



**UCLA Climate Research Lounge**

# What Climate Change Means for LA: What's Coming and What Choices We Face

**Alex Hall**

October 23, 2013



# Road Map

1. Climate modeling
2. The Climate Change in the LA Region Project
3. LA climate projections
4. What they mean for LA
5. The road ahead



Starting



The climate of Los Angeles

defines the city

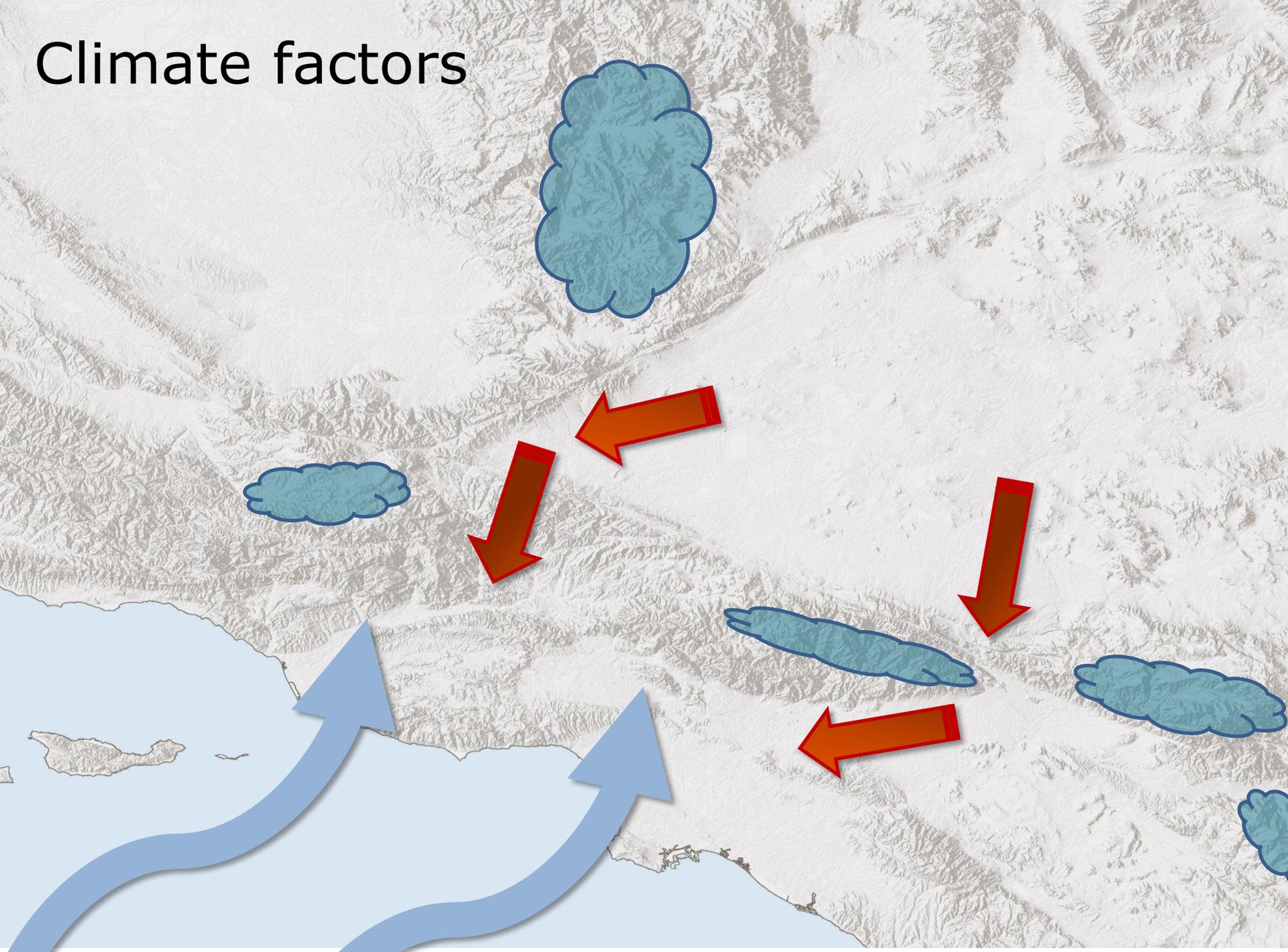


Starting



The climate of LA is complex

# Climate factors



Starting

# Climate change is coming to us



Hotter temperatures



Larger wildfires?

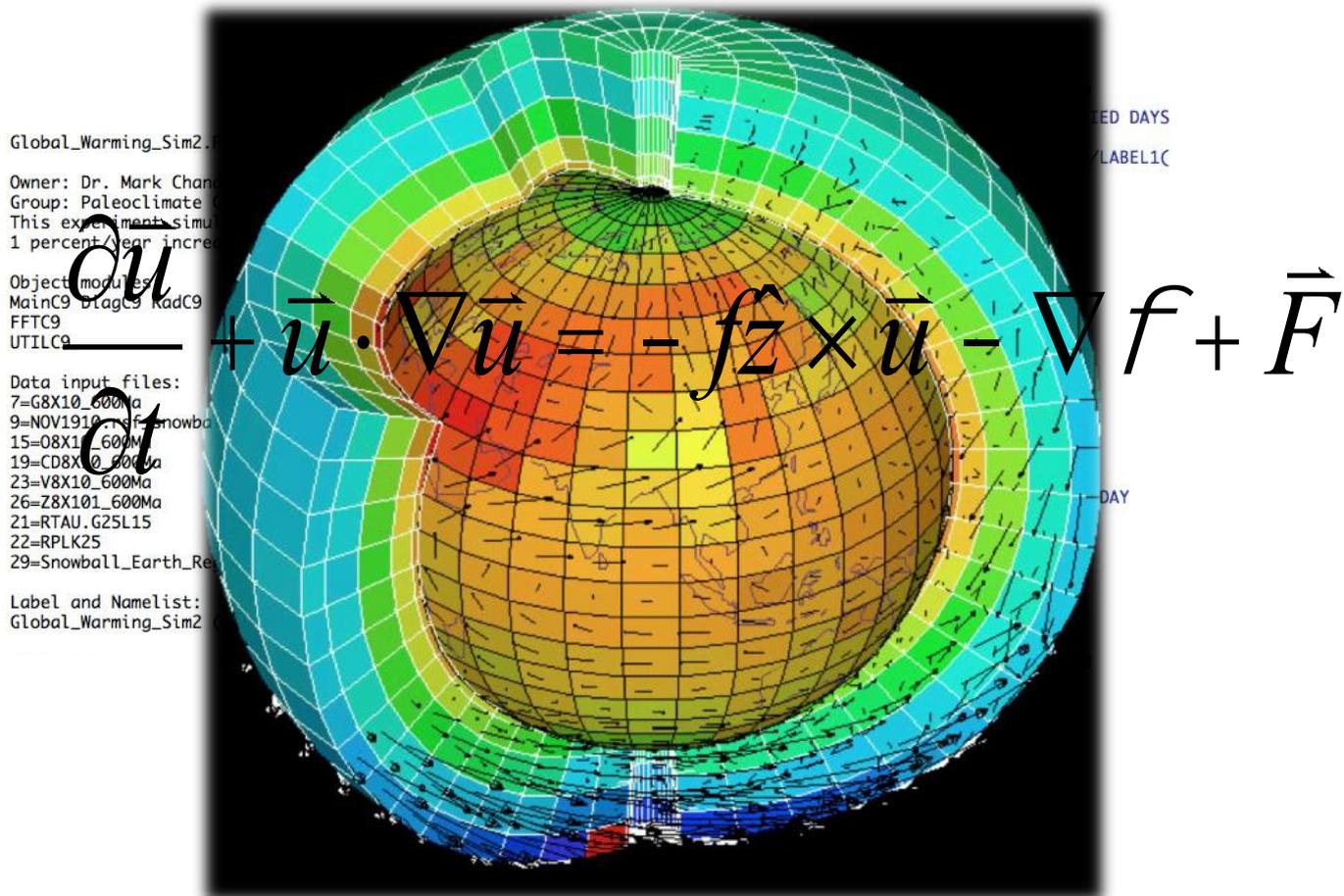


Less water?

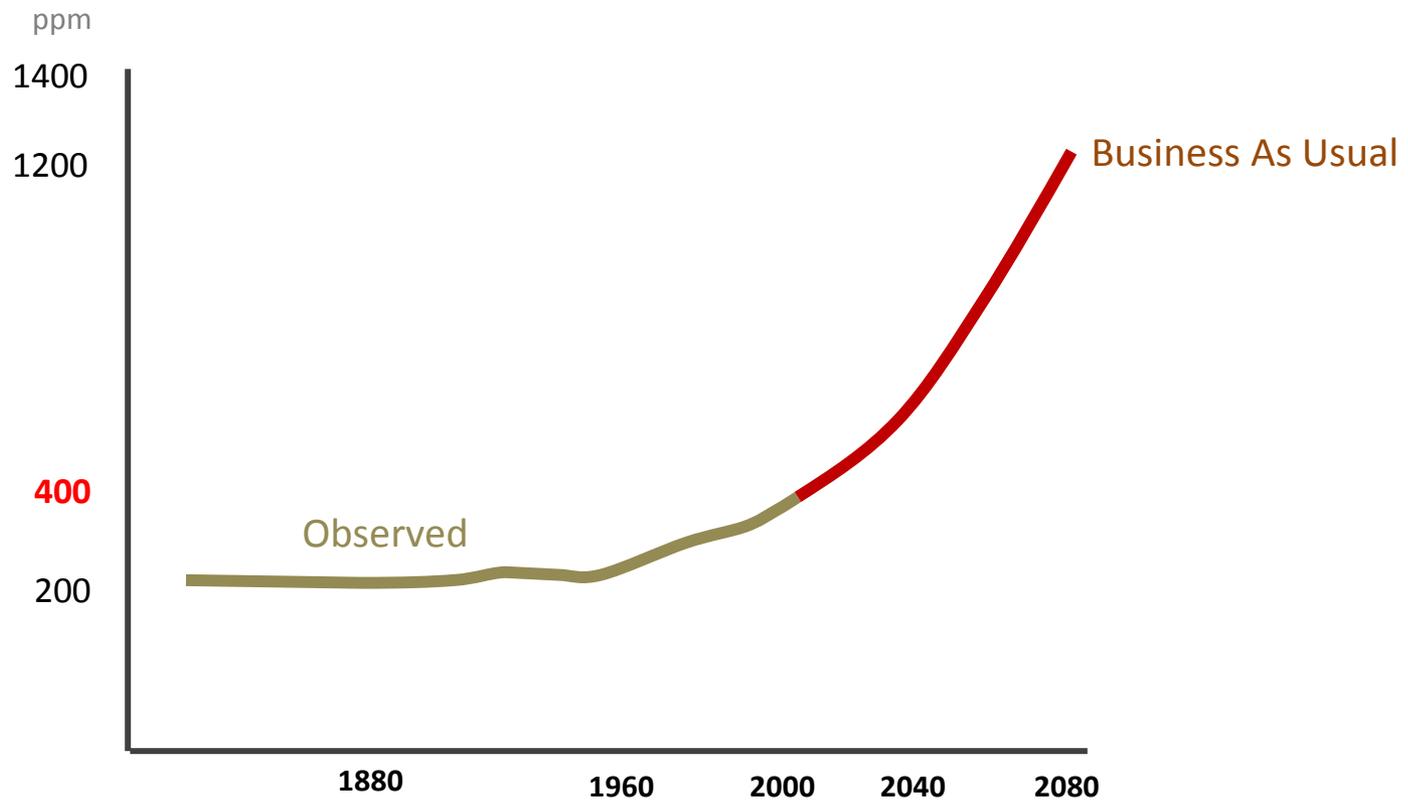
# 1. Climate Models



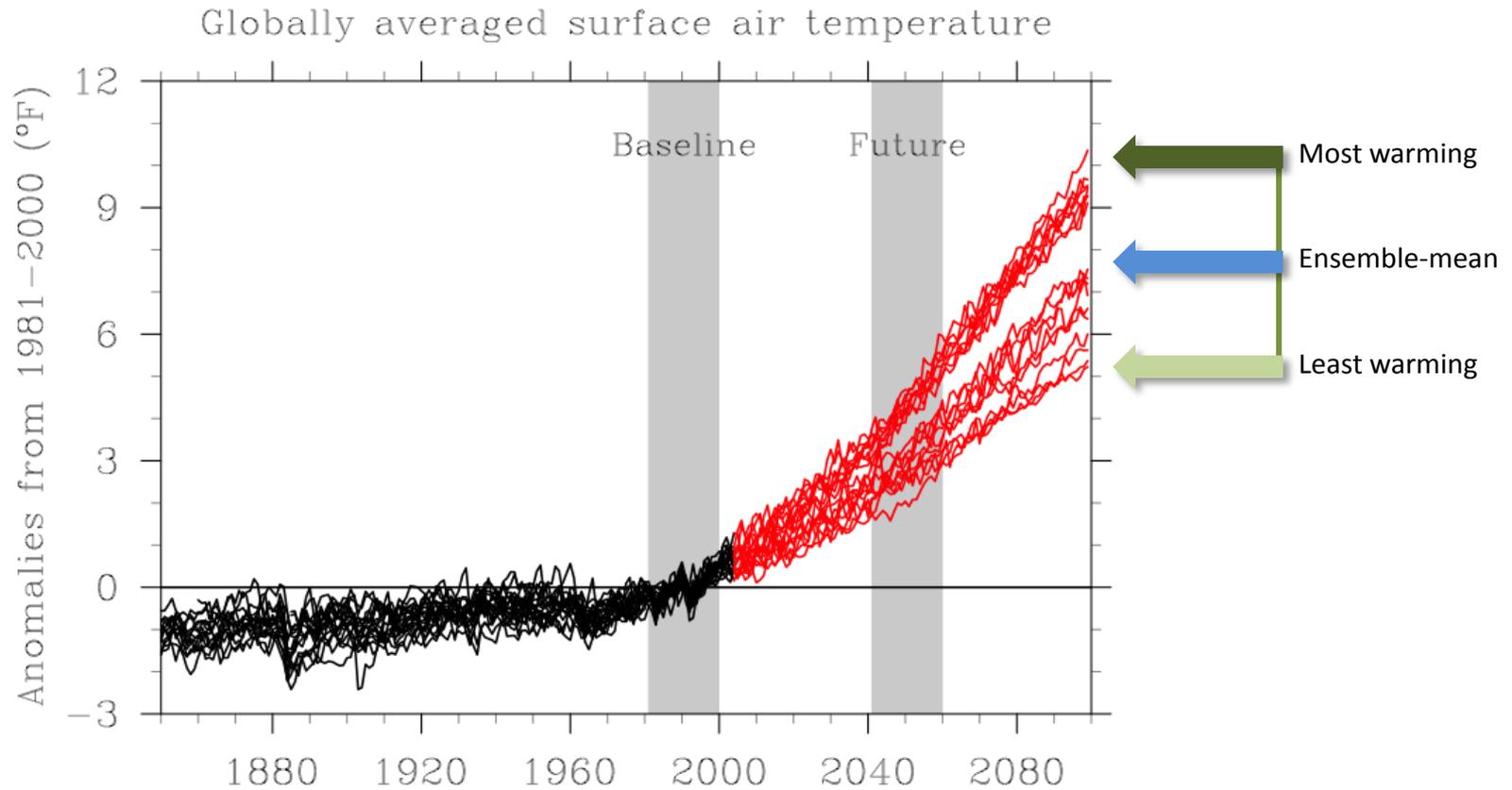
# What is a climate model?



## We can specify greenhouse gas concentration



# Caveats about global climate models





**Ventura**

**San Fernando  
Valley**

**Palmdale**

**Santa Monica**

**Downtown LA**

**Long Beach**

**San Bernardino**

# The scientific challenge

- Bring global models to scale. How to zoom in on Los Angeles region?
- Account for different outcomes among the global climate models.

# 2. The Climate Change in LA Project



Neil Berg



Florent Brient



Scott Capps



Jerry Huang



Alexandre Jousse



Mark Nakamura



Xin Qu



Katharine Reich



Marla Schwartz



Fengpeng Sun



Daniel Walton





**Ventura**

**San Fernando  
Valley**

**Palmdale**

**Santa Monica**

**Downtown LA**

**Long Beach**

**San Bernardino**



Burbank

Sherman Oaks

Glendale

Pasadena

Hollywood

Downtown LA

Santa Monica

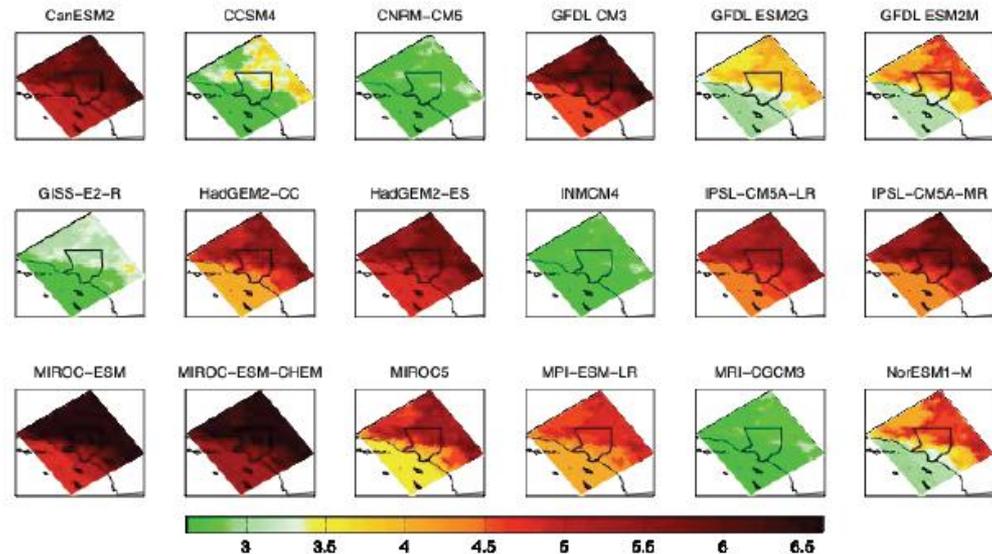
Culver City

South  
Los Angeles

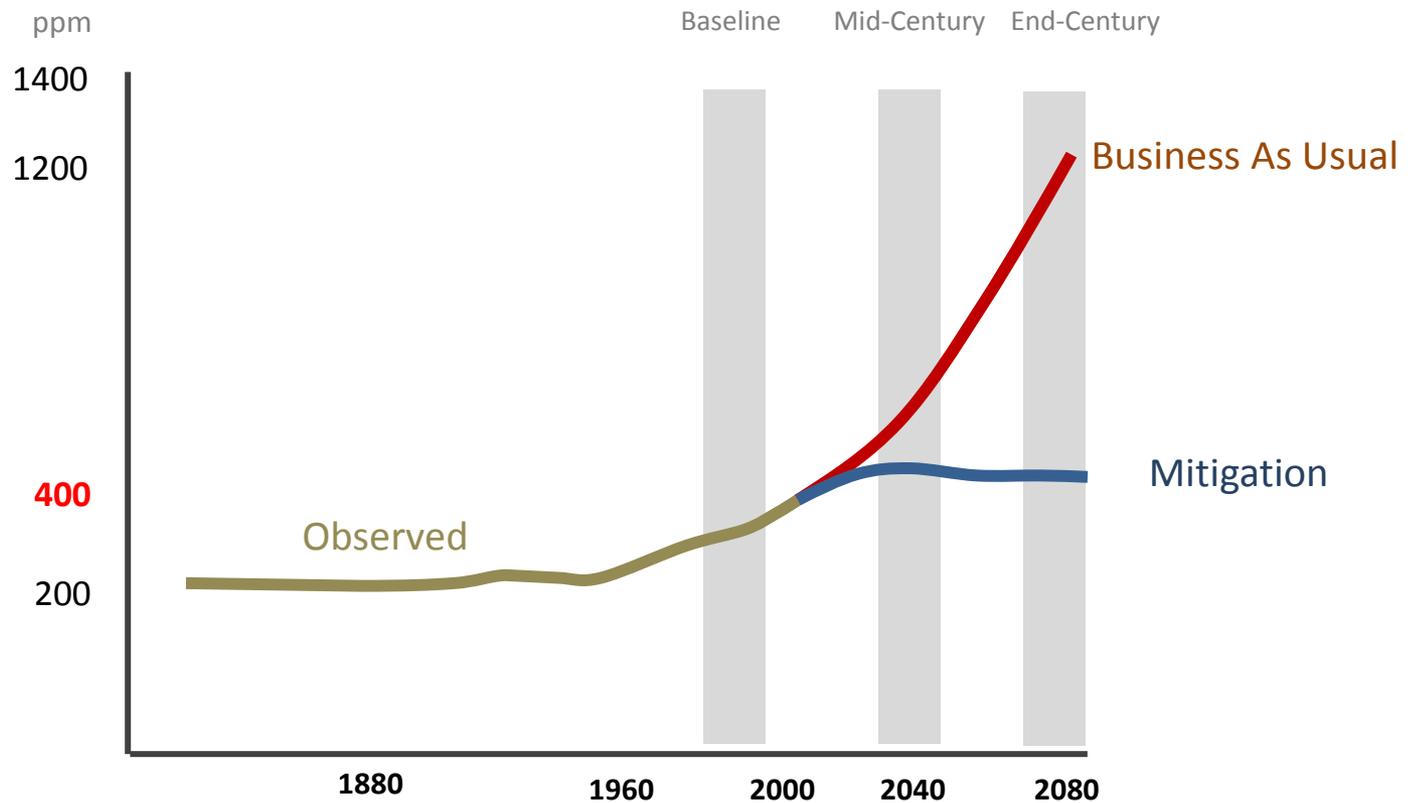
Inglewood

Downey

We applied **~30 global climate models** to the Los Angeles region



# We projected **future climate** for 2 scenarios



We looked at **key elements** of climate



Temperature



Precipitation



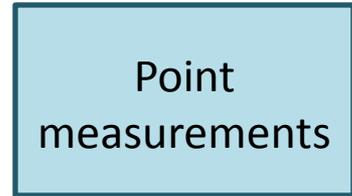
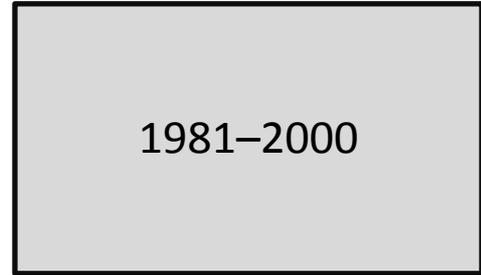
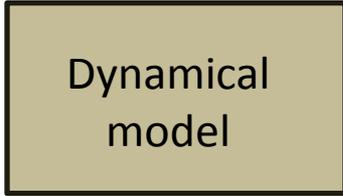
Snowfall



Fire

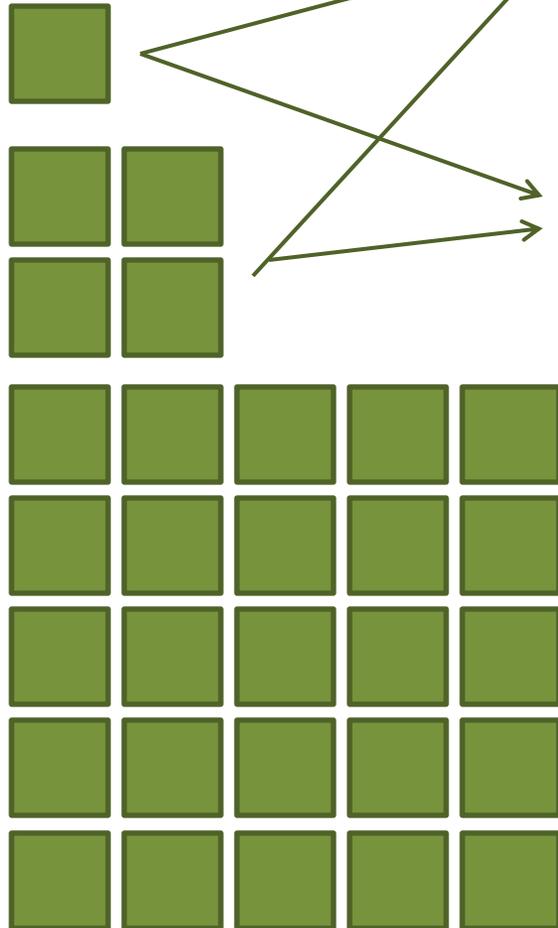
# Our process

Large-scale atmospheric data



# Our process

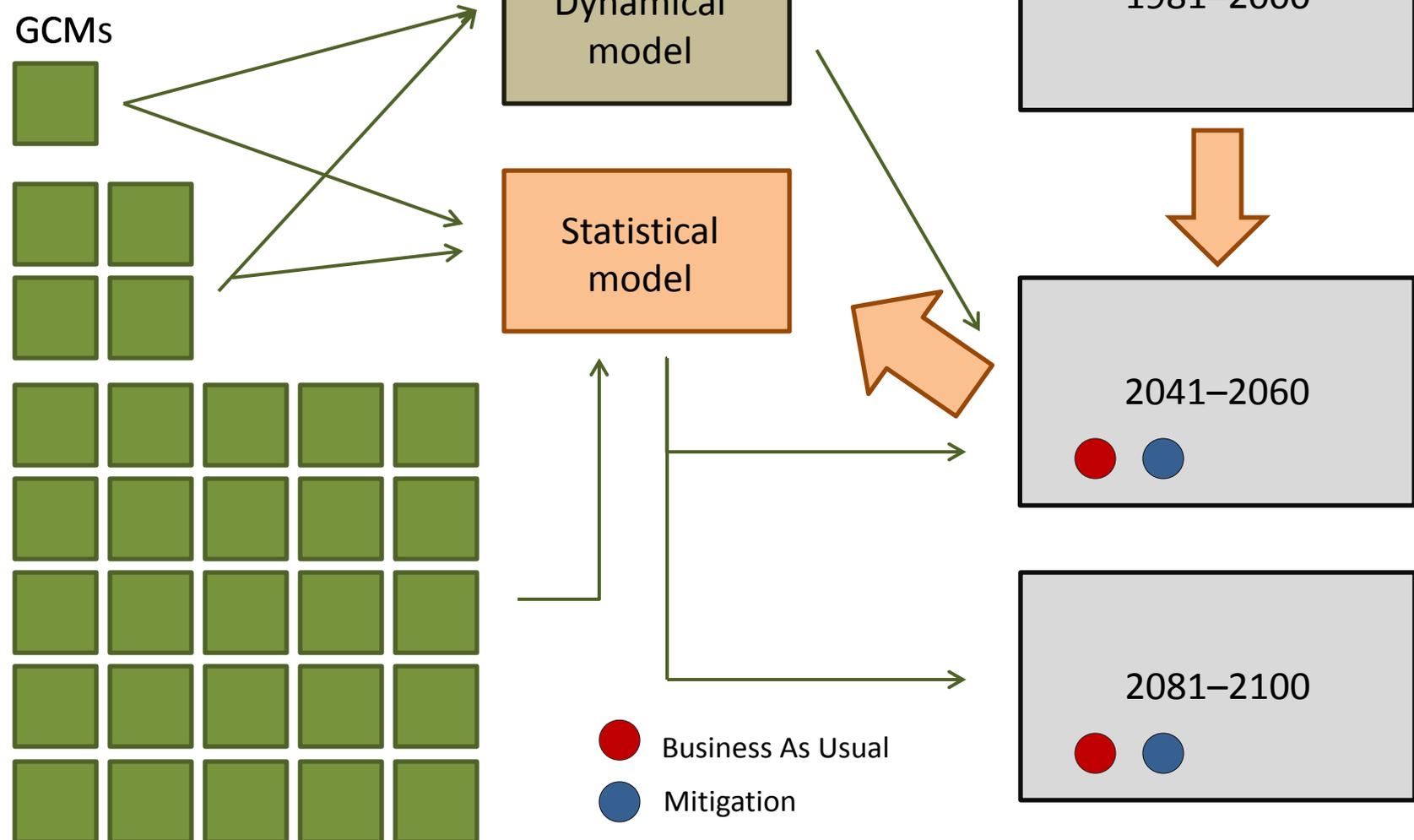
GCMs

Dynamical  
modelStatistical  
model

1981–2000

2041–2060

2081–2100

 Business As Usual Mitigation

# 3. LA Climate Projections

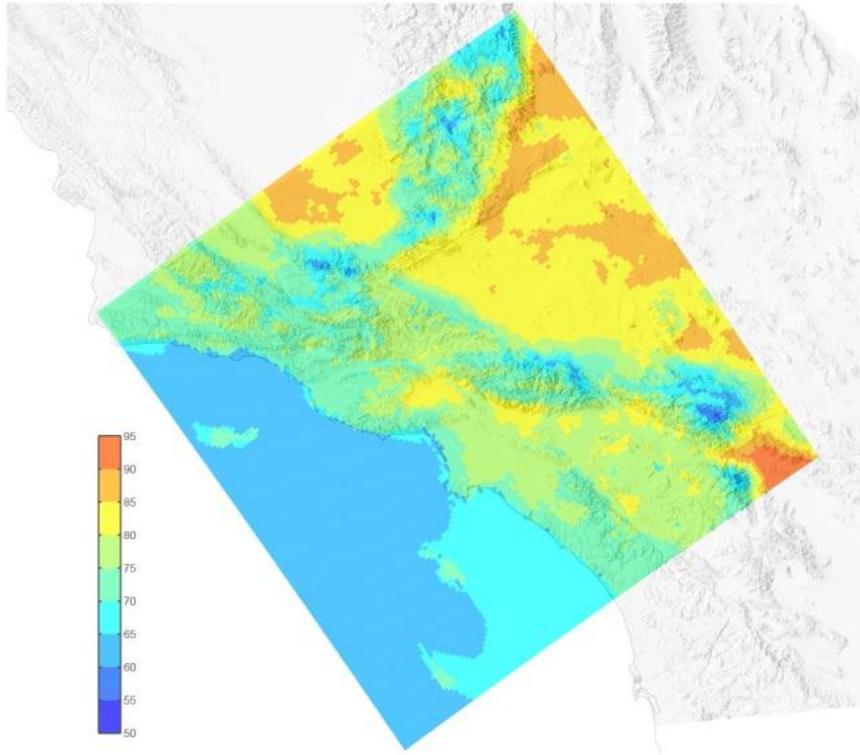


LA Projections

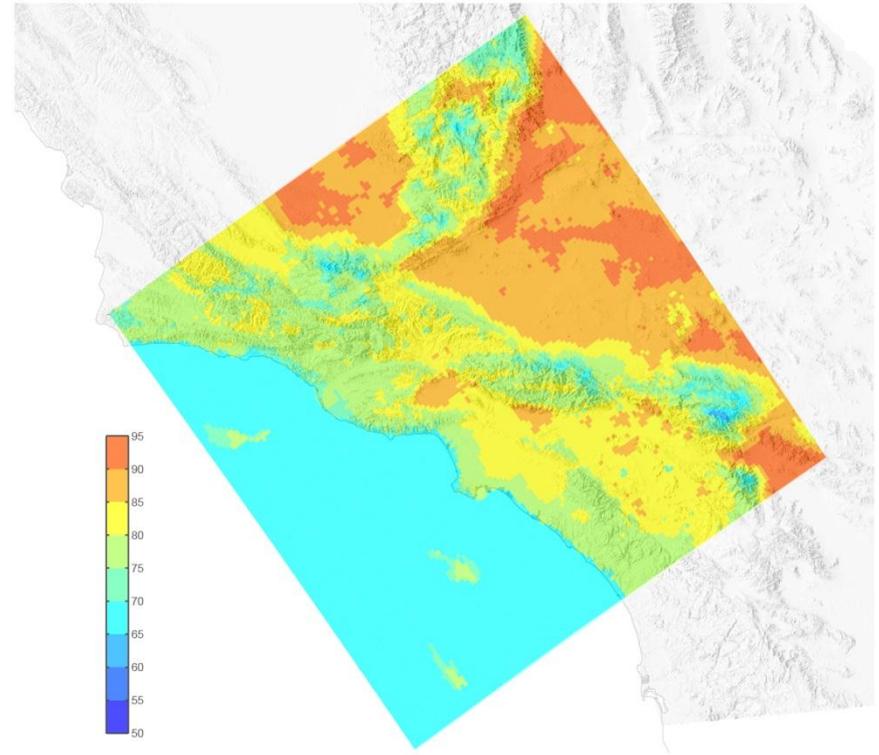


Temperature

Average August Temperature  
1981-2000



Average August Temperature  
2041-2060: **Business As Usual**

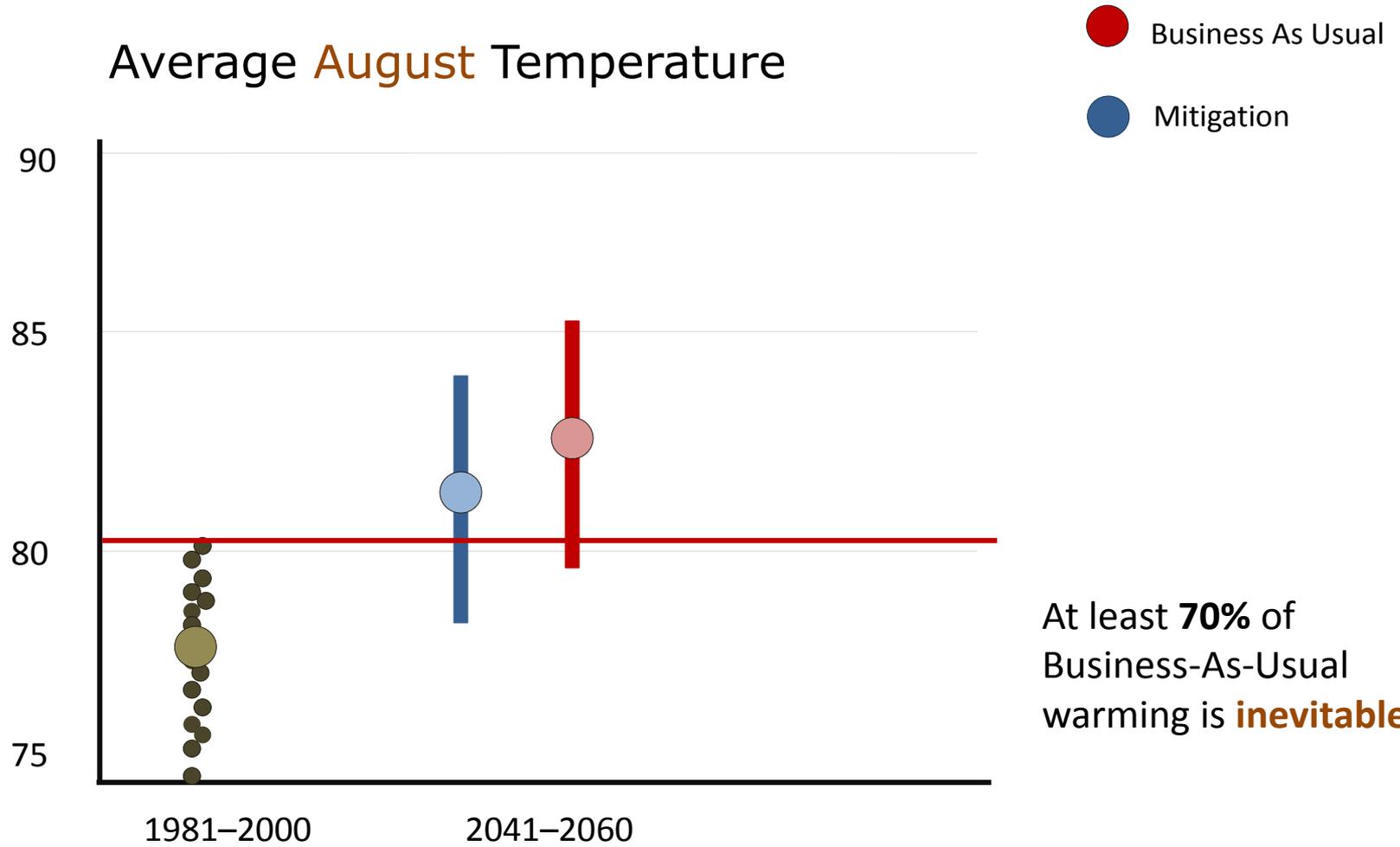


LA Projections



Temperature

# Average August Temperature



At least **70%** of Business-As-Usual warming is **inevitable**

## LA Projections

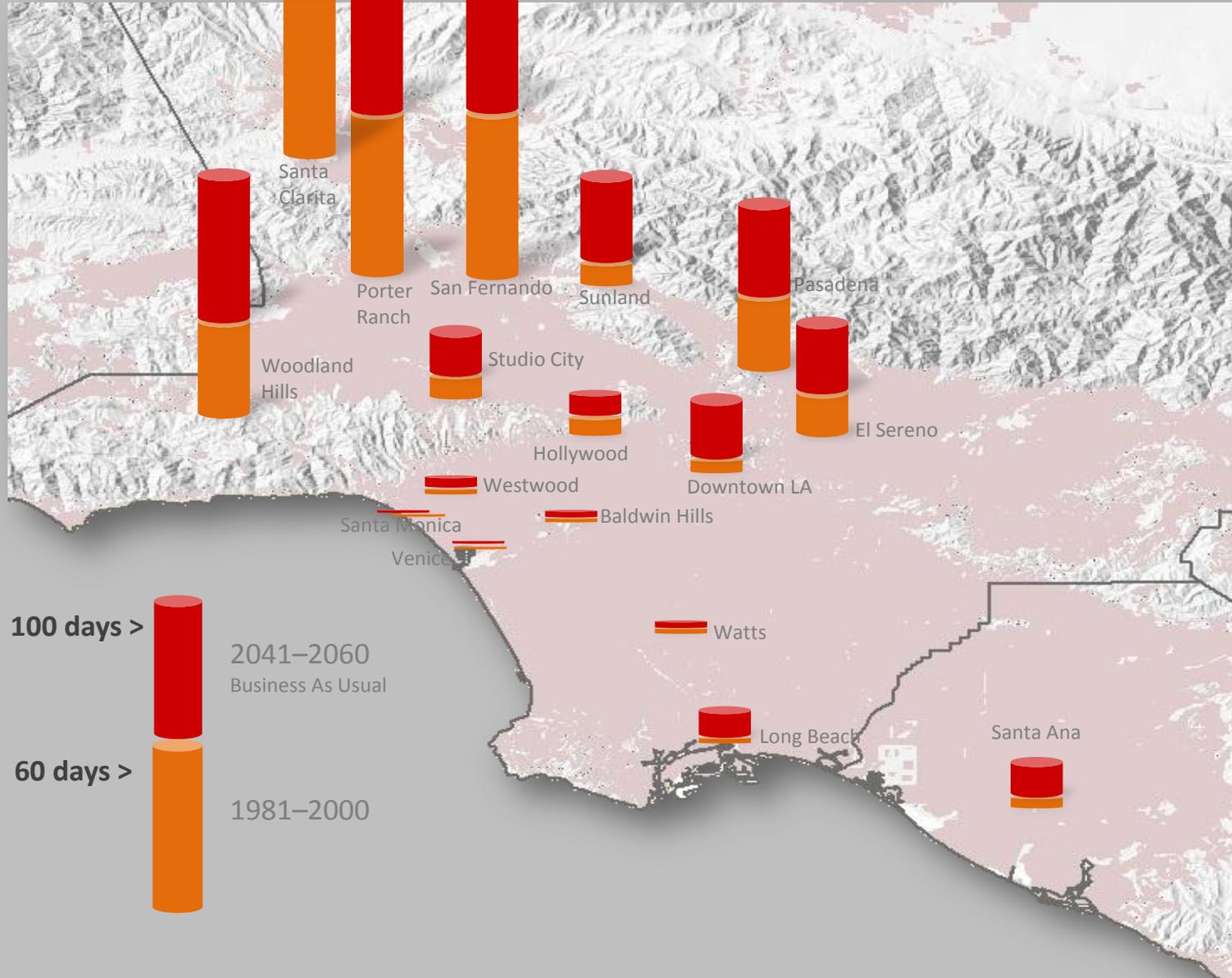


## Temperature

The number of very hot days  
( $>95^{\circ}$ ) will **increase**



# Very Hot Days Per Year

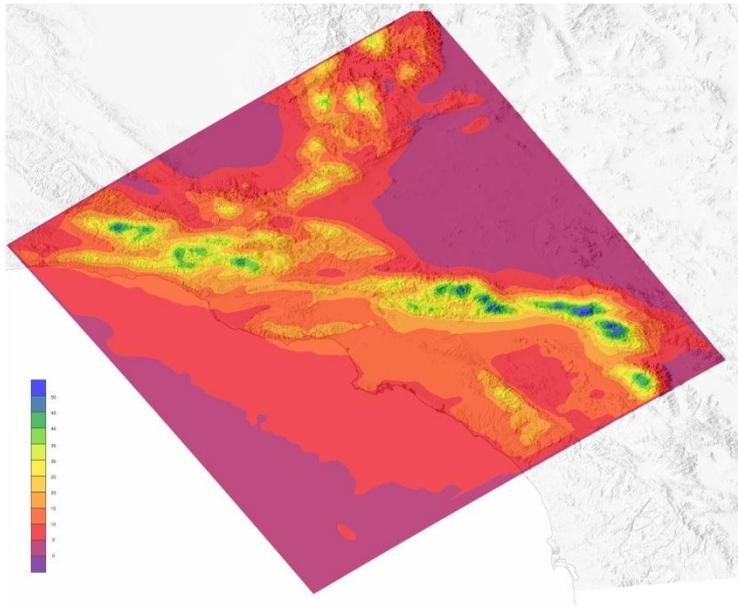




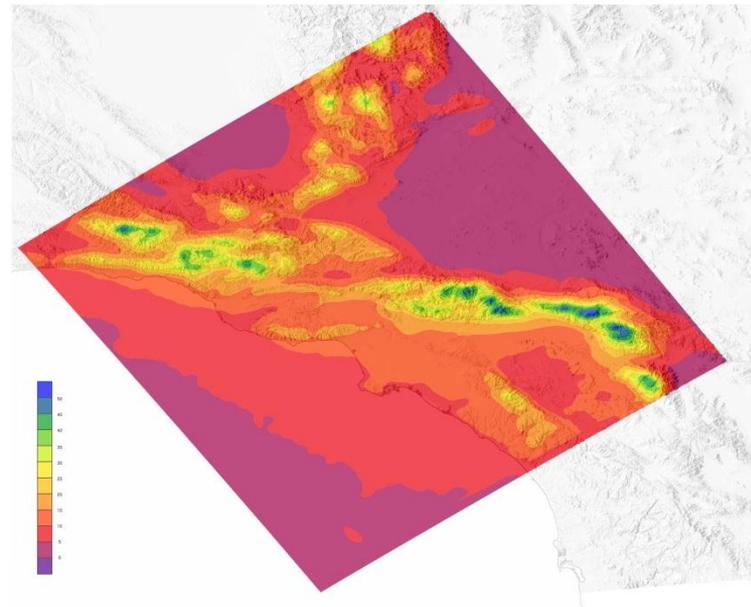
## Precipitation

# Little change in precipitation by mid-century\*

Average Dec–Mar Precipitation  
1981–2000



Average Dec–Mar Precipitation  
2041–2060: **Business As Usual**



\*Results are preliminary



## Precipitation

But other factors affect **water resources**

- Snowpack
- Evaporation
- Streamflow



## Snowfall

# Snow in the LA region



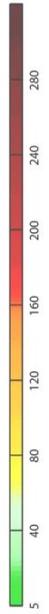
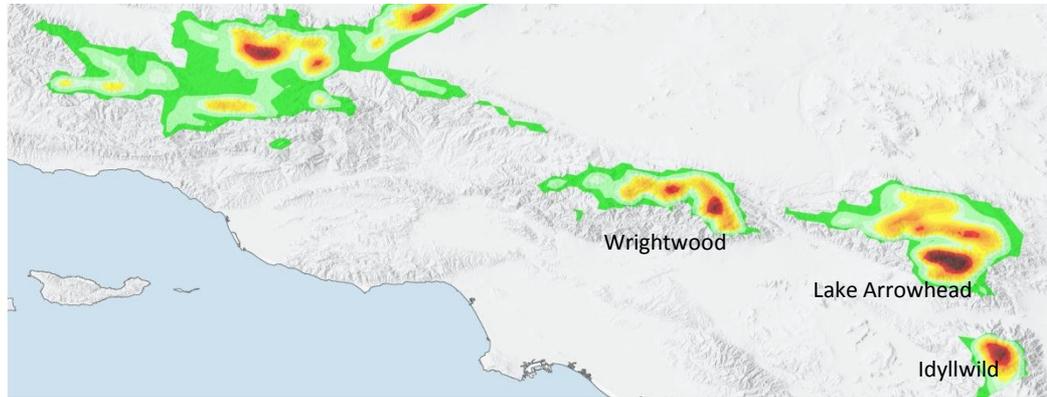


Snowfall

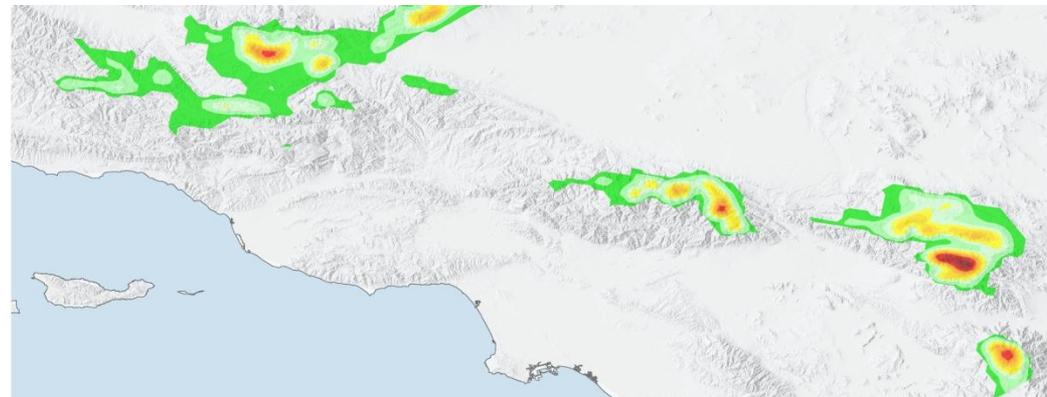
LA Projections

# Average Annual Snowfall

1981–2000



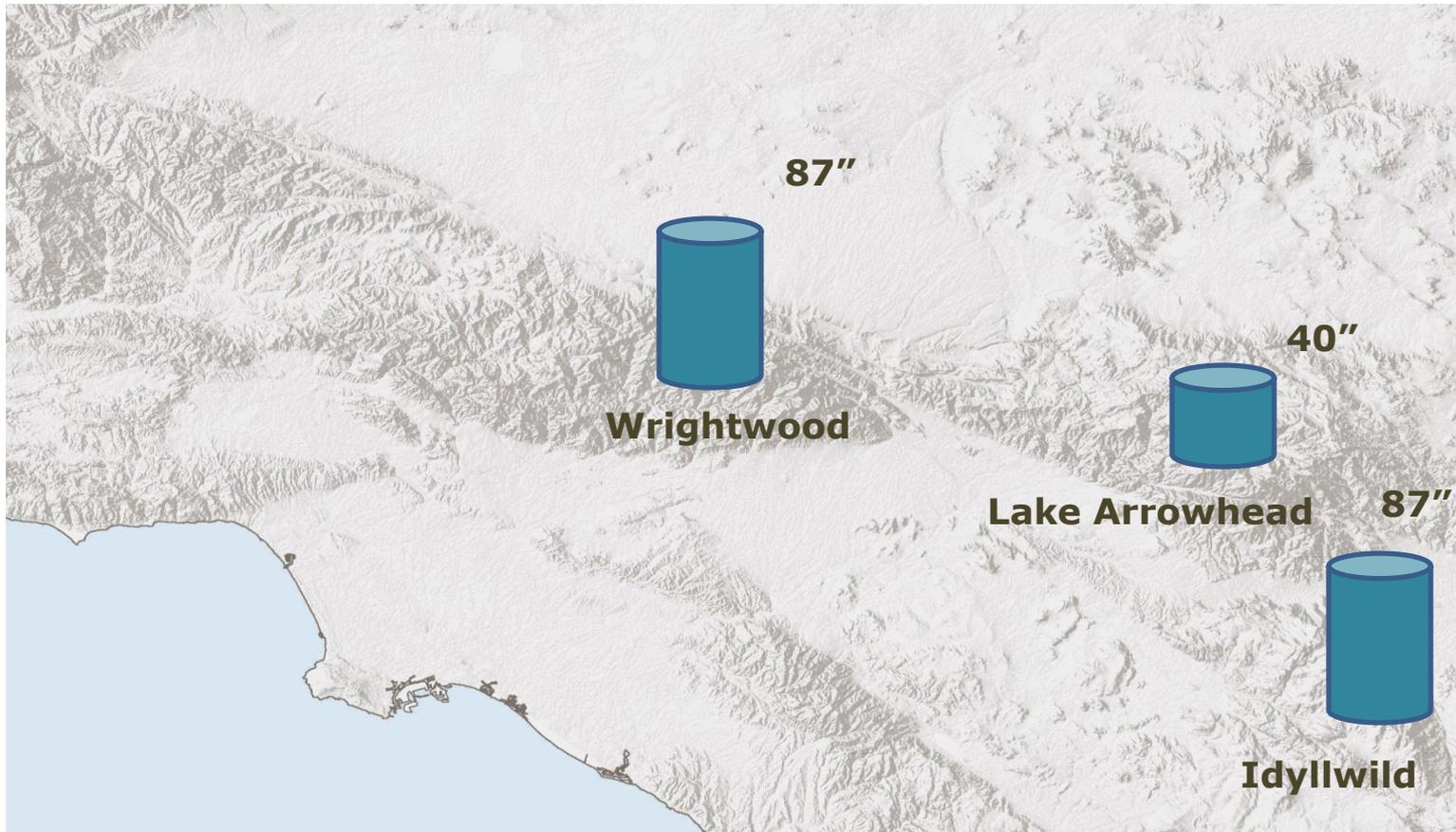
2041–2060  
**Business As Usual**





Snowfall

**Baseline Annual Snowfall**



LA Projections



Snowfall

**Mid-Century**

**Business As Usual**



LA Projections



Snowfall

Mid-Century

Mitigation



**Fire**

October 2007 Fires

**Summer** fires: high temperatures, low humidity

**Fall** fires: Santa Ana winds

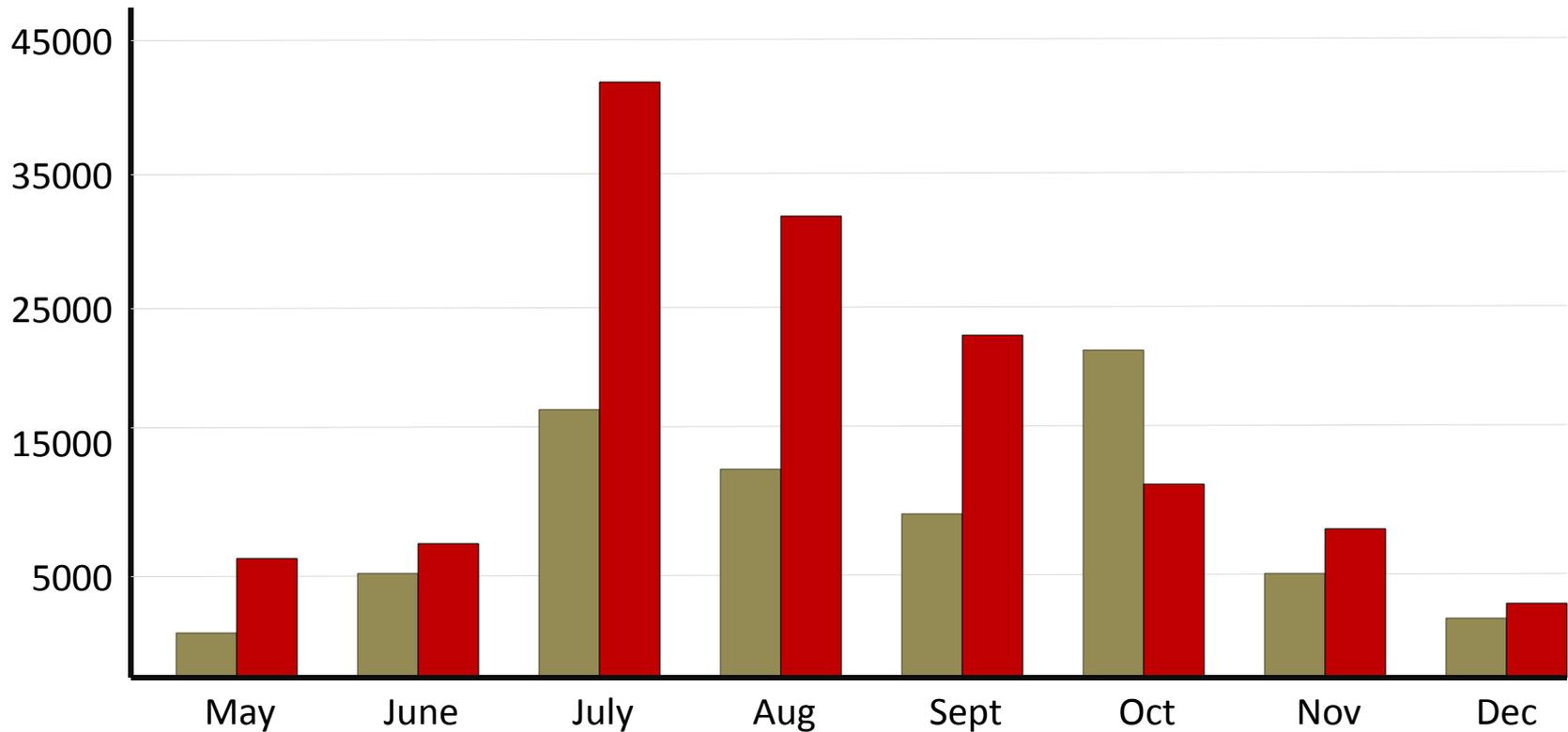


2009 Station Fire

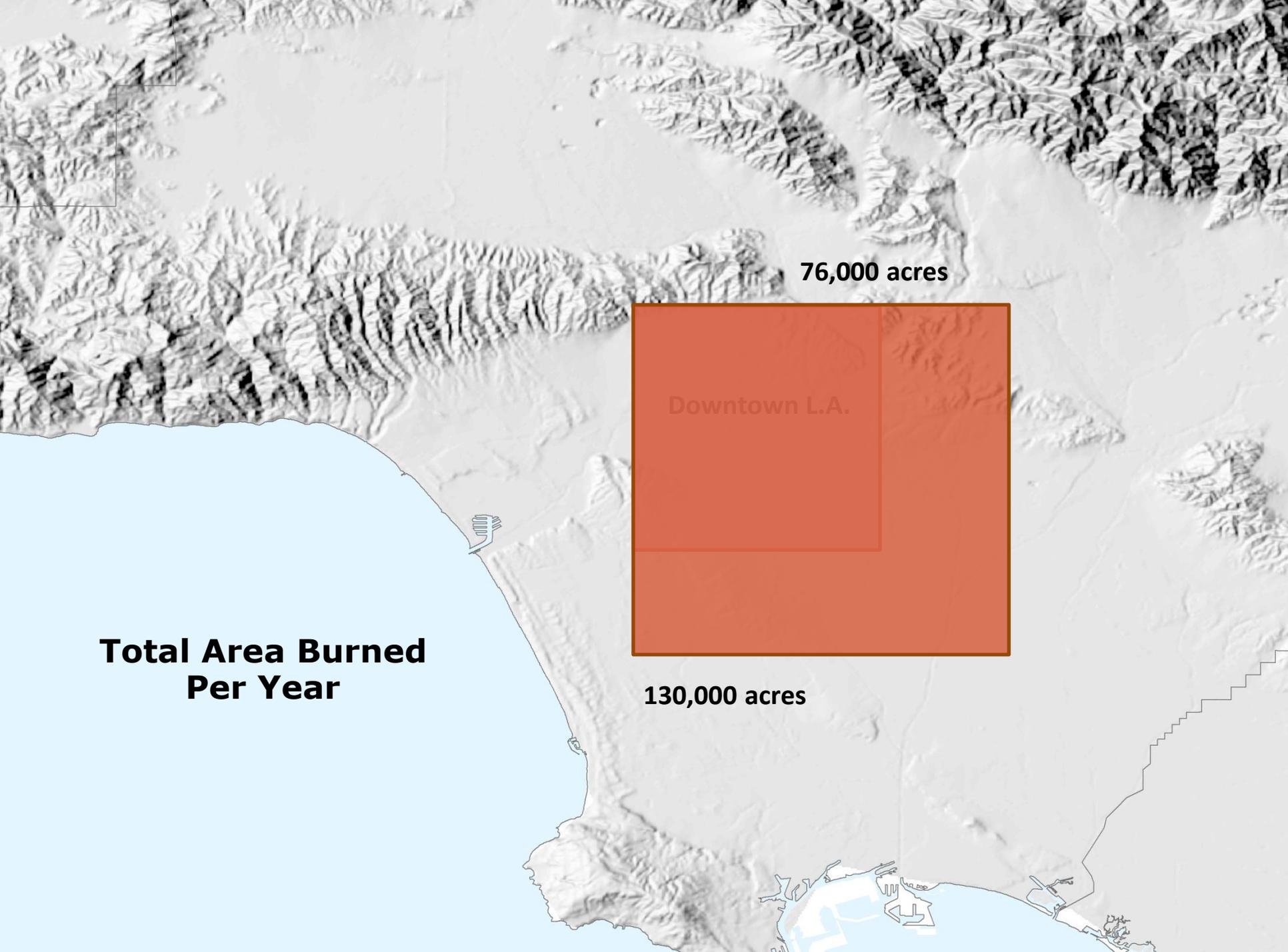
## LA Projections

**Fire****Acres Burned by Wildfires\***

- 1981–2000
- 2041–2060  
Business As Usual



\*Preliminary results from fire study conducted in collaboration with Yufang Jin and Jim Randerson at UC Irvine



**Total Area Burned  
Per Year**

**76,000 acres**

**Downtown L.A.**

**130,000 acres**

# 4. What Does All This Mean for LA?



# Adaptation is inevitable.

**Temperatures**



**Snow**



**Water resources**



**Ecosystem effects**



**Sea level rise**



**Fire**



4

Means for LA?

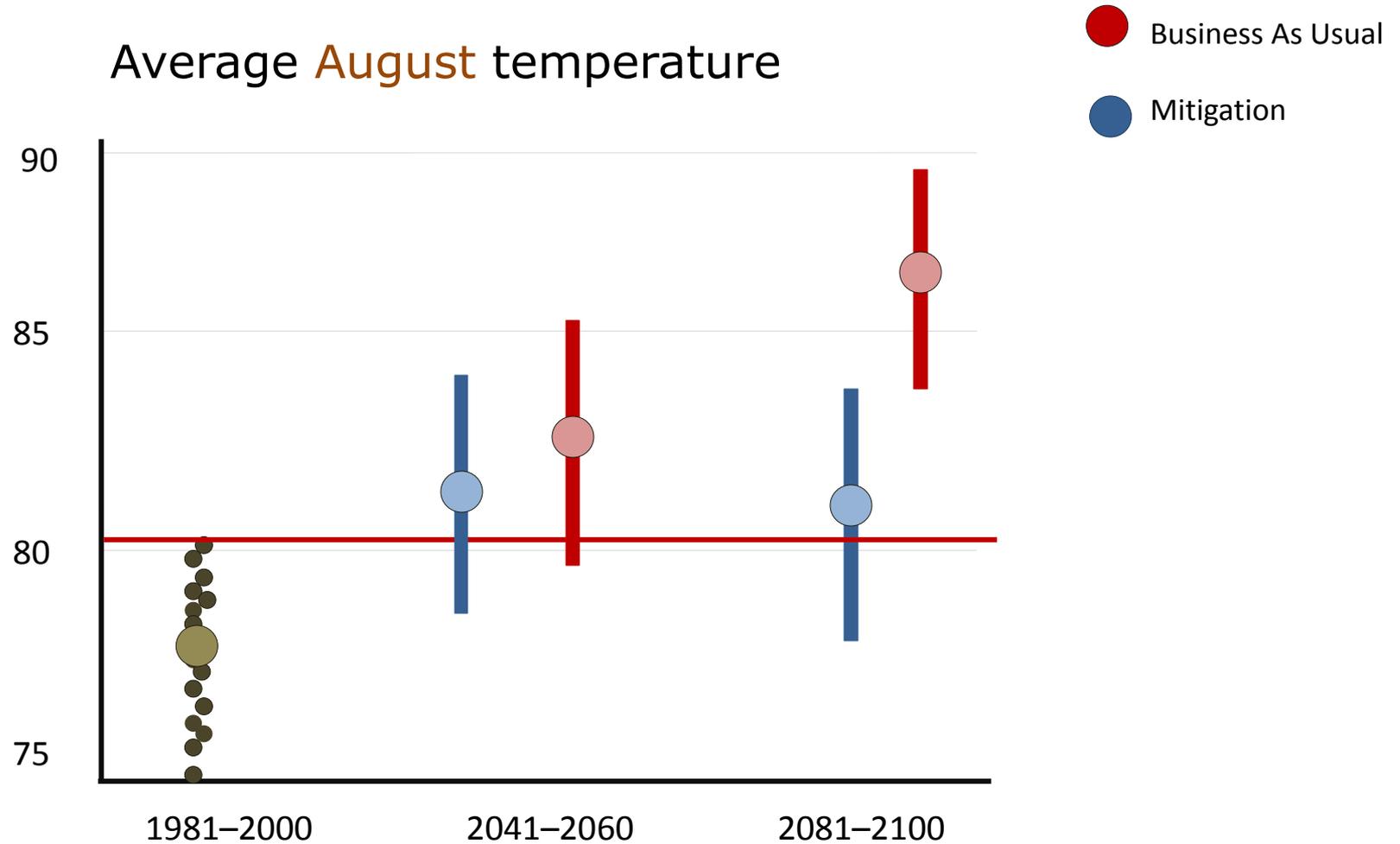
But is adaptation **enough?**



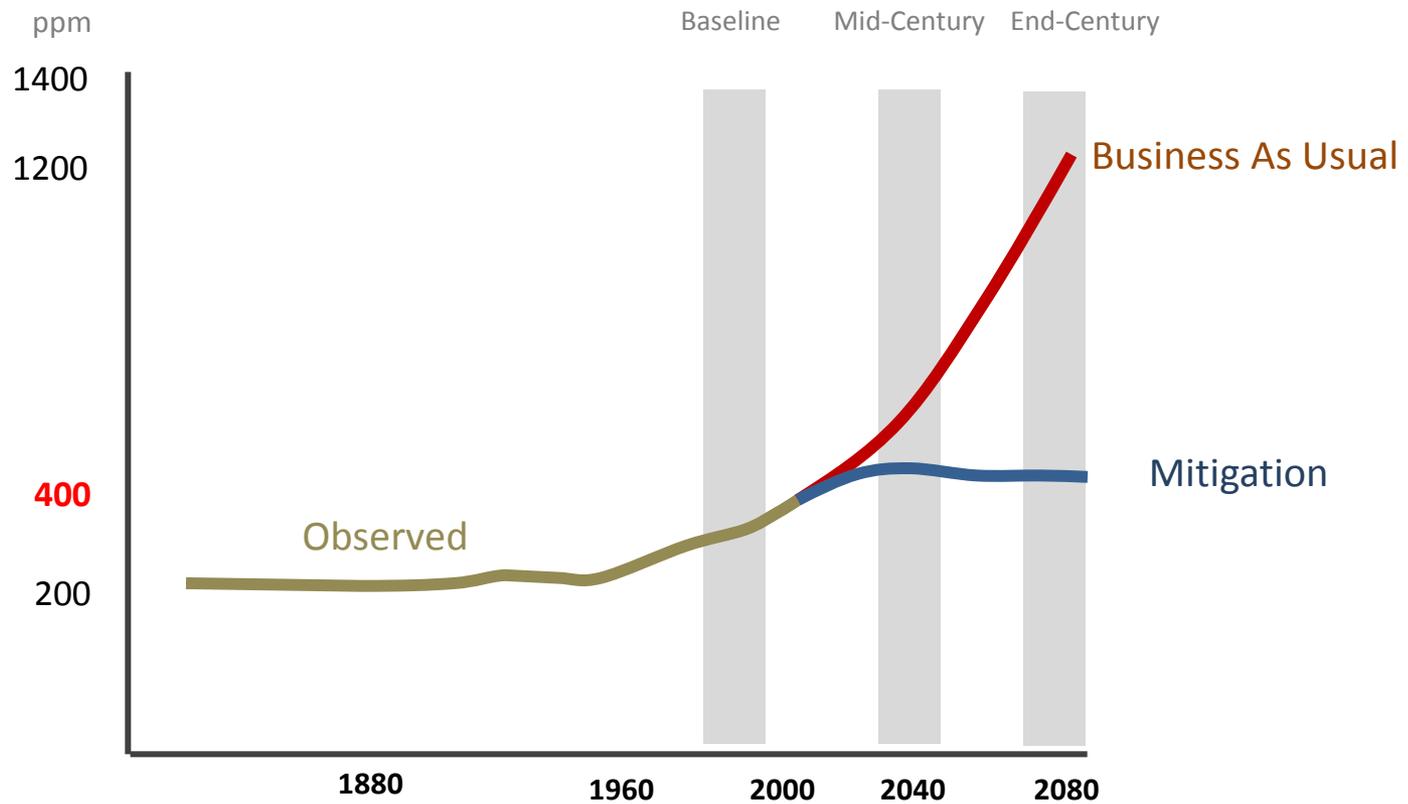


## Temperature

## Average August temperature



## Our actions matter.



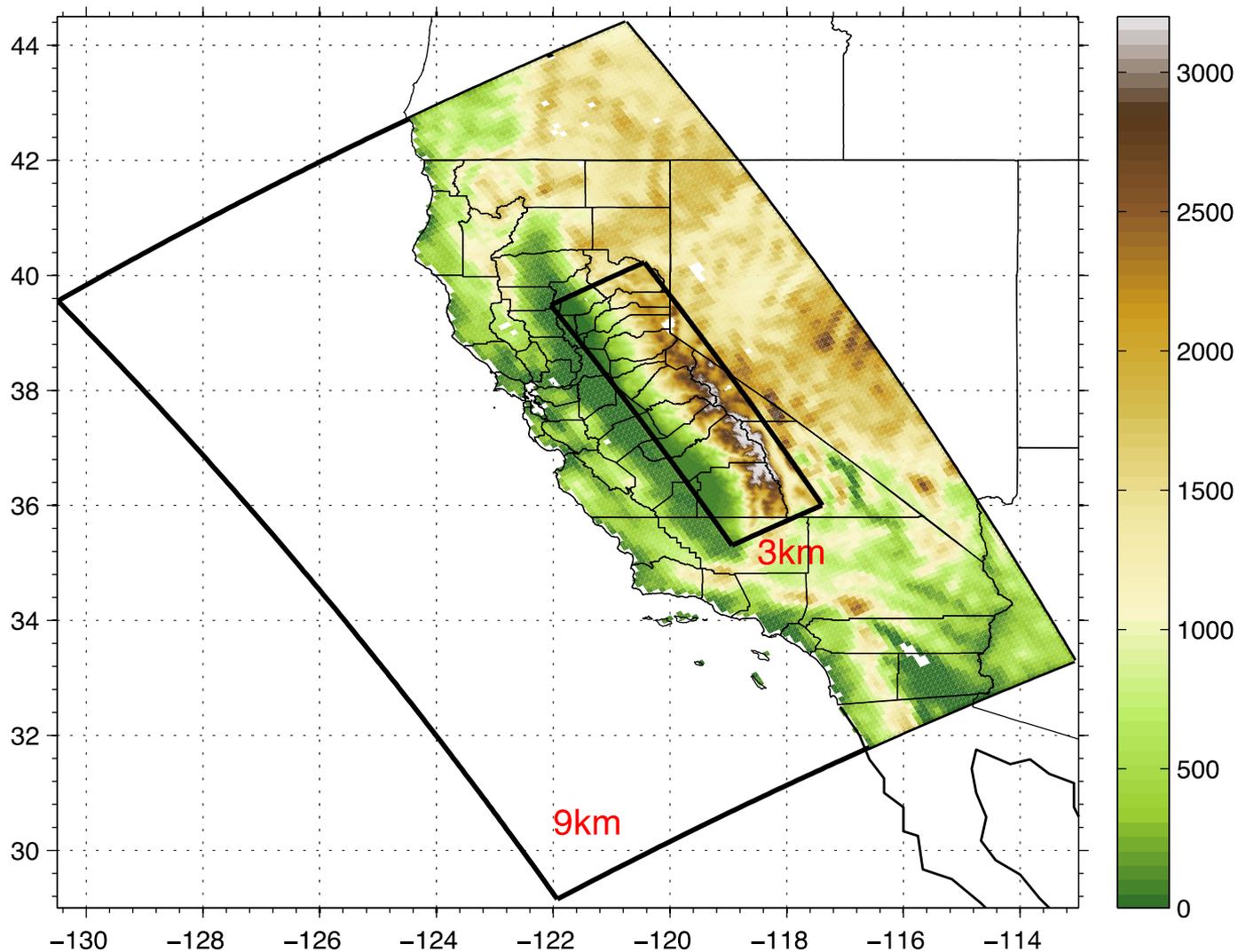
# 5. The Road Ahead



## Future **research**

- Analyze evaporation, streamflow, and other factors affecting **water resources** in LA
- Conduct downscaling study for the rest of California and the **Sierra Nevada**
- Quantify likely impacts on **air quality** and public health

# Climate Change Projections in the Sierra Nevada Project

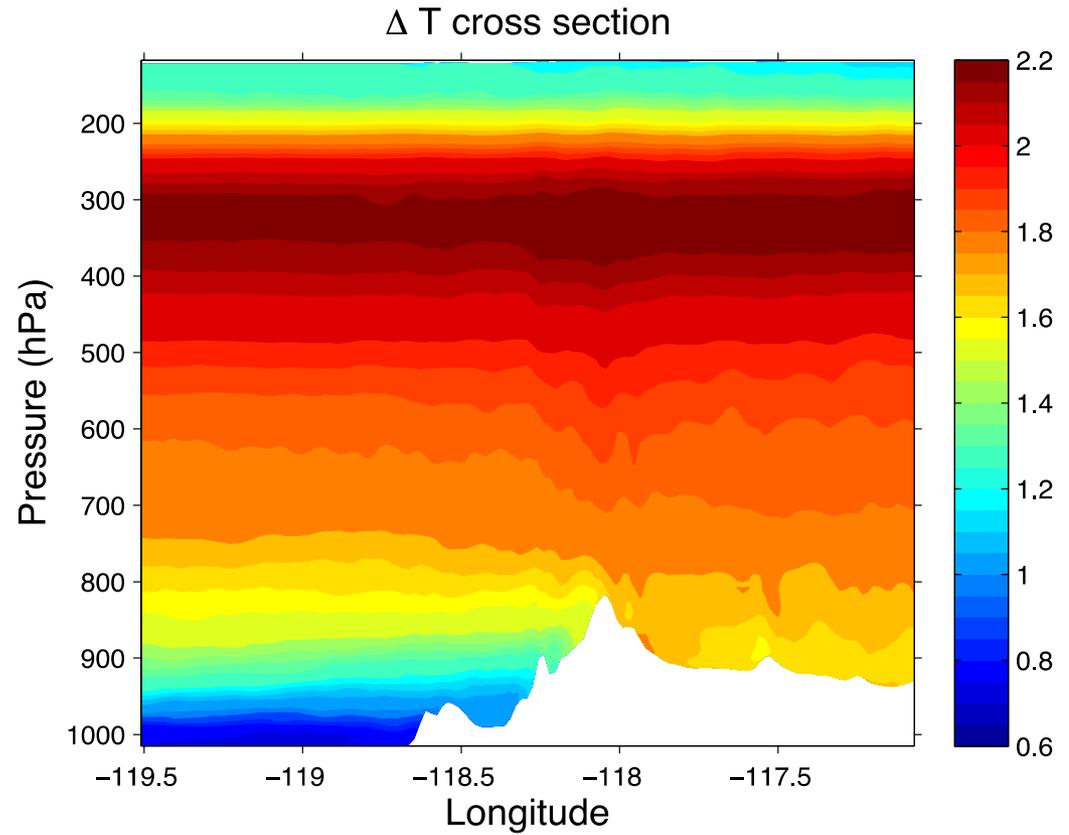


## Climate change and **air quality**

- Chemical reactions are affected by rising temperatures, potentially leading to worse air quality
- Climate change is associated with stronger inversions, trapping pollution



The temperature inversion  
**strengthens** in the future



## Putting regional modeling to **work**

- Create ways for policymakers and the public to interact with and **use our data**
- Bring this scientific understanding and conversation to **other cities**



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For more on the Climate Change  
in LA Project:

**C-CHANGE.LA**



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**Thank You**



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