Instrument: **SP1 Cooperation**

Thematic Priority: **Priority Area 1.1.6.3 "Global Change and Ecosystems"**

FP7 Collaborative Project – Grant Agreement 212492

CLARIS LPB
A Europe-South America Network for Climate Change Assessment and Impact Studies in La Plata Basin

DELIVERABLES

D4.5: WP4 Workshop: Updated assessment report on the relative merits of the IPCC multi-models in representing 20th century low-frequency variability and SAMS seasonal to decadal dynamical changes.

Recommendations to the Task 4.6 and 4.7 teams concerning the selection of the best model-ensemble simulations for 21st century projections analyses

Due date of deliverable: Month 24

Start date of project: **01/10/2008** Duration: 4 **years**

Organisation name of lead contractor for this deliverable: P1-IRD

Deliverable No	Deliverable title	WP	Lead beneficiary	Estimated indicative p-mo (permanent staff)	Nature	Dissemination level	Delivery date
D4.5	WP4 Workshop: Update assessment report on the relative merits of the IPCC multi-models in representing 20th century low-frequency variability and SAMS seasonal to decadal dynamical changes. Recommendations to the Task 4.6 and 4.7 teams concerning the selection of the best model-ensemble simulations for 21st century projections analyses.	4	P1-IRD	9.40	R	PU	24

Summary

The evaluation of the model's skills in representing the mean conditions and the observed variability have led to the following main conclusions.

Mean conditions:

- Overall most of the IPCC models are able to reproduce the key elements of the atmospheric circulation such as the Bolivian High at upper levels and the continental-scale gyre to the east of the Andes that promotes the moisture penetration from the tropical Atlantic into the continent. On the other hand, models tend to represent weaker moisture convergence and less precipitation than observed over LPB. This may be related to the found bias that the IPCC models are not able to represent correctly the weather types that show a deflection of the low-level winds by the Andes Cordillera.
- Most of the IPCC models are able to reproduce the basic characteristics of the precipitation seasonal cycle, such as the northwestward and southeastward migration of precipitation over tropical South America. Nevertheless, there are large discrepancies in the model South Atlantic convergence Zones in both intensity and location, and in their seasonal evolution. Also, most of models do not reproduce the precipitation maximum observed over Southeastern South America during the cold seasons.

Interannual variability:

- ECHAM5-OM captures the ENSO influence on LPB, albeit with a weaker signal than in observations
- Variations in SST over the tropical south Atlantic play an important role in the total summer monsoon precipitation over South America. Even though most IPCC models are able to show realistic SST variability in this basin, they cannot capture this relationship.
- Most IPCC models are able to represent the annular-like structure characteristic of the Southern Annualr Mode (SAM) in the Southern Hemisphere circulation, but they have serious deficiencies in representing the observed relationship between SAM and both precipitation and circulation anomalies in South America.
- Most of the models are not able to reproduce the typical wavetrains observed in the circulation anomalies in the Southern Hemisphere associated to ENSO. Only few models, previously identified as those with reasonable ENSO representation at the equatorial Pacific, have evidences of such wavetrains. Coherently, they exhibit the best representation of the ENSO signal in the South American precipitation.

Inter-decadal variability:

- The LMDz atmospheric model shows similar modes of precipitation variability as observations (for example, recovers the 1970's climate shift) that account for inter-decadal changes in several regions, including Laguna Mar Chiquita. Hydrological modeling suggests that the lake level fluctuations in Mar Chiquita during the 1970's have a strong climatic component.
- The coupled model HadCM3 has a Pacific Decadal Oscillation-like structure with a 16-20 years cycle that is also found in the real world. Moreover, the simulated precipitation changes associated with this pattern resemble those in observations over LPB. The SYNTEX coupled model shows a PDO-like structure with little weight in the tropical region, but it is correlated with precipitation in La Plata Basin during summer time as in observations.

- The South American monsoon shows a climate shift in the mid 1970s: the monsoon starts earlier and finishes later so that after the '70s the mean length has increased to about 195 days (vs. 170 days). Overall, IPCC models can represent correctly the spatiotemporal characteristics of the summer monsoon. They do not indicate significant changes in monsoon onset and demise under a A1B scenario.

Trends:

- Most models are able to represent the leading pattern of precipitation variability during summer, that consists of a dipole with centers over LPB and the South Atlantic Convergence Zone. The predicted increase in precipitation over LPB due to greemhouse gas forcing seems to be associated with an increase in the frequency of events associated with this pattern.

Overall, the CMIP3 models ECHAM5-OM, HadCM3, SYNTEX and IPSL have a reasonable representation of the mean climate as well as of the low-frequency variability. Two of these models are also being used as boundary conditions for the regional climate models. Therefore, we plan to focus the analysis on the output of these models for the 21st century projections, as well as for continuing the analysis of the 20th century runs.