



CLARIS LPB

A Europe–South America Network for Climate Change Assessments and Impact Studies in the La Plata Basin

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Project Overview and Aim

The MPG has participated in the CLARIS-LPB, an EU FP7 Collaborative Project on the Hydroclimate and Society in La Plata Basin. The project is finished with a duration of four years from October 2008 to September 2012. We have contributed to the deliverables within the two Work Packages, namely: a) WP5 – an ensemble of regional climate scenarios and uncertainties for climate impact studies and; b) WP6 – an analysis of extreme events of precipitation and temperature over the La Plata basin based on observational datasets and ensembles of 20th and 21st century regional model simulations.



Major findings

- The project has created an ensemble of RCMs, which gave an indication of the uncertainty in different time periods: hindcast, historical and climate scenarios
- In investigating further research questions for impact studies, a guideline is given to use as many ensemble members as possible
- REMO has a relatively high skill in simulating the climate of South America in terms of precipitation compared to the other RCMs. Thus, REMO can be used to downscale climate change scenarios such as A1B and the three RCP scenarios for South America.

The general aim of the CLARIS-LPB project is to provide an ensemble of regional climate change scenarios and their uncertainties for climate impact studies [1]. CLARIS-LPB has created an ensemble of Regional Climate Models (RCMs) with seven members including REMO. The RCMs have dynamically downscaled three CMIP3 General Circulation Models (GCMs) for the A1B emission scenario.

Experiment Lists in blizzard

Table 1. List of major simulations done within the project duration.

Experiment ID	Description	Status	No. of Mos.
REMO_CTRL	- REMO Control simulation - 1989 to 2008, REMO driven by the ERA INTERIM at 0.44° horizontal resolution	done	240
REMO_MOD	- modified soil properties to reduce the warm bias over the Amazons during winter - 1989 to 2008, modified REMO driven by the ERA INTERIM at 0.44° horizontal resolution	done	240
REMO_A1B_ECHAM5	- climate change run using EH50M-R3 A1B scenario - 1950 to 2100, REMO driven by ECHAM5/MPI-OM A1B Run3 CMIP3 simulation, 0.44° horizontal resolution	done	1,680
REMO_RCPS_CMIP5 (3 RCPs)	- climate change run using the CMIP5 simulations - 1950 to 2100, 3 additional REMO simulations driven by MPI-ESM-LR RCP2.6, RCP4.5, and RCP8.5	done	5,040

WP5: Regional climate change assessments for La Plata Basin – The CLARIS LPB Ensemble

Eleven RCMs are used altogether within the CLARIS LPB ensemble [2]. As shown in Figure 1, six out of 11(10) simulations use ECHAM5 (red) for the near(far) future period while 4(3) use HadCM3 (blue) and one IPSL (black).

As an example, the simulation for austral winter is shown in Figure 1 for different time slices. The figure shows that the spatial patterns for temperature and precipitation are more RCM-dependent rather than GCM-dependent. The individual model dynamics such as processes related to precipitation and land influence the ensemble. However, it is important to note that the ensemble mean is mainly dominated by the downscaling using ECHAM5.

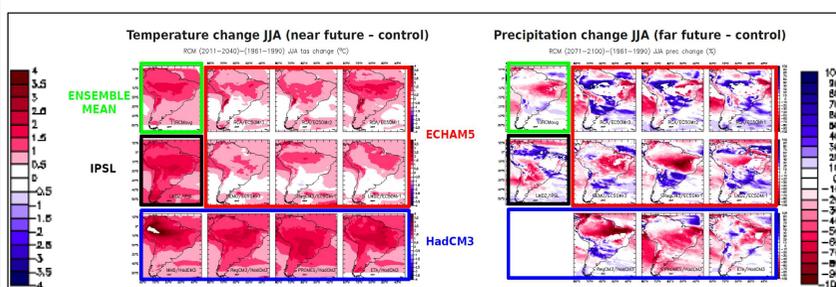


Figure 1. The austral winter climate change signal for temperature (left, absolute difference) and precipitation (right, relative difference) using the CLARIS LPB Ensemble and individual members based on the IPCC A1B Scenario. The GCMs used are indicated in colored boxes: red for ECHAM5, blue for HadCM3 and black for IPSL. Different time periods are shown as examples.

References

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CORDEX Activities

Three RCP scenarios (2.6, 4.5, 8.5) of the MPI-ESM CMIP5 activity are downscaled with REMO as part of the WCRP Coordinated Regional Downscaling Experiment (CORDEX) initiative [3]. For model validation, the bias of MPI-ESM and REMO are calculated from the CRU V3.0 for the period 1971-2000. In general, the patterns are similar for both models in temperature and precipitation although they differ slightly in location and extent as shown in Figure 2. As an example for the climate change (CC) signal, Figure 3 shows the extreme scenario (RCP8.5) CC-signal for the far-future.

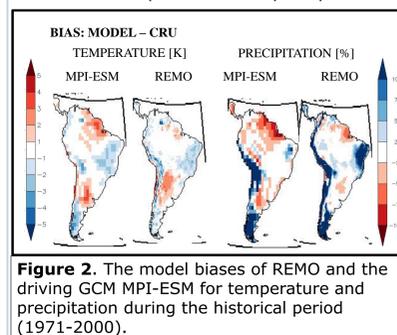


Figure 2. The model biases of REMO and the driving GCM MPI-ESM for temperature and precipitation during the historical period (1971-2000).

The patterns of the climate change signals are similar for both models (MPI-ESM and REMO) however, the precipitation signal in the La Plata Basin is wetter and larger extent in REMO than in MPI-ESM (Figure 3).

As an example for the climate change (CC) signal, Figure 3 shows the extreme scenario (RCP8.5) CC-signal for the far-future.

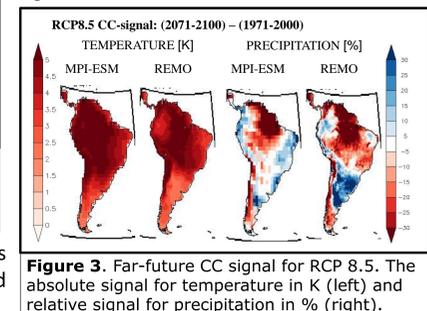


Figure 3. Far-future CC signal for RCP 8.5. The absolute signal for temperature in K (left) and relative signal for precipitation in % (right).

WP6: Processes and evolution of extreme climate events

In WP6, one of the aims is to characterize the uncertainty in simulating the South America climate in terms of daily precipitation distribution, mean and extreme values. As an example, Figure 4 shows the skill using the probability distribution functions (PDF) [5] of the 7 RCMs in simulating the daily precipitation at 11 different subregions. The scores are homogenous during winter compared to summer when precipitation is mainly due to convective processes.

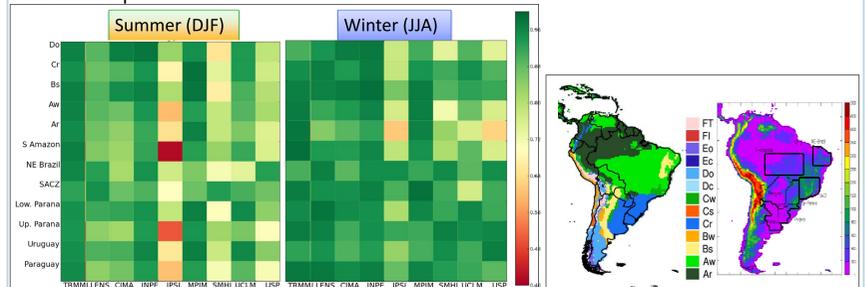


Figure 4. PDF Skill score of daily precipitation distribution for the austral summer and winter (left panel) for the 1998-2008 period at 11 subregions (right panel) based on the Koepfen-Trewartha climate classification [6] and hydrological basins [2]. The PDF skill scores are compared to the NOAA CPC dataset. In addition, the satellite estimates from the TRMM data is evaluated against the CPC dataset to gather information on the observational uncertainty.

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