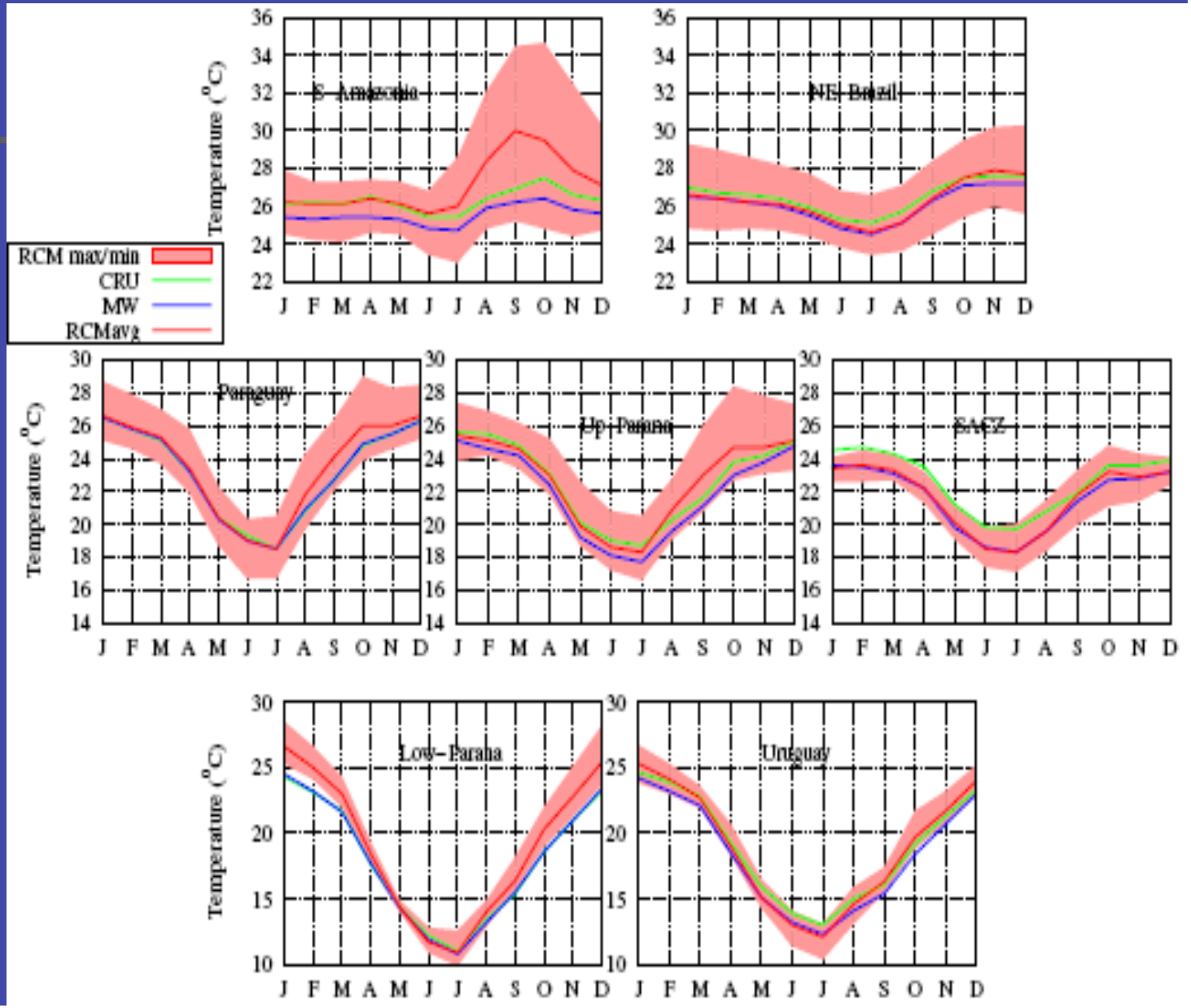
Temperature Annual cycle



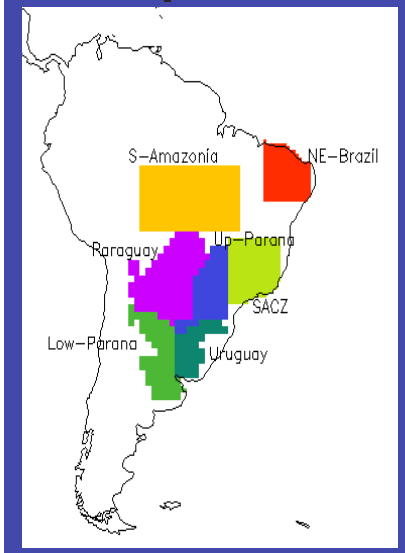


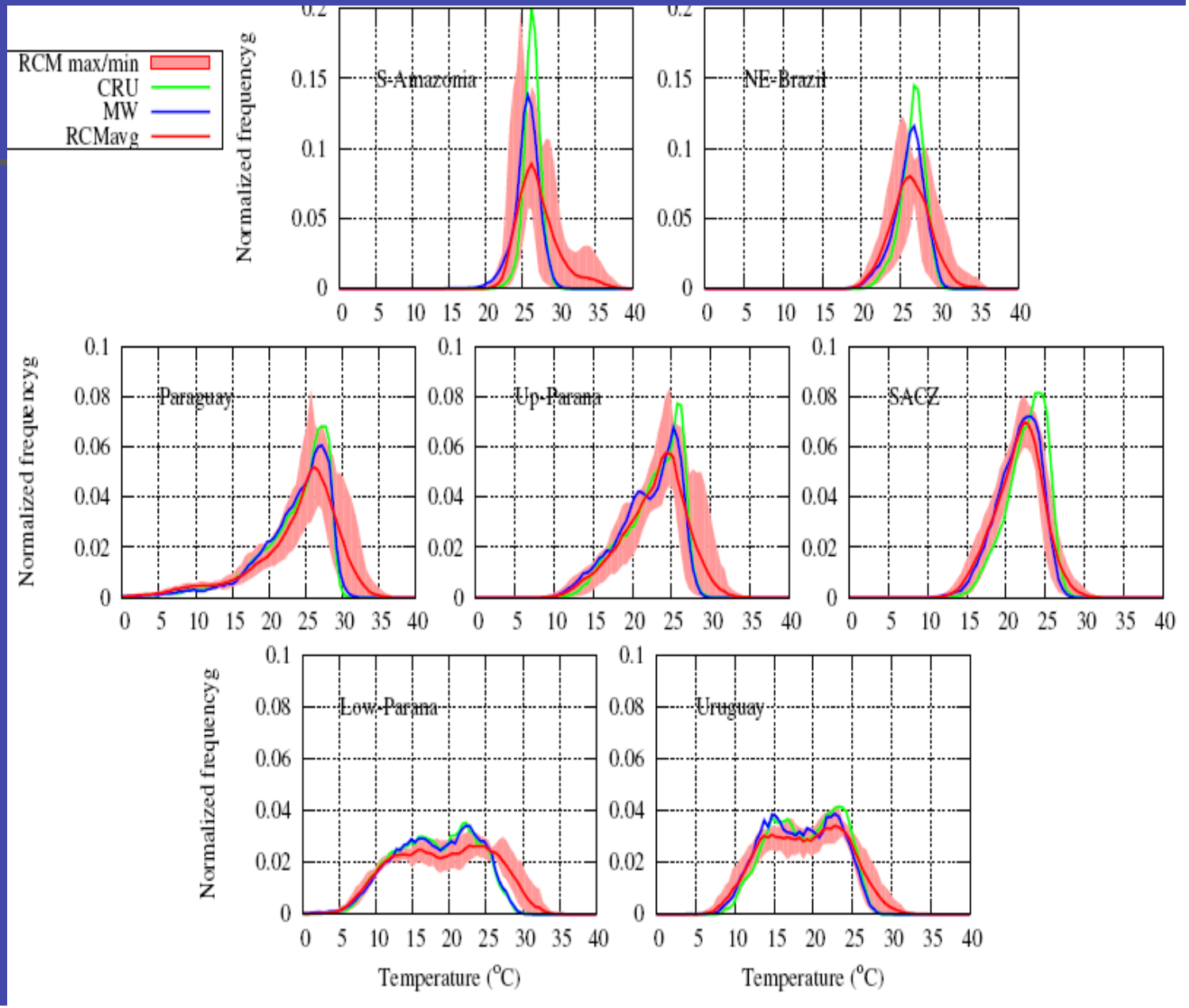
Temperature Annual cycle





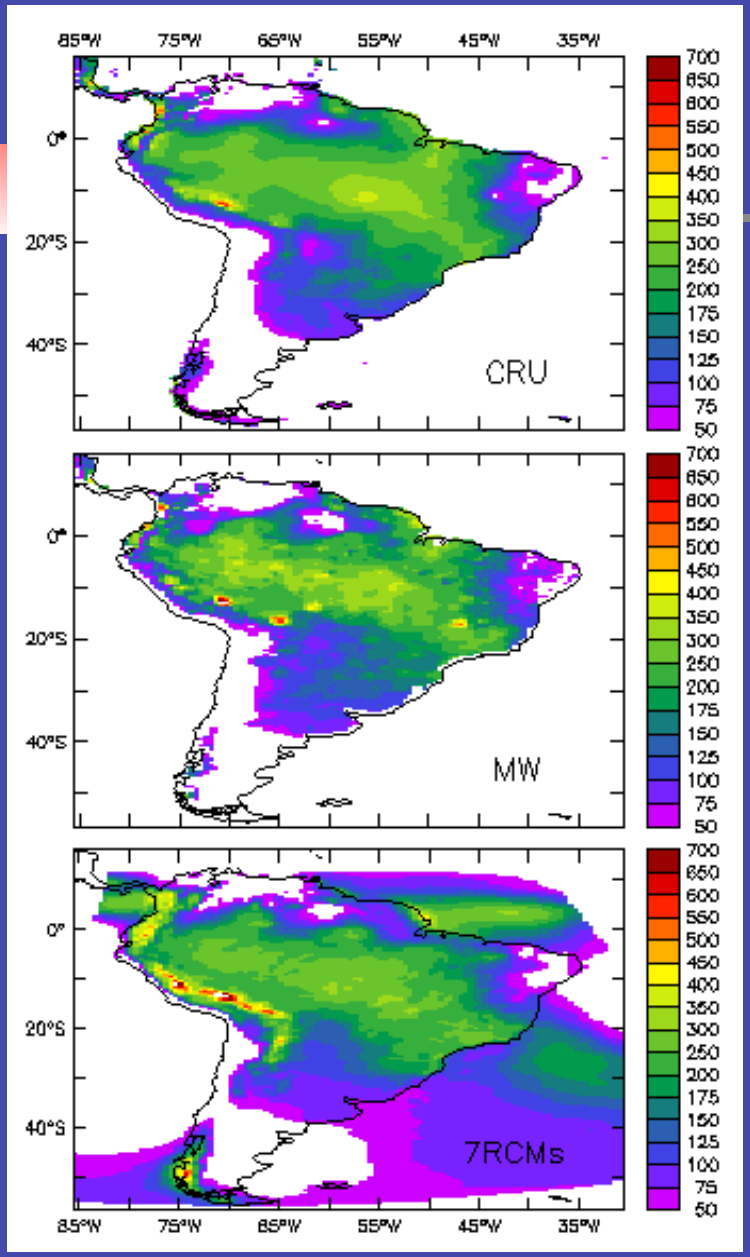
Frequency distribution: Mean Temperature

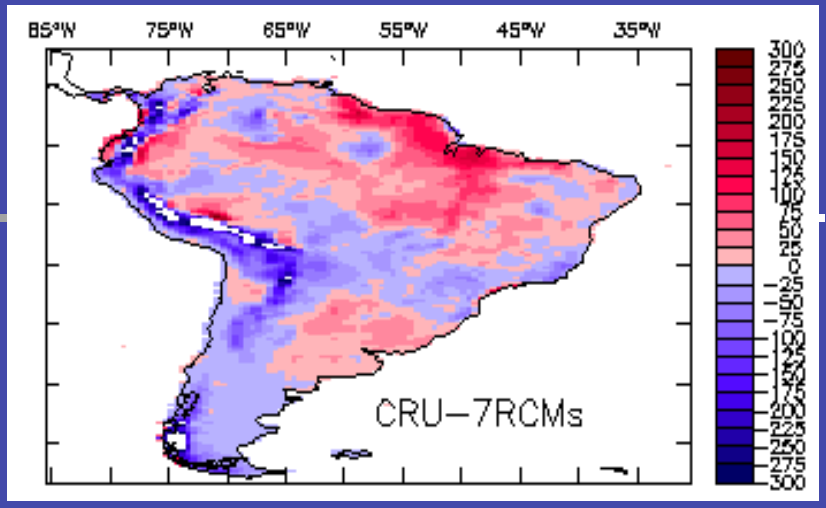


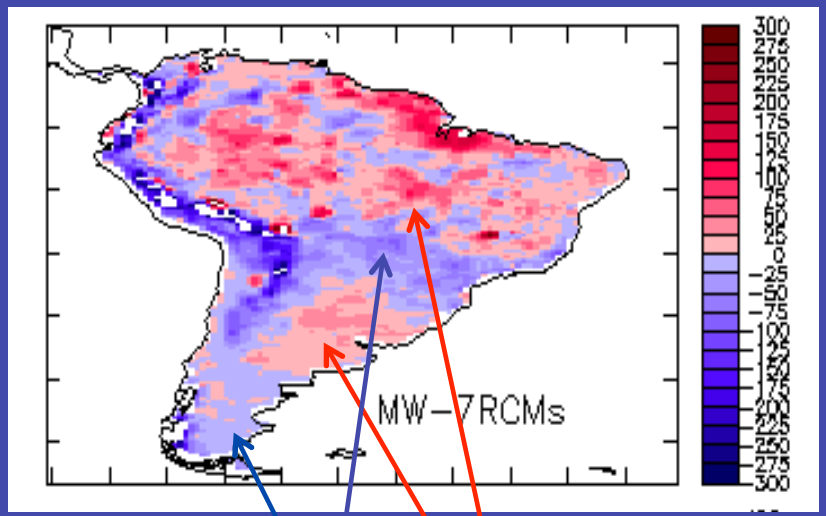


Precipitation (DJF) 1990-2006

BIAS





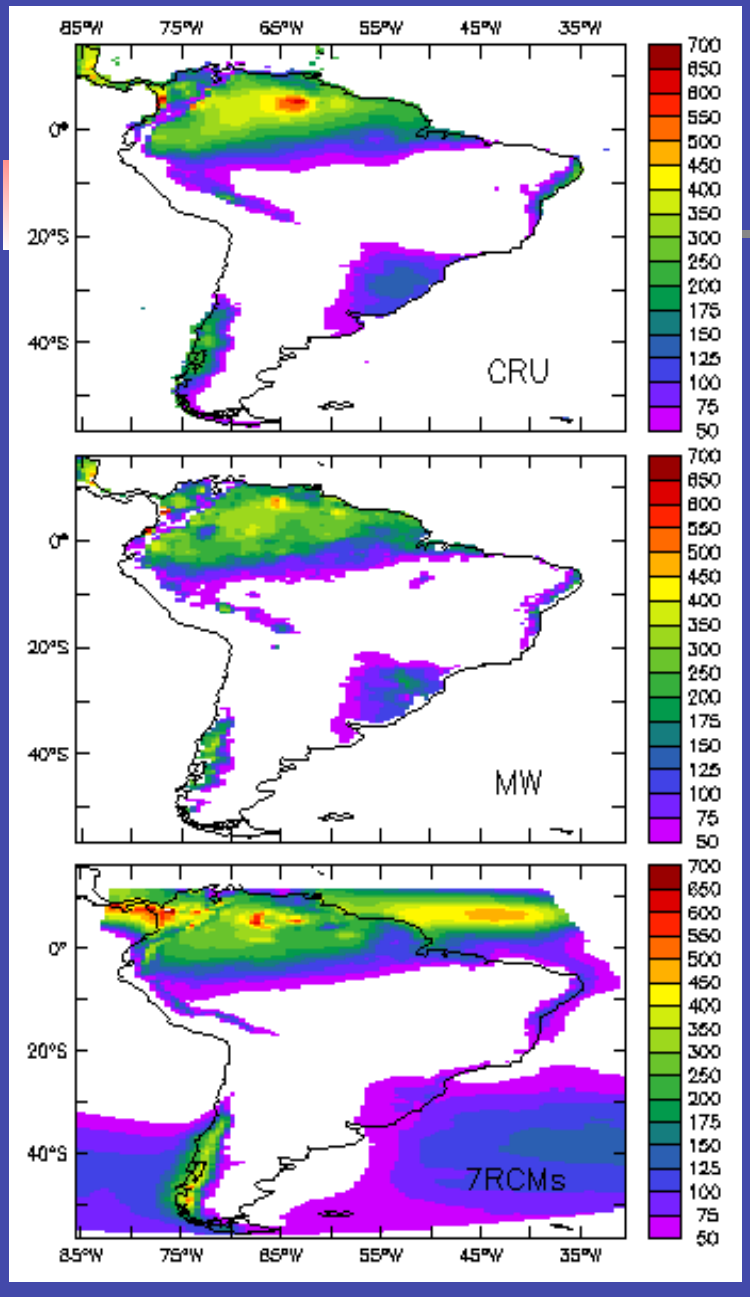


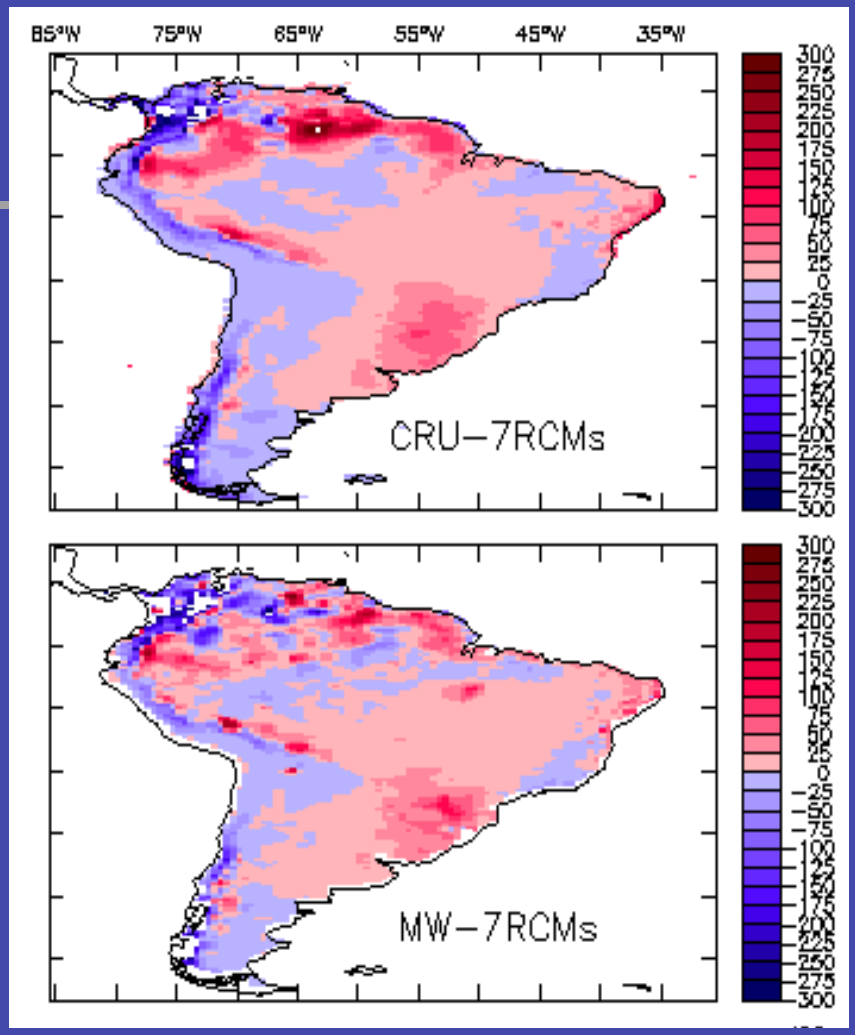
RCMs Ensemble

Wet/dry bias

Precipitation (JJA) 1990-2006

BIAS



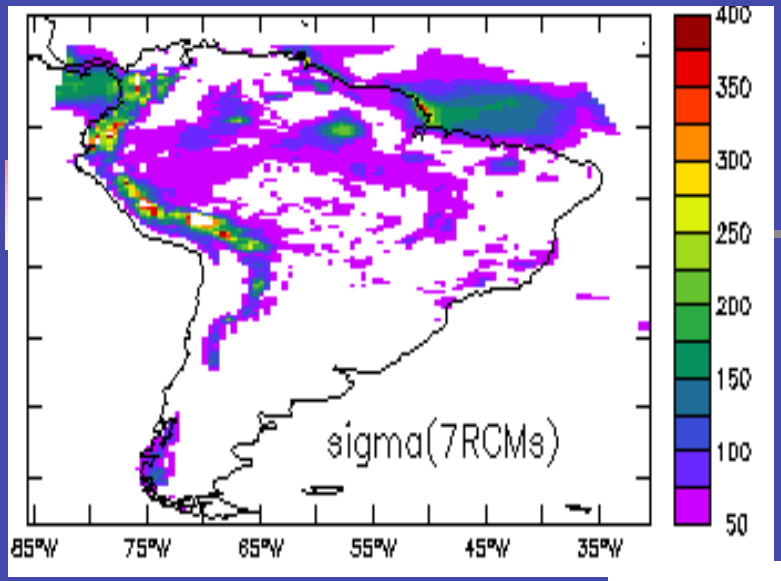


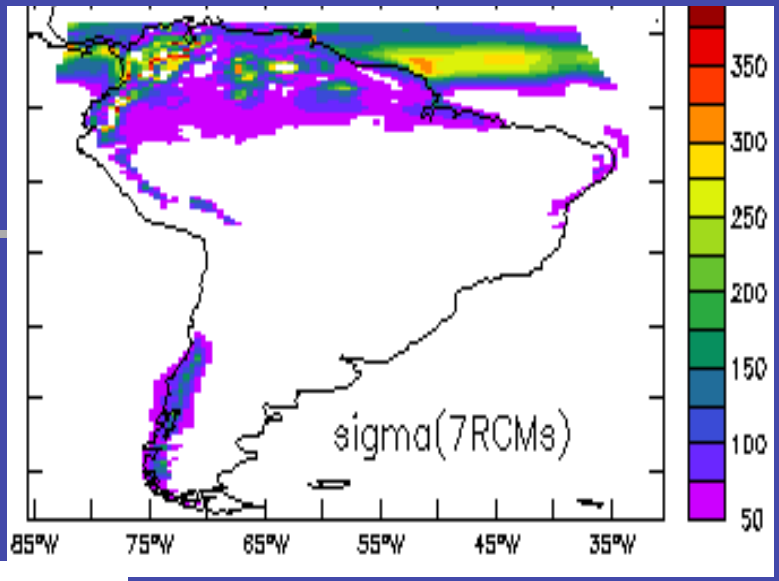
RCMs Ensemble

Ensemble spread

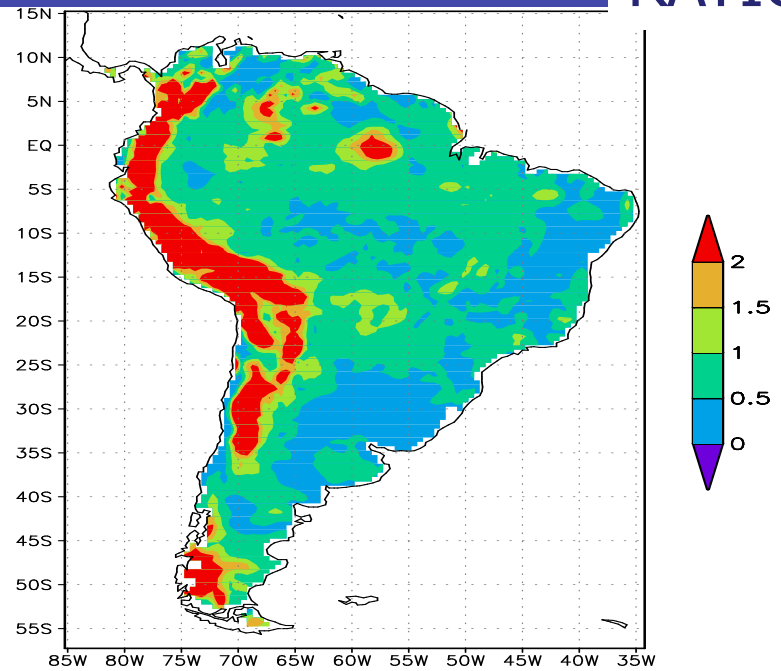
DJF

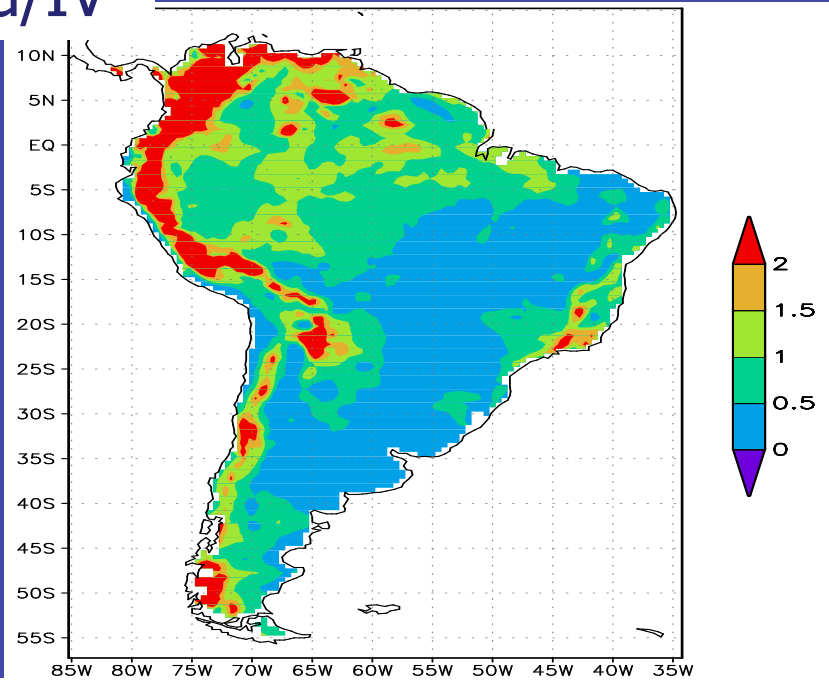
JJA



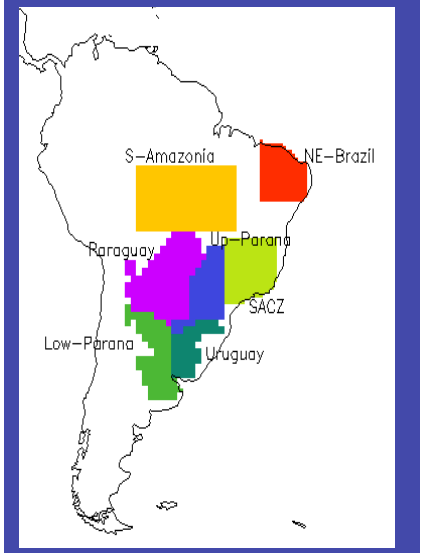


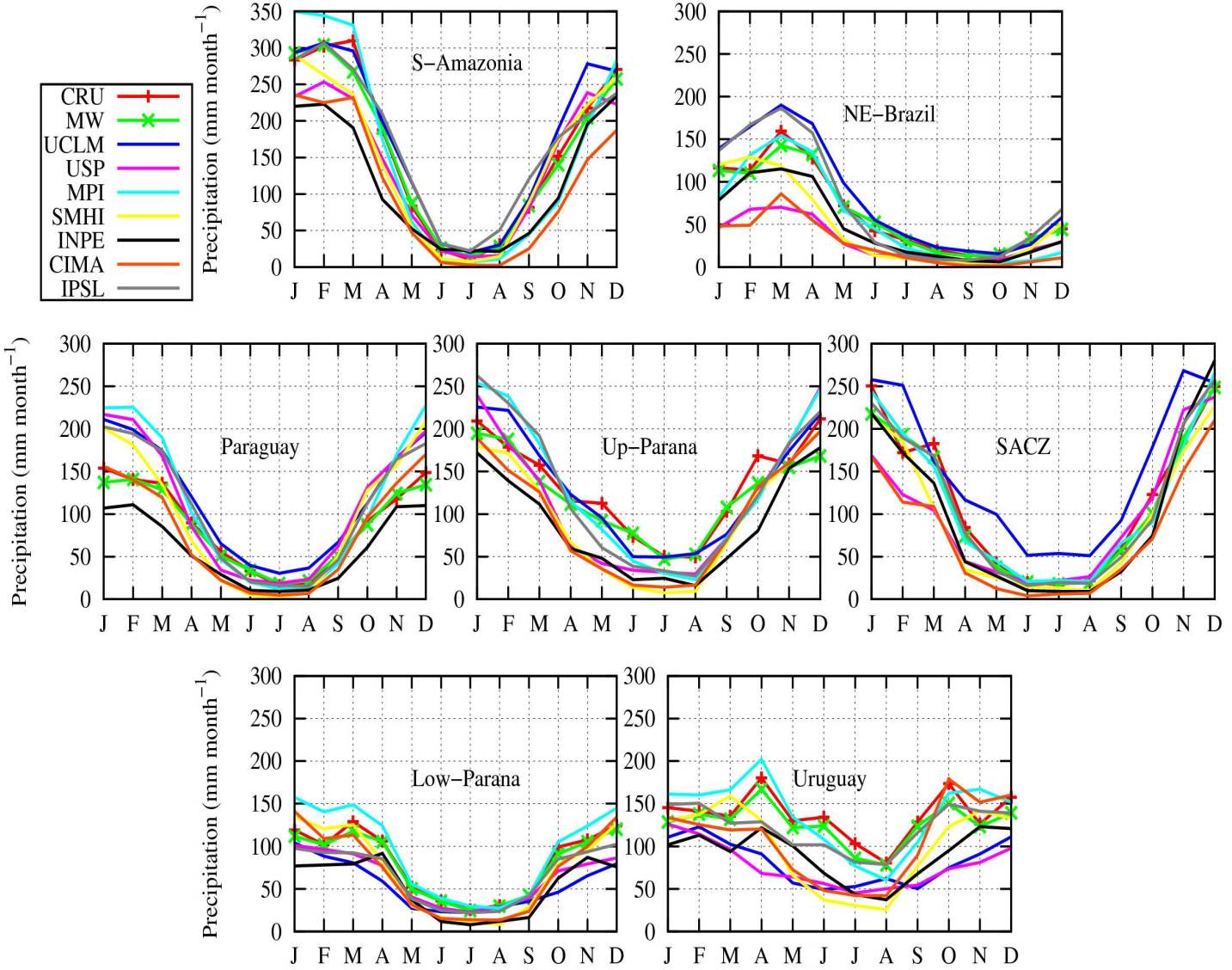
RATIO=spread/IV



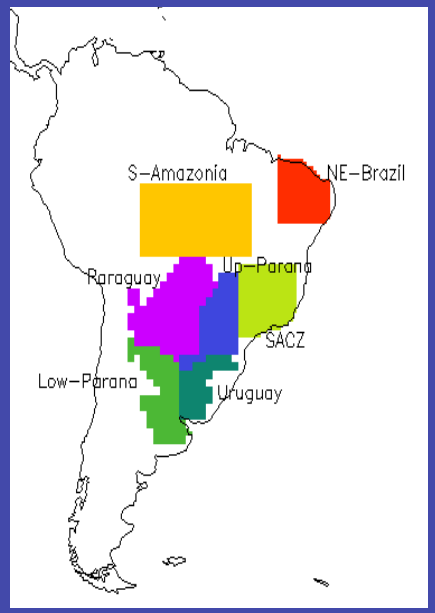


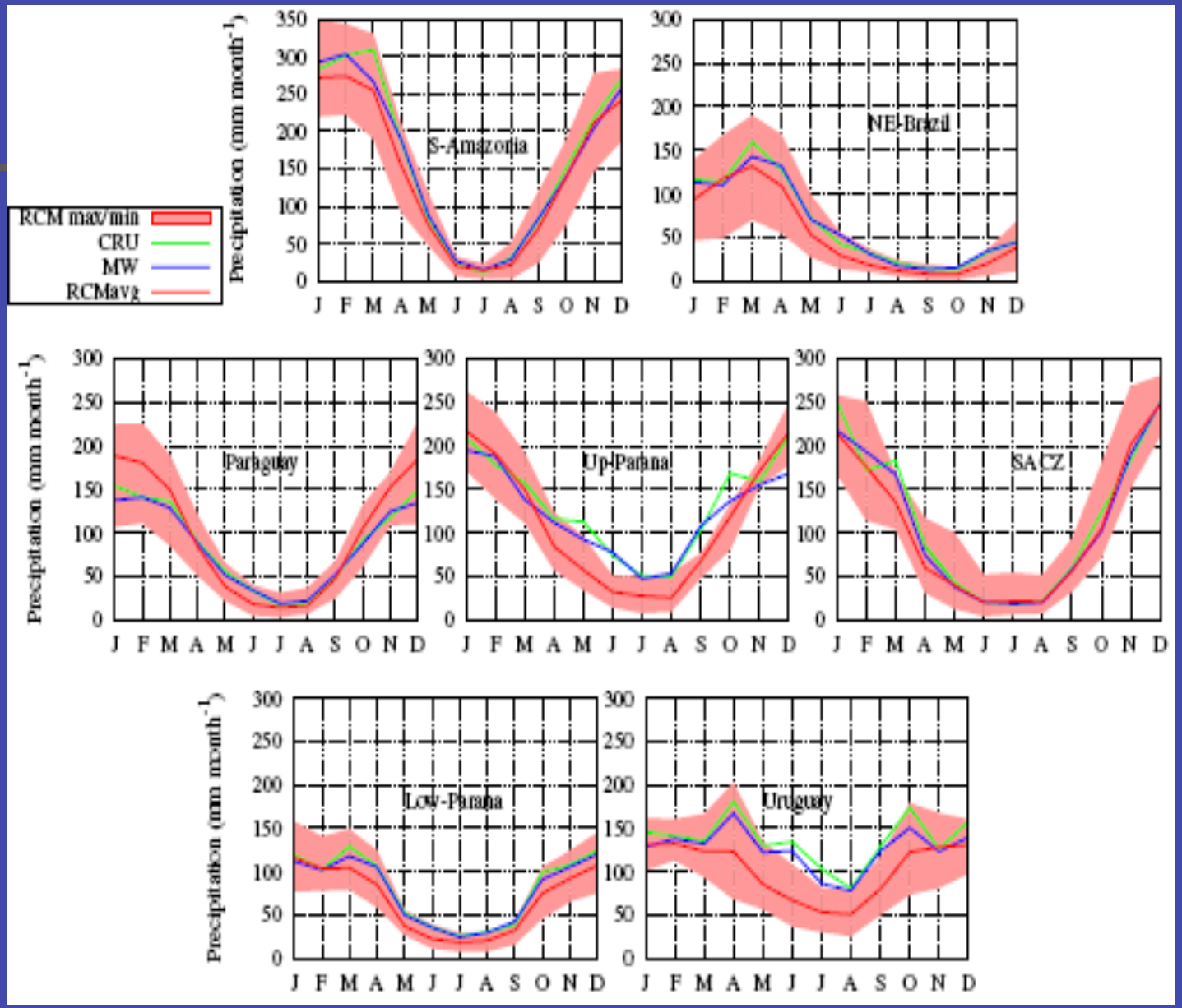
Precipitation Annual cycle



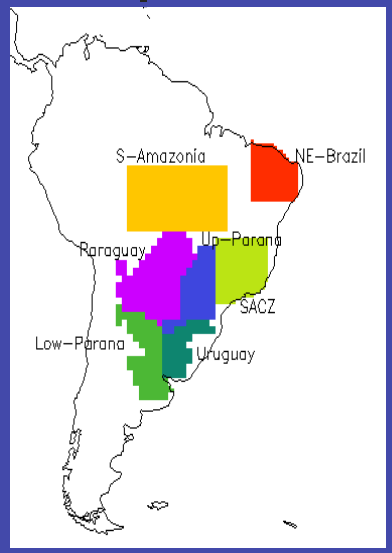


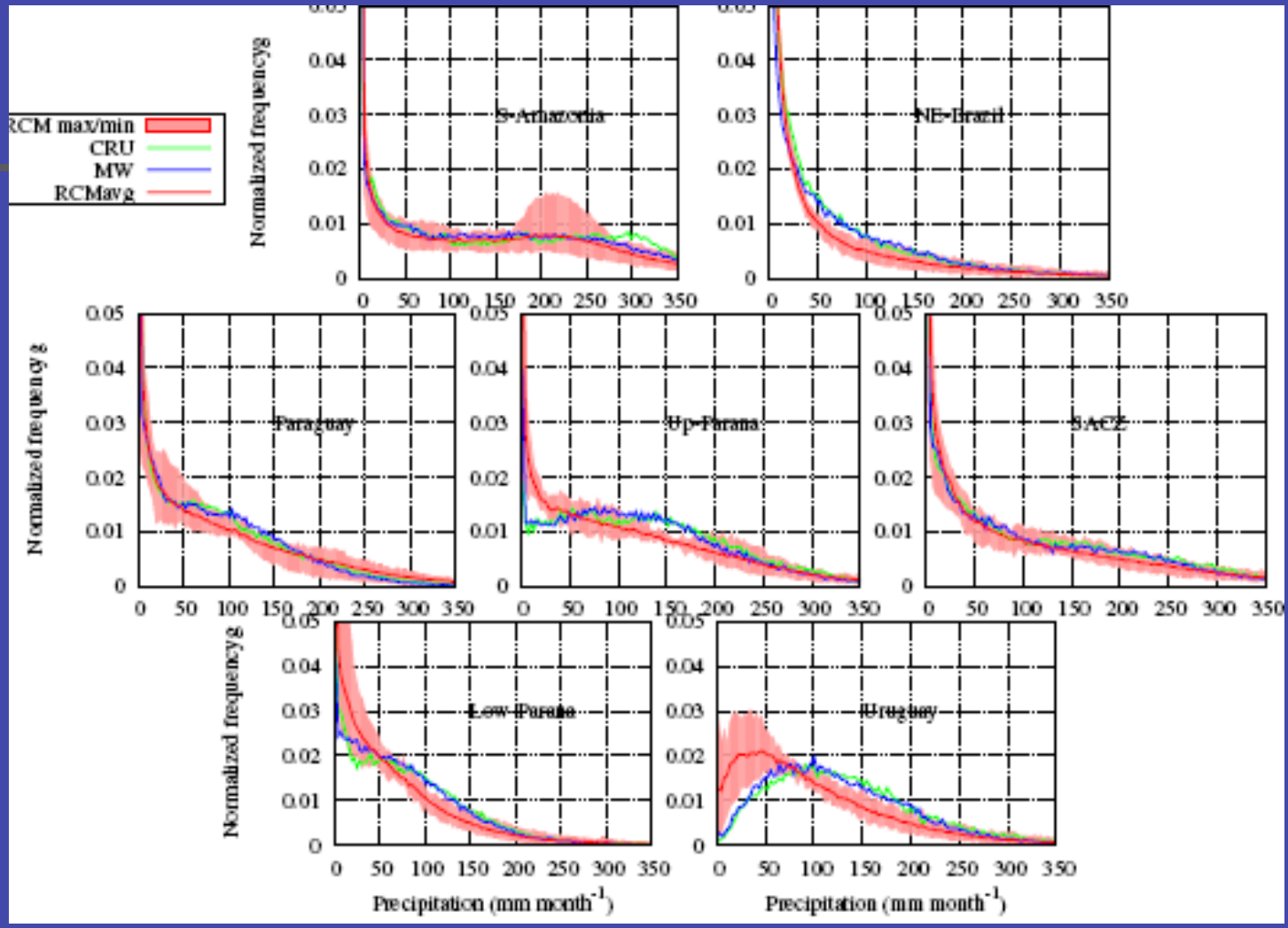
Precipitation Annual cycle





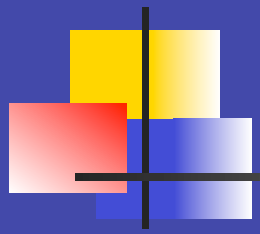
Frequency distribution: Precipiation





4. Concluding remarks

- The spatial distribution of mean precip & temp over SA during DJF and JJA are fairly well reproduced.
- Beware the uncertainty in observations to put the inter-model spread in context!
- Several systematic biases have been identified:
  - Warm and dry biases over tropical regions: Land surface?
  - Dry and no clear temperature biases over LPB: resolution?
- Largest biases mainly over tropical areas where the inter-model spread is also larger: larger uncertainty!
- Subtropical regions seem to be better simulated.



Thank you for your attention!!!!