

Climate Adaptation/Resilience



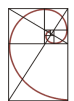
- IDB's Sustainable Energy and Climate Change Initiative (SECC)
- SECCI's aim is the .. “mainstreaming of adaptation to climate change into the policies and programs across sectors in Latin America and the Caribbean”

Climate Resilience of Water and Sanitation Systems in Metropolitan Areas of La Paz and El Alto

Apoyo Técnico al “Programa de Resiliencia Climática para los Sistemas de Agua y Saneamiento de las Áreas Metropolitanas de La Paz y El Alto”



Water Diversion project in Peru (PEOT)

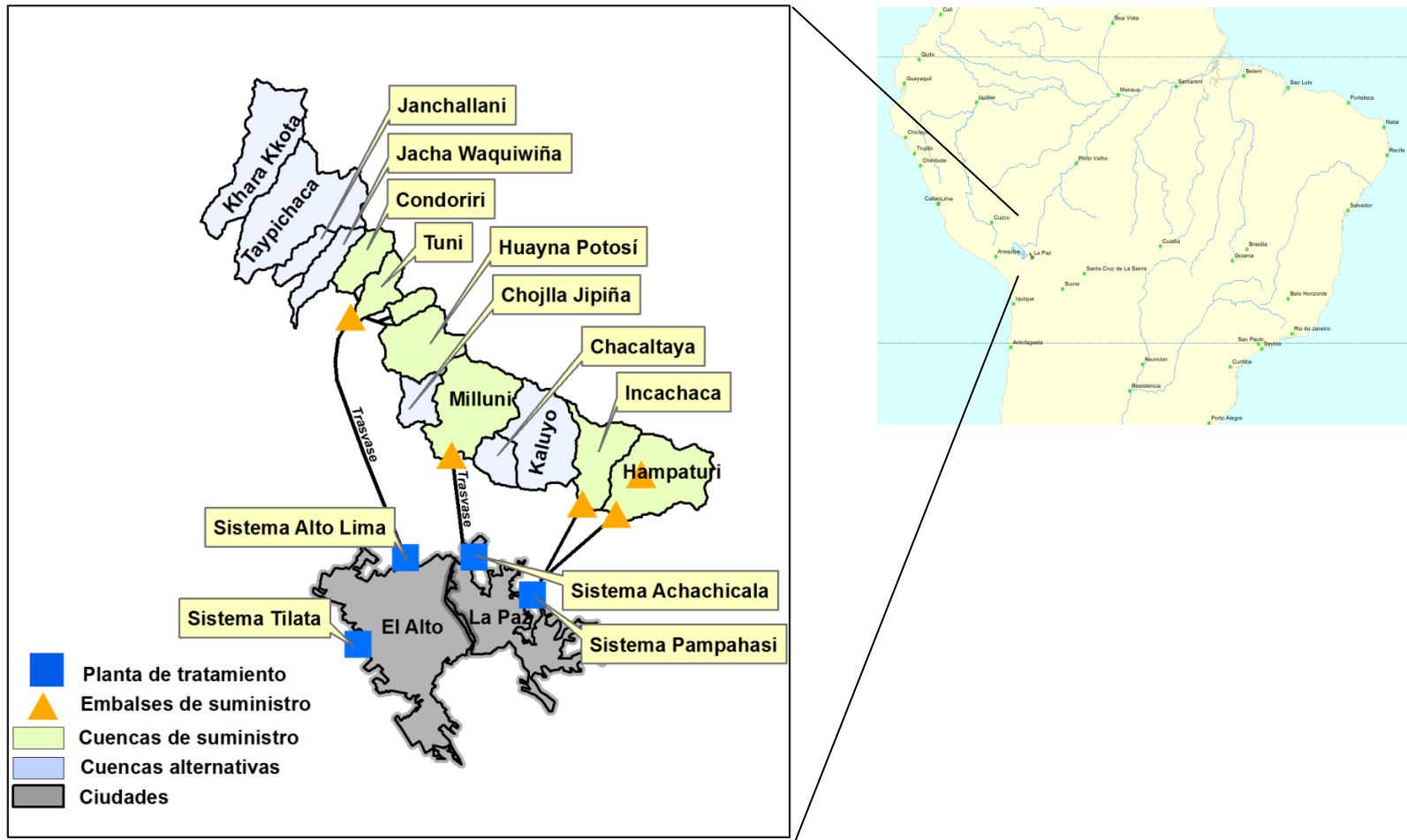


- Technical assistance to investment component of "Programme for Climate Resilience for water and sanitation systems in the metro areas of La Paz and El Alto" *IDB Project*
- Determine the reliability of water systems under current and future climate (resilience).





Water Supplies for Cities of El Alto y La Paz

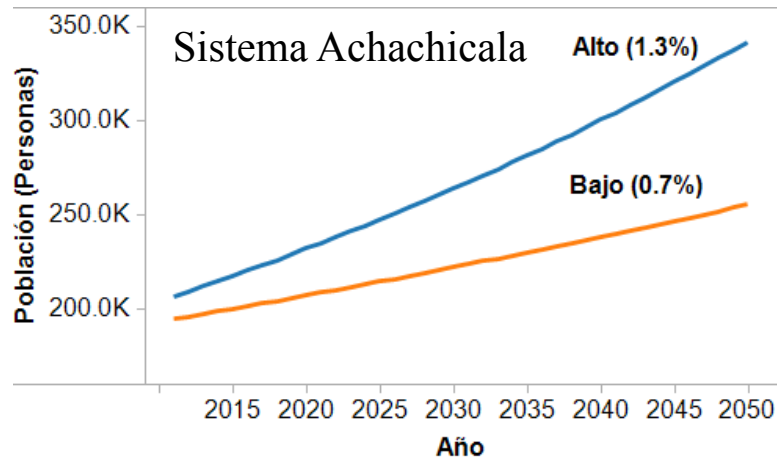
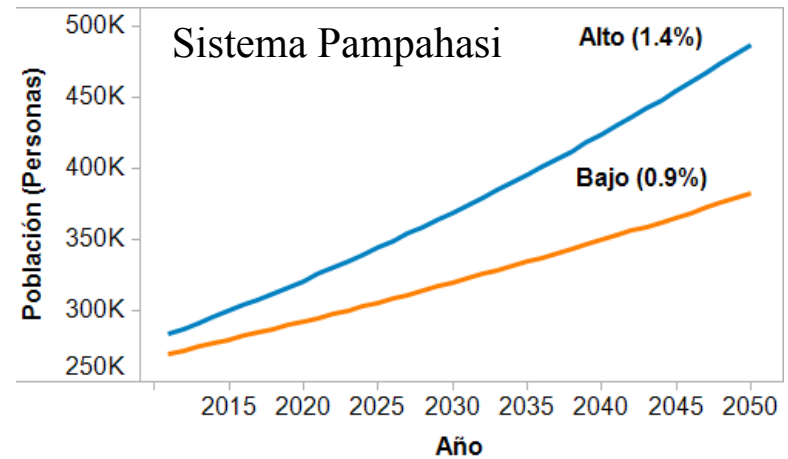
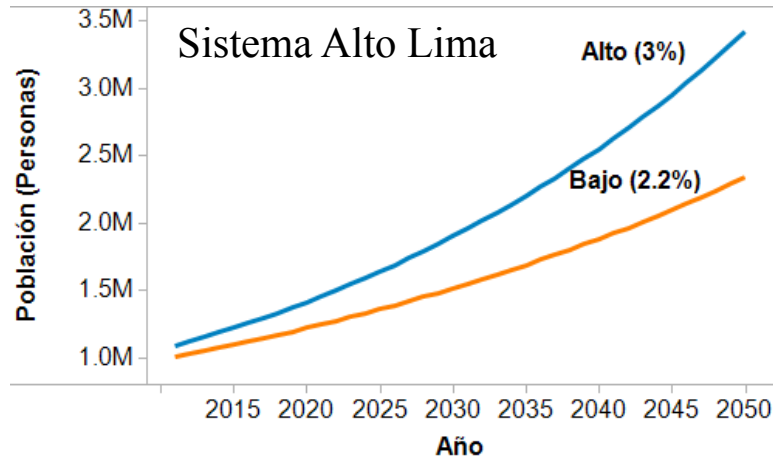


Sistemas de abastecimiento de agua El Alto y La Paz

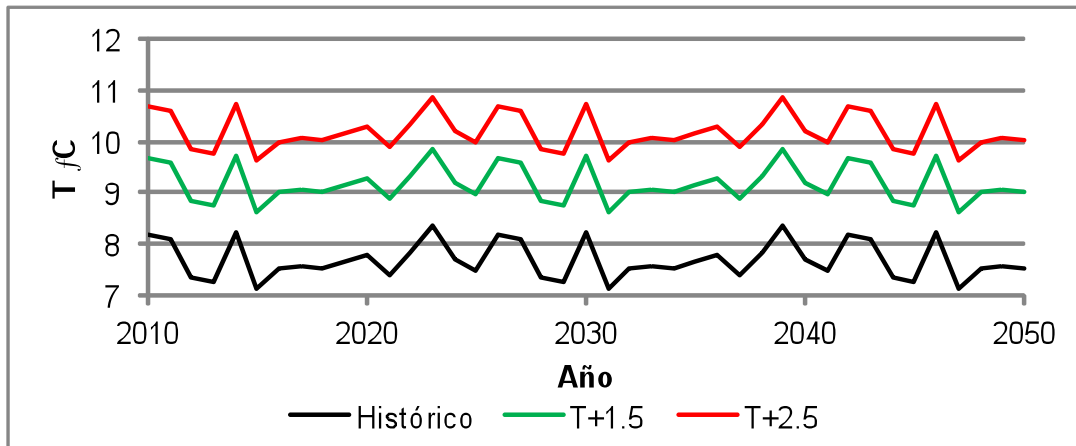
Framing the Problem: XLRM $XL \xrightarrow{R} M$

Uncertain Factors and Scenarios (X)	Management Responses (L)ever
<p>Forces outside the control of the water manager (Scenarios)</p> <ul style="list-style-type: none"> • Demographics • Climate • Land use 	<p>Infrastructure Development Alternative Cropping Systems Irrigation Tech. Investments Land Use Planning Re-operation of System Water Prices</p>
Models and (R)esponse	Performance (M)easures
<p>Models</p> <ul style="list-style-type: none"> • Conceptual • Physical, • Economic Models 	<p>Evaluation Criteria to assess benefits</p> <ul style="list-style-type: none"> • Reliability of Reservoirs • Costs of Service • Low flow violation

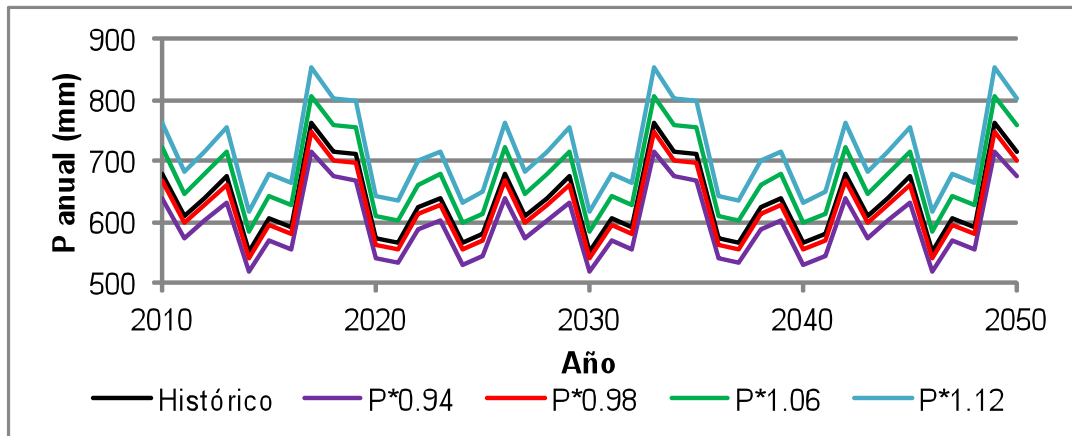
Population Projections (X)



Climate Sensitivity (X): “Simple Delta”



Temperatura-Estación El Alto Aeropuerto



Precipitación-Estación El Alto Aeropuerto

Adapation Options (L)evers

Factores de Incertidumbre (X) y Escenarios	Adaptation (L)
	<p>New Storages: 1, 2 y 3</p> <p>Strategy 4. Conservación de bofedales (Canals)</p> <p>Strategy 5. Reducción de perdidas en los sistemas de abastecimiento agua</p> <p>Strategy 6. Reducción de perdidas en riego</p>
Modelos (R)	Medidas de Desempeño (M)

Performance (M)asures

Factores de Incertidumbre (X) y Escenarios	Estrategias y Opciones de Adaptación (L)
Modelos (R)	Performance Measures (M)
	<ol style="list-style-type: none">1. Min Environ Streamflow2. Área glaciár3. Potable Water Coverage4. Agricultural Water Coverage5. System Losses6. Yield of Reservoirs

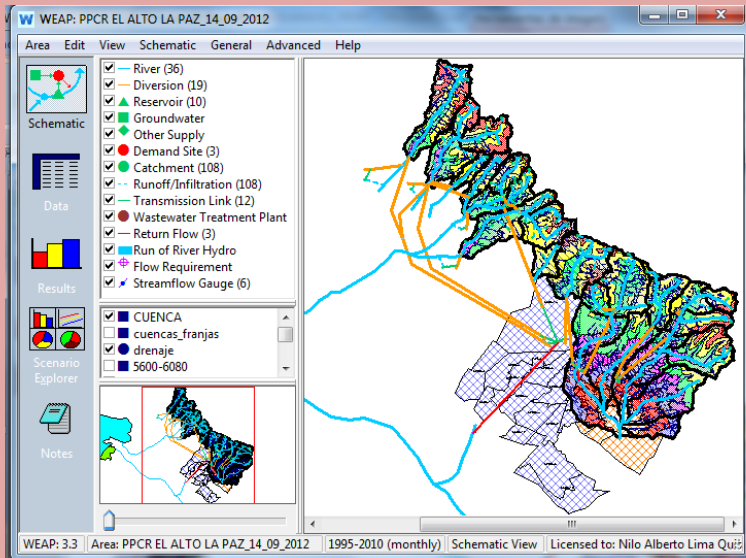
Water System Model (R)elationship

Factores de Incertidumbre (X) y Escenarios

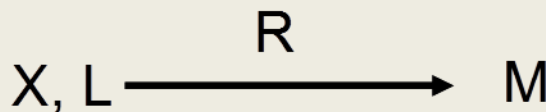
Estrategias y Opciones de Adaptación (L)

Modelos (R)

Medidas de Desempeño (M)



- **Monthly Climate Forcing**
- **Glacial Accretion and Melt**
- **Operation of Reservoirs**
- **Urban and Agricultural Demands**



Explore Dynamical Downscaling (X)

- High-Resolution (4-12 km) Present Day and Future Climate Change Scenarios for Mesoamerica (WRF)
- NCEP –ReAnalysis (evaluate against observed climate, 3-years)
- Bolivia: b40.rcp8_5.1deg.007 (only 5-years of both)
 - Current Climate (2006-2010)
 - Future Climate (2056-2060)

Access: <http://weather.unl.edu/RCM/Boliva>

CMIP-5 Choice: Availability of 6-hourly

RCP SIMULATIONS

Brief Description	Case Details	Diagnostics				Length of Run Diagnostics		
CCSM4 1° RCP8.5 Ensemble Member #1 Case Name: b40.rcp8_5.1deg.001 Data Availability: CESM CMIP5	Details	Yrs 2080-2099 - 20th Century Run Member #1 1980-1999	Atm	Ice	Land	Ocean	CCR	Ocean
		Yrs 2010-2029 - CCSM3 A1FI	Atm	Ice	Land	Ocean		
		Yrs 2080-2099 - CCSM3 A1FI	Atm	Ice	Land	Ocean		
CCSM4 1° RCP8.5 Ensemble Member #2 Case Name: b40.rcp8_5.1deg.002 Data Availability: CESM CMIP5	Details	Yrs 2080-2099 - 20th Century Run Member #1 1980-1999	Atm	Ice	Land	Ocean	CCR	Ocean
		Yrs 2010-2029 - CCSM3 A1FI	Atm	Ice	Land	Ocean		
		Yrs 2080-2099 - CCSM3 A1FI	Atm	Ice	Land	Ocean		
CCSM4 1° RCP8.5 Ensemble Member #3 Case Name: b40.rcp8_5.1deg.003 Data Availability: CESM CMIP5	Details	Yrs 2080-2099 - 20th Century Run Member #1 1980-1999	Atm	Ice	Land	Ocean	CCR	Ocean
		Yrs 2010-2029 - CCSM3 A1FI	Atm	Ice	Land	Ocean		
		Yrs 2080-2099 - CCSM3 A1FI	Atm	Ice	Land	Ocean		
CCSM4 1° RCP8.5 Ensemble Member #4 Case Name: b40.rcp8_5.1deg.004 Data Availability: CESM CMIP5	Details	Yrs 2080-2099 - 20th Century Run Member #1 1980-1999	Atm	Ice	Land	Ocean	CCR	Ocean
		Yrs 2010-2029 - CCSM3 A1FI	Atm	Ice	Land	Ocean		

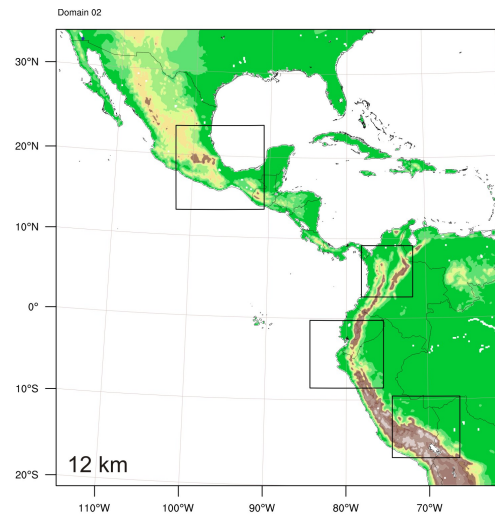
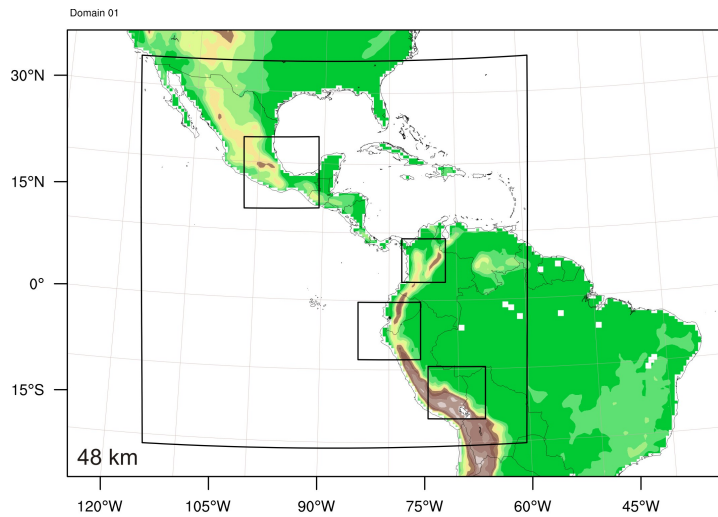
(MOAR)

Case Name: b40.rcp8_5.1deg.007

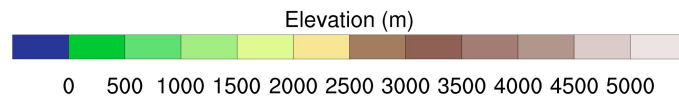
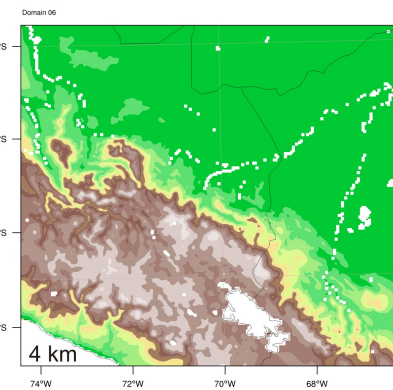
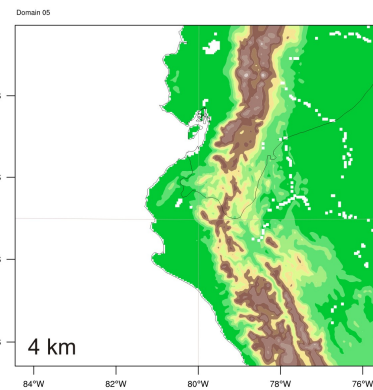
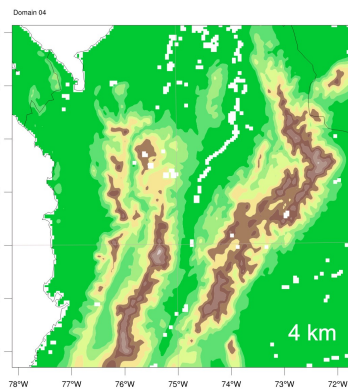
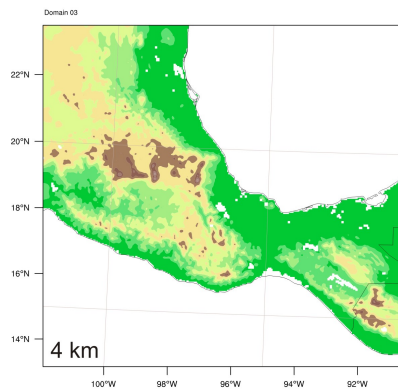
Data Availability: CESM | CESM (6hr) | CMIP5

CCSM4 1° RCP6.0 Extension to 2300 Ensemble Member #1 Case Name: b40.rcp8_5.2300.001 Data Availability: CESM	Details	---	---	---	---	---	CCR	---
CCSM4 1° RCP6.0 Ensemble Member #1		Yrs 2080-2099 - 20th Century Run Member #1 1980-1999	Atm	Ice	Land	Ocean		

Model Domains and Topography

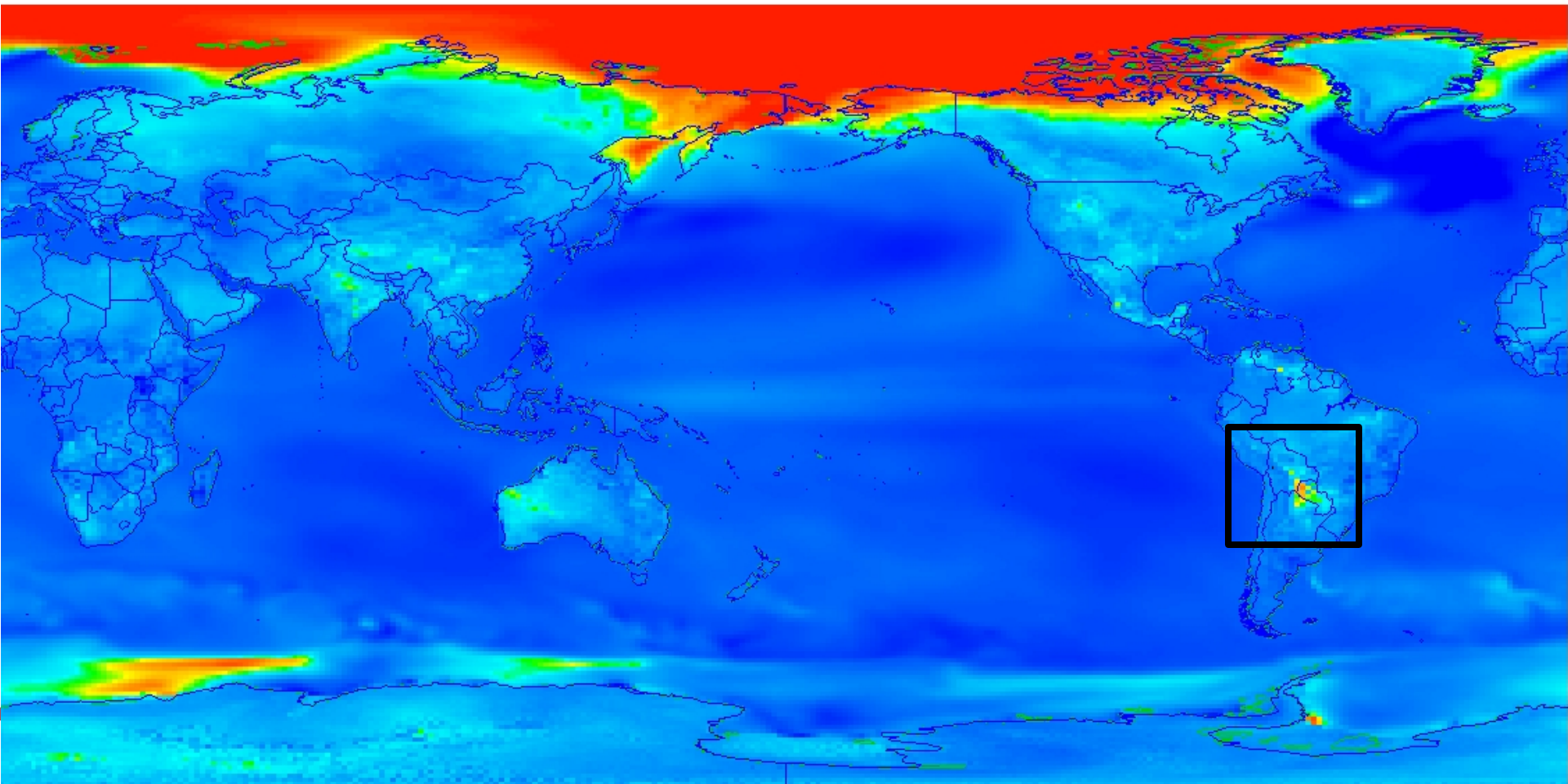


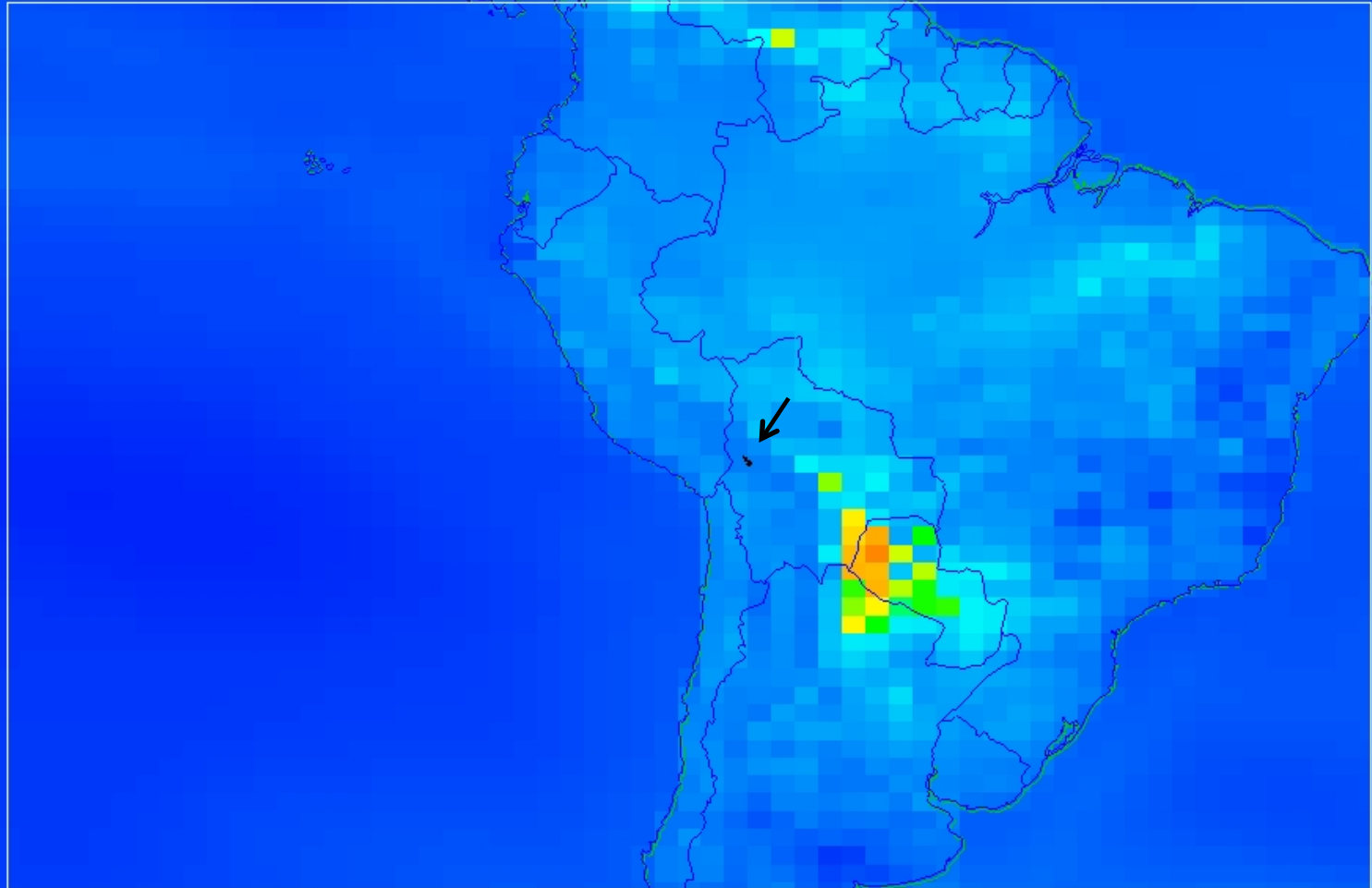
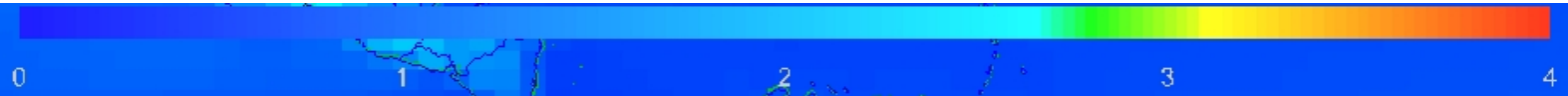
CCSM3 AR4
CESM1 AR6

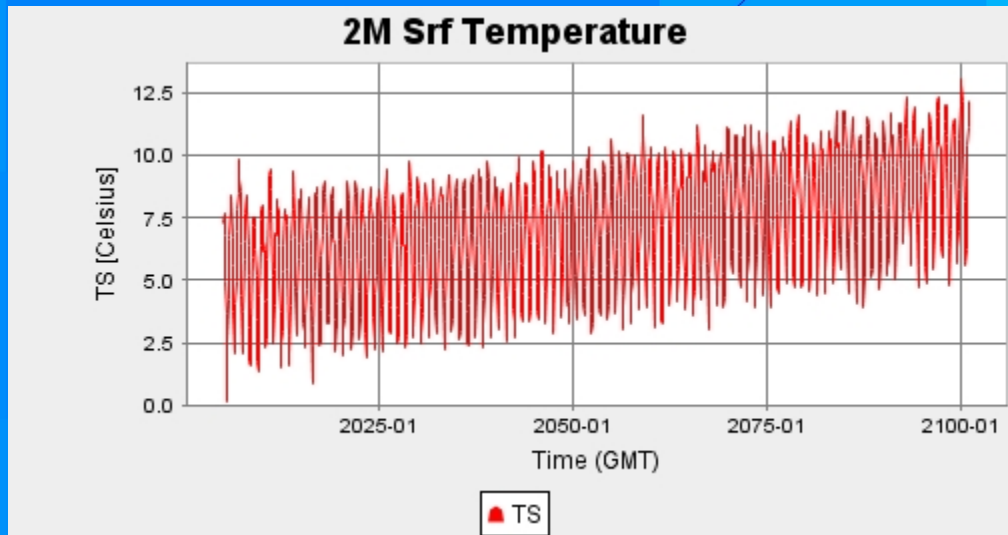


Access: <http://weather.unl.edu/RCM>

2050 – 2010 Surface Temp Difference



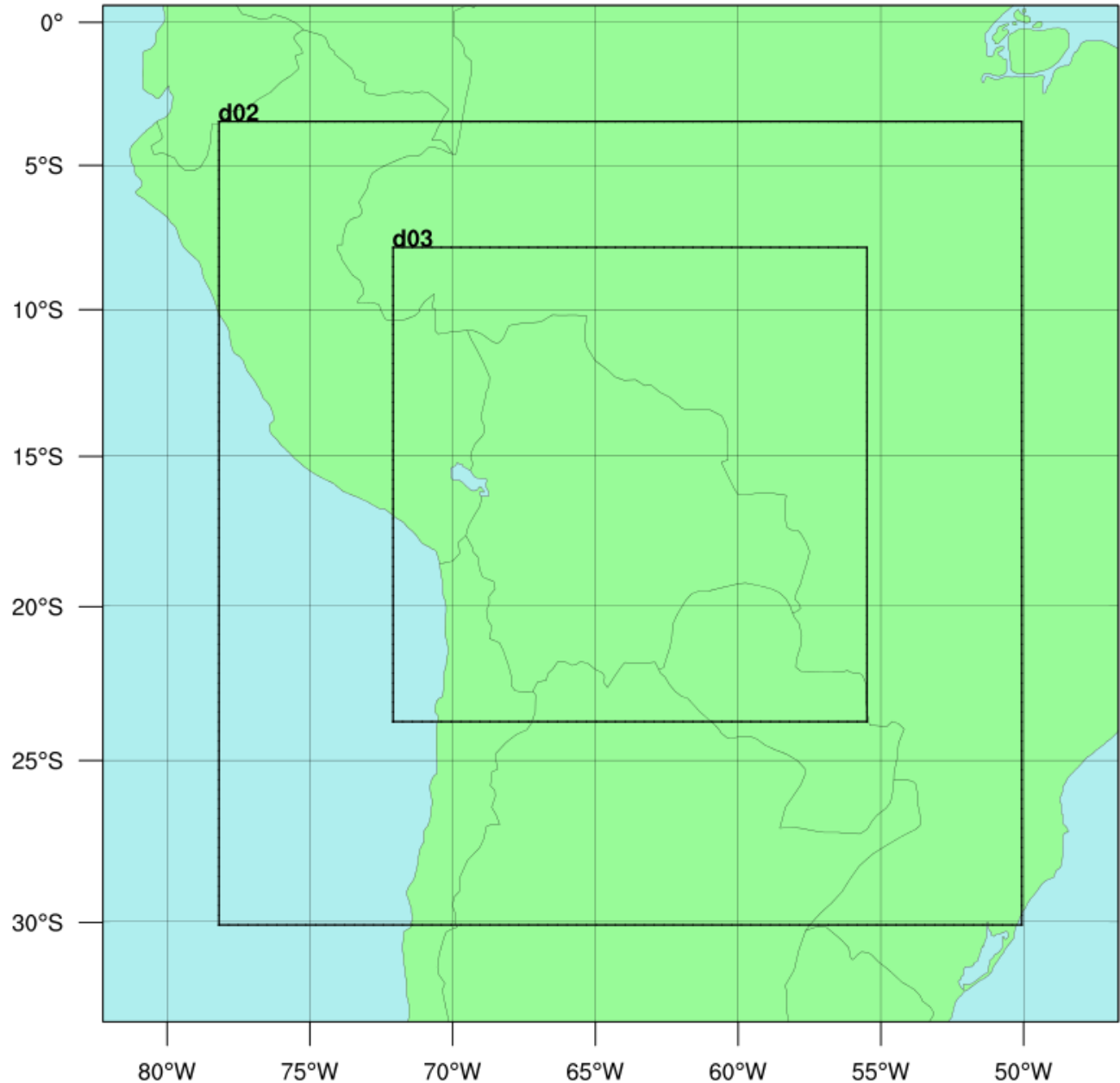




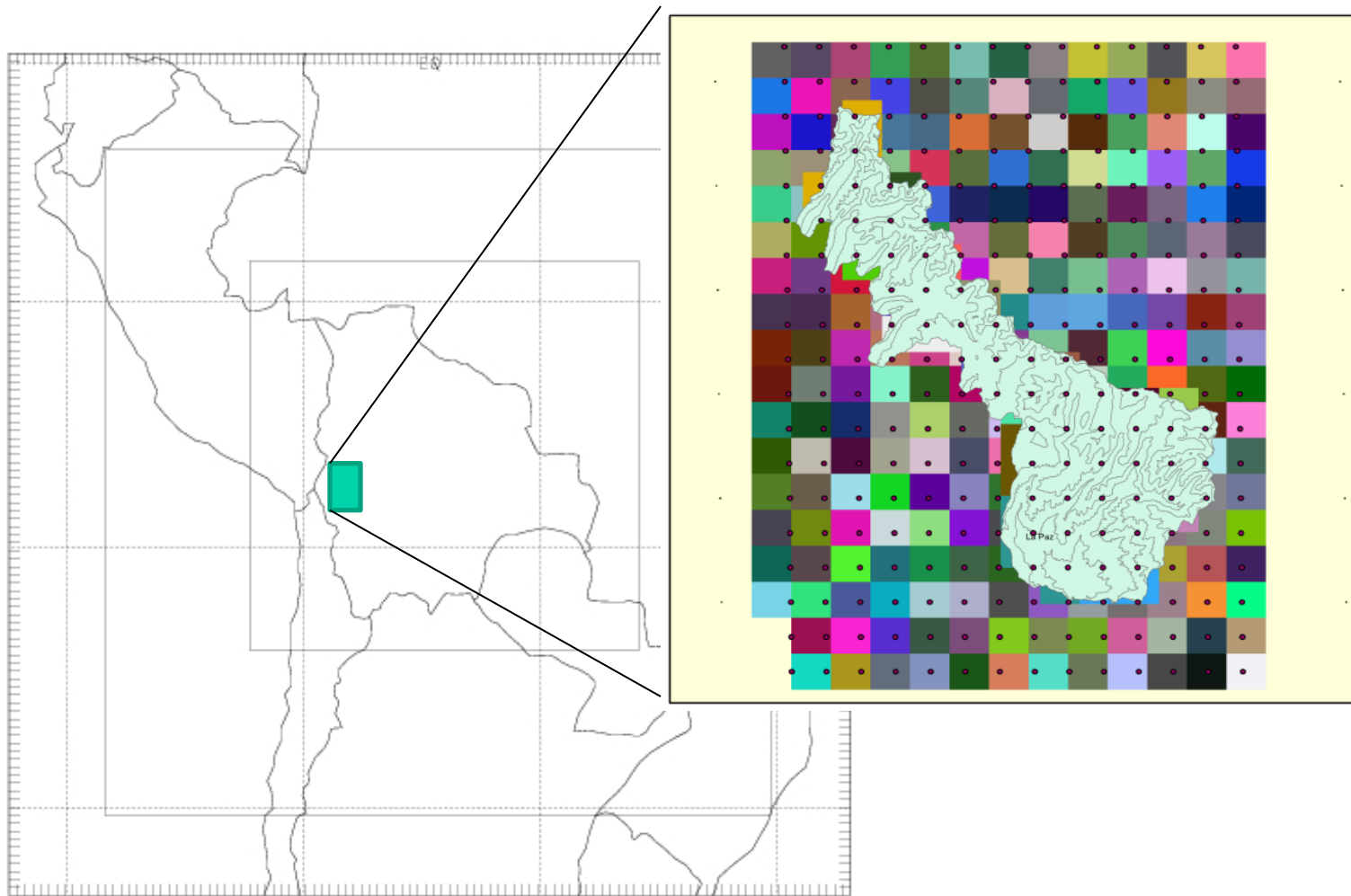
simpleDifference - Color-Shaded Plan View
TS - Color-Shaded Plan View 2055-12-20 00:00:00Z
Data ProbeTime Series

Regional Climate Modeling (WRF)

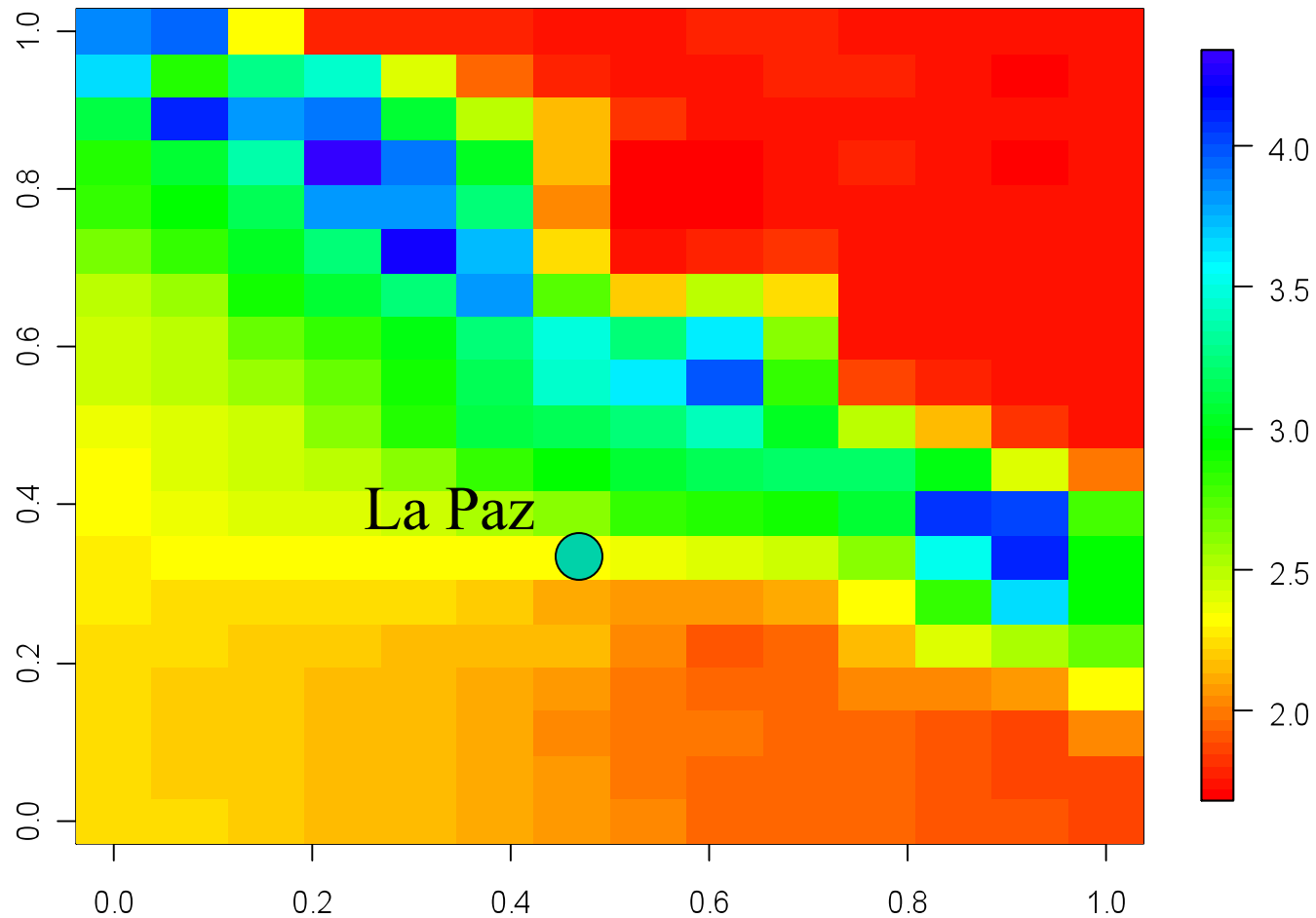
D01- 36KM
D02- 12KM
D03- 4KM



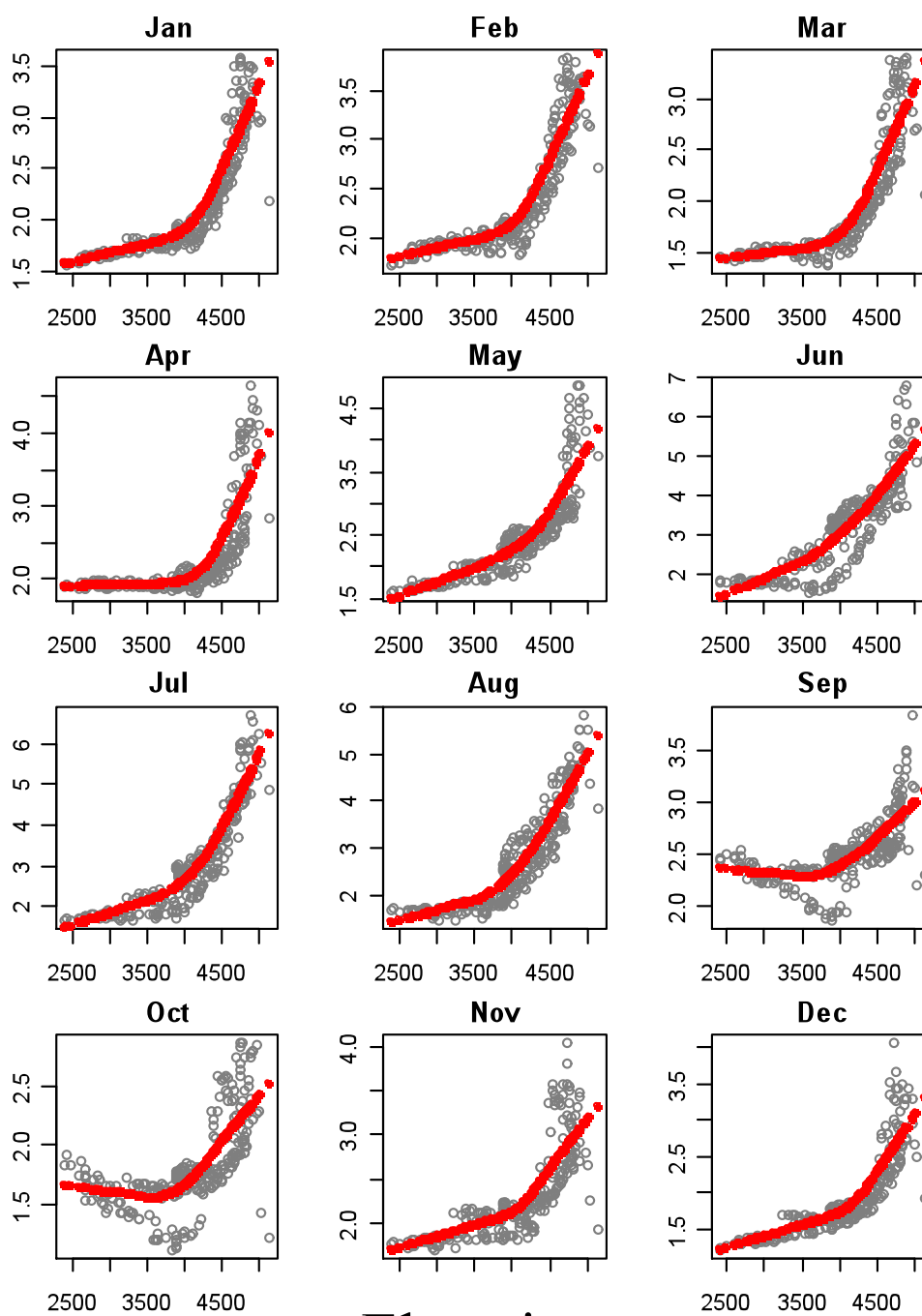
The 4-KM Grid over the La Paz- El Alto



One Result- Change in Temperature at Elevation (Future-Current)



Temperature Change at Elevation



Elevation