



# The U.S. Climate Explorer: Increasing Access to Climate Data for Climate Resilience Planning

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**California State University, Monterey Bay**  
**Seaside, CA**

**WRPI**  
**April 6, 2017**

# The Climate Explorer



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## THE CLIMATE EXPLORER

Explore maps and graphs of historical and projected climate trends in your local area. View data by topics to see how climate change will impact things you care about.

 **Search by location**

 **View by variable**

 **View by topic**

 **New here? Take the tour**

Explore: Boston, Massachusetts

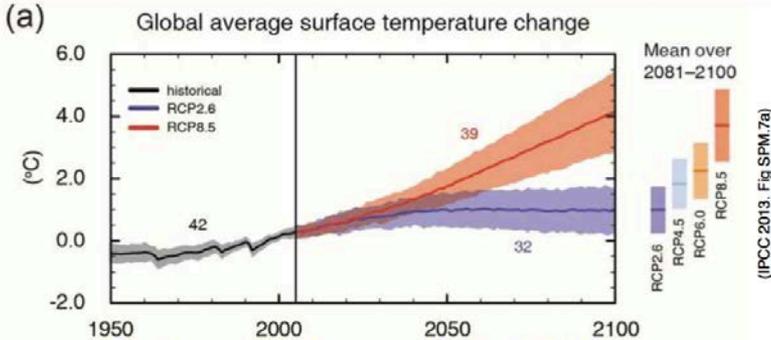
Designed by Habitat Seven



<https://toolkit.climate.gov/climate-explorer2/>

# Climate Change Impacts for California: Temperature

## Projected Global Average Temperature Change by end of 21<sup>st</sup> Century

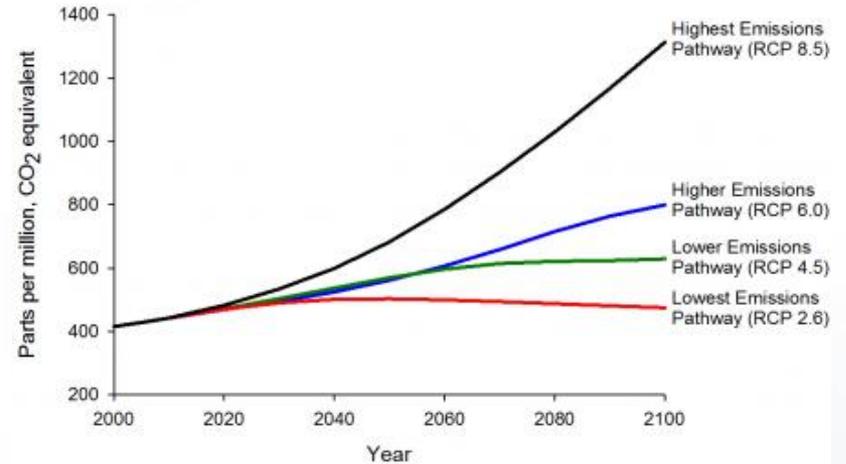


The temperature increase during the last 100 years was only about 0.8°C.

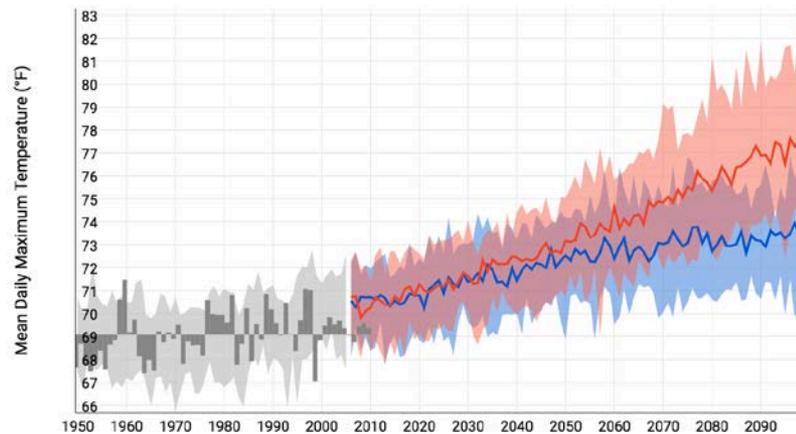
IPCC AR5 Working Group I  
IPCC Climate Change 2013: The Physical Science Basis  
Climate

ipcc  
INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE

## Projected Atmospheric Greenhouse Gas Concentrations

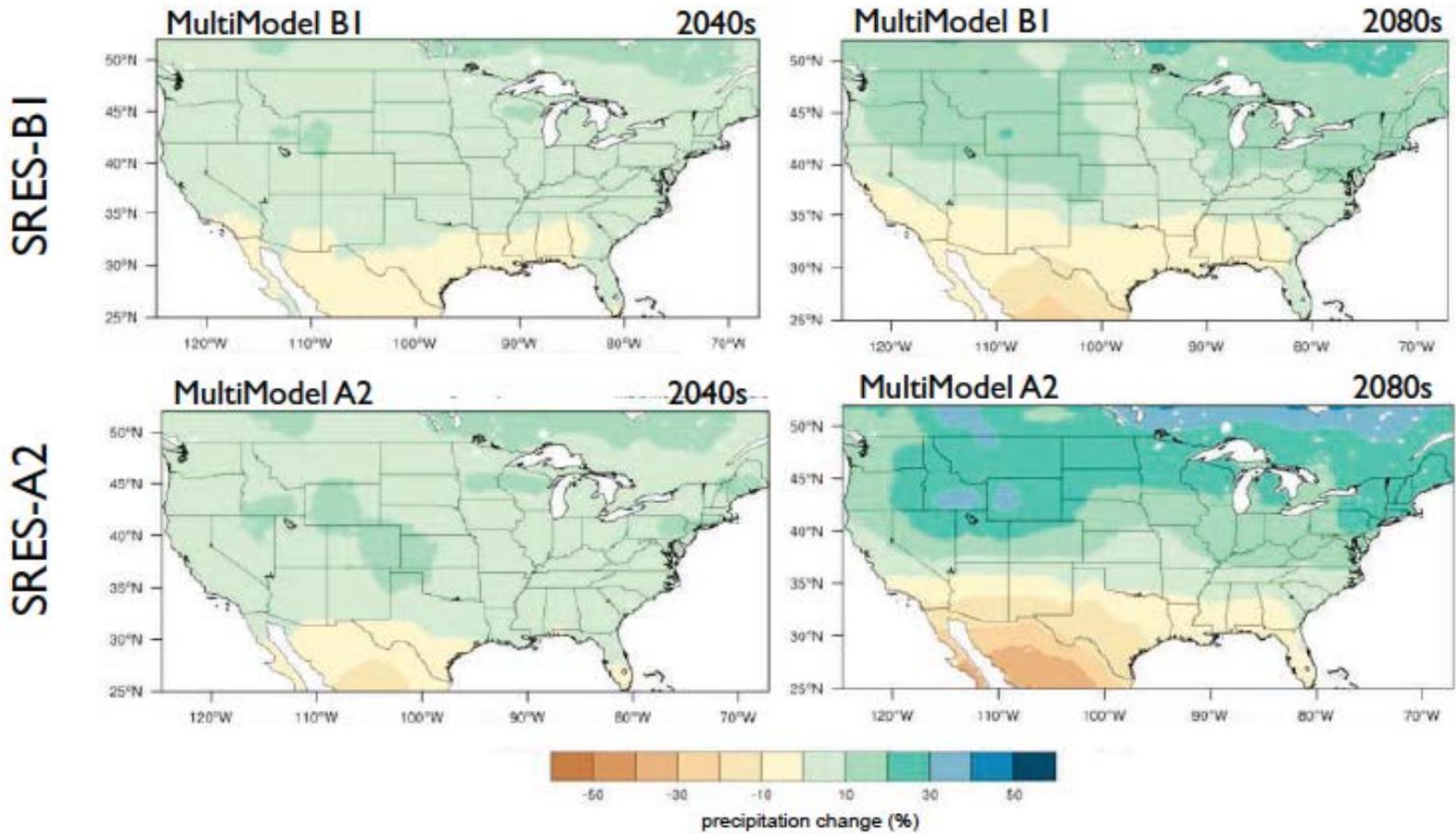


## Chart: Santa Clara County Mean Daily Maximum Temperature



Observations Historical (Modeled) Lower Emissions Higher Emissions Medians

# Climate Change Impacts for California: Precipitation



Source: USDA, 2013

# Climate Change Impacts for California: Precipitation



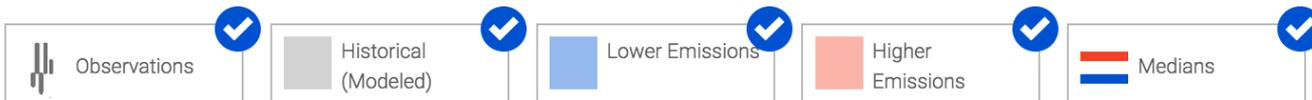
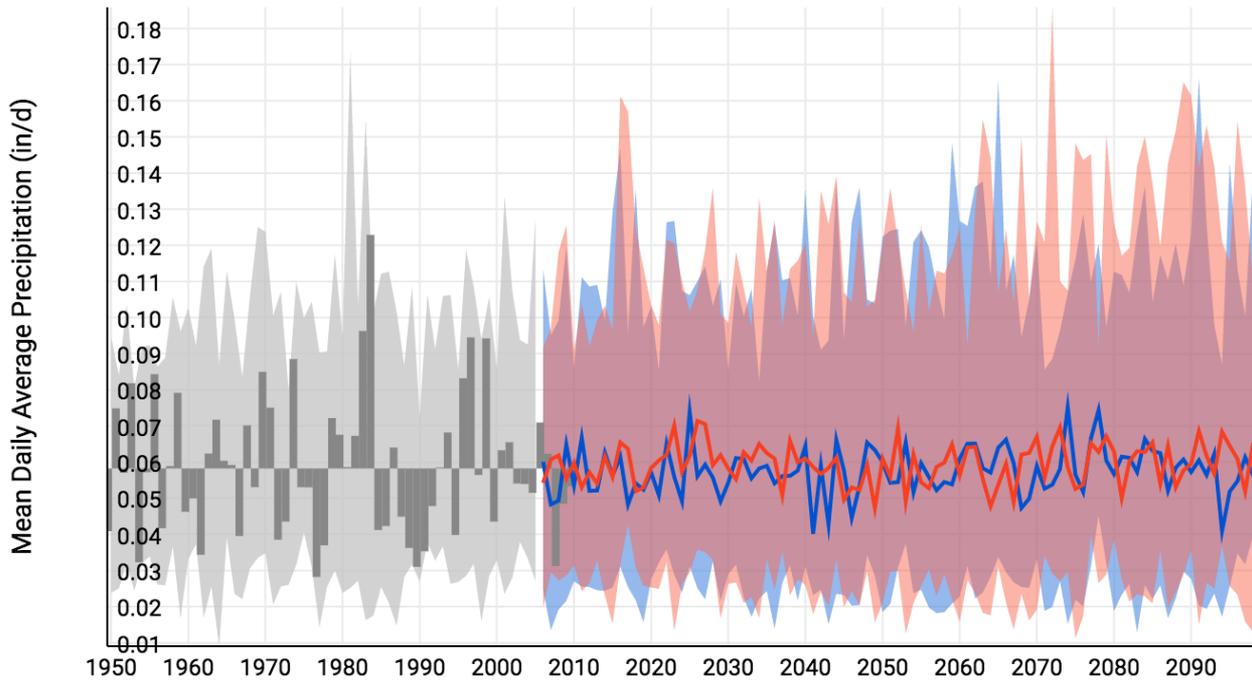
## Chart: Santa Clara County

Mean Daily Precipitation

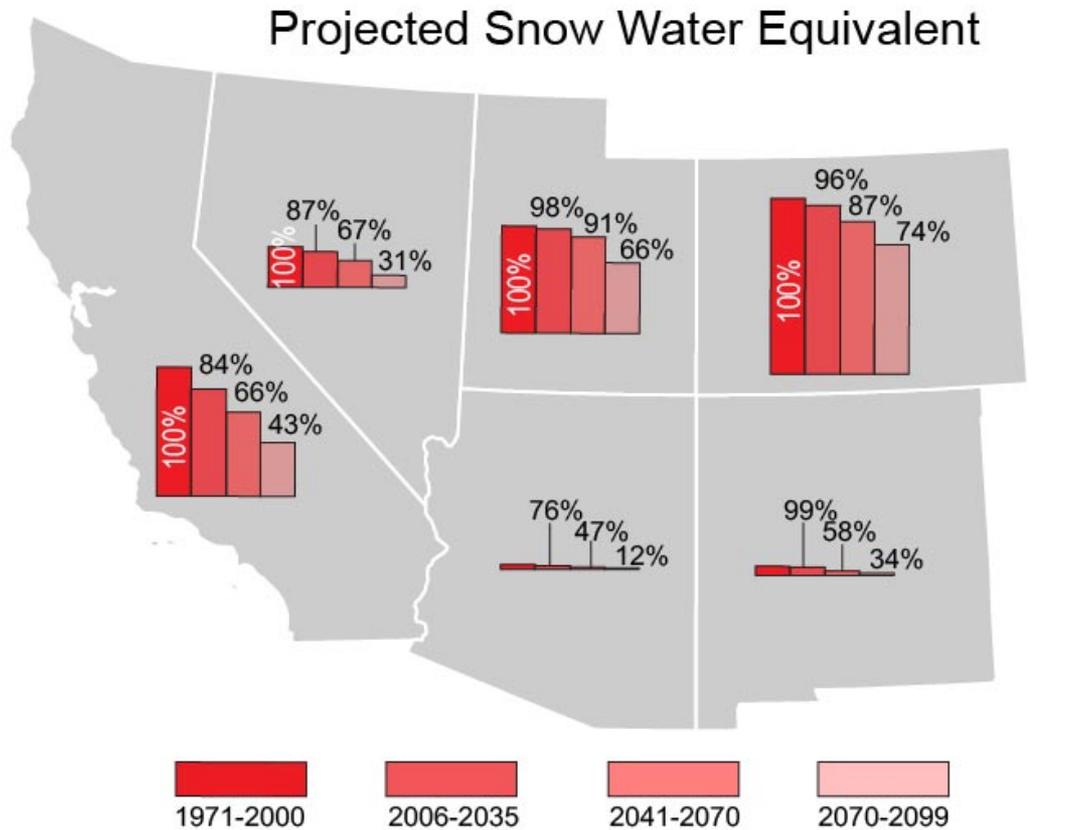
How to read this

Image

Data



# Precipitation: Changes in the Winter Snowpack



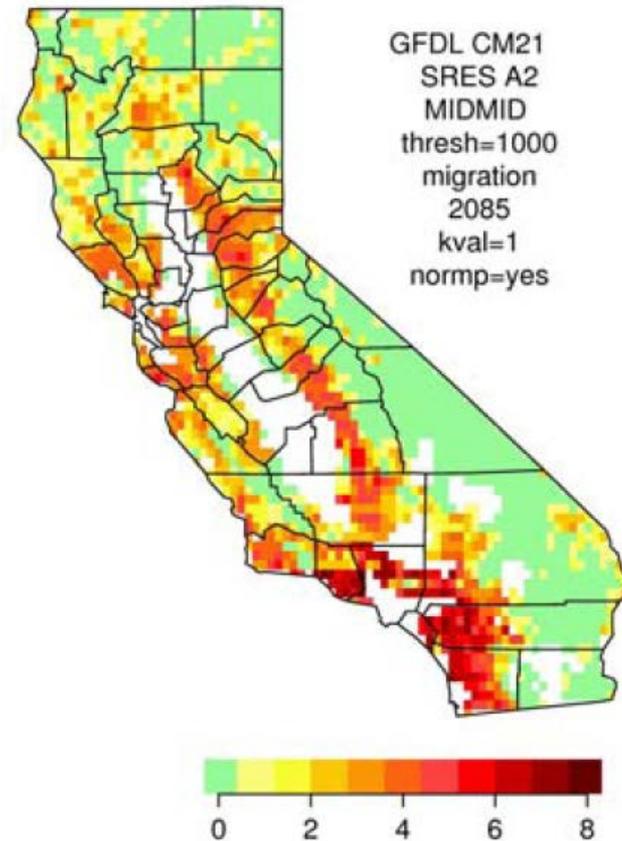
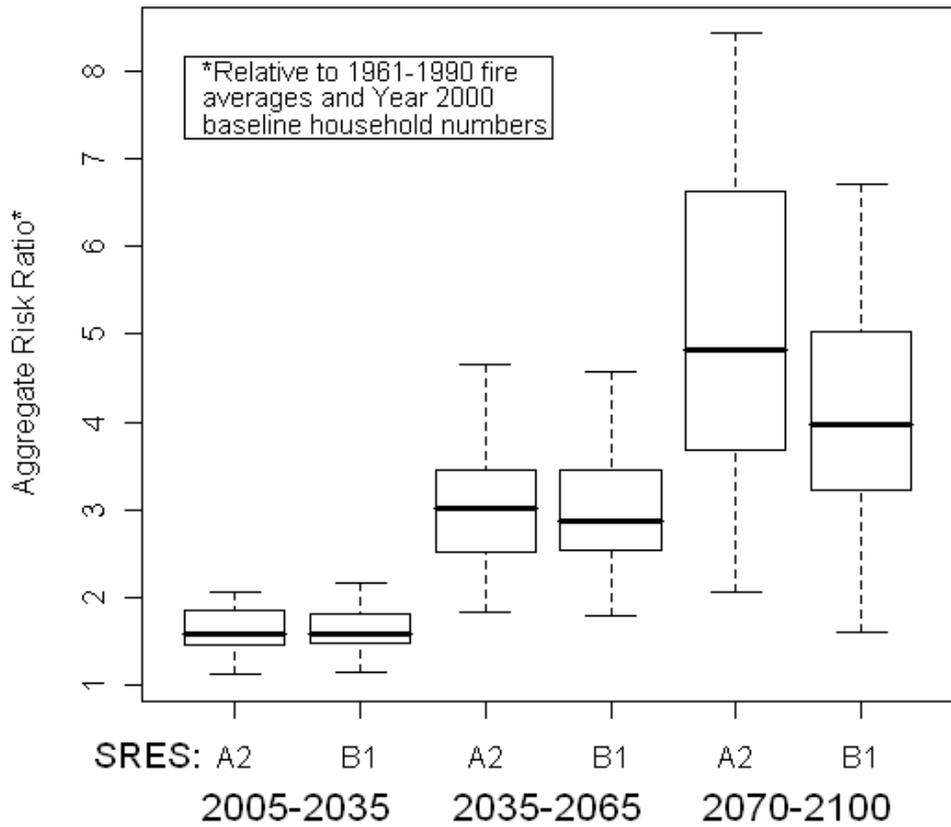
A2, High Emissions Scenario

Drives changes in . . .

- Timing of runoff
- Soil moisture & vegetation water stress
- Evapotranspiration
- Phenology
- Demand for water storage
- Fire return intervals
- Aquatic ecosystems
- . . . and many others

# Increases in Wildfire Risk

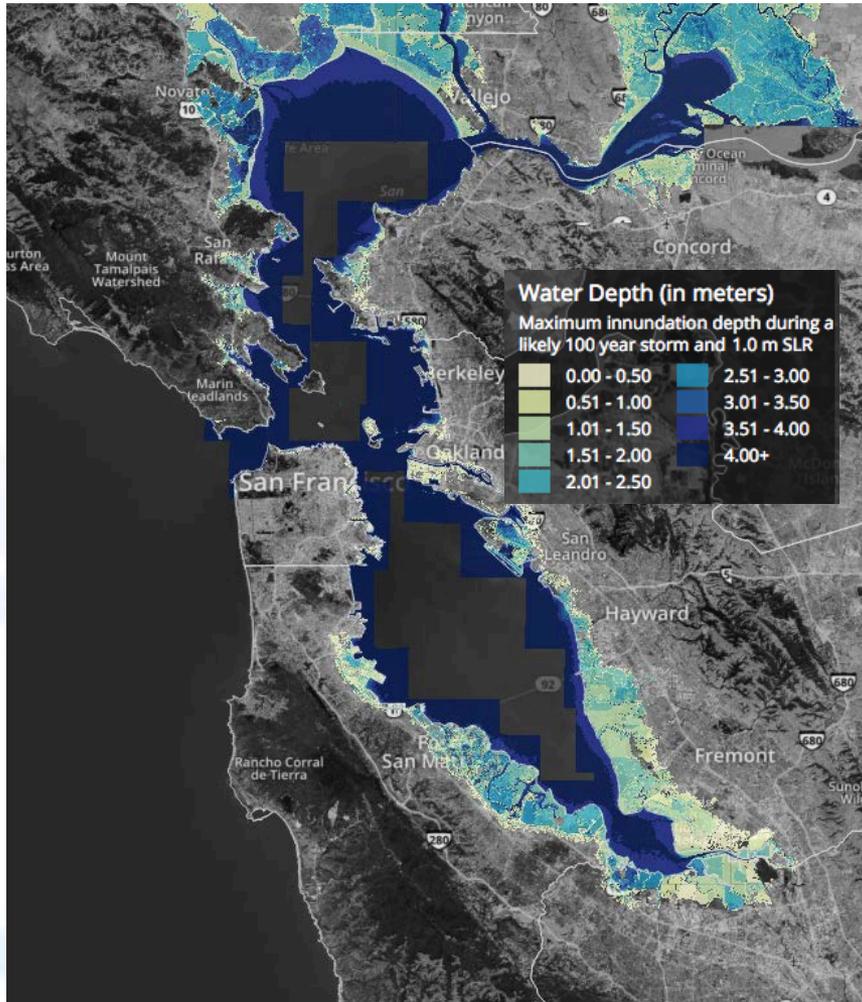
## Changes in Statewide Residential Wildfire Risk



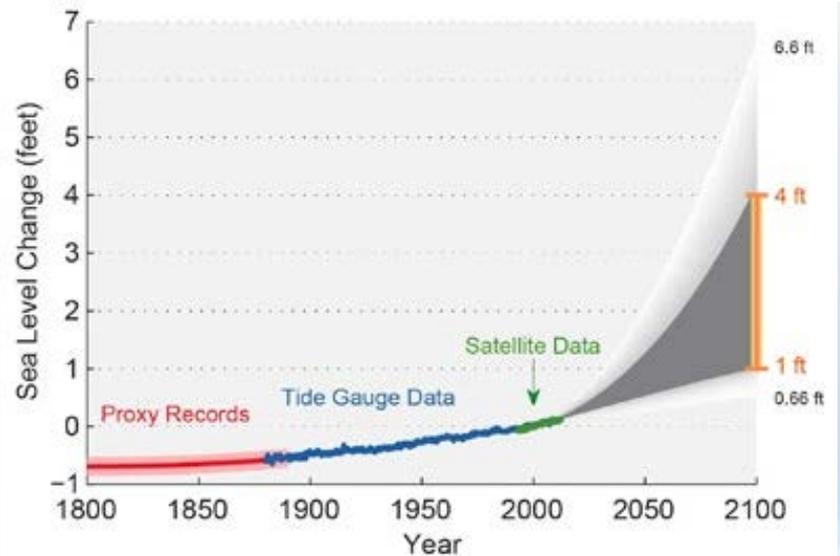
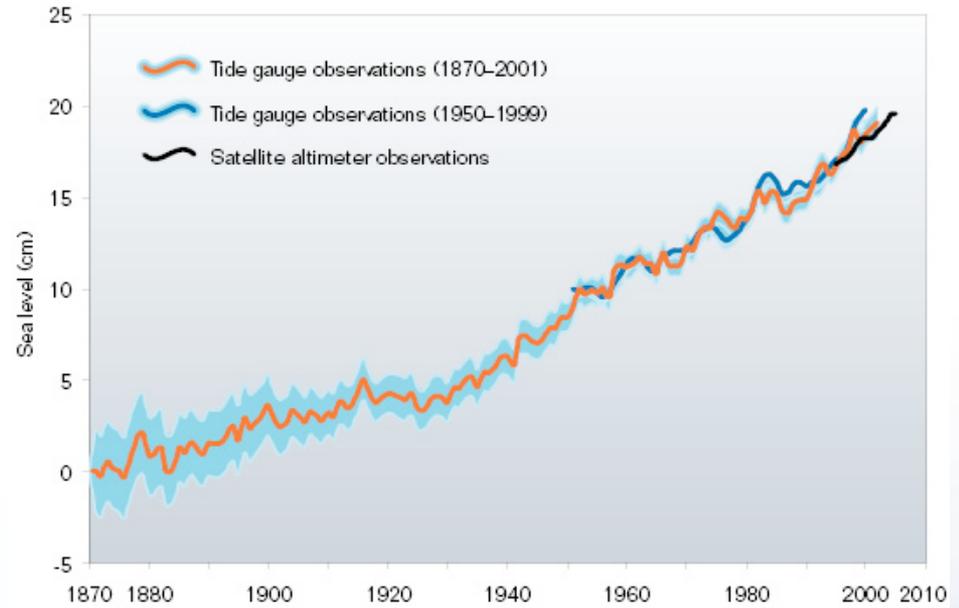
Source: Westerling and Bryant, 2009

Source: Westerling and Bryant, 2009

# Sea Level Rise



Source: Cal-Adapt.org



Impact of 1m rise in Sea Level for SF Bay Area

# Innovation in Big Data: NASA Earth Exchange (NEX)



## Earth Science Big Data



Massive data from multiple  
Missions/Modeling efforts

## Supercomputing



Scalable, diverse computing  
architectures

***Accelerating Earth science research and societal benefits***

# NASA Earth Exchange (NEX)

<http://nex.nasa.gov>



The NASA Earth Exchange (NEX) is virtual collaborative that brings scientists together in a knowledge-based social network and provides the necessary tools, computing power, and access to big data to accelerate research, innovation and provide transparency.



**COLLABORATION**

(over 540 members)

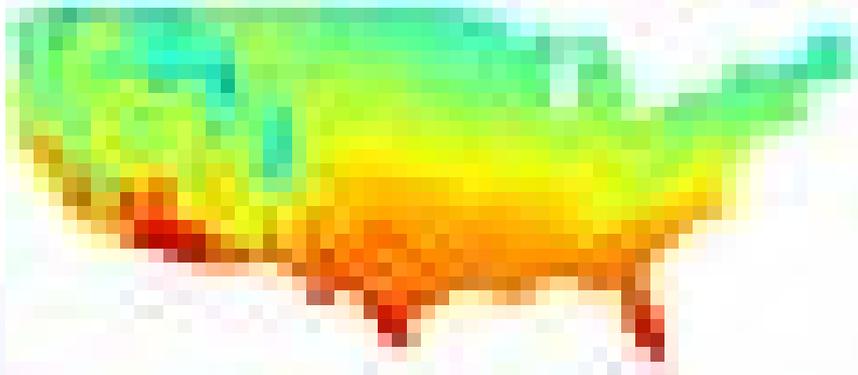
**COMPUTING**

(9PB, 250,000 cores)

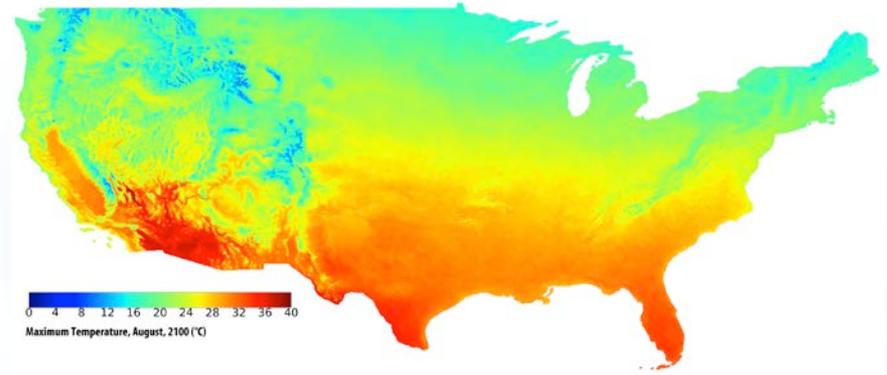
**Centralized Data Repository**

(over 900 TB of data)

# NASA Earth Exchange: Downscaled Climate Scenarios for the U.S.



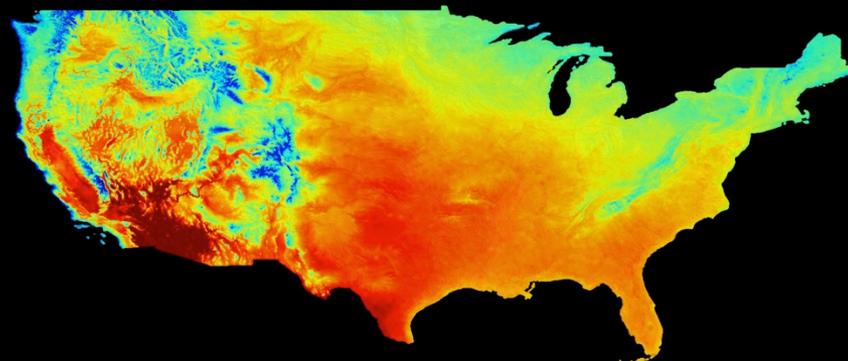
GCM Resolution: ~1 degree



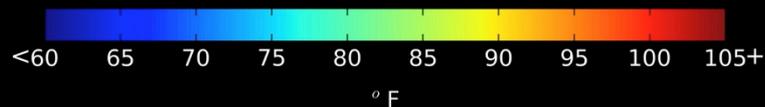
30 arc-seconds / 800m / ~0.5 miles

- Downscaled Bias Corrected Spatial Disaggregation (BCSD) algorithm
- Monthly temperature and precipitation scenarios from 1950-2100
- 33 CMIP5 coupled General Circulation Models (global climate models)
- 4 Representative Concentration Pathways (RCPs): 2.6, 4.5, 6.0, 8.5
- 17 TB of data

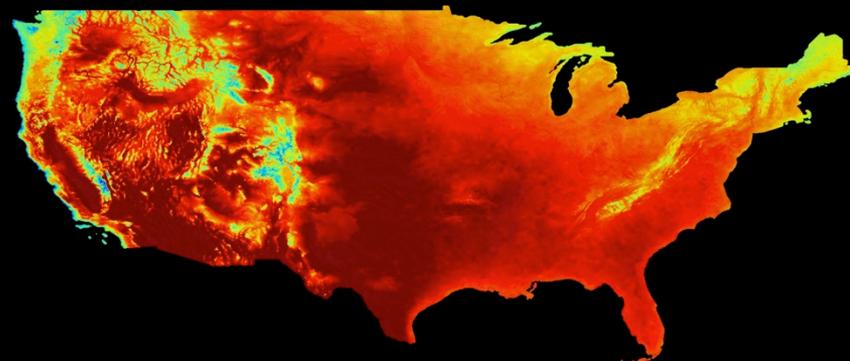
# NASA Earth Exchange: Downscaled Climate Scenarios for the U.S.



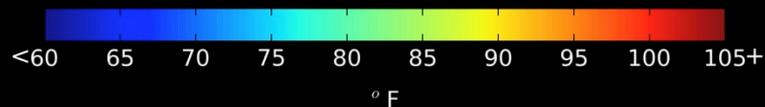
July, 2100



Average July Daily Max Temp, 2100  
Lowest emissions pathway  
421 ppm CO<sub>2</sub> in 2100

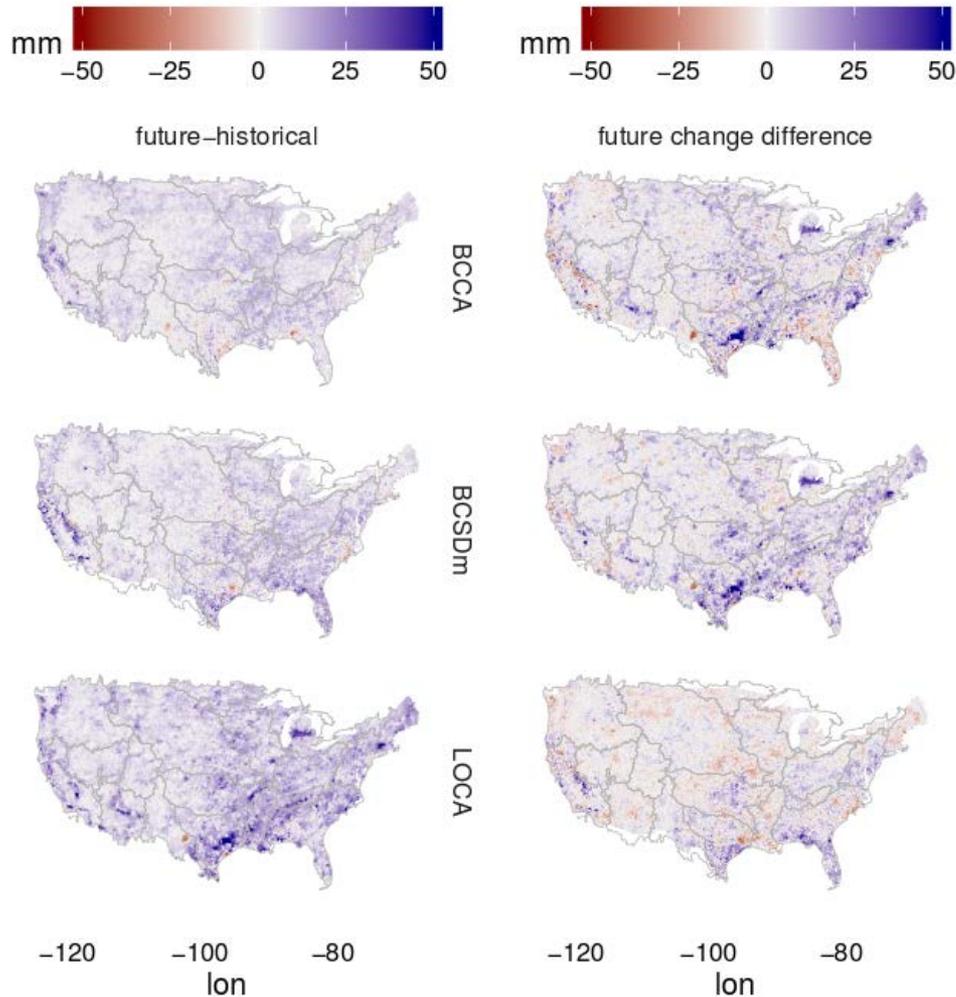


July, 2100



Average July Daily Max Temp, 2100  
Highest emissions pathway  
936 ppm CO<sub>2</sub> in 2100

# Downscaled Climate Scenarios for the U.S.: BCCA and LOCA



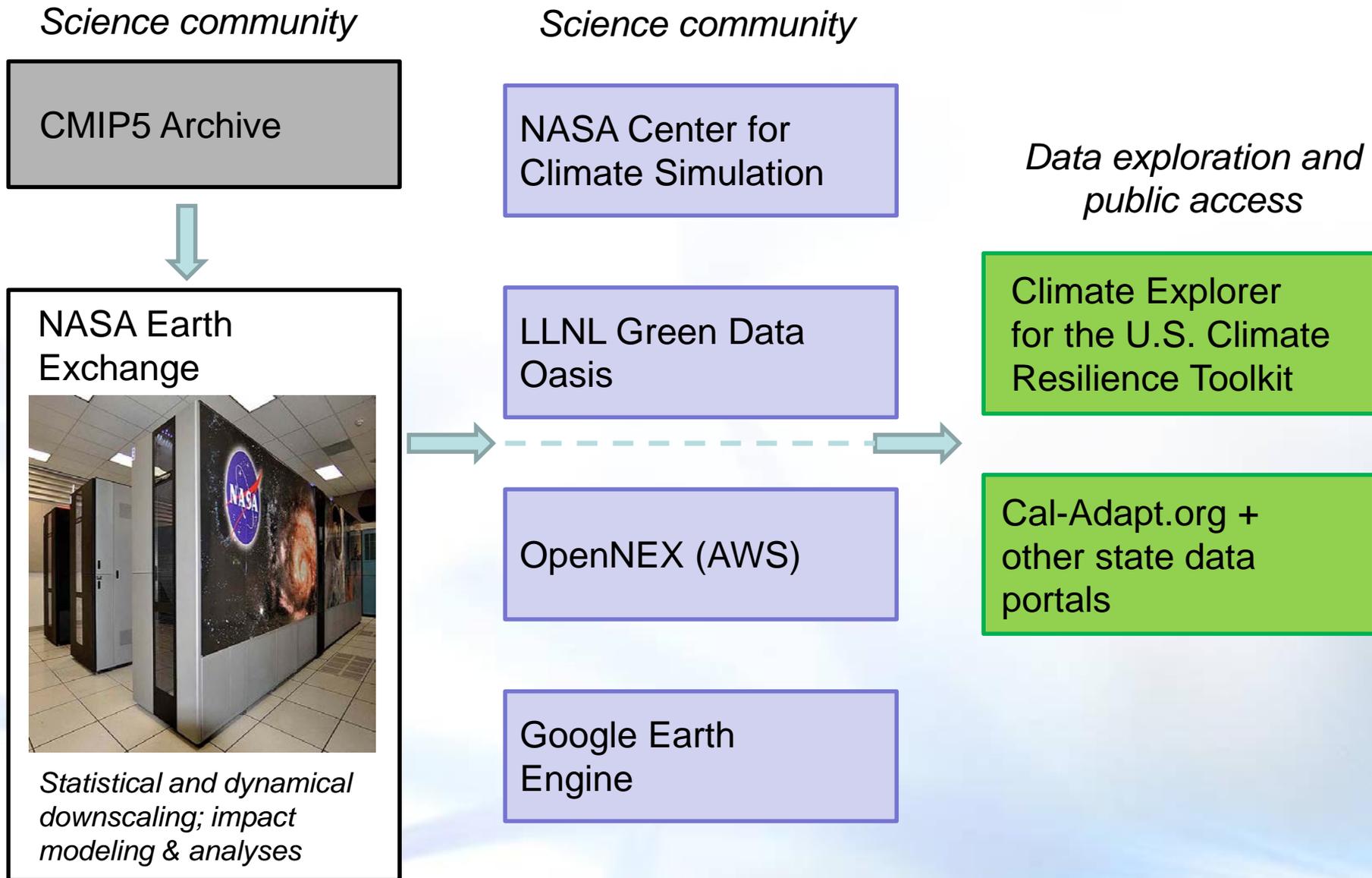
## BCCA

- Bureau of Reclamation, Bias Corrected Constructed Analogs (BCCA)
- Daily temperature and precipitation at 1/8 degree resolution (~12.5 km, 7.8 miles)
- Reclamation, 2014

## LOCA

- Locally Constructed Analogs (LOCA)
- Daily temperature and precipitation at 1/16 degree resolution (~6.25 km, 3.9 miles)
- Pierce et al., 2014, 2015

# Increasing Access to Climate Change Data and Information



# The Climate Explorer



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Explore maps and graphs of historical and projected climate trends in your local area. View data by topics to see how climate change will impact things you care about.



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New here? Take the tour

Explore: Boston, Massachusetts



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<https://toolkit.climate.gov/climate-explorer2/>

# Local Climate Scenarios for Resilience Planning



Menu

Home

Location

San Jose, CA

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Search another City, County or Zip code



## SAN JOSE, CA

### Santa Clara County

Graphs and maps below show observed and modeled data for the county of your selected location. Adjust the displays to focus on times or regions of interest.

JUMP TO: [Temperature](#) [Precipitation](#) [Other](#) [Weather Stations](#)

# Temperature: Mean Daily Max Temp

JUMP TO:

Temperature

Precipitation

Other

Weather Stations



## Temperature

Mean Daily Maximum Temperature



Annual

Monthly

Seasonal

Mean Daily Minimum Temperature



Days with Maximum Above 95°F



Days with Minimum Below 32°F



Display: Actual



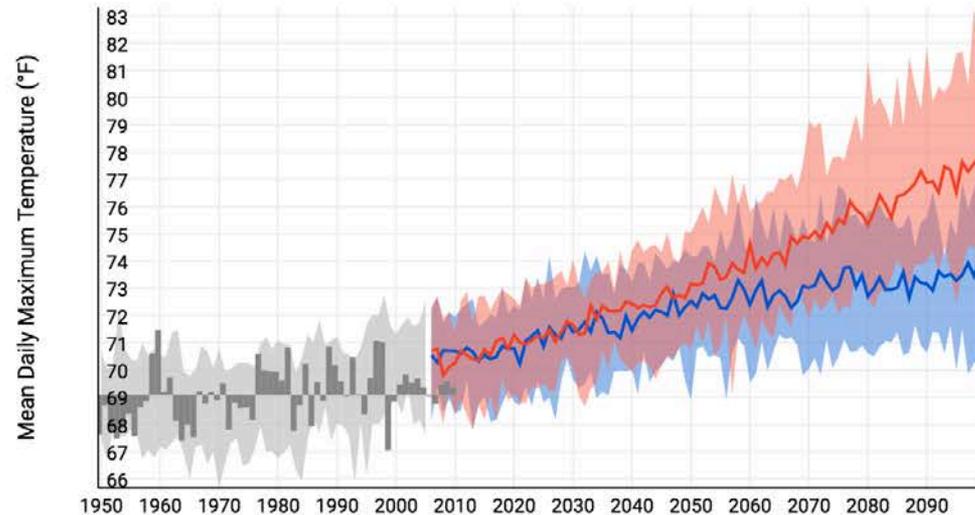
## Chart: Santa Clara County

Mean Daily Maximum Temperature

How to read this

Image

Data



Map

# Temperature: Mean Daily Max Temp



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Mean Daily Maximum Temperature

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Search by location

Data by Counties

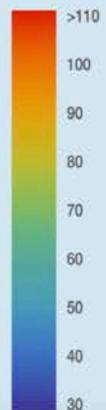
OFF

Mean Daily Maximum Temperature

About Mean Daily Maximum Temperature

## Legend

Degrees Fahrenheit



July

LOWER EMISSIONS



HIGHER EMISSIONS

100 km



1950

2090

# Temperature: Days Above 95° F



## Temperature

Mean Daily Maximum Temperature ?

Mean Daily Minimum Temperature ?

Days with Maximum Above 95°F ?

Annual

Days with Minimum Below 32°F ?

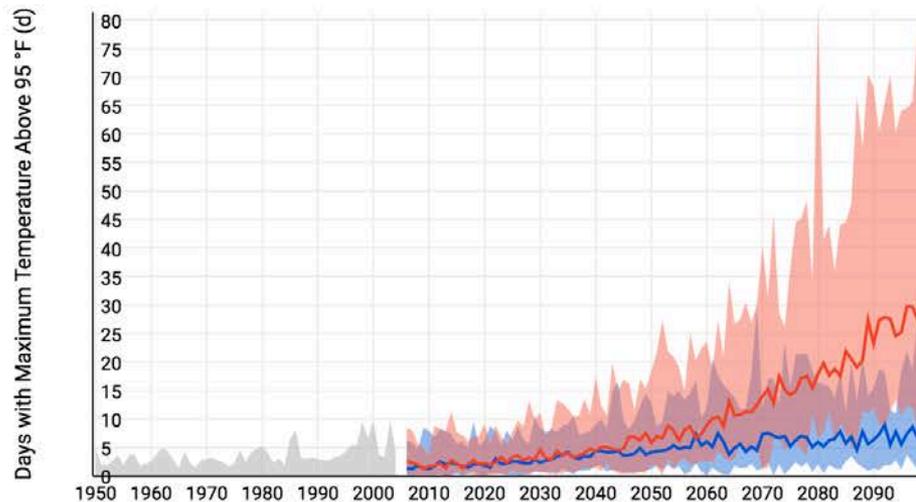
Display: **Actual** ▾



### Chart: Santa Clara County

Days with Maximum Above 95°F

? How to read this 🖨 Image 📄 Data



Observations

Historical (Modeled)  Lower Emissions  Higher Emissions  Medians



Map

# Temperature: Mean Daily Max Temp



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Days With Maximum Above 95° F

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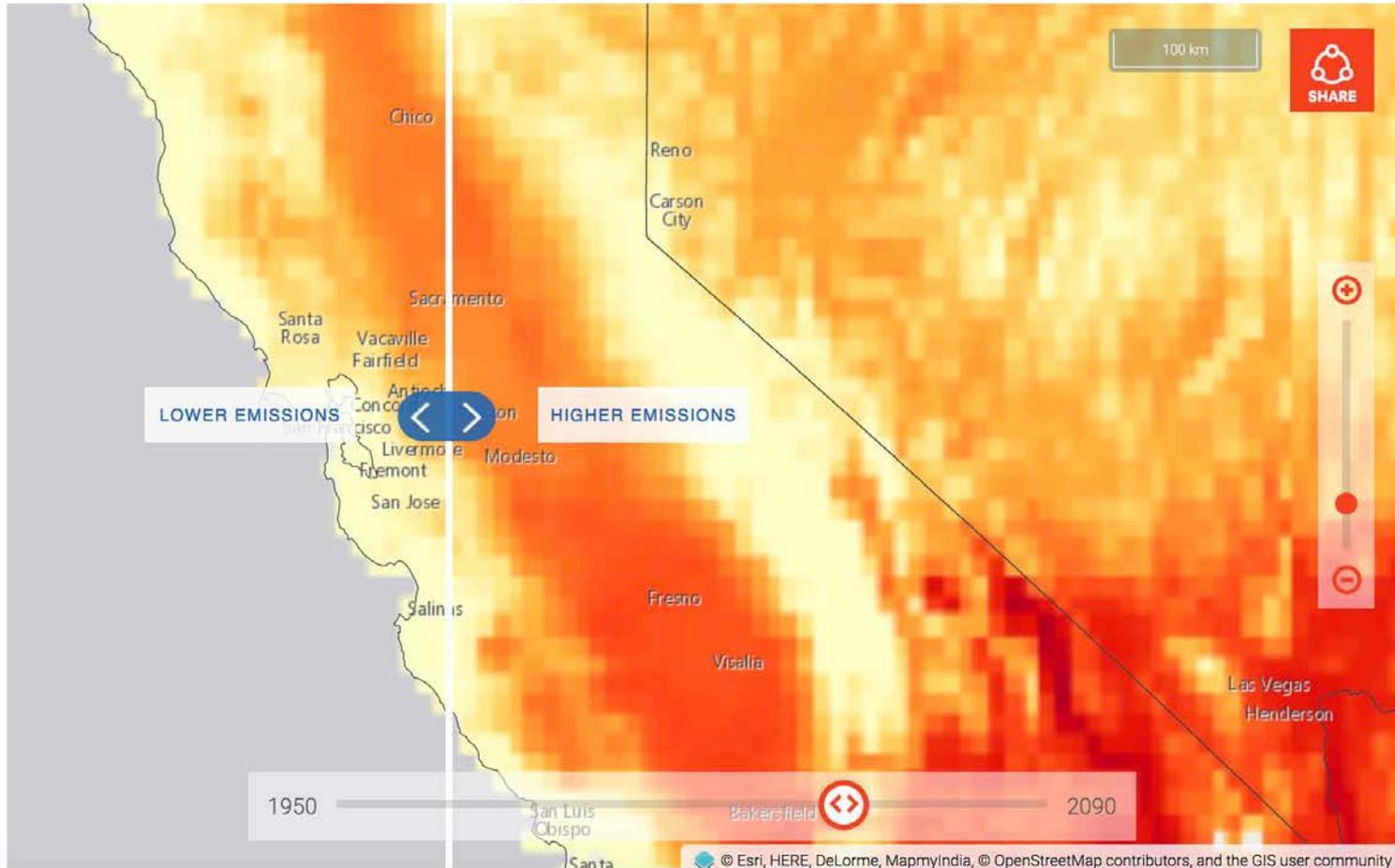
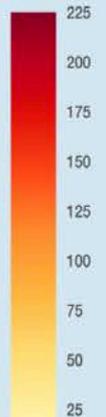
Search by location

Data by Counties  OFF

Days With Maximum Above 95°F

About Days With Maximum Above 95° F

Number of days



# Temperature: Days Below 32° F

JUMP TO: [Temperature](#) [Precipitation](#) [Other](#) [Weather Stations](#)

## Temperature

Mean Daily Maximum Temperature ?

Mean Daily Minimum Temperature ?

Days with Maximum Above 95°F ?

Days with Minimum Below 32°F ?

Annual

Display: **Actual**



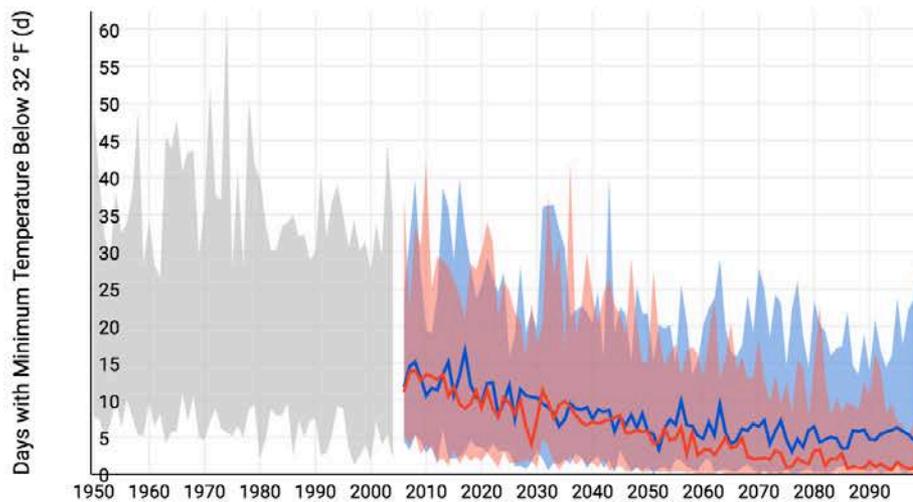
### Chart: Santa Clara County

Days with Minimum Below 32°F

? How to read this

Image

Data



Observations

Historical (Modeled)

Lower Emissions

Higher Emissions

Medians

2010

2100



Map

# Precipitation: Annual

JUMP TO:

Temperature

Precipitation

Other

Weather Stations



## Precipitation

Mean Daily Precipitation

Annual

Monthly

Seasonal

Days of Precipitation Above 1 Inch

Display: Actual



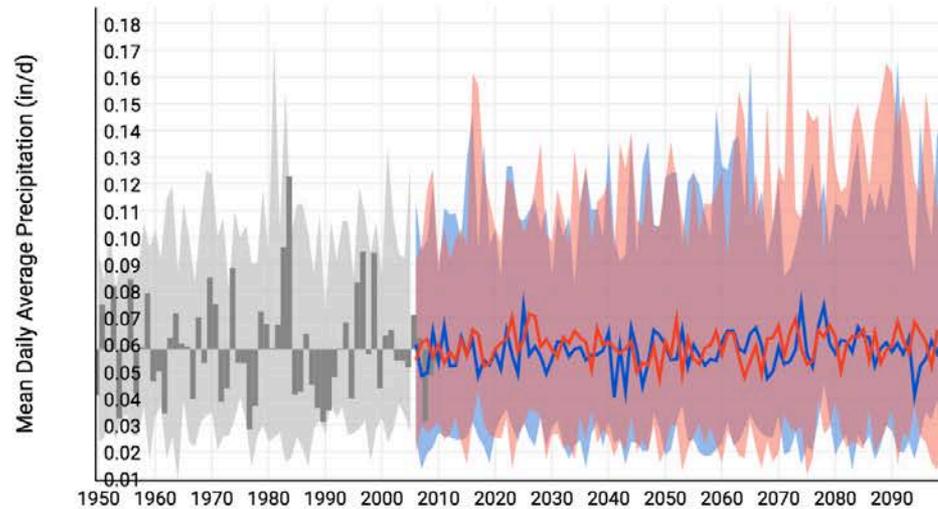
### Chart: Santa Clara County

Mean Daily Precipitation

How to read this

Image

Data



Observations

Historical (Modeled)

Lower Emissions

Higher Emissions

Medians

2010

2100



Map

# Precipitation: Winter



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Mean Daily Precipitation

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Search by location

Data by Counties OFF

Mean Daily Precipitation

About Mean Daily Precipitation

## Legend

% Change Relative to 1960-1989



January

LOWER EMISSIONS



HIGHER EMISSIONS

1950



2090

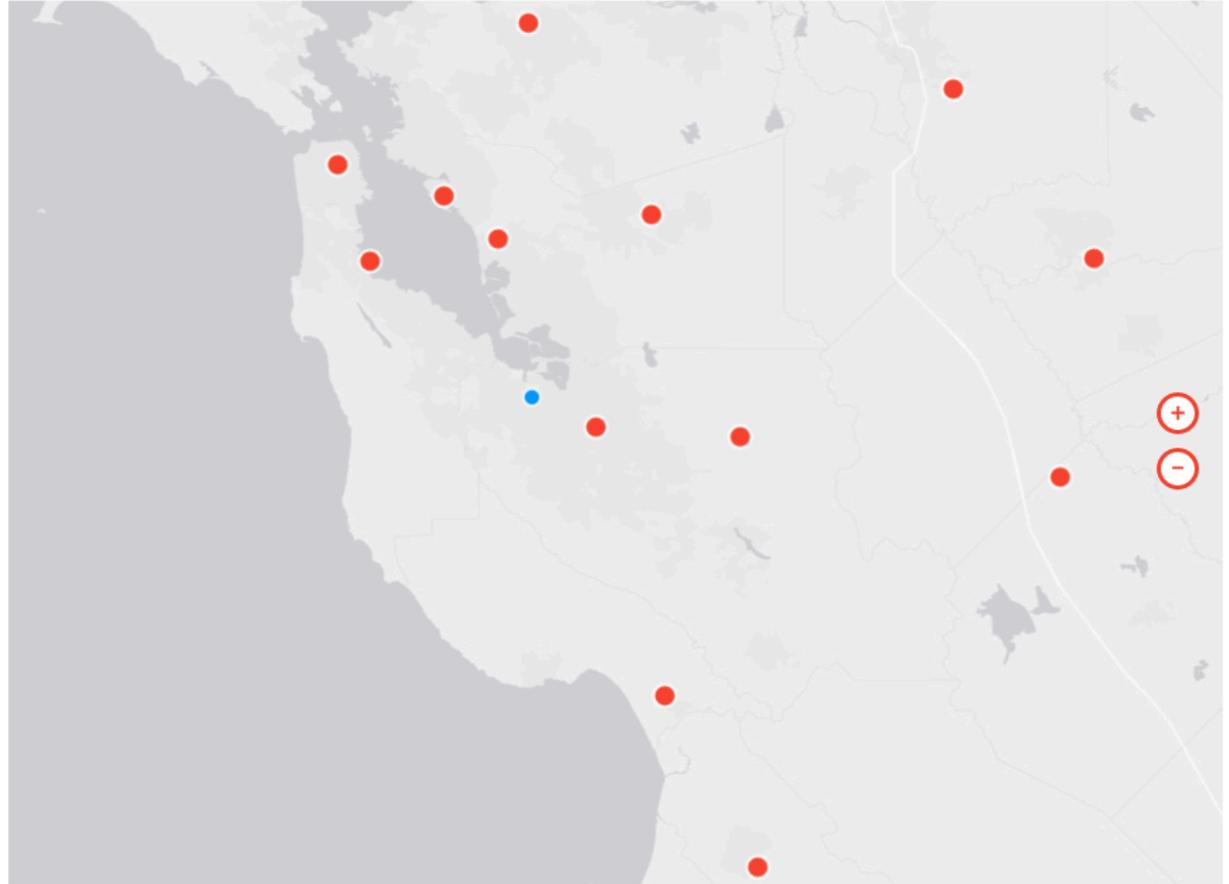
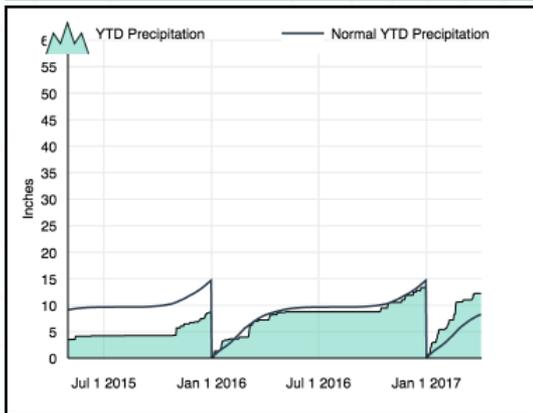
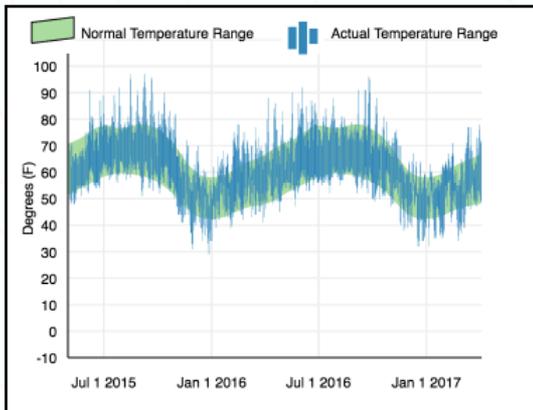
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# Monitoring Change: Weather Station Data

JUMP TO: [Temperature](#) [Precipitation](#) [Other](#) [Weather Stations](#)



Station: MOFFETT FEDERAL AIRFIEL CA



# Climate Explorer Receives Webby Nomination



21<sup>ST</sup> ANNUAL  
PEOPLE'S VOICE

VOTE FOR THE BEST  
OF THE INTERNET



Websites

Best Visual Design - Function

☰ Categories

🔍 Search

1<sup>ST</sup> PLACE  
32%  
Uber | Where To?  
Uber

3<sup>RD</sup> PLACE  
23%  
Bustle's "Interactive Flowcharts"  
Bustle

2<sup>ND</sup> PLACE  
25%  
Climate Explorer  
NOAA OAR/Climate Program Offic...  
Thanks for voting! Spread the word:

4<sup>TH</sup> PLACE  
10%  
Air View  
Rodolfo Agency / Burson-Marste...

5<sup>TH</sup> PLACE  
10%  
Tracking Energy Demand Trends  
The Economist Group



NEXT CATEGORY



RANDOM CATEGORY

# Cal-Adapt

Cal-Adapt

Climate Tools

Data

Resources

Blog

About

Help

## cal-adapt

Exploring California's Climate Change Research

Cal-Adapt provides a view of how climate change might affect California.

<http://beta.cal-adapt.org/>

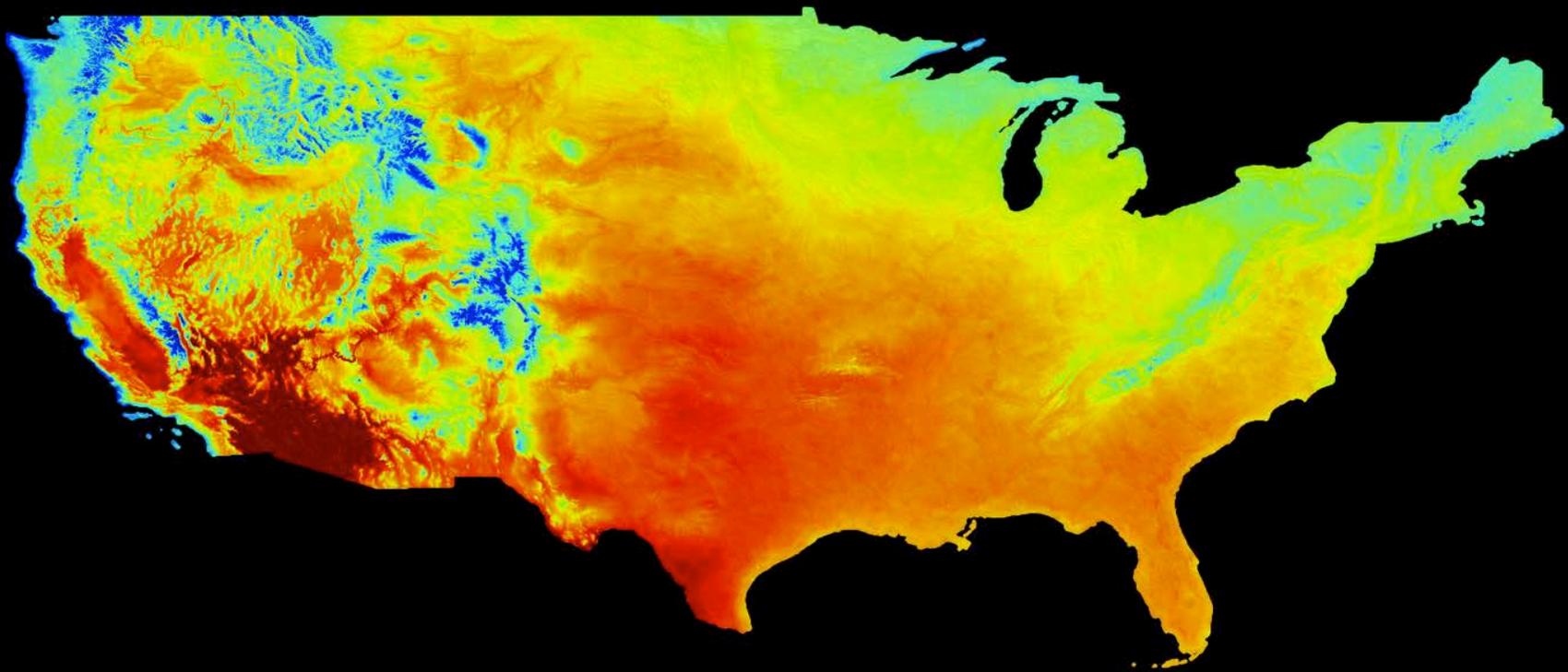


## Snowpack

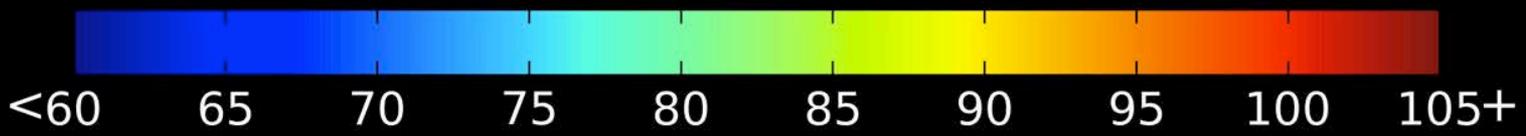
Projected monthly Snow Water Equivalence (amount of water contained within the snowpack).



# Questions?



July, 2100



Average Daily Max Temperature ( ° F )  
Lowest Greenhouse Gas Concentration Pathway