



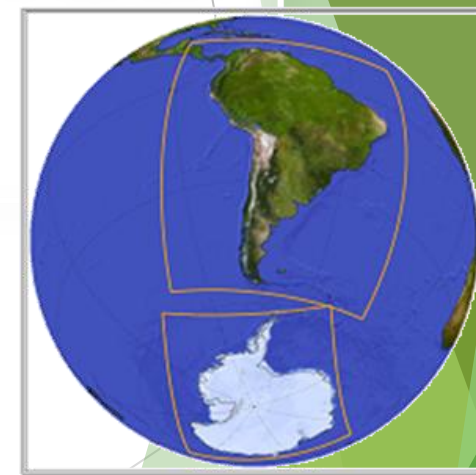
UMI-IFAEI



CORDEX South America (SAM) activities

Silvina Solman

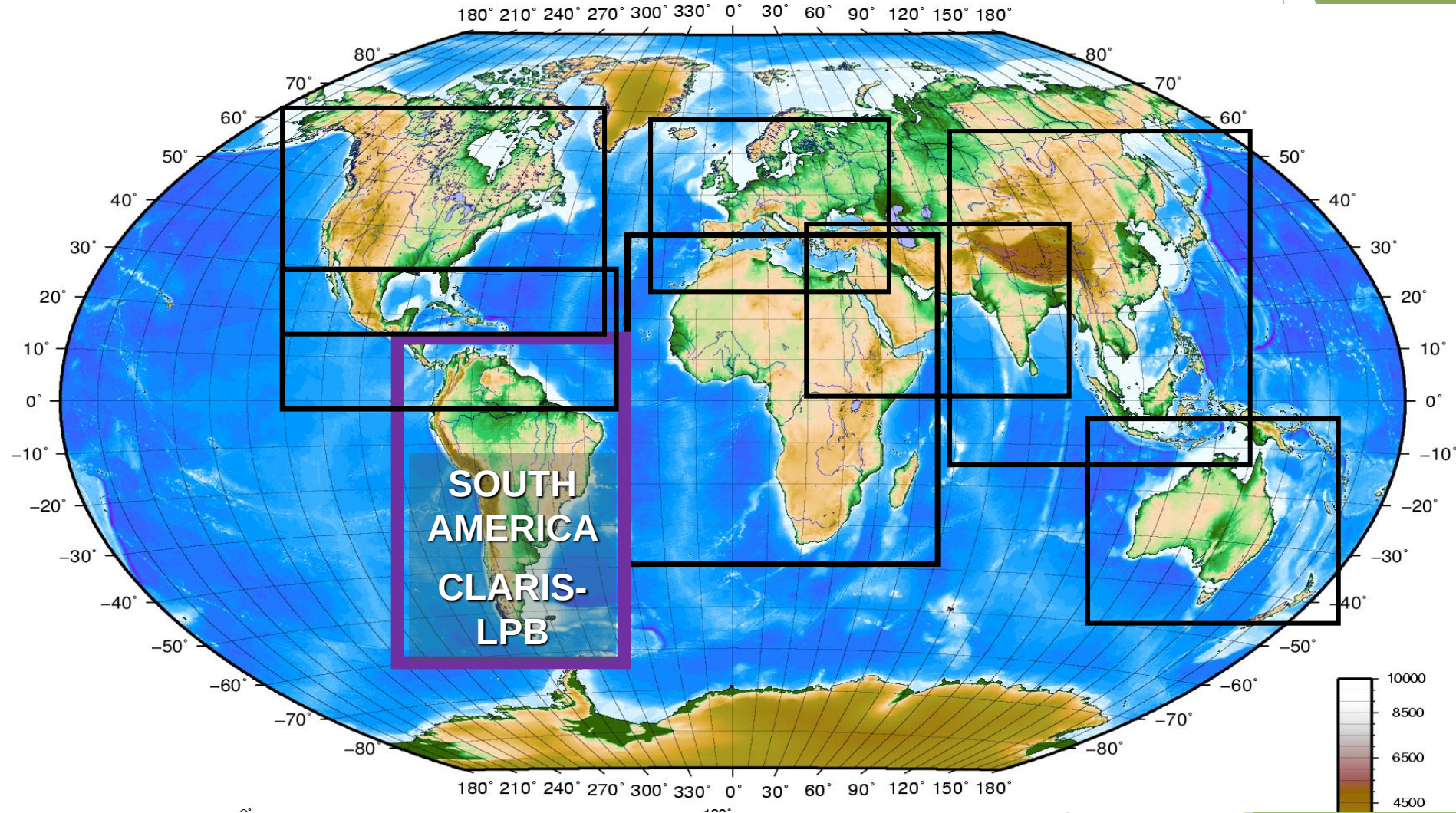
CORDEX Science Advisory Team
CIMA (CONICET-UBA) - DCAO (FCEyN-UBA)
Buenos Aires - Argentina



•South America CORDEX

June 25-27, La Paz, Bolivia

CORDEX-South America



CORDEX experimental design

Model Evaluation
Framework

Climate Projection
Framework

PHASE 1

Multiple regions
0.44, 0.22°, 0.11° grid spacing

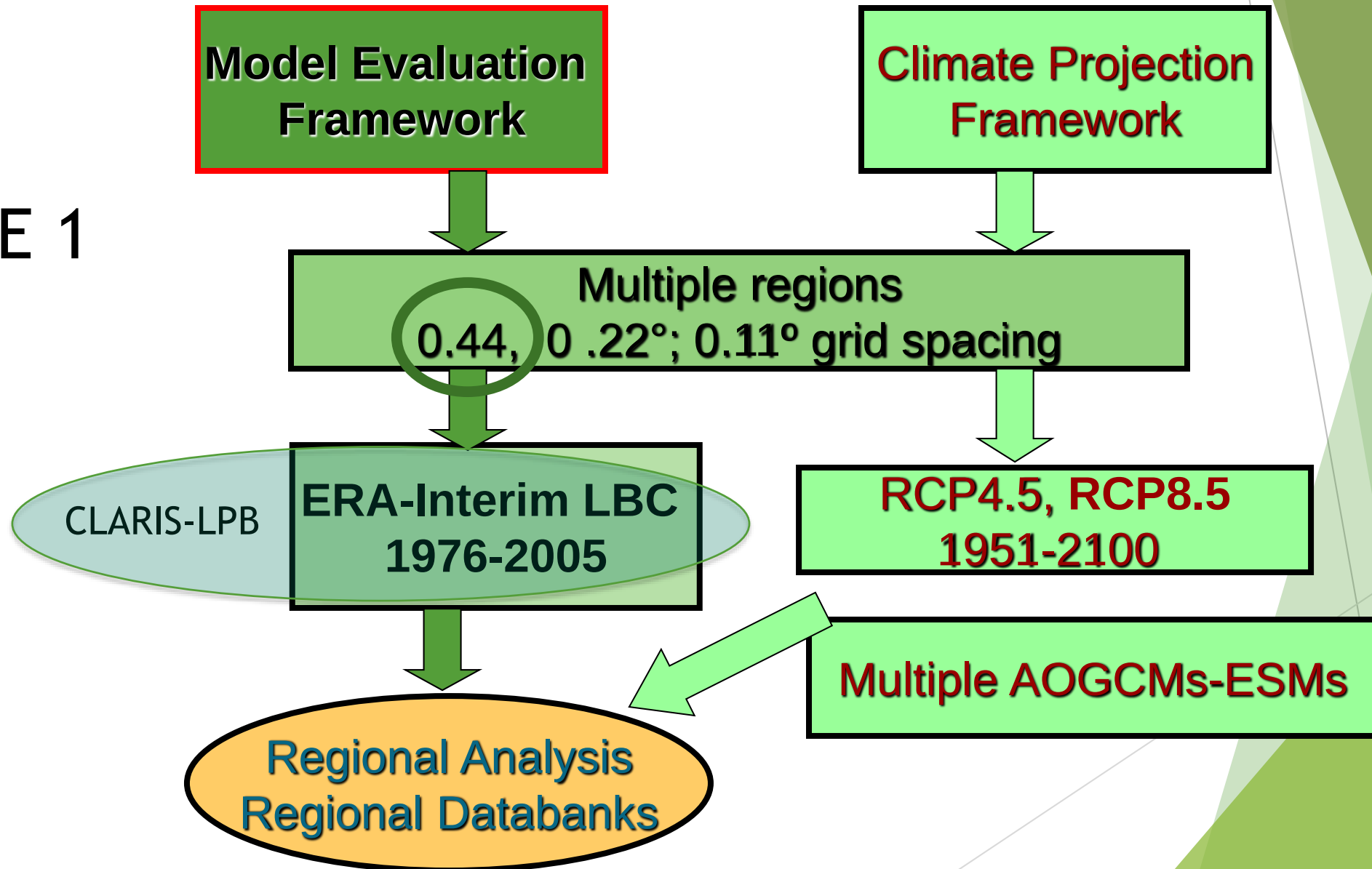
CLARIS-LPB

ERA-Interim LBC
1976-2005

RCP4.5, RCP8.5
1951-2100

Multiple AOGCMs-ESMs

Regional Analysis
Regional Databanks



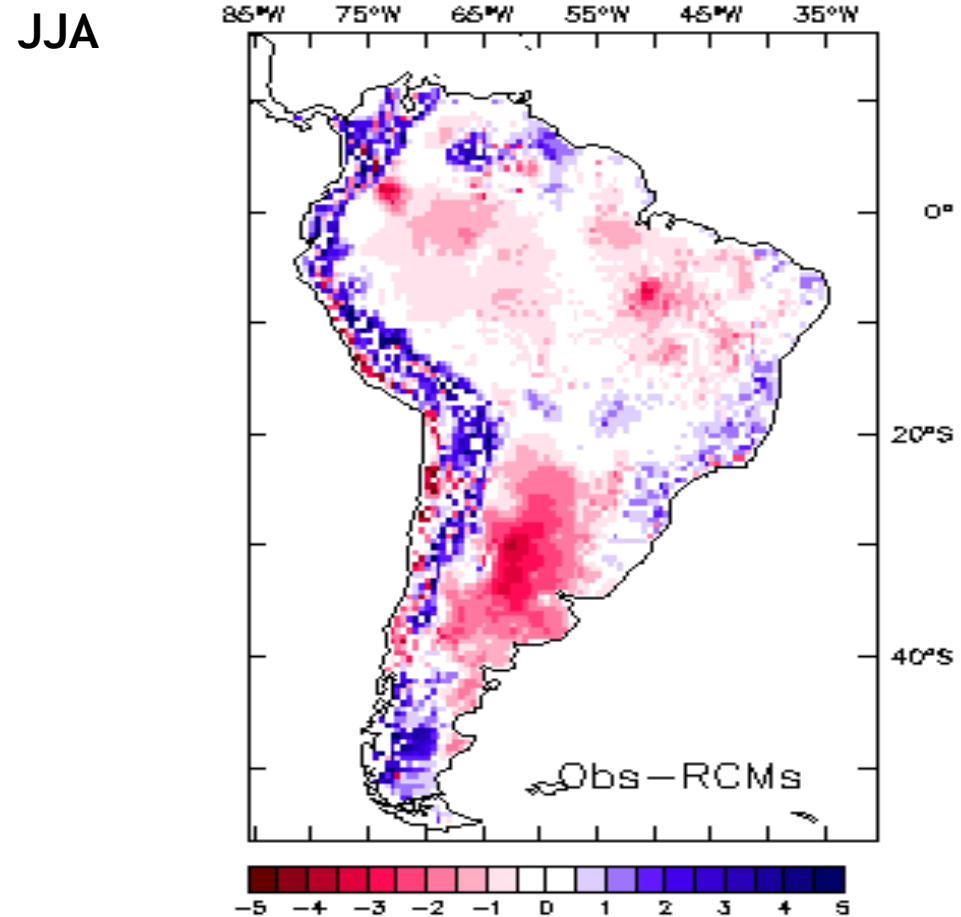
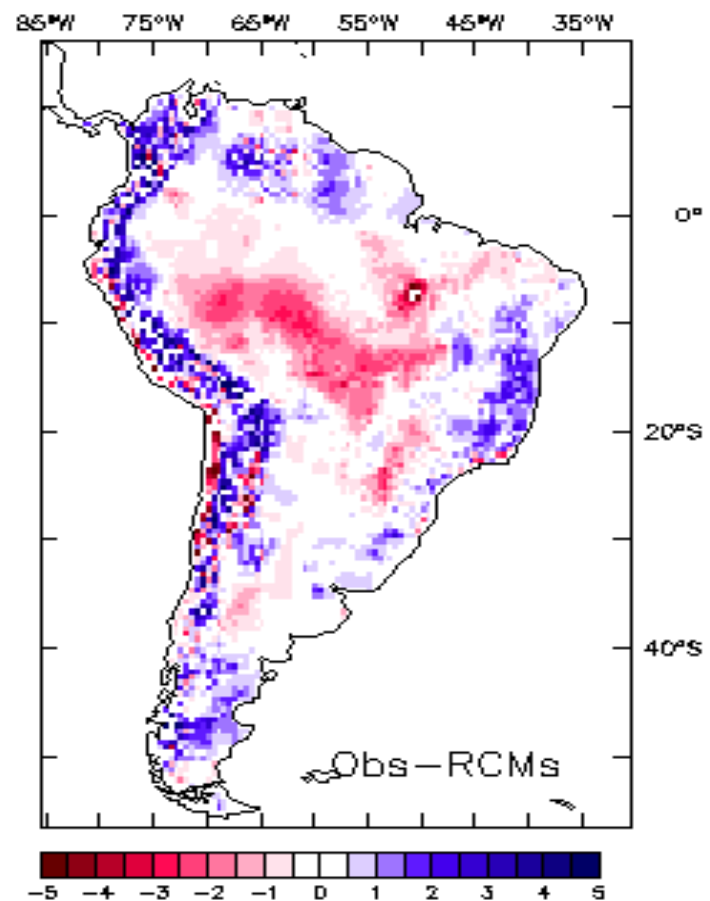
CORDEX-SAM ERA-Interim driven simulations

RCM/Institution
RegCM3/USP-Brazil
RCA/SMHI-Sweeden
MM5/CIMA-Argentina
REMO/MPI-Germany
PROMES/UCLM-Spain
LMDZ/IPSL-France
ETA/INPE-Brazil
COSMO/IACS-Switzerland
WRF/IPSL-France
PRECIS/Met Office-UK
WRF/UniCan - Spain
HadGEM3-RA /Met Office-UK

CLARIS-LPB

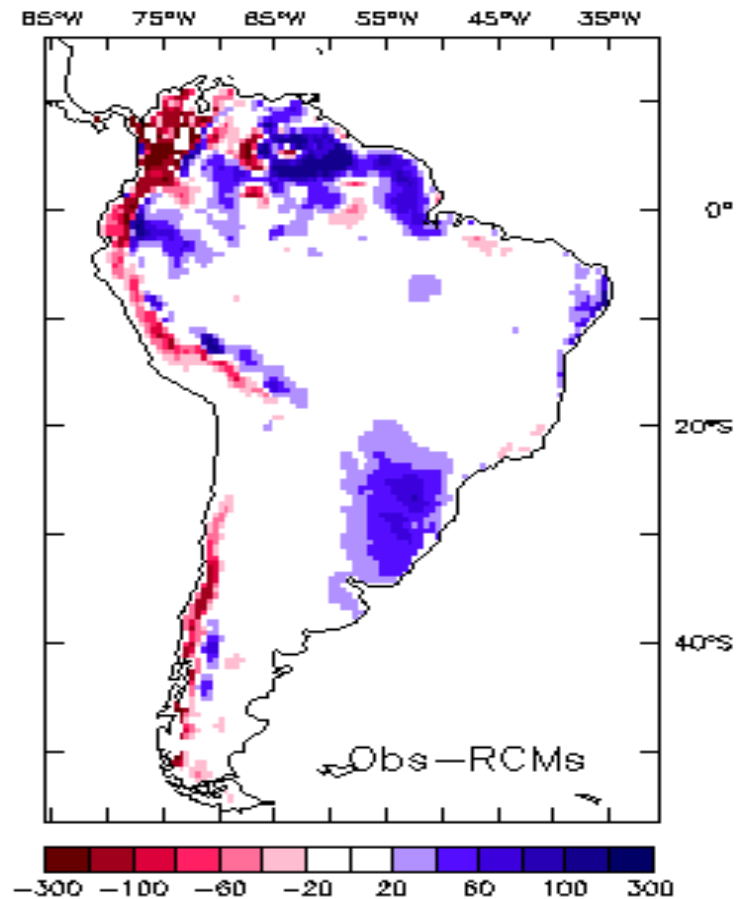
Solman et al, 2032 Clim Dyn
Pessacg et al., 2013 Clim Dyn
Marengo et al., 2013 Clim Dyn
Lopez Franca et al., 2016

Ensemble 7 MCR (CLARIS-LPB): RCM driven by ERA-Interim- Evaluation simulations

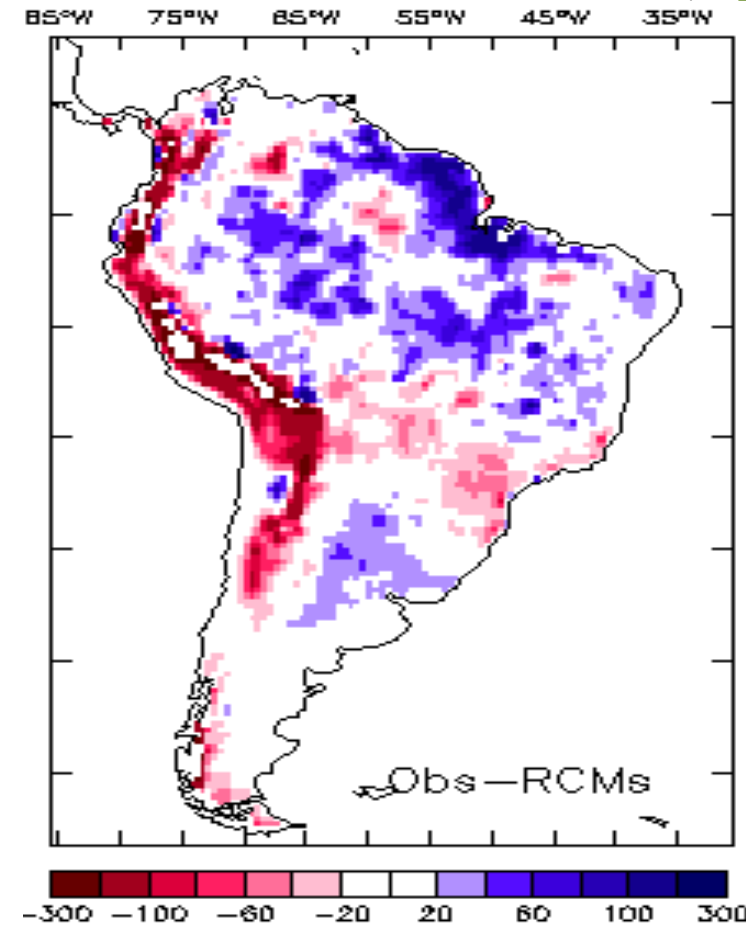


Temperature bias (with respect to CRU data)

Ensemble 7 MCR (CLARIS-LPB): RCM driven by ERA-Interim- Evaluation simulations



JJA



DJF

Precipitation bias (mm/month)

Latest update on RCM simulations

Regional Model (RCM)

	RCA4.V3	REgCM4	REMO2009	WRF3.4	PRECIS	ETA	HadRM3P.V1	RegCM4	XX	XX		
ERA40												
ERA-Int	0.44°	0.44°	0.44°	0.44°	0.22°		0.44°	0.44°			RCP	ECS(°C)
ICHEC-EC-Earth	0.44°							0.44°			2.6/4.5/8.5	
MPI-ESM-LR	0.44°	0.44°	0.44°					0.44°			2.6/4.5/8.5	
HadGEM-ES	0.44°	0.44°			0.22°	20km					2.6/4.5/8.5	
CanESM2	0.44°			0.44°							4.5*/8.5	
GFDL-ESM2M	0.44°	0.44°									4.5/8.5	
IPSL-CM5A-MR	0.44°										4.5/8.5	
MIROC5	0.44°										2.6/4.5/8.5	
CSIRO-Mk3.5.0	0.44°										4.5/8.5	
NorESM1-M	0.44°										2.6/4.5/8.5	
Region	SAM	SAM	SAM	SAM	SAM	SAM	SAM	SAM				
Period	For evaluation 1979-2005 scenario:1850 2100	For evaluation 1979-2005 scenario:1850 2100	For evaluation 1979-2005 scenario:1850 2100	For evaluation 1979-2005 scenario:1850 2100	For evaluation 1979-2005 scenario:1850 2100	For evaluation 1979-2005 scenario:1850 2100	For evaluation 1979-2005 scenario:1850 2100	For evaluation 1979-2005 scenario:1850 2100				
Access	ESGF nodes		ESGF nodes	http://meteo.unican.es/wo			ESGF nodes					
Institution	SMHI/Sweden	ICT-/USP/Italy-Brazil	GERICS/Germany	universidad de	CR2/DGF Chile	CPTEC/Brazil	Hadley Centre/UK	CR2/DGF Chile				
Modeler (or contact) Name	Grigory Nikulin	Marta Lopez		Jesus Fernandez	Maisa Rojas	Sin Chan Chou		Deniz Bozkurt				

† performed but not available at ESGF yet

† in progress

† planned

Data access notes: PO2 - Point of Contact (Modeler); ESGF - Earth System Grid Federation; NN - No Name Website...

Institution notes:

Contact information, time periods, and other details on the simulations are available via the modeling group page.

Simulations organized to highlight possible intercomparison subexperiments

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[Terms of Use for individual models](#)

Period: For evaluation 1979-2005

Scenario: 1850 2100

Access, institution and modeler/contact

For RegCM4 simulations institution: USP/ICTP Contact: Rosmeri Porfirio da Rocha rosmerir@model.iag.usp.br

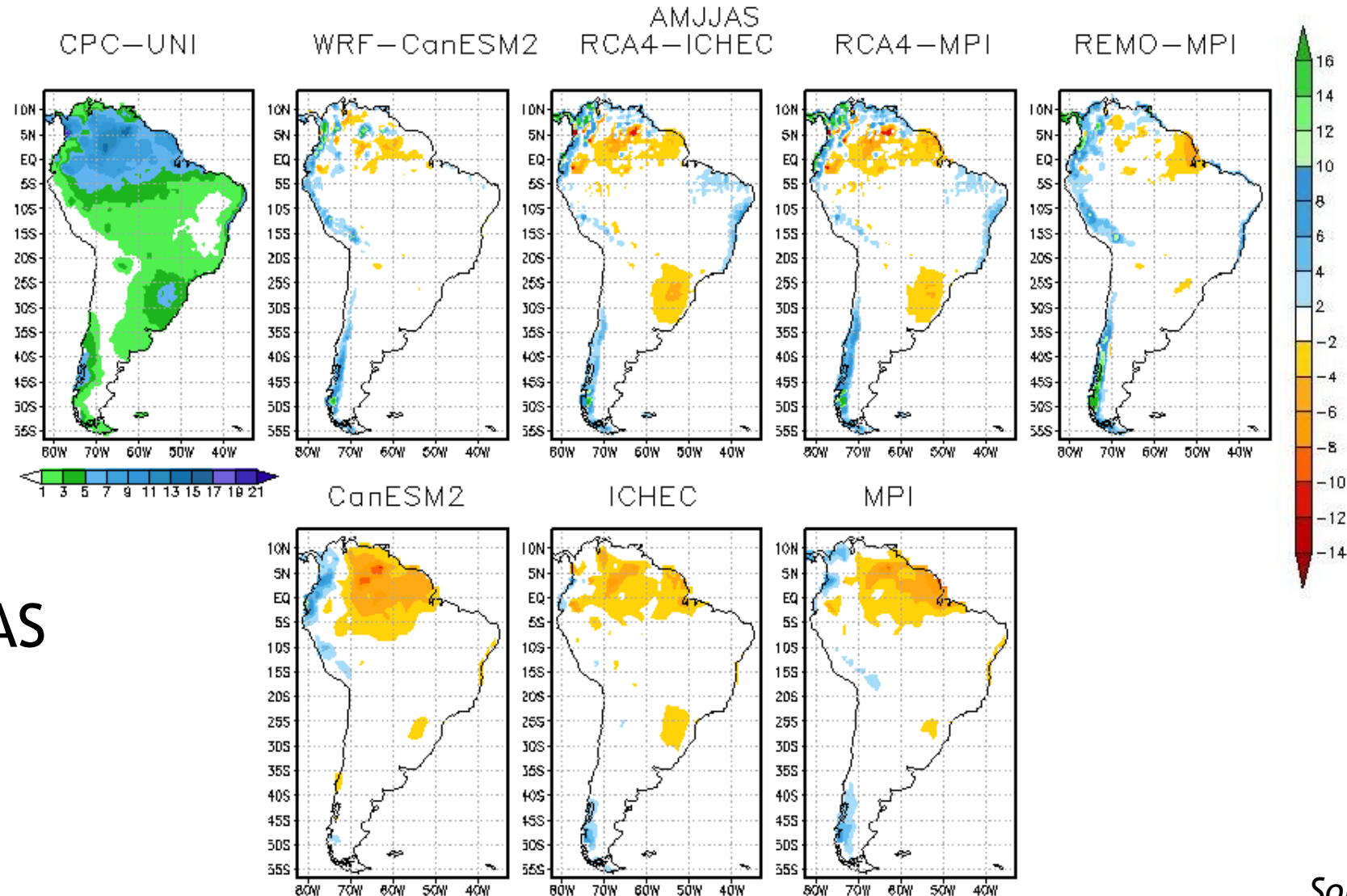
For WRF simulations institution: UNICAN Contact: Jesus Fernandez Jesus.fernandez@unican.es

For PRECIS simulations institution: Universidad de Chile Contact: Maisa Rojas maisa@dgf.uchile.cl

For ETA simulations institution: CPTEC Contact: Sin Chan Chou chou@cptec.inpe.br

CORDEX simulations: Seasonal mean precipitation bias

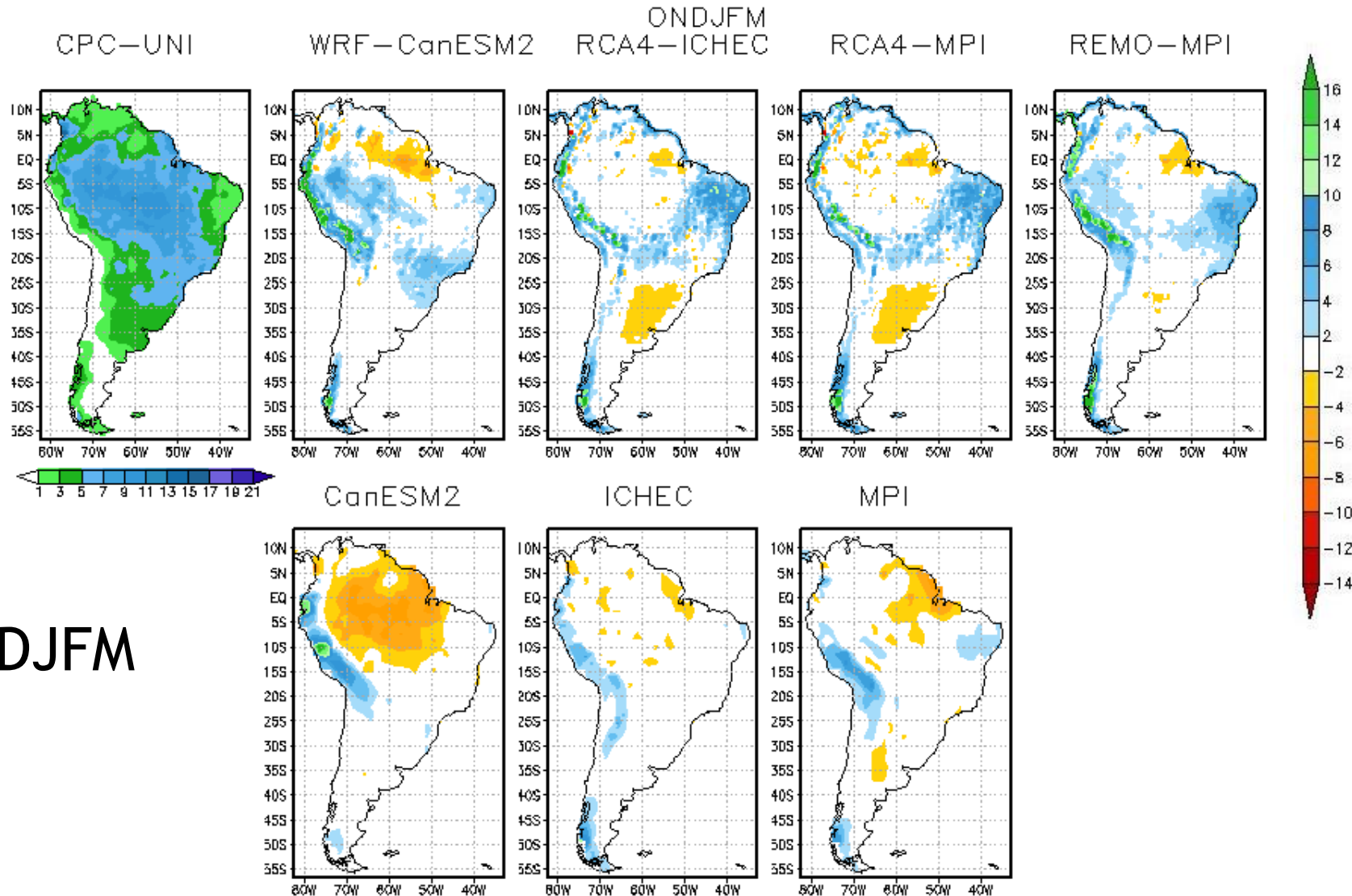
Mean precipitation bias (1979–2005)



AMJJAS

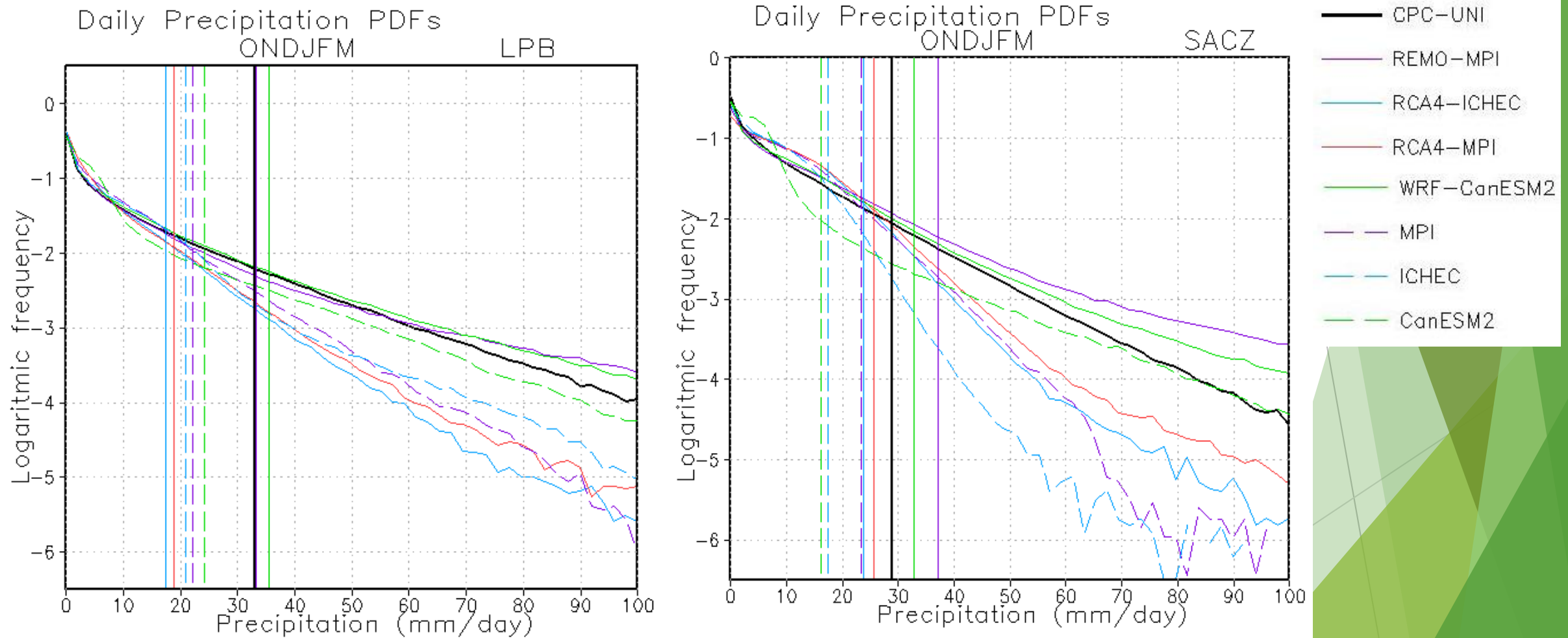
CORDEX simulations: Seasonal mean precipitation bias

Mean precipitation bias (1979–2005)



ONDJFM

CORDEX simulations: Daily precipitation statistics



CORDEX simulations: Extreme precipitation (p95)

Extreme precipitation (95th percentile) (1979–2005)

ONDJFM

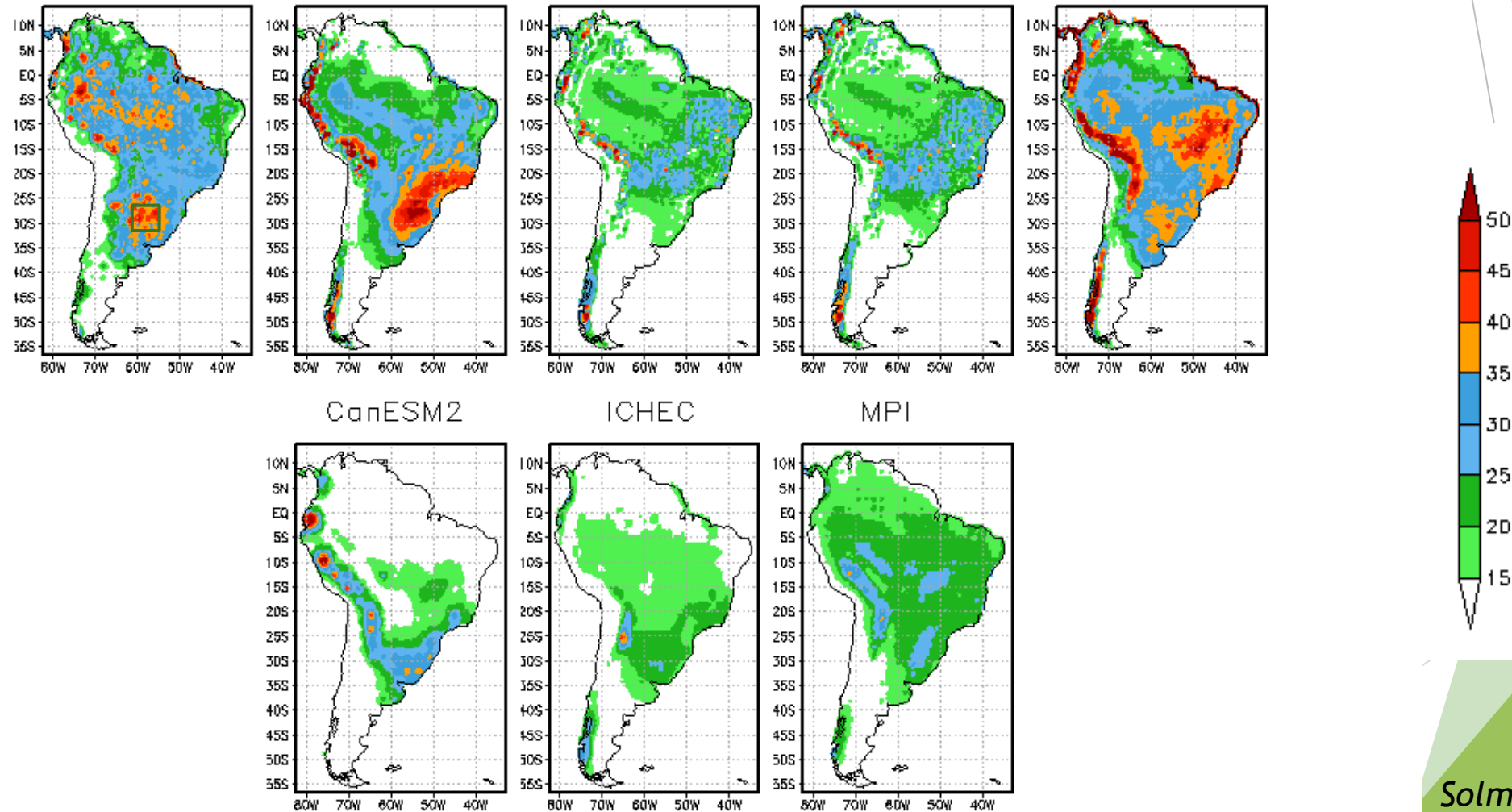
CPC—UNI

WRF—CanESM2

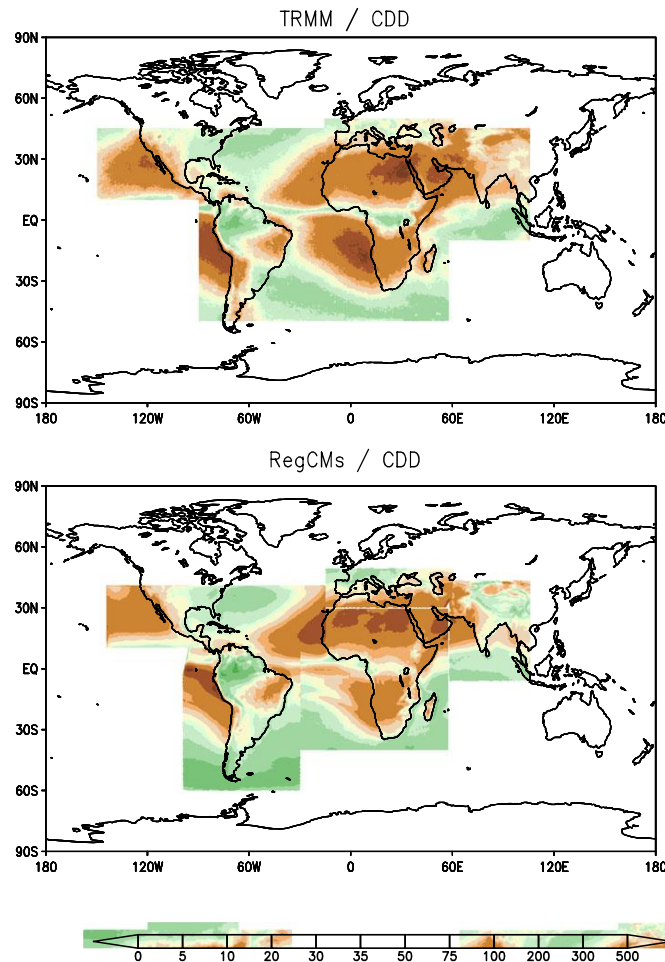
RCA4—ICHEC

RCA4—MPI

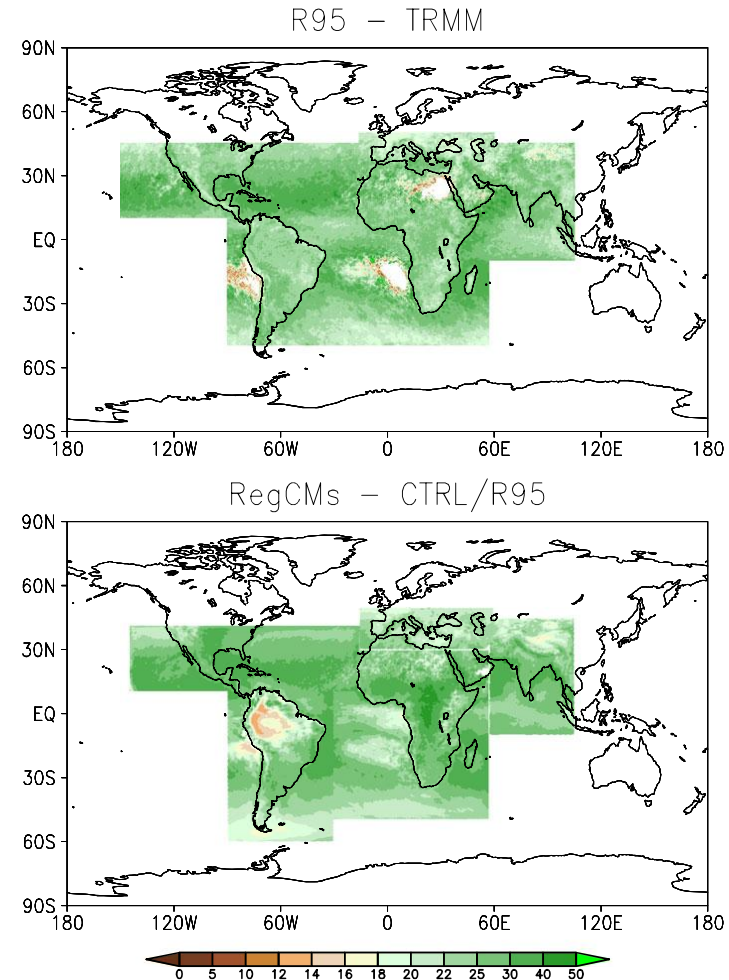
REMO—MPI



Extremes from the CREMA ensemble (RegCM4 RCM)



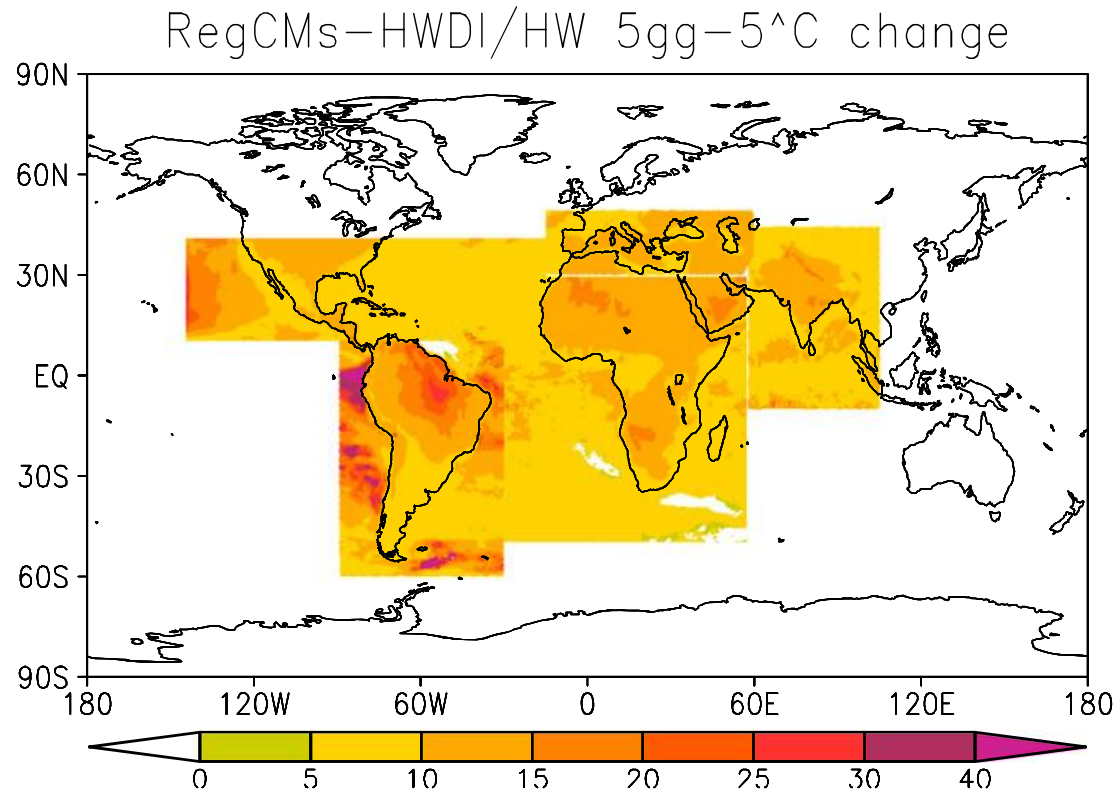
Number of consecutive
dry days (CDD)



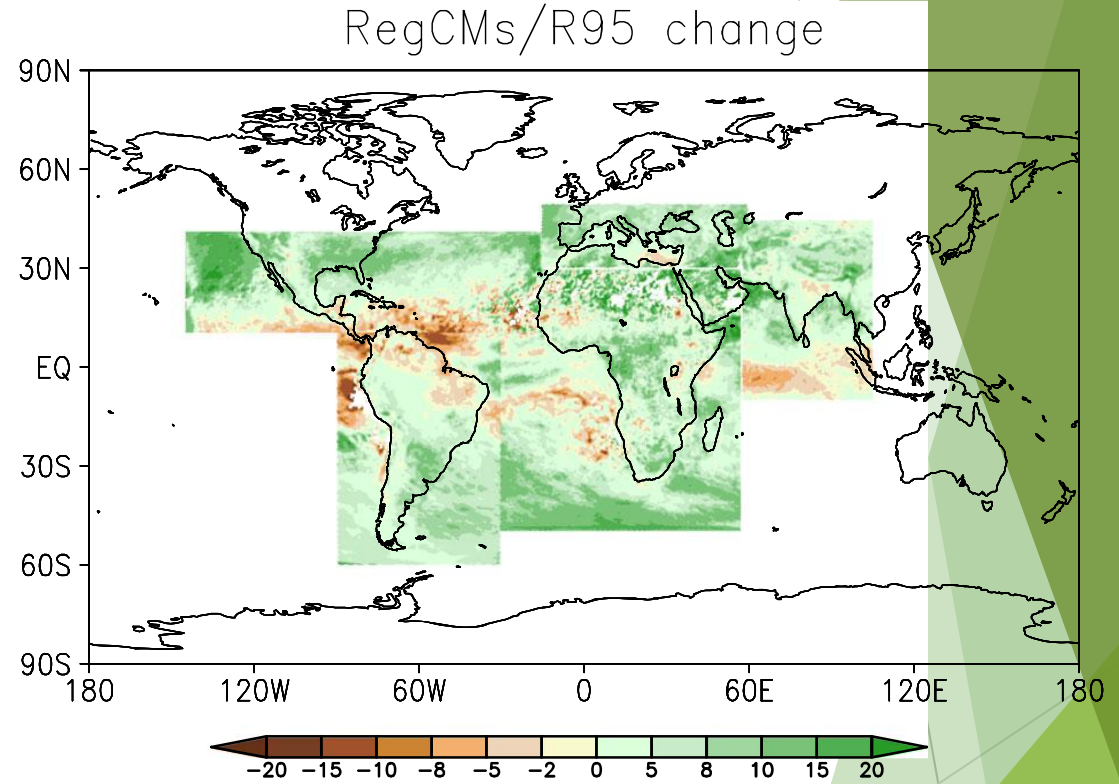
Extreme precipitation (percentage of
precipitation above 95th percentile)

Giorgi et al., 2014

Projected changes from the CREMA ensemble (RegCM4 RCM)



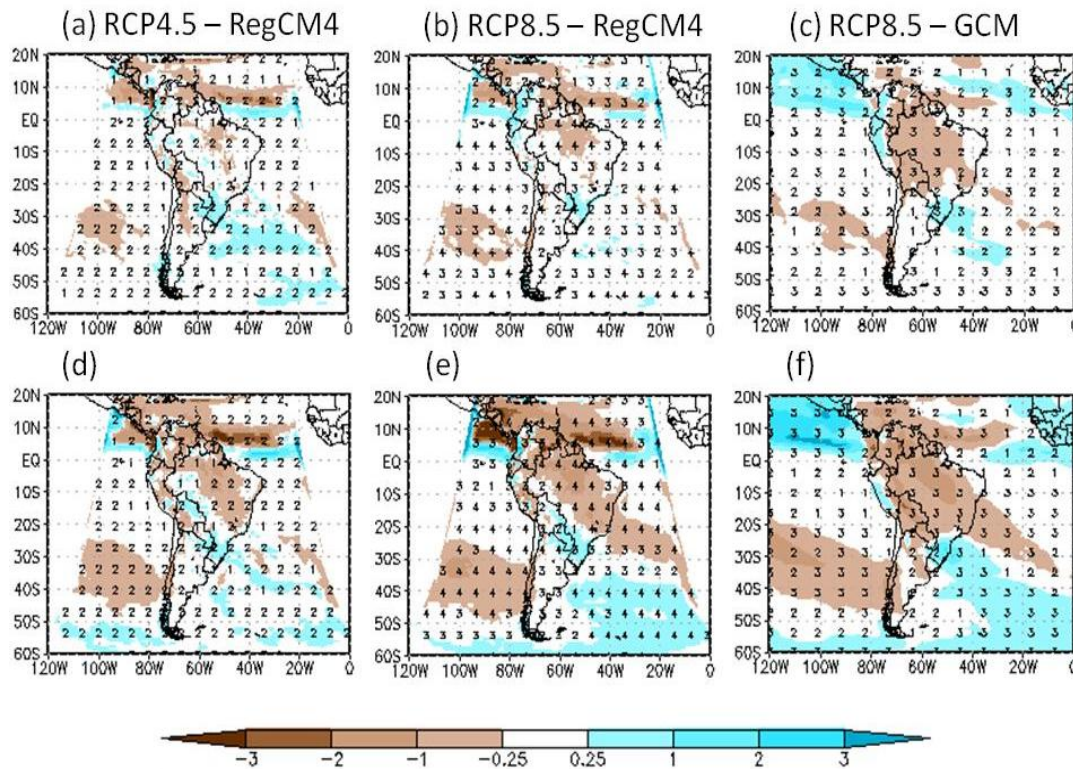
Change (2071-1200 minus 1975-2005) in the longitude of heat waves (days) from the CREMA ensemble for RCP8.5



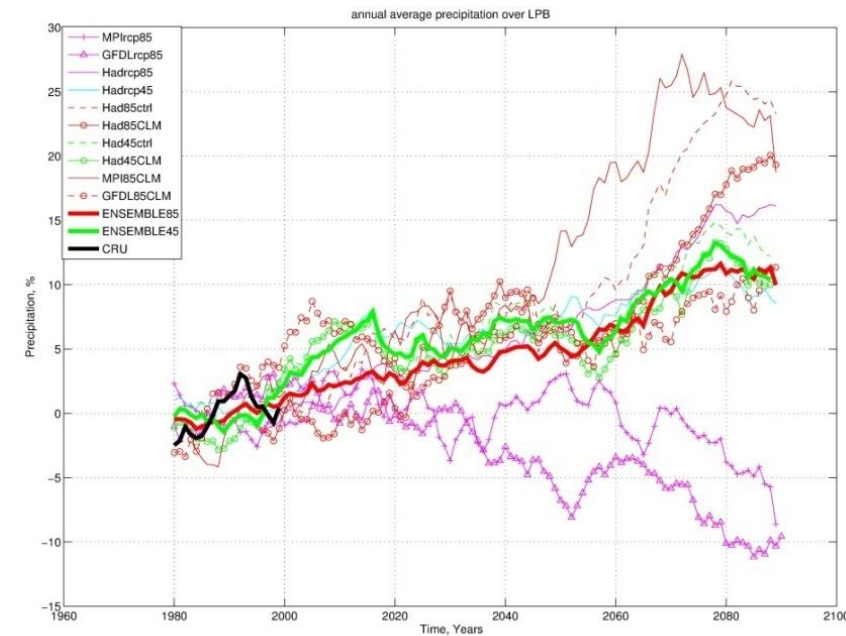
Change (2071-1200 minus 1975-2005) in extreme precipitation (p95) from the CREMA ensemble for RCP8.5

RegCM4 - RCP4.5 & RCP8.5 Changes (2070/2098 - 1975/2005)

Change of precipitation - SON (mm/day)

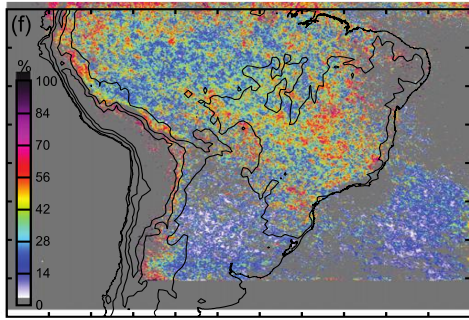


Mean annual trend of
precipitation (mm/day) over LPB



CORDEX-FPS-SA: “Extreme precipitation events in Southeastern South America: a proposal for a better understanding and modeling”

(2017-2019)(PI: Maria Laura Bettolli) Researchers from Argentina, Brazil, Italy, Czech Republic, Spain, Uruguay



% precipitation associated with MCC during summer

Objectives:

- 1) To investigate multi-scale aspects, processes and interactions that result in extreme precipitation events over Southeastern South America by using dynamical models (high resolution, convection permitting and coupled models) and statistical models.
- 2) to develop actionable climate information from multiple sources (statistical and dynamical downscaling products) based on co-production with the impact and user community.

First Workshop on CORDEX-FPS-SA – San José dos Campos, Brasil, March 2017



Challenges for CORDEX-SAM

- ▶ Model improvements, particularly on the land-surface schemes
- ▶ Increasing resolution for the CORDEX - SAM domain (22 km)
- ▶ Increasing the ensemble size
- ▶ Availability of reliable datasets of high-quality observations covering the whole South American continent
- ▶ Initial thoughts on regional phenomena and smaller domains deserving higher resolution (convective-permitting)

CORDEX-SAM publications

- ▶ Fernandez JPR, SH Franchito, VB Rao, M Llopart (2017) Changes in Koppen-Trewartha climate classification over South America from RegCM4 projections. *Atmospheric Science Letters* 18 (11), 427-434
- ▶ Llopart, M., R. P. da Rocha, M. S. Reboita, S. Cuadra. Sensitivity of simulated South America climate to the land surface schemes in RegCM4. *Climate Dynamics*, 49 (11-12), 3975-3987, 2017
- ▶ Reboita, M. S., T Amaro, M. Rodrigues. Winds: Intensity and Power Density Simulated by RegCM4 over South America in the Present and Future Climate. *Climate Dynamics*, p. xx-xx, 2017
- ▶ Batista, R.J.R, F. L. T. Gonçalves, R. P. da Rocha, 2016. Present climate and future projections of the thermal comfort index for the metropolitan region of São Paulo, Brazil. *Climatic Change*, 137 (3-4), 439-454. (doi: 10.1007/s10584-016-1690-5)
- ▶ de Jesus, E. M.; R. P. da Rocha, M. S. Reboita, M. Llopart, L. M. M. Dutra, A. R. Remedio, 2016. Contribution of cold fronts to seasonal rainfall in simulations over the southern La Plata Basin. *Climate Research*, 68, 243-255
- ▶ Reboita, MS; LMM Dutra, CG Dias. Diurnal cycle of precipitation simulated by RegCM4 over South America: present and future scenarios. *Climate Research*, v. 70, p. 39-55, 2016
- ▶ Sánchez, E, S. Solman, A. R. C. Remedio, H. Berbery, P. Samuelsson, R. P. da Rocha, C. Mourão, L. Li, J. Marengo, M. de Castro, D. Jacob. Regional climate modelling in CLARIS-LPB: a concerted approach towards twentyfirst century projections of regional temperature and precipitation over South America. *Climate Dynamics*, 1-20. (DOI 10.1007/s00382-014-2466-0), 2015
- ▶ da Rocha, R. P, M. S. Reboita, L. M. M. Dutra, M. P. Llopart, E. Coppola, 2014. Interannual variability associated with ENSO: present and future climate projections of RegCM4 for South America-CORDEX domain. *Climatic Change*, 125, 95-109. (doi:10.1007/s10584-014-1119-y)

CORDEX-SAM publications

- ▶ Llopart, M., E. Coppola, F. Giorgi, R. P. da Rocha, S. V. Cuadra, 2014. Climate change impact on precipitation for the Amazon and La Plata basins. *Climatic Change*, 124, 1573-1480. (doi: 10.1007/s10584-014-1140-1)
- ▶ Reboita, M.S., R. P. da Rocha, C. G. Dias, R. Y. Ynoue, 2014. Climate projections for South America: RegCM3 driven by HadCM3 and ECHAM5. *Advances in Meteorology*, vol. 2014, Article ID 376738, 17 pages. (DOI:10.1155/2014/376738)
- ▶ Reboita, M. S., J. P. R. Fernandez, M. P. Llopart, R. P. da Rocha, L. A. Pampuch, F. T. Cruz, 2014. Assessment of RegCM4.3 over the CORDEX South America domain: sensitivity analysis for physical parameterization schemes. *Clim Res* 60, 215-234. (doi: 10.3354/cr01239)
- ▶ Solman S. A. (2016): Systematic temperature and precipitation biases in the CLARIS-LPB ensemble simulations over South America and possible implications for climate change projections . *Climate Research*, doi: 10.3354/cr01362. Vol. 68: 117-136
- ▶ Pessacg N.L, S. A. Solman, P.Samuelsson, E. Sanchez, J. Marengo, L. Li, C. Mourão, A. R. C. Remedio, R. P. da Rocha, D. Jacob (2013): The surface radiation budget over South America in a set of regional climate models from the CLARIS-LPB project. *Clim Dyn*
- ▶ DOI 10.1007/s00382-013-1916-4 September 2014, Volume 43, pp 1221-1239
- ▶ Marengo J.A , S. Chou , C. Mourao, S. Solman , E. Sanchez, , P.Samuelsson , R. P. da Rocha , L. Li , N. Pessacg , A. R.C. Remedio A. F.Carril, I.F.A. Cavalcanti, D. Jacob, E. Beserra (2013): Simulation of rainfall anomalies leading to the 2005 drought in Amazonia using the CLARIS LPB regional climate models. *Clim Dyn*, Volume 41, pp 2937-2955. DOI 10.1007/s00382-013-1919-1
- ▶ Solman S., E. Sanchez, P. Samuelsson , R. da Rocha, L. Li , J.Marengo, N. Pessacg , A.R.C. Remedio , S. C. Chou, H. Berbery , H. Le Treut, M. de Castro and D. Jacob (2013) Evaluation of an ensemble of regional climate model simulations over South America driven by the ERA-Interim reanalysis: Model performance and uncertainties (DOI: 10.1007/s00382-013-1667-2).*Clim Dyn*, 41, 1139-1157.

Thank you!

