ACC - VAMOS

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CICESE
www.cicese.mx

13th VAMOS Panel Meeting
Buenos Aires, Argentina, 29-31 July

ACC Task Force Activities: 2008-2010

- Cavazos, T., D. Gochis, J. A. Marengo, and J. P. Boulanger, 2008: VAMOS and anthropogenic climate change in the Americas. *Report of the VAMOS ACC task force*; CLIVAR/VAMOS, 24 pp.

- Cavazos, T. and J. A. Marengo, 2009: Activities on anthropogenic climate change. *Exchanges* 48, Vol. 14, No. 1, pp. 16-19, Joint Edition CLIVAR/VAMOS.

- Updated list of references (2010)
- A review article 2010 (?)

ACC Challenge in the American Monsoons

To understand important processes that control monsoonal climates in the Americas, their variability and change, and how these processes interact with broader societal issues, such as impacts, vulnerability and adaptation.

Relevant Climate Change Issues in VAMOS

- Assessment of GCM model performance and uncertainties
- Regional climate downscaling for integrated assessments of climate change

- Extreme events (observed and scenarios)
- Improvement of the simulation and understanding of major tropical and monsoon-related modes of variability
- Investigation of the role of aerosols, land cover and land use on the radiative balance and hydrological processes

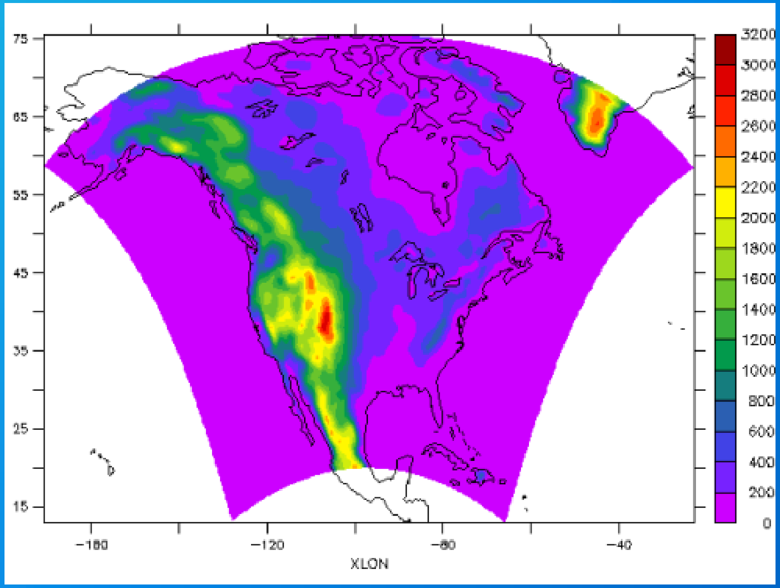
- Development of detection and attribution studies

GCM Performance and Uncertainties/Downscaling

NARCCAP: The North American Regional Climate Change Assessment Program (NARCCAP) is an international program to produce high resolution climate change simulations in order to investigate uncertainties in regional scale projections of future climate and generate climate change scenarios for use in impacts research.

A set of RCMs driven by a set AOGCMs, forced by A2 and A1B emissions scenario for the 21st century

1971-2000 → Observed period
2041-2070 → A2, A1B scenarios (Dly, 3 hourly)



http://www.narccap.ucar.edu/

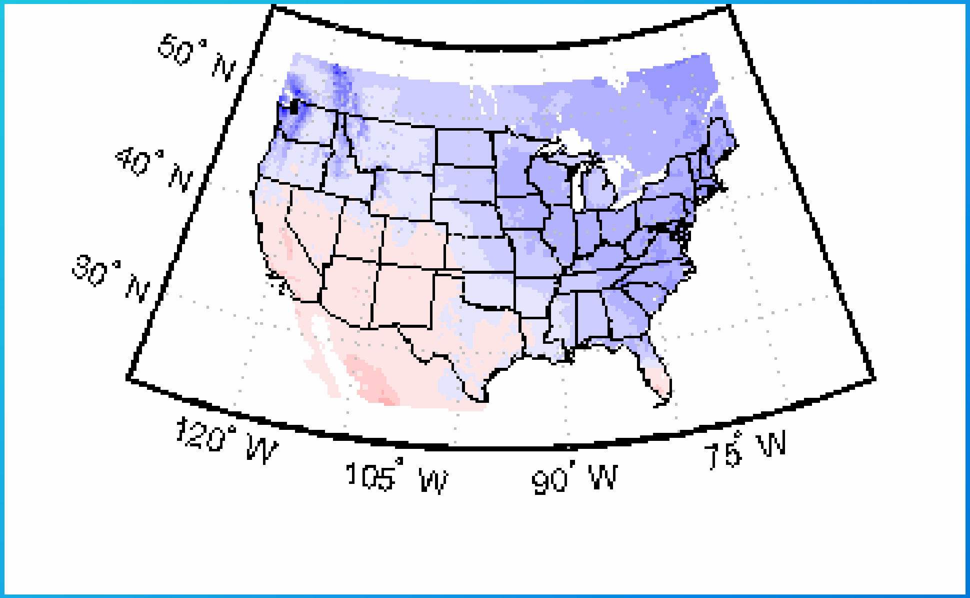
NARCCAP:

Regional Models	Climate Models				
	GFDL	CGCM3	HADCM3	CCSM	NCEP
CRCM					
ECP2					
HRM3			X		X
MM5I					
RCM3	X	X			X
WRFG				X	X
Time Slices					
ECPC					X
WRFP					X

GCM Performance and Uncertainties/Downscaling

Bias Corrected and downscaled WCRP CMIP3 Climate Projections
23 models, several members and scenarios
12 km, monthly: 25ºN – 55ºN

The Livermore National Lab and Santa Clara University, CA
http://gdo-dcp.ucllnl.org/downscaled_cmip3_projections



http://peac-bc.cicese.mx

Climate Action Plan of the State of Baja California (PEAC-BC)

OBJECTIVE (May 2008)

To produce regional climate change scenarios for BC and to evaluate their impact in different sectors of society.

Methodology

Select the GCMs that best reproduce the climate of the region

Metric validation (1961-1990):

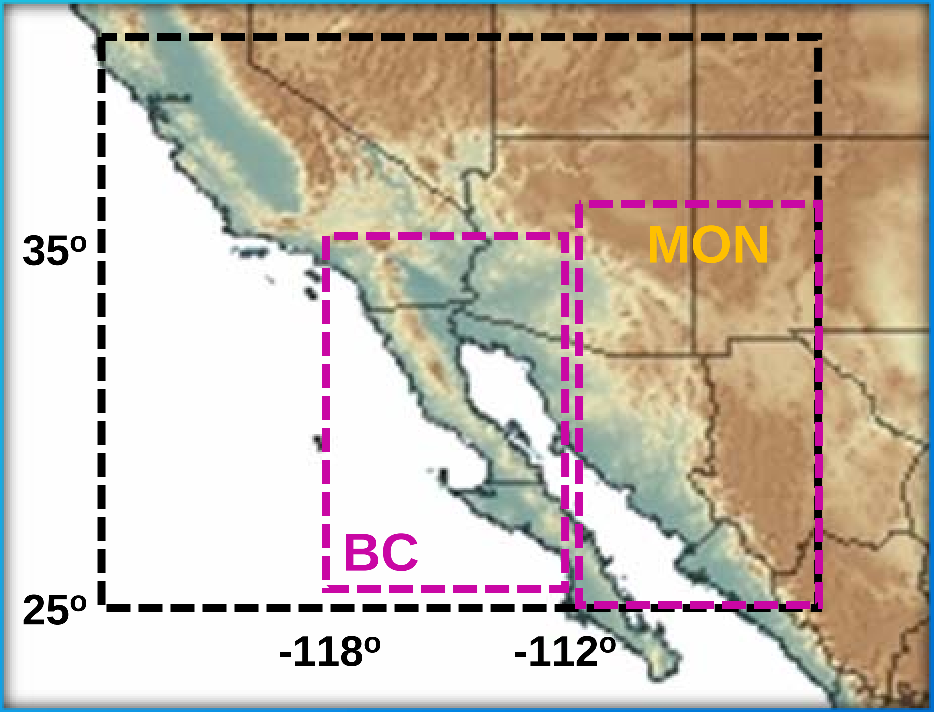
- 23 GCMs from CMIP3 (>250Km de resol.)
- Observed data: P y T from CRU-UK

Downscaled scenarios (T, P):

- With the best models

SRES (2000-2100):

B1: Low emissions (500 ppm)
A2: High emissions (850 ppm)

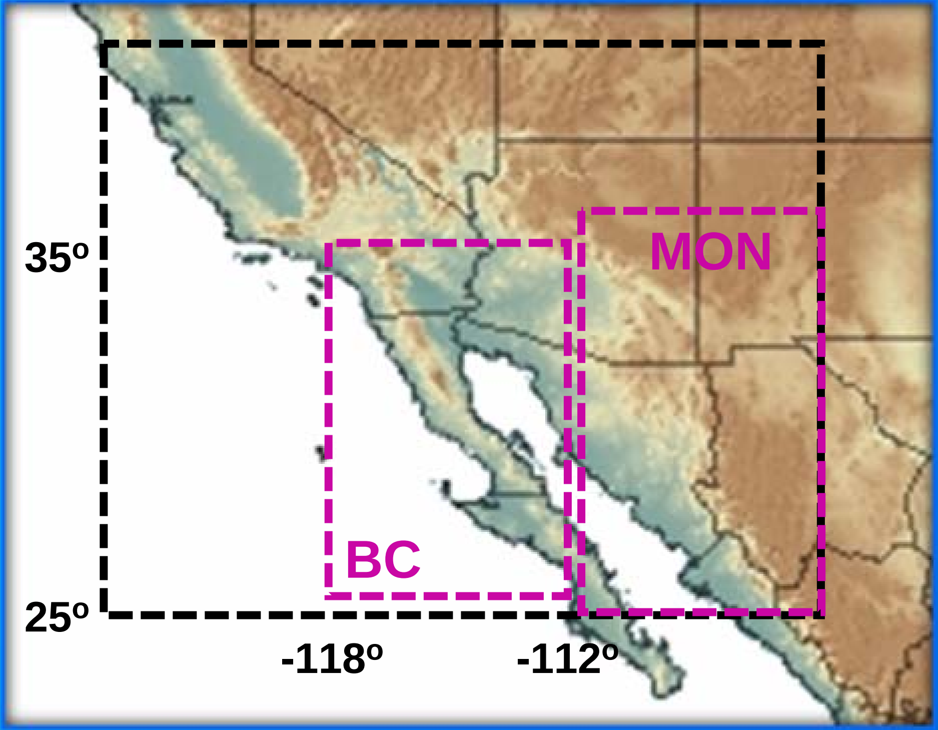


Results: Metric Validation

IPCC-6 models at 12 km:

Model - Members

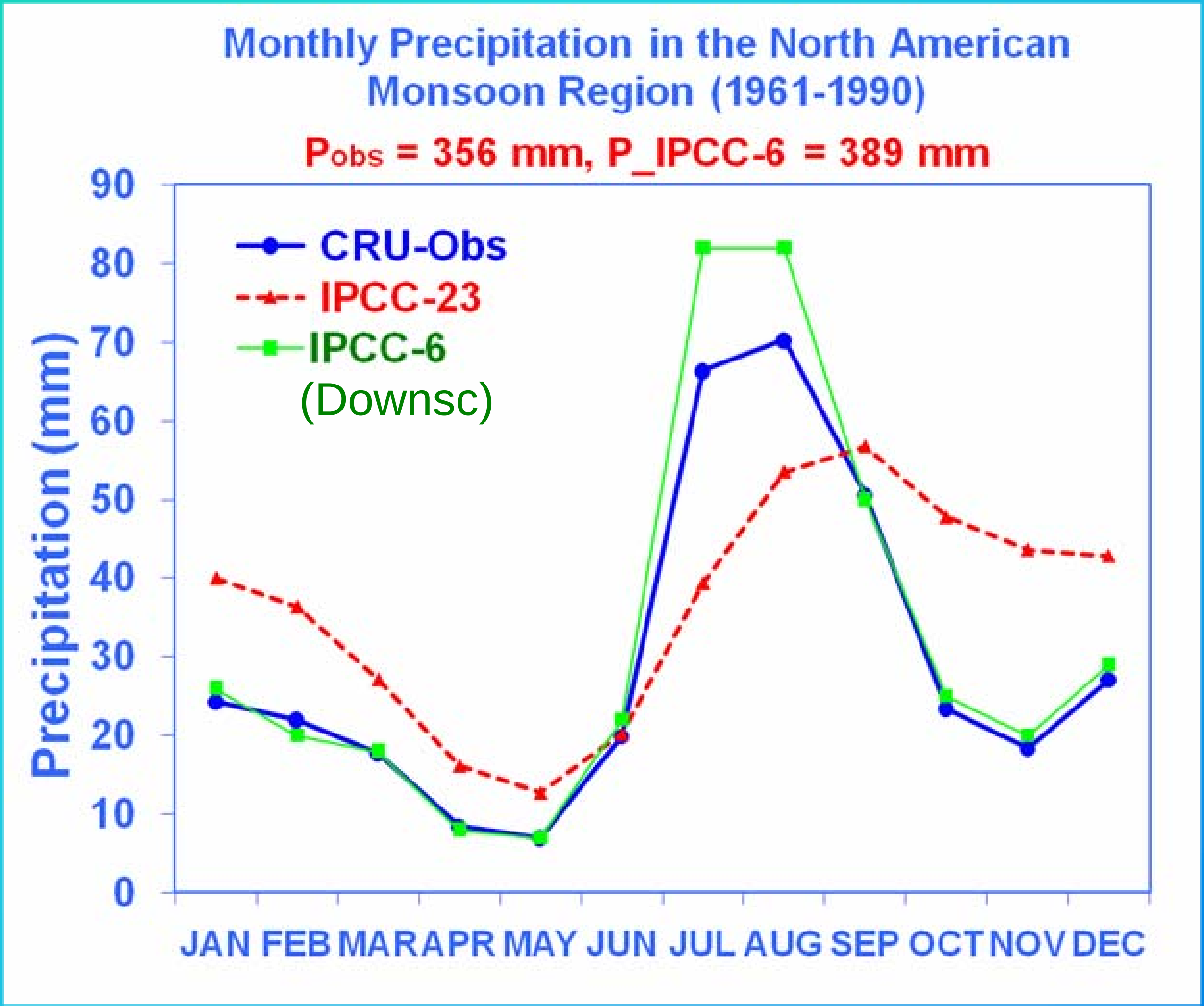
- BCCR2 (NOR) - 1
- CGCM47 (CAN) - 5
- CNRM-C3 (FRA): 1
- CSIRO-MK3 (AUS) - 1
- MIROC3.2 (JPN) - 3
- HADCM3 (UK) - 1



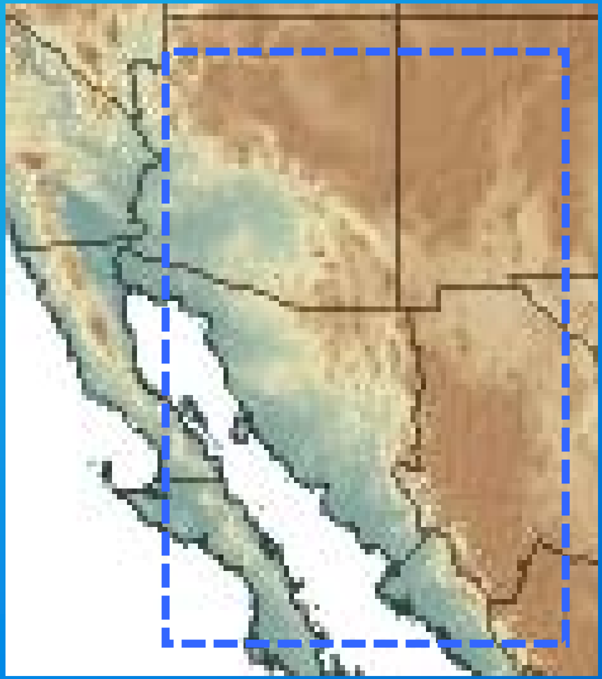
Statistically downscaled IPCC (CMIP3) at 12 km from:

The Livermore National Lab and Santa Clara University, CA

http://gdo-dcp.ucllnl.org/downscaled_cmip3_projections



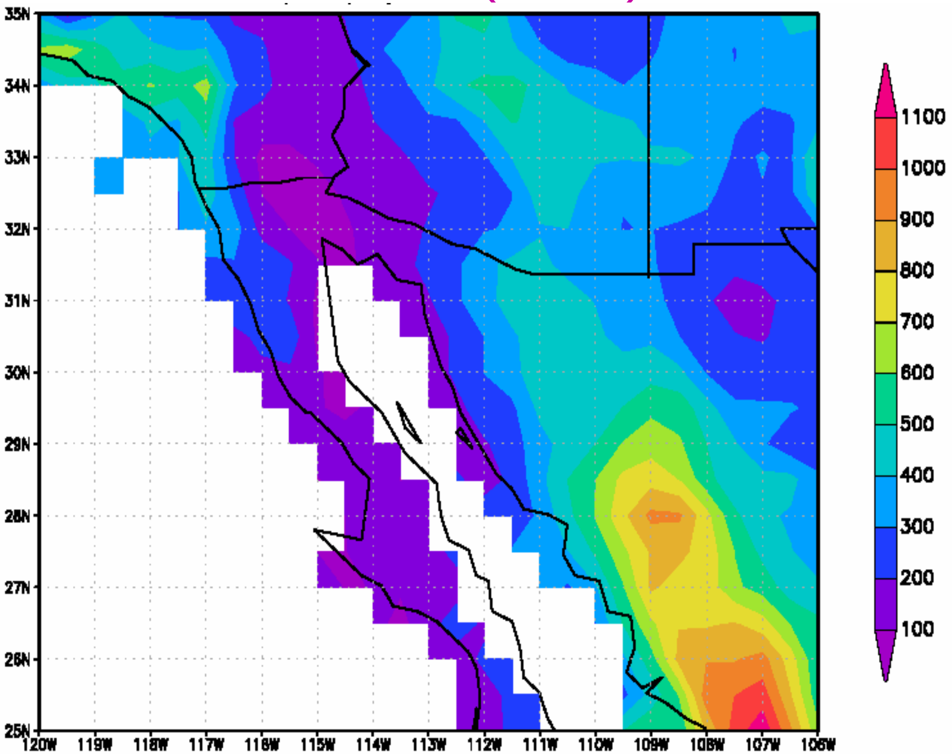
Core Monsoon



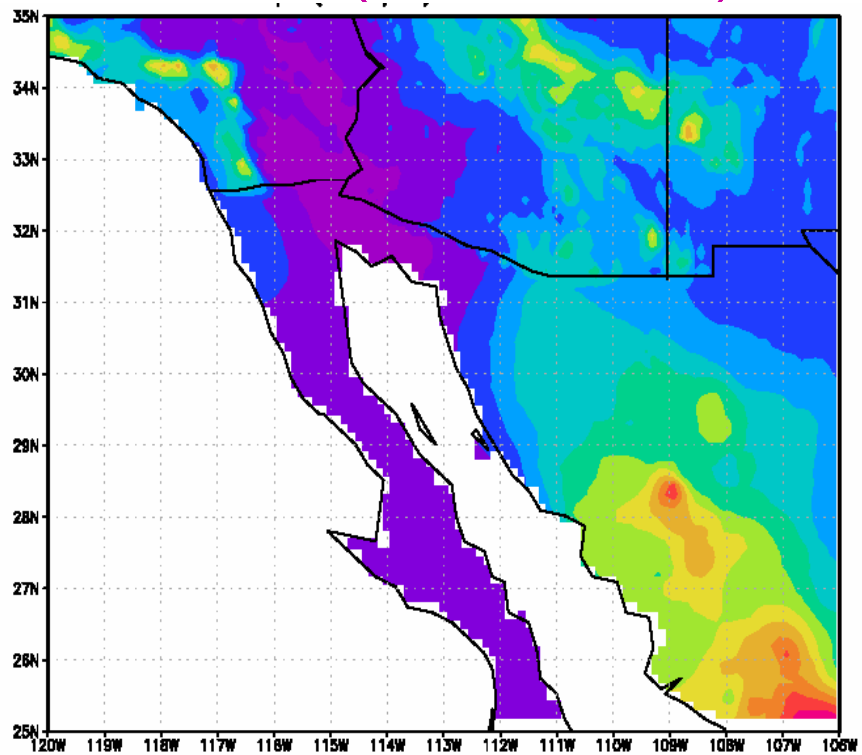
(Cavazos and Arriaga, 2010, in preparation)

Annual Precipitation (mm): 1961-1990

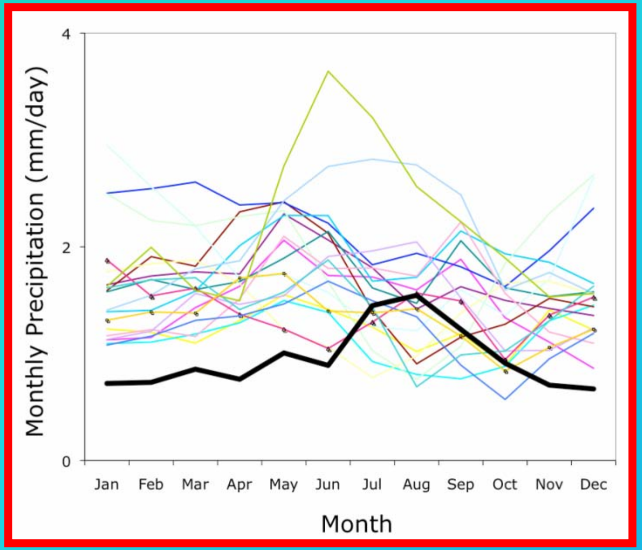
CRU-OBS (50km)

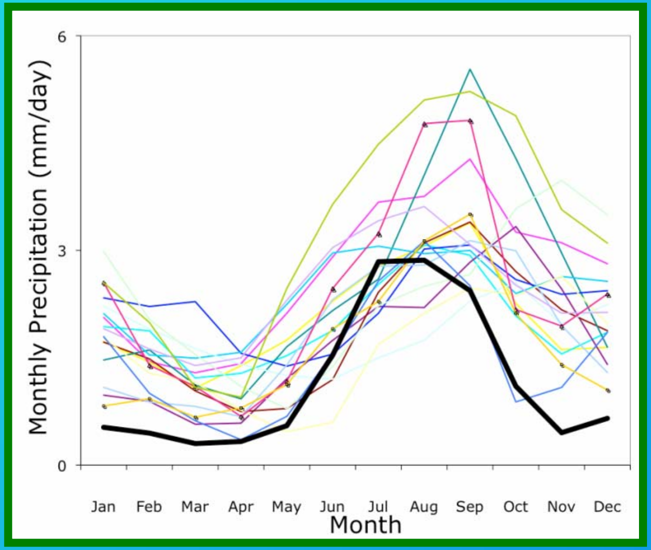


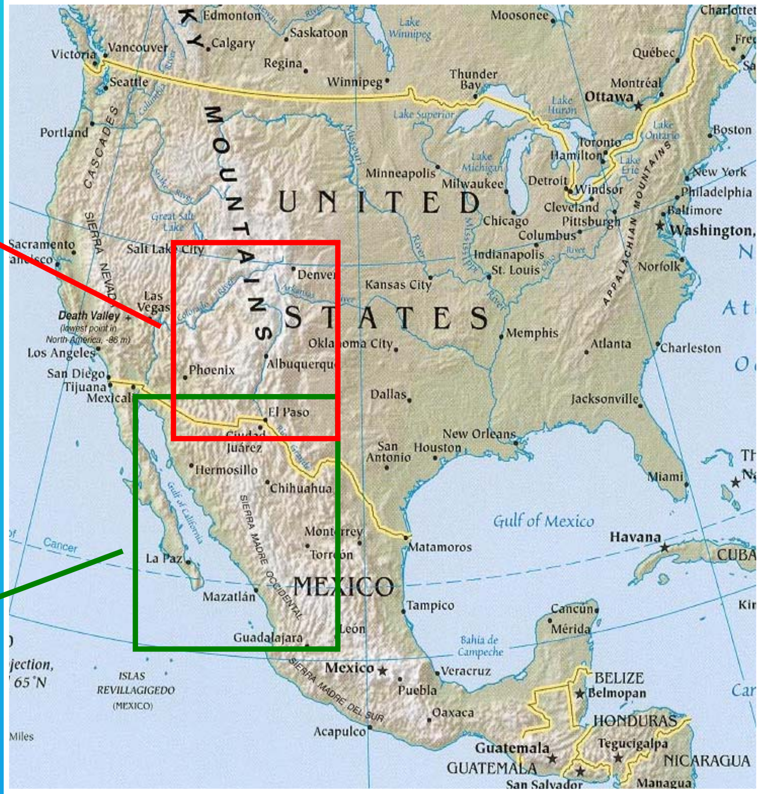
IPCC-6 (Downsc 12 km)



GCM's still have problems capturing the seasonal cycle of precipitation, especially in the SW USA







IPCC average historical model precipitation (mm/day) 1970-2000 and obs (black line). HadCM3 one of the best models for the region.

Dominguez,. et al., 2009:. Accepted in Clim. Change.

GCM's have problems capturing the monsoon moisture sources

Mechanisms controlling precipitation in the northern portion of the North American Monsoon

Ruth Cerezo-Mota
University of Cape Town, Western Cape, South Africa

Myles Allen
University of Oxford, Oxford, UK

Richard Jones
Met Office, Exeter, UK

precipitation of the North American Monsoon (NAM) were analyzed in this paper. Three experiments with the PRECIS regional climate model, HadRM3P, driven by different boundary conditions were carried out. After a detailed analysis of the moisture and low-

Cerezo-Mota et al, 2010:. Submitted J. Climate

GCM Performance and Uncertainties/Downscaling

South America

South America: CLARIS-LPB PROJECT

Menéndez C.G., M. de Castro, J.-P. Boulanger, A. D'Onofrio, E. Sanchez, A.A. Sörensson, J. Blazquez, A. Elizalde, D. Jacob, H. Le Treut, Z.X. Li, M.N. Núñez, S. Pfeiffer, N. Pessacg, A. Rolla, M. Rojas, P. Samuelsson, S.A. Solman, C. Teichmann, 2010: Downscaling extreme month-long anomalies in southern South America. Climatic Change, 98, 379-403, DOI 10.1007/s10584-009-9739-3.

Boulanger J.-P., G. Brasseur, A. Carril, M. Castro, N. Degallier, C. Ereño, J. Marengo, H. Le Treut, C. Menéndez, M. Nuñez, O. Penalba, A. Rolla, M. Rusticucci, R. Terra, 2010: The European CLARIS Project: A Europe-South America Network for Climate Change Assessment and Impact Studies. Climatic Change, 98, 307-329, DOI 10.1007/s10584-009-9734-8.

Sörensson A.A., C.G. Menéndez, P. Samuelsson, U. Willén, U. Hansson, 2010: Soil-precipitation feedbacks during the South American Monsoon as simulated by a regional climate model. Climatic Change, 98, 429-447, DOI 10.1007/s10584-009-9740-x.

Menéndez C.G., A.F. Carril, 2010: Potential changes in extremes and links with the Southern Annular Mode as simulated by a multi-model ensemble. Climatic Change, 98, 359-377, DOI 10.1007/s10584-009-9735-7.

Menéndez C.G., M. de Castro, A.A. Sörensson, J.-P. Boulanger, and Participating CLARIS Modeling Groups, 2010: CLARIS Project: towards climate downscaling in South America. Meteorologische Zeitschift, in press.

Sörensson A. A., C. G. Menéndez, 2010: Summer soil-precipitation coupling in South America. Tellus A, in press. Sörensson A.A., C.G. Menéndez, R. Ruscica, P. Alexander, P. Samuelsson U. and Willén, 2009: Projected precipitation changes in South America: a dynamical downscaling within CLARIS. Meteorologische Zeitschift, accepted.

South America: CLARIS PROJECT

Rodrigo J. Bombardi, Leila M. V. Carvalho, Ana E. Silva, 2010. The South Atlantic Dipole and variations in the characteristics of the South America Monsoon System in the WCRP-CMIP3 multimodel simulations. *Climate Dynamics (in press).*

Alice Grimm , Institutions, 2010. Interannual climate variability in South America: impacts on seasonal precipitation, extreme events and possible effects of climate change. *Statistic Environmental Research and Risk Assessment (In press).*

Penalba, O. y Robledo, F., 2009. Spatial and temporal variability of the frequency of extreme daily rainfall regime in the La Plata Basin during the 20th century. Climatic Change. DOI: 10.1007/s10584-009-9744-6

CREAS: Regional Climate Change Scenarios for South America

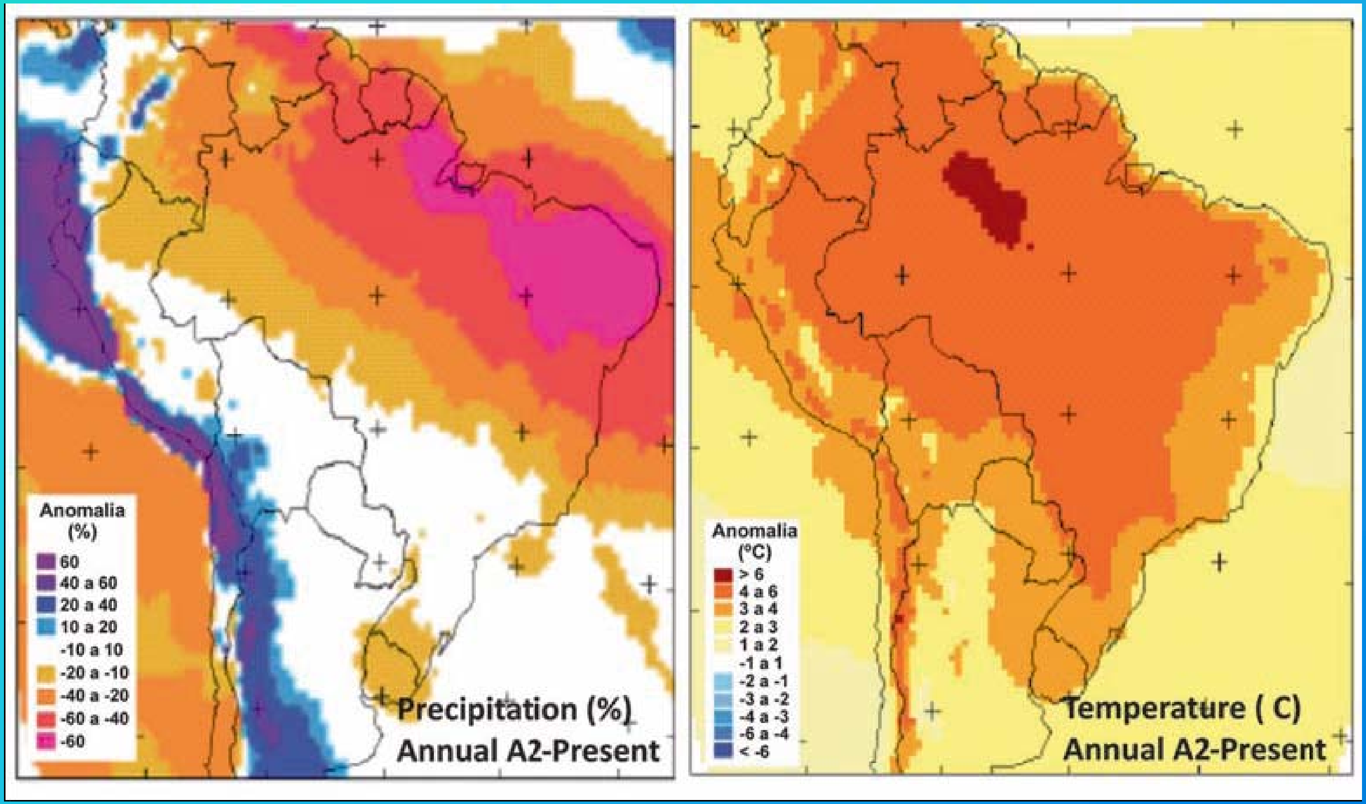
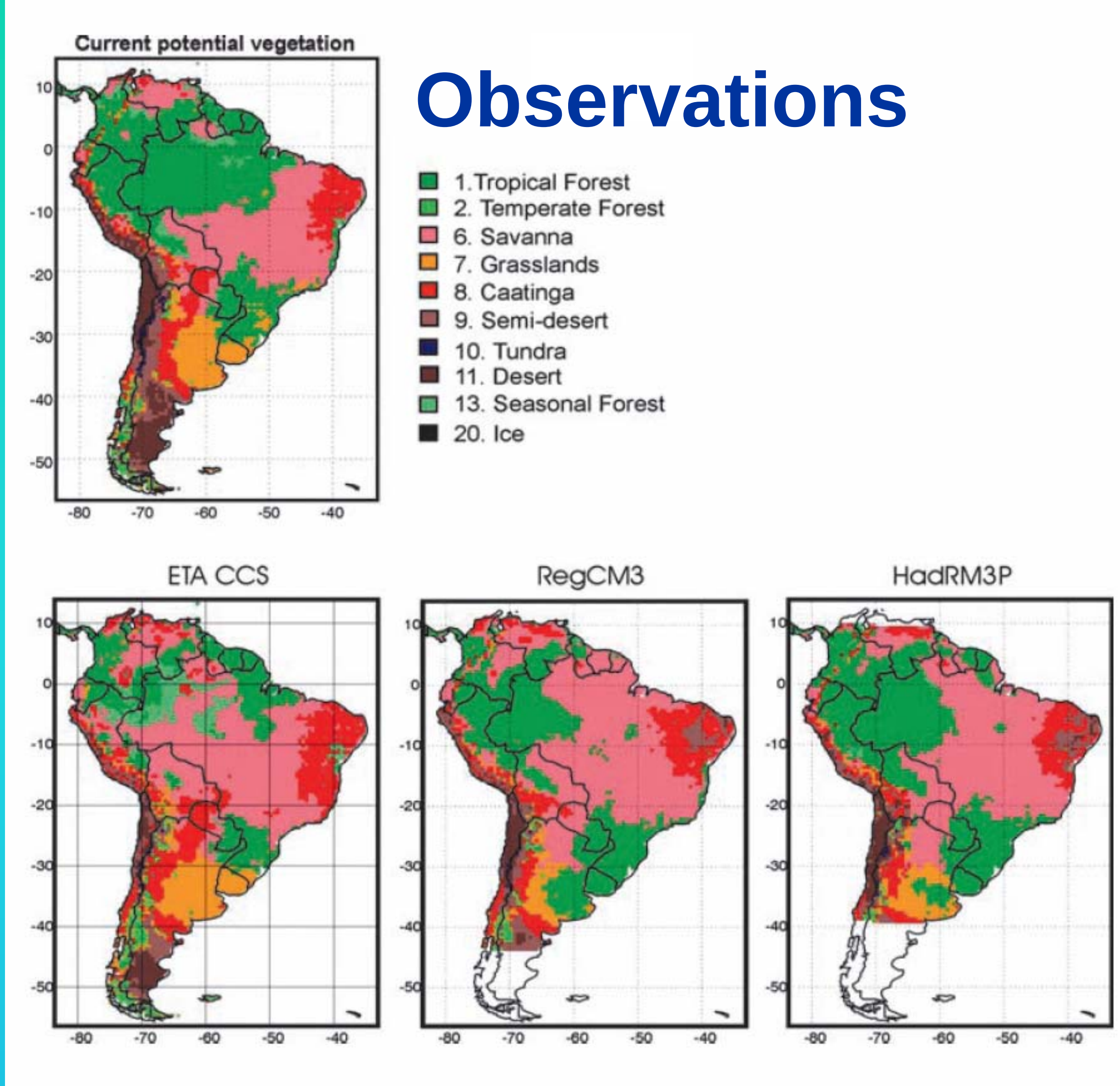


Fig. 3 Projected patterns of rainfall change (%) and air T (°C) over South America for the A2 scenario, at annual time scale for 2071–2100 relative to the 1961–1990 model climatology. The maps represent the mean of the three regional climate models (Marengo et al. 2010).

Nova Acta Leopoldina NF *112*, Nr. 384, XXX–XXX (2010)



MODEL VEG. PROJECTIONS:

Tropical forests ↓

Savanna ↑

Fig. 6 Projected distribution of biomes in South America for 2070 –2099 from ETA CCS, RegCM3 and HadRM3P models for the A2 emission scenario. The top left plot represents the current potential biomes (biomes in equilibrium with observed climatology) (Salazar 2009).

E. Sánchez, H. Berbery, M. Castro, R. García-Ochoa, P Samuelsson, A. Reca C. Remedio, D. Jacob, M. Rojas, A. Sorensson, C. Menéndez, R. Porfirio Rocha, S. Solman, J. Marengo, Sin Chan Chou, L. Li, and H. Le Treut, 2010. **A first overview of an ensemble of regional climate models over South America forced with 1989-2008 ERAinterim reanalysis.** Geophysical Research Abstracts, 12, EGU2010-3568-19, 2010.

Enrique Sanchez, Ernesto Hugo Berbery, Silvina A Solman, Roberto García-Ochoa, Patrick Samuelsson, Armelle Reca Cabase Remedio, Daniela Jacob, Maisa Rojas, Anna Amelia Sörensson, Claudio Menendez, Rosmeri Porfirio da Rocha, Manuel Castro, Natalia Liz Pessacg, Jose Antonio Marengo, SIn-Chan Chou, Laurent Li, Hervé Le Treut, 2010. **Present climate validation of an ensemble of regional climate models over South America forced by 1989-2008 ERAinterim reanalysis.** Congreso: 2010 The Meeting of the Americas, AGU Meetings, Foz do Iguassu, Brazil.

Greene, A.M., L. Goddard, and U. Lall. 2006. Probabilistic multimodel regional temperature change projections. J. Climate, 19: 4326-4343.

Process-oriented Studies

El Niño–Induced Tropical Droughts in Climate Change Projections

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centuries. For climate change models that reproduce realistic oceanic variability of the El Niño–Southern Oscillation (ENSO) phenomenon, results suggest no robust changes in the strength or frequency of El Niño events. These models exhibit realistic patterns, magnitude, and spatial extent of El Niño–induced drought patterns in the twentieth century, and the teleconnections are not projected to change in the twenty-first century, although a possible slight reduction in the spatial extent of droughts is indicated over the tropics as a whole.

El Niño and our future climate: where do we stand?

For submission to "Wiley Interdisciplinary Reviews: Climate Change"

Gabriel A. Vecchi and Andrew T. Wittenberg

variability. However, the extent and character of the response of ENSO to increases in greenhouse gases is still a topic of considerable research, and given the results published to date, we cannot yet rule out possibilities of an increase, decrease, or no change in ENSO activity arising from increases in CO_2. Yet we are fairly confident that ENSO variations will continue to

MJO Simulation Diagnostics

CLIVAR MADDEN–JULIAN OSCILLATION WORKING GROUP:

Waliser, D. et al. 2009: MJO Simulation diagnostics. J. Climate, 22, 3006-3029/

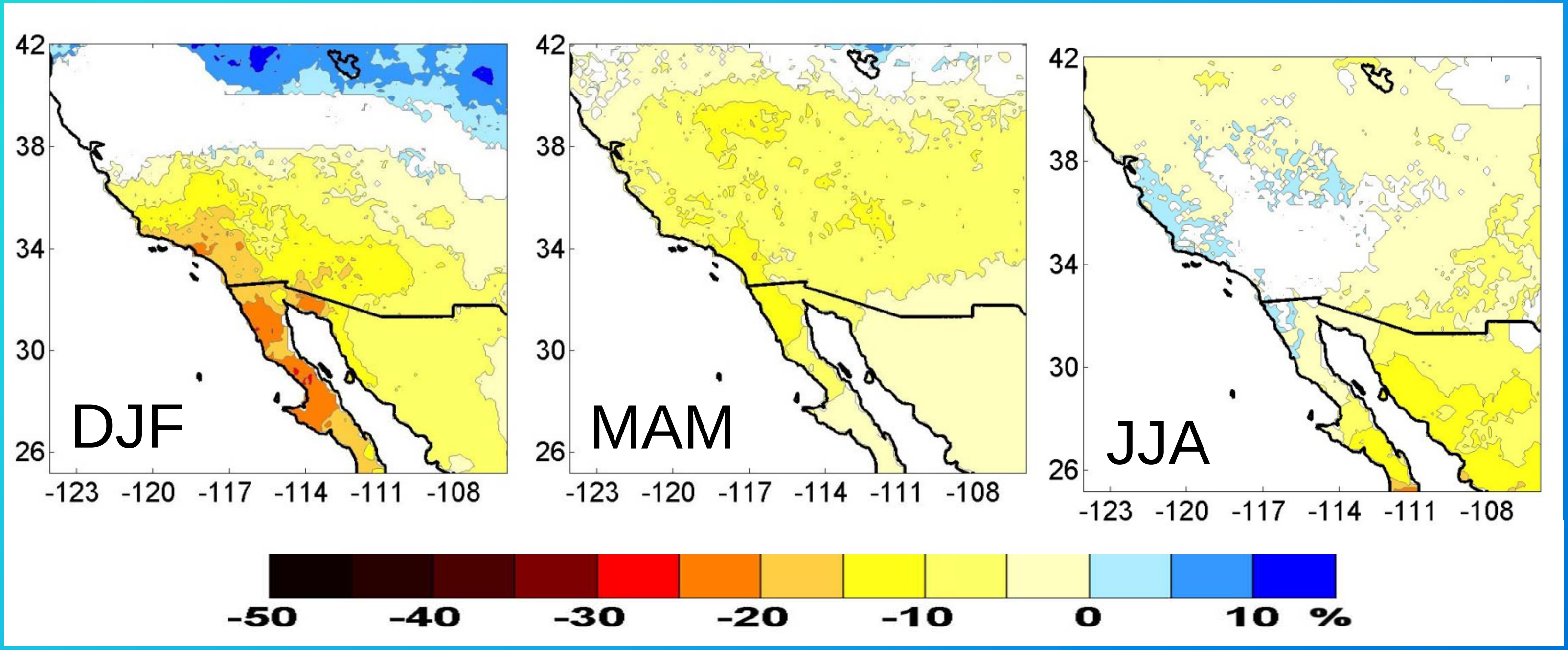
Current global circulation models (GCMs) exhibit considerable shortcomings in representing this phenomenon.

Current discrepancies between different model simulations of the MJO and any of the observation-based data are much greater than between any two observation-based datasets.

Bidecadal change of seasonal precipitation (%) under A2

White areas indicate that 2/3 of the GCM members do not agree on the sign of change

2080-2099 minus 1961-1990



Hydrol. Earth Syst. Sci., 13, 715–733, 2009
www.hydrol-earth-syst-sci.net/13/715/2009/

Hydrology and Earth System Sciences

Semiarid watershed response in central New Mexico and its sensitivity to climate variability and change

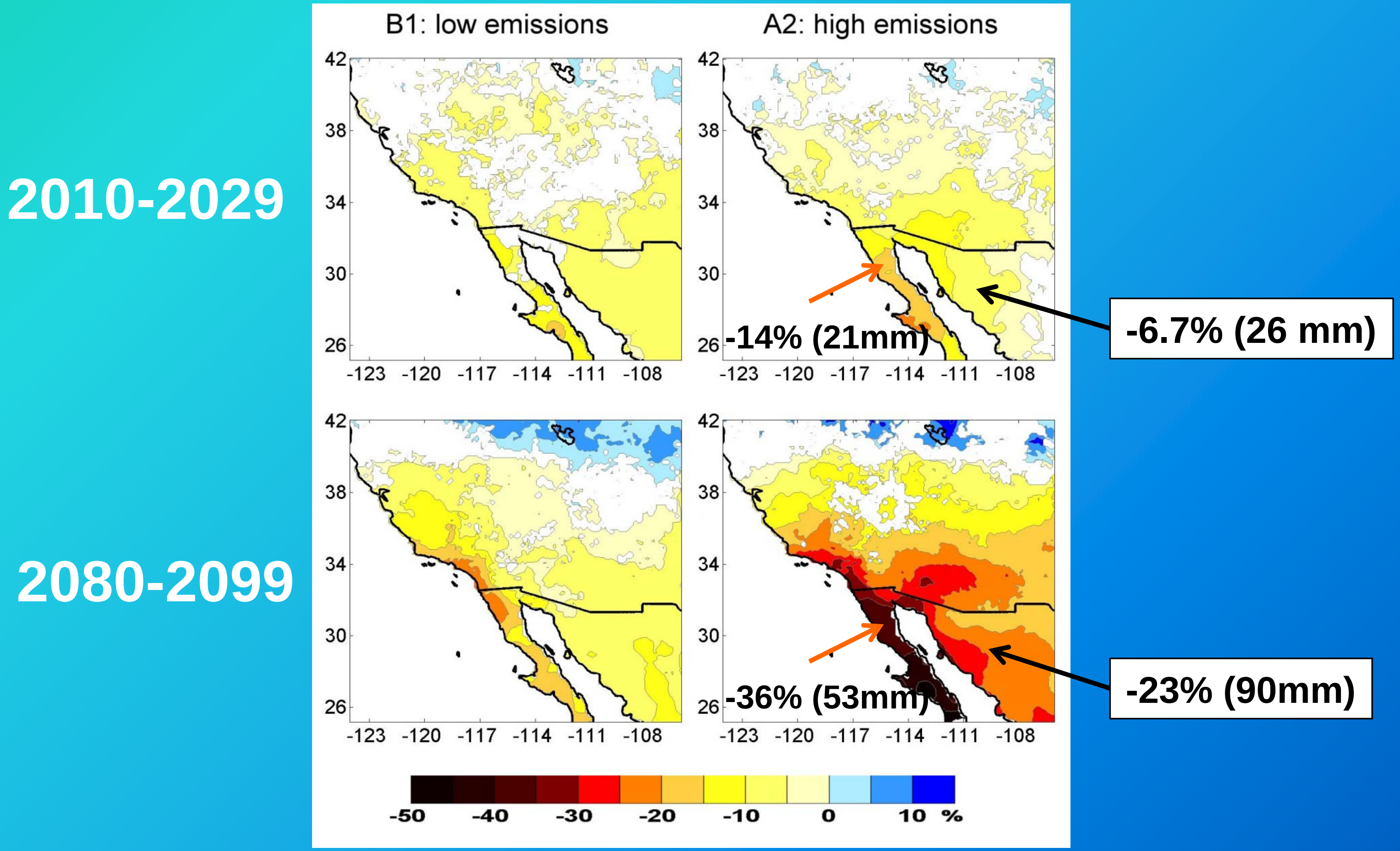
E. R. Vivoni[1,*], C. A. Aragón[1], L. Malczynski[2], and V. C. Tidwell[2]

the basin response. Results of the modeling exercise indicate that precipitation uncertainty is amplified in the hydrologic response, in particular for processes that depend on a soil saturation threshold. We obtained substantially different hydrologic sensitivities for winter and summer precipitation ensembles, indicating a greater sensitivity to more intense summer storms as compared to more frequent winter events. In addition, the impact of changes in precipitation characteris-

Bidecadal change of annual precipitation (%)

(median ensemble with respect to 1961-1990)

Colors other than white indicate that 2/3 of the models agree on the sign of change



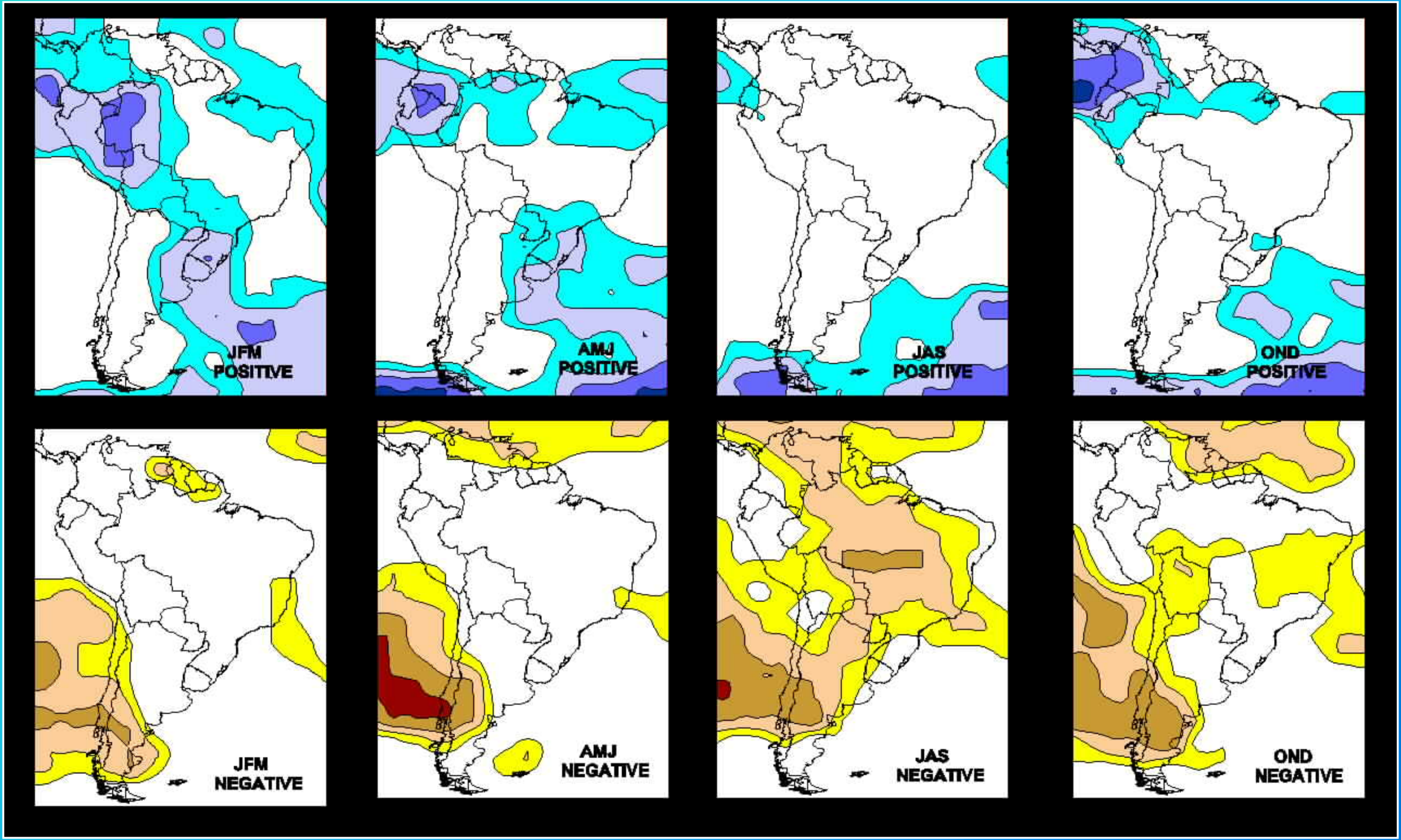
(Cavazos and Arriaga, 2010, in preparation)

Number of IPCC-AR4 models that agree on the sign of the precipitation changes. The consensus is:

1. Significant increase of JFM precip over southeastern subtropical South America and northern Andes;
2. Significant reduction of JAS precip over most of the continent
3. Reduction of precipitation along the southern Andes.

(+)

(-)



Changes are between 2070-2099 and 1970-1999 periods.

Contour level is 1, values larger than 4 are shaded.

(Vera et al. 2006)