Dynamical Downscaling of Forecast over South America

- **ISLAM, SIRAJ ul (Pakistan)**

- **MONCUNILL, DAVID (Brazil)**

- **LISZEWSKA, MALGORZATA (POLAND)**

- **JACZEWSKI, ADAM (POLAND)**

- **REJZER, MAGDALENA (POLAND)**

- **MAIMORE, FILIPPPO (Italy)**

- **ARAUJO, JANDUY GUERRA (Brazil)**

Motivations

- Comparison between GCM-driving model and nested Regional Model in seasonal forecasting

- Assessment of related uncertainties from the analysis of ensemble spread

- Focusing GCM's skillful areas for regional detail analysis

- Comparison of RCM outputs with CRU climatology over South America

GCM Forecast Skill Maps

ECPC—NOAH

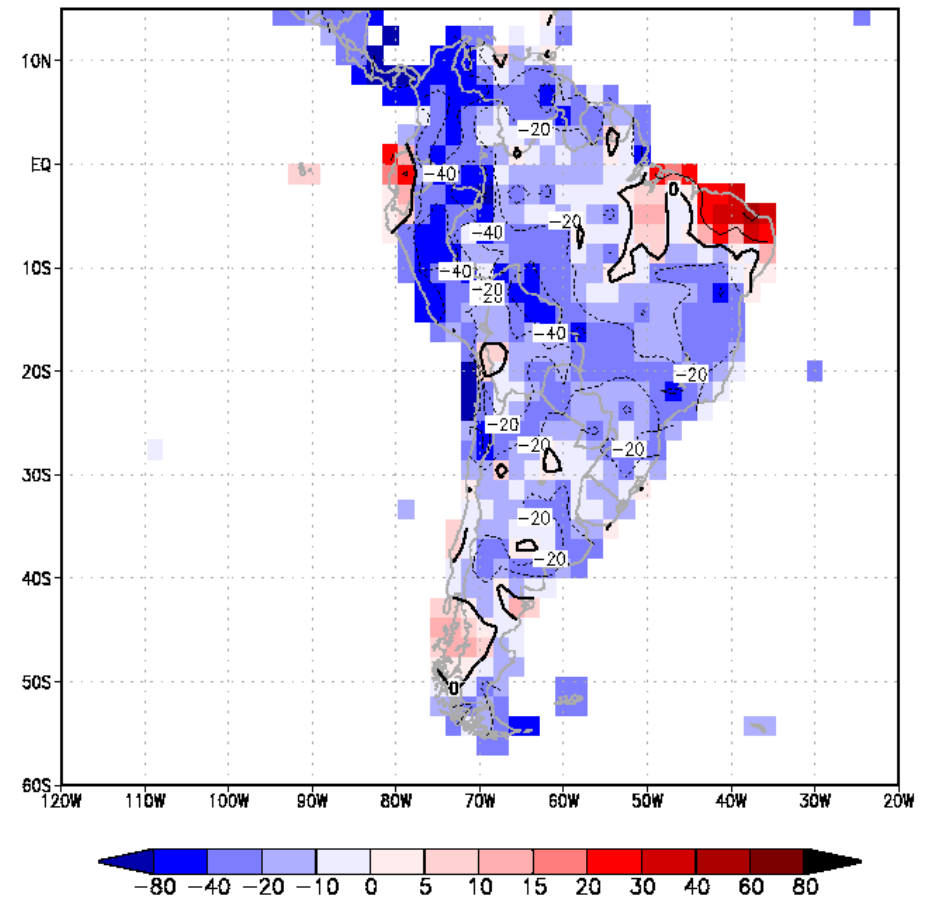2m Air Temperature Anomalies : 1950—2000 MAM
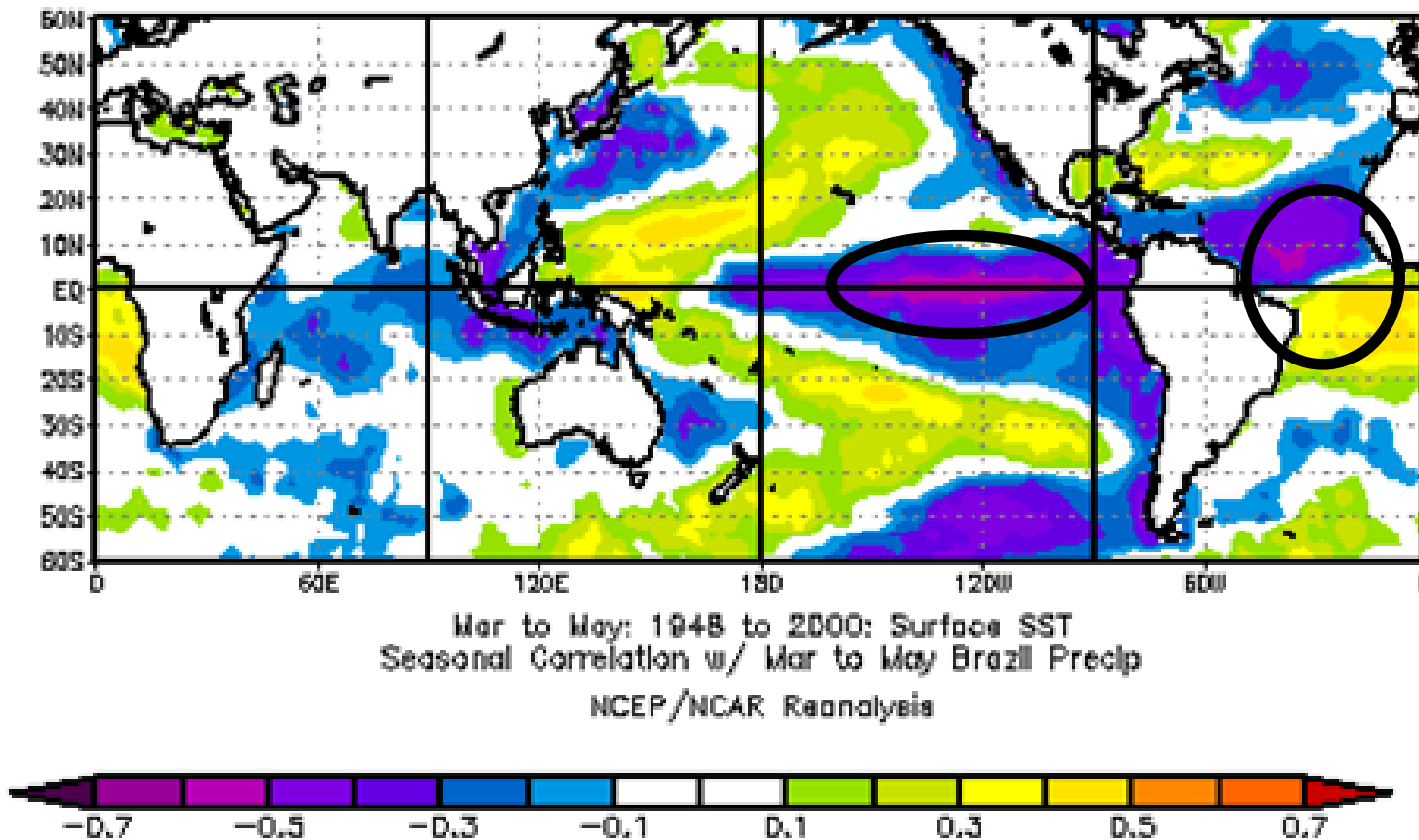
Ranked Probability Skill Scores (%)
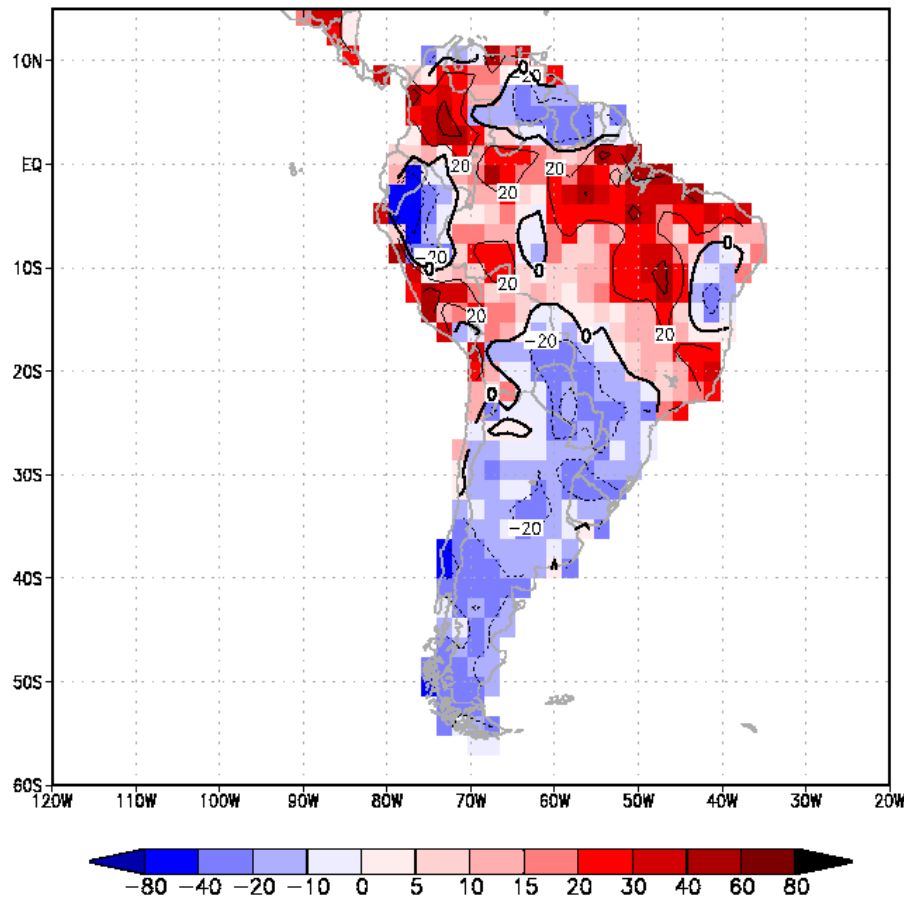
ECPC—NOAH

Precipitation Anomalies : 1950—2000 MAM
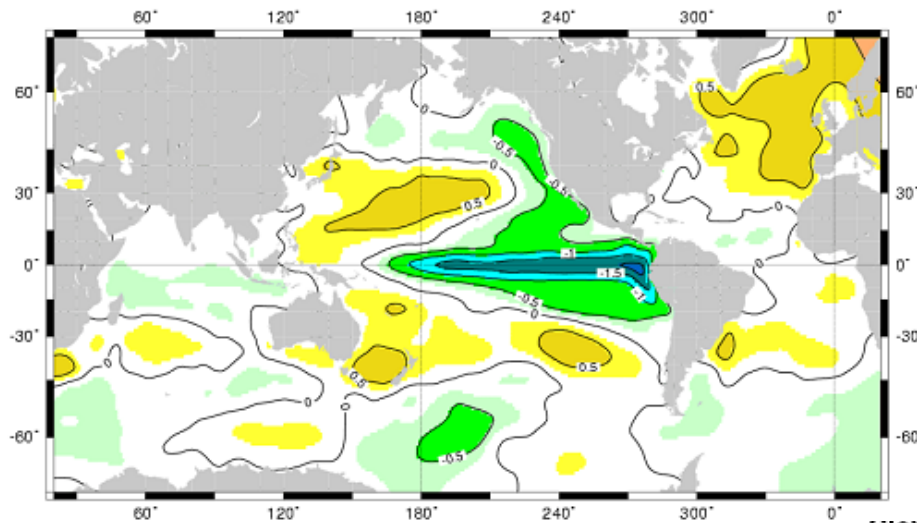
Ranked Probability Skill Scores (%)

Northeast Brazil Rainfall Correlation with SST

Mar to May: 1948 to 2000: Surface SST
Seasonal Correlation w/ Mar to May Brazil Precip
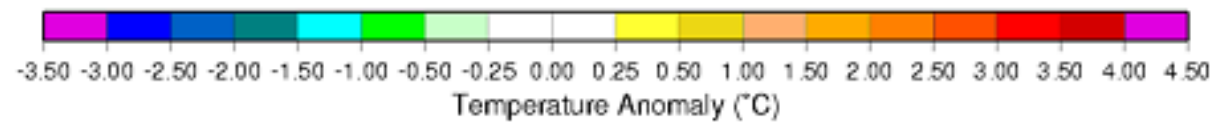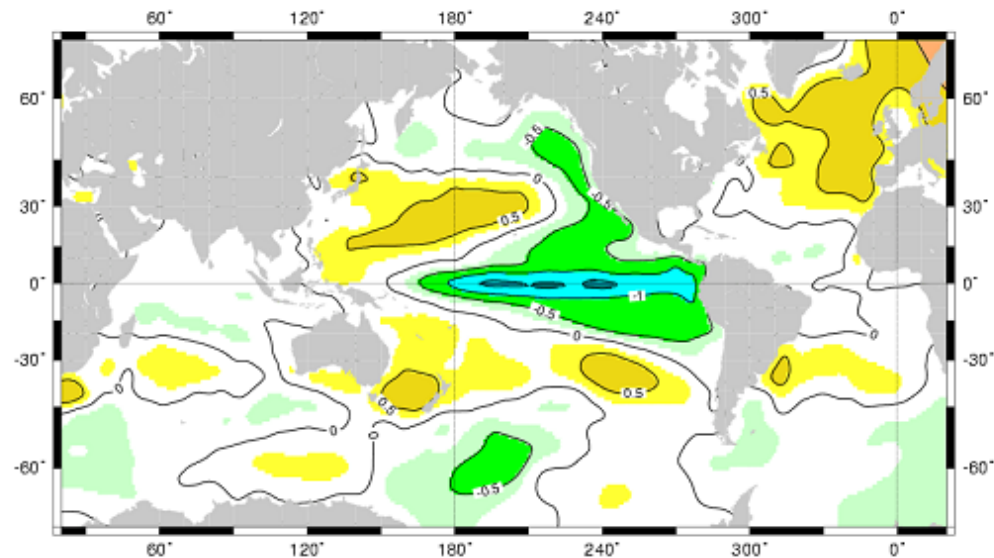NCEP/NCAR Reanalysis

MAM 2008 SST forecast

Global Blend SST Anomalies
(Tropical Forecast: Mean - Uncertainty Factor)
Forecast from FEB-2008 - Season MAM-2008

Global Blend SST Anomalies
(Tropical Forecast: Mean + Uncertainty Factor)
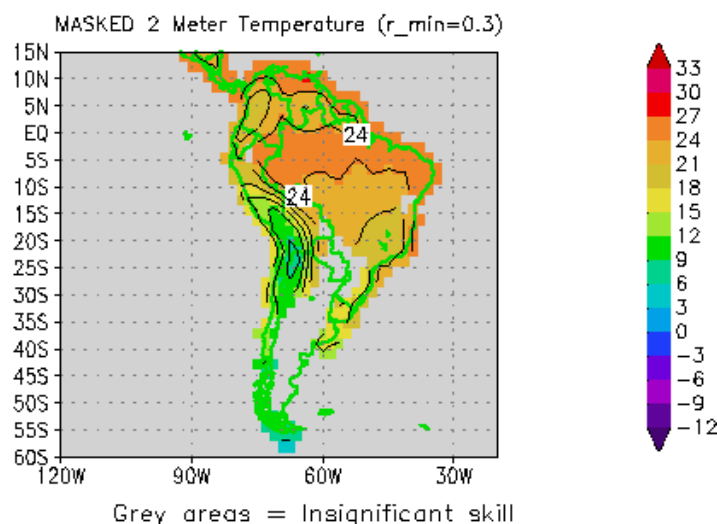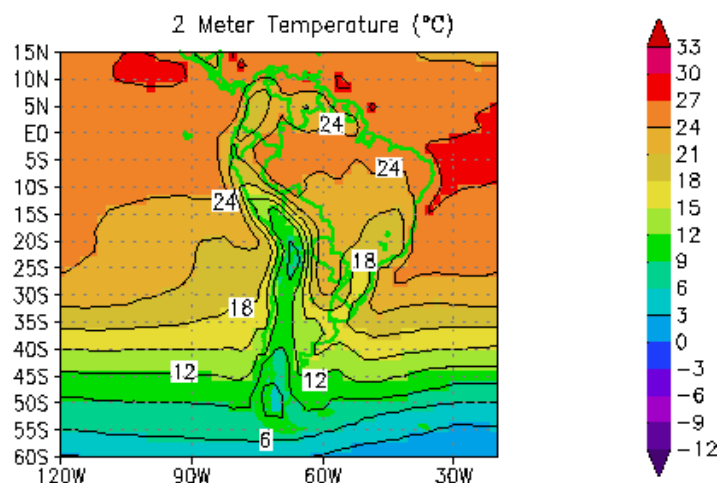Forecast from FEB-2008 - Season MAM-2008
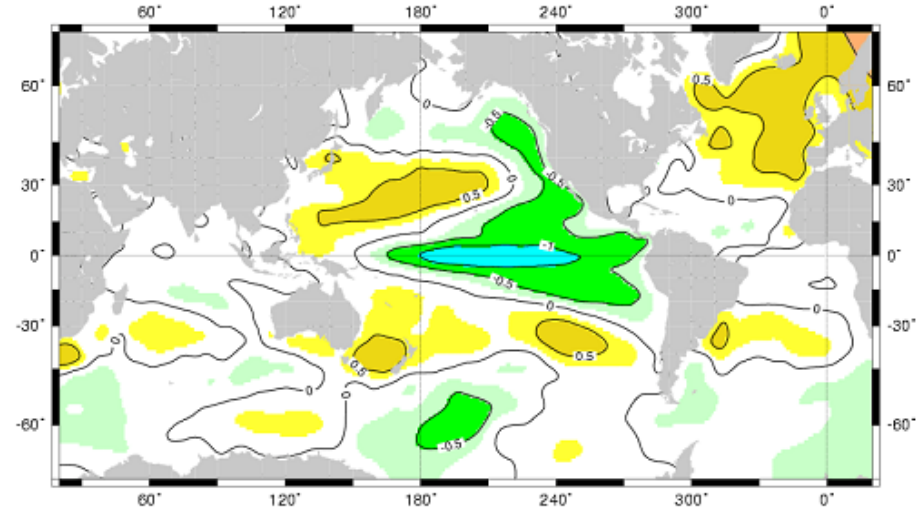
Global Blend SST Anomalies
(Tropical Forecast: Mean)
Forecast from FEB-2008 - Season MAM-2008

-3.50 -3.00 -2.50 -2.00 -1.50 -1.00 -0.50 -0.25 0.00 0.25 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00 4.50
Temperature Anomaly (°C)

MAR–APR–MAY 2008
ECPC 2MT Ensemble Mean
Trop. Ocean SSTa forecast (IRI Multi–Model Scenarios)
from Jan 2008

2 Meter Temperature (°C)

MASKED 2 Meter Temperature (r_min=0.3)
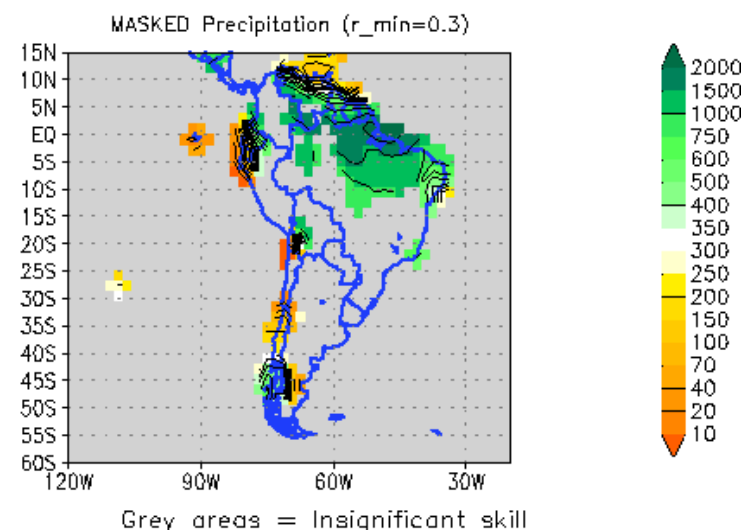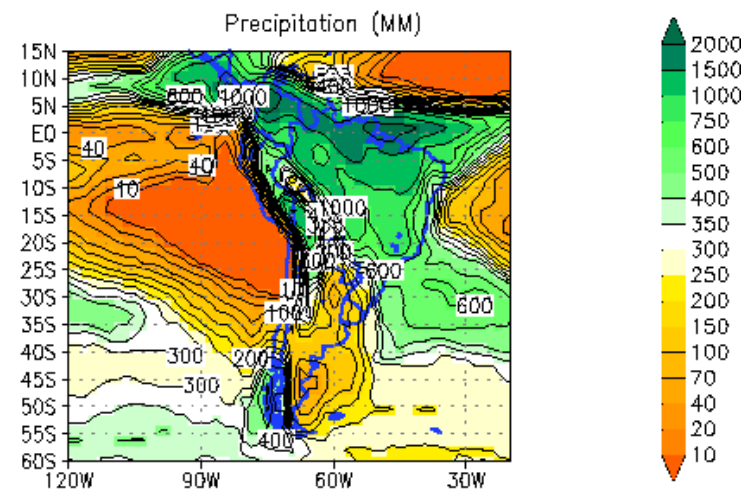
Grey areas = Insignificant skill

IRI International Research Institute
for climate and society

NOTE: This is a research product and should be used with caution.
Consult your local weather/climate authorities for further interpretation.

MAR–APR–MAY 2008
ECPC PRECIP Ensemble Mean
Trop. Ocean SSTa forecast (IRI Multi–Model Scenarios)
from Jan 2008

Precipitation (MM)

MASKED Precipitation (r_min=0.3)

Grey areas = Insignificant skill

IRI International Research Institute
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NOTE: This is a research product and should be used with caution.
Consult your local weather/climate authorities for further interpretation.

Downscaling GCM's forecast using RSM

Model/Run Descripion

General info

- Resolution: 60 Km, 28 sigma levels
- Area: 85W-30W, 35S-10N (Tot. number of grid cells: 108X89=9612)
- Period of simulation: 1 March – 31 June (lead time: 1 month)
- Time step used: 300/400 sec.

Nesting details

7 (6)   ens. members from 12 ens. members of ECPC GSM run (t62 k28)

3 (2) members   **- SST**
3 members   **mean SST**
1 member   **+ SST**

Nesting Time: 6 hours

Parametrizations

- Radiation: M-D Chuo Long-Wave Rad. (time of call: 1 hour)
- Claudiness: Slingo cloud scheme with Insa's adjustment
- Convection: Relaxed Arakawa Shubert with detrained cloud water (RASC2)
- Diffusion: horizontal moisture diffusion
- Land: NOAH scheme
- Orography: use of global 4' data

Model Domain

Topography (m)

Vegetation's Types
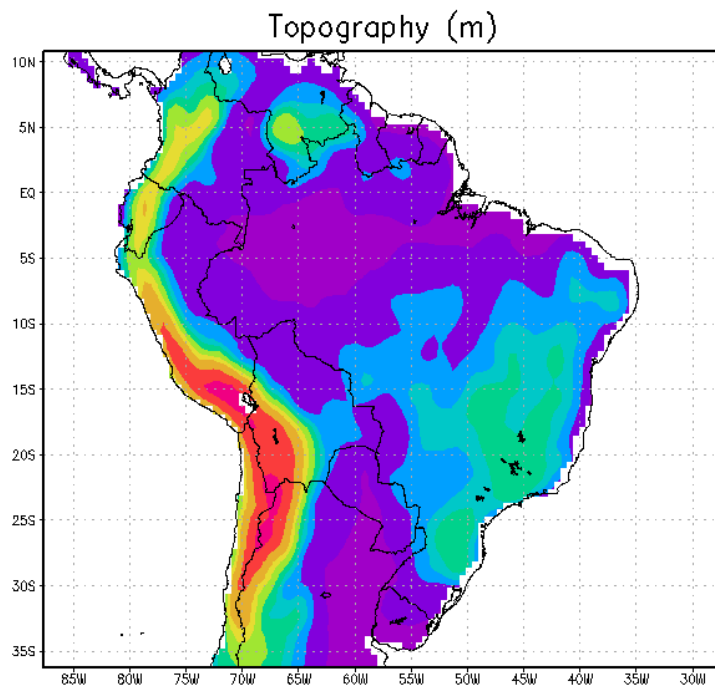
GrADS: COLA/IGES
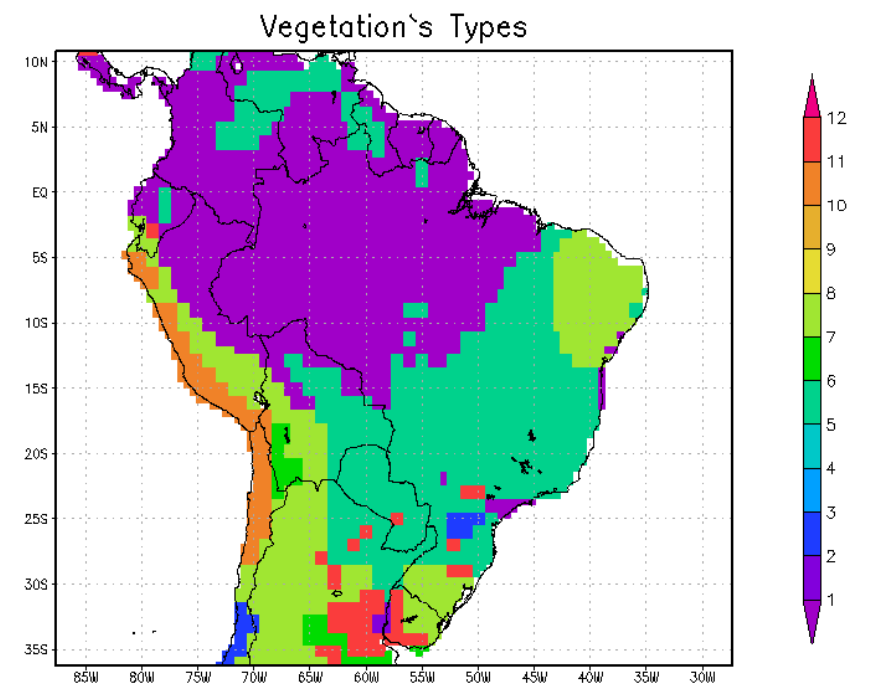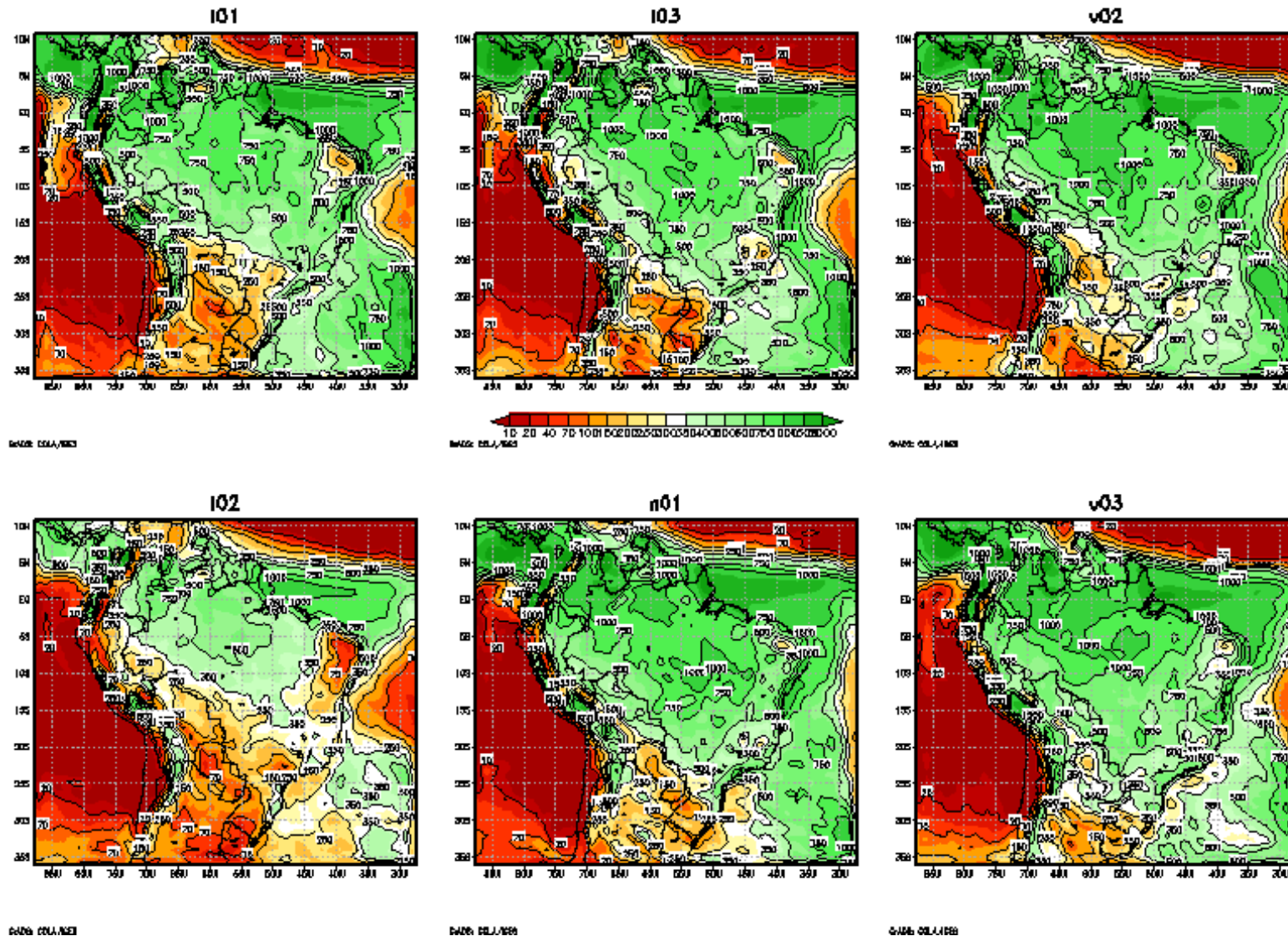
2008-03-11-14:27

GrADS: COLA/IGES

2008-03-11-14:27
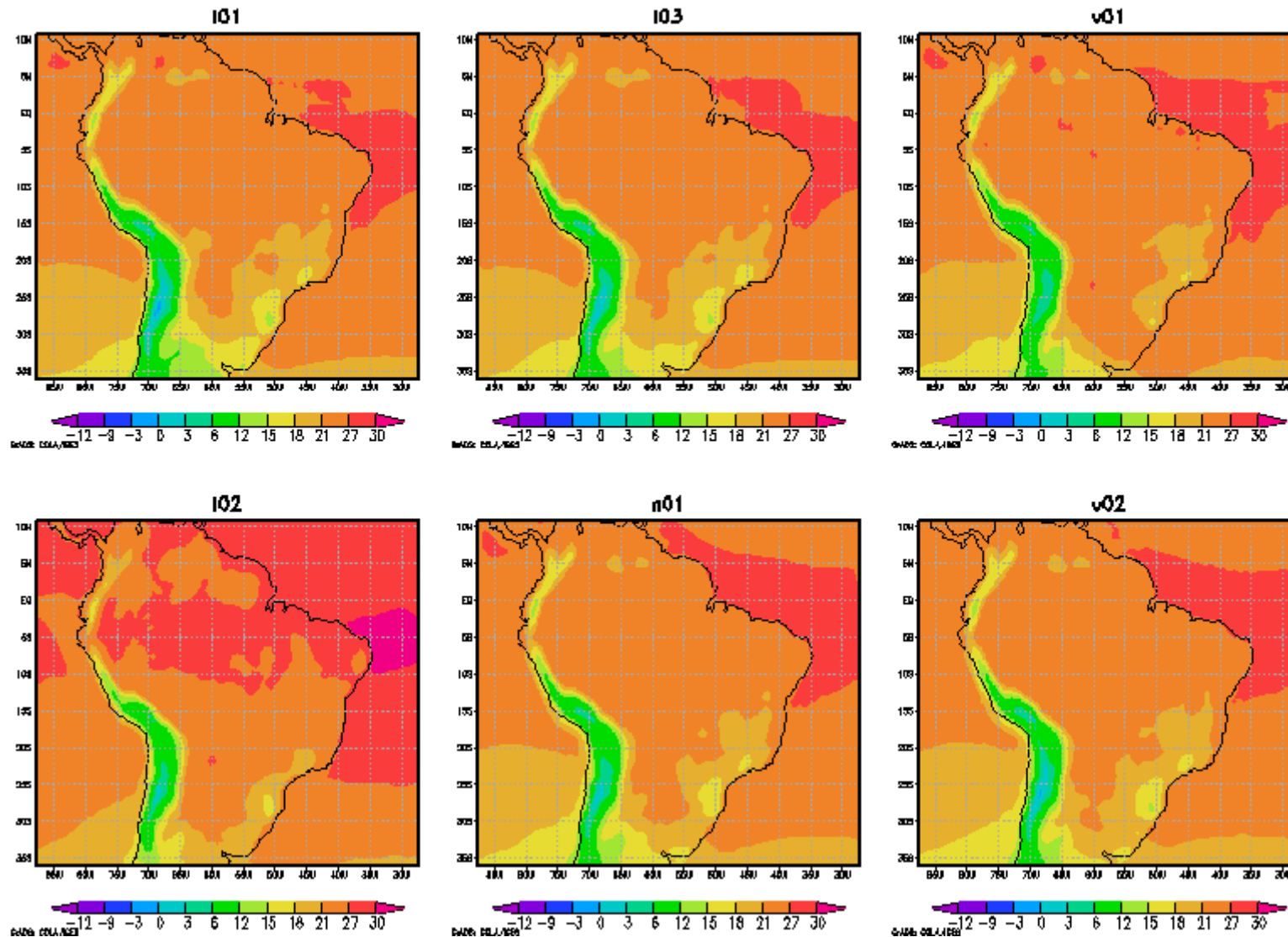
Results of Downscaling

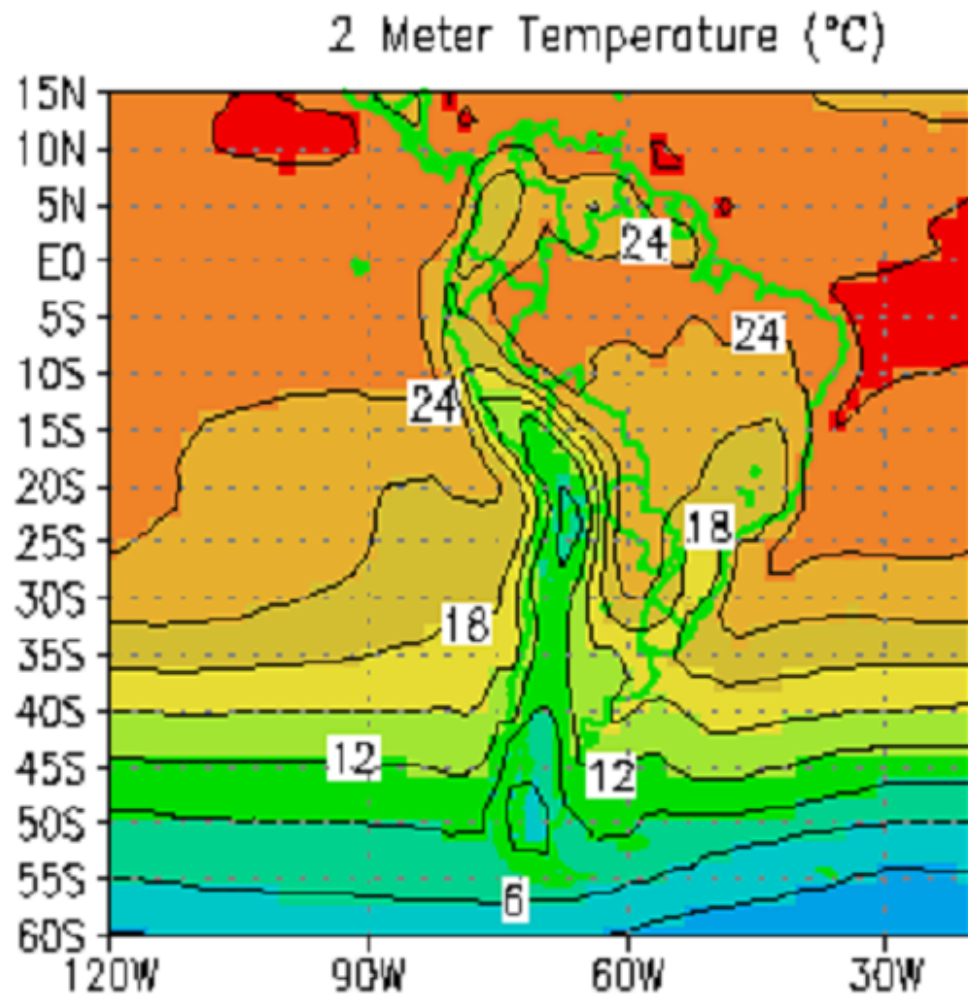# Precipitation Members

Precipitation MAM 2008

Temperature Members
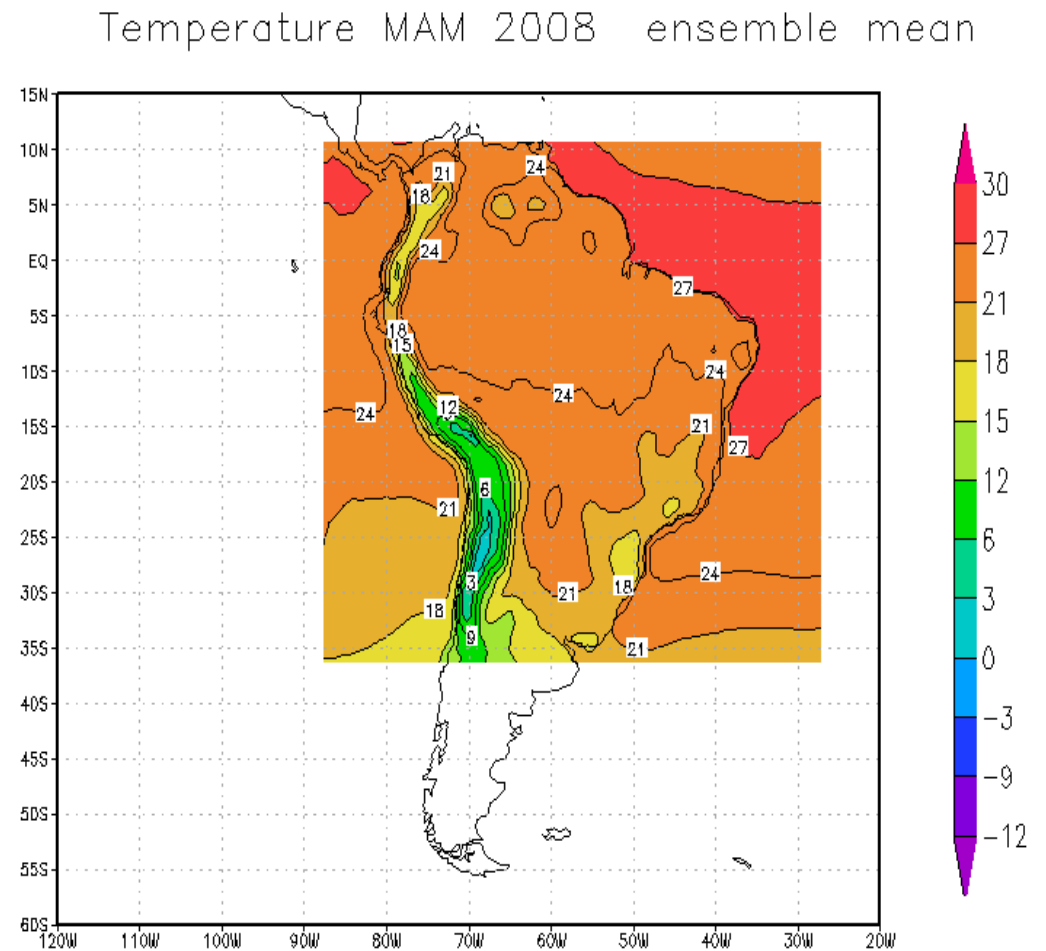

Temperature MAM 2008 ensemble runs

GCM vs RCM
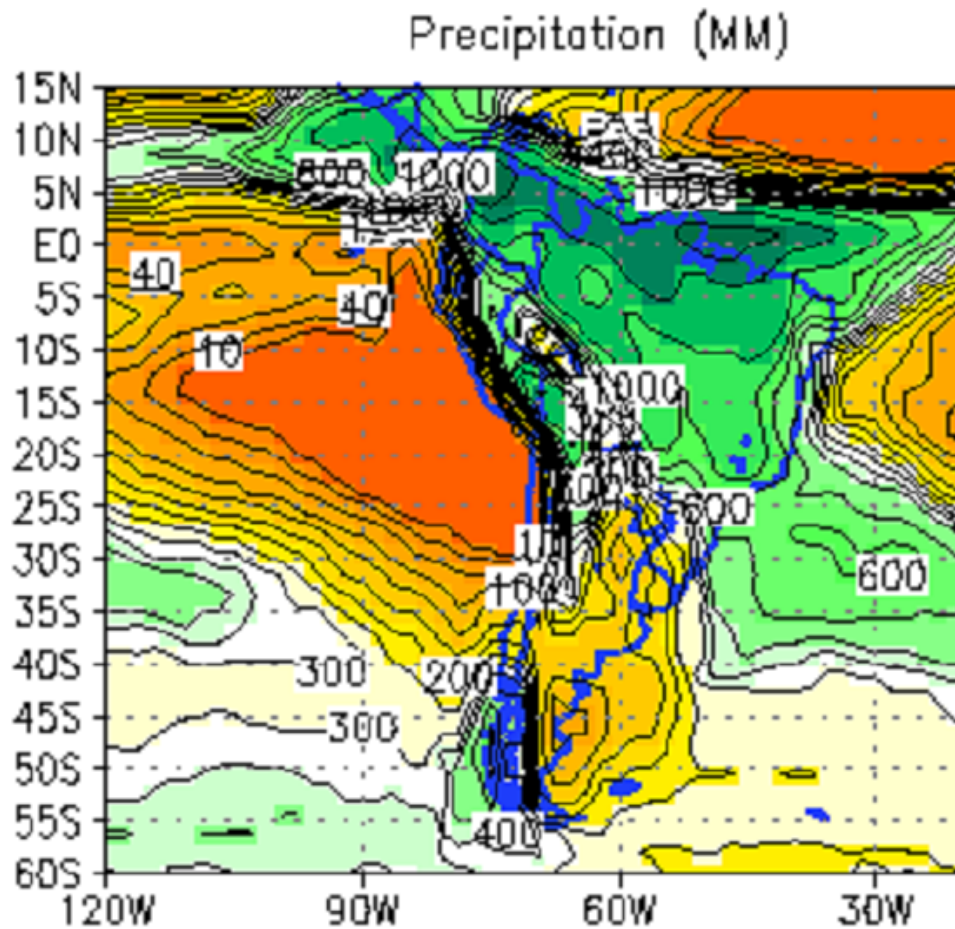
ECPC Forecast (Ensemble)

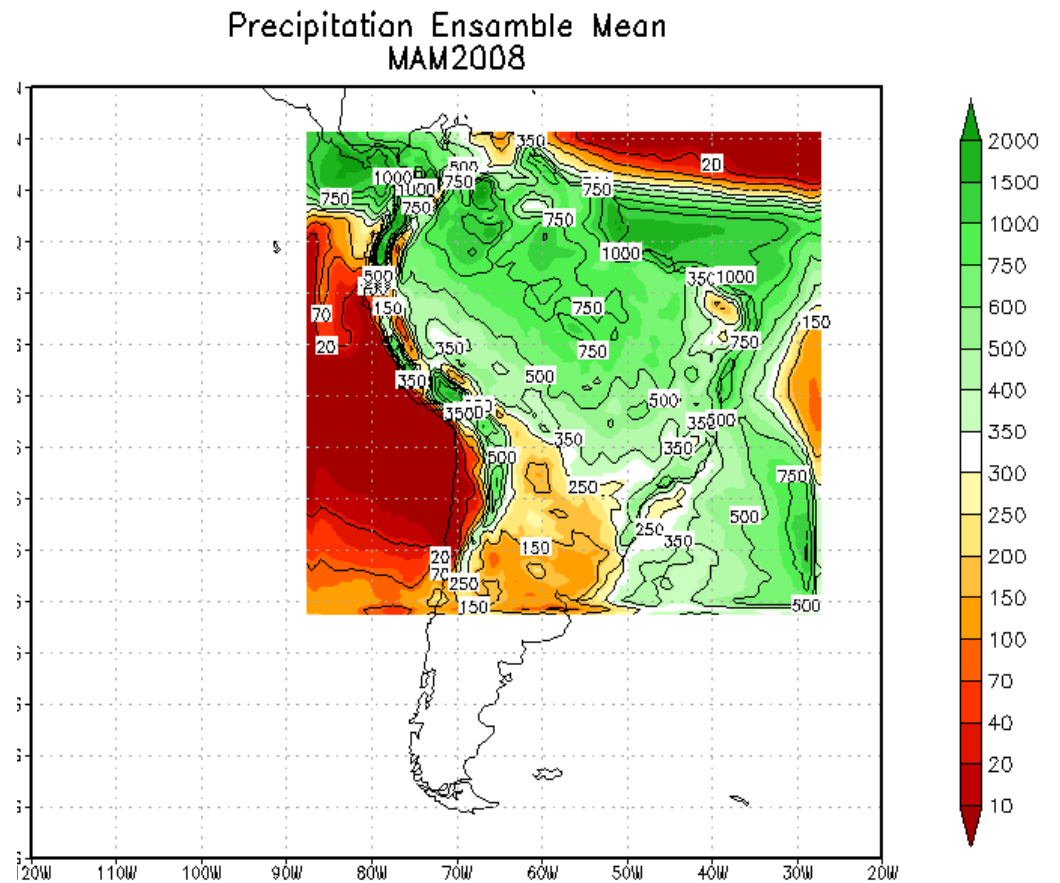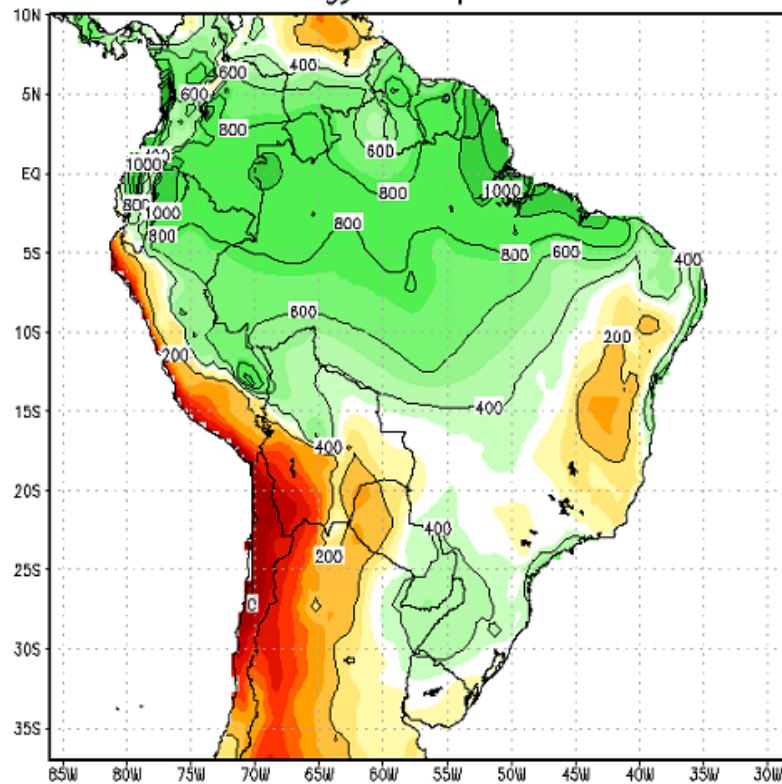RSM Forecast (Ensemble)

GCM vs RCM

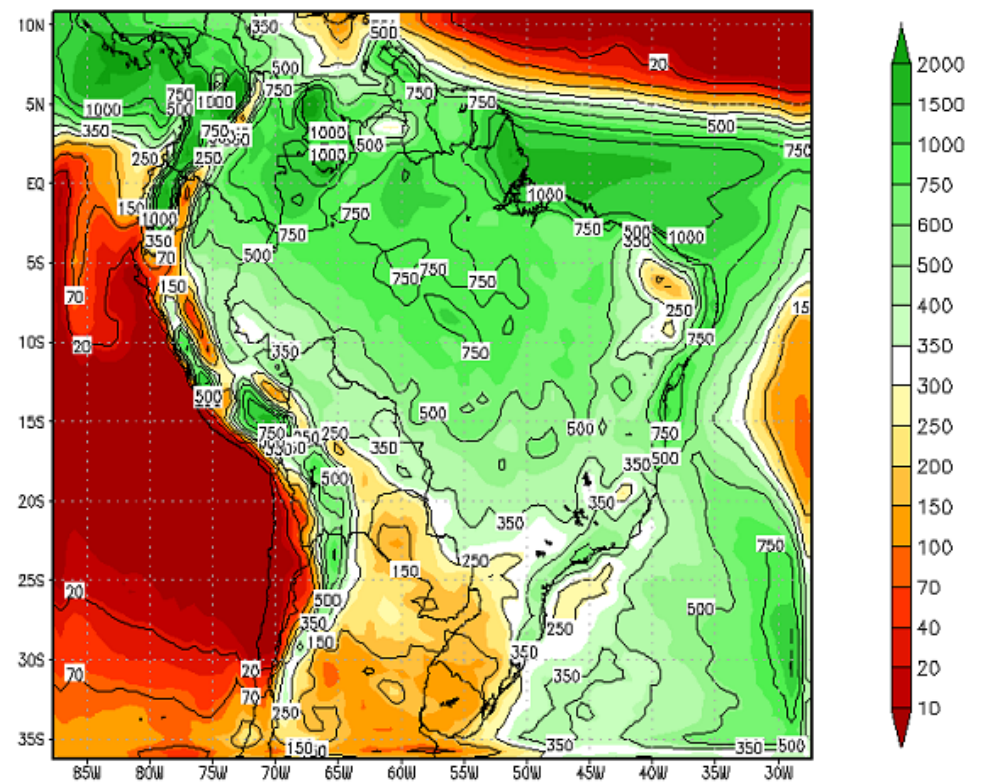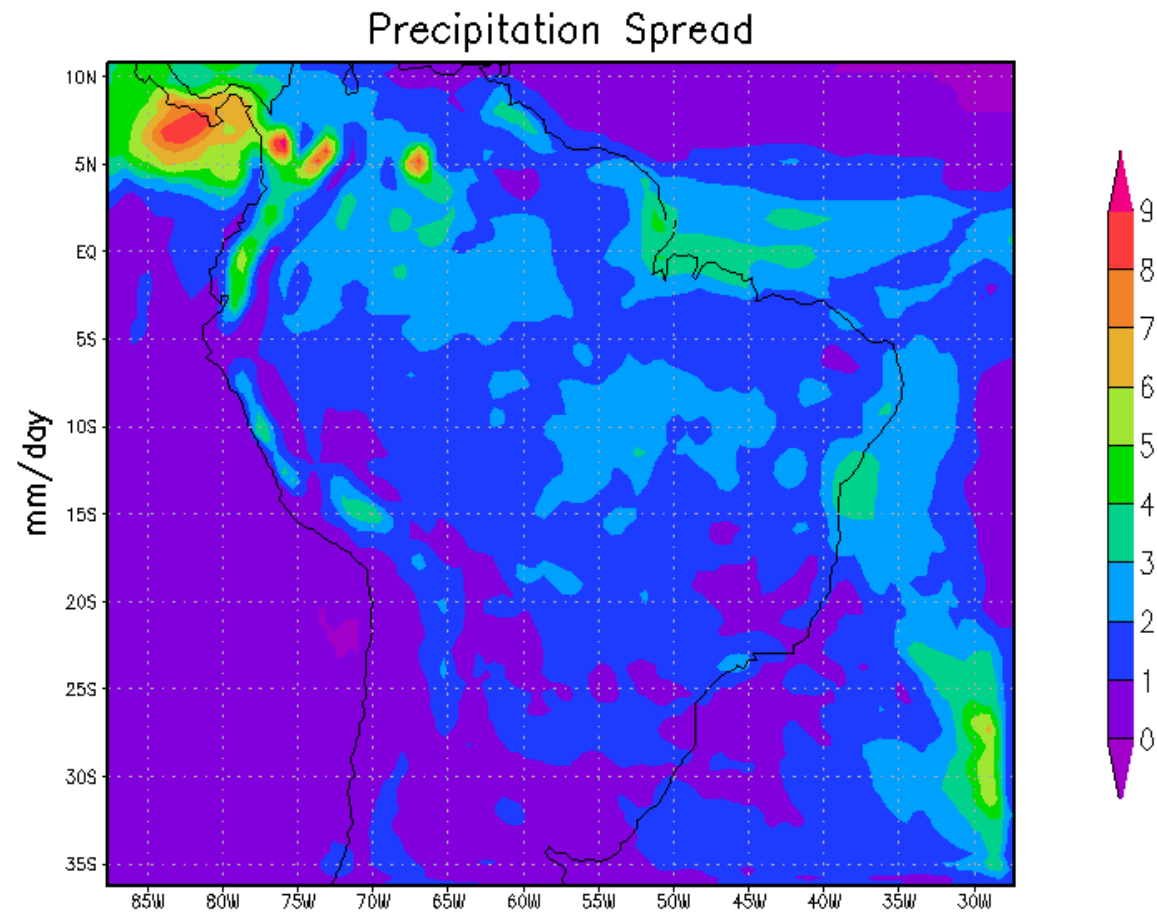ECPC Forecast (Ensemble)

RSM Forecast (Ensemble)

CRU vs Forecast
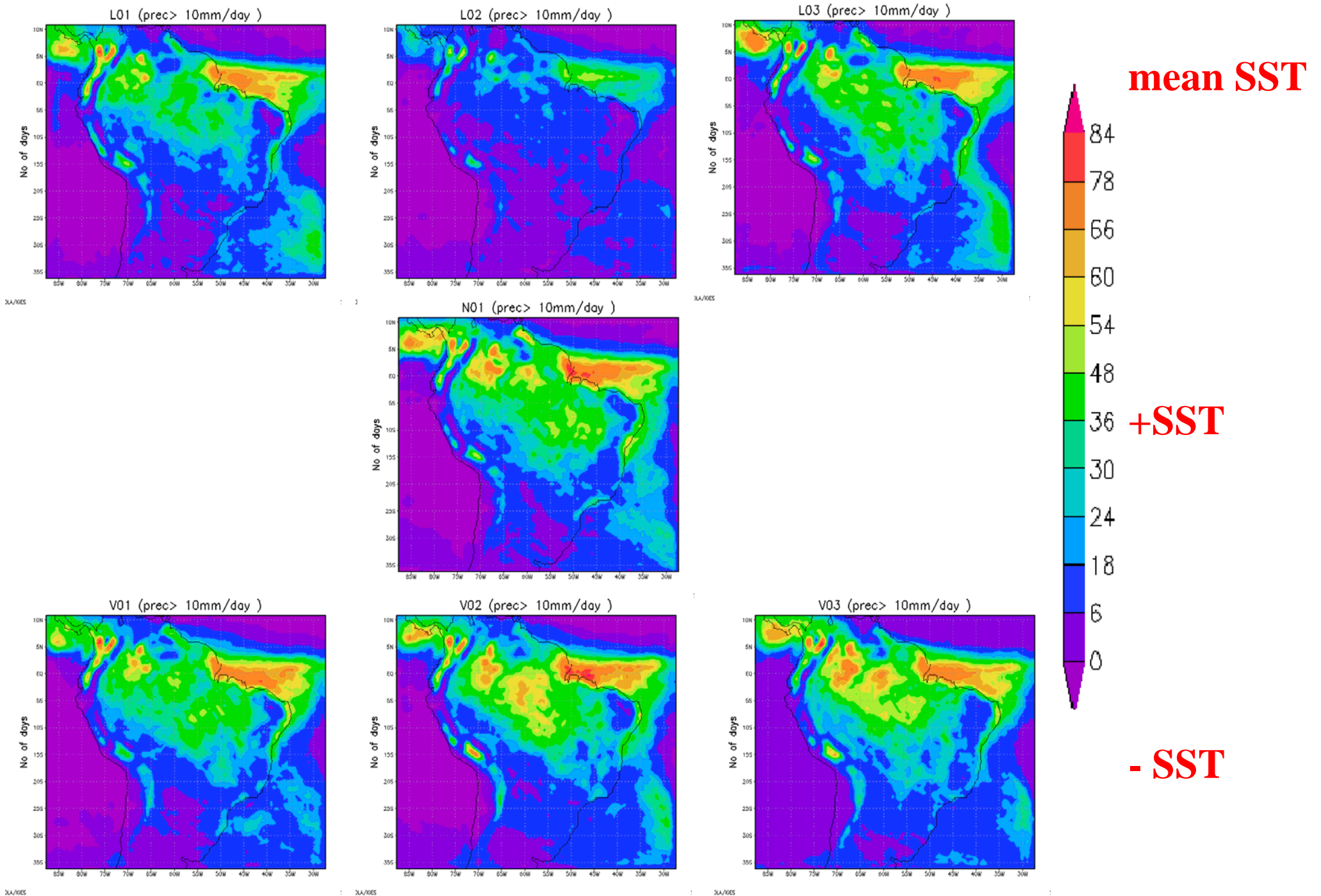

Climatology Precipitation—MAM

Ensemble Spread

Precipitation Spread

Precipitation Frequency

Daily Variability of Rainfall

Topography (m)

Daily Variability of Rainfall

Daily Rain Members and Mean
over lon(−41,−38) lat(−9,−5)
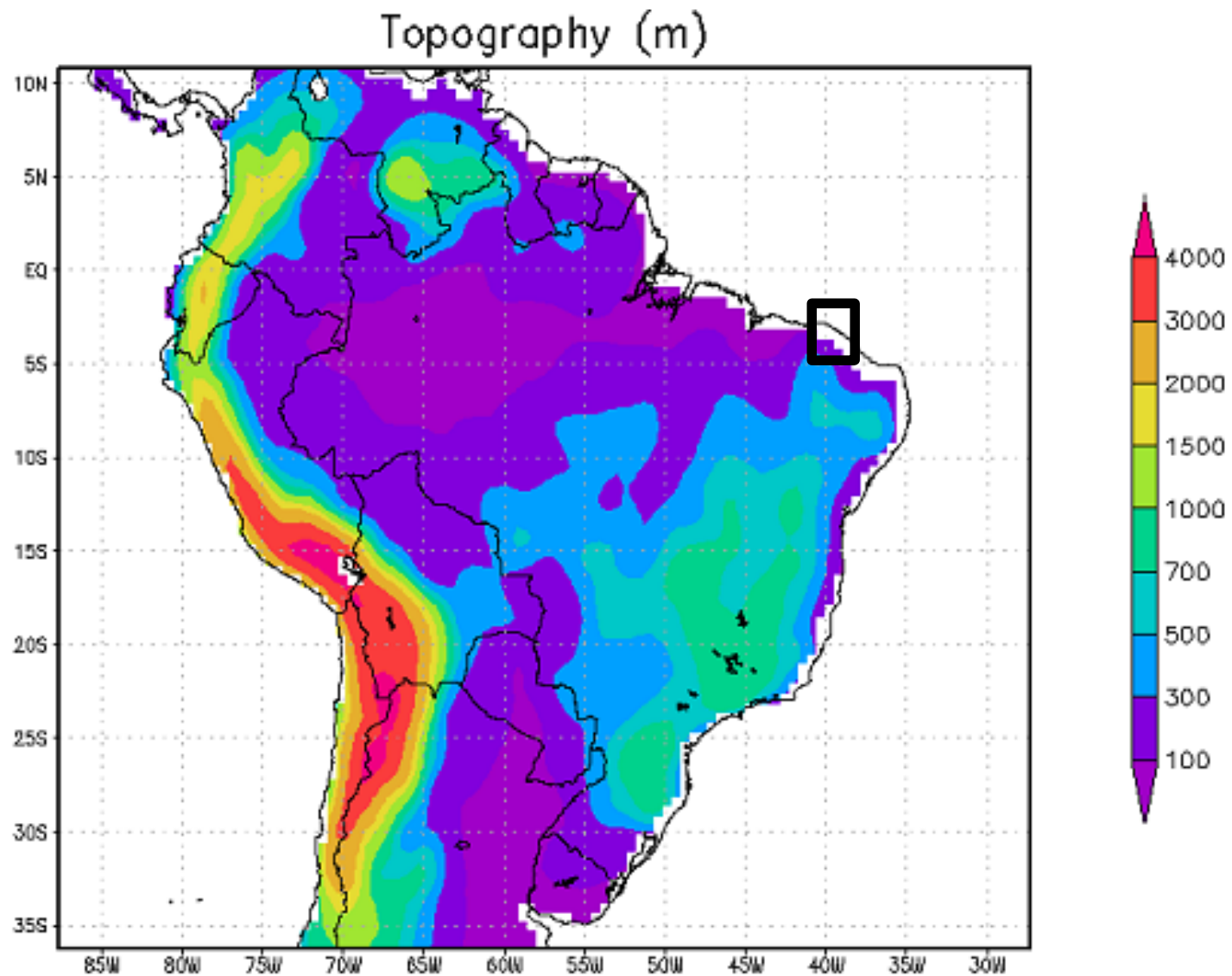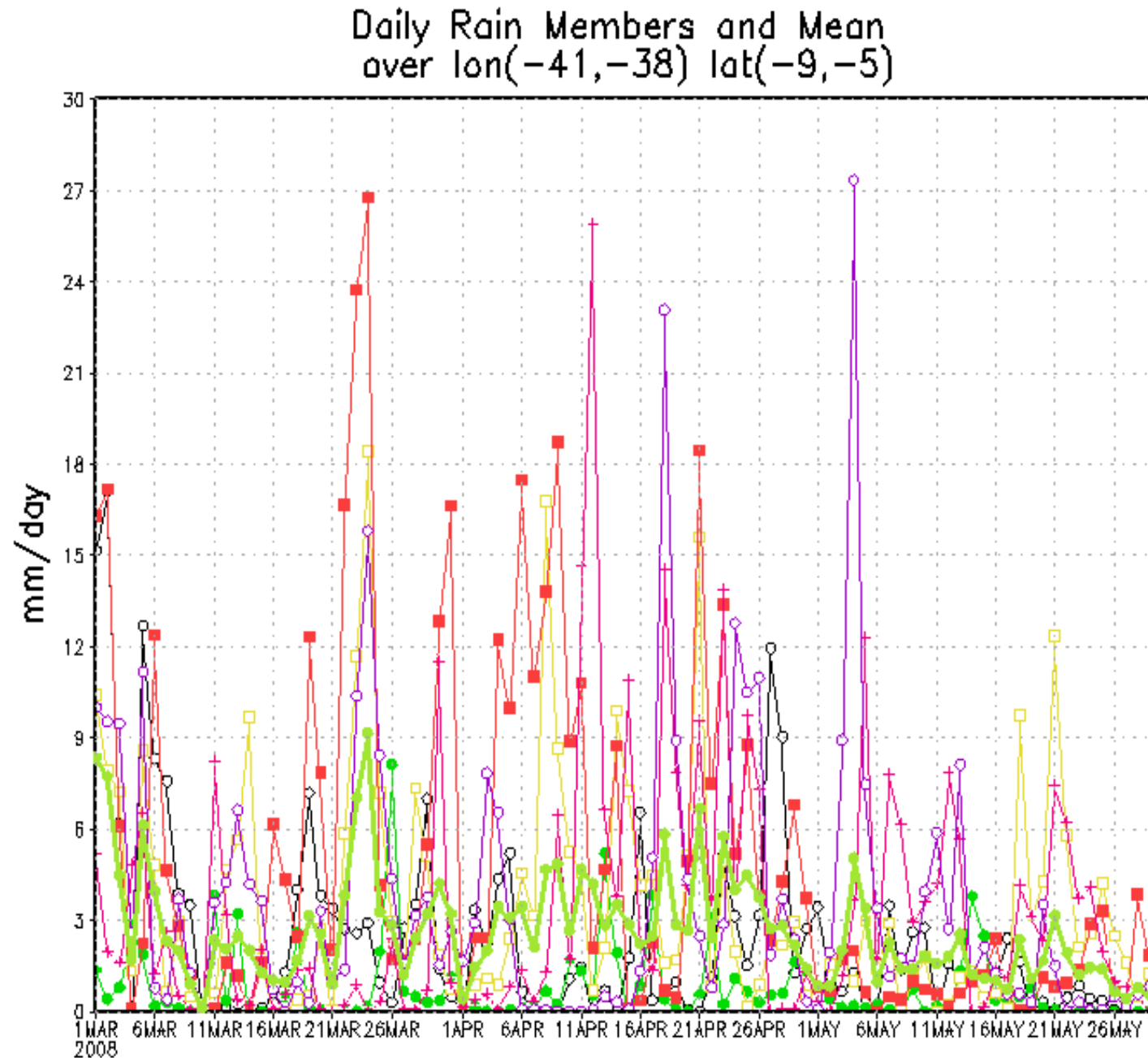
Summary

- The skill of GCM is higher for temperature than precipitation over the domain.

- Regional model shows more realistic representation of the climatology of the domain as compared to GCM

- RSM represents well the ITCZ.

Future Work

- Collaboration
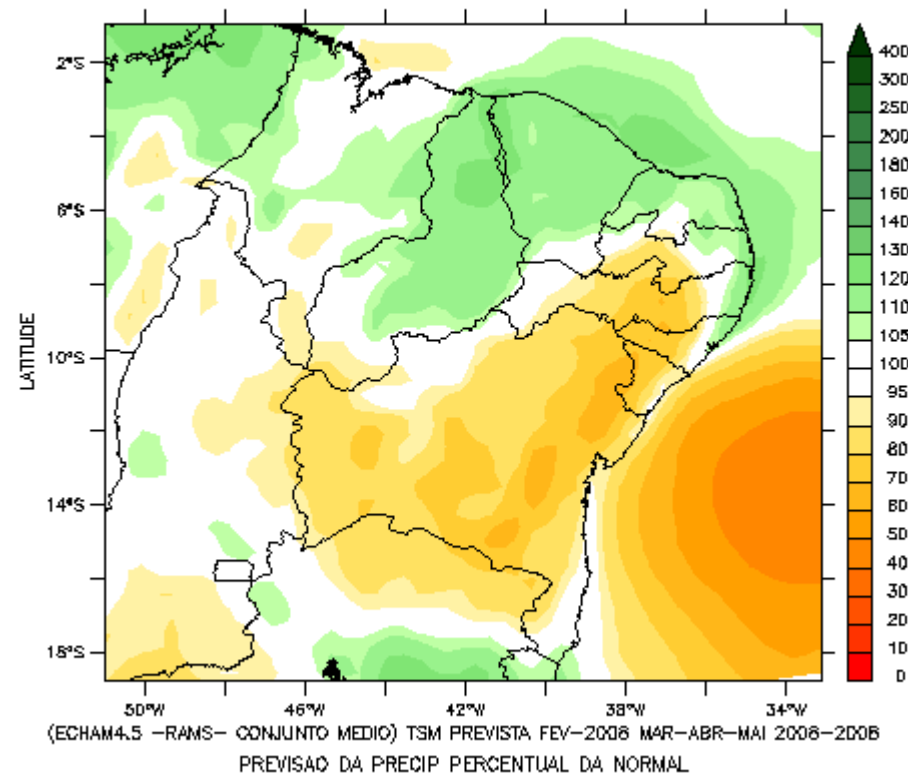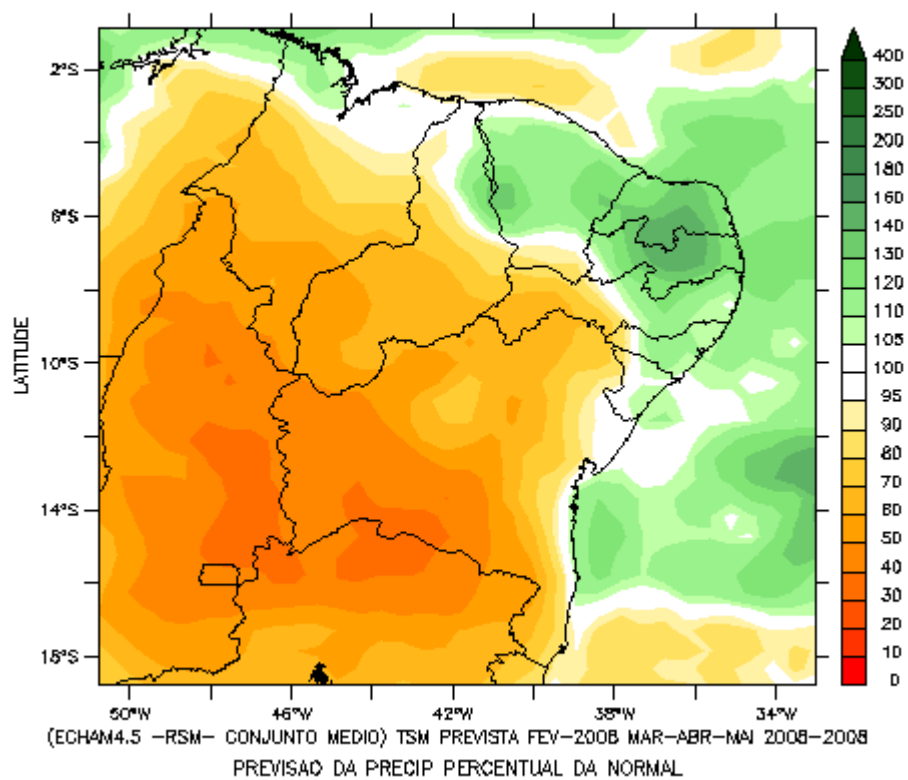
- Data Requirement

- Exchange of Experiences

Grazie per l'attenzione!

(ECHAM4.5 -RSM- CONJUNTO MEDIO) TSM PREVISTA FEV-2008 MAR-ABR-MAI 2008-2008

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