

# CMIP5 GCM Simulations, Downscaled Versions, Recommendations, and 1 or 2 Jokes

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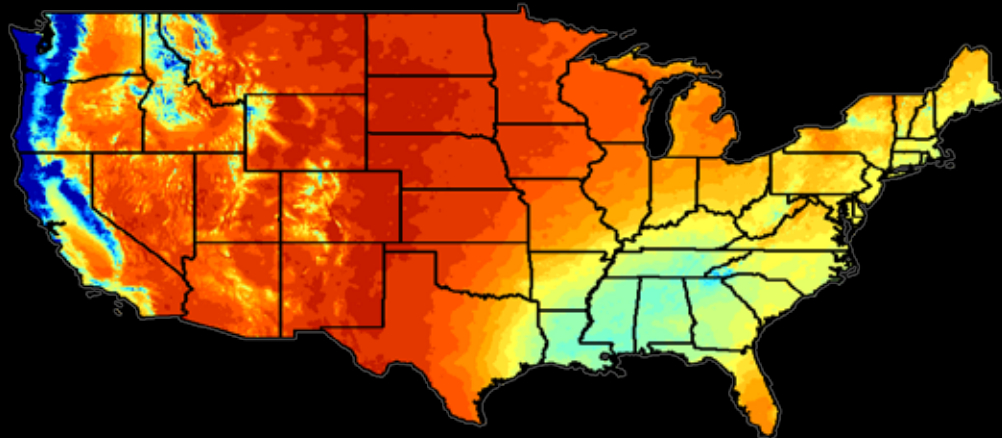
Climate Central, Inc. and  
Stanford University

PUMA  
December 1, 2010

# CMIP5 GCM Simulations

# Outline

- Differences vs. CMIP3:
- ones you don't care about
- ones you might care about
- Schedule/Status
- Downscaling
- Recommendations



# Differences: CMIP5 vs. CMIP3

Improved model physics

Don't expect dramatically improved results

Finer spatial resolution

Great, but still too coarse for your needs

“Time-slice” simulations: short simulations  
at fine resolution

Downscaled data provide more results at finer  
resolutions



# CMIP5 vs. CMIP3...

Different GHG emissions scenarios

RCPs vs SRES: Who cares?

More models with dynamic vegetation types

Vegetation types respond to changing climate

Helpful in principle, but resolutions too coarse



# CMIP5 vs. CMIP3...

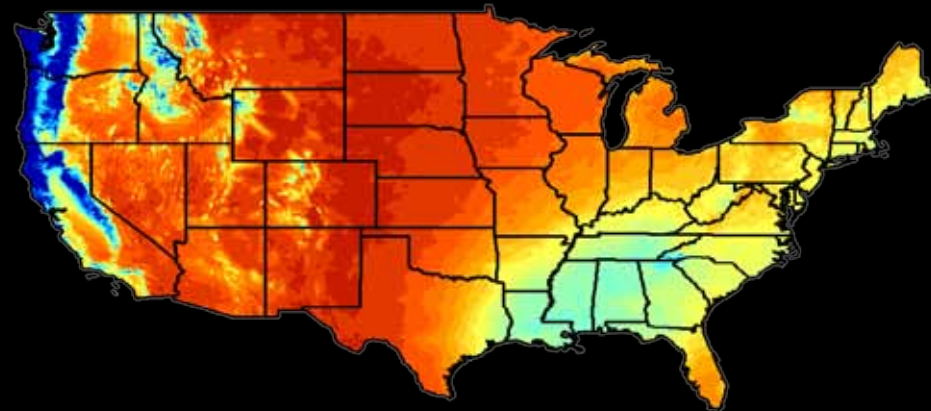
More models: 35 (?) vs 22

Better uncertainty quantification?

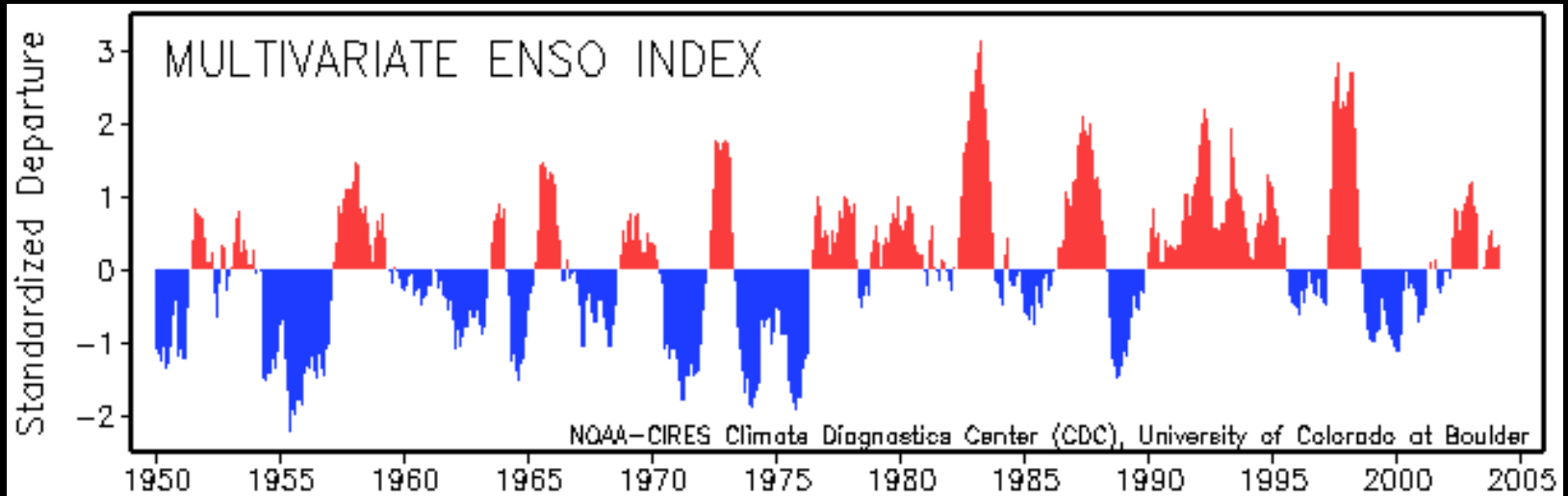
In principle, but range of results might well increase

“Decadal Predictions” simulations:

Should reduce uncertainty on short time horizons.



# Decadal Predictions...

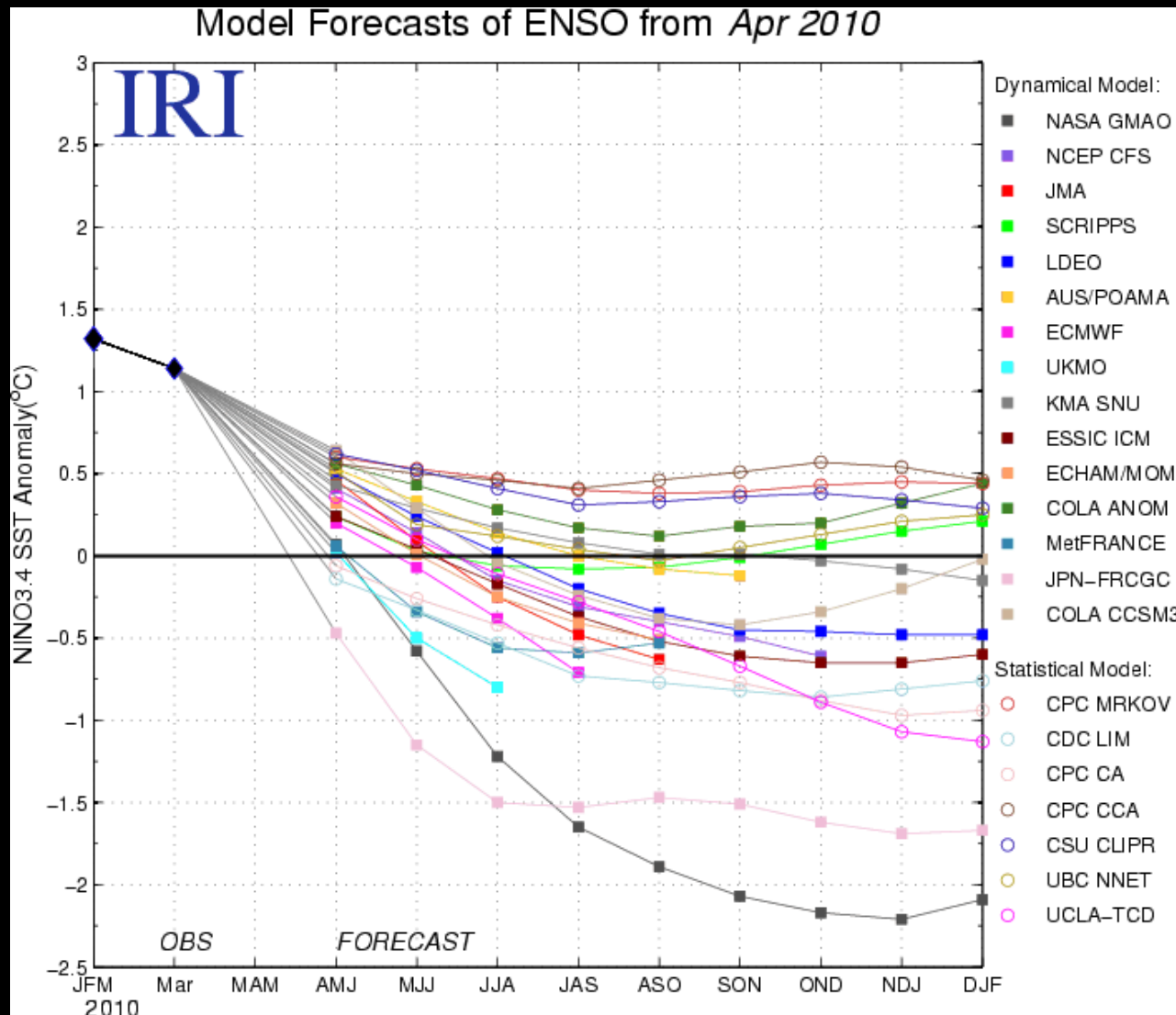


Traditional climate simulations should reproduce the statistical properties of natural variability, but not the timing.

“Decadal predictions” should reproduce the timing as well.

This should reduce uncertainties on short time horizons.

# Problem is, decadal predictions don't have much skill!

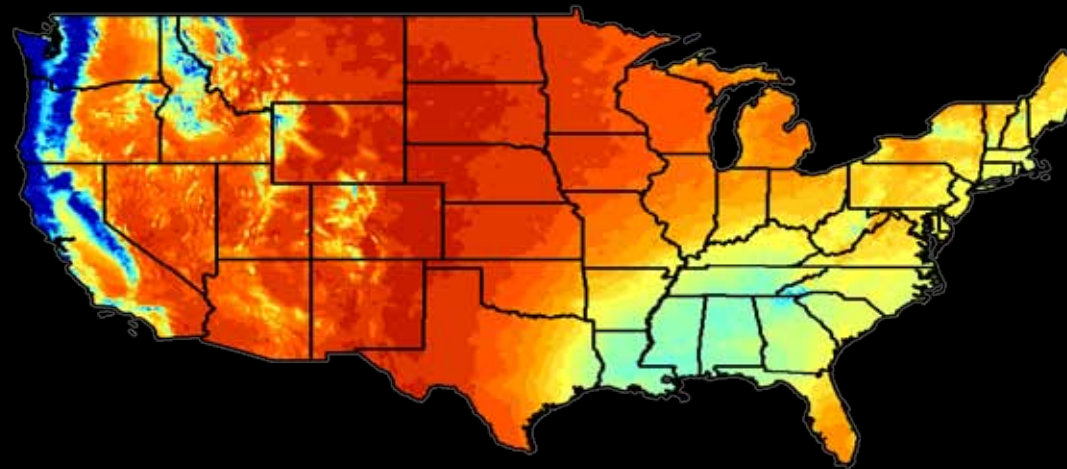


# Schedule

First CMIP5 GCM results expected this month

Remaining results expected first half of 2011

Downscaling will add some delay



# Downscaling

# [http://gdo-dcp.uccln1.org/downscaled\\_cmip3\\_projections/dcplinterface.html](http://gdo-dcp.uccln1.org/downscaled_cmip3_projections/dcplinterface.html)

Bias Corrected and Downscaled WCRP CMIP3 Climate Projections

This site has been optimized for Internet Explorer (IE) 6.0, IE 7.0, and Firefox 2.0.  
(Requires JavaScript to be enabled.)

Reclamation  
Santa Clara University  
CLIMATE CENTRAL

Announcements (updated January 25, 2010 - Now serving Gridded Observations and Intermediate BCSD data products)

Summary  
This archive contains five spatial-resolution translations of 110 contemporary climate projections over the contiguous United States. The original projections are from the [World Climate Research Programme's \(WCRP's\) Coupled Model Intercomparison Project phase 3 \(CMIP3\)](#) multi-model dataset, which was referenced in the Intergovernmental Panel on Climate Change Fourth Assessment Report. Please see the "About" for information on data development, including the methodology to perform climate model bias-correction and spatial downscaling.

Purpose  
The archive was developed to provide planning analysts access to climate projections spatially downscaled to a finer spatial resolution. Such access permits several types of analyses, including:

- assessment of local to regional climate projection uncertainty (Figure 1);
- assessment of climate change impacts on natural and social systems (e.g., watershed hydrology, ecosystems, water and energy demands);
- risk-based exploration of planning and policy responses framed by potential climate changes evident in these projections.

Archive Update To-Date  
The archive was launched in November 2007. Through December 2009, this web-site has served approximately 4.3 terabytes of data to roughly 550 users, collectively issued through 4500+ data requests. Geographically, the requests have covered the contiguous U.S. and parts of southern Canada and northern Mexico (Figure 2).

Terms of Use  
These data are being distributed to interested users for consideration in research and planning applications. Such applications may include any project carried out by an individual or organized by a university, a scientific institute, public agency, or private sector entity for research or planning purposes. Any decision to use these data is at the interested user's discretion and subject to the Disclaimer provided below.

Disclaimer  
These data are being made available to provide immediate access for the convenience of interested persons. While the [University of California, Santa Clara University \(UCSC\)](#), [Reclamation](#), [Santa Clara University \(SCU\)](#), and [Climate Central](#) (CC) believe the information to be reliable, human or mechanical error remain a possibility. Therefore, neither UCLN, Reclamation, SCU nor CC guarantee the accuracy, completeness, timeliness, or correct sequencing of the information. Also, neither UCLN, Reclamation, SCU, CC, nor any of the sources of the information shall be responsible for any errors or omissions, or for the use or results obtained from the use of this information.

Acknowledgments and Citation of these Data  
Whenever you publish research based on data from this archive, please include the following acknowledgment of the superseding CMIP3 effort: "We acknowledge the modeling groups, the Program for Climate Model Diagnosis and Intercomparison (PCMDI) and the WCRP's Working Group on Coupled Modeling (WGCM) for their roles in making available the WCRP CMIP3 multi-model dataset. Support of this dataset is provided by the Office of Science, U.S. Department of Energy."

In first making reference to the data from this archive, please first reference the CMIP3 dataset by including the phrase "the World Climate Research Programme's (WCRP's) Coupled Model Intercomparison Project phase 3 (CMIP3) multi-model dataset". Subsequent references within the same publication might refer to the CMIP3 data with terms such as "CMIP3 data", "the CMIP3 multi-model dataset", "the CMIP3 archive", or the "CMIP3 dataset".

After acknowledging the CMIP3 data, please reference this archive by using the phrase "bias-corrected and spatially downscaled climate projections derived from CMIP3 data and saved at: [http://gdo-dcp.uccln1.org/downscaled\\_cmip3\\_projections/](http://gdo-dcp.uccln1.org/downscaled_cmip3_projections/), described by Maurer et al (2007)." The reference for this is Maurer, E. P., L. Brekke, T. Pruitt, and P. B. Duffy (2007), "Fine-resolution climate projections enhance regional climate change impact studies", *Env. Trans. AGU*, BR4T, 304.

Figure 1: Model projected change in average annual precipitation (mm/year), 2041-70 versus 1971-2000

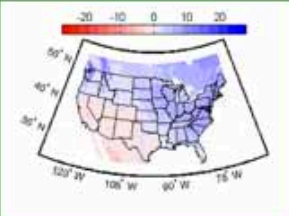
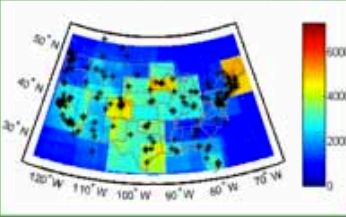


Figure 2: Geographic Distribution of Projection Requests through December 2009. Plot shows spatial histogram of projections, sum at each 1/8° downscaling location. Colorbar shows range of projection counts. Asterisks show locations of data requests.



UCRL-Web-236256  
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Last modified March 21, 2010  
Comments/Questions

Monthly-mean results available now;  
Daily-mean results available within weeks

[http://gdo-dcp.ucllnl.org/downscaled\\_cmip3\\_projections/dcplinterface.html](http://gdo-dcp.ucllnl.org/downscaled_cmip3_projections/dcplinterface.html)

Monthly-mean results (available now):

T and P

16 GCMs, 112 simulations

A2, A1b, and B1 emissions scenarios

Daily-mean results (available January):

Tmax, Tmin, P

10 GCMs, 19 simulations

1961-1999, 2046-2065, 2080-2099 only

A2, A1b, and B1 emissions scenarios



All results at 0.125° grid spacing 48-state domain

# Who?

Climate Central

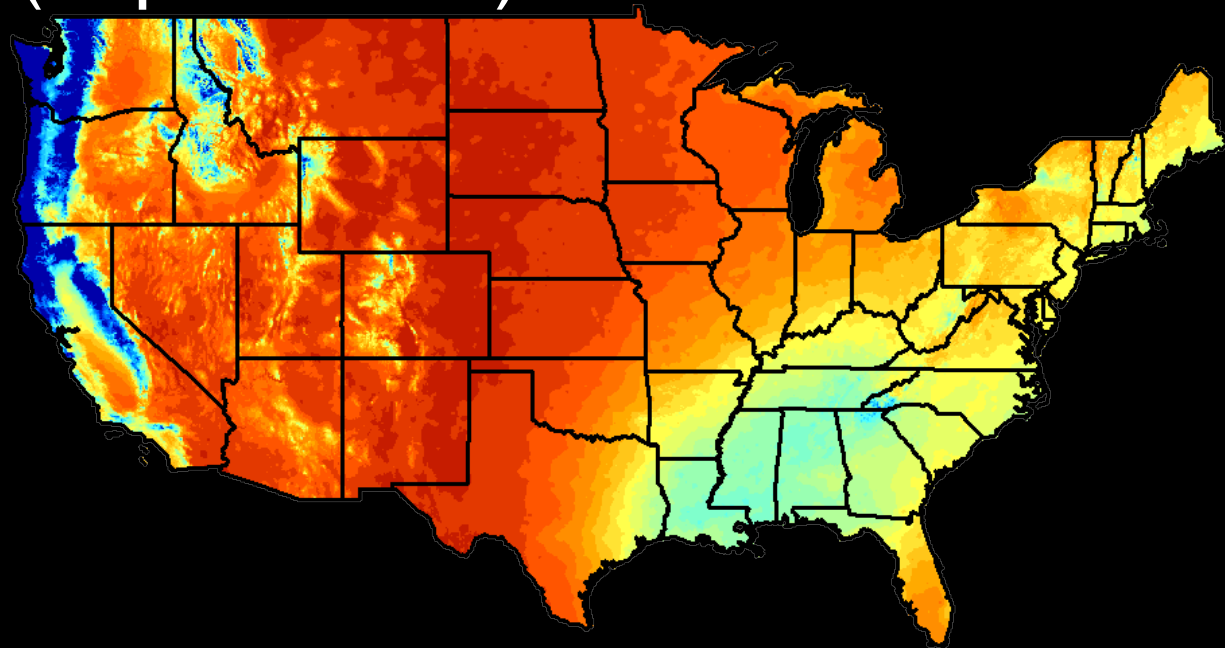
IPCC WG2

Santa Clara U. (Ed Maurer)

Scripps/UCSD (Tapash Das)

LLNL/PCMDI

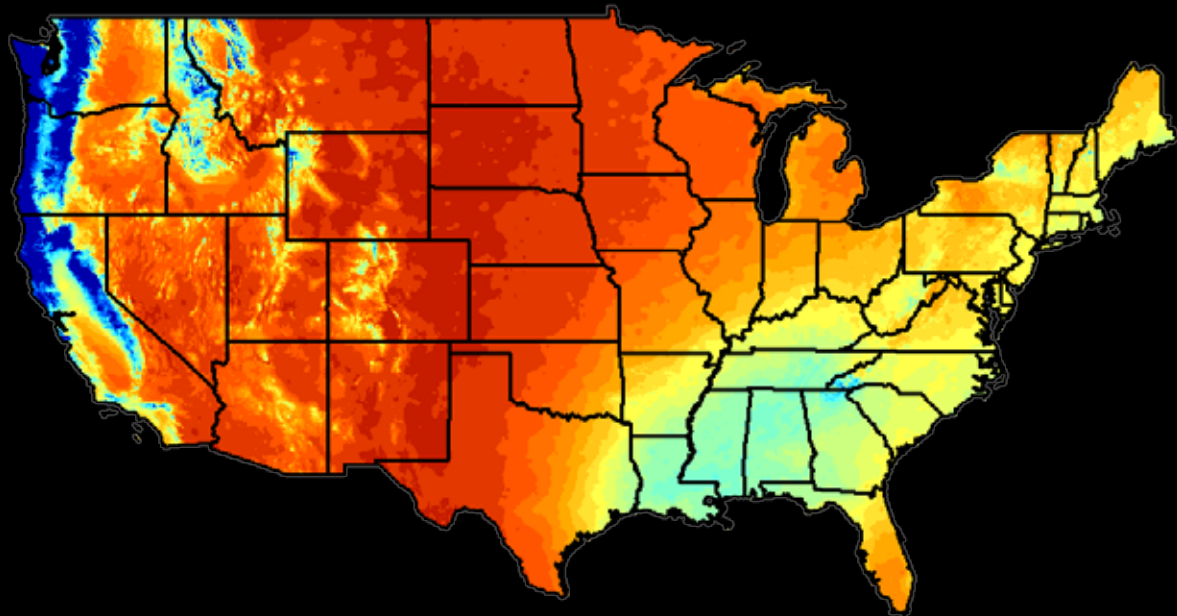
Reclamation



# The Big Picture

We will rapidly produce downscaled temperature and precipitation results from CMIP5 GCM simulations.

PCMDI will archive and distribute through same portal and user interface as CMIP5 GCM results.



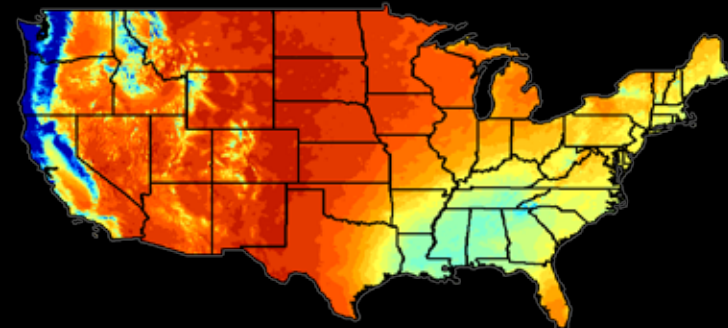
# Specifics

	US Domain	Global Domain
BCSD	monthly, daily @ 0.125°	monthly, daily @ 0.5°
BCCA	daily @ 0.125° Text	X

Also intermediate products like regridded GCM output, Bias-corrected but not downscaled GCM output, etc.

Variables:  $T_{\min}$ ,  $T_{\max}$ ,  $T_{\text{mean}}$ ,  $P$

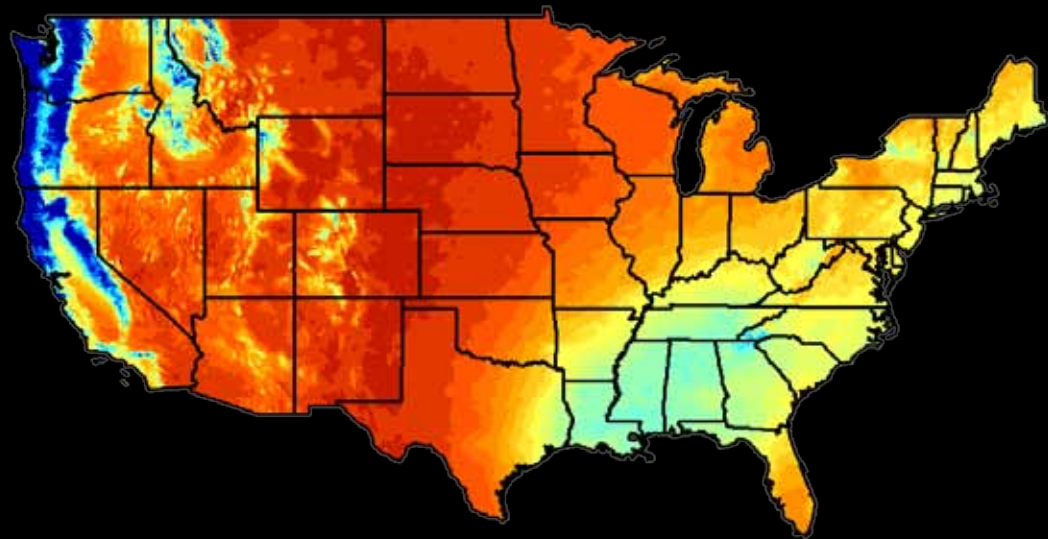
Simulations: 20 C, RCP 4.5, RCP 8.5, ...



# Status

Downscaling codes are installed and tested on cluster attached to LLNL “Green Data Oasis.” This means no data transfers will be needed.

We have exercised codes downscaling CMIP3 results.



I'm almost done.....



# Recommendations

# Recommendations

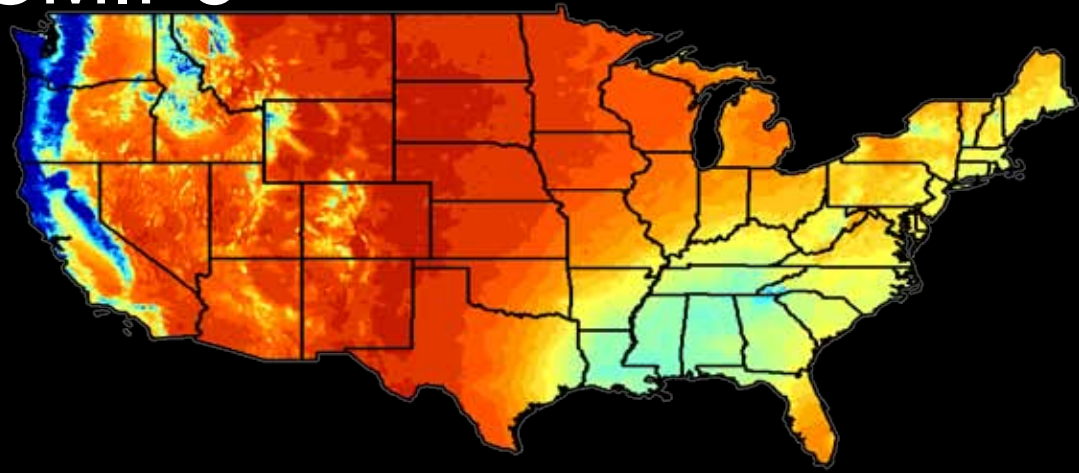
Are you in a hurry?

Then use CMIP3

Do you need daily output?

Then use CMIP5

Consider starting with CMIP3 and then re-doing later with CMIP5



# Science marches on!

